

REPORT NUMBER: R&D-CAL-12-009

**MOVING BARRIER TO VEHICLE CRASH TEST IN SUPPORT OF NHTSA'S
FRONTAL OBLIQUE OFFSET PROGRAM
RESEARCH MOVING DEFORMABLE BARRIER INTO LEFT FRONT OF A**

2012 CHEVROLET SILVERADO 1500

90.1KPH, 15 DEGREE ANGLE, 35% OVERLAP

TEST DATE: 1/8/2013

NHTSA No: RC0185

**CALSPAN CORPORATION
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FINAL REPORT SUBMITTED:

March 5, 2015

PREPARED FOR:

**U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Vehicle safety Research
1200 New Jersey Ave, SE
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Washington, DC 20590**

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Date: March 5, 2015

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: _____

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16. Abstract A test was conducted in accordance with Task Order 0001 of Contract DTNH22-10-D-00155. The Test consisted of a Research Moving Deformable Barrier (RMDB) traveling at a target speed of 90.12 kph into a stationary 2012 Chevrolet Silverado 1500 Crew Cab. The struck vehicle was positioned 15 degrees relative to the moving barrier and impacted 35% of the left side of the vehicle. 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 8, 2013. The RMDB impact velocity was 89.66 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 805 mm. The test vehicle's performance was as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Pass. ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>500.11</td> <td>700</td> <td>56.13</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-34.83</td> <td>63</td> <td>-29.47</td> </tr> <tr> <td>Neck Injury Criteria (Nij)</td> <td>N/A</td> <td>1</td> <td>0.22</td> <td>1</td> <td>0.18</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>1381.91</td> <td>4,170</td> <td>930.44</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-495.38</td> <td>4,000</td> <td>-224.04</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-5969.98</td> <td>10,008</td> <td>-4300.92</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-8687.23</td> <td>10,008</td> <td>-4053.85</td> </tr> </tbody> </table>					Measurement Description	Units	Driver ATD		Pass. ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	500.11	700	56.13	Maximum Chest Compression	mm	63	-34.83	63	-29.47	Neck Injury Criteria (Nij)	N/A	1	0.22	1	0.18	Neck Tension	N	4,170	1381.91	4,170	930.44	Neck Compression	N	4,000	-495.38	4,000	-224.04	Left Femur Force	N	10,008	-5969.98	10,008	-4300.92	Right Femur Force	N	10,008	-8687.23	10,008	-4053.85
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TABLE OF CONTENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

<u>Section</u>	<u>Page No.</u>
1 Purpose of Test	1-1
2 Summary of Test	2-1
Crash Vehicle Summary	2-3
Injury Summary: Driver THOR Male	2-4
Injury Summary: Driver THOR Male Legs	2-6
Injury Summary: Front Passenger THOR Male	2-7
Injury Summary: Front Passenger THOR Male Legs	2-9
3 Data Sheets	3-1

<u>Data Sheet No.</u>	<u>Page No.</u>
1 General Test and Vehicle Parameter Data	3-2
2 Seat Adjustment, Fuel System, and Steering Wheel	3-6
3 Dummy Longitudinal Clearance Dimensions	3-8
4 Dummy Lateral Clearance Dimensions	3-10
5 Seat Belt Positioning Data	3-11
6 High-Speed Camera Locations and Data	3-12
7 Vehicle Instrumentation Data	3-15
8 Photographic Reference Target Locations	3-17
9 Test Vehicle Summary of Results	3-24
10 Post-Test Observations	3-25
11 Vehicle Profile Measurements	3-26
12 Accident Investigation Division Data	3-28
13 Vehicle Intrusion Measurements	3-29
14 RMDB Crush Measurements	3-48
15 Summary of FMVSS 212, 219 (Partial), and 301 Data	
Windshield Periphery Measurements	3-49
Fuel System Integrity Post Impact Data	3-50
16 FMVSS 301 Static Rollover Results	3-51
17 Dummy / Vehicle Temperature Stabilization	3-52

<u>Appendix</u>	<u>Page No.</u>
A Photographs	A-1
B Vehicle & Dummy Response Data Traces	B-1

C	Part 572 E/O Dummy Calibration and Performance Verification Data Sheets	C-1
D	CMM Measurement Procedures	D-1

SECTION 1 PURPOSE OF TEST

Test Vehicle:	2012 Chevrolet Silverado 1500 Crew Cab	NHTSA No.:	RC0185
Test Program:	R&D 90.1kph, 15° angle, 35% offset	Test Date:	1/8/2013

This 90.12 kph (56 mph) Research Moving Deformable Barrier (RMDB) into a vehicle test is part of the Frontal Offset Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-10-D-00155. The purpose of this test is to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

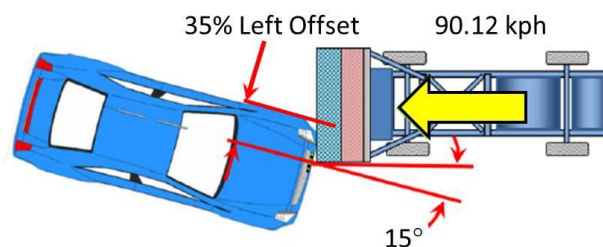
This test was conducted in accordance with the instructions set forth by NHTSA in which the vehicle was placed at a 15° angle, 35% offset relative to the RMDB as outlined in Task Order (TO-1) DTNH22-10-D00155. Data was obtained indicant of Federal Motor Vehicle Safety Standard FMVSS 208-Occupant Crash Protection, FMVSS 212 – Windshield Mounting, FMVSS 219 (partial) – Windshield Zone Intrusion, and FMVSS 301 – Fuel System Integrity, in addition to the requirements of TO-1 of DTNH22-10-D-00155.

SECTION 2 SUMMARY OF TEST

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
Test Date: 1/8/2013

A 2012 Chevrolet Silverado 1500 Crew Cab was impacted on the left front corner by a Research Moving Deformable Barrier (RMDB). This test vehicle was stationary and positioned at a target angle of 15° and at a target offset of 35% to the forward line of motion of the RMDB. The RMDB was towed down the test track in a full forward direction, without any crabbing, and at the targeted impact velocity of 90.12 kph (56.0 mph) into the test vehicle. The test vehicle's mass was 2,624.0 kg (5,784.9 lbs), and the RMDB's mass was 2490.7 kg (5491 lbs). The test was conducted by Calspan Corporation on January 8, 2013.



The test was documented by one (1) real time and fourteen (14) high-speed video cameras. Camera locations and other pertinent data are located in Data Sheet No. 6 of this report. Pre and post – test photographs of the test vehicle, RMDB, and test setup were taken using a digital still camera. Photographic documentation of the test is presented in Appendix A of this report.

One 50% adult male THOR-NT with MOD KIT (TK) Anthropomorphic Test Device (ATD) (Serial No. 007) was seated in the left, front (P1 -Driver's) seating position and one 50% adult male THOR-NT with MOD KIT (TK) ATD (Serial No. 016) was seated in the right front passenger seating position (P2). The THOR TK driver and passenger were positioned according to instructions specified in laboratory test procedures FMVSS 208-14, "Occupant Crash Protection", TP208-14, July 27, 2006.

The driver was restrained with a 3 – point seat belt, a front airbag, curtain airbag, and torso airbag. The passenger was restrained with a 3 – point seat belt, and a front airbag. The passenger's curtain and torso airbags were disabled.

SECTION 2 (CONTINUED)
SUMMARY OF TEST

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
Test Date: 1/8/2013

Two hundred and thirty (230) channels of data from the two ATD's, test vehicle and RMDB were collected using Kayser – Threde and DTS data acquisition systems. Appendix B contains dummy data plots, as well as vehicle and RMDB response data plots.

There was 100% total windshield retention, with 100% and 100% retention on the left and right sides, respectively. 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 805 mm at C1 to the left of the vehicle's centerline. The maximum crush of the structural bumper beam was 870 mm at B2, to the left of the vehicle's centerline. Additional information pertaining to static crush measurements can be found on Data Sheet No.12 of this report.

All four vehicle doors remained closed and latched during the test. The left front door was deformed as a result of the impact causing it to be non-operational. The remaining doors all remained operational after the test.

Structure observations include the following:

- Driver's side A-Pillar buckled rearward. Resulting in separation between the top of the door and roof sill. (See Photo No.061 in Appendix A)
- Windshield cracks throughout; however there was no penetration observed in the protected zone.
- Hood of the vehicle bent upwards exposing part of the engine compartment.

The driver ATD's visible contact points were:

- Head Contact: Front airbag, curtain airbag, and side head liner
- Torso Contact: Front airbag, curtain airbag, and driver's door
- Knee Contact: Knee bolster

The passenger ATD's visible contact points were:

- Head Contact: Front airbag & shifter
- Torso Contact: Front airbag & center console
- Knee Contact: Glove box

SECTION 2 (CONTINUED) CRASH VEHICLE SUMMARY

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

Primary Impact Data

Measured Parameter	Units	Value
RMDB Velocity at Impact	kph	89.66
RMDB Test Weight	kg	2490.7
RMDB Maximum Static Crush	mm	247.7
Vehicle Test Weight	kg	2624
Actual Vehicle Angle	degrees	15
Vehicle Maximum Static Crush	mm	805
Vertical Offset from Target Point (+ down / - up)*	mm	4
Lateral Offset from Target Point (+ left / - right)*	mm	-14
Number of Data Channels		230
Number of Real-Time Cameras		1
Number of High-Speed Cameras		14

*Offsets are in relation to the vehicle coordinate system.

Dummy Contacts

	Driver	Picture Ref.	Passenger	Picture Ref.
Dummy Type	50% Male, Thor 007		50% Male, Thor 016	
Head Contact	Front airbag, curtain airbag & side head liner	A49-A51	Front airbag & shifter	A70-A72
Upper Torso Contact	Front airbag, curtain airbag & driver's door	NA	Front airbag & center console	NA
Lower Torso Contact	None	NA	Center console	NA
Left Knee Contact	Knee Bolster	A28	Glove Box	A52
Right Knee Contact	Knee Bolster	A28	Glove Box	A52

Data Anomalies:

- V2P1 FOTL AZ had a spike at 51.8 ms
- V2P1 FOTR AZ had a spike at 55.7 ms
- V2P2 ANKL RX had questionable data
- V2P2 ANKL RY had questionable data
- V2P2 FOTL AZ failed
- V2P2 ANKR RX had questionable data
- V2P2 ANKR RY had questionable data

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2012 Chevrolet Silverado 1500 - Crew Cab NHTSA No.: RC0185
Test Program: Research and Development Left Oblique Offset Test Date: 1/8/2013

Driver: Thor Serial No. 007 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	3.44	-56.13
	Head CG Y	g	1000	125.88	-8.19
	Head CG Z	g	1000	32.10	-9.01
	Head Resultant	g	Compute	138.29	
	36 ms HIC		Compute	500.11	
	15 ms HIC		Compute	500.11	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	87.61	
	Head Rotational Velocity X	deg/s	60	817.01	-2446.07
	Head Rotational Velocity Y	deg/s	60	605.13	-1362.94
	Head Rotational Velocity Z	deg/s	60	1507.88	-568.24
	Head Rotational Velocity Resultant	deg/s	Compute	2756.44	
	Brain Injury Criteria		Compute	0.98	
	Neck	UNLC Transferred to OC, Neck System, FX	N	1000	77.25
UNLC Neck System Tension, FZ		N	1000	1381.91	
UNLC Neck System Compression, FZ		N	1000		-495.38
UNLC Transferred to OC, Neck System Flexion, MY		N-m	Thortest	0.55	
UNLC Transferred to OC, Neck System Extension, MY		N-m	Thortest		-17.74
NIJ			Compute	0.23	
On head acting through total neck section, FX		N	Thortest	103.27	-585.93
On head acting through total neck section, FY		N	Thortest	687.23	-224.95
On head acting through total neck section, FZ		N	Thortest	1474.43	-515.84
On head acting through total neck section, MX		N-m	Thortest	52.81	-17.43
On head acting through total neck section, MY		N-m	Thortest	33.27	-10.04
On head acting through total neck section, MZ		N-m	Thortest	4.05	-20.20
On head acting through O.C. joint only, FX		N	Thortest	49.06	-927.51
On head acting through O.C. joint only, FZ		N	Thortest	1383.75	-495.04
On head acting through O.C. joint only, MY		N-m	Thortest	0.55	-17.74
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	3.54	-9.07
	Upper Left IR-TRACC Y - deflection	mm	Thortest	12.23	-5.41
	Upper Left IR-TRACC Z - deflection	mm	Thortest	9.02	-7.73
	Upper Left IR-TRACC D - deflection	mm	Thortest	5.54	-7.96
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.10	-29.43
	Upper Right IR-TRACC Y - deflection	mm	Thortest	9.26	-5.86
	Upper Right IR-TRACC Z - deflection	mm	Thortest	18.05	-0.84
	Upper Right IR-TRACC D - deflection	mm	Thortest	0.10	-26.44
	Lower Left IR-TRACC X - deflection	mm	Thortest	3.33	-8.85
	Lower Left IR-TRACC Y - deflection	mm	Thortest	0.19	-13.85

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2012 Chevrolet Silverado 1500 - Crew Cab NHTSA No.: RC0185

Test Program: Research and Development Left Oblique Offset Test Date: 1/8/2013

Driver: Thor Serial No. 007 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	16.27	-0.08
	Lower Left IR-TRACC D - deflection	mm	Thortest	2.36	-9.95
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.41	-35.32
	Lower Right IR-TRACC Y - deflection	mm	Thortest	19.72	-0.03
	Lower Right IR-TRACC Z - deflection	mm	Thortest	0.08	-25.57
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.41	-34.83
	Chest CG Acceleration, 3 ms clip	g	Compute	29.20	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	0.95	-65.23
	Lower Left IR-TRACC Y - deflection	mm	Thortest	1.19	-9.93
	Lower Left IR-TRACC Z - deflection	mm	Thortest	19.62	-0.68
	Lower Left IR-TRACC D - deflection	mm	Thortest	0.96	-65.45
	Left Viscous Criterion Based on X - deflection		Compute	0.85	
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.89	-57.06
	Lower Right IR-TRACC Y - deflection	mm	Thortest	4.91	-6.10
	Lower Right IR-TRACC Z - deflection	mm	Thortest	22.77	-1.50
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.94	-60.51
	Right Viscous Criterion Based on X - deflection		Compute	1.91	
Spine	Upper Spine (T1) AX	g	180	13.79	-41.07
	Upper Spine (T1) AY	g	180	24.29	-10.62
	Upper Spine (T1) AZ	g	180	21.00	-16.31
	Upper Spine (T1) Resultant	g	Compute	42.79	
	Middle Spine (T6) AX	g	180	18.40	-28.88
	Middle Spine (T6) AY	g	180	24.00	-3.41
	Middle Spine (T6) AZ	g	180	5.79	-10.46
	Middle Spine (T6) Resultant	g	Compute	30.19	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	71.62	
Acetabulum	Left FX force	N	600	452.69	-3379.25
	Left FY force	N	600	318.15	-757.43
	Left FZ force	N	600	655.47	-230.28
	Left Acetabulum Resultant	N	Compute	3437.85	
	Right FX force	N	600	517.23	-4397.56
	Right FY force	N	600	278.08	-1812.22
	Right FZ force	N	600	1040.15	-777.67
	Right Acetabulum Resultant	N	Compute	4774.57	
Anomalies					
None					

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver Legs

Test Vehicle: 2012 Chevrolet Silverado 1500 - Crew Cab NHTSA No.: RC0185
 Test Program: Research and Development Left Oblique Offset Test Date: 1/8/2013

Driver: Thor Serial No. 007 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	1.95	-6.46
	Right Knee Displacement, DX	mm	180	2.44	-9.87
Femur	Left Femur Force, FZ	N	600	305.48	-5969.97
	Left Femur Moment, MX	N-m	600	15.48	-255.62
	Left Femur Moment, MY	N-m	600	78.49	-189.87
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	295.44	
	Right Femur Force, FZ	N	600	922.90	-8687.23
	Right Femur Moment, MX	N-m	600	44.93	-118.01
	Right Femur Moment, MY	N-m	600	59.81	-83.56
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	143.52	
	Left Upper Tibia, FZ	N	600	162.38	-4383.88
	Left Upper Tibia, MY	N-m	600	98.51	-30.89
Tibia	Left Upper Tibia, Index		Compute	1.33	
	Right Upper Tibia, FZ	N	600	106.78	-1429.87
	Right Upper Tibia, MY	N-m	600	136.97	-72.53
	Right Upper Tibia, Index		Compute	0.70	
	Left Lower Tibia, FZ	N	600	105.47	-5420.55
	Left Lower Tibia, MY	N-m	600	60.08	-82.01
	Left Lower Tibia, Index		Compute	1.03	
	Right Lower Tibia, FZ	N	600	160.76	-4502.41
	Right Lower Tibia, MY	N-m	600	113.37	-68.76
	Right Lower Tibia, Index		Compute	1.15	
Ankle	Left Ankle Rotation, RX	Deg	180	42.67	-1.24
	Left Ankle Rotation, RY	Deg	180	17.07	-26.12
	Right Ankle Rotation, RX	Deg	180	17.58	-35.84
	Right Ankle Rotation, RY	Deg	180	38.19	-6.97
Anomalies					
None					

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: 2012 Chevrolet Silverado 1500 - Crew Cab NHTSA No.: RC0185
Test Program: Research and Development Left Oblique Offset Test Date: 1/8/2013

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	23.54	-23.56
	Head CG Y	g	1000	16.57	-8.14
	Head CG Z	g	1000	16.00	-1.00
	Head Resultant	g	Compute	28.28	
	36 ms HIC		Compute	93.45	
	15 ms HIC		Compute	56.13	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	27.41	
	Head Rotational Velocity X	deg/s	60	397.39	-1278.11
	Head Rotational Velocity Y	deg/s	60	1505.68	-996.53
	Head Rotational Velocity Z	deg/s	60	2998.16	-1097.59
	Head Rotational Velocity Resultant	deg/s	Compute	3114.09	
	Brain Injury Criteria		Compute	1.35	
	Neck	UNLC Transferred to OC, Neck System, FX	N	1000	193.94
UNLC Neck System Tension, FZ		N	1000	930.44	
UNLC Neck System Compression, FZ		N	1000		-224.04
UNLC Transferred to OC, Neck System Flexion, MY		N-m	Thortest	4.91	
UNLC Transferred to OC, Neck System Extension, MY		N-m	Thortest		-6.61
NIJ			Compute	0.18	
On head acting through total neck section, FX		N	Thortest	226.56	-113.18
On head acting through total neck section, FY		N	Thortest	203.01	-45.60
On head acting through total neck section, FZ		N	Thortest	969.87	-29.67
On head acting through total neck section, MX		N-m	Thortest	40.43	-29.36
On head acting through total neck section, MY		N-m	Thortest	15.41	-20.21
On head acting through total neck section, MZ		N-m	Thortest	8.50	-37.21
On head acting through O.C. joint only, FX		N	Thortest	218.97	-92.39
On head acting through O.C. joint only, FZ		N	Thortest	930.54	-212.90
On head acting through O.C. joint only, MY		N-m	Thortest	4.91	-6.61
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	0.20	-30.22
	Upper Left IR-TRACC Y - deflection	mm	Thortest	7.04	-6.99
	Upper Left IR-TRACC Z - deflection	mm	Thortest	15.12	-7.54
	Upper Left IR-TRACC D - deflection	mm	Thortest	0.21	-29.47
	Upper Right IR-TRACC X - deflection	mm	Thortest	2.28	-12.36
	Upper Right IR-TRACC Y - deflection	mm	Thortest	7.47	-6.52
	Upper Right IR-TRACC Z - deflection	mm	Thortest	8.01	-7.64
	Upper Right IR-TRACC D - deflection	mm	Thortest	1.58	-11.98
	Lower Left IR-TRACC X - deflection	mm	Thortest	6.70	-33.64
	Lower Left IR-TRACC Y - deflection	mm	Thortest	29.58	-0.75

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: 2012 Chevrolet Silverado 1500 - Crew Cab NHTSA No.: RC0185

Test Program: Research and Development Left Oblique Offset Test Date: 1/8/2013

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	4.54	-14.81
	Lower Left IR-TRACC D - deflection	mm	Thortest	13.89	-29.03
	Lower Right IR-TRACC X - deflection	mm	Thortest	6.32	-11.61
	Lower Right IR-TRACC Y - deflection	mm	Thortest	16.00	-7.34
	Lower Right IR-TRACC Z - deflection	mm	Thortest	5.25	-16.37
	Lower Right IR-TRACC D - deflection	mm	Thortest	4.97	-9.23
	Chest CG Acceleration, 3 ms clip	g	Compute	24.86	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	1.06	-66.83
	Lower Left IR-TRACC Y - deflection	mm	Thortest	9.78	-2.26
	Lower Left IR-TRACC Z - deflection	mm	Thortest	12.53	-4.65
	Lower Left IR-TRACC D - deflection	mm	Thortest	1.07	-66.16
	Left Viscous Criterion Based on X - deflection		Compute	1.20	
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.29	-47.44
	Lower Right IR-TRACC Y - deflection	mm	Thortest	12.67	-0.15
	Lower Right IR-TRACC Z - deflection	mm	Thortest	12.01	-2.25
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.29	-47.52
	Right Viscous Criterion Based on X - deflection		Compute	4.78	
Spine	Upper Spine (T1) AX	g	180	8.79	-27.71
	Upper Spine (T1) AY	g	180	20.43	-2.48
	Upper Spine (T1) AZ	g	180	15.70	-1.47
	Upper Spine (T1) Resultant	g	Compute	35.06	
	Middle Spine (T6) AX	g	180	4.62	-22.15
	Middle Spine (T6) AY	g	180	15.05	-1.44
	Middle Spine (T6) AZ	g	180	3.13	-5.82
	Middle Spine (T6) Resultant	g	Compute	25.41	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	44.95	
Acetabulum	Left FX force	N	600	762.48	-965.75
	Left FY force	N	600	1547.19	-286.14
	Left FZ force	N	600	247.84	-930.46
	Left Acetabulum Resultant	N	Compute	1652.41	
	Right FX force	N	600	2173.26	-517.19
	Right FY force	N	600	27.25	-1328.25
	Right FZ force	N	600	782.32	-620.12
	Right Acetabulum Resultant	N	Compute	2344.34	
Anomalies					
None					

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Right Front Passenger Legs

Test Vehicle: 2012 Chevrolet Silverado 1500 - Crew Cab NHTSA No.: RC0185
 Test Program: Research and Development Left Oblique Offset Test Date: 1/8/2013

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	1.71	-7.03
	Right Knee Displacement, DX	mm	180	1.64	-4.83
Femur	Left Femur Force, FZ	N	600	260.62	-4300.92
	Left Femur Moment, MX	N-m	600	41.24	-199.43
	Left Femur Moment, MY	N-m	600	58.01	-84.64
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	212.97	
	Right Femur Force, FZ	N	600	223.00	-4053.85
	Right Femur Moment, MX	N-m	600	43.85	-181.36
	Right Femur Moment, MY	N-m	600	97.44	-73.04
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	193.05	
Tibia	Left Upper Tibia, FZ	N	600	51.25	-2880.21
	Left Upper Tibia, MY	N-m	600	37.84	-88.32
	Left Upper Tibia, Index		Compute	0.98	
	Right Upper Tibia, FZ	N	600	105.59	-1974.09
	Right Upper Tibia, MY	N-m	600	36.37	-42.31
	Right Upper Tibia, Index		Compute	0.43	
	Left Lower Tibia, FZ	N	600	10.23	-2892.57
	Left Lower Tibia, MY	N-m	600	39.54	-81.26
	Left Lower Tibia, Index		Compute	0.77	
	Right Lower Tibia, FZ	N	600	98.66	-2281.01
	Right Lower Tibia, MY	N-m	600	29.04	-31.87
	Right Lower Tibia, Index		Compute	0.37	
Ankle	Left Ankle Rotation, RX	Deg	180	56.93 ⁽¹⁾	-58.23 ⁽¹⁾
	Left Ankle Rotation, RY	Deg	180	45.44 ⁽²⁾	-60.38 ⁽²⁾
	Right Ankle Rotation, RX	Deg	180	23.88	-25.37
	Right Ankle Rotation, RY	Deg	180	4.96	-22.30
Anomalies (1) Channel failed (2) Channel failed					

SECTION 3 DATA SHEETS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

Data Sheet No.		Page No.
1	General Test and Vehicle Parameter Data	3-2
2	Seat Adjustment, Fuel System, and Steering Wheel	3-6
3	Dummy Longitudinal Clearance Dimensions	3-8
4	Dummy Lateral Clearance Dimensions	3-10
5	Seat Belt Positioning Data	3-11
6	High-Speed Camera Locations and Data	3-12
7	Vehicle Instrumentation Data	3-15
8	Photographic Reference Target Locations	3-17
9	Test Vehicle Summary of Results	3-24
10	Post-Test Observations	3-25
11	Vehicle Profile Measurements	3-26
12	Accident Investigation Division Data	3-28
13	Vehicle Intrusion Measurements	3-29
14	RMDB Crush Measurements	3-48
15	Summary of FMVSS 212, 219 (Partial), and 301 Data	
	Windshield Periphery Measurements	3-49
	Fuel System Integrity Post Impact Data	3-50
16	FMVSS 301 Static Rollover Results	3-51
17	Dummy / Vehicle Temperature Stabilization	3-52

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

VEHICLE INFORMATION

NHTSA No.	RC0185
Model Year	2012
Make	Chevrolet
Model	Silverado 1500
Body Style	Crew Cab
VIN	3GCPCPEA7CG248097
Body Color	Light gray/silver
Odometer Reading (km/mi)	6 / 4
Engine Displacement. (L)	4.8
Type/No. Cylinders	V8
Engine Placement	Inline
Transmission Type	Automatic
Transmission Speeds	4-Speed
Overdrive	No
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
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 De Mexico
Date of Manufacture	03/12

GVWR (kg)	3085
GAWR Front (kg)	1656
GAWR Rear (kg)	1792

VEHICLE SEATING AND WEIGHT CAPACITY

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bench	Bench	--	
Number of Occupants	3	3	--	6
Capacity Wt. (VCW) (kg)				751.00
Cargo Wt. (RCLW) (kg)				342.76

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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	673	478.5		723	592	
Right	kg	680.5	471		723	586	
Ratio	%	58.8%	41.2%		55.1%	44.9%	
Totals	kg	1,353.5	949.5	2,303.0	1,446.0	1,178.0	2624

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2,303.00
Weight of 2 P572E ATDs	kg	190.51
Rated Cargo/Luggage Weight (RCLW)	kg	342.76
Calculated Vehicle Target Weight (TVTW)	kg	2,827.27

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	935	930	994	995	1508
As Tested	mm	919	917	964	958	1642
Post Test	mm	976	906	906	1026	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3658
Total Vehicle Length at Left Side	mm	5781
Total Vehicle Length at Centerline	mm	5840
Total Vehicle Length at Right Side	mm	5781
Weight of Ballast in Cargo Area	kg	54.5
Weight of Vehicle Components Removed	kg	34.0
Amount of Stoddard Solvent in Fuel Tank	L	90.6

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Spare tire, jack, and rear seats.

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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements		Pre-Test
1	Total Length	mm	5840
2	Total Width	mm	1985
3	Bumper Top Height	mm	757
4	Bumper Bottom Height	mm	561
5	Longitudinal Member Top Height	mm	635
6	Distance Between Longitudinal Members	mm	903
7	Longitudinal Member Width	mm	97
8	Engine Top Height	mm	1254
9	Engine Bottom Height	mm	331
10	Engine and Gearbox Width	mm	590
11	Front Bumper-Engine Distance	mm	721
12	Front Shock Absorber Fixing Height	mm	820
13	Bonnet Leading Edge Height	mm	1123
14	Front Shock Absorber Fixing Width	mm	969
15	Front Bumper – Front Axle Distance	mm	1001
16	Front Axle – A Pillar Distance	mm	571
17	A-Pillar – B-Pillar Distance	mm	1188
18	B-Pillar – Rear Axle Distance	mm	1900
19	B-Pillar – C-Pillar Distance	mm	934
20	Roof Sill Bottom Height	mm	1764
21	Roof Sill Top Height	mm	1862
22	Floor Sill Bottom Height	mm	600
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: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

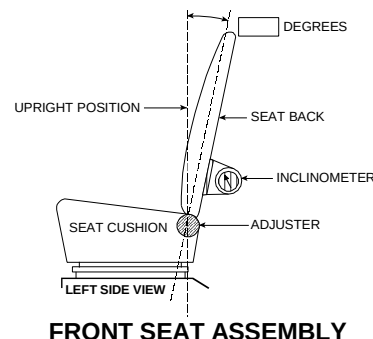
NHTSA No.: RC0185
 Test Date: 1/8/2013

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

Passenger Seat: The passenger seat back was positioned to allow for a zero head angle of the passenger dummy



	Deg.
Driver Seat Back Angle	7.3
Passenger Seat Back Angle	6.5

SEAT FORE/AFT POSITIONS

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

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

The passenger's seat was positioned at the most forward position of fore/aft travel.

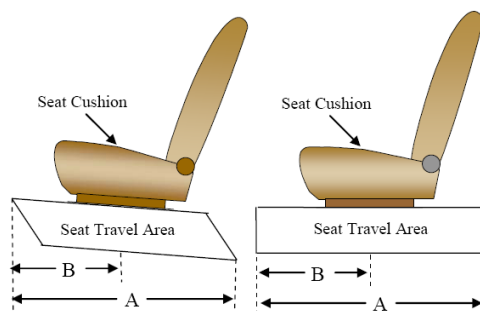
	Total Fore/Aft Travel	Placed in Position #
Driver Seat	240 mm	12 th detent
Passenger Seat	22 detents	11 th detent

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



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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

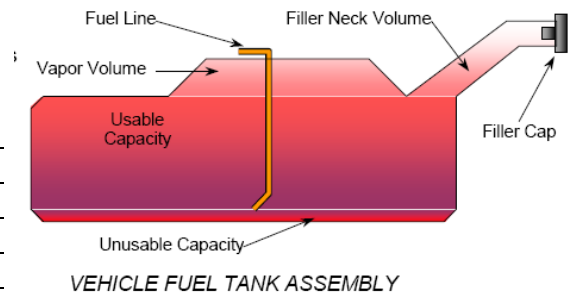
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	97.5
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	90.7
Actual Amount of Solvent Used	90.6
1/3 of Usable Capacity	32.2

FUEL PUMP

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

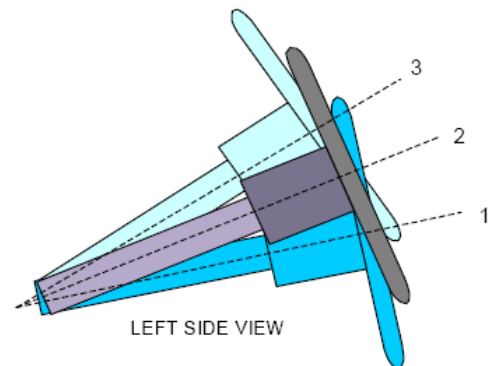
Fuel evacuated according to the specifications provided by the manufacturer in Form 1. Electric fuel pump operates when the ignition is in the 'on' position and the engine is running. The fuel filler neck is located above the left rear wheel.



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 ASSEMBLY

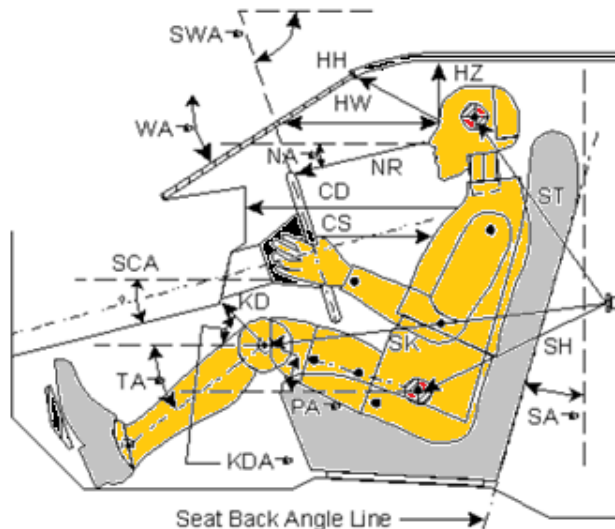
STEERING COLUMN POSITIONS

	Tilt (degrees)	Fore/Aft Position (mm)
Lowermost position No. 1	10.8	
Geometric center position No. 2	20.8	
Uppermost position No. 3	30.8	
Telescoping Steering Wheel Travel		NA
Test Position	20.8	NA

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



Code	Measurement Description	Driver (Serial # Thor 007)		Passenger (Serial # Thor 016)	
		Length (mm)	Angle(°)	Length (mm)	Angle (°)
WA°	Windshield Angle		-33.5		
SWA°	Steering Wheel Angle		20.5		
SCA°	Steering Column Angle		69.5		
SA°	Seat Back Angle (on headrest post)		7.5		7.9
HZ	Head to Roof (Z)	214	90.0	212	90.0
HH	Head to Header	524	14.7	541	13.2
HW	Head to Windshield	707	0.0	726	0.0
NR	Nose to Rim	486	-15.7	690	-29.2
CD	Chest to Dash	561		563	
CS	Chest to Steering Hub	386	-11.3		
RA	Rim to Abdomen	184	0.0		
KDL	Left Knee to Dash	139	27.8	126	25.7
KDR	Right Knee to Dash	134	24.7	145	30.2
PA°	Pelvic Angle		-23.5		21.0
TA°	Tibia Angle		-40.5		-43.1
SK	Striker to Knee	731	5.2	724	5.4
ST	Striker to Head	137	79.1	108	81.3
SH	Striker to H-Point	312	3.0	301	4.9
HAX°	Head Angle (X)		0.1		0.2
HAY°	Head Angle (Y)		-0.2		-0.1
NAX°	Neck Angle (X)		2.4		
NAY°	Neck Angle (Y)		-0.2		
TAX°	T6 Angle (X)		16.8		4.4
TAY°	T6 Angle (Y)		-0.2		-0.8
LAX°	Lumbar Angle (X)				-1.6
LAY°	Lumbar Angle (Y)				19.6

DATA SHEET NO.3 (CONTINUED)
DUMMY CMM MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

Description	Units	Driver			Passenger		
		X	Y	Z	X	Y	Z
Striker	mm	882	-887	945	887	887	941
Head CG	mm	1050	-535	256	1023	525	256
Bridge of Nose	mm	1142	-452	262	1122	455	254
Tip of Nose	mm	1142	-453	299	1124	454	293
Shoulder Bolt	mm	1112	-647	504	1069	638	527
Tip of Chin	mm	1140	-454	382	1121	452	379
H-Point	mm	1225	-653	948	1216	644	932
Left Knee	mm	1644	-625	899	1643	409	871
Right Knee	mm	1639	-383	887	1639	628	889
Left Ankle	mm	1961	-589	1172	1935	417	1171
Right Ankle	mm	1946	-346	1174	1948	626	1171
Left Heel	mm	1982	-567	1308	1914	378	1302
Right Heel	mm	1968	-312	1307	1930	590	1302
Outboard Seat Anchor Bolt	mm	1448	-682	1251	1448	683	1246
Outboard Head Restraint Post	mm	889	-546	444	878	532	433
Top of Head Restraint	mm	939	-447	207	929	455	200
Center of Steering Wheel	mm	1558	-428	605			

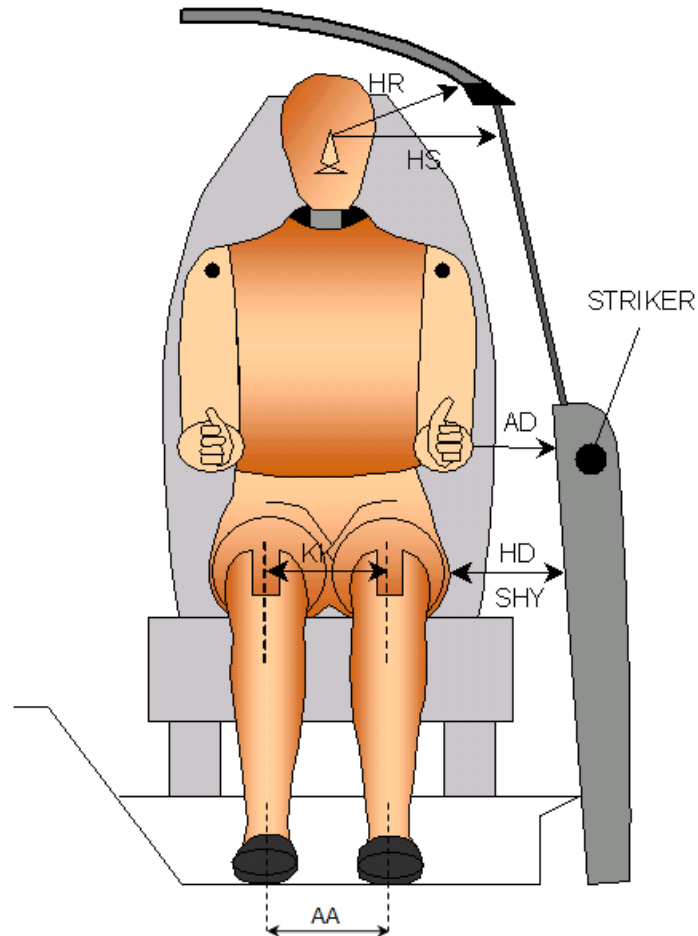
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

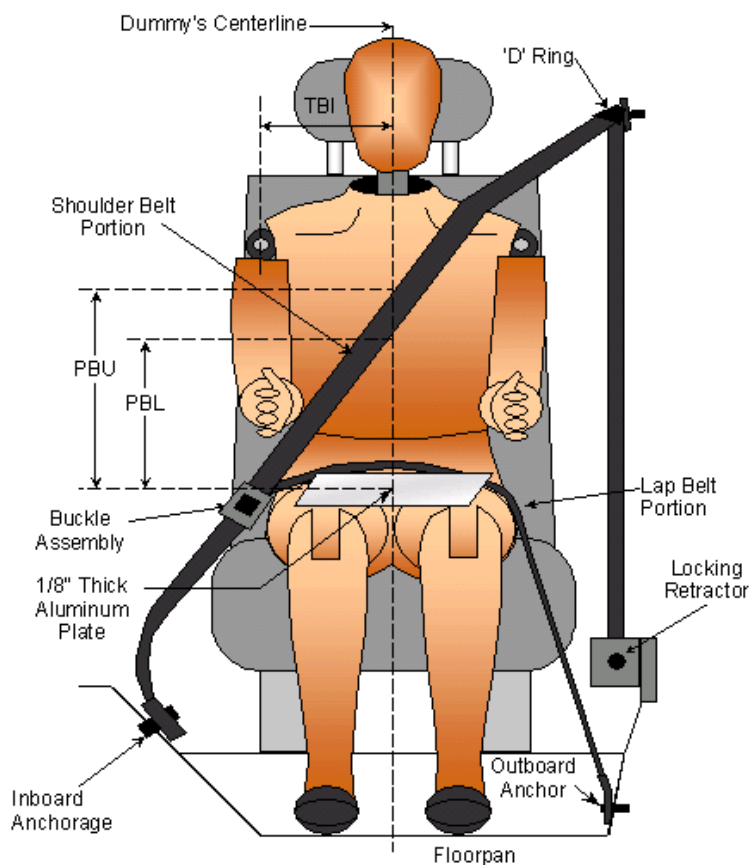


Code	Description	Units	Driver	Passenger
AD	Arm to Door	mm	150	57
HD	H-Point to Door	mm	120	125
HR	Head to Side Header	mm	185	188
HS	Head to Side Window	mm	335	335
KK	Knee to Knee	mm	290	270
SHY	Striker to H-Point (Y Direction)	mm	235	235
AA	Ankle to Ankle	mm	246	227

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	385	400
PBL — Top surface of reference to belt lower edge	mm	310	330

BELT LENGTH DATA

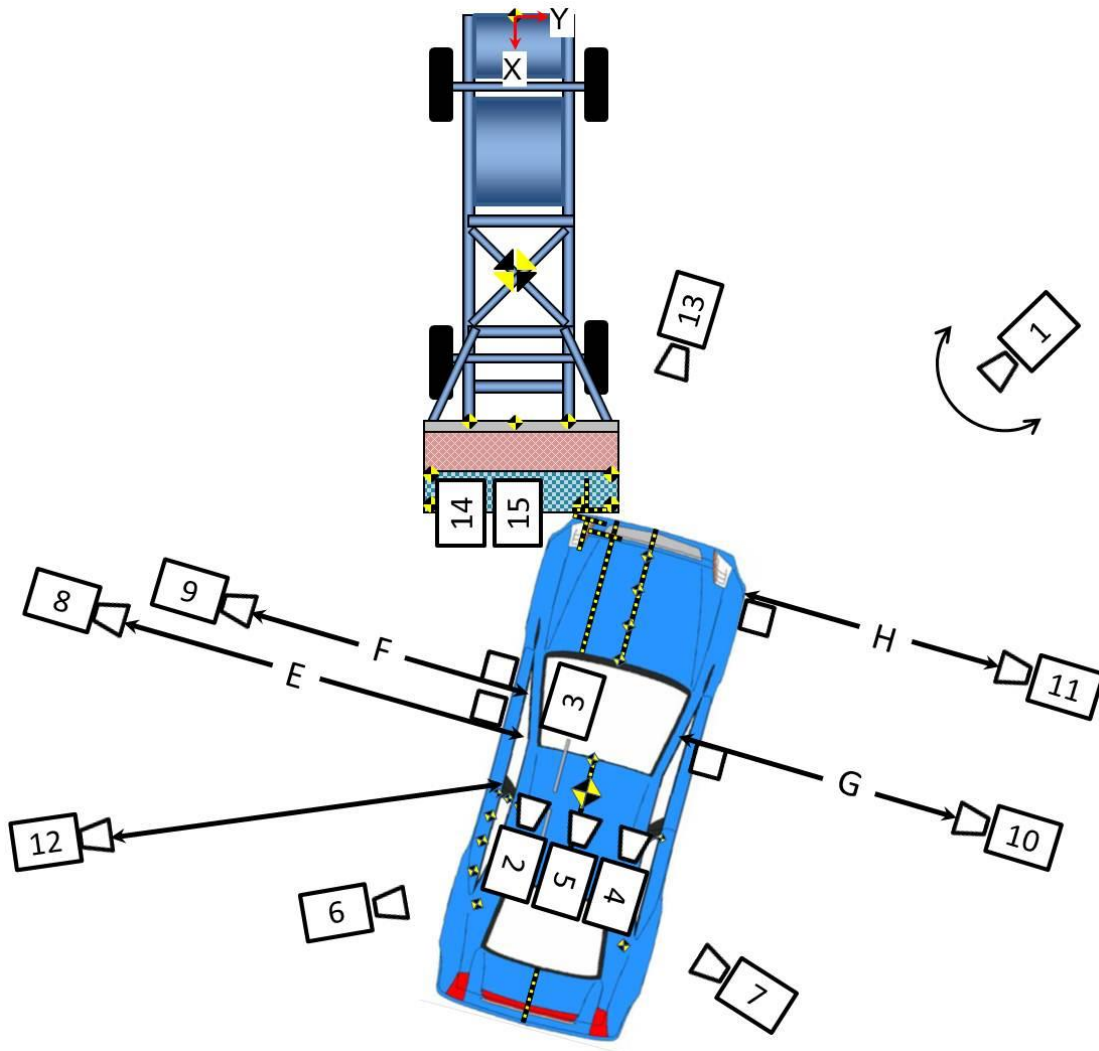
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	900	875
Lap Belt Length as measured on ATD	mm	670	670
Remainder of belt on reel	mm	830	855
Total belt length for continuous webbing systems	mm	2,400	2,400

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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

HORIZONTAL LOCATION



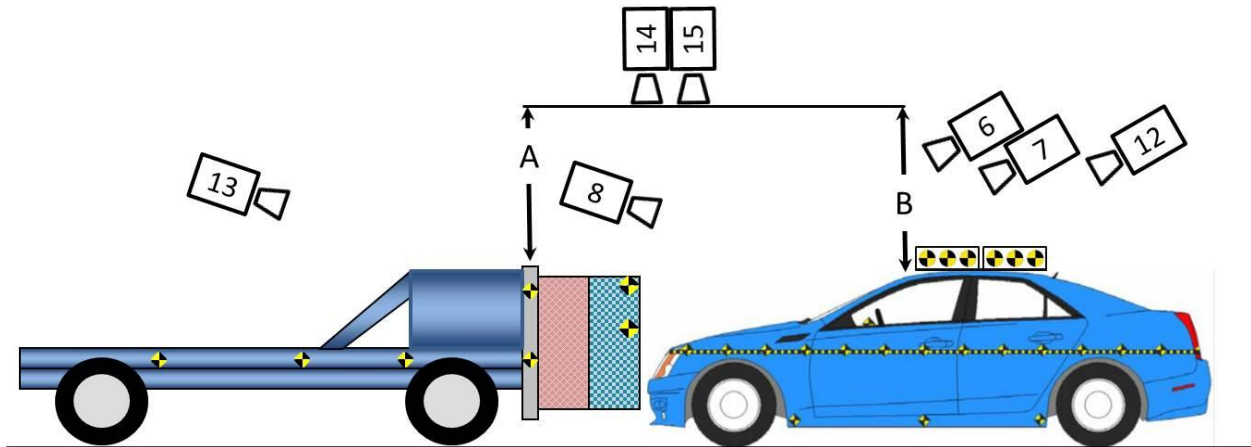
E	mm	9652
F	mm	6544
G	mm	8343
H	mm	8629

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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
Test Date: 1/8/2013

VERTICAL LOCATION



A	mm	3508
B	mm	3455

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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

CAMERA LOCATIONS

No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side	--	--	--	Zoom	30
2	Onboard Passenger Movement	7958	-421	1754	12.5	500
3	Onboard Driver Lower Leg	6551	-474	571	6.5	500
4	Onboard Driver Movement	7881	-75	1711	12.5	500
5	Onboard Centerline	8293	-730	1754	12.5	500
6	Driver Interaction	7176	2090	3570	24	1000
7	Passenger Interaction	12253	-10770	2269	50	1000
8	Target Vehicle Left Side Perpendicular (High)	4859	9654	3409	24-70	1000
9	Target Vehicle Driver Motion	5813	6524	954	24	1000
10	Target Vehicle Passenger Motion	9516	-10183	1759	50	1000
11	Target Vehicle Right Side	8555	-10140	1959	24	1000
12	Target Vehicle Left Side (High)	10246	8506	3124	28-70	1000
13	RMDB/Target Vehicle Interaction	4203	1184	2007	13	1000
14	Close-up Impact Point	4840	-1080	4719	28	1000
15	Overall Impact	6269	-585	5317	14	1000

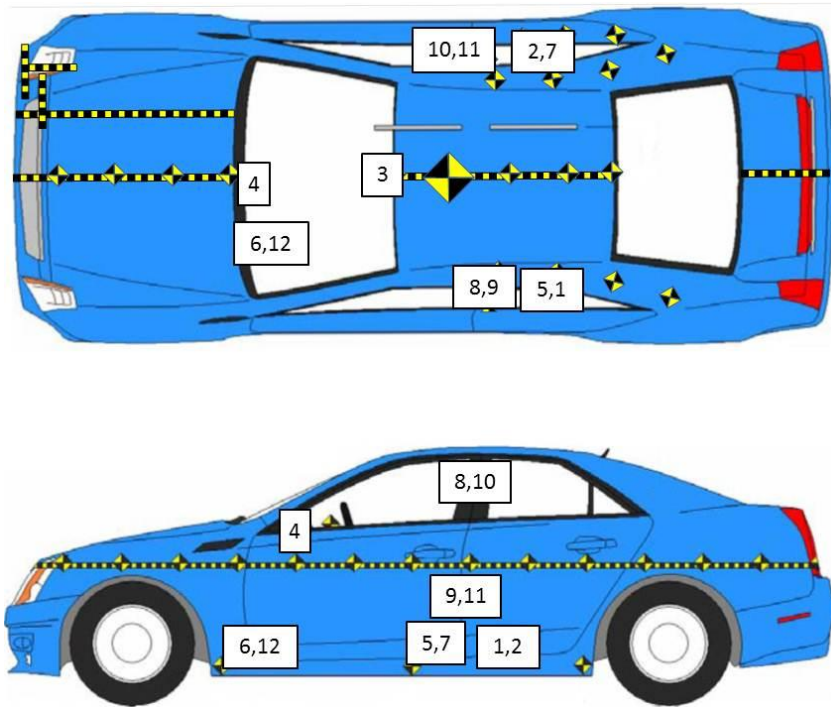
Reference Point: Center most rearward point of the RMDB when in contact with the target vehicle:

- +X – From back of RMDB to front of RMDB
- +Y – Right of monorail center
- +Z – Up from ground

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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Axes	Units	Measurements (mm)		
				X	Y	Z
1	Left Rear Sill	X,Y	mm	396	-672	1248
2	Right Rear Sill	X,Y	mm	365	679	1242
3	Vehicle CG	X,Y,Z	mm	1671	3	1138
4	Instrument Panel	X	mm	1728	-9	700
5	Driver Seat Track	X,Y,Z	mm	1016	-576	1281
6	Behind Brake Pedal	X,Y,Z	mm	2328	-464	1120
7	Passenger Seat Track	X,Y,Z	mm	1015	562	1272

Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
Test Date: 1/8/2013

VEHICLE INSTRUMENTATION DATA

Loc.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Max	Time (ms)
1	Left Rear Sill	X	g	2.27	158.20	-25.48	48.65
		Y	g	15.35	71.15	-5.02	94.70
2	Right Rear Sill	X	g	2.76	123.40	-31.90	50.90
		Y	g	15.69	50.15	-3.93	94.20
3	Vehicle CG	X	g	16.38	67.30	-31.67	59.50
		Y	g	27.16	48.55	-4.84	108.75
		Z	g	76.89	62.00	-55.25	67.15
4	Instrument Panel	X	g	38.34	72.85	-63.77	68.25
5	Driver Seat Track	X	g	2.00	158.15	-28.09	48.60
		Y	g	15.29	49.50	-3.49	103.95
		Z	g	9.58	33.05	-11.21	54.70
6	Behind Brake Pedal	X	g	110.64	52.80	-248.74	44.95
		Y	g	48.74	54.55	-41.92	46.35
		Z	g	28.87	64.45	-78.39	46.65
7	Passenger Seat Track	X	g	2.64	123.40	-31.78	50.75
		Y	g	18.49	49.80	-4.27	103.80
		Z	g	15.34	44.25	-10.04	73.05
8	Driver Shoulder Belt		N	2,979.36	56.15	-21.57	12.85
9	Driver Lap Belt		N	2,374.65	60.60	-0.56	-22.25
10	Passenger Shoulder Belt		N	2,889.28	53.70	-19.76	12.90
11	Passenger Lap Belt		N	4,152.77	69.85	-1.29	-50.00
12	Driver Floor Pan String Pot		mm	0.02	3.55	-49.63	68.10

TIME TO FIRE RESTRAINT TIMING

Loc.	Description	Axes	Units	Time to Fire (ms)
1	Driver Air Bag Squib 1	*	V	16.7
2	Driver Air Bag Squib 2	*	V	19.3
3	Driver Curtain Airbag	*	V	17.8
4	Driver Torso Airbag	*	V	Did Not Fire
5	Driver Knee Airbag	*	V	Not Monitored/Applicable
6	Driver Pretensioner	*	V	11.7
7	Passenger Air Bag Squib 1	*	V	17
8	Passenger Air Bag Squib 2	*	V	19.4
9	Passenger Curtain Airbag	*	V	Airbag Disabled
10	Passenger Torso Airbag	*	V	Airbag Disabled
11	Passenger Knee Airbag	*	V	Not Monitored/Applicable
12	Passenger Pretensioner	*	V	11.7

* The measurement indicates the time the voltage changed

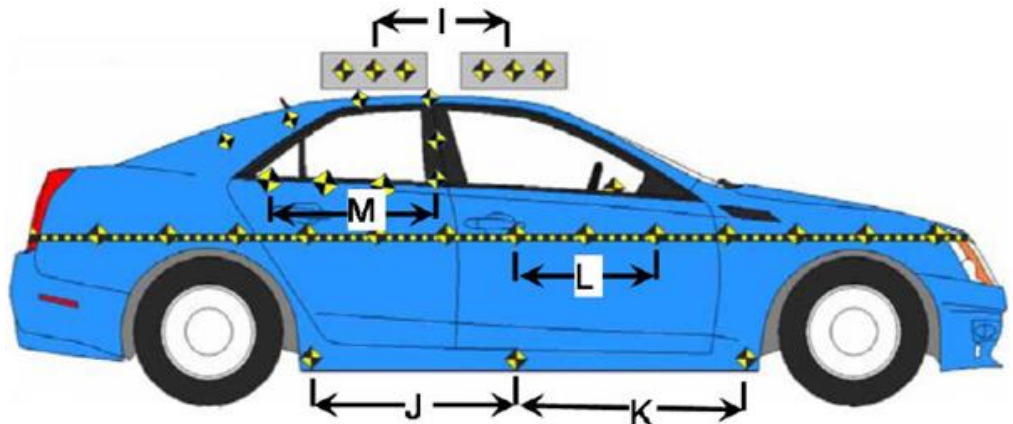
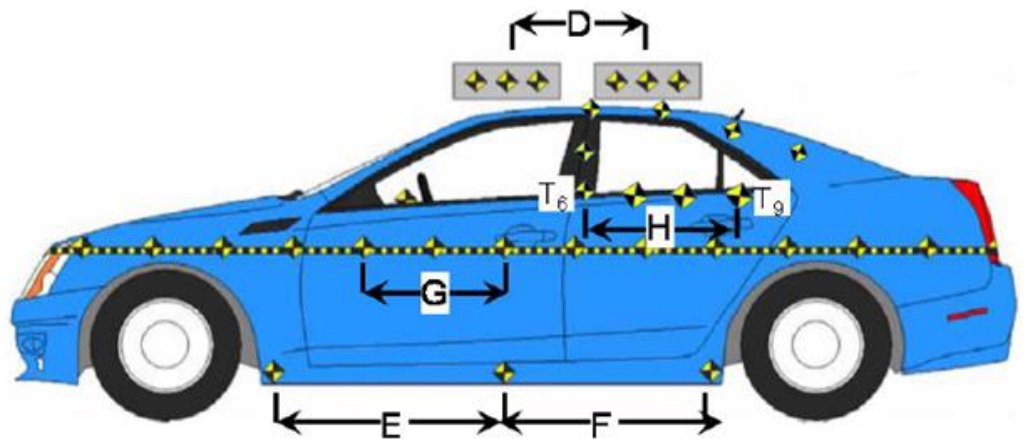
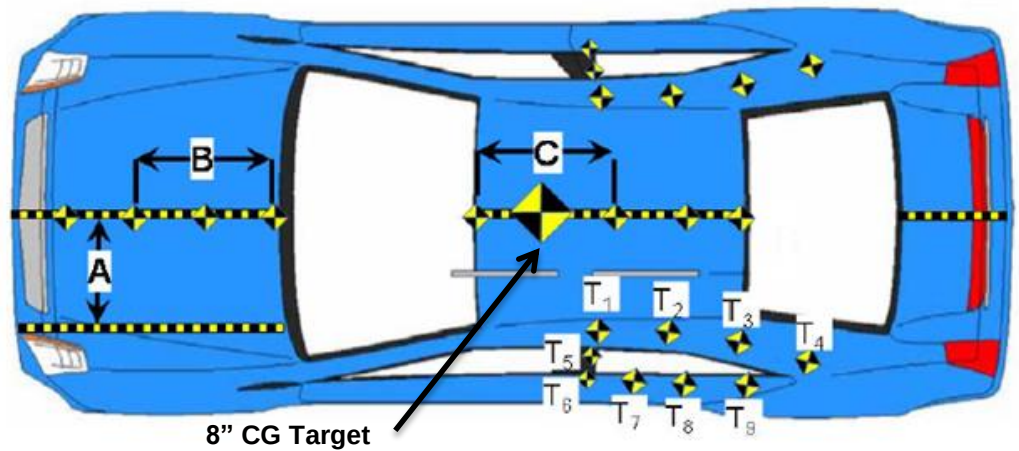
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

Item	Units	Value
A	mm	305
B	mm	1220
C	mm	1220
D	mm	612
E	mm	1008
F	mm	1007
G	mm	1220
H	mm	770
I	mm	612
J	mm	1011
K	mm	1013
L	mm	1220
M	mm	775

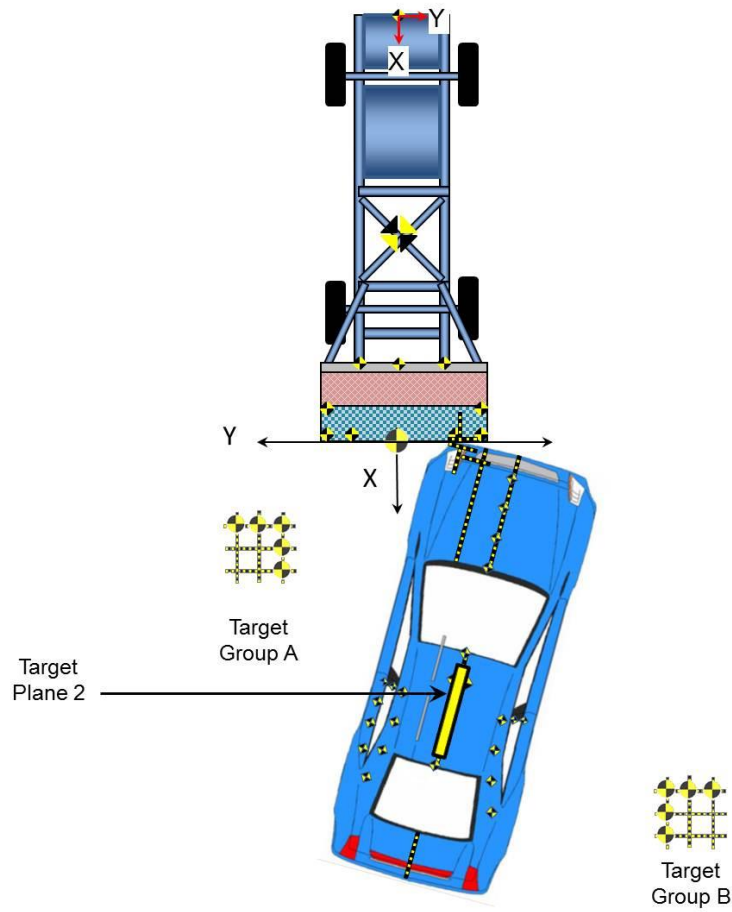
Note: All 6" targets on the centerline of the hood and roof are 610mm apart



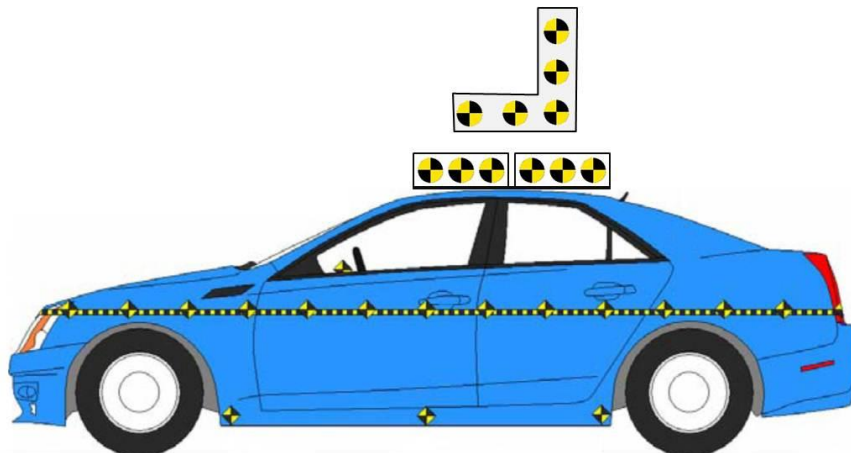
DATA SHEET NO. 8 (CONTINUED)
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
Test Date: 1/8/2013



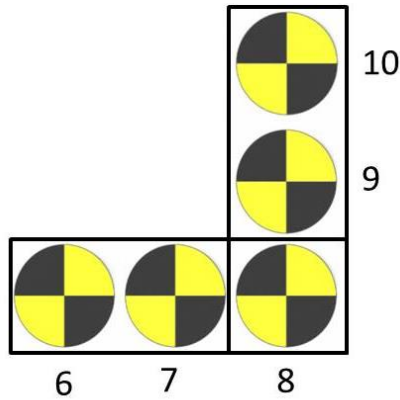
Target Plane 2



DATA SHEET NO. 8 (CONTINUED)
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



Vertical Target
 Plane 2
 (Over Roof)

Target	Units	X	Y	Z
1	mm			
2	mm			
3	mm			
4	mm			
5	mm			
6*	mm	1196	-475	-210
7*	mm	891	-481	-215
8*	mm	587	-489	-223
9*	mm	577	-515	-524
10*	mm	581	-541	-829
11	mm			
12	mm			
13	mm			
14	mm			
15	mm			

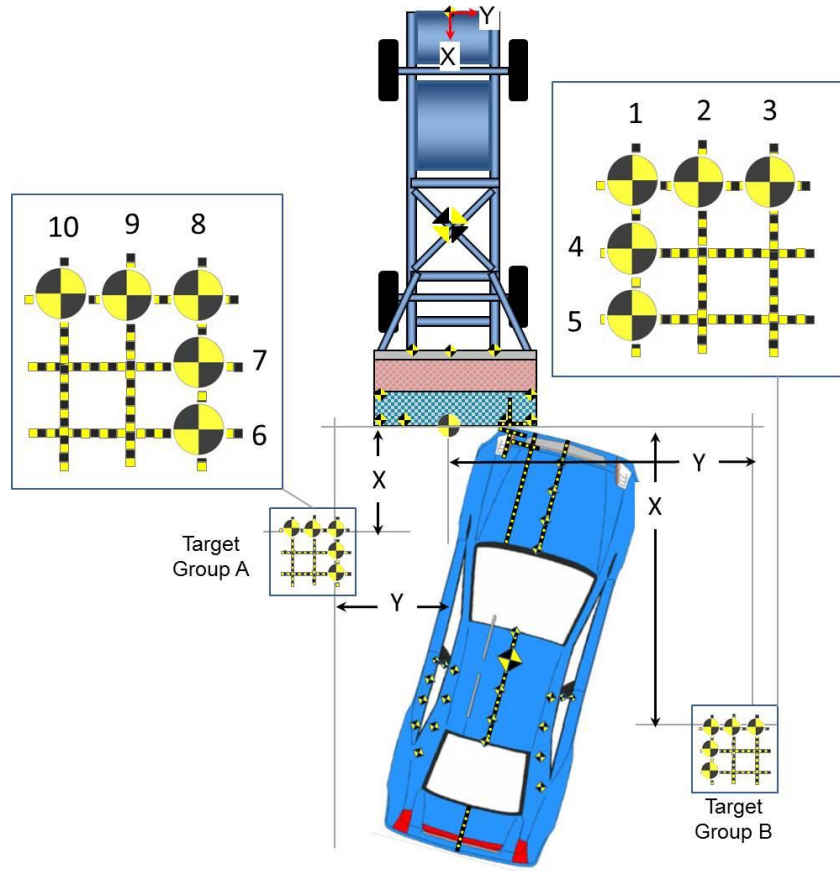
***NOTE:**

- Targets 6-10 are in reference to the vehicle coordinate system
- Vertical Target Plane 1&3 were removed for this test per James Saunders

DATA SHEET NO. 8 (CONTINUED)
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



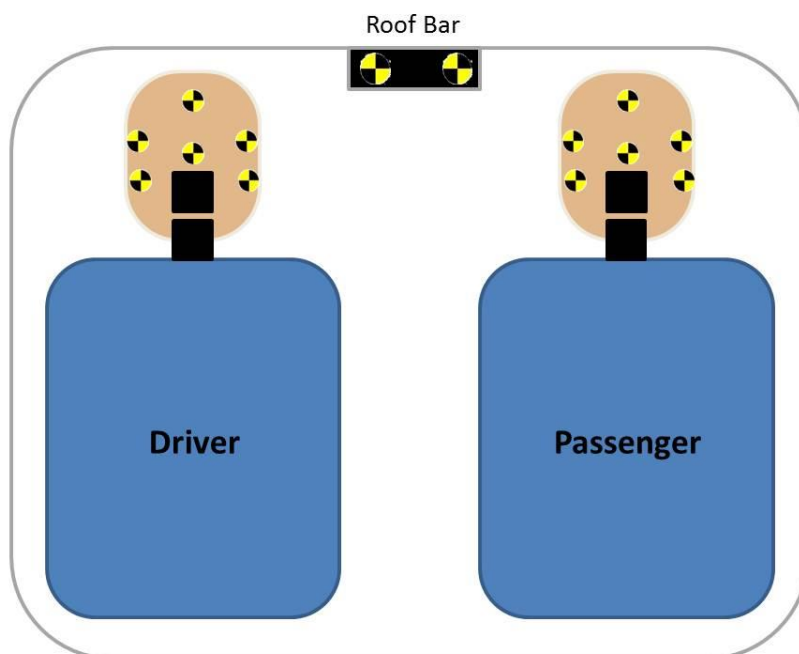
Target	Units	X	Y
1	mm	3198	1820
2	mm	3198	2122
3	mm	3198	2425
4	mm	3500	1820
5	mm	3803	1820
6	mm	1678	615
7	mm	1382	615
8	mm	1068	615
9	mm	1068	923
10	mm	1068	1916

Note: Target Locations are in reference to the front center of RMDB

DATA SHEET NO. 8 (CONTINUED)
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



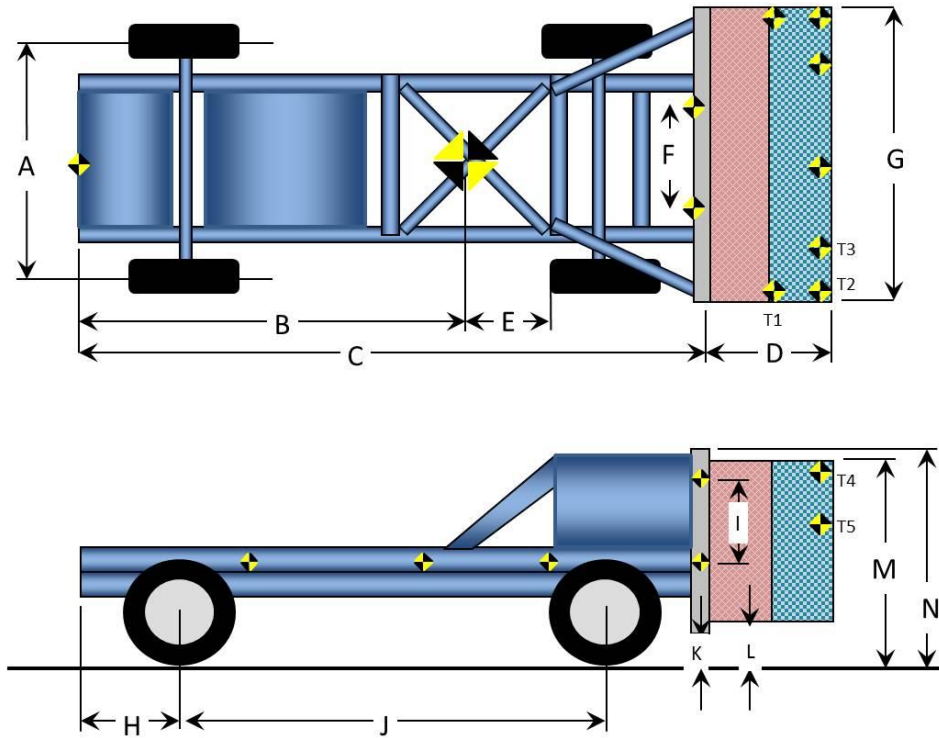
Point	Pre-Test		
	X	Y	Z
Roof Bar Driver	1621	-73	190
Roof Bar Passenger	1619	50	189

Note: Rear target bar was not used for this test per James Saunders.

DATA SHEET NO. 8 (CONTINUED)
RMDB PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



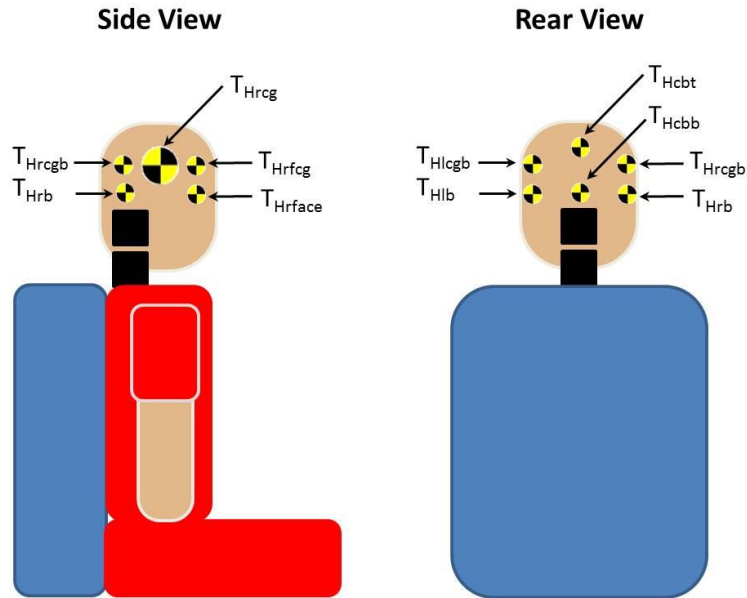
Item	Units	Value	Item	Units	Value
A	mm	1930	H	mm	800
B	mm	2451	I	mm	500
C	mm	3995	J	mm	2555
D	mm	605	K	mm	77
E	mm	904	L	mm	71
F	mm	1123	M	mm	1024
G	mm	2205	N	mm	1177

	Units	Front Axle	Rear Axle	Total
Left	kg	802.0	453.6	1255.6
Right	kg	807.4	427.7	1235.1
Ratio	%	65	35	100
Total	kg	1609.4	881.3	2490.7
CG Aft of Front Axle	mm			904

DATA SHEET NO. 8 (CONTINUED)
DUMMY PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



Driver Dummy Head Targets (THOR007)

Measurement	Units	Value
Distance between T _{Hrcg} & T _{Hrfcg}	mm	50
Distance between T _{Hrcg} & T _{Hrcgb}	mm	40
Distance between T _{Hrcgb} & T _{Hrb}	mm	70
Distance between T _{Hrfcg} & T _{Hrfce}	mm	70
Distance between T _{Hlcbg} & T _{Hlfcg}	mm	50
Distance between T _{Hlcbg} & T _{Hlcb}	mm	40
Distance between T _{Hlcbg} & T _{Hlcb}	mm	70
Distance between T _{Hlfcg} & T _{Hlfce}	mm	70
Distance between T _{Hcbb} & T _{Hcbb}	mm	67

Passenger Dummy Head Targets (THOR016)

Measurement	Units	Value
Distance between T _{Hrcg} & T _{Hrfcg}	mm	50
Distance between T _{Hrcg} & T _{Hrcgb}	mm	40
Distance between T _{Hrcgb} & T _{Hrb}	mm	70
Distance between T _{Hrfcg} & T _{Hrfce}	mm	70
Distance between T _{Hlcbg} & T _{Hlfcg}	mm	50
Distance between T _{Hlcbg} & T _{Hlcb}	mm	40
Distance between T _{Hlcbg} & T _{Hlcb}	mm	70
Distance between T _{Hlfcg} & T _{Hlfce}	mm	70
Distance between T _{Hcbb} & T _{Hcbb}	mm	67

DATA SHEET NO. 9
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
Test Date: 1/8/2013

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	93
Passenger Dummy Accelerometers	93
Vehicle Structure Accelerometers	38
RMDB Cart Accelerometers	6
Total	230

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	4
High-Speed Off-board	10
Real-Time Panning	1
Total	15

DATA SHEET NO. 10 - POST TEST OBSERVATIONS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Right Front Passenger
Dummy Type/Serial No.	THOR 007	THOR 016
Lower Leg Type	THOR LOWER LEG LX	THOR LOWER LEG LX
Lower Leg Serial No.	LX036 / LX037	LX018 / LX019
Head Contact	Front airbag, curtain airbag & side head liner	Front airbag & shifter
Upper Torso Contact	Front airbag, curtain airbag & driver's door	Front airbag & center console
Lower Torso Contact	None	Center Console
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

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

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions	Photo Taken (Y/N)
Pillar Performance	Drivers A-Pillar buckled slightly	Y
Windshield Damage	Cracks throughout, but no penetrations	Y
Window Damage	None	Y
Other Notable Effects	None	--

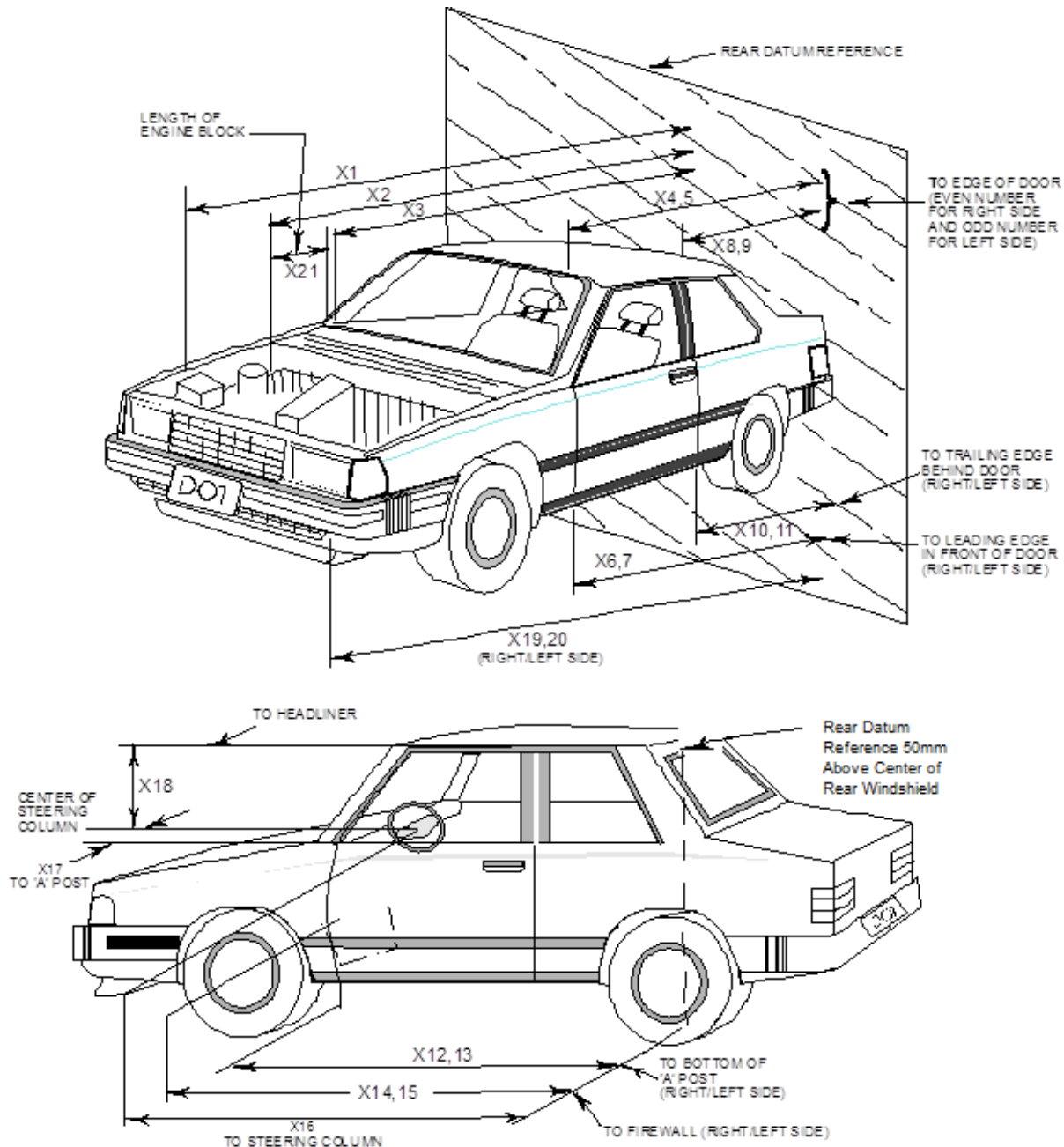
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver (Occupant 1)		Right Front Passenger (Occupant 2)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Curtain Airbag	Yes	Yes	Yes	No
Torso Airbag	Yes	No	Yes	No
Knee Airbag	No	NA	No	NA
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



DATA SHEET NO. 11 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	3623	3272	351
2	Rear Surface of Vehicle (RSOV) to Front of Engine	mm	2902	2808	94
3	RSOV to Firewall	mm	2430	2372	58
4	RSOV to Upper Leading Edge of Right Door	mm	2062	2011	51
5	RSOV to Upper Leading Edge of Left Door	mm	2057	2037	20
6	RSOV to Lower Leading Edge of Right Door	mm	2011	1965	46
7	RSOV to Lower Leading Edge of Left Door	mm	2006	1987	19
8	RSOV to Upper Trailing Edge of Right Door	mm	871	821	50
9	RSOV to Upper Trailing Edge of Left Door	mm	869	849	20
10	RSOV to Lower Trailing Edge of Right Door	mm	863	818	45
11	RSOV to Lower Trailing Edge of Left Door	mm	860	841	19
12	RSOV to Bottom of "A" Post of Right Side	mm	2012	1963	49
13	RSOV to Bottom of "A" Post of Left Side	mm	2013	1988	25
14	RSOV to Firewall, Right Side	mm	2426	2380	46
15	RSOV to Firewall, Left Side	mm	2421	2271	150
16	RSOV to Steering Column	mm	1559	1504	55
17	Center of Steering Column to "A" Post	mm	294	266	28
18	Center of Steering Column to Headliner	mm	439	446	-7
19	RSOV to Right Side of Front Bumper	mm	3576	3540	36
20	RSOV to Left Side of Front Bumper	mm	3576	2853	723
21	Length of Engine Block	mm	605	577	28
RD	RSOV to Right Side of Dash Panel	mm	1742	1696	46
CD	RSOV to Center of Dash Panel	mm	1775	1731	44
LD	RSOV to Left Side of Dash Panel	mm	1743	1674	69

DATA SHEET NO. 12
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

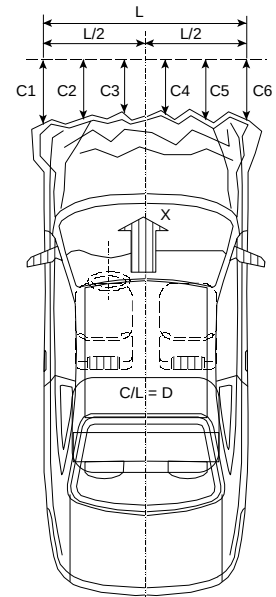
NHTSA No.: RC0185
Test Date: 1/8/2013

VEHICLE INFORMATION

VIN: 3GCPCPEA7CG248097 Wheelbase (mm): 3658
Vehicle Size Category: Passenger Test Weight (kg): 2624.0

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): 89.66
Velocity Change (kph): 89.66



CRUSH PROFILE

Collision Deformation Classification: 11FYEW5
Midpoint of Damage: C2
Damage Region Length (mm): 1398
Impact Mode: Frontal 15° Angle, 35% Left Offset

Crush Measurements: Bumper Cover

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	3531	2726	805
C2	Crush zone 2 at left side	mm	3576	2888	688
C3	Crush zone 3 at left side	mm	3590	3089	501
C4	Crush zone 4 at right side	mm	3589	3298	291
C5	Crush zone 5 at right side	mm	3575	3479	96
C6	Crush zone 6 at right side	mm	3531	3628	-97
L	C1 to C6	mm	1398	1022	376

Crush Measurements: Bumper Cover Removed

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
B1	Bumper Beam 1 at left side	mm	3192	2423	-768
B2	Bumper Beam 2 at left side	mm	3447	2577	-870
B3	Bumper Beam 3 at left side	mm	3564	2799	-765
B4	Bumper Beam 4 at left side	mm	3603	3010	-592
B5	Bumper Beam 5 at right side	mm	3622	3224	-398
B6	Bumper Beam 6 at right side	mm	3601	3423	-177
B7	Bumper Beam 7 at right side	mm	3561	3585	24
B8	Bumper Beam 8 at right side	mm	3432	3554	123
B9	Bumper Beam 9 at right side	mm	3187	3298	111
L	B1 to B9	mm	1944	1640	304

DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

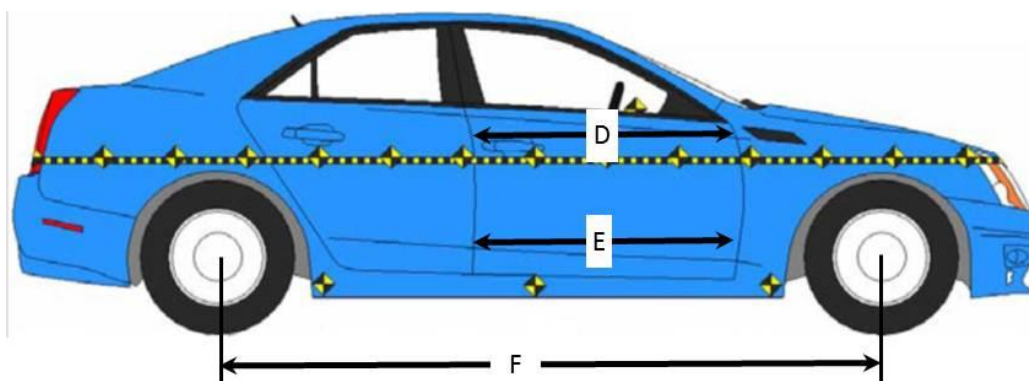
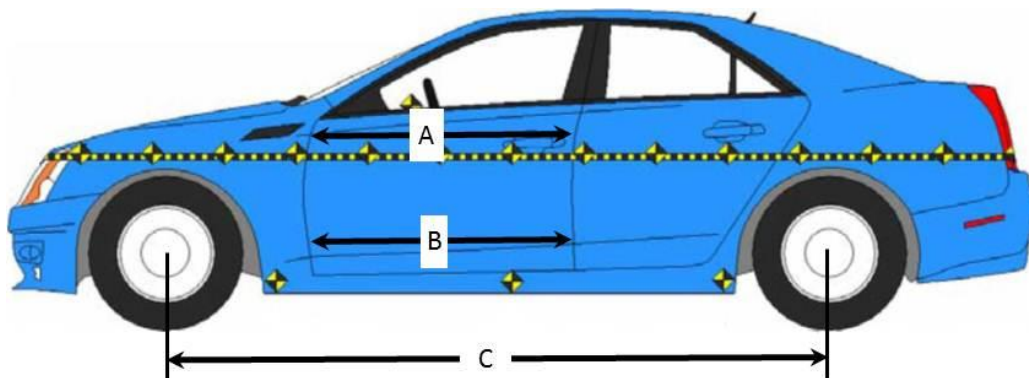
NHTSA No.: RC0185
 Test Date: 1/8/2013

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1115	1083	-32
B	Left Side Lower	mm	1103	1079	-24
D	Right Side Upper	mm	1114	1113	-1
E	Right Side Lower	mm	1102	1099	-3

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3658	3334	-324
F	Right Side Wheelbase	mm	3658	3681	23



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

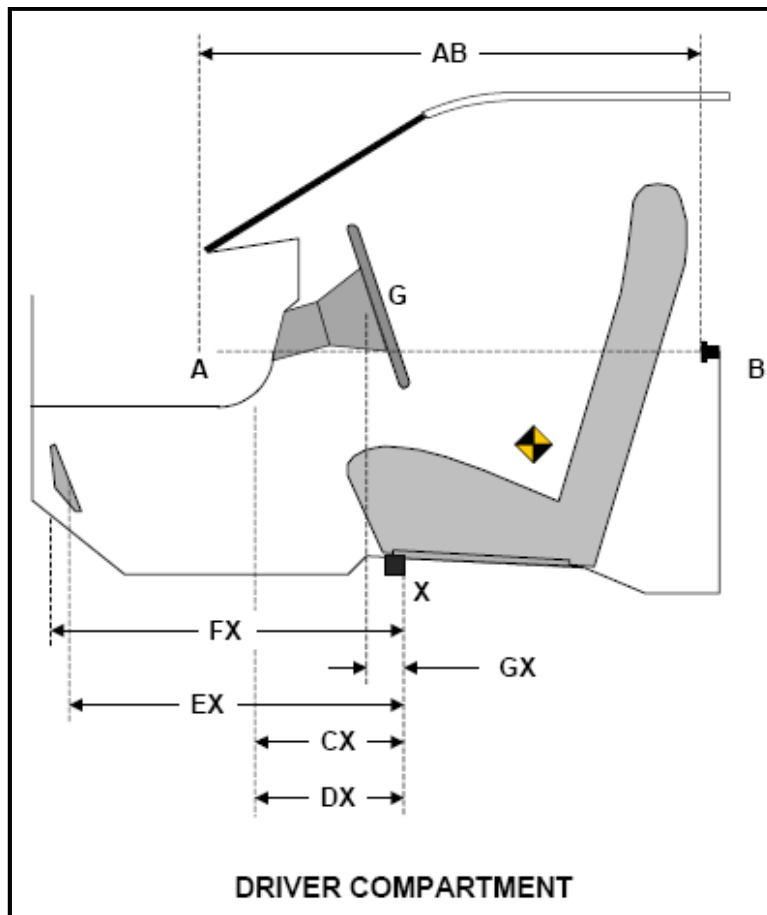
Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	808	807	-1
CX	Left Knee Bolster to X	mm	321	288	-33
DX	Right Knee Bolster to X	mm	317	279	-38
EX	Brake Pedal to X	mm	553	289	-264
FX	Foot Rest to X	mm	705	622	-83
GX	Center of Steering Column Wheel Hub to X	mm	110	67	-43

X = Front of Seat Track (Stationary)



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

DRIVER SIDE DOOR SILL INTRUSIONS



Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
1	2012	-851	1128	1974	-824	1118	-38	27	-10
2	2008	-850	1055	1968	-829	1044	-40	21	-11
3	2009	-850	978	1967	-832	967	-42	18	-11
4	2015	-846	676	1971	-837	666	-44	9	-10
5	1987	-835	601	1946	-822	590	-41	13	-11
6	1940	-833	528	1908	-816	512	-32	17	-16
7	1802	-841	1349	1790	-805	1358	-12	36	9
8	1654	-840	1347	1643	-809	1354	-11	31	7
9	1503	-838	1344	1493	-811	1349	-10	27	5
10	1925	-850	1342	1910	-813	1343	-15	37	1
11	2003	-850	1250	1970	-816	1240	-33	34	-10
12	2020	-849	877	1977	-836	867	-43	13	-10
13	2027	-849	776	1982	-839	765	-45	10	-11
14	1877	-816	464	1850	-798	443	-27	18	-21
15	1813	-796	407	1790	-778	381	-23	18	-26
16	1746	-775	350	1728	-758	321	-18	17	-29

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	1679	-755	296	1666	-738	261	-13	17	-35
18	1609	-737	243	1600	-722	203	-9	15	-40
19	1535	-719	199	1530	-707	153	-5	12	-46
20	1455	-706	163	1451	-698	116	-4	8	-47
21	1370	-697	138	1365	-690	95	-5	7	-43
22	1281	-692	124	1277	-686	93	-4	6	-31
23	1193	-689	115	1188	-681	95	-5	8	-20
24	1106	-687	109	1102	-677	100	-4	10	-9
25	1019	-683	106	1014	-677	106	-5	6	0
26	932	-680	107	926	-674	112	-6	6	5
27	1412	-838	1343	1402	-814	1349	-10	24	6
28	1319	-838	1342	1309	-816	1348	-10	22	6
29	1228	-837	1341	1217	-819	1347	-11	18	6
30	1138	-836	1340	1126	-821	1346	-12	15	6
31	1048	-835	1333	1037	-825	1340	-11	10	7
32	974	-847	1303	963	-836	1308	-11	11	5

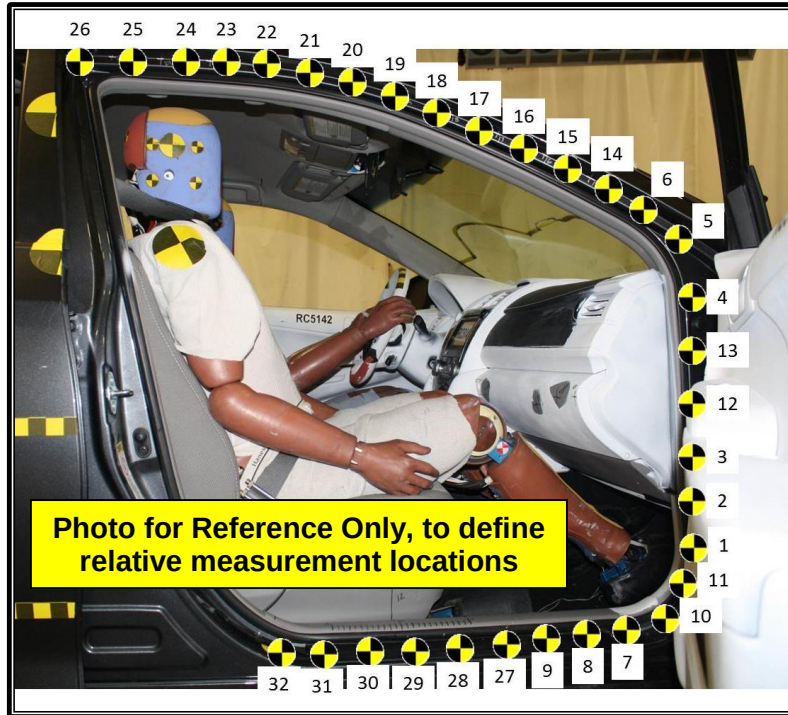
Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

PASSENGER SIDE DOOR SILL INTRUSIONS



Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
1	2008	844	1129	1957	912	1108	-51	68	-21
2	2007	843	1053	1957	910	1032	-50	67	-21
3	2006	843	979	1957	909	957	-49	66	-22
4	2015	838	677	1968	900	657	-47	62	-20
5	1989	829	601	1942	888	580	-47	59	-21
6	1946	827	528	1899	883	507	-47	56	-21
7	1802	838	1341	1750	903	1323	-52	65	-18
8	1651	838	1340	1600	895	1323	-51	57	-17
9	1499	837	1338	1448	886	1322	-51	49	-16
10	1926	845	1330	1874	916	1309	-52	71	-21
11	1995	844	1254	1943	916	1232	-52	72	-22
12	2017	843	877	1969	906	855	-48	63	-22
13	2023	841	778	1976	905	756	-47	64	-22
14	1885	810	466	1840	863	445	-45	53	-21
15	1821	790	408	1776	839	389	-45	49	-19
16	1756	769	353	1711	815	334	-45	46	-19

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

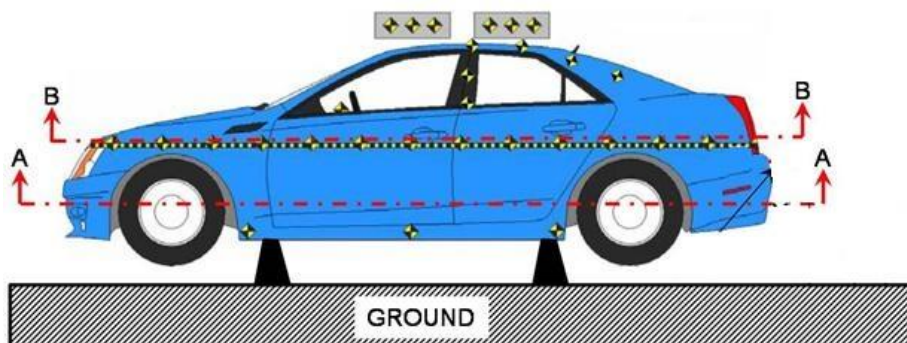
Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	1688	748	298	1645	791	280	-43	43	-18
18	1620	730	245	1577	770	227	-43	40	-18
19	1548	713	199	1506	749	182	-42	36	-17
20	1469	699	160	1427	732	143	-42	33	-17
21	1384	689	134	1342	720	118	-42	31	-16
22	1297	684	118	1255	711	103	-42	27	-15
23	1209	681	109	1167	706	94	-42	25	-15
24	1121	678	103	1079	701	89	-42	23	-14
25	1032	676	99	990	696	86	-42	20	-13
26	929	673	99	887	689	87	-42	16	-12
27	1411	837	1337	1359	883	1322	-52	46	-15
28	1320	837	1336	1269	879	1322	-51	42	-14
29	1230	837	1334	1179	873	1321	-51	36	-13
30	1137	837	1333	1086	869	1323	-51	32	-10
31	1050	840	1328	999	866	1318	-51	26	-10
32	970	847	1293	919	870	1283	-51	23	-10

Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

DATA SHEET NO.13 (CONTINUED) VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
Test Date: 1/8/2013



Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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

VEHICLE EXTERIOR CRUSH PROFILE SECTION A-A

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
1	3099	-1010	1209	1	1769	-925	1208
2	3188	-993	1208	2	1860	-920	1208
3	3258	-975	1208	3	2019	-913	1209
4	3348	-935	1209	4	2122	-889	1209
5	3424	-878	1210	5	2163	-855	1208
6	3478	-812	1209	6	2281	-671	1208
7	3518	-740	1209	7	2455	-723	1209
8	3540	-682	1208	8	2722	-628	1209
9	3558	-598	1209	9	2668	-441	1209
10	3576	-497	1208	10	2684	-358	1208
11	3589	-398	1210	11	2773	-290	1209
12	3600	-303	1209	12	2898	-212	1208
13	3607	-228	1210	13	3005	-163	1208
14	3612	-150	1209	14	3199	125	1208
15	3618	-58	1209	15	3303	263	1209
16	3621	-3	1210	16	3480	399	1209
17	3617	70	1209	17	3596	615	1209
18	3613	140	1210	18	3636	703	1208
19	3604	256	1210	19	3638	774	1208
20	3596	340	1210	20	3585	850	1209
21	3586	421	1209	21	3507	931	1208
22	3574	505	1208	22	3380	980	1209
23	3561	581	1209	23	3251	999	1208
24	3546	655	1209	24	2895	1170	1209
25	3531	710	1209	25	2554	1140	1209

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	3468	829	1209	26	2124	1082	1208
27	3390	909	1208	27	2043	1056	1209
28	3318	952	1209	28	1883	1047	1208
29	3251	978	1209	29	1755	1043	1209
30	3187	994	1209	30	1546	1036	1208
31	3121	1007	1210	31	1333	1027	1208
32	3081	1013	1210	32	1098	1017	1208
33	2176	1010	1207	33	905	1008	1208
34	2126	996	1209	34	734	1000	1209
35	2077	984	1210	35	672	997	1208
36	1983	982	1208	36	523	992	1208
37	1816	984	1209	37	297	983	1209
38	1624	985	1209	38	79	974	1208
39	1422	986	1209	39	-100	966	1209
40	1272	987	1209	40	-219	953	1209
41	1131	986	1209	41	-298	969	1208
42	995	986	1208	42	-441	971	1210
43	876	985	1209	43	-581	972	1208
44	691	984	1207	44	-1537	977	1208
45	555	983	1208	45	-1581	947	1208
46	417	982	1209	46	-1714	926	1209
47	266	980	1208	47	-1799	910	1209
48	120	978	1209	48	-1924	906	1208
49	-58	975	1209	49	-2005	893	1208
50	-196	970	1208	50	-2152	857	1209
51	-271	985	1210	51	-2171	834	1209
52	-387	989	1208	52	-2193	710	1209
53	-487	992	1209	53	-2214	530	1207
54	-554	993	1208	54	-2220	473	1208
55	-1521	996	1210	55	-2239	406	1208
56	-1588	980	1210	56	-2233	382	1209
57	-1688	974	1209	57	-2155	320	1208
58	-1783	968	1209	58	-2110	261	1208
59	-1863	948	1210	59	-2102	145	1209
60	-1913	965	1210	60	-2100	-199	1208
61	-1996	950	1209	61	-2108	-321	1208
62	-2088	925	1209	62	-2155	-381	1208
63	-2143	900	1210	63	-2223	-436	1208
64	-2175	829	1208	64	-2236	-462	1209
65	-2187	706	1208	65	-2233	-514	1208
66	-2196	595	1208	66	-2217	-536	1208

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
66	-2196	595	1208	66	-2203	-691	1208
67	-2204	513	1208	67	-2187	-850	1209
68	-2223	437	1208	68	-2181	-880	1208
69	-2213	414	1208	69	-2140	-928	1208
70	-2176	366	1210	70	-2014	-966	1208
71	-2142	357	1208	71	-1924	-984	1208
72	-2106	316	1208	72	-1878	-966	1209
73	-2087	259	1209	73	-1776	-988	1208
74	-2100	245	1210	74	-1671	-995	1208
75	-2101	186	1210	75	-1600	-998	1209
76	-2086	173	1210	76	-559	-995	1209
77	-2086	121	1209	77	-2203	-691	1208
78	-2086	-123	1209				
79	-2090	-192	1208				
80	-2093	-274	1207				
81	-2102	-310	1210				
82	-2142	-358	1211				
83	-2192	-399	1210				
84	-2221	-421	1209				
85	-2220	-490	1207				
86	-2204	-513	1210				
87	-2193	-648	1209				
88	-2181	-787	1209				
89	-2170	-862	1210				
90	-2150	-897	1208				
91	-2091	-928	1207				
92	-1985	-956	1210				
93	-1921	-968	1209				
94	-1825	-963	1207				
95	-1769	-975	1209				
96	-1695	-980	1210				
97	-1596	-985	1209				
98	-1551	-987	1209				
99	-1500	-1000	1210				
100	-553	-990	1211				
101	-422	-987	1208				
102	-310	-983	1208				
103	-215	-969	1209				
104	-101	-970	1210				
105	-9	-974	1210				
106	162	-977	1209				

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

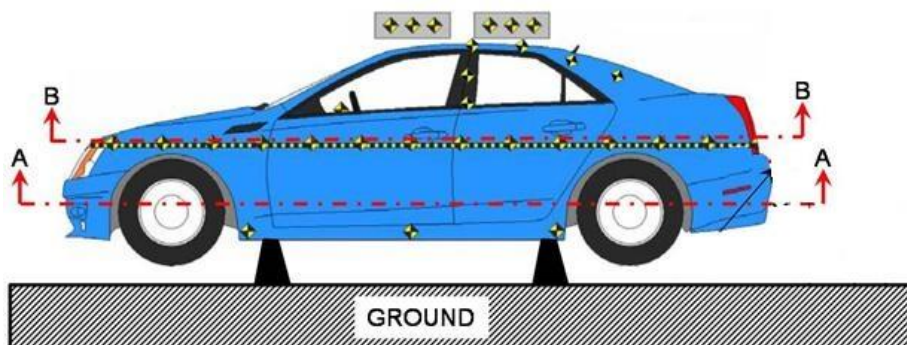
VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test		
	X	Y	Z
107	363	-979	1208
108	530	-981	1208
109	712	-982	1210
110	847	-982	1208
111	1018	-983	1207
112	1154	-984	1207
113	1274	-983	1208
114	1306	-985	1213
115	1361	-985	1214
116	1477	-985	1211
117	1626	-985	1208
118	1755	-984	1208
119	1868	-983	1208
120	1980	-981	1209
121	2058	-983	1209
122	2088	-985	1208
123	2122	-996	1209
124	2184	-1010	1210
125	3099	-1010	1209

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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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

VEHICLE EXTERIOR CRUSH PROFILE **SECTION B-B**

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
1	2747	-962	723	1	1908	-912	722
2	2833	-954	723	2	2032	-903	723
3	2916	-942	723	3	2098	-874	723
4	2993	-929	723	4	2173	-909	722
5	3069	-914	723	5	2234	-874	723
6	3139	-895	722	6	2345	-745	723
7	3204	-871	722	7	2400	-696	723
8	3256	-838	722	8	2456	-449	722
9	3291	-794	721	9	2511	-253	723
10	3326	-745	724	10	2576	-163	722
11	3370	-705	721	11	2691	-107	723
12	3400	-666	720	12	2807	-30	722
13	3420	-608	721	13	2985	100	723
14	3434	-555	722	14	3177	422	722
15	3447	-490	722	15	3254	665	723
16	3468	-363	721	16	3244	709	723
17	3486	-225	722	17	3181	820	722
18	3499	-91	723	18	3289	949	722
19	3504	-3	722	19	3150	1028	722
20	3501	67	723	20	3004	1078	723
21	3494	154	723	21	2833	1089	722
22	3485	242	723	22	2656	1088	723
23	3469	365	722	23	2505	1079	723
24	3455	453	722	24	2369	1068	722
25	3437	544	722	25	2093	1009	723

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	3416	625	720	26	1991	1017	723
27	3393	683	723	27	1845	1015	723
28	3363	713	723	28	1660	1010	722
29	3330	743	724	29	1413	1003	723
30	3302	785	723	30	1223	998	723
31	3272	826	721	31	1003	990	723
32	3212	870	722	32	833	984	722
33	3141	896	722	33	702	981	723
34	3055	919	722	34	650	979	723
35	2975	935	722	35	538	975	722
36	2881	949	721	36	354	971	722
37	2775	962	722	37	181	985	723
38	2647	971	722	38	-93	959	724
39	2531	976	722	39	-178	950	723
40	2407	977	721	40	-260	949	722
41	2331	977	722	41	-410	970	722
42	2254	973	722	42	-581	974	722
43	2228	969	722	43	-729	976	722
44	2168	948	724	44	-858	977	722
45	2092	946	722	45	-955	977	722
46	1985	949	722	46	-1111	977	723
47	1837	952	721	47	-1392	973	723
48	1680	956	722	48	-1718	960	723
49	1484	960	723	49	-1903	925	722
50	1246	963	722	50	-2080	866	722
51	1100	964	722	51	-2096	823	722
52	997	966	723	52	-2101	752	722
53	889	967	724	53	-2113	614	722
54	777	966	722	54	-2114	373	722
55	628	966	722	55	-2114	164	723
56	482	966	721	56	-2114	-1	722
57	358	966	722	57	-2112	-180	723
58	235	967	723	58	-2109	-372	722
59	71	966	722	59	-2103	-616	722
60	-21	965	718	60	-2100	-756	723
61	-124	960	719	61	-2086	-836	722
62	-210	963	721	62	-2064	-929	722
63	-322	976	721	63	-1957	-974	723
64	-440	987	722	64	-1859	-993	722
65	-587	991	723	65	-1741	-1015	722
66	-714	994	724	66	-1673	-1018	722
67	-841	996	722	67	-1644	-1007	722

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
68	-956	992	724	68	-1644	-1007	722
69	-1042	993	724	69	-1406	-1012	723
70	-1190	993	724	70	-1217	-1013	723
71	-1328	992	723	71	-937	-1010	723
72	-1469	989	722	72	-711	-1004	723
73	-1617	984	723	73	-514	-997	723
74	-1724	979	723	74	-315	-978	722
75	-1863	958	724	75	-197	-963	723
76	-1946	942	723	76	-101	-964	722
77	-2042	914	724	77	12	-959	722
78	-2073	886	726	78	220	-957	722
79	-2090	801	723	79	388	-953	722
80	-2097	745	724	80	553	-949	722
81	-2104	611	722	81	781	-943	723
82	-2106	464	722	82	909	-956	723
83	-2108	319	722	83	1096	-949	723
84	-2109	209	722	84	1290	-941	722
85	-2116	87	723	85	1506	-932	723
86	-2116	-72	723	86	1707	-923	723
87	-2108	-190	722	87	1812	-918	722
88	-2106	-386	723				
89	-2103	-578	722				
90	-2100	-730	721				
91	-2087	-809	722				
92	-2069	-892	724				
93	-1994	-934	723				
94	-1887	-956	723				
95	-1776	-976	723				
96	-1738	-983	725				
97	-1605	-990	724				
98	-1395	-995	724				
99	-1179	-997	724				
100	-988	-996	723				
101	-774	-993	723				
102	-569	-988	723				
103	-403	-979	722				
104	-268	-960	723				
105	-112	-964	723				
106	-38	-965	722				
107	58	-966	722				
108	153	-964	723				
109	282	-966	724				

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test		
	X	Y	Z
110	525	-965	722
111	731	-966	723
112	903	-965	721
113	1084	-963	723
114	1225	-962	722
115	1293	-961	722
116	1321	-961	723
117	1483	-958	724
118	1609	-956	724
119	1791	-952	723
120	1982	-947	722
121	2116	-945	723
122	2180	-949	722
123	2269	-971	720
124	2381	-976	722
125	2519	-976	723
126	2620	-972	723
127	2700	-966	722

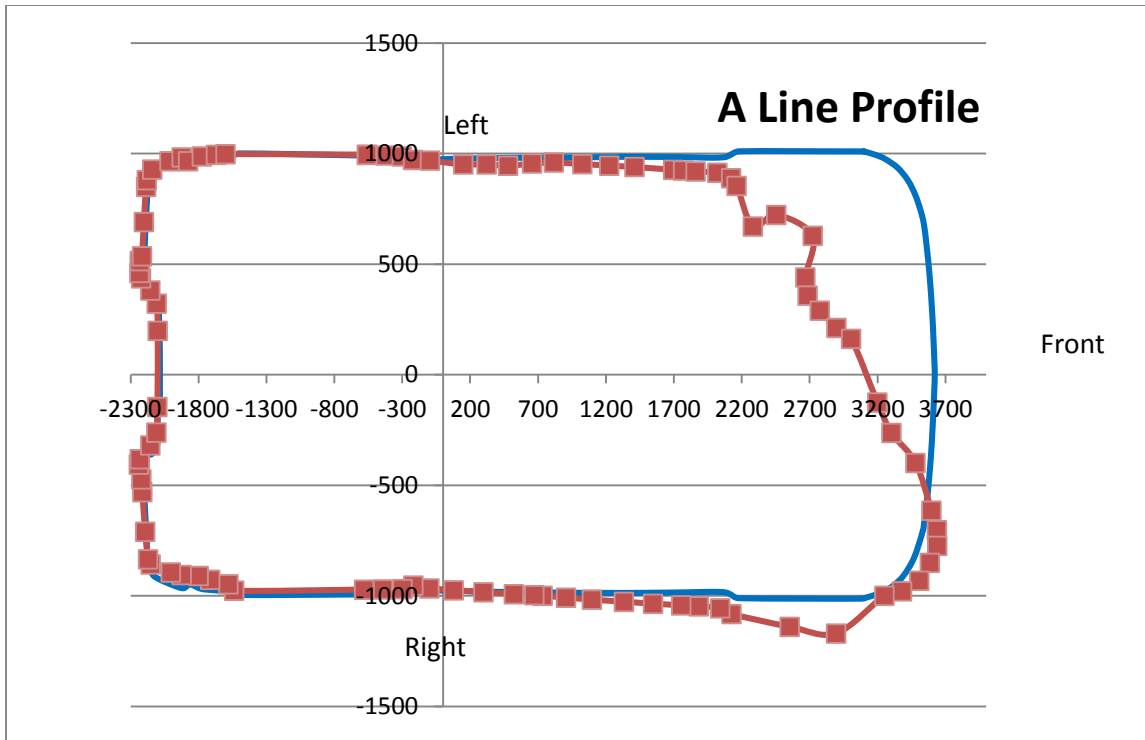
DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

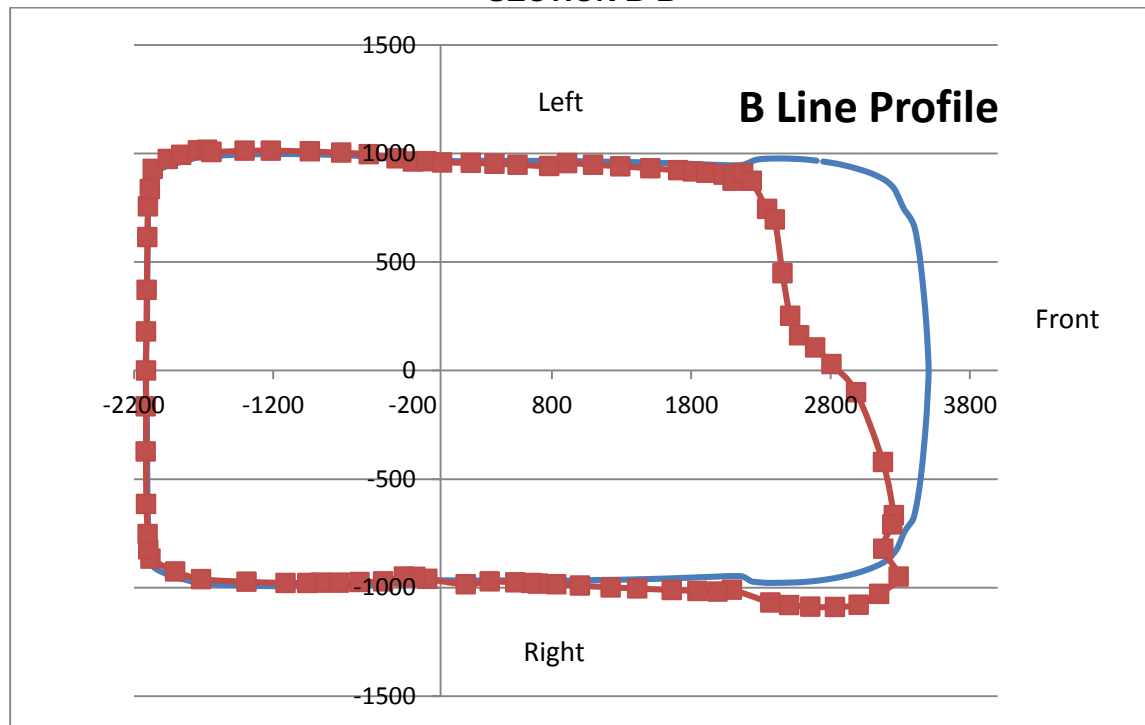
NHTSA No.: RC0185
Test Date: 1/8/2013

VEHICLE EXTERIOR CRUSH PROFILE

SECTION A-A



SECTION B-B



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

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



STRUCTURAL BUMPER BEAM POINTS

	Point	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
		X	Y	Z	X	Y	Z	X	Y	Z
Redundant Structural Bumper Beam	B10	3192	-984	1272	2472	-672	1152	-720	312	-120
	B11	3446	-822	1269	2588	-393	1165	-858	429	-104
	B12	3560	-575	1272	2843	-247	1144	-717	328	-128
	B13	3596	-289	1272	3030	-55	1080	-566	234	-192
	B14	3612	5	1274	3268	142	1123	-344	137	-151
	B15	3596	295	1275	3454	354	1189	-142	59	-86
	B16	3556	588	1275	3593	611	1201	37	23	-74
	B17	3415	846	1275	3539	876	1239	124	30	-36
	B18	3188	988	1273	3293	978	1254	105	-10	-19
Center Structural Bumper Beam	B1	3192	-970	1207	2423	-652	1110	-769	318	-97
	B2	3447	-831	1207	2577	-394	1103	-870	437	-104
	B3	3564	-576	1204	2799	-208	1117	-765	368	-87
	B4	3603	-287	1206	3010	-21	1131	-593	266	-75
	B5	3622	5	1206	3224	161	1156	-398	156	-50
	B6	3601	297	1209	3423	375	1136	-178	78	-73
	B7	3561	588	1210	3585	618	1137	24	30	-73
	B8	3432	848	1209	3554	890	1177	122	42	-32
	B9	3187	974	1208	3298	988	1189	111	14	-19
Upper Radiator Support	1	3171	-806	758	2448	-370	659	-723	436	-99
	2	3222	-610	768	2568	-213	686	-654	397	-82
	3	3222	-408	725	2711	-83	637	-511	325	-88
	4	3219	-204	725	2837	78	620	-382	282	-105
	5	3224	-1	715	2966	241	598	-258	242	-117
	6	3220	202	725	3065	416	603	-155	214	-122
	7	3225	406	726	3177	590	603	-48	184	-123
	8	3224	607	764	3178	765	700	-46	158	-64
	9	3173	808	753	3142	966	712	-31	158	-41

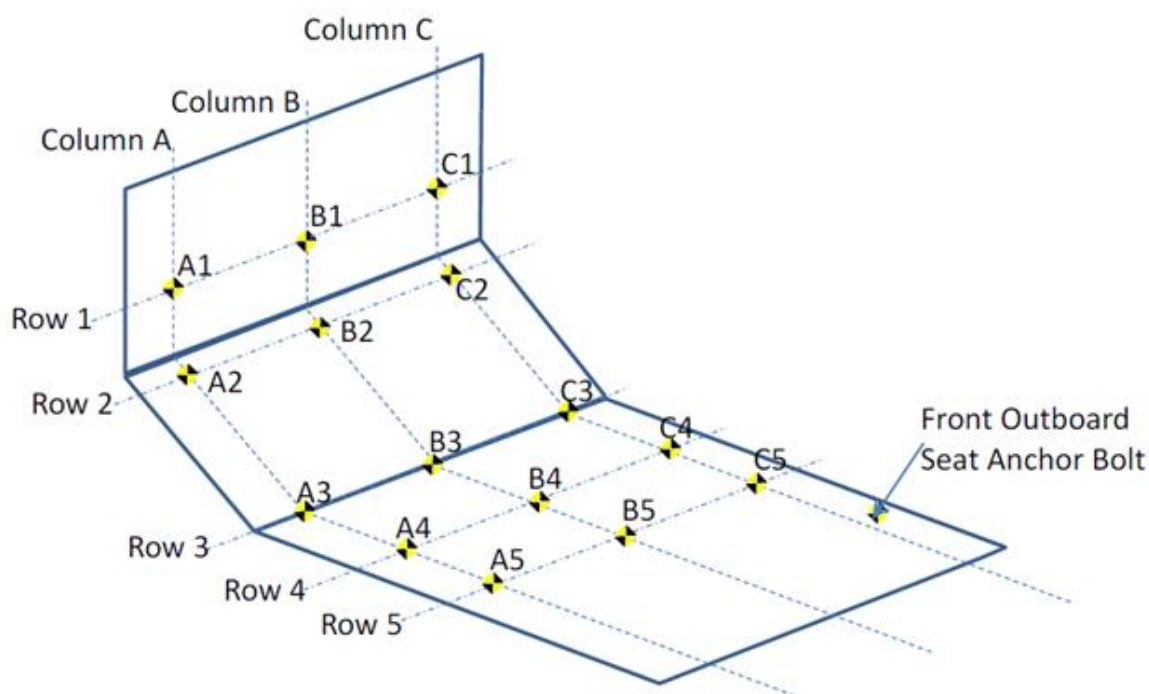
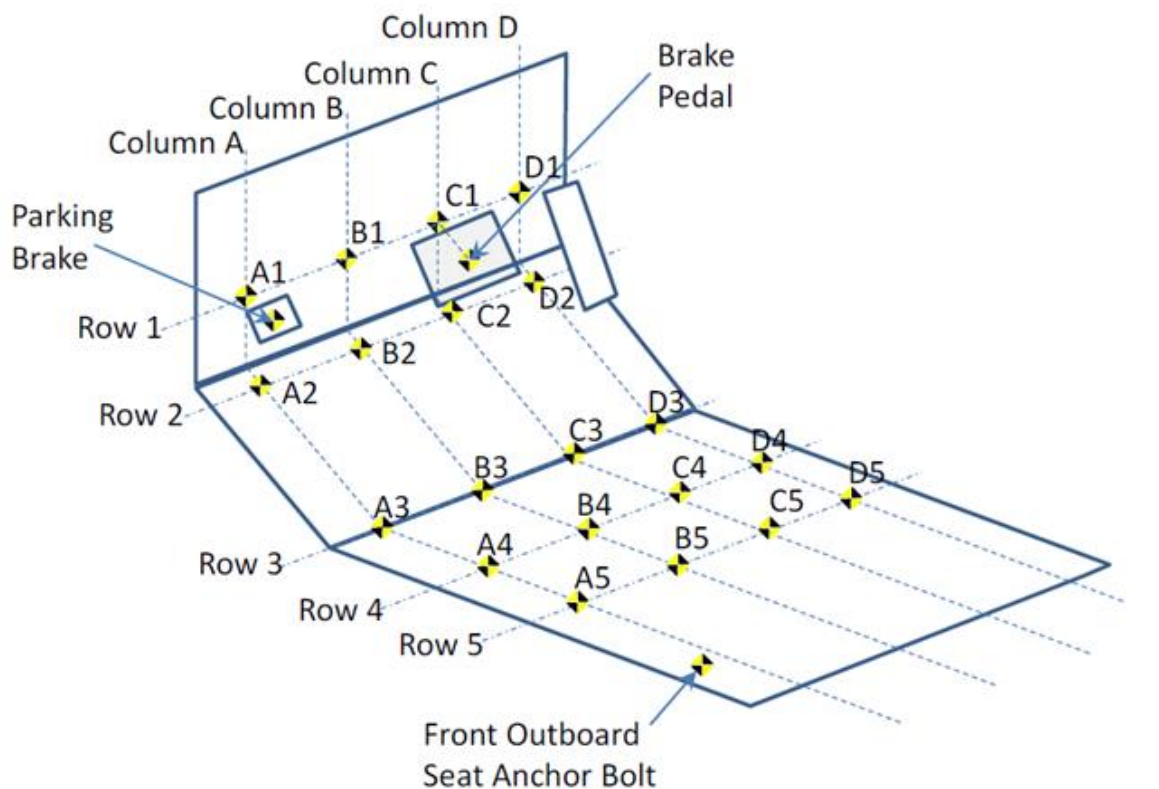
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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 (CONTINUED) **VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



Note: See Appendix D for toe pan measuring procedure

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

DRIVER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2207	-688	1127	2077	-642	1068	-130	46	-59
B1	2248	-590	1128	2101	-541	1058	-147	49	-70
C1	2327	-438	1129	2185	-413	1073	-142	25	-56
D1	2248	-286	1124	2165	-253	1090	-83	33	-35
A2	2173	-687	1208	2039	-637	1146	-133	50	-62
B2	2208	-588	1206	2067	-537	1136	-141	51	-70
C2	2271	-439	1206	2170	-415	1151	-102	24	-55
D2	2193	-289	1205	2128	-252	1173	-65	37	-32
A3	2015	-688	1326	1983	-629	1282	-32	59	-43
B3	2015	-589	1323	1983	-540	1276	-33	49	-47
C3	2017	-435	1327	1976	-389	1299	-41	46	-28
D3	2017	-285	1326	1971	-237	1308	-46	48	-17
A4	1966	-686	1324	1939	-640	1292	-28	46	-32
B4	1966	-586	1322	1932	-539	1276	-34	47	-47
C4	1968	-438	1325	1927	-390	1282	-40	48	-43
D4	1966	-286	1325	1923	-239	1299	-44	46	-25
A5	1918	-687	1323	1891	-643	1300	-26	44	-23
B5	1917	-589	1323	1886	-544	1290	-31	44	-33
C5	1916	-437	1325	1876	-392	1292	-39	45	-33
D5	1918	-287	1324	1874	-241	1305	-43	46	-19
Brake Pedal	2001	-433	1127	1726	-453	941	-275	-20	-185
Driver IP Left	1769	-582	834	1725	-556	796	-44	26	-37
Driver IP Right	1765	-280	836	1715	-257	815	-50	23	-20
DOLP	1772	-681	829	1725	-654	791	-47	27	-38
Steering Column	1559	-428	605	1504	-428	574	-55	0	-31
Front Outboard Bolt	1448	-681	1251	1437	-657	1268	-12	25	17

Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

PASSENGER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2175	300	1131	2103	382	1120	-72	82	-11
B1	2237	454	1127	2157	537	1106	-80	83	-21
C1	2225	603	1127	2171	677	1113	-55	74	-14
A2	2127	304	1206	2059	390	1196	-68	87	-10
B2	2141	455	1206	2089	533	1201	-52	78	-5
C2	2141	605	1205	2089	684	1193	-52	79	-12
A3	2012	303	1269	1969	396	1268	-43	93	-1
B3	2012	453	1312	1968	535	1307	-44	82	-5
C3	2012	602	1310	1963	683	1296	-49	81	-14
A4	1962	304	1286	1922	387	1284	-40	83	-2
B4	1963	451	1321	1918	533	1311	-46	82	-11
C4	1964	602	1319	1913	681	1307	-51	80	-12
A5	1912	301	1309	1873	376	1309	-39	75	0
B5	1912	454	1320	1866	533	1312	-46	79	-8
C5	1913	601	1320	1863	677	1312	-50	76	-8
Pass IP Left	1768	304	843	1725	358	819	-42	54	-24
Pass IP Right	1780	605	844	1738	658	824	-42	54	-20
PORP	1775	705	826	1732	759	806	-43	54	-20
Front Outboard Bolt	1449	683	1246	1403	724	1242	-46	40	-3

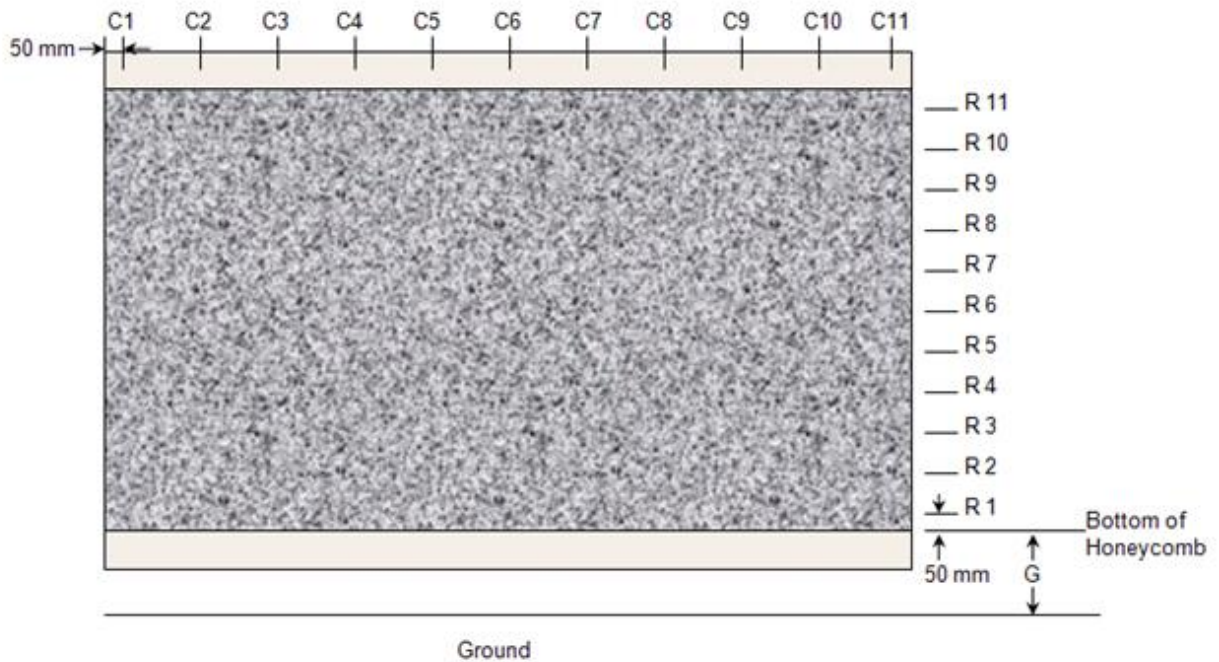
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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.14 **RMDB CRUSH MEASUREMENTS**

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
		50 mm	260 mm	470 mm	680 mm	890 mm	1100 mm	1310 mm	1520 mm	1730 mm	1940 mm	2150 mm
R11	910mm	1.8	3.7	4.0	3.8	4.6	6.2	27.9	24.2	13.6	33.5	174.5
R10	824mm	1.2	1.3	1.3	1.6	2.0	2.4	7.0	8.2	9.4	39.3	183.5
R9	738mm	1.1	0.6	0.7	1.1	1.4	2.2	2.5	4.0	10.1	47.5	193.0
R8	652mm	0.9	0.1	0.3	0.8	1.2	1.8	2.3	8.0	28.2	53.6	203.0
R7	566mm	0.4	-0.1	0.1	0.4	1.1	1.6	2.2	33.9	77.5	112.0	198.8
R6	480mm	0.0	-0.3	0.1	0.2	1.1	1.6	11.1	26.0	76.0	183.7	247.7
R5	384mm	-0.3	-0.8	-0.3	0.1	0.8	1.3	25.6	25.0	35.9	170.3	111.9
R4	308mm	-1.2	-1.2	-0.5	-0.2	0.5	1.1	29.9	48.8	13.0	139.4	33.3
R3	222mm	-1.7	-1.4	-1.2	-0.2	0.3	1.1	30.6	69.9	8.3	86.7	43.2
R2	136mm	-2.3	-1.7	-0.9	-0.2	0.5	1.3	62.0	81.2	19.7	77.9	82.4
R1	50mm	-2.3	-1.5	-0.1	0.5	*	*	87.1	80.9	10.6	28.4	32.3

*Barrier was cut to accommodate the rail, therefore these points were un-measurable.

DATA SHEET NO. 15
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013

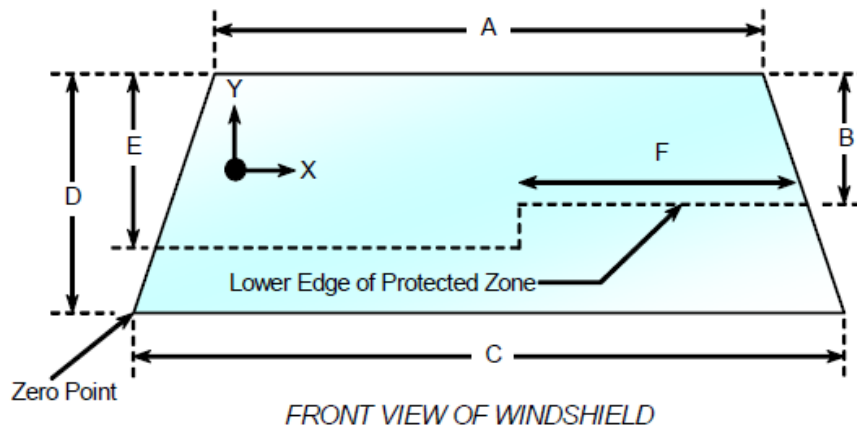
Please provide windshield mounting details. A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2285	2285	100%
Right Side	2285	2285	100%
Total	4570	4570	100%



Item	Units	Value
A	mm	1384
B	mm	396
C	mm	1730
D	mm	728
E	mm	460
F	mm	393

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. 15 (CONTINUED)
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
Test Date: 1/8/2013

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

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

Test Time: 12:55 PM

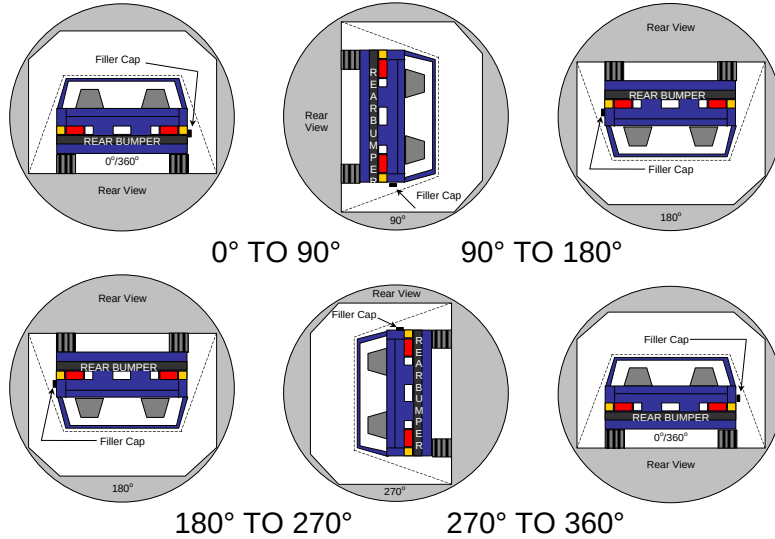
Stoddard Solvent Spillage Measurements

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

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
 Test Date: 1/8/2013



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°	69	300	369
90° to 180°	69	300	369
180° to 270°	61	300	361
270° to 360°	67	300	367

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	

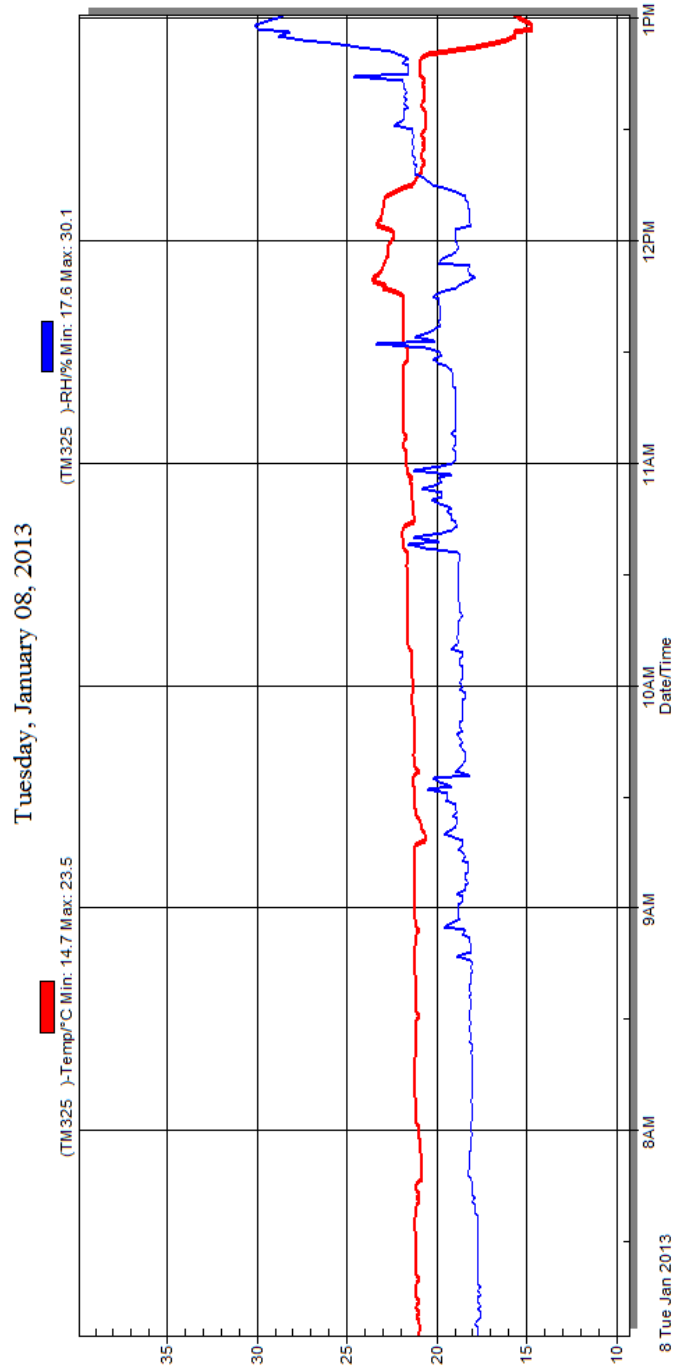
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2012 Chevrolet Silverado 1500 Crew Cab
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RC0185
Test Date: 1/8/2013



Temperature Stabilization Chart/Data
Note: Temperature spike caused by light check

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS		
No.	Description	Page
1	As Delivered Right Front 3-4 View of Test Vehicle	A-9
2	As Delivered Left Rear 3-4 View of Test Vehicle	A-9
3	Test Vehicle Certification Label	A-10
4	Test Vehicle Tire Placard	A-10
5	Pre-Test Front View of Test Vehicle	A-11
6	Post-Test Front View of Test Vehicle	A-11
7	Pre-Test Left Front 3-4 View of Test Vehicle	A-12
8	Post-Test Left Front 3-4 View of Test Vehicle	A-12
9	Pre-Test Left Side View of Test Vehicle	A-13
10	Post-Test Left Side View of Test Vehicle	A-13
11	Pre-Test Left Rear 3-4 View of Test Vehicle	A-14
12	Post-Test Left Rear 3-4 View of Test Vehicle	A-14
13	Pre-Test Rear View of Test Vehicle	A-15
14	Post-Test Rear View of Test Vehicle	A-15
15	Pre-Test Right Rear 3-4 View of Test Vehicle	A-16
16	Post-Test Right Rear 3-4 View of Test Vehicle	A-16
17	Pre-Test Right Side View of Test Vehicle	A-17
18	Post-Test Right Side View of Test Vehicle	A-17
19	Pre-Test Right Front 3-4 View of Test Vehicle	A-18
20	Post-Test Right Front 3-4 View of Test Vehicle	A-18
21	Monroney Label Photograph	A-19
22	Pre-Test Overhead View of RMDB against target vehicle at ideal Impact Point	A-19
23	Pre-Test Left Side View of RMDB against target vehicle at ideal Impact Point	A-20
24	Pre-Test Right Side View of RMDB against target vehicle at ideal Impact Point	A-20
25	Pre-Test Close-up View of Impact Point	A-21
26	Post-Test Close-up View of Impact Point	A-21
27	Post-Test Vehicle Overhead View	A-22
28	Pre-Test Close-up View of Driver Door Latch	A-23
29	Post-Test Close-up View of Driver Door Latch	A-23
30	Pre-Test Close-up View of Passenger Door Latch	A-24

TABLE OF PHOTOGRAPHS (Continued)		
No.	Description	Page
31	Post-Test Close-up View of Passenger Door Latch	A-24
32	Pre-Test Windshield View	A-25
33	Post-Test Windshield View	A-25
34	Pre-Test View of Driver Inner Door Panel	A-26
35	Post-Test View of Driver Inner Door Panel	A-26
36	Pre-Test View of Passenger Inner Door Panel	A-27
37	Post-Test View of Passenger Inner Door Panel	A-27
38	Pre-Test Overall View of Driver Knee Bolsters	A-28
39	Post-Test Overall View of Driver Knee Bolsters	A-28
40	Pre-Test Left Side View of Driver Knee Bolsters	A-29
41	Post-Test Left Side View of Driver Knee Bolsters	A-29
42	Pre-Test Right Side View of Driver Knee Bolsters	A-30
43	Post-Test Right Side View of Driver Knee Bolsters	A-30
44	Pre-Test View of Driver Floor pan at Left sill level, w/carpet	A-31
45	Post-Test View of Driver Floor pan at Left sill level, w/carpet	A-31
46	Pre-Test View of Driver Floor pan at Mid seat level, w/carpet	A-32
47	Post-Test view of Driver Floor pan at Mid seat level, w/carpet	A-32
48	Pre-Test View of Driver Floor pan at Left sill level, w/o carpet	A-33
49	Post-Test View of Driver Floor pan at Left sill level, w/o carpet	A-33
50	Pre-Test View of Driver Floor pan at Mid seat level, w/o carpet	A-34
51	Post-Test view of Driver Floor pan at Mid seat level, w/o carpet	A-34
52	Pre-Test Driver Front Windshield View	A-35
53	Post-Test Driver Front Windshield View	A-35
54	Pre-Test Left Side View of Driver and Interior	A-36
55	Post-Test Left Side View of Driver and Interior	A-36
56	Pre-Test Left Side Driver Window View	A-37
57	Post-Test Left Side Driver Window View	A-37
58	Pre-Test Right Side View of Driver and Interior	A-38
59	Post-Test Right Side View of Driver and Interior	A-38
60	Pre-Test View of Driver Door Clearance	A-39

TABLE OF PHOTOGRAPHS (Continued)		
No.	Description	Page
61	Post-Test View of Driver Door Clearance	A-39
62	Pre-Test View of Parking Brake	A-40
63	Pre-Test Driver Seat Fore Aft Markings	A-41
64	Post-Test Driver Seat Fore Aft Markings	A-41
65	Pre-Test Driver Seat Back Markings	A-42
66	Pre-Test Overhead View of Driver Thighs on Seat	A-42
67	Pre-Test Driver Adjustable D-ring	A-43
68	Post-Test Driver Adjustable D-ring	A-43
69	Pre-Test Driver Feet	A-44
70	Post-Test Driver Feet	A-44
71	Pre-Test View of Driver Right Knee and Bolster	A-45
72	Post-Test View of Driver Right Knee and Bolster	A-45
73	Pre-Test View of Driver Left Knee and Bolster	A-46
74	Post-Test View of Driver Left Knee and Bolster	A-46
75	Pre-Test View of Driver Abdomen	A-47
76	Post-Test View of Driver Abdomen	A-47
77	Pre-Test Left Side View of Steering Wheel set position	A-48
78	Post-Test Left Side View of Steering Wheel set position	A-48
79	Post-Test View of Driver Head Contact with Airbag – Front	A-49
80	Post-Test View of Driver Head Contact with Airbag – Curtain	A-49
81	Post-Test View of Driver Head Contact with Vehicle Interior – A	A-50
81a	Post-Test View of Driver Head Contact with Vehicle Interior – B	A-50
81b	Post-Test View of Driver Head Contact with Vehicle Interior – C	A-51
82	Pre-Test Overall View of Passenger Knee Bolsters	A-52
83	Post-Test Overall View of Passenger Knee Bolsters	A-52
84	Pre-Test Left Side View of Passenger Knee Bolsters	A-53
85	Post-Test Left Side View of Passenger Knee Bolsters	A-53
86	Pre-Test Right Side View of Passenger Knee Bolsters	A-54
87	Post-Test Right Side View of Passenger Knee Bolsters	A-54
88	Pre-Test View of Passenger Floor pan at Left sill level, w/carpet	A-55

TABLE OF PHOTOGRAPHS (Continued)		
No.	Description	Page
89	Post-Test View of Passenger Floor pan at Left sill level, w/carpet	A-55
90	Pre-Test View of Passenger Floor pan at Mid seat level, w/carpet	A-56
91	Post-Test view of Passenger Floor pan at Mid seat level, w/carpet	A-56
92	Pre-Test View of Passenger Floor pan at Left sill level, w/o carpet	A-57
93	Post-Test View of Passenger Floor pan at Left sill level, w/o carpet	A-57
94	Pre-Test View of Passenger Floor pan at Mid seat level, w/o carpet	A-58
95	Post-Test view of Passenger Floor pan at Mid seat level, w/o carpet	A-58
96	Pre-Test Passenger Front Close-up View, Windshield	A-59
97	Post-Test Passenger Front Close-up View, Windshield	A-59
98	Pre-Test Left Side Passenger and Interior View	A-60
99	Post-Test Left Side Passenger and Interior View	A-60
100	Pre-Test Right Side Passenger Window View	A-61
101	Post-Test Right Side Passenger Window View	A-61
102	Pre-Test Right Side Passenger and Interior View	A-62
103	Post-Test Right Side Passenger and Interior View	A-62
104	Pre-Test View of Passenger Door Clearance	A-63
105	Post-Test View of Passenger Door Clearance	A-63
106	Pre-Test Passenger Seat Fore-Aft Markings	A-64
107	Post-Test Passenger Seat Fore-Aft Markings	A-64
108	Pre-Test Passenger Seat Back Markings	A-65
109	Pre-Test Overhead View of Passenger Thighs on seat	A-65
110	Pre-Test Passenger Adjustable D-ring	A-66
111	Post-Test Passenger Adjustable D-ring	A-66
112	Pre-Test View of Passenger Feet	A-67
113	Post-Test View of Passenger Feet	A-67
114	Pre-Test View of Passenger Right Knee and Bolster	A-68
115	Post-Test View of Passenger Right Knee and Bolster	A-68
116	Pre-Test View of Passenger Left Knee and Bolster	A-69
117	Post-Test View of Passenger Left Knee and Bolster	A-69
118	Pre-Test View of Passenger Abdomen	A-70

TABLE OF PHOTOGRAPHS (Continued)		
No.	Description	Page
119	Post-Test View of Passenger Abdomen	A-70
120	Post-Test View of Passenger Head contact with Airbag – Front	A-71
120a	Post-Test View of Passenger Head contact with Airbag – Curtain	A-71
121	Post-Test View of Passenger Head contact with Interior – A	A-72
121a	Post-Test View of Passenger Head contact with Interior – B	A-72
121b	Post-Test View of Passenger Head contact with Interior – C	A-73
122	Post-Test Passenger Contact With Glovebox	A-73
123	Pre-Test Ballast Locations	A-74
124	Post-Test Speed Trap Readout	A-74
125	Pre-Test View of Fuel Filler Cap	A-75
126	Post-Test View of Fuel Filler Cap	A-75
127	Pre-Test Engine Compartment View	A-76
128	Post-Test Engine Compartment View	A-76
129	Pre-Test View of Front Underbody (perpendicular to vehicle)	A-77
130	Post-Test View of Front Underbody (perpendicular to vehicle)	A-77
131	Pre-Test View of Mid Underbody (perpendicular to vehicle)	A-78
132	Post-Test View of Mid Underbody (perpendicular to vehicle)	A-78
133	Pre-Test View of Rear Underbody (perpendicular to vehicle)	A-79
134	Post-Test View of Rear Underbody (perpendicular to vehicle)	A-79
135	Pre-Test View of Steering rack and or sway bar	A-80
136	Post-Test View of Steering rack and or sway bar	A-80
137	Pre-Test Bumper to Rail Attachments and Crush Initiators	A-81
138	Post-Test Bumper to Rail Attachments and Crush Initiators	A-82
139	Post-Test View of Front Sub-Frame Deformation	A-82
140	Pre-Test Frame Rail with tire removed	A-83
141	Post-Test Frame Rail with tire removed	A-83
142	Pre-Test View of Front Driver Wheel Well with tire removed	A-84
143	Post-Test ¾ View of Front Driver Wheel Well w/ tire removed	A-84
144	Post-Test Side View of Front Driver Wheel Well w/ tire removed	A-85
145	Post-Test Right Side 3/4 Rear View of the Front Driver Wheel Well w/ tire removed	A-85

TABLE OF PHOTOGRAPHS (Continued)		
No.	Description	Page
146	Post-Test Looking Down at the Front Driver Shotgun	A-86
147	Post-Test Right Side ¾ View of Front Driver Shotgun	A-86
148	Post-Test Front Driver Close up View of Suspension w/ tire removed	A-87
149	Post-Test ¾ View of Front Passenger Wheel Well w/ tire removed	A-87
150	Post-Test Side View of Front Passenger Wheel Well w/ tire removed	A-88
151	Post-Test Right Side ¾ Rear View of the Front Passenger Wheel Well w/ tire removed	A-88
152	Post-Test Looking Down at the Front Passenger Shotgun	A-89
153	Post-Test Right Side ¾ View of Front Passenger Shotgun	A-89
154	Post-Test Front Passenger Close up View of Suspension w/ tire removed	A-90
155	Post-Test View of Door Sill with door open-Struck Side	A-90
156	Post-Test View of Deformation of A pillar-Struck Side	A-91
157	Post-Test View of Deformation of B pillar-Struck Side	A-91
158	Post-Test View of Deformation of C pillar-Struck Side	A-92
159	Post-Test View of Wheel and/or Tire Deformation-Struck Side	A-92
160	Post-Test View of Deformation of Rocker or Post-Struck Side	A-93
161	Post-Test View of Windshield Separation	A-93
162	Pre-Test Left Side View of RMDB	A-94
163	Post-Test Left Side View of RMDB	A-94
164	Pre-Test Right Side View of RMDB	A-95
165	Post-Test Right Side View of RMDB	A-95
166	Pre-Test Top View of RMDB	A-96
167	Post-Test Top View of RMDB	A-96
168	Pre-Test Front View of RMDB	A-97
169	Post-Test Front View of RMDB	A-97
170	Pre-Test RMDB & Vehicle, Right Side	A-98
171	Post-Test RMDB & Vehicle, Right Side	A-98
172	Pre-Test RMDB & Vehicle, Left Side	A-99
173	Post-Test RMDB & Vehicle, Left Side	A-99
174	Pre-Test RMDB & Vehicle, Top View	A-100
175	Post-Test RMDB & Vehicle, Top View	A-100

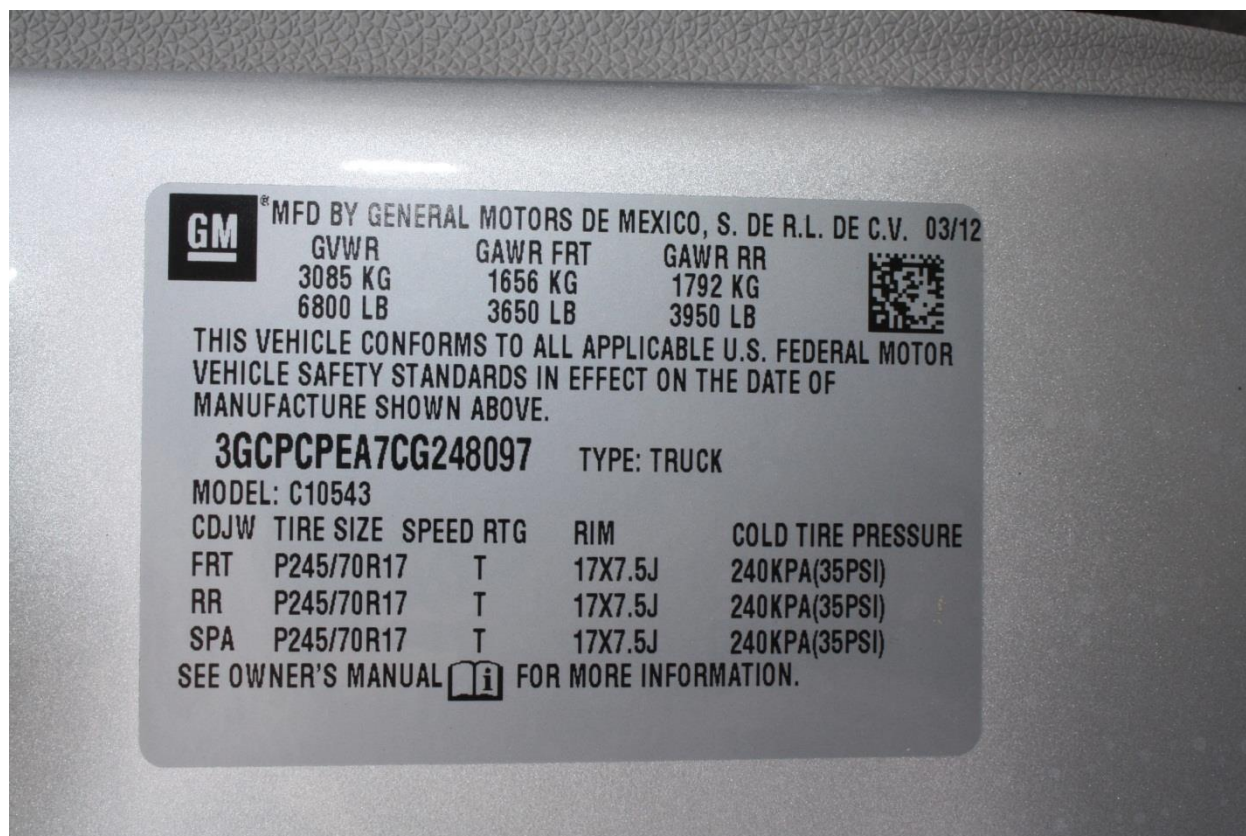
TABLE OF PHOTOGRAPHS (Continued)		
No.	Description	Page
176	Pre-Test RMDB & Vehicle, Rear View	A-101
177	Post-Test RMDB & Vehicle, Rear View	A-101
178	Pre-Test RMDB & Vehicle, Front View	A-102
179	Post-Test RMDB & Vehicle, Front View	A-102
180	Vehicle at 0 Degrees on Static Rollover Device	A-103
181	Vehicle at 90 Degrees on Static Rollover Device	A-103
182	Vehicle at 180 Degrees on Static Rollover Device	A-104
183	Vehicle at 270 Degrees on Static Rollover Device	A-104
184	Vehicle at 360 Degrees on Static Rollover Device	A-105
185	Impact Photo	A-105



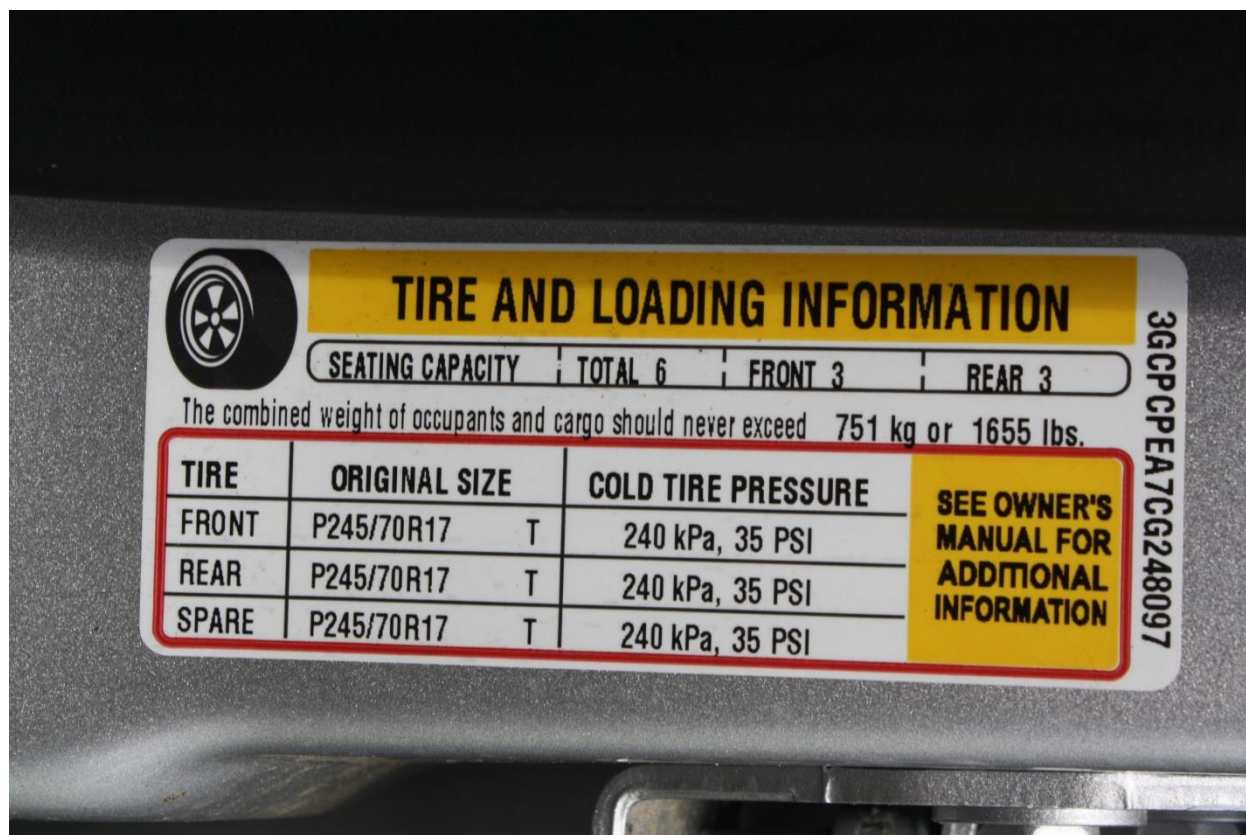
No. 001 As Delivered Right Front 3-4 View of Test Vehicle



No. 002 As Delivered Left Rear 3-4 View of Test Vehicle



No. 003 Test Vehicle Certification Label



No. 004 Test Vehicle Tire Placard



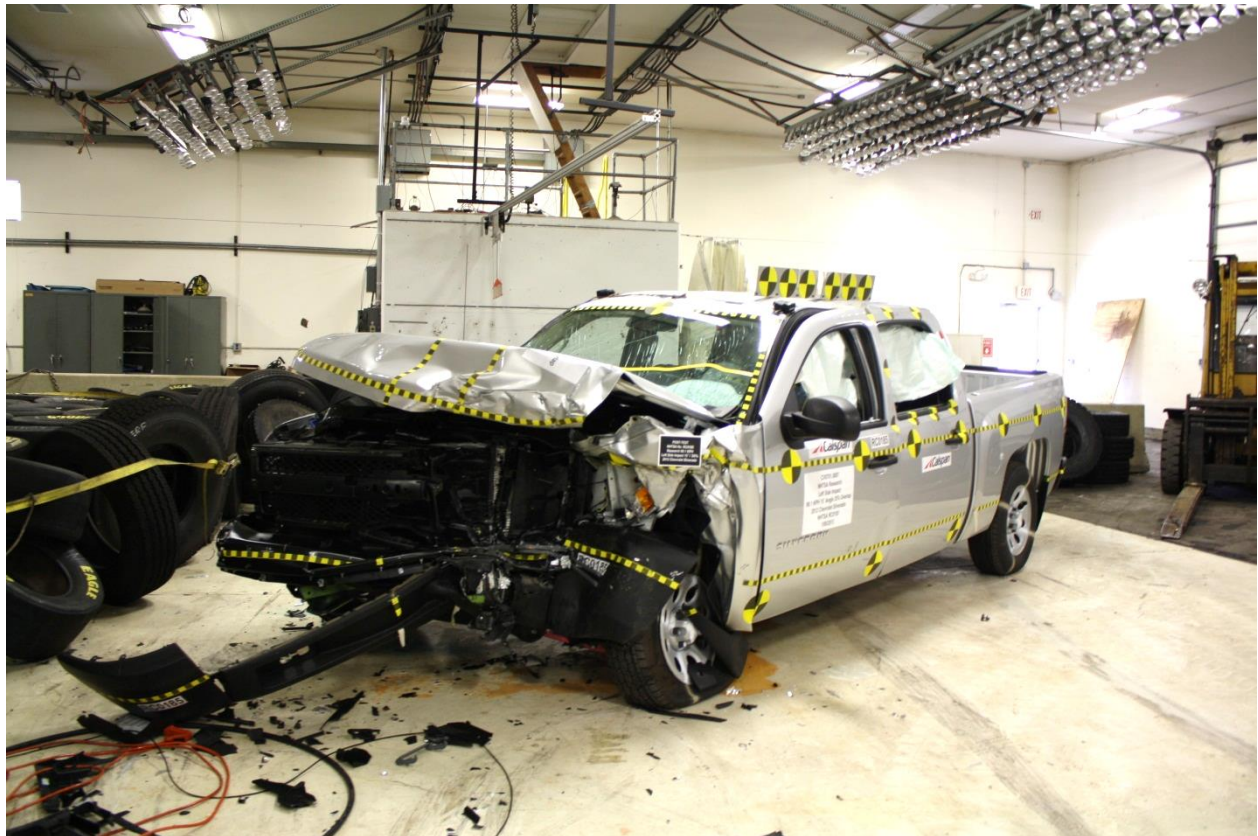
No. 005 Pre-Test Front View of Test Vehicle



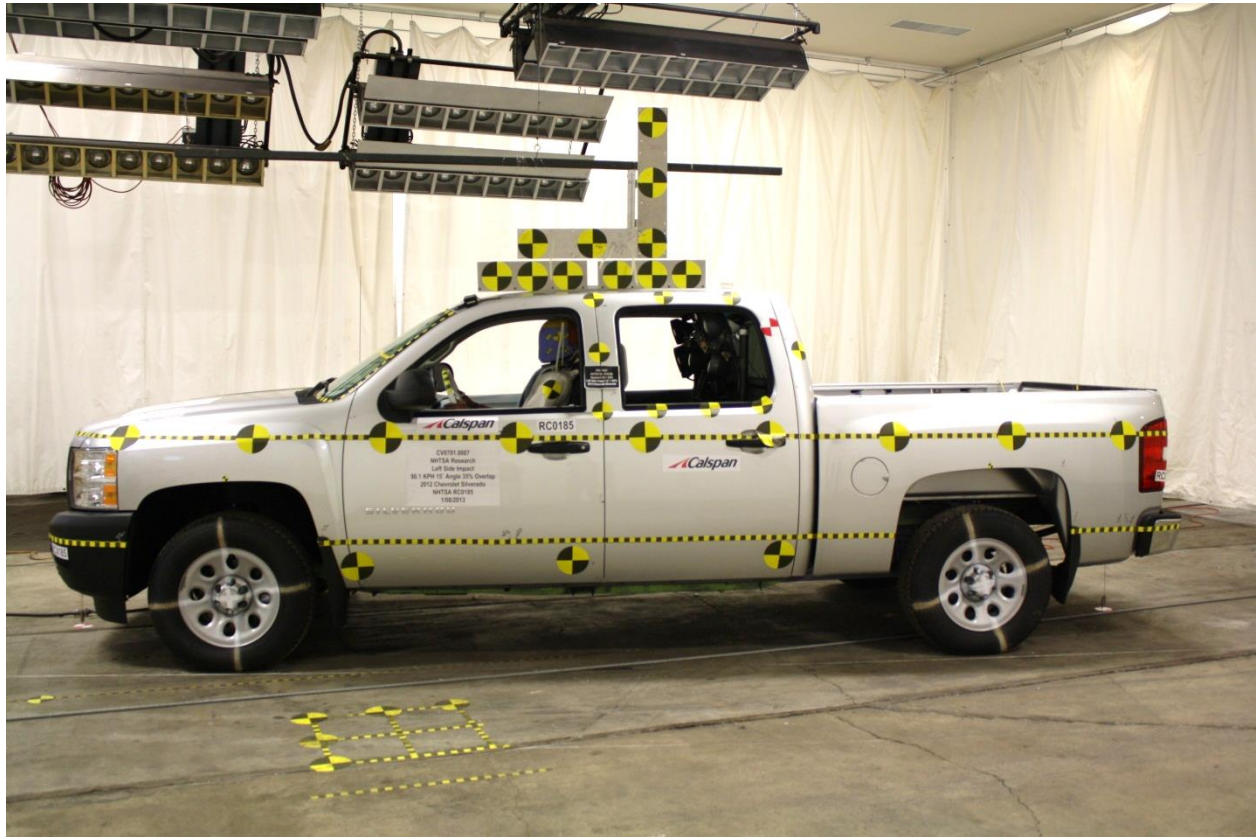
No. 006 Post-Test Front View of Test Vehicle



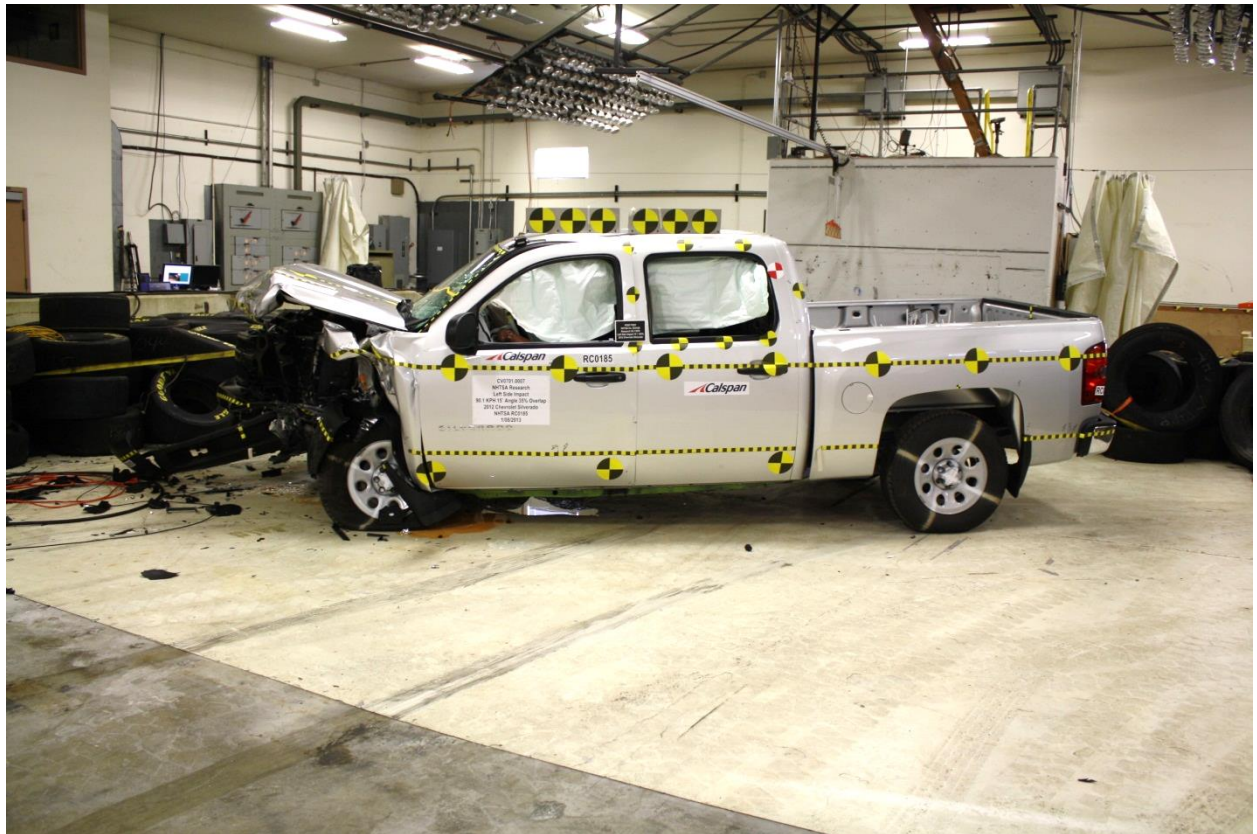
No. 007 Pre-Test Left Front 3-4 View of Test Vehicle



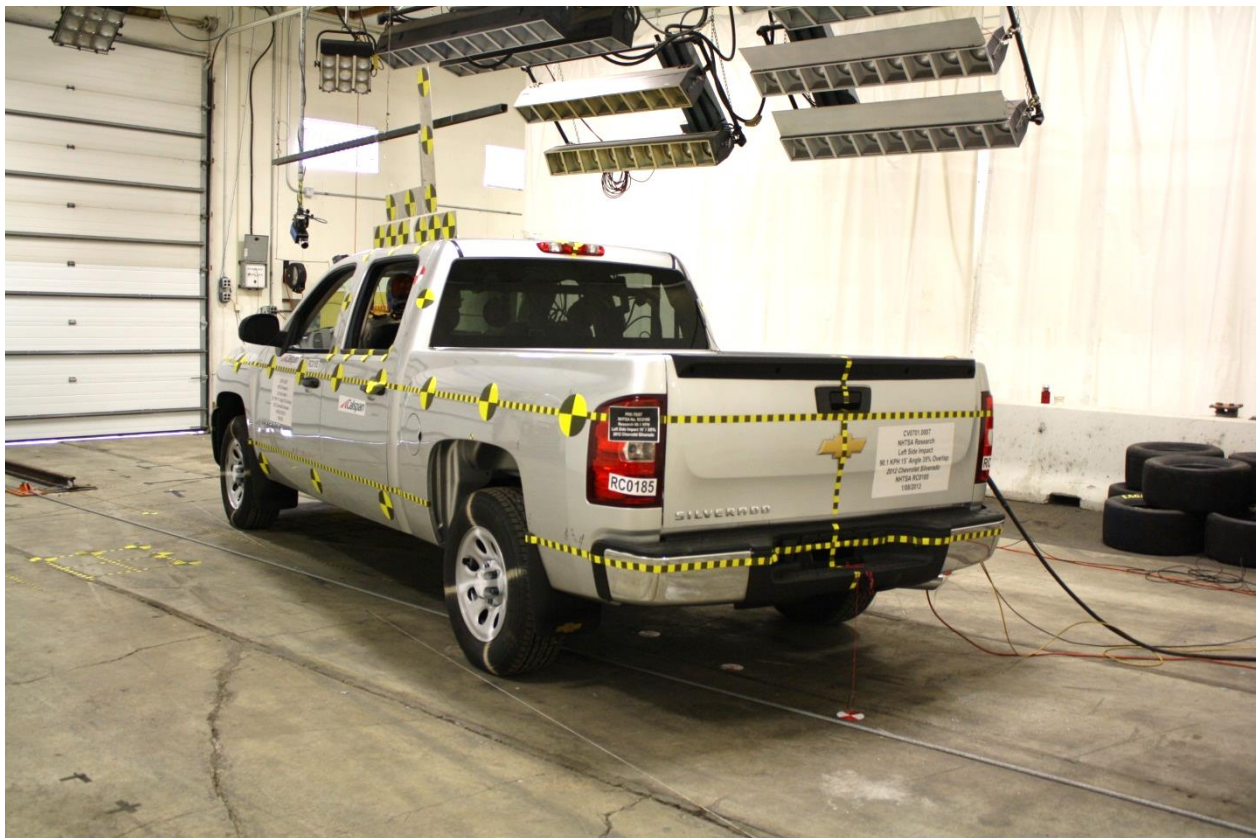
No. 008 Post-Test Left Front 3-4 View of Test Vehicle



No. 009 Pre-Test Left Side View of Test Vehicle



No. 010 Post-Test Left Side View of Test Vehicle



No. 011 Pre-Test Left Rear 3-4 View of Test Vehicle



No. 012 Post-Test Left Rear 3-4 View of Test Vehicle



No. 013 Pre-Test Rear View of Test Vehicle



No. 014 Post-Test Rear View of Test Vehicle



No. 015 Pre-Test Right Rear 3-4 View of Test Vehicle



No. 016 Post-Test Right Rear 3-4 View of Test Vehicle



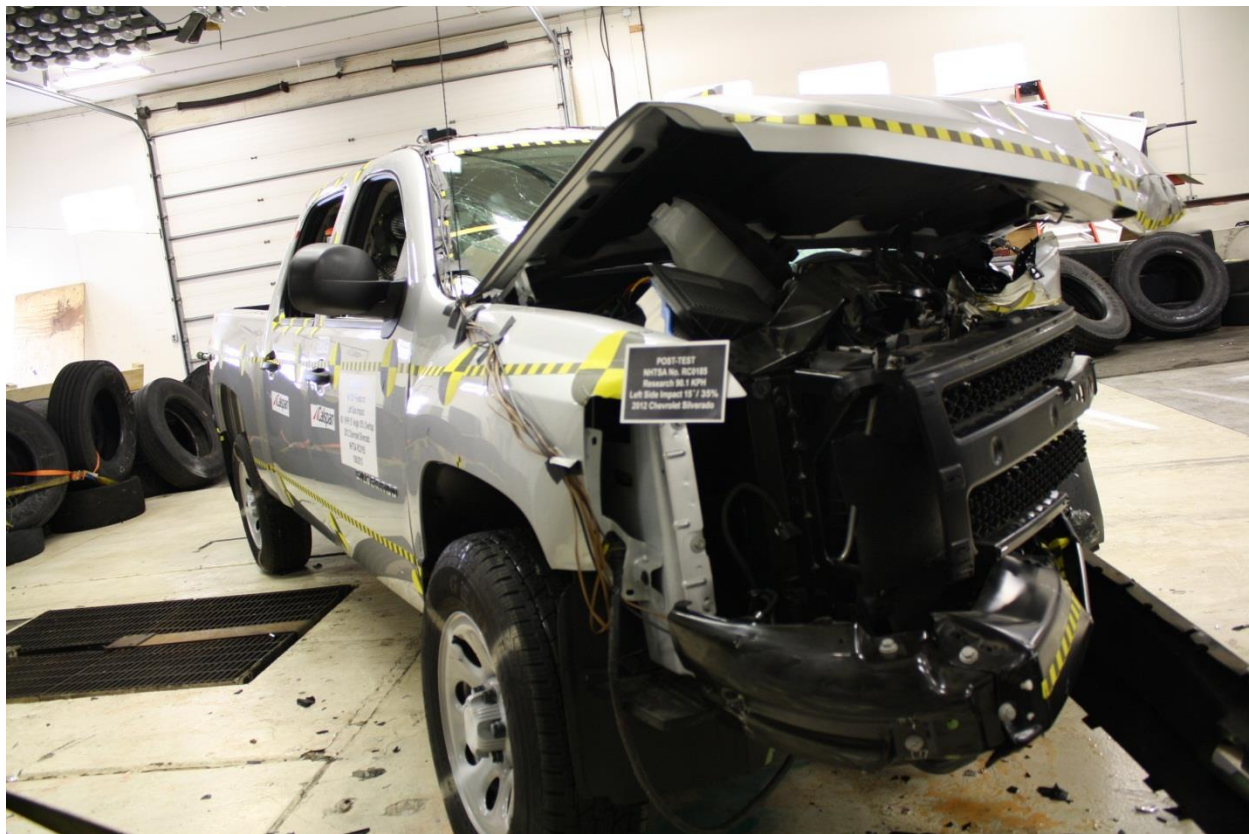
No. 017 Pre-Test Right Side View of Test Vehicle



No. 018 Post-Test Right Side View of Test Vehicle



No. 019 Pre-Test Right Front 3-4 View of Test Vehicle



No. 020 Post-Test Right Front 3-4 View of Test Vehicle



CHEVROLET

**2012 SILVERADO 1500 2WD CREW
CAB WT**

**EXTERIOR: SILVER ICE METALLIC
INTERIOR: DARK TITANIUM**

**VORTEC 4.8L V8 SFI ENGINE
4-SPD AUTOMATIC TRANSMISSION**

Visit us at www.chevy.com

STANDARD EQUIPMENT

ITEMS IN PARENTHESES ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE SCHEDULE.

5 YEAR / 100,000 MILE
POWERTRAIN LIMITED WARRANTY
SEE DEALER FOR DETAILS

MECHANICAL

- VORTEC 4.8L V8
- 4-SPEED AUTO TRANSMISSION
- COIL-OVER-SHOCK FRONT SUSP
- MULTI-LEAF REAR SPRING SUSP
- 783 SMOOTH RIDE SUSPENSION
- BOXED FRAME DESIGN W/ HYDROFORMED TECHNOLOGY
- 145 AMP ALTERNATOR
- PWR RACK AND PINION STEERING

SAFETY & SECURITY

- 4-WHEEL ABS W/ DYNAMIC REAR PROPORTIONING
- DUAL STAGE DRIVER/RT PASS AIR BAGS W/ PASS SENSING SYSTEM
- HEAD CURTAIN SIDE AIRBAGS W/

ROLL-OVER PROTECTION

- SEAT-MOUNTED SIDE-IMPACT AIRBAGS, DRIVER AND RIGHT FRONT PASSENGER
- REMOTE KEYLESS ENTRY
- DAYTIME RUNNING LAMPS
- AUTO HEADLAMPS W/FLASH-TO-PASS
- STABILITRAK-STABILITY CONTROL WITH TRAILER SWAY CONTROL AND HILL START ASSIST
- SPARE TIRE LOCK
- TIRE PRESSURE MONITOR SYSTEM (DOES NOT APPLY TO SPARE TIRE)

EXTERIOR

- CHROME REAR BUMPER
- 17" FULL-SIZE SPARE
- ALL-SEASON TIRES
- FOLDING OUTSIDE MIRRORS
- CHROME BOX LUMINATIONS
- SOLAR-RAY TINTED GLASS

INTERIOR

- AIR CONDITIONING

- 40/20/40 SPLIT BENCH FRT SEAT
- 40/40 SPLIT REAR SEATING
- DUAL GLOVE BOX STORAGE
- AM/FM STEREO WITH SEEK & SCAN
- DRIVER INFO CENTER DISPLAY
- INTERMITTENT WIPERS
- 4-GAUGE CLUSTER W/TACHOMETER
- 12-VOLT AUX PWR OUTLET
- TLT STEERING WHEEL
- CRUISE CONTROL
- RUBBERIZED VINYL FLR COVERING

OTHER

- BATTERY RUN DOWN PROTECTION
- OIL LIFE MONITORING SYSTEM
- 24 HOUR ROADSIDE ASSISTANCE

OPTIONS & PRICING

MANUFACTURER'S SUGGESTED TOTAL PRICE

STANDARD VEHICLE PRICE \$30,320.00

OPTIONAL EQUIPMENT (SEE THE MANUFACTURER'S MAY REPLACE STANDARD EQUIPMENT SHOWN)

- SEO-PWR WINDOWS AND MIRRORS (STD KEYLESS DOOR LOCK DELETED) 593.00
- LOCKING REAR DIFFERENTIAL 295.00
- KEYLESS REMOTE DOOR LOCK 240.00
- DEEP TINTED GLASS 200.00
- MOLDED SPLASH GUARDS (DEALER INSTALLED) 180.00
- CARPETING, COLOR-KEYED 100.00
- GVW RATING - 6,800 LBS INC.
- REAR AXLE 3.23 RATIO INC.

TOTAL OPTIONS \$1,708.00

TOTAL VEHICLE & OPTIONS \$32,028.00

DESTINATION CHARGE 995.00

TOTAL VEHICLE PRICE* \$33,023.00

EPA Fuel Economy Estimates

GASOLINE
CITY MPG

14

Expected range for most drivers
11 to 17 MPG

*Fuel economy when operating on E85 will vary significantly from gasoline. See Fuel Economy Guide for more information.

FLEXIBLE FUEL VEHICLE*
GASOLINE - ETHANOL (E85)

Estimated
Annual Fuel Cost
\$3,469

based on 15,000 miles at
\$3.70 per gallon of GASOLINE

Combined GASOLINE
Fuel Economy
This Vehicle
16

10 21
All STANDARD PICKUP TRUCKS

GASOLINE
HIGHWAY MPG

19

Expected range for most drivers
15 to 23 MPG

Your actual
mileage will vary
depending on how you
drive and maintain
your vehicle.

AGL

See the FREE Fuel Economy Guide at dealers or www.fueleconomy.gov

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 ★ ★ ★ ★
Based on the risk of injury in a frontal impact.
Should ONLY be compared to other vehicles of similar size and weight.

Side Crash Front seat Rear seat ★ ★ ★ ★ ★ ★
Based on the risk of injury in a side impact.

Rollover ★ ★ ★ ★
Based on the risk of rollover in a single vehicle crash.

Star ratings range from 1 to 5 stars (★ ★ ★ ★ ★) with 5 being the highest.

Source: National Highway Traffic Safety Administration (NHTSA)

www.safercar.gov or 1-888-327-4236

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS COUNTRY:

U.S./CANADIAN PARTS CONTENT: 62%

MAJOR SOURCES OF FOREIGN PARTS

CONTENT: MEXICO 34%

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

FOR THIS VEHICLE:

FINAL ASSEMBLY POINT:

SILAO, GJ MEXICO

COUNTRY OF ORIGIN:

ENGINE: UNITED STATES

TRANSMISSION: MEXICO

CREDIT AND COUNTRY RATES CODE: L

VEHICLE IDENTIFICATION CODE: 1G2E65802

VEHICLE IDENTIFICATION CODE: 1G2E65802

VEHICLE IDENTIFICATION CODE: 1G2E65802

VEHICLE IDENTIFICATION CODE: 1G2E65802

VEHICLE IDENTIFICATION CODE: 1G2E65802

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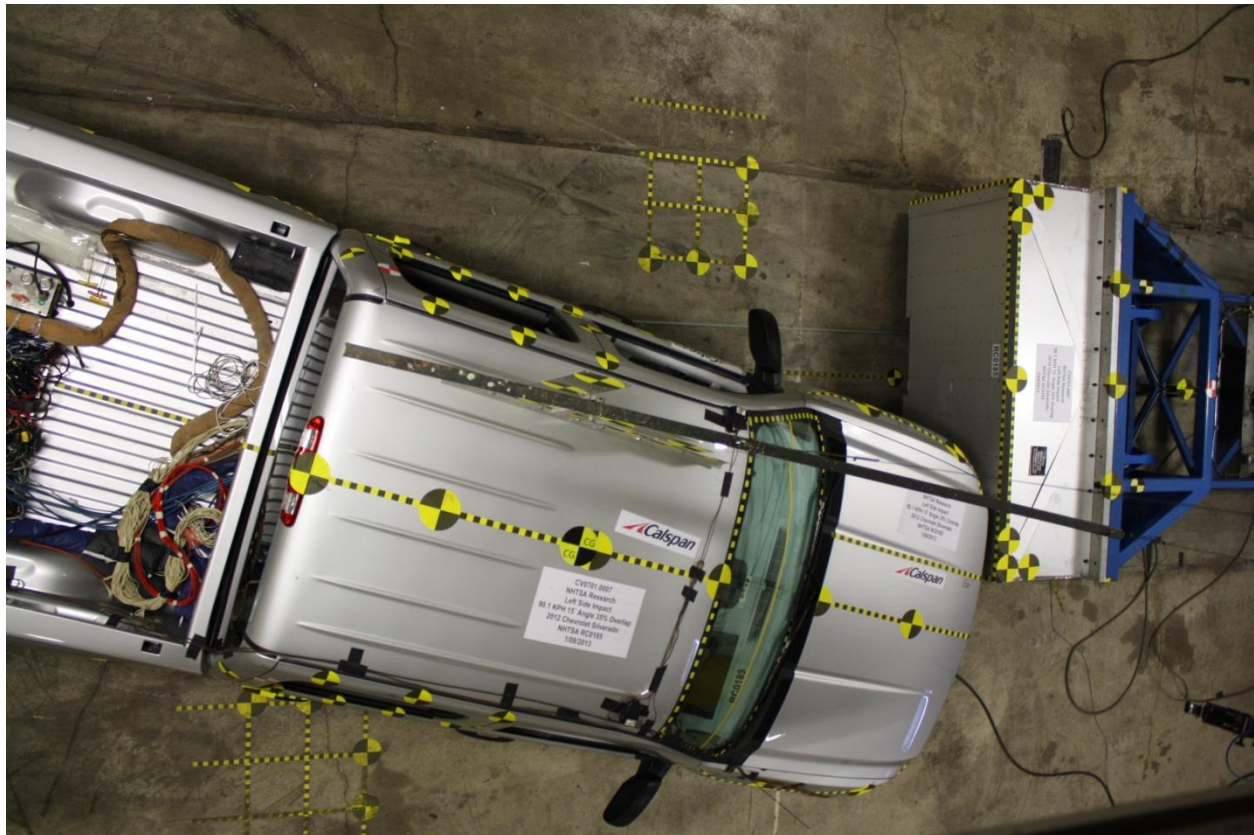
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VEHICLE IDENTIFICATION CODE: 1G2E65802

No. 021 Monroney Label Photograph



No. 022 Pre-Test Overhead View of RMDB against target vehicle at ideal Impact Point



No. 023 Pre-Test Left Side View of RMDB against target vehicle at ideal Impact Point



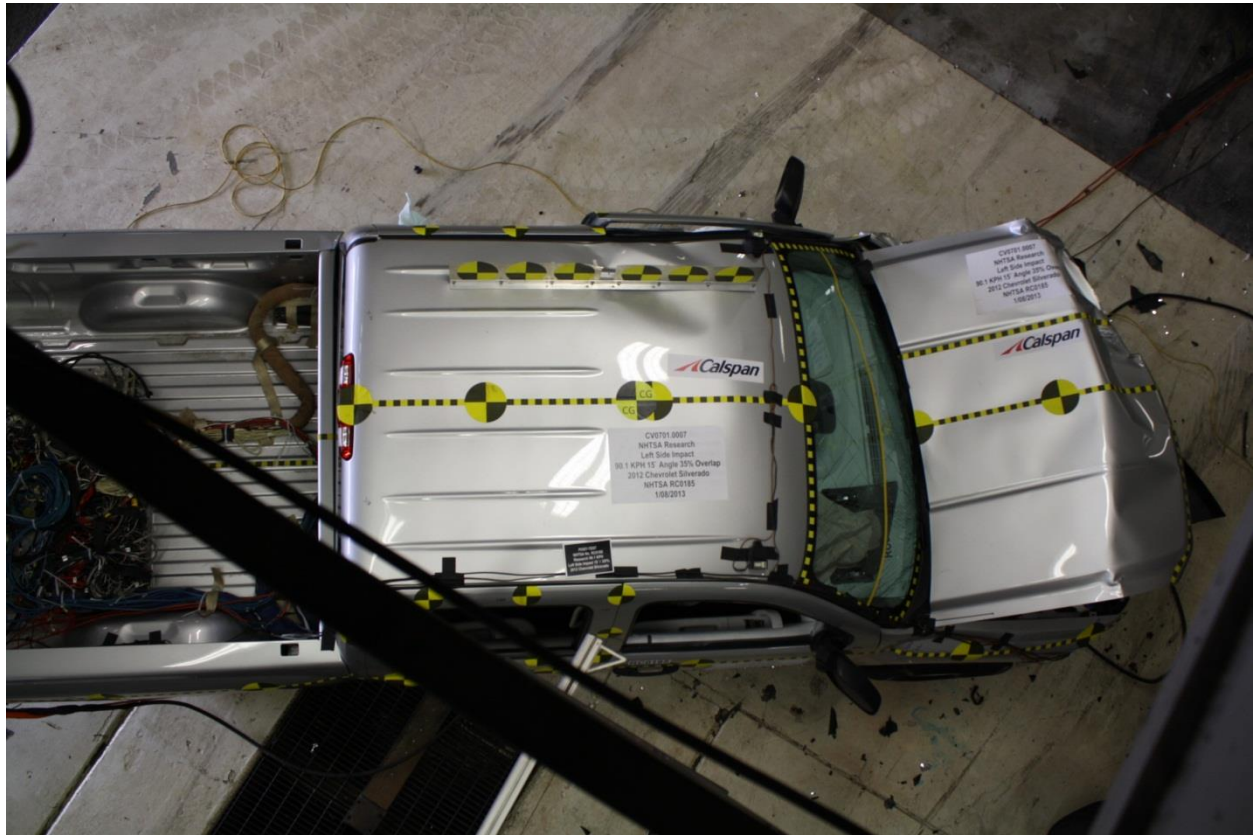
No. 024 Pre-Test Right Side View of RMDB against target vehicle at ideal Impact Point



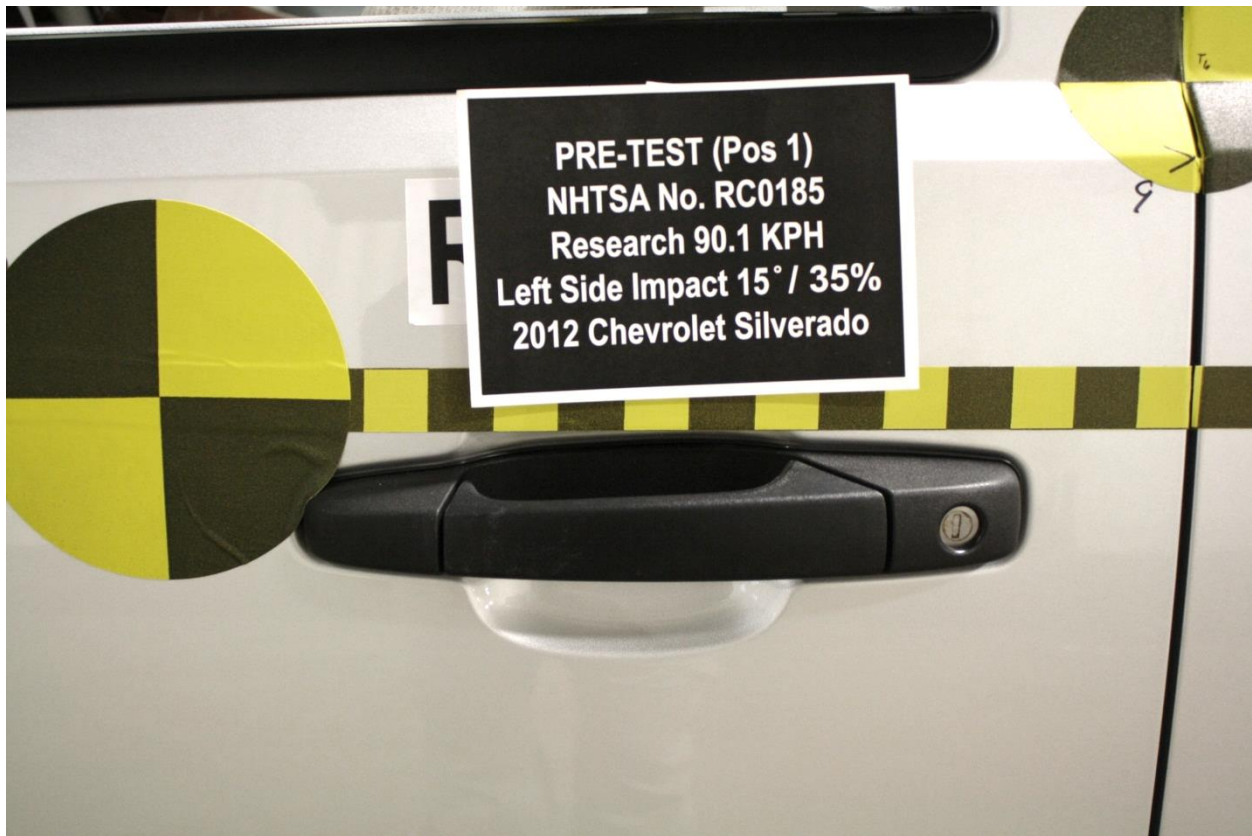
No. 025 Pre-Test Close-up View of Impact Point



No. 026 Post-Test Close-up View of Impact Point



No. 027 Post-Test Vehicle Overhead View



No. 028 Pre-Test Close-up View of Driver Door Latch



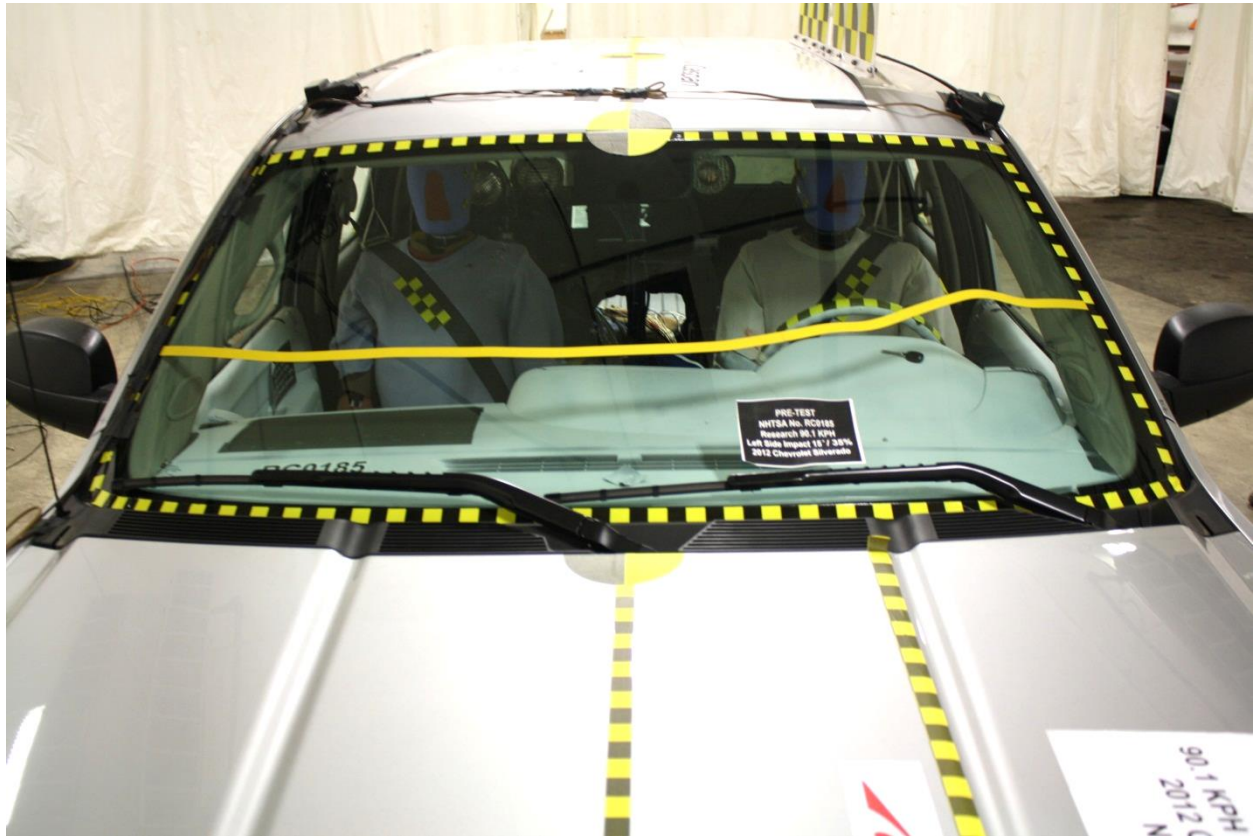
No. 029 Post-Test Close-up View of Driver Door Latch



No. 030 Pre-Test Close-up View of Passenger Door Latch



No. 031 Post-Test Close-up View of Passenger Door Latch



No. 032 Pre-Test Windshield View



No. 033 Post-Test Windshield View



No. 034 Pre-Test View of Driver Inner Door Panel



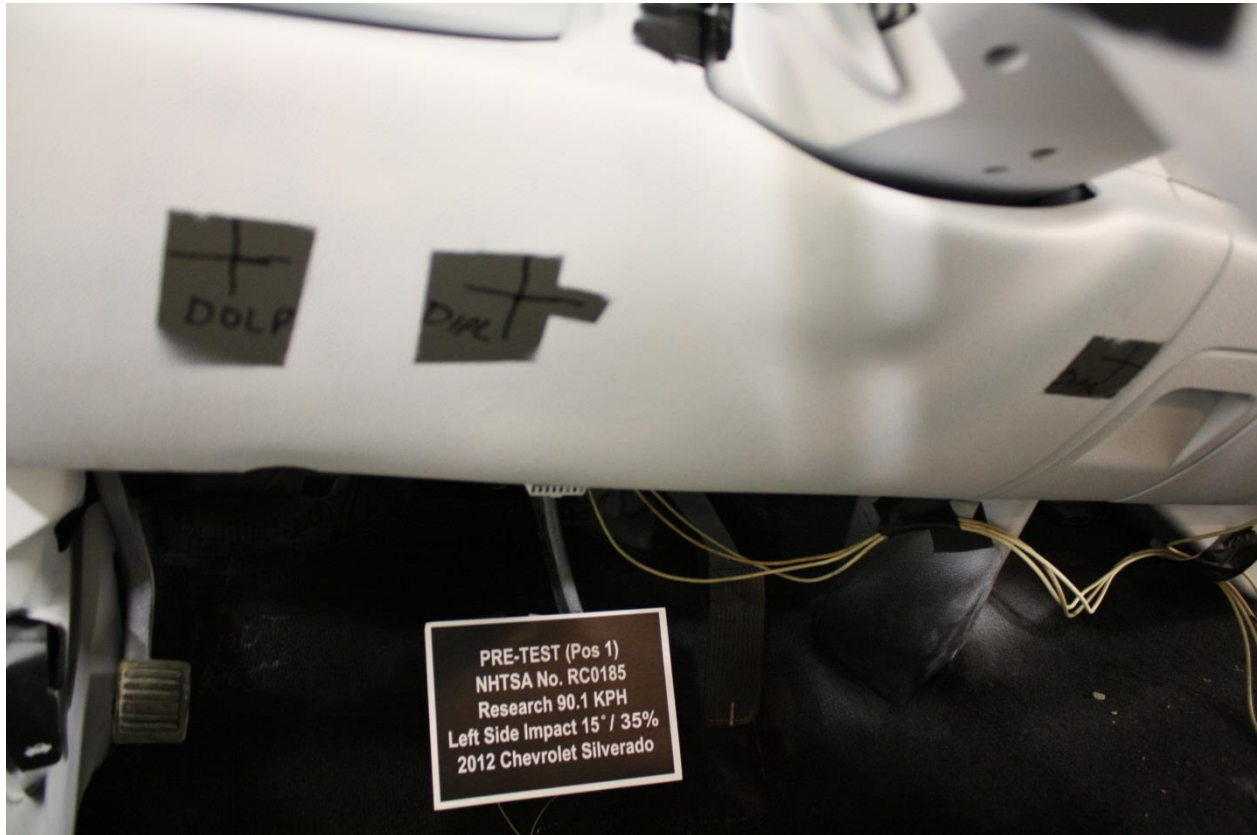
No. 035 Post-Test View of Driver Inner Door Panel



No. 036 Pre-Test View of Passenger Inner Door Panel



No. 037 Post-Test View of Passenger Inner Door Panel



No. 038 Pre-Test Overall View of Driver Knee Bolsters



No. 039 Post-Test Overall View of Driver Knee Bolsters



No. 040 Pre-Test Left Side View of Driver Knee Bolsters



No. 041 Post-Test Left Side View of Driver Knee Bolsters



No. 042 Pre-Test Right Side View of Driver Knee Bolsters



No. 043 Post-Test Right Side View of Driver Knee Bolsters



No. 044 Pre-Test View of Driver Floor pan at Left sill level, w/carpet



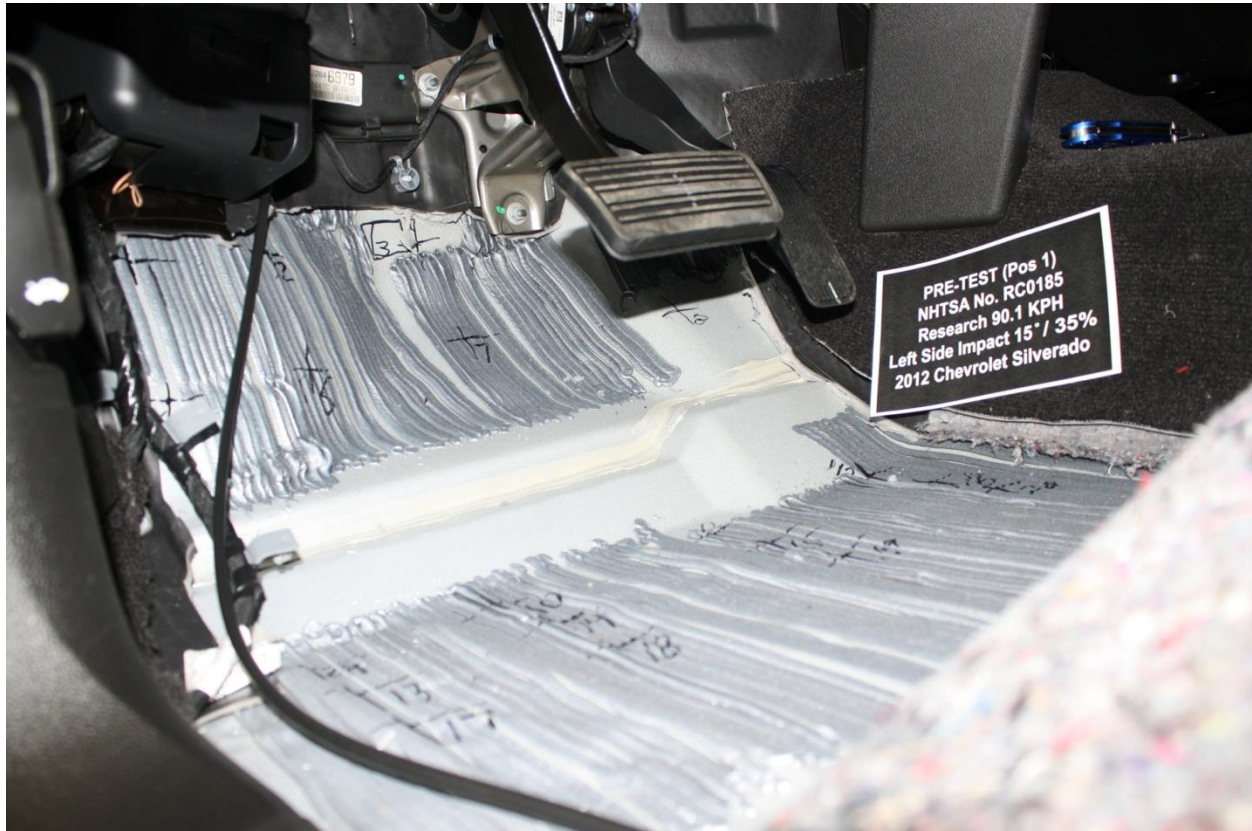
No. 045 Post-Test View of Driver Floor pan at Left sill level, w/carpet



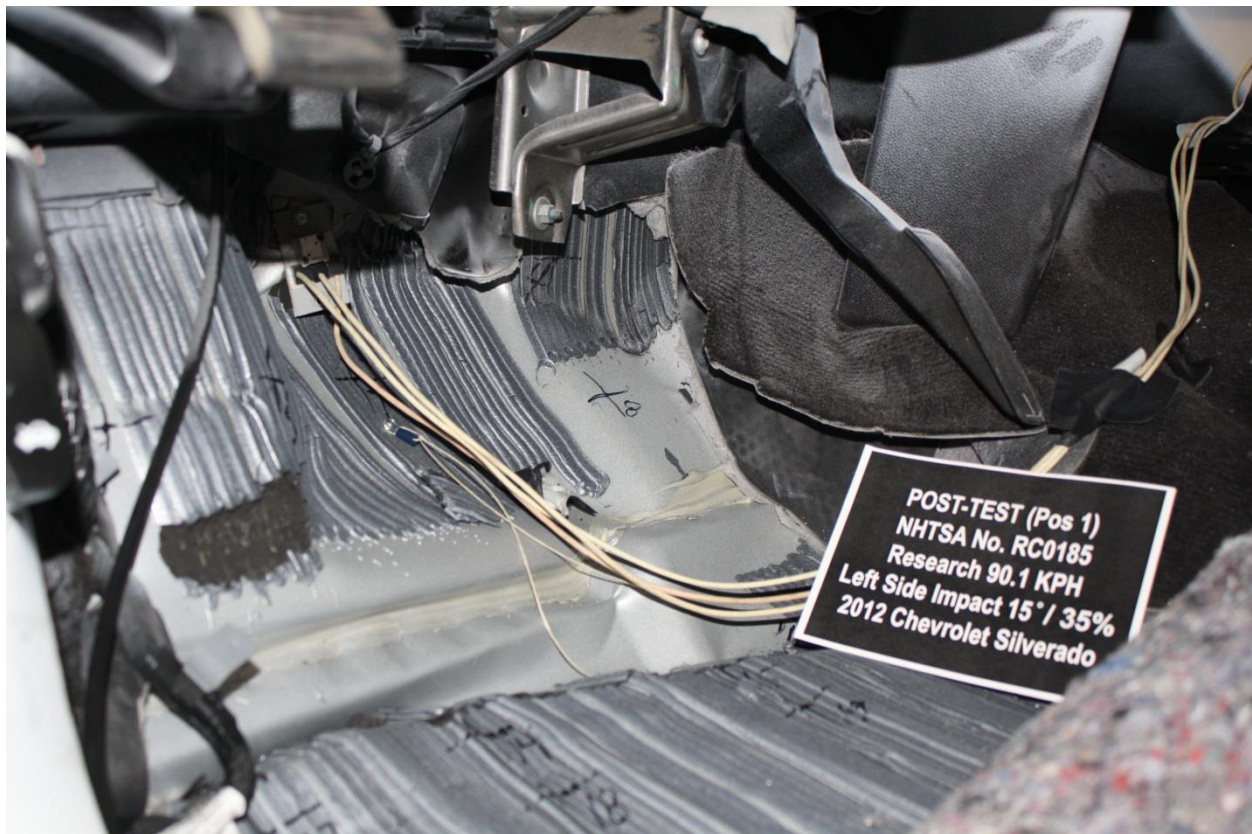
No. 046 Pre-Test View of Driver Floor pan at Mid seat level, w/carpet



No. 047 Post-Test view of Driver Floor pan at Mid seat level, w/carpet



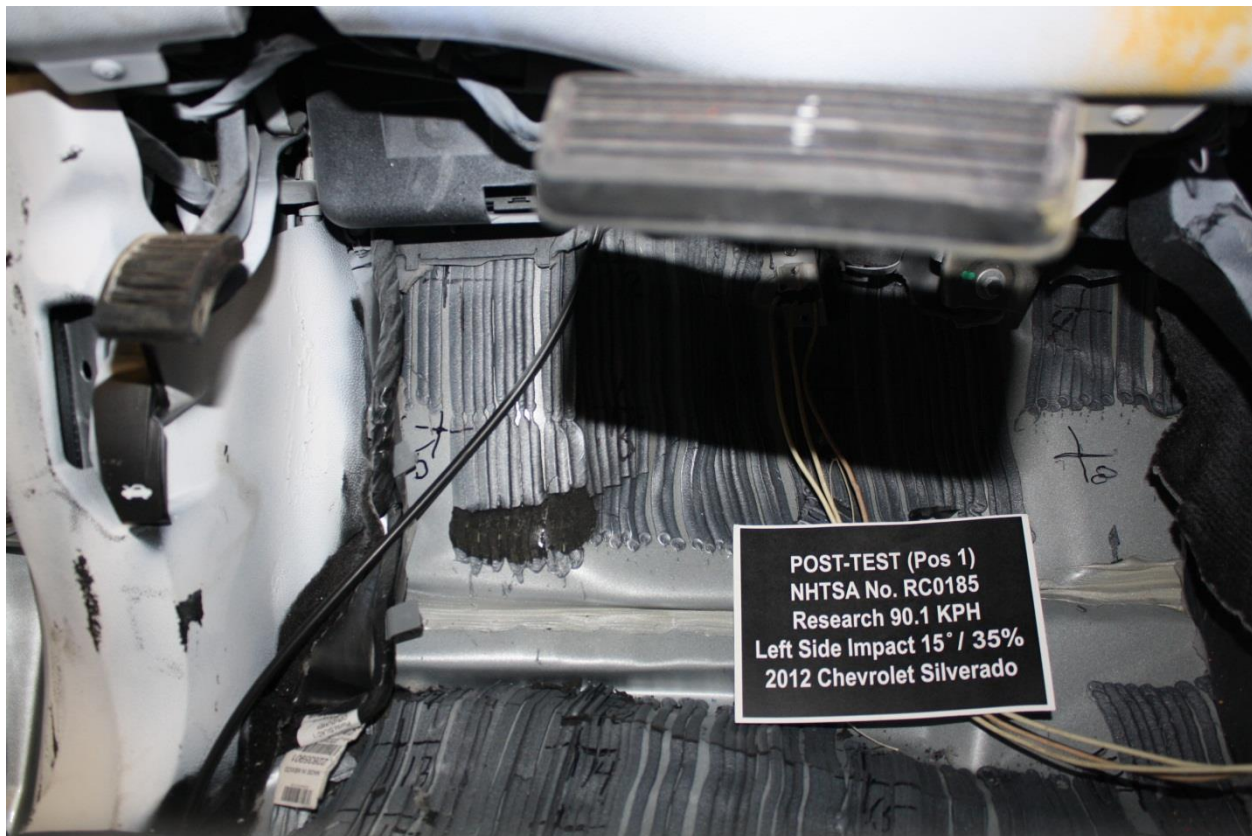
No. 048 Pre-Test View of Driver Floor pan at Left sill level, w/o carpet



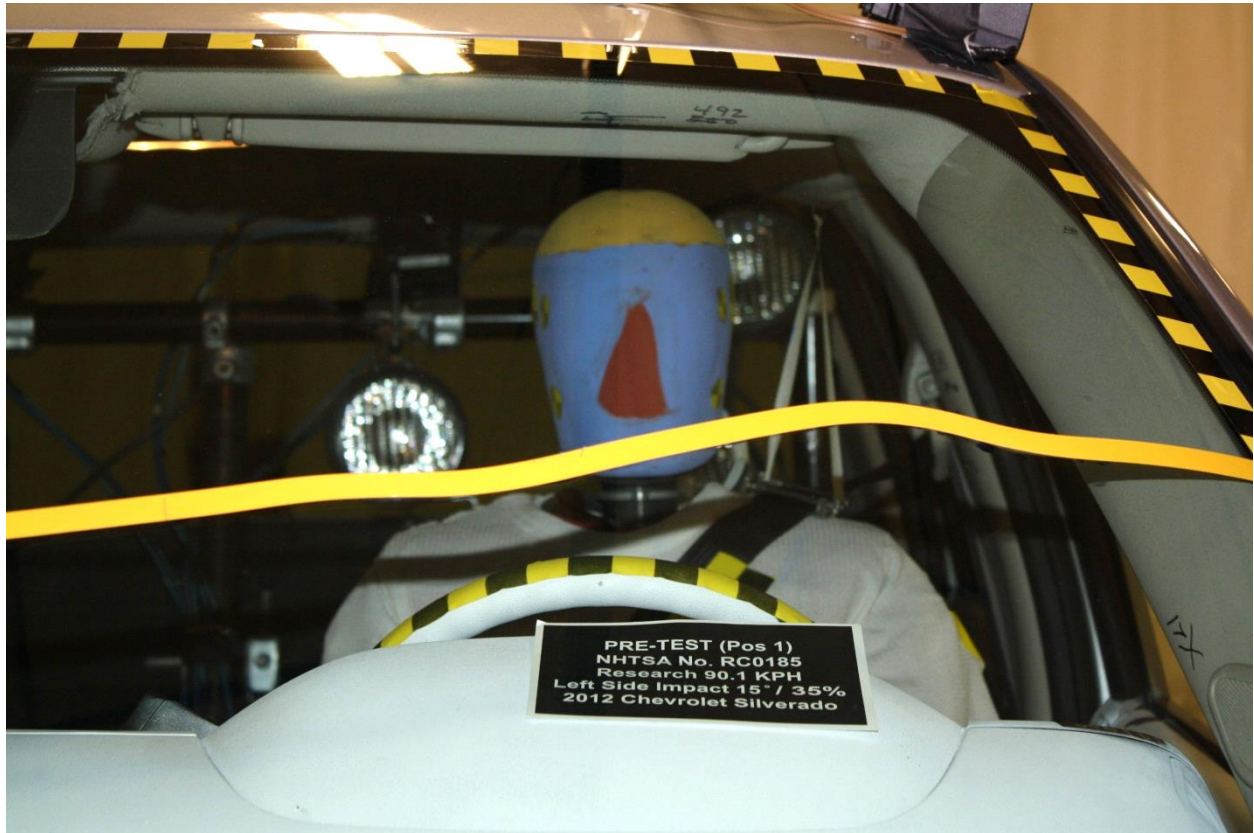
No. 049 Post-Test View of Driver Floor pan at Left sill level, w/o carpet



No. 050 Pre-Test View of Driver Floor pan at Mid seat level, w/o carpet



No. 051 Post-Test view of Driver Floor pan at Mid seat level, w/o carpet



No. 052 Pre-Test Driver Front Windshield View



No. 053 Post-Test Driver Front Windshield View



No. 054 Pre-Test Left Side View of Driver and Interior



No. 055 Post-Test Left Side View of Driver and Interior



No. 056 Pre-Test Left Side Driver Window View



No. 057 Post-Test Left Side Driver Window View



No. 058 Pre-Test Right Side View of Driver and Interior



No. 059 Post-Test Right Side View of Driver and Interior



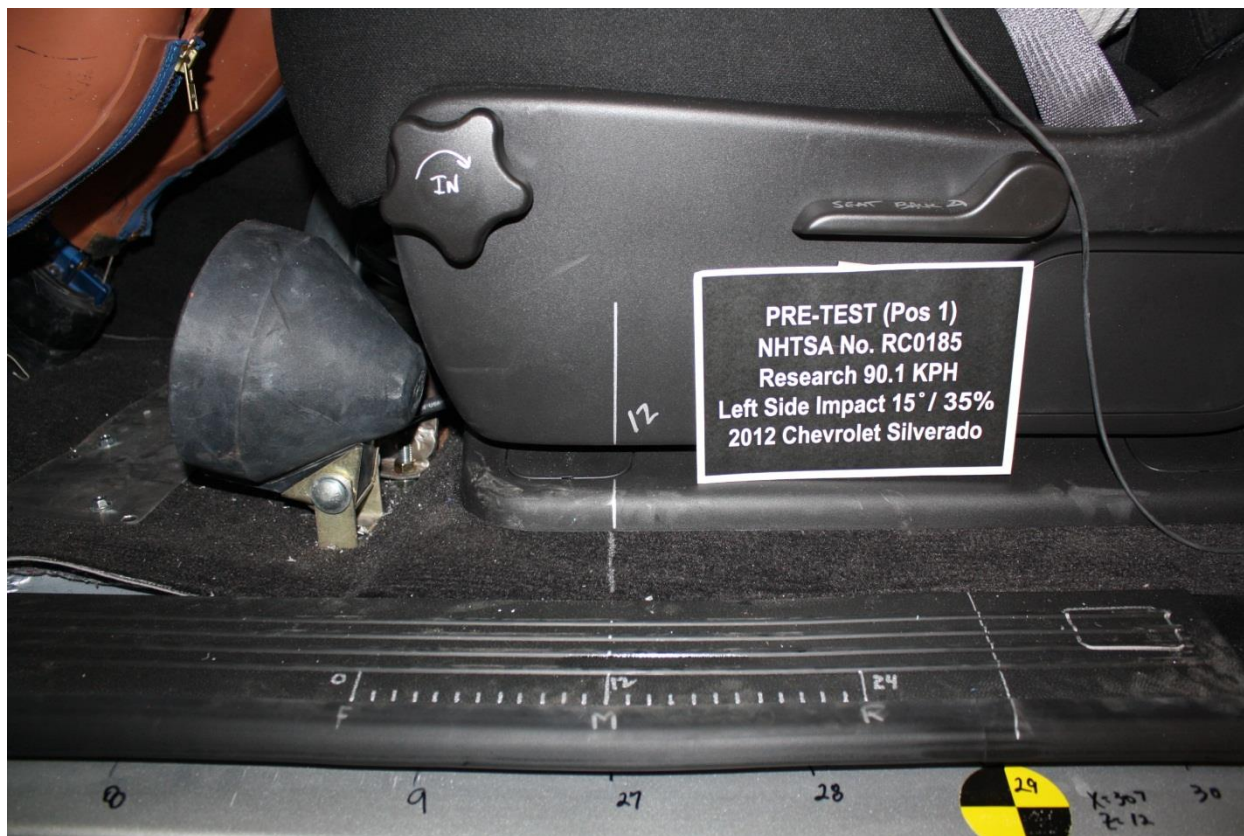
No. 060 Pre-Test View of Driver Door Clearance



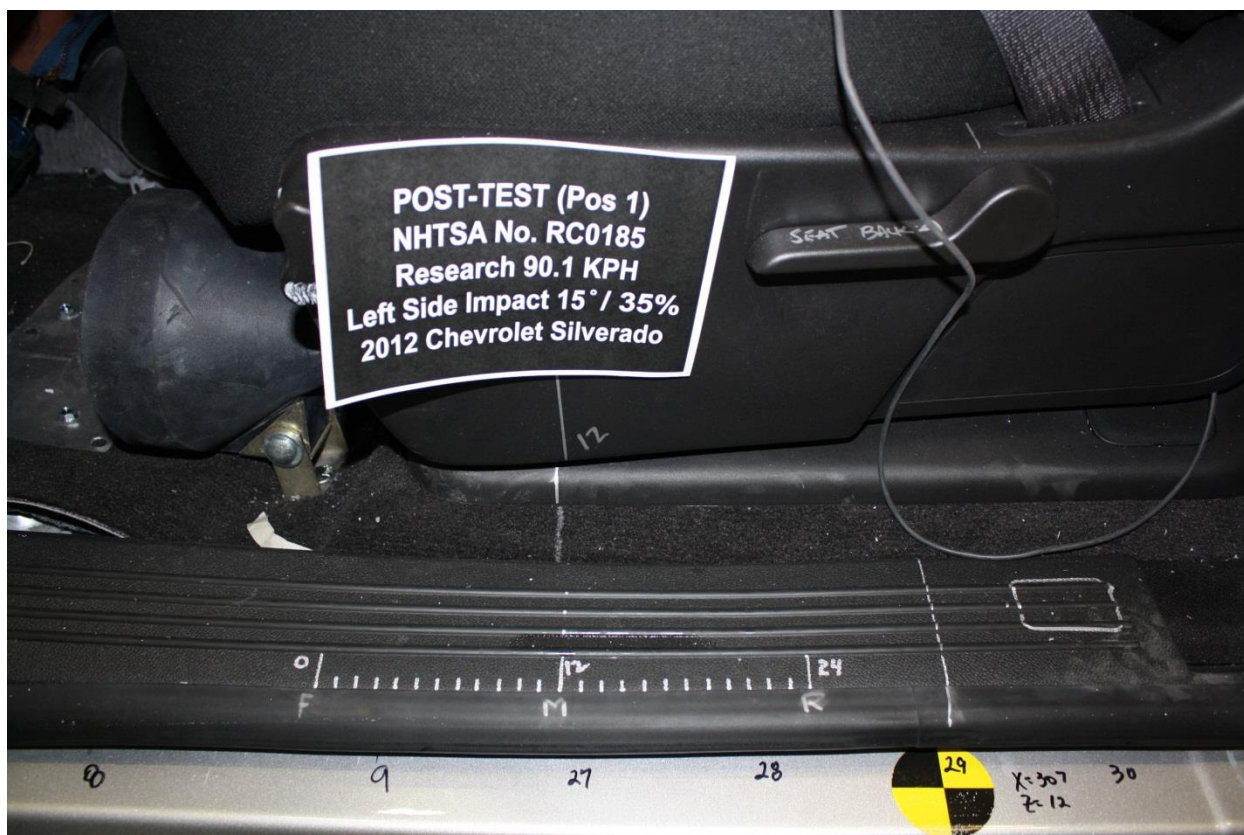
No. 061 Post-Test View of Driver Door Clearance



No. 062 Pre-Test View of Parking Brake



No. 063 Pre-Test Driver Seat Fore Aft Markings



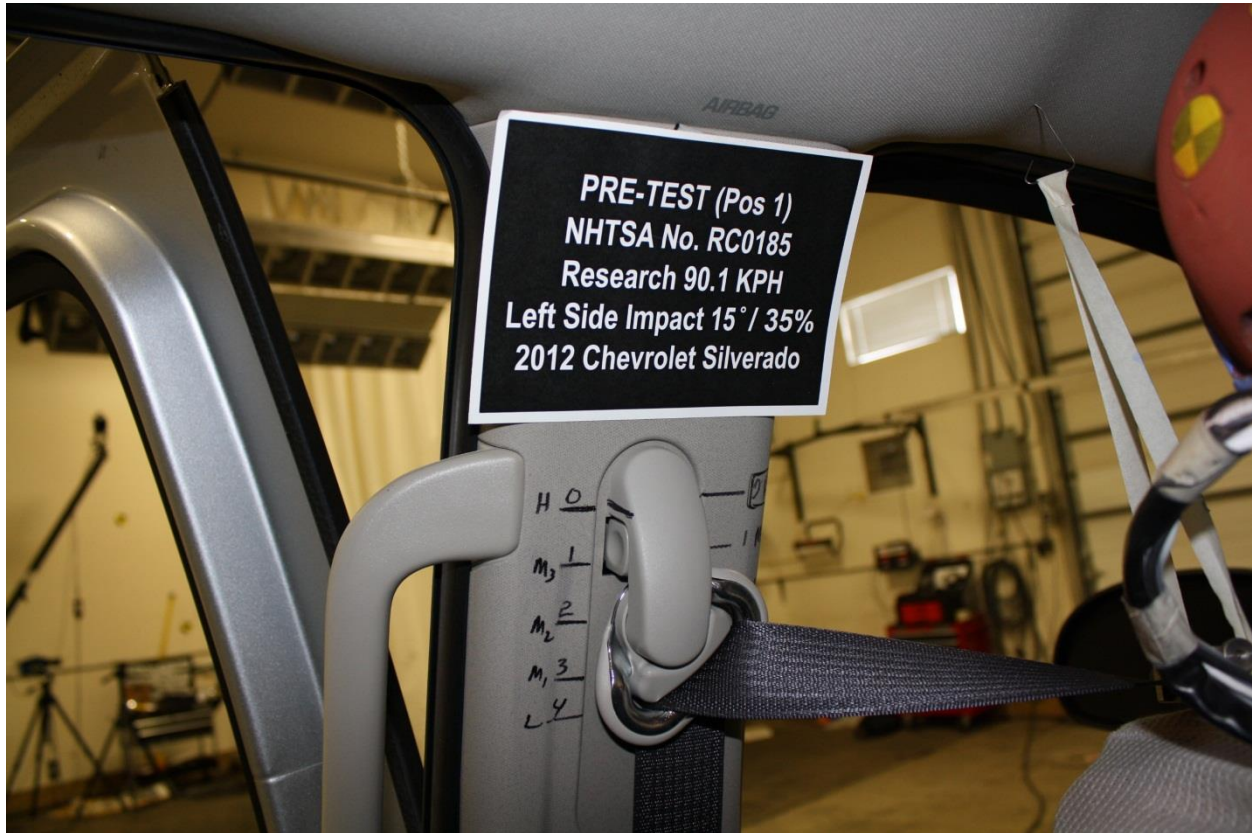
No. 064 Post-Test Driver Seat Fore Aft Markings



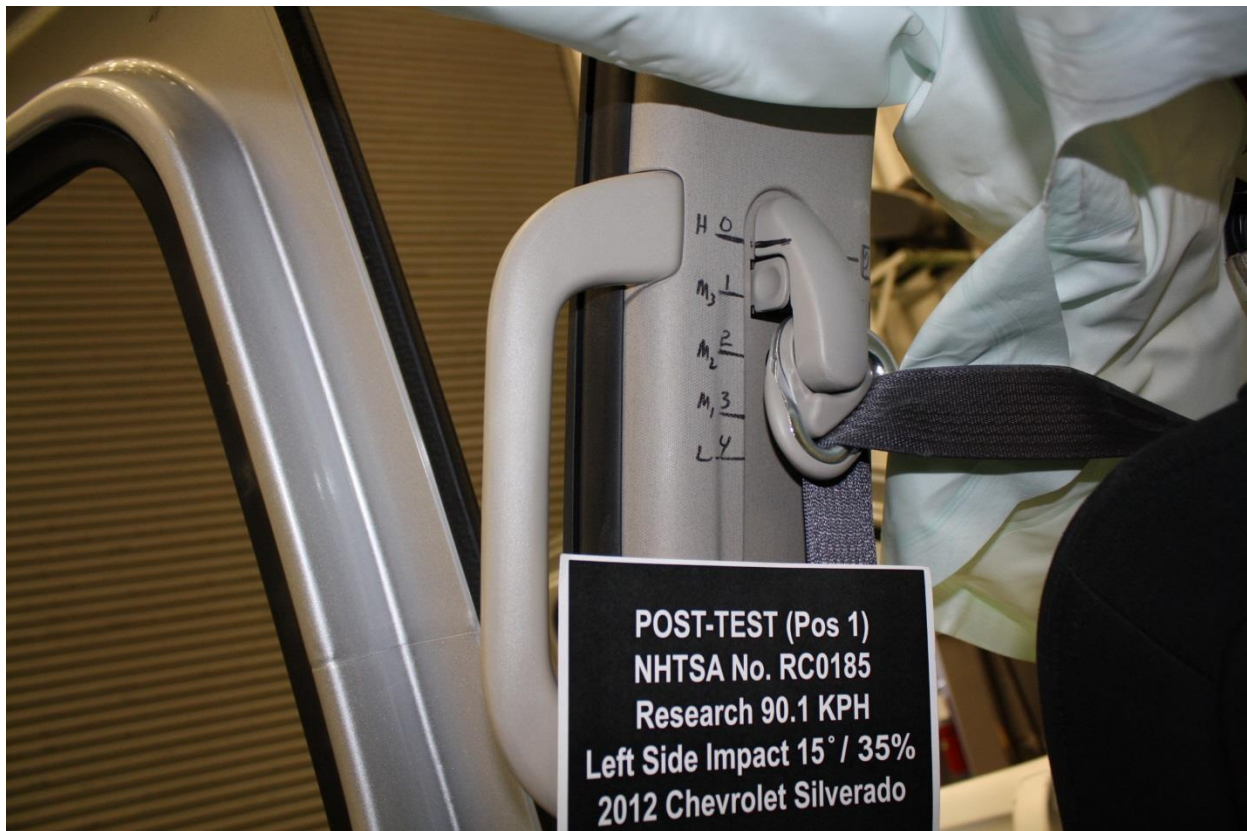
No. 065 Pre-Test Driver Seat Back Markings



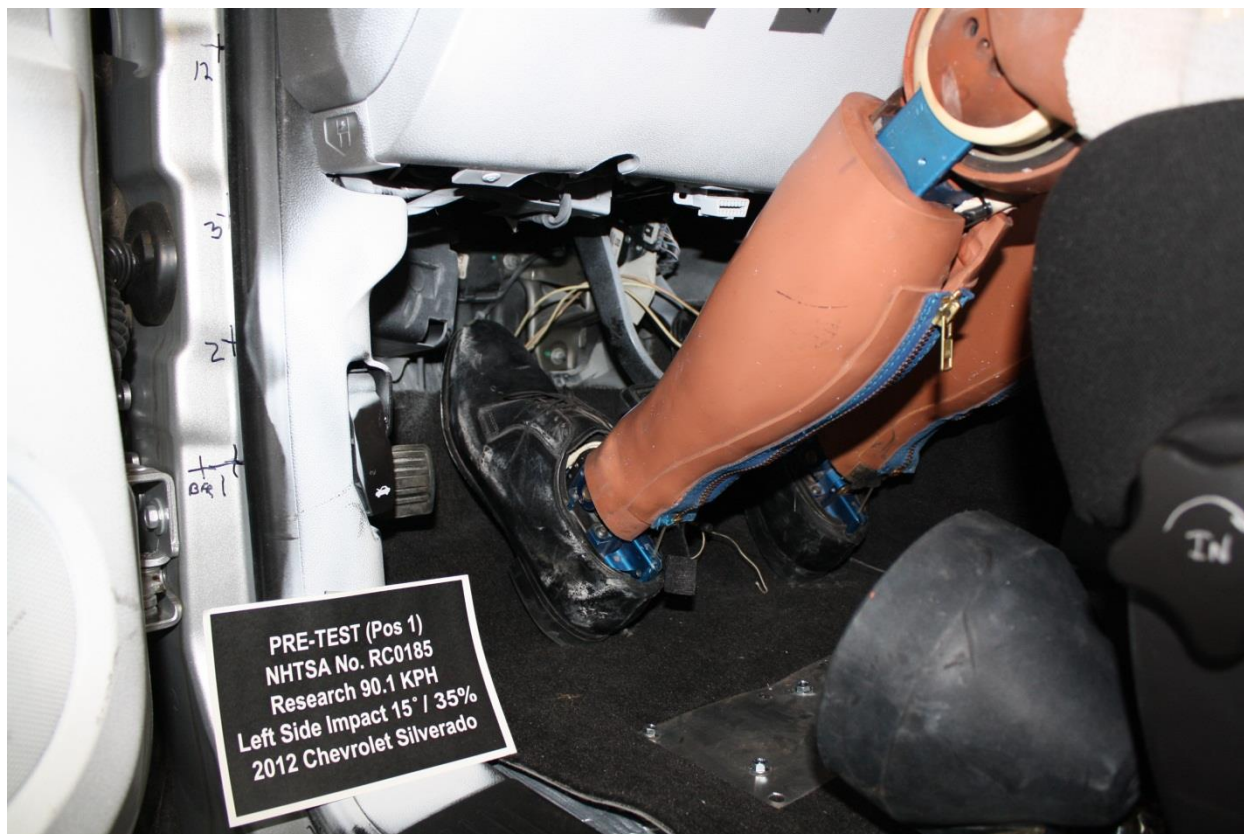
No. 066 Pre-Test Overhead View of Driver Thighs on Seat



No. 067 Pre-Test Driver Adjustable D-Ring



No. 068 Post-Test Driver Adjustable D-Ring



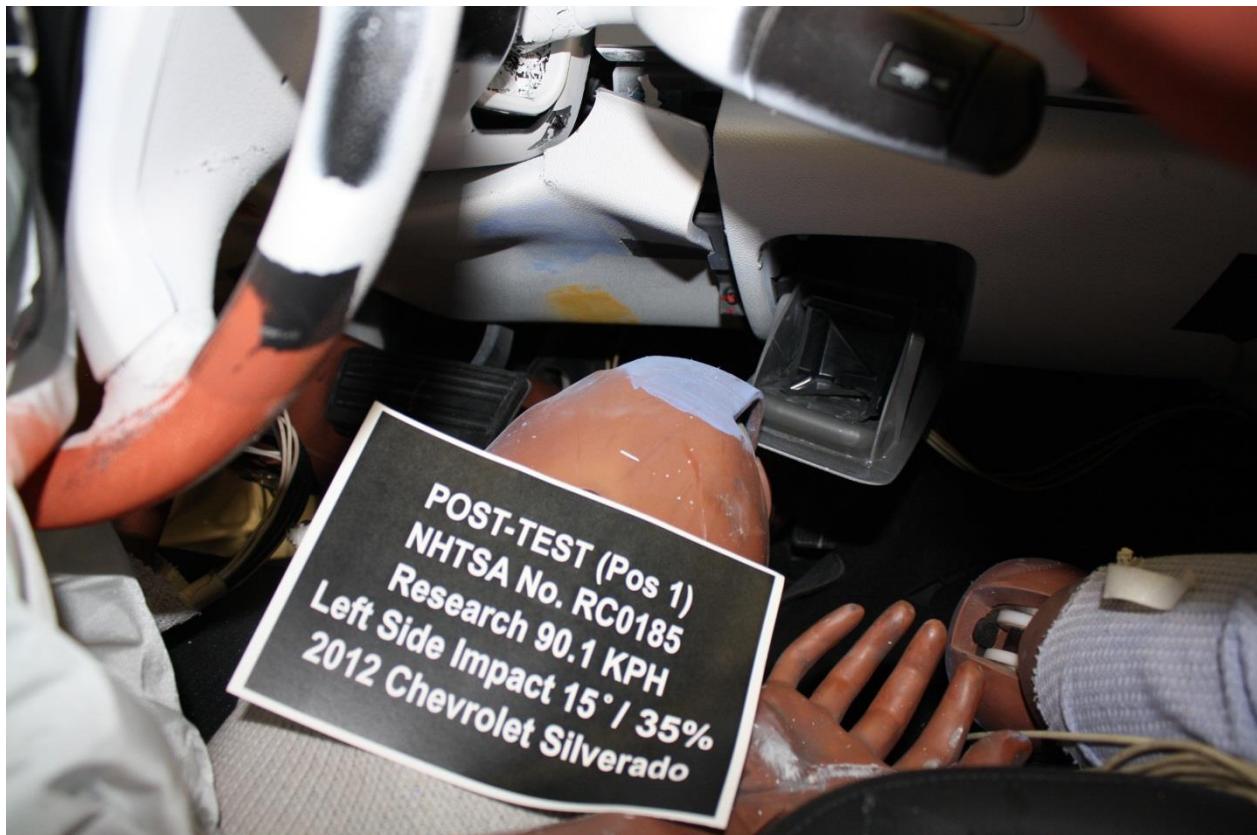
No. 069 Pre-Test Driver Feet



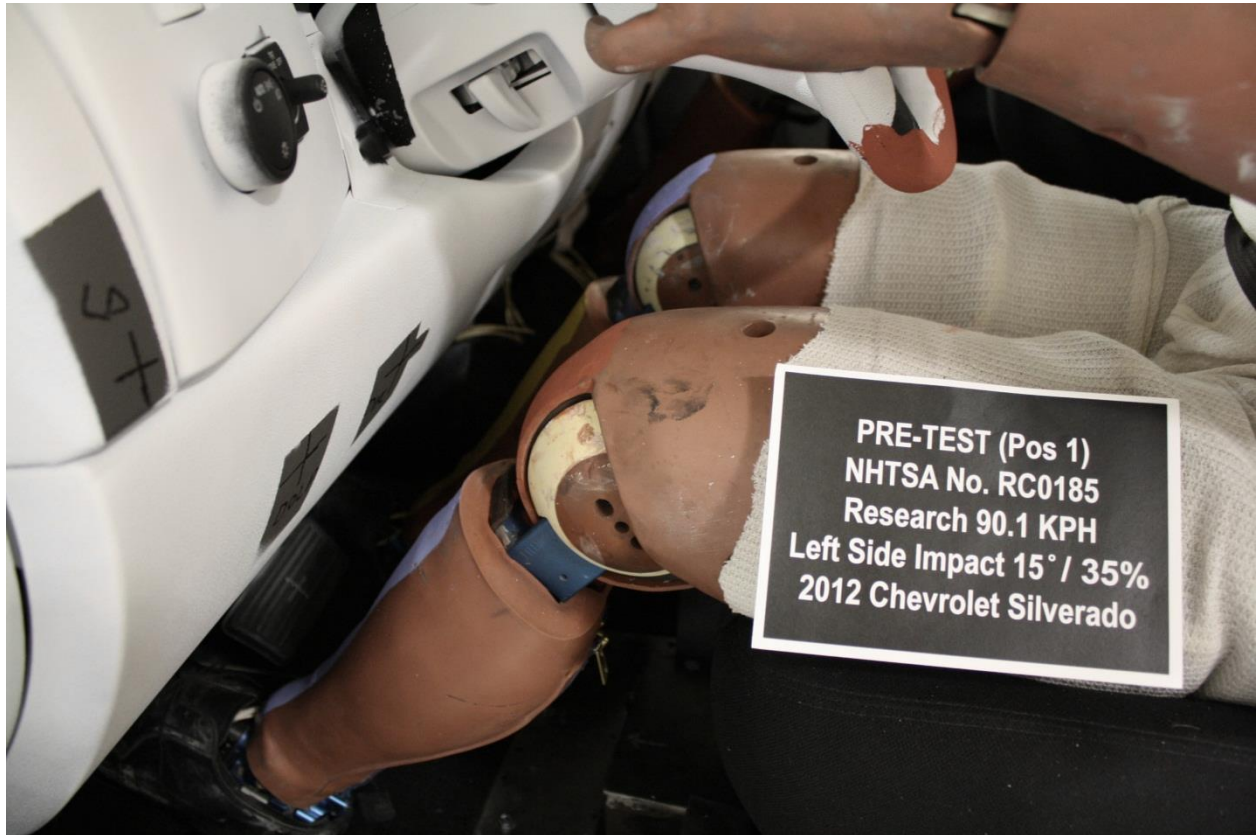
No. 070 Post-Test Driver Feet



No. 071 Pre-Test View of Driver Right Knee and Bolster



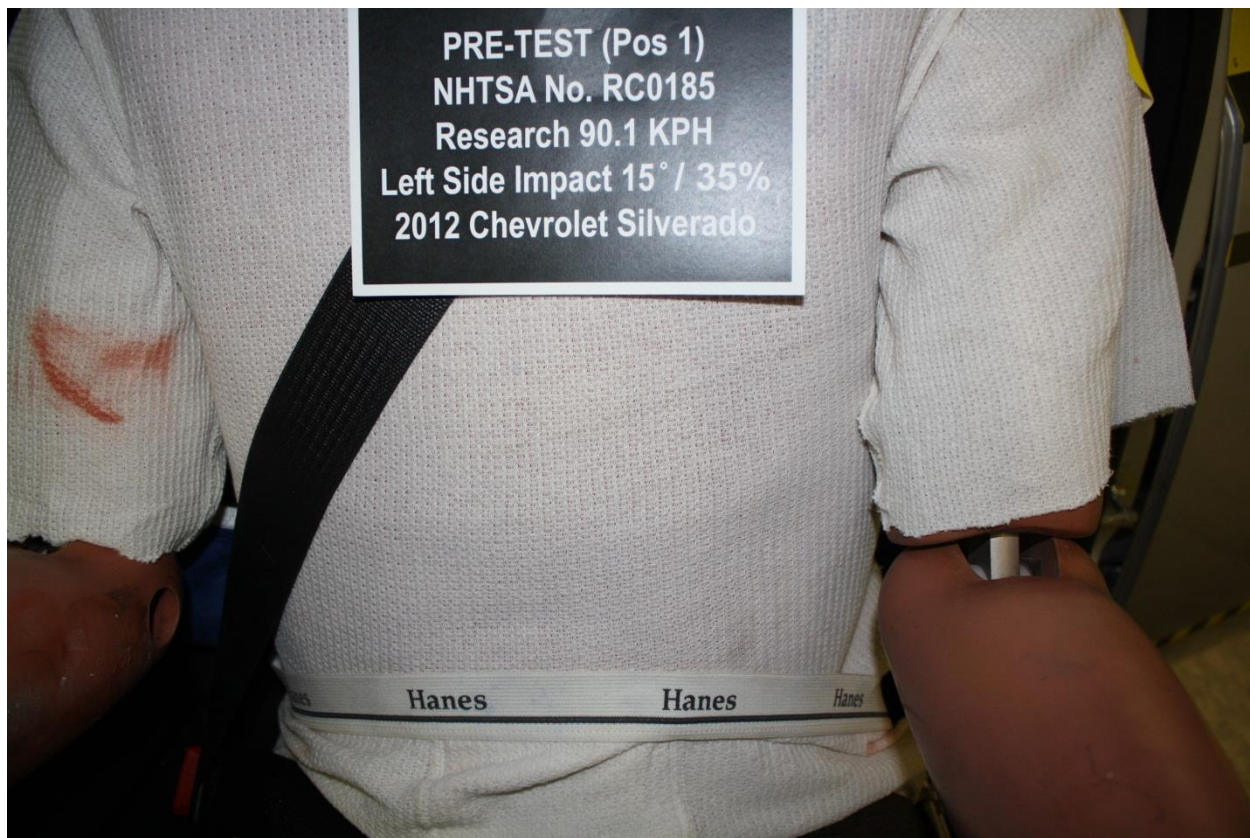
No. 072 Post-Test View of Driver Right Knee and Bolster



No. 073 Pre-Test View of Driver Left Knee and Bolster



No. 074 Post-Test View of Driver Left Knee and Bolster



No. 075 Pre-Test View of Driver Abdomen



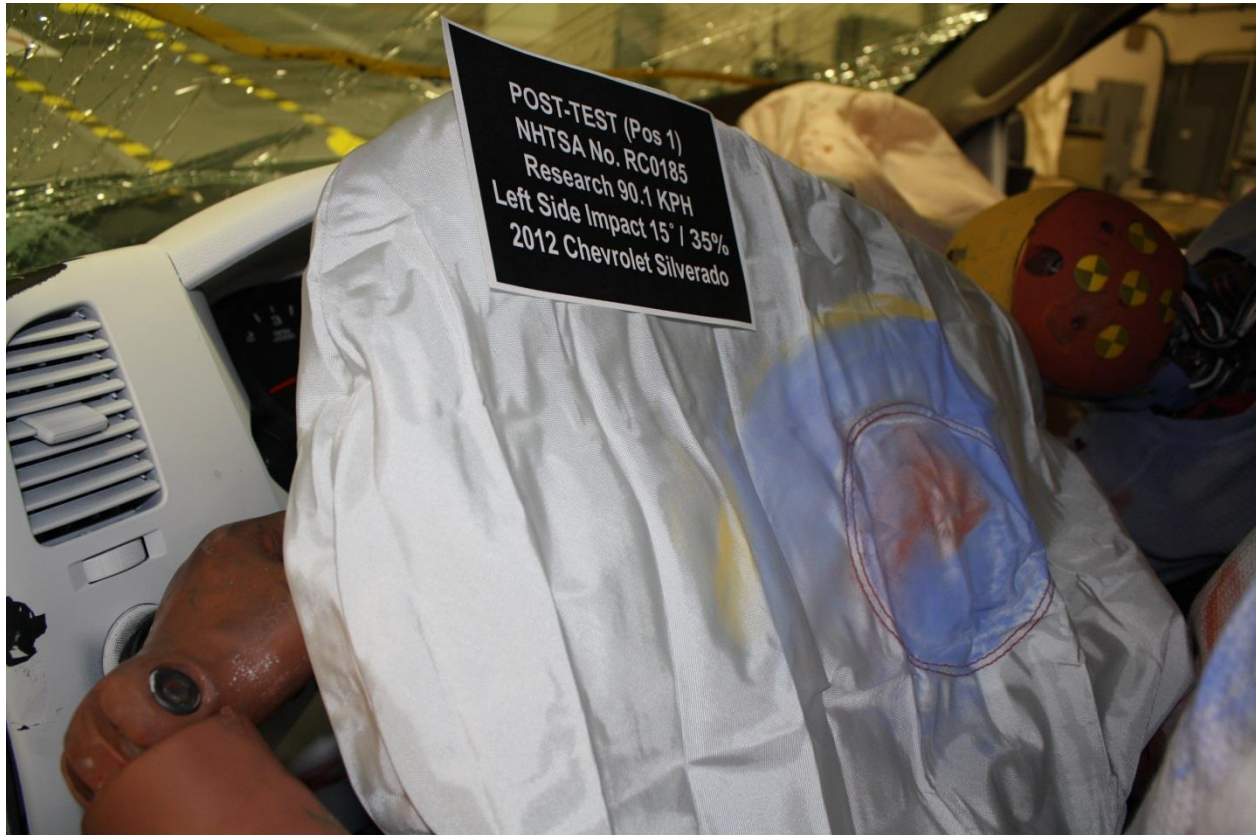
No. 076 Post-Test View of Driver Abdomen



No. 077 Pre-Test Left Side View of Steering Wheel set position



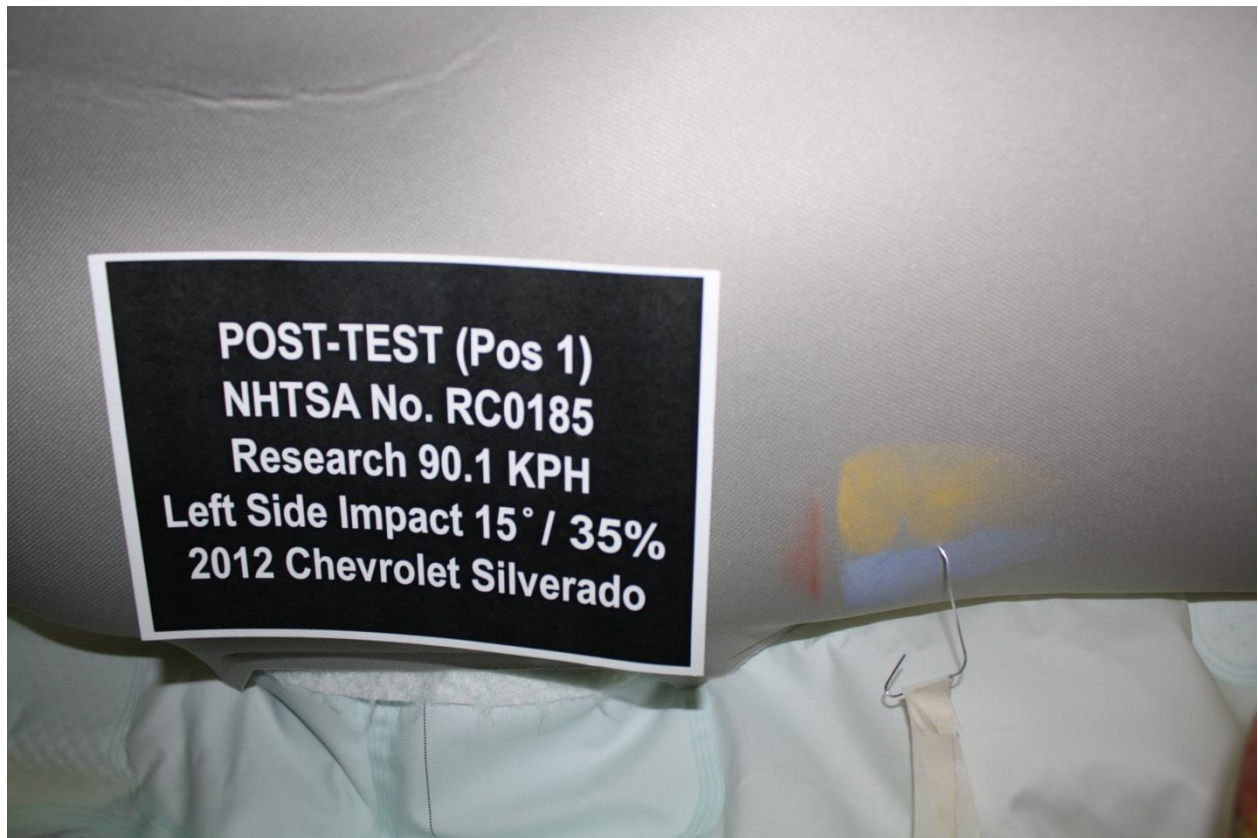
No. 078 Post-Test Left Side View of Steering Wheel set position



No. 079 Post-Test View of Driver Head Contact with Front Airbag



No. 080 Post-Test View of Driver Head Contact with Curtain Airbag



No. 081 Post-Test View of Driver Head Contact with Vehicle Interior – A

Photo Not Applicable

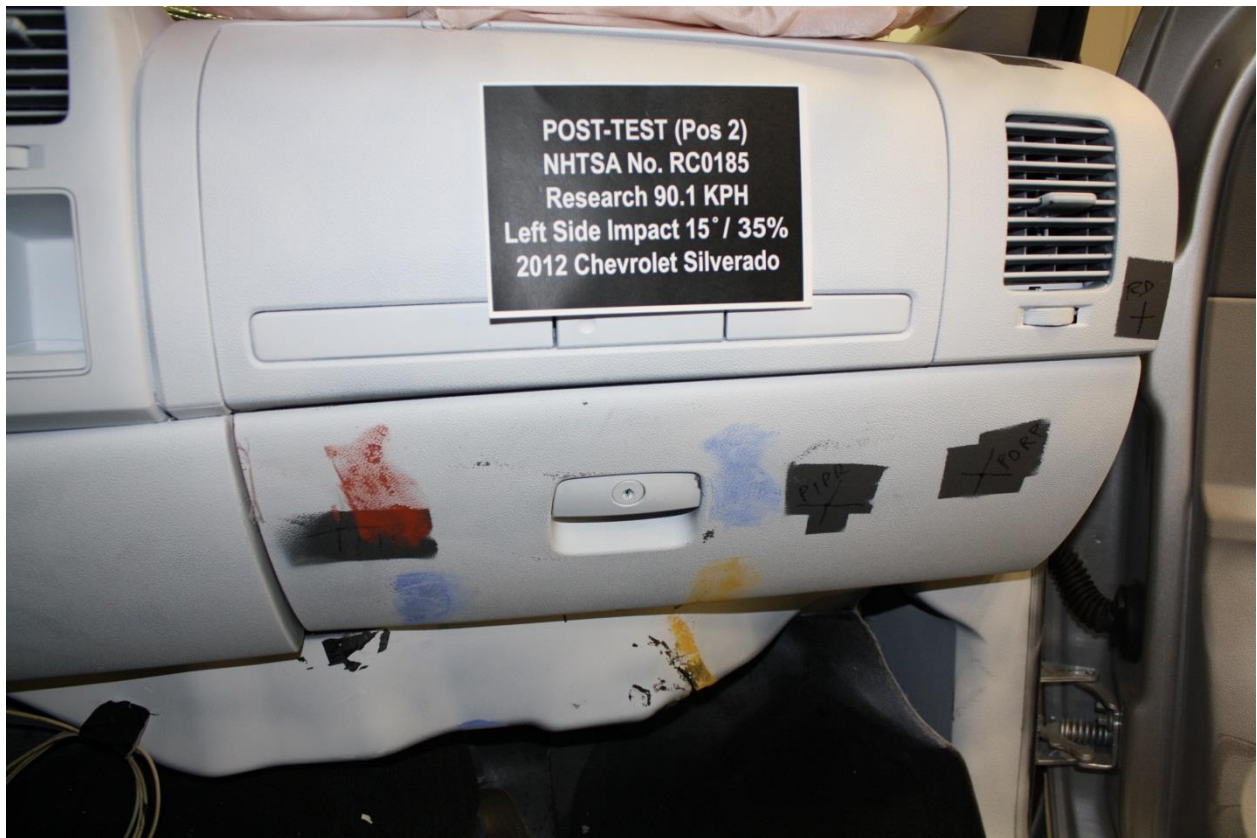
No. 081a Post-Test View of Driver Head Contact with Vehicle Interior - B

Photo Not Applicable

No. 081b Post-Test View of Driver Head Contact with Vehicle Interior - C



No. 082 Pre-Test Overall View of Passenger Knee Bolsters



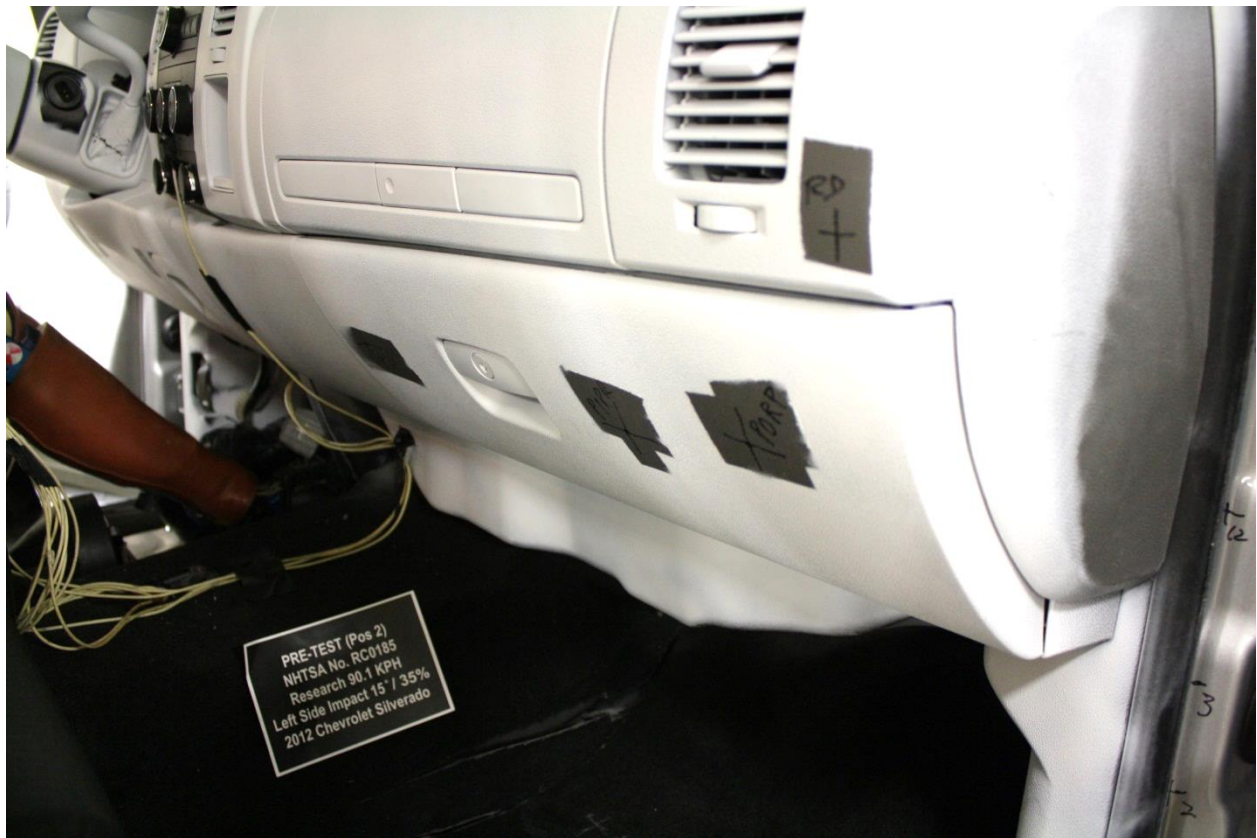
No. 083 Post-Test Overall View of Passenger Knee Bolsters



No. 084 Pre-Test Left Side View of Passenger Knee Bolsters



No. 085 Post-Test Left Side View of Passenger Knee Bolsters



No. 086 Pre-Test Right Side View of Passenger Knee Bolsters



No. 087 Post-Test Right Side View of Passenger Knee Bolsters



No. 088 Pre-Test View of Passenger Floor pan at Left sill level, w/carpet



No. 089 Post-Test View of Passenger Floor pan at Left sill level, w/carpet



No. 090 Pre-Test View of Passenger Floor pan at Mid seat level, w/carpet



No. 091 Post-Test view of Passenger Floor pan at Mid seat level, w/carpet



No. 092 Pre-Test View of Passenger Floor pan at Left sill level, w/o carpet



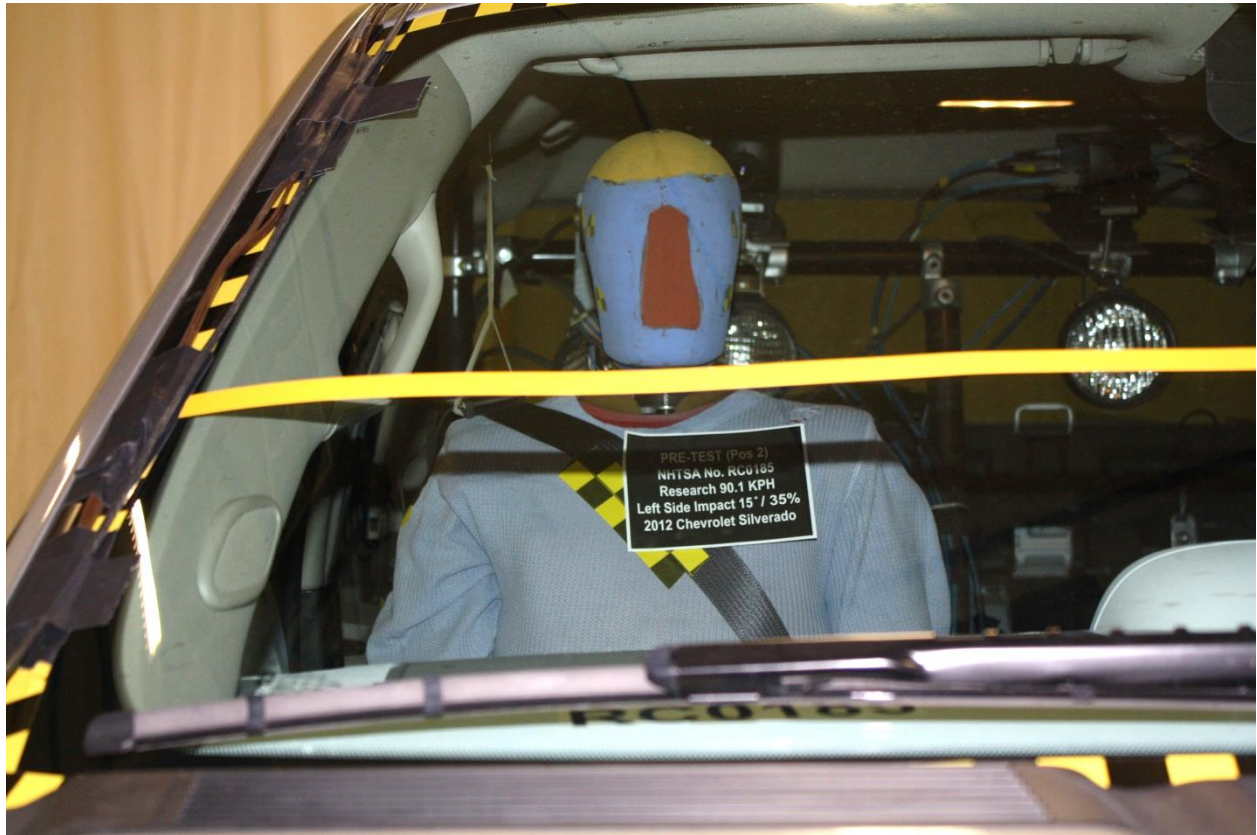
No. 093 Post-Test View of Passenger Floor pan at Left sill level, w/o carpet



No. 094 Pre-Test View of Passenger Floor pan at Mid seat level, without carpet



No. 095 Post-Test view of Passenger Floor pan at Mid seat level, wo carpet



No. 096 Pre-Test Passenger Front Close-up View, Windshield



No. 097 Post-Test Passenger Front Close-up View, Windshield



No. 098 Pre-Test Left Side Passenger and Interior View



No. 099 Post-Test Left Side Passenger and Interior View



No. 100 Pre-Test Right Side Passenger Window View



No. 101 Post-Test Right Side Passenger Window View



No. 102 Pre-Test Right Side Passenger and Interior View



No. 103 Post-Test Right Side Passenger and Interior View



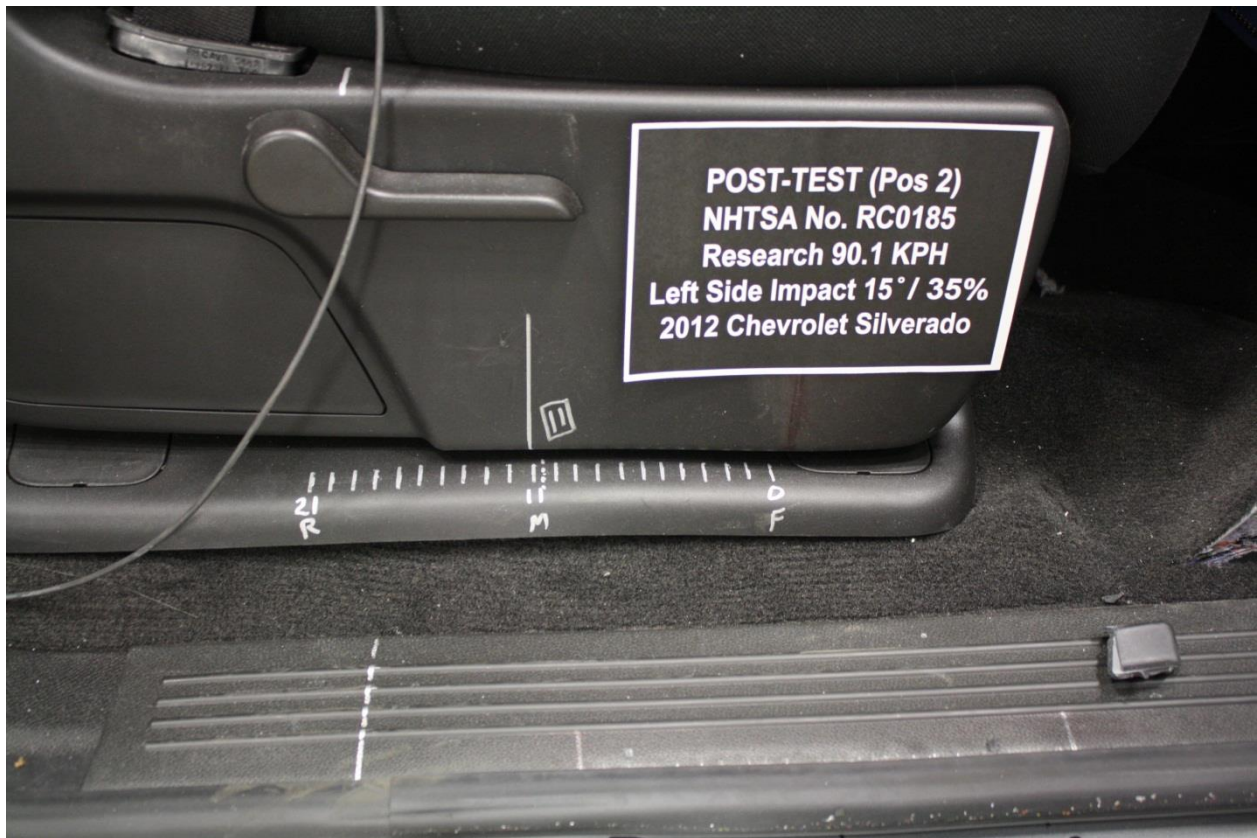
No. 104 Pre-Test View of Passenger Door Clearance



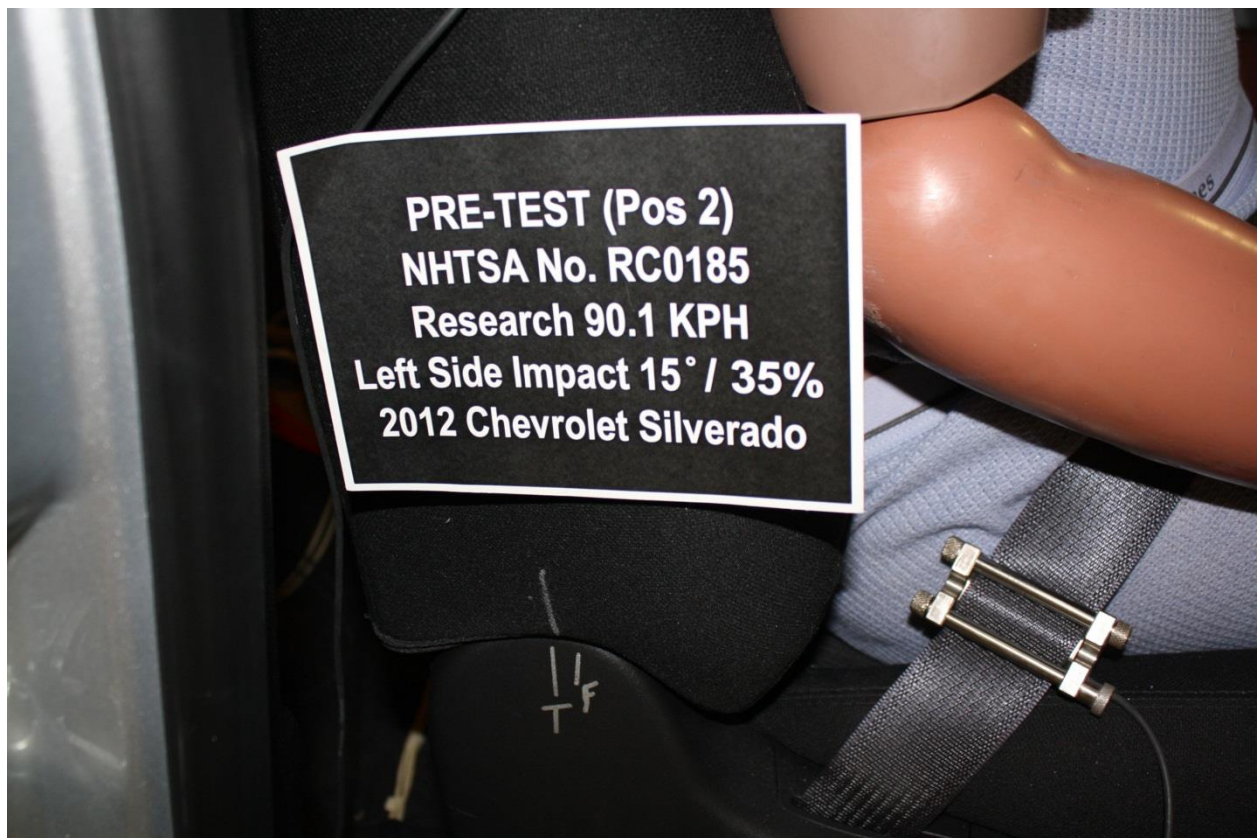
No. 105 Post-Test View of Passenger Door Clearance



No. 106 Pre-Test Passenger Seat Fore-Aft Markings



No. 107 Post-Test Passenger Seat Fore-Aft Markings



No. 108 Pre-Test Passenger Seat Back Markings



No. 109 Pre-Test Overhead View of Passenger Thighs on seat



No. 110 Pre-Test Passenger Adjustable D-ring



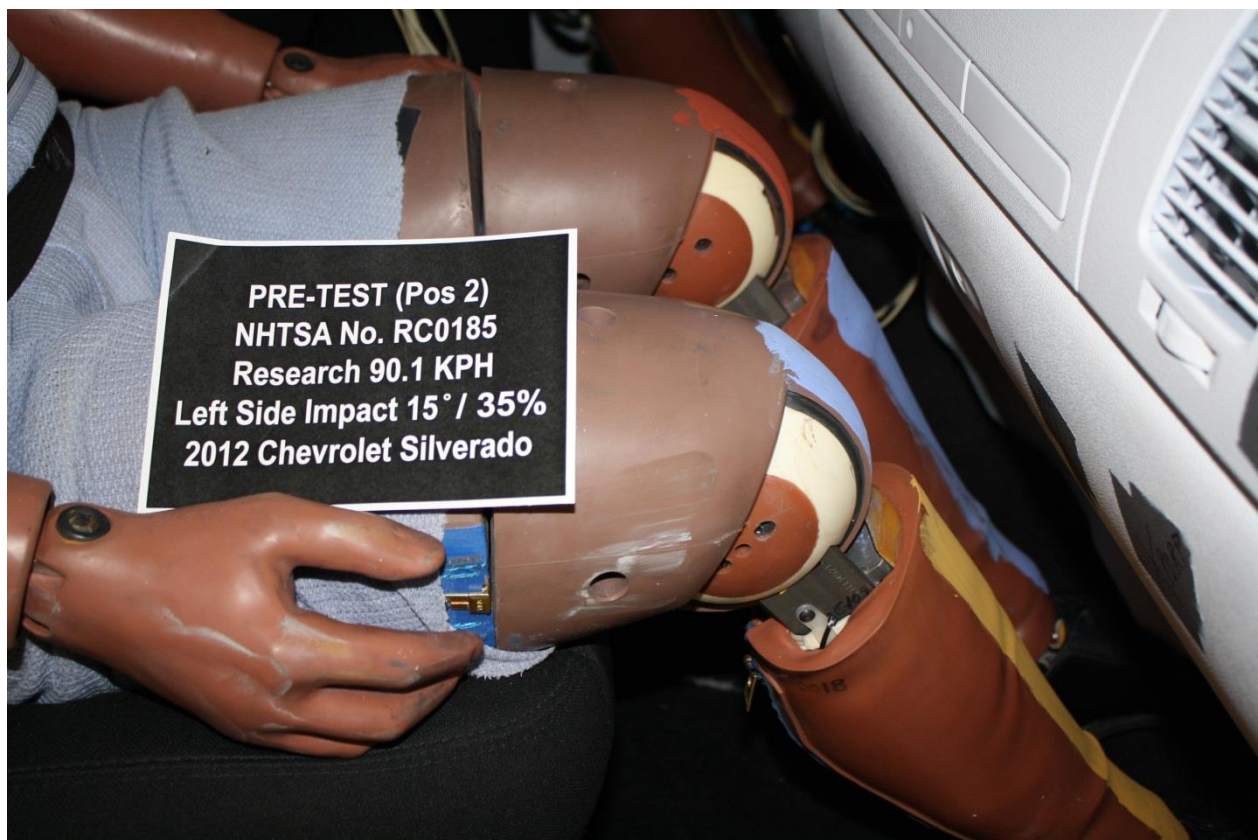
No. 111 Post-Test Passenger Adjustable D-ring



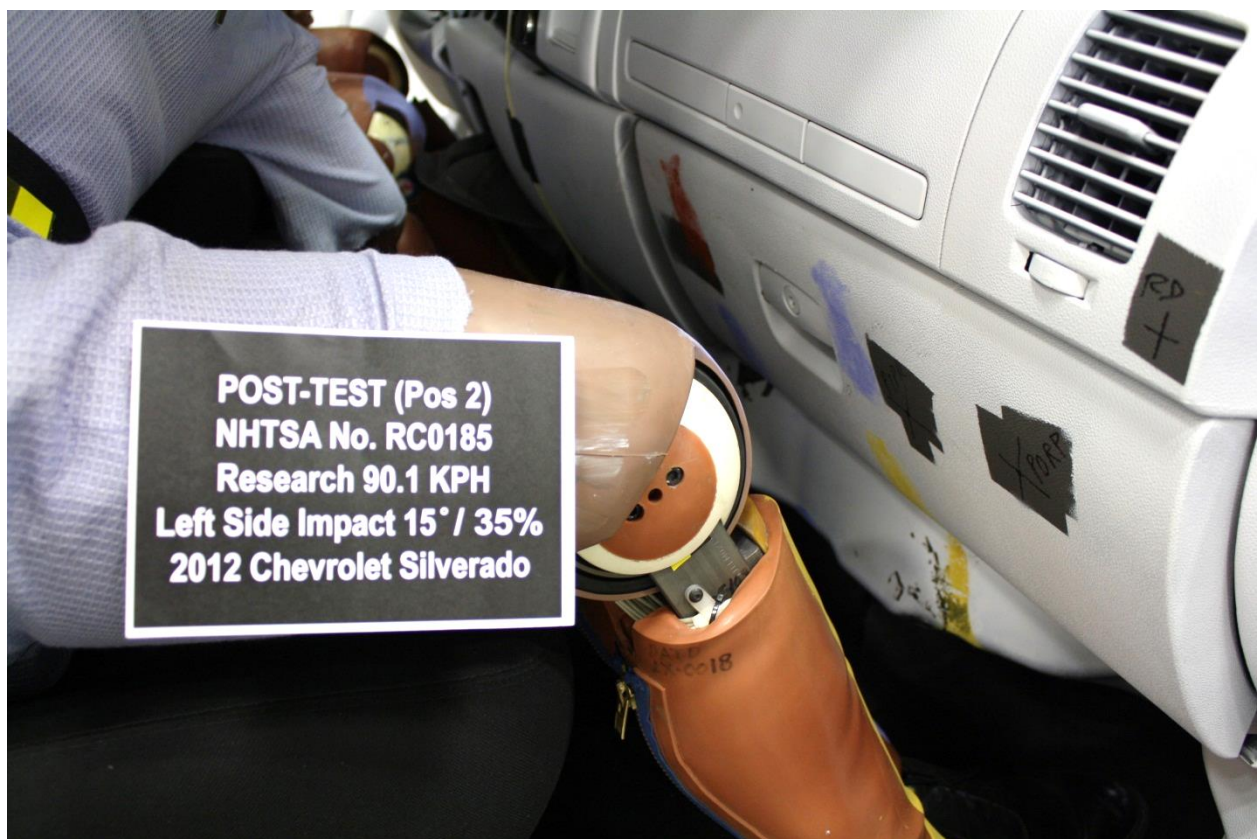
No. 112 Pre-Test View of Passenger Feet



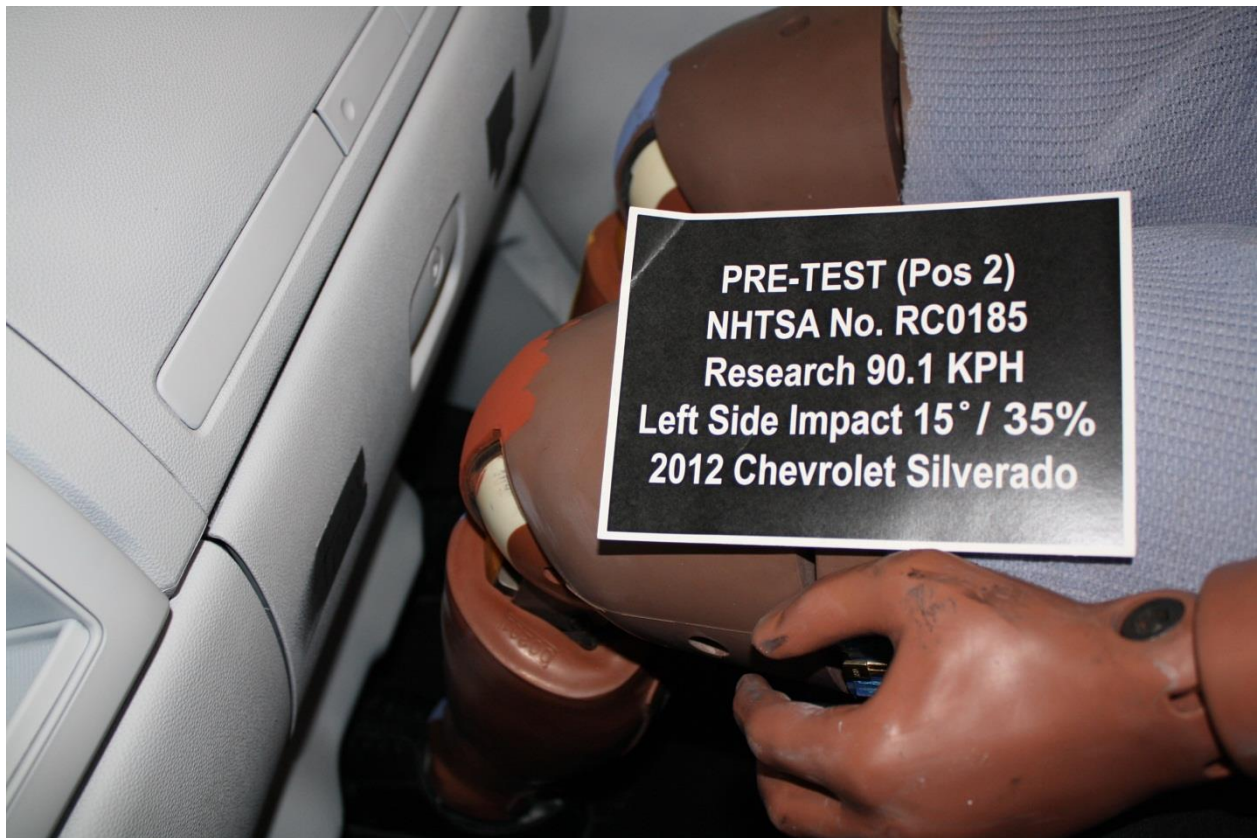
No. 113 Post-Test View of Passenger Feet



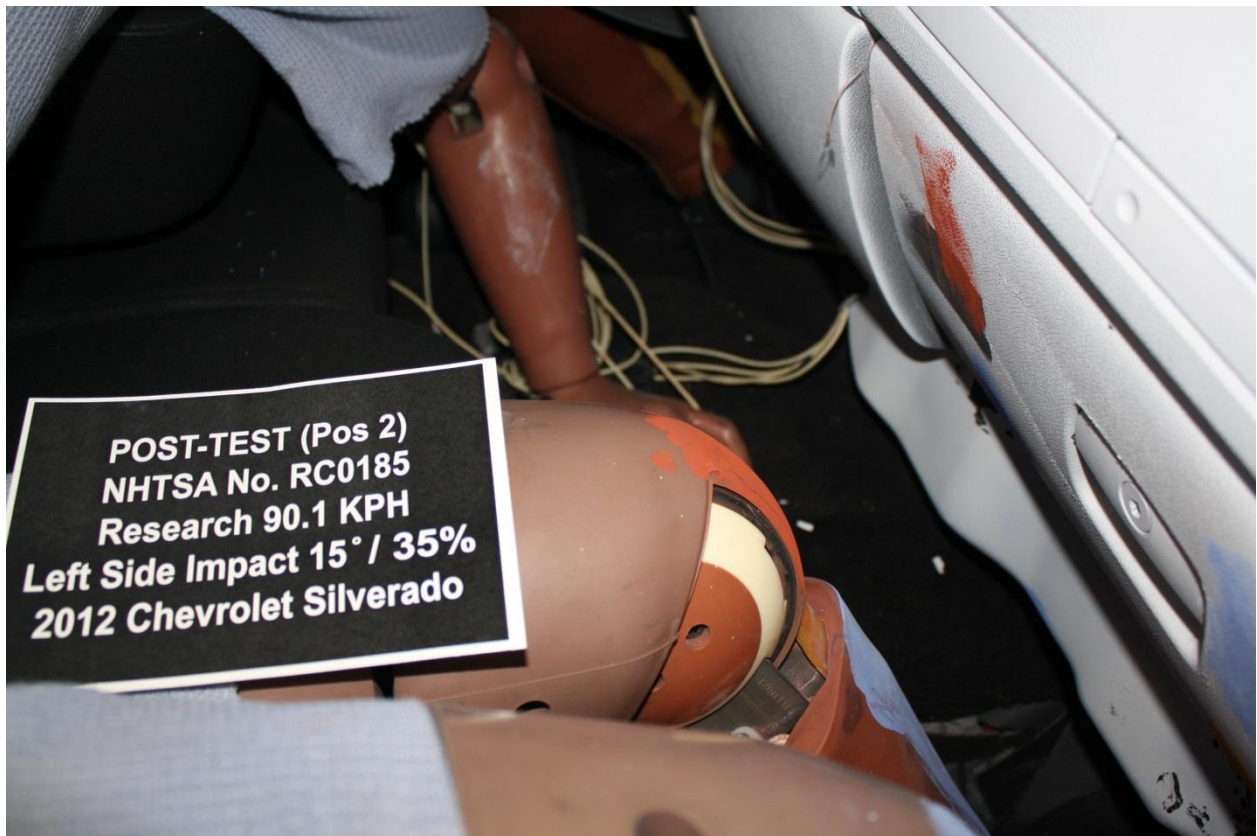
No. 114 Pre-Test View of Passenger Right Knee and Bolster



No. 115 Post-Test View of Passenger Right Knee and Bolster



No. 116 Pre-Test View of Passenger Left Knee and Bolster



No. 117 Post-Test View of Passenger Left Knee and Bolster



No. 118 Pre-Test View of Passenger Abdomen



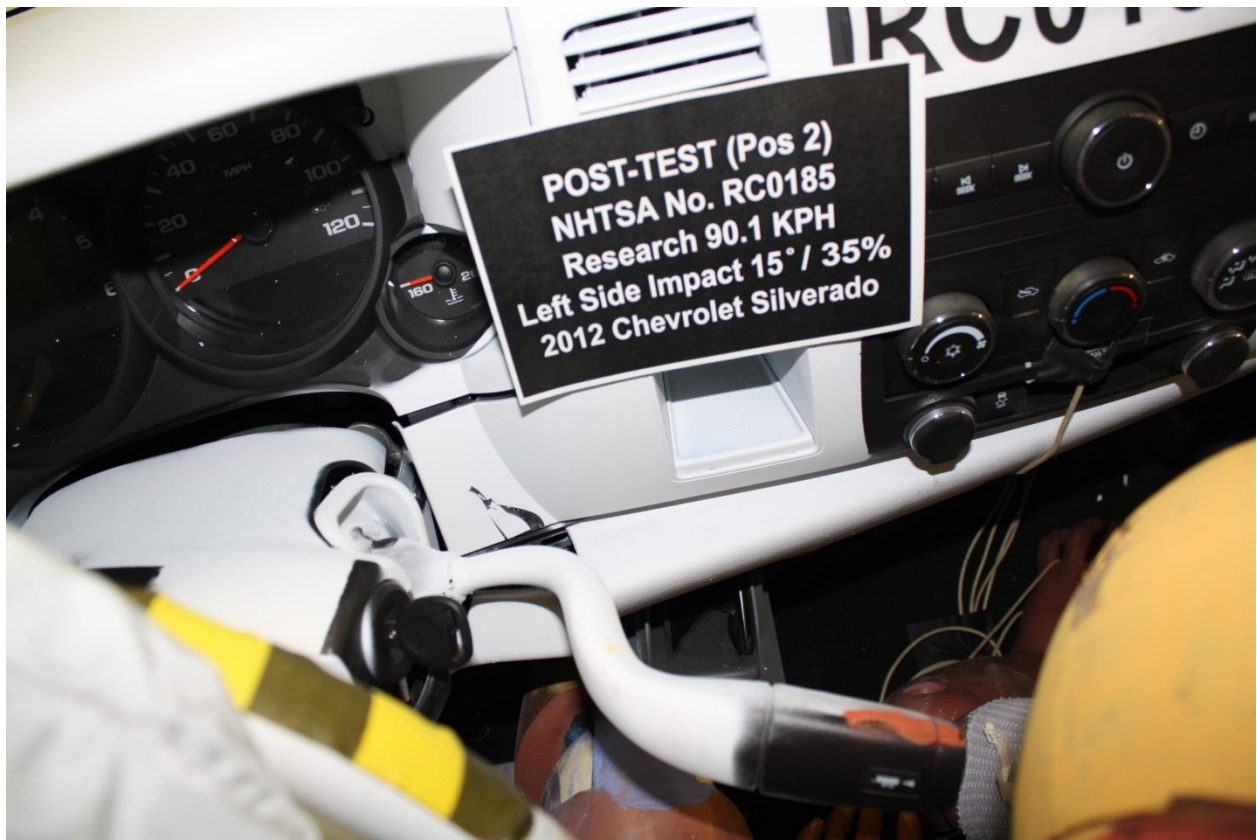
No. 119 Post-Test View of Passenger Abdomen



No. 120 Post-Test View of Passenger Head contact with Airbag – Front

Photo Not Applicable

No. 120a Post-Test View of Passenger Head contact with Airbag - Curtain



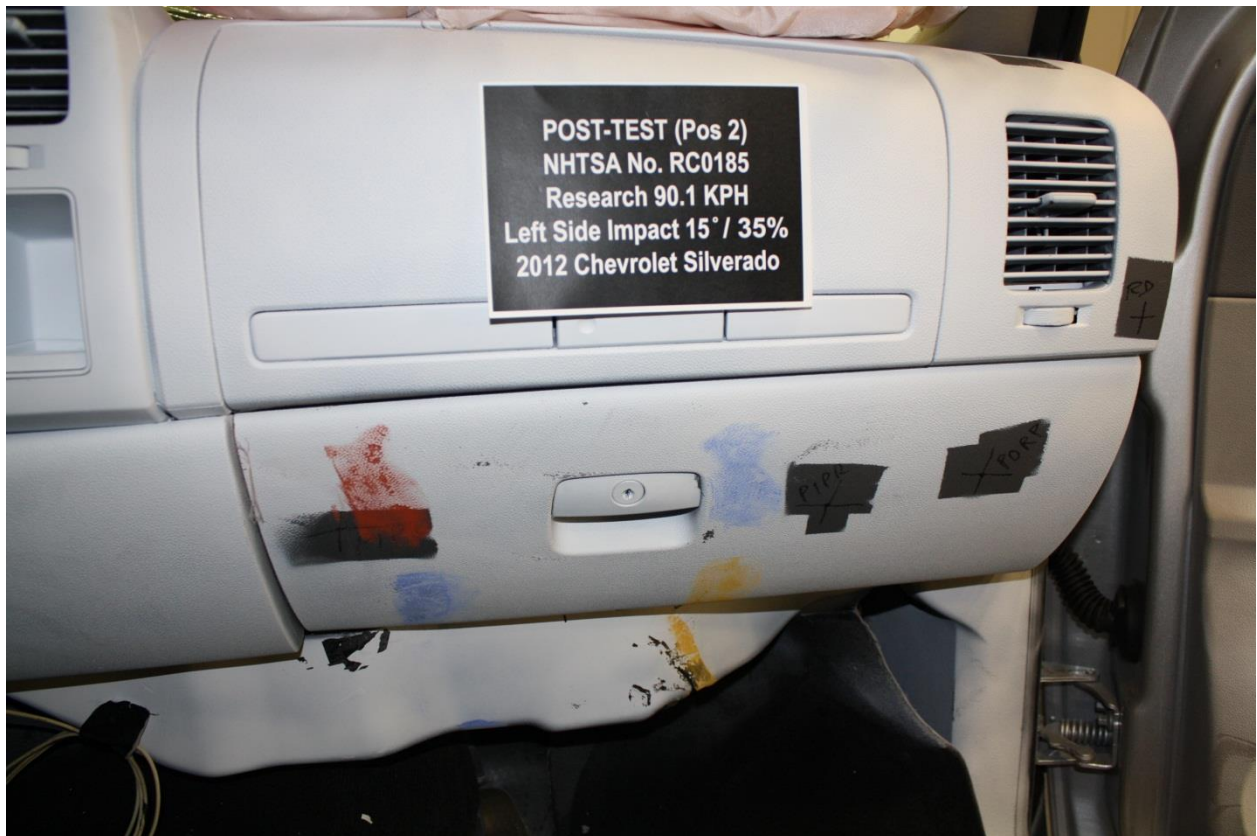
No. 121 Post-Test View of Passenger Head contact with Interior

Photo Not Applicable

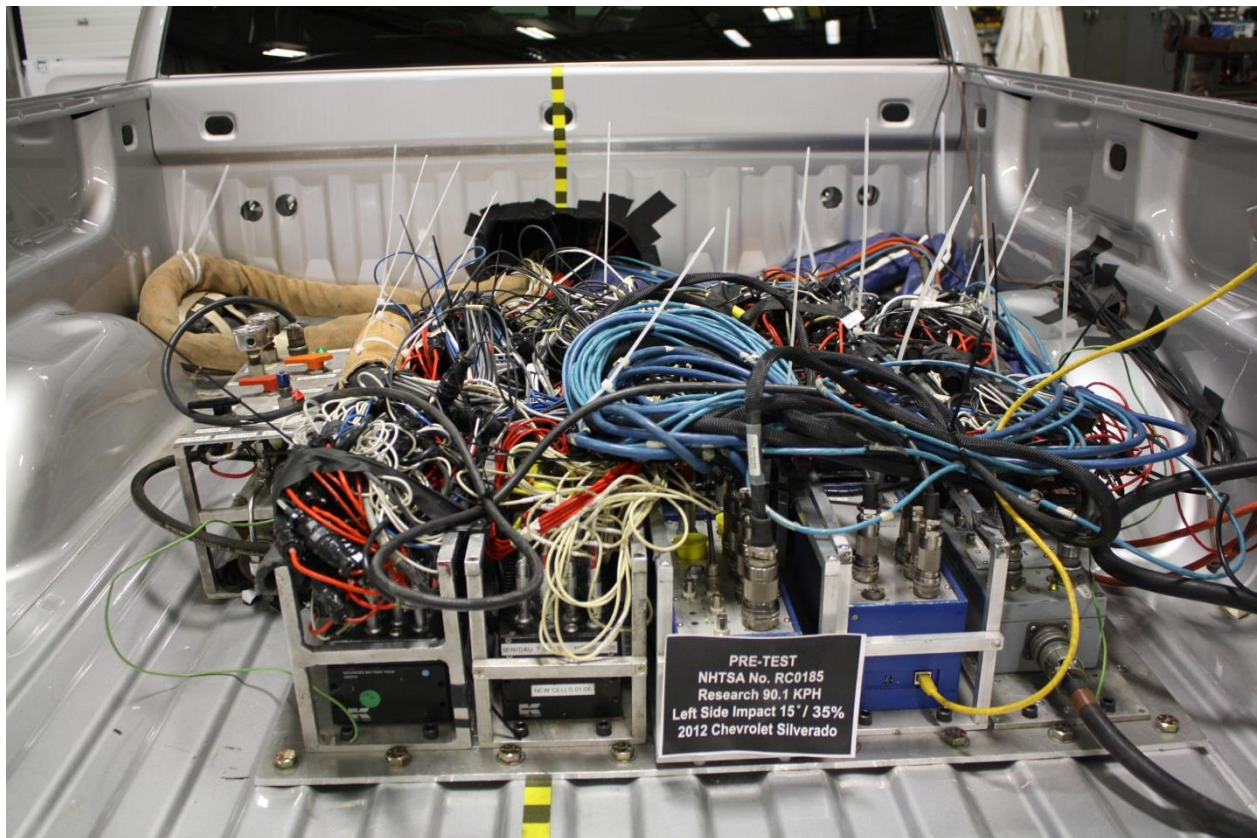
No. 121a Post-Test View of Passenger Head contact with Interior

Photo Not Applicable

No. 121b Post-Test View of Passenger Head contact with Interior



No. 122 Post-Test Passenger Contact With Glovebox



No. 123 Pre-Test Ballast Locations



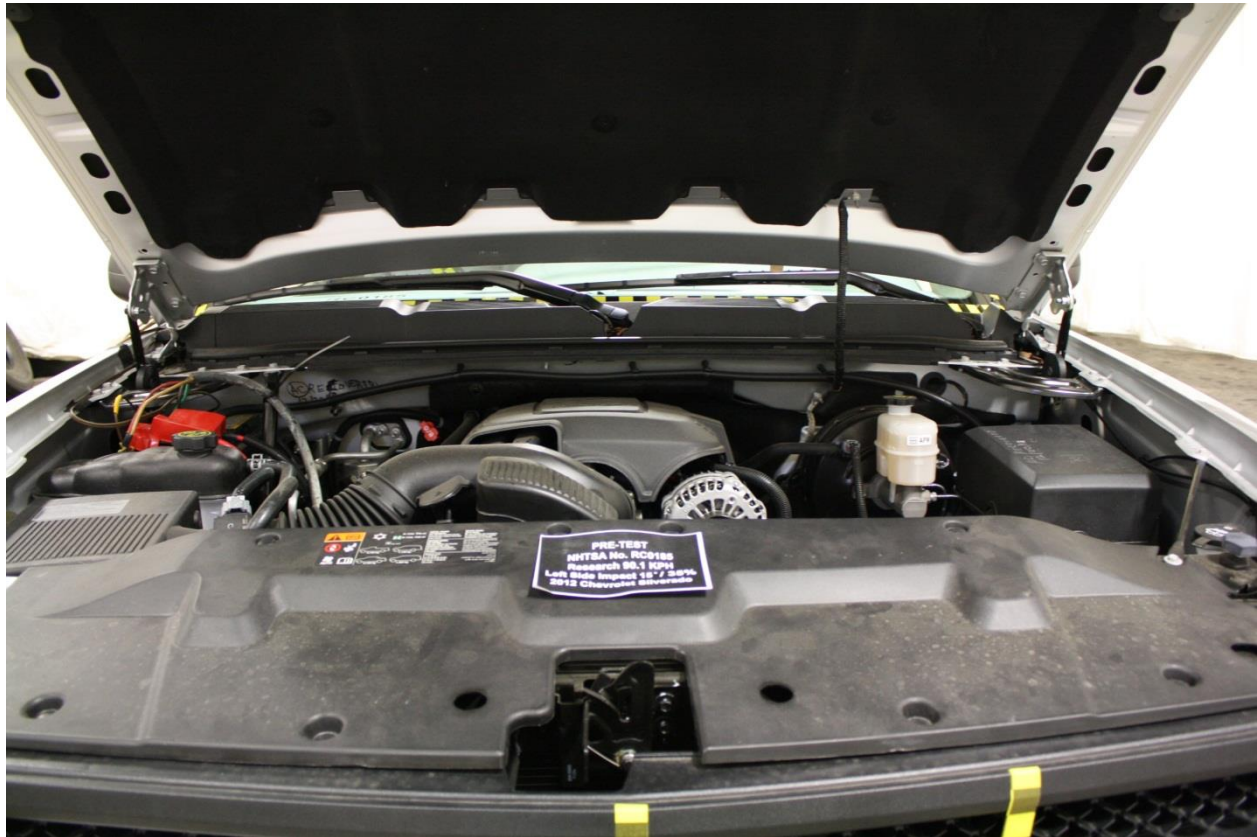
No. 124 Post-Test Speed Trap Readout



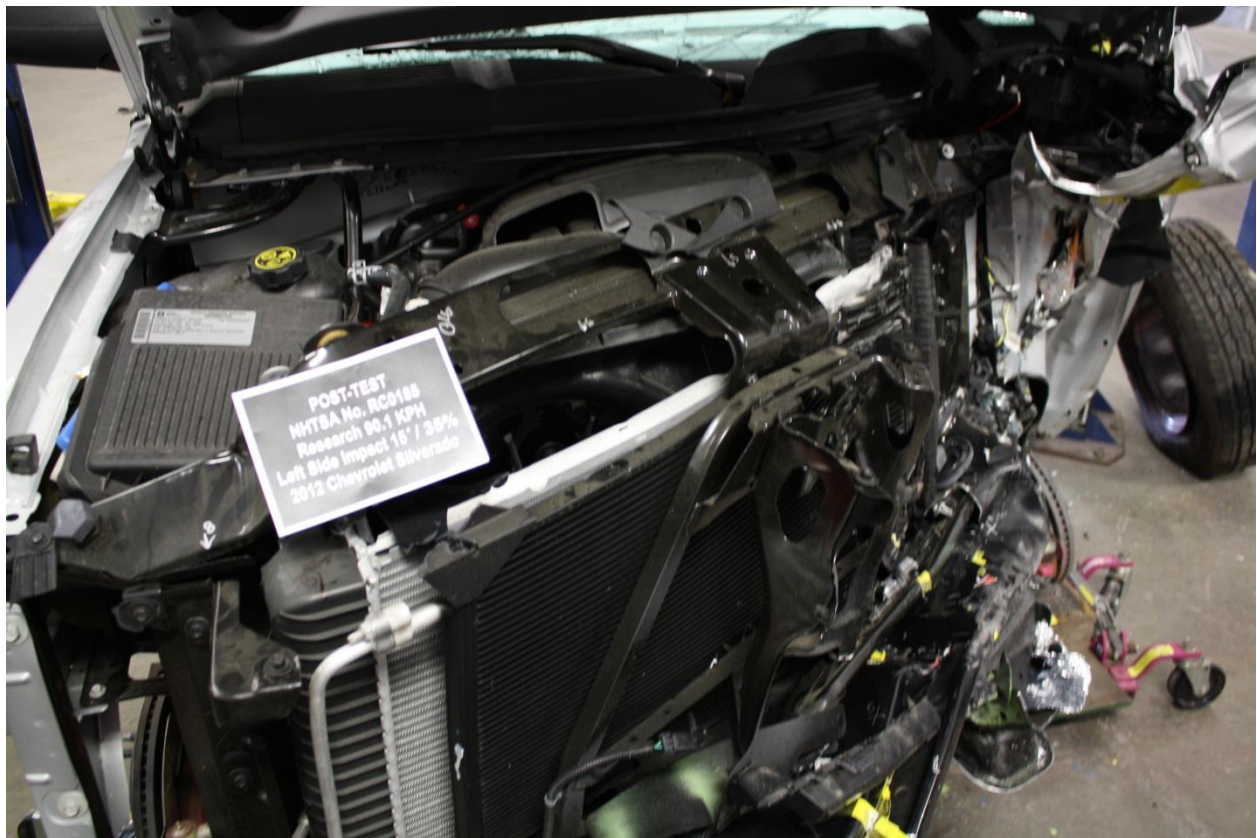
No. 125 Pre-Test View of Fuel Filler Cap



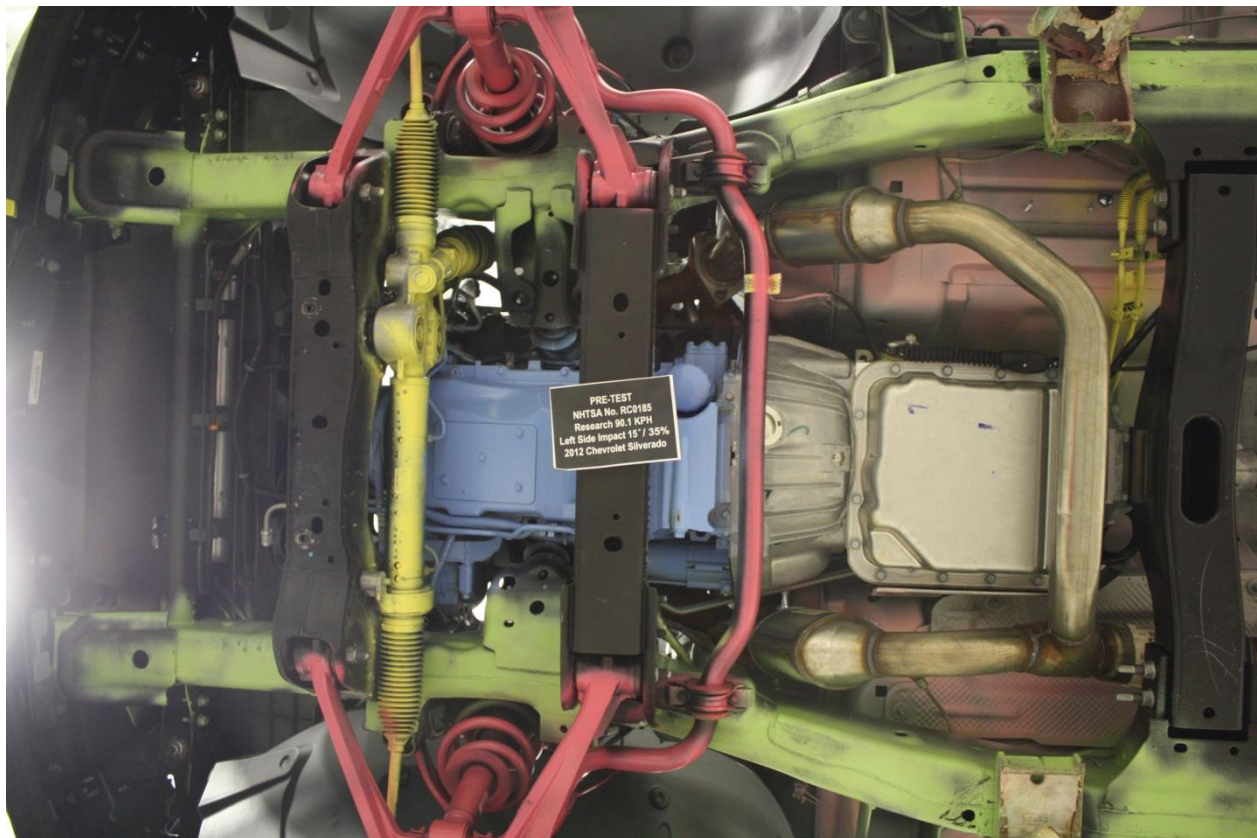
No. 126 Post-Test View of Fuel Filler Cap



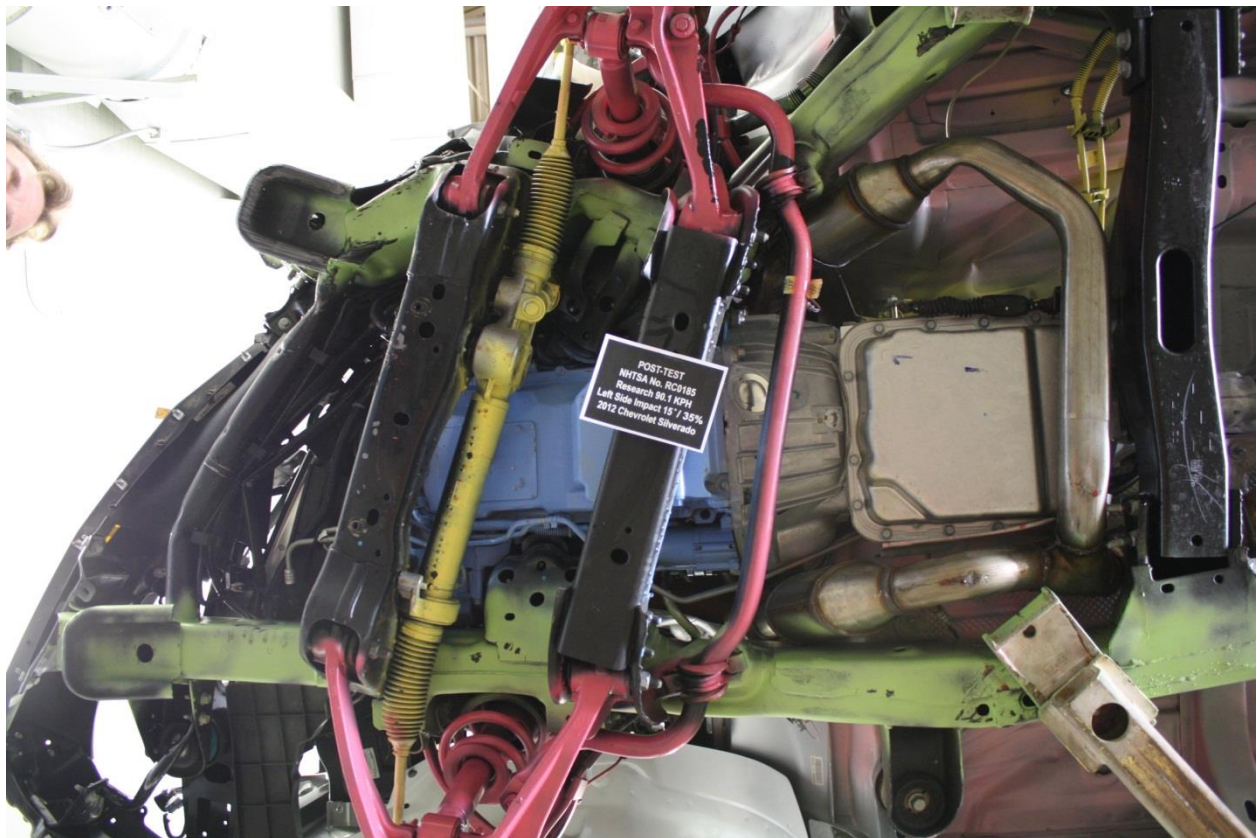
No. 127 Pre-Test Engine Compartment View



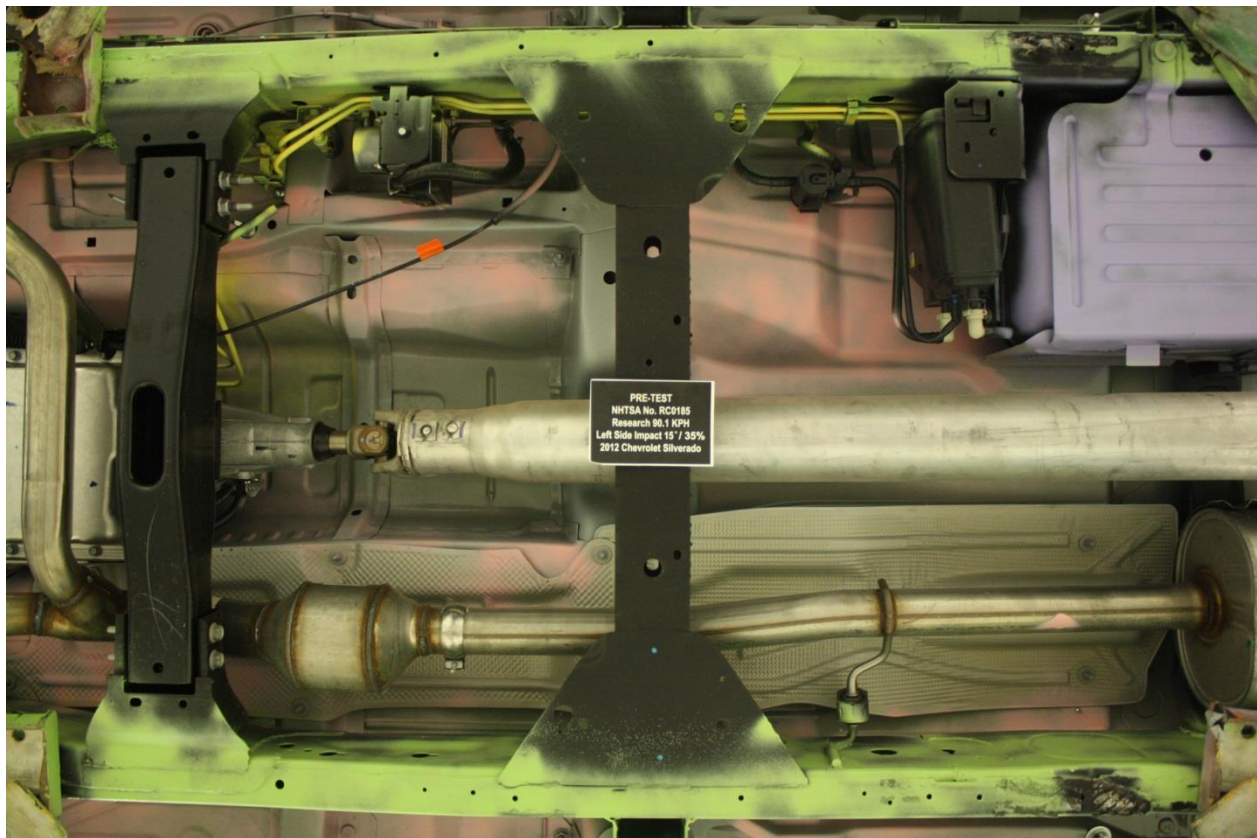
No. 128 Post-Test Engine Compartment View



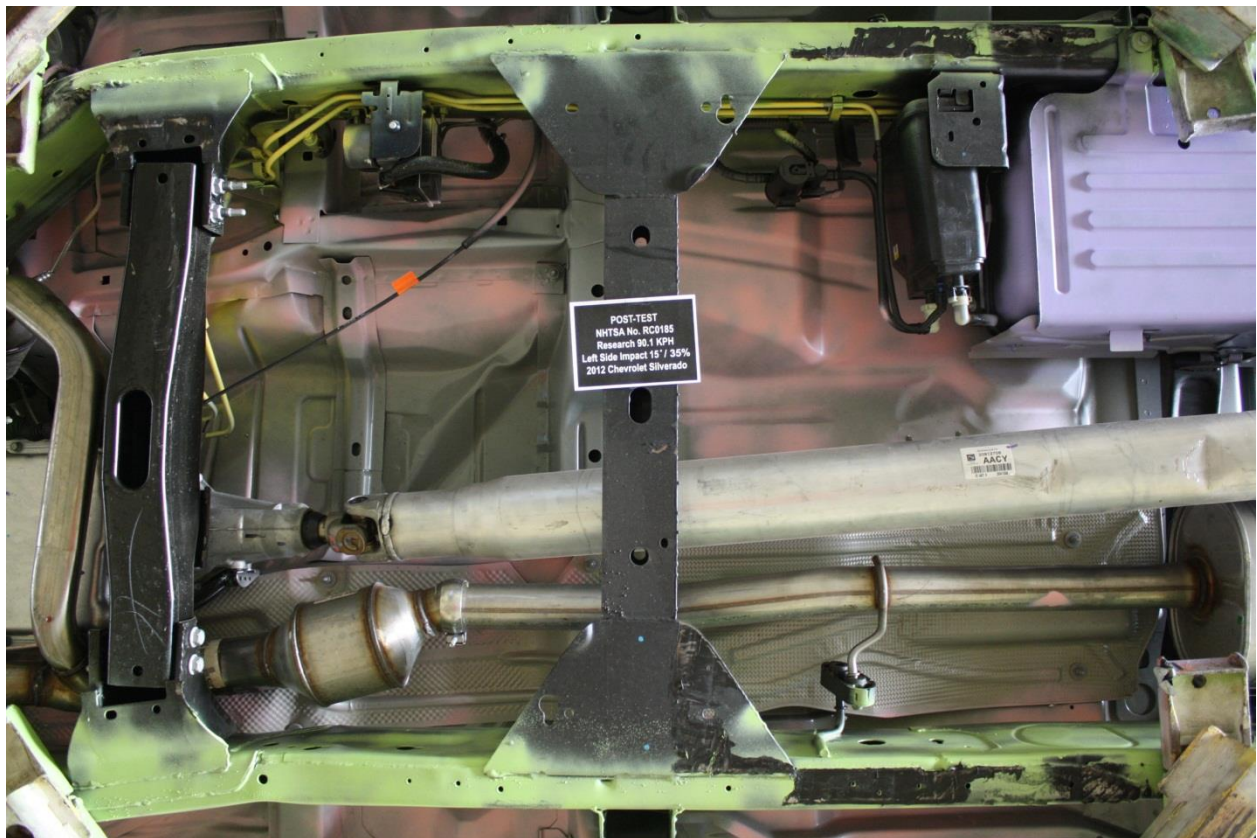
No. 129 Pre-Test View of Front Underbody (perpendicular to vehicle)



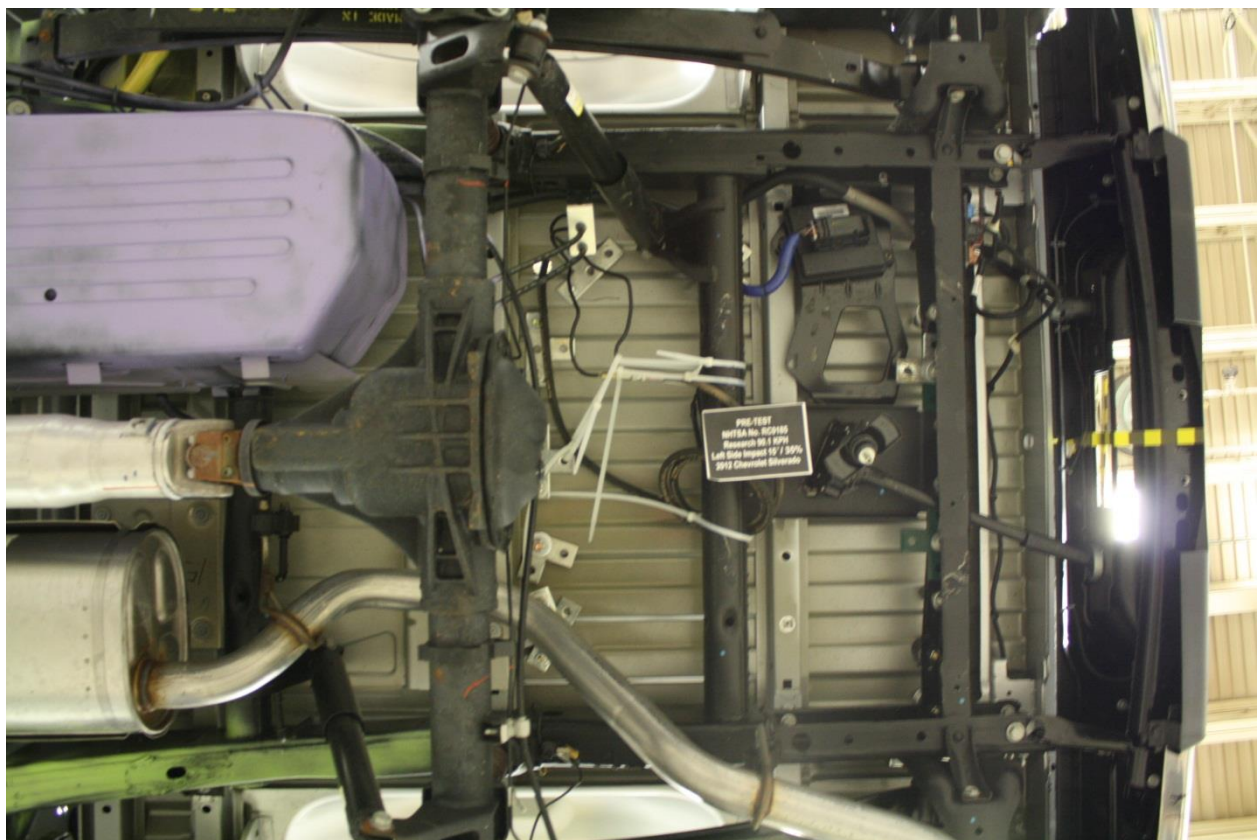
No. 130 Post-Test View of Front Underbody (perpendicular to vehicle)



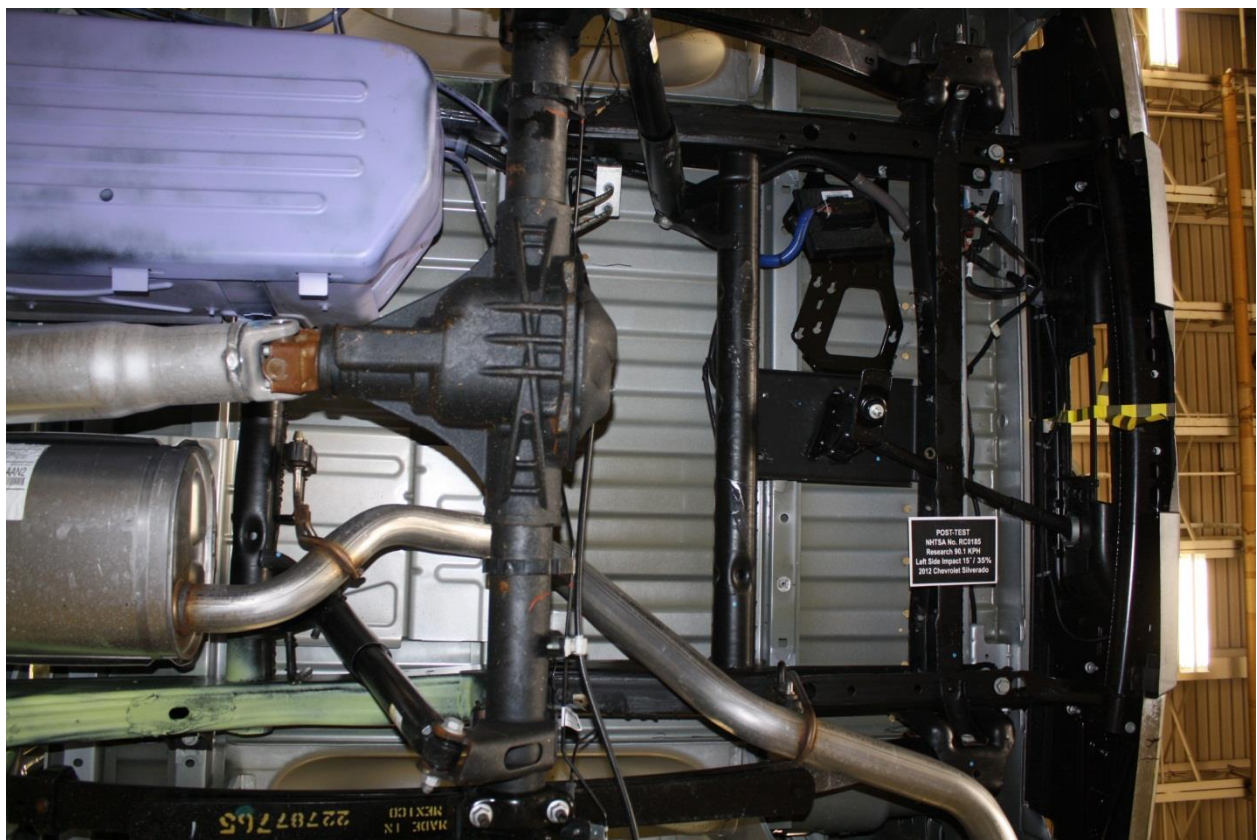
No. 131 Pre-Test View of Mid Underbody (perpendicular to vehicle)



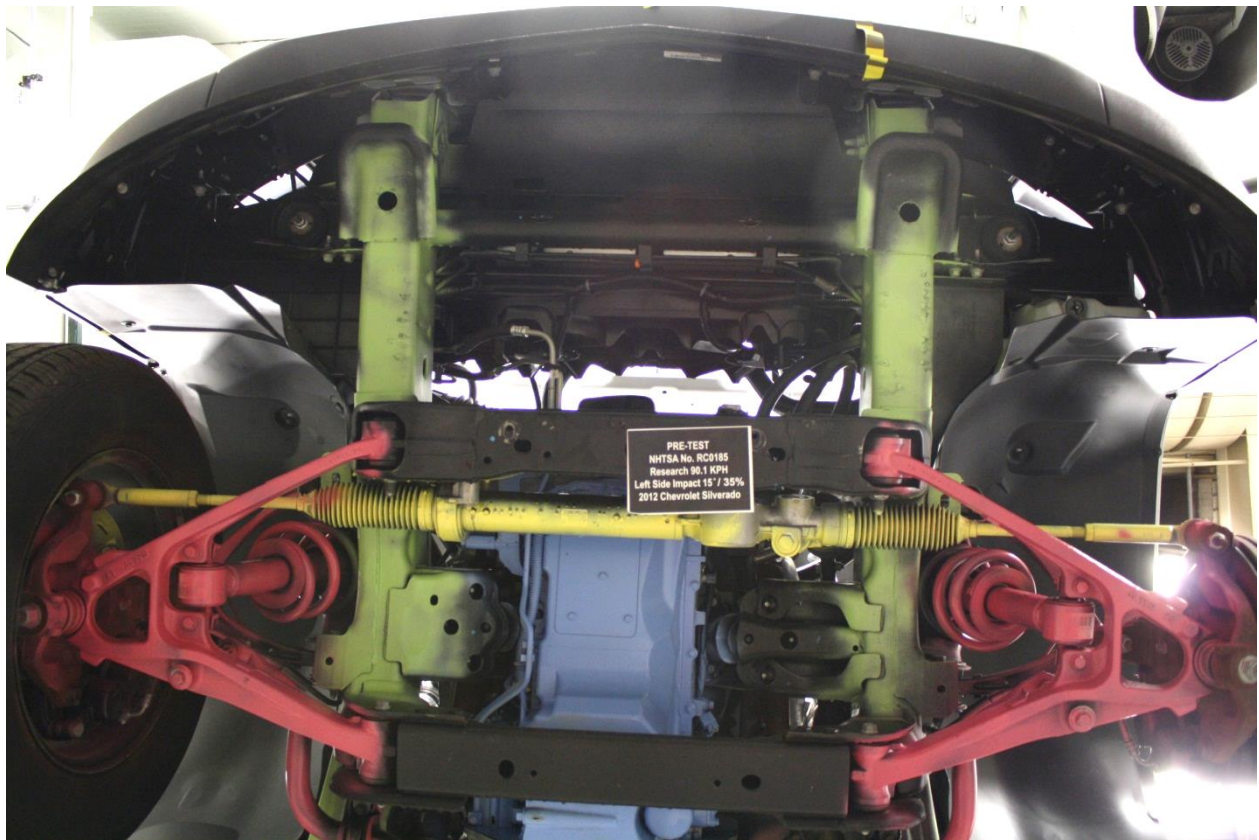
No. 132 Post-Test View of Mid Underbody (perpendicular to vehicle)



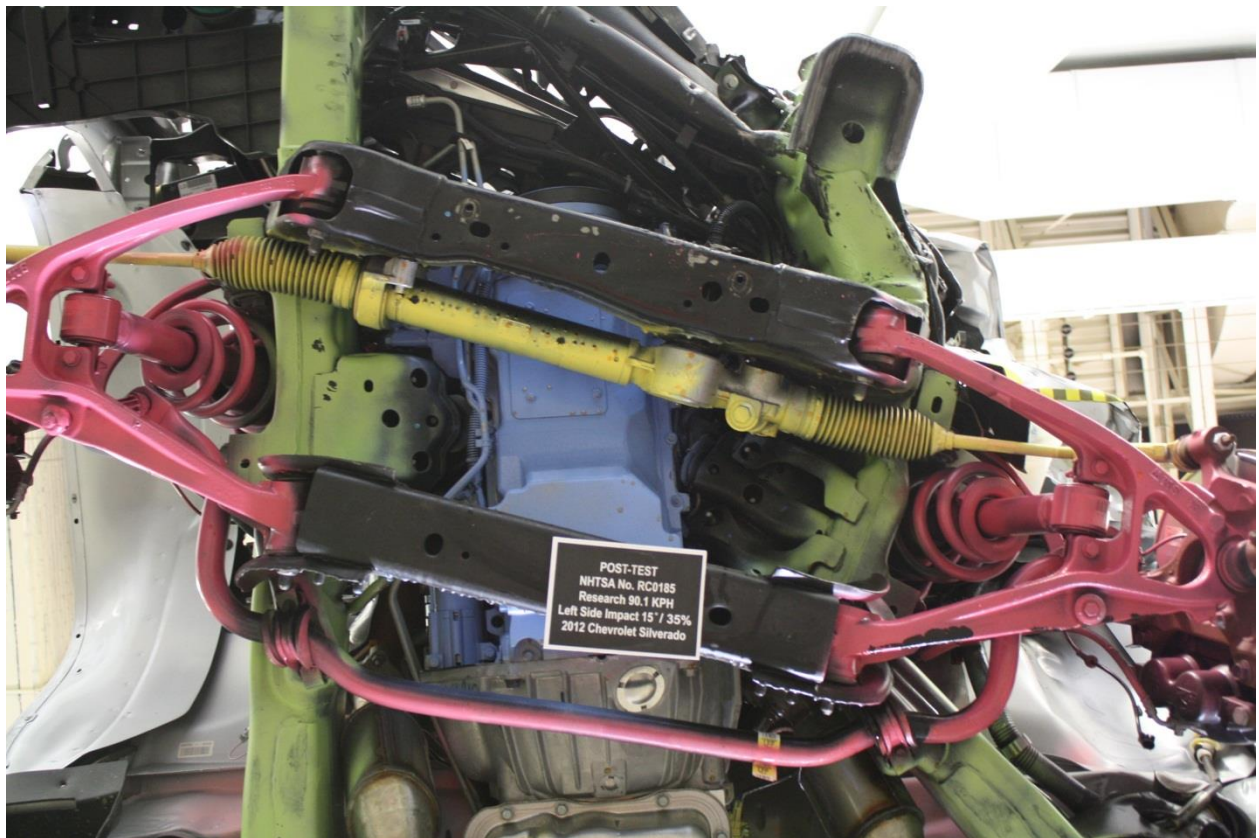
No. 133 Pre-Test View of Rear Underbody (perpendicular to vehicle)



No. 134 Post-Test View of Rear Underbody (perpendicular to vehicle)



No. 135 Pre-Test View of Steering rack and or sway bar



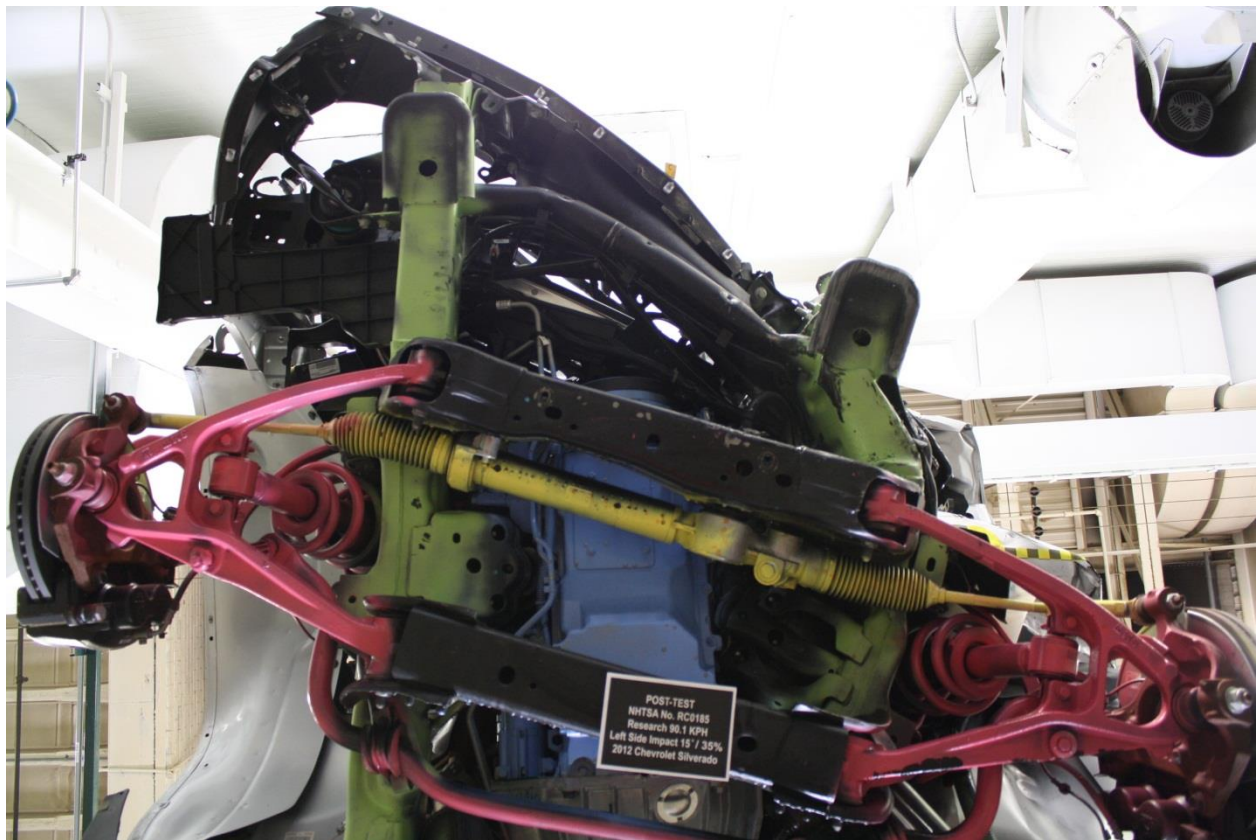
No. 136 Post-Test View of Steering rack and or sway bar



No. 137 Pre-Test Bumper to Rail Attachments and Crush Initiators



No. 138 Post-Test Bumper to Rail Attachments and Crush Initiators



No. 139 Post-Test View of Front Sub-Frame Deformation



No. 140 Pre-Test Frame Rail with tire removed



No. 141 Post-Test Frame Rail with tire removed



No. 142 Pre-Test View of Front Driver Wheel Well w/ Tire Removed



No. 143 Post-Test $\frac{3}{4}$ View of Front Driver Wheel Well w/ Tire Removed



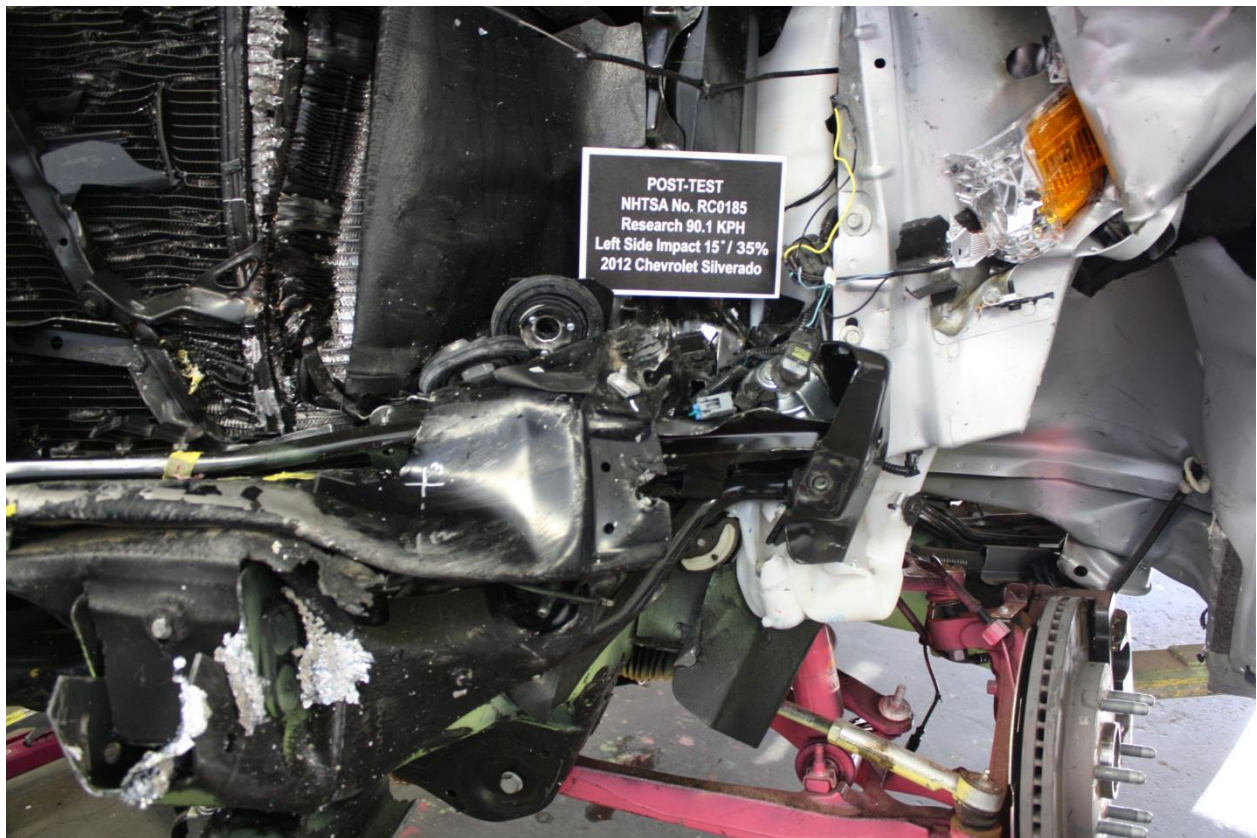
No. 144 Post-Test Side View of Front Driver Wheel Well w/ Tire Removed



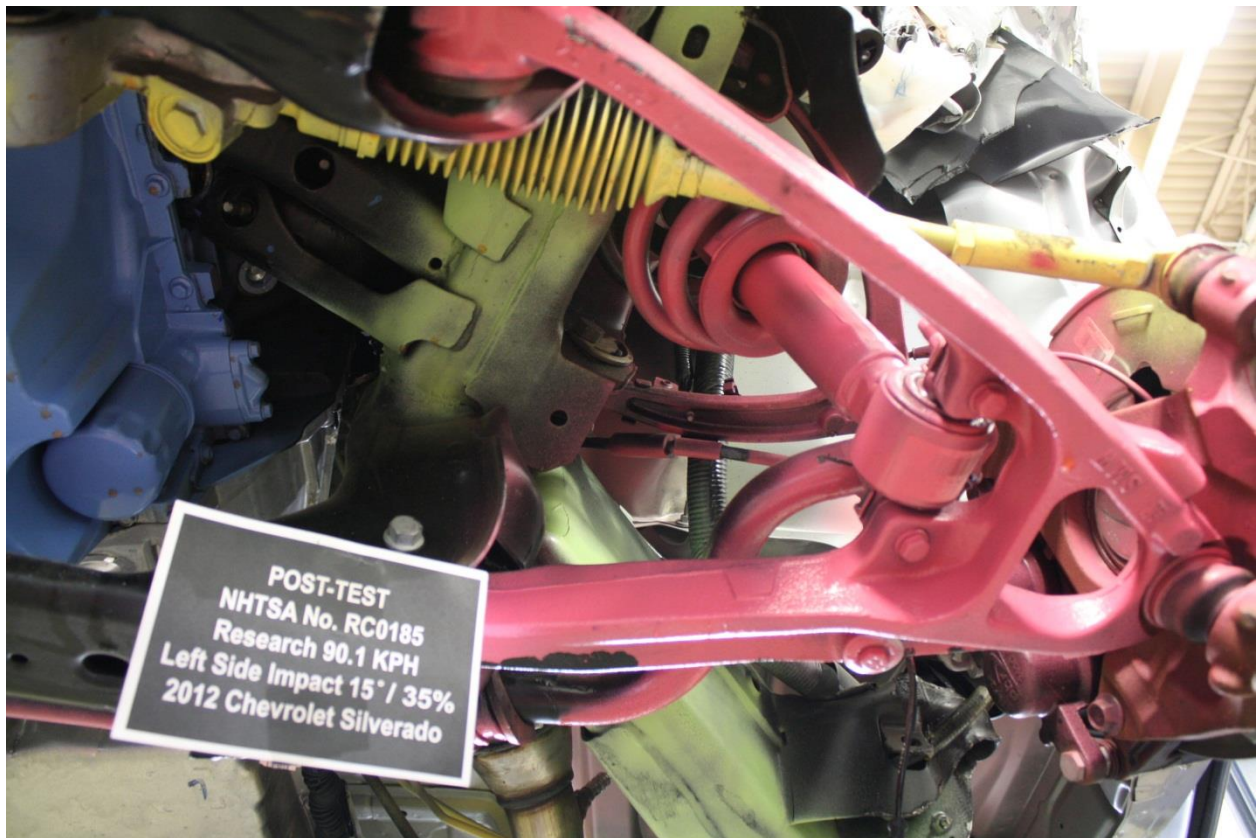
No. 145 Post-Test Right Side 3/4 Rear View of the Front Driver Wheel Well w/ Tire Removed



No. 146 Post-Test Looking Down at the Front Driver Shotgun



No. 147 Post-Test Right Side $\frac{3}{4}$ View of Front Driver Shotgun



No. 148 Post-Test Front Driver Close up View of Suspension w/ Tire Removed



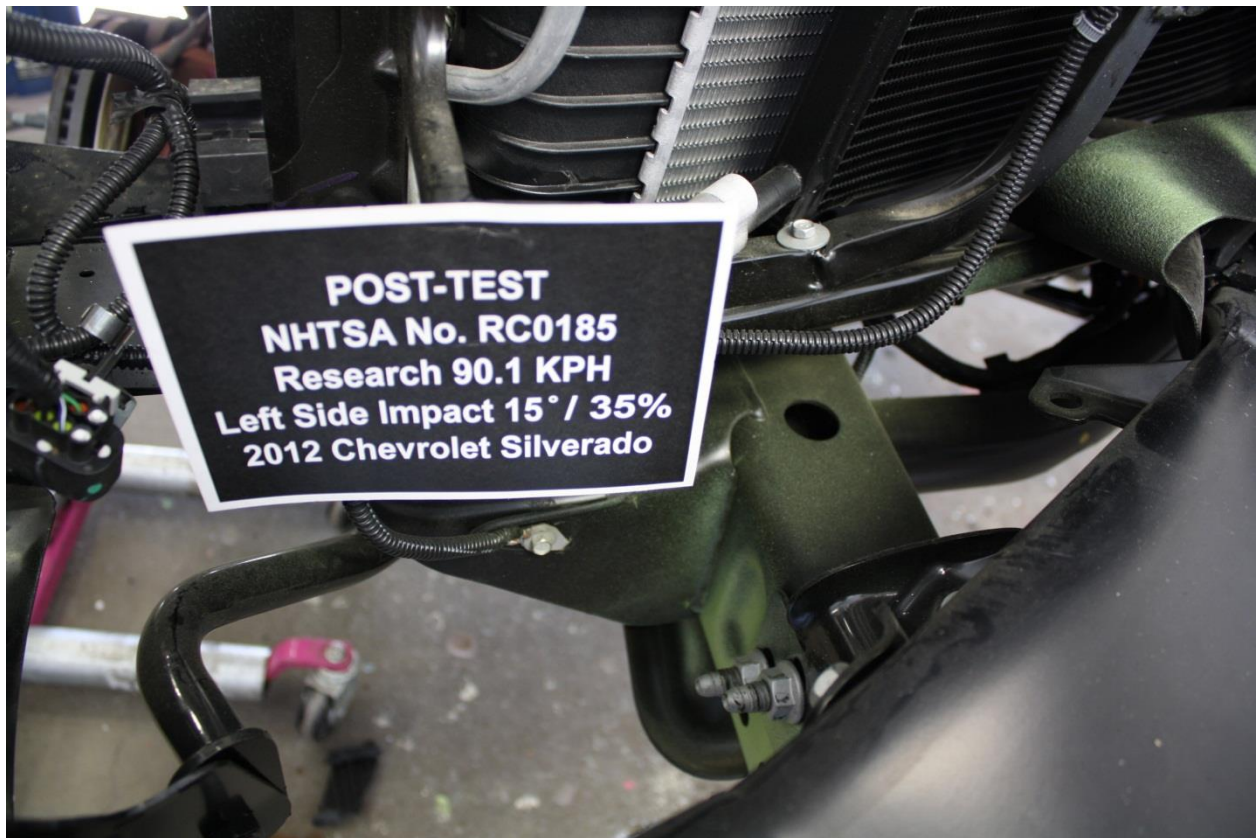
No. 149 Post-Test $\frac{3}{4}$ View of Front Passenger Wheel Well w/ Tire Removed



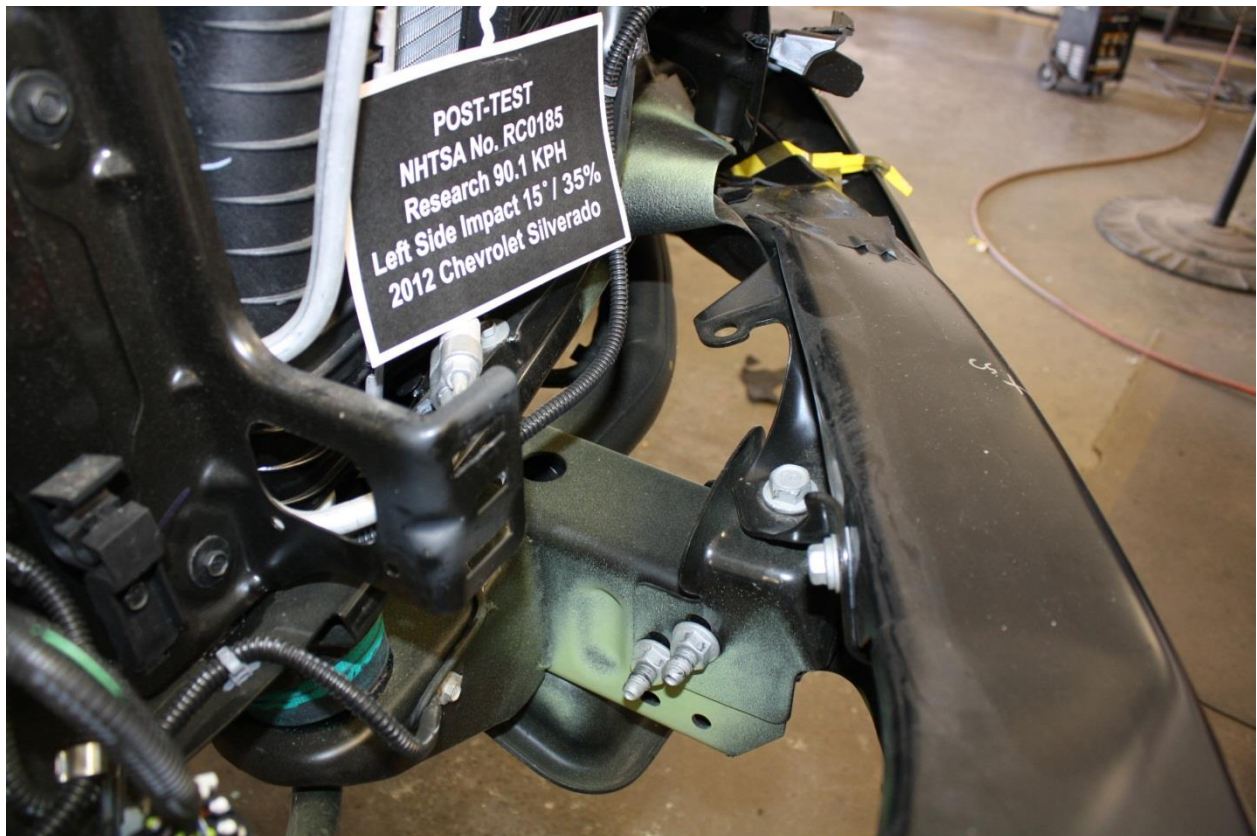
No. 150 Post-Test Side View of Front Passenger Wheel Well w/ Tire Removed



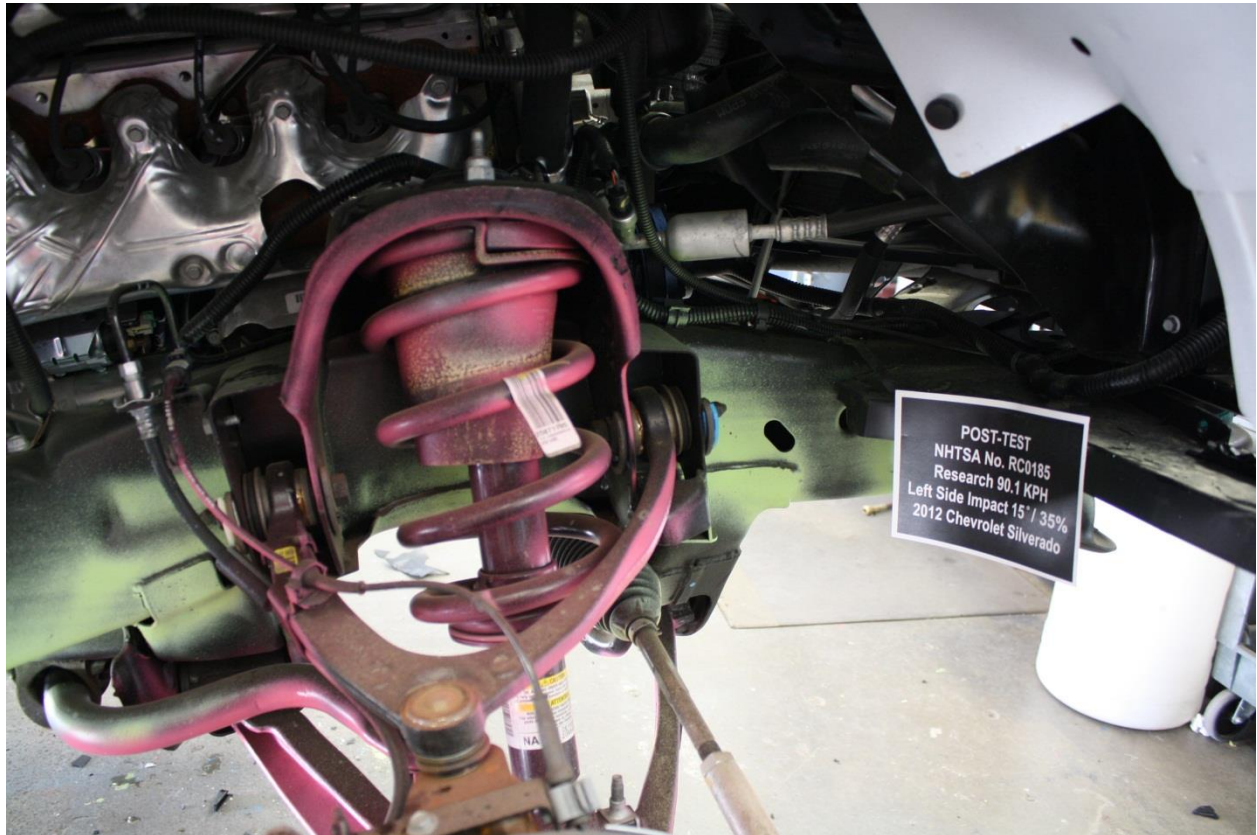
No. 151 Post-Test Right Side 3/4 Rear View of the Front Passenger Wheel Well w/ Tire Removed



No. 152 Post-Test Looking Down at the Front Passenger Shotgun



No. 153 Post-Test Right Side $\frac{3}{4}$ View of Front Passenger Shotgun



No. 154 Post-Test Front Passenger Close up View of Suspension w/ Tire Removed



No. 155 Post-Test View of Door Sill with Door Open- Struck Side



No. 156 Post-Test View of Deformation of A pillar-Struck Side



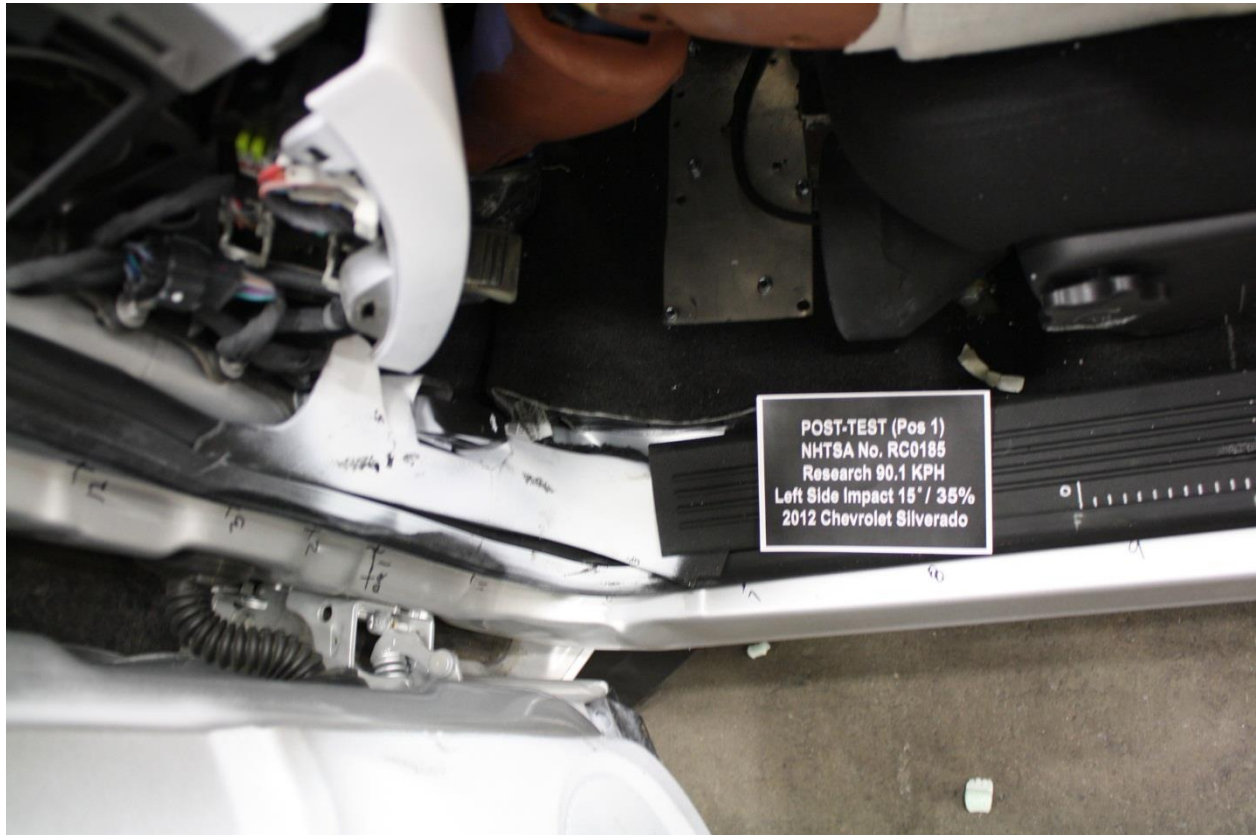
No. 157 Post-Test View of Deformation of B pillar-Struck Side



No. 158 Post-Test View of Deformation of C pillar-Struck Side



No. 159 Post-Test View of Wheel and/or Tire Deformation-Struck Side



No. 160 Post-Test View of Deformation of Rocker or Post-Struck Side

Photo Not Applicable

No. 161 Post-Test View of Windshield Separation



No. 162 Pre-Test Left Side View of RMDB



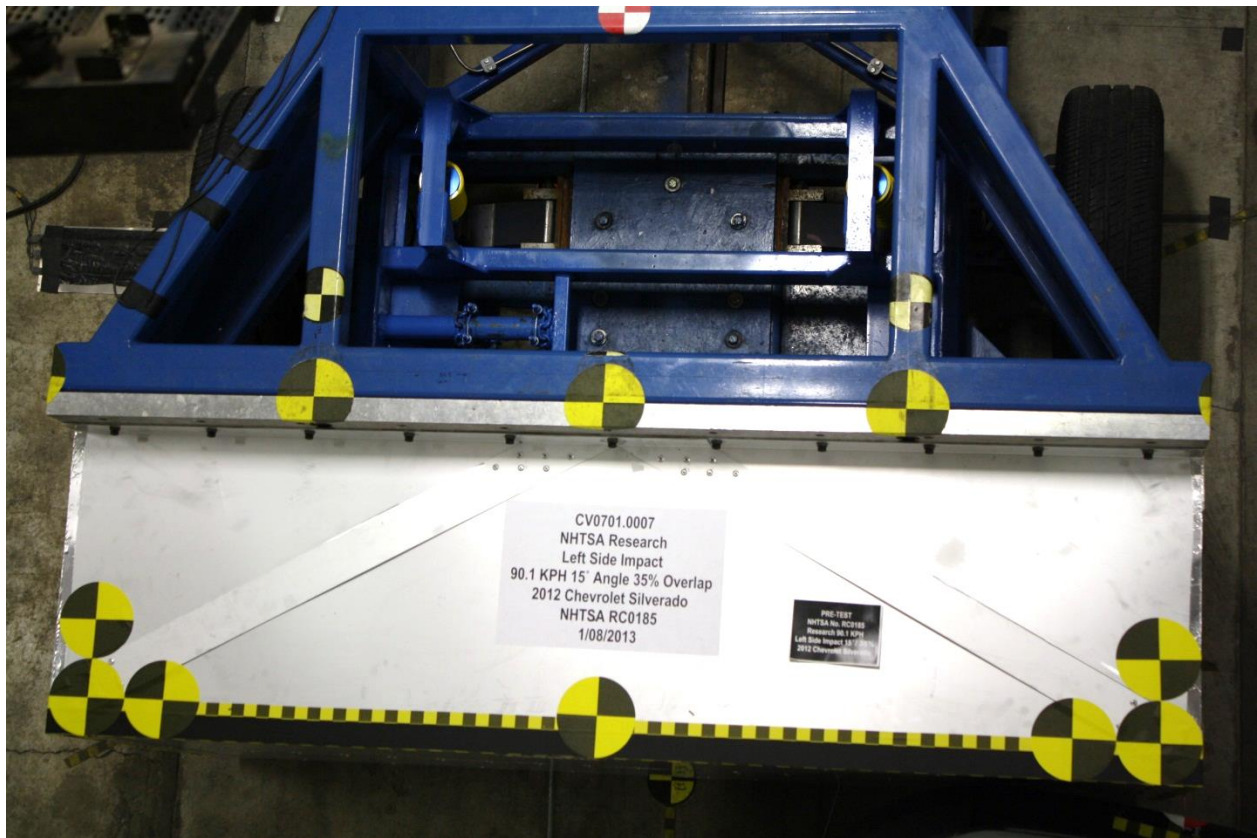
No. 163 Post-Test Left Side View of RMDB



No. 164 Pre-Test Right Side View of RMDB



No. 165 Post-Test Right Side View of RMDB



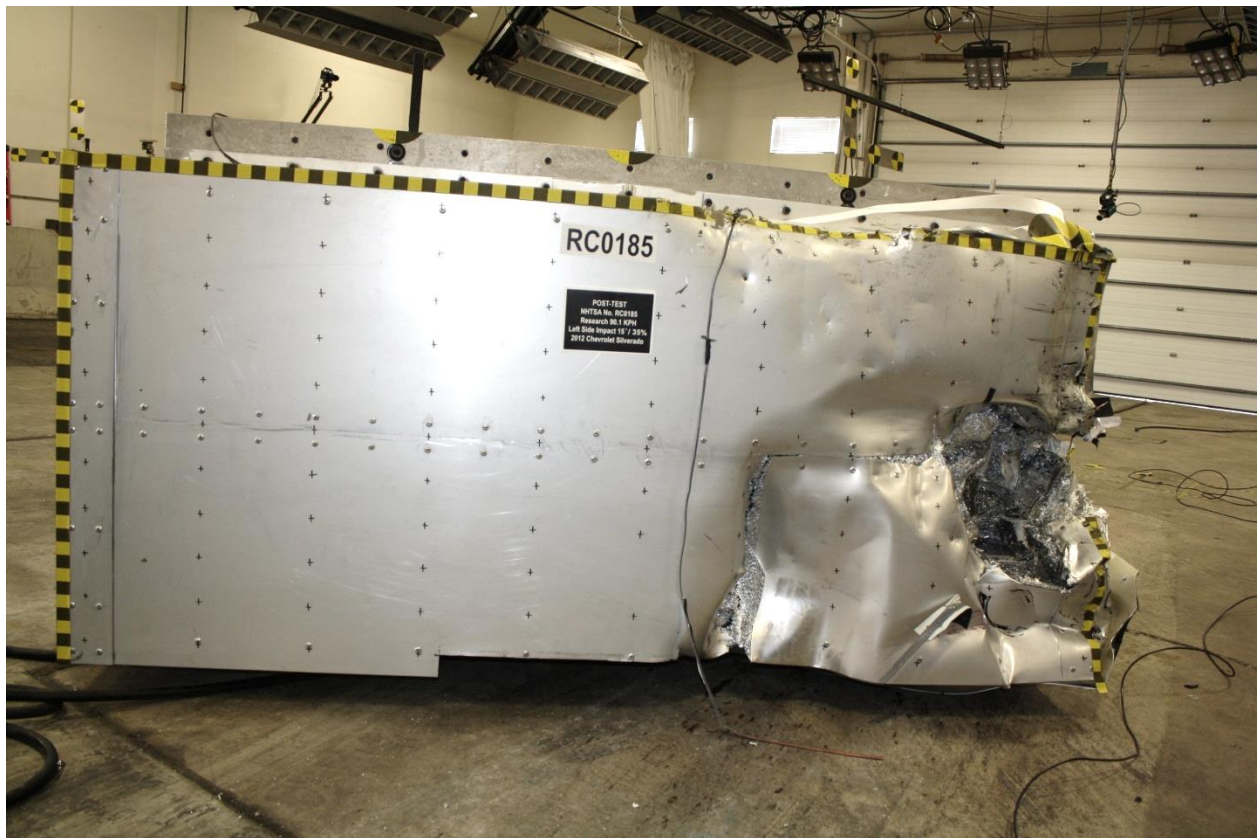
No. 166 Pre-Test Top View of RMD



No. 167 Post-Test Top View of RMD



No. 168 Pre-Test Front View of RMDB



No. 169 Post-Test Front View of RMDB



No. 170 Pre-Test RMDB & Vehicle, Right Side



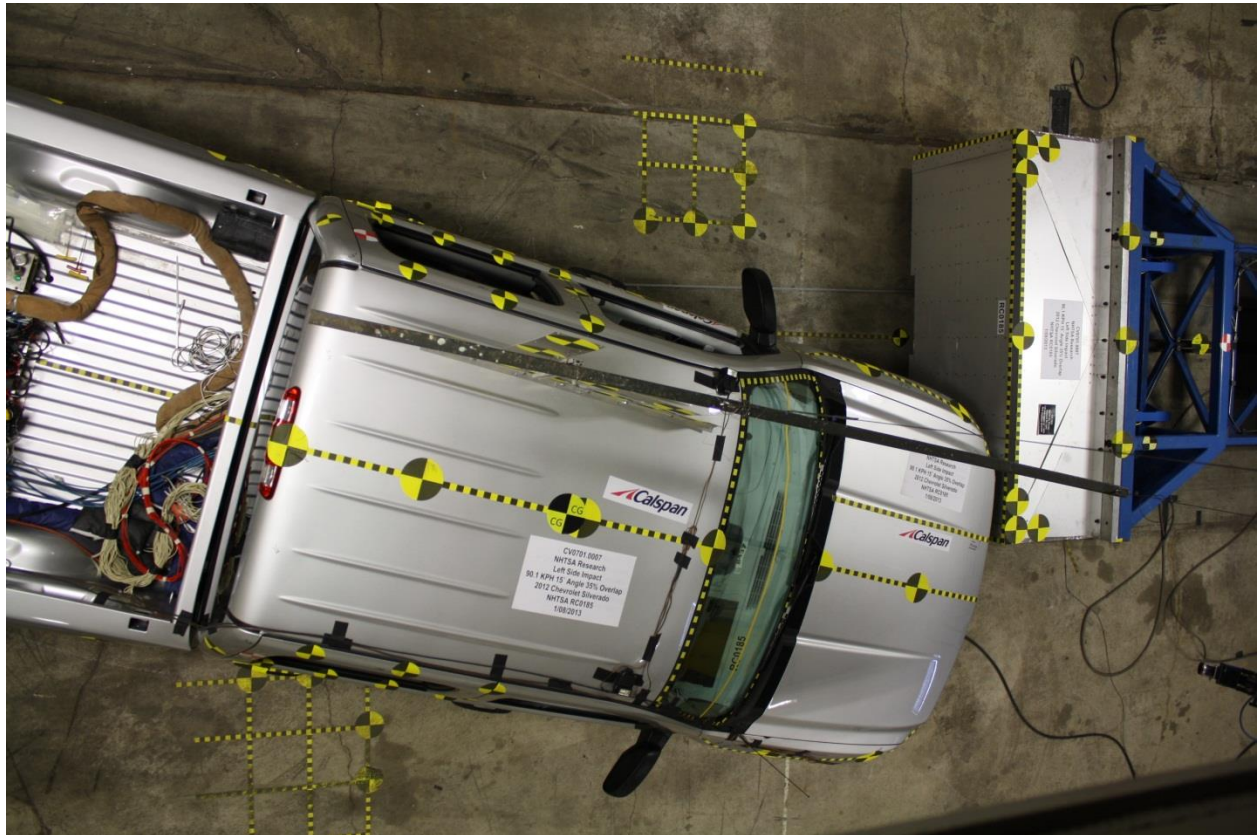
No. 171 Post-Test RMDB & Vehicle, Right Side



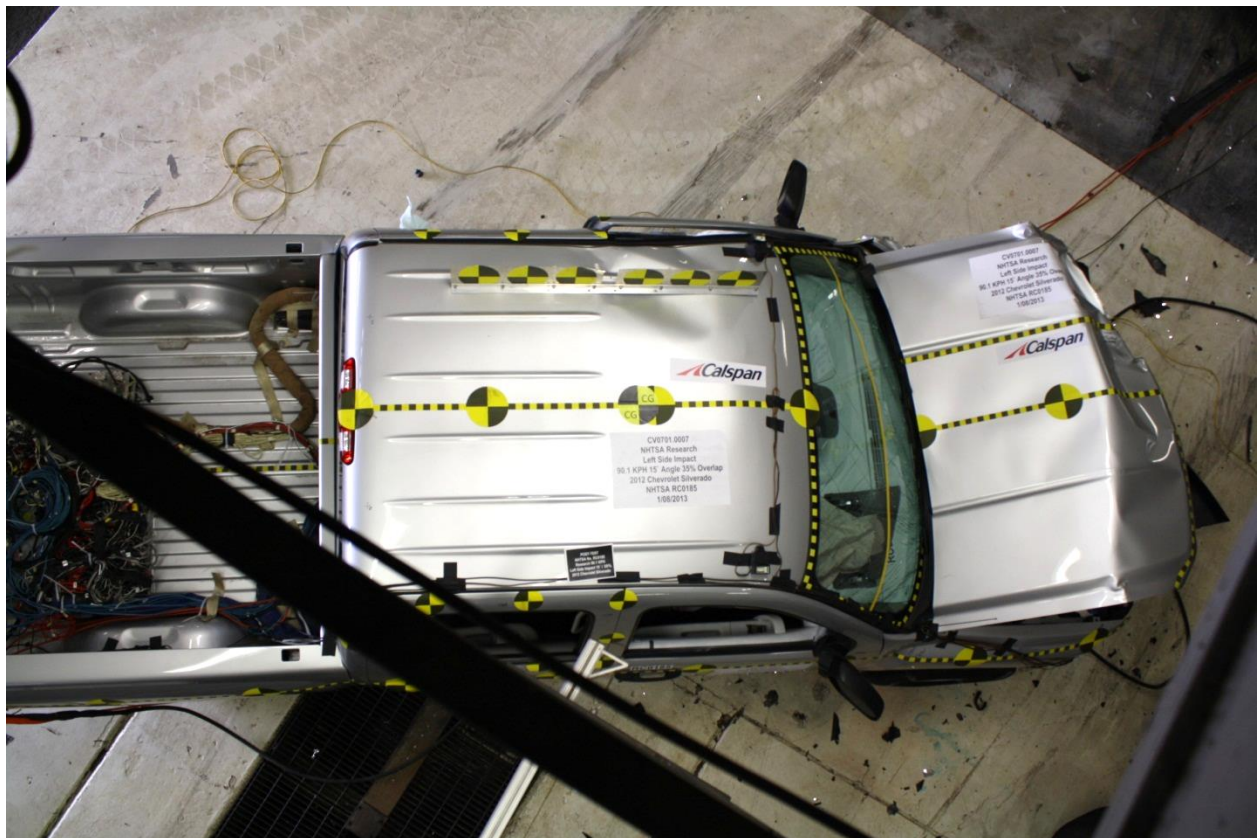
No. 172 Pre-Test RMDB & Vehicle, Left Side



No. 173 Post-Test RMDB & Vehicle, Left Side



No. 174 Pre-Test RMDB & Vehicle, Top View



No. 175 Post-Test RMDB & Vehicle, Top View

Photo Not Available

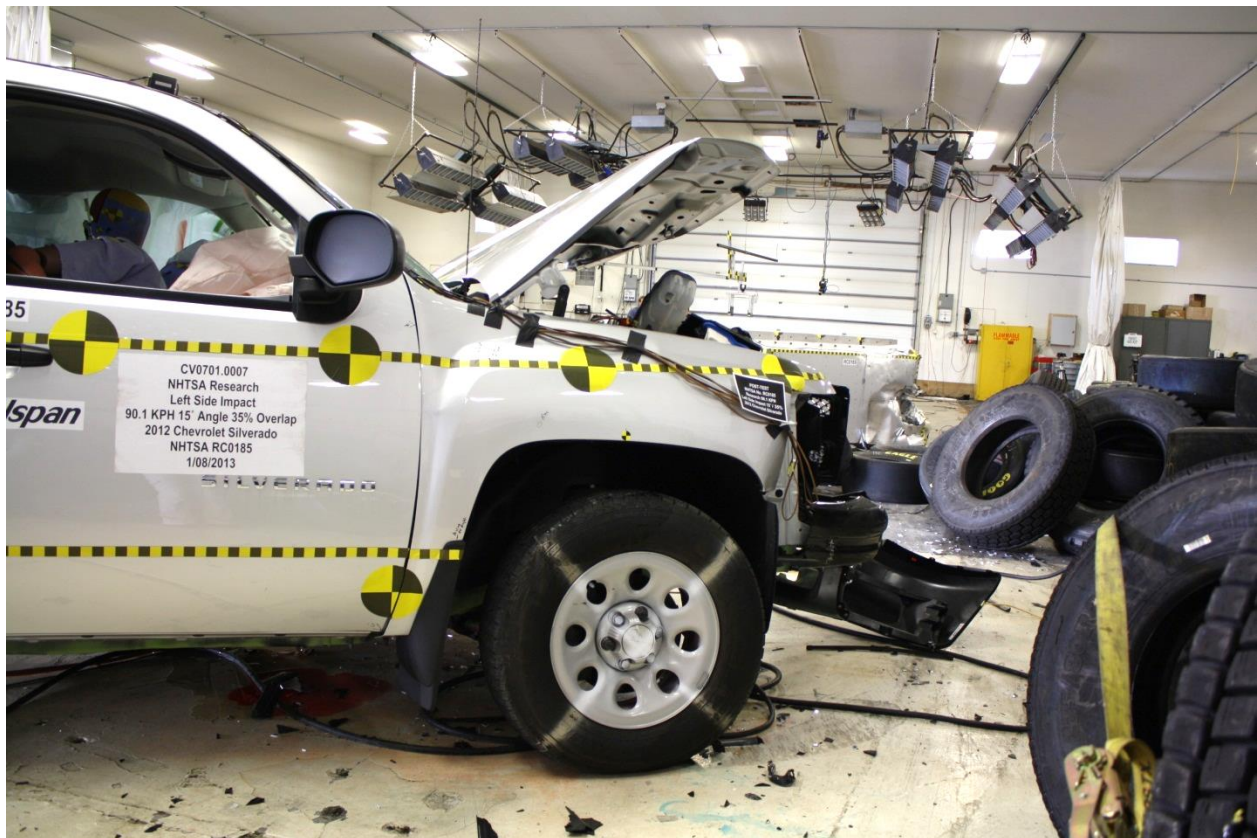
No. 176 Pre-Test RMDB & Vehicle, Rear View



No. 177 Post-Test RMDB & Vehicle, Rear View



No. 178 Pre-Test RMDB & Vehicle, Front View



No. 179 Post-Test RMDB & Vehicle, Front View



No. 180 Vehicle at 0 Degrees on Static Rollover Device



No. 181 Vehicle at 90 Degrees on Static Rollover Device



No. 182 Vehicle at 180 Degrees on Static Rollover Device



No. 183 Vehicle at 270 Degrees on Static Rollover Device



No. 184 Vehicle at 360 Degrees on Static Rollover Device



No. 185 Impact Photo

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots

No.	Description	Page
Plot 1	V2P1 HEAD CG X	B-8
Plot 2	V2P1 HEAD CG Y	B-8
Plot 3	V2P1 HEAD CG Z	B-8
Plot 4	V2P1 HEAD CG WX	B-8
Plot 5	V2P1 HEAD CG WY	B-9
Plot 6	V2P1 HEAD CG WZ	B-9
Plot 7	V2P1 NECK UPPER FX	B-9
Plot 8	V2P1 NECK UPPER FY	B-9
Plot 9	V2P1 NECK UPPER FZ	B-10
Plot 10	V2P1 NECK UPPER MX	B-10
Plot 11	V2P1 NECK UPPER MY	B-10
Plot 12	V2P1 NECK UPPER MZ	B-10
Plot 13	V2P1 NECK LOWER FX	B-11
Plot 14	V2P1 NECK LOWER FY	B-11
Plot 15	V2P1 NECK LOWER FZ	B-11
Plot 16	V2P1 NECK LOWER MX	B-11
Plot 17	V2P1 NECK LOWER MY	B-12
Plot 18	V2P1 NECK LOWER MZ	B-12
Plot 19	V2P1 NECK SPRING LOAD CELL - FRONT	B-12
Plot 20	V2P1 NECK SPRING LOAD CELL - REAR	B-12
Plot 21	V2P1 OC ANGLE RY	B-13
Plot 22	V2P1 T1 ACCEL AX	B-13
Plot 23	V2P1 T1 ACCEL AY	B-13
Plot 24	V2P1 T1 ACCEL AZ	B-13
Plot 25	V2P1 T6 ACCEL AX	B-14
Plot 26	V2P1 T6 ACCEL AY	B-14
Plot 27	V2P1 T6 ACCEL AZ	B-14
Plot 28	V2P1 UL CHEST IRTRACC D	B-14
Plot 29	V2P1 UL CHEST RY	B-15
Plot 30	V2P1 UL CHEST RZ	B-15
Plot 31	V2P1 UR CHEST IRTRACC D	B-15
Plot 32	V2P1 UR CHEST RY	B-15
Plot 33	V2P1 UR CHEST RZ	B-16
Plot 34	V2P1 LL CHEST IRTRACC D	B-16
Plot 35	V2P1 LL CHEST RY	B-16
Plot 36	V2P1 LL CHEST RZ	B-16
Plot 37	V2P1 LR CHEST IRTRACC D	B-17
Plot 38	V2P1 LR CHEST RY	B-17
Plot 39	V2P1 LR CHEST RZ	B-17
Plot 40	V2P1 ABDOMEN LEFT IRTRACC D	B-17
Plot 41	V2P1 ABDOMEN LEFT RY	B-18
Plot 42	V2P1 ABDOMEN LEFT RZ	B-18
Plot 43	V2P1 ABDOMEN RIGHT IRTRACC D	B-18
Plot 44	V2P1 ABDOMEN RIGHT RY	B-18
Plot 45	V2P1 ABDOMEN RIGHT RZ	B-19
Plot 46	V2P1 SPINE LOWER FX	B-19
Plot 47	V2P1 SPINE LOWER FY	B-19
Plot 48	V2P1 SPINE LOWER FZ	B-19
Plot 49	V2P1 SPINE LOWER MX	B-20
Plot 50	V2P1 SPINE LOWER MY	B-20
Plot 51	V2P1 PELVIS CG AX	B-20
Plot 52	V2P1 PELVIS CG AY	B-20
Plot 53	V2P1 PELVIS CG AZ	B-21
Plot 54	V2P1 PELVIS ACETABULUM LEFT FX	B-21
Plot 55	V2P1 PELVIS ACETABULUM LEFT FY	B-21
Plot 56	V2P1 PELVIS ACETABULUM LEFT FZ	B-21

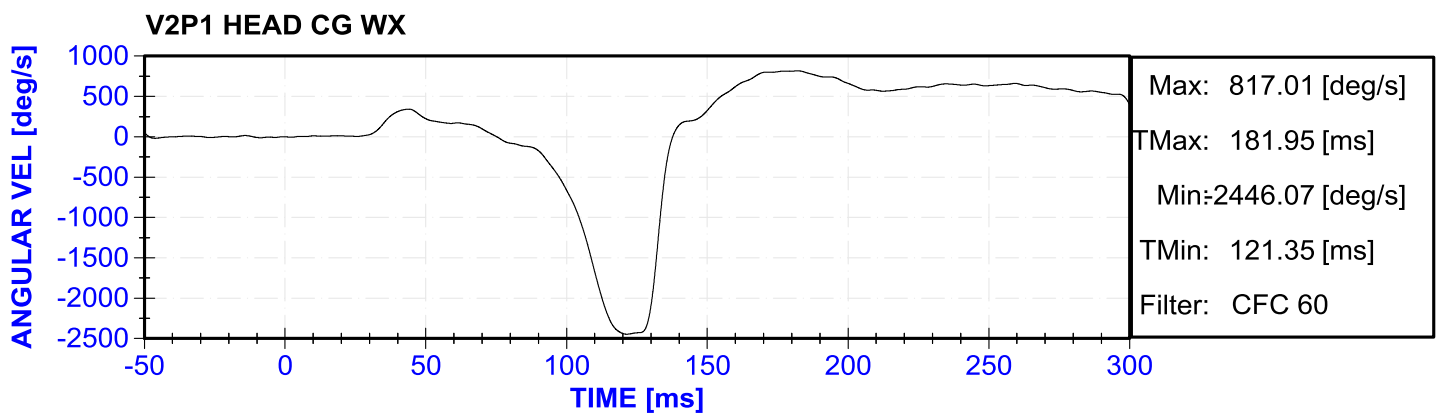
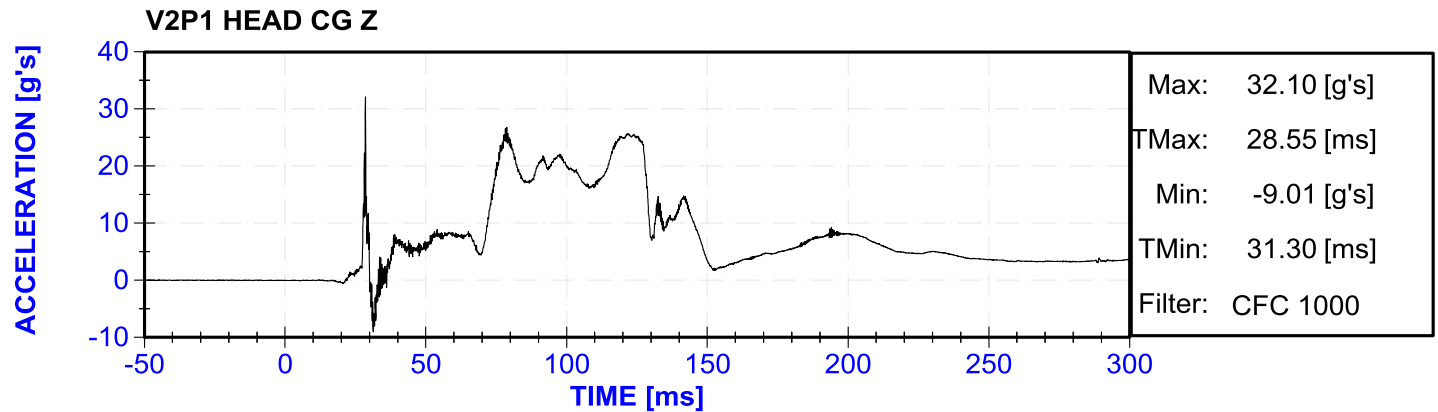
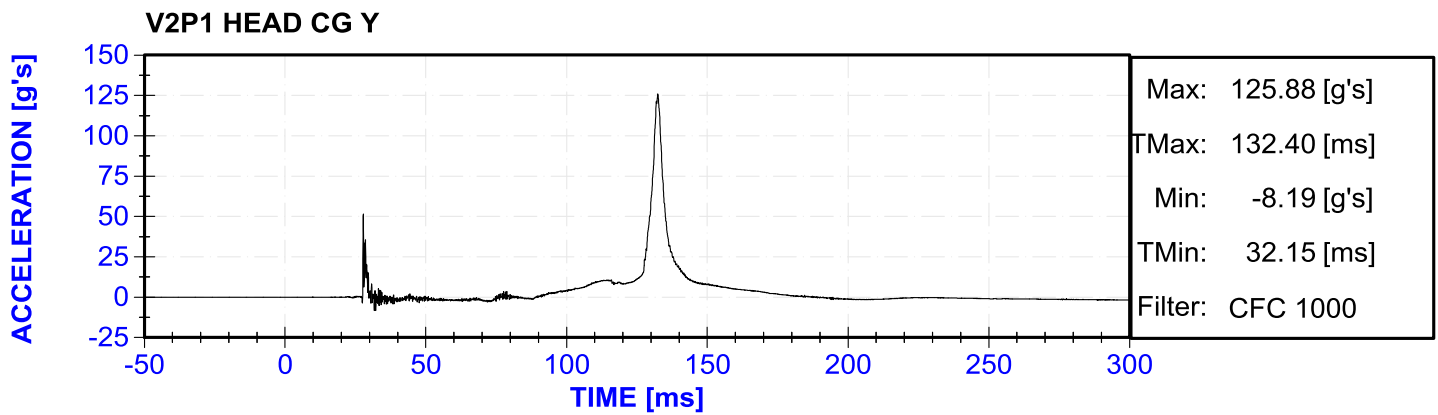
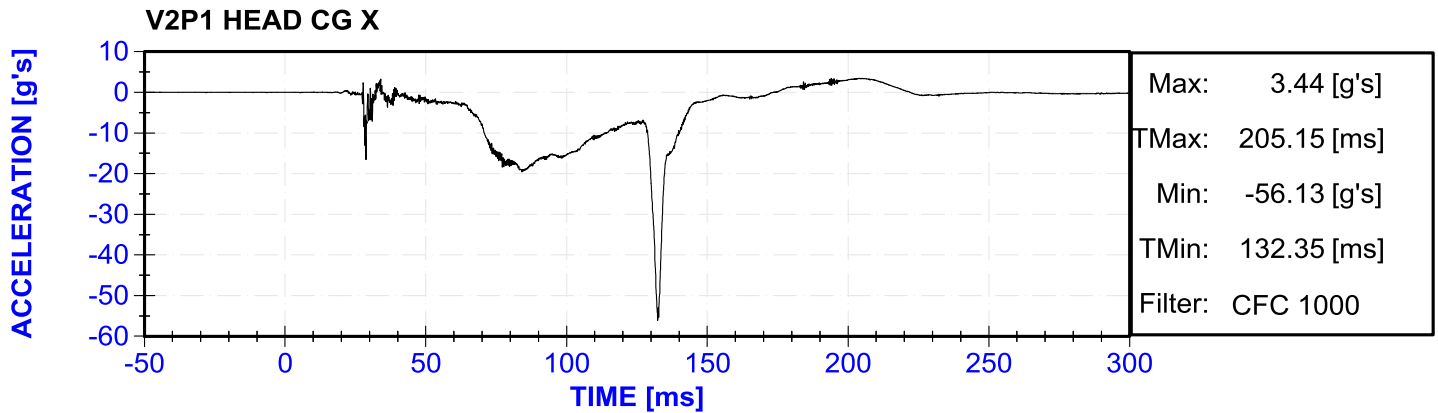
Plot 57	V2P1 PELVIS ACETABULUM RIGHT FX	B-22
Plot 58	V2P1 PELVIS ACETABULUM RIGHT FY	B-22
Plot 59	V2P1 PELVIS ACETABULUM RIGHT FZ	B-22
Plot 60	V2P1 LEFT ASIS FX	B-22
Plot 61	V2P1 RIGHT ASIS FX	B-23
Plot 62	V2P1 LEFT FEMUR FX	B-23
Plot 63	V2P1 LEFT FEMUR FY	B-23
Plot 64	V2P1 LEFT FEMUR FZ	B-23
Plot 65	V2P1 LEFT FEMUR MX	B-24
Plot 66	V2P1 LEFT FEMUR MY	B-24
Plot 67	V2P1 LEFT FEMUR MZ	B-24
Plot 68	V2P1 RIGHT FEMUR FX	B-24
Plot 69	V2P1 RIGHT FEMUR FY	B-25
Plot 70	V2P1 RIGHT FEMUR FZ	B-25
Plot 71	V2P1 RIGHT FEMUR MX	B-25
Plot 72	V2P1 RIGHT FEMUR MY	B-25
Plot 73	V2P1 RIGHT FEMUR MZ	B-26
Plot 74	V2P1 KNEE LEFT DX	B-26
Plot 75	V2P1 TIBIA LEFT UPPER FZ	B-26
Plot 76	V2P1 TIBIA LEFT UPPER MX	B-26
Plot 77	V2P1 TIBIA LEFT UPPER MY	B-27
Plot 78	V2P1 TIBIA LEFT LOWER FZ	B-27
Plot 79	V2P1 TIBIA LEFT LOWER MX	B-27
Plot 80	V2P1 TIBIA LEFT LOWER MY	B-27
Plot 81	V2P1 ANKLE LEFT POT RX	B-28
Plot 82	V2P1 ANKLE LEFT POT RY	B-28
Plot 83	V2P1 FOOT LEFT AZ	B-28
Plot 84	V2P1 KNEE RIGHT DX	B-28
Plot 85	V2P1 TIBIA RIGHT UPPER FZ	B-29
Plot 86	V2P1 TIBIA RIGHT UPPER MX	B-29
Plot 87	V2P1 TIBIA RIGHT UPPER MY	B-29
Plot 88	V2P1 TIBIA RIGHT LOWER FZ	B-29
Plot 89	V2P1 TIBIA RIGHT LOWER MX	B-30
Plot 90	V2P1 TIBIA RIGHT LOWER MY	B-30
Plot 91	V2P1 ANKLE RIGHT POT RX	B-30
Plot 92	V2P1 ANKLE RIGHT POT RY	B-30
Plot 93	V2P1 FOOT RIGHT AZ	B-31
Plot 94	V2 P1 DRIVER LAP BELT	B-31
Plot 95	V2 P1 DRIVER SHOULDER BELT	B-31
Plot 96	V2P2 HEAD CG X	B-31
Plot 97	V2P2 HEAD CG Y	B-32
Plot 98	V2P2 HEAD CG Z	B-32
Plot 99	V2P2 HEAD CG WX	B-32
Plot 100	V2P2 HEAD CG WY	B-32
Plot 101	V2P2 HEAD CG WZ	B-33
Plot 102	V2P2 NECK UPPER FX	B-33
Plot 103	V2P2 NECK UPPER FY	B-33
Plot 104	V2P2 NECK UPPER FZ	B-33
Plot 105	V2P2 NECK UPPER MX	B-34
Plot 106	V2P2 NECK UPPER MY	B-34
Plot 107	V2P2 NECK UPPER MZ	B-34
Plot 108	V2P2 NECK LOWER FX	B-34
Plot 109	V2P2 NECK LOWER FY	B-35
Plot 110	V2P2 NECK LOWER FZ	B-35
Plot 111	V2P2 NECK LOWER MX	B-35
Plot 112	V2P2 NECK LOWER MY	B-35
Plot 113	V2P2 NECK LOWER MZ	B-36
Plot 114	V2P2 NECK SPRING LOAD CELL - FRONT	B-36

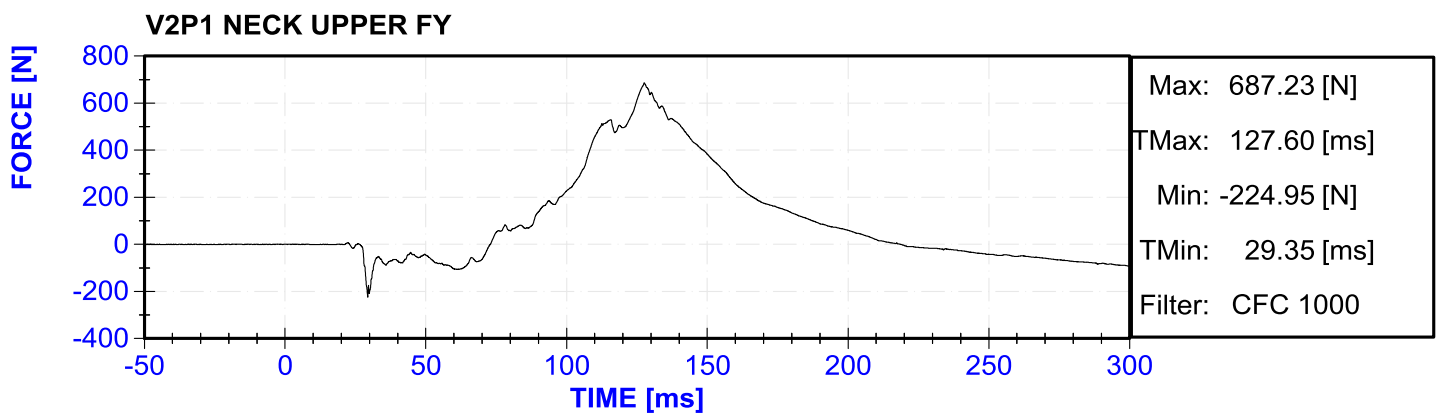
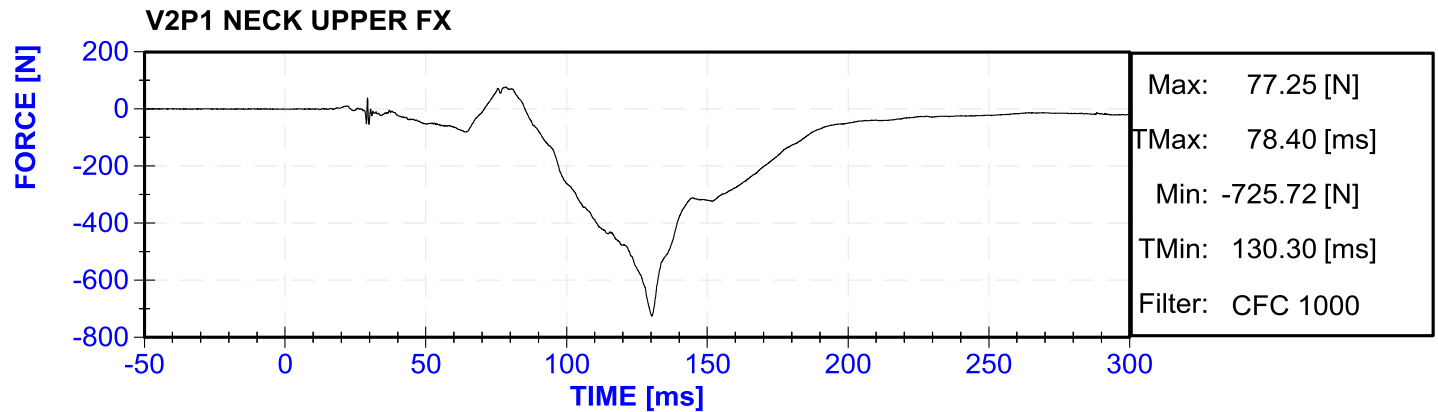
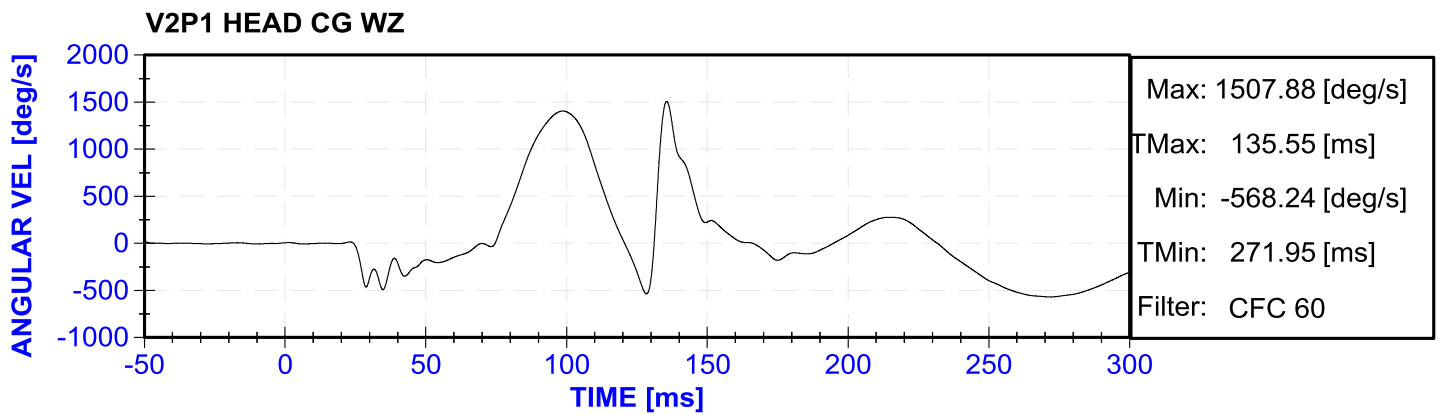
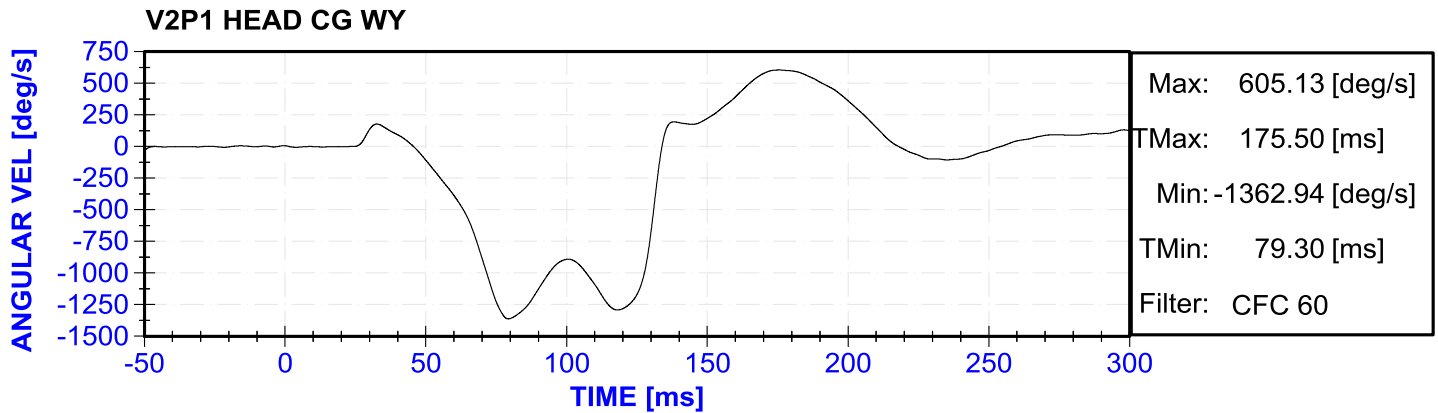
Plot 115	V2P2 NECK SPRING LOAD CELL - REAR	B-36
Plot 116	V2P2 OC ANGLE RY	B-36
Plot 117	V2P2 T1 ACCEL AX	B-37
Plot 118	V2P2 T1 ACCEL AY	B-37
Plot 119	V2P2 T1 ACCEL AZ	B-37
Plot 120	V2P2 T6 ACCEL AX	B-37
Plot 121	V2P2 T6 ACCEL AY	B-38
Plot 122	V2P2 T6 ACCEL AZ	B-38
Plot 123	V2P2 UL CHEST IRTACC D	B-38
Plot 124	V2P2 UL CHEST RY	B-38
Plot 125	V2P2 UL CHEST RZ	B-39
Plot 126	V2P2 UR CHEST IRTACC D	B-39
Plot 127	V2P2 UR CHEST RY	B-39
Plot 128	V2P2 UR CHEST RZ	B-39
Plot 129	V2P2 LL CHEST IRTACC D	B-40
Plot 130	V2P2 LL CHEST RY	B-40
Plot 131	V2P2 LL CHEST RZ	B-40
Plot 132	V2P2 LR CHEST IRTACC D	B-40
Plot 133	V2P2 LR CHEST RY	B-41
Plot 134	V2P2 LR CHEST RZ	B-41
Plot 135	V2P2 ABDOMEN LEFT IRTACC D	B-41
Plot 136	V2P2 ABDOMEN LEFT RY	B-41
Plot 137	V2P2 ABDOMEN LEFT RZ	B-42
Plot 138	V2P2 ABDOMEN RIGHT IRTACC D	B-42
Plot 139	V2P2 ABDOMEN RIGHT RY	B-42
Plot 140	V2P2 ABDOMEN RIGHT RZ	B-42
Plot 141	V2P2 SPINE LOWER FX	B-43
Plot 142	V2P2 SPINE LOWER FY	B-43
Plot 143	V2P2 SPINE LOWER FZ	B-43
Plot 144	V2P2 SPINE LOWER MX	B-43
Plot 145	V2P2 SPINE LOWER MY	B-44
Plot 146	V2P2 PELVIS CG AX	B-44
Plot 147	V2P2 PELVIS CG AY	B-44
Plot 148	V2P2 PELVIS CG AZ	B-44
Plot 149	V2P2 PELVIS ACETABULUM LEFT FX	B-45
Plot 150	V2P2 PELVIS ACETABULUM LEFT FY	B-45
Plot 151	V2P2 PELVIS ACETABULUM LEFT FZ	B-45
Plot 152	V2P2 PELVIS ACETABULUM RIGHT FX	B-45
Plot 153	V2P2 PELVIS ACETABULUM RIGHT FY	B-46
Plot 154	V2P2 PELVIS ACETABULUM RIGHT FZ	B-46
Plot 155	V2P2 LEFT ASIS FX	B-46
Plot 156	V2P2 RIGHT ASIS FX	B-46
Plot 157	V2P2 LEFT FEMUR FX	B-47
Plot 158	V2P2 LEFT FEMUR FY	B-47
Plot 159	V2P2 LEFT FEMUR FZ	B-47
Plot 160	V2P2 LEFT FEMUR MX	B-47
Plot 161	V2P2 LEFT FEMUR MY	B-48
Plot 162	V2P2 LEFT FEMUR MZ	B-48
Plot 163	V2P2 RIGHT FEMUR FX	B-48
Plot 164	V2P2 RIGHT FEMUR FY	B-48
Plot 165	V2P2 RIGHT FEMUR FZ	B-49
Plot 166	V2P2 RIGHT FEMUR MX	B-49
Plot 167	V2P2 RIGHT FEMUR MY	B-49
Plot 168	V2P2 RIGHT FEMUR MZ	B-49
Plot 169	V2P2 KNEE LEFT DX	B-50
Plot 170	V2P2 TIBIA LEFT UPPER FZ	B-50
Plot 171	V2P2 TIBIA LEFT UPPER MX	B-50
Plot 172	V2P2 TIBIA LEFT UPPER MY	B-50

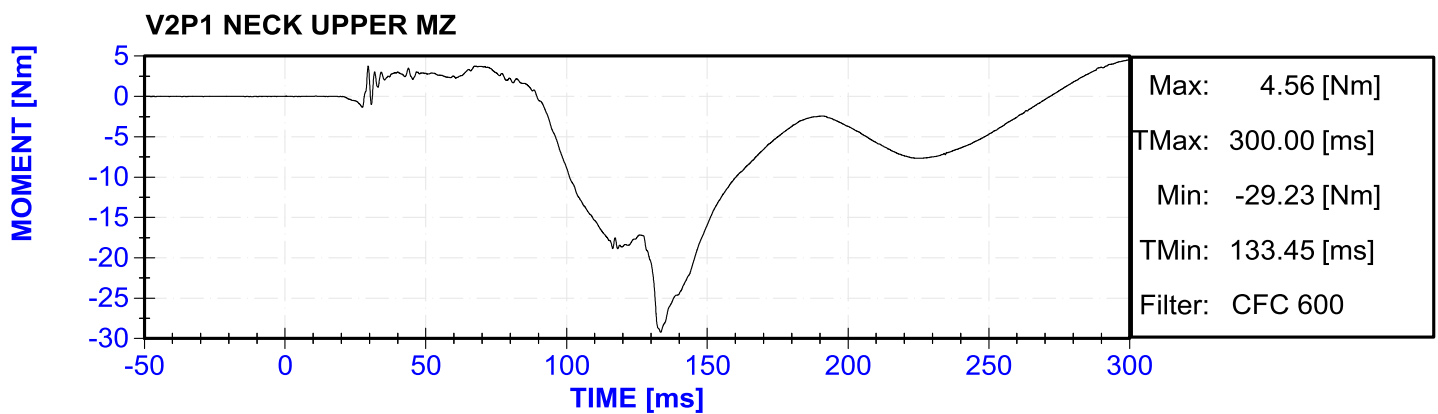
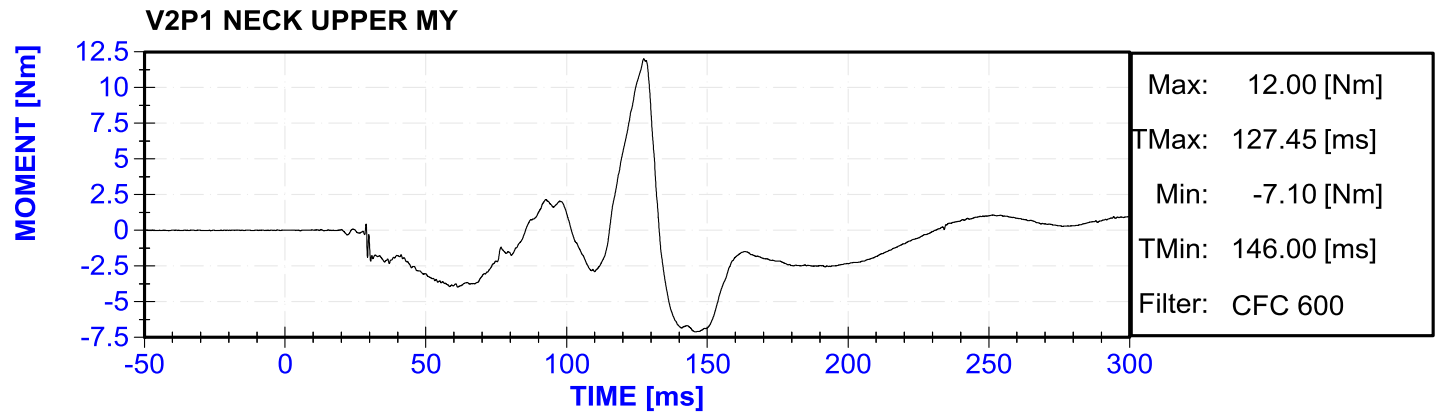
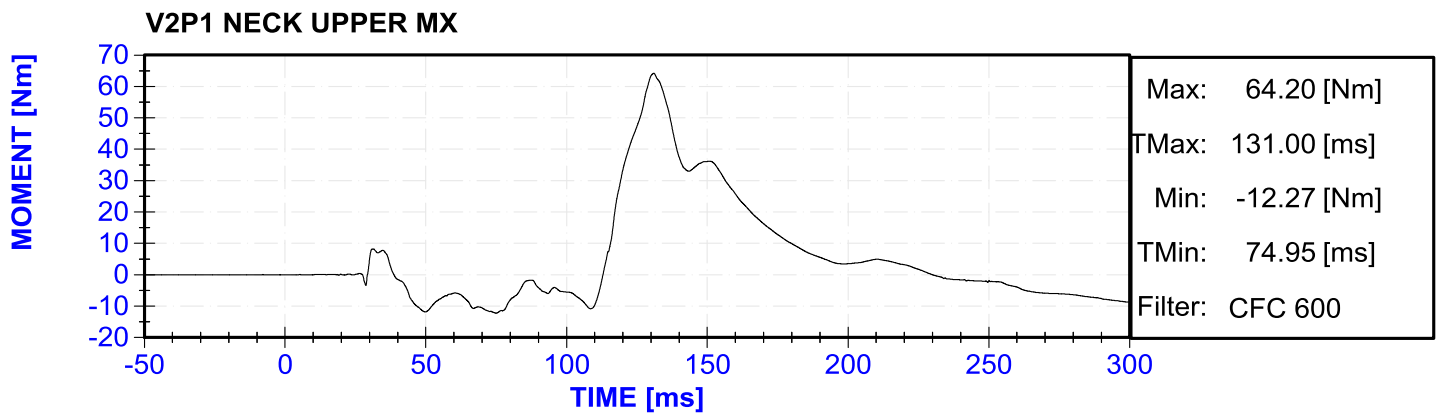
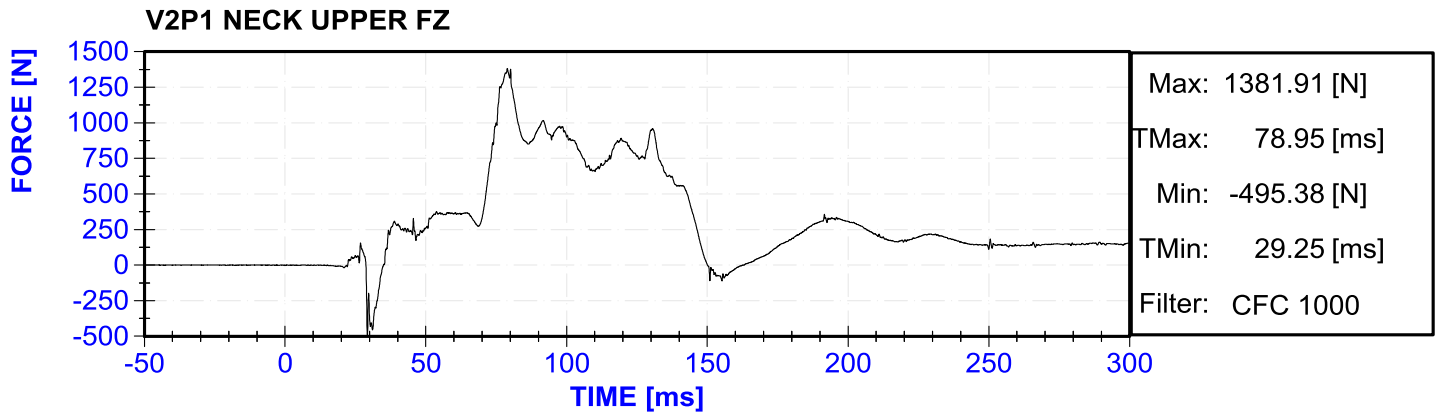
Plot 173	V2P2 TIBIA LEFT LOWER FZ	B-51
Plot 174	V2P2 TIBIA LEFT LOWER MX	B-51
Plot 175	V2P2 TIBIA LEFT LOWER MY	B-51
Plot 176	V2P2 ANKLE LEFT POT RX [W/ OFFSET]	B-51
Plot 177	V2P2 ANKLE LEFT POT RY [W/ OFFSET]	B-52
Plot 178	V2P2 FOOT LEFT AZ	B-52
Plot 179	V2P2 KNEE RIGHT DX	B-52
Plot 180	V2P2 TIBIA RIGHT UPPER FZ	B-52
Plot 181	V2P2 TIBIA RIGHT UPPER MX	B-53
Plot 182	V2P2 TIBIA RIGHT UPPER MY	B-53
Plot 183	V2P2 TIBIA RIGHT LOWER FZ	B-53
Plot 184	V2P2 TIBIA RIGHT LOWER MX	B-53
Plot 185	V2P2 TIBIA RIGHT LOWER MY	B-54
Plot 186	V2P2 ANKLE RIGHT POT RX [W/ OFFSET]	B-54
Plot 187	V2P2 ANKLE RIGHT POT RY [W/ OFFSET]	B-54
Plot 188	V2P2 FOOT RIGHT AZ	B-54
Plot 189	V2 P2 PASSENGER LAP BELT	B-55
Plot 190	V2 P2 PASSENGER SHOULDER BELT	B-55
Plot 191	V2 LEFT REAR SILL X	B-55
Plot 192	V2 LEFT REAR SILL Y	B-55
Plot 193	V2 LEFT REAR SILL RX	B-56
Plot 194	V2 LEFT REAR SILL RY	B-56
Plot 195	V2 RIGHT REAR SILL X	B-56
Plot 196	V2 RIGHT REAR SILL Y	B-56
Plot 197	V2 VEHICLE CG X	B-57
Plot 198	V2 VEHICLE CG Y	B-57
Plot 199	V2 VEHICLE CG Z	B-57
Plot 200	V2 VEHICLE CG RX	B-57
Plot 201	V2 VEHICLE CG RY	B-58
Plot 202	V2 VEHICLE CG RZ	B-58
Plot 203	V2 INSTRUMENT PANEL X	B-58
Plot 204	V2 DRIVER SEAT TRACK X	B-58
Plot 205	V2 DRIVER SEAT TRACK Y	B-59
Plot 206	V2 DRIVER SEAT TRACK Z	B-59
Plot 207	V2 PASSENGER SEAT TRACK X	B-59
Plot 208	V2 PASSENGER SEAT TRACK Y	B-59
Plot 209	V2 PASSENGER SEAT TRACK Z	B-60
Plot 210	V2 DRIVER FLOOR PAN X	B-60
Plot 211	V2 DRIVER FLOOR PAN Y	B-60
Plot 212	V2 DRIVER FLOOR PAN Z	B-60
Plot 213	V2 DRIVER FLOOR PAN STRING POT	B-61
Plot 214	V2 DRIVER SW AIRBAG STAGE 1	B-61
Plot 215	V2 DRIVER SW AIRBAG STAGE 2	B-61
Plot 216	V2 DRIVER HEAD CURTAIN	B-61
Plot 217	V2 DRIVER SEAT HEAD/TORSO/PELVIS	B-62
Plot 218	V2 DRIVER KNEE	B-62
Plot 219	V2 DRIVER TORSO BELT PRETENSIONER	B-62
Plot 220	V2 PASSENGER FRT AIRBAG STAGE 1	B-62
Plot 221	V2 PASSENGER FRT AIRBAG STAGE 2	B-63
Plot 222	V2 PASSENGER HEAD CURTAIN	B-63
Plot 223	V2 PASSENGER HEAD/TORSO/PELVIS	B-63
Plot 224	V2 PASSENGER KNEE	B-63
Plot 225	V2 PASSENGER TORSO BELT PRETENSIONER	B-64
Plot 226	V1 CG AX	B-64
Plot 227	V1 CG AY	B-64
Plot 228	V1 CG AZ	B-64
Plot 229	V1 REAR C/L AX	B-65
Plot 230	V1 REAR C/L AY	B-65

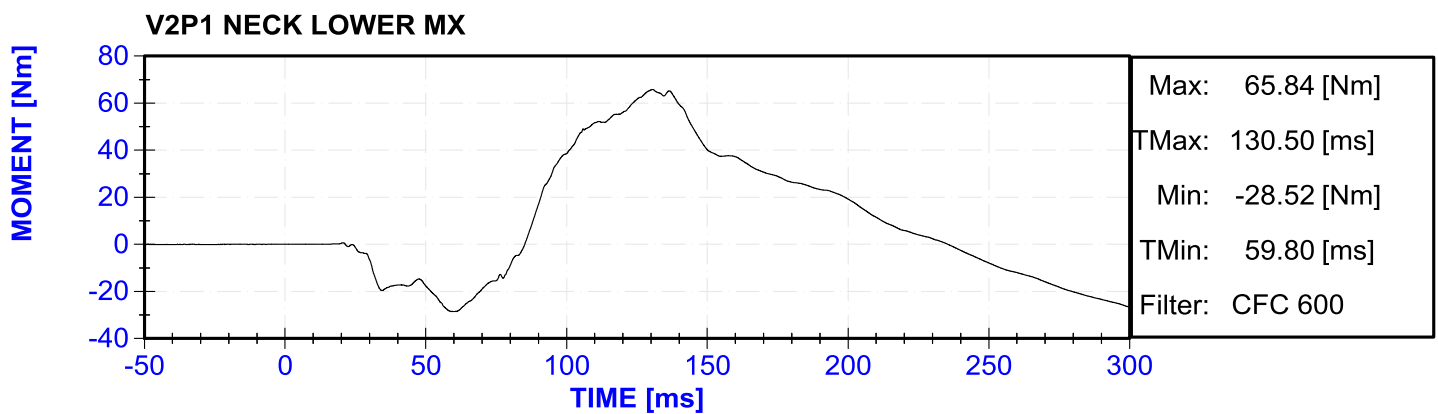
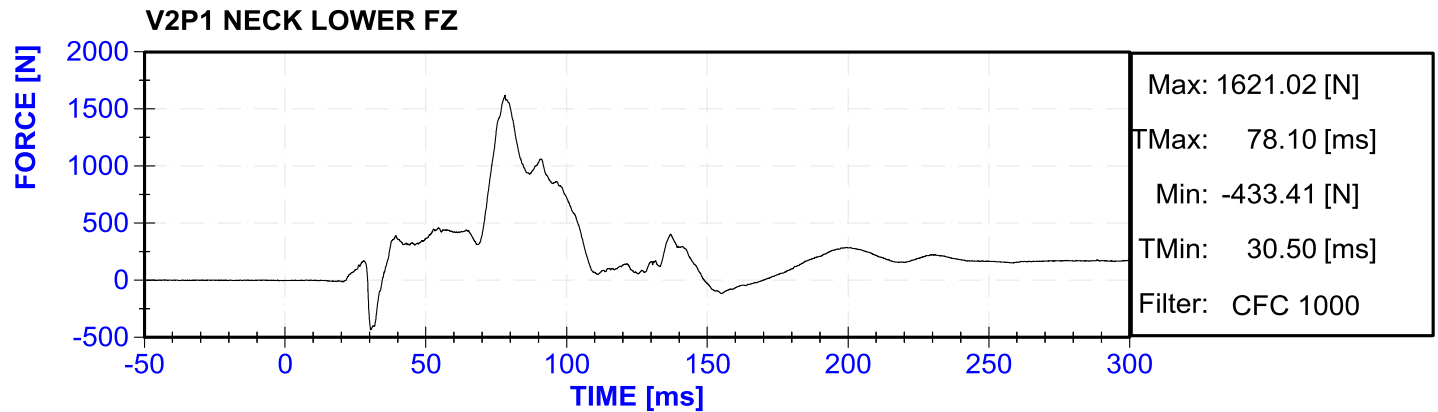
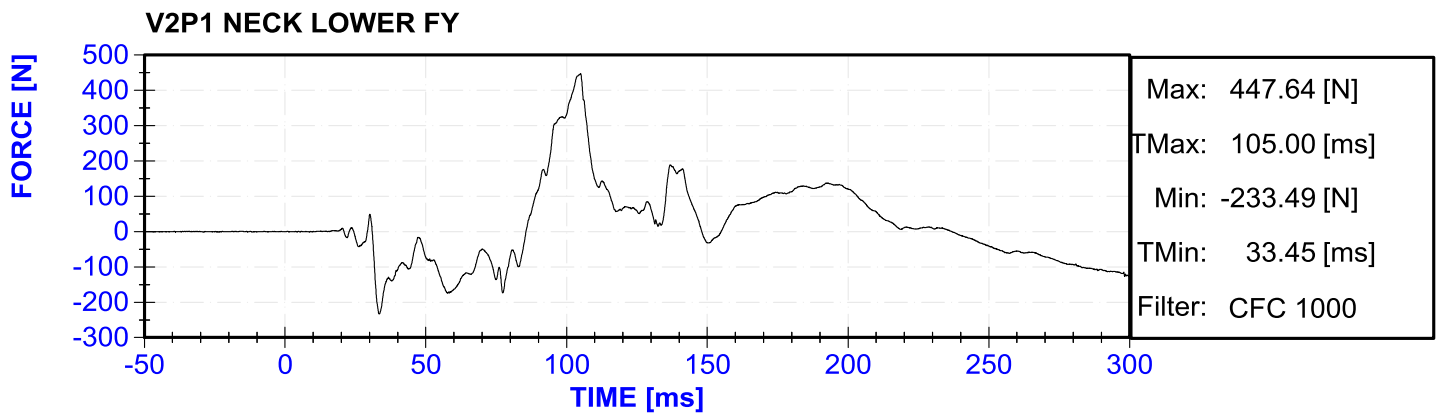
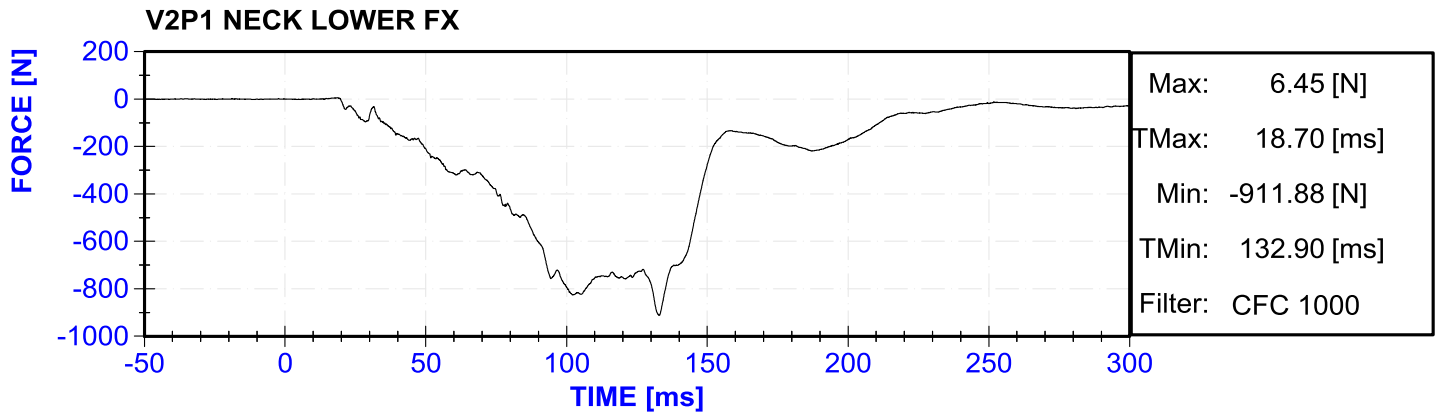
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Plot 232	V2P1 NECK OCCIPITAL CONDYLE FORCE X [THORTEST]	B-65
Plot 233	V2P1 NECK OCCIPITAL CONDYLE FORCE Z [THORTEST]	B-66
Plot 234	V2P1 NECK OCCIPITAL CONDYLE MY [THORTEST]	B-66
Plot 235	V2P1 NECK UPPER FORCE X [THORTEST]	B-66
Plot 236	V2P1 NECK UPPER FORCE Y [THORTEST]	B-66
Plot 237	V2P1 NECK UPPER FORCE Z [THORTEST]	B-67
Plot 238	V2P1 NECK UPPER MOMENT X [THORTEST]	B-67
Plot 239	V2P1 NECK UPPER MOMENT Y [THORTEST]	B-67
Plot 240	V2P1 NECK UPPER MOMENT Z [THORTEST]	B-67
Plot 241	V2P1 CHEST UPPER LEFT X [CFC_180]	B-68
Plot 242	V2P1 CHEST UPPER LEFT Y [CFC_180]	B-68
Plot 243	V2P1 CHEST UPPER LEFT Z [CFC_180]	B-68
Plot 244	V2P1 CHEST UPPER LEFT D [CFC_180]	B-68
Plot 245	V2P1 CHEST UPPER RIGHT X [CFC_180]	B-69
Plot 246	V2P1 CHEST UPPER RIGHT Y [CFC_180]	B-69
Plot 247	V2P1 CHEST UPPER RIGHT Z [CFC_180]	B-69
Plot 248	V2P1 CHEST UPPER RIGHT D [CFC_180]	B-69
Plot 249	V2P1 CHEST LOWER LEFT X [CFC_180]	B-70
Plot 250	V2P1 CHEST LOWER LEFT Y [CFC_180]	B-70
Plot 251	V2P1 CHEST LOWER LEFT Z [CFC_180]	B-70
Plot 252	V2P1 CHEST LOWER LEFT D [CFC_180]	B-70
Plot 253	V2P1 CHEST LOWER RIGHT X [CFC_180]	B-71
Plot 254	V2P1 CHEST LOWER RIGHT Y [CFC_180]	B-71
Plot 255	V2P1 CHEST LOWER RIGHT Z [CFC_180]	B-71
Plot 256	V2P1 CHEST LOWER RIGHT D [CFC_180]	B-71
Plot 257	V2P1 ABDOMEN LEFT LOWER X [CFC_180]	B-72
Plot 258	V2P1 ABDOMEN LEFT LOWER Y [CFC_180]	B-72
Plot 259	V2P1 ABDOMEN LEFT LOWER Z [CFC_180]	B-72
Plot 260	V2P1 ABDOMEN LEFT LOWER D [CFC_180]	B-72
Plot 261	V2P1 ABDOMEN RIGHT LOWER X [CFC_180]	B-73
Plot 262	V2P1 ABDOMEN RIGHT LOWER Y [CFC_180]	B-73
Plot 263	V2P1 ABDOMEN RIGHT LOWER Z [CFC_180]	B-73
Plot 264	V2P1 ABDOMEN RIGHT LOWER D [CFC_180]	B-73
Plot 265	V2P2 NECK OCCIPITAL CONDYLE FORCE X [THORTEST]	B-74
Plot 266	V2P2 NECK OCCIPITAL CONDYLE FORCE Z [THORTEST]	B-74
Plot 267	V2P2 NECK OCCIPITAL CONDYLE MY [THORTEST]	B-74
Plot 268	V2P2 NECK UPPER FORCE X [THORTEST]	B-74
Plot 269	V2P2 NECK UPPER FORCE Y [THORTEST]	B-75
Plot 270	V2P2 NECK UPPER FORCE Z [THORTEST]	B-75
Plot 271	V2P2 NECK UPPER MOMENT X [THORTEST]	B-75
Plot 272	V2P2 NECK UPPER MOMENT Y [THORTEST]	B-75
Plot 273	V2P2 NECK UPPER MOMENT Z [THORTEST]	B-76
Plot 274	V2P2 CHEST UPPER LEFT X [CFC_180]	B-76
Plot 275	V2P2 CHEST UPPER LEFT Y [CFC_180]	B-76
Plot 276	V2P2 CHEST UPPER LEFT Z [CFC_180]	B-76
Plot 277	V2P2 CHEST UPPER LEFT D [CFC_180]	B-77
Plot 278	V2P2 CHEST UPPER RIGHT X [CFC_180]	B-77
Plot 279	V2P2 CHEST UPPER RIGHT Y [CFC_180]	B-77
Plot 280	V2P2 CHEST UPPER RIGHT Z [CFC_180]	B-77
Plot 281	V2P2 CHEST UPPER RIGHT D [CFC_180]	B-78
Plot 282	V2P2 CHEST LOWER LEFT X [CFC_180]	B-78
Plot 283	V2P2 CHEST LOWER LEFT Y [CFC_180]	B-78
Plot 284	V2P2 CHEST LOWER LEFT Z [CFC_180]	B-78
Plot 285	V2P2 CHEST LOWER LEFT D [CFC_180]	B-79
Plot 286	V2P2 CHEST LOWER RIGHT X [CFC_180]	B-79
Plot 287	V2P2 CHEST LOWER RIGHT Y [CFC_180]	B-79
Plot 288	V2P2 CHEST LOWER RIGHT Z [CFC_180]	B-79

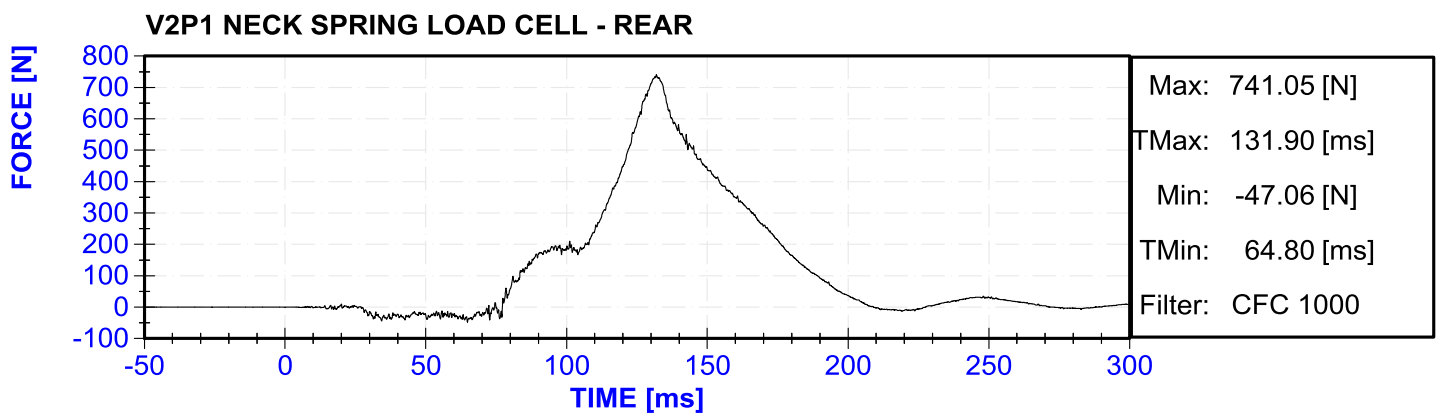
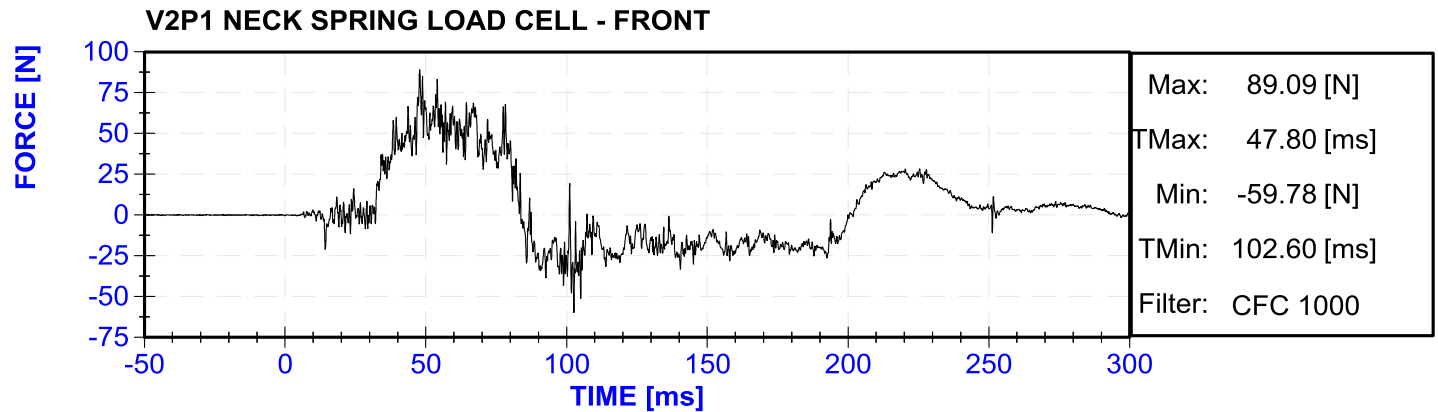
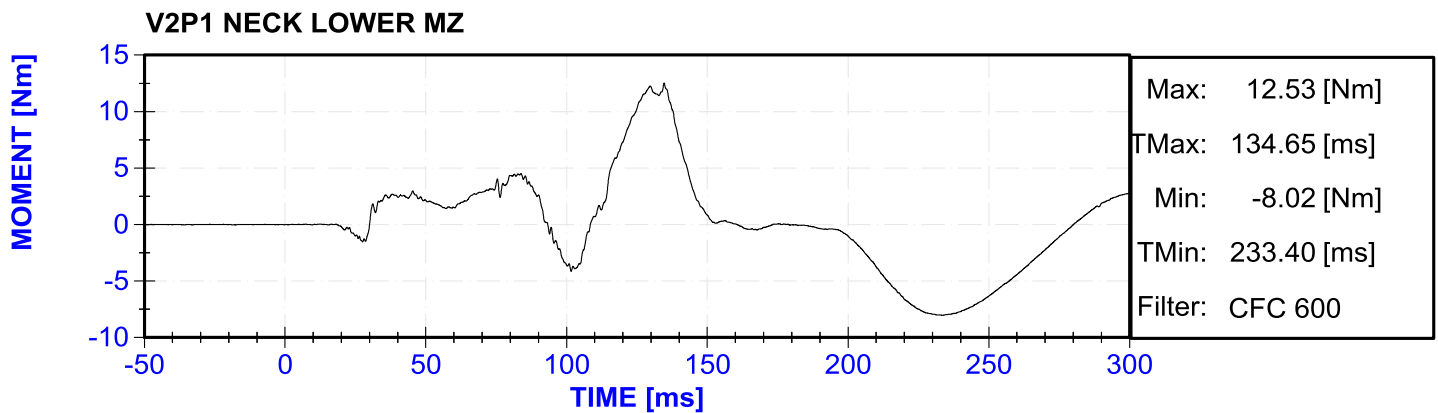
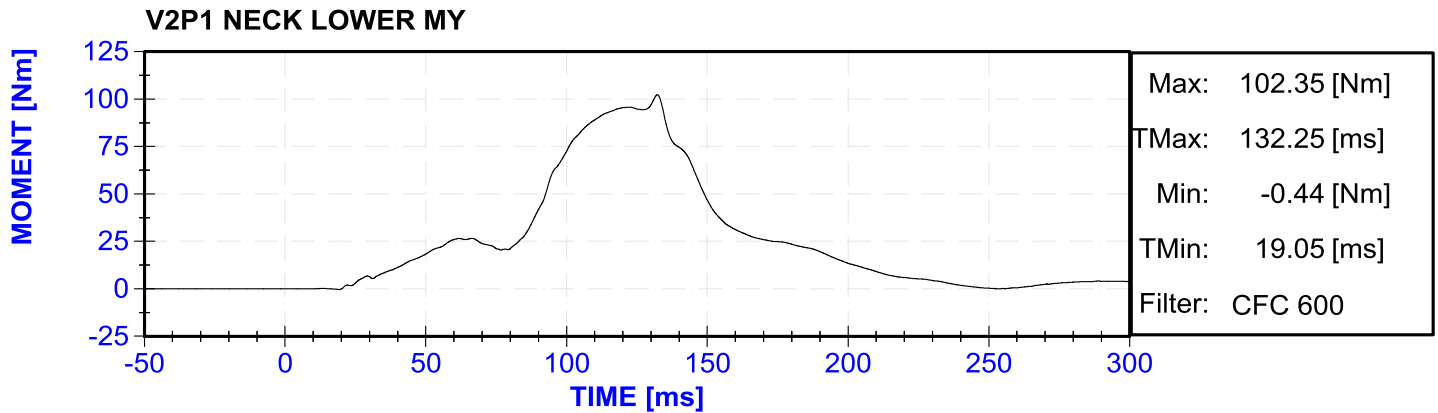
Plot 289	V2P2 CHEST LOWER RIGHT D [CFC_180]	B-80
Plot 290	V2P2 ABDOMEN LEFT LOWER X [CFC_180]	B-80
Plot 291	V2P2 ABDOMEN LEFT LOWER Y [CFC_180]	B-80
Plot 292	V2P2 ABDOMEN LEFT LOWER Z [CFC_180]	B-80
Plot 293	V2P2 ABDOMEN LEFT LOWER D [CFC_180]	B-81
Plot 294	V2P2 ABDOMEN RIGHT LOWER X [CFC_180]	B-81
Plot 295	V2P2 ABDOMEN RIGHT LOWER Y [CFC_180]	B-81
Plot 296	V2P2 ABDOMEN RIGHT LOWER Z [CFC_180]	B-81
Plot 297	V2P2 ABDOMEN RIGHT LOWER D [CFC_180]	B-82

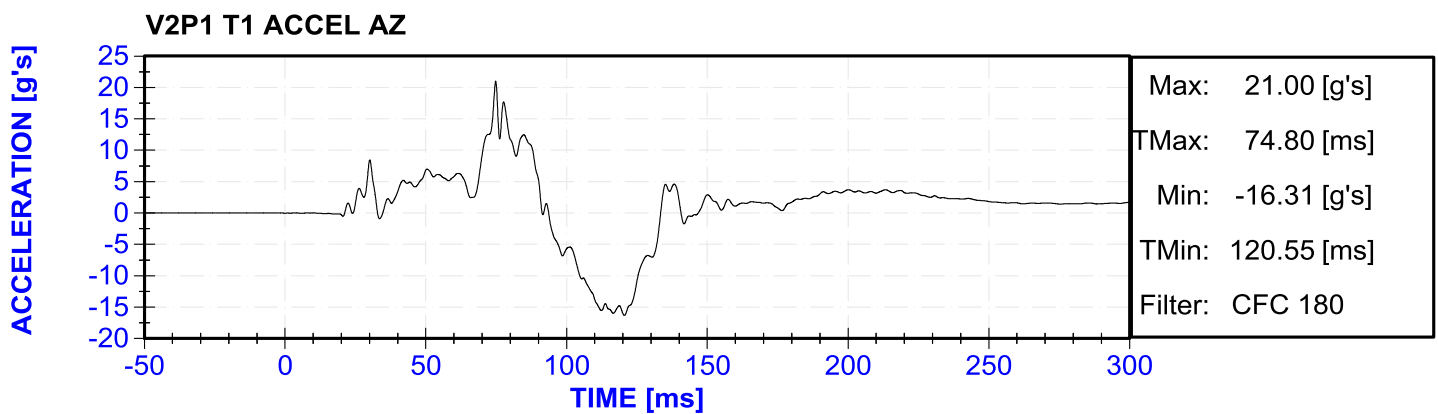
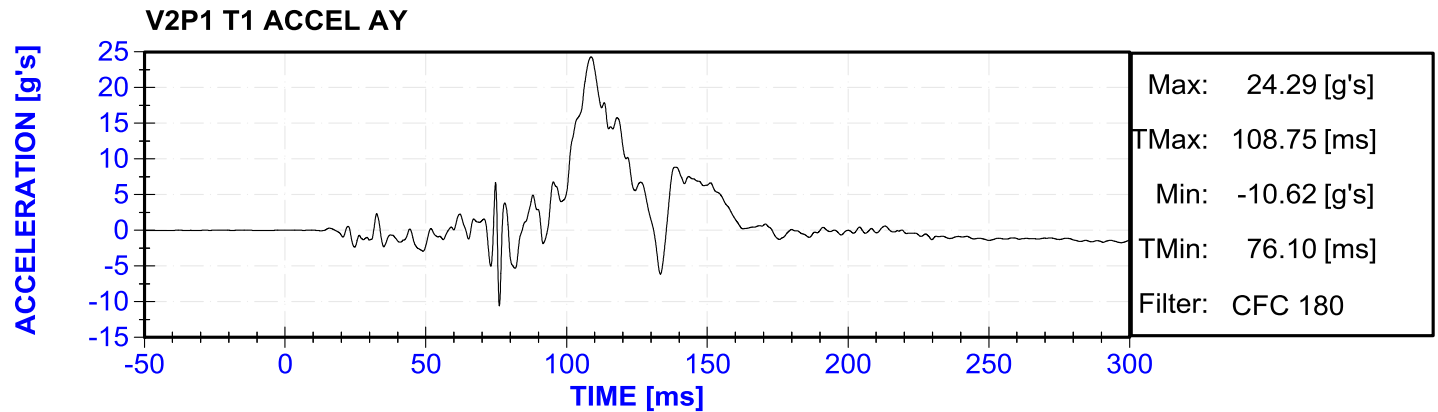
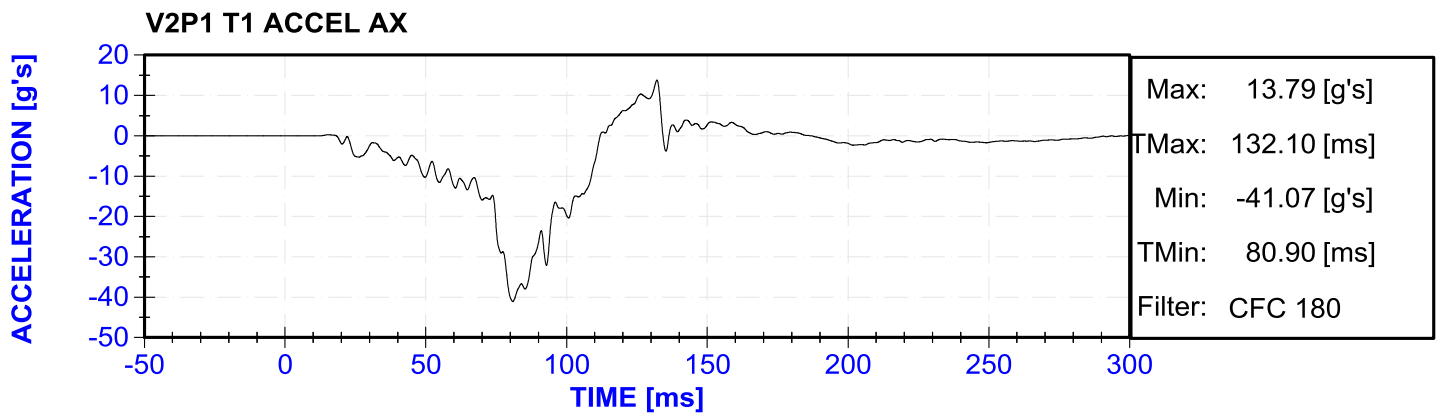
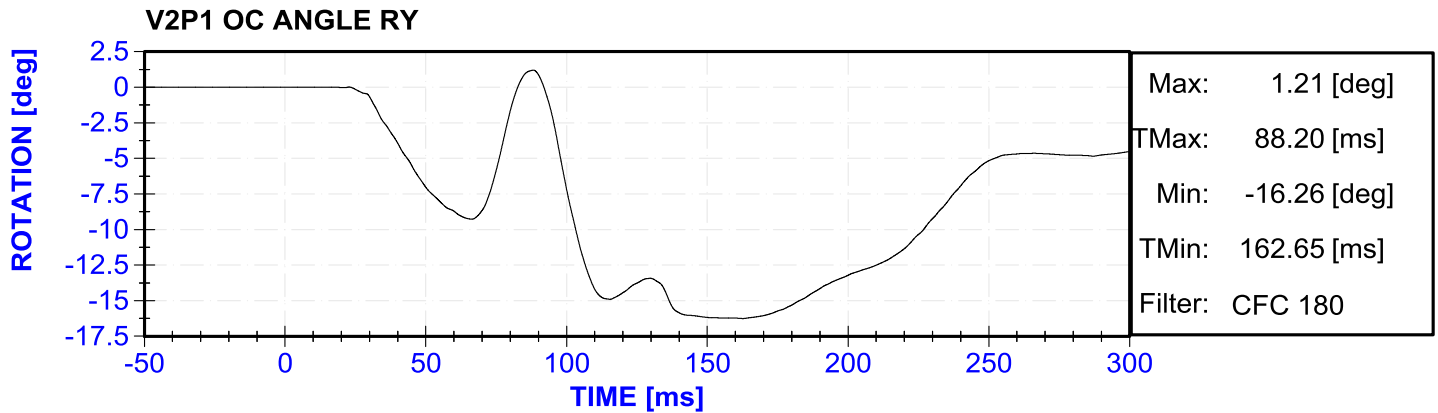


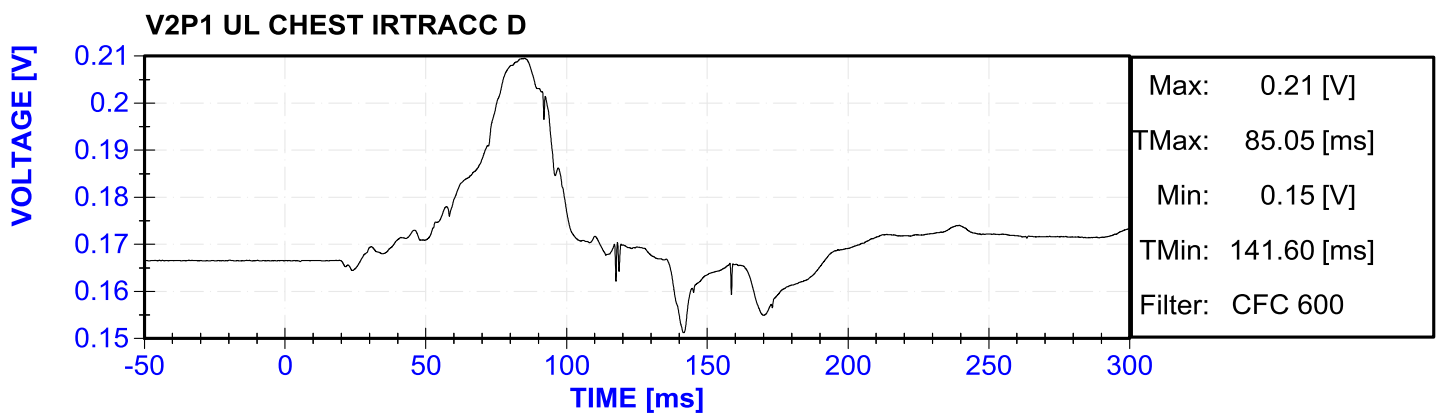
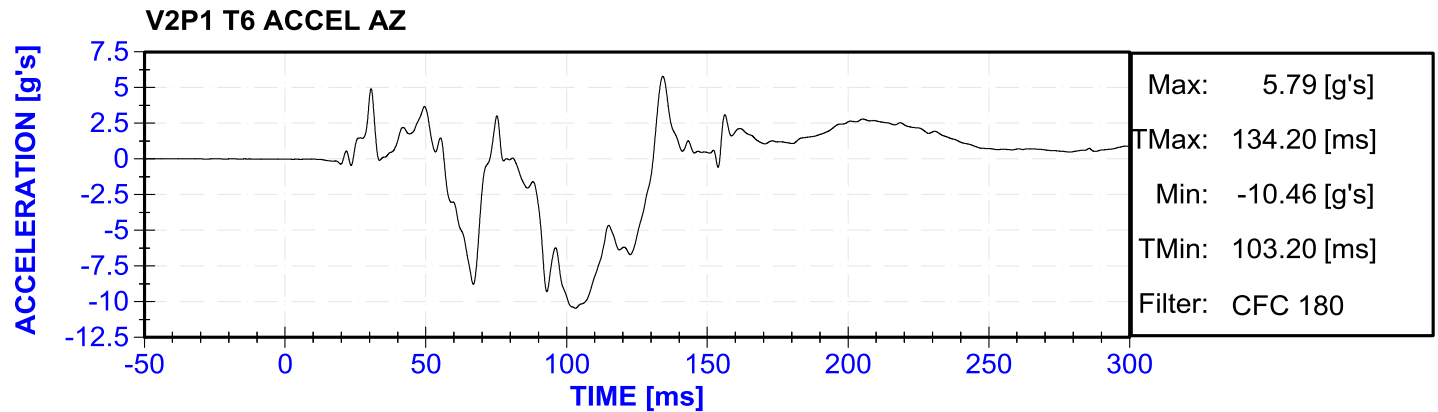
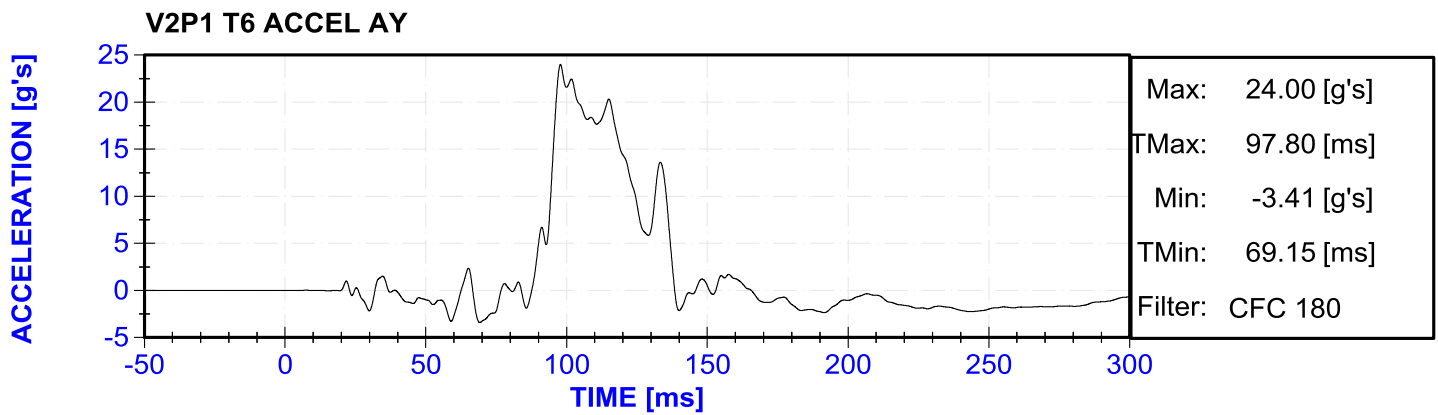
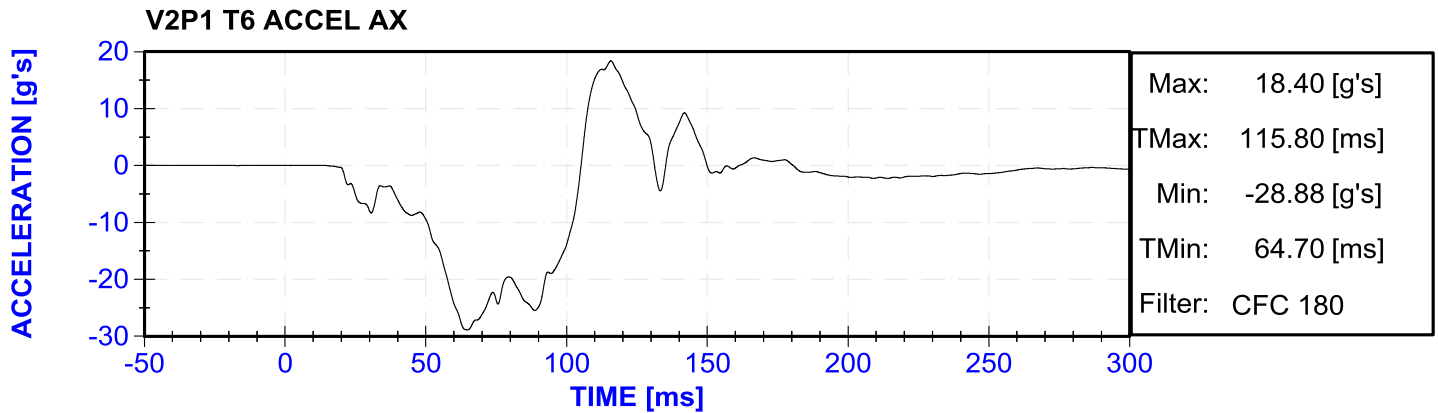


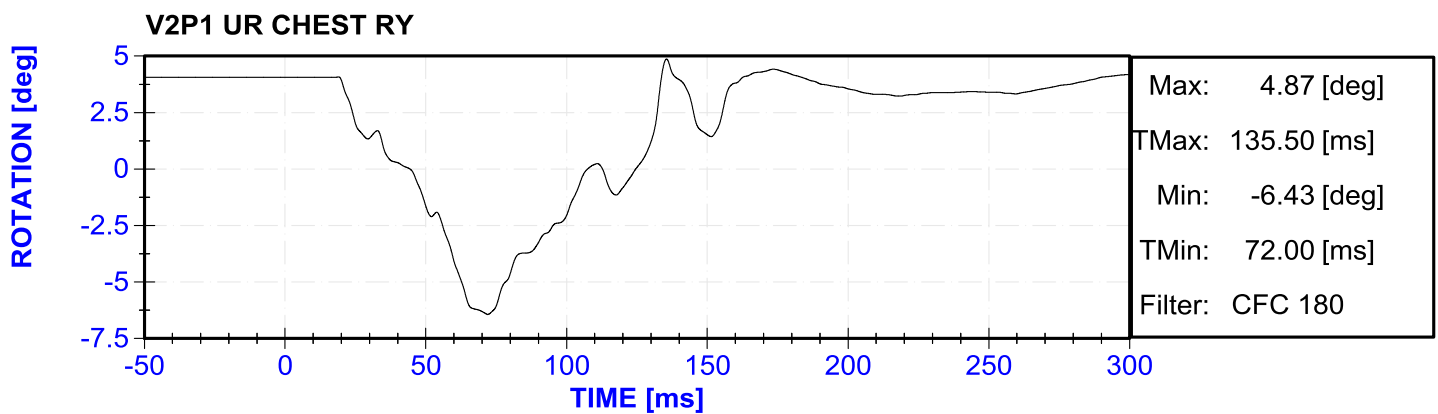
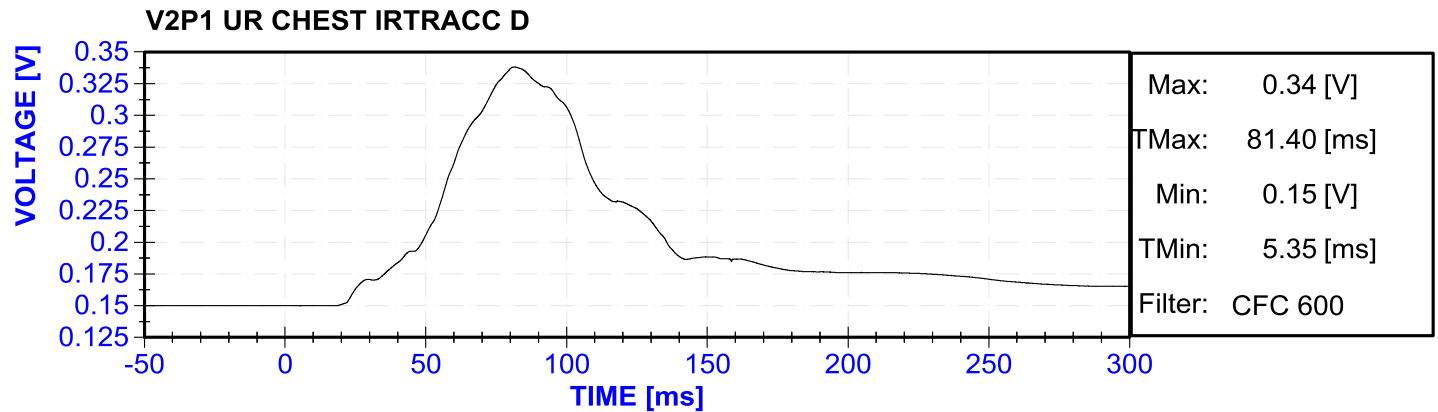
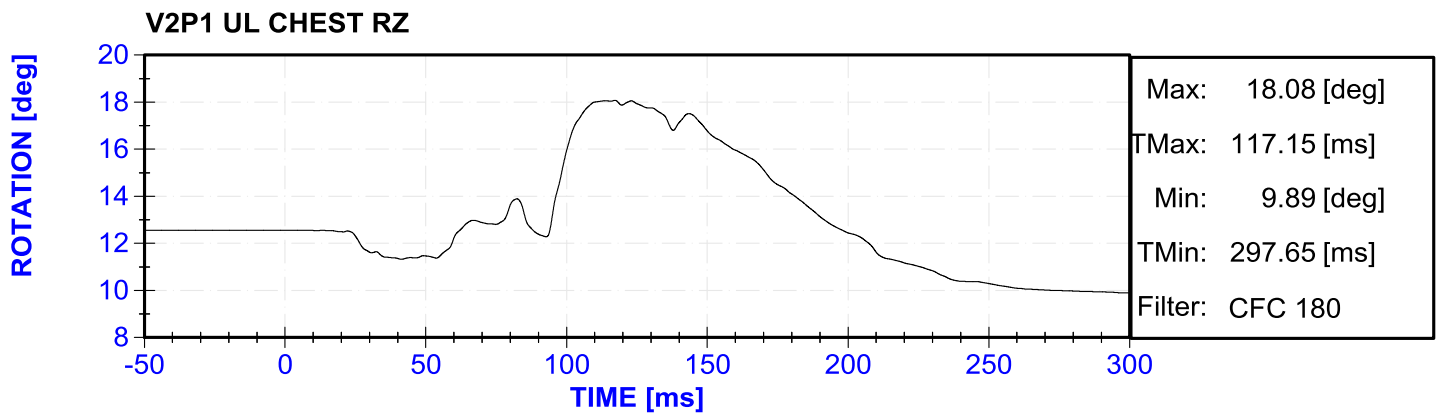
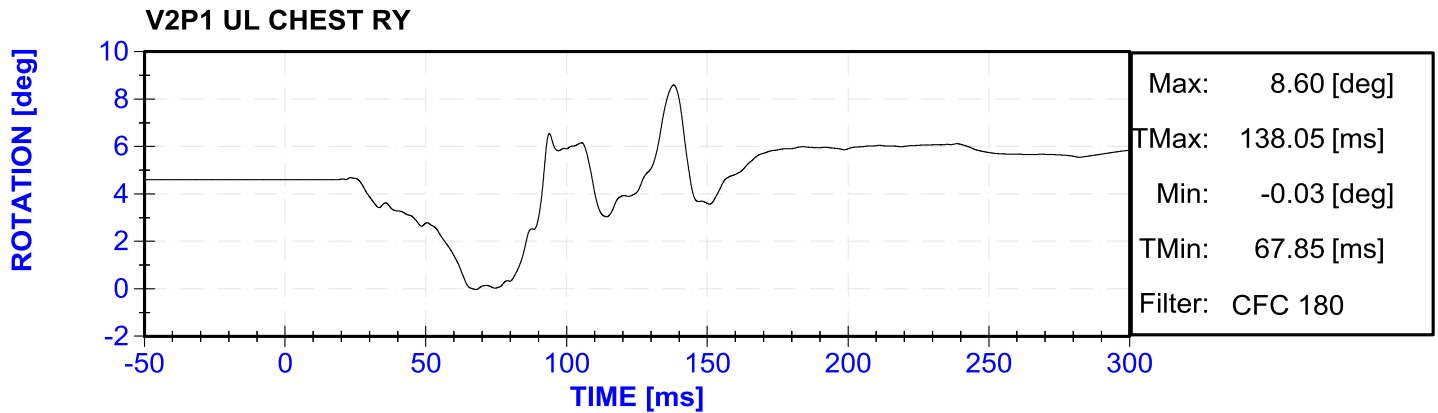


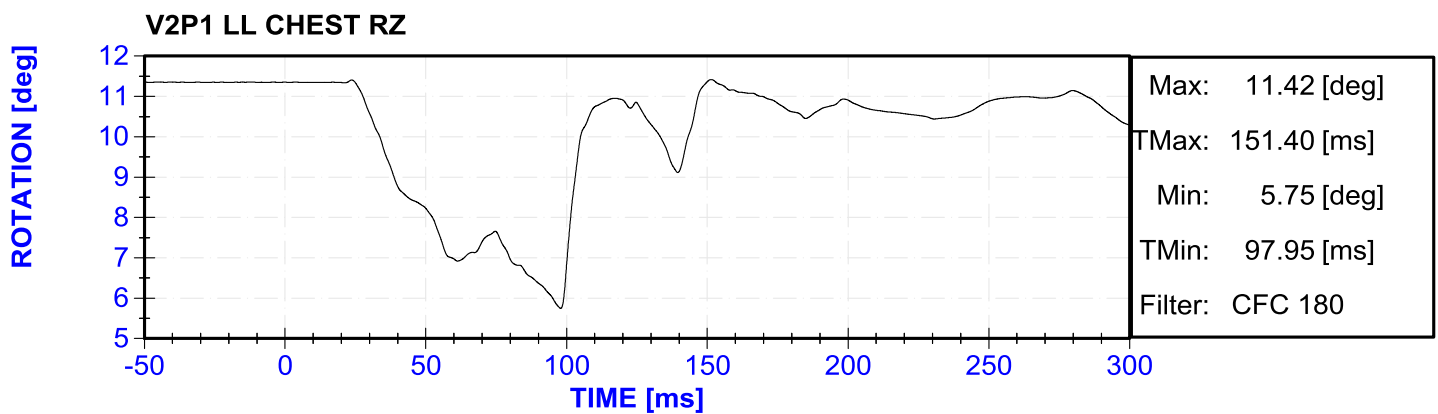
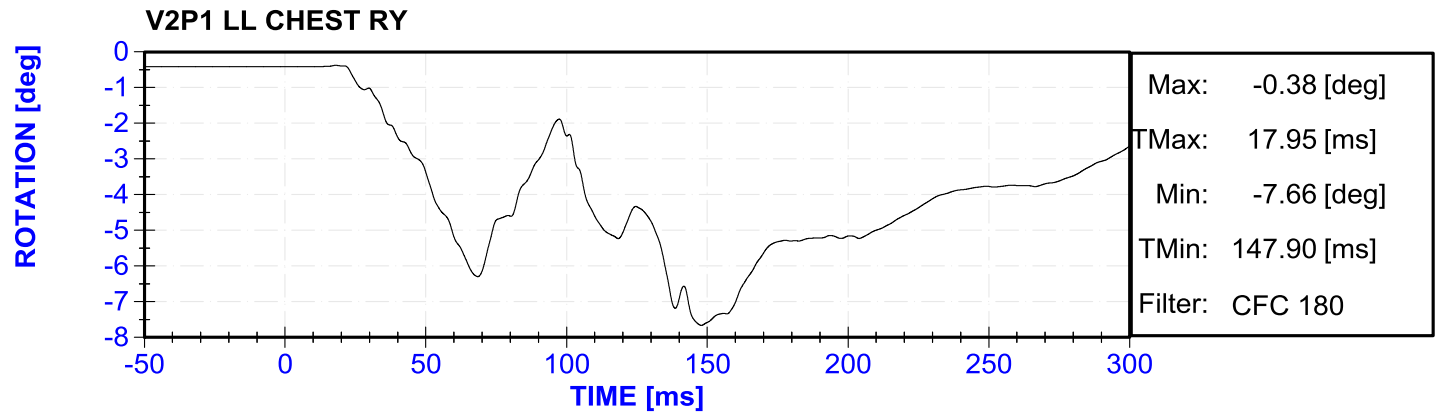
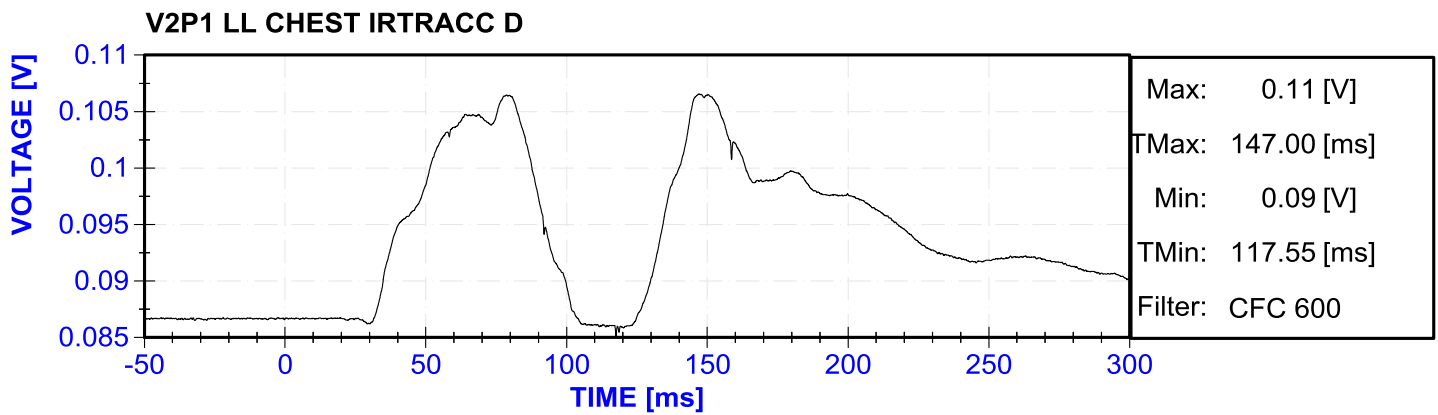
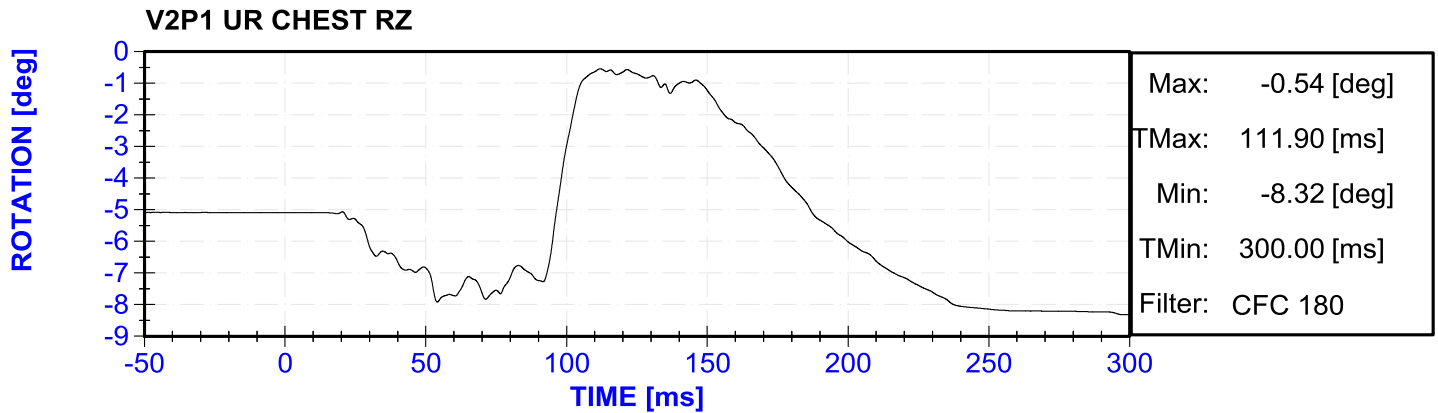




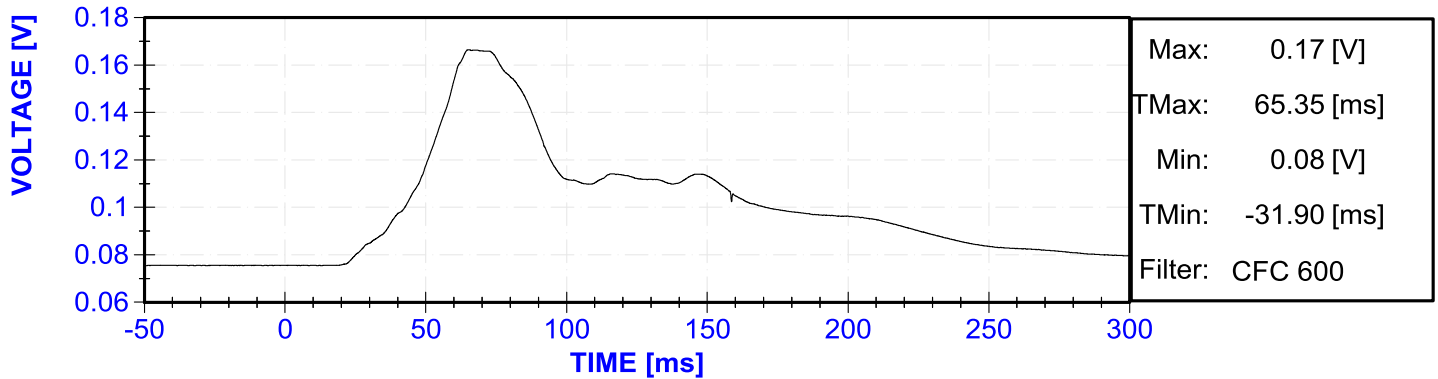




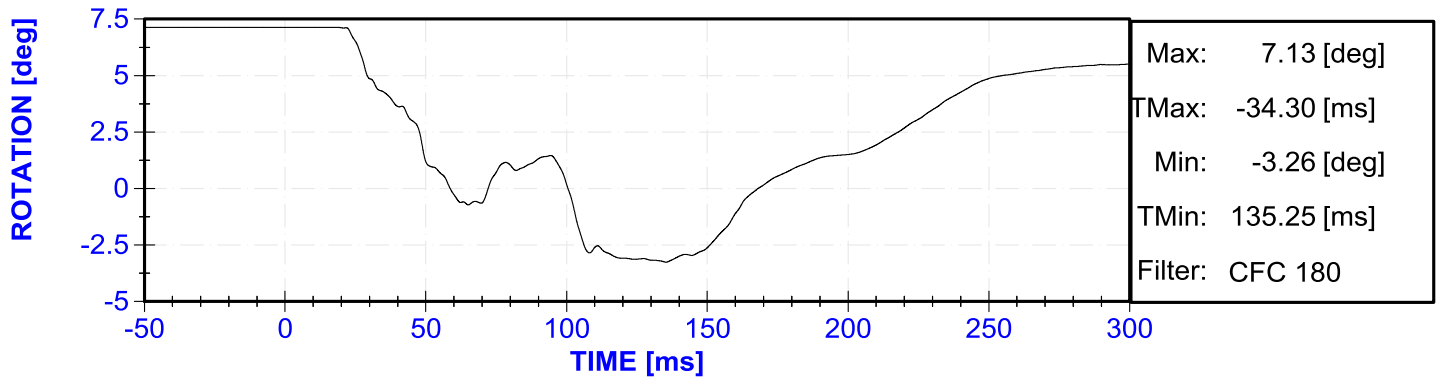




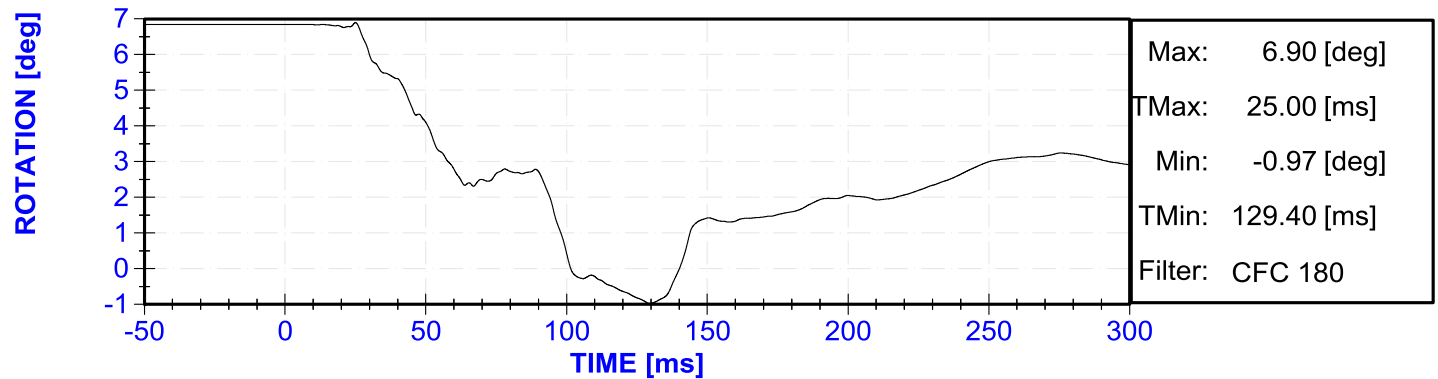
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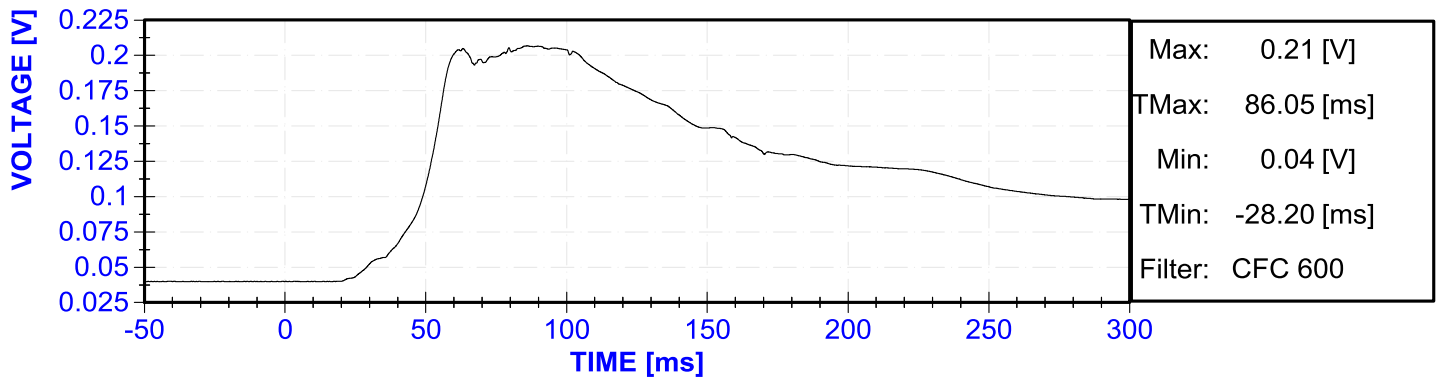
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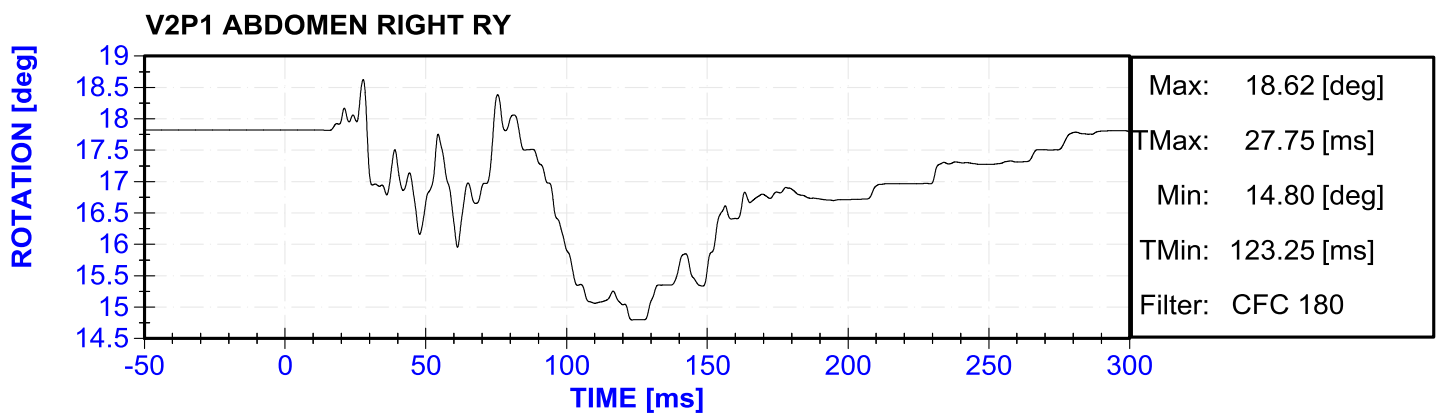
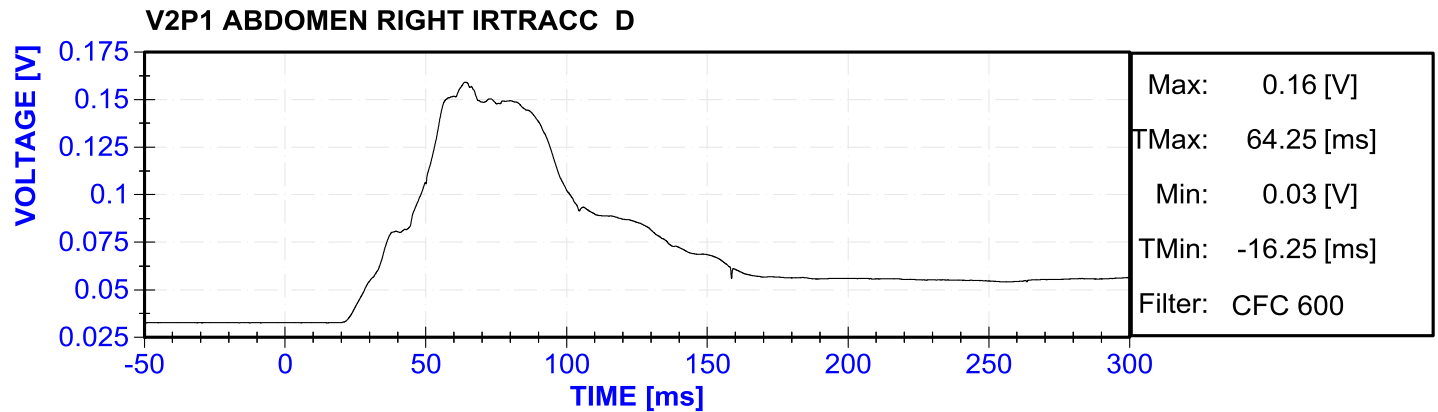
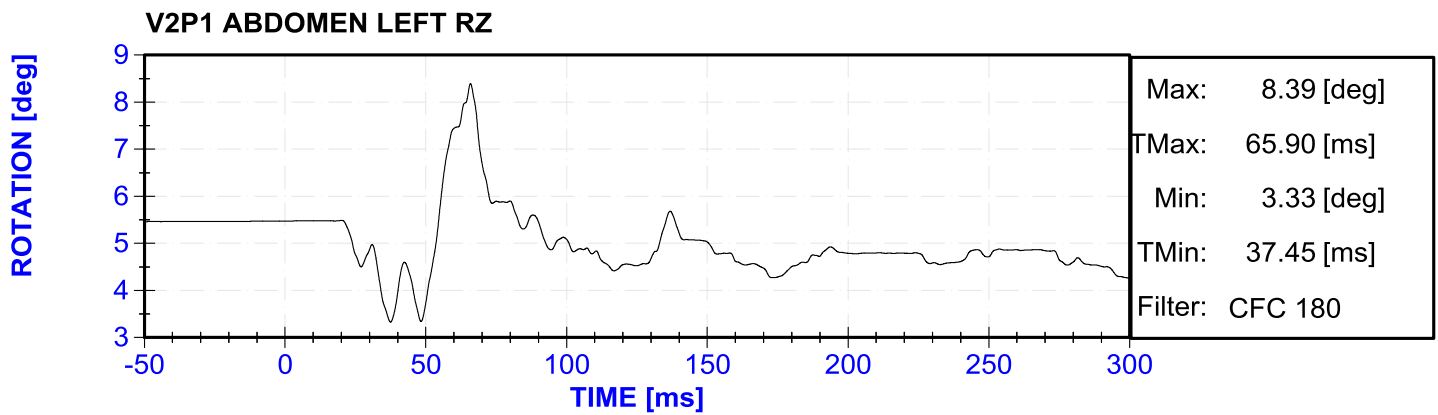
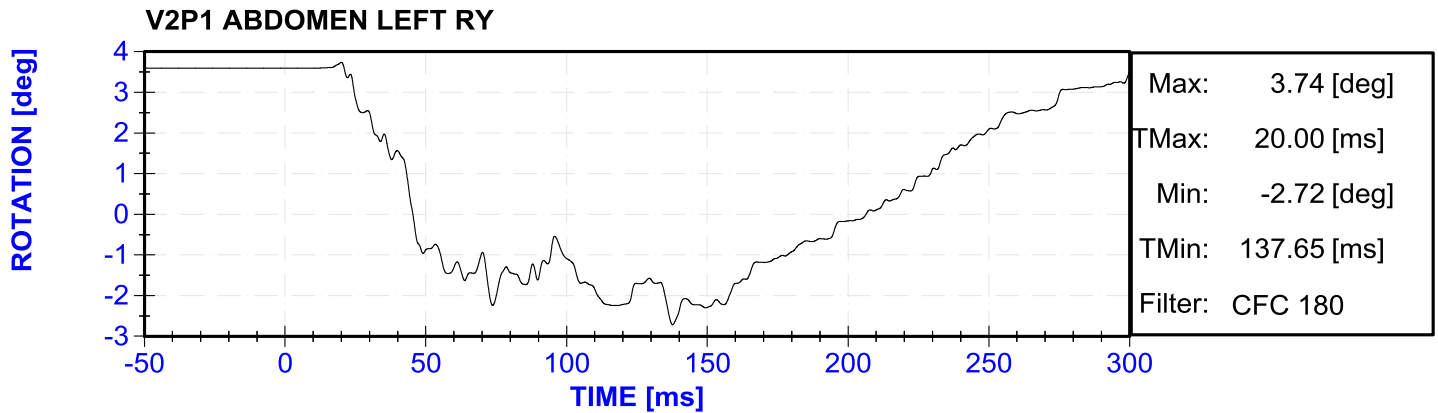


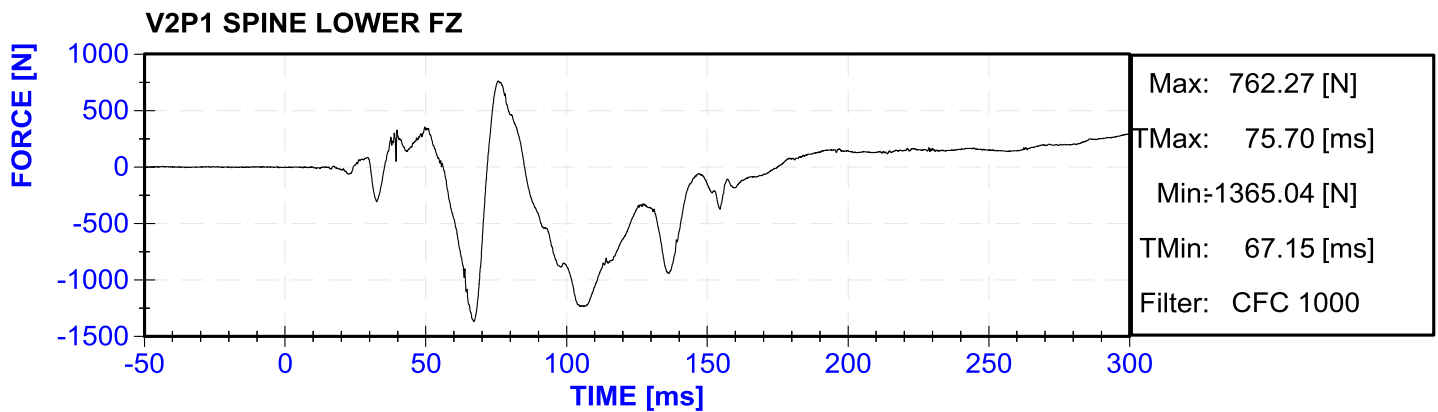
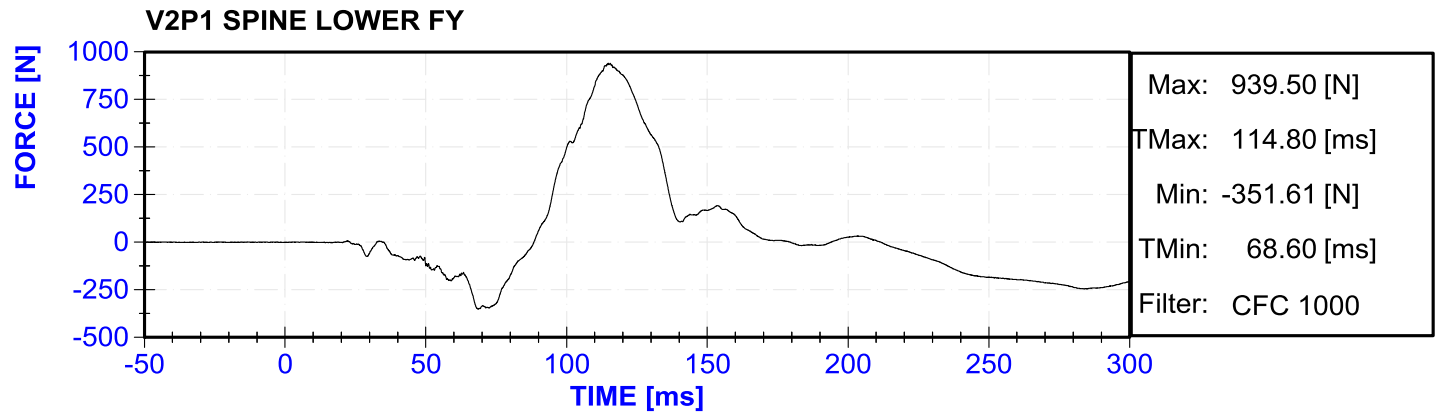
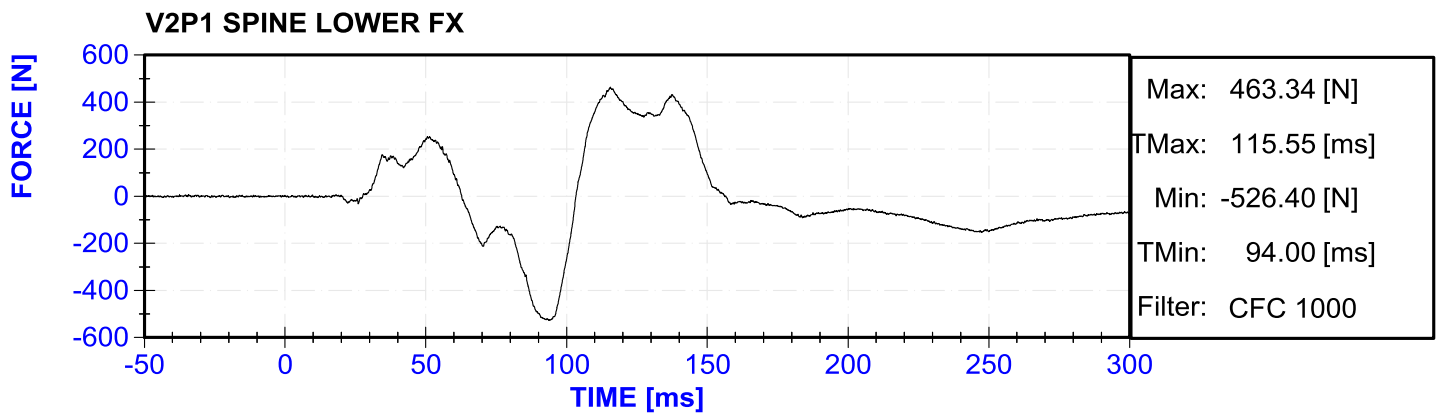
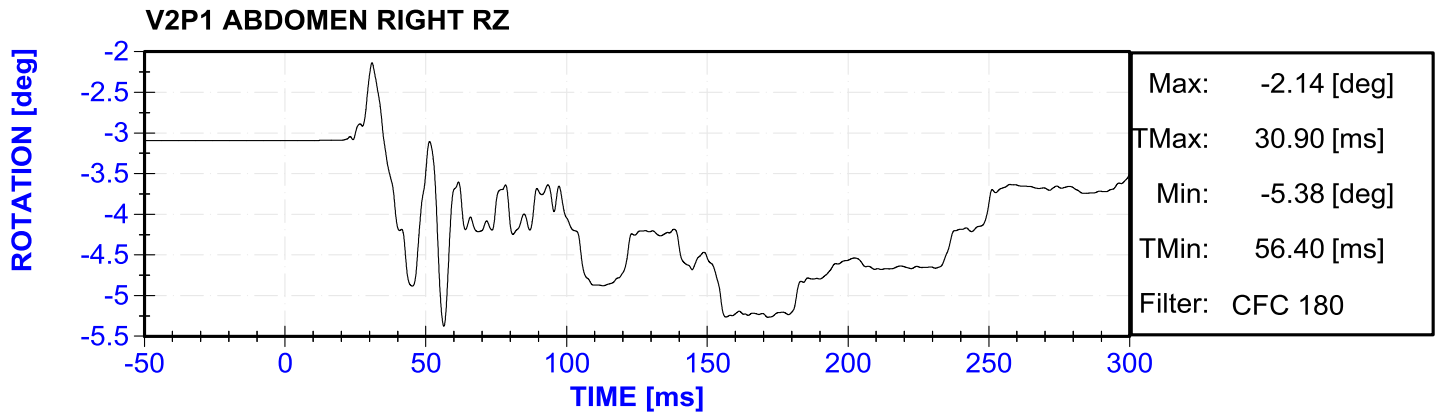
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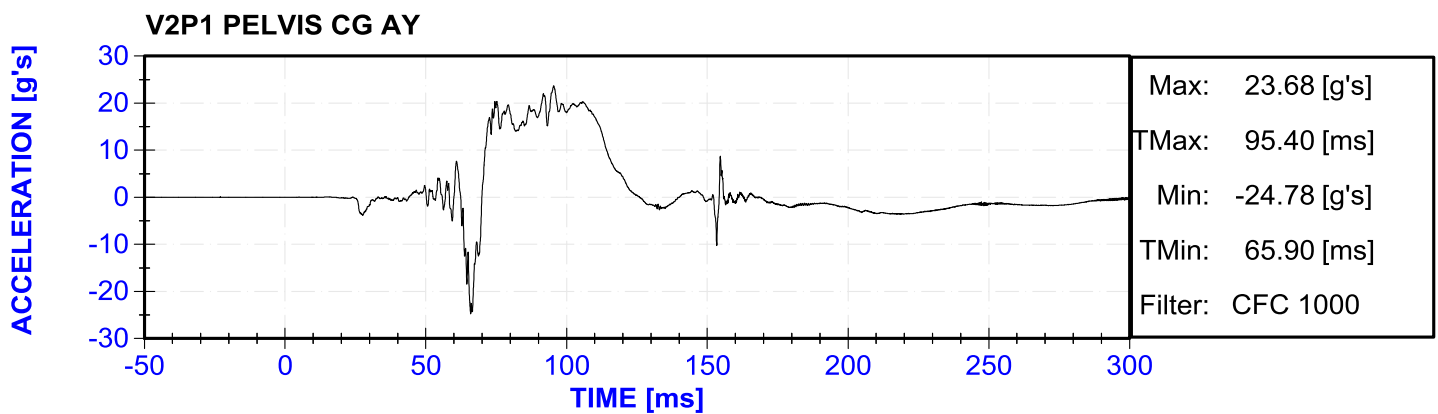
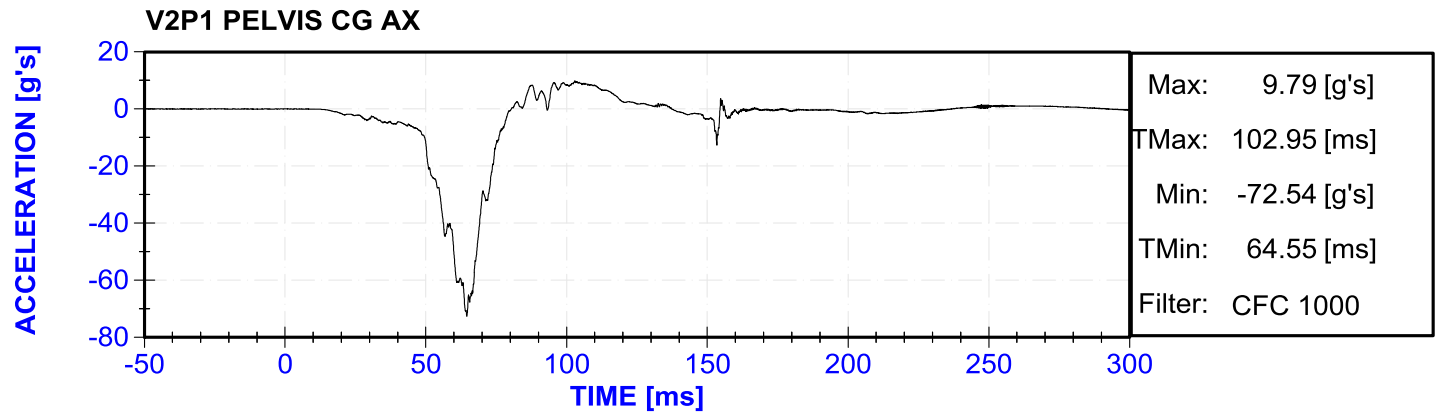
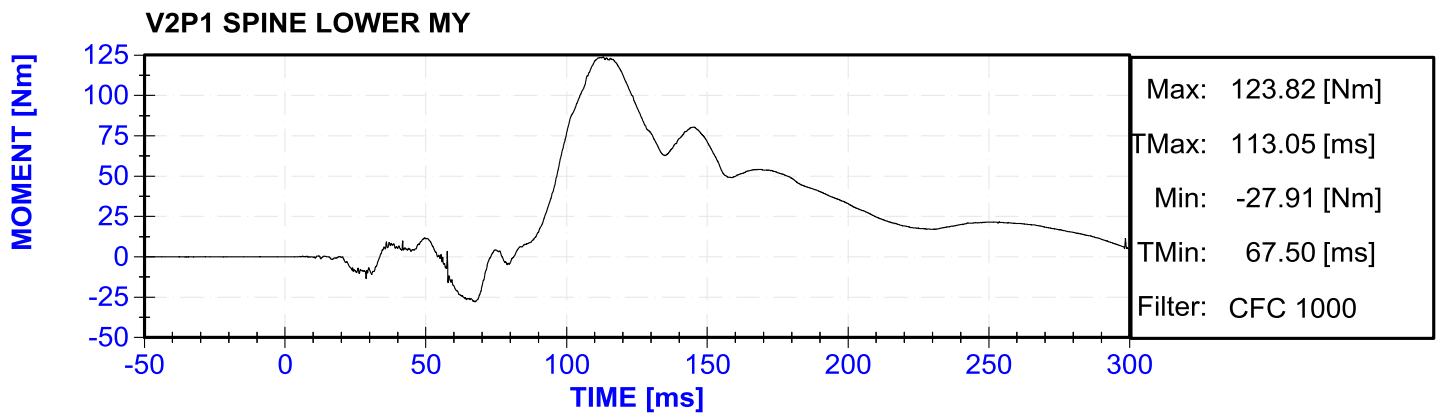
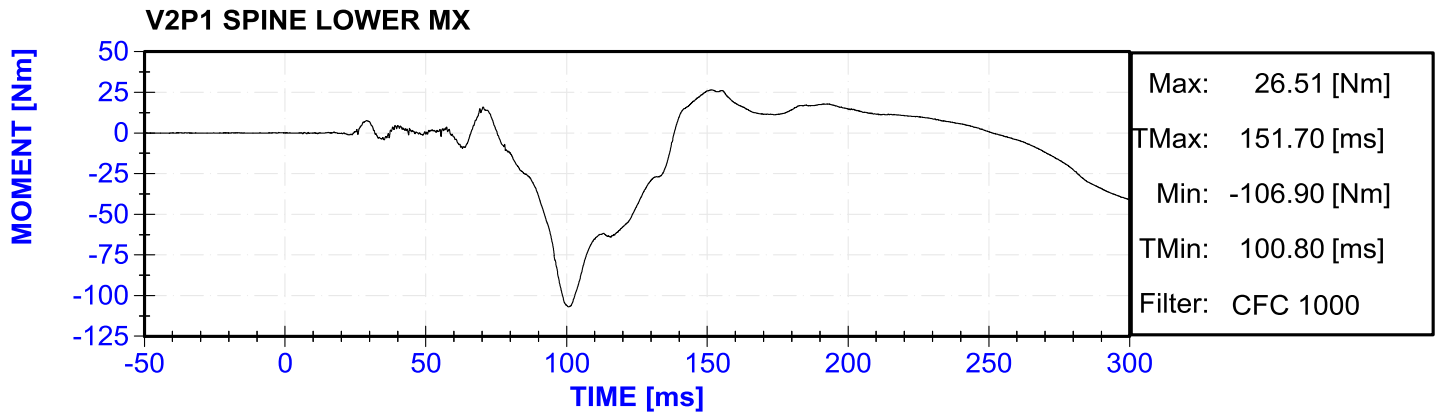


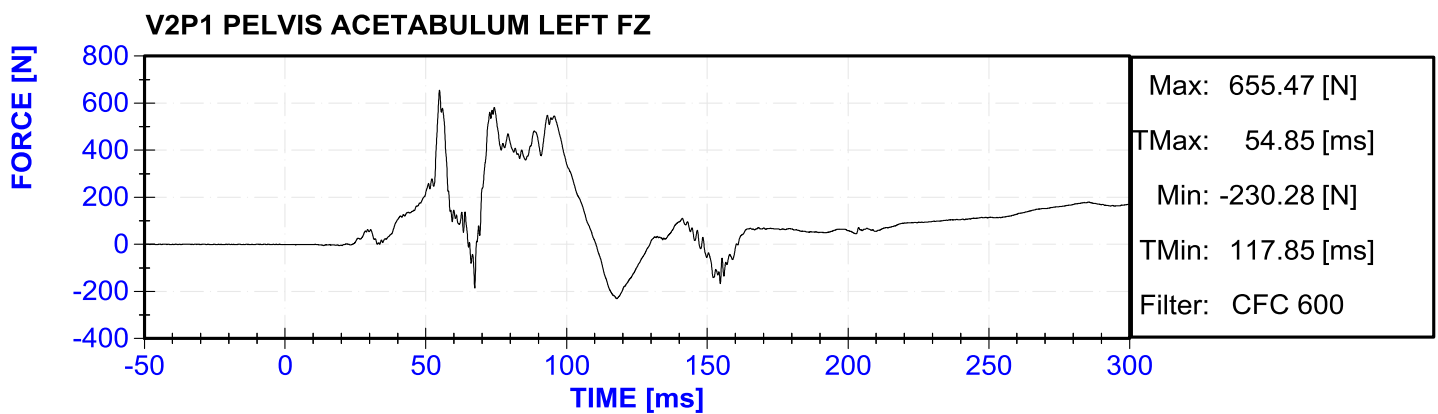
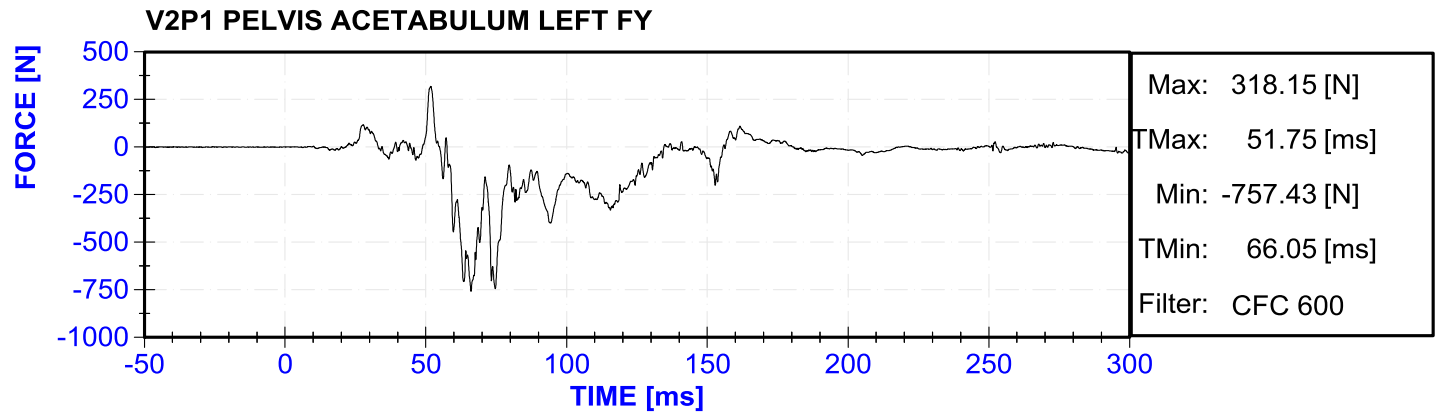
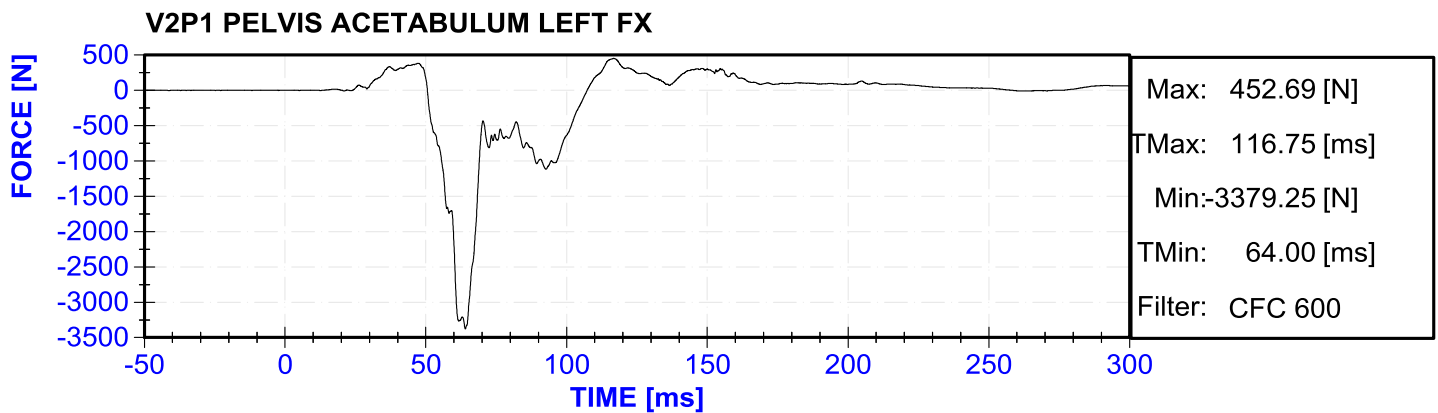
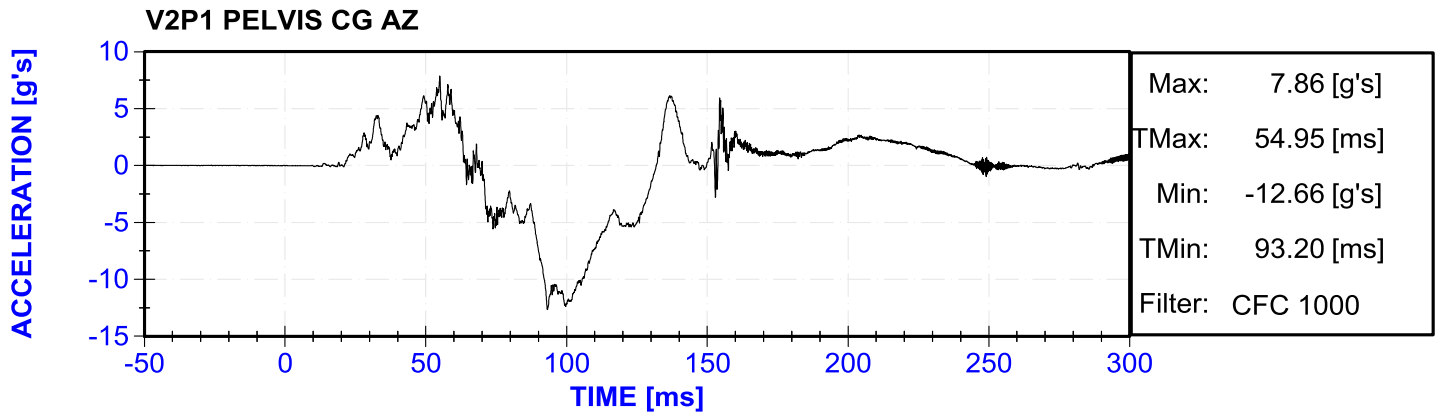
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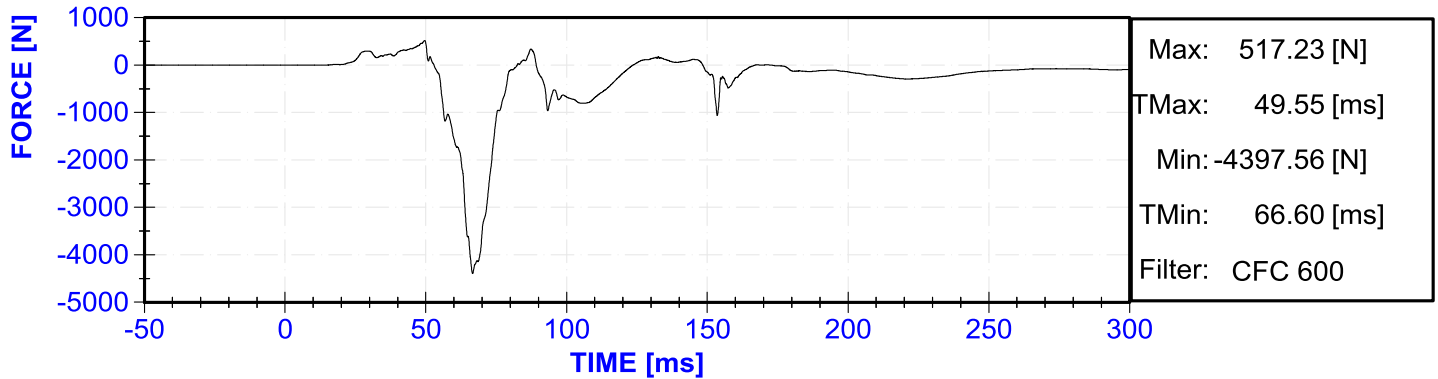




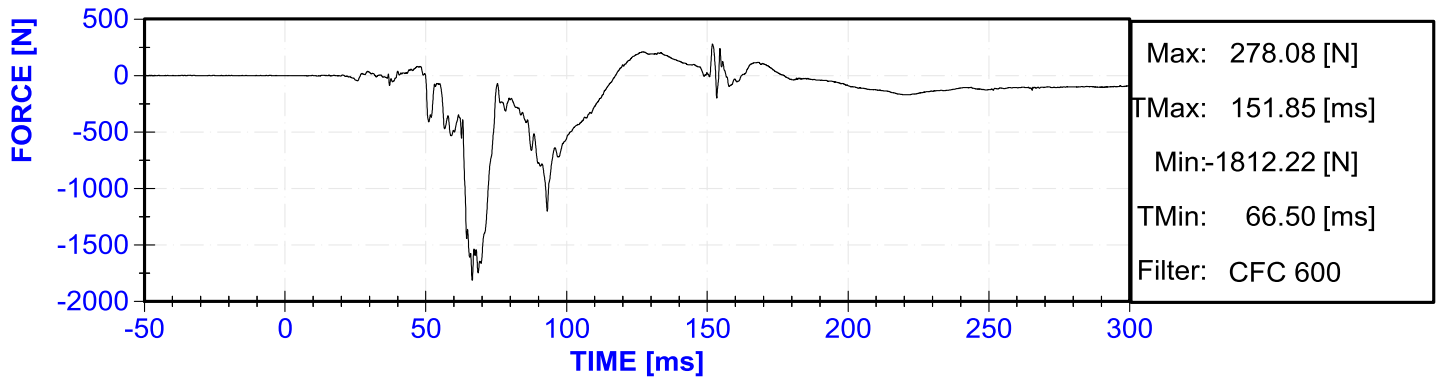




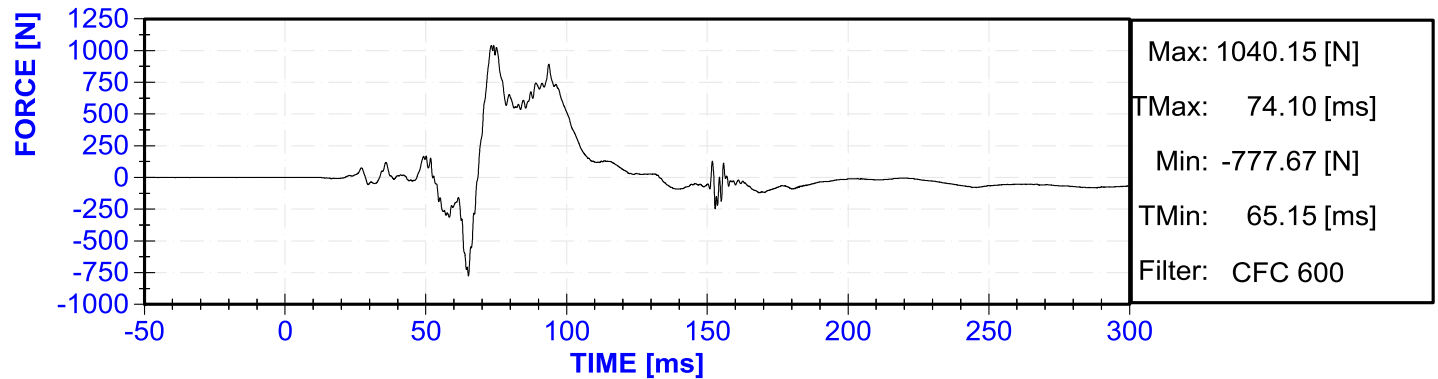
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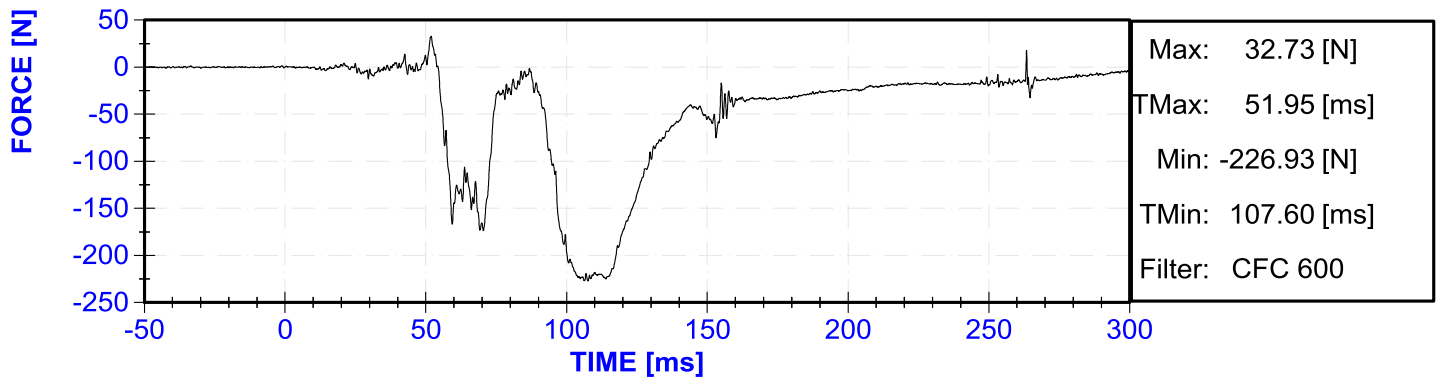
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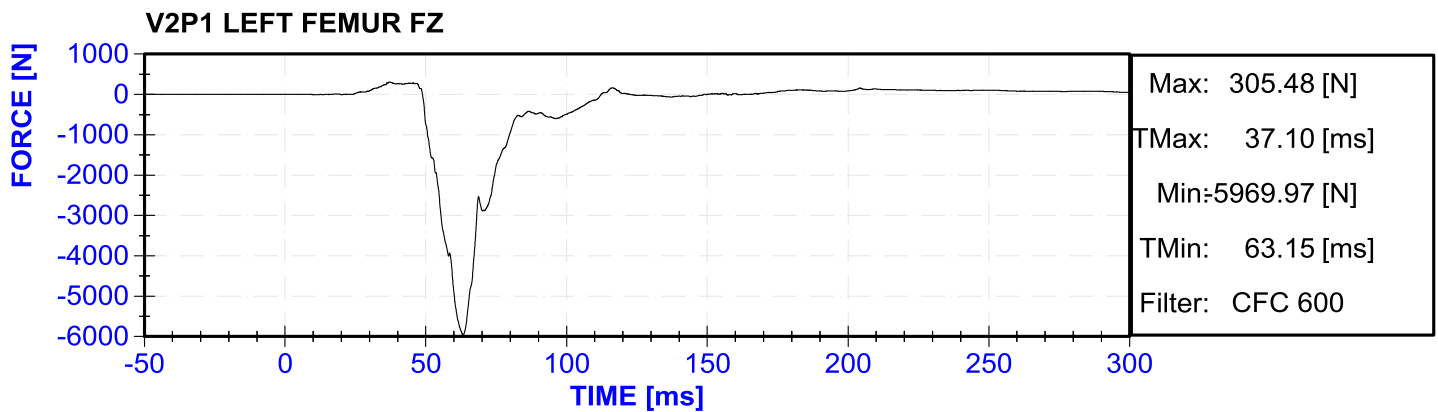
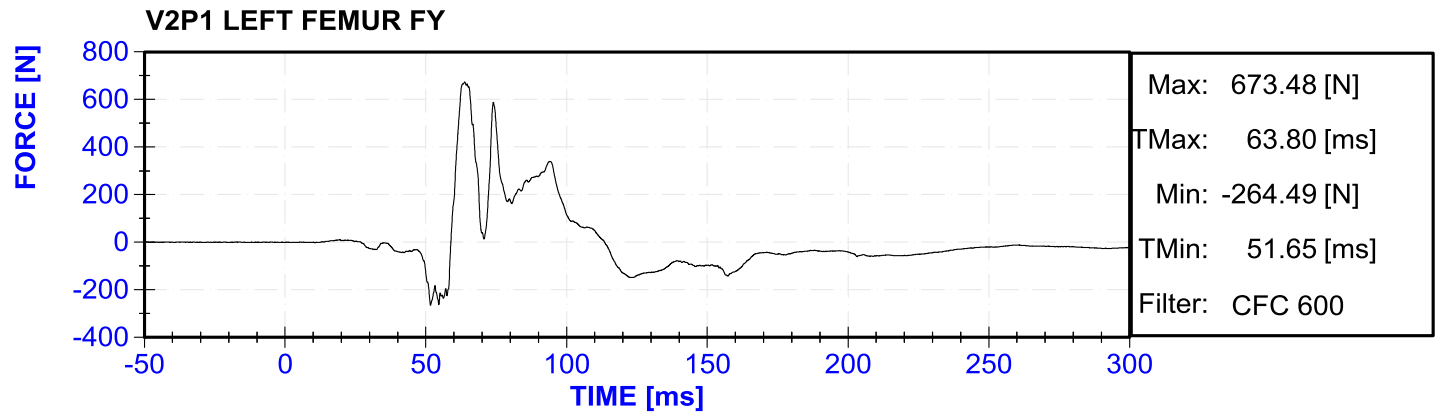
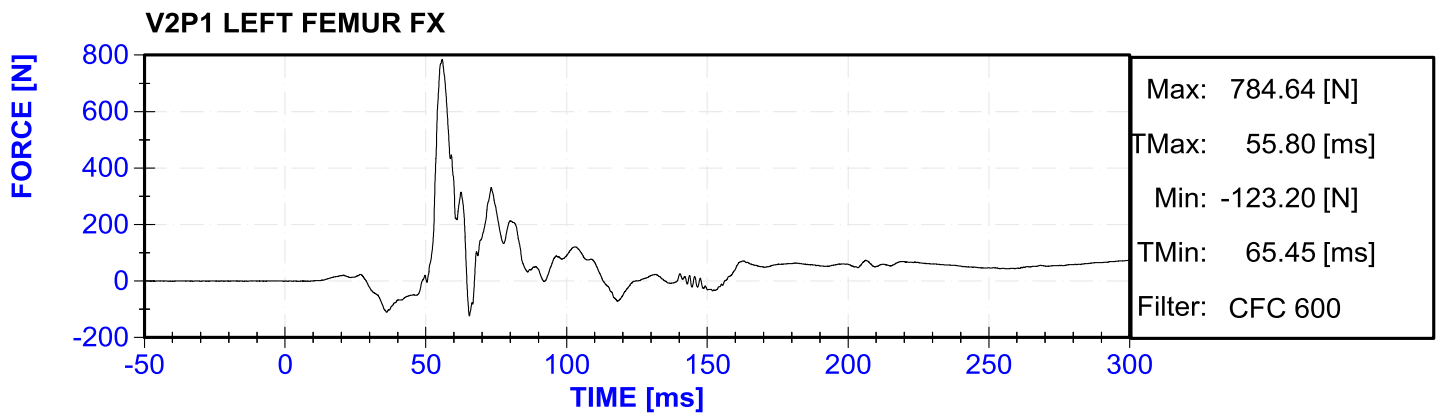
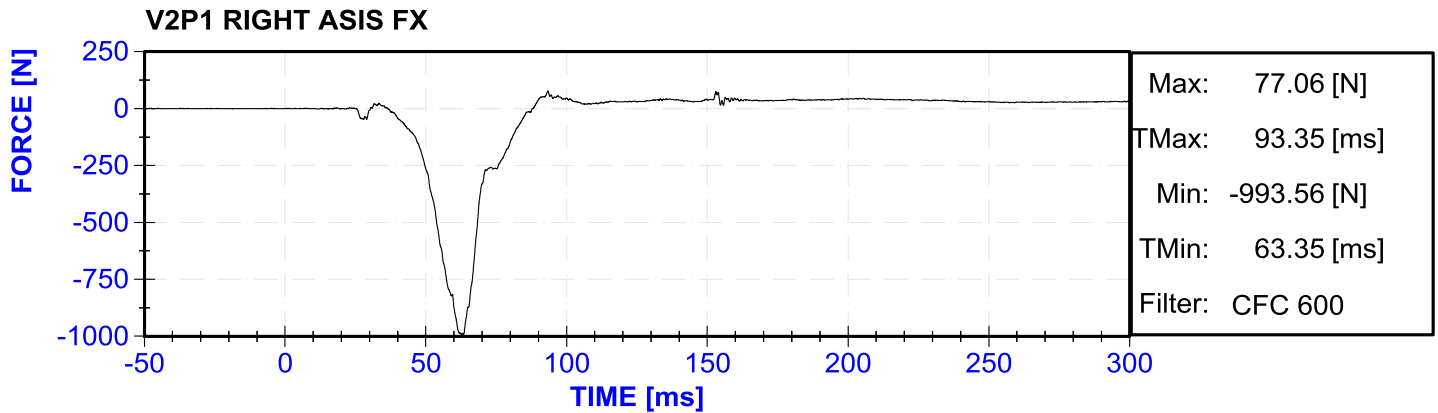


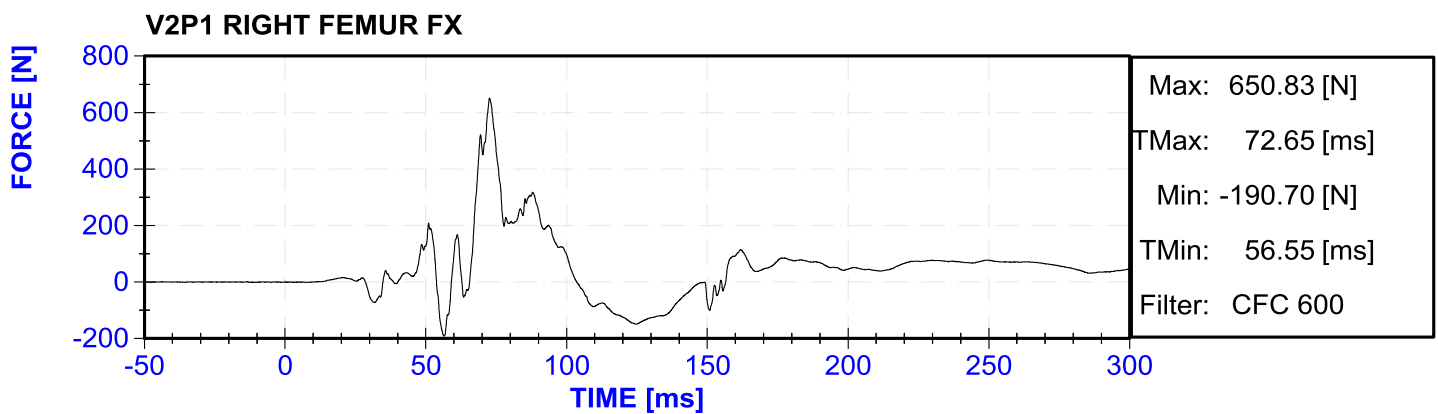
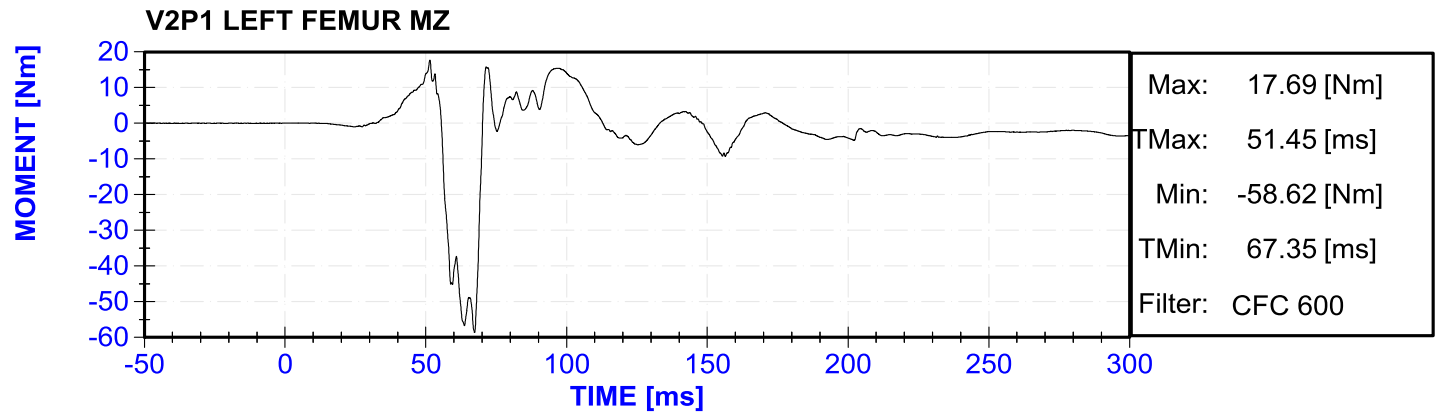
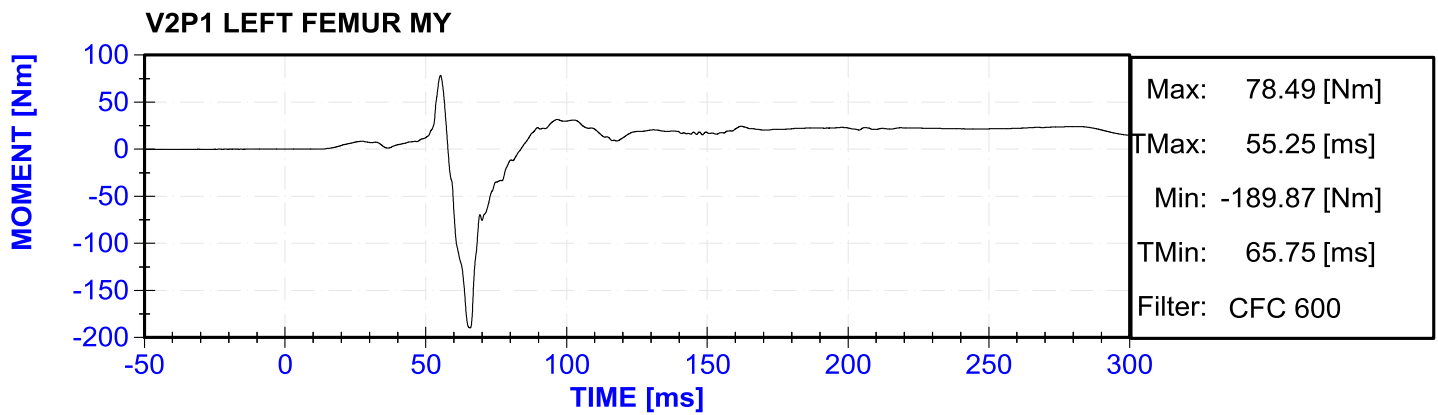
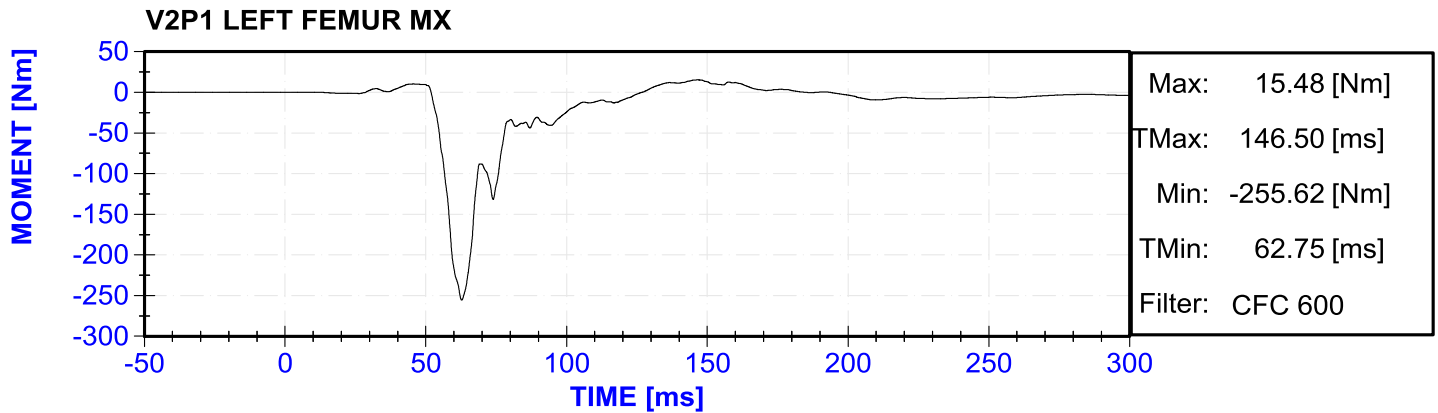
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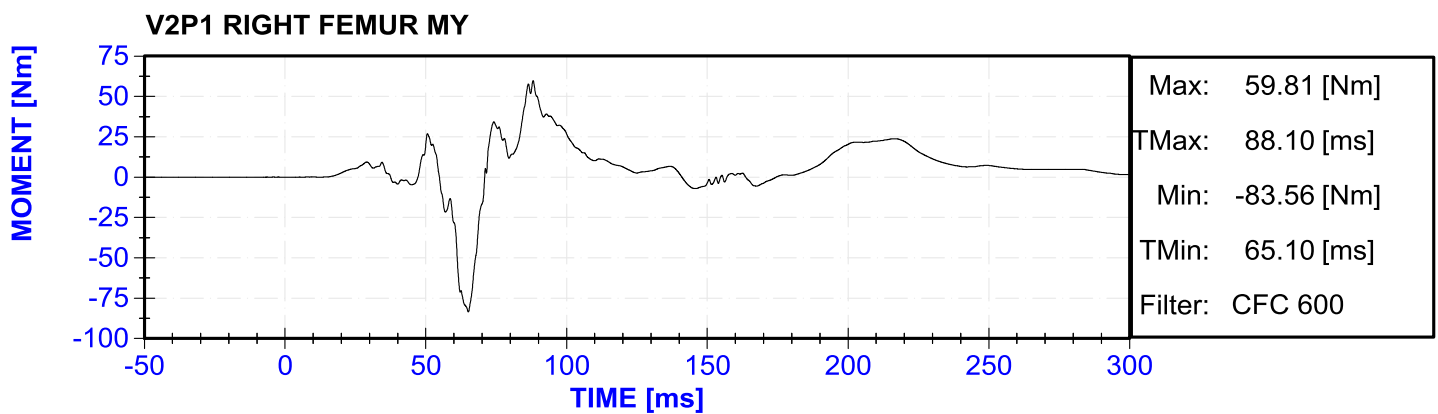
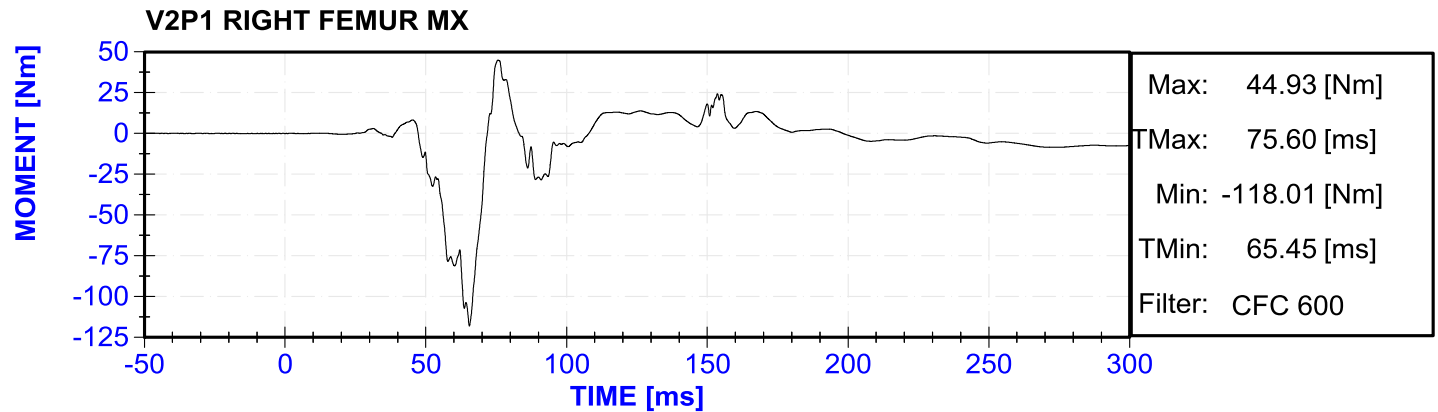
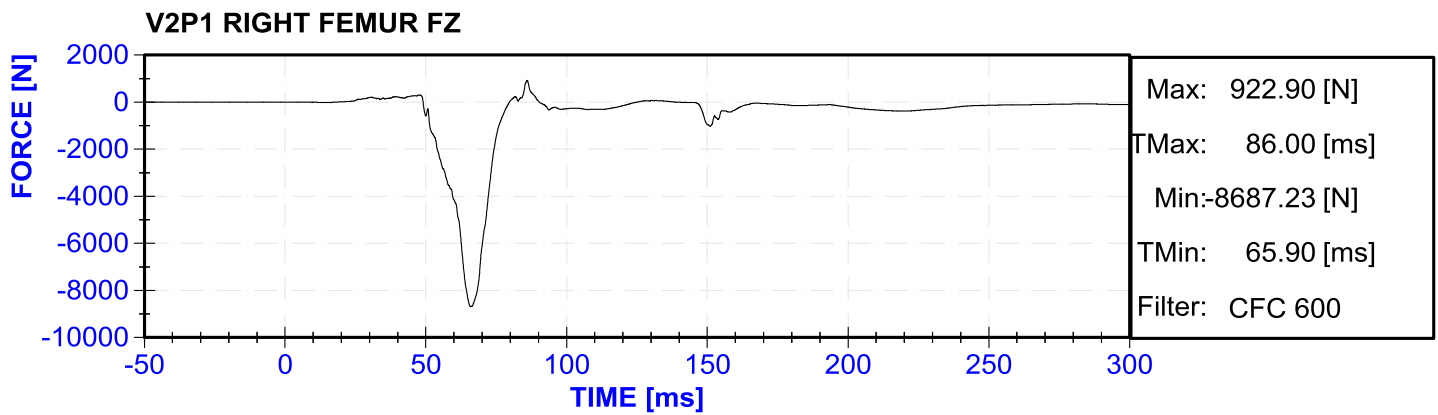
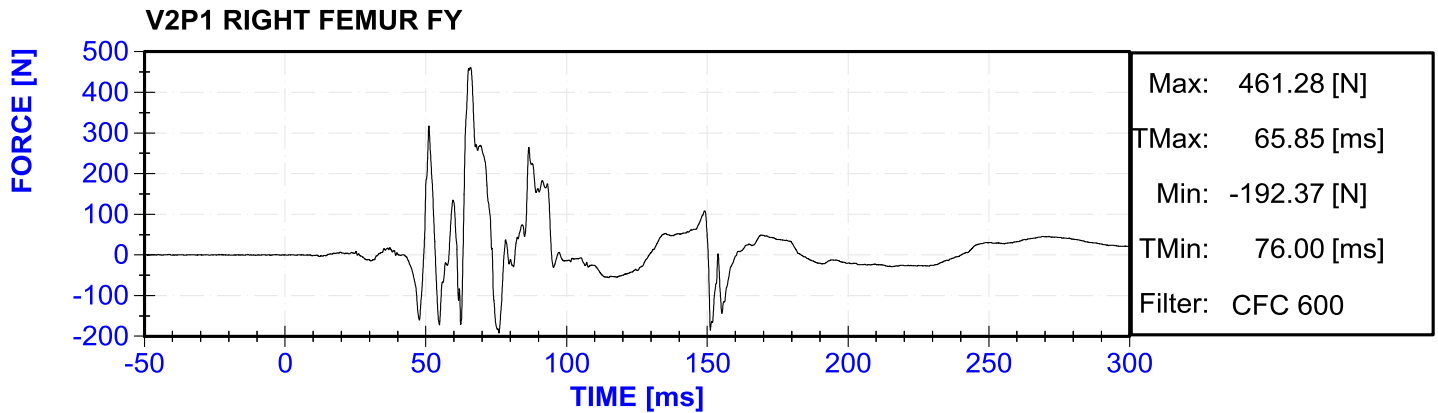


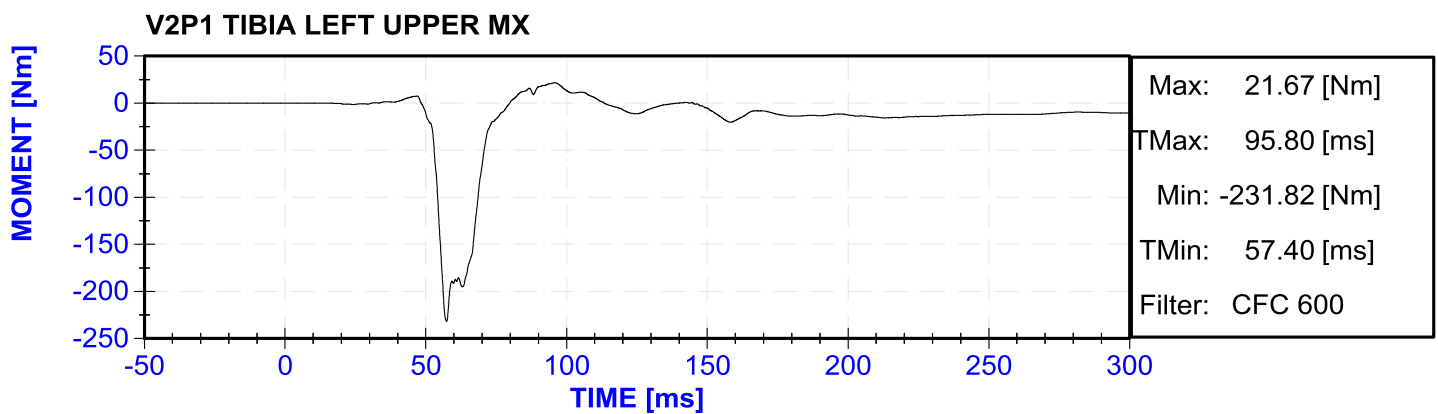
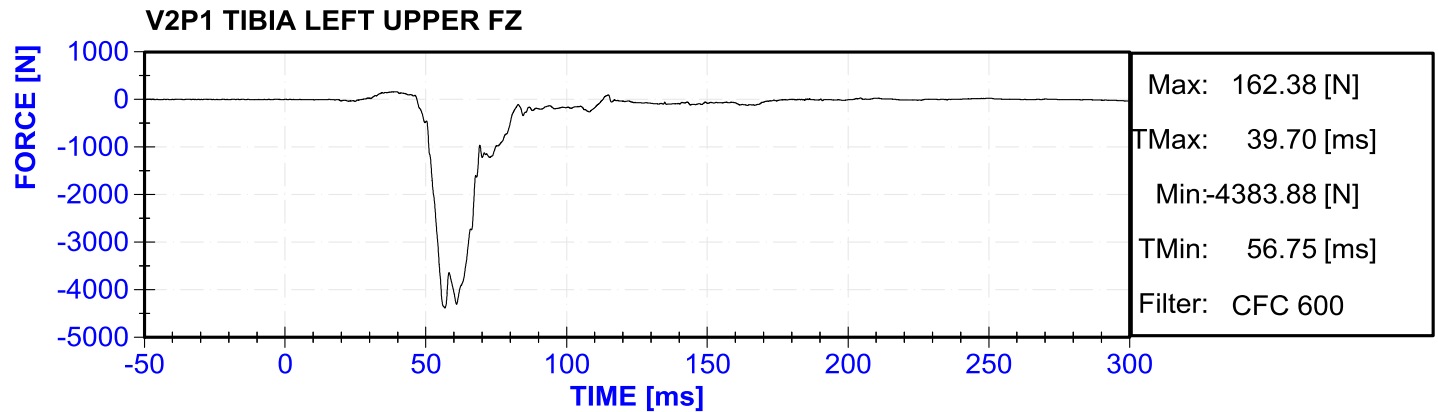
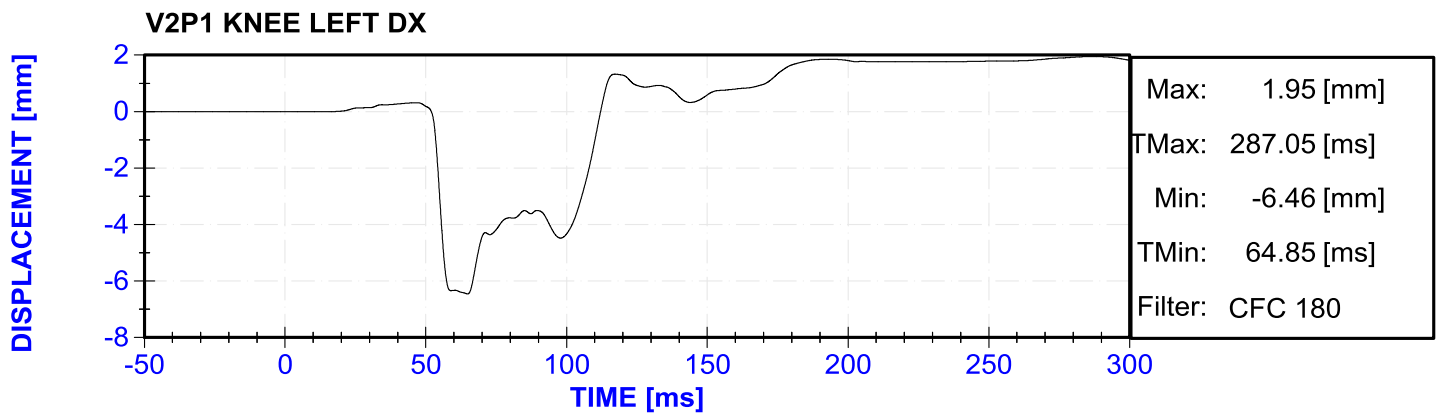
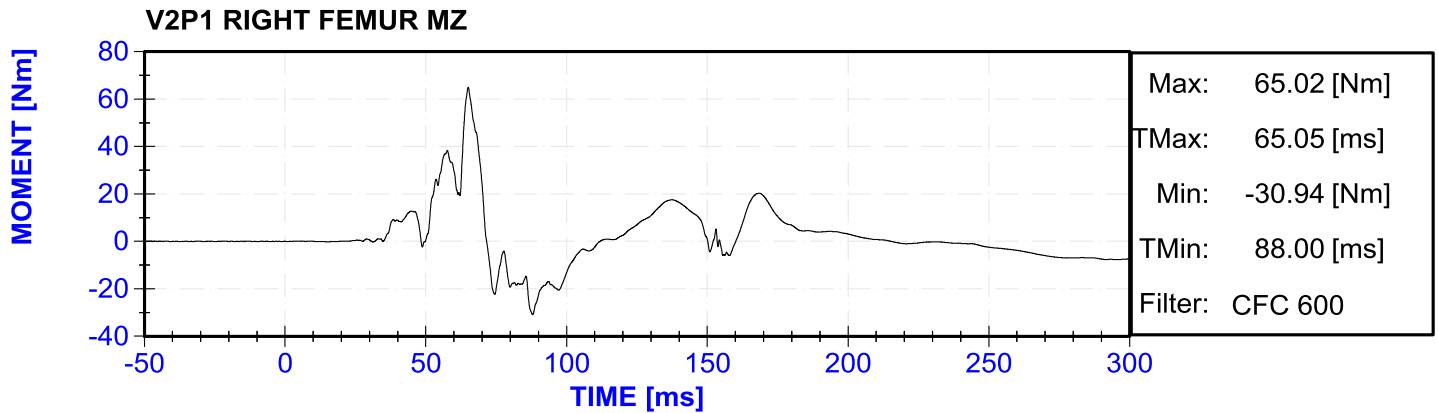
V2P1 LEFT ASIS FX

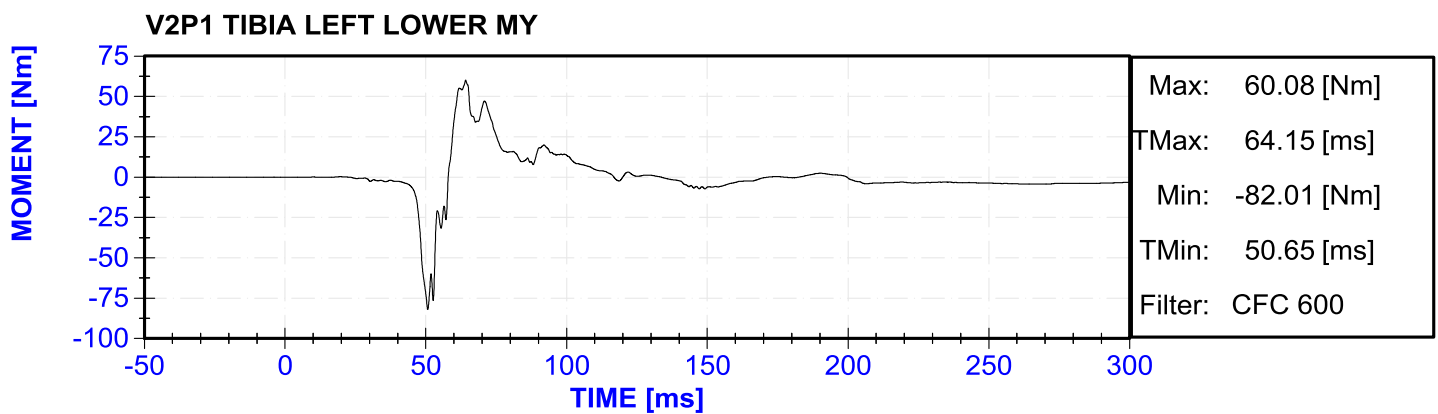
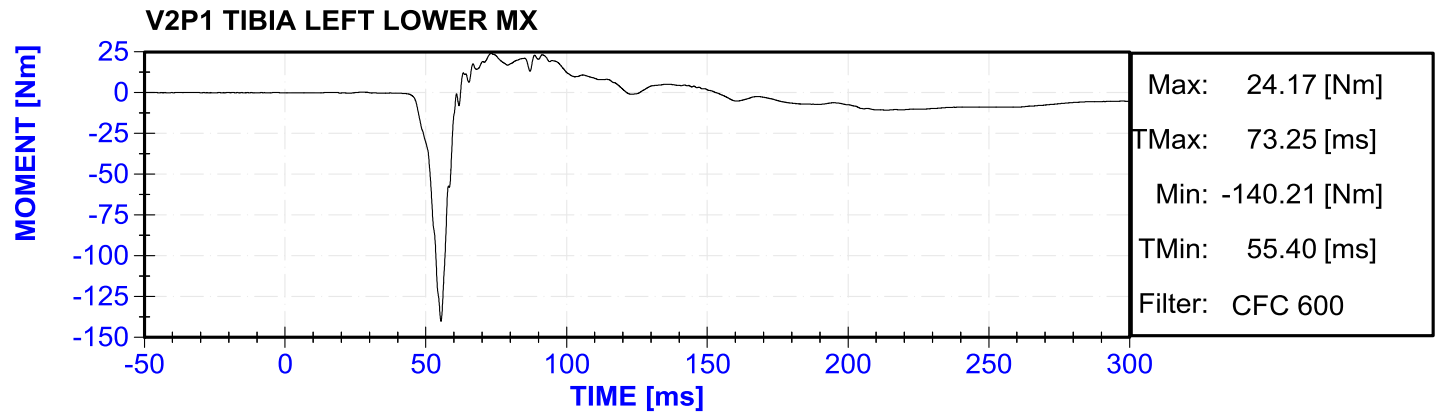
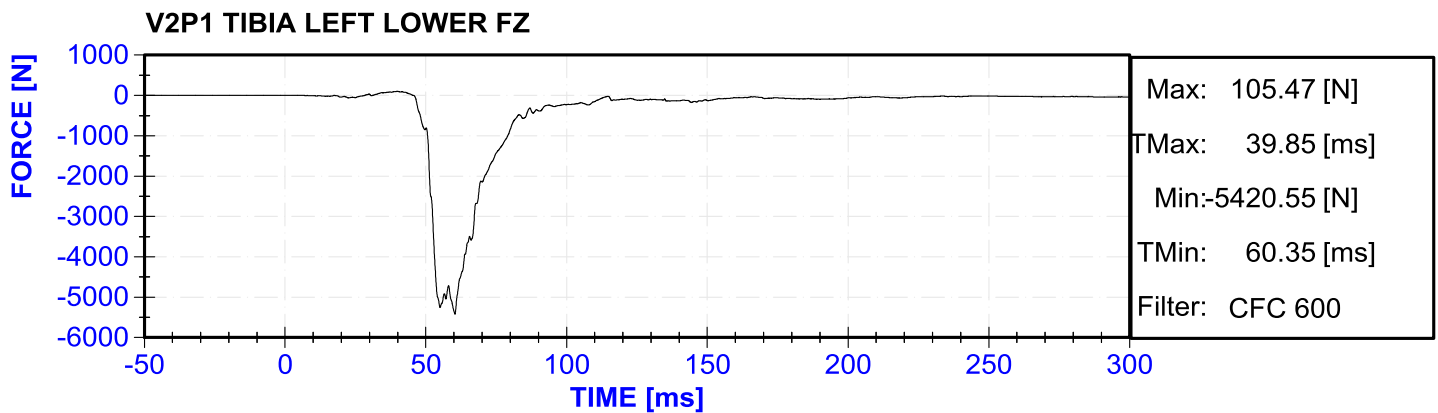
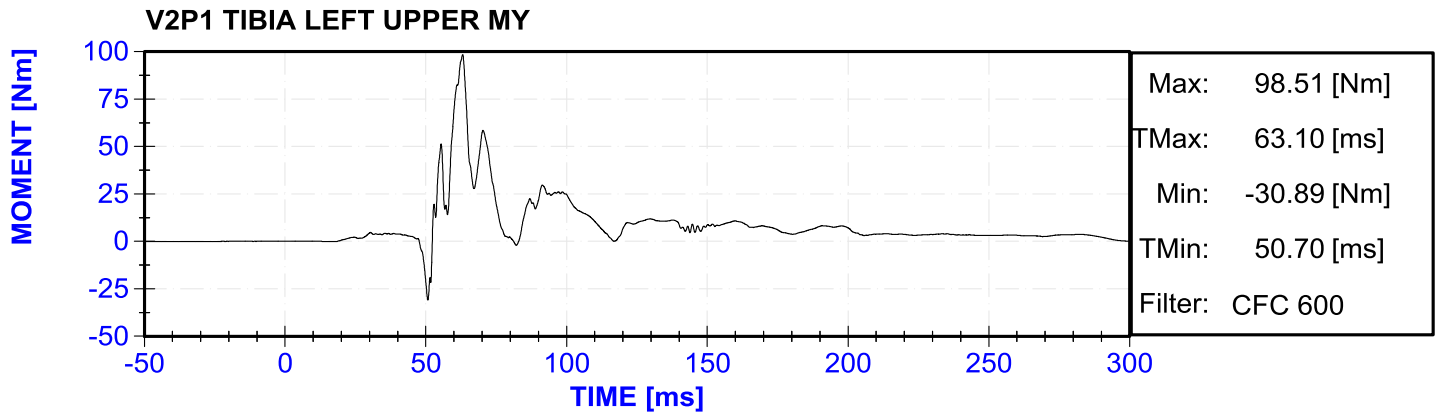


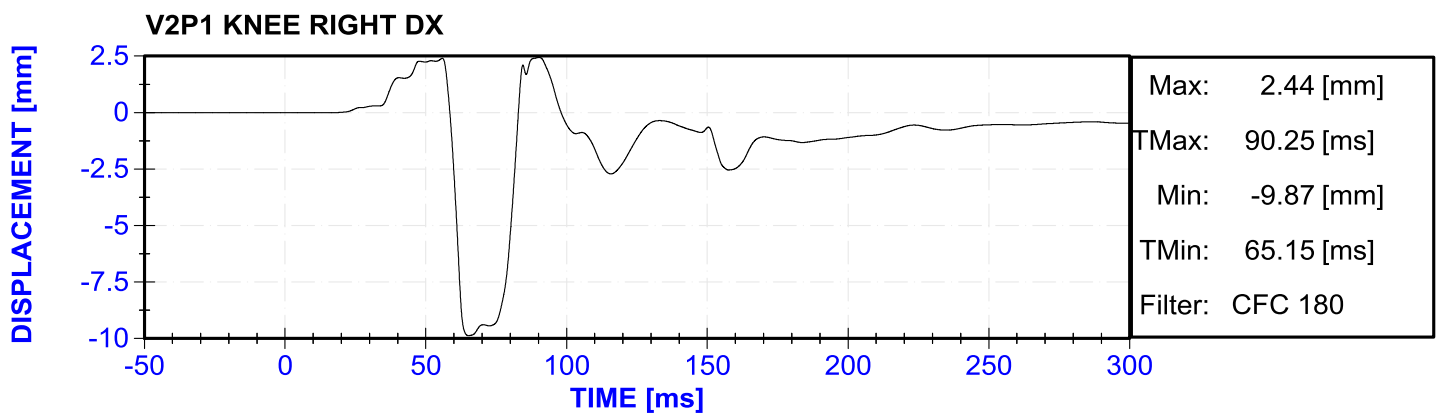
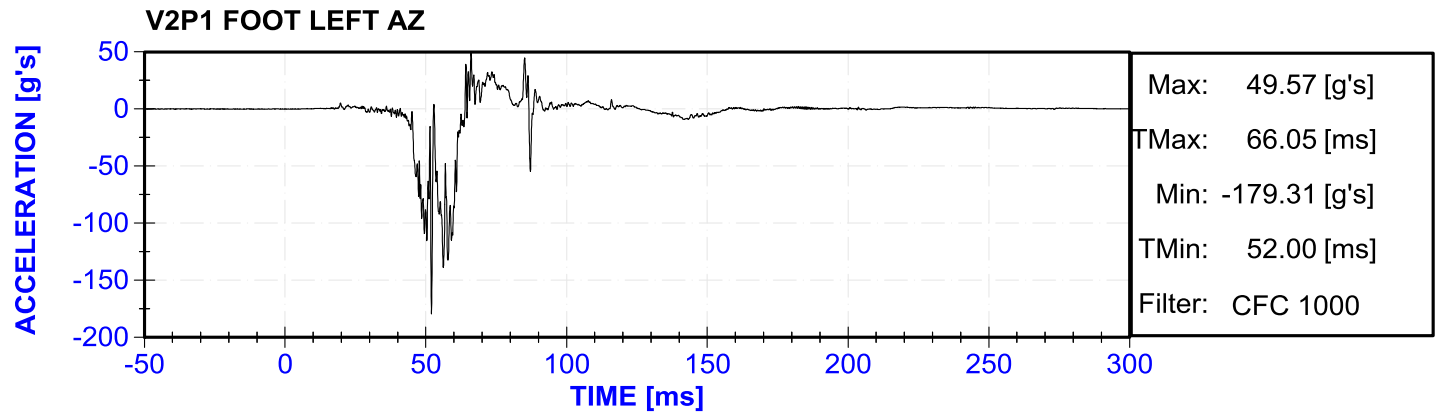
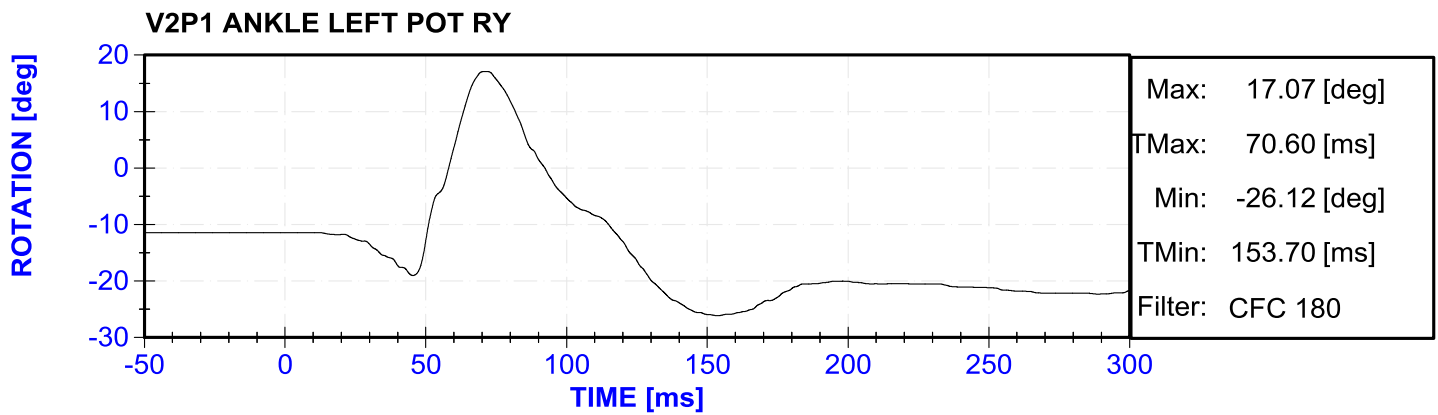
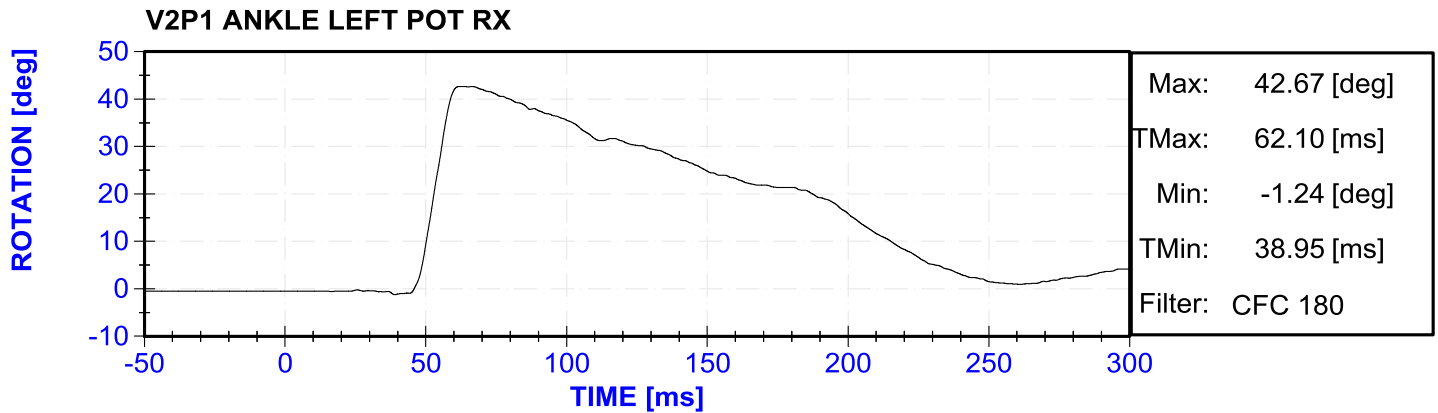


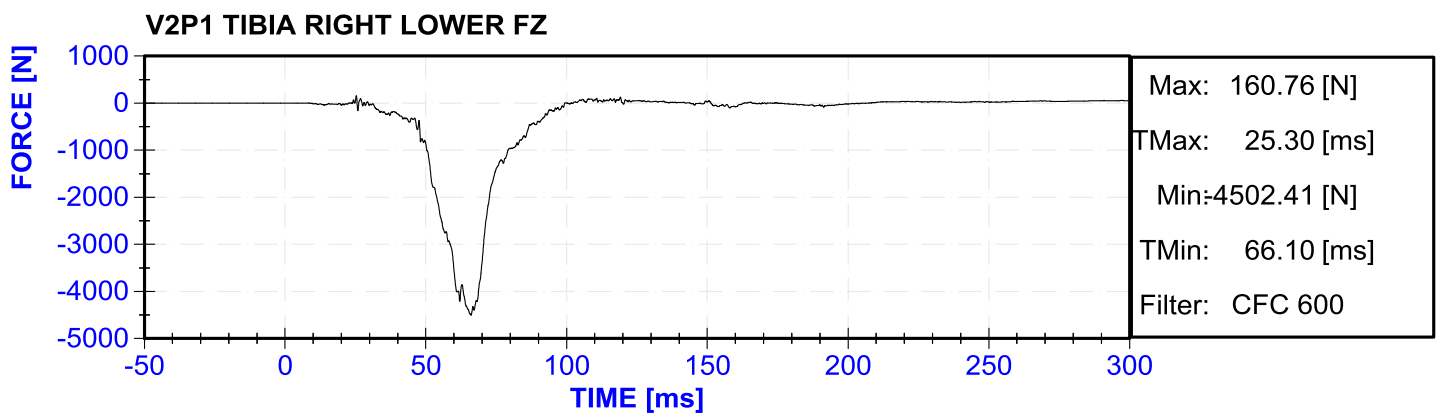
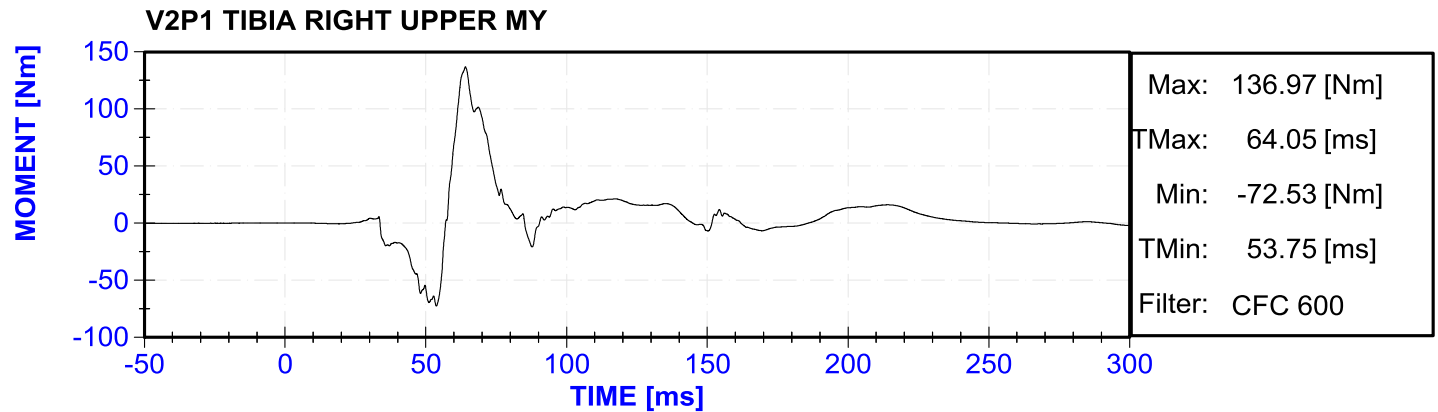
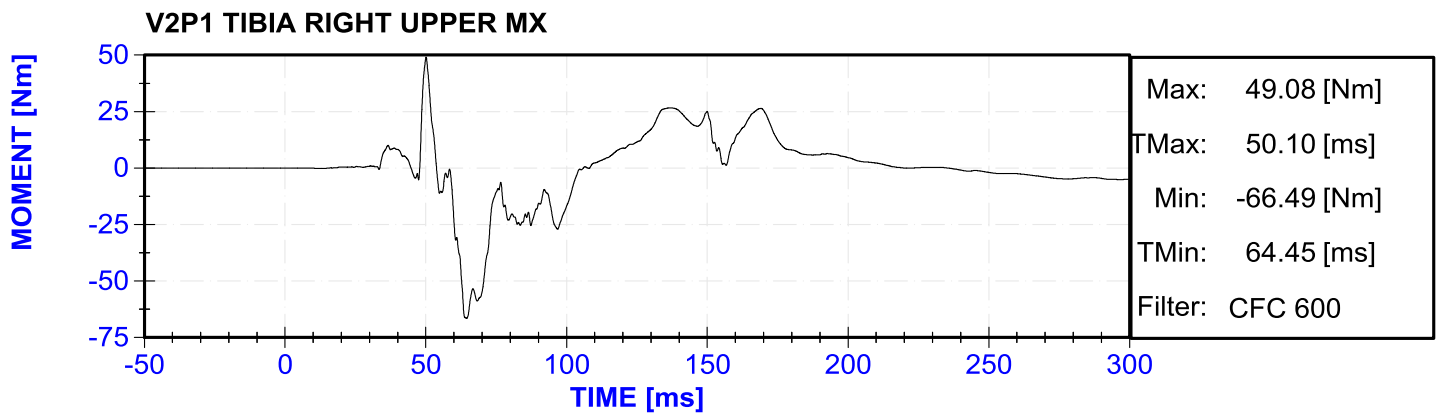
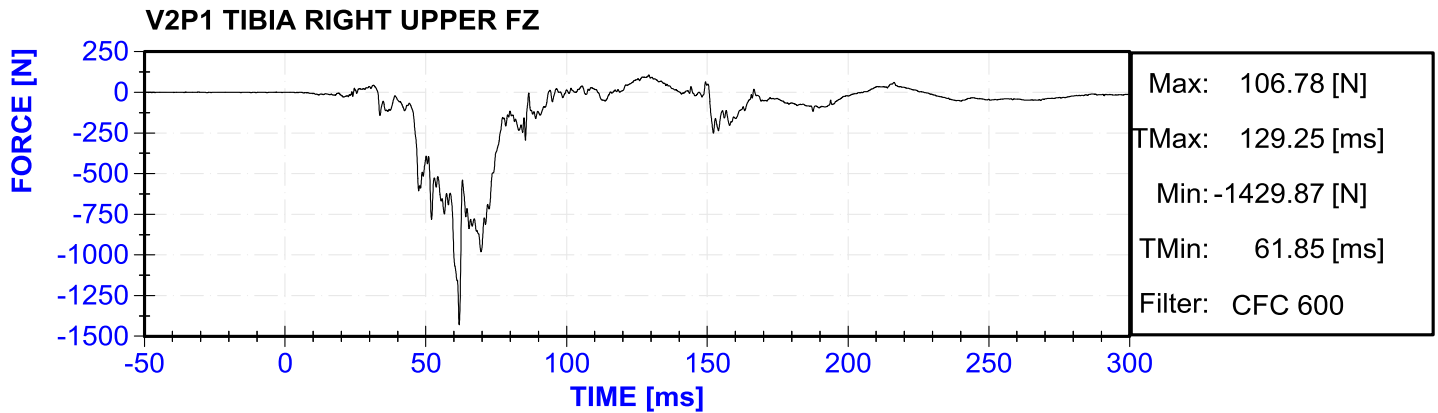


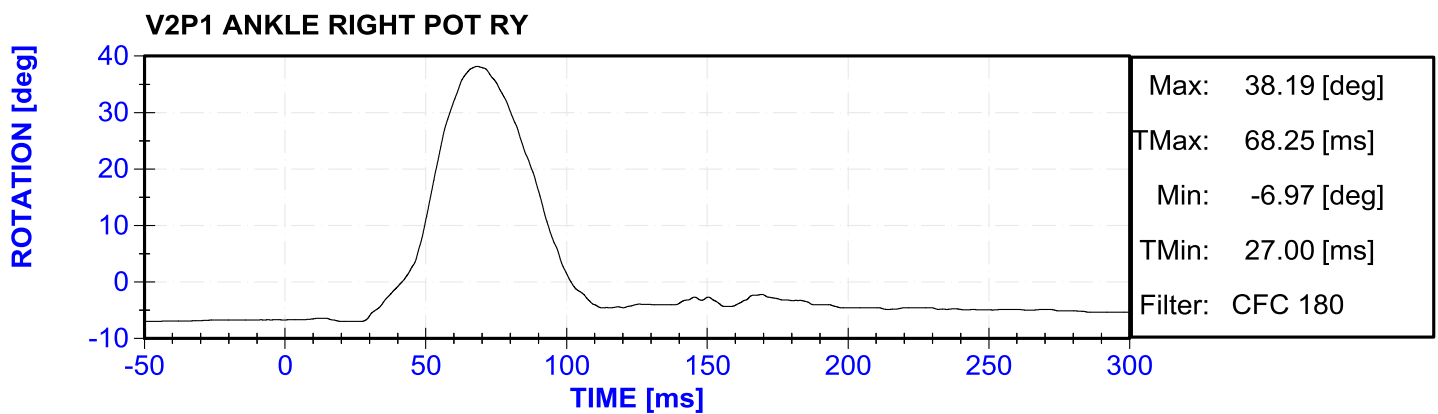
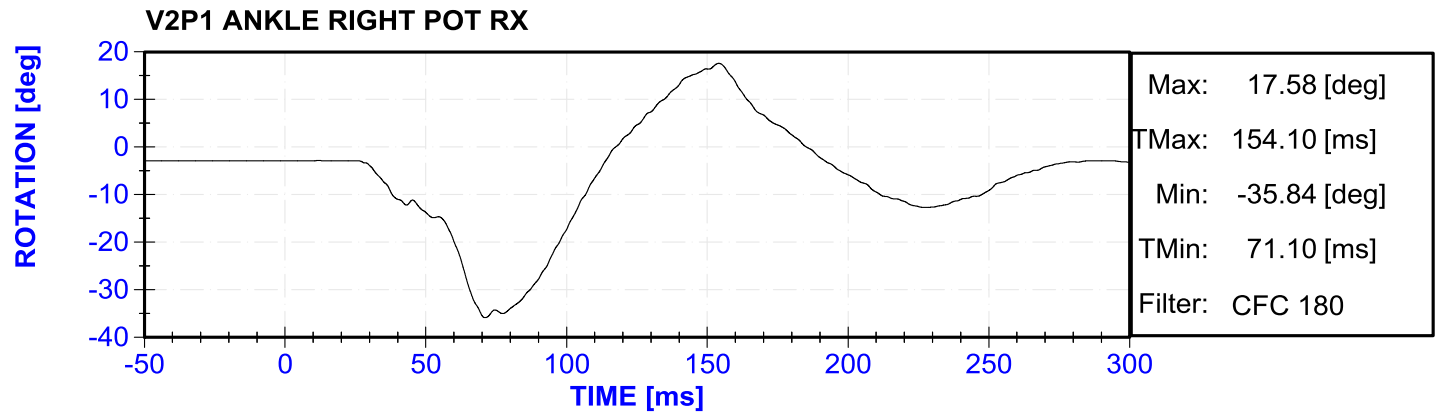
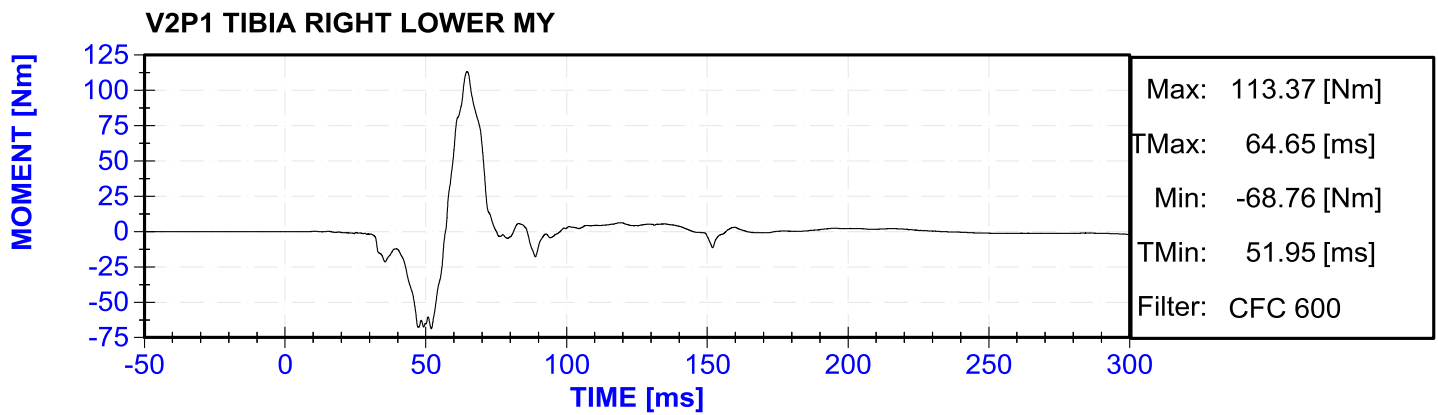
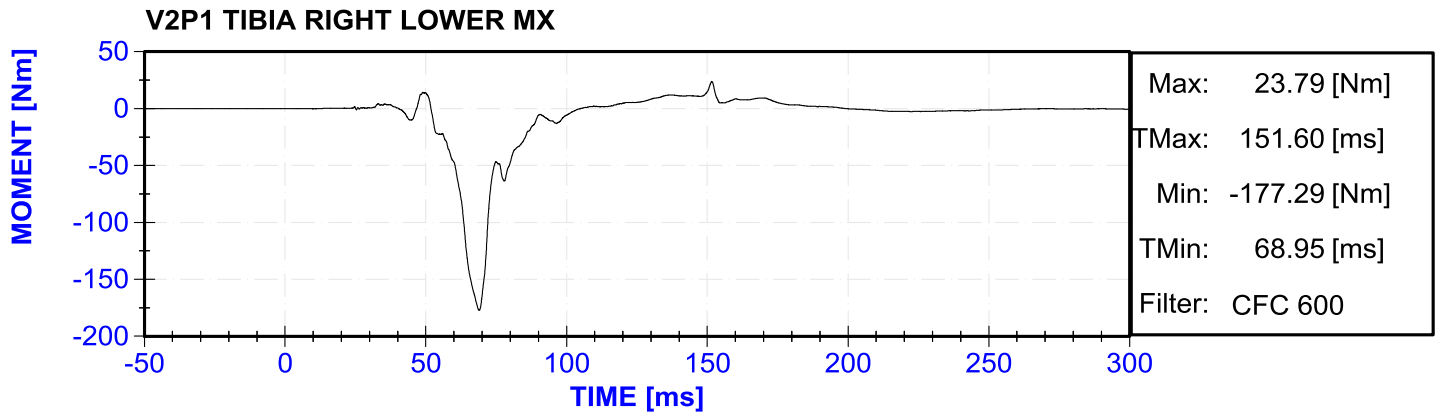


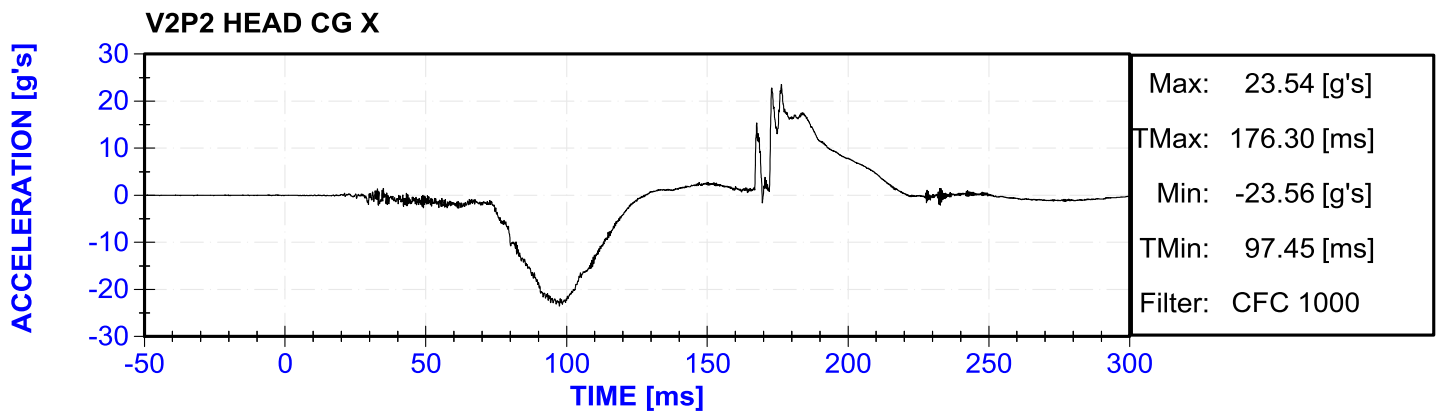
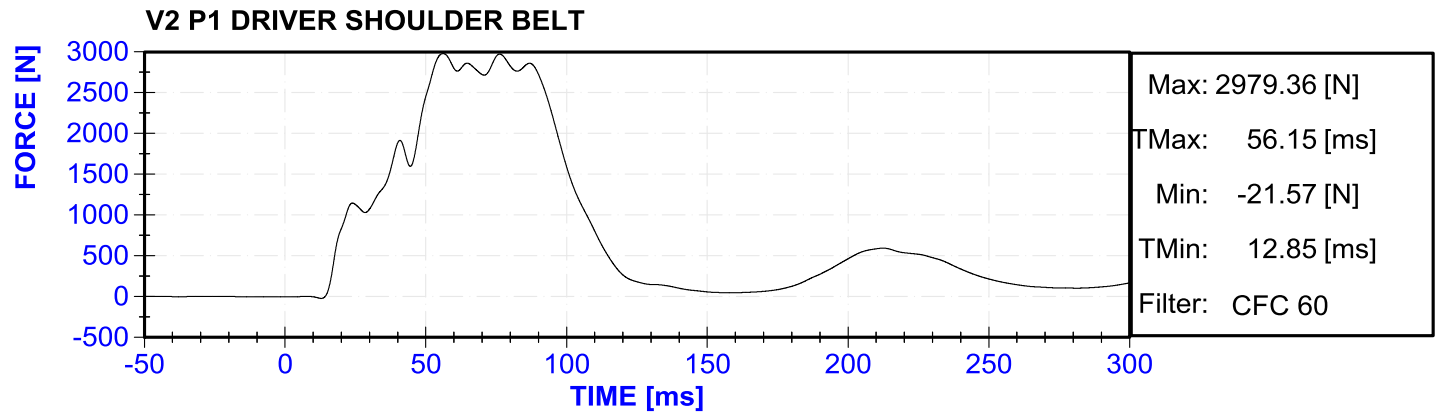
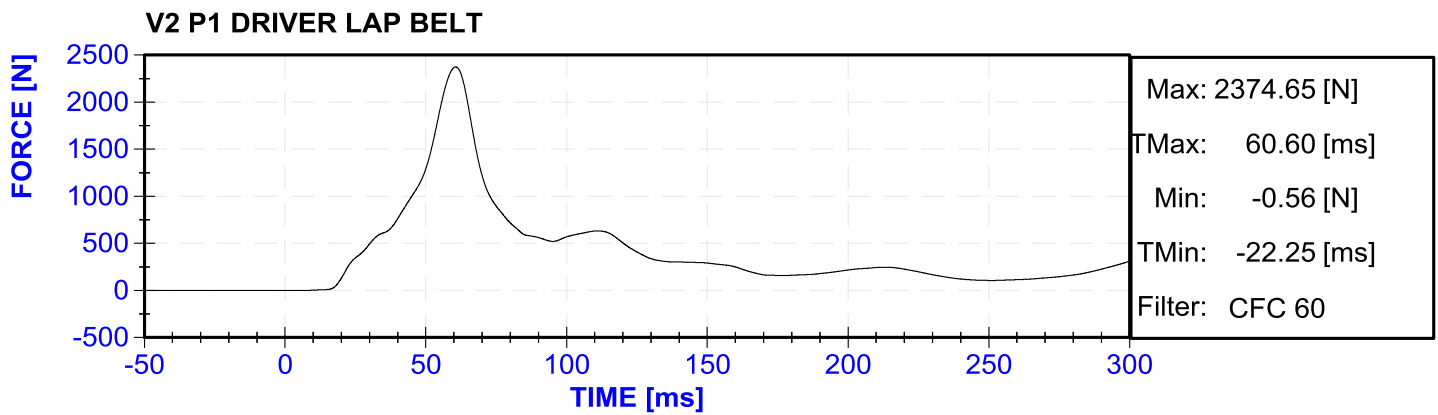
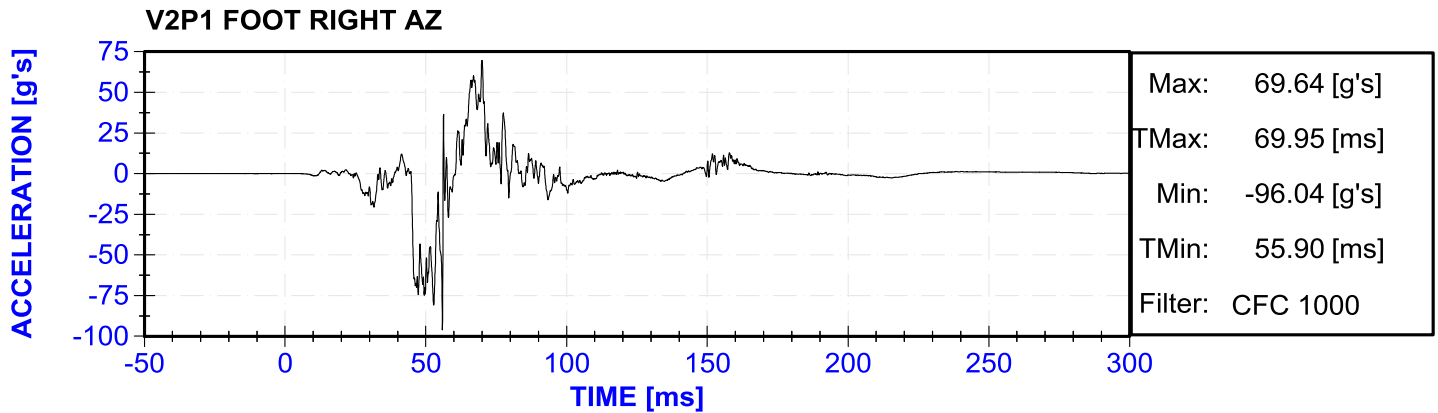


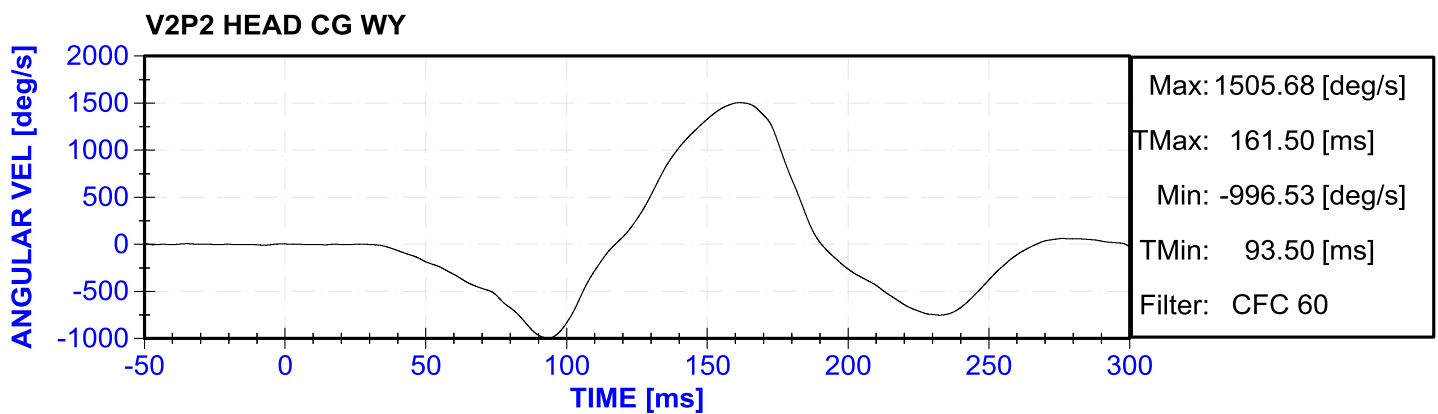
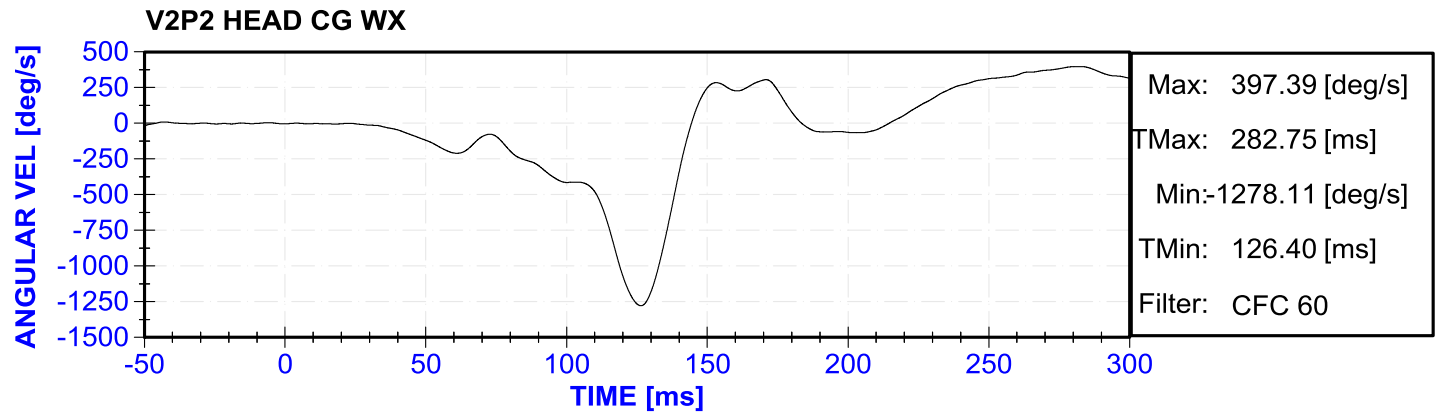
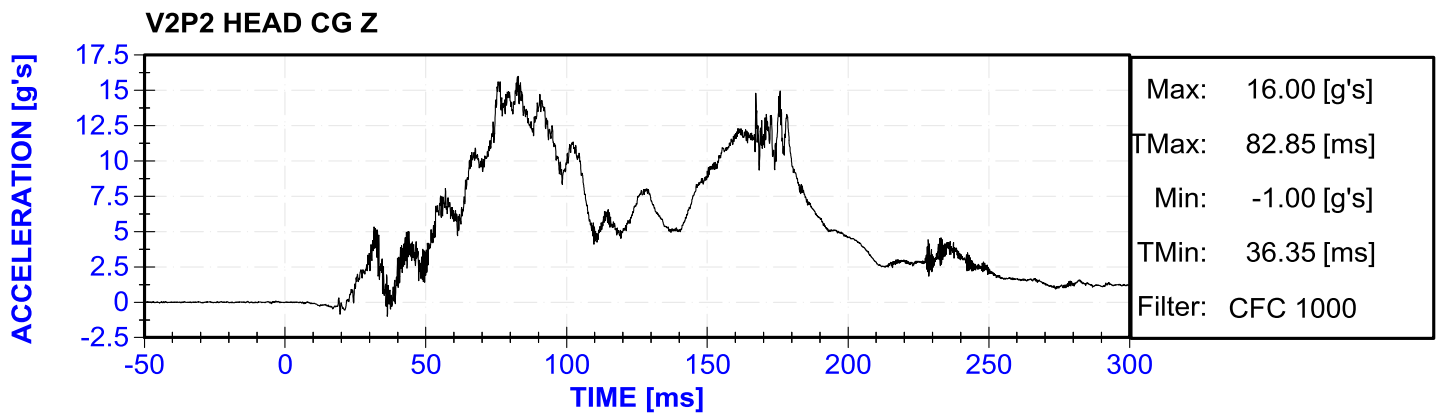
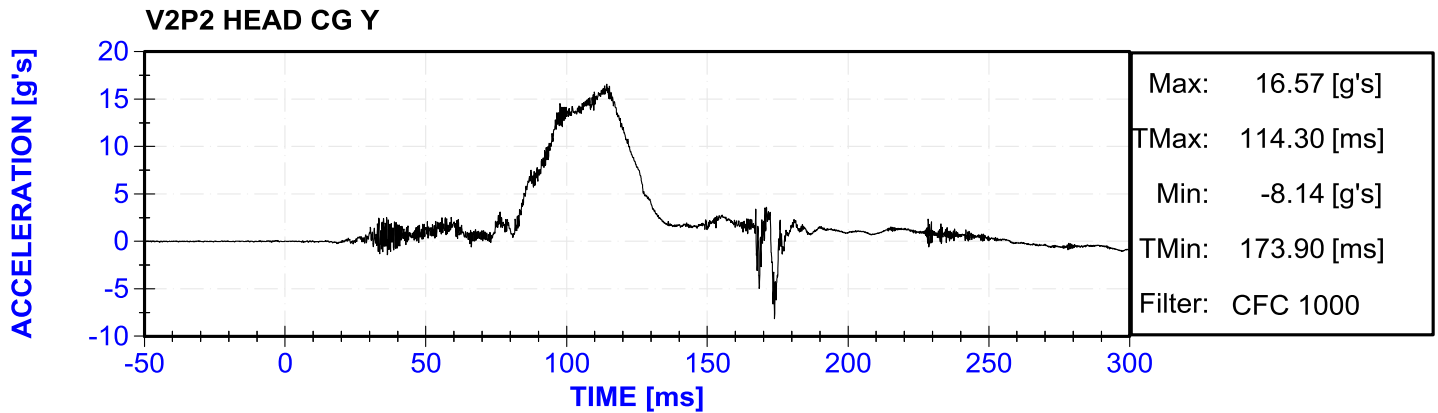


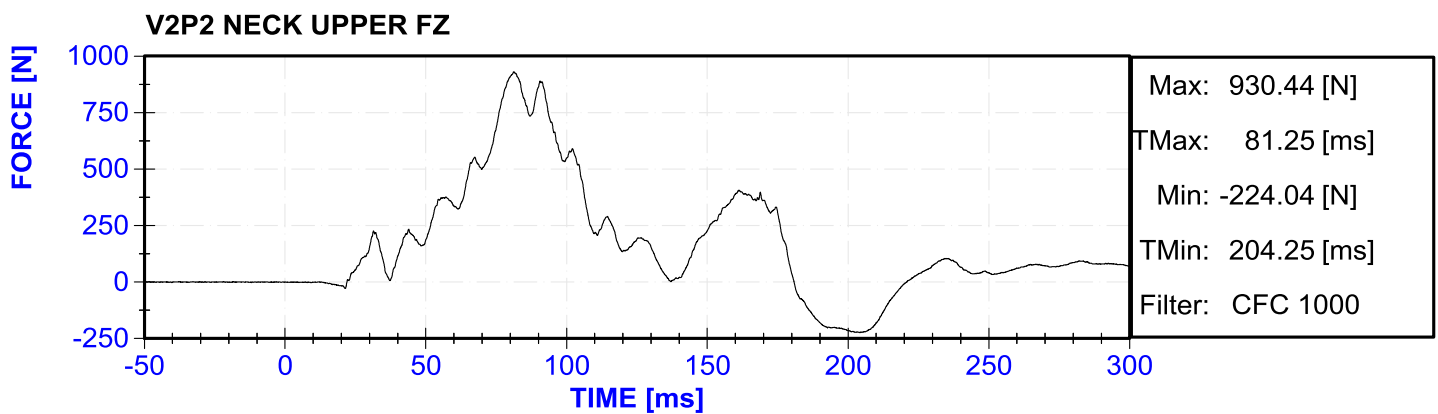
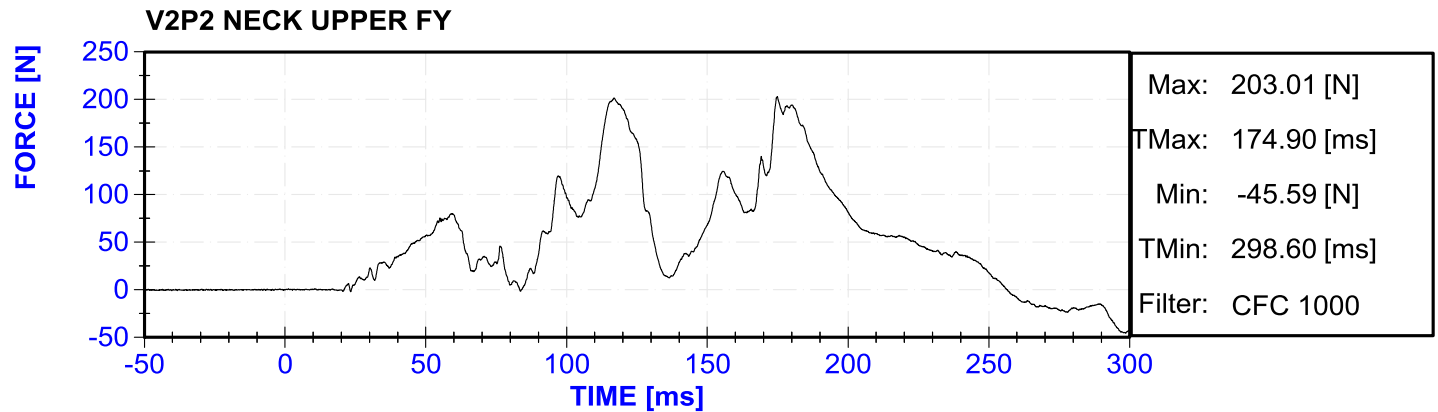
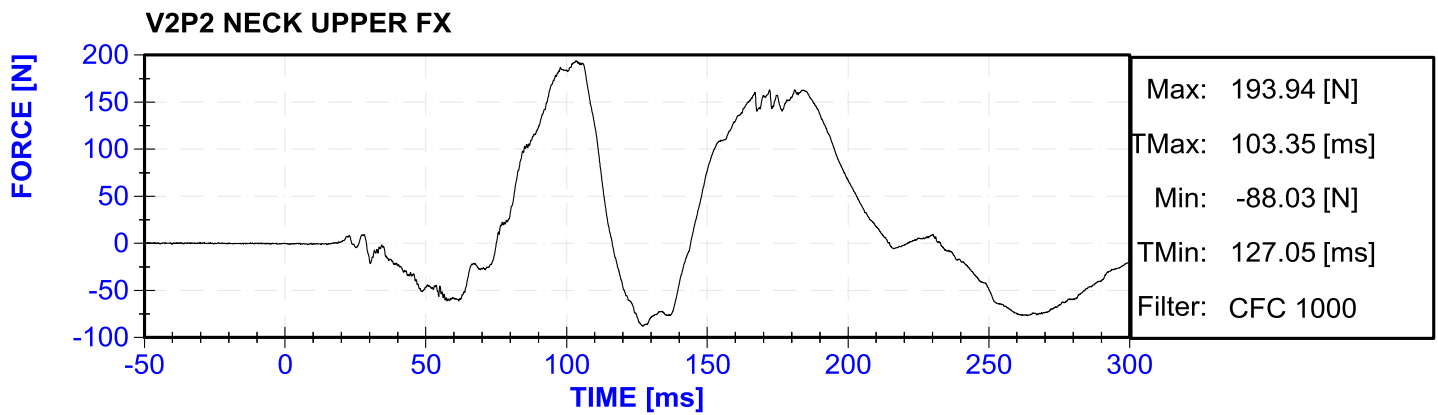
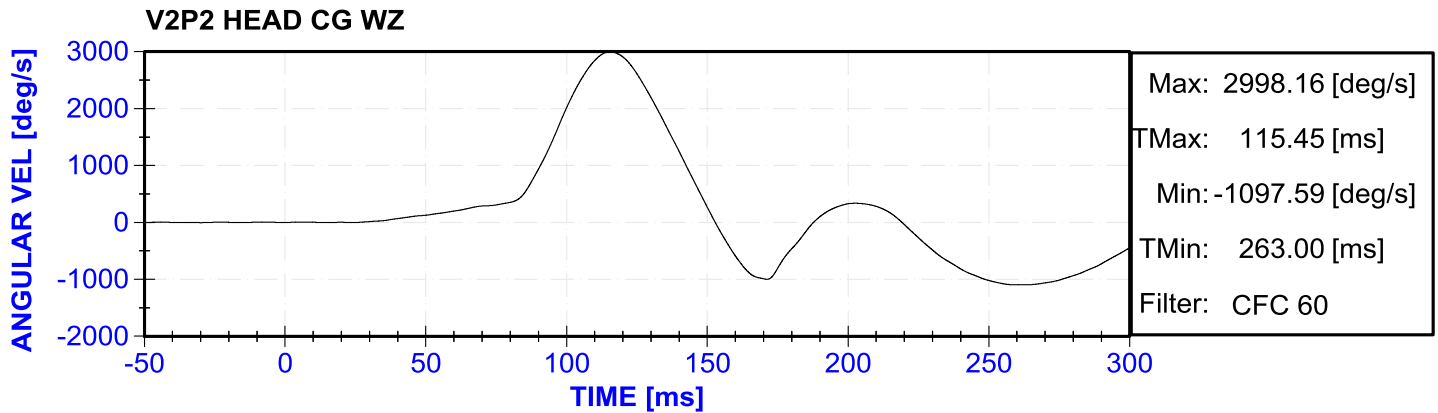


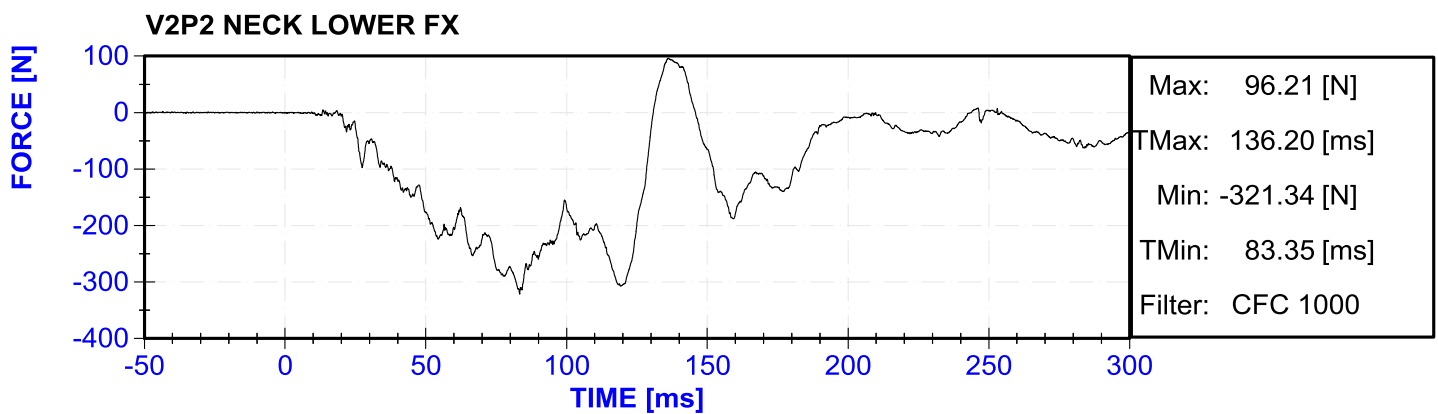
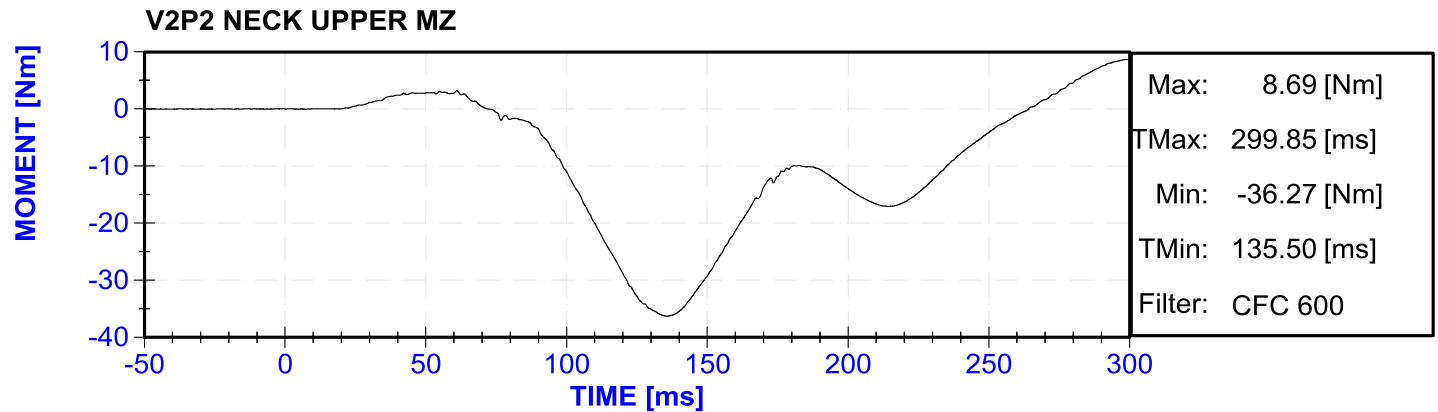
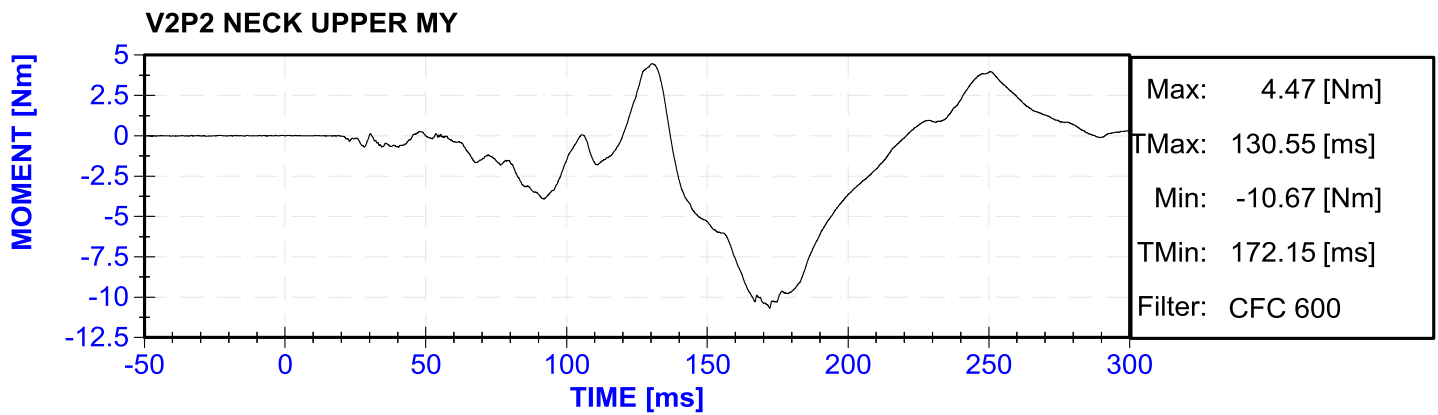
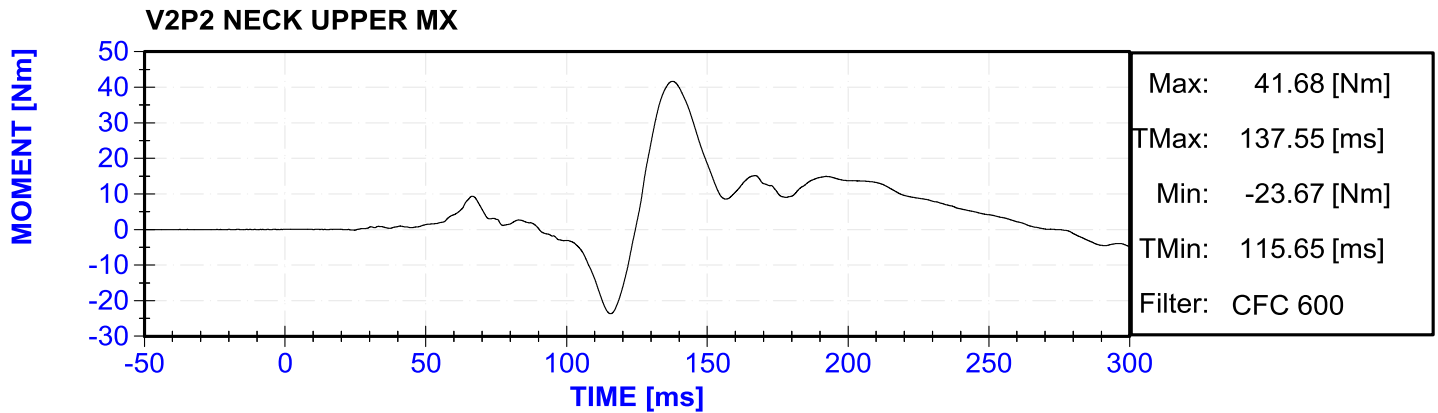




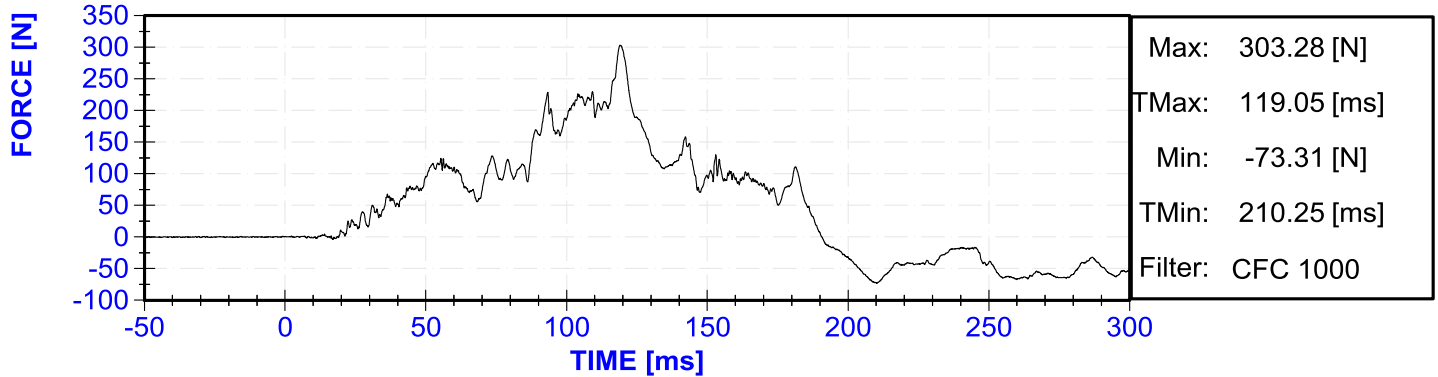




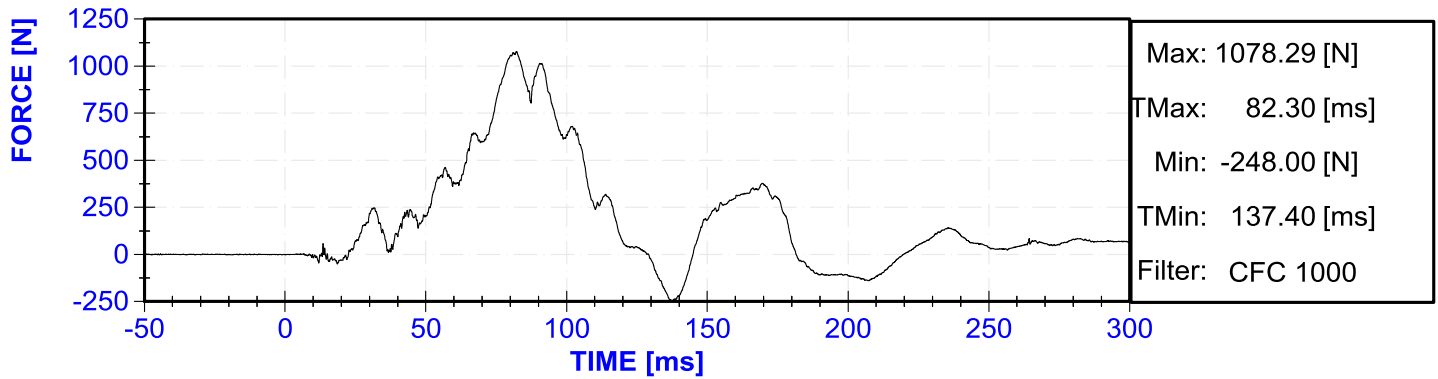




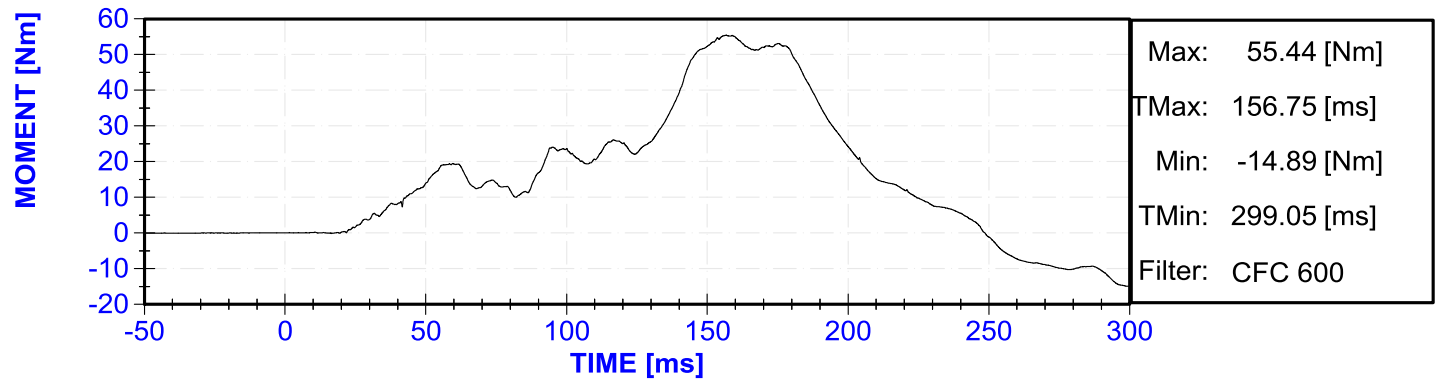
V2P2 NECK LOWER FY



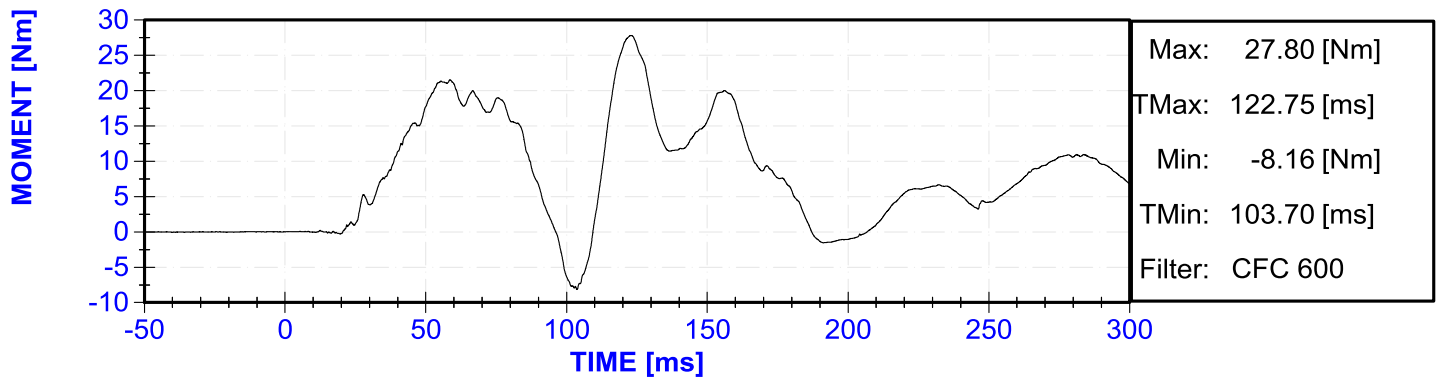
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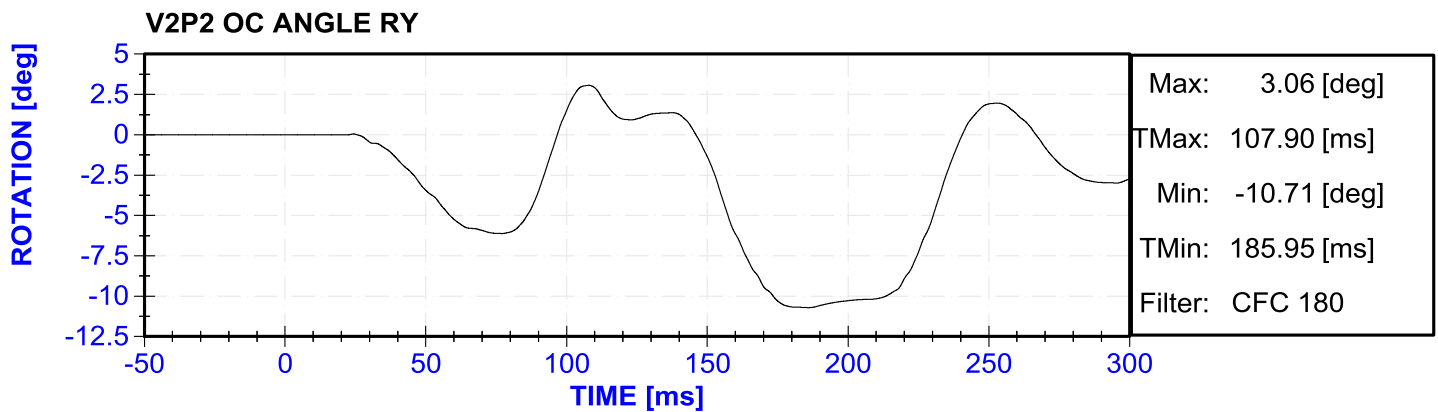
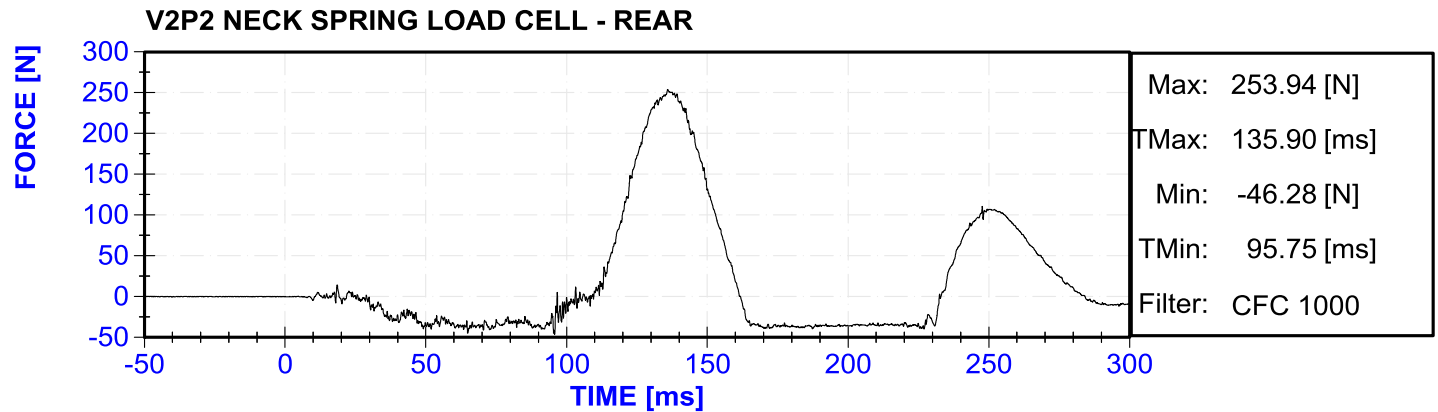
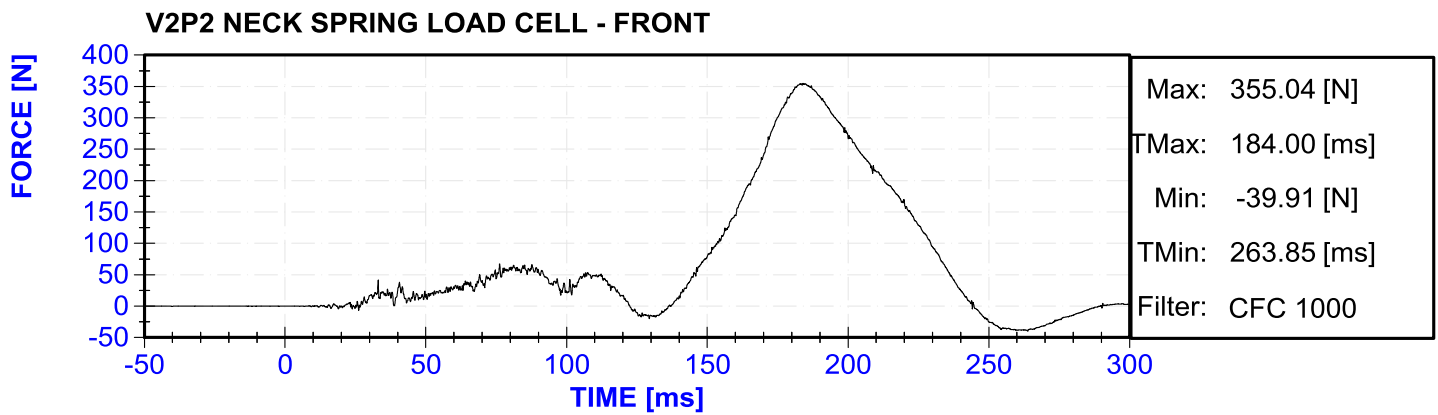
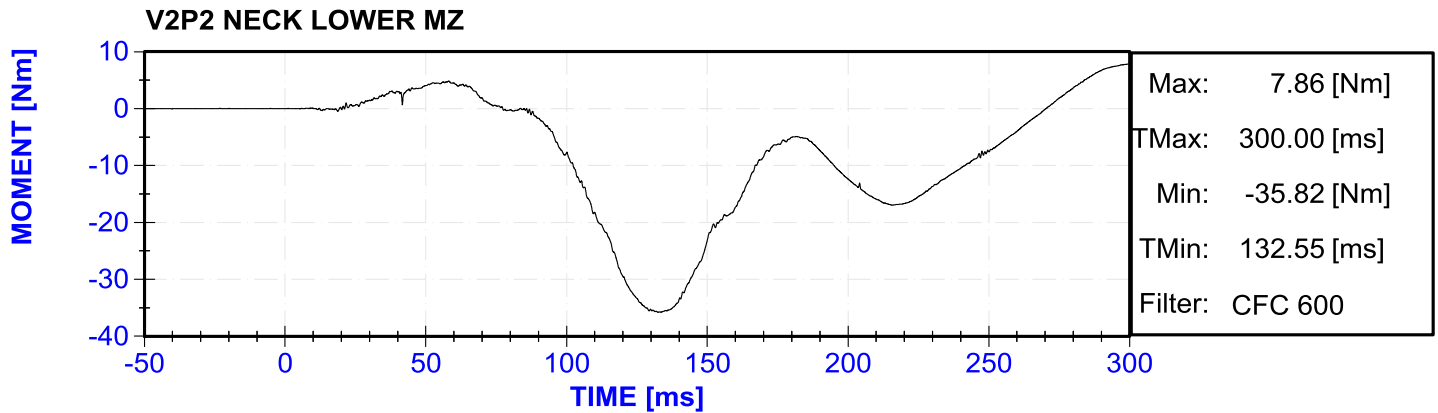


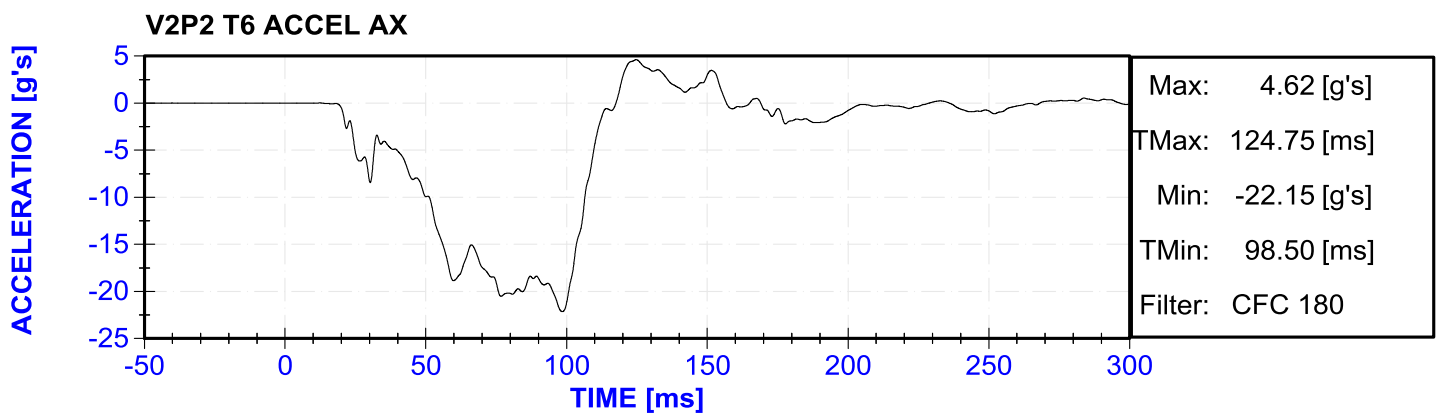
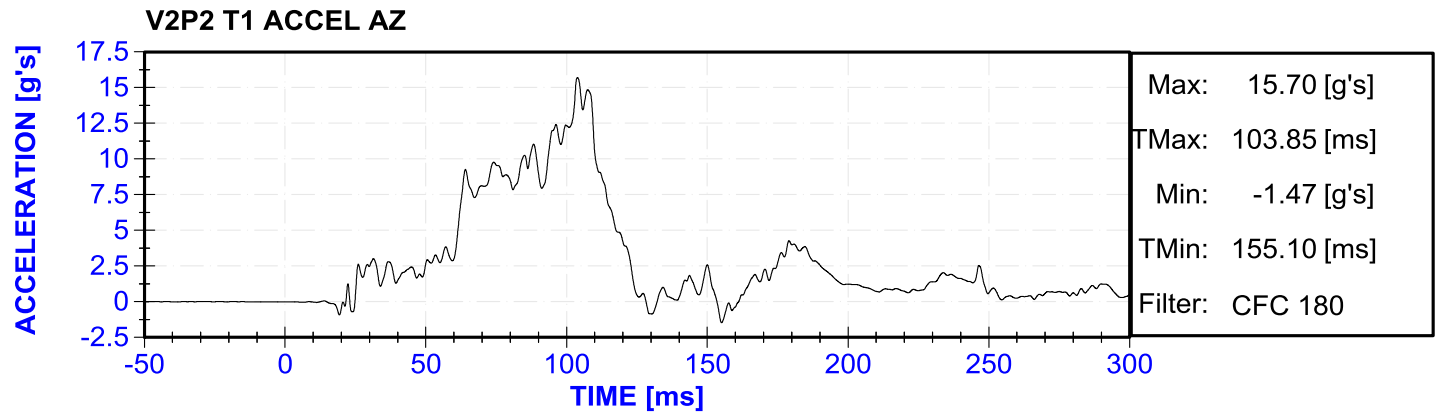
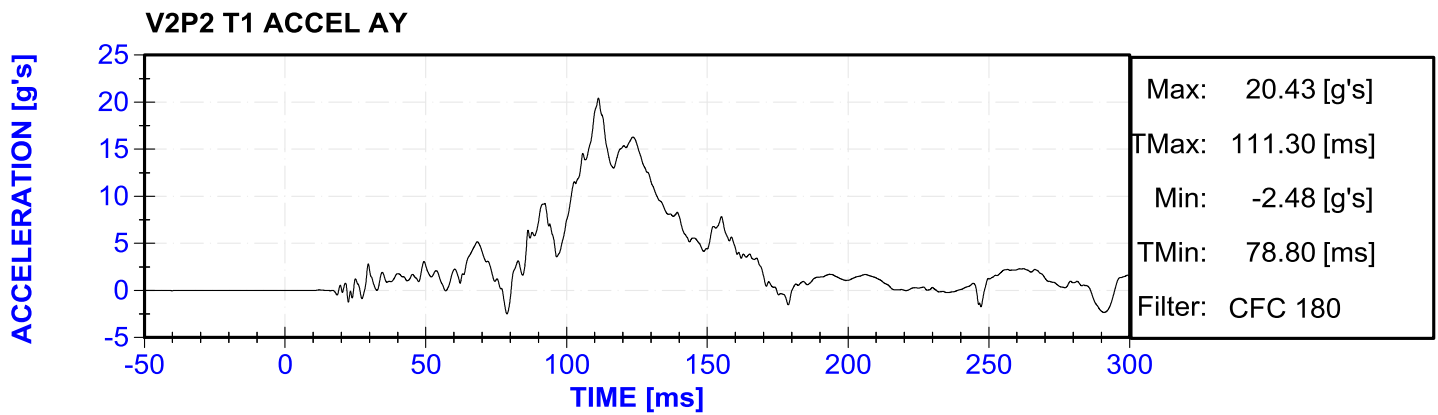
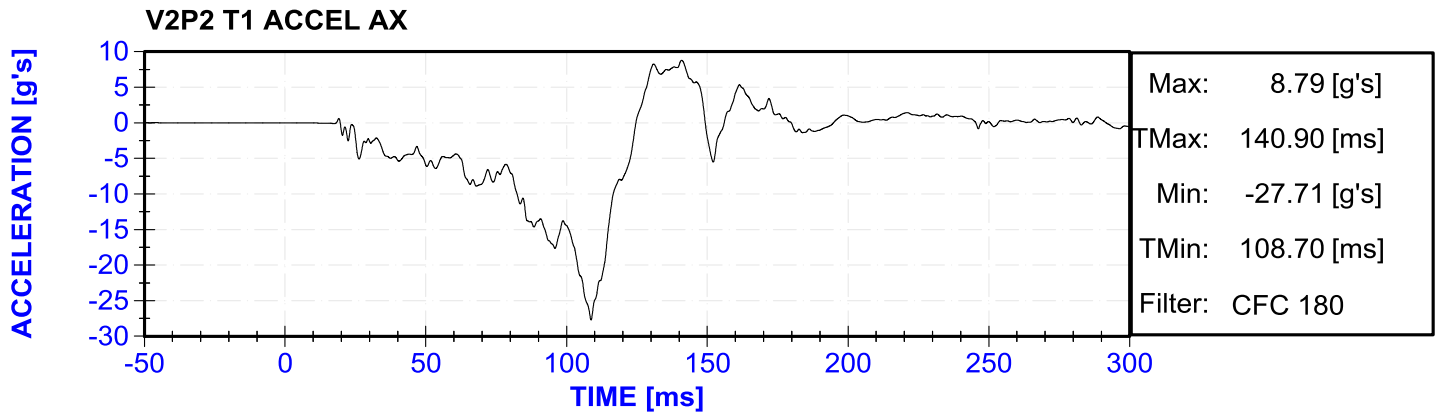
V2P2 NECK LOWER MX

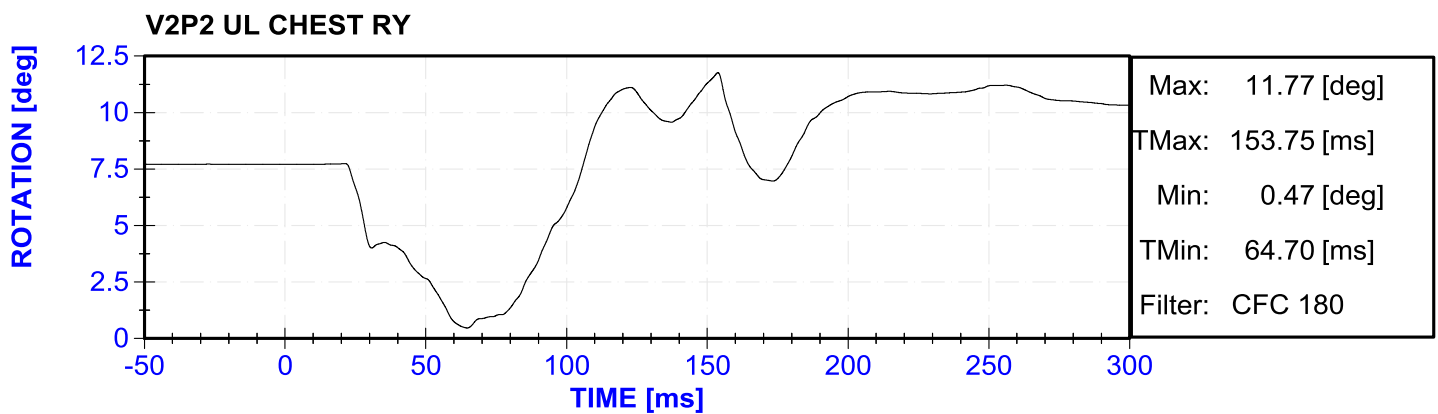
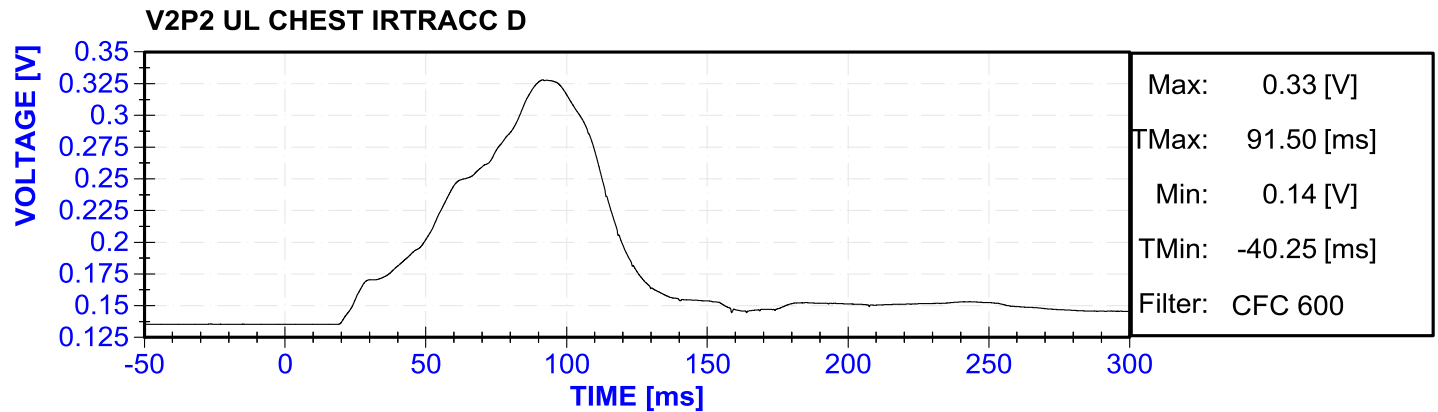
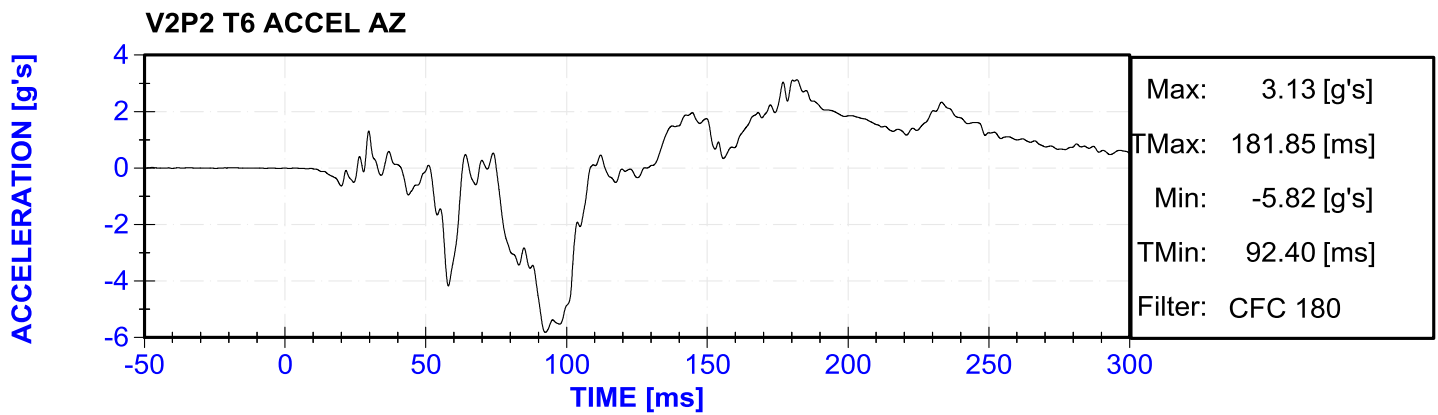
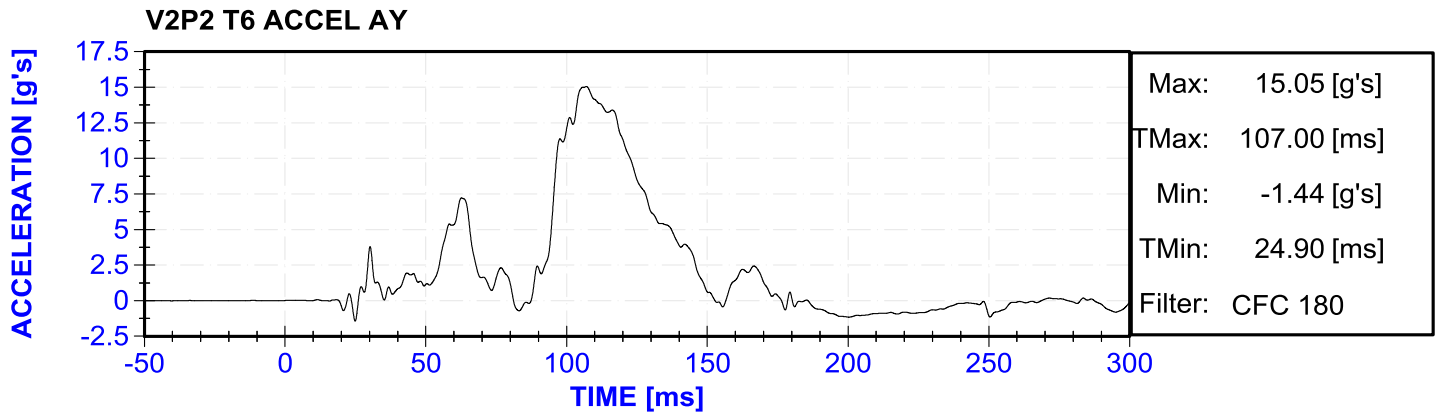


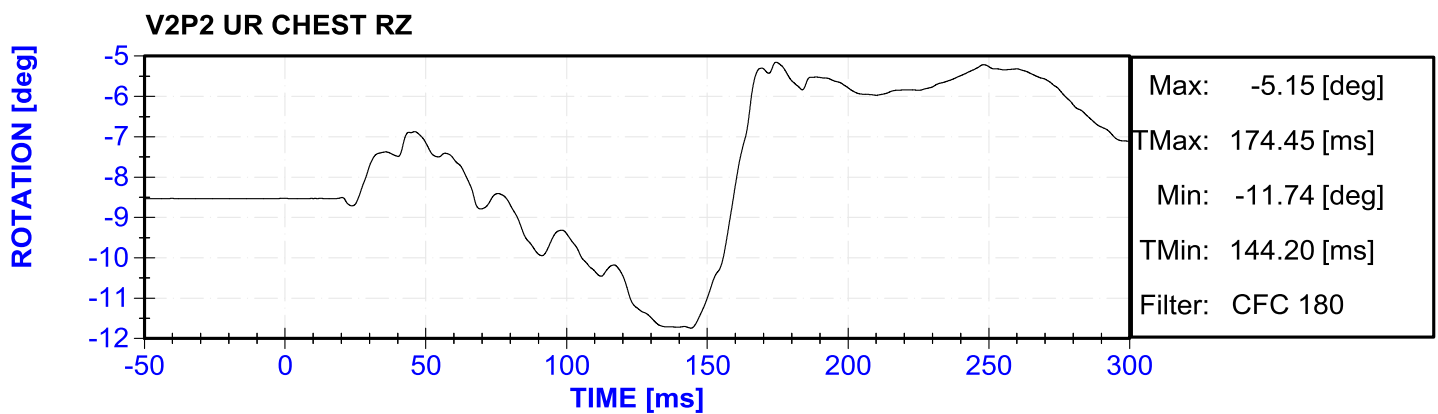
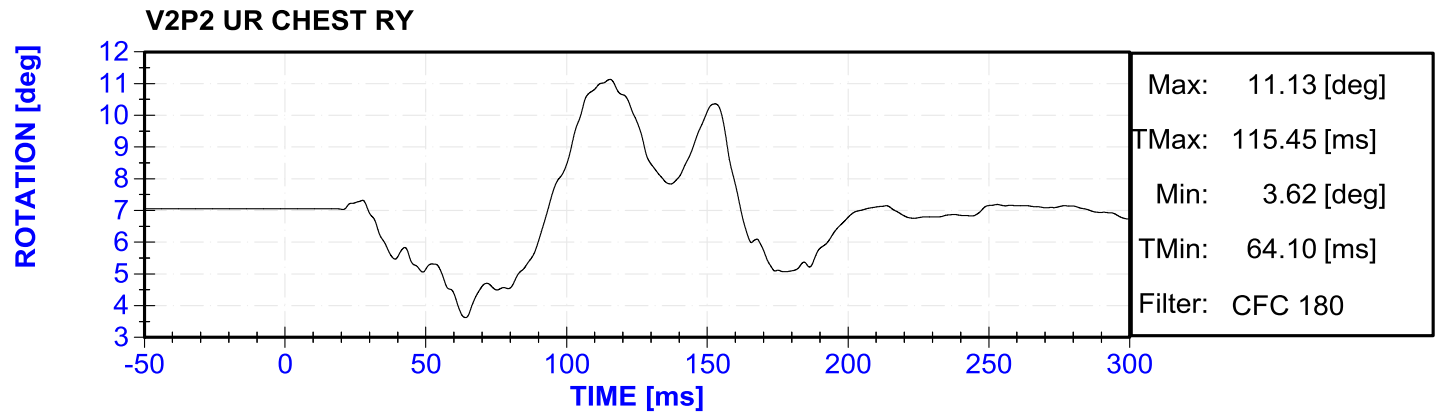
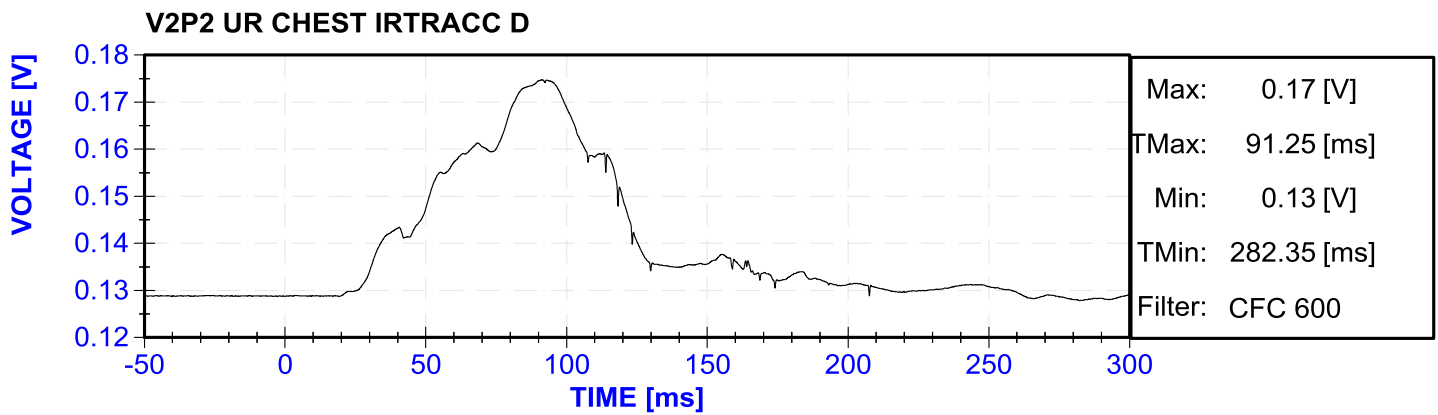
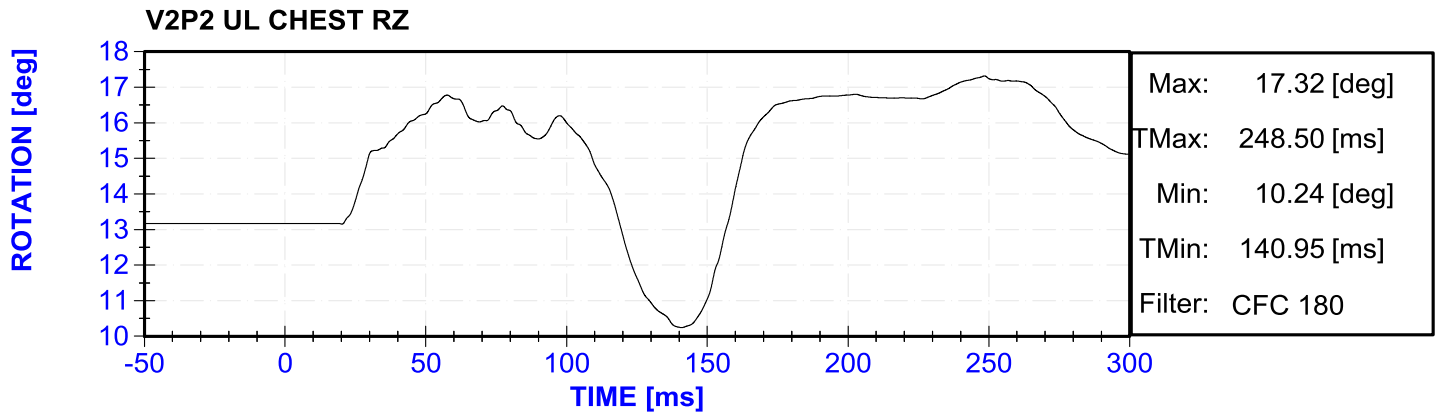
V2P2 NECK LOWER MY

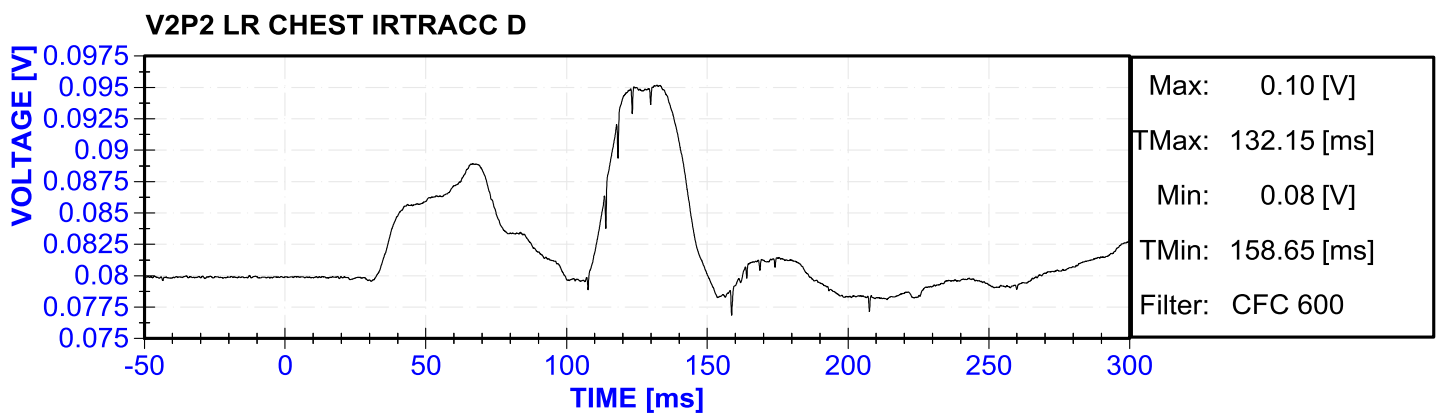
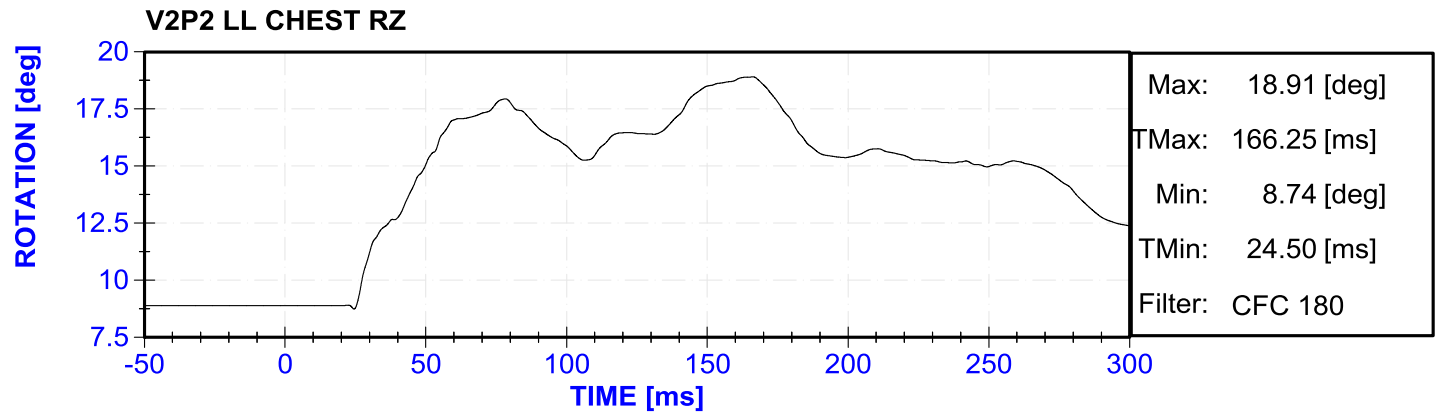
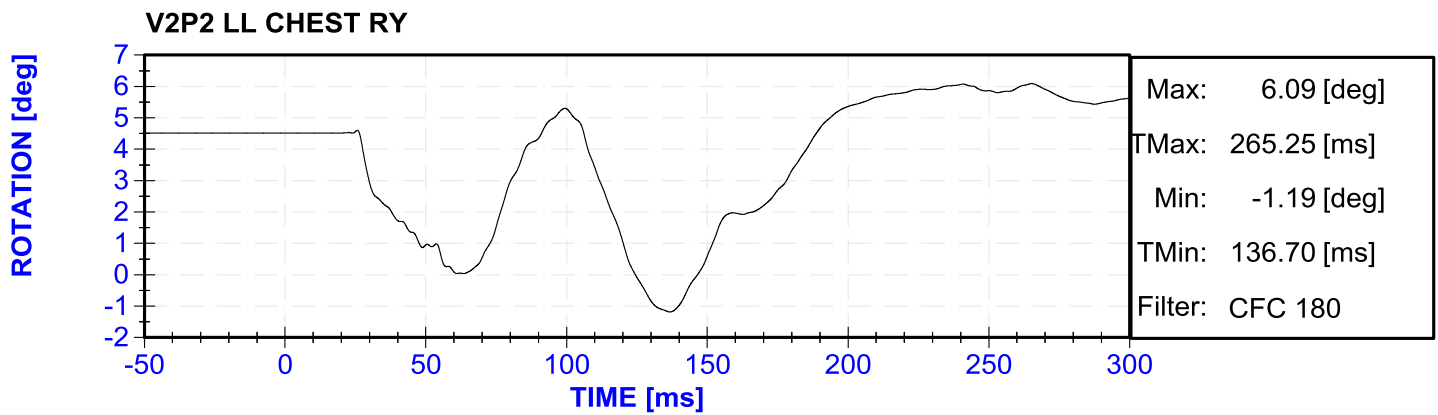
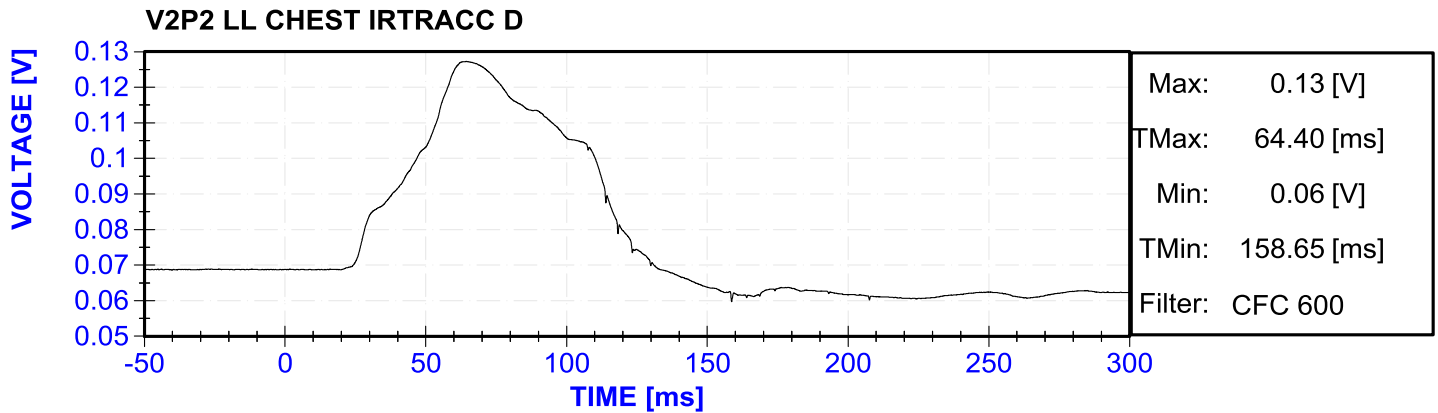


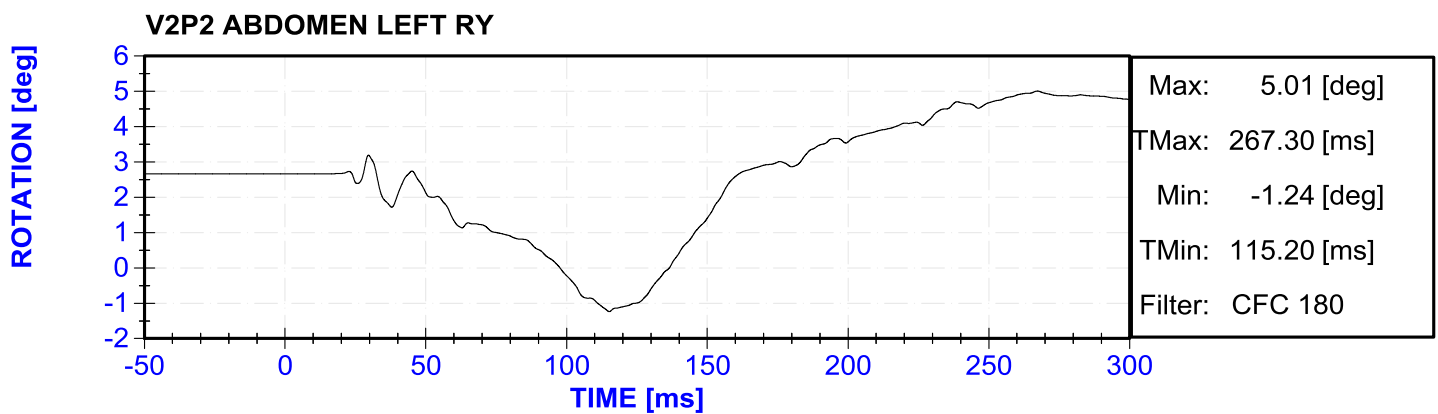
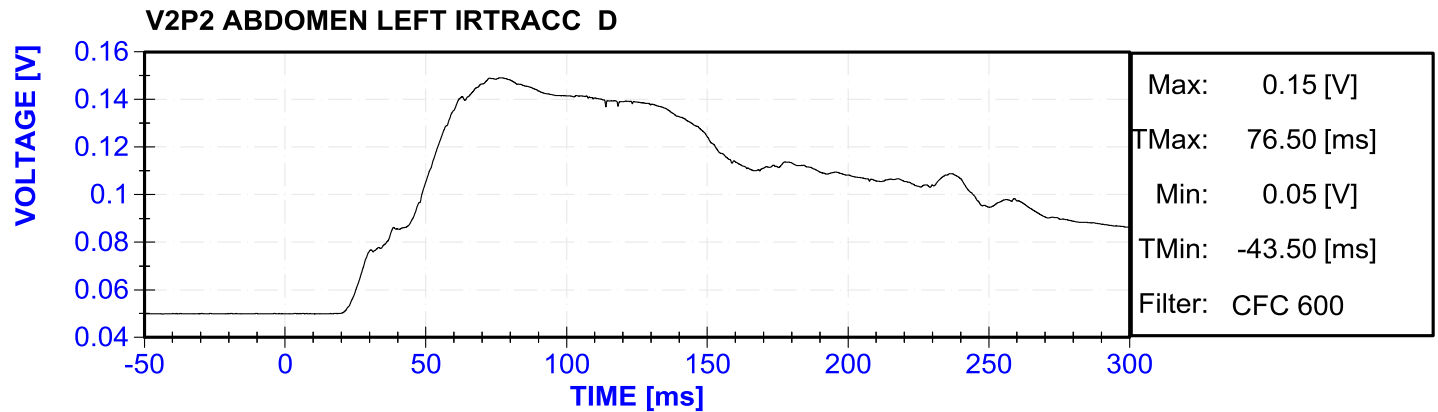
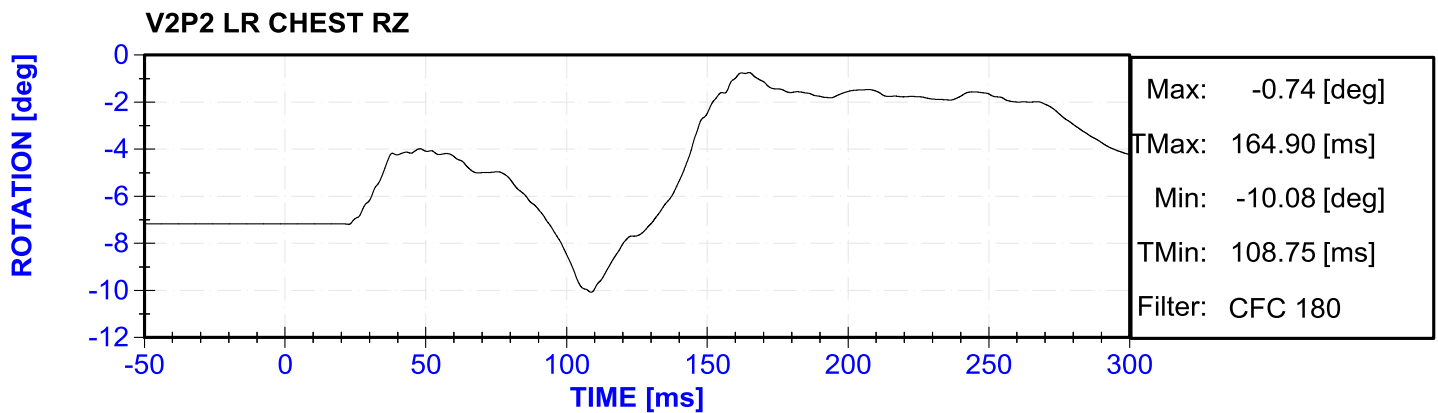
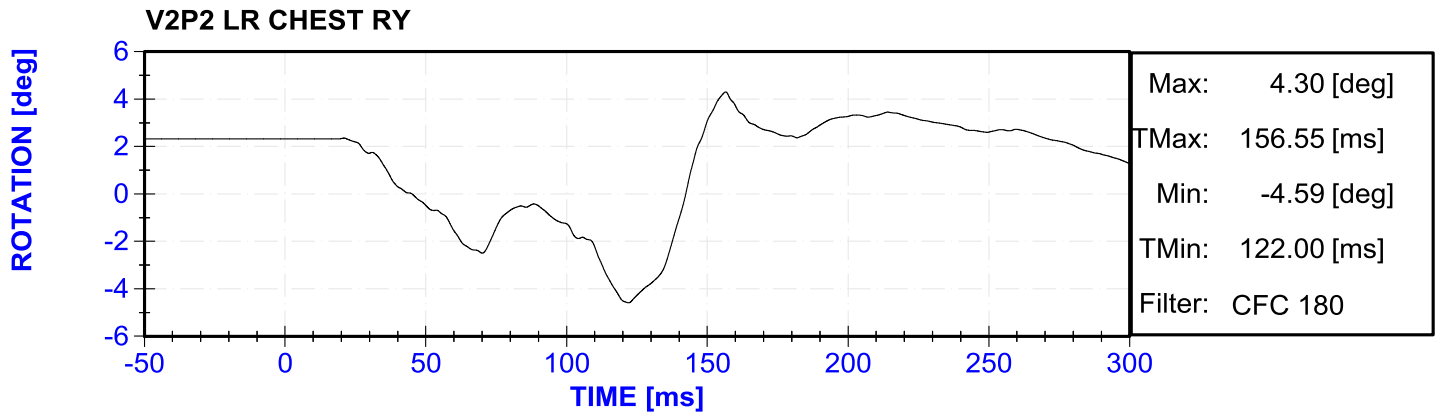


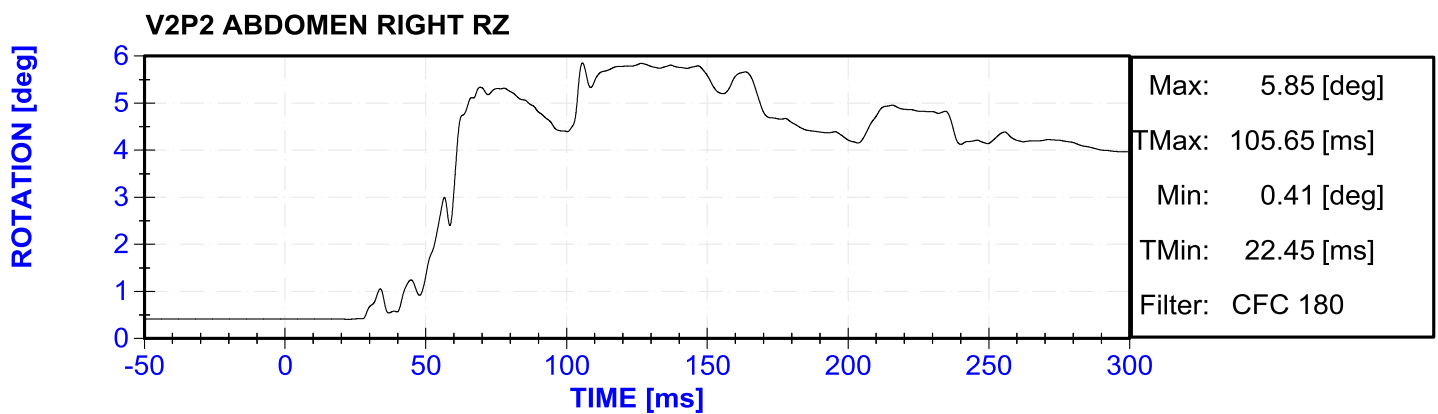
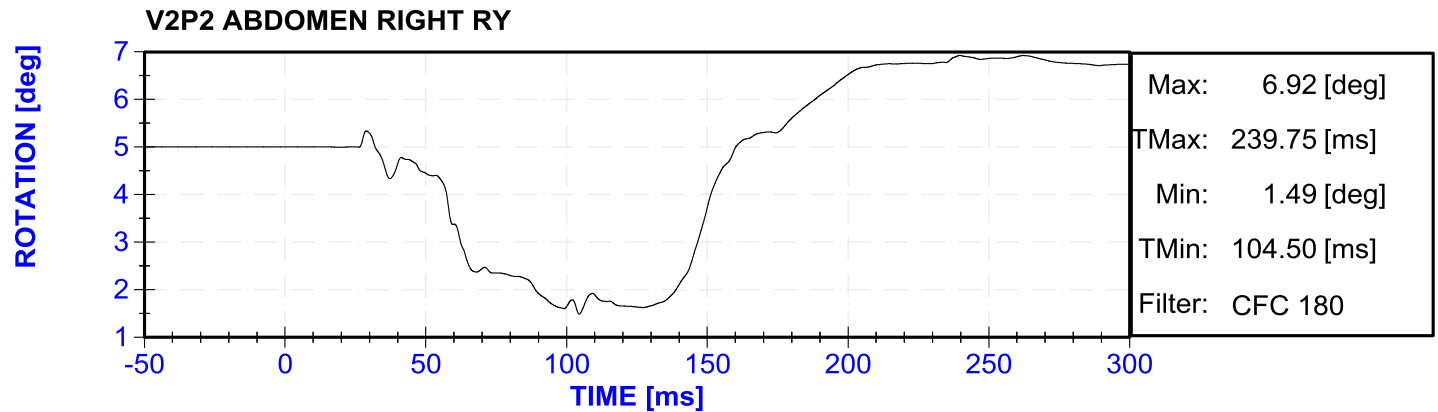
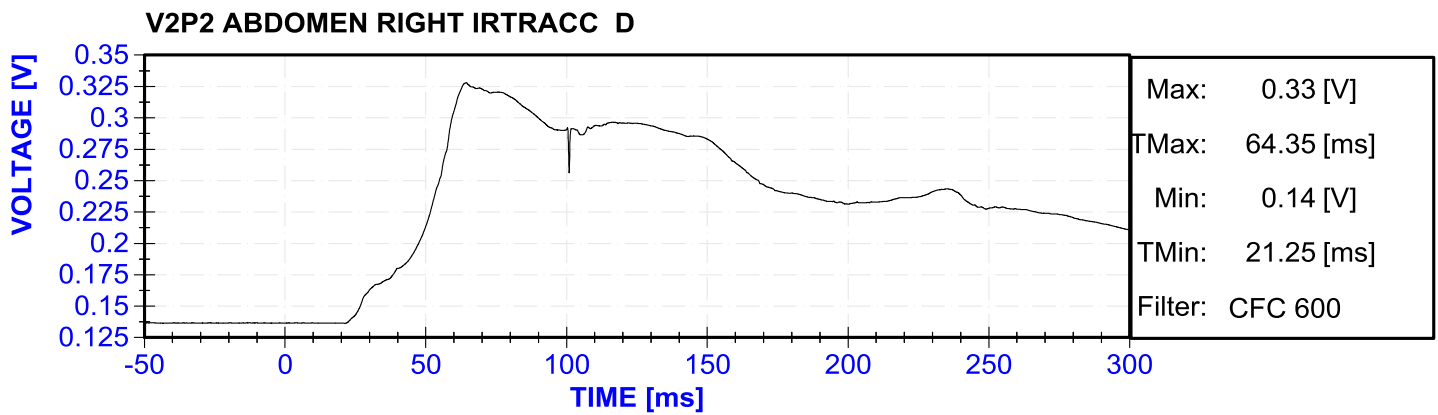
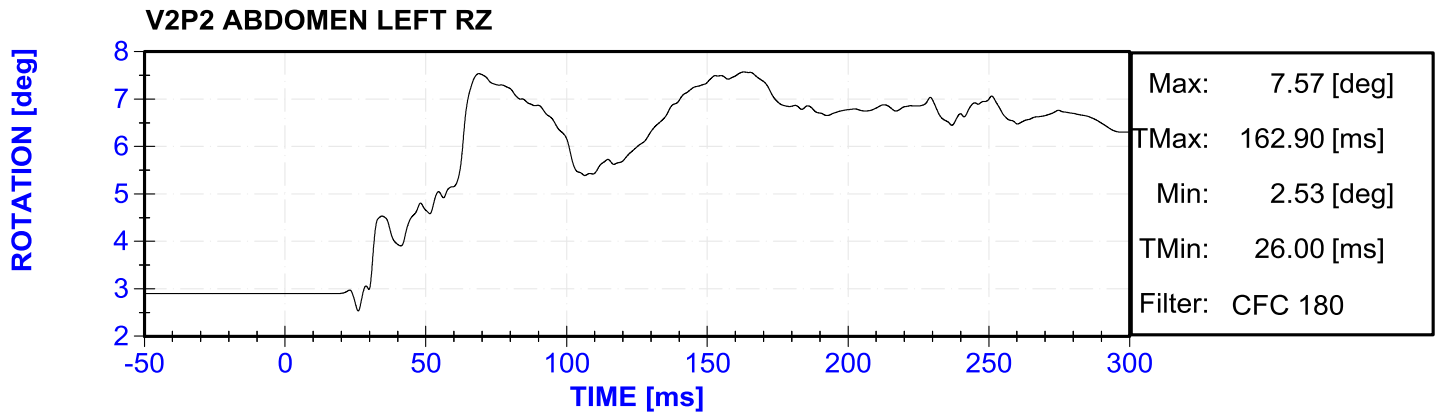


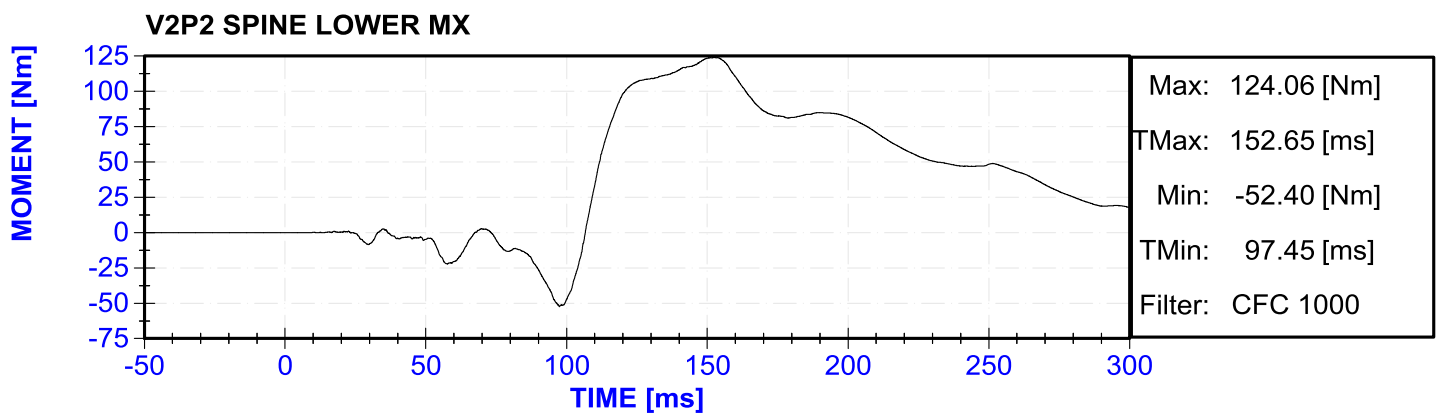
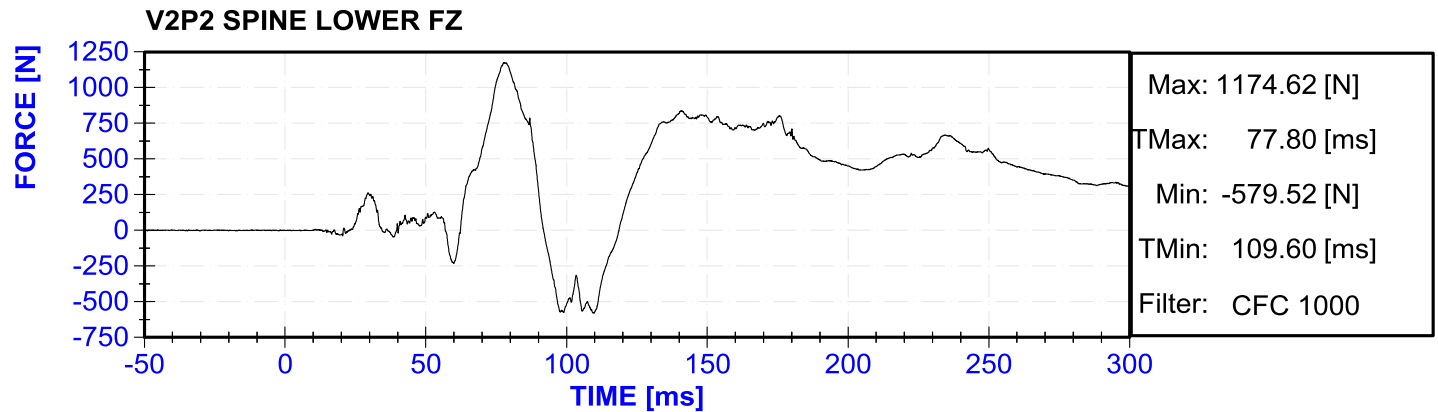
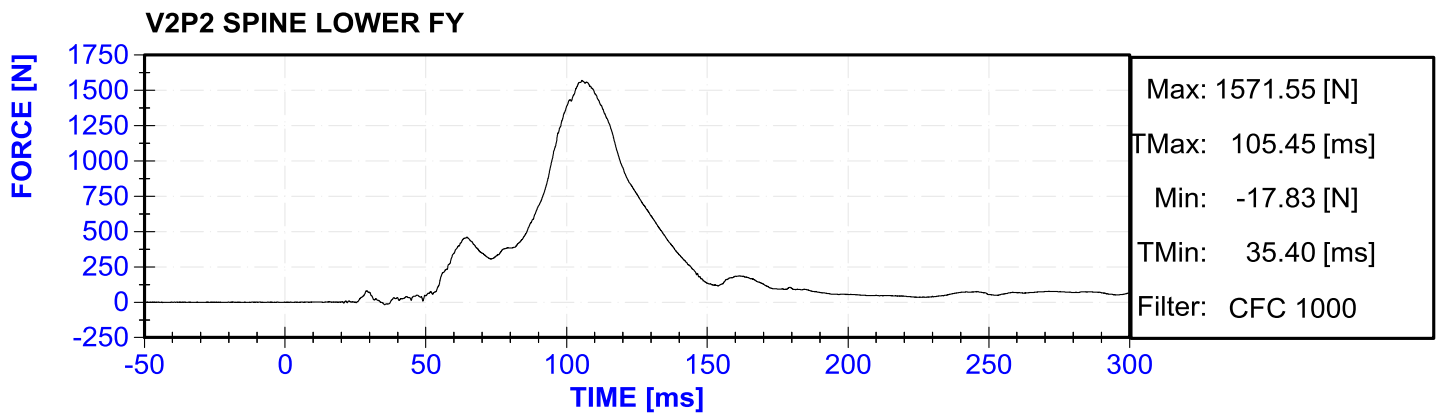
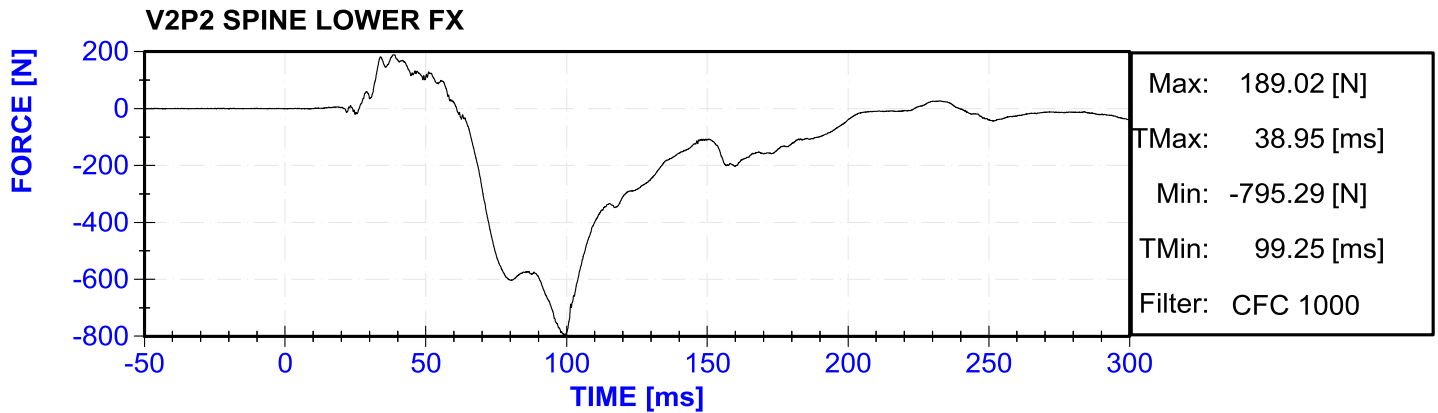


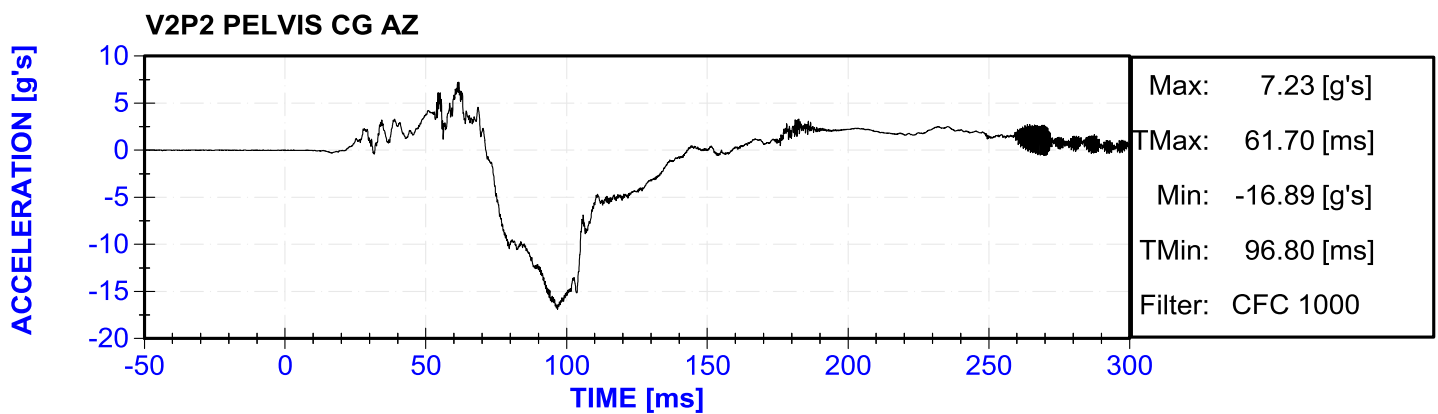
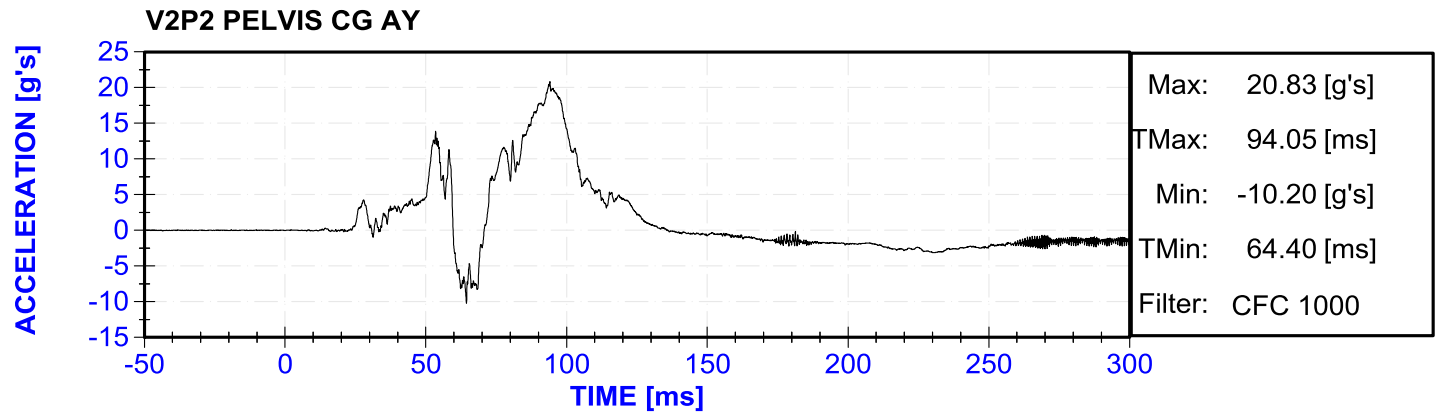
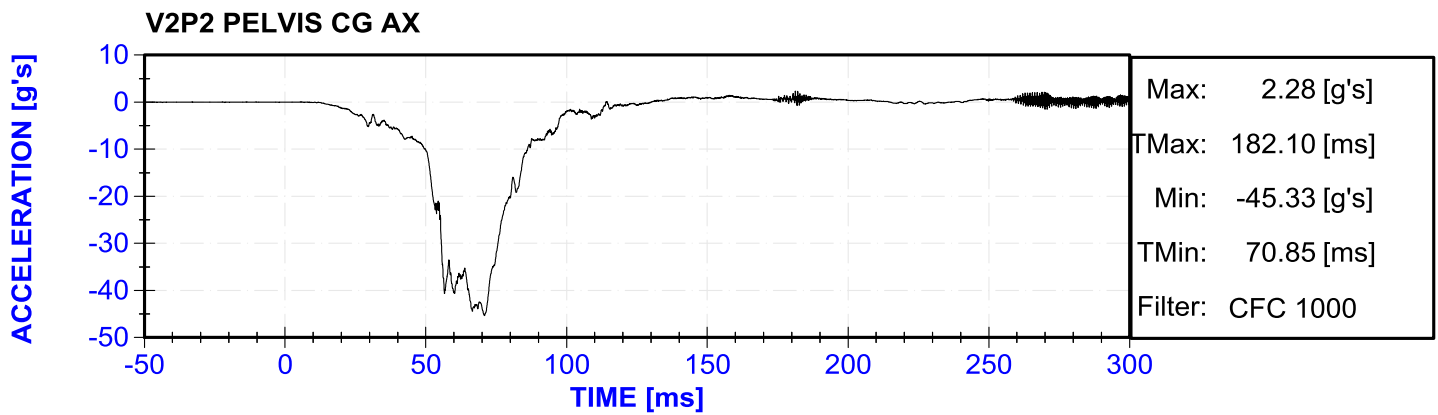
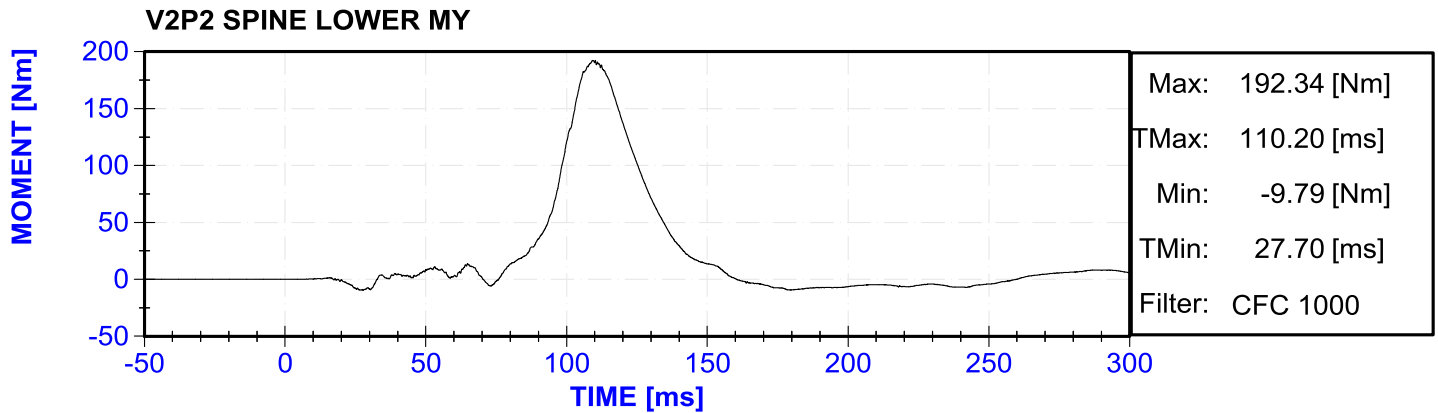




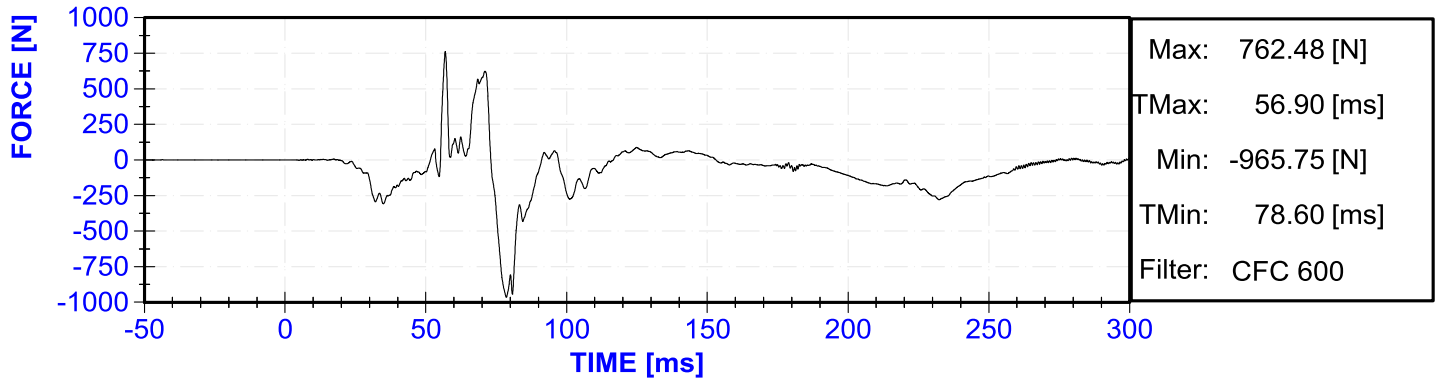




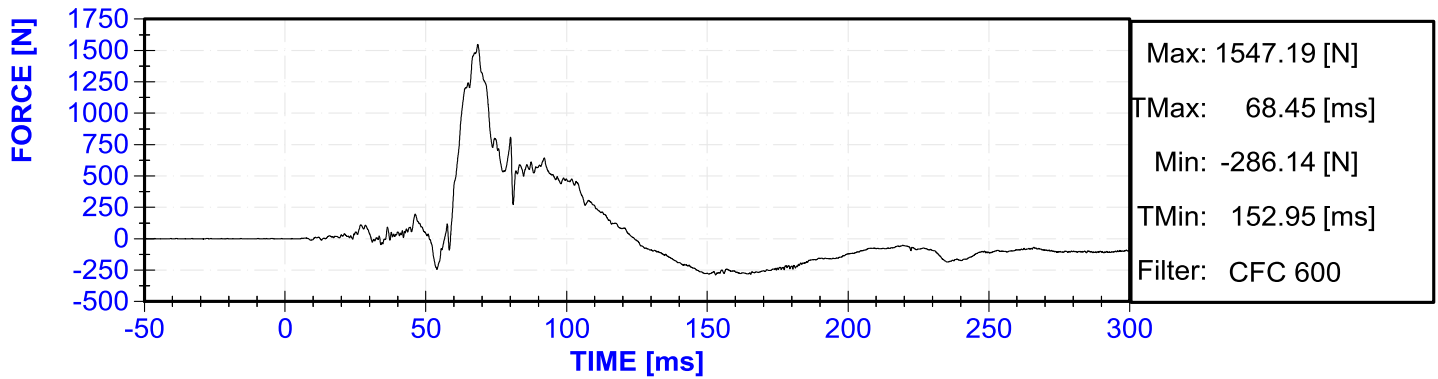




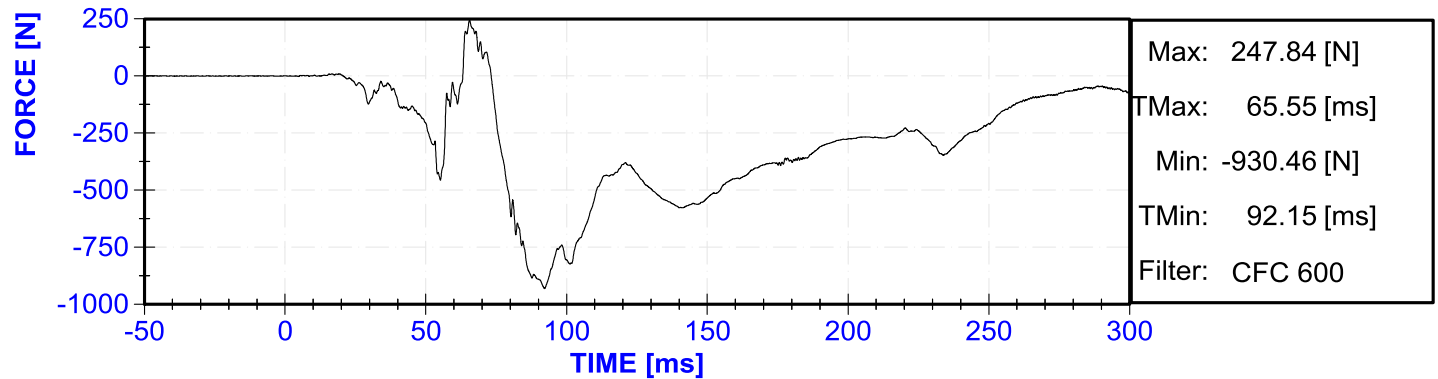
V2P2 PELVIS ACETABULUM LEFT FX



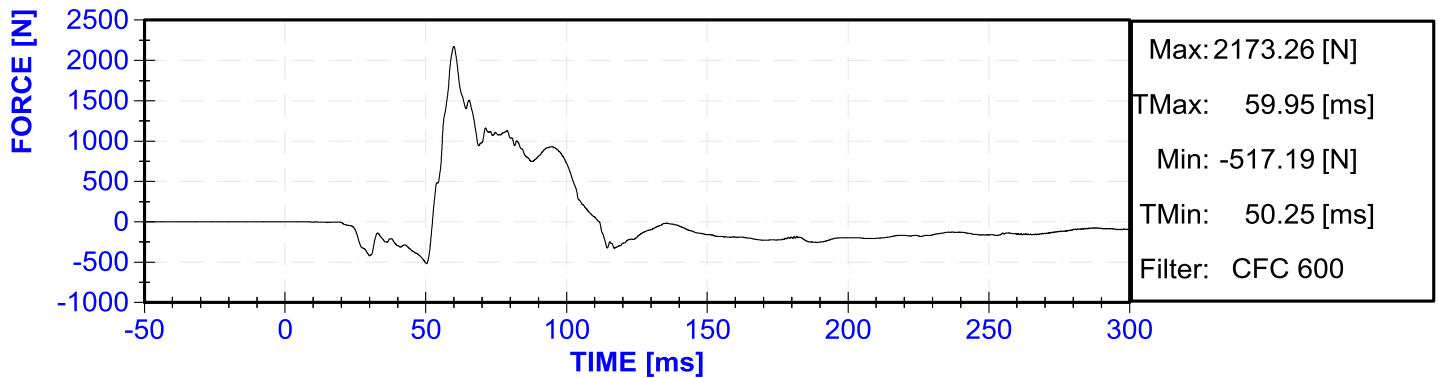
V2P2 PELVIS ACETABULUM LEFT FY



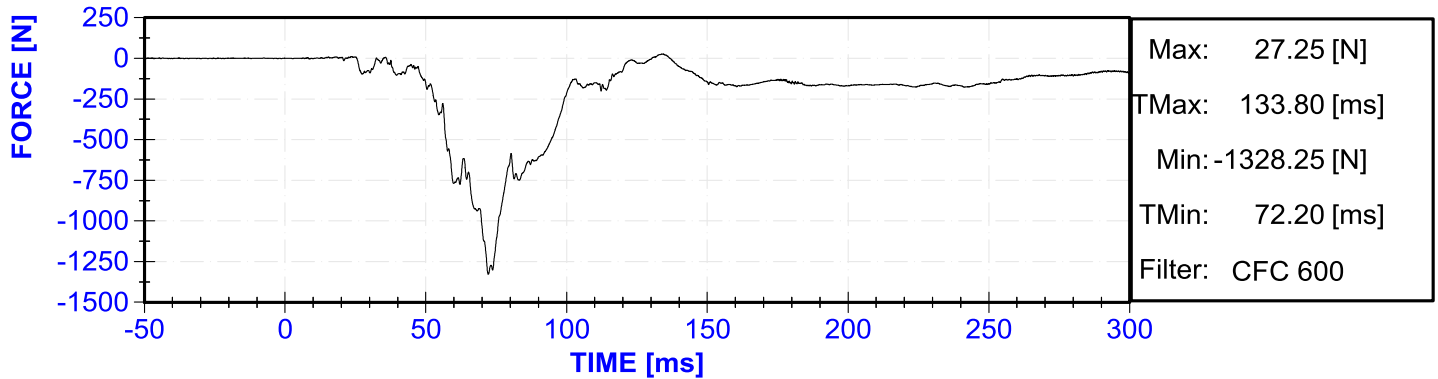
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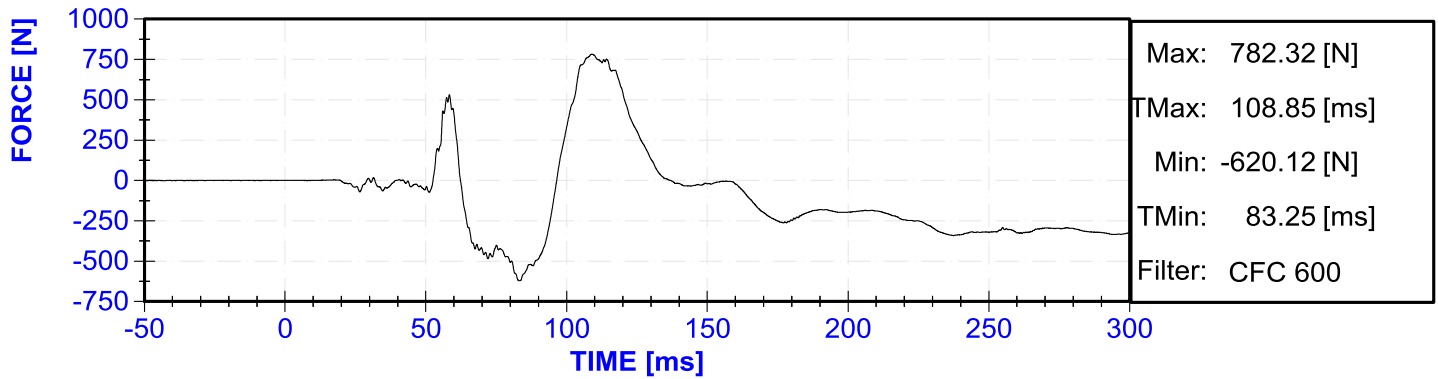
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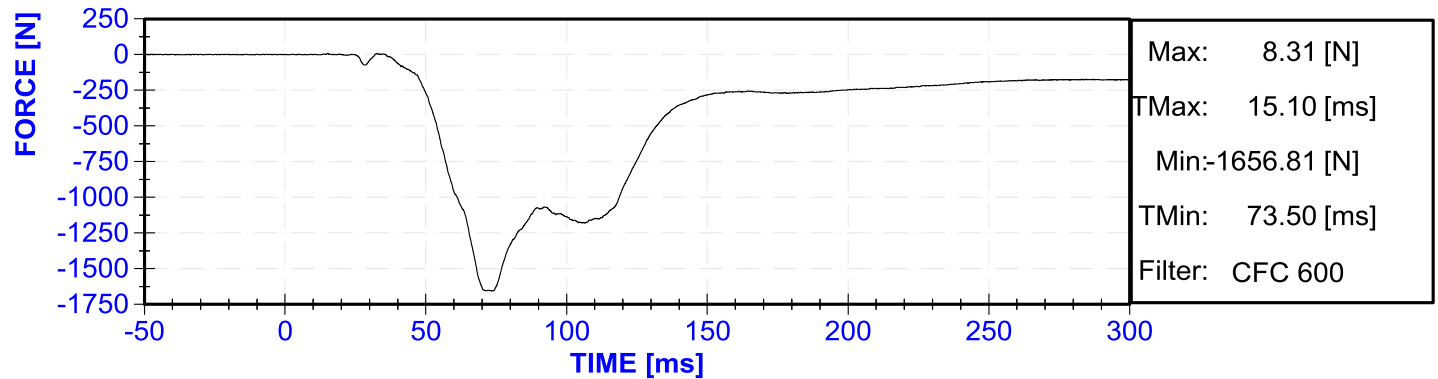
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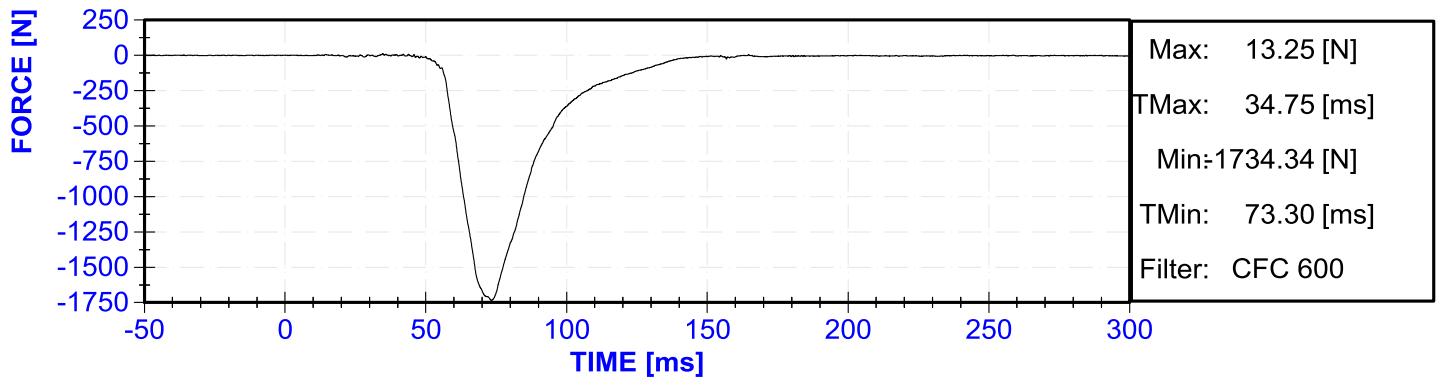
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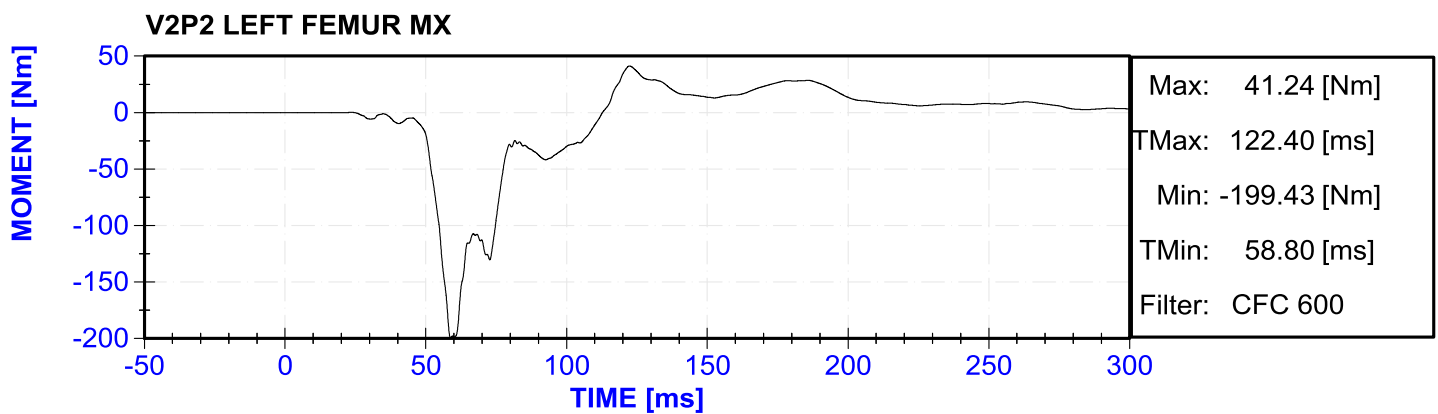
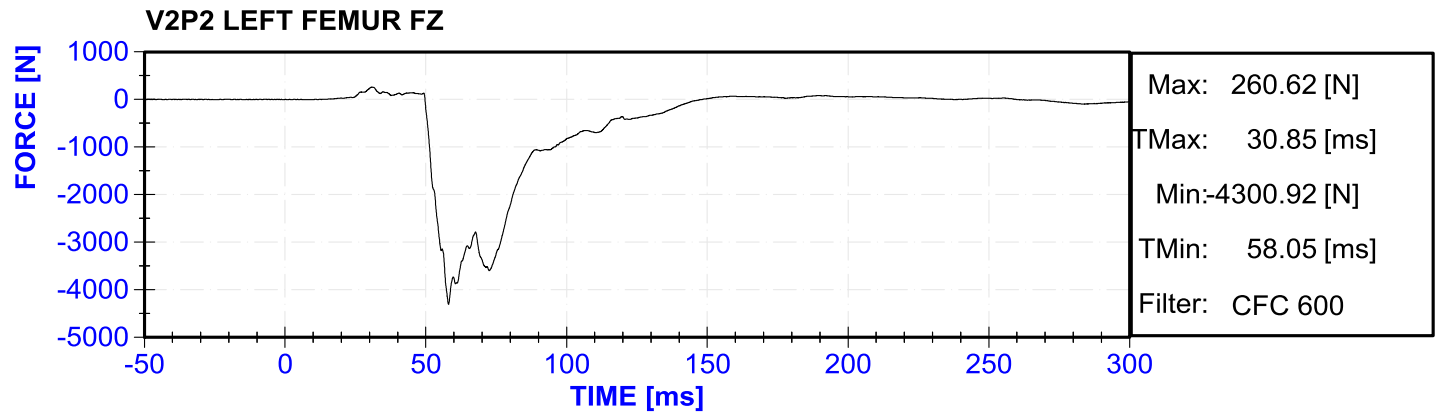
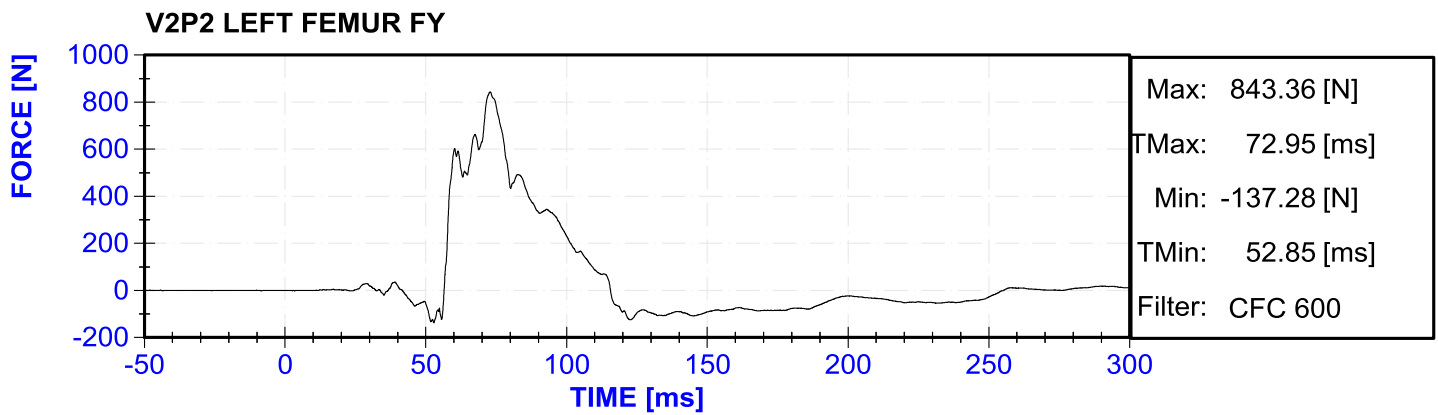
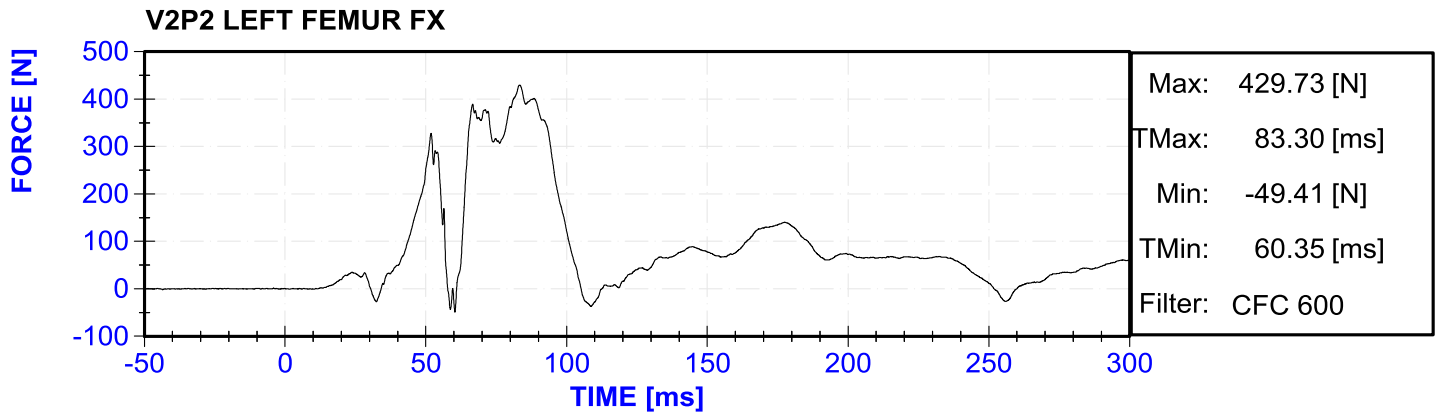


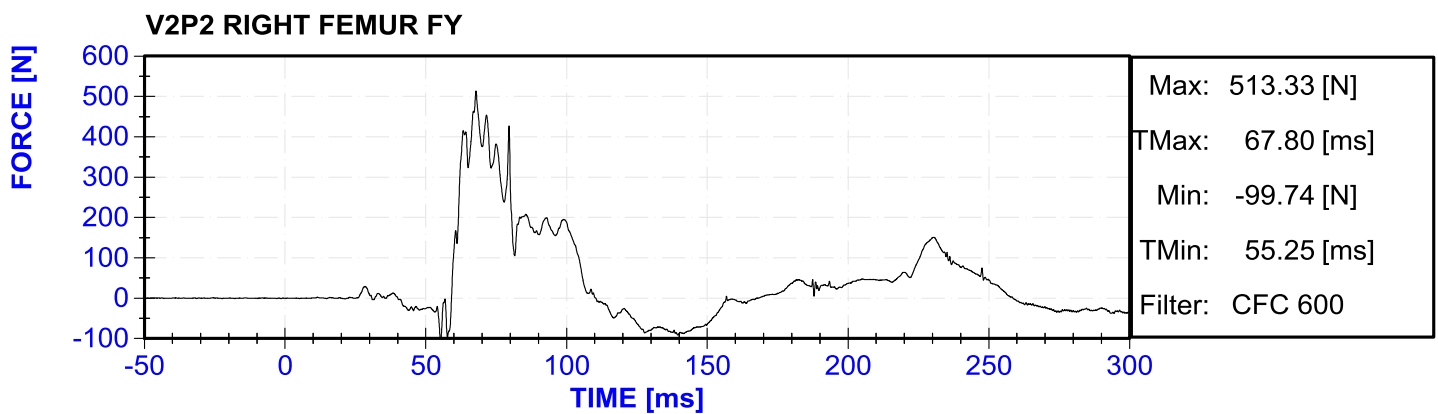
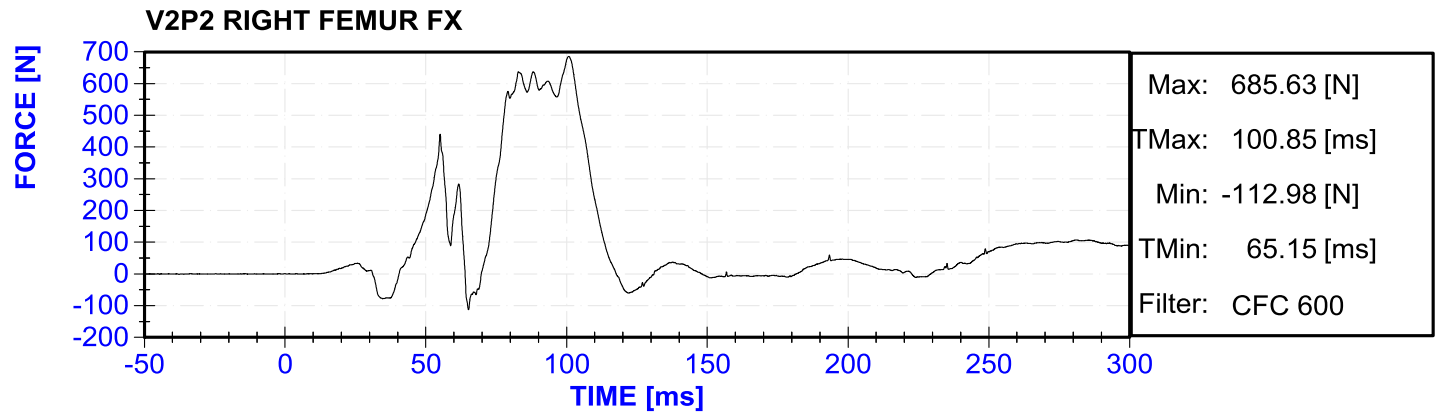
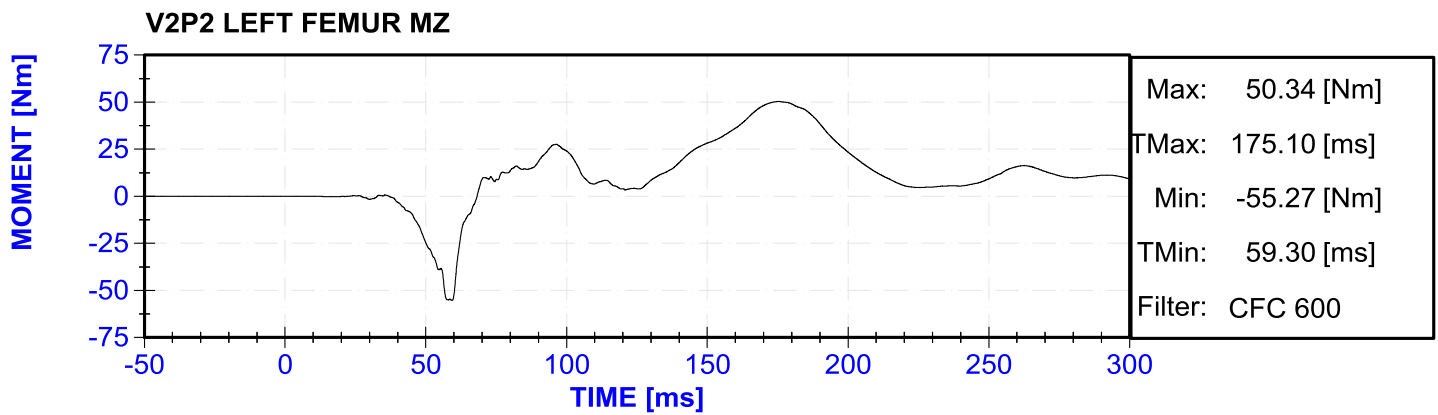
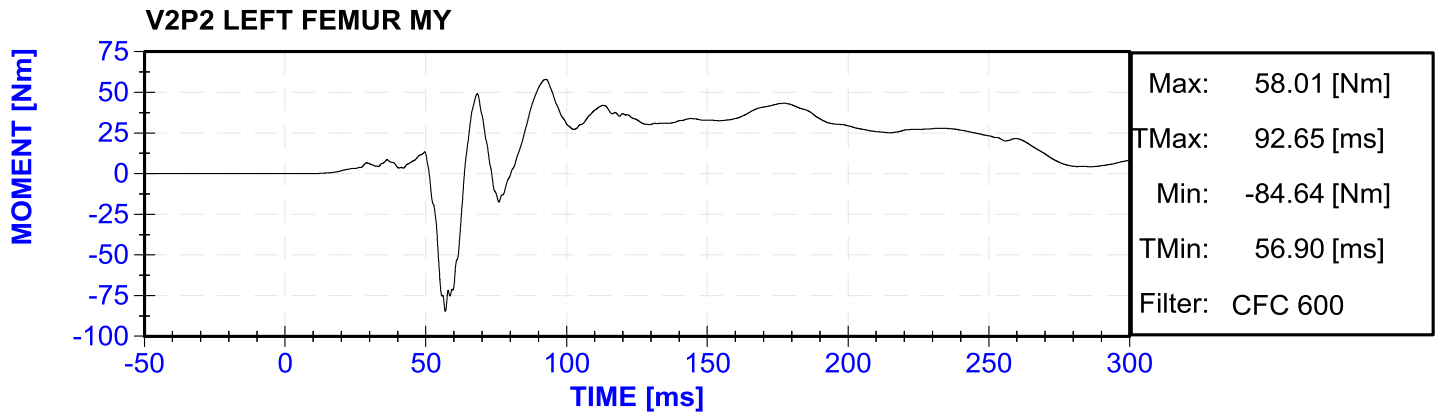
V2P2 LEFT ASIS FX

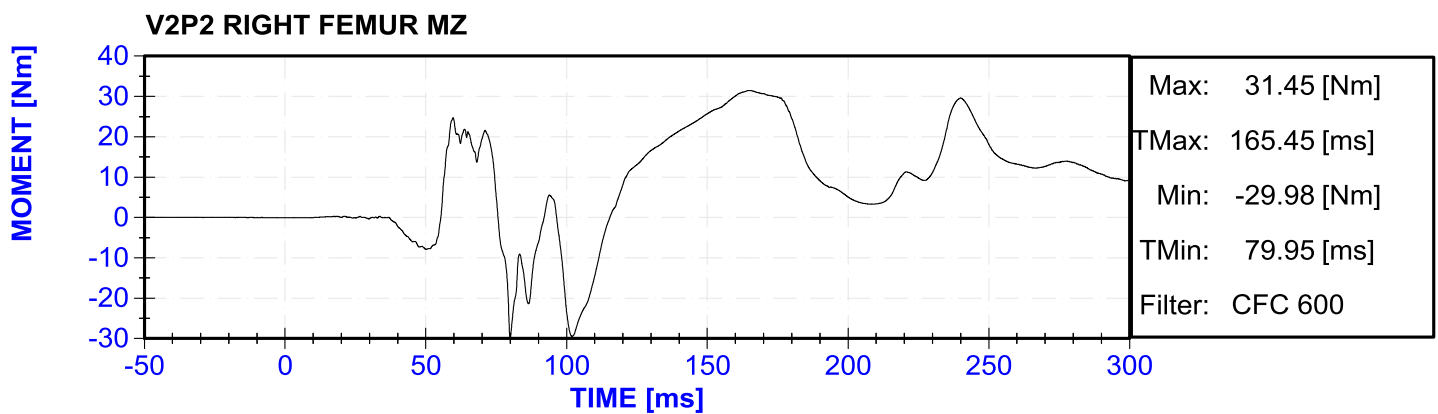
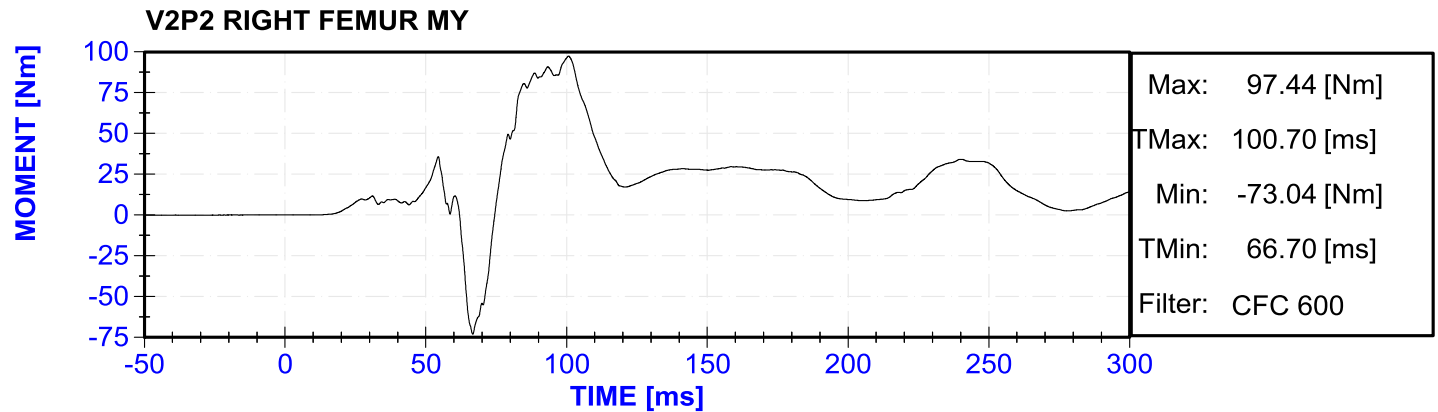
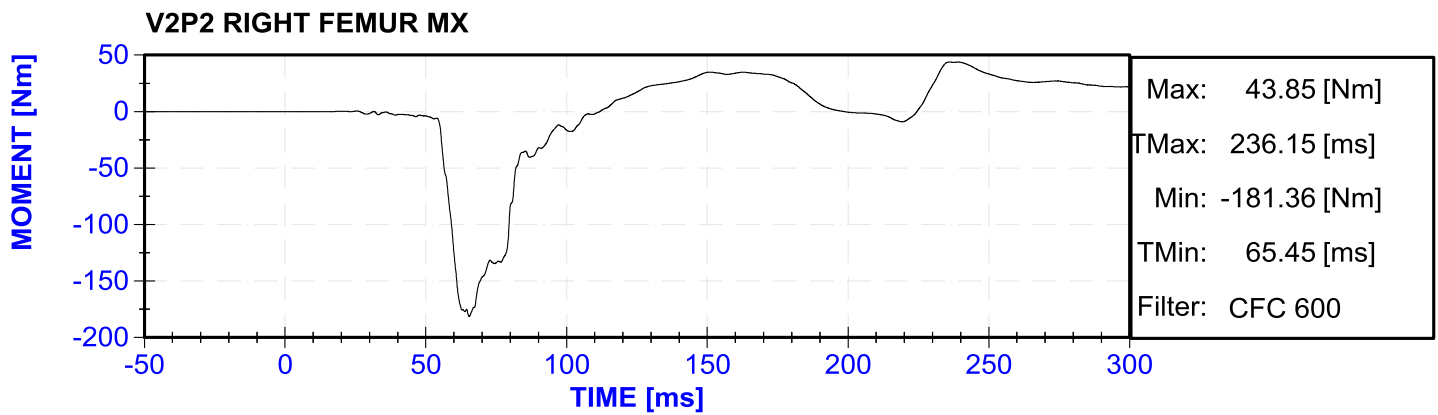
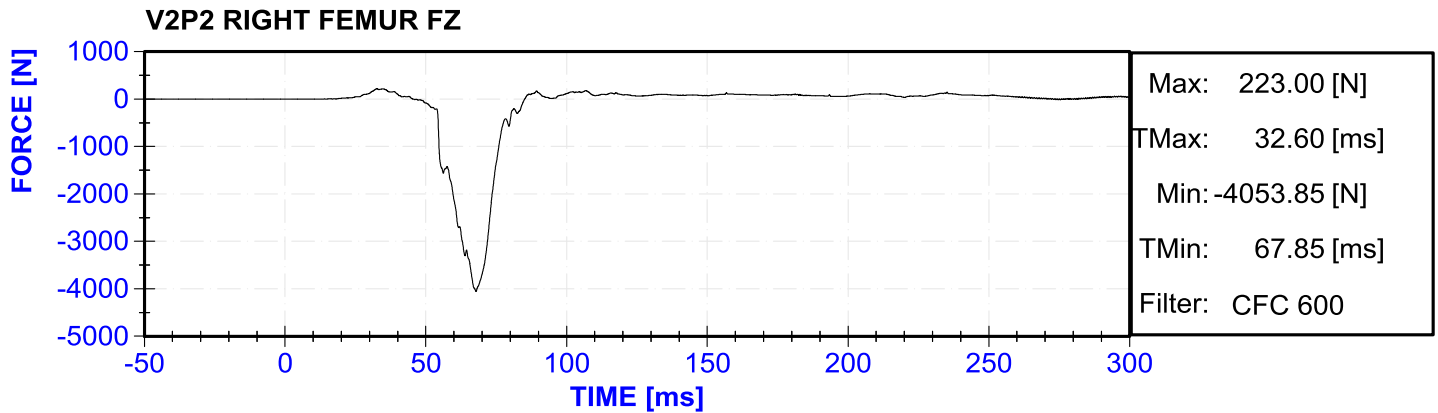


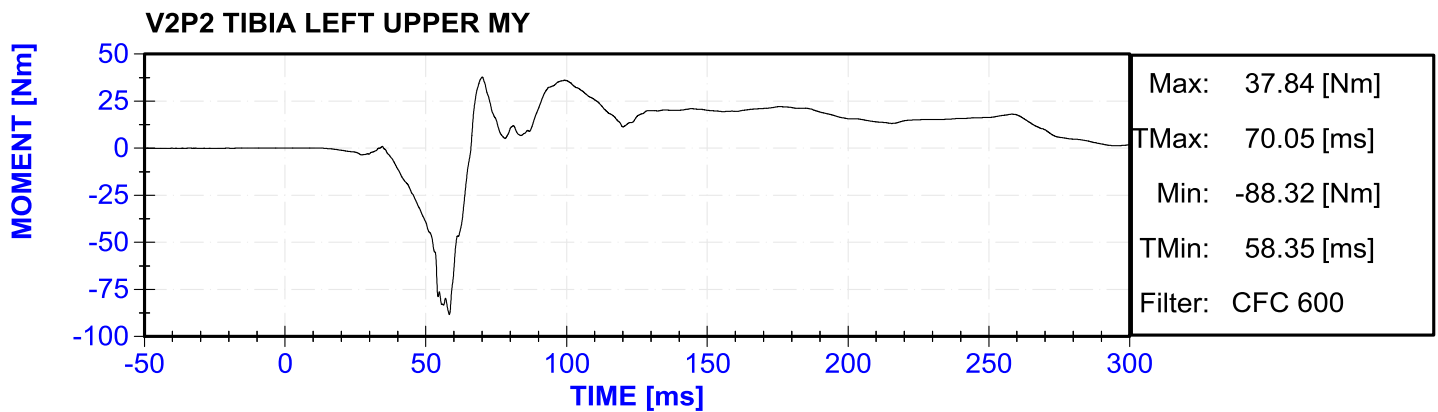
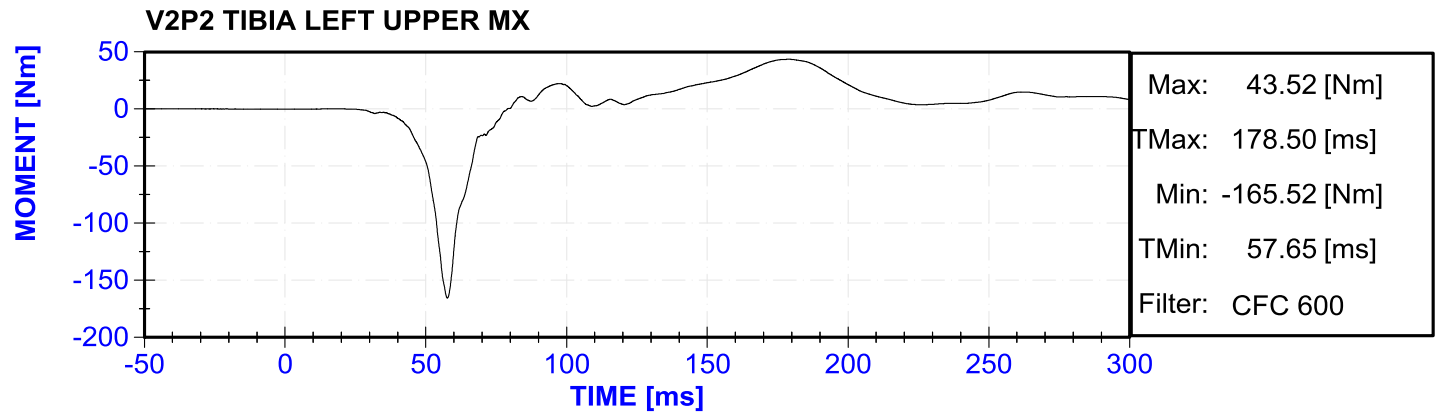
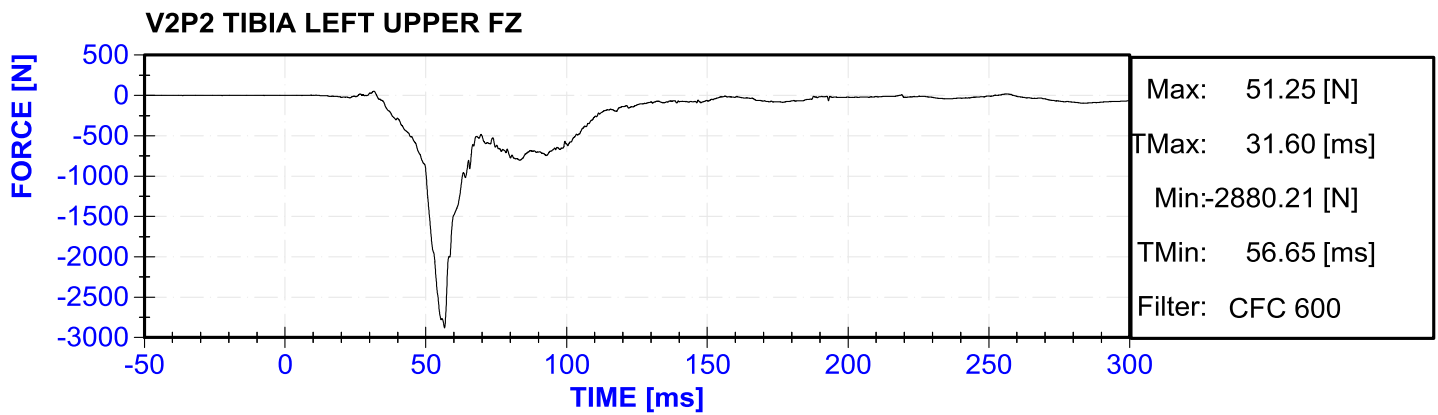
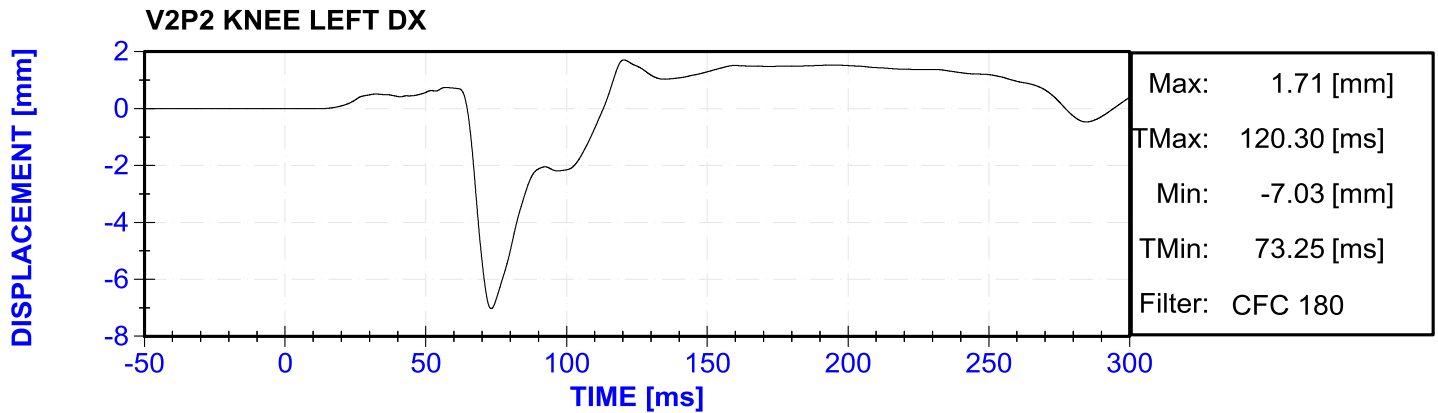
V2P2 RIGHT ASIS FX

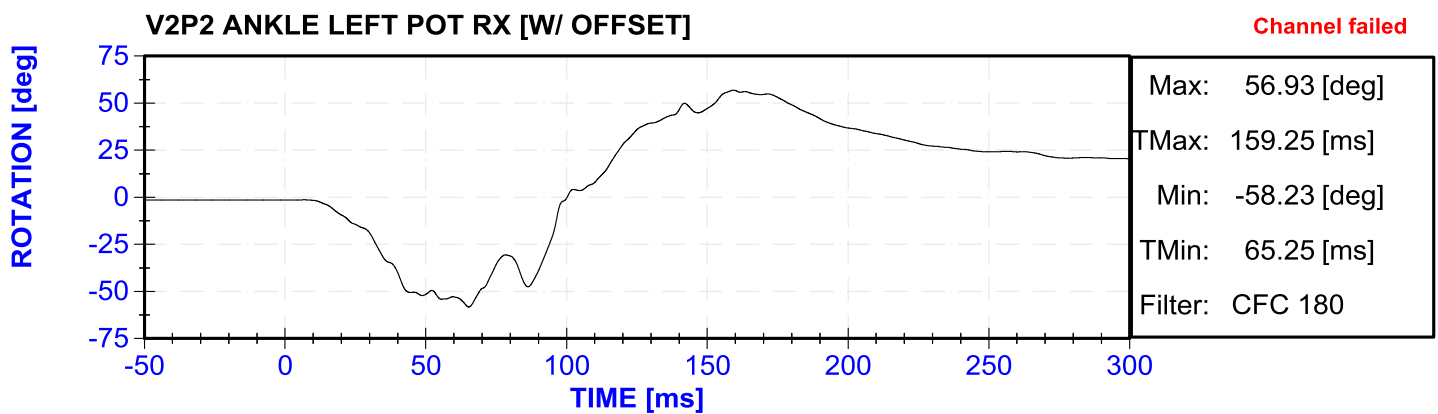
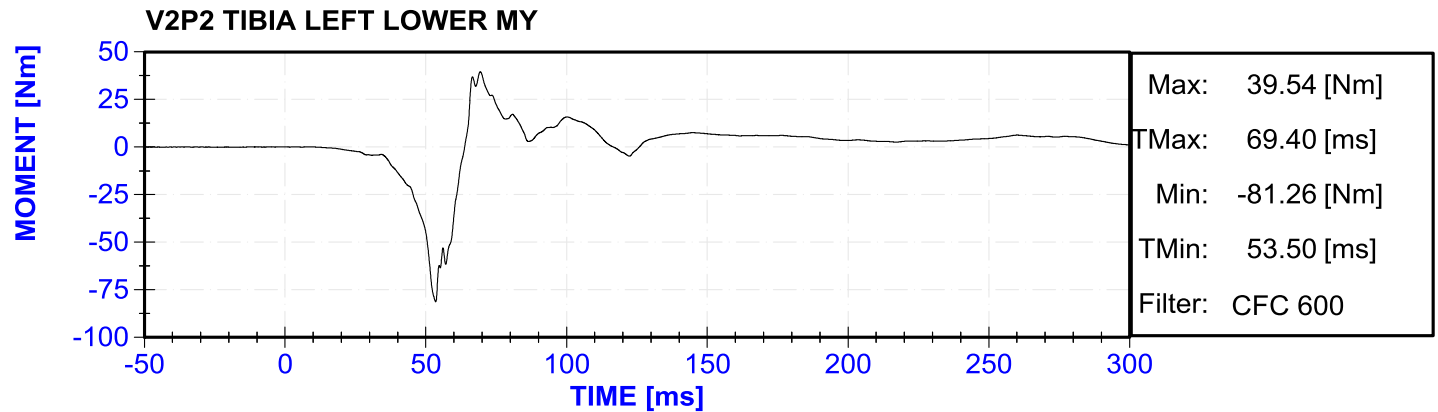
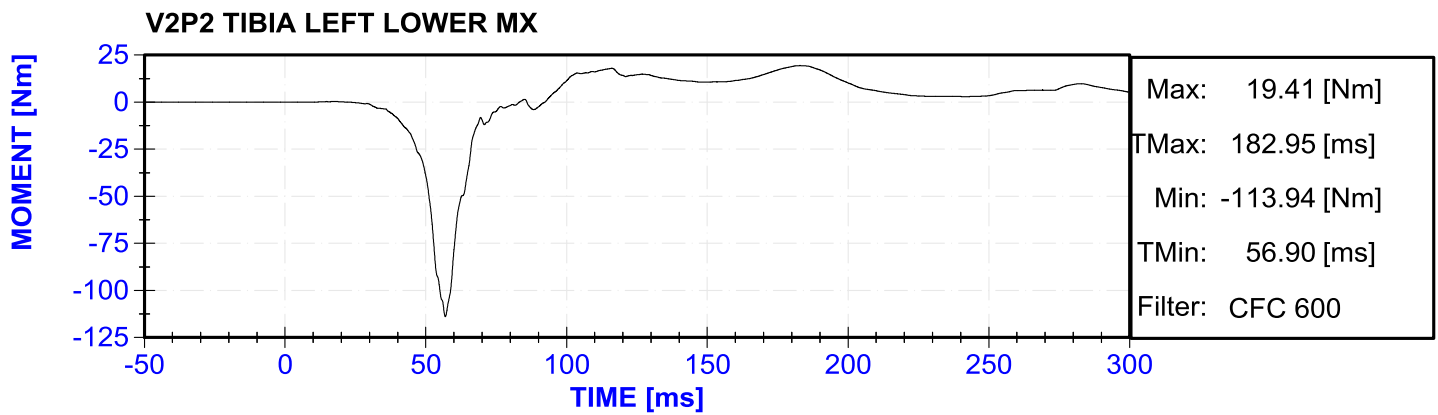
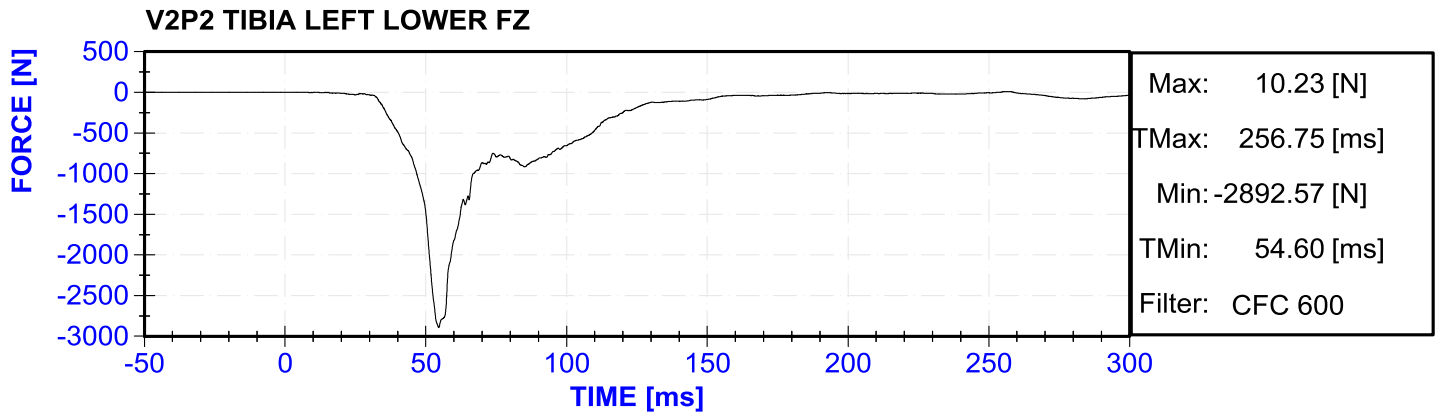


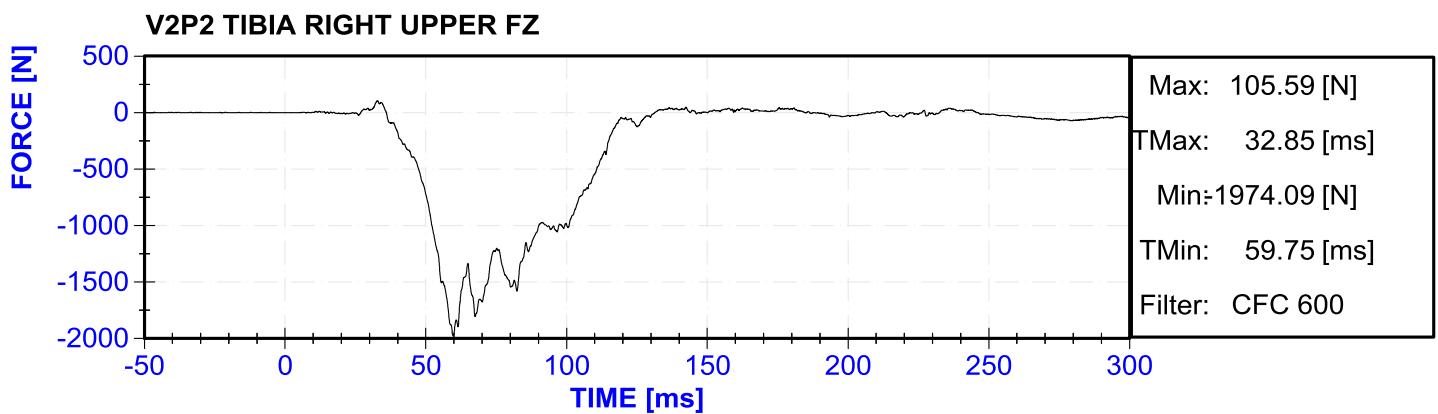
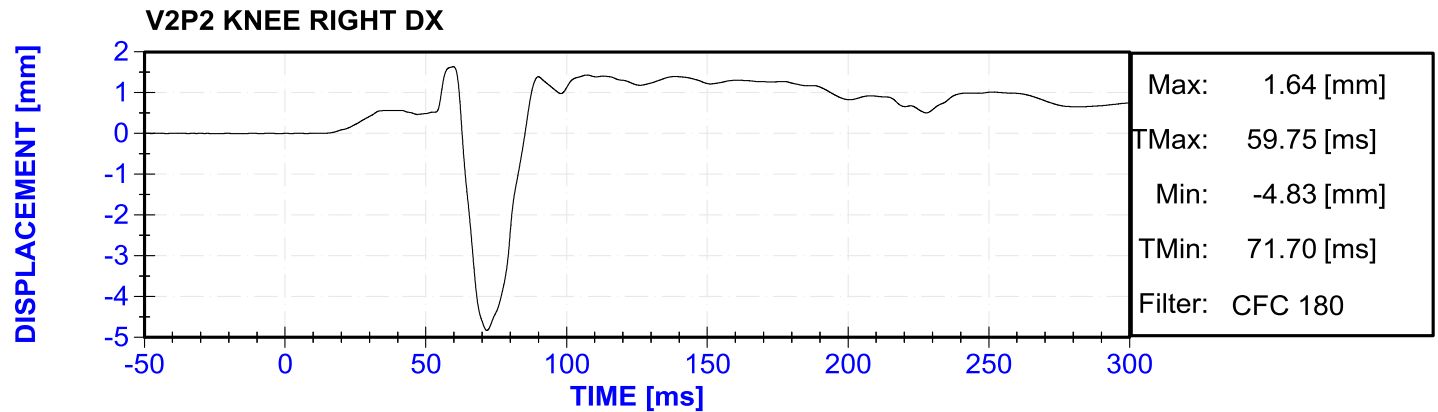
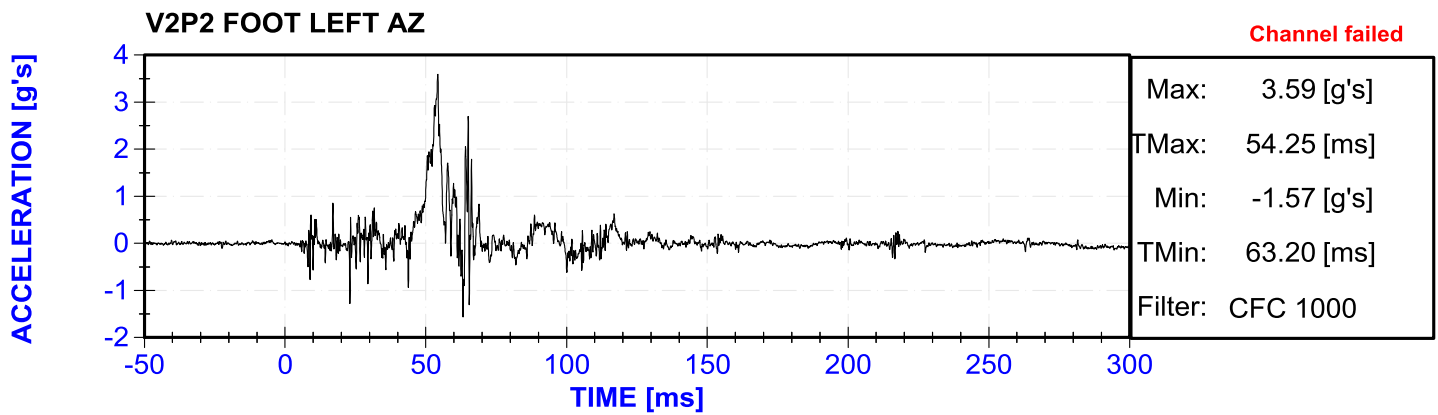
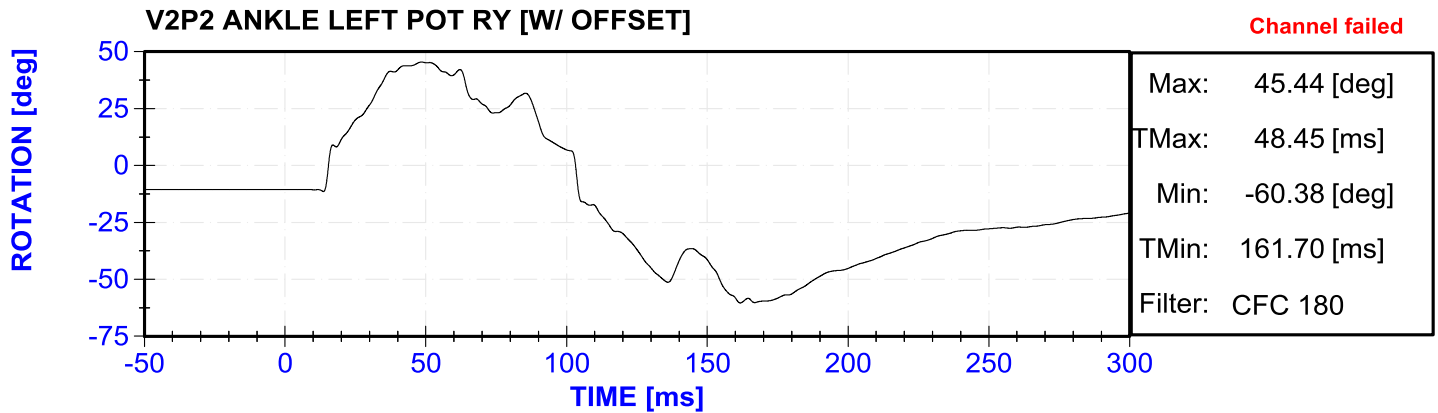


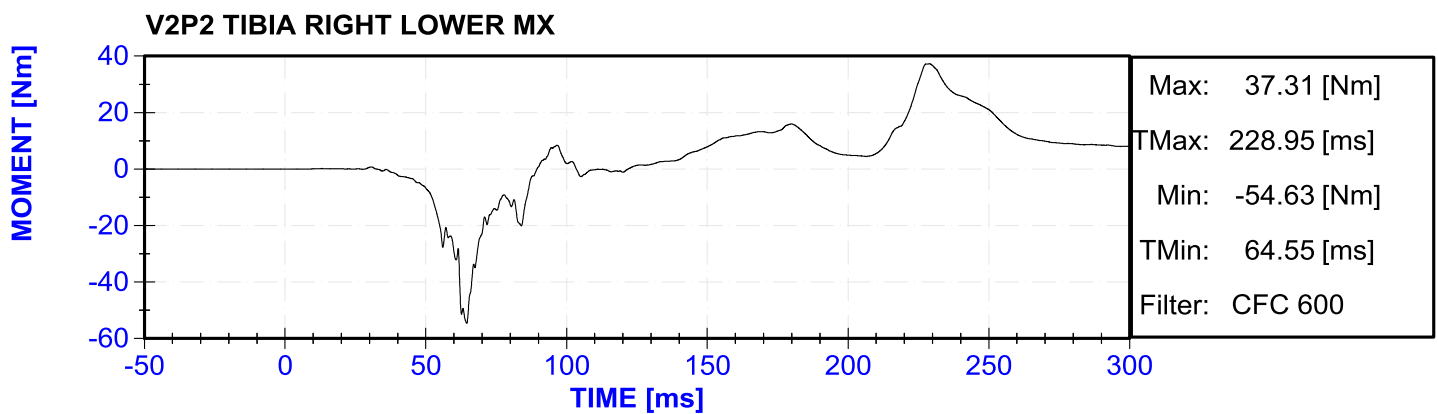
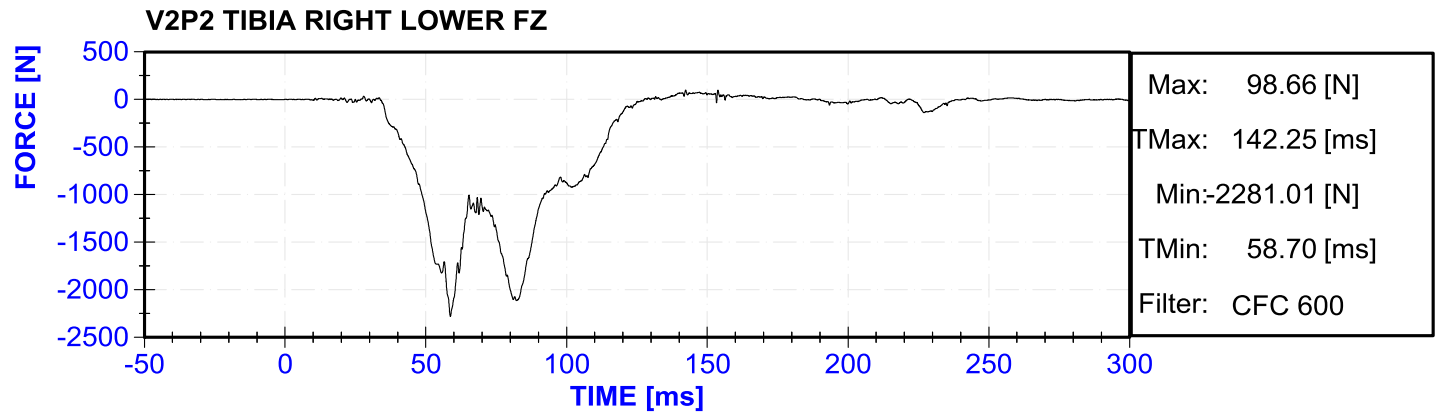
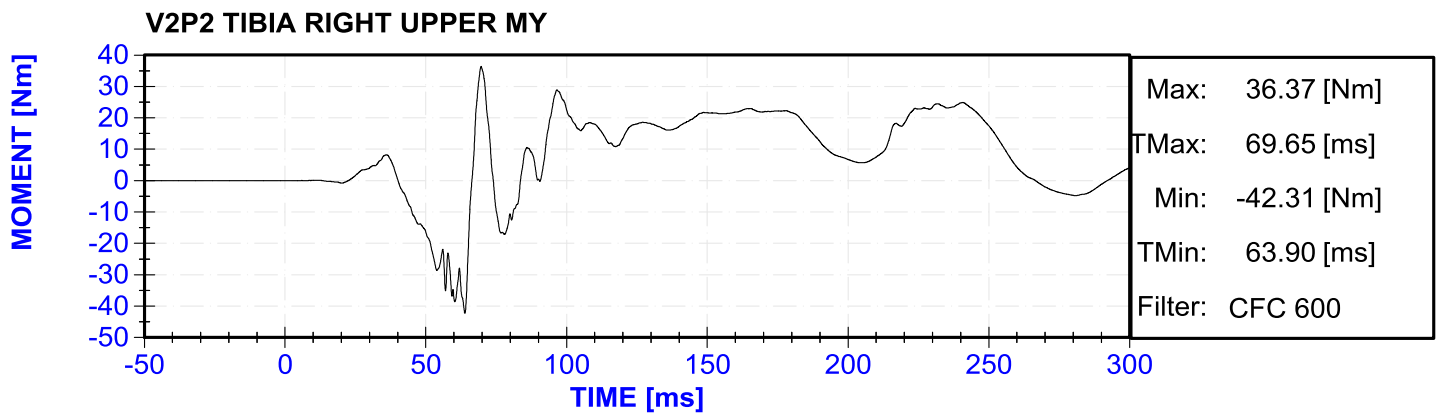
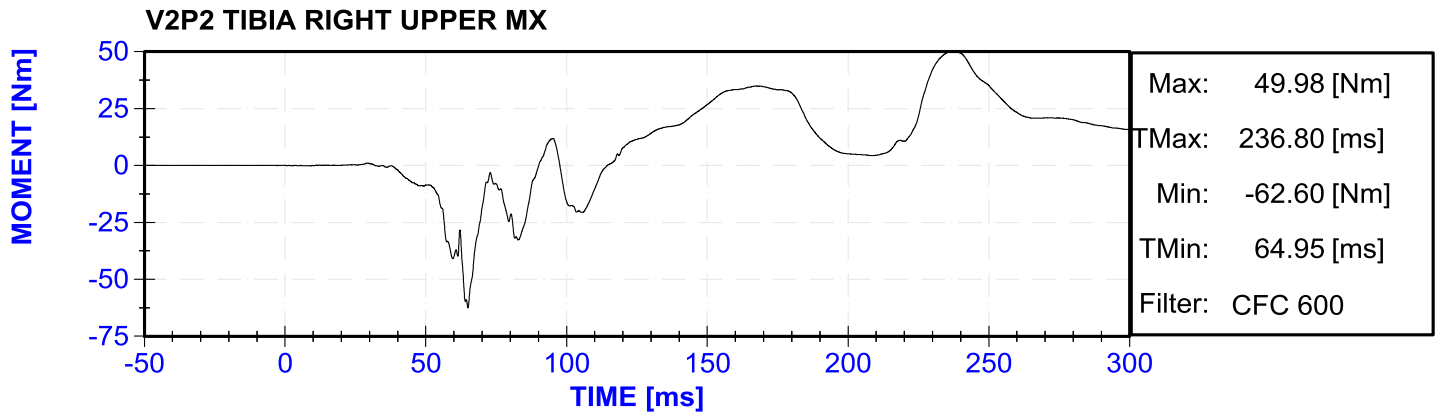


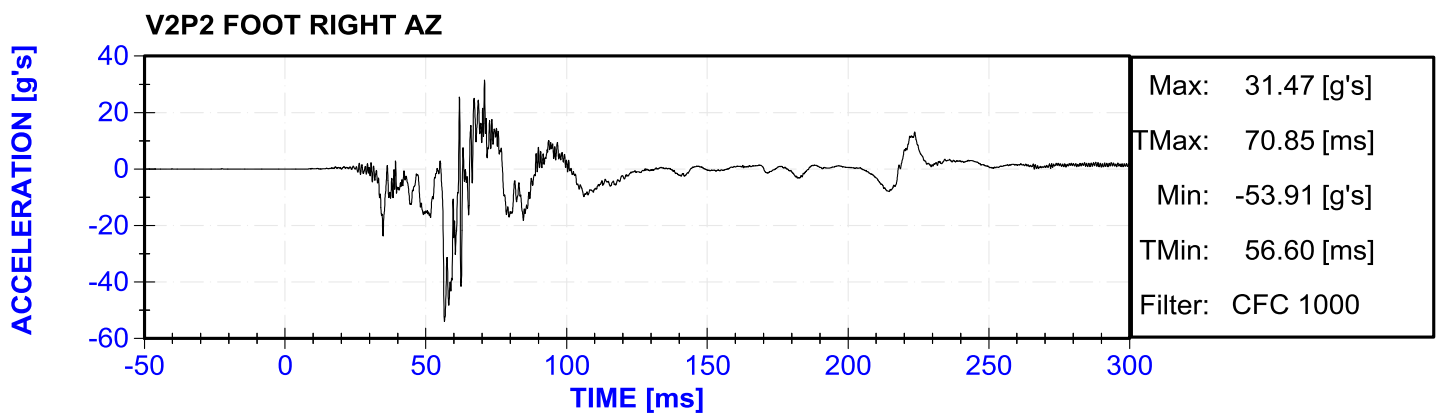
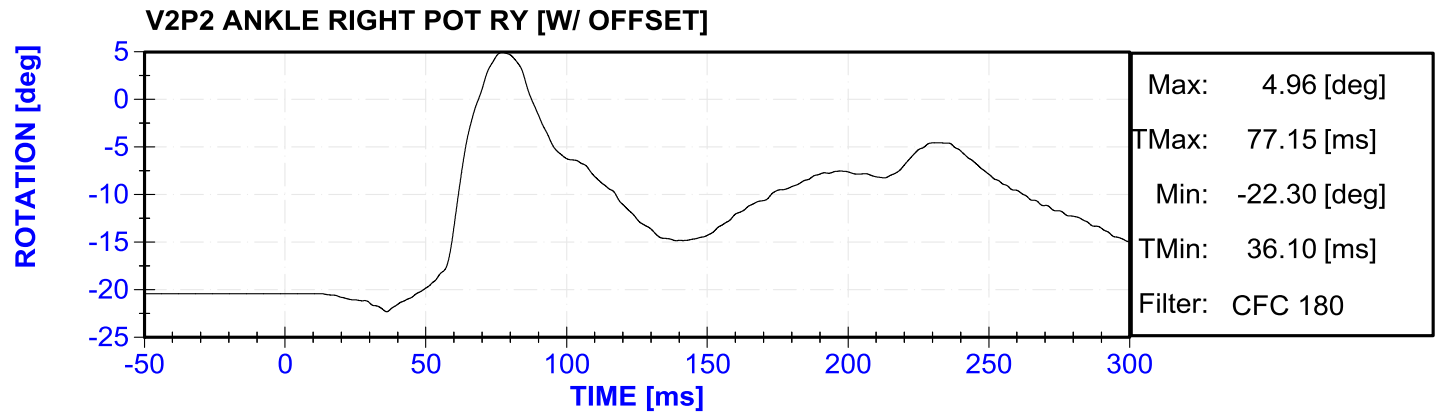
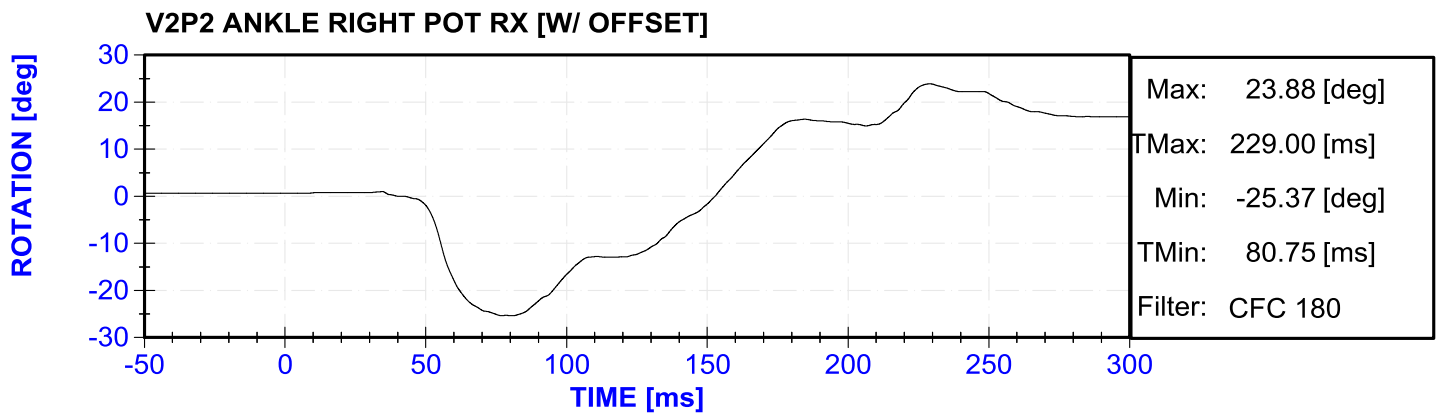
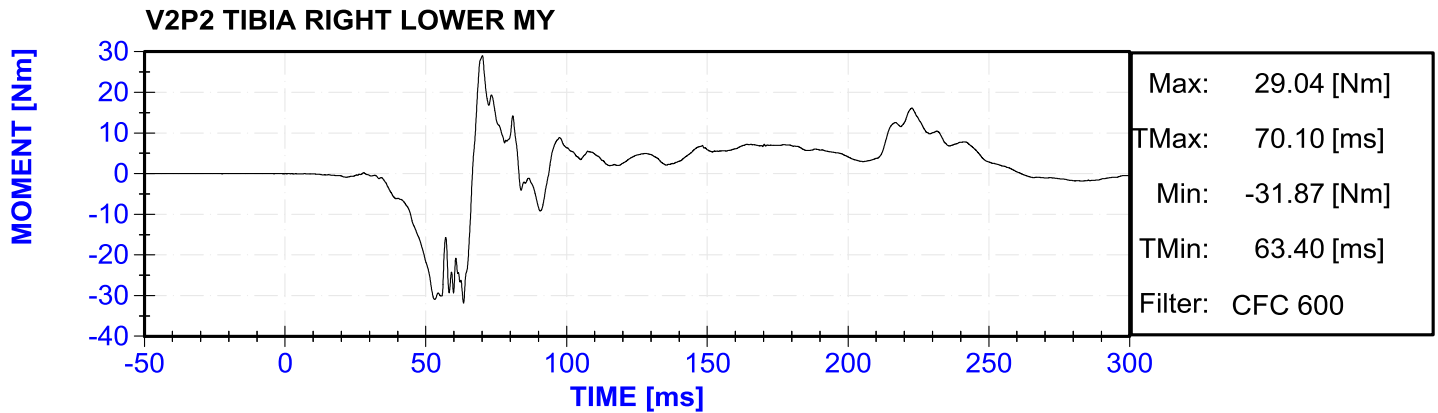




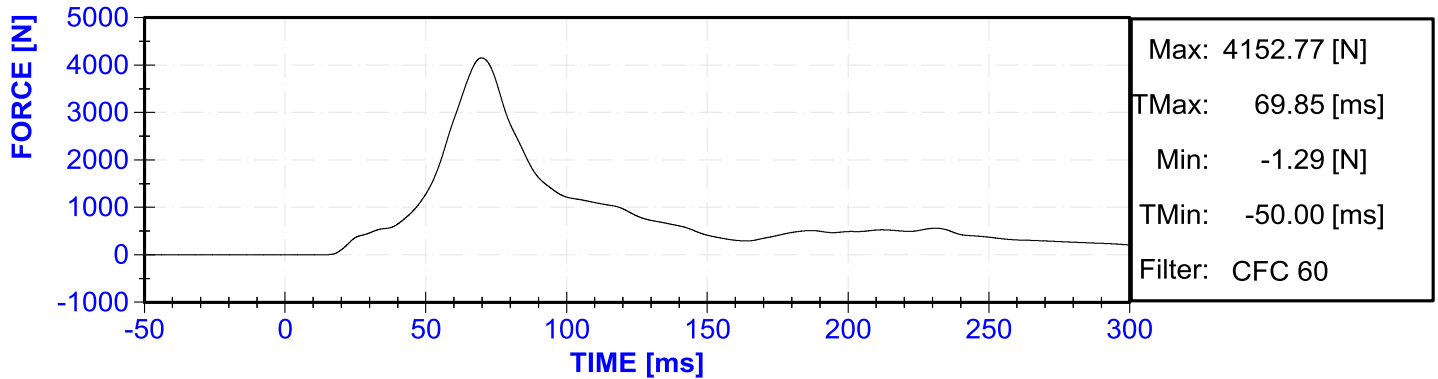




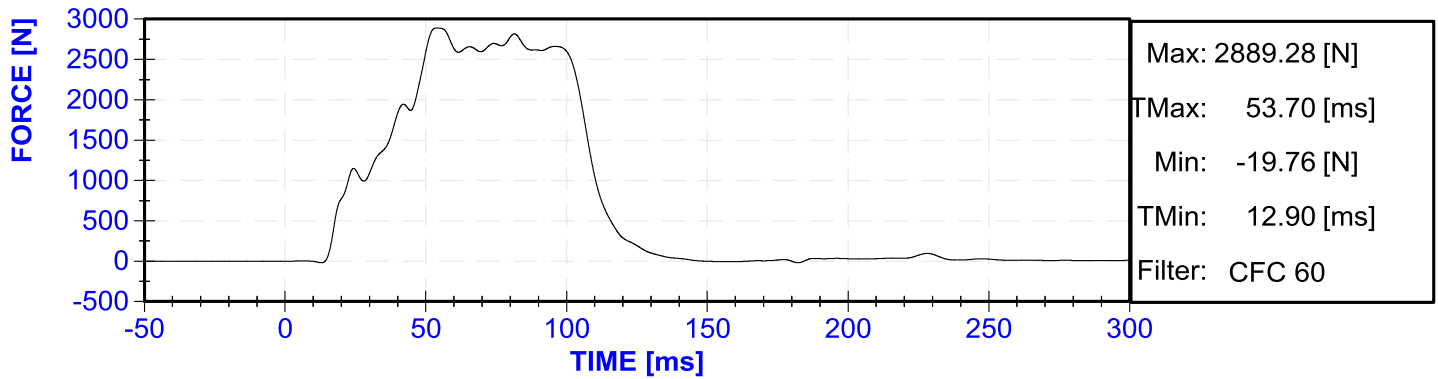




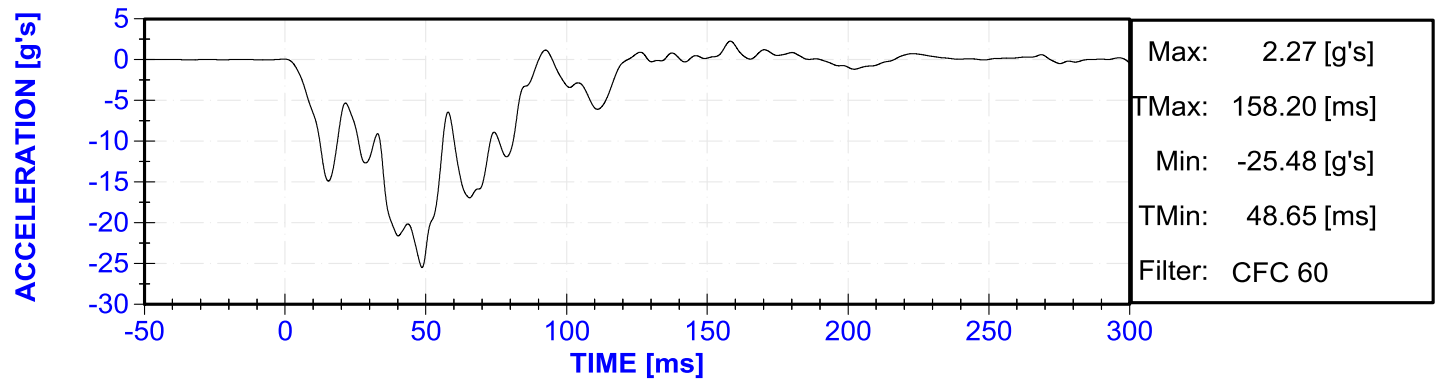
V2 P2 PASSENGER LAP BELT



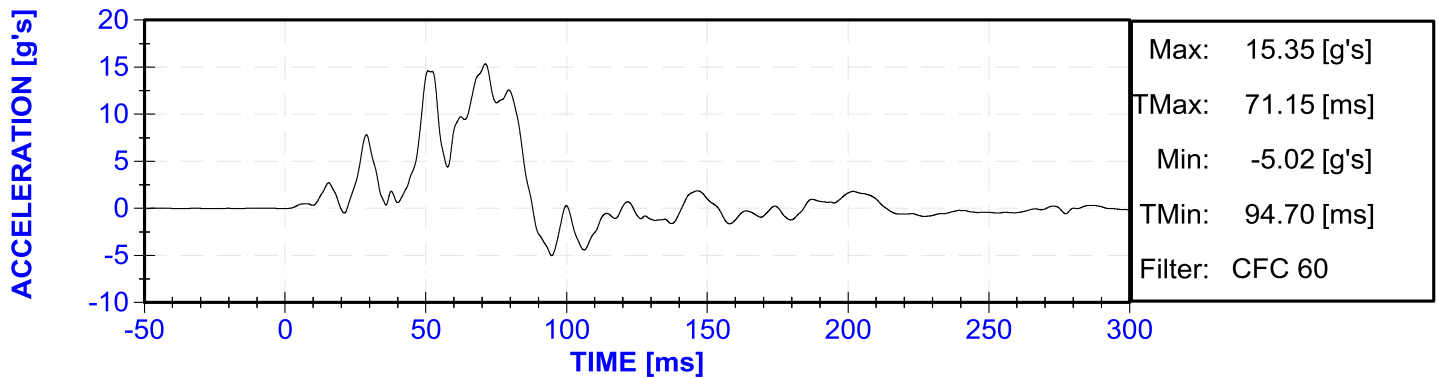
V2 P2 PASSENGER SHOULDER BELT

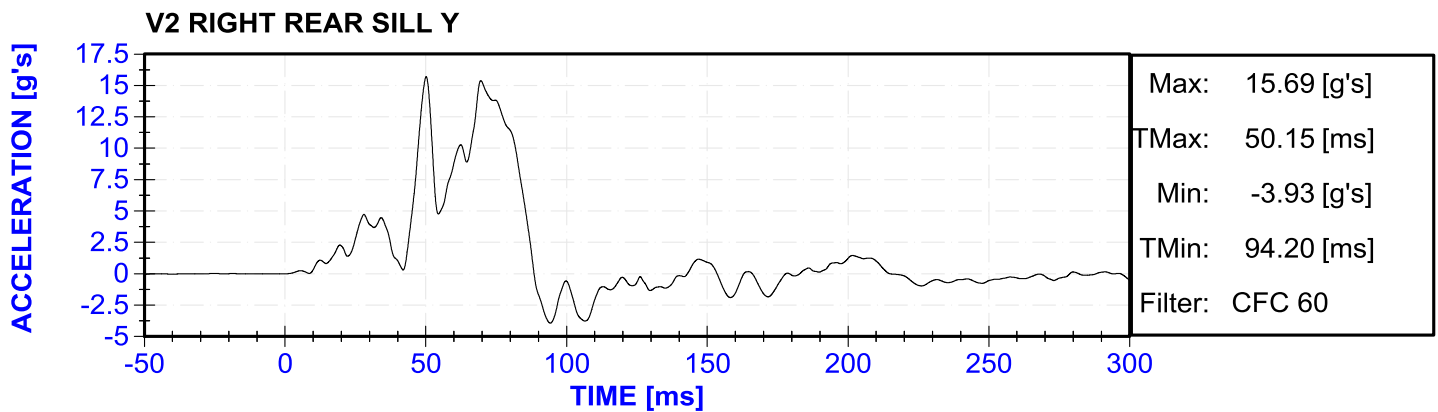
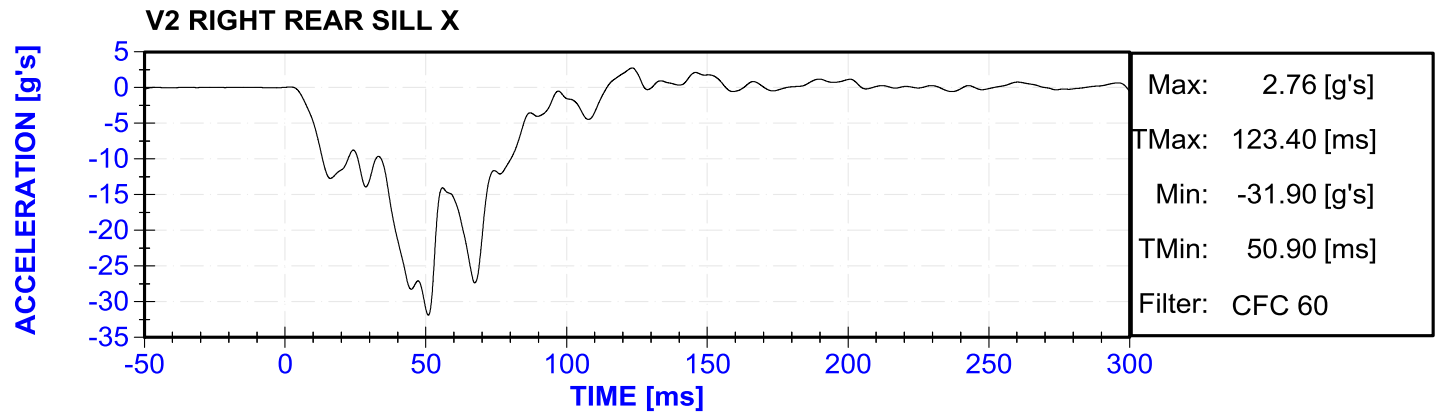
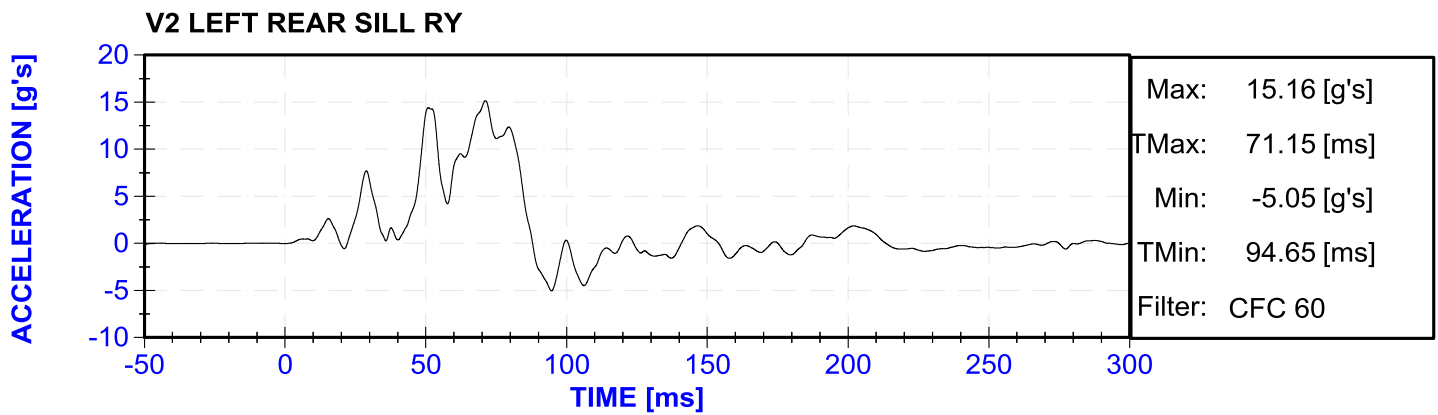
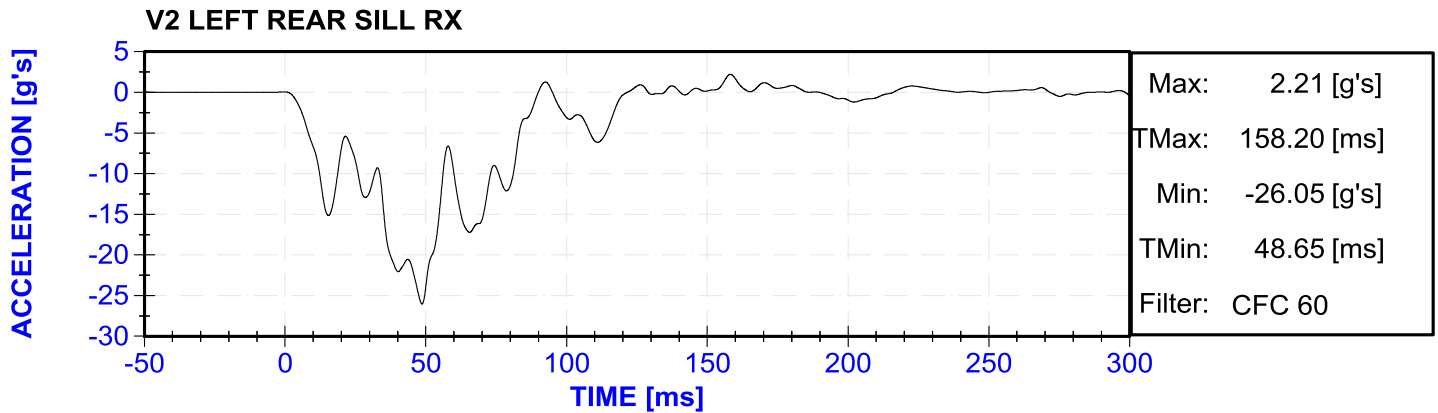


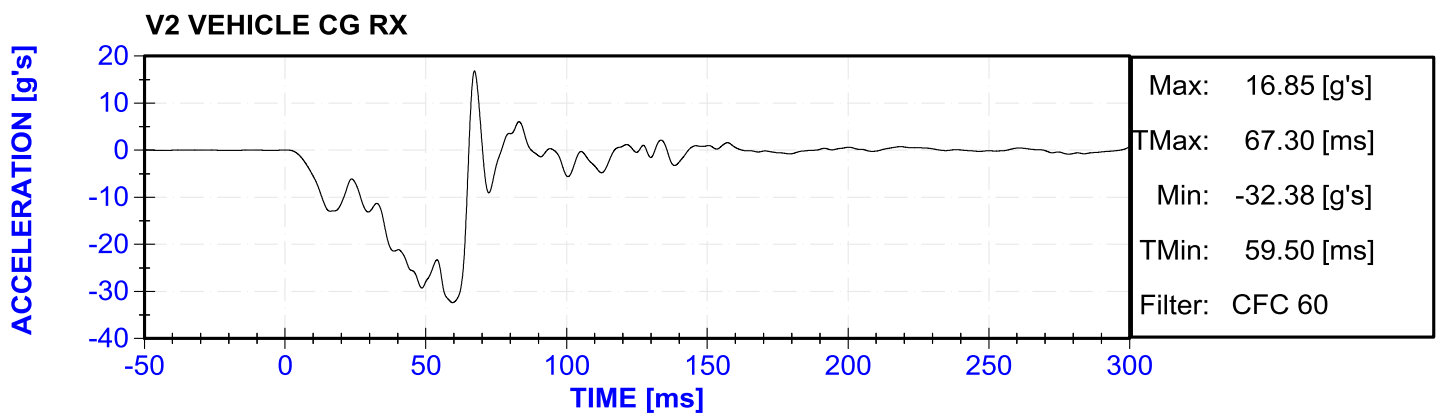
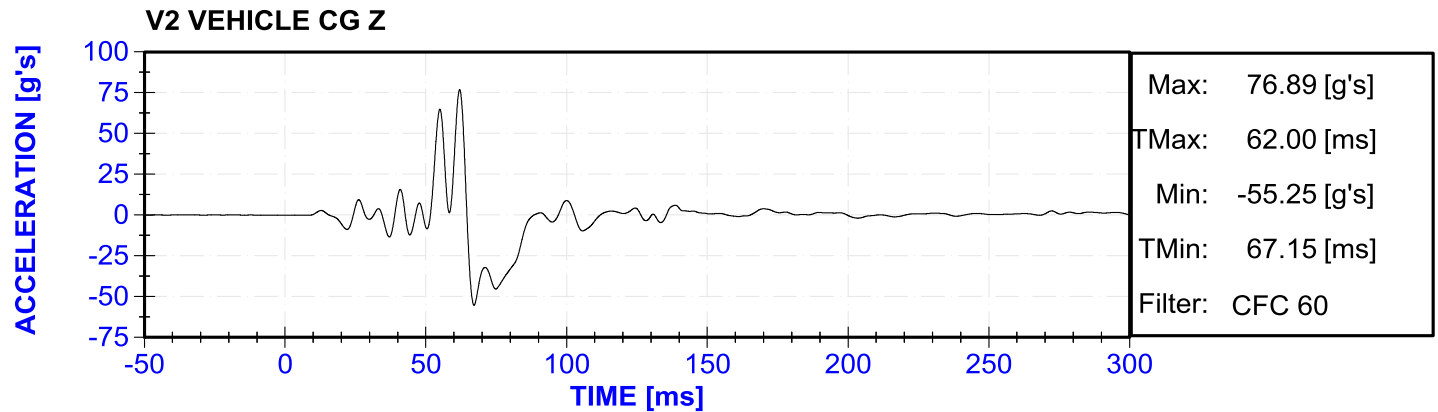
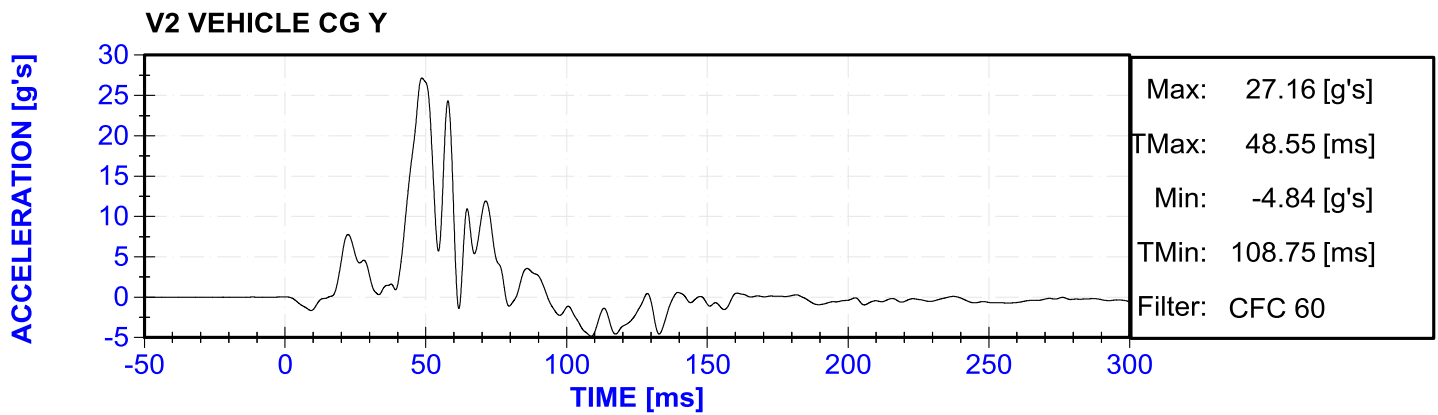
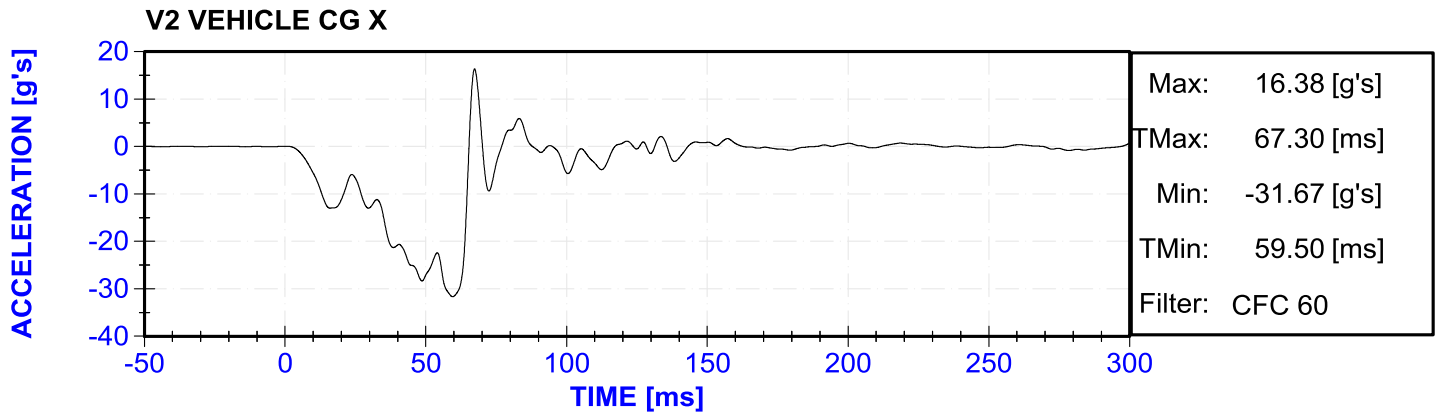
V2 LEFT REAR SILL X

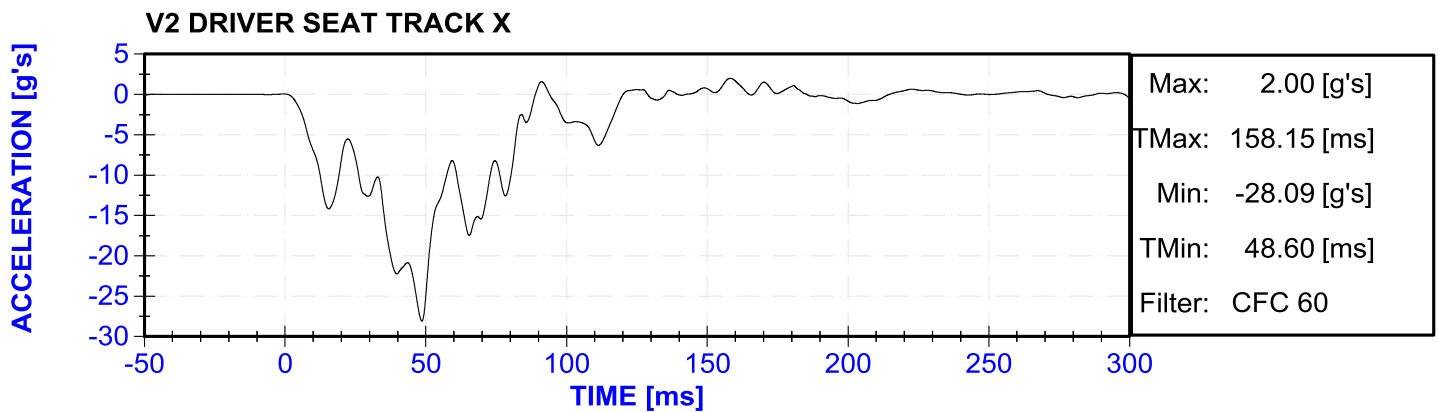
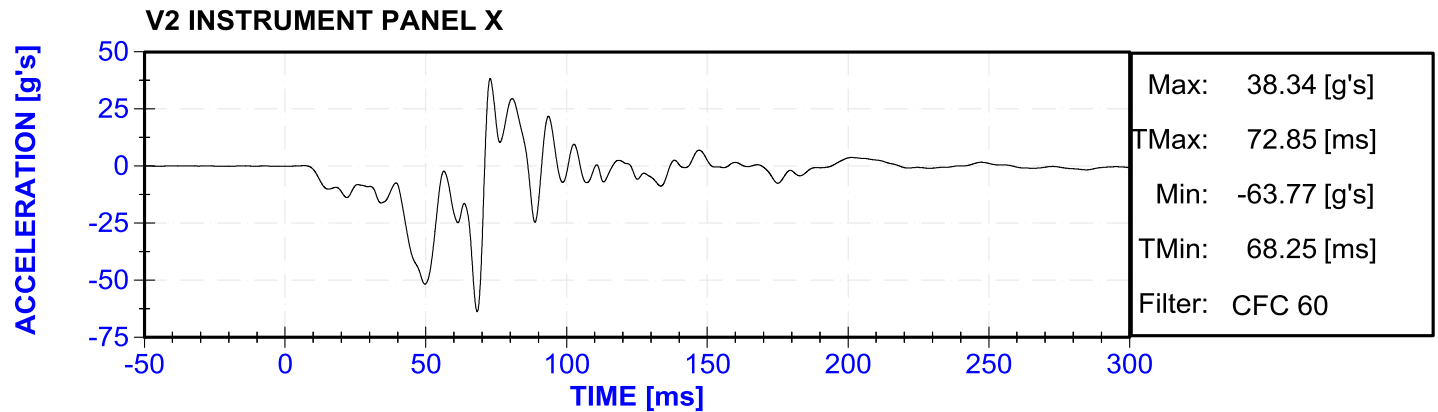
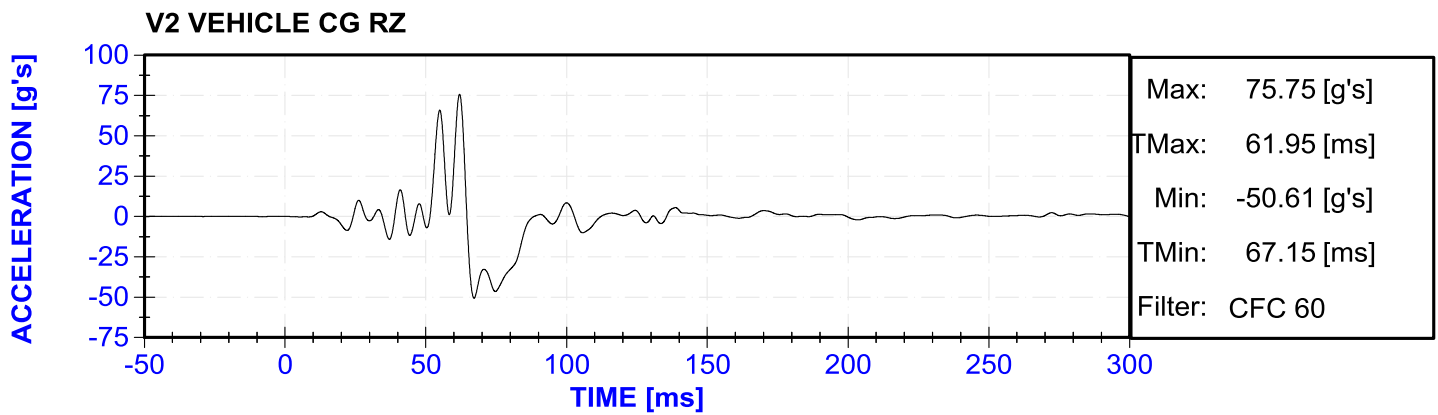
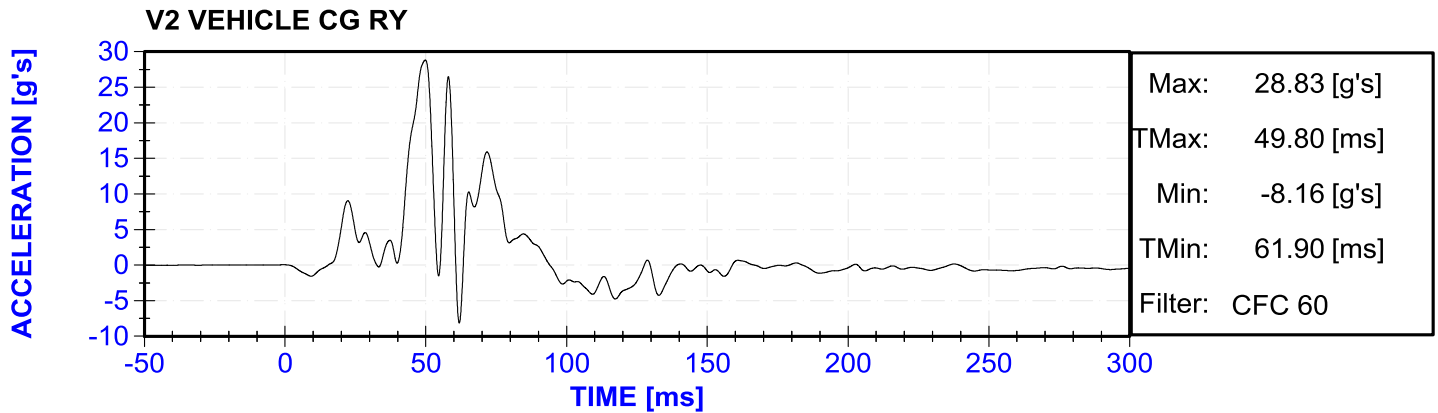


V2 LEFT REAR SILL Y

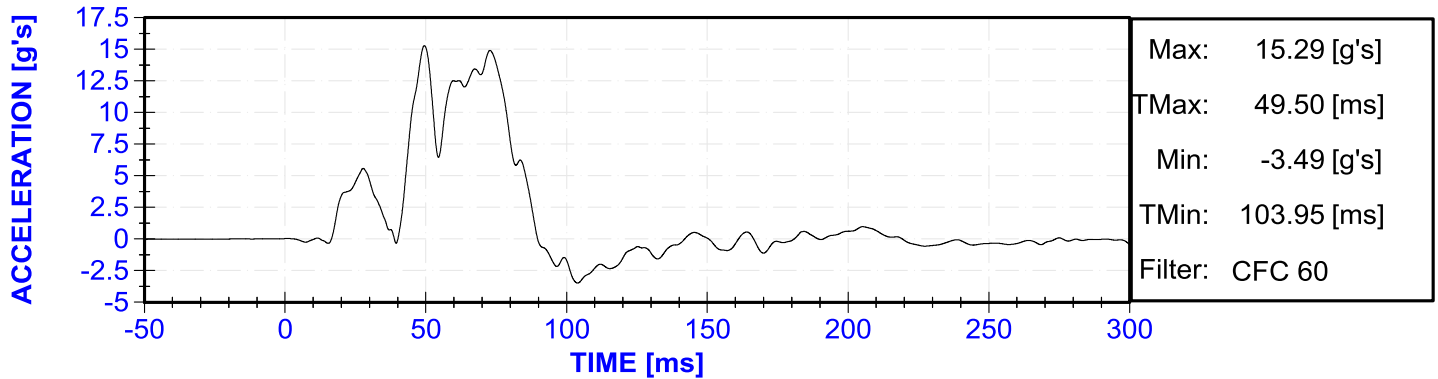




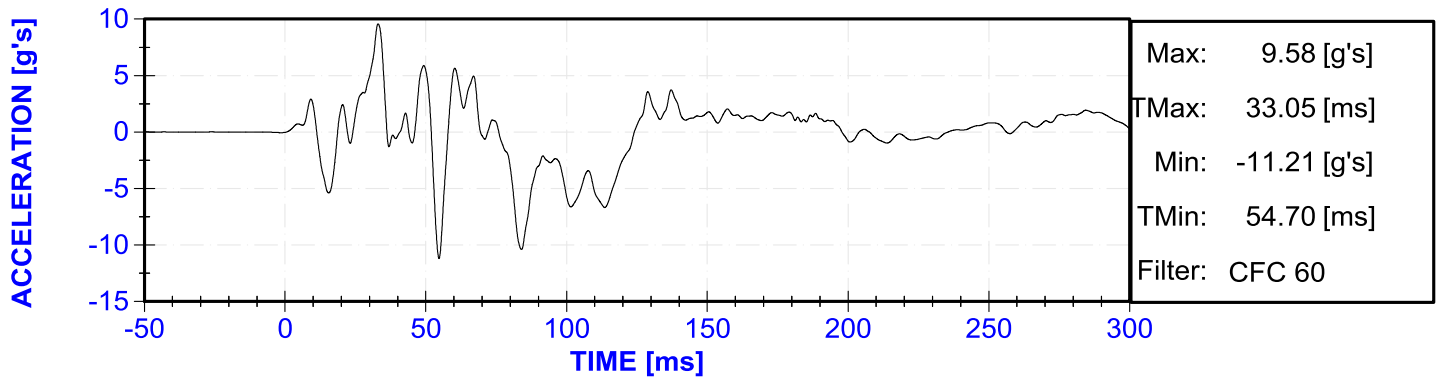




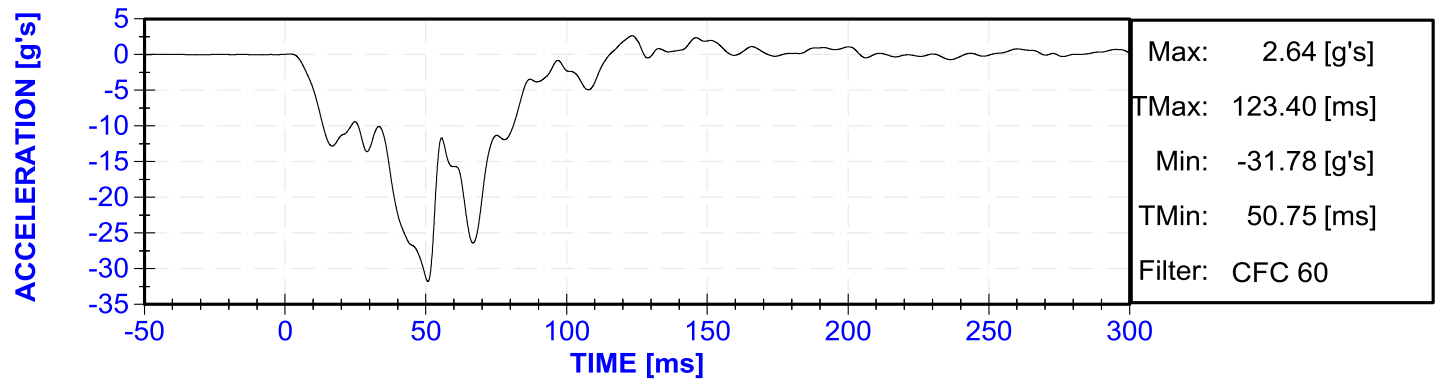
V2 DRIVER SEAT TRACK Y



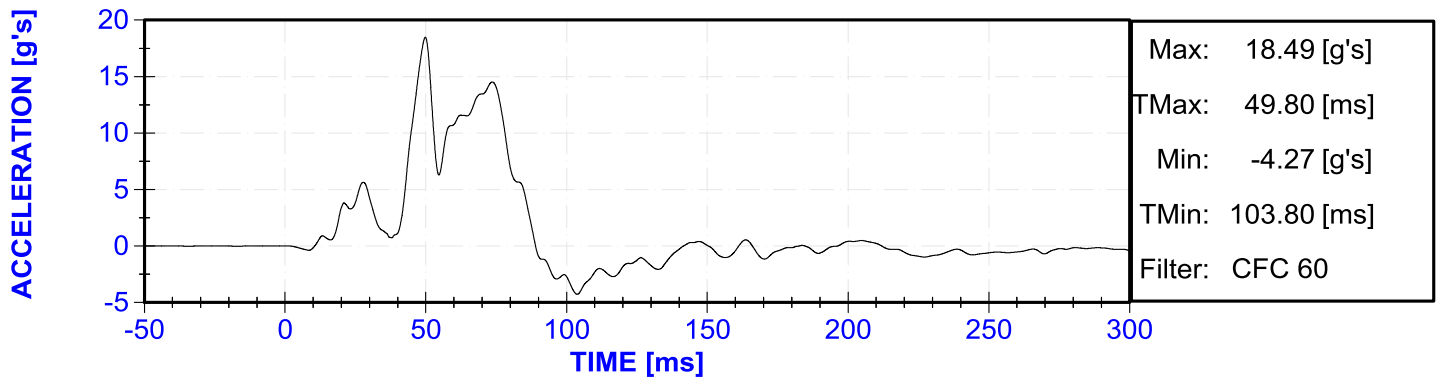
V2 DRIVER SEAT TRACK Z

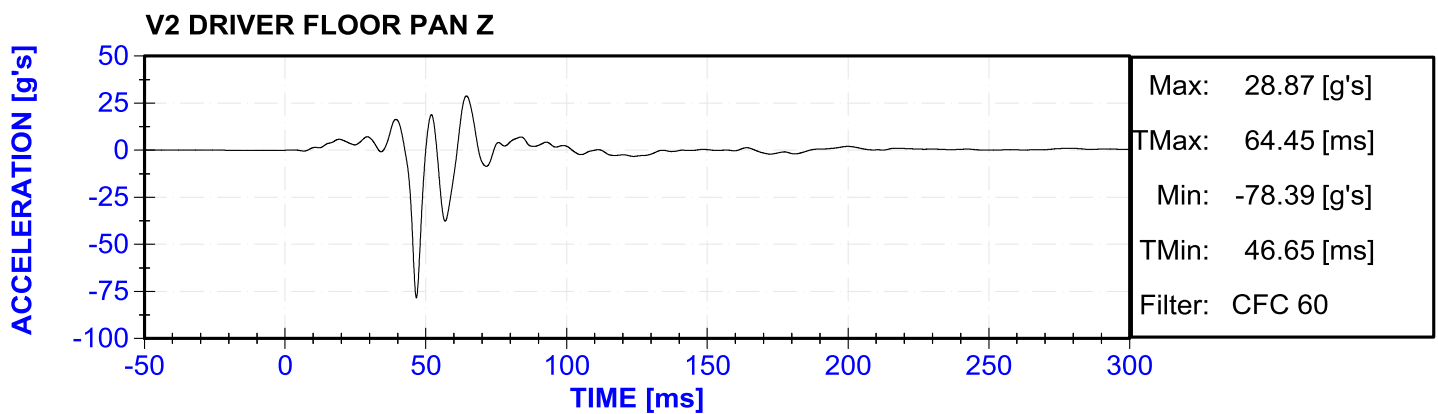
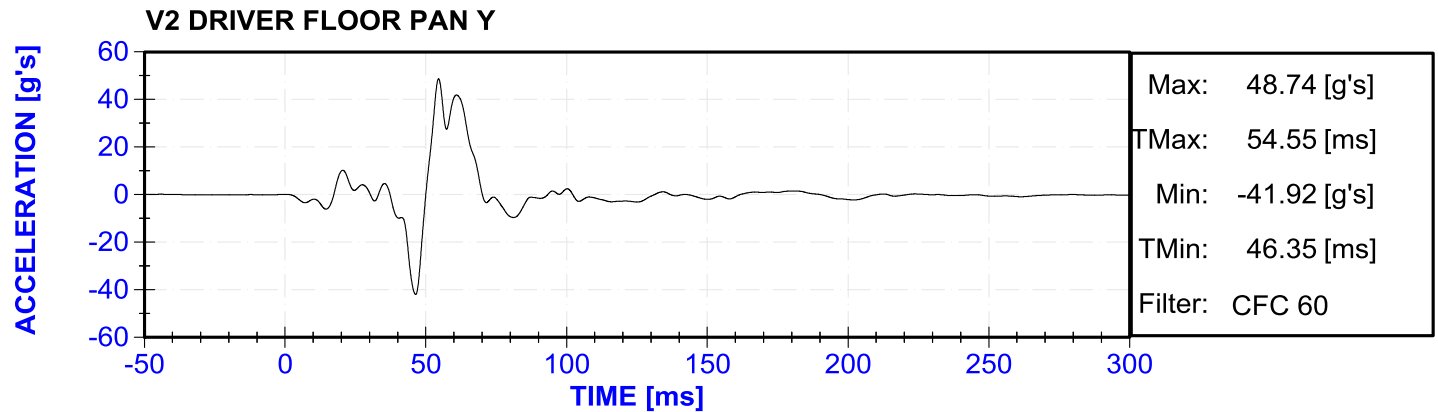
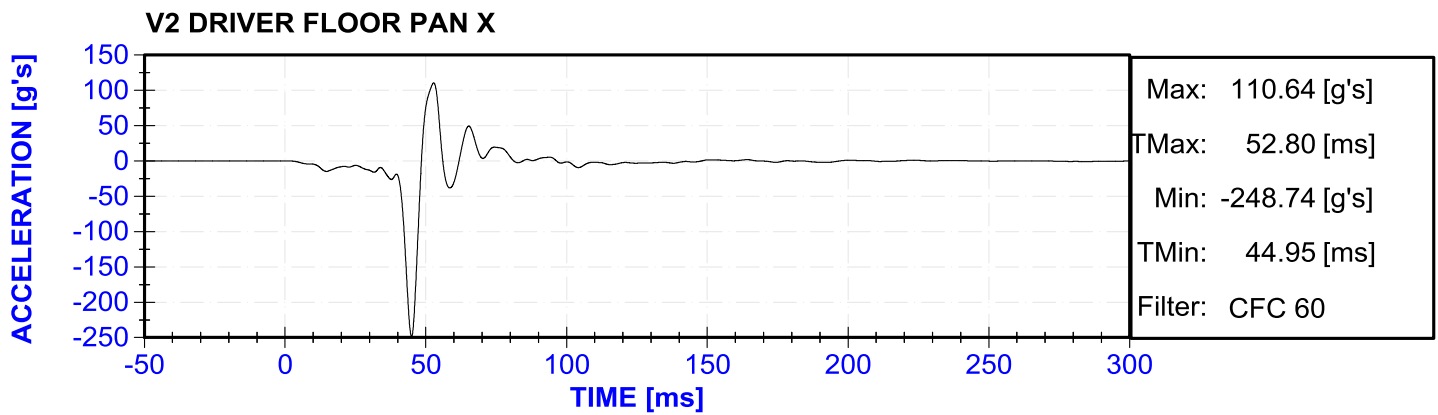
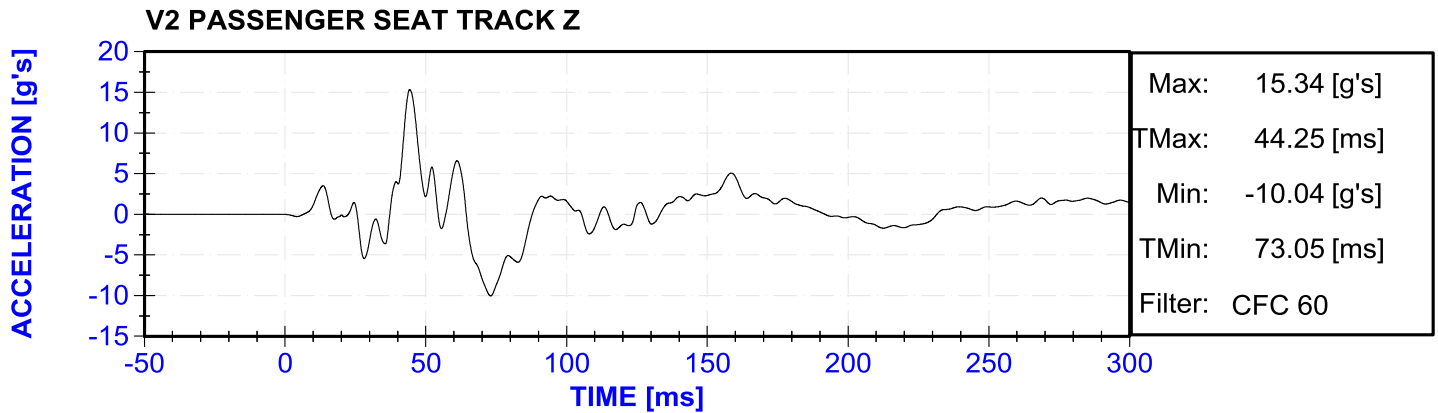


V2 PASSENGER SEAT TRACK X

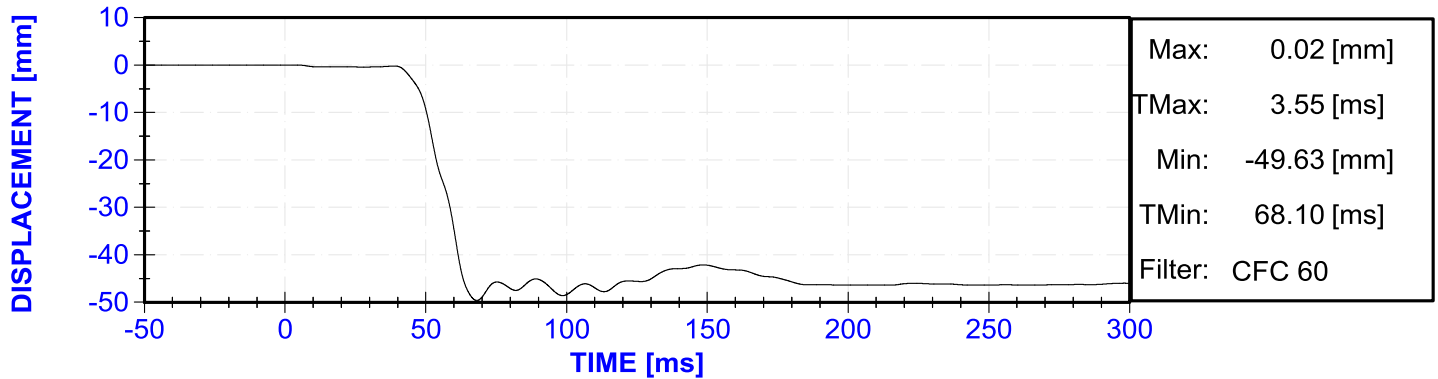


V2 PASSENGER SEAT TRACK Y

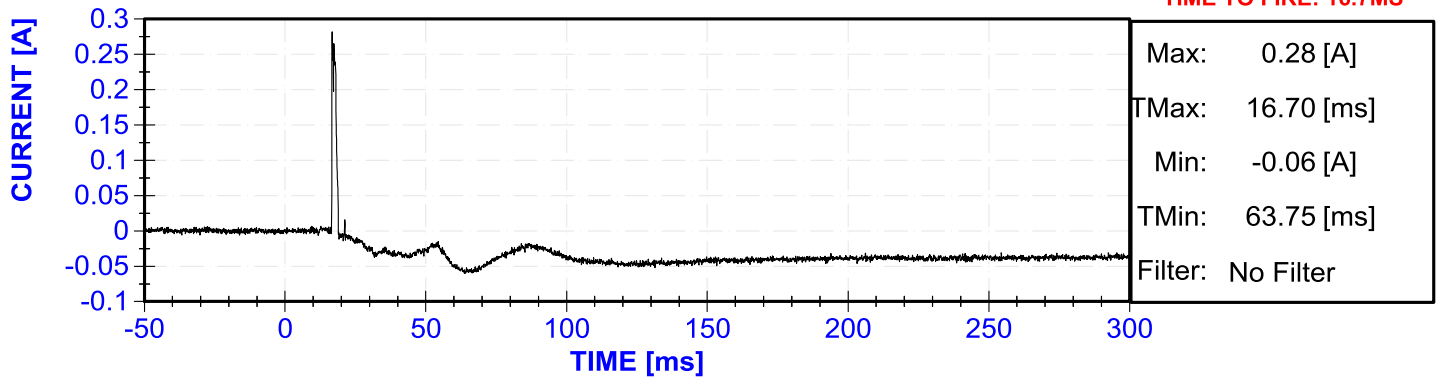




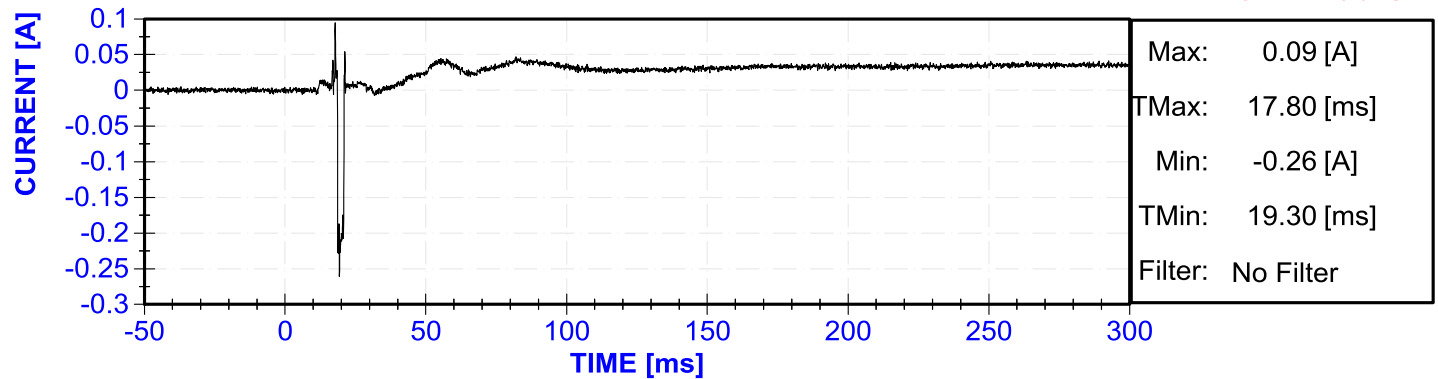
V2 DRIVER FLOOR PAN STRING POT



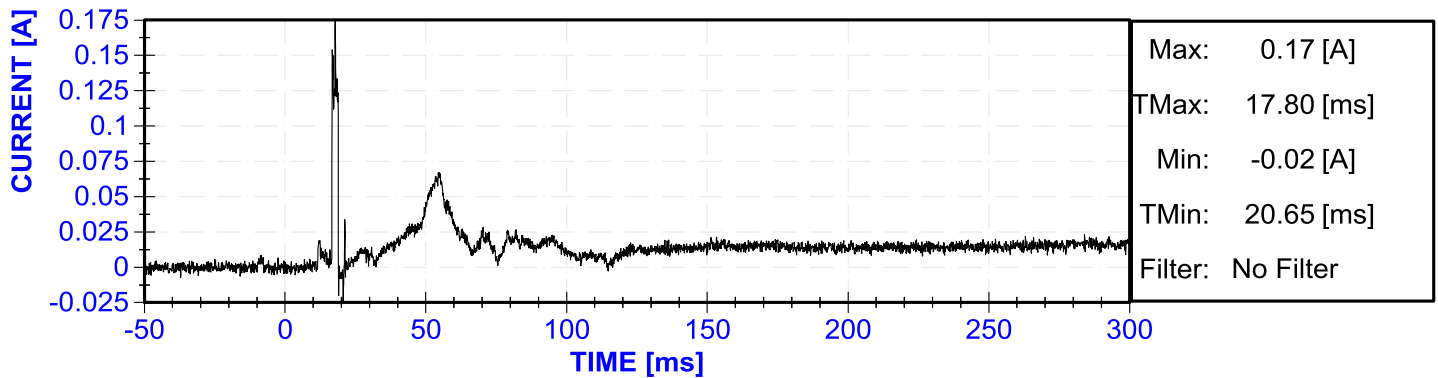
V2 DRIVER SW AIRBAG STAGE 1

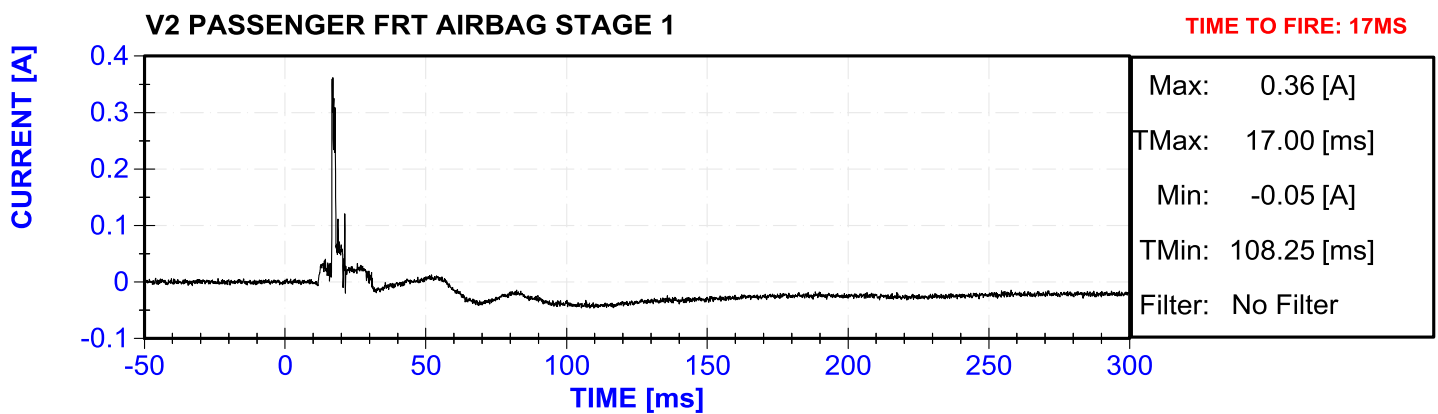
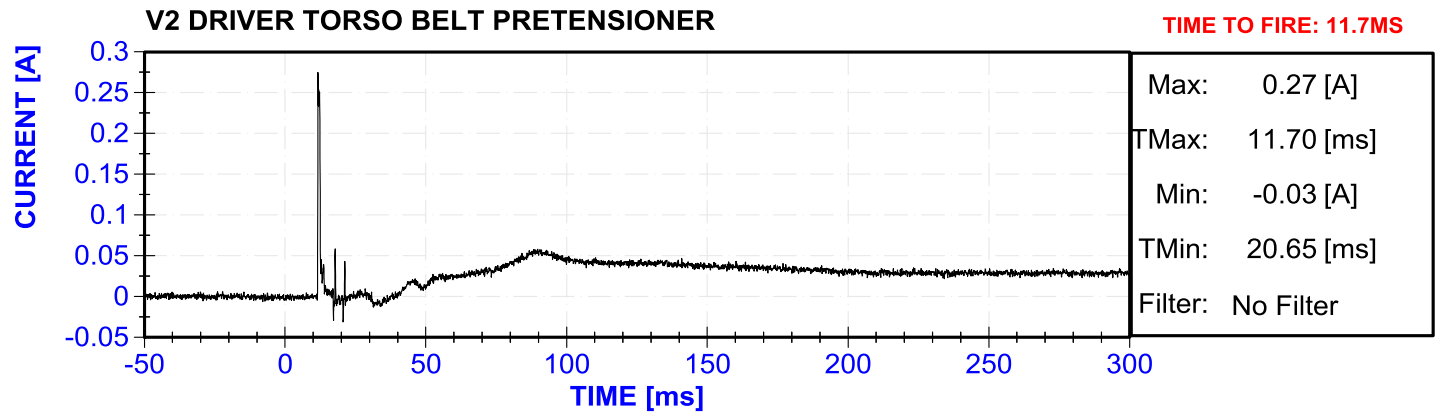
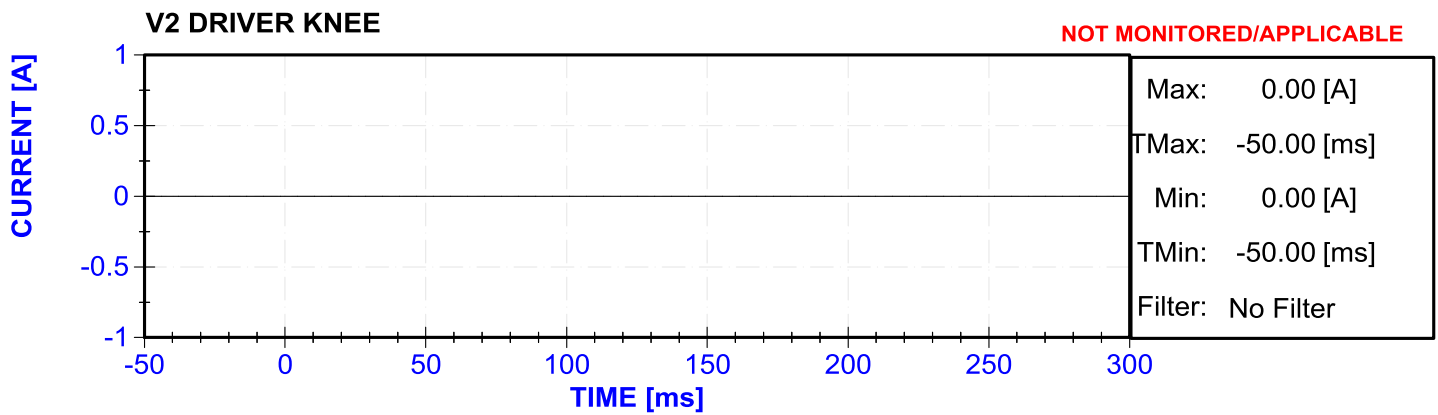
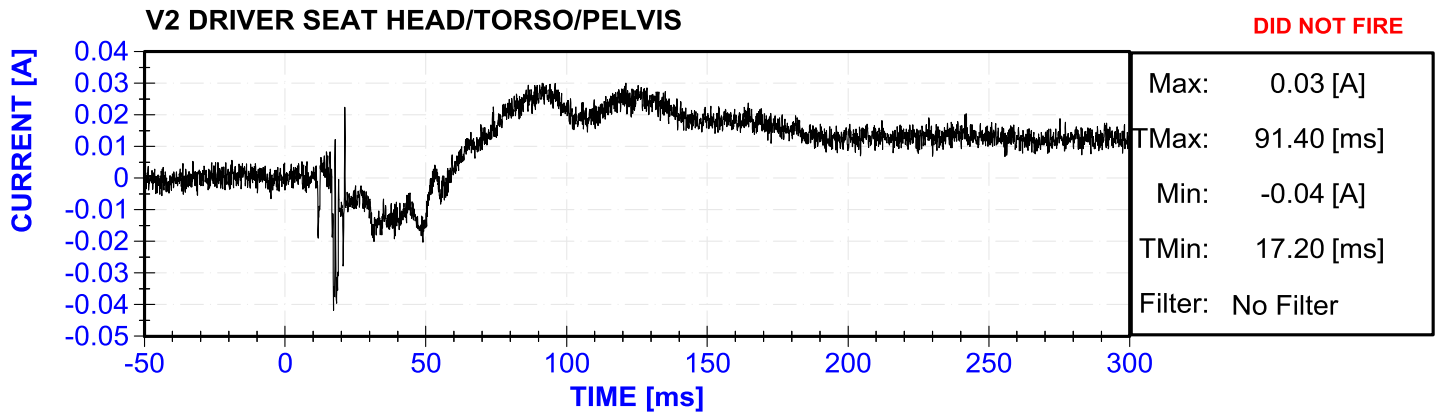


V2 DRIVER SW AIRBAG STAGE 2



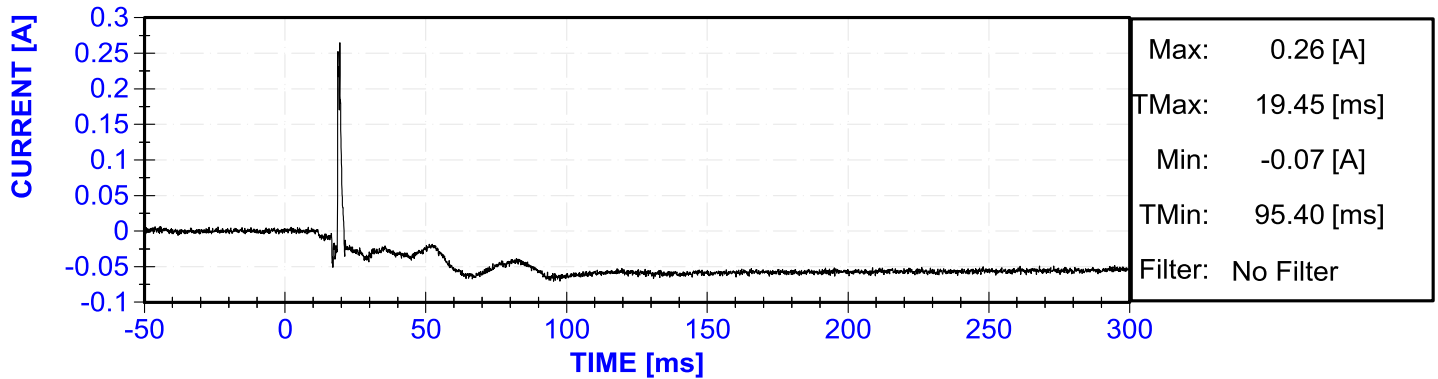
V2 DRIVER HEAD CURTAIN





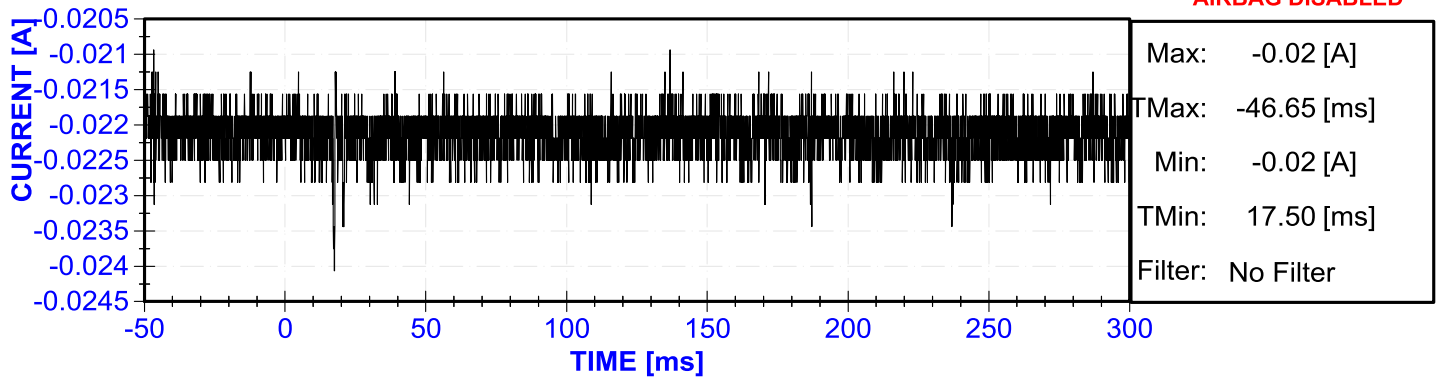
V2 PASSENGER FRT AIRBAG STAGE 2

TIME TO FIRE: 19.4MS



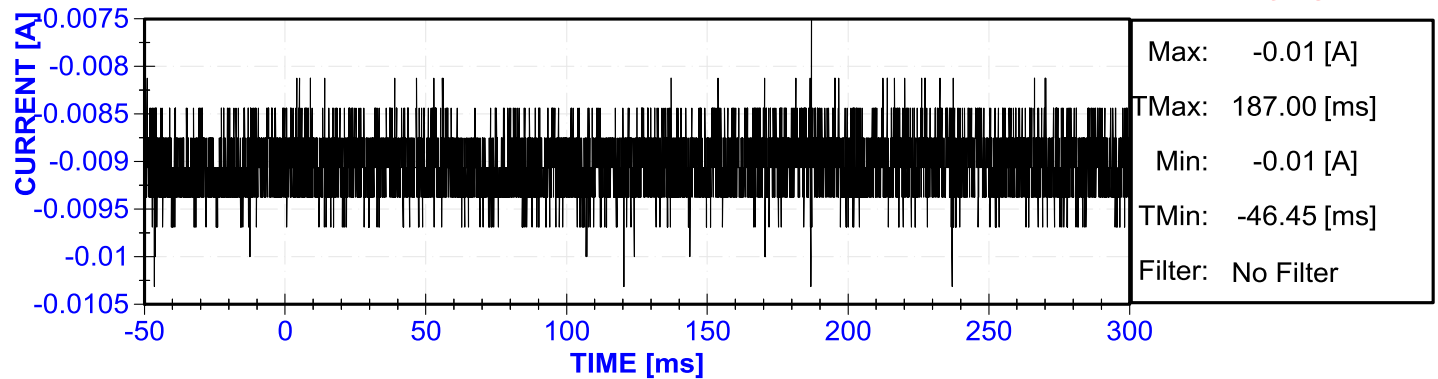
V2 PASSENGER HEAD CURTAIN

AIRBAG DISABLED



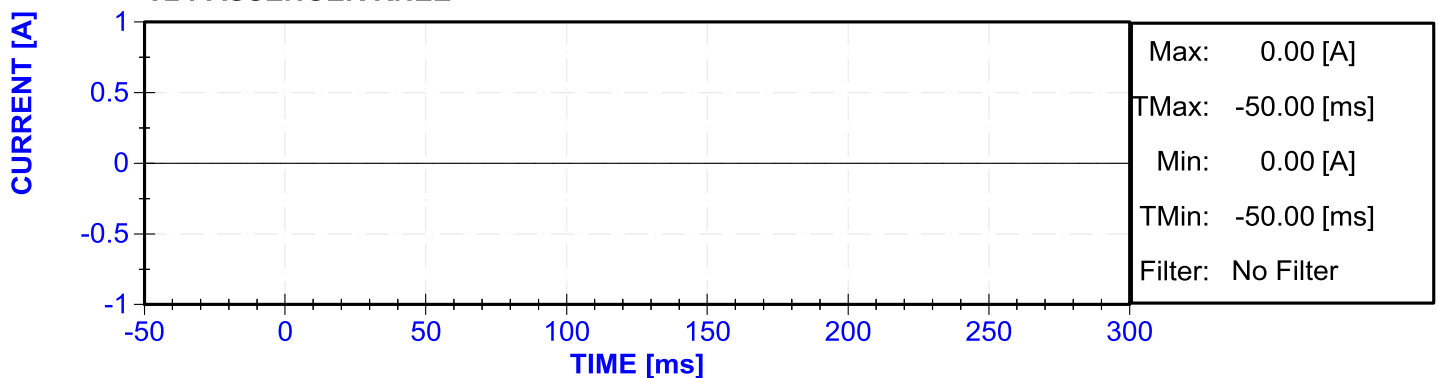
V2 PASSENGER HEAD/TORSO/PELVIS

AIRBAG DISABLED



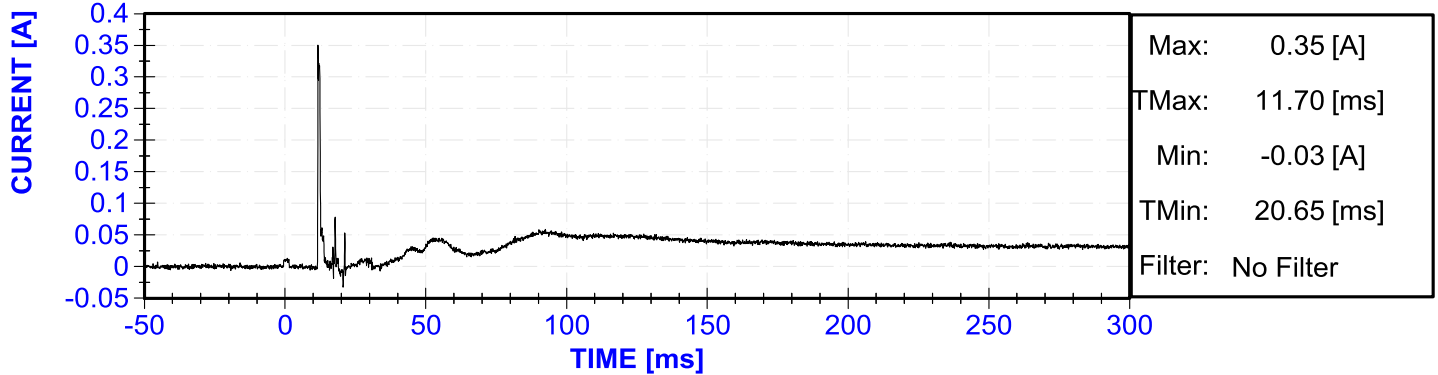
V2 PASSENGER KNEE

NOT MONITORED/APPLICABLE

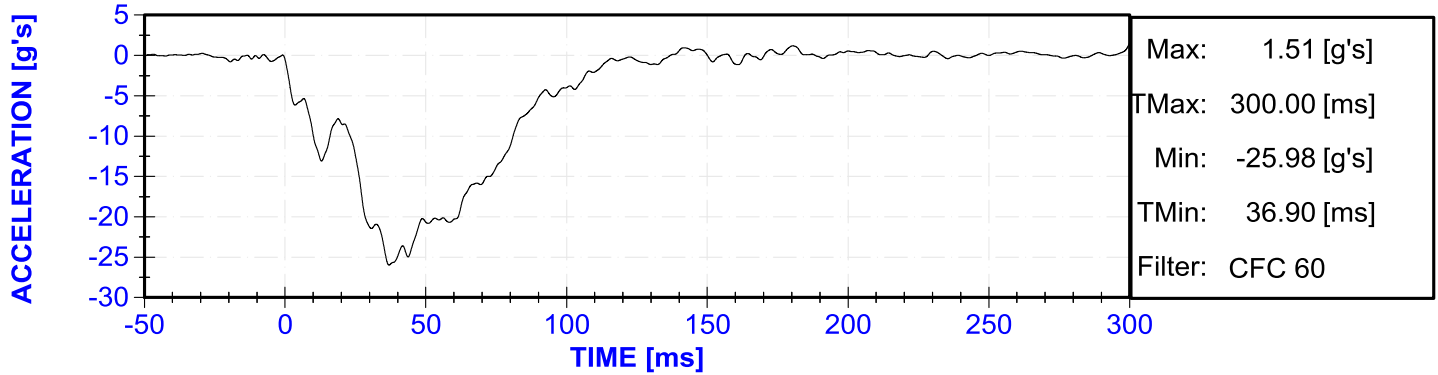


V2 PASSENGER TORSO BELT PRETENSIONER

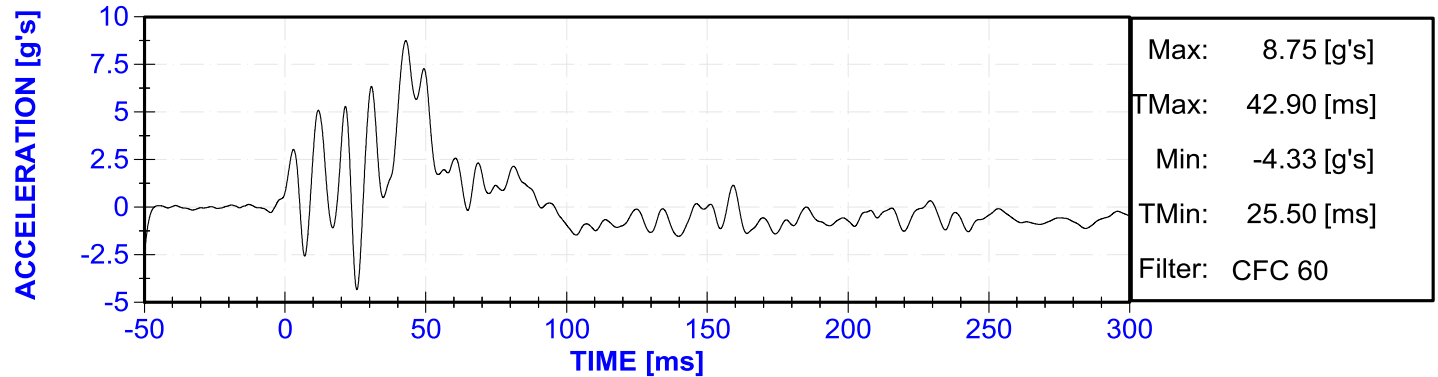
TIME TO FIRE: 11.7MS



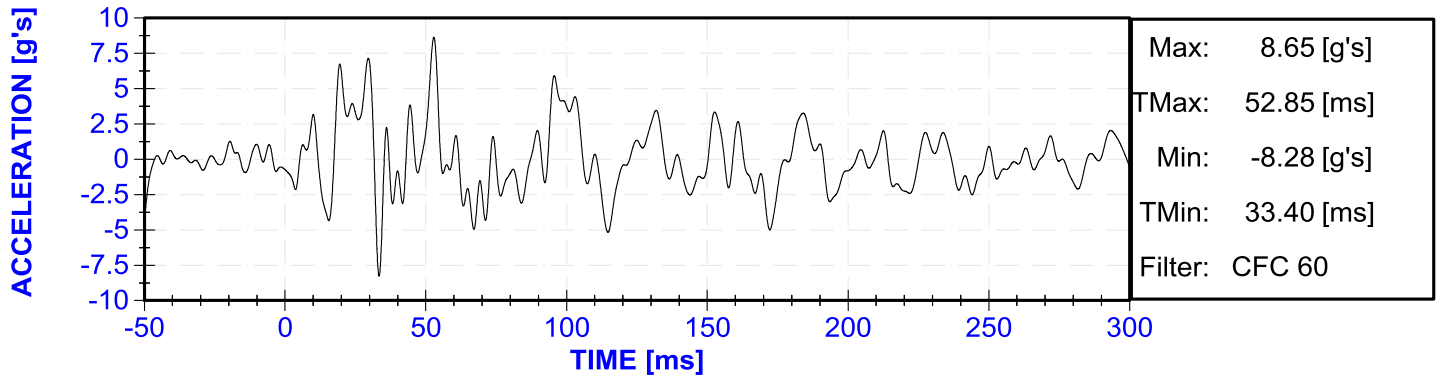
V1 CG AX

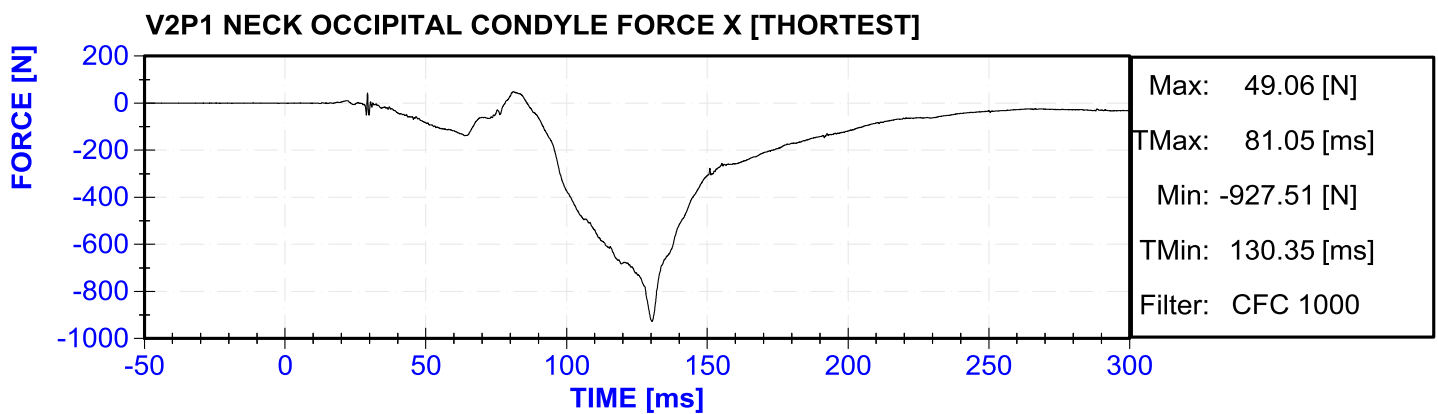
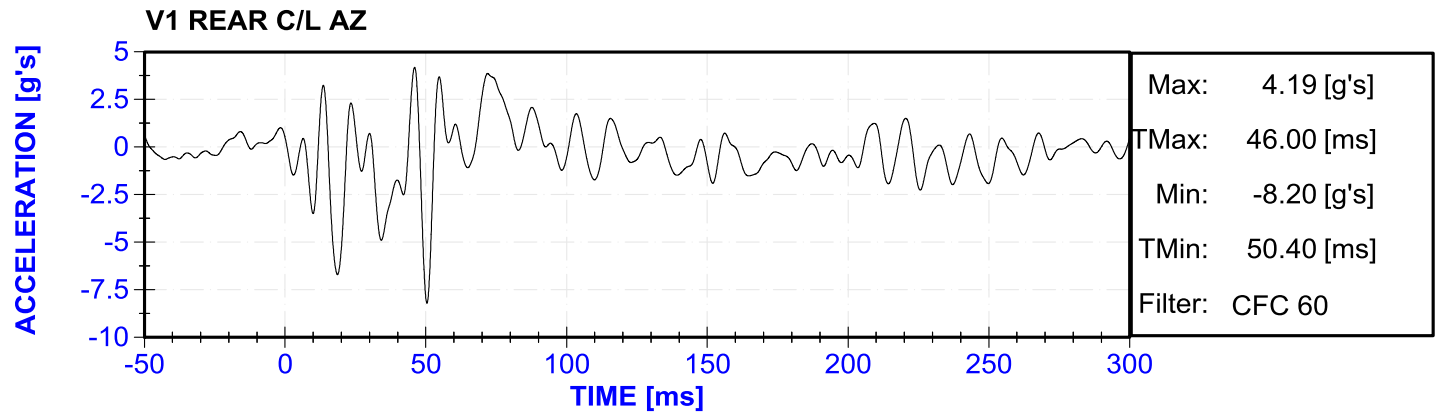
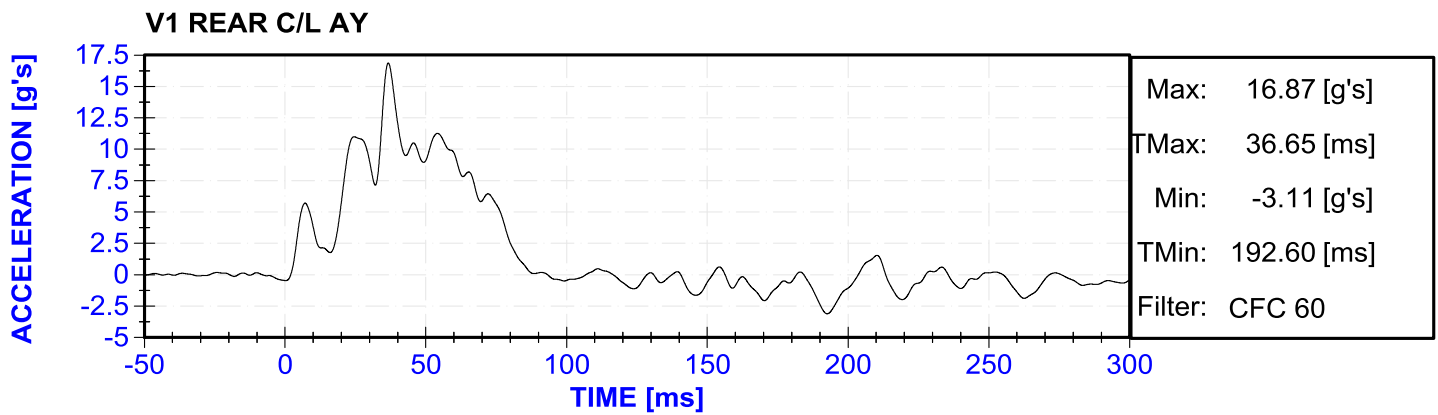
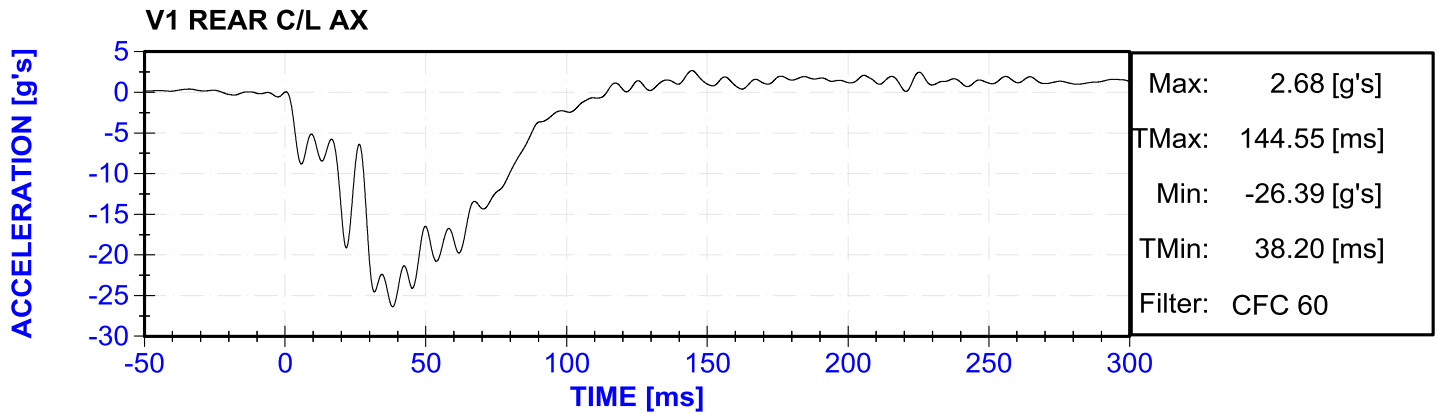


V1 CG AY

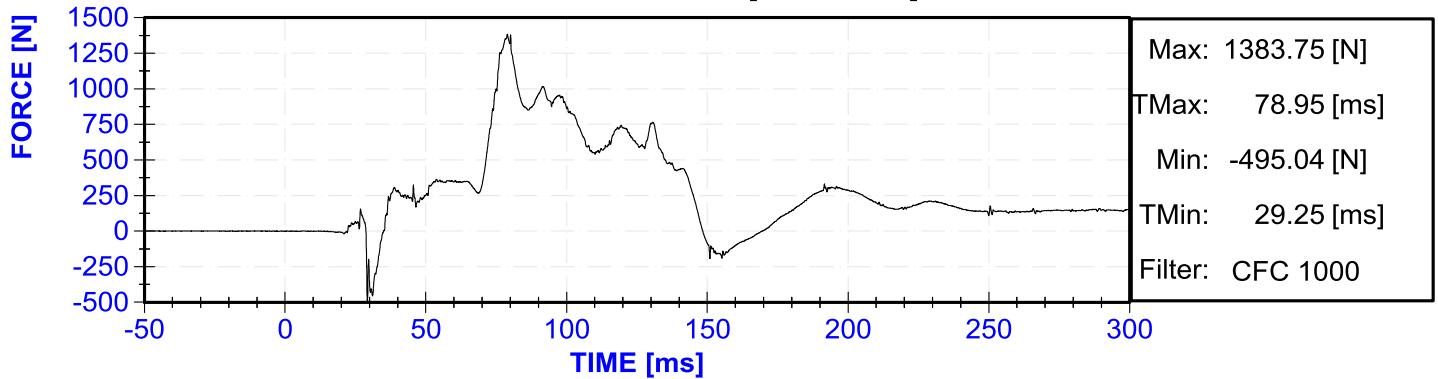


V1 CG AZ

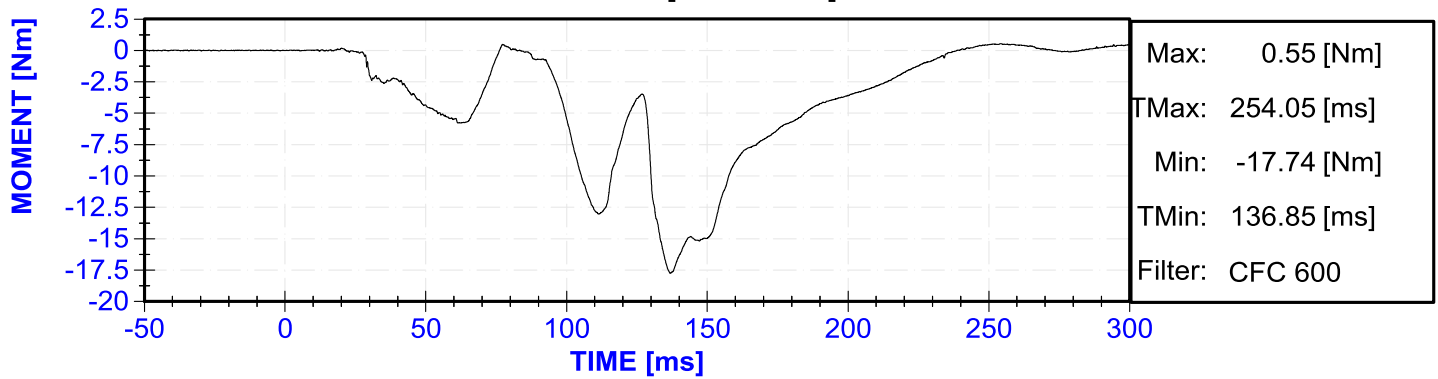




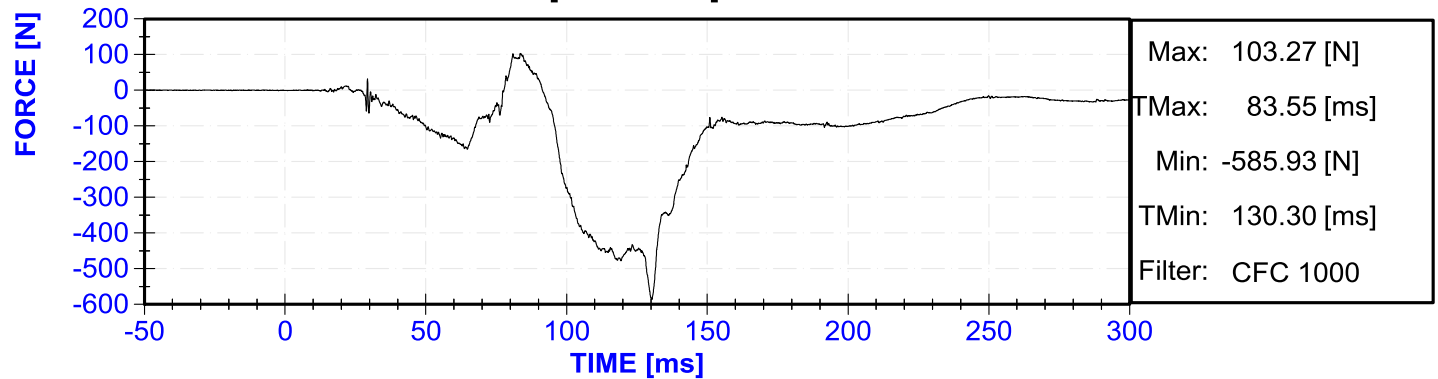
V2P1 NECK OCCIPITAL CONDYLE FORCE Z [THORTEST]



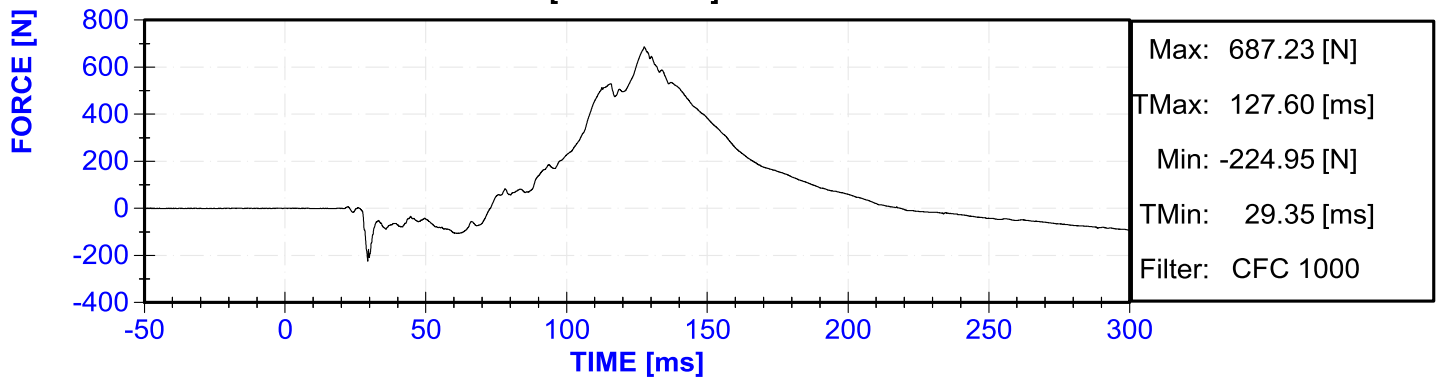
V2P1 NECK OCCIPITAL CONDYLE MY [THORTEST]



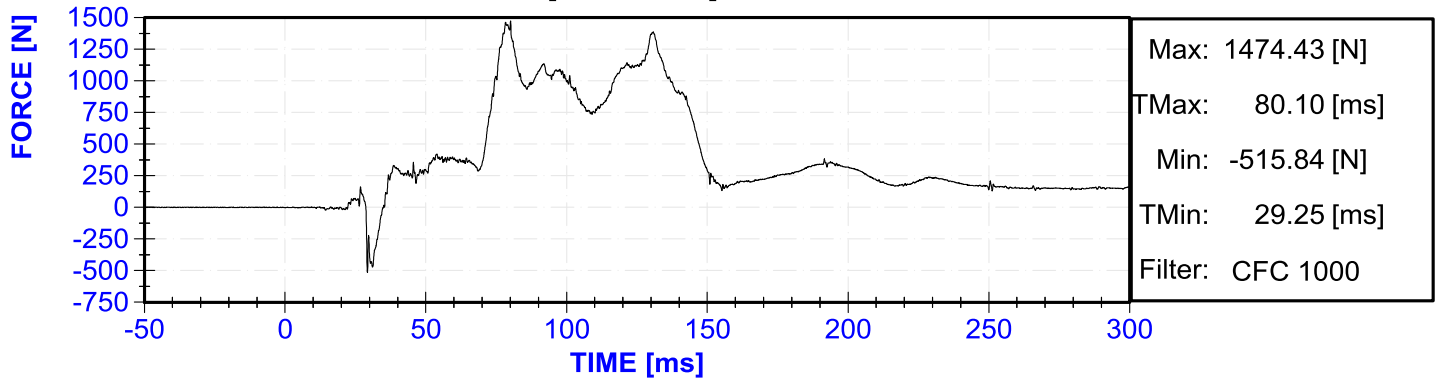
V2P1 NECK UPPER FORCE X [THORTEST]



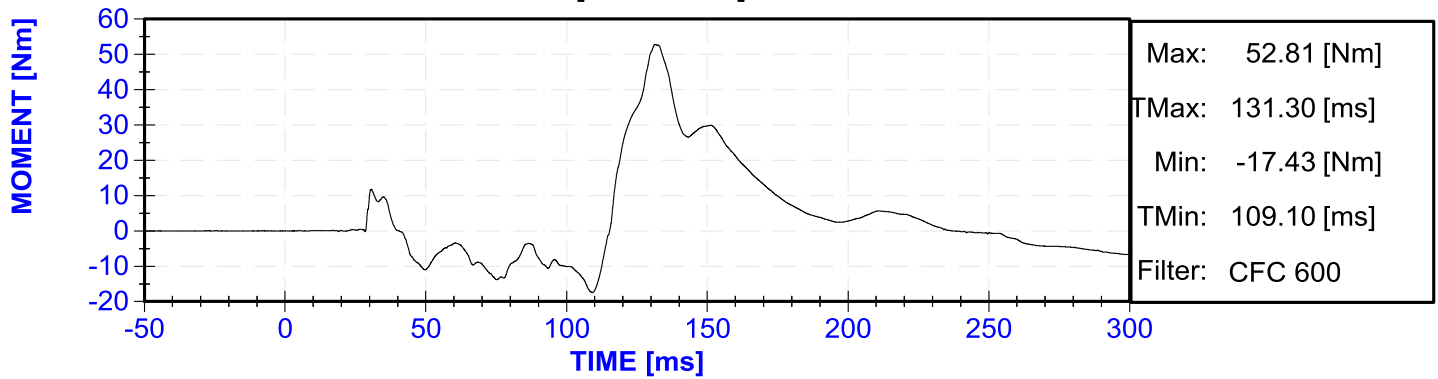
V2P1 NECK UPPER FORCE Y [THORTEST]



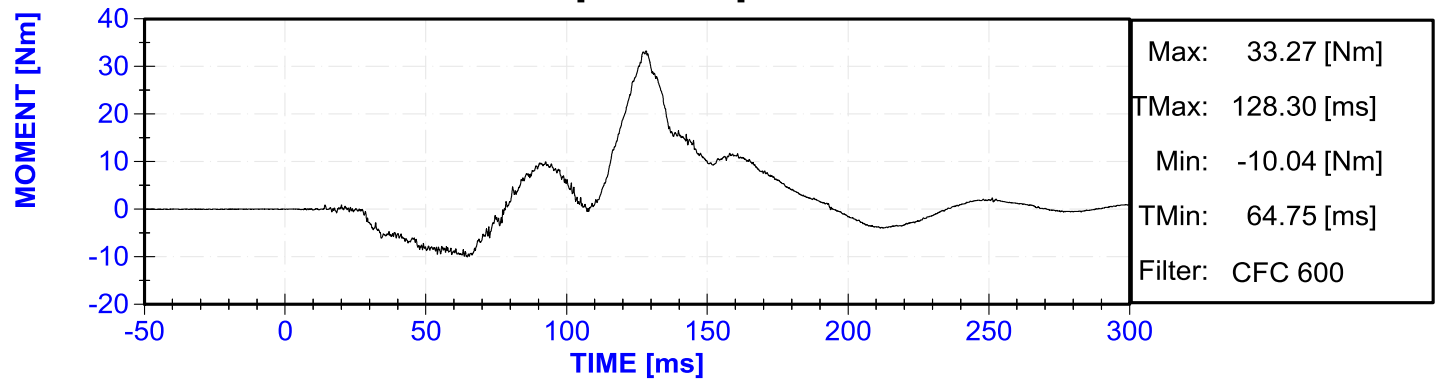
V2P1 NECK UPPER FORCE Z [THORTEST]



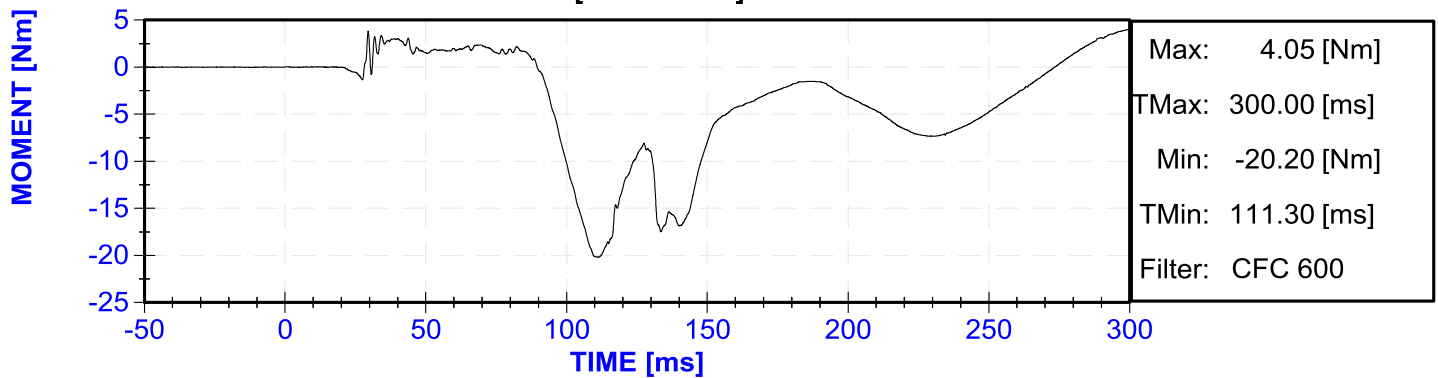
V2P1 NECK UPPER MOMENT X [THORTEST]

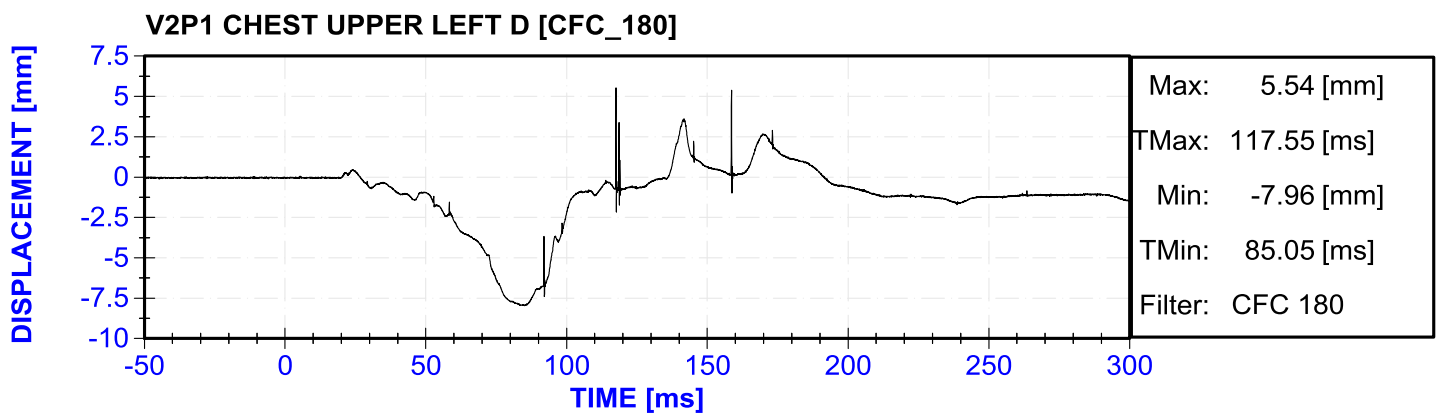
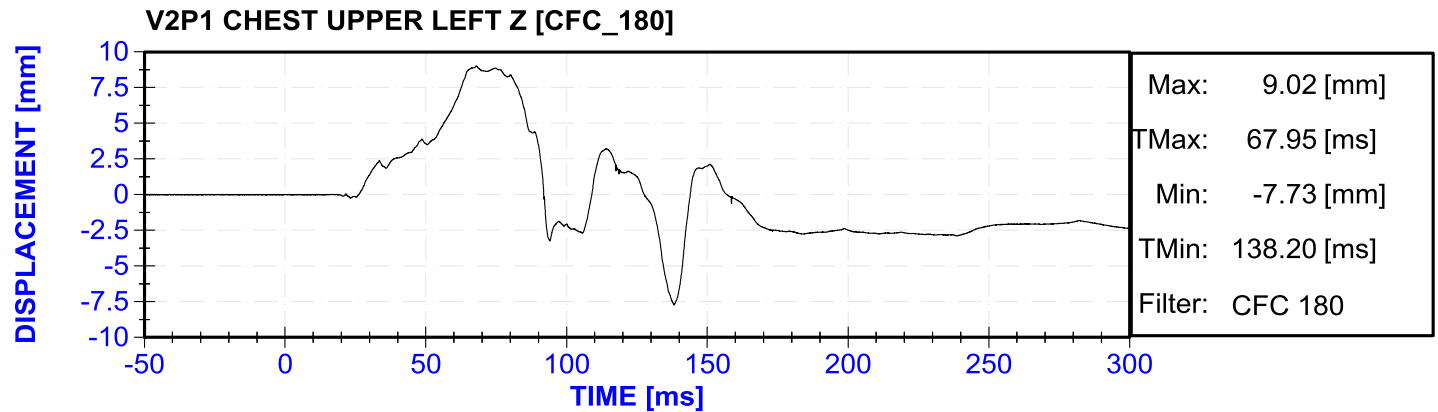
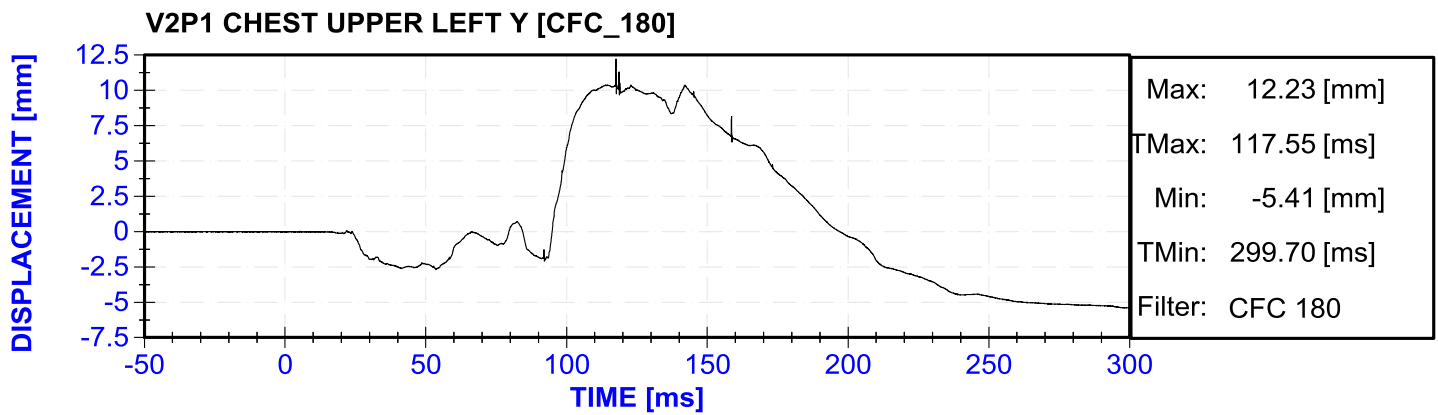
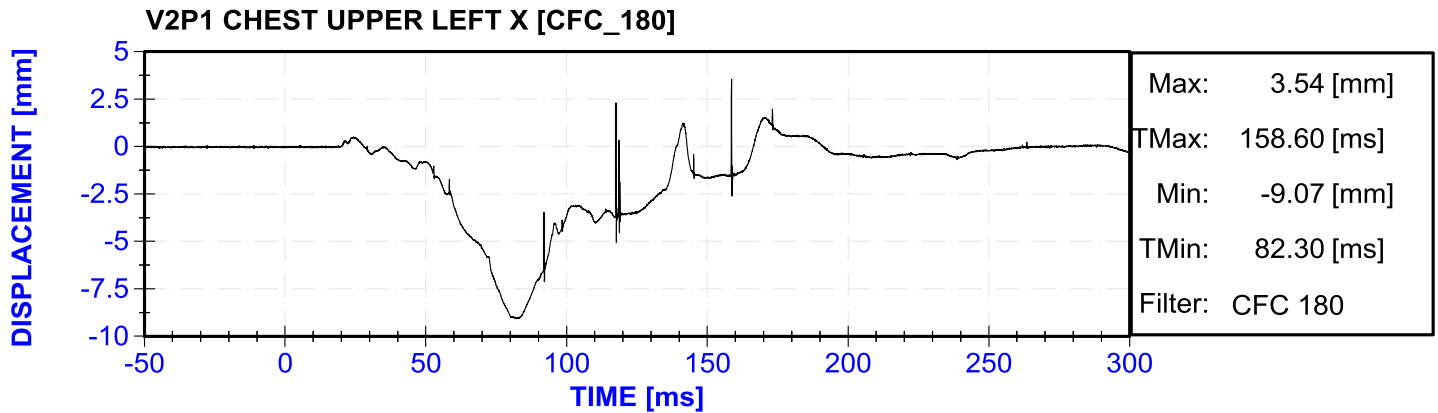


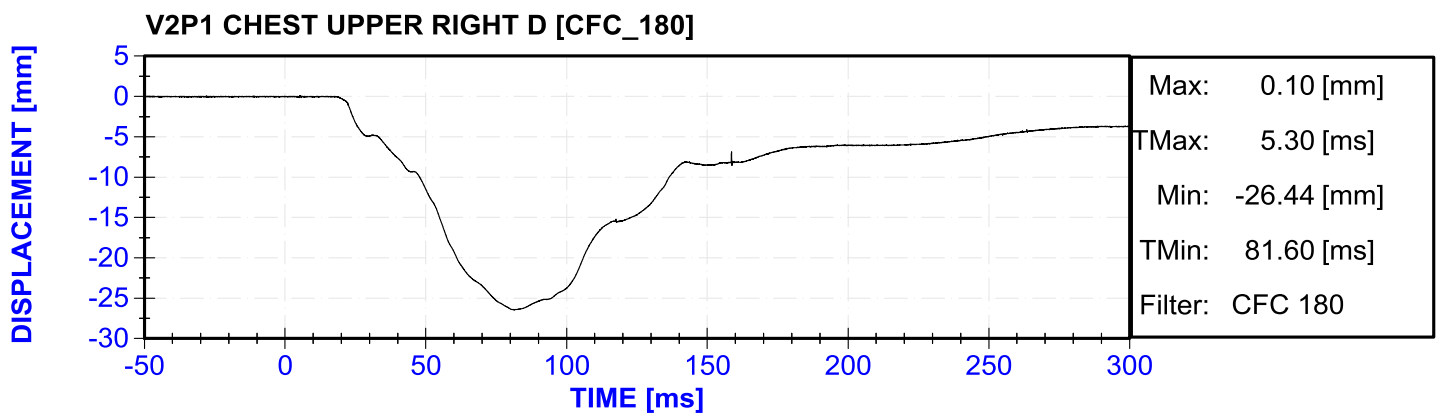
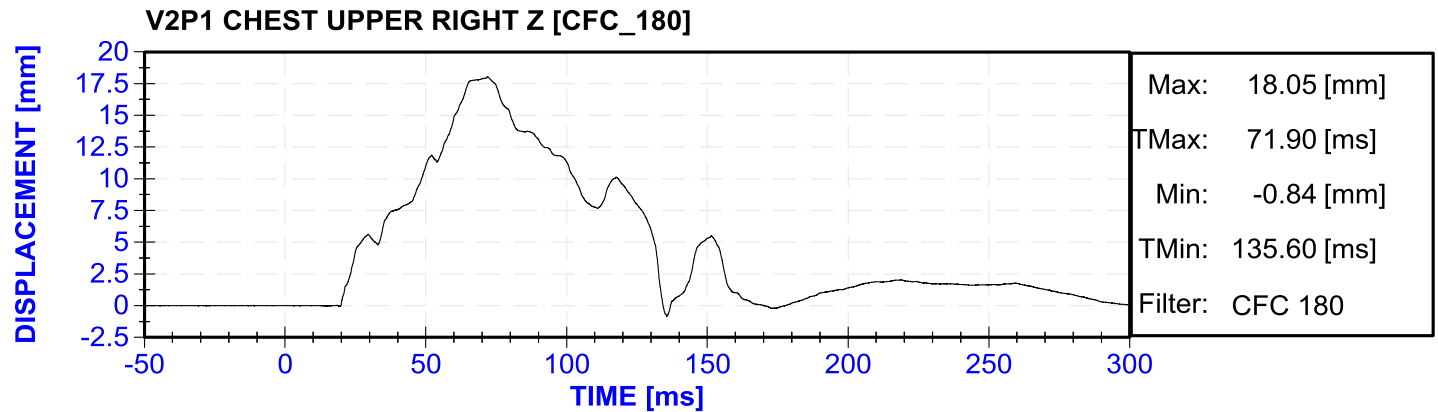
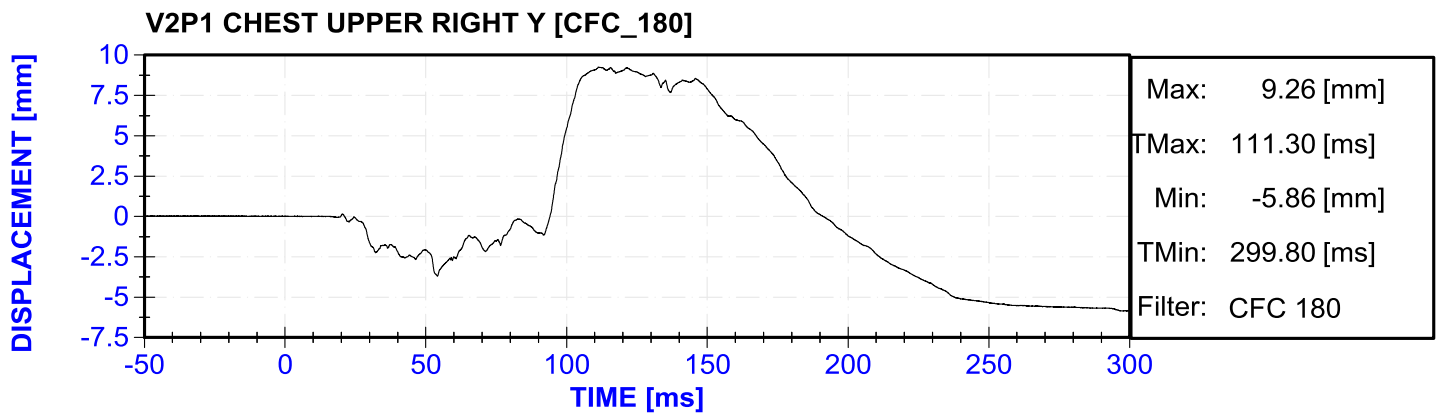
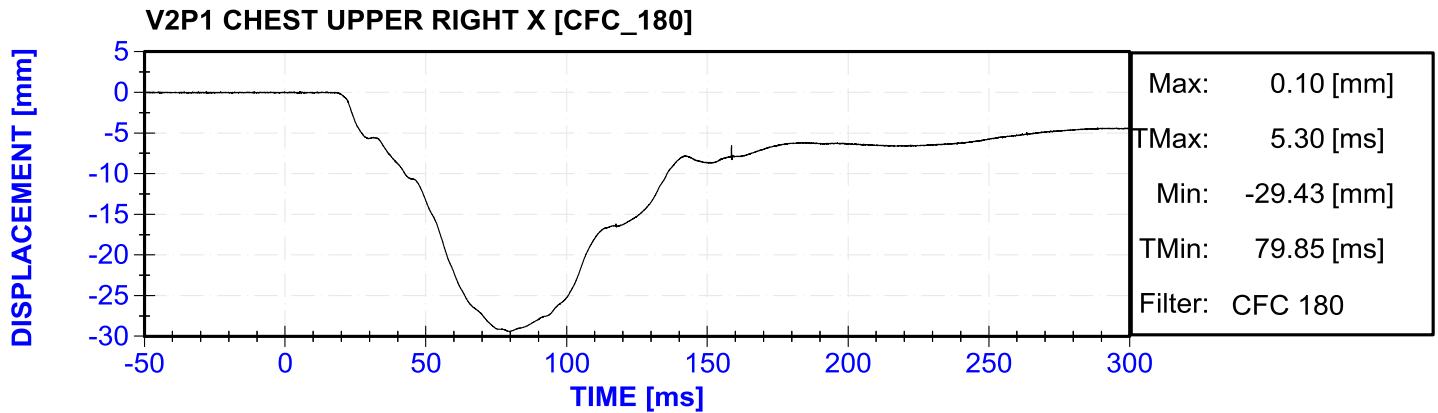
V2P1 NECK UPPER MOMENT Y [THORTEST]

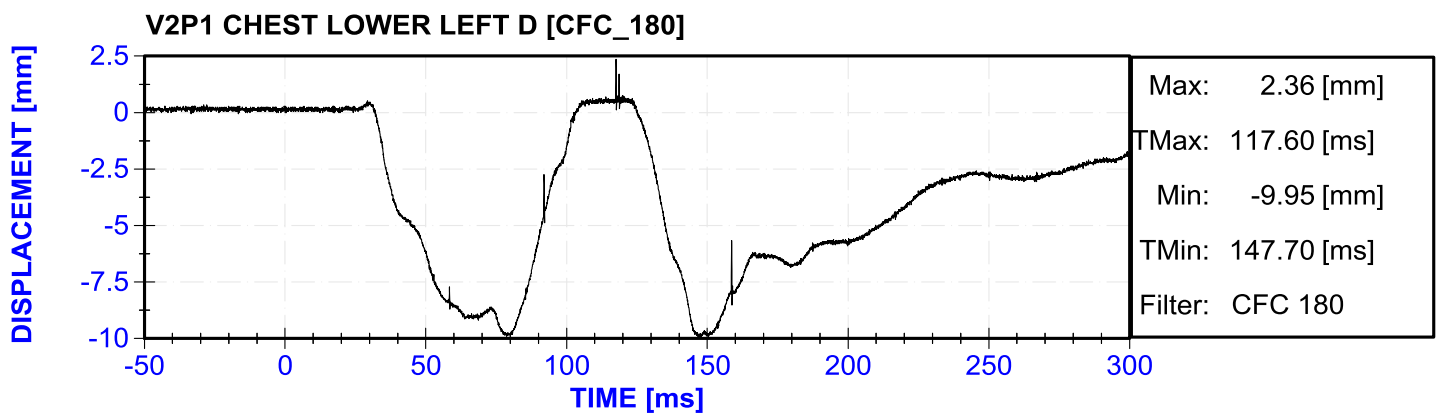
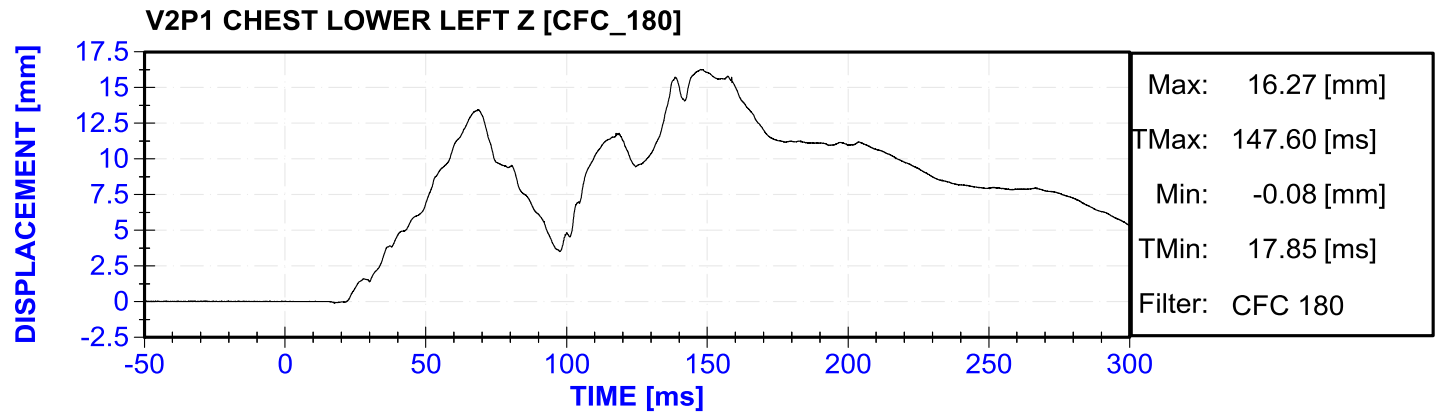
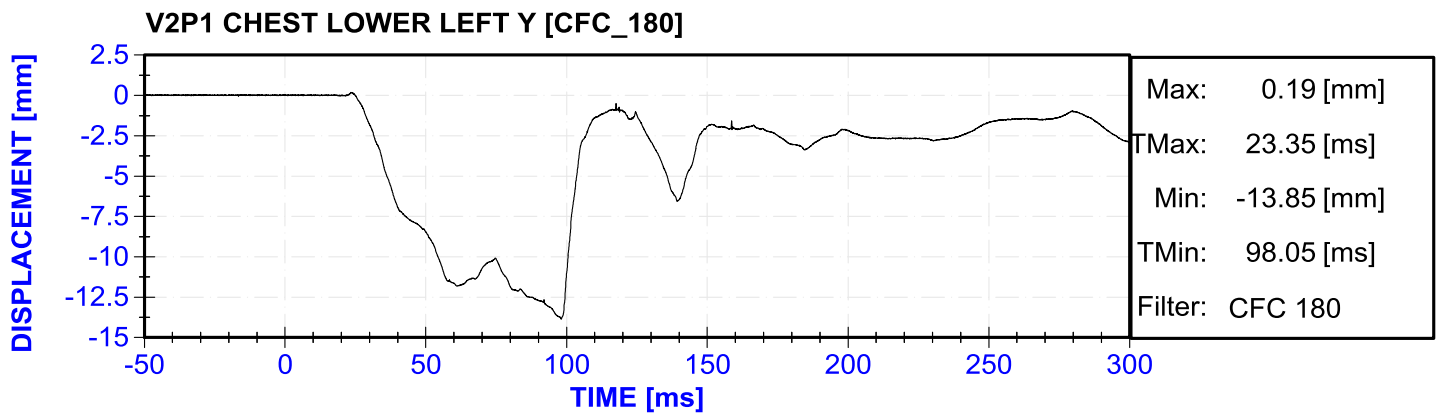
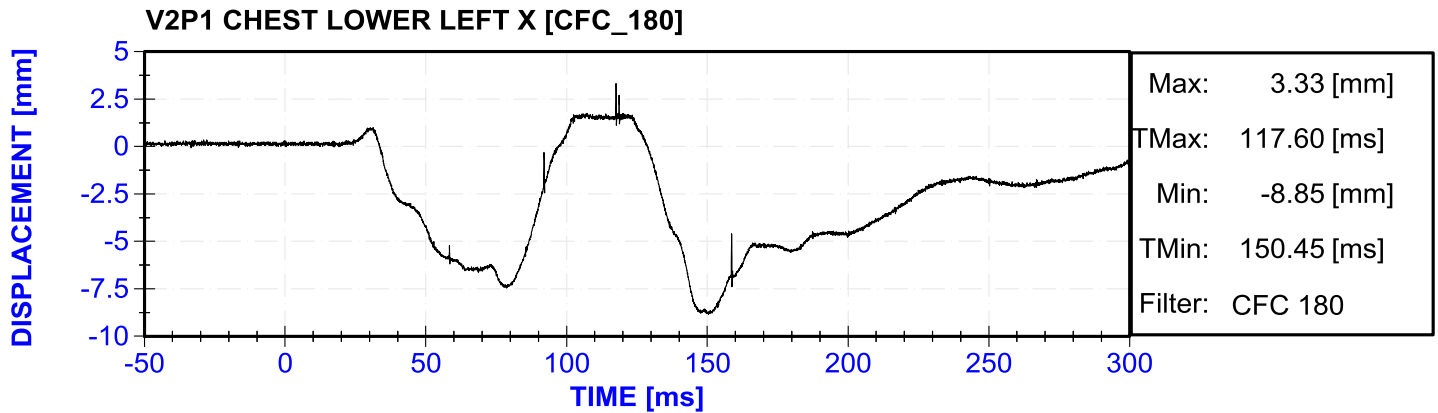


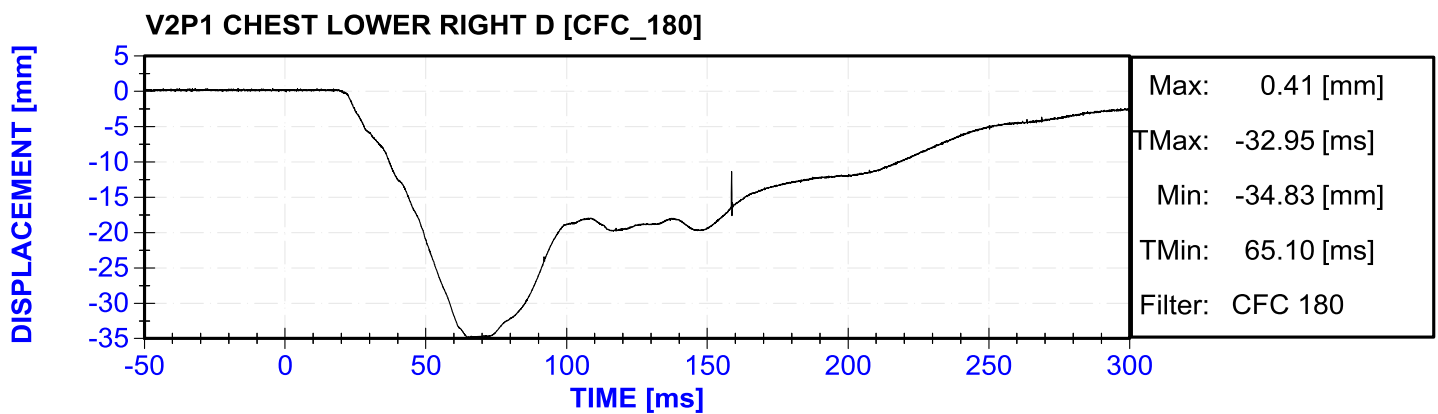
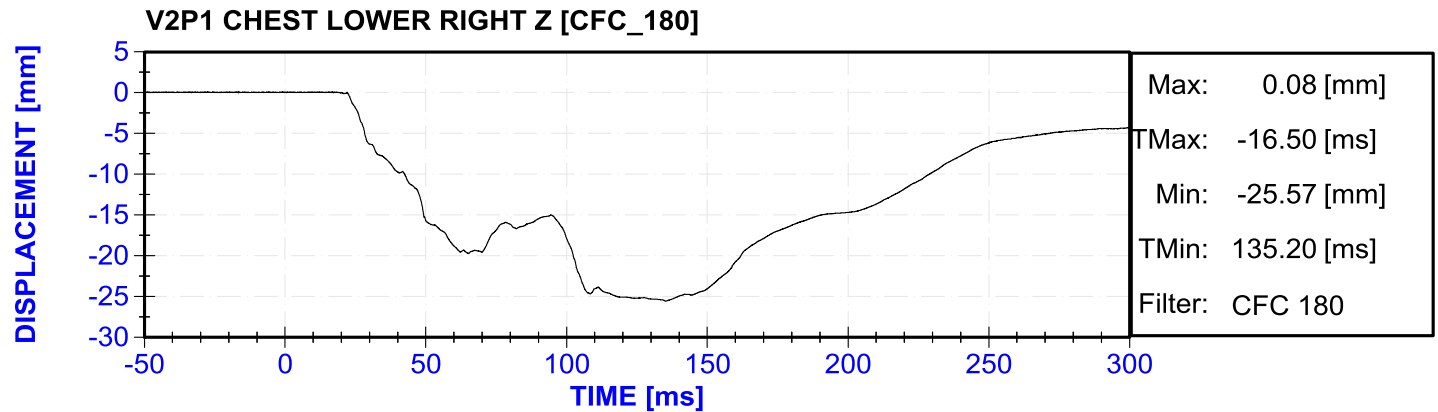
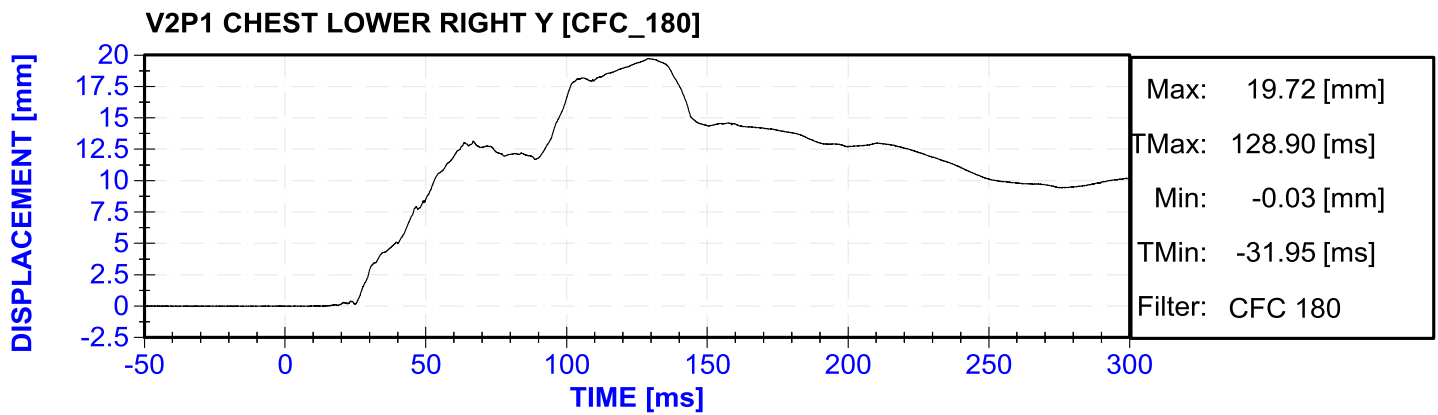
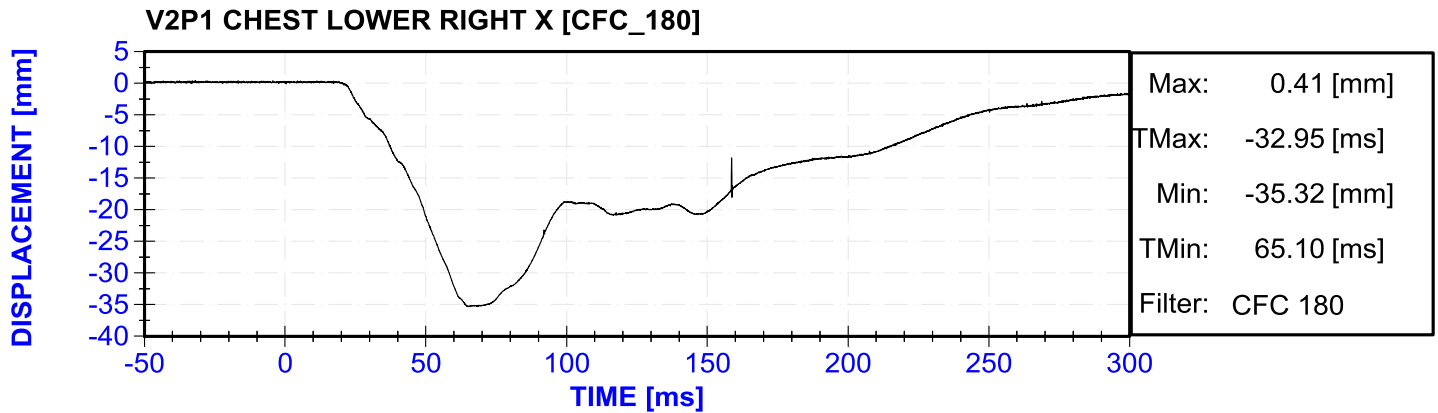
V2P1 NECK UPPER MOMENT Z [THORTEST]

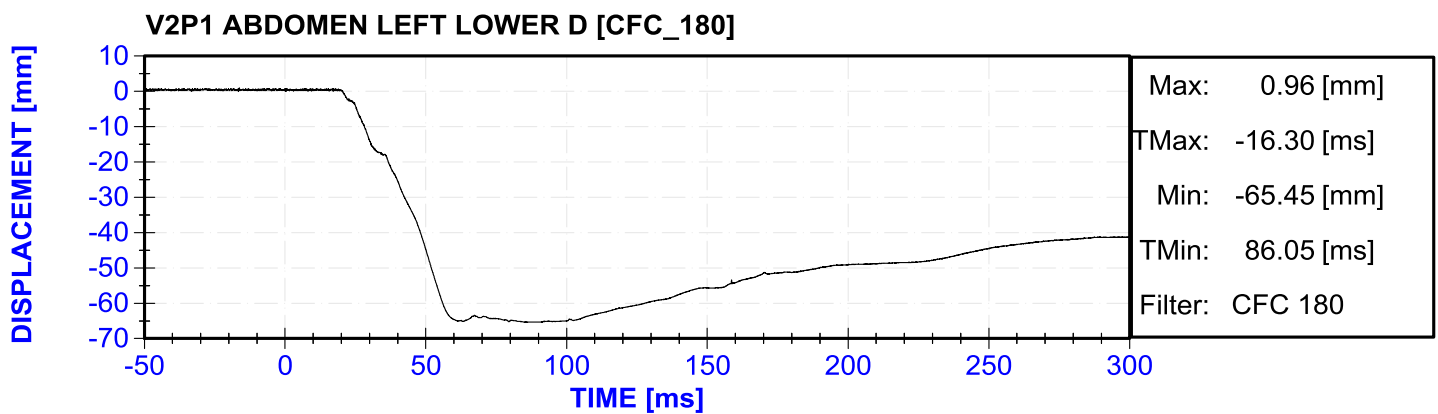
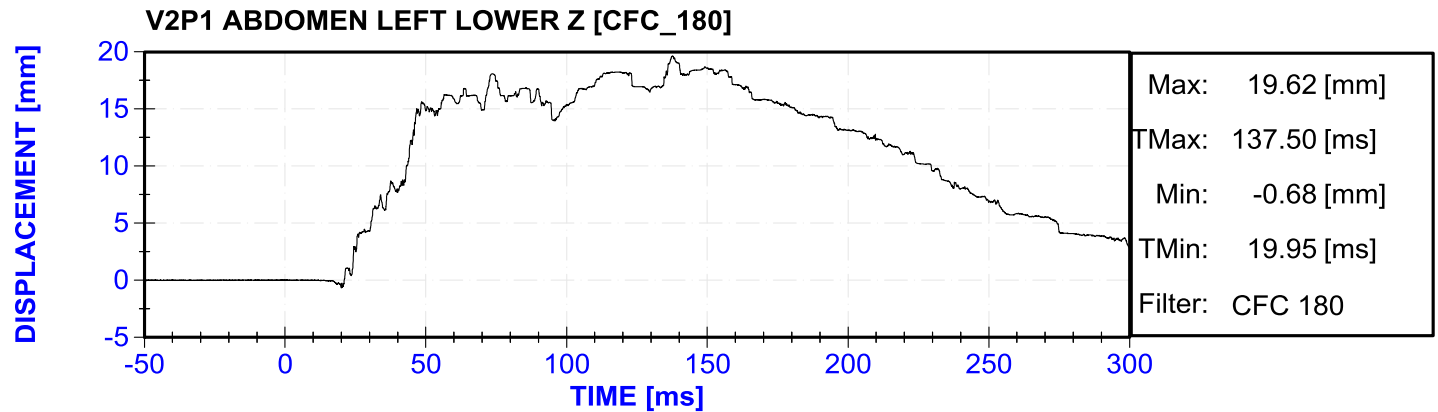
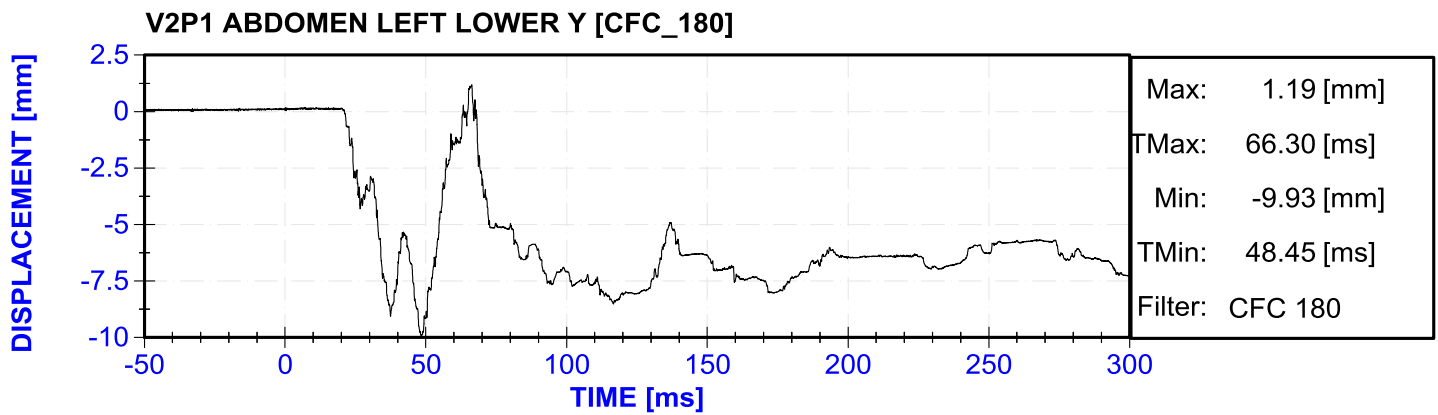
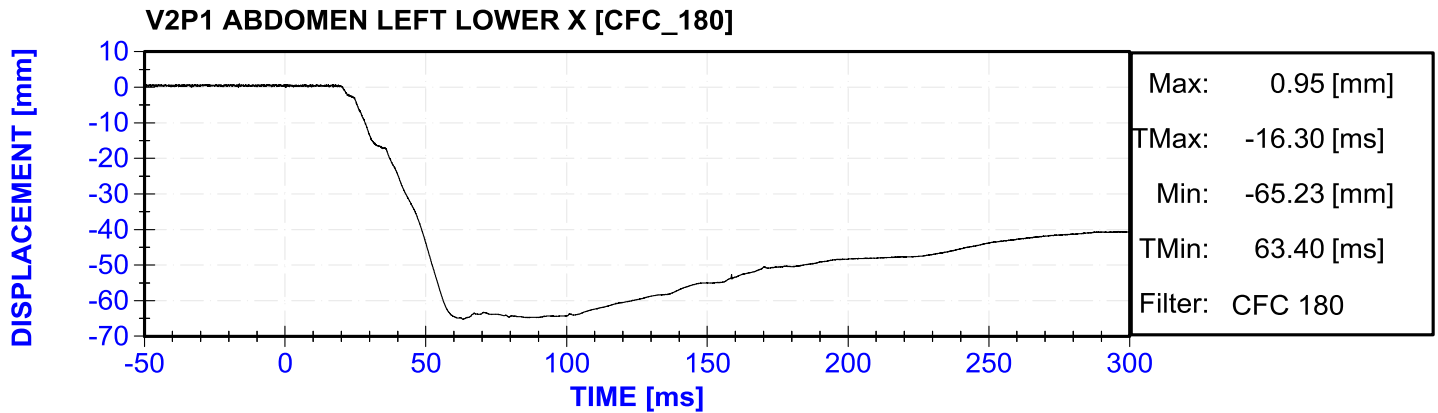


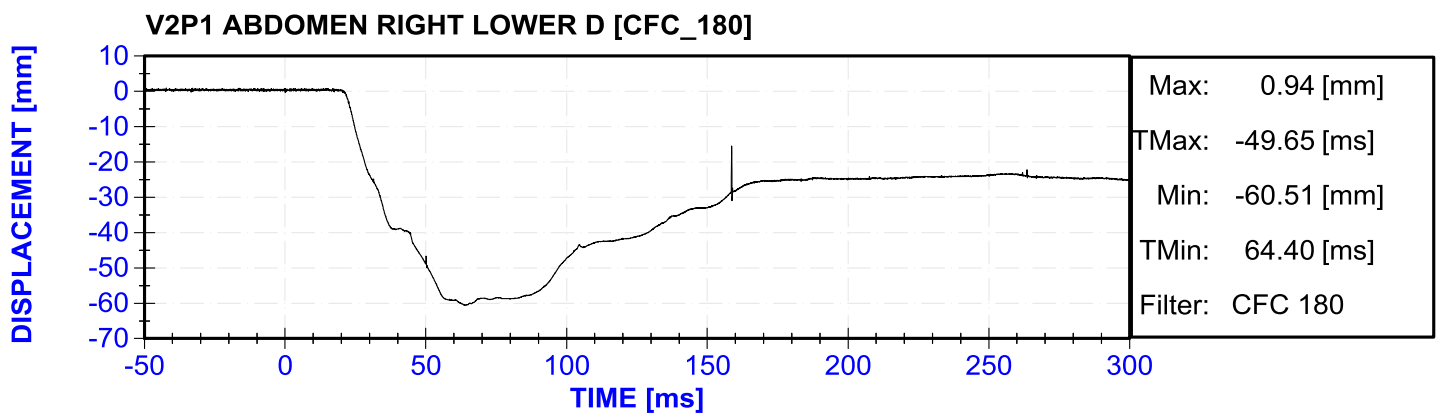
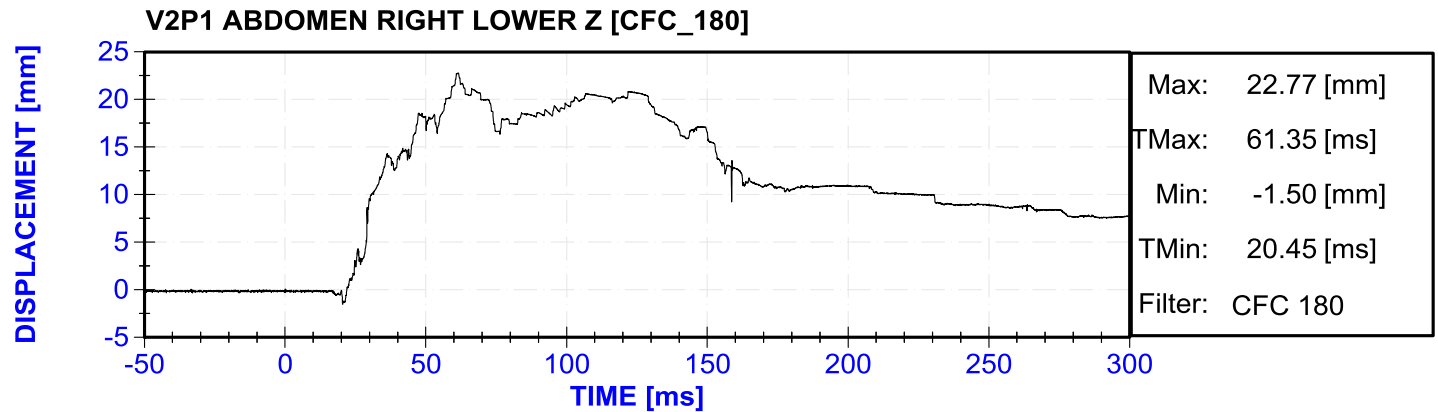
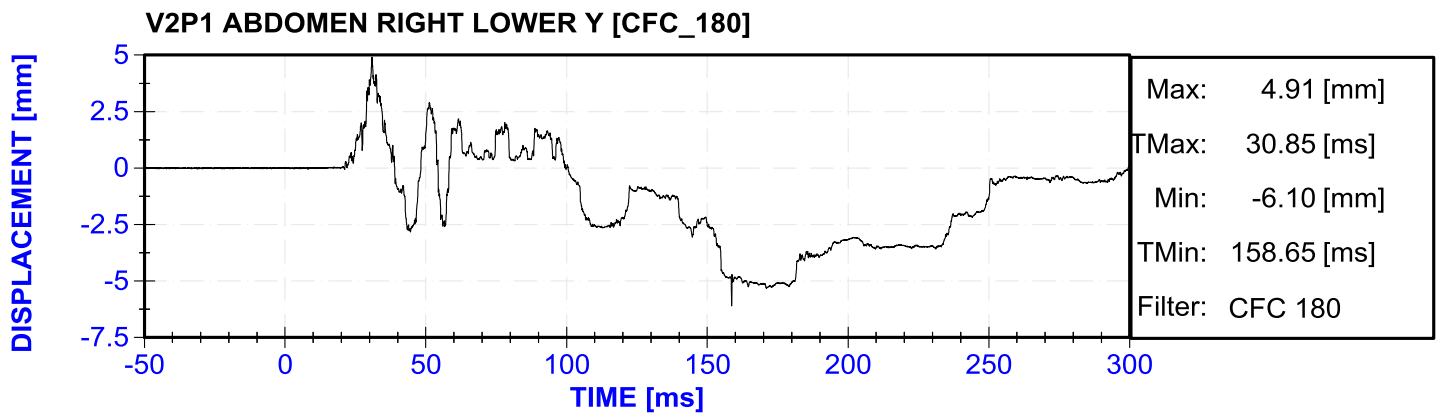
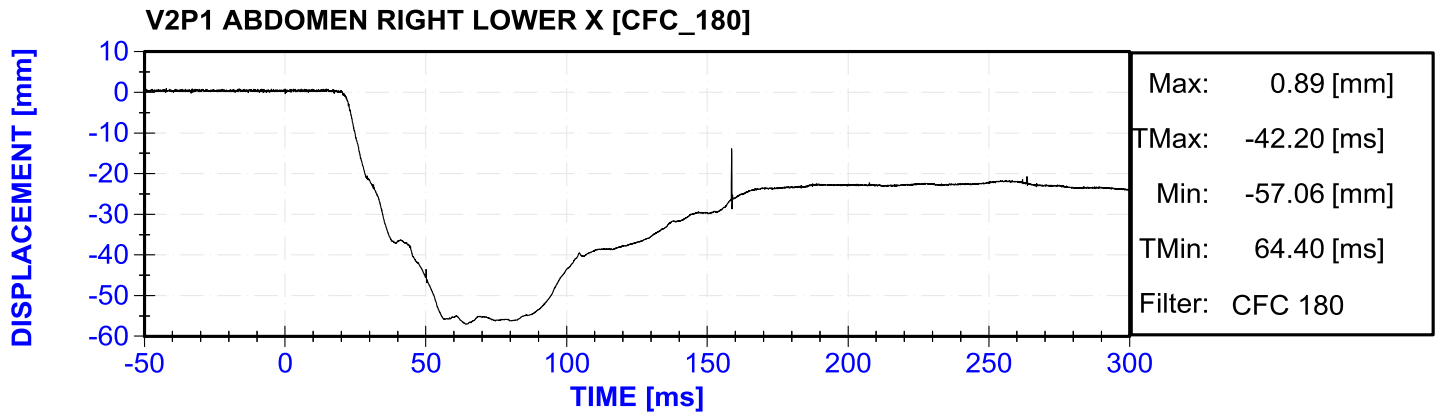




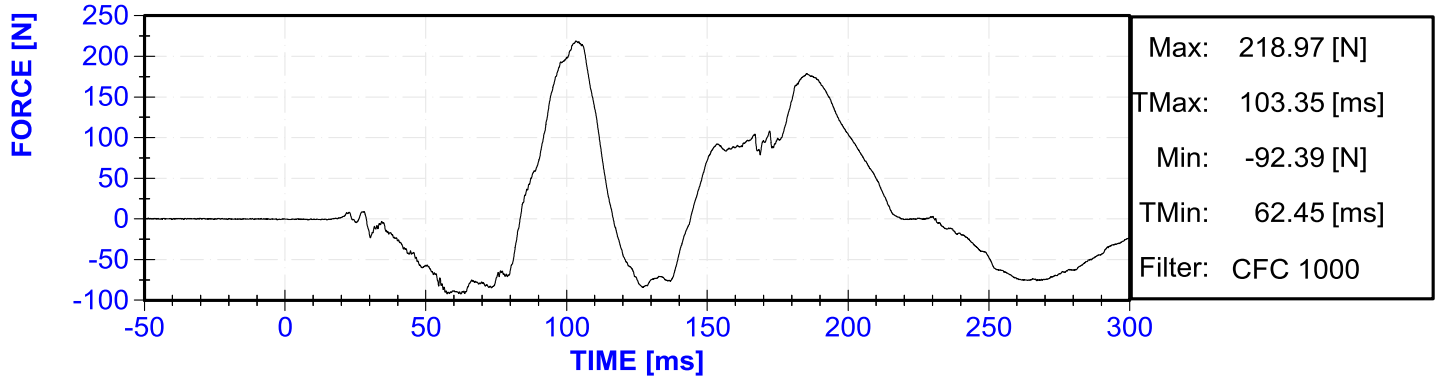




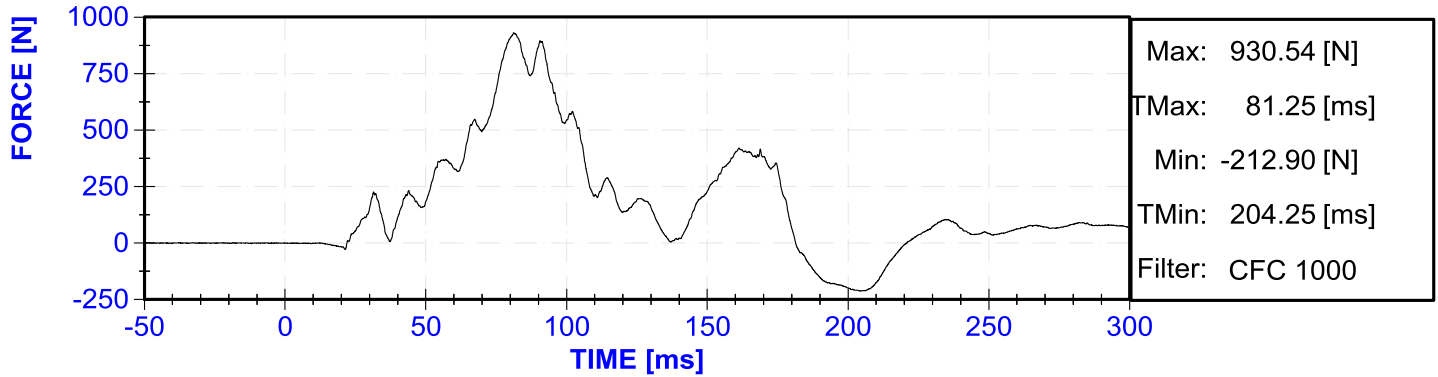




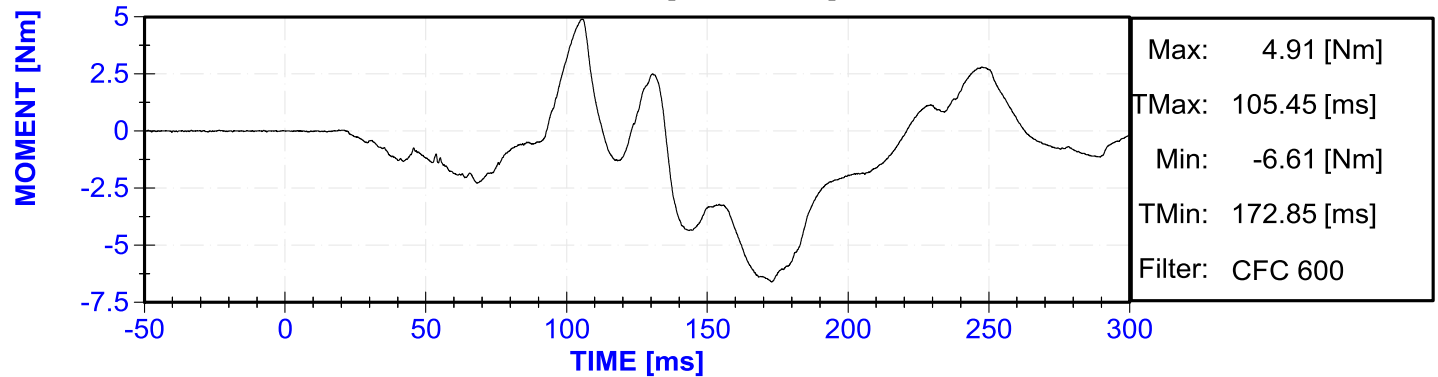
V2P2 NECK OCCIPITAL CONDYLE FORCE X [THORTEST]



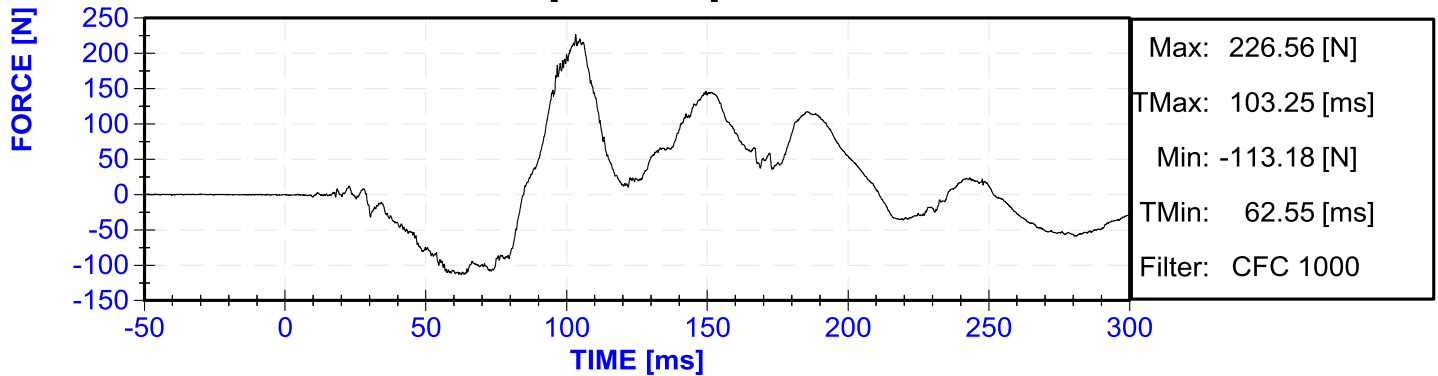
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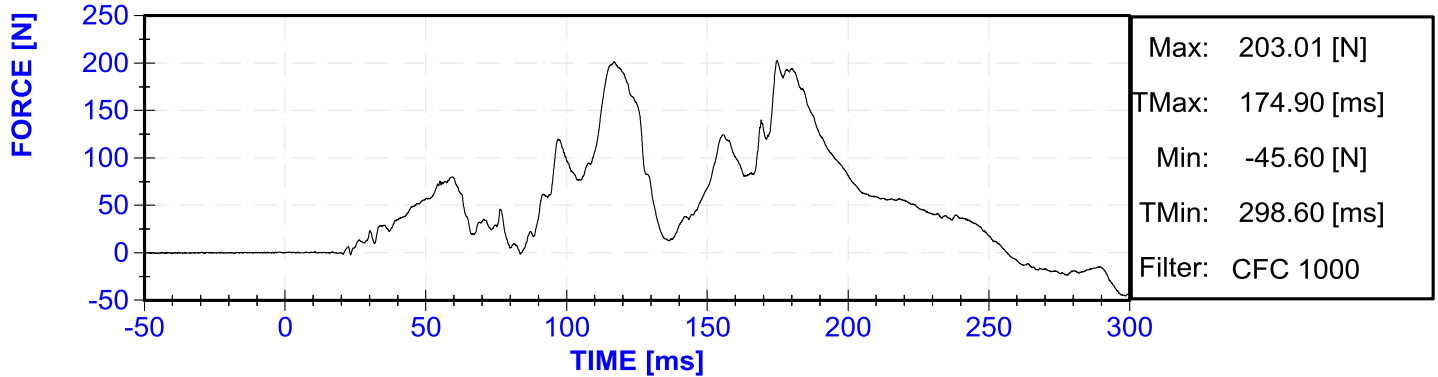
V2P2 NECK OCCIPITAL CONDYLE MY [THORTEST]



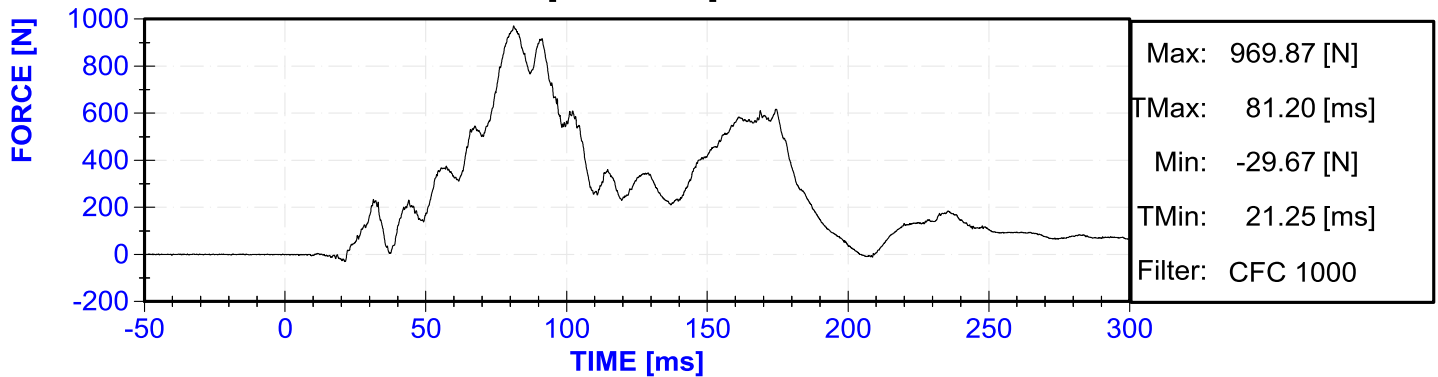
V2P2 NECK UPPER FORCE X [THORTEST]



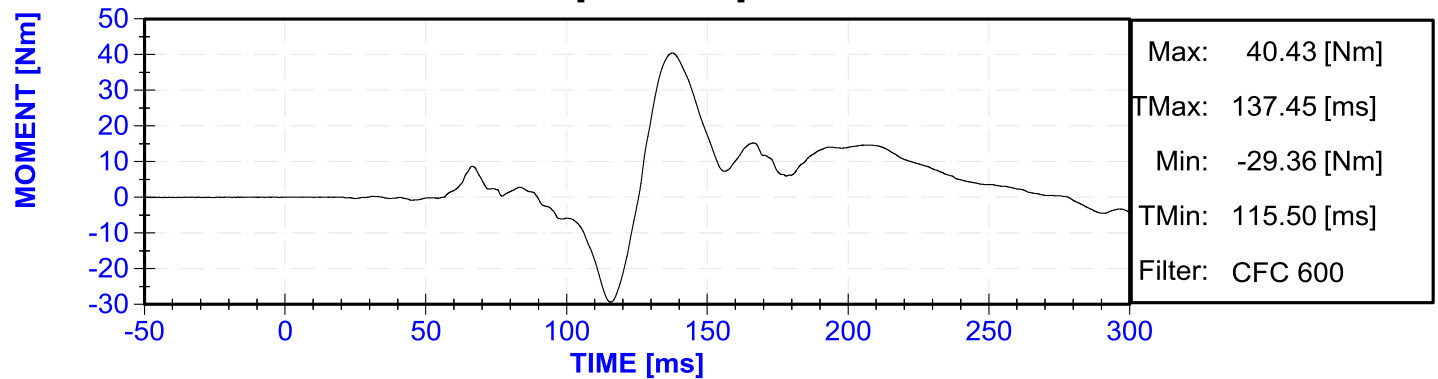
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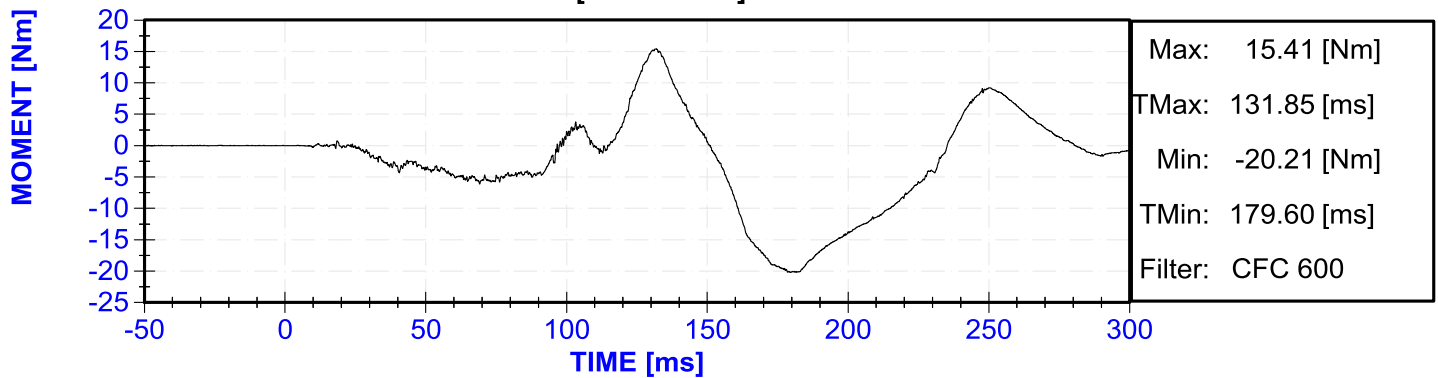
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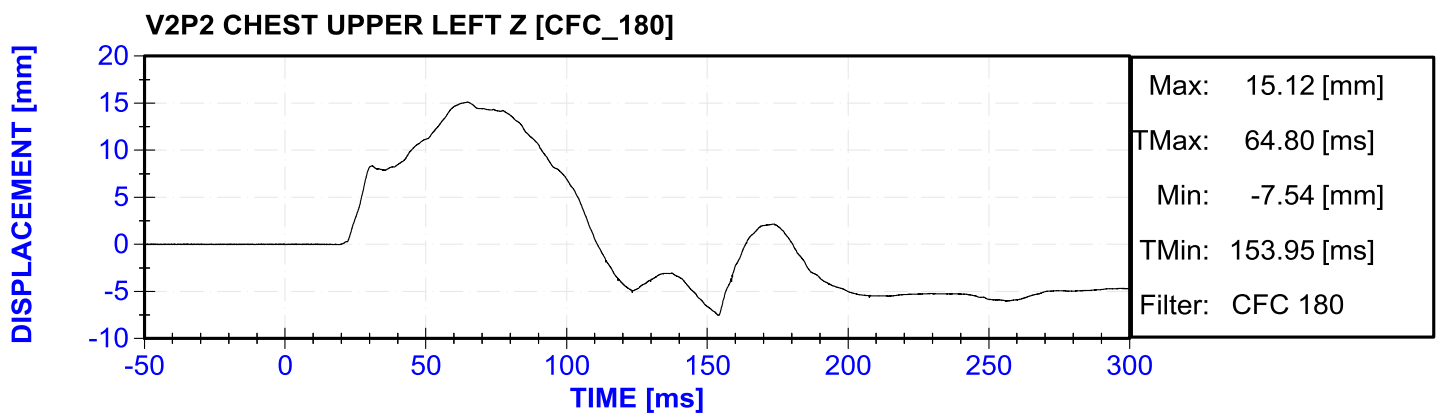
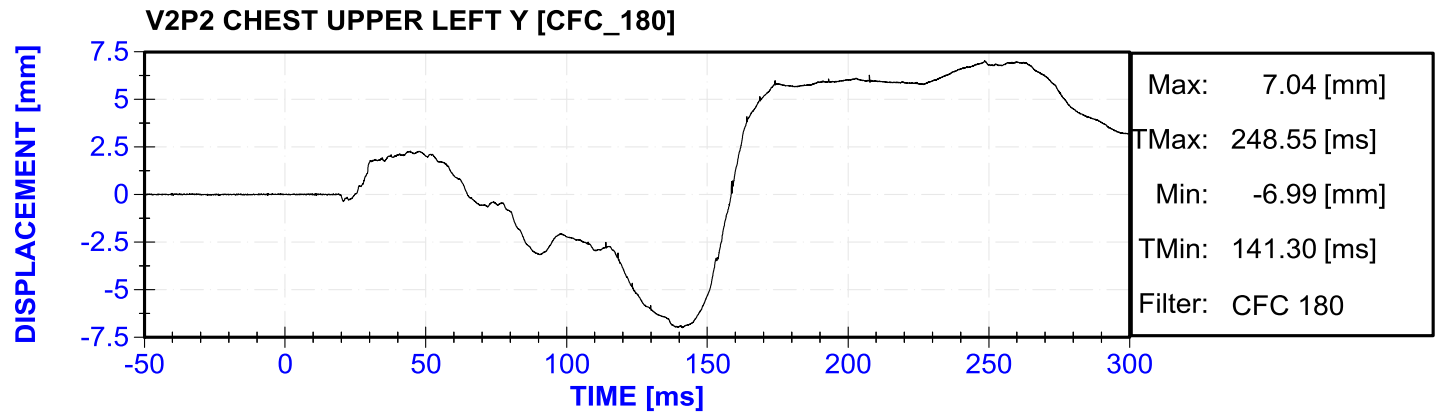
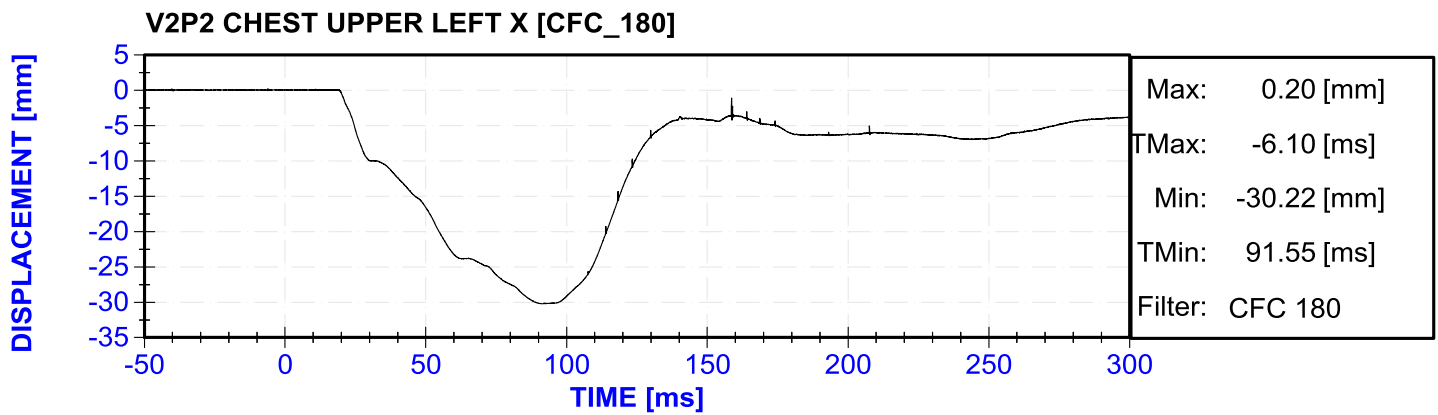
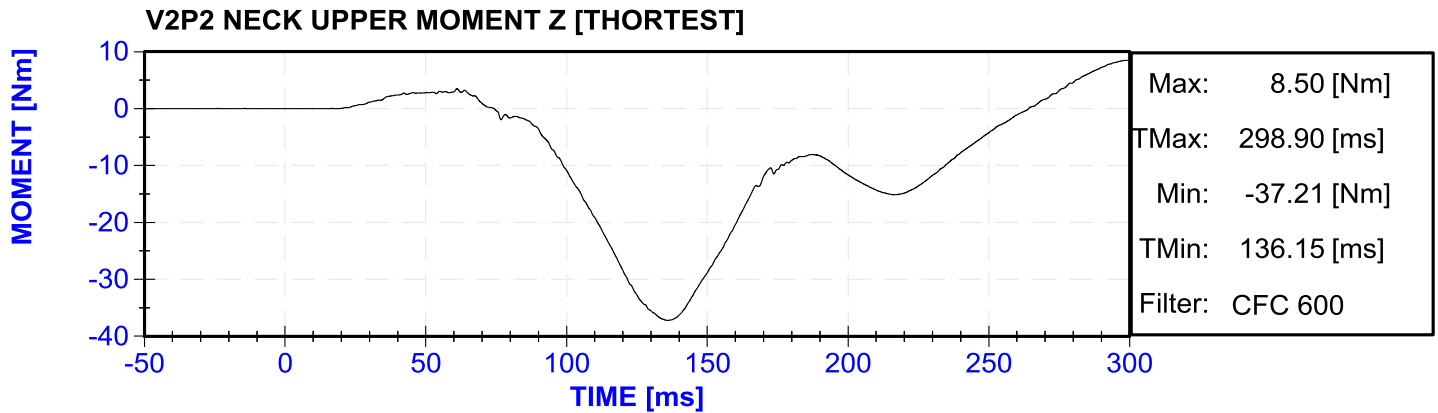


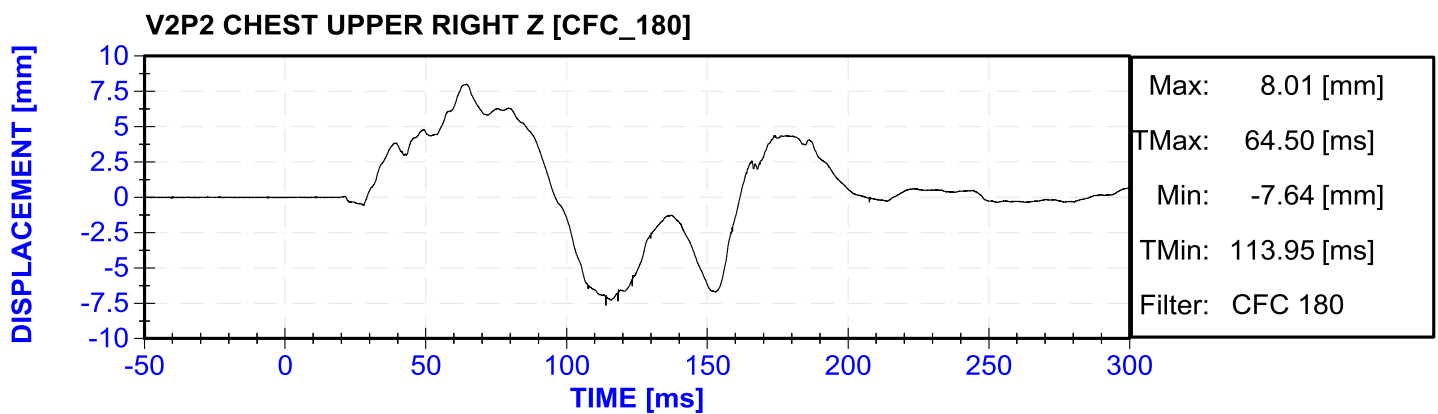
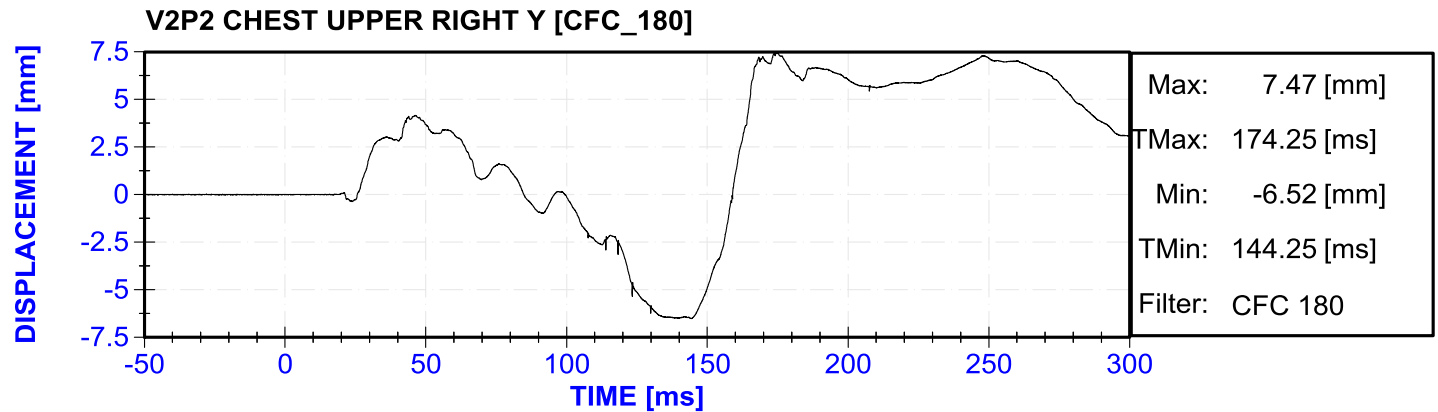
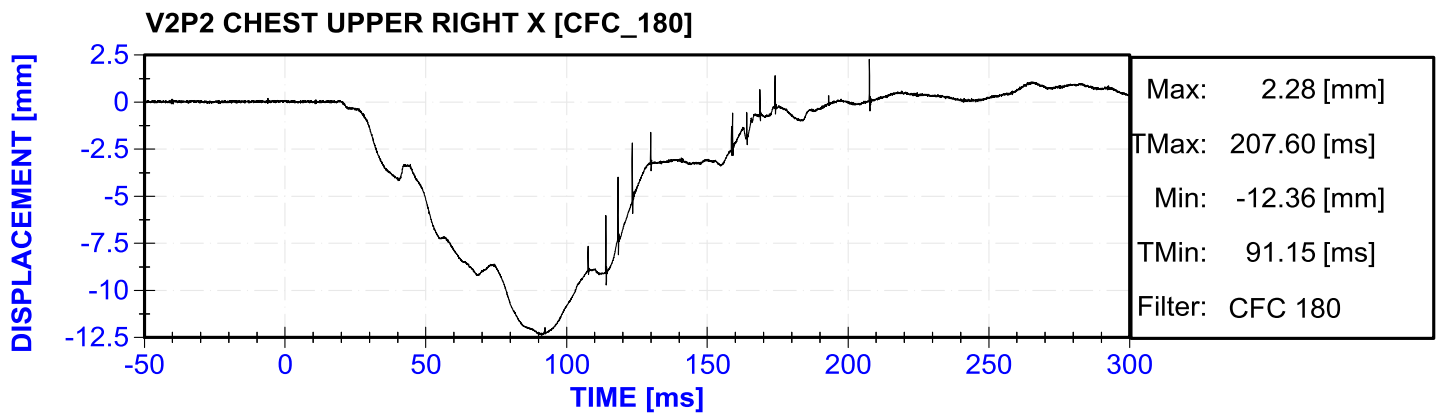
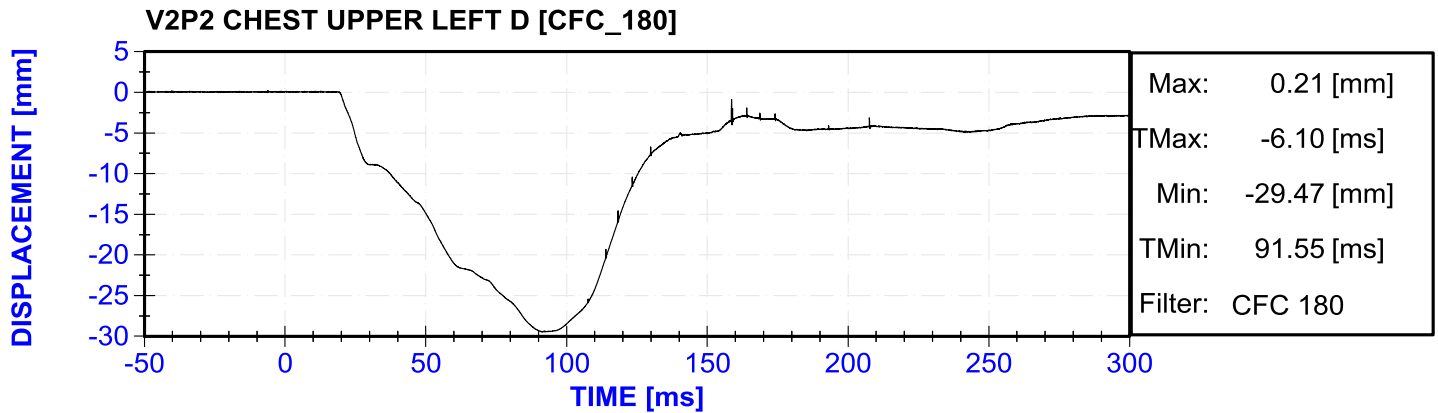
V2P2 NECK UPPER MOMENT X [THORTEST]

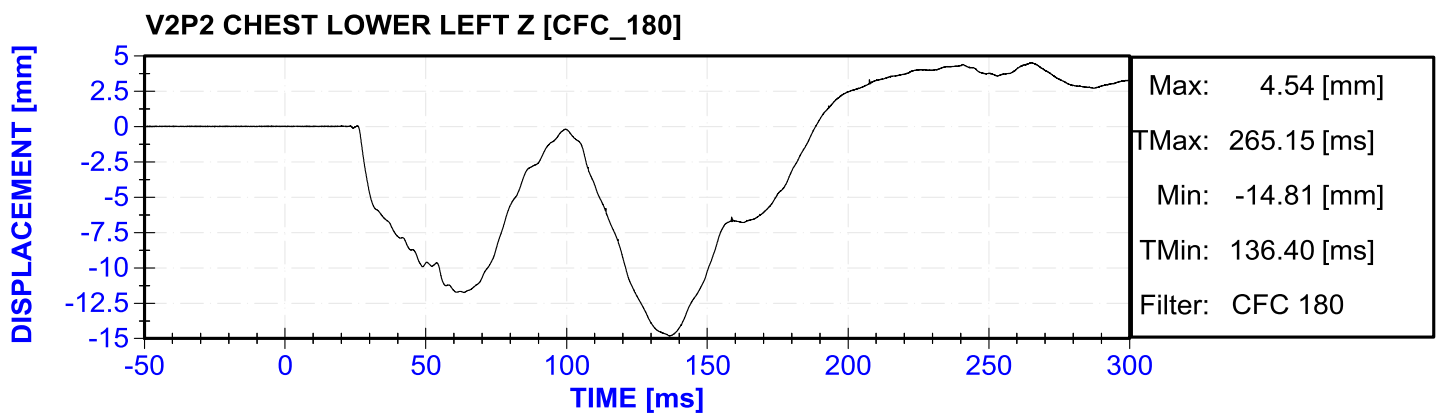
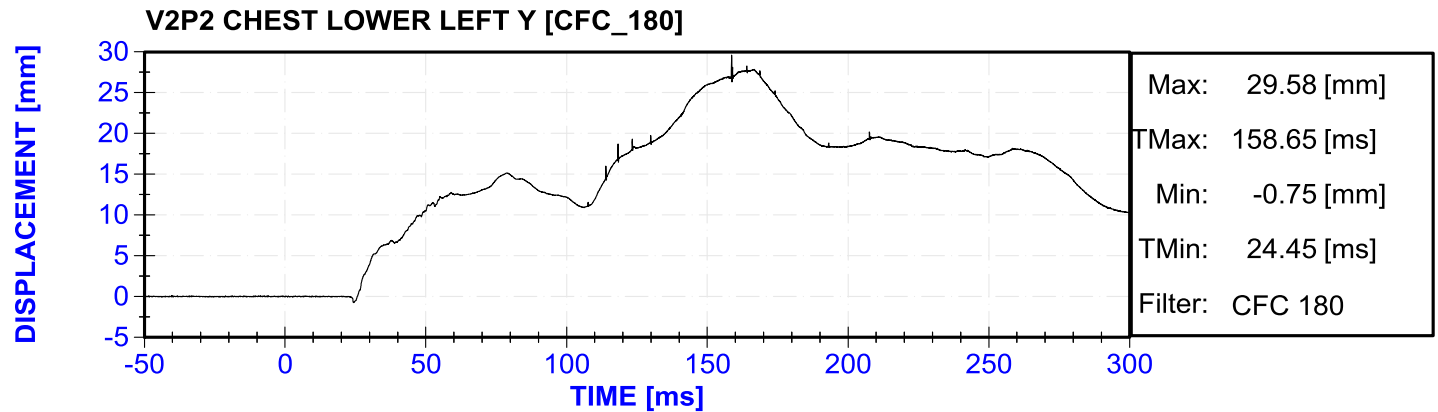
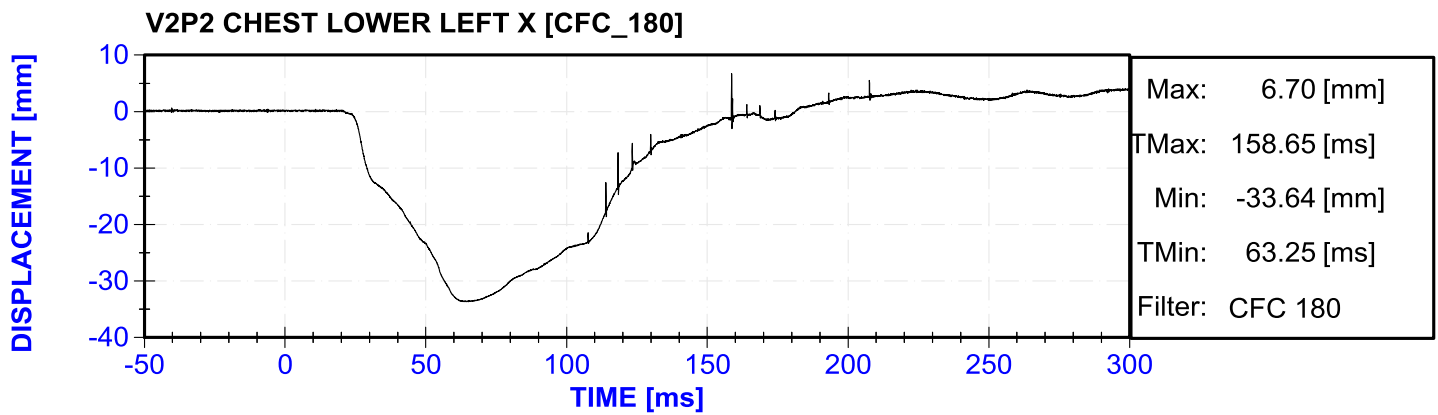
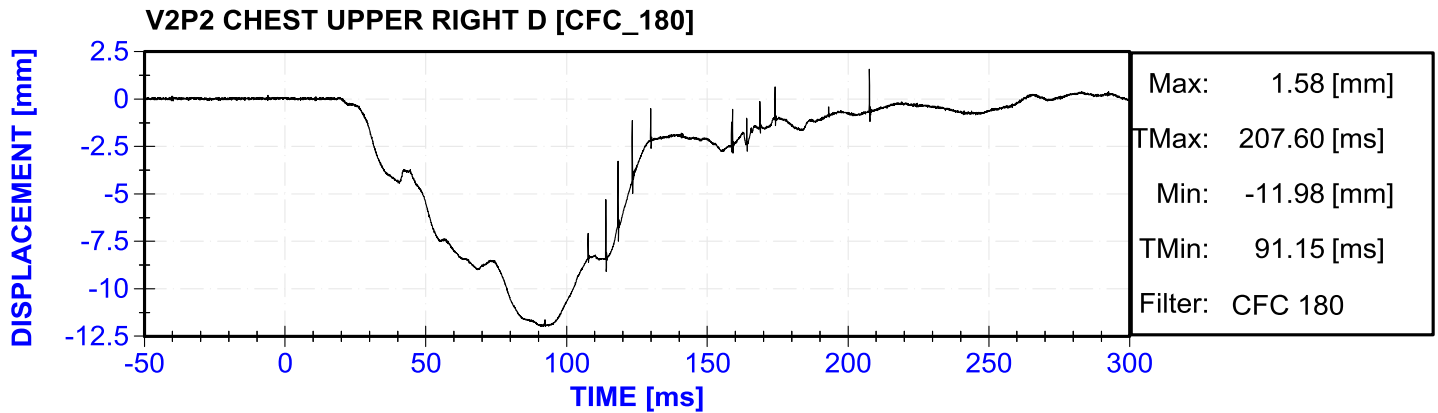


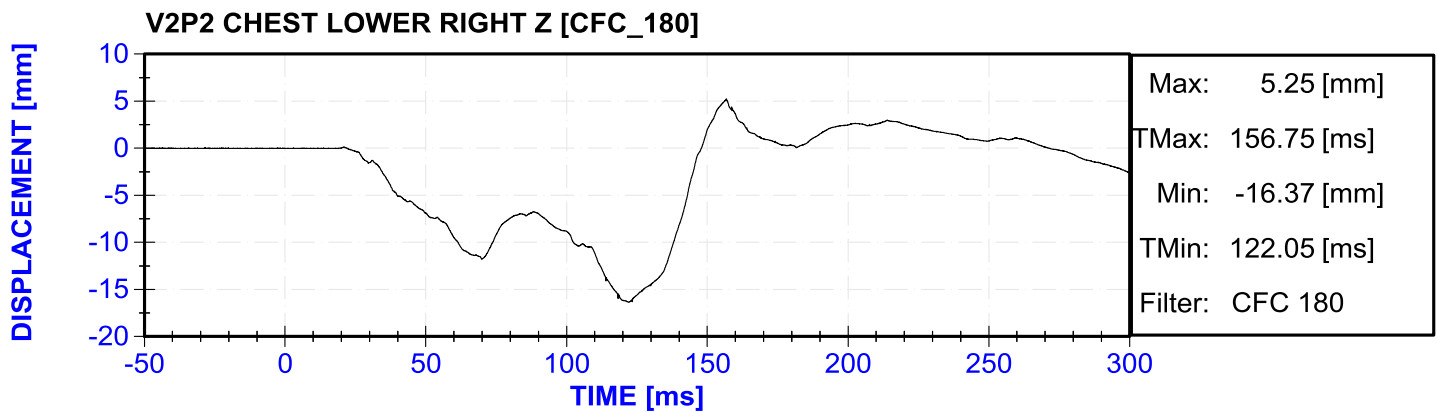
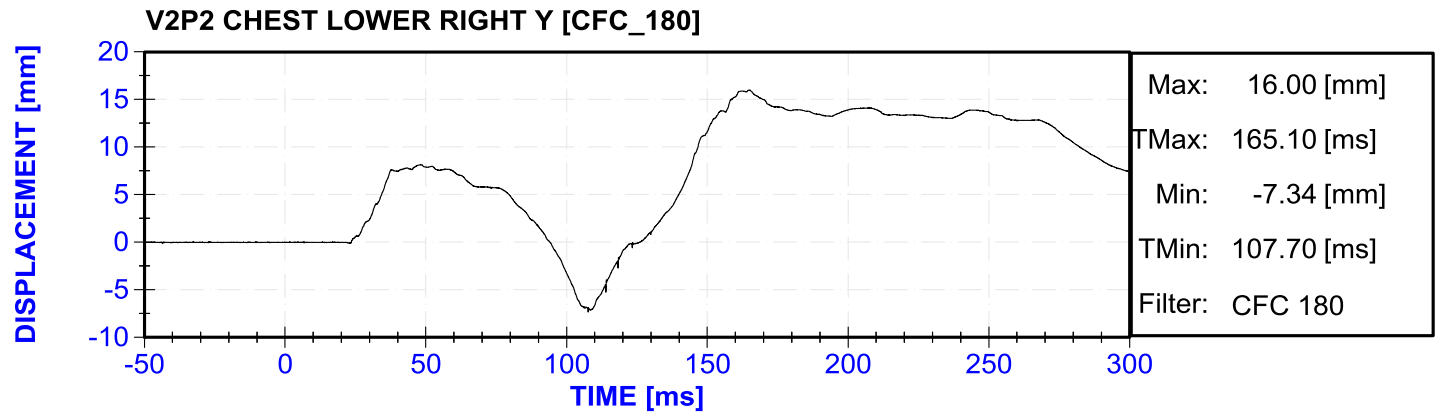
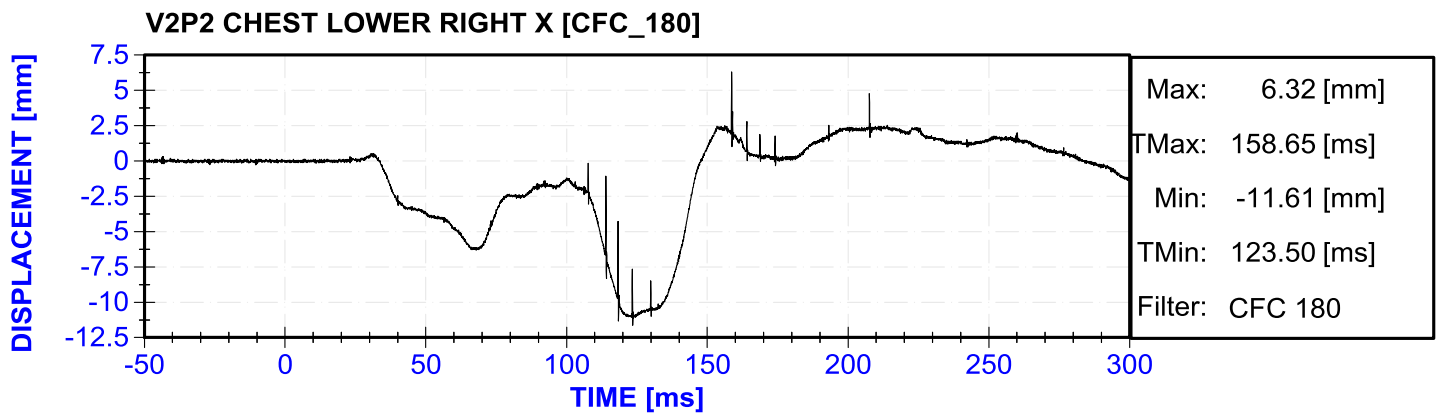
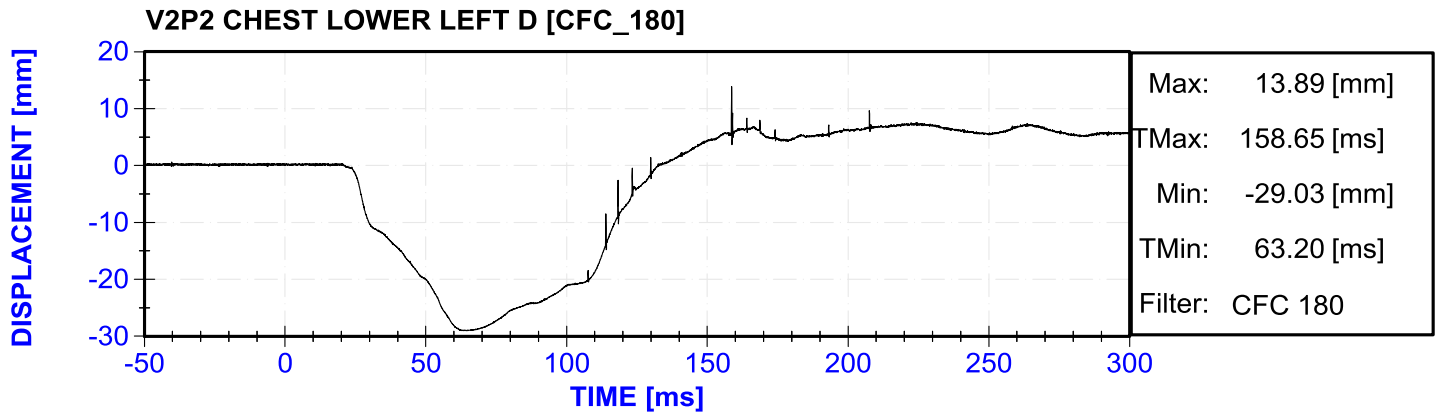
V2P2 NECK UPPER MOMENT Y [THORTEST]

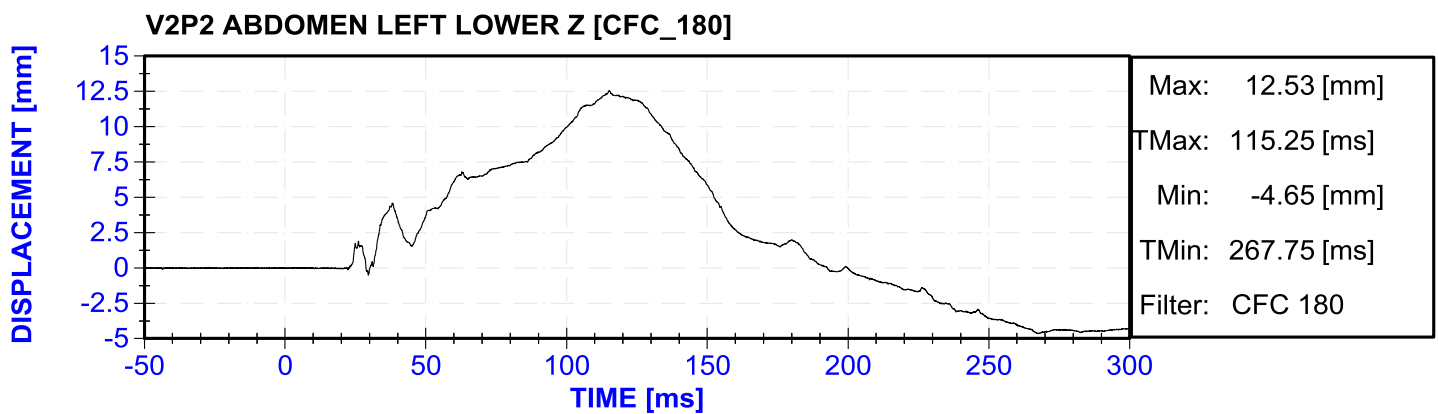
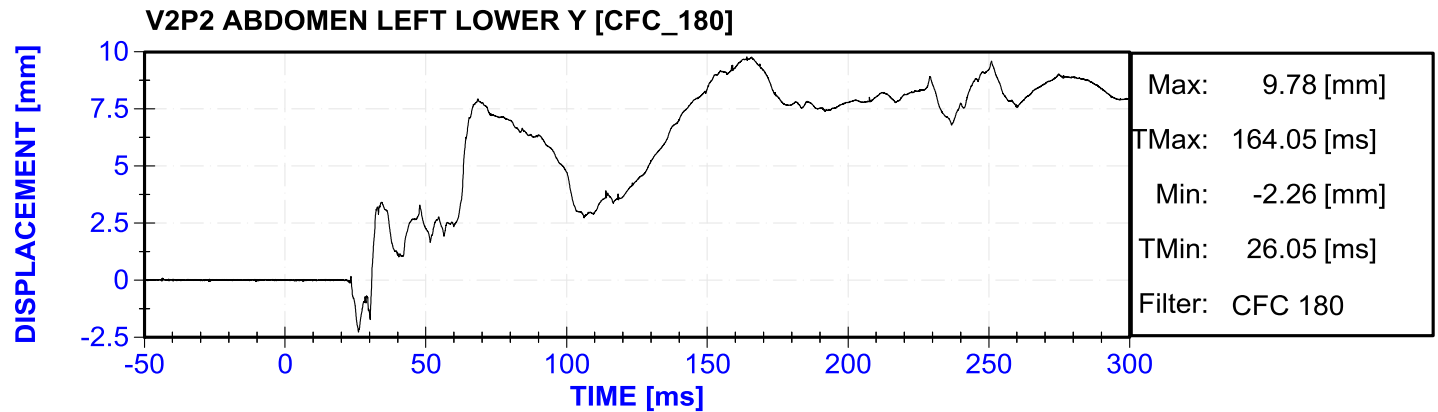
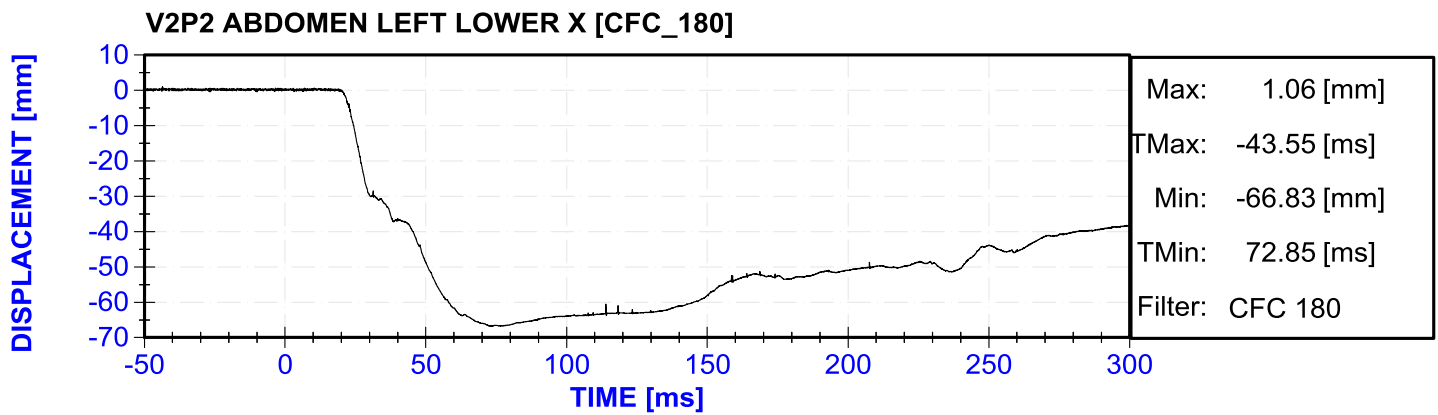
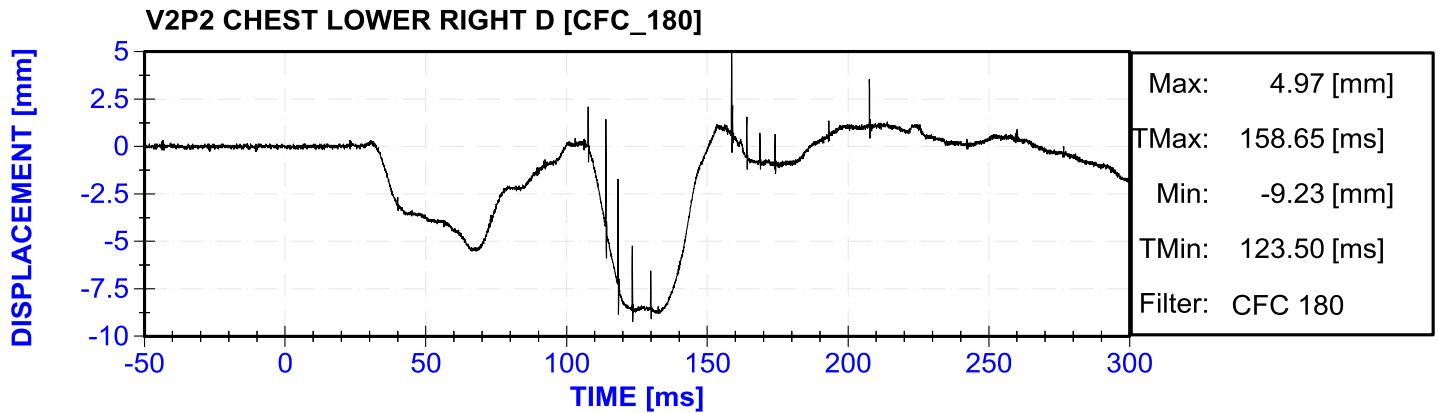


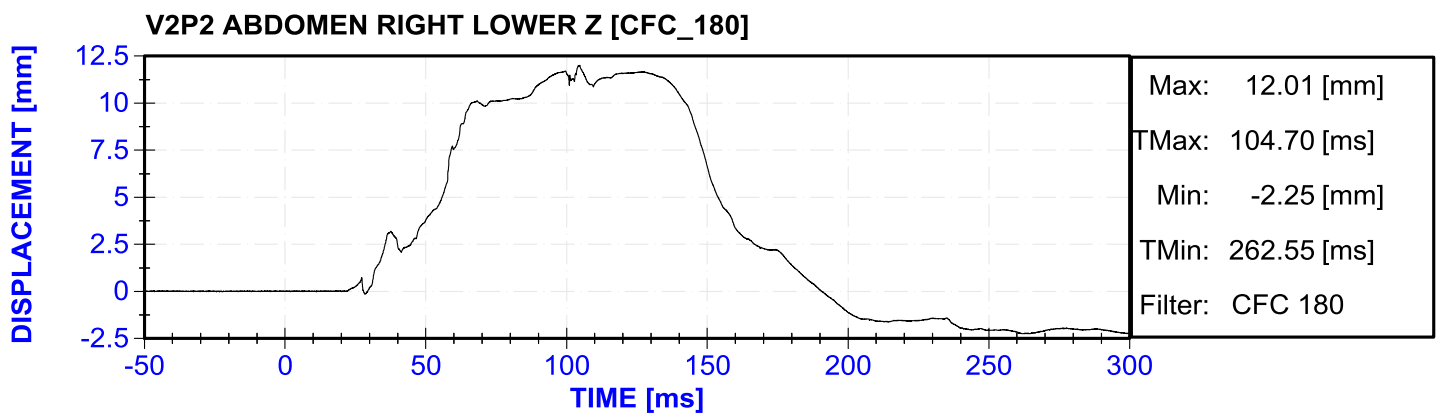
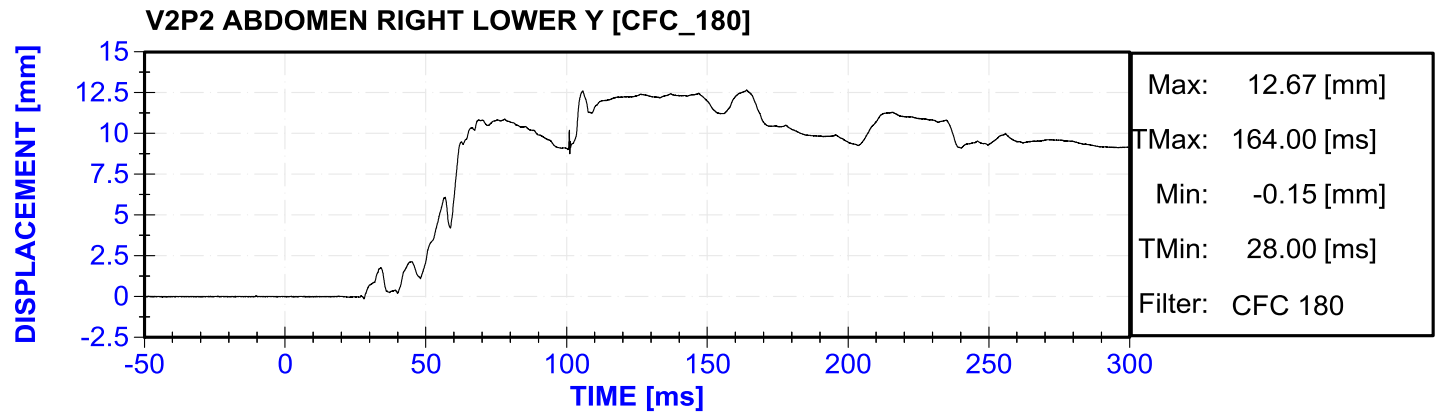
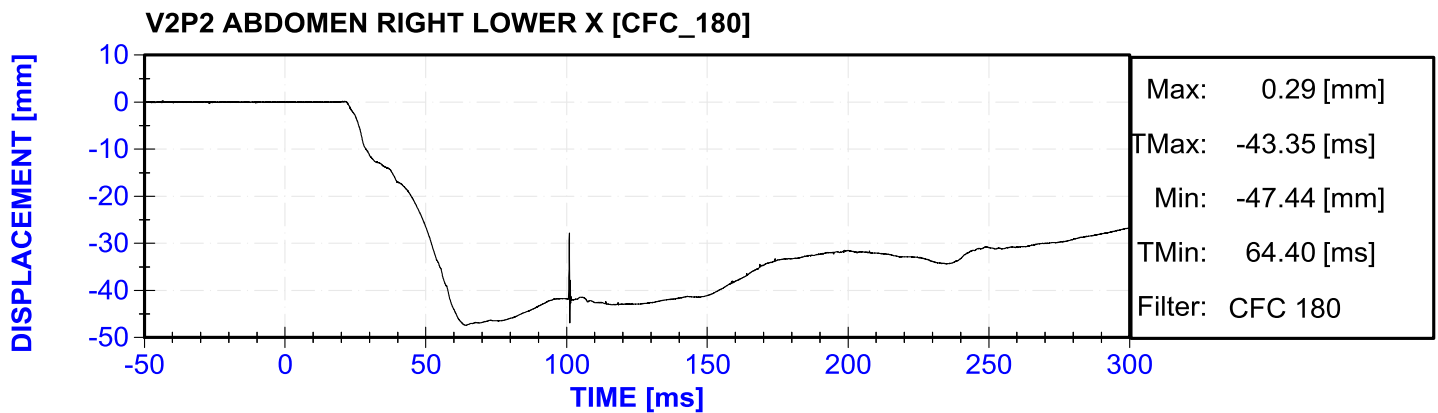
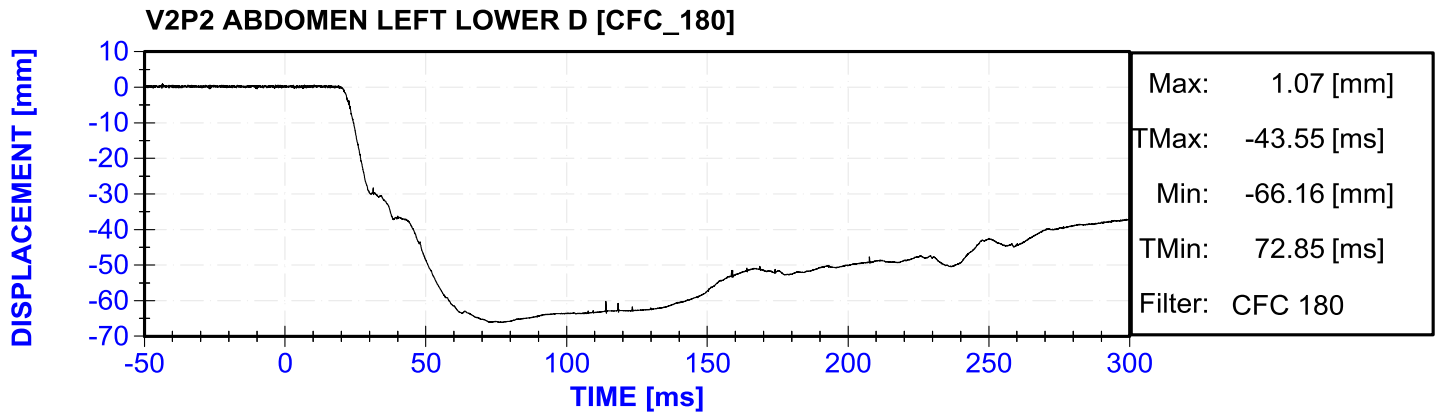


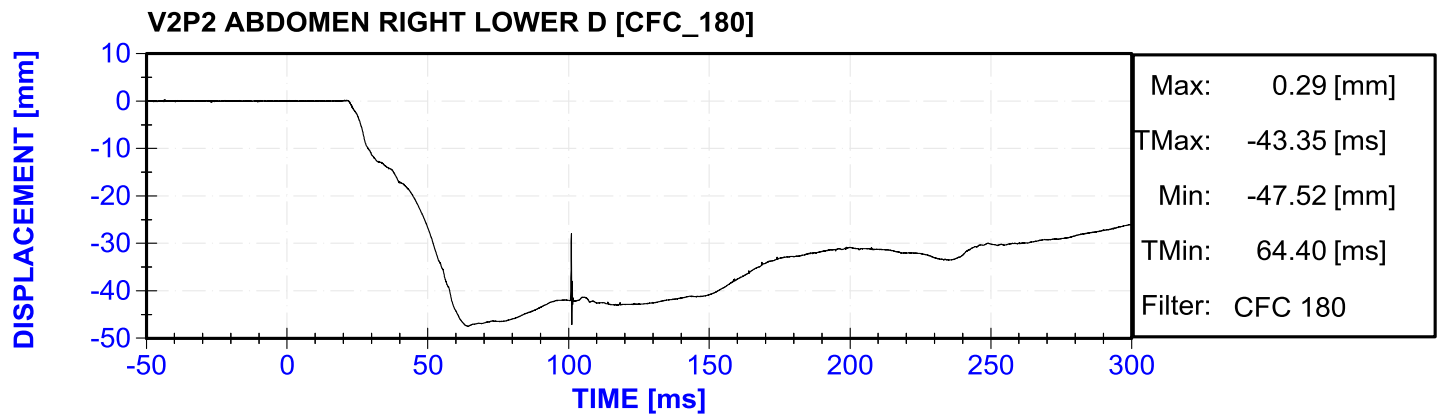












APPENDIX C

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

Table C-1: Dummy Information

TYPE	DESCRIPTION	SERIAL NUMBER
THOR TK	50 TH Male	007
THOR TK	50 TH Male	016

Table C-2: Ankle Offset Files

THOR – TK S/N: 007					
LFTX	LFTY	LFTZ	RFTX	RFTY	RFTZ
Left Ankle X Rotation	Left Ankle Y Rotation	Left Ankle Z Rotation	Right Ankle X Rotation	Right Ankle Y Rotation	Right Ankle Z Rotation
-0.83479	-16.049		0.0405	-11.961	
THOR – TK S/N: 016					
LFTX	LFTY	LFTZ	RFTX	RFTY	RFTZ
Left Ankle X Rotation	Left Ankle Y Rotation	Left Ankle Z Rotation	Right Ankle X Rotation	Right Ankle Y Rotation	Right Ankle Z Rotation
-0.9575	-14.97		-6.842	13.223	

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

THOR – TK S/N: 0007								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
HEAD CG X	MFG: ENDEVCO S/N: P74967	2000	g	g	-1000	1000	0.0185	0
HEAD CG Y	MFG: ENDEVCO S/N: P71875	2000	g	g	-1000	1000	0.0176	0
HEAD CG Z	MFG: ENDEVCO S/N: P74784	2000	g	g	-1000	1000	0.01999	0
HDCG Wx	MFG: DTS S/N: ARS4643	36000	deg/s	deg/s	-18000	1000	0.0921	0
HDCG Wy	MFG: DTS S/N: ARS4651	36000	deg/s	deg/s	-18000	1000	0.09301	0
HDCG Wz	MFG: DTS S/N: ARS4650	36000	deg/s	deg/s	-18000	1000	0.09444	0
NEKU Fx	MFG: Denton S/N: 94	18000	lbf	N	-9000	1000	-0.00022811	0
NEKU Fy	MFG: Denton S/N: 94	18000	lbf	N	-9000	1000	0.00022894	0
NEKU Fz	MFG: Denton S/N: 94	26000	lbf	N	-13000	1000	-0.00008764	0
NEKU Mx	MFG: Denton S/N: 94	1200	in-lbf	N-m	-600	600	-0.00591849	0
NEKU My	MFG: Denton S/N: 94	1200	in-lbf	N-m	-600	600	0.00598399	0
NEKU Mz	MFG: Denton S/N: 94	1200	in-lbf	N-m	-600	600	0.00965262	0
NEKL Fx	MFG: DENTON S/N: 88	26000	lbf	N	-13000	1000	0.00017038	0
NEKL Fy	MFG: DENTON S/N: 88	26000	lbf	N	-13000	1000	0.0001704	0
NEKL Fz	MFG: DENTON S/N: 88	26000	lbf	N	-13000	1000	-0.00007065	0
NEKL Mx	MFG: DENTON S/N: 88	1200	in-lbf	N-m	-600	600	-0.0040085	0
NEKL My	MFG: DENTON S/N: 88	1200	in-lbf	N-m	-600	600	0.00400231	0
NEKL Mz	MFG: DENTON S/N: 88	1200	in-lbf	N-m	-600	600	0.0067779	0
NKCF Fz	MFG: DENTON S/N: 93	90000	lbf	N	-45000	1000	0.00086877	0

THOR – TK (Continued) S/N: 0007								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
NKCR Fz	MFG: DENTON S/N: 132	90000	lbf	N	-45000	1000	0.00071044	0
HDOT RDy	MFG: Sfernice S/N: 0942	340	deg	deg	-170	180	3.038	0
SPNU Ax	MFG: ENDEVCO S/N: P74970	1000	g	g	-500	180	0.02212	0
SPNU Ay	MFG: ENDEVCO S/N: P74979	1000	g	g	-500	180	0.01907	0
SPNU Az	MFG: ENDEVCO S/N: P75158	1000	g	g	-500	180	0.01723	0
SPNM Ax	MFG: ENDEVCO S/N: P75155	1000	g	g	-500	180	0.01993	0
SPNM Ay	MFG: ENDEVCO S/N: P75150	1000	g	g	-500	180	0.01954	0
SPNM Az	MFG: ENDEVCO S/N: P75153	1000	g	g	-500	180	0.02378	0
CHLU Dx	MFG: FTSS S/N: AC3556	3.3	V	mm	3.3	600	1000	
CHLU Ry	MFG: Sfernice S/N: AC6043	150	deg	deg	-75	180	3.0419	8.364
CHLU Rz	MFG: Sfernice S/N: AC6041	150	deg	deg	-75	180	3.0642	12.383
CHRU Dx	MFG: FTSS S/N: AC2288	3.3	V	mm	3.3	600	1000	
CHRU Ry	MFG: Sfernice S/N: AC6045	150	deg	deg	-75	180	3.0685	4.271
CHRU Rz	MFG: Sfernice S/N: AC6044	150	deg	deg	-75	180	3.0637	-7.104
CHLL Dx	MFG: FTSS S/N: AC3555	3.3	V	mm	3.3	600	1000	
CHLL Ry	MFG: Sfernice S/N: AC6158	150	deg	deg	-75	180	3.0696	-2.058
CHLL Rz	MFG: Sfernice S/N: AC6159	150	deg	deg	-75	180	3.0682	12.064
CHRL Dx	MFG: FTSS S/N: AC2287	3.3	V	mm	3.3	600	1000	
CHRL Ry	MFG: Sfernice S/N: AC6042	150	deg	deg	-75	180	2.6324	4.158
CHRL Rz	MFG: Sfernice S/N: AC6040	150	deg	deg	-75	180	3.0327	-3.550
ABDL Dx	MFG: Denton S/N: 173	3.3	V	mm	3.3	600	12.97679	
ABDL Ry	MFG: Contelec S/N: DS-558	150	deg	deg	-75	180	3.0172	1.067
ABDL Rz	MFG: Contelec S/N: DS-556	150	deg	deg	-75	180	3.0149	4.797
ABDR Dx	MFG: Denton S/N: 172	3.3	V	mm	3.3	600	13.03657	
ABDR Ry	MFG: Contelec S/N: DS-523	150	deg	deg	-75	180	3.0277	16.200
ABDR Rz	MFG: Contelec S/N: DS-557	150	deg	deg	-75	180	3.0114	-4.094
SPNL Fx	MFG: Denton S/N: 122	26000	lbf	N	-13000	1000	-0.0001395	0
SPNL Fy	MFG: Denton S/N: 122	26000	lbf	N	-13000	1000	0.00014053	0
SPNL Fz	MFG: Denton S/N: 122	36000	lbf	N	-18000	1000	-0.0000533	0
SPNL Mx	MFG: Denton S/N: 122	1400	in-lbf	N-m	-700	1000	-0.00209586	0
SPNL My	MFG: Denton S/N: 122	1400	in-lbf	N-m	-700	1000	0.00184981	0
PVCG Ax	MFG: ENDEVCO S/N: P74965	1000	g	g	-500	1000	0.0202	0
PVCG Ay	MFG: ENDEVCO S/N: P74976	1000	g	g	-500	1000	0.01703	0
PVCG Az	MFG: ENDEVCO S/N: P49439	1000	g	g	-500	1000	0.01961	0
PVAL Fx	MFG: DENTON S/N: 75	44000	lbf	N	-22000	600	0.00012174	0
PVAL Fy	MFG: DENTON S/N: 75	27000	lbf	N	-13500	600	-0.00005981	0
PVAL Fz	MFG: DENTON S/N: 75	27000	lbf	N	-13500	600	0.00016528	0
PVAR Fx	MFG: DENTON S/N: 75	44000	lbf	N	-22000	600	0.00012302	0
PVAR Fy	MFG: DENTON S/N: 75	26000	lbf	N	-13000	600	-0.00006078	0
PVAR Fz	MFG: DENTON S/N: 75	26000	lbf	N	-13000	600	-0.0001662	0
PILL Fx	MFG: Denton S/N: 75	26000	lbf	N	-13000	600	-0.00006743	0
PILR Fx	MFG: Denton S/N: 76	26000	lbf	N	-13000	600	-0.00006867	0
FMRL Fx	MFG: Humanetics S/N: DJ1040Fx	30000	N	N	-15000	600	0.0001436	0
FMRL Fy	MFG: Humanetics S/N: DJ1040Fy	30000	N	N	-15000	600	0.0001441	0
FMRL Fz	MFG: Humanetics S/N: DJ1040Fz	40000	N	N	-20000	600	-0.0000728	0
FMRL Mx	MFG: Humanetics S/N: DJ1040Mx	700	N-m	N-m	-350	600	0.0064454	0

THOR – TK (Continued) S/N: 0007								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
FMRL My	MFG: Humanetics S/N: DJ1040My	700	N-m	N-m	-350	600	0.0064621	0
FMRL Mz	MFG: Humanetics S/N: DJ1040Mz	600	N-m	N-m	-300	600	0.009063	0
KNEL Dx	MFG: Humanetics S/N: DJ1045Fx	80	mm	mm	-40	180	23.8618	0
TBLU Fz	MFG: Humanetics S/N: DJ1045Fy	50000	N	N	-25000	600	-0.0000908	0
TBLU Mx	MFG: Humanetics S/N: DJ1045Fz	800	N-m	N-m	-400	600	0.0072731	0
TBLU My	MFG: Humanetics S/N: DJ1045Mx	800	N-m	N-m	-400	600	0.0072771	0
TBLL Fz	MFG: Humanetics S/N: DJ1045My	50000	N	N	-25000	600	-0.00009686	0
TBLL Mx	MFG: Humanetics S/N: DJ1045Mz	800	N-m	N-m	-400	600	0.00750986	0
TBLL My	MFG: Space Age Controls S/N: 025670	800	N-m	N-m	-400	600	0.0075842	0
ANKL Rx	MFG: DENTON S/N: 110Fz	200	deg	deg	-100	180	2.995	-0.83479
ANKL Ry	MFG: DENTON S/N: 110Mx	200	deg	deg	-100	180	3.014	-16.049
FOTL Az	MFG: DENTON S/N: 110My	3000	g	g	-1500	1000	0.01972	0
FMRR Fx	MFG: Denton S/N: 120Fz	30000	N	N	-15000	600	0.0001461	0
FMRR Fy	MFG: Denton S/N: 120Mx	30000	N	N	-15000	600	0.0001465	0
FMRR Fz	MFG: Denton S/N: 120My	40000	N	N	-20000	600	-0.0000756	0
FMRR Mx	MFG: Contelec S/N: ANKLX-0371	700	N-m	N-m	-350	600	0.0065482	0
FMRR My	MFG: Contelec S/N: ANKLY-0367	700	N-m	N-m	-350	600	0.006518	0
FMRR Mz	MFG: ENDEVCO S/N: P51711	600	N-m	N-m	-300	600	0.0097325	0
KNER Dx	MFG: Space Age Controls S/N: 019588	80	mm	mm	-40	180	23.9349	0
TBRU Fz	MFG: DENTON S/N: 107Fz	50000	N	N	-25000	600	-0.0000955	0
TBRU Mx	MFG: DENTON S/N: 107Mx	800	N-m	N-m	-400	600	0.0074272	0
TBRU My	MFG: DENTON S/N: 107My	800	N-m	N-m	-400	600	0.007333	0
TBRL Fz	MFG: Denton S/N: 75Fz	50000	N	N	-25000	600	-0.00009964	0
TBRL Mx	MFG: Denton S/N: 75Mx	800	N-m	N-m	-400	600	0.00736028	0
TBRL My	MFG: Denton S/N: 75My	800	N-m	N-m	-400	600	0.00736294	0
ANKR Rx	MFG: Contelec S/N: ANKRX-0368	200	deg	deg	-100	180	3.017	0.0405
ANKR Ry	MFG: Contelec S/N: ANKRY-0369	200	deg	deg	-100	180	3.009	-11.961
FOTR Az	MFG: ENDEVCO S/N: P64128	3000	g	g	-1500	1000	0.02344	0

THOR – TK S/N: 016								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
HEAD CG X	MFG: ENDEVCO S/N: P52086	2000	g	g	-1000	1000	0.0177	0
HEAD CG Y	MFG: ENDEVCO S/N: P52043	2000	g	g	-1000	1000	0.02065	0
HEAD CG Z	MFG: DTS S/N: ARS4727	2000	g	g	-1000	1000	0.01721	0
HDCG Wx	MFG: DTS S/N: ARS4712	36000	deg/s	deg/s	-18000	1000	0.09262	0
HDCG Wy	MFG: DTS S/N: ARS4714	36000	deg/s	deg/s	-18000	1000	0.09378	0
HDCG Wz	MFG: DENTON S/N: 77	36000	deg/s	deg/s	-18000	1000	0.09563	0
NEKU Fx	MFG: DENTON S/N: 77TFx	18000	lbf	N	-9000	1000	0.0002406	0
NEKU Fy	MFG: DENTON S/N: 77	18000	lbf	N	-9000	1000	0.00024081	0
NEKU Fz	MFG: DENTON S/N: 77	26000	lbf	N	-13000	1000	-0.00008546	0
NEKU Mx	MFG: DENTON S/N: 77	1200	in-lbf	N-m	-600	600	0.00584857	0
NEKU My	MFG: DENTON S/N: 77	1200	in-lbf	N-m	-600	600	0.00609285	0

THOR – TK (Continued) S/N: 016								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
NEKU Mz	MFG: DENTON S/N: 77	1200	in-lbf	N-m	-600	600	0.00980132	0
NEKL Fx	MFG: DENTON S/N: 80	26000	lbf	N	-13000	1000	-0.00017312	0
NEKL Fy	MFG: DENTON S/N: 80	26000	lbf	N	-13000	1000	0.00017328	0
NEKL Fz	MFG: DENTON S/N: 80	26000	lbf	N	-13000	1000	-0.00006903	0
NEKL Mx	MFG: DENTON S/N: 80	1200	in-lbf	N-m	-600	600	-0.00417667	0
NEKL My	MFG: DENTON S/N: 80	1200	in-lbf	N-m	-600	600	0.00421295	0
NEKL Mz	MFG: DENTON S/N: 80	1200	in-lbf	N-m	-600	600	0.00690093	0
NKCF Fz	MFG: DENTON S/N: 80	90000	lbf	N	-45000	1000	0.00052317	0
NKCR Fz	MFG: DENTON S/N: 75	90000	lbf	N	-45000	1000	0.0004801	0
HDOT RDy	MFG: Sfernice S/N: DI7189	340	deg	deg	-170	180	3.038	0
SPNU Ax	MFG: ENDEVCO S/N: P64099	1000	g	g	-500	180	0.01844	0
SPNU Ay	MFG: ENDEVCO S/N: P58838	1000	g	g	-500	180	0.01739	0
SPNU Az	MFG: ENDEVCO S/N: P58834	1000	g	g	-500	180	0.0188	0
SPNM Ax	MFG: ENDEVCO S/N: P64002	1000	g	g	-500	180	0.01799	0
SPNM Ay	MFG: ENDEVCO S/N: P58735	1000	g	g	-500	180	0.01841	0
SPNM Az	MFG: ENDEVCO S/N: P64111	1000	g	g	-500	180	0.01674	0
CHLU Dx	MFG: FTSS S/N: DI4715	3.3	V	mm	3.3	600	1000	
CHLU Ry	MFG: Denton S/N: DI2382	150	deg	deg	-75	180	3.0087	8.434
CHLU Rz	MFG: Denton S/N: DI2383	150	deg	deg	-75	180	3.0074	11.913
CHRU Dx	MFG: FTSS S/N: DI4716	3.3	V	mm	3.3	600	1000	
CHRU Ry	MFG: Denton S/N: DI2381	150	deg	deg	-75	180	3.0077	7.451
CHRU Rz	MFG: Denton S/N: DI2380	150	deg	deg	-75	180	3.0199	-9.781
CHLL Dx	MFG: FTSS S/N: DI4718	3.3	V	mm	3.3	600	1000	
CHLL Ry	MFG: Denton S/N: DI2386	150	deg	deg	-75	180	3.0211	3.758
CHLL Rz	MFG: Denton S/N: DI6129	150	deg	deg	-75	180	3.01218	7.021
CHRL Dx	MFG: FTSS S/N: DI4717	3.3	V	mm	3.3	600	1000	
CHRL Ry	MFG: Denton S/N: DI2385	150	deg	deg	-75	180	3.016	.5991
CHRL Rz	MFG: Denton S/N: DI2384	150	deg	deg	-75	180	3.0217	-8.613
ABDL Dx	MFG: Denton S/N: 183T	3.3	V	mm	3.3	600	1000	
ABDL Ry	MFG: Denton S/N: 219	150	deg	deg	-75	180	3.218	4.171
ABDL Rz	MFG: Denton S/N: 218	150	deg	deg	-75	180	3.165	1.789
ABDR Dx	MFG: Denton S/N: 184	3.3	V	mm	3.3	600	1000	
ABDR Ry	MFG: Denton S/N: 220	150	deg	deg	-75	180	3.182	5.652
ABDR Rz	MFG: Denton S/N: 221	150	deg	deg	-75	180	3.168	-1.162
SPNL Fx	MFG: Denton S/N: 123	26000	lbf	N	-13000	1000	0.00139138	0
SPNL Fy	MFG: Denton S/N: 123	26000	lbf	N	-13000	1000	0.00013943	0
SPNL Fz	MFG: Denton S/N: 123	36000	lbf	N	-18000	1000	-0.00005291	0
SPNL Mx	MFG: Denton S/N: 123	1400	in-lbf	N-m	-700	1000	-0.00209586	0
SPNL My	MFG: Denton S/N: 123	1400	in-lbf	N-m	-700	1000	0.00182945	0
PVCG Ax	MFG: ENDEVCO S/N: P64087	1000	g	g	-500	1000	0.01834	0
PVCG Ay	MFG: ENDEVCO S/N: P50065	1000	g	g	-500	1000	0.01785	0
PVCG Az	MFG: ENDEVCO S/N: P64123	1000	g	g	-500	1000	0.01914	0
PVAL Fx	MFG: DENTON S/N: 77	44000	lbf	N	-22000	600	-0.00011976	0
PVAL Fy	MFG: DENTON S/N: 77	27000	lbf	N	-13500	600	-0.00005959	0
PVAL Fz	MFG: DENTON S/N: 77	27000	lbf	N	-13500	600	-0.00016344	0

THOR – TK (Continued) S/N: 016								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
PVAR Fx	MFG: DENTON S/N: 84	44000	lbf	N	-22000	600	0.00012055	0
PVAR Fy	MFG: DENTON S/N: 84	26000	lbf	N	-13000	600	-0.00006006	0
PVAR Fz	MFG: DENTON S/N: 84	26000	lbf	N	-13000	600	0.00016272	0
PILL Fx	MFG: Denton S/N: DI4774	26000	lbf	N	-13000	1000	-0.00012118	0
PILR Fx	MFG: Denton S/N: DI4775	26000	lbf	N	-13000	1000	-0.00012068	0
FMRL Fx	MFG: Denton S/N: DH9717	30000	N	N	-15000	600	0.0001446	0
FMRL Fy	MFG: Denton S/N: DH9717	30000	N	N	-15000	600	0.0001458	0
FMRL Fz	MFG: Denton S/N: DH9717	40000	N	N	-20000	600	-0.0000724	0
FMRL Mx	MFG: Denton S/N: DH9717	700	N-m	N-m	-350	600	0.0065482	0
FMRL My	MFG: Denton S/N: DH9717	700	N-m	N-m	-350	600	0.0065257	0
FMRL Mz	MFG: Denton S/N: DH9717	600	N-m	N-m	-300	600	0.0091723	0
KNEL Dx	MFG: Denton S/N: DH9722	80	mm	mm	-40	180	22.147	0
TBLU Fz	MFG: Denton S/N: DH9722	50000	N	N	-25000	600	-0.0000921	0
TBLU Mx	MFG: Denton S/N: DH9722	800	N-m	N-m	-400	600	0.0073598	0
TBLU My	MFG: Denton S/N: DH9722	800	N-m	N-m	-400	600	0.0073288	0
TBLL Fz	MFG: Denton S/N: DH9722	50000	N	N	-25000	600	-0.0000948	0
TBLL Mx	MFG: Denton S/N: DH9722	800	N-m	N-m	-400	600	0.0073026	0
TBLL My	MFG: Space Age Controls S/N: D2103665B	800	N-m	N-m	-400	600	0.0073735	0
ANKL Rx	MFG: Denton S/N: 89	200	deg	deg	-100	180	3.04982	-0.9575
ANKL Ry	MFG: Denton S/N: 89	200	deg	deg	-100	180	2.96419	-14.97
FOTL Az	MFG: Denton S/N: 89	3000	g	g	-1500	1000	0.0191	0
FMRR Fx	MFG: Denton S/N: 142	30000	N	N	-15000	600	0.0001474	0
FMRR Fy	MFG: Denton S/N: 142	30000	N	N	-15000	600	0.0001474	0
FMRR Fz	MFG: Denton S/N: 142	40000	N	N	-20000	600	-0.0000737	0
FMRR Mx	MFG: Contelec S/N: LX0019	700	N-m	N-m	-350	600	0.0065614	0
FMRR My	MFG: Contelec S/N: LX0019	700	N-m	N-m	-350	600	0.0065759	0
FMRR Mz	MFG: ENDEVCO S/N: P52001	600	N-m	N-m	-300	600	0.0089348	0
KNER Dx	MFG: Space Age Controls S/N: D2103657B	80	mm	mm	-40	180	23.135	0
TBRU Fz	MFG: Denton S/N: 95	50000	N	N	-25000	600	-0.0000918	0
TBRU Mx	MFG: Denton S/N: 95	800	N-m	N-m	-400	600	0.0073681	0
TBRU My	MFG: Denton S/N: 95	800	N-m	N-m	-400	600	0.0072947	0
TBRL Fz	MFG: Denton S/N: 164	50000	N	N	-25000	600	-0.0000956	0
TBRL Mx	MFG: Denton S/N: 164	800	N-m	N-m	-400	600	0.0075105	0
TBRL My	MFG: Denton S/N: 164	800	N-m	N-m	-400	600	0.0073588	0
ANKR Rx	MFG: Contelec S/N: LX0018	200	deg	deg	-100	180	3.13066	-6.842
ANKR Ry	MFG: Contelec S/N: LX0018	200	deg	deg	-100	180	2.95682	13.223
FOTR Az	MFG: ENDEVCO S/N: P64102	3000	g	g	-1500	1000	0.01986	0

Table C-4: THOR Dummy Initial Set-Up Information (IR-TRACC)

THOR – TK S/N: 007			
Sensor	IR-TRACC Exponent	IR-TRACC Slope	IR-TRACC Intercept
CHLU Dx	-0.4675	-34.009493	120.7103
CHRU Dx	-0.4675	-34.871682	125.2528
CHLL Dx	-0.4675	-34.916600	123.9557
CHRL Dx	-0.4675	-34.121632	121.9603
ABDL Dx	-0.43568	31.6159	3.688
ABDR Dx	-0.40940	31.7099	3.774
THOR – TK S/N: 016			
Sensor	IR-TRACC Exponent	IR-TRACC Slope	IR-TRACC Intercept
CHLU Dx	-0.48024	33.0284	3.680
CHRU Dx	-0.4675	-34.919035	121.2325
CHLL Dx	-0.4672	33.6317	3.612
CHRL Dx	-0.48206	32.0908	3.791
ABDL Dx	-0.47743	38.9774	3.894
ABDR Dx	-0.48020	53.1720	2.874

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 007

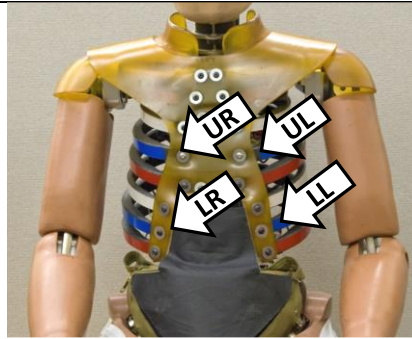
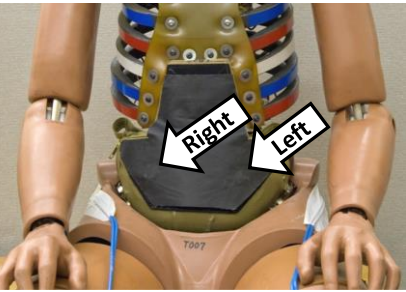


Figure 1. Manipulation to determine thoracic IR-TRACC polarity.

UR				UL			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.1501	.1760	Increase	DX (V)	.1759	.2025	Increase
			Increase				Increase
RY (Deg)	4.271	-.331	Increase	RY (Deg)	8.364	5.141	Decrease
			Decrease				Decrease
RZ (Deg)	-7.104	-5.851	Decrease	RZ (Deg)	12.383	13.858	Decrease
			Increase				Increase
LR				LL			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.0781	.1042	Increase	DX (V)	.0921	.1323	Increase
			Increase				Increase
RY (Deg)	4.158	.9250	Increase	RY (Deg)	-2.058	-4.612	Decrease
			Decrease				Decrease
RZ (Deg)	-3.550	-1.357	Decrease	RZ (Deg)	12.064	17.925	Increase
			Increase				Increase
							
Abdomen Left				Abdomen Right			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.0431	.1373	Increase	DX (V)	.0329	.9302	Increase
			Increase				Increase
RY (Deg)	1.067	-3.028	Decrease	RY (Deg)	16.200	8.392	Increase
			Decrease				Decrease
RZ (Deg)	4.797	10.073	Increase	RZ (Deg)	-4.094	.4204	Decrease
			Increase				Increase

THOR 0016

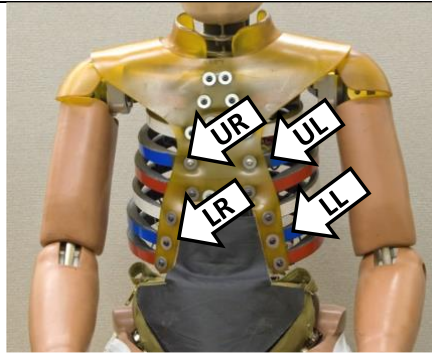
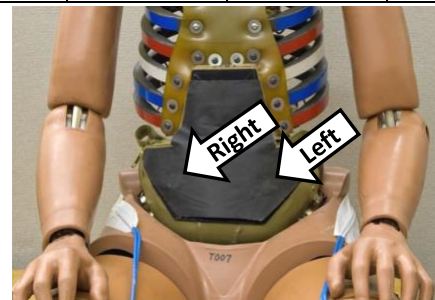


Figure 2. Manipulation to determine thoracic IR-TRACC polarity.

UR				UL			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.1312	.2071	Increase	DX (V)	.1357	.2316	Increase
			Increase				Increase
RY (Deg)	7.451	2.791	Increase	RY (Deg)	8.434	1.591	Decrease
			Decrease				Decrease
RZ (Deg)	-9.781	-6.440	Decrease	RZ (Deg)	11.913	16.909	Decrease
			Increase				Increase
LR				LL			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.0856	.1421	Increase	DX (V)	.0753	.1350	Increase
			Increase				Increase
RY (Deg)	.5991	-3.319	Increase	RY (Deg)	3.758	-1.598	Decrease
			Decrease				Decrease
RZ (Deg)	-8.613	-1.556	Decrease	RZ (Deg)	7.021	15.472	Increase
			Increase				Increase
							
Abdomen Left				Abdomen Right			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.0512	.1152	Increase	DX (V)	.1361	.2685	Increase
			Increase				Increase
RY (Deg)	4.171	-2.343	Decrease	RY (Deg)	5.652	-.500	Increase
			Decrease				Decrease
RZ (Deg)	1.789	10.213	Increase	RZ (Deg)	-1.162	2.668	Decrease
			Increase				Increase

THOR Inspection Checklist

Date: 01/05/2013
NHTSA Representative: James Saunders
Witness(es):
Inspection type (check one): ☒ PRE ☐ POST
Dummy S/N: 007
Dummy Description: Thor NT 50th Male
Date of last Certification or Inspection: 12/21/2012
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RC5370 Left Side Odyssey <u>Since last certification:</u> RD5227 Right side Versa RC5142 Right side Camry RD5226 Left side Versa RD4200 Left side Elantra RC5141 Left side Camry RC5369 Left side CR-V RC5370 Left Side Odyssey
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> CHLL DX had a spike at 160 ms SPNL MX had a spike at 111ms FOTL AZ had a spike at 59 ms TBRL FZ had spikes at 15 & 64ms
<u>Physical evidence of damage:</u>
<u>Anecdotal evidence of damage:</u>
<u>Equipment delivered to Borrower:</u>

HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull -slightly small, does not fit 100% in rear
Y / N	Head skin shows no sign of tears or damage -nicks/cuts 
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 debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell): -debonding above pucks 4, 5 
Y / N	No evidence of debonding or permanent compression in neck soft stop assemblies
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	

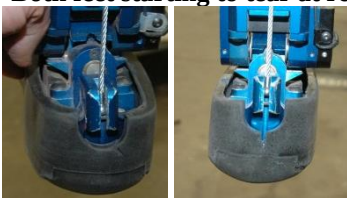
SPINE	
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates -tears in left/right sides? 
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged
OTHER	

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 debonding, tearing, or permanent compression of posterior soft stops -left stop slightly debonded 
OTHER	

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material -top interior left ribs 2, 5 -top interior right rib 4 
Y / N	No evidence of debonding between rib damping material and ribs
Y / N	CRUX anterior arms securely attached to anterior ribs
Y / N	CRUX posterior arms 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	-Right arm has a gouge near elbow 
ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper -holes in left, right sides near 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
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	-holes in pelvis flesh near ASIS anterior surfaces 

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 -cuts/tears/hole in both knee flesh covers 
OTHER	

LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
OTHER	-Both feet starting to tear at rear 

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
OTHER	

THOR Inspection Checklist

Date: 01/09/2013
NHTSA Representative: James Saunders
Witness(es):
Inspection type (check one): ☐ PRE ☒ POST
Dummy S/N: 007
Dummy Description: Thor NT 50th Male
Date of last Certification or Inspection: 01/05/2013
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RC0185 Left Side Silverado <u>Since last certification:</u> RD5227 Right side Versa RC5142 Right side Camry RD5226 Left side Versa RD4200 Left side Elantra RC5141 Left side Camry RC5369 Left side CR-V RC5370 Left Side Odyssey RC0185 Left Side Silverado
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> FOTL AZ had a spike at 51.8 ms V2P1 FOTR AZ had a spike at 55.7 ms V2P2 ANKL RX had questionable data V2P2 ANKL RY had questionable data V2P2 FOTL AZ failed V2P2 ANKR RX had questionable data V2P2 ANKR RY had questionable data
<u>Physical evidence of damage:</u>
<u>Anecdotal evidence of damage:</u>
<u>Equipment delivered to Borrower:</u>

HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull -slightly small, does not fit 100% in rear
Y / N	Head skin shows no sign of tears or damage -nicks/cuts 
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 debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell): -debonding above pucks 4, 5 
Y / N	No evidence of debonding or permanent compression in neck soft stop assemblies
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	

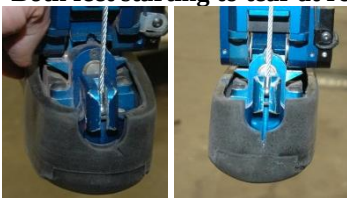
SPINE	
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates -tears in left/right sides? 
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged
OTHER	

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 debonding, tearing, or permanent compression of posterior soft stops -left stop slightly debonded 
OTHER	

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material -top interior left ribs 2, 5 -top interior right rib 4 
Y / N	No evidence of debonding between rib damping material and ribs
Y / N	CRUX anterior arms securely attached to anterior ribs
Y / N	CRUX posterior arms 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	-Right arm has a gouge near elbow 
ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper -holes in left, right sides near 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
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	-holes in pelvis flesh near ASIS anterior surfaces  

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 -cuts/tears/hole in both knee flesh covers 
OTHER	

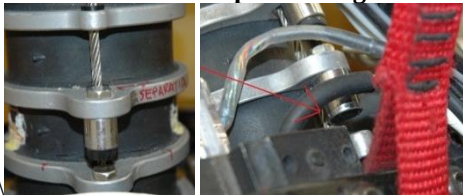
LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
OTHER	-Both feet starting to tear at rear 

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
OTHER	

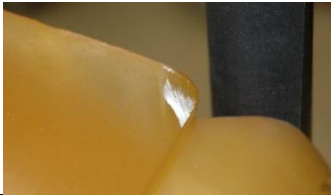
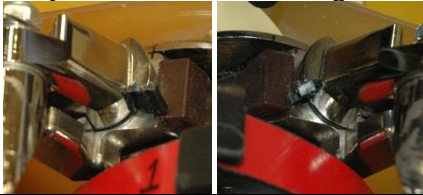
THOR Inspection Checklist

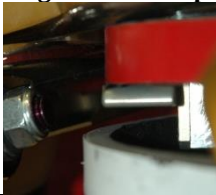
Date: 01/05/2013
NHTSA Representative: James Saunders
Witness(es):
Inspection type (check one): ☒ PRE ☐ POST
Dummy S/N: 0016
Dummy Description: Thor NT 50th Male
Date of last Certification or Inspection: 12/21/2012
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RC5370 Left Side Odyssey <u>Since last certification:</u> RD5227 Right side Versa RC5142 Right side Camry RD5226 Left side Versa RD4200 Left side Elantra RC5141 Left side Camry RC5369 Left side CR-V RC5370 Left Side Odyssey
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> HDCG AX had a spike at 116 ms NEKL MZ had a spike at 164 ms ANKL RX had questionable data ANKL RY had questionable data FOTL AZ failed ANKR RX had questionable data ANKR RY had questionable data
<u>Physical evidence of damage:</u>
<u>Anecdotal evidence of damage:</u>
<u>Equipment delivered to Borrower:</u> Thor 16 ATD

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 -Small scrapes on right side of head 
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 debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell): -cracks in neck rubber, 2-3, 3-4 -Lower rear neck stop is missing 
Y / N	No evidence of debonding or permanent compression in neck soft stop assemblies
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	

SPINE	
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged
OTHER	

SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact -small white mark on left shoulder 
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops
OTHER	-Stops on shoulder interacting with mechanism that rotates on the y-axis are breaking. 

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material -slight contact top right of rib #2 under arm 
Y / N	No evidence of debonding between rib damping material and ribs -right front of rib #5 
Y / N	CRUX anterior arms securely attached to anterior ribs
Y / N	CRUX posterior arms securely attached to double gimbals, spine

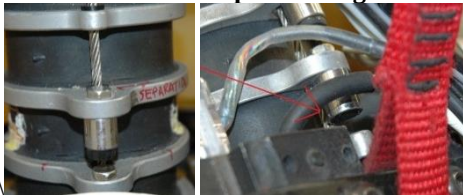
Y / N	Urethane bib is securely attached to ribs with no sign of tearing or washer penetration
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)
OTHER	- Left lower IR-Tracc sticks during compression
ABDOMEN	
Y / N	No 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 -torn stitches on left/right side at leg zipper
	
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
OTHER	
LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops -ankle roll stops cracked 
OTHER	-Right leg skin is tearing -Right leg has a chip out of structural ring 
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
OTHER	

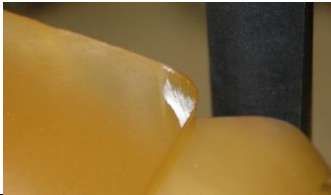
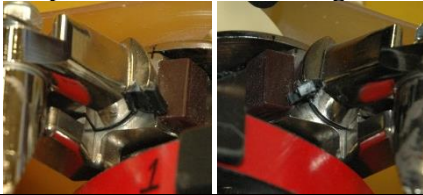
THOR Inspection Checklist

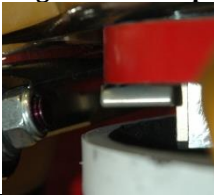
Date: 01/09/2013
NHTSA Representative: James Saunders
Witness(es):
Inspection type (check one): ☐ PRE ☒ POST
Dummy S/N: 0016
Dummy Description: Thor NT 50th Male
Date of last Certification or Inspection: 01/05/2013
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RC0185 Chevy Silverado <u>Since last certification:</u> RD5227 Right side Versa RC5142 Right side Camry RD5226 Left side Versa RD4200 Left side Elantra RC5141 Left side Camry RC5369 Left side CR-V RC5370 Left Side Odyssey
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> ANKL RX had questionable data ANKL RY had questionable data FOTL AZ failed ANKR RX had questionable data ANKR RY had questionable data
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<u>Equipment delivered to Borrower:</u> Thor 16 ATD

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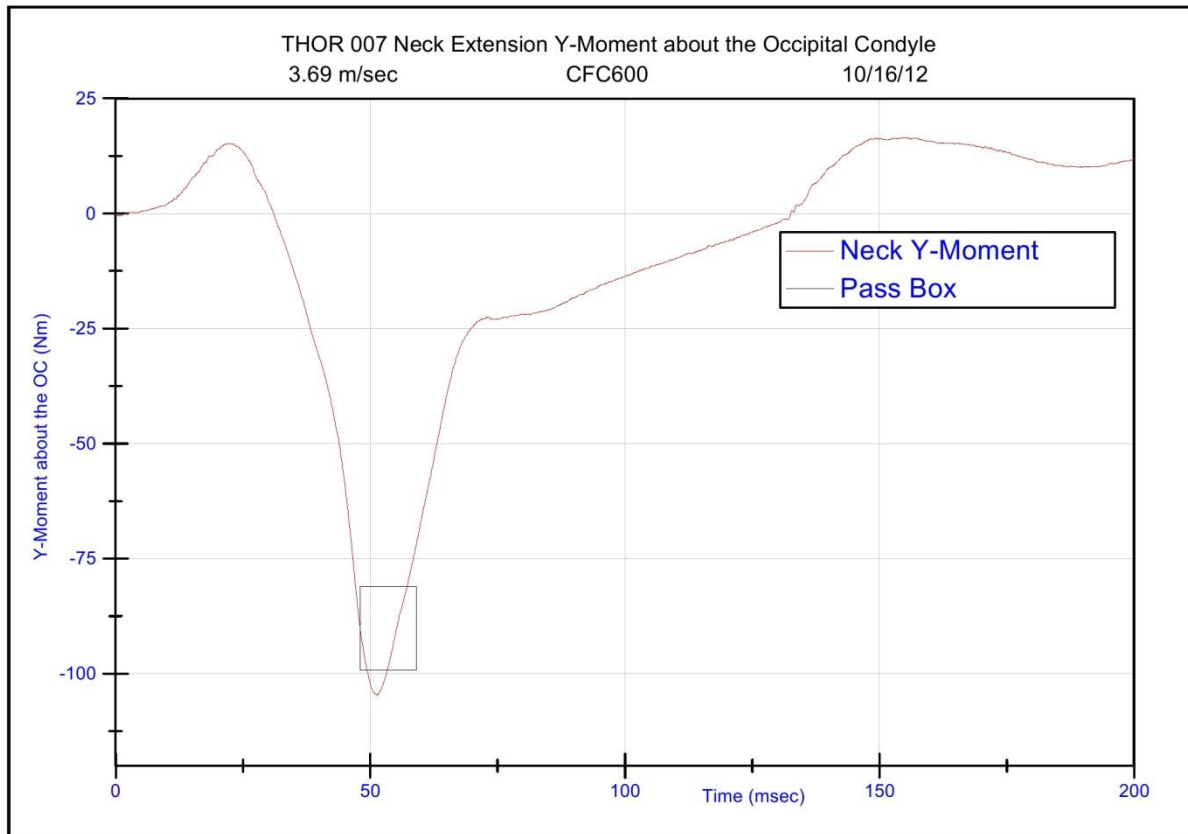
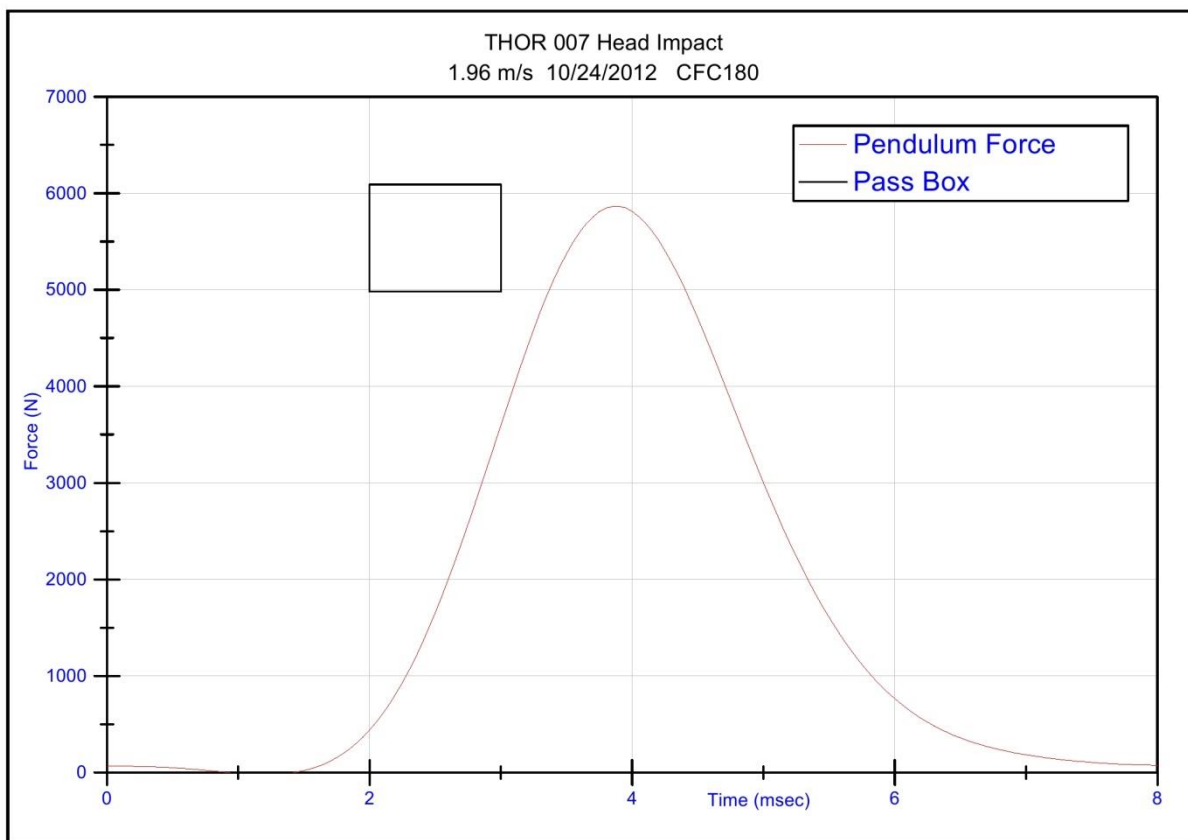
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Y / N	Upper abdomen insert shows no evidence of permanent set
Y / N	No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper -torn stitches on left/right side at leg zipper
	
Y / N	Lower abdomen insert securely attached to spine
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	

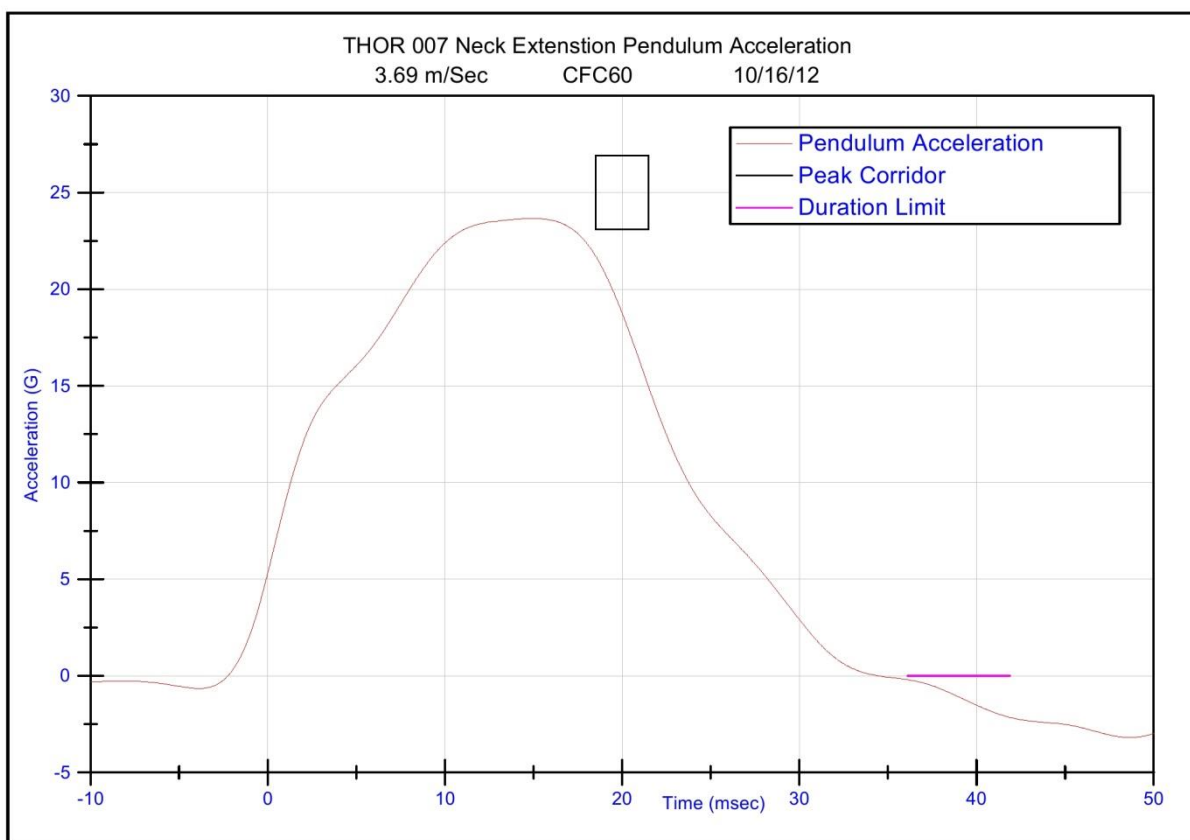
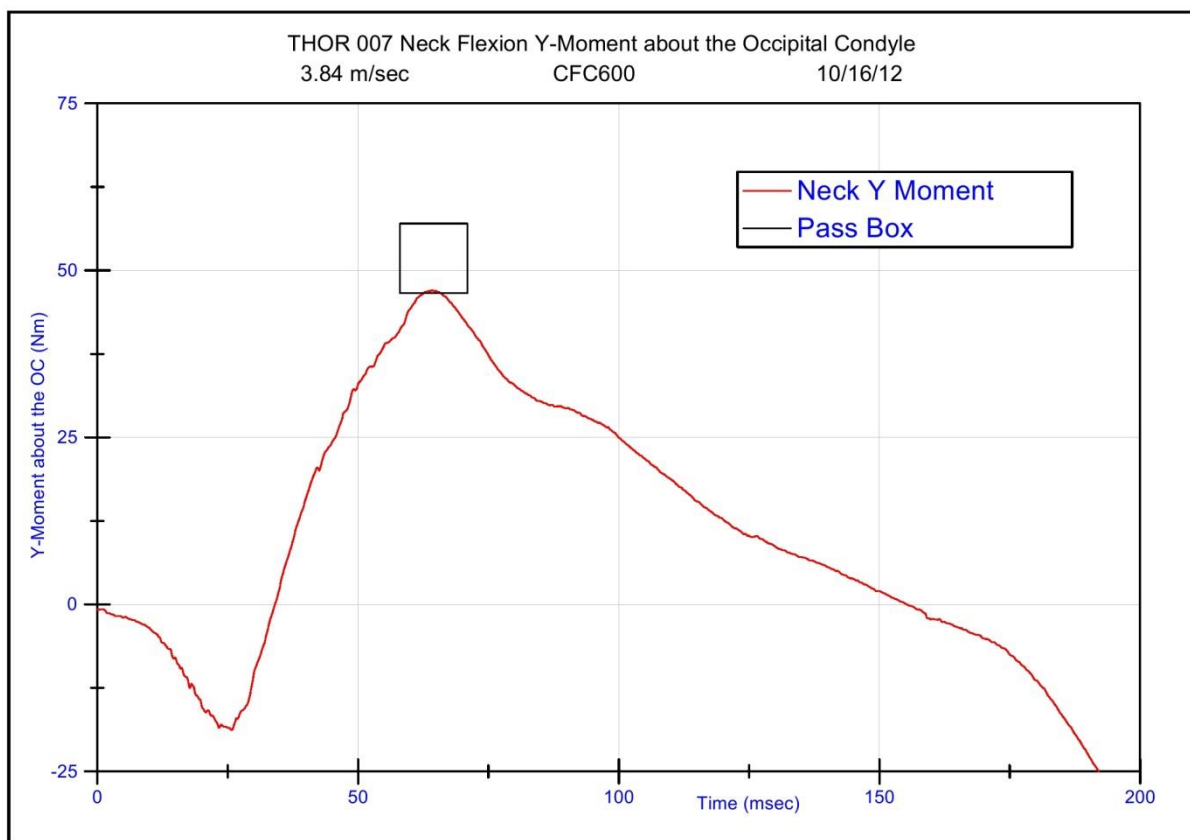
FEMUR	
Y / N	Acetabular load cells firmly attached
Y / N	Femur load cells firmly attached
Y / N	No evidence of deformation of knee slider bump stop
Y / N	No cuts, tears, or scuffing of knee flesh
OTHER	
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OTHER	-Right leg skin is tearing -Right leg has a chip out of structural ring 
JACKET	
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OTHER	

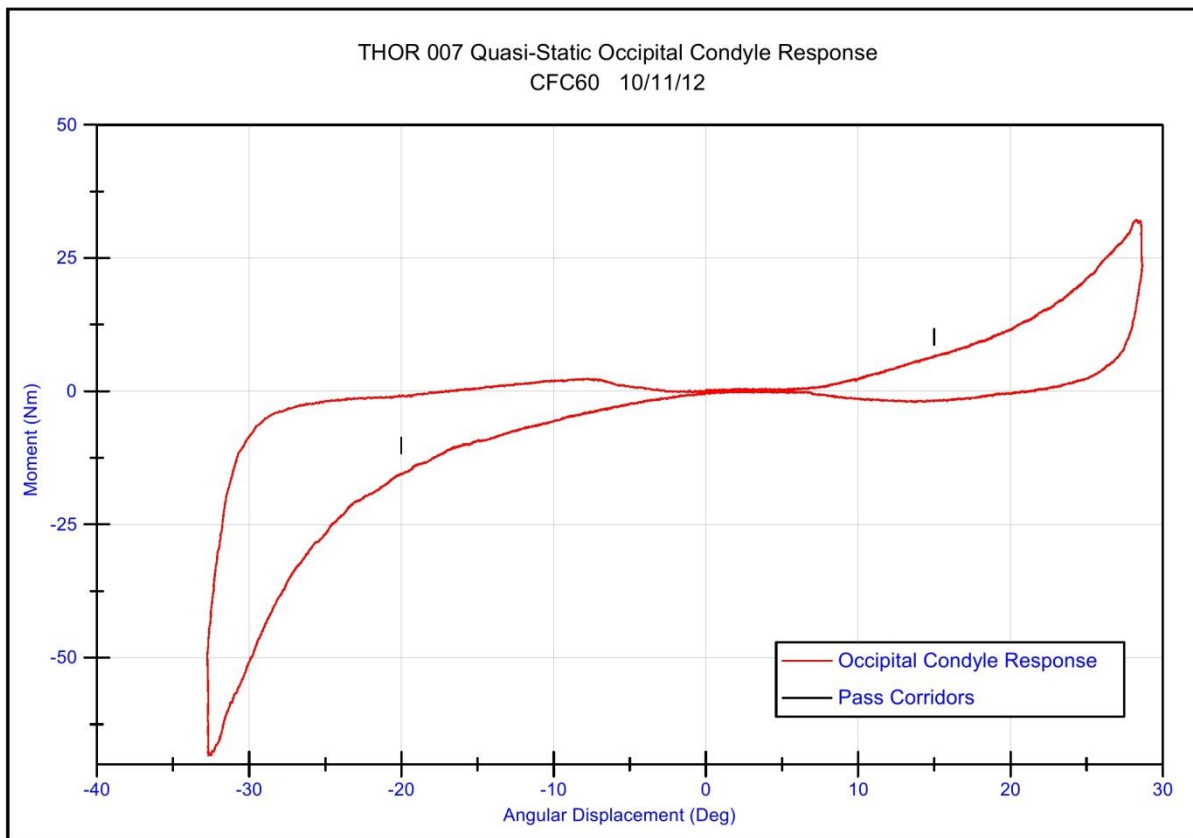
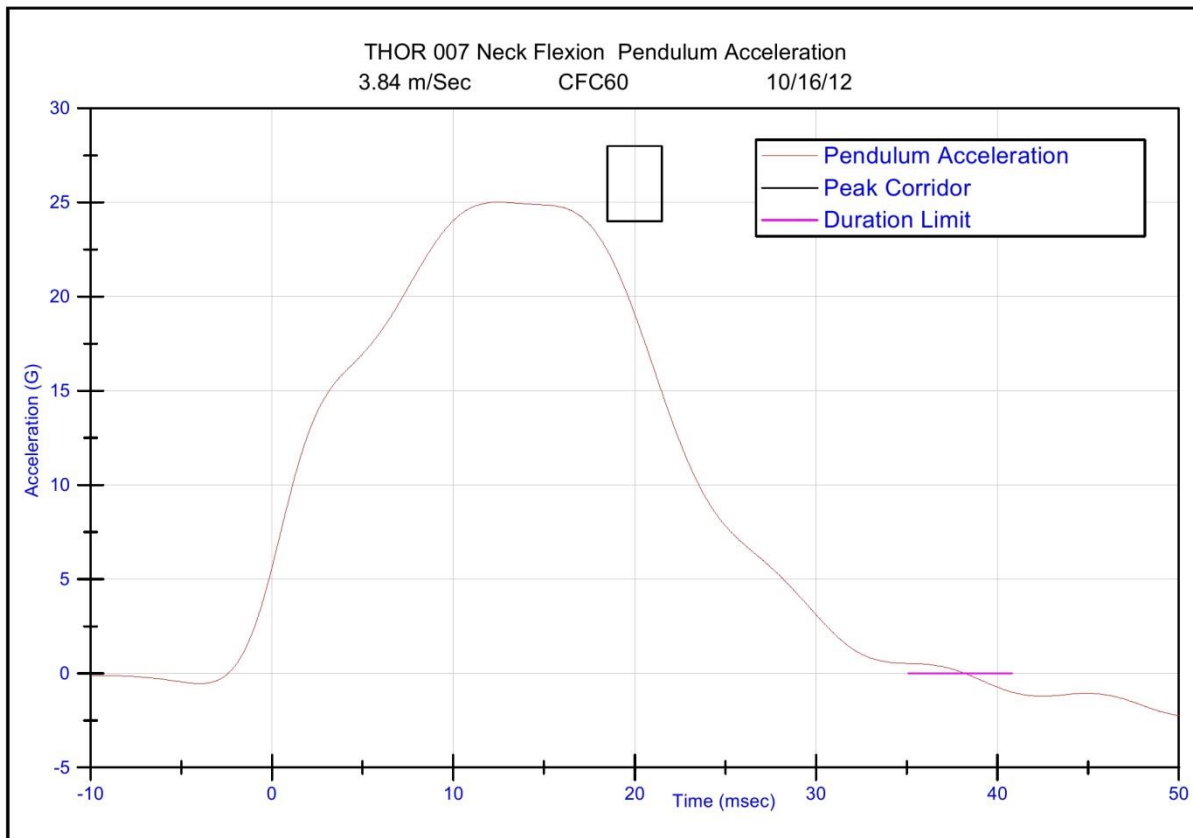
Test Data/Sensor Repair Notes

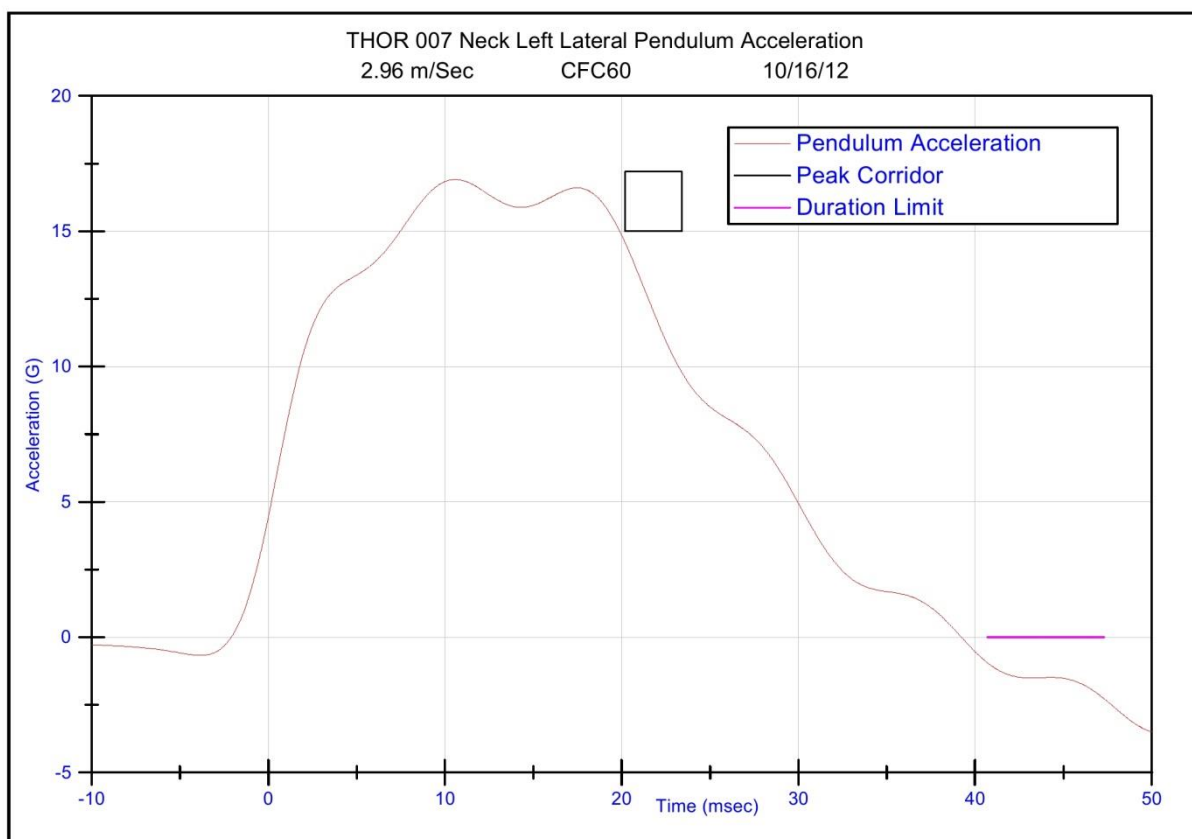
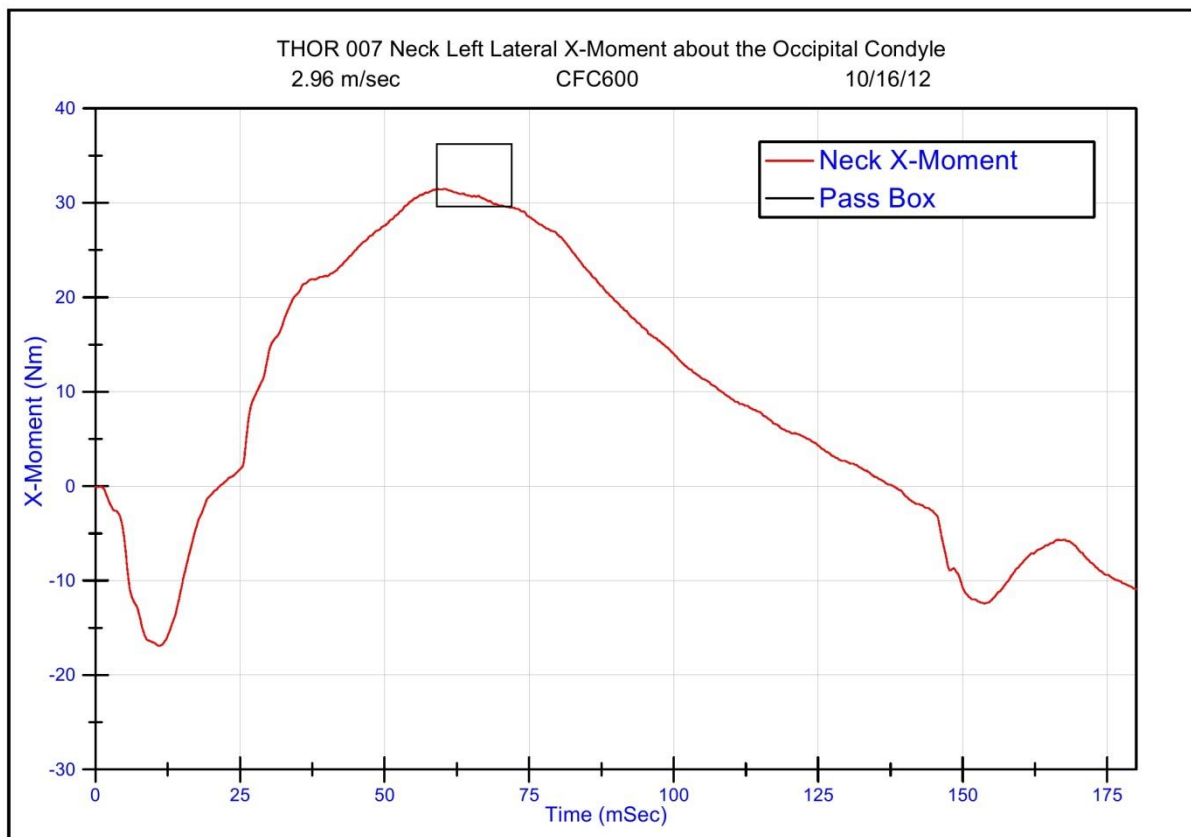
DUMMY CALIBRATIONS

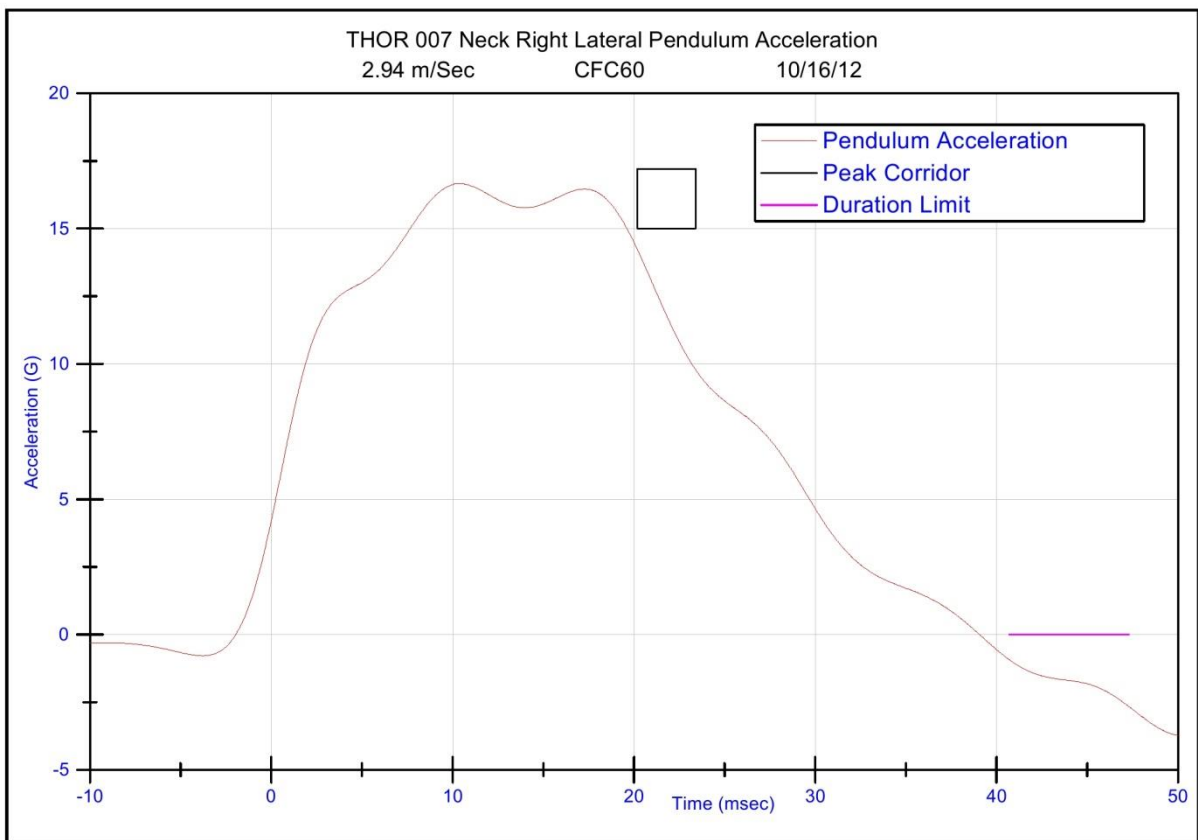
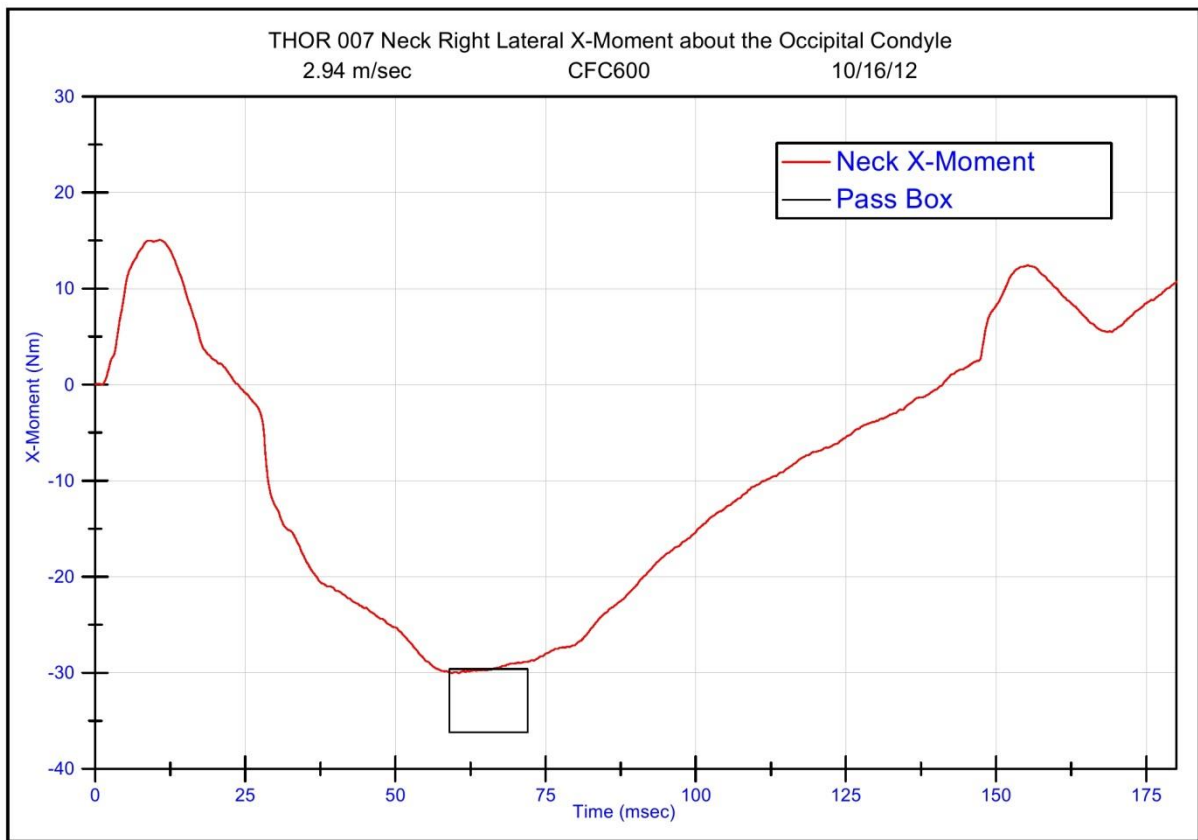
50% ADULT MALE THOR007 DUMMY CALIBRATIONS

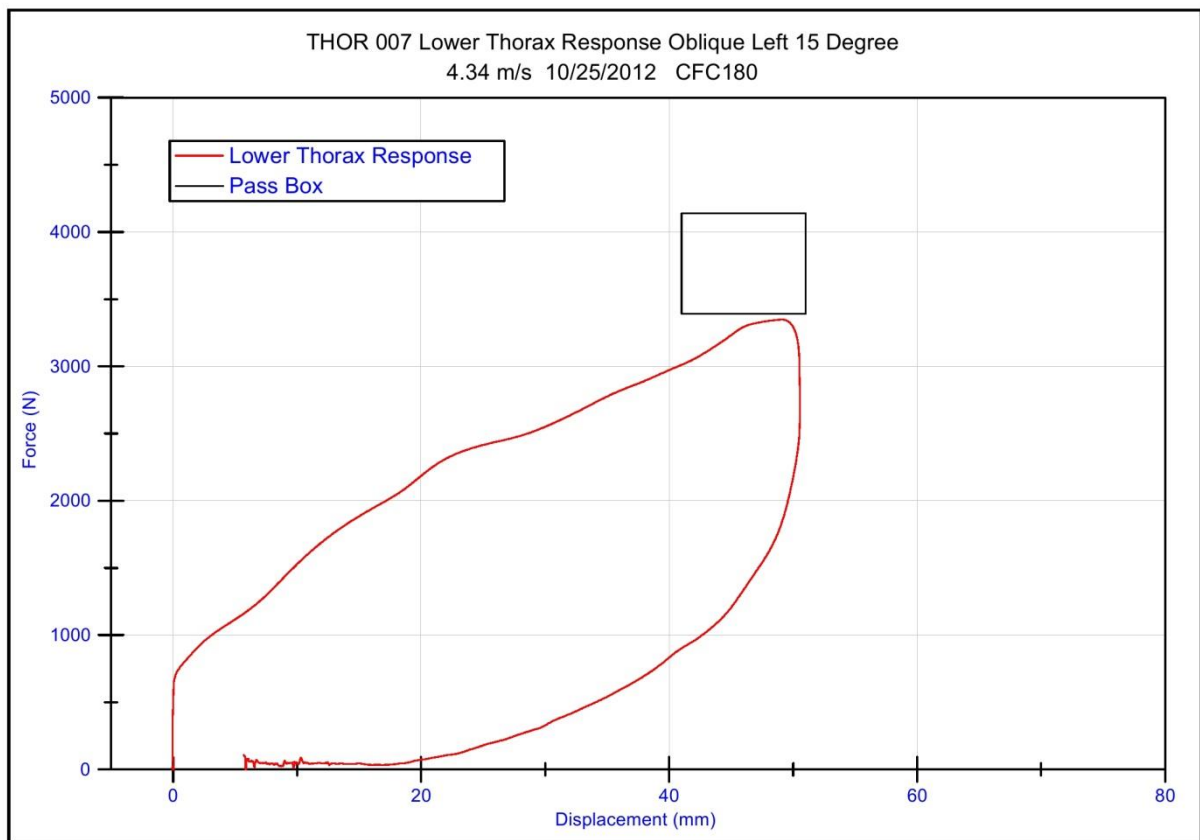
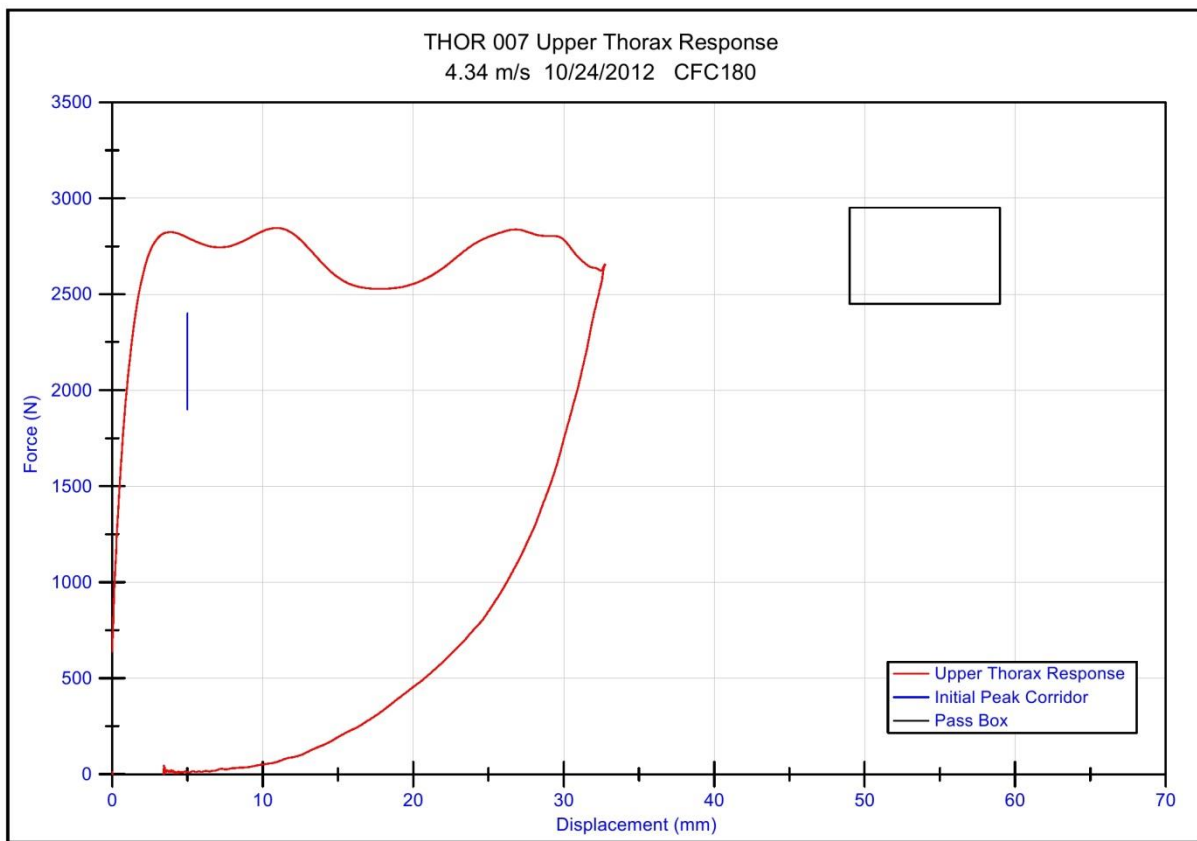


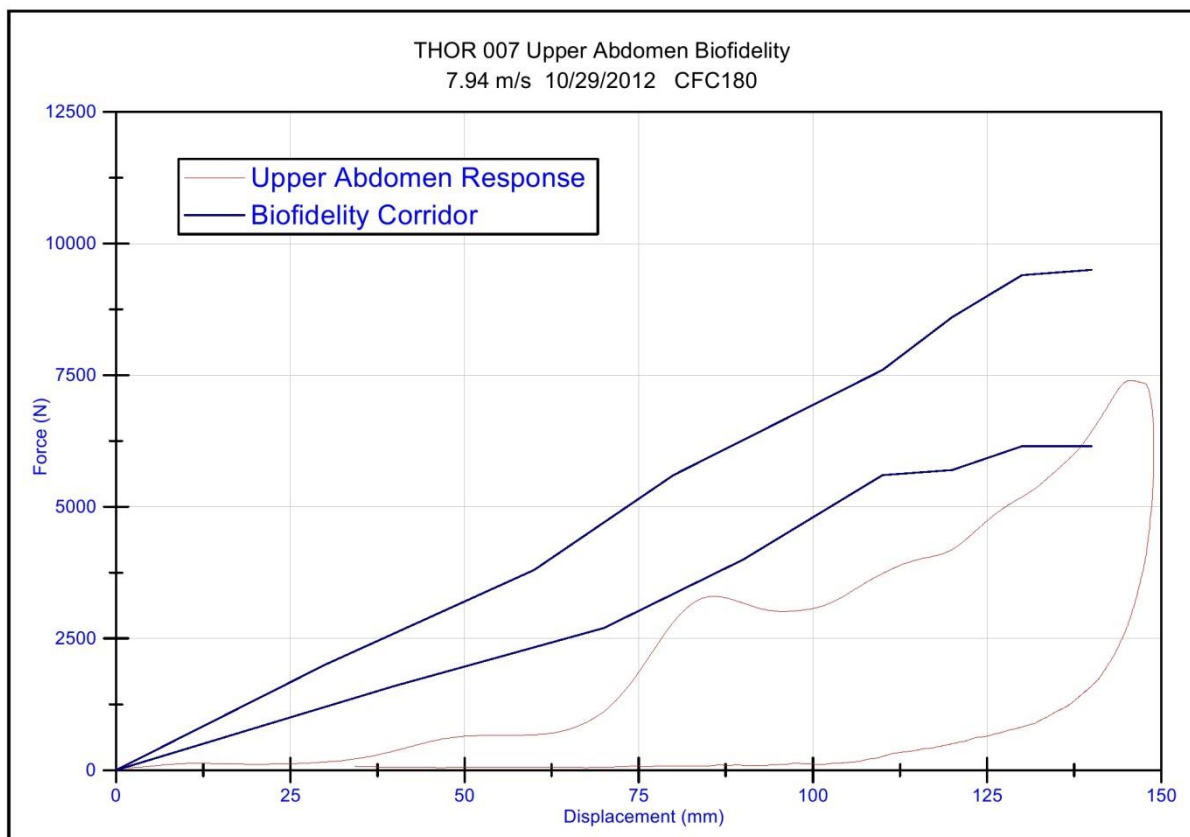
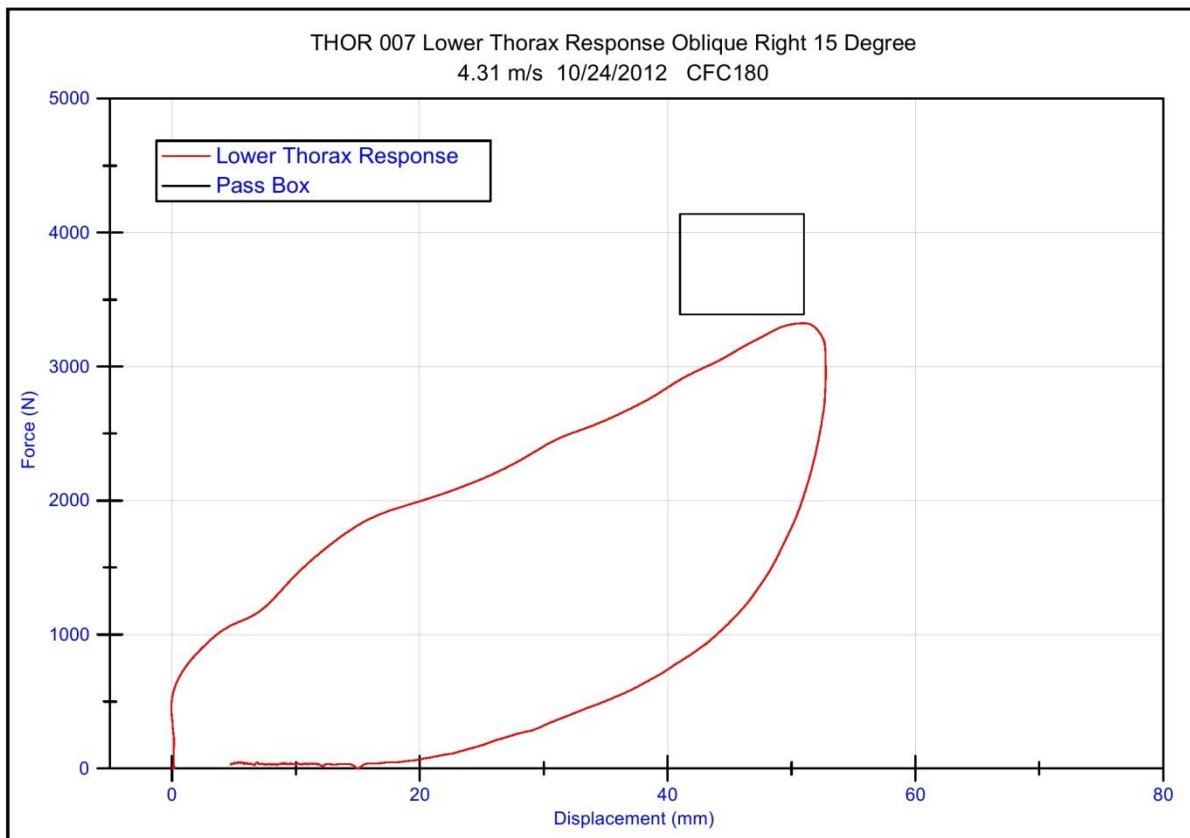


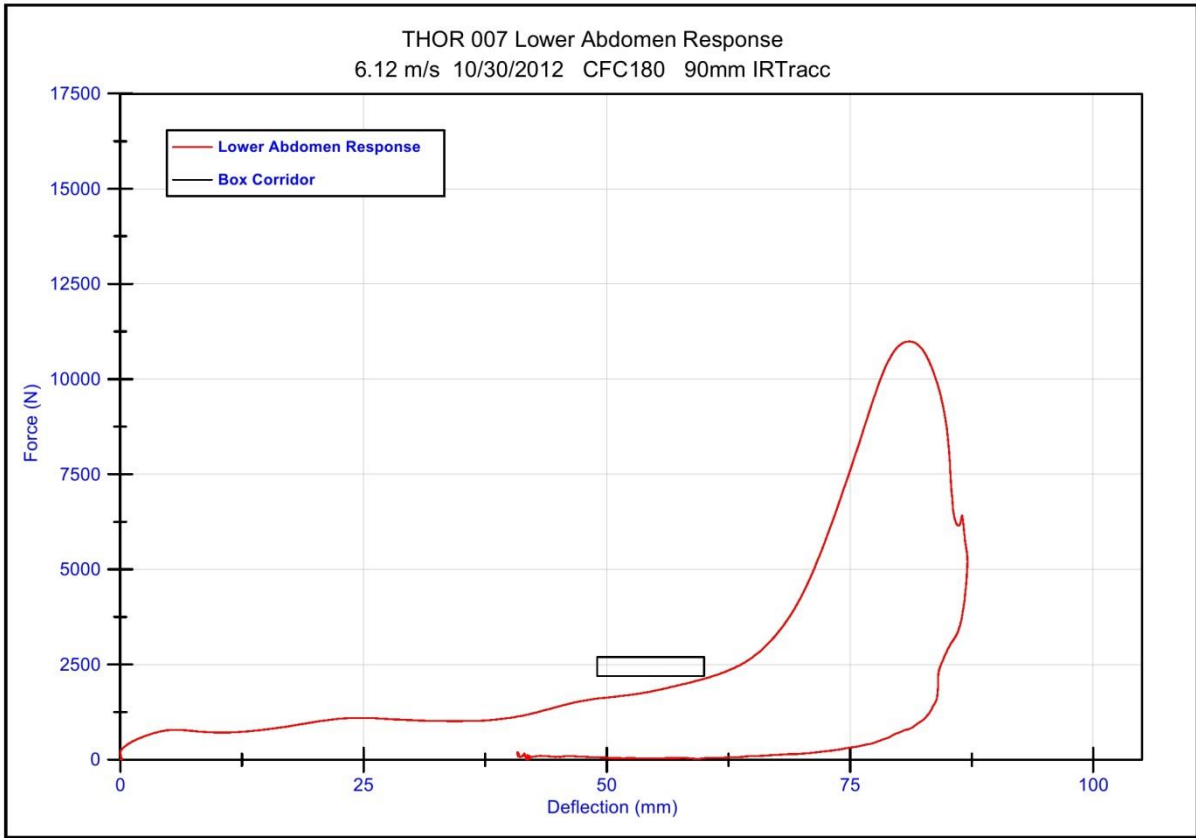






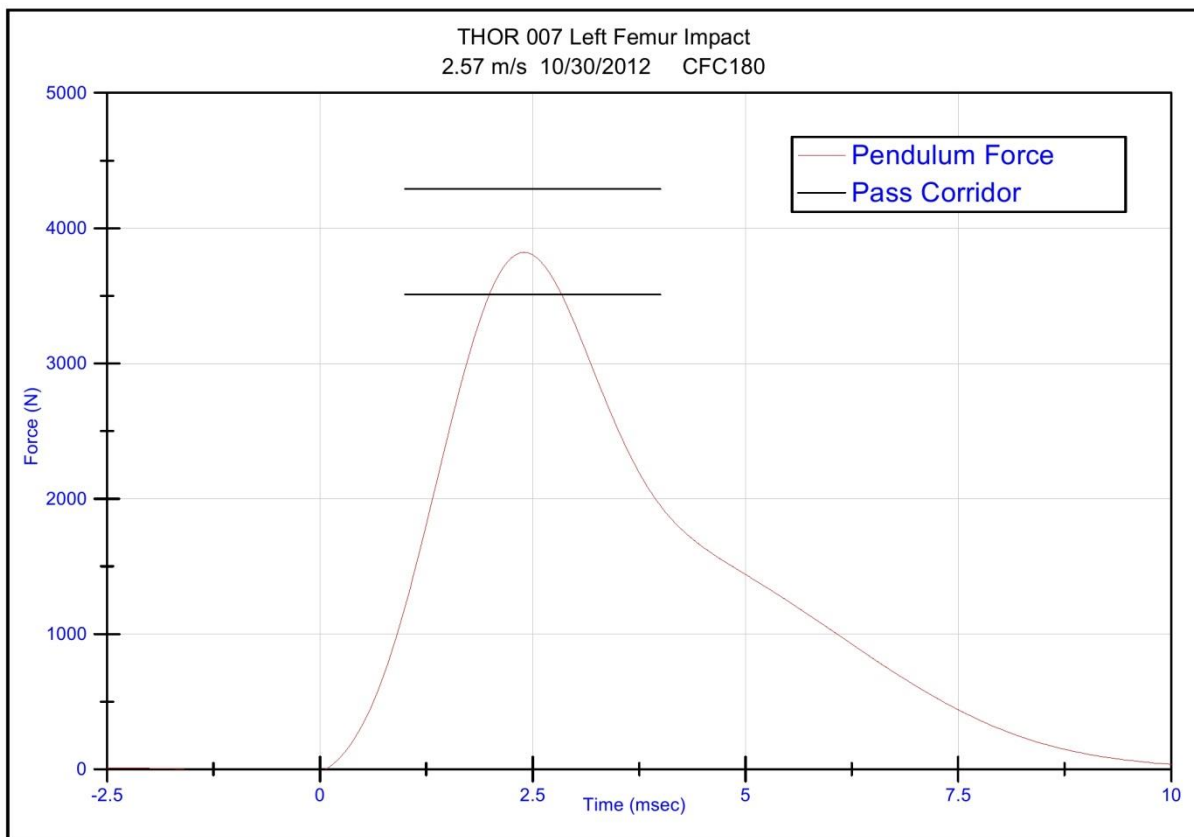
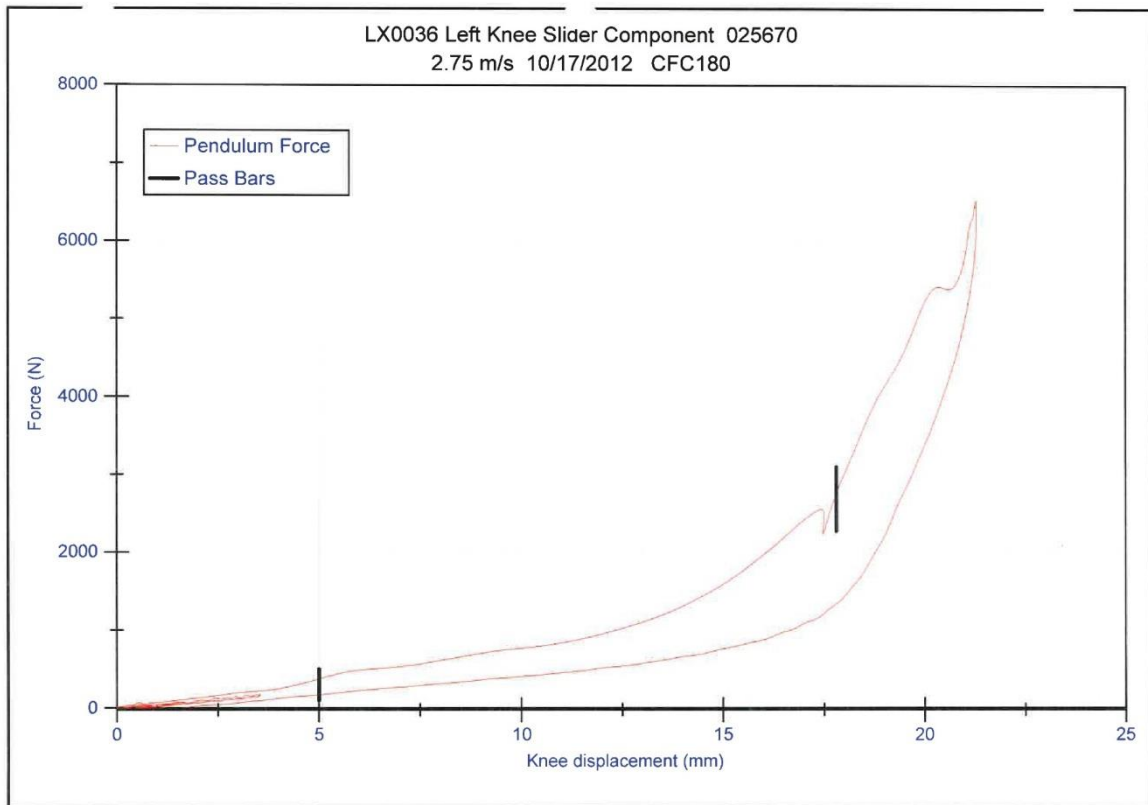


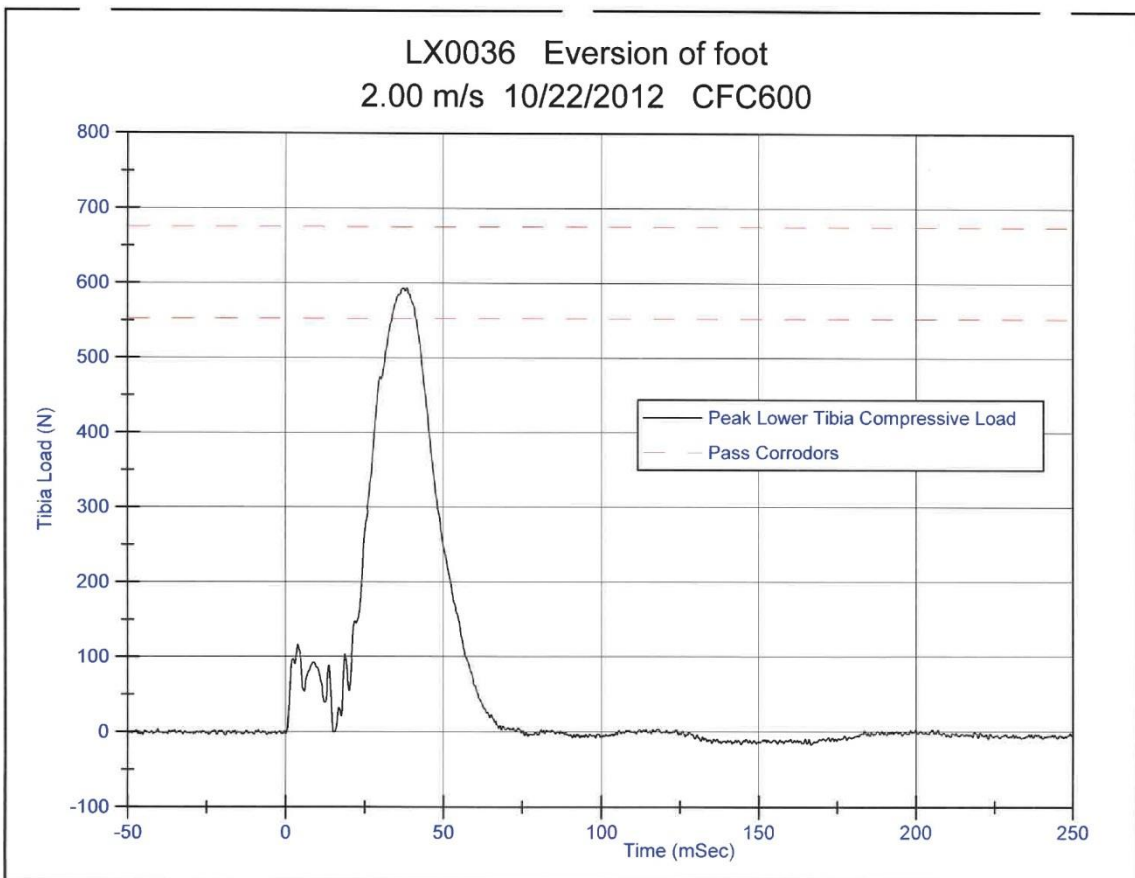
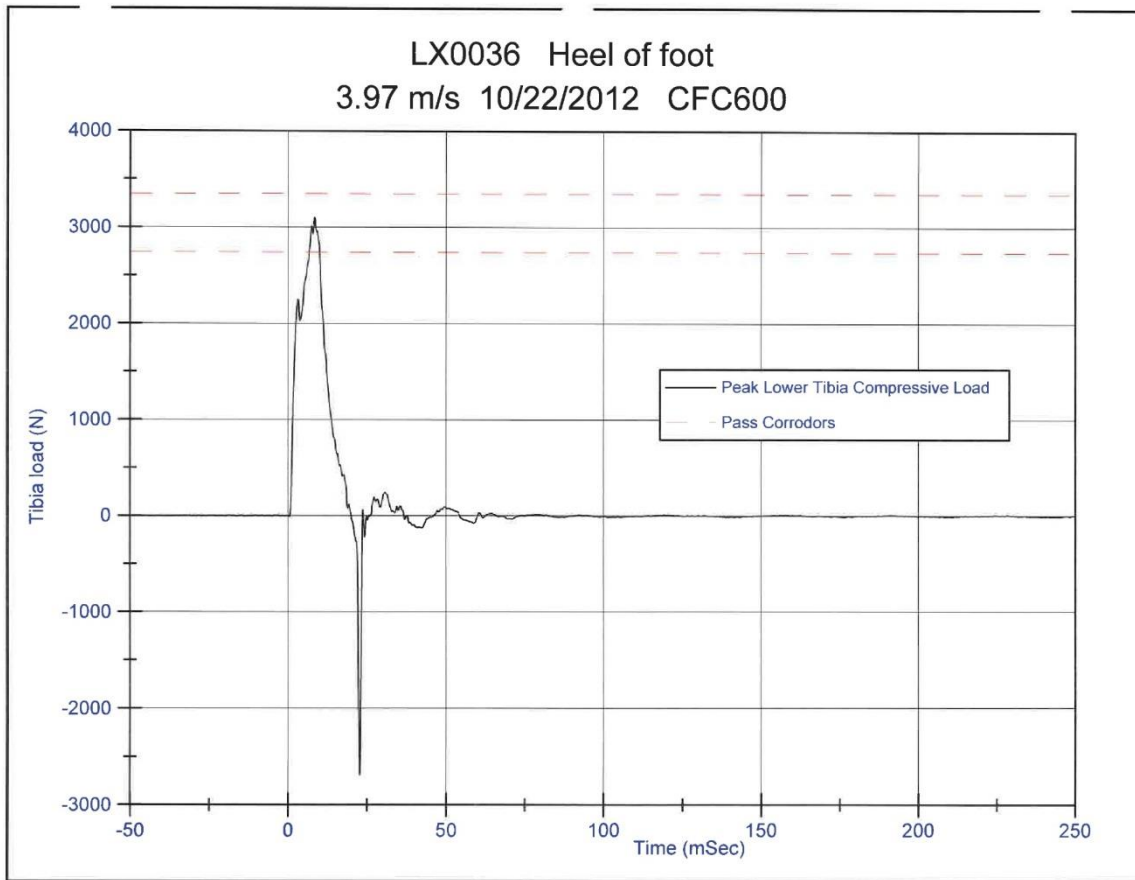


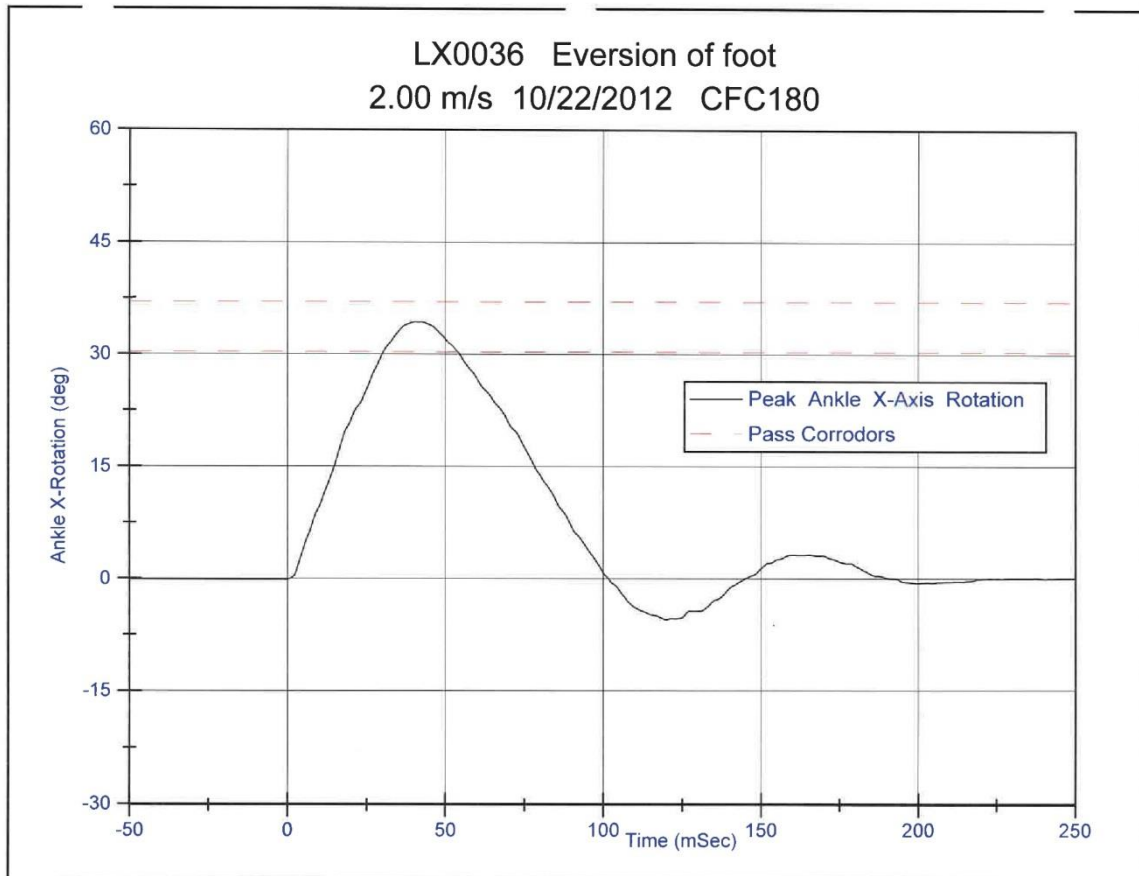
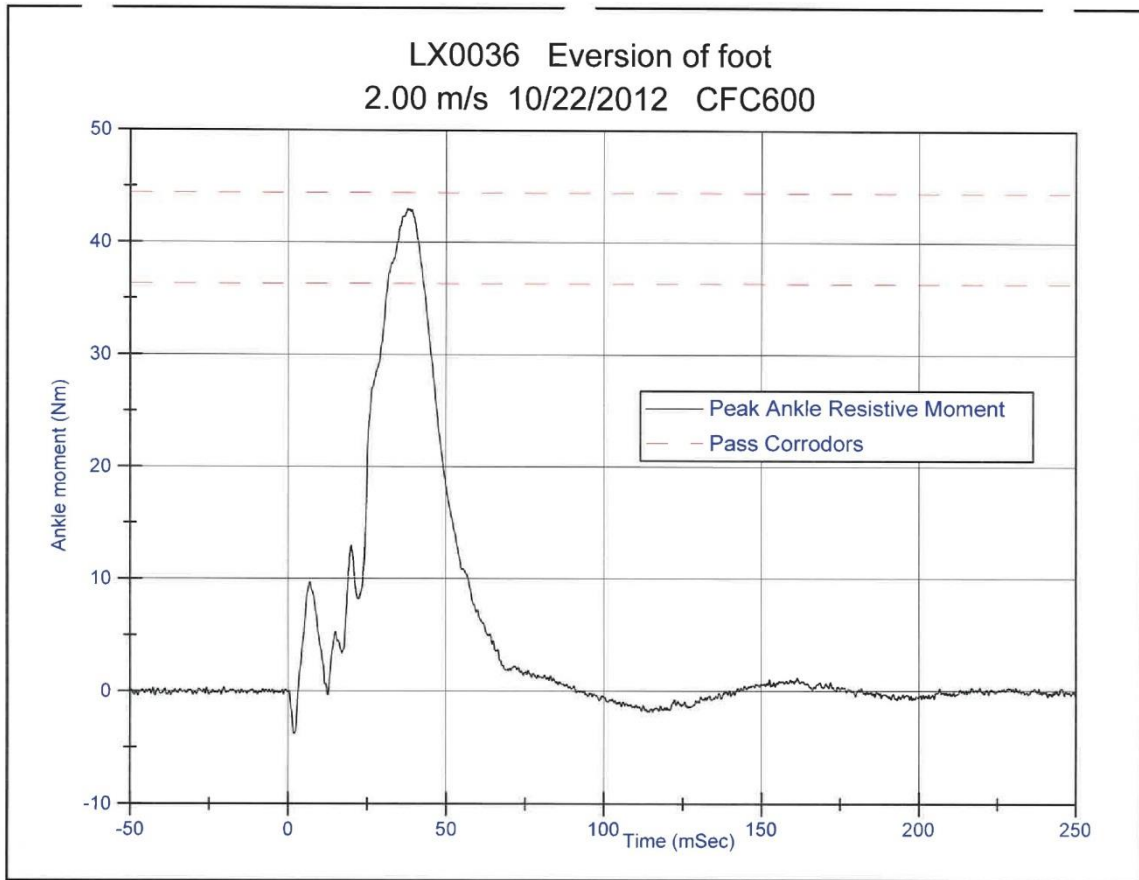


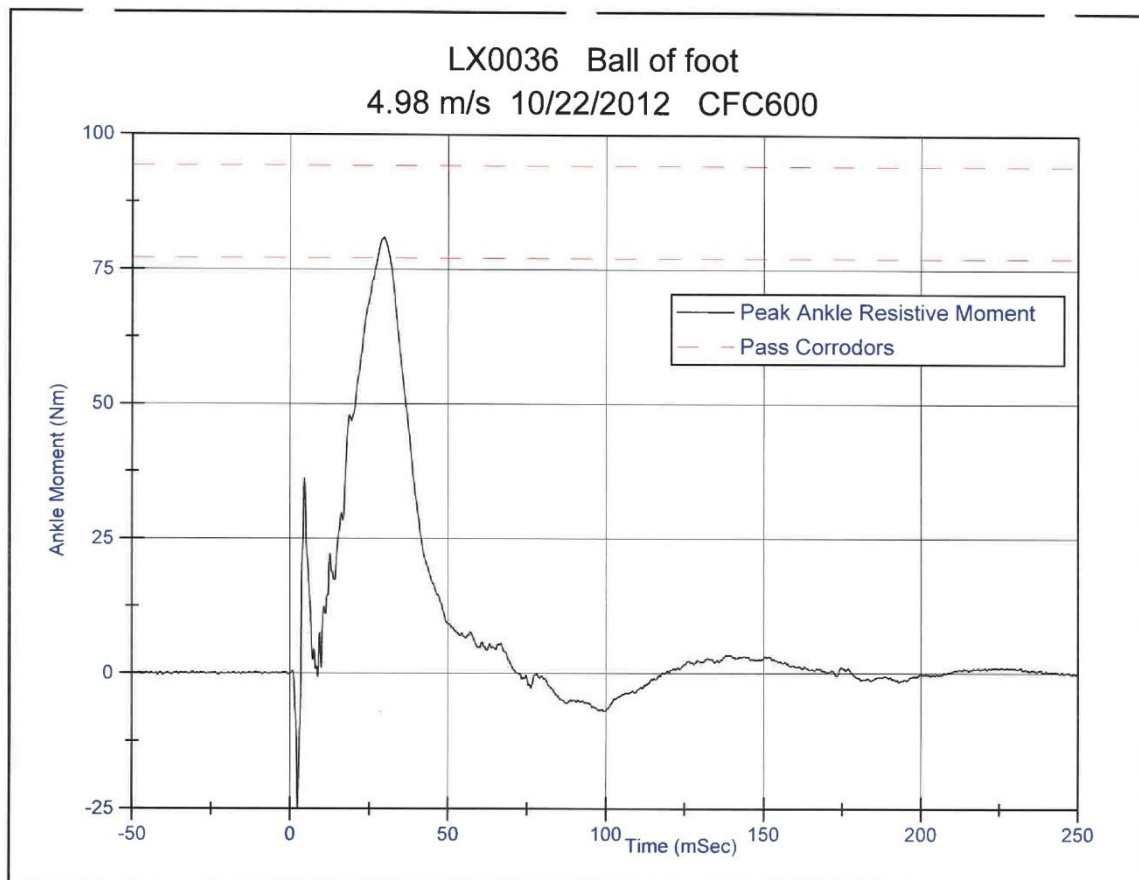
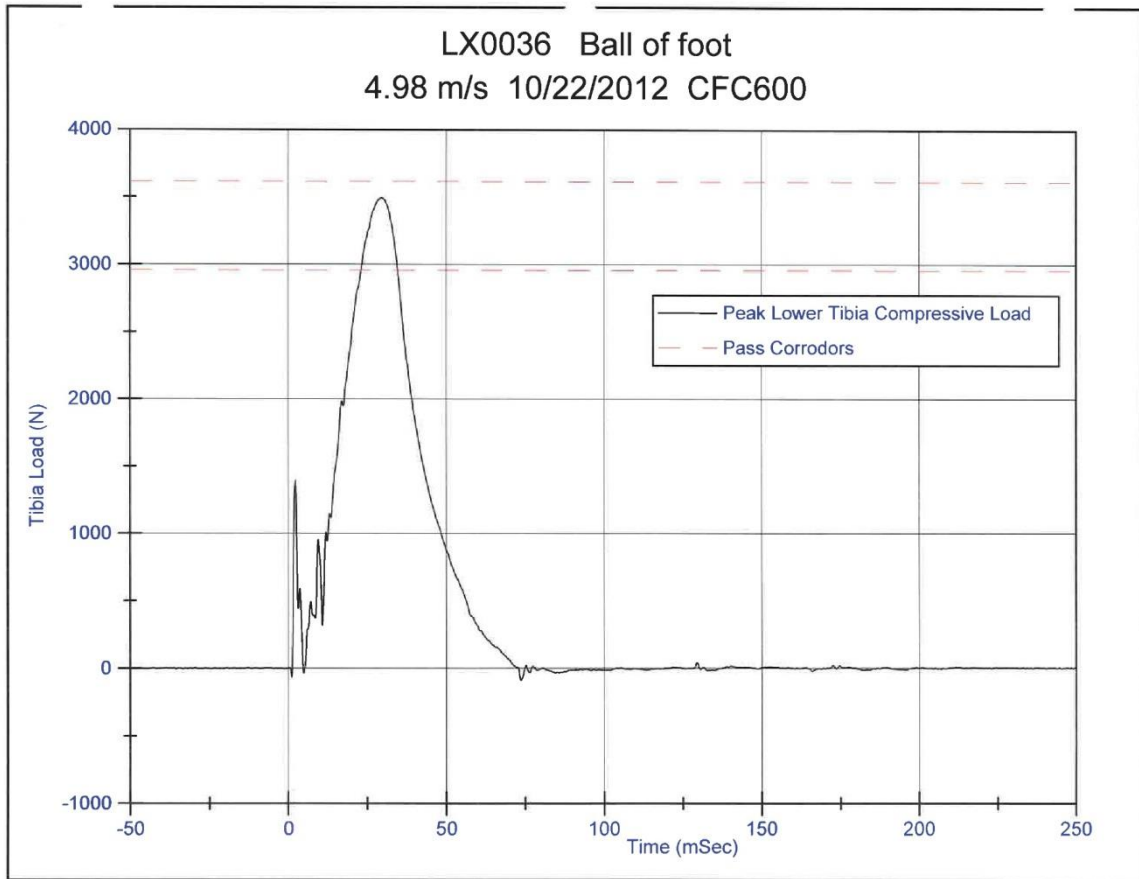
THOR 007 LEG CALIBRATIONS
LX0036 / LX0037

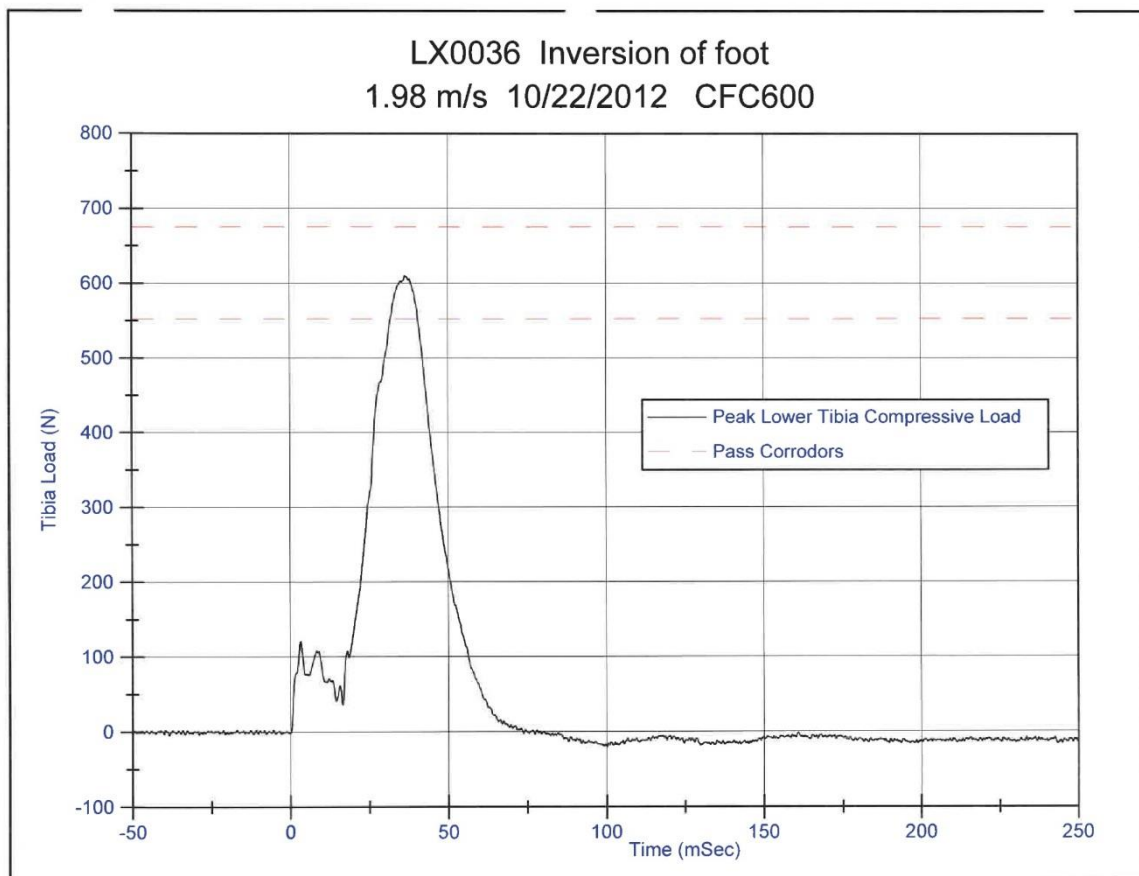
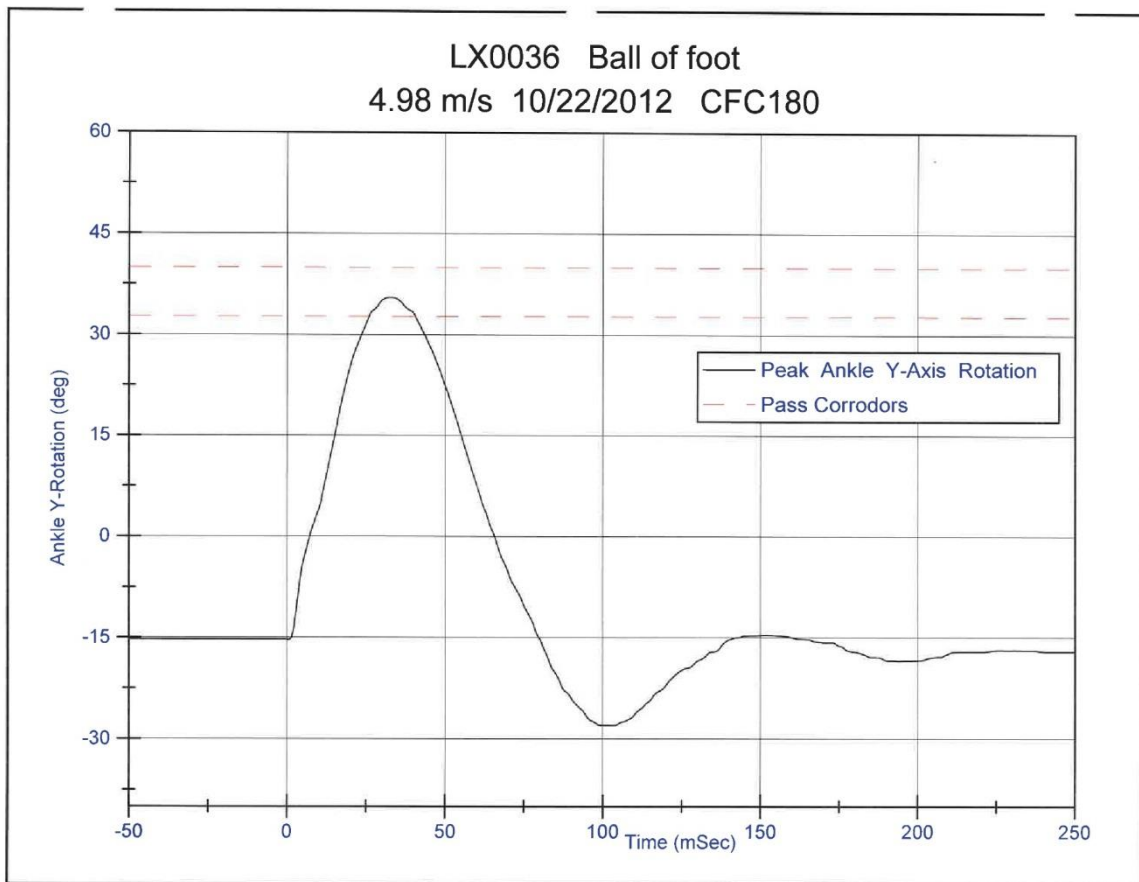
LX0036

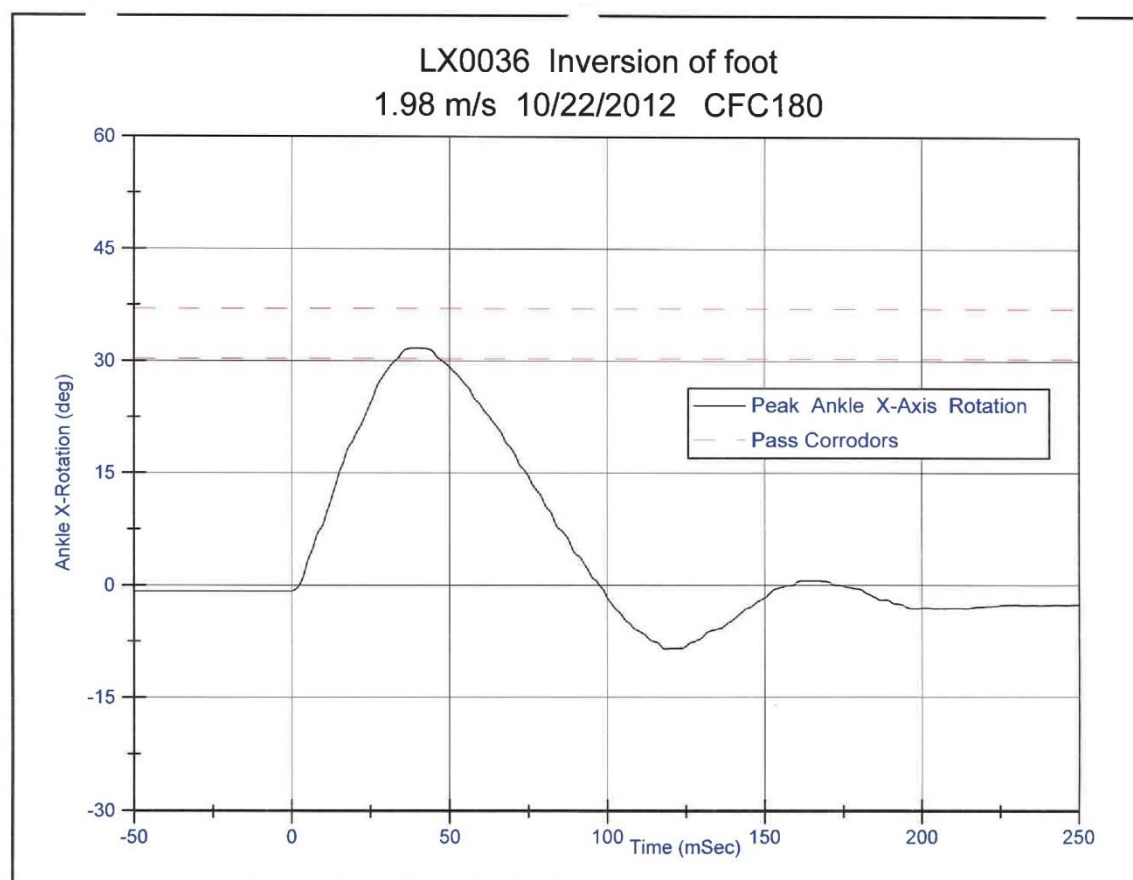
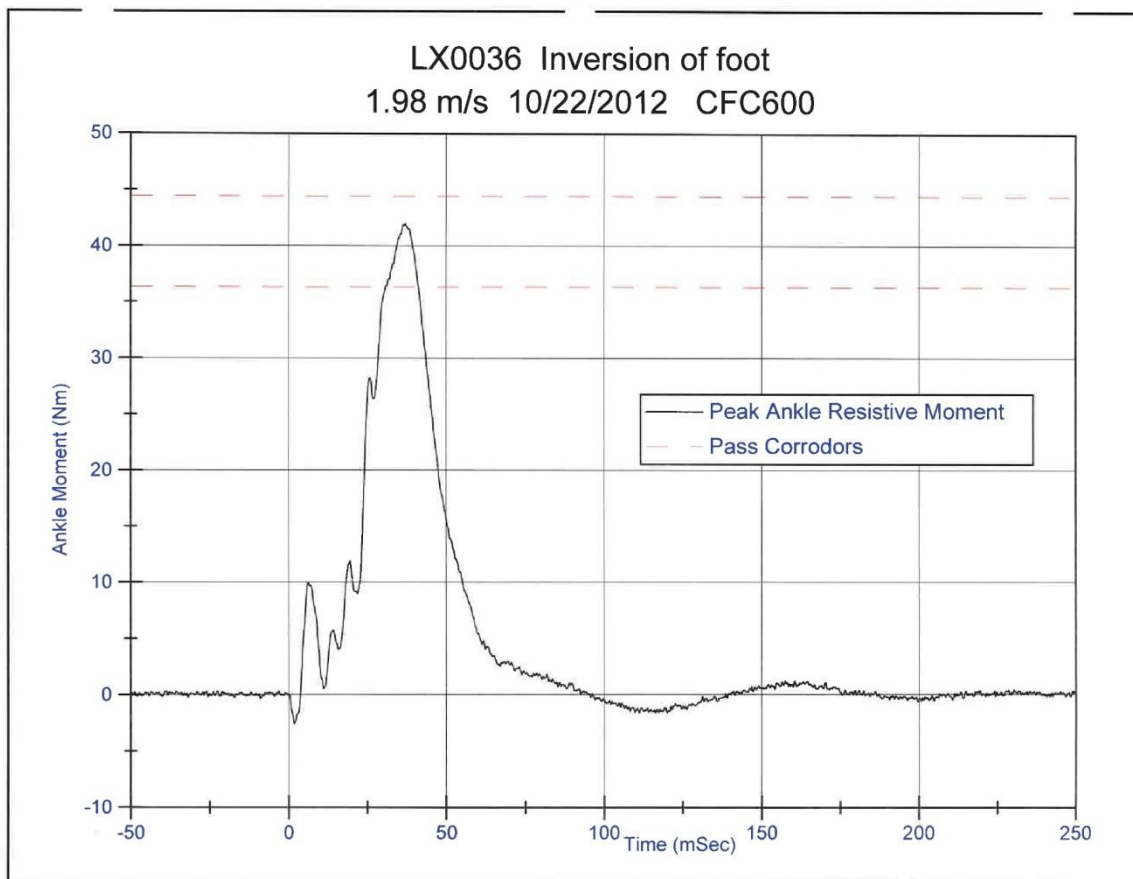




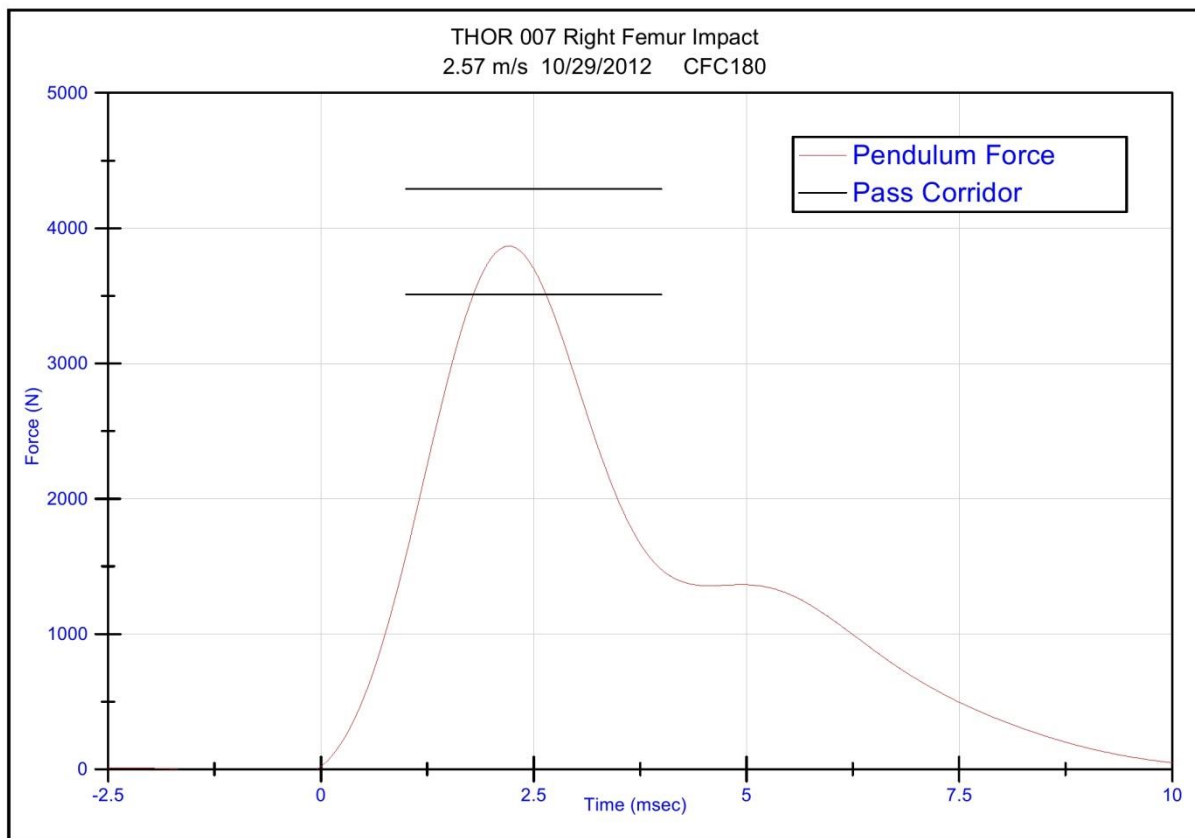
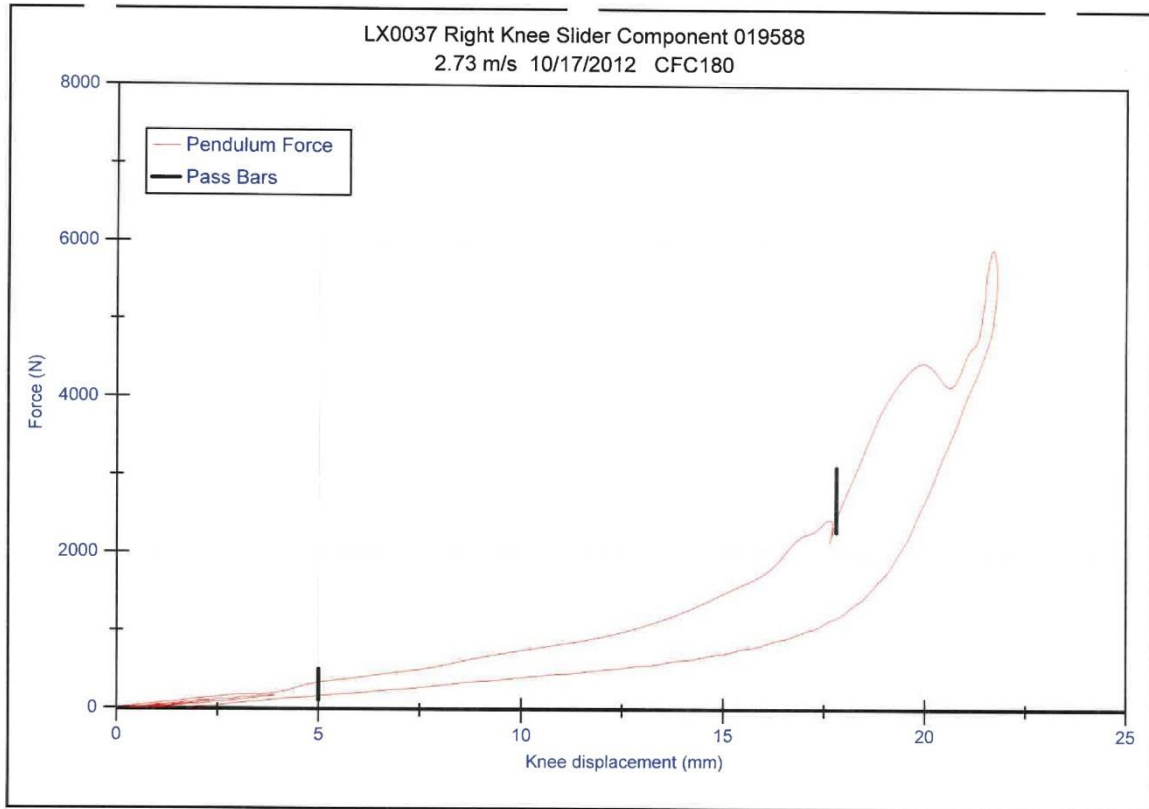


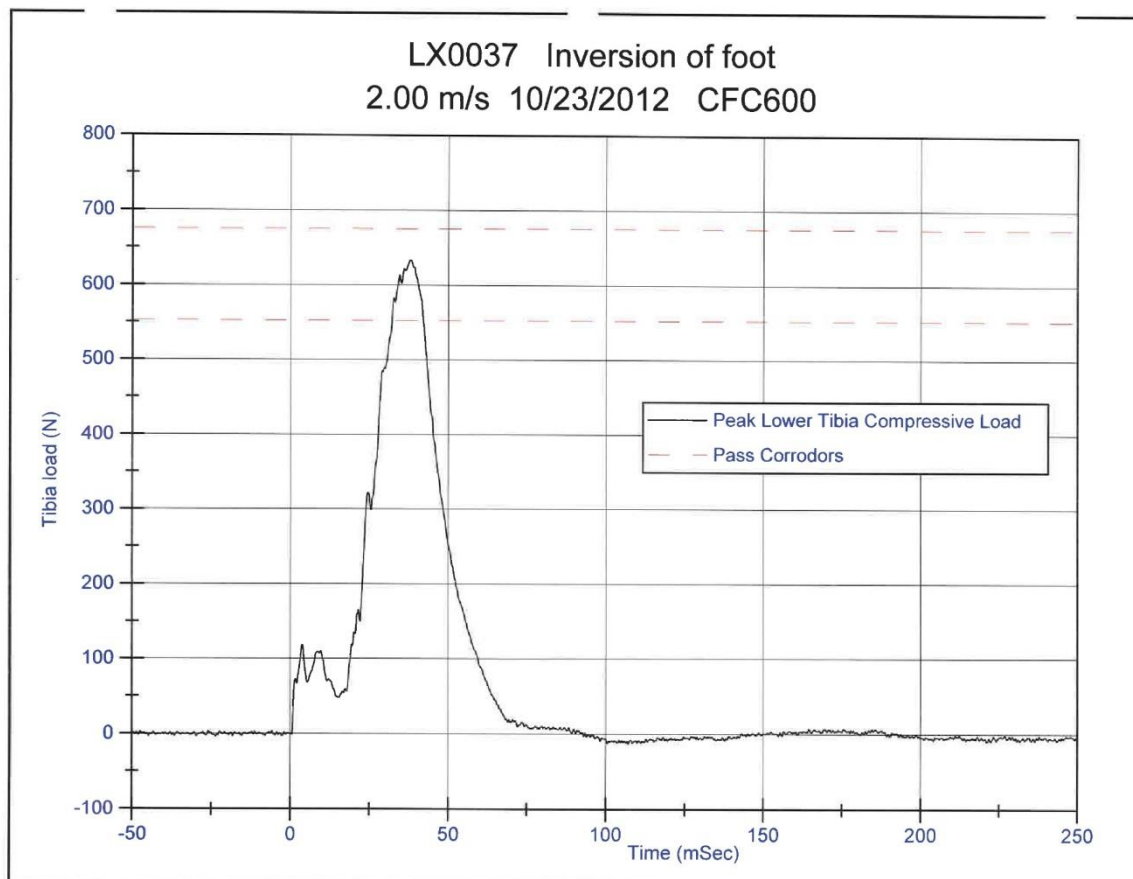
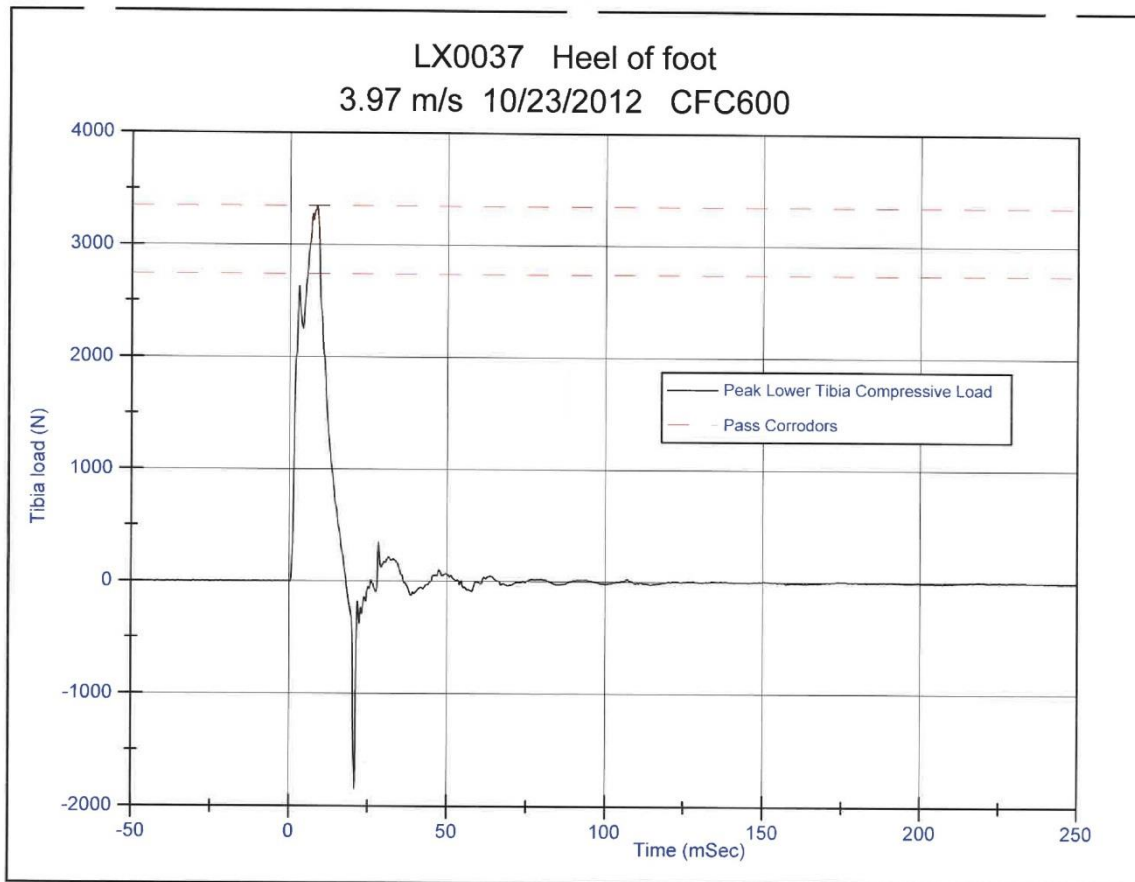


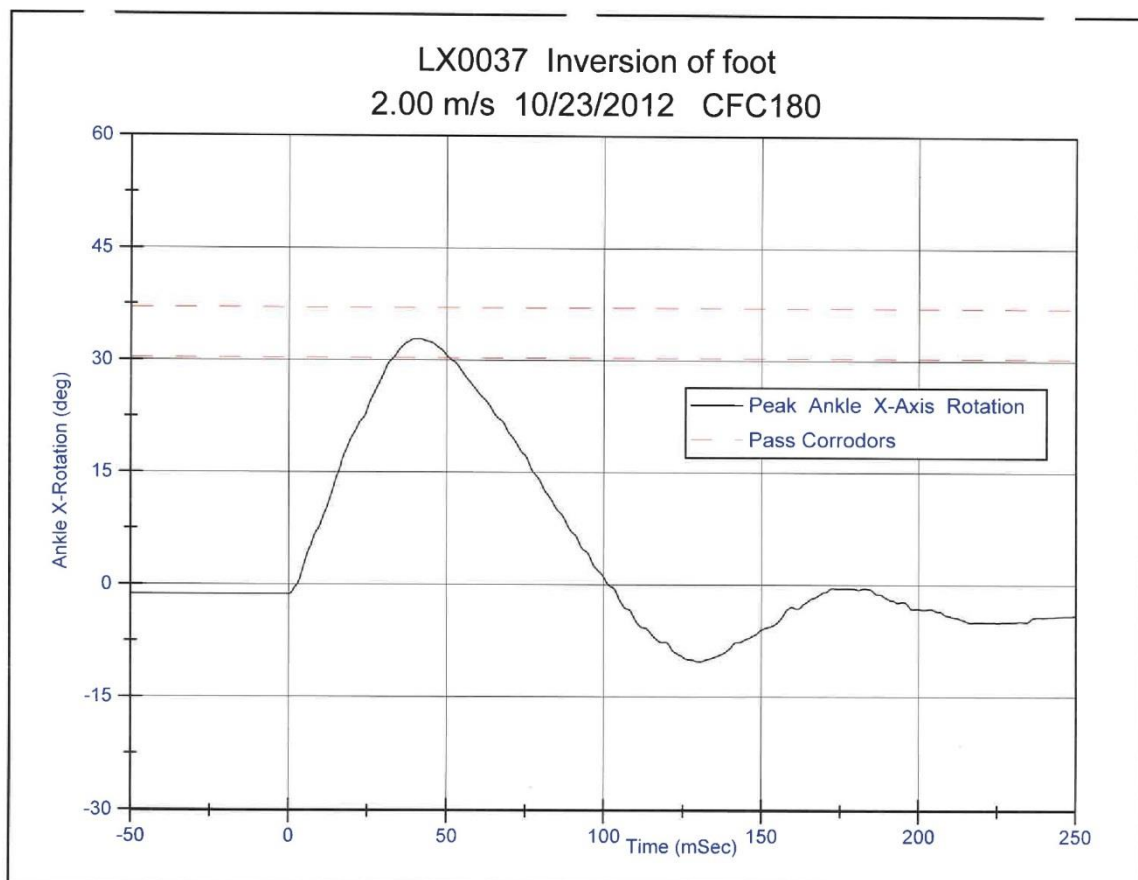
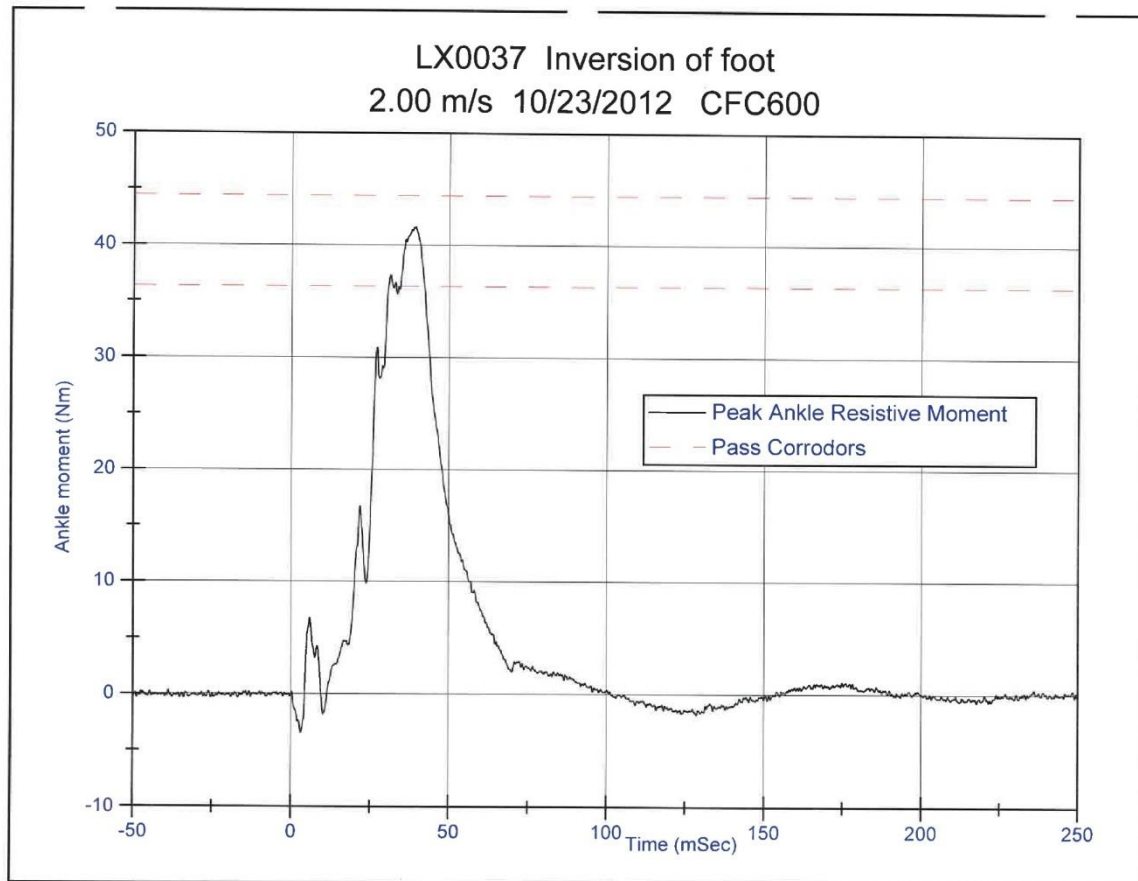


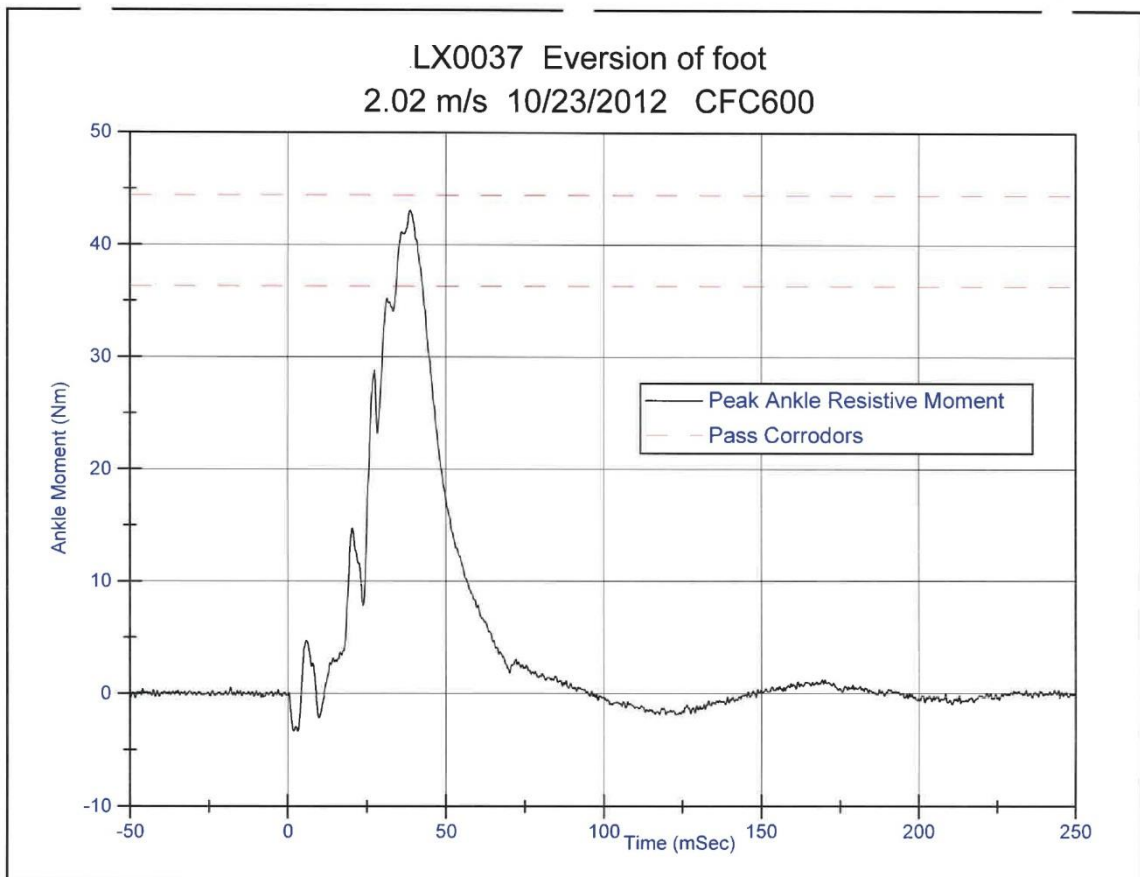
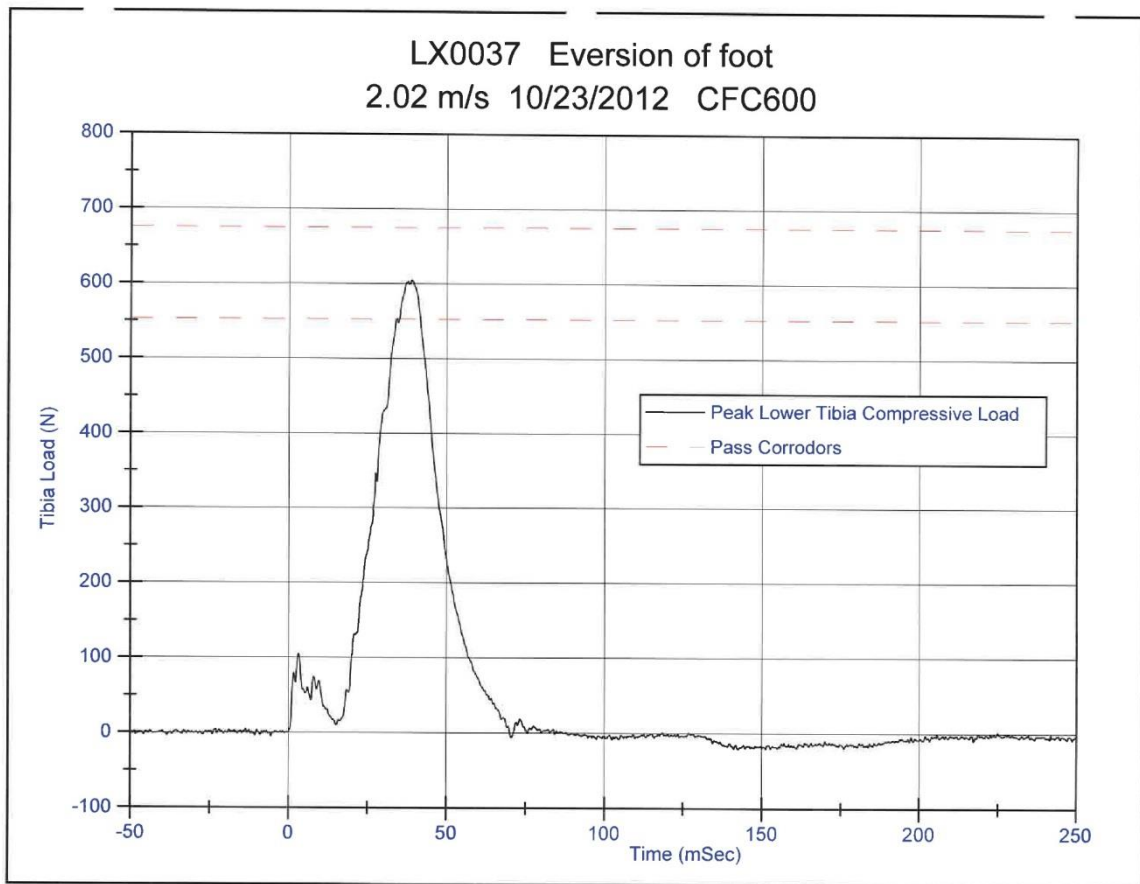


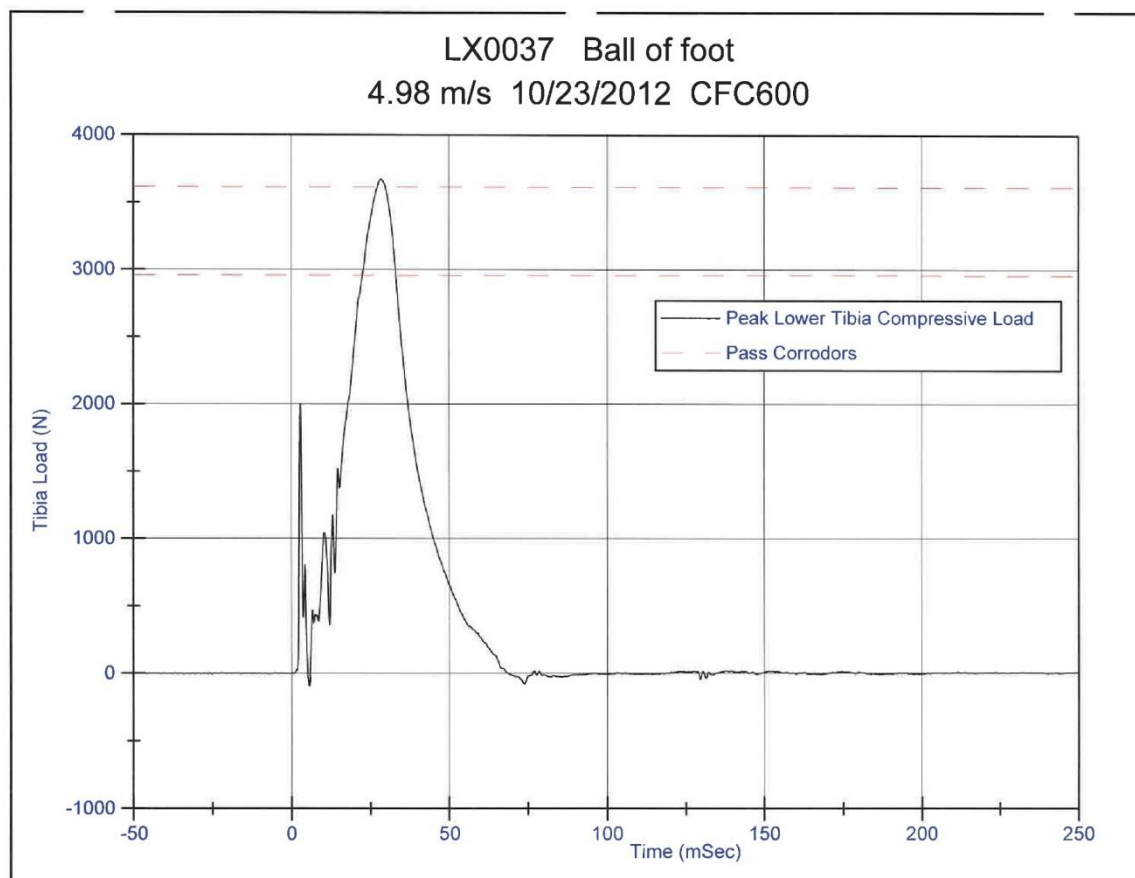
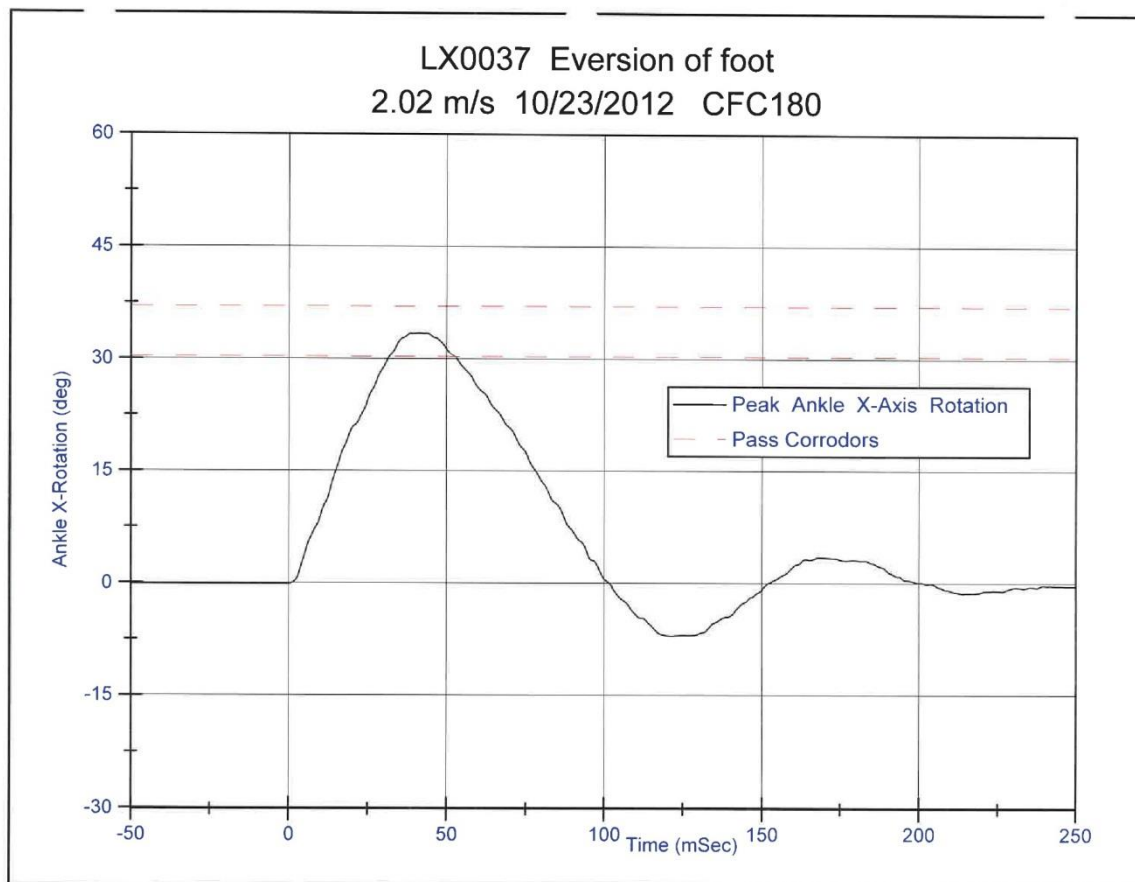
LX0037

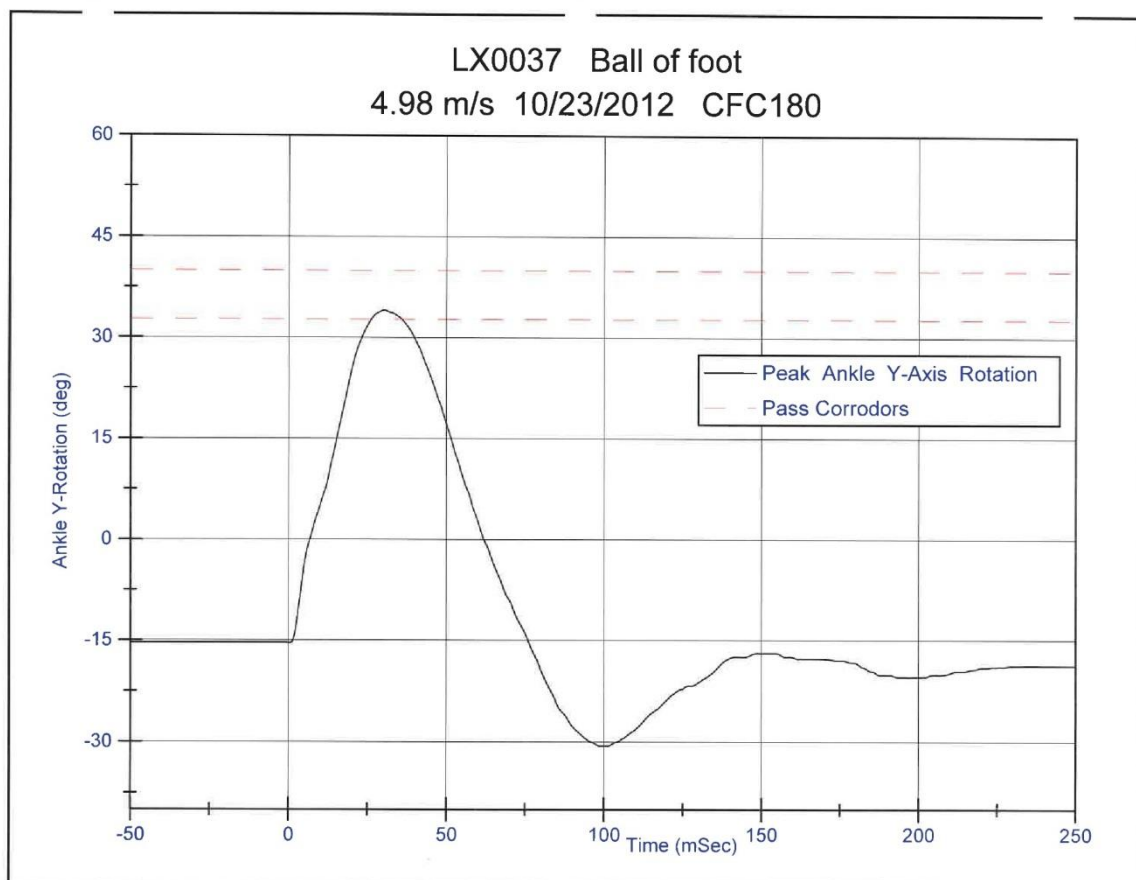
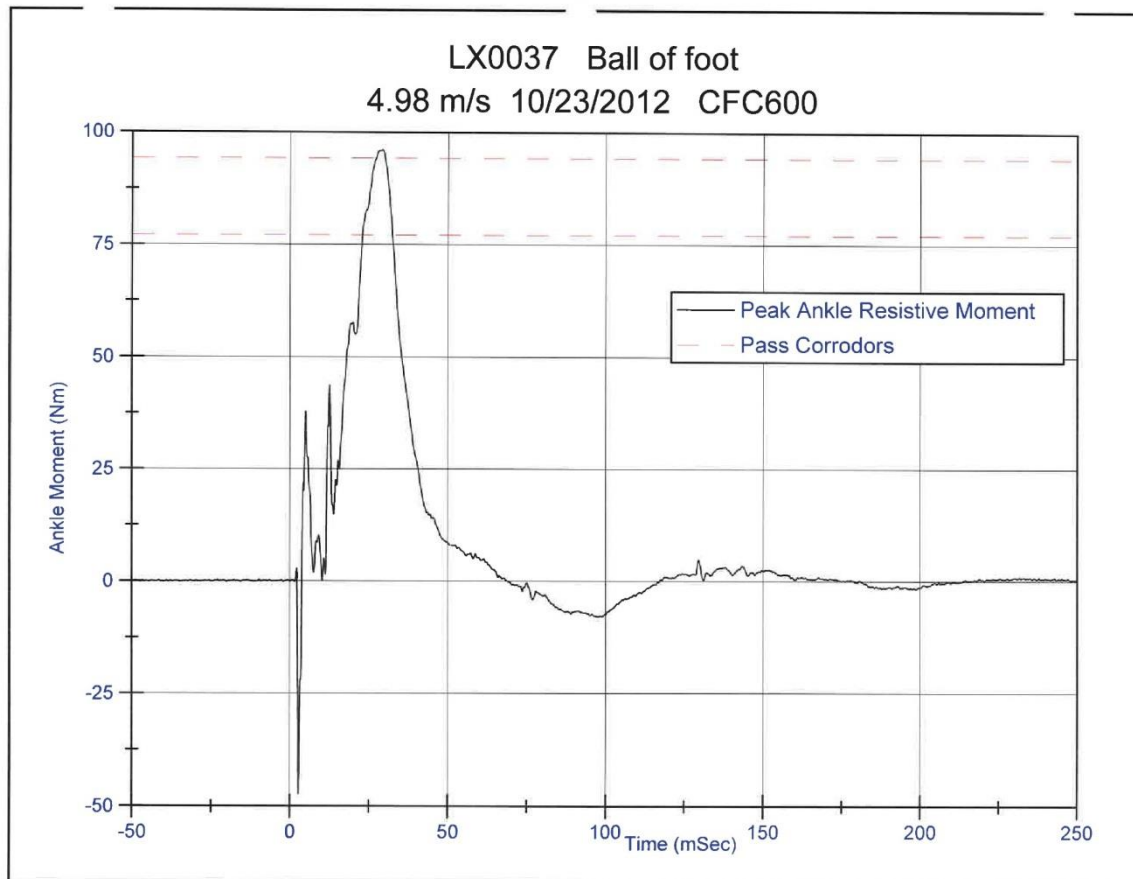




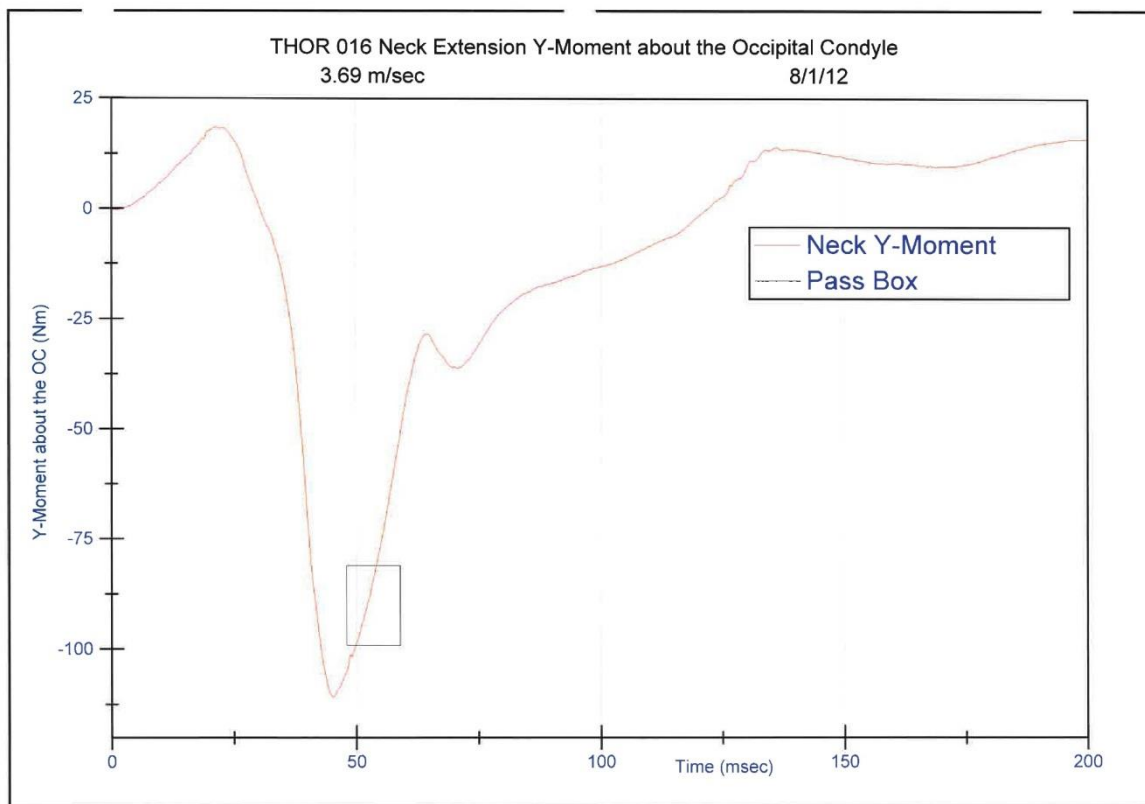
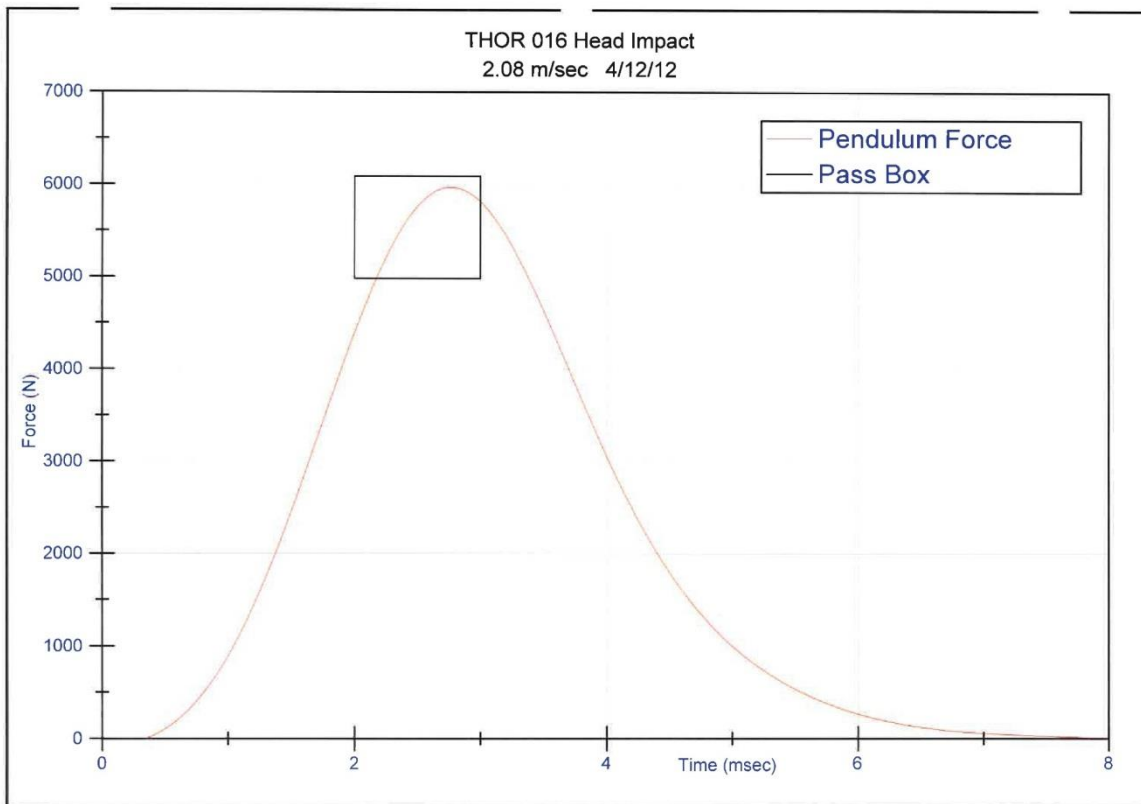


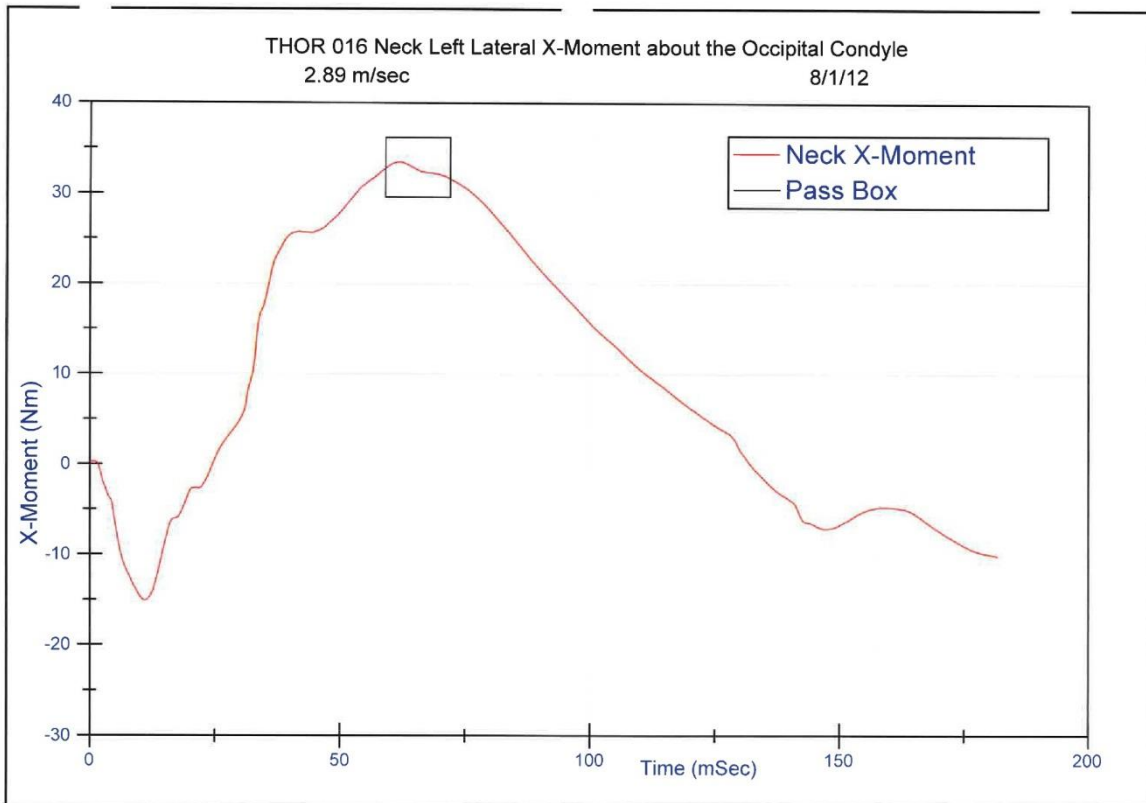
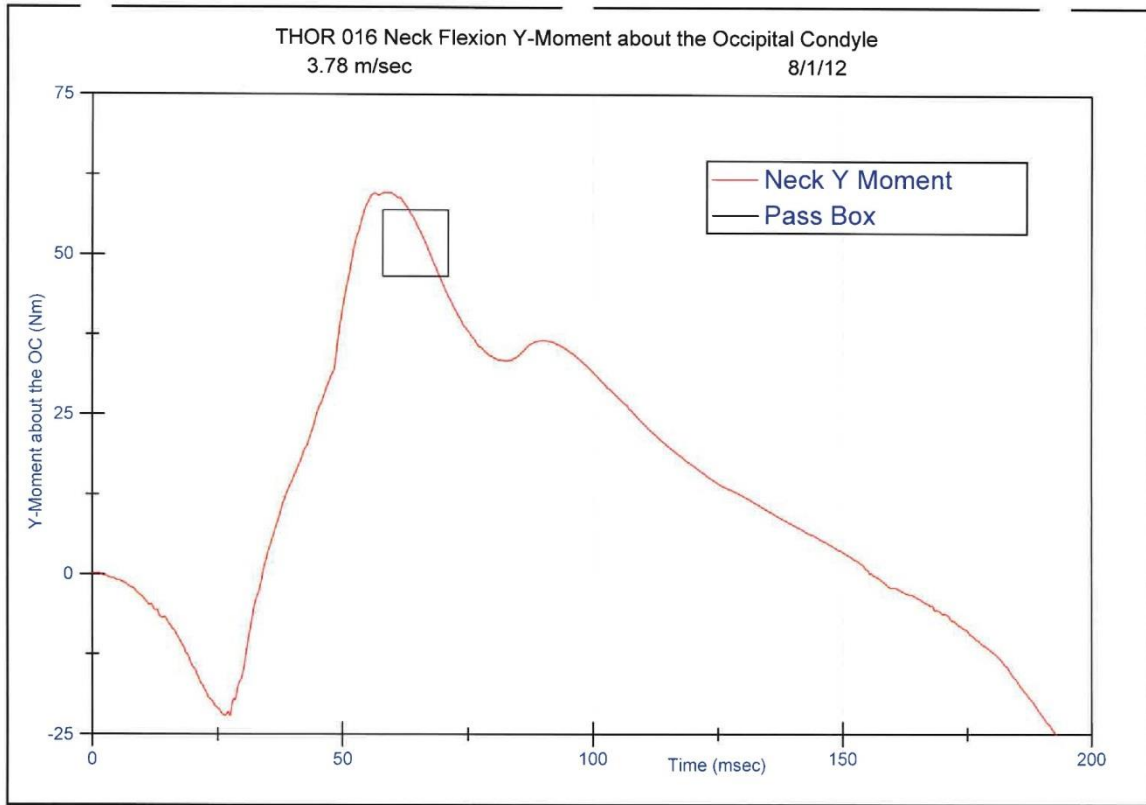


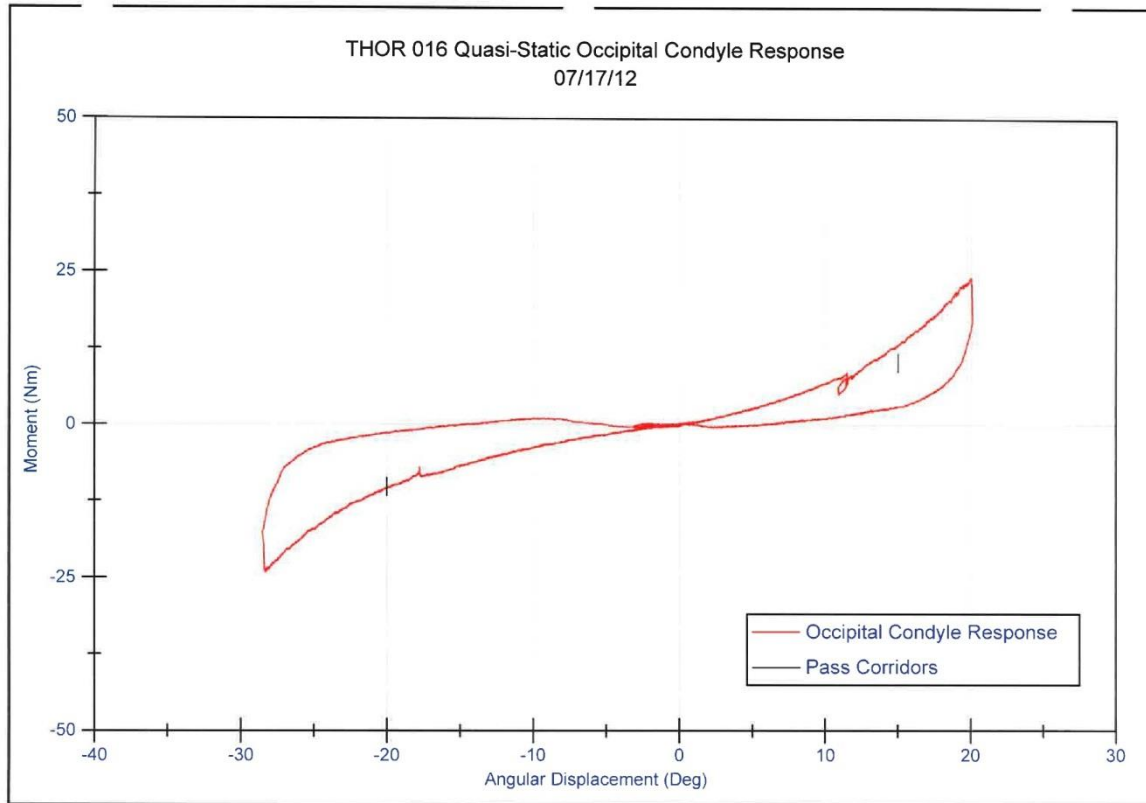
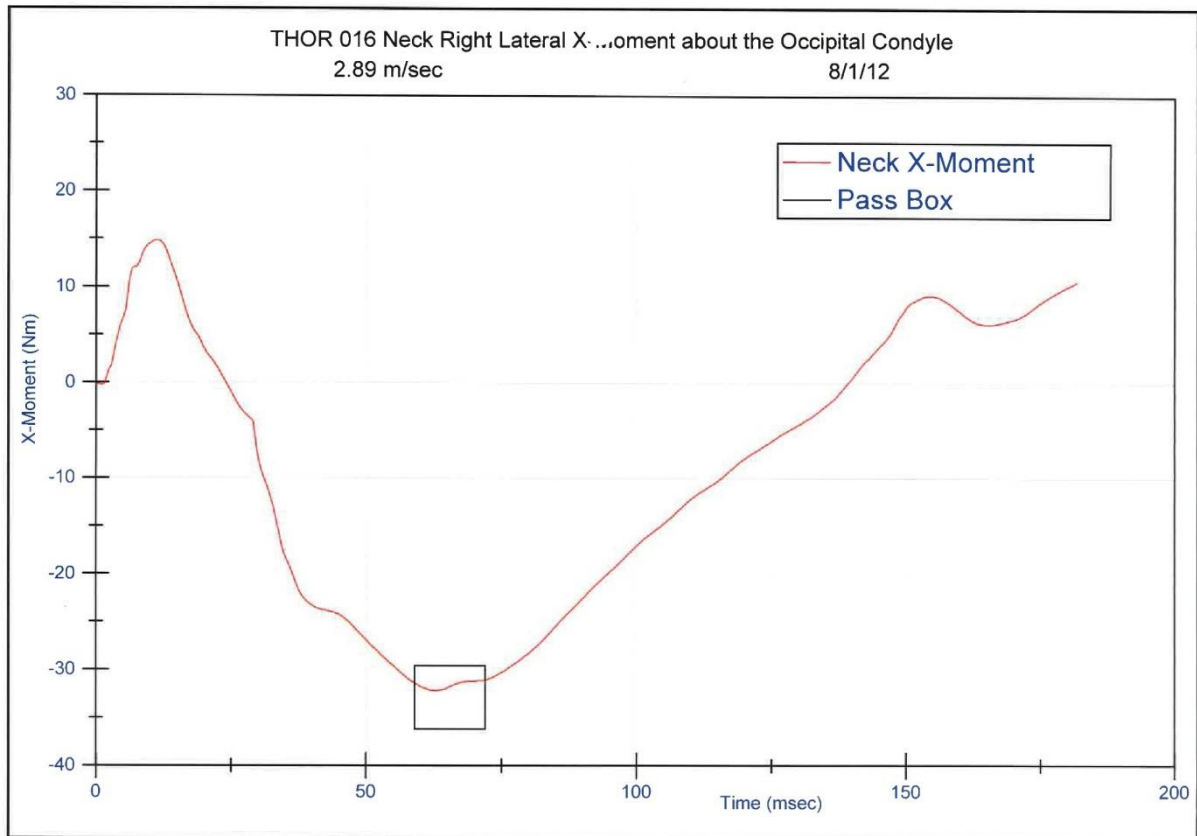


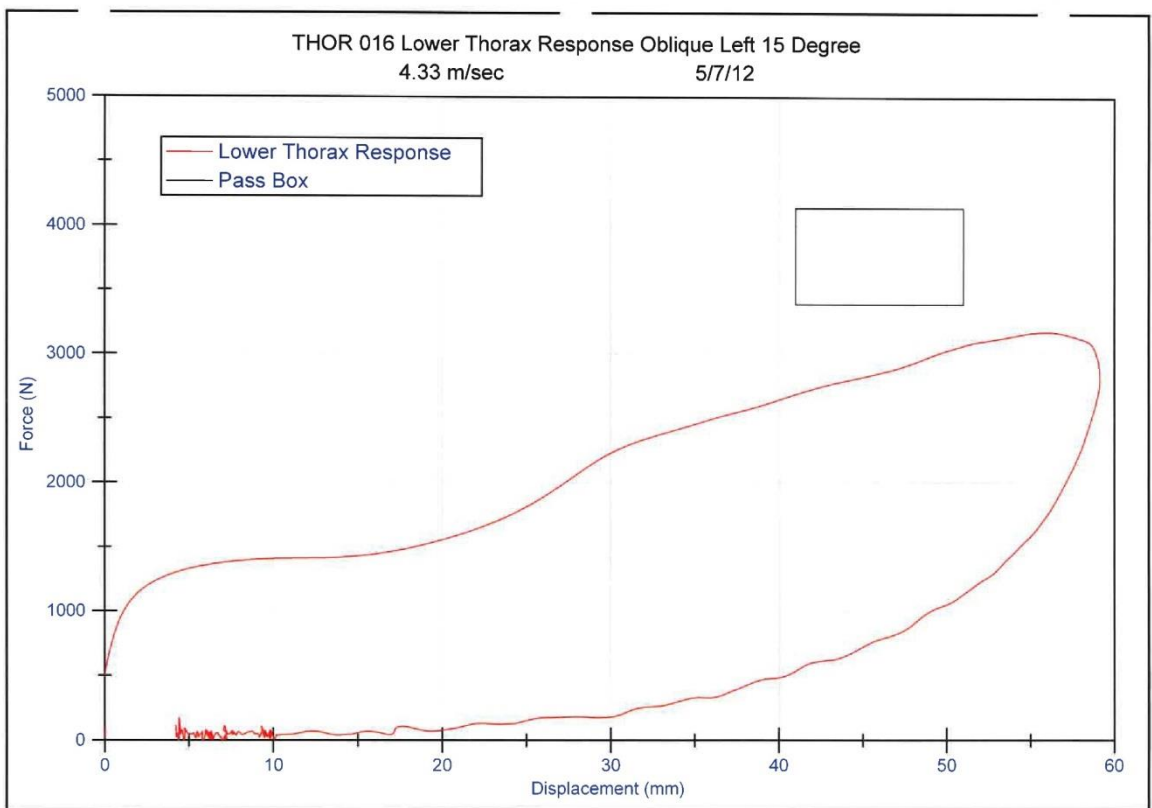
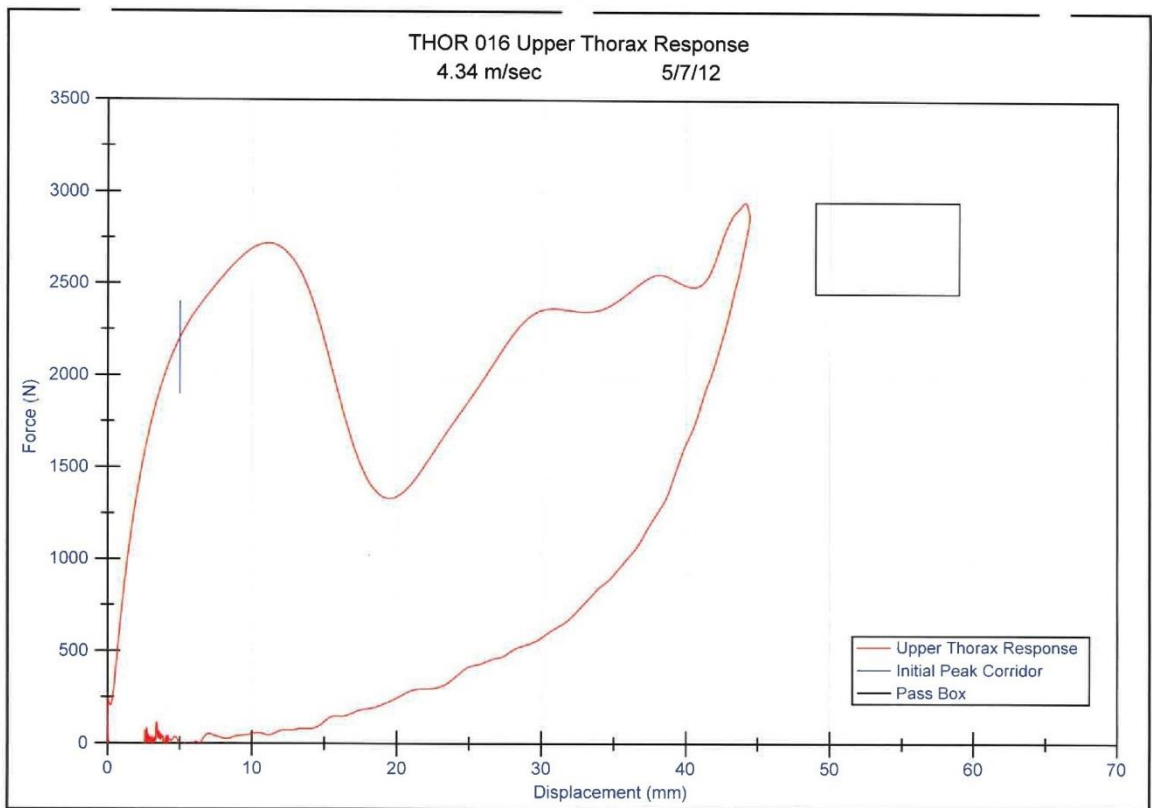


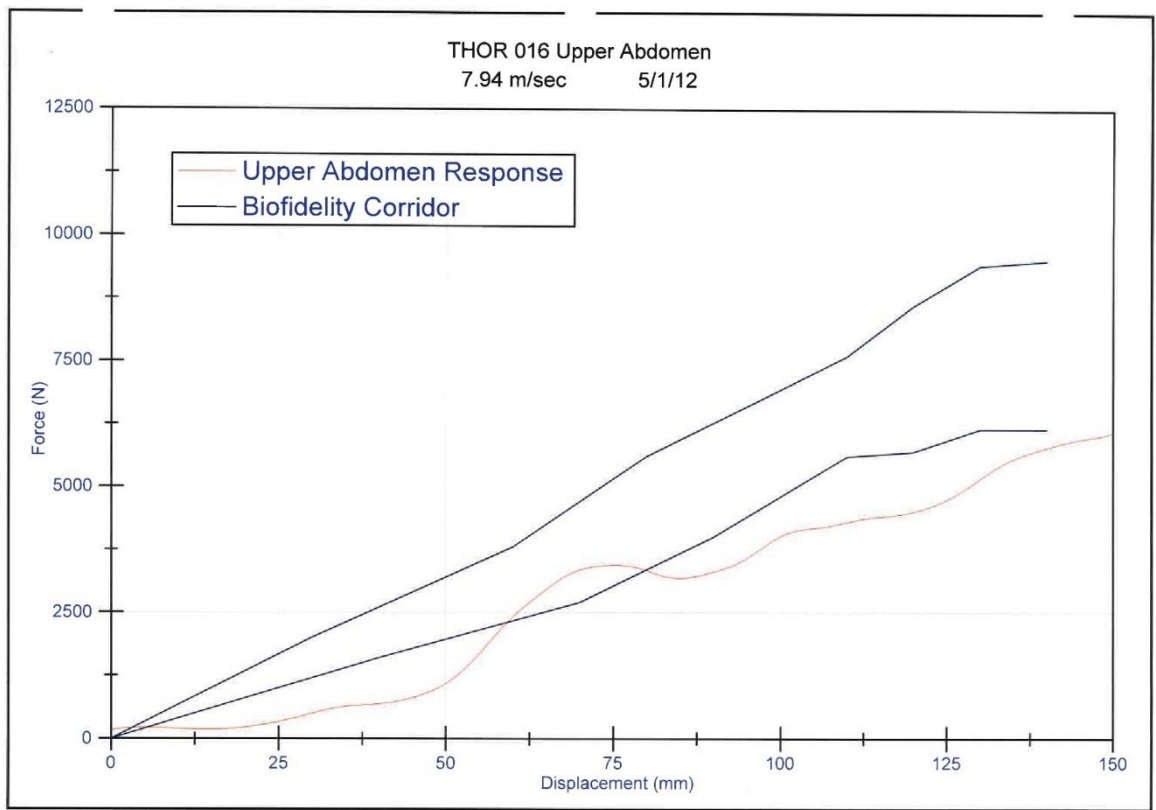
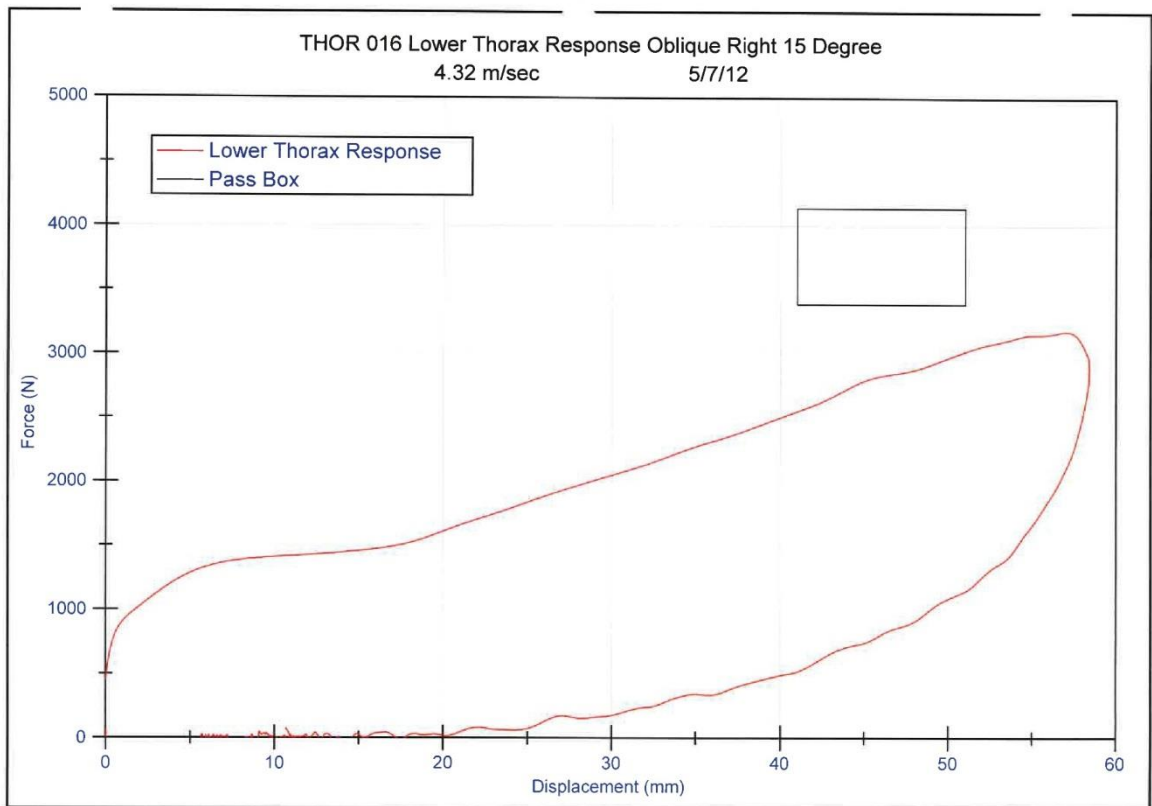
50% ADULT MALE THOR016 DUMMY CALIBRATIONS

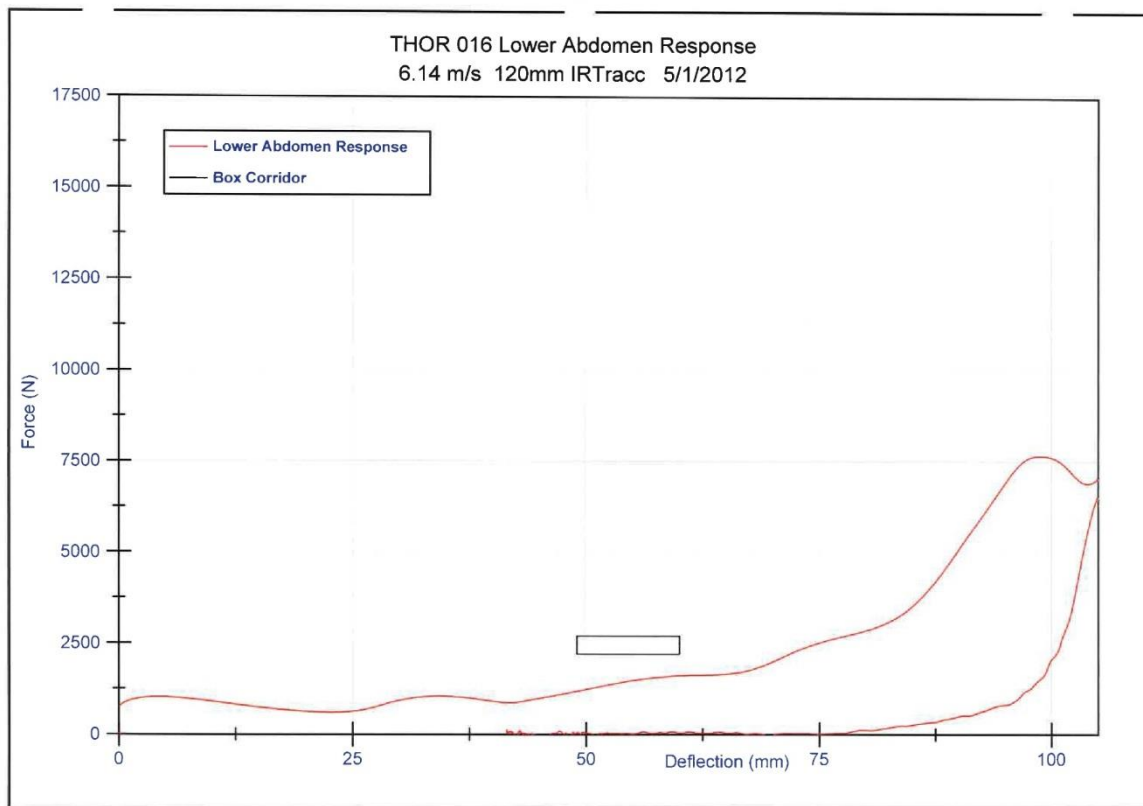






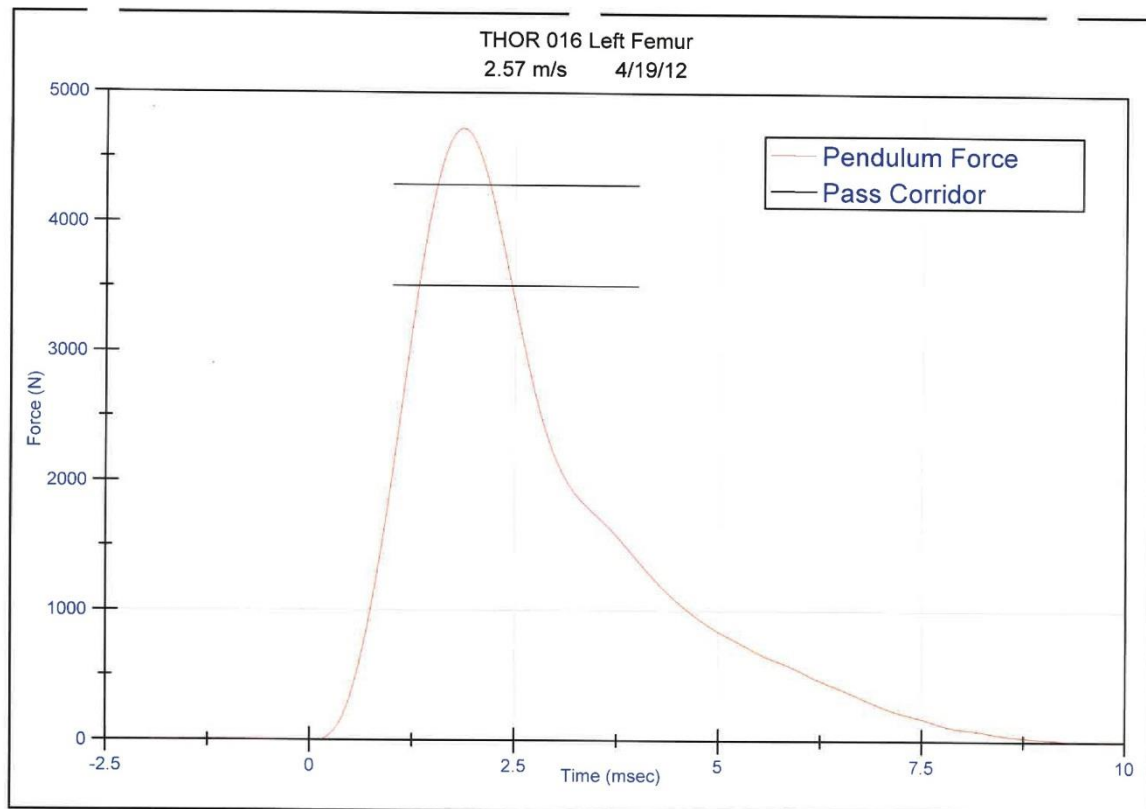
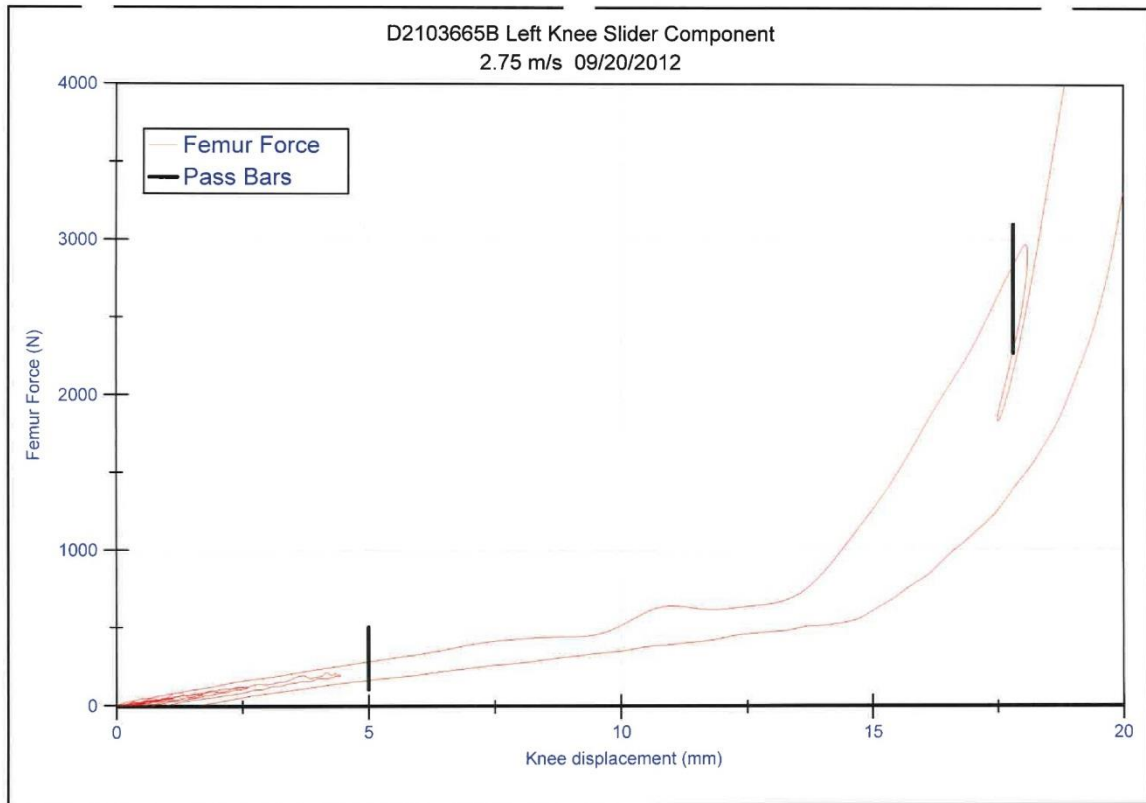


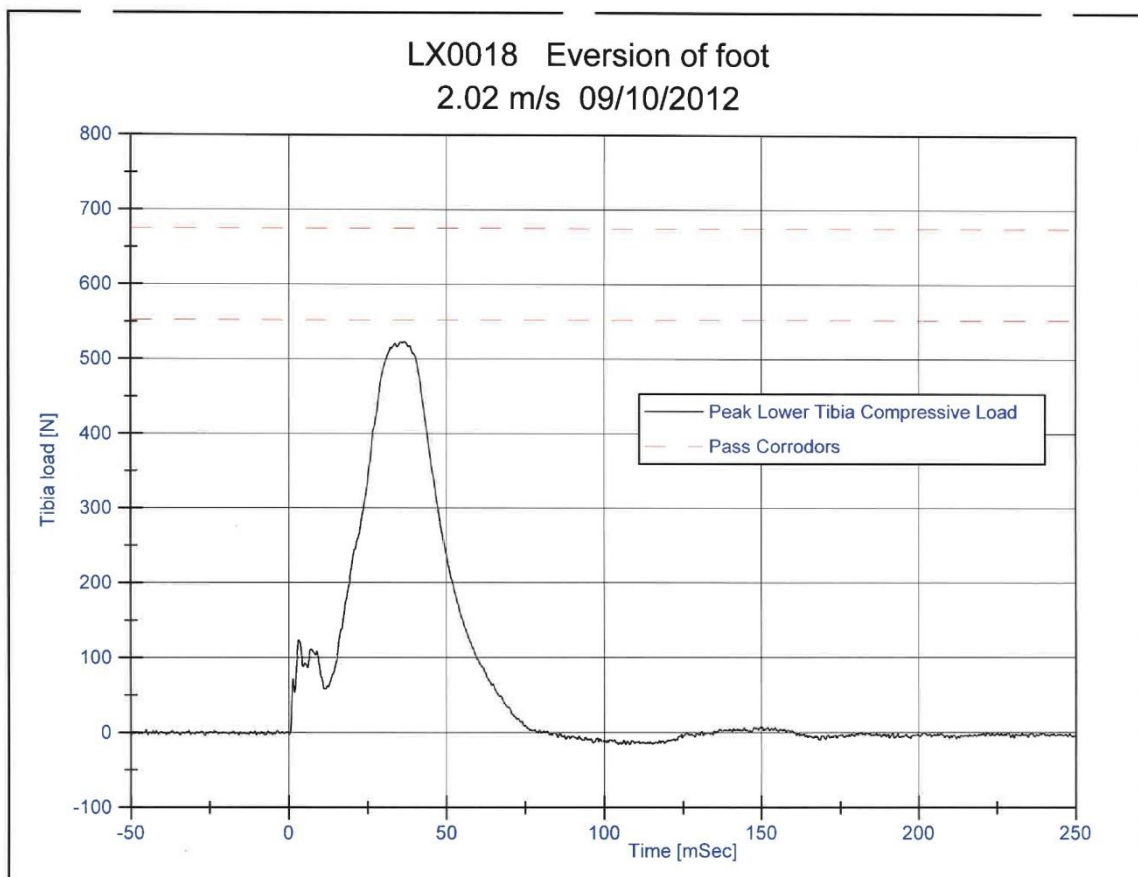
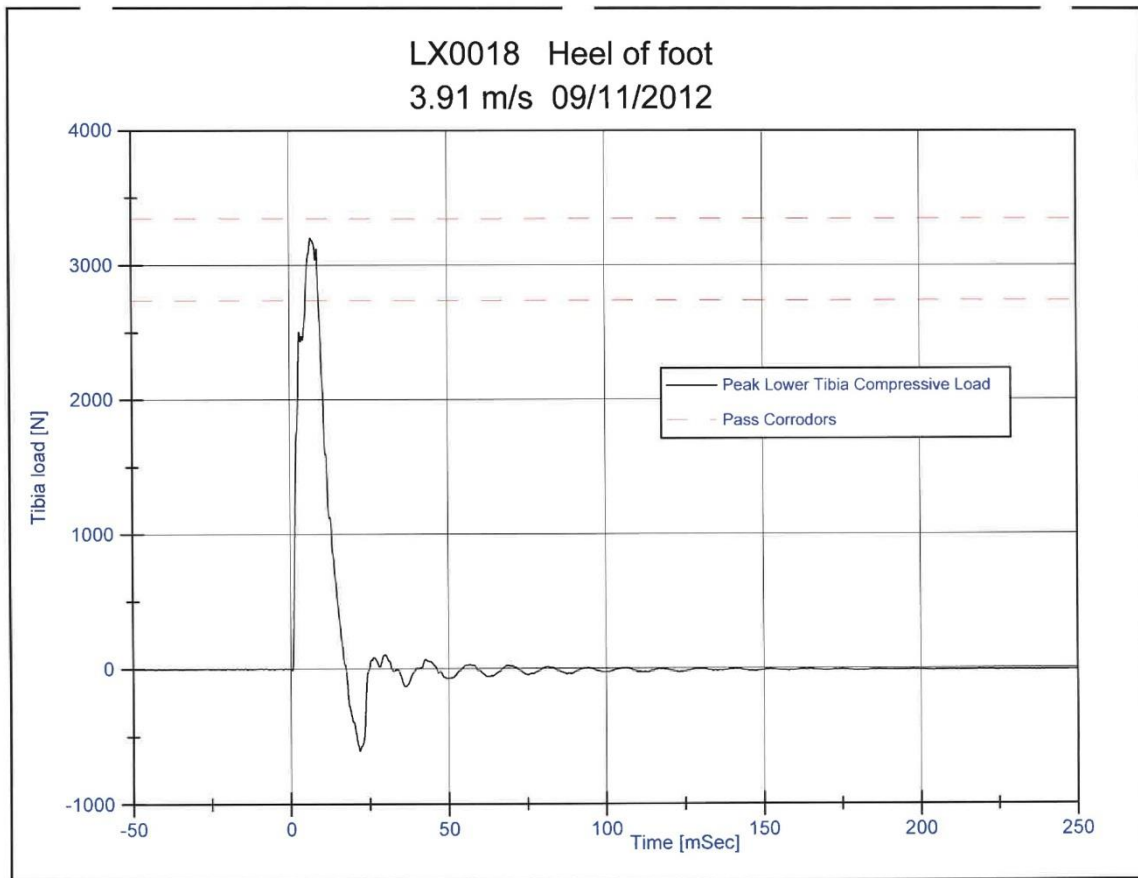


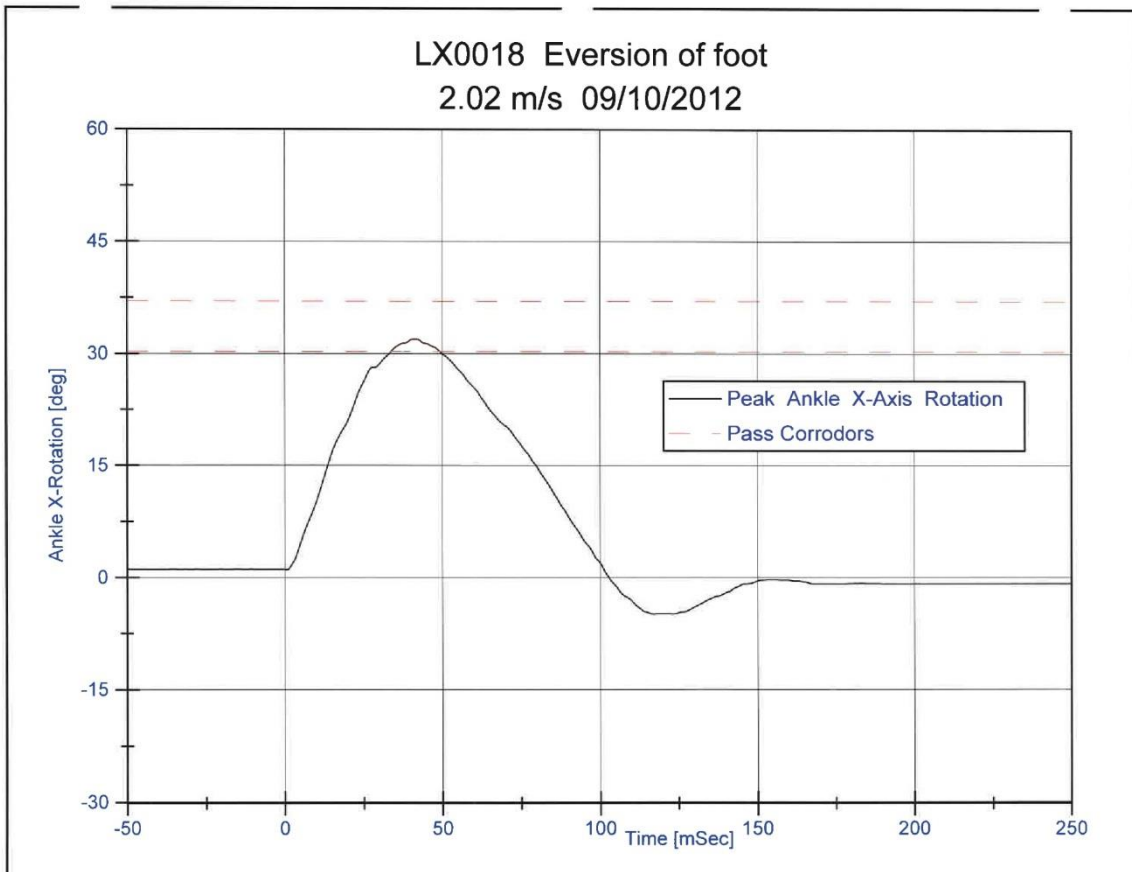
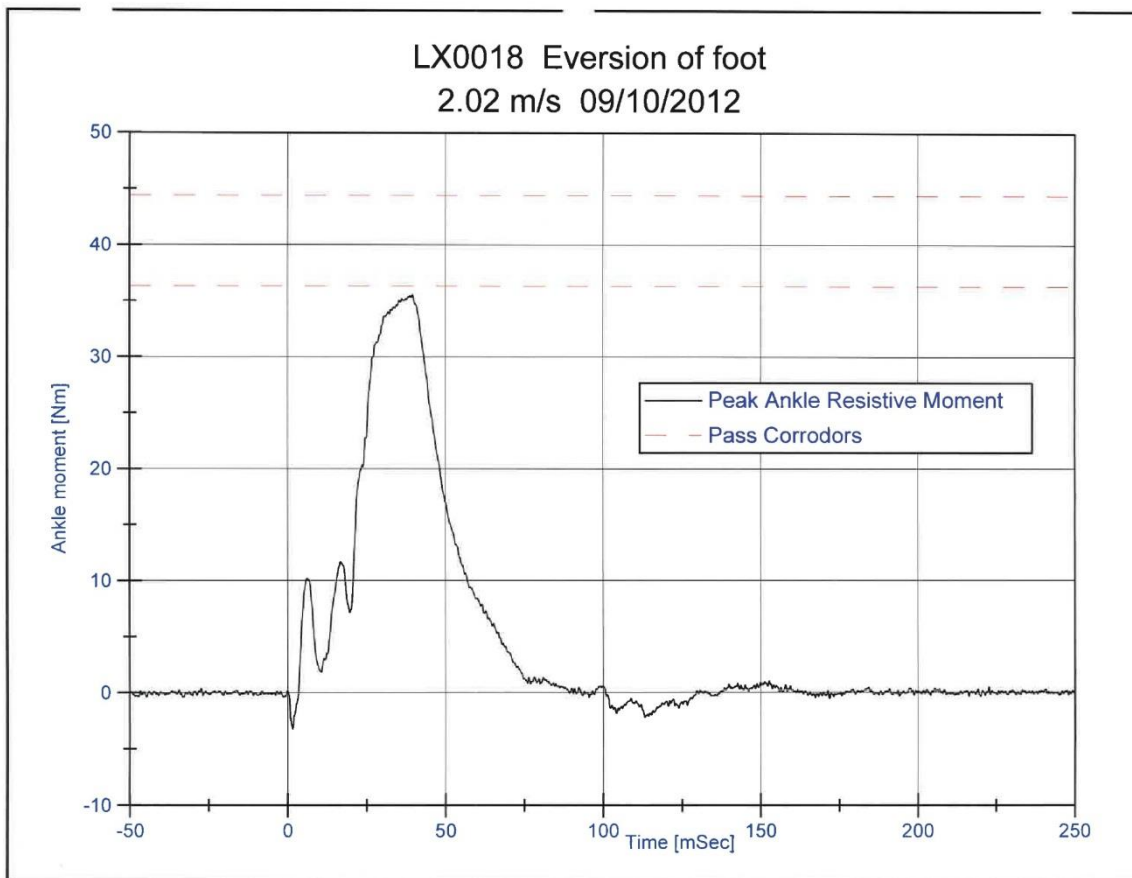


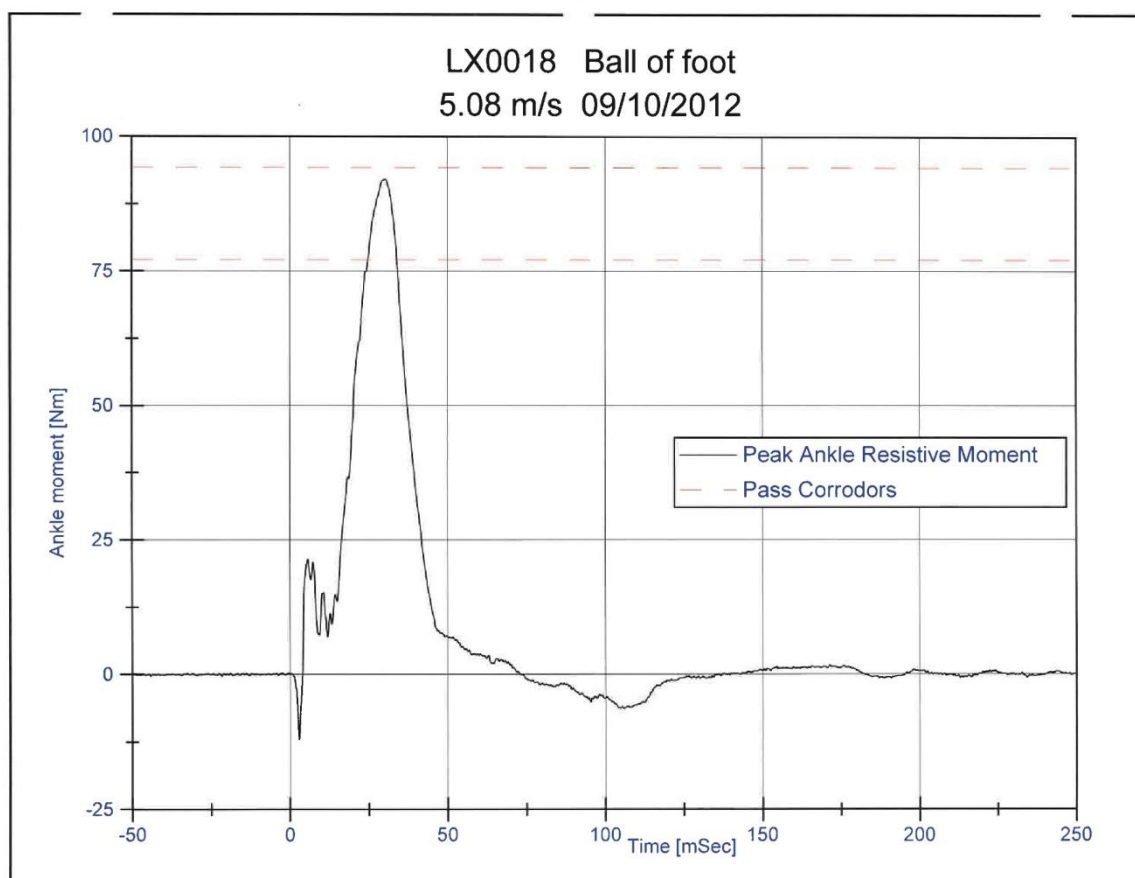
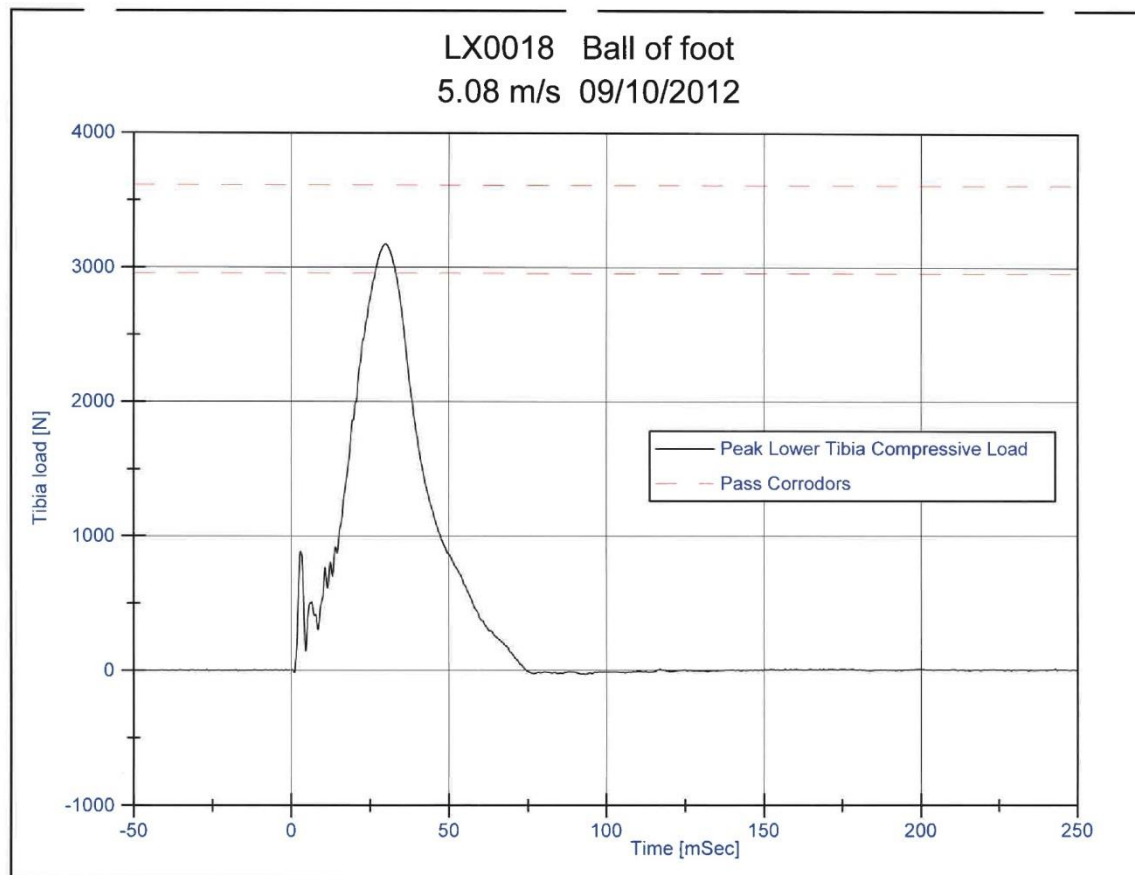
THOR 016 LEG CALIBRATIONS
LX0018 / LX0019

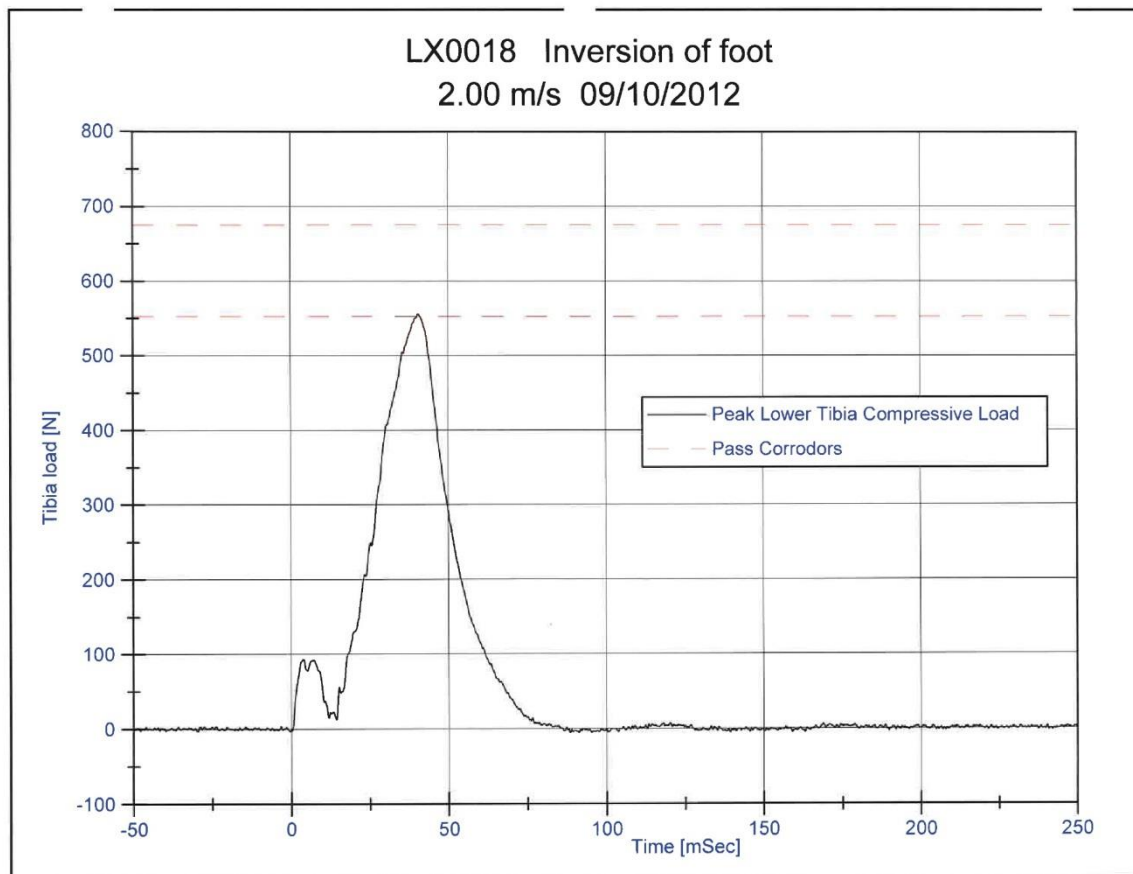
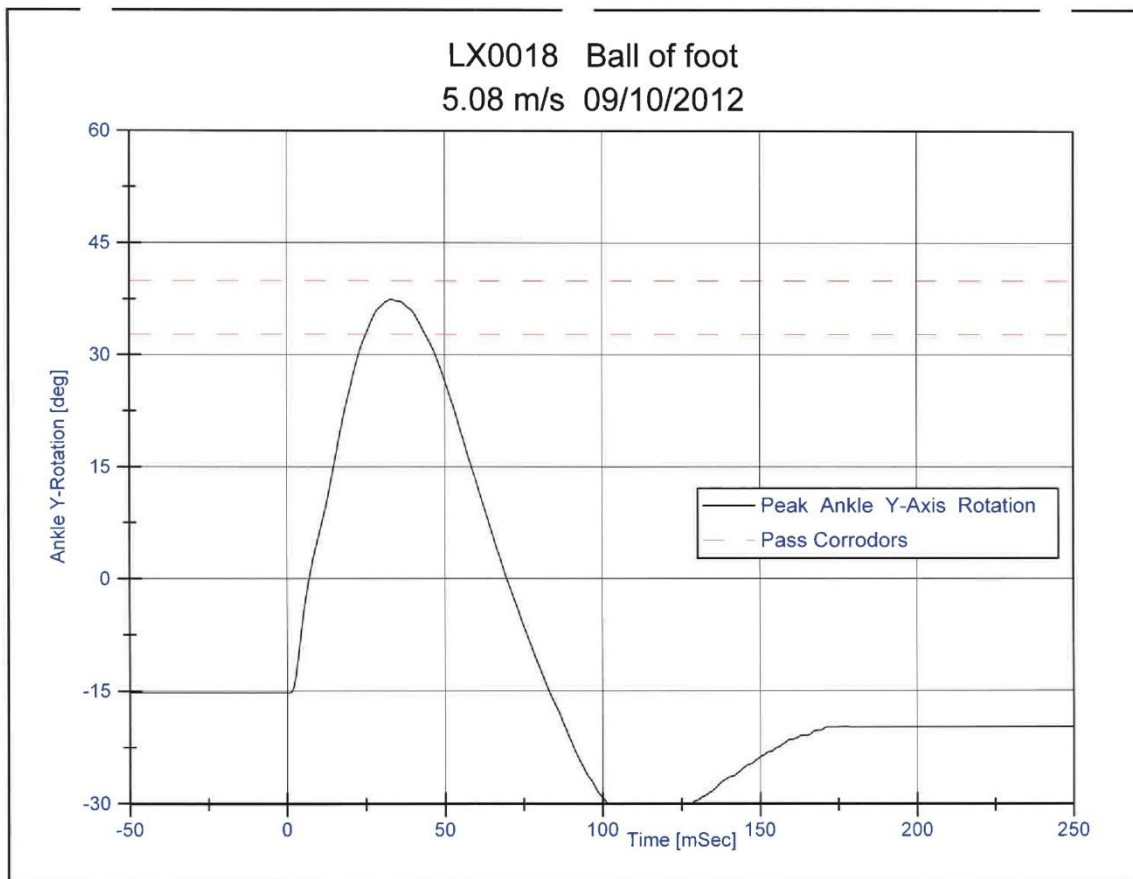
LX0018

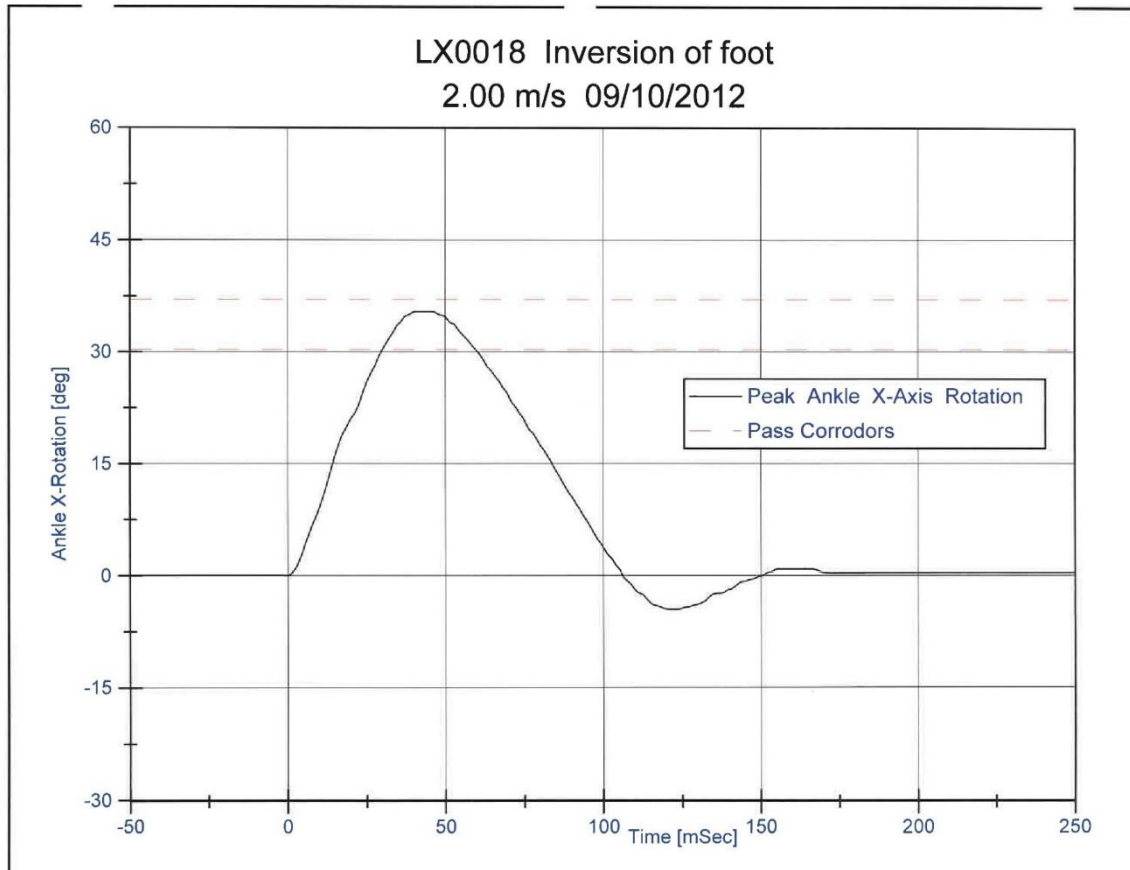
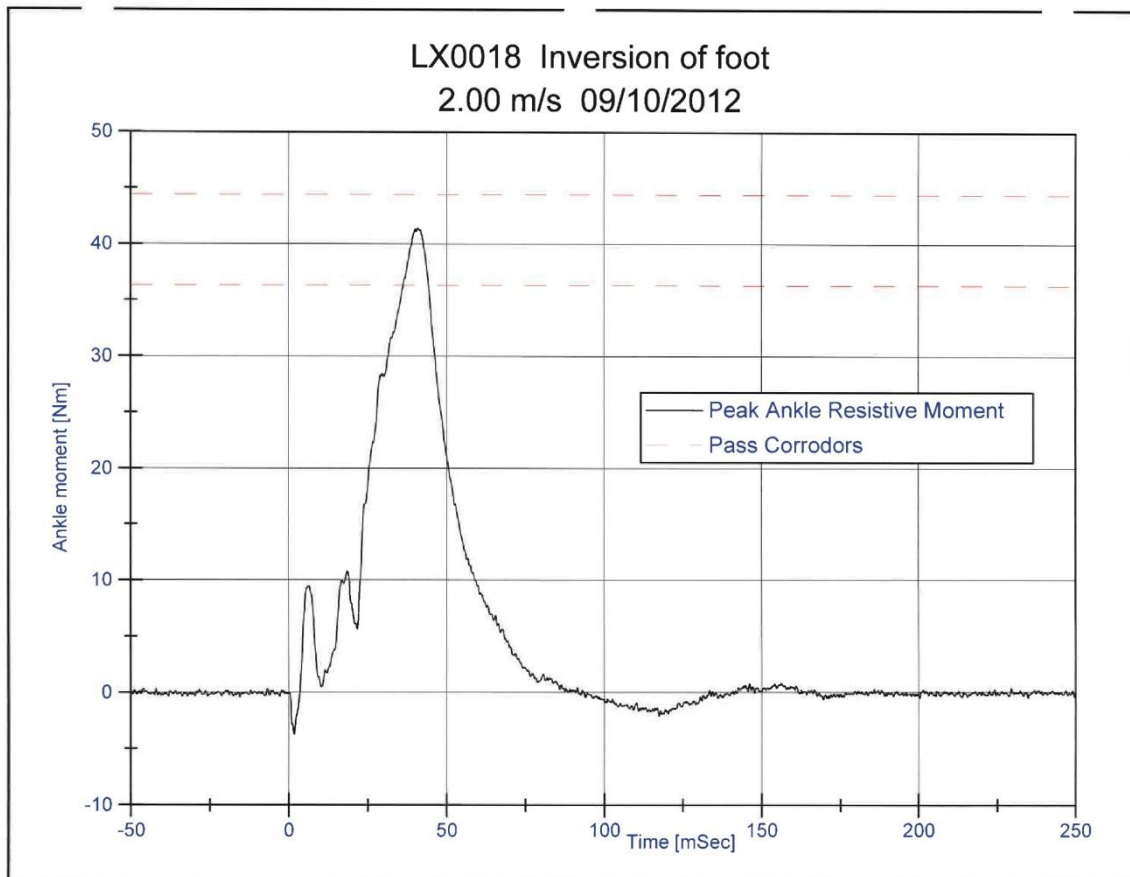




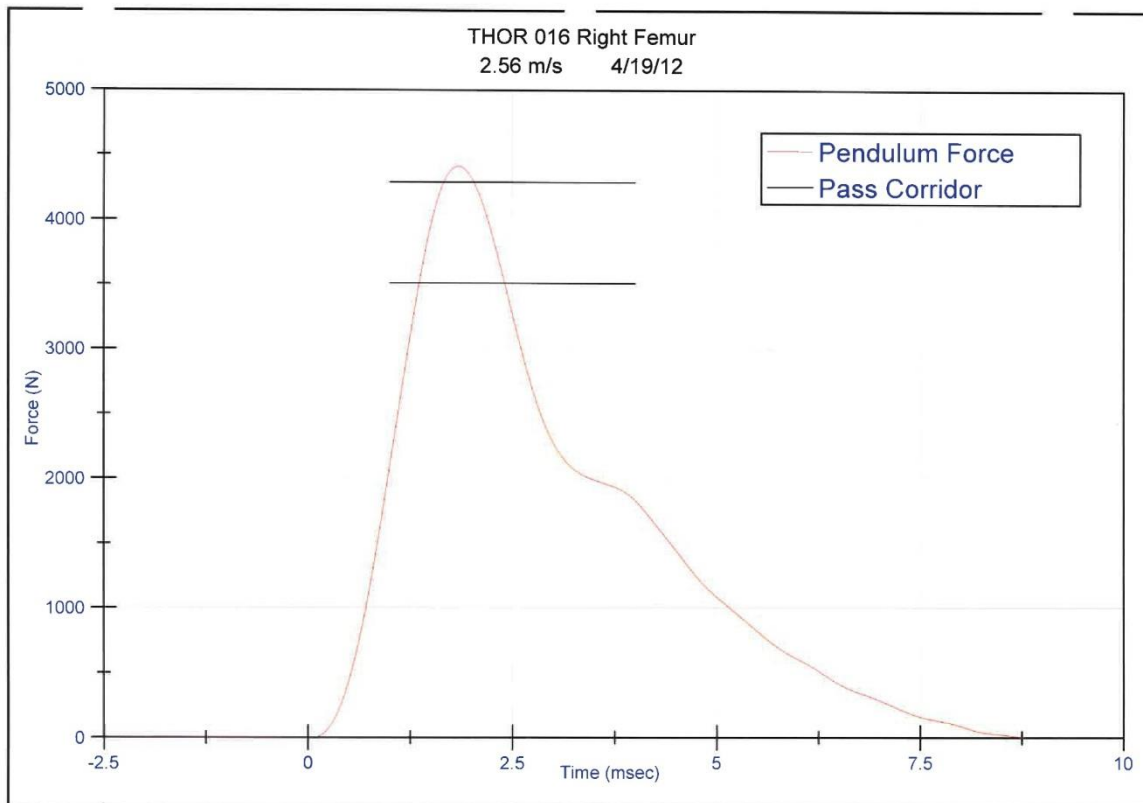
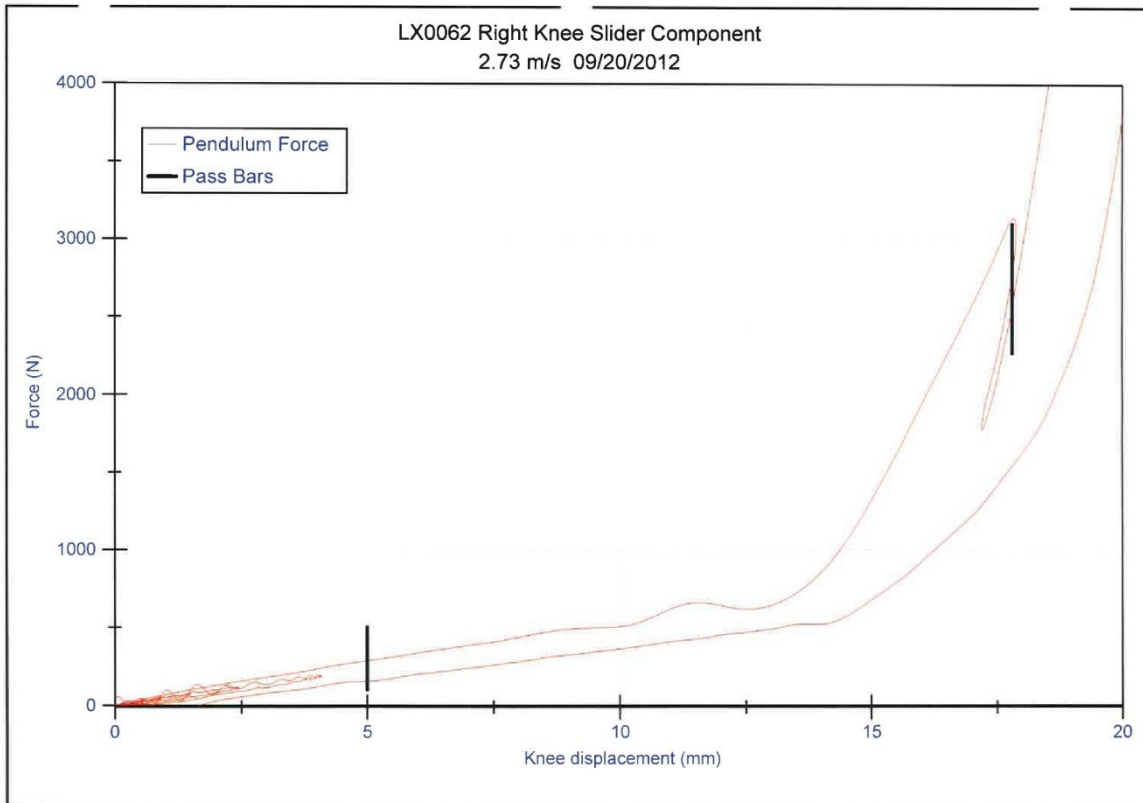


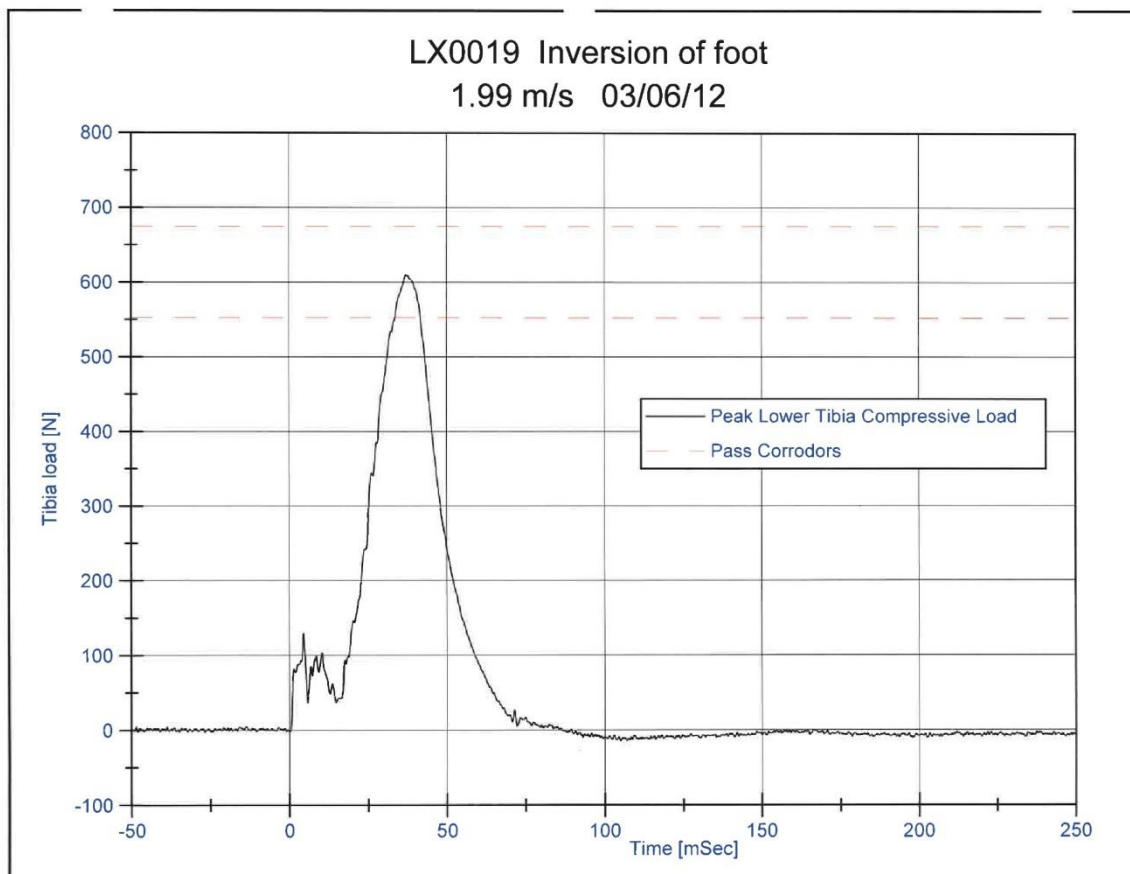
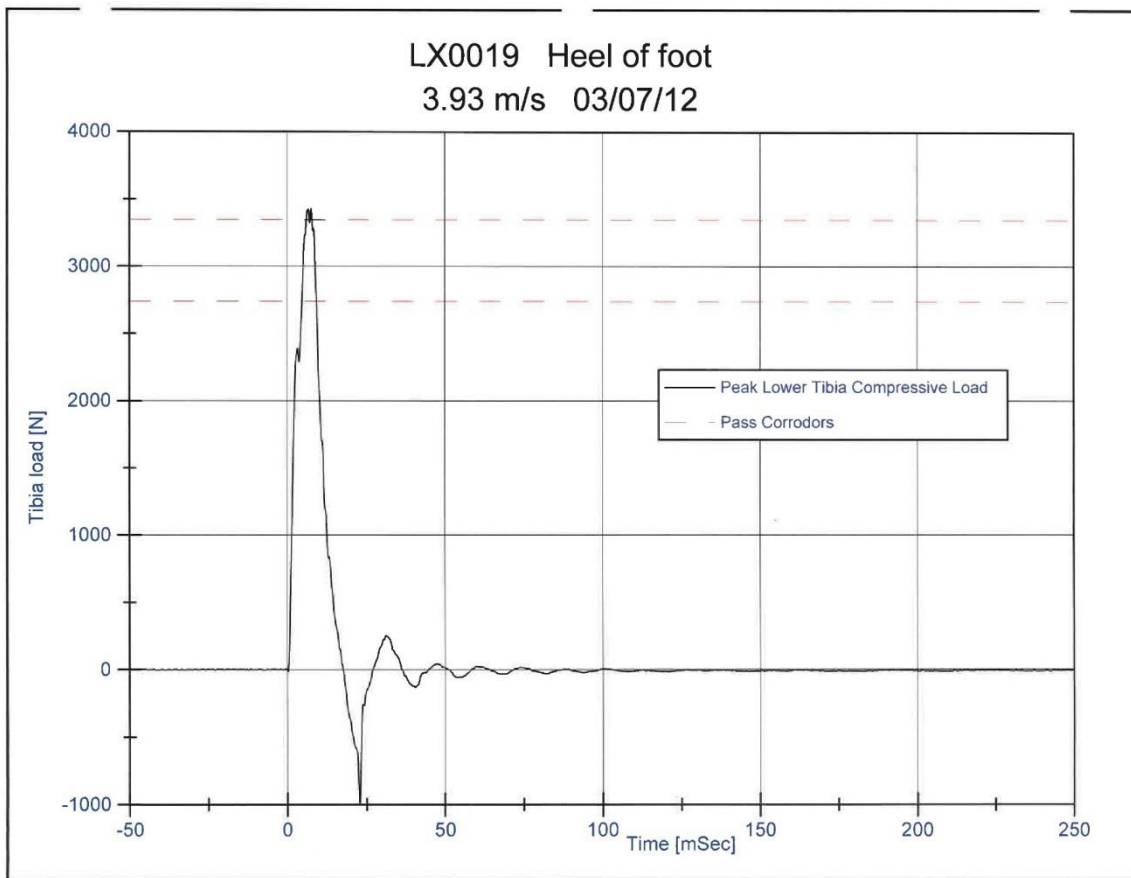


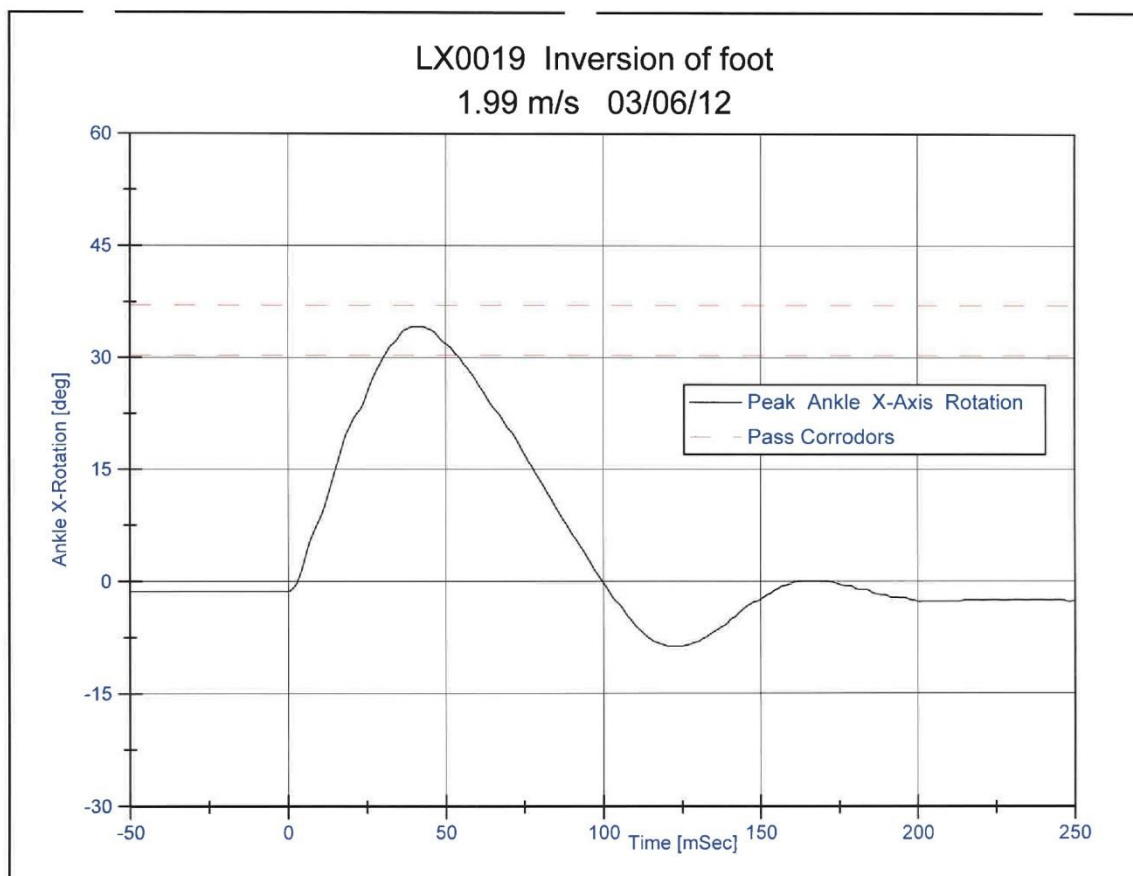
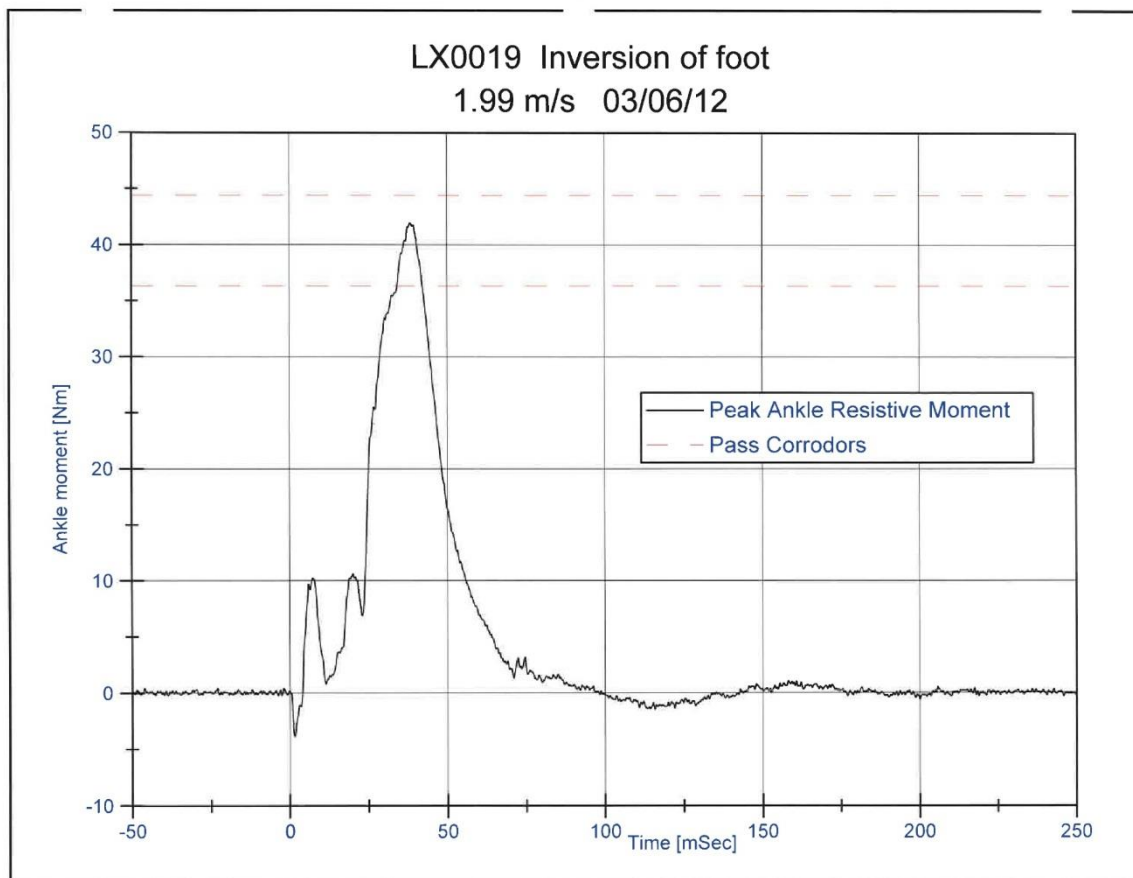




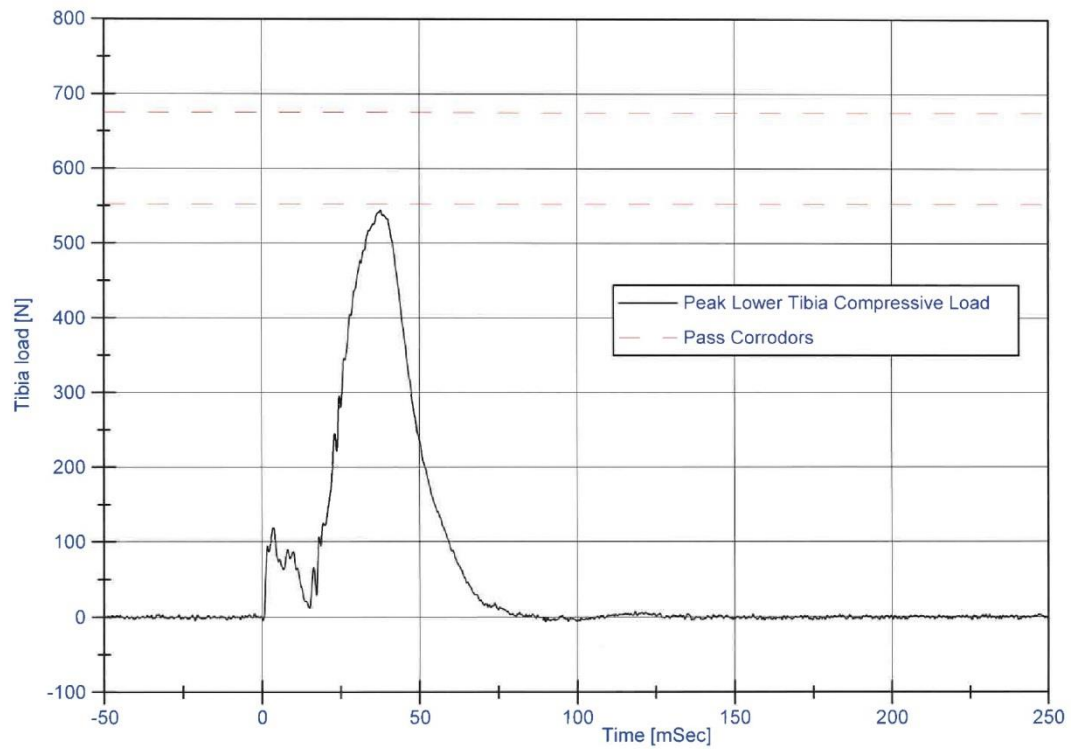
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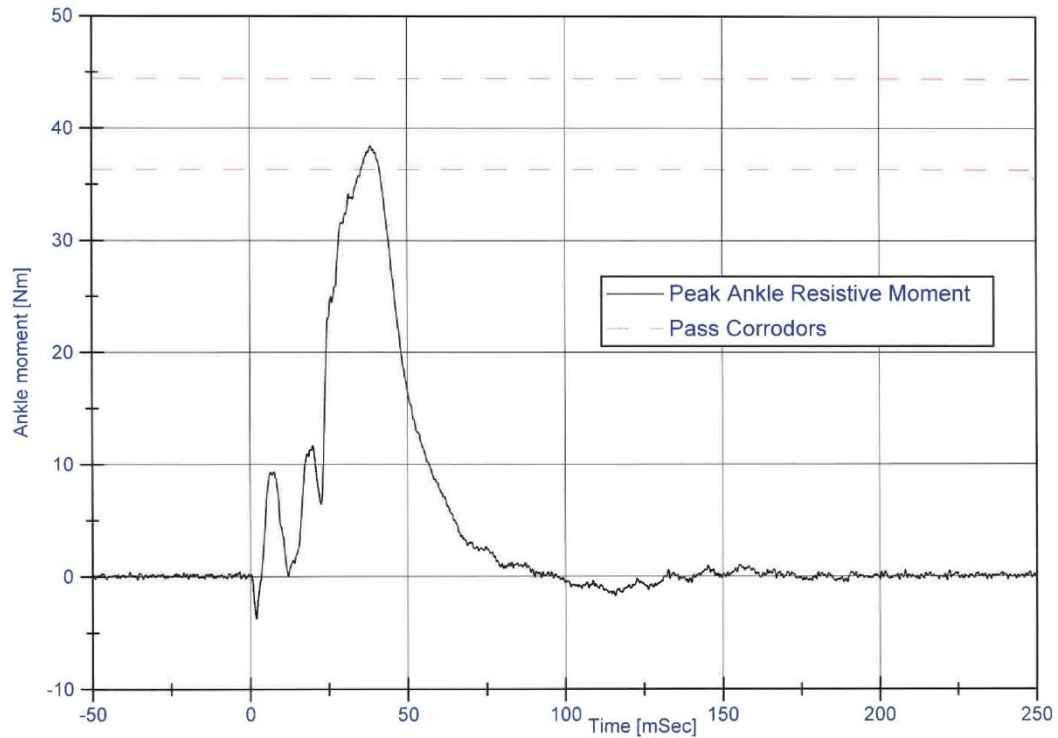


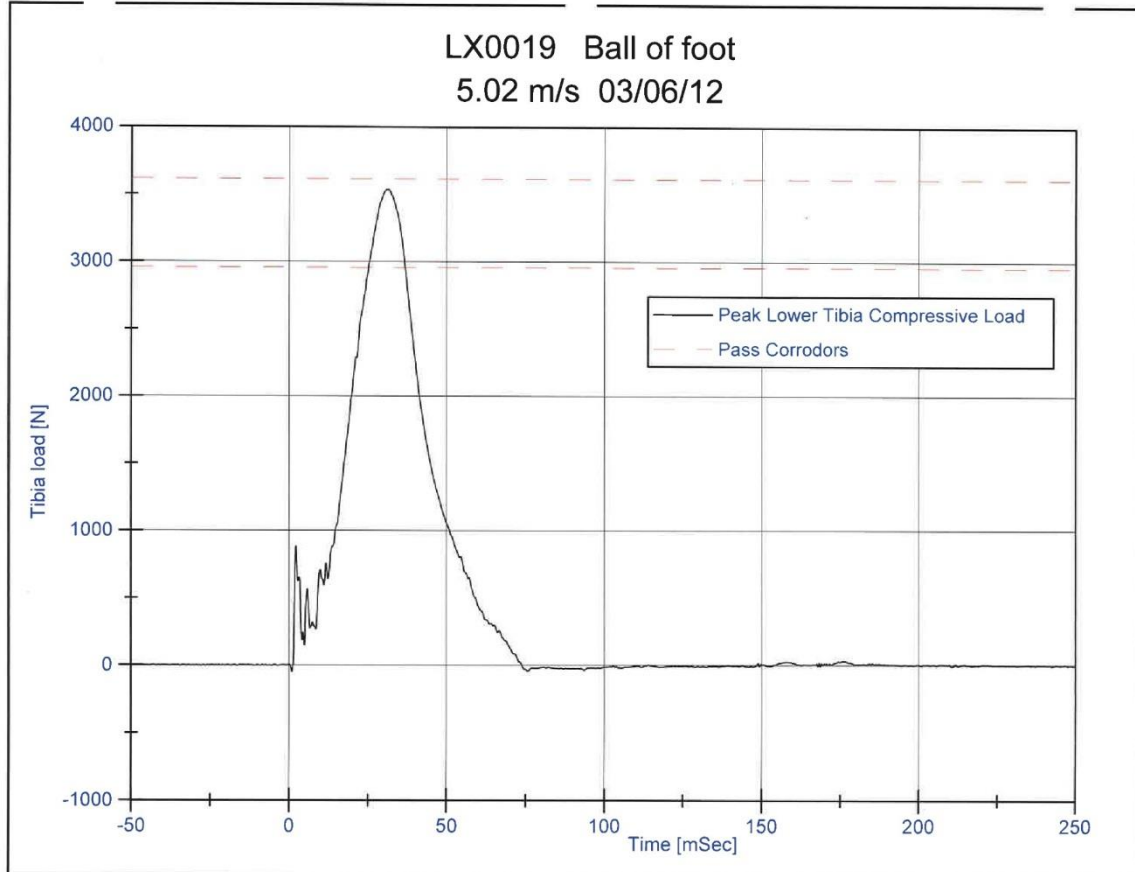
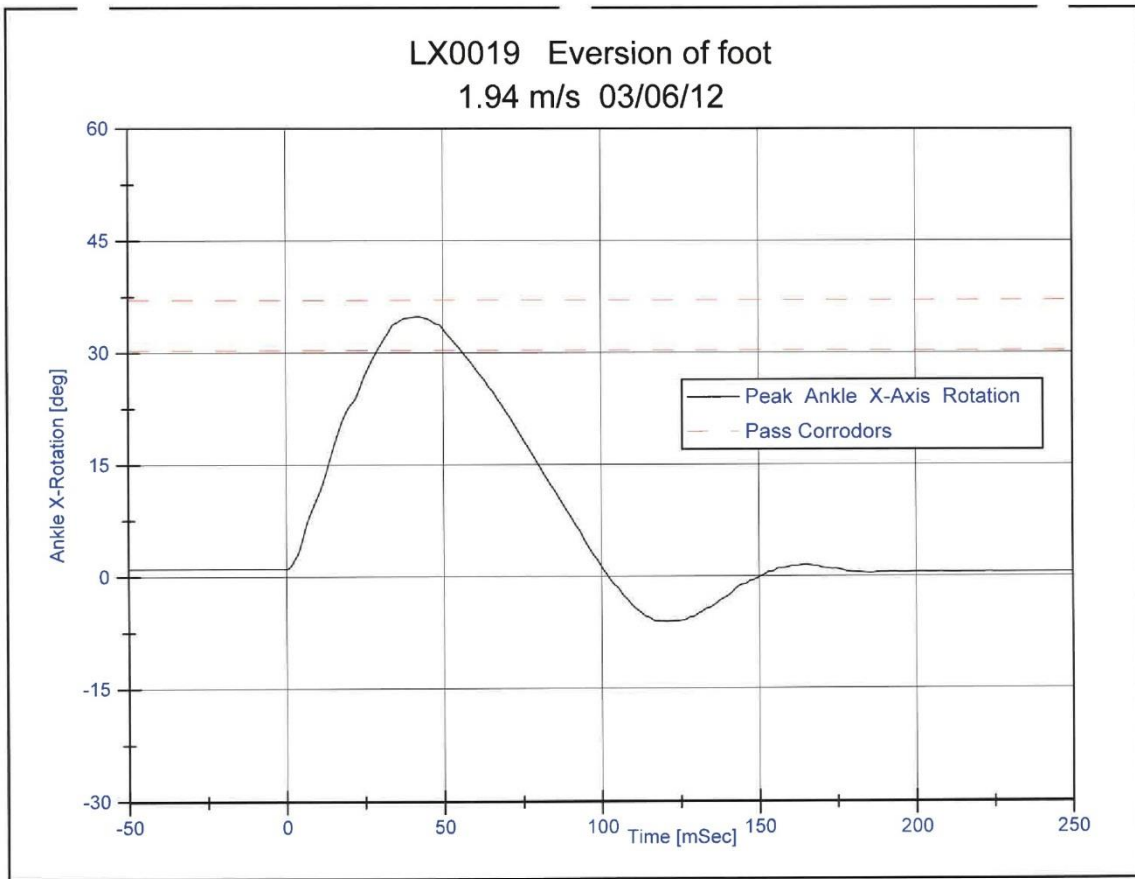


LX0019 Eversion of foot
1.94 m/s 03/06/12

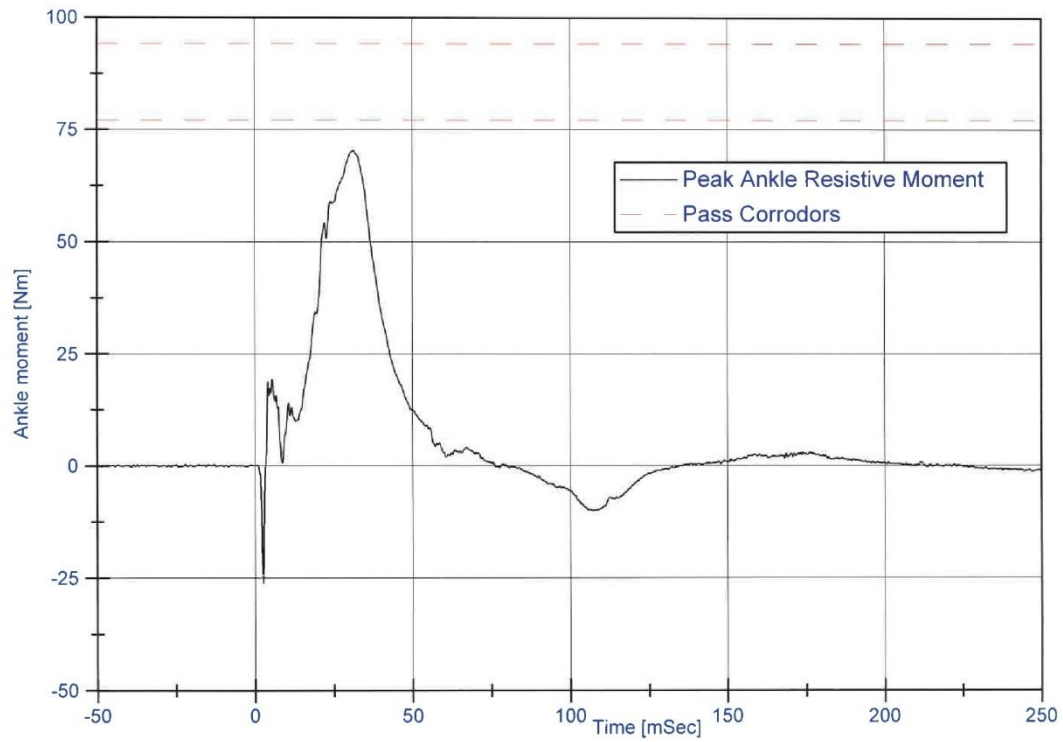


LX0019 Eversion of foot
1.94 m/s 03/06/12

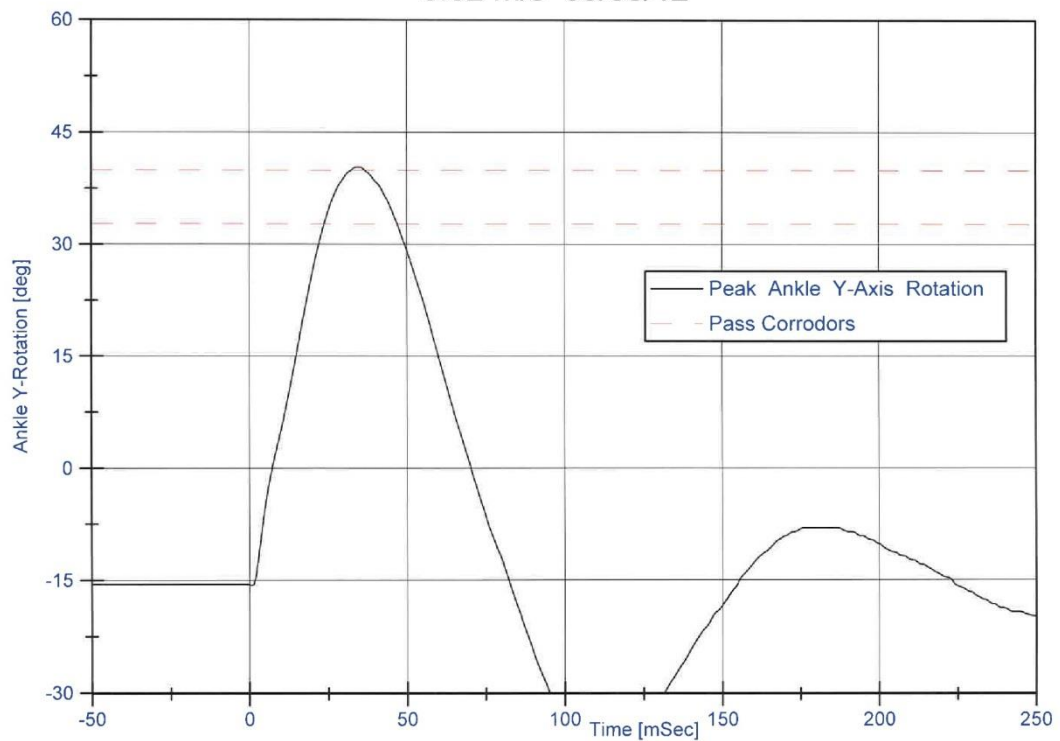




LX0019 Ball of foot
5.02 m/s 03/06/12



LX0019 Ball of foot
5.02 m/s 03/06/12



APPENDIX D:
CMM MEASUREMENT PROCEDURES

Vehicle Coordinate System

The origin point of the VCS is a point 50 mm forward of the rear window glass or hatchback door onto the roof of the vehicle along the vehicle's lateral centerline. The ground is not used as a reference.

The following procedure was used to create the Vehicle Coordinate System (VCS):

- 1) Place the As Delivered vehicle on a flat surface.
- 2) Measure the width of the vehicle at the rear of the vehicle to establish a first center point.
- 3) Measure the width of the vehicle at the front of the vehicle to establish a second center point.
- 4) Using a vertical laser beam, connect the two points to establish the lateral centerline of the vehicle.
- 5) Establish a point 50 mm from the edge of the rear window glass or rear hatchback door frame at the intersection of the roof onto the roof to establish the VCS origin point.
- 6) Construct a line perpendicular to the lateral centerline of the vehicle from VCS origin point towards the C-pillar. Mark a point along this line that is on the C-pillar at the body crease line between the roof and pillar geometry. This will be reference point #2.
- 7) Construct another perpendicular line in the opposite direction from the lateral centerline of the vehicle that is the same distance from the centerline as reference point #2. This will be reference point #3.
- 8) The VCS origin point is defined as the following:
 - Positive X is from the VCS origin point to the front of the vehicle
 - Positive Y is from the driver side of the vehicle to the passenger side of the vehicle
 - Positive Z is from the VCS origin point of the vehicle to the bottom of the vehicle

Steering Column Reference Point

The Steering Column Reference point is the x, y, and z location of the geometric center of the steering wheel in the VCS.

Brake Pedal Reference Point

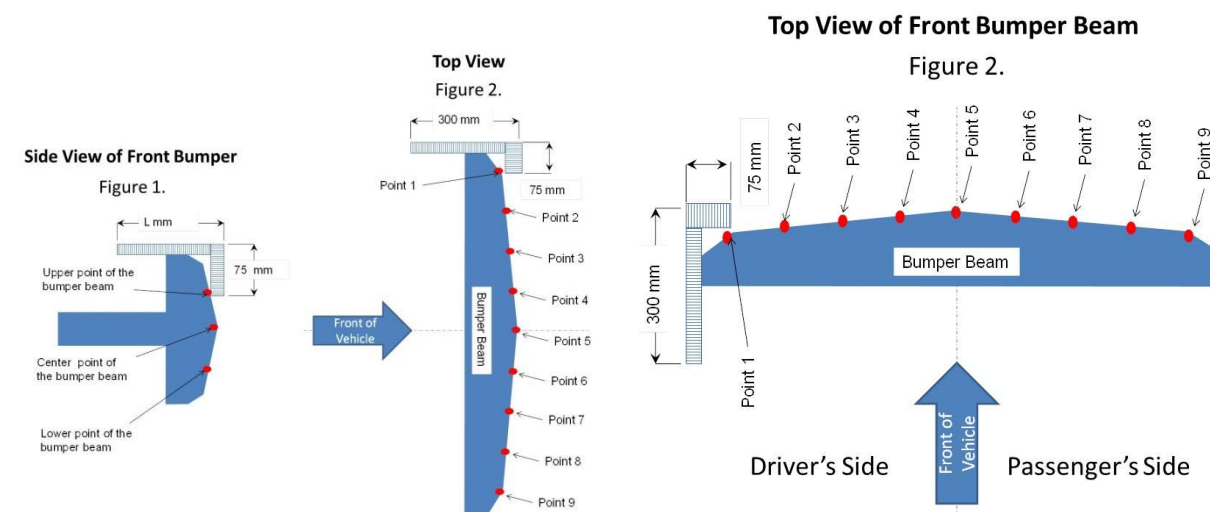
The Brake Pedal Reference Point is the x, y, and z location of the geometric center of the brake pedal pad (top surface) in the VCS.

Floor Reference Point

The Floor Reference Point is the x, y, and z location of the floor in the VCS. Use the following procedure to determine the Floor Reference Point:

1. If the vehicle has an accelerator pedal with fore-aft adjustment, adjust the pedal to its forward most position
2. Locate the centerline of the top surface of the bottom of the accelerator pedal (CLAP)
3. Remove floor mats
4. Project a vertical line down from the CLAP point until contact is made to the floor. This point is the Floor Reference Point

Pre and Post Bumper Beam and Radiator Support Measurement



Find the vertical center of the bumper beam using the following procedure (Reference Figure 1).

- 1) Position a square above the bumper beam at the centerline of the vehicle such that the plan of the square is aligned with the longitudinal axis of the vehicle and the "L mm" part of the square is parallel to the ground.
- 2) Move the square toward the ground until it contacts the bumper beam.
- 3) Move the square toward the rear of the vehicle until it contacts the bumper beam. The point where the 75 mm part of the square contacts the bumper beam is the Upper point of the bumper beam.
- 4) Perform the same procedure for the lower part of the bumper beam. The point where the 75 mm part of the square contacts the bumper beam is the Lower point of the bumper beam.
- 5) The center point of the bumper beam is half the distance between the Upper and Lower points of the bumper beam.
- 6) Transpose the lateral center of the bumper beam up onto the top of the upper radiator support.
- 7) Mark the center of the upper radiator support along its forward leading edge. If the radiator support is not flat this mark is made along the top edge.
- 8) Mark enough points along this edge to define its profile.

Pre and Post Driver Left Lower Instrument Panel

The left lower instrument panel (knee bolster) lateral coordinates are defined by adding 15 cm from the steering column reference lateral coordinate, respectively. The vertical coordinate is defined as 45 cm above the height of the floor reference point. If the panel or knee bolster loosens or breaks away in the crash, the post-crash measurements are taken by pressing and holding the panel against the underlying structure.

Create a floor vehicle coordinate system on the floor at the location of this measurement.

Pre and Post Driver Right Lower Instrument Panel

The left lower instrument panel (knee bolster) lateral coordinates are defined by subtracting 15 cm from the steering column reference lateral coordinate, respectively. The vertical coordinate is defined as 45 cm above the height of the floor reference point. If the panel or knee bolster loosens or breaks away in the crash, the post-crash measurements are taken by pressing and holding the panel against the underlying structure.

Pre and Post Brake Pedal (Figure 22)

If the brake pedal is constructed so that it dangles loosely after the crash, the brake pedal is pushed straight forward against the toepan/floor pan and held there to take the post-crash measurement. If the pedal drops away entirely, no post-crash measurement is taken.

Pre and Post Driver Toe pan and Floor Board (Figure 22)

DRIVER POINT A1

The vertical coordinate for the A1 measurement location is the vertical of the brake pedal reference. The lateral coordinate of the A1 is obtained by subtracting 25 cm from the brake pedal reference lateral coordinate.

DRIVER POINT B1

The vertical coordinate for the B1 location is the vertical coordinate of the brake pedal reference. The lateral coordinate of the B1 is obtained by subtracting 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT C1

The vertical coordinate for the C1 location is the vertical coordinate of the brake pedal reference. The lateral coordinate of the C1 is obtained by subtracting 0 cm from the brake pedal reference lateral coordinate.

DRIVER POINT D1

The vertical coordinate for the D1 location is the vertical coordinate of the brake pedal reference. The lateral coordinate of the D1 is obtained by adding 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT A2

The vertical coordinate of the A2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference and the vertical coordinate of the floor reference. The lateral coordinate of the A2 is obtained by subtracting 25 cm from the brake pedal reference lateral coordinate.

DRIVER POINT B2

The vertical coordinate of the B2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference the vertical coordinate of the floor reference. The lateral coordinate of the B2 is obtained by subtracting 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT C2

The vertical coordinate of the C2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference and the vertical coordinate of the floor reference. The lateral coordinate of the C2 is obtained by subtracting 0 cm from the brake pedal reference lateral coordinate.

DRIVER POINT D2

The vertical coordinate of the D2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference and the vertical coordinate of the floor reference. The lateral coordinate of the 22 is obtained by adding 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT A3

The vertical coordinate of the A3 measurement location is obtained by subtracting 1 cm from the floor reference. The lateral coordinate of the A3 is obtained by subtracting 25 cm from the brake pedal reference lateral coordinate.

DRIVER POINT B3

The vertical coordinate of the B3 measurement location is obtained by subtracting 1 cm from the floor reference. The lateral coordinate of the B3 is obtained by subtracting 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT C3

The vertical coordinate of the C3 measurement location is obtained by subtracting 1 cm from the floor reference. The lateral coordinate of the C3 is obtained by subtracting 0 cm from the brake pedal reference lateral coordinate.

DRIVER POINT D3

The vertical coordinate of the D3 measurement location is obtained by subtracting 1 cm from the floor reference. The lateral coordinate of the D3 is obtained by adding 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT A4

The longitudinal coordinate of the A4 measurement location is obtained by subtracting 5 cm from the A3 reference. The lateral coordinate of the A4 is obtained by subtracting 25 cm from the brake pedal reference lateral coordinate.

DRIVER POINT B4

The longitudinal coordinate of the B4 measurement location is obtained by subtracting 5 cm from the B3 reference. The lateral coordinate of the B4 is obtained by subtracting 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT C4

The longitudinal coordinate of the C4 measurement location is obtained by subtracting 5 cm from the C3 reference. The lateral coordinate of the C4 is obtained by subtracting 0 cm from the brake pedal reference lateral coordinate.

DRIVER POINT D4

The longitudinal coordinate of the D4 measurement location is obtained by subtracting 5 cm from the D3 reference. The lateral coordinate of the D4 is obtained by adding 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT A5

The longitudinal coordinate of the A5 measurement location is obtained by subtracting 5 cm from the A4 reference. The lateral coordinate of the A5 is obtained by subtracting 25 cm from the brake pedal reference lateral coordinate.

DRIVER POINT B5

The longitudinal coordinate of the B5 measurement location is obtained by subtracting 5 cm from the B4 reference. The lateral coordinate of the B5 is obtained by subtracting 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT C5

The longitudinal coordinate of the C5 measurement location is obtained by subtracting 5 cm from the C4 reference. The lateral coordinate of the C5 is obtained by subtracting 0 cm from the brake pedal reference lateral coordinate.

DRIVER POINT D5

The longitudinal coordinate of the D5 measurement location is obtained by subtracting 5 cm

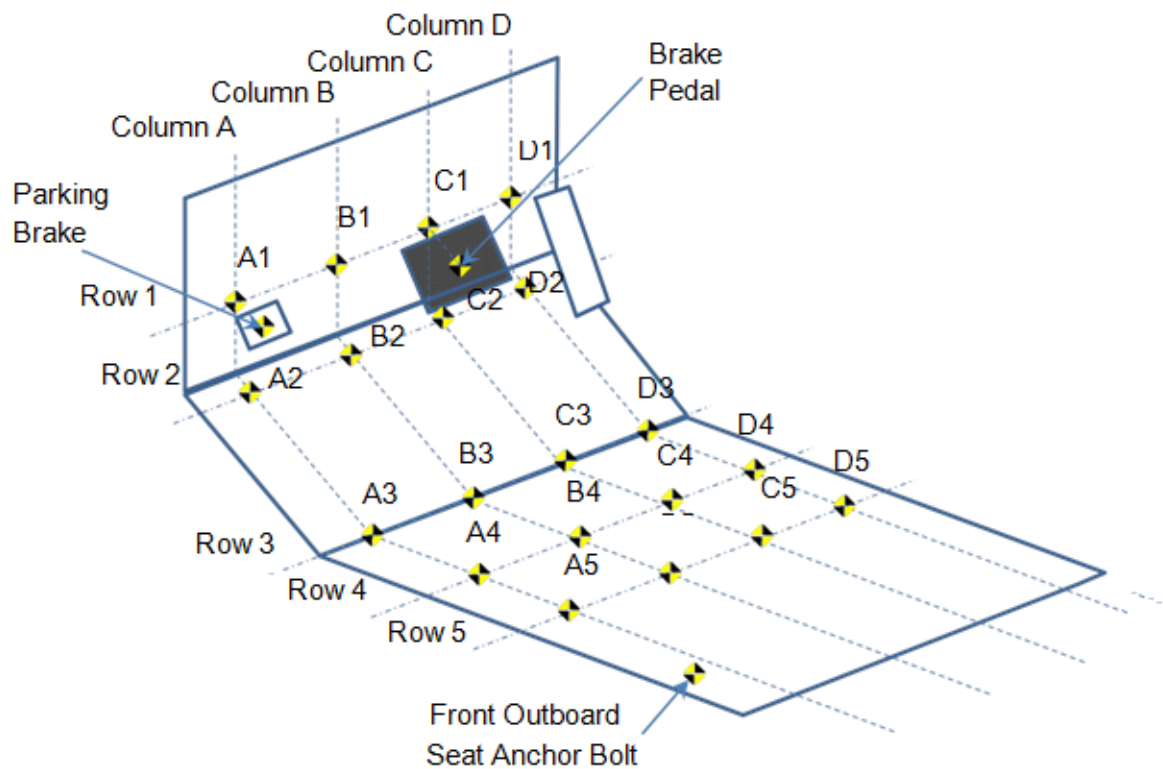
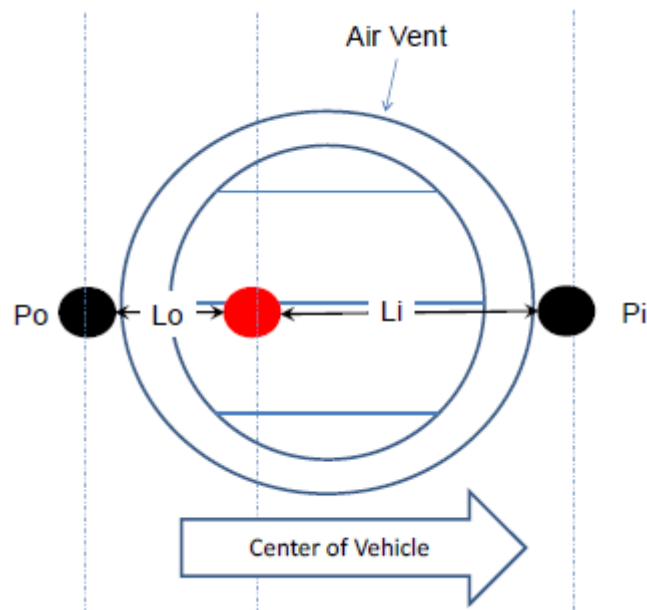


Figure 22: Lower interior intrusion measurements

Driver Upper Dash

The upper dash point is obtained by subtracting 25 cm from the lateral coordinate of the steering column reference lateral coordinate. This defines a line of points on the edge of the upper dash. The upper dash point is located on the rearward most (toward the rear of the vehicle) point on this line. This point must be located at least 30 cm above the brake pedal reference point to ensure a vertical location high enough to represent a location that could be contacted by the driver's upper body or head. If the rearward most point is less than 30 cm above the brake pedal reference point, the upper dash point is located at this 30 cm reference location.

There may be instances when the upper dash point is located on a "soft component" such as an air vent or control knob (Figure 23). To measure a more robust structure, the upper dash point is replaced with two additional points, and the weighted average of their coordinates is used to represent the deformation of a point at the original location (Equation 1). Each new point is determined by moving inboard/outboard to a location that is just off of the soft component.



$$dp = \frac{Li}{Lo + Li} [X_o, Y_o, Z_o] + \frac{Lo}{Lo + Li} [X_o, Y_o, Z_o]$$

Figure 23: Equation for Measuring Soft Component Driver Upper Dash Point

Passenger Left Lower Instrument Panel

The left lower instrument panel (knee bolster) lateral coordinates are defined by adding 15 cm from the center passenger seat reference lateral coordinate, respectively. The vertical coordinate is defined as 45 cm above the height of the floor (without floor mats). If the panel or knee bolster loosens or breaks away in the crash, the post-crash measurements are taken by pressing and holding the panel against the underlying structure.

Create a floor vehicle coordinate system on the floor at the location of this measurement.

Passenger Right Lower Instrument Panel

The left lower instrument panel (knee bolster) lateral coordinates are defined by subtracting 15 cm from the center passenger seat reference lateral coordinate, respectively. The vertical coordinate is defined as 45 cm above the height of the floor (without floor mats). If the panel or knee bolster loosens or breaks away in the crash, the post-crash measurements are taken by pressing and holding the panel against the underlying structure.

Passenger Toe pan and Floor Board (Figure 24)

PASSENGER POINT A1

The vertical coordinate for the A1 measurement location is the vertical coordinate of the brake pedal reference. The lateral coordinate of the A1 is obtained by subtracting 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B1

The vertical coordinate for the B1 location is the vertical coordinate of the brake pedal reference. The lateral coordinate of the B1 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C1

The vertical coordinate for the C1 location is the vertical coordinate of the brake pedal reference. The lateral coordinate of the C1 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate..

PASSENGER POINT A2

The vertical coordinate of the A2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference and the vertical coordinate of the floor reference. The lateral coordinate of the A2 is obtained by subtracting 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B2

The vertical coordinate of the B2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference the vertical coordinate of the floor reference. The lateral coordinate of the B2 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C2

The vertical coordinate of the C2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference and the vertical coordinate of the floor reference. The lateral coordinate of the C2 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT A3

The vertical coordinate of the A3 measurement location is obtained by subtracting 1 cm from the floor reference. The lateral coordinate of the A3 is obtained by subtracting 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B3

The vertical coordinate of the B3 measurement location is obtained by subtracting 1 cm from the floor reference. The lateral coordinate of the B3 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C3

The vertical coordinate of the C3 measurement location is obtained by subtracting 1 cm from the floor reference. The lateral coordinate of the C3 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT A4

The longitudinal coordinate of the A4 measurement location is obtained by subtracting 5 cm from the A3 reference. The lateral coordinate of the A4 is obtained by subtracting 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B4

The longitudinal coordinate of the B4 measurement location is obtained by subtracting 5 cm from the B3 reference. The lateral coordinate of the B4 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C4

The longitudinal coordinate of the C4 measurement location is obtained by subtracting 5 cm from the C3 reference. The lateral coordinate of the C4 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT A5

The longitudinal coordinate of the A5 measurement location is obtained by subtracting 5 cm from the A4 reference. The lateral coordinate of the A5 is obtained by subtracting 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B5

The longitudinal coordinate of the B5 measurement location is obtained by subtracting 5 cm from the B4 reference. The lateral coordinate of the B5 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C5

The longitudinal coordinate of the C5 measurement location is obtained by subtracting 5 cm from the C4 reference. The lateral coordinate of the C5 is obtained by adding 15 cm from the center passenger seat reference lateral coordinate.

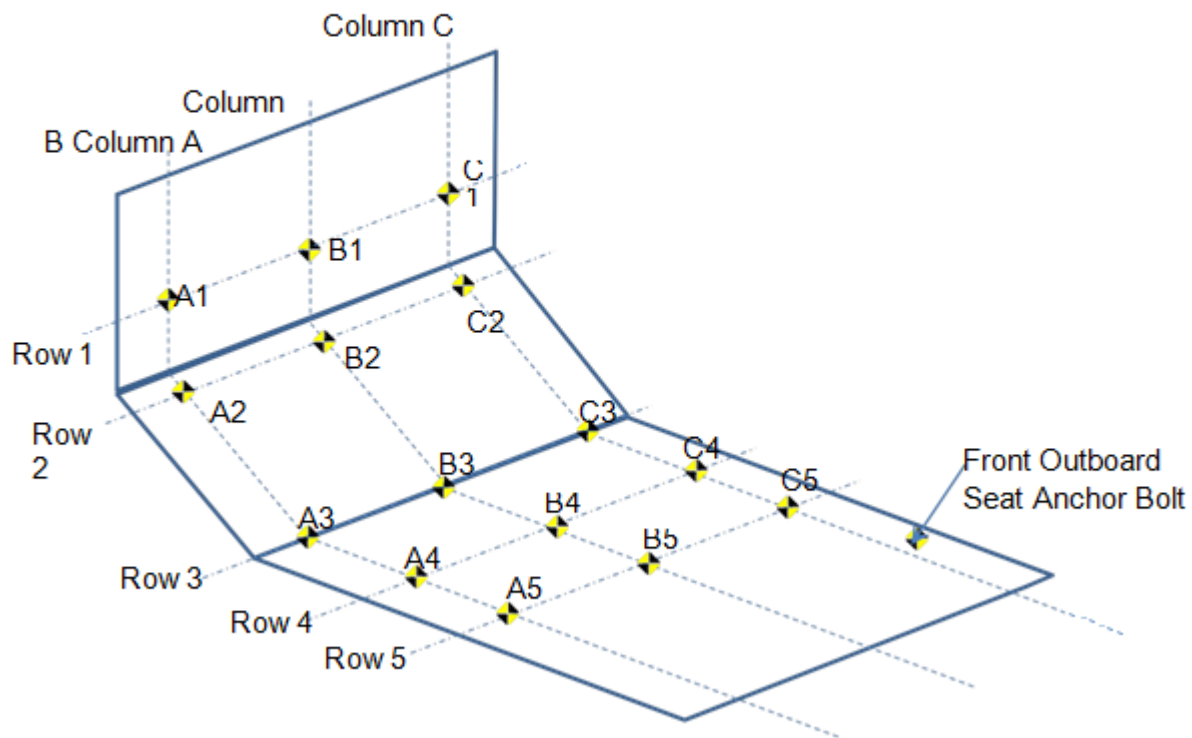


Figure 24: Passenger side lower interior measurements

Passenger Upper Dash

The upper dash point is obtained by adding 25 cm from the lateral coordinate of the center passenger seat reference lateral coordinate. This defines a line of points on the edge of the upper dash. The upper dash point is located on the rearward most (toward the rear of the vehicle) point on this line. This point must be located at least 30 cm above the brake pedal reference point to ensure a vertical location high enough to represent a location that could be contacted by the driver's upper body or head. If the rearward most point is less than 30 cm above the brake pedal reference point, the upper dash point is located at this 30 cm reference location.

There may be instances when the upper dash point is located on a "soft component" such as an air vent or control knob (Figure 23). To measure a more robust structure, the upper dash point is replaced with two additional points, and the weighted average of their coordinates is used to represent the deformation of a point at the original location (Equation 1). Each new point is determined by moving inboard/outboard to a location that is just off of the soft component.

Driver Door Measurements (Figure 25)

Mark the following points on the inner most surface of the door opening, typically on the pinch weld.

- 1) **Point 1:** The vertical coordinates of this point is obtained by subtracting 0 cm from the brake pedal reference point.
- 2) **Point 2:** The vertical coordinates of this point is obtained by subtracting 7.5 cm from the

brake pedal reference point.

- 3) **Point 3:** The vertical coordinates of this point is obtained by subtracting 15 cm from the brake pedal reference point
- 4) **Point 4:** The vertical coordinates of this point is obtained by subtracting 45 cm from the brake pedal reference point.
- 5) **Point 5:** The vertical coordinates of this point is obtained by subtracting 52.5 cm from the brake pedal reference point).
- 6) **Point 6:** The vertical coordinates of this point is obtained by subtracting 60 cm from the brake pedal reference point
- 7) **Point 7:** The longitudinal coordinates of this point is obtained by subtracting 20 cm from the brake pedal reference point. If the 20 cm point is forward of the actual door frame, this point is located 5 cm rearward of lower hinge pillar point.
- 8) **Point 8:** The longitudinal coordinates of this point is obtained by subtracting 35 cm from the brake pedal reference point.
- 9) **Point 9:** The longitudinal coordinates of this point is obtained by subtracting 50 cm from the brake pedal reference point.
- 10) **Point 10 and 11:** Mark 2 evenly spaced points between points 1 and 7
- 11) **Point 12 and 13:** Mark 2 evenly spaced points between points 3 and 4
- 12) **Point 26:** Mark a point at the intersection of the roof rail and the start of the B-pillar
- 13) **Points 14-25:** Mark 12 evenly spaced points between points 6 and 26
- 14) **Point 32:** Mark a point at the intersection of the lower sill and the start of the B-pillar
- 15) **Points 27-31:** Mark 5 evenly spaced points between points 9 and 32



Figure 25: Driver Door Measurements

Passenger Door Measurements

Perform the same procedure as the driver door on the passenger side.

Pre-Test Exterior Profile

- 1) Expose the front bumper beam.
- 2) At the lateral center of the bumper beam, measure and mark the center of the front bumper beam (along front face of beam).
- 3) Using this Z coordinate, mark and measure enough points around the complete circumference of the vehicle to establish cross section A-A.
- 4) Transpose the lateral center of the bumper beam up onto the top of the upper radiator support.
- 5) Mark the center of the upper radiator support along its forward leading edge.
- 6) Using this Z coordinate, mark and measure enough points around the complete circumference of the vehicle to establish cross section B-B.

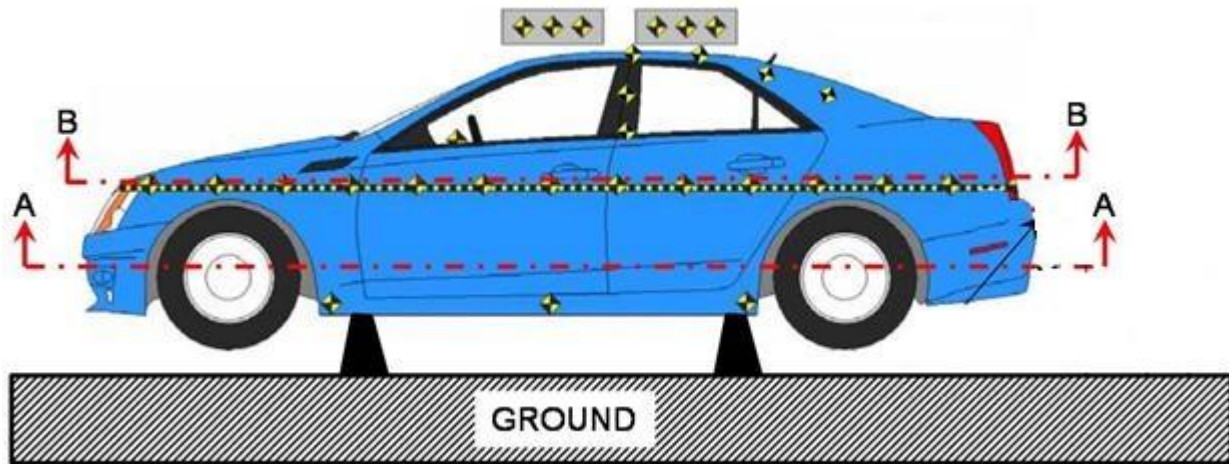


Figure 26: Pre-Test Vehicle Profile

Post-Test Exterior Profile

- 1) Remove bumper cover
- 2) Using the vehicle's origin reference point leap into vehicle's coordinate system.
- 3) Using the pre-test z-value at section A-A which was recorded from VCS origin, take measurements at this z-distance around the circumference of the vehicle.
- 4) Using the pre-test z-value at section B-B that was recorded from VCS origin, take measurements at this z-distance around the circumference of the vehicle.

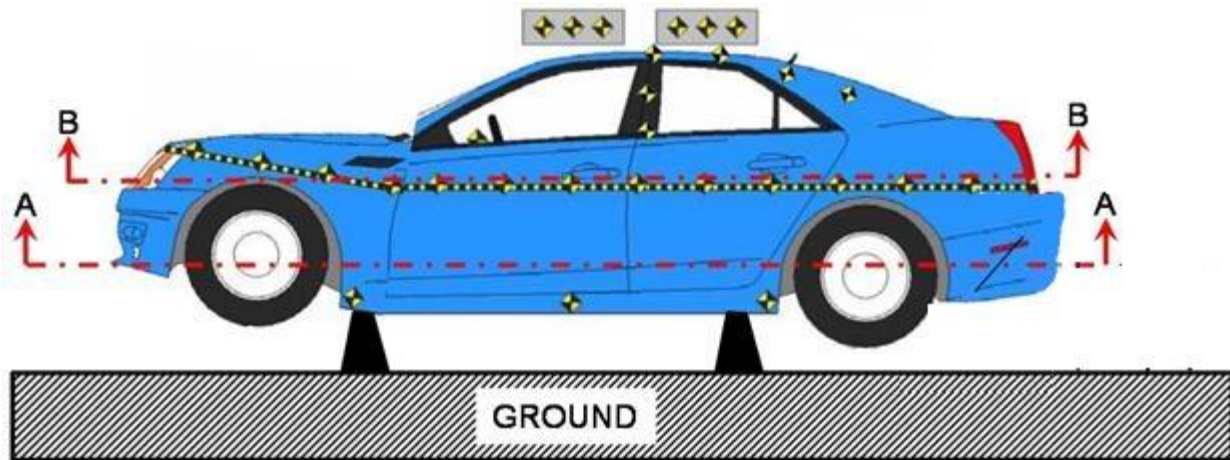


Figure 27: Post-Test Vehicle Profile

Pre and Post Honeycomb Requirements

The contractor shall take pre-and post-crush measurements of the honeycomb while attached to the barrier. These measurements shall be documented in the appropriate datasheet. Also, the contractor shall take pre-and post-test pictures of the left and right side, top, and front view of the honeycomb while attached to the barrier.