

**REPORT NUMBER: R&D-CAL-15-009**

**VEHICLE TO FRONTAL BARRIER CRASH TEST IN SUPPORT OF NHTSA'S  
FRONTAL RESEARCH PROGRAM**

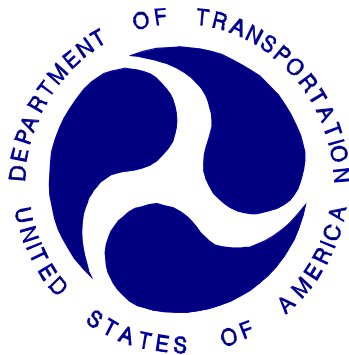
**2016 Chevrolet Tahoe**

**56.3 KPH RIGID BARRIER FRONTAL**

**TEST DATE: 1/15/2016**

**NHTSA No: M20160118**

**CALSPAN CORPORATION  
TRANSPORTATION TEST OPERATIONS  
P.O. BOX 400  
BUFFALO, NEW YORK 14225**



**FINAL REPORT SUBMITTED:**

**May 2, 2016**

**PREPARED FOR:**

**U. S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Vehicle safety Research  
1200 New Jersey Ave, SE  
Room W46-446  
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Prepared by: Vanessa Hansen  
Vanessa Hansen, Test Engineer

Date: May 2, 2016

Approved by: Edward J. Dutton  
Edward J. Dutton, Operations Manager  
Transportation Test Operations

Date: May 2, 2016

FINAL REPORT ACCEPTANCE BY VEHICLE SAFETY RESEARCH, OFFICE OF  
STRUCTURAL AND RESTRAINTS RESEARCH DIVISION:

\_\_\_\_\_  
Date: \_\_\_\_\_

\_\_\_\_\_  
TOM, Vehicle Crash Testing  
NHTSA, Office of Structures and Restraints Research  
Date: \_\_\_\_\_



# **TECHNICAL REPORT STANDARD TITLE PAGE**

| <b>1. Report No.</b><br>R&D-CAL-15-009                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>2. Government Accession No.</b>                       |                         | <b>3. Recipient's Catalog No.</b>                                                                                                                                                                                   |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
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| <b>4. Title and Subtitle</b><br>Report for Frontal Research Program<br>Testing of a 2016 Chevrolet Tahoe SUV<br>NHTSA No.: M20160118                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                          |                         | <b>5. Report Date</b><br>5/2/2016                                                                                                                                                                                   |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
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| <b>7. Author(s)</b><br>Vanessa Hansen, Test Engineer<br>Edward Dutton, Operations Manager                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                          |                         | <b>8. Performing Organization Report No.</b><br>CAL-DOT-2015-009                                                                                                                                                    |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| <b>9. Performing Organization Name and Address</b><br>Calspan Corporation<br>4455 Genesee Street<br>Buffalo, New York 14225                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                          |                         | <b>10. Work Unit No.</b>                                                                                                                                                                                            |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
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| <b>12. Sponsoring Agency Name and Address</b><br>U.S. Department of Transportation<br>National Highway Traffic Safety Administration<br>Office of Vehicle Safety Research<br>1200 New Jersey Ave SE, Room W46-446<br>Washington, DC 20590                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                          |                         | <b>13. Type of Report and Period Covered</b><br>Final Report, 5/2/2016                                                                                                                                              |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
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| <b>15. Supplementary Notes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                         |                                                                                                                                                                                                                     |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| <b>16. Abstract</b><br><p>A test was conducted in accordance with Contract DTNH22-14-D-00359 Task Order 0002. The test consisted of a 2016 Chevrolet Tahoe SUV traveling at a target speed of 56.3 kph into a stationary flat frontal barrier wall. The test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at the Calspan Corporation's Transportation Test Operation's facility in Buffalo, New York on January 15, 2016. The vehicle's impact velocity was 56.48 KPH and the ambient temperature at the test vehicle at the time of impact was 21°C. The target vehicle post-test maximum crush was 720 mm. The test vehicle's occupant performance was as follows:</p> <table border="1"> <thead> <tr> <th>Measurement Description</th> <th>Units</th> <th>Driver</th> <th>Front Passenger</th> <th>Rear Passenger</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>15</sub>)</td> <td>N/A</td> <td>374.03</td> <td>204.85</td> <td>578.55</td> </tr> <tr> <td>Brain Injury Criterion (BrIC)</td> <td>N/A</td> <td>0.69</td> <td>0.87</td> <td></td> </tr> <tr> <td>Abdomen Deflection</td> <td>mm</td> <td>-57.43</td> <td></td> <td></td> </tr> <tr> <td>Resultant Acetabulum Force</td> <td>N</td> <td>2007.42</td> <td></td> <td></td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>-54.14</td> <td>-19.92</td> <td>-44.96</td> </tr> <tr> <td>Neck Injury Criteria (Nij)</td> <td>N/A</td> <td>0.82</td> <td>0.55</td> <td>1.49</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>1690.56</td> <td>989.85</td> <td>2715.55</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>-878.01</td> <td>-612.74</td> <td>-1417.76</td> </tr> <tr> <td>Tibia Index</td> <td>N/A</td> <td>0.61</td> <td>0.91</td> <td></td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>-2409.06</td> <td>-427.97</td> <td>-259.77</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>-4167.96</td> <td>-181.09</td> <td>-155.38</td> </tr> </tbody> </table> |                                                          |                         |                                                                                                                                                                                                                     |                | Measurement Description | Units | Driver | Front Passenger | Rear Passenger | Head Injury Criteria (HIC <sub>15</sub> ) | N/A | 374.03 | 204.85 | 578.55 | Brain Injury Criterion (BrIC) | N/A | 0.69 | 0.87 |  | Abdomen Deflection | mm | -57.43 |  |  | Resultant Acetabulum Force | N | 2007.42 |  |  | Maximum Chest Compression | mm | -54.14 | -19.92 | -44.96 | Neck Injury Criteria (Nij) | N/A | 0.82 | 0.55 | 1.49 | Neck Tension | N | 1690.56 | 989.85 | 2715.55 | Neck Compression | N | -878.01 | -612.74 | -1417.76 | Tibia Index | N/A | 0.61 | 0.91 |  | Left Femur Force | N | -2409.06 | -427.97 | -259.77 | Right Femur Force | N | -4167.96 | -181.09 | -155.38 |
| Measurement Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Units                                                    | Driver                  | Front Passenger                                                                                                                                                                                                     | Rear Passenger |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Head Injury Criteria (HIC <sub>15</sub> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | N/A                                                      | 374.03                  | 204.85                                                                                                                                                                                                              | 578.55         |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Brain Injury Criterion (BrIC)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | N/A                                                      | 0.69                    | 0.87                                                                                                                                                                                                                |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Abdomen Deflection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | mm                                                       | -57.43                  |                                                                                                                                                                                                                     |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Resultant Acetabulum Force                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | N                                                        | 2007.42                 |                                                                                                                                                                                                                     |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Maximum Chest Compression                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | mm                                                       | -54.14                  | -19.92                                                                                                                                                                                                              | -44.96         |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Neck Injury Criteria (Nij)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | N/A                                                      | 0.82                    | 0.55                                                                                                                                                                                                                | 1.49           |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Neck Tension                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | N                                                        | 1690.56                 | 989.85                                                                                                                                                                                                              | 2715.55        |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Neck Compression                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | N                                                        | -878.01                 | -612.74                                                                                                                                                                                                             | -1417.76       |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Tibia Index                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | N/A                                                      | 0.61                    | 0.91                                                                                                                                                                                                                |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Left Femur Force                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | N                                                        | -2409.06                | -427.97                                                                                                                                                                                                             | -259.77        |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| Right Femur Force                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | N                                                        | -4167.96                | -181.09                                                                                                                                                                                                             | -155.38        |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| <b>17. Key Words</b><br>THOR ATD<br>HIII 5 <sup>th</sup> Female RibEye<br>Frontal<br>Research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          |                         | <b>18. Distribution Statement</b><br>Copies of this report are available from:<br>National Highway Traffic Safety Administration<br>Technical Reference Division<br>1200 New Jersey Ave, SE<br>Washington, DC 20590 |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |
| <b>19. Security Classif. (of this report)</b> UNCLASSIFIED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>20. Security Classif. (of this page)</b> UNCLASSIFIED | <b>21. No. of Pages</b> | <b>22. Price</b>                                                                                                                                                                                                    |                |                         |       |        |                 |                |                                           |     |        |        |        |                               |     |      |      |  |                    |    |        |  |  |                            |   |         |  |  |                           |    |        |        |        |                            |     |      |      |      |              |   |         |        |         |                  |   |         |         |          |             |     |      |      |  |                  |   |          |         |         |                   |   |          |         |         |

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Prepared by: Vanessa Hansen  
Vanessa Hansen, Test Engineer

Date: May 2, 2016

Approved by: Edward J. Dutton  
Edward J. Dutton, Operations Manager  
Transportation Test Operations

Date: May 2, 2016

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 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

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**SECTION 1**  
**PURPOSE OF TEST**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

This 56.3 kph (35 mph) test vehicle into a rigid barrier is part of the Frontal Rigid Barrier Test as outlined in Contract No. DTNH22-14-D-00359 Task Order 0002. The purpose of this test is to obtain vehicle crashworthiness and occupant restraint system performance data for research purposes.

This test was conducted in accordance with the instructions set forth for a vehicle to rigid barrier impact, outlined in Contract No. DTNH22-14-D-00359 Task Order 0002. Data was obtained indicant of Federal Motor Vehicle Safety Standard FMVSS 208-Occupant Crash Protection, FMVSS 212 – Windshield Mounting, FMVSS 219 (partial) – Windshield Zone Intrusion, and FMVSS 301 – Fuel System Integrity, in addition to the requirements of Contract No. DTNH22-14-D-00359 Task Order 0002.

## SECTION 2 SUMMARY OF TEST

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

A rigid fixed barrier was impacted by a 2016 Chevrolet Tahoe SUV at a velocity of 56.48 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on January 15, 2016. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. One real-time camera and 16 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of this report.

One 50% adult male THOR-M anthropomorphic test device (ATD) (Serial No. DL9207), was placed in the driver seating position according to dummy placement instructions specified in the THOR Seating Test Procedure, and one Part 572O 5<sup>th</sup> percentile female ATD with RibEye (Serial No. 324), was placed in the right-front passenger seating position at mid-track and positioned according to dummy placement instructions specified in the frontal NCAP laboratory test procedure. One Part 572O 5<sup>th</sup> percentile female ATD with RibEye (Serial No. 019) was also placed in the rear seating position (P3) and positioned according to dummy placement instructions specified in the Side MDB NCAP Laboratory Test Procedure.

Seat belt load cells were also on the drivers and passengers' shoulder and lap belts to measure the dummy's torso and pelvic section loading. In addition to seat belt load cells, belt movement sensors were utilized on both the driver and front passengers' seat belts to measure displacement. The driver (position 1) ATD (Serial No. DL9207), right-front passenger (position 2) ATD (Serial No. 324), and the rear passenger ATD (Serial No. 019) were calibrated previous to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

Two hundred and sixty eight (268) channels of data from the ATD's and test vehicle were collected using Kayser – Threde data acquisition systems. Appendix B contains dummy and vehicle response data plots.

There was 100% total windshield retention. There appeared to be no intrusion into the protected zone of the windshield during any portion of the impact event. The maximum static crush of the vehicle was 720 mm at the vehicle's centerline. Full vehicle measurements are presented in section 3 of this report.

**SECTION 2 (CONTINUED)**  
**SUMMARY OF TEST**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

All four vehicle doors remained closed and latched during the test. All doors remained operational after the impact event.

Structure observations include the following:

- Windshield has cracks throughout
- Hood bent inwards

The driver ATD's visible contact points were:

- Head contacted the frontal & curtain airbag and headrest
- Torso contacted the frontal airbag
- Knees contacted the knee bolster

The right front passenger ATD's visible contact points were:

- Head contacted the frontal & curtain airbag and headrest
- Knees contacted the glove box

The rear passenger ATD's visible contact points were:

- Head contacted the headrest and curtain airbag

**SECTION 2 (CONTINUED)**  
**CRASH VEHICLE SUMMARY**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

**Primary Impact Data**

| Measured Parameter              | Units | Value |
|---------------------------------|-------|-------|
| Test Vehicle Velocity at Impact | kph   | 56.48 |
| Vehicle Test Weight             | kg    | 2762  |
| Vehicle Maximum Static Crush    | mm    | 720   |
| Number of Data Channels         |       | 268   |
| Number of Real-Time Cameras     |       | 1     |
| Number of High-Speed Cameras    |       | 16    |

**GENERAL COMMENTS:**

1. P1 (Driver) serial number – DL9207
2. P2 (Passenger) serial number – 324
3. P3 (Rear Passenger) serial number – 019

**Data Anamolies:**

- Rear Passenger RibEye Left Rib 01 Displacement X, Questionable data 88.3ms to 121ms B-56
- Rear Passenger RibEye Left Rib 01 Displacement Y, Questionable data 88.3ms to 121ms B-56
- Rear Passenger RibEye Right Rib 05 Displacement X, Anomaly to due to chest pot and abdominal insert B-61
- Rear Passenger RibEye Right Rib 05 Displacement Y, Anomaly to due to chest pot and abdominal insert B-61
- Rear Passenger RibEye Right Rib 06 Displacement X, Anomaly to due to chest pot and abdominal insert B-62
- Rear Passenger RibEye Right Rib 06 Displacement Y, Anomaly to due to chest pot and abdominal insert B-62
- Left Front Seat Mid Crossmember X Acceleration, Questionable data 110ms to 119ms B-68
- V1 Engine Top X acceleration, Questionable spike at 80ms B-71

# PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2016 Chevrolet Tahoe - M20160118 NHTSA No.: M20160118  
 Test Program: NHTSA R&D Frontal Rigid Barrier Test Date: 1/15/2016

## Driver: THOR Serial No. DL9207 Injury Summary

| Location           | Description                            | Unit  | Source   | Max     | Min      |
|--------------------|----------------------------------------|-------|----------|---------|----------|
| Head               | HIC 15ms                               |       | Compute  | 374.03  |          |
|                    | Brain Injury Criteria (BrIC)           |       | Compute  | 0.69    |          |
|                    | Head Rotational Velocity X             | Deg/s | 60       | 423.28  | -518.15  |
|                    | Head Rotational Velocity Y             | Deg/s | 60       | 1182.32 | -2086.30 |
|                    | Head Rotational Velocity Z             | Deg/s | 60       | 376.68  | -456.78  |
| Neck               | Upper Neck Z-axis Force                | N     | 1000     | 1690.56 | -878.01  |
|                    | Upper Neck Y-axis Moment               | Nm    | Thortest | 52.14   | -36.58   |
| Chest              | Upper Left Resultant Chest Deflection  | mm    | Thortest | 30.56   |          |
|                    | Upper Right Resultant Chest Deflection | mm    | Thortest | 54.14   |          |
|                    | Lower Left Resultant Chest Deflection  | mm    | Thortest | 11.93   |          |
|                    | Lower Right Resultant Chest Deflection | mm    | Thortest | 31.15   |          |
| Abdomen            | Lower Left X-axis Deflection           | mm    | Thortest | 0.11    | -56.27   |
|                    | Lower Right X-axis Deflection          | mm    | Thortest | 0.16    | -57.43   |
| Acetabulum         | Left Acetabulum Resultant Force        | N     | Compute  | 1905.08 | 0.67     |
|                    | Right Acetabulum Resultant Force       | N     | Compute  | 2007.42 | 0.04     |
| Femur              | Left Femur Force, FZ                   | N     | 600      | 576.55  | -2409.06 |
|                    | Right Femur Force, FZ                  | N     | 600      | 1016.18 | -4167.96 |
| Tibia              | Left Upper Tibia, FZ                   | N     | 600      | 135.78  | -1058.39 |
|                    | Left Upper Tibia Index                 |       | Compute  | 0.42    |          |
|                    | Right Upper Tibia, FZ                  | N     | 600      | 185.46  | -2736.07 |
|                    | Right Upper Tibia Index                |       | Compute  | 0.61    |          |
|                    | Left Lower Tibia, FZ                   | N     | 600      | 102.89  | -1357.44 |
|                    | Left Lower Tibia Index                 |       | Compute  | 0.38    |          |
|                    | Right Lower Tibia, FZ                  | N     | 600      | 178.90  | -4599.70 |
|                    | Right Lower Tibia Index                |       | Compute  | 0.59    |          |
| Ankle              | Left Ankle Rotation, RX                | Deg   | 180      | 9.61    | -5.21    |
|                    | Left Ankle Rotation, RY                | Deg   | 180      | -13.00  | -33.95   |
|                    | Left Ankle Dorsiflexion Moment, MY     | Nm    | Compute  | 15.46   | -50.14   |
|                    | Left Ankle In/Eversion Moment, MX      | Nm    | Compute  | 24.07   | -19.59   |
|                    | Right Ankle Rotation, RX               | Deg   | 180      | 14.87   | -25.49   |
|                    | Right Ankle Rotation, RY               | Deg   | 180      | 30.15   | -9.36    |
|                    | Right Ankle Dorsiflexion Moment, MY    | Nm    | Compute  | 76.05   | -73.31   |
|                    | Right Ankle In/Eversion Moment, MX     | Nm    | Compute  | 81.09   | -34.10   |
| Anomalies:<br>None |                                        |       |          |         |          |



# PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: 2016 Chevrolet Tahoe - M20160118 NHTSA No.: M20160118  
 Test Program: NHTSA R&D Frontal Rigid Barrier Test Date: 1/15/2016

## Right Front Passenger: HF Serial No. 324 Injury Summary

| Location  | Description                             | Unit | Source  | Max     | Min      |
|-----------|-----------------------------------------|------|---------|---------|----------|
| Head      | 15 ms HIC                               |      | Compute | 204.85  |          |
|           | Brain Injury Criteria (BrIC)            |      | Compute | 0.87    |          |
| Neck      | Upper Neck Force Z                      | N    | 1000    | 989.85  | -612.74  |
|           | Upper Neck Moment Y                     | Nm   | 600     | 32.67   | -36.88   |
|           | NIJ                                     |      | Compute | 0.55    |          |
| Chest     | Chest Potentiometer Deflection          | mm   | 600     |         | -18.46   |
|           | Left Ribeye 01 X-Axis Deflection        | mm   | 600     | 0.22    | -19.92   |
|           | Left Ribeye 02 X-Axis Deflection        | mm   | 600     | 0.22    | -18.77   |
|           | Left Ribeye 03 X-Axis Deflection        | mm   | 600     | 0.21    | -17.44   |
|           | Left Ribeye 04 X-Axis Deflection        | mm   | 600     | 0.17    | -16.34   |
|           | Left Ribeye 05 X-Axis Deflection        | mm   | 600     | 0.19    | -15.46   |
|           | Left Ribeye 06 X-Axis Deflection        | mm   | 600     | 0.19    | -13.94   |
|           | Right Ribeye 01 X-Axis Deflection       | mm   | 600     | 0.20    | -16.42   |
|           | Right Ribeye 02 X-Axis Deflection       | mm   | 600     | 0.36    | -13.91   |
|           | Right Ribeye 03 X-Axis Deflection       | mm   | 600     | 2.04    | -12.16   |
|           | Right Ribeye 04 X-Axis Deflection       | mm   | 600     | 0.22    | -10.49   |
|           | Right Ribeye 05 X-Axis Deflection       | mm   | 600     | 0.24    | -8.81    |
|           | Right Ribeye 06 X-Axis Deflection       | mm   | 600     | 0.32    | -6.27    |
|           | Overall Ribeye X-Axis Deflection        | Mm   | 600     | 2.04    | -19.92   |
|           | Chest Resultant Acceleration            | g    | Compute | 42.22   |          |
|           | Chest Resultant Acceleration, 3 ms clip | g    | Compute | 41.61   |          |
|           | Pelvis Resultant Acceleration           | g    | Compute | 40.33   |          |
| Femur     | Left Femur Force, FZ                    | N    | 600     | 1935.81 | -427.97  |
|           | Right Femur Force, FZ                   | N    | 600     | 2200.13 | -181.09  |
| Tibia     | Left Upper Tibia, FZ                    | N    | 600     | 740.00  | -960.11  |
|           | Left Upper Tibia Index                  |      | Compute | 0.60    |          |
|           | Right Upper Tibia, FZ                   | N    | 600     | 1299.09 | -157.91  |
|           | Right Upper Tibia Index                 |      | Compute | 0.42    |          |
|           | Left Lower Tibia, FZ                    | N    | 600     | 647.50  | -1188.58 |
|           | Left Lower Tibia Index                  |      | Compute | 1.10    |          |
|           | Right Lower Tibia, FZ                   | N    | 600     | 1181.89 | -298.83  |
|           | Right Lower Tibia Index                 |      | Compute | 0.91    |          |
| Anomalies |                                         |      |         |         |          |
| None      |                                         |      |         |         |          |

## PRELIMINARY INJURY SUMMARY: Right Rear Passenger

Test Vehicle: 2016 Chevrolet Tahoe - M20160118 NHTSA No.: M20160118  
 Test Program: NHTSA R&D Frontal Rigid Barrier Test Date: 1/15/2016

### Right Rear Passenger: HF Serial No. 019 Injury Summary

| Location                                                                                                                | Description                             | Unit | Source  | Max                  | Min                   |
|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------|---------|----------------------|-----------------------|
| <b>Head</b>                                                                                                             | 15 ms HIC                               |      | Compute | 578.55               |                       |
| <b>Neck</b>                                                                                                             | Upper Neck Force Z                      | N    | 1000    | 2715.55              | -1417.76              |
|                                                                                                                         | Upper Neck Moment Y                     | Nm   | 600     | 21.08                | -74.29                |
|                                                                                                                         | NIJ                                     |      | Compute | 1.49                 |                       |
| <b>Chest</b>                                                                                                            | Chest Potentiometer Deflection          | mm   | 600     |                      | -39.41                |
|                                                                                                                         | Left Ribeye 01 X-Axis Deflection        | mm   | 600     | 0.20 <sup>(1)</sup>  | -84.38 <sup>(1)</sup> |
|                                                                                                                         | Left Ribeye 02 X-Axis Deflection        | mm   | 600     | 0.24                 | -42.50                |
|                                                                                                                         | Left Ribeye 03 X-Axis Deflection        | mm   | 600     | 0.25                 | -43.68                |
|                                                                                                                         | Left Ribeye 04 X-Axis Deflection        | mm   | 600     | 0.25                 | -43.78                |
|                                                                                                                         | Left Ribeye 05 X-Axis Deflection        | mm   | 600     | 0.21                 | -44.96                |
|                                                                                                                         | Left Ribeye 06 X-Axis Deflection        | mm   | 600     | 0.22                 | -44.05                |
|                                                                                                                         | Right Ribeye 01 X-Axis Deflection       | mm   | 600     | 0.20                 | -28.95                |
|                                                                                                                         | Right Ribeye 02 X-Axis Deflection       | mm   | 600     | 0.29                 | -27.12                |
|                                                                                                                         | Right Ribeye 03 X-Axis Deflection       | mm   | 600     | 0.17                 | -24.51                |
|                                                                                                                         | Right Ribeye 04 X-Axis Deflection       | mm   | 600     | 0.21                 | -22.02                |
|                                                                                                                         | Right Ribeye 05 X-Axis Deflection       | mm   | 600     | 17.89 <sup>(2)</sup> | -92.72 <sup>(2)</sup> |
|                                                                                                                         | Right Ribeye 06 X-Axis Deflection       | mm   | 600     | 34.68 <sup>(2)</sup> | -91.83 <sup>(2)</sup> |
|                                                                                                                         | Overall Ribeye X-Axis Deflection        | Mm   | 600     | 34.68 <sup>(2)</sup> | -92.72 <sup>(2)</sup> |
|                                                                                                                         | Chest Resultant Acceleration            | g    | Compute | 42.61                |                       |
|                                                                                                                         | Chest Resultant Acceleration, 3 ms clip | g    | Compute | 41.93                |                       |
|                                                                                                                         |                                         |      |         |                      |                       |
| <b>Pelvis</b>                                                                                                           | Pelvis Resultant Acceleration           | g    | Compute | 57.43                |                       |
|                                                                                                                         | Left ASIS Force X                       | N    | 600     | 111.52               | -2985.02              |
|                                                                                                                         | Right ASIS Force X                      | N    | 600     | 60.29                | -2843.77              |
| <b>Femur</b>                                                                                                            | Left Femur Force Z                      | N    | 600     | 2070.80              | -259.77               |
|                                                                                                                         | Right Femur Force Z                     | N    | 600     | 2163.68              | -155.38               |
| <b>Anomalies</b><br>(1) Questionable data 88.3ms to 121ms<br>(2) Anomaly by Chest Pot Interference and Abdominal Insert |                                         |      |         |                      |                       |

### SECTION 3 DATA SHEETS

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

| Data Sheet<br>No. |                                                   | Page No. |
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**DATA SHEET NO. 1**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

**VEHICLE INFORMATION**

|                               |                   |
|-------------------------------|-------------------|
| NHTSA No.                     | M20160118         |
| Model Year                    | 2016              |
| Make                          | Chevrolet         |
| Model                         | Tahoe             |
| Body Style                    | SUV               |
| VIN                           | 1GNSCAKC2GR170032 |
| Body Color                    | Silver            |
| Odometer Reading (km/mi)      | 12.9 km / 8 mi    |
| Engine Displacement. (L)      | 5.3               |
| Type/No. Cylinders            | V8                |
| Engine Placement              | Inline            |
| Transmission Type             | Automatic         |
| Transmission Speeds           | 6-Speed           |
| Overdrive                     | Yes               |
| Final Drive                   | Rear Wheel Drive  |
| Roof Rack                     | No                |
| Sunroof/T-Top                 | No                |
| Running Boards                | Yes               |
| Tilt Steering Wheel           | Yes               |
| Power Seats                   | Yes               |
| Anti-Lock Brakes (ABS)        | Yes               |
| All-Wheel Drive (AWD)         | No                |
| Traction Control System (TCS) | Yes               |

**VEHICLE OPTIONS**

|                               |     |
|-------------------------------|-----|
| Auto-Leveling System          | No  |
| Automatic Door Locks (ADL)    | Yes |
| Power Window Auto-Reverse     | No  |
| Other Optional Feature        | -   |
| Driver Front Airbag           | Yes |
| Driver Curtain Airbag         | Yes |
| Driver Head/Torso Airbag      | No  |
| Driver Torso Airbag           | Yes |
| Driver Torso/Pelvis Airbag    | No  |
| Driver Pelvis Airbag          | No  |
| Driver Knee Airbag            | No  |
| Pass. Front Airbag            | Yes |
| Pass. Curtain Airbag          | Yes |
| Pass. Head/Torso Airbag       | No  |
| Pass. Torso Airbag            | Yes |
| Pass. Torso/Pelvis Airbag     | No  |
| Pass. Pelvis Airbag           | No  |
| Pass. Knee Airbag             | No  |
| Driver Seat Belt Pretensioner | Yes |
| Pass. Seat Belt Pretensioner  | Yes |
| Driver Load Limiter           | Yes |
| Pass. Load Limiter            | Yes |
| Other Safety Restraint        | -   |

Does owner's manual provide instructions to turn off automatic door locks?

Yes

**DATA FROM CERTIFICATION LABEL**

|                     |                    |
|---------------------|--------------------|
| Manufactured By     | General Motors LLC |
| Date of Manufacture | 09/15              |

|                 |      |
|-----------------|------|
| GWR (kg)        | 3221 |
| GAWR Front (kg) | 1452 |
| GAWR Rear (kg)  | 1860 |

**VEHICLE SEATING AND WEIGHT CAPACITY**

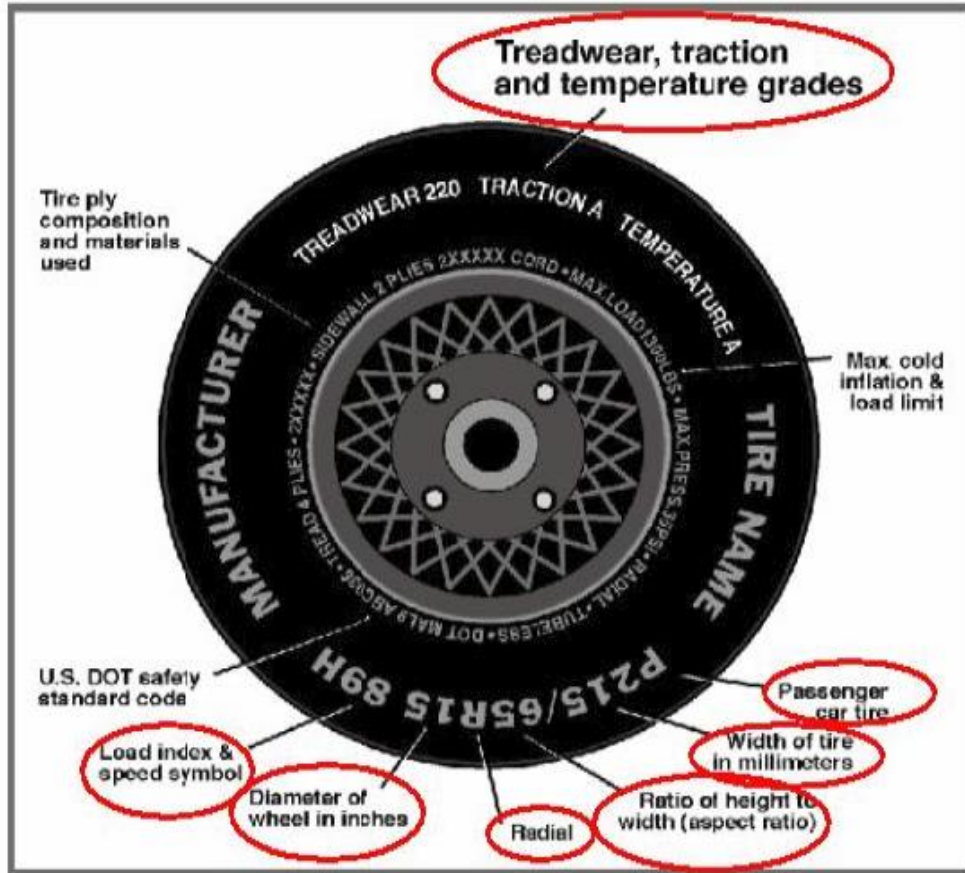
| Measured Parameter      | Front  | Rear  | Third | Total |
|-------------------------|--------|-------|-------|-------|
| Type of Seats           | Bucket | Bench | Bench |       |
| Number of Occupants     | 2      | 3     | 3     | 8     |
| Capacity Wt. (VCW) (kg) |        |       |       | 786   |
| Cargo Wt. (RCLW) (kg)   |        |       |       | 136   |

**DATA SHEET NO. 1 (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

Collect items circled in red, tire manufacturer, and tire name.



| Measured Parameter          | Front                                | Rear                                 |
|-----------------------------|--------------------------------------|--------------------------------------|
| Maximum Tire Pressure (kPa) | 360                                  | 360                                  |
| Cold Pressure (kPa)         | 240                                  | 240                                  |
| Recommended Tire Size       | P265/65/R15                          | P265/65/R15                          |
| Tire Size on Vehicle        | P265/65/R15                          | P265/65/R15                          |
| Tire Manufacturer           | Goodyear                             | Goodyear                             |
| Tire Model                  | Assurance                            | Assurance                            |
| Treadwear                   | 600                                  | 600                                  |
| Traction                    | A                                    | A                                    |
| Temperature Grades          | B                                    | B                                    |
| Tire Plies Sidewall         | 2 Polyester                          | 2 Polyester                          |
| Tire Plies Body             | 2 Polyester, 2 Steel,<br>1 Polyamide | 2 Polyester, 2 Steel,<br>1 Polyamide |
| Load Index/Speed Symbol     | 112T                                 | 112T                                 |
| Tire Material               | Rubber                               | Rubber                               |
| DOT Safety Code Right       | PJXPJK1R3315                         | PJXPJK1R3315                         |
| DOT Safety Code Left        | PJXPJK1R3215                         | PJXPJK1R3315                         |

**DATA SHEET NO. 1 (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

**TEST VEHICLE WEIGHTS**

|        | Units | As Delivered (UVW) (Axle) |      |       | As Tested (ATW) (Axle) |      |       |
|--------|-------|---------------------------|------|-------|------------------------|------|-------|
|        |       | Front                     | Rear | Total | Front                  | Rear | Total |
| Left   | kg    | 654                       | 567  |       | 672                    | 699  |       |
| Right  | kg    | 578                       | 623  |       | 617                    | 774  |       |
| Ratio  | %     | 50.8                      | 49.1 |       | 47                     | 53   |       |
| Totals | kg    | 1232                      | 1190 | 2422  | 1289                   | 1473 | 2762  |

**TARGET TEST WEIGHT CALCULATION**

| Measured Parameter                                | Units | Value |
|---------------------------------------------------|-------|-------|
| Total Delivered Weight (UVW)                      | kg    | 2422  |
| Weight of 1 THOR & 2 HIII 5 <sup>th</sup> Females | kg    | 211   |
| Rated Cargo/Luggage Weight (RCLW)                 | kg    | 136   |
| Calculated Vehicle Target Weight (TVTW)           | kg    | 2769  |

**TEST VEHICLE ATTITUDES AND CG**

|              | Units | LF  | RF  | LR  | RR  | CG<br>(aft of front axle) |
|--------------|-------|-----|-----|-----|-----|---------------------------|
| As Delivered | mm    | 917 | 913 | 976 | 979 | 1451                      |
| As Tested    | mm    | 912 | 913 | 937 | 937 | 1575                      |
| Post Test    | mm    | 870 | 886 | 953 | 953 |                           |

**GENERAL TEST VEHICLE DATA**

| Measurement Description                 | Units | Value |
|-----------------------------------------|-------|-------|
| Total Vehicle Wheel Base                | mm    | 2954  |
| Total Vehicle Length at Left Side       | mm    | 5060  |
| Total Vehicle Length at Centerline      | mm    | 5165  |
| Total Vehicle Length at Right Side      | mm    | 5057  |
| Weight of Ballast in Cargo Area         | kg    | 108   |
| Weight of Vehicle Components Removed    | kg    | 80    |
| Amount of Stoddard Solvent in Fuel Tank | L     | 91.5  |

**LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:**

Trunk carpeting, jack, tail light, third row seats, driver & rear door windows

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**DATA SHEET NO.1 (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

**TARGET VEHICLE STRUCTURAL MEASUREMENT**

|     | Elements                              | Units | Pre-Test |
|-----|---------------------------------------|-------|----------|
| 1   | Total Length                          | mm    | 5165     |
| 2   | Total Width                           | mm    | 2005     |
| 3*  | Bumper Top Height                     | mm    | 705      |
| 4*  | Bumper Bottom Height                  | mm    | 579      |
| 5*  | Longitudinal Member Top Height        | mm    | 680      |
| 6   | Distance Between Longitudinal Members | mm    | 860      |
| 7   | Longitudinal Member Width             | mm    | 75       |
| 8*  | Engine Top Height                     | mm    | 1130     |
| 9*  | Engine Bottom Height                  | mm    | 309      |
| 10  | Engine and Gearbox Width              | mm    | 619      |
| 11  | Front Bumper-Engine Distance          | mm    | 863      |
| 12* | Front Shock Absorber Fixing Height    | mm    | 850      |
| 13* | Bonnet Leading Edge Height            | mm    | 1161     |
| 14  | Front Shock Absorber Fixing Width     | mm    | 959      |
| 15  | Front Bumper – Front Axle Distance    | mm    | 1019     |
| 16  | Front Axle – A Pillar Distance        | mm    | 572      |
| 17  | A-Pillar – B-Pillar Distance          | mm    | 1148     |
| 18  | B-Pillar – Rear Axle Distance         | mm    | 1236     |
| 19  | B-Pillar – C-Pillar Distance          | mm    | 1018     |
| 20* | Roof Sill Bottom Height               | mm    | 1824     |
| 21* | Roof Sill Top Height                  | mm    | 1860     |
| 22* | Floor Sill Bottom Height              | mm    | 601      |
| 23* | Floor Sill Top Height                 | mm    | 612      |

\*Note: Height measurements are in reference to the ground.

## DATA SHEET NO. 2

### SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

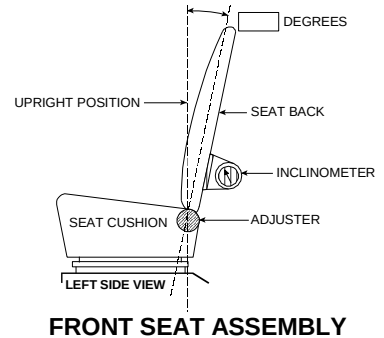
NHTSA No.: M20160118  
 Test Date: 1/15/2016

#### **NORMAL DESIGN RIDING POSITION**

*For adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.*

**Driver seat:** The driver seat back was positioned according to the Nominal Design Riding position listed in FORM 1 and THOR Seating Procedure.

**Passenger Seat:** The passenger seat back was positioned according to the Nominal Design Riding position listed in FORM 1 and THOR Seating Procedure.



|                                | Deg. |
|--------------------------------|------|
| Driver Seat Back Angle         | 7.7  |
| Passenger Seat Back Angle      | 1.5  |
| Rear Passenger Seat Back Angle | 8.3  |

#### **SEAT FORE/AFT POSITIONS**

*Describe the method used of determining seat fore/aft positions.*

The driver's seat was positioned at its lowest position and at the mid-point of fore/aft travel.

The passenger's seat was positioned at the mid-point of fore/aft travel.

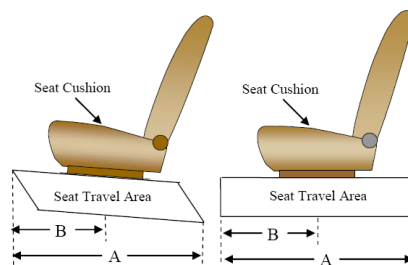
|                     | Total Fore/Aft Travel | Placed in Position # |
|---------------------|-----------------------|----------------------|
| Driver Seat         | 260                   | 130                  |
| Passenger Seat      | 210                   | 105                  |
| Rear Passenger Seat | FIXED                 | FIXED                |

#### **SEAT BELT UPPER ANCHORAGES**

*Describe the method of positioning seat belt upper anchorages.* Belt anchorages were moved along the full range of motion, and marked on the B-Pillar to their respective possible positions.

Photographic evidence can be found in Appendix A of this report. Zero is defined as the upper-most position.

|                     | Total # of Positions | Placed in Position # |
|---------------------|----------------------|----------------------|
| Driver Seat         | 5                    | 0                    |
| Passenger Seat      | 5                    | 0                    |
| Rear Passenger Seat | FIXED                | FIXED                |





**DATA SHEET NO. 2 (CONTINUED)**  
**SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

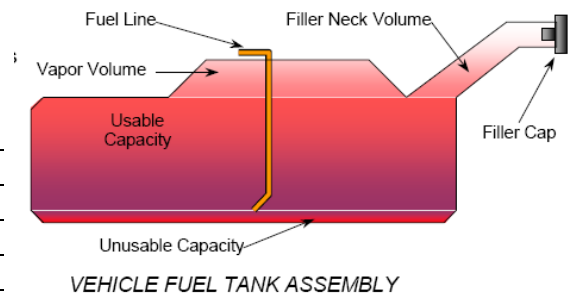
**FUEL TANK CAPACITY**

|                                    | Liters |
|------------------------------------|--------|
| Usable Capacity of "Standard Tank" | 98.4   |
| Usable Capacity of "Optional Tank" |        |
| 93% of Usable Capacity             | 91.5   |
| Actual Amount of Solvent Used      | 91.5   |
| 1/3 of Usable Capacity             | 32.8   |

**FUEL PUMP**

*Describe the fuel system - what type of fuel pump, details about how it operates, etc.*

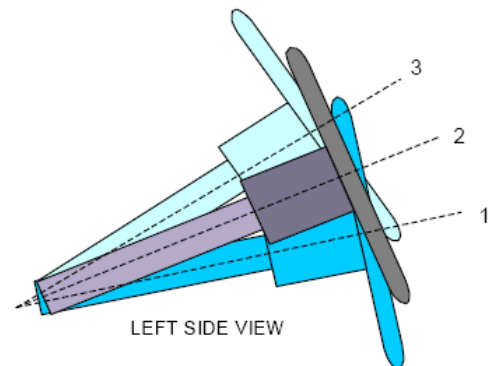
Fuel evacuated according to the specifications provided by the manufacturer in Form 1. Electric fuel pump operates when the ignition is in the 'on' position and the engine is running. The fuel filler neck is located above the left rear wheel.



**STEERING COLUMN ADJUSTMENT**

*Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. Describe how this measurement was taken.*

The steering wheel was adjusted to the midpoint of tilt angle range and the midpoint of the telescoping travel (if applicable)



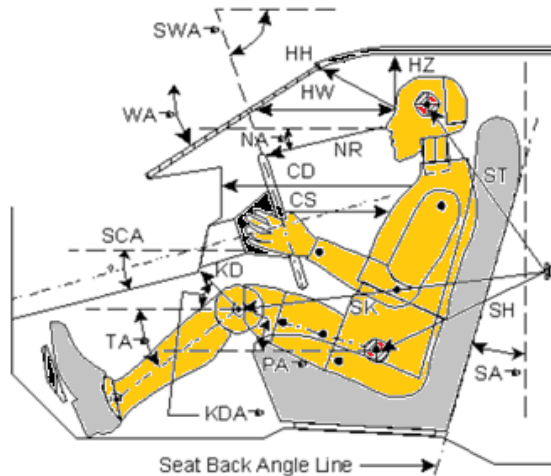
**STEERING COLUMN POSITIONS**

|                                   | Tilt (degrees) | Fore/Aft Position (mm) |
|-----------------------------------|----------------|------------------------|
| Lowermost position No. 1          | 10.3           |                        |
| Geometric center position No. 2   | 21.55          |                        |
| Uppermost position No. 3          | 32.8           |                        |
| Telescoping Steering Wheel Travel |                | N/A                    |
| Test Position                     | 20.25          | N/A                    |

### DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

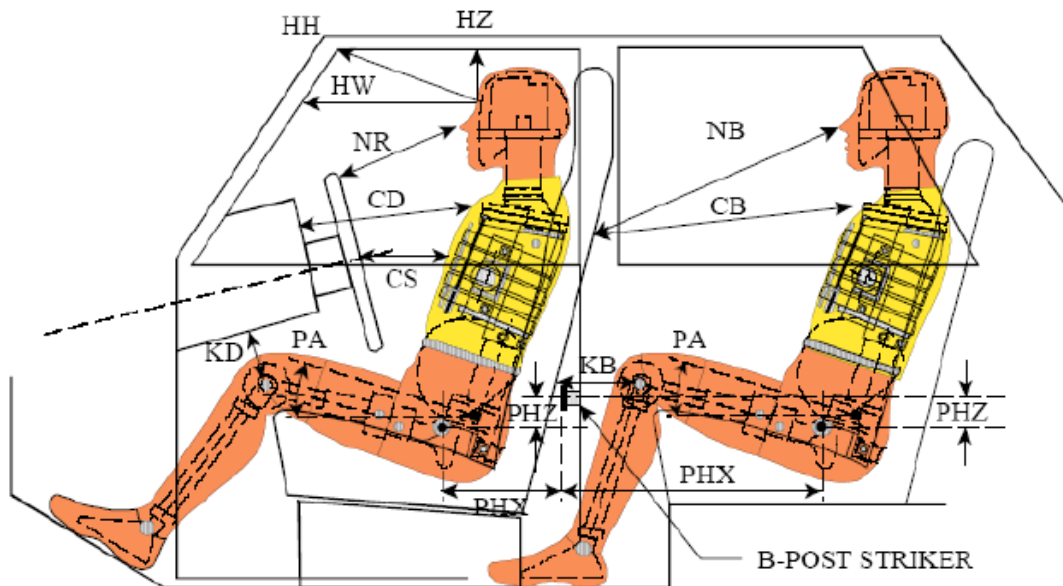


| Code | Measurement Description            | Driver<br>(Serial # THOR DL9207) |          | Front Passenger<br>(Serial # 324) |           |
|------|------------------------------------|----------------------------------|----------|-----------------------------------|-----------|
|      |                                    | Length (mm)                      | Angle(°) | Length (mm)                       | Angle (°) |
| WA°  | Windshield Angle                   |                                  | 33.5     |                                   |           |
| SWA° | Steering Wheel Angle               |                                  | 20.2     |                                   |           |
| SCA° | Steering Column Angle              |                                  | 69.8     |                                   |           |
| SA°  | Seat Back Angle (on headrest post) |                                  | 7.7      |                                   | 1.5       |
| HZ   | Head to Roof (Z)                   | 306                              | 90       | 355                               | 90        |
| HH   | Head to Header                     | 607                              | 16.2     | 519                               | 28.5      |
| HW   | Head to Windshield                 | 895                              | 0        | 861                               | 0         |
| NR   | Nose to Rim                        | 563                              | 7.5      | 581                               | 24.0      |
| CD   | Chest to Dash                      | 650                              |          | 548                               |           |
| CS   | Chest to Steering Hub              | 446                              | 1.7      |                                   |           |
| RA   | Rim to Abdomen                     | 288                              | 0        |                                   |           |
| KDL  | Left Knee to Dash                  | 161                              | 26.6     | 222                               | 29.5      |
| KDR  | Right Knee to Dash                 | 153                              | 30.6     | 220                               | 31.5      |
| PA°  | Pelvic Angle                       |                                  | 35.2     |                                   | 19.0      |
| TA°  | Tibia Angle                        |                                  | 43.2     |                                   | 46.2      |
| SK   | Striker to Knee                    | 606                              | -7.5     | 564                               | -4.2      |
| ST   | Striker to Head                    | 621                              | 86.5     | 569                               | -81.1     |
| SH   | Striker to H-Point                 | 205                              | -8.1     | 232                               | -2.7      |
| HAX° | Head Angle (X)                     |                                  | -0.3     |                                   |           |
| HAY° | Head Angle (Y)                     |                                  | -3.5     |                                   |           |
| TAX° | T6 Angle (X)                       |                                  | -1.6     |                                   |           |
| TAY° | T6 Angle (Y)                       |                                  | 26.3     |                                   |           |
| TAX° | T1 (X)                             |                                  | -1.4     |                                   |           |
| TAY° | T1 (Y)                             |                                  | 5.4      |                                   |           |
| TAX° | T12 (X)                            |                                  | -1.4     |                                   |           |
| TAY° | T12 (Y)                            |                                  | 35.2     |                                   |           |
| PAX° | Pelvis (X)                         |                                  | -0.6     |                                   |           |
| PAY° | Pelvis (Y)                         |                                  | 35.2     |                                   |           |

**DATA SHEET NO. 3 (CONTINUED)**  
**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016



**LEFT SIDE VIEW**

NOTE: 2-DOOR VEHICLE SHOWN.  
 REAR DUMMY PHX & PHZ  
 MEASUREMENTS FOR A 4-DOOR  
 VEHICLE WOULD USE THE C-POST  
 STRIKER AS A REFERENCE POINT

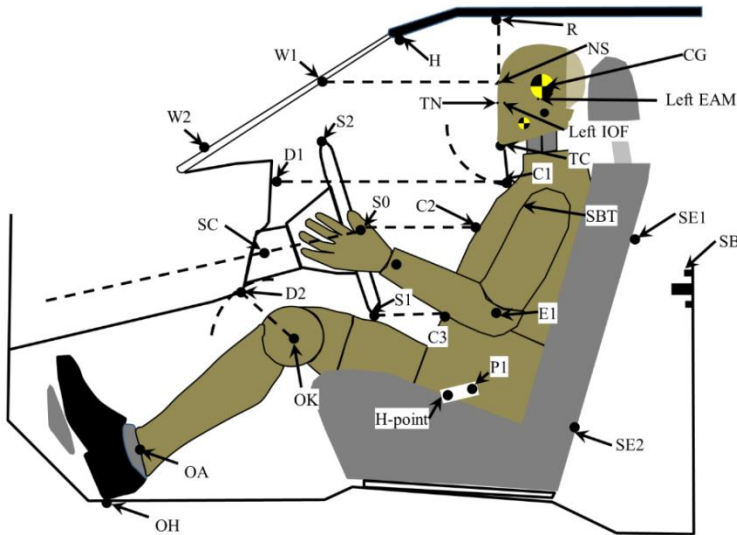
| Code | Measurement Description            | Rear Passenger<br>(Serial # 019) |           |
|------|------------------------------------|----------------------------------|-----------|
|      |                                    | Length (mm)                      | Angle (°) |
| SA°  | Seat Back Angle (on headrest post) |                                  | 8.3       |
| HZ   | Head to Roof (Z)                   | 312                              |           |
| NB   | Nose to Seatback                   | 570                              |           |
| CB   | Chest to Seatback                  | 585                              |           |
| KDL  | Left Knee to Seatback              | 305                              | 20.2      |
| KDR  | Right Knee to Seatback             | 290                              | 20.5      |
| PAX° | Pelvic Tilt Angle (X-axis)         |                                  | 19.6      |
| PAY° | Pelvic Tilt Angle (Y-axis)         |                                  | 0.4       |
| PHX  | Hip Point to Striker (X-Axis)      | 275                              |           |
| PHZ  | Hip Point to Striker (Z-Axis)      | 166                              |           |

# **DATA SHEET NO.3 (CONTINUED)** **DUMMY CMM MEASUREMENTS**

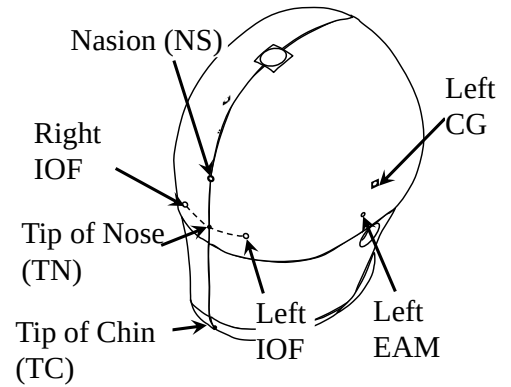
Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

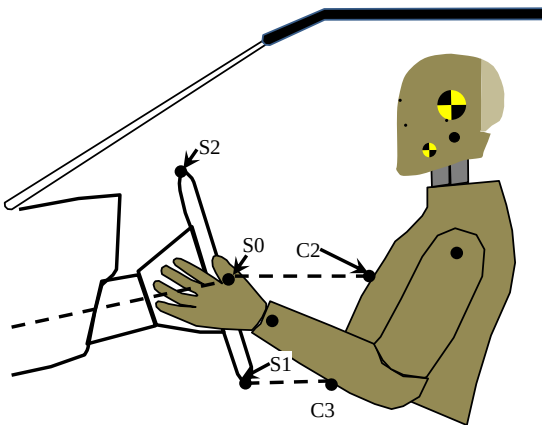
## **MEASUREMENT LOCATIONS**



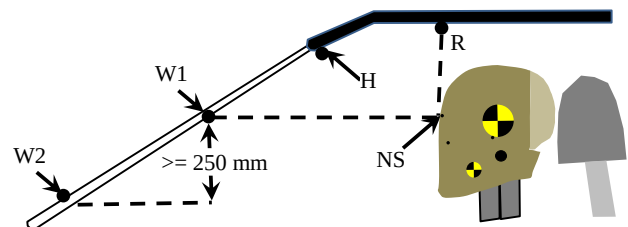
**DIAGRAM #1**



**DIAGRAM #2**



**DIAGRAM #3**



**DIAGRAM #4**

**DATA SHEET NO.3 (CONTINUED)**  
**DUMMY CMM MEASUREMENTS**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

**DRIVER MEASUREMENT PONITS**

| Description                          | Units | Driver |      |       |
|--------------------------------------|-------|--------|------|-------|
|                                      |       | X      | Y    | Z     |
| Tip of Striker                       | mm    | 2512   | -873 | -184  |
| Top of Head Restraint                | mm    | 2322   | -461 | -885  |
| Outboard Head Restraint Post         | mm    | 2283   | -544 | -626  |
| Head CG                              | mm    | 2474   | -539 | -804  |
| Nasion                               | mm    | 2567   | -459 | -805  |
| Tip of Nose                          | mm    | 2566   | -461 | -769  |
| Tip of Chin                          | mm    | 2556   | -463 | -670  |
| LEAM                                 | mm    | 2479   | -535 | -774  |
| LIOF                                 | mm    | 2562   | -493 | -769  |
| RIOF                                 | mm    | 2562   | -430 | -767  |
| Outboard Elbow                       | mm    | 2774   | -689 | -435  |
| H-Point                              | mm    | 2715   | -785 | -155  |
| Center of H-Point Tool               | mm    | 2640   | -709 | -185  |
| Left Knee                            | mm    | 3113   | -667 | -263  |
| Right Knee                           | mm    | 3124   | -365 | -257  |
| Left Ankle                           | mm    | 3406   | -688 | 30    |
| Right Heel                           | mm    | 3371   | -667 | 162   |
| Left Heel                            | mm    | 3447   | -282 | 156   |
| W1 – Upper Windshield                | mm    | 3460   | -460 | -805  |
| W2 – Lower Windshield                | mm    | 3609   | -460 | -704  |
| Header                               | mm    | 3145   | -461 | -994  |
| Head to Roof                         | mm    | 2567   | -461 | -1112 |
| C1- Upper Chest                      | mm    | 2611   | -460 | -541  |
| C2 – Mid Chest                       | mm    | 2616   | -460 | -534  |
| C3 – Lower Chest                     | mm    | 2711   | -460 | -373  |
| S2 – Top Steering Wheel Rim          | mm    | 3123   | -462 | -710  |
| S1 – Lower Steering Wheel Rim        | mm    | 2996   | -460 | -376  |
| SC – Steering Column                 | mm    | 3259   | -512 | -486  |
| D1 – Dash Point                      | mm    | 3055   | -429 | -541  |
| D2 – Knee Bolster                    | mm    | 3261   | -671 | -327  |
| SE1 – Seatback Point                 | mm    | 2236   | -461 | -614  |
| SE2 – Seatback Point                 | mm    | 2434   | -461 | -87   |
| Left Front Outboard Seat Anchor Bolt | mm    | 2957   | -672 | 76    |
| Left Rear Outboard Seat Anchor Bolt  | mm    | 2525   | -673 | 67    |

Reference point: Origin at rear centerline of vehicle. Vertical coordinate point for origin determined with contact of vehicle structure by 10mm deep block moved downward along front edge of a level. The level is positioned perpendicular to ground and in contact with rear centerline of the vehicle.

- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

**DATA SHEET NO.3 (CONTINUED)**  
**DUMMY CMM MEASUREMENTS**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

**FRONT PASSENGER MEASUREMENT POINTS**

| Description                           | Units | Front Passenger |     |       |
|---------------------------------------|-------|-----------------|-----|-------|
|                                       |       | X               | Y   | Z     |
| Tip of Striker                        | mm    | 2509            | 874 | -190  |
| Top of Head Restraint                 | mm    | 2424            | 460 | -890  |
| Outboard Head Restraint Post          | mm    | 2359            | 538 | -709  |
| Head CG                               | mm    | 2597            | 533 | -752  |
| Bridge of Nose                        | mm    | 2688            | 461 | -750  |
| Tip of Nose                           | mm    | 2710            | 464 | -721  |
| Tip of Chin                           | mm    | 2695            | 461 | -647  |
| Outboard Shoulder Bolt                | mm    | 2579            | 620 | -510  |
| Outboard Elbow                        | mm    | 2648            | 678 | -299  |
| H-Point                               | mm    | 2741            | 717 | -179  |
| Center of H-Point Tool                | mm    | 2656            | 705 | -214  |
| Left Knee                             | mm    | 3067            | 401 | -233  |
| Right Knee                            | mm    | 3072            | 563 | -231  |
| Left Ankle                            | mm    | 3273            | 380 | 48    |
| Right Ankle                           | mm    | 3268            | 551 | 58    |
| Left Heel                             | mm    | 3257            | 368 | 148   |
| Right Heel                            | mm    | 3260            | 538 | 152   |
| W1 – Upper Windshield                 | mm    | 3546            | 461 | -753  |
| W2 – Lower Windshield                 | mm    | 3688            | 460 | -654  |
| Header                                | mm    | 3143            | 460 | -998  |
| Head up to Roof                       | mm    | 2687            | 460 | -1108 |
| C1 - Upper Chest                      | mm    | 2691            | 461 | -517  |
| D1 - Dash Point                       | mm    | 3249            | 460 | -517  |
| D2 - Dash Bolster                     | mm    | 3266            | 564 | -333  |
| SE1 - Seat Back Point                 | mm    | 2303            | 460 | -695  |
| SE2 - Seat Back Point                 | mm    | 2457            | 460 | -99   |
| Right Front Outboard Seat Anchor Bolt | mm    | 2955            | 673 | 72    |
| Right Rear Outboard Seat Anchor Bolt  | mm    | 2522            | 670 | 62    |

Reference point: Origin at rear centerline of vehicle. Vertical coordinate point for origin determined with contact of vehicle structure by 10mm deep block moved downward along front edge of a level. The level is positioned perpendicular to ground and in contact with rear centerline of the vehicle.

- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

**DATA SHEET NO.3 (CONTINUED)**  
**DUMMY CMM MEASUREMENTS**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

| Description                  | Units | Rear Passenger |     |       |
|------------------------------|-------|----------------|-----|-------|
|                              |       | X              | Y   | Z     |
| Tip of Striker               | mm    | 1516           | 874 | -396  |
| Top of Head Restraint        | mm    | 1391           | 452 | -903  |
| Outboard Head Restraint Post | mm    | 1369           | 542 | -730  |
| Head CG                      | mm    | 1630           | 521 | -788  |
| Bridge of Nose               | mm    | 1720           | 452 | -789  |
| Tip of Nose                  | mm    | 1742           | 449 | -757  |
| Tip of Chin                  | mm    | 1724           | 452 | -681  |
| Outboard Shoulder Bolt       | mm    | 1626           | 612 | -552  |
| Outboard Elbow               | mm    | 1683           | 692 | -344  |
| H-Point                      | mm    | 1791           | 692 | -230  |
| Center of H-Point Tool       | mm    | 1706           | 679 | -261  |
| Left Knee                    | mm    | 2117           | 410 | -268  |
| Right Knee                   | mm    | 2124           | 569 | -270  |
| Left Ankle                   | mm    | 2280           | 391 | 47    |
| Right Ankle                  | mm    | 2281           | 556 | 43    |
| Left Heel                    | mm    | 2208           | 365 | 116   |
| Right Heel                   | mm    | 2213           | 543 | 109   |
| Head up to Roof              | mm    | 1720           | 453 | -1100 |
| C1 - Upper Chest             | mm    | 1732           | 452 | -552  |
| D1 - Dash Point              | mm    | 2332           | 453 | -553  |
| D2 - Dash Bolster            | mm    | 2405           | 571 | -357  |
| SE1 - Seat Back Point        | mm    | 1435           | 686 | -698  |
| SE2 - Seat Back Point        | mm    | 1568           | 701 | -354  |

Reference point: Origin at rear centerline of vehicle. Vertical coordinate point for origin determined with contact of vehicle structure by 10mm deep block moved downward along front edge of a level. The level is positioned perpendicular to ground and in contact with rear centerline of the vehicle.

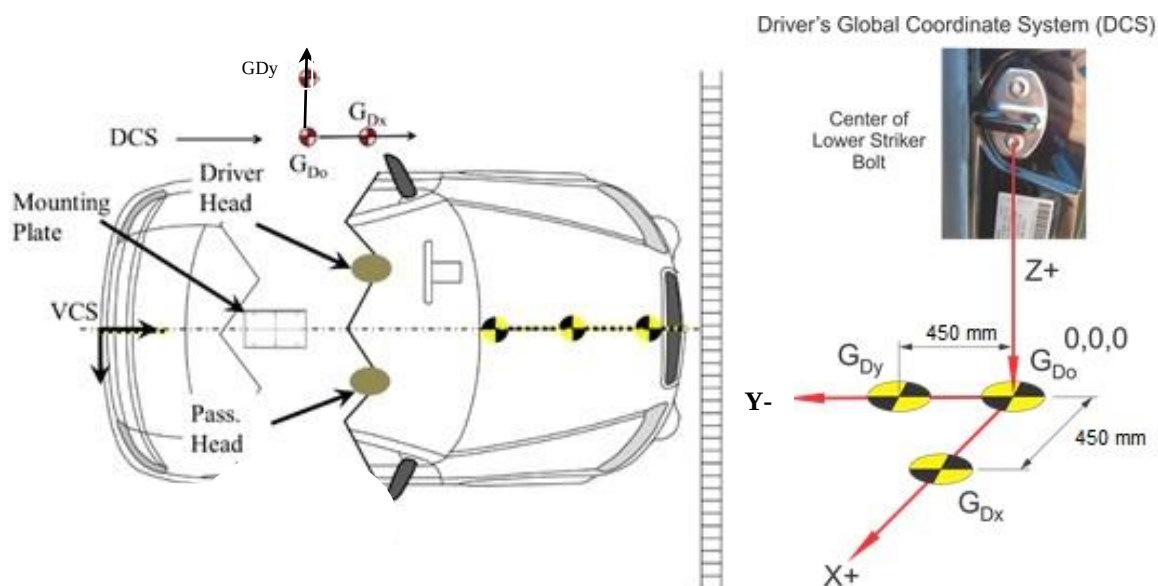
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

### DATA SHEET NO.3 (CONTINUED) DUMMY CMM MEASUREMENTS

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

#### DRIVER GLOBAL COORDINATE SYSTEM



#### Driver ATD Measurement Points

| Measurement Points | Units | Measurements (mm) |     |       |
|--------------------|-------|-------------------|-----|-------|
|                    |       | X                 | Y   | Z     |
| Head CG            | mm    | -15               | 330 | -1521 |
| Nasion             | mm    | 78                | 410 | -1524 |
| Tip of Nose        | mm    | 76                | 408 | -1487 |
| Tip of Chin        | mm    | 67                | 407 | -1388 |
| LEAM               | mm    | -10               | 334 | -1492 |
| LIOF               | mm    | 73                | 376 | -1487 |
| RIOF               | mm    | 72                | 440 | -1486 |

Reference point:

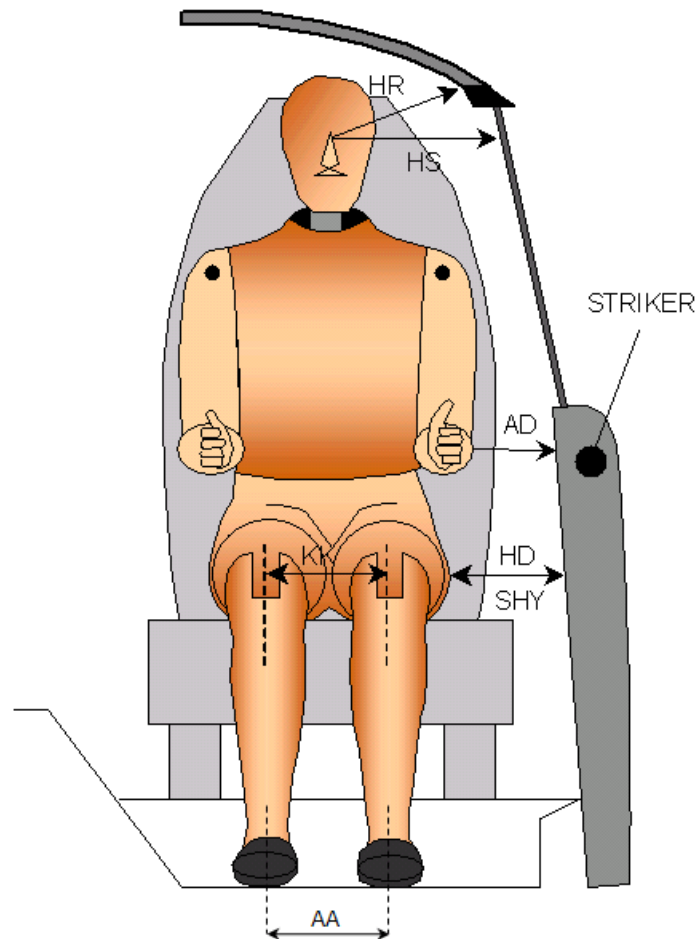
- +X – From GD<sub>0</sub> to the front of the vehicle
- +Y – From GD<sub>0</sub> to the right side of the vehicle
- +Z – From GD<sub>0</sub> into the ground



**DATA SHEET NO. 4**  
**DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

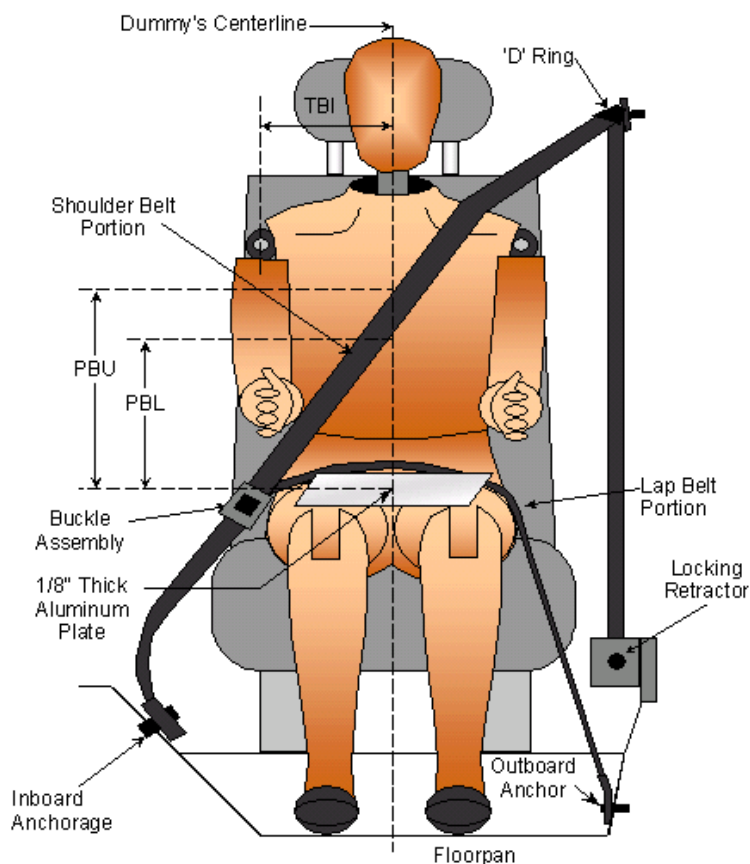


| Code | Description                      | Units | Driver | Front Passenger | Rear Passenger |
|------|----------------------------------|-------|--------|-----------------|----------------|
| AD   | Arm to Door                      | mm    | 146    | 95              | 72             |
| HD   | H-Point to Door                  | mm    | 110    | 165             | 147            |
| HR   | Head to Side Header              | mm    | 262    | 308             | 290            |
| HS   | Head to Side Window              | mm    | 355    | 368             | 380            |
| KK   | Knee to Knee                     | mm    | 360    | 165             | 162            |
| SHY  | Striker to H-Point (Y Direction) | mm    | 225    | 270             | 270            |
| AA   | Ankle to Ankle                   | mm    | 377    | 165             | 162            |

## DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016



### SEAT BELT POSITIONING MEASUREMENTS

| Measurement Description                                  | Units | Driver | Passenger | Rear Pass. |
|----------------------------------------------------------|-------|--------|-----------|------------|
| <b>PBU</b> — Top surface of reference to belt upper edge | mm    | 370    | 310       | 310        |
| <b>PBL</b> — Top surface of reference to belt lower edge | mm    | 285    | 230       | 220        |

### BELT LENGTH DATA

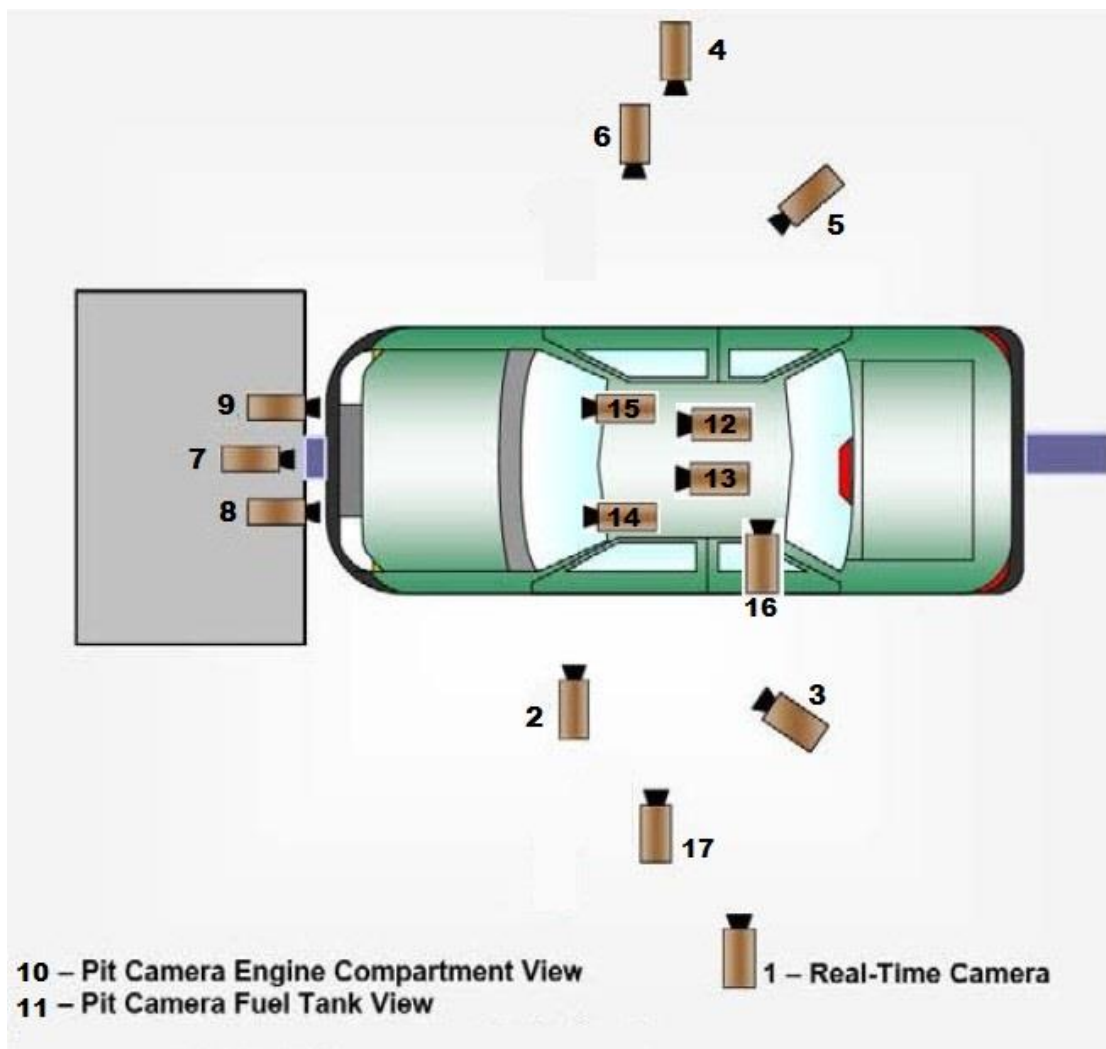
| Measurement Description                          | Units | Driver | Passenger | Rear Pass. |
|--------------------------------------------------|-------|--------|-----------|------------|
| Shoulder belt length as measured on ATD          | mm    | 790    | 810       | 810        |
| Lap Belt Length as measured on ATD               | mm    | 510    | 495       | 590        |
| Remainder of belt on reel                        | mm    | 970    | 995       | 900        |
| Total belt length for continuous webbing systems | mm    | 2270   | 2300      | 2300       |

**DATA SHEET NO. 6**  
**HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

**HORIZONTAL LOCATION**



**DATA SHEET NO. 6 (CONTINUED)**  
**HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

**CAMERA LOCATIONS**

| No. | Camera View                      | Location (mm) |       |       | Lens (mm) | Speed (fps) |
|-----|----------------------------------|---------------|-------|-------|-----------|-------------|
|     |                                  | X             | Y     | Z     |           |             |
| 1   | Real-Time Left Side              | --            | --    | --    | Zoom      | 30          |
| 2   | Left Front Half                  | -1346         | -8974 | -1602 | 35        | 1000        |
| 3   | Left Angle                       | -2451         | -2854 | -2221 | 24        | 1000        |
| 4   | Right Overall                    | -2467         | 10495 | -1402 | 24        | 1000        |
| 5   | Right Angle                      | -2608         | 2998  | -2280 | 24        | 1000        |
| 6   | Right Front Half                 | -1286         | 7325  | -1572 | 28        | 1000        |
| 7   | Windshield                       | 954           | 0     | -3505 | 20        | 1000        |
| 8   | Driver Windshield                | -395          | 600   | -2051 | 12.5      | 1000        |
| 9   | Passenger Windshield             | -395          | -600  | -2051 | 12.5      | 1000        |
| 10  | Pit Front                        | -776          | 0     | 2102  | 13        | 1000        |
| 11  | Pit Rear                         | -2772         | 0     | 2102  | 13        | 1000        |
| 12  | Onboard Driver Airbag            | -2709         | -60   | 1672  | 12.5      | 1000        |
| 13  | Onboard Passenger Airbag         | -2709         | 60    | 1672  | 12.5      | 1000        |
| 14  | Onboard Driver Toepan            | -1910         | -432  | 623   | 6.5       | 1000        |
| 15  | Onboard Front Passenger Toepan   | -1947         | 466   | 639   | 6.5       | 1000        |
| 16  | Onboard Rear Passenger Side View | -3154         | -625  | 1144  | 8         | 1000        |
| 17  | Left Overall                     | -2352         | -9043 | -1605 | 28        | 1000        |

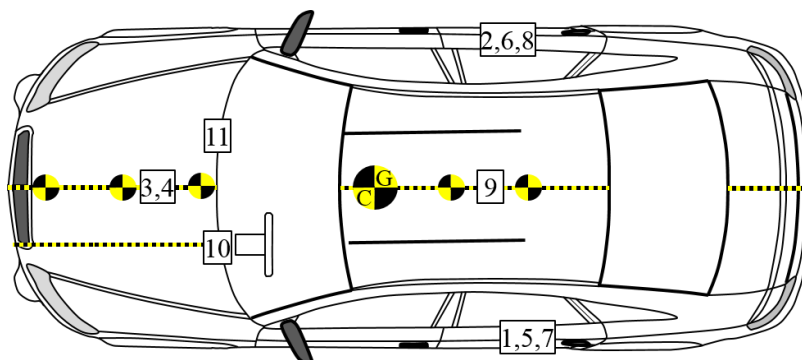
Reference Point:

- +X – Forward of impact plane
- +Y – Right of monorail center
- +Z – into ground

# **DATA SHEET NO. 7** **VEHICLE INSTRUMENTATION DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016



## **VEHICLE INSTRUMENTATION PRE-TEST LOCATIONS**

| No. | Instrumentation Location                  | Axes  | Units | Measurements (mm) |      |      |
|-----|-------------------------------------------|-------|-------|-------------------|------|------|
|     |                                           |       |       | X                 | Y    | Z    |
| 1   | Left Rear Seat Cross Member               | X,Z   | mm    | 576               | 984  | 755  |
| 2   | Right Rear Seat Cross Member              | X,Z   | mm    | 1543              | 513  | 752  |
| 3   | Top of Engine                             | X     | mm    | 4193              | 37   | 1219 |
| 4   | Bottom of Engine                          | X     | mm    | 0                 | 0    | 768  |
| 5   | Left Sill                                 | X,Y   | mm    | 435               | 1416 | 604  |
| 6   | Right Sill                                | X,Y   | mm    | 1921              | 774  | 604  |
| 7   | Left Rear Seat Cross Member Redundant     | X,Z   | mm    | 1541              | 514  | 752  |
| 8   | Right Rear Seat Cross Member Redundant    | X,Z   | mm    | 579               | 989  | 755  |
| 9   | Linear Acceleration & Angular Rate Sensor | X     | mm    | 2306              | 2    | 66   |
|     |                                           | Y     | mm    | 2294              | 11   | 66   |
|     |                                           | Z     | mm    | 2295              | 0    | 64   |
| 10  | Driver Toe Pan                            | X,Y,Z | mm    | 3834              | -441 | 787  |
| 11  | Front Passenger Toe Pan                   | X,Y,Z | mm    | 3637              | 466  | 691  |

Reference point: Origin at rear centerline of vehicle. Vertical coordinate point for origin determined with contact of vehicle structure by 10 mm deep block moved downward along front edge of a level. The level is positioned perpendicular to ground and in contact with rear centerline of vehicle.

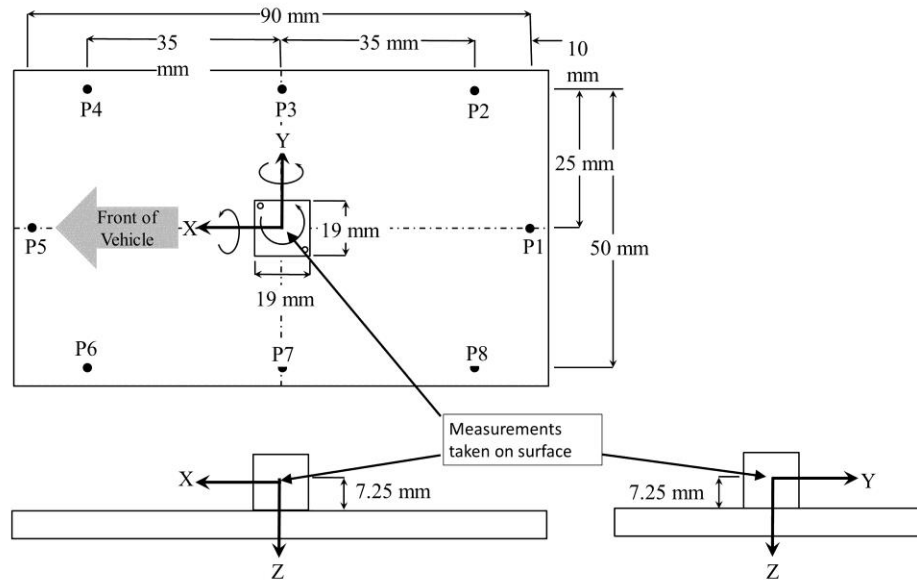
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

## DATA SHEET NO. 7 (CONTINUED) VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

### ANGULAR RATE SENSOR



| VEHICLE COORDINATE SYSTEM |                                |       |                   |     |    |
|---------------------------|--------------------------------|-------|-------------------|-----|----|
| No.                       | Accelerometer Location         | Units | Measurements (mm) |     |    |
|                           |                                |       | X                 | Y   | Z  |
| ACC-1                     | Accelerometer CG – X Direction | mm    | 2306              | 2   | 66 |
| ACC-2                     | Accelerometer CG – Y Direction | mm    | 2294              | 11  | 66 |
| ACC-3                     | Accelerometer CG – Z Direction | mm    | 2295              | 0   | 64 |
| M1                        | Mounting Bolt 1                | mm    | 2288              | -7  | 64 |
| M2                        | Mounting Bolt 2                | mm    | 2303              | 8   | 64 |
| P1                        | Plate Point 1                  | mm    | 2250              | 0   | 80 |
| P2                        | Plate Point 2                  | mm    | 2260              | 25  | 80 |
| P3                        | Plate Point 3                  | mm    | 2295              | 25  | 79 |
| P4                        | Plate Point 4                  | mm    | 2331              | 25  | 79 |
| P5                        | Plate Point 5                  | mm    | 2340              | 0   | 79 |
| P6                        | Plate Point 6                  | mm    | 2330              | -25 | 79 |
| P7                        | Plate Point 7                  | mm    | 2295              | -25 | 79 |
| P8                        | Plate Point 8                  | mm    | 2260              | -25 | 79 |

Reference point: Origin at rear centerline of vehicle. Vertical coordinate point for origin determined with contact of vehicle structure by 10mm deep block moved downward along front edge of a level. The level is positioned perpendicular to ground and in contact with rear centerline of the vehicle.

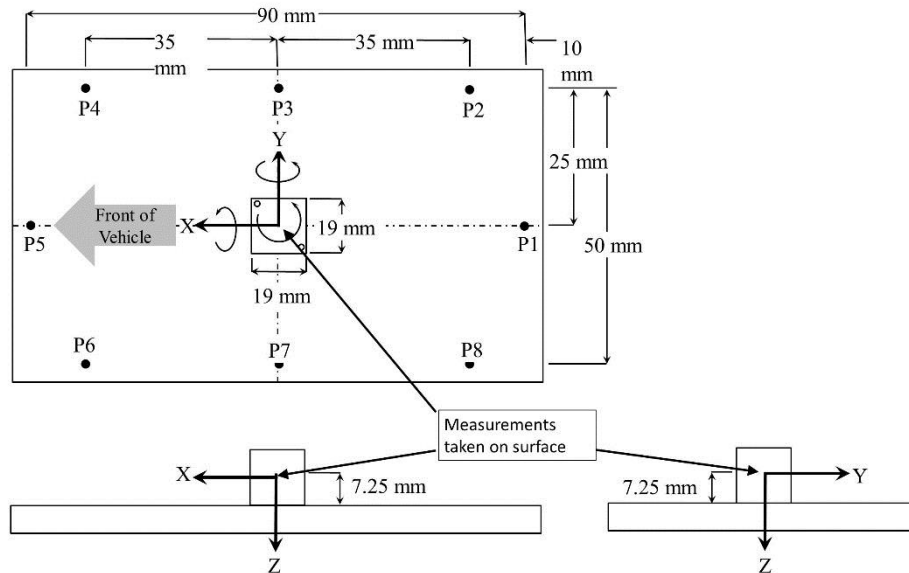
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

# **DATA SHEET NO. 7 (CONTINUED)** **VEHICLE INSTRUMENTATION DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

## **ANGULAR RATE SENSOR**



| DRIVER GLOBAL COORDINATE SYSTEM |                                |       |                   |     |      |
|---------------------------------|--------------------------------|-------|-------------------|-----|------|
| No.                             | Accelerometer Location         | Units | Measurements (mm) |     |      |
|                                 |                                |       | X                 | Y   | Z    |
| ACC-1                           | Accelerometer CG – X Direction | mm    | -180              | 874 | -653 |
| ACC-2                           | Accelerometer CG – Y Direction | mm    | -192              | 884 | -653 |
| ACC-3                           | Accelerometer CG – Z Direction | mm    | -191              | 873 | -655 |
| M1                              | Mounting Bolt 1                | mm    | -198              | 865 | -655 |
| M2                              | Mounting Bolt 2                | mm    | -183              | 880 | -655 |
| P1                              | Plate Point 1                  | mm    | -236              | 873 | -639 |
| P2                              | Plate Point 2                  | mm    | -225              | 898 | -639 |
| P3                              | Plate Point 3                  | mm    | -190              | 898 | -640 |
| P4                              | Plate Point 4                  | mm    | -155              | 898 | -640 |
| P5                              | Plate Point 5                  | mm    | -145              | 873 | -640 |
| P6                              | Plate Point 6                  | mm    | -155              | 848 | -640 |
| P7                              | Plate Point 7                  | mm    | -190              | 848 | -640 |
| P8                              | Plate Point 8                  | mm    | -226              | 848 | -639 |

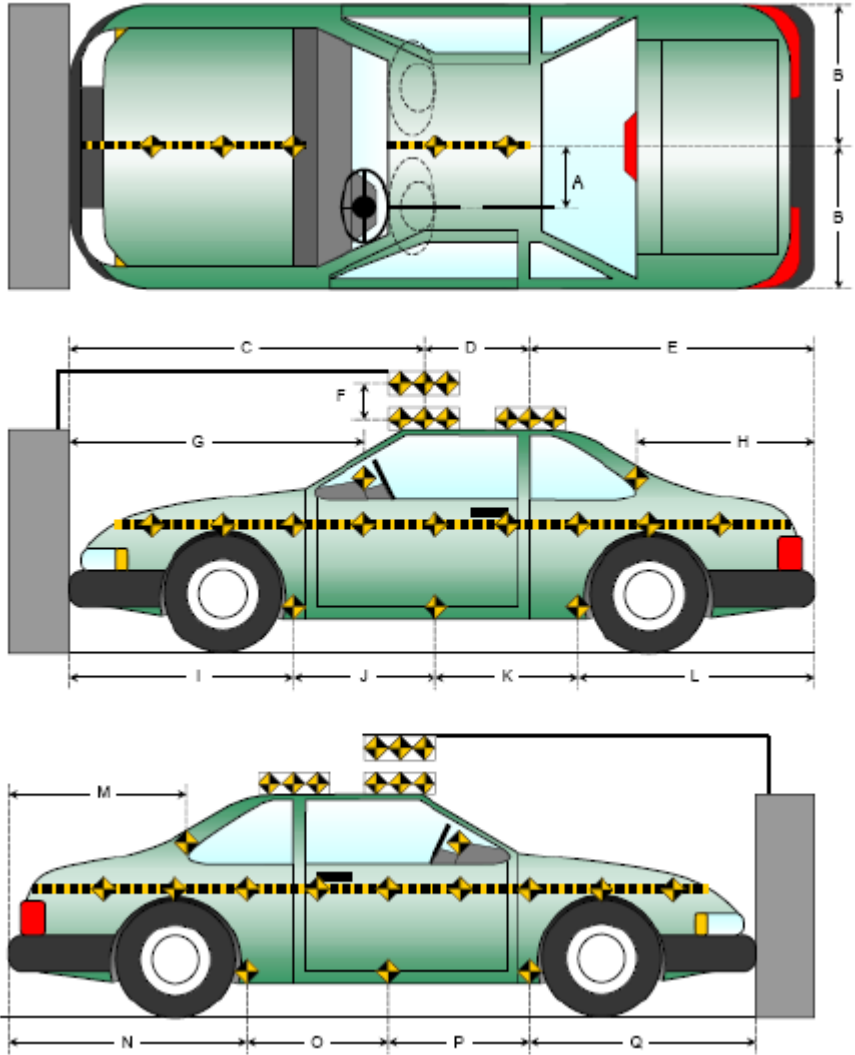
**DATA SHEET NO. 8**  
**PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2016 Chevrolet Tahoe  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: R20155144  
 Test Date: 8/11/2015

| Item | Value |
|------|-------|
| A    | 449   |
| B    | 1003  |
| C    | 2948  |
| D    | 609   |
| E    | 1596  |
| F    | 135   |
| G    | 1928  |
| H    | 1200  |
| I    | 1548  |
| J    | 947   |
| K    | 947   |
| L    | 1712  |
| M    | 1199  |
| N    | 1709  |
| O    | 942   |
| P    | 950   |
| Q    | 1551  |

All units in millimeters





**DATA SHEET NO. 9**  
**TEST VEHICLE SUMMARY OF RESULTS**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

**INSTRUMENTATION**

| Instrumentation                     | Number of Channels Collected |
|-------------------------------------|------------------------------|
| Driver Dummy Accelerometers         | 108                          |
| Passenger Dummy Accelerometers      | 74                           |
| Rear Passenger Dummy Accelerometers | 46                           |
| Vehicle Structure Accelerometers    | 40                           |
| <b>Total</b>                        | <b>268</b>                   |

**CAMERA COVERAGE**

| Type of Camera             | Number Used in this Test |
|----------------------------|--------------------------|
| High-Speed Vehicle Onboard | 5                        |
| High-Speed Off-board       | 11                       |
| Real-Time Panning          | 1                        |
| <b>Total</b>               | <b>17</b>                |

**DATA SHEET NO. 10**  
**POST TEST OBSERVATIONS**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

**TEST DUMMY INFORMATION AND CONTACT LOCATIONS**

| Description           | Driver                            | Right Front Passenger             | Rear Passenger            |
|-----------------------|-----------------------------------|-----------------------------------|---------------------------|
| Dummy Type/Serial No. | DL9207                            | 324                               | 019                       |
| Lower Leg Type        | LX                                |                                   |                           |
| Lower Leg Serial No.  | LX0045/LX0046                     |                                   |                           |
| Head Contact          | Front & Curtain Airbag & Headrest | Front & Curtain Airbag & Headrest | Curtain Airbag & Headrest |
| Upper Torso Contact   | Front Airbag                      | Front Airbag                      | None                      |
| Lower Torso Contact   | None                              | None                              | None                      |
| Left Knee Contact     | Knee Bolster                      | Glove Box                         | None                      |
| Right Knee Contact    | Knee Bolster                      | Glove Box                         | None                      |

**DOOR OPENING AND SEAT TRACK INFORMATION**

| Description           | Driver               | Right Front Passenger | Rear Passenger       |
|-----------------------|----------------------|-----------------------|----------------------|
| Locked/Unlocked Doors | Unlocked             | Unlocked              | Unlocked             |
| Front Door Opening    | Closed & Operational | Closed & Operational  | Closed & Operational |
| Rear Door Opening     | Closed & Operational | Closed & Operational  | Closed & Operational |
| Seat Track Shift (mm) | 0                    | 0                     | 0                    |
| Seat Back Failure     | No                   | No                    | No                   |
| Glazing Damage        | None                 | None                  | None                 |

**POST TEST STRUCTURAL OBSERVATIONS**

| Critical Areas of Performance | Observations and Conclusions |
|-------------------------------|------------------------------|
| Pillar Performance            | A-Pillar & B-Pillar Buckled  |
| Windshield Damage             | Cracks throughout            |
| Window Damage                 | None                         |
| Other Notable Effects         | None                         |

**VEHICLE REBOUND FROM BARRIER**

| Measured Parameter | Units | Value |
|--------------------|-------|-------|
| Left Side          | mm    | 587   |
| Center             | mm    | 622   |
| Right Side         | mm    | 645   |
| Average            | mm    | 618   |

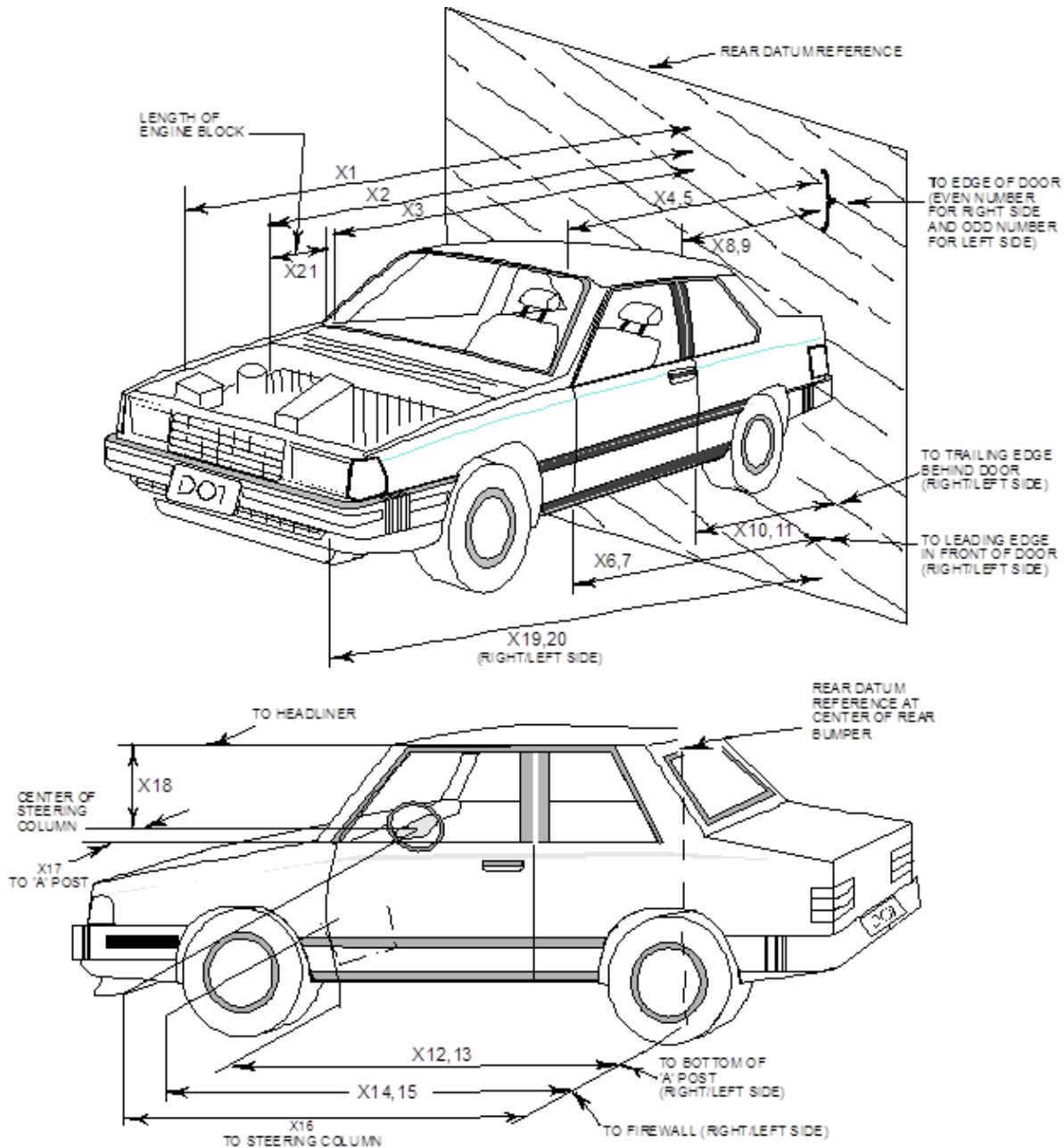
**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

| Restraint Type         | Driver<br>(Occupant 1) |          | Right Front Pass.<br>(Occupant 2) |          | Rear Passenger<br>(Occupant 3) |          |
|------------------------|------------------------|----------|-----------------------------------|----------|--------------------------------|----------|
|                        | Installed              | Deployed | Installed                         | Deployed | Installed                      | Deployed |
| Front Airbag           | Yes                    | Yes      | Yes                               | Yes      | No                             | N/A      |
| Curtain Airbag         | Yes                    | Yes      | Yes                               | Yes      | Yes                            | Yes      |
| Torso Airbag           | Yes                    | No       | Yes                               | No       | No                             | N/A      |
| Knee Airbag            | No                     | N/A      | No                                | N/A      | No                             | N/A      |
| Seat Belt Pretensioner | Yes                    | Yes      | Yes                               | Yes      | No                             | N/A      |
| Seat Belt Load Limiter | Yes                    | Yes      | Yes                               | Yes      | No                             | N/A      |
| Other                  |                        |          |                                   |          |                                |          |

# **DATA SHEET NO. 11** **VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016



**DATA SHEET NO. 11 (CONTINUED)**  
**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

| No. | Measurement Description                           | Units | Pre-Test | Post-Test | Difference |
|-----|---------------------------------------------------|-------|----------|-----------|------------|
| 1   | Total Length of Vehicle at Centerline             | mm    | 5165     | 4445      | -720       |
| 2   | Rear Surface of Vehicle (RSOV) to Front of Engine | mm    | 4301     | 4104      | -197       |
| 3   | RSOV to Firewall                                  | mm    | 3940     | 3881      | -60        |
| 4   | RSOV to Upper Leading Edge of Right Door          | mm    | 3587     | 3587      | 0          |
| 5   | RSOV to Upper Leading Edge of Left Door           | mm    | 3590     | 3574      | -16        |
| 6   | RSOV to Lower Leading Edge of Right Door          | mm    | 3508     | 3523      | 15         |
| 7   | RSOV to Lower Leading Edge of Left Door           | mm    | 3511     | 3507      | -4         |
| 8   | RSOV to Upper Trailing Edge of Right Door         | mm    | 2426     | 2427      | 1          |
| 9   | RSOV to Upper Trailing Edge of Left Door          | mm    | 2427     | 2416      | -11        |
| 10  | RSOV to Lower Trailing Edge of Right Door         | mm    | 2400     | 2415      | 15         |
| 11  | RSOV to Lower Trailing Edge of Left Door          | mm    | 2404     | 2403      | 0          |
| 12  | RSOV to Bottom of "A" Post of Right Side          | mm    | 3661     | 3666      | 5          |
| 13  | RSOV to Bottom of "A" Post of Left Side           | mm    | 3662     | 3647      | -14        |
| 14  | RSOV to Firewall, Right Side                      | mm    | 3888     | 3853      | -34        |
| 15  | RSOV to Firewall, Left Side                       | mm    | 3889     | 3875      | -14        |
| 16  | RSOV to Steering Column                           | mm    | 3062     | 3044      | -18        |
| 17  | Center of Steering Column to "A" Post             | mm    | 305      | 267       | -38        |
| 18  | Center of Steering Column to Headliner            | mm    | 443      | 430       | -13        |
| 19  | RSOV to Right Side of Front Bumper                | mm    | 5095     | 4455      | -641       |
| 20  | RSOV to Left Side of Front Bumper                 | mm    | 5097     | 4463      | -634       |
| 21  | Length of Engine Block                            | mm    | 467      | 467       | 0          |
| RD  | RSOV to Right Side of Dash Panel                  | mm    | 3229     | 3232      | 3          |
| CD  | RSOV to Center of Dash Panel                      | mm    | 3242     | 3203      | -39        |
| LD  | RSOV to Left Side of Dash Panel                   | mm    | 3230     | 3217      | -13        |

UR\* = Unrecoverable Data Point

**DATA SHEET NO. 12**  
**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

**VEHICLE INFORMATION**

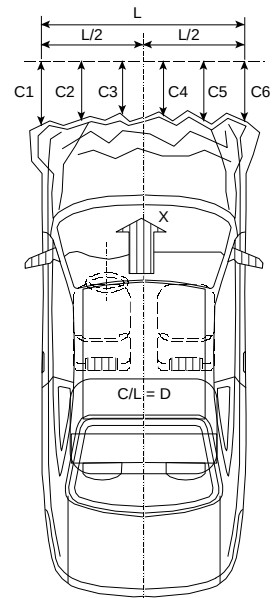
VIN: 1GNSCAKC2GR170032 Wheelbase (mm): 2954  
 Vehicle Size Category: Passenger Test Weight (kg): 2762

**ACCELEROMETER DATA**

Accelerometer Locations: As Described in Data Sheet No. 7  
 Cal. Procedure/Interval: Calspan Procedure / 6 month  
 Integration Algorithm: Trapezoidal  
 Linearity: > 99%  
 Impact Velocity (kph): 56.48  
 Velocity Change (kph): 56.48

**CRUSH PROFILE**

Collision Deformation Classification: 12FDEW3  
 Midpoint of Damage: C3  
 Damage Region Length (mm): 1695  
 Impact Mode: Frontal Barrier



**Crush Measurements: Bumper Cover**

| No. | Measurement Description                                                                        | Units | Pre-Test | Post-Test | Difference |
|-----|------------------------------------------------------------------------------------------------|-------|----------|-----------|------------|
| C1  | Crush zone 1 at left side                                                                      | mm    | 4901     | 4554      | 347        |
| C2  | Crush zone 2 at left side                                                                      | mm    | 5076     | 4458      | 618        |
| C3  | Crush zone 3 at left side                                                                      | mm    | 5137     | 4440      | 697        |
| C4  | Crush zone 4 at right side                                                                     | mm    | 5137     | 4443      | 694        |
| C5  | Crush zone 5 at right side                                                                     | mm    | 5073     | 4445      | 628        |
| C6  | Crush zone 6 at right side                                                                     | mm    | 4894     | 4543      | 351        |
| L   | C1 to C6                                                                                       | mm    | 1695     | 1768      | -72        |
|     | Logitudinal horizontal distance from the tip of the front bumper to the base of the windshield | mm    | 1,317    | 620       | 697        |

Reference point: Origin at rear centerline of vehicle. Vertical coordinate point for origin determined with contact of vehicle structure by 10mm deep block moved downward along front edge of a level. The level is positioned perpendicular to ground and in contact with rear centerline of the vehicle.

- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

**DATA SHEET NO. 13**  
**VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

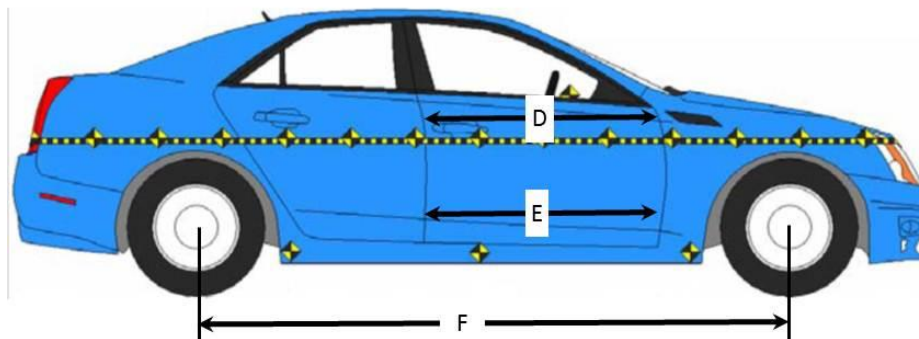
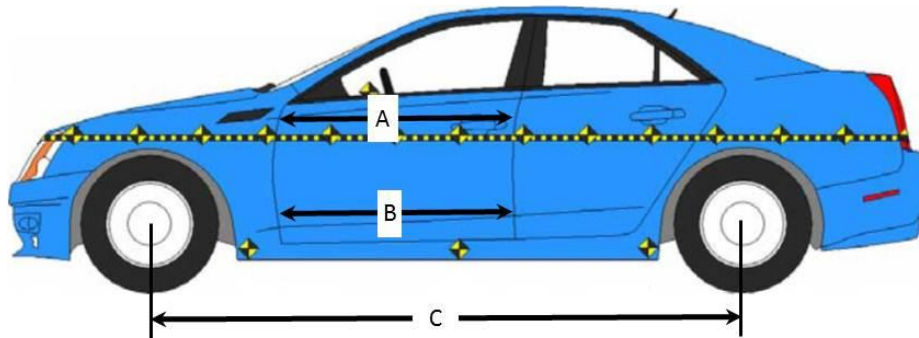
NHTSA No.: M20160118  
 Test Date: 1/15/2016

**DOOR OPENING WIDTH**

| Item | Description      | Units | Pre-Test | Post-Test | Difference |
|------|------------------|-------|----------|-----------|------------|
| A    | Left Side Upper  | mm    | 1036     | 1025      | -11        |
| B    | Left Side Lower  | mm    | 956      | 952       | -4         |
| D    | Right Side Upper | mm    | 1036     | 1035      | -1         |
| E    | Right Side Lower | mm    | 954      | 954       | 0          |

**WHEELBASE MEASUREMENTS**

| Item | Description          | Units | Pre-Test | Post-Test | Difference |
|------|----------------------|-------|----------|-----------|------------|
| C    | Left Side Wheelbase  | mm    | 2954     | 2867      | -87        |
| F    | Right Side Wheelbase | mm    | 2954     | 2874      | -80        |



**DATA SHEET NO.13 (CONTINUED)**  
**VEHICLE INTRUSION MEASUREMENTS**

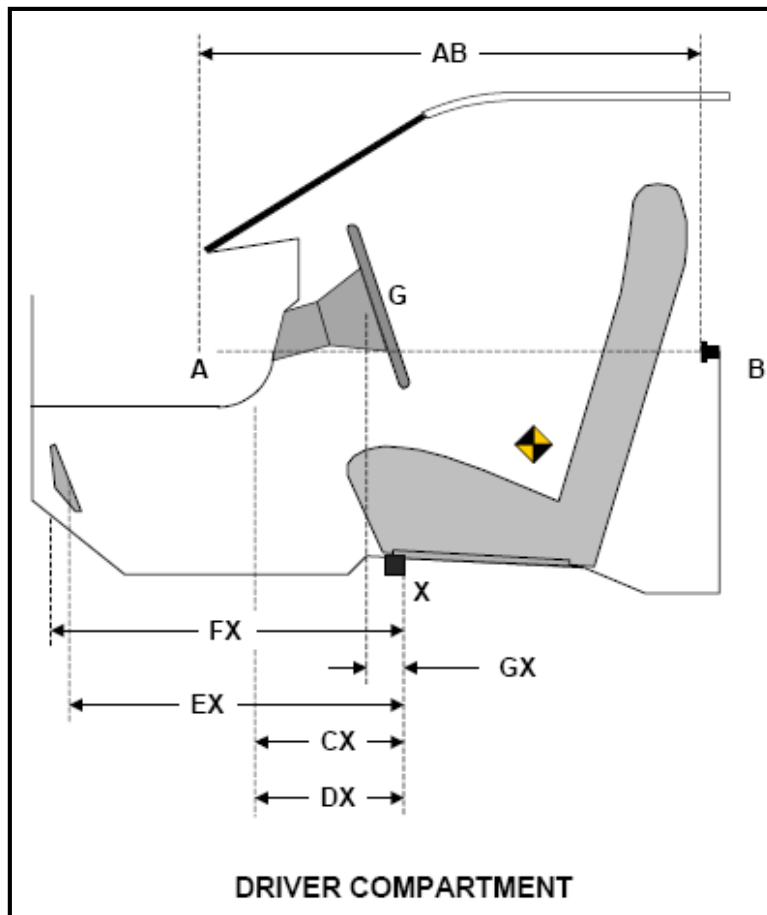
Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

**DRIVER COMPARTMENT INTRUSION**

| Item | Description                              | Units | Pre-Test | Post-Test | Difference |
|------|------------------------------------------|-------|----------|-----------|------------|
| AB   | Door Opening (Inside Window Jam)         | mm    | 742      | 742       | 0          |
| CX   | Left Knee Bolster to X                   | mm    | 310      | 292       | -18        |
| DX   | Right Knee Bolster to X                  | mm    | 297      | 273       | -24        |
| EX   | Brake Pedal to X                         | mm    | 558      | 490       | -68        |
| FX   | Foot Rest to X                           | mm    | 716      | 703       | -13        |
| GX   | Center of Steering Column Wheel Hub to X | mm    | 93       | 77        | -16        |

*X = Front of Seat Track (Stationary)*



**DATA SHEET NO. 14**  
**SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
 Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
 Test Date: 1/15/2016

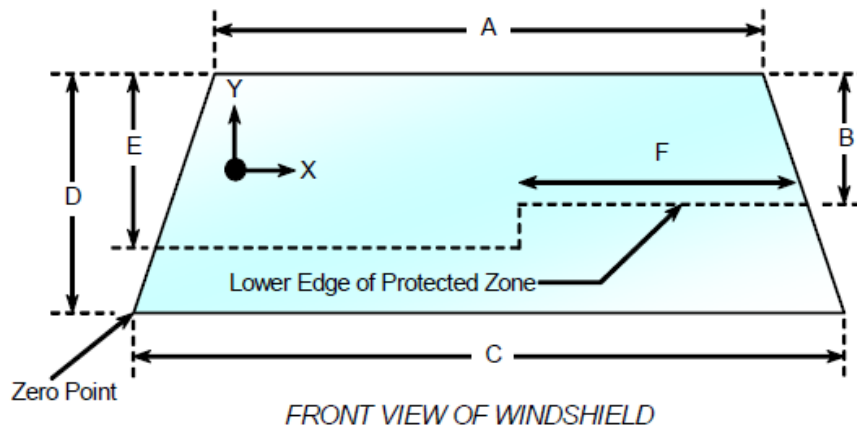
*Please provide windshield mounting details. A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.*

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21°C

**WINDSHIELD PERIPHERY MEASUREMENTS**

| Measurement | Pre-Test (mm) | Post-Test (mm) | % Retention |
|-------------|---------------|----------------|-------------|
| Left Side   | 1913          | 1913           | 100         |
| Right Side  | 1911          | 1911           | 100         |
| Total       | 3824          | 3824           | 100         |



| Item | Units | Value |
|------|-------|-------|
| A    | mm    | 1380  |
| B    | mm    | 442   |
| C    | mm    | 1668  |
| D    | mm    | 806   |
| E    | mm    | 445   |
| F    | mm    | 541   |

**AREAS OF PROTECTED ZONE FAILURES**

A. Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.

- No penetration

| X | Y |
|---|---|
|   |   |
|   |   |
|   |   |
|   |   |

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

- No Penetration

| X | Y |
|---|---|
|   |   |
|   |   |
|   |   |
|   |   |



**DATA SHEET NO. 14 (CONTINUED)**  
**SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016

**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Ambient Temperature at Test Vehicle Time of Impact: 21° C

Test Time: 12:10 PM

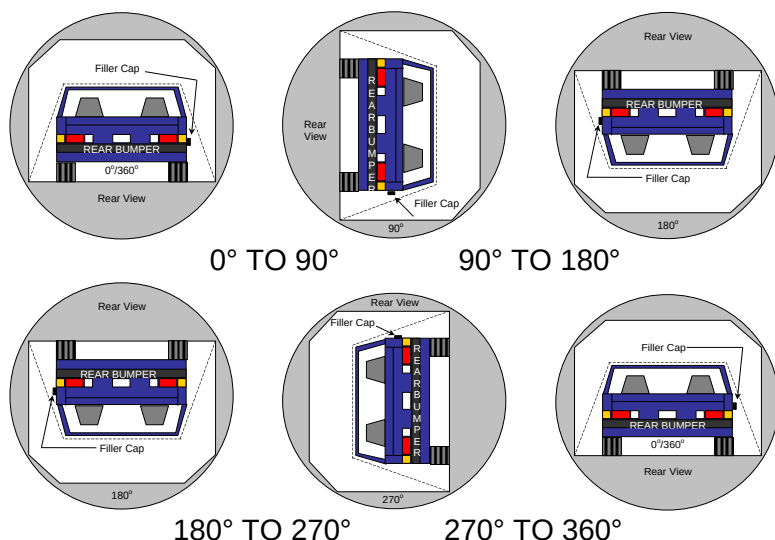
**Stoddard Solvent Spillage Measurements**

|    |                                                                             |          |    |
|----|-----------------------------------------------------------------------------|----------|----|
| A. | From impact until vehicle motion ceases:<br>(Maximum allowable = 1 oz.)     | <u>0</u> | oz |
| B. | For the 5-minute period after motion ceases:<br>(Maximum allowable = 5 oz.) | <u>0</u> | oz |
| C. | For the following 25 minutes:<br>(Maximum allowable = 1 oz./minute)         | <u>0</u> | oz |
| D. | Spillage                                                                    | <u>0</u> | oz |

## DATA SHEET NO. 15 FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.

2. The position hold time at each position is 300 seconds (minimum).

3. Details of Stoddard Solvent spillage: None

### SOLVENT COLLECTION TIME TABLE IN SECONDS

| Test Phase   | Rotation Time | Hold Time | Total Time |
|--------------|---------------|-----------|------------|
| 0° to 90°    | 66            | 300       | 366        |
| 90° to 180°  | 64            | 300       | 364        |
| 180° to 270° | 66            | 300       | 366        |
| 270° to 360° | 68            | 300       | 368        |

### FMVSS 301 SPILLAGE TABLE

| Test Phase   | First 5 Minutes | Sixth Minute | Seventh Minute | Eighth Minute |
|--------------|-----------------|--------------|----------------|---------------|
| 0° to 90°    | 0               | 0            | 0              |               |
| 90° to 180°  | 0               | 0            | 0              |               |
| 180° to 270° | 0               | 0            | 0              |               |
| 270° to 360° | 0               | 0            | 0              |               |

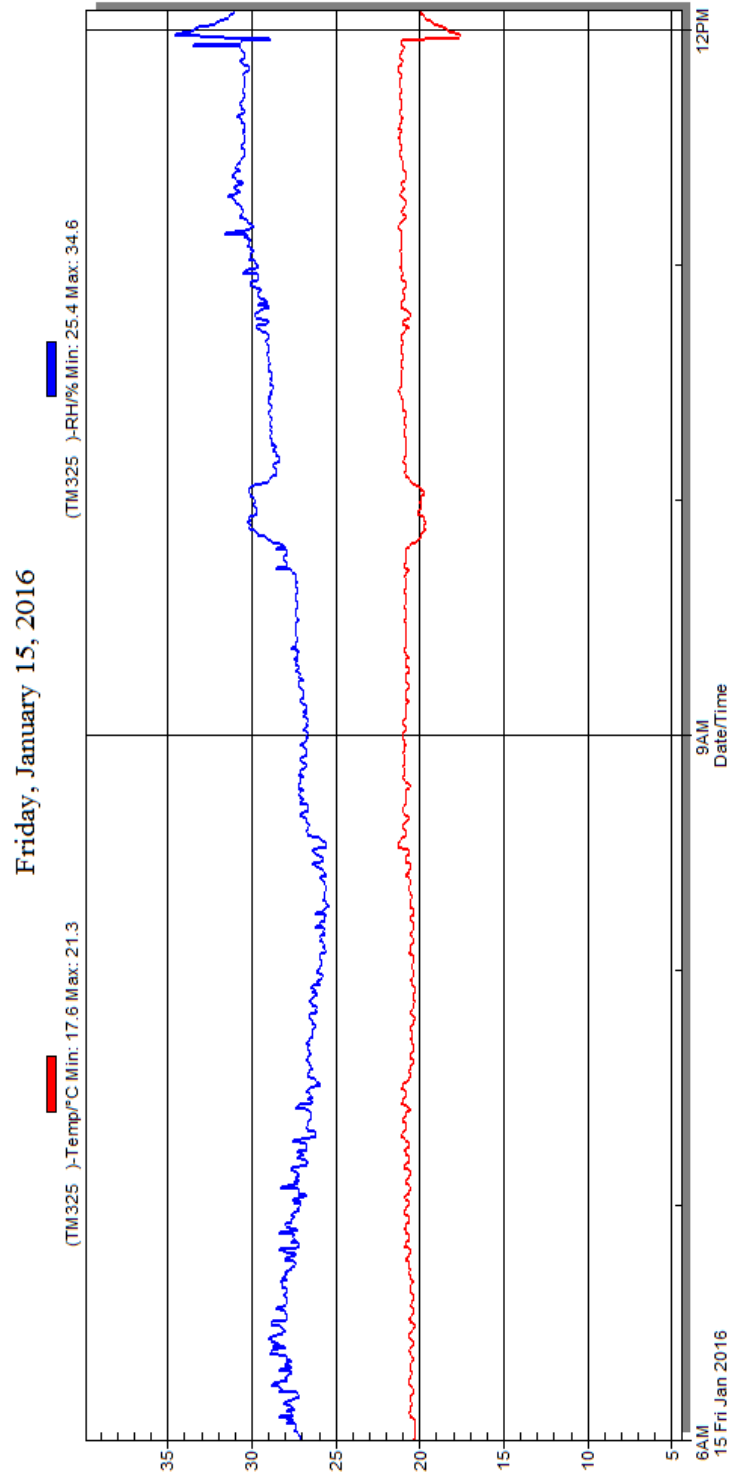
### SOLVENT SPILLAGE LOCATION TABLE

| Test Phase   | Spillage Location |
|--------------|-------------------|
| 0° to 90°    | None              |
| 90° to 180°  | None              |
| 180° to 270° | None              |
| 270° to 360° | None              |

**DATA SHEET NO. 16**  
**DUMMY/VEHICLE TEMPERATURE STABILIZATION**

Test Vehicle: 2016 Chevrolet Tahoe SUV  
Test Program: 56.3 KPH Research Frontal Rigid Barrier Test

NHTSA No.: M20160118  
Test Date: 1/15/2016



**Temperature Stabilization Chart/Data**

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**PHOTOGRAPHS**

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**Photo Not Applicable**

Figure A-1: Load Cell Location

**Photo Not Applicable**

Figure A-2: Rigid Barrier Frontal Wall



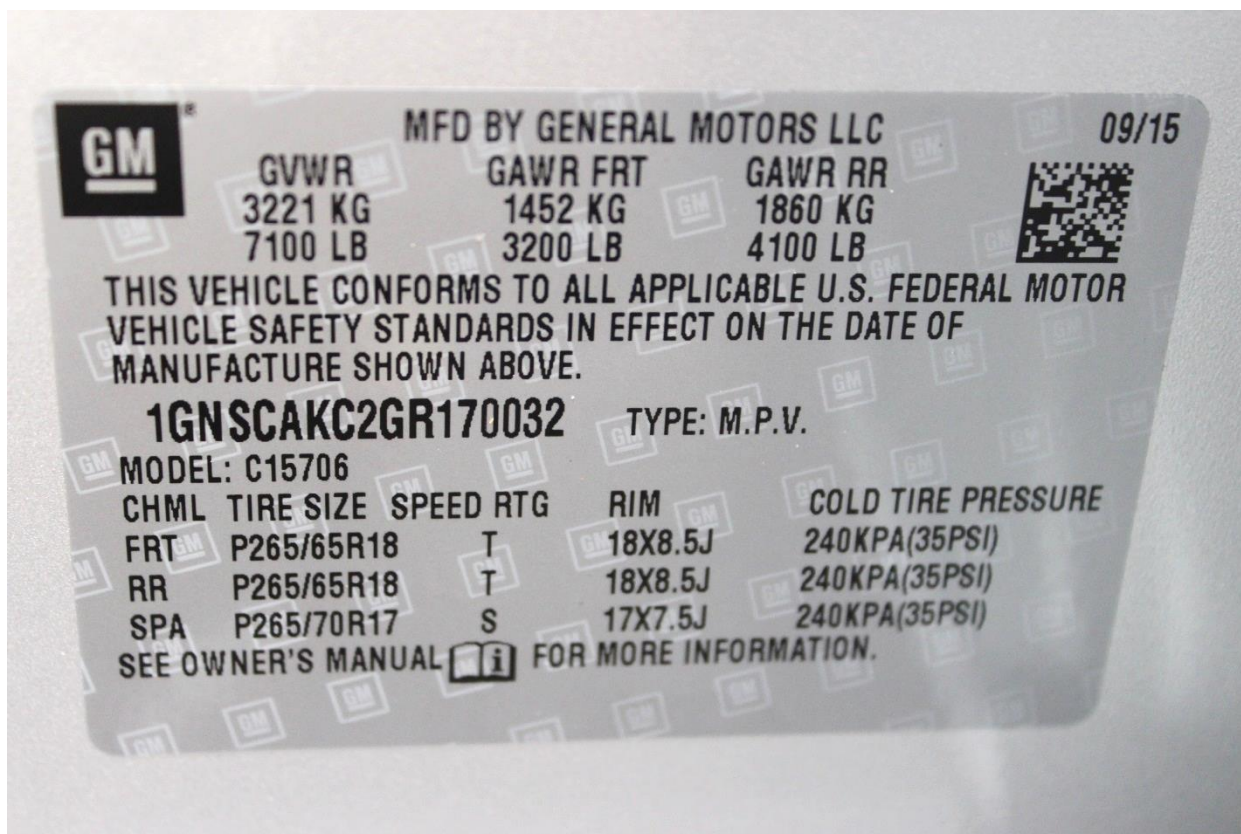


Figure A-3: Manufacturer's Label

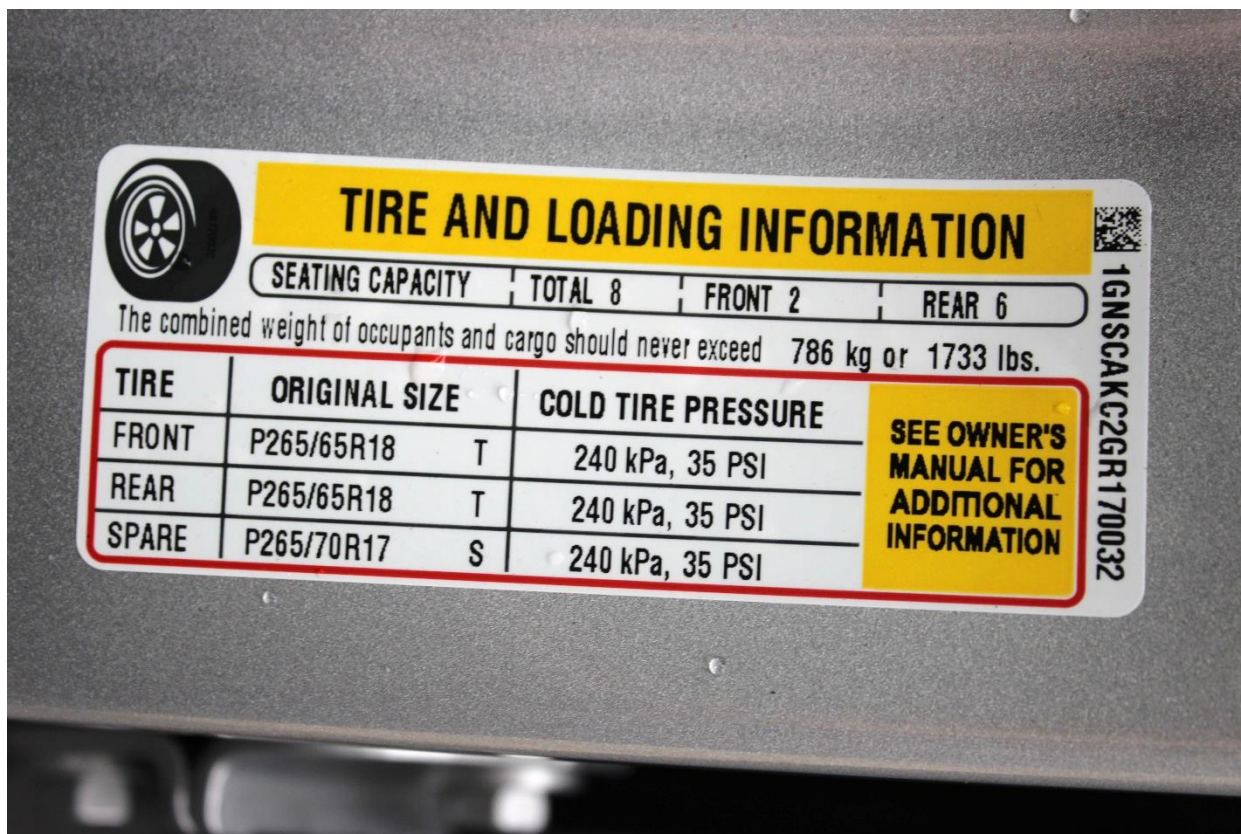


Figure A-4: Tire Placard





**Figure A-5: 2016 Chevrolet Tahoe Frontal As Delivered**



**Figure A-6: Left Rear 3/4 View, As Received**





**Figure A-7: Pre-Test Front View of Test Vehicle**



**Figure A-8: Post-Test Front View of Test Vehicle**





**Figure A-9: Pre-Test Left View of Test Vehicle**



**Figure A-10: Post-Test Left View of Test Vehicle**





**Figure A-11: Pre-Test Right View of Test Vehicle**



**Figure A-12: Post-Test Right View of Test Vehicle**





**Figure A-13: Pre-Test Right Front 3/4 View**



**Figure A-14: Post-Test Right Front 3/4 View**





**Figure A-15: Pre-Test Left Rear 3/4 View**



**Figure A-16: Post-Test Left Rear 3/4 View**





**Figure A-17: Pre-Test Windshield View**

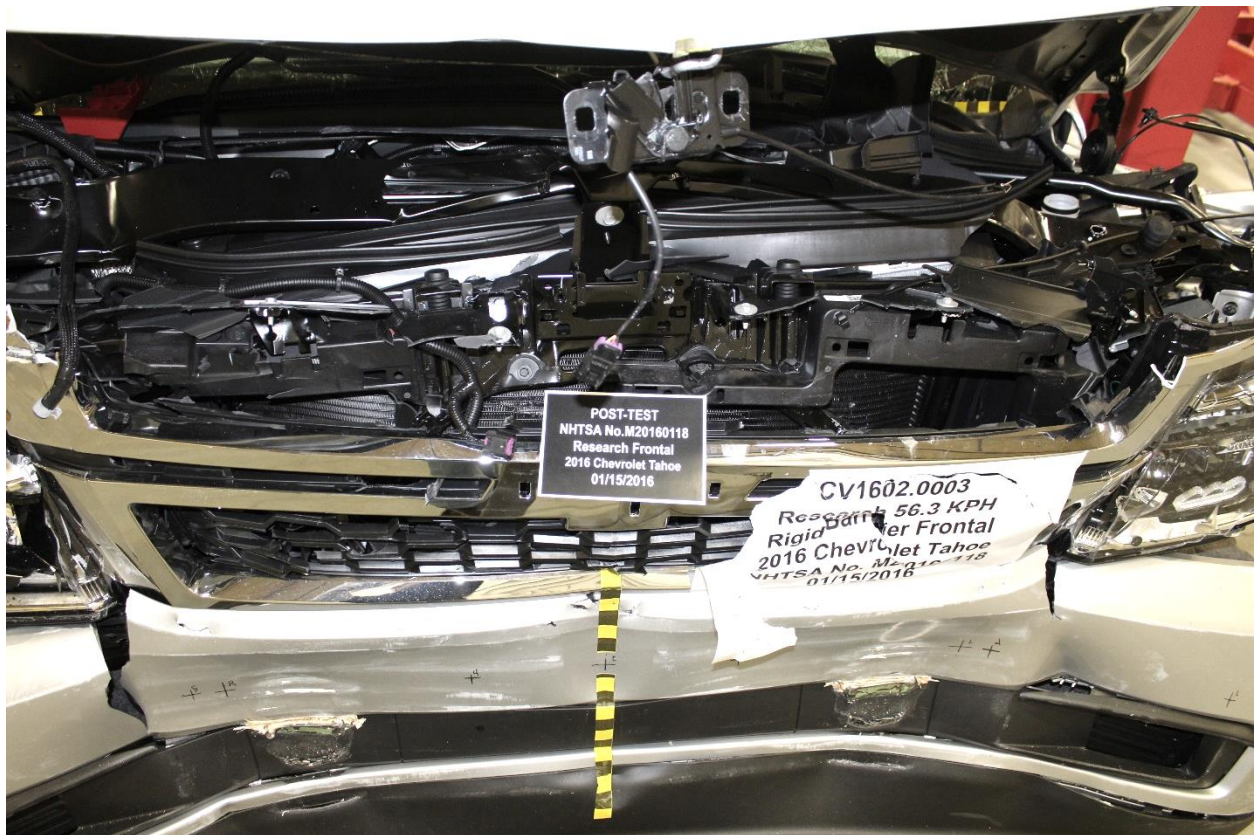


**Figure A-18: Post-Test Windshield View**





**Figure A-19: Pre-Test Engine Compartment View**



**Figure A-20: Post-Test Engine Compartment View**

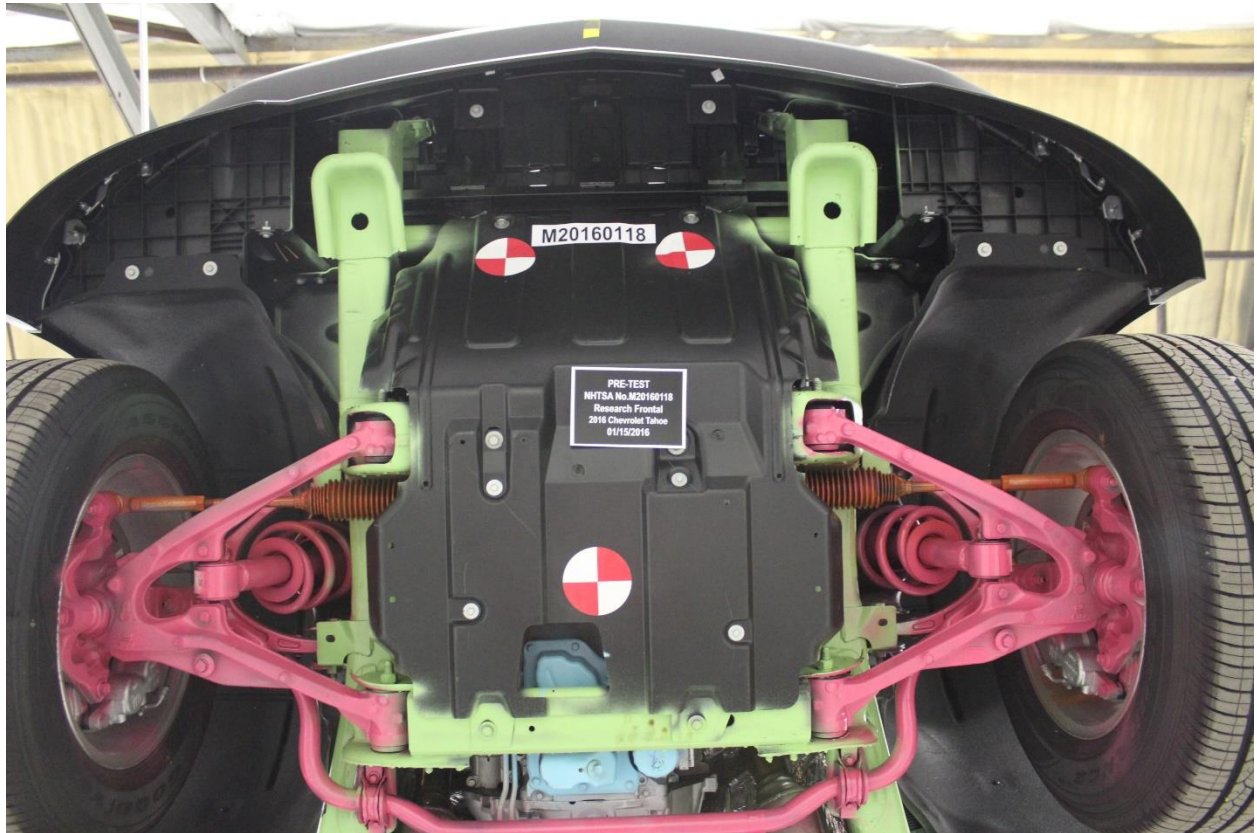


Figure A-21: Pre-Test Fuel Filler Cap View

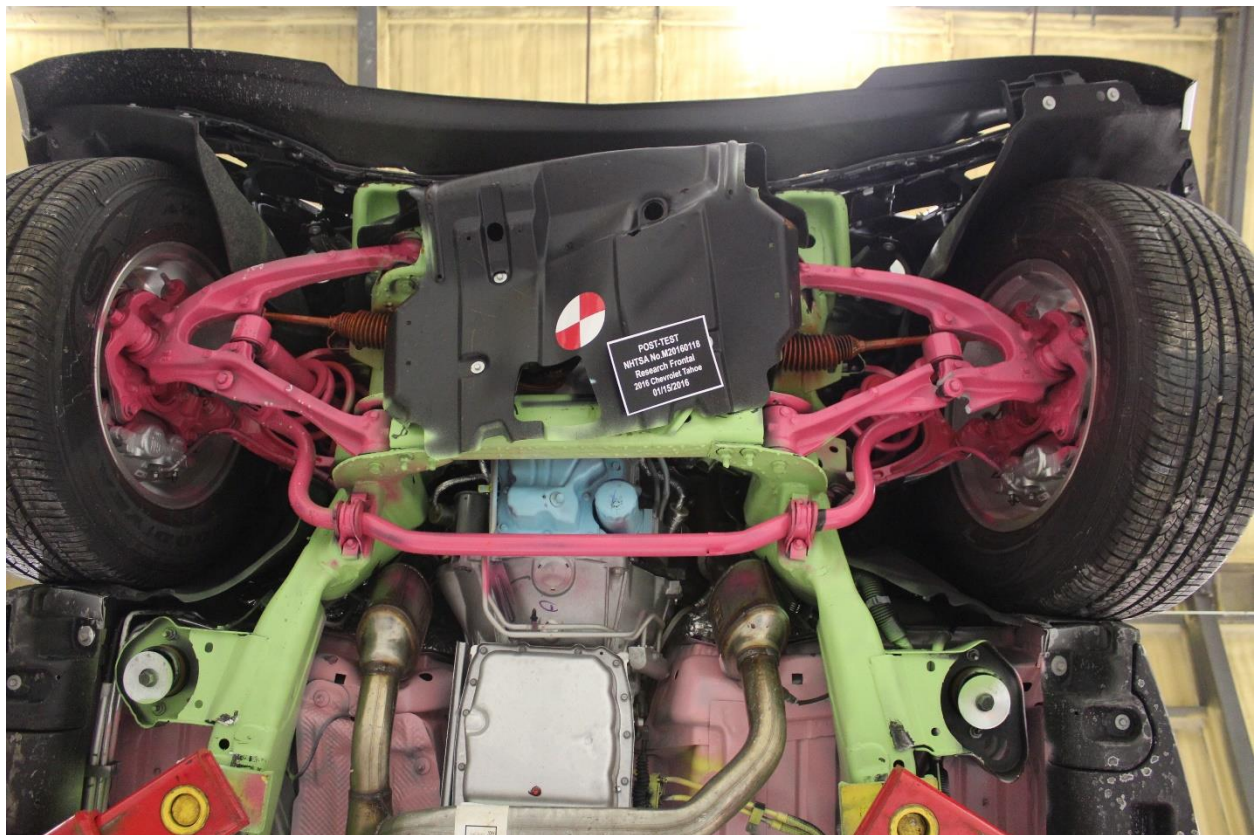


Figure A-22: Post-Test Fuel Filler Cap View



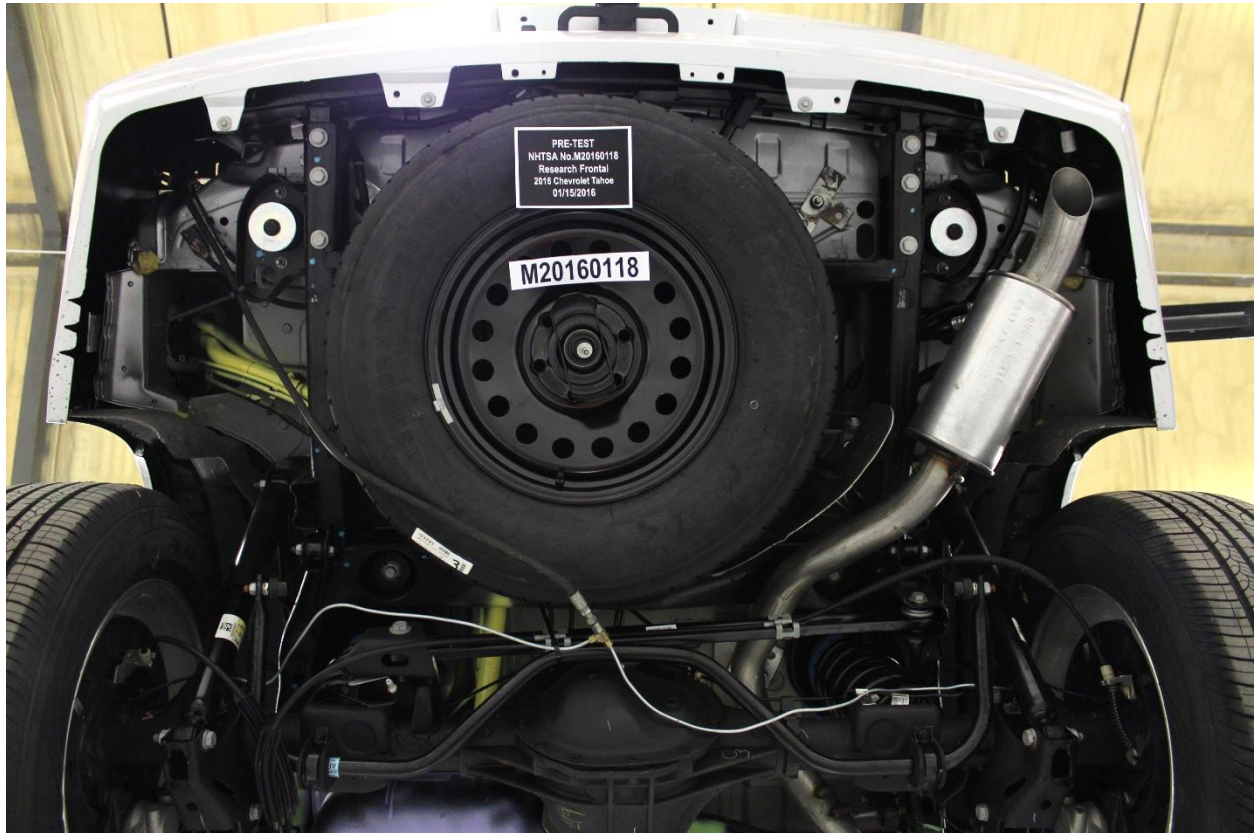


**Figure A-23: Pre-Test Front Underbody View**

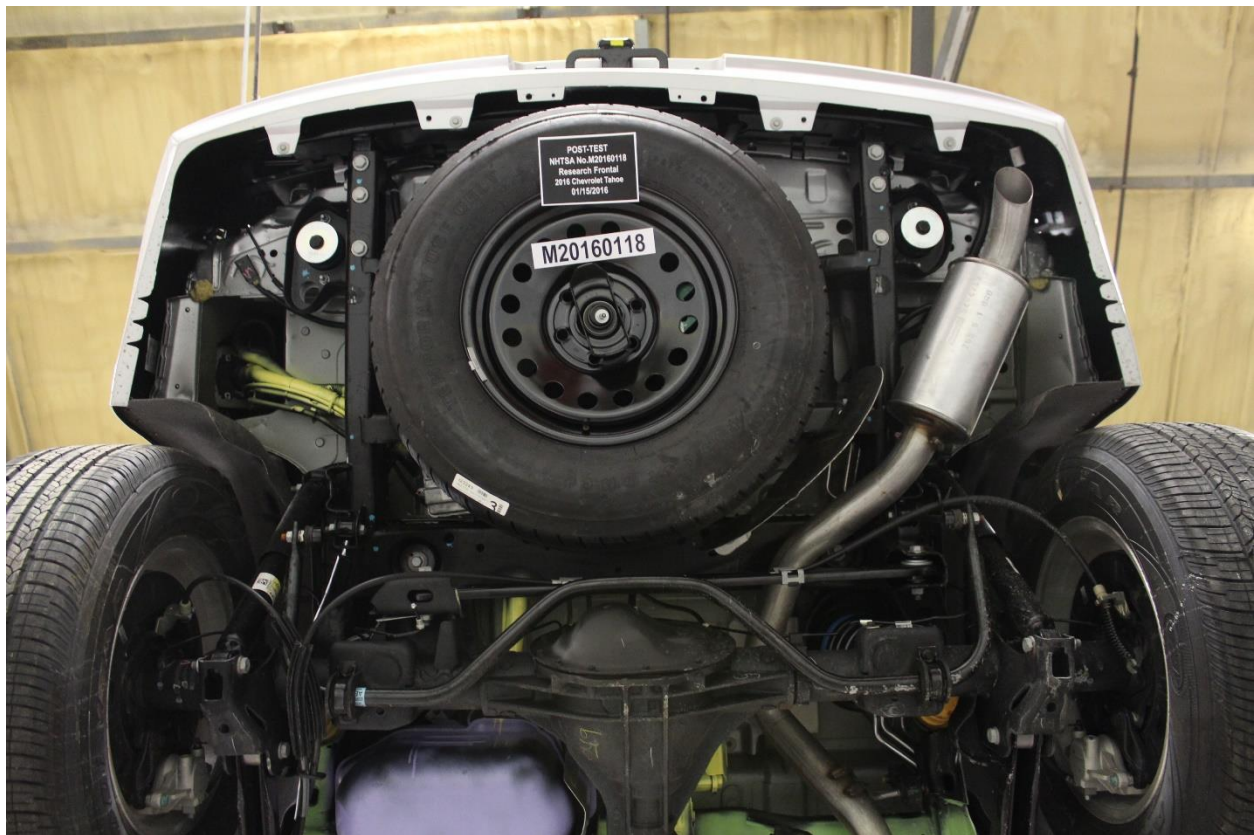


**Figure A-24: Post-Test Front Underbody View**





**Figure A-25: Pre-Test Rear Underbody View**



**Figure A-26: Post-Test Rear Underbody View**





**Figure A-27: Pre-Test Dummy Cable Routing**



**Figure A-28: Post-Test Dummy Cable Routing**





**Figure A-29: Pre-Test Driver Dummy Front View**



**Figure A-30: Post-Test Driver Dummy Front View**





**Figure A-31: Pre-Test Driver Dummy Window View**



**Figure A-32: Post-Test Driver Dummy Window View**





**Figure A-33: Pre-Test Driver Dummy and Vehicle Interior View**



**Figure A-34: Post-Test Driver Dummy and Vehicle Interior View**



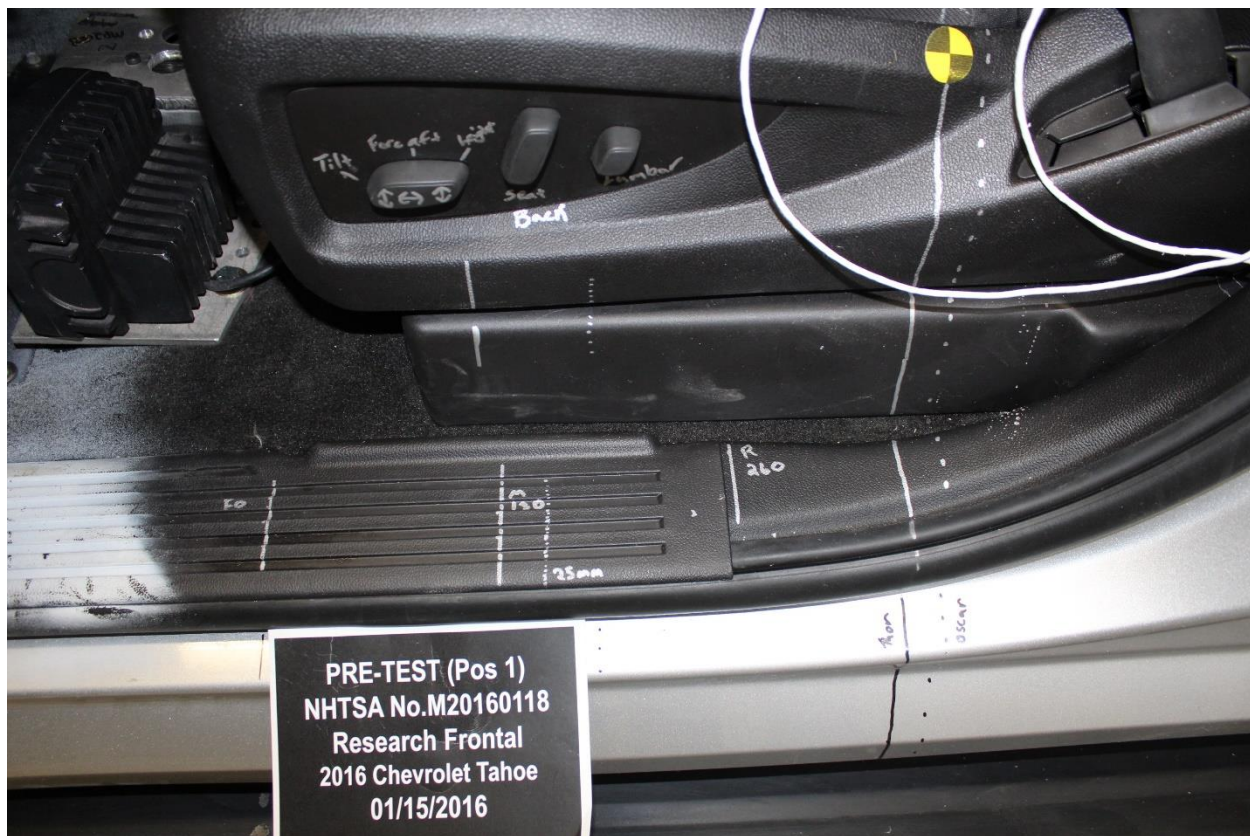


Figure A-35: Pre-Test Driver's Seat Fore-Aft Markings

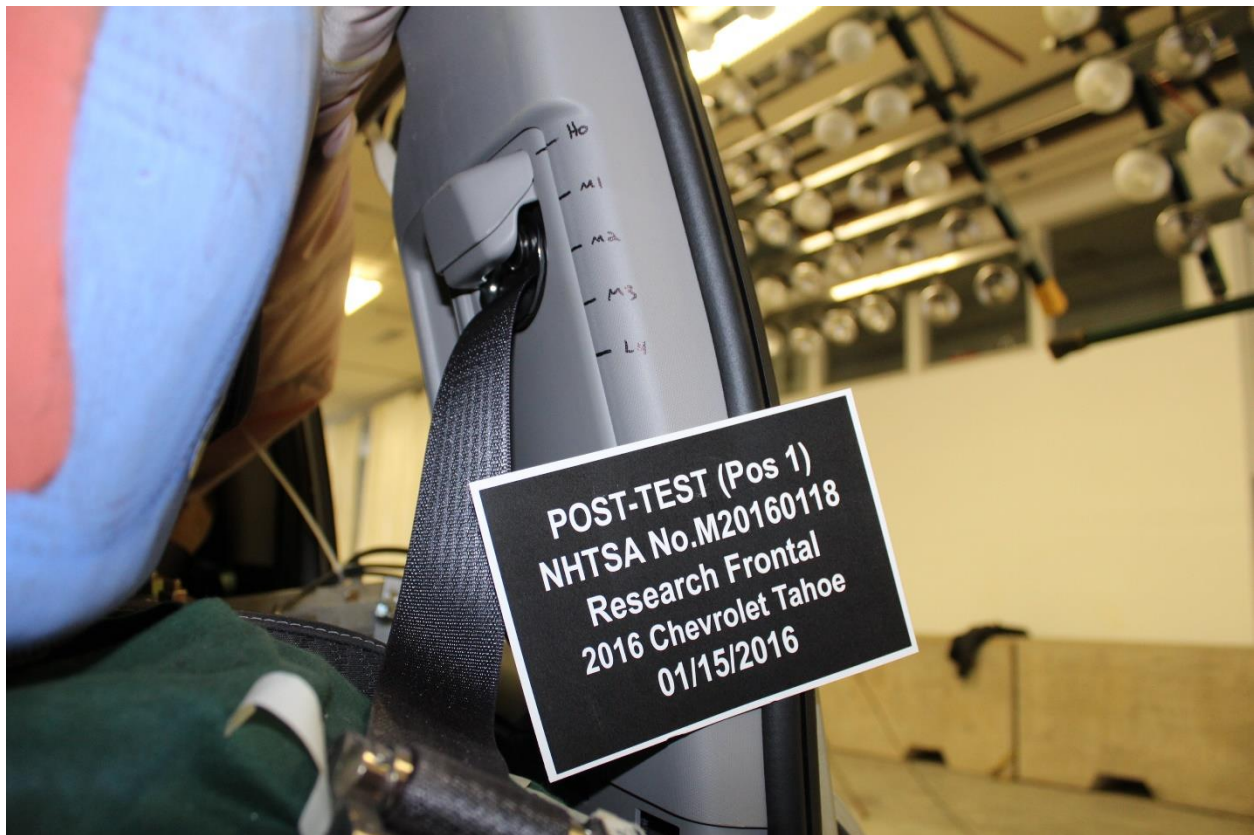


Figure A-36: Post-Test Driver's Seat Fore-Aft Markings





**Figure A-37: Pre-Test View of Belt Anchorage for Driver Dummy**

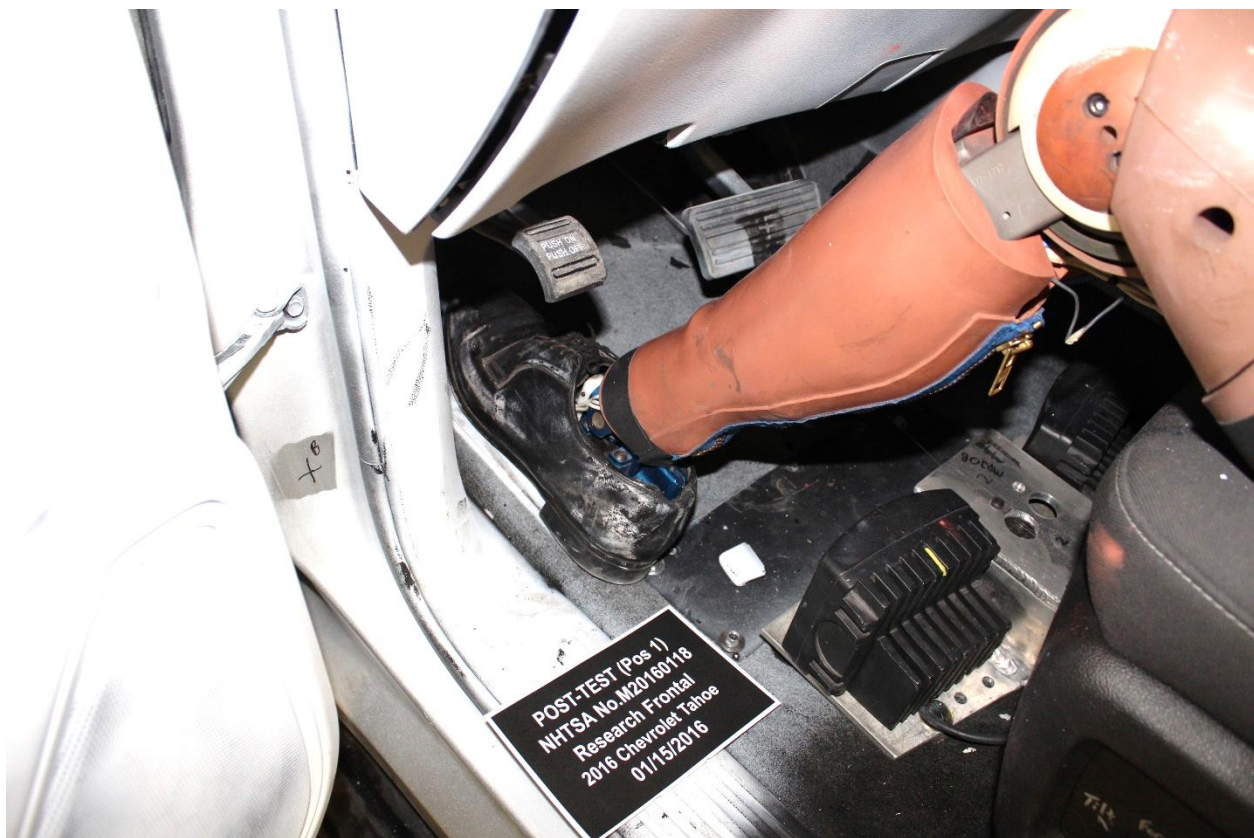


**Figure A-38: Post-Test View of Belt Anchorage for Driver Dummy**





**Figure A-39: Pre-Test Driver Dummy Feet**



**Figure A-40: Post-Test Driver Dummy Feet**





**Figure A-41: Pre-Test Driver's Side Knee Bolster**



**Figure A-42: Post-Test Driver's Side Knee Bolster**





**Figure A-43: Pre-Test Driver's Side Floorpan**



**Figure A-44: Post-Test Driver's Side Floorpan**



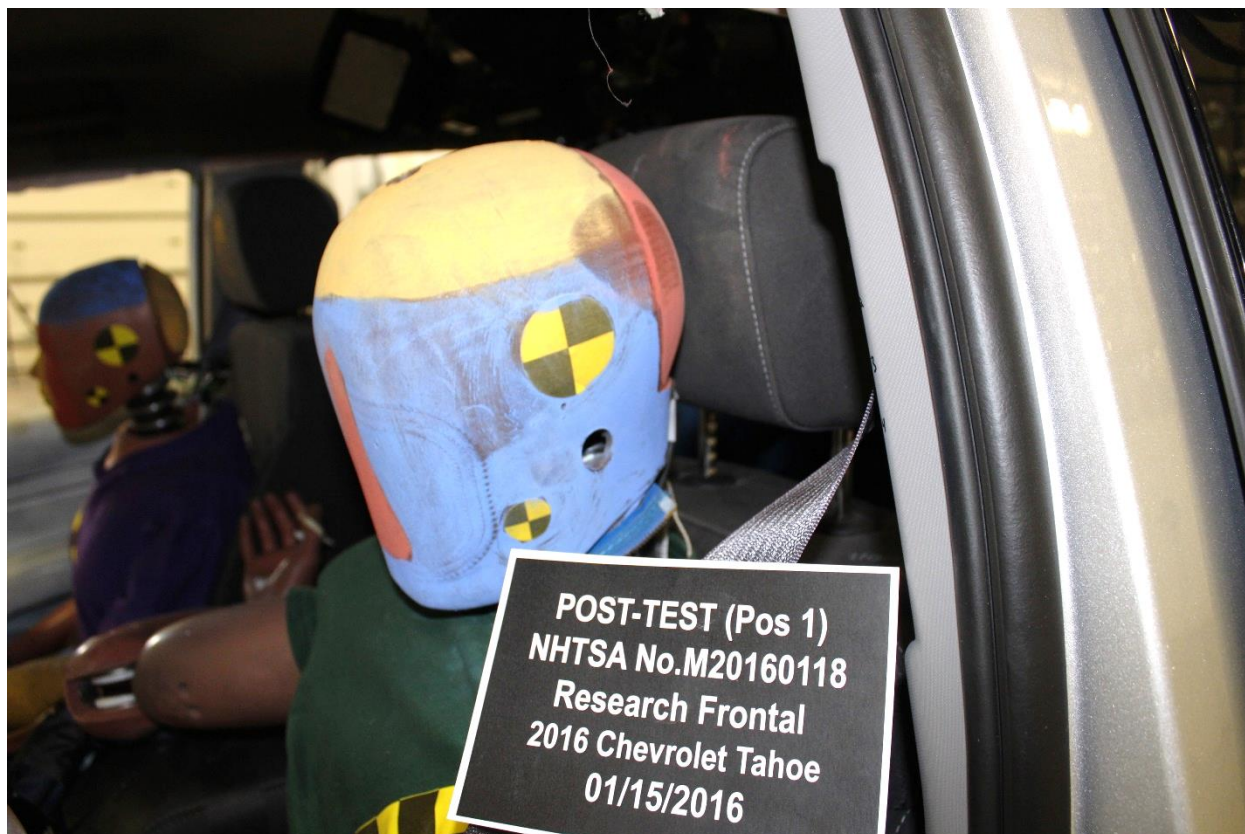


**Figure A-45: Post-Test Driver Dummy Face**



**Figure A-46: Post-Test Driver Dummy Contact With Airbag**





**Figure A-47: Post-Test Driver Dummy Contact With Headrest**

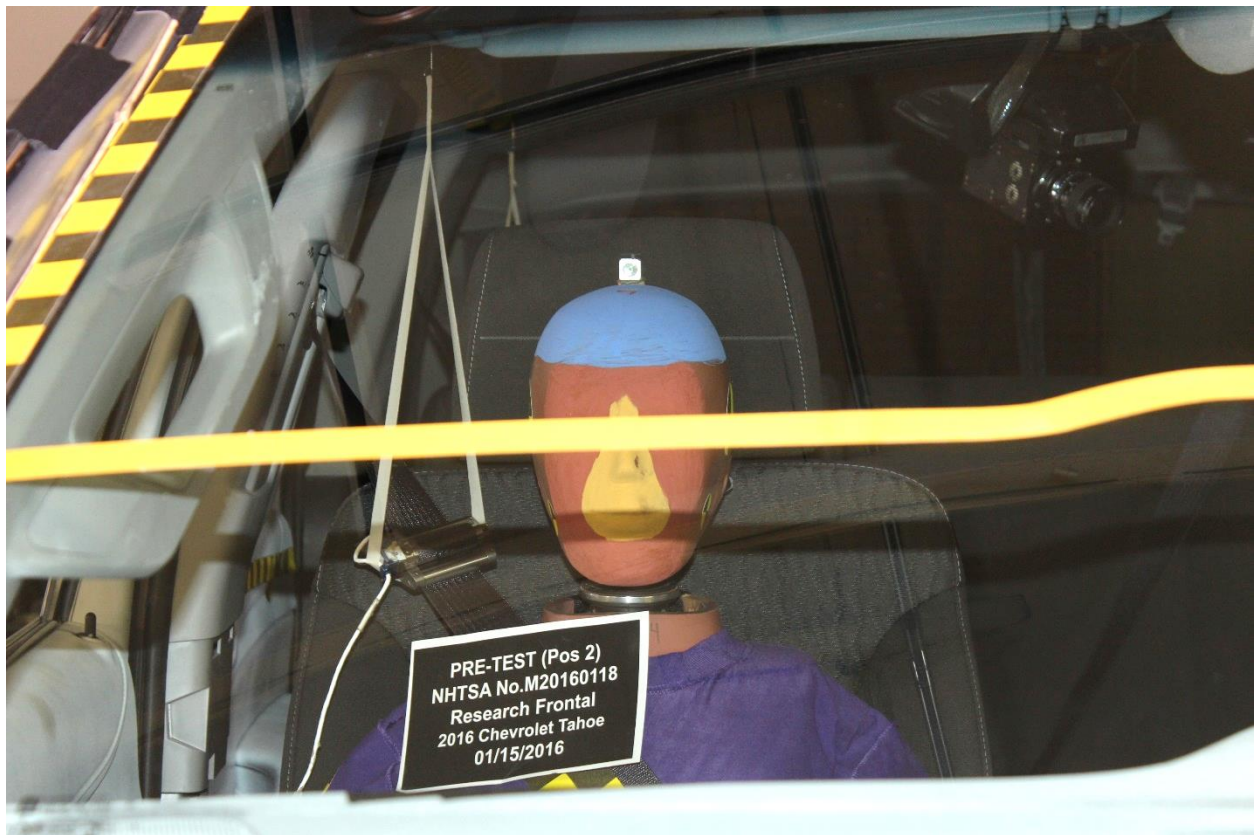


**Figure A-48: Pre-Test View of the Steering Wheel**





**Figure A-49: Post-Test View of the Steering Wheel**



**Figure A-50: Pre-Test Passenger Dummy Front View**





**Figure A-51: Post-Test Passenger Dummy Front View**



**Figure A-52: Pre-Test Passenger Dummy Window View**





**Figure A-53: Post-Test Passenger Dummy Window View**



**Figure A-54: Pre-Test Passenger Dummy and Vehicle Interior View**





**Figure A-55: Post-Test Passenger Dummy and Vehicle Interior View**

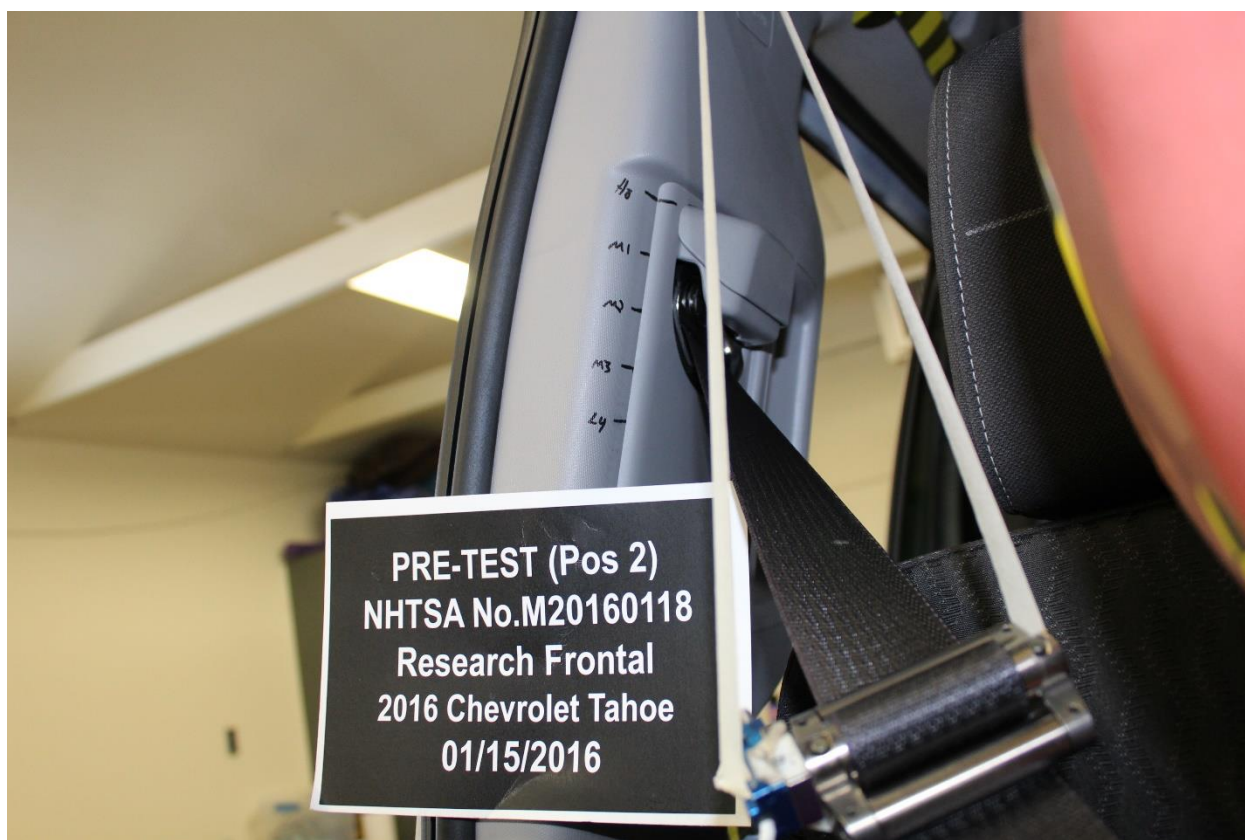


**Figure A-56: Pre-Test Passenger's Seat Fore-Aft Markings**



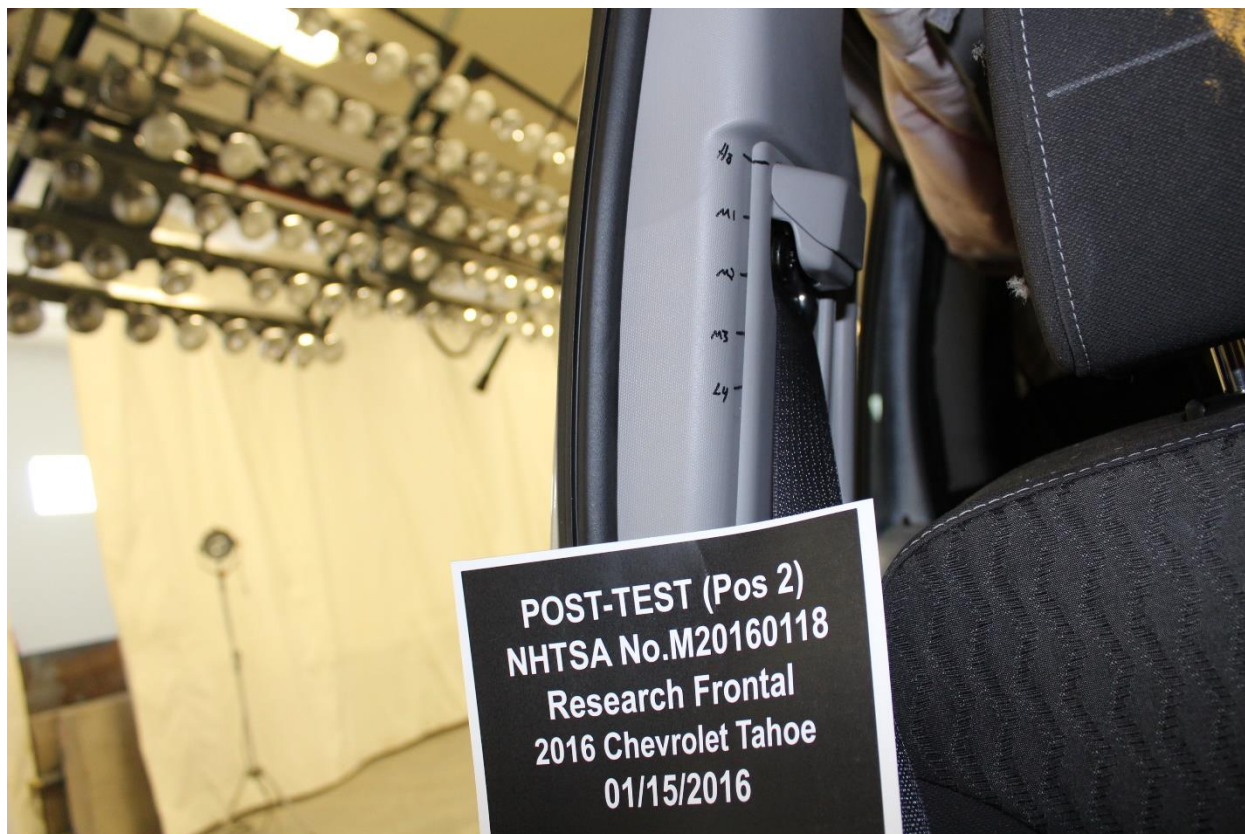


**Figure A-57: Post-Test Passenger's Seat Fore-Aft Markings**



**Figure A-58: Pre-Test View of Belt Anchorage for Passenger Dummy**





**Figure A-59: Post-Test View of Belt Anchorage for Passenger Dummy**

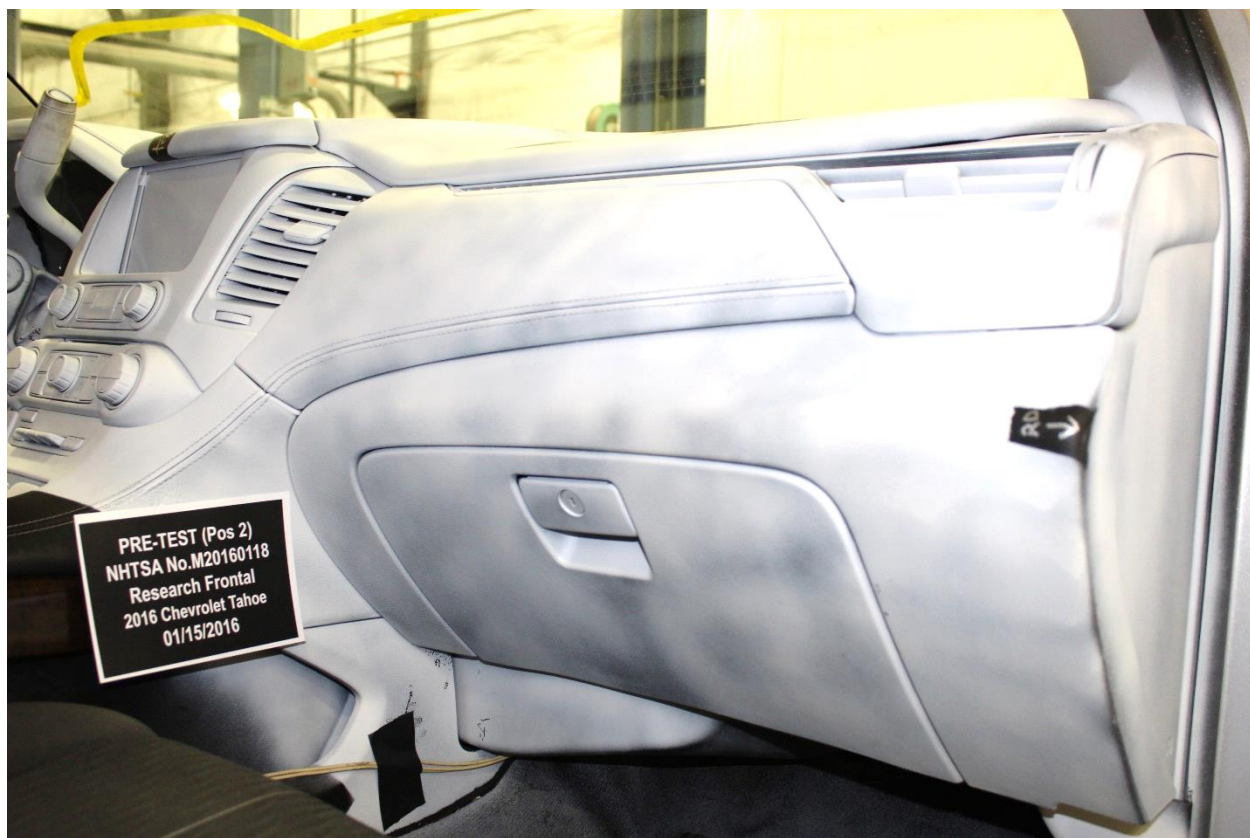


**Figure A-60: Pre-Test Passenger Dummy Feet**





**Figure A-61: Post-Test Passenger Dummy Feet**



**Figure A-62: Pre-Test Passenger's Side Knee Bolster**





**Figure A-63: Post-Test Passenger's Side Knee Bolster**



**Figure A-64: Pre-Test Passenger's Side Floorpan**



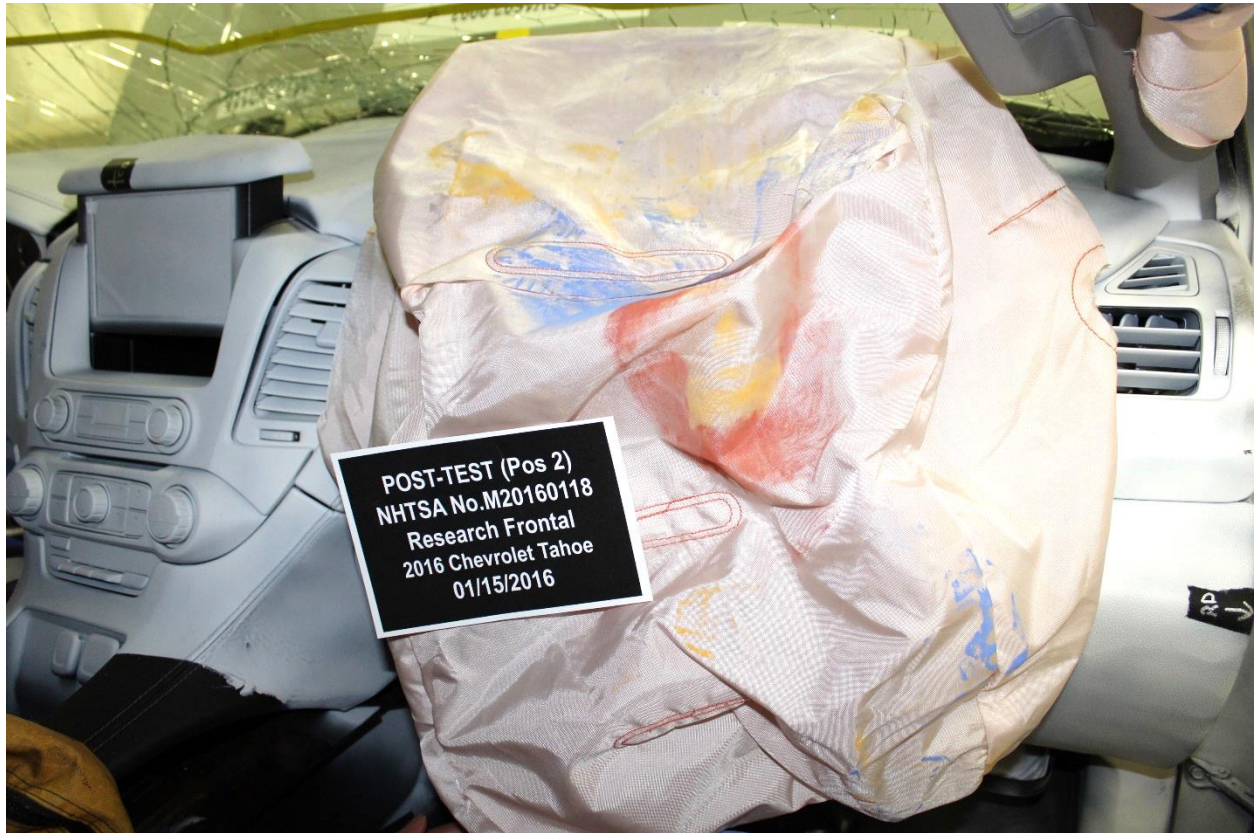


**Figure A-65: Post-Test Passenger's Side Floorpan**



**Figure A-66: Post-Test Passenger Dummy Face**



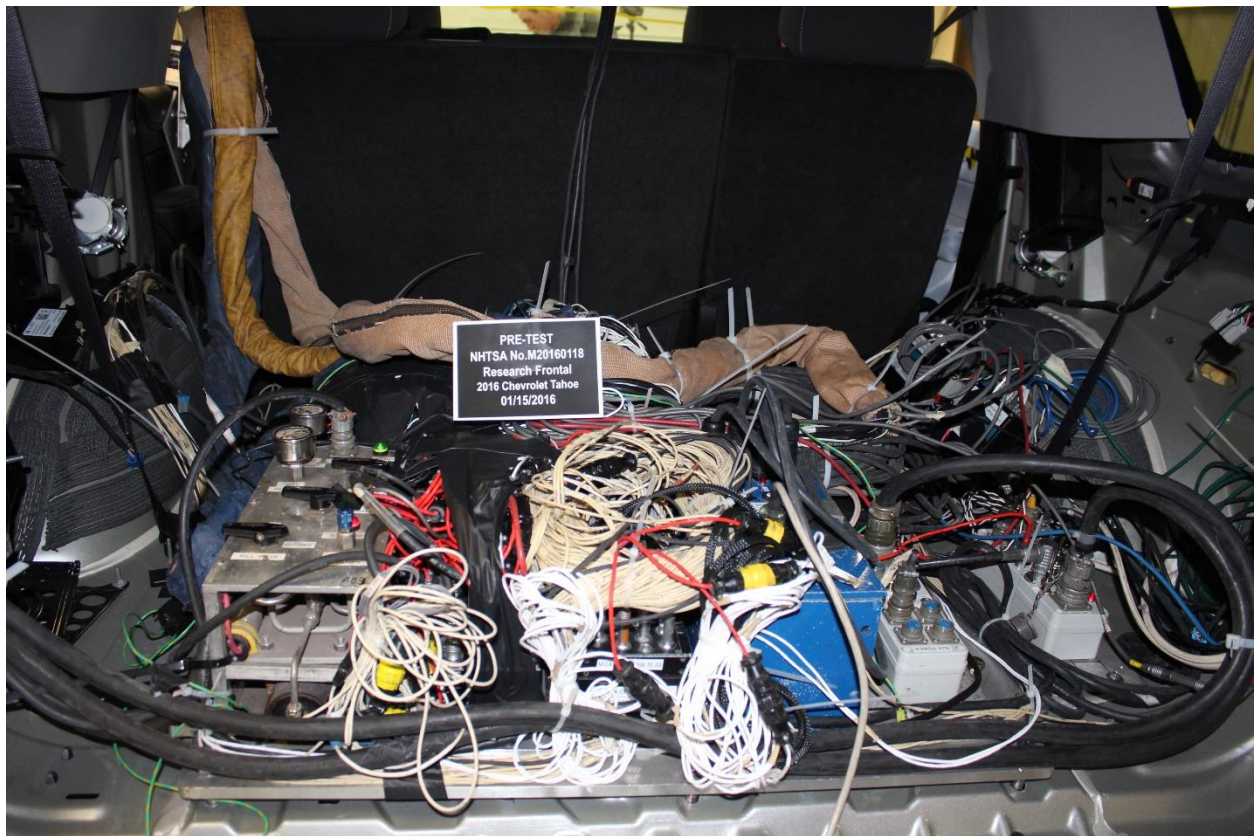


**Figure A-67: Post-Test Passenger Dummy Contact With Airbag**



**Figure A-68: Post-Test Passenger Dummy Contact With Headrest**





**Figure A-69: Photograph of Ballast Installed in Vehicle**

**Photo Not Applicable**

**Figure A-70: Post-Test Stoddard Solvent Spillage Location View, If Required**



Figure A-71: Post-Test Speed Trap Read-Out



Figure A-72: Vehicle at 0° on Static Rollover Device





**Figure A-73: Vehicle at 90° on Static Rollover Device**



**Figure A-74: Vehicle at 180° on Static Rollover Device**





**Figure A-75: Vehicle at 270° on Static Rollover Device**



**Figure A-76: Vehicle at 360° on Static Rollover Device**

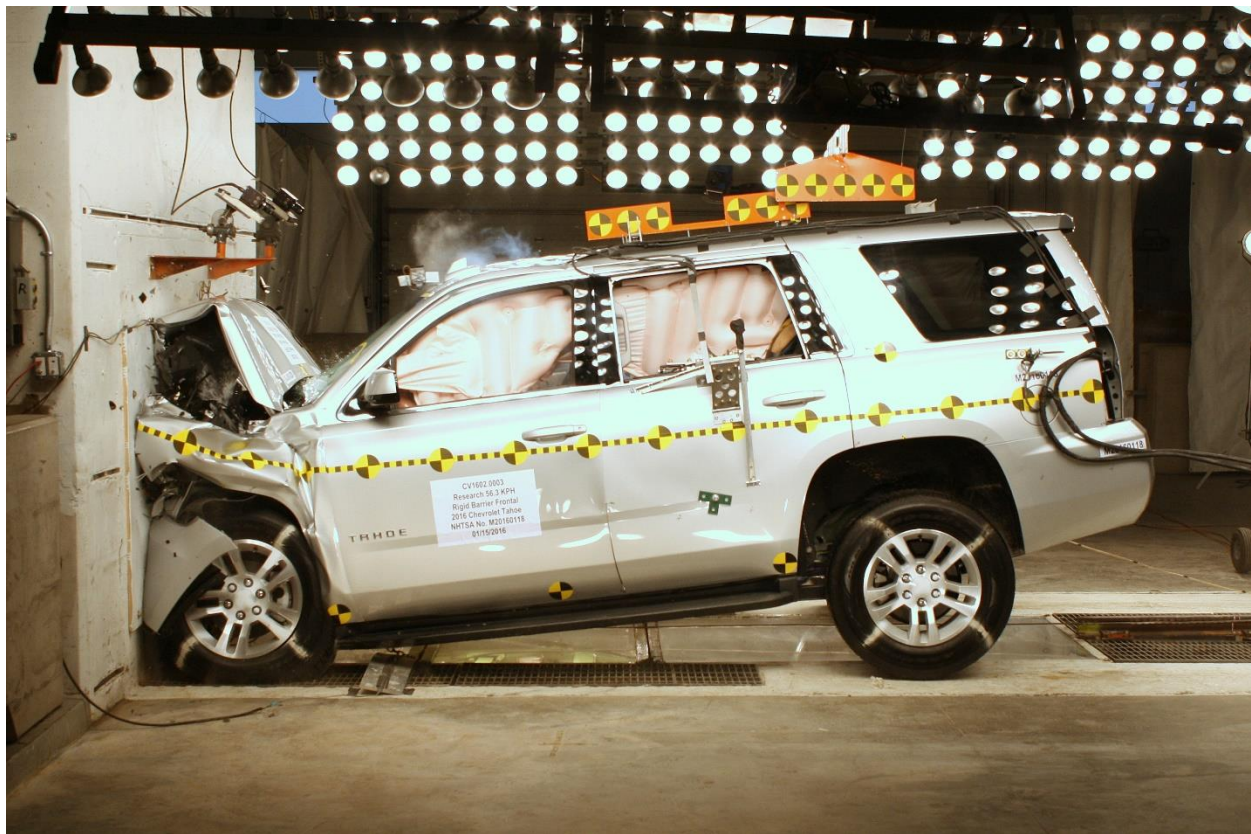


Figure A-77: 2016 Chevrolet Tahoe Frontal Impact Event



**CHEVROLET**

**2016 TAHOE 2WD LS**



EXTERIOR: SILVER ICE METALLIC  
INTERIOR: JET BLACK

ENGINE: 5.3L V8 ECOTEC3  
TRANSMISSION: 6 SPD AUTOMATIC

**STANDARD EQUIPMENT**

ITEMS LISTED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE SHOWN

- 5 YEAR / 80,000 MILE POWERTRAIN LIMITED WARRANTY
- TWO MAINTENANCE VISITS OIL & FILTER
- 4 WHEEL TIRE ROTATION SEE WWW.CHEVY.COM OR DEALER FOR DETAILS

**MECHANICAL**

- 5.3L V8 ECOTEC3 ENGINE
- 6 SPD AUTOMATIC TRANSMISSION
- FULLY AUTOMATIC LOCKING REAR DIFFERENTIAL
- PREMIUM RIDE SUSPENSION
- REAR AXLE 3.08 RATIO
- ENGINE OIL COOLING SYSTEM
- REAR PARK ASSIST
- TRAILERING EQUIPMENT
- 4 WHEEL ANTILOCK DISC BRAKES
- DURABLE BRAKE ROTORS

**SAFETY & SECURITY**

- REAR VISION CAMERA
- TIRE PRESSURE MONITOR SYSTEM (EXCL. SPARE TIRE)
- AIR BAGS, FRONTAL AND SIDE-IMPACT, FOR DRIVER AND FRONT PASSENGER, DRIVER INBOARD SEAT MOUNTED, SIDE-IMPACT AND HEAD CURTAIN SIDE-IMPACT FOR ALL ROWS IN OUTBOARD SEAT POSITIONS
- THEFT DETERRENT SYSTEM
- STABILITRAK ELECTRONIC STABILITY

**EXTERIOR**

- RAIN SENSING WIPERS
- POWER HEATED OUTSIDE MIRRORS
- REMOTE KEYLESS ENTRY
- 18" POLISHED ALUMINUM WHEELS
- 17" STEEL SPARE WHEEL

**INTERIOR**

- CLOTH FRONT BUCKET SEATS

- DRIVER AND FRONT PASSENGER POWER SEAT ADJUSTER (SUBJECT TO TERMS SEE ONSTAR.COM)
- LEATHER WRAP STEERING WHEEL
- STEERING WHEEL CONTROLS
- TILTING STEERING COLUMN
- REMOTE VEHICLE START
- EXPRESS DOWN, EXPRESS UP FRONT, POWER WINDOWS
- TRI-ZONE AUTOMATIC CLIMATE CONTROL
- 110-VOLT AC POWER OUTLET
- SECOND ROW 60/40 SPLIT FOLD FLAT BENCH SEAT
- 3RD ROW 60/40 FOLD FLAT BENCH SEAT

**CONNECTIVITY FEATURES**

- ONSTAR/IVN INCLUDES 5 YR BASIC PLAN PLUS 6 MTH SERVICE W/ AUTOMATIC CRASH RESPONSE, NAVIGATION & MORE (SUBJECT TO TERMS SEE ONSTAR.COM)
- 4G LTE V8-VRV HOTSPOT WITH LIMITED DATA TRIAL AND MORE. (SUBJECT TO TERMS SEE ONSTAR.COM)
- BLUETOOTH FOR PHONE
- CHEVROLET MYLINK AUDIO SYSTEM W/ 8" DIAGONAL COLOR TOUCH APPLE CARPLAY CAPABILITY PROVIDED BY APPLE. AVAILABLE WITH COMPATIBLE SMARTPHONES
- XM RADIO + SERVICE SUBSCRIPTION SOLD SEPARATELY BY SIRIUSXM AFTER 3 MTHS

**OPTIONS & PRICING**

MANUFACTURER'S SUGGESTED RETAIL PRICE

|                             |                    |
|-----------------------------|--------------------|
| STANDARD VEHICLE PRICE      | \$47,000.00        |
| DESTINATION CHARGE          | \$47,000.00        |
| <b>TOTAL VEHICLE PRICE*</b> | <b>\$48,195.00</b> |

OPTIONS INSTALLED BY THE MANUFACTURER ONLY REPLACE STANDARD EQUIPMENT SHOWN

|                       |        |
|-----------------------|--------|
| GVW RATING - 7100 LBS | INC.   |
| TOTAL OPTIONS         | \$0.00 |

Visit us at [www.chevy.com](http://www.chevy.com)

|                             |                    |
|-----------------------------|--------------------|
| TOTAL VEHICLE & OPTIONS     | \$47,000.00        |
| DESTINATION CHARGE          | 1,195.00           |
| <b>TOTAL VEHICLE PRICE*</b> | <b>\$48,195.00</b> |

**EPA DOT Fuel Economy and Environment**

**Fuel Economy**

**18 MPG** combined city/hwy

16 city 23 highway

5.6 gallons per 100 miles

**You spend \$3,500 more in fuel costs over 5 years** compared to the average new vehicle.

**Annual fuel cost \$2,500**

**Fuel Economy & Greenhouse Gas Rating** (tailpipe only)

**4** (1 to 10 scale)

**Smog Rating** (tailpipe only)

**5** (1 to 5 scale)

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 25 MPG and costs \$9,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.00 per gallon. MPGs to miles per gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

[fuelconomy.gov](http://fuelconomy.gov)

Calculate personalized estimates and compare vehicles

**GOVERNMENT 5-STAR SAFETY RATINGS**

**Overall Vehicle Score ★★★★★**

Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

|               |                      |       |
|---------------|----------------------|-------|
| Frontal Crash | Driver Passenger     | ★★★★★ |
| Side Crash    | Front seat Rear seat | ★★★★★ |
| Rollover      |                      | ★★★   |

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA) [www.safercar.gov](http://www.safercar.gov) or 1-888-327-4236

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Equipped with the safety and connectivity of OnStar®

Visit [onstar.com](http://onstar.com) for details.

onstar.com/chevy

**PARTS CONTENT INFORMATION**

FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 65% MAJOR SOURCES OF FOREIGN PARTS CONTENT: MEXICO 26%

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE: FINAL ASSEMBLY POINT: ARLINGTON, TX U.S.A. COUNTRY OF ORIGIN: ENGINE: UNITED STATES TRANSMISSION: UNITED STATES

ORDER AND SHIPMENT - SALES CODE E (SALES MODEL CODE COUNTRY)

DEALER NO. 100170032

VIN 1GNSKAKC2GR170032

DEALER TO WHOM DELIVERED: DIVER CHEVROLET 2101 PENNSYLVANIA AVE WILMINGTON, DE 19806-2494

TU 1A20923249

Figure A-78: Monroney Label Photograph





**Figure A-79: Pre-Test Rear Passenger Dummy Front view**



**Figure A-80: Post-Test Rear Passenger Dummy Front view**





**Figure A-81: Pre-Test Rear Passenger Dummy Window View**



**Figure A-82: Post-Test Rear Passenger Dummy Window View**





**Figure A-83: Pre-Test Rear Passenger Dummy and Vehicle Interior View**



**Figure A-84: Post-Test Rear Passenger Dummy and Vehicle Interior View**



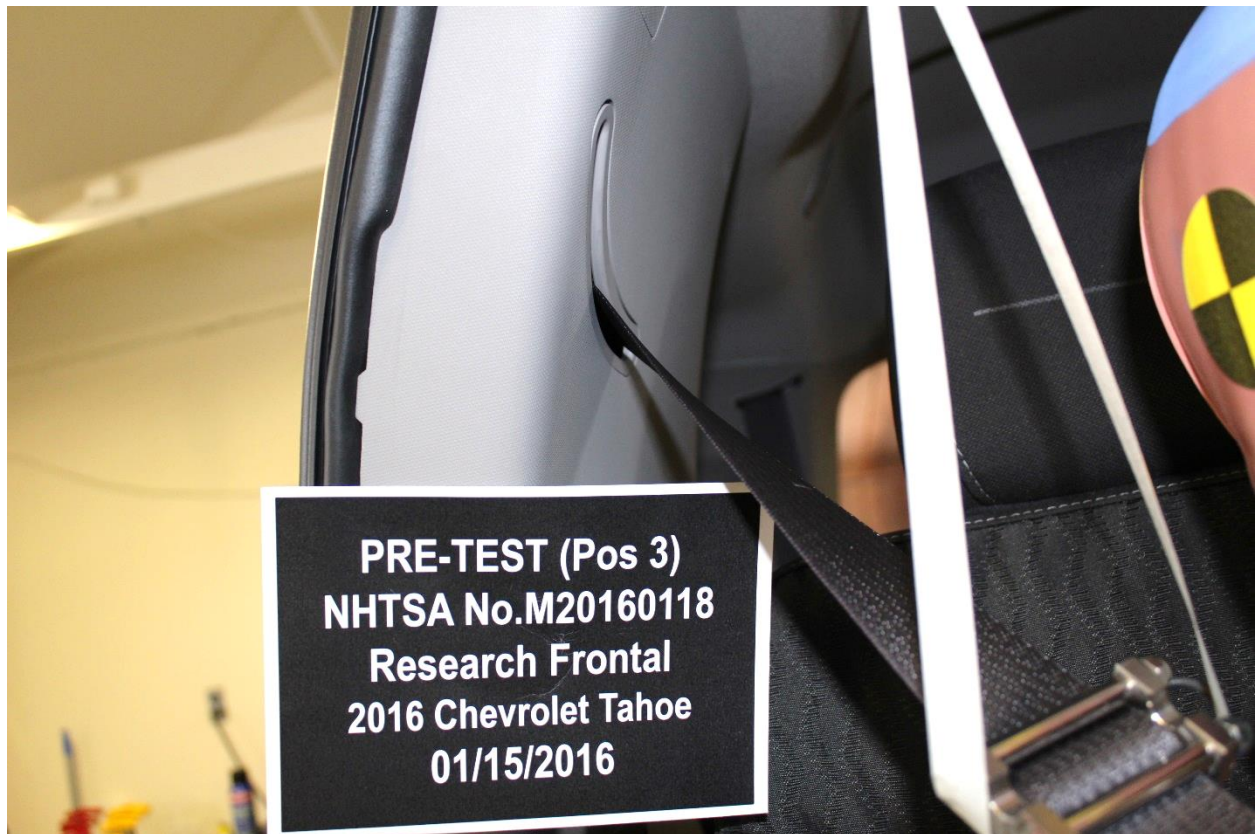


**Figure A-85: Pre-Test Rear Passenger Seat Fore-Aft Markings**



**Figure A-86: Post-Test Rear Passenger Seat Fore-Aft Markings**





**Figure A-87: Pre-Test View of Belt Anchorage for Rear Passenger Dummy**



**Figure A-88: Post-Test View of Belt Anchorage for Rear Passenger Dummy**





**Figure A-89: Pre-Test Rear Passenger Dummy Feet**



**Figure A-90: Post-Test Rear Passenger Dummy Feet**





**Figure A-91: Pre-Test Rear Passenger Dummy Knee and Seatback View**



**Figure A-92: Post-Test Rear Passenger Dummy Knee Contact with Seatback**

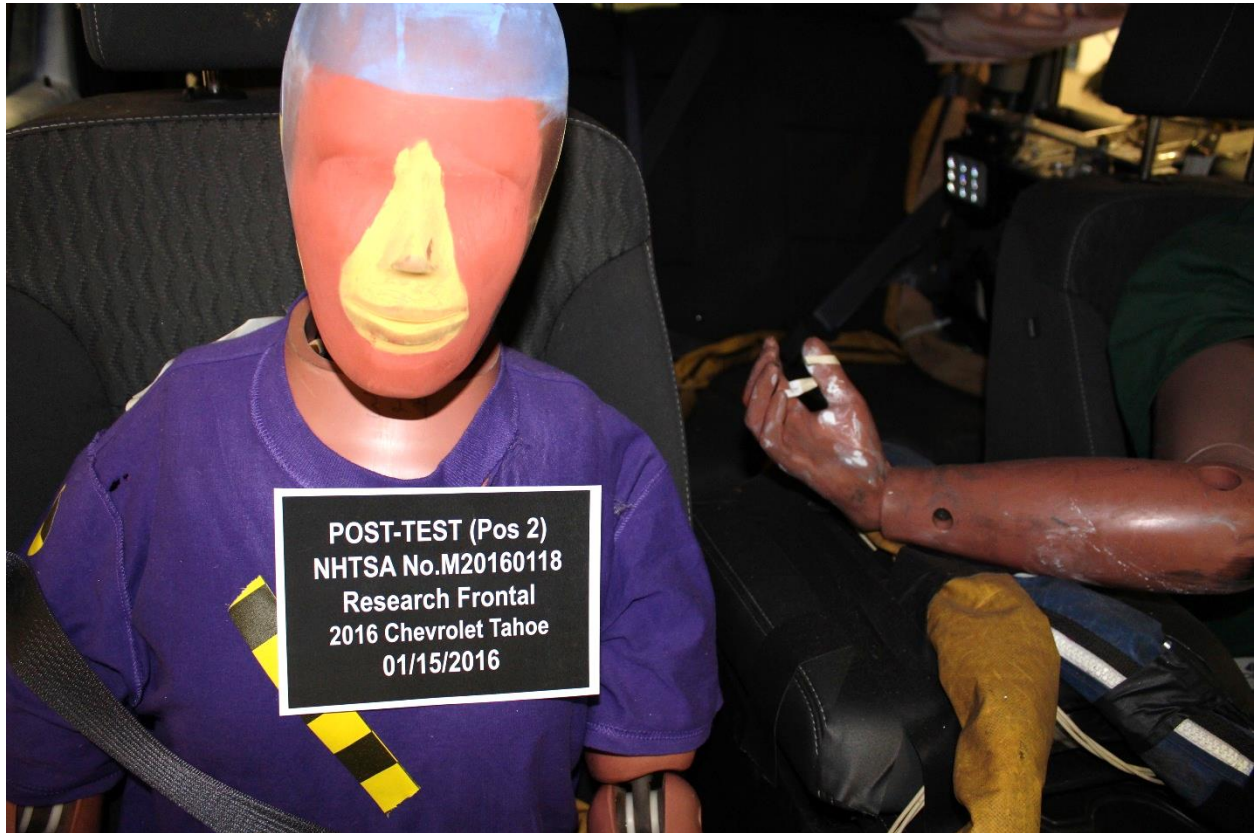




**Figure A-93: Pre-Test Rear Passenger's Side Floorpan**



**Figure A-94: Post-Test Rear Passenger's Side Floorpan**



**Figure A-95: Post-Test Rear Passenger Dummy Face**

**Photo Not Applicable**

**Figure A-96: Post-Test Rear Passenger Dummy Contact with Airbag**





**Figure A-97: Post-Test Rear Passenger dummy Contact with Headrest**



**APPENDIX B**  
**VEHICLE & DUMMY RESPONSE DATA TRACES**

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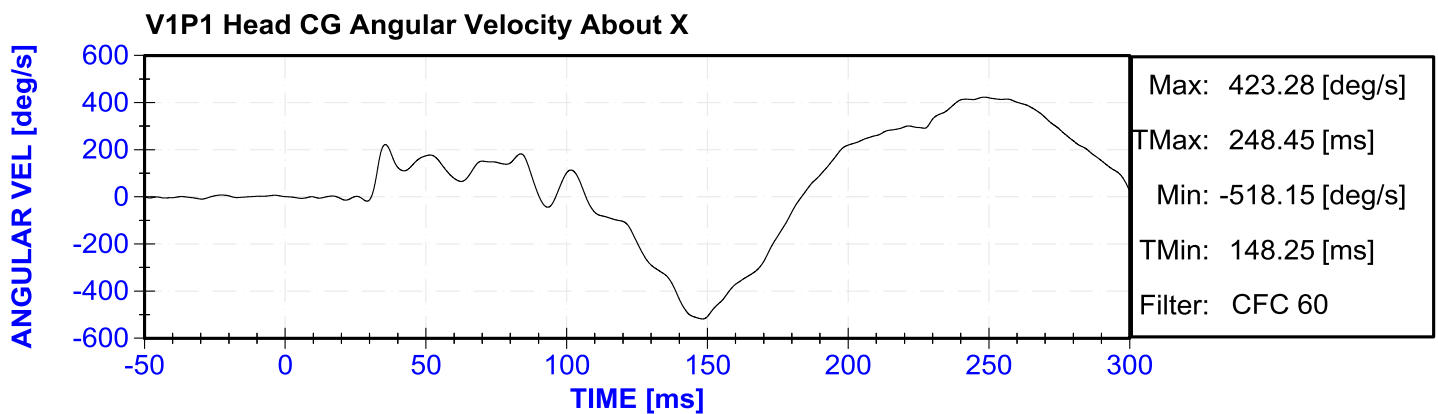
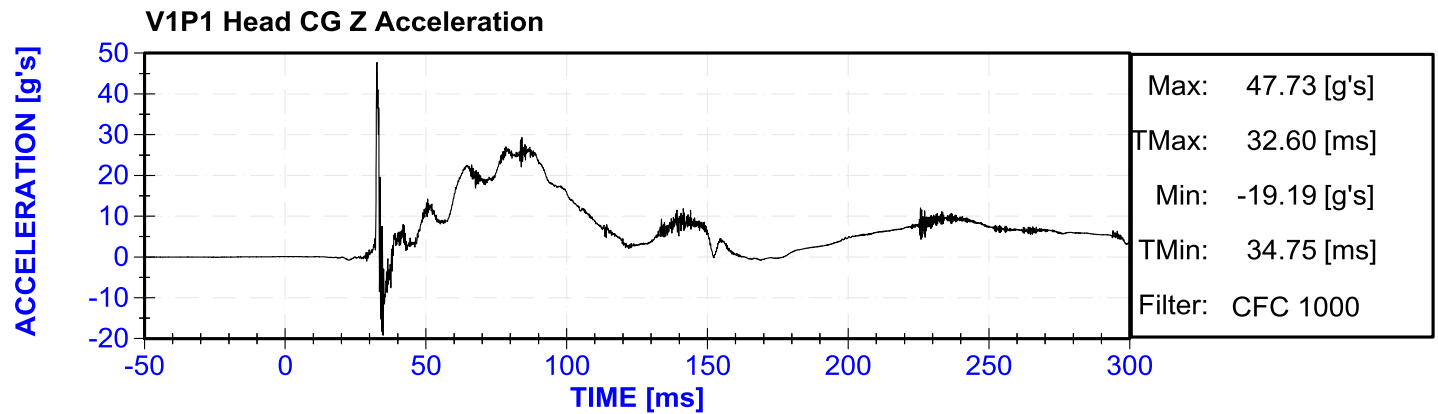
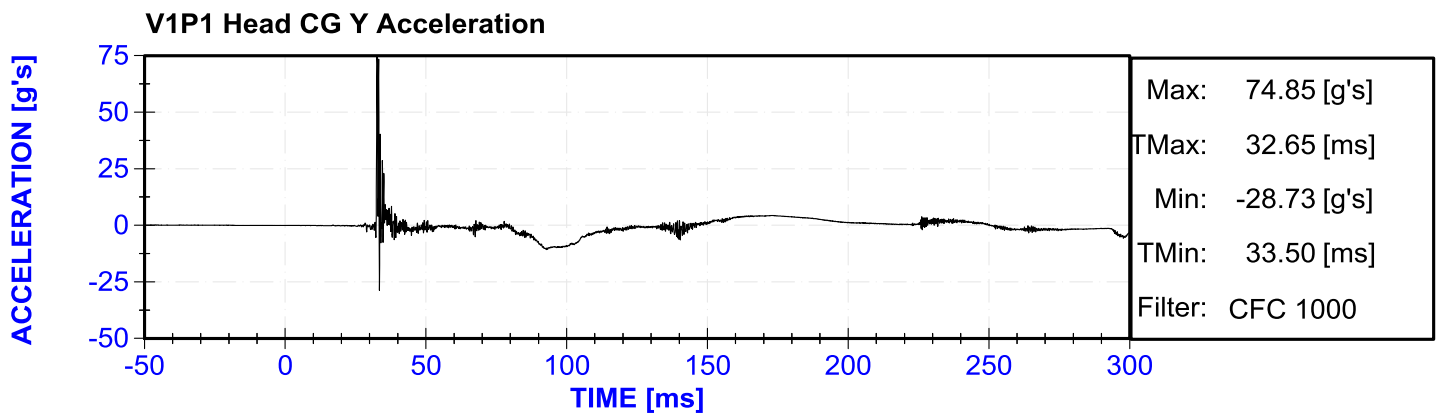
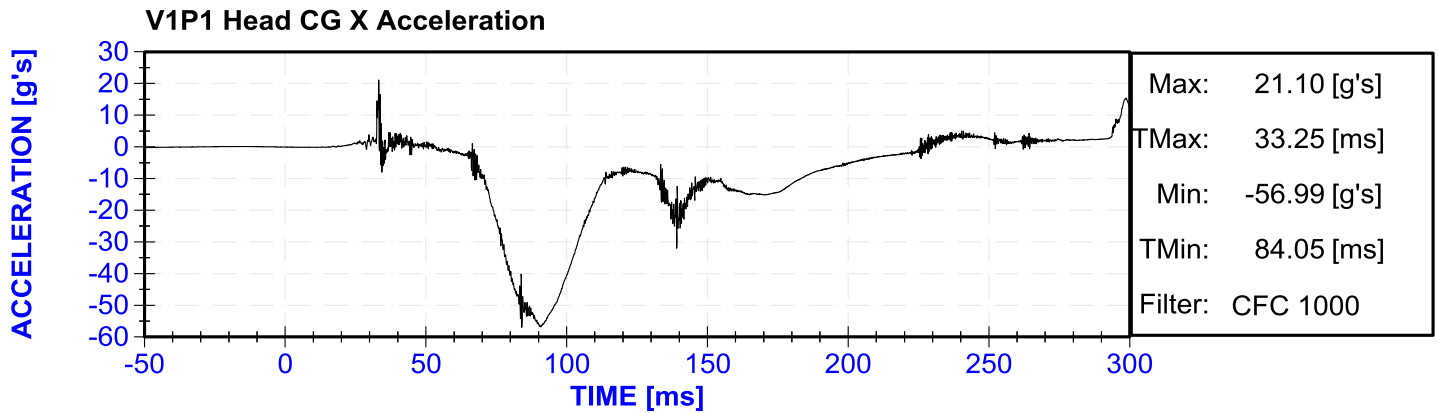
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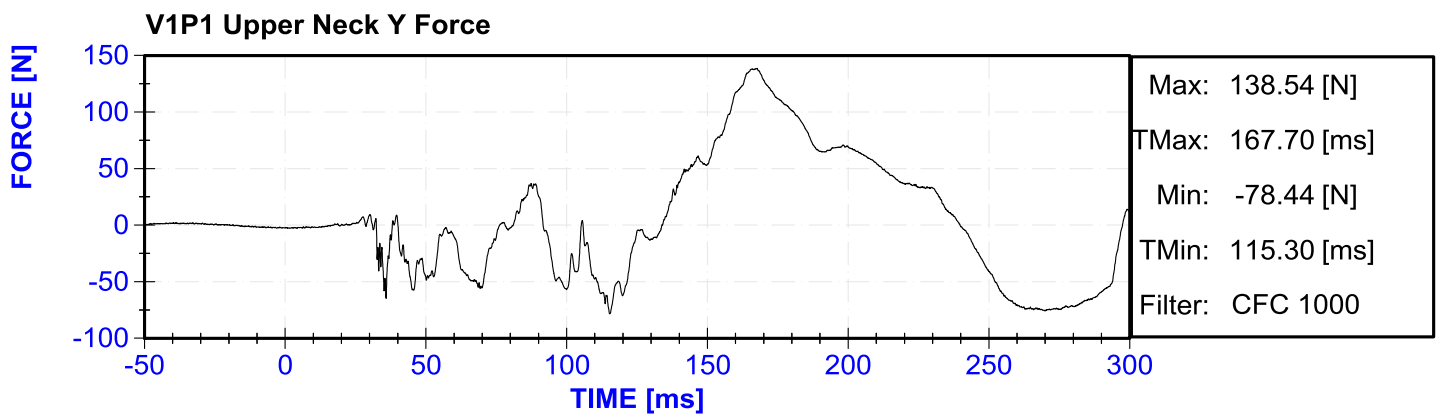
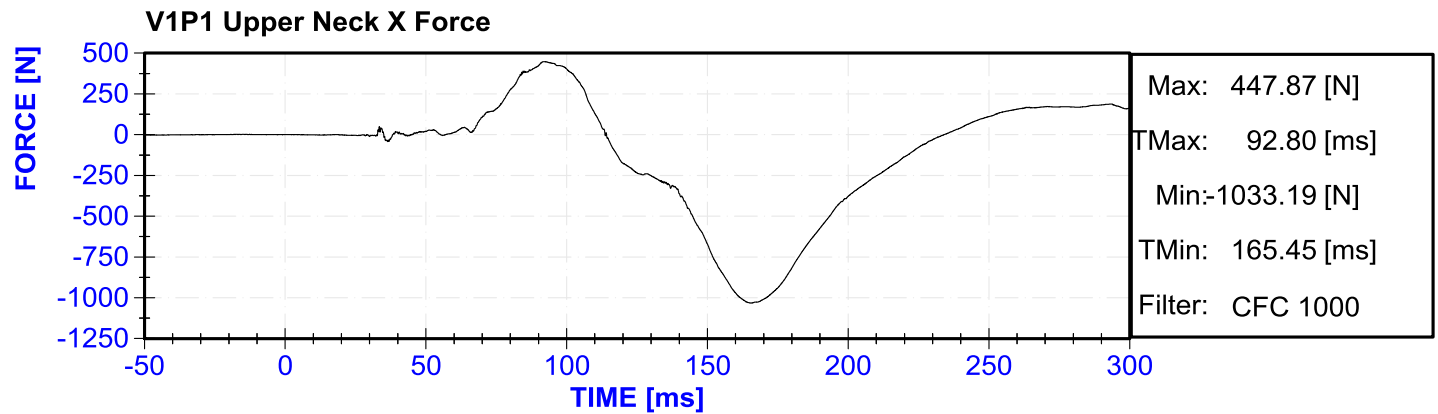
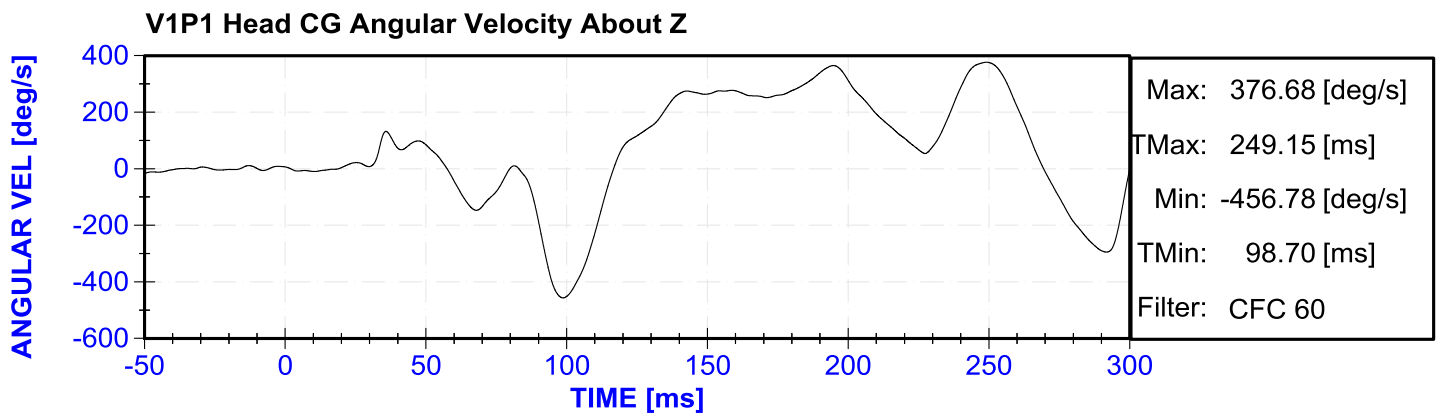
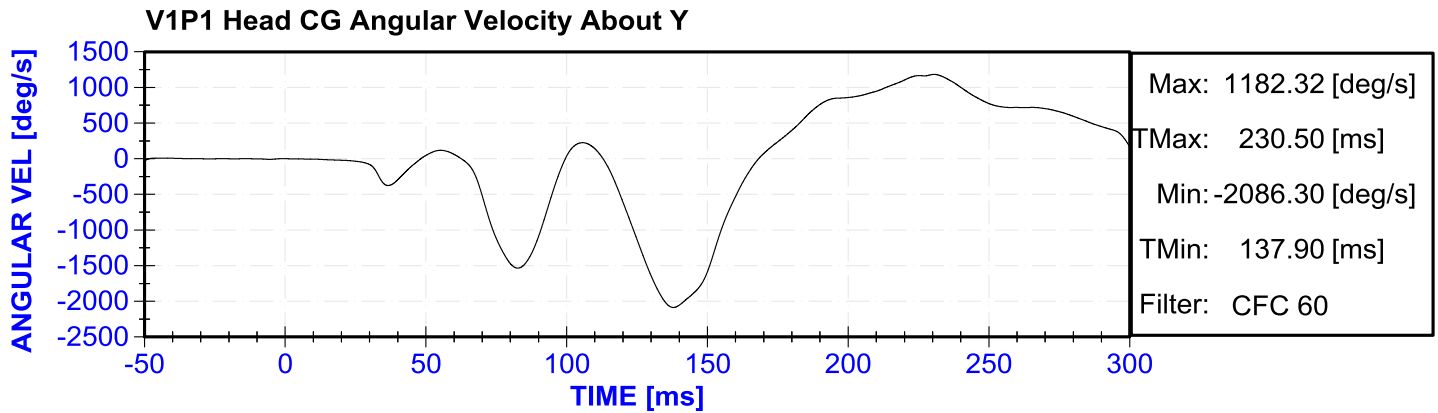
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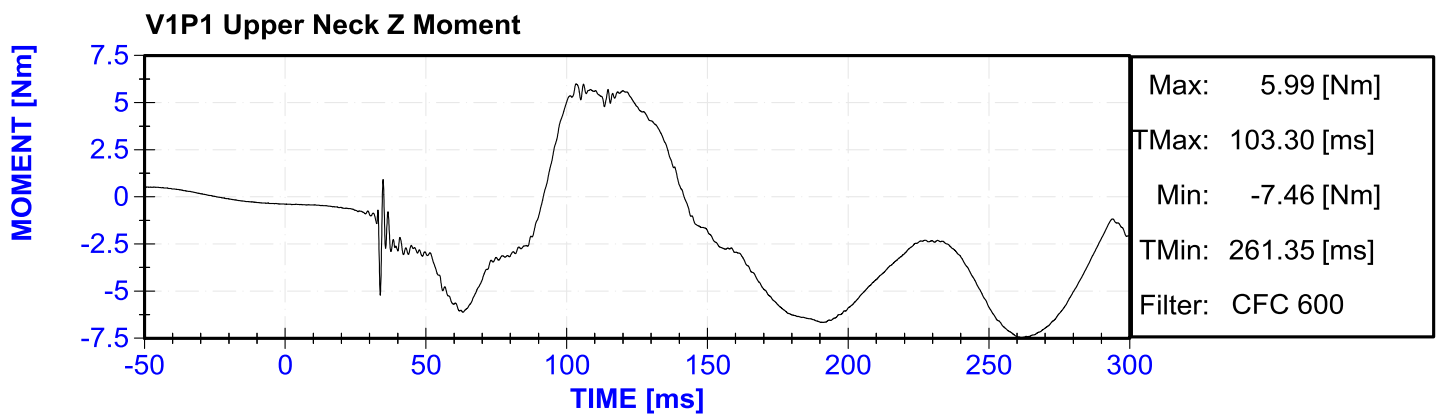
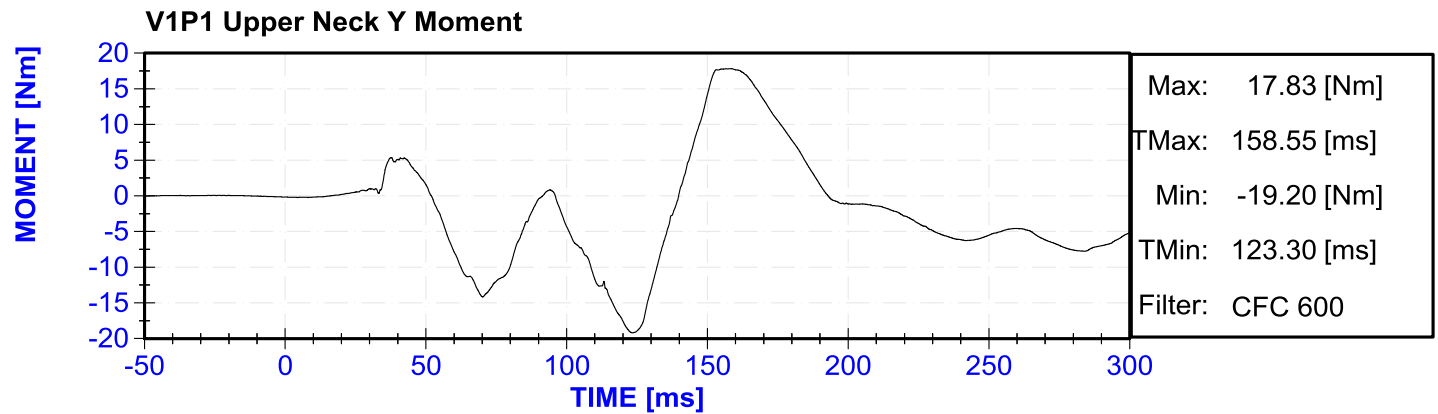
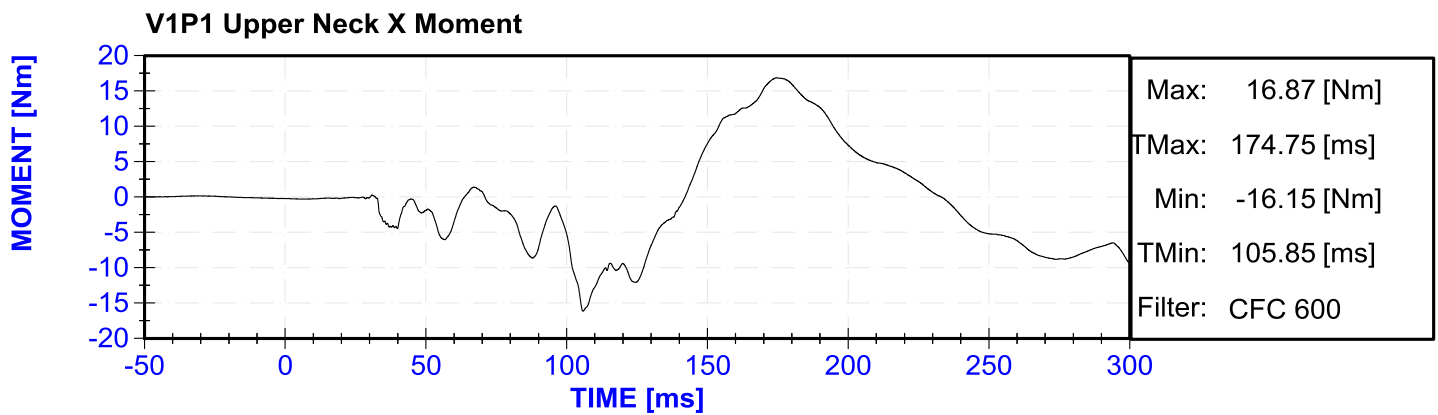
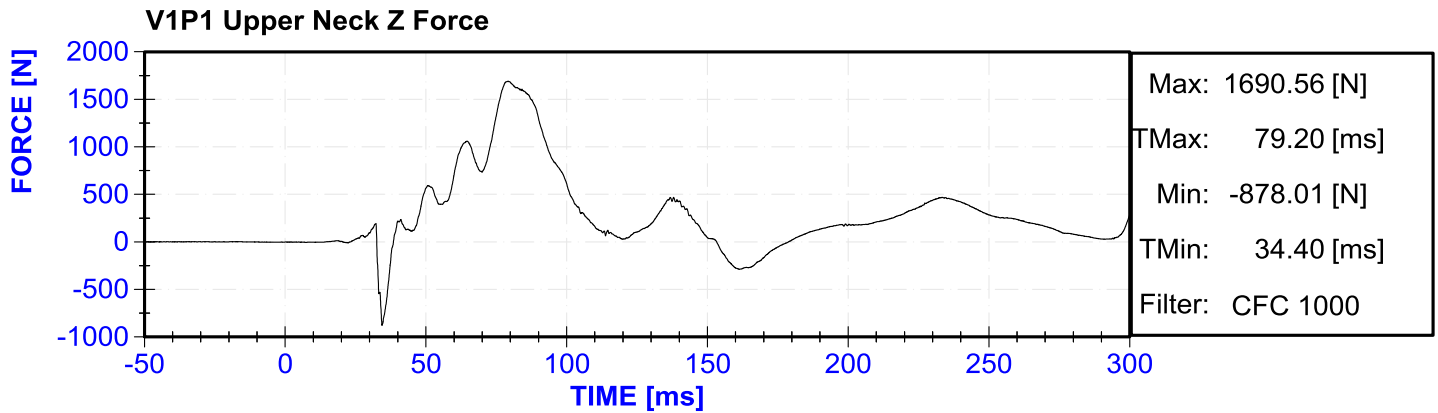


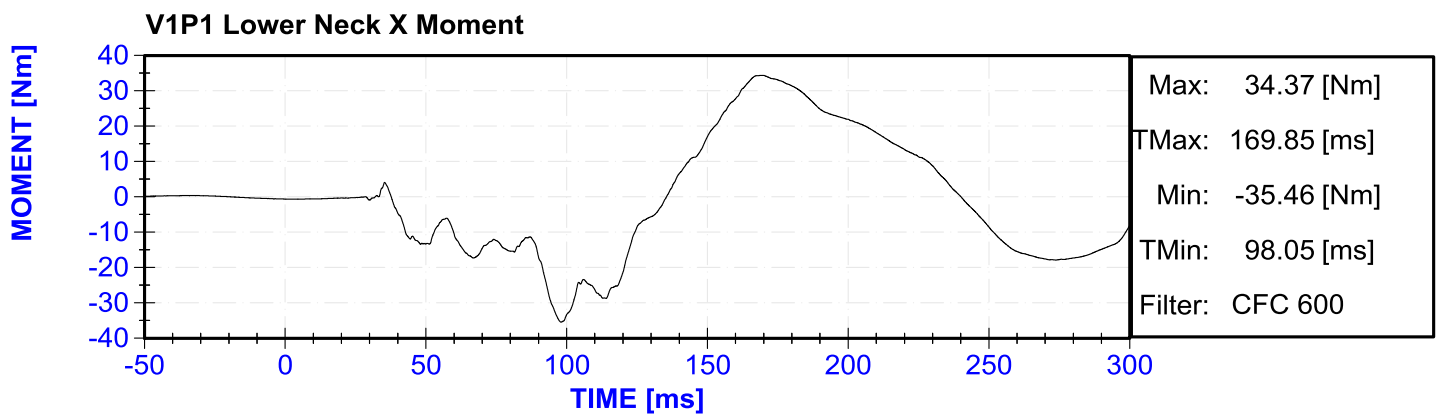
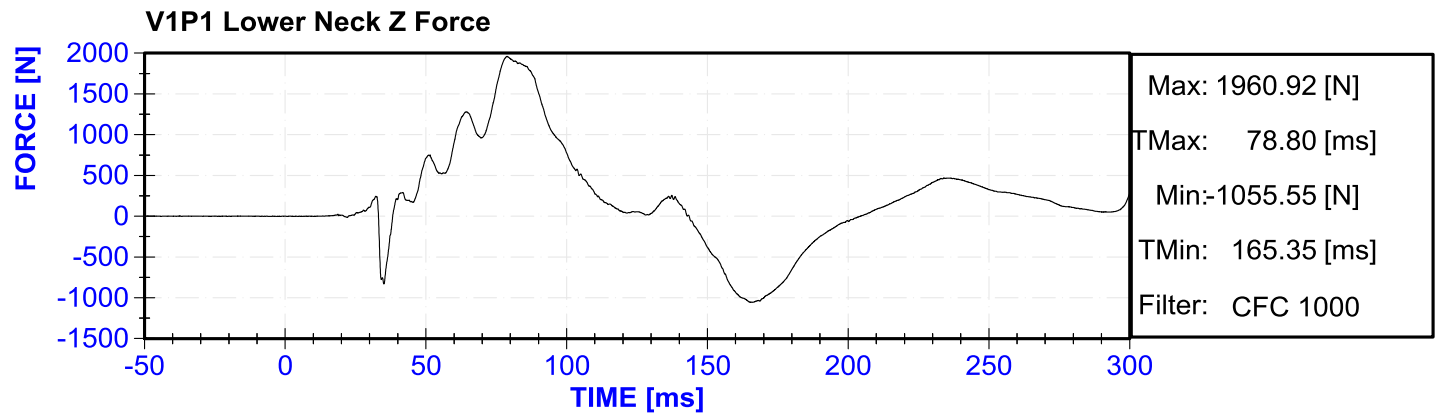
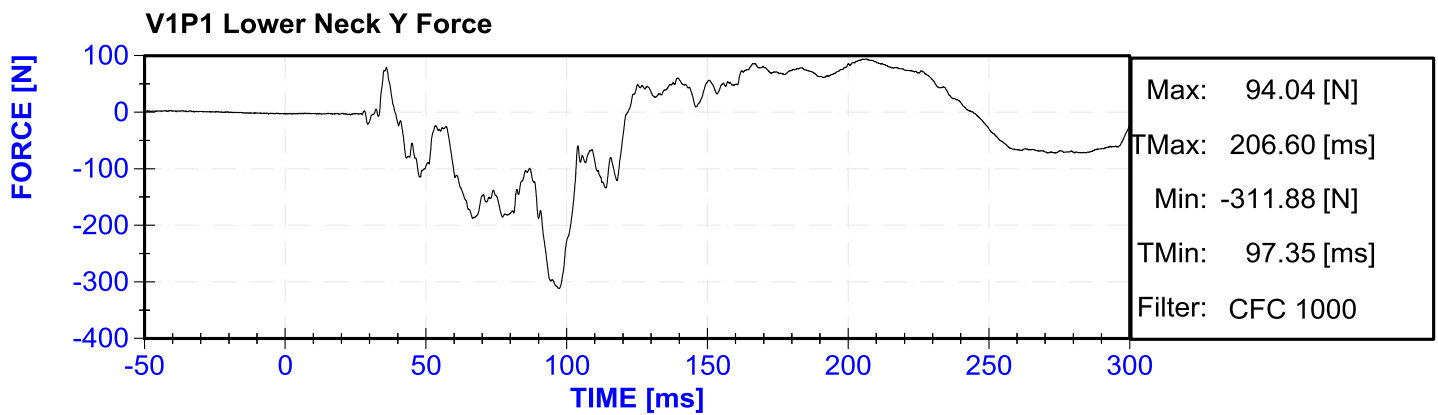
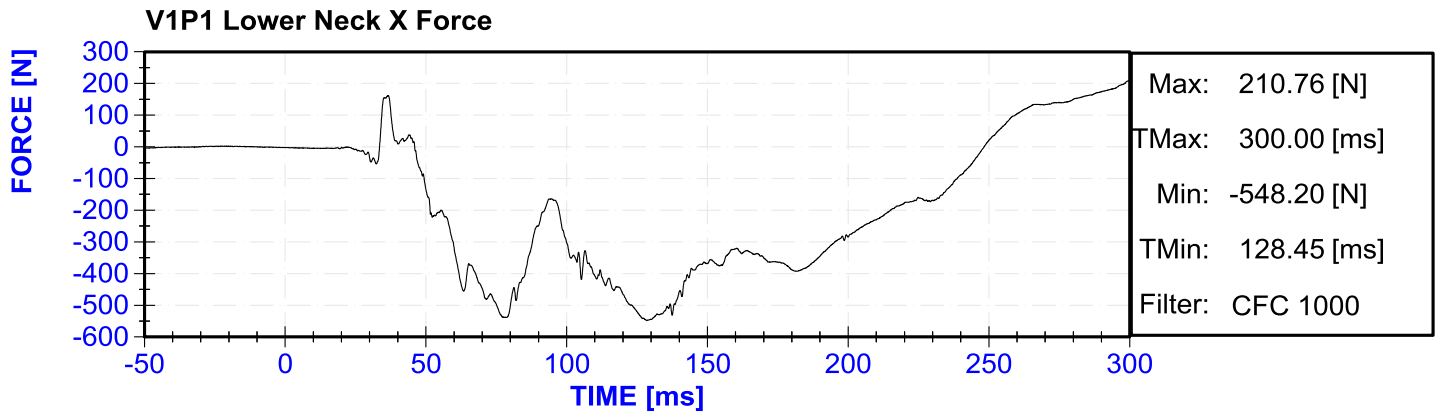
|          |                             |      |
|----------|-----------------------------|------|
| Plot 294 | V1P1 Abdomen Right Lower Dx | B-81 |
| Plot 295 | V1P1 Abdomen Right Lower Dy | B-81 |
| Plot 296 | V1P1 Abdomen Right Lower Dz | B-81 |
| Plot 297 | V1P1 Abdomen Right Lower D  | B-82 |

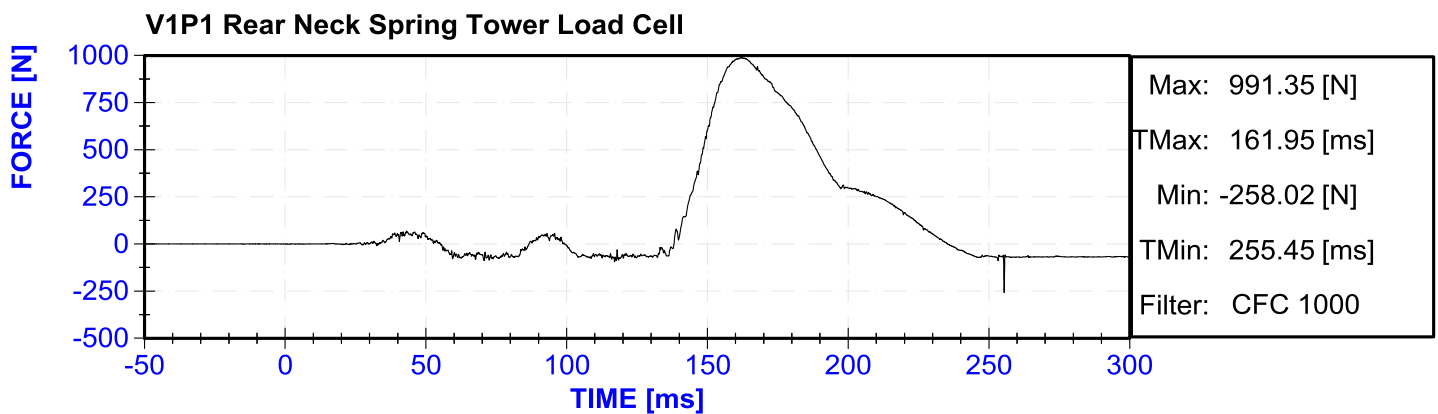
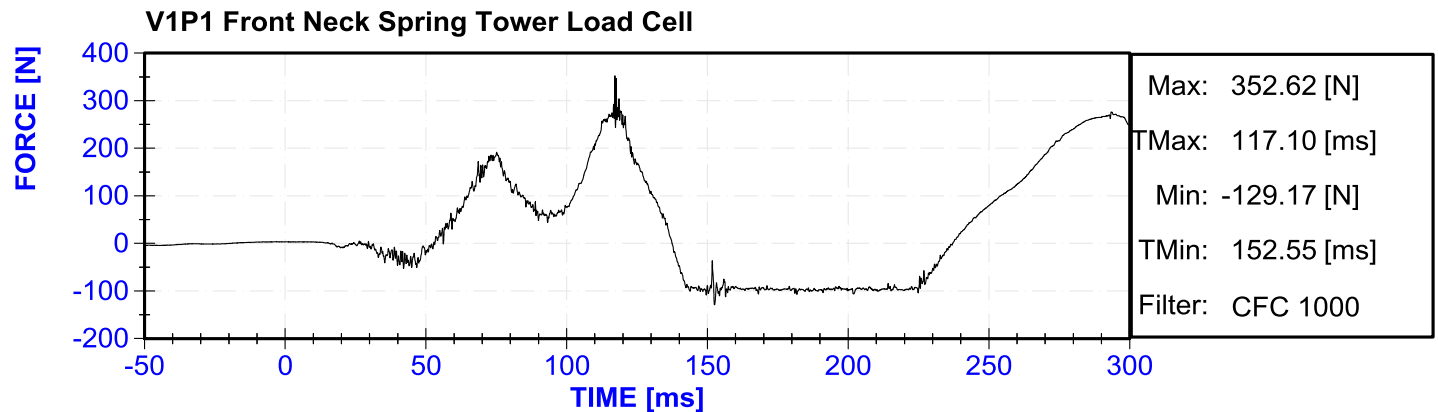
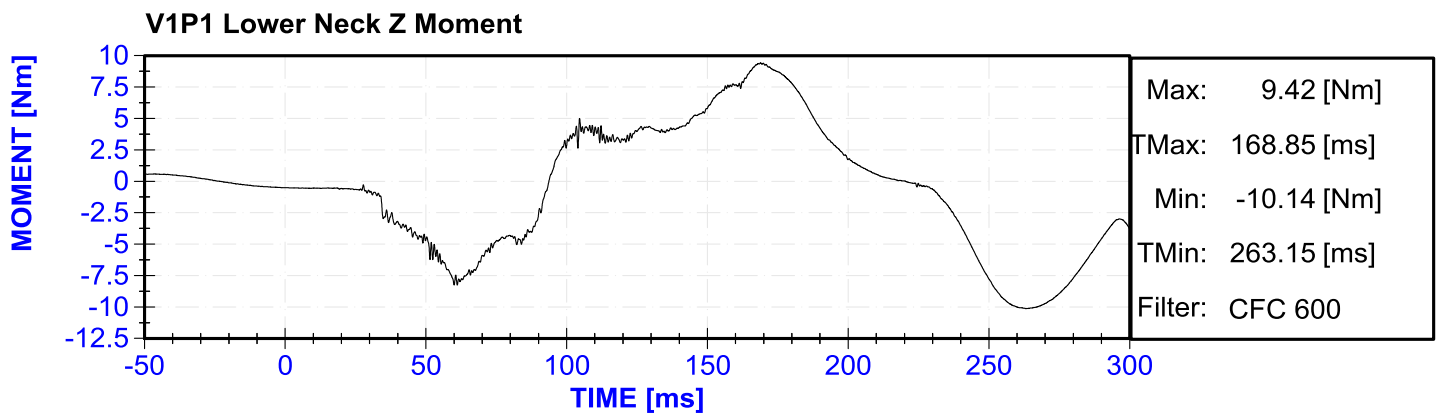
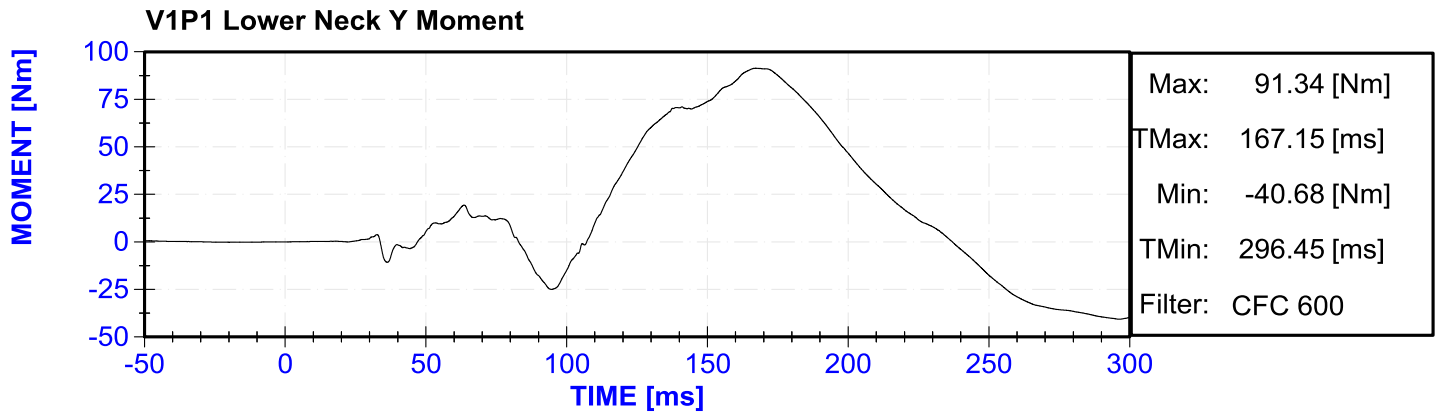




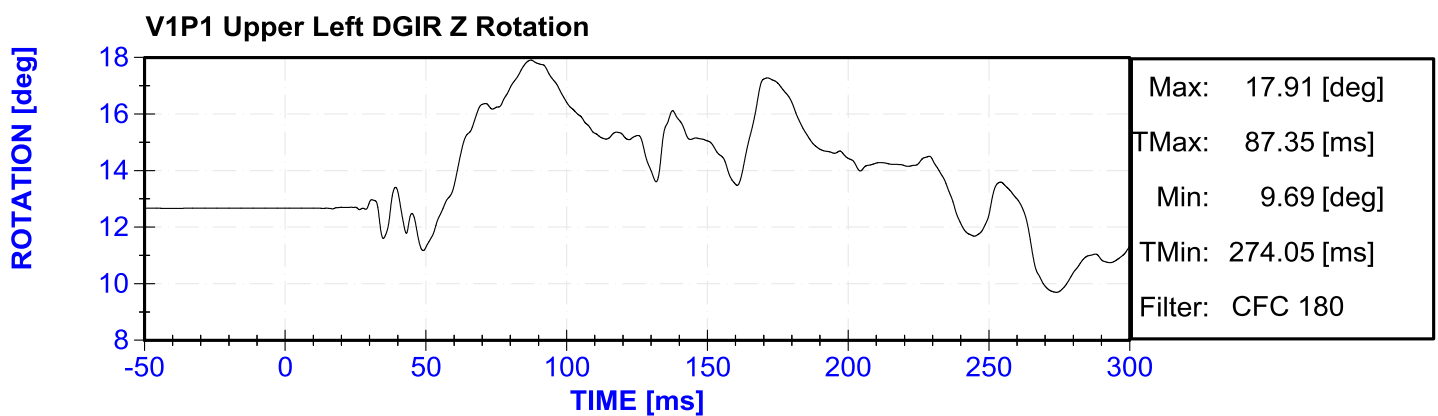
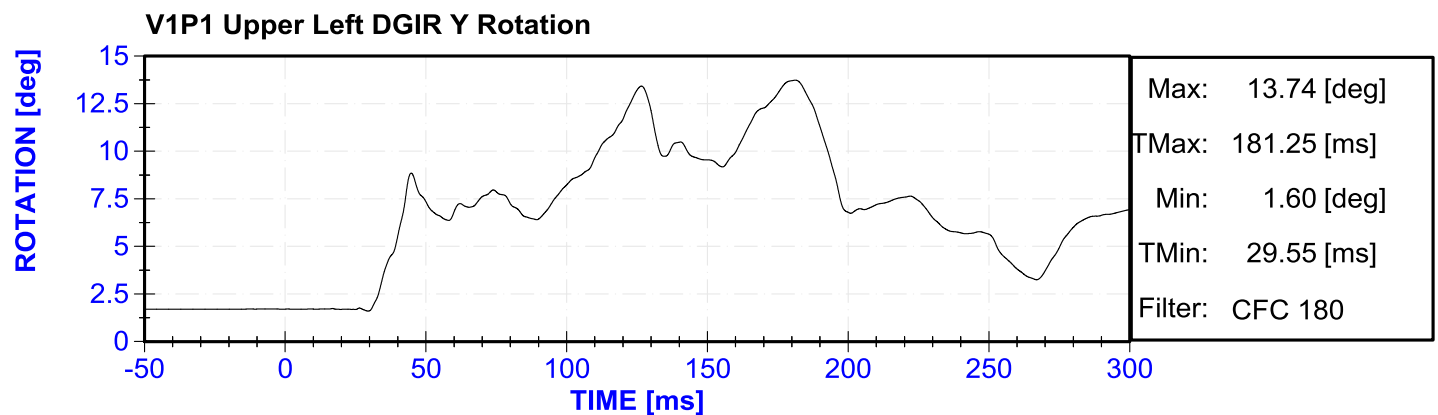
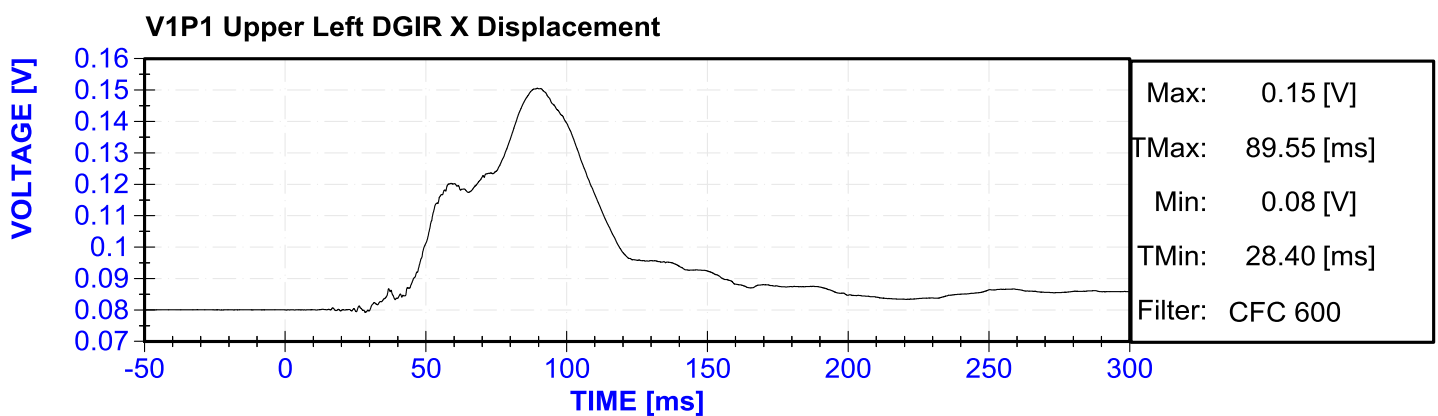
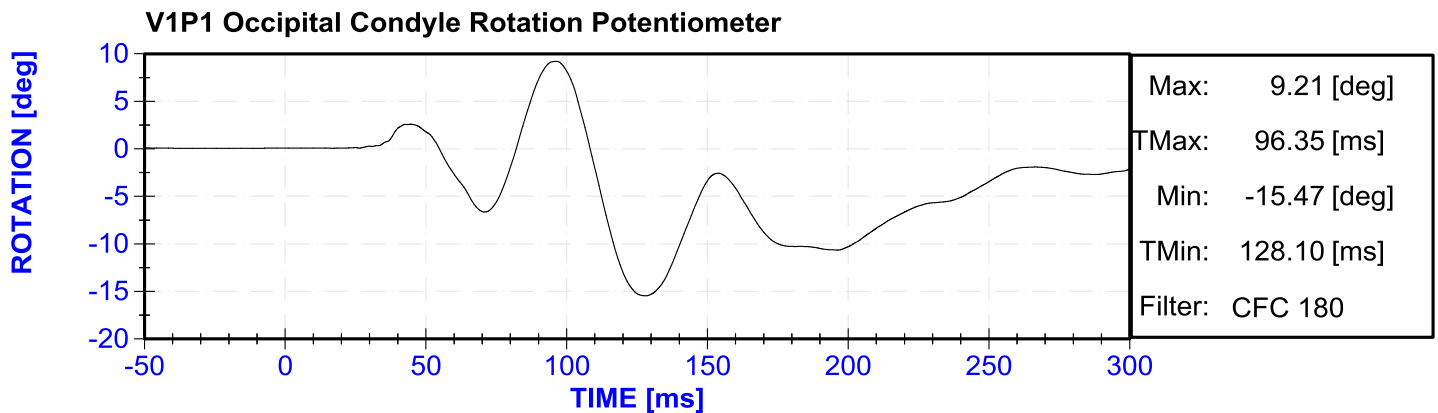


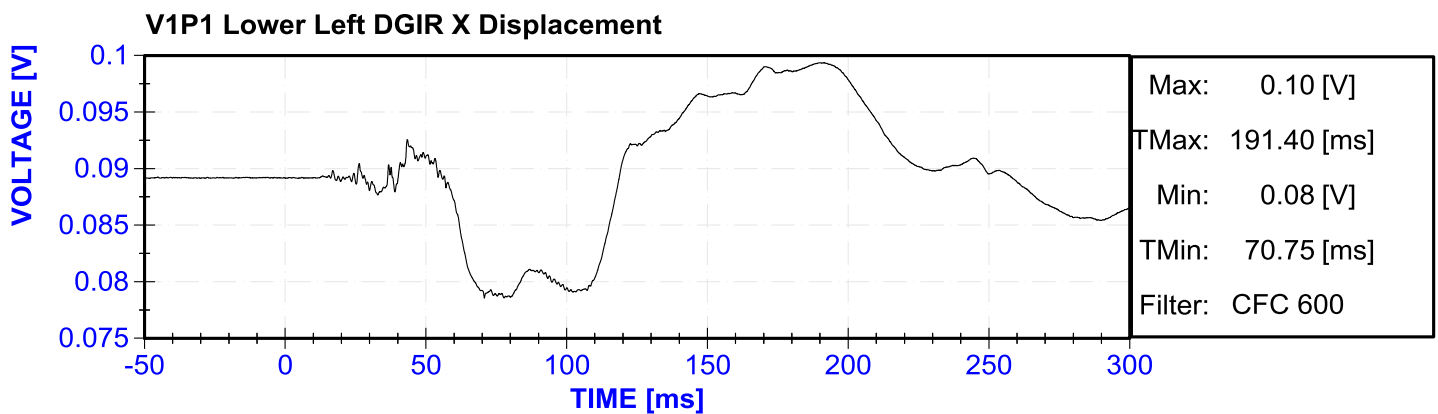
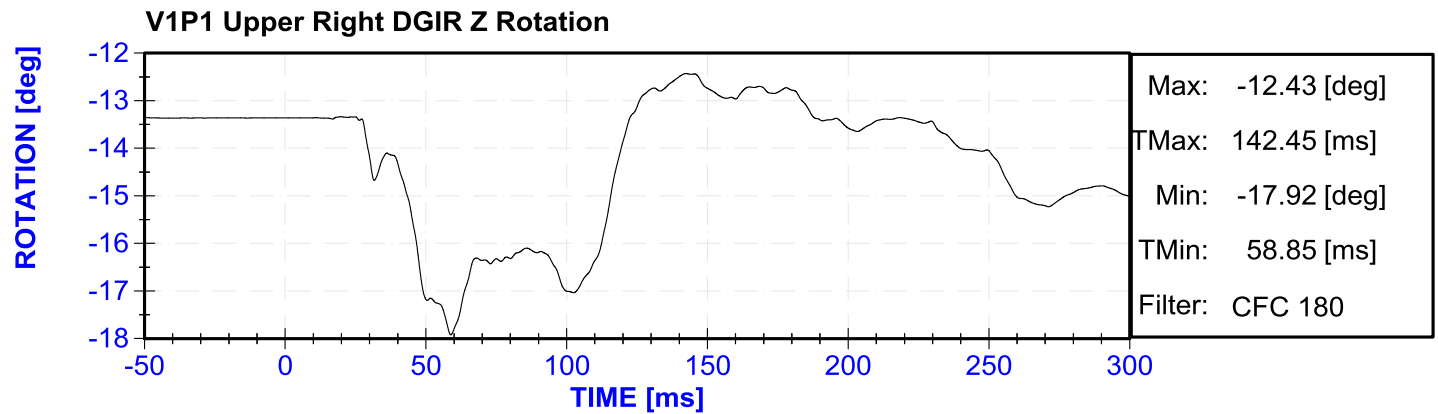
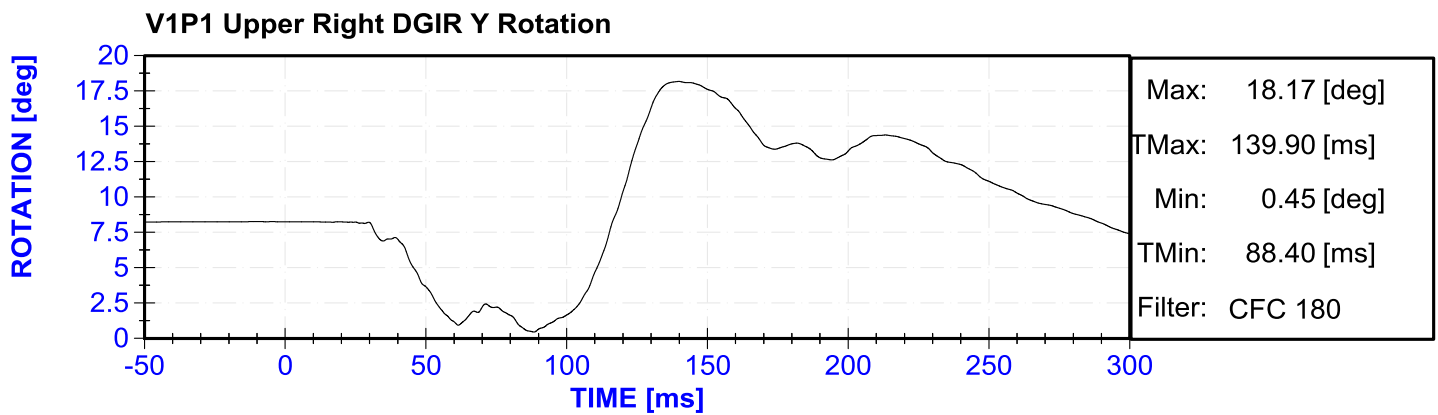
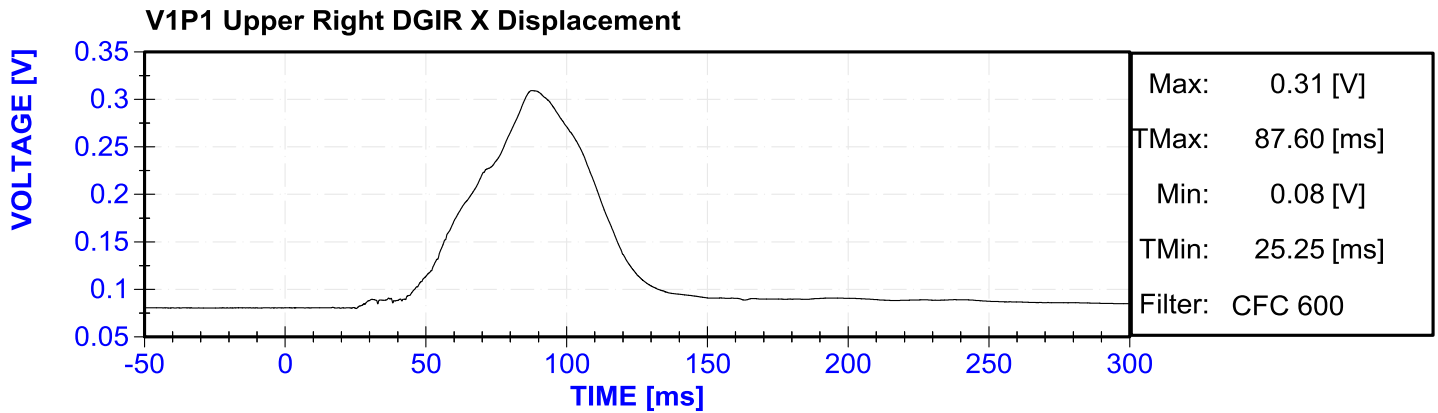


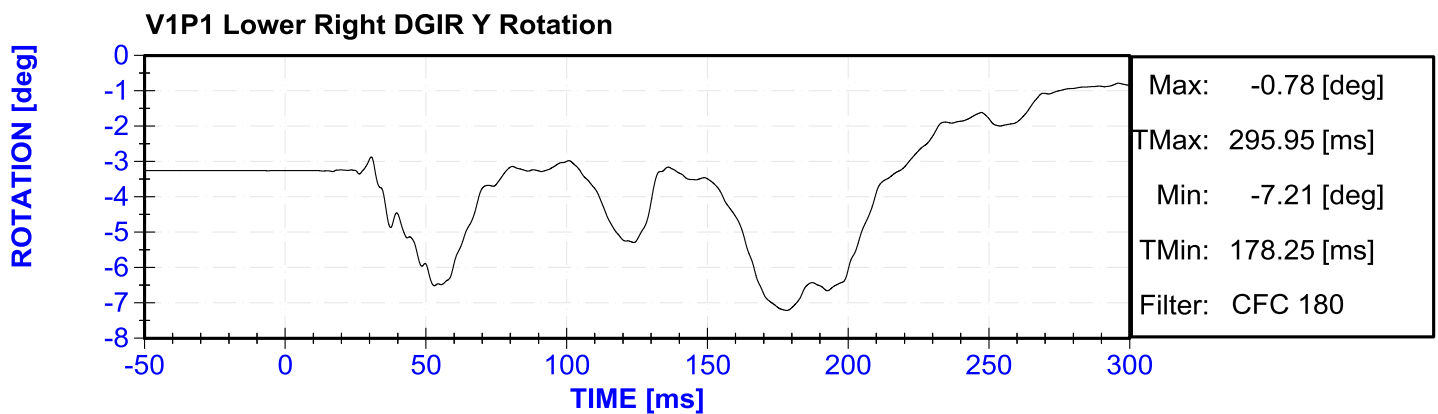
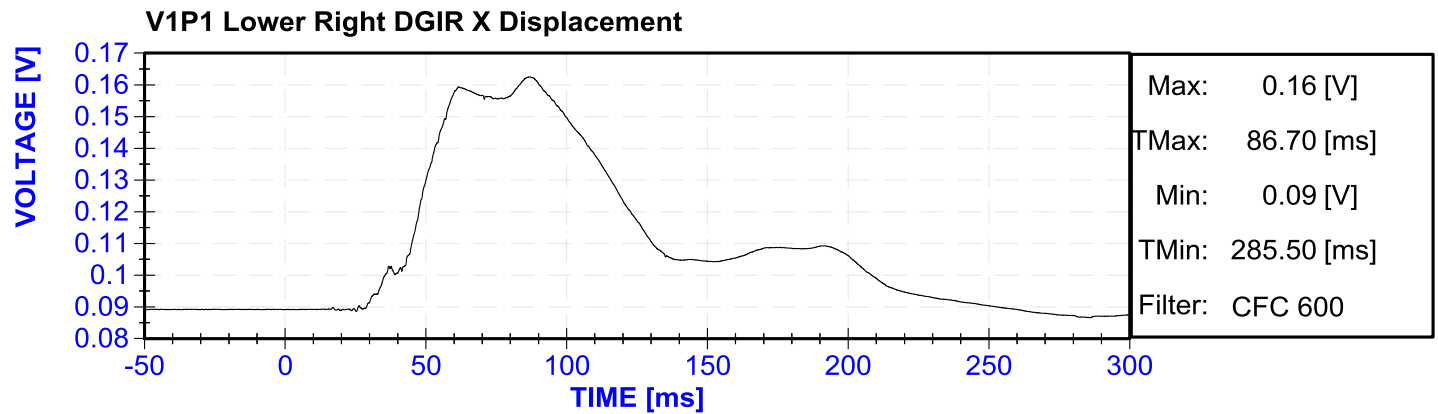
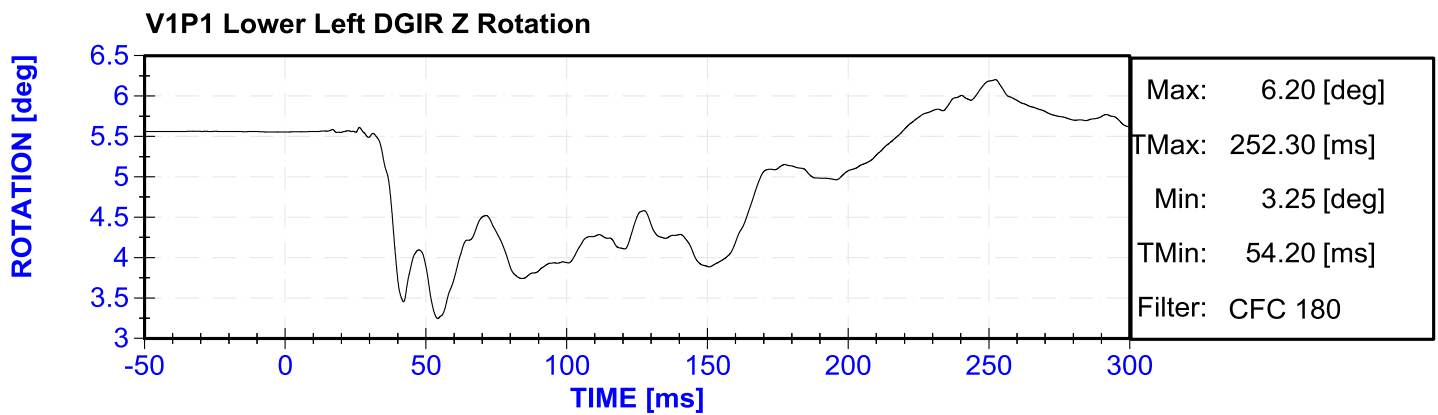
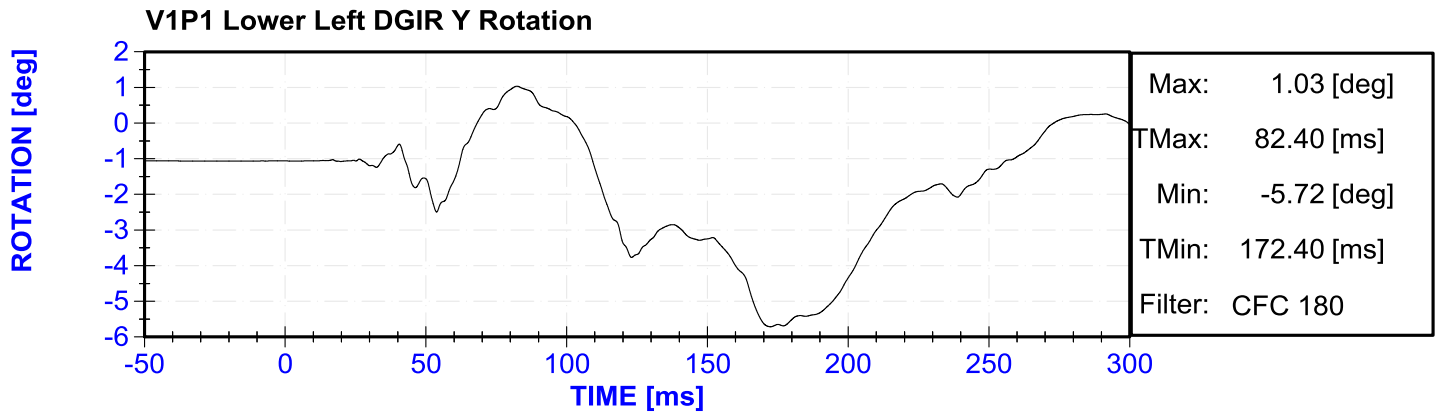




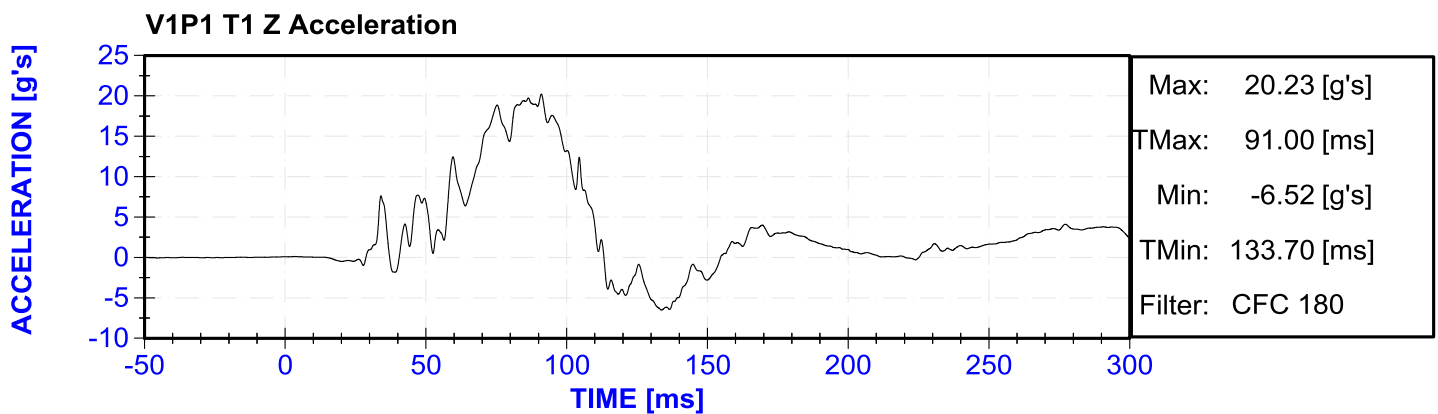
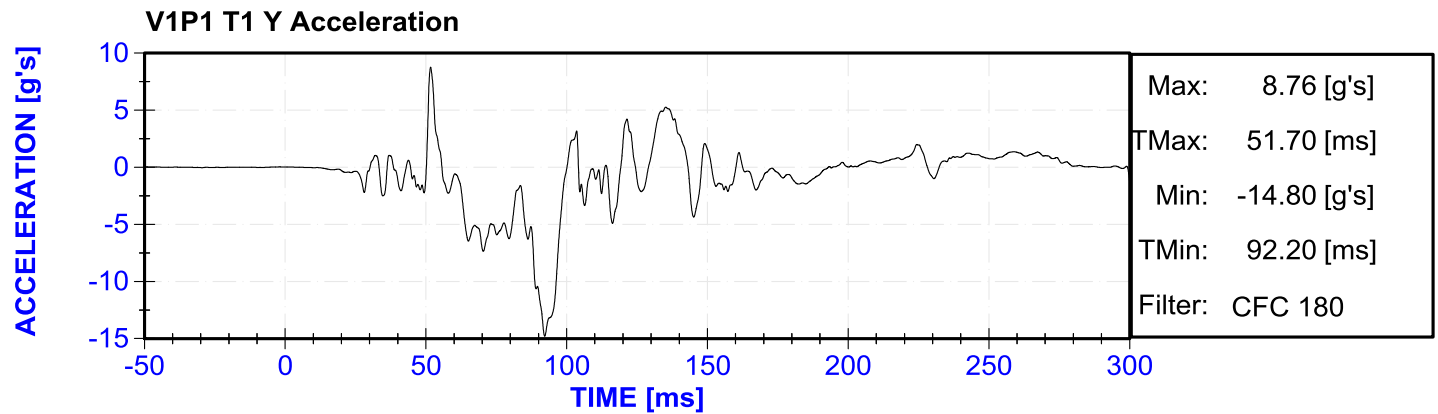
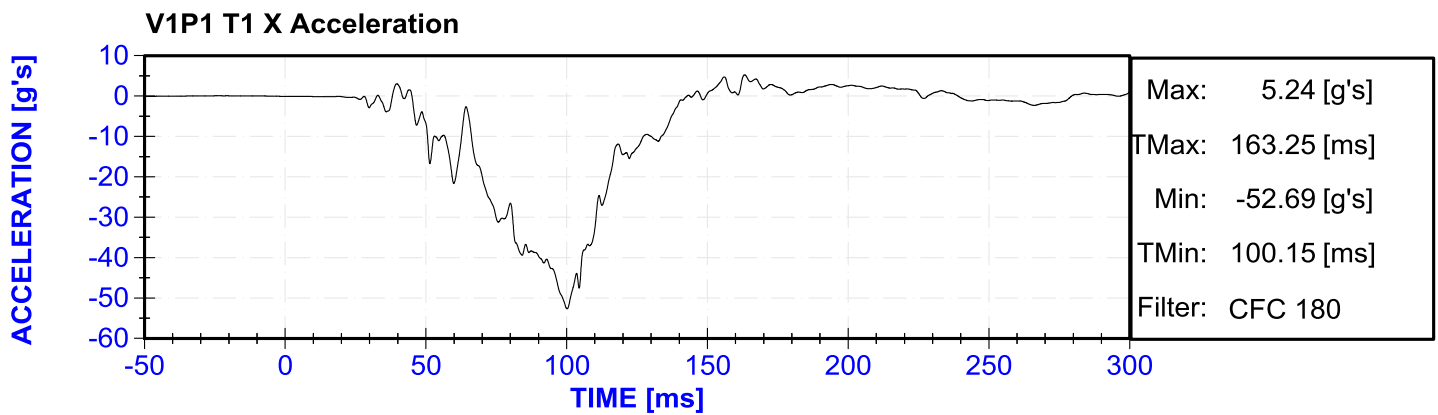
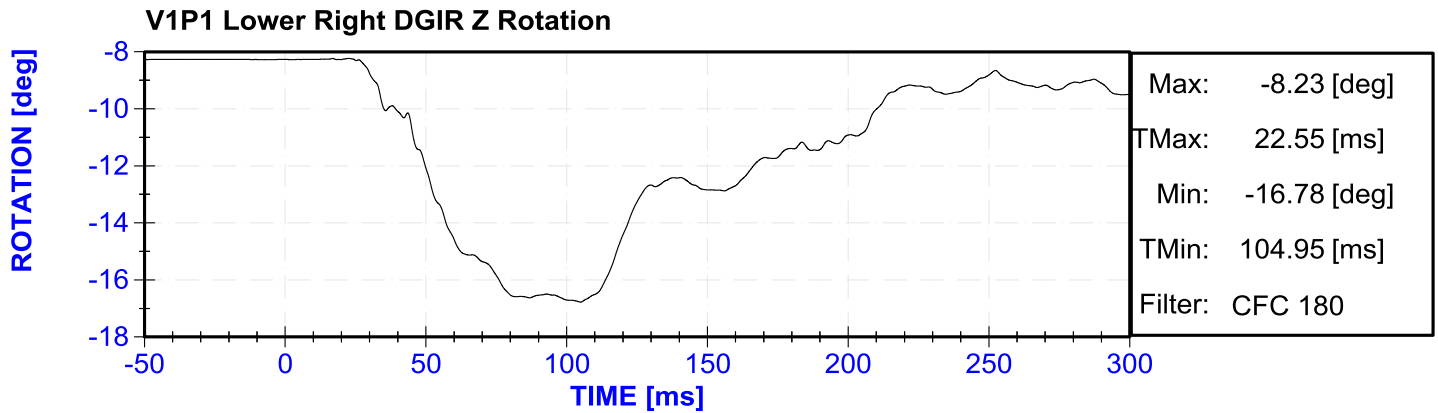


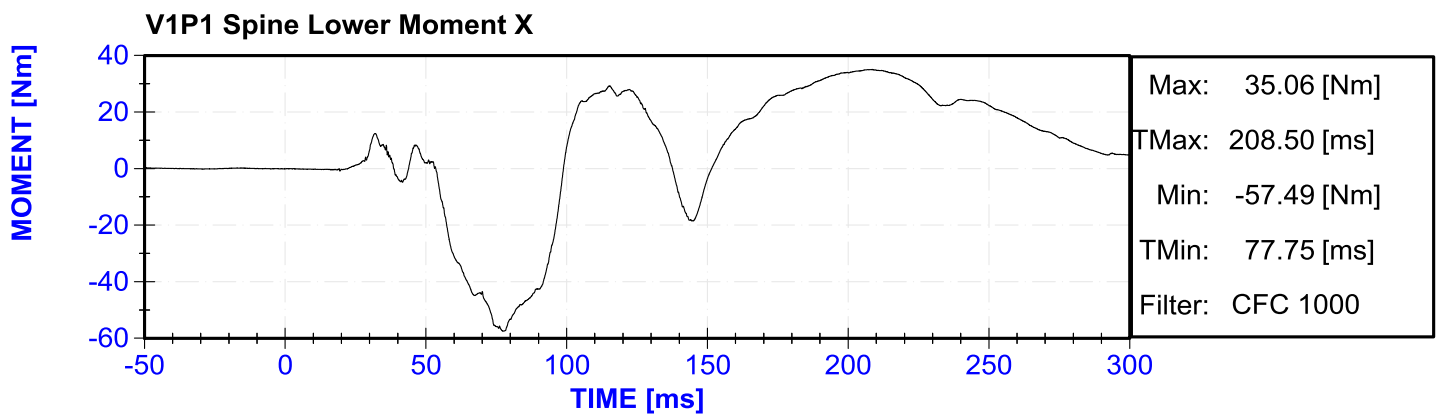
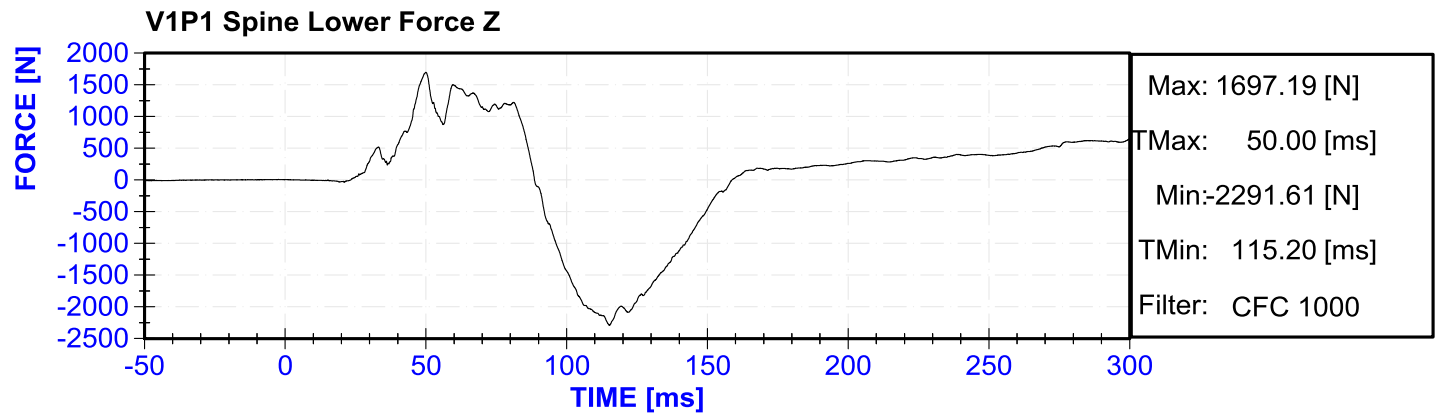
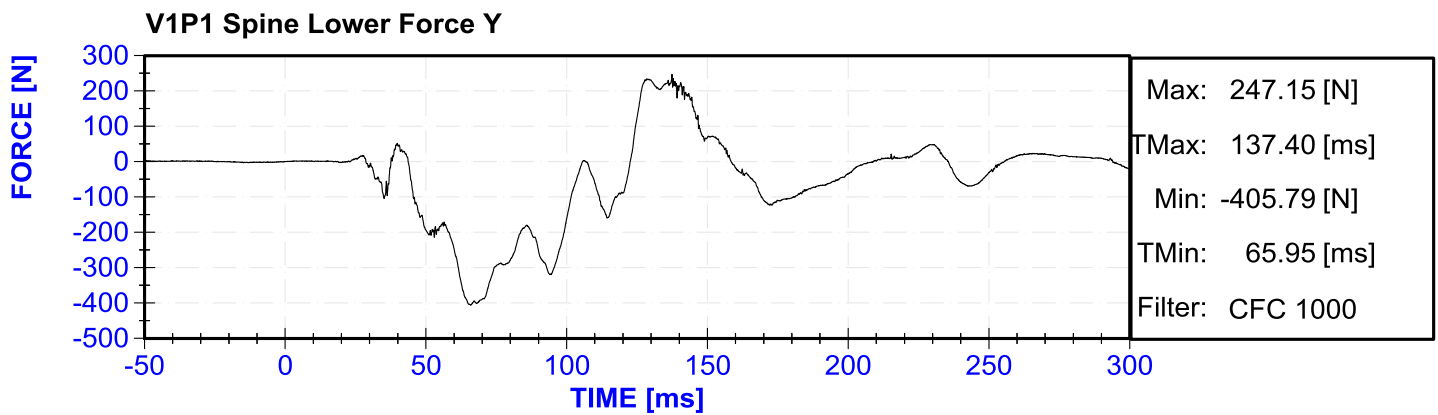
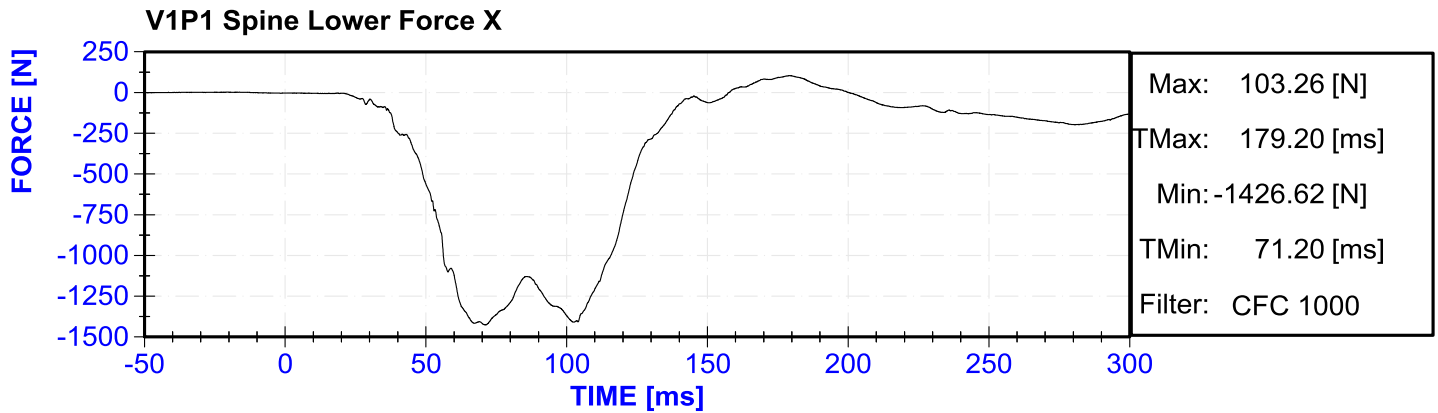


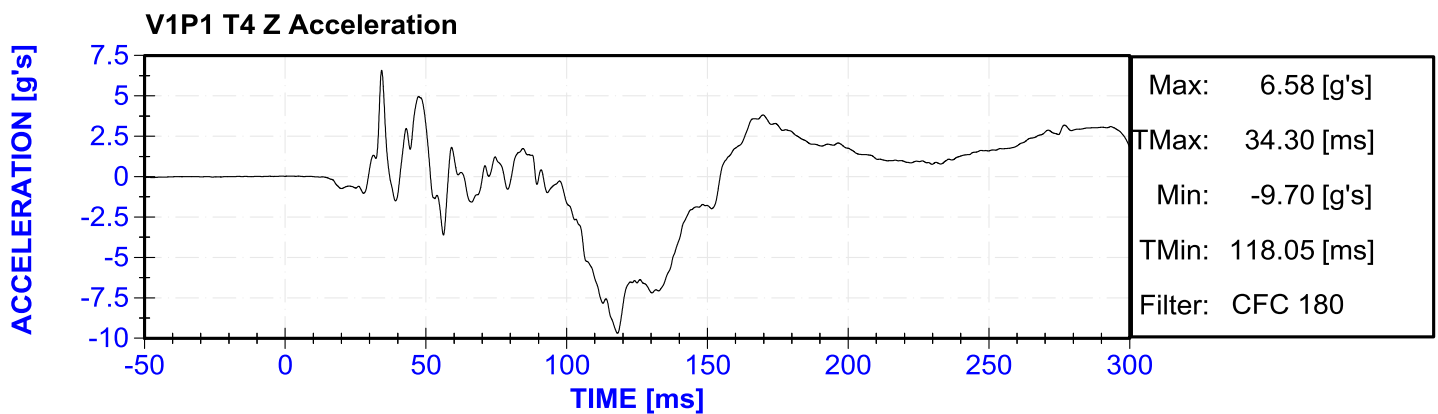
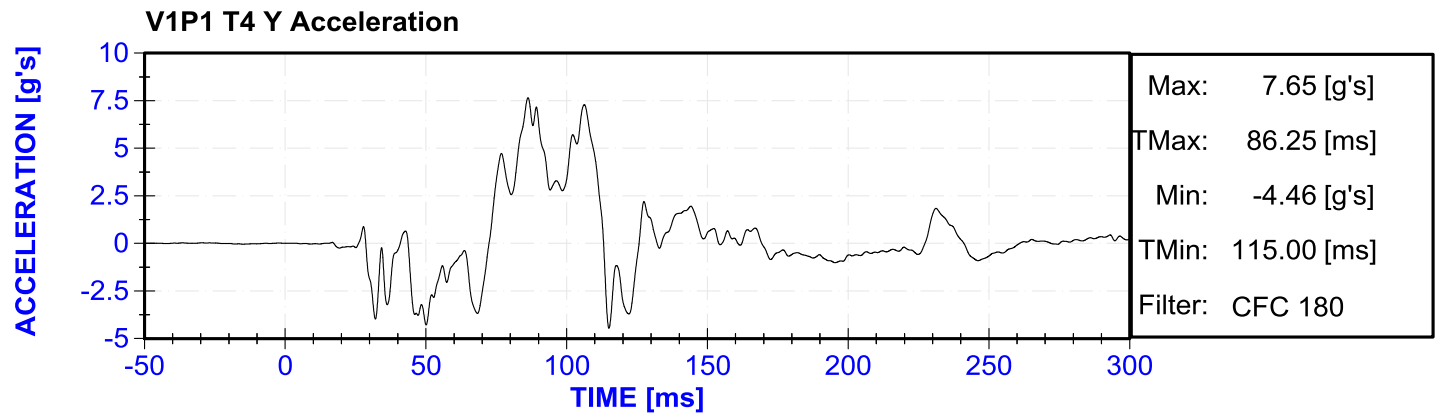
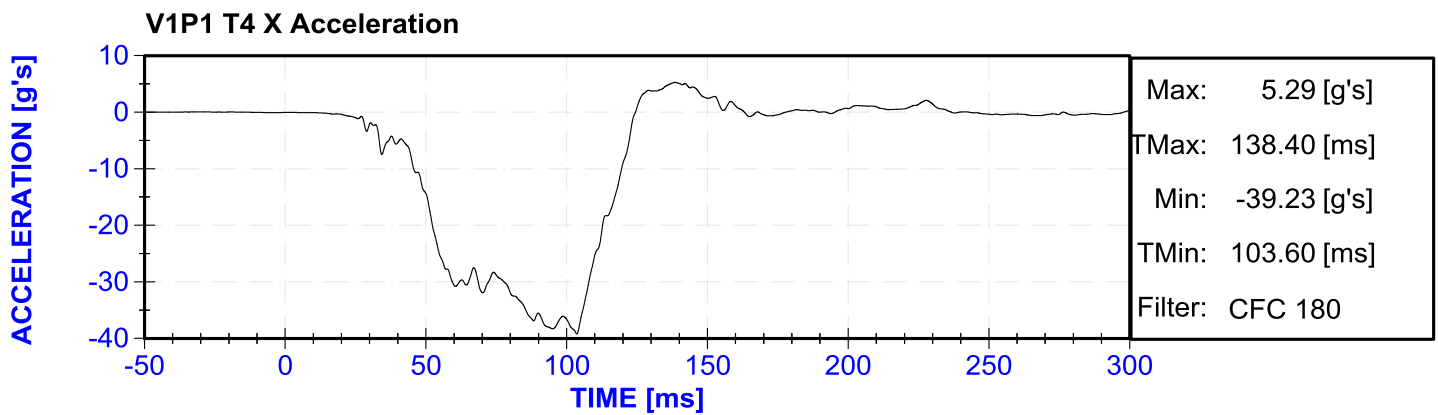
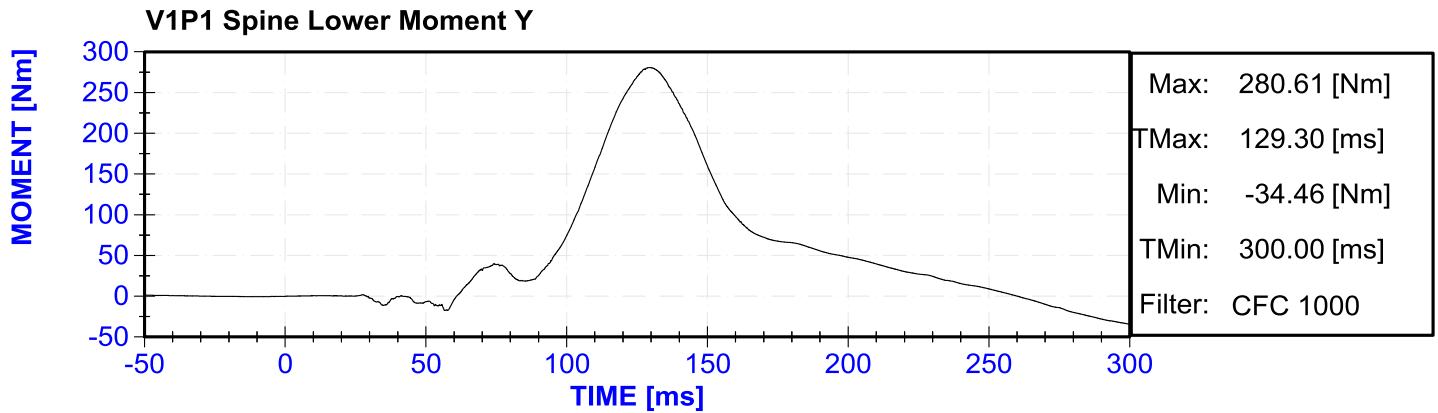






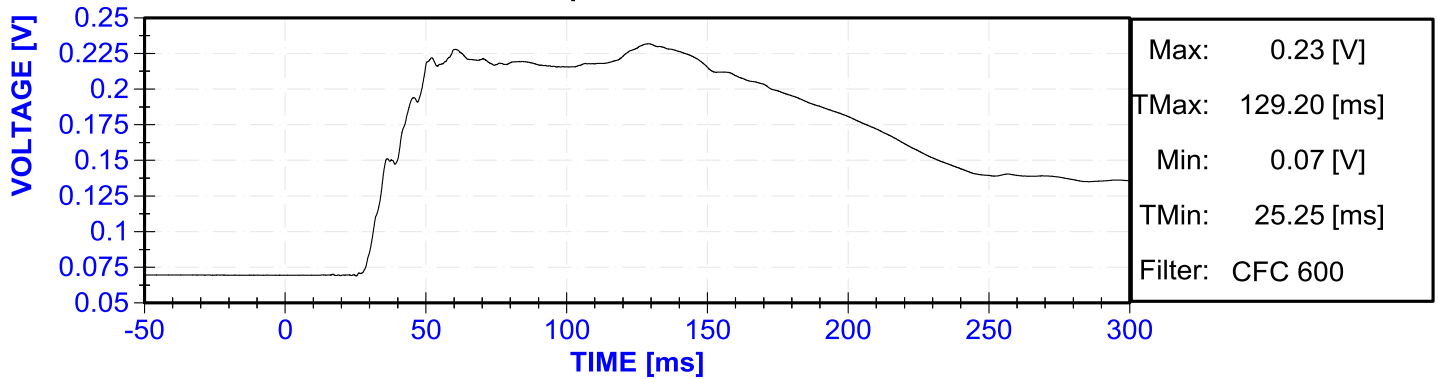




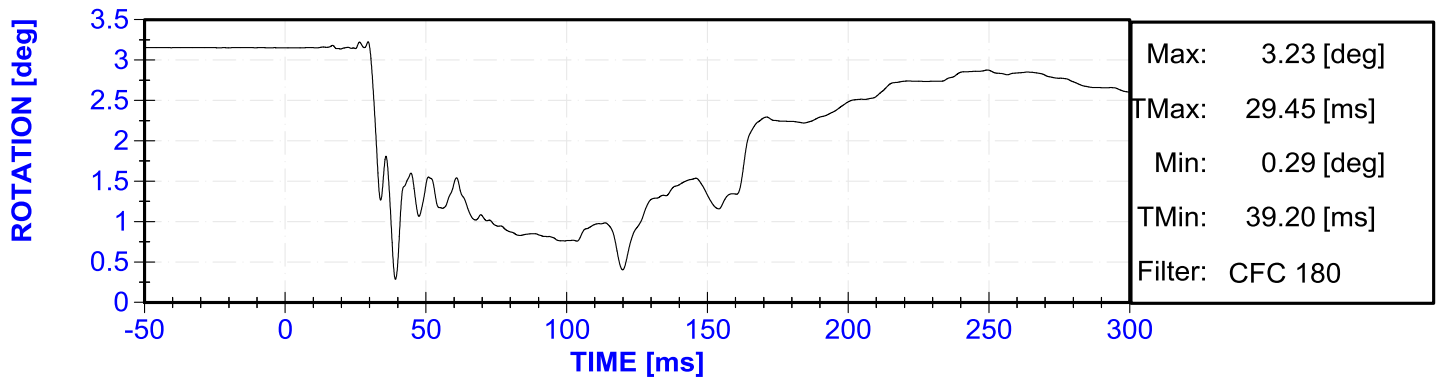




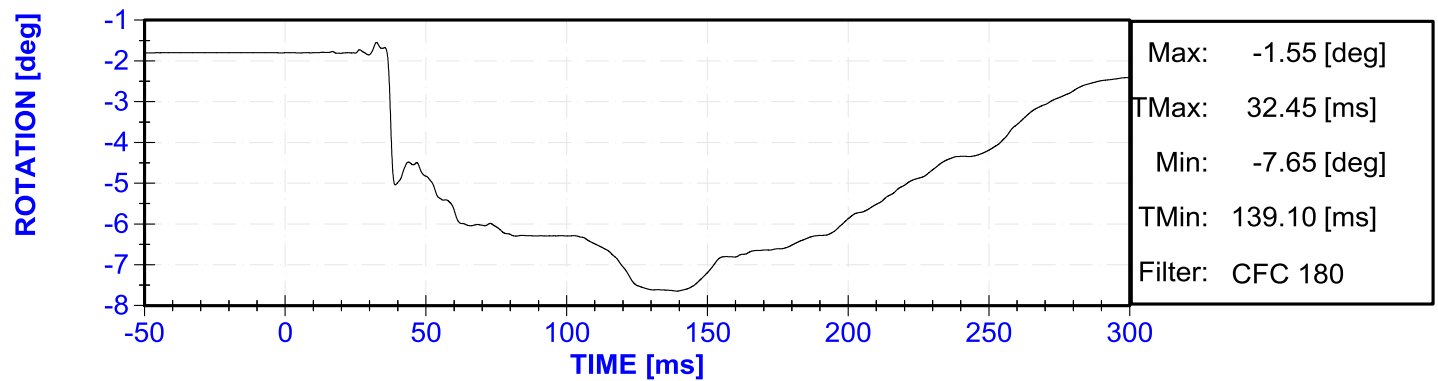
V1P1 Abdomen Left DGIR X Displacement



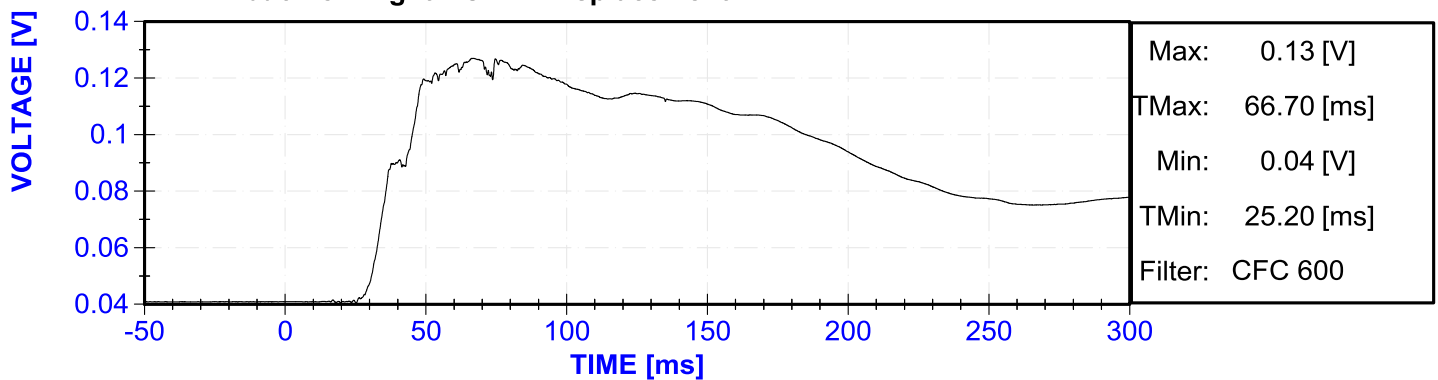
V1P1 Abdomen Left DGIR Y Rotation

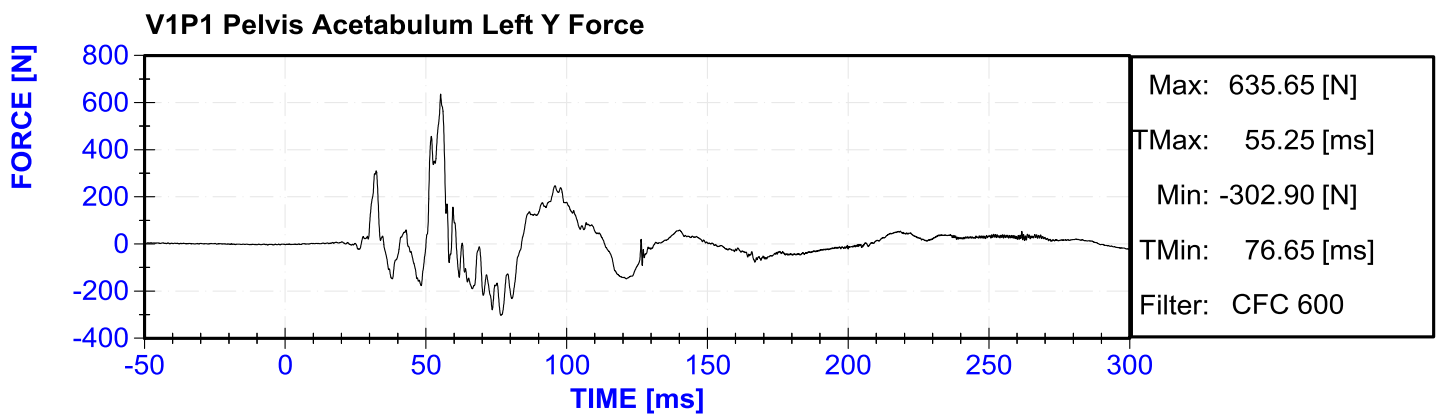
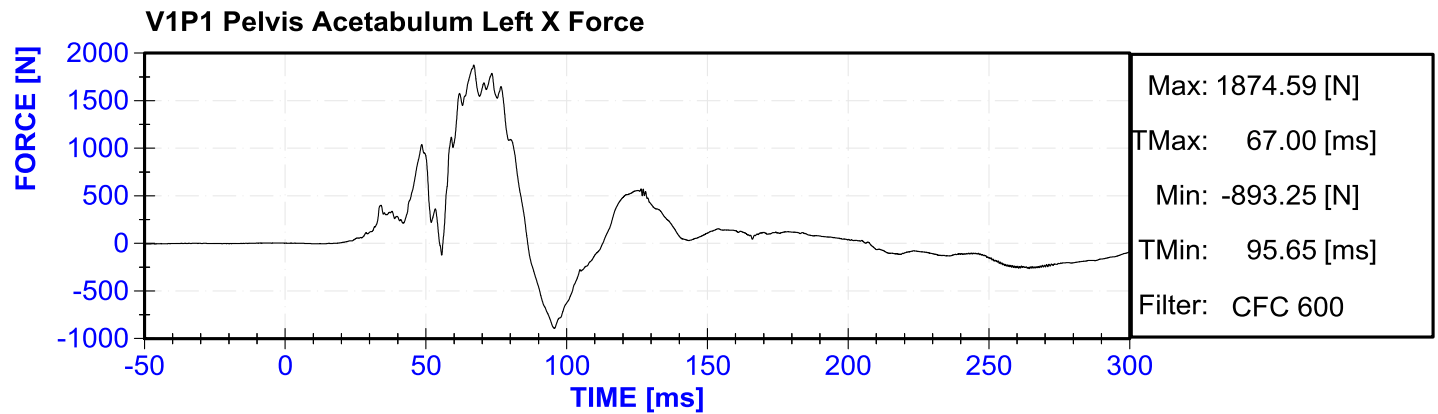
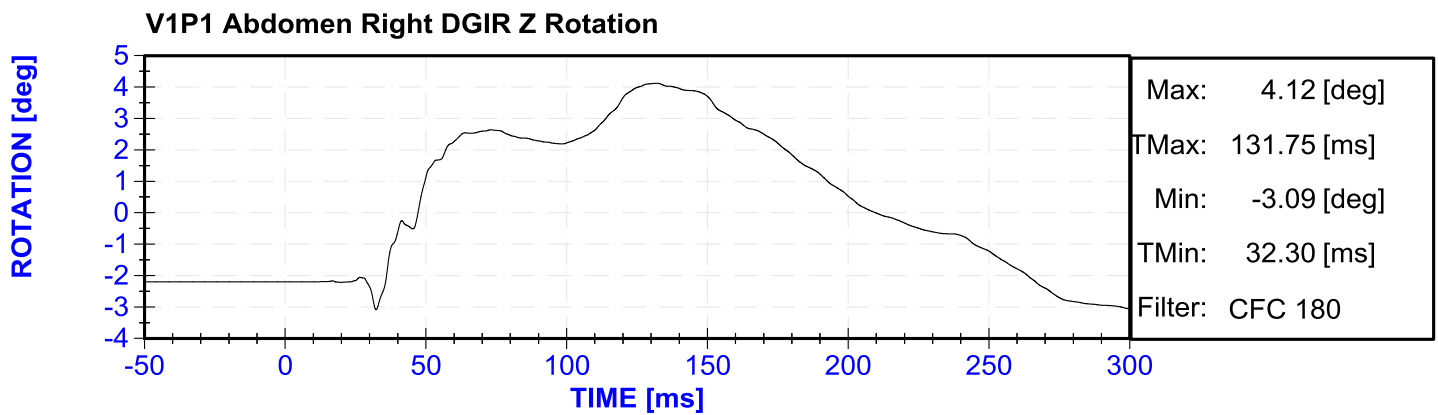
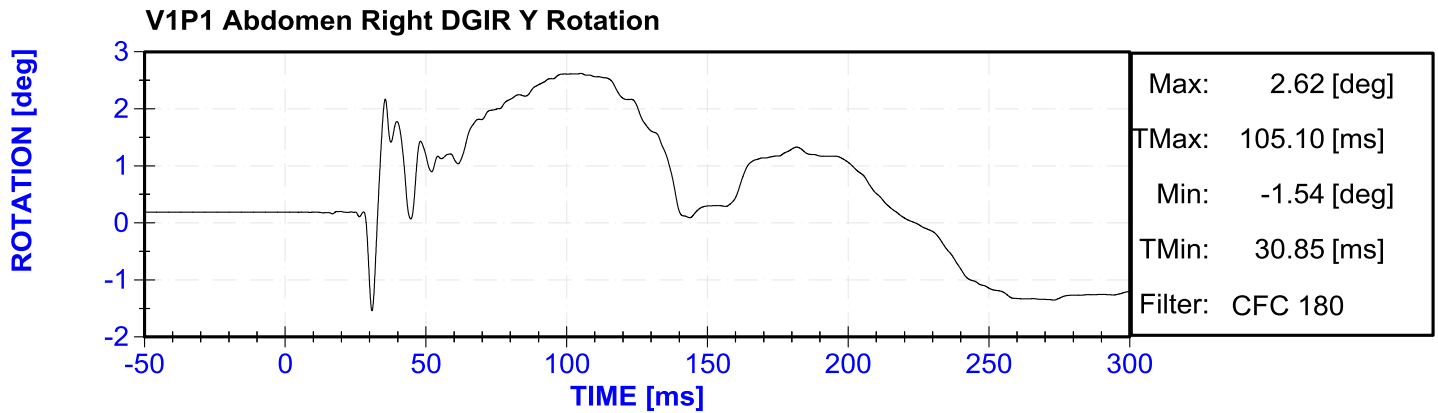


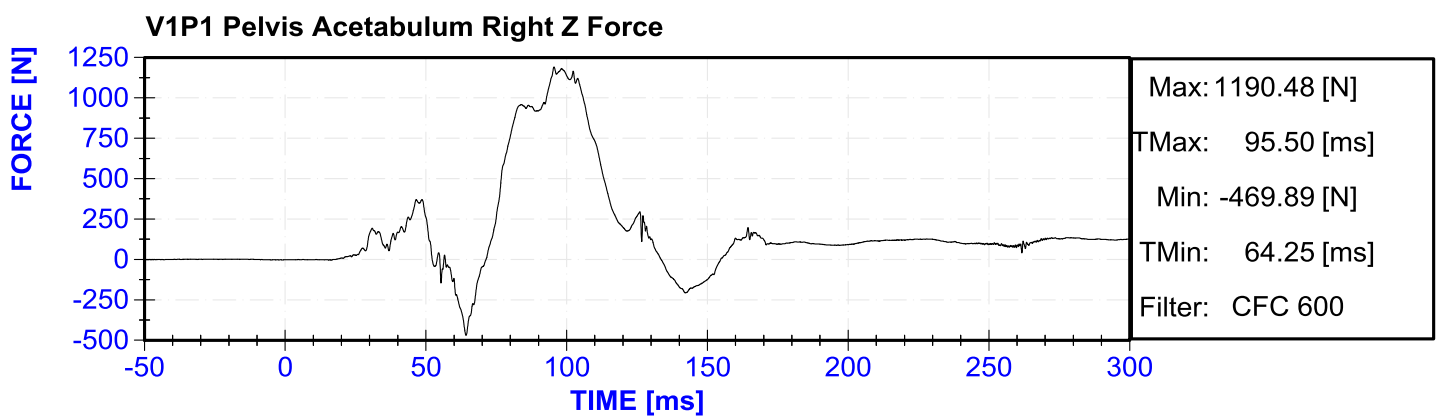
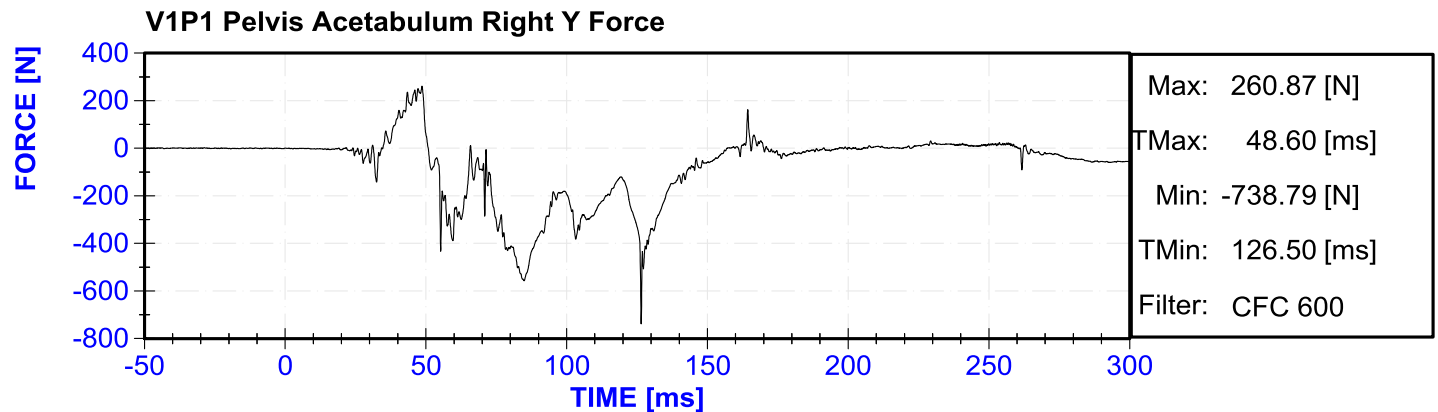
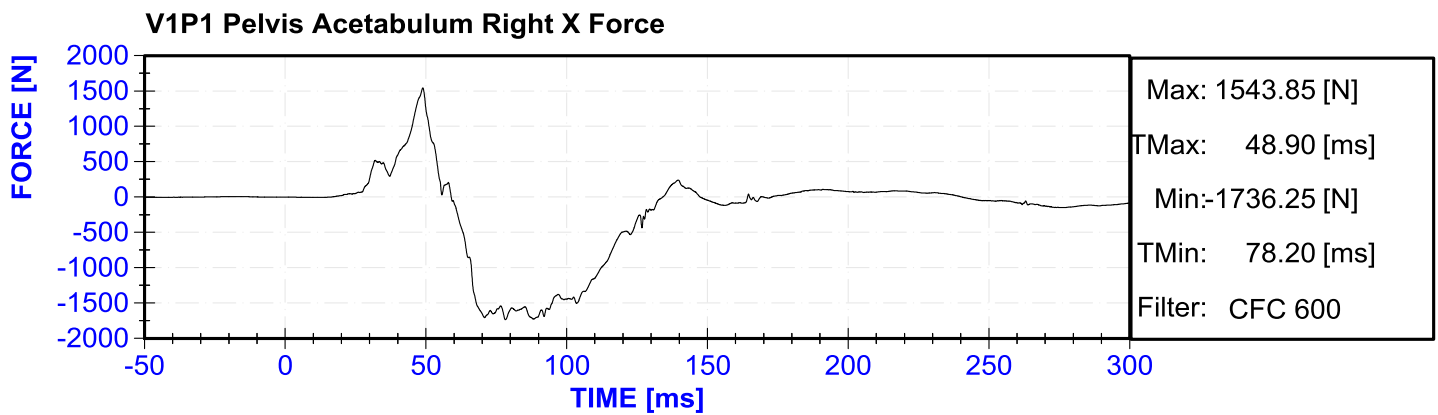
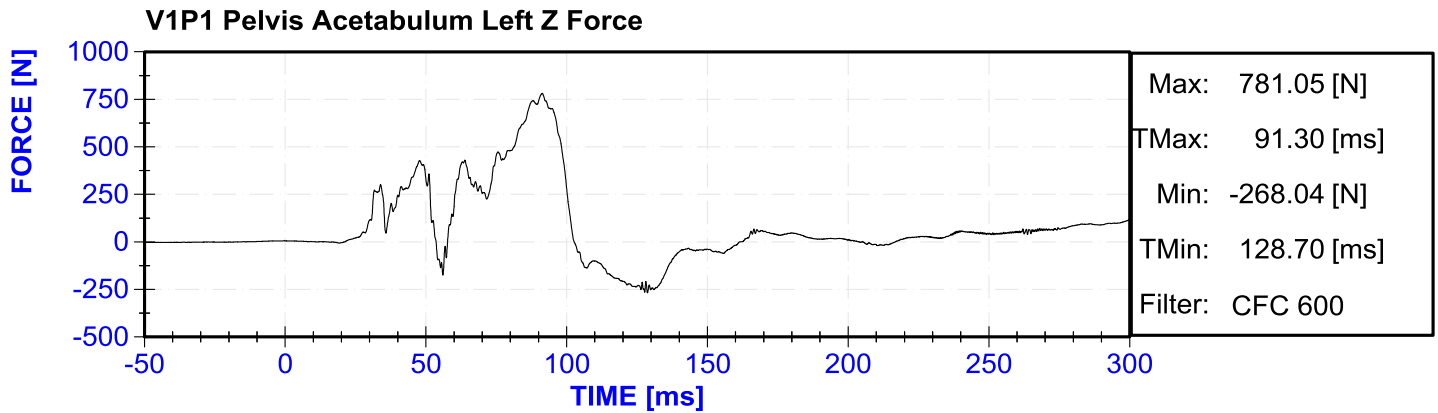
V1P1 Abdomen Left DGIR Z Rotation



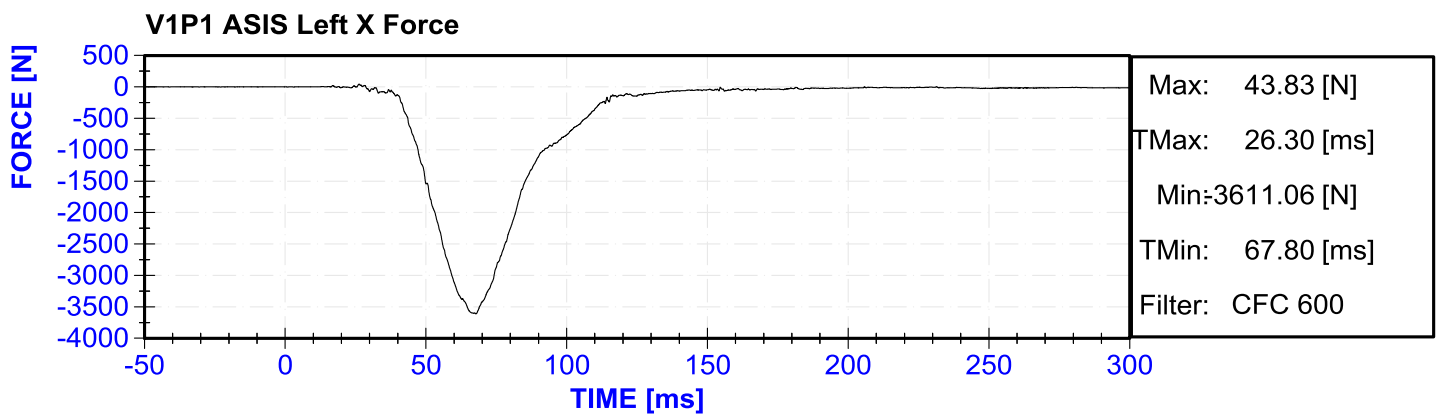
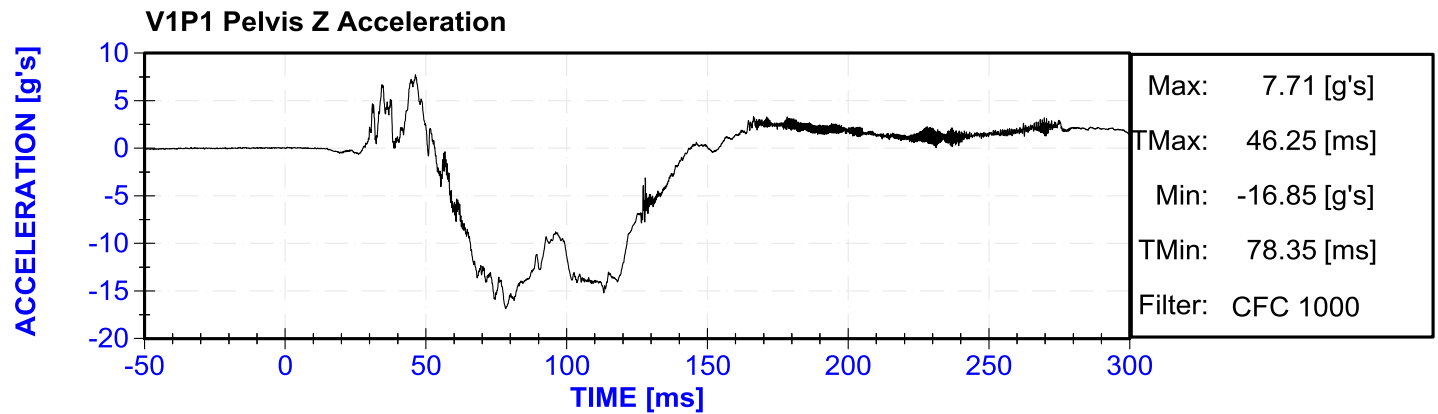
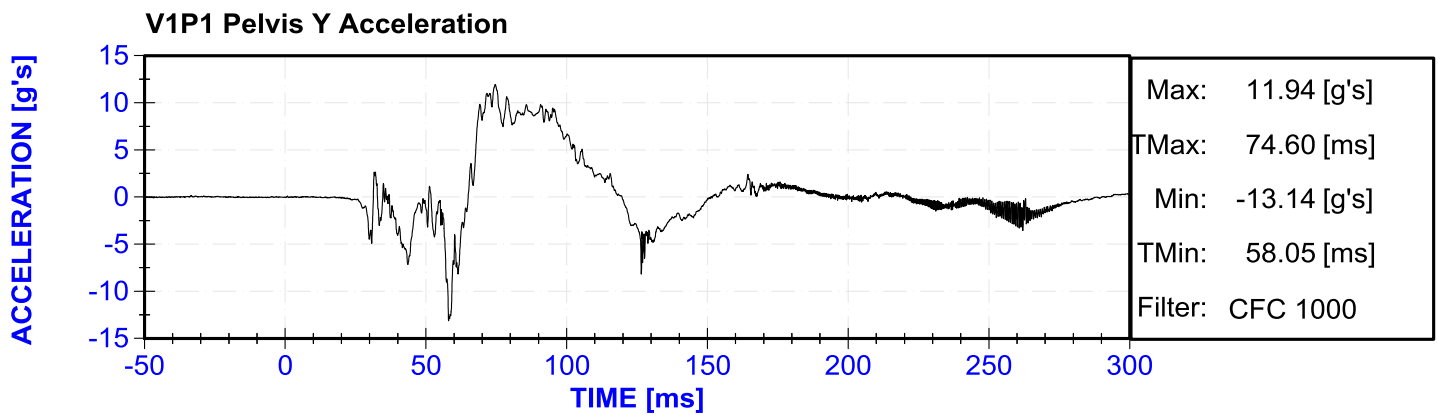
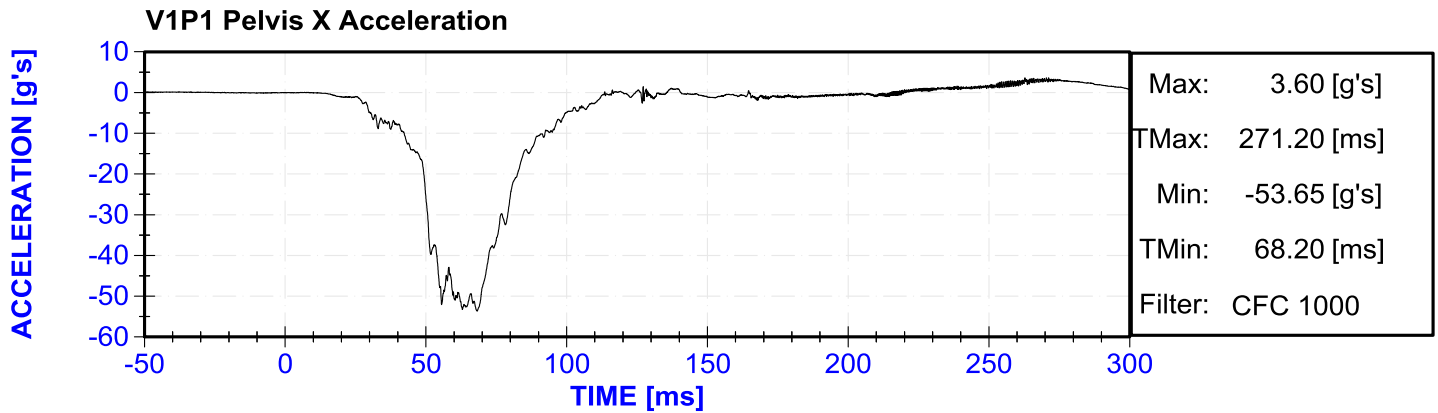
V1P1 Abdomen Right DGIR X Displacement

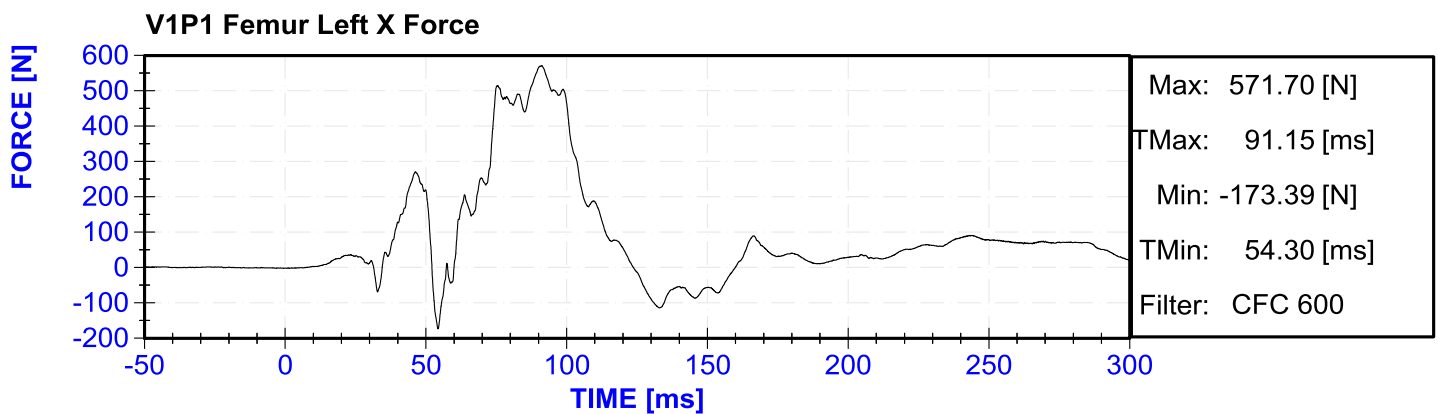
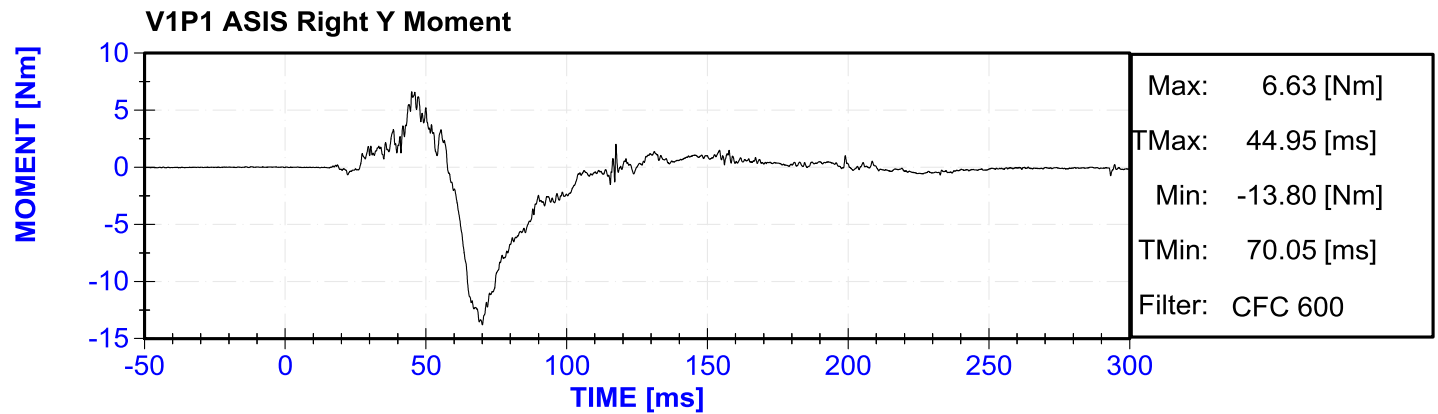
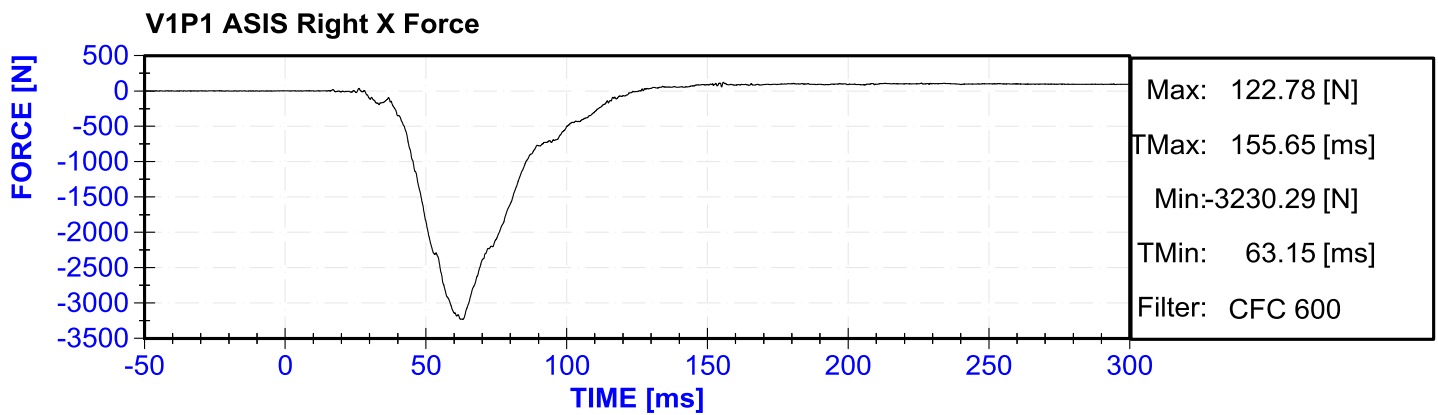
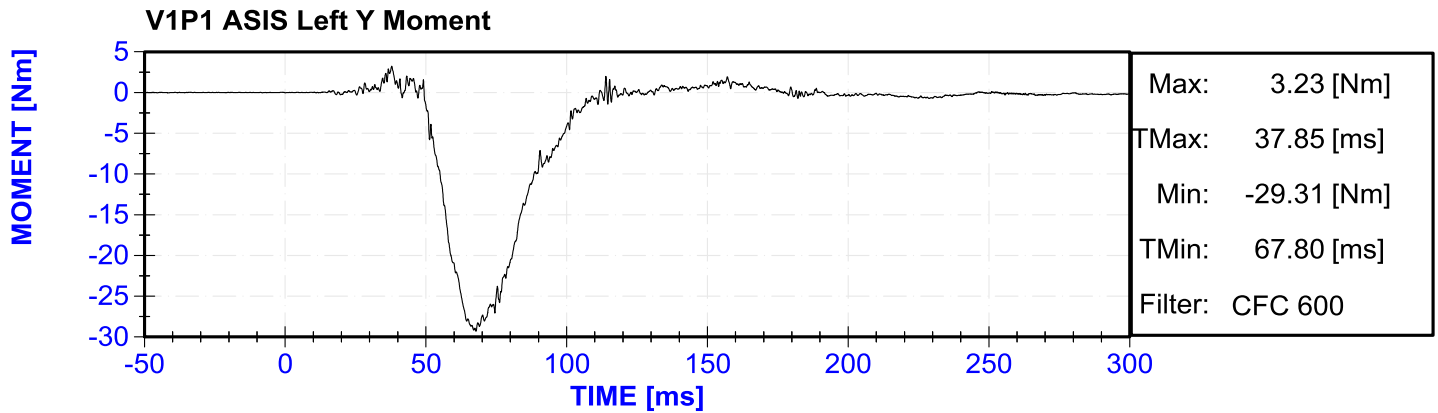


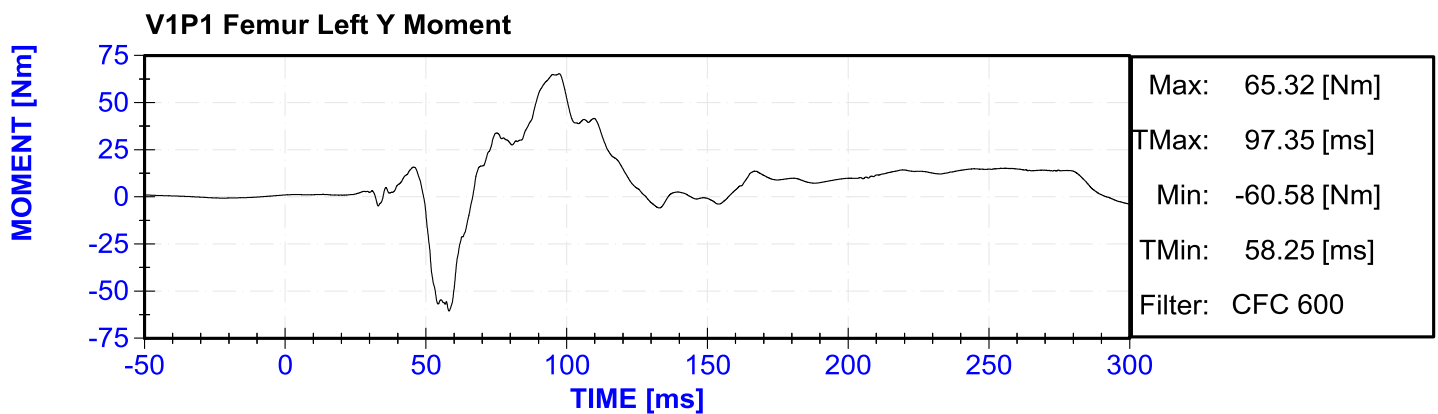
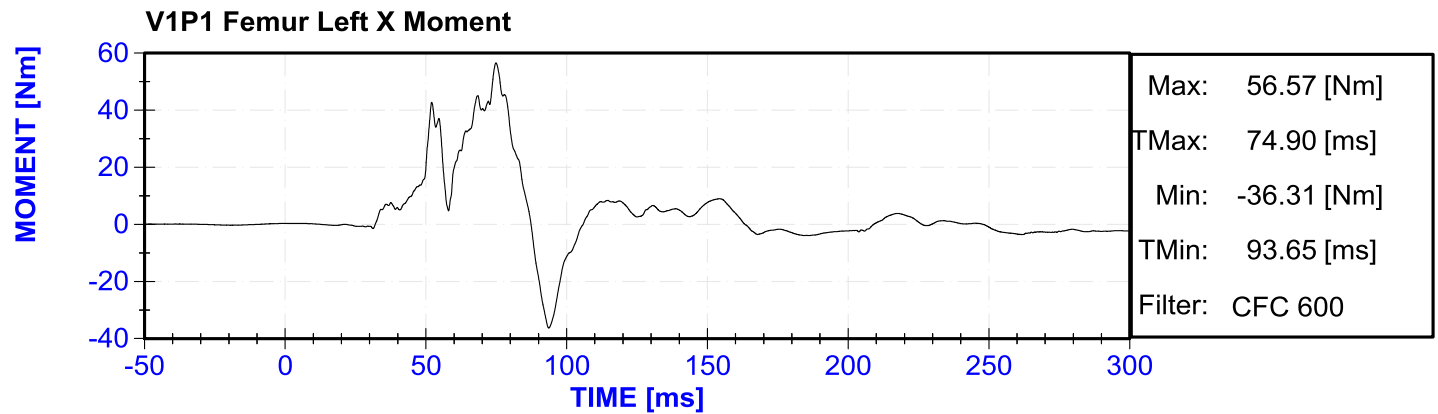
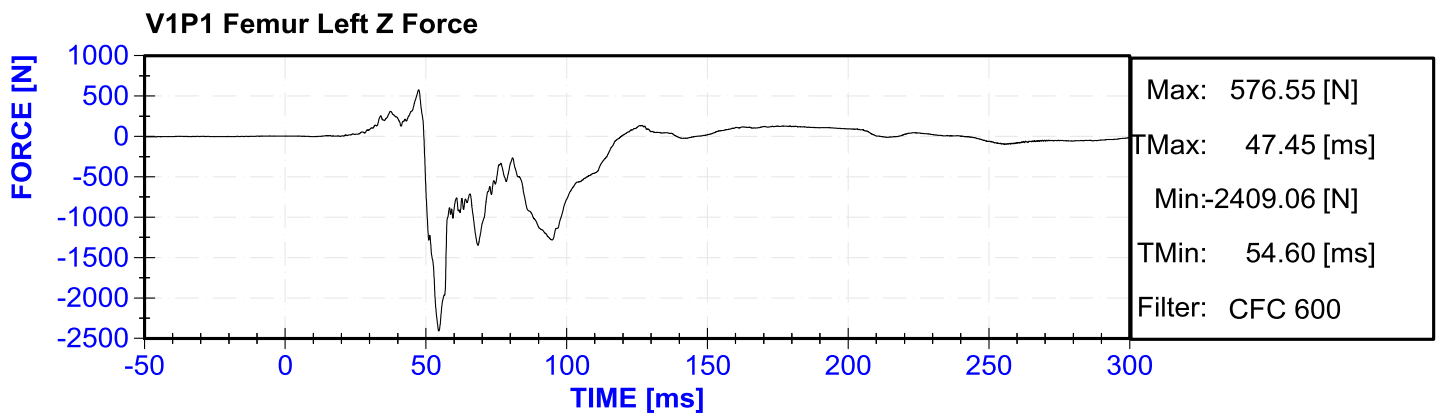
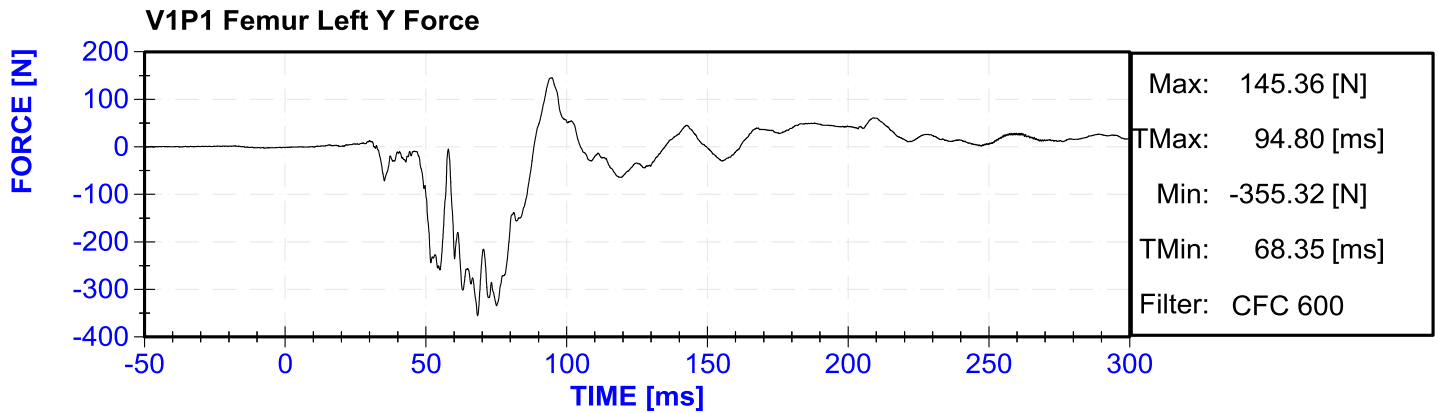




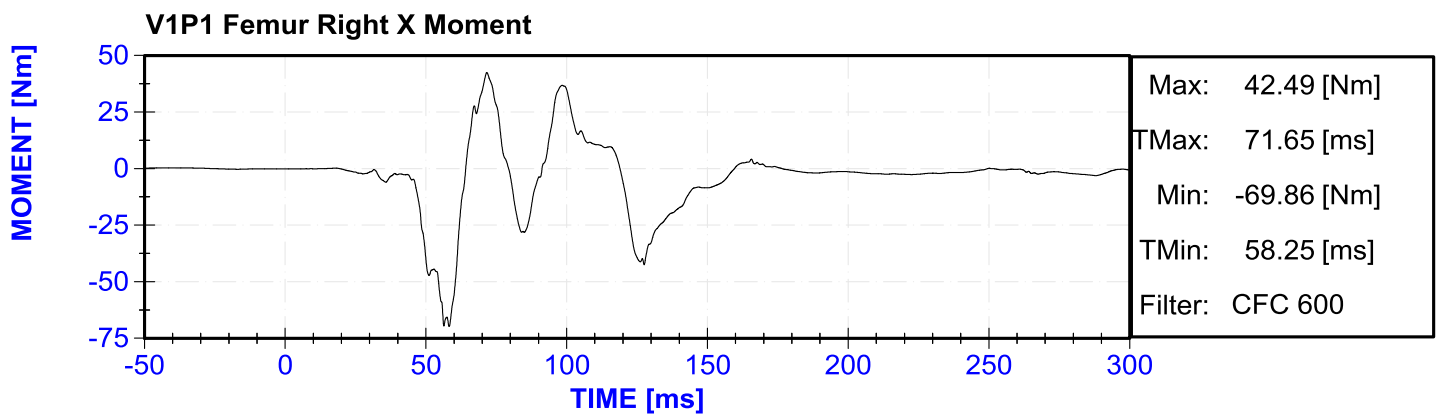
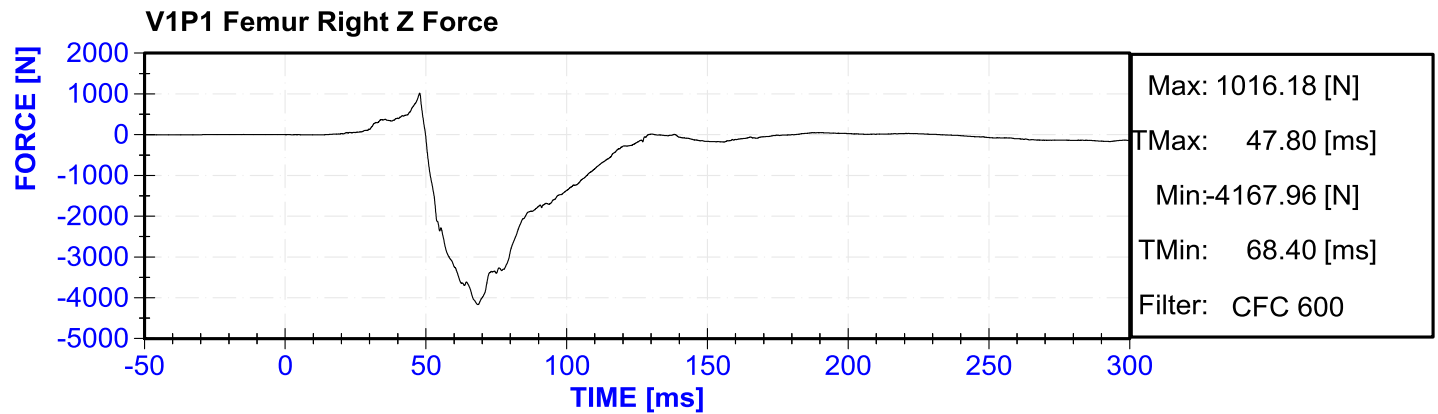
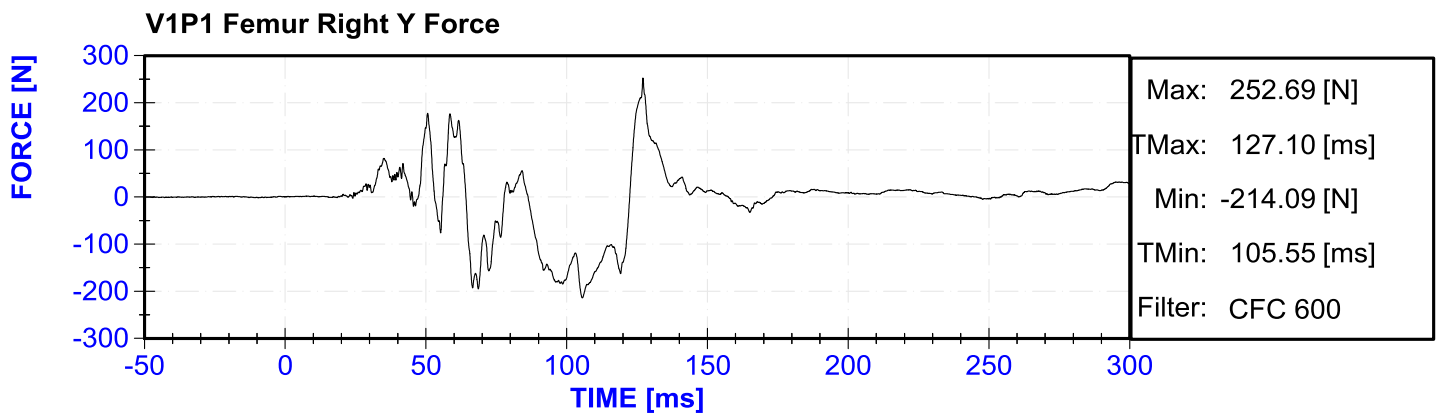
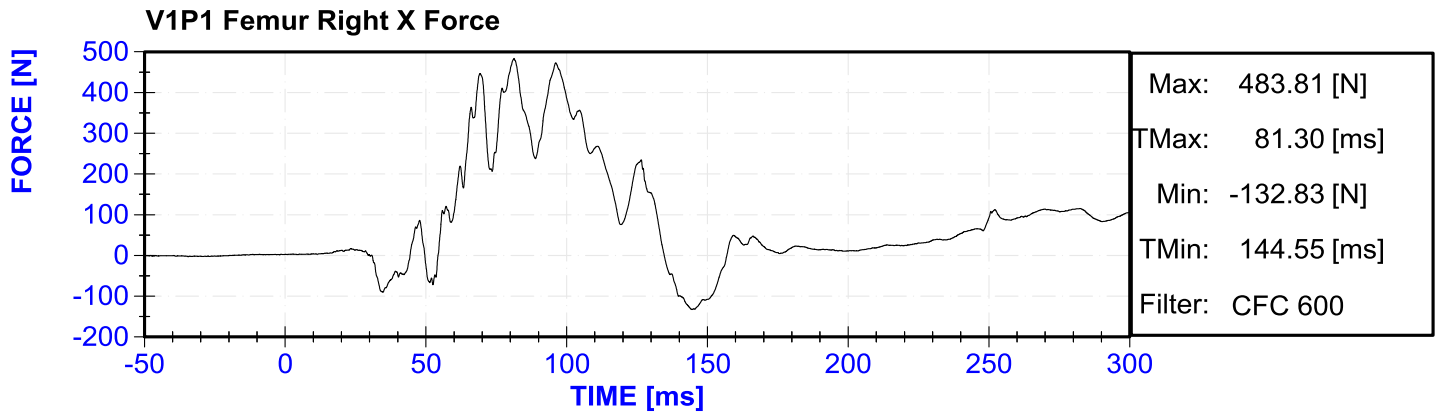


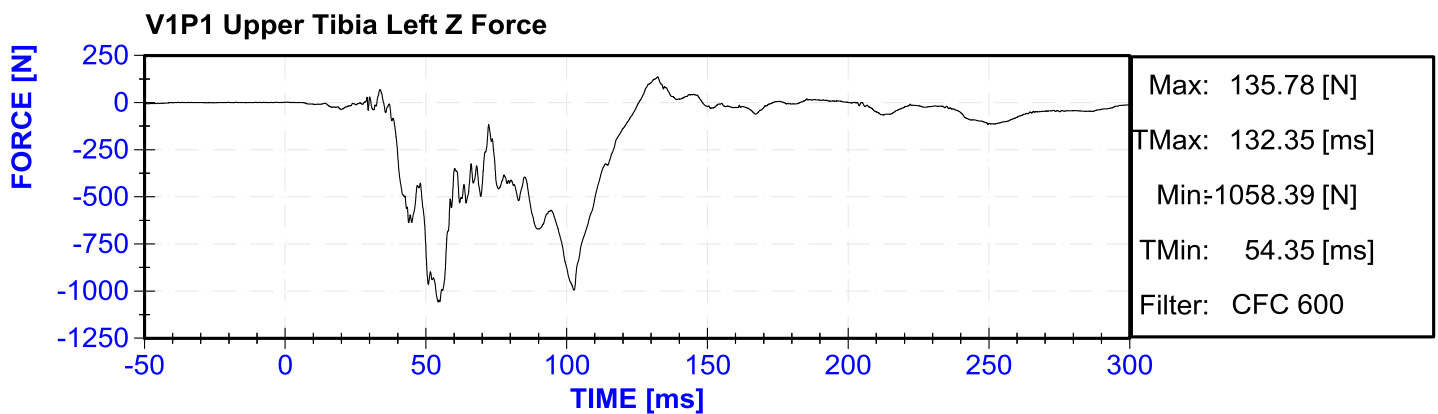
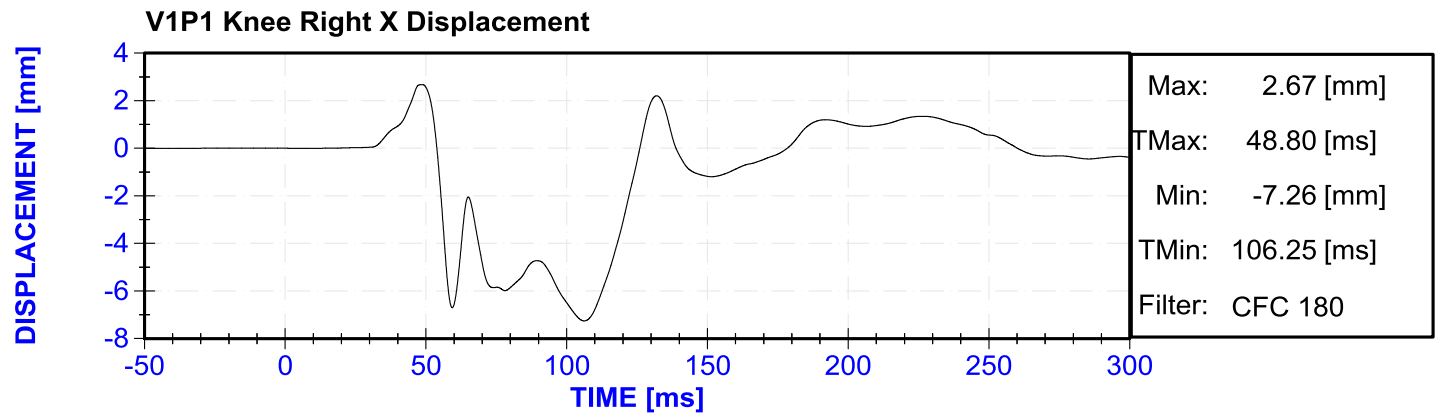
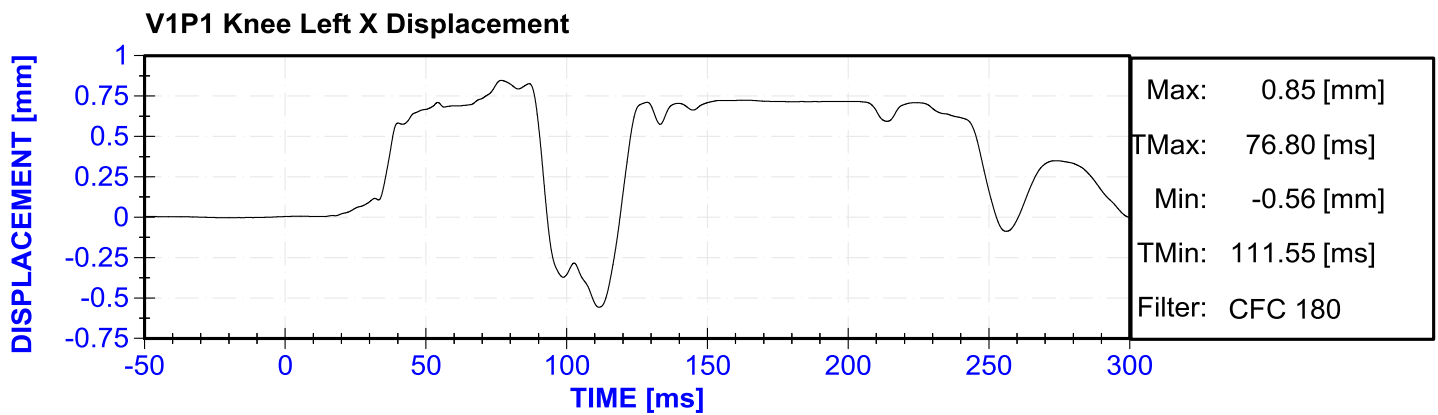
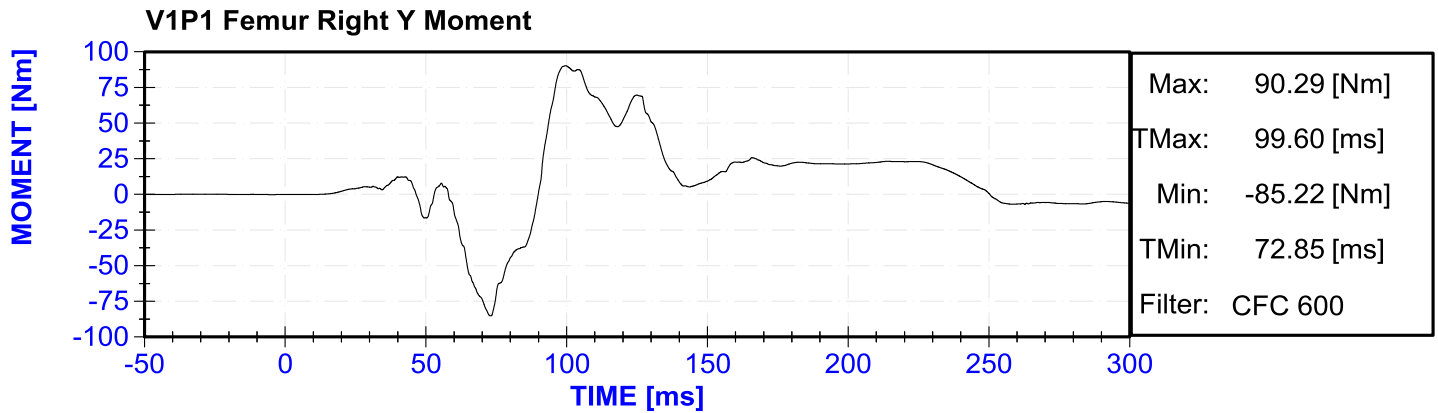


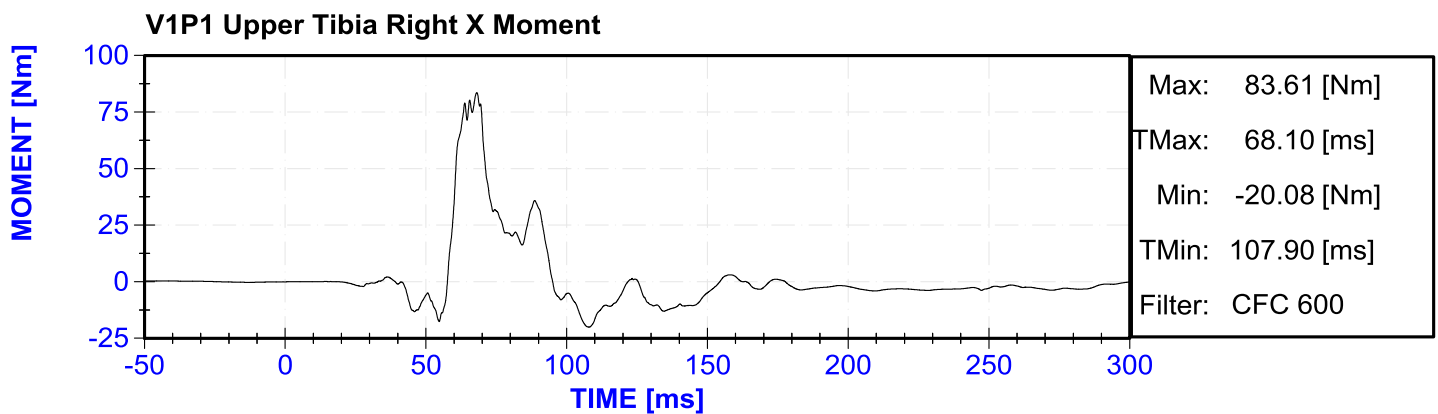
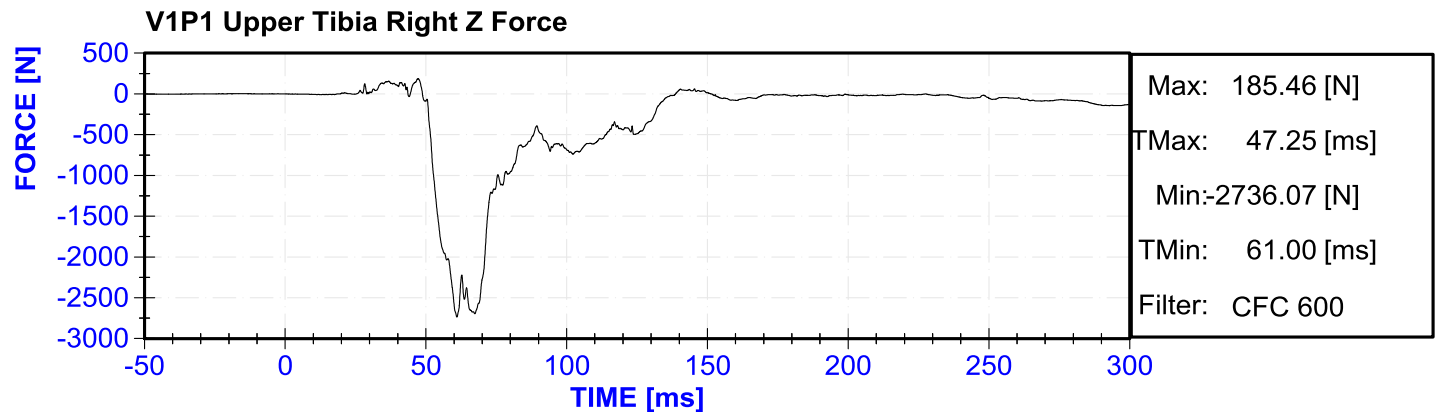
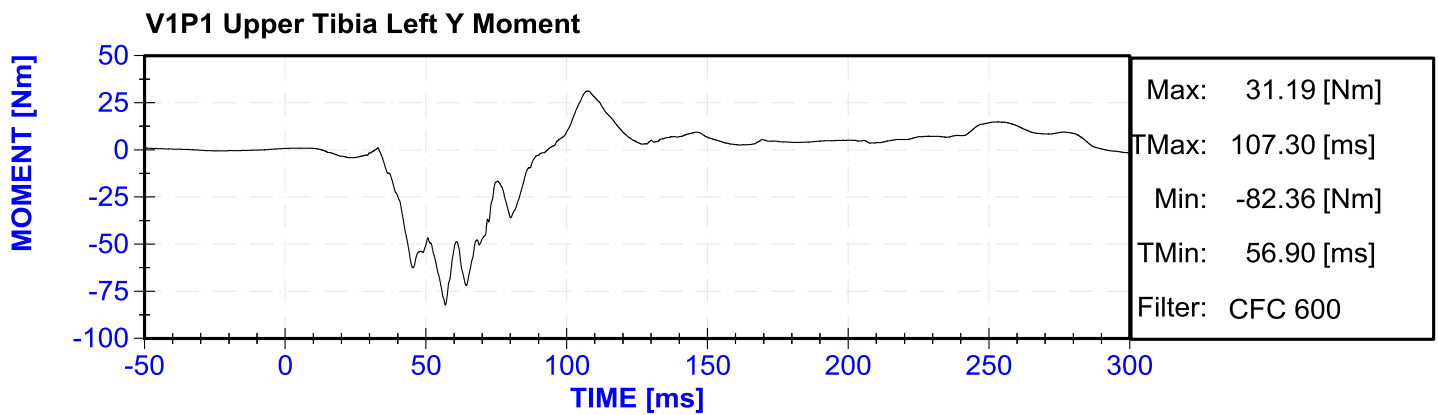
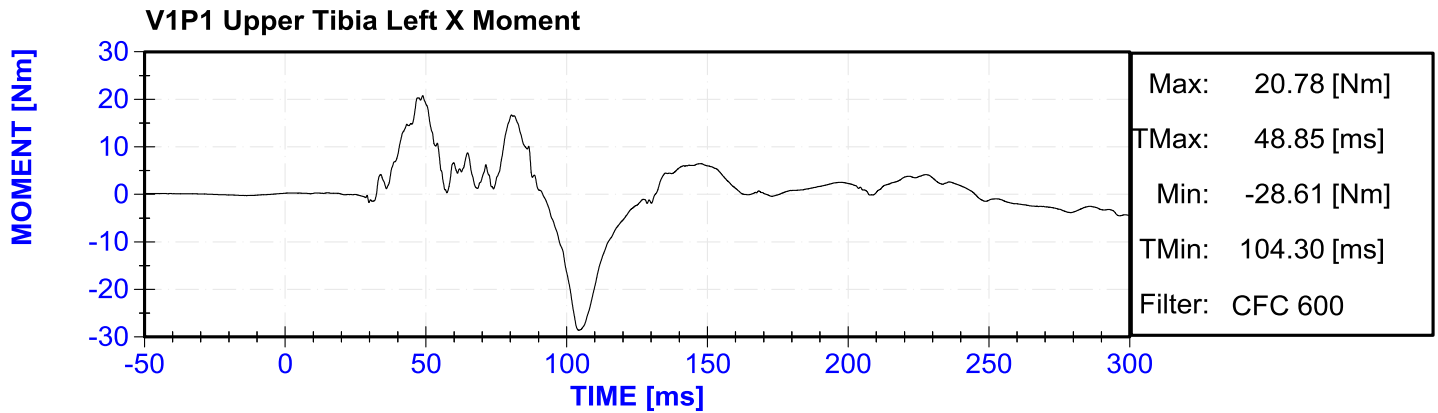




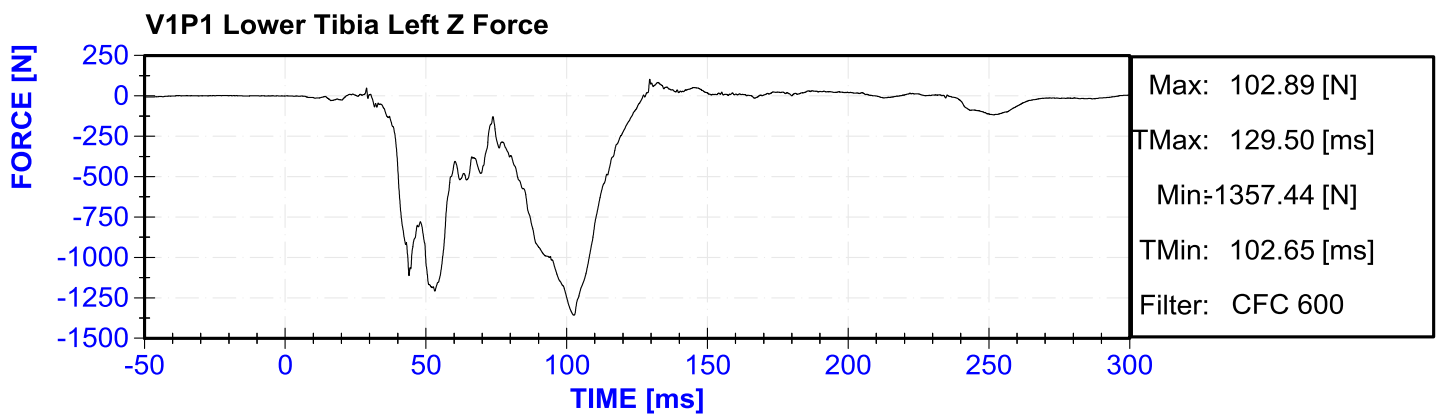
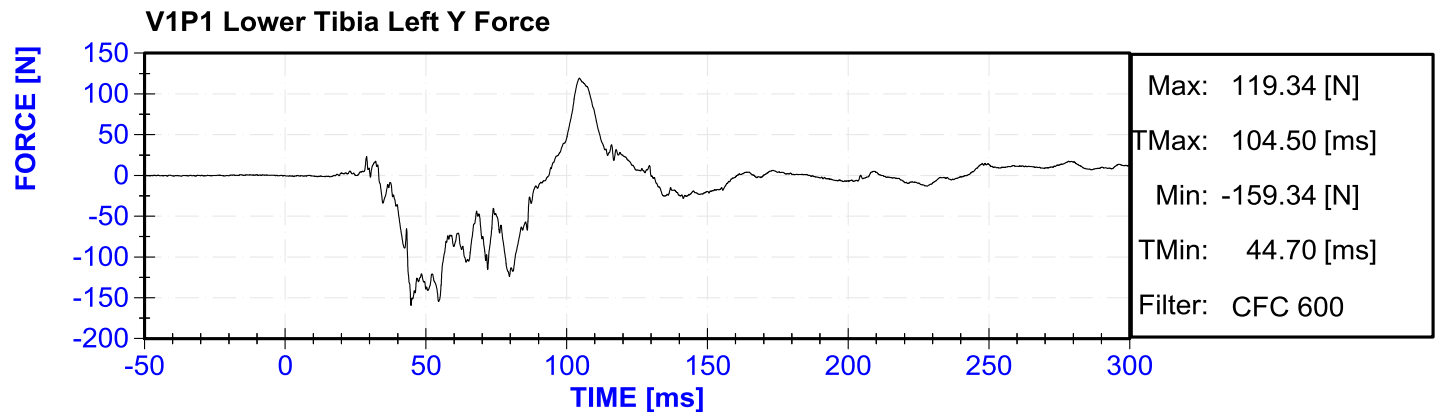
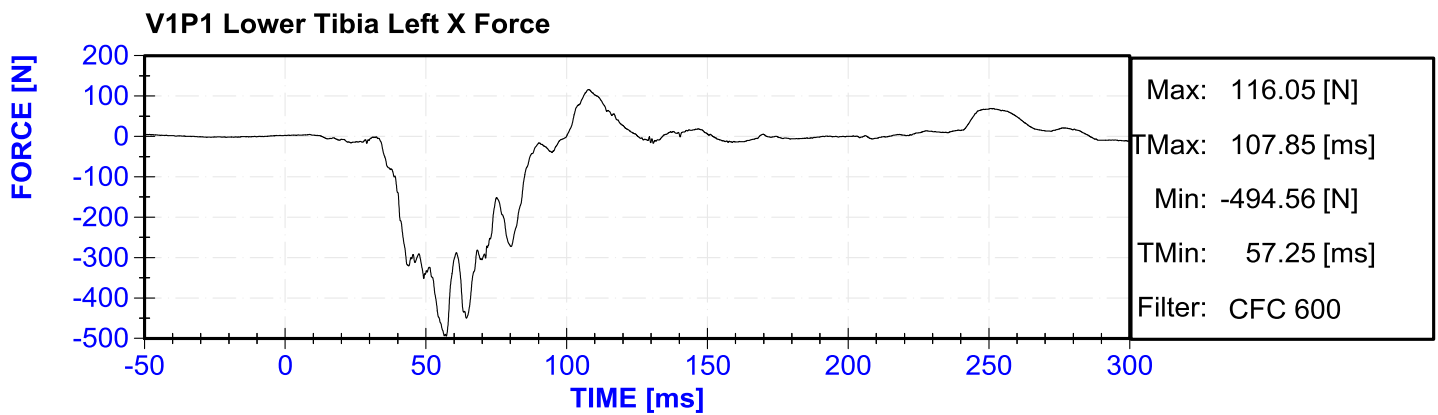
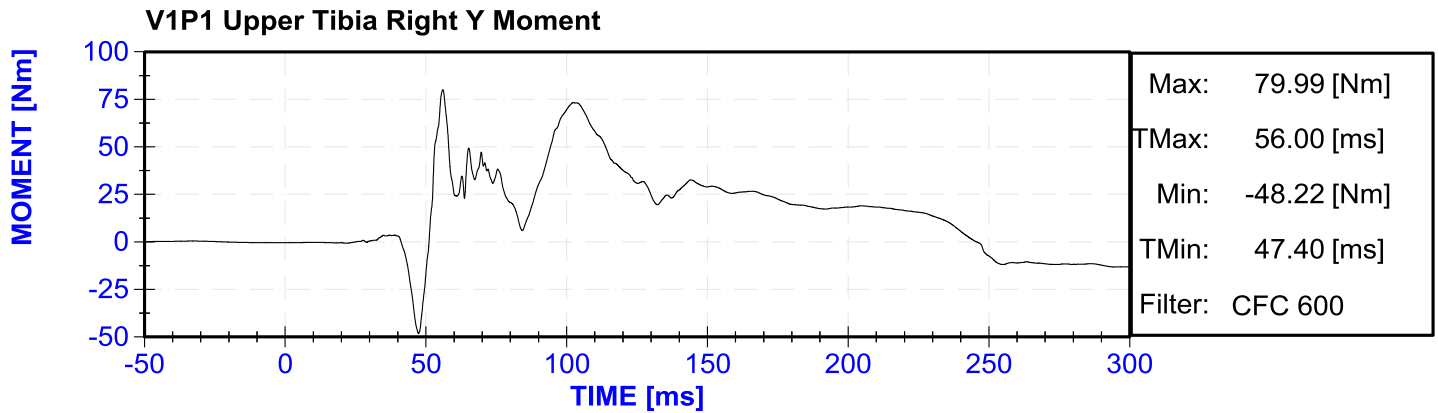


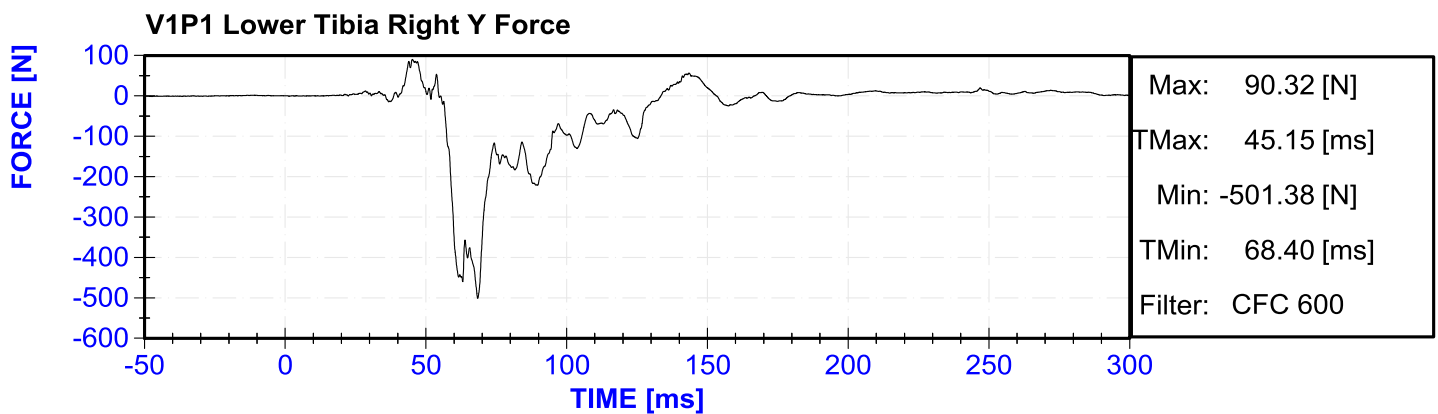
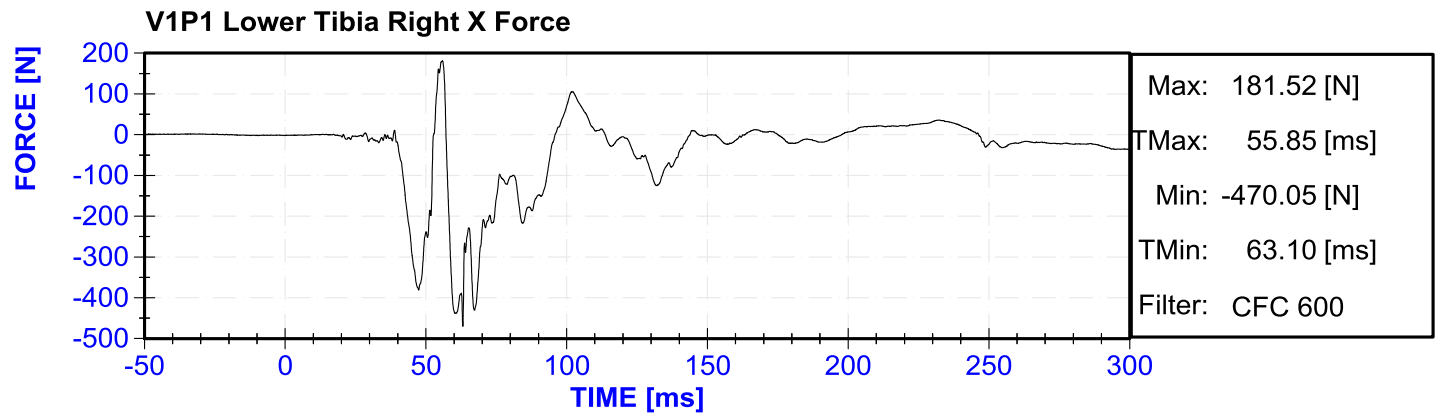
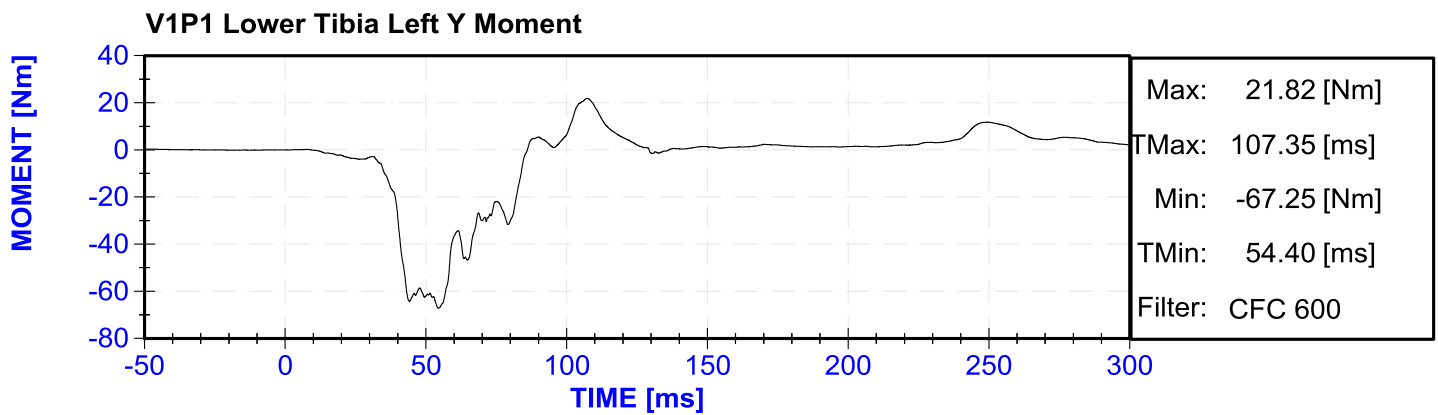
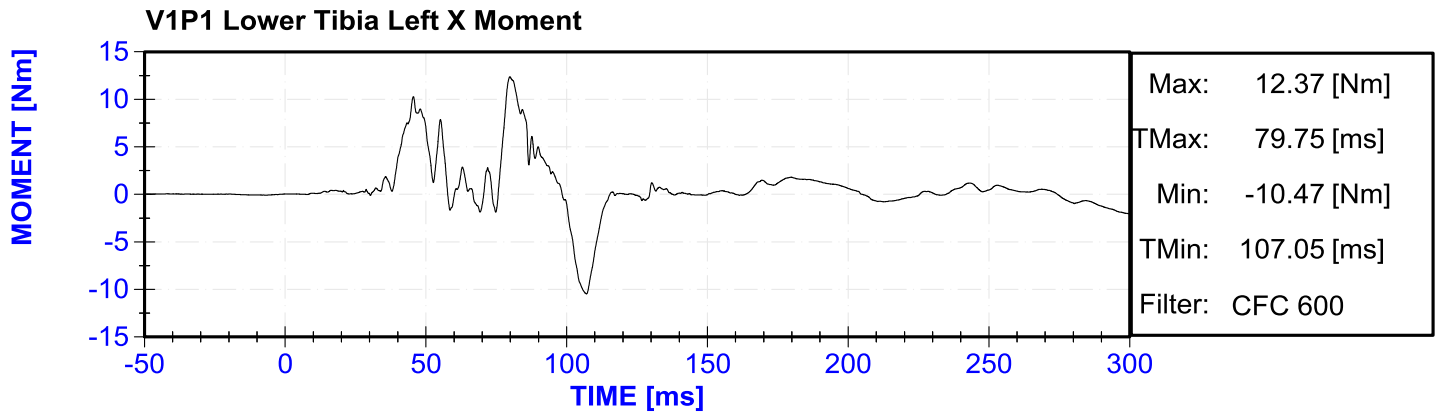


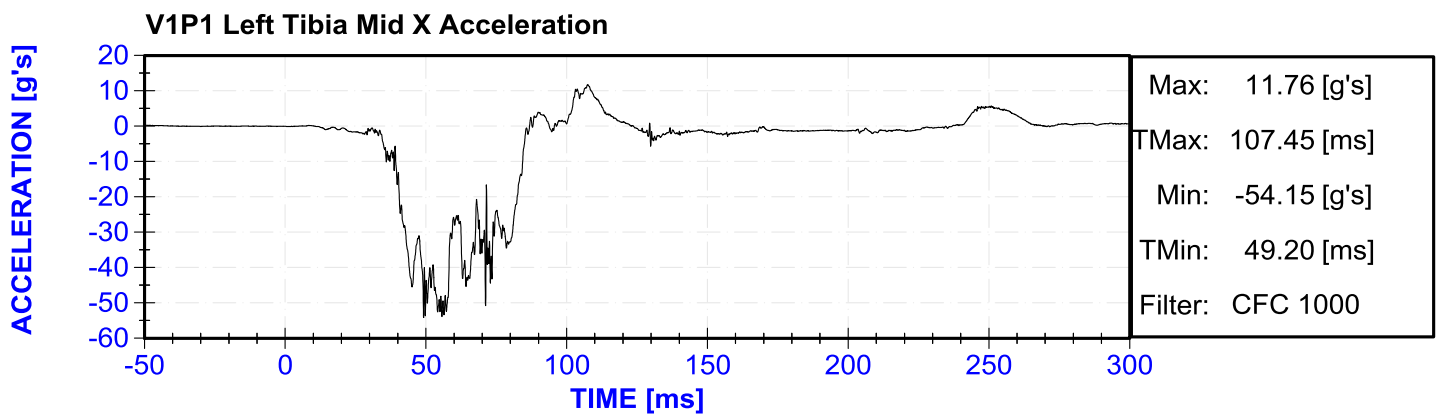
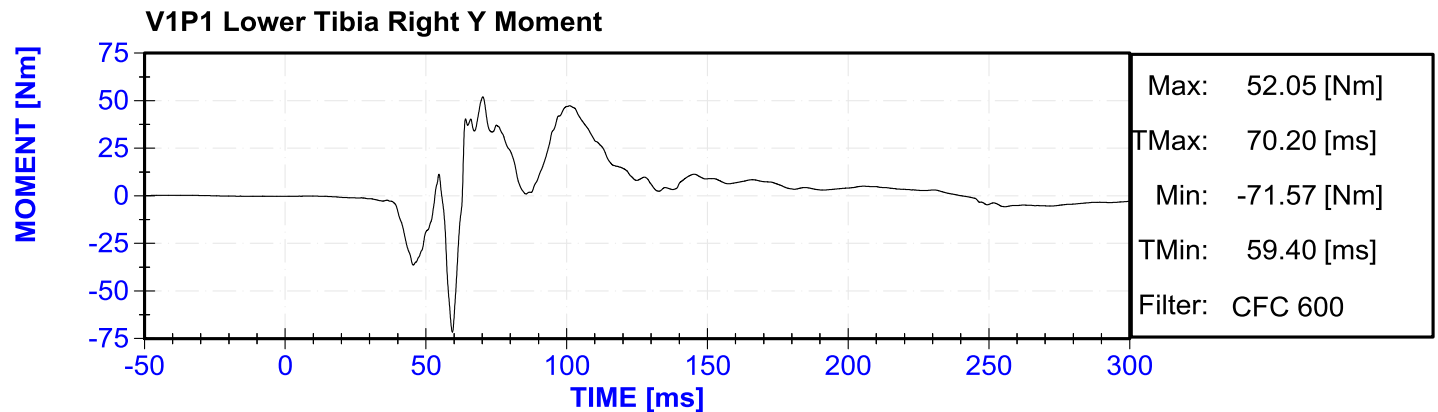
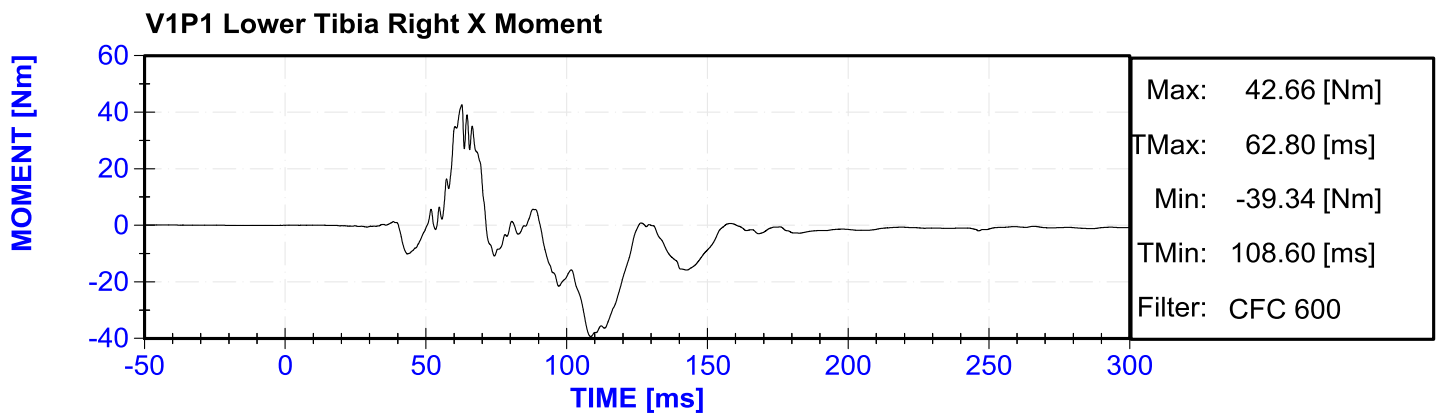
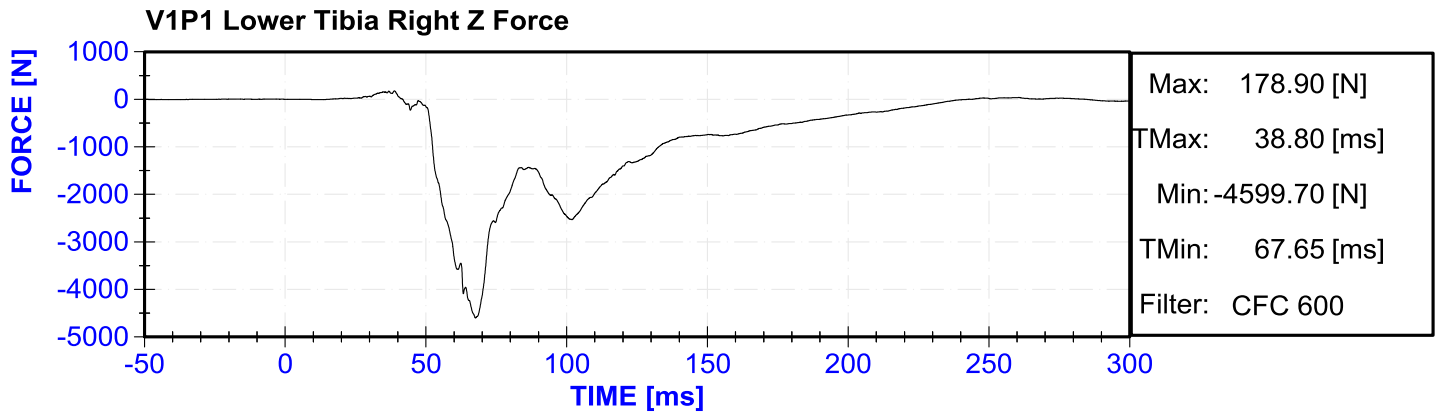




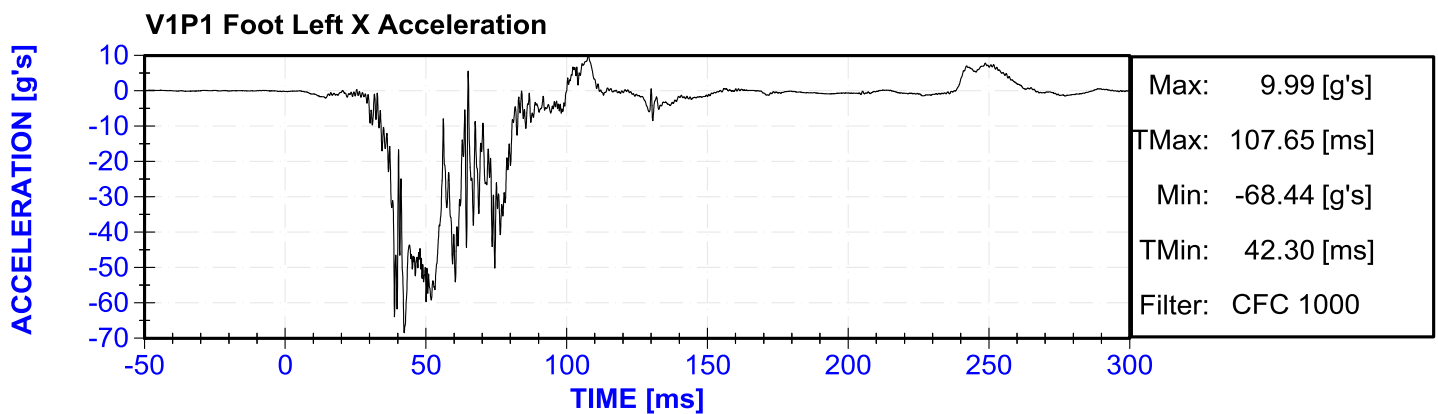
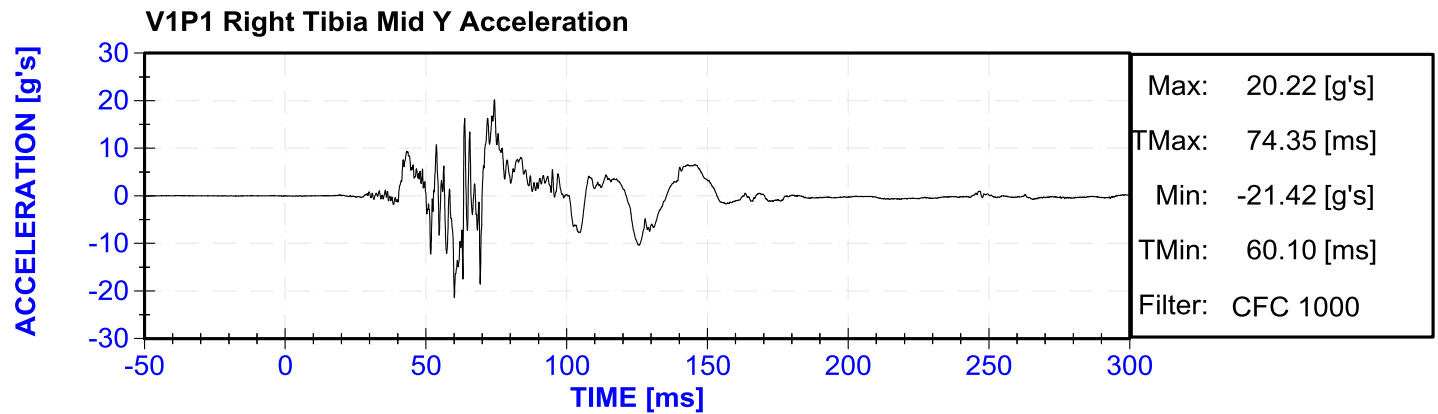
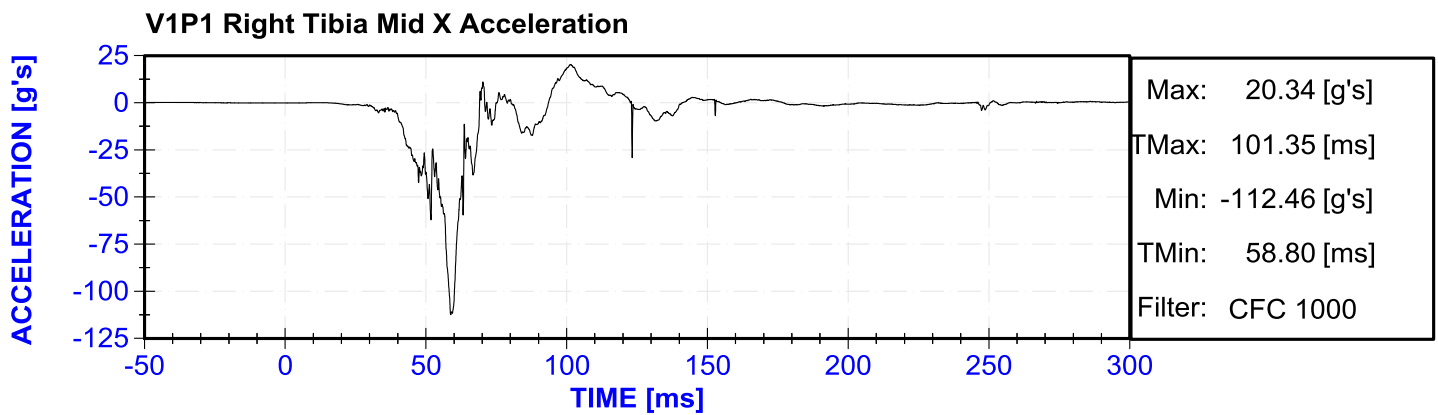
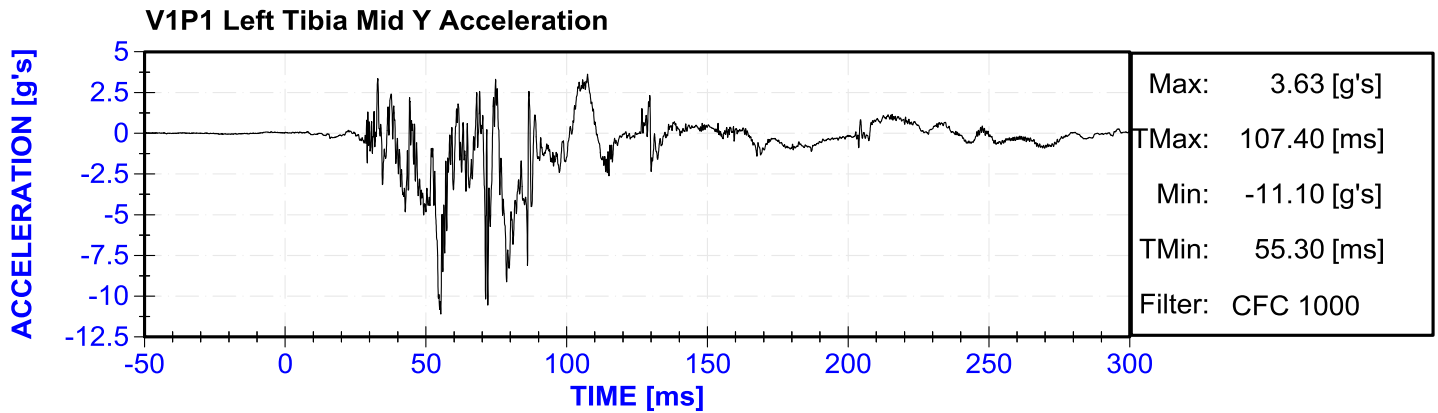


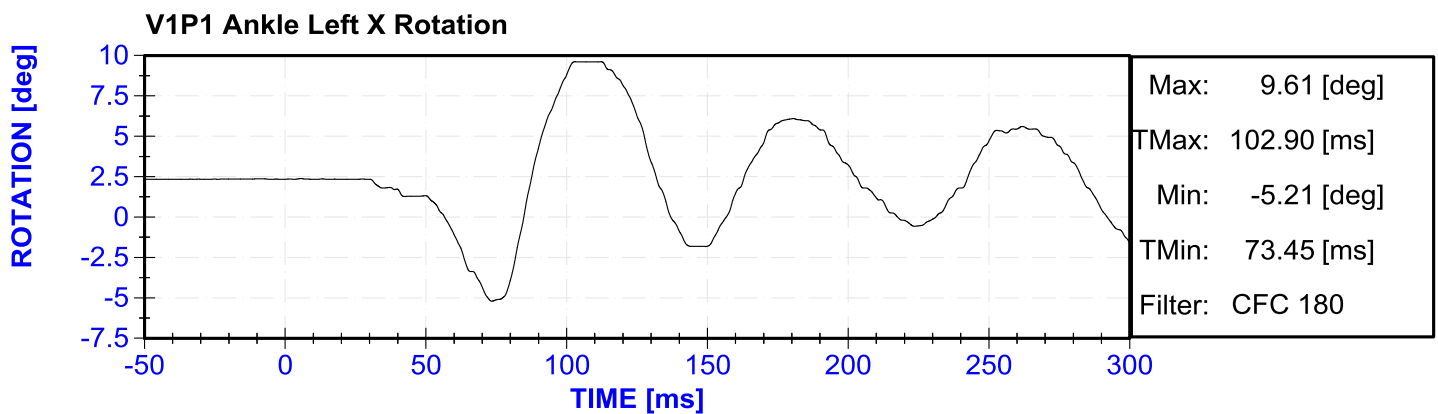
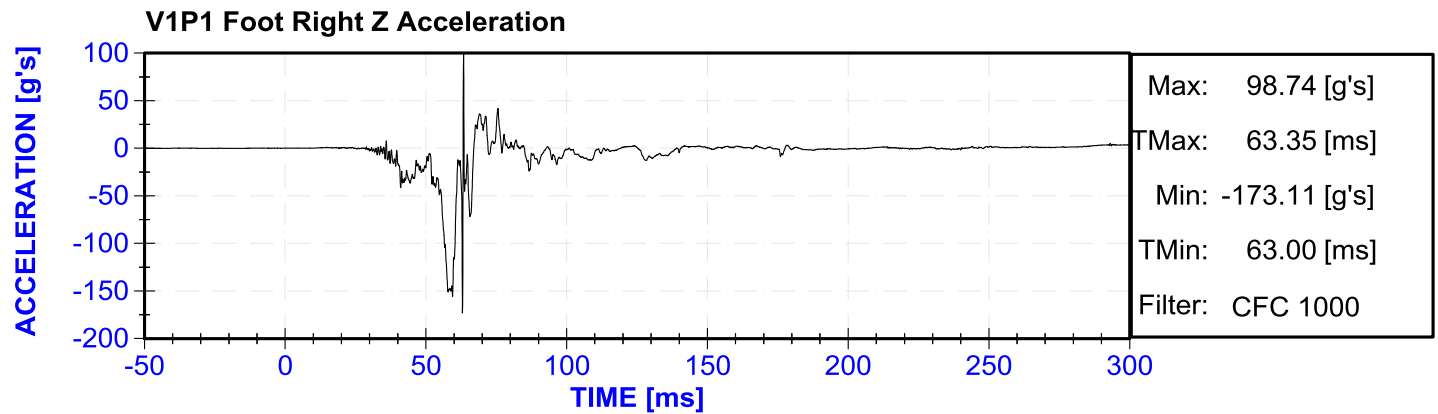
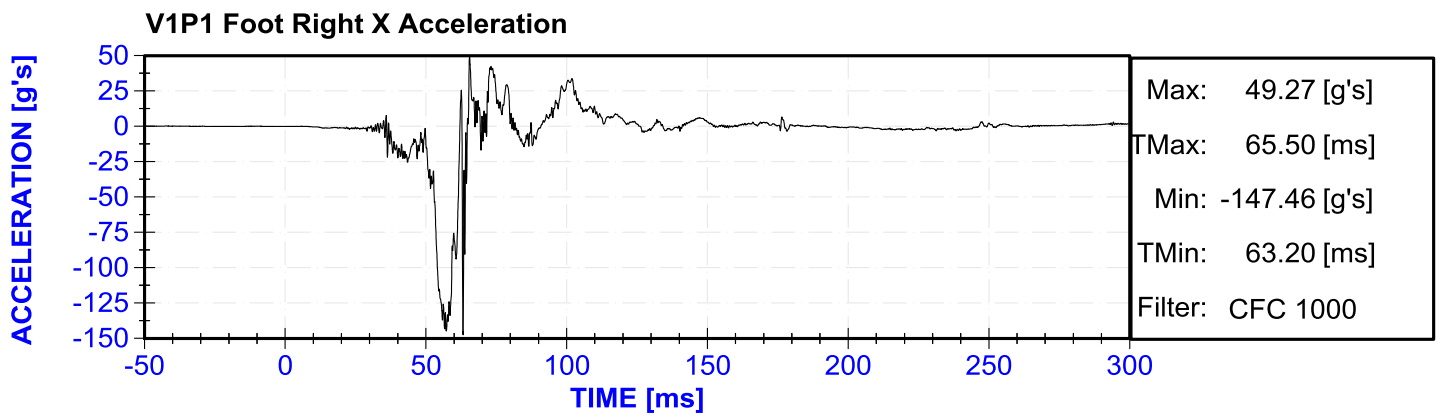
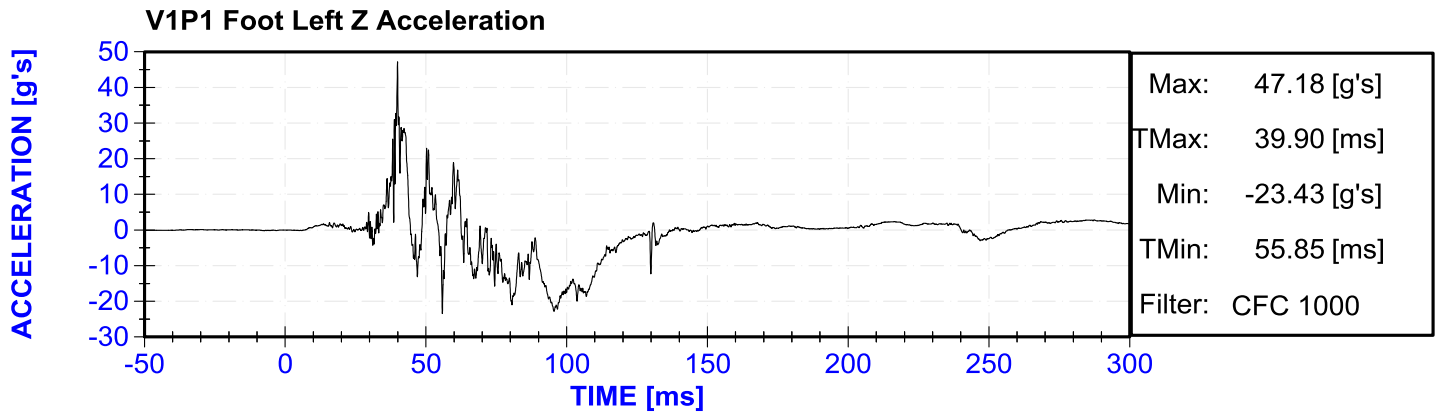


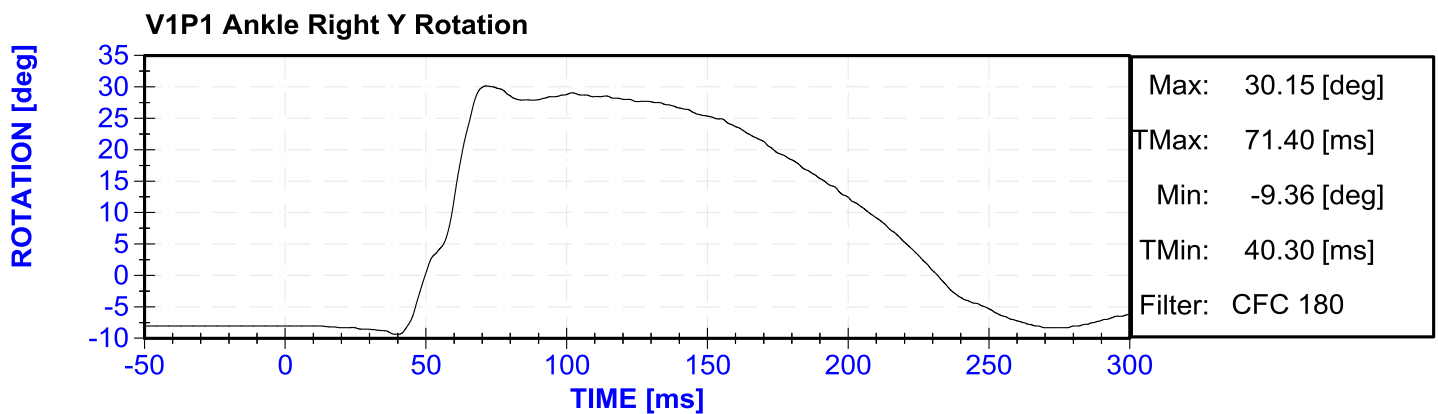
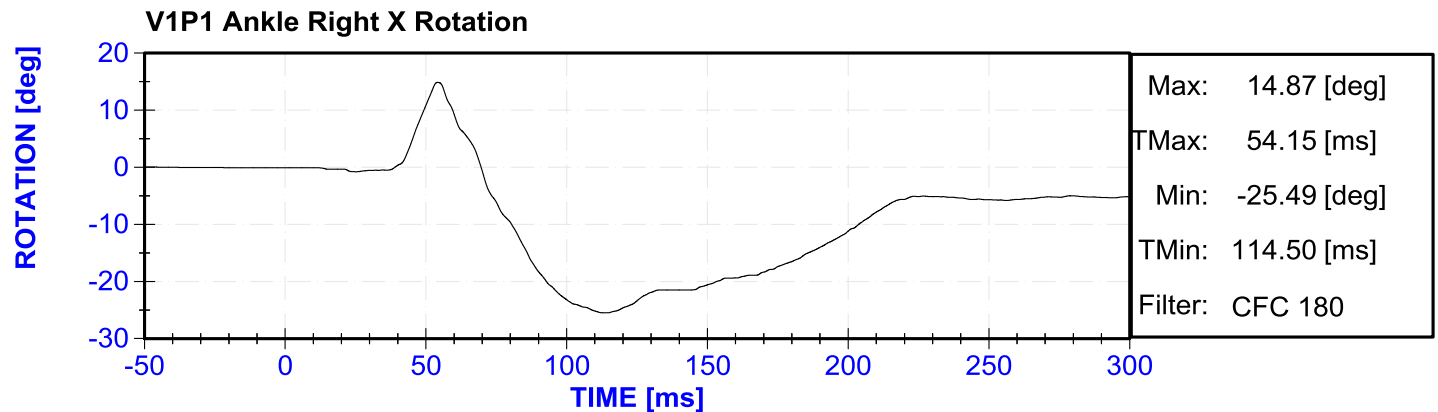
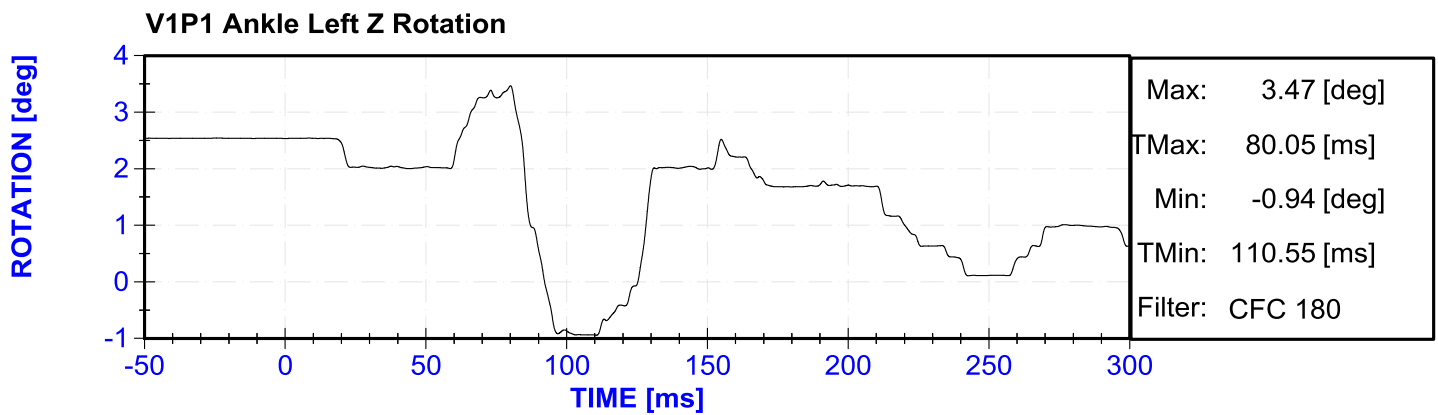
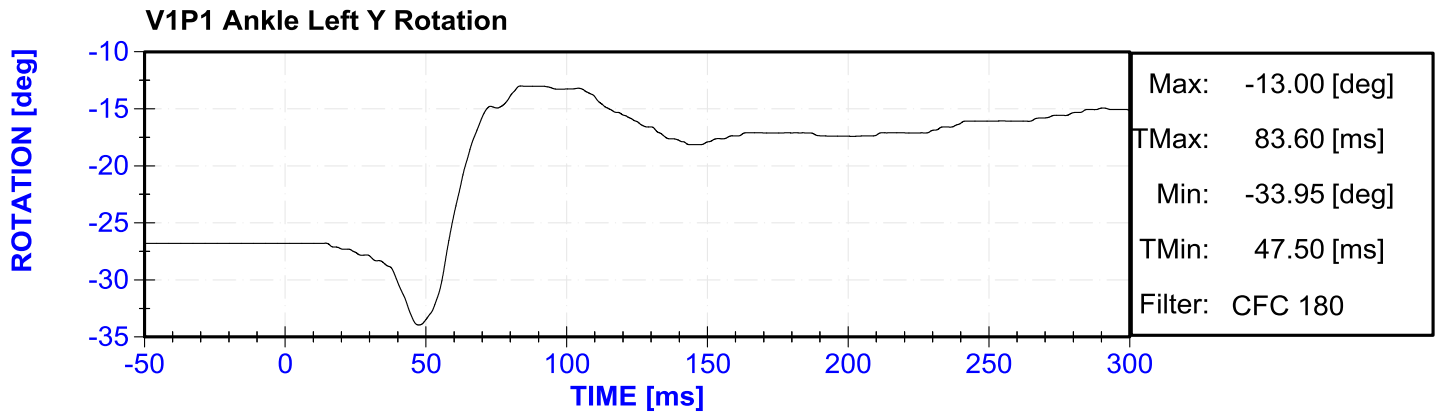




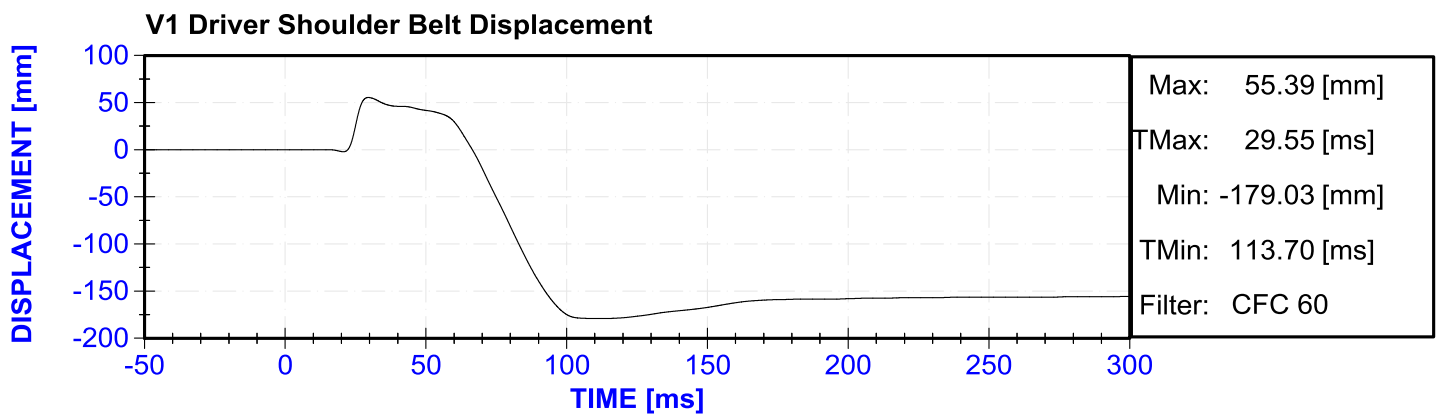
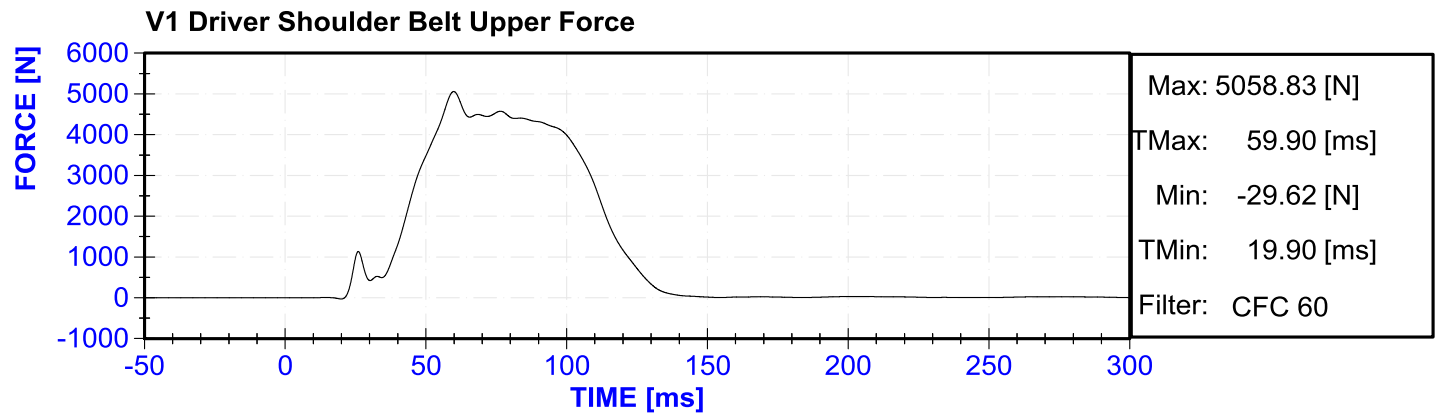
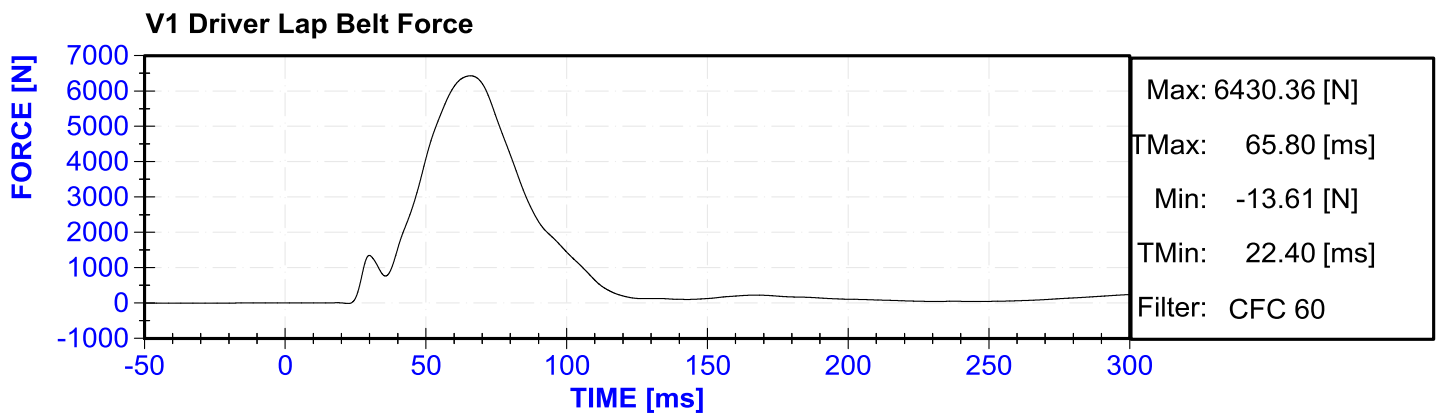
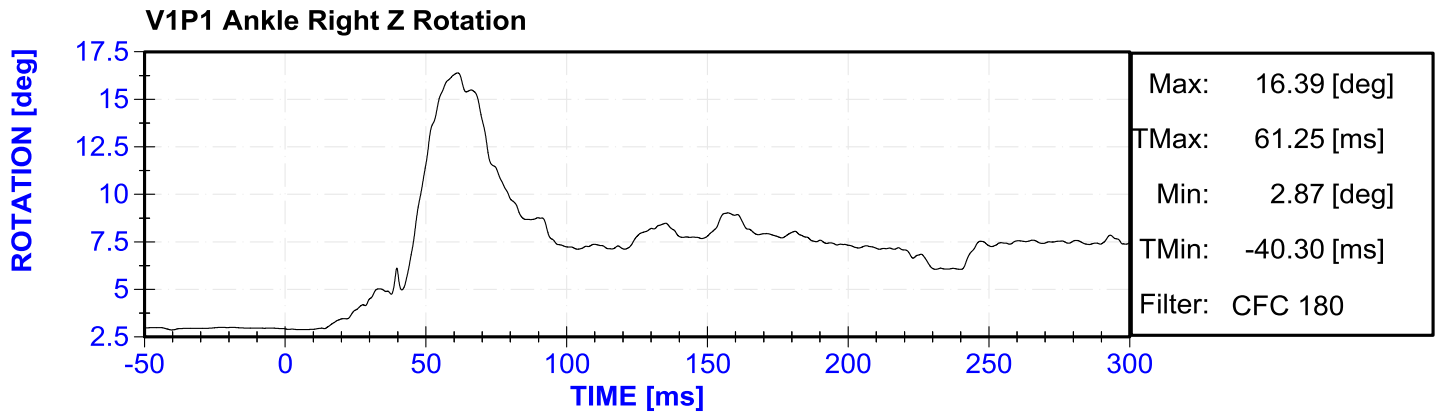


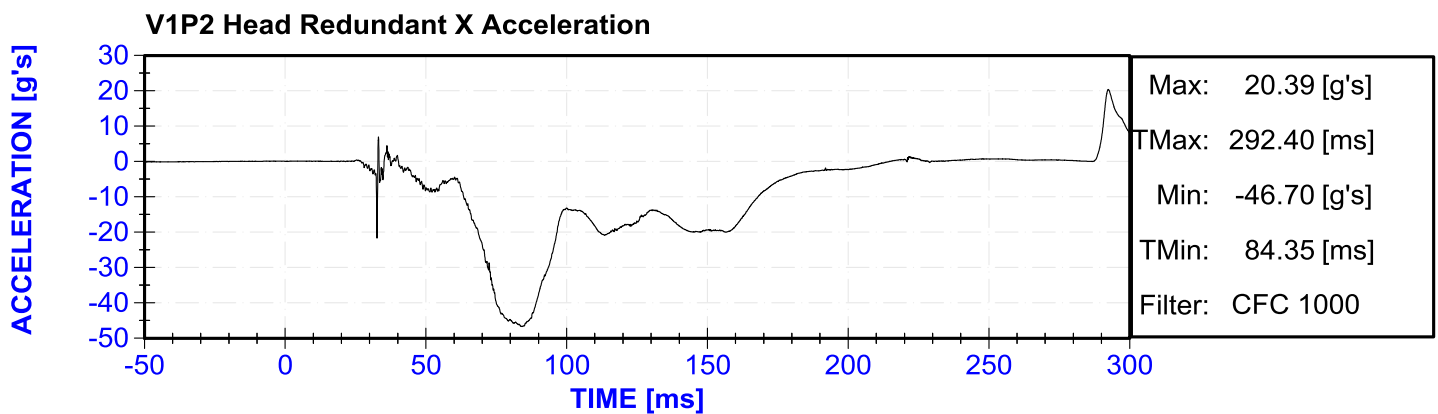
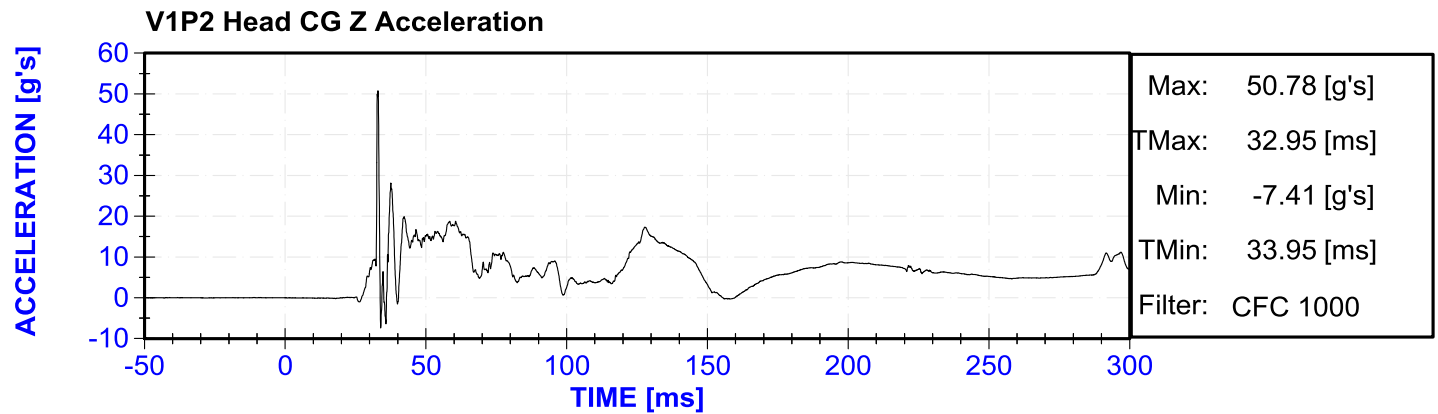
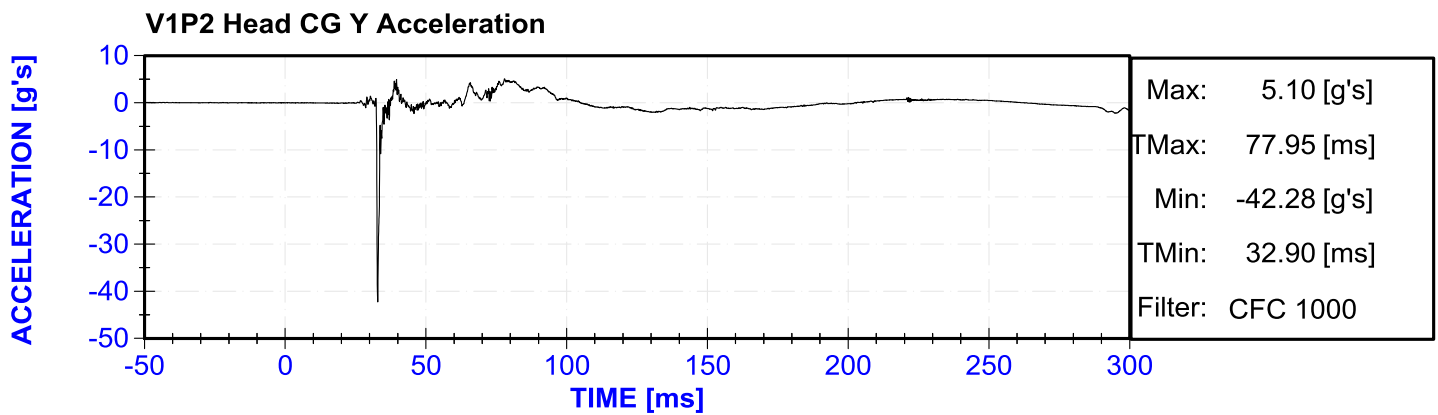
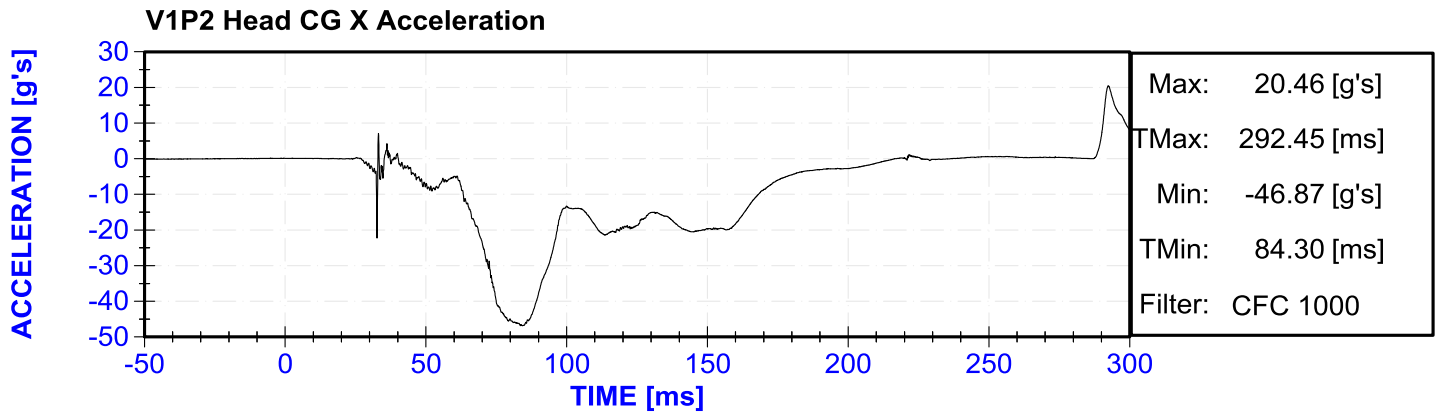


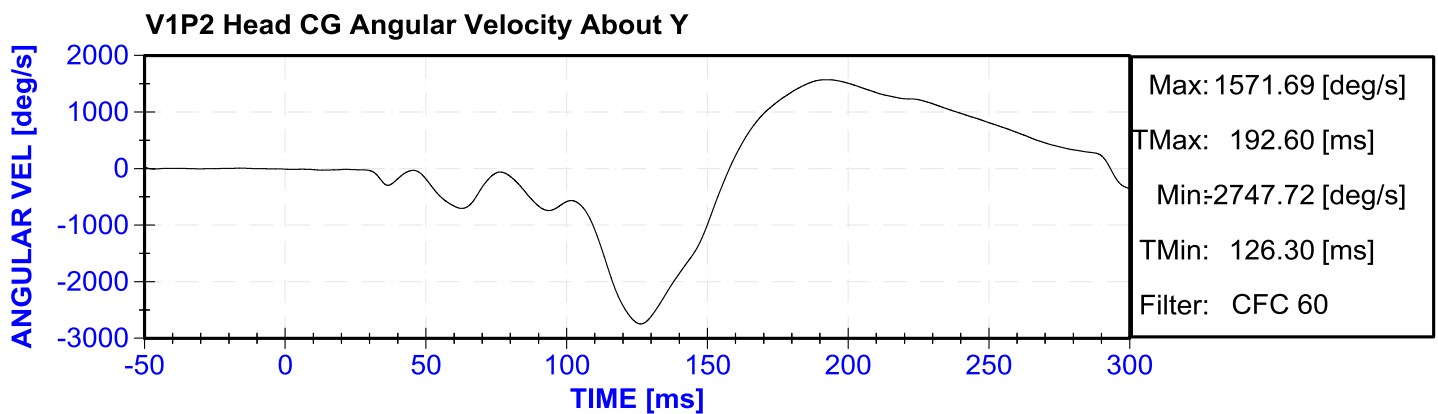
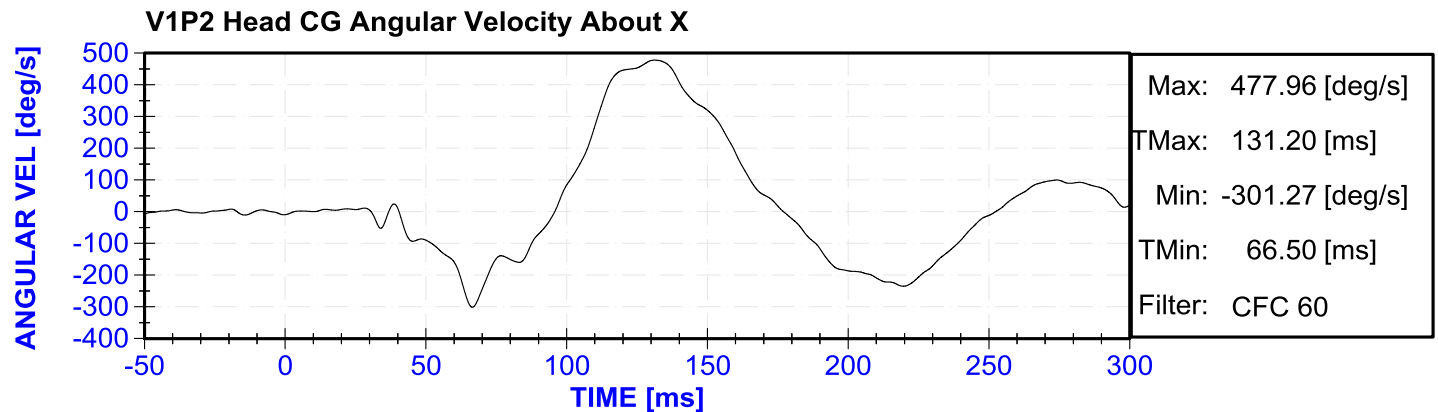
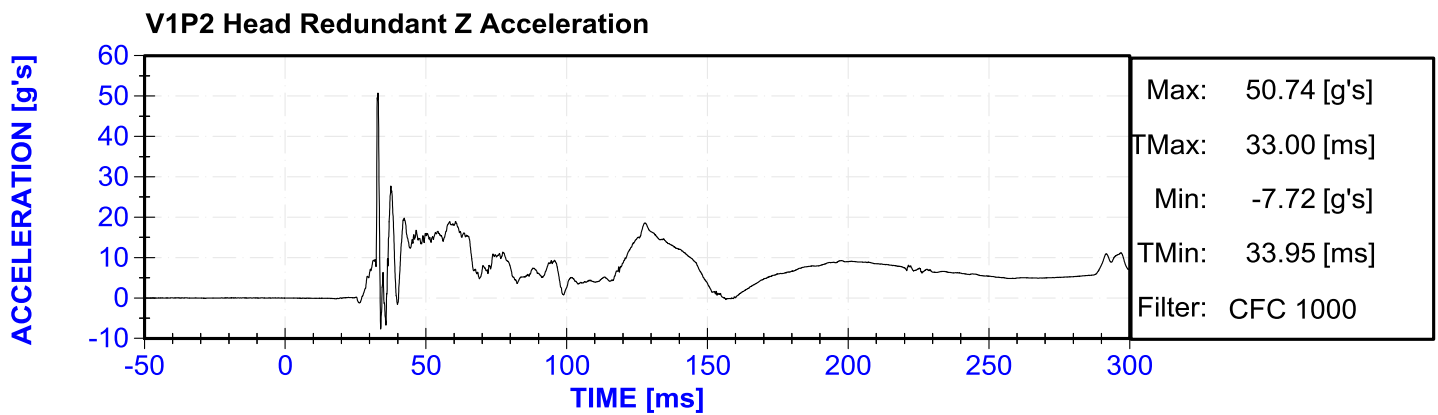
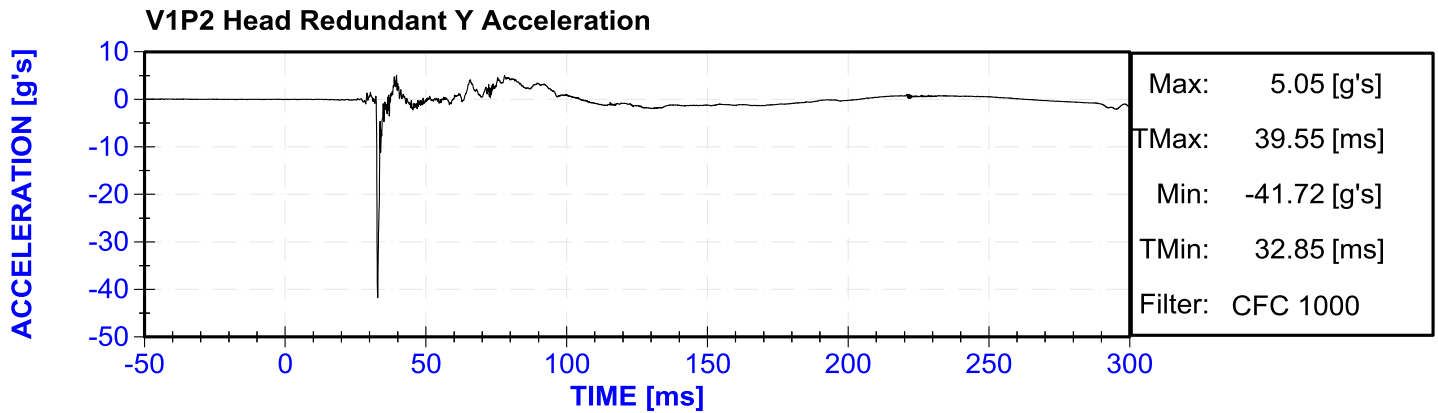




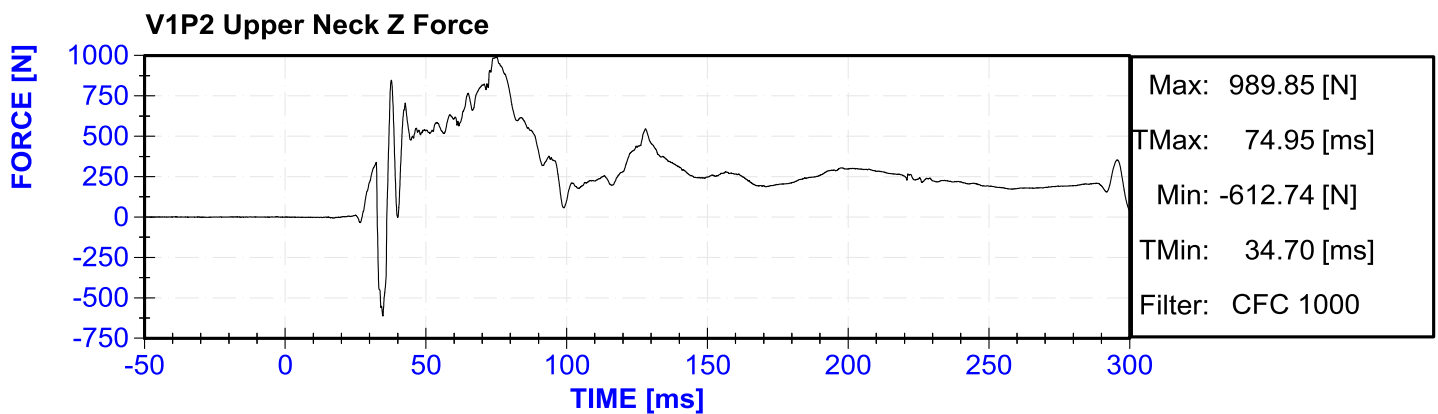
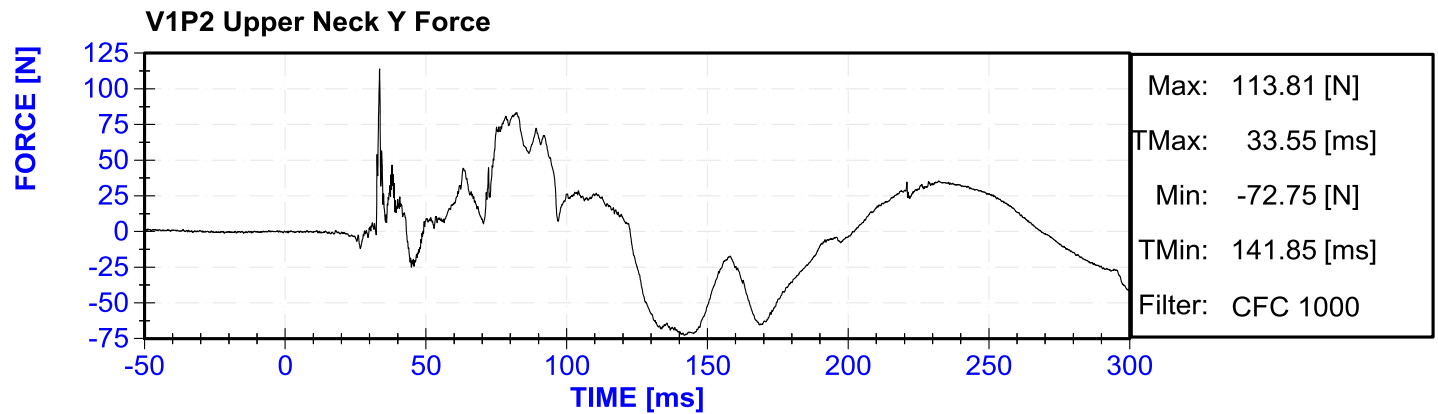
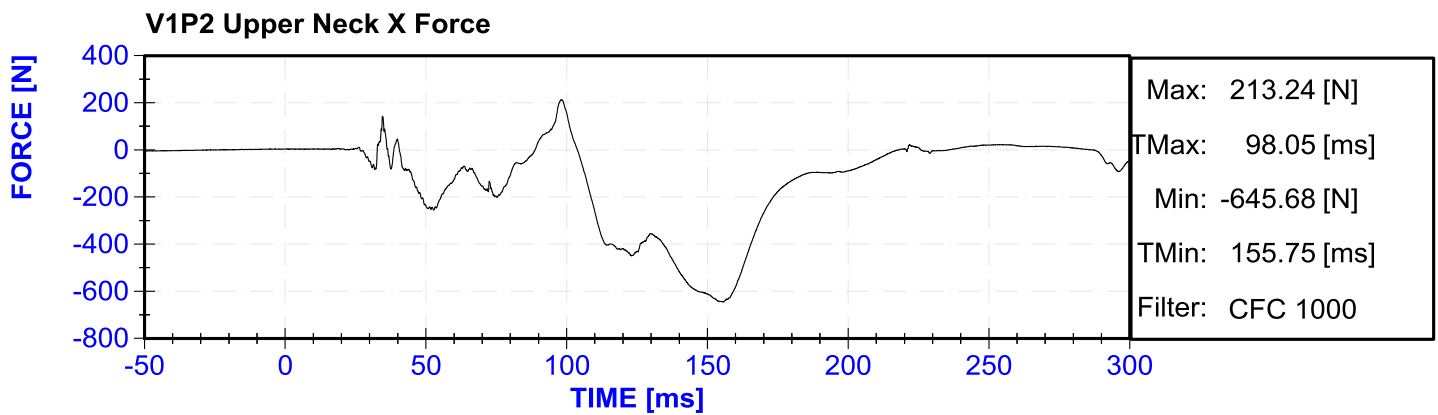
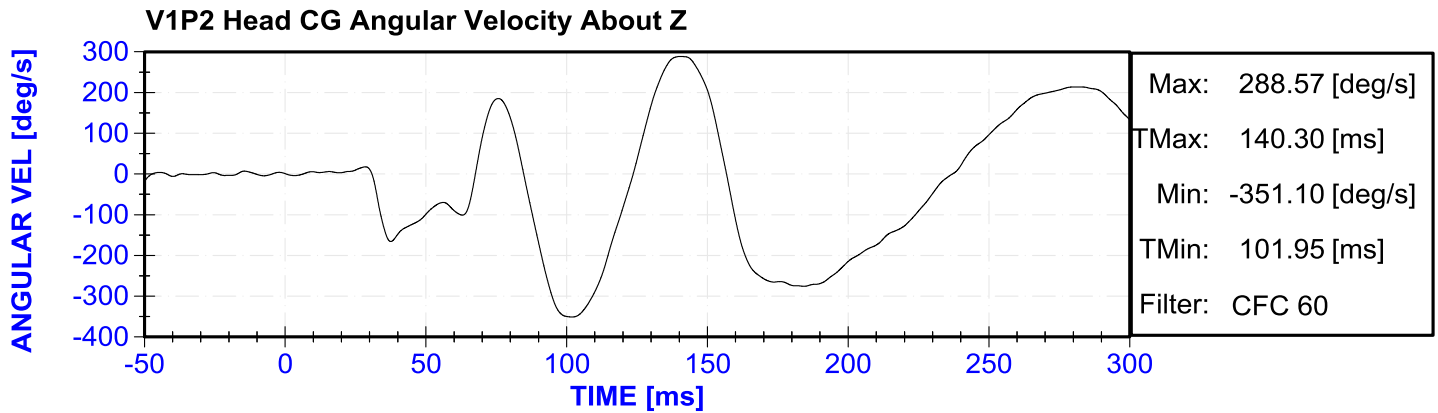


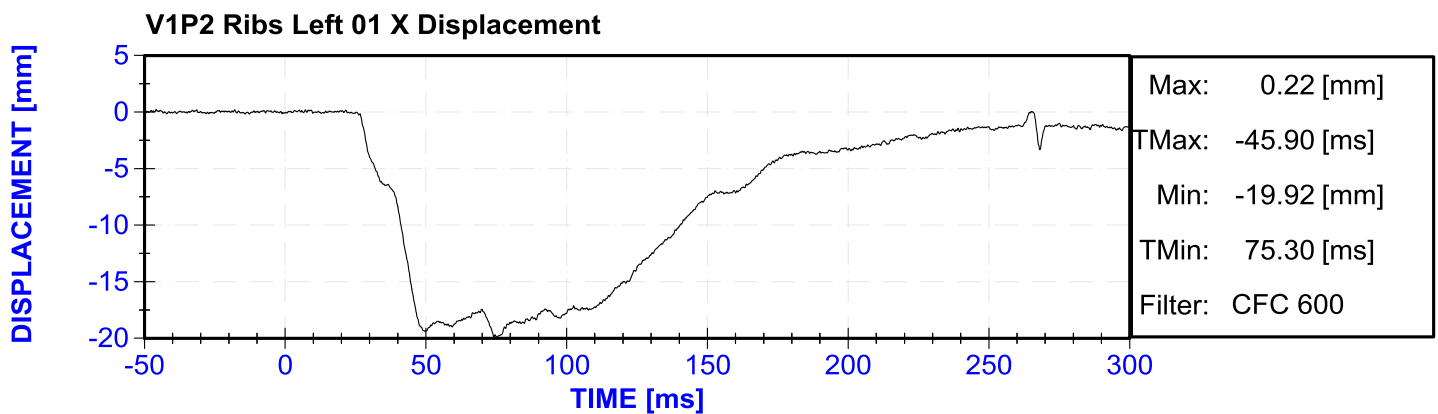
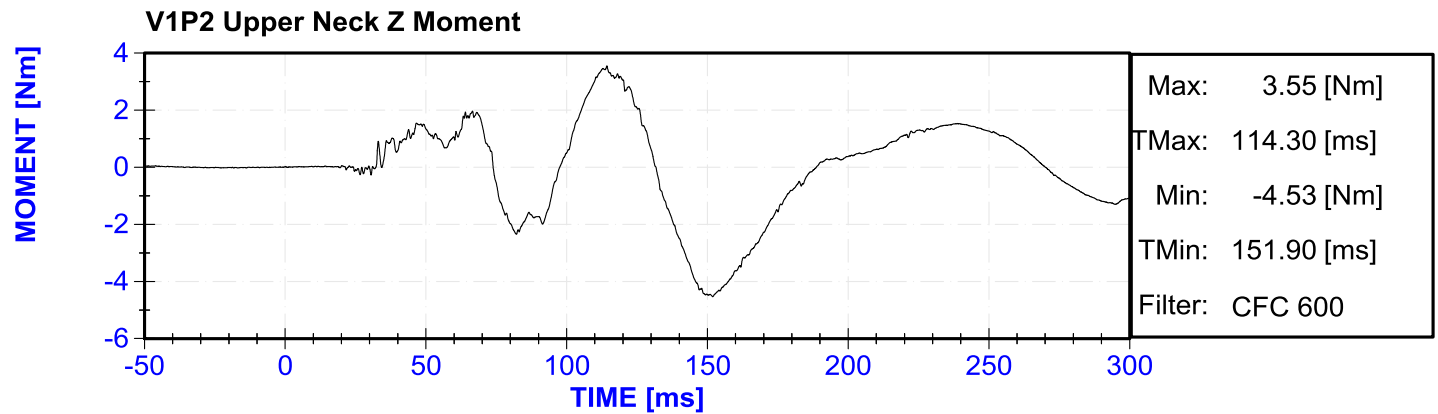
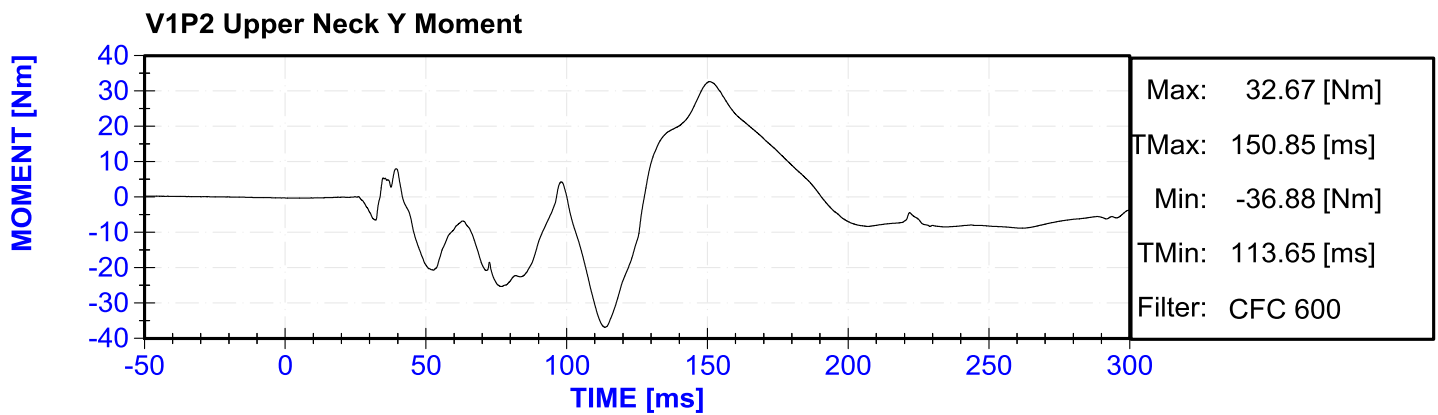
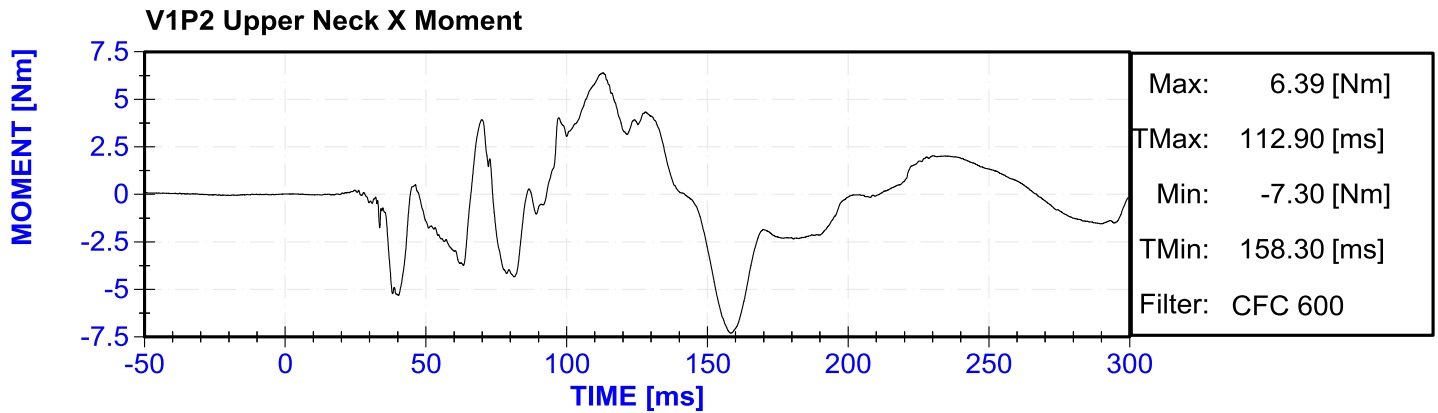


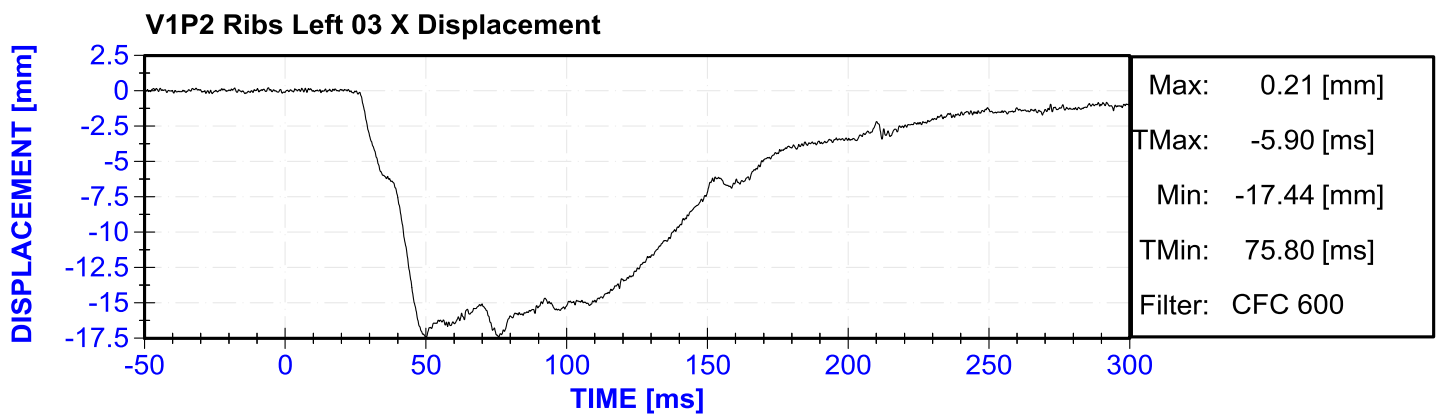
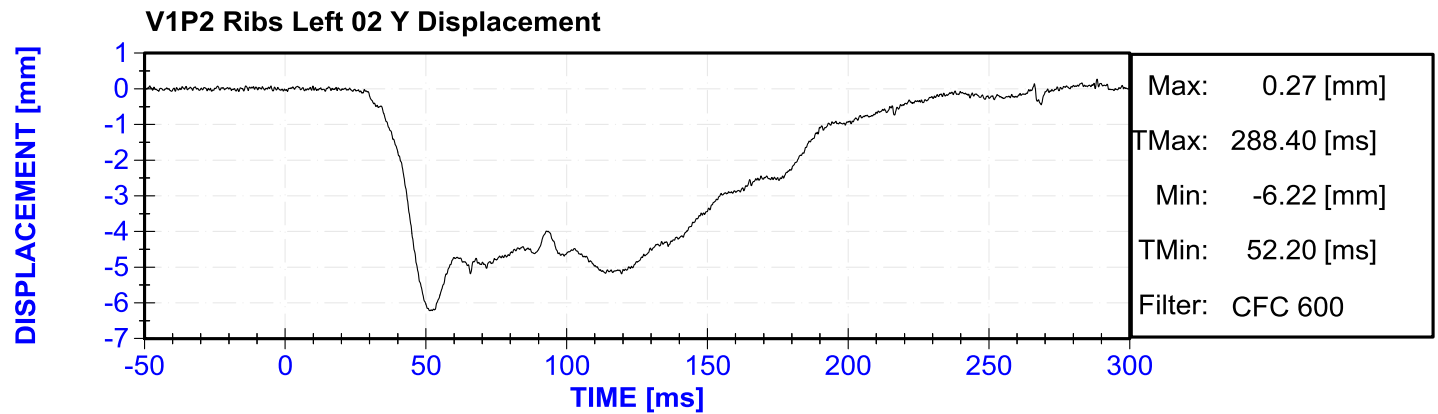
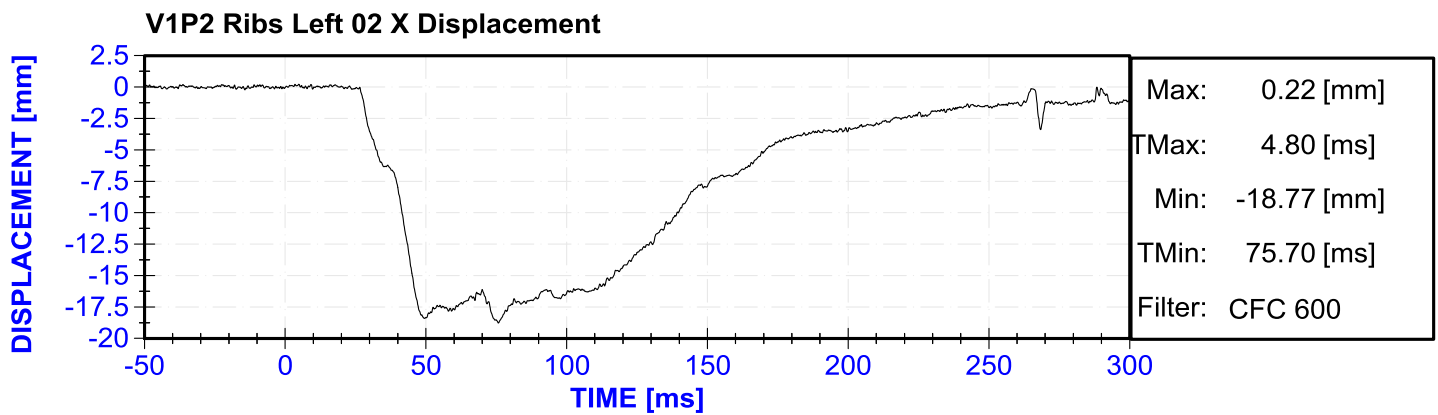
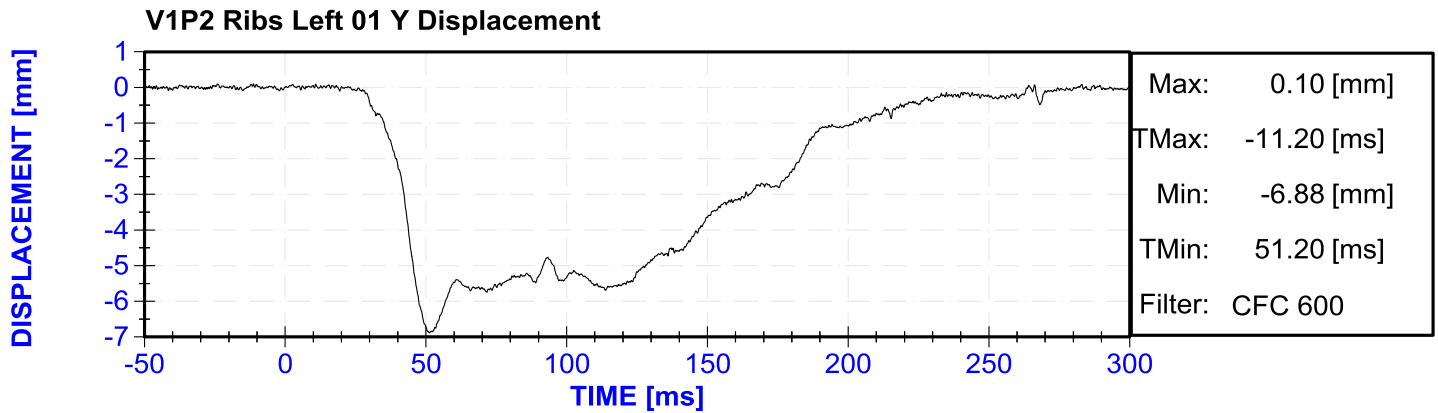




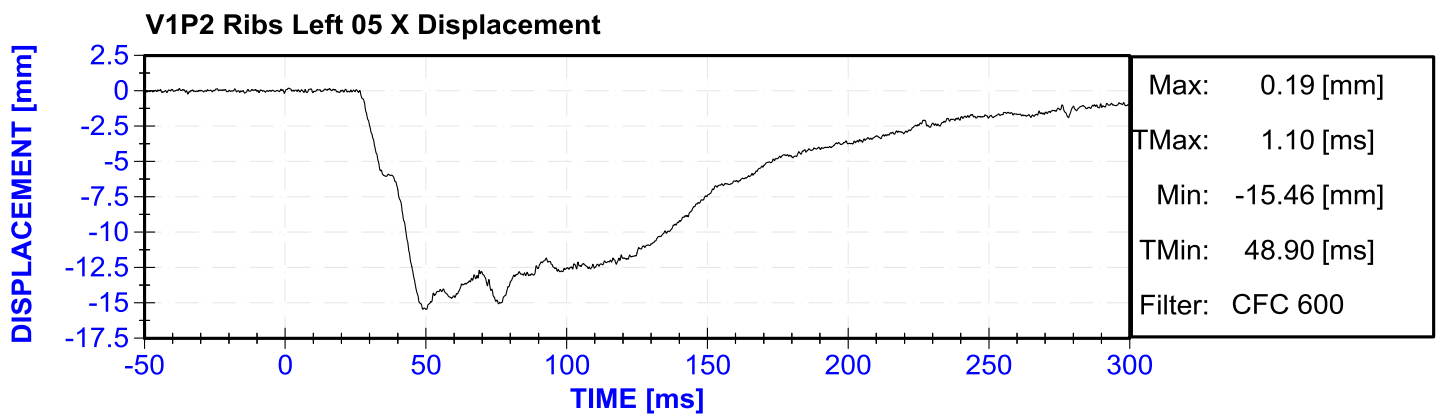
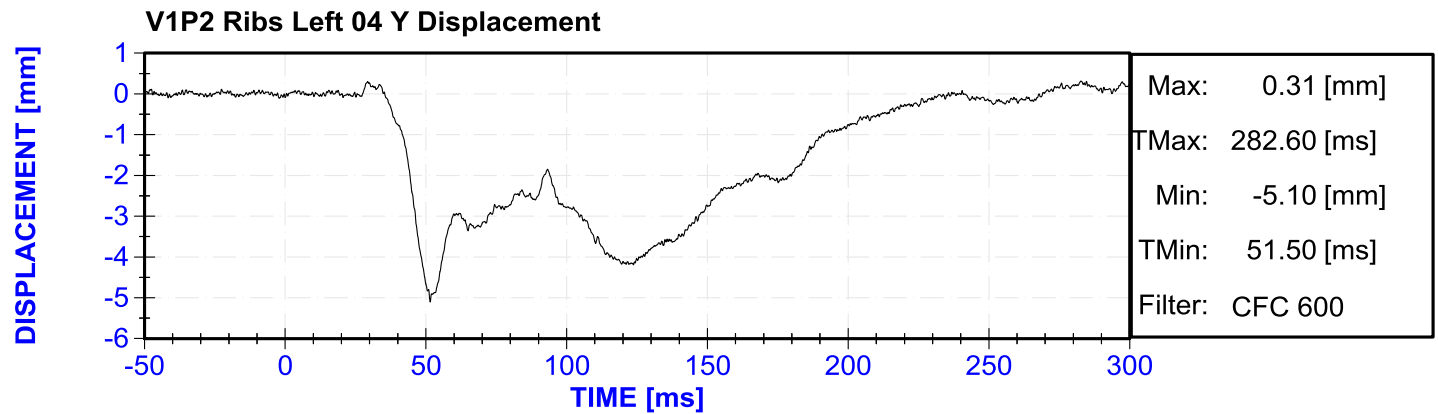
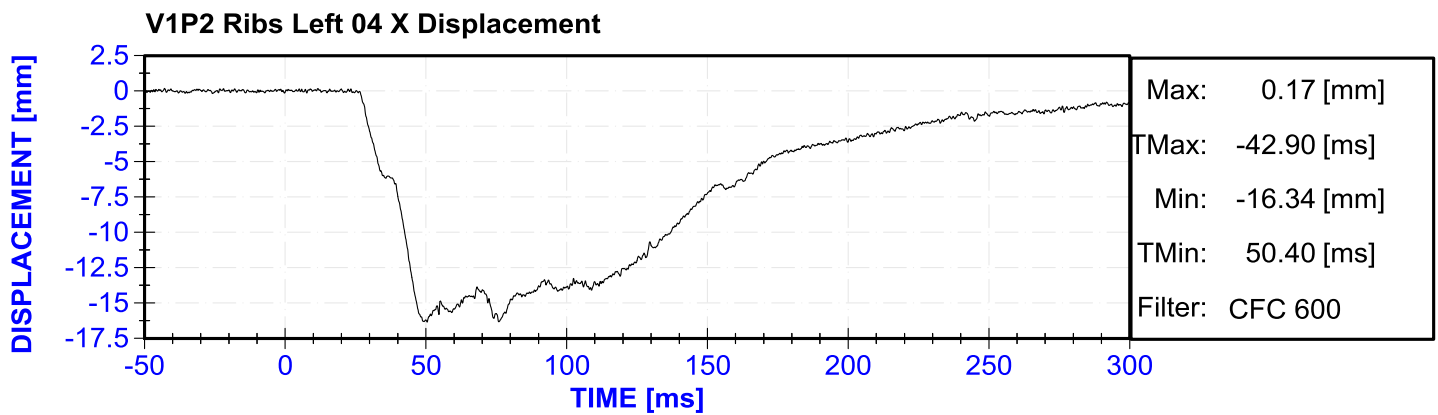
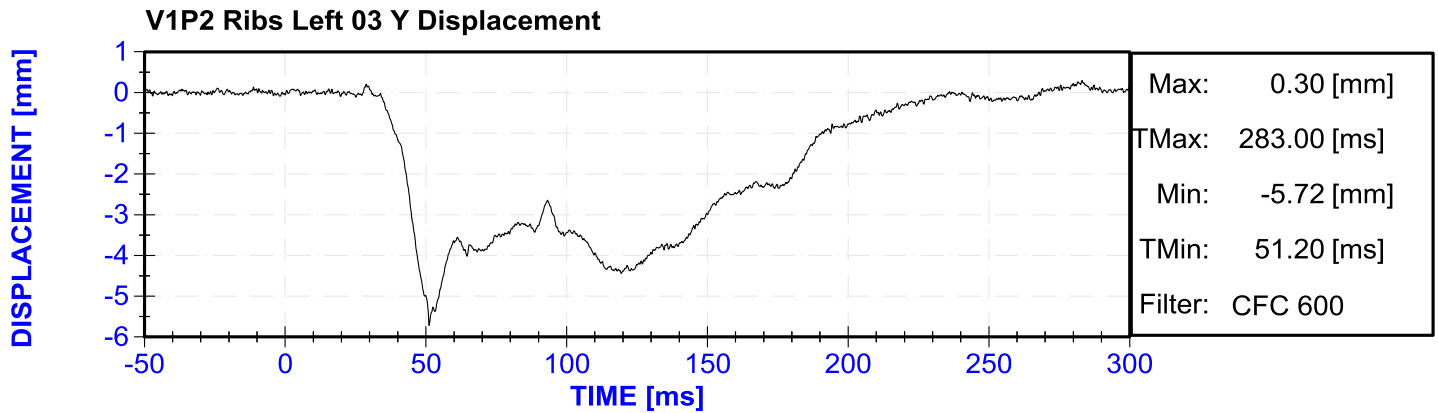


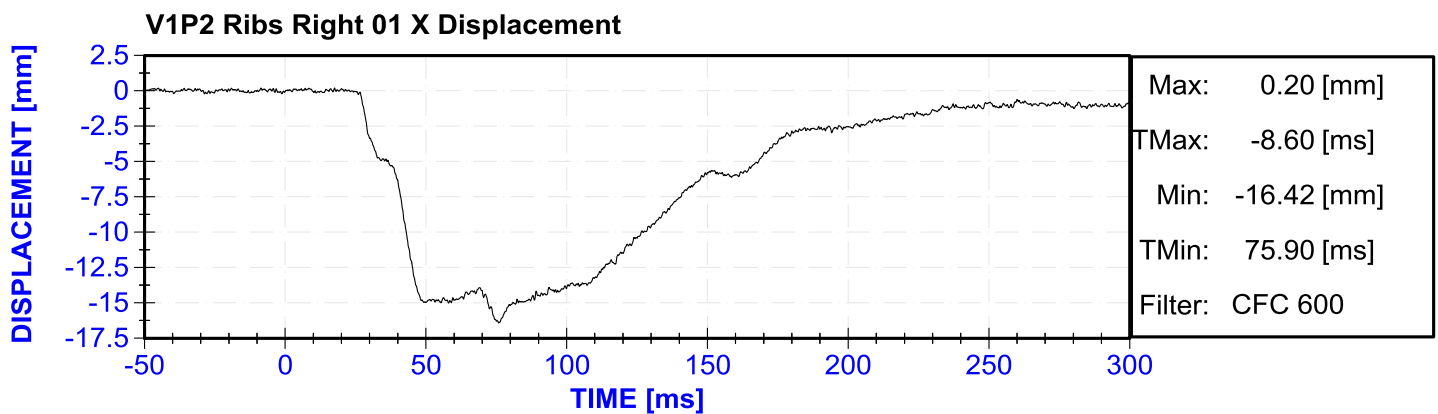
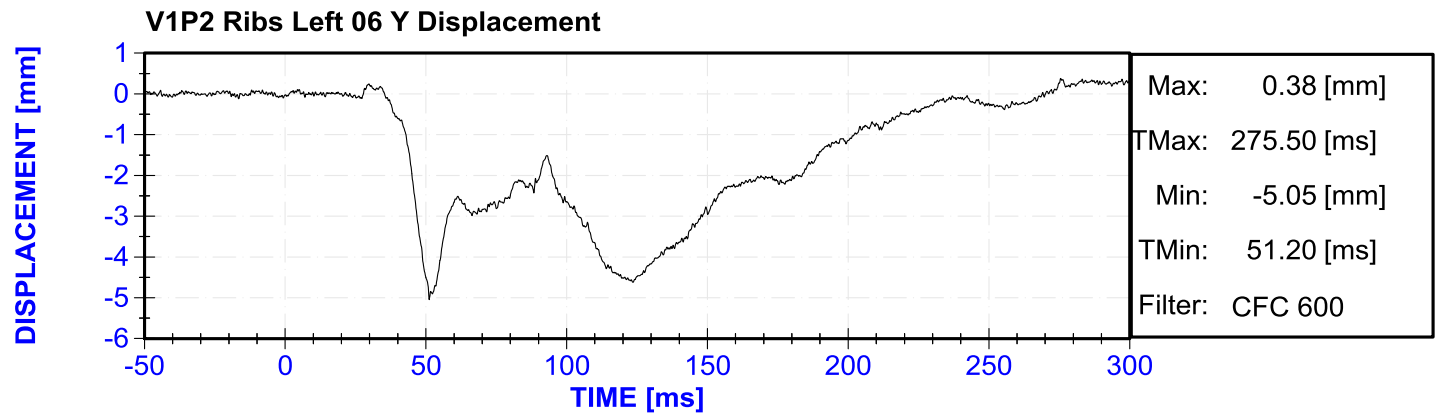
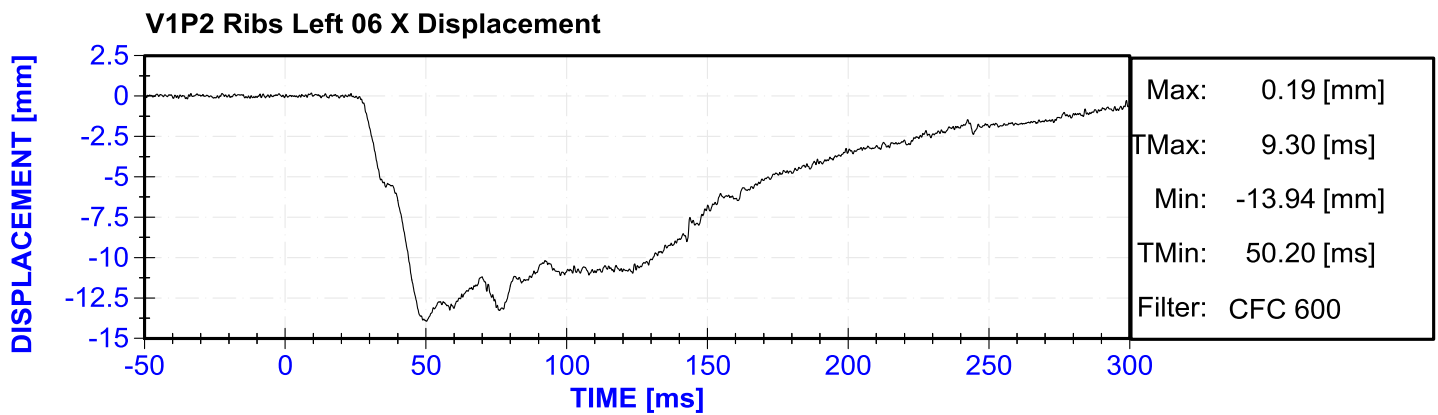
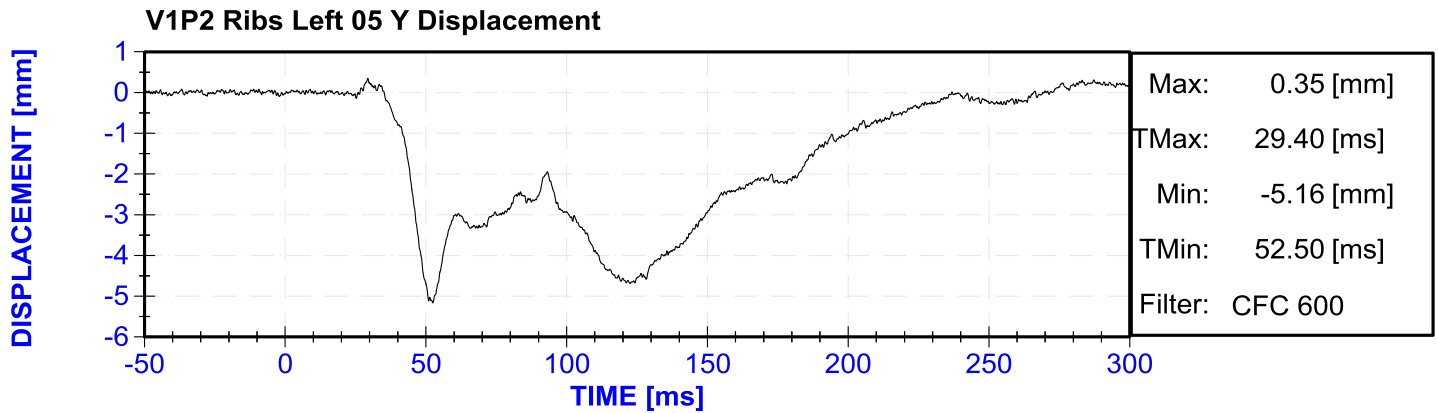


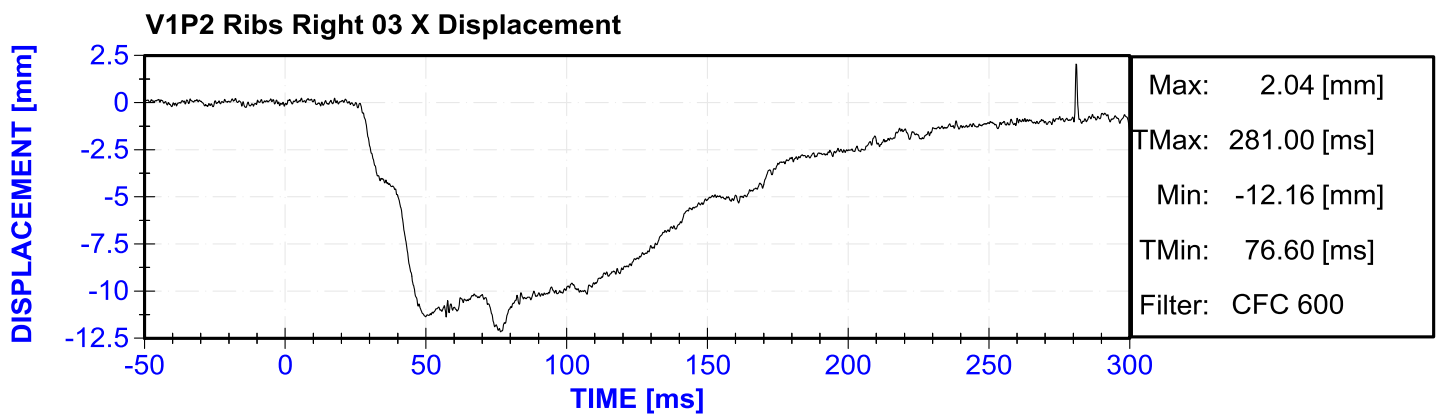
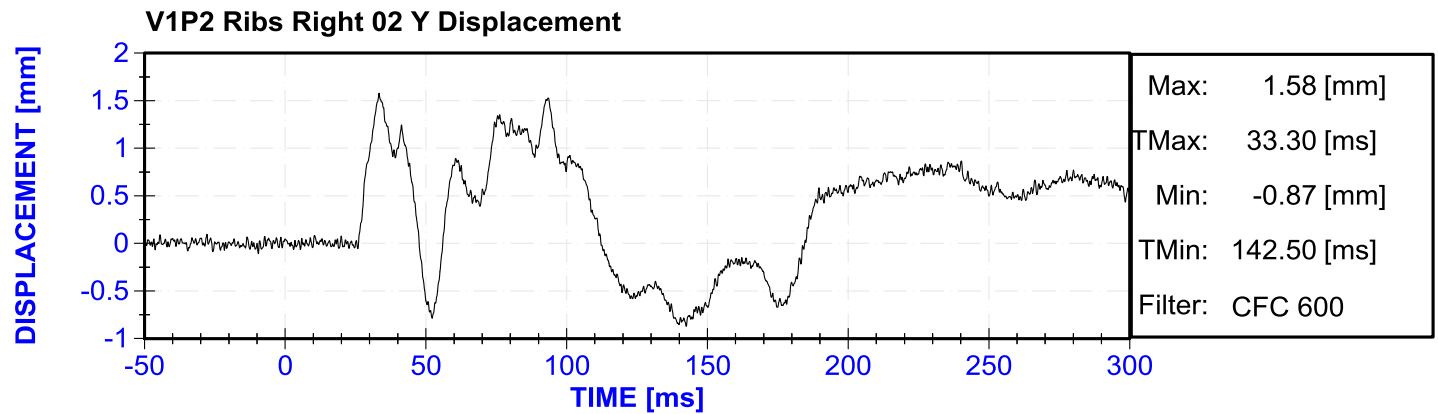
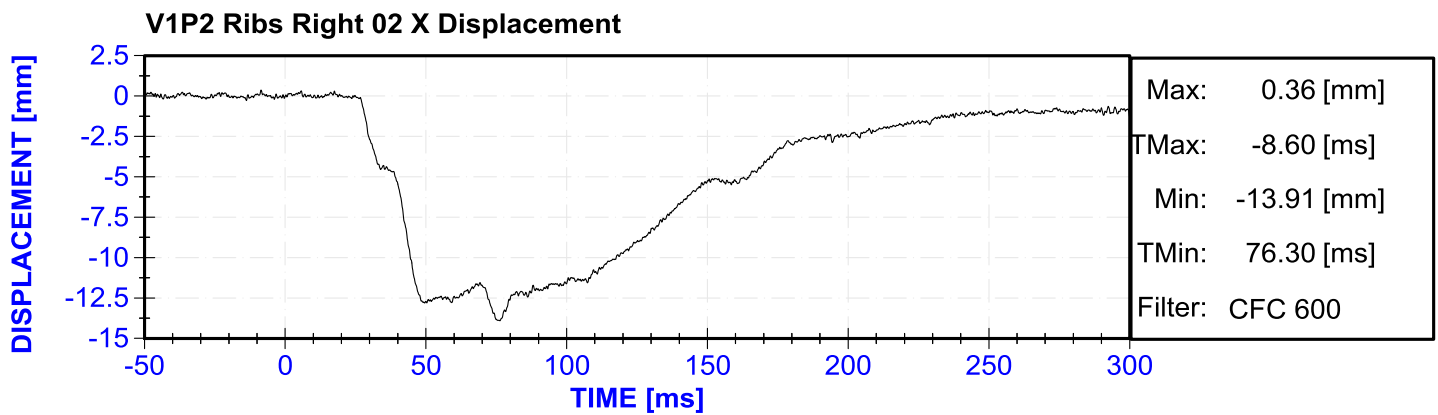
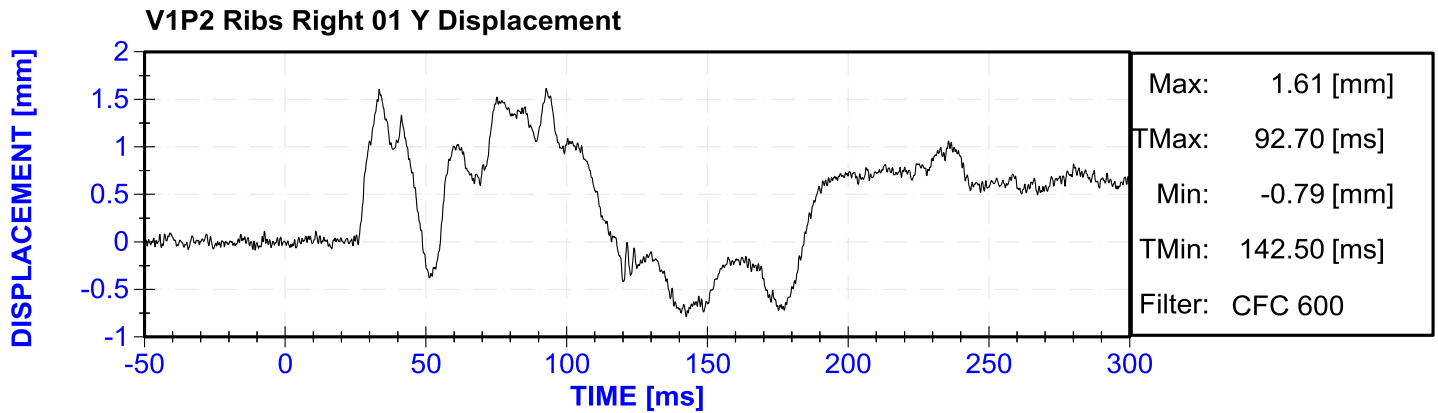


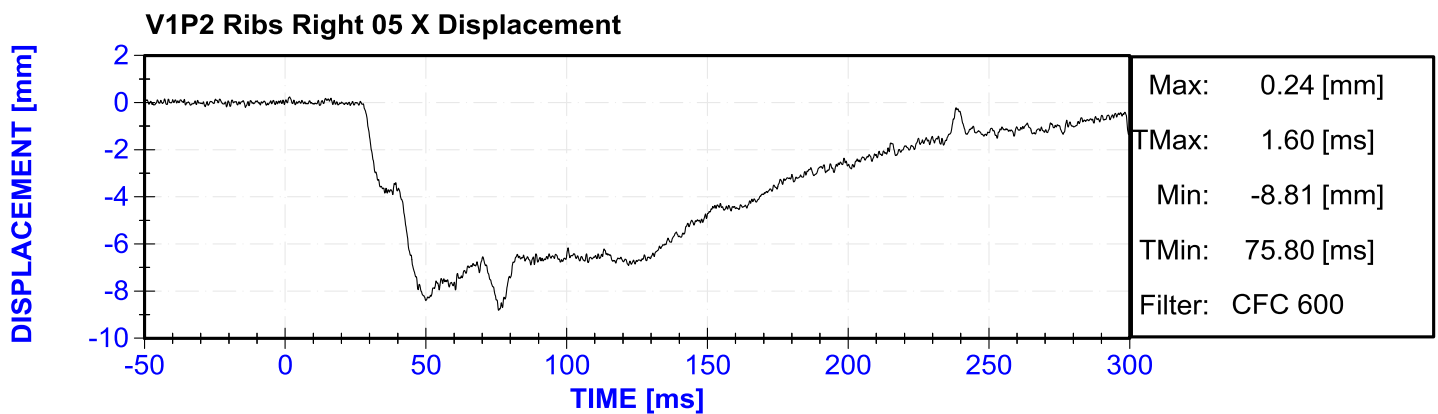
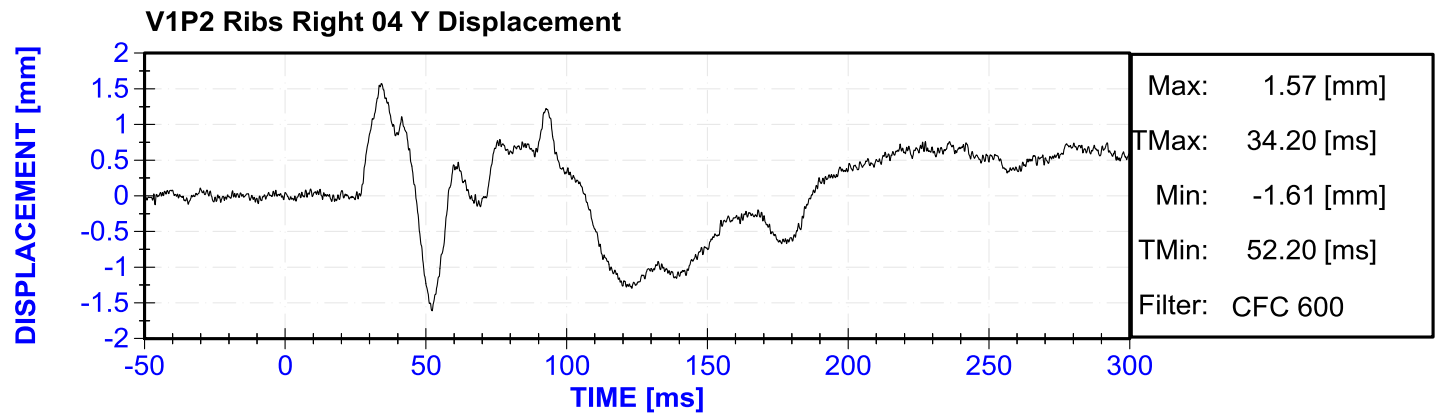
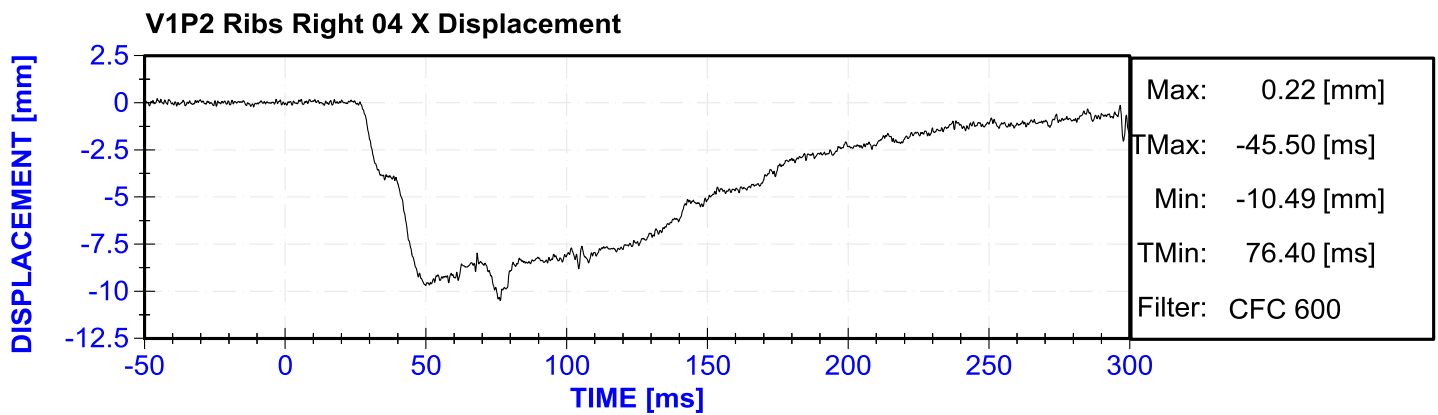
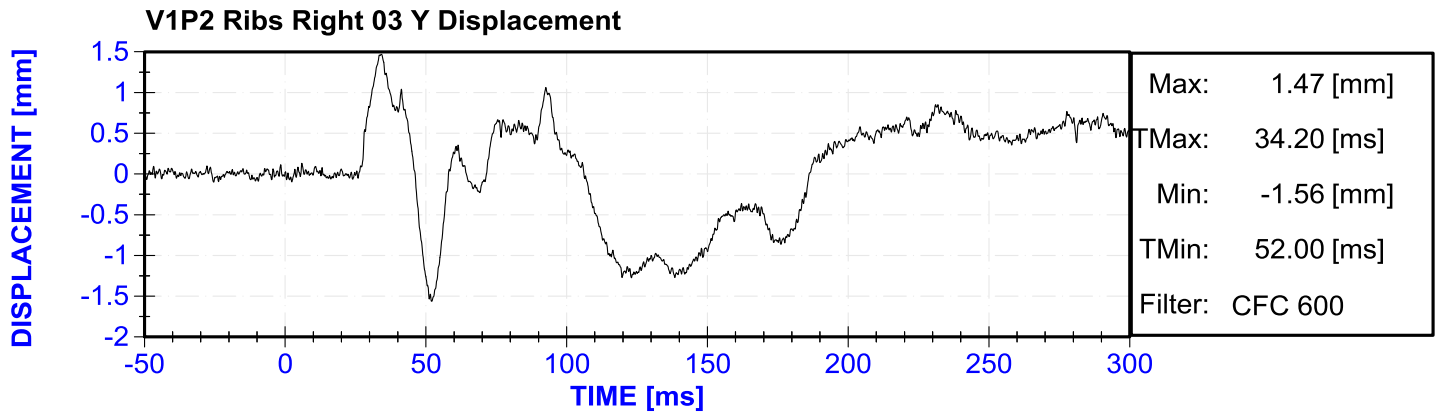




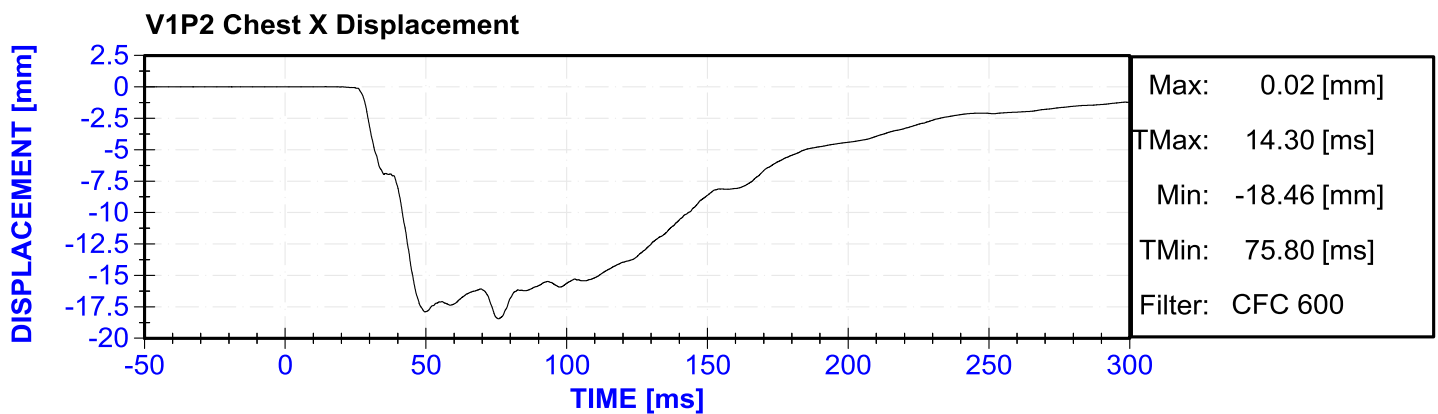
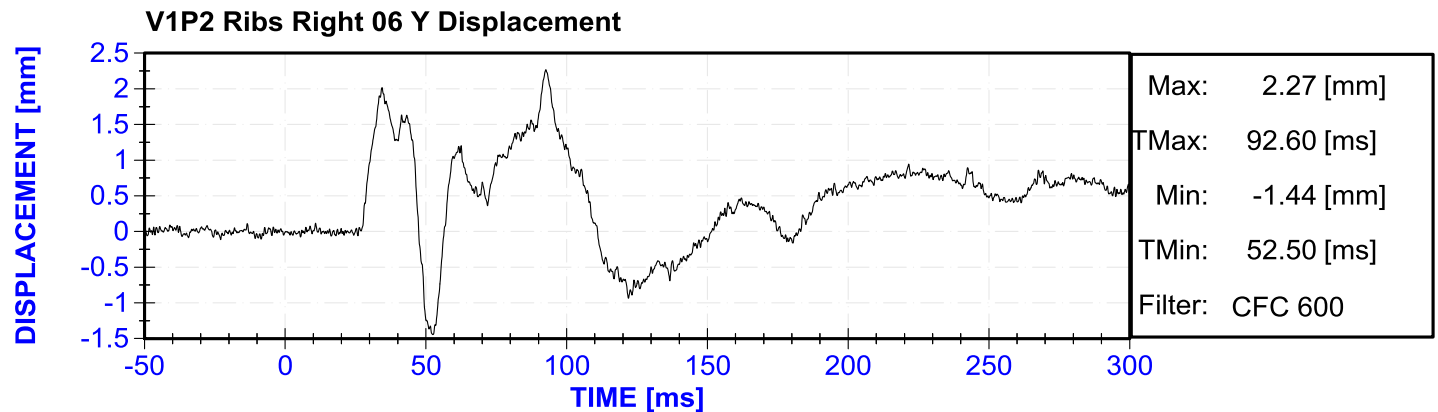
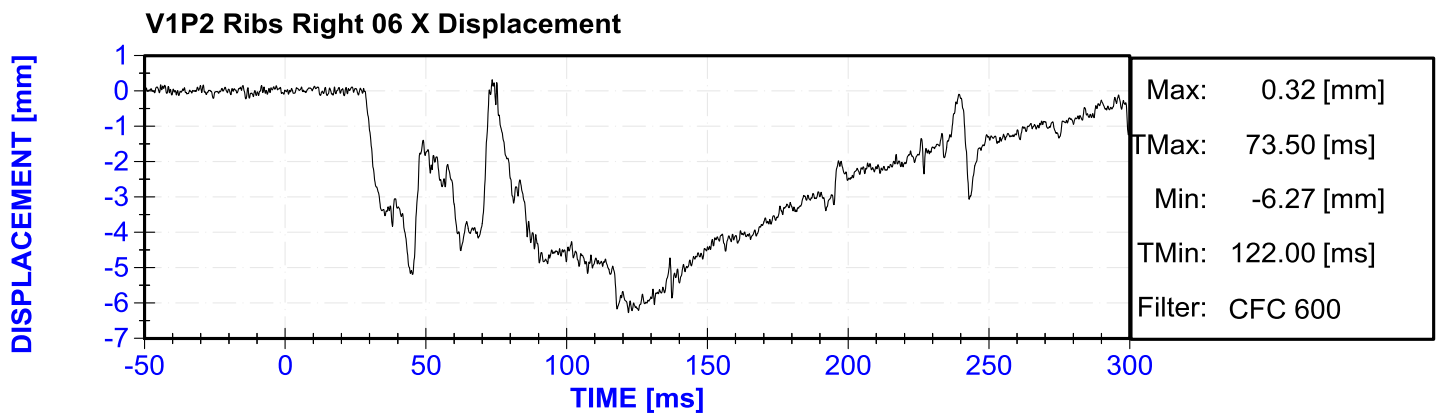
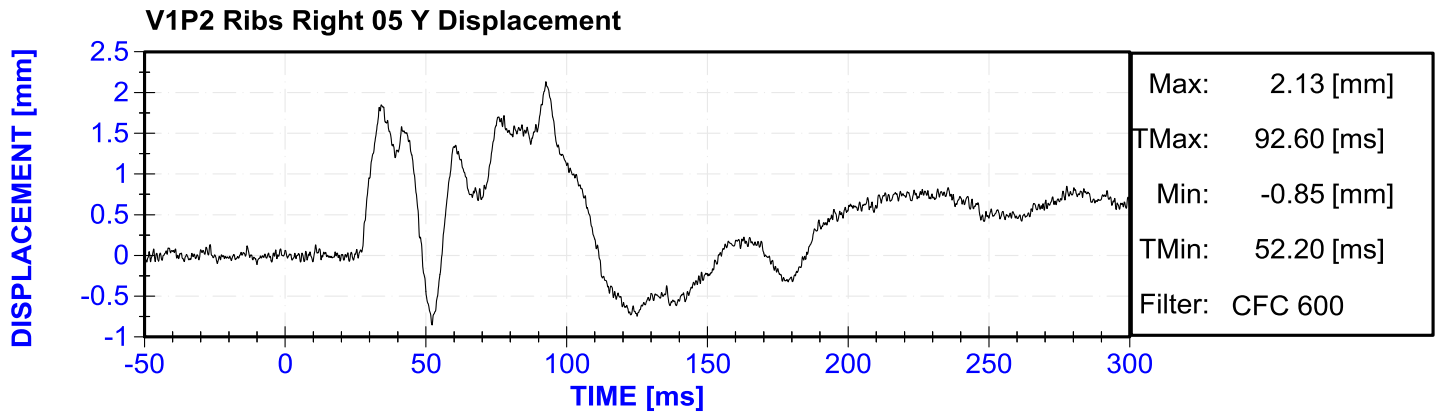


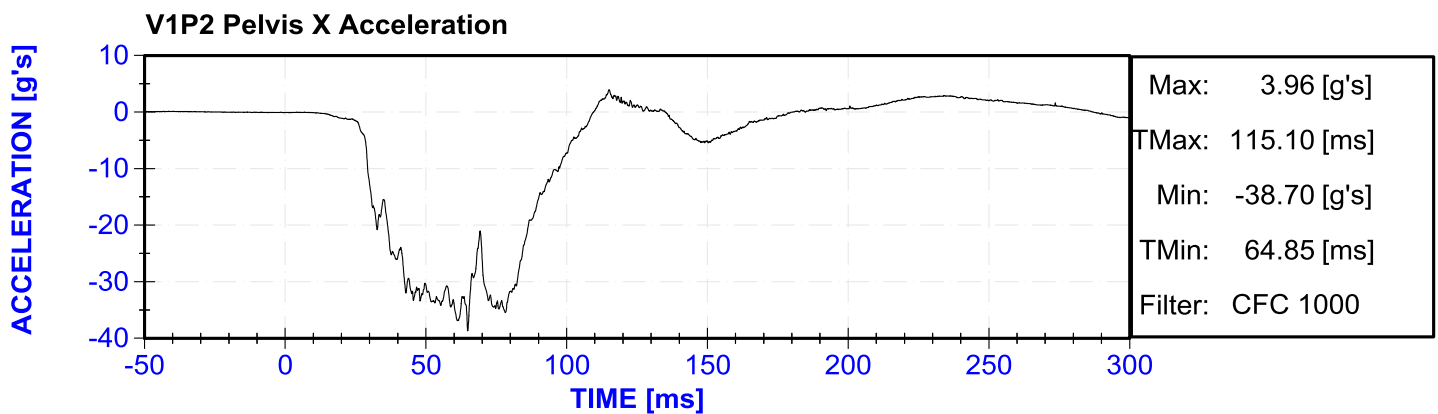
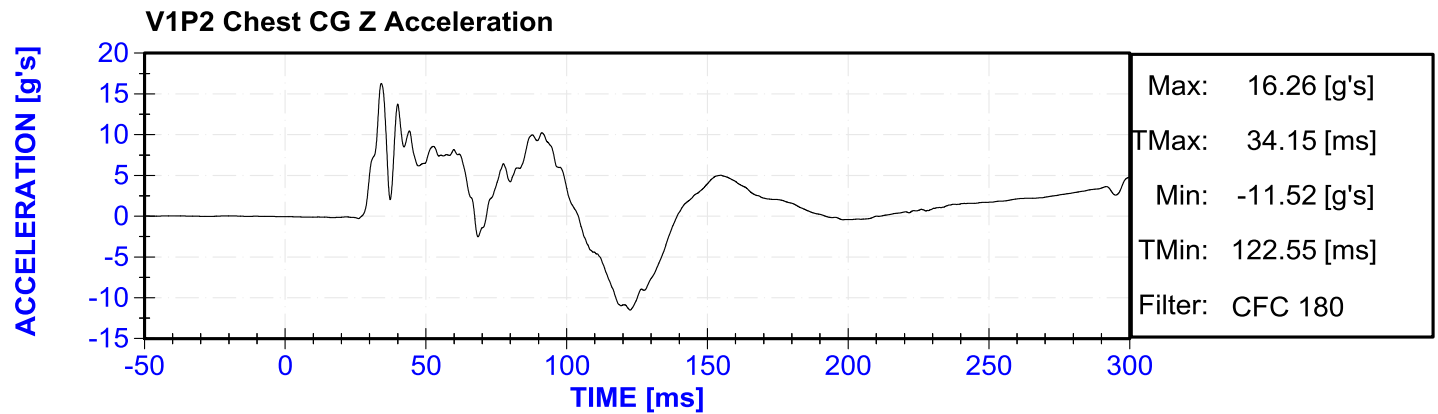
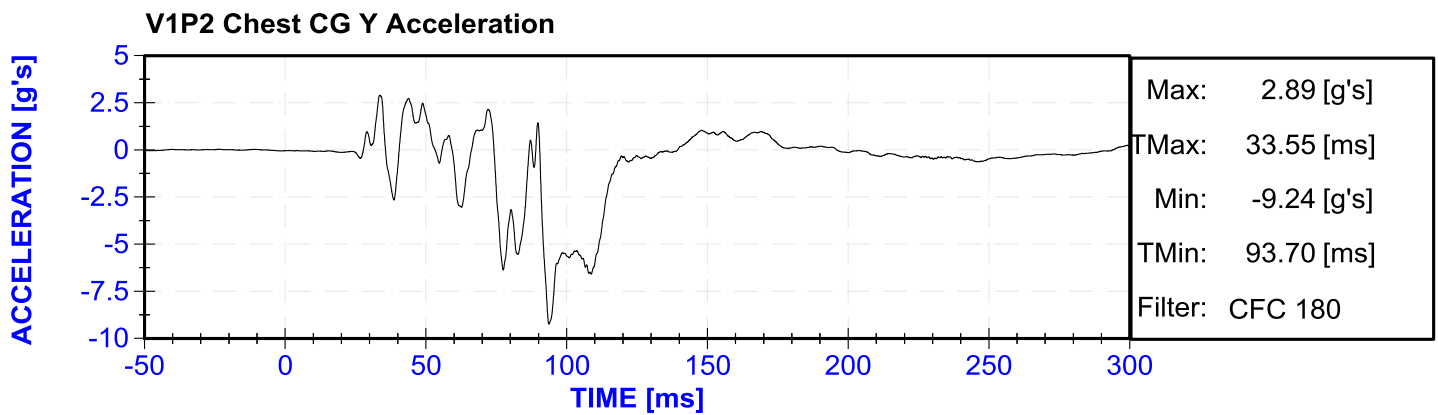
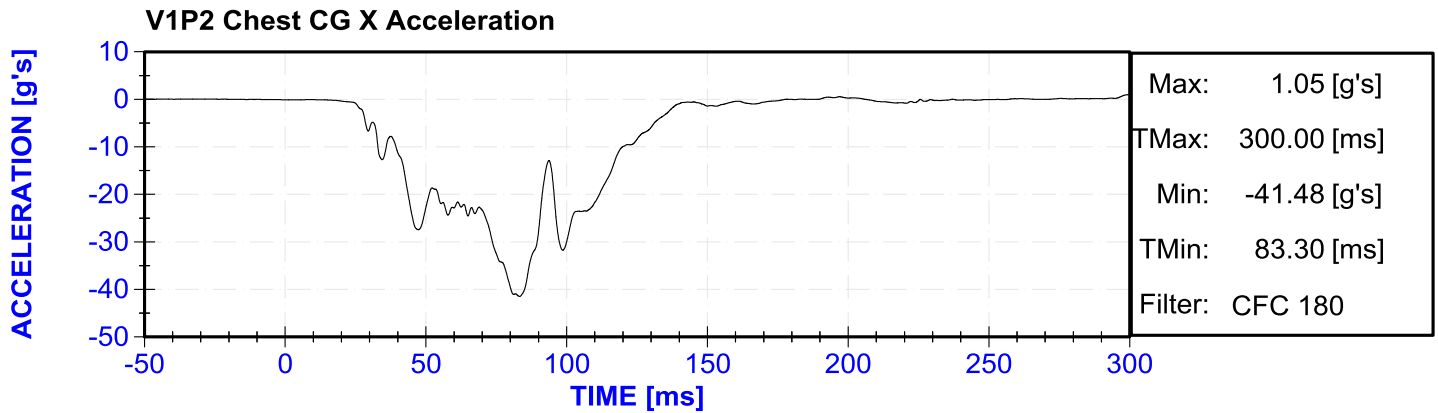


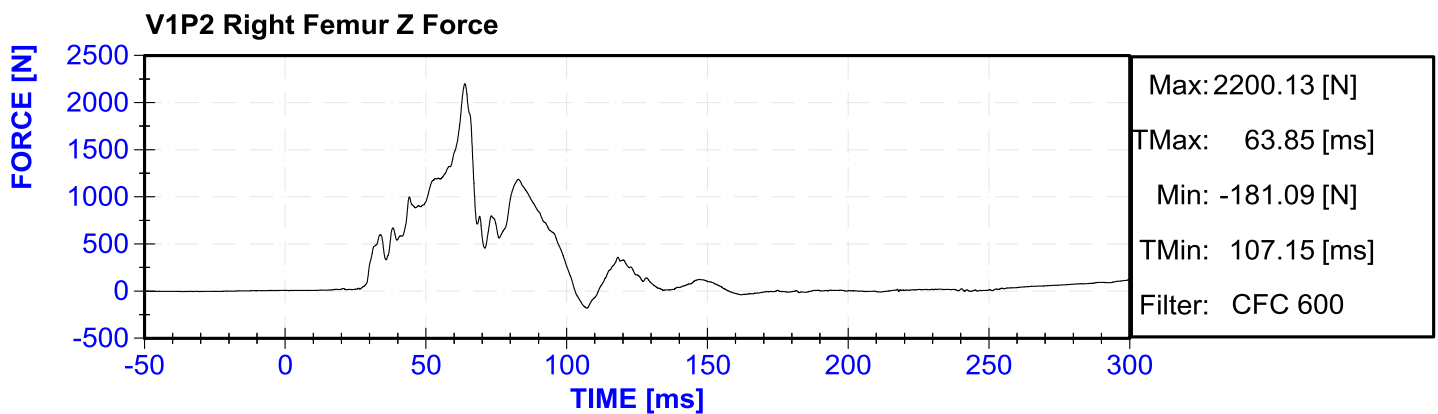
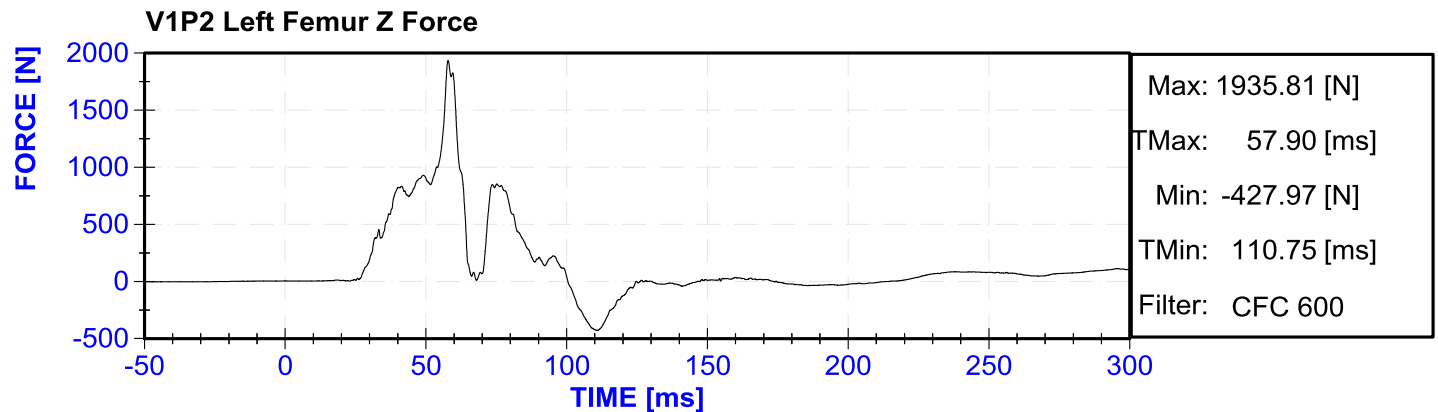
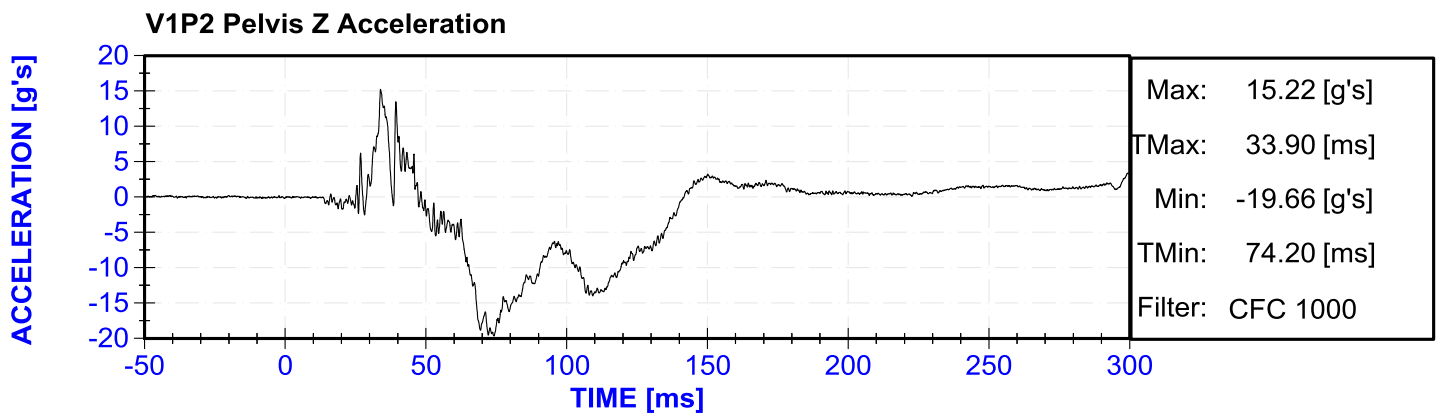
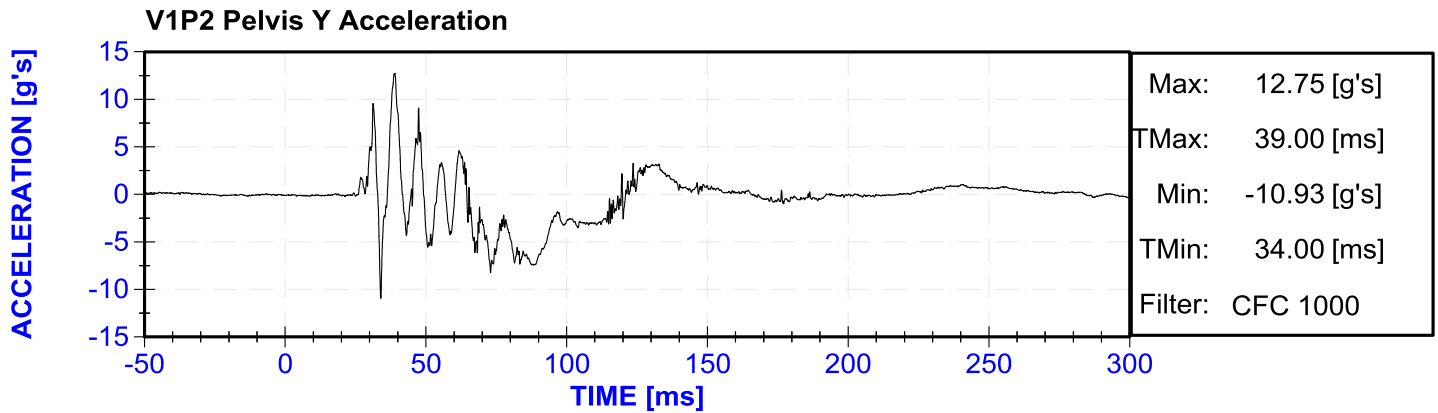


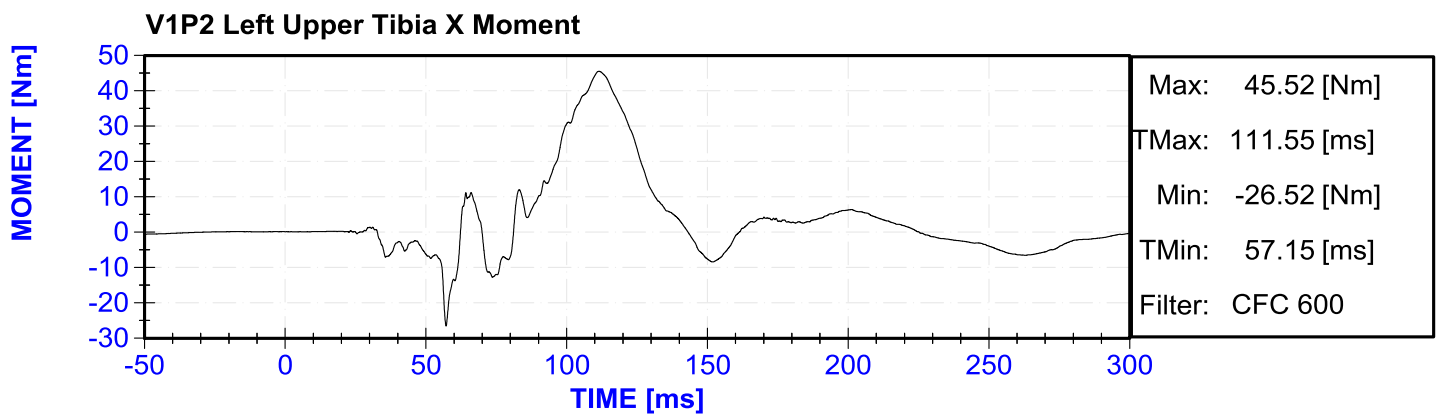
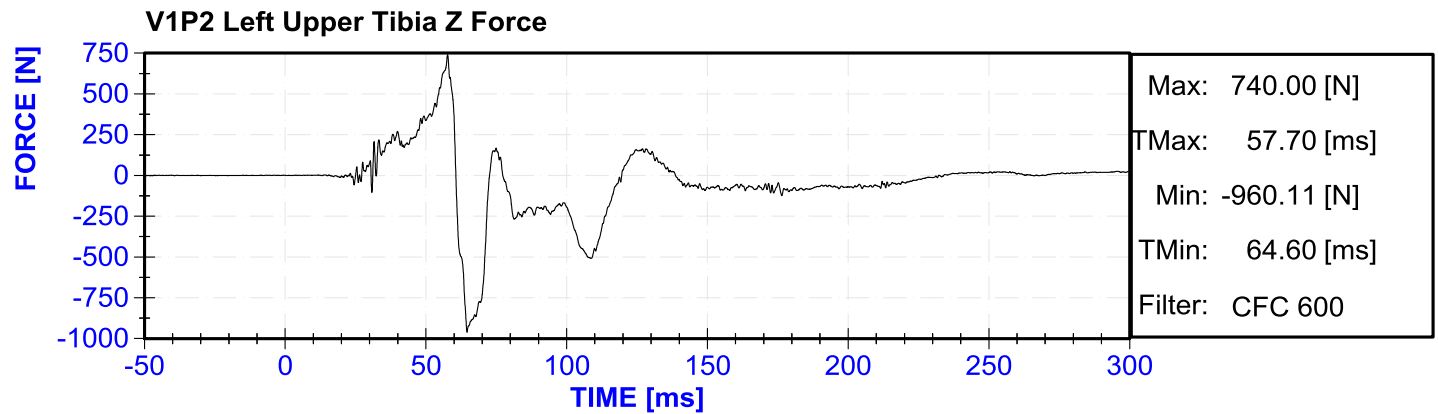
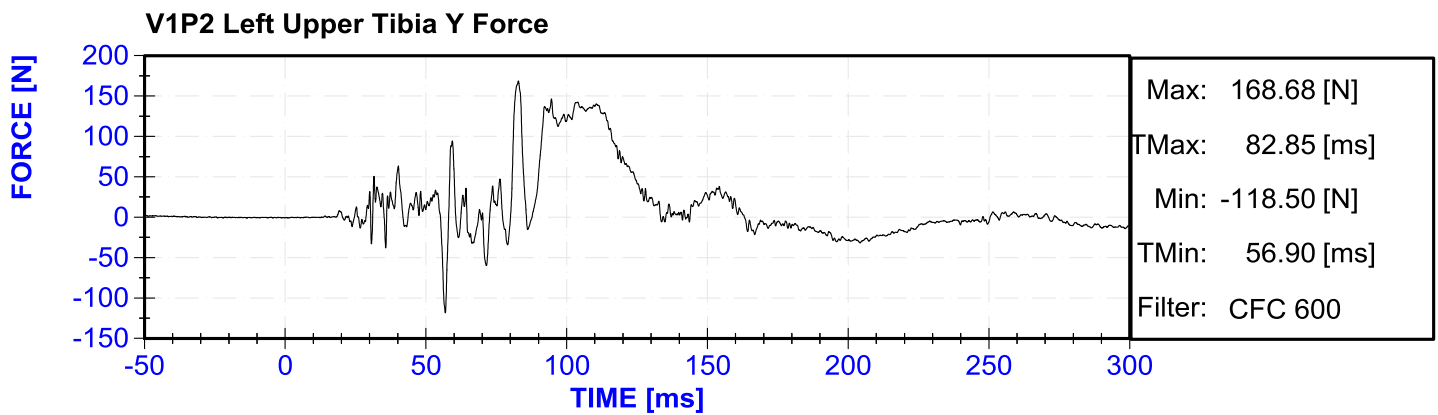
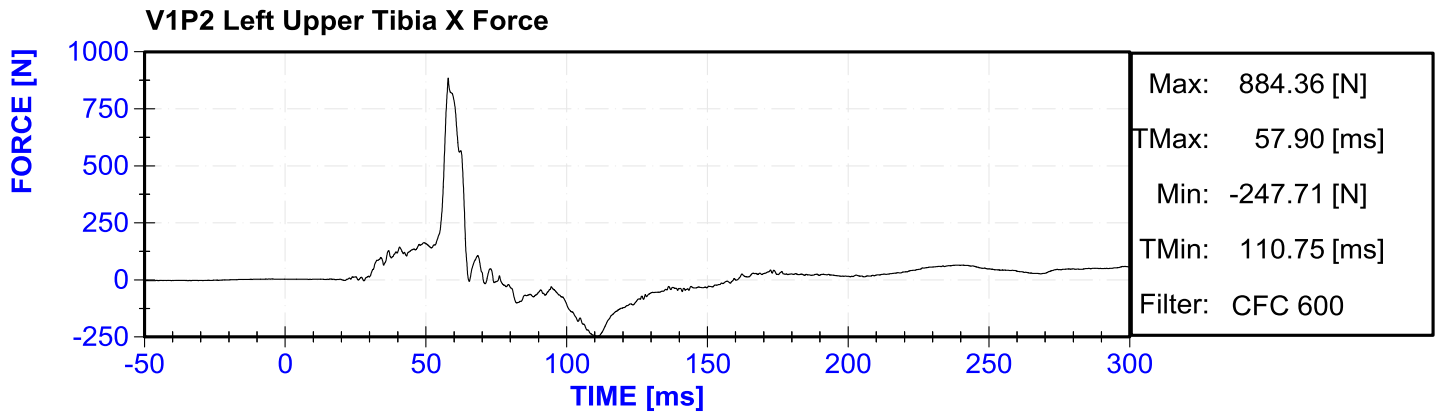




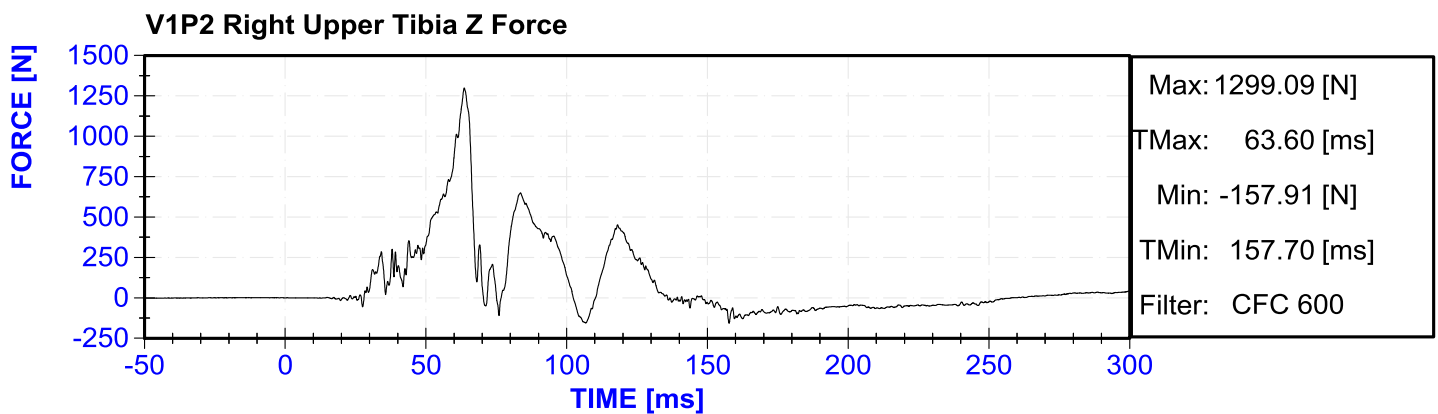
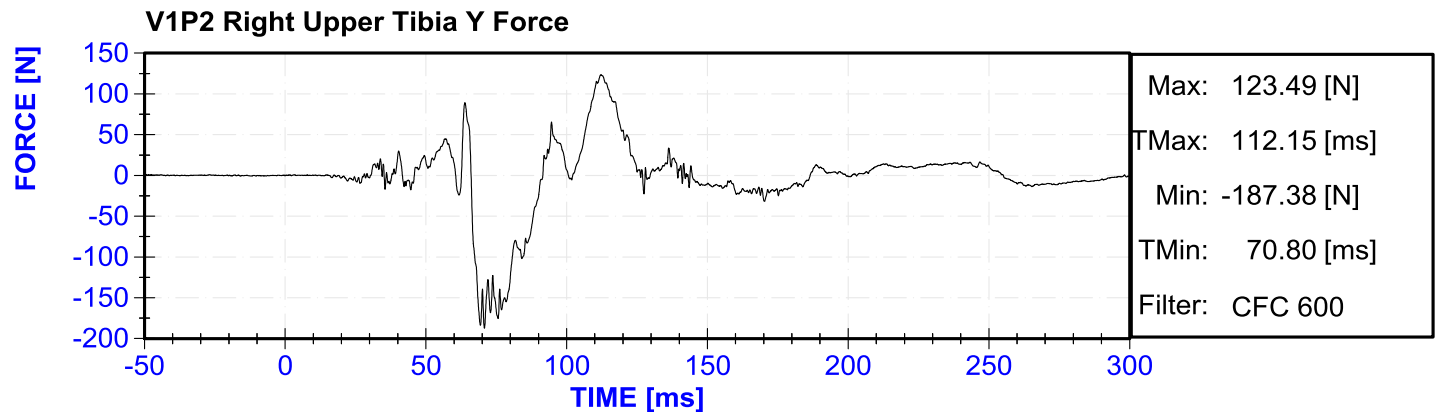
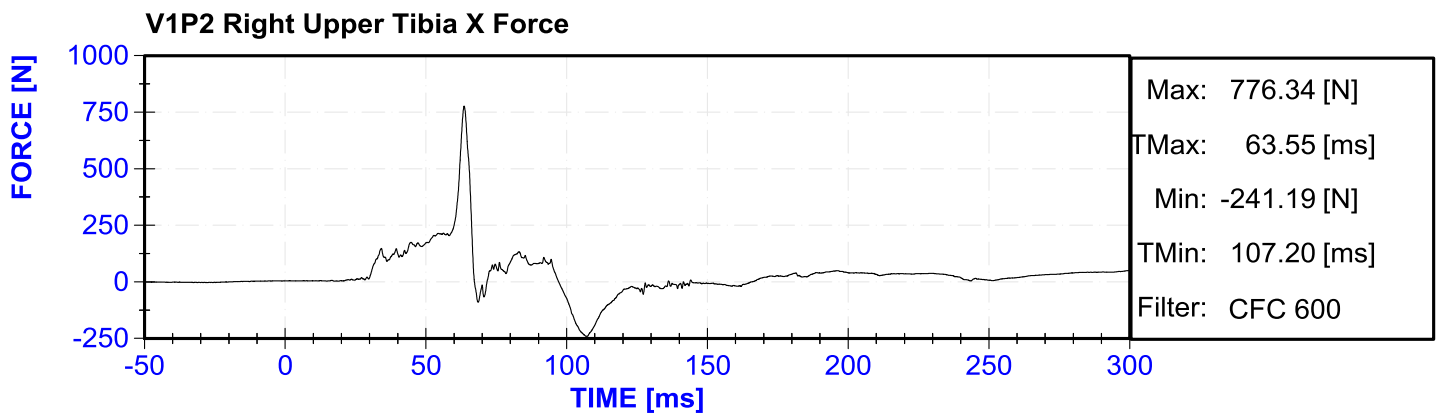
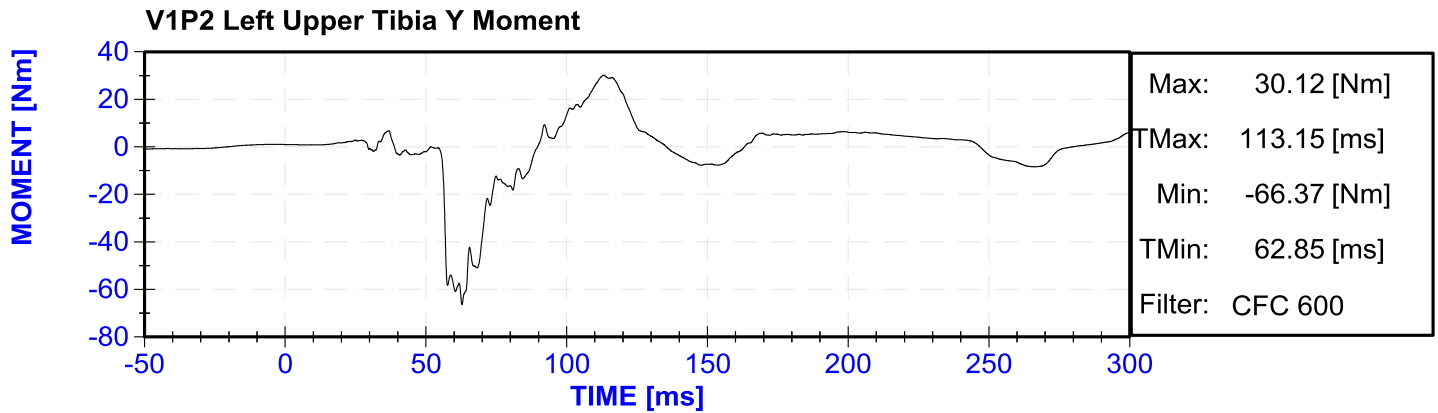


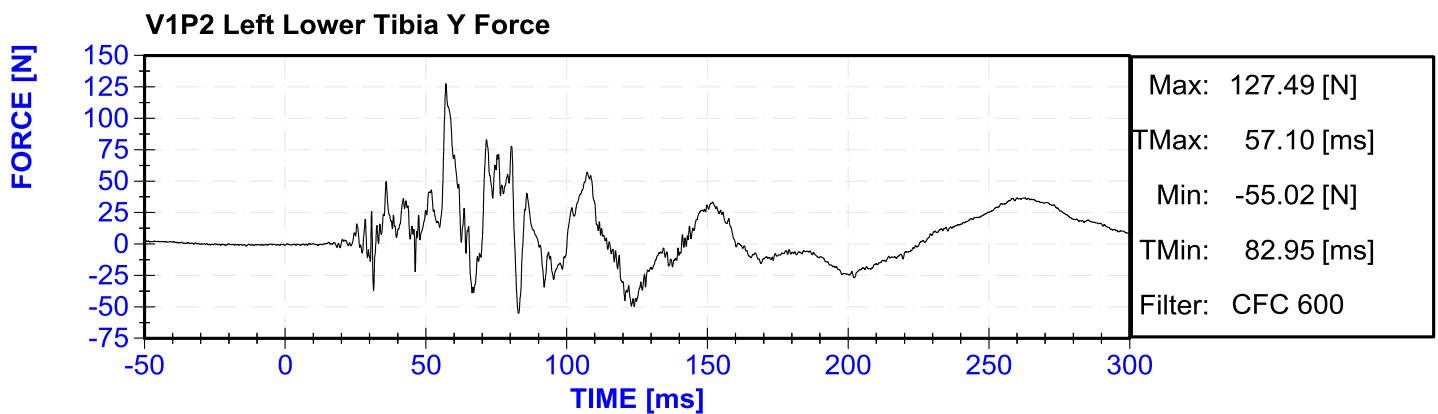
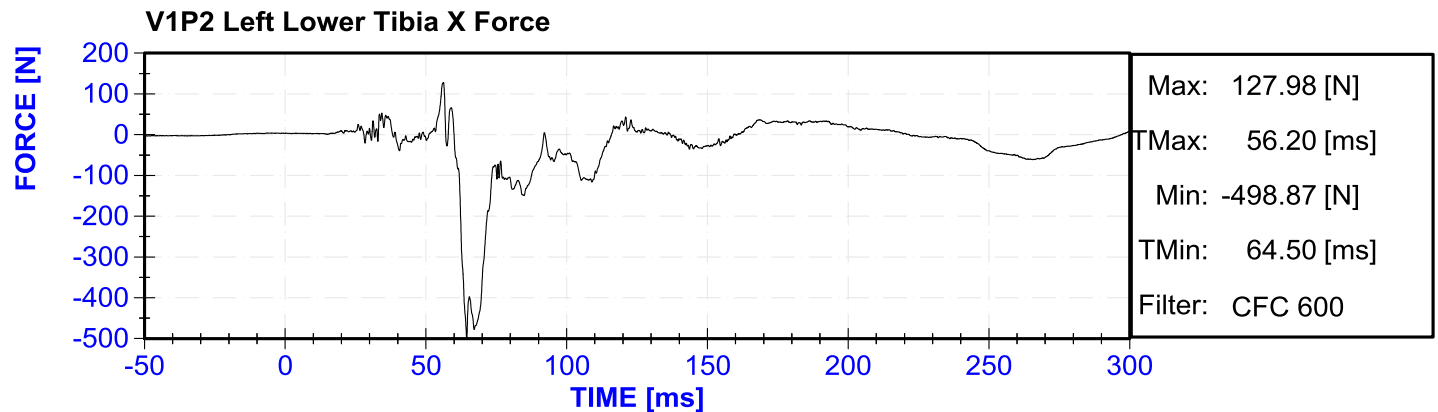
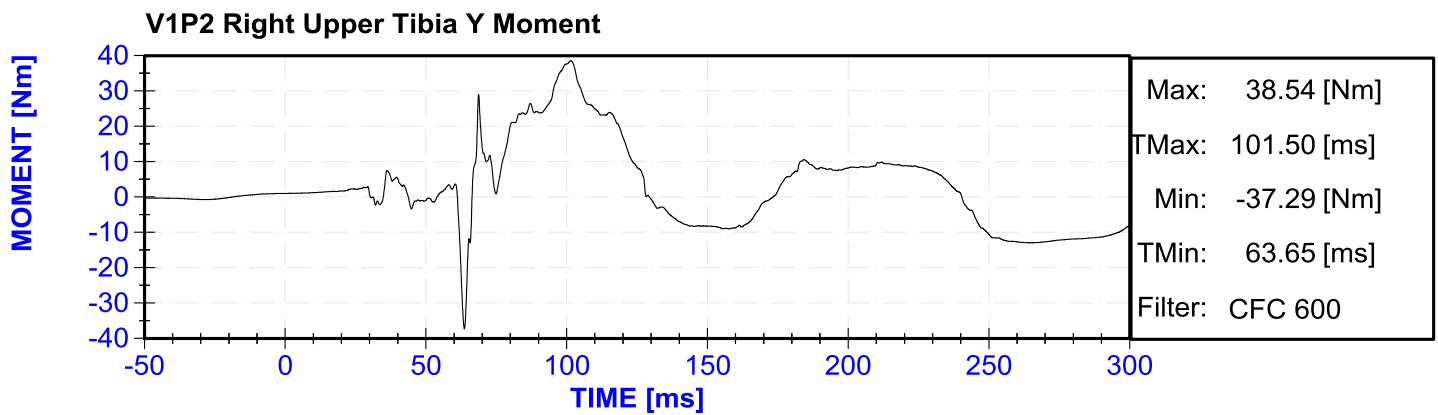
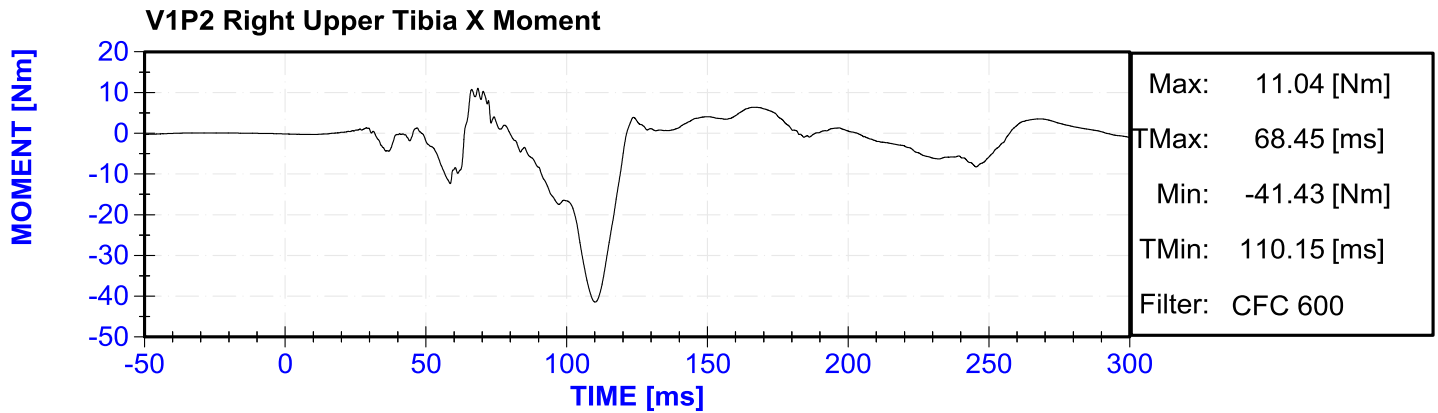


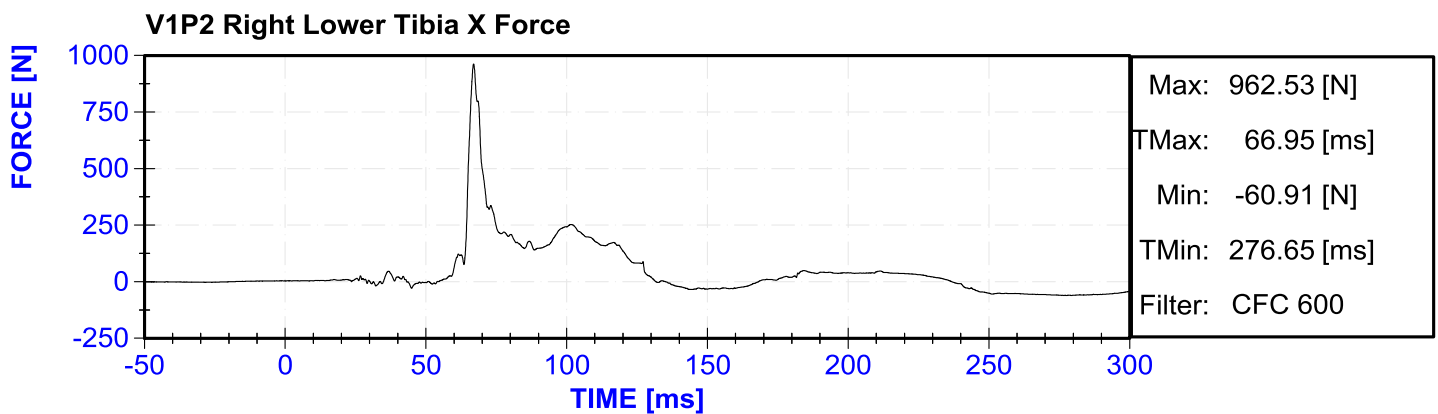
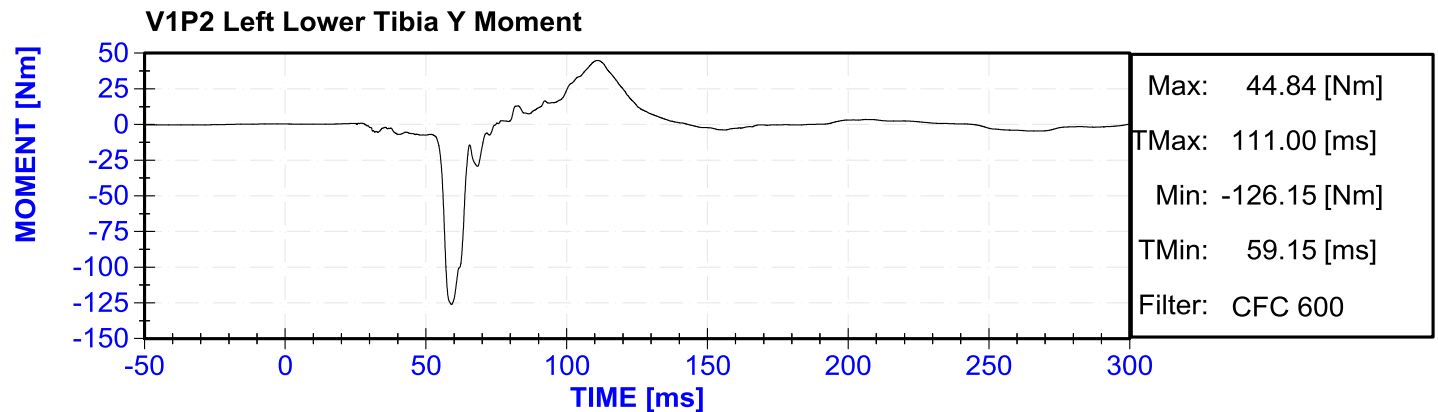
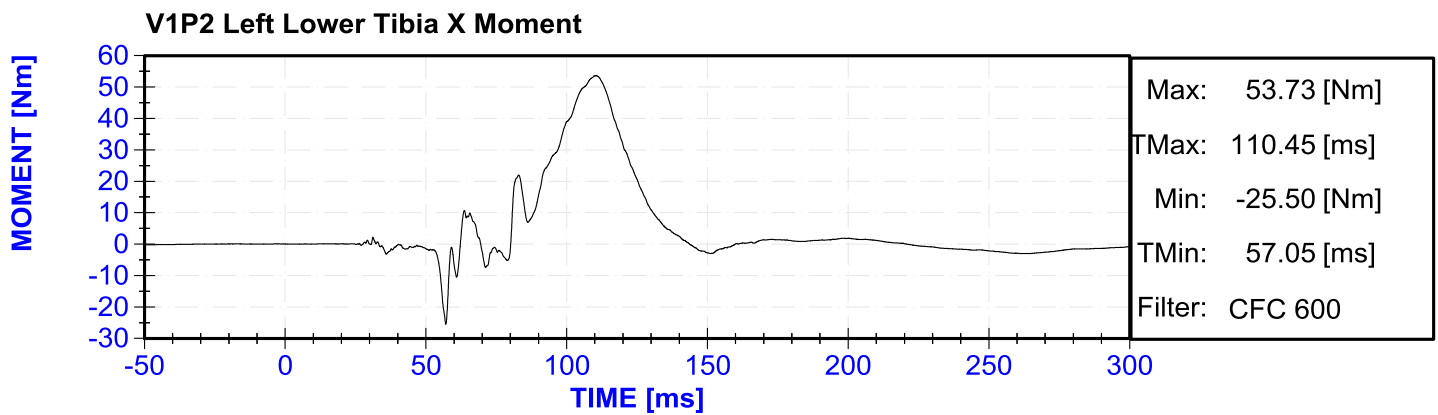
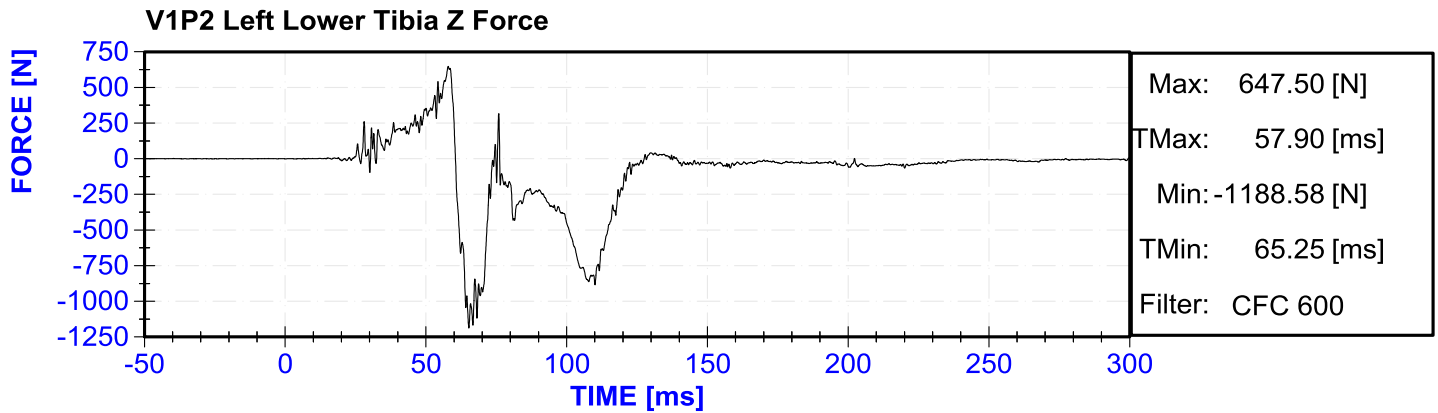


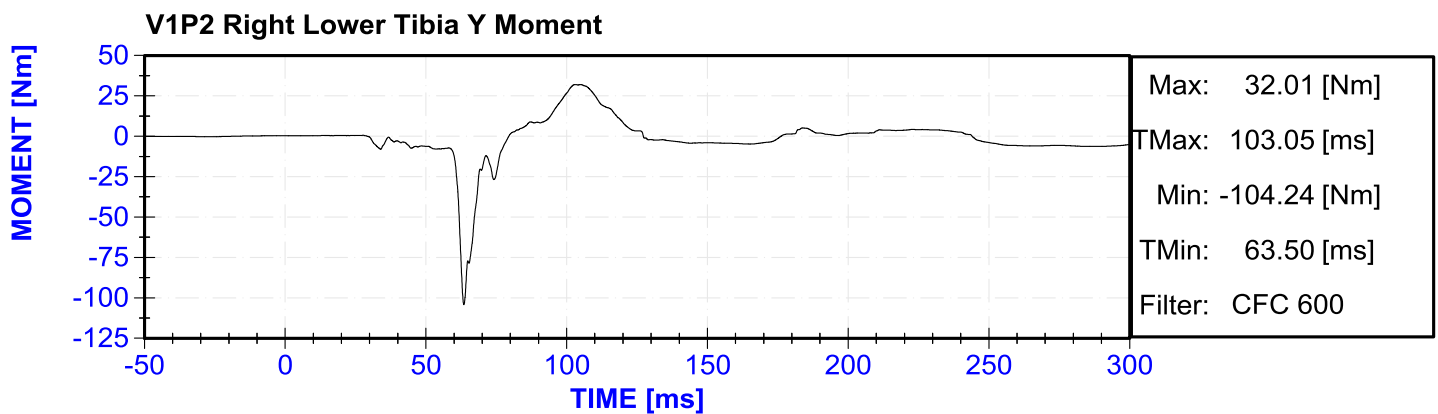
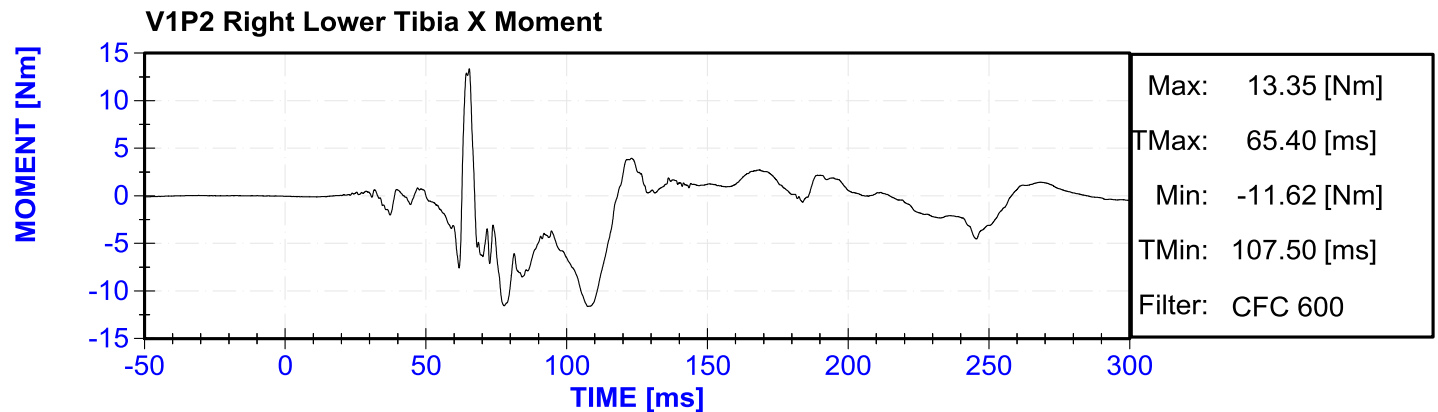
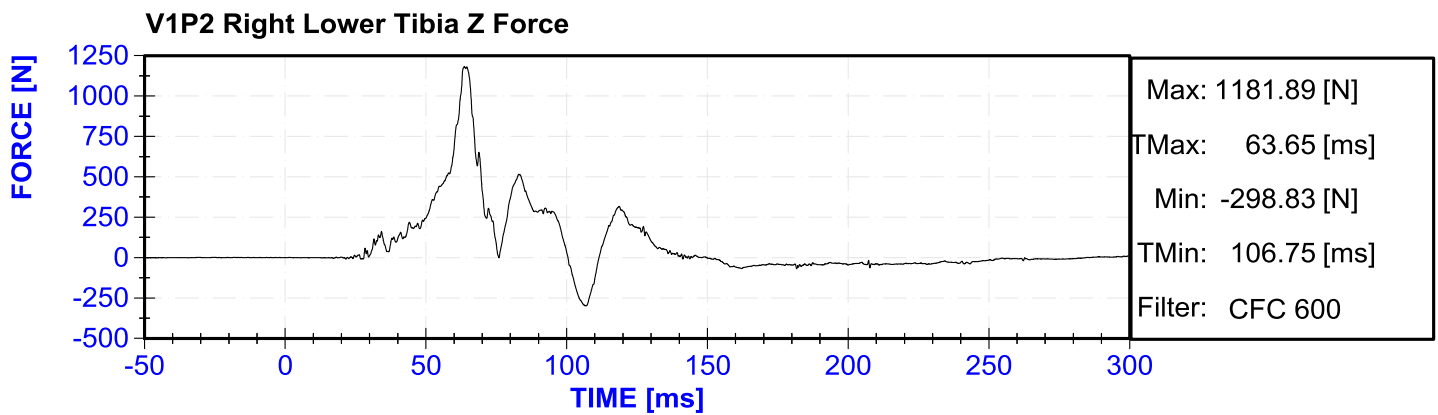
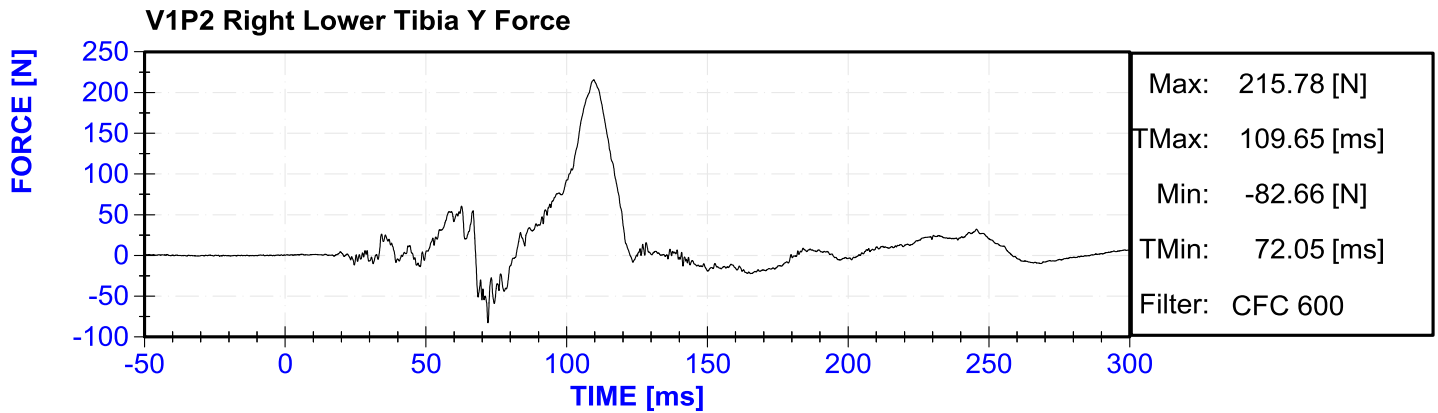




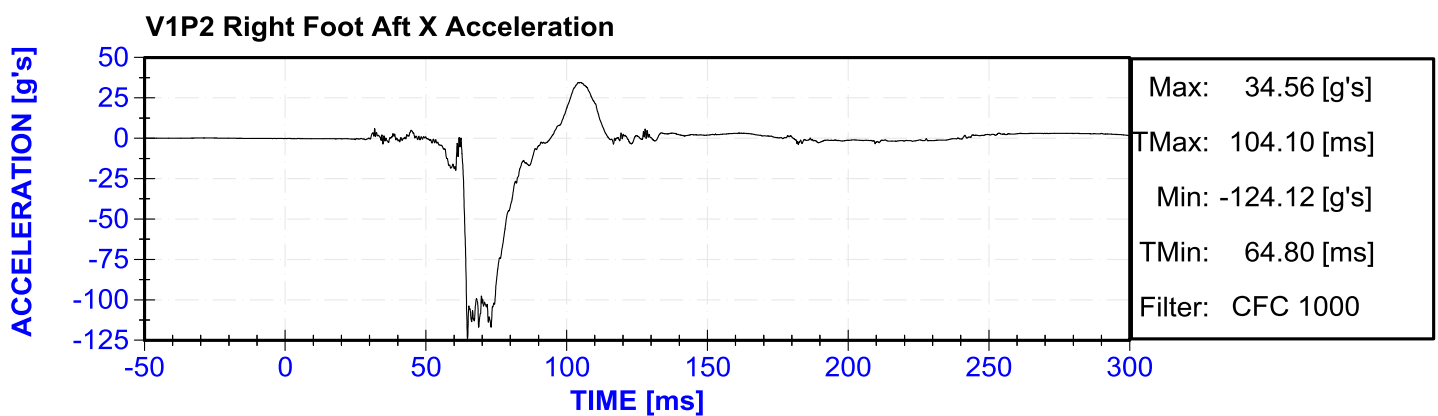
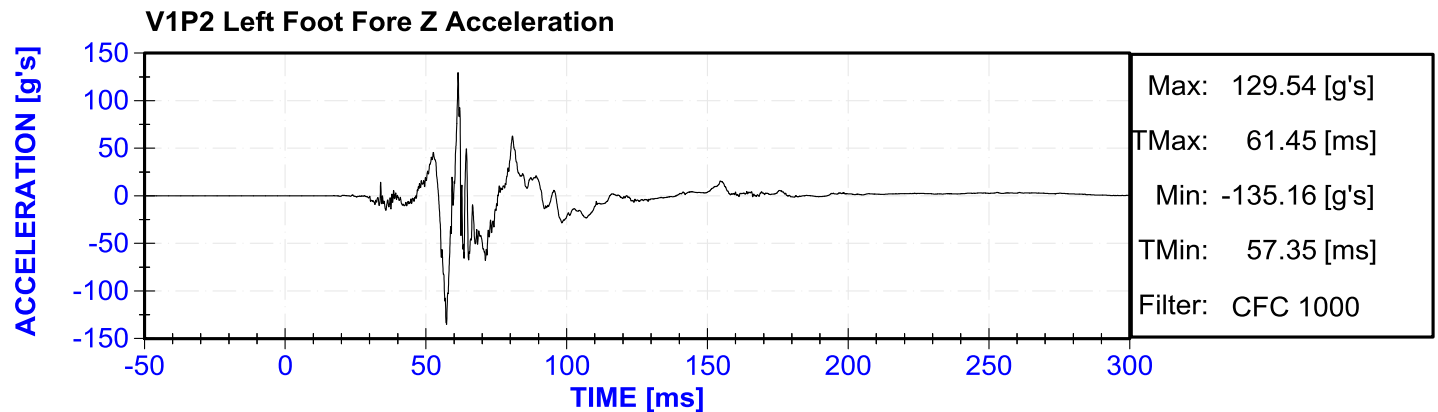
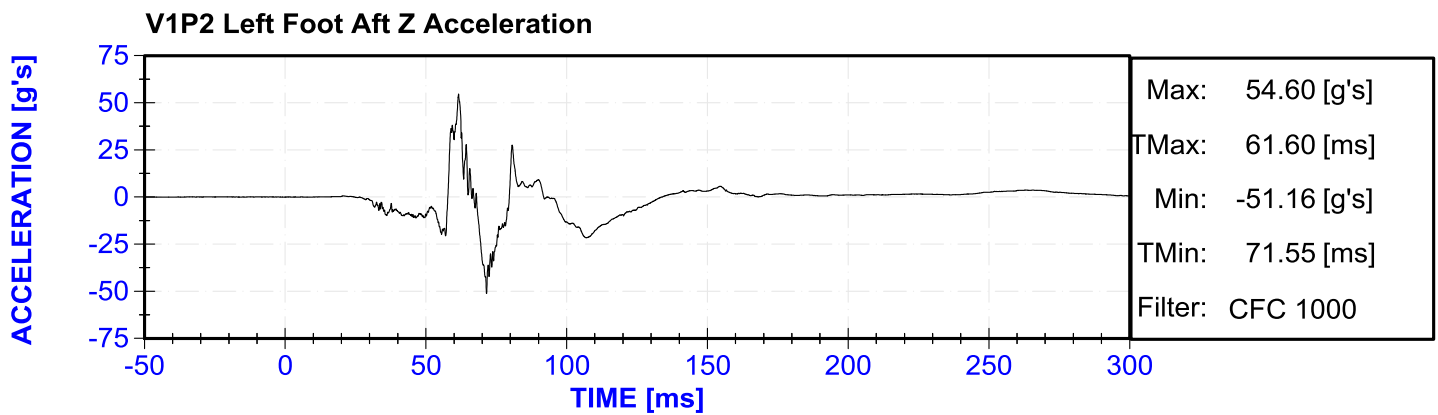
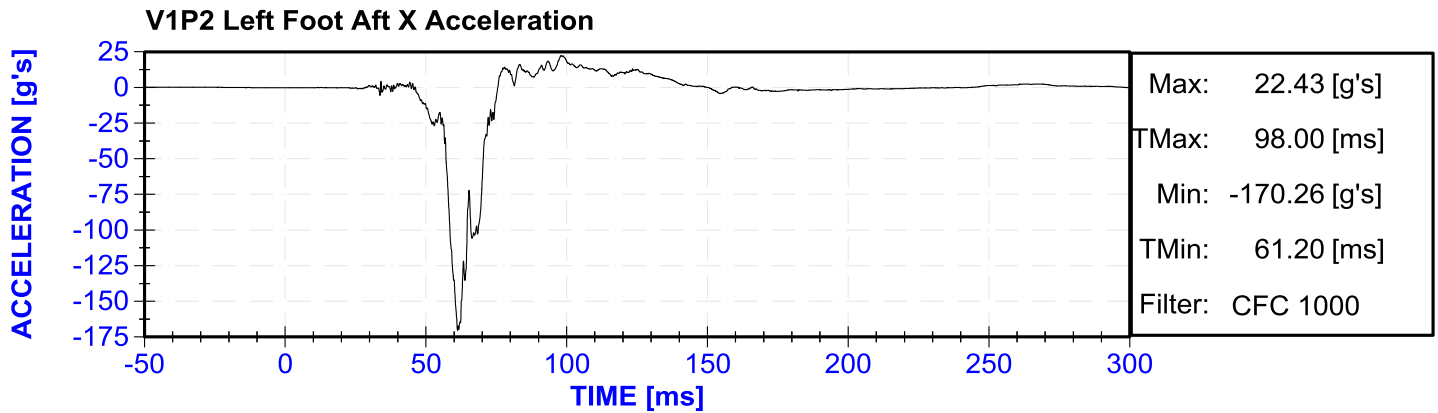


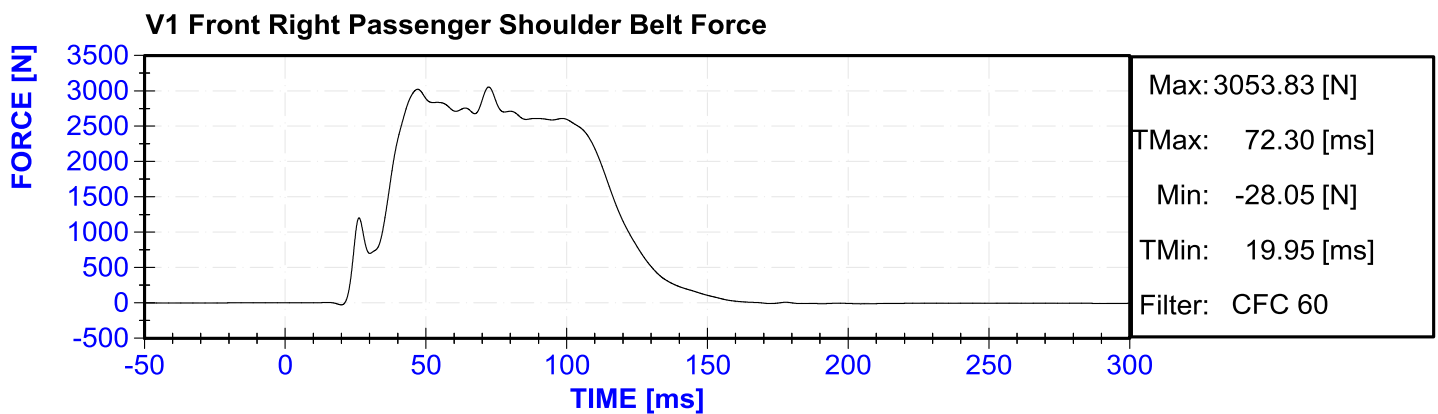
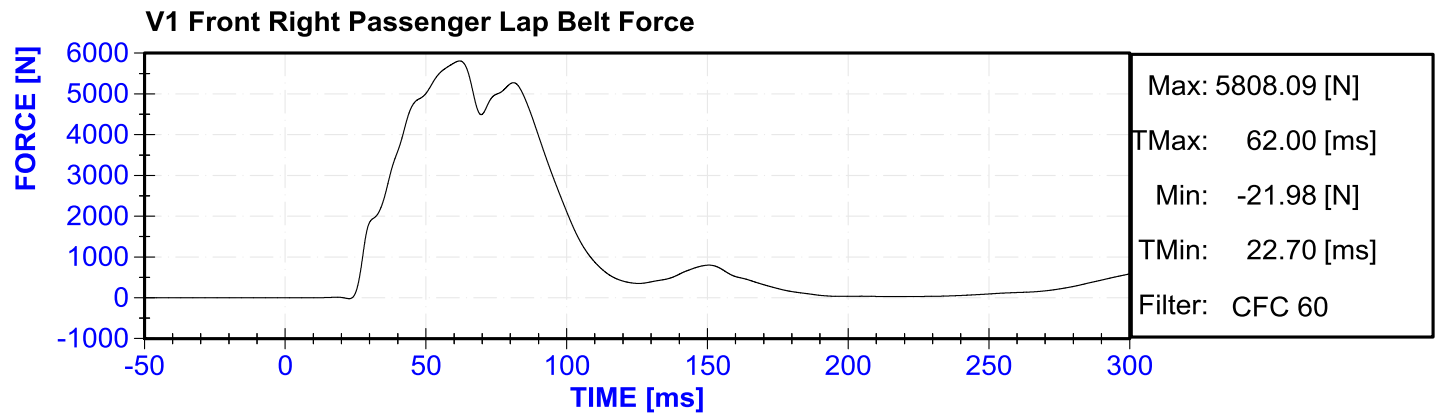
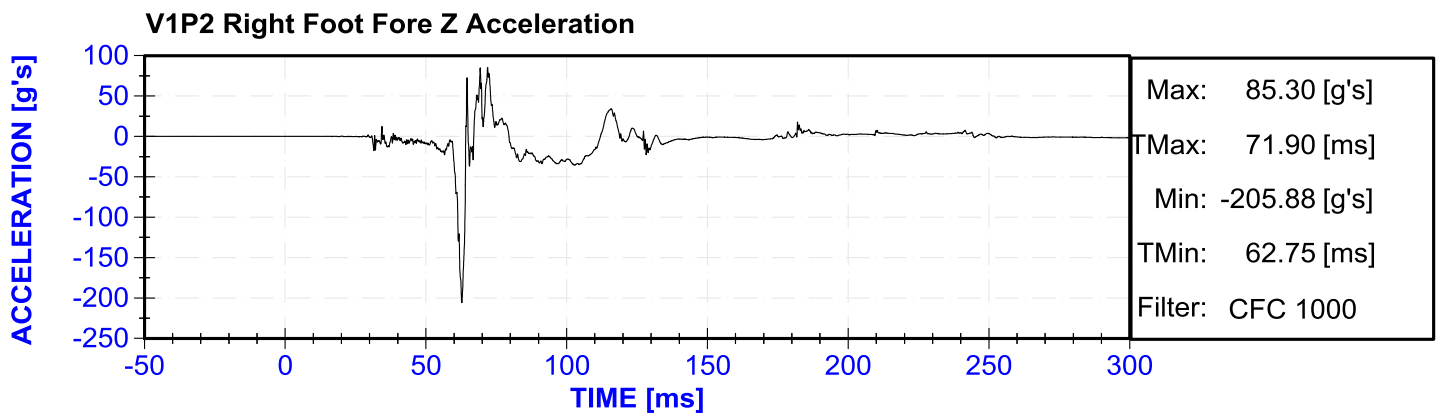
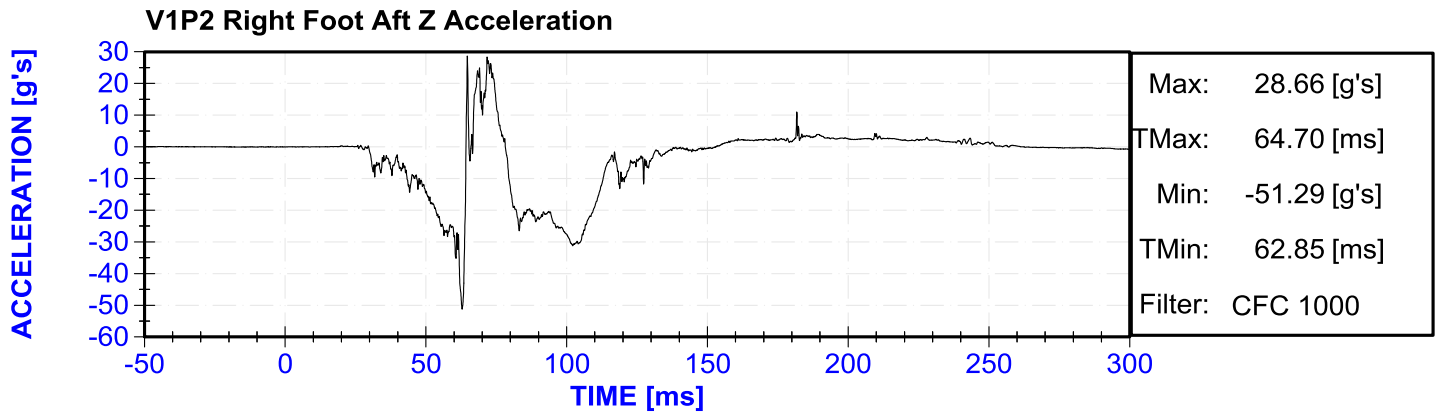




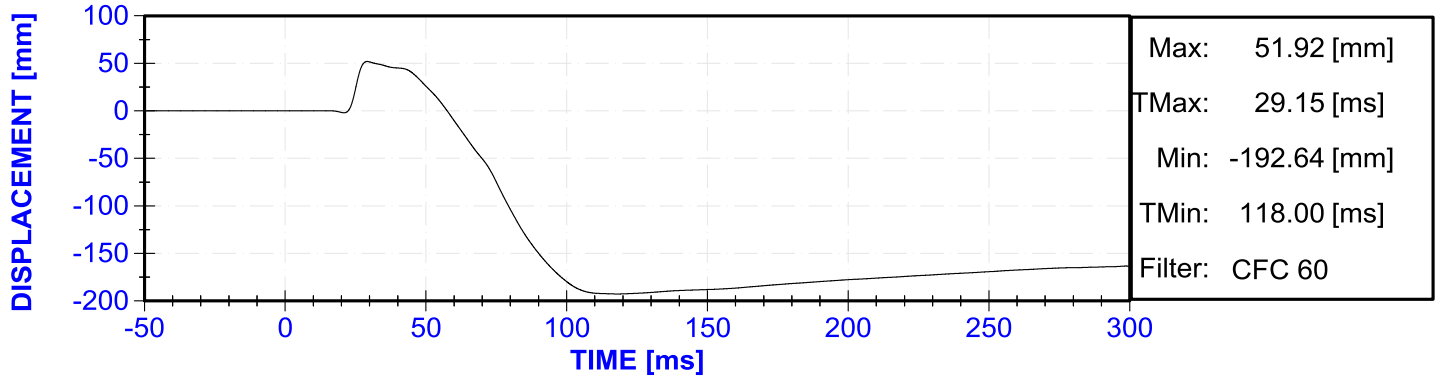




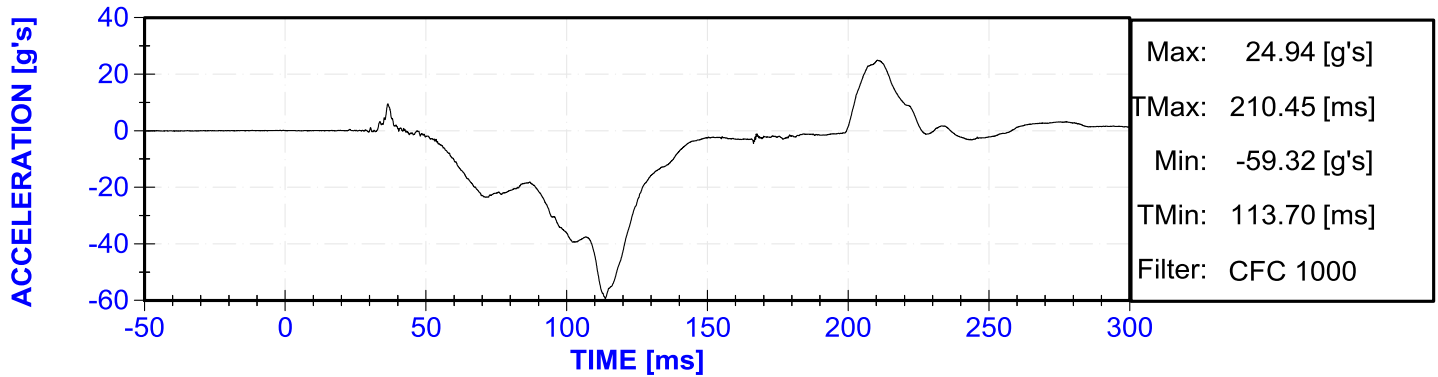




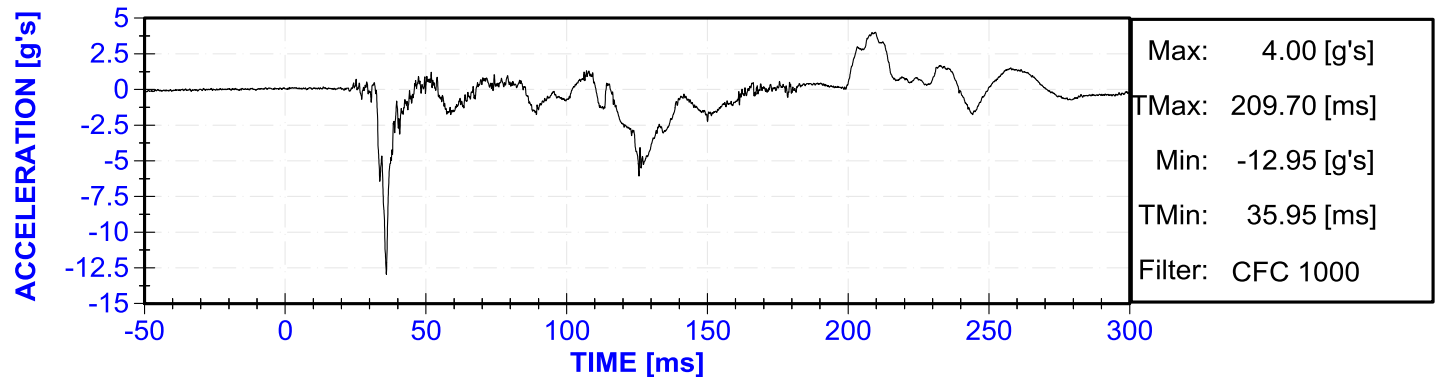
## V1 Front Right Passenger Shoulder Belt Displacement



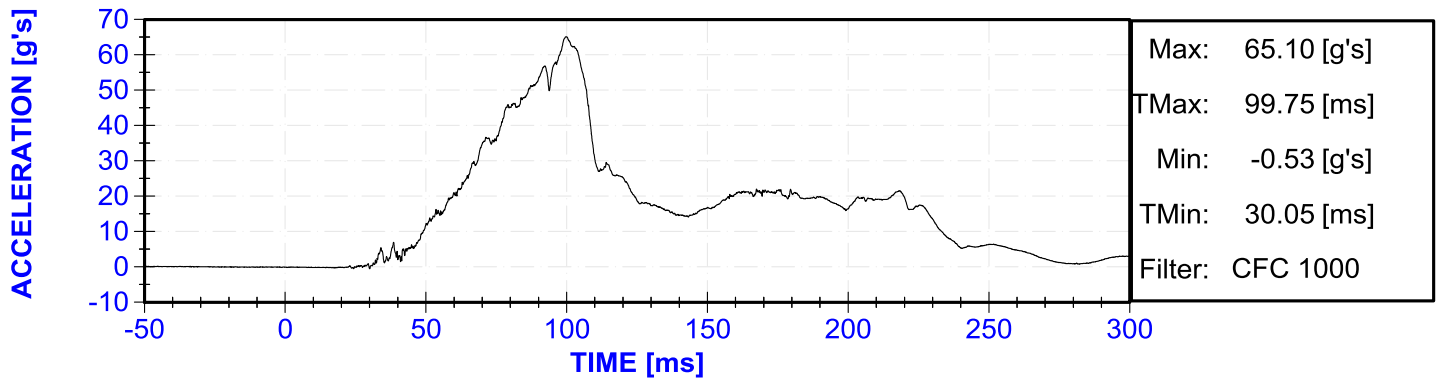
## V1P3 Head CG X Acceleration

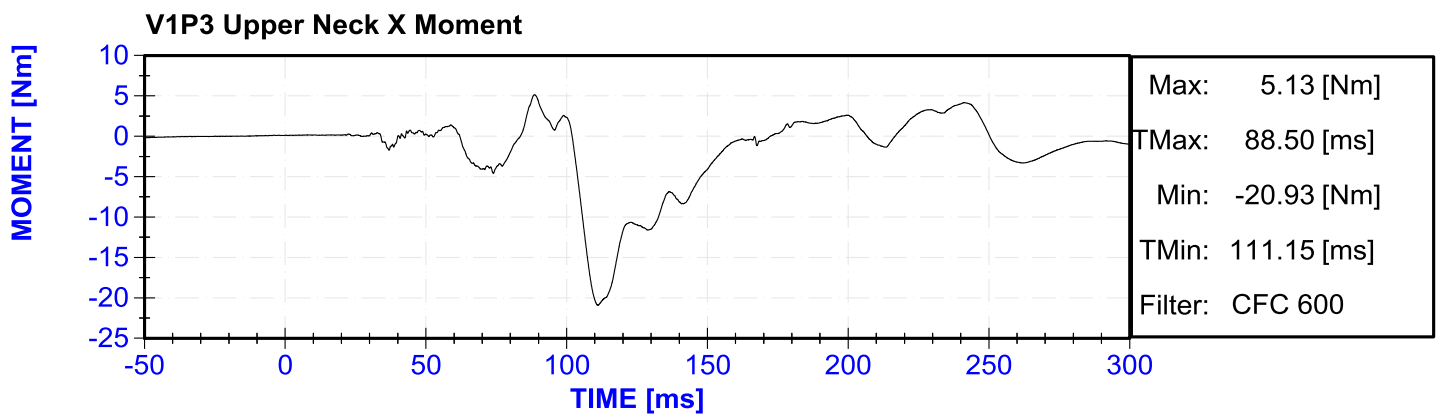
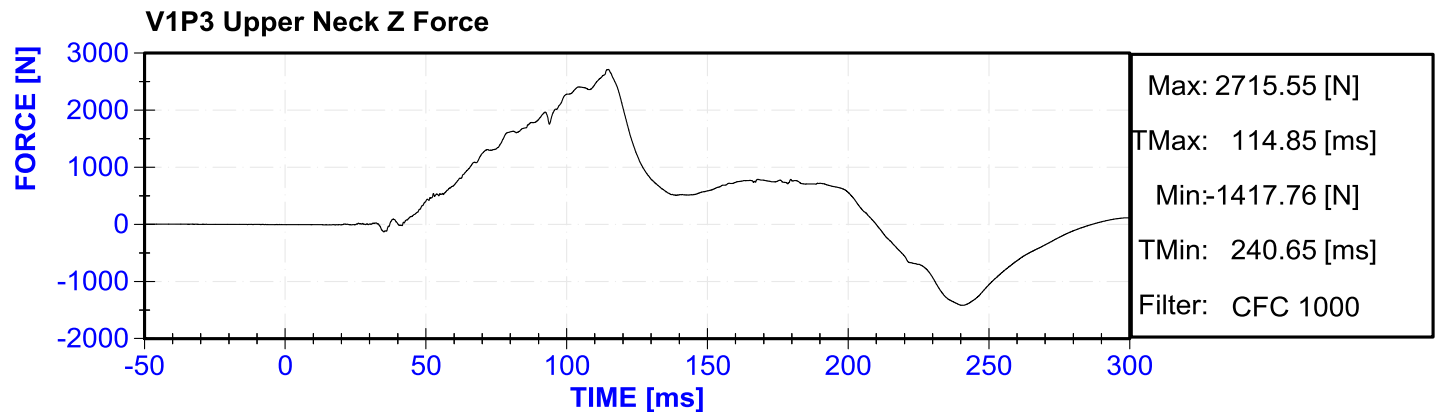
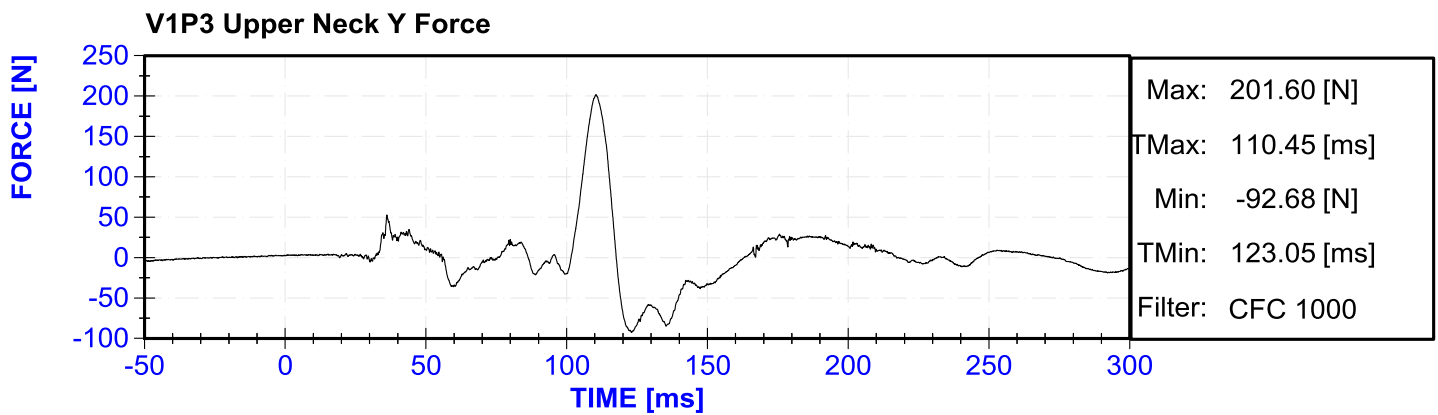
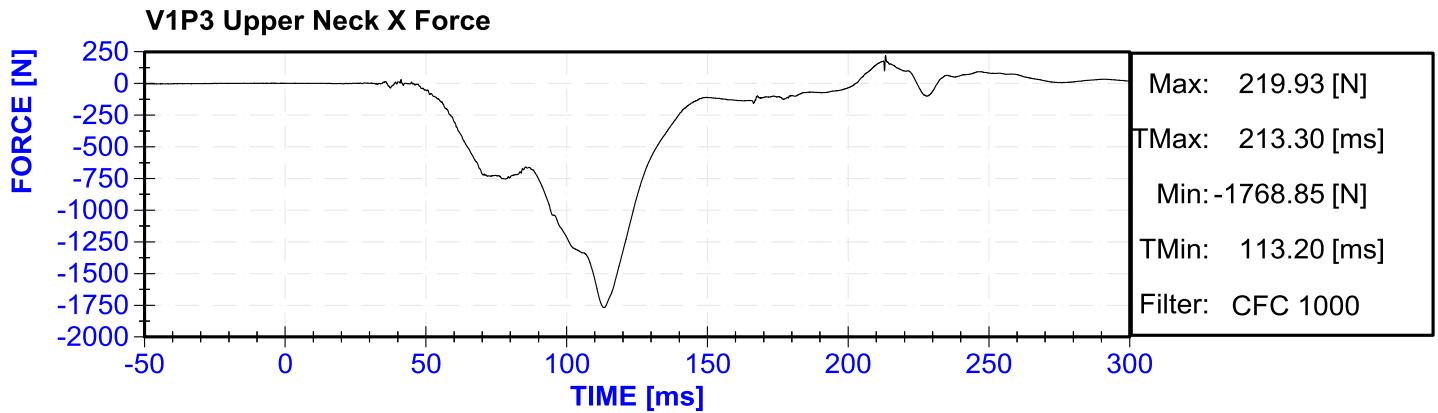


## V1P3 Head CG Y Acceleration

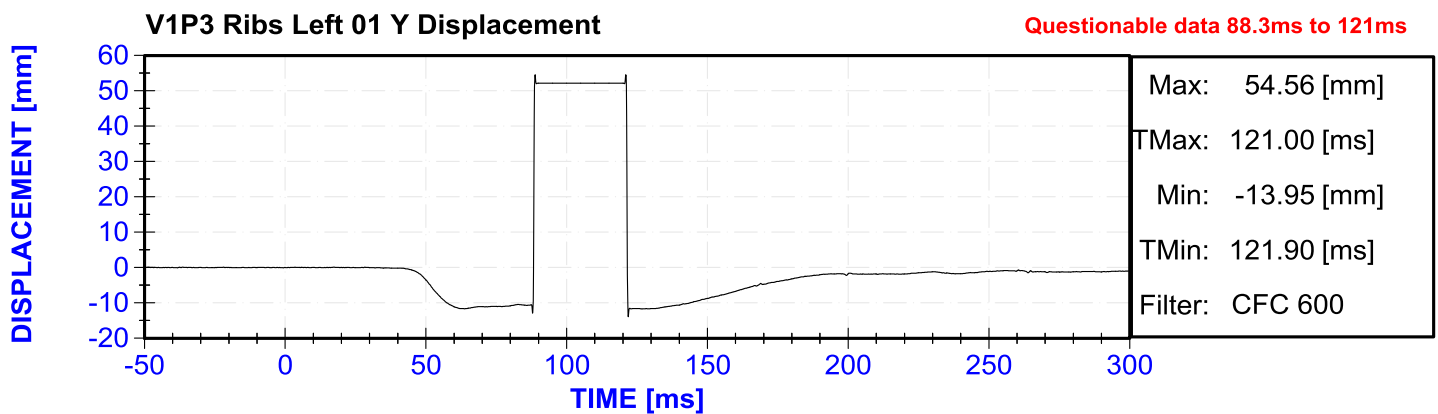
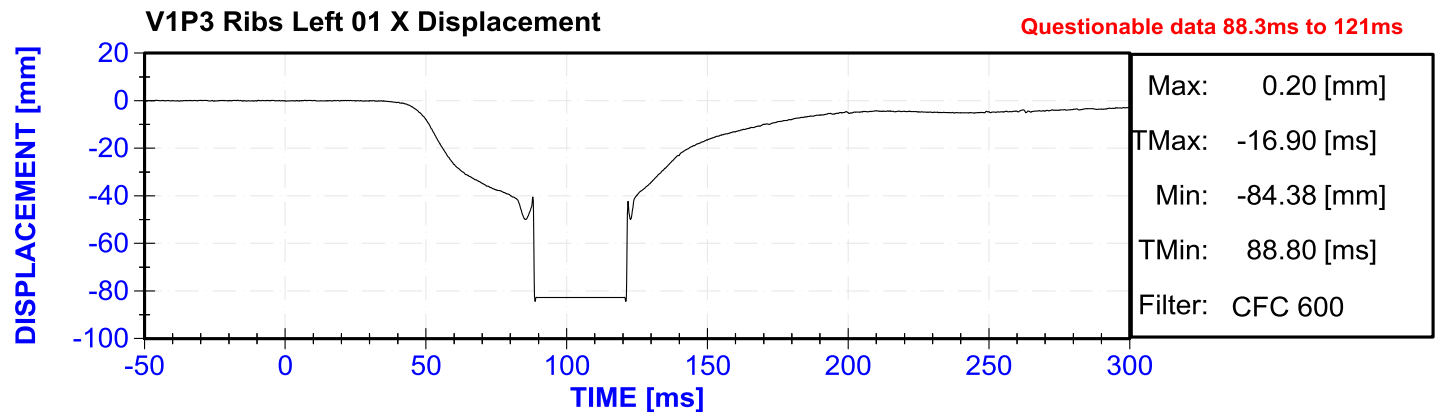
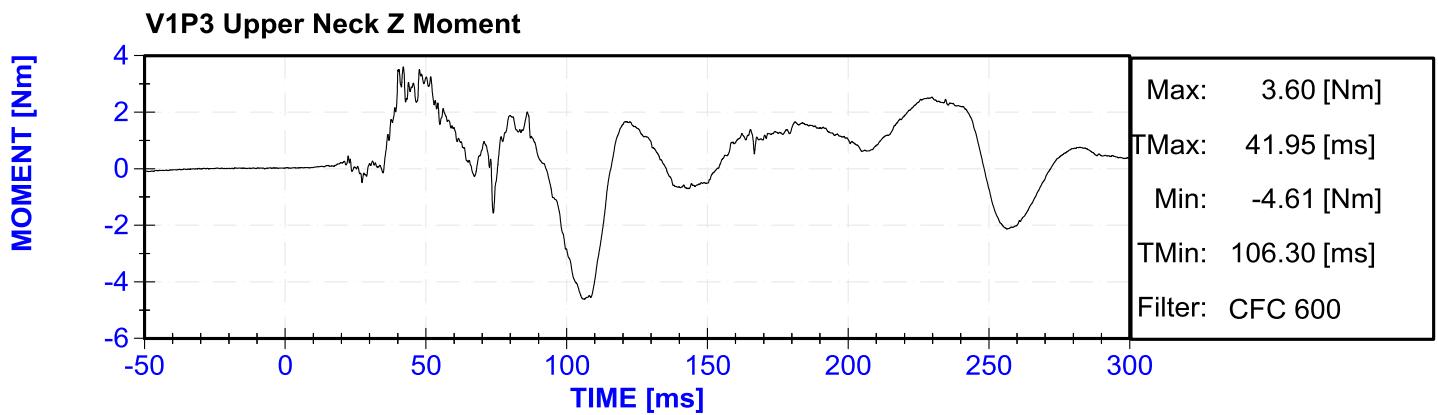
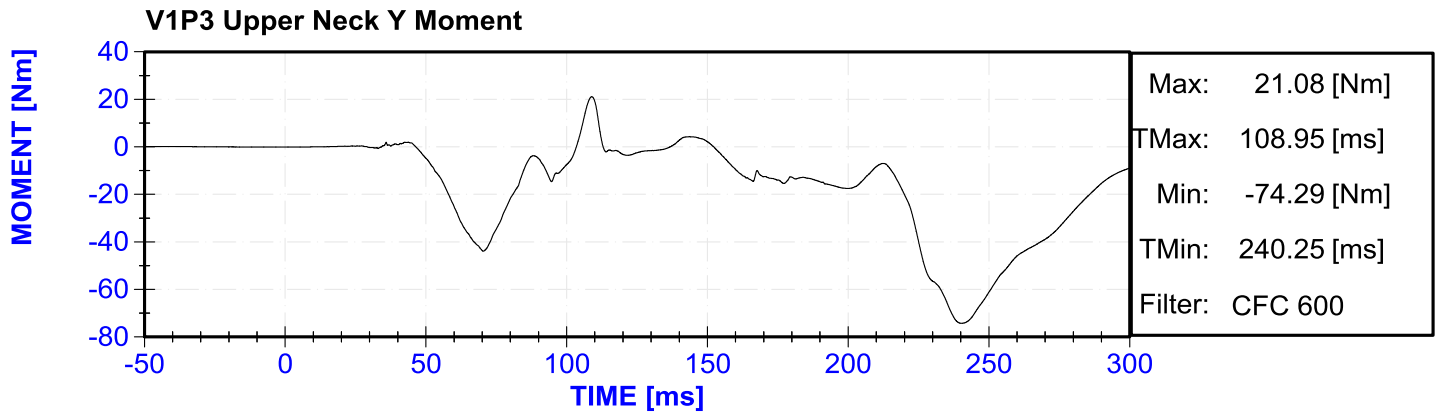


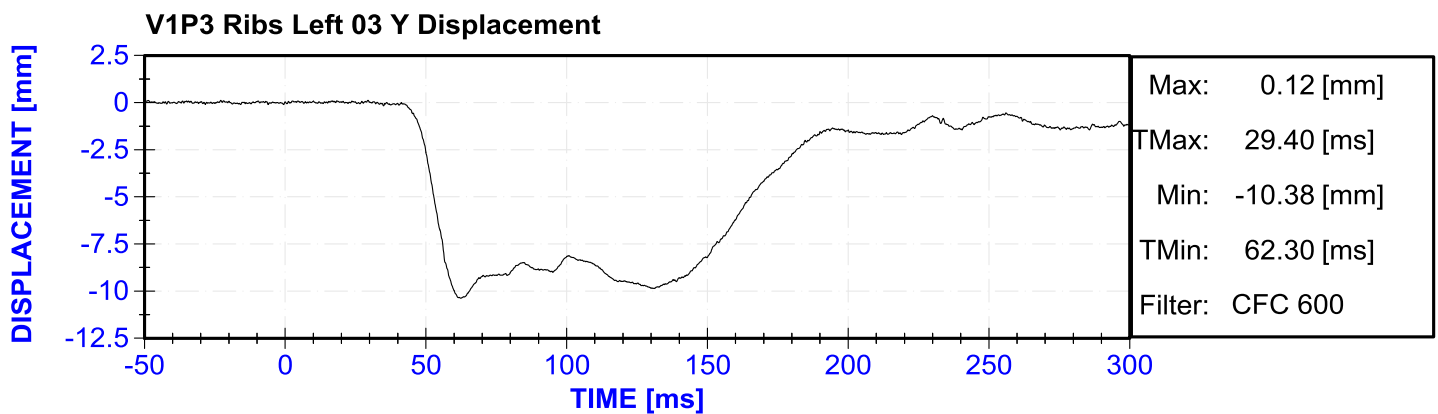
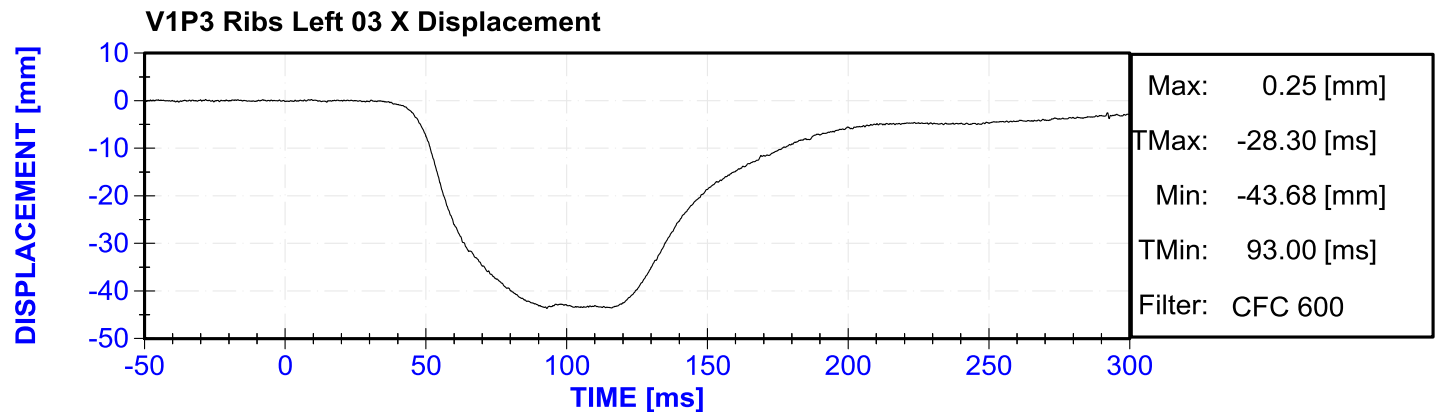
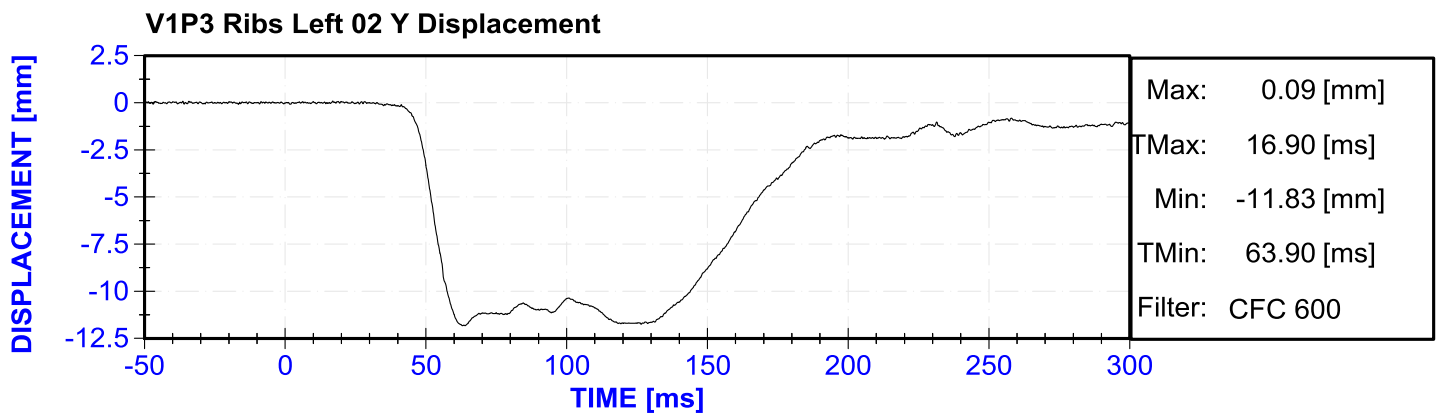
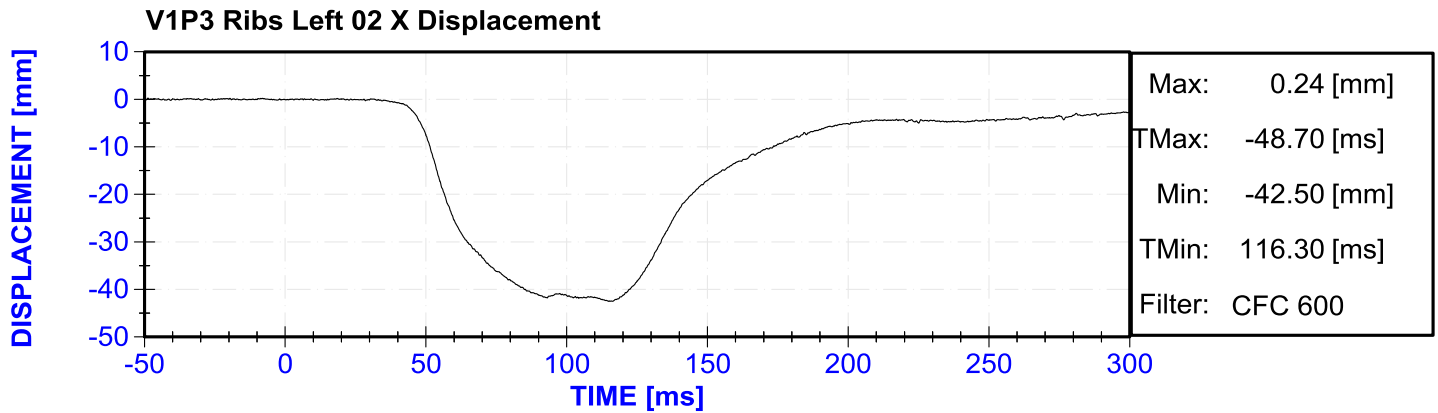
## V1P3 Head CG Z Acceleration

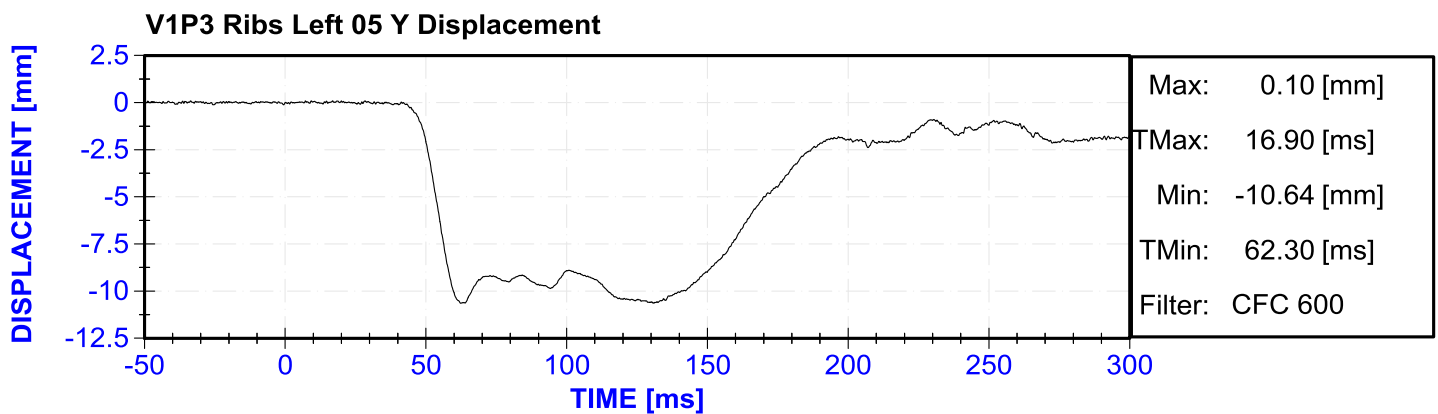
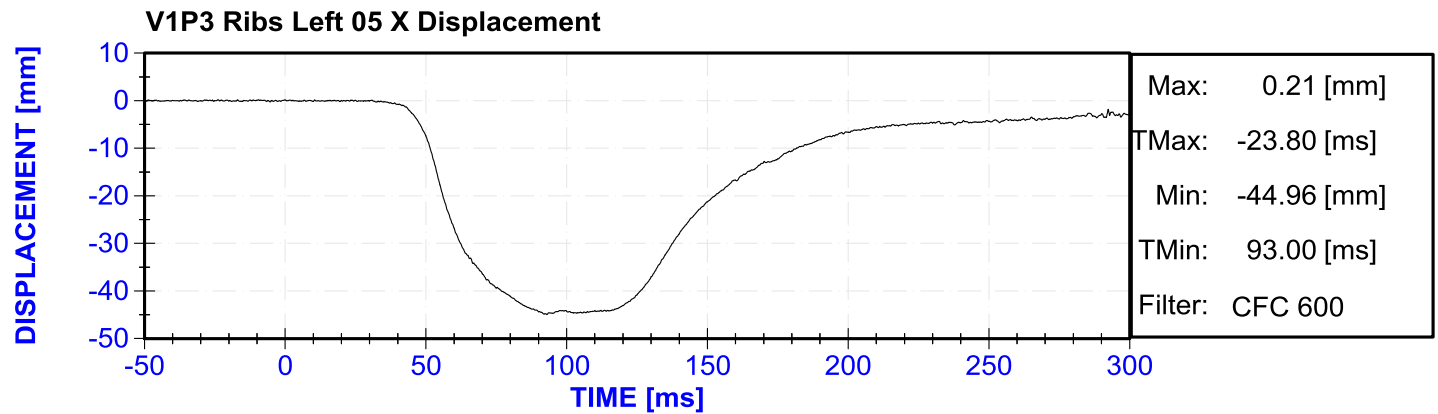
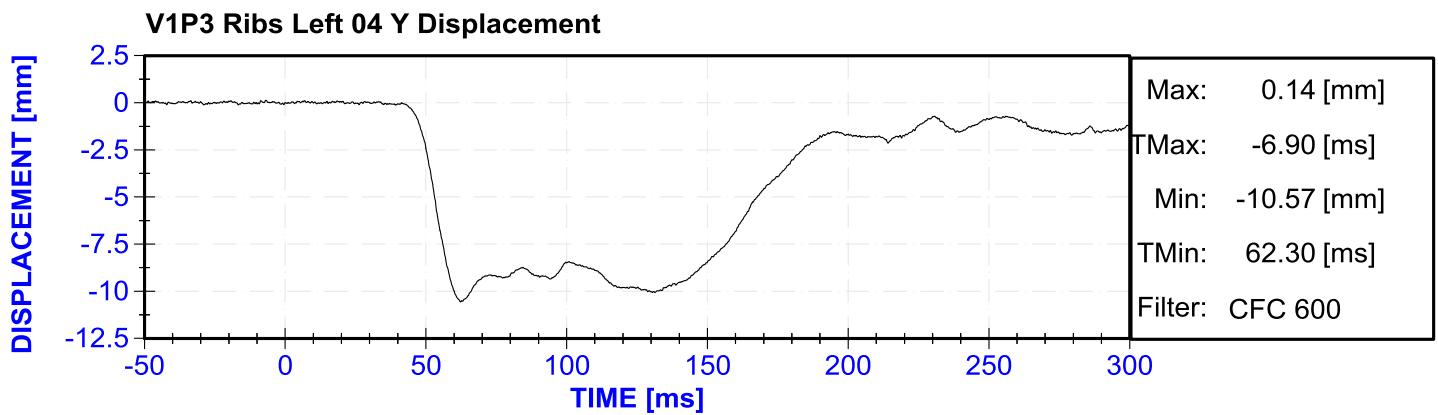
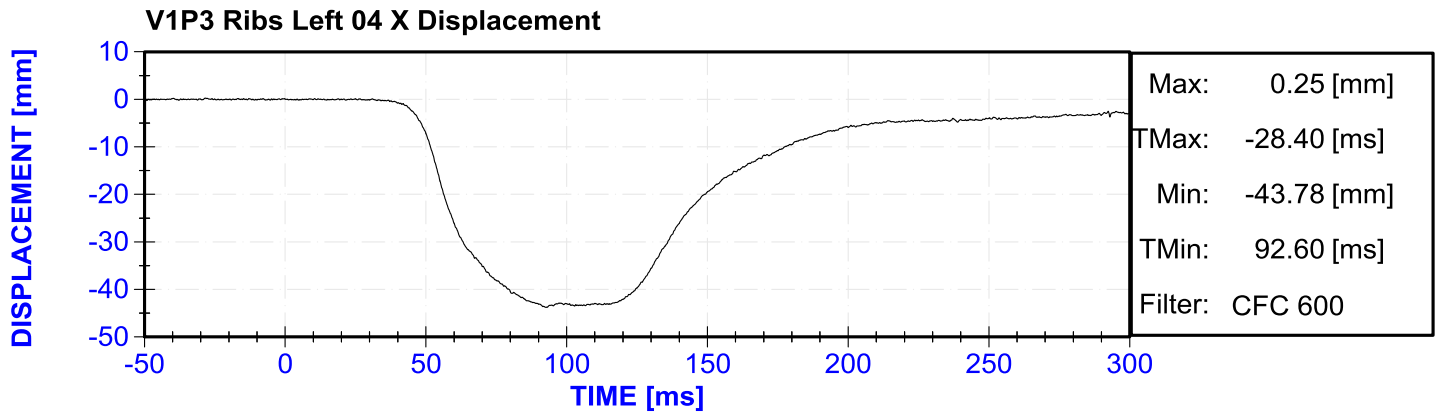


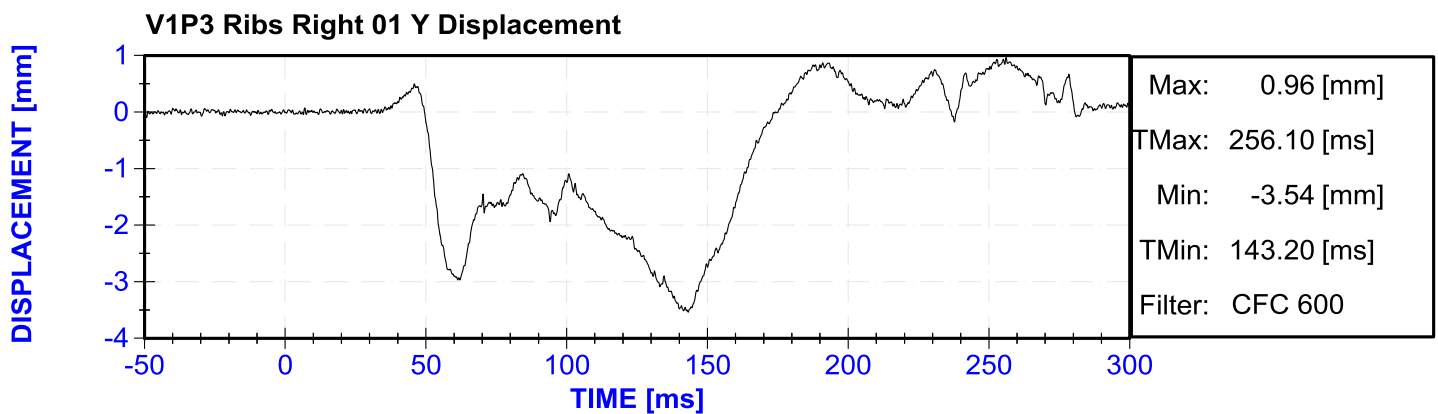
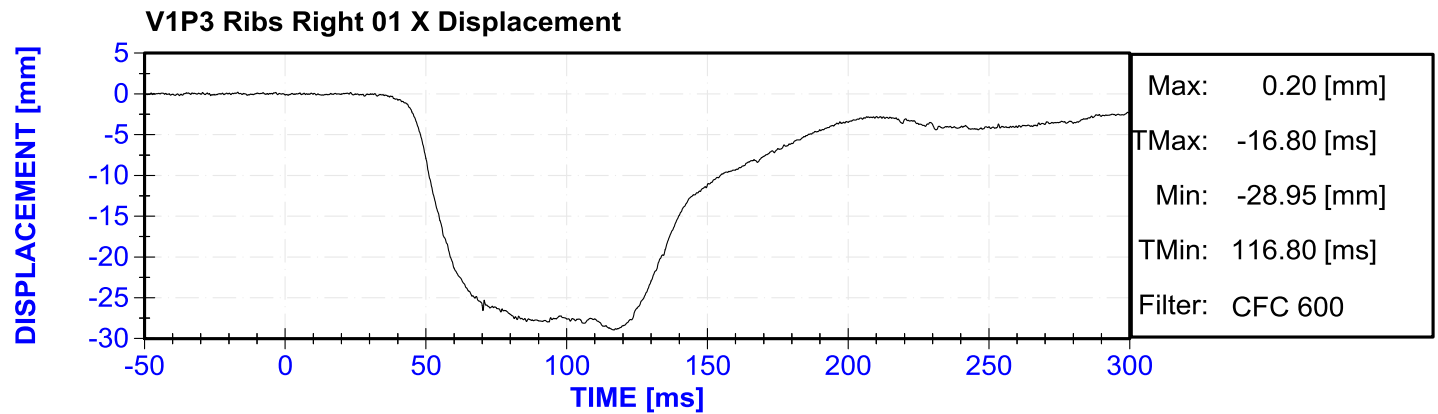
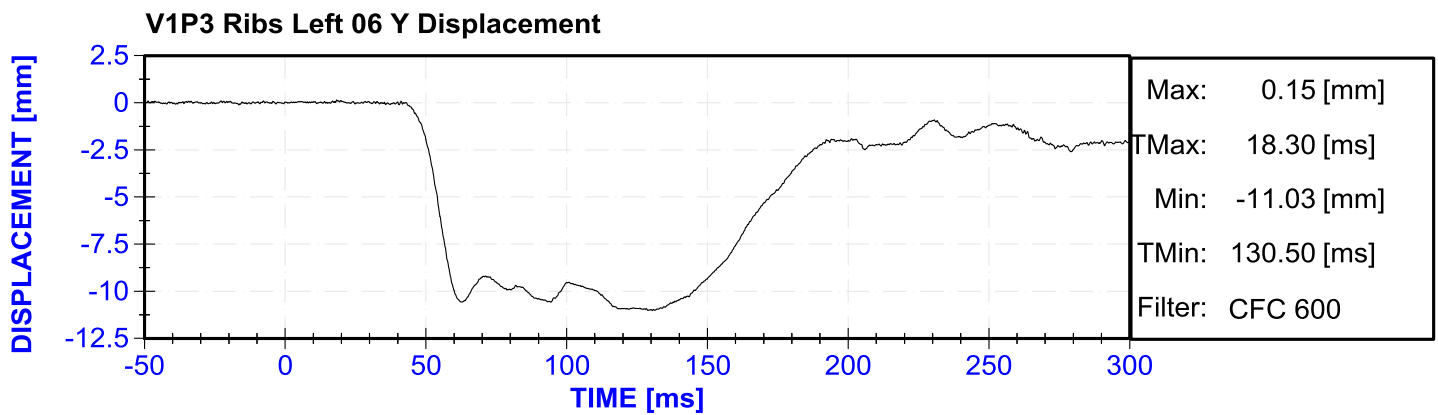
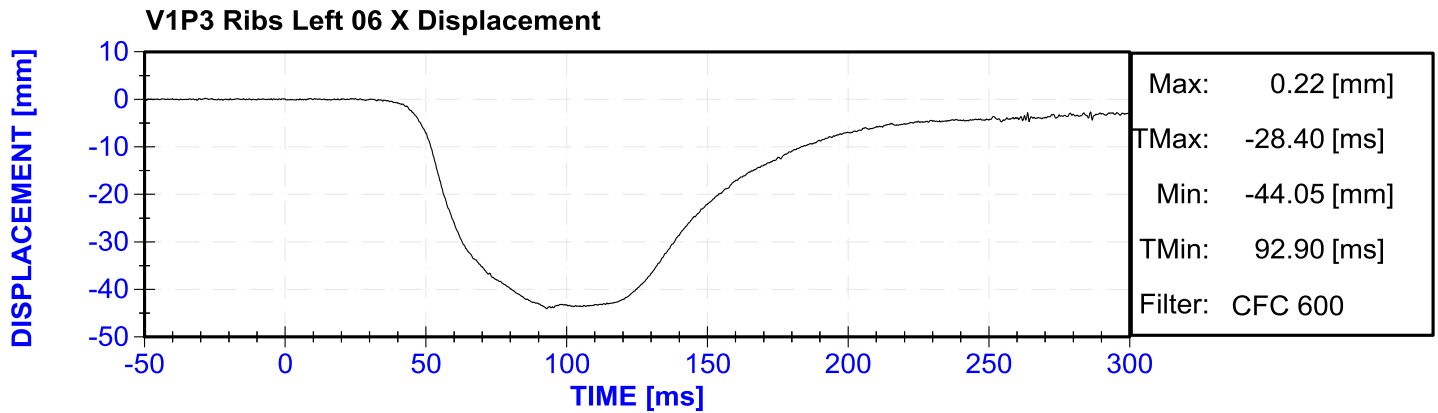




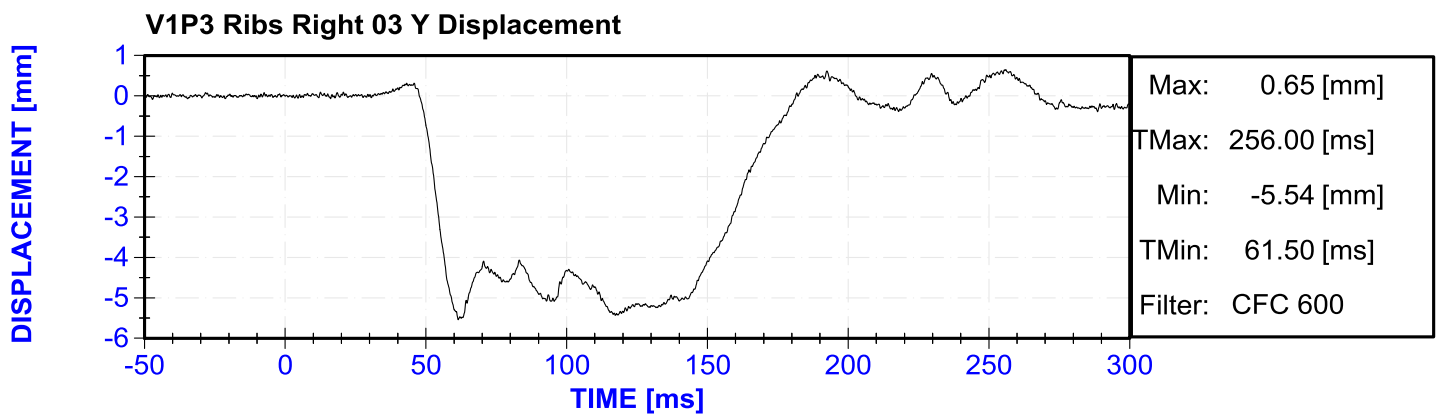
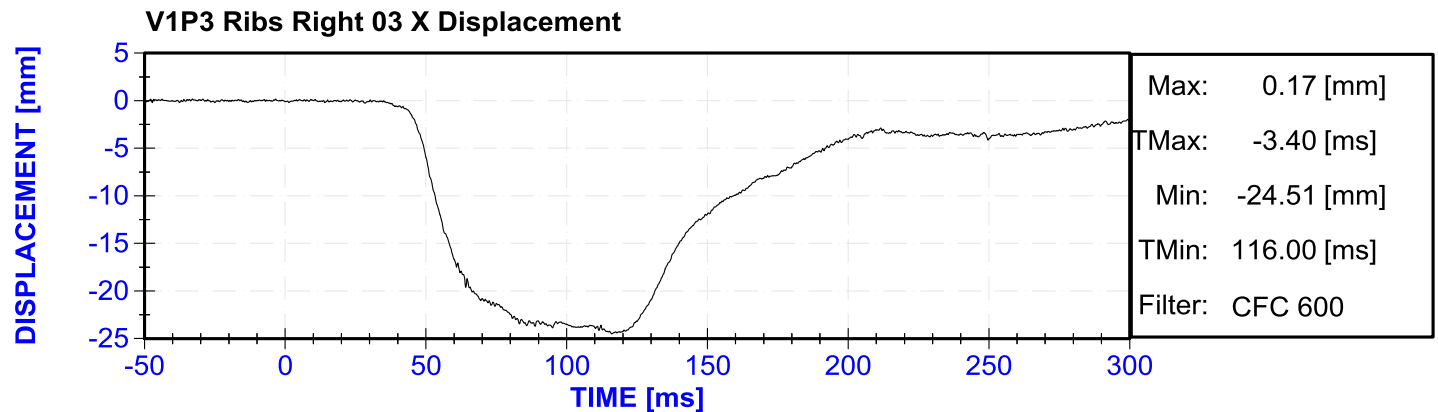
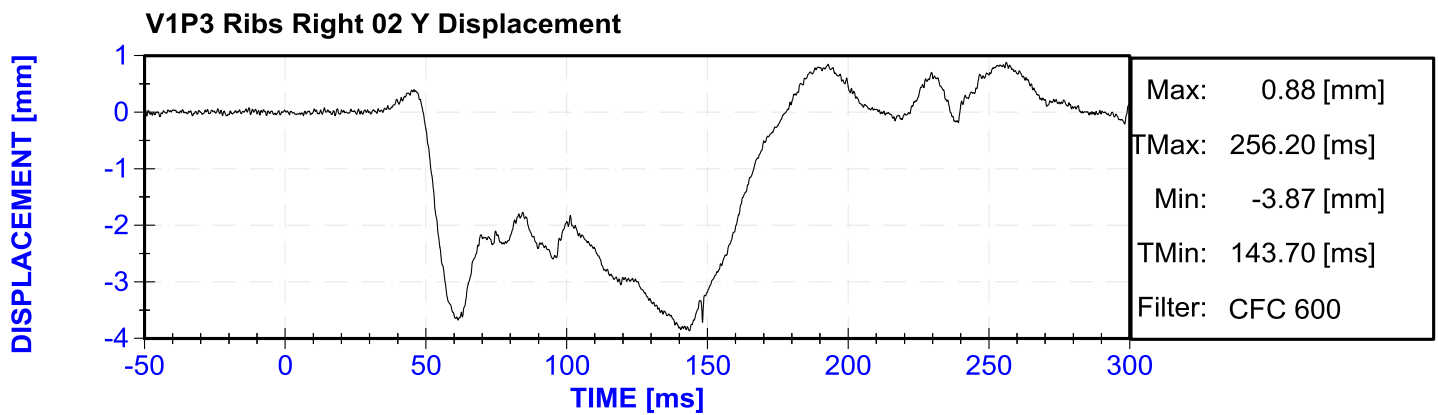
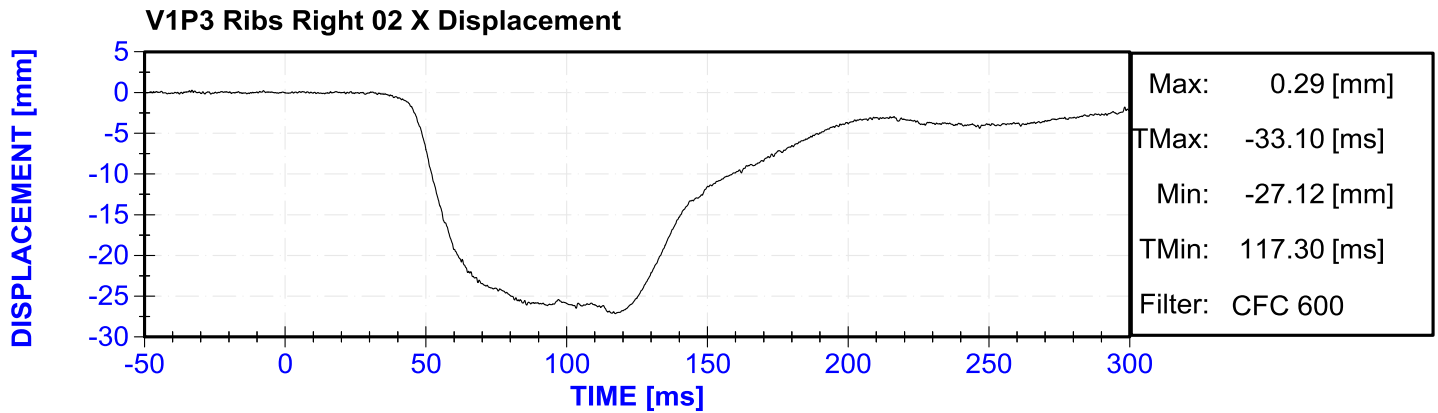


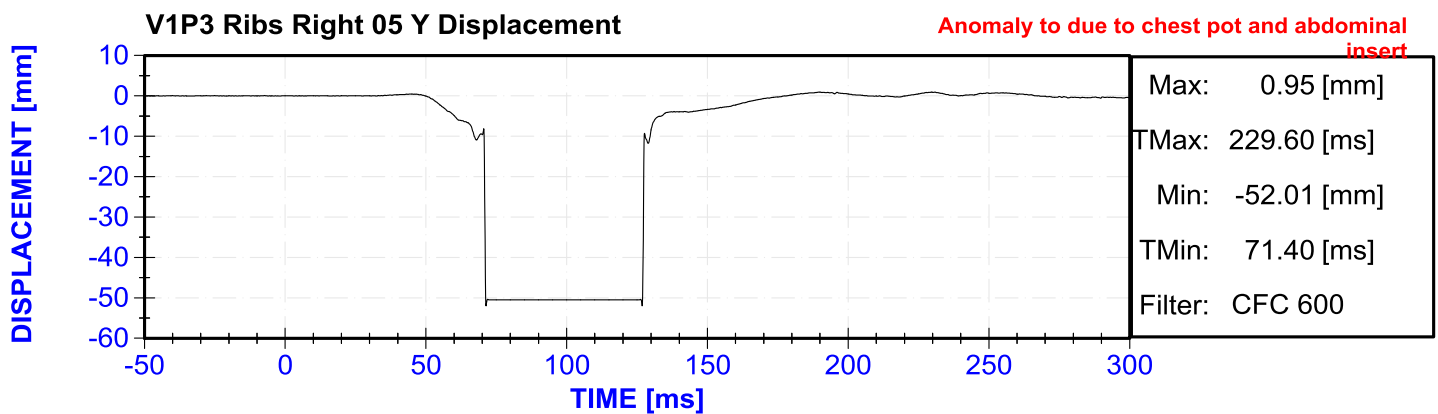
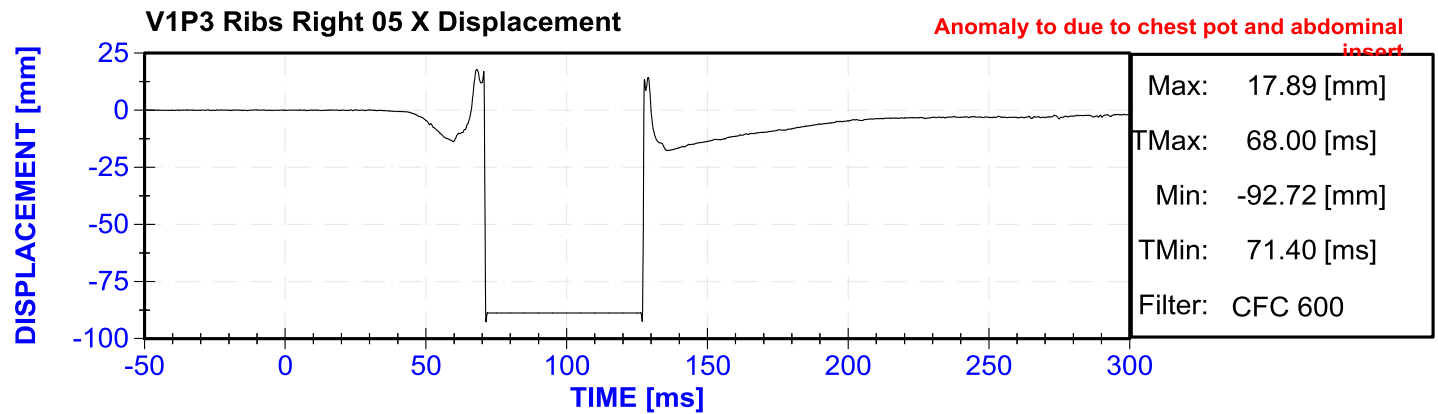
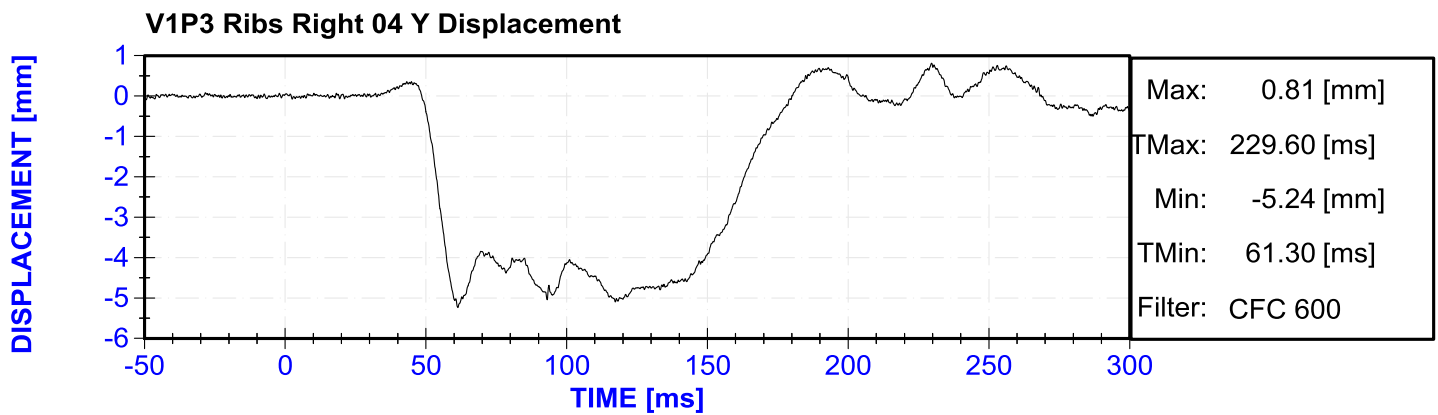
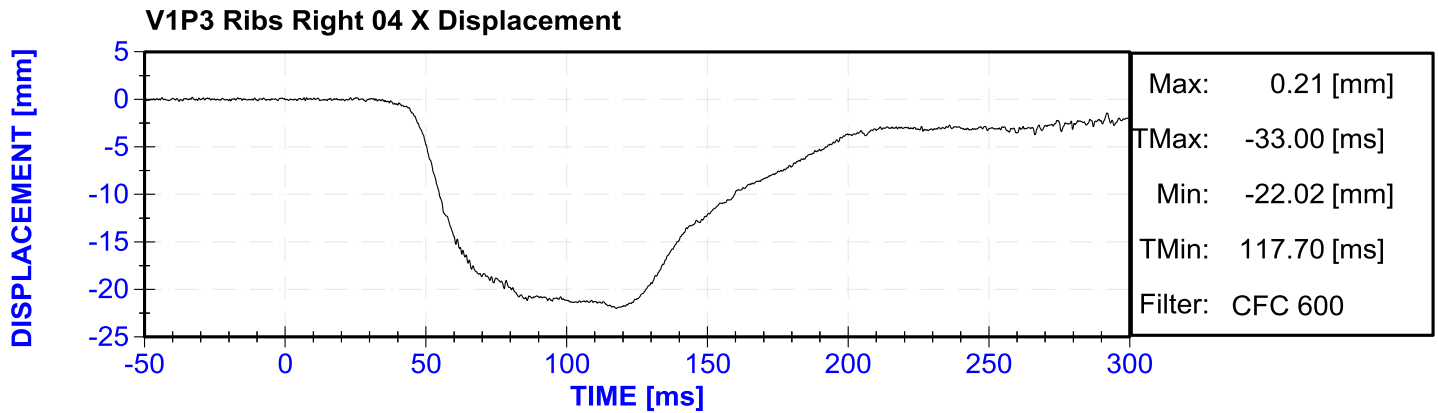


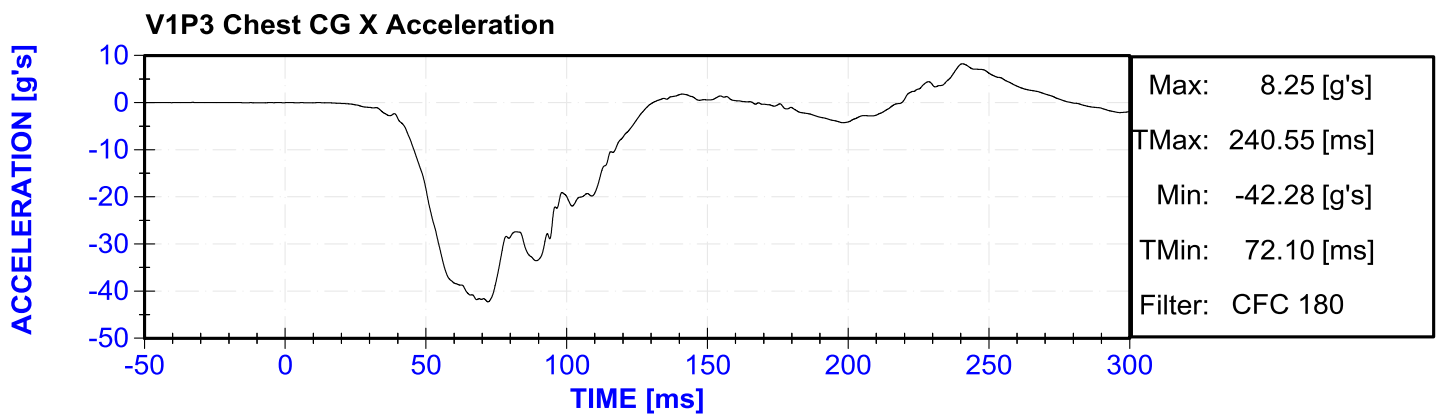
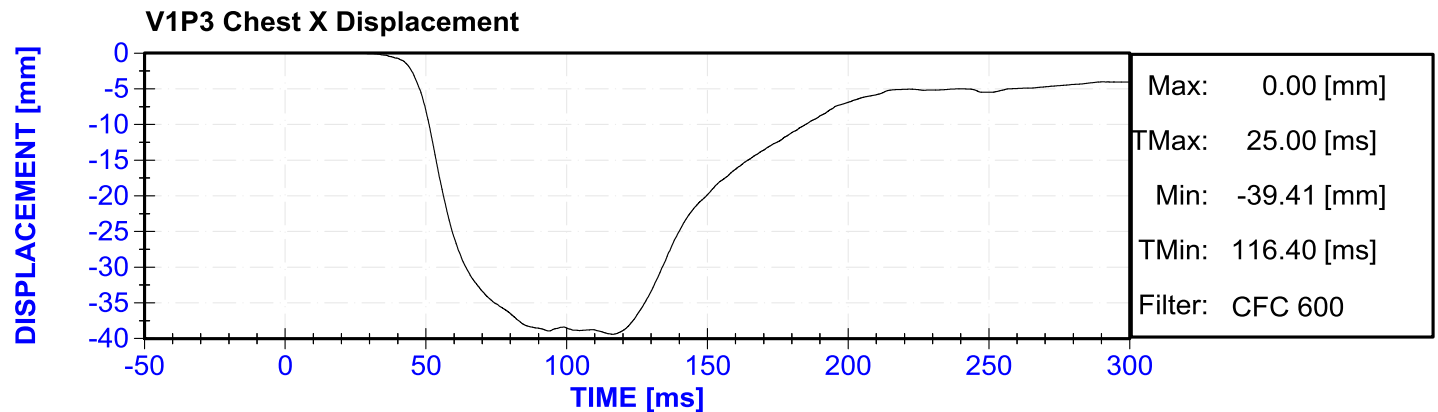
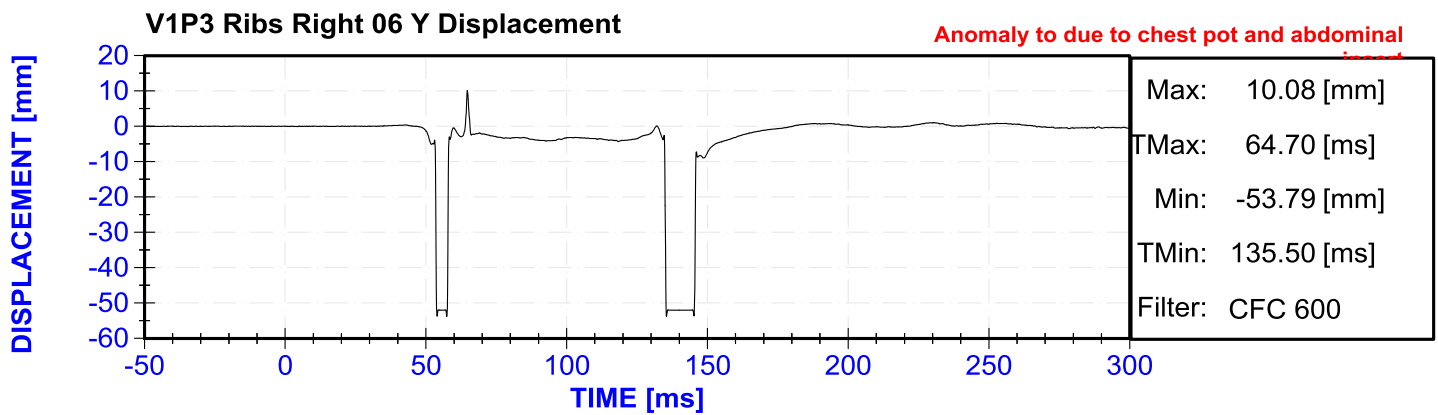
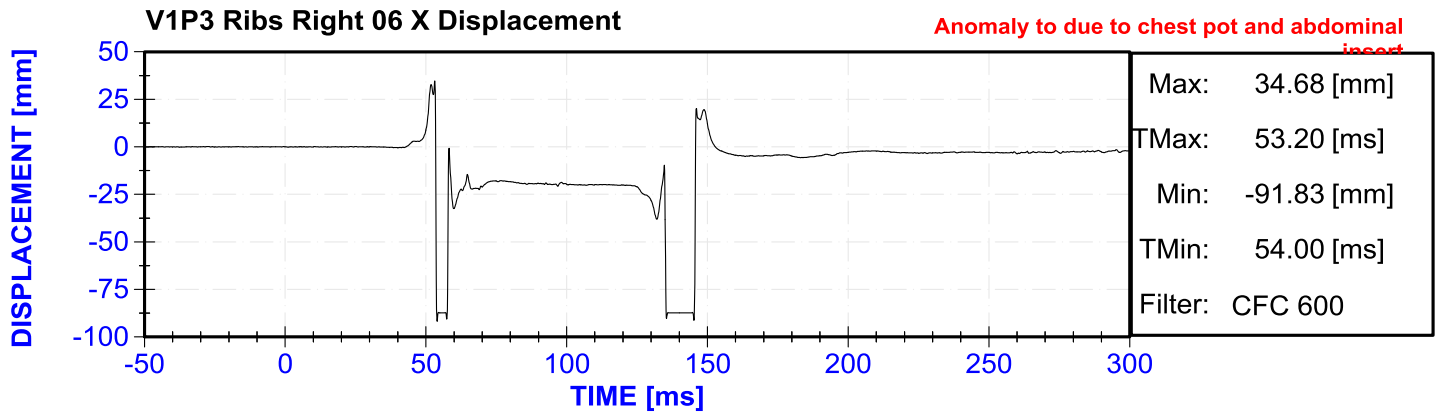


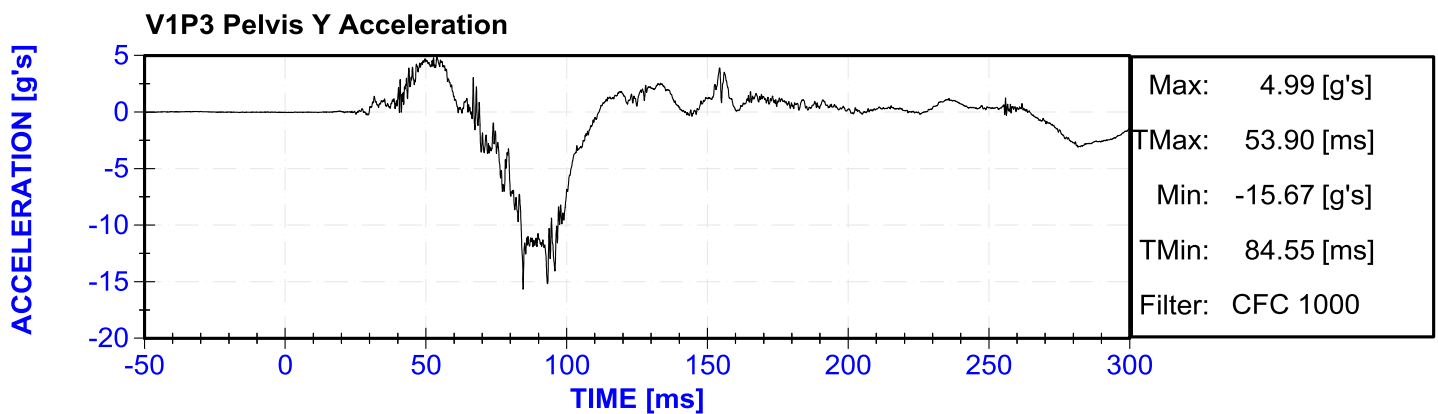
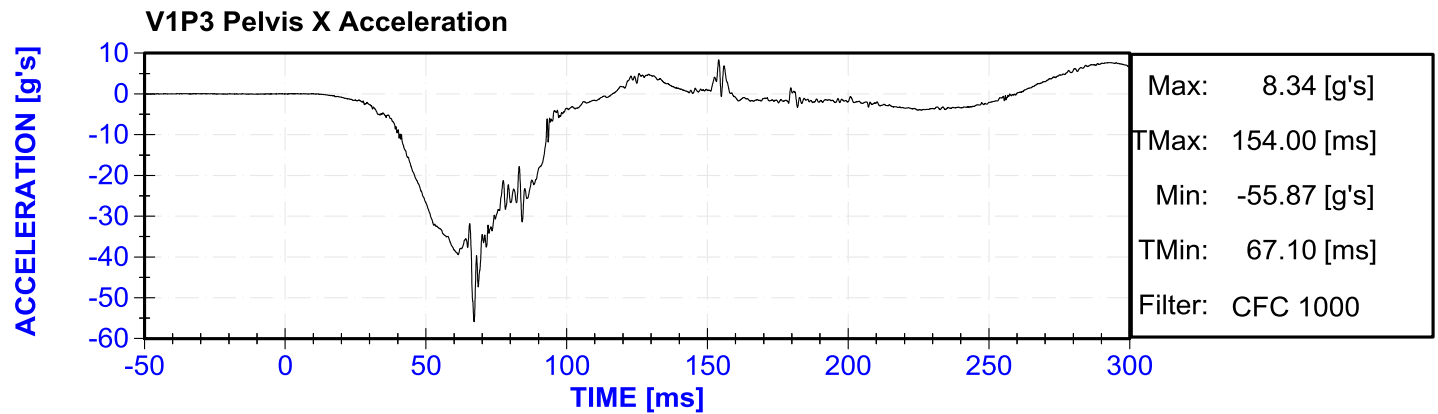
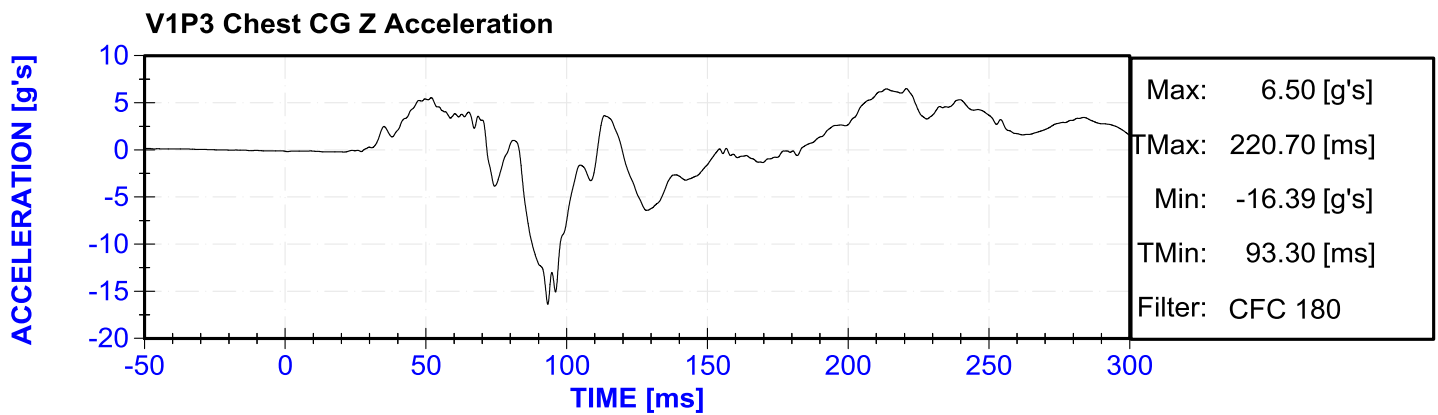
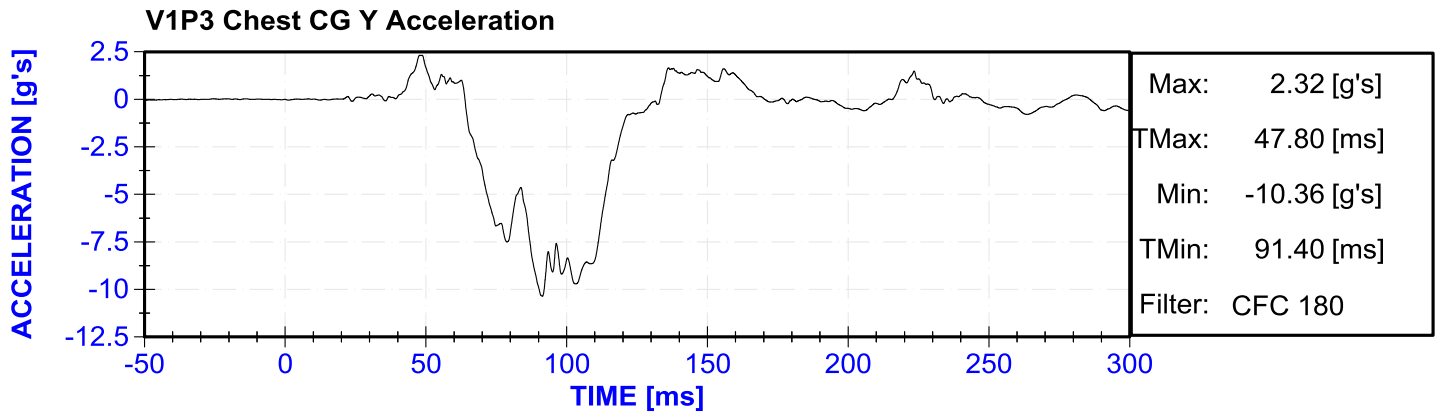




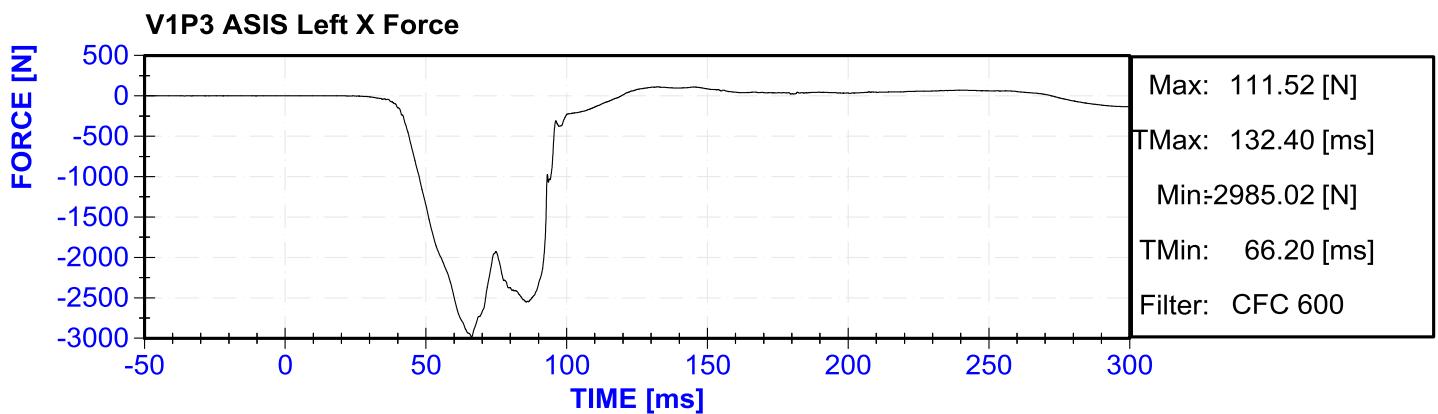
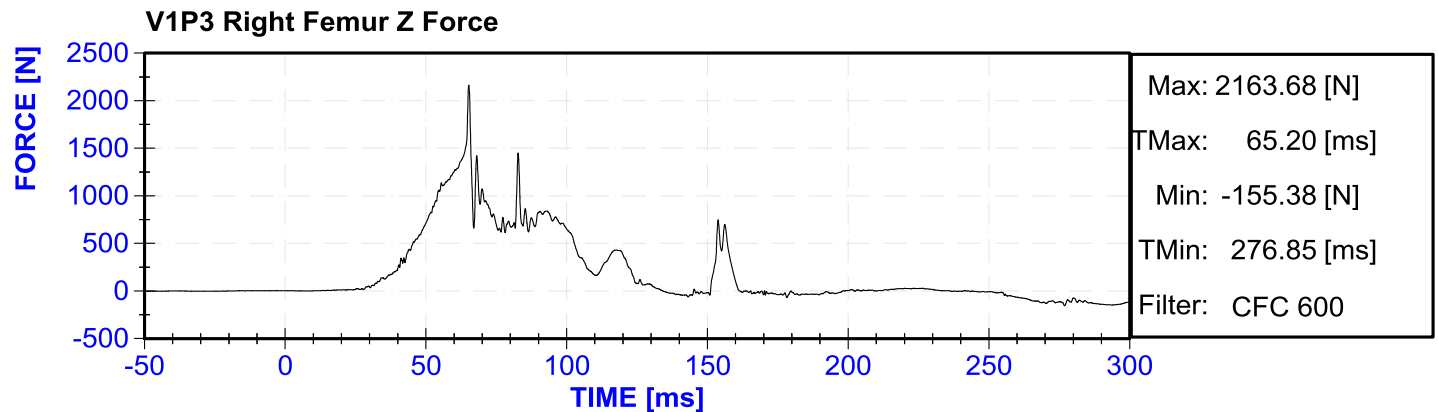
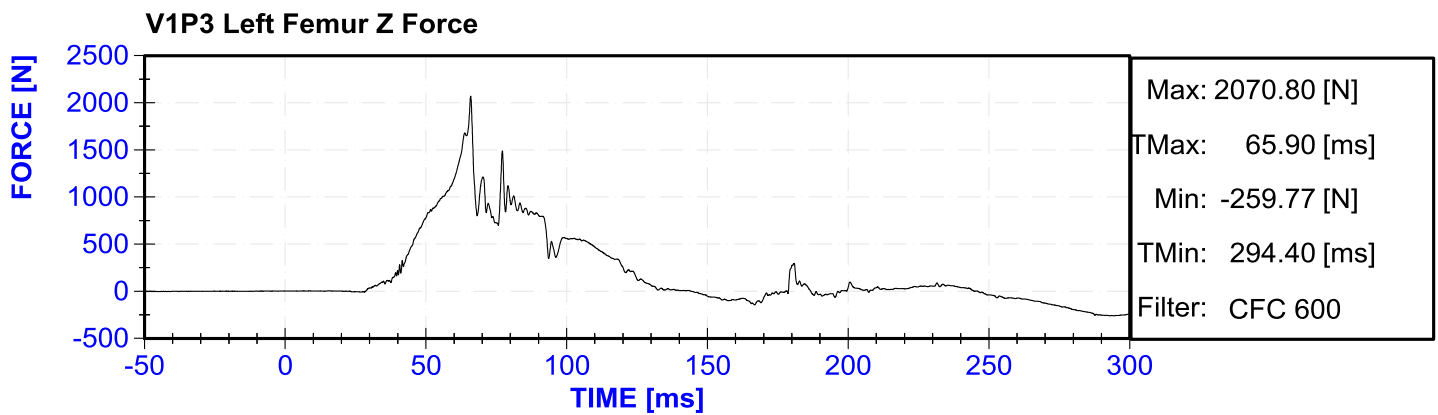
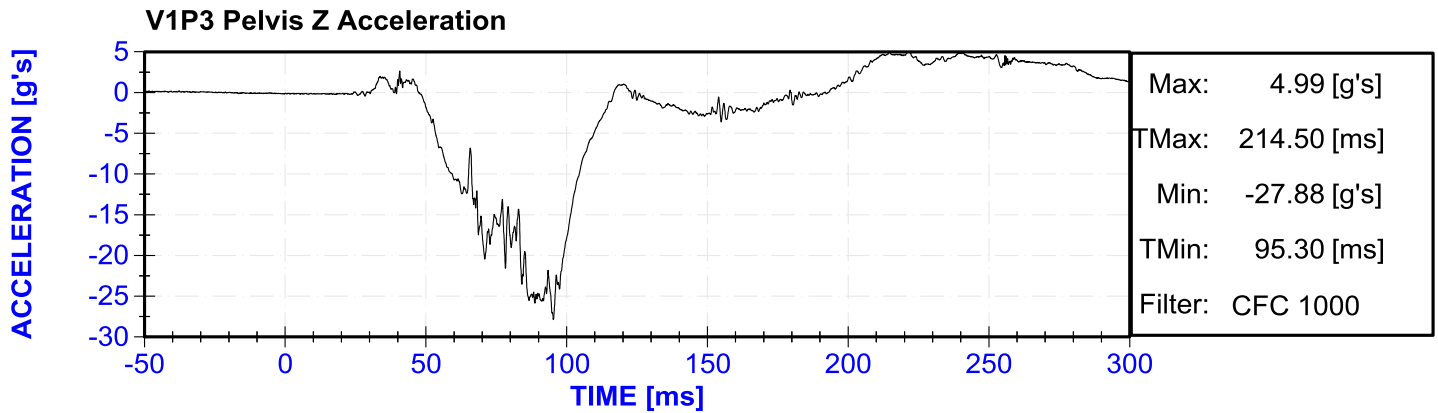


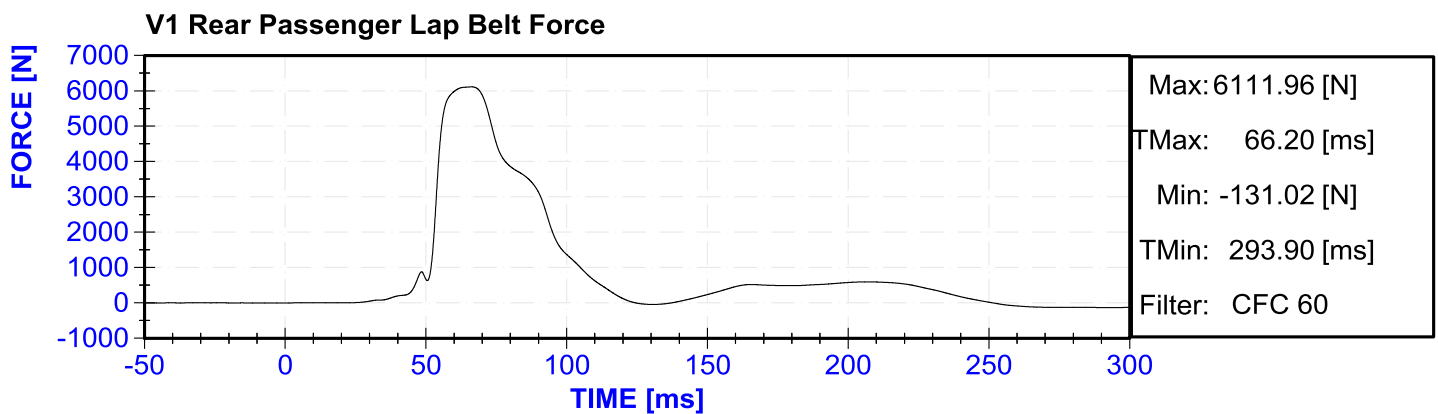
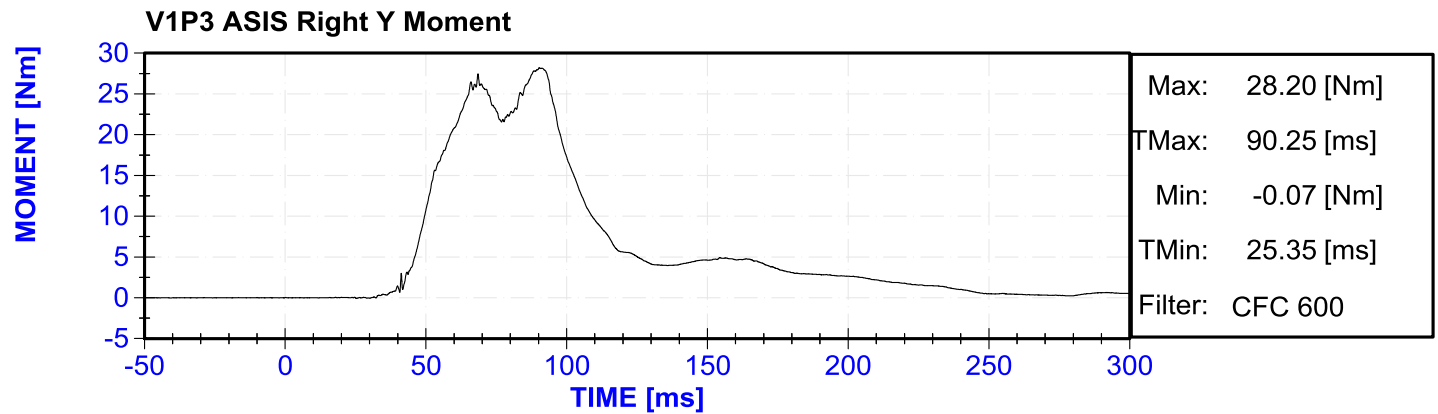
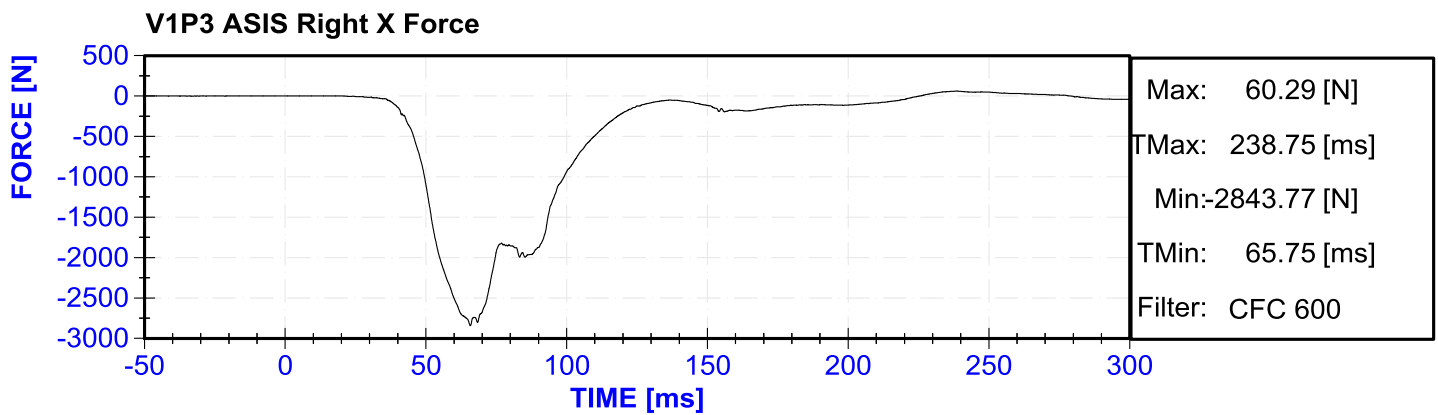
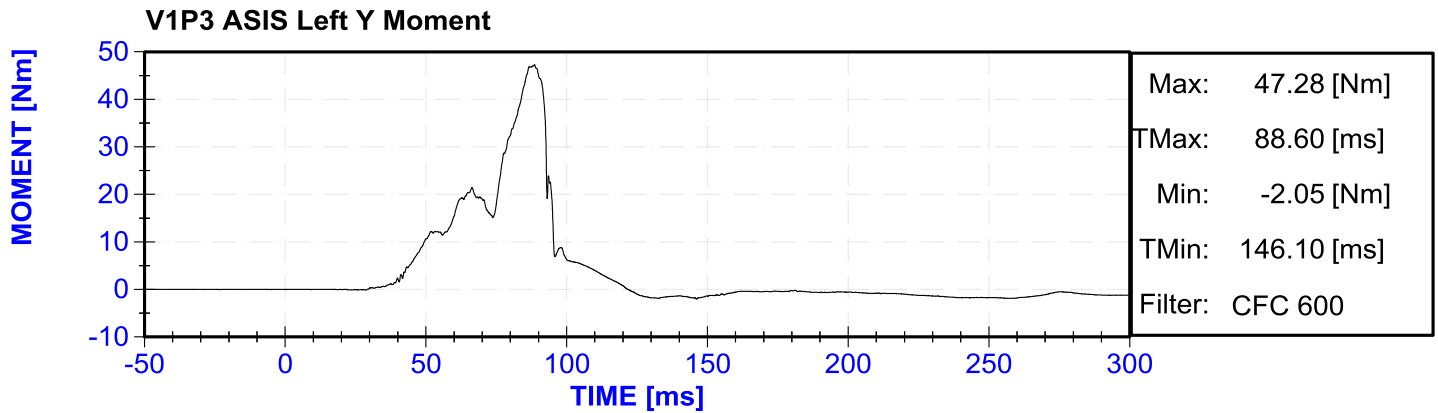




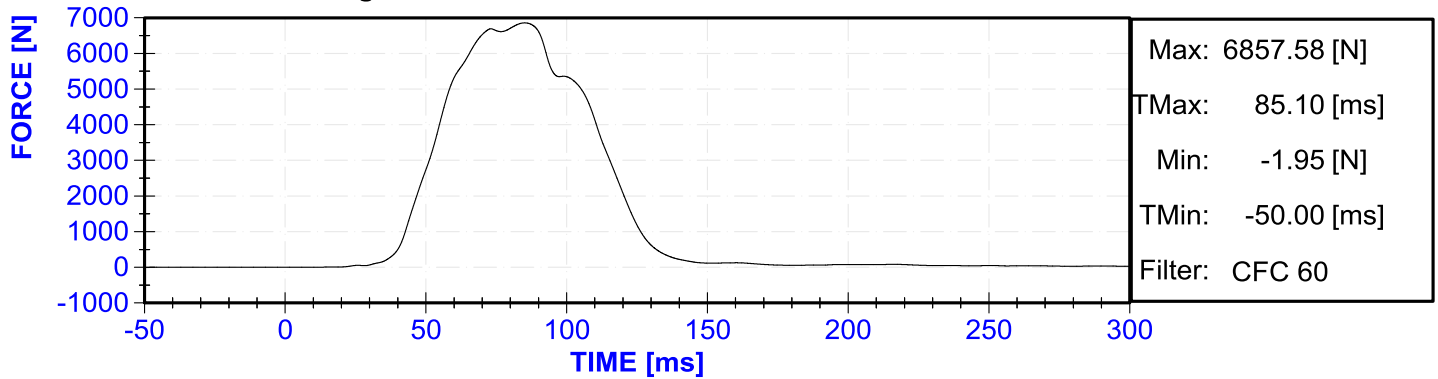




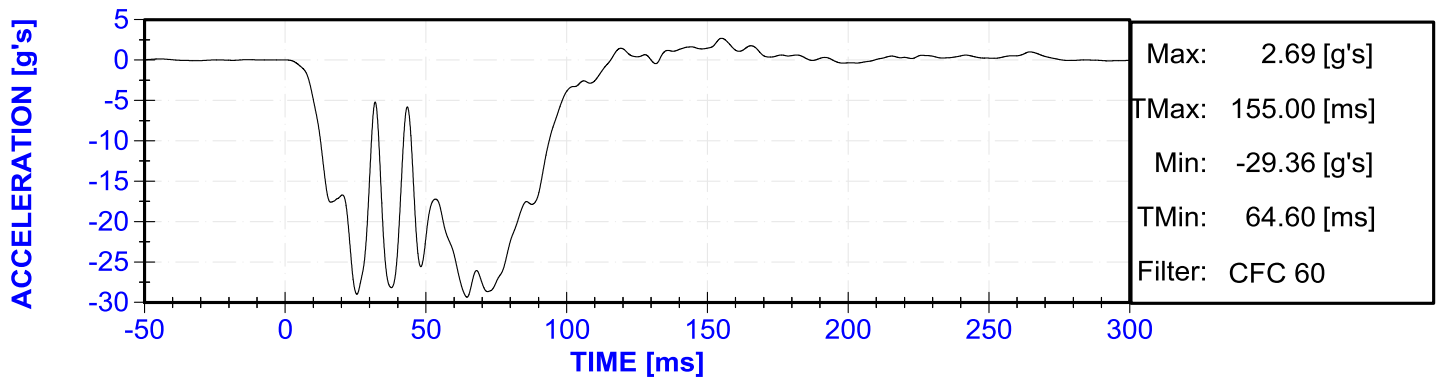




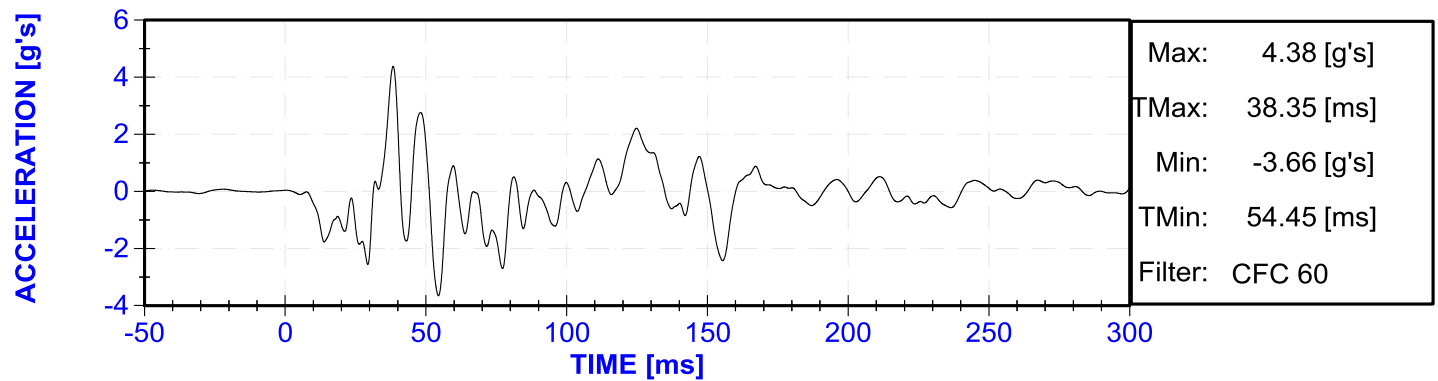
V1 Rear Passenger Shoulder Belt Force



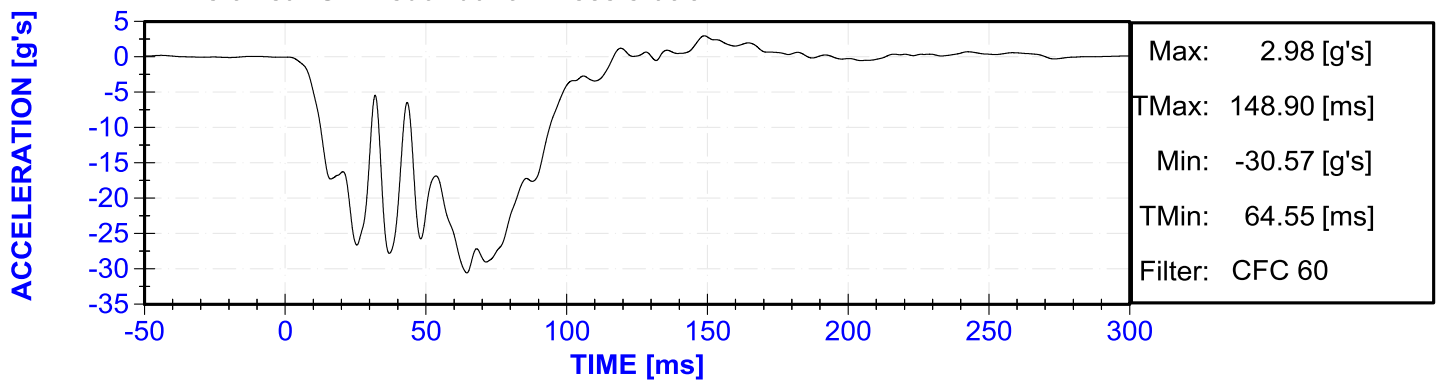
V1 Left Rear Sill X Acceleration

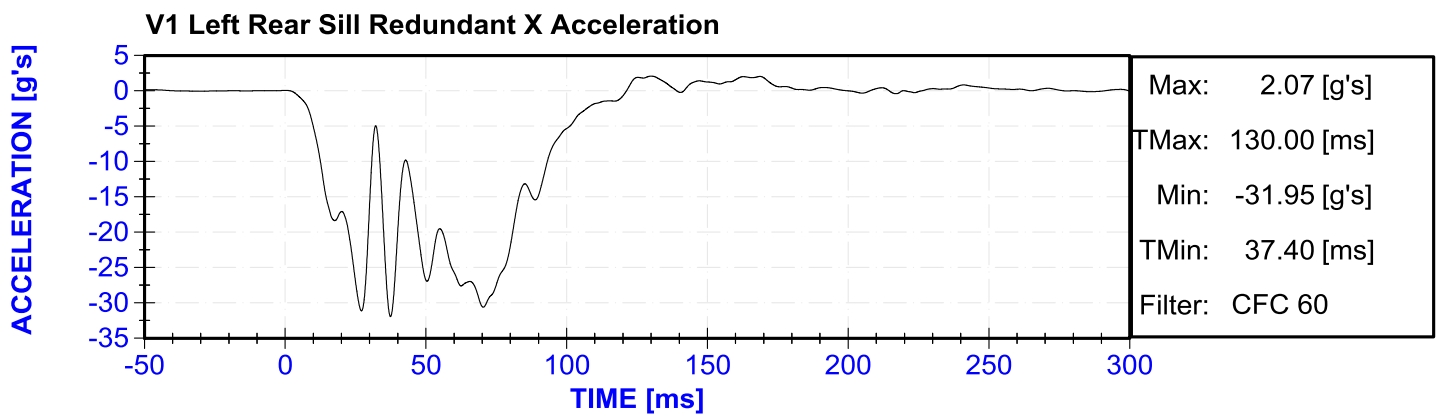
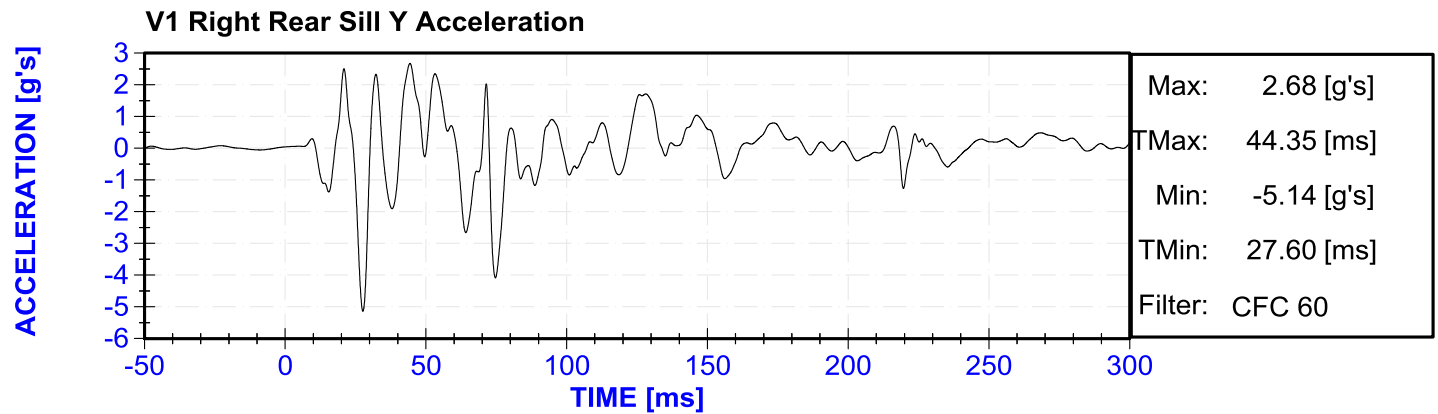
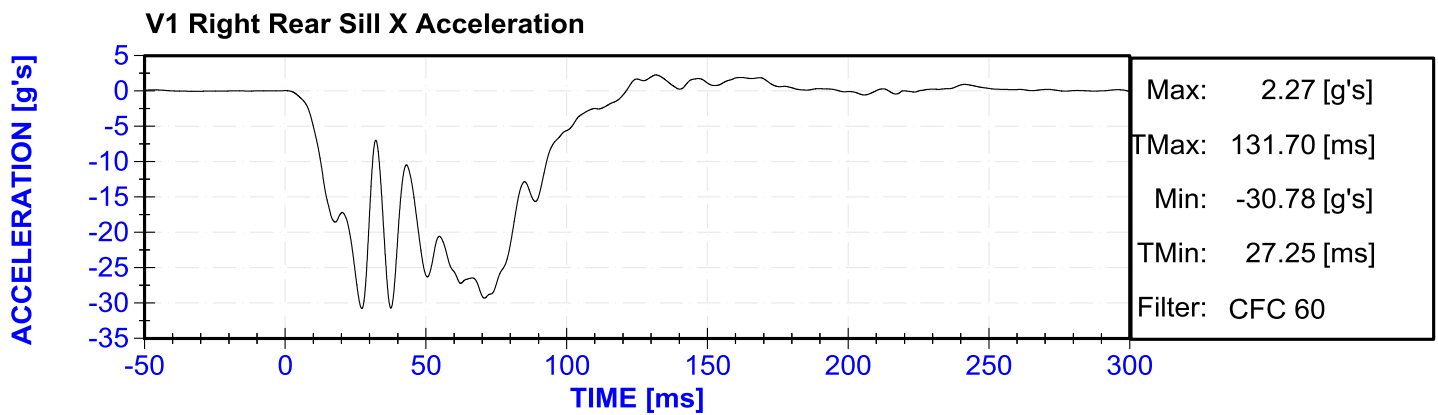
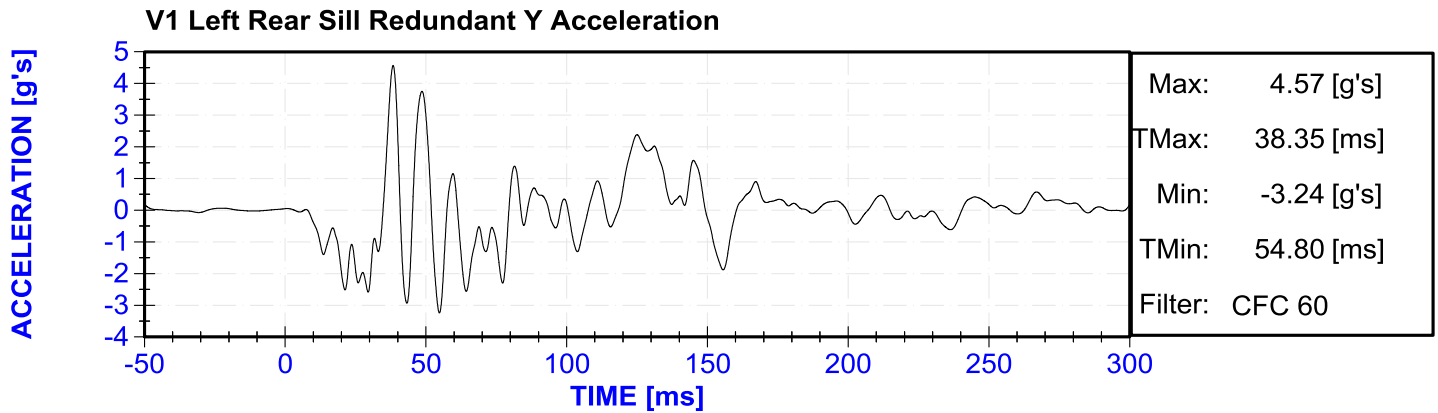


V1 Left Rear Sill Y Acceleration

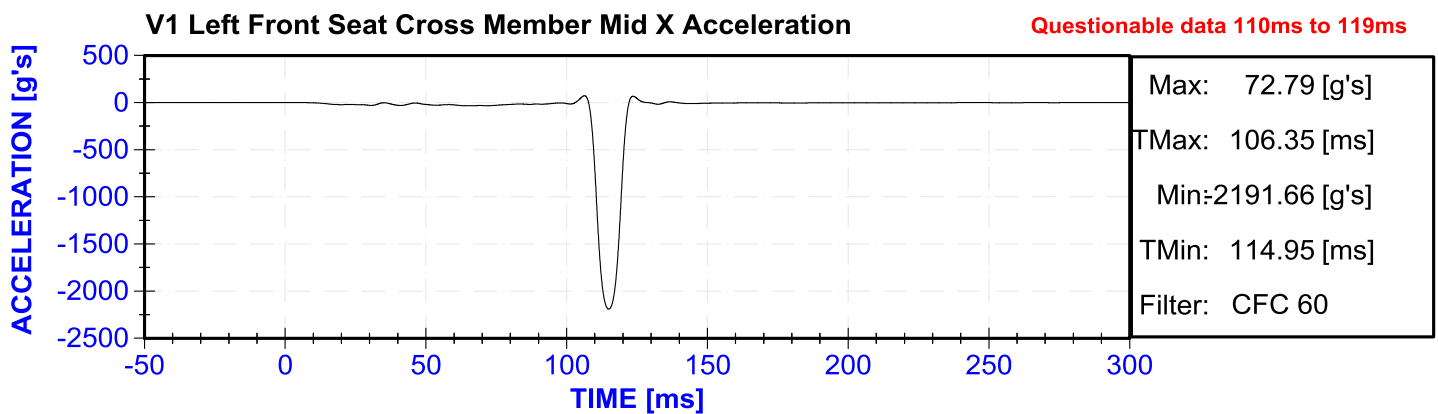
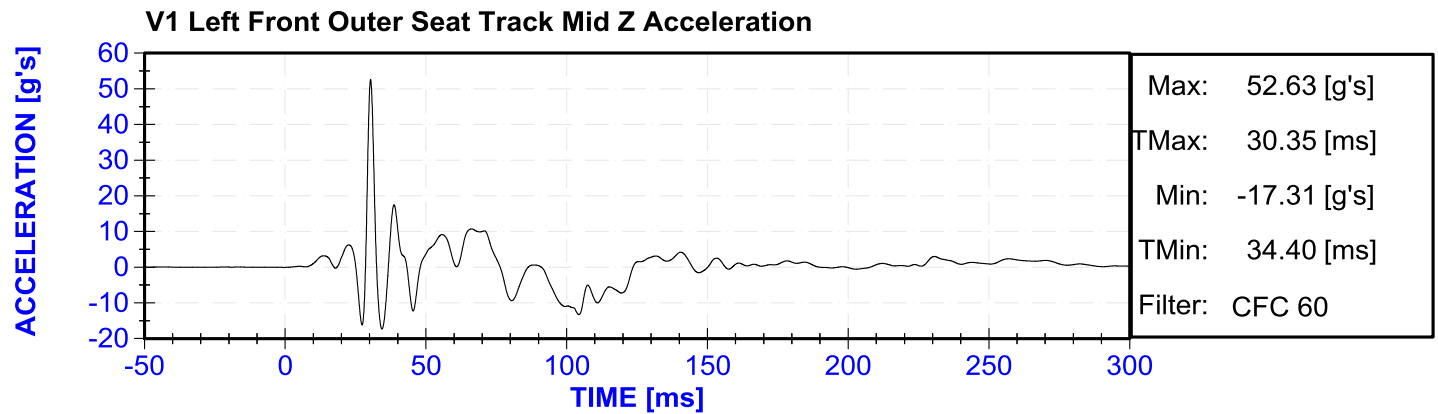
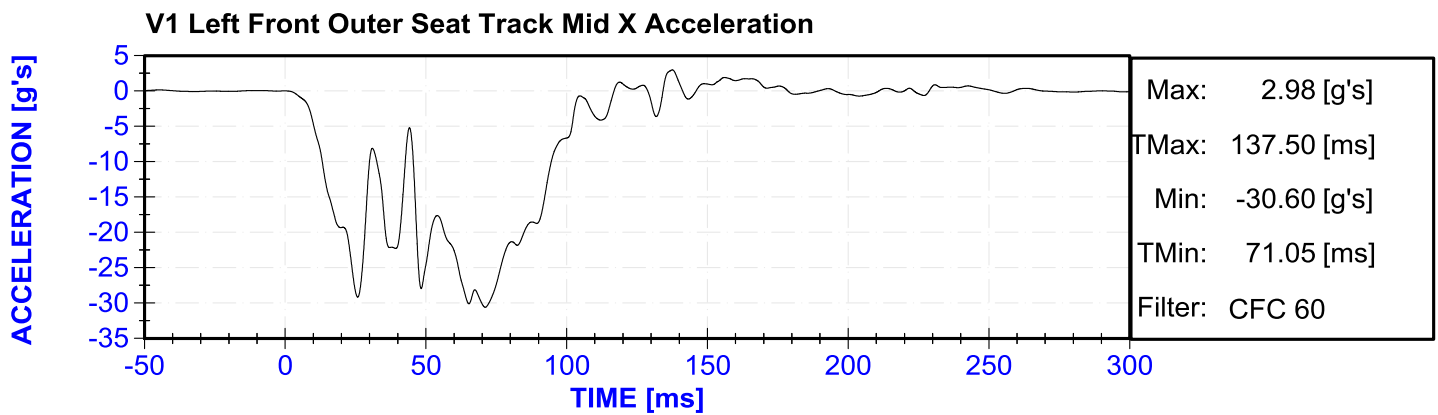
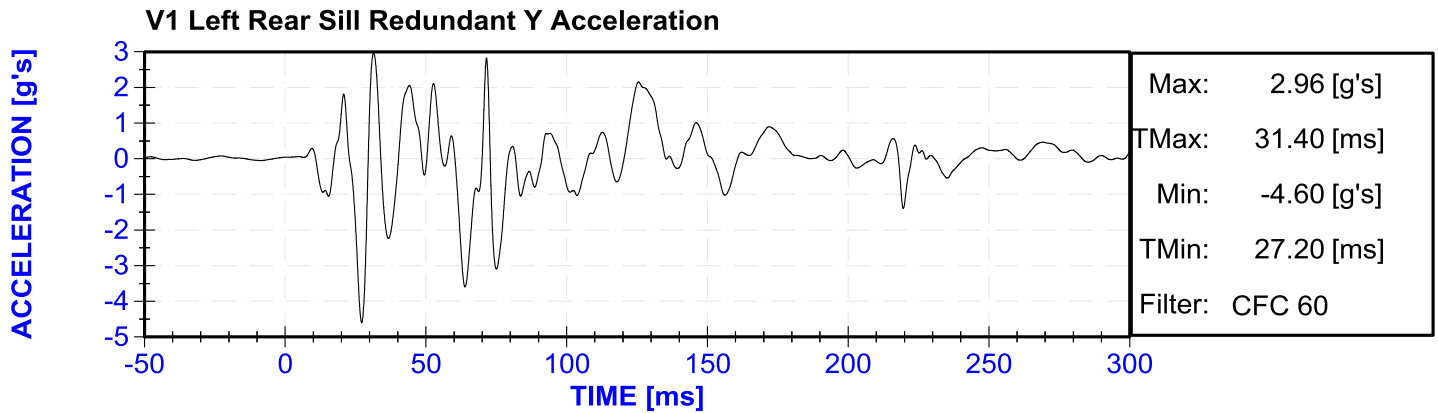


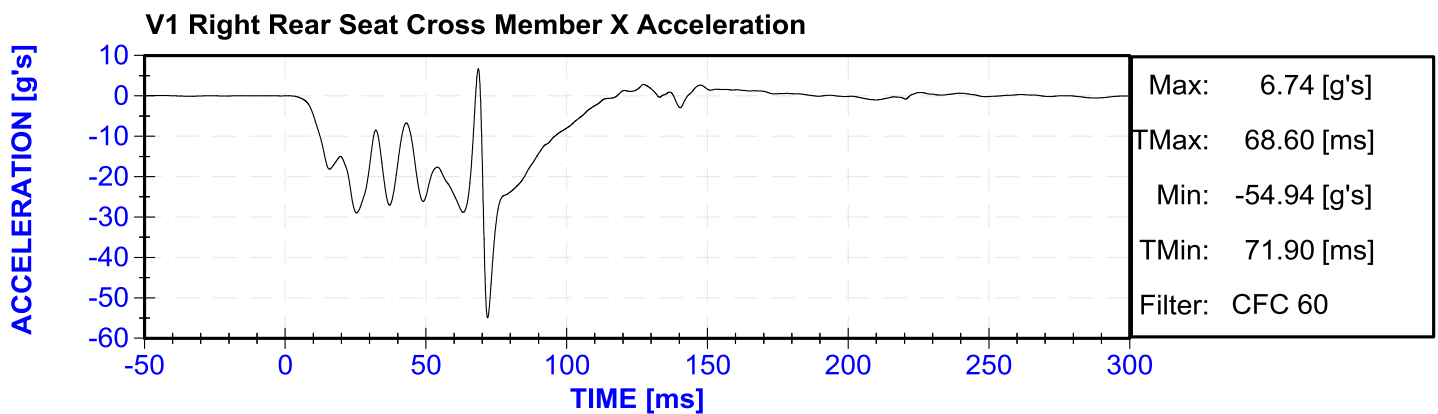
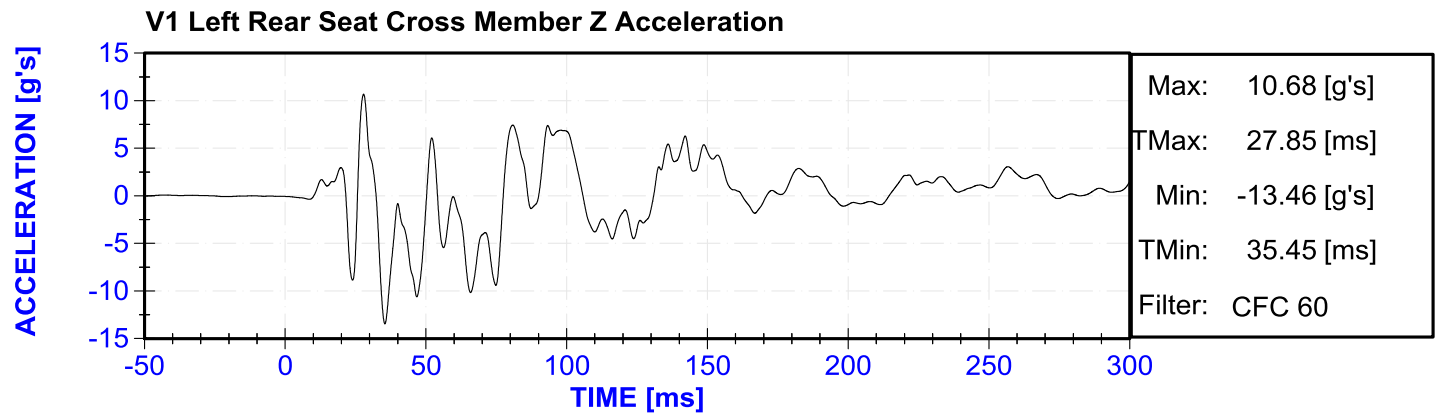
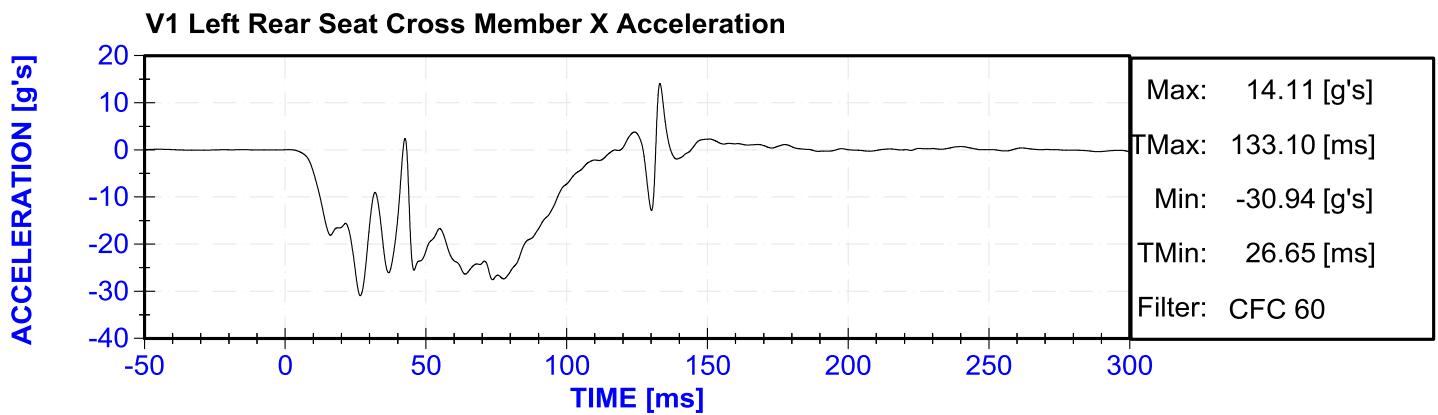
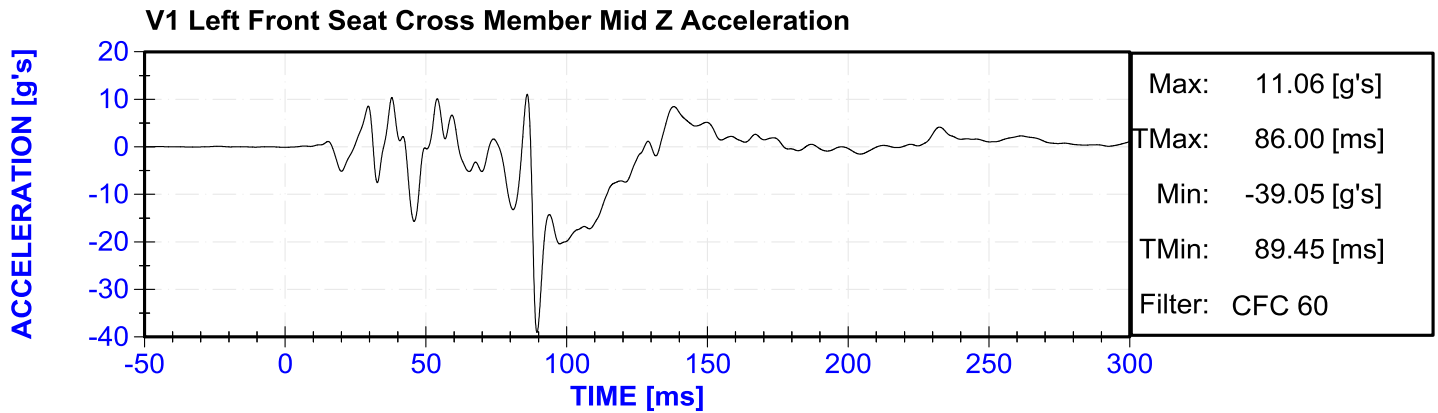
V1 Left Rear Sill Redundant X Acceleration



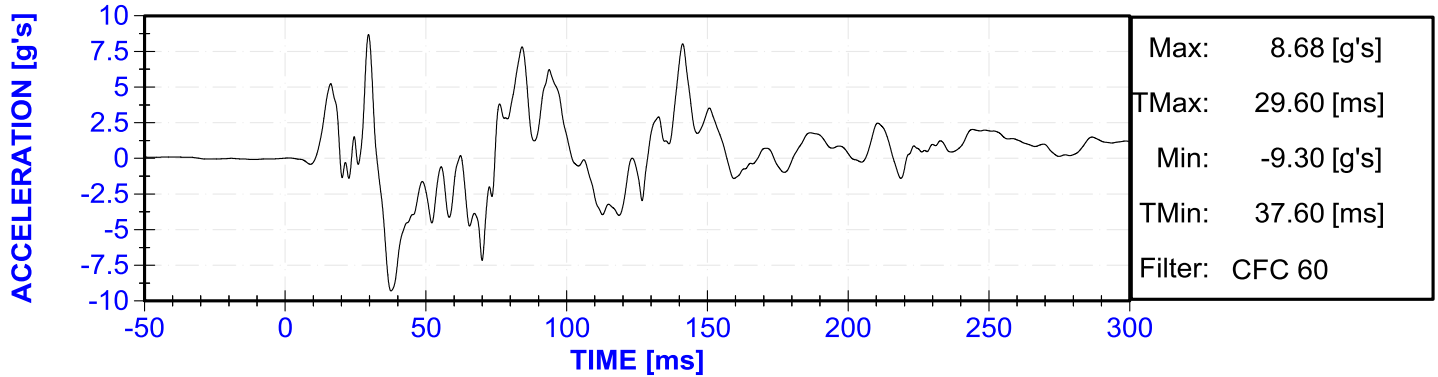




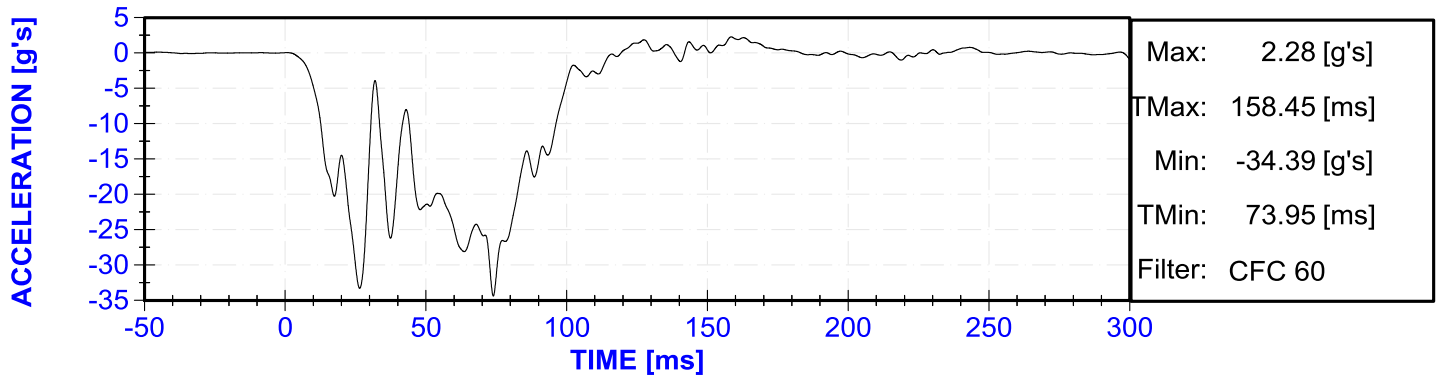




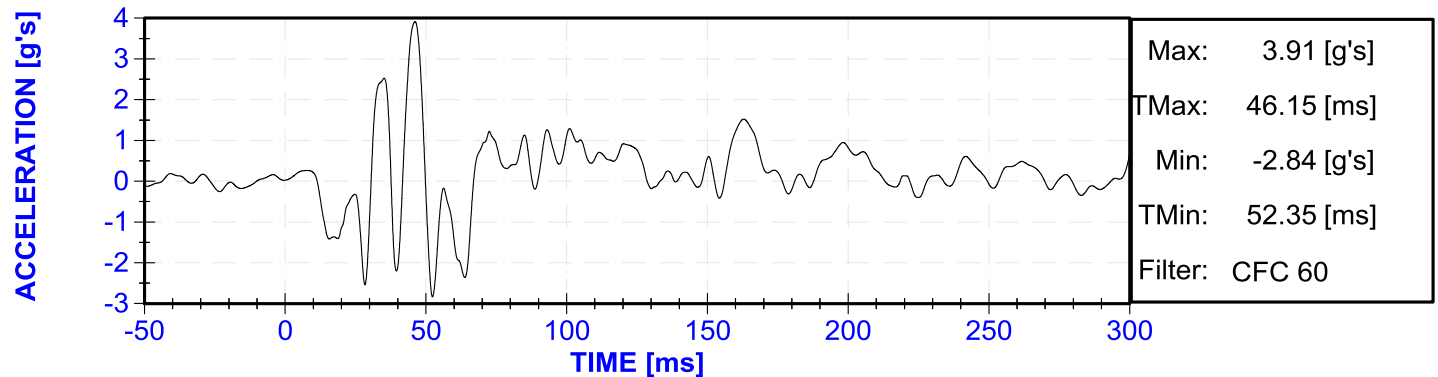
V1 Right Rear Seat Cross Member Z Acceleration



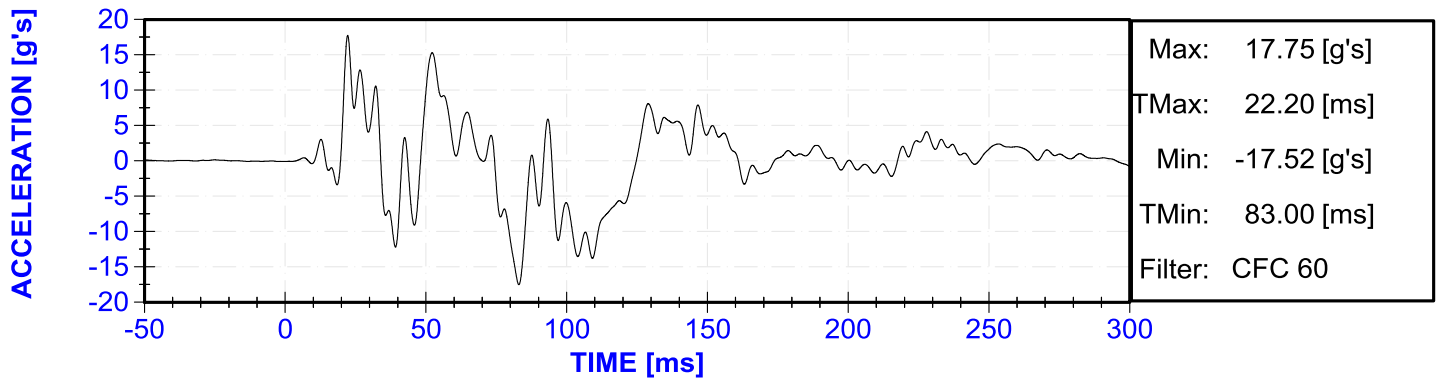
V1 Vehicle CG X Acceleration

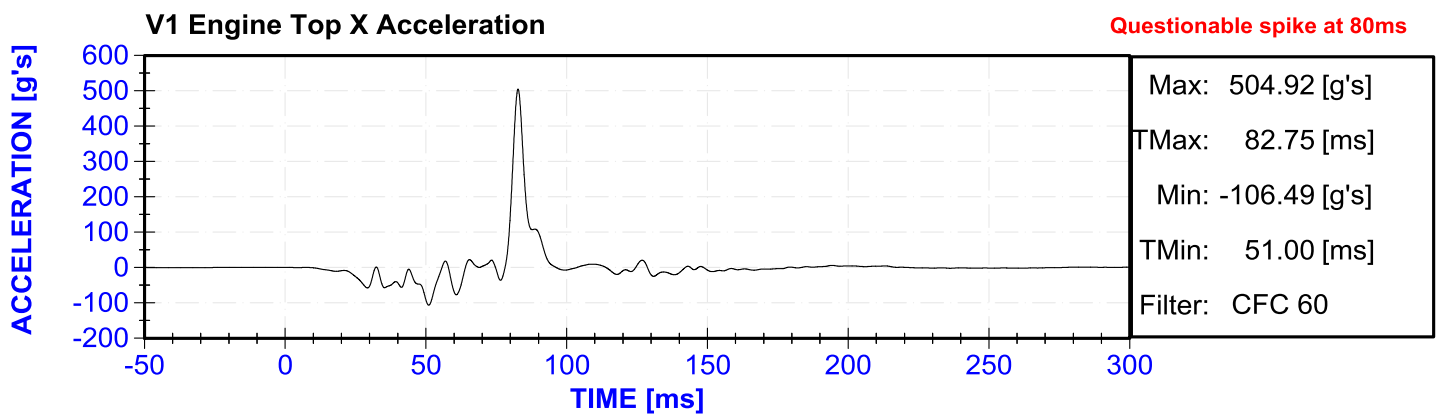
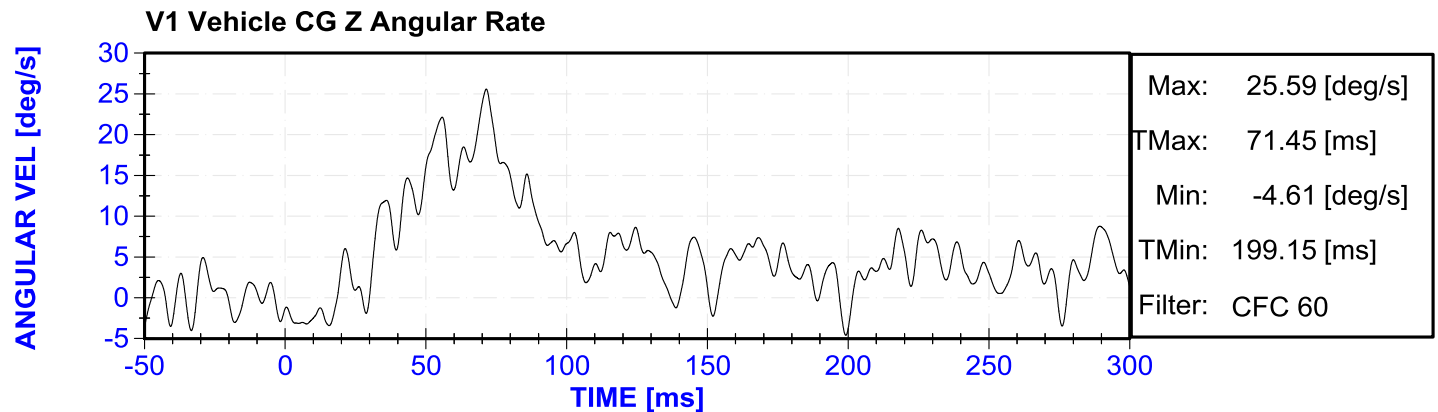
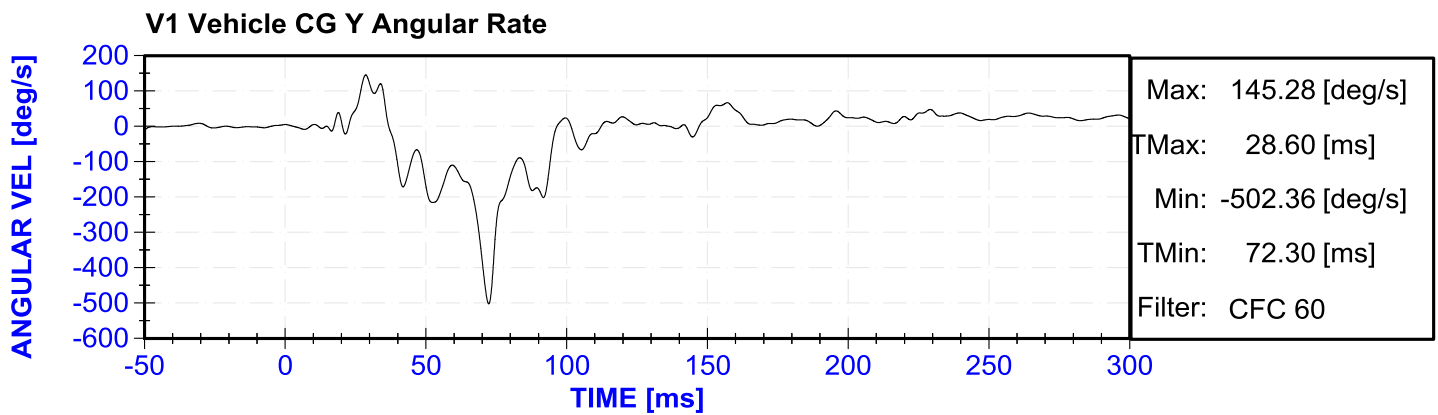
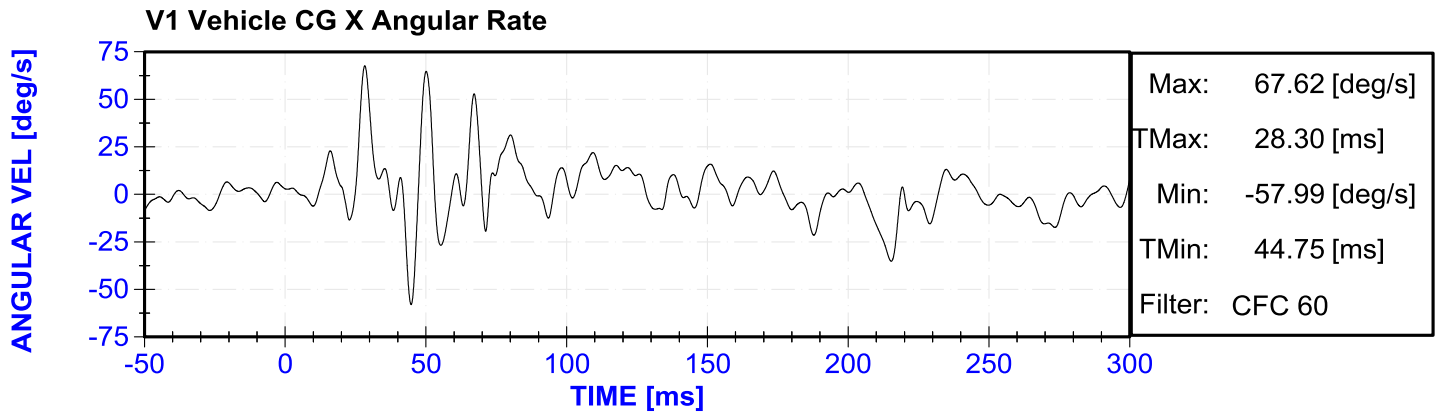


V1 Vehicle CG Y Acceleration

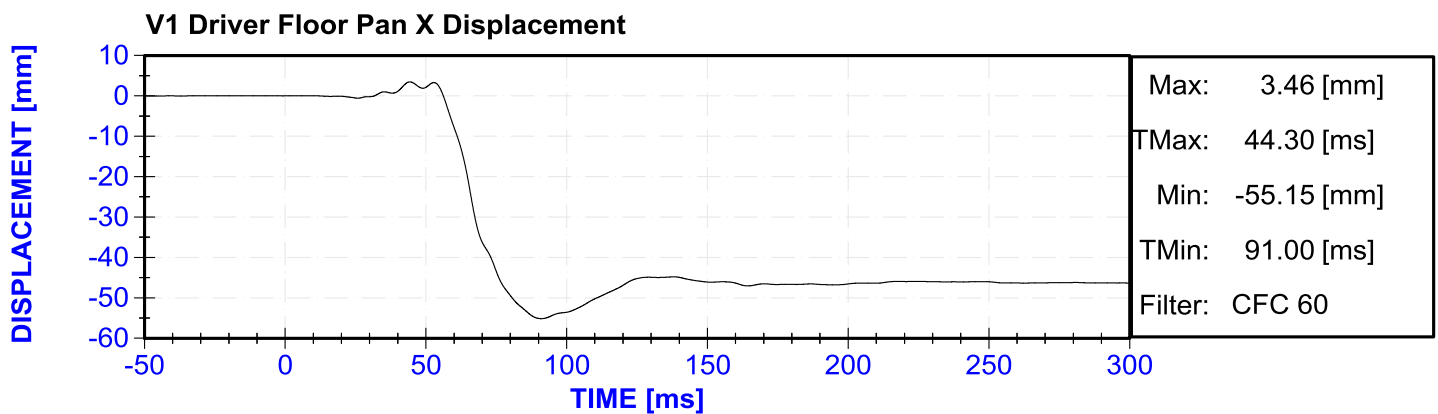
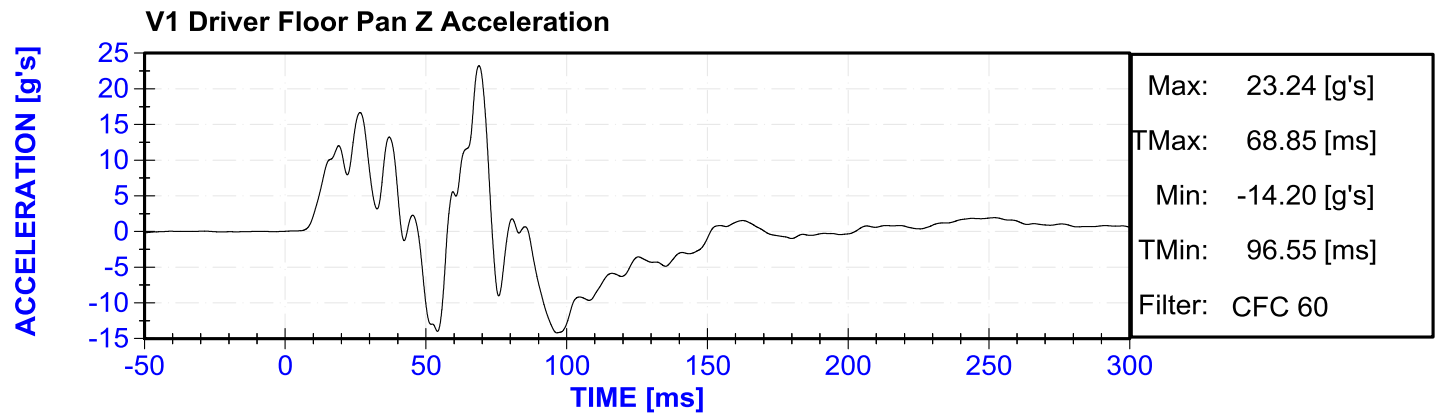
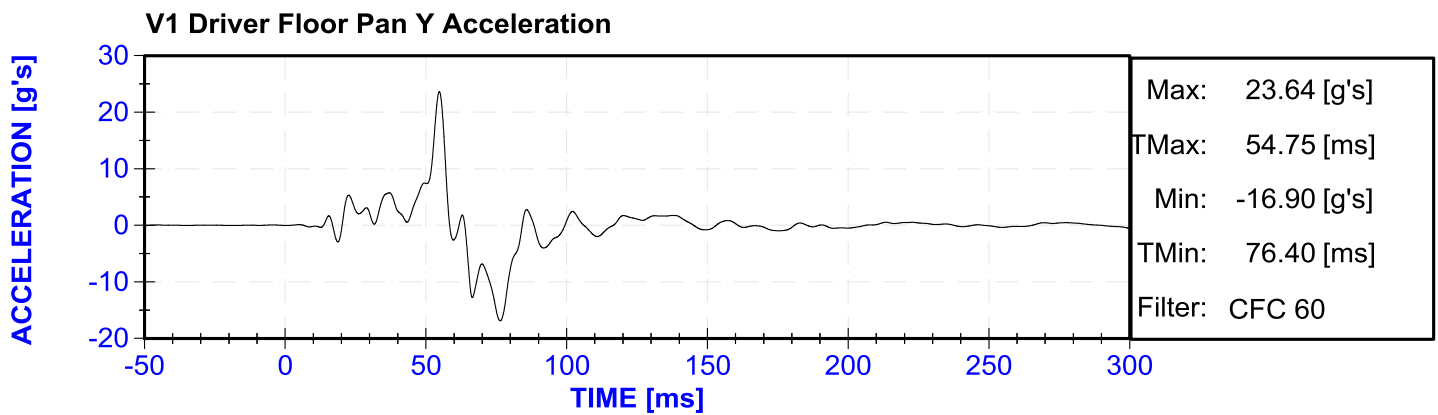
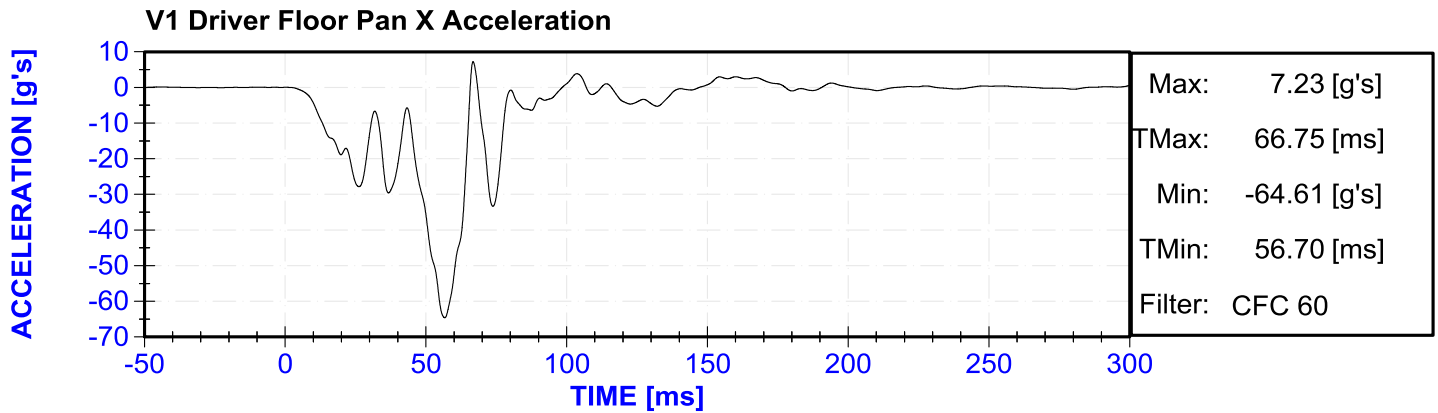


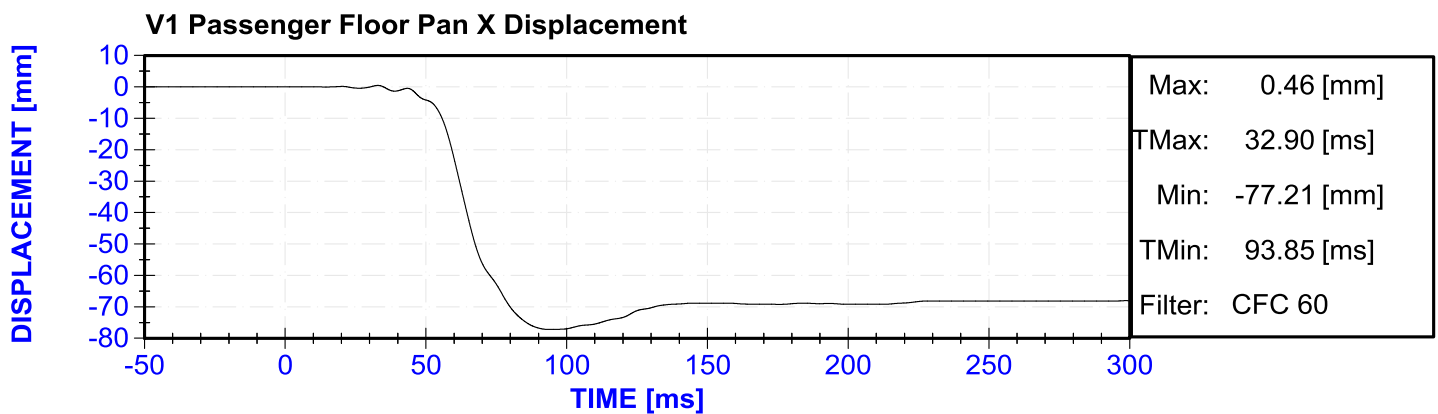
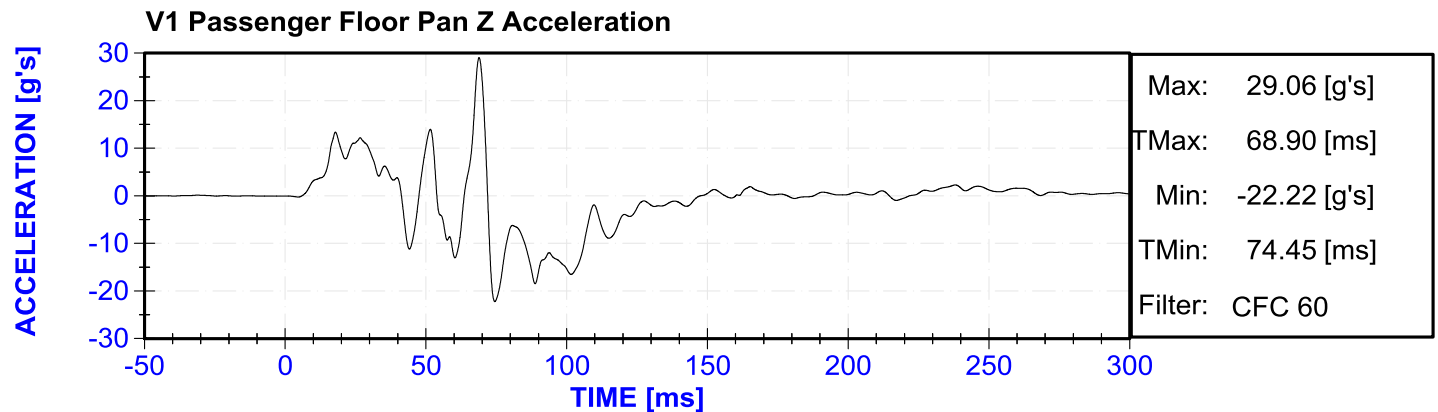
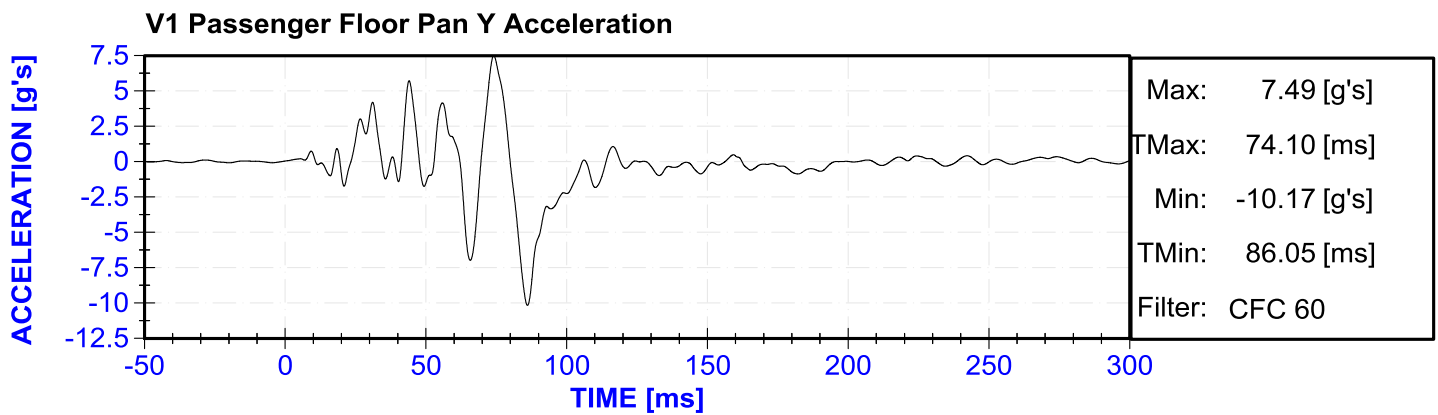
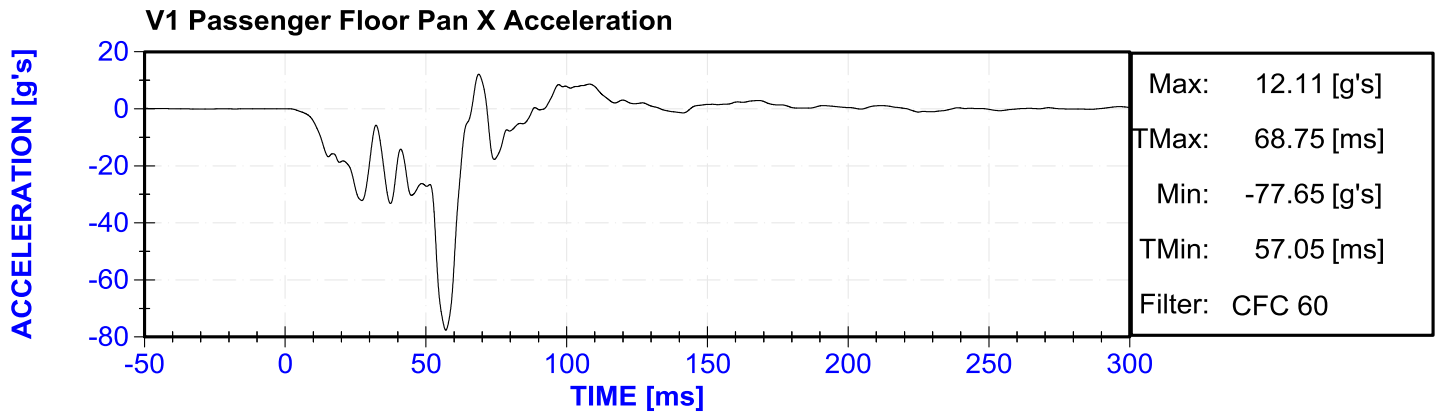
V1 Vehicle CG Z Acceleration



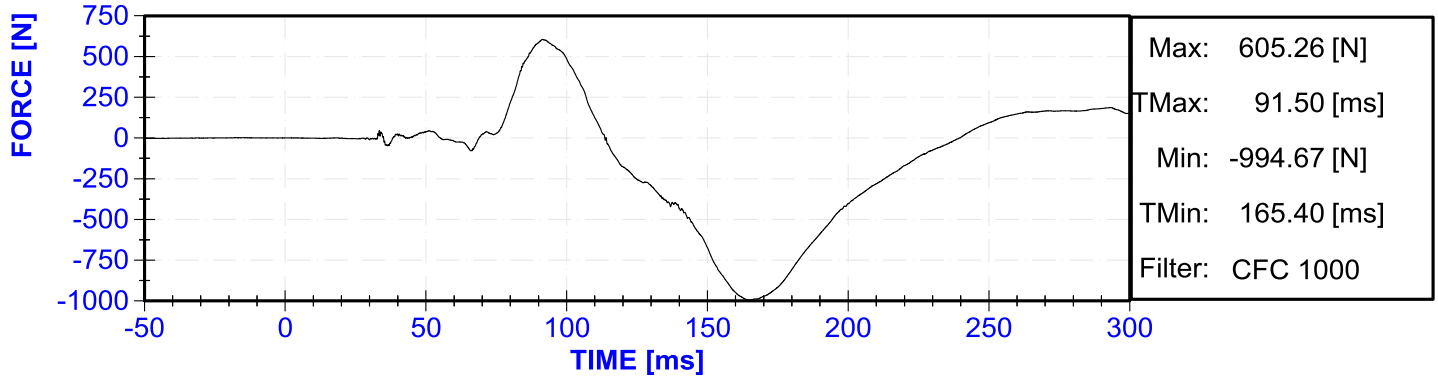




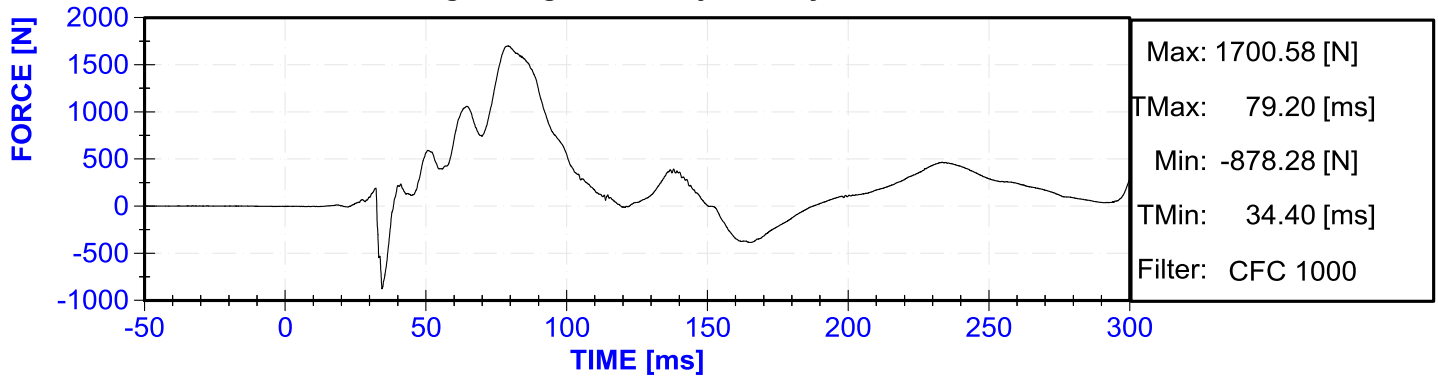




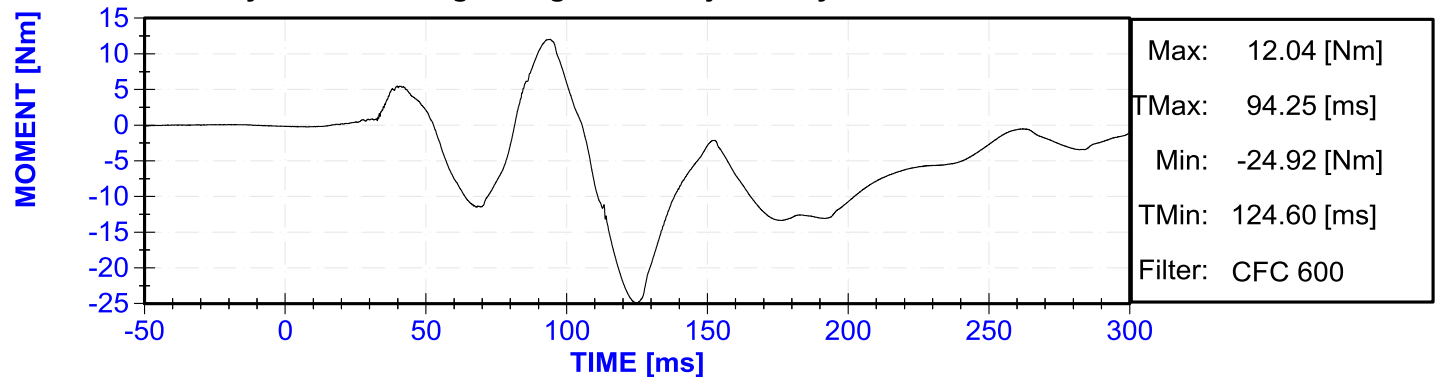
V1P1 Fx on head acting through the O.C. joint only



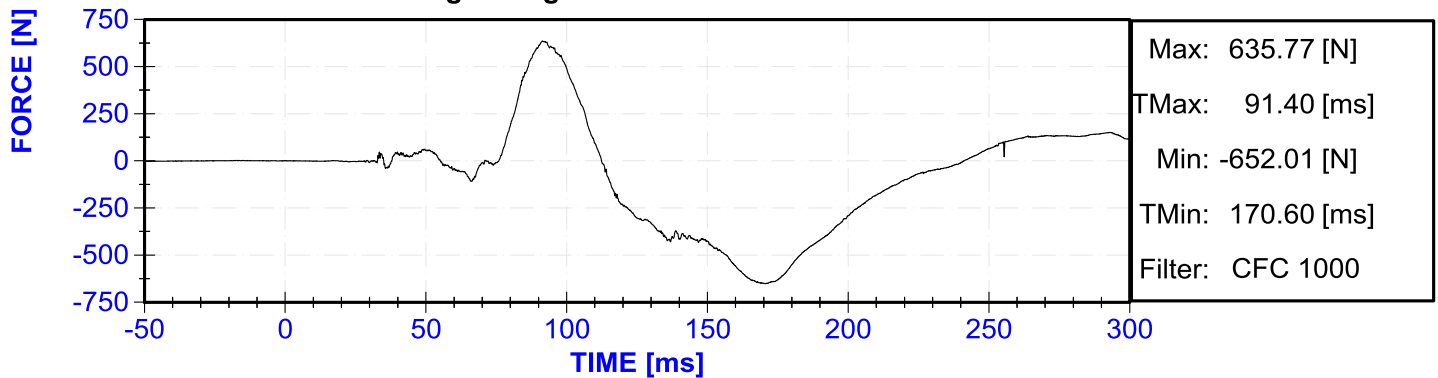
V1P1 Fz on head acting through the O.C. joint only

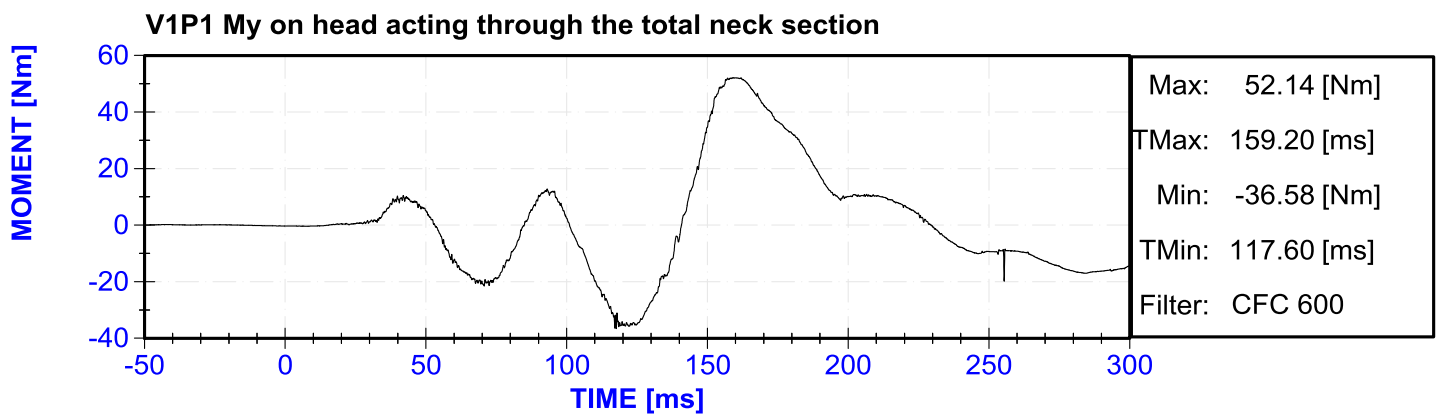
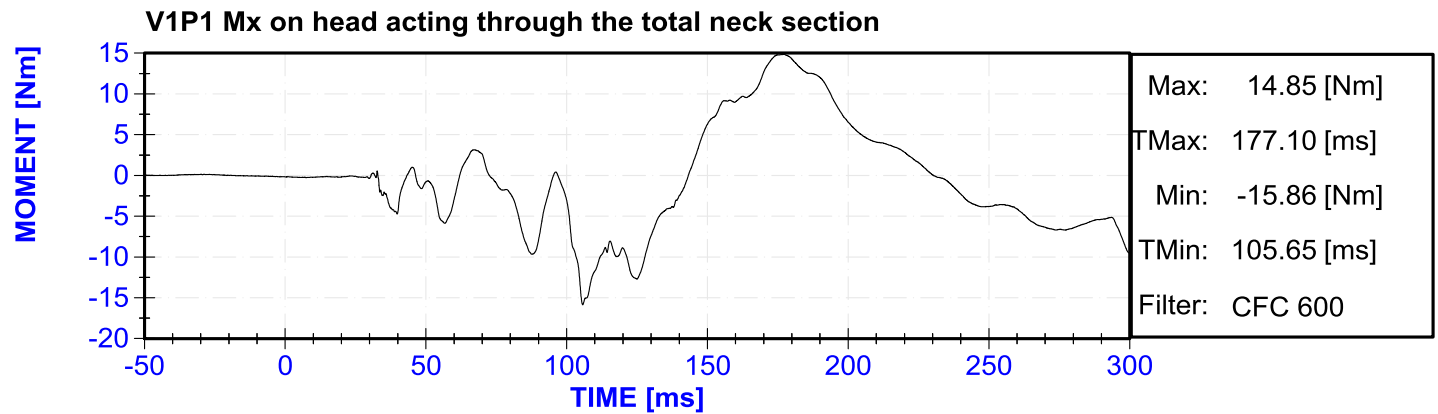
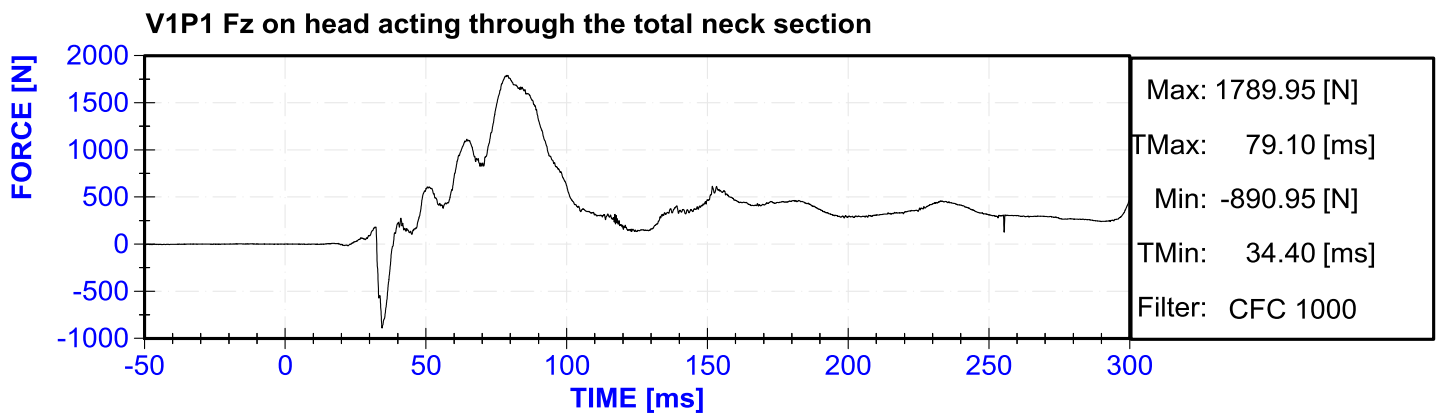
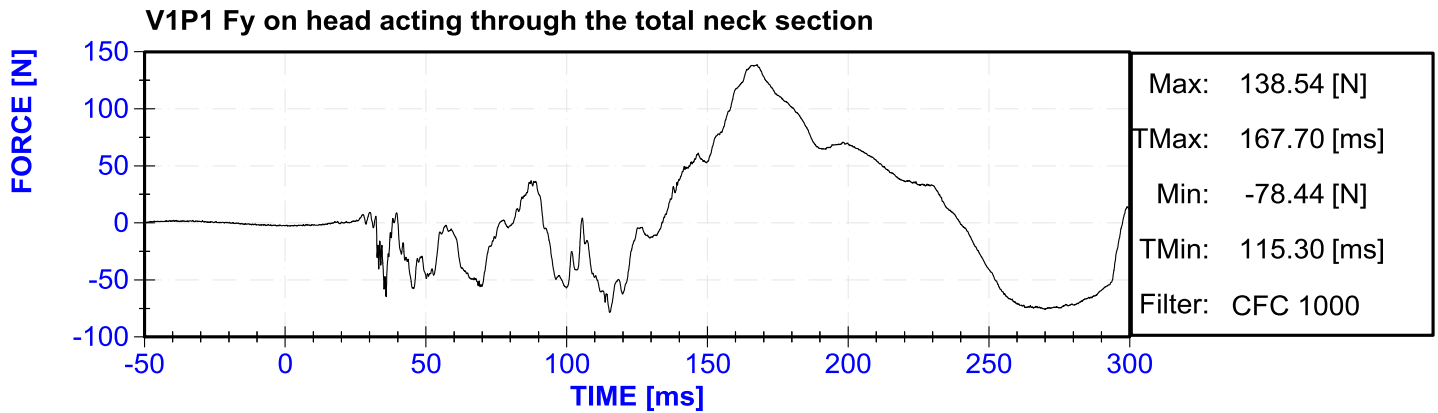


V1P1 My on head acting through the O.C. joint only



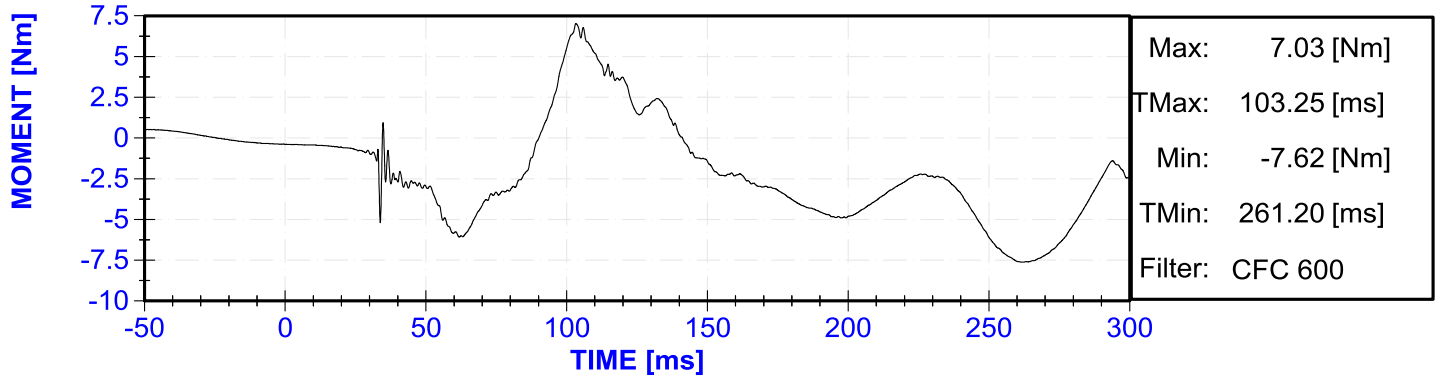
V1P1 Fx on head acting through the total neck section



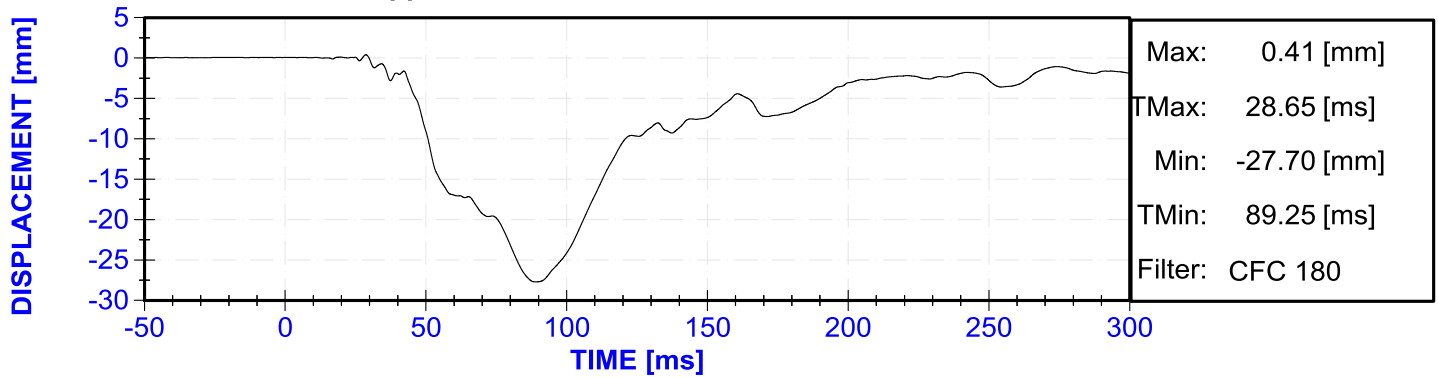




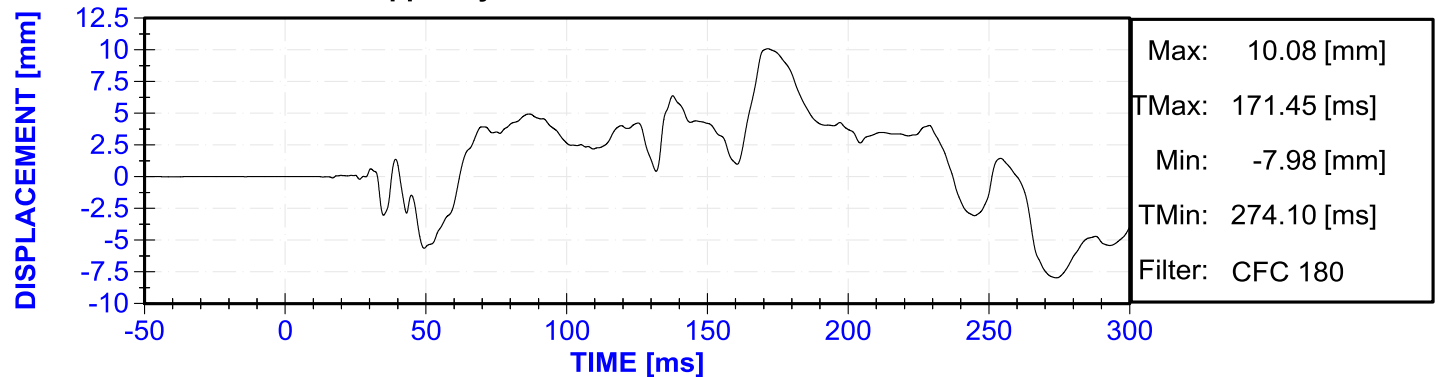
V1P1 Mz on head acting through the total neck section



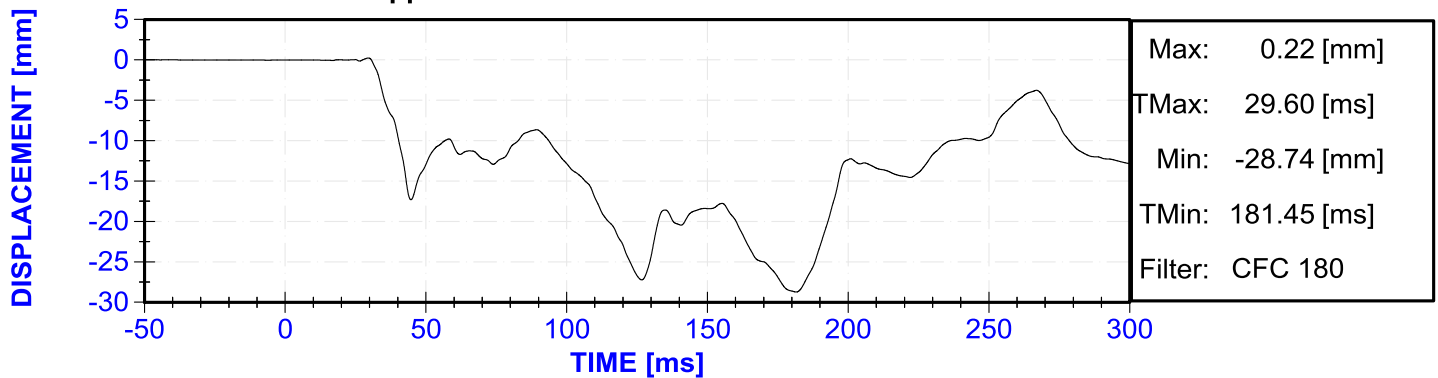
V1P1 Chest Left Upper Dx

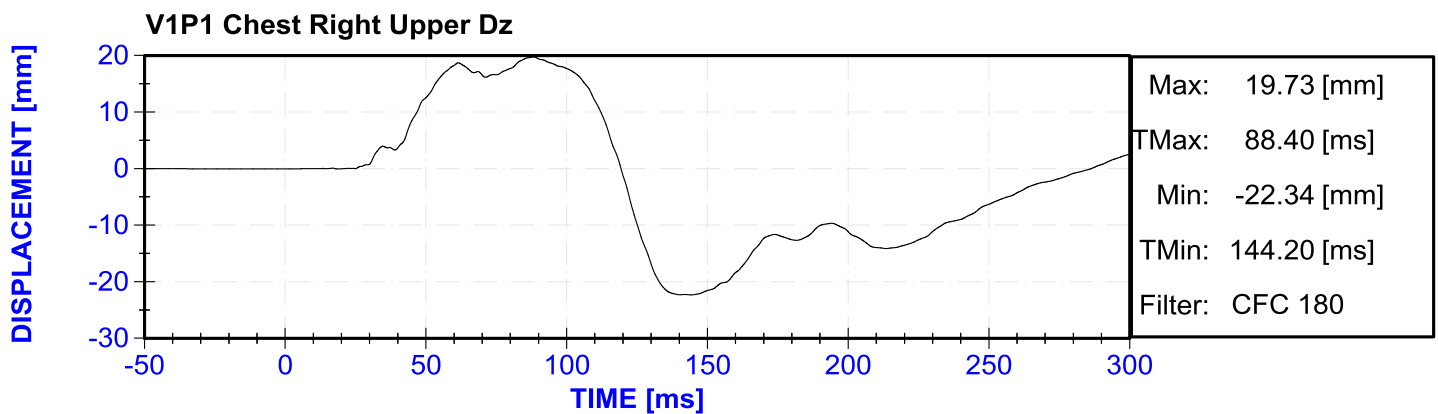
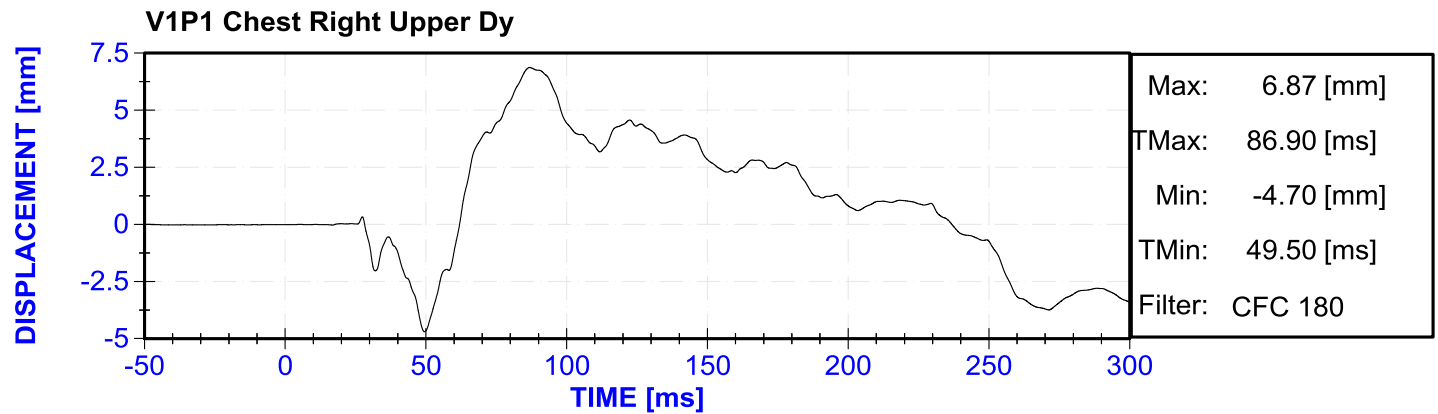
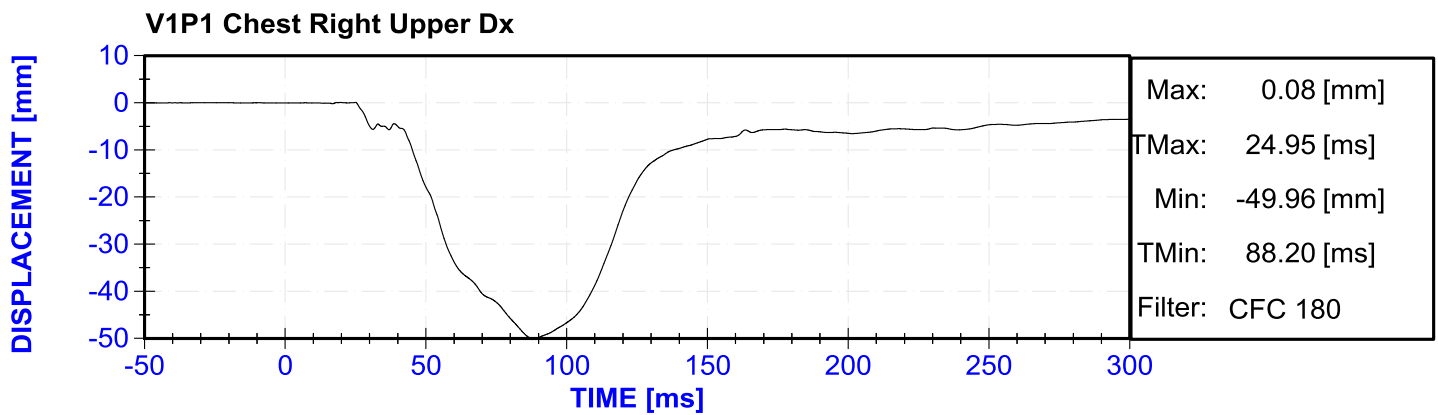
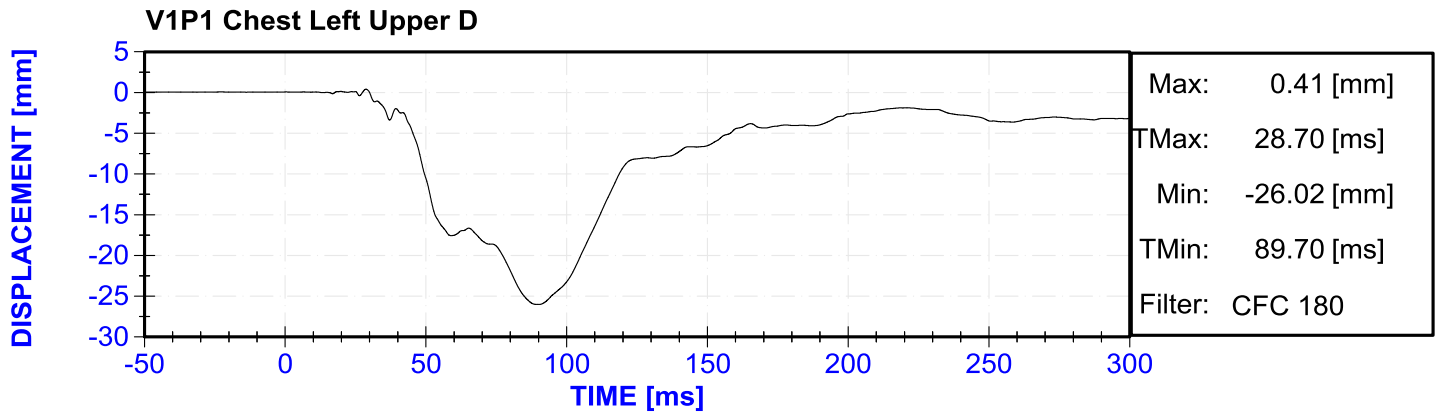


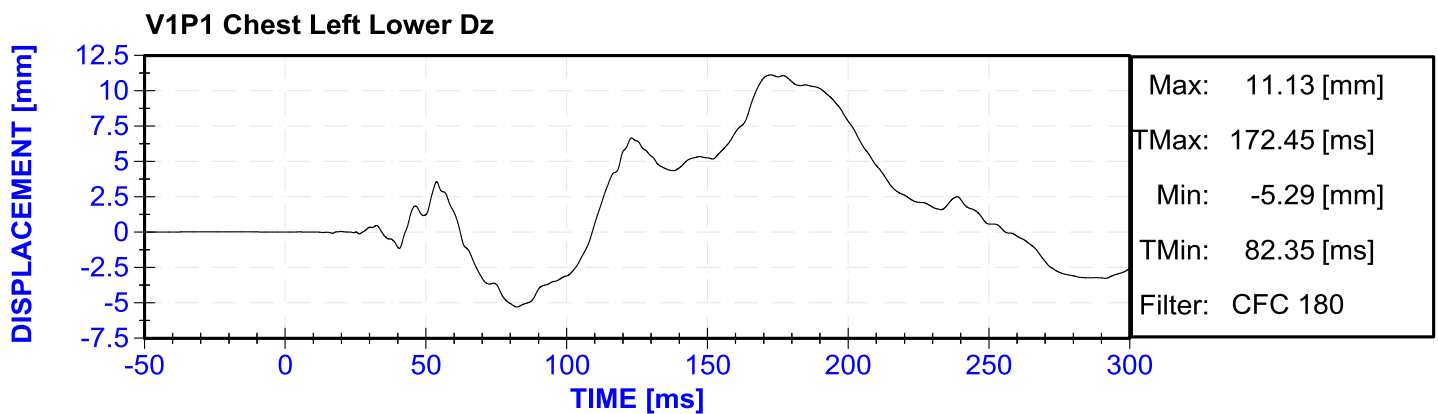
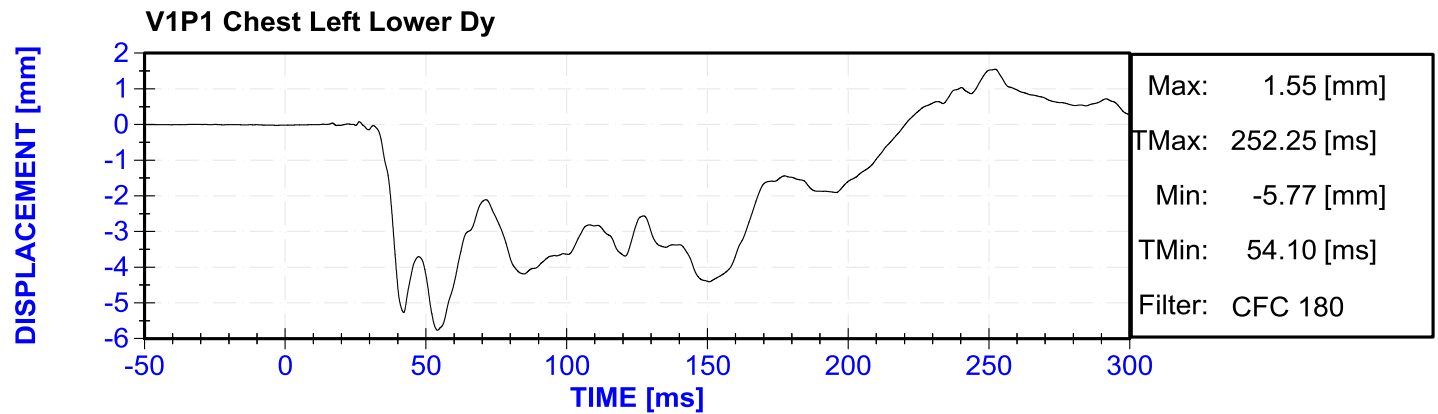
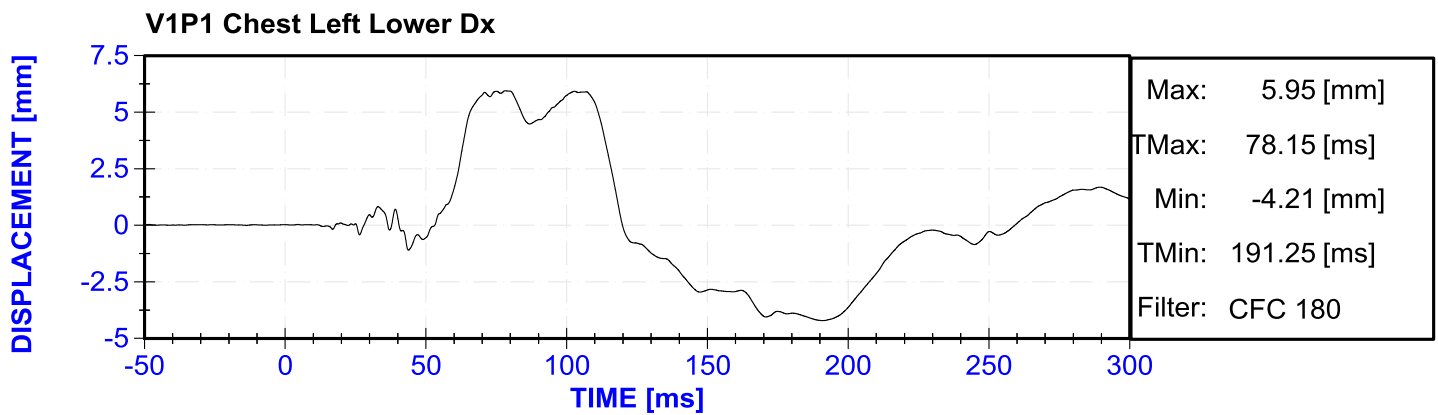
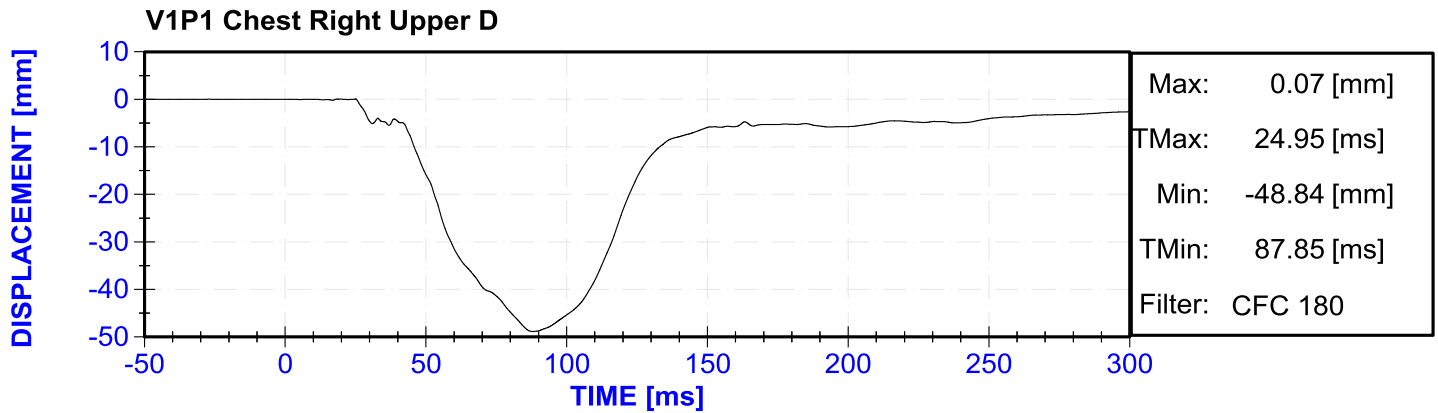
V1P1 Chest Left Upper Dy

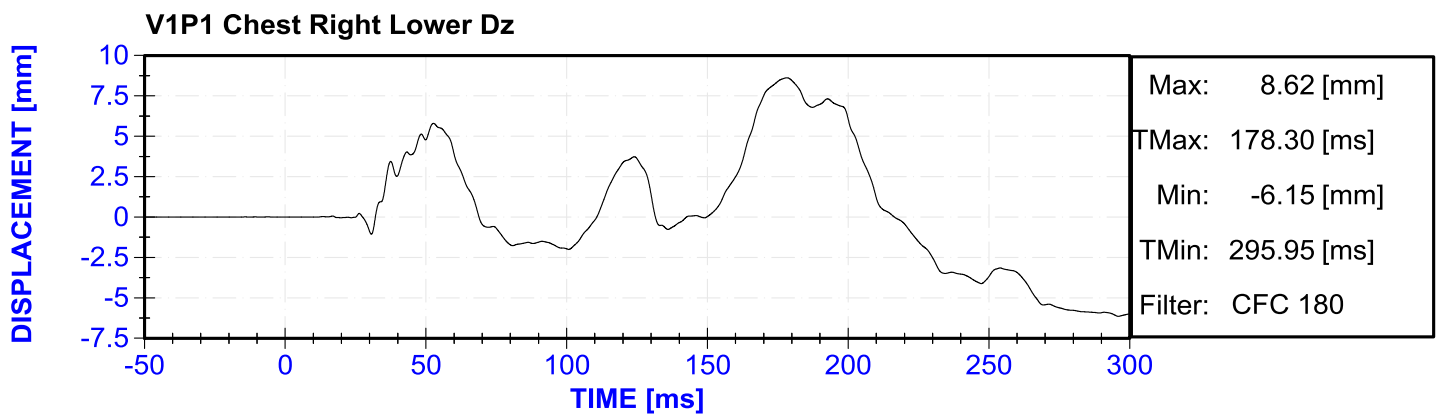
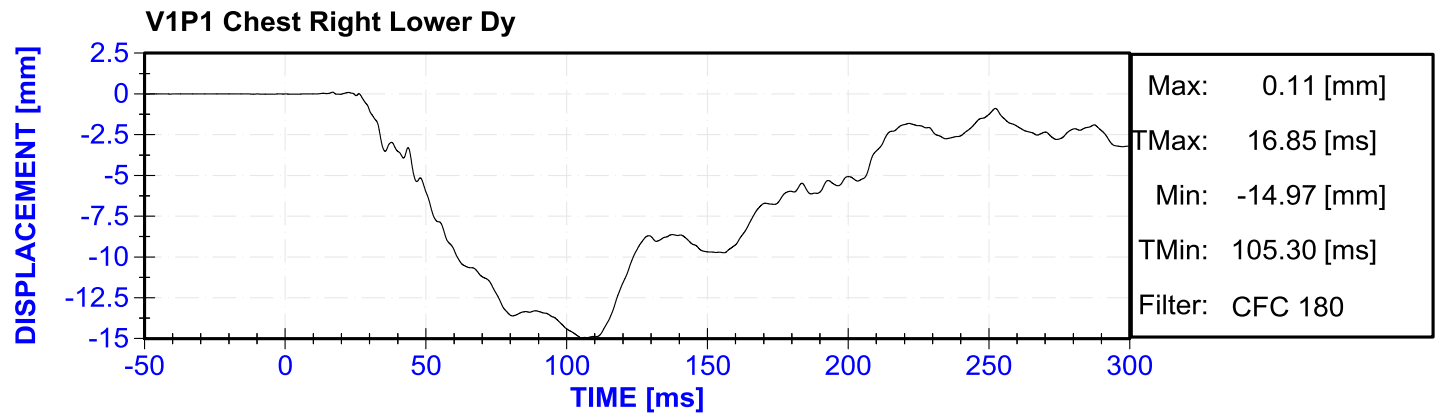
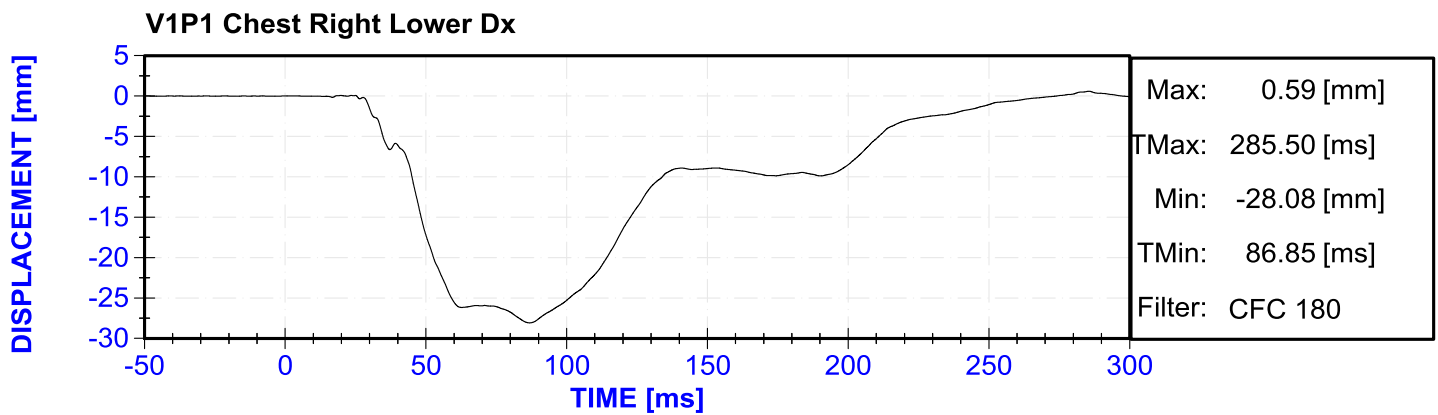
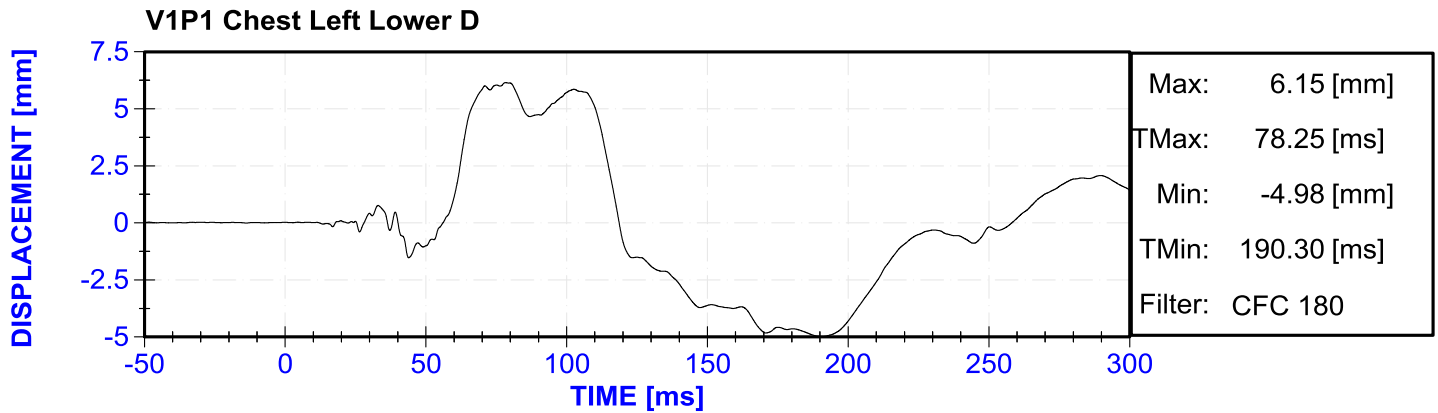


V1P1 Chest Left Upper Dz

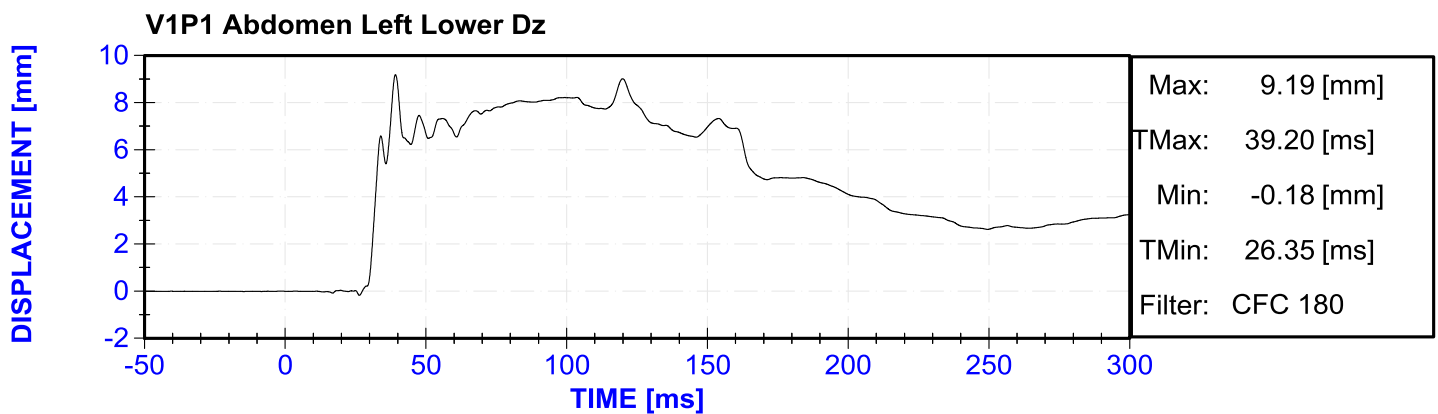
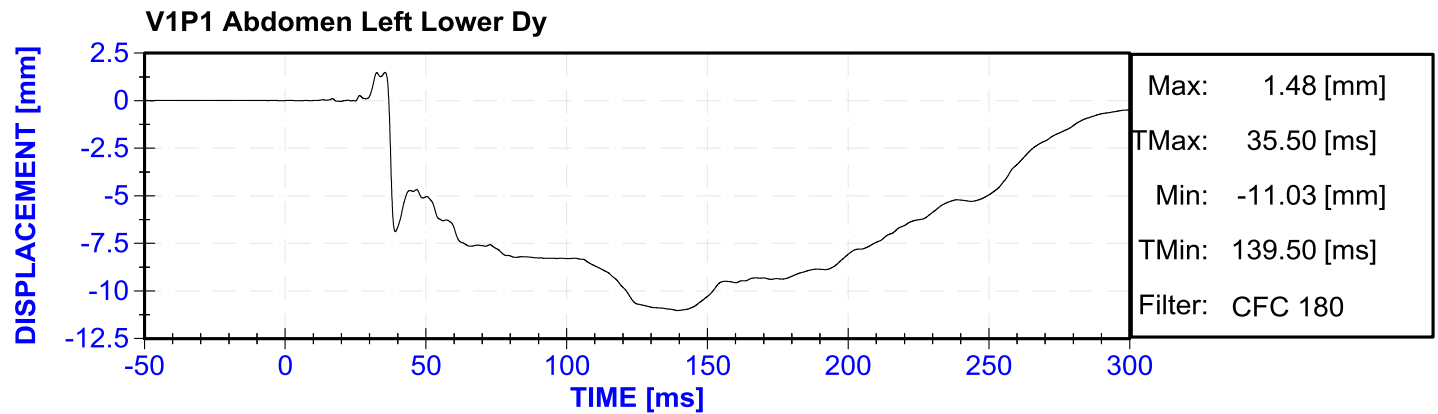
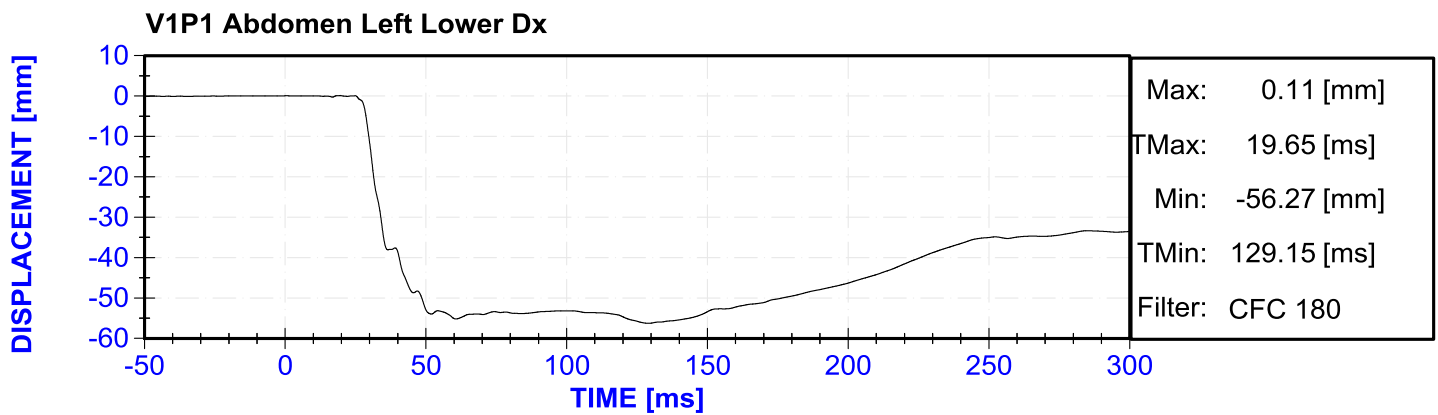
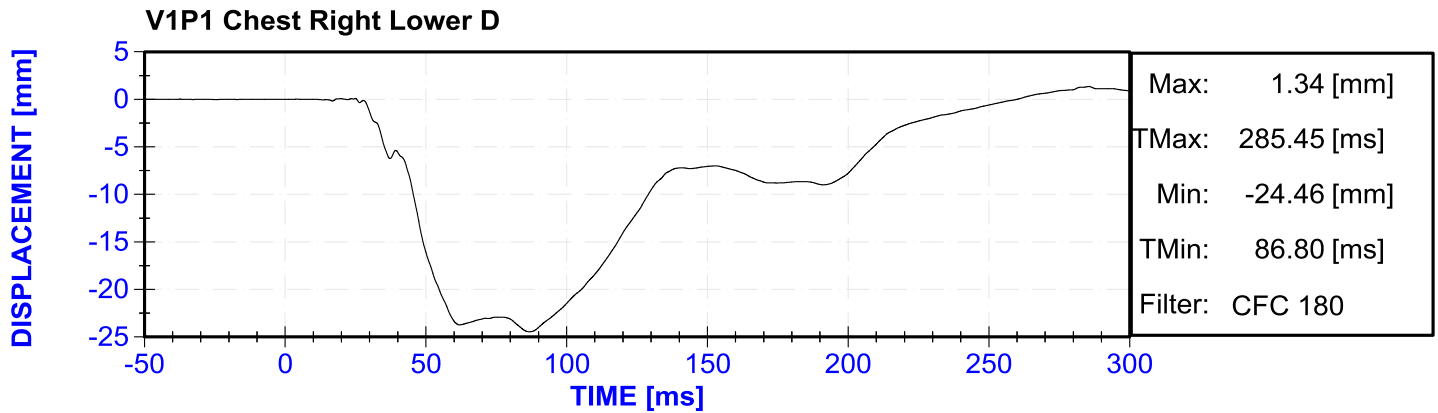


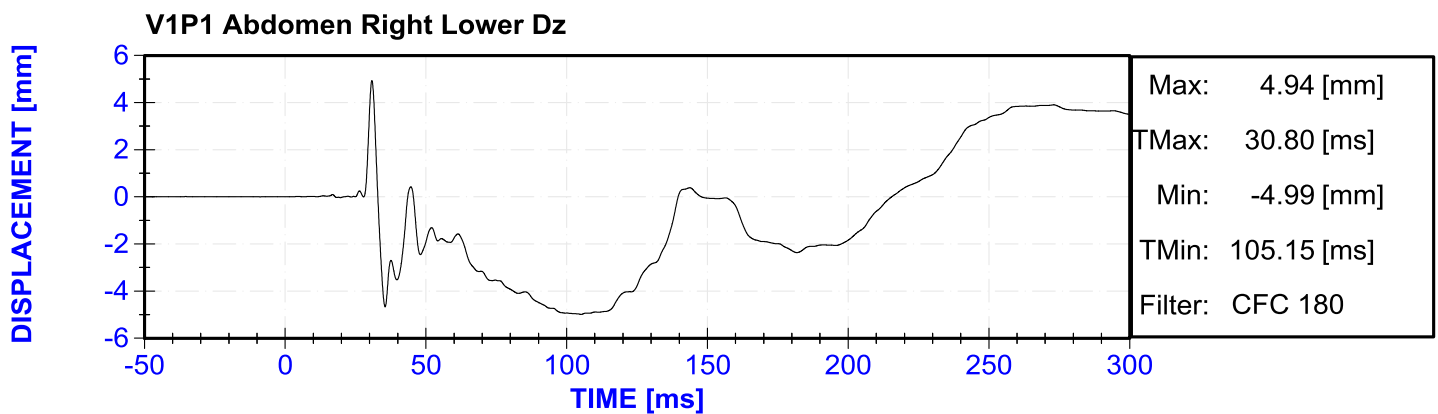
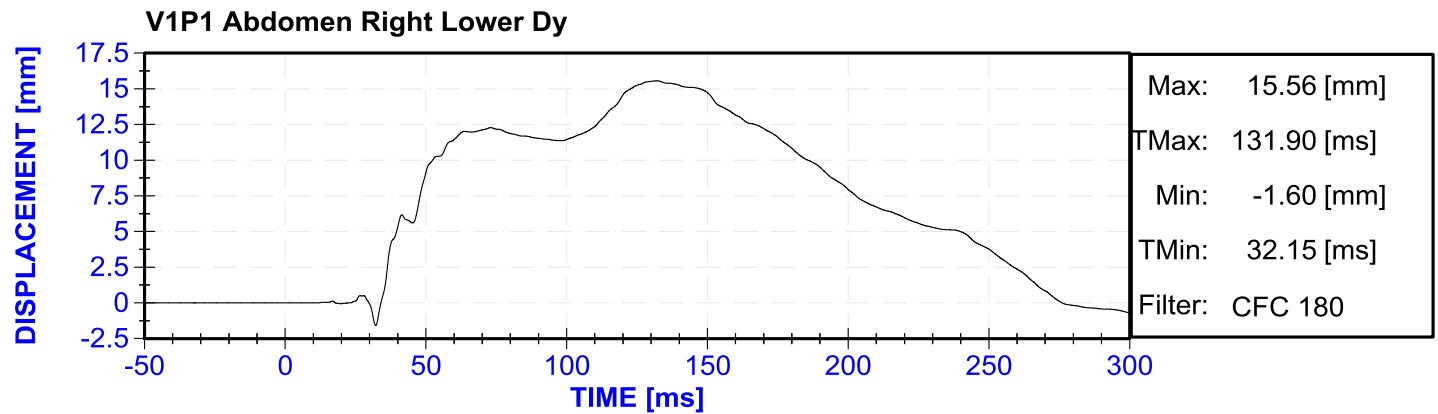
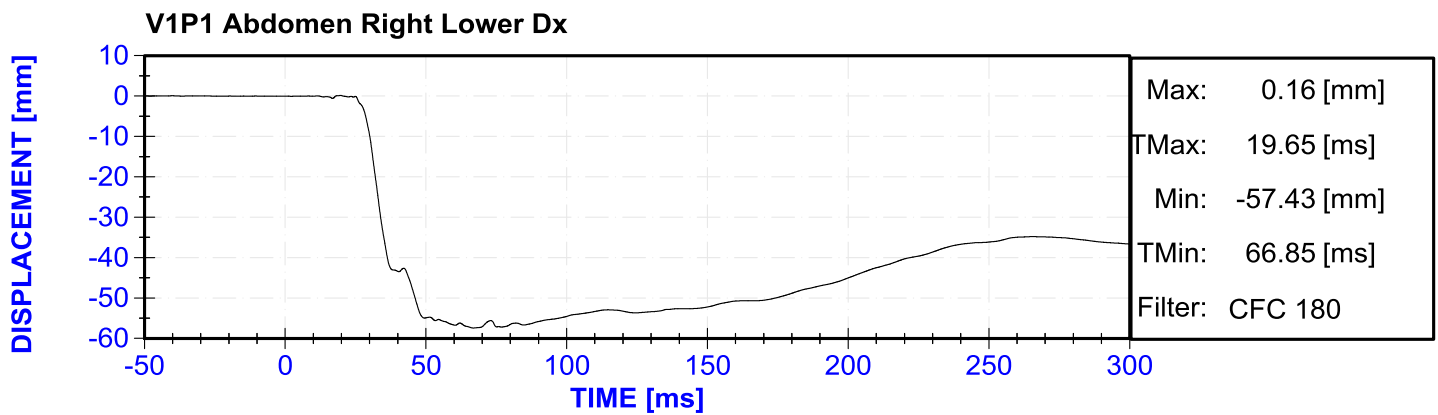
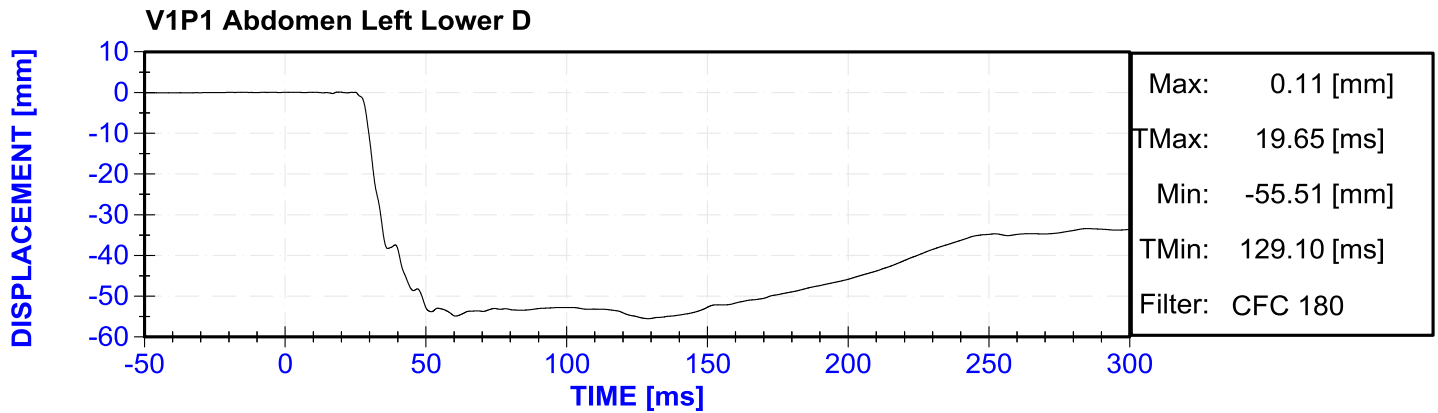


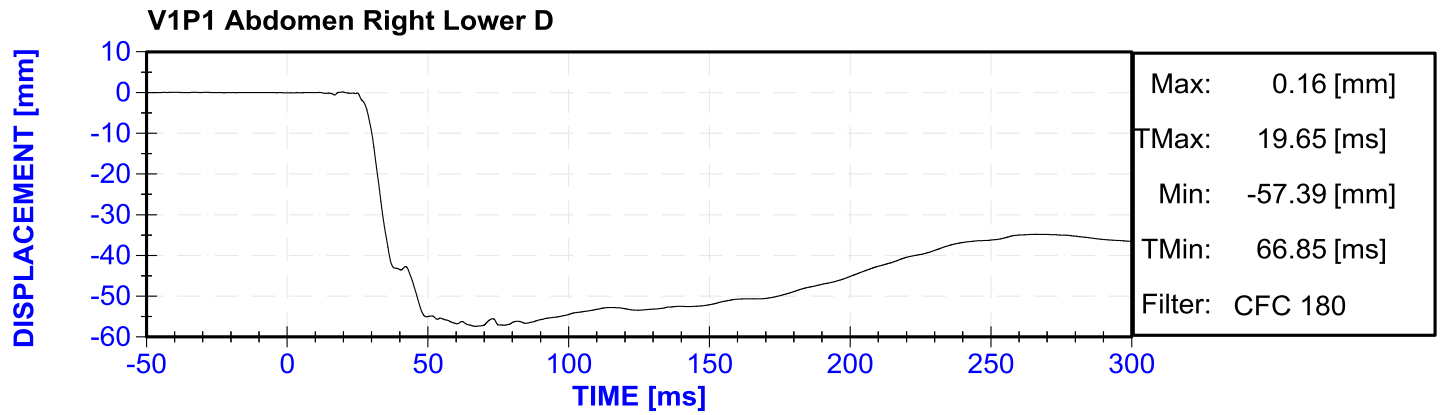












## APPENDIX C

### PART 572 E/O DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA SHEETS

Table C-1: Dummy Information

| TYPE                         | SERIAL NUMBER |
|------------------------------|---------------|
| THOR-M 50 <sup>TH</sup> Male | DL9207        |
| 5 <sup>th</sup> Female       | 324           |
| 5 <sup>th</sup> Female       | 019           |

Table C-2: THOR IR-TRACC Initial Set-Up Information

| THOR – M<br>S/N: DL9207 |                   |                |
|-------------------------|-------------------|----------------|
| IR-TRACC Location       | IR-TRACC Exponent | IR-TRACC Slope |
| Upper Left Thorax Dx    | -0.43199          | 36.9703        |
| Upper Right Thorax Dx   | -0.48860          | 29.8982        |
| Lower Left Thorax Dx    | -0.45268          | 35.3389        |
| Lower Right Thorax Dx   | -0.43502          | 37.4827        |
| Left Abdomen Dx         | -0.34061          | 66.5336        |
| Right Abdomen Dx        | -0.50000          | 26.8025        |

Table C- 3: THOR Dummy Initial Set-Up Information

| THOR – M<br>S/N: DL9207 |              |               |         |             |                   |
|-------------------------|--------------|---------------|---------|-------------|-------------------|
| Sensor                  | Manufacturer | Serial Number | Range   | Sensitivity | Sensitivity Units |
| Head CG Ax              | Endevco      | P82183        | 2000    | 0.017690000 | mV/V/g            |
| Head CG Ay              | Endevco      | P81384        | 2000    | 0.017600000 | mV/V/g            |
| Head CG Az              | Endevco      | P81797        | 2000    | 0.019350000 | mV/V/g            |
| Head Wx                 | DTS          | ARS4740       | 18000   | 0.091430000 | mV/deg/sec        |
| Head Wy                 | DTS          | ARS4737       | 18000   | 0.095640000 | mV/deg/sec        |
| Head Wz                 | DTS          | ARS4073       | 18000   | 0.093760000 | mV/deg/sec        |
| Skull Spring Front Fz   | Humanetics   | DO9740        | 4448.2  | 0.000512814 | mV/V/N            |
| Skull Spring Rear Fz    | Humanetics   | DO9741        | 4448.2  | 0.000508183 | mV/V/N            |
| Condyle Pot Ry          | Humanetics   | DK5911        | 180     | 3.021000000 | mV/V/deg          |
| Upper Neck Fx           | Humanetics   | DP3956        | 8896.4  | 0.000224158 | mV/V/N            |
| Upper Neck Fy           | Humanetics   | DP3956        | 8896.4  | 0.000227755 | mV/V/N            |
| Upper Neck Fz           | Humanetics   | DP3956        | 13344.7 | 0.000085255 | mV/V/N            |
| Upper Neck Mx           | Humanetics   | DP3956        | 282.5   | 0.005819469 | mV/V/Nm           |
| Upper Neck My           | Humanetics   | DP3956        | 282.5   | 0.005983009 | mV/V/Nm           |
| Upper Neck Mz           | Humanetics   | DP3956        | 282.5   | 0.009425133 | mV/V/Nm           |
| Lower Neck Fx           | Humanetics   | DP4780        | 13344.7 | 0.000173709 | mV/V/N            |
| Lower Neck Fy           | Humanetics   | DP4780        | 13344.7 | 0.000174489 | mV/V/N            |



|                       |            |        |         |             |          |
|-----------------------|------------|--------|---------|-------------|----------|
| Lower Neck Fz         | Humanetics | DP4780 | 13344.7 | 0.000070575 | mV/V/N   |
| Lower Neck Mx         | Humanetics | DP4780 | 451.9   | 0.004108210 | mV/V/Nm  |
| Lower Neck My         | Humanetics | DP4780 | 451.9   | 0.004146714 | mV/V/Nm  |
| Lower Neck Mz         | Humanetics | DP4780 | 226     | 0.006740265 | mV/V/Nm  |
| T1 Ax                 | Endevco    | P79630 | 2000    | 0.020870000 | mV/V/g   |
| T1 Ay                 | Endevco    | P78880 | 2000    | 0.019820000 | mV/V/g   |
| T1 Az                 | Endevco    | P82758 | 2000    | 0.018610000 | mV/V/g   |
| Upper Left Thorax Dx  | Humanetics | DS6355 |         |             |          |
| Upper Left Thorax Ry  | Humanetics | DI2382 | 180     | 2.978800000 | mV/V/deg |
| Upper Left Thorax Rz  | Humanetics | DI2383 | 180     | 3.007300000 | mV/V/deg |
| Upper Right Thorax Dx | Humanetics | DJ2613 |         |             |          |
| Upper Right Thorax Ry | Humanetics | DI7753 | 180     | 3.035900000 | mV/V/deg |
| Upper Right Thorax Rz | Humanetics | DI7752 | 180     | 3.052400000 | mV/V/deg |
| Lower Left Thorax Dx  | Humanetics | DS6353 |         |             |          |
| Lower Left Thorax Ry  | Humanetics | DM4781 | 180     | 3.001400000 | mV/V/deg |
| Lower Left Thorax Rz  | Humanetics | DS4092 | 180     | 3.072500000 | mV/V/deg |
| Lower Right Thorax Dx | Humanetics | DS6354 |         |             |          |
| Lower Right Thorax Ry | Humanetics | DM4776 | 180     | 3.004900000 | mV/V/deg |
| Lower Right Thorax Rz | Humanetics | DM4777 | 180     | 2.994700000 | mV/V/deg |
| T6 Ax                 | Endevco    | P49229 | 2000    | 0.018010000 | mV/V/g   |
| T6 Ay                 | Endevco    | P49215 | 2000    | 0.016950000 | mV/V/g   |
| T6 Az                 | Endevco    | P52122 | 2000    | 0.017050000 | mV/V/g   |
| Thoracic Spine Fx     | Humanetics | DP2984 | 13344.7 | 0.000146365 | mV/V/N   |
| Thoracic Spine Fy     | Humanetics | DP2984 | 13344.7 | 0.000147107 | mV/V/N   |
| Thoracic Spine Fz     | Humanetics | DP2984 | 17792.9 | 0.000060193 | mV/V/N   |
| Thoracic Spine Mx     | Humanetics | DP2984 | 677.9   | 0.002146039 | mV/V/Nm  |
| Thoracic Spine My     | Humanetics | DP2984 | 903.9   | 0.001914371 | mV/V/Nm  |
| T12 Ax                | Endevco    | P74936 | 2000    | 0.017350000 | mV/V/g   |
| T12 Ay                | Endevco    | P74937 | 2000    | 0.017230000 | mV/V/g   |
| T12 Az                | Endevco    | P52005 | 2000    | 0.019870000 | mV/V/g   |
| Abdomen Left Dx       | Humanetics | DQ2303 |         |             |          |
| Abdomen Left Ry       | Humanetics | DS8363 | 150     | 3.024100000 | mV/V/deg |
| Abdomen Left Rz       | Humanetics | DS8361 | 150     | 3.047400000 | mV/V/deg |
| Abdomen Right Dx      | Humanetics | DM2641 |         |             |          |
| Abdomen Right Ry      | Humanetics | DS4094 | 150     | 3.012300000 | mV/V/deg |
| Abdomen Right Rz      | Humanetics | DS4121 | 150     | 3.021800000 | mV/V/deg |
| Acetabulum Right Fx   | Humanetics | DP3835 | 22241.1 | 0.000118506 | mV/V/N   |
| Acetabulum Right Fy   | Humanetics | DP3835 | 13344.7 | 0.000059342 | mV/V/N   |
| Acetabulum Right Fz   | Humanetics | DP3835 | 13344.7 | 0.000161173 | mV/V/N   |
| Acetabulum Left Fx    | Humanetics | DP4639 | 22241.1 | 0.000121280 | mV/V/N   |
| Acetabulum Left Fy    | Humanetics | DP4639 | 13344.7 | 0.000059432 | mV/V/N   |
| Acetabulum Left Fz    | Humanetics | DP4639 | 13344.7 | 0.000165871 | mV/V/N   |
| Pelvis Ax             | Endevco    | P83434 | 2000    | 0.017540000 | mV/V/g   |
| Pelvis Ay             | Endevco    | P82752 | 2000    | 0.018310000 | mV/V/g   |
| Pelvis Az             | Endevco    | P80296 | 2000    | 0.019410000 | mV/V/g   |
| ASIS Right Fx         | Humanetics | DP5091 | 13000   | 0.000065215 | mV/V/N   |
| ASIS Right My         | Humanetics | DP5091 | 325     | 0.003697538 | mV/V/Nm  |

|                |            |           |       |             |          |
|----------------|------------|-----------|-------|-------------|----------|
| ASIS Left Fx   | Humanetics | DP5092    | 13000 | 0.000067323 | mV/V/N   |
| ASIS Left My   | Humanetics | DP5092    | 325   | 0.003688923 | mV/V/Nm  |
| Femur Left Fx  | Denton     | DM4975    | 15000 | 0.000143700 | mV/V/N   |
| Femur Left Fy  | Denton     | DM4975    | 15000 | 0.000143600 | mV/V/N   |
| Femur Left Fz  | Denton     | DM4975    | 15000 | 0.000072700 | mV/V/N   |
| Femur Left Mx  | Denton     | DM4975    | 350   | 0.006601400 | mV/V/Nm  |
| Femur Left My  | Denton     | DM4975    | 350   | 0.006642000 | mV/V/Nm  |
| Femur Left Mz  | Denton     | DM4975    | 300   | 0.008961300 | mV/V/Nm  |
| Femur Right Fx | Denton     | DM4976    | 15000 | 0.000142600 | mV/V/N   |
| Femur Right Fy | Denton     | DM4976    | 15000 | 0.000142900 | mV/V/N   |
| Femur Right Fz | Denton     | DM4976    | 15000 | 0.000072200 | mV/V/N   |
| Femur Right Mx | Denton     | DM4976    | 350   | 0.006505700 | mV/V/Nm  |
| Femur Right My | Denton     | DM4976    | 350   | 0.006488900 | mV/V/Nm  |
| Femur Right Mz | Denton     | DM4976    | 300   | 0.008811600 | mV/V/Nm  |
| Upper Tibia Fx | Denton     | 97        | 11120 | 0.00017270  | mv/v/N   |
| Upper Tibia Fz | Denton     | 97        | 11120 | 0.00009330  | mv/v/N   |
| Upper Tibia Mx | Denton     | 97        | 395   | 0.00733320  | mv/v/Nm  |
| Upper Tibia My | Denton     | 97        | 395   | 0.00739800  | mv/v/Nm  |
| Lower Tibia Fx | Denton     | 121       | 11100 | 0.00017510  | mv/v/N   |
| Lower Tibia Fy | Denton     | 121       | 11100 | 0.00017180  | mv/v/N   |
| Lower Tibia Fz | Denton     | 121       | 11100 | 0.00009580  | mv/v/N   |
| Lower Tibia Mx | Denton     | 121       | 395   | 0.00739650  | mv/v/Nm  |
| Lower Tibia My | Denton     | 121       | 395   | 0.00744720  | mv/v/Nm  |
| Ankle Rx       | Contelec   | 0523      | 180   | 3.17860     | mv/v/deg |
| Ankle Ry       | Contelec   | 0524      | 180   | 3.19060     | mv/v/deg |
| Ankle Rz       | Contelec   | 0525      | 180   | 3.18790     | mv/v/deg |
| Knee Dx        | Space Age  | C2102639B | 33    | 24.09410    | mv/v/mm  |
| Leg Ax         | Endevco    | P77996    | 2000  | 0.01803     | mv/v/g   |
| Leg Ay         | Endevco    | P64094    | 2000  | 0.02214     | mv/v/g   |
| Foot Ax        | Endevco    | P80271    | 2000  | 0.02100     | mv/v/g   |
| Foot Ay        | Endevco    | P74950    | 2000  | 0.01782     | mv/v/g   |
| Foot Az        | Endevco    | P51684    | 2000  | 0.01953     | mv/v/g   |
| Achilles Fz    | Denton     | 136       | 4448  | 0.000257800 | mv/V/N   |
| Upper Tibia Fx | Denton     | 75        | 11120 | 0.00017350  | mv/v/N   |
| Upper Tibia Fz | Denton     | 75        | 11120 | 0.00009520  | mv/v/N   |
| Upper Tibia Mx | Denton     | 75        | 395   | 0.00749000  | mv/v/Nm  |
| Upper Tibia My | Denton     | 75        | 395   | 0.00747580  | mv/v/Nm  |
| Lower Tibia Fx | Denton     | 166       | 11100 | 0.00017560  | mv/v/N   |
| Lower Tibia Fy | Denton     | 166       | 11100 | 0.00017130  | mv/v/N   |
| Lower Tibia Fz | Denton     | 166       | 11100 | 0.00009950  | mv/v/N   |
| Lower Tibia Mx | Denton     | 166       | 395   | 0.00742480  | mv/v/Nm  |
| Lower Tibia My | Denton     | 166       | 395   | 0.00737260  | mv/v/Nm  |
| Ankle Rx       | Contelec   | 0528      | 180   | 3.20220     | mv/v/deg |
| Ankle Ry       | Contelec   | 0526      | 180   | 3.15530     | mv/v/deg |

|             |           |        |      |             |          |
|-------------|-----------|--------|------|-------------|----------|
| Ankle Rz    | Contelec  | 0527-1 | 180  | 3.16060     | mv/v/deg |
| Knee Dx     | Space Age | 021033 | 30   | 23.25080    | mv/v/mm  |
| Leg Ax      | Endevco   | P82744 | 2000 | 0.01827     | mv/v/g   |
| Leg Ay      | Endevco   | P82322 | 2000 | 0.01726     | mv/v/g   |
| Foot Ax     | Endevco   | P74976 | 2000 | 0.01784     | mv/v/g   |
| Foot Ay     | Endevco   | P83340 | 2000 | 0.02038     | mv/v/g   |
| Foot Az     | Endevco   | P83339 | 2000 | 0.01990     | mv/v/g   |
| Achilles Fz | Denton    | 129    | 4448 | 0.000278100 | mv/V/N   |

**Table C- 4: 5<sup>th</sup> Female Dummy Initial Set-Up Information**

| 5 <sup>th</sup> Female<br>S/N: 324 |              |               |          |             |                   |
|------------------------------------|--------------|---------------|----------|-------------|-------------------|
| Sensor                             | Manufacturer | Serial Number | Range    | Sensitivity | Sensitivity Units |
| Head CG Ax                         | Endevco      | AC-P72219     | 2000     | 0.017320001 | mV/V/g            |
| Head CG Ax                         | Endevco      | AC-P49160     | 2000     | 0.016579999 | mV/V/g            |
| Head CG Ax                         | Endevco      | AC-P78168     | 2000     | 0.017820001 | mV/V/g            |
| Head CG RAx                        | Endevco      | AC-P49438     | 2000     | 0.019560001 | mV/V/g            |
| Head CG RAY                        | Endevco      | AC-P82323     | 2000     | 0.018110000 | mV/V/g            |
| Head CG RAz                        | Endevco      | AC-P74784     | 2000     | 0.017210001 | mV/V/g            |
| Head Wx                            | DTS          | LC-2254 Fx    | 18000    | 0.000190700 | mV/V/sec          |
| Head Wy                            | DTS          | LC-2254 Fy    | 18000    | 0.000185600 | mV/V/sec          |
| Head Wz                            | DTS          | LC-2254 Fz    | 18000    | 0.000099100 | mV/V/sec          |
| Upper Neck Fx                      | Denton       | LC-2254 Mx    | 8896.4   | 0.005778900 | mV/V/N            |
| Upper Neck Fy                      | Denton       | LC-2254 My    | 8896.4   | 0.005884700 | mV/V/N            |
| Upper Neck Fz                      | Denton       | LC-2254 Mz    | 13344.6  | 0.008229600 | mV/V/N            |
| Upper Neck Mx                      | Denton       | ARS-5931      | 282.5    | 0.093230003 | mV/V/Nm           |
| Upper Neck My                      | Denton       | ARS-4714      | 282.5    | 0.094490002 | mV/V/Nm           |
| Upper Neck Mz                      | Denton       | ARS-6635      | 282.5    | 0.098429999 | mV/V/Nm           |
| Chest Ax                           | Endevco      | AC-P83431     | 2000     | 0.017900000 | mV/V/g            |
| Chest Ay                           | Endevco      | AC-P84365     | 2000     | 0.019450001 | mV/V/g            |
| Chest Az                           | Endevco      | AC-P84472     | 2000     | 0.019229999 | mV/V/g            |
| Chest Dx                           | Servo        | DS-CST324     | 54       | 1.752399956 | mV/V/deg          |
| Pelvis Ax                          | Endevco      | AC-ACCE6      | 2000     | 0.023119999 | mV/V/g            |
| Pelvis Ay                          | Endevco      | AC-AGT82      | 2000     | 0.019800000 | mV/V/g            |
| Pelvis Az                          | Endevco      | AC-J19561     | 2000     | 0.026219999 | mV/V/g            |
| Femur Right Fz                     | Denton       | LC-1702 Fz    | 13340    | 0.000109400 | mV/V/N            |
| Femur Left Fz                      | Denton       | LC-1714 Fz    | 13340    | 0.000108200 | mV/V/N            |
| Upper Tibia Right Fx               | Denton       | LC-372 Fx     | 11120.55 | 0.000171412 | mV/V/N            |
| Upper Tibia Right Fy               | Denton       | LC-372 Fy     | 11120.55 | 0.000170342 | mV/V/N            |
| Upper Tibia Right Fz               | Denton       | LC-372 Fz     | 11120.55 | 0.000092600 | mV/V/N            |
| Upper Tibia Right Mx               | Denton       | LC-372 Mx     | 395.4467 | 0.007423756 | mV/V/Nm           |

|                              |         |           |          |             |         |
|------------------------------|---------|-----------|----------|-------------|---------|
| Upper Tibia Right My         | Denton  | LC-372 My | 395.4467 | 0.007387342 | mV/V/Nm |
| Lower Tibia Right Fx         | Denton  | LC-405 Fx | 11120.55 | 0.000174398 | mV/V/N  |
| Lower Tibia Right Fy         | Denton  | LC-405 Fy | 11120.55 | 0.000178211 | mV/V/N  |
| Lower Tibia Right Fz         | Denton  | LC-405 Fz | 11120.55 | 0.000093900 | mV/V/N  |
| Lower Tibia Right Mx         | Denton  | LC-405 Mx | 395.4467 | 0.007600771 | mV/V/Nm |
| Lower Tibia Right My         | Denton  | LC-405 My | 395.4467 | 0.007638450 | mV/V/Nm |
| Upper Tibia Left Fx          | Denton  | LC-484 Fx | 11120.55 | 0.000172159 | mV/V/N  |
| Upper Tibia Left Fy          | Denton  | LC-484 Fy | 11120.55 | 0.000170585 | mV/V/N  |
| Upper Tibia Left Fz          | Denton  | LC-484 Fz | 11120.55 | 0.000098900 | mV/V/N  |
| Upper Tibia Left Mx          | Denton  | LC-484 Mx | 395.4467 | 0.007399480 | mV/V/Nm |
| Upper Tibia Left My          | Denton  | LC-484 My | 395.4467 | 0.007426791 | mV/V/Nm |
| Lower Tibia Left Fx          | Denton  | LC-397 Fx | 11120.55 | 0.000174299 | mV/V/N  |
| Lower Tibia Left Fy          | Denton  | LC-397 Fy | 11120.55 | 0.000178453 | mV/V/N  |
| Lower Tibia Left Fz          | Denton  | LC-397 Fz | 11120.55 | 0.000095000 | mV/V/N  |
| Lower Tibia Left Mx          | Denton  | LC-397 Mx | 395.4467 | 0.007559047 | mV/V/Nm |
| Lower Tibia Left My          | Denton  | LC-397 My | 395.4467 | 0.007546908 | mV/V/Nm |
| Right Toe Az                 | Endevco | AC-P77601 | 2000     | 0.019200001 | mV/V/g  |
| Right Foot Ax                | Endevco | AC-P80250 | 2000     | 0.020280000 | mV/V/g  |
| Right Foot Az                | Endevco | AC-P63954 | 2000     | 0.021530001 | mV/V/g  |
| Left Toe Az                  | Endevco | AC-P82324 | 2000     | 0.017890001 | mV/V/g  |
| Left Foot Ax                 | Endevco | AC-P58708 | 2000     | 0.017799999 | mV/V/g  |
| Left Foot Az                 | Endevco | AC-P64109 | 2000     | 0.019409999 | mV/V/g  |
| RibEye Rib Deflection System | Boxboro | 108       | N/A      | N/A         | N/A     |

**Table C- 5: 5<sup>th</sup> Female Dummy Initial Set-Up Information**

| 5 <sup>th</sup> Female<br>S/N: 019 |              |               |         |             |                   |
|------------------------------------|--------------|---------------|---------|-------------|-------------------|
| Sensor                             | Manufacturer | Serial Number | Range   | Sensitivity | Sensitivity Units |
| Head CG Ax                         | Endevco      | AC-P79591     | 2000    | 0.023450000 | mV/V/g            |
| Head CG Ay                         | Endevco      | AC-P49181     | 2000    | 0.016900000 | mV/V/g            |
| Head CG Az                         | Endevco      | AC-P49214     | 2000    | 0.018500001 | mV/V/g            |
| Upper Neck Fx                      | Denton       | LC-2184 Fx    | 8896.4  | 0.000186800 | mV/V/N            |
| Upper Neck Fy                      | Denton       | LC-2184 Fy    | 8896.4  | 0.000182300 | mV/V/N            |
| Upper Neck Fz                      | Denton       | LC-2184 Fz    | 13344.6 | 0.000098100 | mV/V/N            |
| Upper Neck Mx                      | Denton       | LC-2184 Mx    | 282.5   | 0.005686400 | mV/V/Nm           |
| Upper Neck My                      | Denton       | LC-2184 My    | 282.5   | 0.005715100 | mV/V/Nm           |
| Upper Neck Mz                      | Denton       | LC-2184 Mz    | 282.5   | 0.008202000 | mV/V/Nm           |
| Chest Ax                           | Endevco      | AC-P80261     | 2000    | 0.020690000 | mV/V/g            |
| Chest Ay                           | Endevco      | AC-P80259     | 2000    | 0.019980000 | mV/V/g            |
| Chest Az                           | Endevco      | AC-P80254     | 2000    | 0.020050000 | mV/V/g            |
| Chest Ds                           | Servo        | DS-FEM019     | 54      | 1.831499976 | mV/V/deg          |
| Pelvis Ax                          | Endevco      | AC-P83343     | 2000    | 0.019850000 | mV/V/g            |



|                              |         |            |        |             |         |
|------------------------------|---------|------------|--------|-------------|---------|
| Pelvis Ay                    | Endevco | AC-P49439  | 2000   | 0.019120000 | mV/V/g  |
| Pelvis Az                    | Endevco | AC-P82757  | 2000   | 0.018490000 | mV/V/g  |
| ASIS Left Fx                 | Denton  | LC-1396 Fz | 8896.4 | 0.000107900 | mV/V/N  |
| ASIS Left My                 | Denton  | LC-1527 Fz | 225.9  | 0.000106300 | mV/V/Nm |
| ASIS Right Fx                | Denton  | LC-79 Fx   | 8896.4 | 0.000185400 | mV/V/N  |
| ASIS Right My                | Denton  | LC-79 My   | 225.9  | 0.005273300 | mV/V/Nm |
| Left Femur Fz                | Denton  | LC-76 Fx   | 13340  | 0.000185200 | mV/V/N  |
| Right Femur Fz               | Denton  | LC-76 My   | 13340  | 0.005243000 | mV/V/N  |
| RibEye Rib Deflection System | Boxboro | 107        | N/A    | N/A         | N/A     |

**Table 5 – THOR IR-TRACC Polarity**

In order to reduce the risk of damage to instrumentation, it is recommended that the 3D IR-TRACC units are not disconnected from the rib cage to conduct the polarity test. An alternate procedure for checking the IR-TRACC polarity is described below.

1. Using the data acquisition system control software, open a live view of each channel. If possible, view the DX, RY, and RZ components of a given quadrant simultaneously.
2. Record the initial reading of each channel
3. Perform the following motions on each of the four rib attachment locations and two abdomen attachment locations (specified by the hexagonal bolt attaching the blue ribs).
  - a. DX: Push inward (front-to-back). The IR-TRACC tube voltage should increase.
  - b. RY: Push downward (head-to-pelvis). The Y-axis potentiometer reading should decrease.
  - c. RZ: Push rightward (left-to-right). The Z-axis potentiometer should increase.
4. Record the final reading of each channel
5. If the “Measured” value (increase or decrease) does not match the “Expected” value, the polarity of the channel must be inverted.

## THOR DL9207

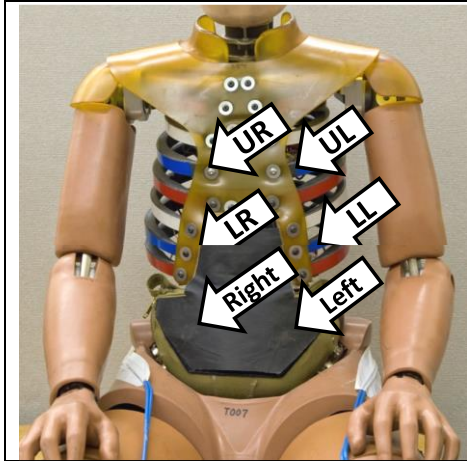


Figure 1. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

| Channel | Motion         |
|---------|----------------|
| DX      | Push inward    |
| RY      | Push upward    |
| RZ      | Push rightward |

| Upper Right Thorax |               |                   |                   | Upper Left Thorax |               |                   |                   |
|--------------------|---------------|-------------------|-------------------|-------------------|---------------|-------------------|-------------------|
| Channel            | Initial Value | Expected Polarity | Recorded Polarity | Channel           | Initial Value | Expected Polarity | Recorded Polarity |
| DX (V)             | 0.12625       | +                 | +                 | DX (V)            | 0.14208       | +                 | +                 |
| RY (Deg)           | 8.1864        | +                 | +                 | RY (Deg)          | 3.5479        | +                 | +                 |
| RZ (Deg)           | -8.7763       | +                 | +                 | RZ (Deg)          | 11.9783       | +                 | +                 |
| Lower Right Thorax |               |                   |                   | Lower Left Thorax |               |                   |                   |
| Channel            | Initial Value | Expected Polarity | Recorded Polarity | Channel           | Initial Value | Expected Polarity | Recorded Polarity |
| DX (V)             | 0.07354       | +                 | +                 | DX (V)            | 0.08948       | +                 | +                 |
| RY (Deg)           | 0.77097       | +                 | +                 | RY (Deg)          | 3.7068        | +                 | +                 |
| RZ (Deg)           | -6.8798       | +                 | +                 | RZ (Deg)          | 7.1676        | +                 | +                 |
| Abdomen Right      |               |                   |                   | Abdomen Left      |               |                   |                   |
| Channel            | Initial Value | Expected Polarity | Recorded Polarity | Channel           | Initial Value | Expected Polarity | Recorded Polarity |
| DX (V)             | N/A           | +                 | +                 | DX (V)            | N/A           | +                 | +                 |
| RY (Deg)           | N/A           | +                 | +                 | RY (Deg)          | N/A           | +                 | +                 |
| RZ (Deg)           | N/A           | +                 | +                 | RZ (Deg)          | N/A           | +                 | +                 |

# THOR Inspection Checklist

|                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date: <b>1/13/2016</b>                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                           |
| NHTSA Representative: <b>Tim Keon</b>                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                           |
| Inspection Reporter: <b>Matt Goehle</b>                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                           |
| Inspection type (check one): <input checked="" type="checkbox"/> Pre-Test <input type="checkbox"/> Post-Test                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                           |
| Dummy S/N: <b>DL9207</b>                                                                                                                                                                                                                                                                                                                               | Legs S/N: <b>LX0045/LX0046</b>                                                                                                                                                                                                                                                                                                            |
| Dummy Description: <b>THOR-M 50<sup>th</sup> Male</b>                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                           |
| Date of last Certification: <b>12/23/2015</b>                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                           |
| Tests conducted since last inspection:<br><b>M20160113-2016 Chevrolet Malibu</b>                                                                                                                                                                                                                                                                       | Since last certification:<br><b>M20165306 - 2016 Honda Fit</b><br><b>M20160113 – 2016 Chevrolet Malibu</b>                                                                                                                                                                                                                                |
| <u>Known errors in data channels (no data, clipping, unexpected drops):</u><br>- 13TIBILELOHFFOZP, Left Lower Tibia Z Force, Questionable spike at 42.5ms, SN:LC-405 Fz                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                           |
| <u>Physical evidence of damage:</u><br><b>None New</b>                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                           |
| <u>Anecdotal evidence of damage:</u><br><b>None</b>                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                           |
| <u>Equipment delivered to Borrower:</u><br><b>THOR DL9207 ATD</b><br><b>26 Accelerometers</b><br><b>3 Angular Rate Sensors</b><br><b>2 Skull Spring LC</b><br><b>1 Condyle Pot</b><br><b>1 Upper Neck LC</b><br><b>6 IRTraccs</b><br><b>12 Rotational Pots</b><br><b>1 Spine LC</b><br><b>2 Acetabulum LC</b><br><b>2 ASIS LC</b><br><b>2 Femur LC</b> | <i>Continued</i><br><b>2 LX Leg Assemblies</b><br><b>2 Upper Tibia LC</b><br><b>2 Lower Tibia LC</b><br><b>6 Ank1e Potentiometers</b><br><b>2 Knee Sliders</b><br><b>1 Neck Skin</b><br><b>1 Neck Foam</b><br><b>1 Tiltview Interface Cable</b><br><b>4 Tilt Sensors</b><br><b>1 H-Point Tool</b><br><b>1 Tool Box</b><br><b>1 Laptop</b> |

**Note: New Damage is Noted in Red**

| HEAD     |                                                                                                                                                                                                             |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Y / N    | Rear head cap mounts securely to head                                                                                                                                                                       |
| Y / N    | Head skin fits securely over skull                                                                                                                                                                          |
| Y / N    | Head skin shows no sign of tears or damage                                                                                                                                                                  |
| Y / N    | Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached                                                                                                        |
| Y / N    | Head securely mounted to OC joint                                                                                                                                                                           |
| OTHER    |                                                                                                                                                                                                             |
| NECK     |                                                                                                                                                                                                             |
| Y / N    | Neck cables slide freely through holes in neck plates                                                                                                                                                       |
| Y / N    | Neck cables show no sign of fraying, broken strands, or kinking                                                                                                                                             |
| Y / N    | No evidence of de-bonding between neck pucks and plates                                                                                                                                                     |
| Y / N    | No evidence of de-bonding or permanent compression in neck soft stop assemblies<br><b>Front of the neck is missing the soft stop</b>                                                                        |
|          |                                                                                                                            |
| Y / N    | Neck securely attached to upper neck load cell                                                                                                                                                              |
| Y / N    | Neck securely attached to lower neck load cell                                                                                                                                                              |
| Y / N    | Neck pitch change joint mechanism mating teeth are engaged                                                                                                                                                  |
| OTHER    |                                                                                                                                                                                                             |
| SHOULDER |                                                                                                                                                                                                             |
| Y / N    | Urethane shoulder pads show no evidence of contact                                                                                                                                                          |
| Y / N    | Clavicles securely attached to sternum and shoulder                                                                                                                                                         |
| Y / N    | No evidence of de-bonding, tearing, or permanent compression of posterior soft stops<br><b>Damage to both the left and right shoulder soft stops. The left shoulder is missing one.</b>                     |
|          | <div>Left:</div>  <div>Right:</div>  |
| OTHER    |                                                                                                                                                                                                             |
| SPINE    |                                                                                                                                                                                                             |
| Y / N    | No evidence of de-bonding between thoracic spine flex joint and metal plates                                                                                                                                |
| Y / N    | No evidence of de-bonding between lumbar spine flex joint and metal plates                                                                                                                                  |
| Y / N    | Lumbar spine pitch change joint mechanism mating teeth are engaged                                                                                                                                          |
| OTHER    |                                                                                                                                                                                                             |
| THORAX   |                                                                                                                                                                                                             |
| Y / N    | No evidence of contact at top, bottom, or interior faces of rib damping material                                                                                                                            |
| Y / N    | No evidence of de-bonding between rib damping material and ribs                                                                                                                                             |
| Y / N    | IRTRACCs securely attached to anterior ribs                                                                                                                                                                 |
| Y / N    | IRTRACCs securely attached to double gimbals, spine                                                                                                                                                         |
| Y / N    | Urethane bib is securely attached to ribs with no sign of tearing or washer penetration                                                                                                                     |
| Y / N    | Ribs securely attached to posterior spine                                                                                                                                                                   |
| Y / N    | Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)                                                                                                                            |
| OTHER    |                                                                                                                                                                                                             |



| ABDOMEN |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Y / N   | No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Y / N   | Upper abdomen insert securely attached to spine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Y / N   | Upper abdomen insert shows no evidence of permanent set                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Y / N   | No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper<br><b>Multiple tears and broken stitches in lower abdomen bag. The upper and lower abdomen bags appear to be from THOR SN007</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|         |         |
| Y / N   | Lower abdomen insert securely attached to spine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Y / N   | Lower abdomen insert shows no evidence of permanent set                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| OTHER   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| PELVIS  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Y / N   | Pelvis flesh fits securely over pelvis bones                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Y / N   | H-point tool fits securely into hole on both sides of pelvis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| OTHER   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| FEMUR   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Y / N   | Acetabular load cells firmly attached                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Y / N   | Femur load cells firmly attached                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Y / N   | No evidence of deformation of knee slider bump stop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Y / N   | No cuts, tears, or scuffing of knee flesh<br><b>Right knee flesh torn</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                             |                                                                                                                                                                                                                                                                                                                  |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OTHER                       | <p><b>Left femur flesh is separating from zipper. We placed gaffer's tape across zipper to prevent further damage.</b></p>                                                                                                      |
| <b>LOWER EXTREMITY (LX)</b> |                                                                                                                                                                                                                                                                                                                  |
| Y / N                       | Rotational potentiometers in ankle securely attached                                                                                                                                                                                                                                                             |
| Y / N                       | Achilles tendon provides resistance to dorsiflexion                                                                                                                                                                                                                                                              |
| Y / N                       | No evidence of de-bonding, tearing, or permanent compression of ankle soft stops                                                                                                                                                                                                                                 |
| Y / N                       | <p>No cuts, tears, or scuffing of leg flesh</p> <p><b>Left lower leg flesh is torn near zipper. We placed gaffer's tape around the flesh to prevent further damage.</b></p>                                                    |
| OTHER                       |                                                                                                                                                                                                                                                                                                                  |
| <b>JACKET</b>               |                                                                                                                                                                                                                                                                                                                  |
| Y / N                       | Rib stiffeners show no sign of permanent deformation                                                                                                                                                                                                                                                             |
| Y / N                       | <p>No evidence of tears or holes in jacket fabric, Velcro, or zippers</p> <p><b>The chest jacket has two tears near the middle:</b></p>   |
| OTHER                       |                                                                                                                                                                                                                                                                                                                  |

# THOR Inspection Checklist

|                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date: <b>1/16/2016</b>                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                           |
| NHTSA Representative: <b>Tim Keon</b>                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                           |
| Inspection Reporter: <b>Mike Hartung</b>                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                           |
| Inspection type (check one): <input type="checkbox"/> Pre-Test <input checked="" type="checkbox"/> Post-Test                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                           |
| Dummy S/N: <b>DL9207</b>                                                                                                                                                                                                                                                                                                                               | Legs S/N: <b>LX0045/LX0046</b>                                                                                                                                                                                                                                                                                                            |
| Dummy Description: <b>THOR-M 50<sup>th</sup> Male</b>                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                           |
| Date of last Certification: <b>12/23/2015</b>                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                           |
| <u>Tests conducted since last inspection:</u><br><b>M20160118- Chevrolet Tahoe</b>                                                                                                                                                                                                                                                                     | <u>Since last certification:</u><br><b>M20165306 - 2016 Honda Fit</b><br><b>M20160113 – 2016 Chevrolet Malibu</b><br><b>M20160118- Chevrolet Tahoe</b>                                                                                                                                                                                    |
| <u>Known errors in data channels (no data, clipping, unexpected drops):</u><br>- <b>None</b>                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                           |
| <u>Physical evidence of damage:</u><br><b>None New</b>                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                           |
| <u>Anecdotal evidence of damage:</u><br><b>None</b>                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                           |
| <u>Equipment delivered to Borrower:</u><br><b>THOR DL9207 ATD</b><br><b>26 Accelerometers</b><br><b>3 Angular Rate Sensors</b><br><b>2 Skull Spring LC</b><br><b>1 Condyle Pot</b><br><b>1 Upper Neck LC</b><br><b>6 IRTraccs</b><br><b>12 Rotational Pots</b><br><b>1 Spine LC</b><br><b>2 Acetabulum LC</b><br><b>2 ASIS LC</b><br><b>2 Femur LC</b> | <i>Continued</i><br><b>2 LX Leg Assemblies</b><br><b>2 Upper Tibia LC</b><br><b>2 Lower Tibia LC</b><br><b>6 Ank1e Potentiometers</b><br><b>2 Knee Sliders</b><br><b>1 Neck Skin</b><br><b>1 Neck Foam</b><br><b>1 Tiltview Interface Cable</b><br><b>4 Tilt Sensors</b><br><b>1 H-Point Tool</b><br><b>1 Tool Box</b><br><b>1 Laptop</b> |

**Note: New Damage is Noted in Red**

| HEAD     |                                                                                                                                                                                                     |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Y / N    | Rear head cap mounts securely to head                                                                                                                                                               |
| Y / N    | Head skin fits securely over skull                                                                                                                                                                  |
| Y / N    | Head skin shows no sign of tears or damage                                                                                                                                                          |
| Y / N    | Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached                                                                                                |
| Y / N    | Head securely mounted to OC joint                                                                                                                                                                   |
| OTHER    |                                                                                                                                                                                                     |
| NECK     |                                                                                                                                                                                                     |
| Y / N    | Neck cables slide freely through holes in neck plates                                                                                                                                               |
| Y / N    | Neck cables show no sign of fraying, broken strands, or kinking                                                                                                                                     |
| Y / N    | No evidence of de-bonding between neck pucks and plates                                                                                                                                             |
| Y / N    | No evidence of de-bonding or permanent compression in neck soft stop assemblies<br><b>Front of the neck is missing the soft stop</b>                                                                |
|          |                                                                                                                    |
| Y / N    | Neck securely attached to upper neck load cell                                                                                                                                                      |
| Y / N    | Neck securely attached to lower neck load cell                                                                                                                                                      |
| Y / N    | Neck pitch change joint mechanism mating teeth are engaged                                                                                                                                          |
| OTHER    |                                                                                                                                                                                                     |
| SHOULDER |                                                                                                                                                                                                     |
| Y / N    | Urethane shoulder pads show no evidence of contact                                                                                                                                                  |
| Y / N    | Clavicles securely attached to sternum and shoulder                                                                                                                                                 |
| Y / N    | No evidence of de-bonding, tearing, or permanent compression of posterior soft stops<br><b>Damage to both the left and right shoulder soft stops. The left shoulder is missing one.</b>             |
|          | <b>Left:</b>  <b>Right:</b>  |
| OTHER    |                                                                                                                                                                                                     |
| SPINE    |                                                                                                                                                                                                     |
| Y / N    | No evidence of de-bonding between thoracic spine flex joint and metal plates                                                                                                                        |
| Y / N    | No evidence of de-bonding between lumbar spine flex joint and metal plates                                                                                                                          |
| Y / N    | Lumbar spine pitch change joint mechanism mating teeth are engaged                                                                                                                                  |
| OTHER    |                                                                                                                                                                                                     |
| THORAX   |                                                                                                                                                                                                     |
| Y / N    | No evidence of contact at top, bottom, or interior faces of rib damping material                                                                                                                    |
| Y / N    | No evidence of de-bonding between rib damping material and ribs                                                                                                                                     |
| Y / N    | IRTRACCs securely attached to anterior ribs                                                                                                                                                         |
| Y / N    | IRTRACCs securely attached to double gimbals, spine                                                                                                                                                 |
| Y / N    | Urethane bib is securely attached to ribs with no sign of tearing or washer penetration                                                                                                             |
| Y / N    | Ribs securely attached to posterior spine                                                                                                                                                           |
| Y / N    | Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)                                                                                                                    |
| OTHER    |                                                                                                                                                                                                     |



| ABDOMEN |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Y / N   | No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Y / N   | Upper abdomen insert securely attached to spine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Y / N   | Upper abdomen insert shows no evidence of permanent set                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Y / N   | No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper<br><b>Multiple tears and broken stitches in lower abdomen bag. The upper and lower abdomen bags appear to be from THOR SN007</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|         |         |
| Y / N   | Lower abdomen insert securely attached to spine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Y / N   | Lower abdomen insert shows no evidence of permanent set                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| OTHER   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| PELVIS  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Y / N   | Pelvis flesh fits securely over pelvis bones                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Y / N   | H-point tool fits securely into hole on both sides of pelvis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| OTHER   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| FEMUR   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Y / N   | Acetabular load cells firmly attached                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Y / N   | Femur load cells firmly attached                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Y / N   | No evidence of deformation of knee slider bump stop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Y / N   | No cuts, tears, or scuffing of knee flesh<br><b>Right knee flesh torn</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| OTHER   | Left femur flesh is separating from zipper. We placed gaffer's tape across zipper to prevent further damage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

|                      |                                                                                                                                                                  |                                                                                      |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|                      |                                                                                  |                                                                                      |
| LOWER EXTREMITY (LX) |                                                                                                                                                                  |                                                                                      |
| Y / N                | Rotational potentiometers in ankle securely attached                                                                                                             |                                                                                      |
| Y / N                | Achilles tendon provides resistance to dorsiflexion                                                                                                              |                                                                                      |
| Y / N                | No evidence of de-bonding, tearing, or permanent compression of ankle soft stops                                                                                 |                                                                                      |
| Y / N                | No cuts, tears, or scuffing of leg flesh<br><b>Left lower leg flesh is torn near zipper. We placed gaffer's tape around the flesh to prevent further damage.</b> |                                                                                      |
|                      |                                                                                |                                                                                      |
| OTHER                |                                                                                                                                                                  |                                                                                      |
| JACKET               |                                                                                                                                                                  |                                                                                      |
| Y / N                | Rib stiffeners show no sign of permanent deformation                                                                                                             |                                                                                      |
| Y / N                | No evidence of tears or holes in jacket fabric, Velcro, or zippers<br><b>The chest jacket has two tears near the middle:</b>                                     |                                                                                      |
|                      |                                                                               |  |
| OTHER                |                                                                                                                                                                  |                                                                                      |

## ATD 324: Pre-Test Inspection

### 5<sup>th</sup> Female Inspection Checklist

|                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Date: <b>1/13/2016</b>                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                 |
| NHTSA Representative: <b>Tim Keon</b>                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                 |
| Inspection Reporter: <b>Matt Goehle</b>                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                 |
| Inspection type (check one): <input checked="" type="checkbox"/> Pre-Test <input type="checkbox"/> Post-Test                                                                                                                                                                                                                                                                                                         |                                                                                                                 |
| Dummy S/N: <b>324</b>                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                 |
| Dummy Description: <b>Hybrid 3 – 5<sup>th</sup> Female</b>                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                 |
| Date of last Certification: <b>1/5/2016</b>                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                 |
| <u>Tests conducted since last inspection:</u><br><b>M20160113 – 2016 Chevrolet Malibu</b>                                                                                                                                                                                                                                                                                                                            | <u>Since last certification:</u><br><b>M20165306-2016 Honda Fit</b><br><b>M20160113 – 2016 Chevrolet Malibu</b> |
| <u>Known errors in data channels (no data, clipping, unexpected drops):</u><br><b>None</b>                                                                                                                                                                                                                                                                                                                           |                                                                                                                 |
| <u>Physical evidence of damage:</u><br><b>None New</b>                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                 |
| <u>Anecdotal evidence of damage:</u><br><b>None</b>                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                 |
| <u>Equipment delivered to Borrower:</u><br><b>Hybrid 3 5<sup>th</sup> Female</b><br><b>1 RibEye rib displacement system</b><br><b>1 RibEye trunk box</b><br><b>1 RibEye power cable</b><br><b>1 RibEye trigger cable</b><br><b>1 Ethernet cable</b><br><b>1 RibEye software and manual disk</b><br><b>9 Accelerometers</b><br><b>1 Upper neck load cell</b><br><b>2 ASIS load cells</b><br><b>2 Femur load cells</b> |                                                                                                                 |

**Note: New Damage is Noted in Red**

|                       |                                                                                                                                                                   |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>HEAD</b>           |                                                                                                                                                                   |
| <b>Y</b> / N          | Ballast secure                                                                                                                                                    |
| Y / <b>N</b>          | General appearance<br><b>Minor cuts and scuffing</b><br>                         |
| OTHER                 |                                                                                                                                                                   |
| <b>NECK</b>           |                                                                                                                                                                   |
| <b>Y</b> / N          | Rubber is not cracked or broken                                                                                                                                   |
| <b>Y</b> / N          | Upper neck bracket is firmly attached to the lower neck bracket                                                                                                   |
| <b>Y</b> / N          | The condyle joint is tight                                                                                                                                        |
| <b>Y</b> / N          | Nodding blocks are not cracked, broken, or out of position                                                                                                        |
| OTHER                 |                                                                                                                                                                   |
| <b>SPINE/PELVIS</b>   |                                                                                                                                                                   |
| <b>Y</b> / N          | Rubber is not cracked or broken                                                                                                                                   |
| <b>Y</b> / N          | Pelvis is not broken or damaged                                                                                                                                   |
| OTHER                 |                                                                                                                                                                   |
| <b>THORAX/ABDOMEN</b> |                                                                                                                                                                   |
| <b>Y</b> / N          | Ribs are intact and straight                                                                                                                                      |
| <b>Y</b> / N          | Rib supports are intact and straight                                                                                                                              |
| <b>Y</b> / N          | Rib damping material not separated or cracked                                                                                                                     |
| <b>Y</b> / N          | Rubber bumpers in place                                                                                                                                           |
| <b>Y</b> / N          | Abdomen is not deformed                                                                                                                                           |
| <b>Y</b> / N          | Abdomen is not cracked or broken                                                                                                                                  |
| OTHER                 |                                                                                                                                                                   |
| <b>KNEES</b>          |                                                                                                                                                                   |
| <b>Y</b> / N          | Skin is not torn                                                                                                                                                  |
| <b>Y</b> / N          | Inserts are in good condition and the proper position                                                                                                             |
| <b>Y</b> / N          | Slider wires are intact                                                                                                                                           |
| <b>Y</b> / N          | Slider rubber returns to “at rest” position                                                                                                                       |
| OTHER                 |                                                                                                                                                                   |
| <b>LIMBS</b>          |                                                                                                                                                                   |
| <b>Y</b> / N          | Arms have normal movement and adjustment                                                                                                                          |
| <b>Y</b> / N          | Arm flesh is in good condition                                                                                                                                    |
| <b>Y</b> / N          | Legs have normal movement and adjustment                                                                                                                          |
| Y / <b>N</b>          | Leg flesh is in good condition<br><b>Small cuts at top of tibia flesh:</b><br> |
| <b>Y</b> / N          | Feet are in good condition                                                                                                                                        |
| OTHER                 |                                                                                                                                                                   |



| INSTRUMENTATION |                                                                         |
|-----------------|-------------------------------------------------------------------------|
| Y / N           | Chest pot shaft is straight                                             |
| Y / N           | Slider arm is riding in track                                           |
| Y / N           | RibEye system (if equipped) has no physically broken wires or equipment |
| Y / N           | Transducer cables are not torn or exposing shield                       |
| Y / N           | Accelerometer mounts are all secure                                     |
| Y / N           | LEMO connectors are straight and securely fit into acquisition hardware |
| OTHER           |                                                                         |

## ATD 324: Post-Test Inspection

### 5<sup>th</sup> Female Inspection Checklist

|                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date: <b>1/16/2016</b>                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                            |
| NHTSA Representative: <b>Tim Keon</b>                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                            |
| Inspection Reporter: <b>Mike Hartung</b>                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                            |
| Inspection type (check one): <input type="checkbox"/> Pre-Test <input checked="" type="checkbox"/> Post-Test                                                                                                                                                                                                                                                                                                         |                                                                                                                                                            |
| Dummy S/N: <b>324</b>                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                            |
| Dummy Description: <b>Hybrid 3 – 5<sup>th</sup> Female</b>                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                            |
| Date of last Certification: <b>1/5/2016</b>                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                            |
| <u>Tests conducted since last inspection:</u><br><b>M20160118 – 2016 Chevrolet Tahoe</b>                                                                                                                                                                                                                                                                                                                             | <u>Since last certification:</u><br><b>M20165306-2016 Honda Fit</b><br><b>M20160113 – 2016 Chevrolet Malibu</b><br><b>M20160118 – 2016 Chevrolet Tahoe</b> |
| <u>Known errors in data channels (no data, clipping, unexpected drops):</u><br><b>None</b>                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                            |
| <u>Physical evidence of damage:</u><br><b>None New</b>                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                            |
| <u>Anecdotal evidence of damage:</u><br><b>None</b>                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                            |
| <u>Equipment delivered to Borrower:</u><br><b>Hybrid 3 5<sup>th</sup> Female</b><br><b>1 RibEye rib displacement system</b><br><b>1 RibEye trunk box</b><br><b>1 RibEye power cable</b><br><b>1 RibEye trigger cable</b><br><b>1 Ethernet cable</b><br><b>1 RibEye software and manual disk</b><br><b>9 Accelerometers</b><br><b>1 Upper neck load cell</b><br><b>2 ASIS load cells</b><br><b>2 Femur load cells</b> |                                                                                                                                                            |

**Note: New Damage is Noted in Red**

|                       |                                                                                                                                                                   |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>HEAD</b>           |                                                                                                                                                                   |
| <b>Y</b> / N          | Ballast secure                                                                                                                                                    |
| Y / <b>N</b>          | General appearance<br><b>Minor cuts and scuffing</b><br>                         |
| OTHER                 |                                                                                                                                                                   |
| <b>NECK</b>           |                                                                                                                                                                   |
| <b>Y</b> / N          | Rubber is not cracked or broken                                                                                                                                   |
| <b>Y</b> / N          | Upper neck bracket is firmly attached to the lower neck bracket                                                                                                   |
| <b>Y</b> / N          | The condyle joint is tight                                                                                                                                        |
| <b>Y</b> / N          | Nodding blocks are not cracked, broken, or out of position                                                                                                        |
| OTHER                 |                                                                                                                                                                   |
| <b>SPINE/PELVIS</b>   |                                                                                                                                                                   |
| <b>Y</b> / N          | Rubber is not cracked or broken                                                                                                                                   |
| <b>Y</b> / N          | Pelvis is not broken or damaged                                                                                                                                   |
| OTHER                 |                                                                                                                                                                   |
| <b>THORAX/ABDOMEN</b> |                                                                                                                                                                   |
| <b>Y</b> / N          | Ribs are intact and straight                                                                                                                                      |
| <b>Y</b> / N          | Rib supports are intact and straight                                                                                                                              |
| <b>Y</b> / N          | Rib damping material not separated or cracked                                                                                                                     |
| <b>Y</b> / N          | Rubber bumpers in place                                                                                                                                           |
| <b>Y</b> / N          | Abdomen is not deformed                                                                                                                                           |
| <b>Y</b> / N          | Abdomen is not cracked or broken                                                                                                                                  |
| OTHER                 |                                                                                                                                                                   |
| <b>KNEES</b>          |                                                                                                                                                                   |
| <b>Y</b> / N          | Skin is not torn                                                                                                                                                  |
| <b>Y</b> / N          | Inserts are in good condition and the proper position                                                                                                             |
| <b>Y</b> / N          | Slider wires are intact                                                                                                                                           |
| <b>Y</b> / N          | Slider rubber returns to “at rest” position                                                                                                                       |
| OTHER                 |                                                                                                                                                                   |
| <b>LIMBS</b>          |                                                                                                                                                                   |
| <b>Y</b> / N          | Arms have normal movement and adjustment                                                                                                                          |
| <b>Y</b> / N          | Arm flesh is in good condition                                                                                                                                    |
| <b>Y</b> / N          | Legs have normal movement and adjustment                                                                                                                          |
| Y / <b>N</b>          | Leg flesh is in good condition<br><b>Small cuts at top of tibia flesh:</b><br> |
| <b>Y</b> / N          | Feet are in good condition                                                                                                                                        |
| OTHER                 |                                                                                                                                                                   |

| INSTRUMENTATION |                                                                         |
|-----------------|-------------------------------------------------------------------------|
| Y / N           | Chest pot shaft is straight                                             |
| Y / N           | Slider arm is riding in track                                           |
| Y / N           | RibEye system (if equipped) has no physically broken wires or equipment |
| Y / N           | Transducer cables are not torn or exposing shield                       |
| Y / N           | Accelerometer mounts are all secure                                     |
| Y / N           | LEMO connectors are straight and securely fit into acquisition hardware |
| OTHER           |                                                                         |



## ATD 019: Pre-Test Inspection

### 5<sup>th</sup> Female Inspection Checklist

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Date: <b>1/13/2016</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                   |
| NHTSA Representative: <b>Tim Keon</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                   |
| Inspection Reporter: <b>Matt Goehle</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                   |
| Inspection type (check one): <input checked="" type="checkbox"/> Pre-Test <input type="checkbox"/> Post-Test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                   |
| Dummy S/N: <b>019</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                   |
| Dummy Description: <b>Hybrid 3 – 5<sup>th</sup> Female</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                   |
| Date of last Certification: <b>1/5/2016</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                   |
| <u>Tests conducted since last inspection:</u><br><b>M20160113 – 2016 Chevrolet Malibu</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <u>Since last certification:</u><br><b>M20165306 - 2016 Honda Fit</b><br><b>M20160113 – 2016 Chevrolet Malibu</b> |
| <u>Known errors in data channels (no data, clipping, unexpected drops):</u> <ul style="list-style-type: none"><li>• 16RIBS01LEHFDSXP,RibEye Left Rib 01 Displacement X, Questionable data 76.7ms to 100ms</li><li>• 16RIBS01LEHFDSYP,RibEye Left Rib 01 Displacement Y, Questionable data 76.7ms to 100ms</li><li>• 16RIBS05RIHFDSXP,RibEye Right Rib 05 Displacement X, Interference by Chest Pot and Abdominal Insert</li><li>• 16RIBS05RIHFDSYP,RibEye Right Rib 05 Displacement Y, Interference by Chest Pot and Abdominal Insert</li><li>• 16RIBS06RIHFDSXP,RibEye Right Rib 06 Displacement X, Interference by Chest Pot and Abdominal Insert</li><li>• 16RIBS06RIHFDSYP,RibEye Right Rib 06 Displacement Y, Interference by Chest Pot and Abdominal Insert</li></ul> |                                                                                                                   |
| <u>Physical evidence of damage:</u><br><b>None New</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                   |
| <u>Anecdotal evidence of damage:</u><br><b>None</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                   |
| <u>Equipment delivered to Borrower:</u><br><b>Hybrid 3 5<sup>th</sup> Female</b><br><b>1 RibEye rib displacement system</b><br><b>1 RibEye trunk box</b><br><b>1 RibEye power cable</b><br><b>1 RibEye trigger cable</b><br><b>1 Ethernet cable</b><br><b>1 RibEye software and manual disk</b><br><b>9 Accelerometers</b><br><b>1 Upper neck load cell</b><br><b>2 ASIS load cells</b><br><b>2 Femur load cells</b>                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                   |

**Note: New Damage is Noted in Red**

| HEAD            |                                                                                          |
|-----------------|------------------------------------------------------------------------------------------|
| Y / N           | Ballast secure                                                                           |
| Y / N           | General appearance<br><b>Minor scuffing</b>                                              |
| OTHER           |                                                                                          |
| NECK            |                                                                                          |
| Y / N           | Rubber is not cracked or broken<br><b>Minor scuffing</b>                                 |
| Y / N           | Upper neck bracket is firmly attached to the lower neck bracket                          |
| Y / N           | The condyle joint is tight                                                               |
| Y / N           | Nodding blocks are not cracked, broken, or out of position                               |
| OTHER           |                                                                                          |
| SPINE/PELVIS    |                                                                                          |
| Y / N           | Rubber is not cracked or broken                                                          |
| Y / N           | Pelvis is not broken or damaged                                                          |
| OTHER           |                                                                                          |
| THORAX/ABDOMEN  |                                                                                          |
| Y / N           | Ribs are intact and straight                                                             |
| Y / N           | Rib supports are intact and straight                                                     |
| Y / N           | Rib damping material not separated or cracked                                            |
| Y / N           | Rubber bumpers in place                                                                  |
| Y / N           | Abdomen is not deformed                                                                  |
| Y / N           | Abdomen is not cracked or broken                                                         |
| OTHER           |                                                                                          |
| KNEES           |                                                                                          |
| Y / N           | Skin is not torn                                                                         |
| Y / N           | Inserts are in good condition and the proper position                                    |
| Y / N           | Slider wires are intact                                                                  |
| Y / N           | Slider rubber returns to “at rest” position                                              |
| OTHER           |                                                                                          |
| LIMBS           |                                                                                          |
| Y / N           | Arms have normal movement and adjustment                                                 |
| Y / N           | Arm flesh is in good condition                                                           |
| Y / N           | Legs have normal movement and adjustment                                                 |
| Y / N           | Leg flesh is in good condition<br><b>Right tibia flesh has minor cut at bottom front</b> |
|                 |       |
| Y / N           | Feet are in good condition                                                               |
| OTHER           |                                                                                          |
| INSTRUMENTATION |                                                                                          |
| Y / N           | Chest pot shaft is straight                                                              |
| Y / N           | Slider arm is riding in track                                                            |
| Y / N           | RibEye system (if equipped) has no physically broken wires or equipment                  |
| Y / N           | Transducer cables are not torn or exposing shield                                        |
| Y / N           | Accelerometer mounts are all secure                                                      |
| Y / N           | LEMO connectors are straight and securely fit into acquisition hardware                  |
| OTHER           |                                                                                          |

**ATD 019: Post-Test Inspection**

**Test Data/Sensor Repair Notes**



## DUMMY CALIBRATIONS

## 50% ADULT MALE THOR DL9207 DUMMY CALIBRATIONS

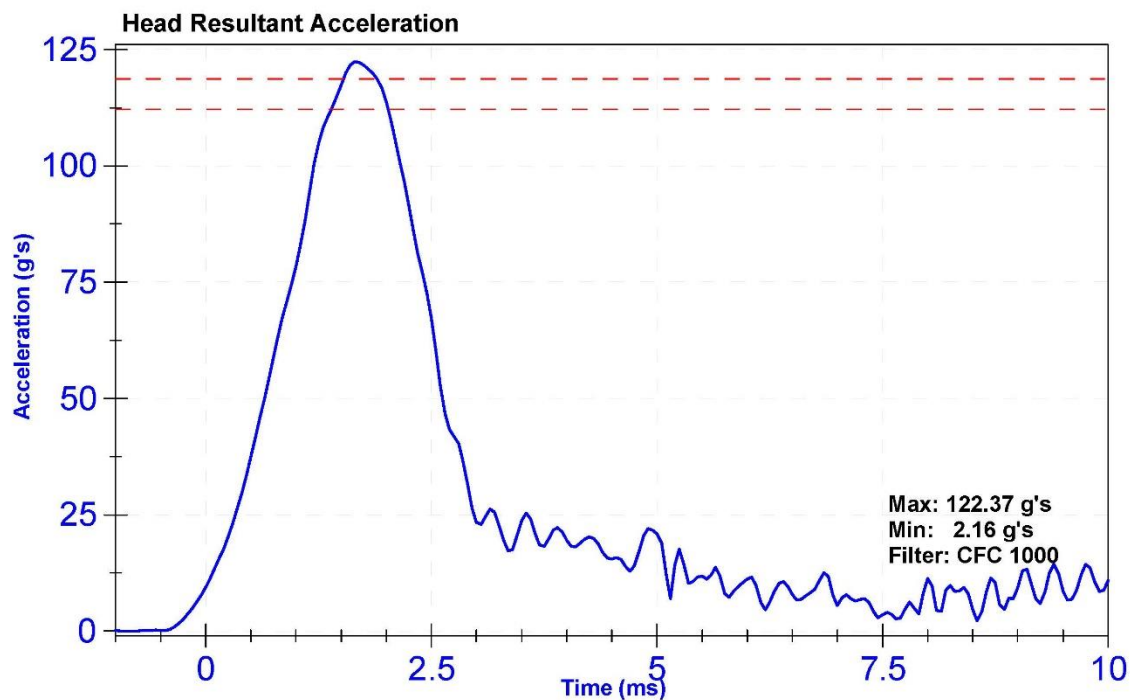
|                   |            |                       |           |
|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

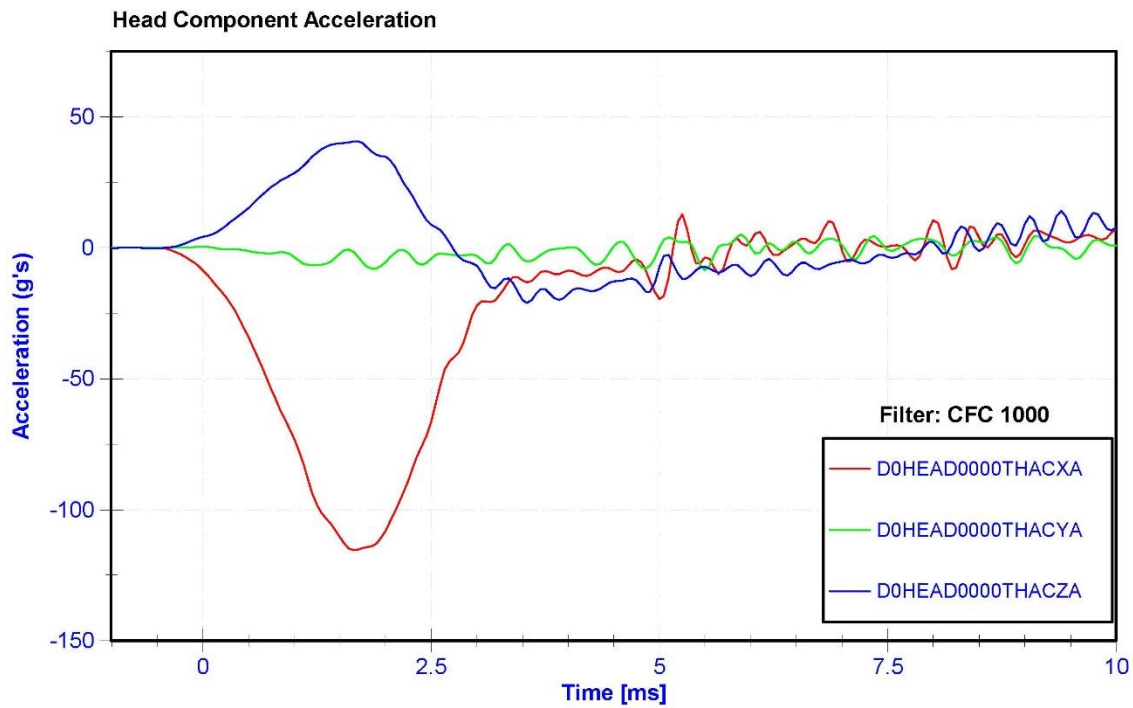
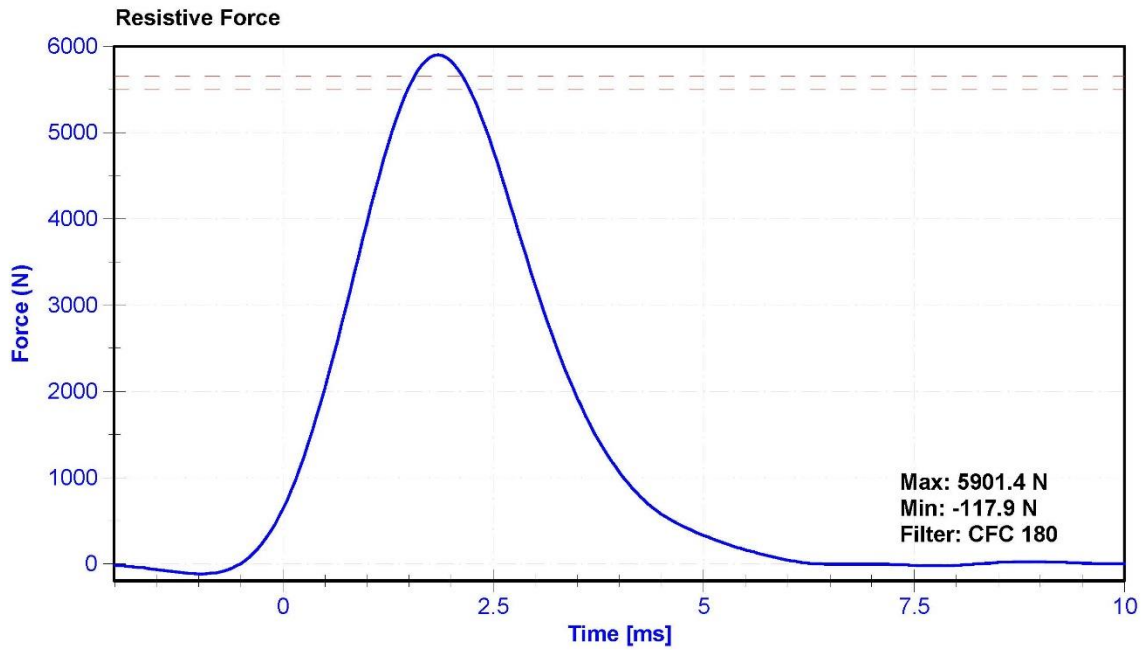
#### Results

| Test Parameter         | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature            | 20.6                  | 22.2                  | °C   | 21.3   | Pass      |
| Humidity               | 10                    | 70                    | %    | 17.7   | Pass      |
| Impact Velocity        | 1.95                  | 2.05                  | m/s  | 2.020  | Pass      |
| Probe Force            | 5498                  | 5660                  | N    | 5901.4 | Fail      |
| Resultant Acceleration | 112.2                 | 118.7                 | g's  | 122.37 | Fail      |

#### Transducer Calibrations

| Channel      | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|--------------|----------------|---------------|------------------|----------------------|
| Head X Accel | Endevco 7264   | AC-P82183     | 4/3/2015         | 4/2/2016             |
| Head Y Accel | Endevco 7264   | AC-P81384     | 4/3/2015         | 4/2/2016             |
| Head Z Accel | Endevco 7264   | AC-P81797     | 4/3/2015         | 4/2/2016             |
| Probe Accel  | ENDEVCO 7231CT | AC-C15018     | 7/15/2015        | 7/14/2016            |





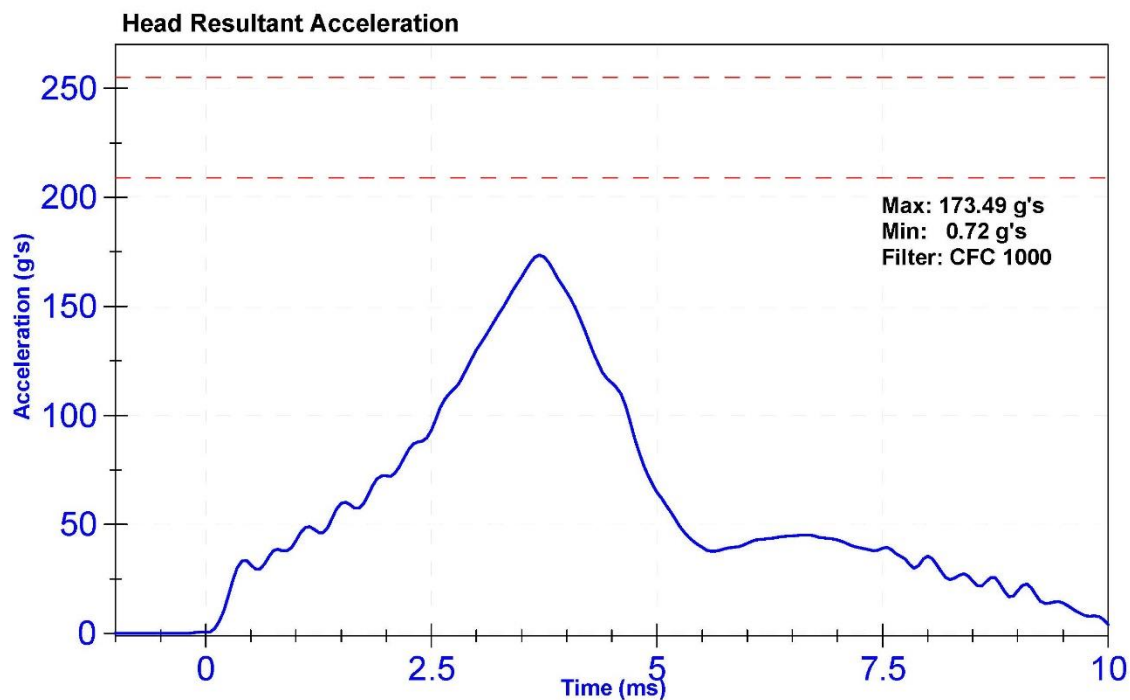
|                   |            |                       |           |
|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

#### Results

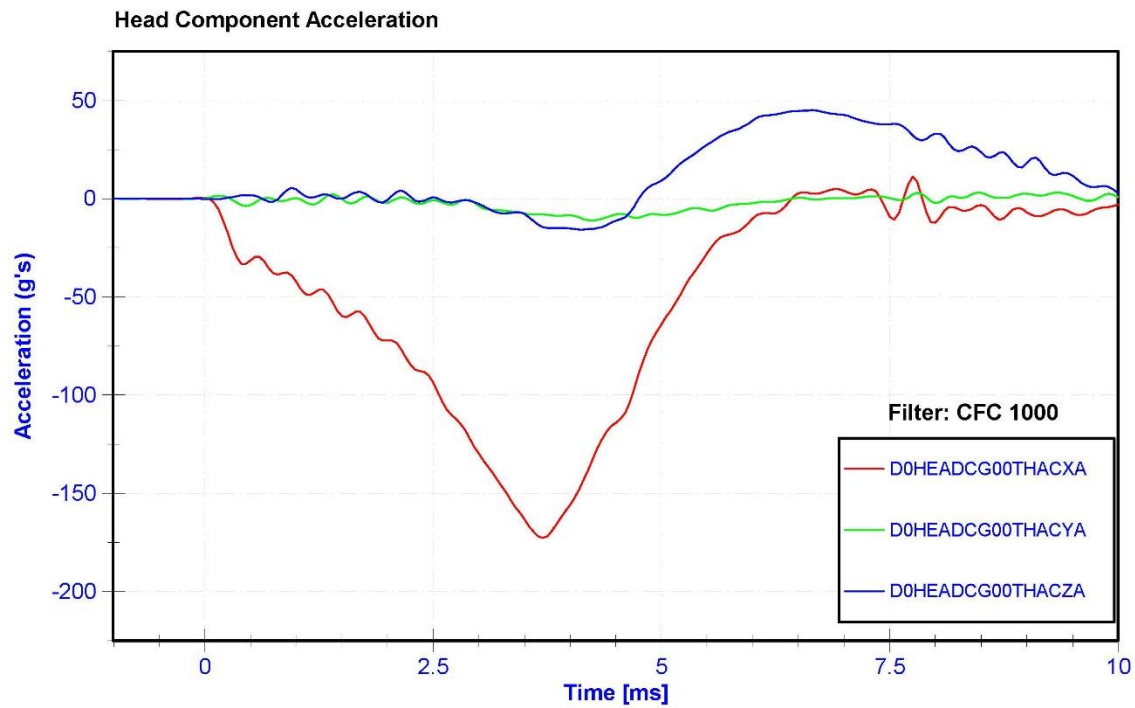
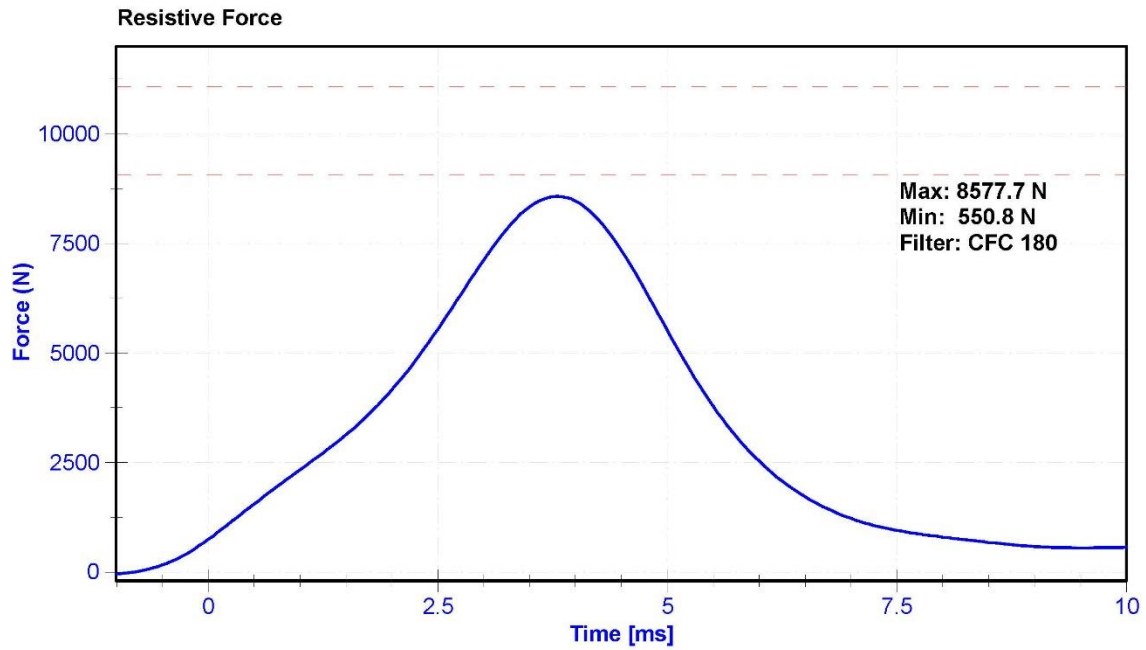
| Test Parameter         | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature            | 20.6                  | 22.2                  | °C   | 21.2   | Pass      |
| Humidity               | 10                    | 70                    | %    | 20.7   | Pass      |
| Impact Velocity        | 6.68                  | 6.78                  | m/s  | 6.699  | Pass      |
| Probe Force            | 9067                  | 11082                 | N    | 8577.7 | Fail      |
| Resultant Acceleration | 209                   | 255                   | g's  | 173.5  | Fail      |

#### Transducer Calibrations

| Channel      | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|--------------|----------------|---------------|------------------|----------------------|
| Head X Accel | Endevco 7264   | AC-P82183     | 4/3/2015         | 4/2/2016             |
| Head Y Accel | Endevco 7264   | AC-P81384     | 4/3/2015         | 4/2/2016             |
| Head Z Accel | Endevco 7264   | AC-P81797     | 4/3/2015         | 4/2/2016             |
| Probe Accel  | ENDEVCO 7231CT | AC-C15018     | 7/15/2015        | 7/14/2016            |







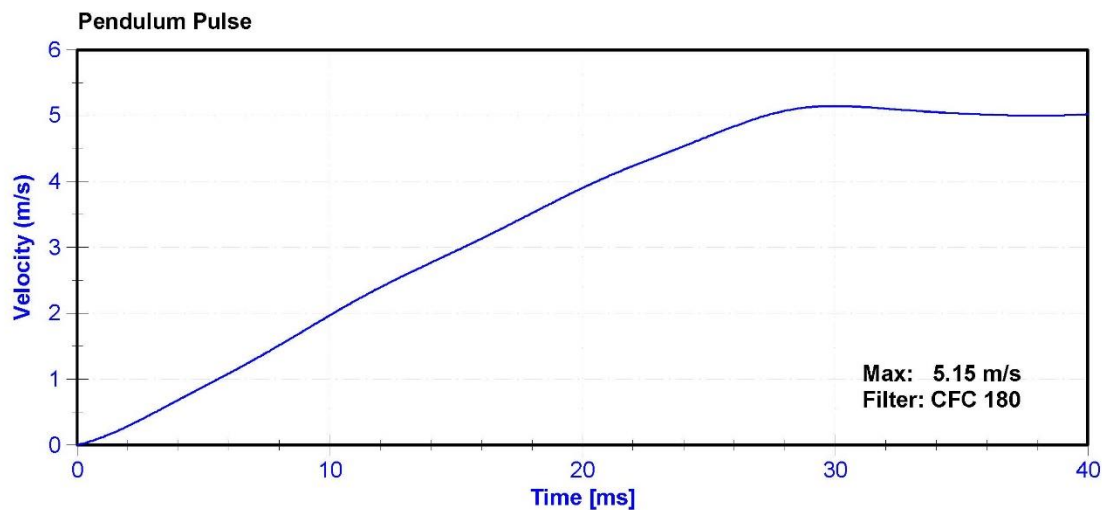
|                   |            |                       |           |
|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

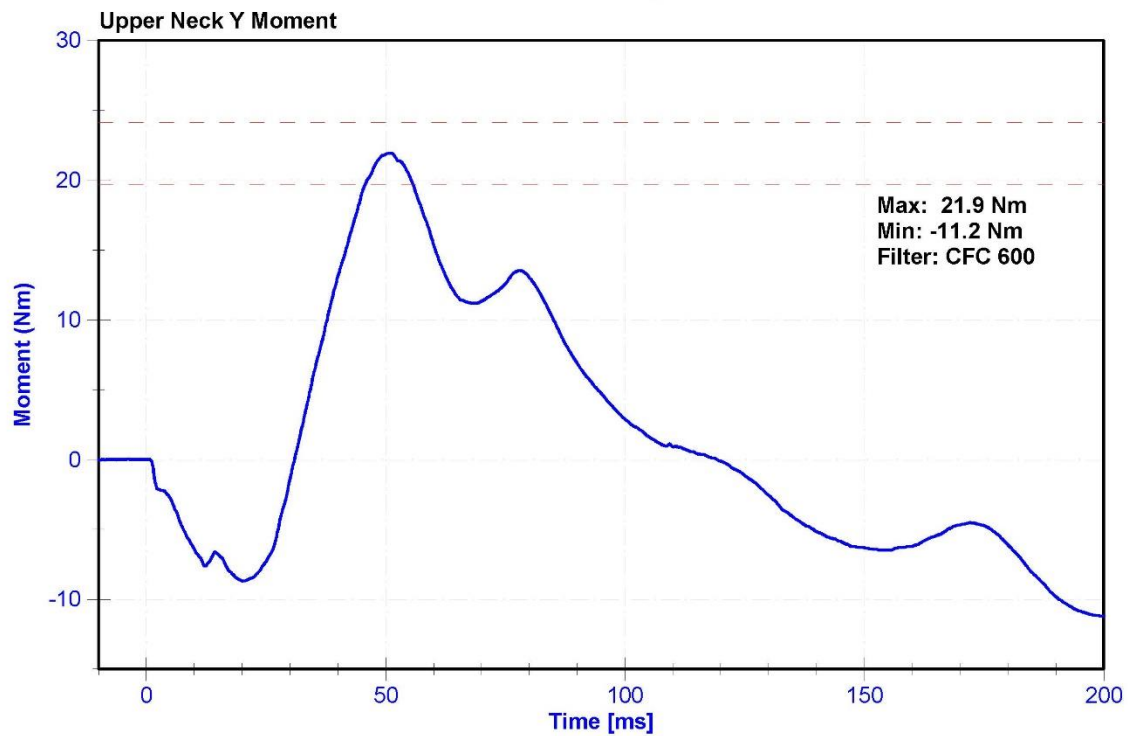
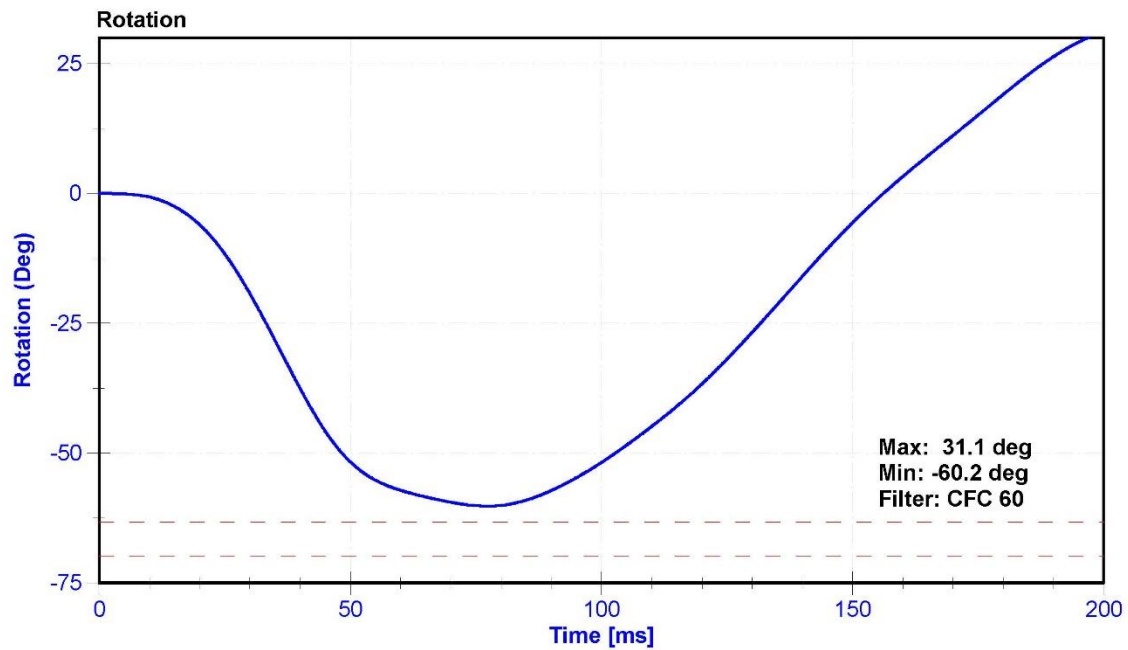
### Results

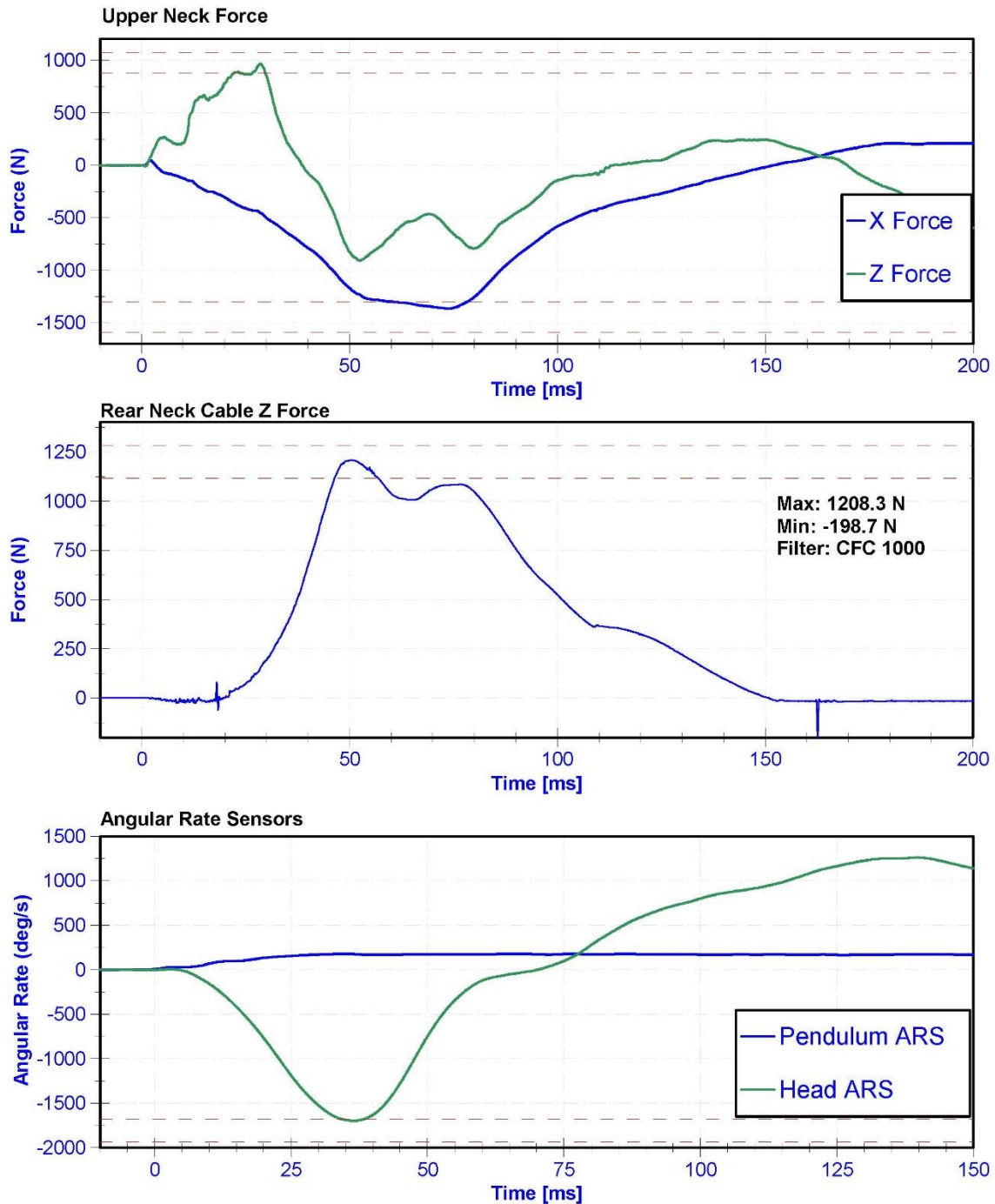
| Test Parameter                   | Minimum Specification | Maximum Specification | Unit  | Result  | Pass/Fail |
|----------------------------------|-----------------------|-----------------------|-------|---------|-----------|
| Temperature                      | 20.6                  | 22.2                  | °C    | 21.0    | Pass      |
| Humidity                         | 10                    | 70                    | %     | 33.0    | Pass      |
| Velocity                         | 4.95                  | 5.05                  | m/s   | 4.985   | Pass      |
| Pendulum Impulse at 8ms          | 1.49                  | 1.85                  | m/s   | 1.515   | Pass      |
| Pendulum Impulse at 16ms         | 3.08                  | 3.86                  | m/s   | 3.134   | Pass      |
| Pendulum Impulse at 24ms         | 4.48                  | 5.26                  | m/s   | 4.536   | Pass      |
| Peak Upper Neck Y Moment         | 19.7                  | 24.1                  | Nm    | 21.94   | Pass      |
| Peak Upper Neck X Force          | -1592                 | -1302                 | N     | -1364.0 | Pass      |
| Maximum Upper Neck Z Force       | 877                   | 1072                  | N     | 965.4   | Pass      |
| First Peak Rear Neck Cable Force | 1115                  | 1282                  | N     | 1208.3  | Pass      |
| Peak Head Y Angular Rate         | -1935                 | -1675                 | deg/s | -1696.4 | Pass      |
| Peak Head Y Rotation             | -69.9                 | -63.3                 | deg   | -60.20  | Fail      |
| Rotation Decay Time to Zero      | 83.0                  | 86.2                  | ms    | 78.70   | Fail      |

### Transducer Calibrations

| Channel                   | Manufacturer        | Serial Number | Calibration Date | Calibration Due Date |
|---------------------------|---------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer    | ENDEVCO 7231CT      | AC-AH5F3      | 5/7/2015         | 5/6/2016             |
| Upper Neck Load Cell      | Humanetics 10380JL4 | LC-DP3956 Fx  | 3/5/2015         | 3/4/2016             |
| Rear Neck Cable Load Cell | Humanetics 10386JL4 | LC-DO9741     | 3/6/2015         | 3/5/2016             |
| Pendulum ARS              | DTS ARS PRO-18K     | ARS-9122      | 9/30/2015        | 9/29/2016            |
| Head Y ARS                | DTS ARS-18K         | ARS-4737      | 3/30/2015        | 3/29/2016            |







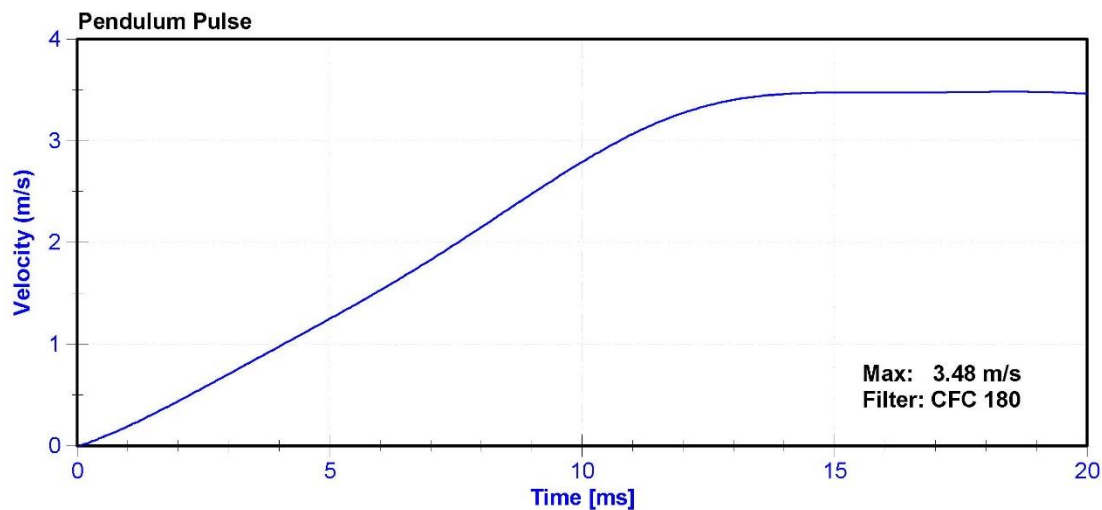
|                   |            |                       |           |
|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

### Results

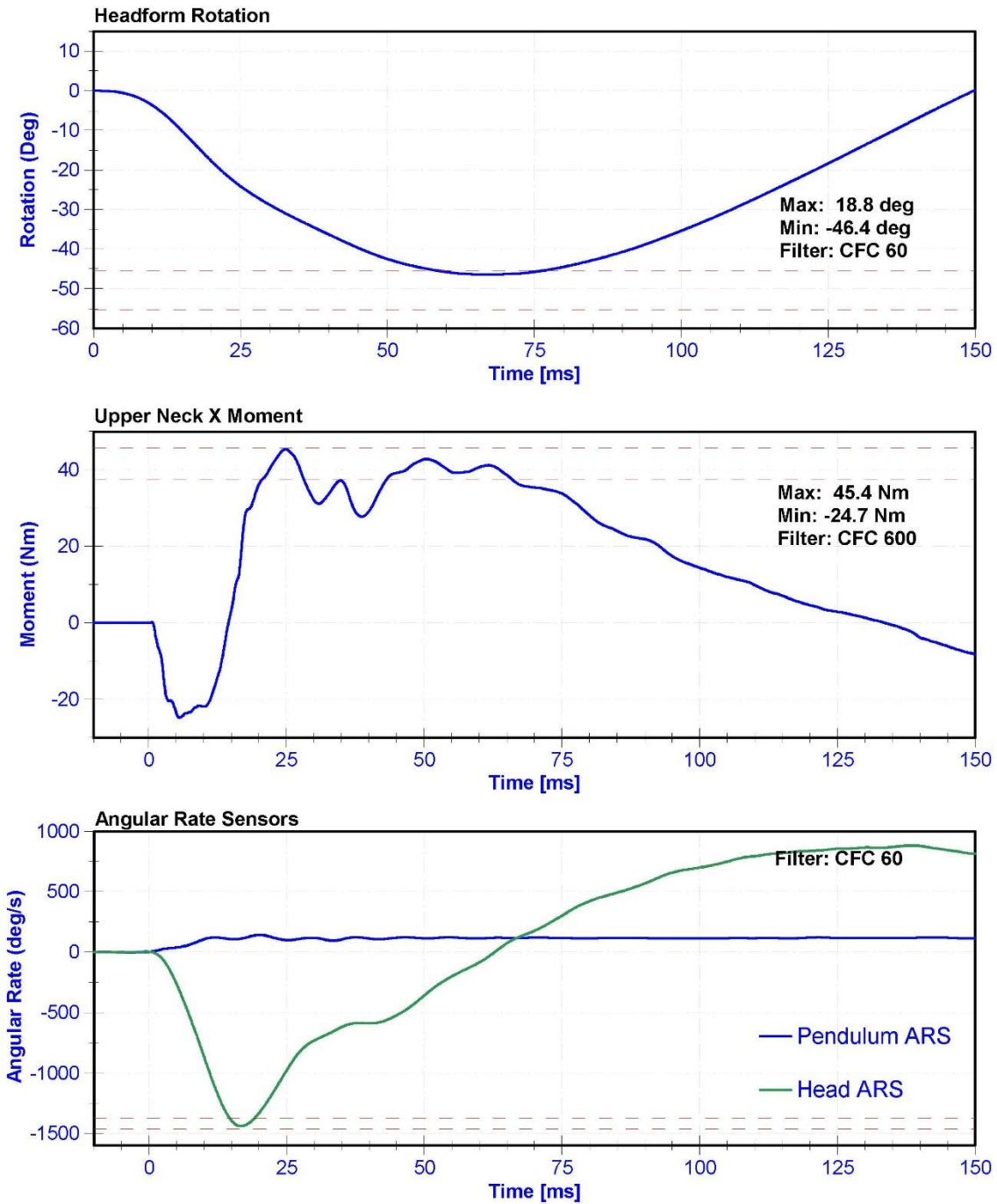
| Test Parameter                      | Minimum Specification | Maximum Specification | Unit  | Result  | Pass/Fail |
|-------------------------------------|-----------------------|-----------------------|-------|---------|-----------|
| Temperature                         | 20.6                  | 22.2                  | °C    | 21.3    | Pass      |
| Humidity                            | 10                    | 70                    | %     | 35.5    | Pass      |
| Velocity                            | 3.35                  | 3.45                  | m/s   | 3.418   | Pass      |
| Pendulum Impulse at 4ms             | 0.89                  | 1.08                  | m/s   | 0.977   | Pass      |
| Pendulum Impulse at 8ms             | 2.04                  | 2.36                  | m/s   | 2.150   | Pass      |
| Pendulum Impulse at 12ms            | 3.21                  | 3.46                  | m/s   | 3.273   | Pass      |
| Peak Upper Neck X Moment after 40ms | 37.4                  | 45.7                  | Nm    | 42.80   | Pass      |
| Peak Head X Angular Rate            | -1462                 | -1375                 | deg/s | -1440.0 | Pass      |
| Peak Head X Rotation                | -55.3                 | -45.4                 | deg   | -46.41  | Pass      |
| Rotational Decay Time to Zero       | 83.7                  | 90.9                  | ms    | 82.95   | Fail      |

### Transducer Calibrations

| Channel                | Manufacturer        | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|---------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT      | AC-AH5F3      | 5/7/2015         | 5/6/2016             |
| Upper Neck Load Cell   | Humanetics 10380J14 | LC-DP3956 Mx  | 3/5/2015         | 3/4/2016             |
| Pendulum ARS           | DTS ARS PRO-18K     | ARS-9122      | 9/30/2015        | 9/29/2016            |
| Head X ARS             | DTS ARS-18K         | ARS-4740      | 3/30/2015        | 3/29/2016            |







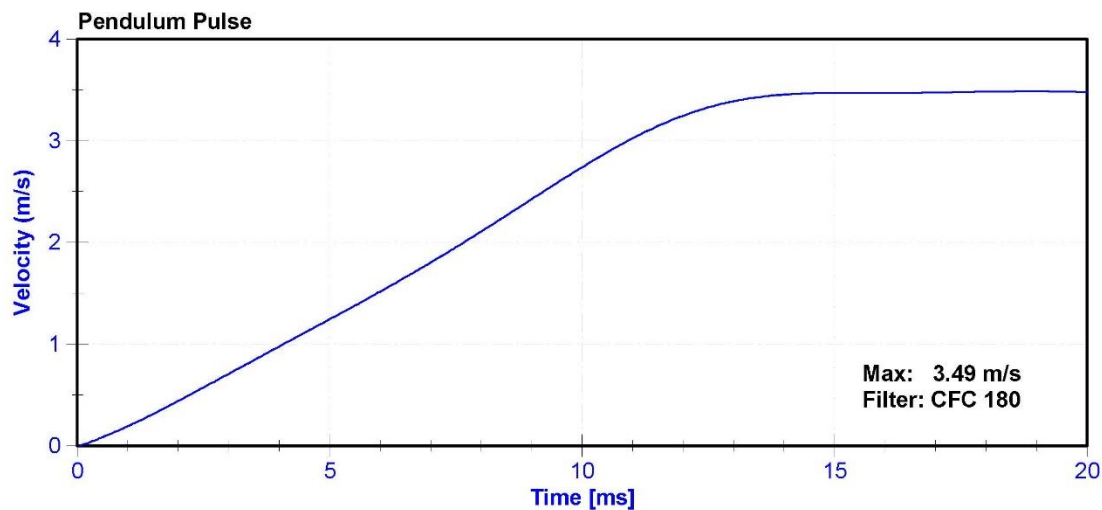
|                   |            |                       |           |
|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

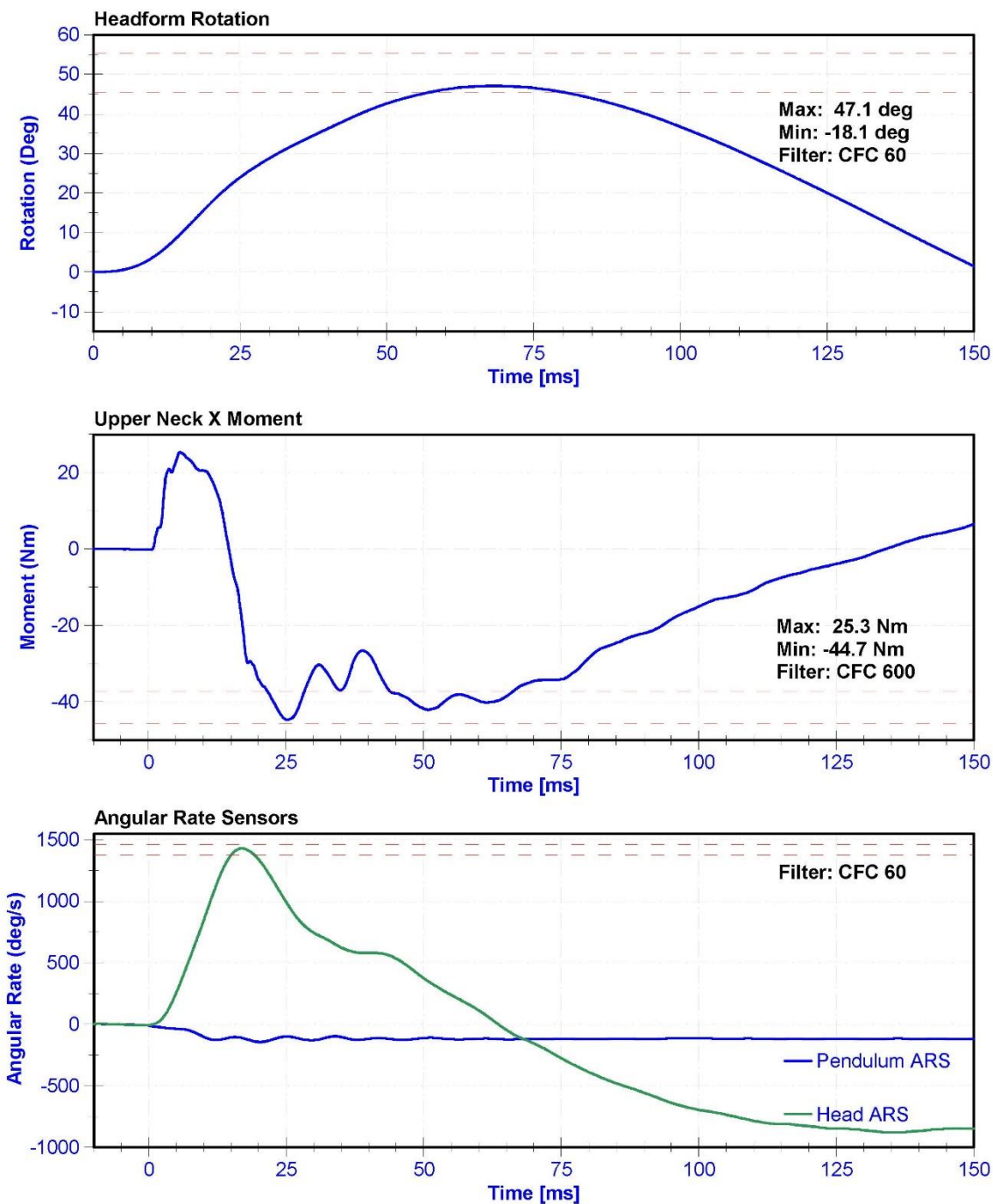
### Results

| Test Parameter                      | Minimum Specification | Maximum Specification | Unit  | Result | Pass/Fail |
|-------------------------------------|-----------------------|-----------------------|-------|--------|-----------|
| Temperature                         | 20.6                  | 22.2                  | °C    | 21.3   | Pass      |
| Humidity                            | 10                    | 70                    | %     | 34.3   | Pass      |
| Velocity                            | 3.35                  | 3.45                  | m/s   | 3.42   | Pass      |
| Pendulum Impulse at 4ms             | 0.89                  | 1.08                  | m/s   | 0.977  | Pass      |
| Pendulum Impulse at 8ms             | 2.04                  | 2.36                  | m/s   | 2.107  | Pass      |
| Pendulum Impulse at 12ms            | 3.21                  | 3.46                  | m/s   | 3.246  | Pass      |
| Peak Upper Neck X Moment after 40ms | -45.7                 | -37.4                 | Nm    | -42.03 | Pass      |
| Peak Head X Angular Rate            | 1375                  | 1462                  | deg/s | 1430.3 | Pass      |
| Peak Head X Rotation                | 45.4                  | 55.3                  | deg   | 47.06  | Pass      |
| Rotation Decay Time to Zero         | 83.7                  | 90.9                  | ms    | 83.85  | Pass      |

### Transducer Calibrations

| Channel                | Manufacturer        | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|---------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT      | AC-AH5F3      | 5/7/2015         | 5/6/2016             |
| Upper Neck Load Cell   | Humanetics 10380J14 | LC-DP3956 Mx  | 3/5/2015         | 3/4/2016             |
| Pendulum ARS           | DTS ARS PRO-18K     | ARS-9122      | 9/30/2015        | 9/29/2016            |
| Head X ARS             | DTS ARS-18K         | ARS-4740      | 3/30/2015        | 3/29/2016            |





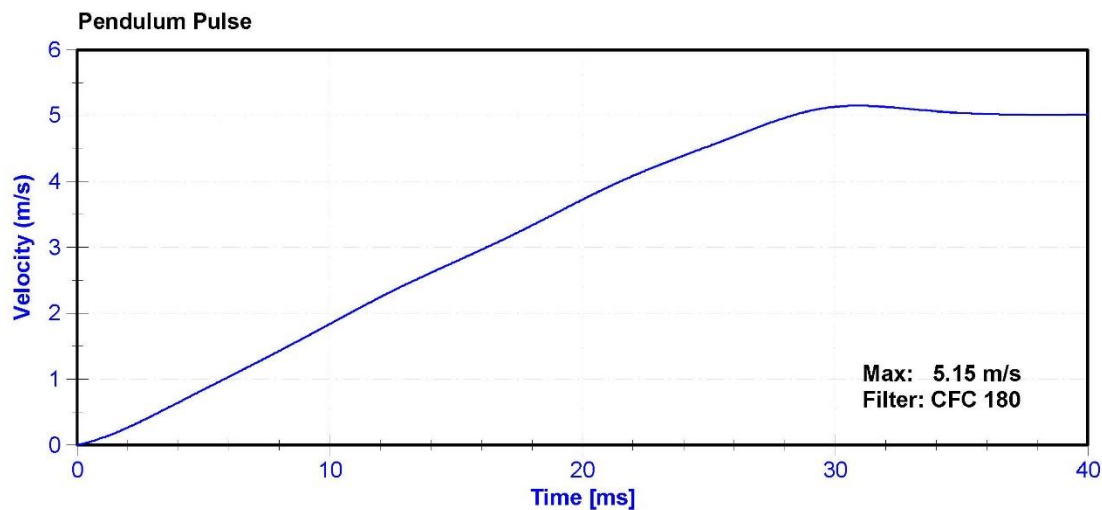
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| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

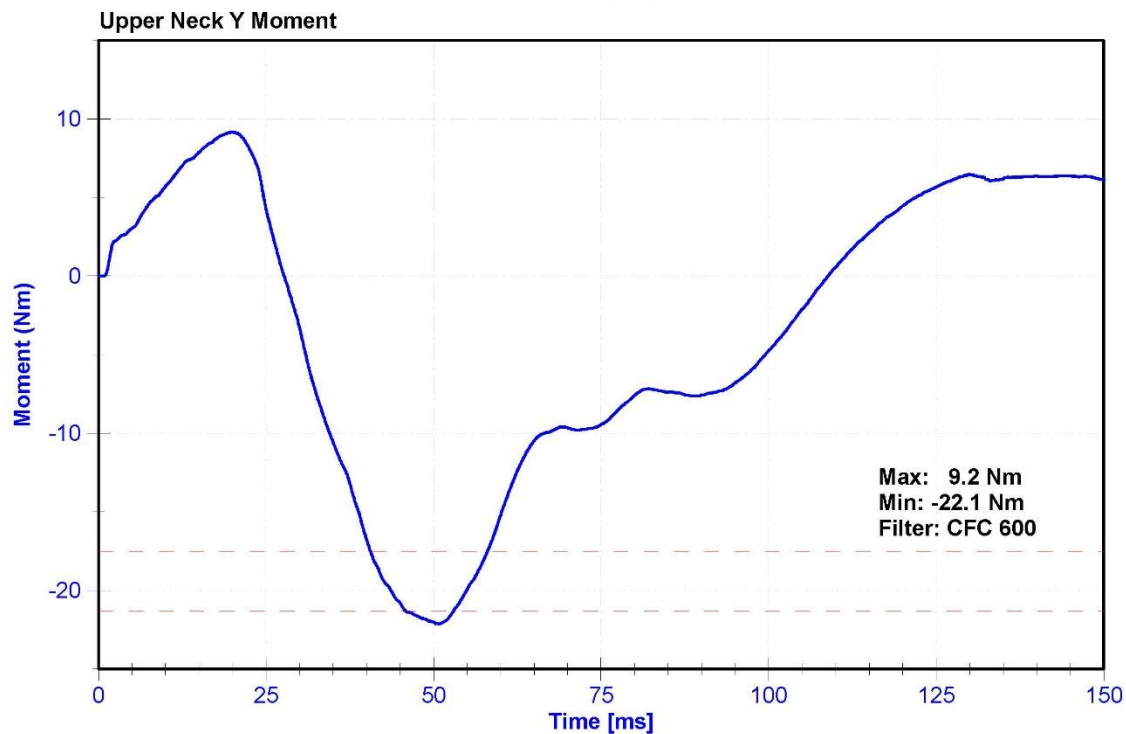
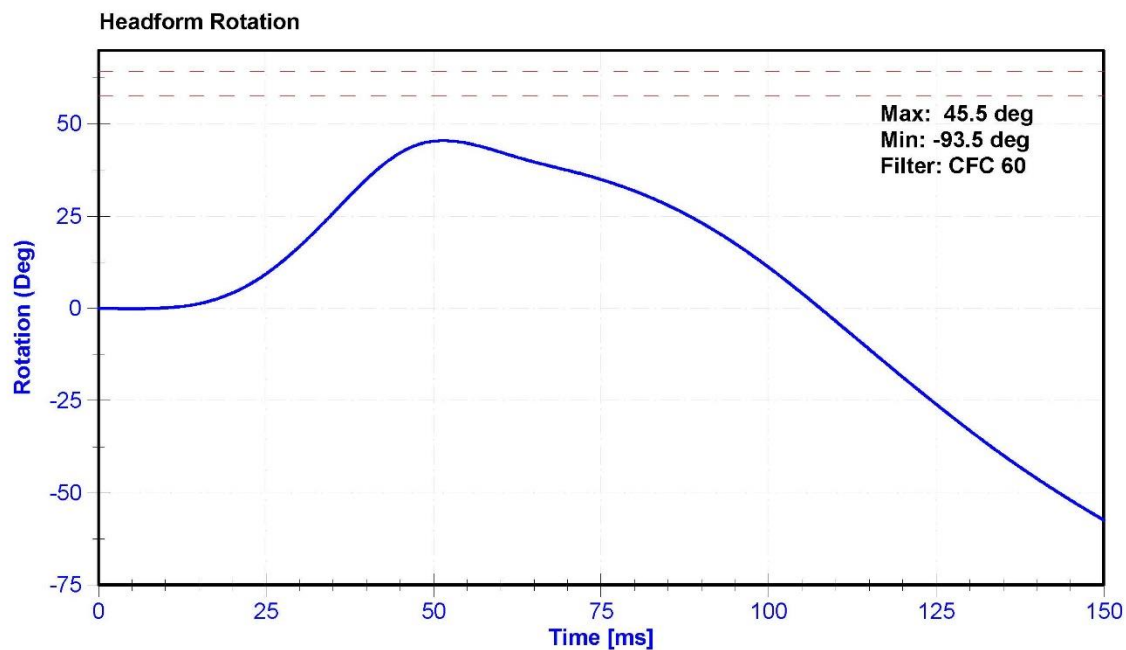
### Results

| Test Parameter                | Minimum Specification | Maximum Specification | Unit  | Result  | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|-------|---------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C    | 21.3    | Pass      |
| Humidity                      | 10                    | 70                    | %     | 36.0    | Pass      |
| Velocity                      | 4.95                  | 5.05                  | m/s   | 4.985   | Pass      |
| Pendulum Impulse at 10ms      | 1.76                  | 1.91                  | m/s   | 1.840   | Pass      |
| Pendulum Impulse at 20ms      | 3.50                  | 3.75                  | m/s   | 3.727   | Pass      |
| Pendulum Impulse at 30ms      | 4.88                  | 5.20                  | m/s   | 5.134   | Pass      |
| Peak Upper Neck Y Moment      | -21.3                 | -17.5                 | Nm    | -22.12  | Fail      |
| Peak Upper Neck X Force       | 967                   | 1182                  | N     | 1078.0  | Pass      |
| Peak Upper Neck Z Force       | -2893                 | -2603                 | N     | -2701.5 | Pass      |
| Peak Front Neck Cable Force   | 2482                  | 2809                  | N     | 2546.2  | Pass      |
| Peak Head Y Angular Rate      | 1907                  | 2043                  | deg/s | 2056.4  | Fail      |
| Peak Head Y Rotation          | 57.6                  | 64.2                  | deg   | 45.50   | Fail      |
| Rotational Decay Time to Zero | 79.3                  | 82.5                  | ms    | 56.30   | Fail      |

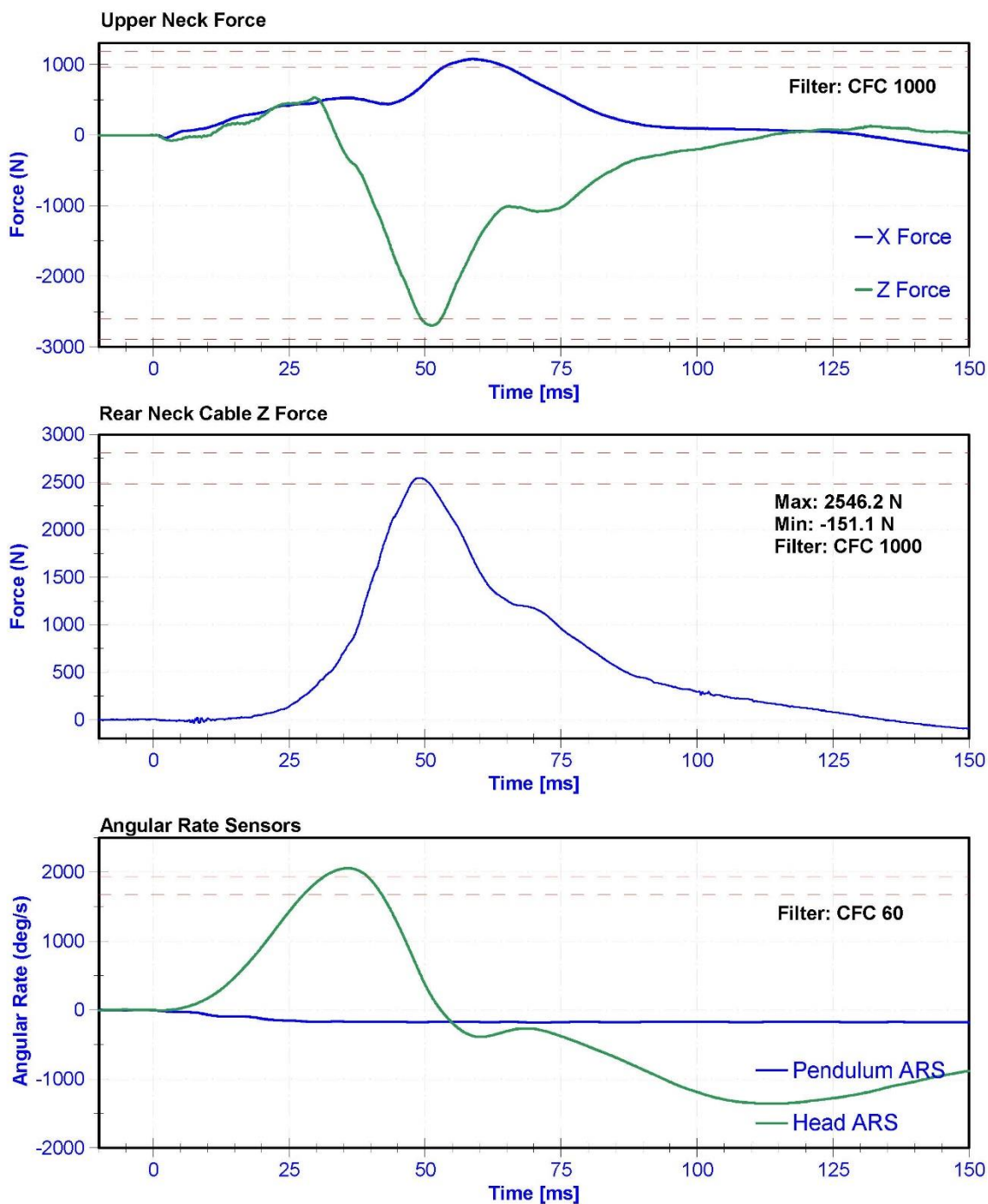
### Transducer Calibrations

| Channel                | Manufacturer        | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|---------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT      | AC-AH5F3      | 5/7/2015         | 5/6/2016             |
| Upper Neck Load Cell   | Humanetics 10380Jl4 | LC-DP3956 Fx  | 3/5/2015         | 3/4/2016             |
| Fr Neck Cable Load     | Humanetics 10386Jl4 | LC-DO9740     | 3/6/2015         | 3/5/2016             |
| Pendulum ARS           | DTS ARS PRO-18K     | ARS-9122      | 9/30/2015        | 9/29/2016            |
| Head ARS Y-Axis        | DTS ARS-18K         | ARS-4737      | 3/30/2015        | 3/29/2016            |









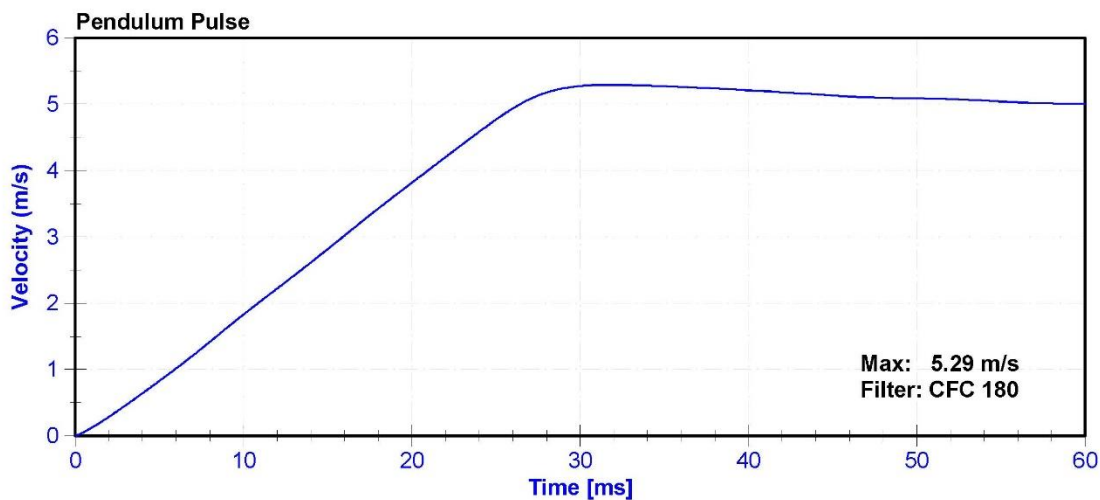
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| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

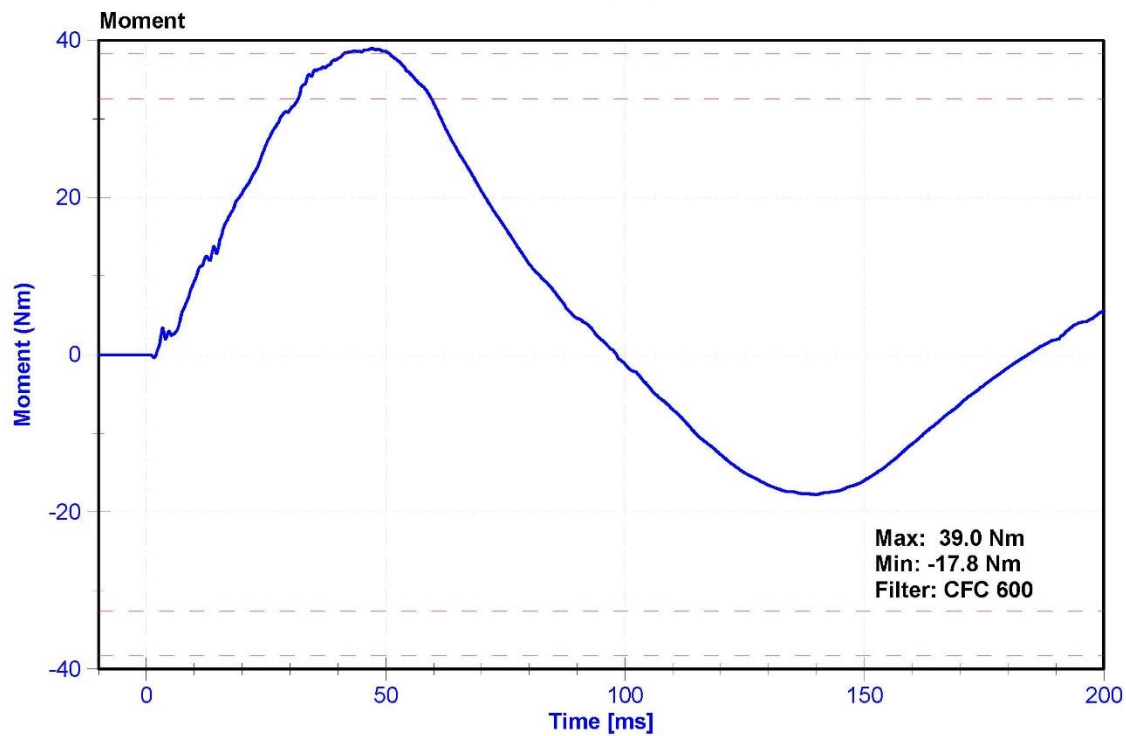
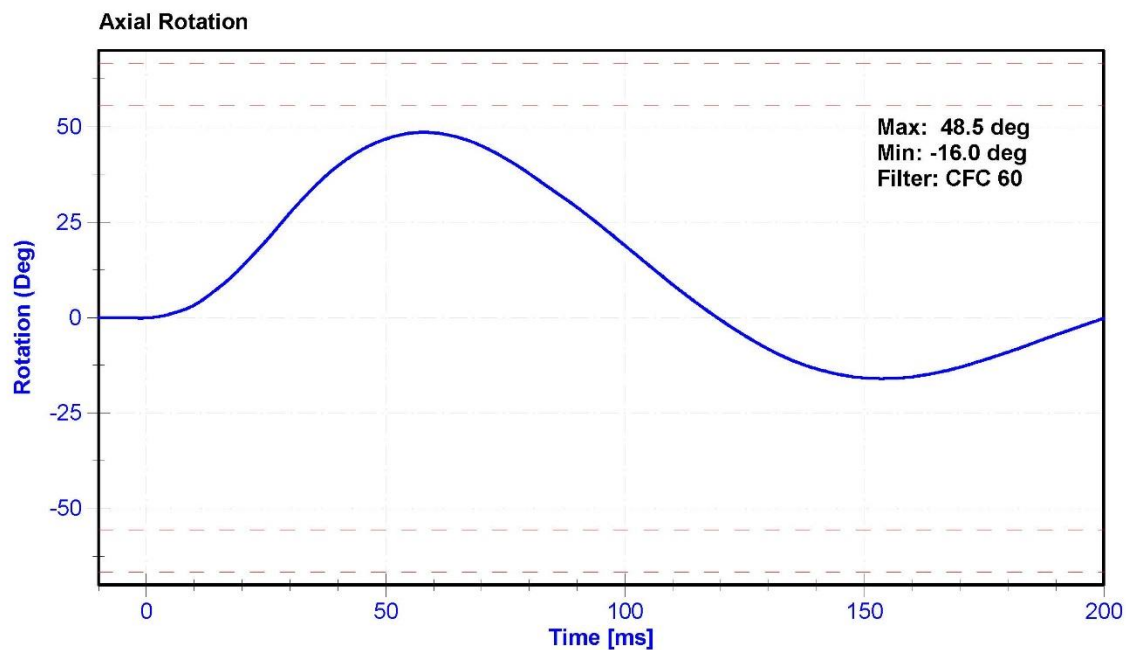
### Results

| Test Parameter                   | Minimum Specification | Maximum Specification | Unit  | Result  | Pass/Fail |
|----------------------------------|-----------------------|-----------------------|-------|---------|-----------|
| Temperature                      | 20.6                  | 22.2                  | °C    | 21.1    | Pass      |
| Humidity                         | 10                    | 70                    | %     | 29.7    | Pass      |
| Velocity                         | 4.95                  | 5.05                  | m/s   | 5.04    | Pass      |
| Pendulum Impulse at 10ms         | 1.72                  | 1.98                  | m/s   | 1.829   | Pass      |
| Pendulum Impulse at 15ms         | 2.67                  | 2.97                  | m/s   | 2.816   | Pass      |
| Pendulum Impulse at 20ms         | 3.59                  | 3.98                  | m/s   | 3.817   | Pass      |
| Pendulum Impulse at 25ms         | 4.43                  | 4.92                  | m/s   | 4.769   | Pass      |
| Peak Upper Neck Z Moment         | 32.6                  | 38.3                  | Nm    | 38.98   | Fail      |
| Peak Neck Axial Rotation         | 55.6                  | 66.6                  | deg   | 48.54   | Fail      |
| Rotation Decay Time to Zero      | 58.0                  | 61.6                  | ms    | 61.35   | Pass      |
| Peak Upper Neck Angular Velocity | 1559                  | 1709                  | deg/s | 1576.78 | Pass      |

### Transducer Calibrations

| Channel                    | Manufacturer        | Serial Number | Calibration Date | Calibration Due Date |
|----------------------------|---------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer     | ENDEVCO 7231CT      | AC-AH5F3      | 5/7/2015         | 5/6/2016             |
| Neck Fixture Potentiometer | Servo 14CB1-3615    | DS-0001       | 10/21/2015       | 10/20/2016           |
| Upper Neck Load Cell       | Humanetics 10380JI4 | LC-DP3956 Mz  | 3/5/2015         | 3/4/2016             |
| Upper Neck ARS             | DTS ARS PRO-18K     | ARS-9097      | 9/30/2015        | 9/29/2016            |





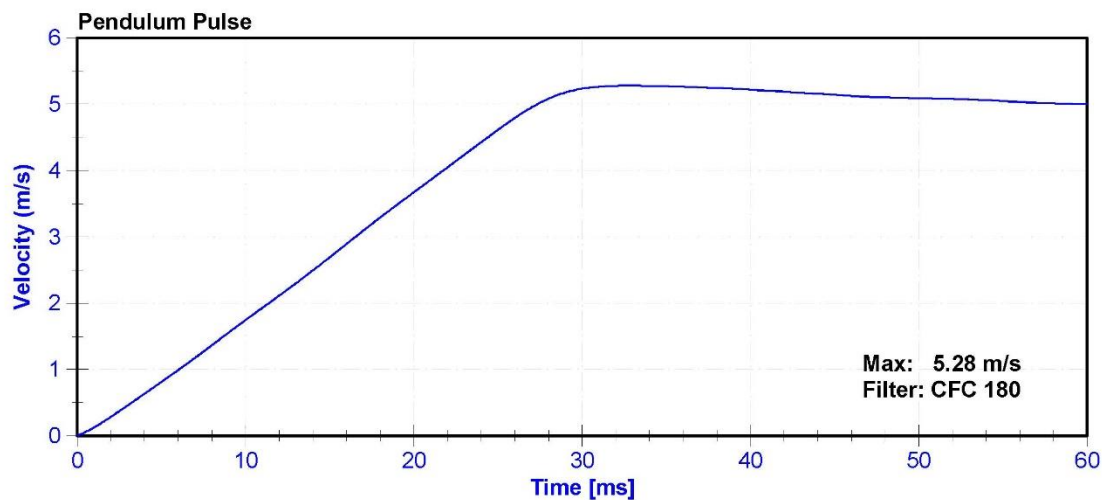
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

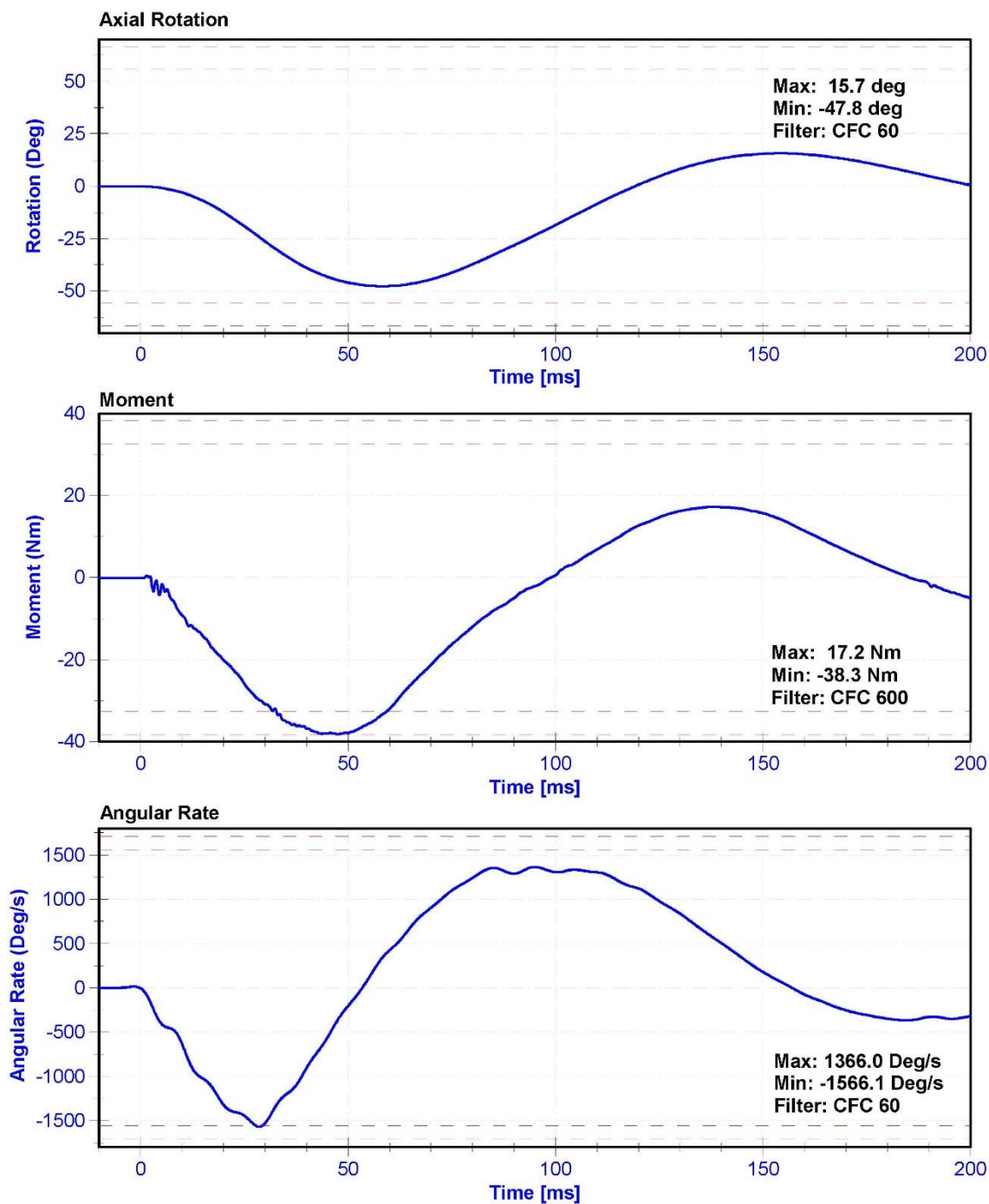
### Results

| Test Parameter                   | Minimum Specification | Maximum Specification | Unit  | Result | Pass/Fail |
|----------------------------------|-----------------------|-----------------------|-------|--------|-----------|
| Temperature                      | 20.6                  | 22.2                  | °C    | 21.0   | Pass      |
| Humidity                         | 10                    | 70                    | %     | 31.8   | Pass      |
| Velocity                         | 4.95                  | 5.05                  | m/s   | 5.045  | Pass      |
| Pendulum Impulse at 10ms         | 1.72                  | 1.98                  | m/s   | 1.746  | Pass      |
| Pendulum Impulse at 15ms         | 2.67                  | 2.97                  | m/s   | 2.693  | Pass      |
| Pendulum Impulse at 20ms         | 3.59                  | 3.98                  | m/s   | 3.674  | Pass      |
| Pendulum Impulse at 25ms         | 4.43                  | 4.92                  | m/s   | 4.615  | Pass      |
| Peak Upper Neck Z Moment         | 32.6                  | 38.3                  | Nm    | 38.26  | Pass      |
| Peak Neck Axial Rotation         | 55.6                  | 66.6                  | deg   | 47.76  | Fail      |
| Rotation Decay Time to Zero      | 58.0                  | 61.6                  | ms    | 47.00  | Fail      |
| Peak Upper Neck Angular Velocity | 1559                  | 1709                  | deg/s | 1566.1 | Pass      |

### Transducer Calibrations

| Channel                    | Manufacturer        | Serial Number | Calibration Date | Calibration Due Date |
|----------------------------|---------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer     | ENDEVCO 7231CT      | AC-AH5F3      | 5/7/2015         | 5/6/2016             |
| Neck Fixture Potentiometer | Servo 14CB1-3615    | DS-0001       | 10/21/2015       | 10/20/2016           |
| Upper Neck Load Cell       | Humanetics 10380JI4 | LC-DP3956 Mz  | 3/5/2015         | 3/4/2016             |
| Upper Neck ARS             | DTS ARS PRO-18K     | ARS-9097      | 9/30/2015        | 9/29/2016            |







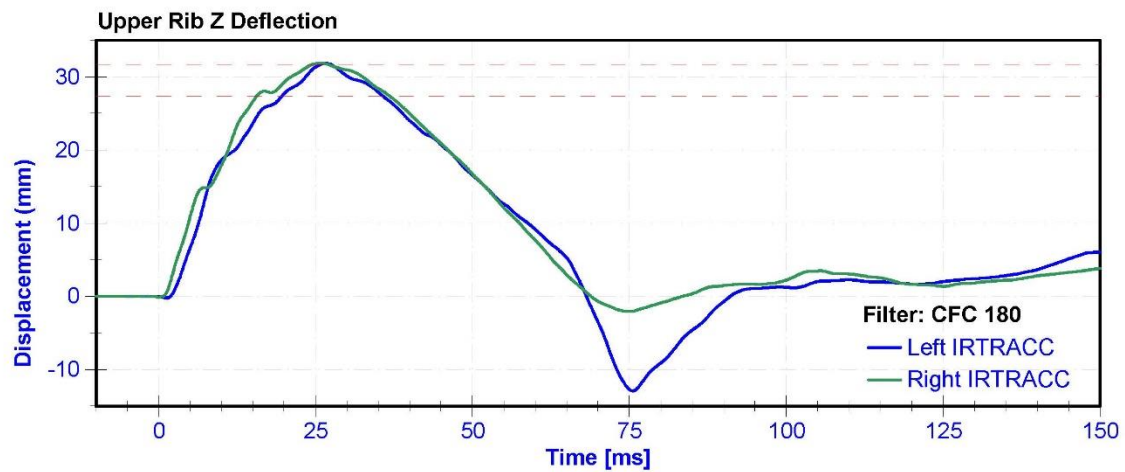
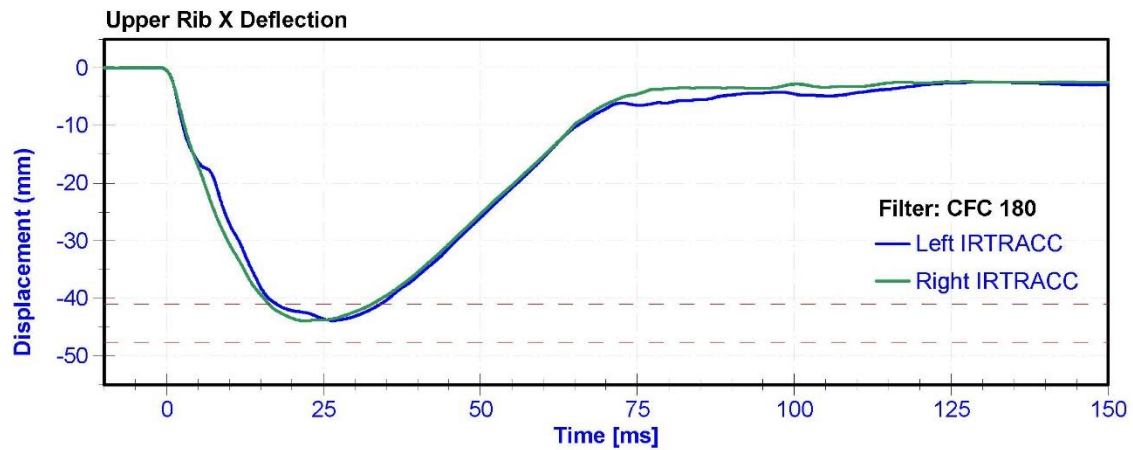
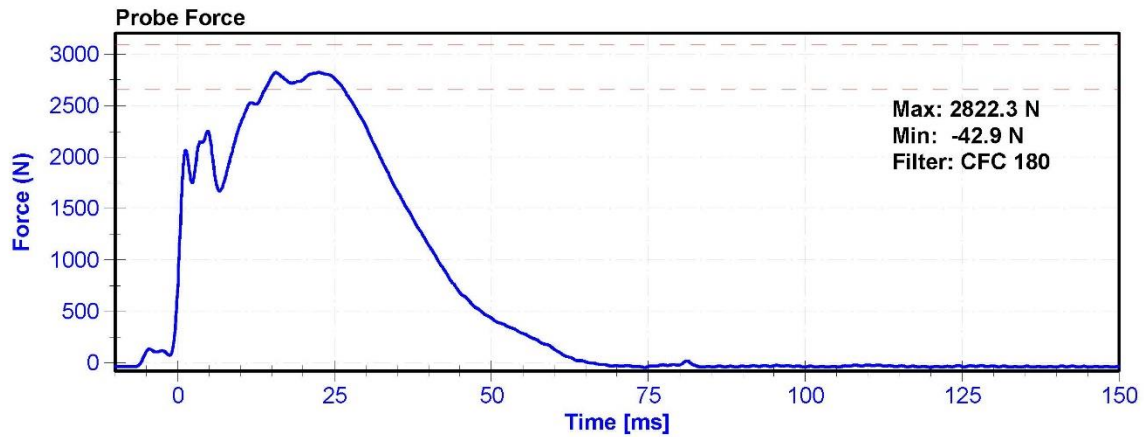
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| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

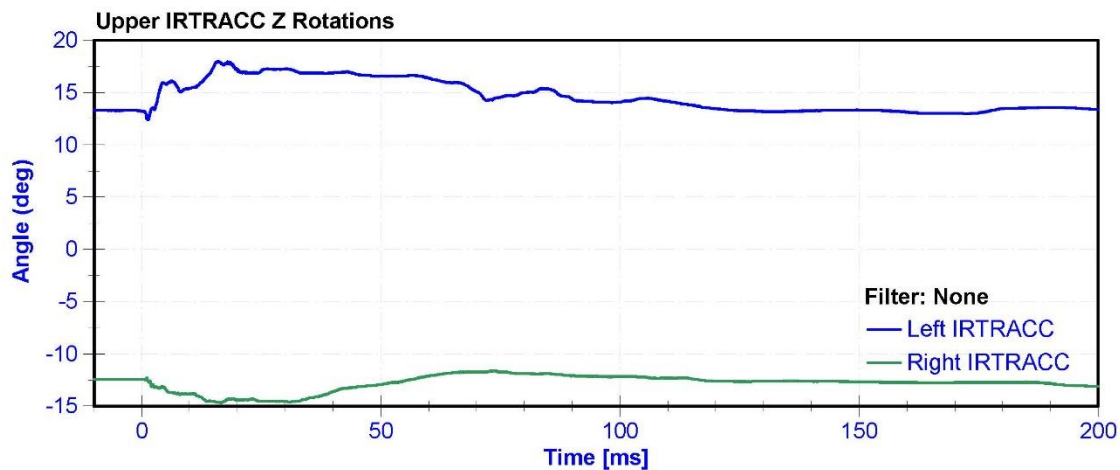
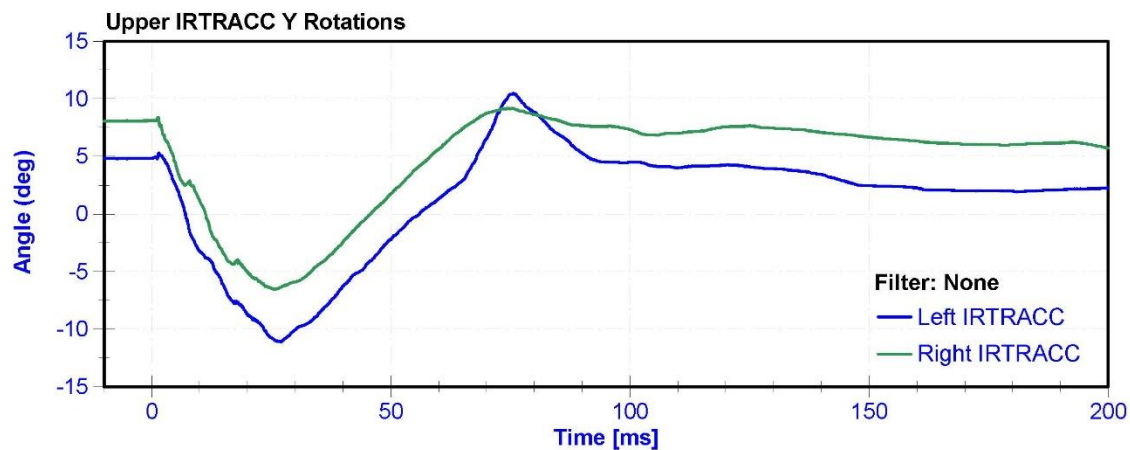
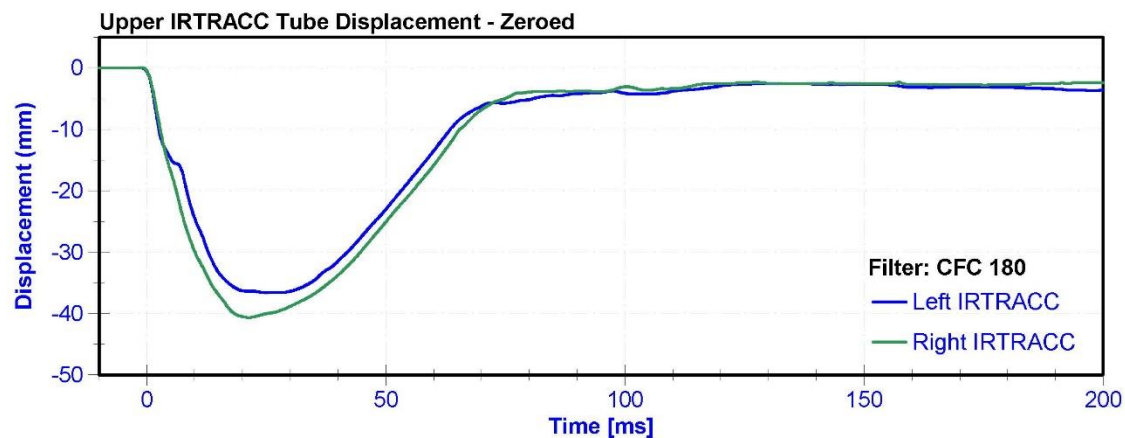
### Results

| Test Parameter               | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                  | 18.9                  | 25.6                  | °C   | 20.8   | Pass      |
| Humidity                     | 10                    | 70                    | %    | 30.8   | Pass      |
| Impact Velocity              | 4.25                  | 4.35                  | m/s  | 4.323  | Pass      |
| Probe Force                  | 2474                  | 2850                  | N    | 2822.3 | Pass      |
| Upper Left X Rib Deflection  | -47.6                 | -41.0                 | mm   | -43.87 | Pass      |
| Upper Right X Rib Deflection | -47.6                 | -41.0                 | mm   | -43.90 | Pass      |
| Left/Right X Rib Deviation   | -7.00                 | 7.00                  | mm   | 0.033  | Pass      |
| Upper Left Z Rib Deflection  | 27.3                  | 31.7                  | mm   | 31.86  | Fail      |
| Upper Right Z Rib Deflection | 27.3                  | 31.7                  | mm   | 31.90  | Fail      |
| Left/Right Z Rib Deviation   | -7.00                 | 7.00                  | mm   | -0.031 | Pass      |

### Transducer Calibrations

| Channel                     | Manufacturer           | Serial Number | Calibration Date | Calibration Due Date |
|-----------------------------|------------------------|---------------|------------------|----------------------|
| Probe Accelerometer         | ENDEVCO 7231CT         | AC-C14972     | 8/13/2015        | 2/11/2016            |
| Upper Left IRTRACC          | Humanetics IF-364-C-R3 | DS-DS6355     | 11/10/2015       | 11/9/2016            |
| Upper Left Y Potentiometer  | Humanetics 9945        | DS-DI2382     | 4/8/2015         | 4/7/2016             |
| Upper Left Z Potentiometer  | Humanetics 9945        | DS-DI2383     | 4/8/2015         | 4/7/2016             |
| Upper Right IRTRACC         | Humanetics IF-364-C-R3 | DS-DJ2613     | 4/8/2015         | 4/7/2016             |
| Upper Right Y Potentiometer | Humanetics 9945        | DS-DI7753     | 4/9/2015         | 4/8/2016             |
| Upper Right Z Potentiometer | Humanetics 9945        | DS-DI7752     | 4/9/2015         | 4/8/2016             |





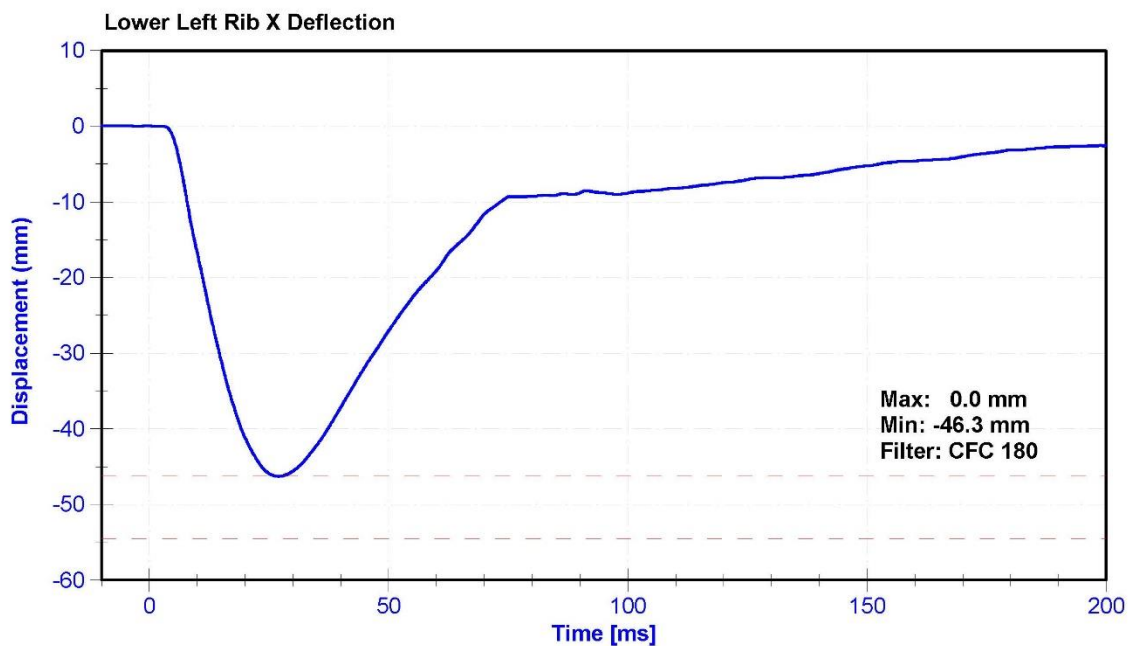
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| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

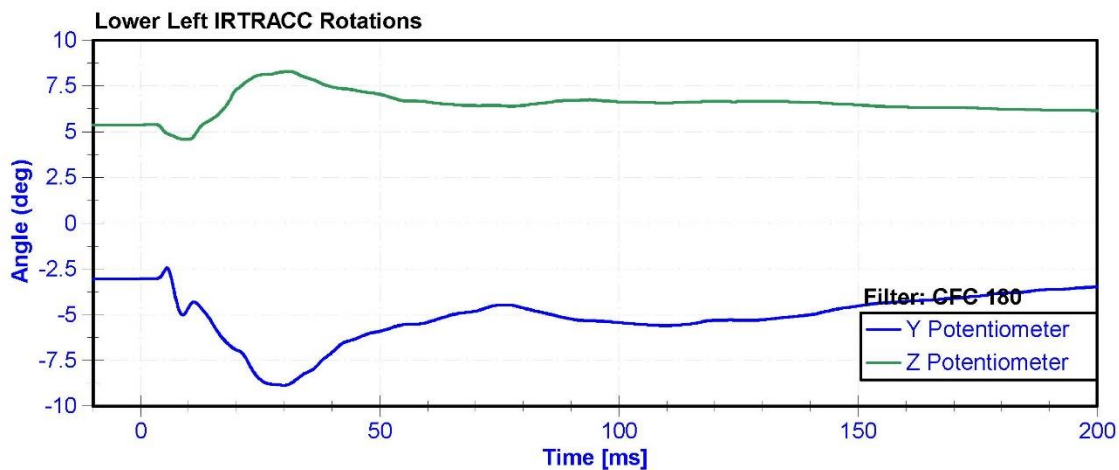
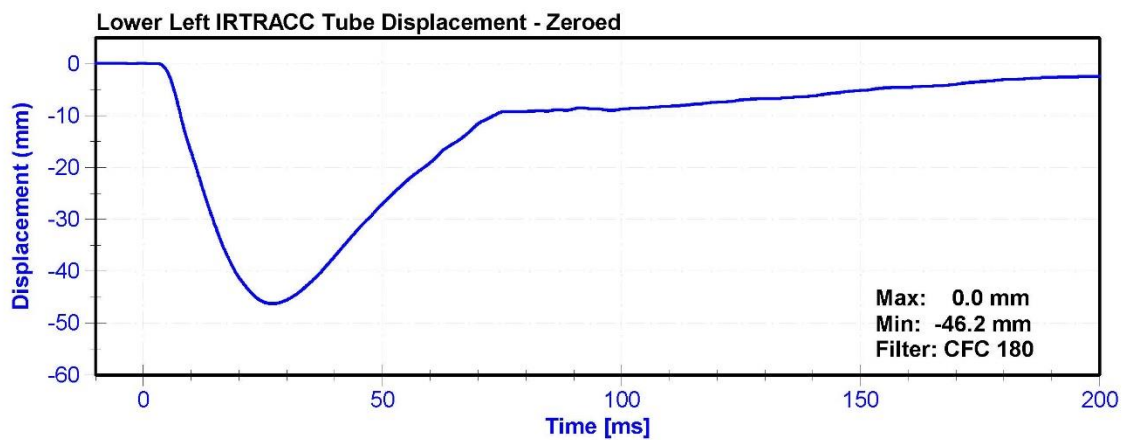
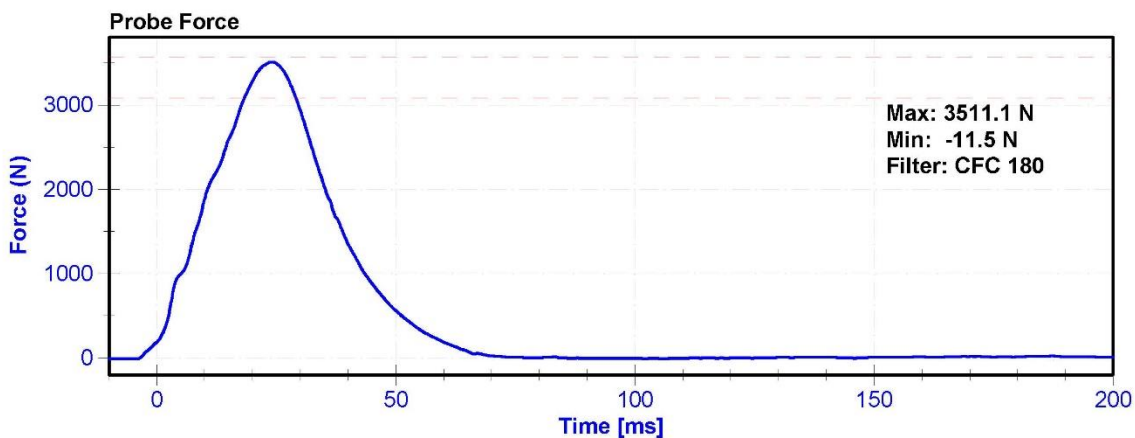
### Results

| Test Parameter                     | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|------------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                        | 20.6                  | 22.2                  | °C   | 20.8   | Pass      |
| Humidity                           | 10                    | 70                    | %    | 17.4   | Pass      |
| Impact Velocity                    | 4.25                  | 4.35                  | m/s  | 4.311  | Pass      |
| Peak Left X Rib Deflection         | -54.5                 | -46.2                 | mm   | -46.28 | Pass      |
| Probe Force during Peak Deflection | 3083                  | 3571                  | N    | 3511.1 | Pass      |

### Transducer Calibrations

| Channel                    | Manufacturer           | Serial Number | Calibration Date | Calibration Due Date |
|----------------------------|------------------------|---------------|------------------|----------------------|
| Probe Accel                | ENDEVCO 7231CT         | AC-C14972     | 8/13/2015        | 2/11/2016            |
| Lower Left IRTACC          | Humanetics IF-364-C-R3 | DS-DS6353     | 11/10/2015       | 11/9/2016            |
| Lower Left Y Potentiometer | Humanetics 9945        | DS-DM4781     | 4/7/2015         | 4/6/2016             |
| Lower Left Z Potentiometer | Humanetics 9945        | DS-DS4092     | 4/7/2015         | 4/6/2016             |







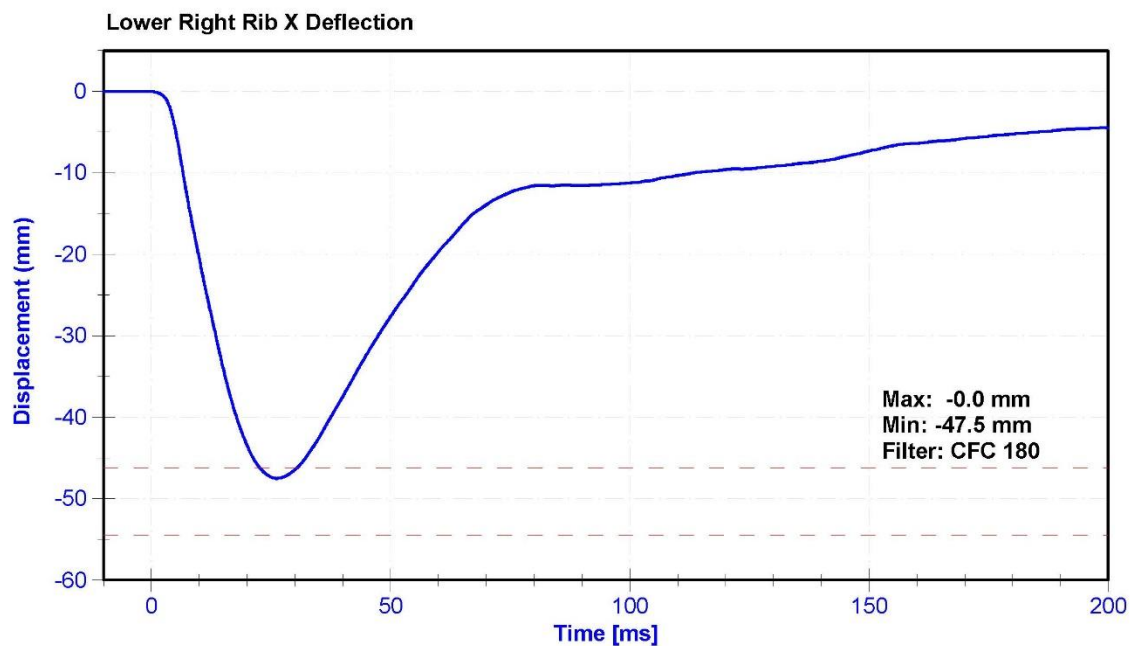
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| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

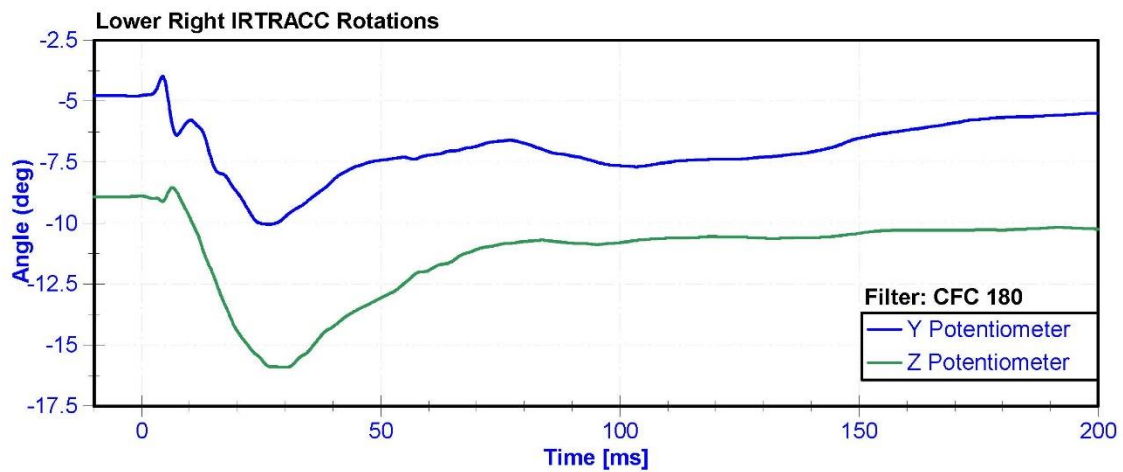
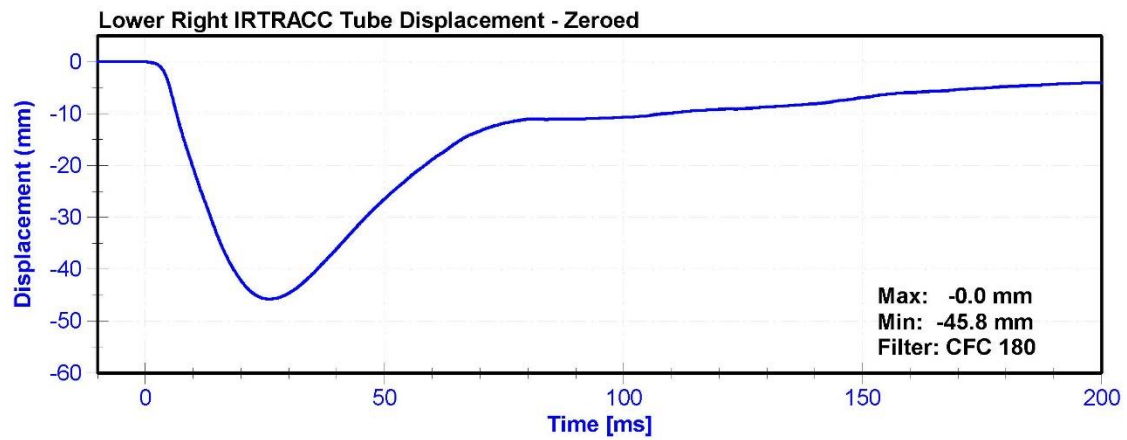
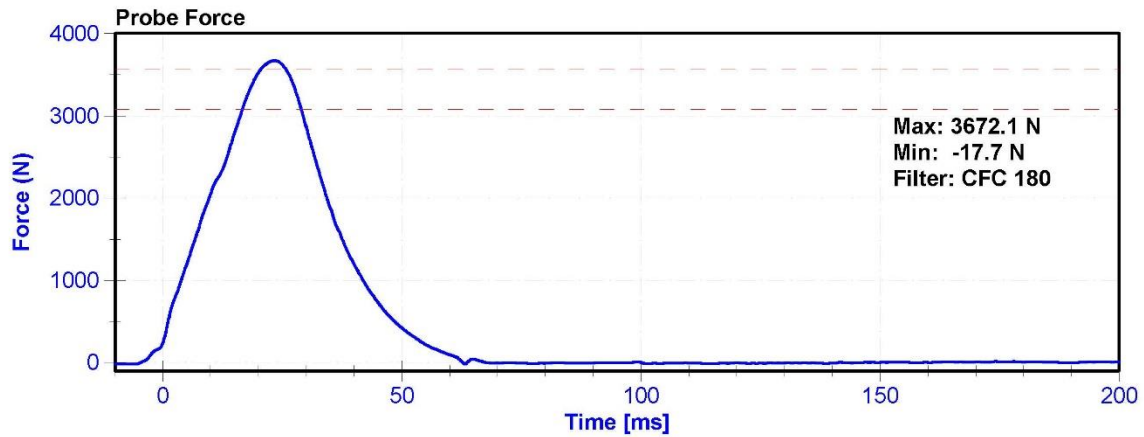
### Results

| Test Parameter                     | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|------------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                        | 20.6                  | 22.2                  | °C   | 20.9   | Pass      |
| Humidity                           | 10                    | 70                    | %    | 17.3   | Pass      |
| Impact Velocity                    | 4.25                  | 4.35                  | m/s  | 4.314  | Pass      |
| Peak Right X Rib Deflection        | -54.5                 | -46.2                 | mm   | -47.51 | Pass      |
| Probe Force during Peak Deflection | 3083                  | 3571                  | N    | 3672.1 | Fail      |

### Transducer Calibrations

| Channel                     | Manufacturer           | Serial Number | Calibration Date | Calibration Due Date |
|-----------------------------|------------------------|---------------|------------------|----------------------|
| Probe Accel                 | ENDEVCO 7231CT         | AC-C14972     | 8/13/2015        | 2/11/2016            |
| Lower Right IRTRACC         | Humanetics IF-364-C-R3 | DS-DS6354     | 11/10/2015       | 11/9/2016            |
| Lower Right Y Potentiometer | Humanetics 9945        | DS-DM4776     | 4/7/2015         | 4/6/2016             |
| Lower Right Z Potentiometer | Humanetics 9945        | DS-DM4777     | 4/7/2015         | 4/6/2016             |







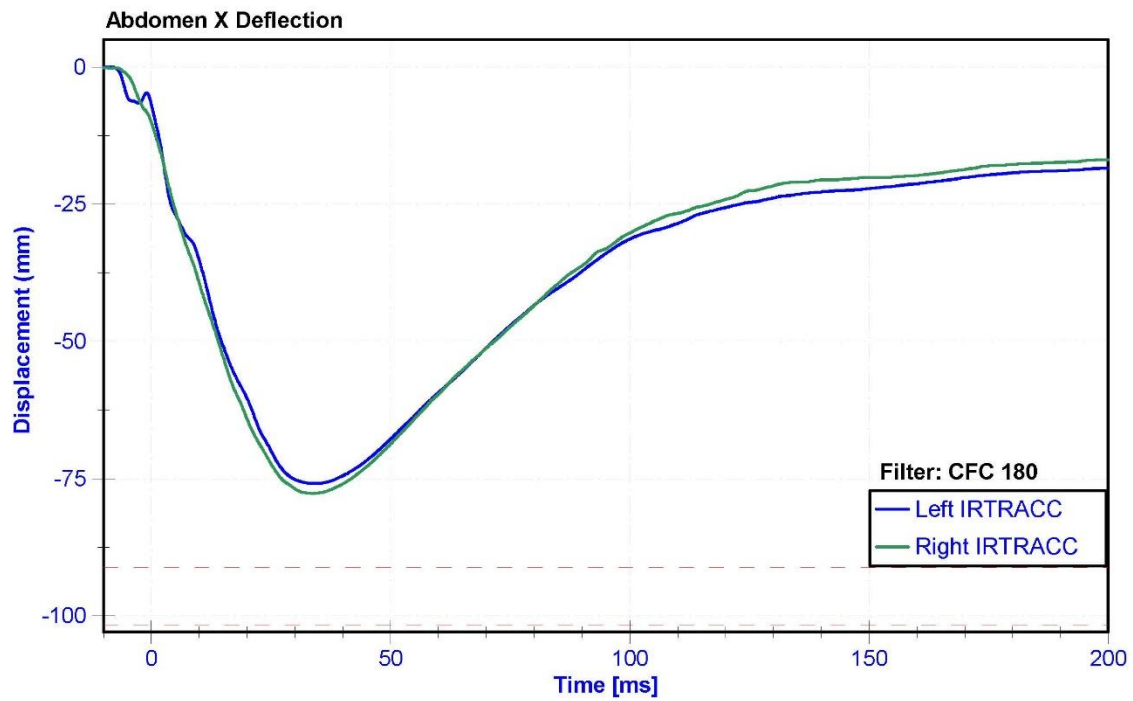
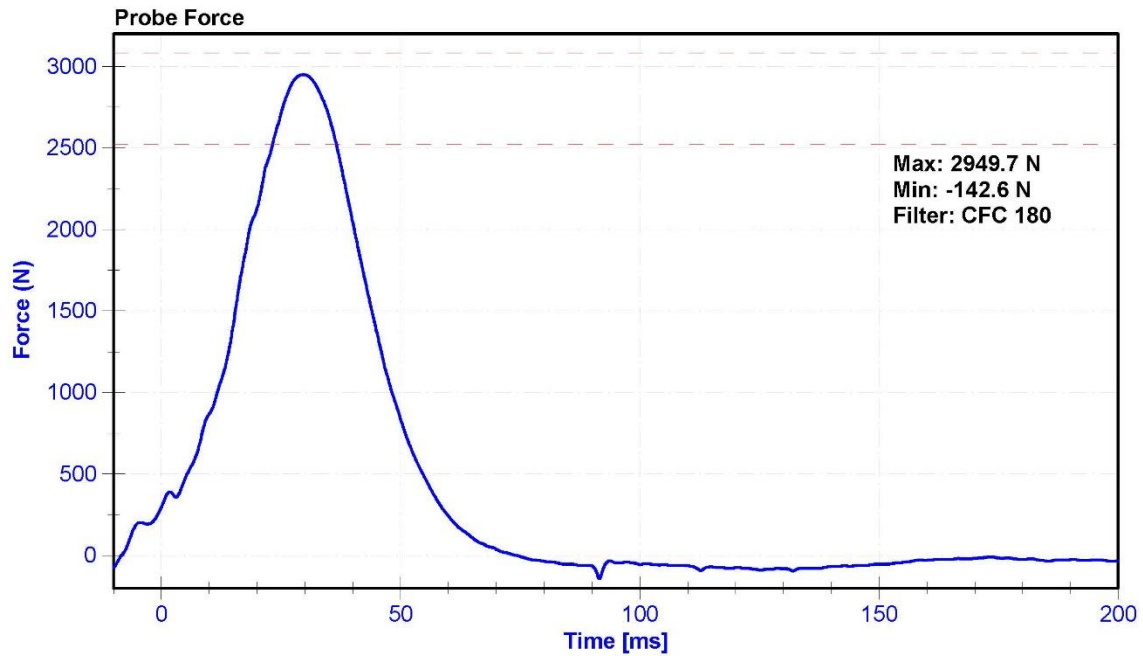
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| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

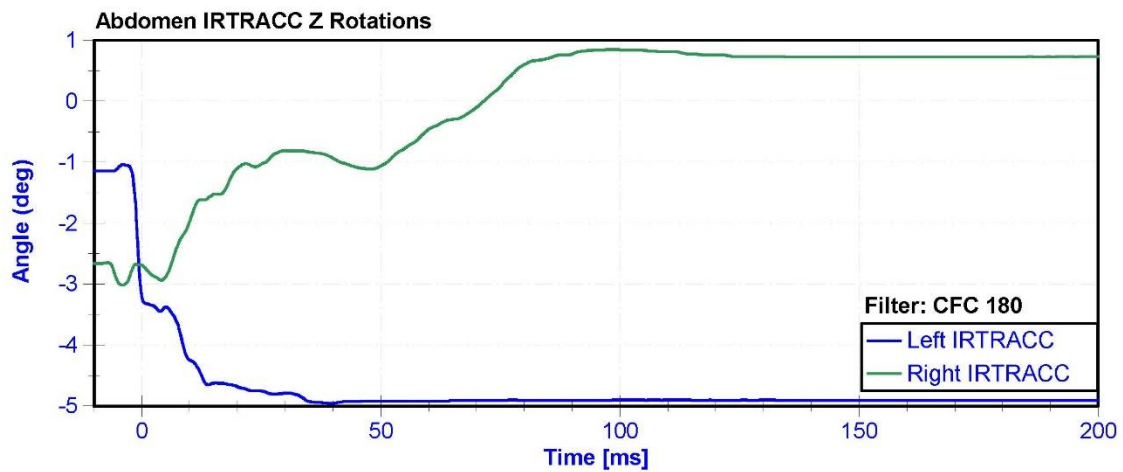
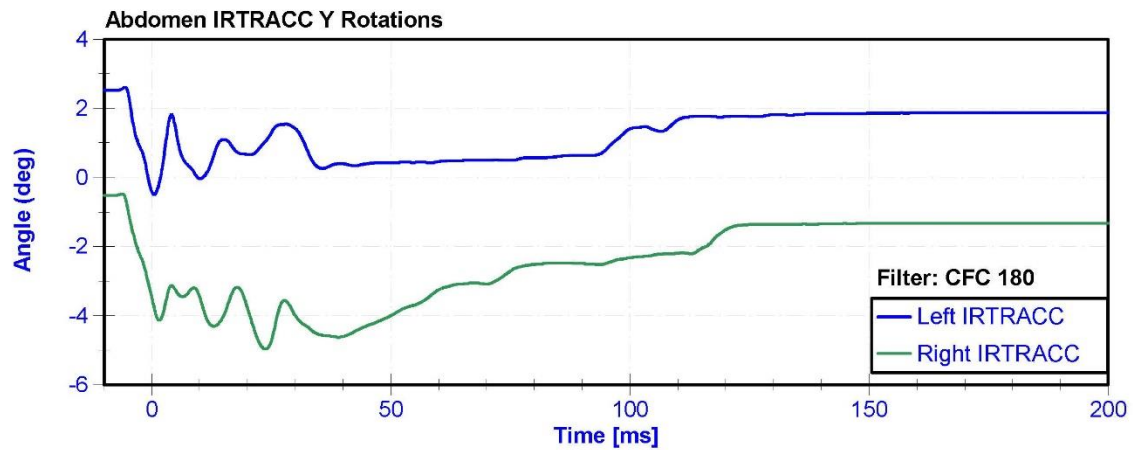
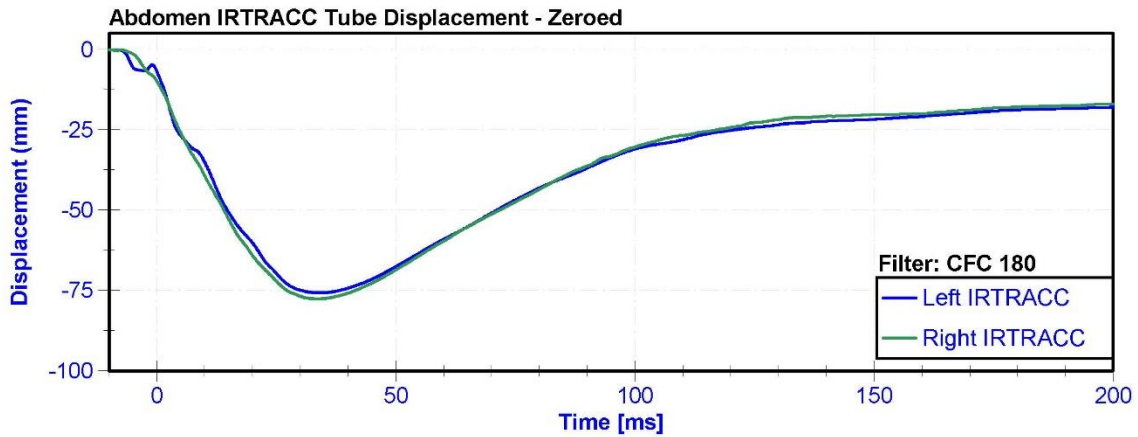
#### Results

| Test Parameter             | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|----------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                | 20.6                  | 22.2                  | °C   | 20.9   | Pass      |
| Humidity                   | 10                    | 70                    | %    | 17.9   | Pass      |
| Impact Velocity            | 3.25                  | 3.35                  | m/s  | 3.315  | Pass      |
| Probe Force                | 2523                  | 3083                  | N    | 2949.7 | Pass      |
| Left Abdomen X Deflection  | -101.6                | -91.2                 | mm   | -75.86 | Fail      |
| Right Abdomen X Deflection | -101.6                | -91.2                 | mm   | -77.68 | Fail      |
| Left/Right X Deviation     | -7.00                 | 7.00                  | mm   | 1.824  | Pass      |

#### Transducer Calibrations

| Channel                      | Manufacturer    | Serial Number | Calibration Date | Calibration Due Date |
|------------------------------|-----------------|---------------|------------------|----------------------|
| Probe Accel                  | ENDEVCO 7231CT  | AC-C14972     | 8/13/2015        | 2/11/2016            |
| Abdomen Left IRTRACC         | Humanetics 9910 | DS-DQ2303     | 4/13/2015        | 4/12/2016            |
| Abdomen Left Y Potentiometer | Humanetics 9945 | DS-DS8363     | 12/16/2015       | 12/15/2016           |
| Abdomen Left Z Potentiometer | Humanetics 9945 | DS-DS8361     | 12/16/2015       | 12/15/2016           |







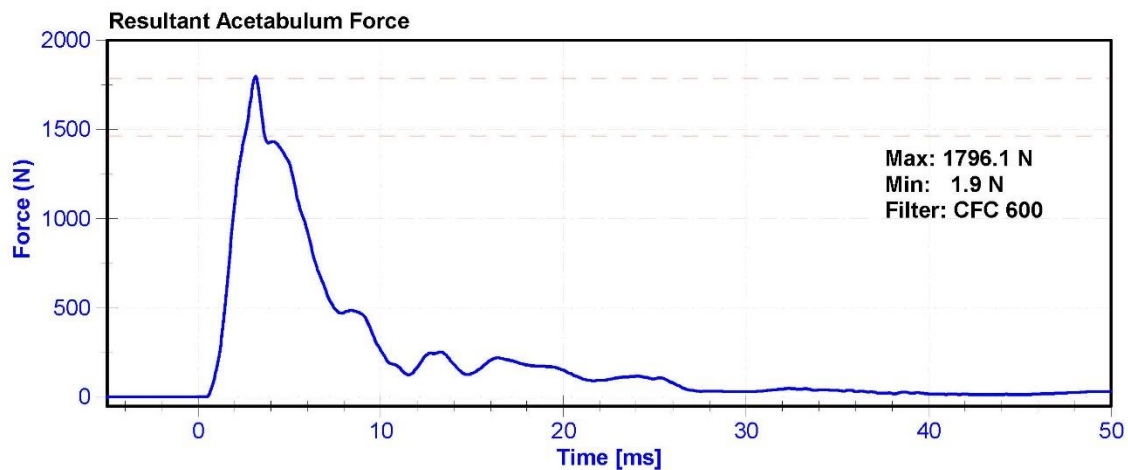
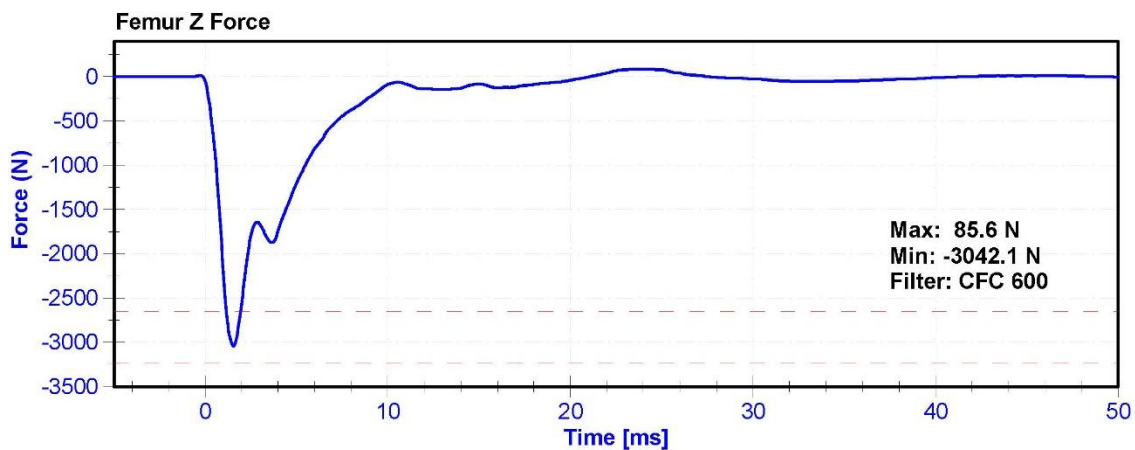
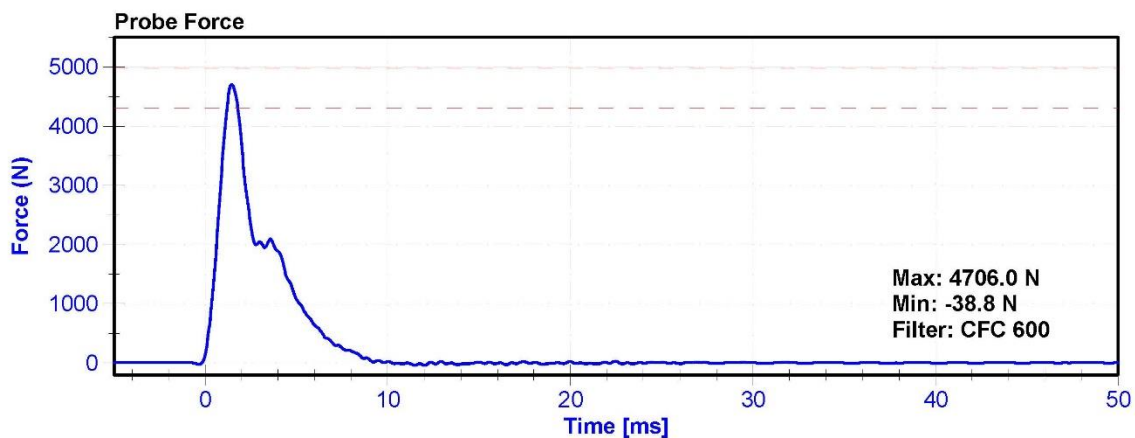
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| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

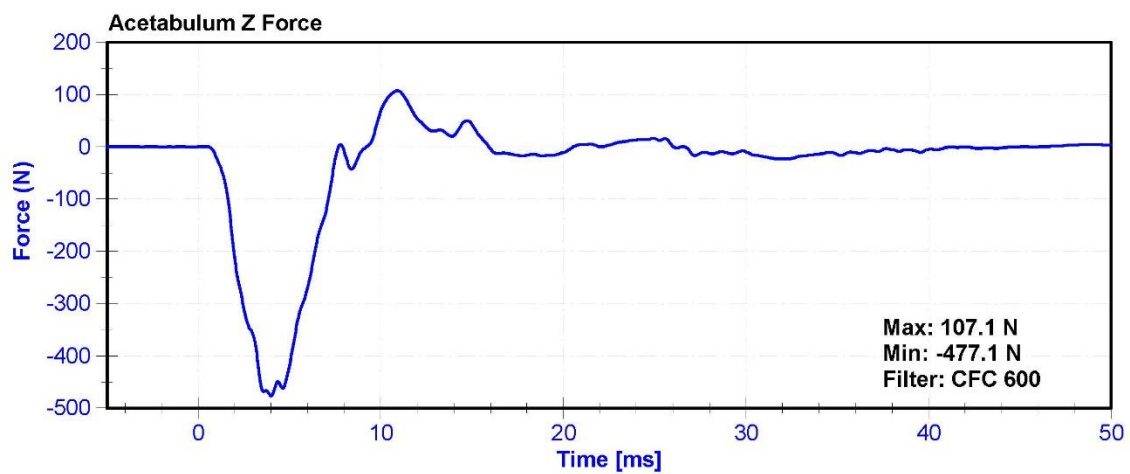
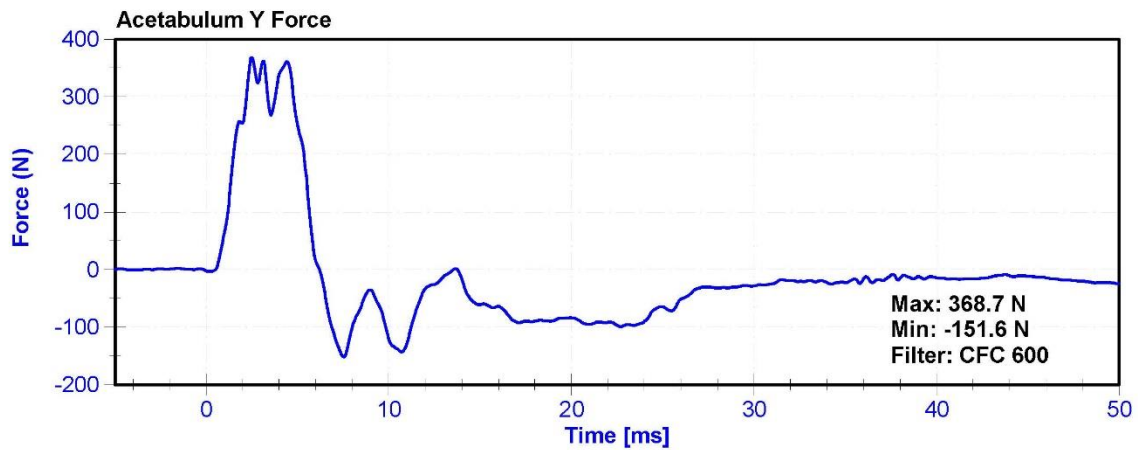
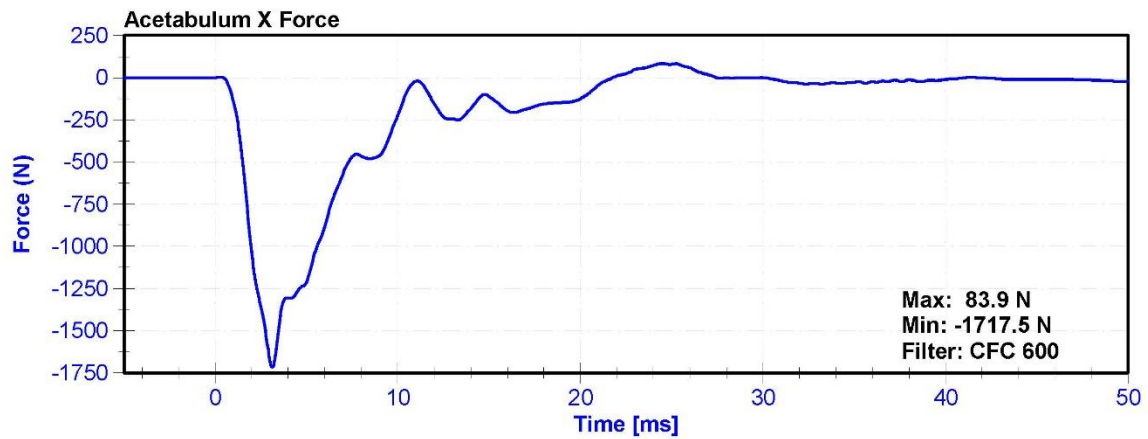
### Results

| Test Parameter                  | Minimum Specification | Maximum Specification | Unit | Result   | Pass/Fail |
|---------------------------------|-----------------------|-----------------------|------|----------|-----------|
| Temperature                     | 20.6                  | 22.2                  | °C   | 21.2     | Pass      |
| Humidity                        | 10                    | 70                    | %    | 15.3     | Pass      |
| Impact Velocity                 | 2.55                  | 2.65                  | m/s  | 2.592    | Pass      |
| Probe Force                     | 4318                  | 4989                  | N    | 4706.0   | Pass      |
| Peak Femur Z Force              | -3241                 | -2652                 | N    | -3042.13 | Pass      |
| Peak Resultant Acetabulum Force | 1462                  | 1787                  | N    | 1796.09  | Fail      |

### Transducer Calibrations

| Channel                   | Manufacturer        | Serial Number | Calibration Date | Calibration Due Date |
|---------------------------|---------------------|---------------|------------------|----------------------|
| Probe Accel               | ENDEVCO 7231CT      | AC-C14972     | 8/13/2015        | 2/11/2016            |
| Left Femur Load Cell      | Denton W50-7101051  | LC-DM4975 Fz  | 2/20/2015        | 2/20/2016            |
| Left Acetabulum Load Cell | Humanetics 10530JI4 | LC-DP4639 Fx  | 3/6/2015         | 3/5/2016             |





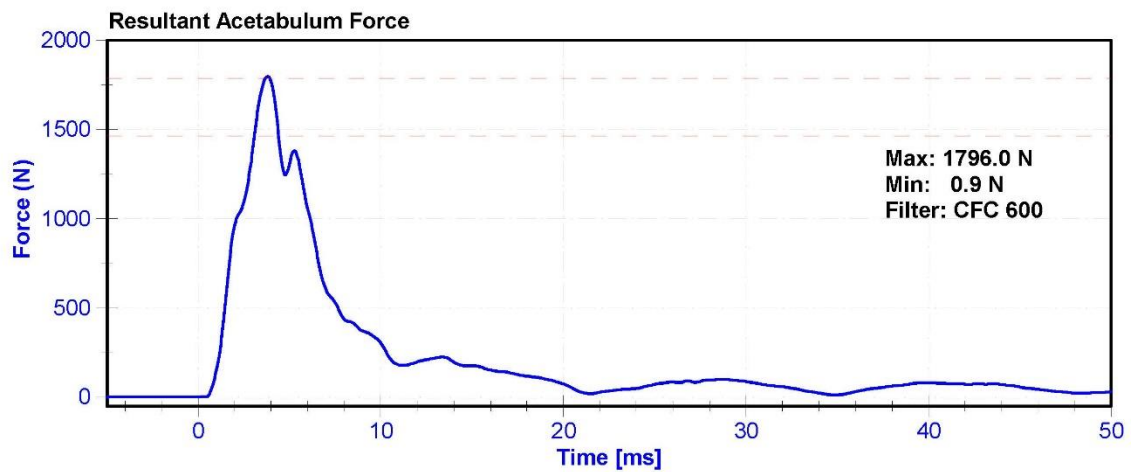
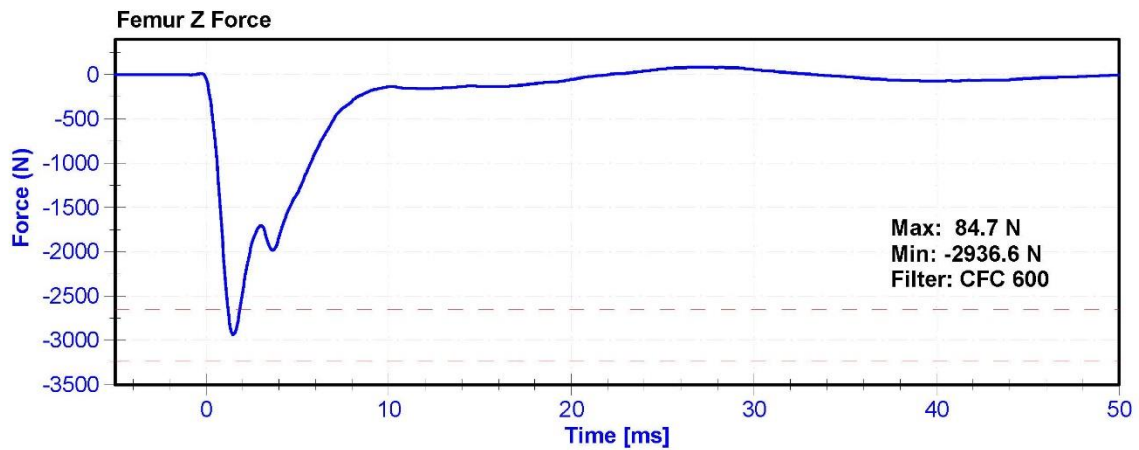
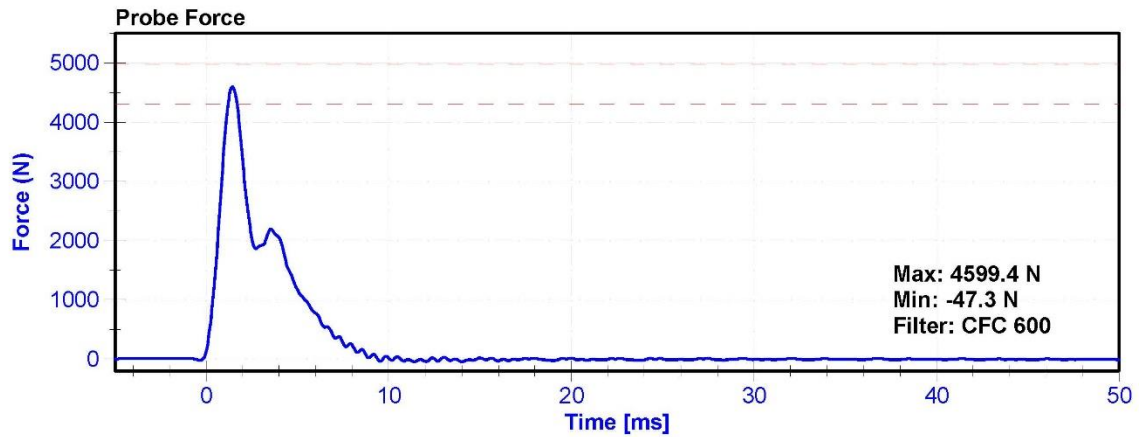
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

**Results**

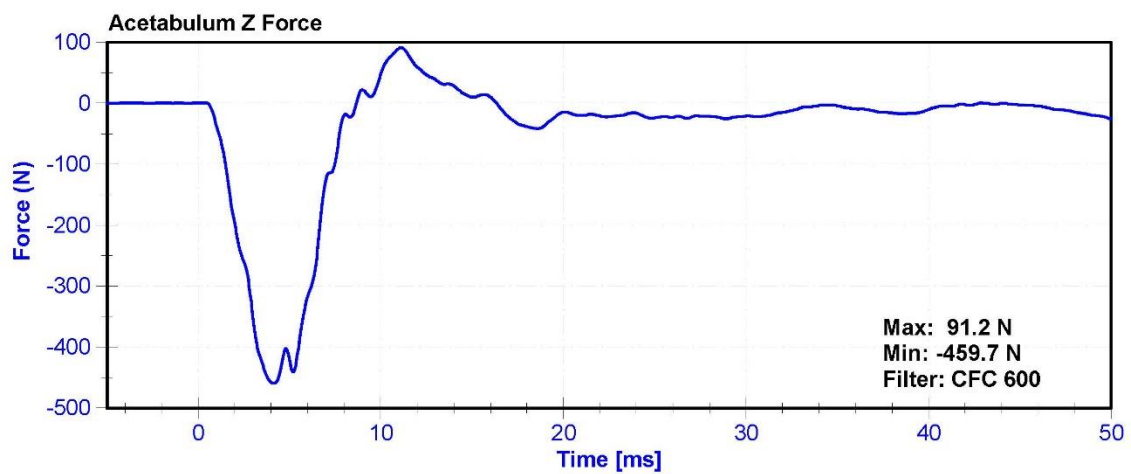
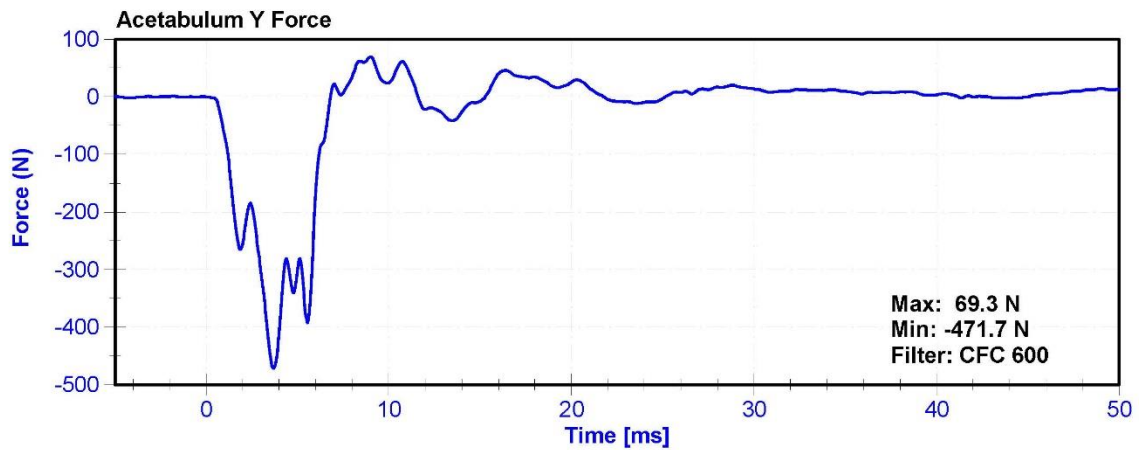
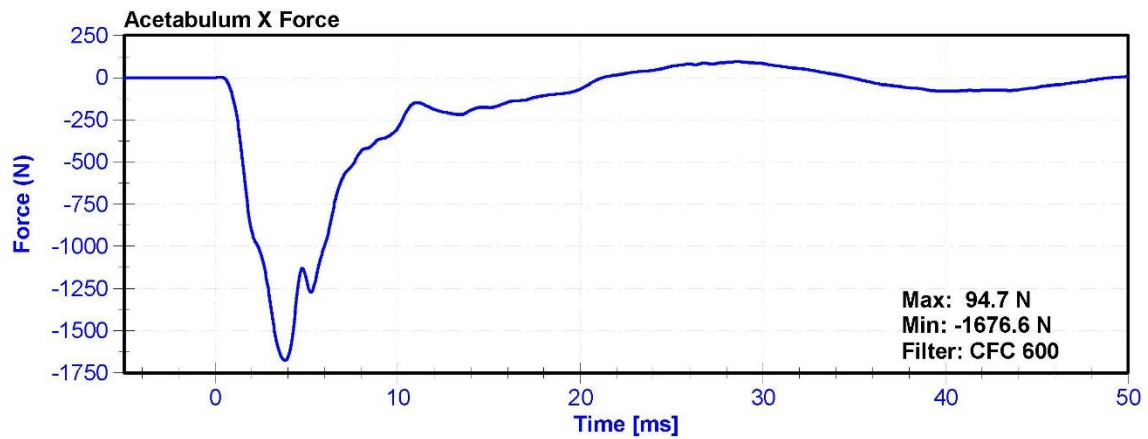
| Test Parameter                  | Minimum Specification | Maximum Specification | Unit | Result   | Pass/Fail |
|---------------------------------|-----------------------|-----------------------|------|----------|-----------|
| Temperature                     | 20.6                  | 22.2                  | °C   | 21.1     | Pass      |
| Humidity                        | 10                    | 70                    | %    | 15.6     | Pass      |
| Impact Velocity                 | 2.55                  | 2.65                  | m/s  | 2.579    | Pass      |
| Probe Force                     | 4318                  | 4989                  | N    | 4599.4   | Pass      |
| Peak Femur Z Force              | -3241                 | -2652                 | N    | -2936.62 | Pass      |
| Peak Resultant Acetabulum Force | 1462                  | 1787                  | N    | 1795.97  | Fail      |

**Transducer Calibrations**

| Channel                    | Manufacturer        | Serial Number | Calibration Date | Calibration Due Date |
|----------------------------|---------------------|---------------|------------------|----------------------|
| Probe Accel                | ENDEVCO 7231CT      | AC-C14972     | 8/13/2015        | 2/11/2016            |
| Right Femur Load Cell      | Denton W50-7101051  | LC-DM4976 Fz  | 2/23/2015        | 2/23/2016            |
| Right Acetabulum Load Cell | Humanetics 10670JI4 | LC-DP3835 Fx  | 3/7/2015         | 3/6/2016             |







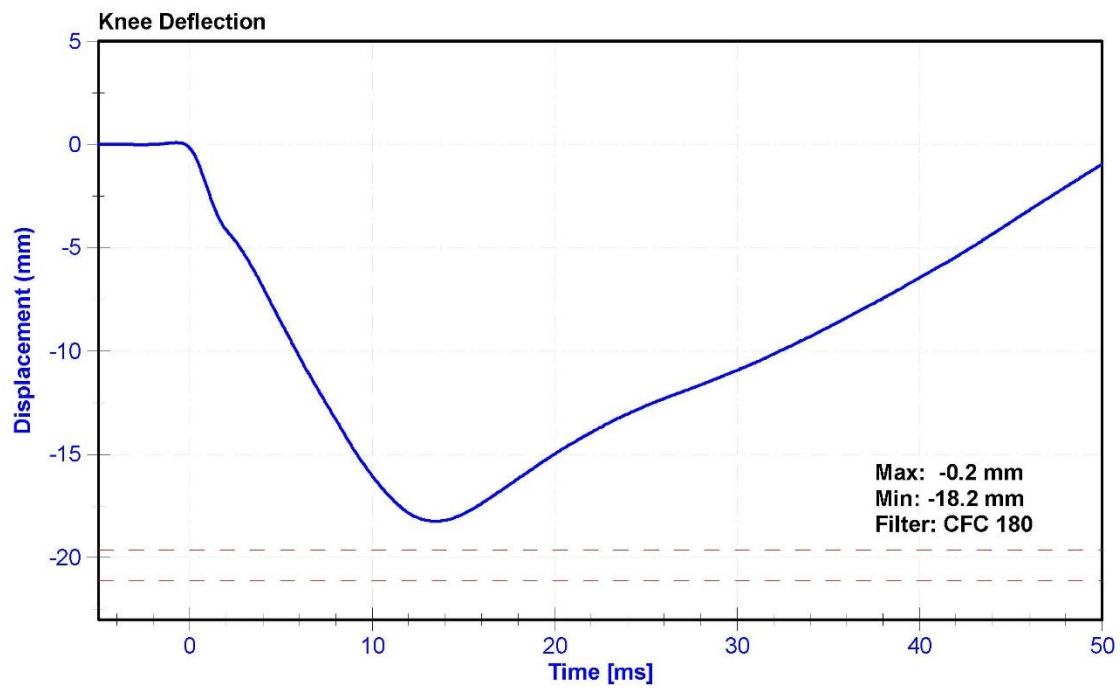
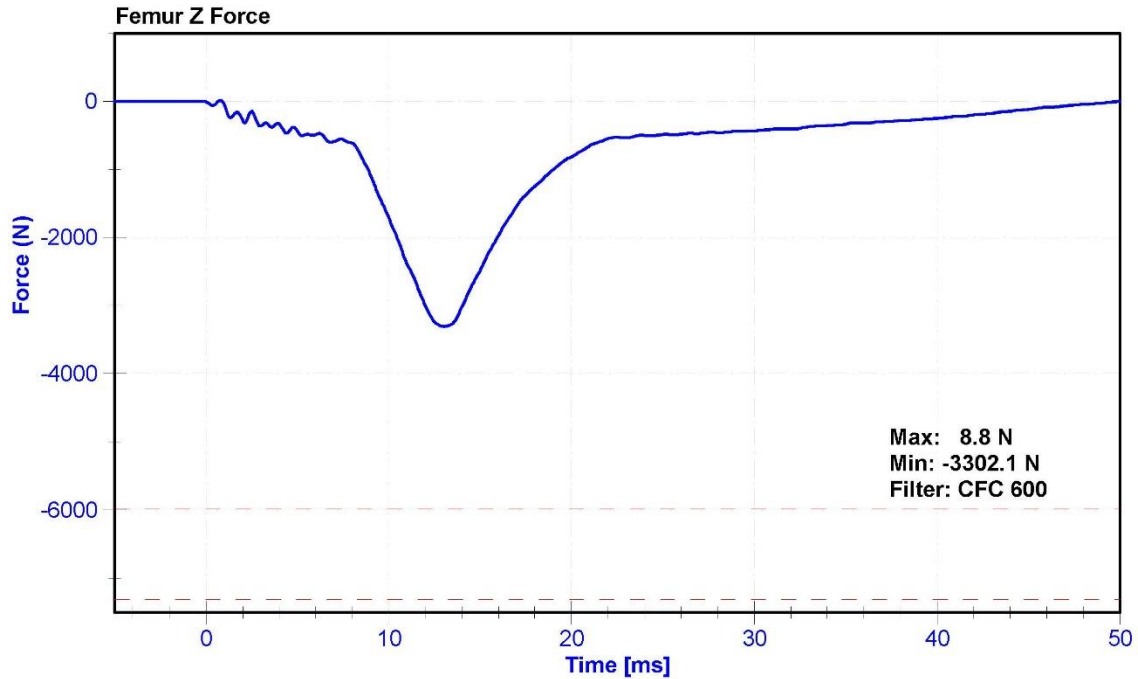
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

**Results**

| Test Parameter                | Minimum Specification | Maximum Specification | Unit | Result  | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|------|---------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C   | 21.5    | Pass      |
| Humidity                      | 10                    | 70                    | %    | 16.4    | Pass      |
| Impact Velocity               | 2.15                  | 2.25                  | m/s  | 2.223   | Pass      |
| Peak Femur Z Force            | -7317                 | -5987                 | N    | -3302.1 | Fail      |
| Knee Deflection at Peak Force | -21.12                | -19.62                | mm   | -18.24  | Fail      |

**Transducer Calibrations**

| Channel            | Manufacturer        | Serial Number | Calibration Date | Calibration Due Date |
|--------------------|---------------------|---------------|------------------|----------------------|
| Probe Accel        | ENDEVCO 7231CT      | AC-C14972     | 8/13/2015        | 2/11/2016            |
| Femur Load Cell    | Denton W50-7101051  | LC-DM4975 Fz  | 2/20/2015        | 2/20/2016            |
| Knee Potentiometer | Space Age 150-0121V | DS-C2102639B  | 2/17/2015        | 2/17/2016            |



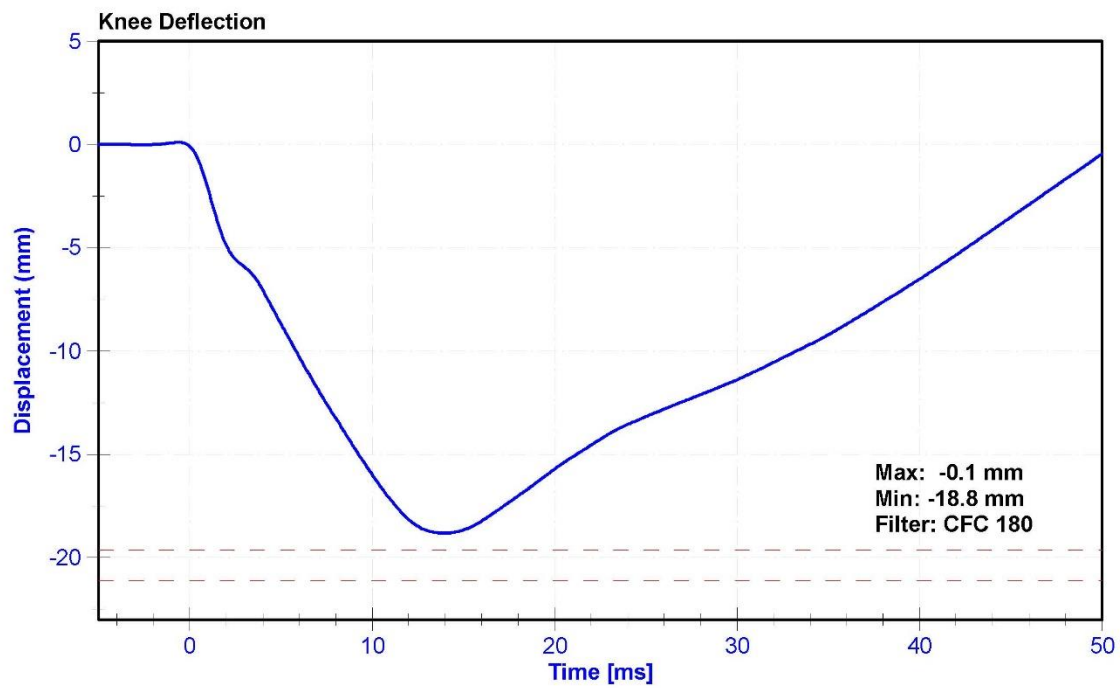
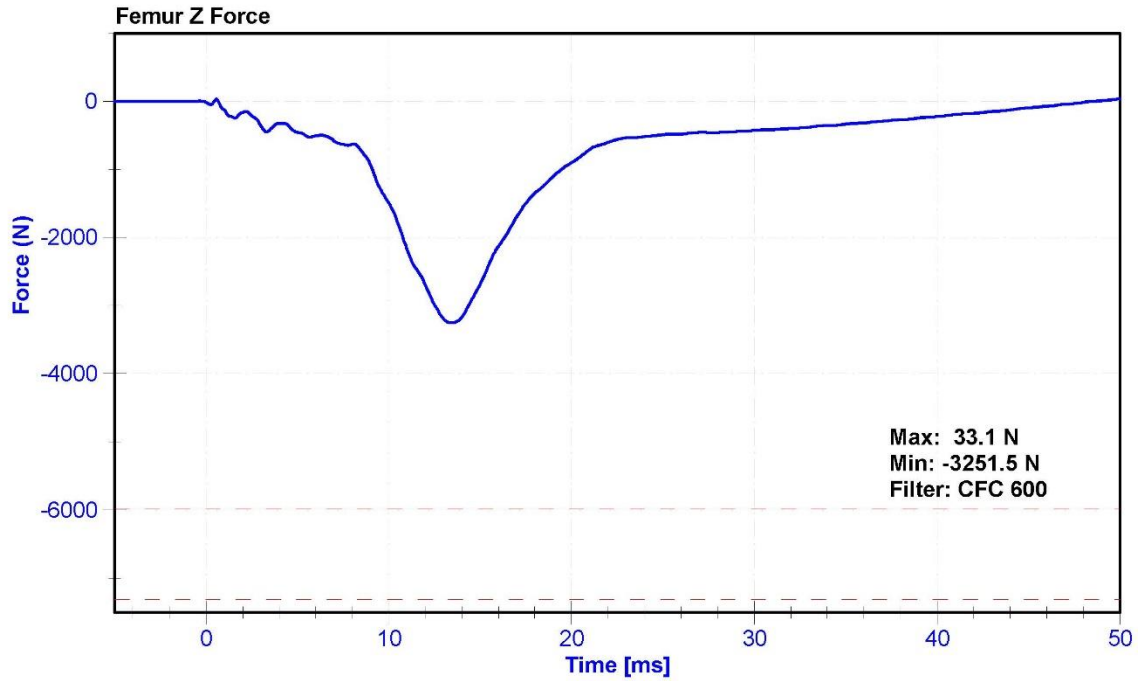
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M. Goehle |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

**Results**

| Test Parameter                | Minimum Specification | Maximum Specification | Unit | Result  | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|------|---------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C   | 21.2    | Pass      |
| Humidity                      | 10                    | 70                    | %    | 16.4    | Pass      |
| Impact Velocity               | 2.15                  | 2.25                  | m/s  | 2.190   | Pass      |
| Peak Femur Z Force            | -7317                 | -5987                 | N    | -3251.5 | Fail      |
| Knee Deflection at Peak Force | -21.12                | -19.62                | mm   | -18.82  | Fail      |

**Transducer Calibrations**

| Channel            | Manufacturer         | Serial Number | Calibration Date | Calibration Due Date |
|--------------------|----------------------|---------------|------------------|----------------------|
| Probe Accel        | ENDEVCO 7231CT       | AC-C14972     | 8/13/2015        | 2/11/2016            |
| Femur Load Cell    | Denton W50-7101051   | LC-DM4976 Fz  | 2/23/2015        | 2/23/2016            |
| Knee Potentiometer | Space Age 150-0121VL | DS-021033     | 3/18/2015        | 3/17/2016            |





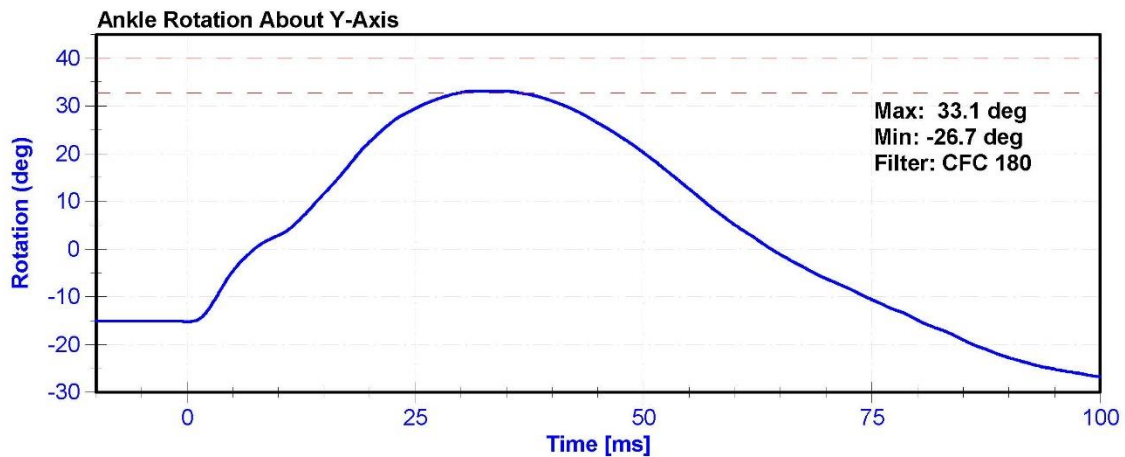
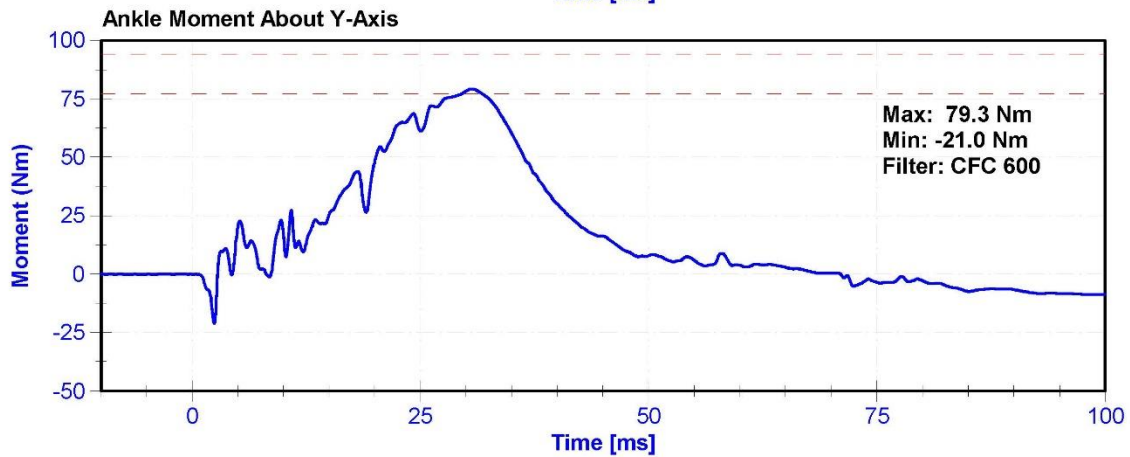
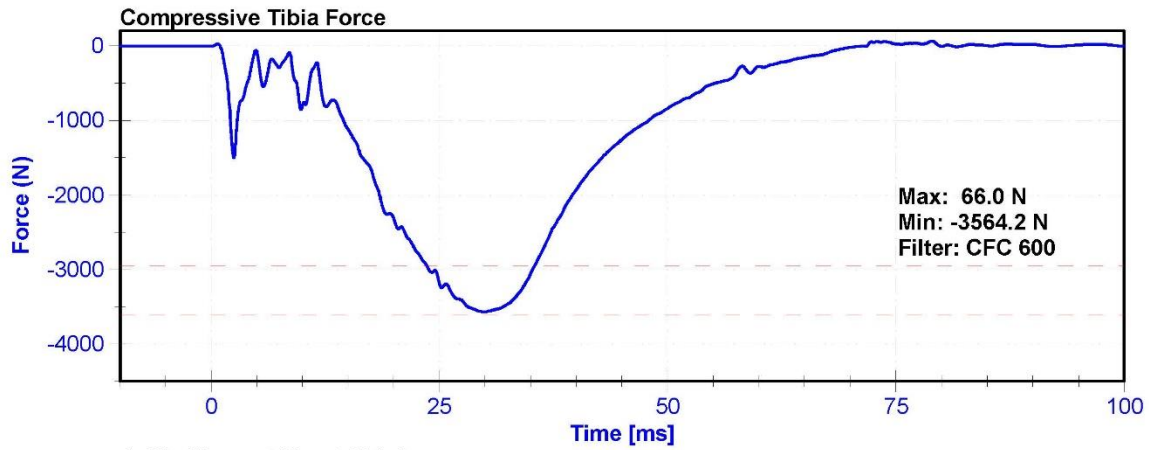
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M.Hartung |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

**Results**

| Test Parameter                | Minimum Specification | Maximum Specification | Unit | Result  | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|------|---------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C   | 21.2    | Pass      |
| Humidity                      | 10                    | 70                    | %    | 44.9    | Pass      |
| Velocity                      | 4.9                   | 5.1                   | m/s  | 4.948   | Pass      |
| Lower Tibia Compressive Force | -3613                 | -2956                 | N    | -3564.2 | Pass      |
| Peak Moment about Y-Axis      | 77.1                  | 94.2                  | Nm   | 79.35   | Pass      |
| Peak Rotation about Y-Axis    | 32.7                  | 39.9                  | deg  | 33.08   | Pass      |

**Transducer Calibrations**

| Channel                | Manufacturer      | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|-------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT    | AC-C15018     | 7/15/2015        | 7/14/2016            |
| Lower Tibia Load Cell  | Denton 4929J      | LC-121 Fz     | 2/10/2015        | 2/10/2016            |
| Ankle Y Potentiometer  | Contelec PD210-4B | DS-0524       | 2/18/2015        | 2/18/2016            |



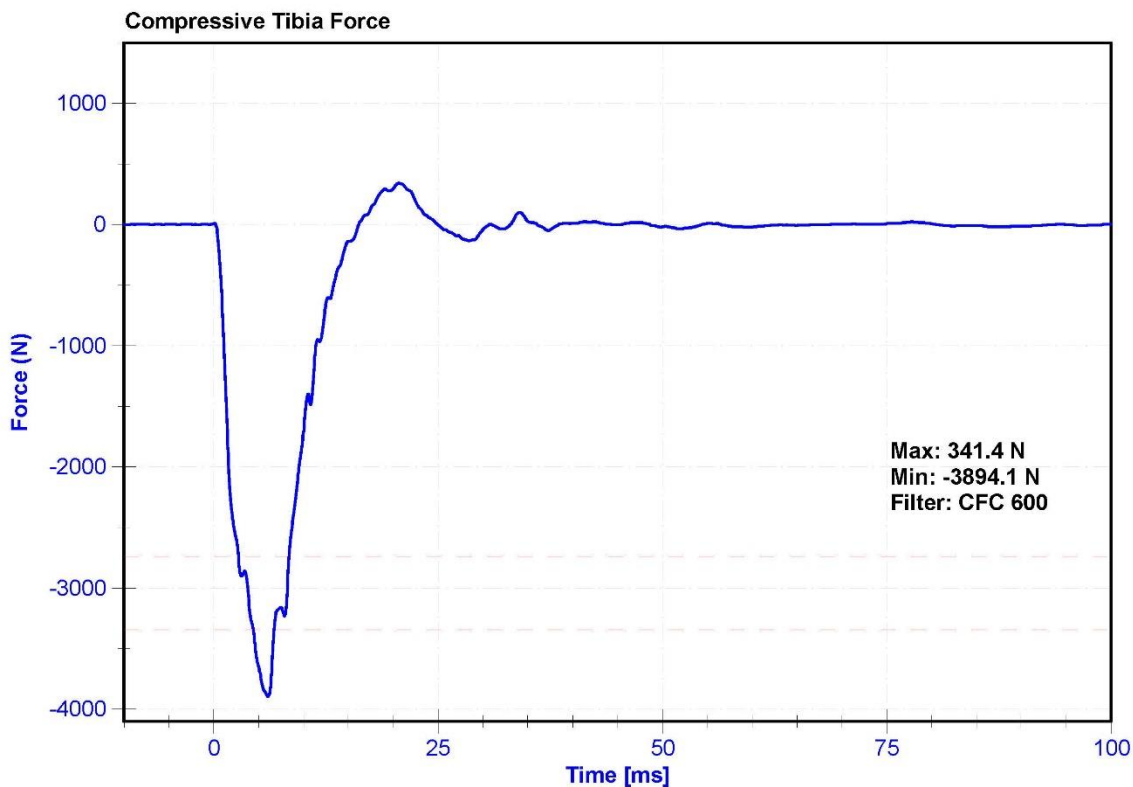
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M.Hartung |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

#### Results

| Test Parameter                | Minimum Specification | Maximum Specification | Unit | Result  | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|------|---------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C   | 21      | Pass      |
| Humidity                      | 10                    | 70                    | %    | 43.2    | Pass      |
| Velocity                      | 3.9                   | 4.1                   | m/s  | 4.053   | Pass      |
| Lower Tibia Compressive Force | -3346                 | -2738                 | N    | -3894.1 | Fail      |

#### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-C15018     | 7/15/2015        | 7/14/2016            |
| Lower Tibia Load Cell  | Denton 4929J   | LC-121 Fz     | 2/10/2015        | 2/10/2016            |





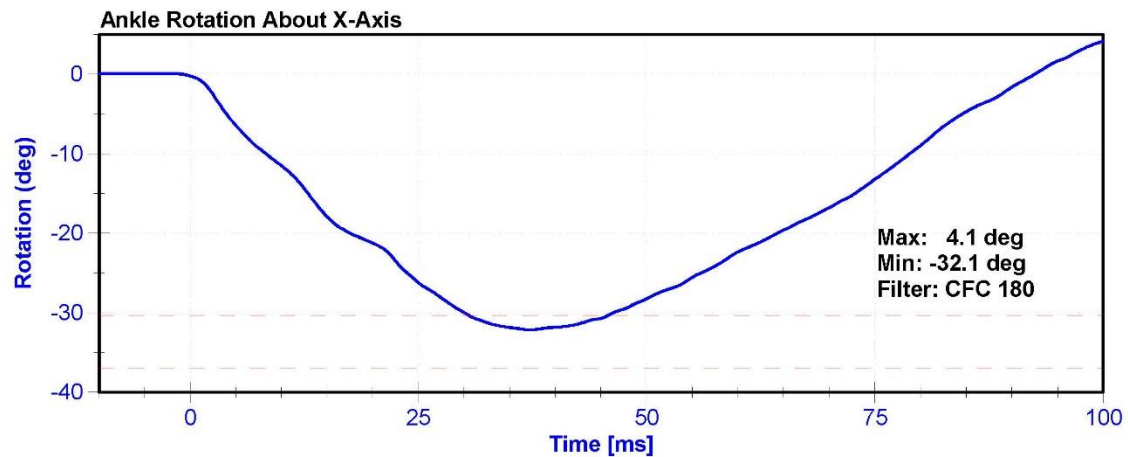
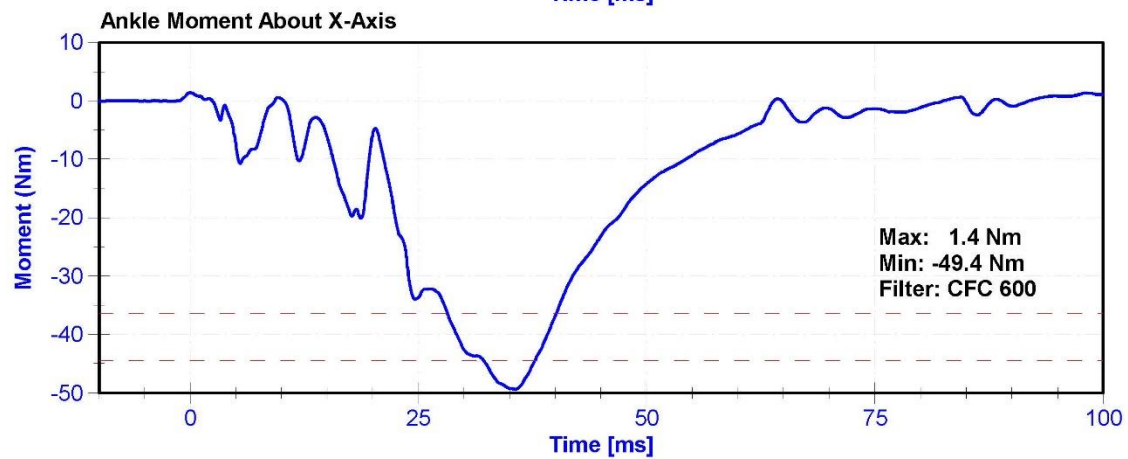
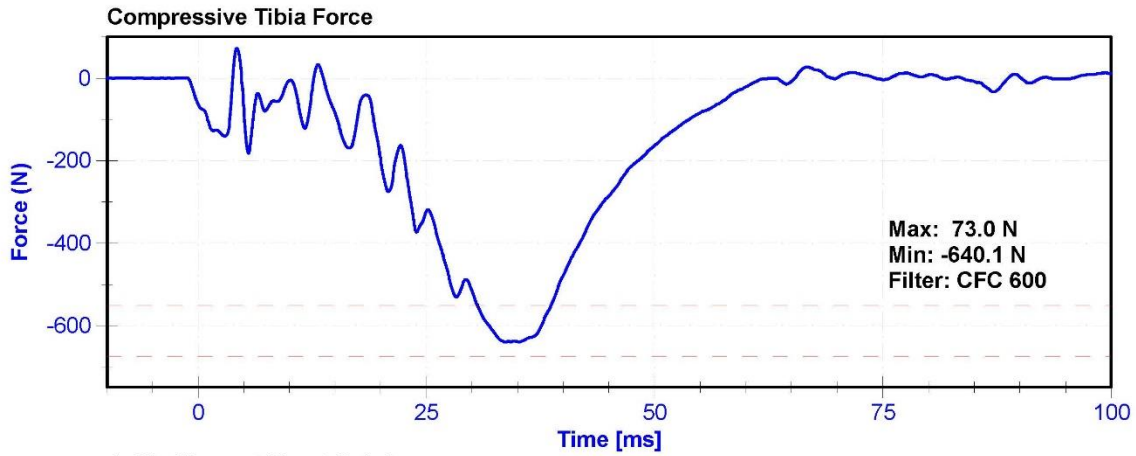
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M.Hartung |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

#### Results

| Test Parameter                | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C   | 21.1   | Pass      |
| Humidity                      | 10                    | 70                    | %    | 45.5   | Pass      |
| Velocity                      | 1.9                   | 2.1                   | m/s  | 2.016  | Pass      |
| Lower Tibia Compressive Force | -675                  | -552                  | N    | -640.1 | Pass      |
| Peak Moment about X-Axis      | -44.4                 | -36.3                 | Nm   | -49.36 | Fail      |
| Peak Rotation about X-Axis    | -37.0                 | -30.3                 | deg  | -32.11 | Pass      |

#### Transducer Calibrations

| Channel                | Manufacturer      | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|-------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT    | AC-C15018     | 7/15/2015        | 7/14/2016            |
| Lower Tibia Load Cell  | Denton 4929J      | LC-121 Fz     | 2/10/2015        | 2/10/2016            |
| Ankle Y Potentiometer  | Contelec PD210-4B | DS-0525       | 2/18/2015        | 2/18/2016            |





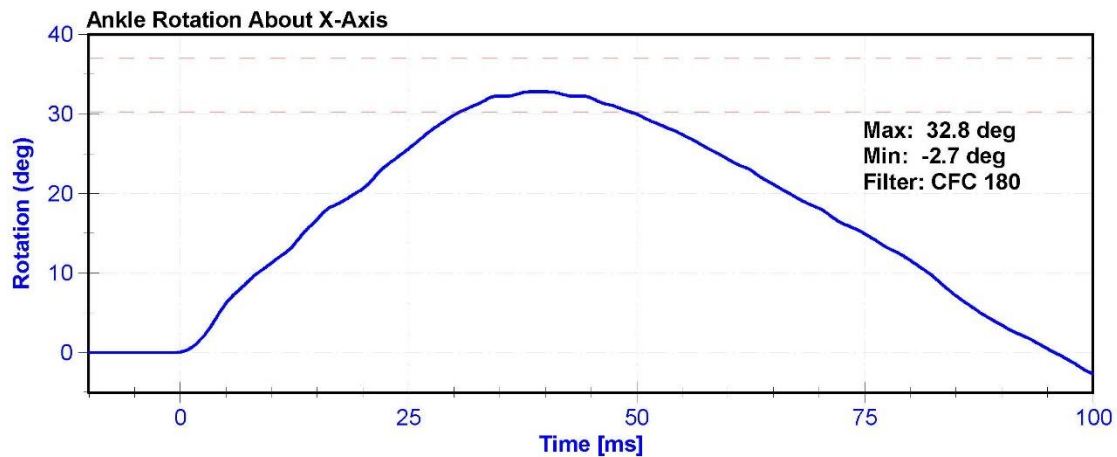
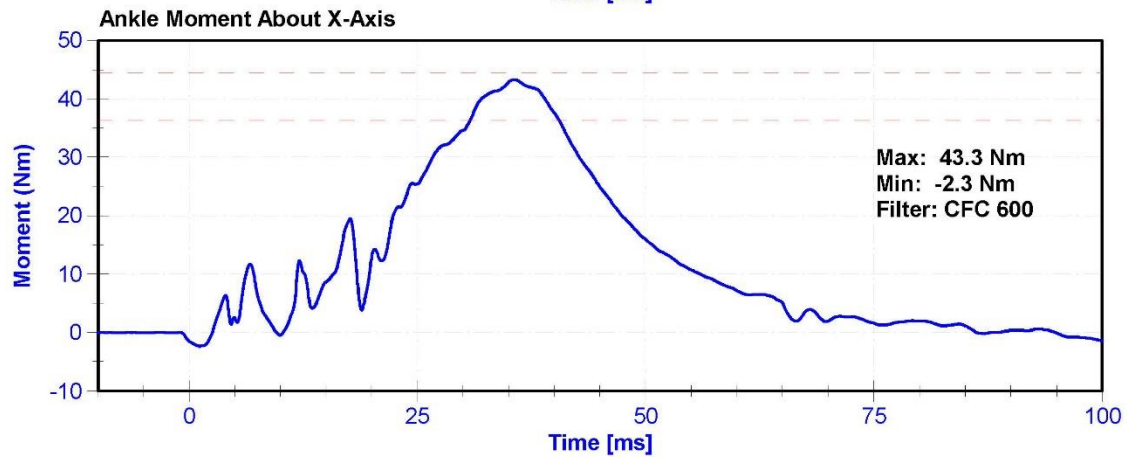
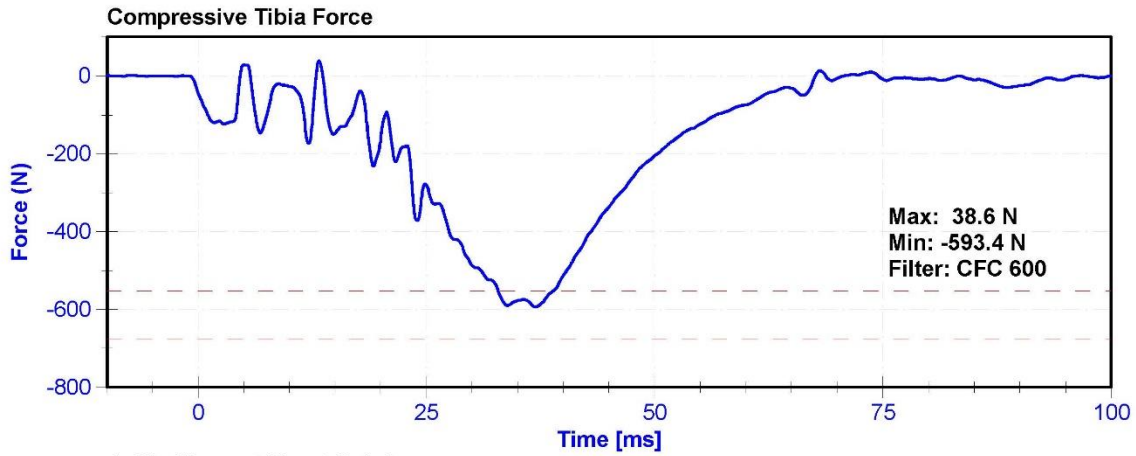
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M.Hartung |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

**Results**

| Test Parameter                | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C   | 21.1   | Pass      |
| Humidity                      | 10                    | 70                    | %    | 45.7   | Pass      |
| Velocity                      | 1.9                   | 2.1                   | m/s  | 2.016  | Pass      |
| Lower Tibia Compressive Force | -675                  | -552                  | N    | -593.4 | Pass      |
| Peak Moment about X-Axis      | 36.3                  | 44.4                  | Nm   | 43.27  | Pass      |
| Peak Rotation about X-Axis    | 30.3                  | 37.0                  | deg  | 32.78  | Pass      |

**Transducer Calibrations**

| Channel                | Manufacturer      | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|-------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT    | AC-C15018     | 7/15/2015        | 7/14/2016            |
| Lower Tibia Load Cell  | Denton 4929J      | LC-121 Fz     | 2/10/2015        | 2/10/2016            |
| Ankle Y Potentiometer  | Contelec PD210-4B | DS-0525       | 2/18/2015        | 2/18/2016            |



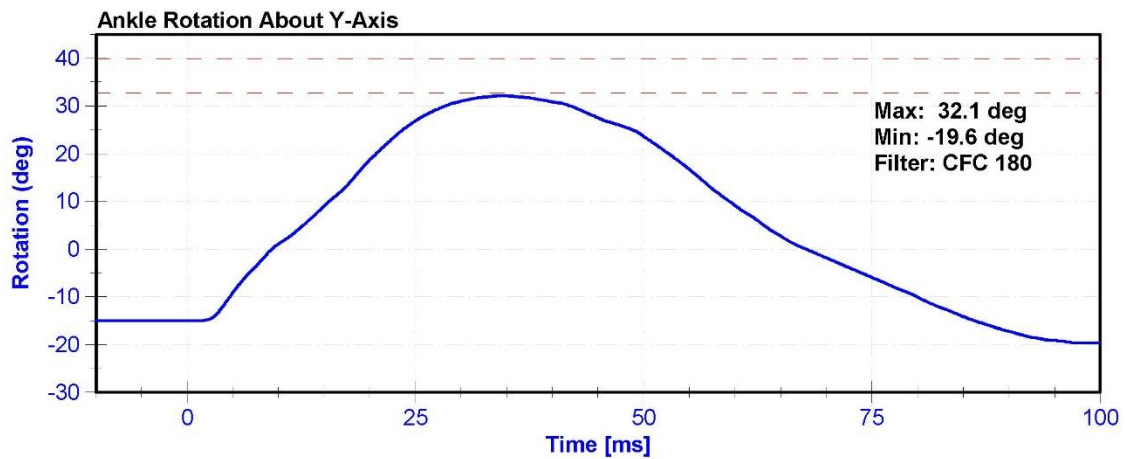
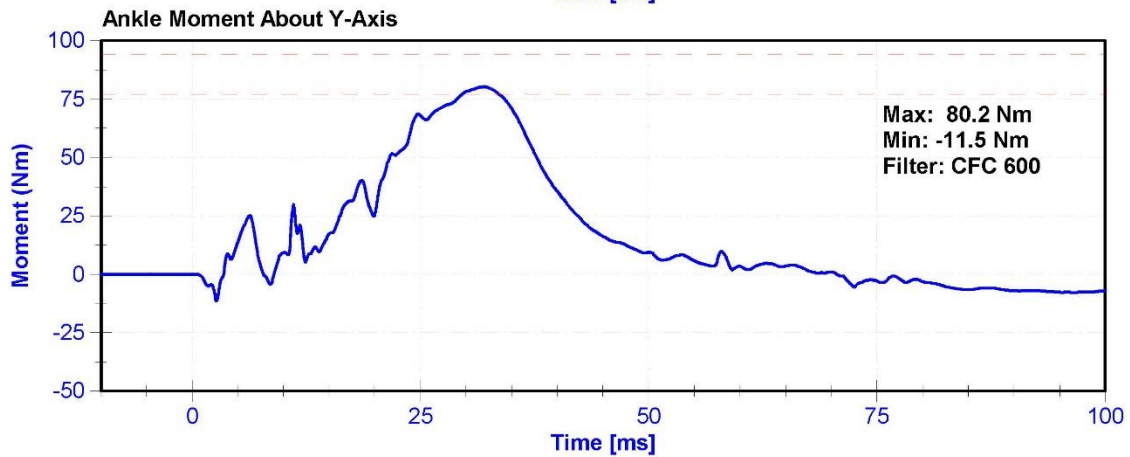
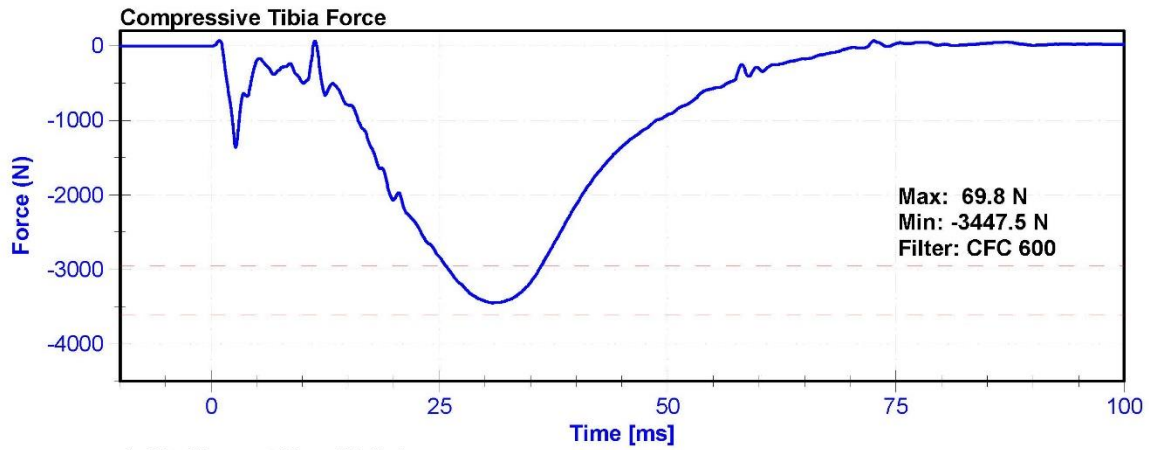
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M.Hartung |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

**Results**

| Test Parameter                | Minimum Specification | Maximum Specification | Unit | Result  | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|------|---------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C   | 21.3    | Pass      |
| Humidity                      | 10                    | 70                    | %    | 48.7    | Pass      |
| Velocity                      | 4.9                   | 5.1                   | m/s  | 4.916   | Pass      |
| Lower Tibia Compressive Force | -3613                 | -2956                 | N    | -3447.5 | Pass      |
| Peak Moment about Y-Axis      | 77.1                  | 94.2                  | Nm   | 80.21   | Pass      |
| Peak Rotation about Y-Axis    | 32.7                  | 39.9                  | deg  | 32.14   | Fail      |

**Transducer Calibrations**

| Channel                | Manufacturer      | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|-------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT    | AC-C15018     | 7/15/2015        | 7/14/2016            |
| Lower Tibia Load Cell  | Denton 4929J      | LC-166 Fz     | 2/9/2015         | 2/9/2016             |
| Ankle Y Potentiometer  | Contelec PD210-4B | DS-0526       | 2/19/2015        | 2/19/2016            |



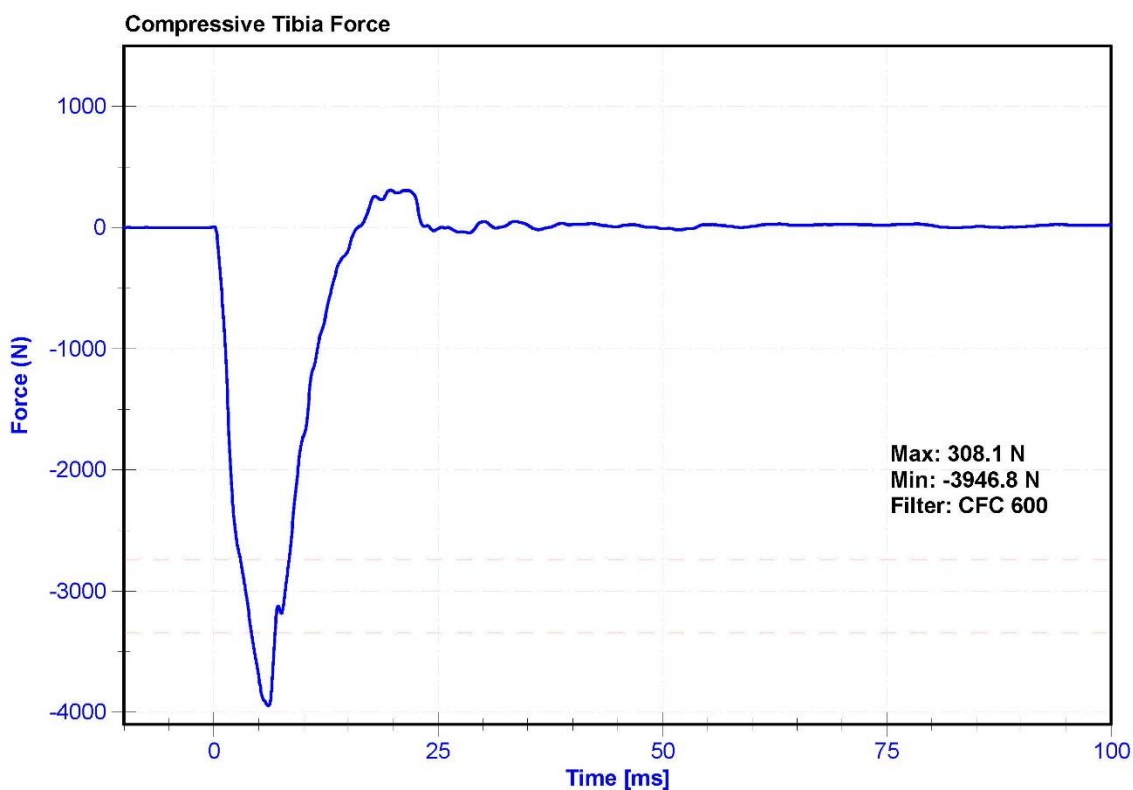
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M.Hartung |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

### Results

| Test Parameter                | Minimum Specification | Maximum Specification | Unit | Result  | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|------|---------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C   | 21.3    | Pass      |
| Humidity                      | 10                    | 70                    | %    | 48.3    | Pass      |
| Velocity                      | 3.9                   | 4.1                   | m/s  | 4.032   | Pass      |
| Lower Tibia Compressive Force | -3346                 | -2738                 | N    | -3946.8 | Fail      |

### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-C15018     | 7/15/2015        | 7/14/2016            |
| Lower Tibia Load Cell  | Denton 4929J   | LC-166 Fz     | 2/9/2015         | 2/9/2016             |







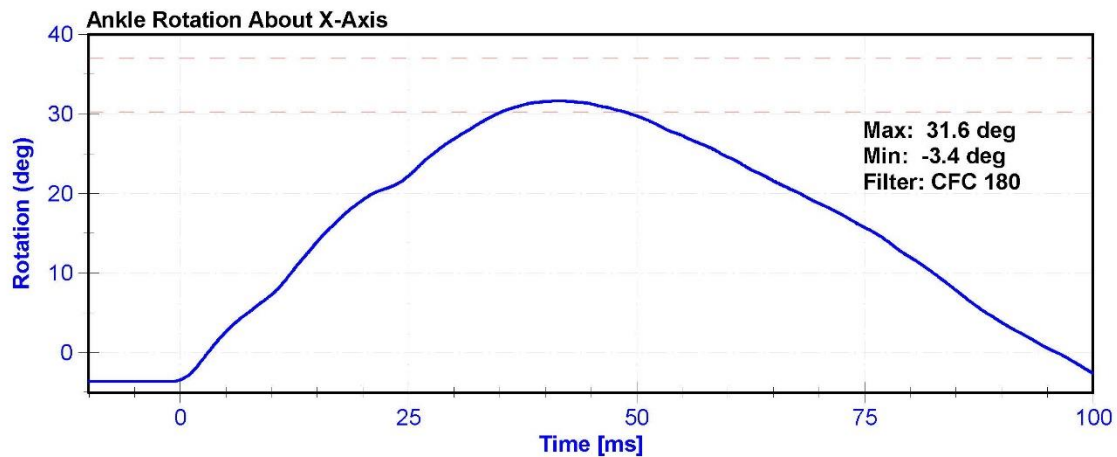
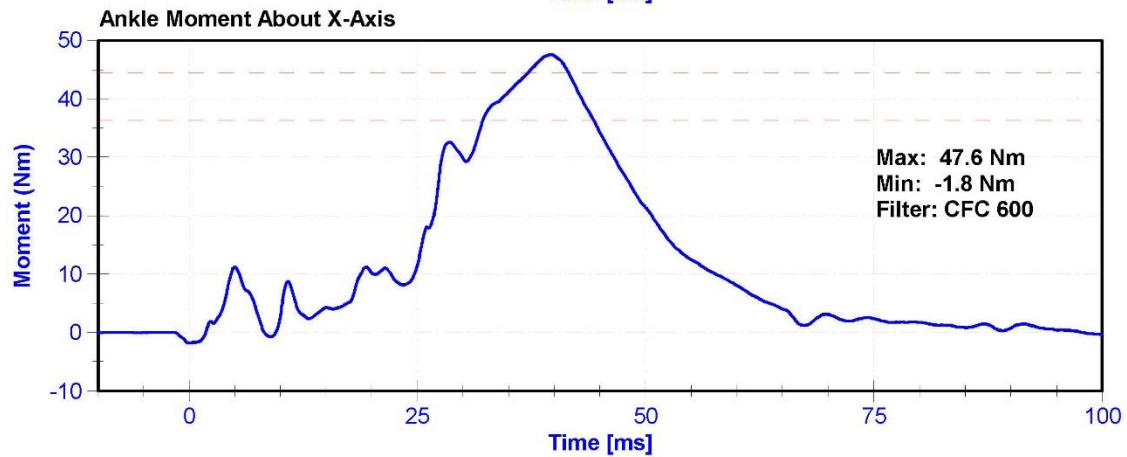
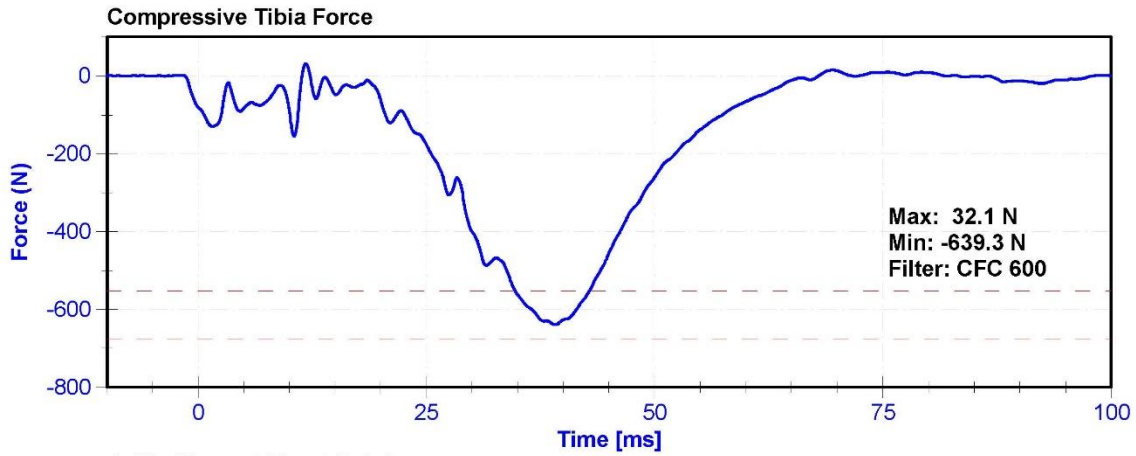
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M.Hartung |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

#### Results

| Test Parameter                | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C   | 21.3   | Pass      |
| Humidity                      | 10                    | 70                    | %    | 51.0   | Pass      |
| Velocity                      | 1.9                   | 2.1                   | m/s  | 1.949  | Pass      |
| Lower Tibia Compressive Force | -675                  | -552                  | N    | -639.3 | Pass      |
| Peak Moment about X-Axis      | 36.3                  | 44.4                  | Nm   | 47.58  | Fail      |
| Peak Rotation about X-Axis    | 30.3                  | 37.0                  | deg  | 31.61  | Pass      |

#### Transducer Calibrations

| Channel                | Manufacturer      | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|-------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT    | AC-C15018     | 7/15/2015        | 7/14/2016            |
| Lower Tibia Load Cell  | Denton 4929J      | LC-166 Fz     | 2/9/2015         | 2/9/2016             |
| Ankle Y Potentiometer  | Contelec PD210-4B | DS-0528       | 2/19/2015        | 2/19/2016            |





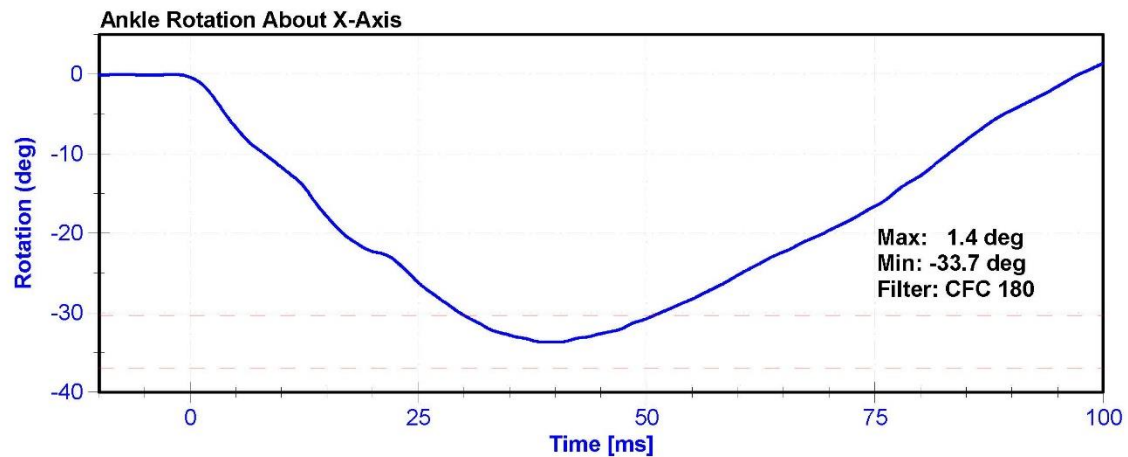
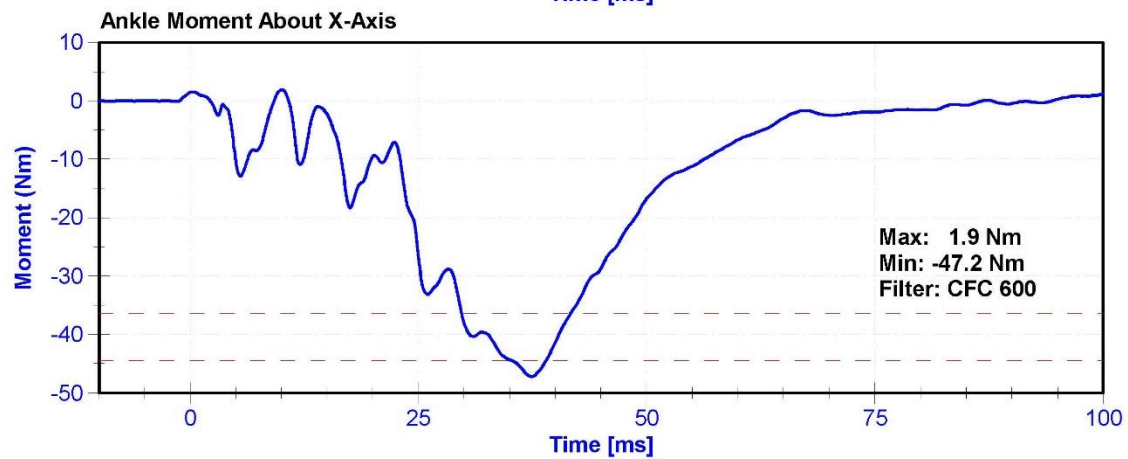
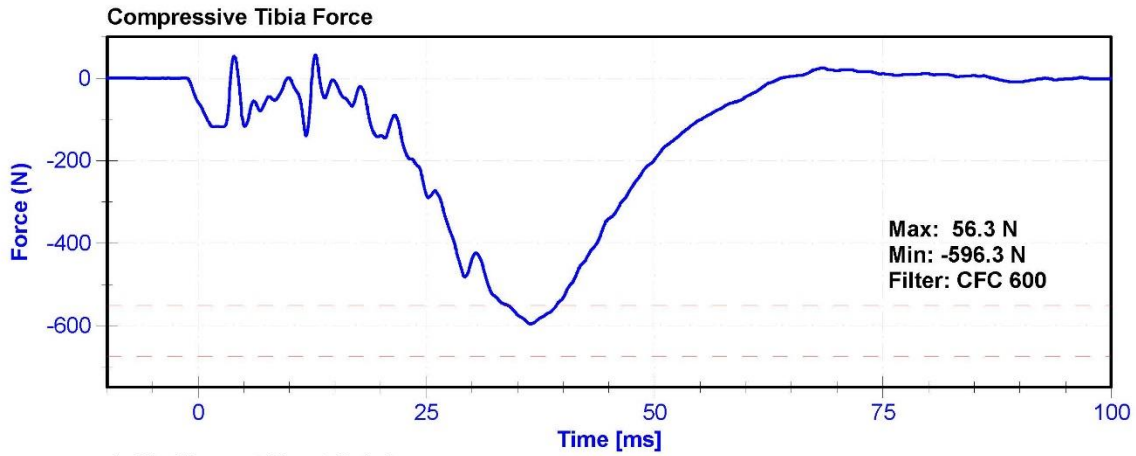
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|-------------------|------------|-----------------------|-----------|
| ATD Manufacturer  | Humanetics | Test Technician       | M.Hartung |
| ATD Serial Number | DL9207     | Laboratory Supervisor | M. Goehle |

#### Results

| Test Parameter                | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|-------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                   | 20.6                  | 22.2                  | °C   | 21.3   | Pass      |
| Humidity                      | 10                    | 70                    | %    | 51.6   | Pass      |
| Velocity                      | 1.9                   | 2.1                   | m/s  | 1.944  | Pass      |
| Lower Tibia Compressive Force | -675                  | -552                  | N    | -596.3 | Pass      |
| Peak Moment about X-Axis      | -44.4                 | -36.3                 | Nm   | -47.18 | Fail      |
| Peak Rotation about X-Axis    | -37.0                 | -30.3                 | deg  | -33.66 | Pass      |

#### Transducer Calibrations

| Channel                | Manufacturer      | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|-------------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT    | AC-C15018     | 7/15/2015        | 7/14/2016            |
| Lower Tibia Load Cell  | Denton 4929J      | LC-166 Fz     | 2/9/2015         | 2/9/2016             |
| Ankle Y Potentiometer  | Contelec PD210-4B | DS-0528       | 2/19/2015        | 2/19/2016            |



## Hybrid III 5<sup>th</sup> Female 019 DUMMY CALIBRATIONS



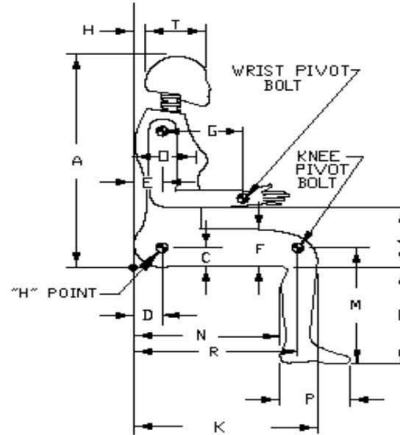
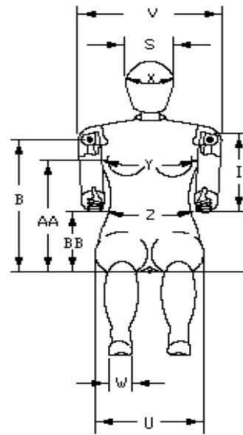


# External Measurements - Hybrid 3 - 5th Female

Technician: M.Hartung

Date: 1/6/2016

Dummy Serial Number: 19



| Symbol | Description                              | Specification (mm) |     | Result (mm) | Pass/Fail |
|--------|------------------------------------------|--------------------|-----|-------------|-----------|
| A      | Sitting Height                           | 775                | 800 | 778         | Pass      |
| B      | Shoulder Pivot Height                    | 432                | 457 | 446         | Pass      |
| C      | H-Point Height                           | 81                 | 86  | 85          | Pass      |
| D      | H-Point from Backline                    | 145                | 150 | 147         | Pass      |
| E      | Shoulder Pivot from Backline             | 69                 | 84  | 74          | Pass      |
| F      | Thigh Clearance                          | 119                | 135 | 133         | Pass      |
| G      | Back of Elbow to Wrist Pivot             | 244                | 259 | 250         | Pass      |
| H      | Head Back to Backline                    | 43                 | 48  | 45          | Pass      |
| I      | Shoulder to Elbow Length                 | 277                | 297 | 282         | Pass      |
| J      | Elbow Rest Height                        | 183                | 203 | 190         | Pass      |
| K      | Buttock to Knee Length                   | 521                | 546 | 539         | Pass      |
| L      | Popliteal Height                         | 356                | 376 | 361         | Pass      |
| M      | Knee Pivot Height                        | 394                | 419 | 400         | Pass      |
| N      | Buttock Popliteal Length                 | 414                | 439 | 427         | Pass      |
| O      | Chest Depth without Jacket               | 175                | 191 | 182         | Pass      |
| P      | Foot Length (right)                      | 219                | 234 | 227         | Pass      |
| R      | Buttock To Knee Pivot Length             | 457                | 483 | 473         | Pass      |
| S      | Head Breadth                             | 137                | 147 | 145         | Pass      |
| T      | Head Depth                               | 178                | 188 | 180         | Pass      |
| U      | Hip Breadth                              | 300                | 315 | 311         | Pass      |
| V      | Shoulder Breadth                         | 351                | 366 | 360         | Pass      |
| W      | Foot Breadth                             | 79                 | 94  | 82          | Pass      |
| X      | Head Circumference                       | 528                | 549 | 530         | Pass      |
| Y      | Chest Circumference with Jacket          | 851                | 881 | 872         | Pass      |
| Z      | Waist Circumference                      | 460                | 790 | 768         | Pass      |
| AA     | Reference Location (Chest Circumference) | 333                | 358 | 338         | Pass      |
| BB     | Reference Location (Waist Circumference) | 160                | 170 | 166         | Pass      |

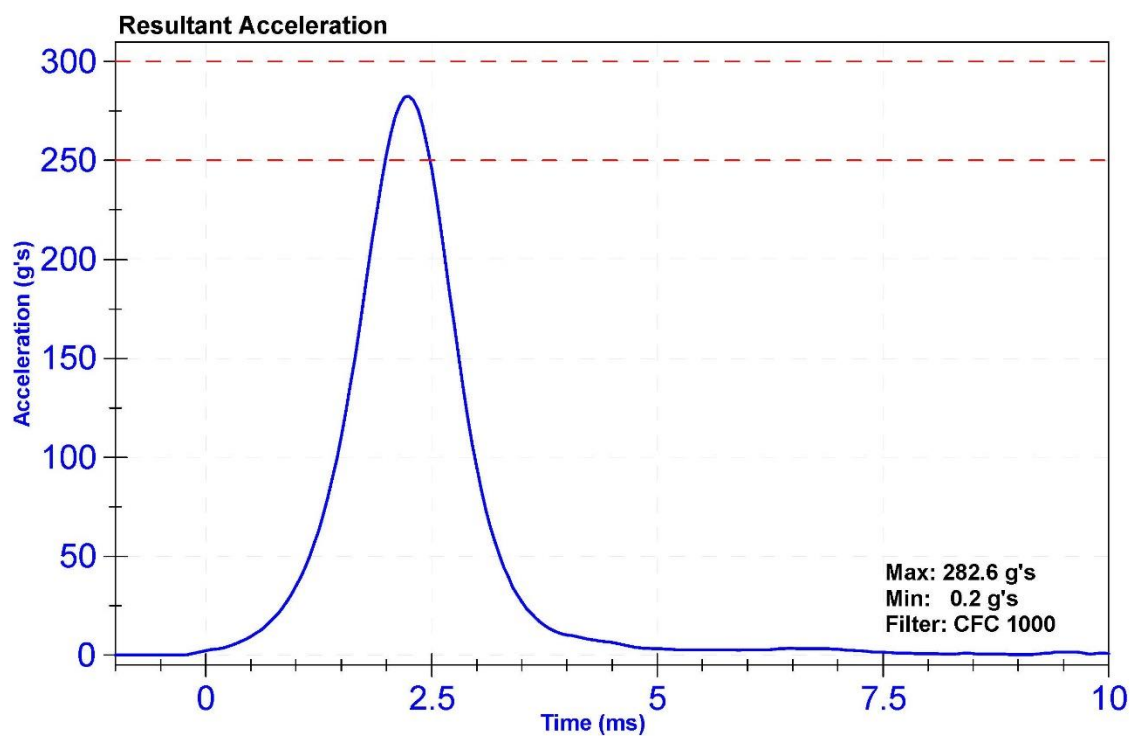
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| ATD Manufacturer  | ATSC | Test Technician       | M.Hartung |
| ATD Serial Number | 019  | Laboratory Supervisor | M.Goehle  |

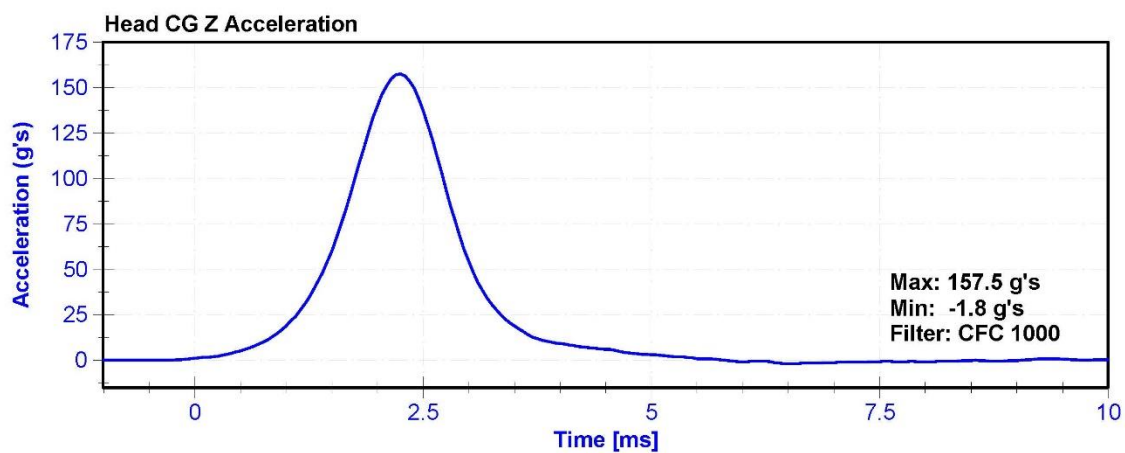
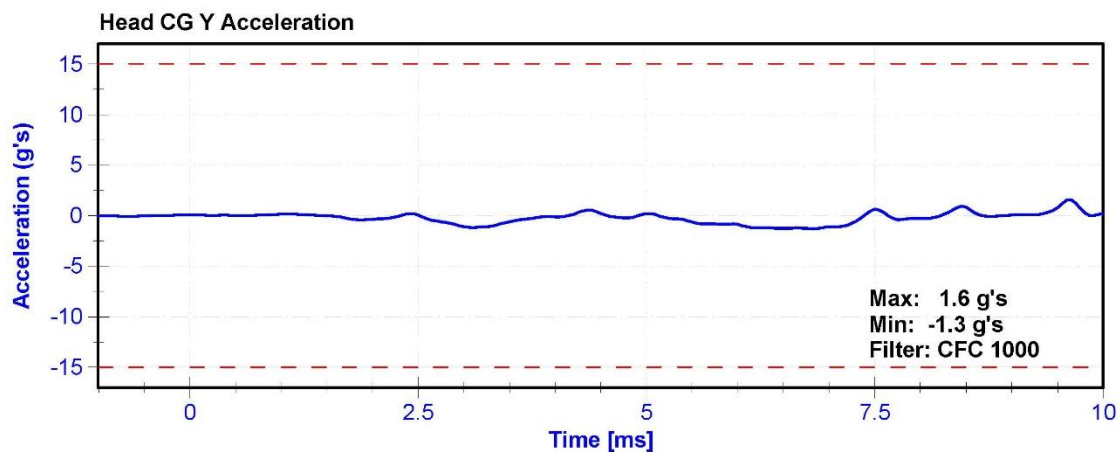
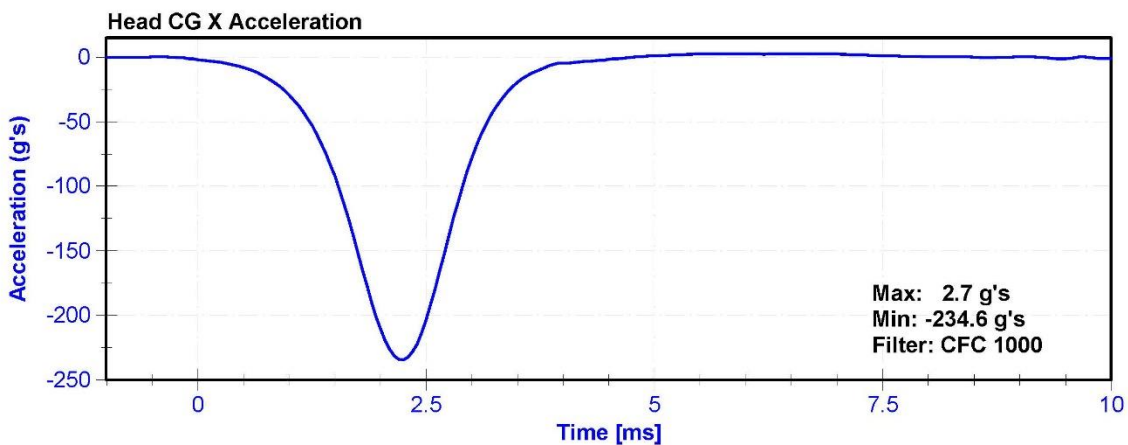
#### Results

| Test Parameter         | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature            | 18.9                  | 25.6                  | °C   | 21.9   | Pass      |
| Humidity               | 10                    | 70                    | %    | 19.7   | Pass      |
| Resultant Acceleration | 250                   | 300                   | g's  | 282.6  | Pass      |
| Oscillation            | 0                     | 10                    | %    | 1.2    | Pass      |
| Lateral Acceleration   | -15                   | 15                    | g's  | 1.6    | Pass      |

#### Transducer Calibrations

| Channel         | Manufacturer  | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|---------------|---------------|------------------|----------------------|
| X Accelerometer | Endevco 7264C | AC-P79591     | 10/30/2015       | 4/29/2016            |
| Y Accelerometer | Endevco 7264C | AC-P49181     | 10/30/2015       | 4/29/2016            |
| Z Accelerometer | Endevco 7264C | AC-P49214     | 10/30/2015       | 4/29/2016            |





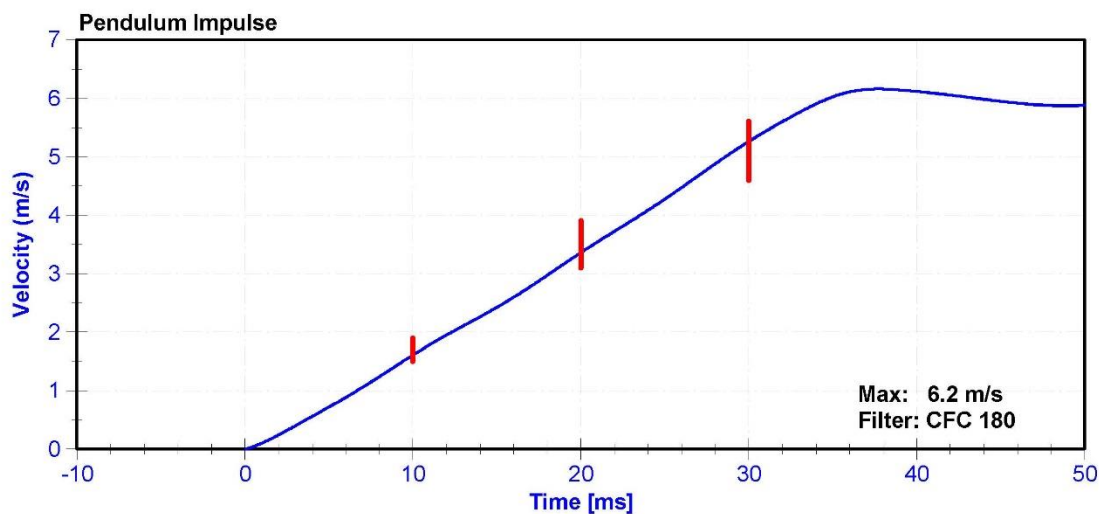
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|-------------------|------|-----------------------|-----------|
| ATD Manufacturer  | ATSC | Test Technician       | M. Goehle |
| ATD Serial Number | 019  | Laboratory Supervisor | M. Goehle |

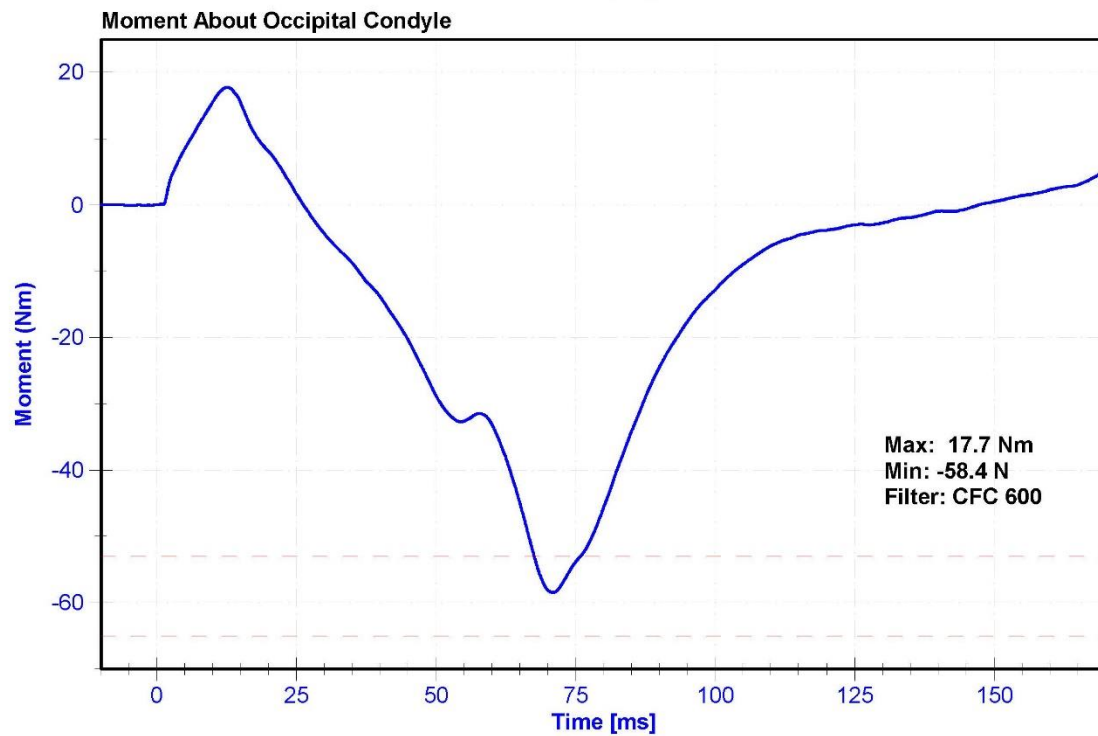
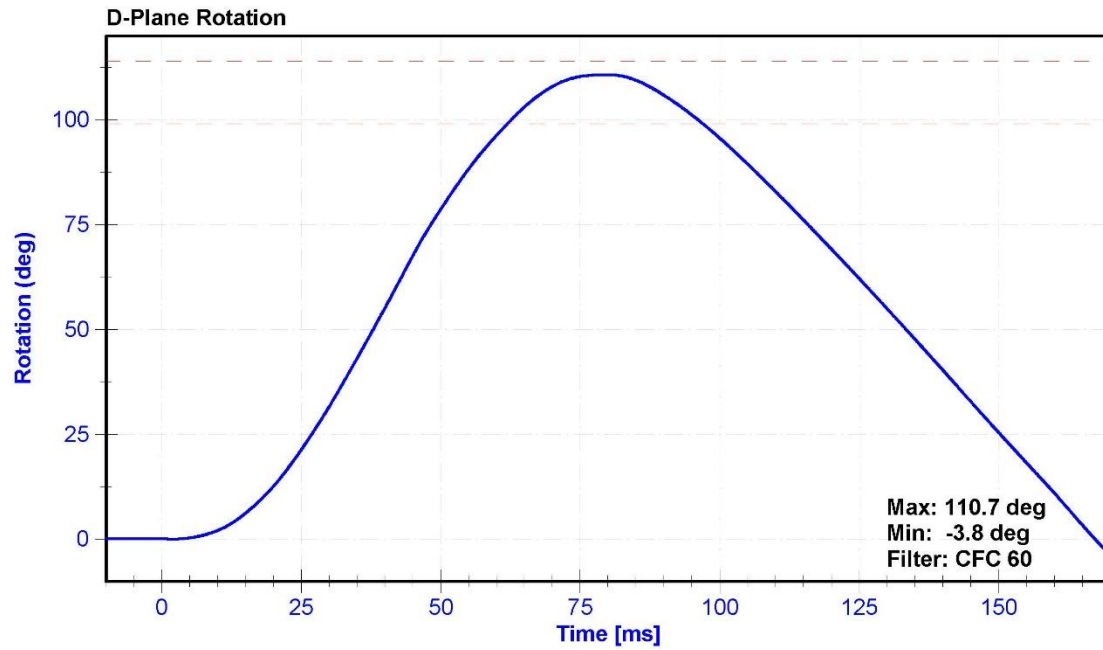
### Results

| Test Parameter                  | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                     | 20.6                  | 22.2                  | °C   | 21.9   | Pass      |
| Humidity                        | 10                    | 70                    | %    | 17.0   | Pass      |
| Velocity                        | 5.95                  | 6.19                  | m/s  | 6.068  | Pass      |
| Pendulum Impulse at 10ms        | 1.5                   | 1.9                   | m/s  | 1.61   | Pass      |
| Pendulum Impulse at 20ms        | 3.1                   | 3.9                   | m/s  | 3.36   | Pass      |
| Pendulum Impulse at 30ms        | 4.6                   | 5.6                   | m/s  | 5.26   | Pass      |
| D Plane Rotation                | 99                    | 114                   | deg  | 110.7  | Pass      |
| Moment During Rotation Interval | -65                   | -53                   | Nm   | -58.4  | Pass      |
| Moment Decay to -10Nm           | 94                    | 114                   | ms   | 103.5  | Pass      |

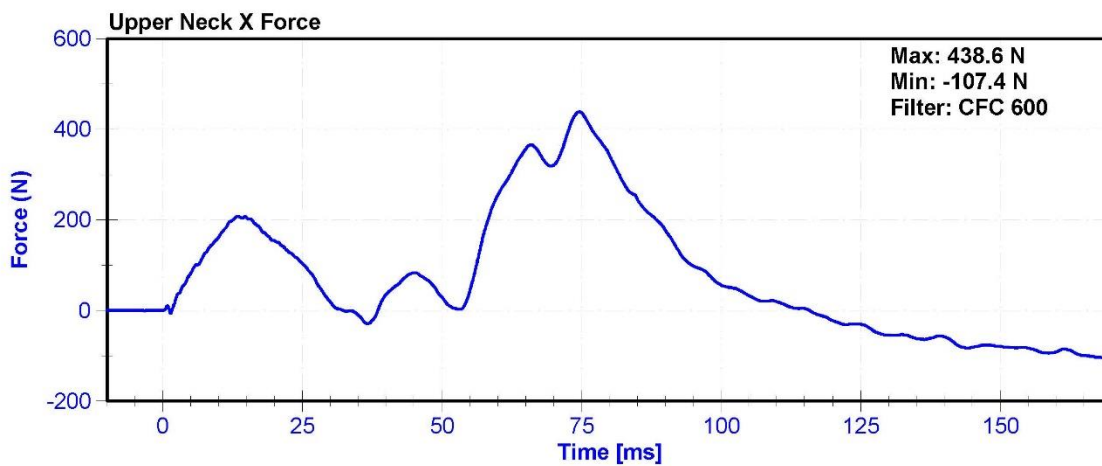
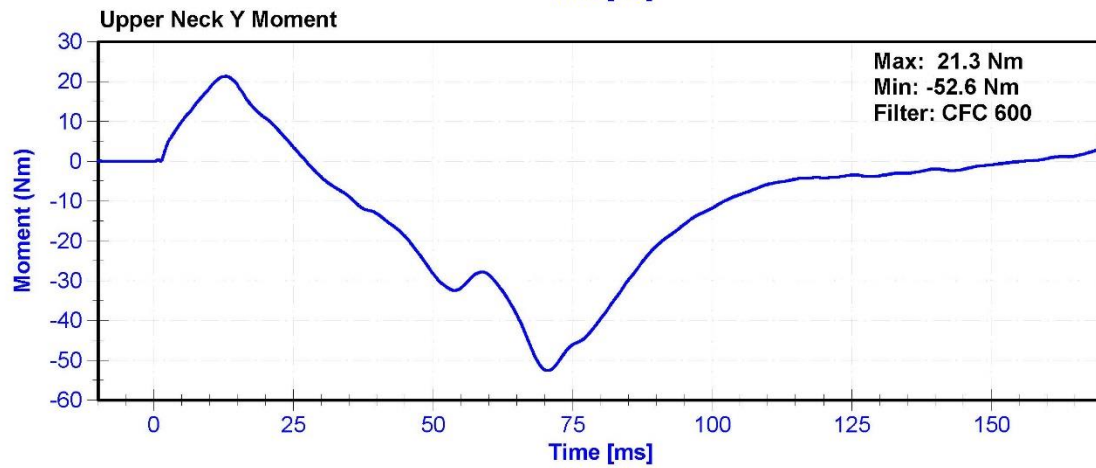
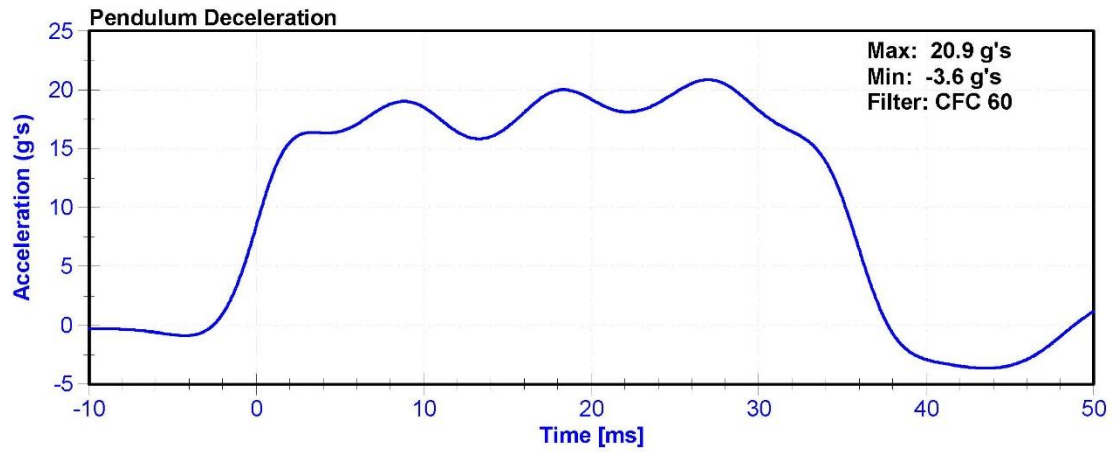
### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-AH5F3      | 5/7/2015         | 5/6/2016             |
| Pendulum Potentiometer | ETI SP22G      | DS-PendPot    | 9/28/2015        | 9/27/2016            |
| Condyle Potentiometer  | ETI SP22G      | DS-CondPot    | 9/28/2015        | 9/27/2016            |
| Upper Neck Load Cell   | Denton 1716ATF | LC-2184 Fx    | 6/29/2015        | 6/28/2016            |









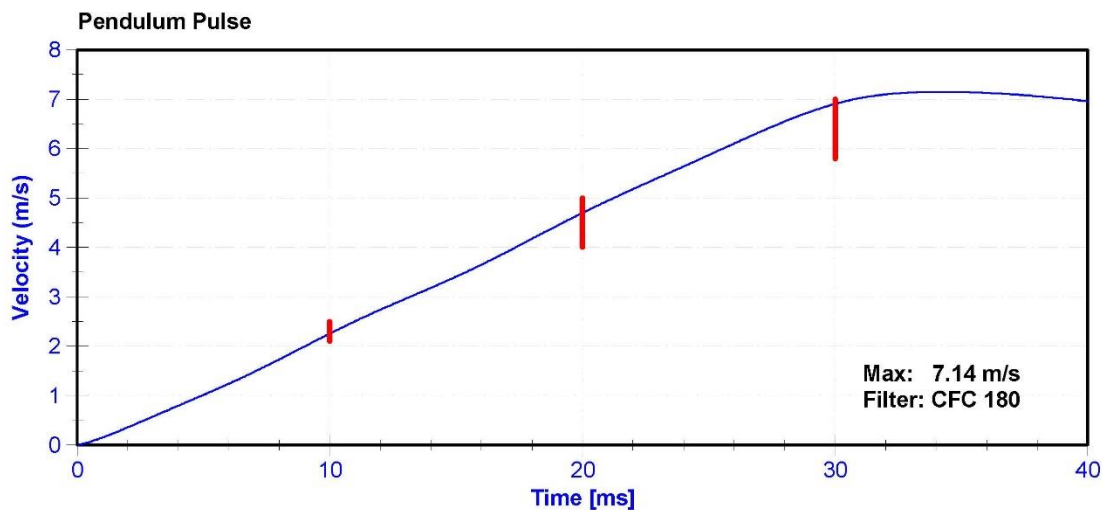
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| ATD Manufacturer  | ATSC | Test Technician       | M. Goehle |
| ATD Serial Number | 019  | Laboratory Supervisor | M. Goehle |

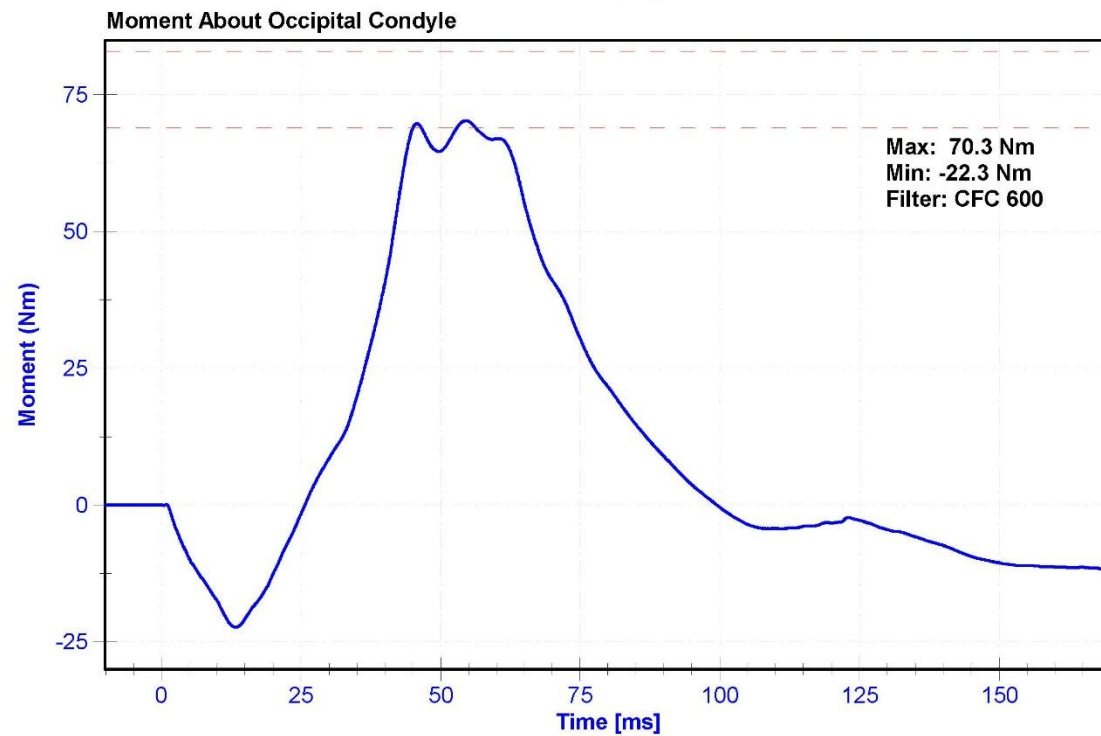
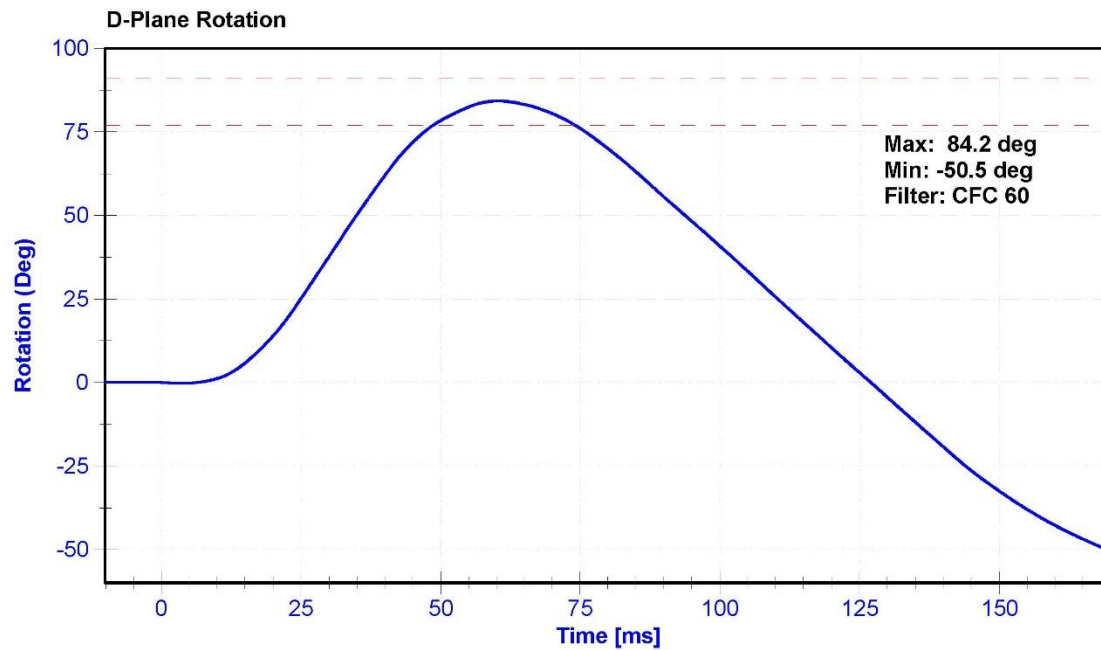
### Results

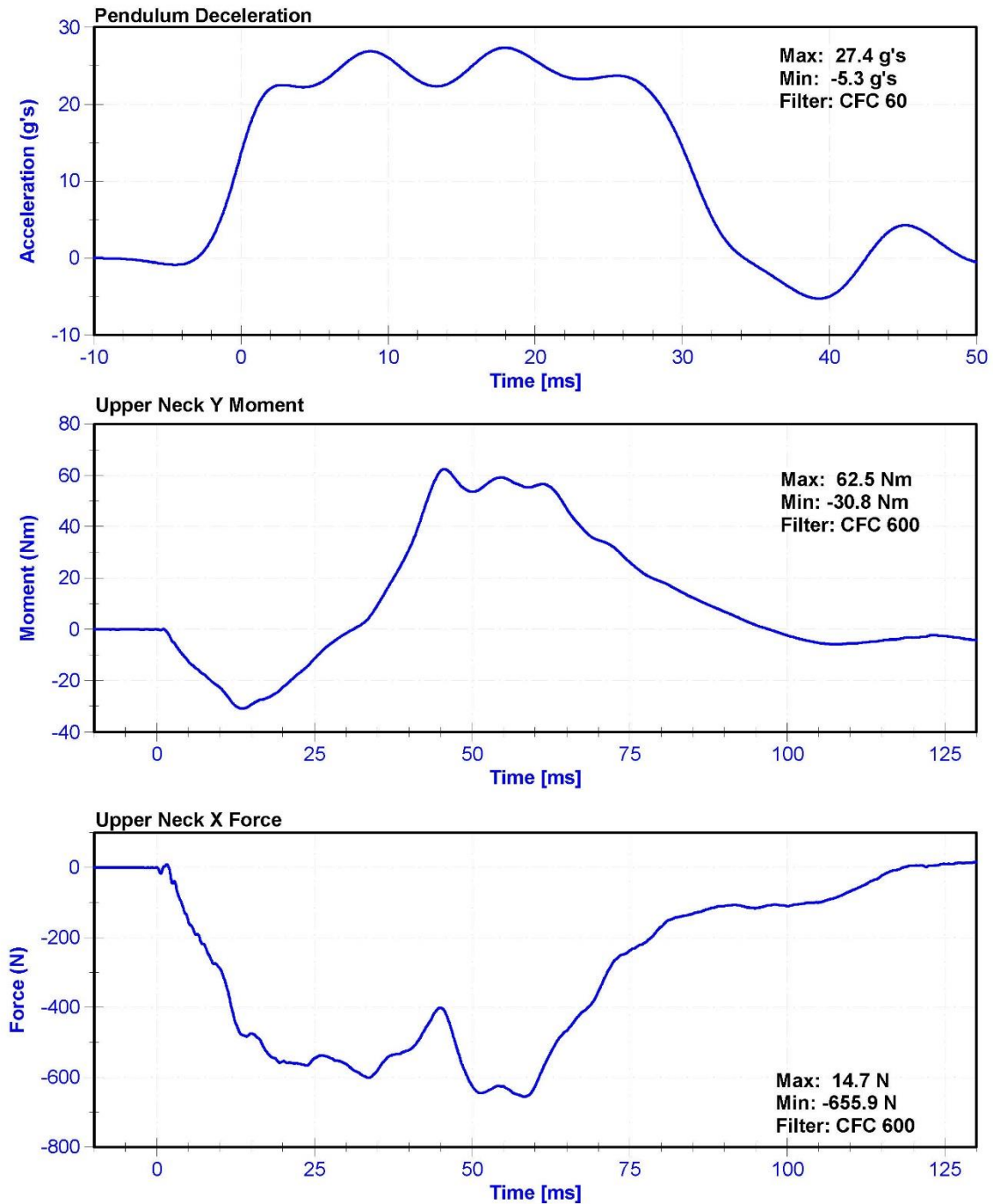
| Test Parameter                      | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|-------------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                         | 20.6                  | 22.2                  | °C   | 22.0   | Pass      |
| Humidity                            | 10                    | 70                    | %    | 17.0   | Pass      |
| Velocity                            | 6.89                  | 7.13                  | m/s  | 6.979  | Pass      |
| Pendulum Impulse at 10ms            | 2.1                   | 2.5                   | m/s  | 2.26   | Pass      |
| Pendulum Impulse at 20ms            | 4.0                   | 5.0                   | m/s  | 4.70   | Pass      |
| Pendulum Impulse at 30ms            | 5.8                   | 7.0                   | m/s  | 6.90   | Pass      |
| Max D Plane Rotation                | 77                    | 91                    | deg  | 84.2   | Pass      |
| Max Moment During Rotation Interval | 69                    | 83                    | Nm   | 70.3   | Pass      |
| Moment Decay to 10.0 Nm             | 80                    | 100                   | ms   | 89.0   | Pass      |

### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-AH5F3      | 5/7/2015         | 5/6/2016             |
| Pendulum Potentiometer | ETI SP22G      | DS-PendPot    | 9/28/2015        | 9/27/2016            |
| Condyle Potentiometer  | ETI SP22G      | DS-CondPot    | 9/28/2015        | 9/27/2016            |
| Upper Neck Load Cell   | Denton 1716ATF | LC-2184 Fx    | 6/29/2015        | 6/28/2016            |







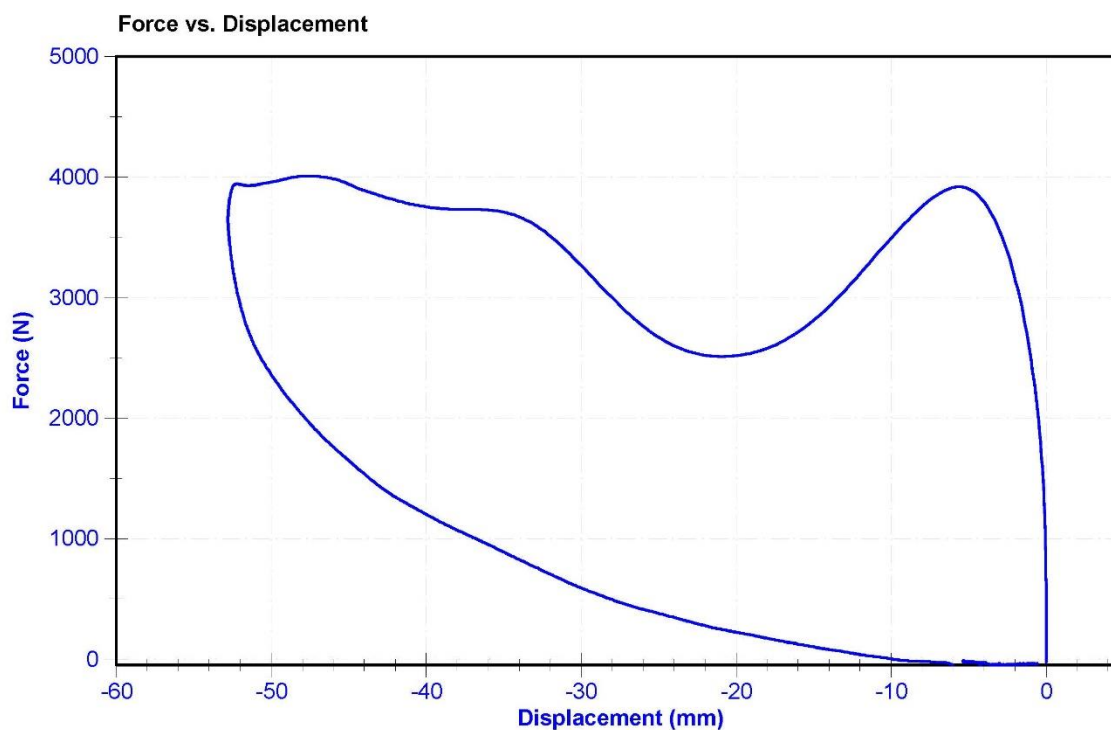
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| ATD Manufacturer  | ASTC | Test Technician       | M. Geesey |
| ATD Serial Number | 019  | Laboratory Supervisor | M. Goehle |

### Results

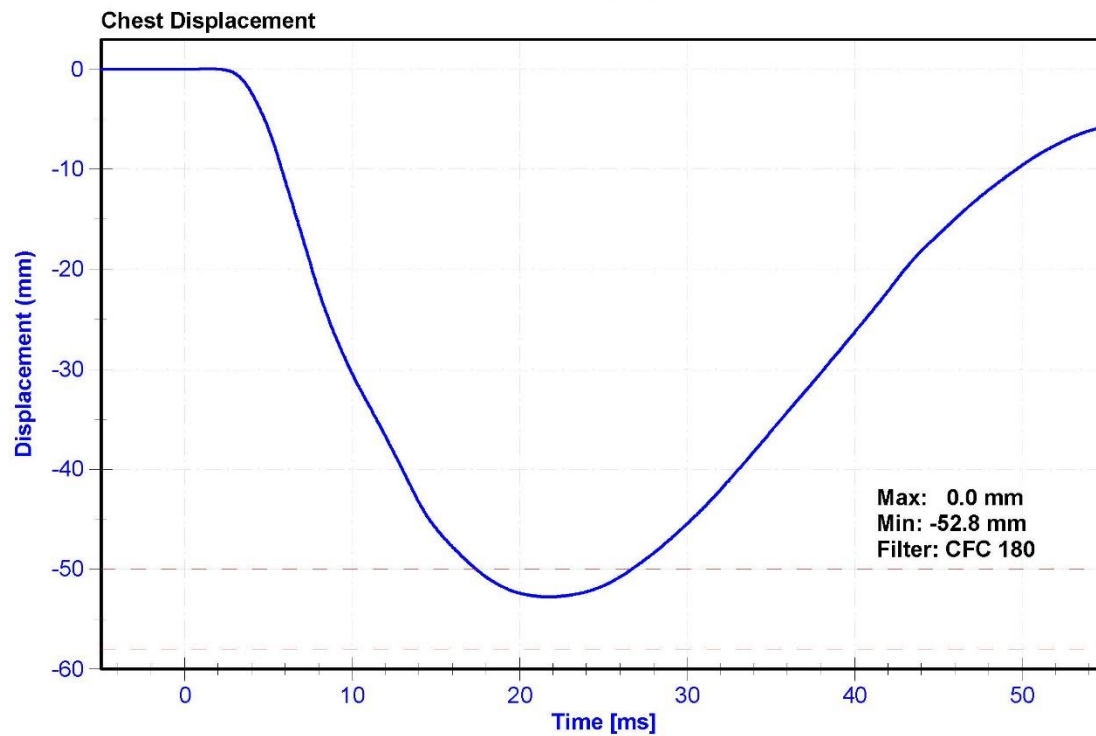
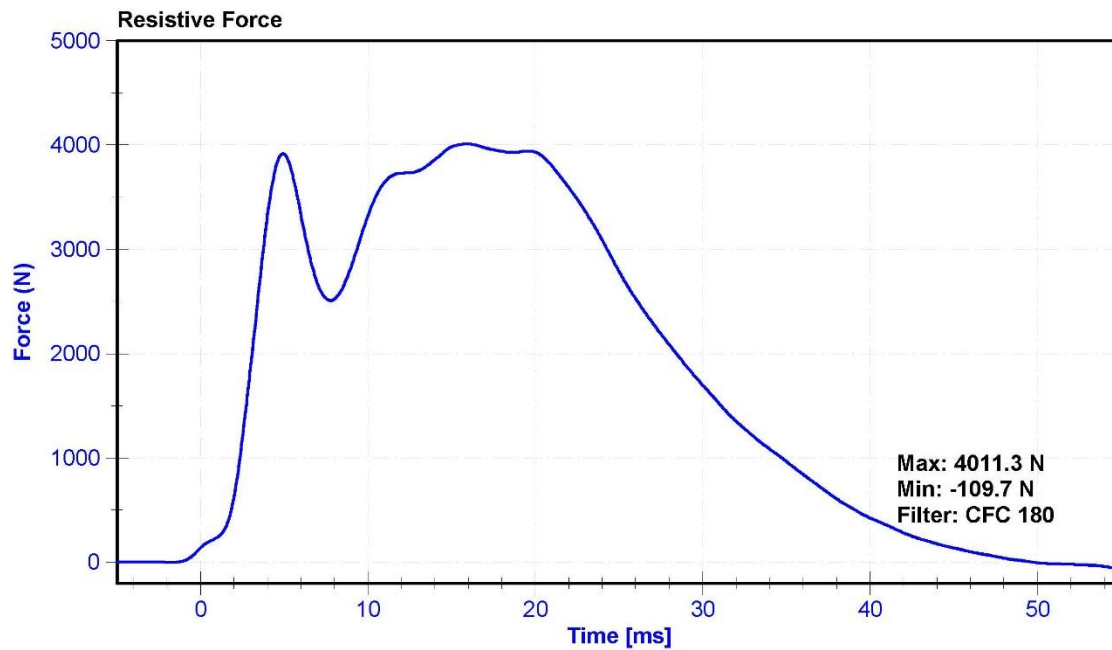
| Test Parameter                       | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|--------------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                          | 20.6                  | 22.2                  | °C   | 20.8   | Pass      |
| Humidity                             | 10                    | 70                    | %    | 16.3   | Pass      |
| Velocity                             | 6.59                  | 6.83                  | m/s  | 6.773  | Pass      |
| Chest Deflection                     | -58                   | -50                   | mm   | -52.8  | Pass      |
| Maximum Resistive Force (50 to 58mm) | 3900                  | 4400                  | N    | 3959.5 | Pass      |
| Maximum Resistive Force (18 to 50mm) | 0                     | 4600                  | N    | 4011.3 | Pass      |
| Hysteresis                           | 69                    | 85                    | %    | 78.3   | Pass      |

### Transducer Calibrations

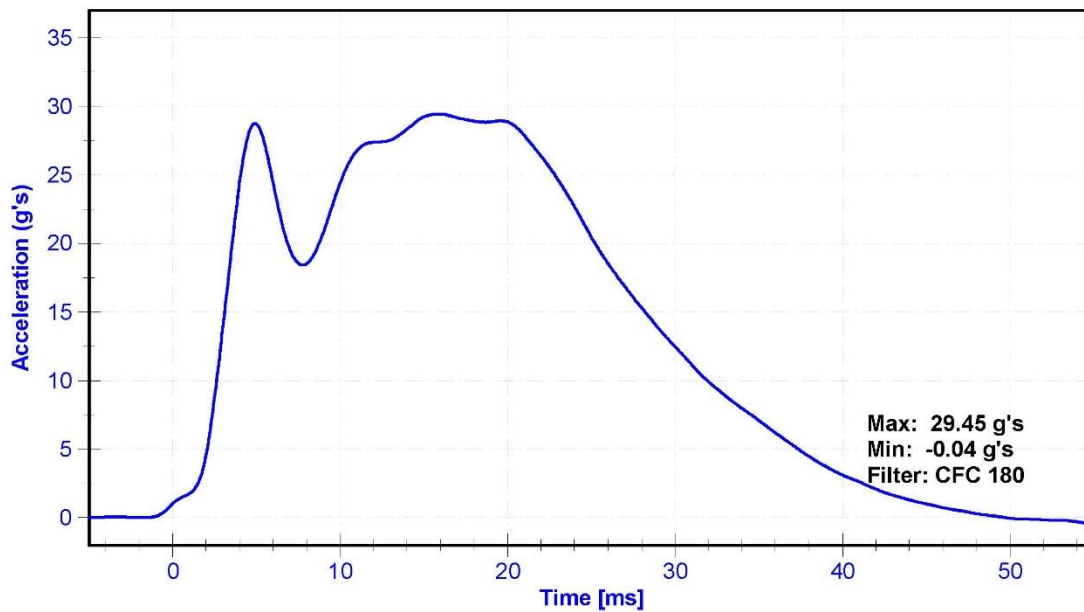
| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-C15018     | 7/15/2015        | 7/14/2016            |
| Chest Potentiometer    | Servo 14CB1    | DS-FEM019     | 7/1/2015         | 6/30/2016            |



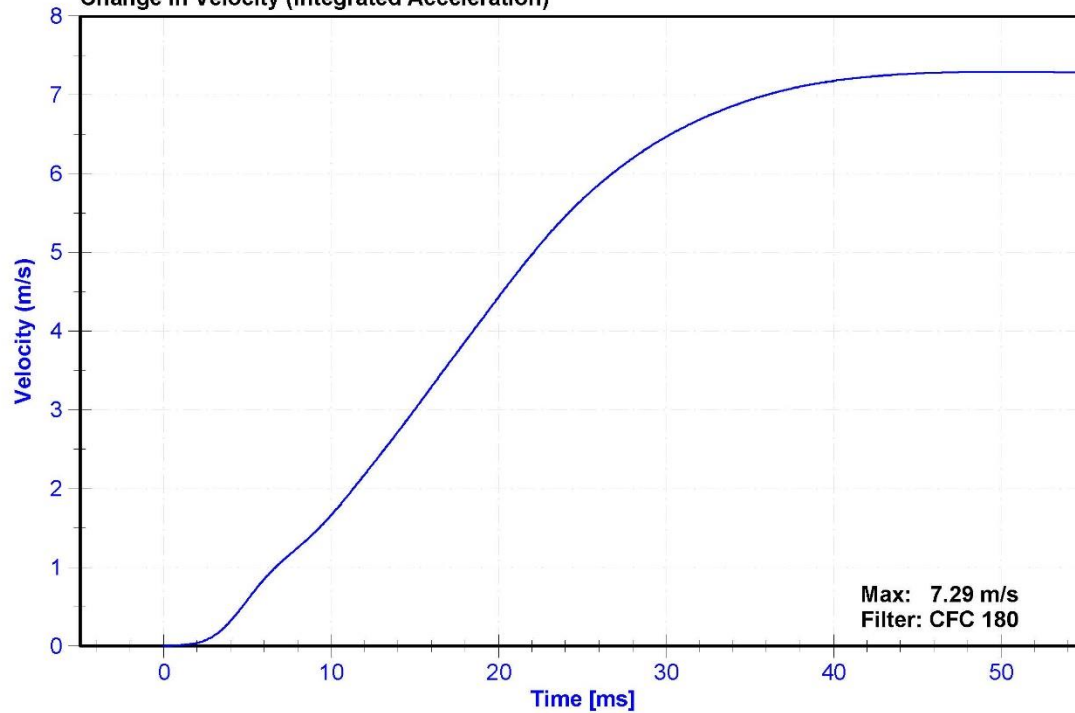




Probe Acceleration



Change in Velocity (Integrated Acceleration)



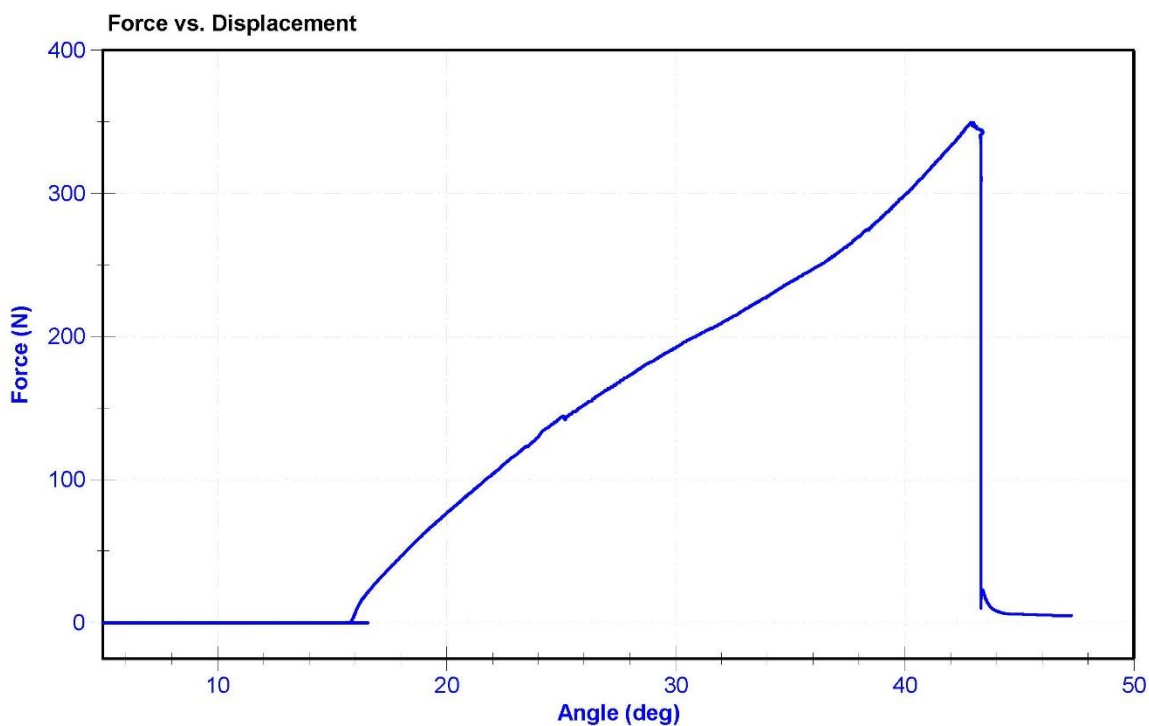
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|-------------------|------|-----------------------|-----------|
| ATD Manufacturer  | ATSC | Test Technician       | M.Hartung |
| ATD Serial Number | 019  | Laboratory Supervisor | M.Goehle  |

#### Results

| Test Parameter                   | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|----------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                      | 18.6                  | 25.6                  | °C   | 21.5   | Pass      |
| Humidity                         | 10                    | 70                    | %    | 17.7   | Pass      |
| Initial Angle                    | 0                     | 20                    | deg  | 15.4   | Pass      |
| Force at 45 Degrees              | 320                   | 390                   | N    | 349.6  | Pass      |
| Return Angle Relative to Initial | 0                     | 8                     | deg  | 5.8    | Pass      |

#### Transducer Calibrations

| Channel       | Manufacturer      | Serial Number | Calibration Date | Calibration Due Date |
|---------------|-------------------|---------------|------------------|----------------------|
| Potentiometer | Rieker N4C-1      | DS-13051548   | 8/14/2015        | 8/13/2016            |
| Load Cell     | Interface SML-200 | LC-493319     | 8/13/2015        | 8/12/2016            |



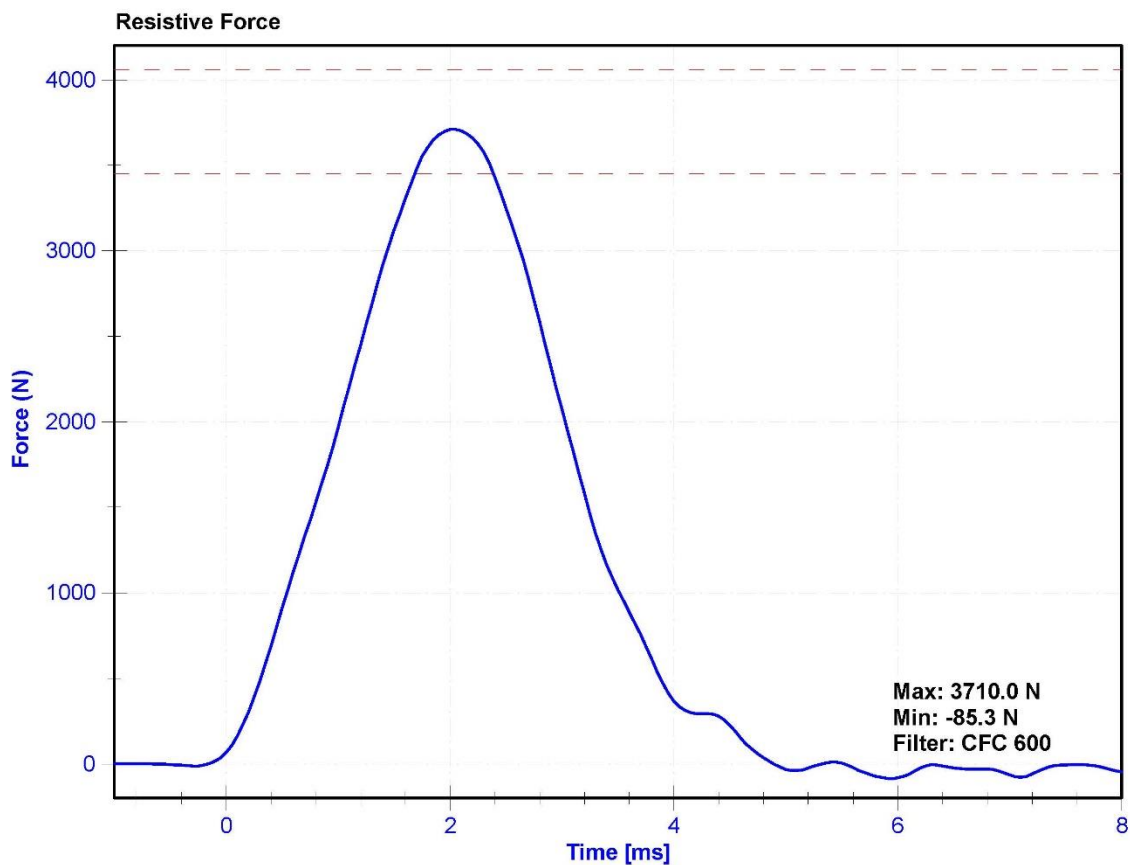
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|-------------------|------|-----------------------|-----------|
| ATD Manufacturer  | ASTC | Test Technician       | M. Geesey |
| ATD Serial Number | 019  | Laboratory Supervisor | M. Goehle |

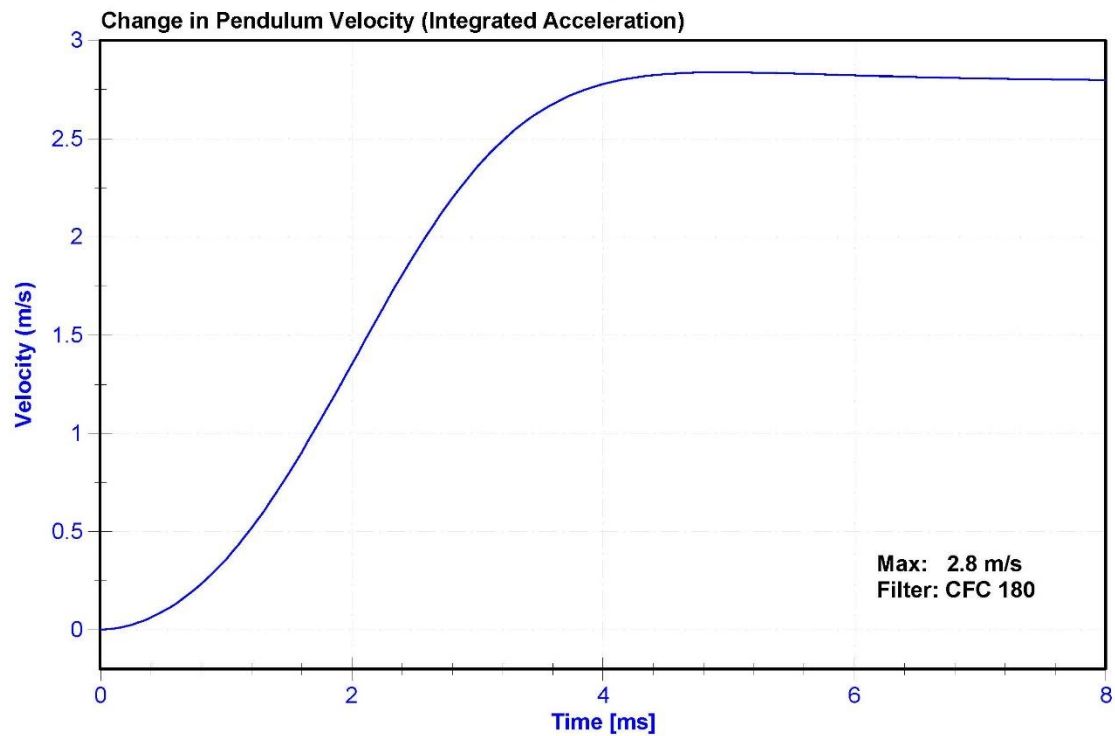
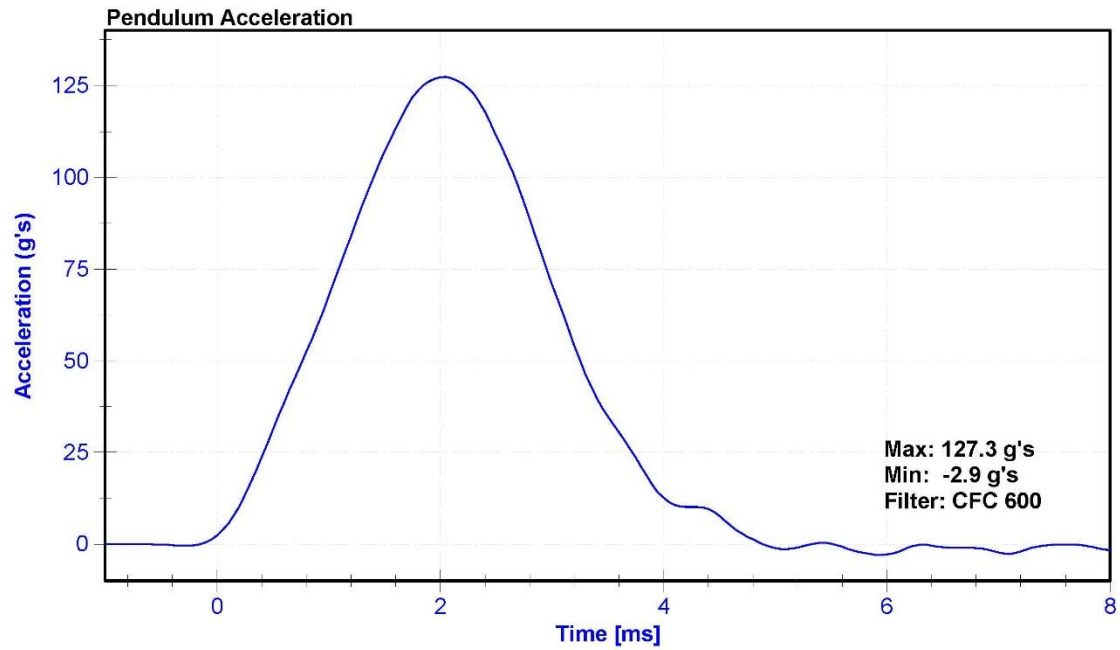
### Results

| Test Parameter  | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|-----------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature     | 18.9                  | 25.6                  | °C   | 21.5   | Pass      |
| Humidity        | 10                    | 70                    | %    | 15.1   | Pass      |
| Velocity        | 2.07                  | 2.13                  | m/s  | 2.088  | Pass      |
| Resistive Force | 3450                  | 4060                  | N    | 3710.0 | Pass      |

### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-C15018     | 7/15/2015        | 7/14/2016            |







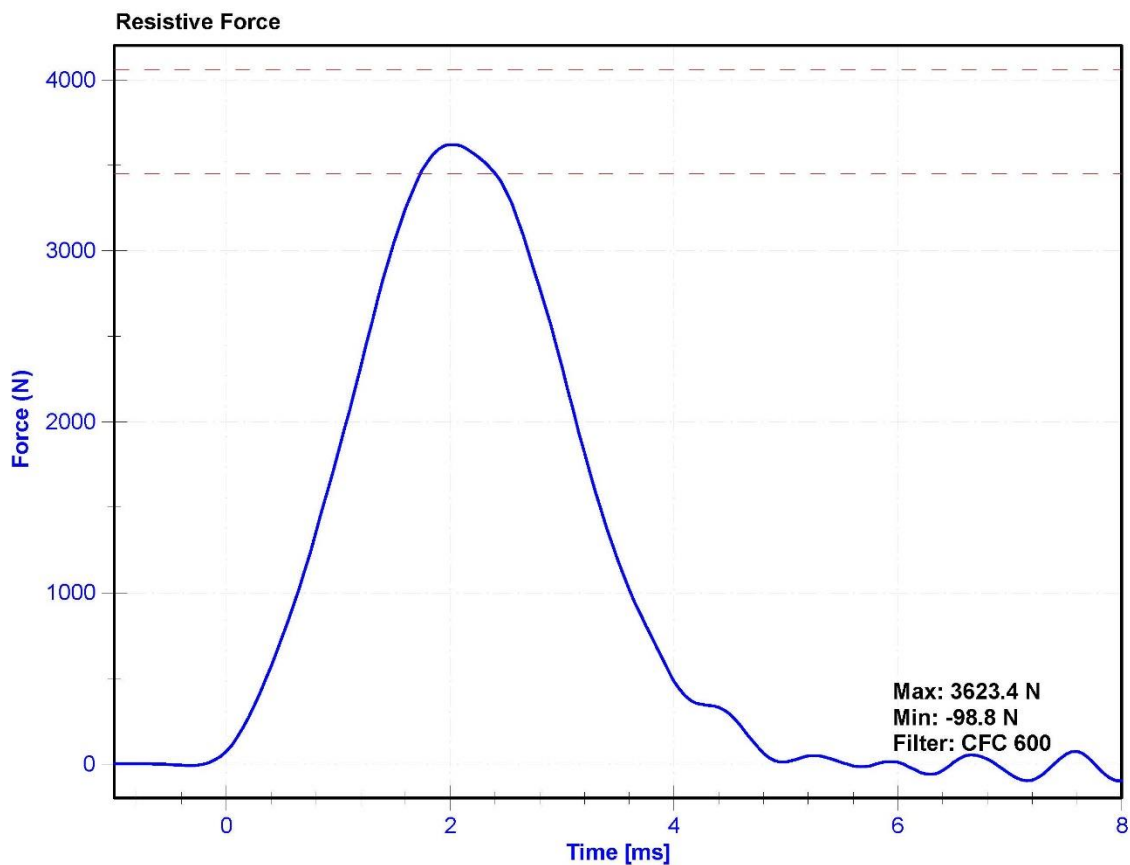
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| ATD Manufacturer  | ASTC | Test Technician       | M. Geesey |
| ATD Serial Number | 019  | Laboratory Supervisor | M. Goehle |

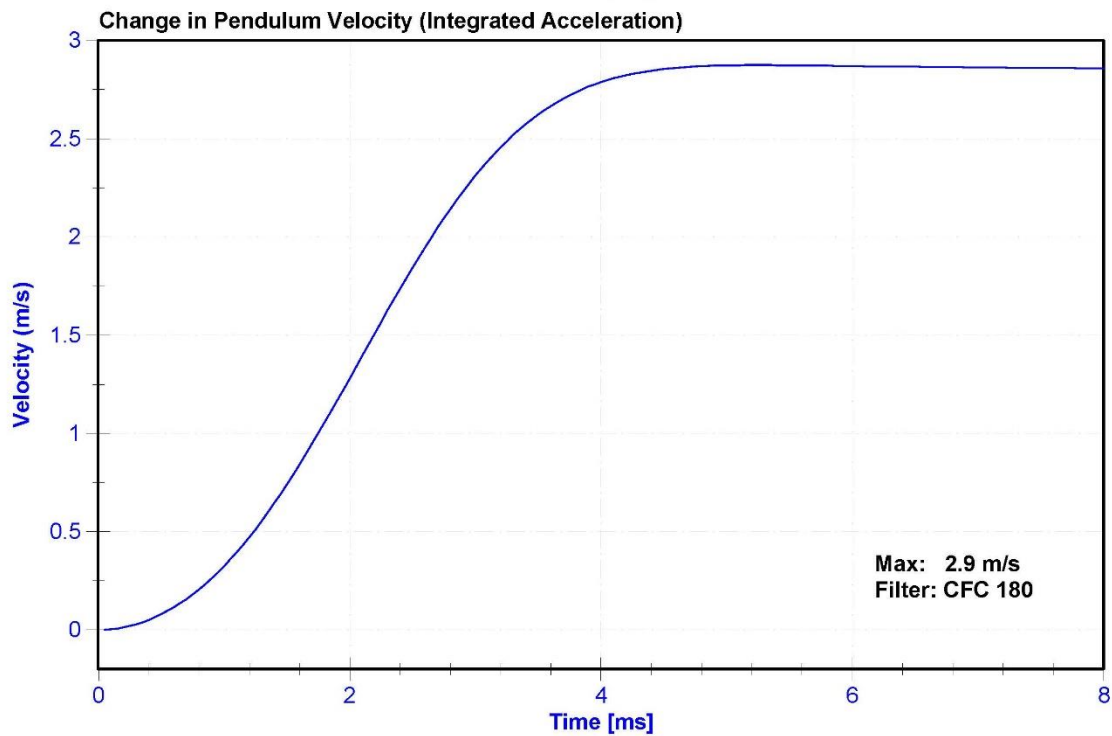
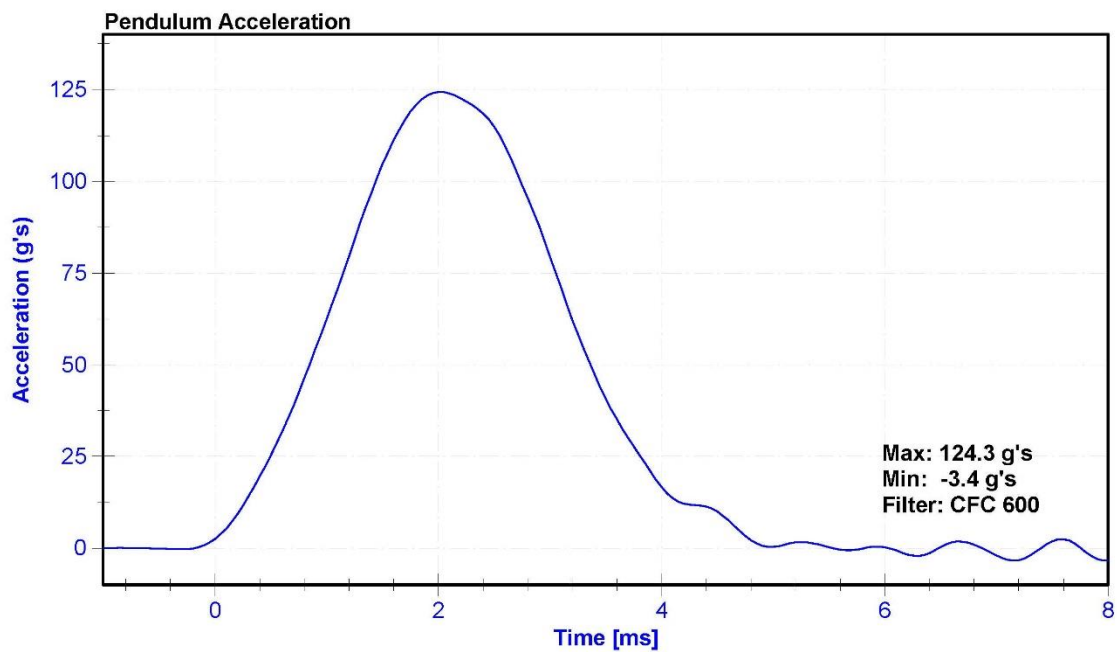
### Results

| Test Parameter  | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|-----------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature     | 18.9                  | 25.6                  | °C   | 21.5   | Pass      |
| Humidity        | 10                    | 70                    | %    | 15.1   | Pass      |
| Velocity        | 2.07                  | 2.13                  | m/s  | 2.086  | Pass      |
| Resistive Force | 3450                  | 4060                  | N    | 3623.4 | Pass      |

### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-C15018     | 7/15/2015        | 7/14/2016            |





## Hybrid III 5<sup>th</sup> Female 324 DUMMY CALIBRATIONS

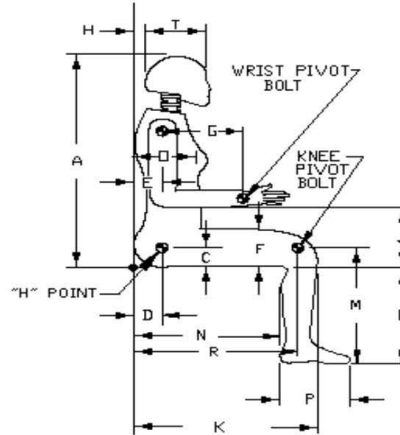
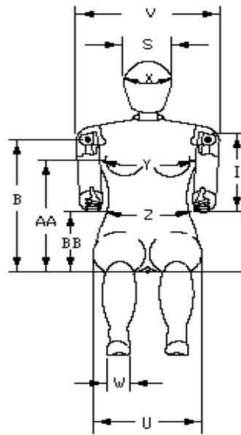


# External Measurements - Hybrid 3 - 5th Female

Technician: M.Hartung

Date: 1/6/2016

Dummy Serial Number: 324



| Symbol | Description                              | Specification (mm) |     | Result (mm) | Pass/Fail |
|--------|------------------------------------------|--------------------|-----|-------------|-----------|
| A      | Sitting Height                           | 775                | 800 | 782         | Pass      |
| B      | Shoulder Pivot Height                    | 432                | 457 | 445         | Pass      |
| C      | H-Point Height                           | 81                 | 86  | 86          | Pass      |
| D      | H-Point from Backline                    | 145                | 150 | 147         | Pass      |
| E      | Shoulder Pivot from Backline             | 69                 | 84  | 81          | Pass      |
| F      | Thigh Clearance                          | 119                | 135 | 130         | Pass      |
| G      | Back of Elbow to Wrist Pivot             | 244                | 259 | 247         | Pass      |
| H      | Head Back to Backline                    | 43                 | 48  | 45          | Pass      |
| I      | Shoulder to Elbow Length                 | 277                | 297 | 285         | Pass      |
| J      | Elbow Rest Height                        | 183                | 203 | 192         | Pass      |
| K      | Buttock to Knee Length                   | 521                | 546 | 530         | Pass      |
| L      | Popliteal Height                         | 356                | 376 | 366         | Pass      |
| M      | Knee Pivot Height                        | 394                | 419 | 411         | Pass      |
| N      | Buttock Popliteal Length                 | 414                | 439 | 430         | Pass      |
| O      | Chest Depth without Jacket               | 175                | 191 | 182         | Pass      |
| P      | Foot Length (right)                      | 219                | 234 | 224         | Pass      |
| R      | Buttock To Knee Pivot Length             | 457                | 483 | 473         | Pass      |
| S      | Head Breadth                             | 137                | 147 | 142         | Pass      |
| T      | Head Depth                               | 178                | 188 | 181         | Pass      |
| U      | Hip Breadth                              | 300                | 315 | 307         | Pass      |
| V      | Shoulder Breadth                         | 351                | 366 | 355         | Pass      |
| W      | Foot Breadth                             | 79                 | 94  | 84          | Pass      |
| X      | Head Circumference                       | 528                | 549 | 536         | Pass      |
| Y      | Chest Circumference with Jacket          | 851                | 881 | 867         | Pass      |
| Z      | Waist Circumference                      | 460                | 790 | 775         | Pass      |
| AA     | Reference Location (Chest Circumference) | 333                | 358 | 346         | Pass      |
| BB     | Reference Location (Waist Circumference) | 160                | 170 | 166         | Pass      |

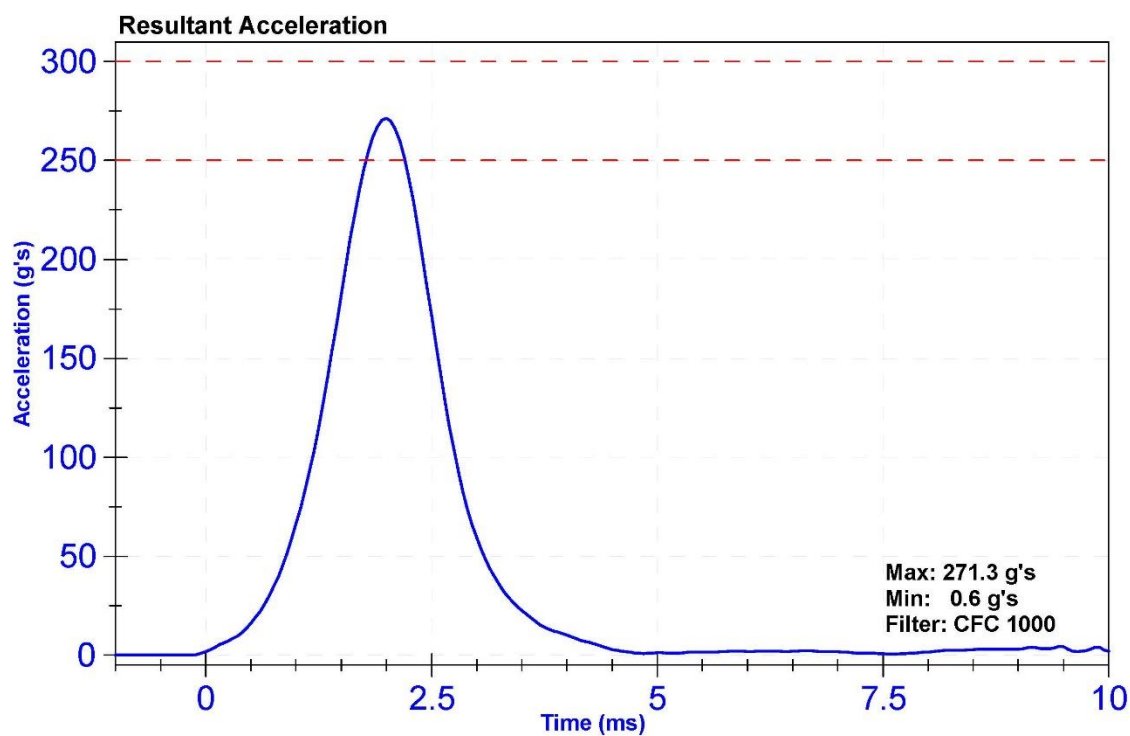
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|-------------------|------|-----------------------|-----------|
| ATD Manufacturer  | FTSS | Test Technician       | M.Hartung |
| ATD Serial Number | 324  | Laboratory Supervisor | M.Goehle  |

#### Results

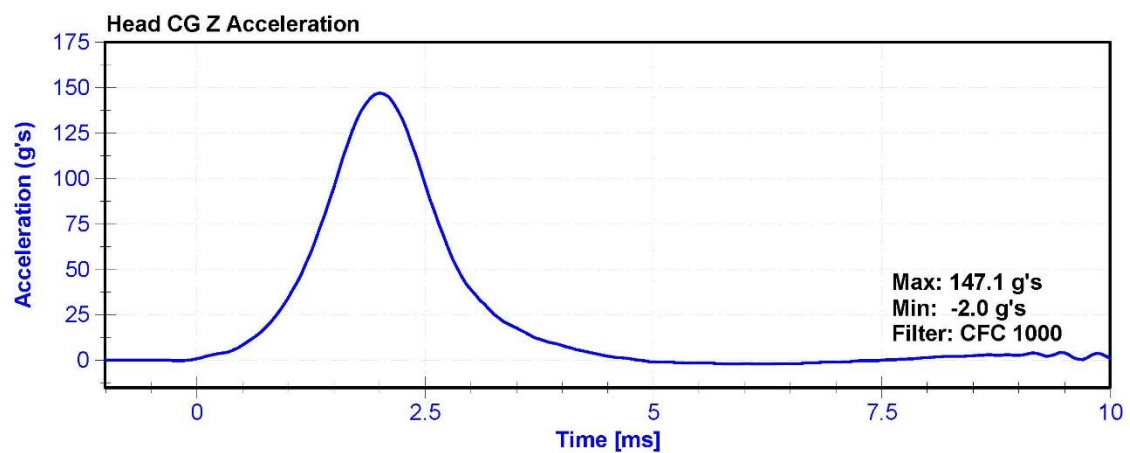
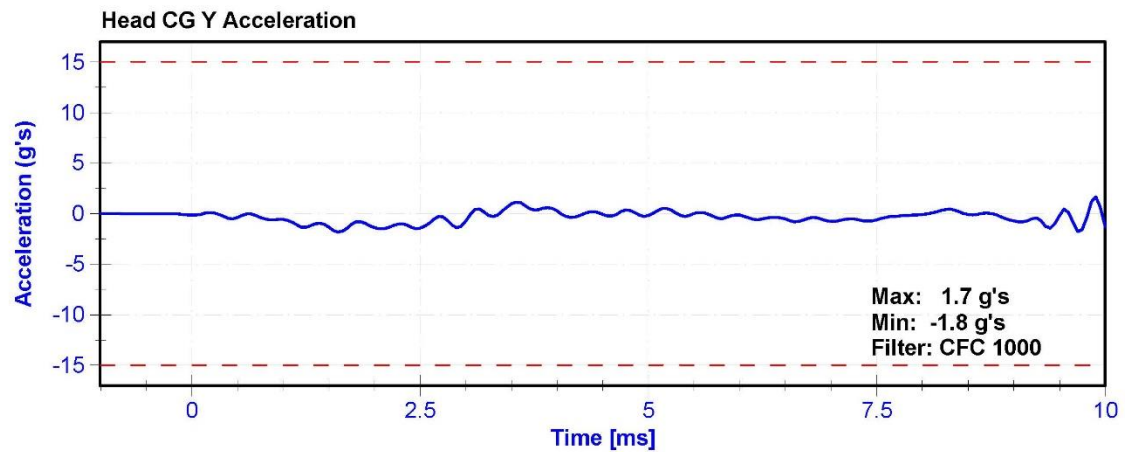
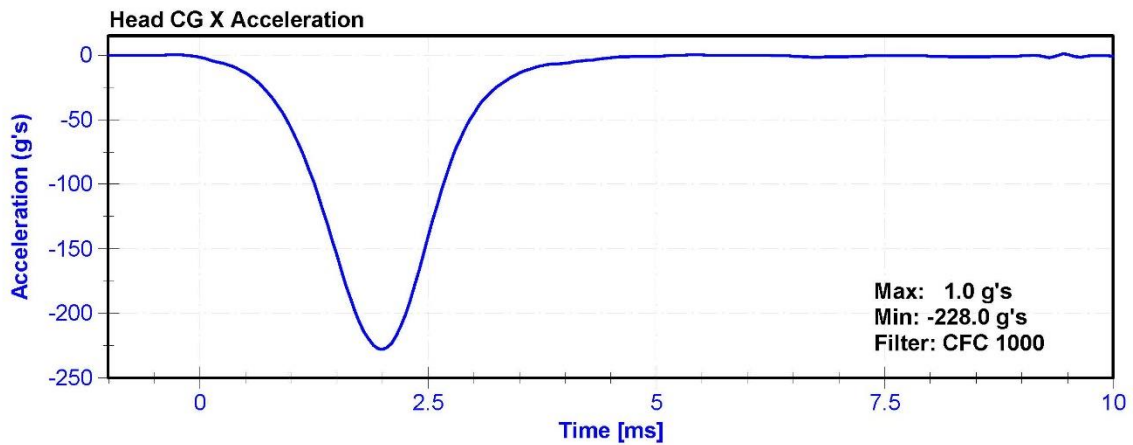
| Test Parameter         | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature            | 18.9                  | 25.6                  | °C   | 21.9   | Pass      |
| Humidity               | 10                    | 70                    | %    | 16.9   | Pass      |
| Resultant Acceleration | 250                   | 300                   | g's  | 271.3  | Pass      |
| Oscillation            | 0                     | 10                    | %    | 1.7    | Pass      |
| Lateral Acceleration   | -15                   | 15                    | g's  | -2.4   | Pass      |

#### Transducer Calibrations

| Channel         | Manufacturer  | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|---------------|---------------|------------------|----------------------|
| X Accelerometer | Endevco 7264C | AC-P72219     | 12/8/2015        | 6/7/2016             |
| Y Accelerometer | Endevco 7264C | AC-P49160     | 12/8/2015        | 6/7/2016             |
| Z Accelerometer | Endevco 7264  | AC-P78168     | 12/8/2015        | 6/7/2016             |







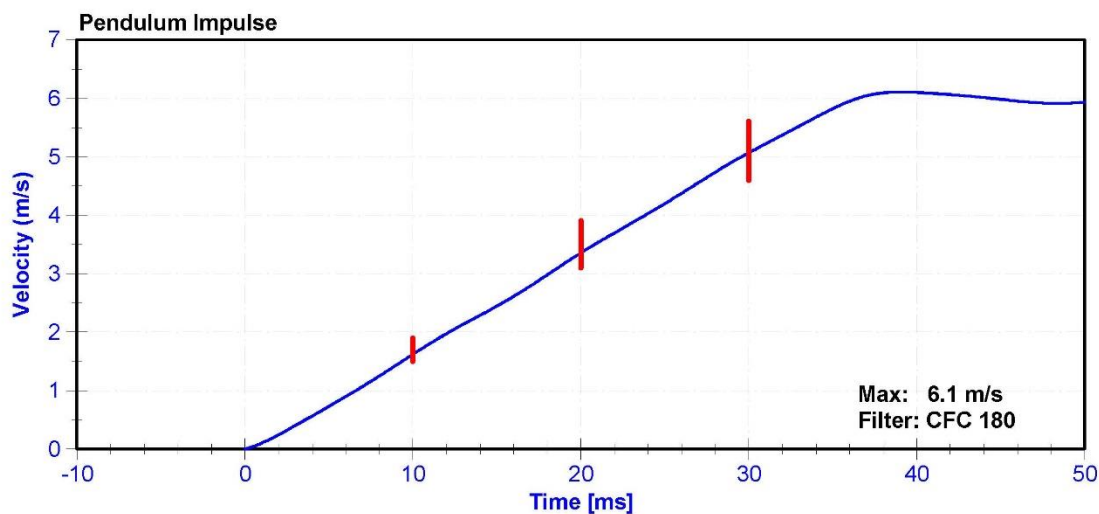
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|-------------------|------|-----------------------|-----------|
| ATD Manufacturer  | FTSS | Test Technician       | M. Goehle |
| ATD Serial Number | 324  | Laboratory Supervisor | M. Goehle |

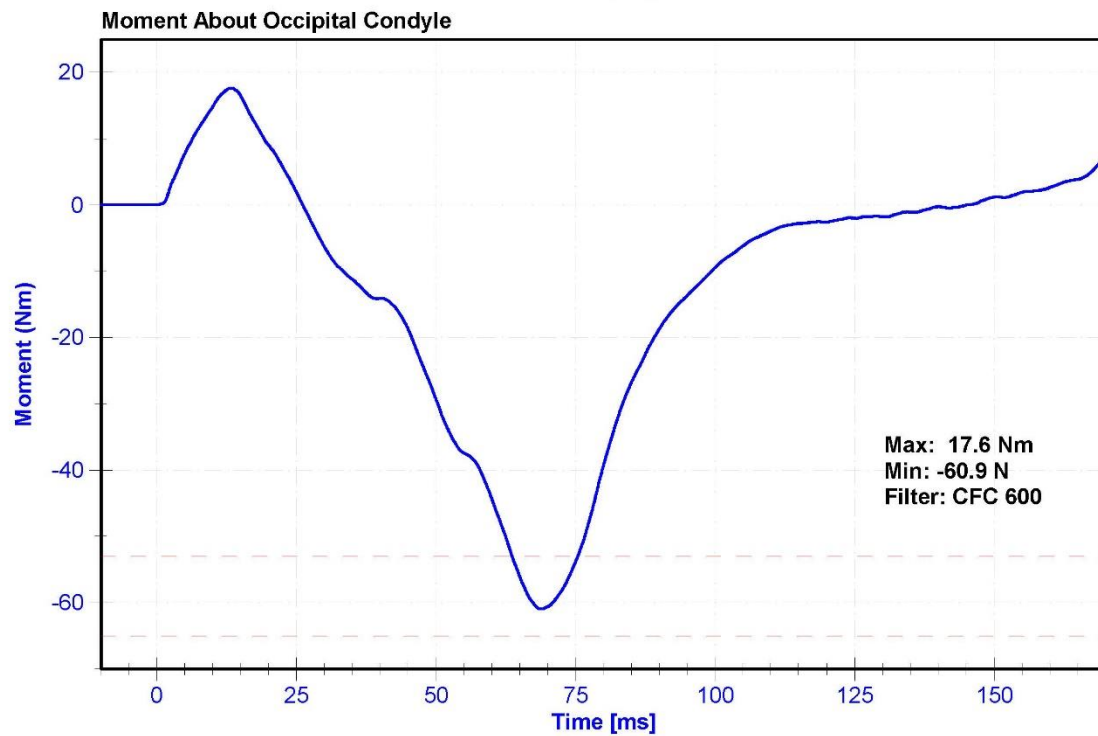
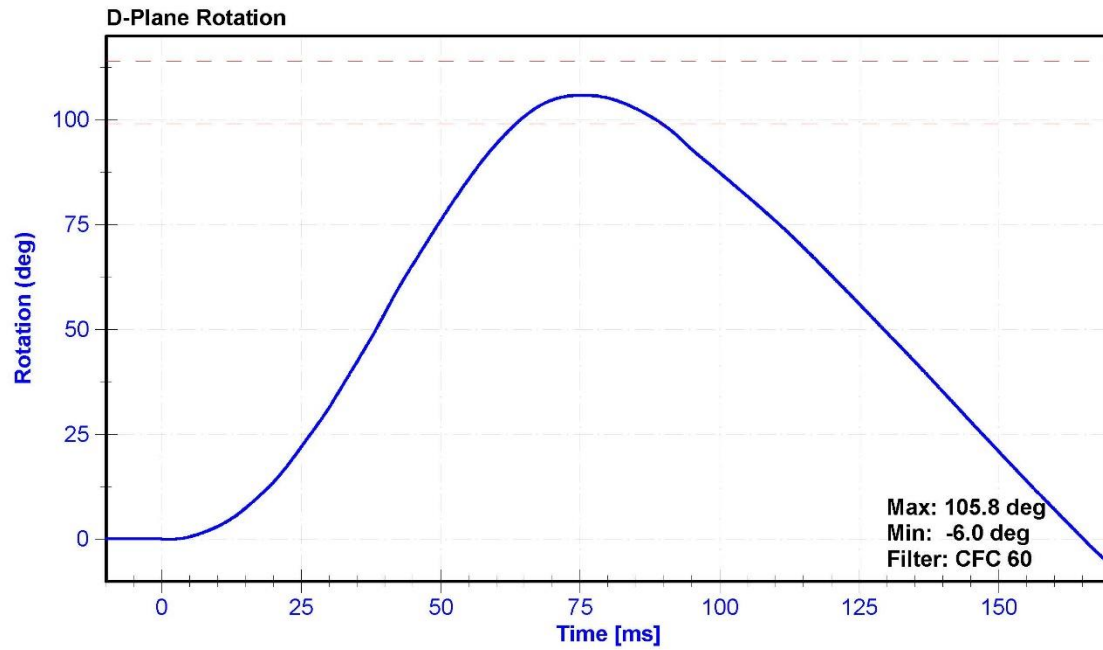
### Results

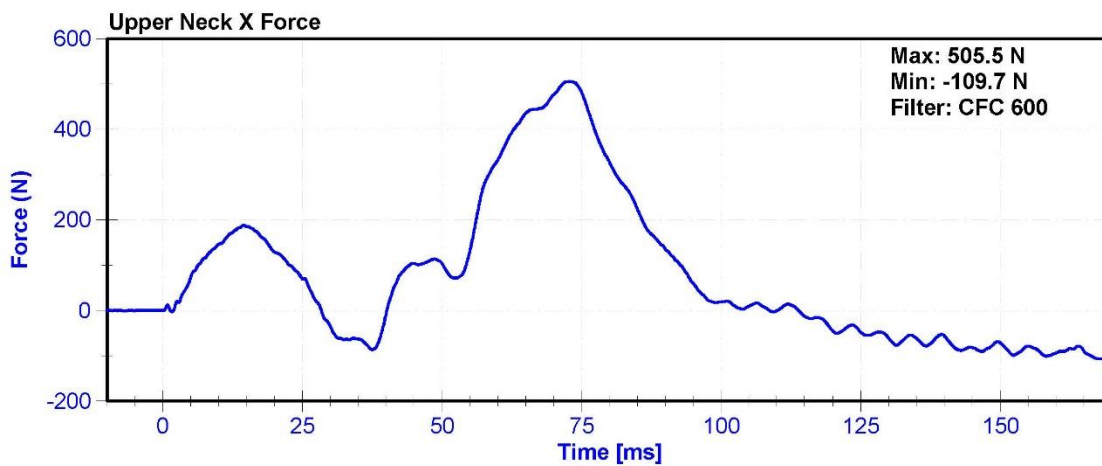
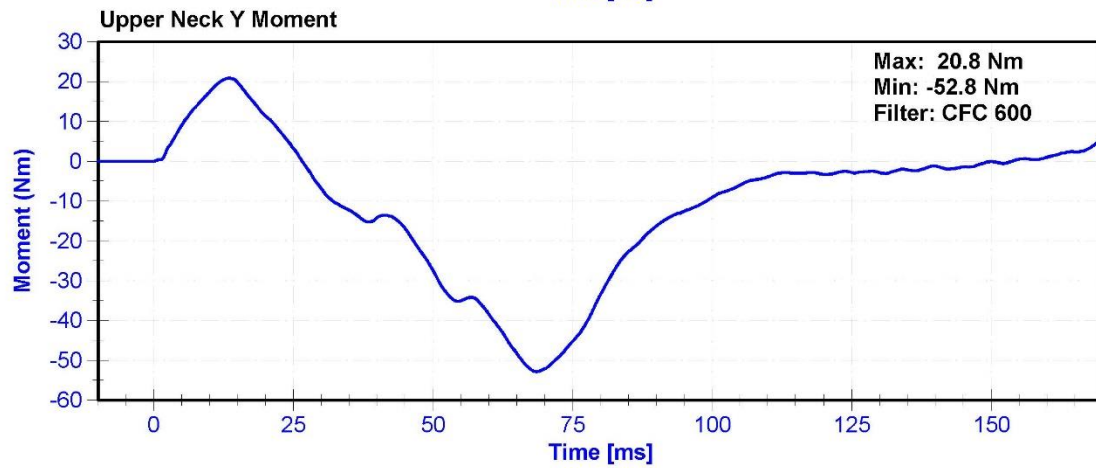
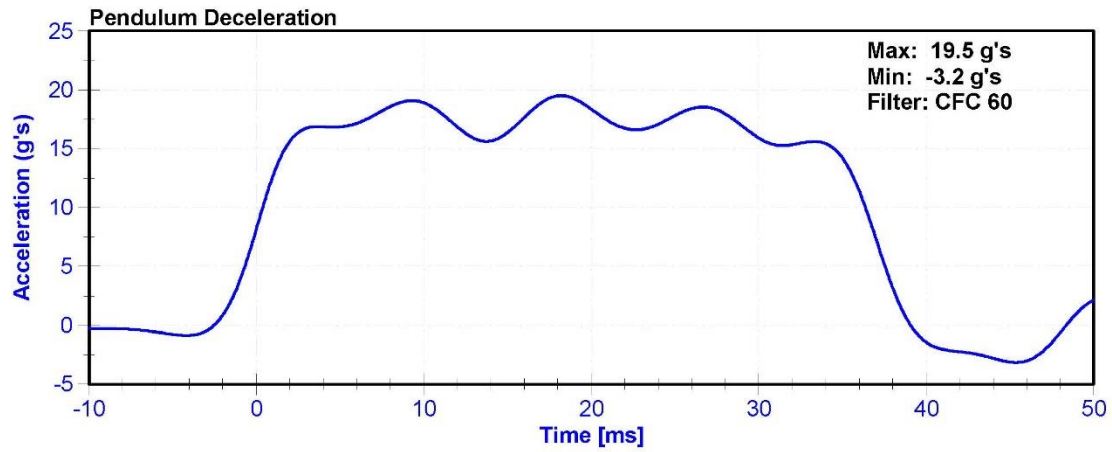
| Test Parameter                  | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                     | 20.6                  | 22.2                  | °C   | 21.9   | Pass      |
| Humidity                        | 10                    | 70                    | %    | 17.0   | Pass      |
| Velocity                        | 5.95                  | 6.19                  | m/s  | 6.068  | Pass      |
| Pendulum Impulse at 10ms        | 1.5                   | 1.9                   | m/s  | 1.62   | Pass      |
| Pendulum Impulse at 20ms        | 3.1                   | 3.9                   | m/s  | 3.36   | Pass      |
| Pendulum Impulse at 30ms        | 4.6                   | 5.6                   | m/s  | 5.07   | Pass      |
| D Plane Rotation                | 99                    | 114                   | deg  | 105.8  | Pass      |
| Moment During Rotation Interval | -65                   | -53                   | Nm   | -60.9  | Pass      |
| Moment Decay to -10Nm           | 94                    | 114                   | ms   | 99.4   | Pass      |

### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-AH5F3      | 5/7/2015         | 5/6/2016             |
| Pendulum Potentiometer | ETI SP22G      | DS-PendPot    | 9/28/2015        | 9/27/2016            |
| Condyle Potentiometer  | ETI SP22G      | DS-CondPot    | 9/28/2015        | 9/27/2016            |
| Upper Neck Load Cell   | DENTON 1716    | LC-2254 Fx    | 12/17/2015       | 12/16/2016           |







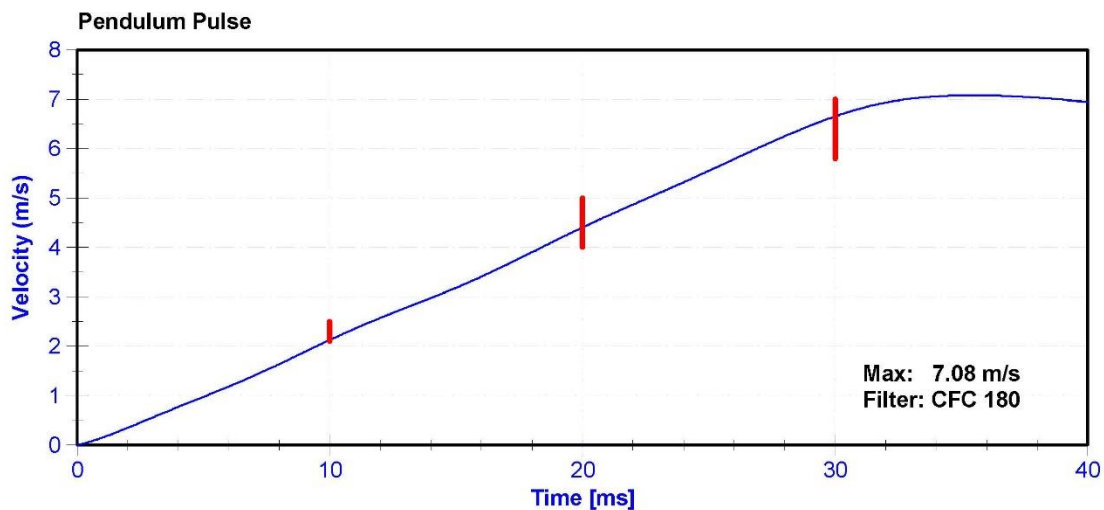
|                   |      |                       |           |
|-------------------|------|-----------------------|-----------|
| ATD Manufacturer  | FTSS | Test Technician       | M. Goehle |
| ATD Serial Number | 324  | Laboratory Supervisor | M. Goehle |

### Results

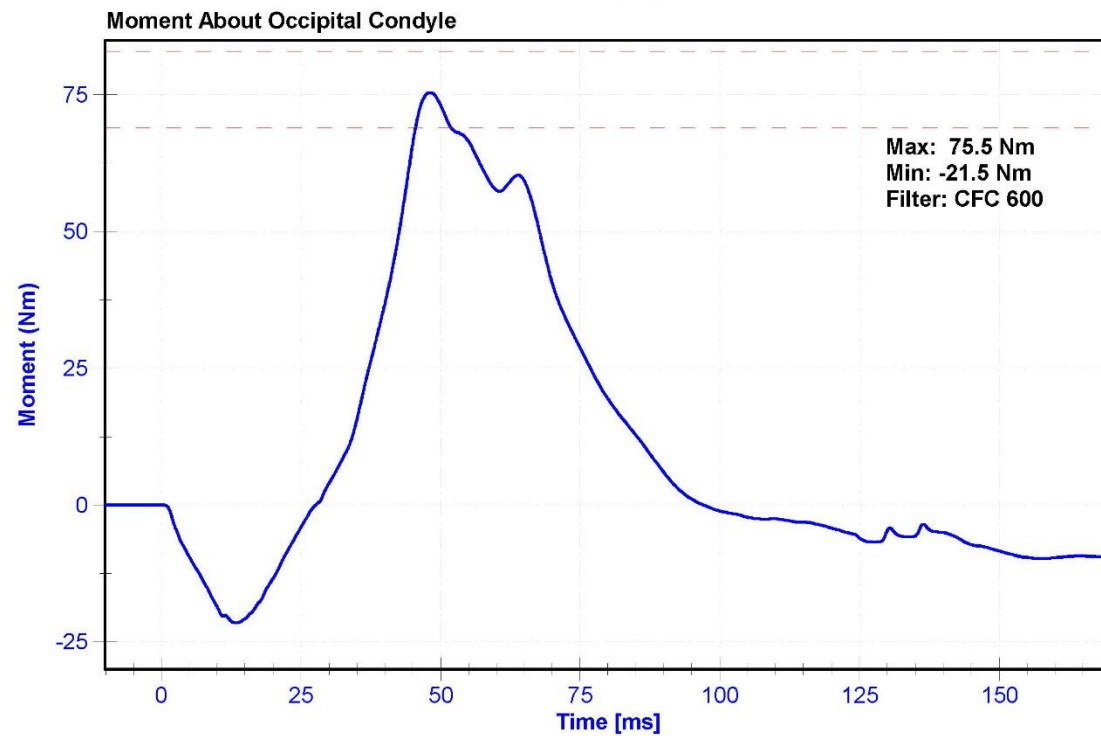
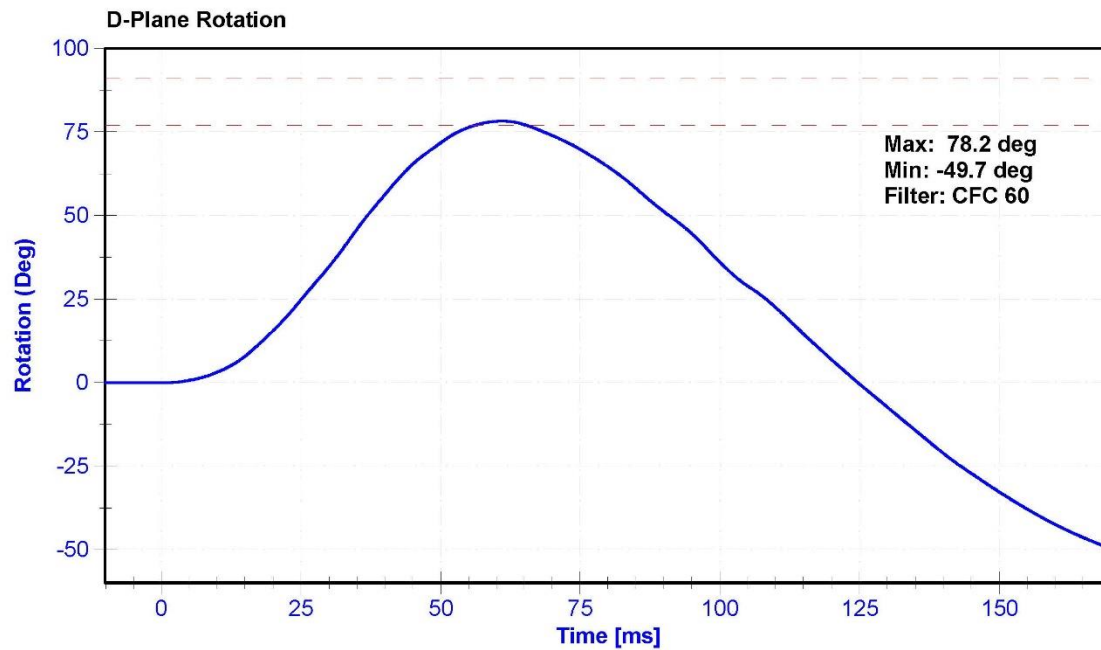
| Test Parameter                      | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|-------------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                         | 20.6                  | 22.2                  | °C   | 22.0   | Pass      |
| Humidity                            | 10                    | 70                    | %    | 16.9   | Pass      |
| Velocity                            | 6.89                  | 7.13                  | m/s  | 6.979  | Pass      |
| Pendulum Impulse at 10ms            | 2.1                   | 2.5                   | m/s  | 2.13   | Pass      |
| Pendulum Impulse at 20ms            | 4.0                   | 5.0                   | m/s  | 4.40   | Pass      |
| Pendulum Impulse at 30ms            | 5.8                   | 7.0                   | m/s  | 6.65   | Pass      |
| Max D Plane Rotation                | 77                    | 91                    | deg  | 78.2   | Pass      |
| Max Moment During Rotation Interval | 69                    | 83                    | Nm   | 75.5   | Pass      |
| Moment Decay to 10.0 Nm             | 80                    | 100                   | ms   | 87.0   | Pass      |

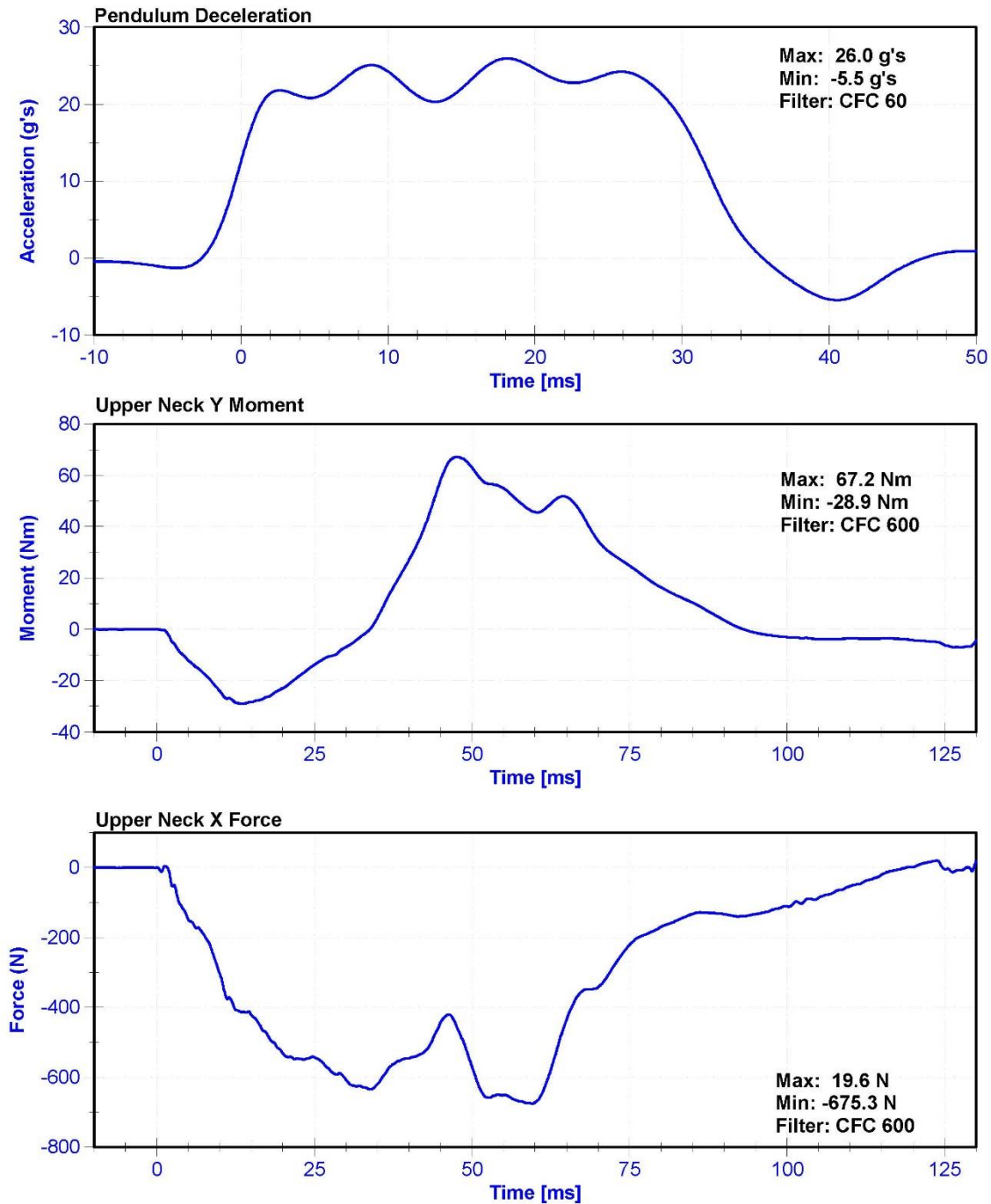
### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-AH5F3      | 5/7/2015         | 5/6/2016             |
| Pendulum Potentiometer | ETI SP22G      | DS-PendPot    | 9/28/2015        | 9/27/2016            |
| Condyle Potentiometer  | ETI SP22G      | DS-CondPot    | 9/28/2015        | 9/27/2016            |
| Upper Neck Load Cell   | DENTON 1716    | LC-2254 Fx    | 12/17/2015       | 12/16/2016           |









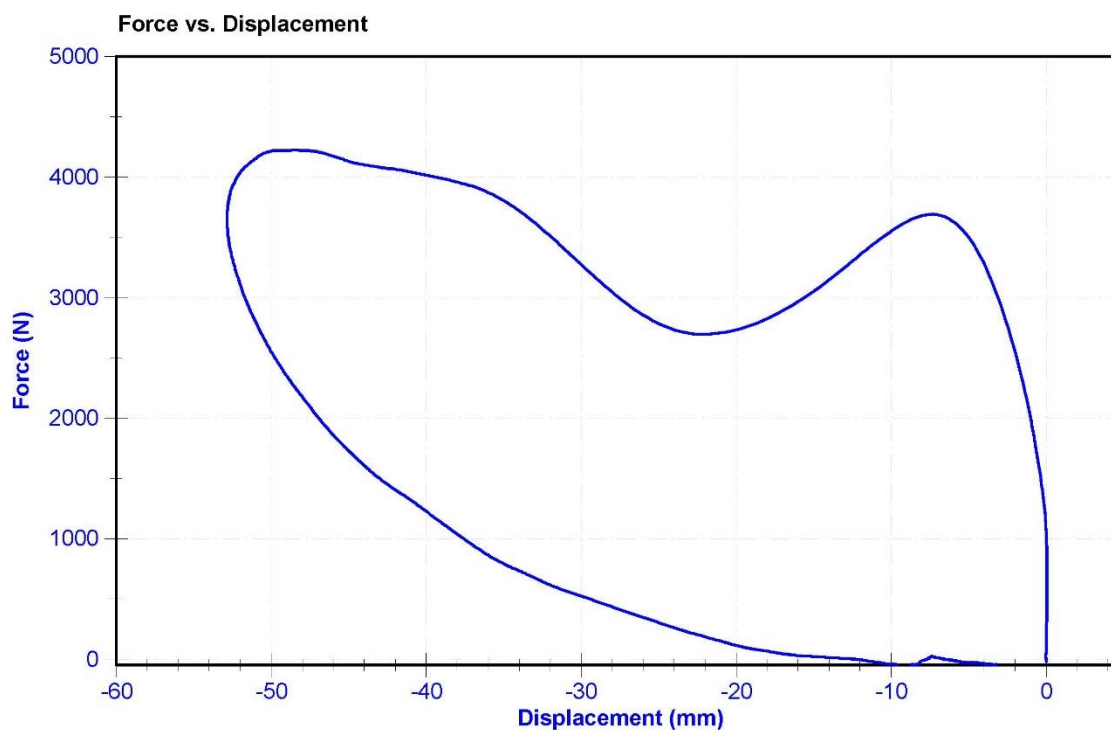
|                   |      |                       |           |
|-------------------|------|-----------------------|-----------|
| ATD Manufacturer  | FTSS | Test Technician       | M. Geesey |
| ATD Serial Number | 324  | Laboratory Supervisor | M. Goehle |

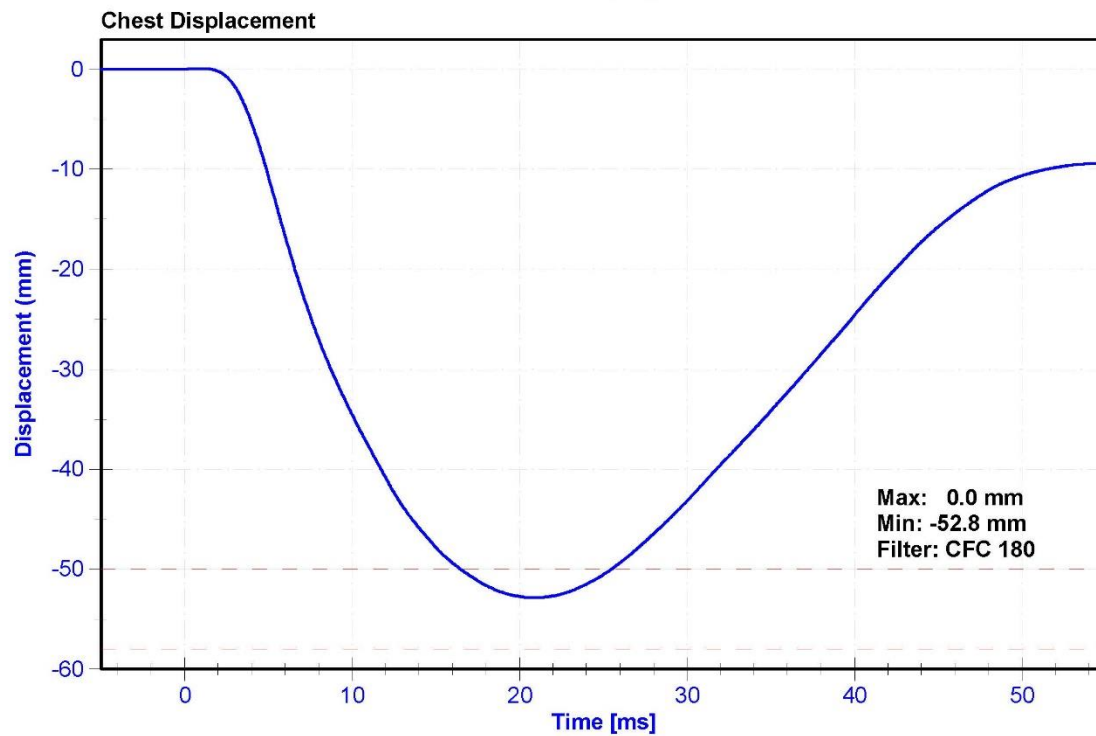
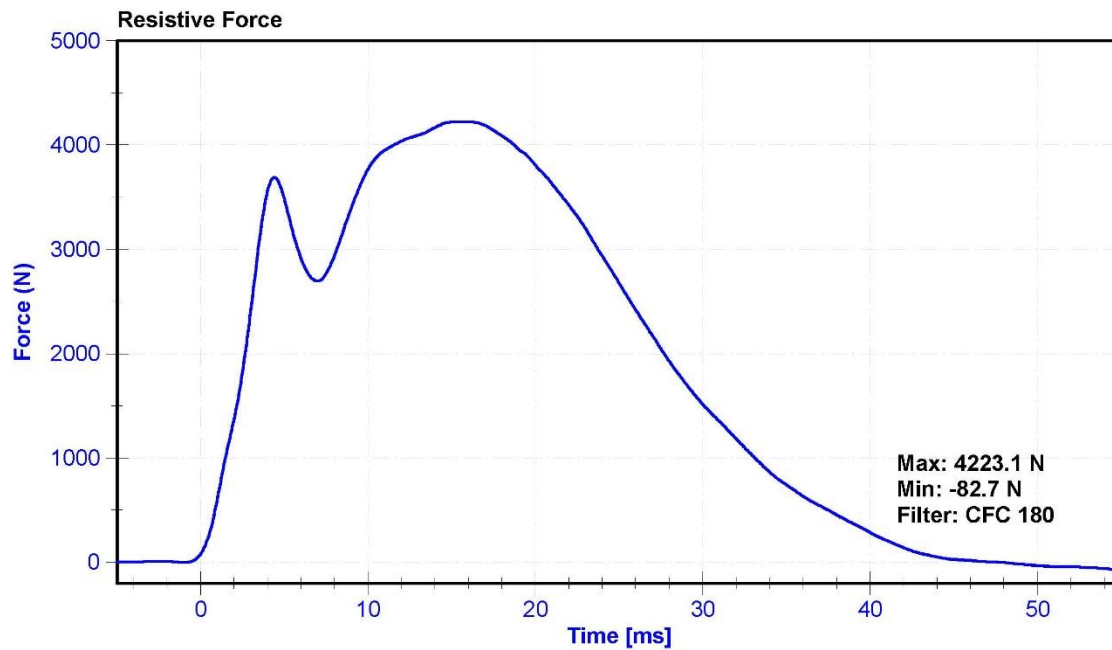
### Results

| Test Parameter                       | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|--------------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                          | 20.6                  | 22.2                  | °C   | 21.2   | Pass      |
| Humidity                             | 10                    | 70                    | %    | 16.7   | Pass      |
| Velocity                             | 6.59                  | 6.83                  | m/s  | 6.699  | Pass      |
| Chest Deflection                     | -58                   | -50                   | mm   | -52.8  | Pass      |
| Maximum Resistive Force (50 to 58mm) | 3900                  | 4400                  | N    | 4216.6 | Pass      |
| Maximum Resistive Force (18 to 50mm) | 0                     | 4600                  | N    | 4223.1 | Pass      |
| Hysteresis                           | 69                    | 85                    | %    | 79.1   | Pass      |

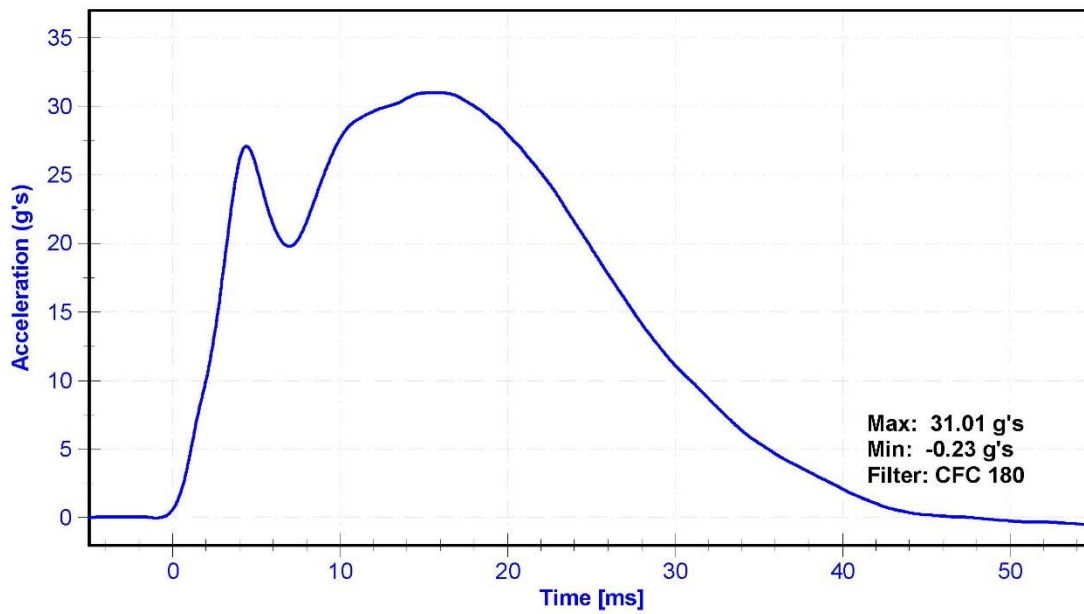
### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-C15018     | 7/15/2015        | 7/14/2016            |
| Chest Potentiometer    | Servo 14CB1    | DS-CST324     | 6/30/2015        | 6/29/2016            |

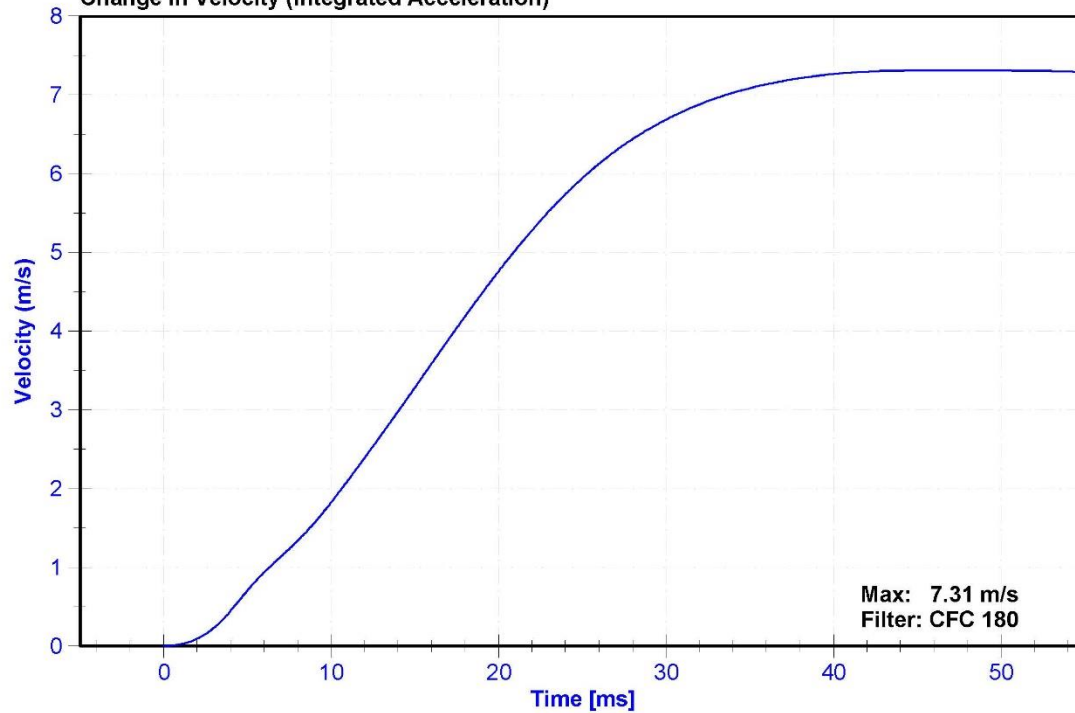




Probe Acceleration



Change in Velocity (Integrated Acceleration)





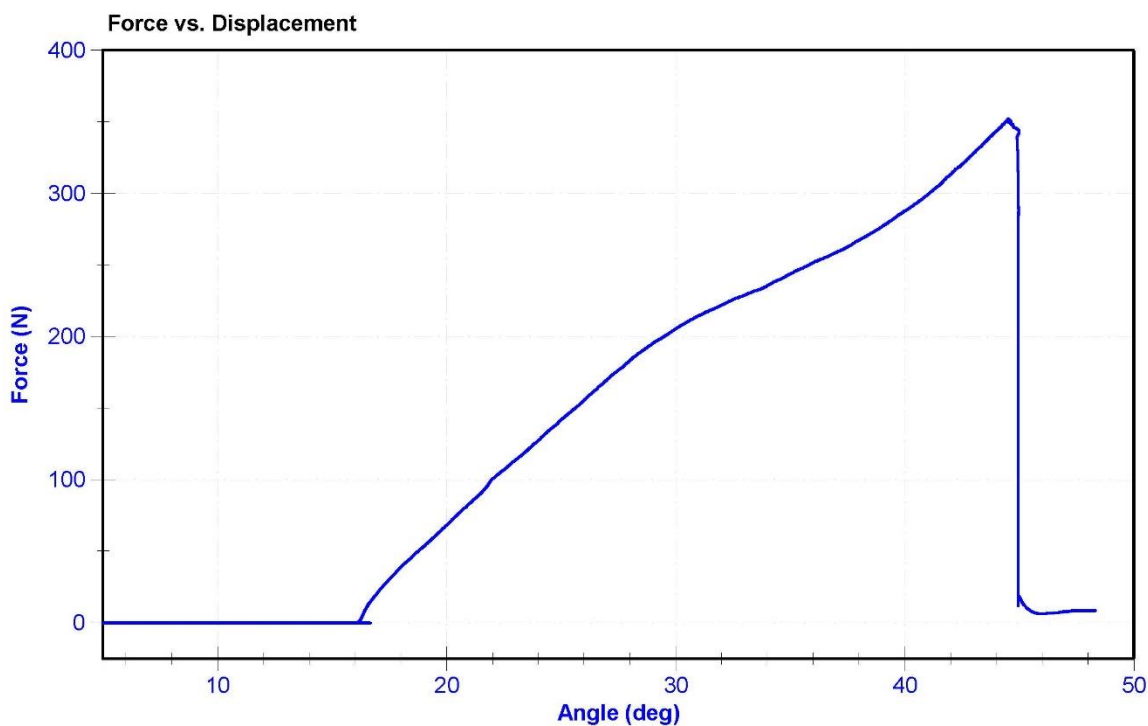
|                   |      |                       |           |
|-------------------|------|-----------------------|-----------|
| ATD Manufacturer  | FTSS | Test Technician       | M.Hartung |
| ATD Serial Number | 324  | Laboratory Supervisor | M.Goehle  |

### Results

| Test Parameter                   | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|----------------------------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature                      | 18.6                  | 25.6                  | °C   | 22.2   | Pass      |
| Humidity                         | 10                    | 70                    | %    | 17.2   | Pass      |
| Initial Angle                    | 0                     | 20                    | deg  | 15.6   | Pass      |
| Force at 45 Degrees              | 320                   | 390                   | N    | 351.9  | Pass      |
| Return Angle Relative to Initial | 0                     | 8                     | deg  | 7.9    | Pass      |

### Transducer Calibrations

| Channel       | Manufacturer      | Serial Number | Calibration Date | Calibration Due Date |
|---------------|-------------------|---------------|------------------|----------------------|
| Potentiometer | Rieker N4C-1      | DS-13051548   | 8/14/2015        | 8/13/2016            |
| Load Cell     | Interface SML-200 | LC-493319     | 8/13/2015        | 8/12/2016            |



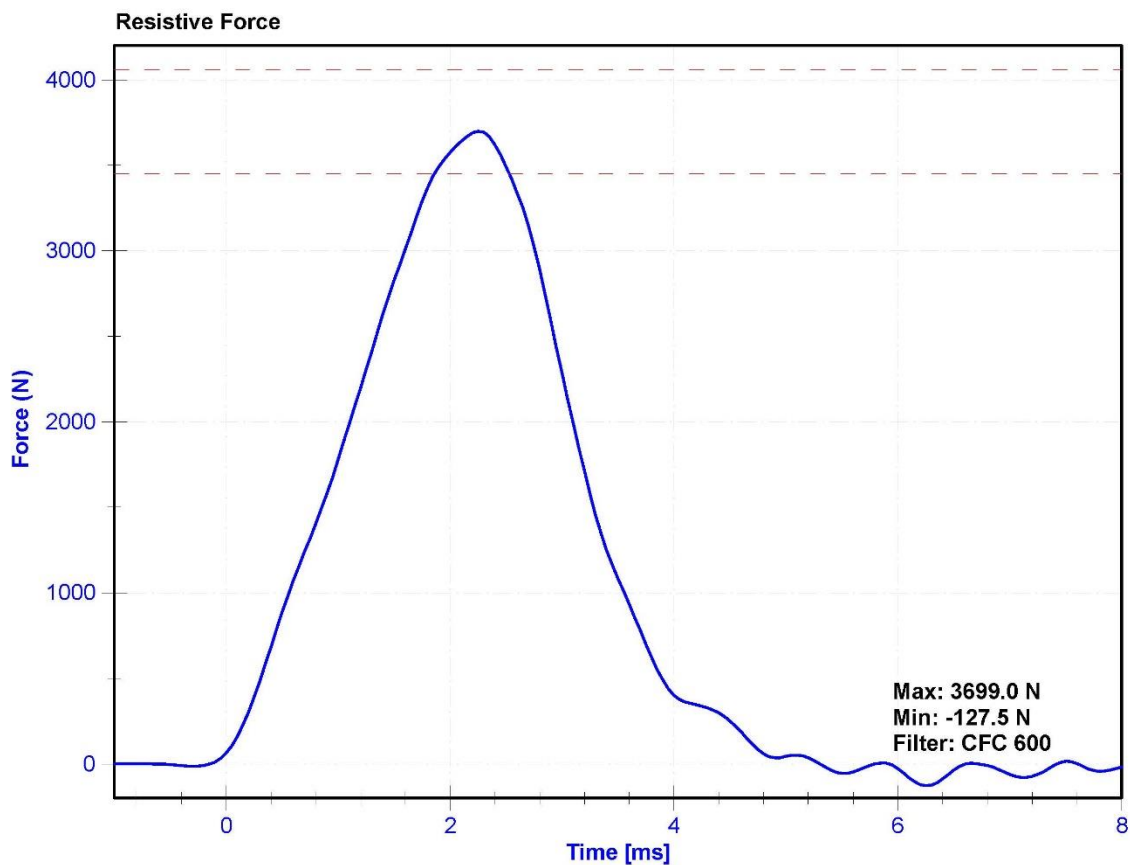
|                   |      |                       |           |
|-------------------|------|-----------------------|-----------|
| ATD Manufacturer  | FTSS | Test Technician       | M. Geesey |
| ATD Serial Number | 324  | Laboratory Supervisor | M. Goehle |

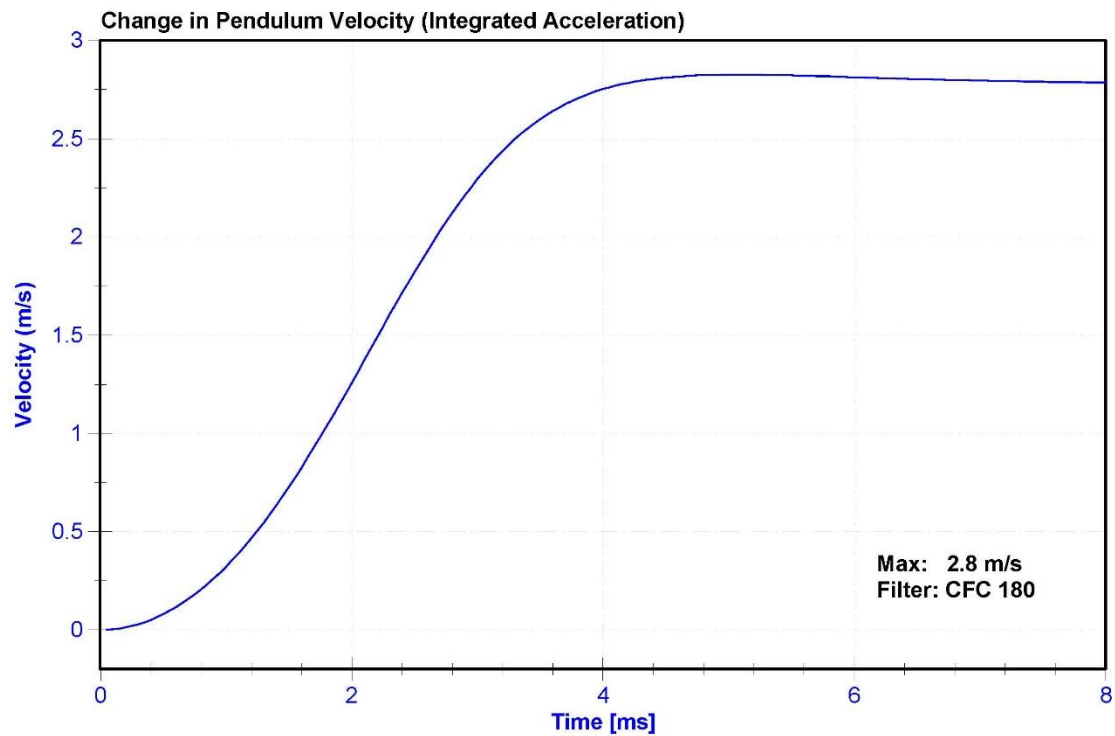
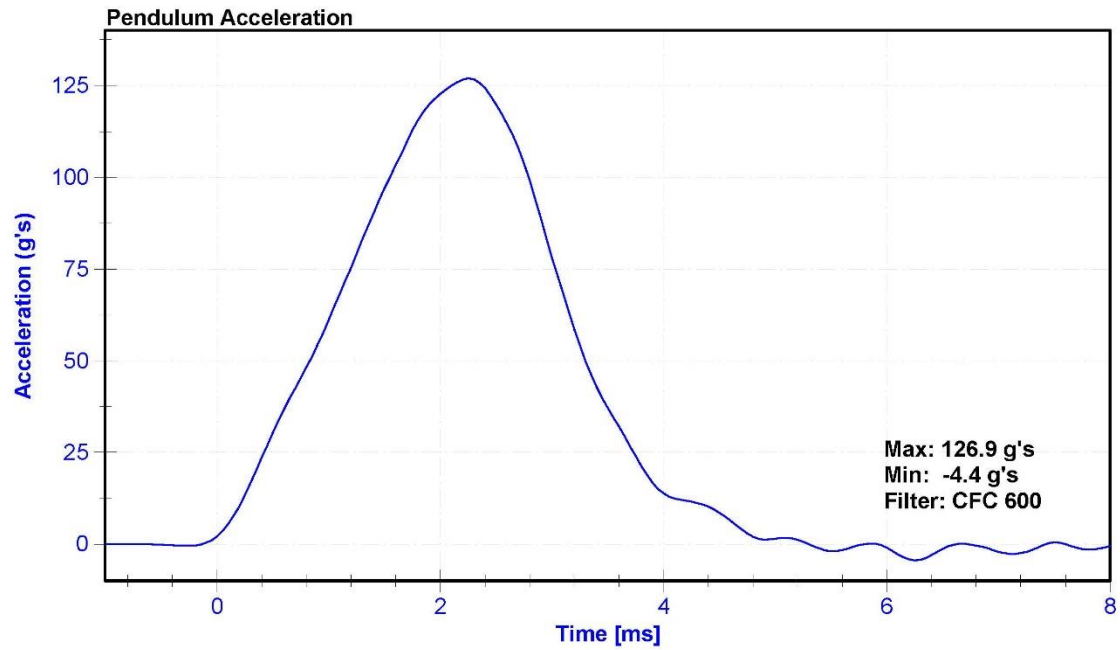
### Results

| Test Parameter  | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|-----------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature     | 18.9                  | 25.6                  | °C   | 20.9   | Pass      |
| Humidity        | 10                    | 70                    | %    | 14.9   | Pass      |
| Velocity        | 2.07                  | 2.13                  | m/s  | 2.088  | Pass      |
| Resistive Force | 3450                  | 4060                  | N    | 3699.0 | Pass      |

### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-C15018     | 7/15/2015        | 7/14/2016            |





|                   |      |                       |           |
|-------------------|------|-----------------------|-----------|
| ATD Manufacturer  | FTSS | Test Technician       | M. Geesey |
| ATD Serial Number | 324  | Laboratory Supervisor | M. Goehle |

### Results

| Test Parameter  | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|-----------------|-----------------------|-----------------------|------|--------|-----------|
| Temperature     | 18.9                  | 25.6                  | °C   | 21.3   | Pass      |
| Humidity        | 10                    | 70                    | %    | 15.1   | Pass      |
| Velocity        | 2.07                  | 2.13                  | m/s  | 2.088  | Pass      |
| Resistive Force | 3450                  | 4060                  | N    | 3657.7 | Pass      |

### Transducer Calibrations

| Channel                | Manufacturer   | Serial Number | Calibration Date | Calibration Due Date |
|------------------------|----------------|---------------|------------------|----------------------|
| Pendulum Accelerometer | ENDEVCO 7231CT | AC-C15018     | 7/15/2015        | 7/14/2016            |

