

REPORT NUMBER: R&D-CAL-13-003

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

2014 SUBARU FORESTER

90.1KPH, 15 DEGREE ANGLE, 35% OVERLAP

TEST DATE: 11/07/2013

NHTSA No: RE5507

**CALSPAN CORPORATION
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FINAL REPORT SUBMITTED:

October 30, 2014

PREPARED FOR:

**U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Vehicle safety Research
1200 New Jersey Ave, SE
Room W46-446
Washington, DC 20590**

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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

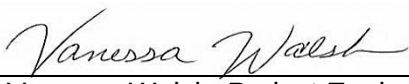
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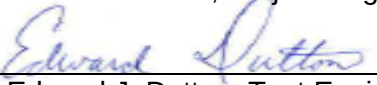
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16. Abstract A test was conducted in accordance with Task Order 0002 of Contract DTNH22-10-D-00155. The Test consisted of a Research Moving Deformable Barrier (RMDB) traveling at a target speed of 90.12 kph into a stationary 2014 Subaru Forester SUV. 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 November 7, 2013. The RMDB impact velocity was 89.73 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 533 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>192.29</td> <td>700</td> <td>199.04</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-49.15</td> <td>52</td> <td>-35.33</td> </tr> <tr> <td>Neck Injury Criteria (Nij)</td> <td>N/A</td> <td>1</td> <td>0.30</td> <td>1</td> <td>0.27</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>2032.37</td> <td>2,620</td> <td>1078.07</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-189.19</td> <td>2,520</td> <td>-117.17</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-2697.28</td> <td>6,805</td> <td>-4021.03</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-2594.24</td> <td>6,805</td> <td>-3397.27</td> </tr> </tbody> </table>					Measurement Description	Units	Driver ATD		Pass. ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	192.29	700	199.04	Maximum Chest Compression	mm	63	-49.15	52	-35.33	Neck Injury Criteria (Nij)	N/A	1	0.30	1	0.27	Neck Tension	N	4,170	2032.37	2,620	1078.07	Neck Compression	N	4,000	-189.19	2,520	-117.17	Left Femur Force	N	10,008	-2697.28	6,805	-4021.03	Right Femur Force	N	10,008	-2594.24	6,805	-3397.27
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The contents of this report relate only to the specific product evaluated under the specific test conditions, as defined within this report. The findings and conclusions are those of the author(s) and not necessarily those of Calspan Corporation. For the purposes of this report, Calspan Corporation provided test services only and was not involved with the consulting, design or manufacture of any product. Calspan Corporation does not endorse products or manufacturers. Further, Calspan Corporation (to include: any of its affiliates, parent companies or subsidiaries) assumes no liability associated with the contents of this report or the use of this report.

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TABLE OF CONTENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

<u>Section</u>	<u>Page No.</u>
1 Purpose of Test	1-1
2 Summary of Test	2-1
Crash Vehicle Summary	2-3
Preliminary Injury Summary: Driver	2-4
Preliminary Injury Summary: Driver Legs	2-6
Preliminary Injury Summary: Front Passenger	2-7
Preliminary Injury Summary: Front Passenger 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	3-18
9 Test Vehicle Summary of Results	3-25
10 Post-Test Observations	3-26
11 Vehicle Profile Measurements	3-27
12 Accident Investigation Division Data	3-29
13 Vehicle Intrusion Measurements	3-30
14 RMDB Crush Measurements	3-47
15 Summary of FMVSS 212, 219 (Partial), and 301 Data	3-48
Windshield Periphery Measurements	3-48
Areas of Protected Zone Failures	3-48
Fuel System Integrity Post Impact Data	3-49
16 FMVSS 301 Static Rollover Results	3-50
17 Dummy / Vehicle Temperature Stabilization	3-51

<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: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013

This 90.12 kph (56 mph) Moving Barrier into a test vehicle is part of the Frontal Offset Test outlined in Contract No. DTNH22-10-D-00155, Task Order 0002. The purpose of this test is to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

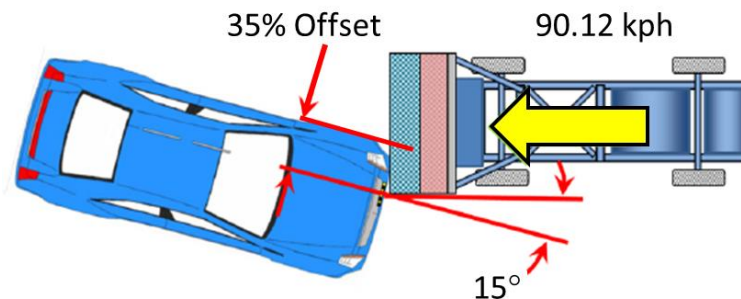
This test was conducted in accordance with the instructions set forth for a 15° angle, 35% offset moving barrier to vehicle impact, outlined in Contract No. DTNH22-10-D-00155, TO 0002. Data was obtained indicant of Federal Motor Vehicle Safety Standard FMVSS 208-Occupant Crash Protection, FMVSS 212 – Windshield Mounting, FMVSS 219 (partial) – Windshield Zone Intrusion, and FMVSS 301 – Fuel System Integrity, in addition to the requirements of Contract No. DTNH22-10-D-00155, TO 0002.

SECTION 2 SUMMARY OF TEST

Test Vehicle: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013

A 2014 Subaru Forester SUV 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 1,803 kg (3,973.8 lbs), and the RMDB's mass was 2490.7 kg (5491 lbs). The test was conducted by Calspan Corporation on November 7, 2013.



The test was documented by two (2) 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 anthropomorphic test device (ATD) (Serial No. 016) was seated in the left, front (P1 -Driver's) seating position and one 50% adult male THOR-NT adult male ATD (Serial No. 015) was seated in the right front passenger seating position (P2). The 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 frontal, curtain, torso, and knee airbag. The passenger was restrained with a 3 – point seat belt and frontal airbag. The passenger's curtain and torso airbags were disabled.

SECTION 2 (CONTINUED)

SUMMARY OF TEST

Test Vehicle: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
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Two hundred and seventeen (217) 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 95.9% total windshield retention, with 91.8% 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 533 mm at C1 to the left of the vehicle's centerline. The maximum crush of the structural bumper beam was 456 mm at B1, to the left of the vehicle's centerline. Full vehicle measurements are presented in Section 3 of this report.

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

Structure observations include the following:

- All pillars remained in good condition
- Windshield had cracks throughout with minor separation
- Hood bent inwards and exposed part of the engine compartment

The driver ATD's visible contact points were:

- Head contacted the frontal and curtain airbag
- Torso contacted the frontal airbag, torso/pelvis airbag, and driver's side door
- Outer left leg contacted the driver's side door
- Knee contacted the knee airbag

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

- Head contacted the frontal airbag and the headliner
- Torso contacted the frontal airbag
- Knee contacted the knee bolster

SECTION 2 (CONTINUED) CRASH VEHICLE SUMMARY

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

Primary Impact Data

Measured Parameter	Units	Value
RMDB Velocity at Impact	kph	89.73
RMDB Test Weight	kg	2490.7
RMDB Maximum Static Crush	mm	286.1
Vehicle Test Weight	kg	1,803
Actual Vehicle Angle	degrees	15
Vehicle Maximum Static Crush	mm	533
Vertical Offset from Target Point (+ down / - up)*	mm	-20
Lateral Offset from Target Point (+ left / - right)*	mm	+7
Number of Data Channels		217
Number of Real-Time Cameras		2
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	THOR, S/N: 016		THOR, S/N: 015	
Head Contact	Front & curtain airbags	A49-A51	Front airbag & headliner	A70-A72
Upper Torso Contact	Frontal & torso/pelvis airbag	NA	Front airbag	NA
Lower Torso Contact	None	NA	None	NA
Side Torso Contact	Shoulder, side torso and outer left leg contacted the driver's door	NA	Shoulder contacted the center instrument panel	NA
Left Knee Contact	Knee airbag	A28	Knee bolster	A52
Right Knee Contact	Knee airbag	A28	Knee bolster	A52

Data Anamolies:

- Driver lap belt force – Questionable spike at 170 ms
- Passenger lap belt force – Questionable spikes
- Right rear sill Ax – Questionable data from 60 – 80 ms
- Driver Ankle left X rotation – Questionable data throughout
- Passenger Right knee displacement – Questionable maximum

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2013 Subaru Forester NHTSA No.: RE5507

Test Program: Research and Development Left Oblique Offset Test Date: 11/07/2013

Driver: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	5.66	-63.49
	Head CG Y	g	1000	37.63	-5.24
	Head CG Z	g	1000	41.78	-6.22
	Head Resultant	g	Compute	73.25	
	36 ms HIC		Compute	421.91	
	15 ms HIC		Compute	192.29	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	59.08	
	Head Rotational Velocity X	deg/s	60	506.53	-916.91
	Head Rotational Velocity Y	deg/s	60	874.60	-2051.29
	Head Rotational Velocity Z	deg/s	60	1114.22	-535.20
	Head Rotational Velocity Resultant	deg/s	Compute	2419.48	
	Brain Injury Criteria		Compute	0.82	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	97.84	-621.30
	UNLC Neck System Tension, FZ	N	1000	2032.37	
	UNLC Neck System Compression, FZ	N	1000		-189.19
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	0.87	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-12.38
	NIJ		Compute	0.30	
	On head acting through total neck section, FX	N	Thortest	69.10	-625.34
	On head acting through total neck section, FY	N	Thortest	423.79	-140.75
	On head acting through total neck section, FZ	N	Thortest	2021.39	-48.94
	On head acting through total neck section, MX	N-m	Thortest	22.09	-20.17
	On head acting through total neck section, MY	N-m	Thortest	25.74	-19.81
	On head acting through total neck section, MZ	N-m	Thortest	11.20	-16.06
	On head acting through O.C. joint only, FX	N	Thortest	92.72	-686.43
	On head acting through O.C. joint only, FZ	N	Thortest	1989.91	-284.23
	On head acting through O.C. joint only, MY	N-m	Thortest	0.87	-12.38
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	1.84	-16.26
	Upper Left IR-TRACC Y - deflection	mm	Thortest	9.49	-2.13
	Upper Left IR-TRACC Z - deflection	mm	Thortest	4.26	-28.35
	Upper Left IR-TRACC D - deflection	mm	Thortest	1.67	-15.33
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.03	-35.55
	Upper Right IR-TRACC Y - deflection	mm	Thortest	10.17	-2.80
	Upper Right IR-TRACC Z - deflection	mm	Thortest	25.30	-9.41
	Upper Right IR-TRACC D - deflection	mm	Thortest	0.03	-34.00
	Lower Left IR-TRACC X - deflection	mm	Thortest	8.70	-7.74
	Lower Left IR-TRACC Y - deflection	mm	Thortest	9.73	-6.76

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2013 Subaru Forester NHTSA No.: RE5507
 Test Program: Research and Development Left Oblique Offset Test Date: 11/07/2013

Driver: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	2.95	-15.37
	Lower Left IR-TRACC D - deflection	mm	Thortest	8.34	-6.40
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.09	-51.60
	Lower Right IR-TRACC Y - deflection	mm	Thortest	2.70	-16.75
	Lower Right IR-TRACC Z - deflection	mm	Thortest	14.13	-2.63
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.10	-49.15
	Chest CG Acceleration, 3 ms clip	g	Compute	N/A	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC Y - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC Z - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC D - deflection	mm	Thortest	N/A	N/A
	Left Viscous Criterion Based on X - deflection		Compute	N/A	
	Lower Right IR-TRACC X - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC Y - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC Z - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC D - deflection	mm	Thortest	N/A	N/A
	Right Viscous Criterion Based on X - deflection		Compute	N/A	
Spine	Upper Spine (T1) AX	g	180	19.17	-39.28
	Upper Spine (T1) AY	g	180	25.74	-14.69
	Upper Spine (T1) AZ	g	180	16.45	-7.70
	Upper Spine (T1) Resultant	g	Compute	40.79	
	Middle Spine (T6) AX	g	180	9.57	-40.89
	Middle Spine (T6) AY	g	180	18.62	-2.93
	Middle Spine (T6) AZ	g	180	5.56	-18.13
	Middle Spine (T6) Resultant	g	Compute	40.96	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	47.42	
Acetabulum	Left FX force	N	600	703.91	-1032.98
	Left FY force	N	600	694.86	-366.60
	Left FZ force	N	600	601.89	-1902.37
	Left Acetabulum Resultant	N	Compute	1924.02	
	Right FX force	N	600	380.09	-849.46
	Right FY force	N	600	242.63	-958.15
	Right FZ force	N	600	1184.85	-165.74
	Right Acetabulum Resultant	N	Compute	1537.95	
Anomalies None					

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver leg

Test Vehicle: 2013 Subaru Forester NHTSA No.: RE5507
Test Program: Research and Development Left Oblique Offset Test Date: 11/07/2013

Driver: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	0.86	-13.68
	Right Knee Displacement, DX	mm	180	1.24	-7.17
Femur	Left Femur Force, FZ	N	600	134.79	-2697.28
	Left Femur Moment, MX	N-m	600	24.77	-97.81
	Left Femur Moment, MY	N-m	600	66.00	-75.60
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	123.38	
	Right Femur Force, FZ	N	600	140.27	-2594.24
	Right Femur Moment, MX	N-m	600	40.63	-60.80
	Right Femur Moment, MY	N-m	600	122.82	-40.60
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	129.88	
Tibia	Left Upper Tibia, FZ	N	600	111.13	-2403.25
	Left Upper Tibia, MY	N-m	600	87.49	-25.35
	Left Upper Tibia, Index		Compute	0.43	
	Right Upper Tibia, FZ	N	600	103.54	-1877.51
	Right Upper Tibia, MY	N-m	600	75.42	-59.87
	Right Upper Tibia, Index		Compute	0.59	
	Left Lower Tibia, FZ	N	600	92.09	-4339.49
	Left Lower Tibia, MY	N-m	600	50.14	-50.73
	Left Lower Tibia, Index		Compute	0.60	
	Right Lower Tibia, FZ	N	600	55.29	-3642.29
	Right Lower Tibia, MY	N-m	600	32.63	-76.17
	Right Lower Tibia, Index		Compute	0.94	
Ankle	Left Ankle Rotation, RX	Deg	180	165.57 ⁽¹⁾	-120.16 ⁽¹⁾
	Left Ankle Rotation, RY	Deg	180	30.98	-19.16
	Right Ankle Rotation, RX	Deg	180	11.95	-41.25
	Right Ankle Rotation, RY	Deg	180	24.48	-12.54
Anomalies					
(1) Questionable data throughout					

SECTION 2 (CONTINUED)

PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: 2013 Subaru Forester NHTSA No.: RE5507

Test Program: Research and Development Left Oblique Offset Test Date: 11/07/2013

Right Front Passenger: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	20.31	-16.40
	Head CG Y	g	1000	50.31	-4.50
	Head CG Z	g	1000	34.13	-2.95
	Head Resultant	g	Compute	58.83	
	36 ms HIC		Compute	341.74	
	15 ms HIC		Compute	199.04	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	49.45	
	Head Rotational Velocity X	deg/s	60	595.25	-2198.41
	Head Rotational Velocity Y	deg/s	60	296.04	-821.53
	Head Rotational Velocity Z	deg/s	60	2157.64	-1247.61
	Head Rotational Velocity Resultant	deg/s	Compute	2892.21	
	Brain Injury Criteria		Compute	1.08	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	579.32	-115.21
	UNLC Neck System Tension, FZ	N	1000	1078.07	
	UNLC Neck System Compression, FZ	N	1000		-117.17
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	12.05	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-6.04
	NIJ		Compute	0.27	
	On head acting through total neck section, FX	N	Thortest	704.51	-188.92
	On head acting through total neck section, FY	N	Thortest	478.31	-114.75
	On head acting through total neck section, FZ	N	Thortest	1233.67	-53.39
	On head acting through total neck section, MX	N-m	Thortest	33.58	-66.06
	On head acting through total neck section, MY	N-m	Thortest	8.58	-10.08
	On head acting through total neck section, MZ	N-m	Thortest	10.56	-35.05
	On head acting through O.C. joint only, FX	N	Thortest	682.14	-174.37
	On head acting through O.C. joint only, FZ	N	Thortest	1067.51	-116.47
	On head acting through O.C. joint only, MY	N-m	Thortest	12.05	-6.04
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	0.00	-22.25
	Upper Left IR-TRACC Y - deflection	mm	Thortest	3.28	-17.93
	Upper Left IR-TRACC Z - deflection	mm	Thortest	15.09	-1.08
	Upper Left IR-TRACC D - deflection	mm	Thortest	0.00	-21.43
	Upper Right IR-TRACC X - deflection	mm	Thortest	1.45	-13.11
	Upper Right IR-TRACC Y - deflection	mm	Thortest	4.79	-16.49
	Upper Right IR-TRACC Z - deflection	mm	Thortest	11.36	-8.34
	Upper Right IR-TRACC D - deflection	mm	Thortest	1.57	-12.35
	Lower Left IR-TRACC X - deflection	mm	Thortest	0.00	-37.02
	Lower Left IR-TRACC Y - deflection	mm	Thortest	8.69	-2.80

SECTION 2 (CONTINUED)

PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: 2013 Subaru Forester NHTSA No.: RE5507

Test Program: Research and Development Left Oblique Offset Test Date: 11/07/2013

Right Front Passenger: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	8.48	-11.25
	Lower Left IR-TRACC D - deflection	mm	Thortest	0.00	-35.33
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.00	-13.21
	Lower Right IR-TRACC Y - deflection	mm	Thortest	6.41	-17.95
	Lower Right IR-TRACC Z - deflection	mm	Thortest	0.13	-16.86
	Lower Right IR-TRACC D - deflection	mm	Thortest	1.90	-10.62
	Chest CG Acceleration, 3 ms clip	g	Compute	N/A	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC Y - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC Z - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC D - deflection	mm	Thortest	N/A	N/A
	Left Viscous Criterion Based on X - deflection		Compute	N/A	
	Lower Right IR-TRACC X - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC Y - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC Z - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC D - deflection	mm	Thortest	N/A	N/A
	Right Viscous Criterion Based on X - deflection		Compute	N/A	
Spine	Upper Spine (T1) AX	g	180	7.28	-37.80
	Upper Spine (T1) AY	g	180	62.15	-6.62
	Upper Spine (T1) AZ	g	180	31.44	-10.73
	Upper Spine (T1) Resultant	g	Compute	72.54	
	Middle Spine (T6) AX	g	180	1.68	-24.08
	Middle Spine (T6) AY	g	180	17.86	-2.25
	Middle Spine (T6) AZ	g	180	17.55	-12.97
	Middle Spine (T6) Resultant	g	Compute	27.85	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	66.91	
Acetabulum	Left FX force	N	600	1740.67	-2554.47
	Left FY force	N	600	1734.20	-425.58
	Left FZ force	N	600	1386.27	-2356.92
	Left Acetabulum Resultant	N	Compute	2990.01	
	Right FX force	N	600	1390.39	-488.87
	Right FY force	N	600	249.40	-2000.29
	Right FZ force	N	600	1861.21	-20.02
	Right Acetabulum Resultant	N	Compute	2344.03	
Anomalies					
None					

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

Test Vehicle: 2013 Subaru Forester NHTSA No.: RE5507
Test Program: Research and Development Left Oblique Offset Test Date: 11/07/2013

Right Front Passenger: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	1.32	-2.56
	Right Knee Displacement, DX	mm	180	1.71 ⁽²⁾	-1.45 ⁽²⁾
Femur	Left Femur Force, FZ	N	600	650.63	-4021.03
	Left Femur Moment, MX	N-m	600	64.98	-202.73
	Left Femur Moment, MY	N-m	600	112.08	-228.92
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	289.63	
	Right Femur Force, FZ	N	600	766.89	-3397.27
	Right Femur Moment, MX	N-m	600	31.47	-252.25
	Right Femur Moment, MY	N-m	600	120.61	-128.37
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	260.36	
Tibia	Left Upper Tibia, FZ	N	600	65.80	-2113.62
	Left Upper Tibia, MY	N-m	600	44.24	-109.25
	Left Upper Tibia, Index		Compute	0.89	
	Right Upper Tibia, FZ	N	600	273.29	-2536.75
	Right Upper Tibia, MY	N-m	600	32.56	-55.56
	Right Upper Tibia, Index		Compute	0.56	
	Left Lower Tibia, FZ	N	600	116.16	-2837.45
	Left Lower Tibia, MY	N-m	600	23.01	-60.03
	Left Lower Tibia, Index		Compute	0.62	
	Right Lower Tibia, FZ	N	600	228.03	-2968.52
	Right Lower Tibia, MY	N-m	600	16.97	-43.58
	Right Lower Tibia, Index		Compute	0.73	
Ankle	Left Ankle Rotation, RX	Deg	180	21.45	-17.34
	Left Ankle Rotation, RY	Deg	180	-1.35	-27.46
	Right Ankle Rotation, RX	Deg	180	19.84	-34.85
	Right Ankle Rotation, RY	Deg	180	-10.98	-31.47
Anomalies					
(1) Questionable magnitude					

SECTION 3 DATA SHEETS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

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	3-18
9	Test Vehicle Summary of Results	3-25
10	Post-Test Observations	3-26
11	Vehicle Profile Measurements	3-27
12	Accident Investigation Division Data	3-29
13	Vehicle Intrusion Measurements	3-30
14	RMDB Crush Measurements	3-47
15	Summary of FMVSS 212, 219 (Partial), and 301 Data	3-48
	Windshield Periphery Measurements	3-48
	Areas of Protected Zone Failures	3-48
	Fuel System Integrity Post Impact Data	3-49
16	FMVSS 301 Static Rollover Results	3-50
17	Dummy / Vehicle Temperature Stabilization	3-51

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

VEHICLE INFORMATION

NHTSA No.	RE5507
Model Year	2014
Make	Subaru
Model	Forester
Body Style	Utility Vehicle
VIN	JF2SJADC3EH464572
Body Color	White
Odometer Reading (km/mi)	53.1 km / 33 mi
Engine Displacement. (L)	2.5
Type/No. Cylinders	I4
Engine Placement	Inline
Transmission Type	Automatic
Transmission Speeds	CVT
Overdrive	Yes
Final Drive	All-Wheel Drive
Roof Rack	No
Sunroof/T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes
All-Wheel Drive (AWD)	Yes
Traction Control System (TCS)	Yes

VEHICLE OPTIONS

Auto-Leveling System	No
Automatic Door Locks (ADL)	No
Power Window Auto-Reverse	No
Other Optional Feature	-
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Pass. Front Airbag	Yes
Pass. Curtain Airbag	Yes
Pass. Head/Torso Airbag	No
Pass. Torso Airbag	No
Pass. Torso/Pelvis Airbag	Yes
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?

N/A

DATA FROM CERTIFICATION LABEL

Manufactured By	Fuji Heavy Industries LTD.
Date of Manufacture	06/13

GWR (kg)	2032
GAWR Front (kg)	1048
GAWR Rear (kg)	1093

VEHICLE SEATING AND WEIGHT CAPACITY

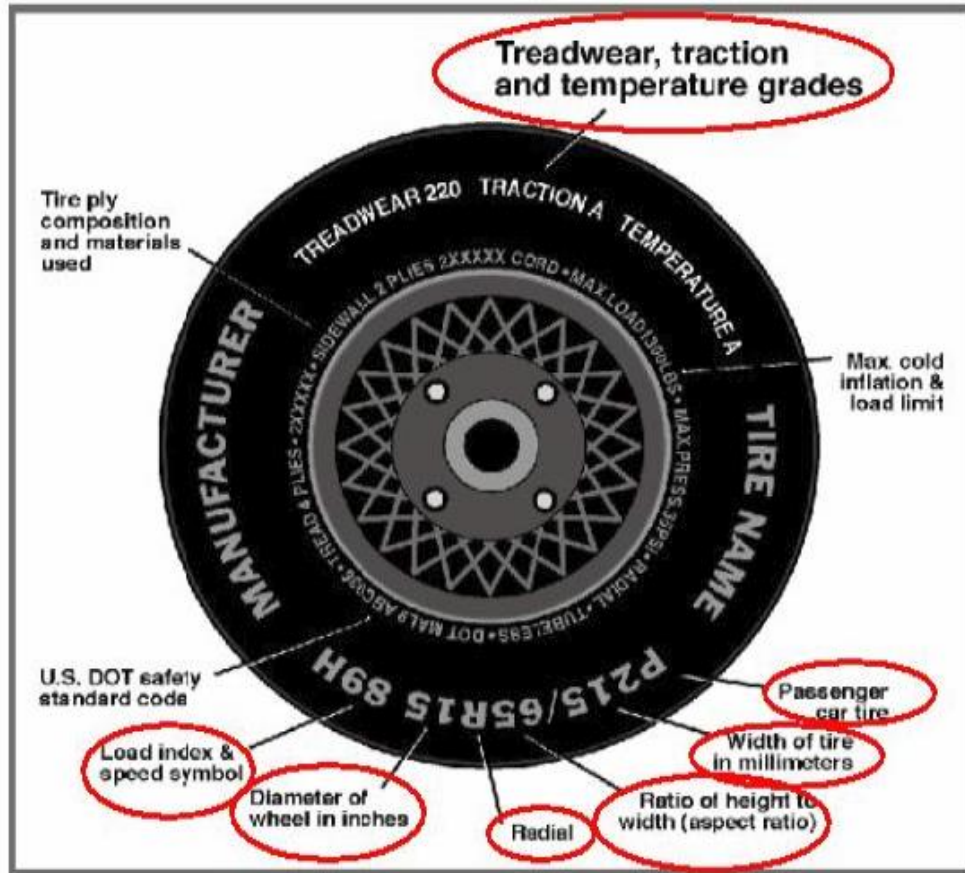
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	--	
Number of Occupants	2	3	--	5
Capacity Wt. (VCW) (kg)				408
Cargo Wt. (RCLW) (kg)				67.8

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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

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



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	210	200
Recommended Tire Size	P225/60R17	P225/60R17
Tire Size on Vehicle	P225/60R17	P225/60R17
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Geolander G91	Geolander G91
Treadwear	320	320
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel	2 Polyester, 2 Steel
Load Index/Speed Symbol	98H	98H
Tire Material	Rubber	Rubber
DOT Safety Code Right	FDFCE22413	FDFCE22413
DOT Safety Code Left	FDFCE22413	FDFCE22413

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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	446	339		482	435	
Right	kg	446	315		481	405	
Ratio	%	58%	42%		53.4%	46.6%	
Totals	kg	892	654	1546	963	840	1803

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1546
Weight of 2 P572E ATDs	kg	197.8
Rated Cargo/Luggage Weight (RCLW)	kg	67.8
Calculated Vehicle Target Weight (TVTW)	kg	1811.6

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	772	777	803	806	1116
As Tested	mm	758	753	769	774	1229
Post Test	mm	811	738	669	797	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2,640
Total Vehicle Length at Left Side	mm	4,532
Total Vehicle Length at Centerline	mm	4,592
Total Vehicle Length at Right Side	mm	4,528
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	45.2
Amount of Stoddard Solvent in Fuel Tank	L	54.9

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting, spare tire, jack, rear seats, tail lights, and muffler.

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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements		Pre-Test
1	Total Length	mm	4592
2	Total Width	mm	1785
3*	Bumper Top Height	mm	614
4*	Bumper Bottom Height	mm	521
5*	Longitudinal Member Top Height	mm	634
6	Distance Between Longitudinal Members	mm	1024
7	Longitudinal Member Width	mm	72
8*	Engine Top Height	mm	939
9*	Engine Bottom Height	mm	313
10	Engine and Gearbox Width	mm	731
11	Front Bumper-Engine Distance	mm	455
12*	Front Shock Absorber Fixing Height	mm	945
13*	Bonnet Leading Edge Height	mm	820
14	Front Shock Absorber Fixing Width	mm	1112
15	Front Bumper – Front Axle Distance	mm	955
16	Front Axle – A Pillar Distance	mm	472
17	A-Pillar – B-Pillar Distance	mm	1134
18	B-Pillar – Rear Axle Distance	mm	1036
19	B-Pillar – C-Pillar Distance	mm	920
20*	Roof Sill Bottom Height	mm	1563
21*	Roof Sill Top Height	mm	1669
22*	Floor Sill Bottom Height	mm	387
23*	Floor Sill Top Height	mm	455

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

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

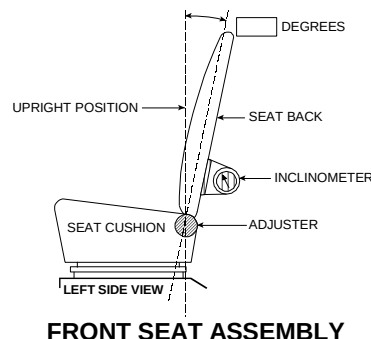
NHTSA No.: RE5507
 Test Date: 11/7/2013

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 according to the Nominal Design Riding position listed in FORM 1



	Deg.
Driver Seat Back Angle	-2.6
Passenger Seat Back Angle	-3.4

SEAT FORE/AFT POSITIONS

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

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

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

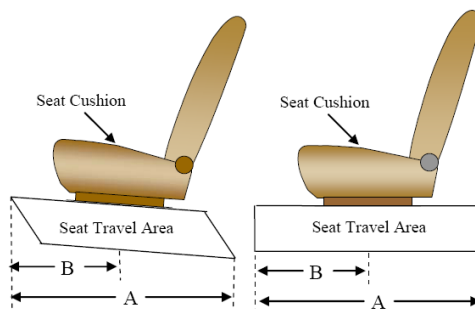
	Total Fore/Aft Travel	Placed in Position #
Driver Seat	305	152.5
Passenger Seat	26	13

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	4	1
Passenger Seat	4	1



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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

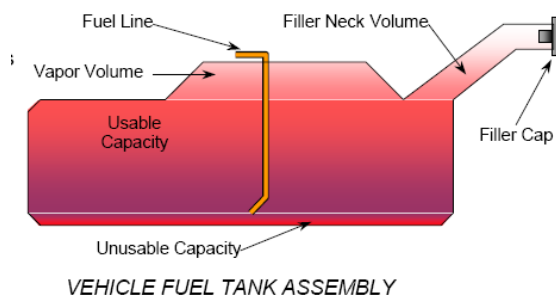
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	59
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	54.9
Actual Amount of Solvent Used	54.9
1/3 of Usable Capacity	19.7

FUEL PUMP

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

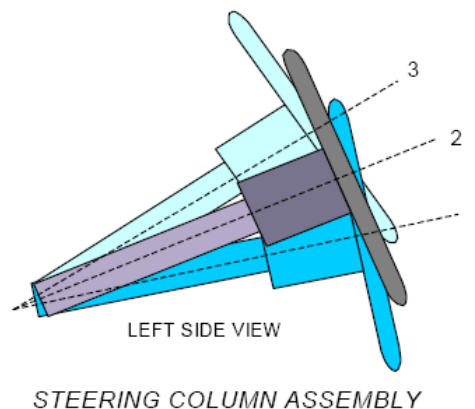
Fuel evacuated according to the specifications provided by the manufacturer in Form 1. Electric fuel pump operates when the ignition is in the 'on' position and the engine is running. The fuel filler neck is located above the right rear wheel.



STEERING COLUMN ADJUSTMENT

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

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



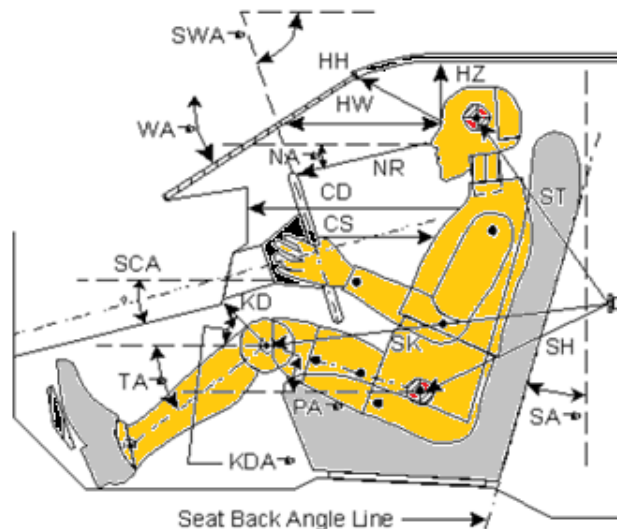
STEERING COLUMN POSITIONS

	Tilt (degrees)	Fore/Aft Position (mm)
Lowermost position No. 1	25.6	
Geometric center position No. 2	27.1	
Uppermost position No. 3	28.6	
Telescoping Steering Wheel Travel		40
Test Position	27.1	20

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



Code	Measurement Description	Driver (Serial # THOR 016)		Passenger (Serial # THOR 015)	
		Length (mm)	Angle(°)	Length (mm)	Angle (°)
WA°	Windshield Angle		-31.4		
SWA°	Steering Wheel Angle		26.7		
SCA°	Steering Column Angle		63.3		
SA°	Seat Back Angle (on headrest post)		-2.6		-3.4
HZ	Head to Roof (Z)	186	90	164	90
HH	Head to Header	473	17.4	466	18.5
HW	Head to Windshield	743	0	788	0
NR	Nose to Rim	552	19.9	758	22.5
CD	Chest to Dash	591		622	
CS	Chest to Steering Hub	365	0		
RA	Rim to Abdomen	199	0		
KDL	Left Knee to Dash	185	35.2	162	41.0
KDR	Right Knee to Dash	165	33.4	175	40.1
PA°	Pelvic Angle		25.0		23.6
TA°	Tibia Angle		38.5		-33.0
SK	Striker to Knee	619	-11.1	629	-12.4
ST	Striker to Head	8	-89.1	17	-88.1
SH	Striker to H-Point	216	-42.6	212	-36.9
HAX°	Head Angle (X)		0.1		0.0
HAY°	Head Angle (Y)		0.3		0.4
NAX°	Neck Angle (X)		N/A		N/A
NAY°	Neck Angle (Y)		N/A		N/A
TAX°	T6 Angle (X)		-1.9		-0.9
TAY°	T6 Angle (Y)		19.2		17.3
LAX°	Lumbar Angle (X)		0.7		-0.3
LAY°	Lumbar Angle (Y)		-1.7		0.7

DATA SHEET NO.3 (CONTINUED)
DUMMY CMM MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013

Description	Units	Driver			Passenger		
		X	Y	Z	X	Y	Z
Striker	mm	1404	-788	748	1404	786	748
Head CG	mm	1446	-434	271	1453	431	242
Bridge of Nose	mm	1539	-354	265	1548	358	233
Tip of Nose	mm	1540	-356	306	1546	358	271
Shoulder Bolt	mm	1495	-564	542	1520	549	502
Tip of Chin	mm	1533	-360	406	1545	357	369
H-Point	mm	1654	-562	960	1648	561	925
Left Knee	mm	2056	-568	883	2064	303	879
Right Knee	mm	2062	-280	903	2065	528	904
Left Ankle	mm	2370	-574	1152	2377	296	1164
Right Ankle	mm	2397	-261	1156	2389	520	1164
Left Heel	mm	2381	-554	1290	2349	252	1297
Right Heel	mm	2407	-231	1286	2353	484	1297
Head Bolt 1 – Top Left	mm	1373	-391	228	1391	318	195
Head Bolt 2 – Lower Left	mm	1385	-384	313	1398	327	280
Head Bolt 3 – Top Right	mm	1375	-320	232	1387	388	194
Head Bolt 4 – Lower Right	mm	1384	-334	316	1395	378	280
Driver's Outboard Seat Anchor Bolt	mm	1919	-567	1256	1404	786	748
Outboard Head Restraint Post	mm	1283	-417	452	1288	422	415
Top of Head Restraint	mm	1341	-354	159	1355	358	124
Center of Steering Wheel	mm	1977	-348	595			

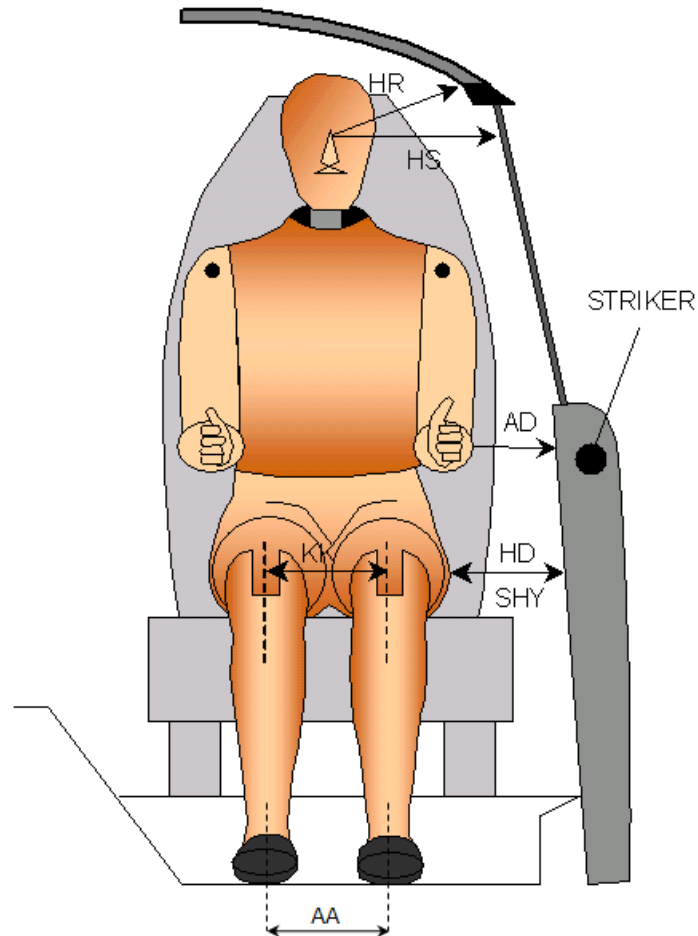
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

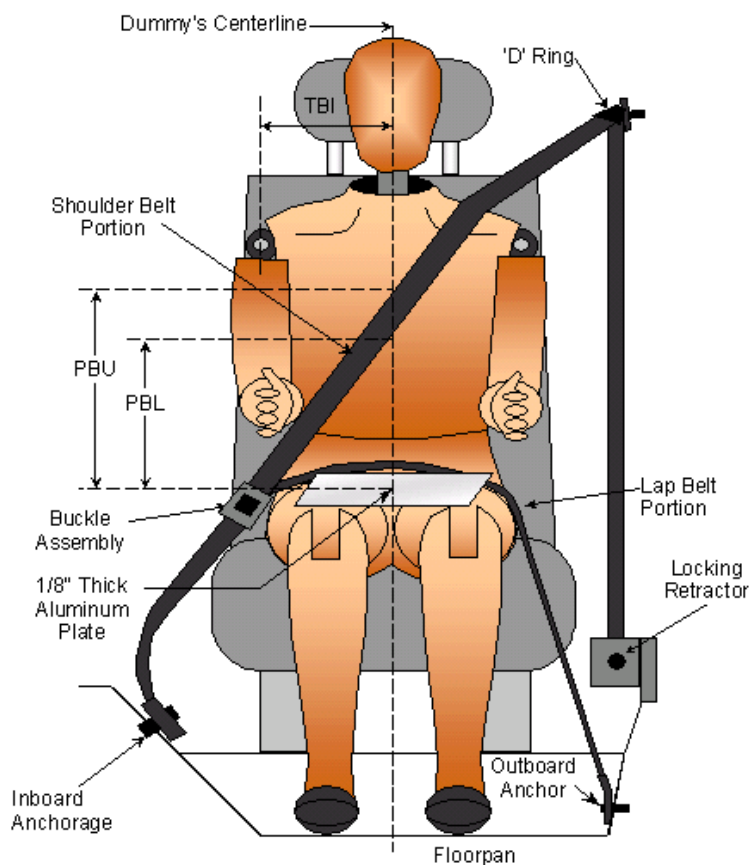


Code	Description	Units	Driver	Passenger
AD	Arm to Door	mm	149	48
HD	H-Point to Door	mm	127	131
HR	Head to Side Header	mm	213	200
HS	Head to Side Window	mm	325	325
KK	Knee to Knee	mm	342	270
SHY	Striker to H-Point (Y Direction)	mm	225	220
AA	Ankle to Ankle	mm	310	232

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	380	385
PBL — Top surface of reference to belt lower edge	mm	300	305

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	835	900
Lap Belt Length as measured on ATD	mm	805	755
Remainder of belt on reel	mm	960	945
Total belt length for continuous webbing systems	mm	2600	2600

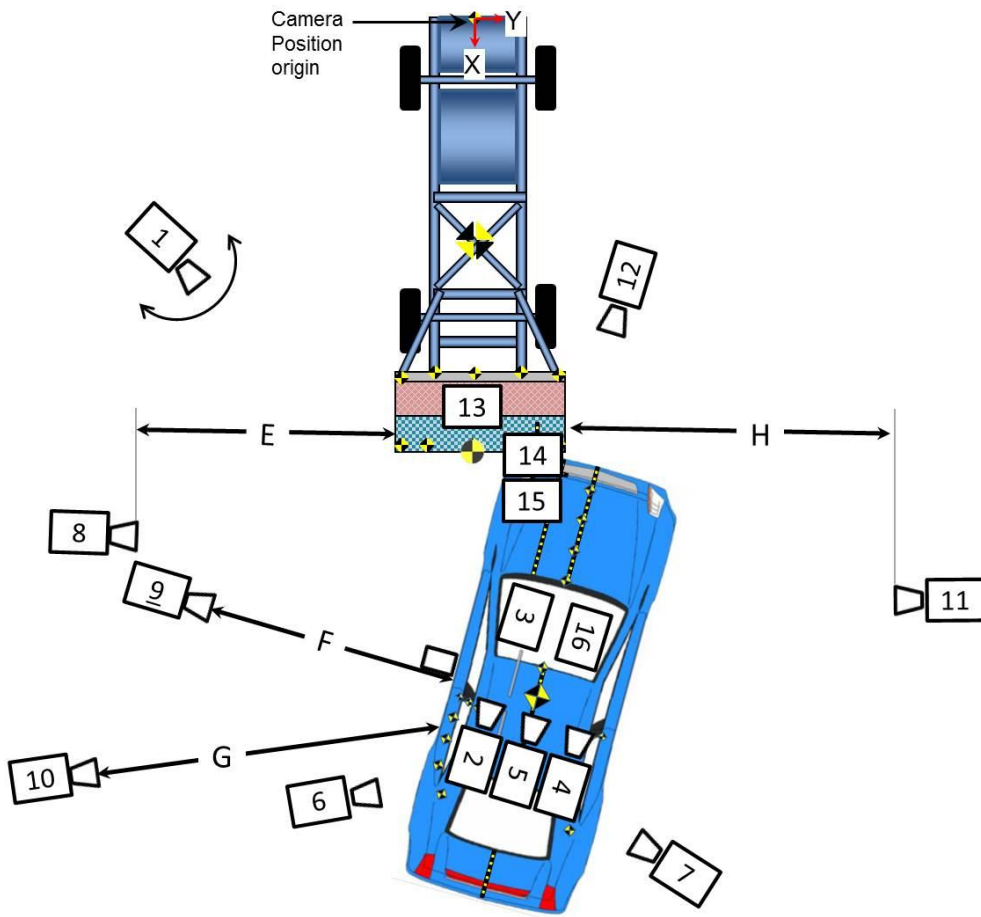
DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle:	2014 Subaru Forester SUV
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013

HORIZONTAL LOCATION



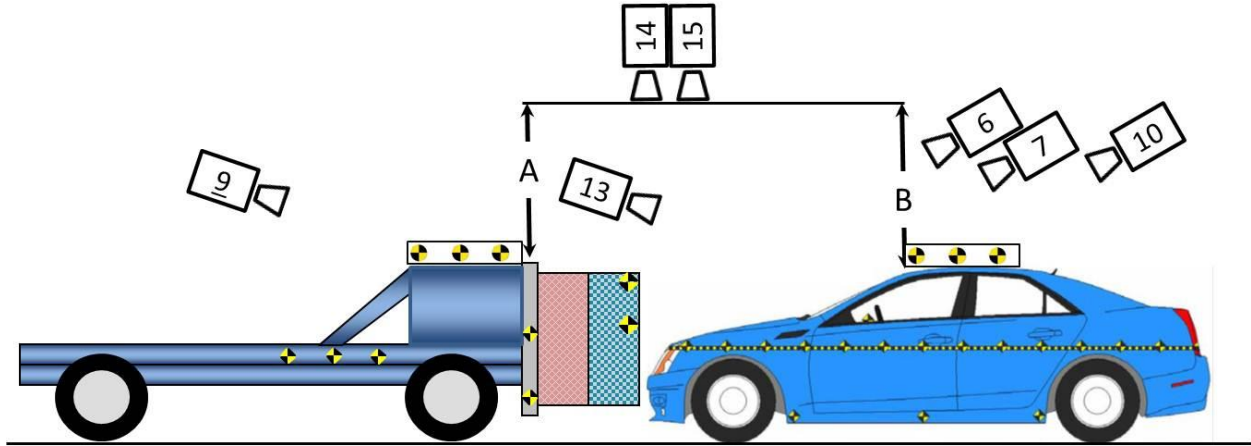
E	mm	6782
F	mm	7557
G	mm	9431
H	mm	6735

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

Test Vehicle: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013

VERTICAL LOCATION



A	mm	4164
B	mm	3672

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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

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	7790	110	1370	12.5	1000
3	Onboard Driver Lower Leg	6474	-499	317	6.5	1000
4	Onboard Driver Movement	7901	-977	1397	12.5	1000
5	Onboard Centerline	8432	-368	1483	12.5	1000
6	Driver Interaction	7553	2216	3663	24	1000
7	Passenger Interaction	11233	-8570	2526	50	1000
8	Target Vehicle Left Side Perpendicular (High)	4912	7557	1026	24-70	1000
9	Target Vehicle Driver Motion	5800	7601	1021	24	1000
10	Target Vehicle Passenger Motion	10271	8893	3416	50	1000
11	Target Vehicle Right Side	4746	-7812	977	24	1000
12	Target Vehicle Left Side (High)	1268	-2009	1234	28-70	1000
13	RMDB/Target Vehicle Interaction	4844	1018	4630	13	1000
14	Close-up Impact Point	6767	662	5341	28	1000
15	Overall Impact	4842	662	5341	14	1000

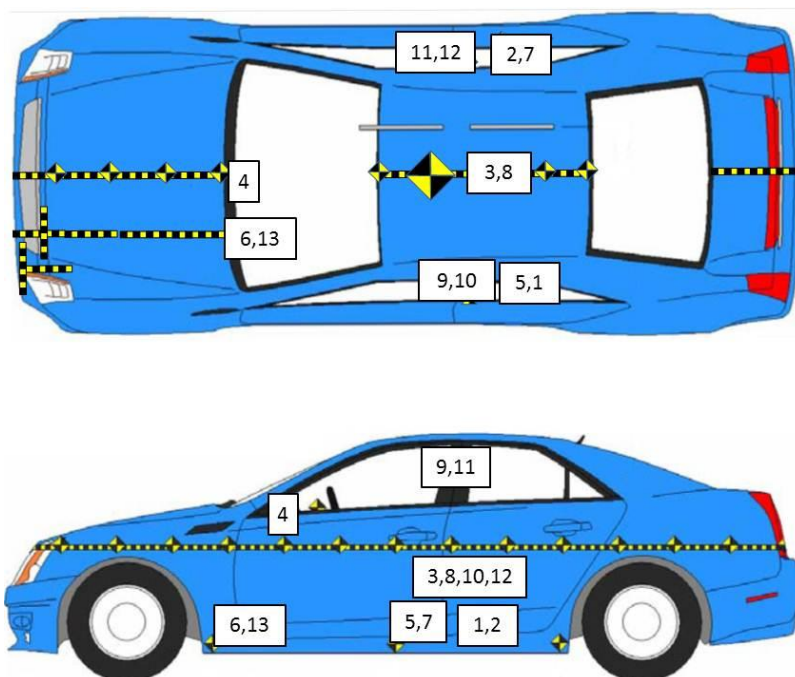
Reference Point: Center most rearward point of the RMDB when in contact with the target vehicle:

- +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: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Axes	Units	Measurements (mm)		
				X	Y	Z
1	Left Rear Sill	X,Y	mm	1353	-622	1266
2	Right Rear Sill	X,Y	mm	1353	622	1265
3	Vehicle CG	X,Y,Z	mm	1168	-6	1187
4	Instrument Panel	X	mm	2204	-3	870
5	Driver Seat Track	X,Y,Z	mm	1457	-572	1351
6	Behind Brake Pedal	X,Y,Z	mm	2706	-364	1050
7	Passenger Seat Track	X,Y,Z	mm	1431	580	1363
8	Angular Rate Sensors	X	mm	1138	-6	1211
		Y	mm	1167	-28	1210
		Z	mm	1168	-6	1187

Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

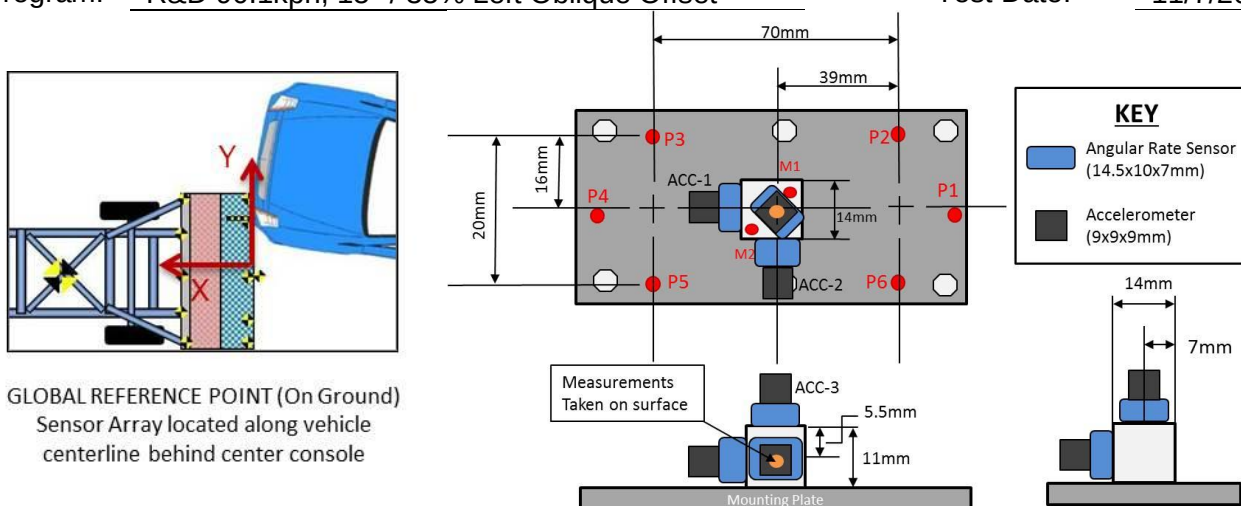
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

DATA SHEET NO. 7 (CONTINUED)

VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



VEHICLE COORDINATE SYSTEM					
No.	Accelerometer Location	Units	Measurements (mm)		
			X	Y	Z
ACC-1	Accelerometer CG – X Direction	mm	1138	-6	1211
ACC-2	Accelerometer CG – Y Direction	mm	1167	-28	1210
ACC-3	Accelerometer CG – Z Direction	mm	1168	-6	1187
M1	Mounting Bolt 1	mm	1170	-15	1203
M2	Mounting Bolt 2	mm	1159	-4	1203
P1	Plate Point 1	mm	1215	-6	1215
P2	Plate Point 2	mm	1204	-26	1216
P3	Plate Point 3	mm	1134	-26	1217
P4	Plate Point 4	mm	1123	-5	1217
P5	Plate Point 5	mm	1134	15	1217
P6	Plate Point 6	mm	1204	15	1216

GLOBAL COORDINATE SYSTEM*					
No.	Accelerometer Location	Units	Measurements (mm)		
			X	Y	Z
ACC-1	Accelerometer CG – X Direction	mm	-2516	1345	-404
ACC-2	Accelerometer CG – Y Direction	mm	-2487	1322	-405
ACC-3	Accelerometer CG – Z Direction	mm	-2487	1345	-428
M1	Mounting Bolt 1	mm	-2484	1335	-412
M2	Mounting Bolt 2	mm	-2495	1346	-412
P1	Plate Point 1	mm	-2440	1345	-399
P2	Plate Point 2	mm	-2451	1324	-399
P3	Plate Point 3	mm	-2521	1325	-398
P4	Plate Point 4	mm	-2532	1345	-398
P5	Plate Point 5	mm	-2521	1366	-398
P6	Plate Point 6	mm	-2451	1366	-399

*Global coordinate system is located at the front center of RMDB on the ground

DATA SHEET NO. 7 (CONTINUED)
VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

VEHICLE INSTRUMENTATION DATA

Loc.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Max	Time (ms)
1	Left Rear Sill	X	g	4.65	13.15	-36.76	40.40
		Y	g	3.62	13.20	-34.41	40.30
2	Right Rear Sill	X	g	194.43	65.95	-46.72	52.15
		Y	g	24.85	46.35	-8.16	37.20
3	Vehicle CG	X	g	6.90	13.45	-40.91	55.30
		Y	g	22.25	44.45	-7.63	38.15
		Z	g	23.25	41.20	-32.35	35.30
4	Instrument Panel	X	g	80.52	71.65	-97.08	81.60
5	Driver Seat Track	X	g	5.25	13.10	-36.54	40.30
		Y	g	33.53	45.00	-8.51	38.20
		Z	g	15.03	44.40	-20.95	76.30
6	Behind Brake Pedal	X	g	45.84	52.70	-115.69	41.75
		Y	g	47.32	30.15	-12.53	70.50
		Z	g	28.44	45.05	-24.85	69.90
7	Passenger Seat Track	X	g	1.70	112.05	-43.91	52.35
		Y	g	29.51	44.70	-6.05	79.60
		Z	g	12.84	42.05	-11.97	62.05
8	Angular Rate Sensors	X	deg/s	170.40	45.00	-263.28	68.10
		Y	deg/s	520.97	47.15	-255.13	36.40
		Z	deg/s	588.26	51.20	-309.04	11.10
9	Driver Shoulder Belt		N	7566.68	60.65	-3.25	12.10
10	Driver Lap Belt		N	4181.64	61.80	-1.21	2.45
11	Passenger Shoulder Belt		N	4461.97	49.15	-18.35	11.95
12	Passenger Lap Belt		N	3879.62	61.05	-141.10	45.05
13	Driver Floor Pan String Pot		mm	2.85	295.05	-85.25	64.25

Note: See Appendix B for all additional vehicle channel data

TIME TO FIRE RESTRAINT TIMING

Loc.	Description	Axes	Units	Time to Fire (ms)
1	Driver Air Bag Squib 1	*	V	32.45
2	Driver Air Bag Squib 2	*	V	13.30
3	Driver Curtain Airbag	*	V	25.50
4	Driver Torso Airbag	*	V	25.50
5	Driver Knee Airbag	*	V	13.30
6	Driver Pretensioner	*	V	25.45
7	Passenger Air Bag Squib 1	*	V	28.55
8	Passenger Air Bag Squib 2	*	V	24.440
9	Passenger Curtain Airbag	*	V	Disabled
10	Passenger Torso Airbag	*	V	Disabled
11	Passenger Knee Airbag	*	V	N/A
12	Passenger Pretensioner	*	V	24.50

* The measurement indicates the time the voltage changed

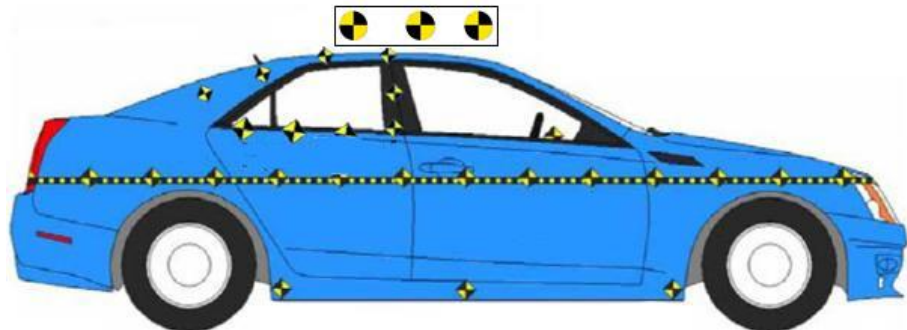
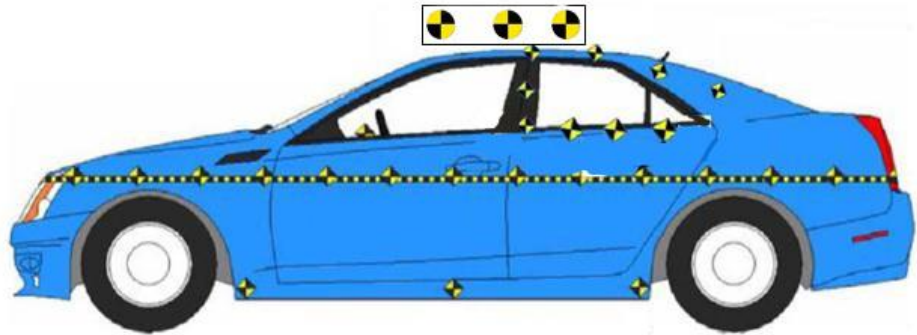
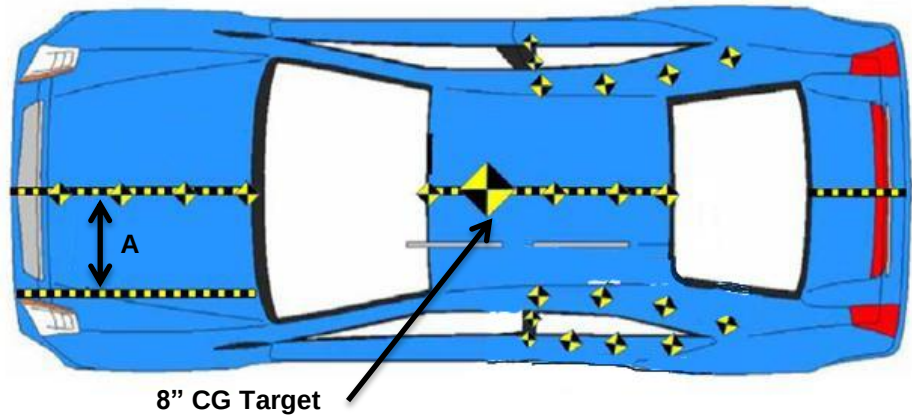
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013

Item	Units	Value
A	mm	270

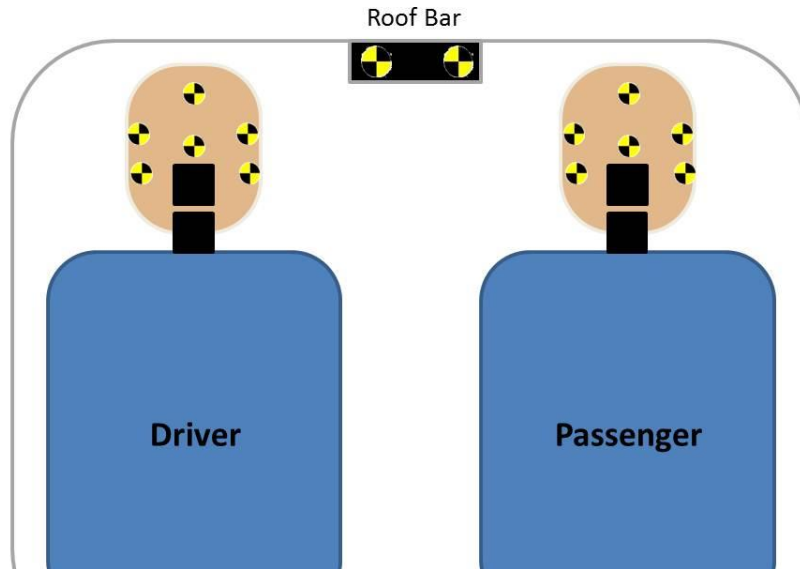
Note: All 6" targets on the vehicle are 450 mm apart.



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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



Point	Pre-Test		
	X	Y	Z
Roof Bar Driver	1930	-63	197
Roof Bar Passenger	1931	62	197

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

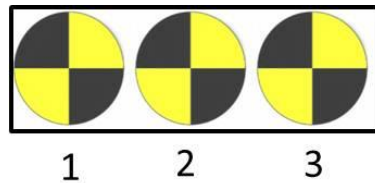
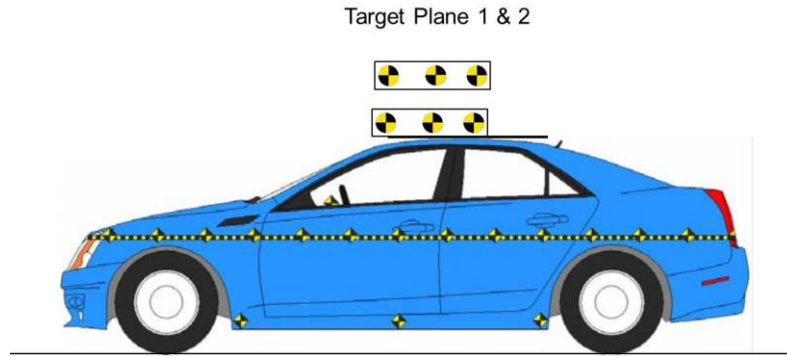
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

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

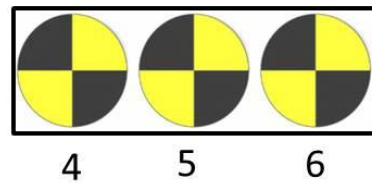
Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

OVERHEAD TARGET BARS



Vertical Target
Plane 1
(Driver's Side)



Vertical Target
Plane 2
(Passenger Side)

Target	Units	X	Y	Z
1	mm	1914	-499	-355
2	mm	1464	-492	-352
3	mm	1012	-493	-352
4	mm	1928	501	-332
5	mm	1477	495	-337
6	mm	1024	487	-338

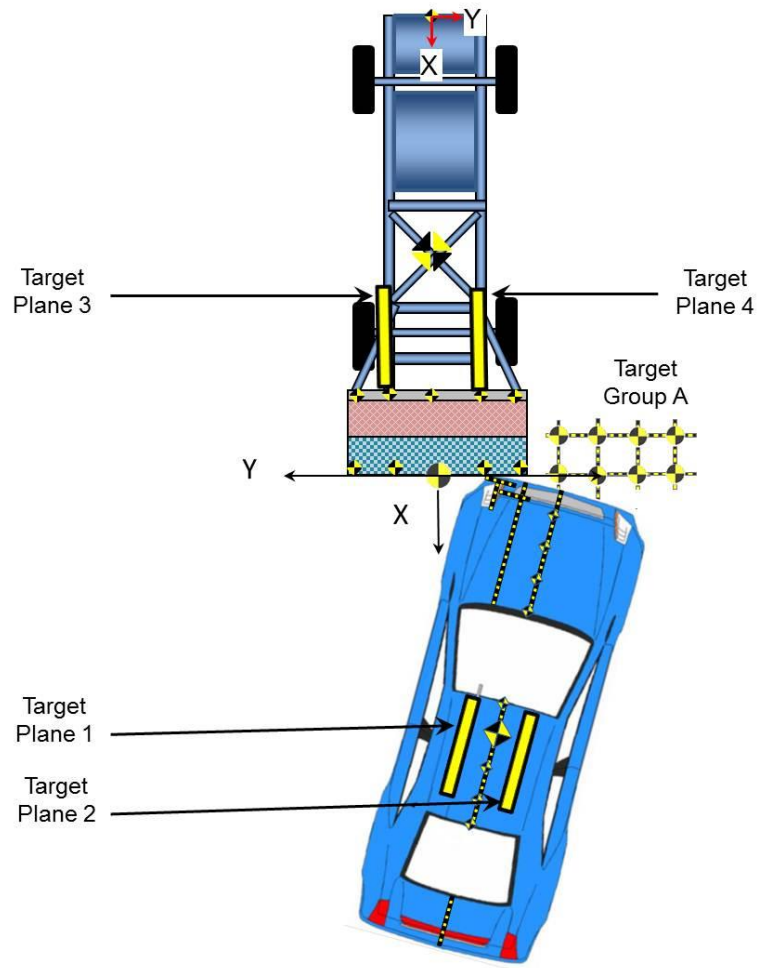
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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. 8 (CONTINUED)
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

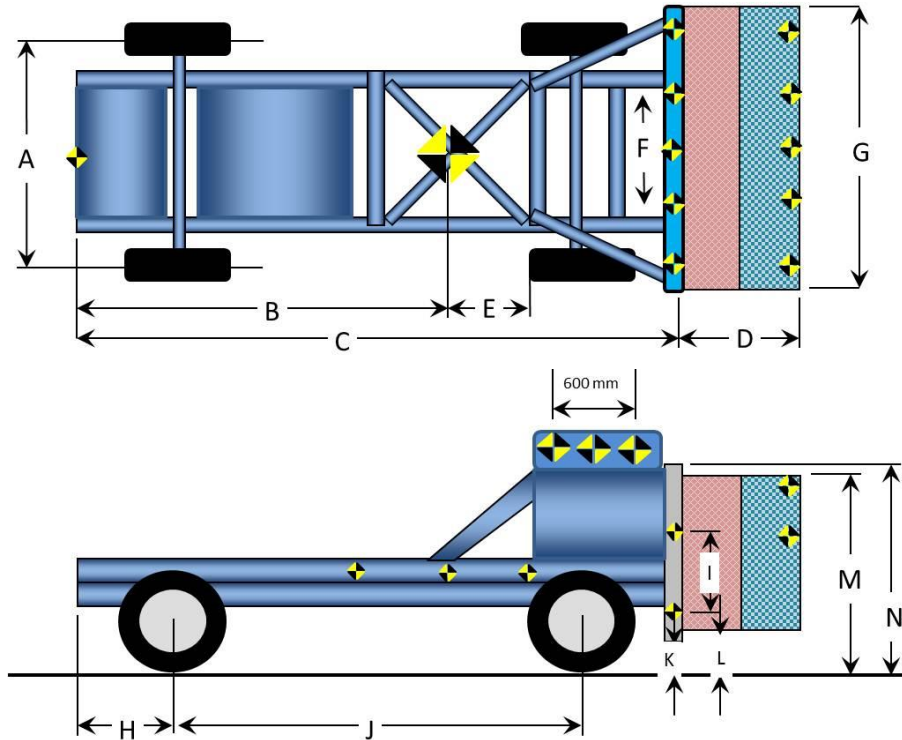


Target	Units	X	Y
1	mm	0	1411
2	mm	0	1861
3	mm	0	2311
4	mm	-450	1411
5	mm	-450	1861
6	mm	-450	2311

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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



Item	Units	Value	Item	Units	Value
A	mm	1930	H	mm	800
B	mm	2451	I	mm	450
C	mm	3995	J	mm	2555
D	mm	605	K	mm	77
E	mm	904	L	mm	71
F	mm	900	M	mm	1024
G	mm	2205	N	mm	1177

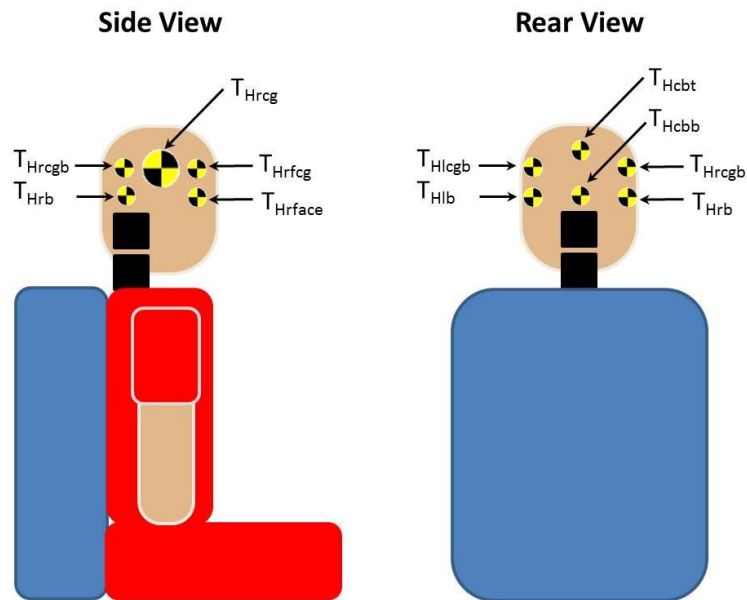
	Units	Front Axle	Rear Axle	Total
Left	kg	802.0	453.6	1255.6
Right	kg	807.4	427.7	1235.1
Ratio	%	65	35	100
Total	kg	1609.4	881.3	2490.7
CG Aft of Front Axle	mm			904

Note: All targets on the RMDB honeycomb are 450mm apart except on the target bar which are 300mm apart.

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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



Driver Dummy Head Targets (S/N 116)

Measurement	Units	Value
Distance between T _{Hrcg} & T _{Hrfcg}	mm	38
Distance between T _{Hrcg} & T _{Hrcgb}	mm	38
Distance between T _{Hrcgb} & T _{Hrb}	mm	70
Distance between T _{Hrfcg} & T _{Hrface}	mm	70
Distance between T _{Hlcbg} & T _{Hlfcg}	mm	38
Distance between T _{Hlcbg} & T _{Hlcb}	mm	38
Distance between T _{Hlcb} & T _{Hlface}	mm	70
Distance between T _{Hlfcg} & T _{Hlface}	mm	70
Distance between T _{Hcgt} & T _{Hcbb}	mm	72

Passenger Dummy Head Targets (S/N 366)

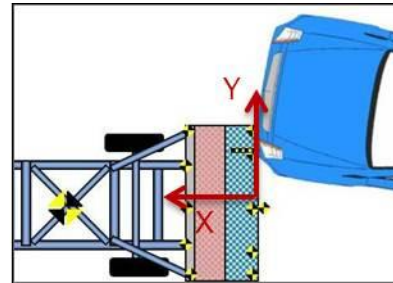
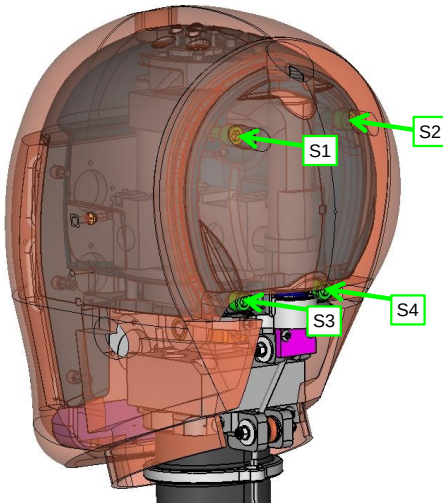
Measurement	Units	Value
Distance between T _{Hrcg} & T _{Hrfcg}	mm	38
Distance between T _{Hrcg} & T _{Hrcgb}	mm	38
Distance between T _{Hrcgb} & T _{Hrb}	mm	70
Distance between T _{Hrfcg} & T _{Hrface}	mm	70
Distance between T _{Hlcbg} & T _{Hlfcg}	mm	38
Distance between T _{Hlcbg} & T _{Hlcb}	mm	38
Distance between T _{Hlcb} & T _{Hlface}	mm	70
Distance between T _{Hlfcg} & T _{Hlface}	mm	70
Distance between T _{Hcgt} & T _{Hcbb}	mm	72

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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

THOR HEAD BOLT MEASUREMENTS
GLOBAL COORDINATE SYSTEM
Front of RMDB is the Origin



GLOBAL REFERENCE POINT (On Ground)
 Sensor Array located along vehicle
 centerline behind center console

BOLT POINTS RELATIVE TO HEAD CG

Target	X	Y	Z
S1	-65.32	-35.43	-45.75
S2	-65.32	35.43	-45.75
S3	-60.16	-25.40	36.90
S4	-60.16	25.40	36.90

DRIVER'S HEAD BOLT POINTS

Target	X	Y	Z
S1	-2281	960	-1387
S3	-2270	966	-1302
S2	-2280	1031	-1383
S4	-2271	1016	-1299

FRONT PASSENGER'S HEAD BOLT POINTS

Target	X	Y	Z
S1	-2264	1668	-1419
S3	-2257	1678	-1335
S2	-2268	1739	-1421
S4	-2259	1728	-1335

DATA SHEET NO. 9
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	87
Passenger Dummy Accelerometers	81
Vehicle Structure Accelerometers	43
RMDB Cart Accelerometers	6
Total	217

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	4
High-Speed Off-board	10
Real-Time Panning	2
Total	16

DATA SHEET NO. 10 - POST TEST OBSERVATIONS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Right Front Passenger
Dummy Type/Serial No.	THOR016	THOR015
Lower Leg Type	LX	LX
Lower Leg Serial No.	LX0018/ LX0019	LX0038/LX0039
Head Contact	Front & Curtain airbag	Front airbag and head liner
Upper Torso Contact	Front & torso/pelvis airbag	Front airbag
Lower Torso Contact	None	None
Side torso Contact	Shoulder, side torso & outer left leg contacted driver's door	Left shoulder contacted the center instrument panel
Left Knee Contact	Knee Airbag	Knee Bolster
Right Knee Contact	Knee Airbag	Knee Bolster

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Right Front Passenger
Locked/Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed & Operational	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	All pillars remained in good condition	Y
Windshield Damage	Cracks throughout	Y
Window Damage	None	Y
Other Notable Effects	None	--

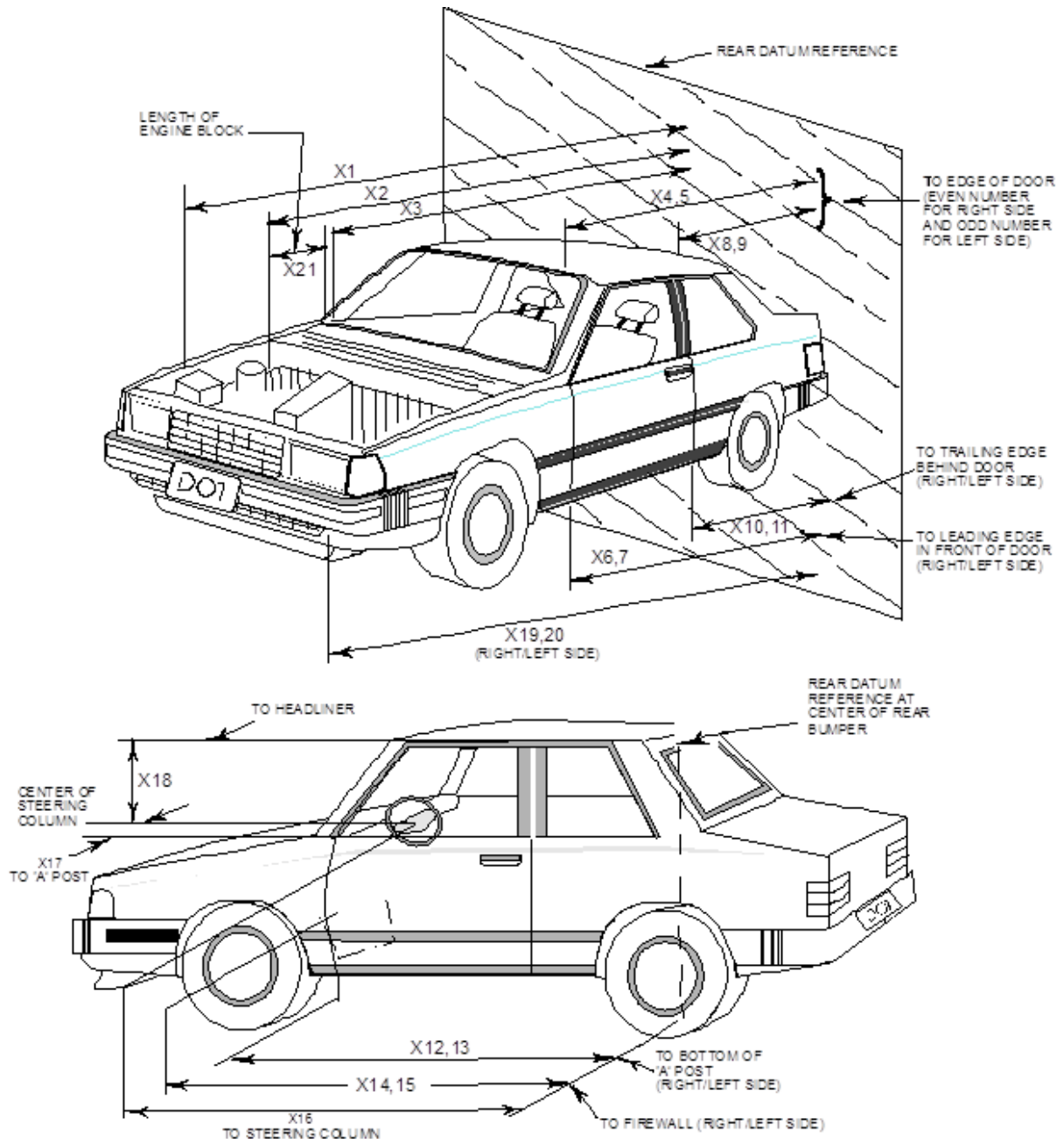
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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	Disabled
Torso/Pelvis Airbag	Yes	Yes	Yes	Disabled
Knee Airbag	Yes	Yes	No	N/A
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: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



DATA SHEET NO. 11 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	3896	3606	290
2	Rear Surface of Vehicle (RSOV) to Front of Engine	mm	3442	3273	169
3	RSOV to Firewall	mm	2760	0	2760
4	RSOV to Upper Leading Edge of Right Door	mm	2468	2466	1
5	RSOV to Upper Leading Edge of Left Door	mm	2467	2463	4
6	RSOV to Lower Leading Edge of Right Door	mm	2426	2430	-4
7	RSOV to Lower Leading Edge of Left Door	mm	2423	2420	3
8	RSOV to Upper Trailing Edge of Right Door	mm	1339	1340	-1
9	RSOV to Upper Trailing Edge of Left Door	mm	1340	1336	5
10	RSOV to Lower Trailing Edge of Right Door	mm	1372	1377	-4
11	RSOV to Lower Trailing Edge of Left Door	mm	1373	1370	4
12	RSOV to Bottom of "A" Post of Right Side	mm	2511	2511	0
13	RSOV to Bottom of "A" Post of Left Side	mm	2510	2507	3
14	RSOV to Firewall, Right Side	mm	2962	2965	-3
15	RSOV to Firewall, Left Side	mm	2960	2812	149
16	RSOV to Steering Column	mm	1977	2015	-38
17	Center of Steering Column to "A" Post	mm	302	207	95
18	Center of Steering Column to Headliner	mm	459	468	-9
19	RSOV to Right Side of Front Bumper	mm	3878	3838	40
20	RSOV to Left Side of Front Bumper	mm	3883	3373	510
21	Length of Engine Block	mm	626	545	81
RD	RSOV to Right Side of Dash Panel	mm	2188	2190	-1
CD	RSOV to Center of Dash Panel	mm	2195	2178	17
LD	RSOV to Left Side of Dash Panel	mm	2188	2162	27

DATA SHEET NO. 12
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013

VEHICLE INFORMATION

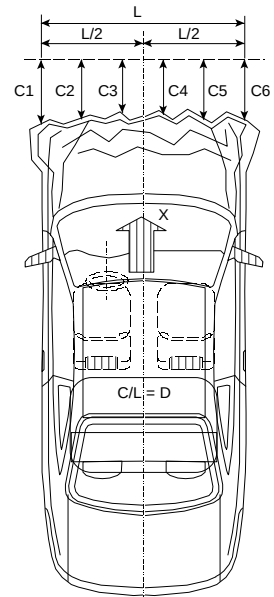
VIN: 1C3CDFAA2DD149198 Wheelbase (mm): 2,639
Vehicle Size Category: Passenger Test Weight (kg): 1,803

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): 89.73
Velocity Change (kph): 89.73

CRUSH PROFILE

Collision Deformation Classification: 11FYEW3
Midpoint of Damage: C2
Damage Region Length (mm): 1043
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	3863	3330	533
C2	Crush zone 2 at left side	mm	3892	3442	450
C3	Crush zone 3 at left side	mm	3894	3548	346
C4	Crush zone 4 at right side	mm	3894	3654	240
C5	Crush zone 5 at right side	mm	3892	3756	136
C6	Crush zone 6 at right side	mm	3860	3833	27
L	C1 to C6	mm	1043	941	102

Crush Measurements: Bumper Cover Removed

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
B1	Bumper Beam 1 at left side	mm	3712	3256	-456
B2	Bumper Beam 2 at left side	mm	3723	3351	-372
B3	Bumper Beam 3 at left side	mm	3781	3374	-407
B4	Bumper Beam 4 at left side	mm	3785	3431	-354
B5	Bumper Beam 5 at right side	mm	3787	3525	-262
B6	Bumper Beam 6 at right side	mm	3785	3611	-174
B7	Bumper Beam 7 at right side	mm	3781	3692	-89
B8	Bumper Beam 8 at right side	mm	3758	3757	-1
B9	Bumper Beam 9 at right side	mm	3713	3782	69
L	B1 to B9	mm	1288	1122	166

DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

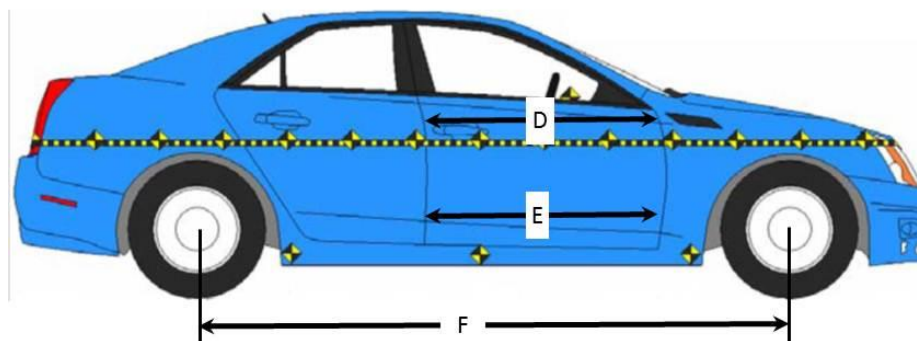
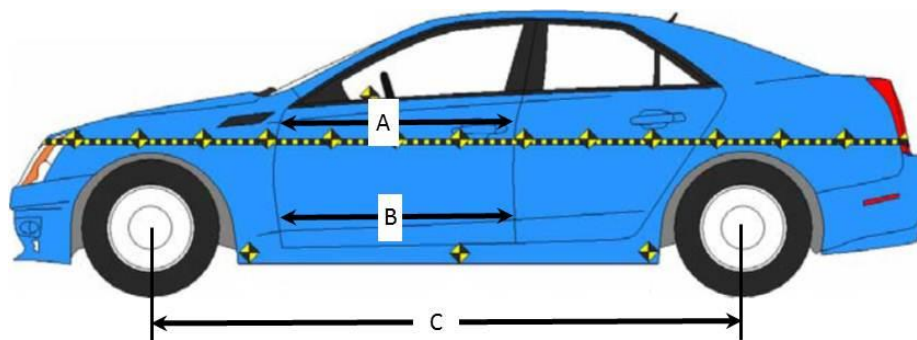
NHTSA No.: RE5507
 Test Date: 11/7/2013

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1042	1033	-9
B	Left Side Lower	mm	879	875	-4
D	Right Side Upper	mm	1042	1043	1
E	Right Side Lower	mm	886	885	-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2639	2554	-85
F	Right Side Wheelbase	mm	2639	2726	-87



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

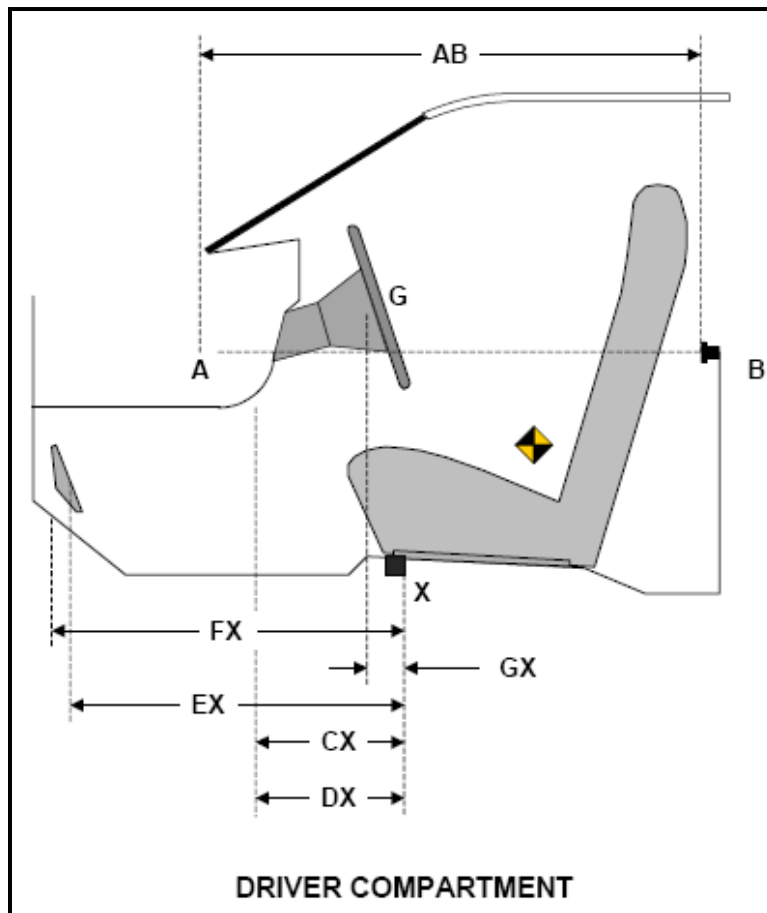
NHTSA No.: RE5507
 Test Date: 11/7/2013

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	748	750	2
CX	Left Knee Bolster to X	mm	274	UR*	UR*
DX	Right Knee Bolster to X	mm	267	270	3
EX	Brake Pedal to X	mm	569	461	-108
FX	Foot Rest to X	mm	651	556	-95
GX	Center of Steering Column Wheel Hub to X	mm	57	93	35

UR = Unrecoverable

X = Front of Seat Track (Stationary)

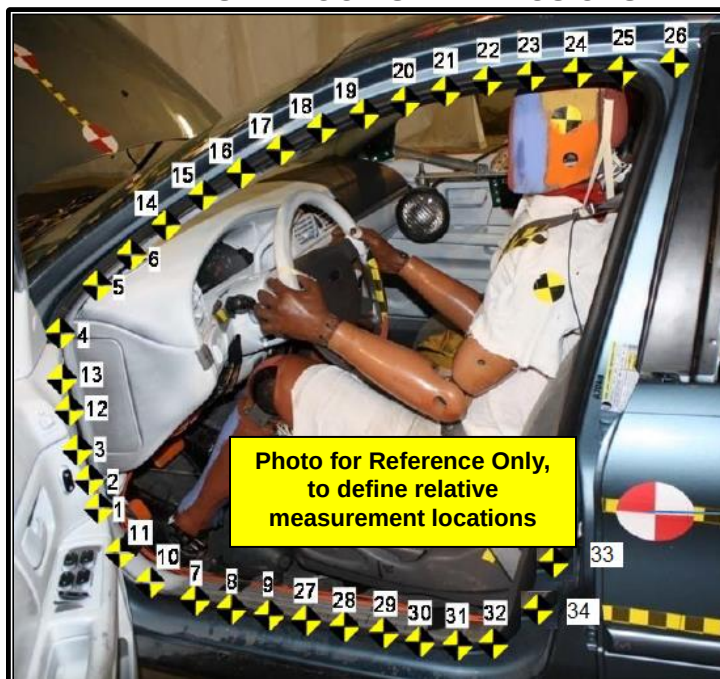


DATA SHEET NO.13 (CONTINUED) **VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013

DRIVER SIDE DOOR SILL INTRUSIONS



Reference point: Rear most center of the top of rear window (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	2369	-732	1104	2365	-742	1103	-4	-10	-1
2	2367	-728	1029	2360	-741	1028	-7	-13	-1
3	2348	-724	954	2342	-744	952	-6	-20	-2
4	2375	-718	654	2368	-737	653	-7	-19	-1
5	2394	-717	580	2390	-726	578	-4	-9	-2
6	2367	-720	504	2366	-726	501	-1	-6	-3
7	2288	-736	1202	2287	-745	1204	-1	-9	2
8	2138	-735	1216	2139	-740	1217	1	-5	1
9	1989	-738	1213	1990	-742	1214	1	-4	1
10	2325	-736	1177	2323	-744	1178	-2	-8	1
11	2354	-733	1141	2351	-743	1141	-3	-10	0
12	2318	-721	858	2313	-750	856	-5	-29	-2
13	2300	-721	758	2296	-756	755	-4	-35	-3
14	2306	-714	447	2306	-717	444	0	-3	-3
15	2237	-701	397	2237	-706	393	0	-5	-4
16	2168	-687	348	2169	-690	344	1	-3	-4

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	2096	-671	300	2097	-673	296	1	-2	-4
18	2024	-656	256	2024	-657	251	0	-1	-5
19	1949	-639	215	1949	-640	210	0	-1	-5
20	1871	-624	181	1872	-624	176	1	0	-5
21	1790	-613	156	1791	-613	152	1	0	-4
22	1708	-604	138	1709	-604	135	1	0	-3
23	1623	-595	123	1624	-595	121	1	0	-2
24	1538	-592	114	1539	-593	112	1	-1	-2
25	1451	-588	106	1453	-589	105	2	-1	-1
26	1367	-587	102	1367	-587	102	0	0	0
27	1932	-736	1214	1932	-741	1215	0	-5	1
28	1874	-735	1214	1875	-740	1215	1	-5	1
29	1817	-735	1213	1818	-738	1215	1	-3	2
30	1761	-735	1213	1762	-737	1214	1	-2	1
31	1704	-736	1208	1706	-738	1210	2	-2	2
32	1655	-736	1192	1657	-738	1193	2	-2	1
33	1496	-736	955	1497	-736	956	1	-1	1
34	1553	-736	1106	1553	-737	1107	1	-1	1

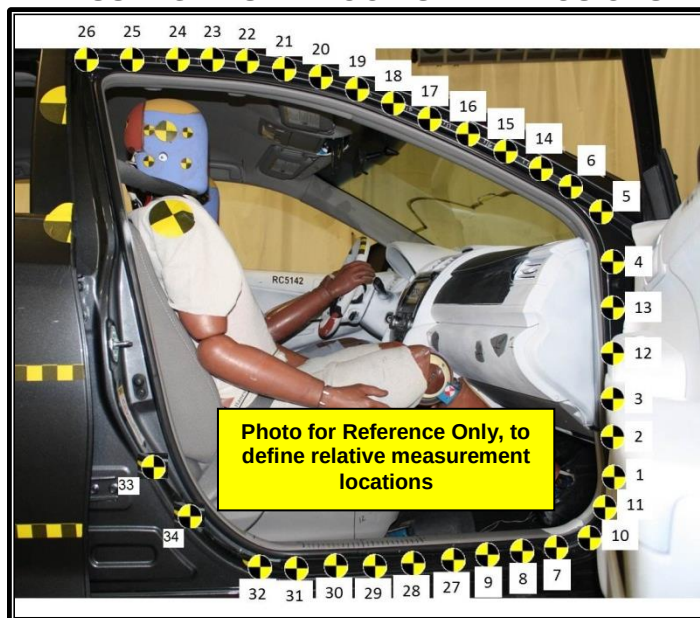
Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

PASSENGER SIDE DOOR SILL INTRUSIONS



Reference point: Rear most center of the top of rear window (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	2370	732	1105	2367	743	1107	-3	11	2
2	2369	727	1032	2366	738	1034	-3	11	2
3	2351	722	956	2348	733	958	-3	11	2
4	2375	717	654	2373	725	656	-2	8	2
5	2396	716	579	2394	723	583	-2	7	4
6	2370	719	506	2369	725	508	-1	6	2
7	2287	736	1199	2284	748	1203	-3	12	4
8	2140	735	1213	2138	746	1216	-2	11	3
9	1989	737	1211	1986	746	1215	-3	9	4
10	2324	735	1176	2321	749	1179	-3	14	3
11	2354	734	1140	2351	746	1142	-3	12	2
12	2320	719	857	2317	729	860	-3	10	3
13	2302	718	755	2300	726	759	-2	8	4
14	2299	711	439	2297	716	442	-2	5	3
15	2229	698	389	2228	704	391	-1	6	2
16	2160	682	341	2159	688	343	-1	6	2

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

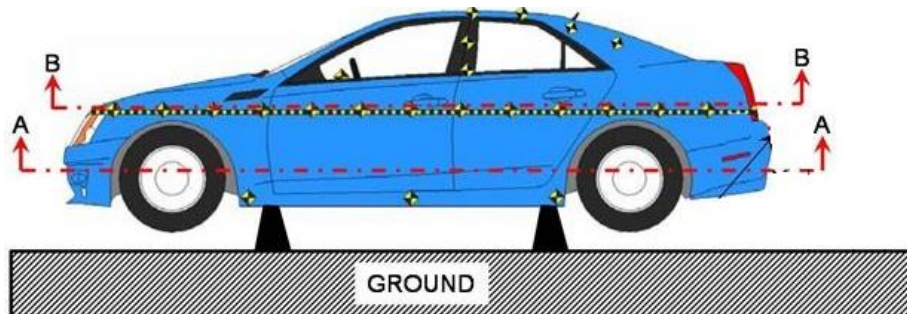
Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	2090	668	295	2089	672	297	-1	4	2
18	2017	651	251	2016	655	254	-1	4	3
19	1944	636	211	1943	638	213	-1	2	2
20	1866	621	178	1865	623	180	-1	2	2
21	1786	610	153	1786	613	156	0	3	3
22	1702	602	136	1703	604	138	1	2	2
23	1619	595	122	1619	597	124	0	2	2
24	1536	592	112	1535	593	115	-1	1	3
25	1451	588	105	1451	589	107	0	1	2
26	1367	586	101	1367	587	103	0	1	2
27	1932	735	1212	1929	744	1215	-3	9	3
28	1874	735	1212	1871	743	1215	-3	8	3
29	1818	735	1211	1815	741	1214	-3	6	3
30	1762	735	1211	1759	741	1214	-3	6	3
31	1707	736	1206	1704	741	1209	-3	5	3
32	1656	735	1190	1652	740	1193	-4	5	3
33	1498	735	956	1495	738	959	-3	3	3
34	1552	736	1102	1549	738	1105	-3	3	3

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: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



Reference point: Rear most center of the top of rear window (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	3328	-892	1103	1	3125	-783	1103
2	3409	-871	1103	2	3145	-698	1102
3	3497	-845	1103	3	3087	-574	1101
4	3578	-829	1102	4	3038	-376	1103
5	3636	-812	1102	5	3122	-340	1102
6	3714	-760	1102	6	3185	-383	1103
7	3776	-673	1103	7	3297	-255	1103
8	3828	-588	1102	8	3344	-157	1102
9	3850	-548	1103	9	3420	-38	1103
10	3874	-483	1102	10	3487	77	1102
11	3889	-376	1103	11	3570	100	1103
12	3894	-265	1102	12	3655	226	1102
13	3894	-178	1102	13	3705	304	1103
14	3894	-61	1102	14	3779	408	1103
15	3894	53	1103	15	3842	485	1103
16	3894	139	1103	16	3851	521	1103
17	3894	236	1103	17	3764	591	1102
18	3891	333	1103	18	3795	699	1102
19	3885	420	1102	19	3502	747	1103
20	3866	507	1103	20	3431	759	1103
21	3836	571	1102	21	3213	786	1102
22	3789	650	1103	22	3075	853	1102
23	3736	729	1103	23	2943	920	1102
24	3683	784	1102	24	2853	972	1102
25	3578	825	1102	25	2775	1005	1102

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	3476	847	1102	26	2553	897	1103
27	3401	872	1102	27	2490	888	1104
28	3329	889	1103	28	2458	902	1103
29	2532	897	1103	29	2356	888	1103
30	2468	888	1102	30	2205	889	1103
31	2352	873	1102	31	2057	891	1103
32	2212	875	1103	32	1872	893	1104
33	2052	879	1102	33	1741	893	1103
34	1870	883	1103	34	1591	893	1103
35	1721	886	1103	35	1434	891	1104
36	1561	888	1103	36	1315	886	1104
37	1386	888	1102	37	1124	883	1104
38	1353	888	1103	38	958	878	1104
39	1210	888	1103	39	819	876	1105
40	1040	886	1103	40	690	884	1105
41	859	883	1102	41	-96	900	1104
42	754	889	1102	42	-96	900	1104
43	690	893	1103	43	-170	883	1103
44	-98	898	1103	44	-241	869	1103
45	-222	871	1103	45	-344	851	1103
46	-272	863	1102	46	-439	831	1103
47	-357	848	1102	47	-483	816	1103
48	-446	830	1102	48	-559	721	1103
49	-496	808	1102	49	-608	623	1102
50	-533	767	1103	50	-643	495	1103
51	-597	660	1103	51	-667	352	1103
52	-643	526	1102	52	-685	117	1102
53	-678	310	1103	53	-689	2	1103
54	-692	103	1102	54	-686	-118	1102
55	-694	-23	1102	55	-676	-272	1102
56	-685	-236	1102	56	-655	-438	1102
57	-673	-351	1102	57	-626	-578	1102
58	-648	-500	1103	58	-571	-703	1102
59	-620	-603	1103	59	-511	-790	1102
60	-560	-727	1103	60	-429	-828	1102
61	-522	-780	1102	61	-345	-847	1102
62	-399	-839	1101	62	-248	-864	1103
63	-278	-860	1102	63	-155	-884	1102
64	-141	-888	1103	64	-94	-897	1102
65	-96	-896	1103	65	686	-892	1102
66	691	-890	1103	66	829	-882	1102

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

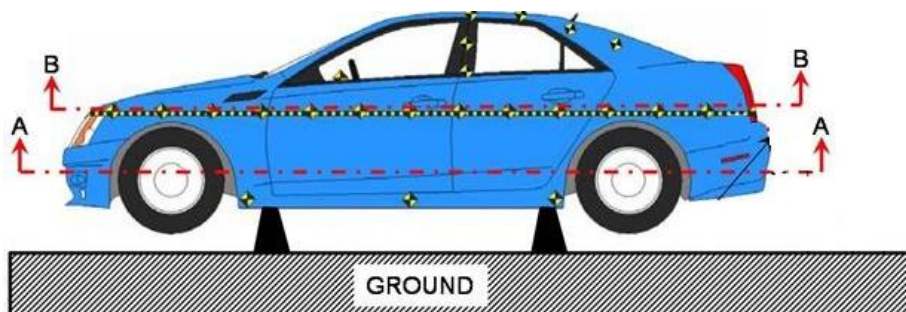
Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
67	783	-883	1102	67	1027	-883	1103
68	905	-881	1103	68	1192	-885	1102
69	1069	-884	1103	69	1330	-885	1102
70	1232	-885	1102	70	1485	-884	1103
71	1381	-887	1103	71	1644	-884	1103
72	1586	-887	1102	72	1822	-884	1103
73	1675	-886	1103	73	2015	-882	1102
74	1869	-883	1103	74	2189	-880	1102
75	2062	-879	1102	75	2382	-882	1102
76	2234	-875	1102	76	2422	-887	1102
77	2410	-879	1102	77	2416	-926	1102
78	2543	-898	1102	78	2452	-946	1102
				79	2494	-948	1102
				80	2570	-1014	1102
				81	2608	-1001	1102
				82	2695	-933	1103
				83	2780	-887	1102
				84	2894	-844	1103
				85	3045	-787	1102

Note: See Appendix D for detailed procedure on how to measure vehicle exterior crush profile

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



Reference point: Rear most center of the top of rear window (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	2497	-878	807	1	2977	-458	807
2	2567	-879	807	2	3041	-343	806
3	2665	-886	806	3	3145	-323	807
4	2759	-895	807	4	3261	-306	807
5	2913	-896	806	5	3281	-263	806
6	3054	-895	807	6	3305	-241	806
7	3147	-882	807	7	3320	-119	807
8	3279	-849	806	8	3377	-15	807
9	3388	-826	807	9	3394	43	807
10	3473	-802	806	10	3442	66	806
11	3537	-801	806	11	3479	125	806
12	3595	-770	806	12	3444	148	806
13	3666	-673	806	13	3484	221	807
14	3715	-565	807	14	3535	311	807
15	3747	-473	806	15	3552	343	807
16	3783	-428	806	16	3614	328	806
17	3789	-374	807	17	3658	376	807
18	3810	-293	807	18	3410	587	807
19	3833	-155	806	19	3428	657	807
20	3837	-97	806	20	3407	736	807
21	3833	-69	806	21	3437	764	807
22	3837	3	807	22	3501	829	806
23	3833	64	807	23	3347	833	806
24	3836	90	807	24	3205	865	807
25	3832	156	807	25	3048	886	807

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	3813	274	807	26	2901	908	806
27	3790	366	806	27	2699	902	806
28	3794	389	808	28	2542	890	807
29	3788	417	807	29	2502	889	807
30	3759	462	806	30	2422	893	807
31	3720	554	807	31	2273	894	807
32	3663	679	807	32	2073	895	808
33	3586	776	807	33	1912	896	807
34	3556	795	806	34	1749	896	808
35	3457	807	807	35	1533	894	808
36	3265	851	806	36	1390	892	808
37	3102	888	807	37	1237	887	808
38	2885	893	807	38	1071	884	809
39	2708	889	807	39	869	878	808
40	2567	877	806	40	696	875	808
41	2496	876	806	41	561	884	808
42	2338	879	806	42	424	884	808
43	2172	883	806	43	399	894	807
44	1999	886	806	44	399	894	807
45	1808	890	807	45	302	896	807
46	1653	891	806	46	187	894	807
47	1491	892	806	47	73	889	807
48	1374	891	806	48	-92	860	806
49	1285	891	807	49	-250	838	807
50	1133	889	807	50	-386	810	807
51	928	886	807	51	-452	742	807
52	730	883	806	52	-497	673	806
53	522	896	806	53	-552	504	807
54	365	896	807	54	-582	358	807
55	194	894	807	55	-593	280	807
56	1	880	807	56	-603	142	807
57	-167	850	807	57	-606	-1	806
58	-296	830	807	58	-603	-110	806
59	-338	822	810	59	-594	-242	807
60	-393	806	806	60	-583	-333	806
61	-442	763	806	61	-562	-442	807
62	-485	685	807	62	-530	-561	807
63	-516	604	806	63	-492	-668	806
64	-562	440	807	64	-432	-771	807
65	-588	285	807	65	-289	-827	806
66	-601	103	806	66	-93	-857	807
67	-602	-20	806	67	96	-887	807

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
68	-596	-190	806	68	328	-894	807
69	-586	-294	807	69	401	-894	806
70	-577	-360	807	70	533	-893	806
71	-557	-461	806	71	682	-882	806
72	-532	-552	805	72	849	-882	806
73	-495	-659	807	73	1030	-886	806
74	-467	-720	807	74	1220	-888	807
75	-430	-778	807	75	1402	-892	806
76	-377	-810	807	76	1548	-893	806
77	-245	-836	806	77	1798	-895	807
78	-88	-859	806	78	1949	-894	807
79	54	-884	806	79	2077	-893	806
80	173	-890	807	80	2229	-891	807
81	313	-894	806	81	2324	-890	806
82	463	-896	806	82	2387	-890	806
83	602	-889	806	83	2396	-973	807
84	697	-882	806	84	2486	-991	806
85	796	-880	805	85	2572	-1033	806
86	983	-884	806	86	2619	-994	807
87	1152	-887	806	87	2643	-923	806
88	1326	-890	806	88	2668	-825	807
89	1490	-891	806	89	2737	-776	807
90	1733	-891	806	90	2789	-719	806
91	1889	-889	806	91	2847	-648	807
92	2081	-886	807	92	2891	-569	806
93	2270	-882	807	93	2889	-502	807
94	2466	-878	806				

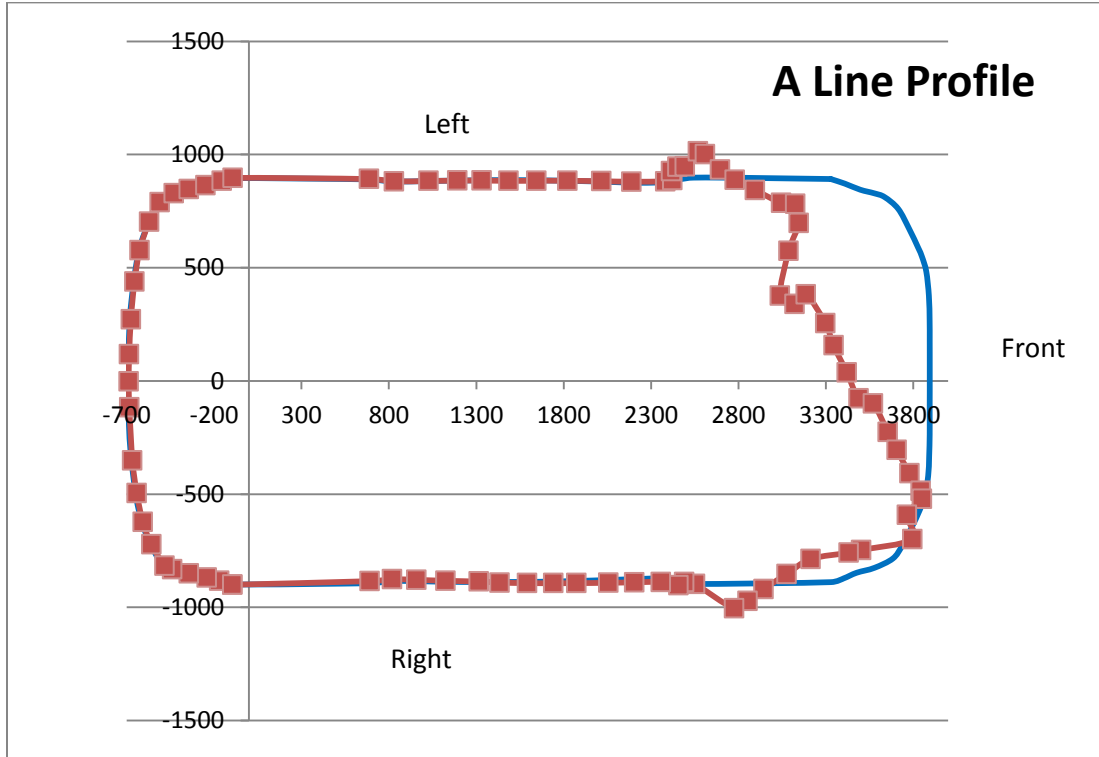
Note: See Appendix D for detailed procedure on how to measure vehicle exterior crush profile

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

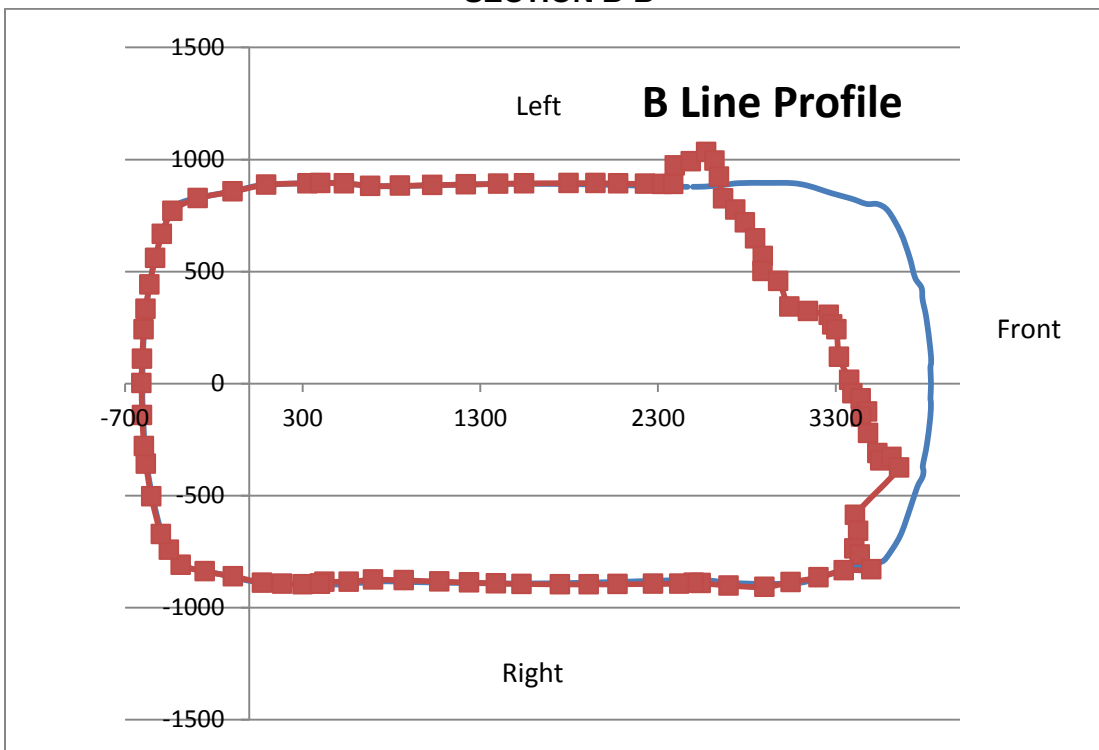
Test Vehicle: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A



SECTION B-B



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

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



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	3712	-646	1076	3269	-489	881	-443	157	-195
	B11	3752	-485	1078	3370	-380	949	-382	105	-129
	B12	3786	-329	1077	3393	-225	971	-393	104	-106
	B13	3795	-166	1077	3439	-92	981	-356	74	-96
	B14	3797	-1	1077	3538	40	999	-259	41	-78
	B15	3795	160	1077	3622	175	1019	-173	15	-58
	B16	3785	324	1077	3701	319	1036	-84	-5	-41
	B17	3756	483	1079	3757	468	1053	1	-15	-26
	B18	3713	642	1078	3784	631	1068	71	-11	-10
Center Structural Bumper Beam	B1	3712.0	-646	1102	3256	-492	905	-456	154	-197
	B2	3723	-485	1101	3351	-380	964	-372	105	-137
	B3	3781	-327	1101	3374	-226	987	-407	101	-114
	B4	3785	-164	1099	3431	-86	1001	-354	78	-98
	B5	3787	-1	1102	3525	45	1024	-262	46	-78
	B6	3785	161	1102	3611	182	1043	-174	21	-59
	B7	3781	324	1103	3692	322	1061	-89	-2	-42
	B8	3758	483	1100	3757	466	1075	-1	-17	-25
	B9	3713	642	1100	3782	630	1091	69	-12	-9
Upper Radiator Support	1	3683	-363	810	3208	-182	634	-475	181	-176
	2	3685	-275	810	3262	-116	633	-423	159	-177
	3	3694	-185	810	3316	-44	650	-378	141	-160
	4	3695	-96	810	3364	26	664	-331	122	-146
	5	3686	-1	806	3413	108	669	-273	109	-137
	6	3694	90	809	3476	174	676	-218	84	-133
	7	3696	180	811	3537	233	703	-159	53	-108
	8	3687	269	810	3591	302	729	-96	33	-81
	9	3684	359	810	3650	364	746	-34	5	-64

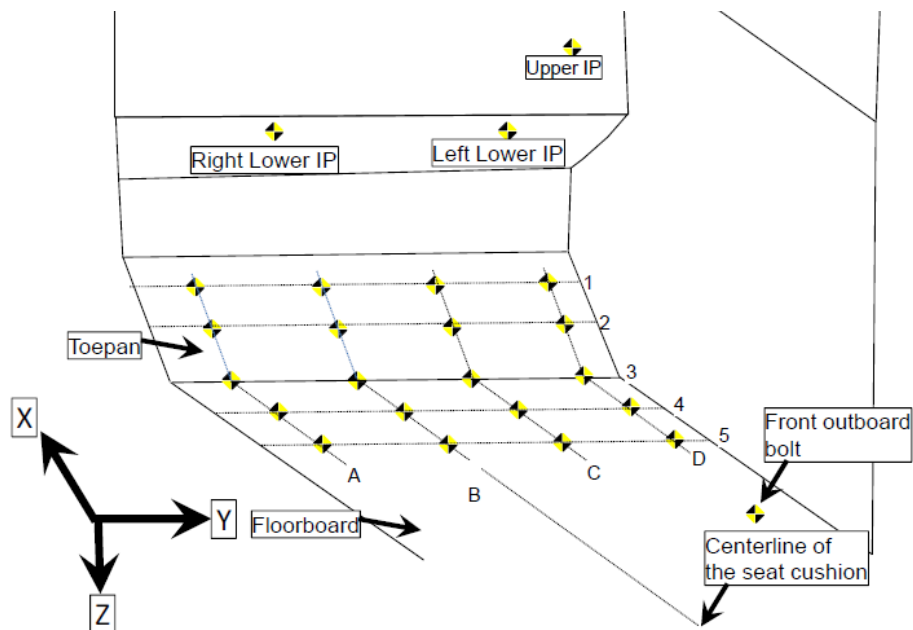
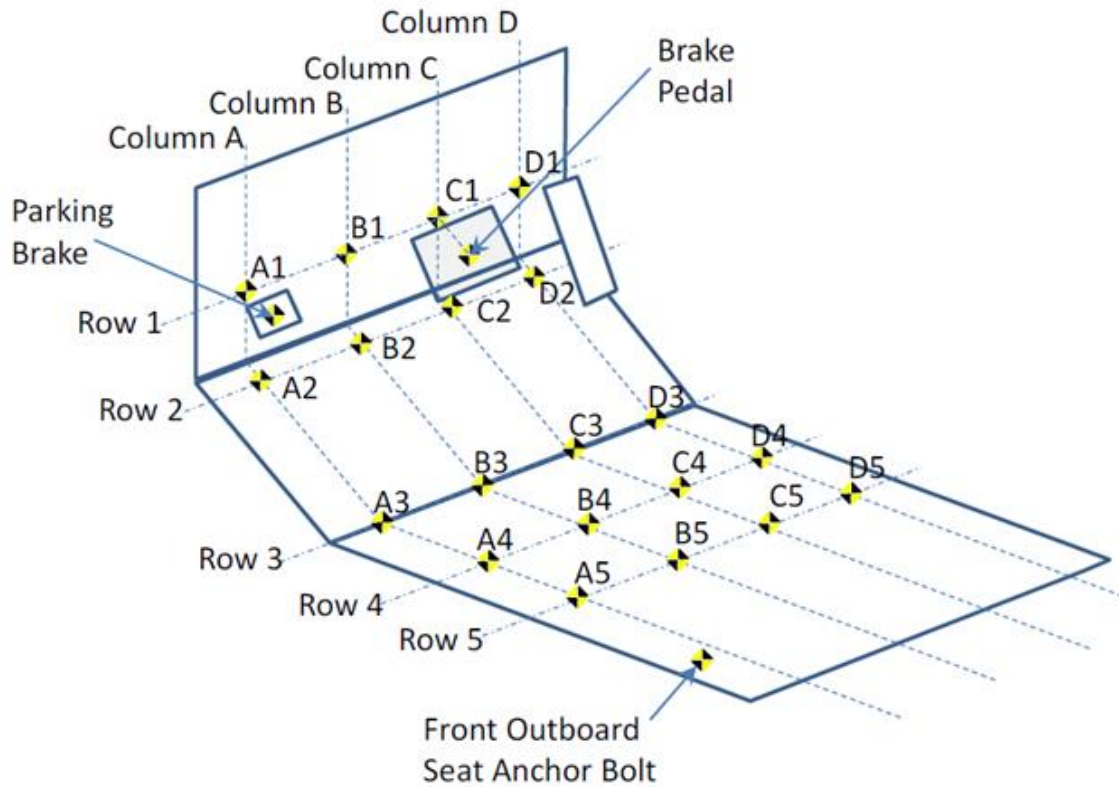
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



Note: See Appendix D for toe pan measuring procedure

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

DRIVER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2550	-616	1105	2519	-621	1095	-31	-5	-10
B1	2624	-519	1105	2548	-502	1080	-76	17	-25
C1	2701	-369	1106	2605	-344	1073	-96	25	-33
D1	2677	-220	1106	2586	-197	1092	-91	23	-14
A2	2533	-621	1167	2508	-624	1158	-25	-3	-9
B2	2602	-520	1167	2543	-507	1148	-59	13	-19
C2	2641	-369	1168	2575	-351	1150	-66	18	-18
D2	2638	-218	1168	2560	-203	1158	-78	15	-10
A3	2524	-621	1239	2504	-619	1231	-20	2	-8
B3	2538	-519	1240	2505	-515	1236	-33	4	-4
C3	2549	-368	1240	2509	-363	1247	-40	5	7
D3	2551	-220	1239	2504	-214	1258	-47	6	19
A4	2450	-620	1295	2452	-623	1298	2	-3	3
B4	2451	-519	1299	2453	-522	1314	2	-3	15
C4	2448	-370	1297	2447	-376	1339	-1	-6	42
D4	2451	-219	1301	2453	-225	1339	2	-6	38
A5	2350	-620	1311	2351	-623	1313	1	-3	2
B5	2351	-519	1312	2353	-523	1324	2	-4	12
C5	2350	-370	1304	2353	-374	1329	3	-4	25
D5	2350	-219	1295	2354	-223	1332	4	-4	37
Brake Pedal	2488	-370	1105	2383	-435	1061	-105	-65	-44
Driver IP Left	2193	-498	781	UR	UR	UR	UR	UR	UR
Driver IP Right	2186	-198	781	2193	-208	814	7	-10	33
DOLP	2220	-598	804	2214	-629	797	-6	-31	-7
Steering Column	1977	-348	595	2015	-444	602	38	-96	7
Front Outboard Bolt	1919	-567	1256	1922	-569	1263	3	-2	7
Emergency Brake									

UR= Un-recoverable data point

Reference point: Rear most center of the top of rear window (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: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

PASSENGER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2635	207	1104	2601	258	1094	-34	51	-10
B1	2702	355	1106	2693	368	1107	-9	13	1
C1	2633	507	1106	2627	522	1108	-6	15	2
D1	2550	605	1101	2547	622	1105	-3	17	4
A2	2610	212	1166	2578	254	1156	-32	42	-10
B2	2642	356	1167	2636	371	1173	-6	15	6
C2	2612	508	1166	2606	521	1169	-6	13	3
D2	2547	609	1167	2543	624	1170	-4	15	3
A3	2549	208	1241	2536	229	1238	-13	21	-3
B3	2548	356	1240	2545	372	1248	-3	16	8
C3	2538	508	1239	2533	523	1244	-5	15	5
D3	2534	608	1238	2529	622	1241	-5	14	3
A4	2446	205	1288	2439	225	1299	-7	20	11
B4	2449	355	1296	2446	370	1305	-3	15	9
C4	2447	508	1299	2444	523	1305	-3	15	6
D4	2447	607	1300	2445	620	1304	-2	13	4
A5	2347	207	1284	2341	219	1324	-6	12	40
B5	2349	355	1305	2347	369	1315	-2	14	10
C5	2349	507	1311	2345	521	1317	-4	14	6
D5	2350	608	1311	2347	623	1315	-3	15	4
Pass IP Left	2218	206	835	2237	195	874	19	-11	39
Pass IP Right	2241	509	834	2250	498	862	9	-11	28
PORP	2224	608	805	2231	595	830	7	-13	25
Front Outboard Bolt	1921	567	1254	1919	574	1262	-2	7	8

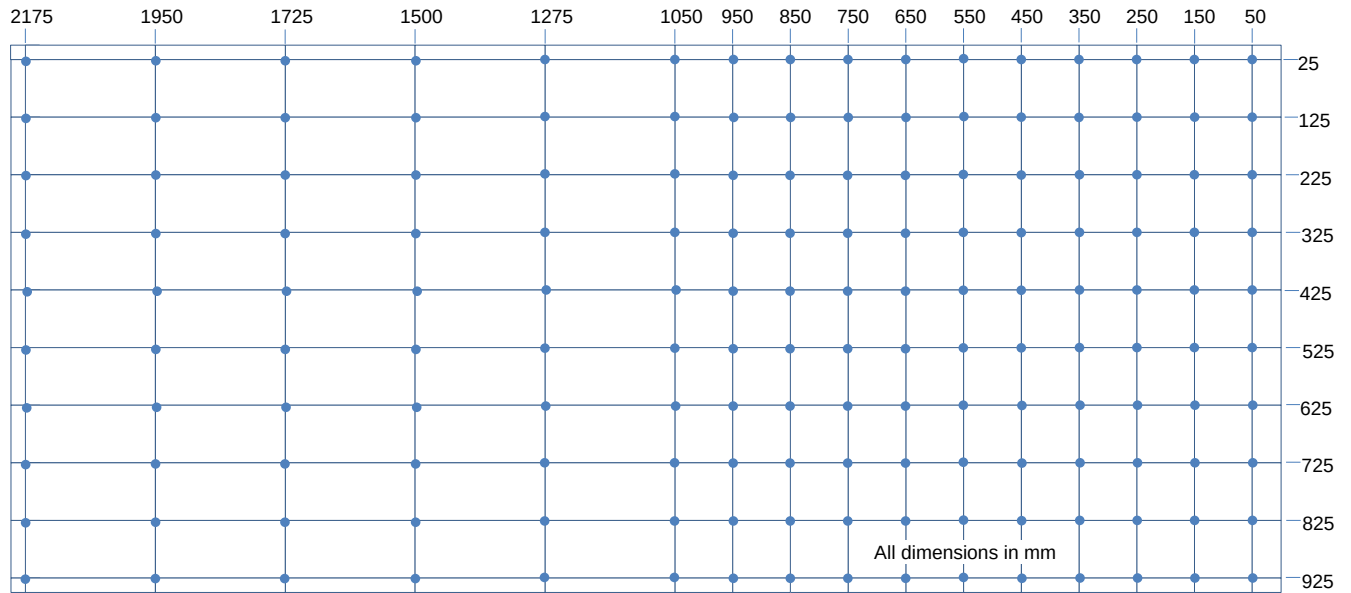
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013



	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
R10	-1.1	-0.5	-0.5	-0.4	-0.3	-0.2	-0.1	-0.1	0.2	1.3	3.1	4.2	6.5	10.5	15.1	25.2
R9	-0.2	-0.2	0.0	-0.2	-0.2	0.0	0.1	0.3	11.0	7.6	6.6	7.6	11.9	16.9	22.9	50.5
R8	-0.2	-0.1	-0.2	0.0	0.1	0.2	0.3	2.1	33.1	69.8	69.1	45.6	27.8	32.9	76.0	116.3
R7	0.1	0.0	0.1	0.3	0.4	0.6	0.7	0.8	12.5	60.8	78.9	66.4	58.6	107.8	159.8	201.7
R6	0.5	0.4	0.2	0.4	0.7	0.7	0.9	1.4	3.9	14.8	49.2	86.1	125.3	181.5	231.8	254.0
R5	0.3	0.1	0.4	0.5	0.5	0.9	1.0	15.1	32.1	8.5	14.9	125.5	190.1	247.9	286.1	279.2
R4	0.7	0.8	0.6	0.4	0.4	0.7	1.0	33.2	80.3	30.5	1.5	48.3	121.0	180.0	219.0	246.9
R3	0.7	0.7	0.9	0.9	0.9	1.0	4.7	58.5	130.8	66.4	12.2	28.8	95.7	100.5	144.0	174.7
R2	1.3	1.1	1.2	1.2	1.2	1.3	22.8	81.2	154.9	85.3	19.6	26.7	37.6	42.6	60.9	91.2
R1	0.9	1.4	1.3	1.4						108.2	29.2	17.9	21.3	30.6	39.0	51.4

*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: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013

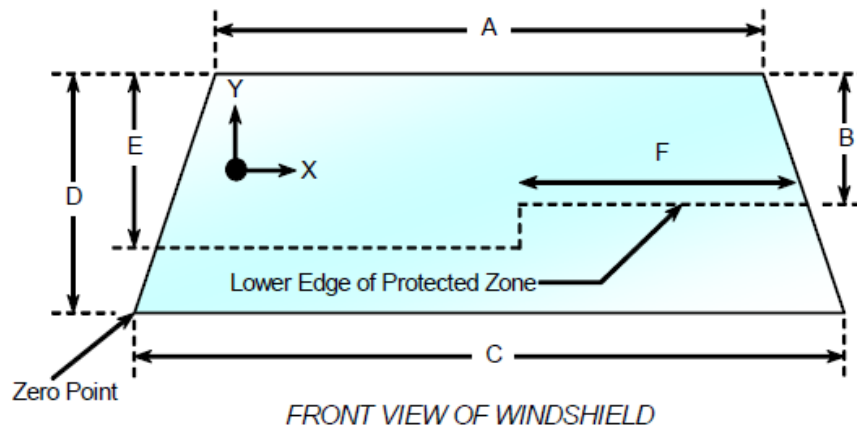
Please provide windshield mounting details. A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2195	2015	91.8%
Right Side	2195	2195	100%
Total	4390	4210	95.9%



Item	Units	Value
A	mm	1220
B	mm	578
C	mm	1500
D	mm	835
E	mm	585
F	mm	345

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: 2014 Subaru Forester SUV
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
Test Date: 11/7/2013

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

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

Test Time: 11:15 AM

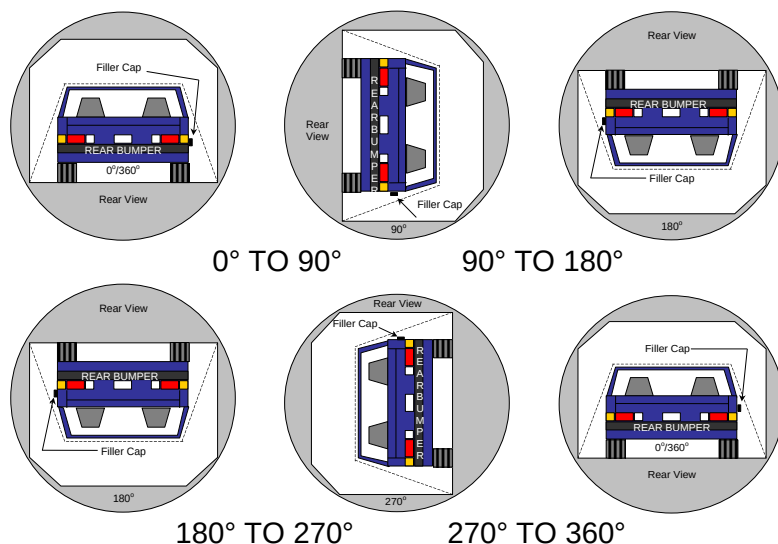
Stoddard Solvent Spillage Measurements

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: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



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°	71	300	371
90° to 180°	69	300	369
180° to 270°	63	300	363
270° to 360°	66	300	366

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	

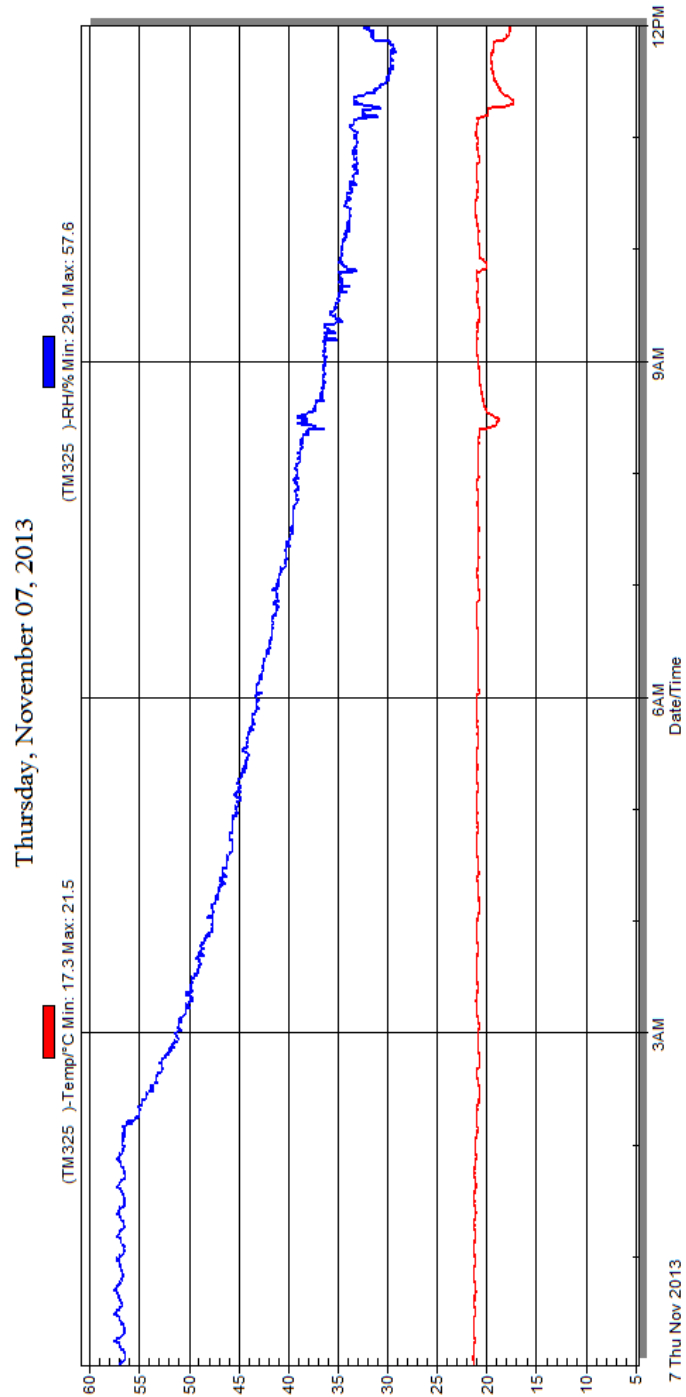
SOLVENT SPILLAGE LOCATION TABLE

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: 2014 Subaru Forester SUV
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: RE5507
 Test Date: 11/7/2013



Temperature Stabilization Chart/Data

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 3/4 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

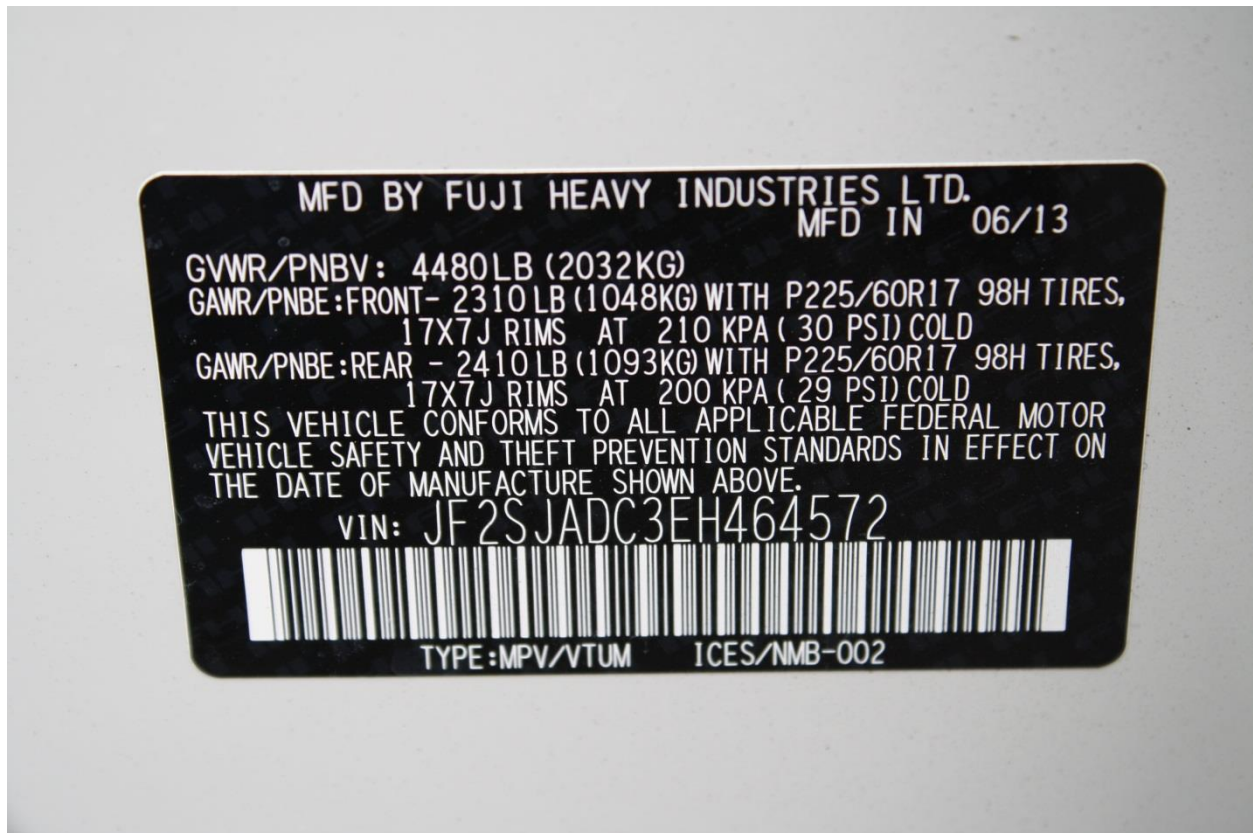
TABLE OF PHOTOGRAPHS (Continued)		
No.	Description	Page
176	Pre-Test RMDB & Vehicle, Rear View	A-101
177	Post-Test RMDB & Vehicle, Rear View	A-101
178	Pre-Test RMDB & Vehicle, Front View	A-102
179	Post-Test RMDB & Vehicle, Front View	A-102
180	Vehicle at 0 Degrees on Static Rollover Device	A-103
181	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



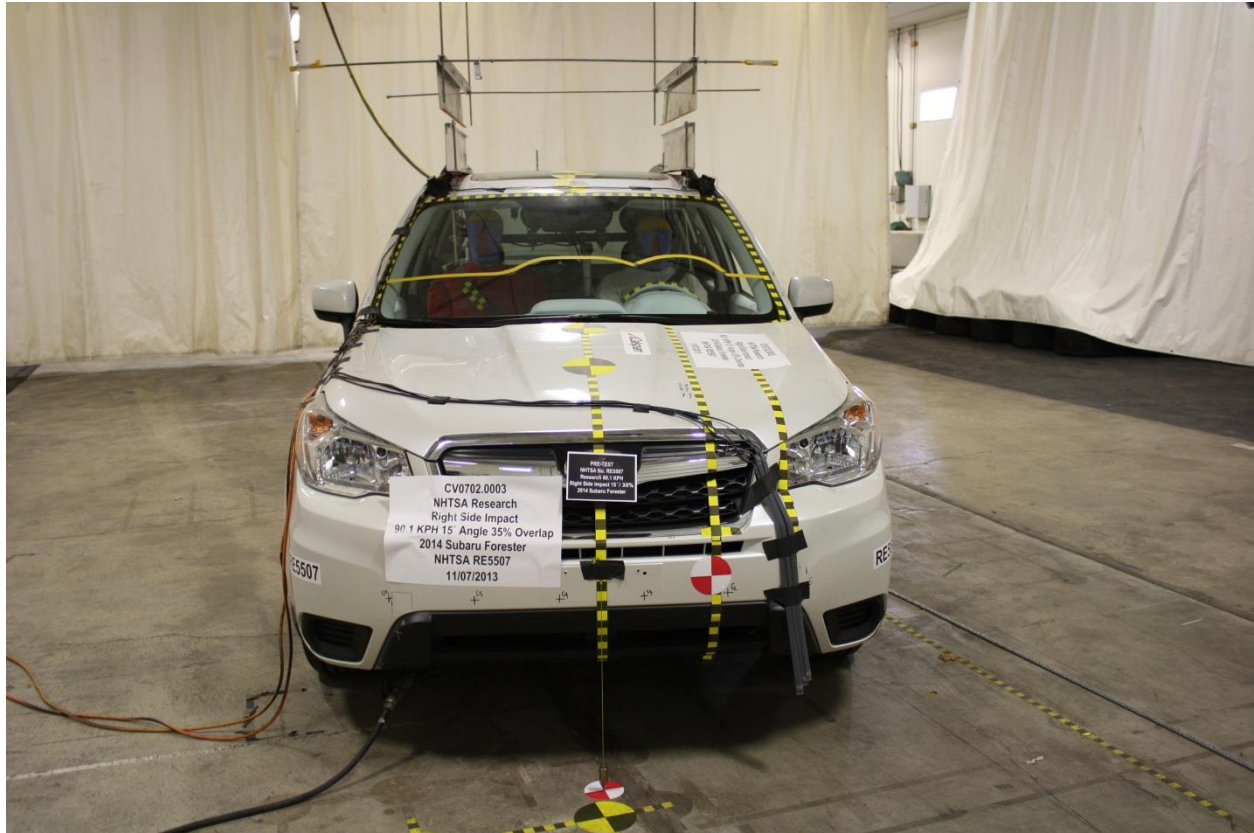
No. 002 As Delivered Left Rear 3-4 View of Test Vehicle



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

FORESTER

VIN: JF2SJADC3EH464572
 Model/Code: 2014 Subaru Forester 2.5i Premium / EFF
 Exterior Color: Sain White Pearl
 Port / Assembly: Richmond
 Deliver by / Carrier: Truck / 601-601130

SHIP TO: 040725
 JUBILEE MITSUBISHI
 4717 WEST WACO DR
 WACO, TX 76710

SOLD TO: 040725
 JUBILEE MITSUBISHI
 4717 WEST WACO DR
 WACO, TX 76710

SUBARU
 Confidence in Motion

STANDARD EQUIPMENT

SAFETY
 Symmetrical All-Wheel Drive (AWD)
 Vehicle Dynamics Control (VDC)
 4-Wheel Disc Brakes w/Brake Assist
 Anti-Lock Braking System (ABS)
 Electronic Brake-Force Distribution
 Brake Override System
 Driver's Side Knee Airbag
 Subaru Advanced Frontal Air Bag System
 Front Seat Side (Pelvic/Torso) Airbag
 Side Curtain Air Bags w/Rollover Sensor
 Anti-Theft Alarm & Immobilizer System
 Daytime Running Lights

PERFORMANCE AND EXTERIOR
 Whiplash Protection Front Seats
 Safety Pedal System
 2.5L Horizontally-Opposed DOHC Engine
 Lineartronic CVT Transmission
 17-Inch Aluminum Alloy Wheels
 Privacy Glass&Panoramic Power Moonroof
 Roof Rails

COMFORT, CONVENIENCE AND INTERIOR
 Air Conditioning w/Air Filtration System
 AM/FM Stereo HD Radio w/ CD Player

USB Port with iPod Connectivity
 Steering Wheel: Bluetooth&Audio Switches
 Bluetooth Hands-Free Phone Connectivity
 Bluetooth Audio Streaming Connectivity
 Power Door Locks & Dual Power Mirrors
 Reclining Rear Seatback Function
 Power Windows w/Driver's Auto Up/Down
 10-Way Power Driver's Seat/Power Lumbar
 60/40 Split Fold-Down Rear Seatback
 Color Multi-Function Display
 Rear Vision Camera
 12V Outlet in Dash, Console & Cargo Area

LIMITED WARRANTY/ROADSIDE ASSISTANCE
 3 Years / 36,000 Miles Basic
 5 Years / 60,000 Miles Powertrain
 5 Yrs/Unlimited Mileage Rust Perforation
 3 Yrs / 36,000 24/7 Roadside Assistance
 See Owner's Info Kit&Warranty For Details

OPTIONAL EQUIPMENT AND OTHER ITEMS
 Manufacturer's Suggested Retail Price \$24,995.00
 Option Package: 01 - STANDARD PACKAGE
 Full Tank of Gas INCLD

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score Not Rated
 Based on the combined ratings of frontal, side and rollover.
 Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.	Driver Passenger	Not Rated
Side Crash Based on the risk of injury in a side impact.	Front seat Rear seat	Not Rated
Rollover Based on the risk of rollover in a single-vehicle crash.		Not Rated

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

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Fuel Economy **27** MPG
 combined city/hwy

Small SUVs: cars range from 16 to 30 MPG. The best vehicle rates 121 MPG.

You Save \$1,750 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel COST \$1,950

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

1 10 10 10 10 10 10 10

This vehicle emits 308 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions, learn more at fuelconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 23 MPG and costs \$11,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.50 per gallon. MPG is miles per gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuelconomy.gov
 Calculate personalized estimates and compare vehicles

PART CONTENTS INFORMATION
 FOR VEHICLES IN THIS COUNTRY:
 U.S./CANADIAN PARTS CONTENT: 0%
 MAJOR SOURCES OF FOREIGN PARTS CONTENT: JAPAN: 90%
 Note: Parts content does not include final assembly, distribution, or other non-parts costs.

FOR THIS VEHICLE:
 FINAL ASSEMBLY POINT: OTA GUNMA, JAPAN
 COUNTRY OF ORIGIN: ENGINE: JAPAN
 TRANSMISSION: JAPAN

Destination and Delivery \$825.00
Total Suggested Retail Price \$25,820.00

Additional protection is available on this vehicle from Subaru

ADDED SECURITY

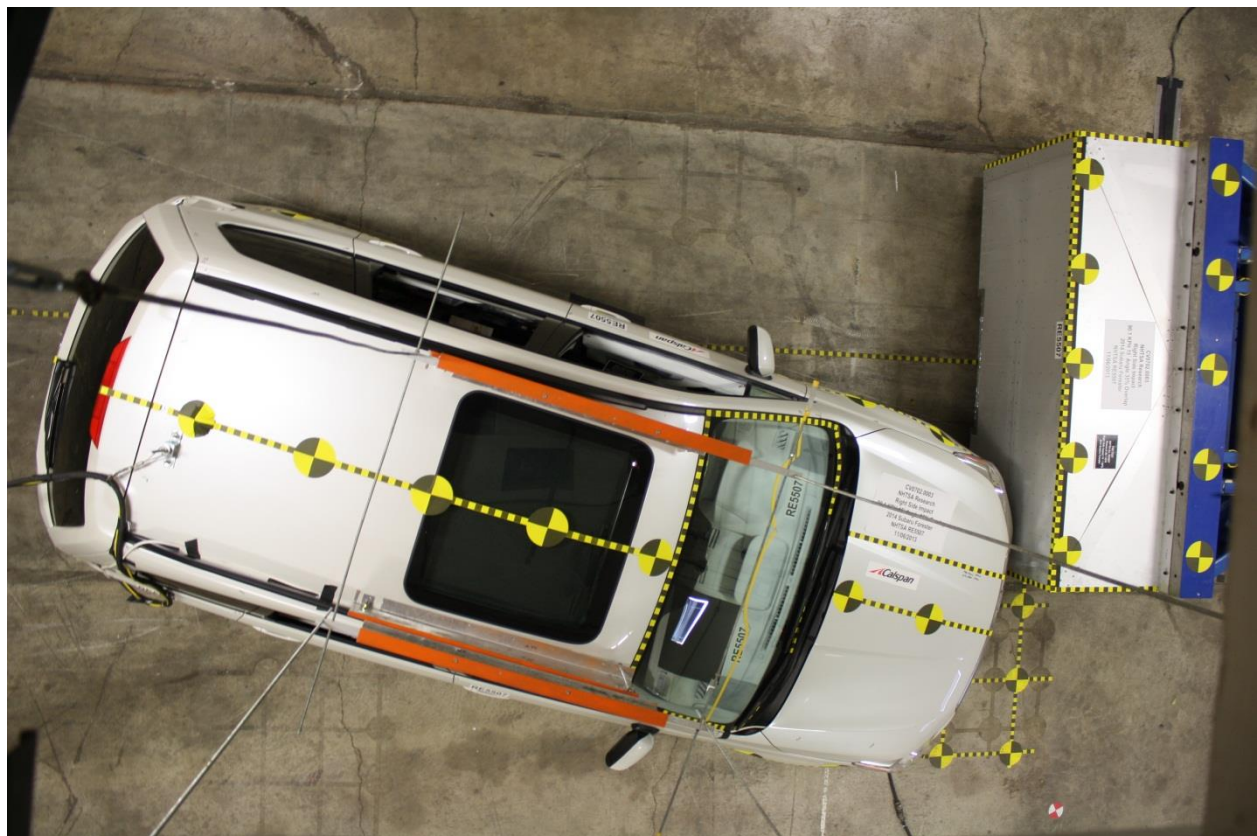
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No. 021 Monroney Label Photograph



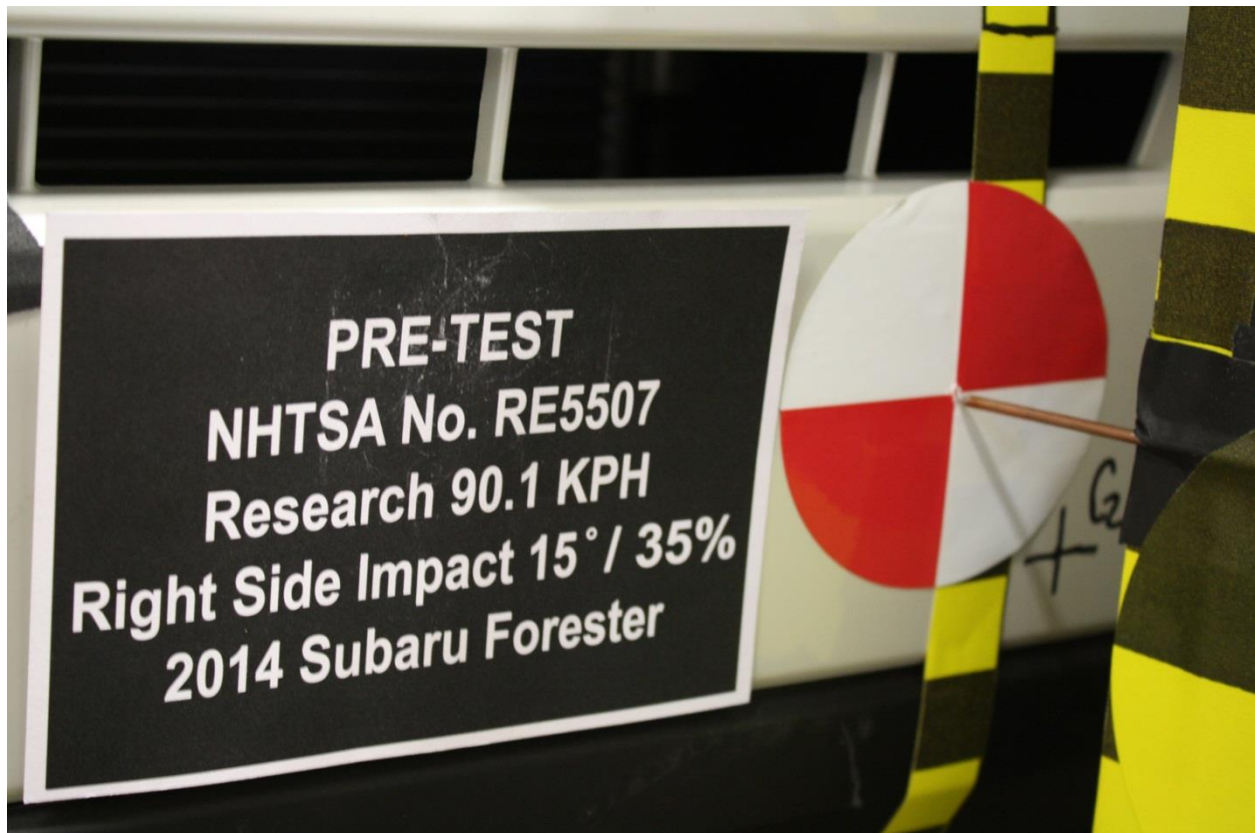
No. 022 Pre-Test Overhead View of RMDB against target vehicle at ideal Impact Point



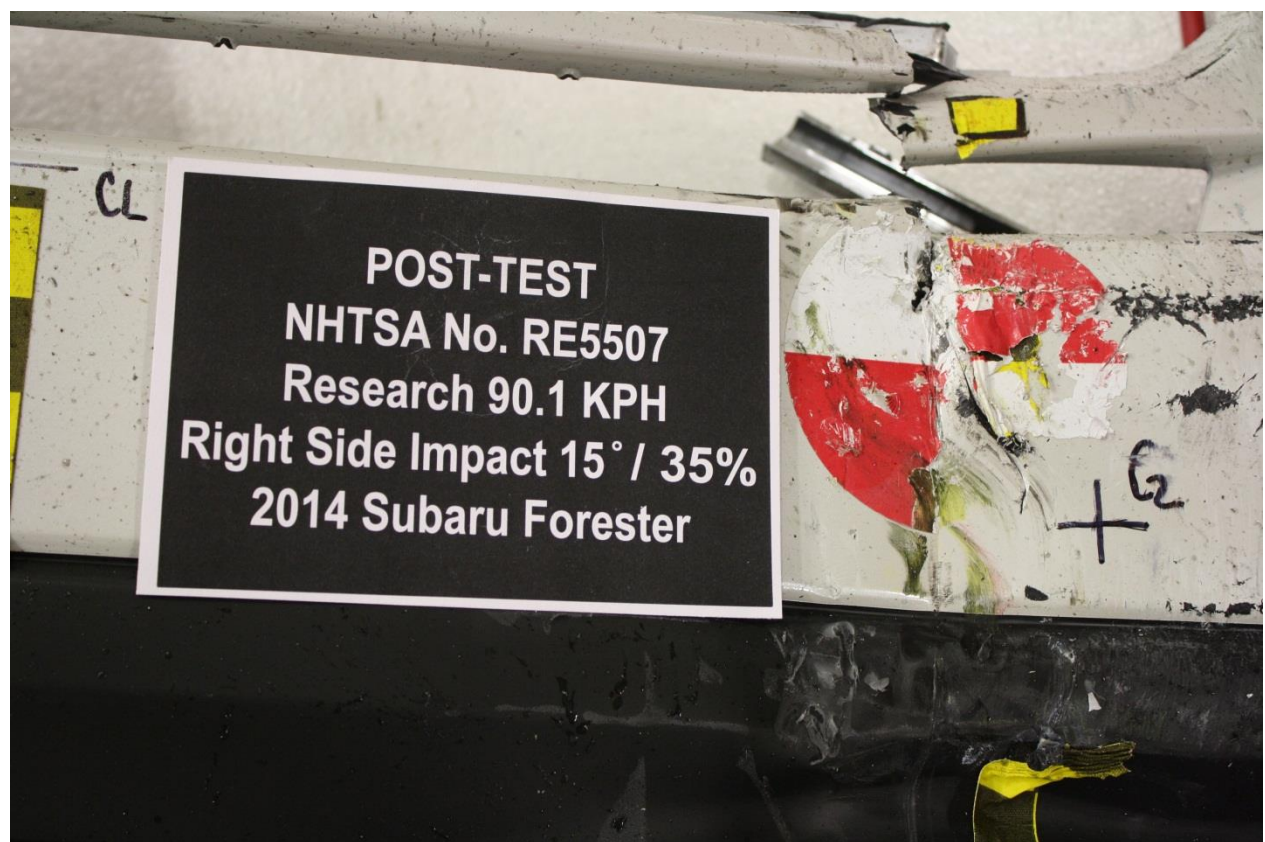
No. 023 Pre-Test Left Side View of RMDB against target vehicle at ideal Impact Point



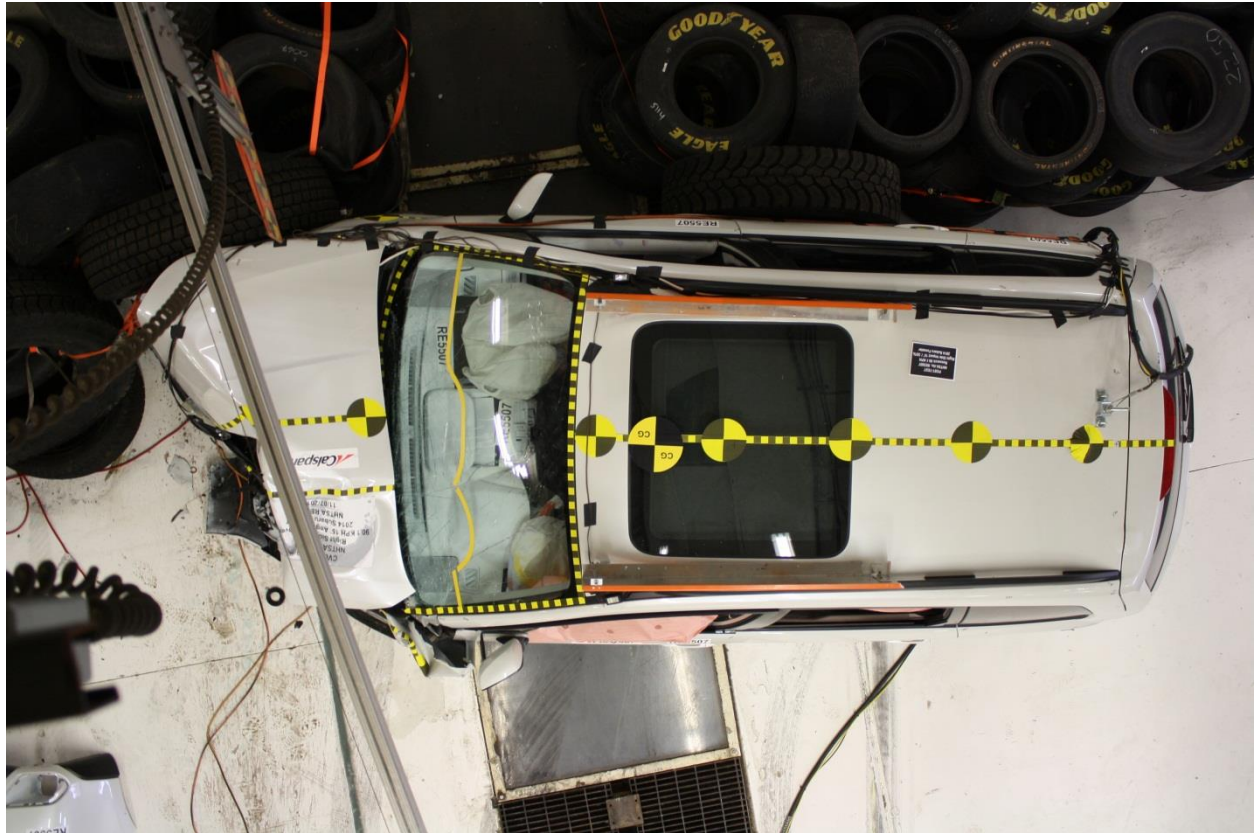
No. 024 Pre-Test Right Side View of RMDB against target vehicle at ideal Impact Point



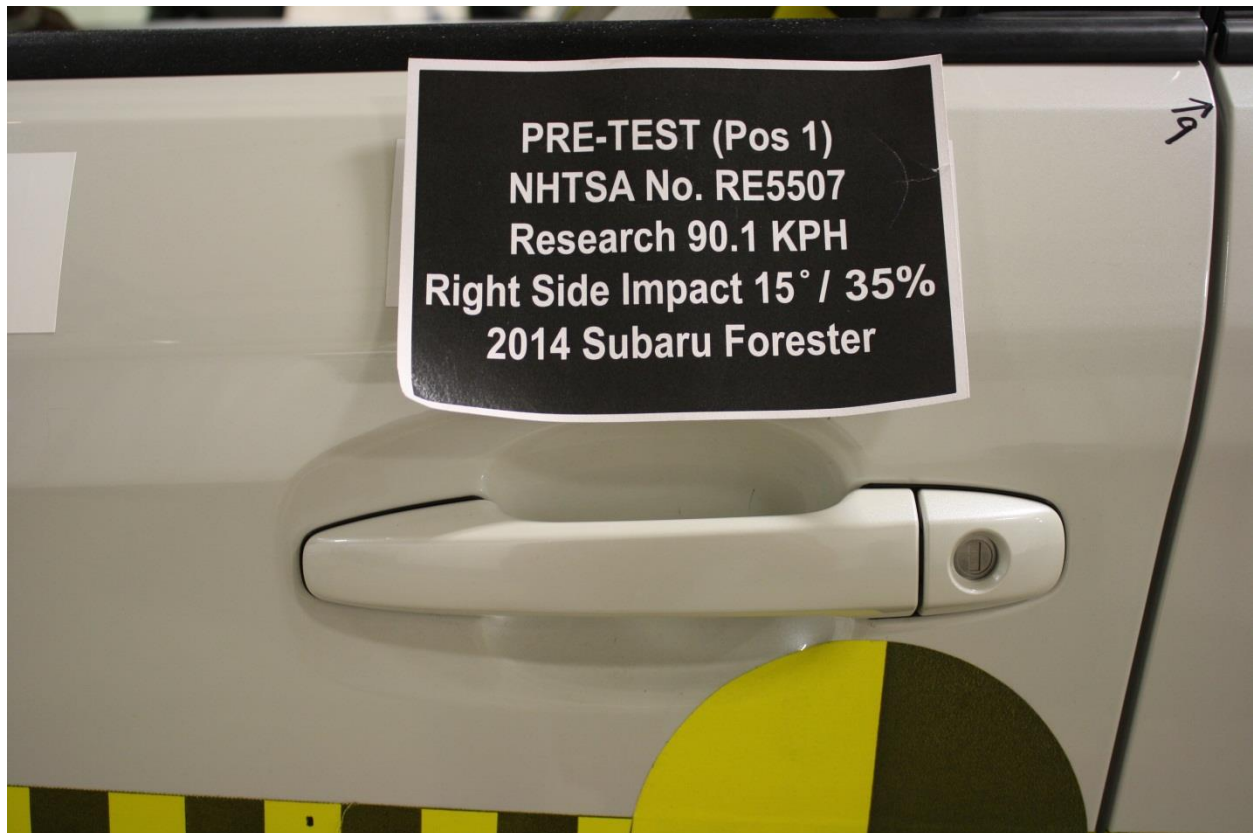
No. 025 Pre-Test Close-up View of Impact Point



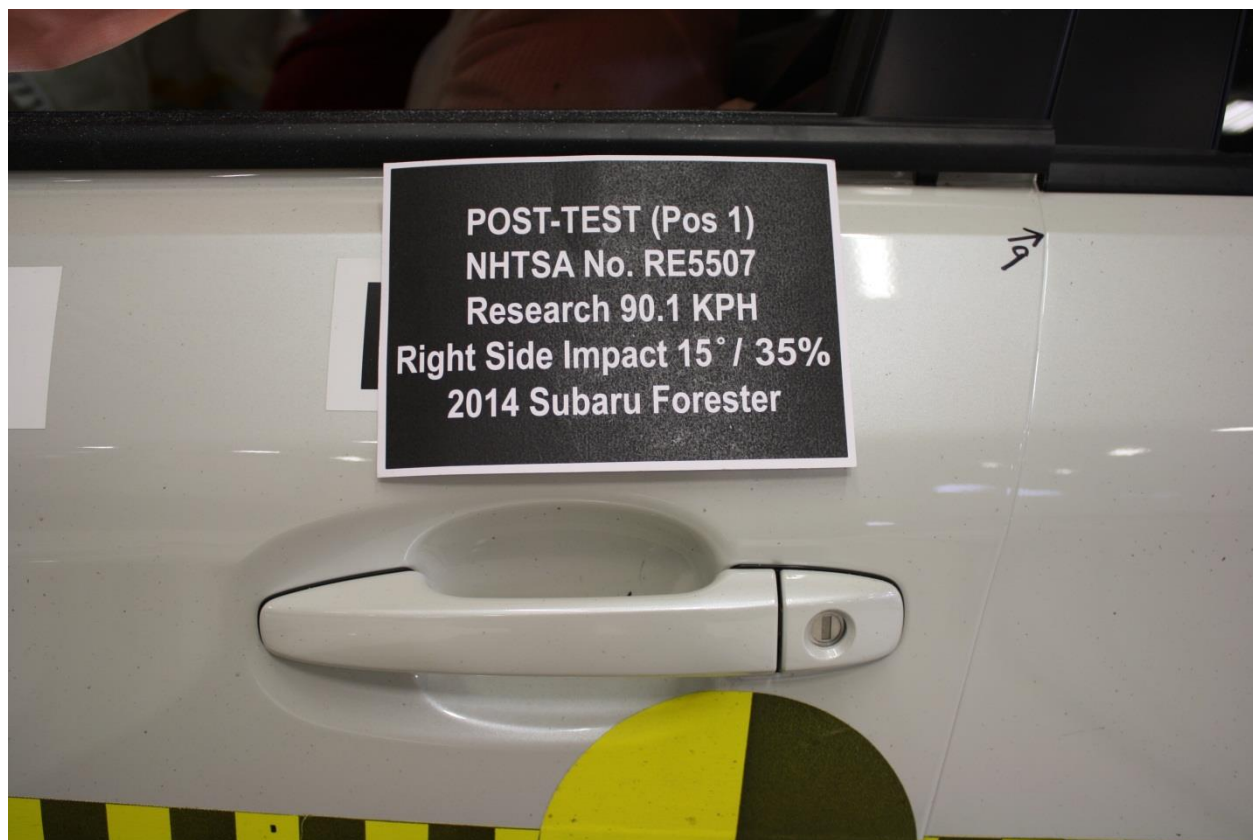
No. 026 Post-Test Close-up View of Impact Point



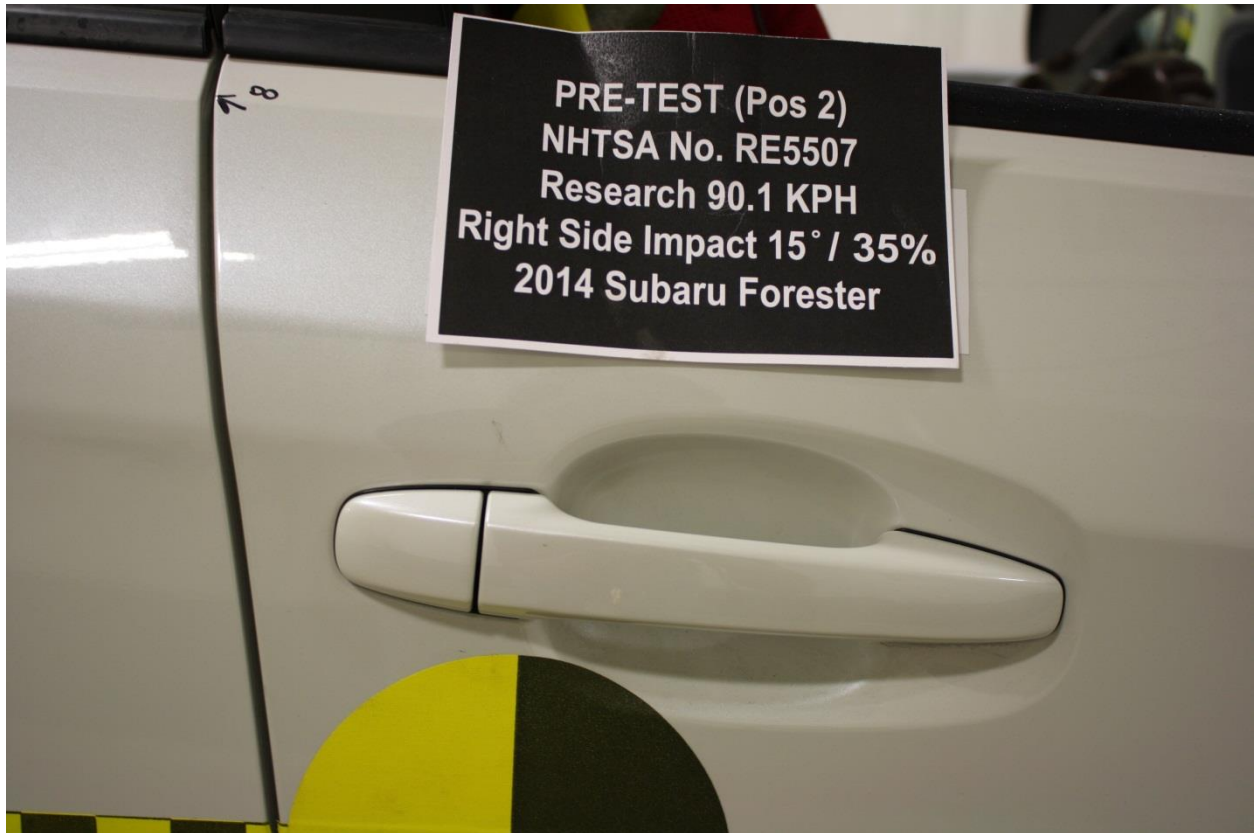
No. 027 Post-Test Vehicle Overhead View



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



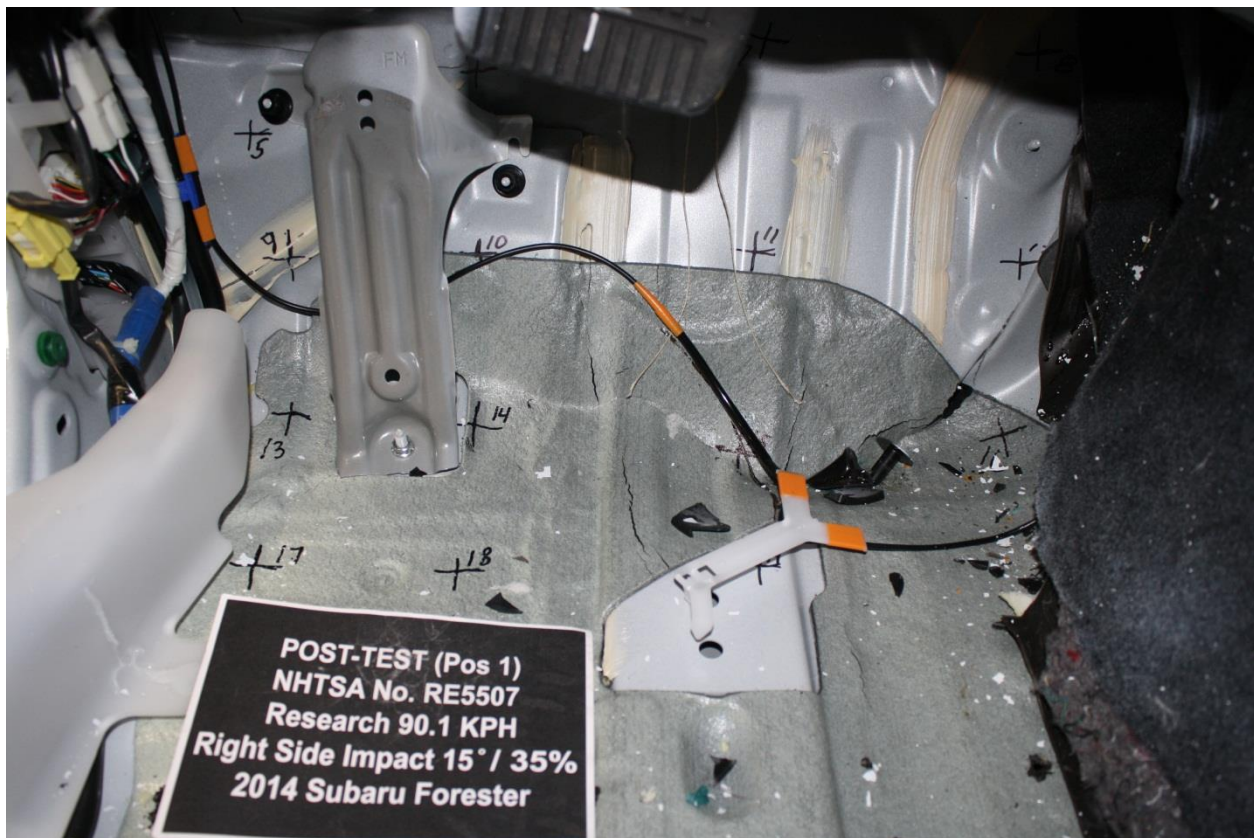
No. 048 Pre-Test View of Driver Floor pan at Left sill level, w/o carpet



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



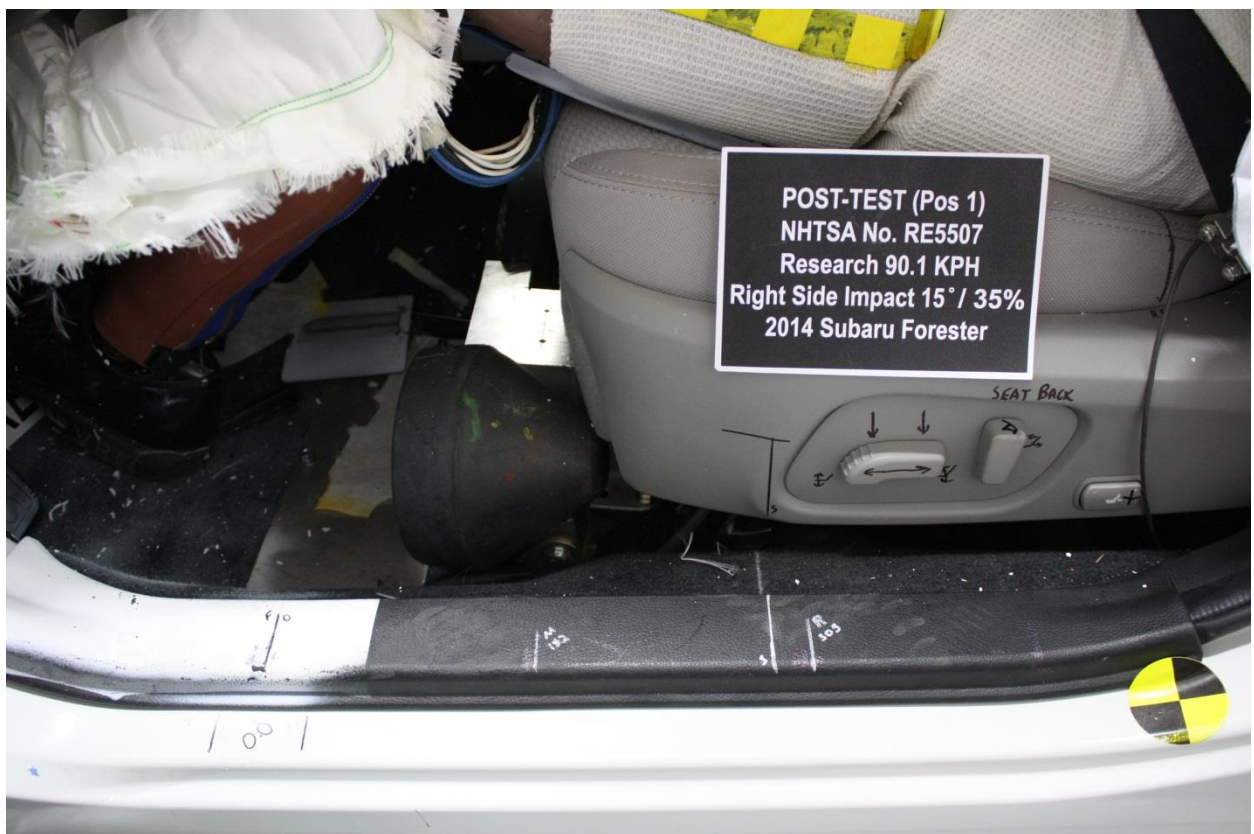
No. 061 Post-Test View of Driver Door Clearance



No. 062 Pre-Test View of Parking Brake



No. 063 Pre-Test Driver Seat Fore Aft Markings



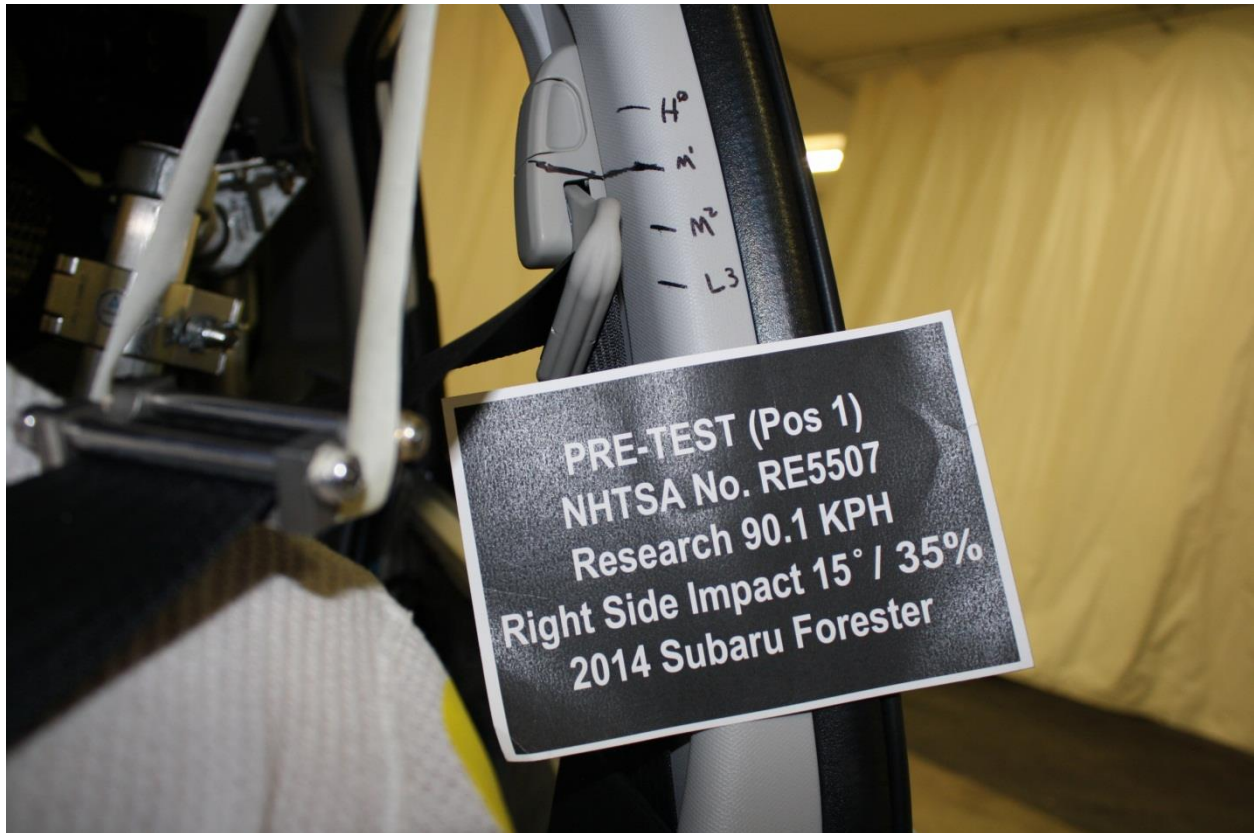
No. 064 Post-Test Driver Seat Fore Aft Markings



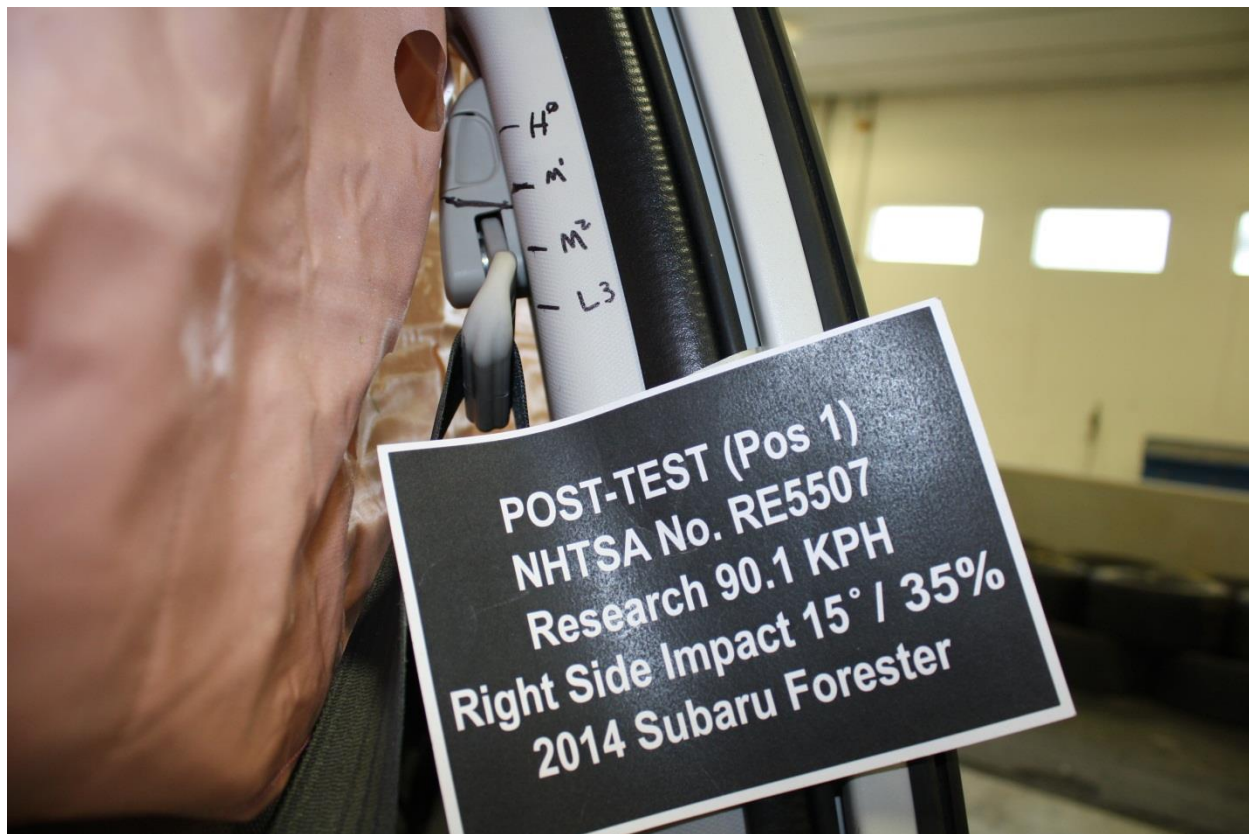
No. 065 Pre-Test Driver Seat Back Markings



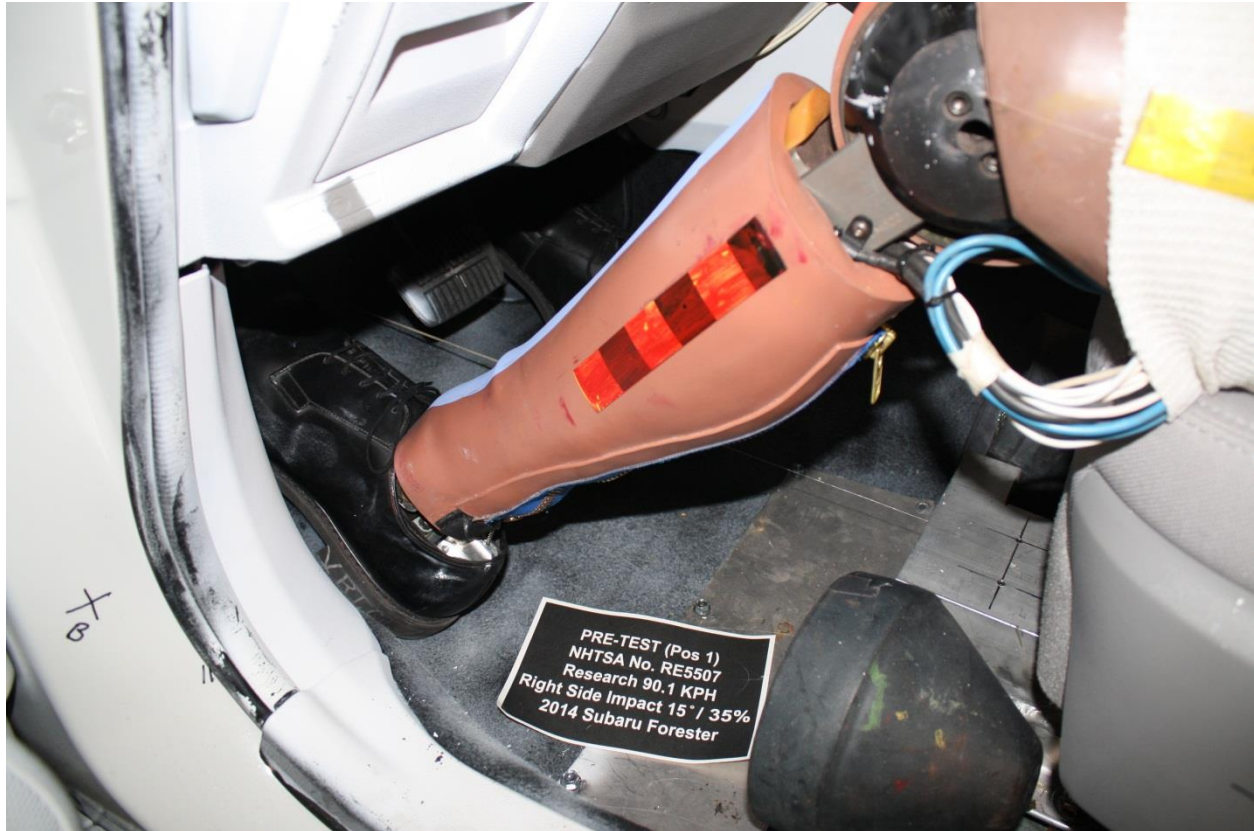
No. 066 Pre-Test Overhead View of Driver Thighs on Seat



No. 067 Pre-Test Driver Adjustable D-Ring



No. 068 Post-Test Driver Adjustable D-Ring



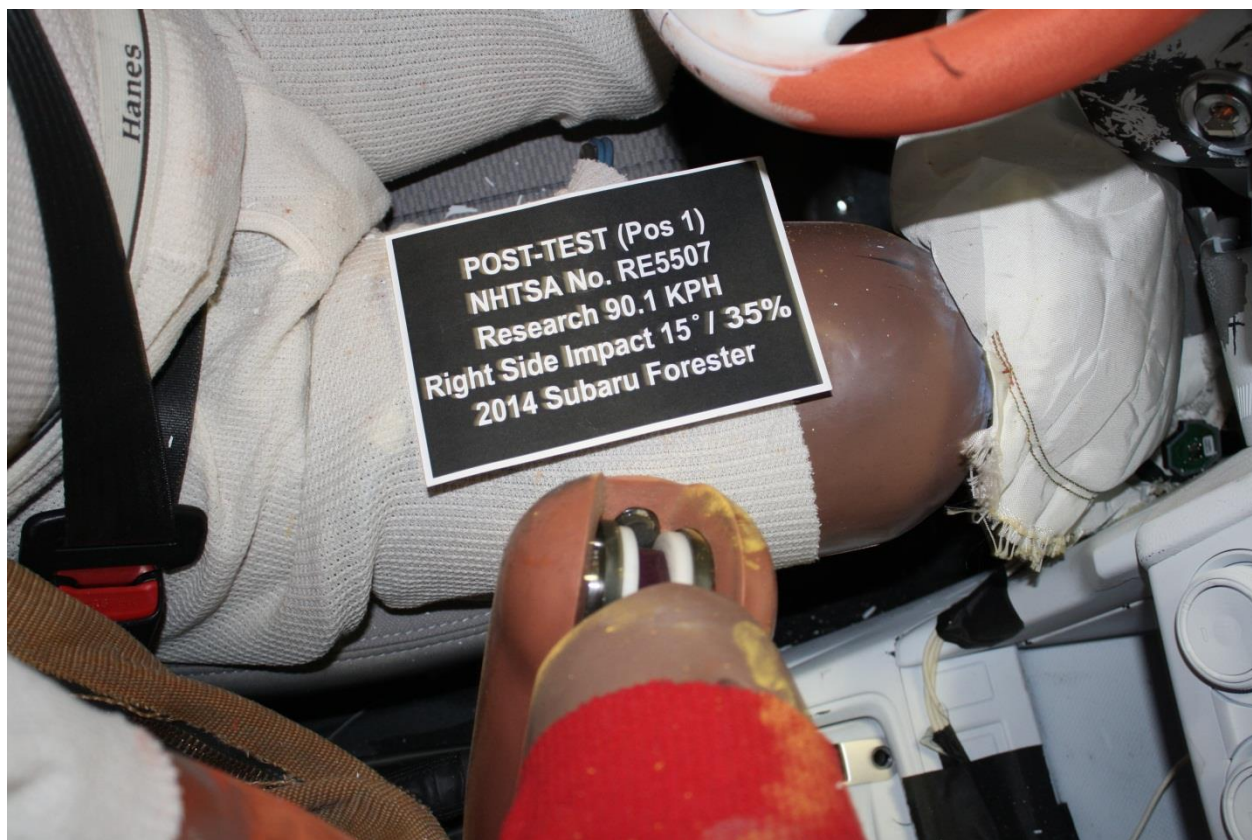
No. 069 Pre-Test Driver Feet



No. 070 Post-Test Driver Feet



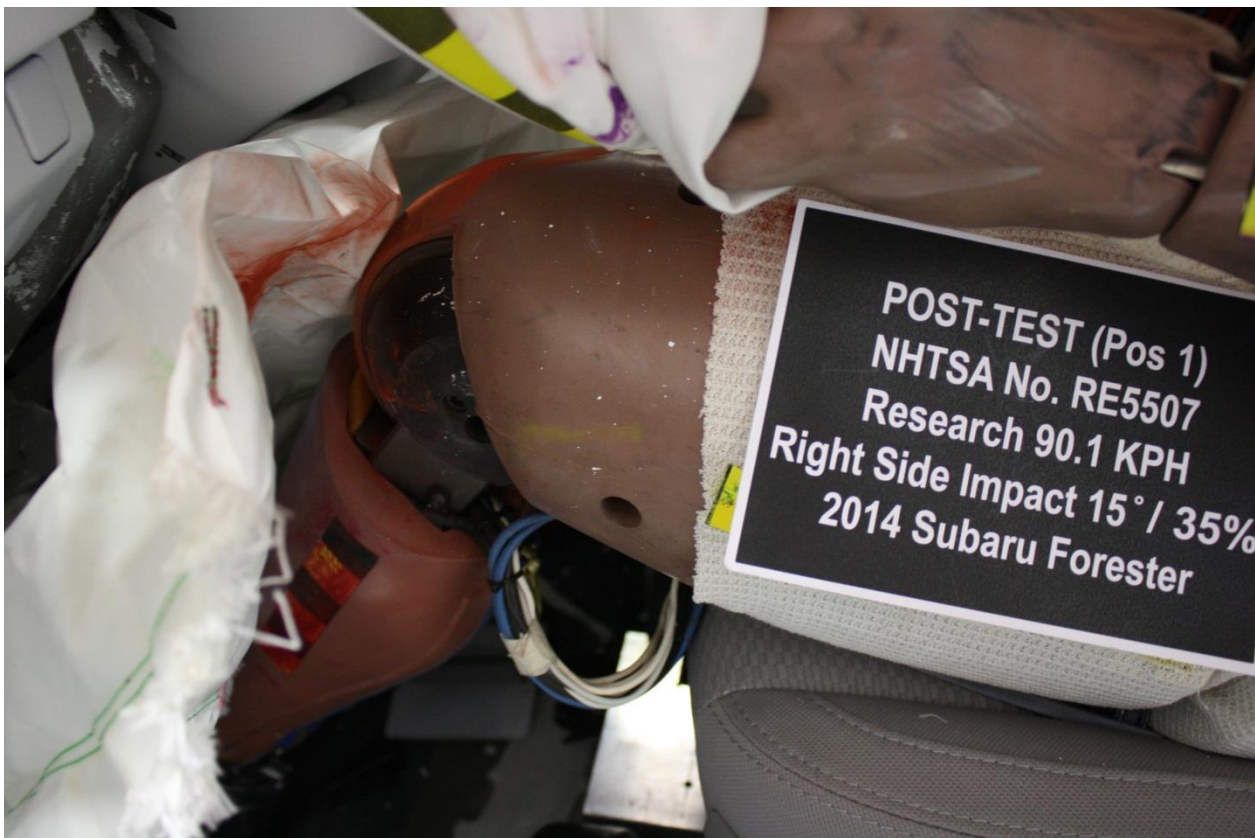
No. 071 Pre-Test View of Driver Right Knee and Bolster



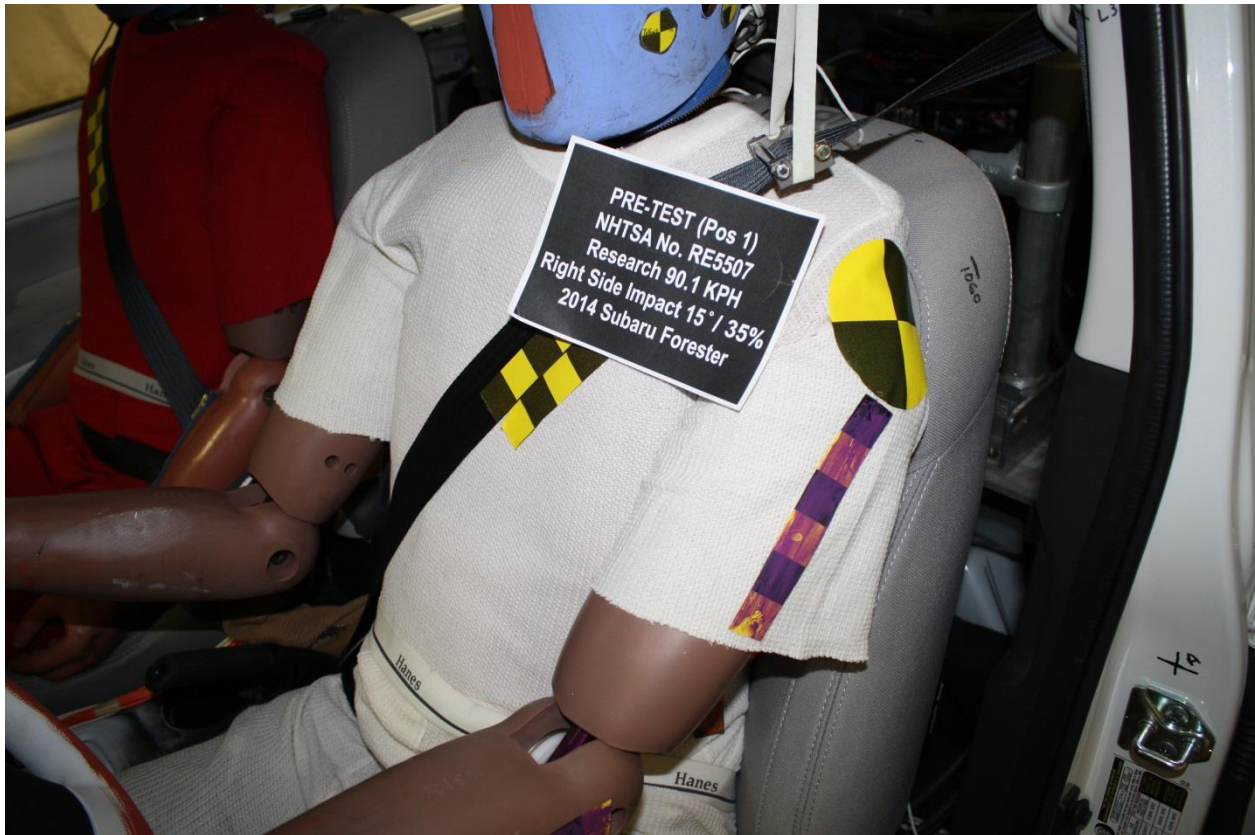
No. 072 Post-Test View of Driver Right Knee and Bolster



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



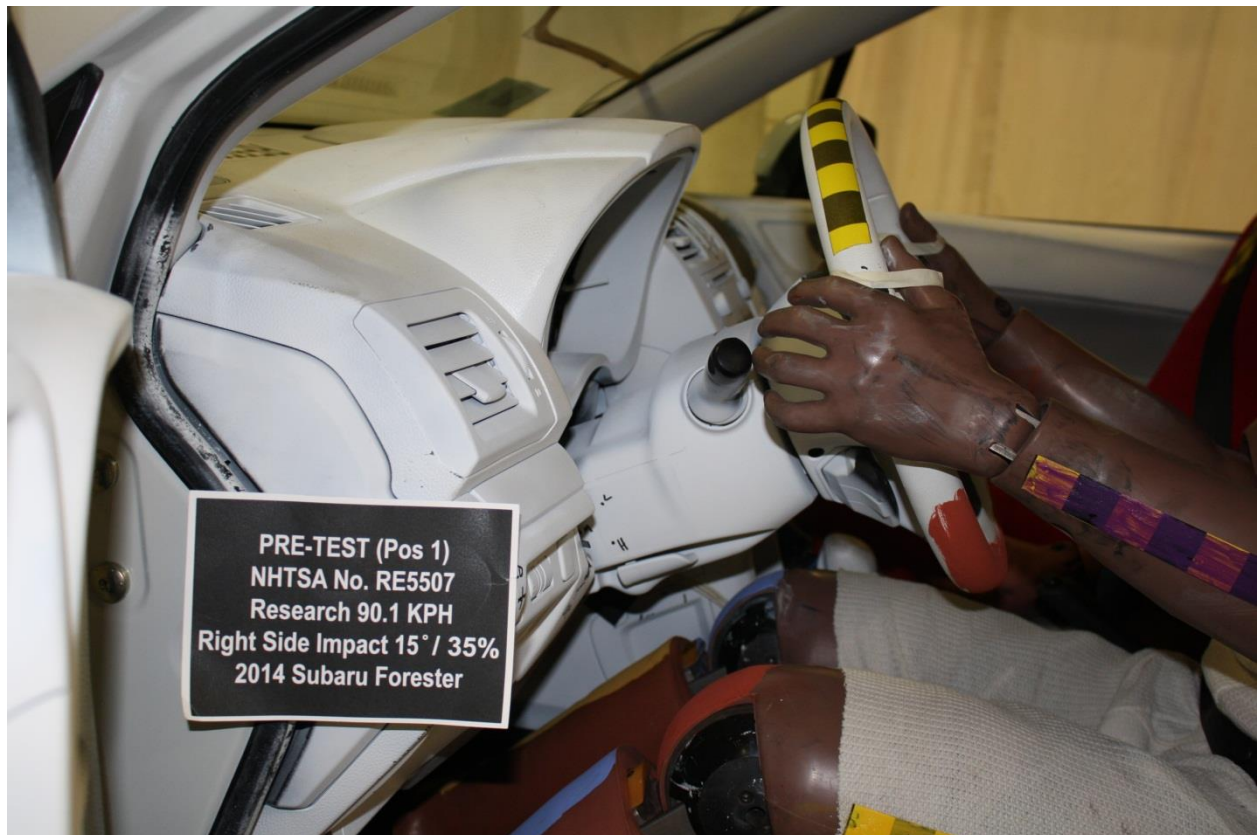
No. 074 Post-Test View of Driver Left Knee and Bolster



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



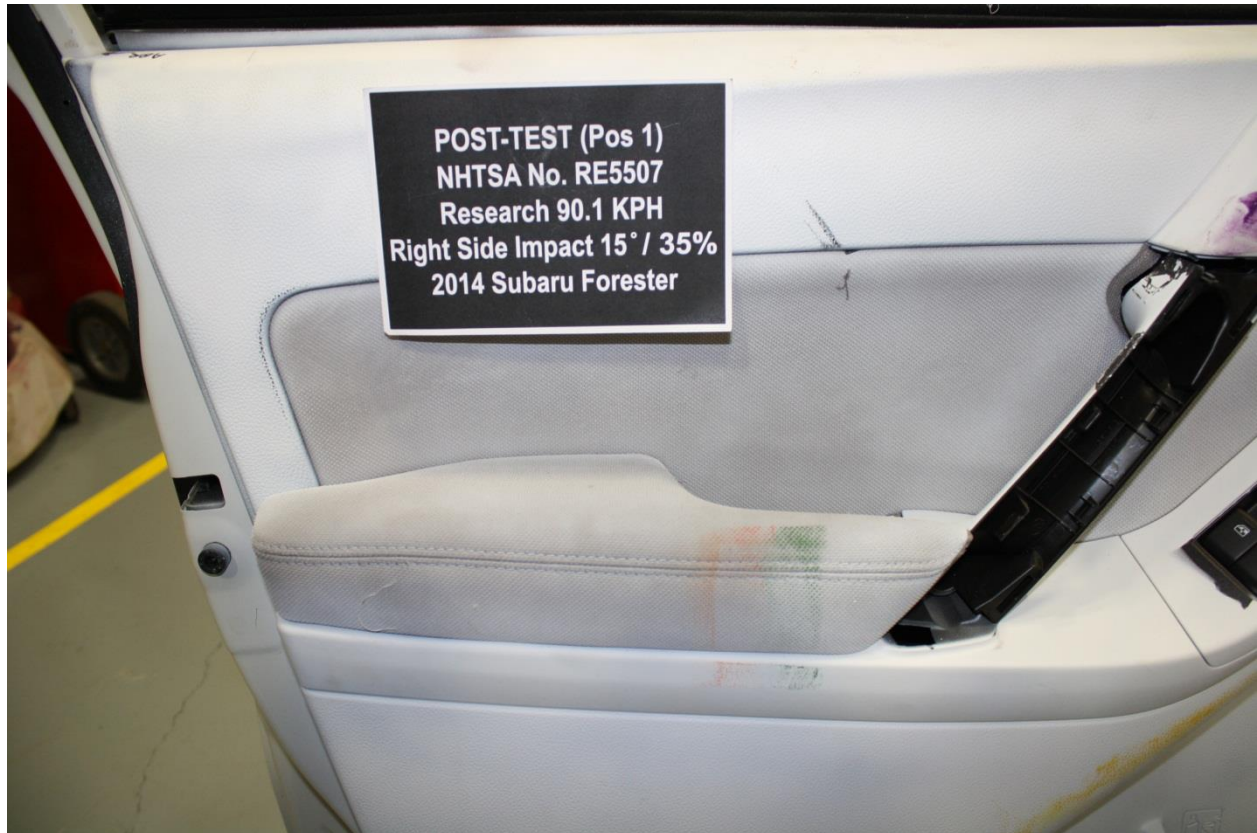
No. 078 Post-Test Left Side View of Steering Wheel set position



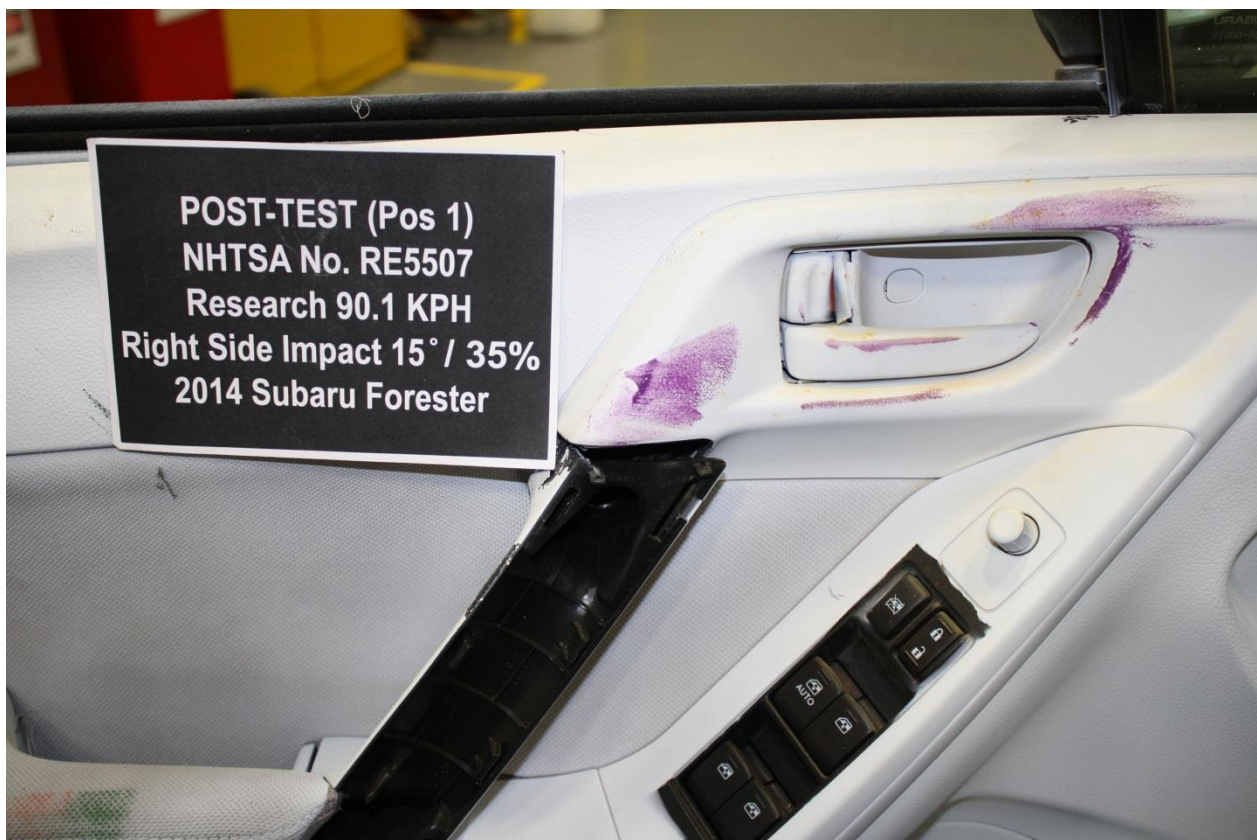
No. 079 Post-Test View of Driver Head Contact with Front Airbag



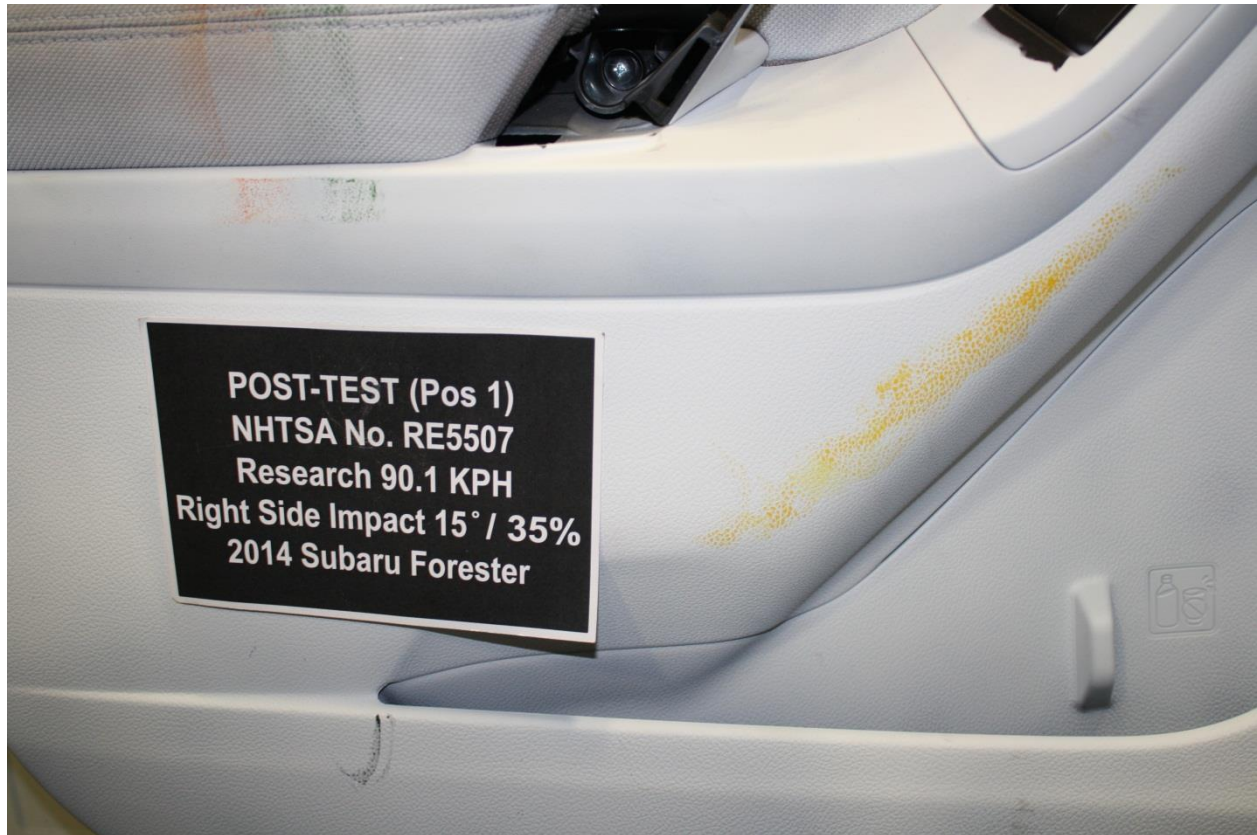
No. 080 Post-Test View of Driver Head Contact with Curtain Airbag



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



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



No. 081b Post-Test View of Driver Body 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 right sill level, w/carpet



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



No. 093 Post-Test View of Passenger Floor pan at right 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



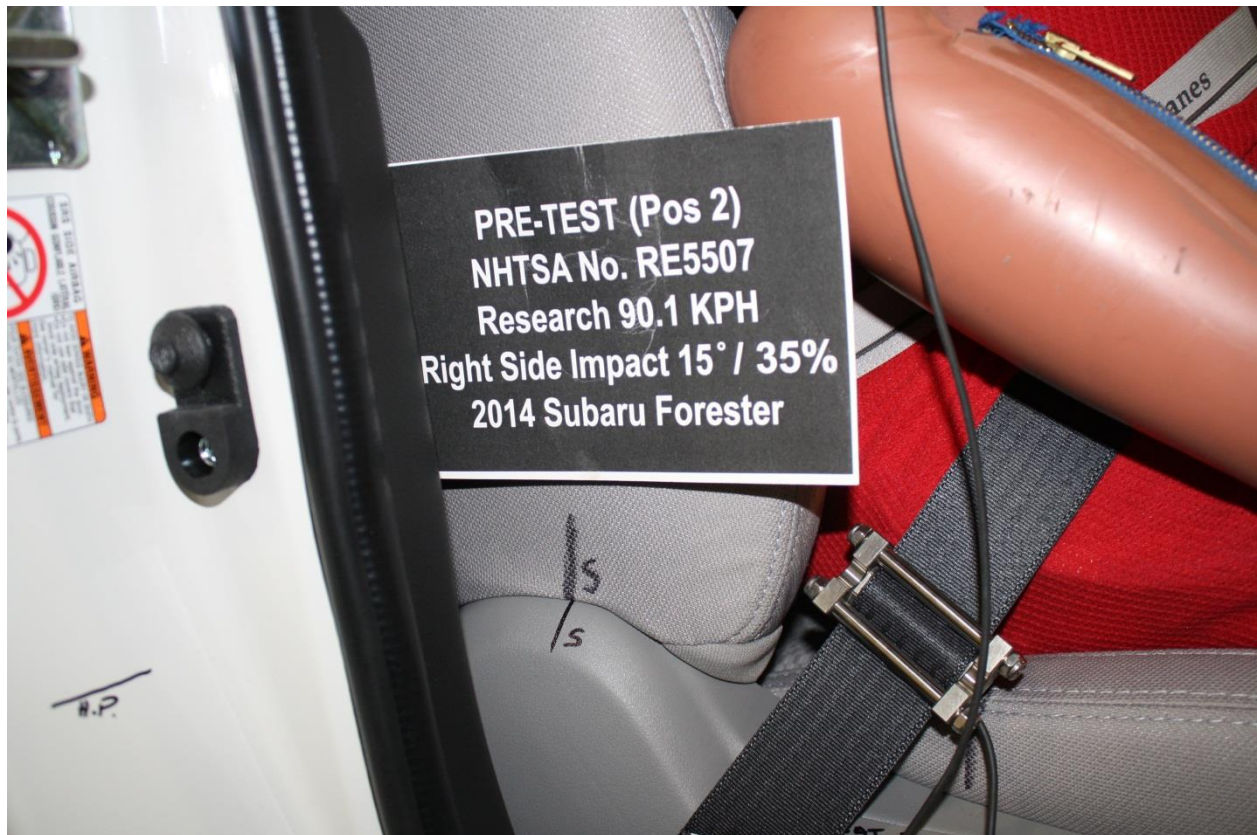
No. 105 Post-Test View of Passenger Door Clearance



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



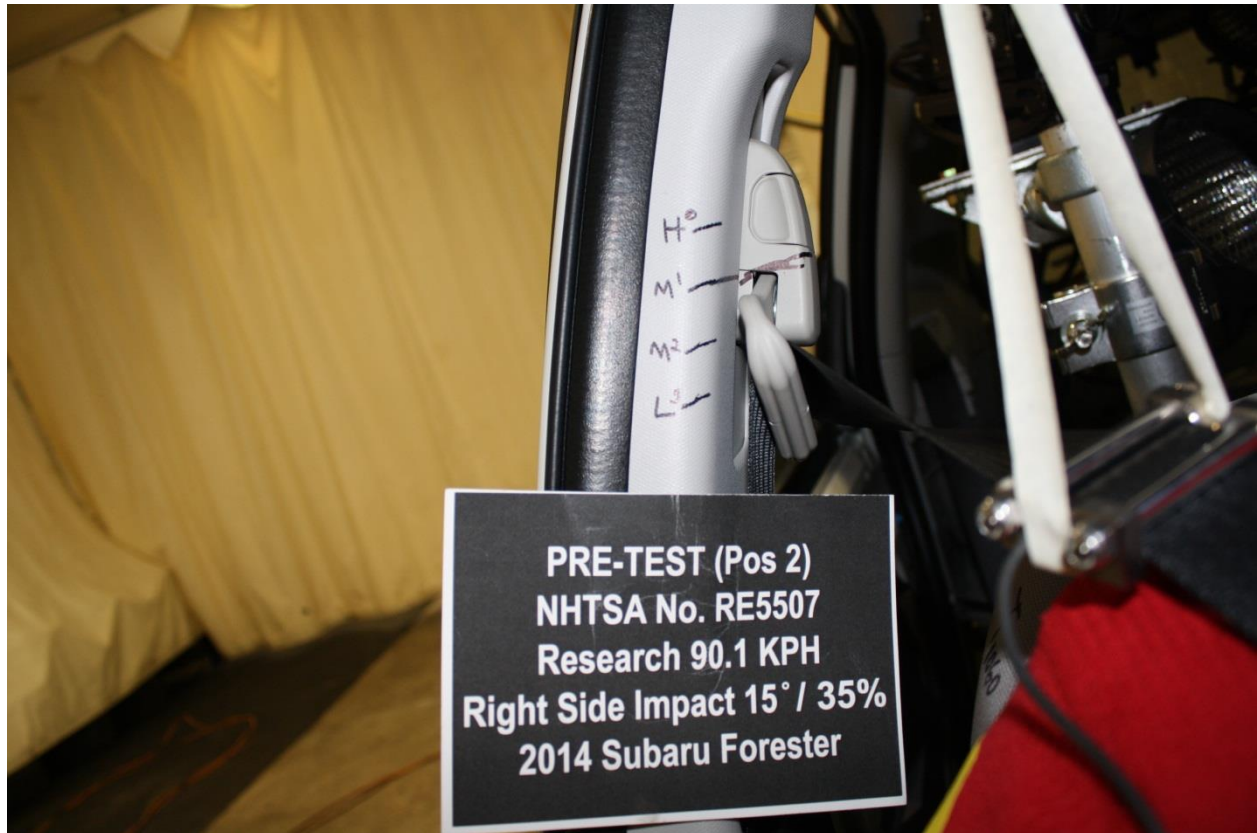
No. 107 Post-Test Passenger Seat Fore-Aft Markings



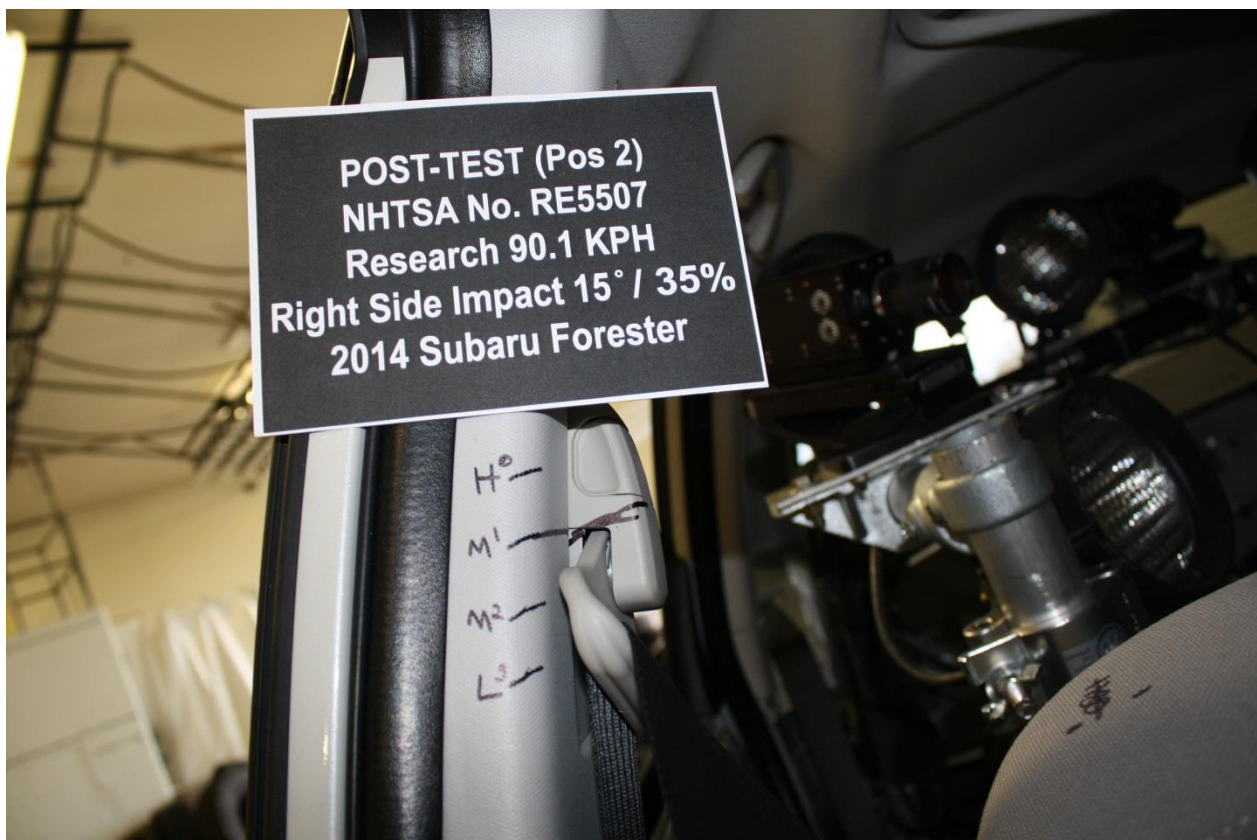
No. 108 Pre-Test Passenger Seat Back Markings



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



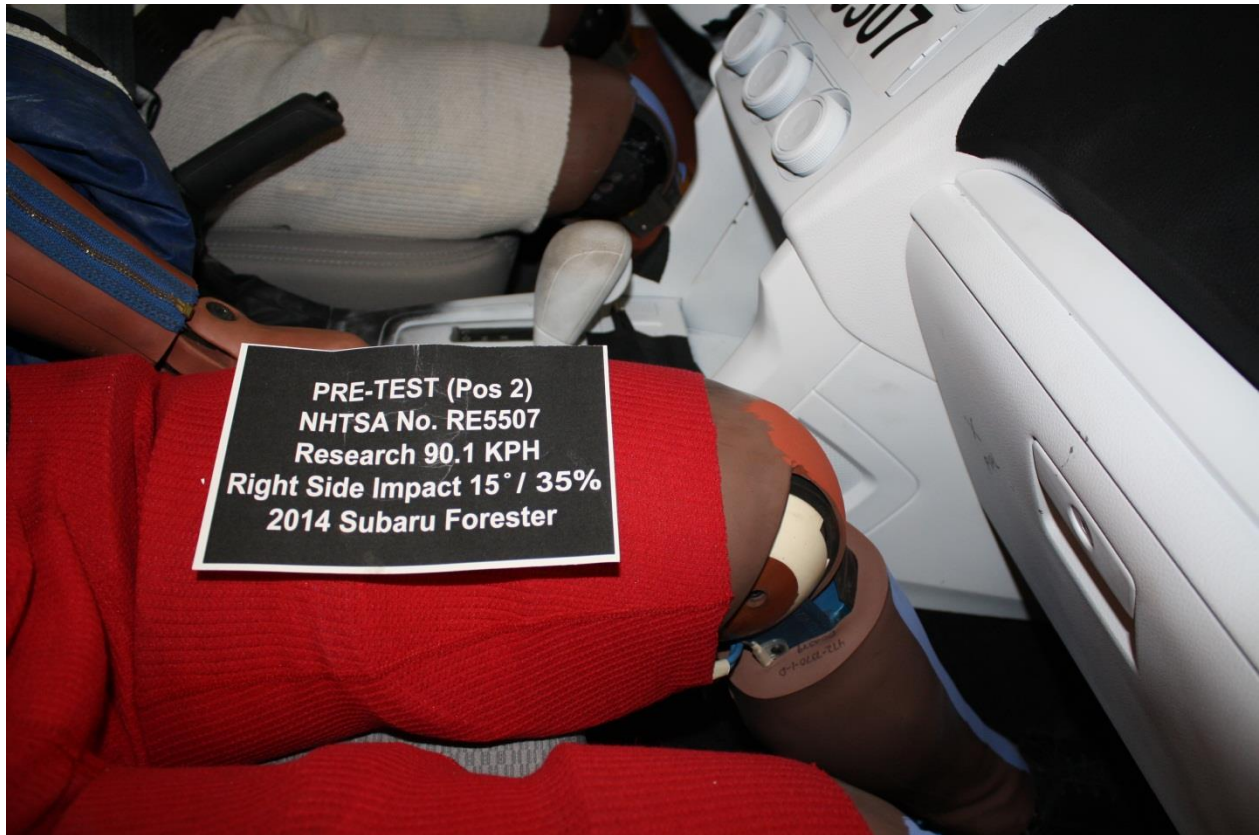
No. 113 Post-Test View of Passenger Feet



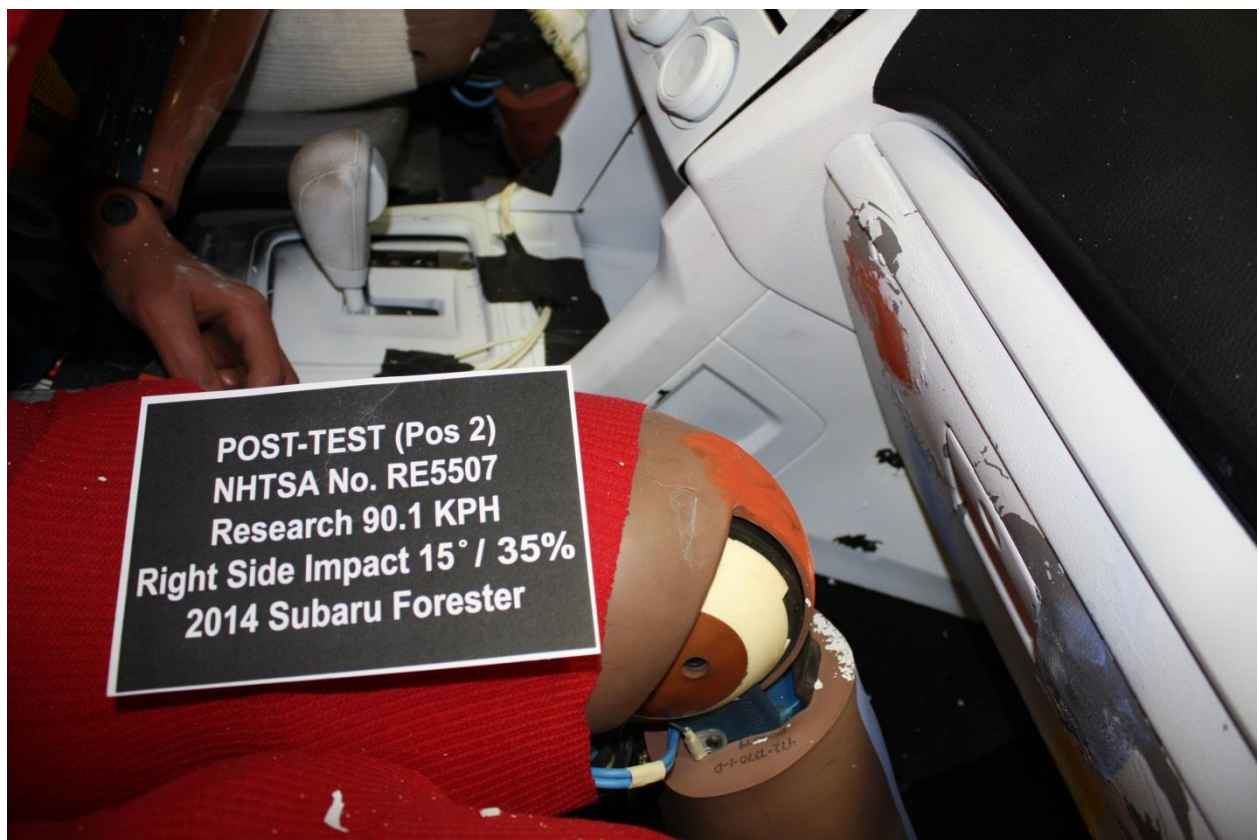
No. 114 Pre-Test View of Passenger Right Knee and Bolster



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



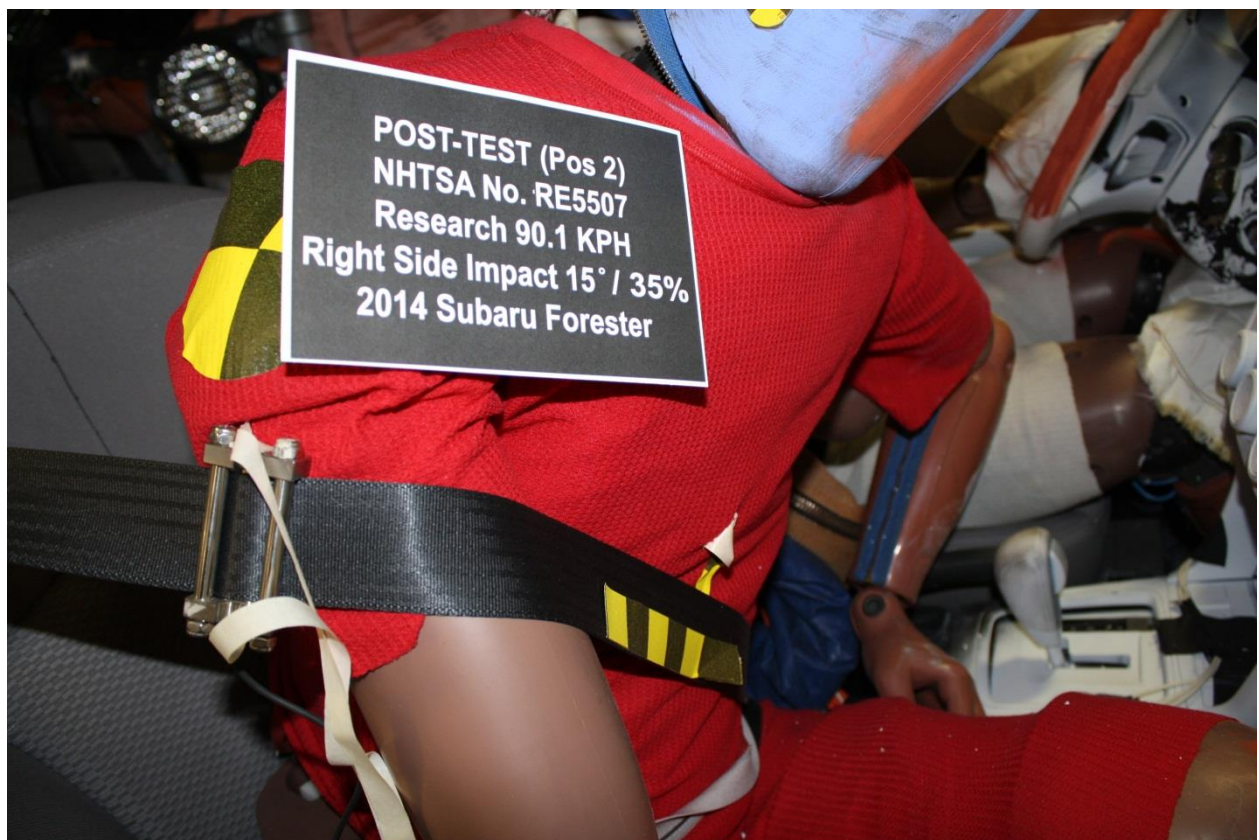
No. 116 Pre-Test View of Passenger Left Knee and Bolster



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



No. 118 Pre-Test View of Passenger Abdomen



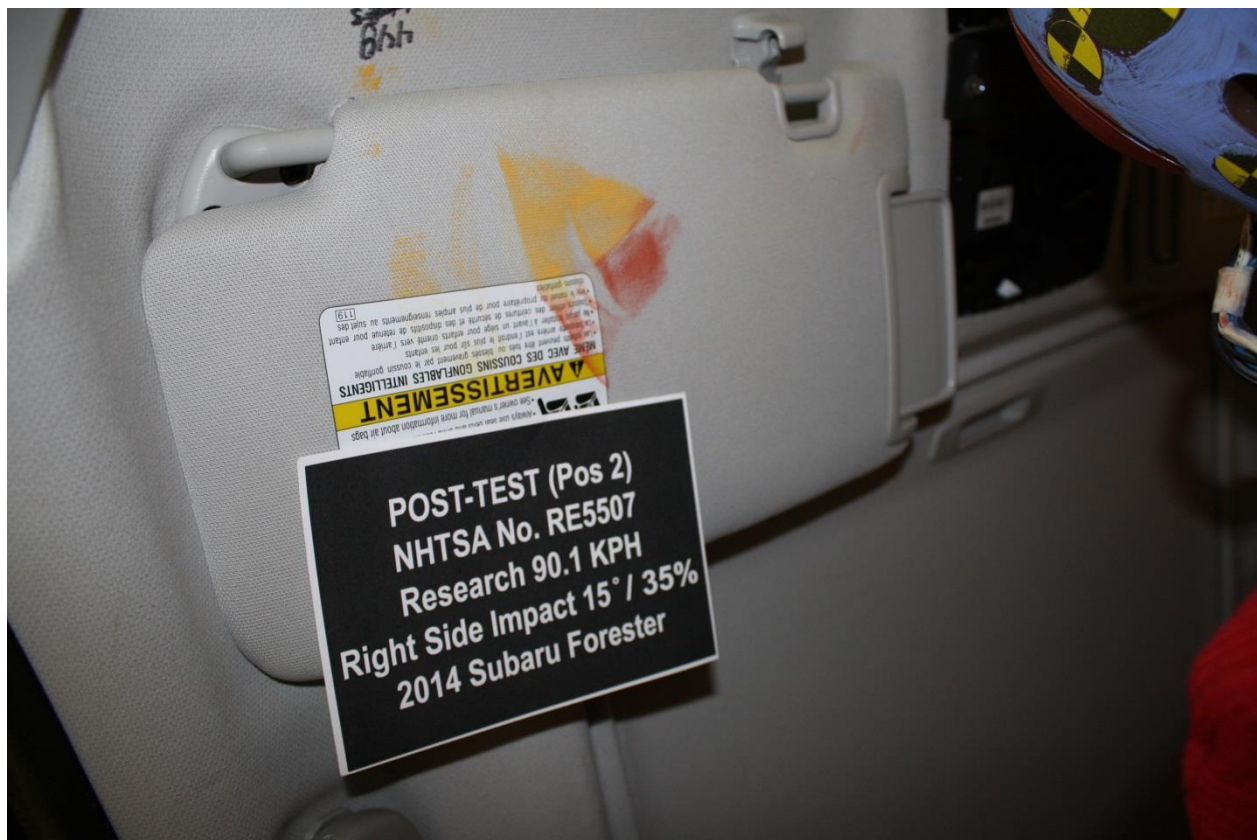
No. 119 Post-Test View of Passenger Abdomen



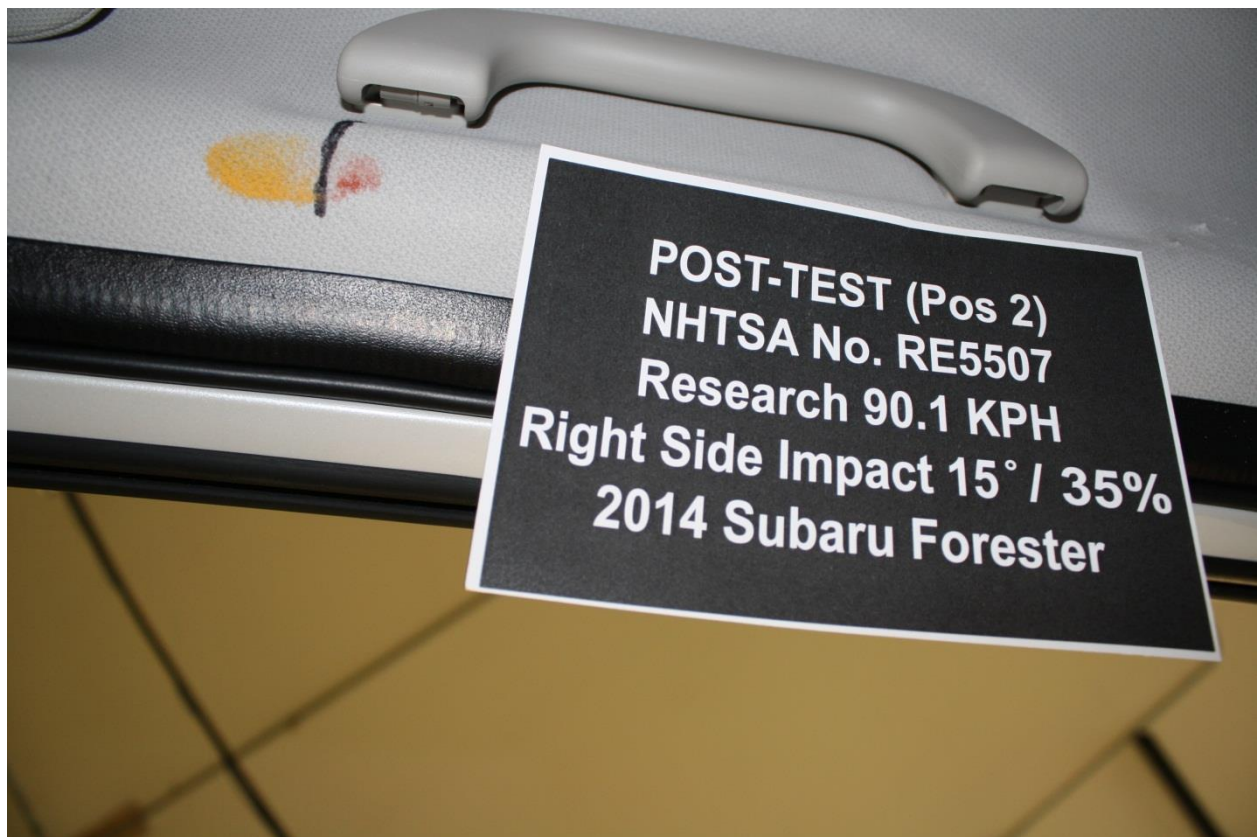
No. 120 Post-Test View of Passenger Head contact with Airbag – Front

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



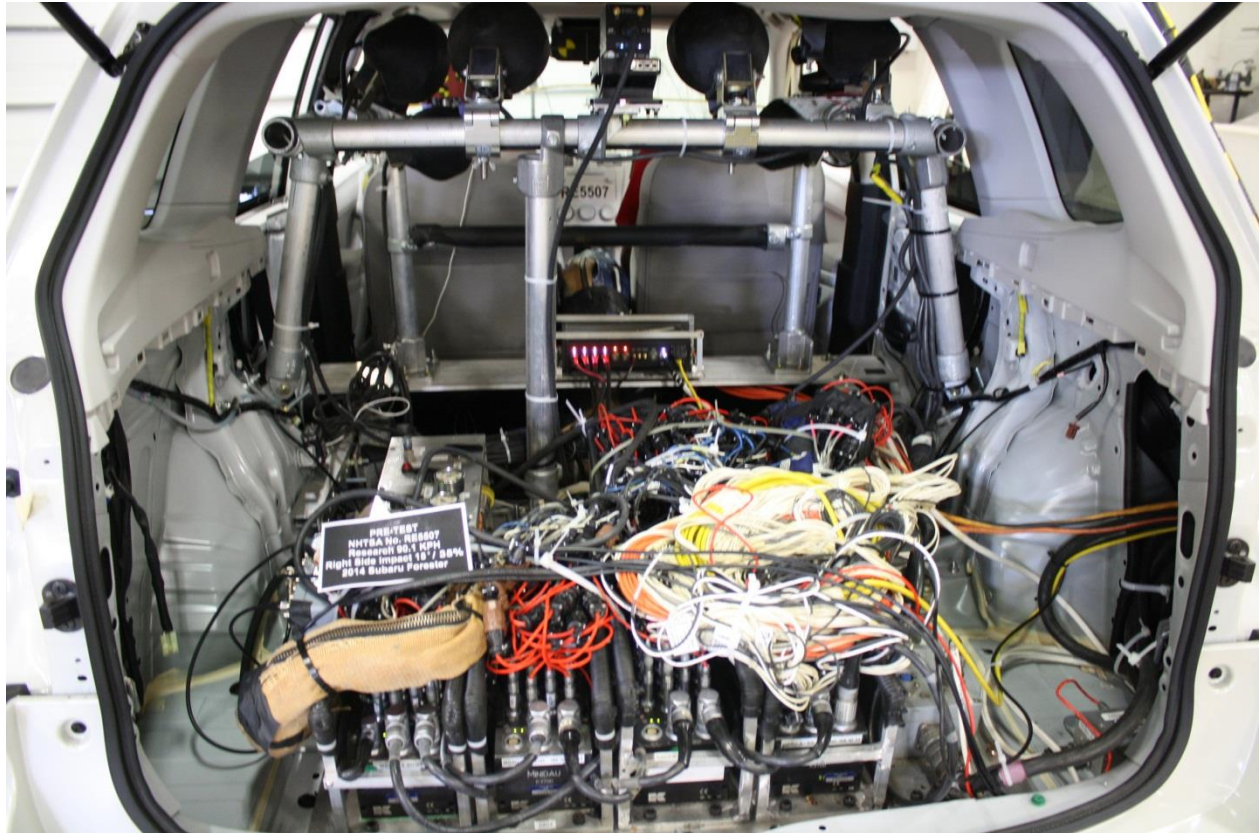
No. 121a Post-Test View of Passenger Head contact with Interior

Photo Not Applicable

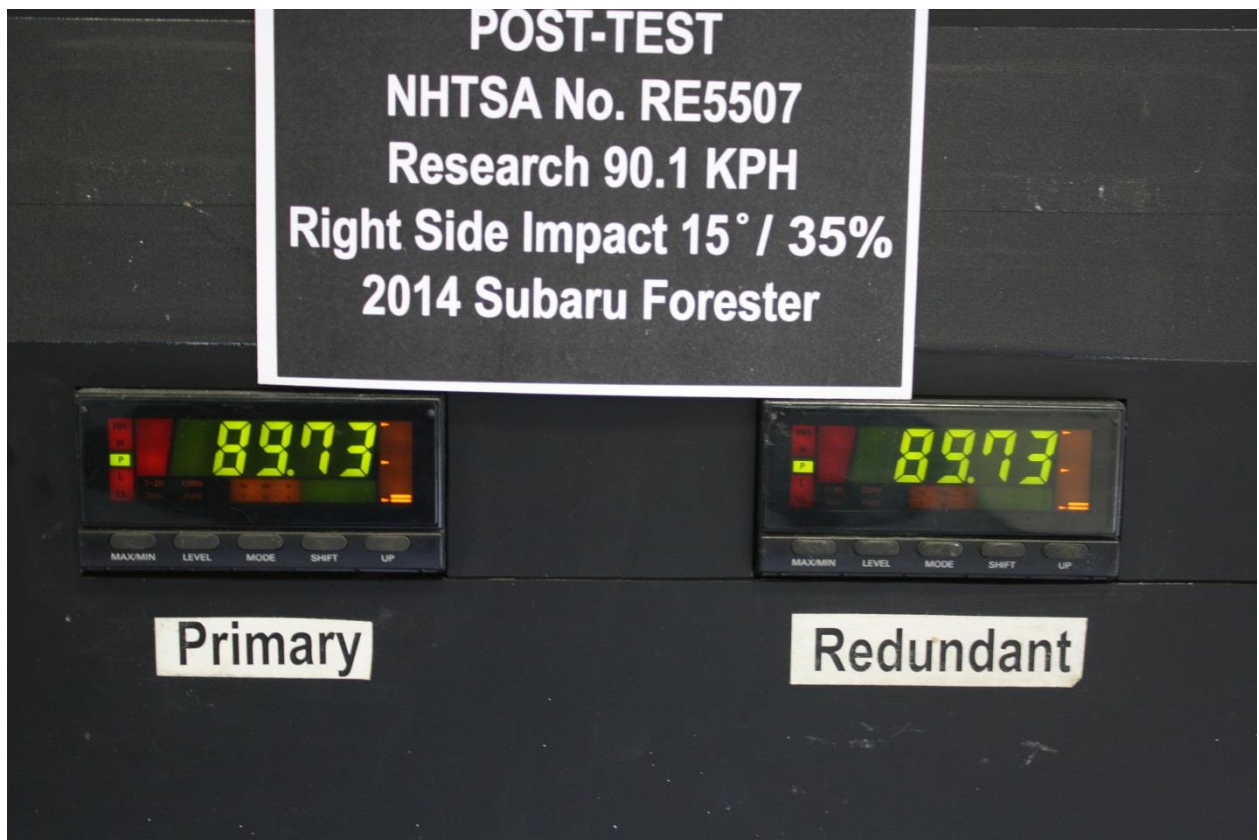
No. 121b Post-Test View of Passenger Head contact with Interior



No. 122 Post-Test Passenger Contact With Glovebox



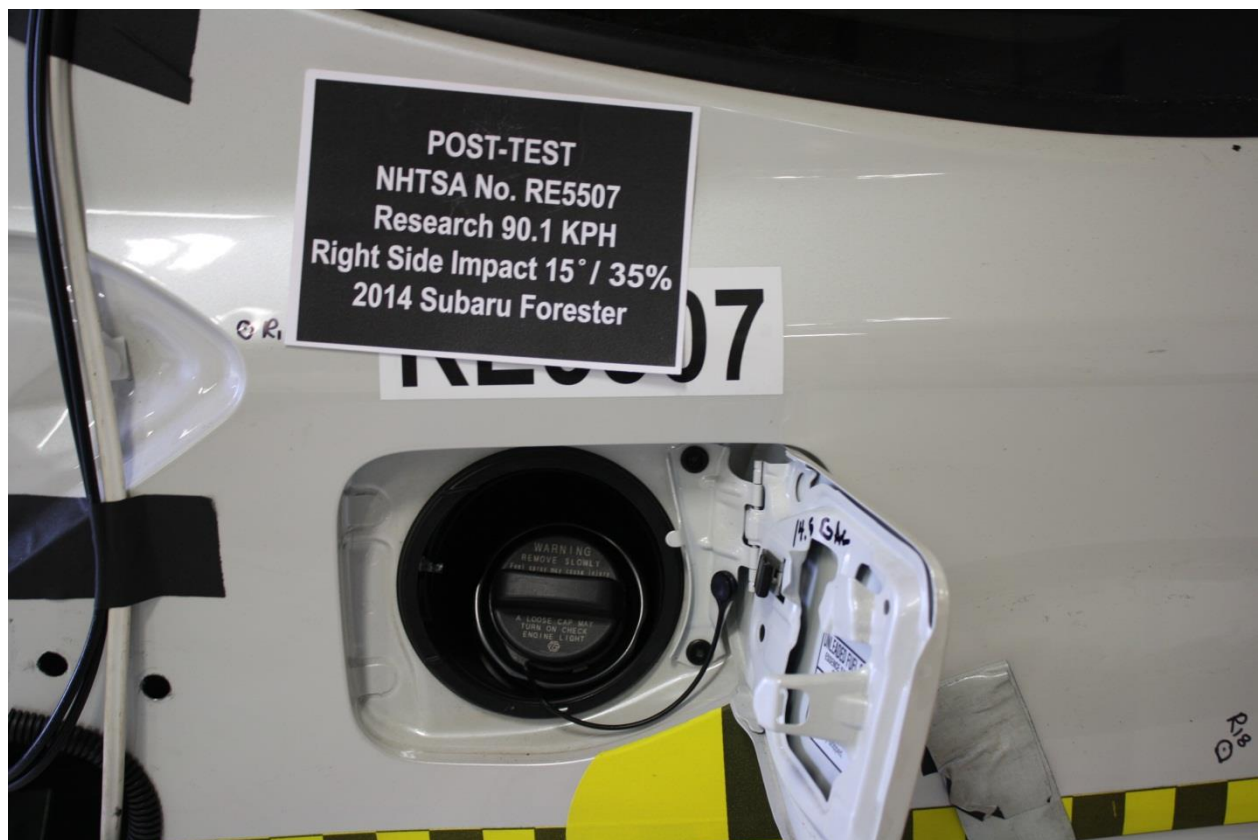
No. 123 Pre-Test Ballast Locations



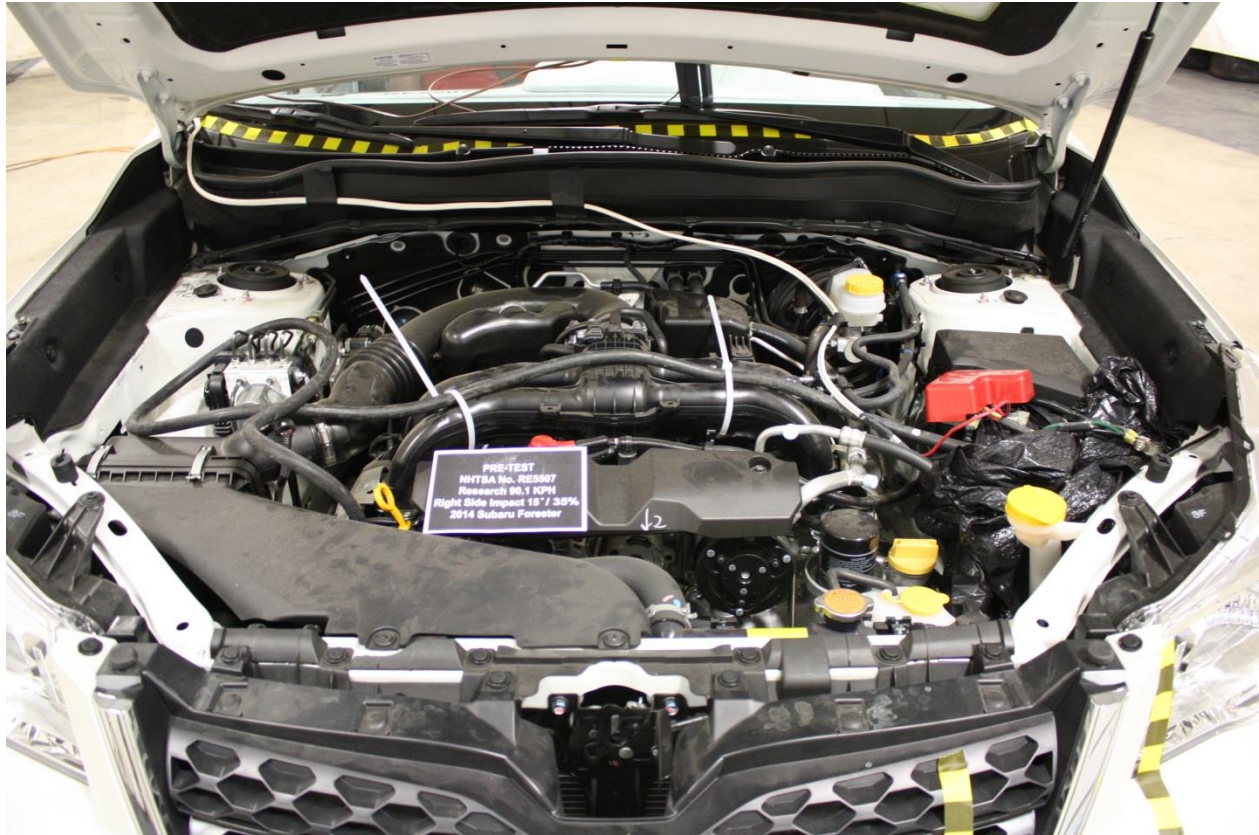
No. 124 Post-Test Speed Trap Readout



No. 125 Pre-Test View of Fuel Filler Cap



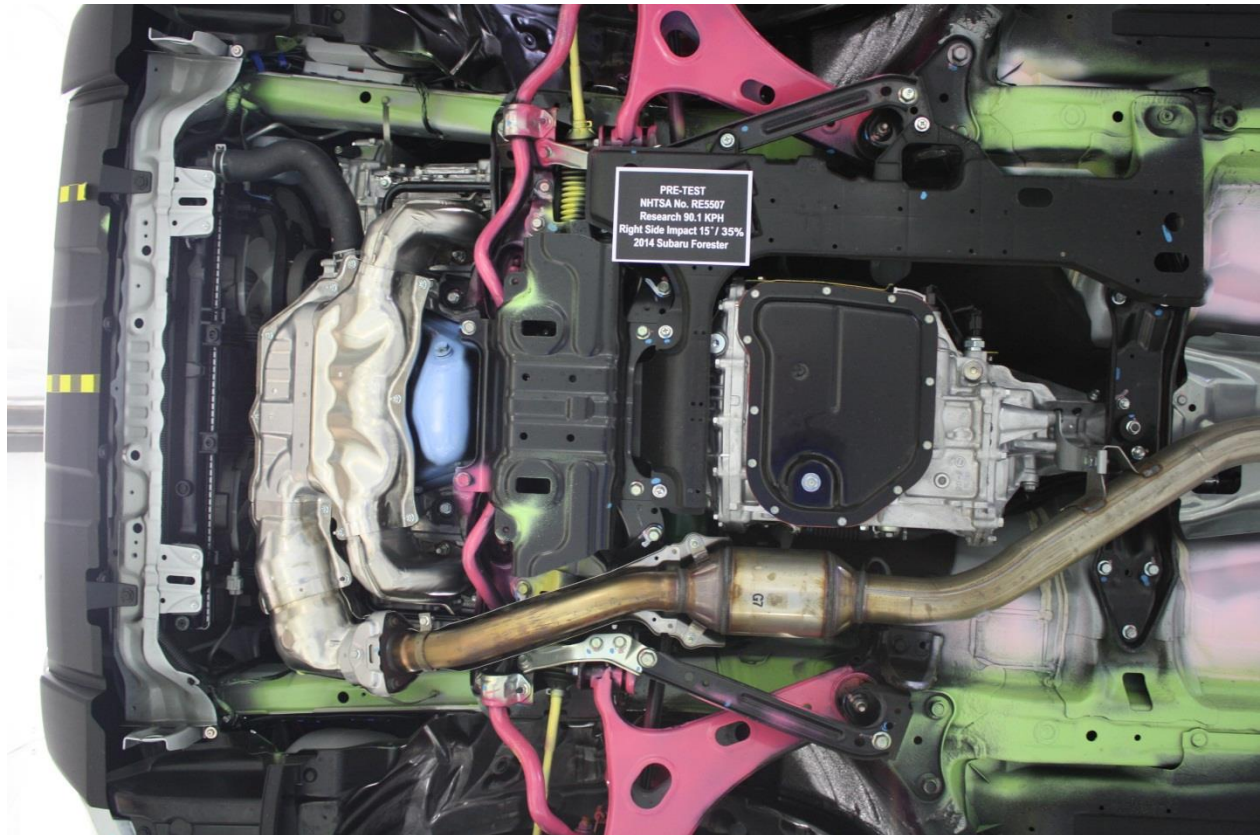
No. 126 Post-Test View of Fuel Filler Cap



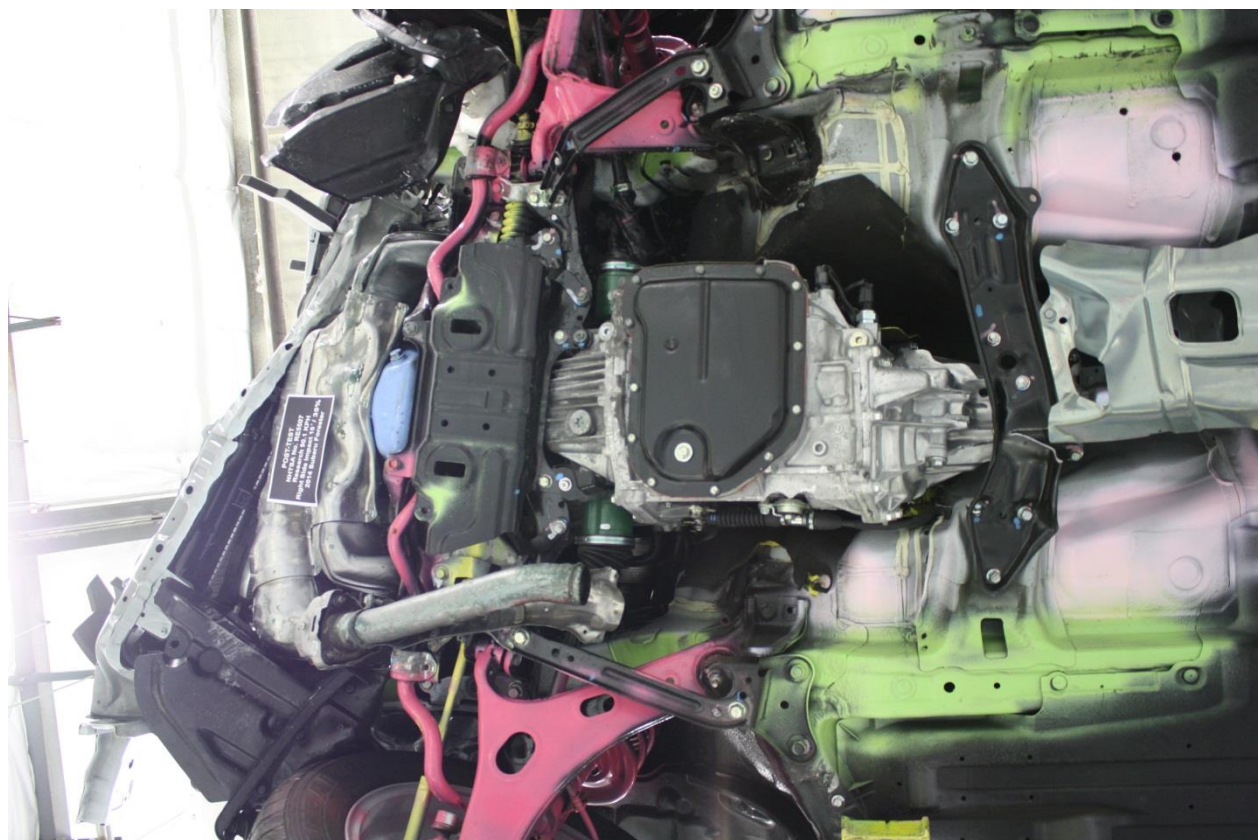
No. 127 Pre-Test Engine Compartment View



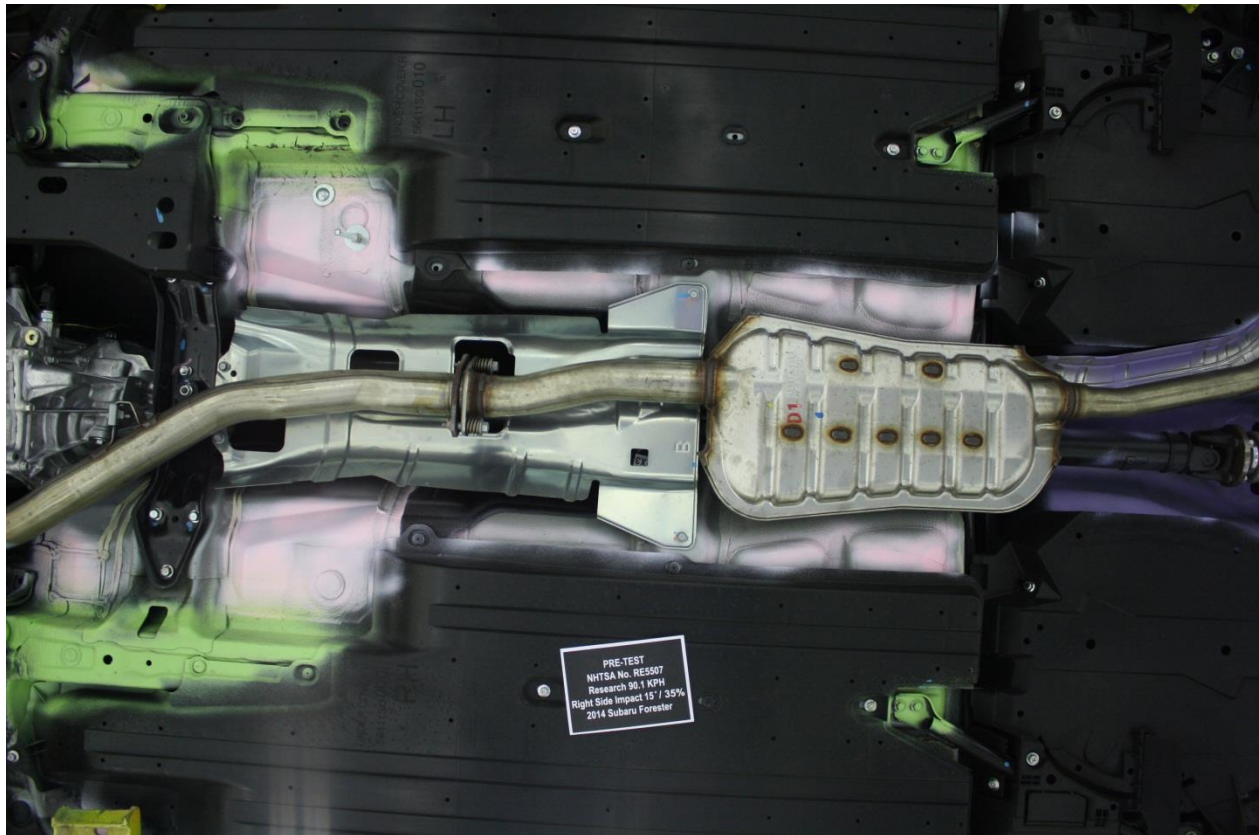
No. 128 Post-Test Engine Compartment View



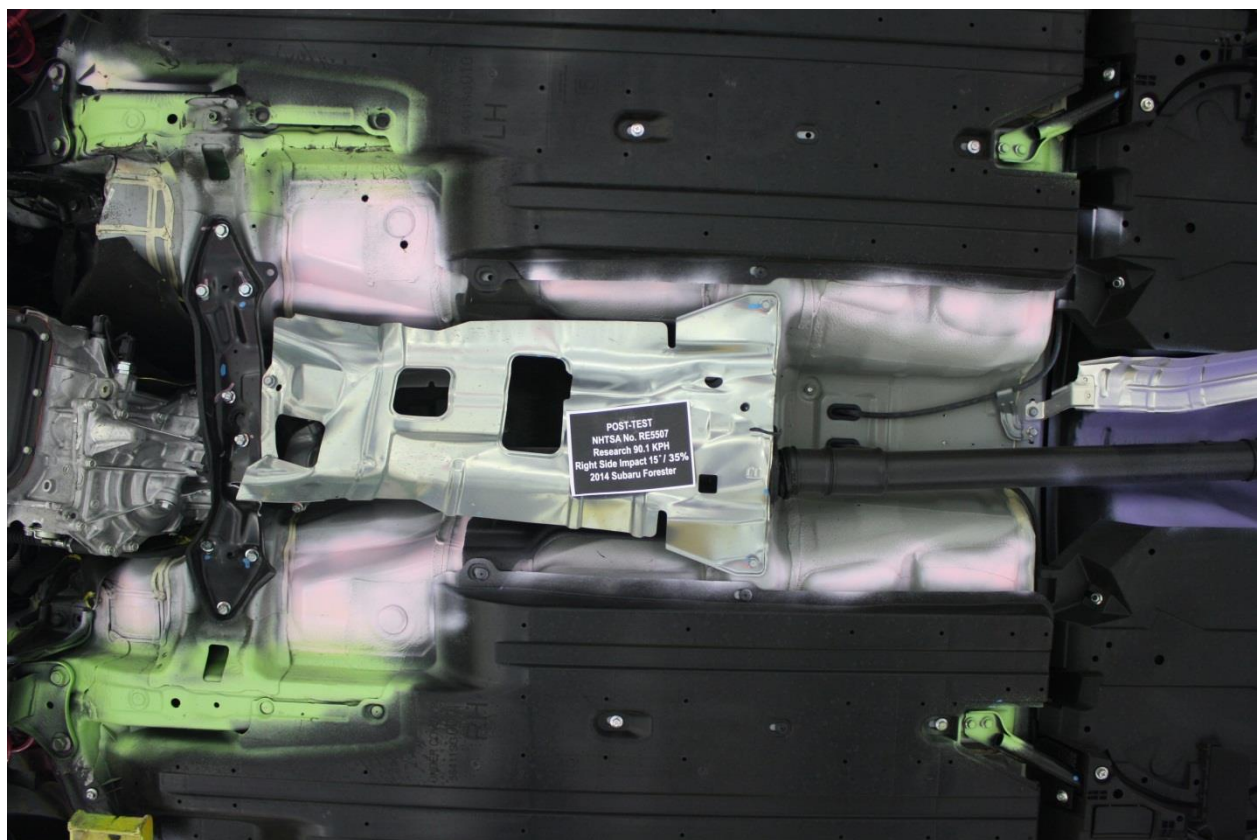
No. 129 Pre-Test View of Front Underbody (perpendicular to vehicle)



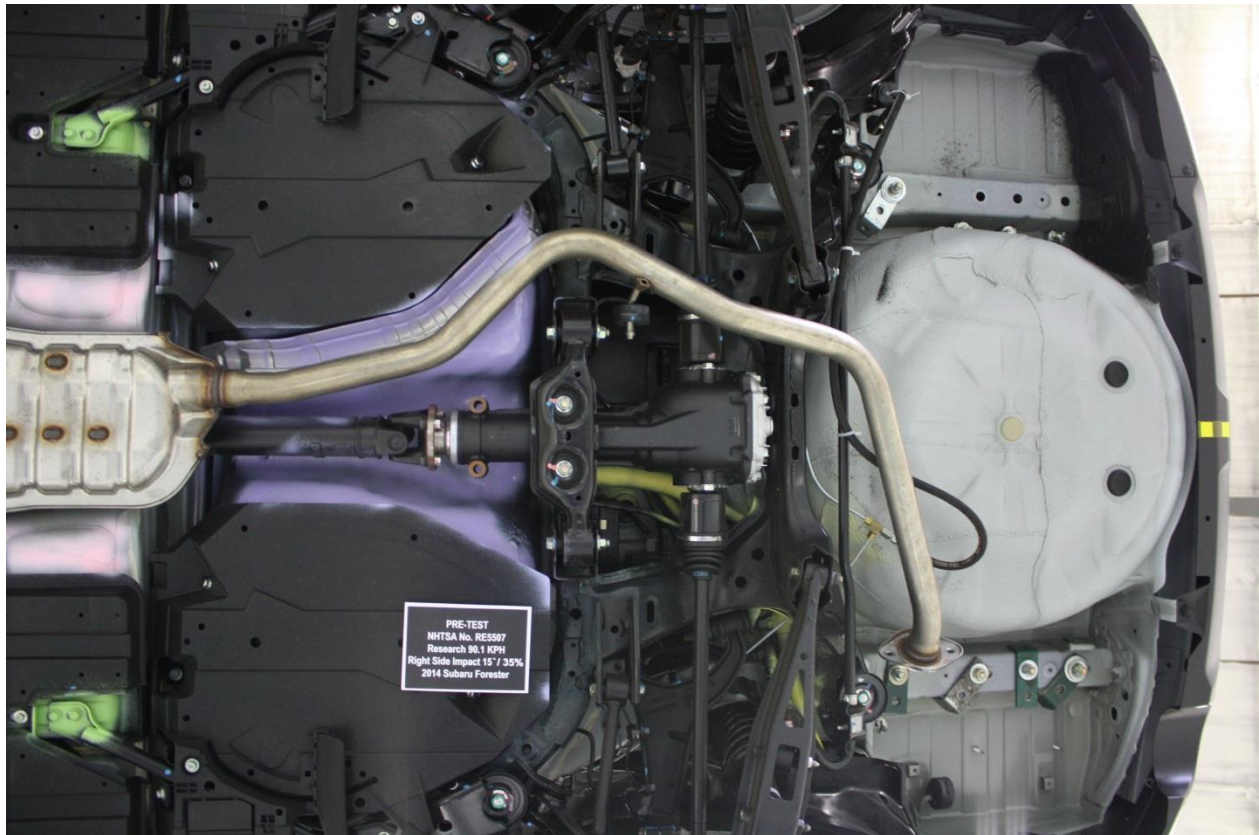
No. 130 Post-Test View of Front Underbody (perpendicular to vehicle)



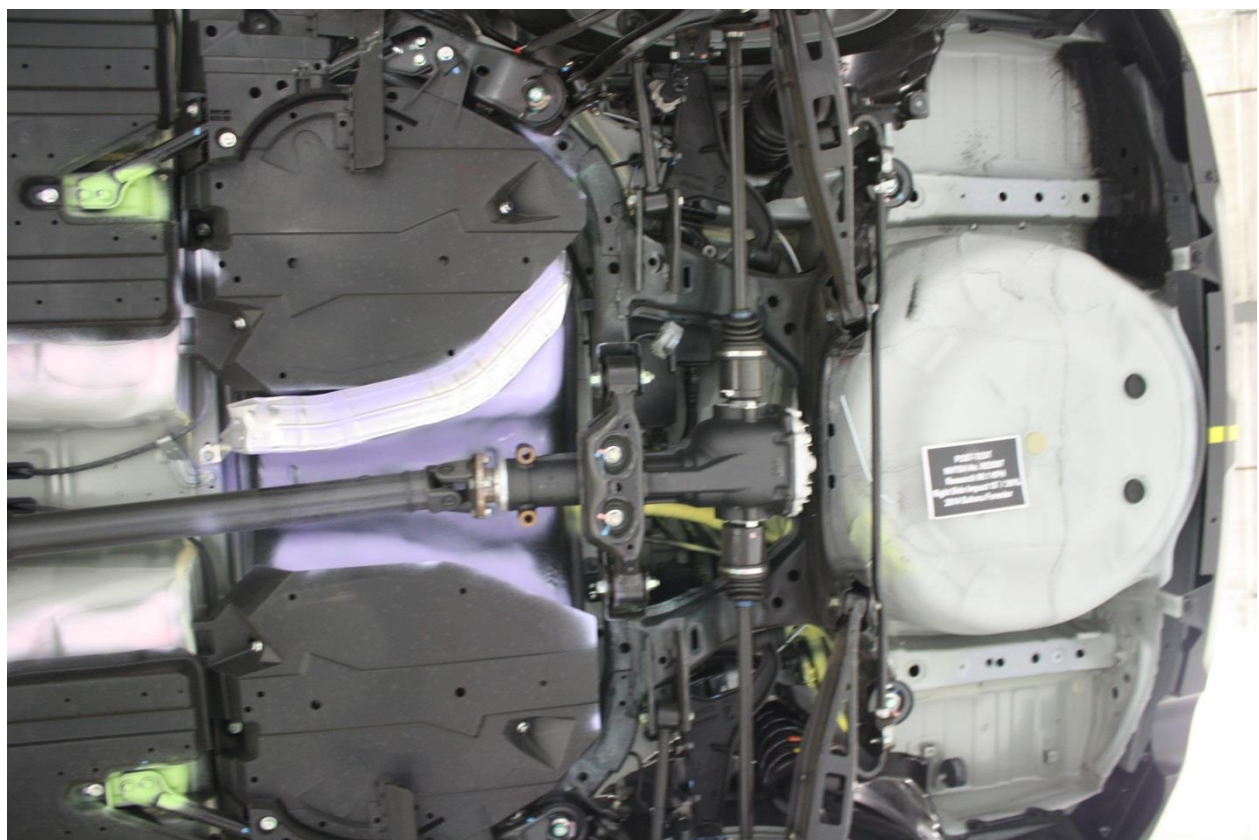
No. 131 Pre-Test View of Mid Underbody (perpendicular to vehicle)



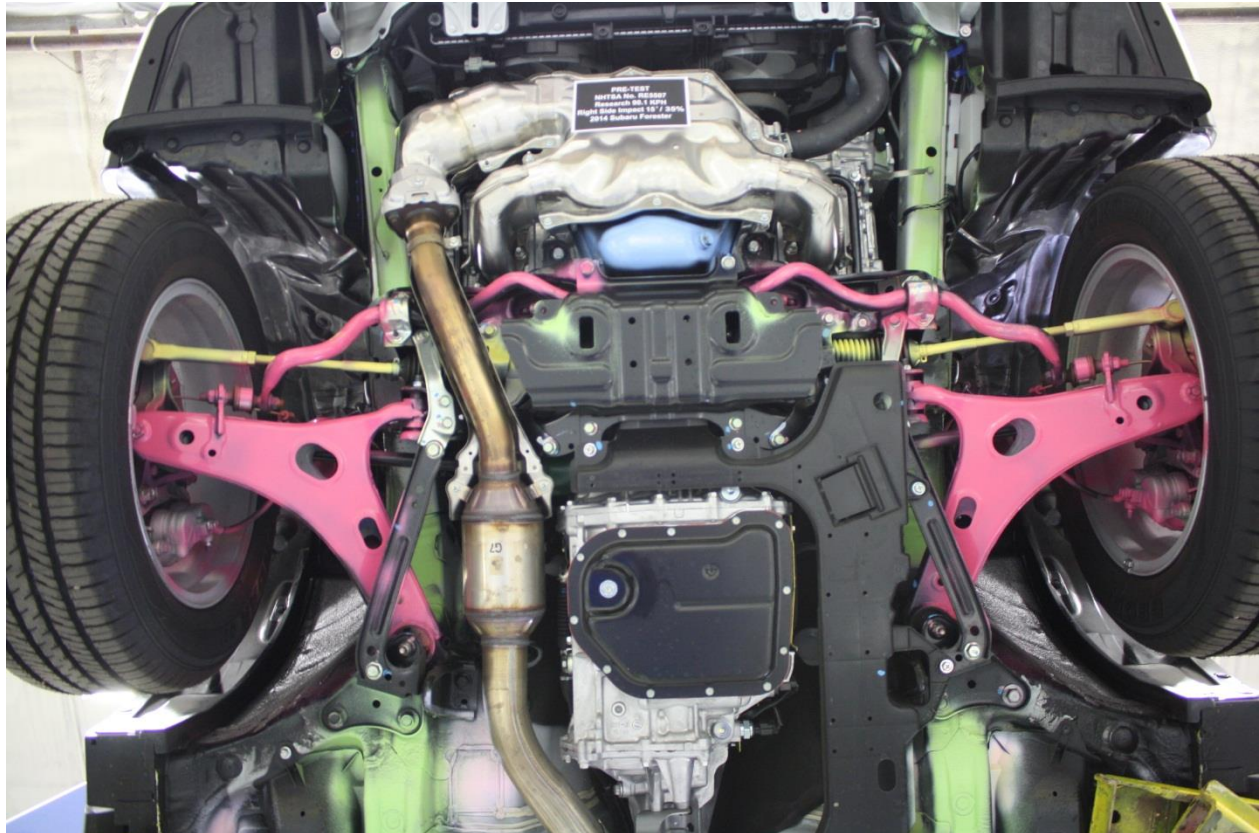
No. 132 Post-Test View of Mid Underbody (perpendicular to vehicle)



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



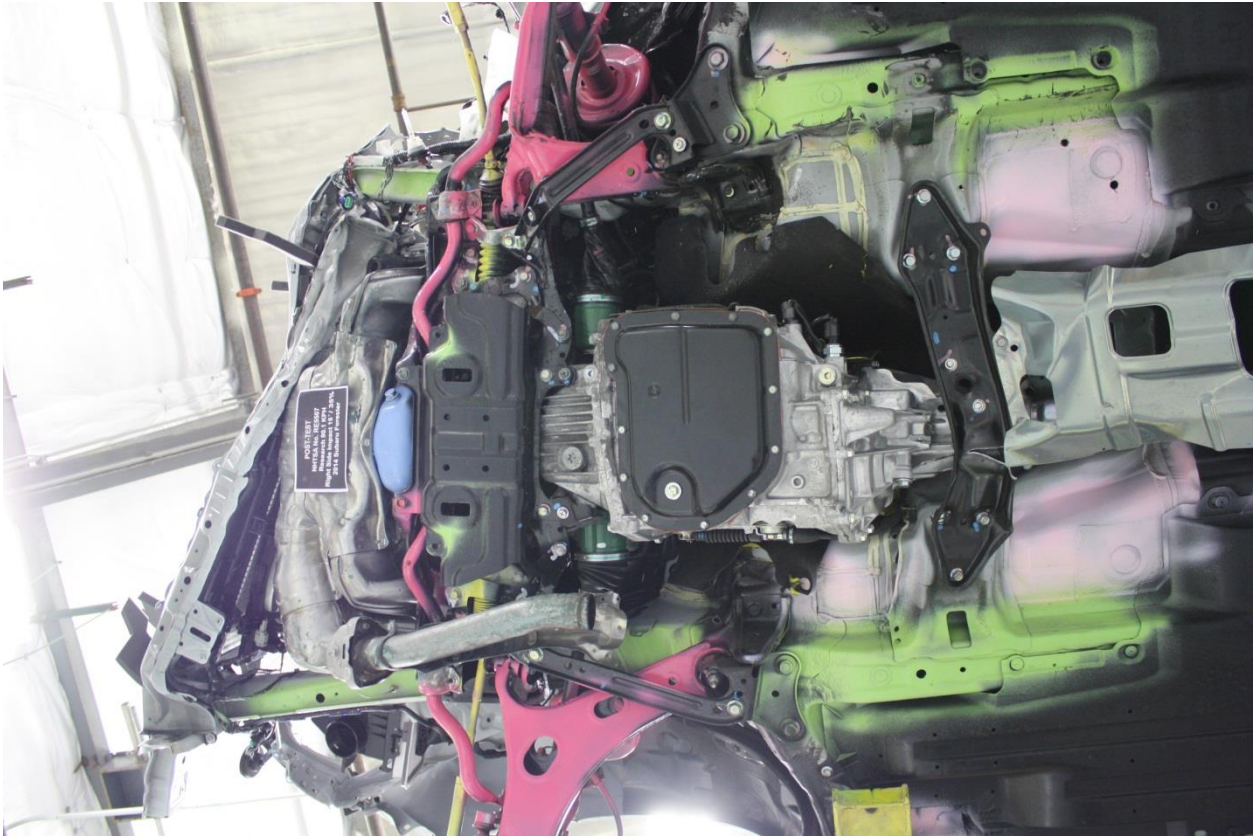
No. 136 Post-Test View of Steering rack and or sway bar



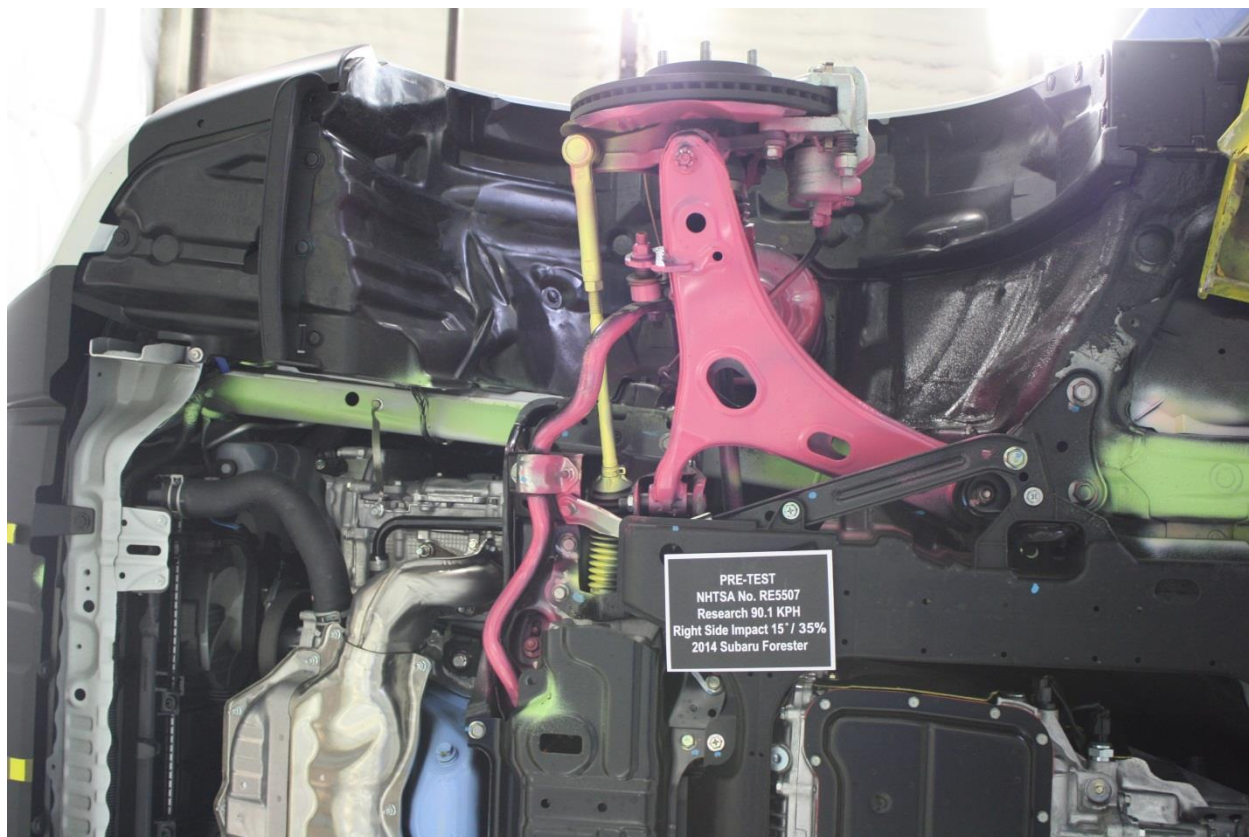
No. 137 Pre-Test Bumper to Rail Attachments and Crush Initiators



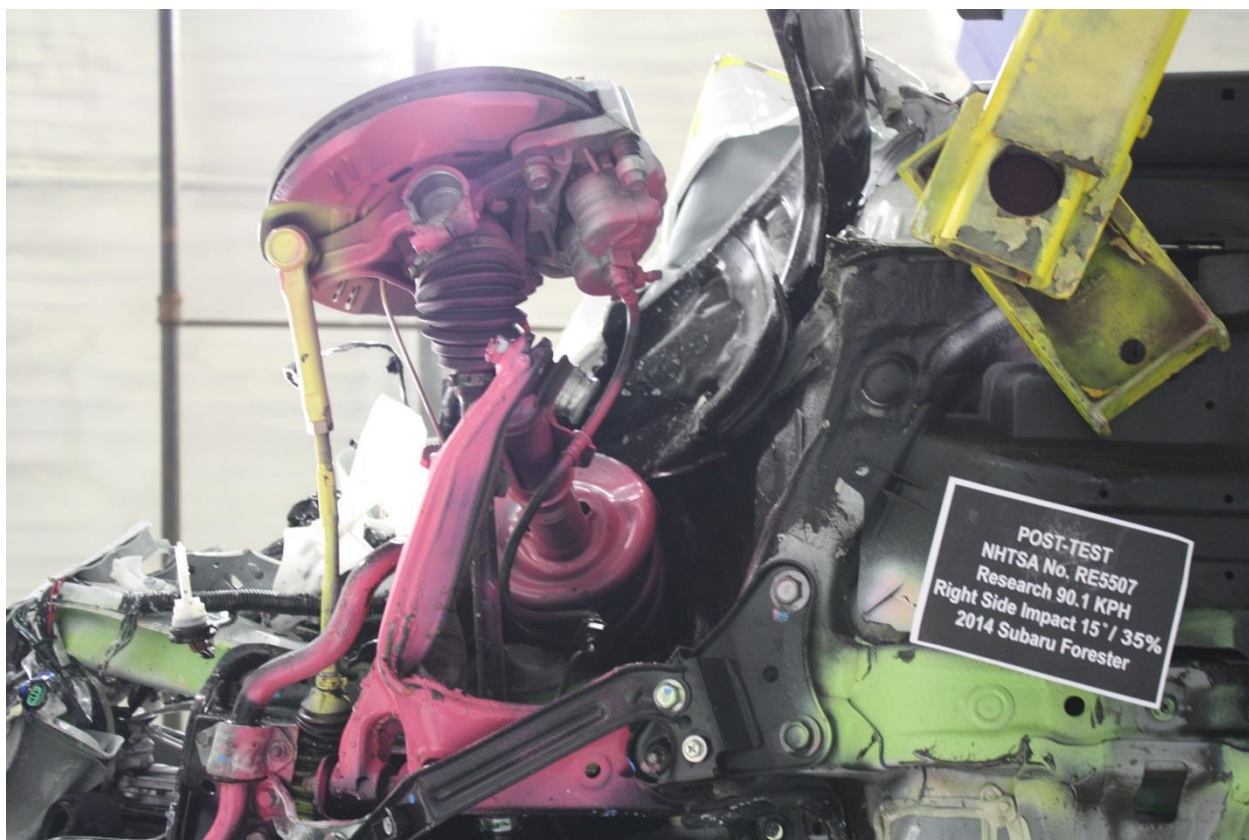
No. 138 Post-Test Bumper to Rail Attachments and Crush Initiators



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



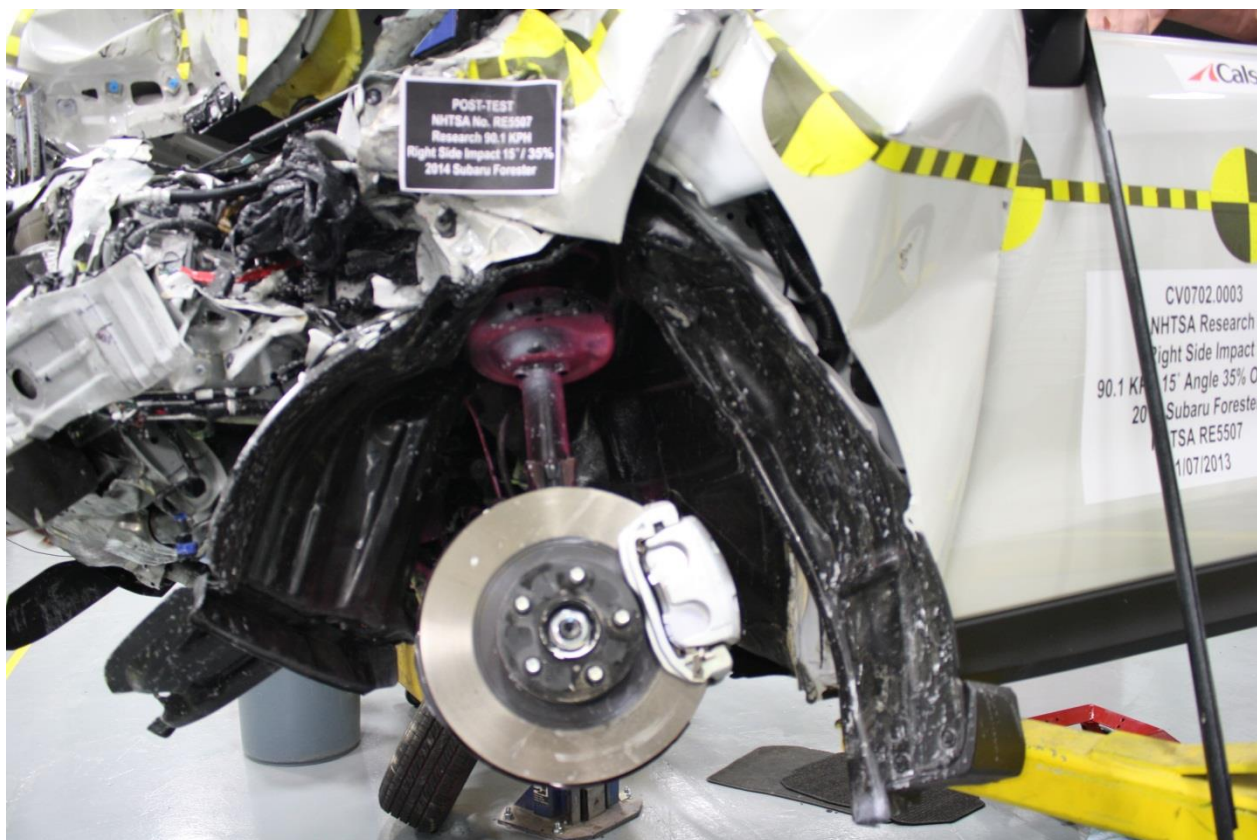
No. 140 Pre-Test Frame Rail with tire removed



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



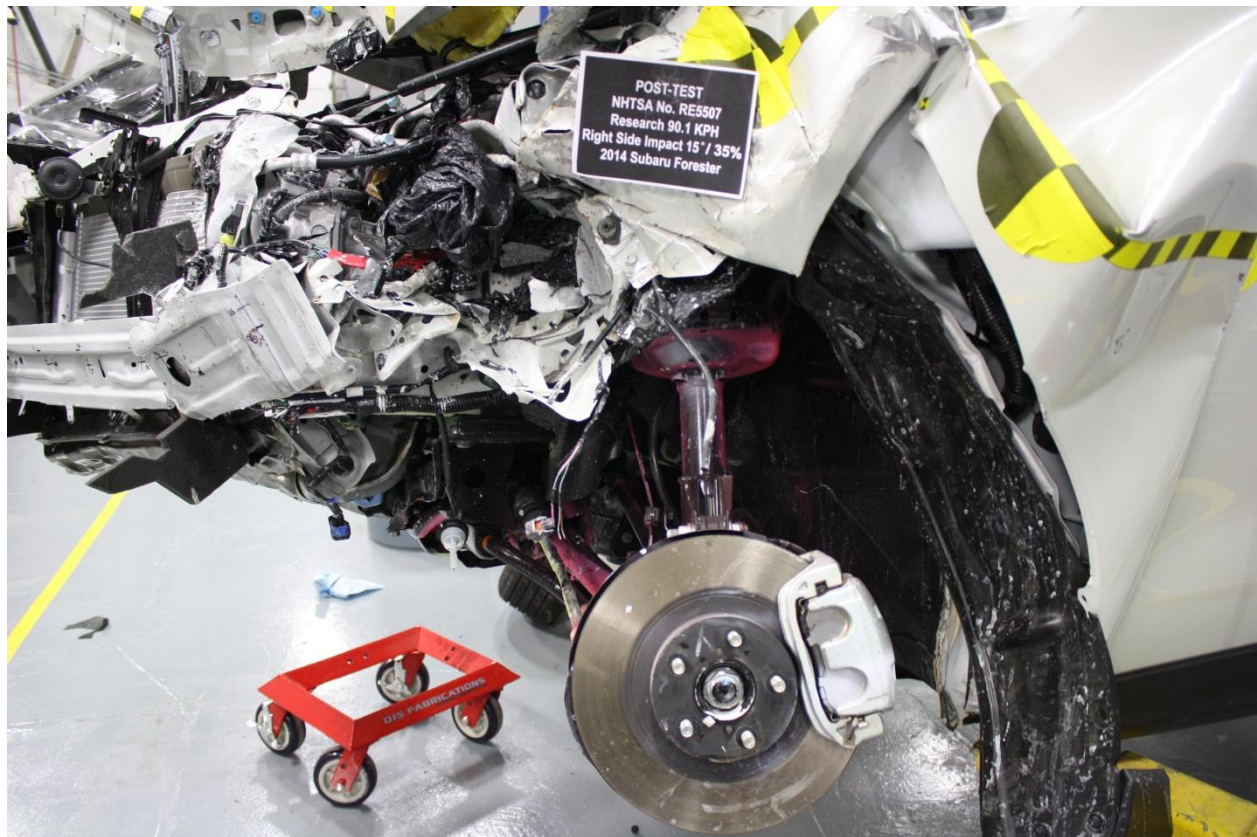
No. 145 Post-Test Right Side 3/4 Rear View of the Front Driver Wheel Well w/ Tire Removed



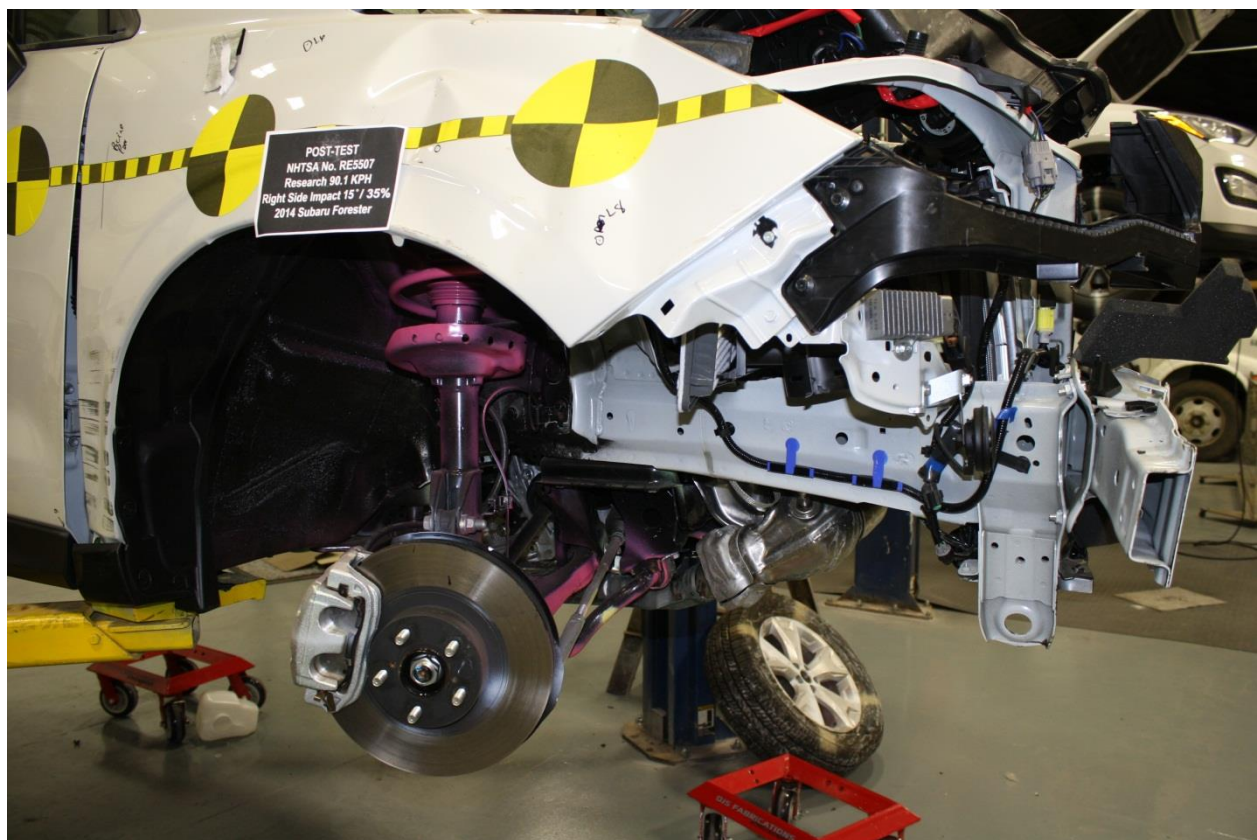
No. 146 Post-Test Looking Down at the Front Driver Shotgun



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



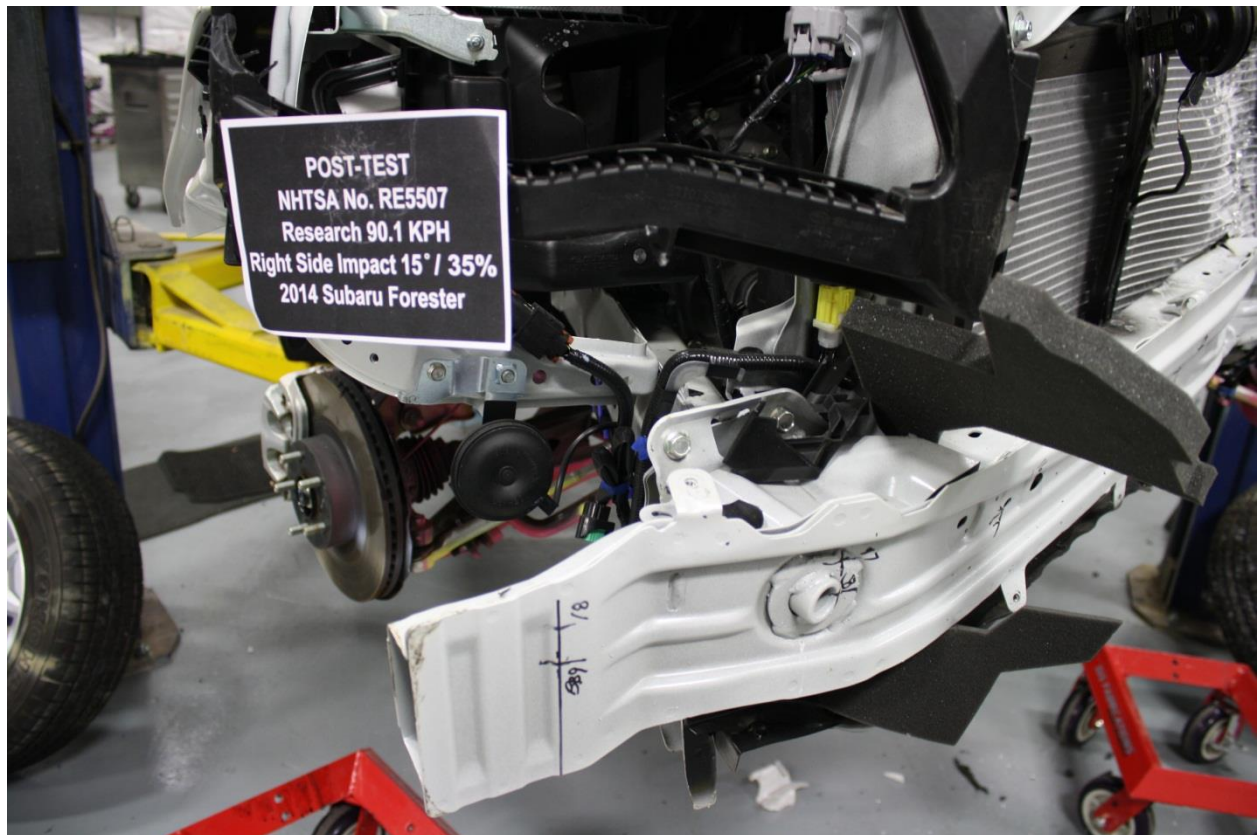
No. 149 Post-Test $\frac{3}{4}$ View of Front Passenger Wheel Well w/ Tire Removed



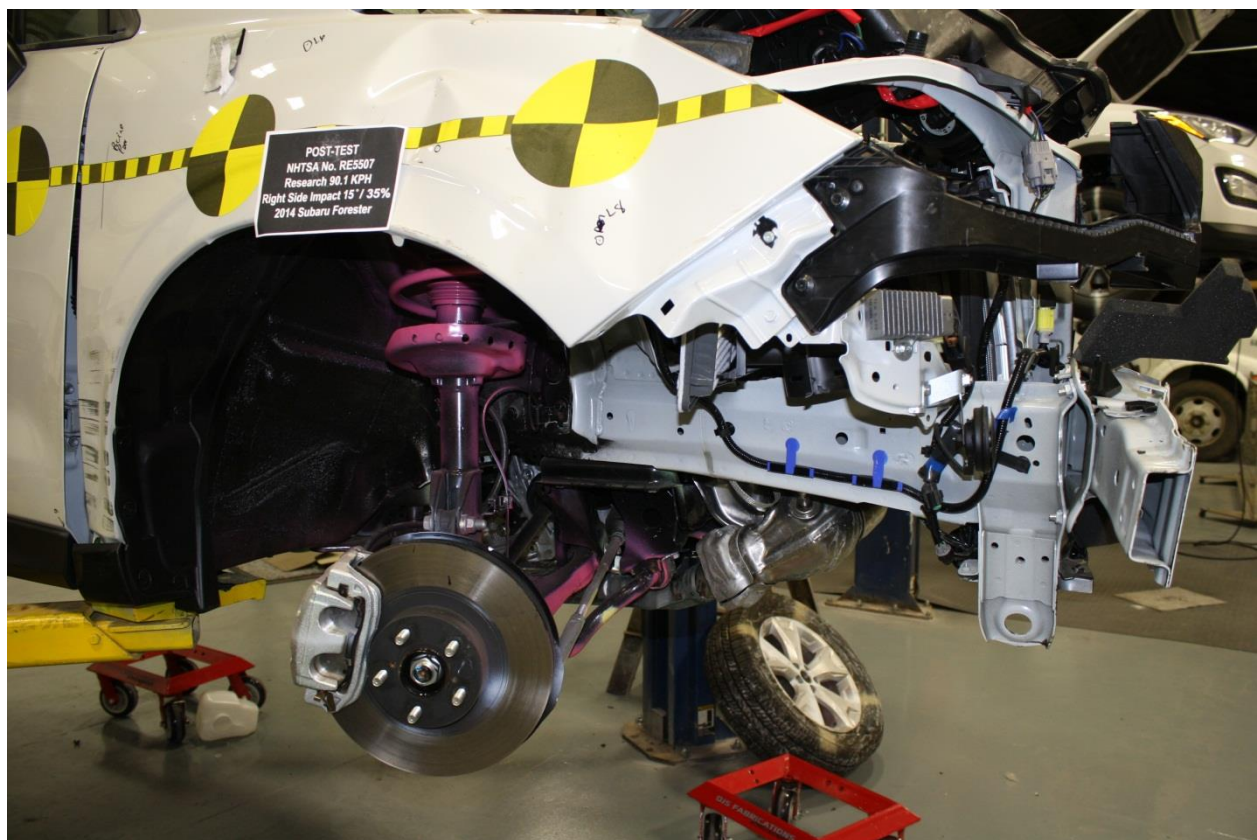
No. 150 Post-Test Side View of Front Passenger Wheel Well w/ Tire Removed



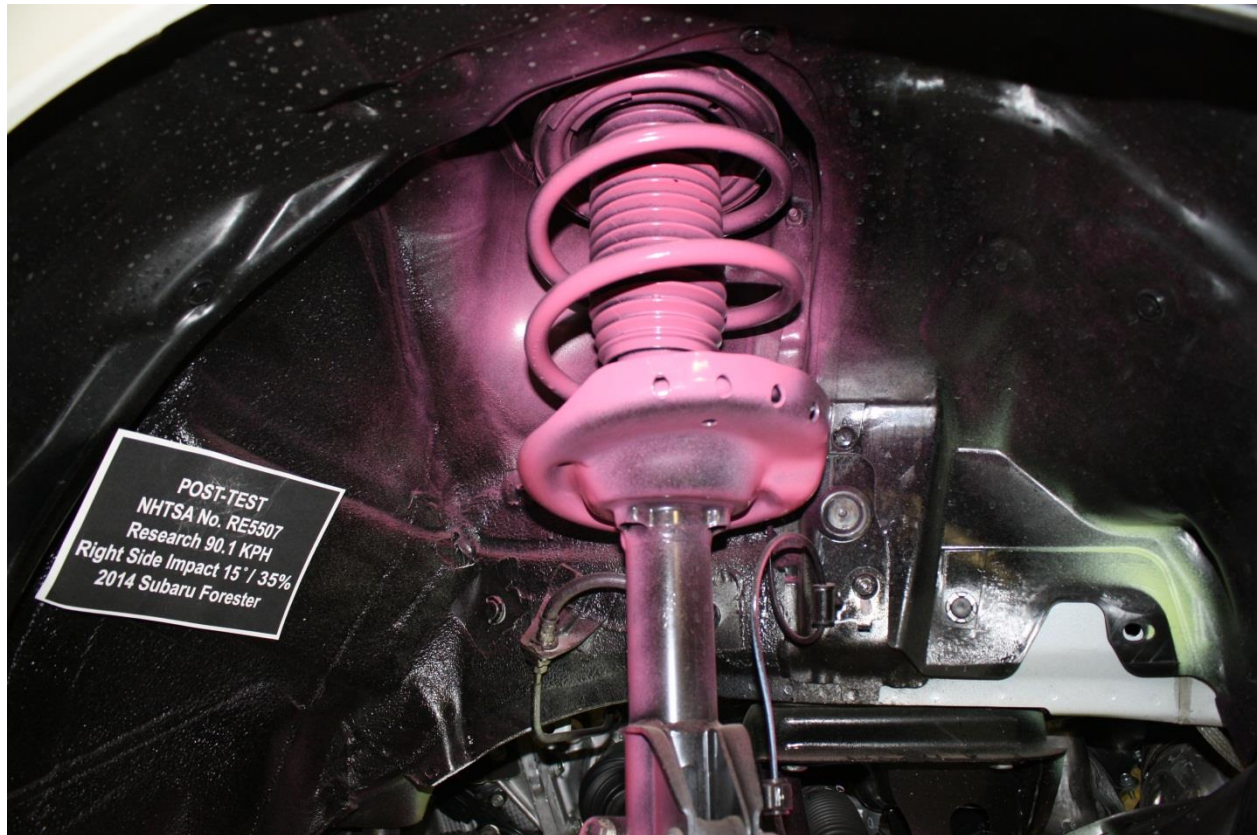
No. 151 Post-Test Right Side 3/4 Rear View of the Front Passenger Wheel Well w/ Tire Removed



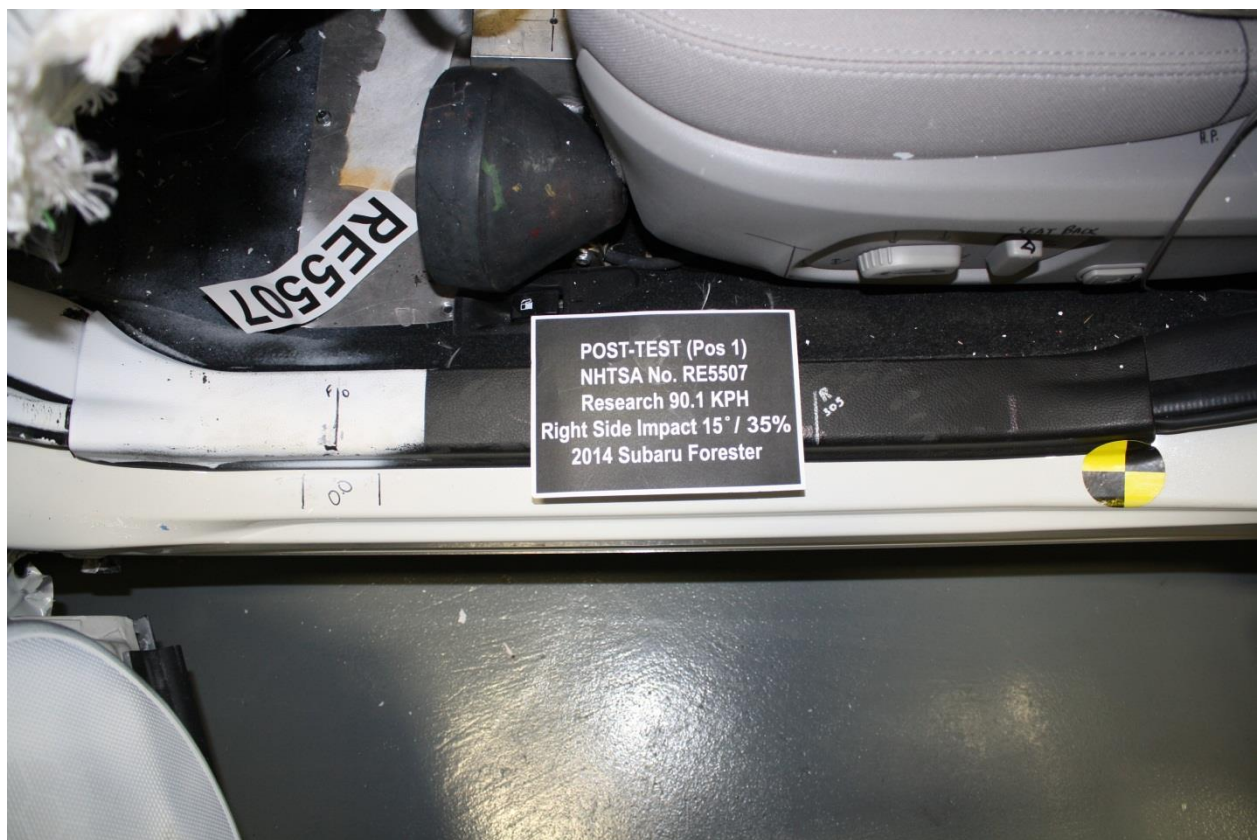
No. 152 Post-Test Looking Down at the Front Passenger Shotgun



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



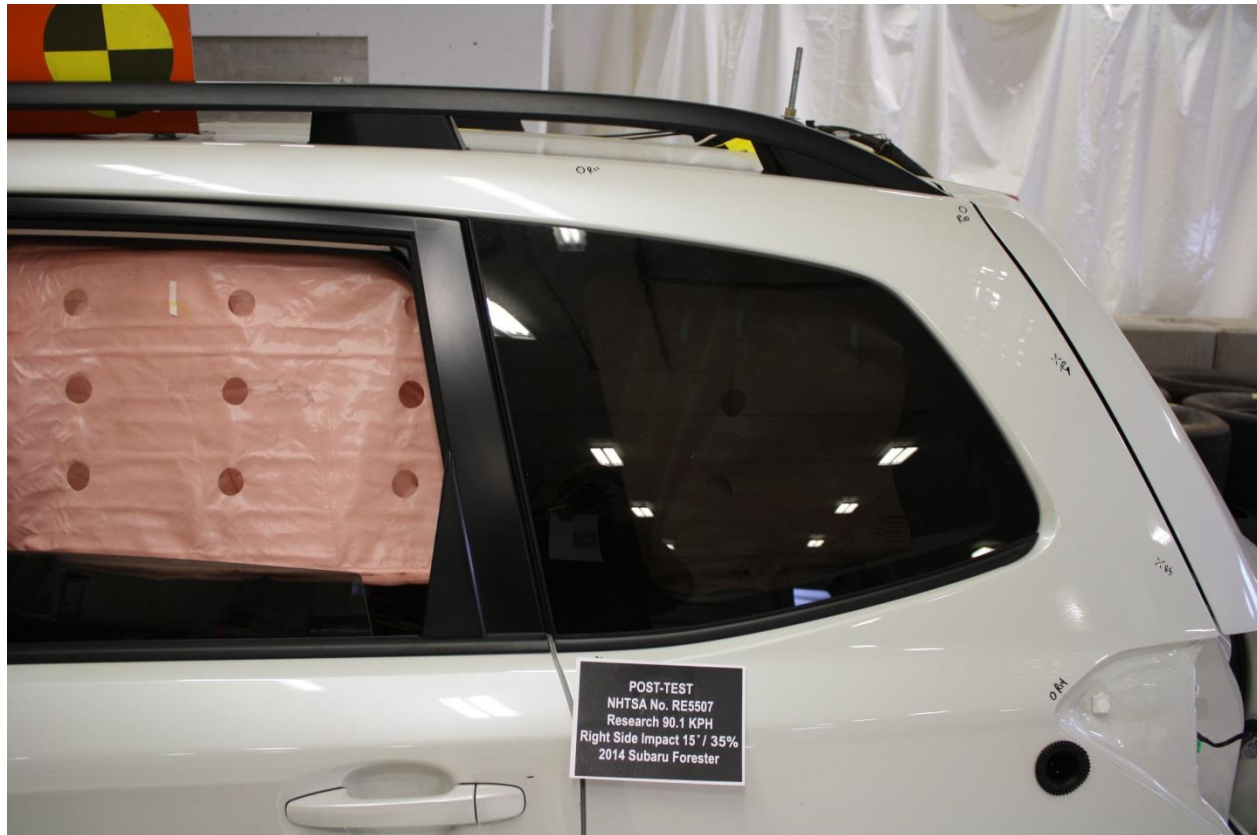
No. 155 Post-Test View of Door Sill with Door Open- Struck Side



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



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



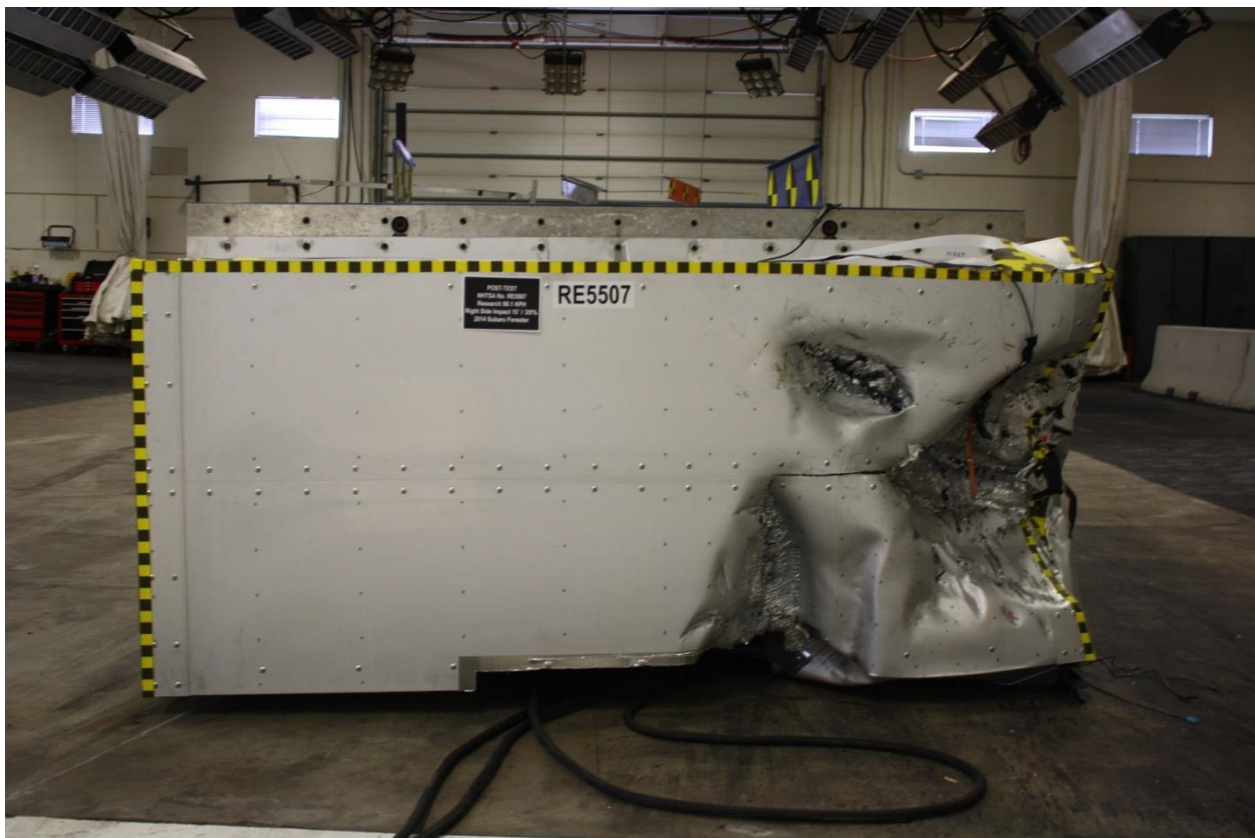
No. 166 Pre-Test Top View of RMDB



No. 167 Post-Test Top View of RMDB



No. 168 Pre-Test Front View of RMDB



No. 169 Post-Test Front View of RMDB



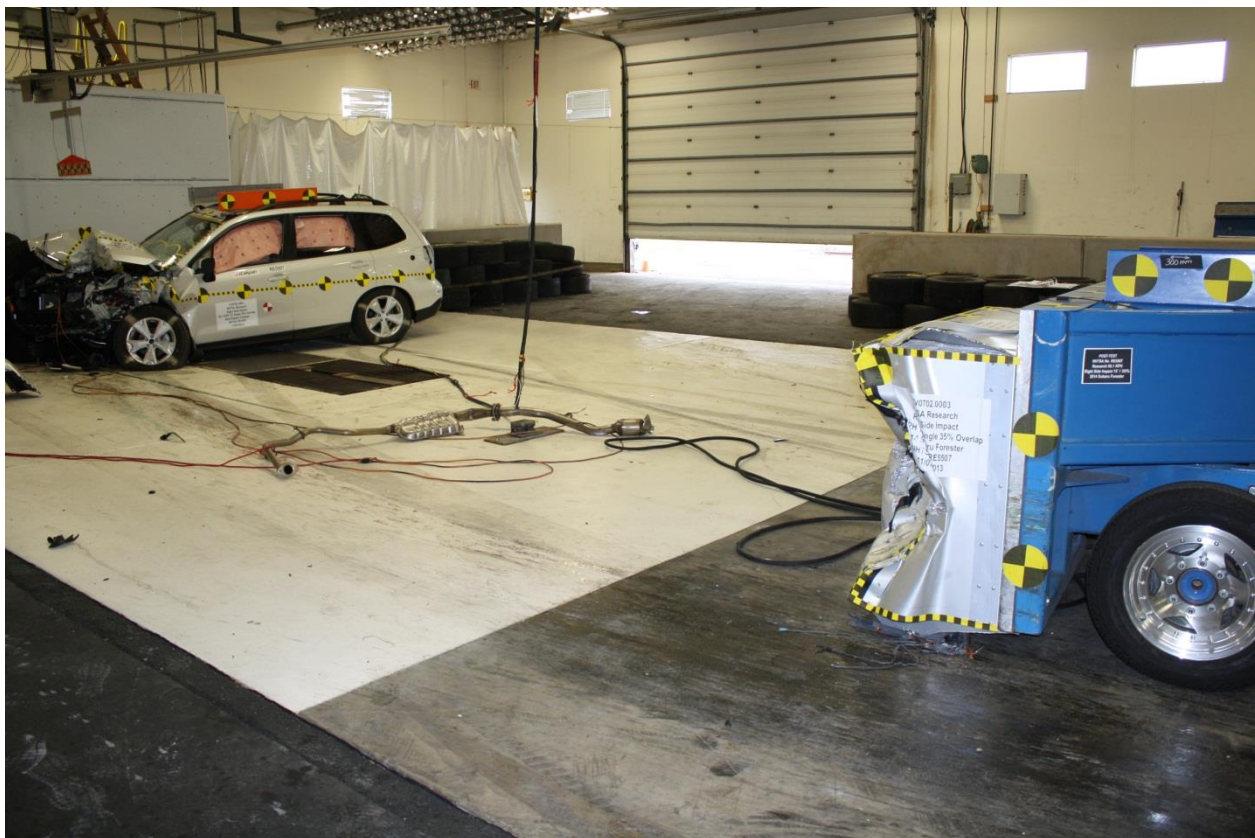
No. 170 Pre-Test RMDB & Vehicle, Right Side



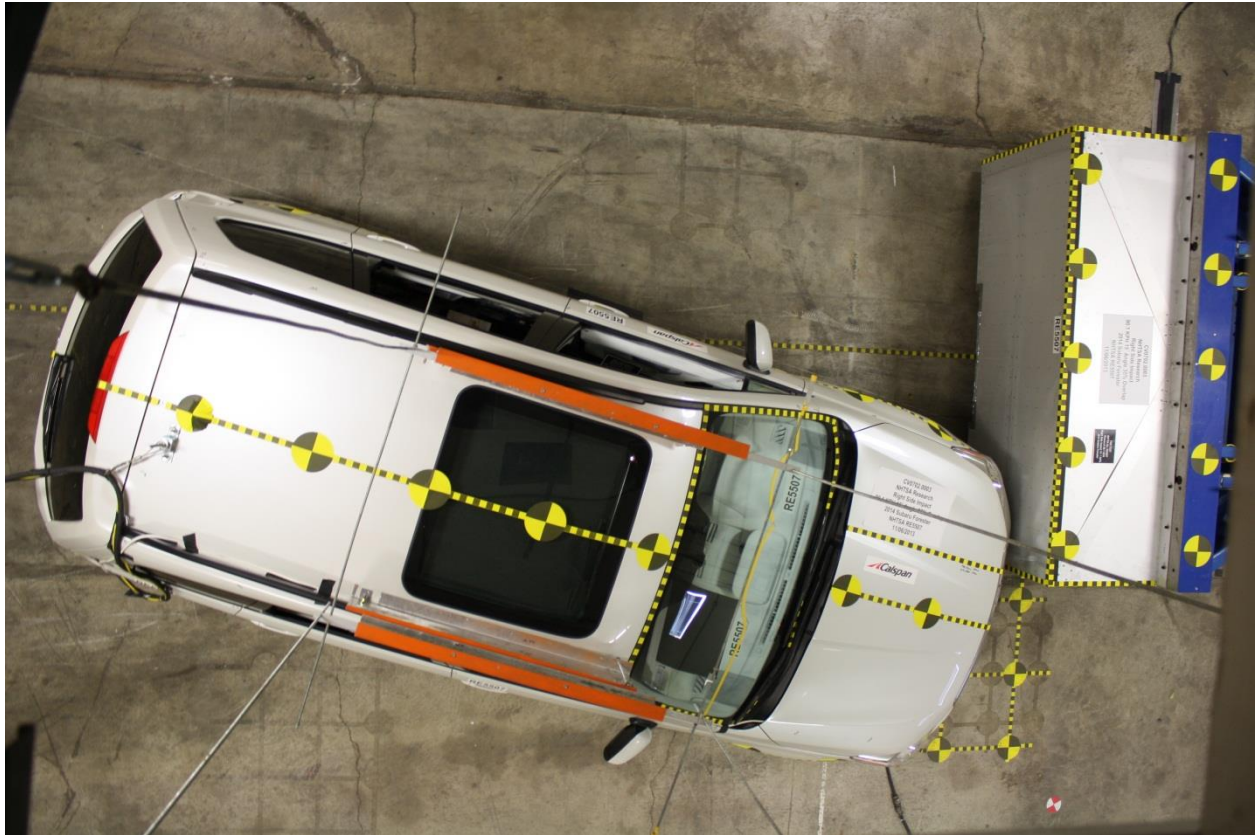
No. 171 Post-Test RMDB & Vehicle, Right Side



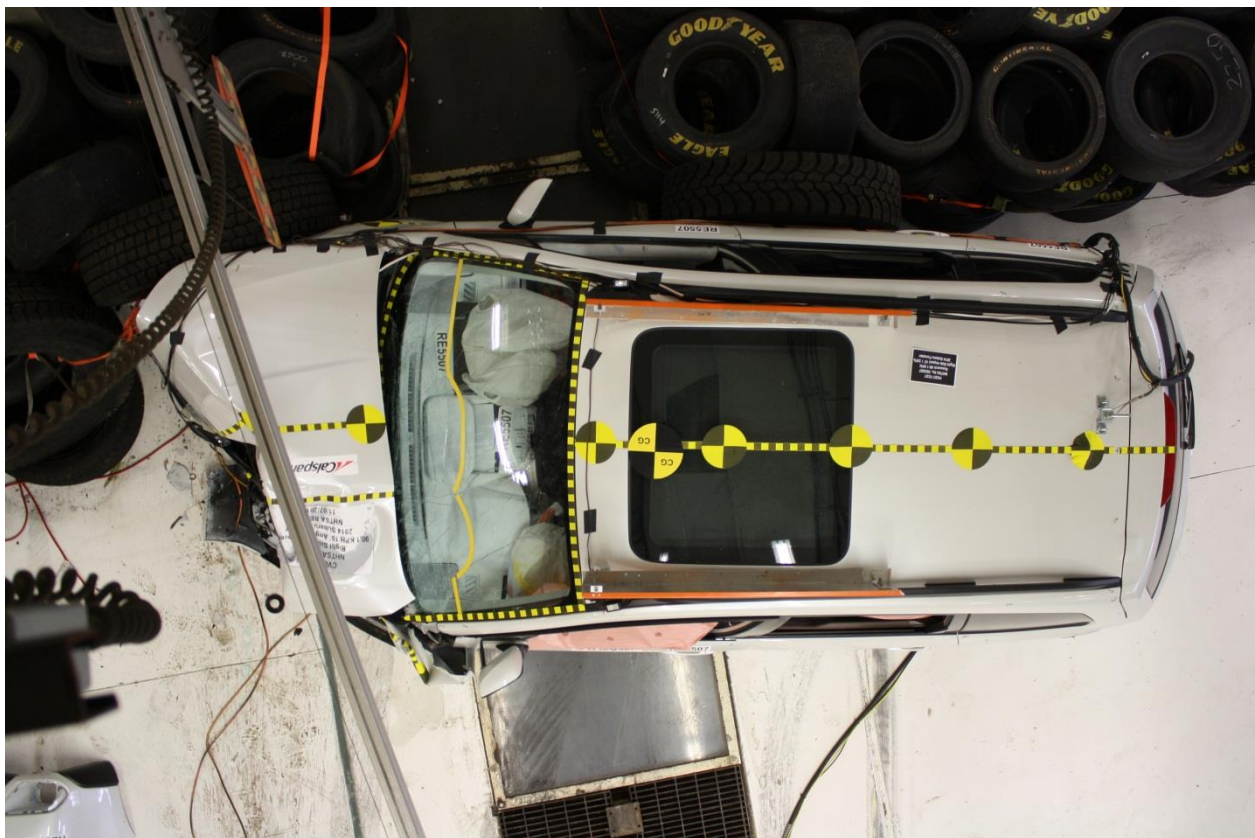
No. 172 Pre-Test RMDB & Vehicle, Left Side



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



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



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



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



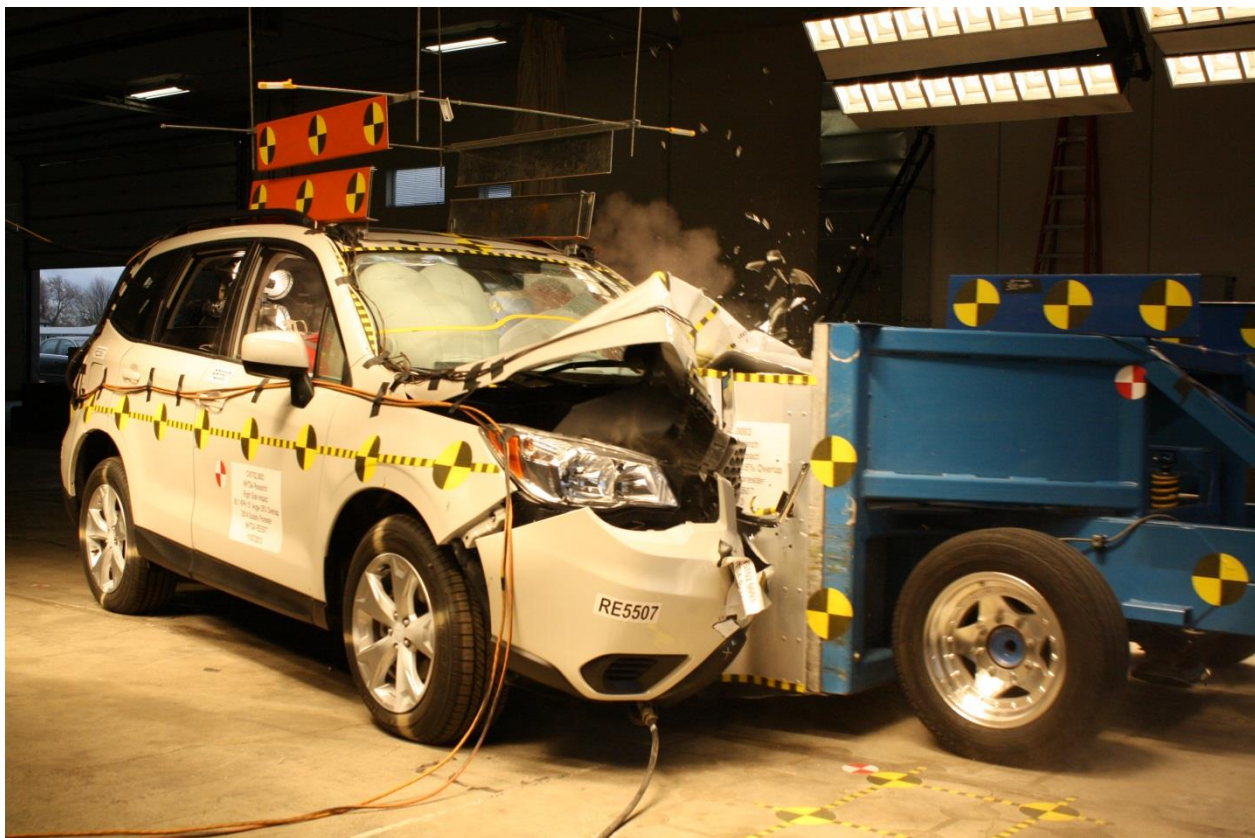
No. 182 Vehicle at 180 Degrees on Static Rollover Device



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 Acceleration	B-8
Plot 2	V2P1 Head CG Y Acceleration	B-8
Plot 3	V2P1 Head CG Z Acceleration	B-8
Plot 4	V2P1 Head CG Angular Velocity About X	B-8
Plot 5	V2P1 Head CG Angular Velocity About Y	B-9
Plot 6	V2P1 Head CG Angular Velocity About Z	B-9
Plot 7	V2P1 Upper Neck X Force	B-9
Plot 8	V2P1 Upper Neck Y Force	B-9
Plot 9	V2P1 Upper Neck Z Force	B-10
Plot 10	V2P1 Upper Neck X Moment	B-10
Plot 11	V2P1 Upper Neck Y Moment	B-10
Plot 12	V2P1 Upper Neck Z Moment	B-10
Plot 13	V2P1 Lower Neck X Force	B-11
Plot 14	V2P1 Lower Neck Y Force	B-11
Plot 15	V2P1 Lower Neck Z Force	B-11
Plot 16	V2P1 Lower Neck X Moment	B-11
Plot 17	V2P1 Lower Neck Y Moment	B-12
Plot 18	V2P1 Lower Neck Z Moment	B-12
Plot 19	V2P1 Front Neck Spring Tower Load Cell	B-12
Plot 20	V2P1 Rear Neck Spring Tower Load Cell	B-12
Plot 21	V2P1 Occipital Condyle Rotation Potentiometer	B-13
Plot 22	V2P1 T1 X Acceleration	B-13
Plot 23	V2P1 T1 Y Acceleration	B-13
Plot 24	V2P1 T1 Z Acceleration	B-13
Plot 25	V2P1 T6 X Acceleration	B-14
Plot 26	V2P1 T6 Y Acceleration	B-14
Plot 27	V2P1 T6 Z Acceleration	B-14
Plot 28	V2P1 Upper Left DGIR X Displacement	B-14
Plot 29	V2P1 Upper Left DGIR Y Rotation	B-15
Plot 30	V2P1 Upper Left DGIR Z Rotation	B-15
Plot 31	V2P1 Upper Right DGIR X Displacement	B-15
Plot 32	V2P1 Upper Right DGIR Y Rotation	B-15
Plot 33	V2P1 Upper Right DGIR Z Rotation	B-16
Plot 34	V2P1 Lower Left DGIR X Displacement	B-16
Plot 35	V2P1 Lower Left DGIR Y Rotation	B-16
Plot 36	V2P1 Lower Left DGIR Z Rotation	B-16
Plot 37	V2P1 Lower Right DGIR X Displacement	B-17
Plot 38	V2P1 Lower Right DGIR Y Rotation	B-17
Plot 39	V2P1 Lower Right DGIR Z Rotation	B-17
Plot 40	V2P1 Spine Force X	B-17
Plot 41	V2P1 Spine Force Y	B-18
Plot 42	V2P1 Spine Force Z	B-18
Plot 43	V2P1 Spine Moment X	B-18
Plot 44	V2P1 Spine Moment Y	B-18
Plot 45	V2P1 Pelvis X Acceleration	B-19
Plot 46	V2P1 Pelvis Y Acceleration	B-19
Plot 47	V2P1 Pelvis Z Acceleration	B-19
Plot 48	V2P1 Acetabular Left X Force	B-19

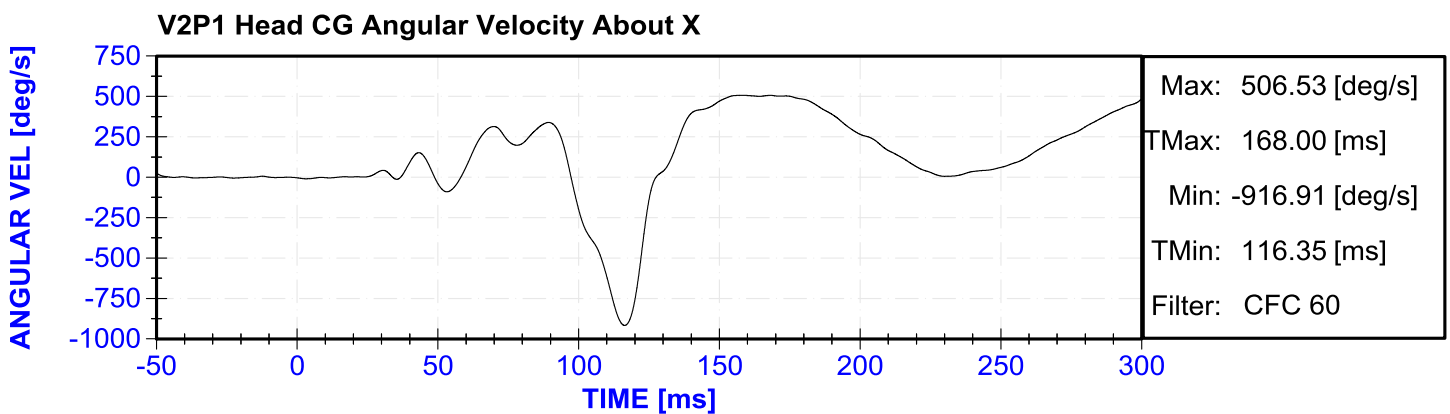
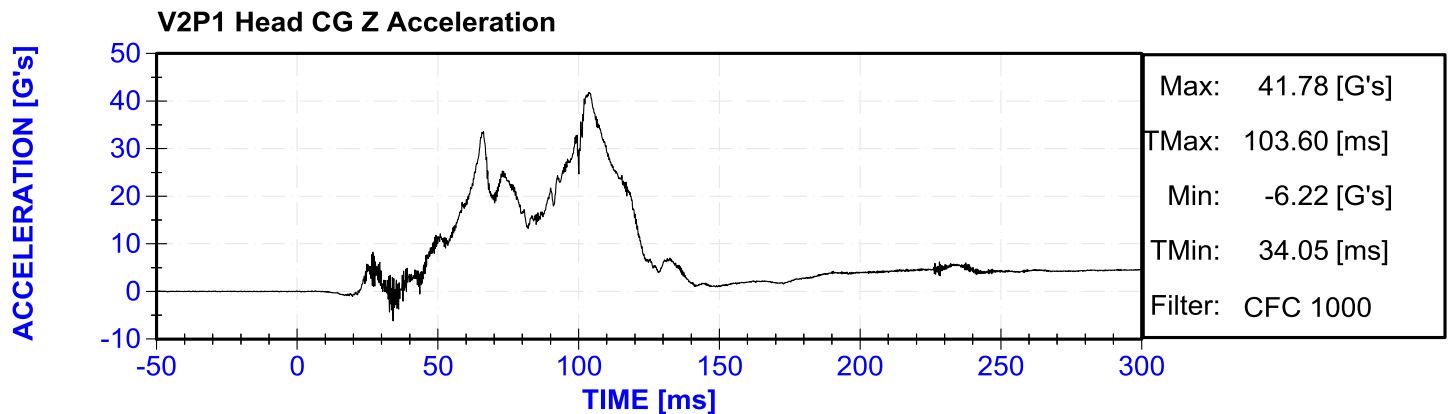
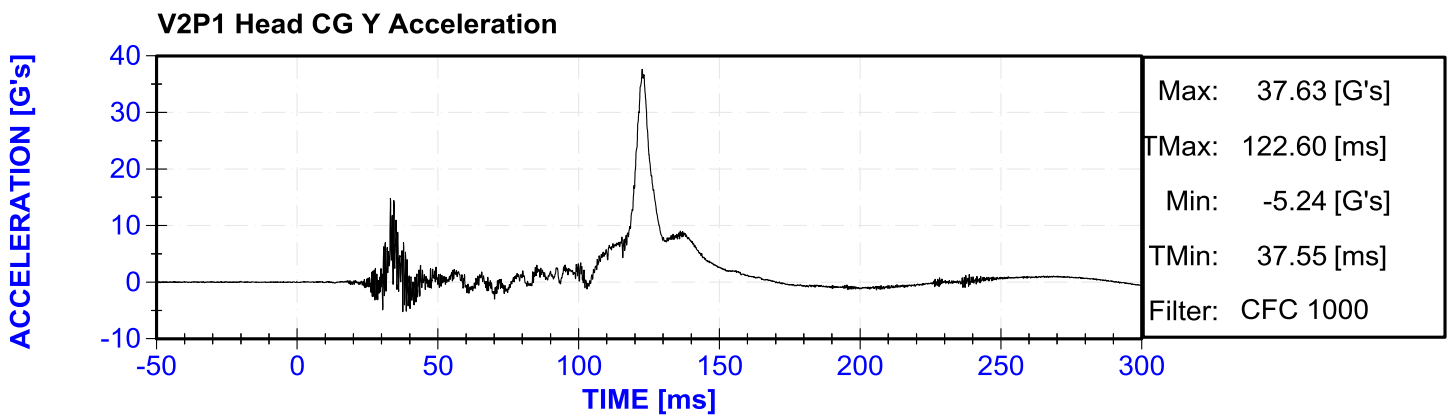
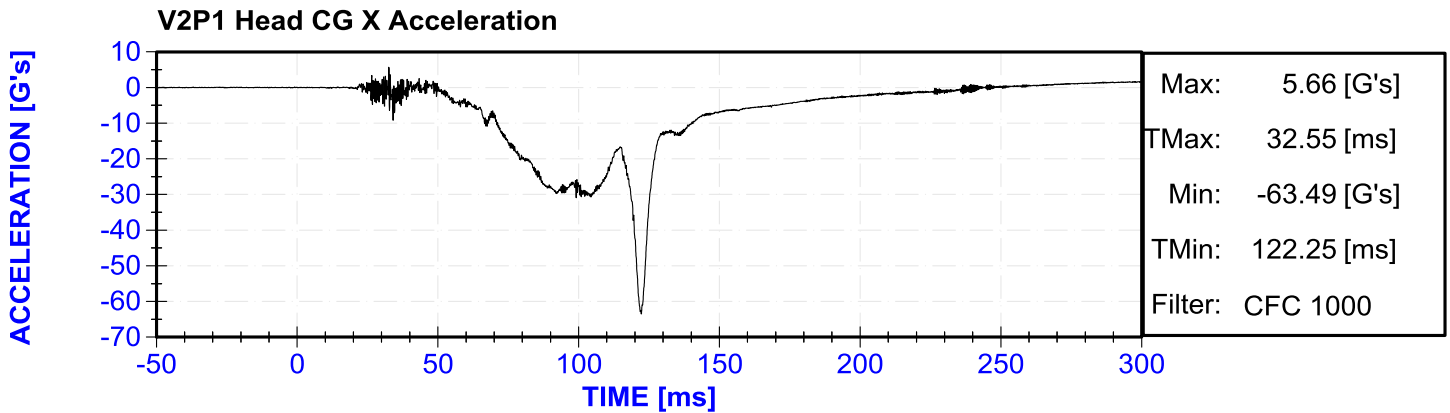
Plot 49	V2P1 Acetabular Left Y Force	B-20
Plot 50	V2P1 Acetabular Left Z Force	B-20
Plot 51	V2P1 Acetabular Right X Force	B-20
Plot 52	V2P1 Acetabular Right Y Force	B-20
Plot 53	V2P1 Acetabular Right Z Force	B-21
Plot 54	V2P1 ASIS Left X Force	B-21
Plot 55	V2P1 ASIS Right X Force	B-21
Plot 56	V2P1 Femur Left X Force	B-21
Plot 57	V2P1 Femur Left Y Force	B-22
Plot 58	V2P1 Femur Left Z Force	B-22
Plot 59	V2P1 Femur Left X Moment	B-22
Plot 60	V2P1 Femur Left Y Moment	B-22
Plot 61	V2P1 Femur Left Z Moment	B-23
Plot 62	V2P1 Femur Right X Force	B-23
Plot 63	V2P1 Femur Right Y Force	B-23
Plot 64	V2P1 Femur Right Z Force	B-23
Plot 65	V2P1 Femur Right X Moment	B-24
Plot 66	V2P1 Femur Right Y Moment	B-24
Plot 67	V2P1 Femur Right Z Moment	B-24
Plot 68	V2P1 Knee Left X Displacement	B-24
Plot 69	V2P1 Upper Tibia Left Z Force	B-25
Plot 70	V2P1 Upper Tibia Left X Moment	B-25
Plot 71	V2P1 Upper Tibia Left Y Moment	B-25
Plot 72	V2P1 Lower Tibia Left Z Force	B-25
Plot 73	V2P1 Lower Tibia Left X Moment	B-26
Plot 74	V2P1 Lower Tibia Left Y Moment	B-26
Plot 75	V2P1 Ankle Left X Rotation	B-26
Plot 76	V2P1 Ankle Left Y Rotation	B-26
Plot 77	V2P1 Foot Left Z Acceleration	B-27
Plot 78	V2P1 Knee Right X Displacement	B-27
Plot 79	V2P1 Upper Tibia Right Z Force	B-27
Plot 80	V2P1 Upper Tibia Right X Moment	B-27
Plot 81	V2P1 Upper Tibia Right Y Moment	B-28
Plot 82	V2P1 Lower Tibia Right Z Force	B-28
Plot 83	V2P1 Lower Tibia Right X Moment	B-28
Plot 84	V2P1 Lower Tibia Right Y Moment	B-28
Plot 85	V2P1 Ankle Right X Rotation	B-29
Plot 86	V2P1 Ankle Right Y Rotation	B-29
Plot 87	V2P1 Foot Right Z Acceleration	B-29
Plot 88	V2 Driver Lap Belt Force	B-29
Plot 89	V2 Driver Shoulder Belt Force	B-30
Plot 90	V2P2 Head CG X Acceleration	B-30
Plot 91	V2P2 Head CG Y Acceleration	B-30
Plot 92	V2P2 Head CG Z Acceleration	B-30
Plot 93	V2P2 Head CG Angular Velocity About X	B-31
Plot 94	V2P2 Head CG Angular Velocity About Y	B-31
Plot 95	V2P2 Head CG Angular Velocity About Z	B-31
Plot 96	V2P2 Upper Neck X Force	B-31
Plot 97	V2P2 Upper Neck Y Force	B-32
Plot 98	V2P2 Upper Neck Z Force	B-32

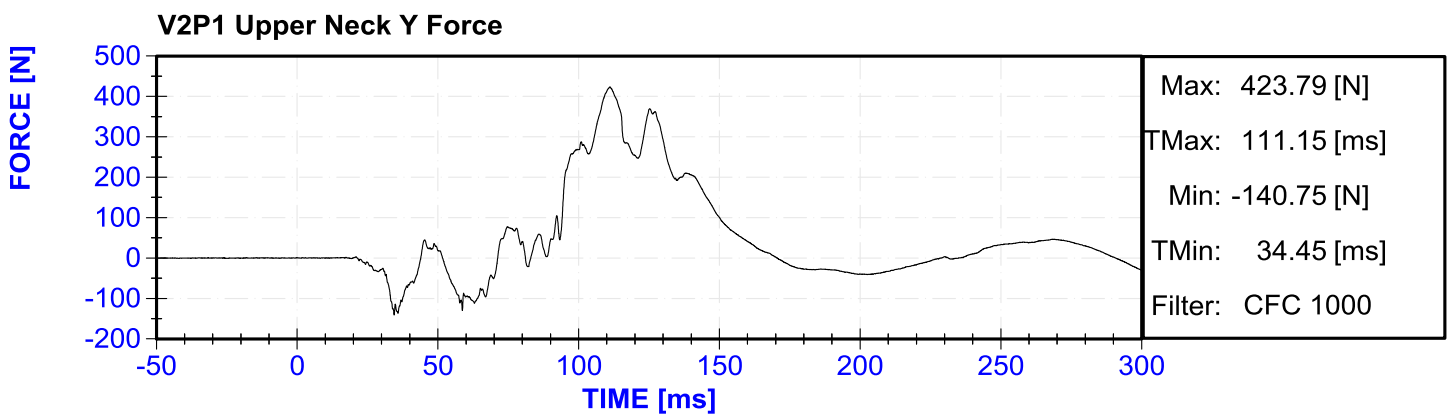
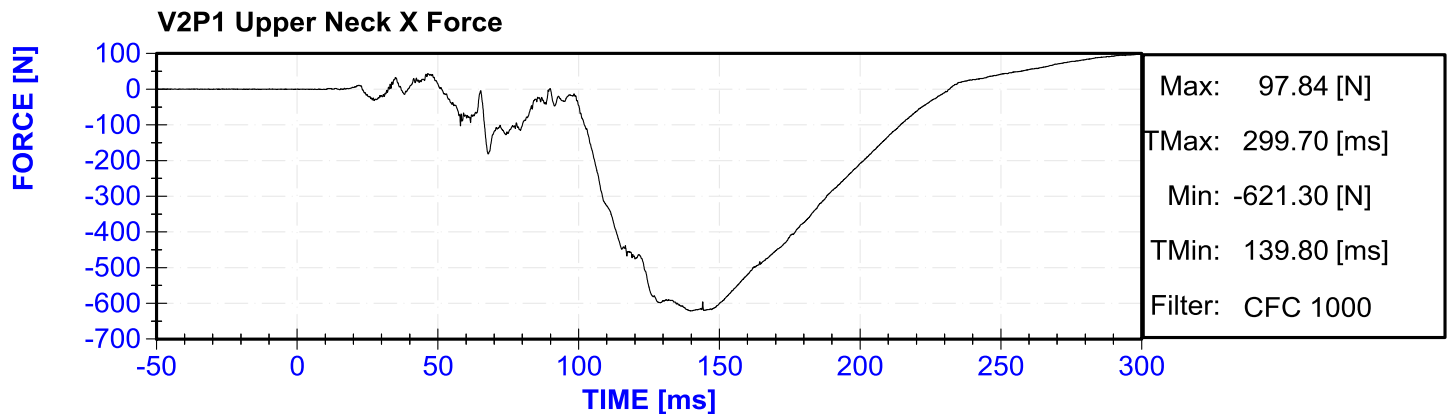
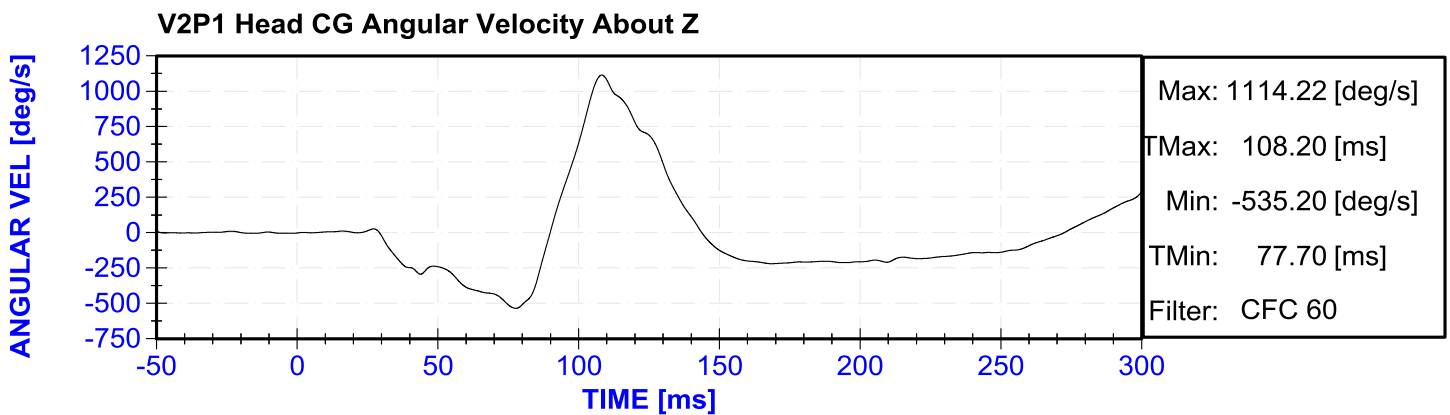
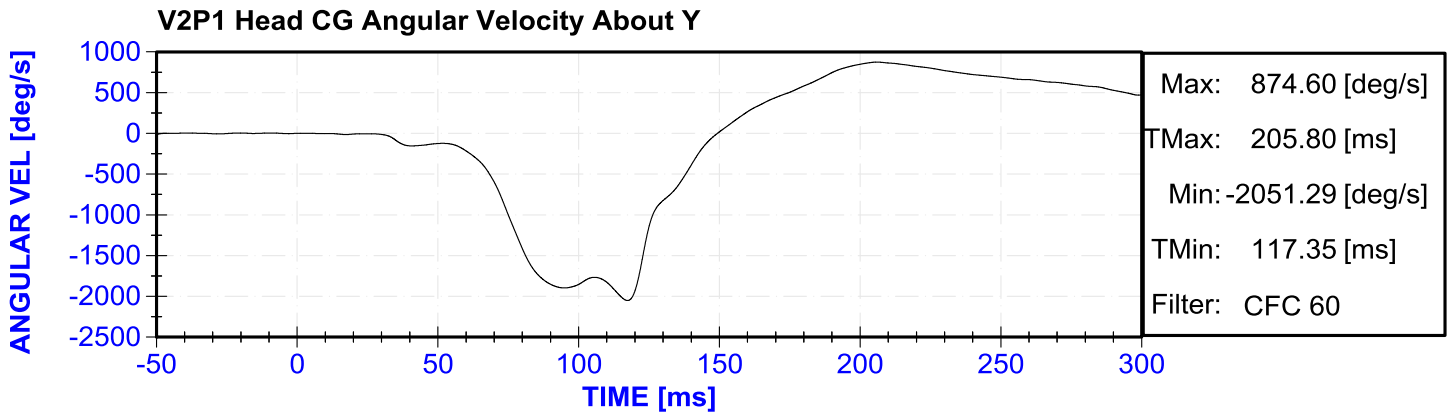
Plot 99	V2P2 Upper Neck X Moment	B-32
Plot 100	V2P2 Upper Neck Y Moment	B-32
Plot 101	V2P2 Upper Neck Z Moment	B-33
Plot 102	V2P2 Front Neck Spring Tower Load Cell	B-33
Plot 103	V2P2 Rear Neck Spring Tower Load Cell	B-33
Plot 104	V2P2 Occipital Condyle Rotation Potentiometer	B-33
Plot 105	V2P2 T1 X Acceleration	B-34
Plot 106	V2P2 T1 Y Acceleration	B-34
Plot 107	V2P2 T1 Z Acceleration	B-34
Plot 108	V2P2 T6 X Acceleration	B-34
Plot 109	V2P2 T6 Y Acceleration	B-35
Plot 110	V2P2 T6 Z Acceleration	B-35
Plot 111	V2P2 Upper Left DGIR X Displacement	B-35
Plot 112	V2P2 Upper Left DGIR Y Rotation	B-35
Plot 113	V2P2 Upper Left DGIR Z Rotation	B-36
Plot 114	V2P2 Upper Right DGIR X Displacement	B-36
Plot 115	V2P2 Upper Right DGIR Y Rotation	B-36
Plot 116	V2P2 Upper Right DGIR Z Rotation	B-36
Plot 117	V2P2 Lower Left DGIR X Displacement	B-37
Plot 118	V2P2 Lower Left DGIR Y Rotation	B-37
Plot 119	V2P2 Lower Left DGIR Z Rotation	B-37
Plot 120	V2P2 Lower Right DGIR X Displacement	B-37
Plot 121	V2P2 Lower Right DGIR Y Rotation	B-38
Plot 122	V2P2 Lower Right DGIR Z Rotation	B-38
Plot 123	V2P2 Spine Force X	B-38
Plot 124	V2P2 Spine Force Y	B-38
Plot 125	V2P2 Spine Force Z	B-39
Plot 126	V2P2 Spine Moment X	B-39
Plot 127	V2P2 Spine Moment Y	B-39
Plot 128	V2P2 Pelvis X Acceleration	B-39
Plot 129	V2P2 Pelvis Y Acceleration	B-40
Plot 130	V2P2 Pelvis Z Acceleration	B-40
Plot 131	V2P2 Acetabular Left X Force	B-40
Plot 132	V2P2 Acetabular Left Y Force	B-40
Plot 133	V2P2 Acetabular Left Z Force	B-41
Plot 134	V2P2 Acetabular Right X Force	B-41
Plot 135	V2P2 Acetabular Right Y Force	B-41
Plot 136	V2P2 Acetabular Right Z Force	B-41
Plot 137	V2P2 ASIS Left X Force	B-42
Plot 138	V2P2 ASIS Right X Force	B-42
Plot 139	V2P2 Femur Left X Force	B-42
Plot 140	V2P2 Femur Left Y Force	B-42
Plot 141	V2P2 Femur Left Z Force	B-43
Plot 142	V2P2 Femur Left X Moment	B-43
Plot 143	V2P2 Femur Left Y Moment	B-43
Plot 144	V2P2 Femur Left Z Moment	B-43
Plot 145	V2P2 Femur Right X Force	B-44
Plot 146	V2P2 Femur Right Y Force	B-44
Plot 147	V2P2 Femur Right Z Force	B-44
Plot 148	V2P2 Femur Right X Moment	B-44

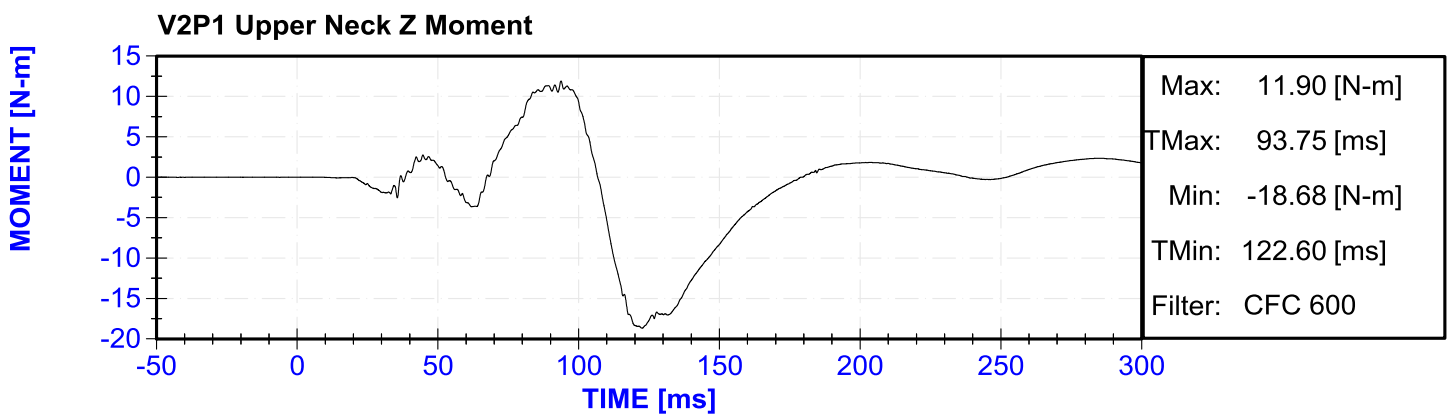
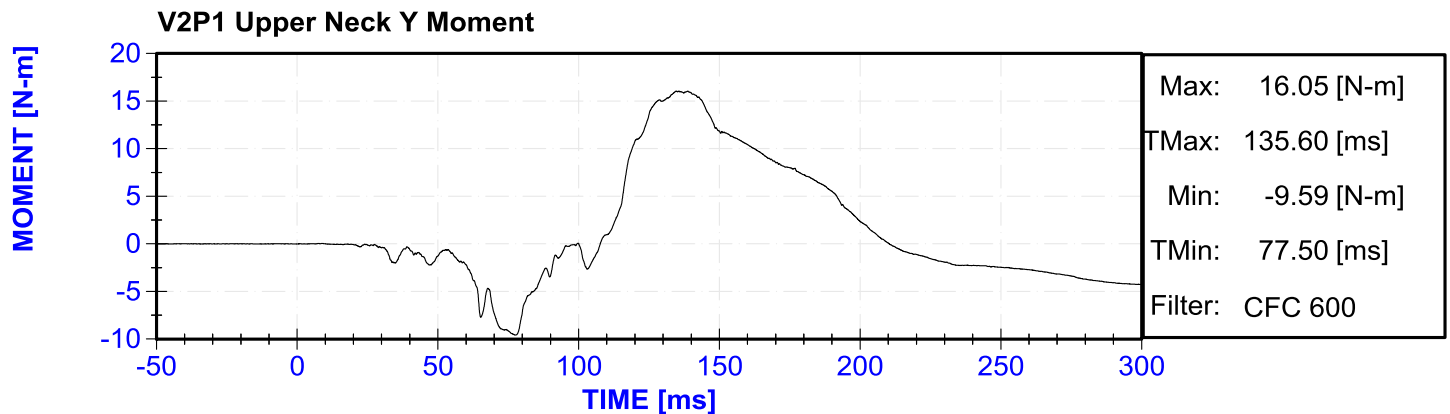
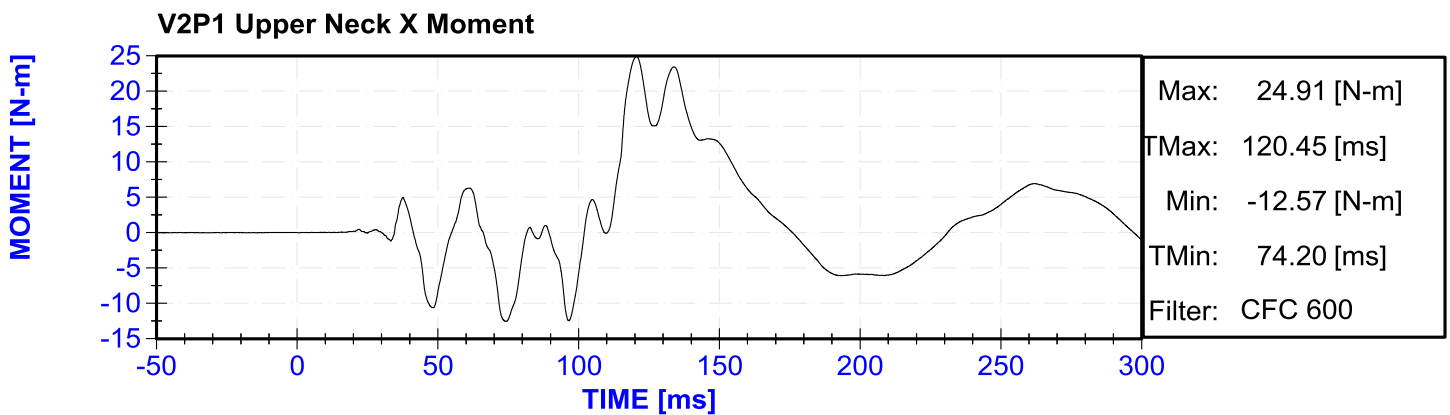
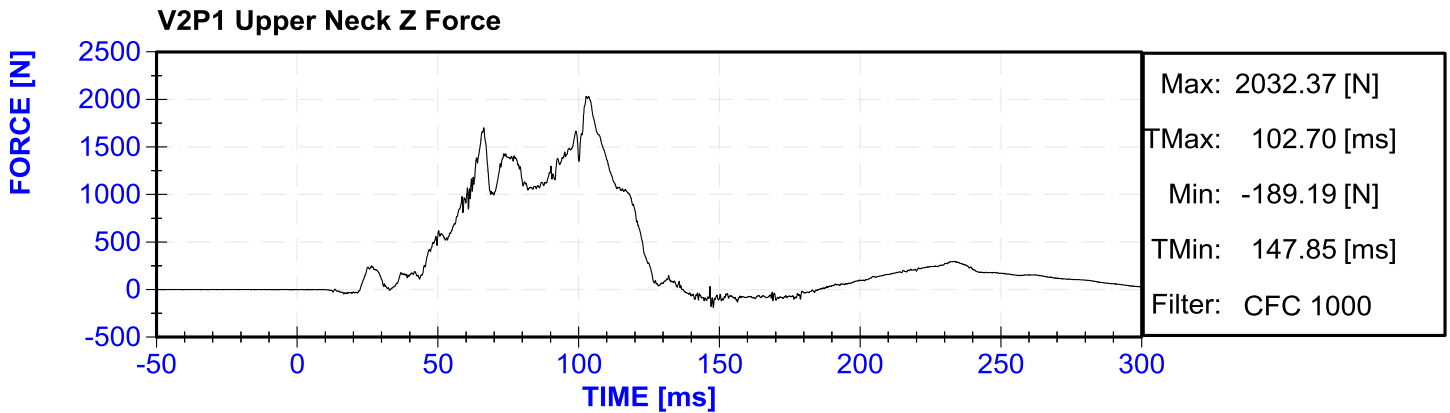
Plot 149	V2P2 Femur Right Y Moment	B-45
Plot 150	V2P2 Femur Right Z Moment	B-45
Plot 151	V2P2 Knee Left X Displacement	B-45
Plot 152	V2P2 Upper Tibia Left Z Force	B-45
Plot 153	V2P2 Upper Tibia Left X Moment	B-46
Plot 154	V2P2 Upper Tibia Left Y Moment	B-46
Plot 155	V2P2 Lower Tibia Left Z Force	B-46
Plot 156	V2P2 Lower Tibia Left X Moment	B-46
Plot 157	V2P2 Lower Tibia Left Y Moment	B-47
Plot 158	V2P2 Ankle Left X Rotation	B-47
Plot 159	V2P2 Ankle Left Y Rotation	B-47
Plot 160	V2P2 Foot Left Z Acceleration	B-47
Plot 161	V2P2 Knee Right X Displacement	B-48
Plot 162	V2P2 Upper Tibia Right Z Force	B-48
Plot 163	V2P2 Upper Tibia Right X Moment	B-48
Plot 164	V2P2 Upper Tibia Right Y Moment	B-48
Plot 165	V2P2 Lower Tibia Right Z Force	B-49
Plot 166	V2P2 Lower Tibia Right X Moment	B-49
Plot 167	V2P2 Lower Tibia Right Y Moment	B-49
Plot 168	V2P2 Ankle Right X Rotation	B-49
Plot 169	V2P2 Ankle Right Y Rotation	B-50
Plot 170	V2P2 Foot Right Z Acceleration	B-50
Plot 171	V2 Passenger Lap Belt Force	B-50
Plot 172	V2 Passenger Shoulder Belt Force	B-50
Plot 173	V2 Left Rear Sill X Acceleration	B-51
Plot 174	V2 Left Rear Sill Y Acceleration	B-51
Plot 175	V2 Left Rear Sill Redundent X Acceleration	B-51
Plot 176	V2 Left Rear Sill Redundent Y Acceleration	B-51
Plot 177	V2 Right Rear Sill X Acceleration	B-52
Plot 178	V2 Right Rear Sill Y Acceleration	B-52
Plot 179	V2 Vehicle CG X Acceleration	B-52
Plot 180	V2 Vehicle CG Y Acceleration	B-52
Plot 181	V2 Vehicle CG Z Acceleration	B-53
Plot 182	V2 Vehicle CG Angular Rate X	B-53
Plot 183	V2 Vehicle CG Angular Rate Y	B-53
Plot 184	V2 Vehicle CG Angular Rate Z	B-53
Plot 185	V2 Instrument Panel X Acceleration	B-54
Plot 186	V2 Driver Seat Track X Acceleration	B-54
Plot 187	V2 Driver Seat Track Y Acceleration	B-54
Plot 188	V2 Driver Seat Track Z Acceleration	B-54
Plot 189	V2 Passenger Seat Track X Acceleration	B-55
Plot 190	V2 Passenger Seat Track Y Acceleration	B-55
Plot 191	V2 Passenger Seat Track Z Acceleration	B-55
Plot 192	V2 Driver Floor Pan X Acceleration	B-55
Plot 193	V2 Driver Floor Pan Y Acceleration	B-56
Plot 194	V2 Driver Floor Pan Z Acceleration	B-56
Plot 195	V2 Driver Floor Pan X Deflection	B-56
Plot 196	V2 Driver Seat Pan Z Accelerometer	B-56
Plot 197	V2 Driver Seat Thigh Bar X Acceleration	B-57
Plot 198	V2 Driver Seat Thigh Bar Z Acceleration	B-57

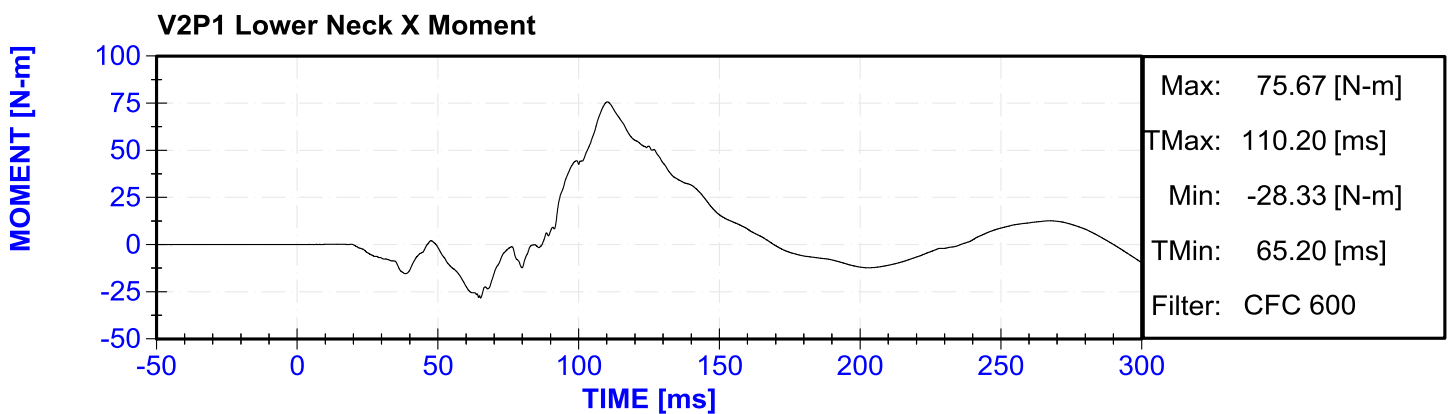
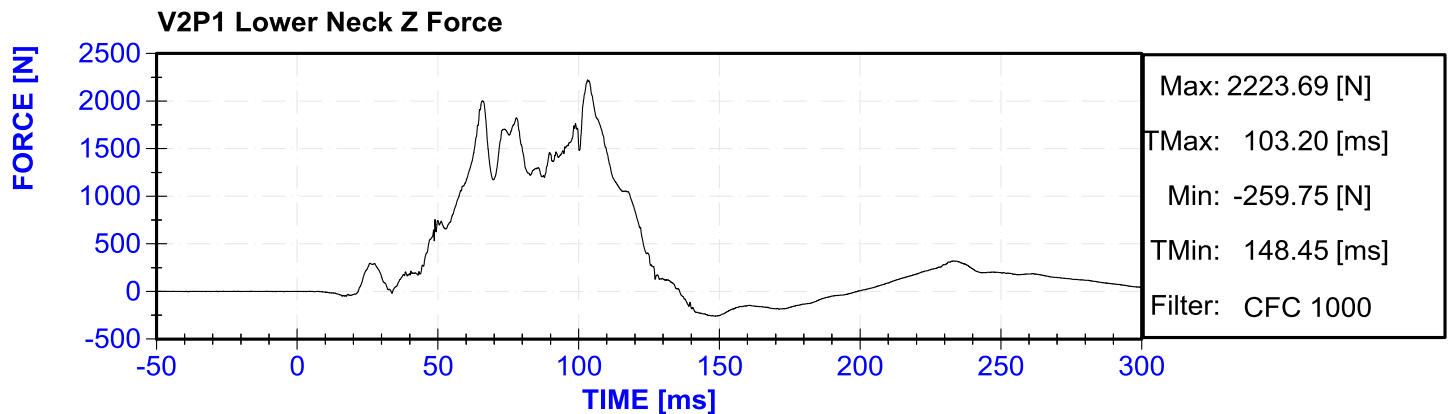
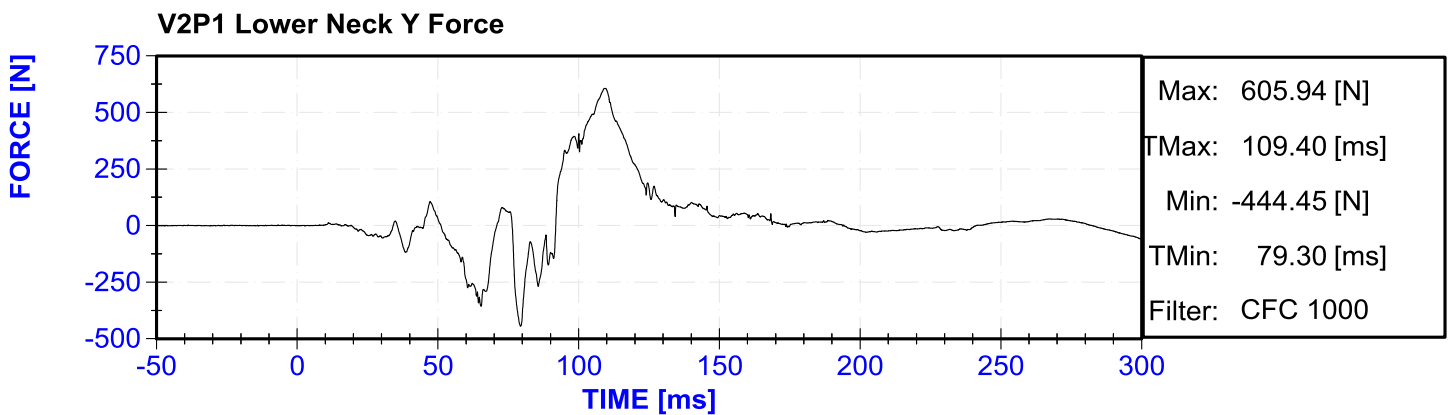
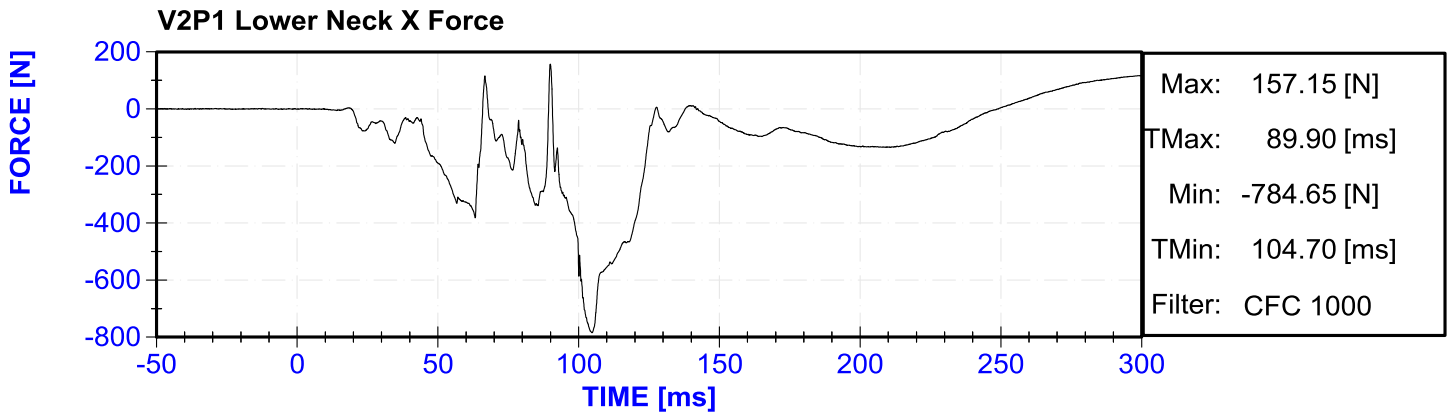
Plot 199	V2 Passenger Seat Pan Z Accelerometer	B-57
Plot 200	V2 Passenger Seat Thigh Bar X Accelerometer	B-57
Plot 201	V2 Passenger Seat Thigh Bar Z Accelerometer	B-58
Plot 202	V2 Driver Front Airbag Stage 1 Monitor	B-58
Plot 203	V2 Driver Front Airbag Stage 2 Monitor	B-58
Plot 204	V2 Driver Curtain Airbag Monitor	B-58
Plot 205	V2 Driver Seat Airbag Monitor	B-59
Plot 206	V2 Driver Knee Airbag Monitor	B-59
Plot 207	V2 Driver Retractor Pretensioner Monitor	B-59
Plot 208	V2 Passenger Front Airbag Stage 1 Monitor	B-59
Plot 209	V2 Passenger Front Airbag Stage 2 Monitor	B-60
Plot 210	V2 Passenger Retractor Pretensioner Monitor	B-60
Plot 211	V1 CG Ax	B-60
Plot 212	V1 CG Ay	B-60
Plot 213	V1 CG Az	B-61
Plot 214	V1 Rear C/L Ax	B-61
Plot 215	V1 Rear C/L Ay	B-61
Plot 216	V1 Rear C/L Az	B-61
Plot 217	V2P1 Fx on head acting through the O.C. joint only	B-62
Plot 218	V2P1 Fz on head acting through the O.C. joint only	B-62
Plot 219	V2P1 My on head acting through the O.C. joint only	B-62
Plot 220	V2P1 Fx on head acting through the total neck section	B-62
Plot 221	V2P1 Fy on head acting through the total neck section	B-63
Plot 222	V2P1 Fz on head acting through the total neck section	B-63
Plot 223	V2P1 Mx on head acting through the total neck section	B-63
Plot 224	V2P1 My on head acting through the total neck section	B-63
Plot 225	V2P1 Mz on head acting through the total neck section	B-64
Plot 226	V2P1 Chest Left Upper Dx	B-64
Plot 227	V2P1 Chest Left Upper Dy	B-64
Plot 228	V2P1 Chest Left Upper Dz	B-64
Plot 229	V2P1 Chest Left Upper D	B-65
Plot 230	V2P1 Chest Right Upper Dx	B-65
Plot 231	V2P1 Chest Right Upper Dy	B-65
Plot 232	V2P1 Chest Right Upper Dz	B-65
Plot 233	V2P1 Chest Right Upper D	B-66
Plot 234	V2P1 Chest Left Lower Dx	B-66
Plot 235	V2P1 Chest Left Lower Dy	B-66
Plot 236	V2P1 Chest Left Lower Dz	B-66
Plot 237	V2P1 Chest Left Lower D	B-67
Plot 238	V2P1 Chest Right Lower Dx	B-67
Plot 239	V2P1 Chest Right Lower Dy	B-67
Plot 240	V2P1 Chest Right Lower Dz	B-67
Plot 241	V2P1 Chest Right Lower D	B-68
Plot 242	V2P2 Fx on head acting through the O.C. joint only	B-68
Plot 243	V2P2 Fz on head acting through the O.C. joint only	B-68
Plot 244	V2P2 My on head acting through the O.C. joint only	B-68
Plot 245	V2P2 Fx on head acting through the total neck section	B-69
Plot 246	V2P2 Fy on head acting through the total neck section	B-69
Plot 247	V2P2 Fz on head acting through the total neck section	B-69
Plot 248	V2P2 Mx on head acting through the total neck section	B-69

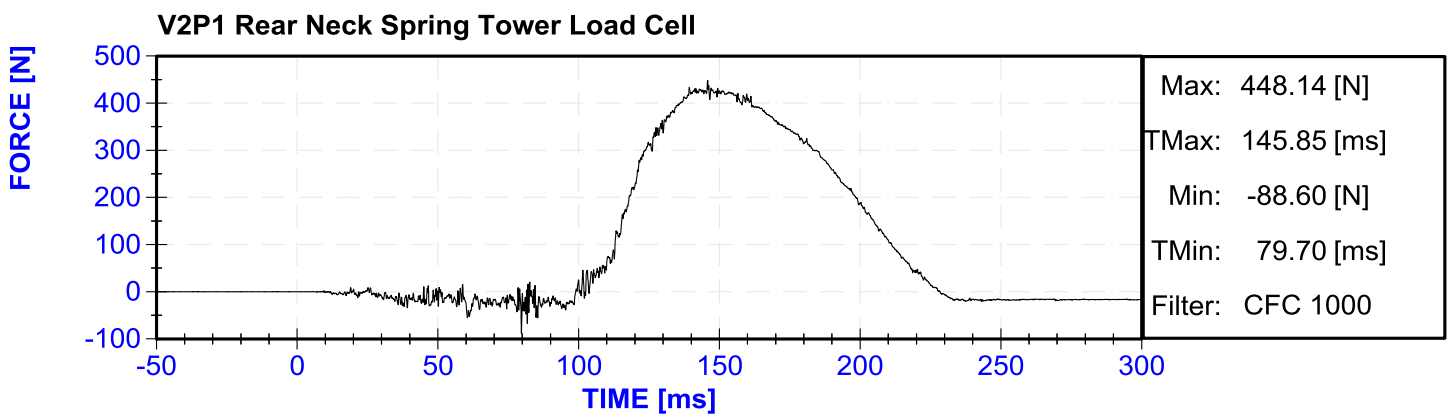
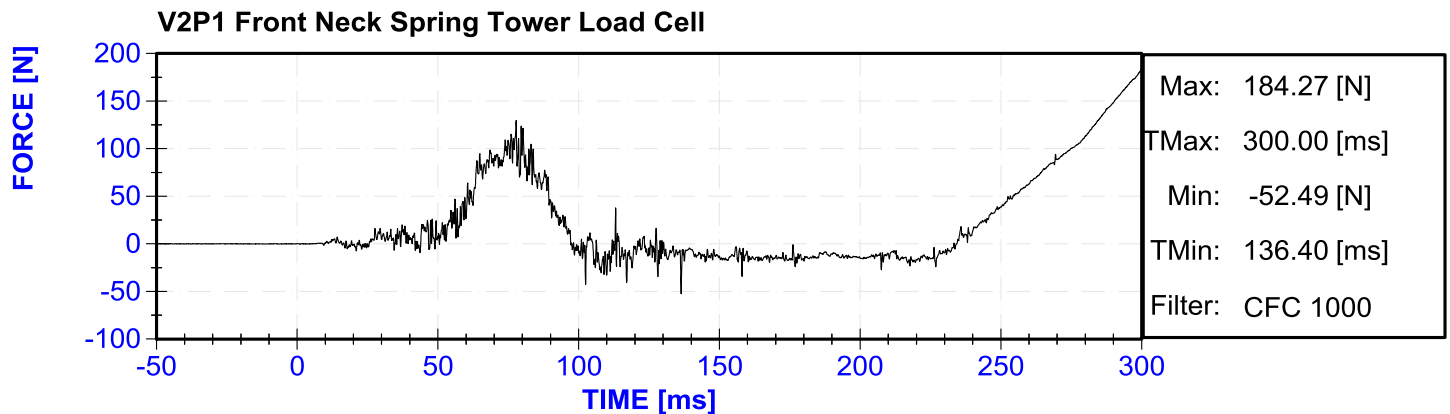
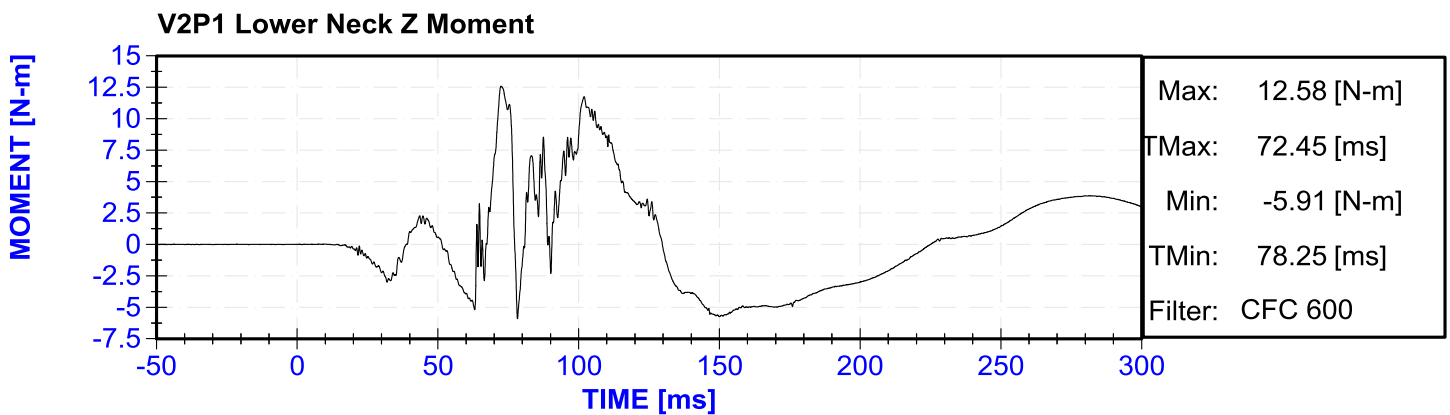
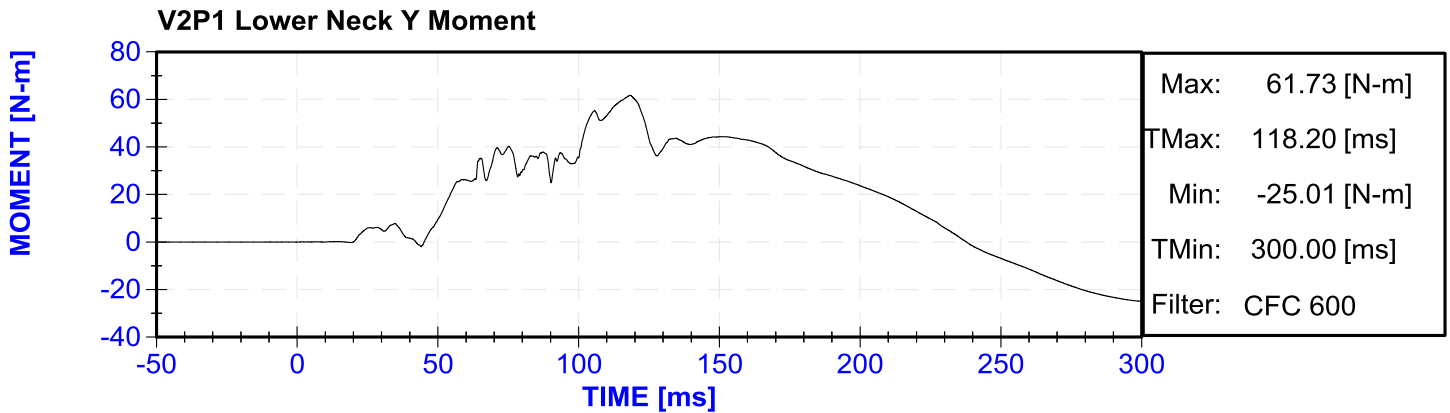
Plot 249	V2P2 My on head acting through the total neck section	B-70
Plot 250	V2P2 Mz on head acting through the total neck section	B-70
Plot 251	V2P2 Chest Left Upper Dx	B-70
Plot 252	V2P2 Chest Left Upper Dy	B-70
Plot 253	V2P2 Chest Left Upper Dz	B-71
Plot 254	V2P2 Chest Left Upper D	B-71
Plot 255	V2P2 Chest Right Upper Dx	B-71
Plot 256	V2P2 Chest Right Upper Dy	B-71
Plot 257	V2P2 Chest Right Upper Dz	B-72
Plot 258	V2P2 Chest Right Upper D	B-72
Plot 259	V2P2 Chest Left Lower Dx	B-72
Plot 260	V2P2 Chest Left Lower Dy	B-72
Plot 261	V2P2 Chest Left Lower Dz	B-73
Plot 262	V2P2 Chest Left Lower D	B-73
Plot 263	V2P2 Chest Right Lower Dx	B-73
Plot 264	V2P2 Chest Right Lower Dy	B-73
Plot 265	V2P2 Chest Right Lower Dz	B-74
Plot 266	V2P2 Chest Right Lower D	B-74



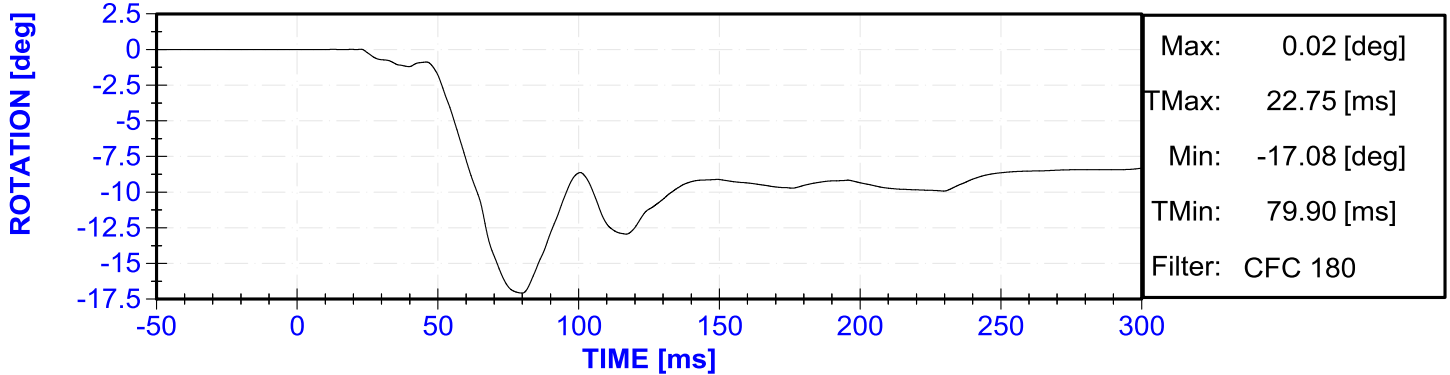




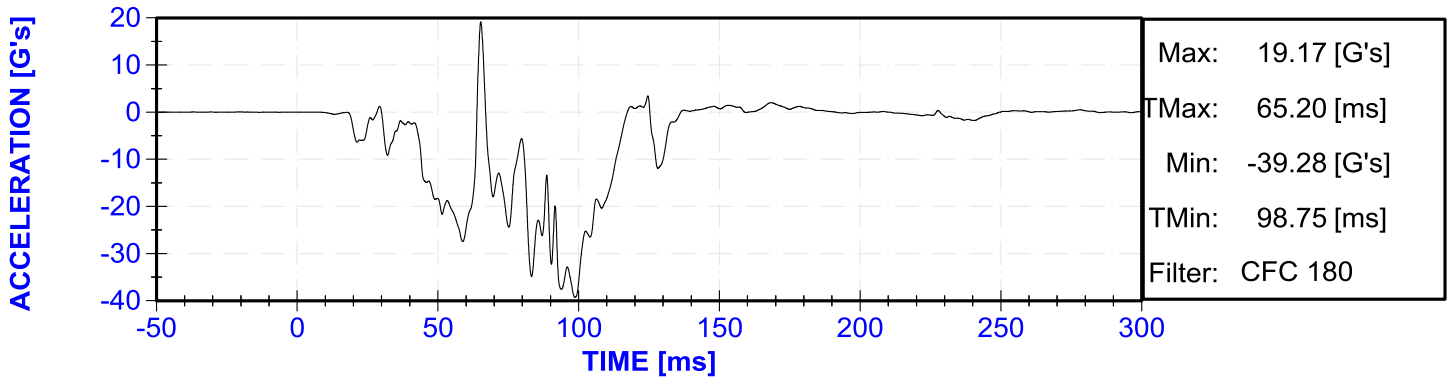




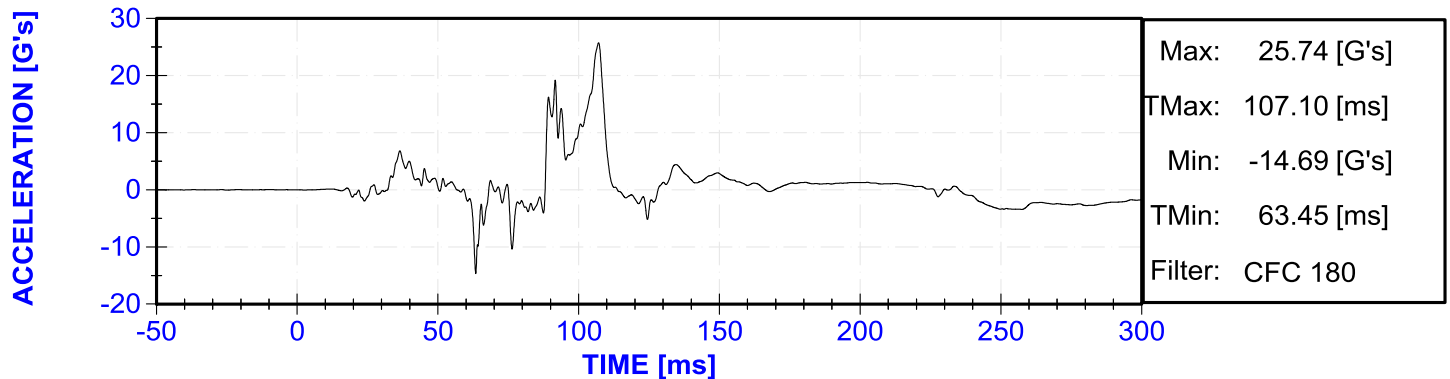
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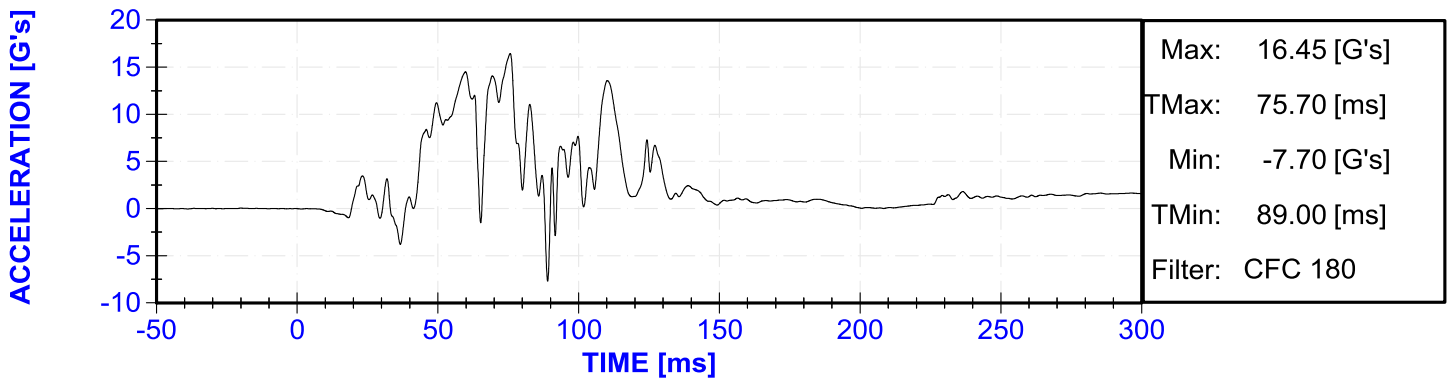
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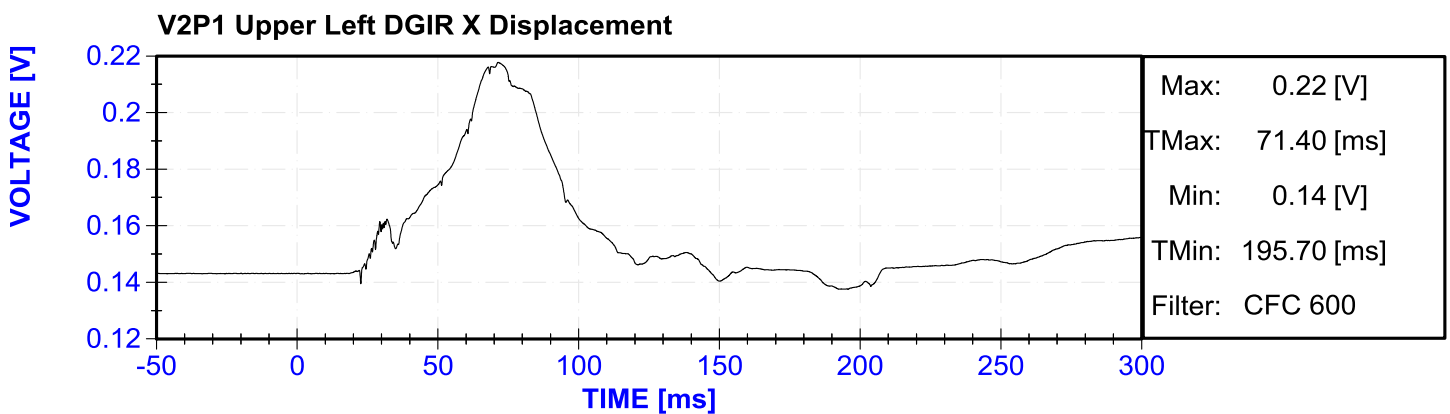
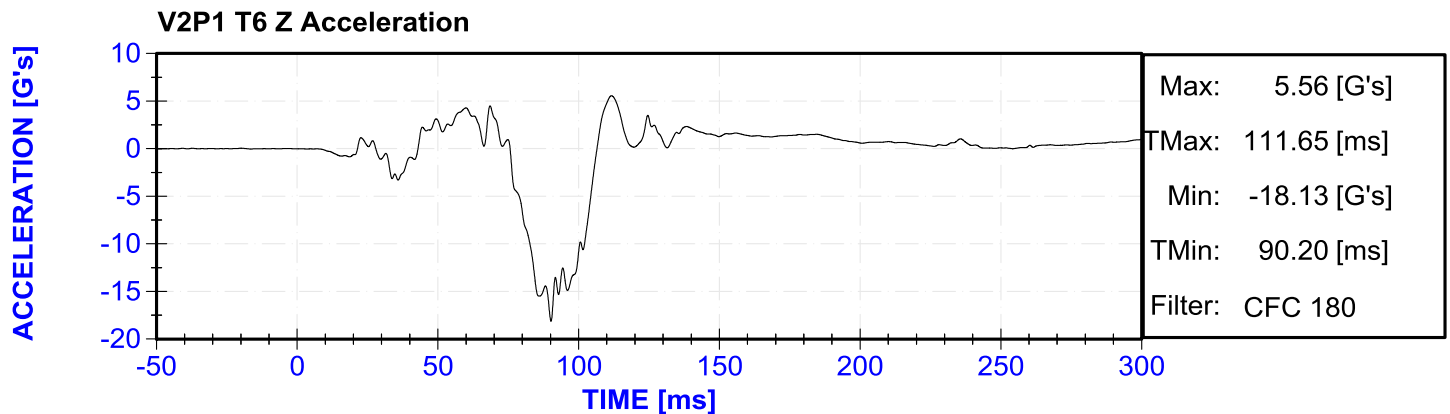
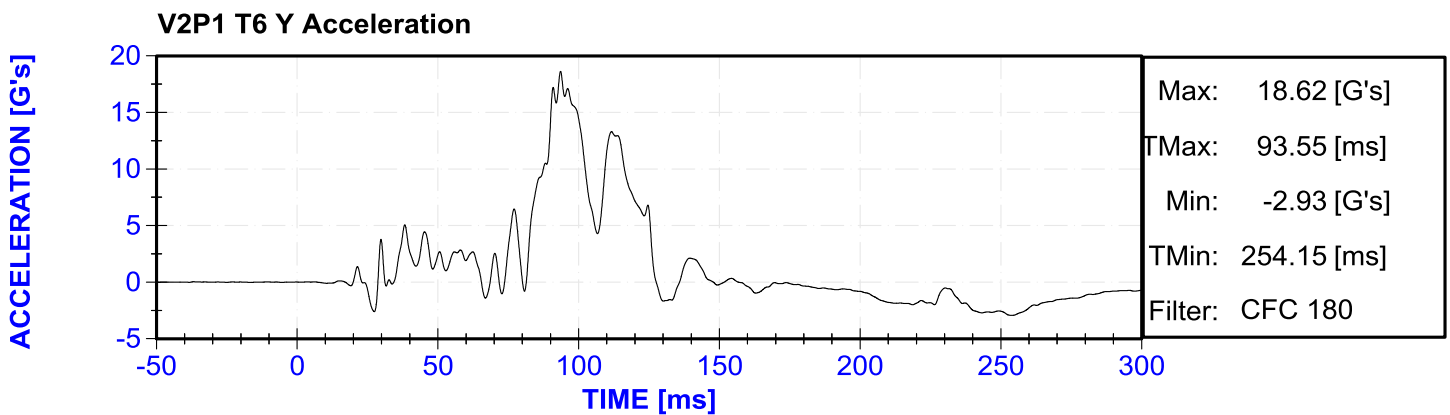
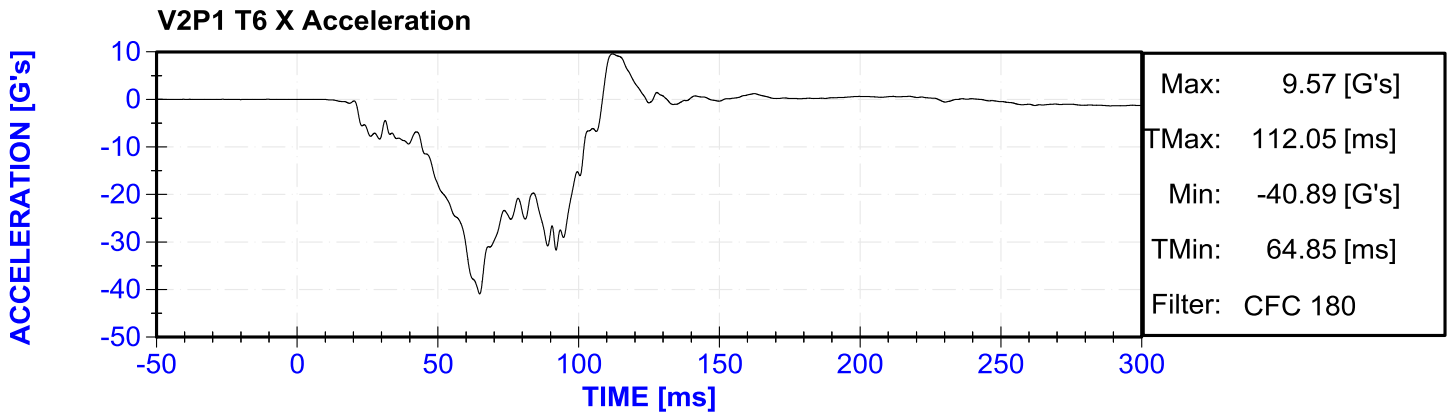


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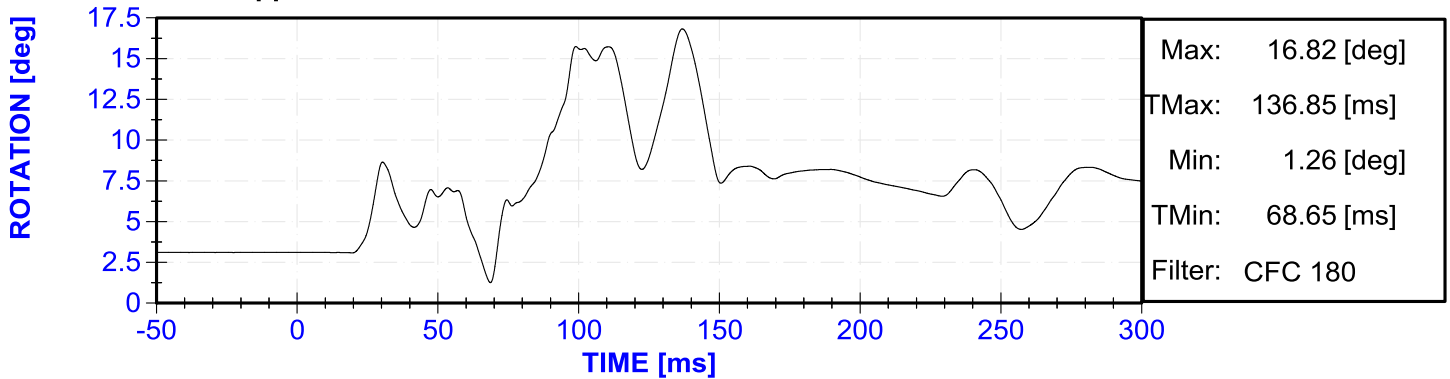


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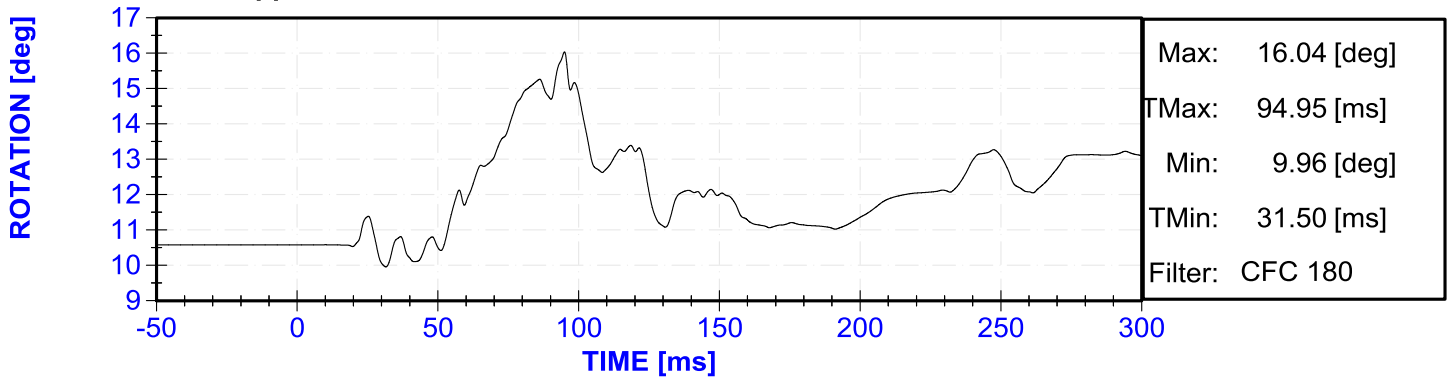




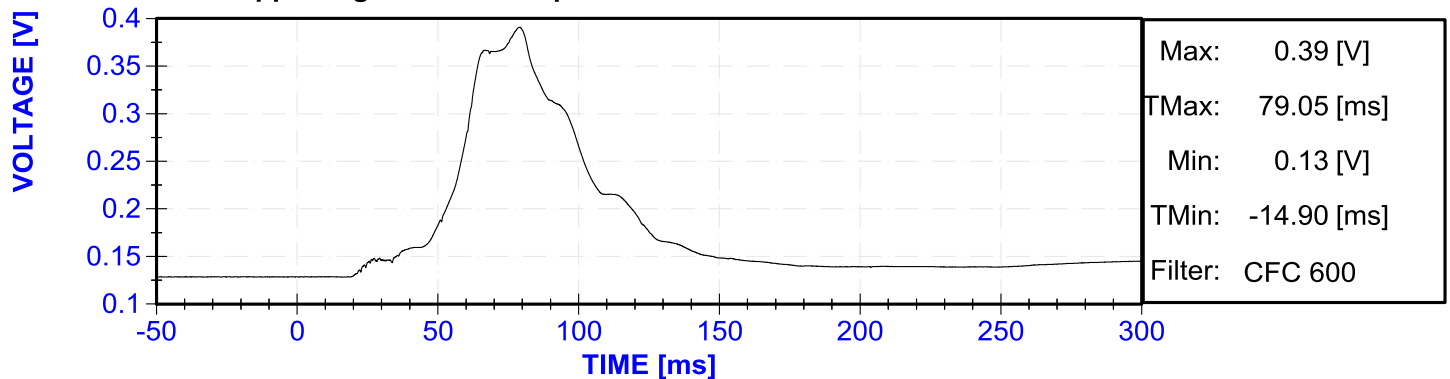
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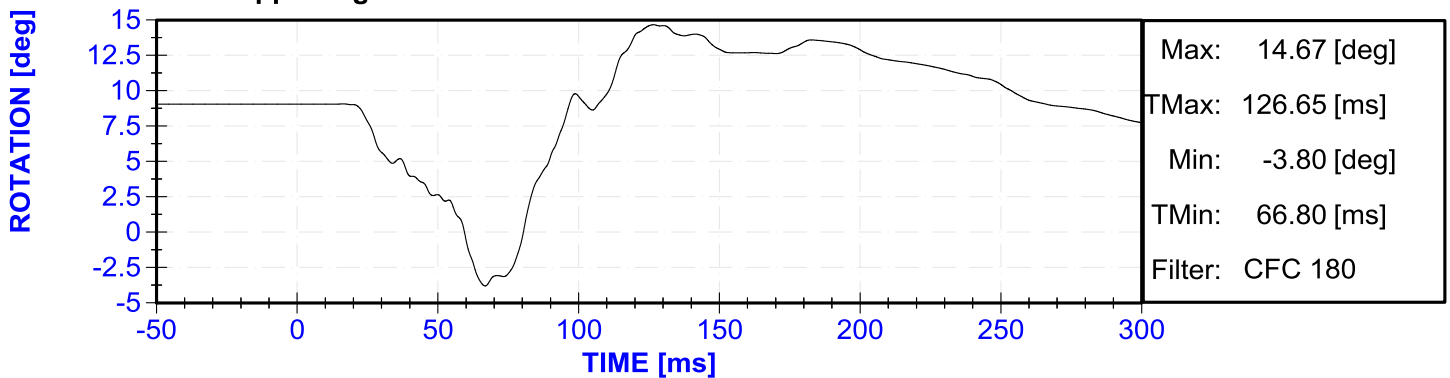
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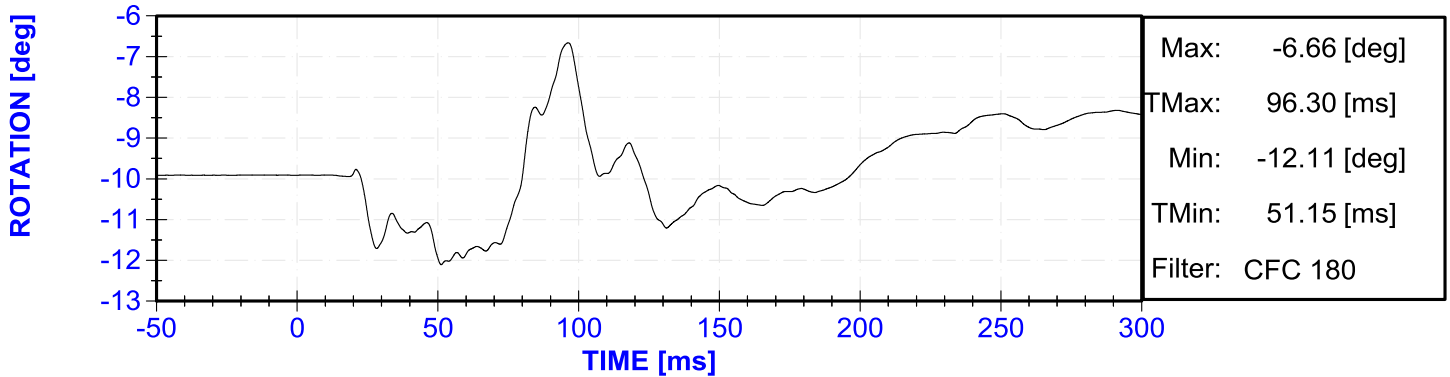
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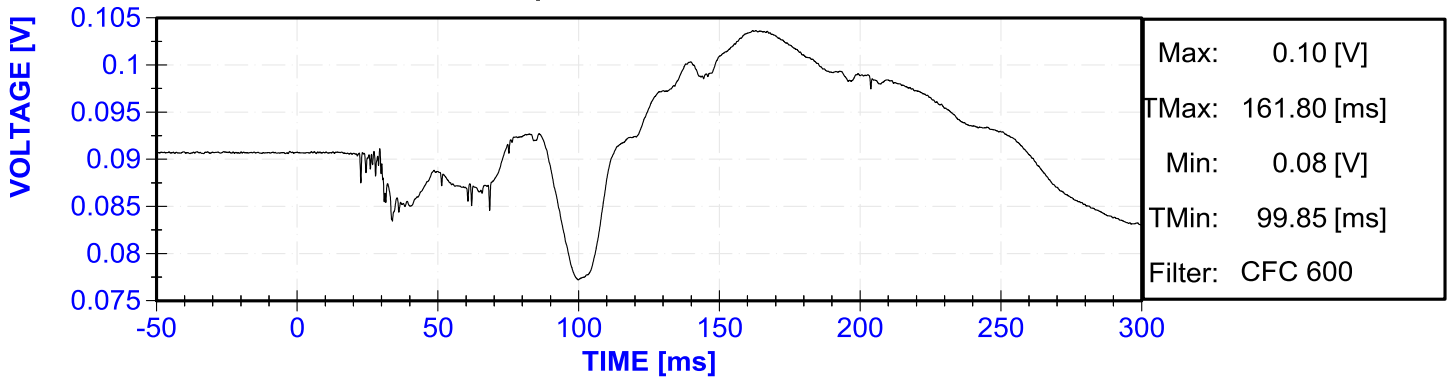
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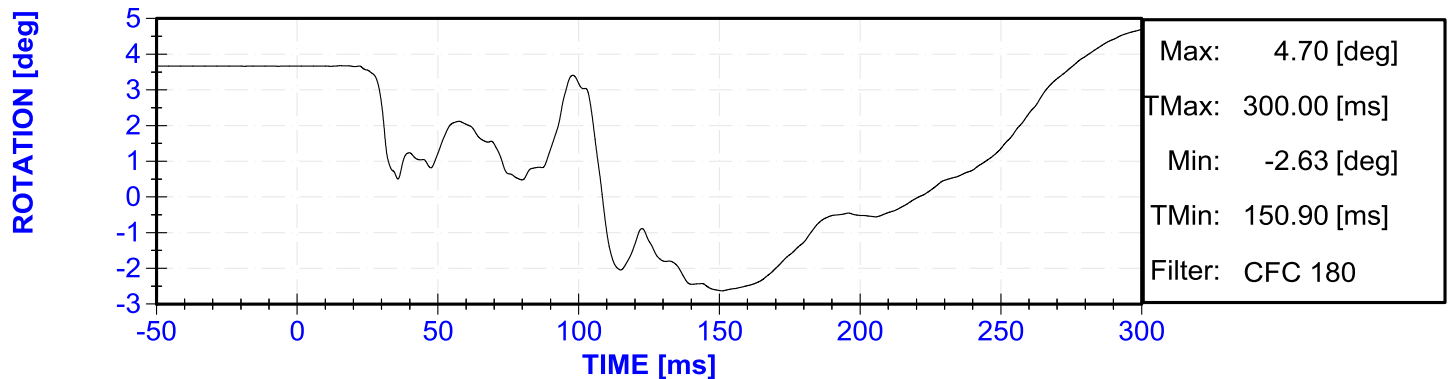
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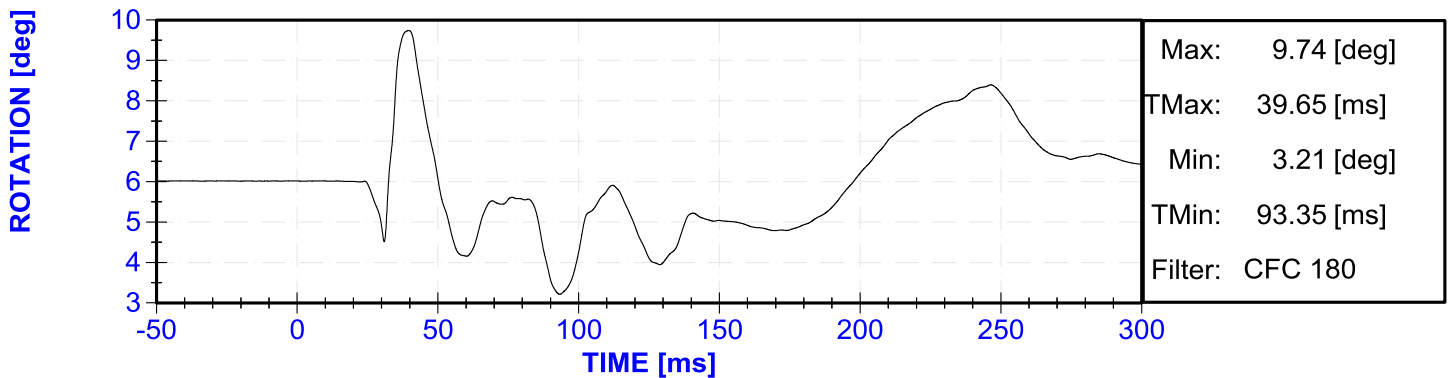
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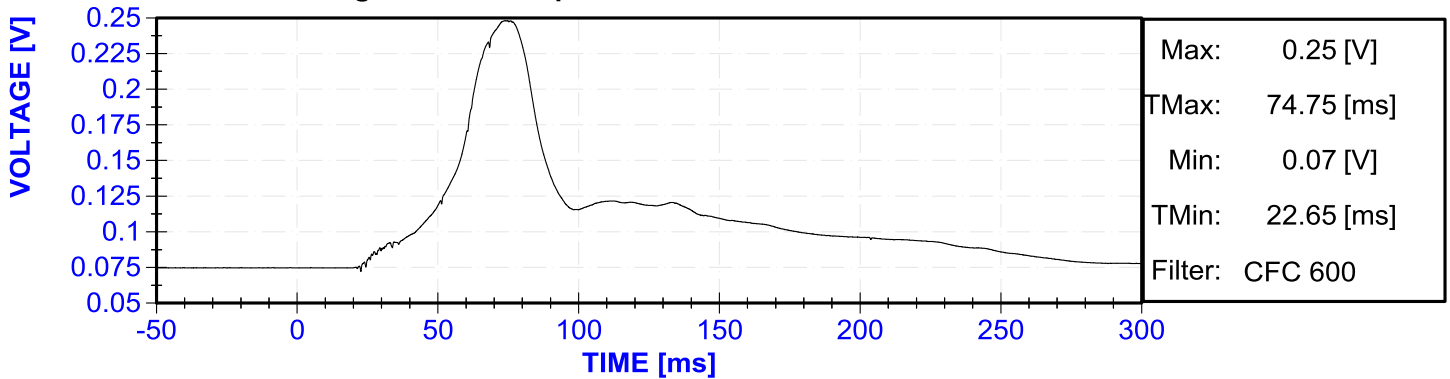
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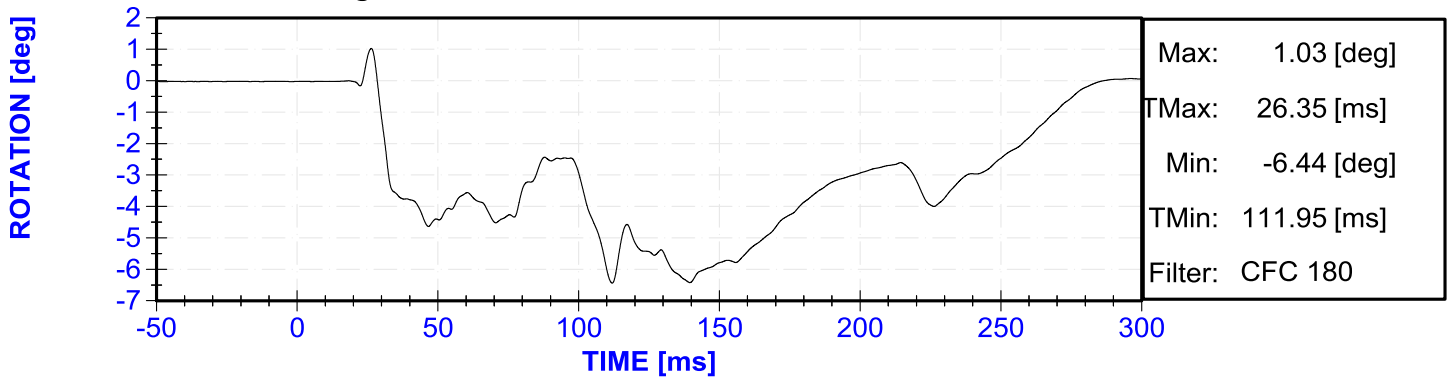
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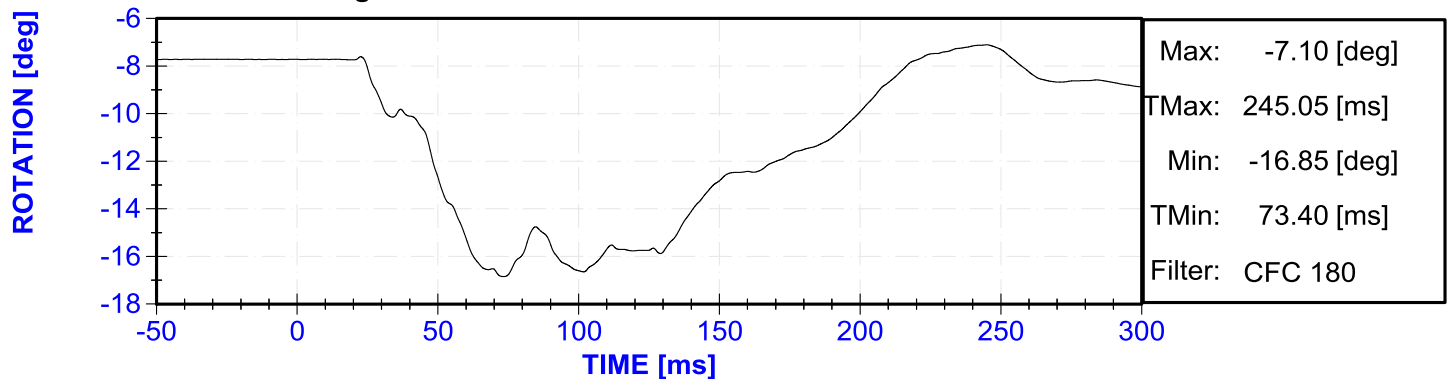
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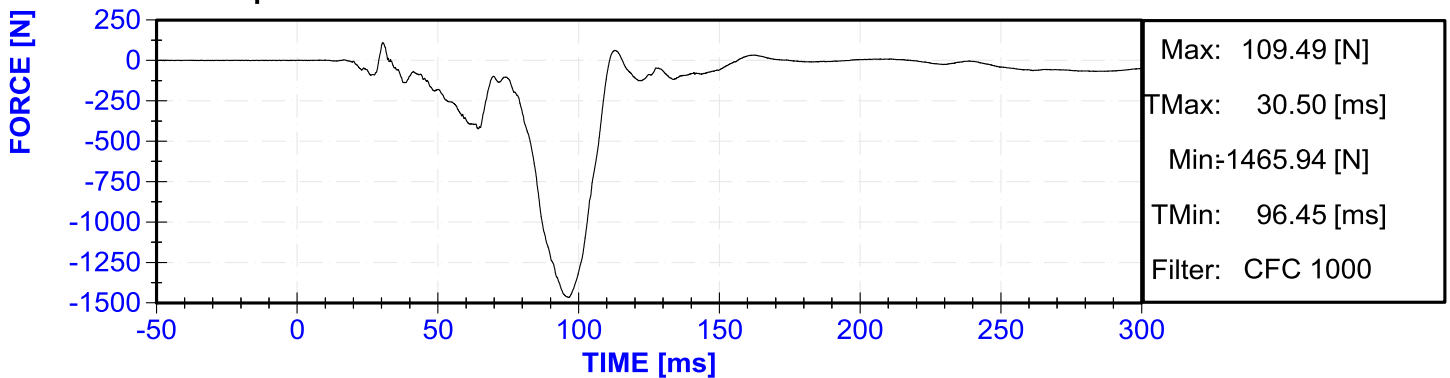
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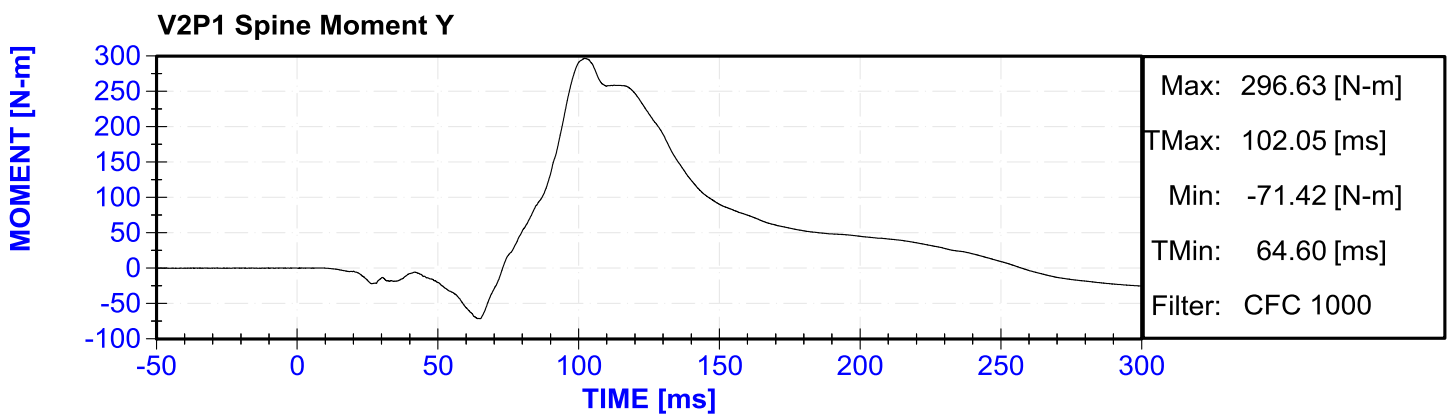
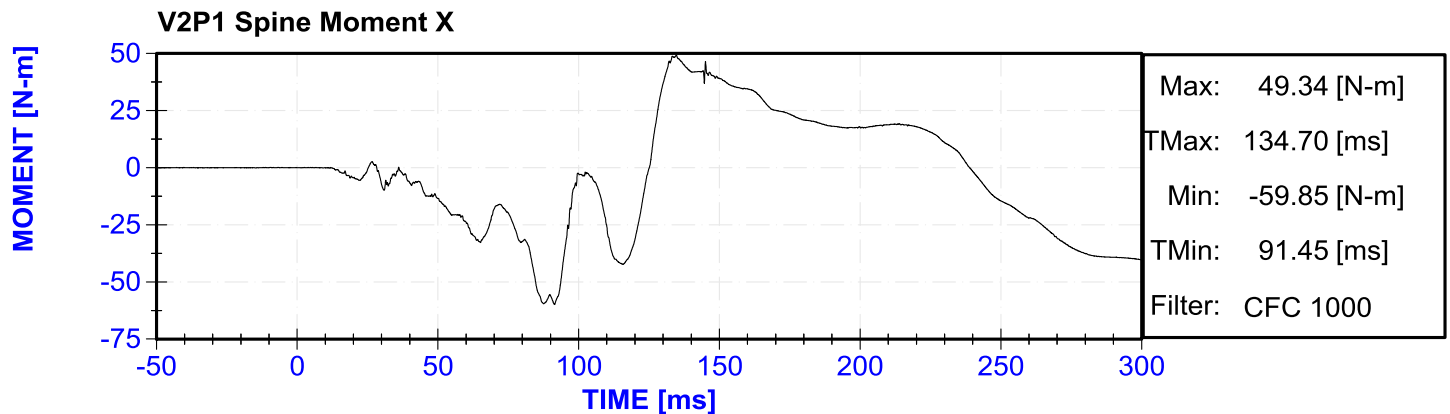
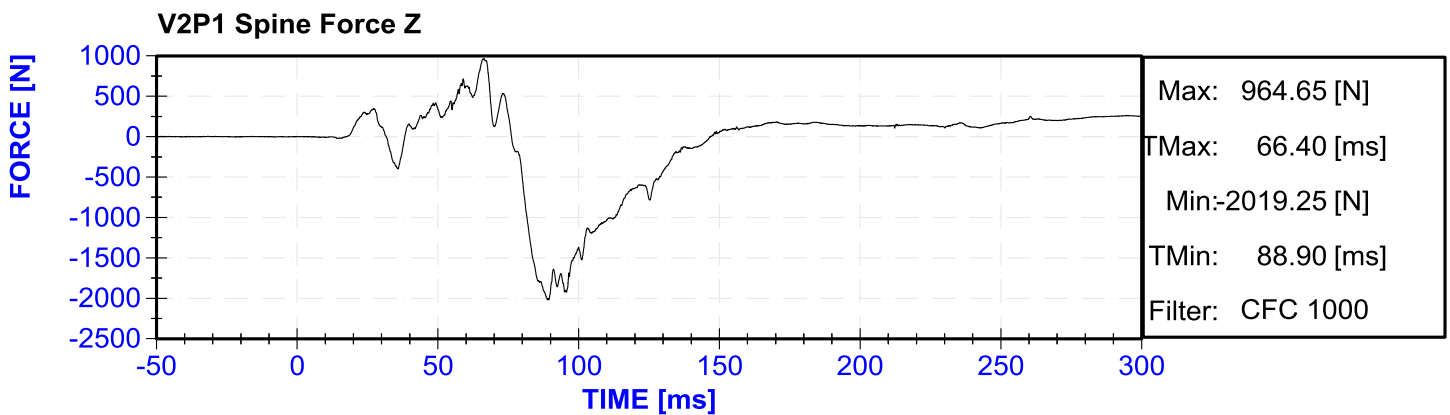
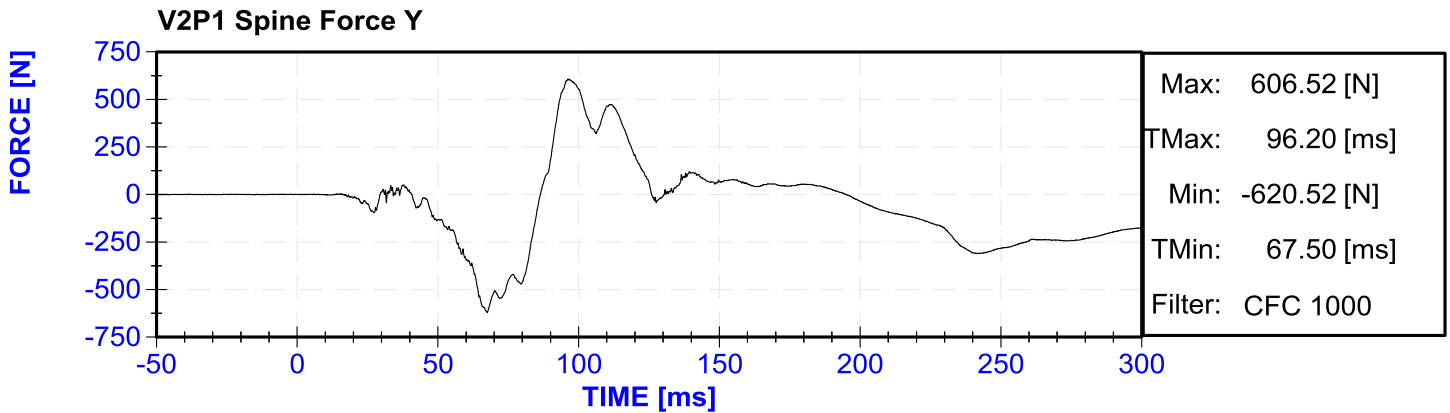


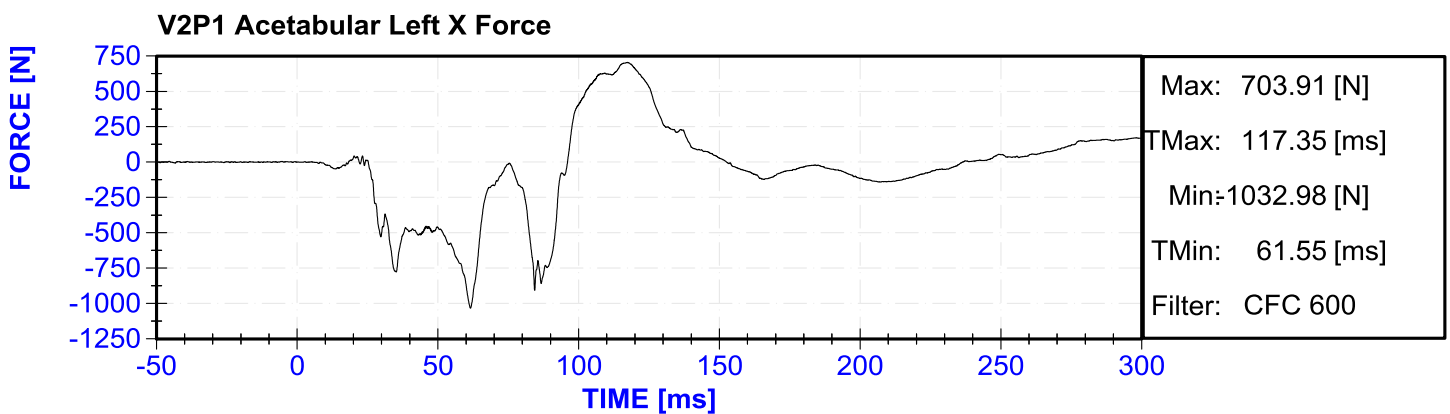
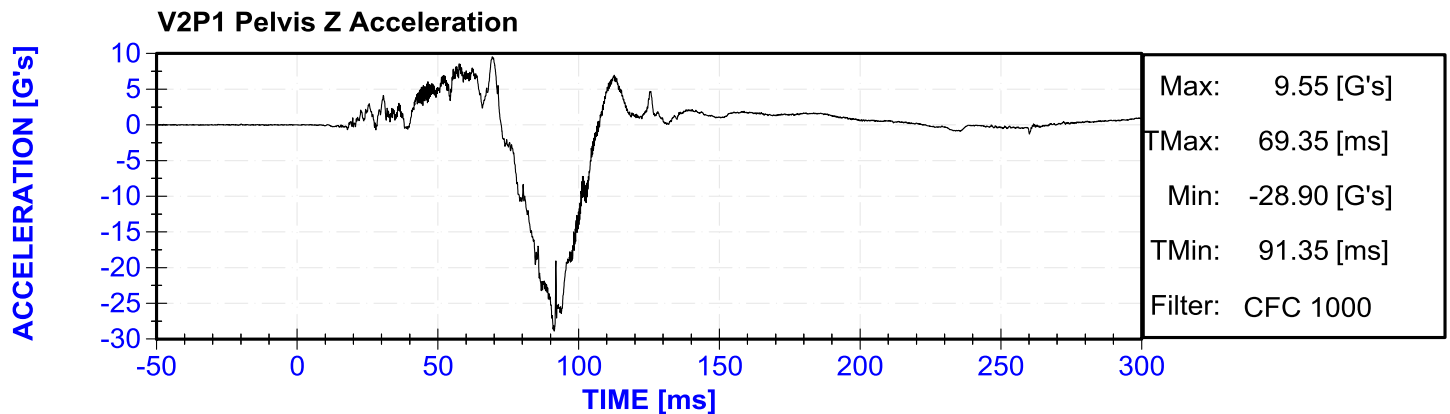
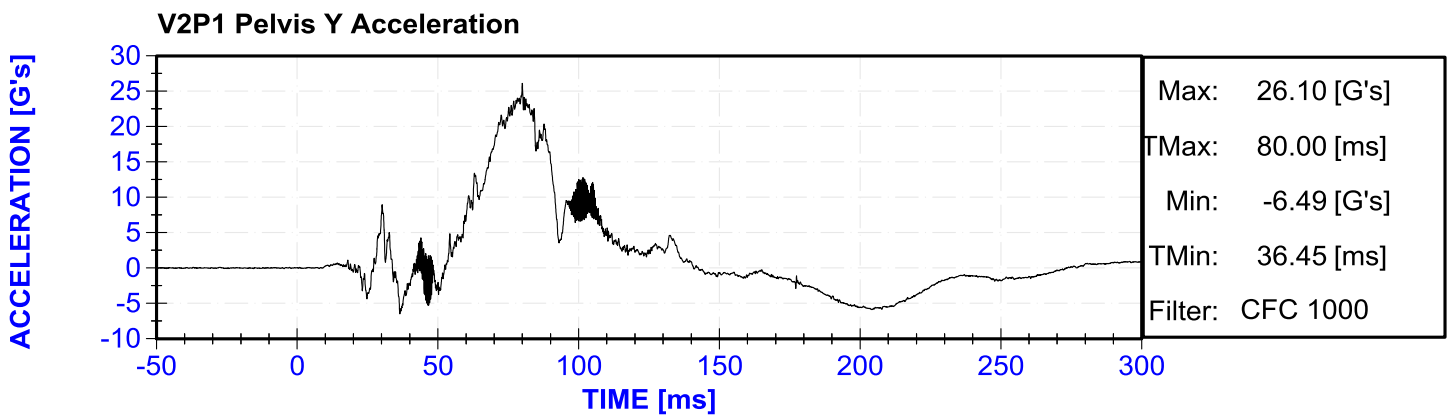
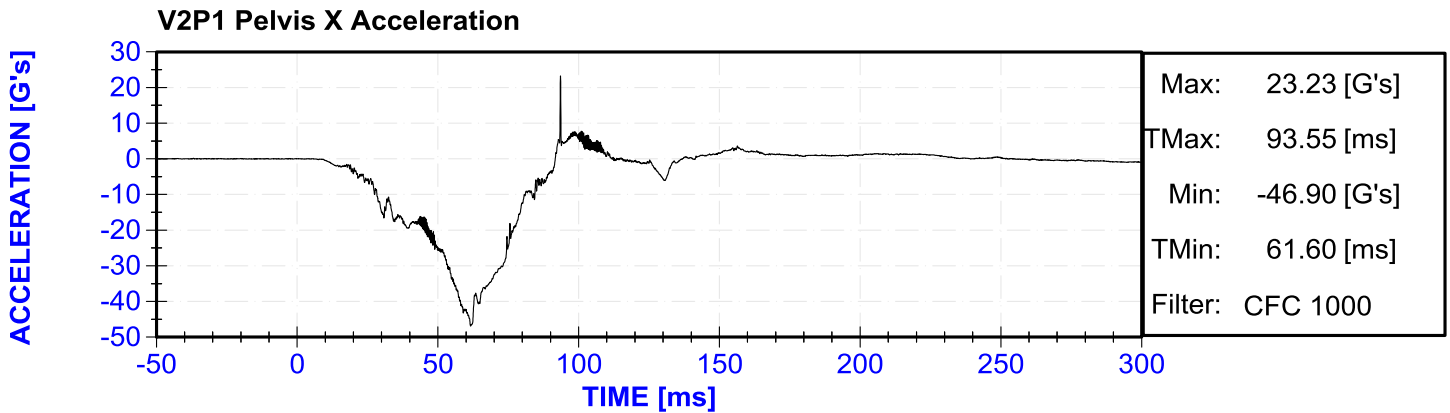
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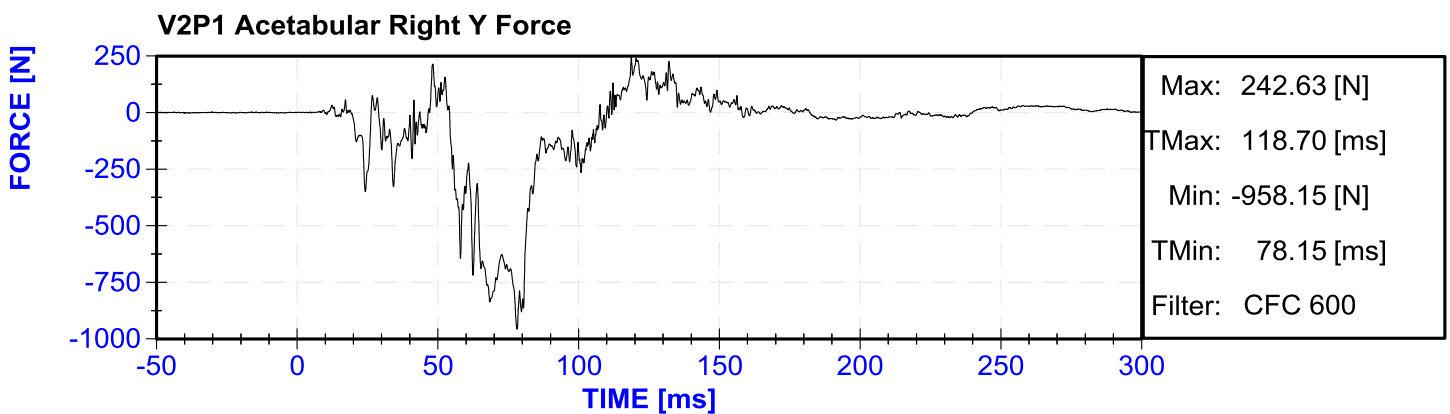
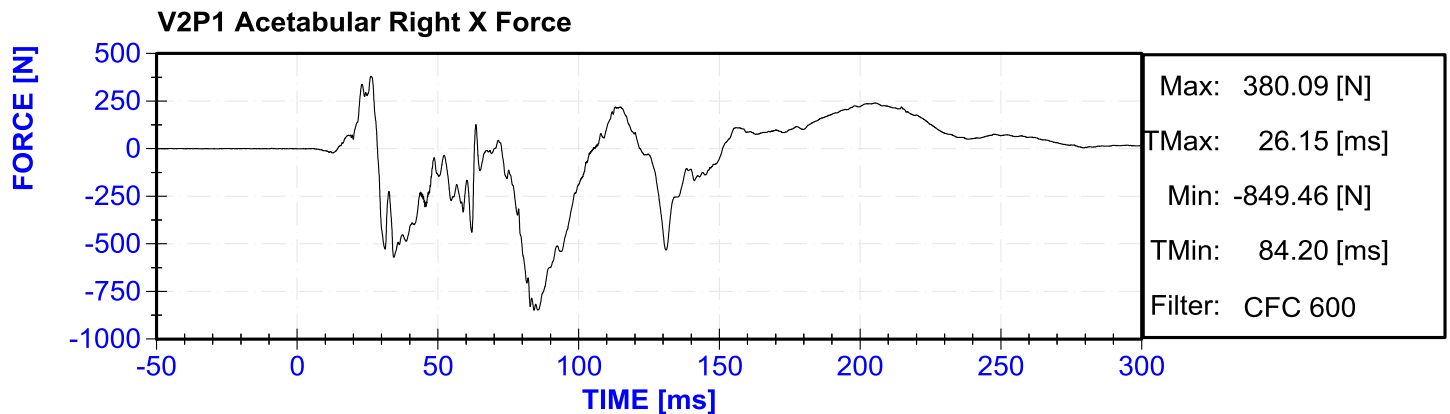
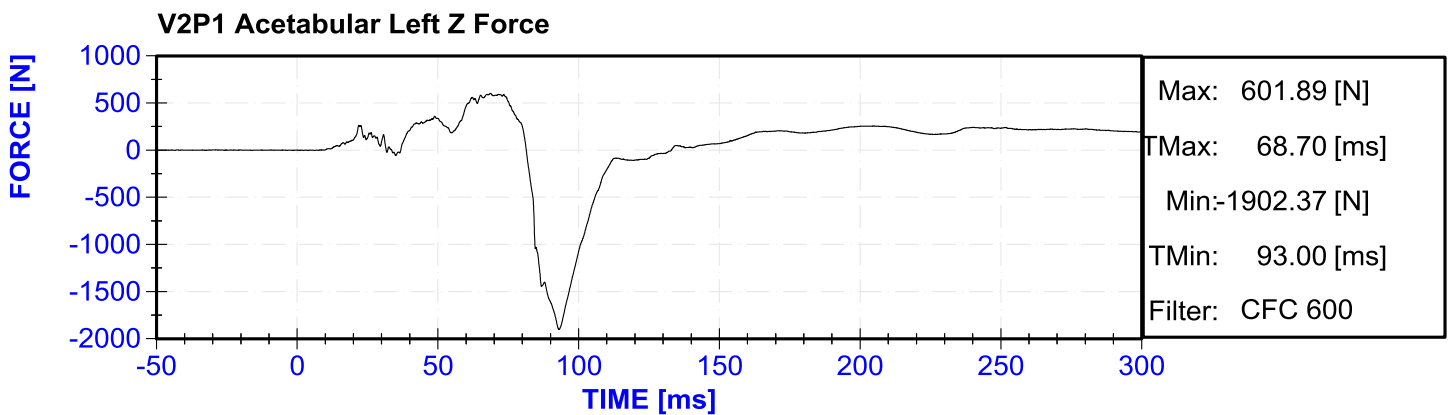
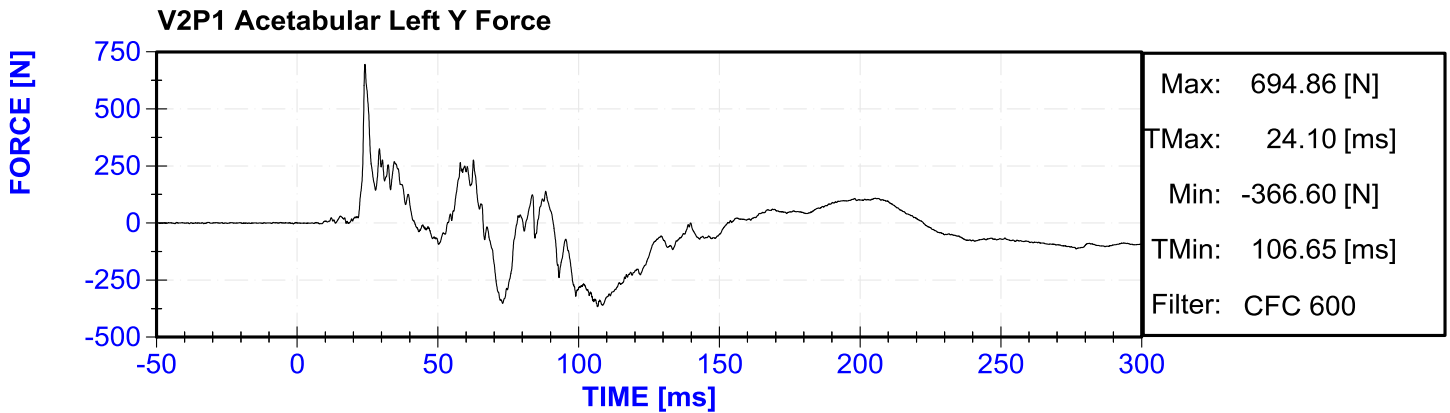


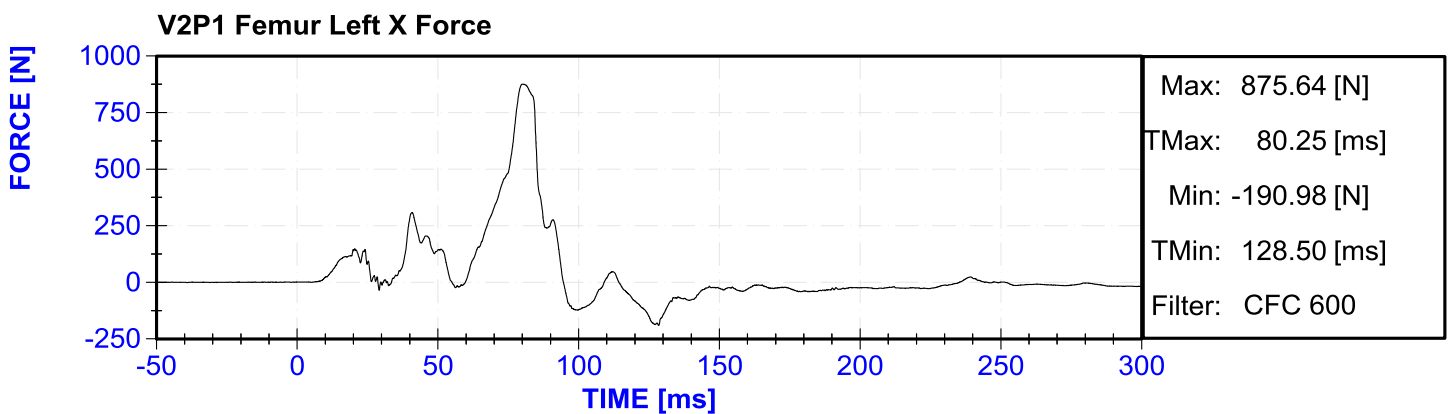
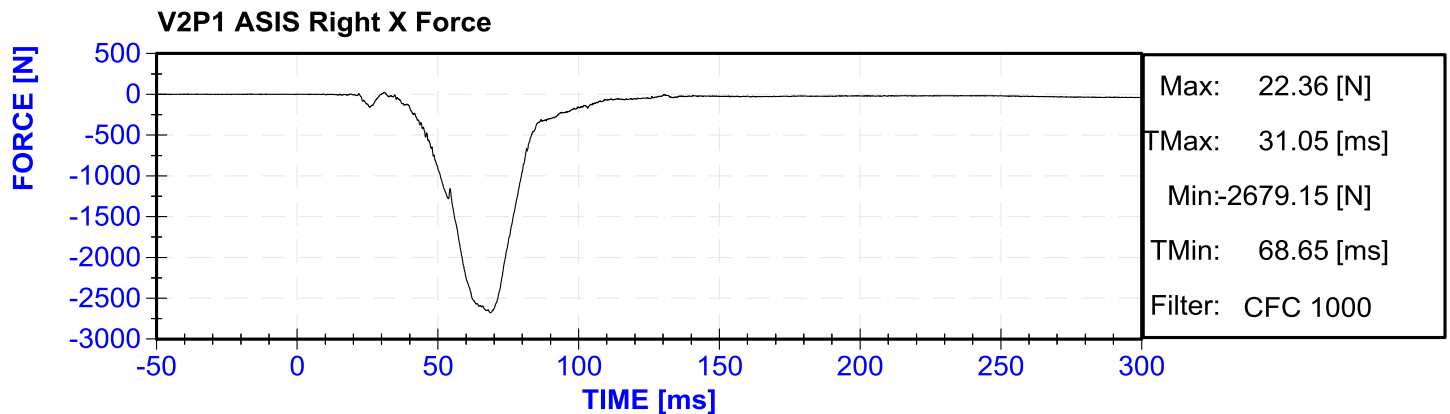
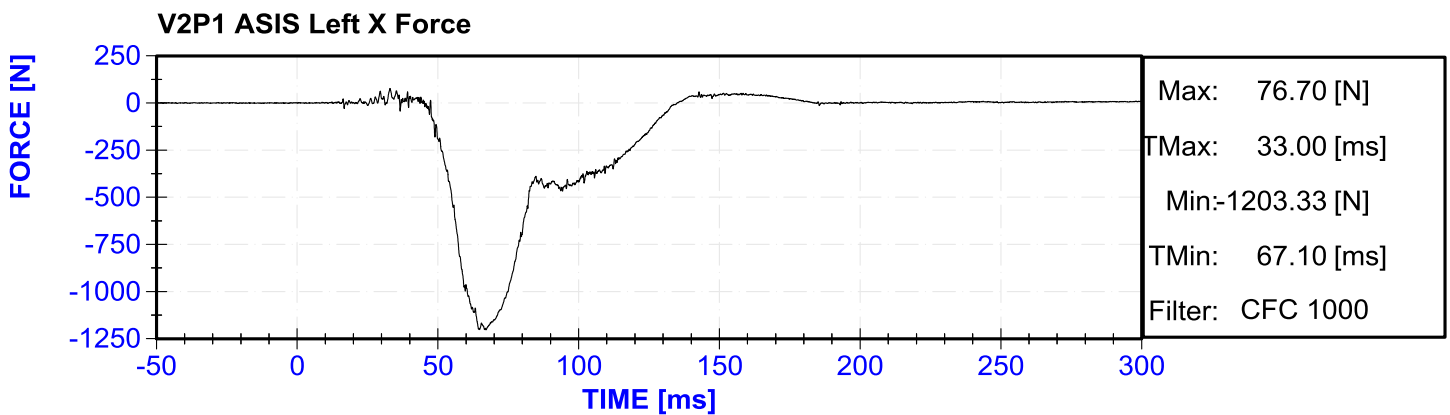
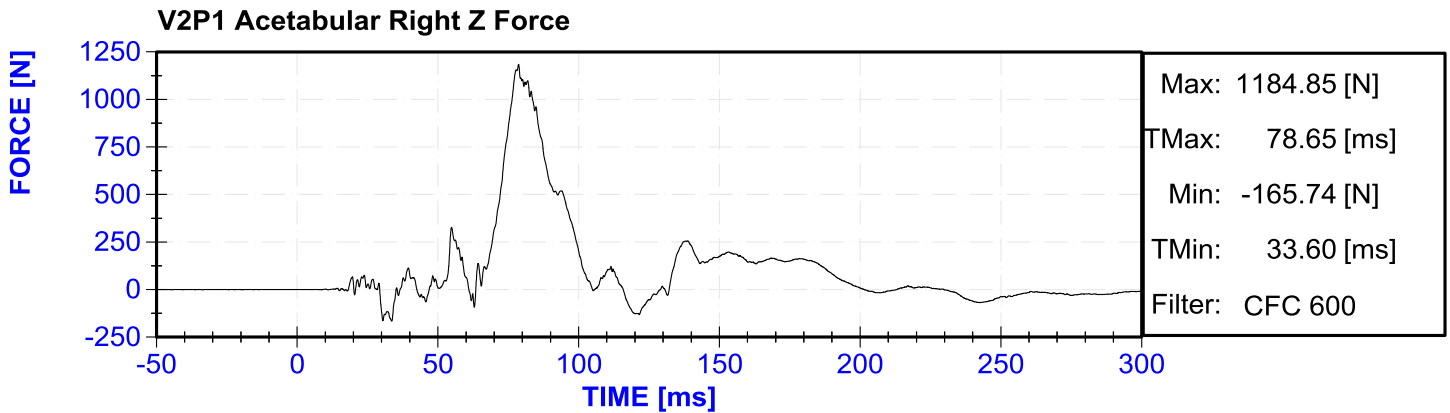
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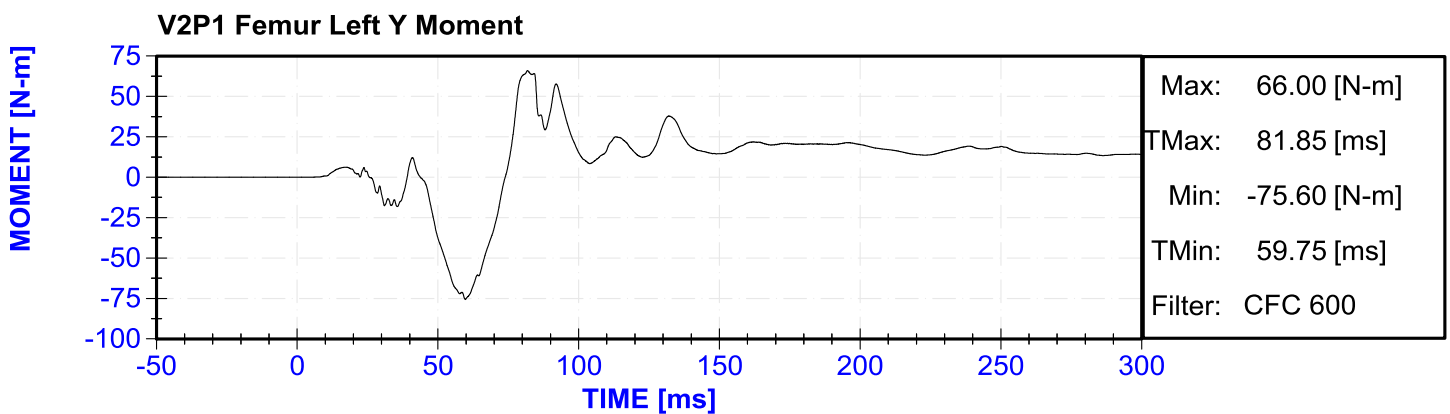
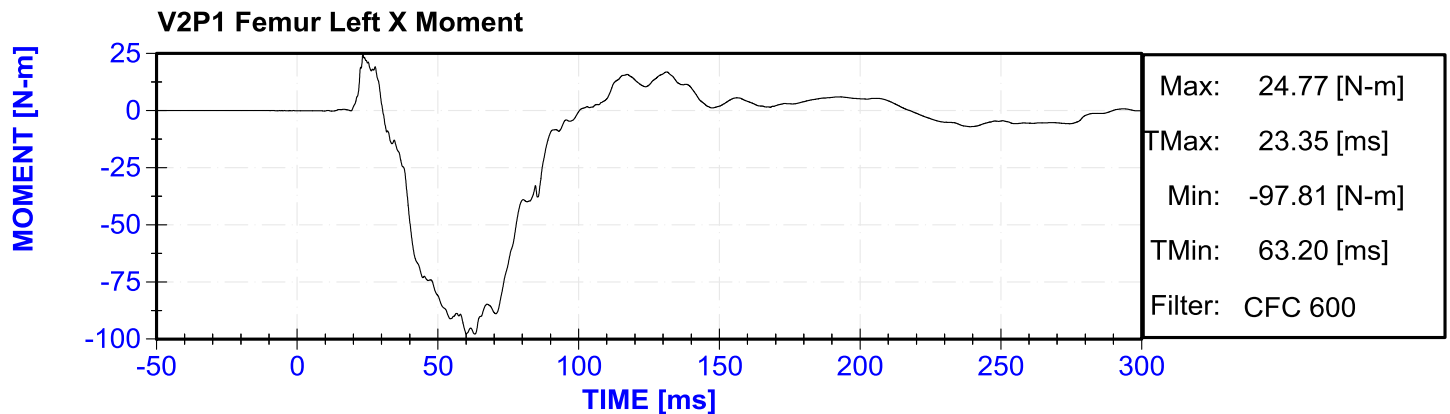
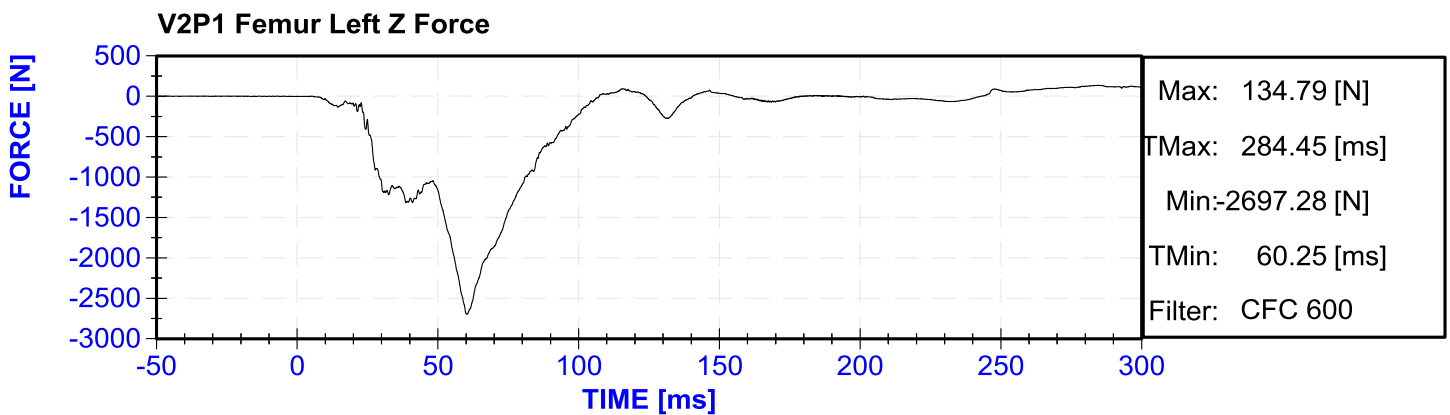
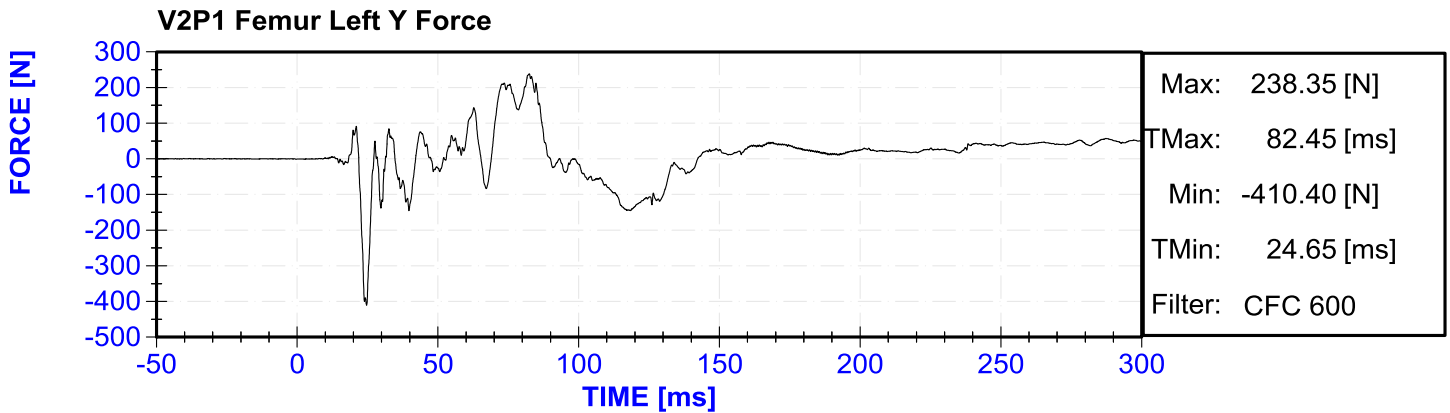


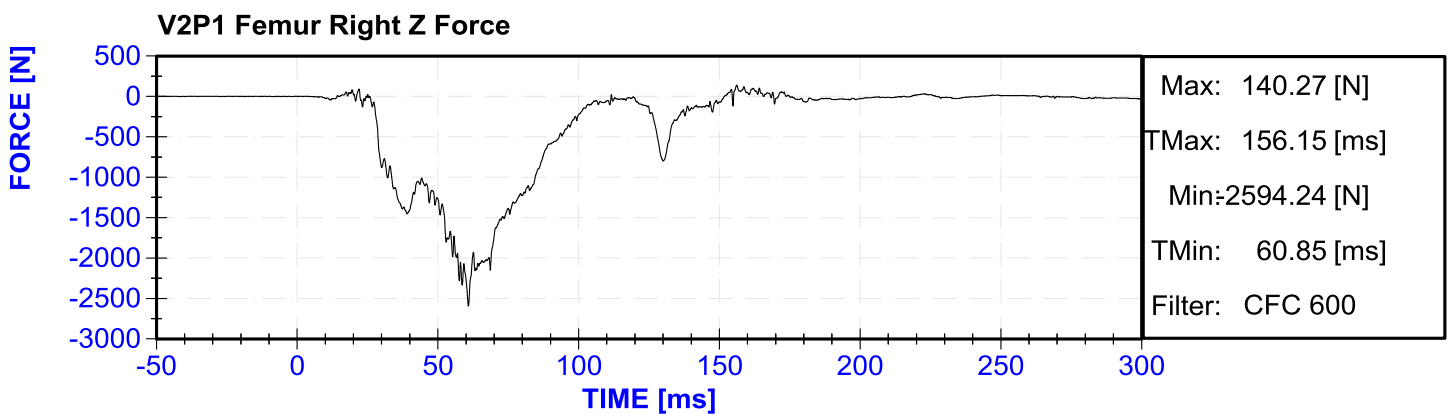
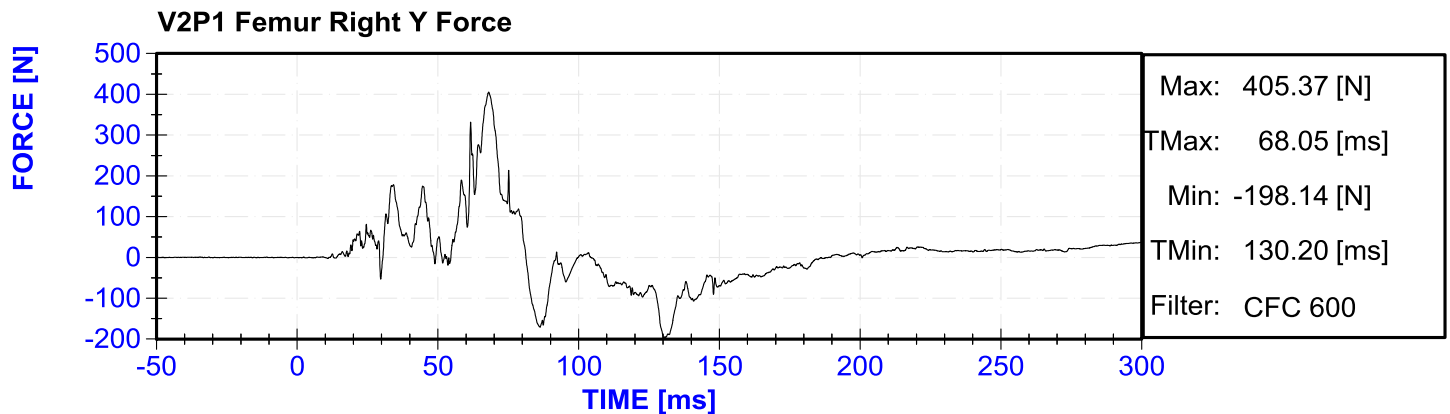
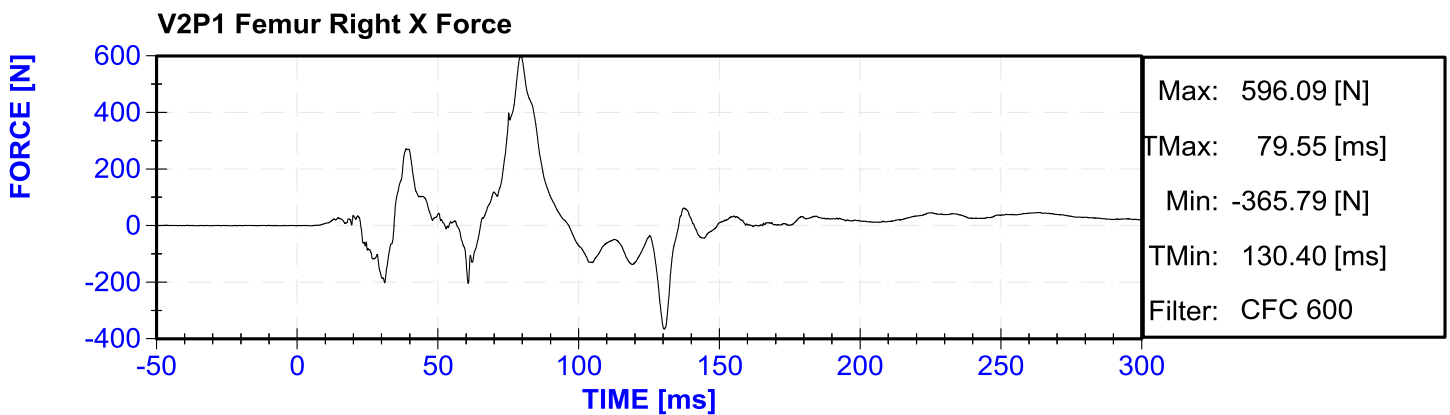
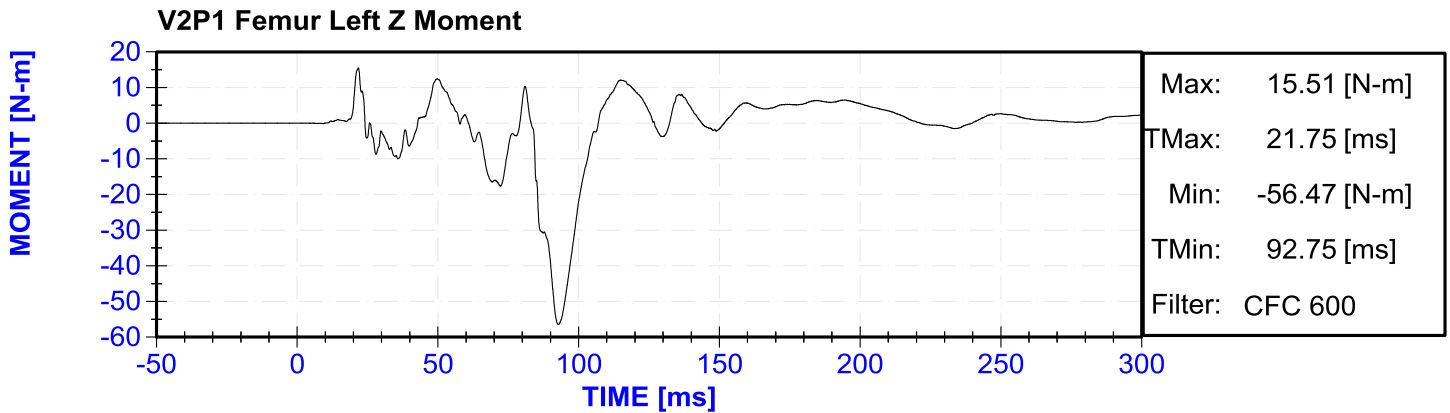


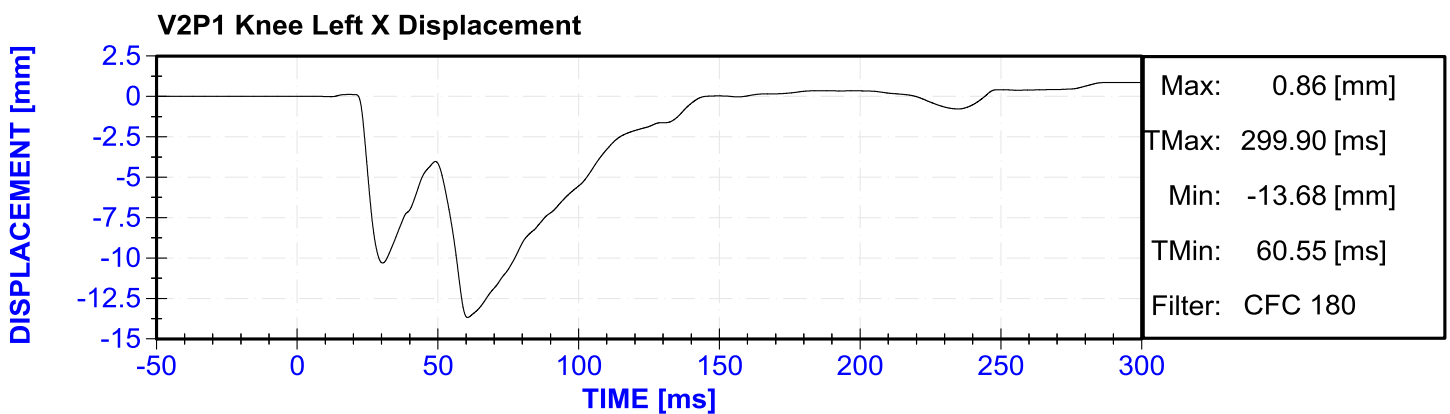
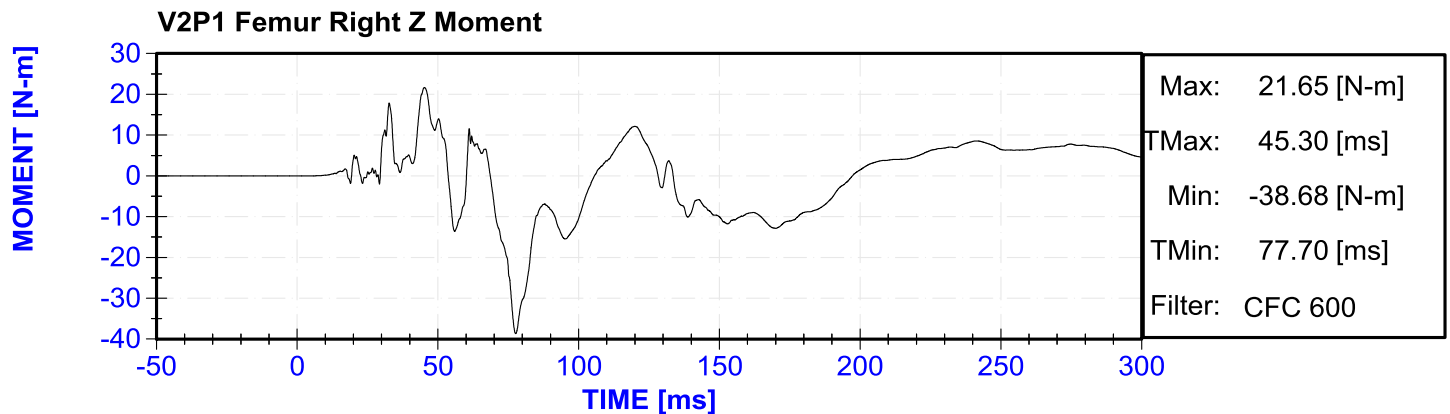
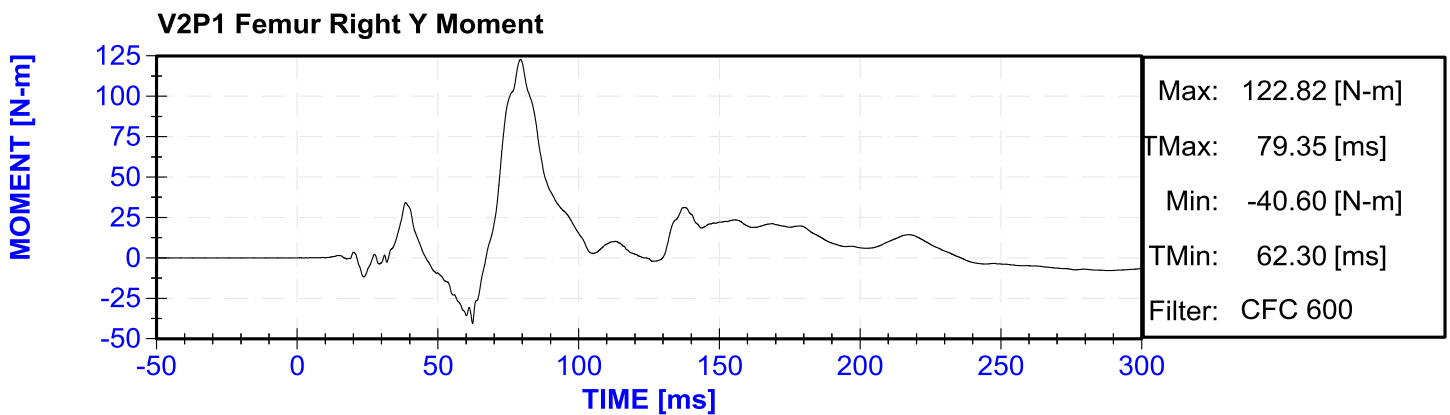
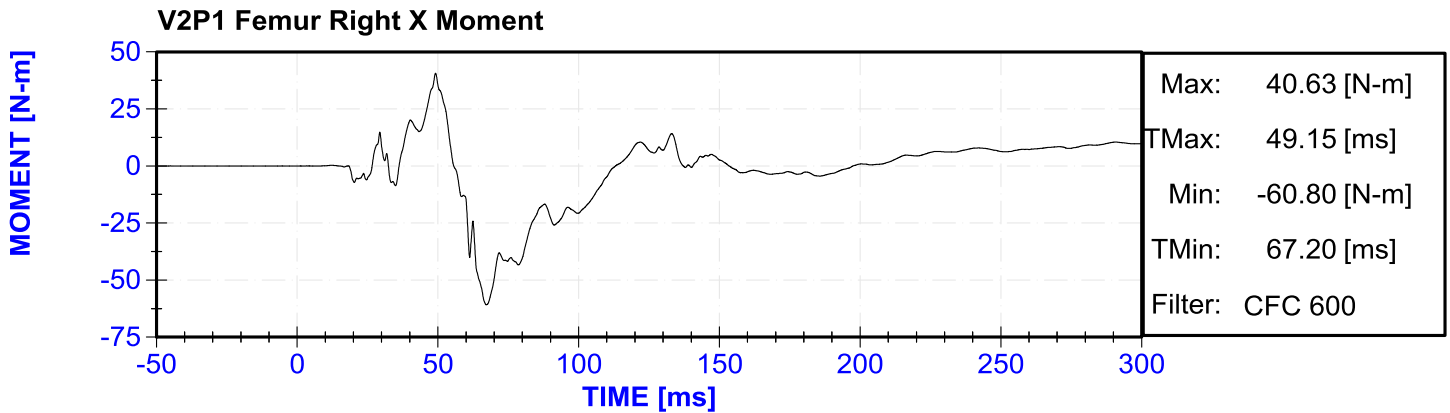


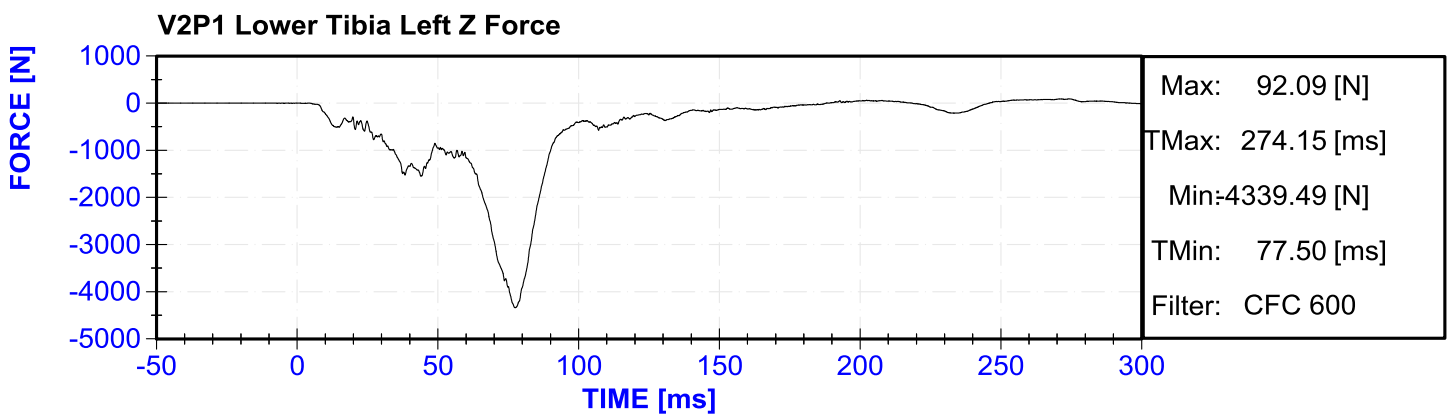
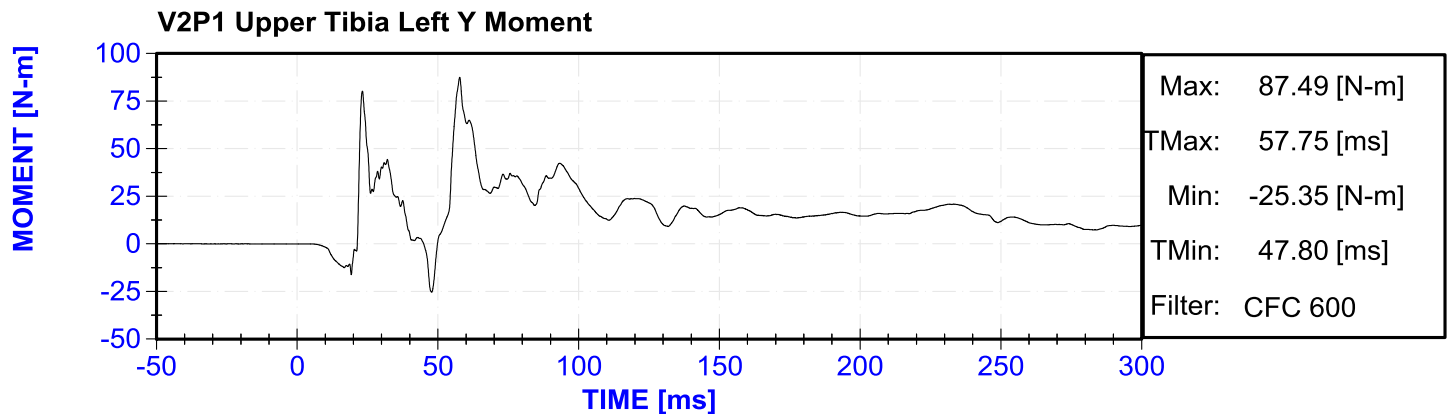
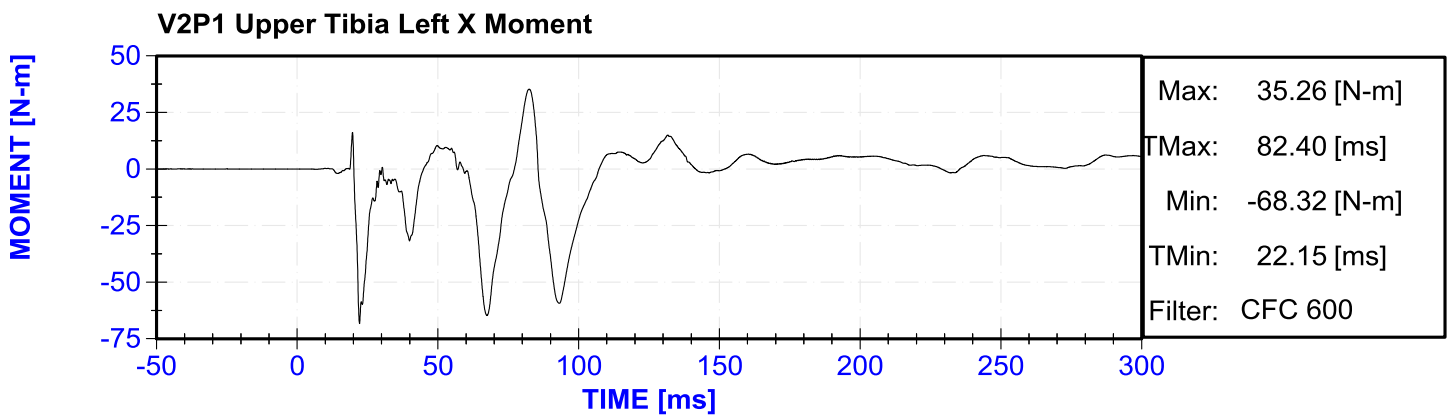
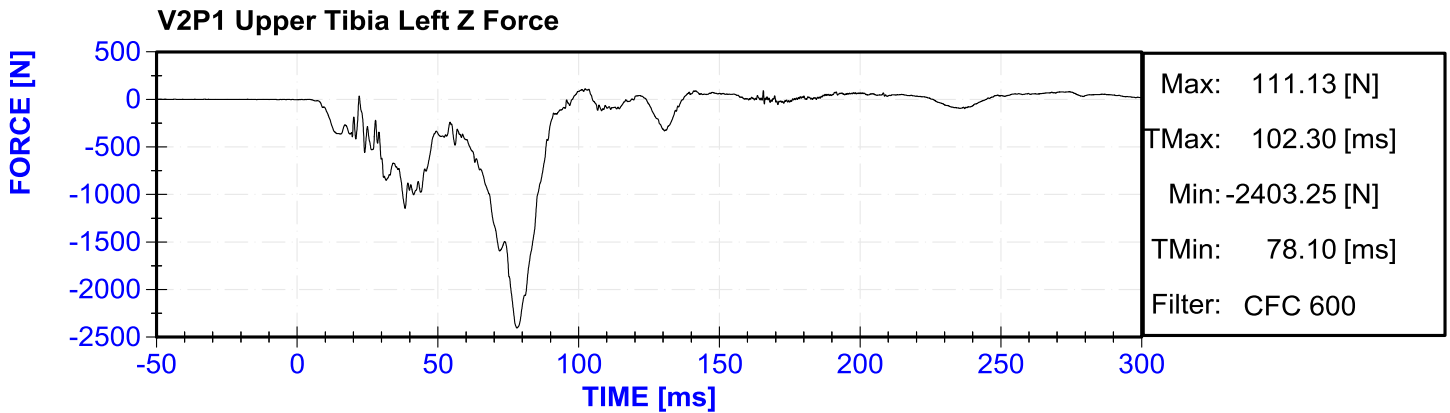


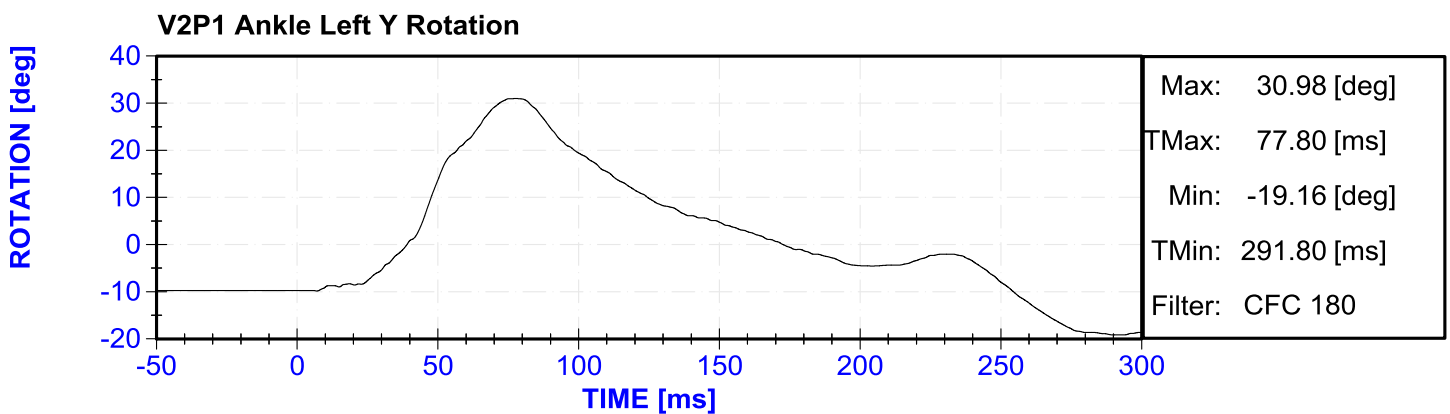
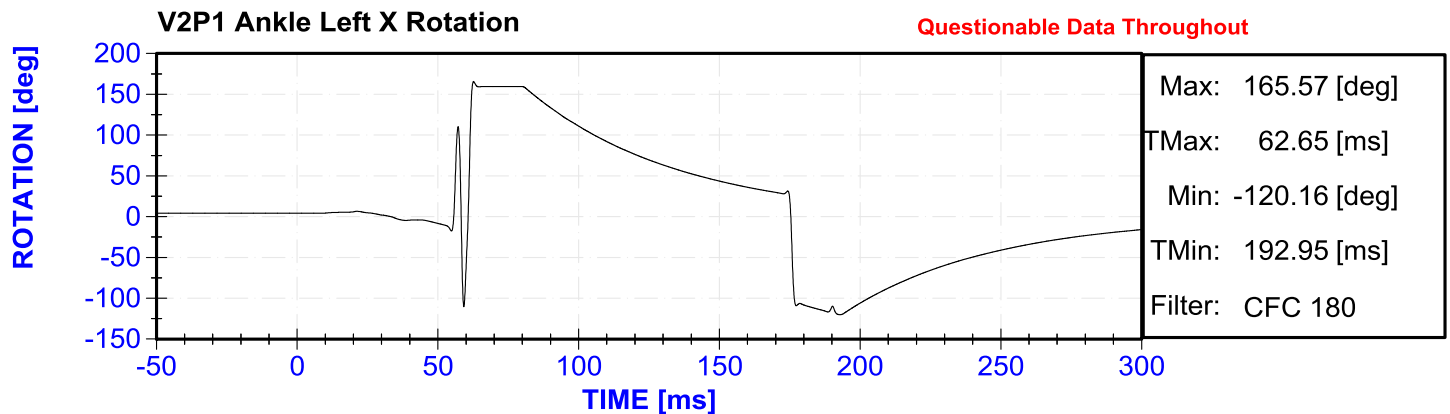
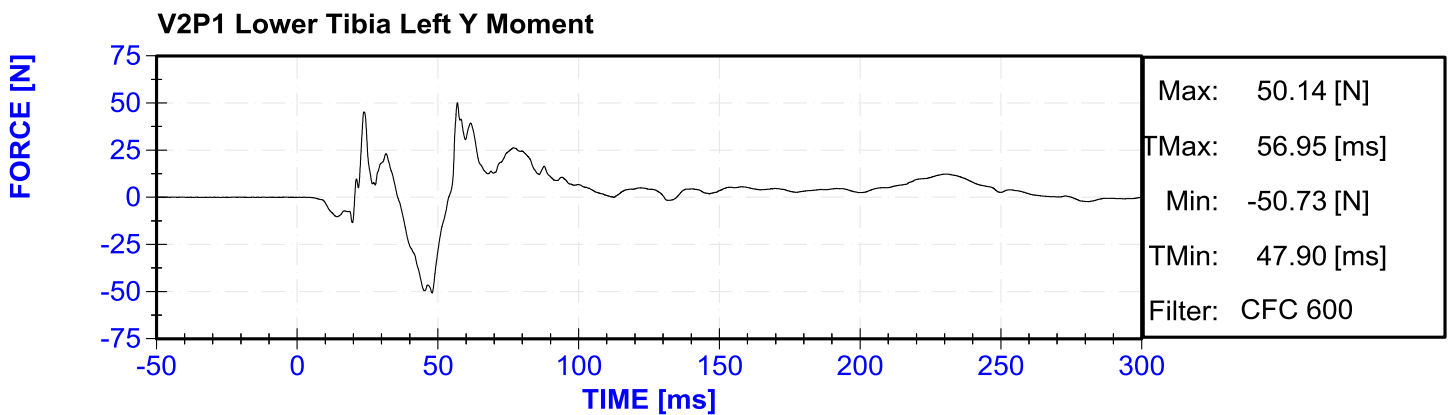
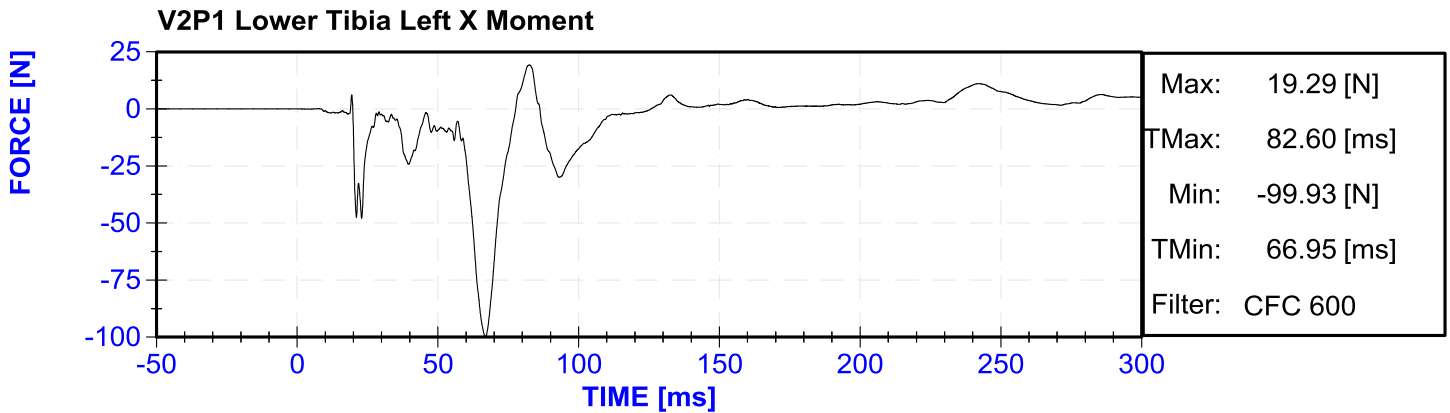


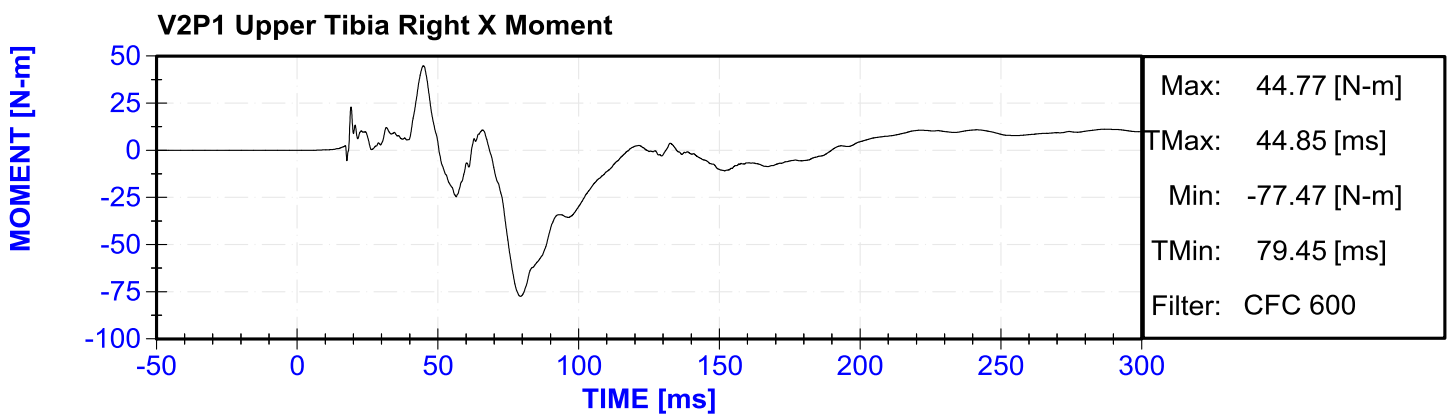
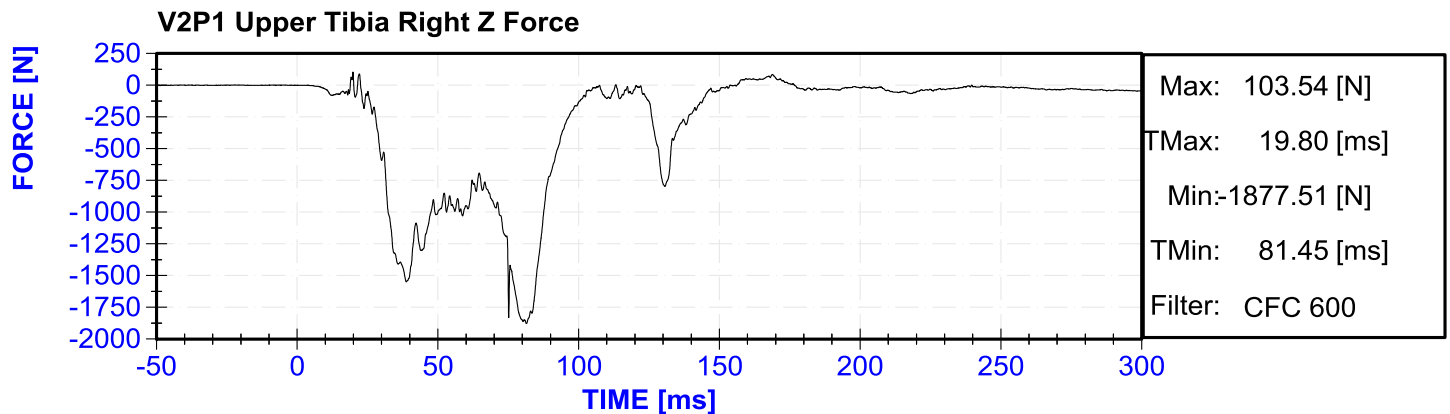
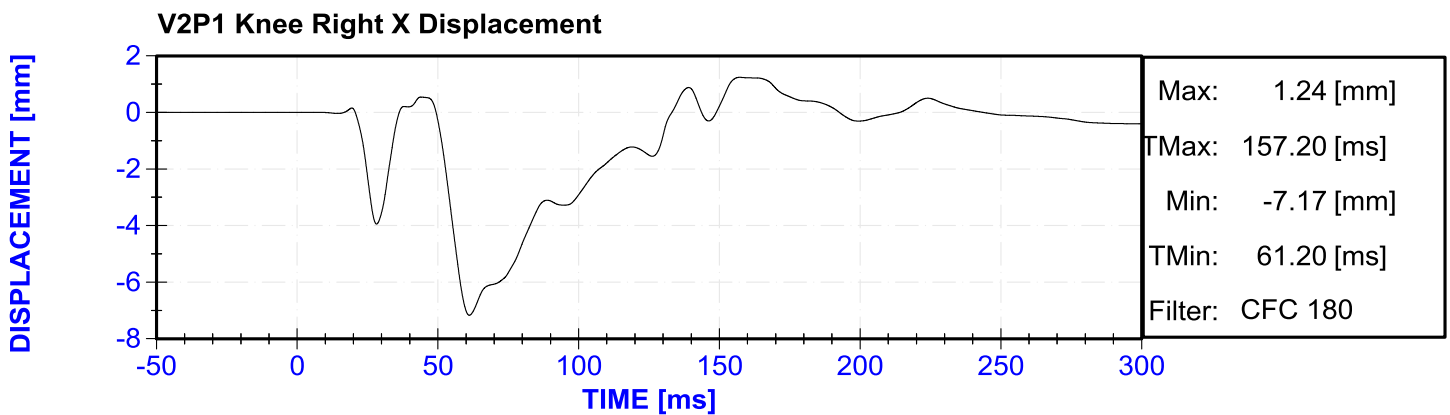
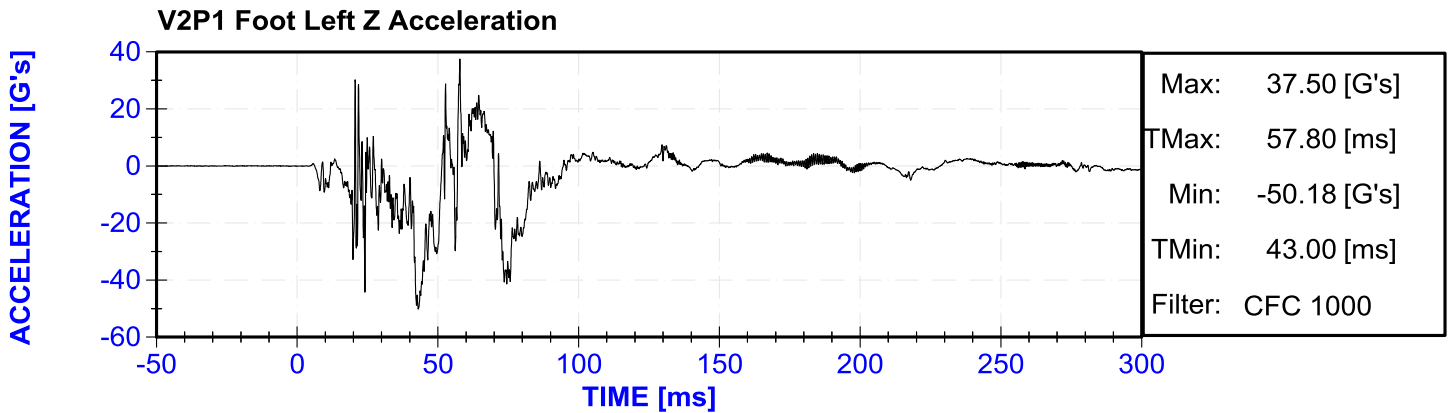


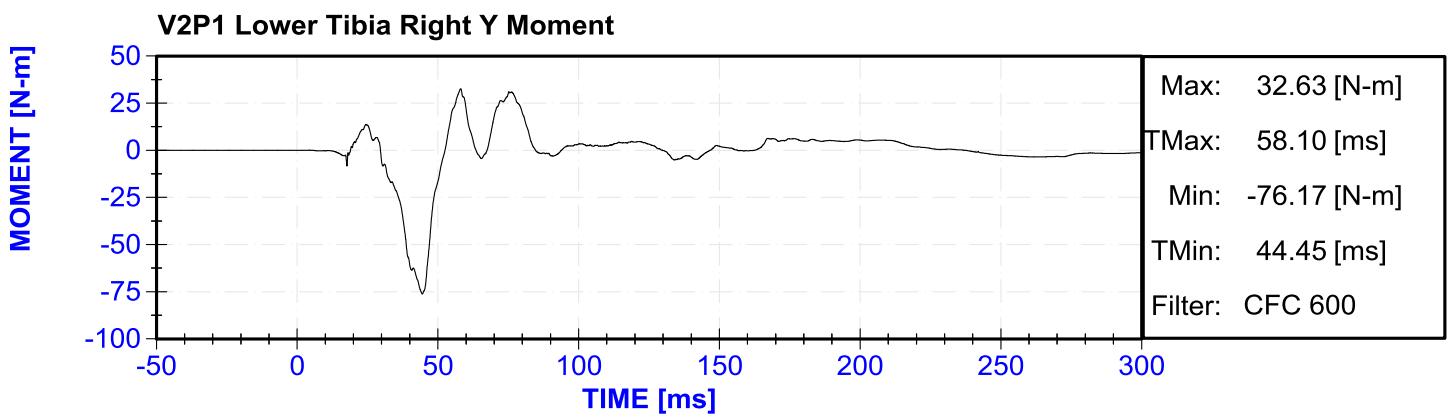
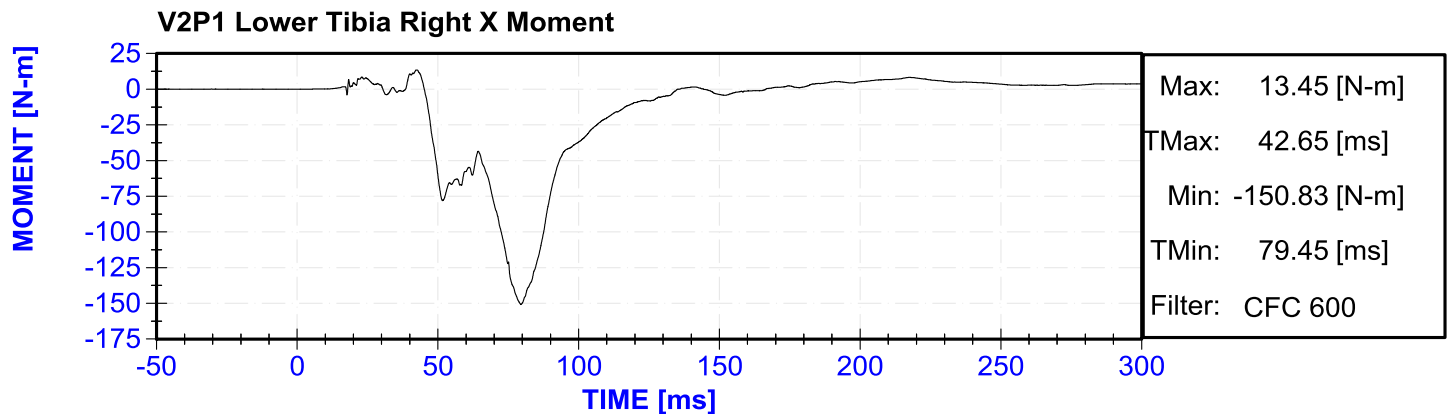
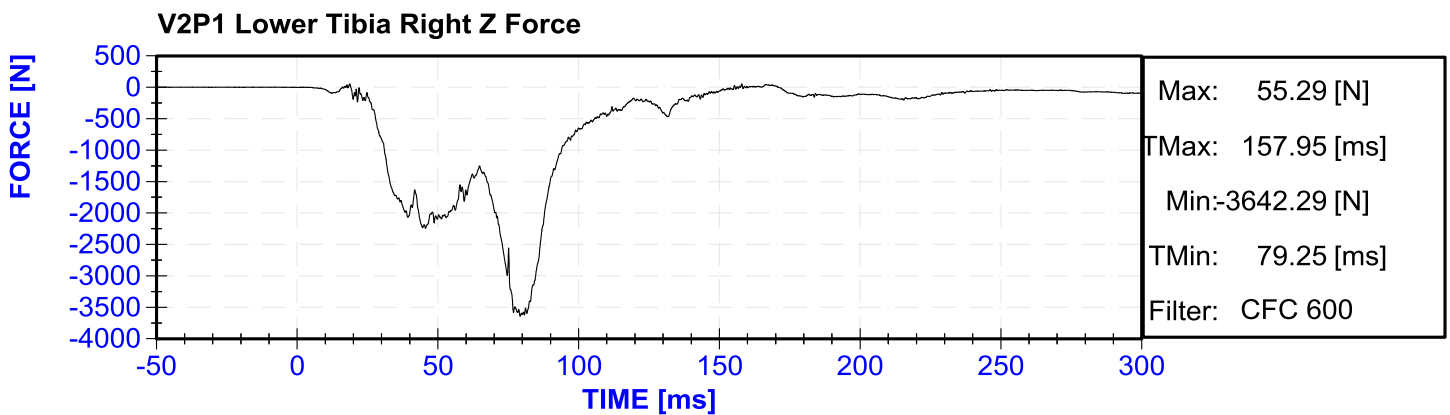
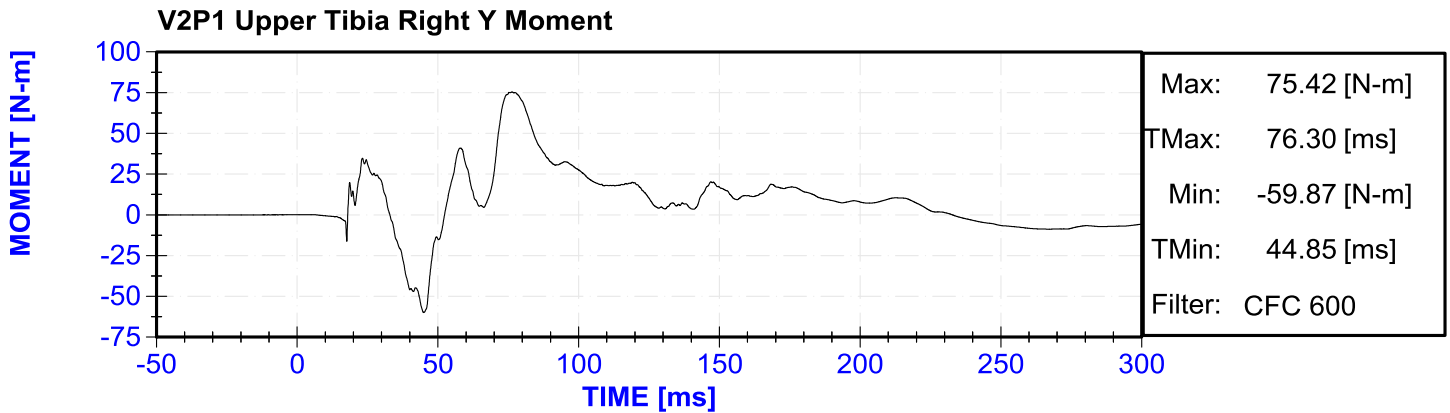


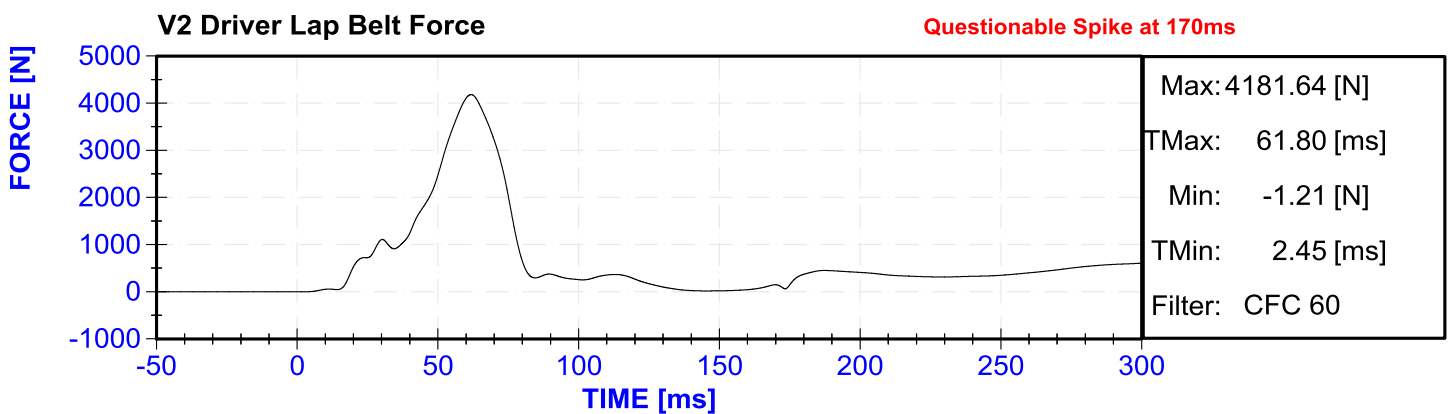
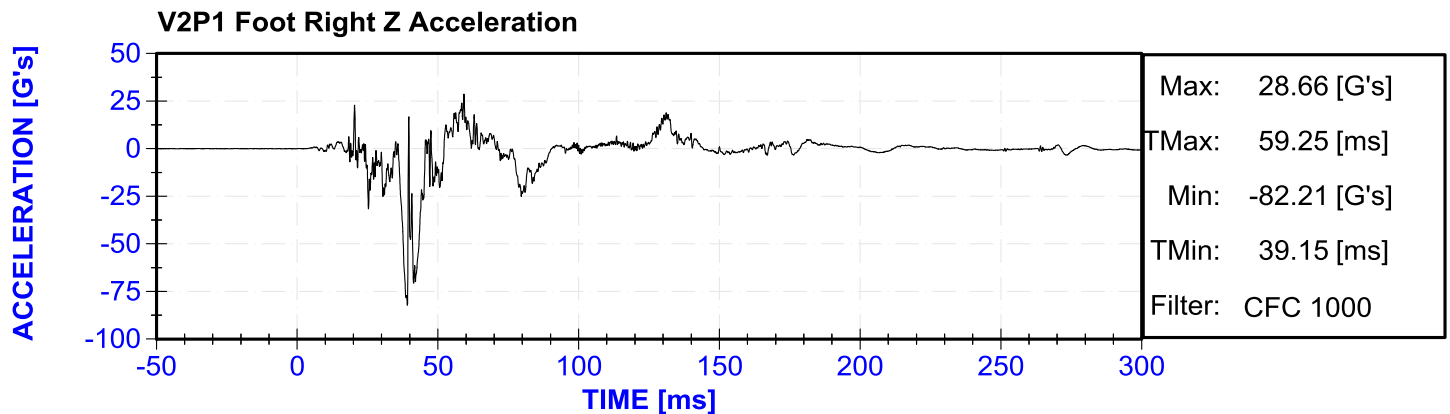
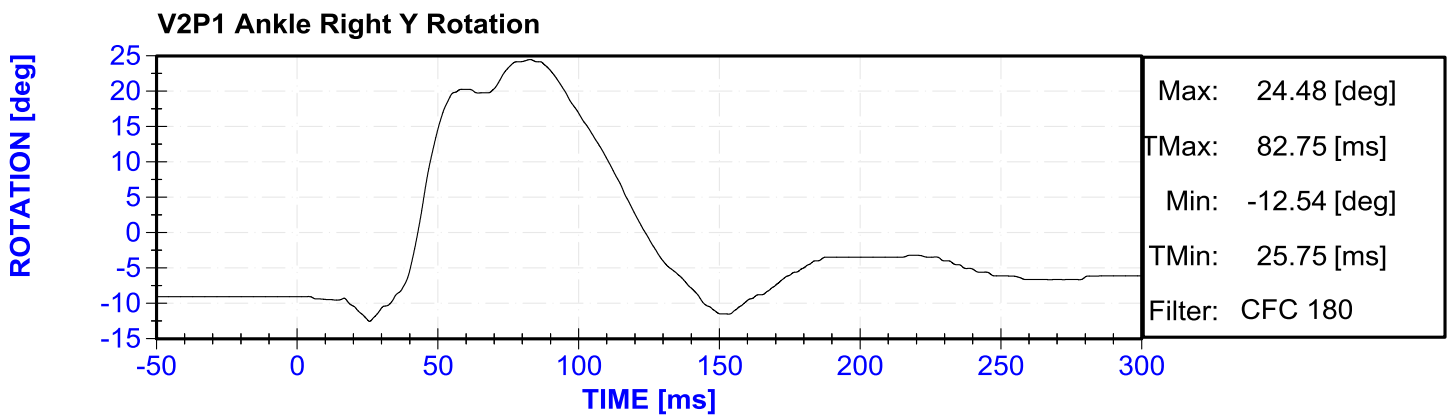
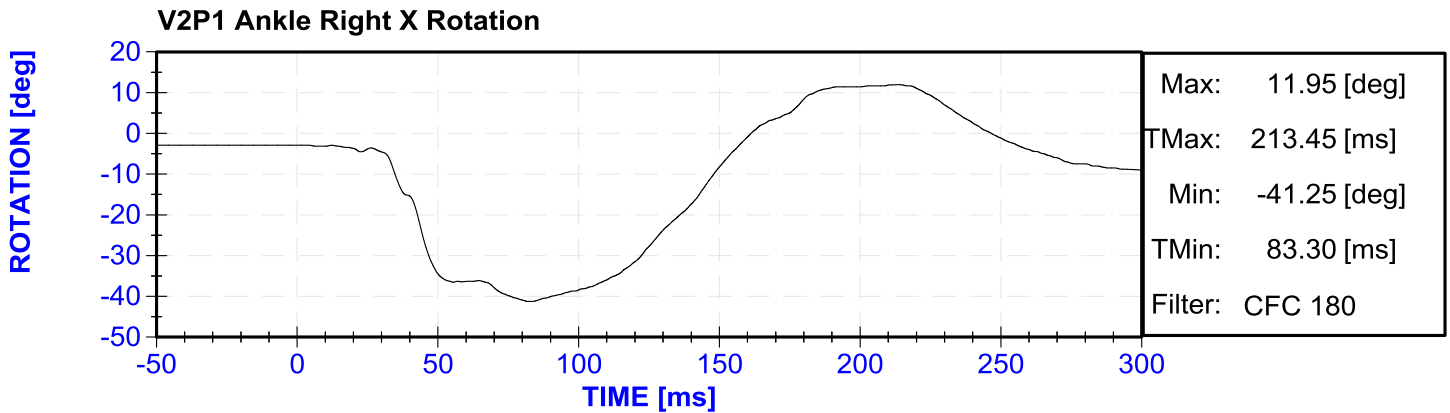




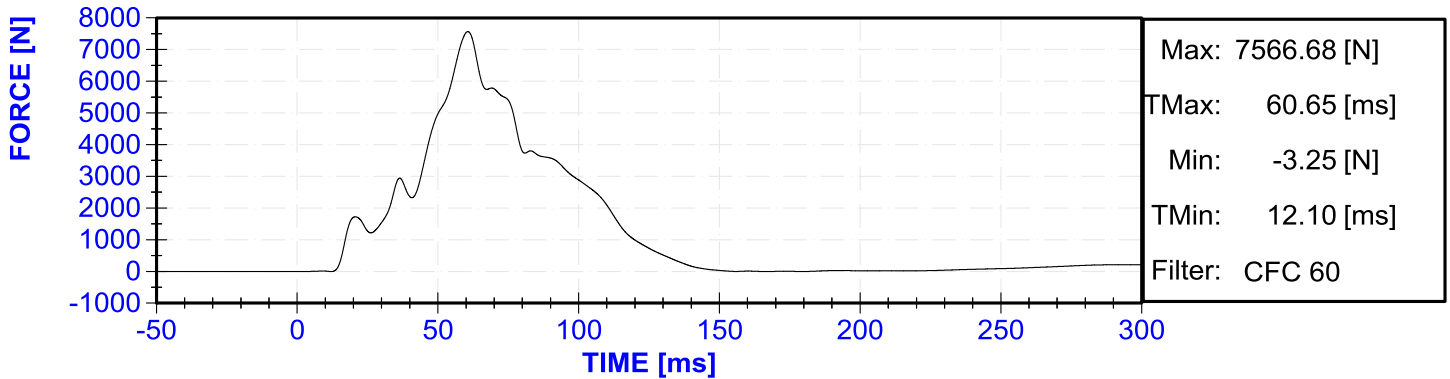




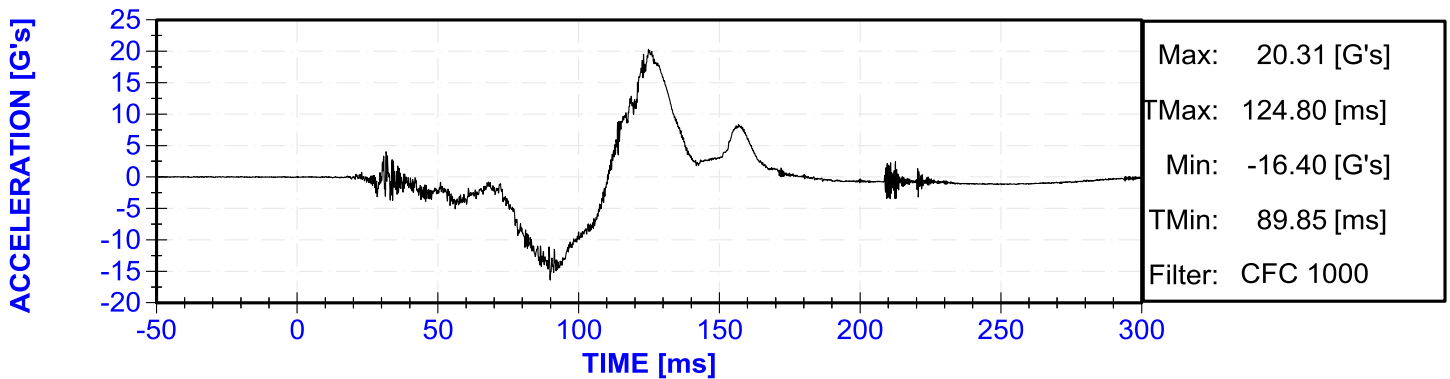




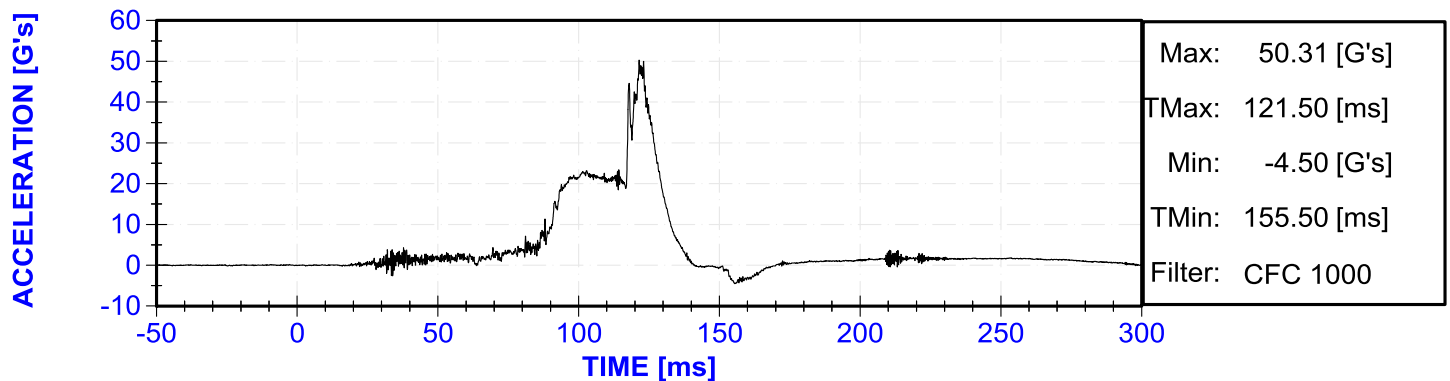
V2 Driver Shoulder Belt Force



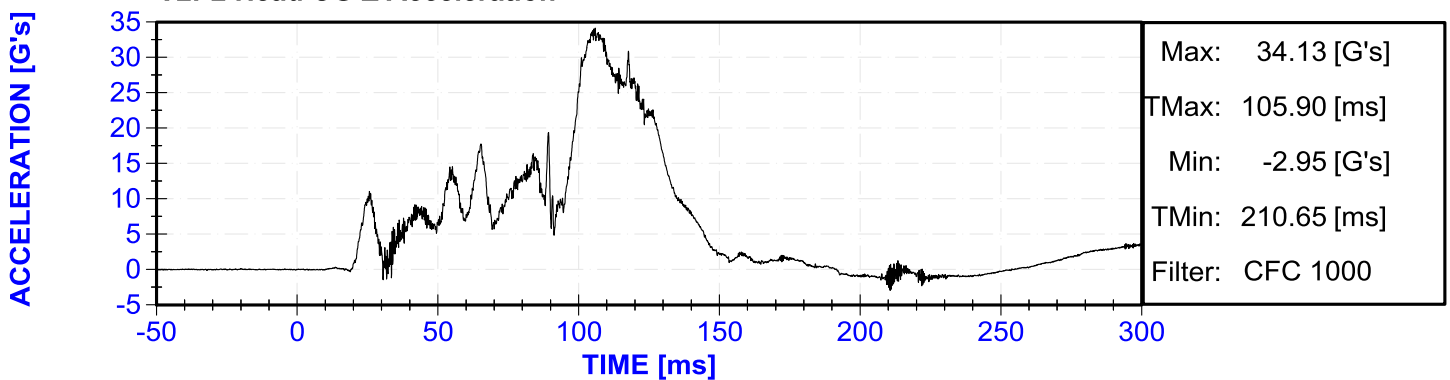
V2P2 Head CG X Acceleration

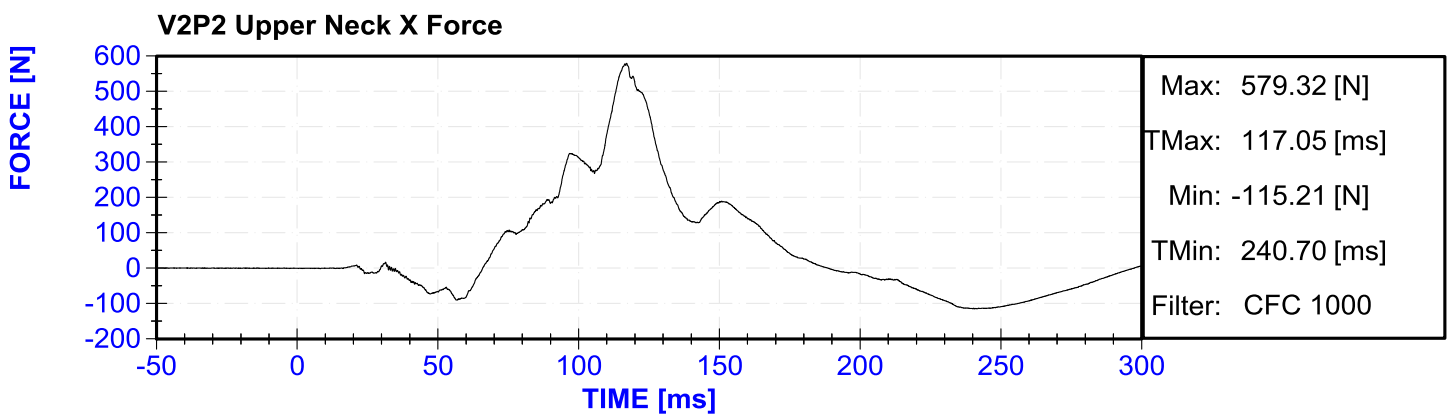
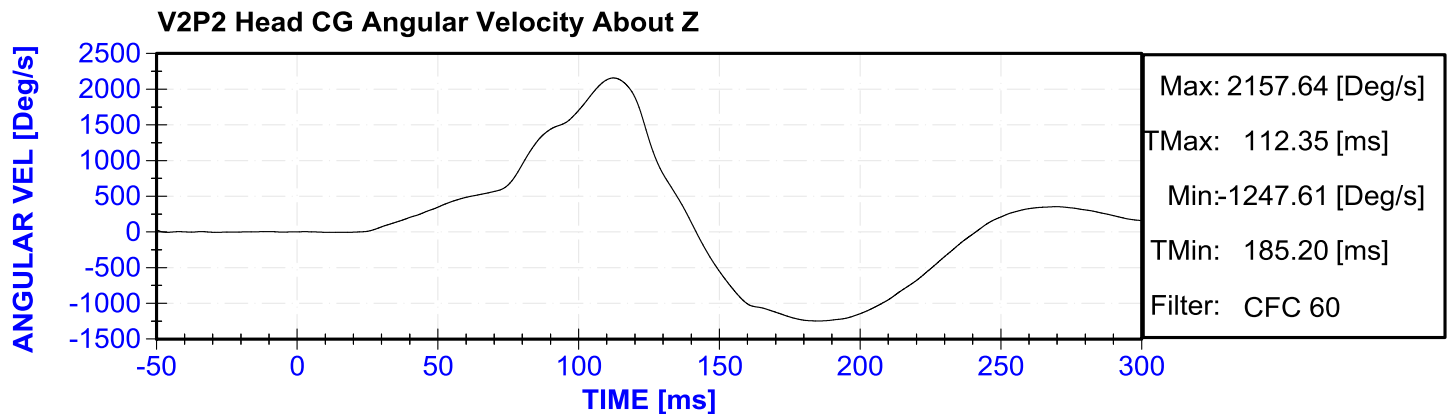
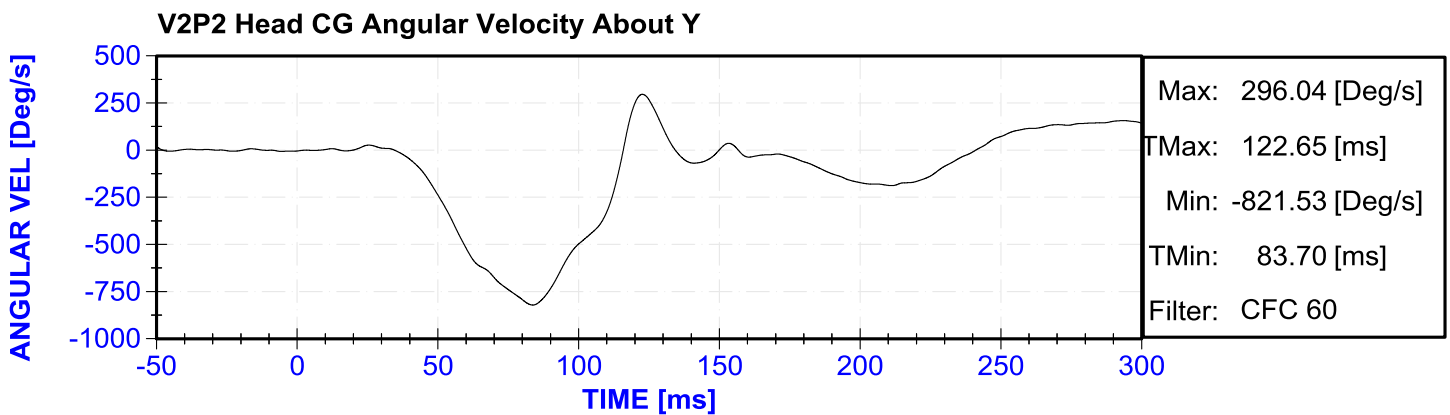
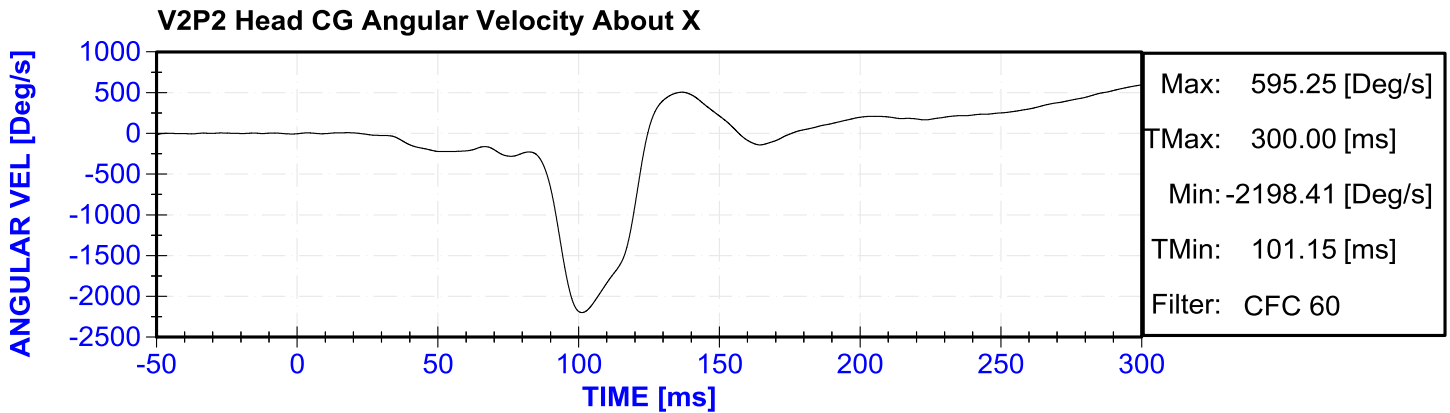


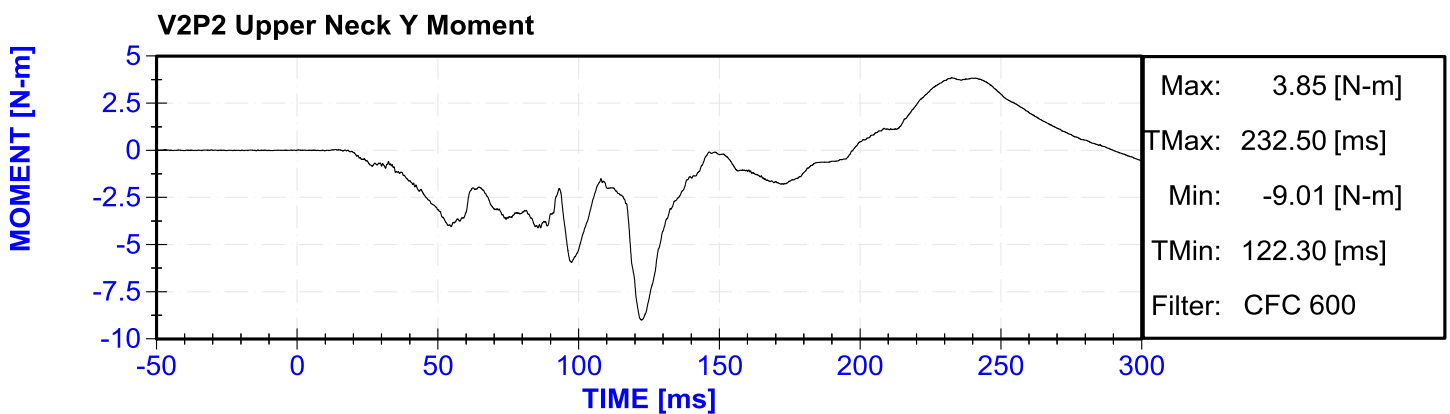
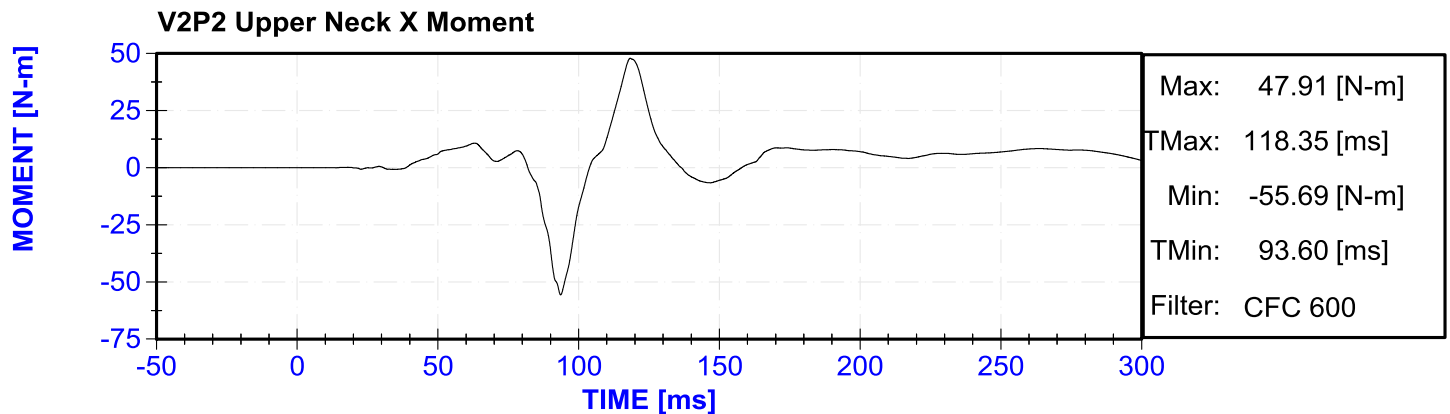
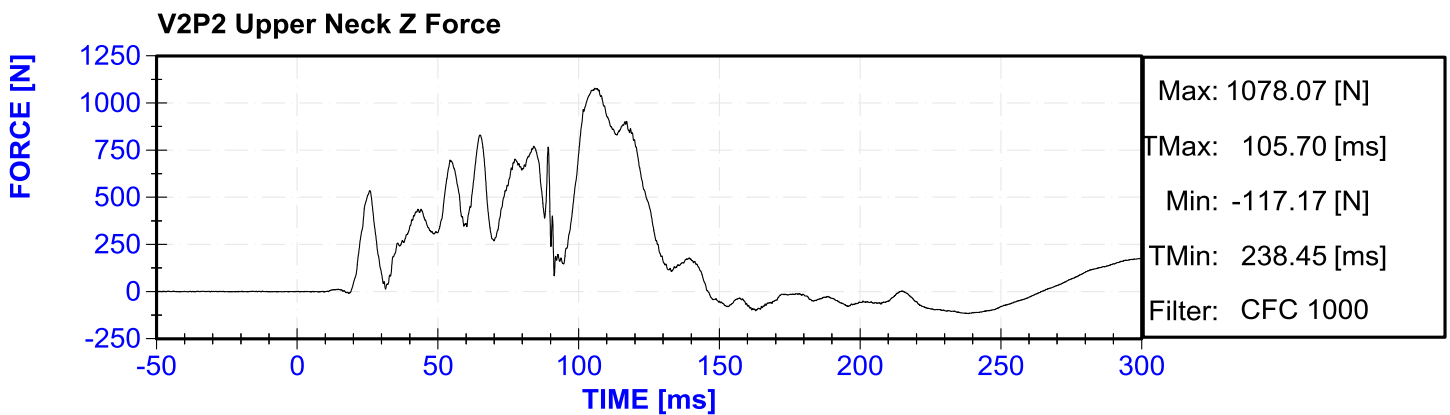
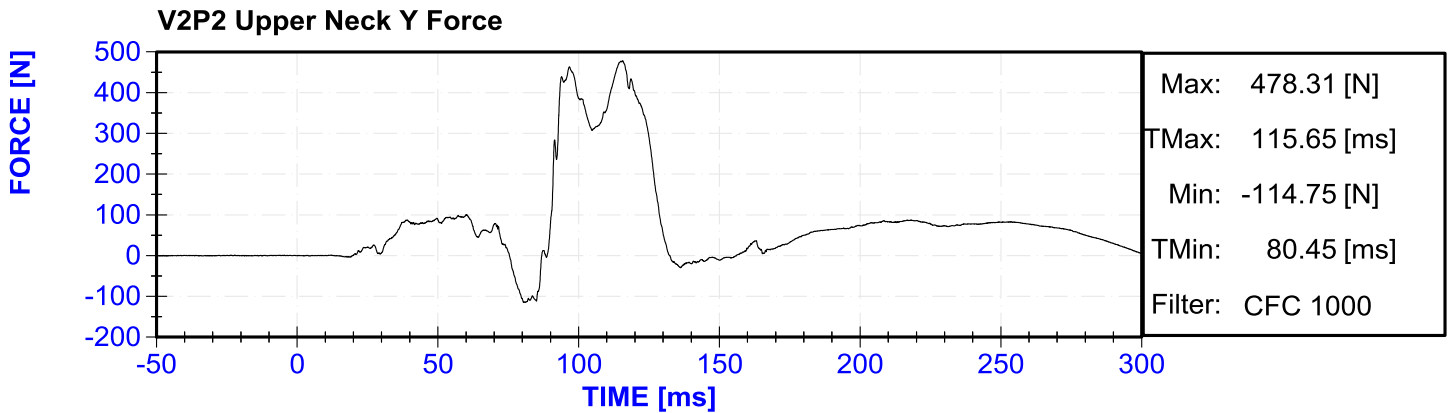
V2P2 Head CG Y Acceleration

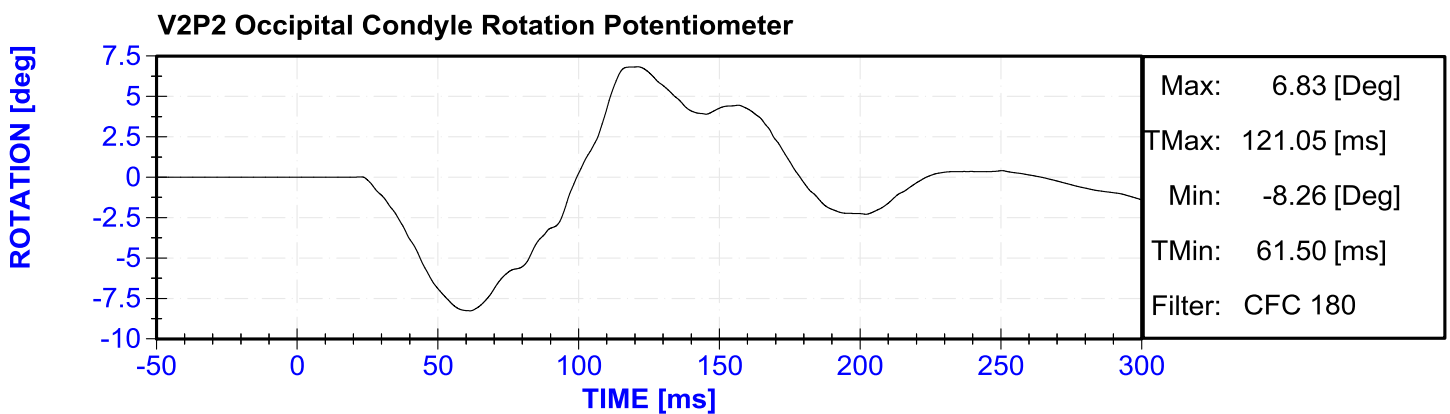
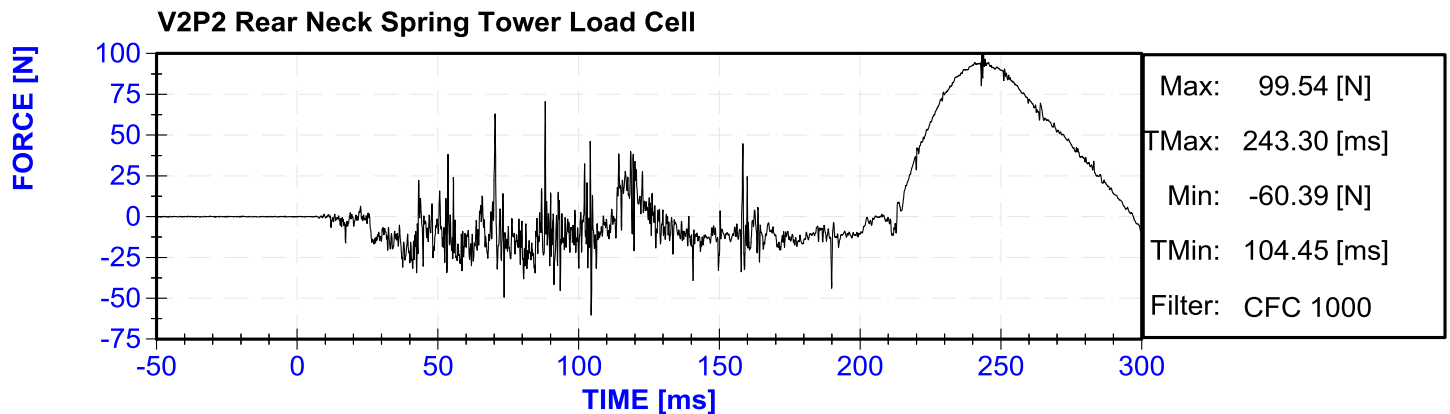
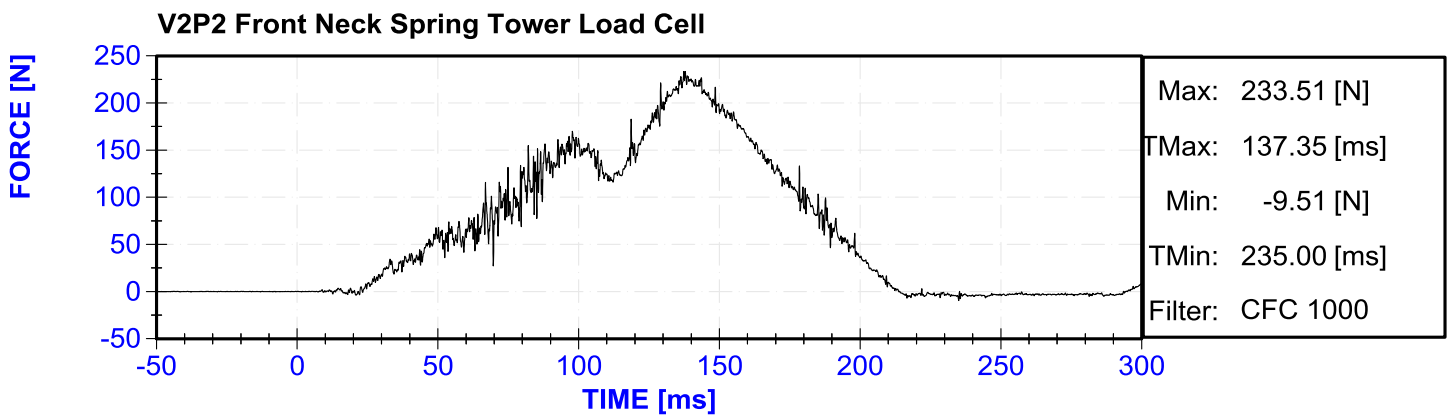
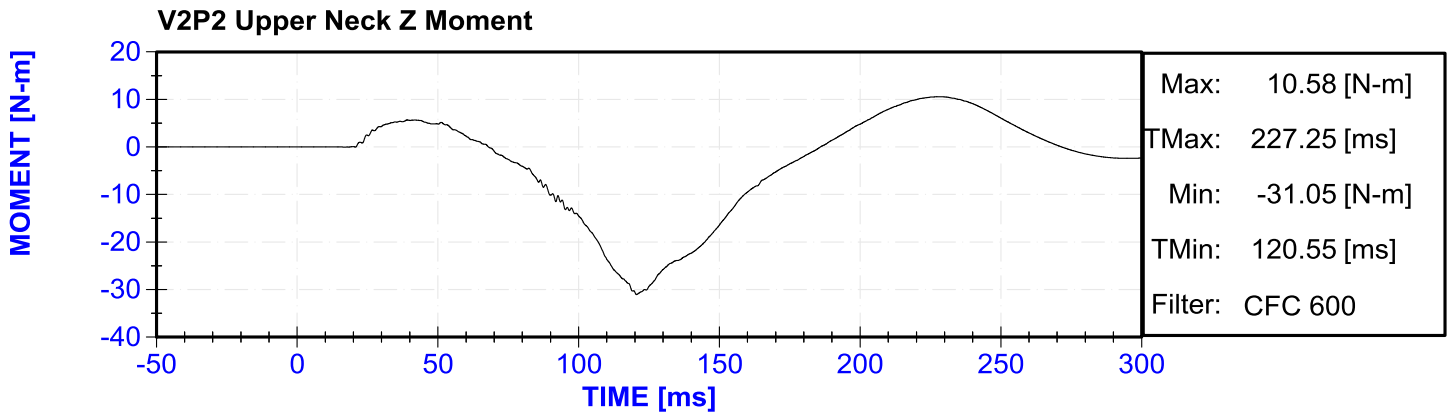


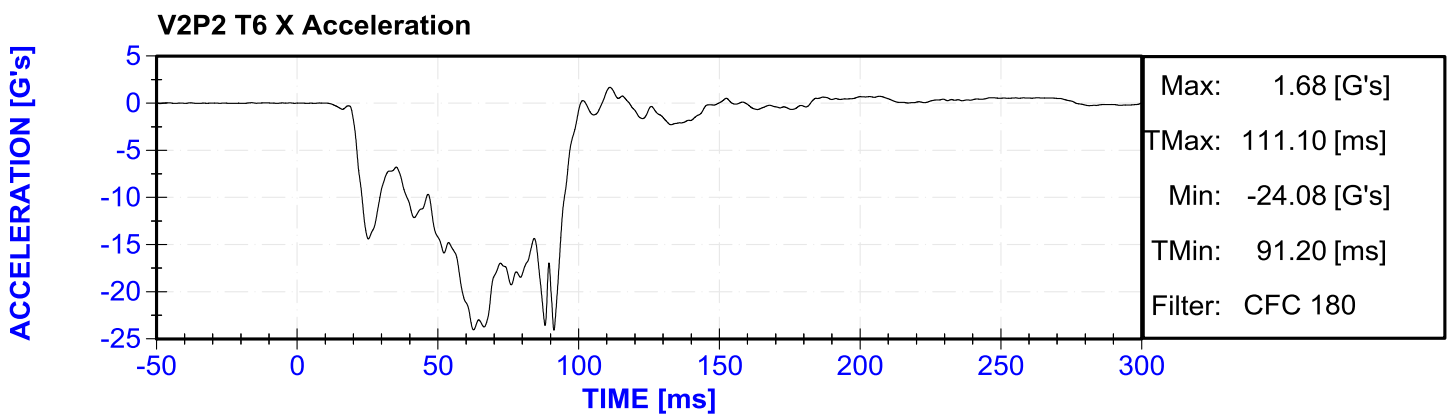
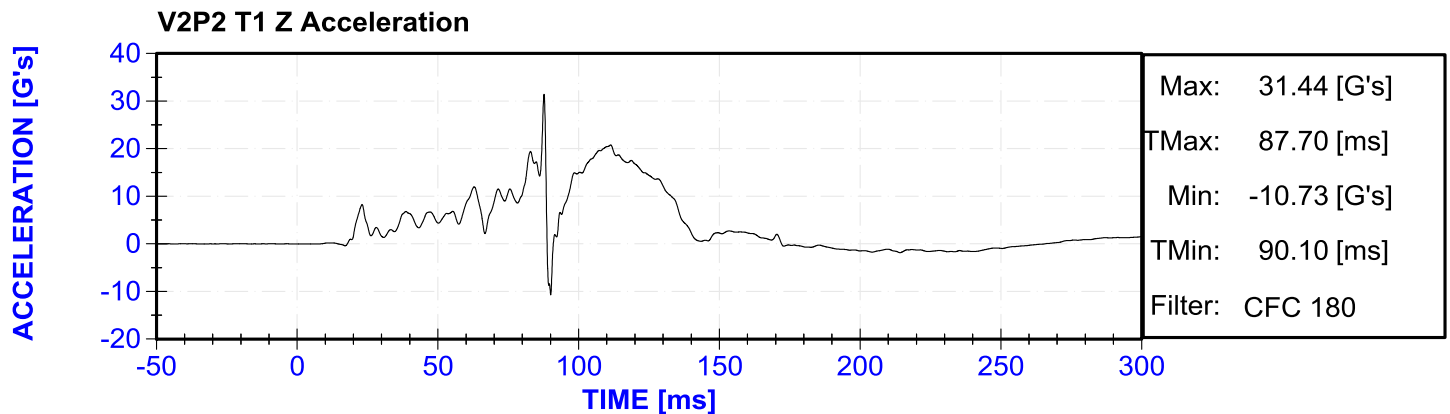
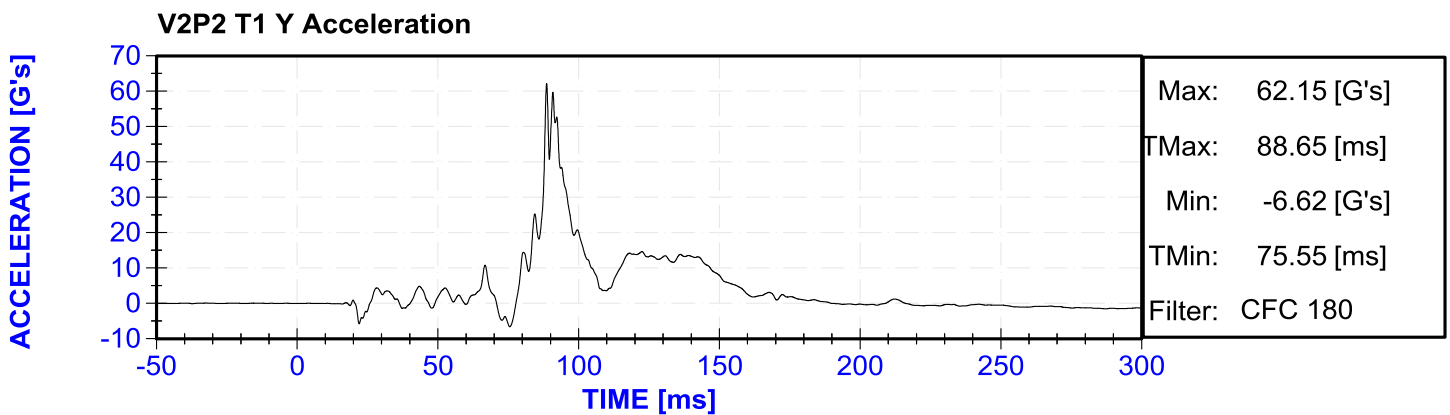
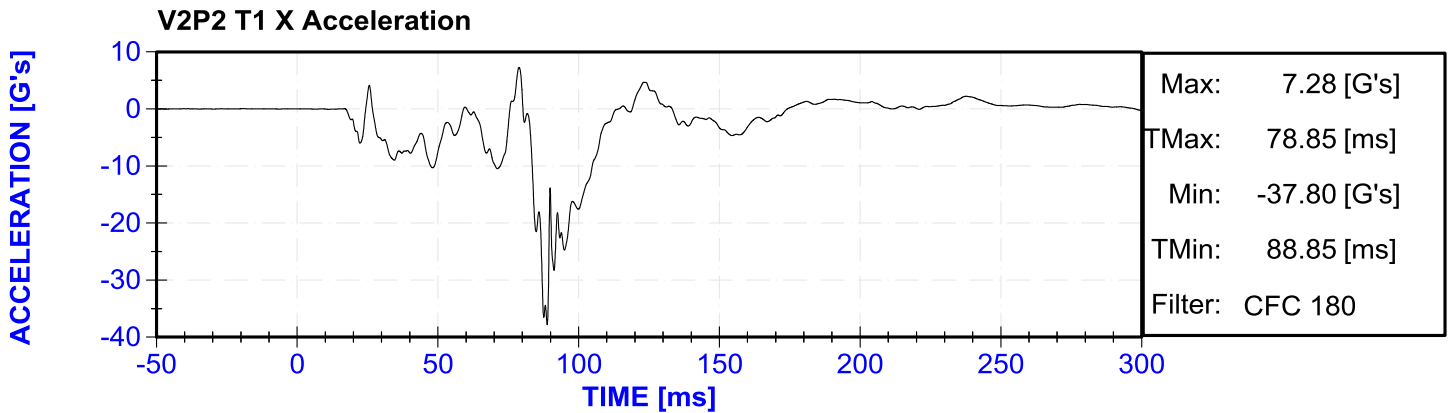
V2P2 Head CG Z Acceleration

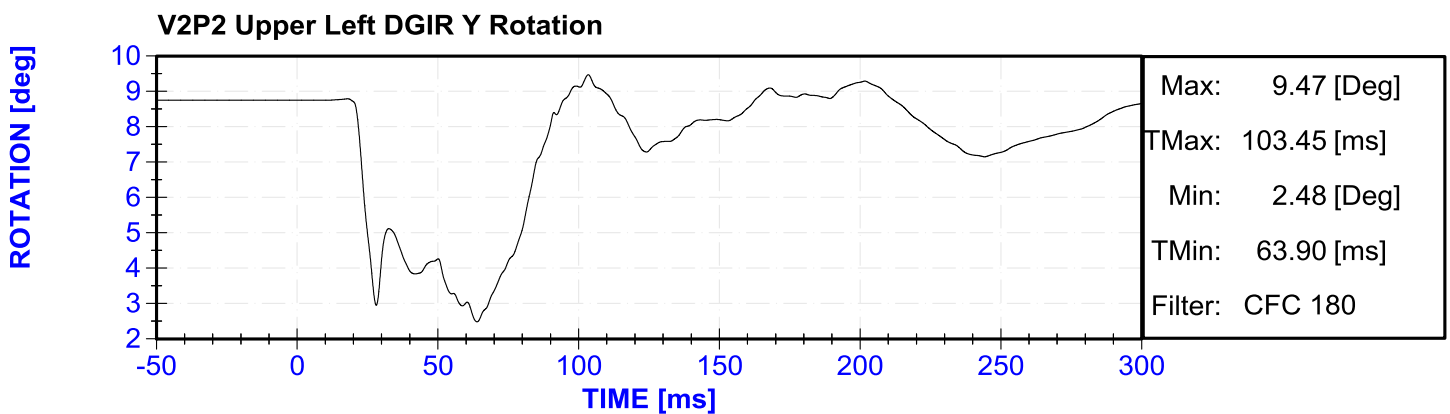
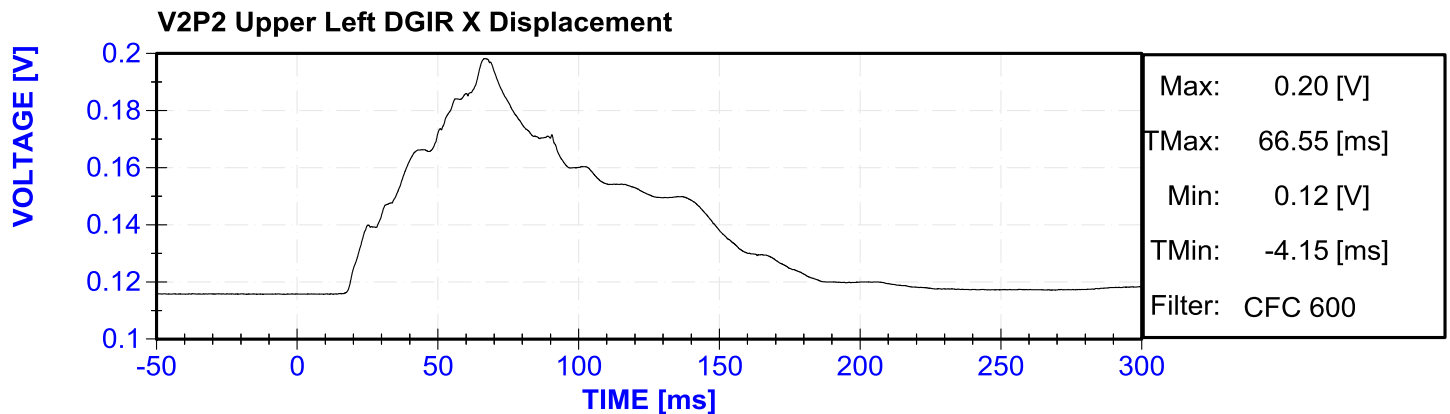
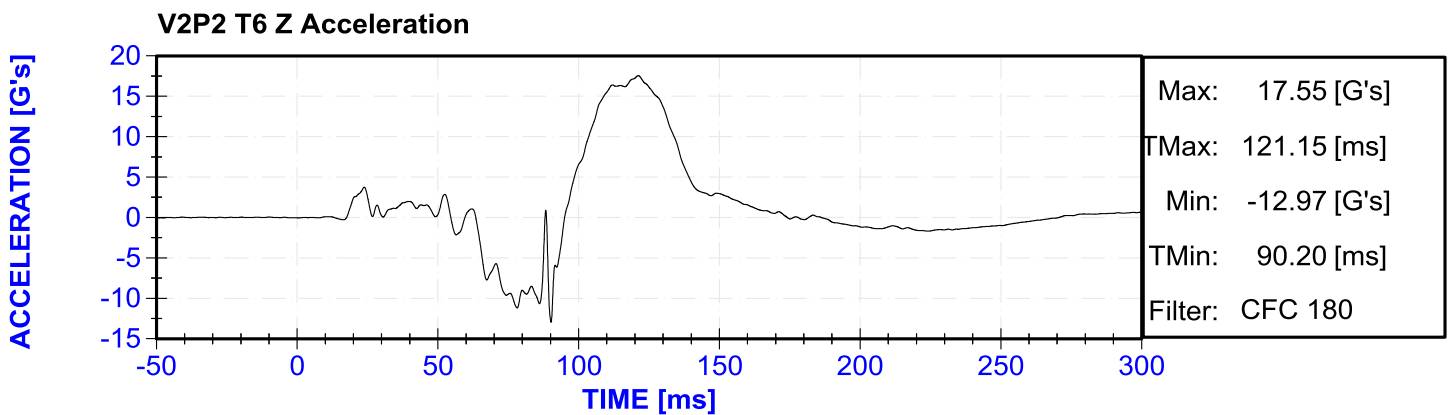
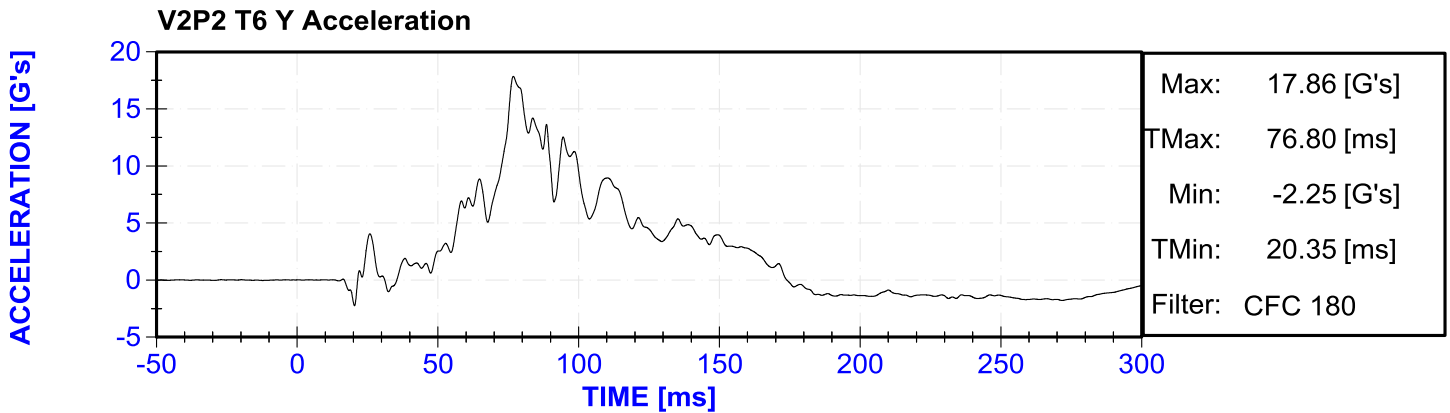


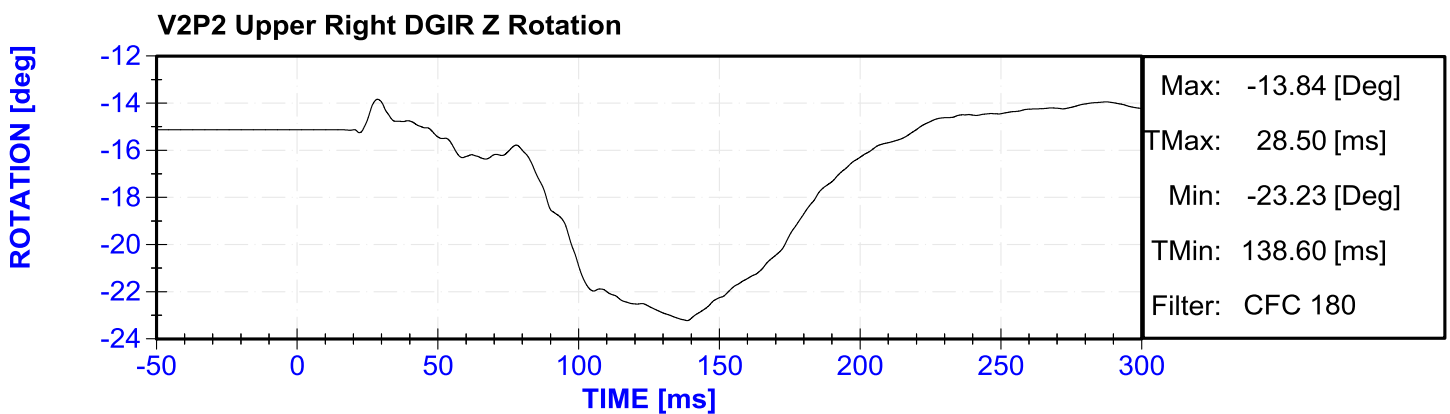
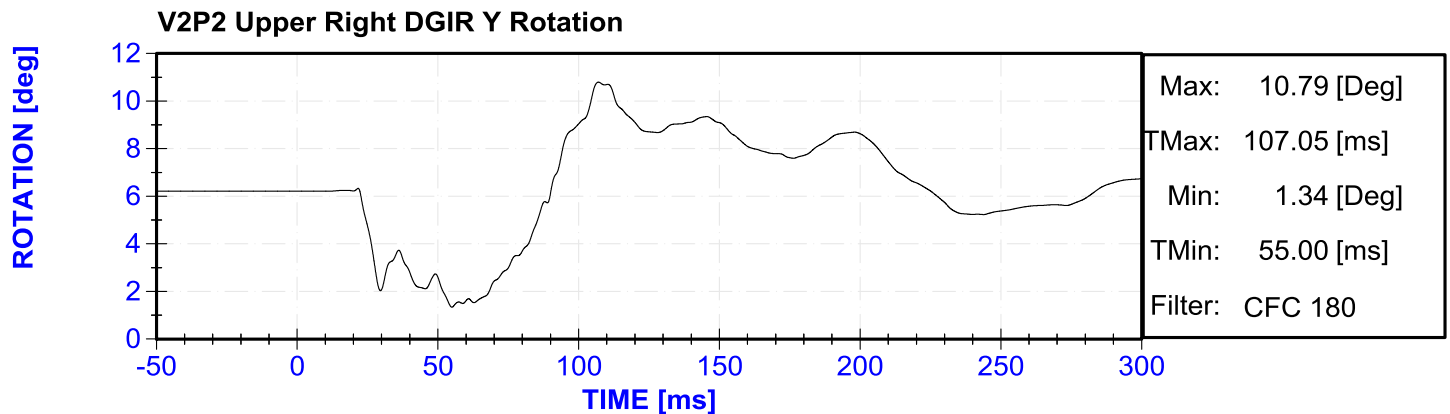
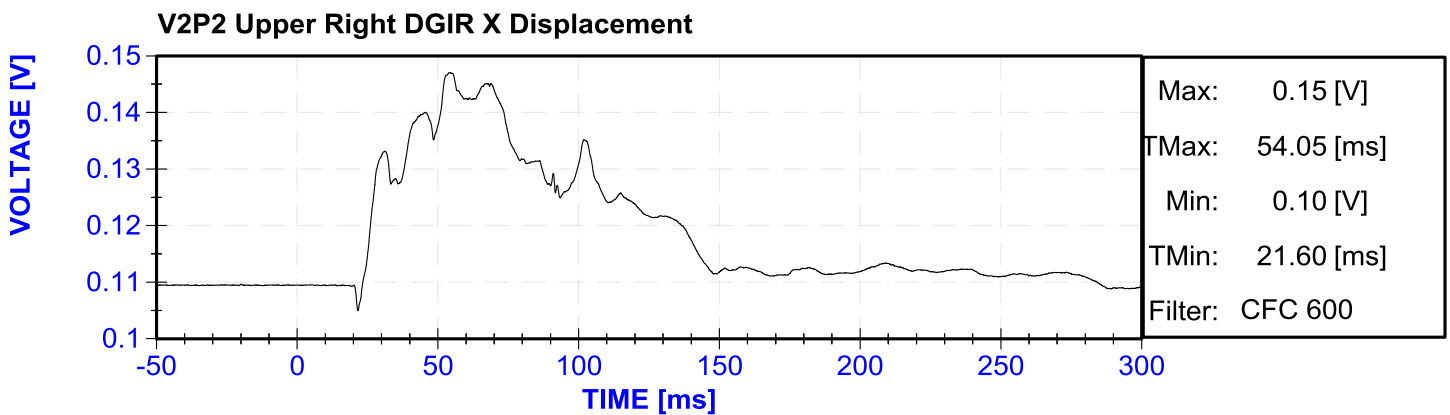
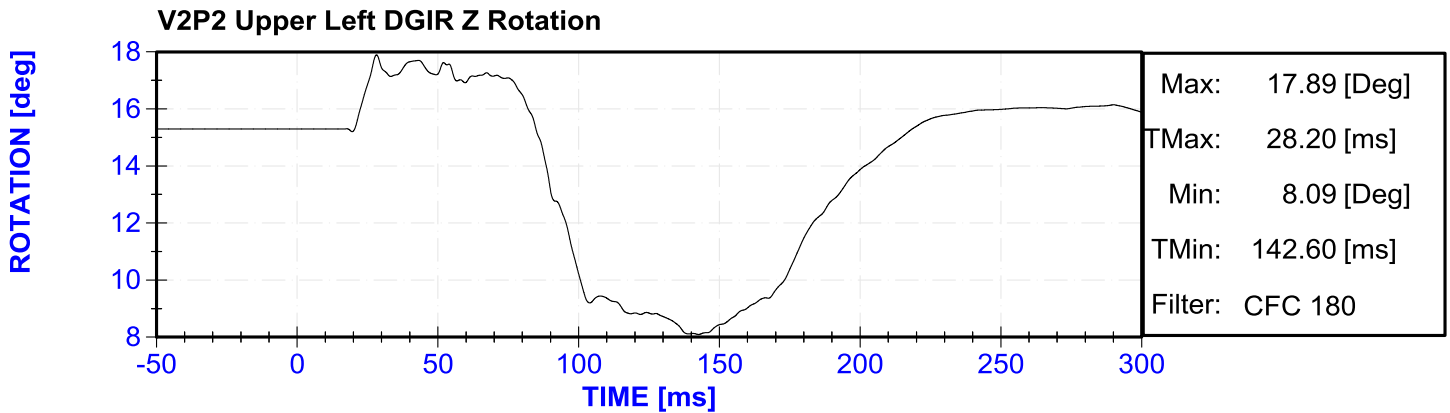




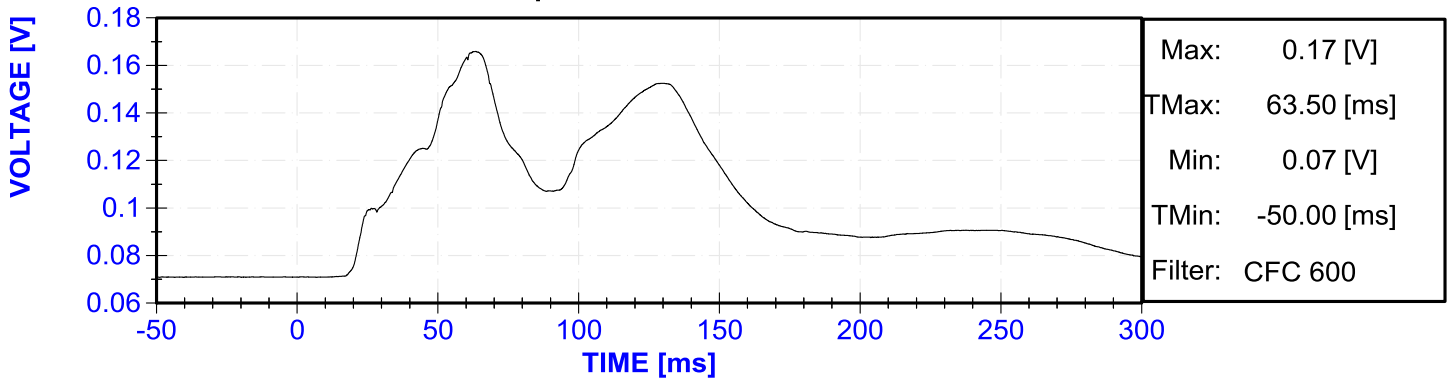




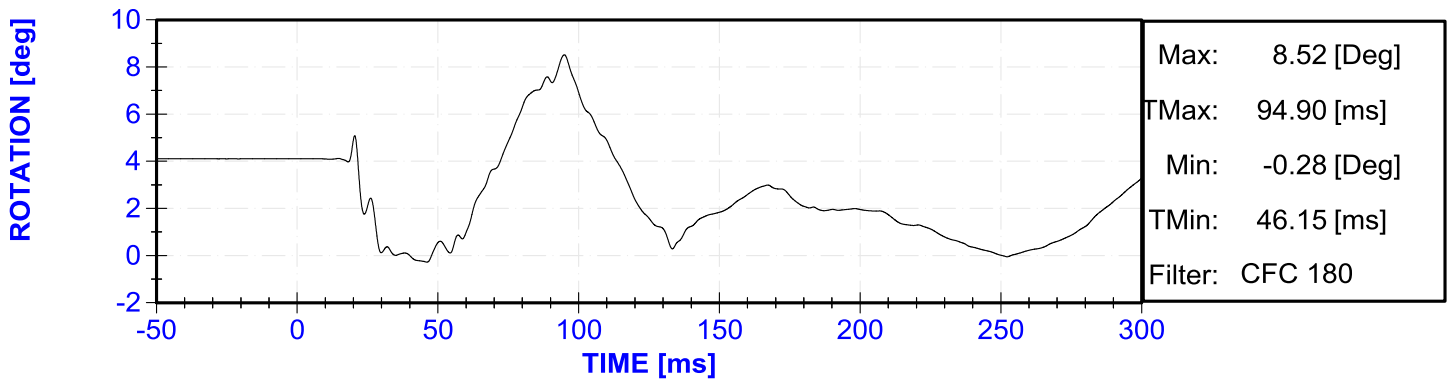




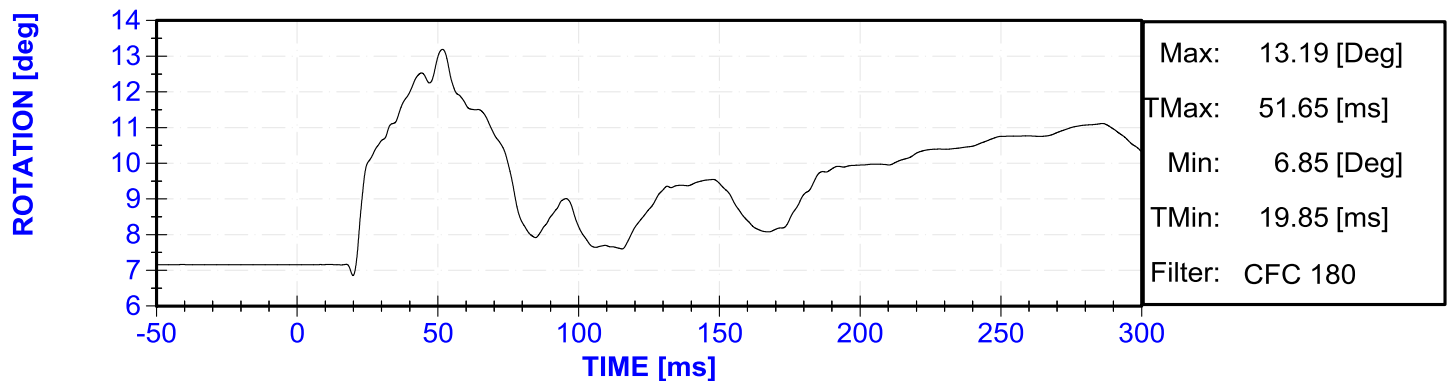
V2P2 Lower Left DGIR X Displacement



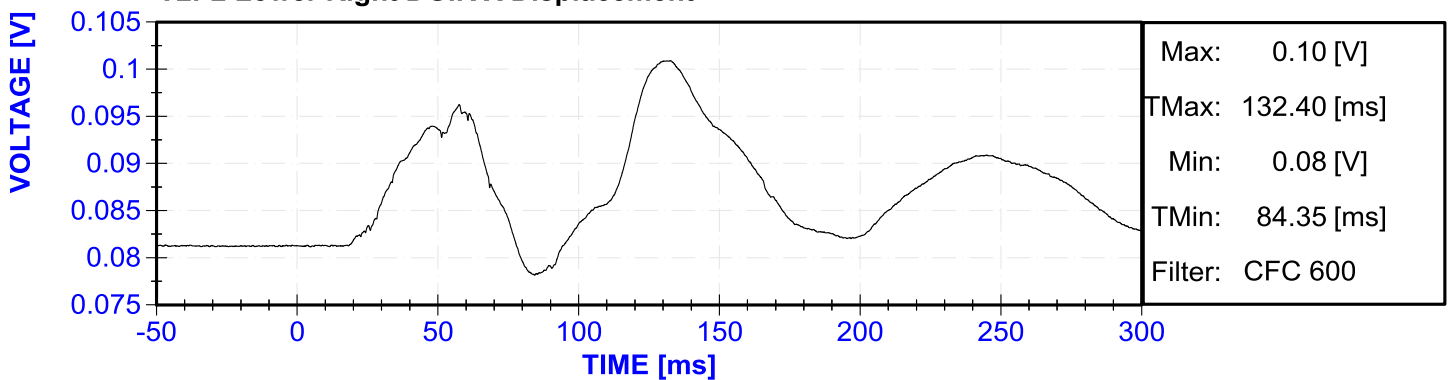
V2P2 Lower Left DGIR Y Rotation

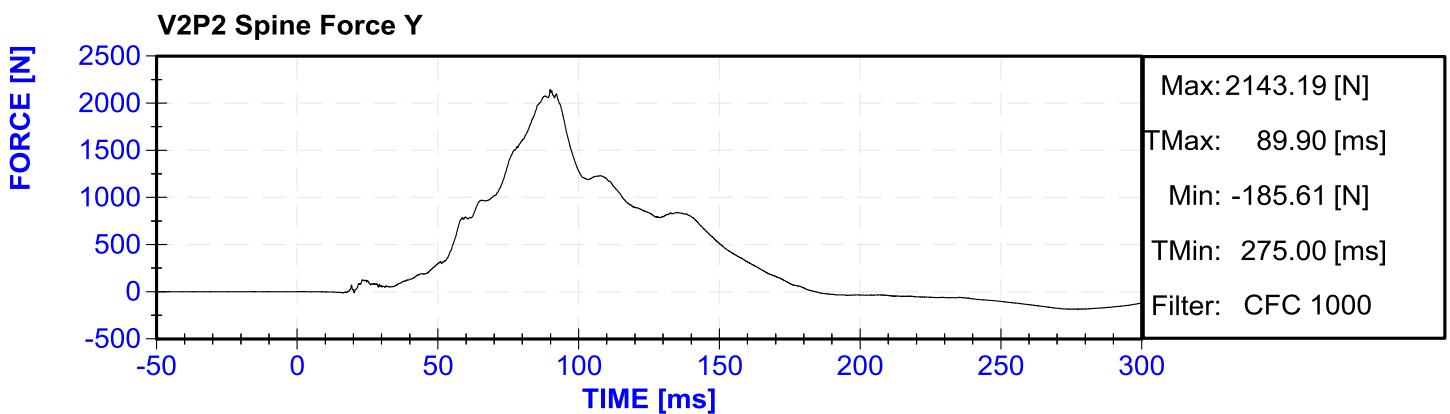
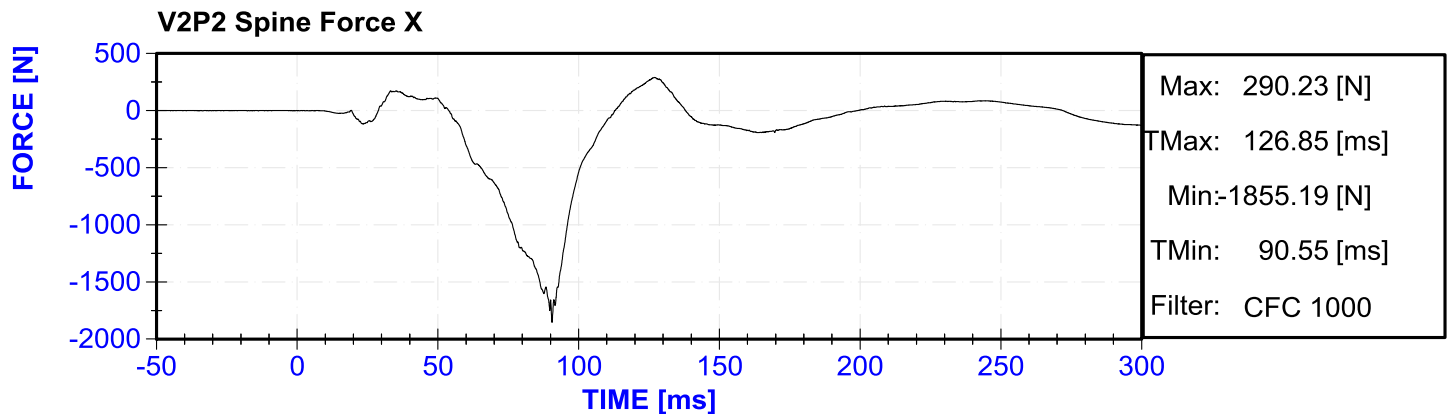
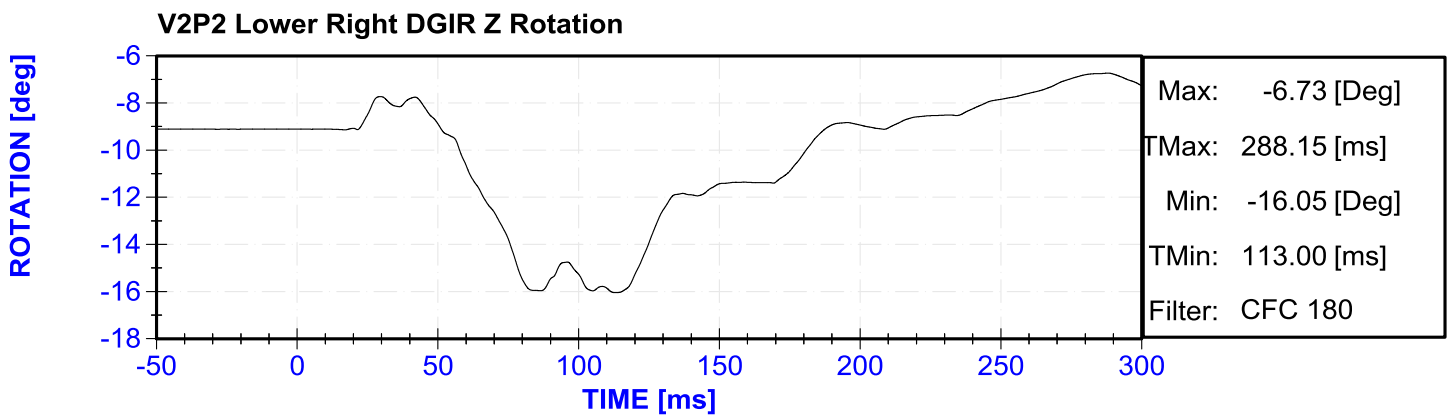
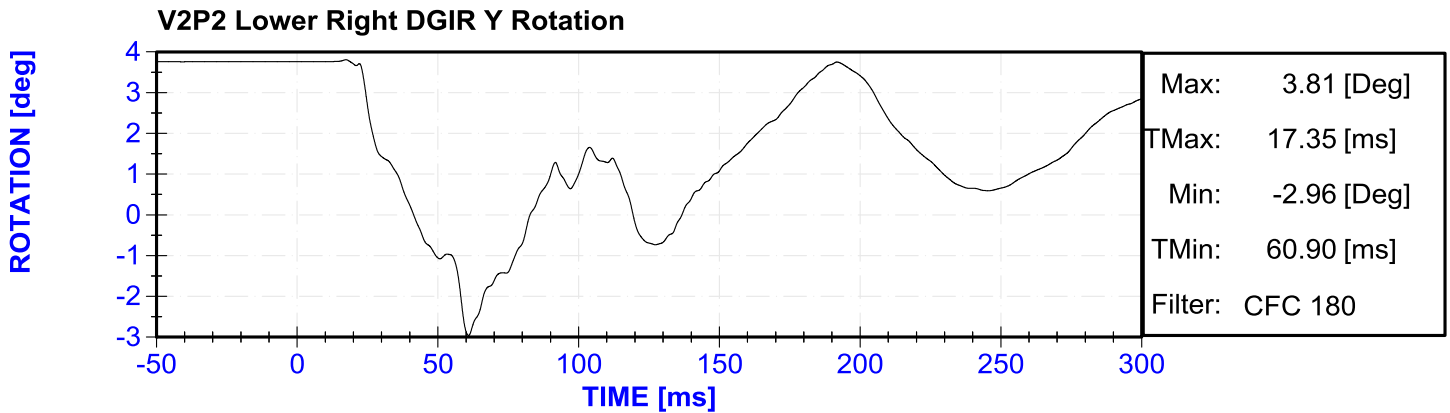


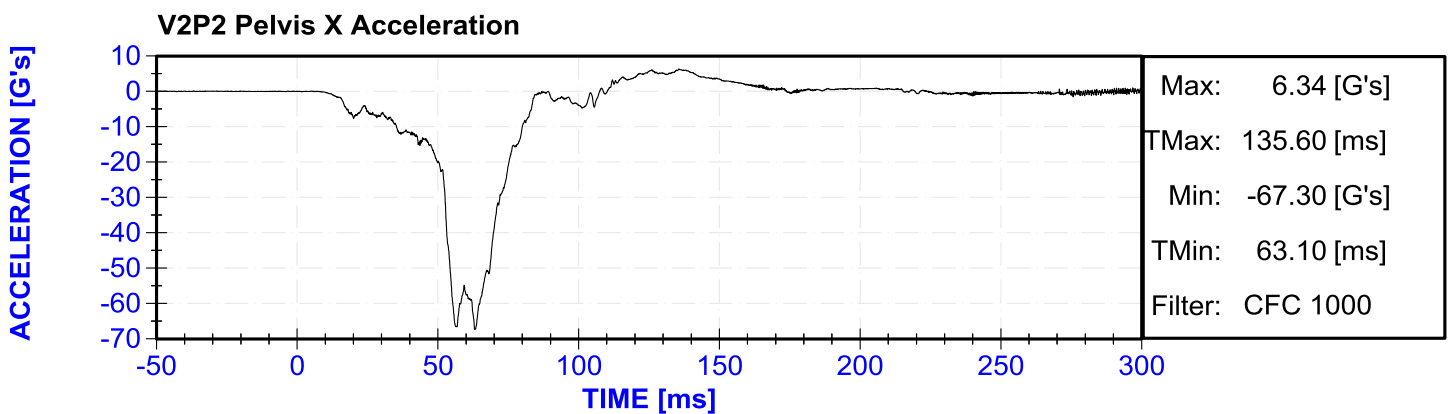
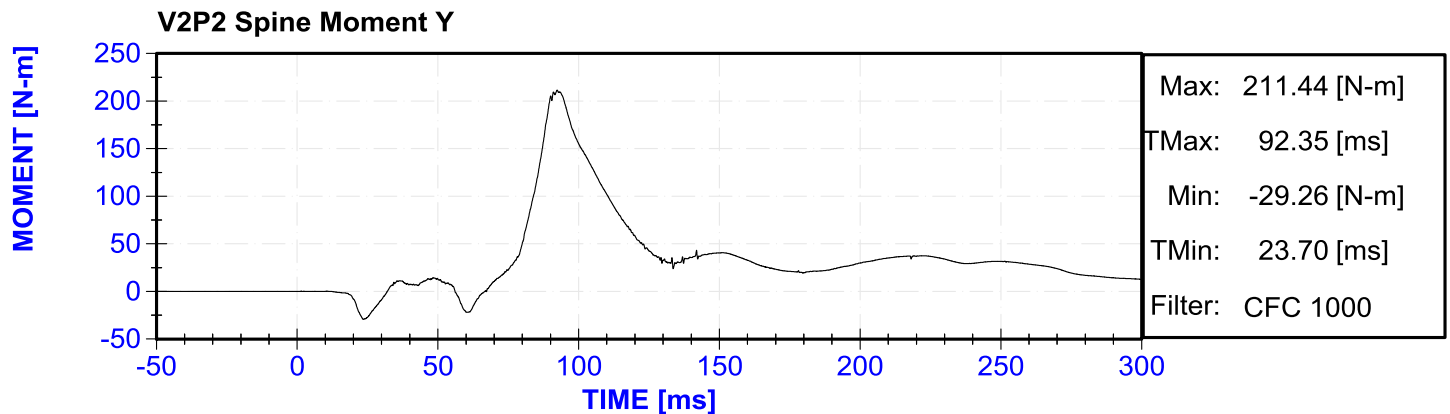
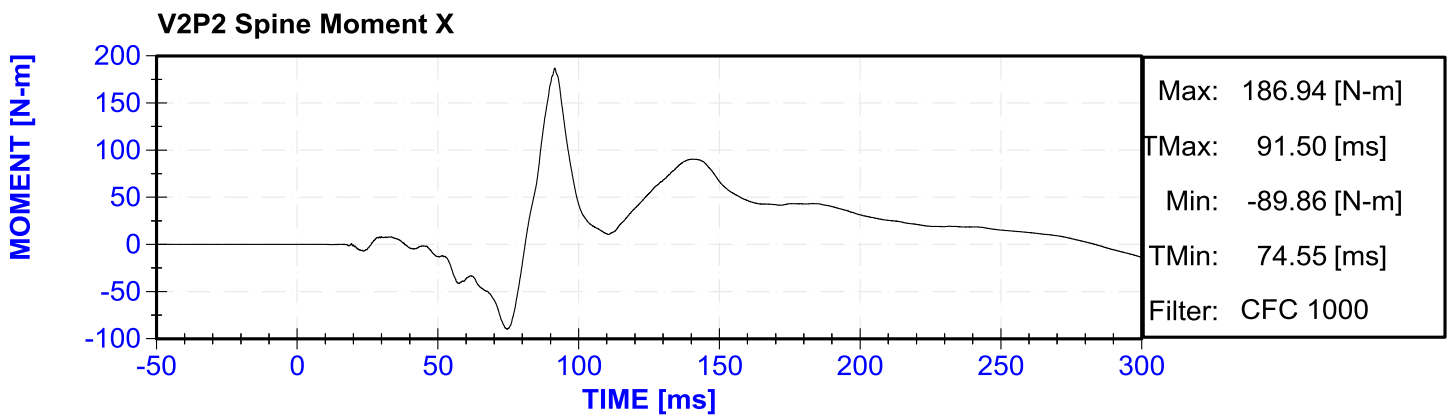
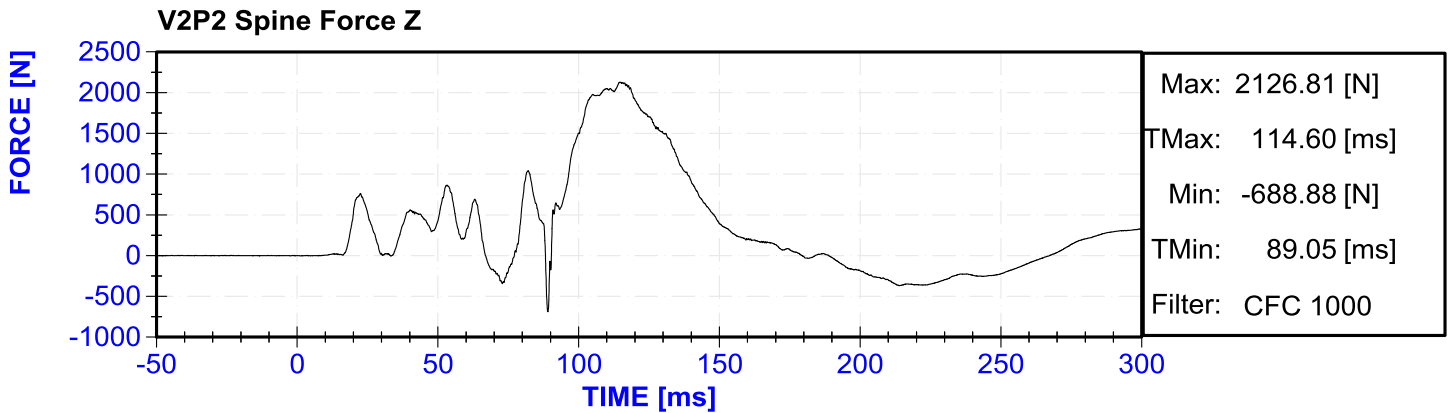
V2P2 Lower Left DGIR Z Rotation

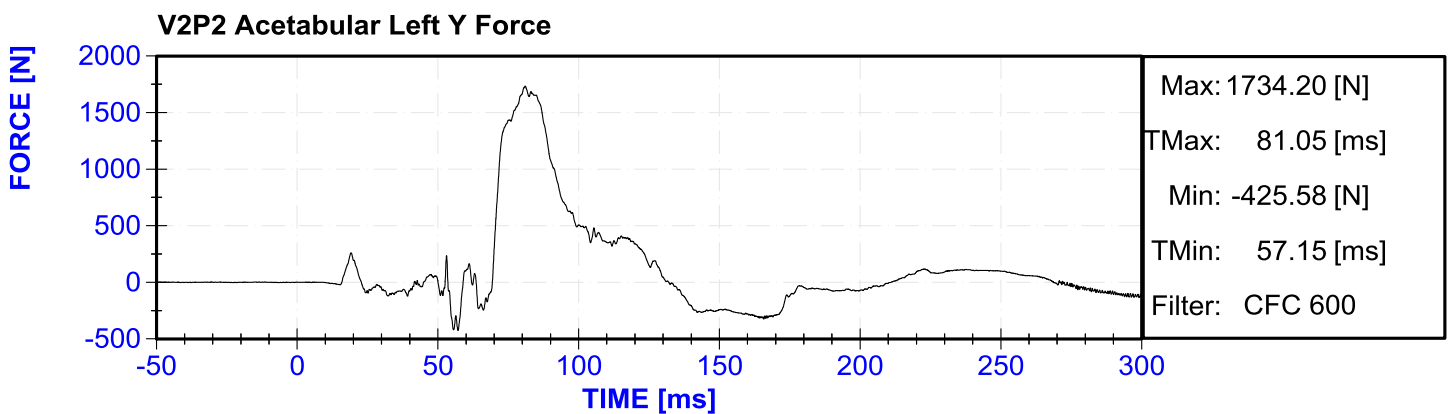
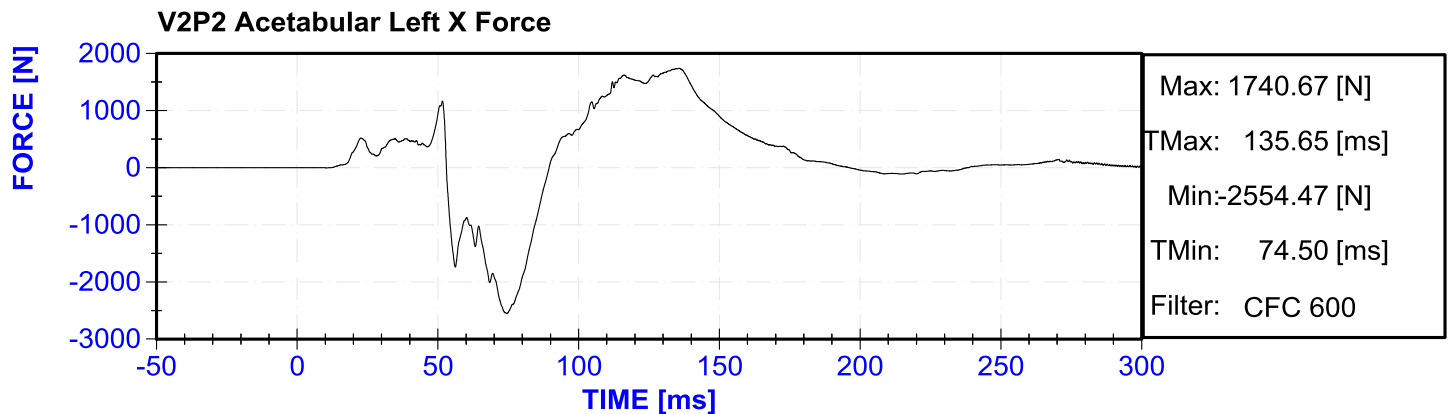
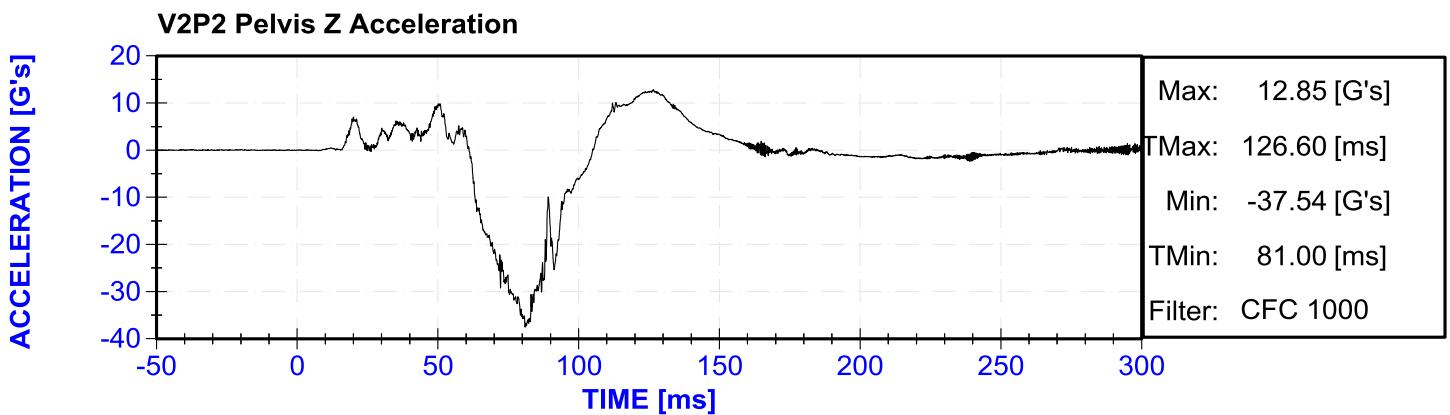
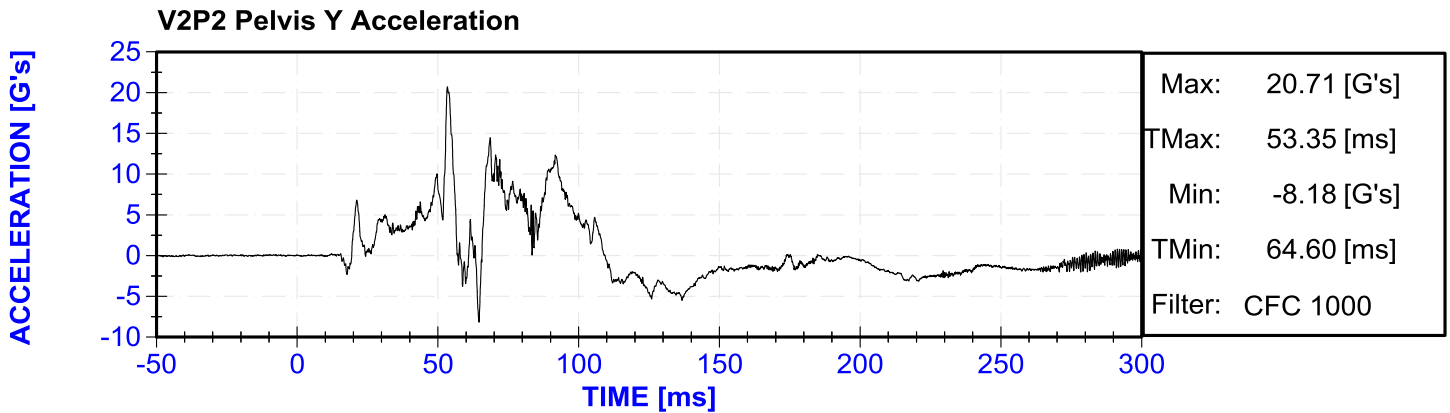


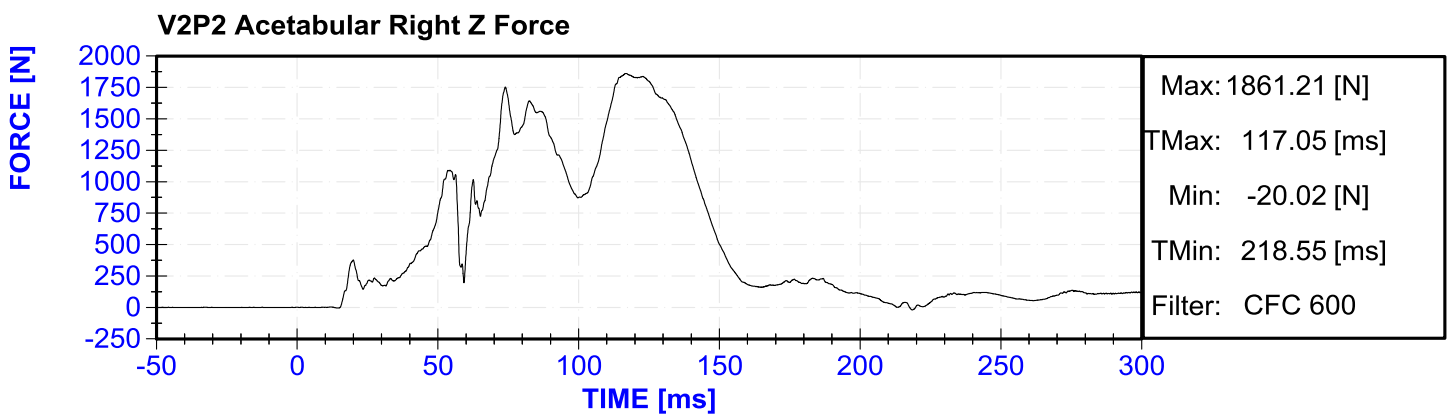
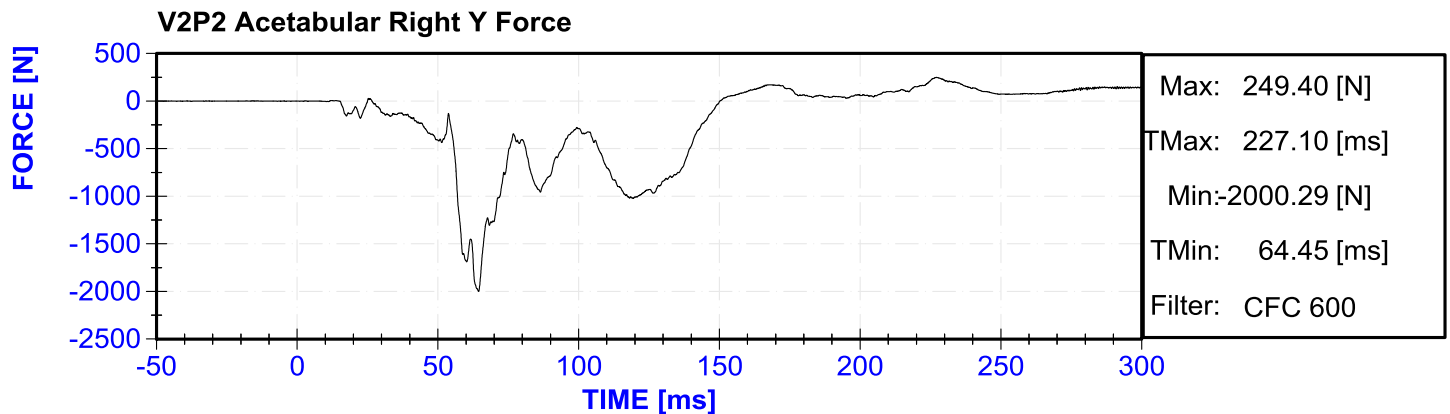
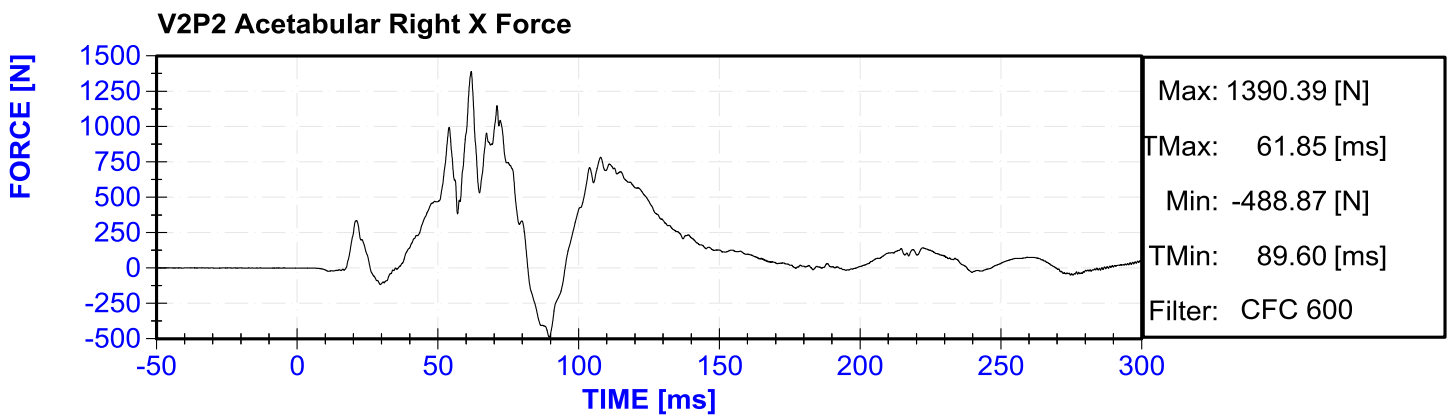
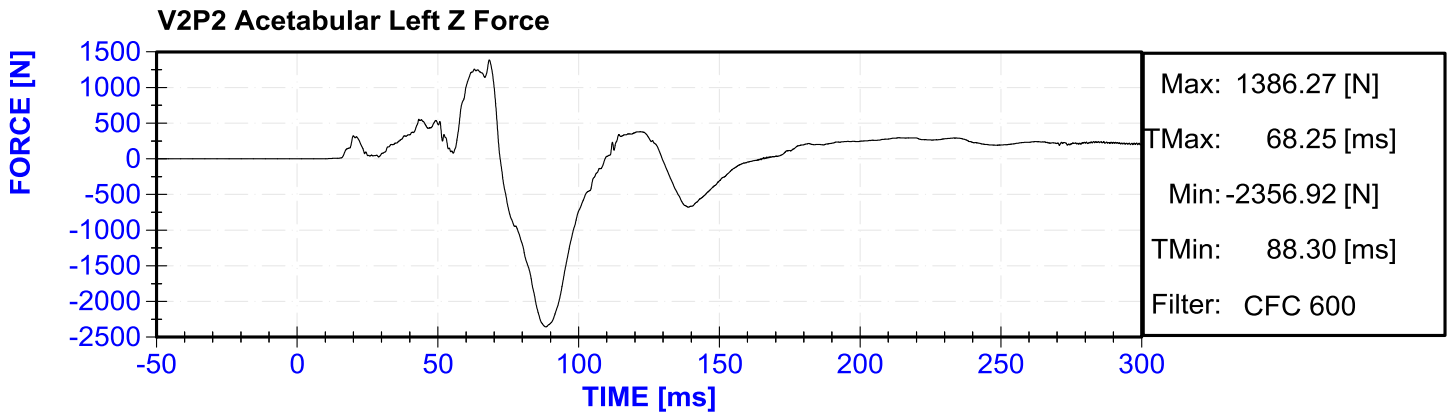
V2P2 Lower Right DGIR X Displacement

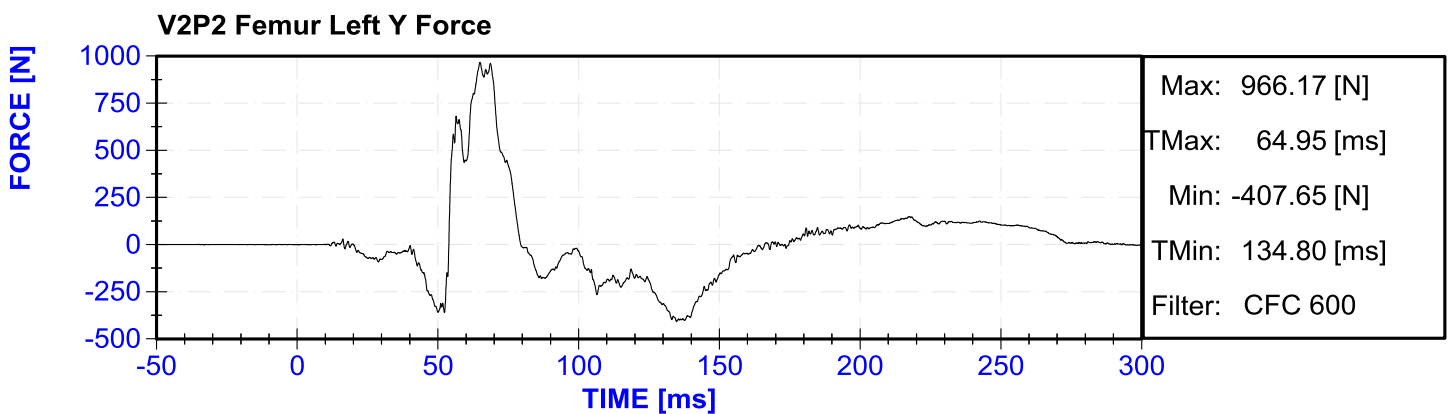
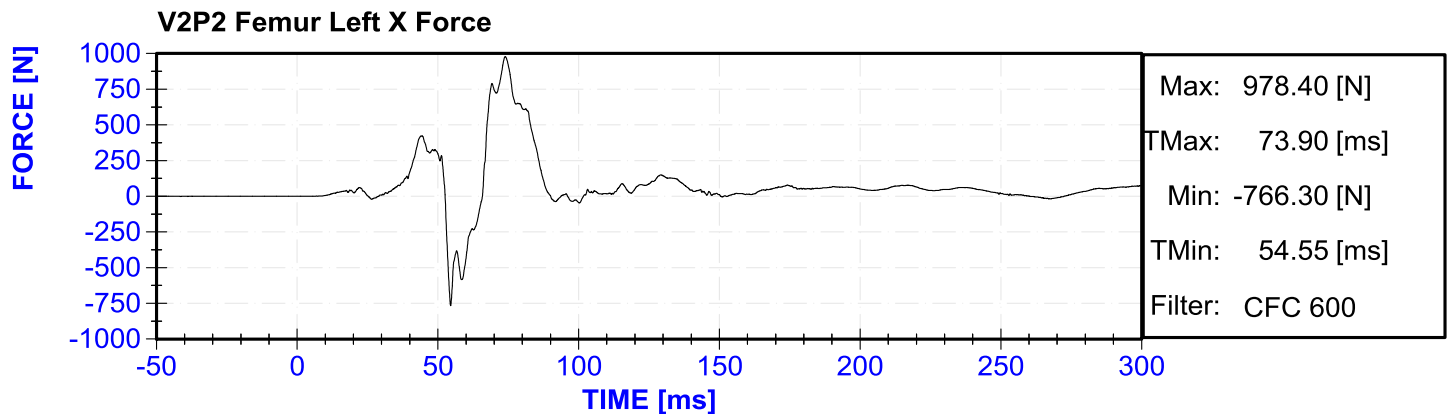
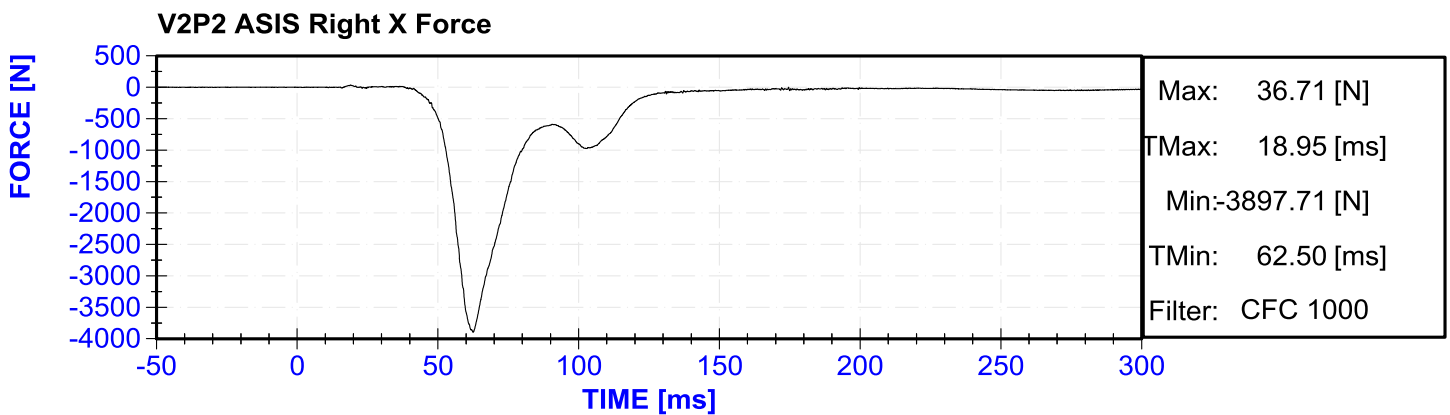
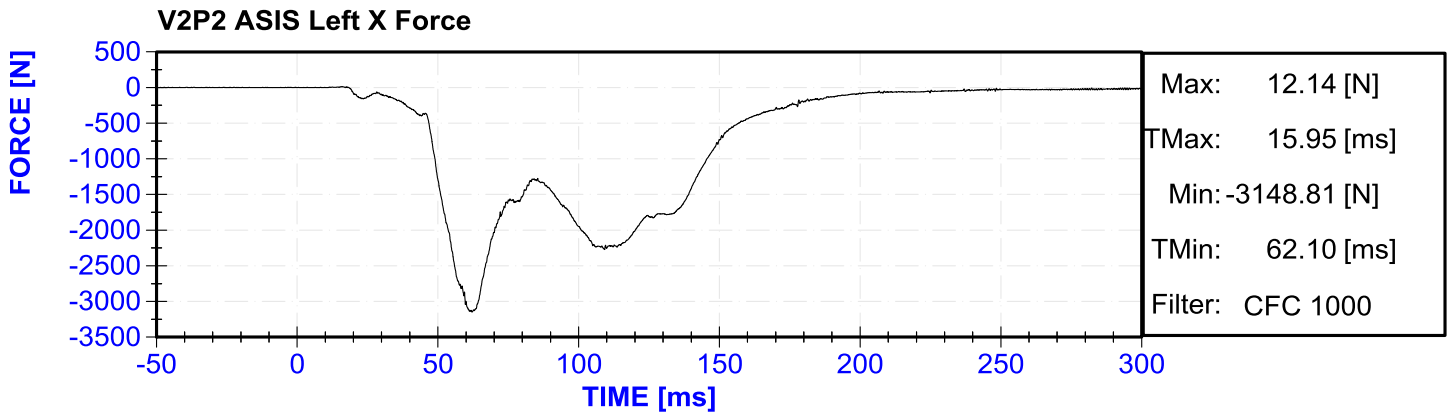


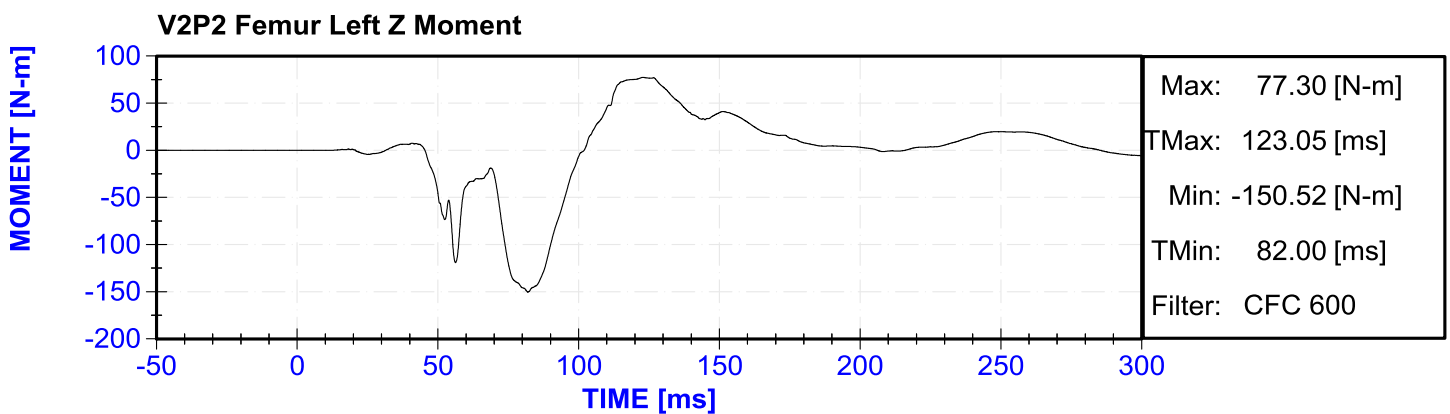
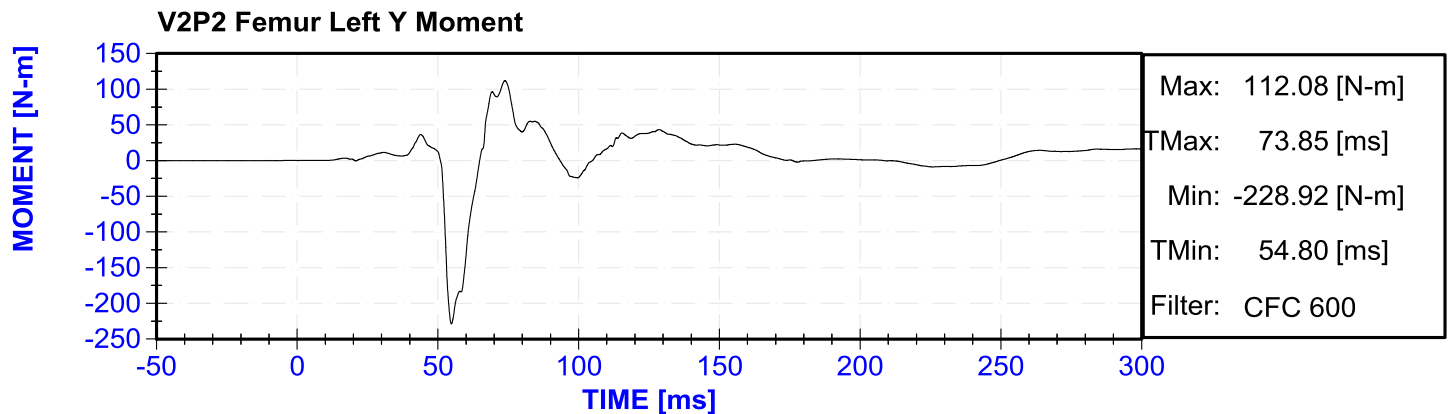
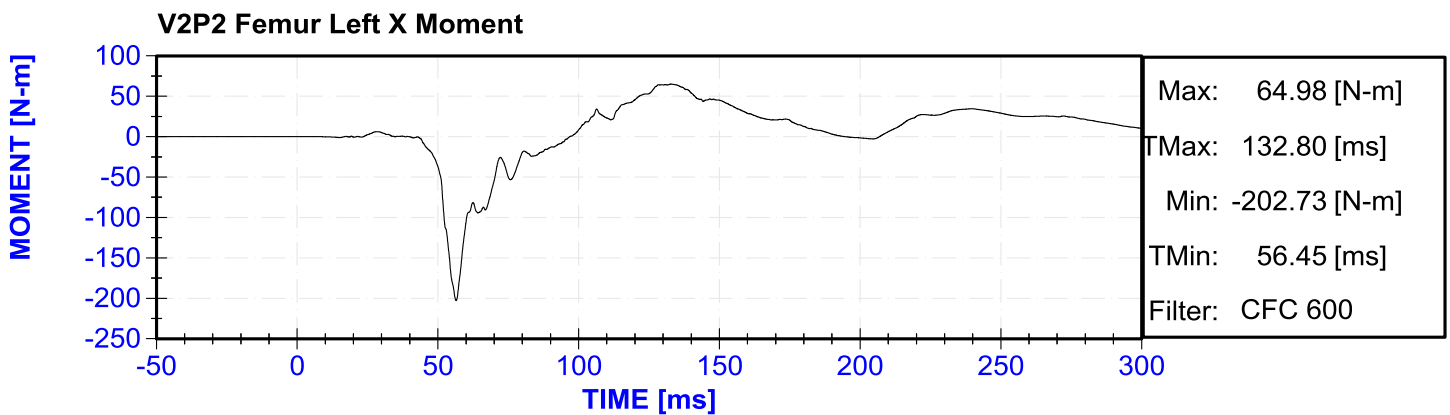
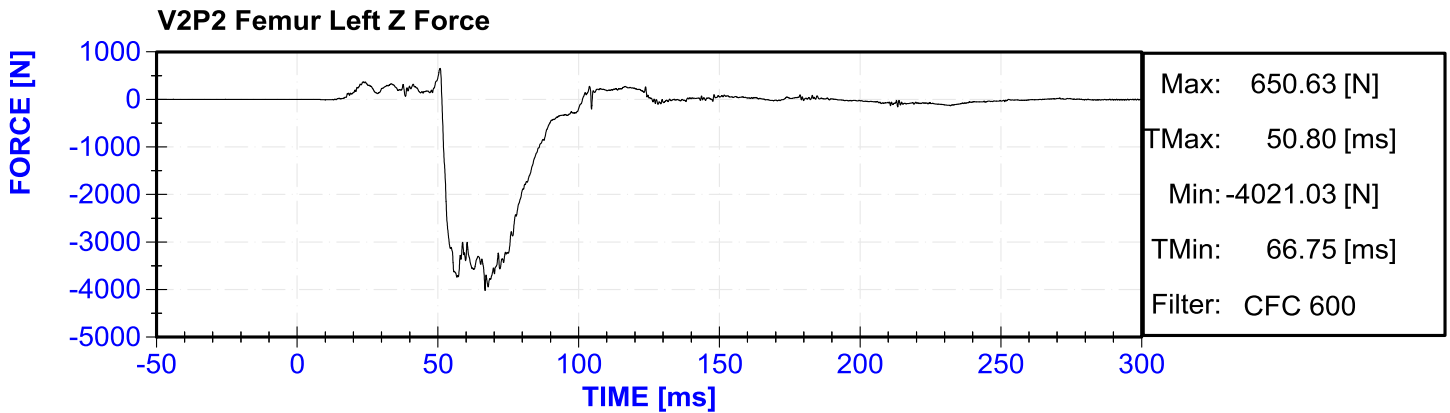


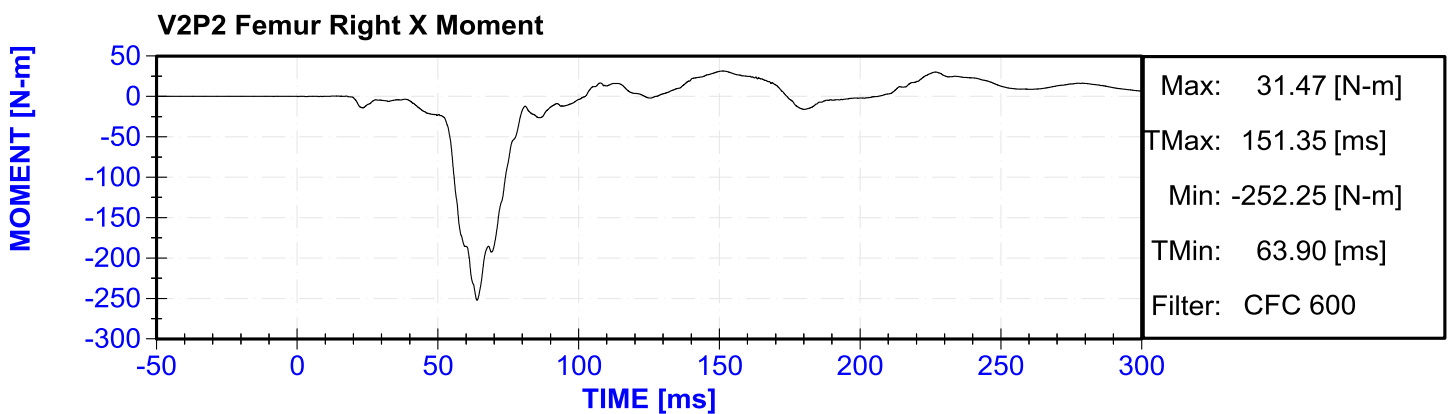
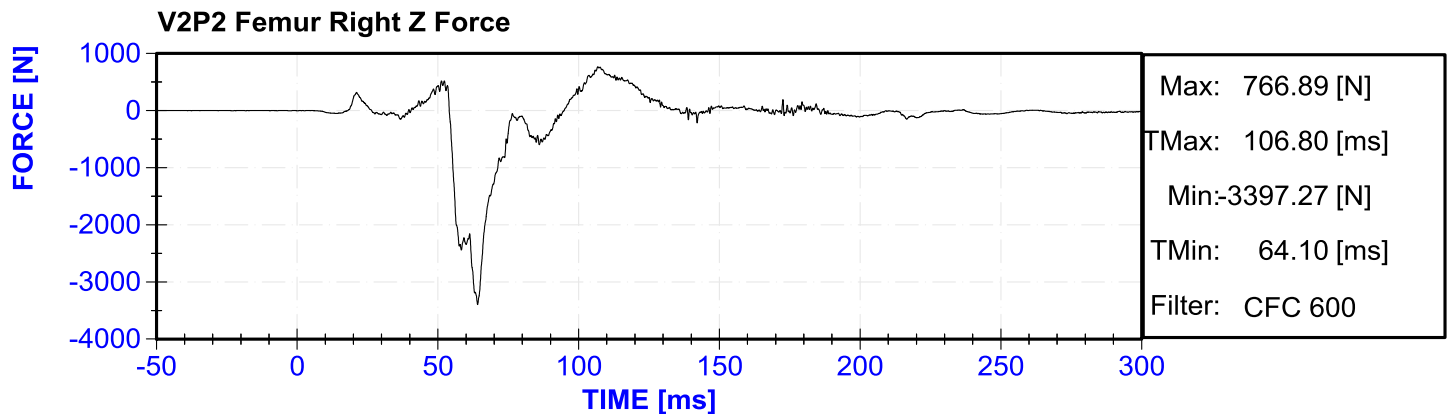
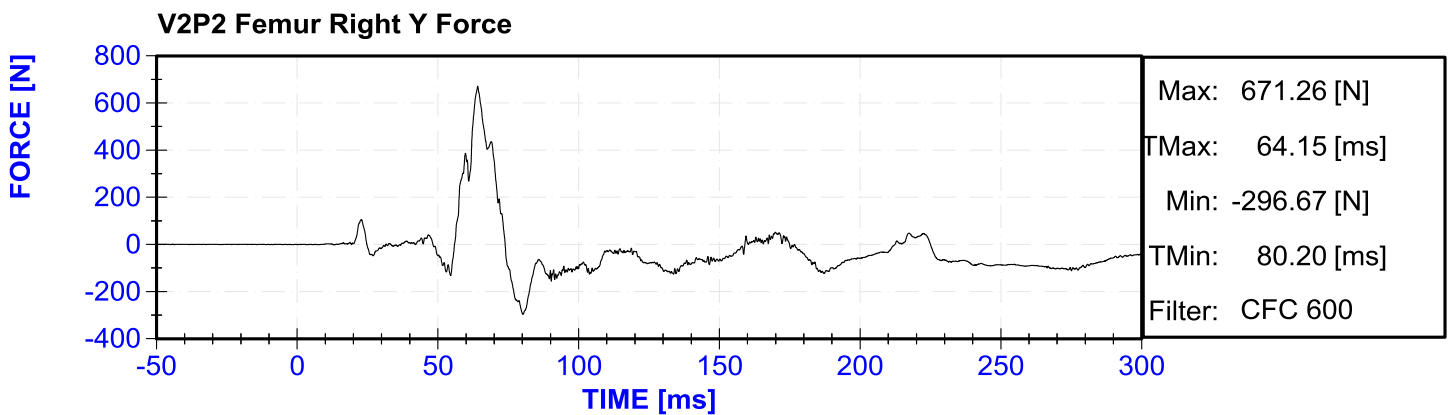
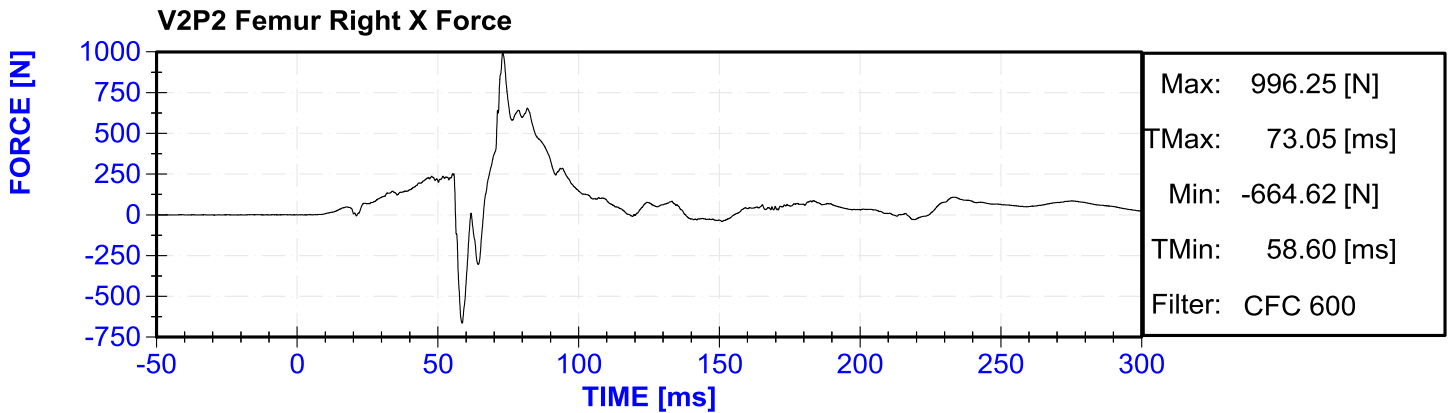


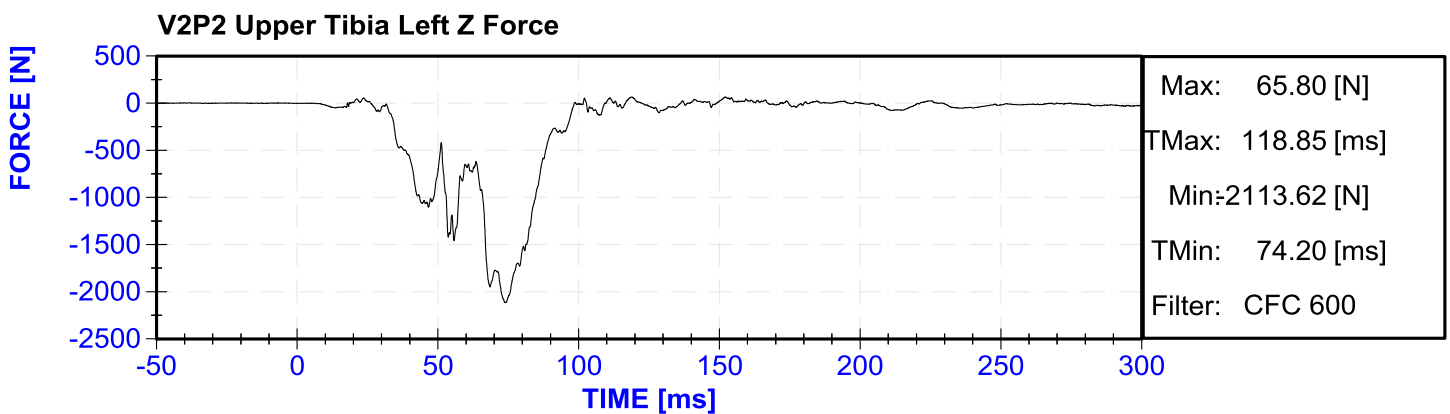
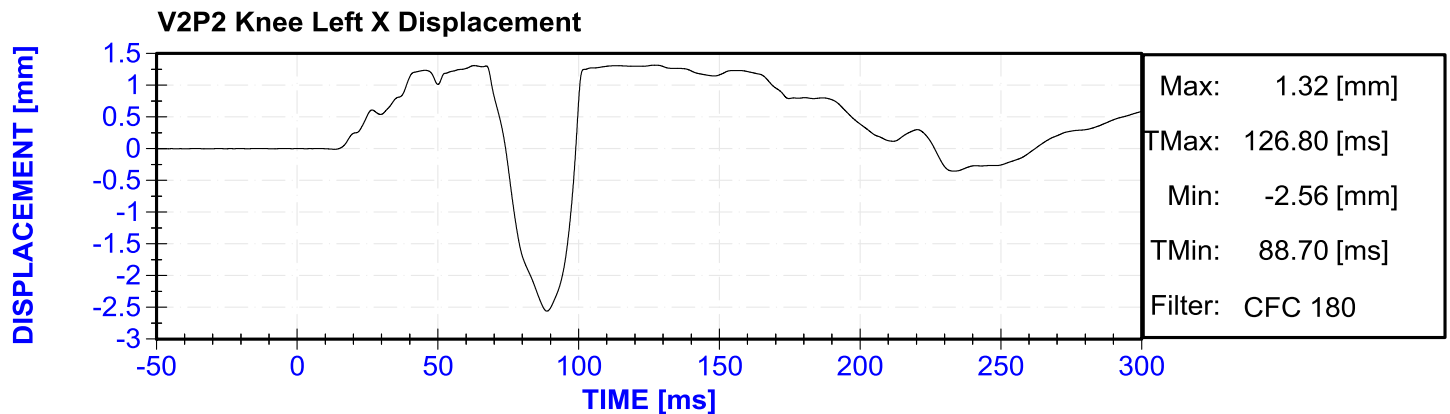
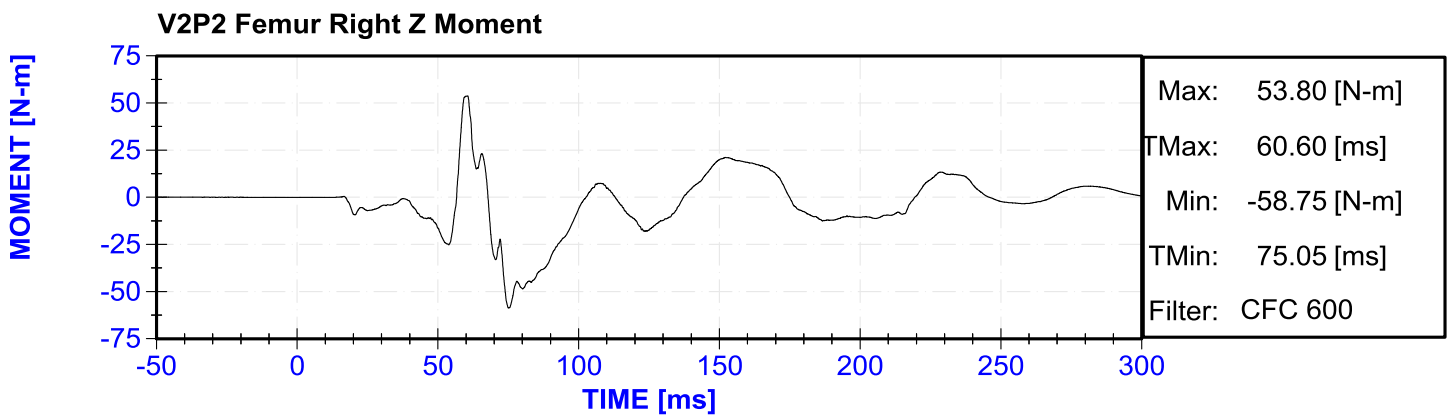
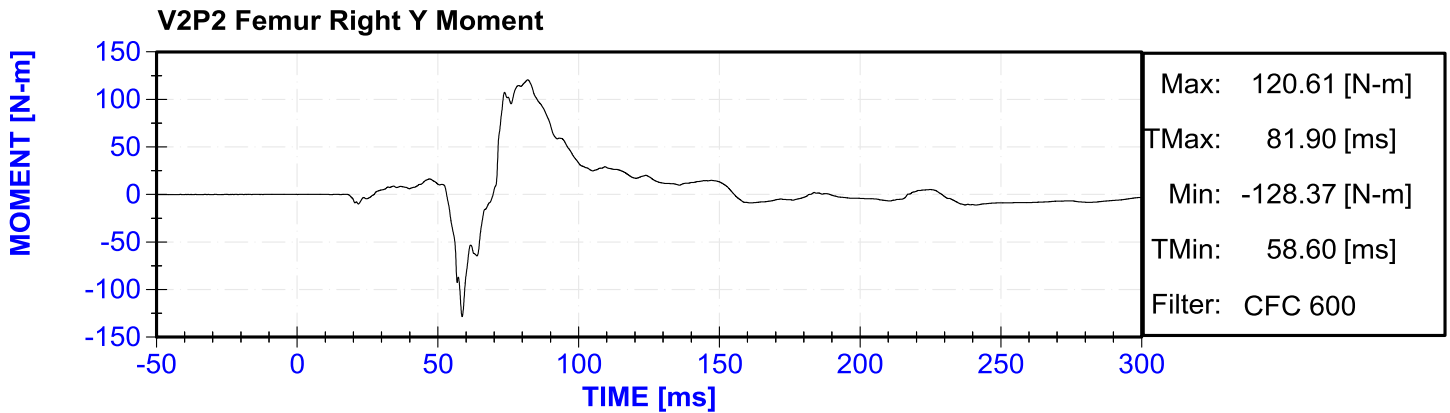


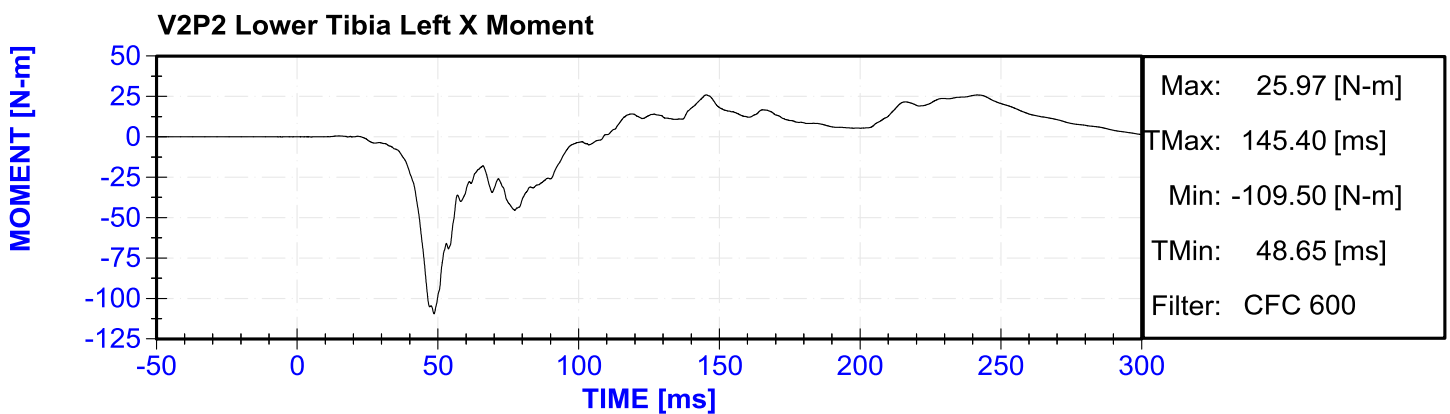
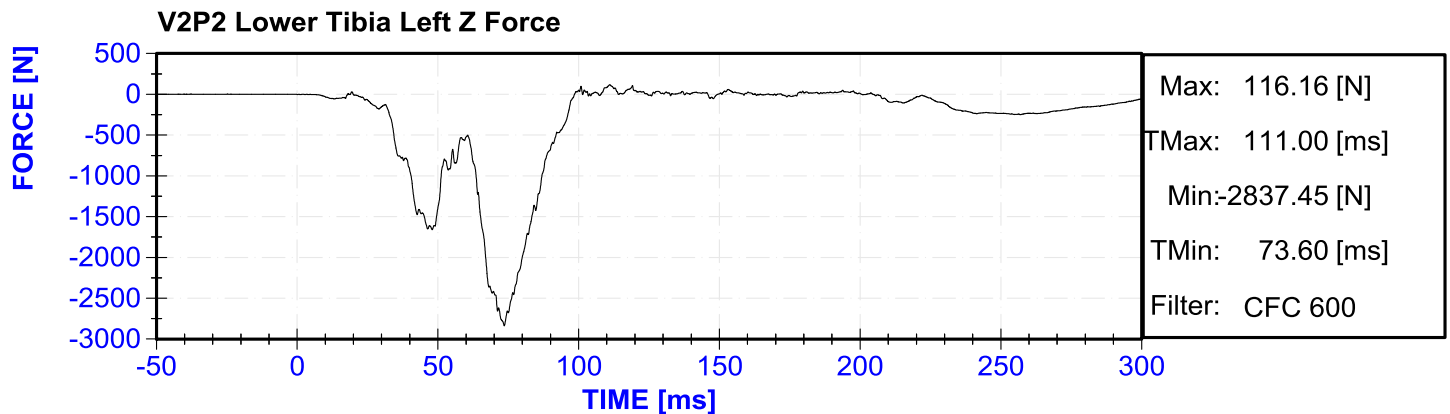
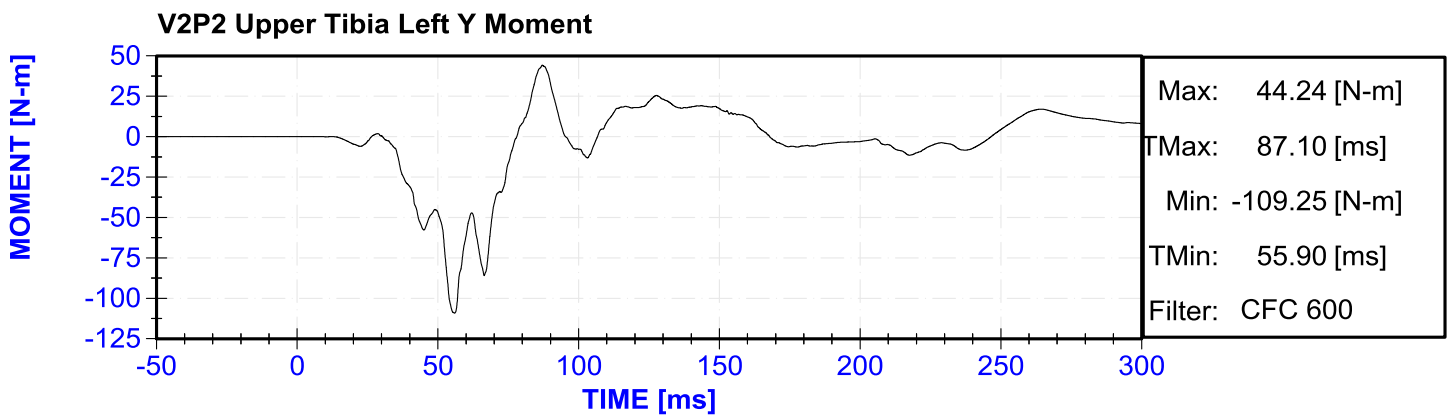
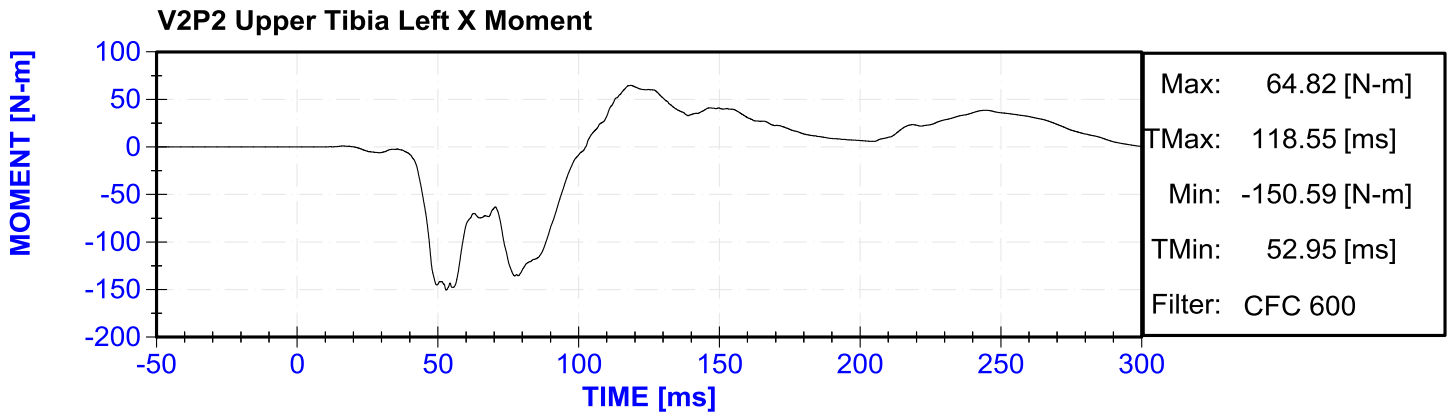


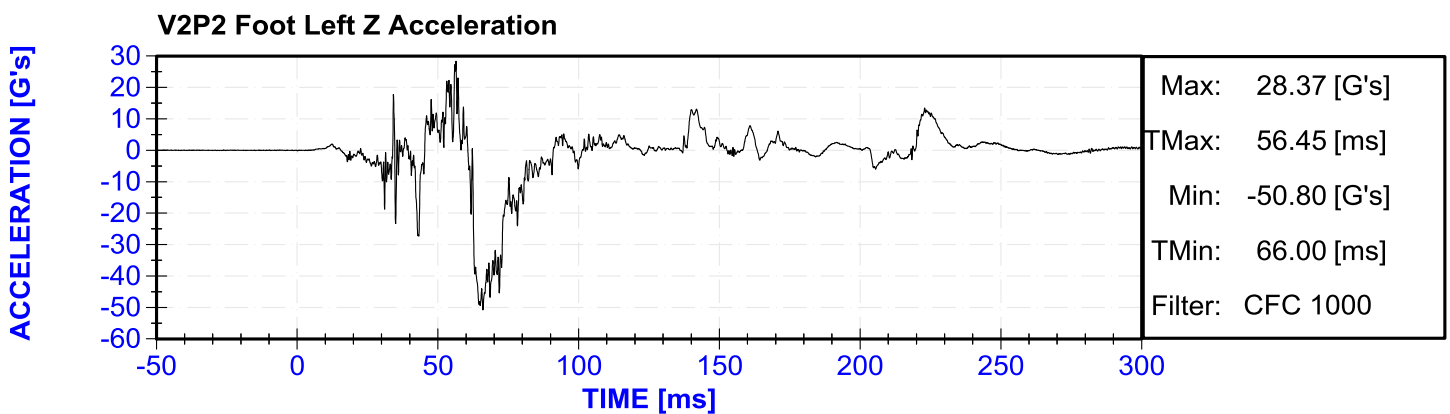
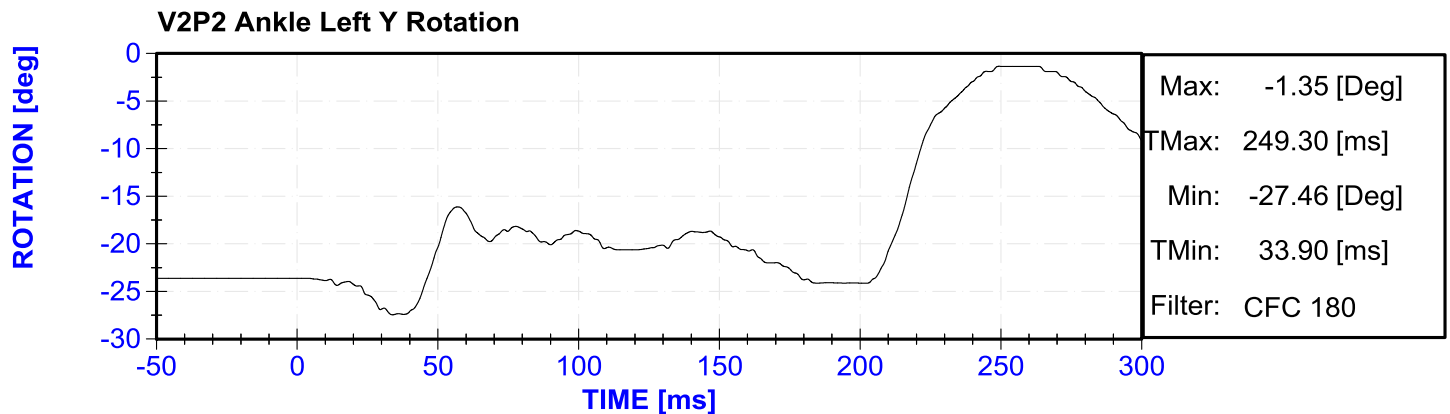
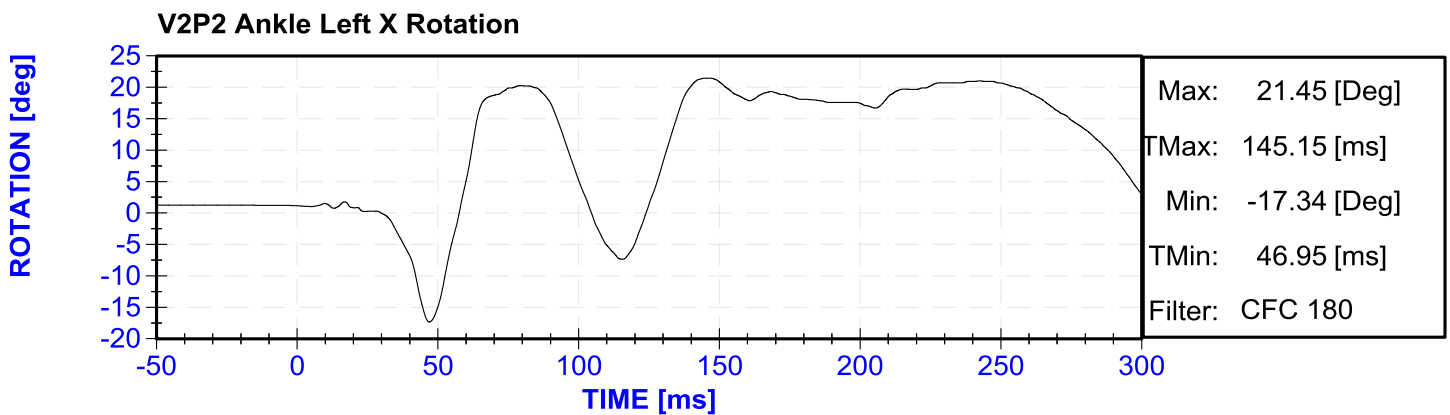
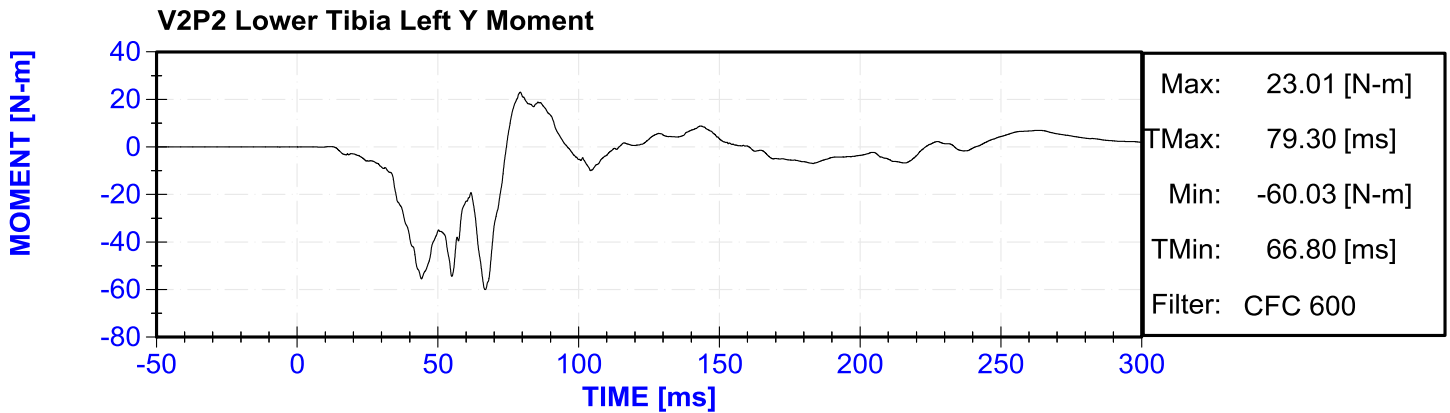


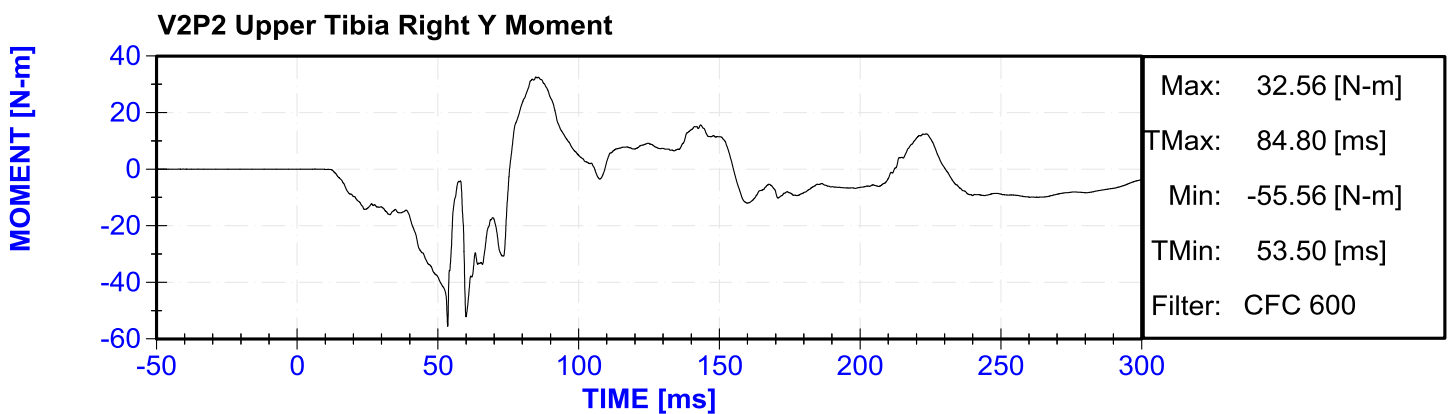
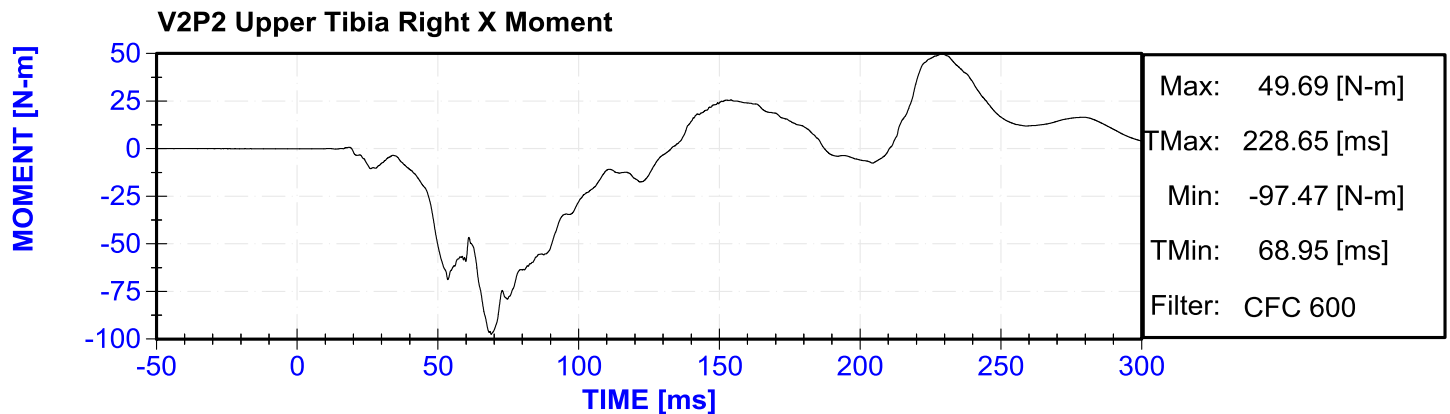
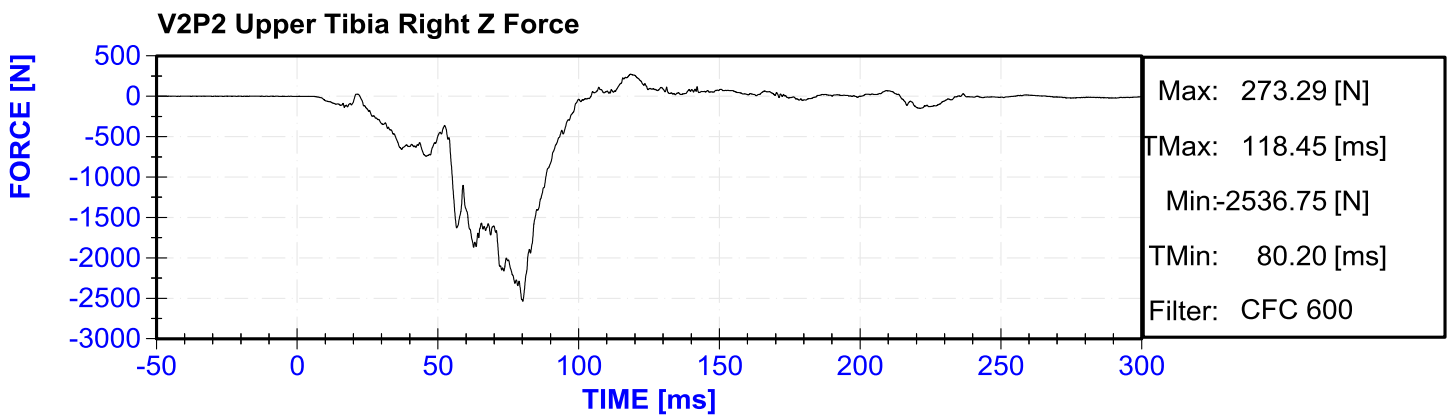
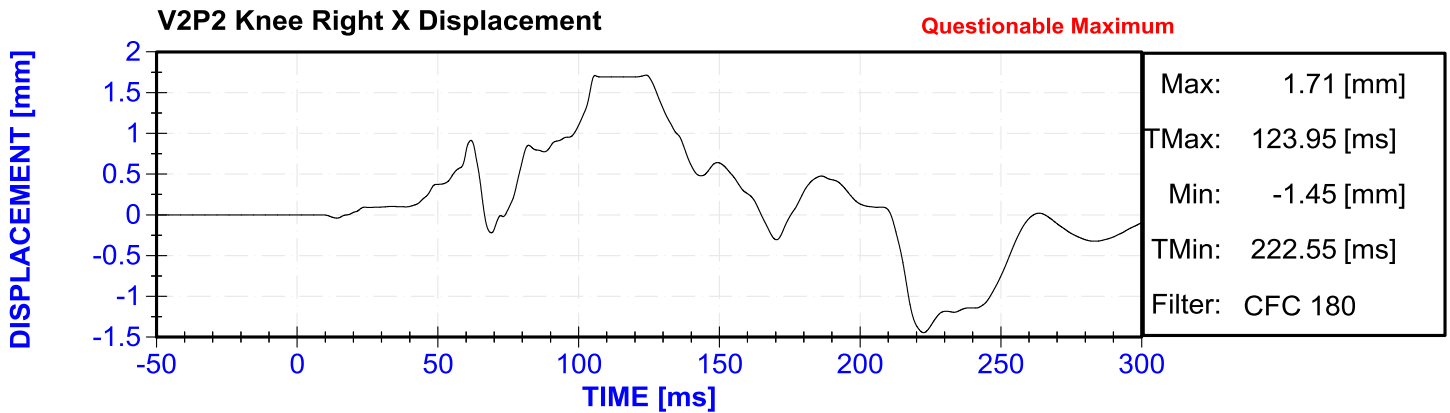


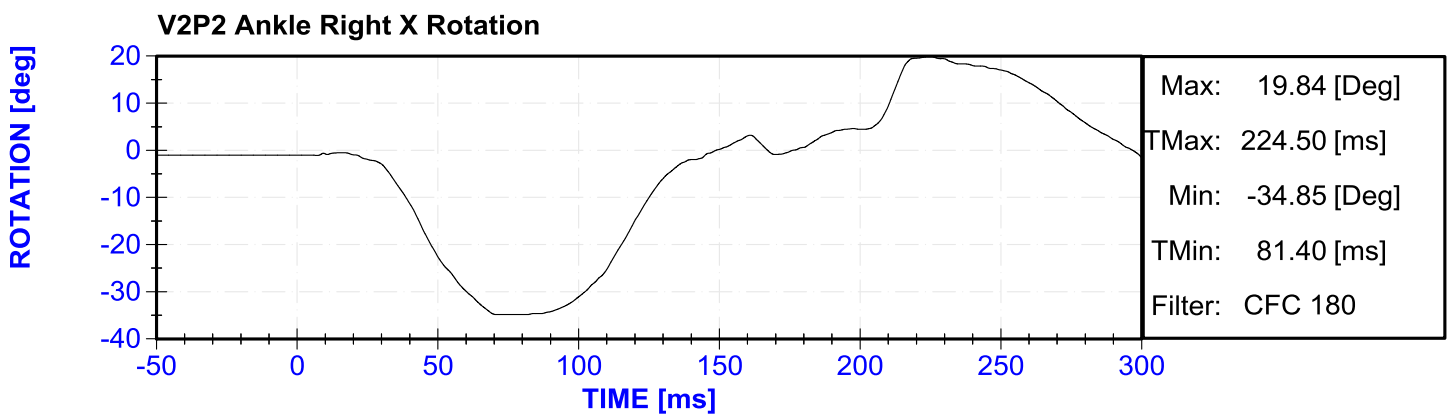
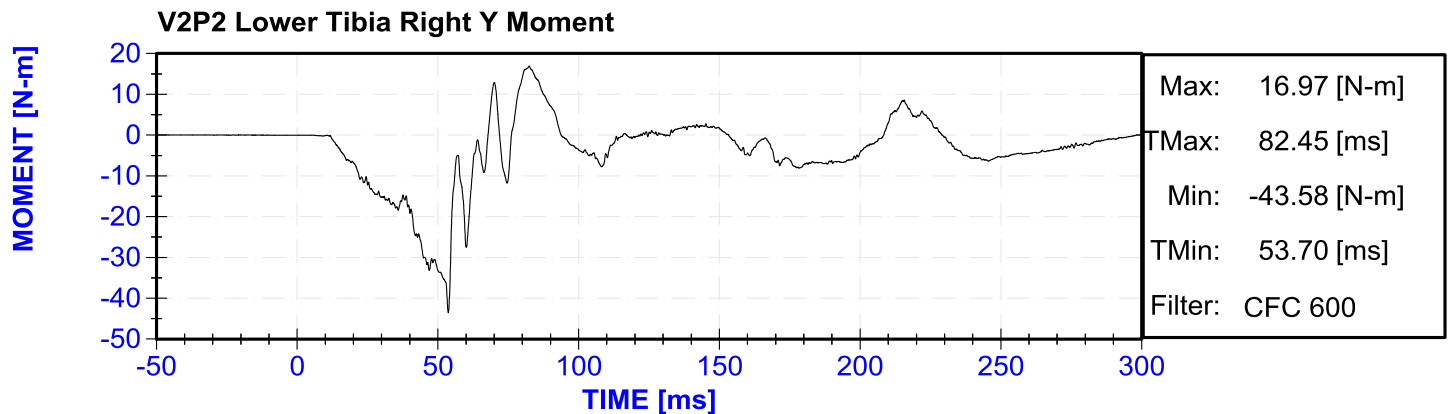
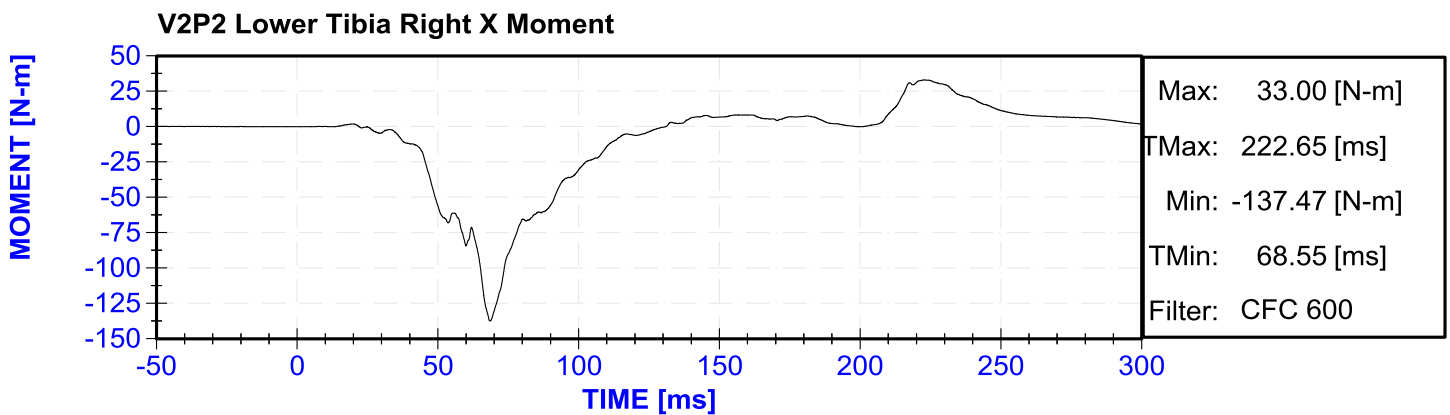
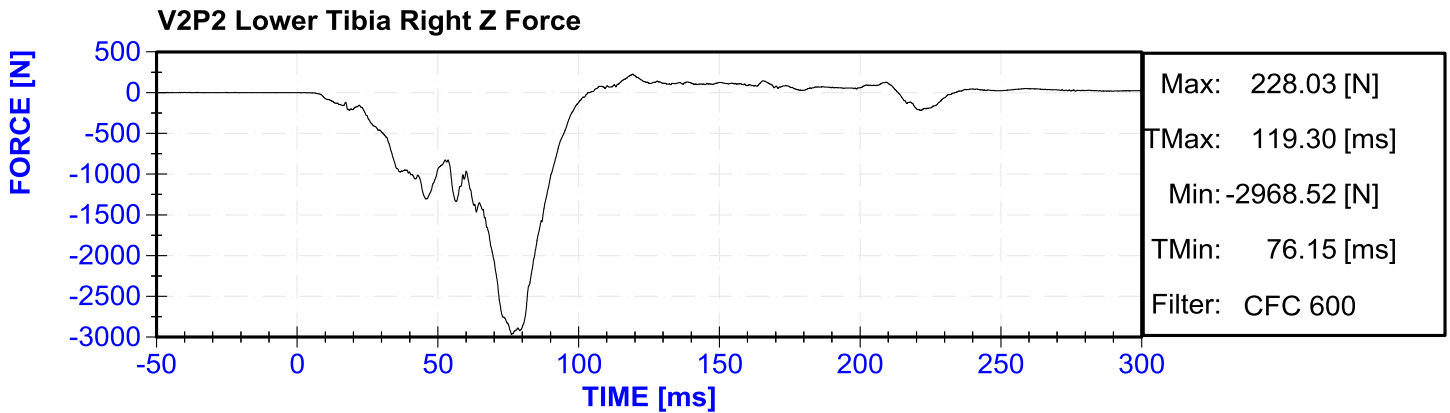


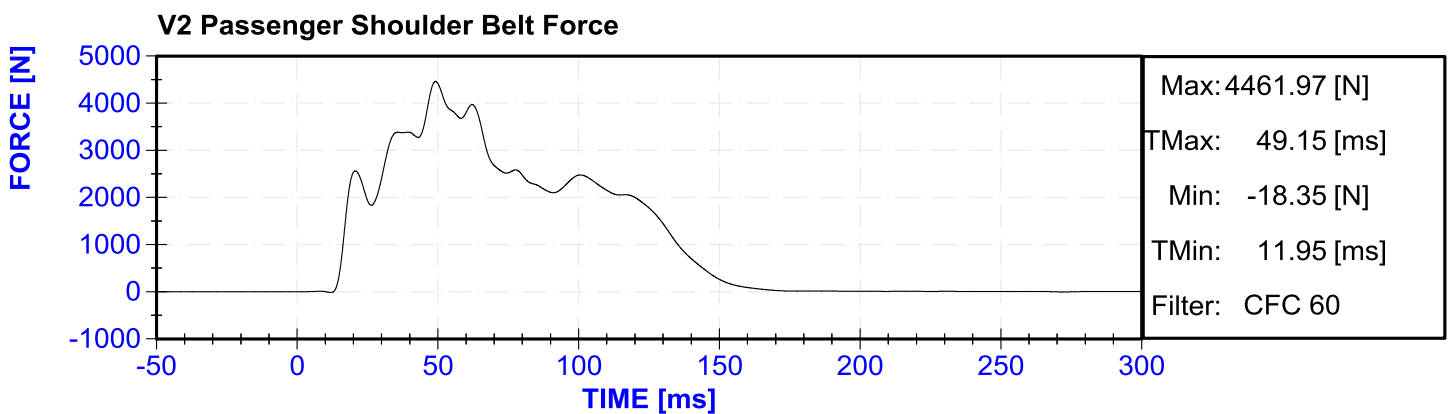
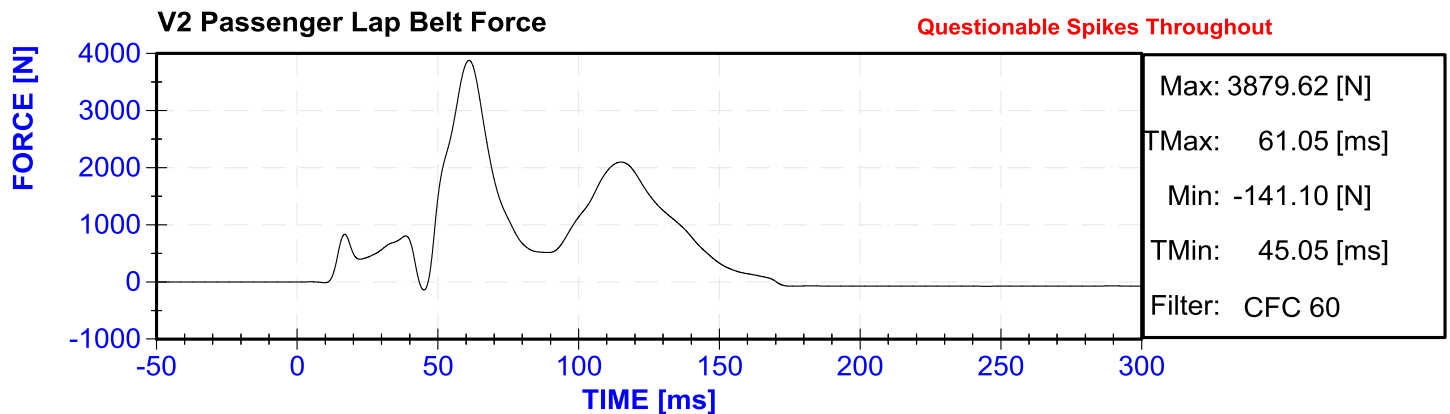
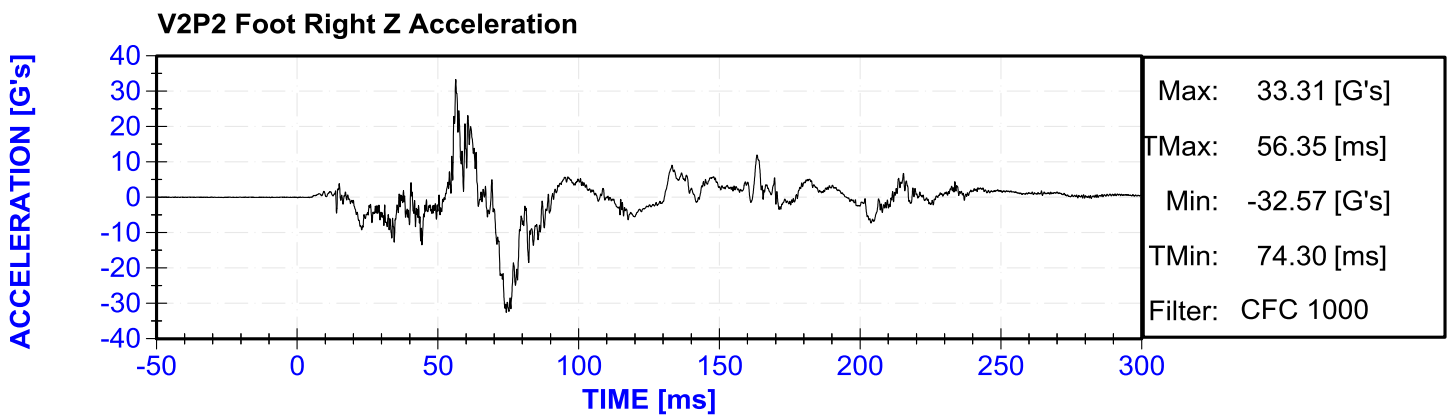
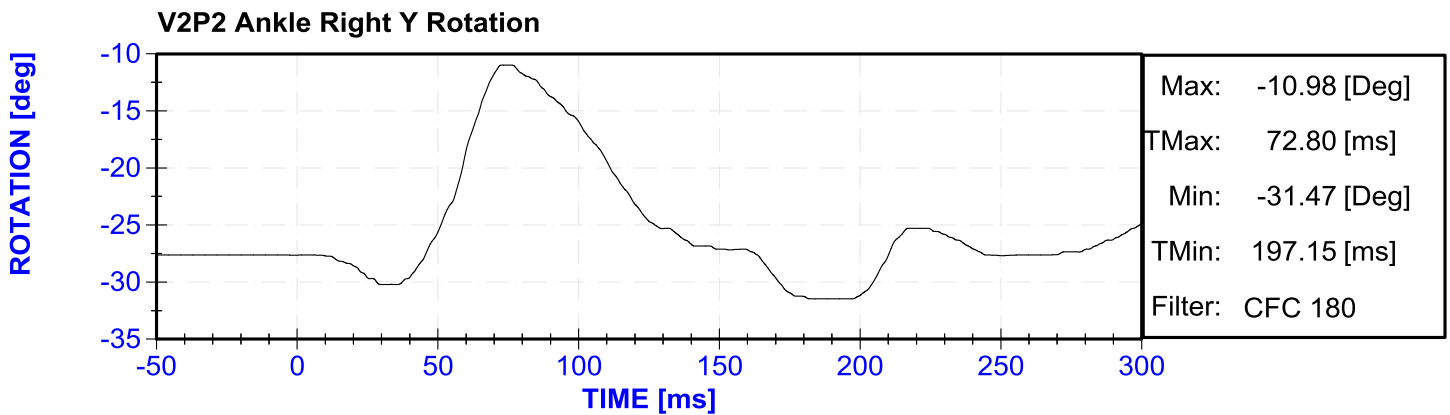


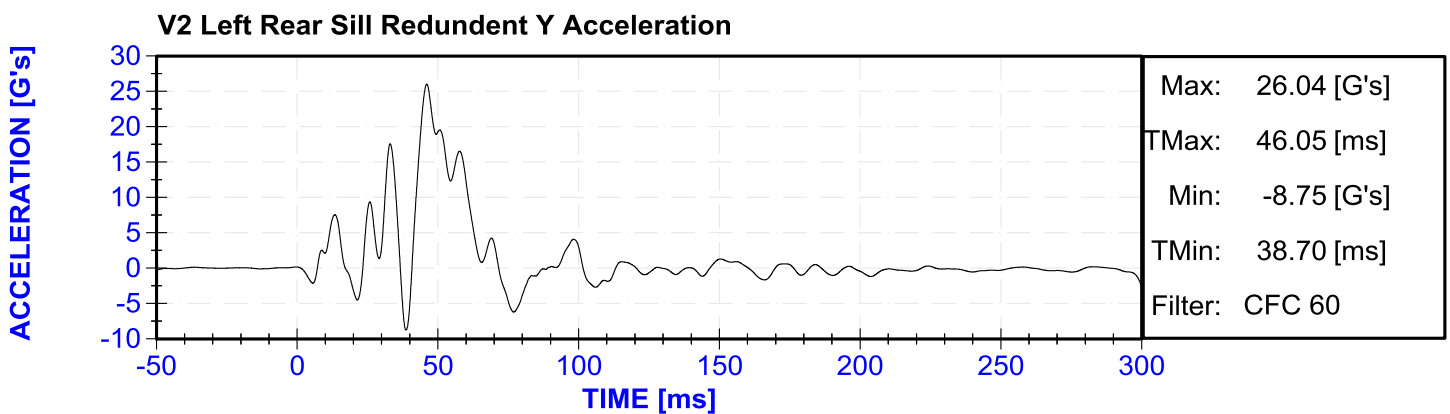
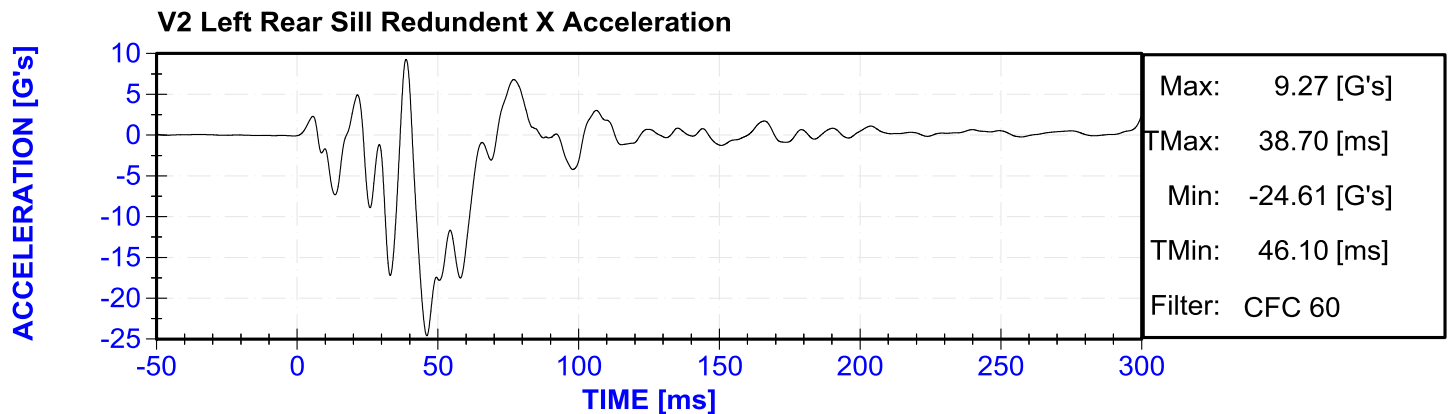
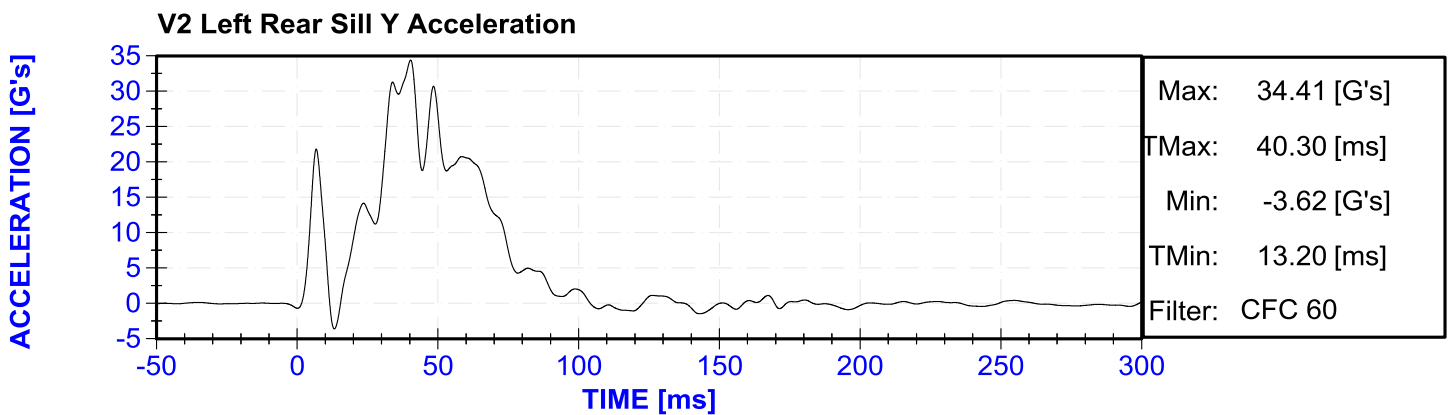
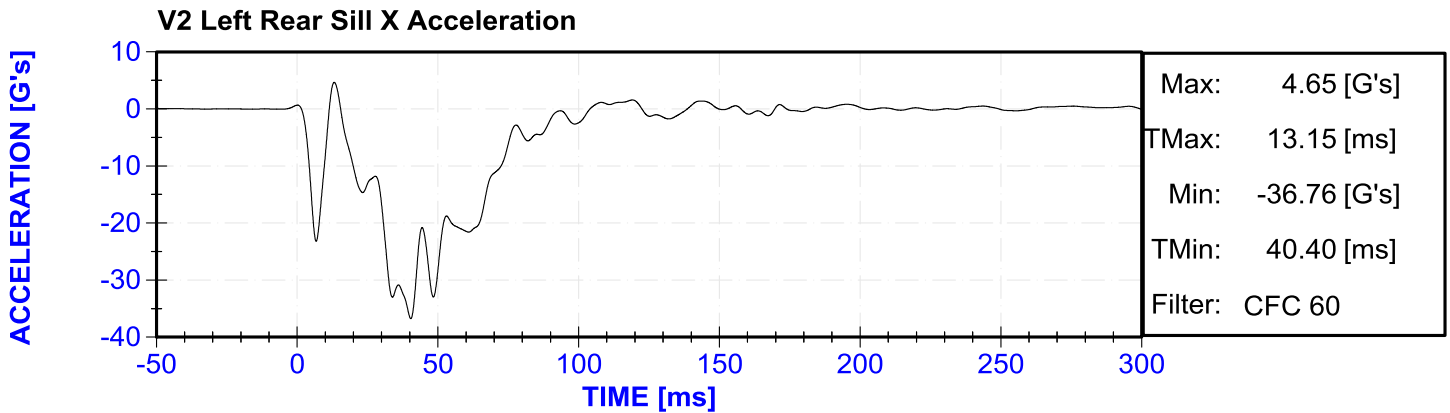


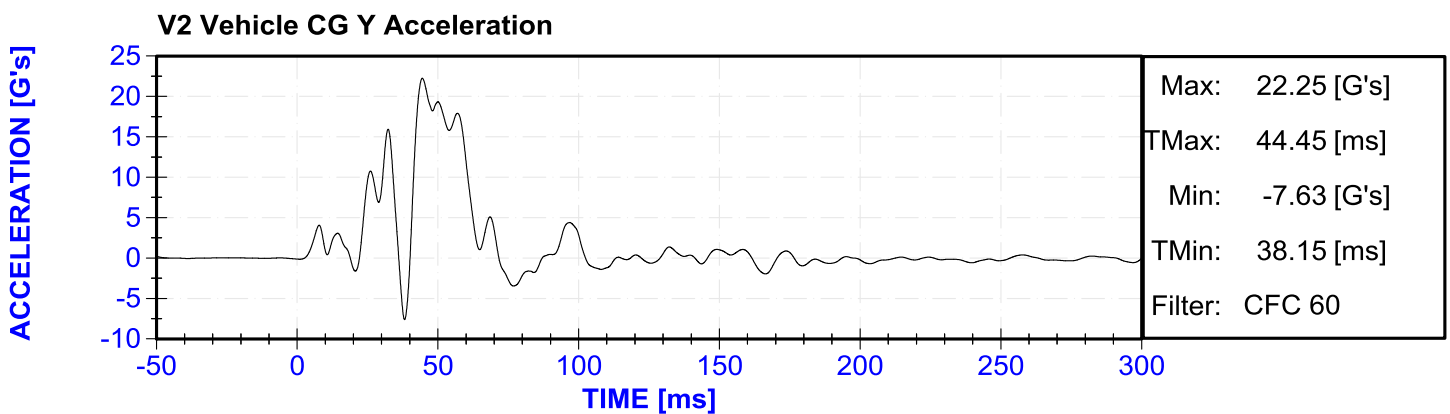
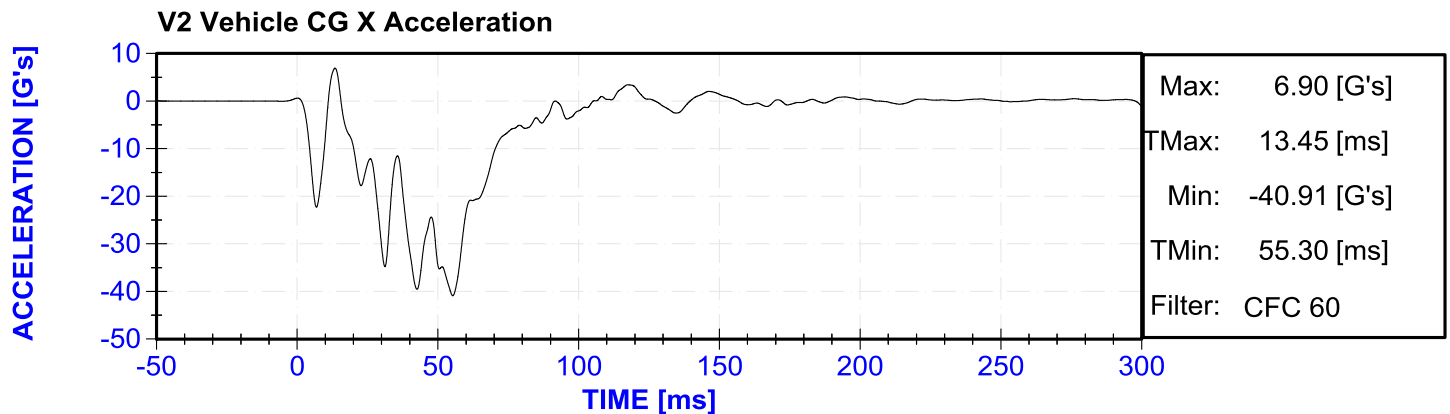
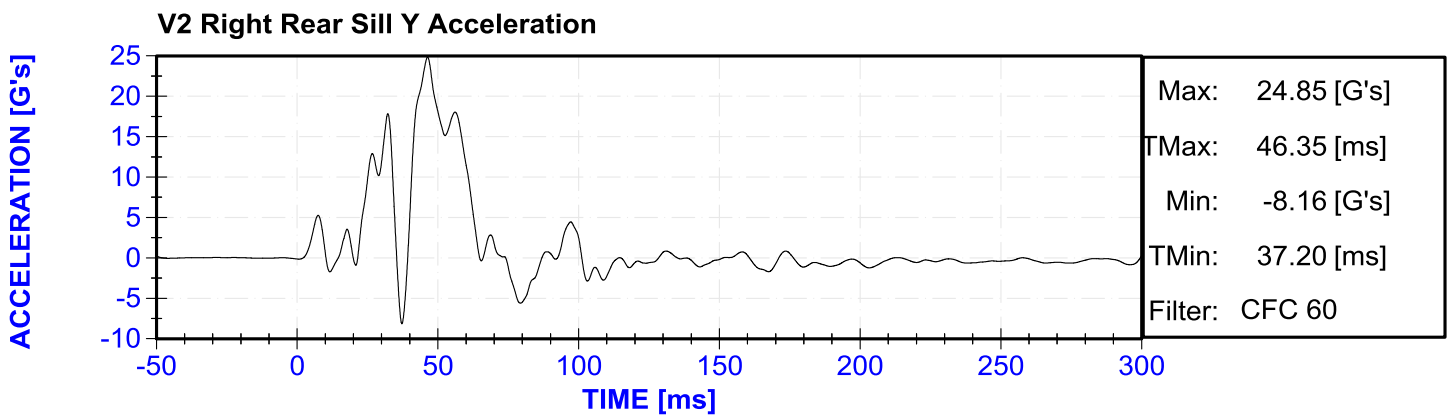
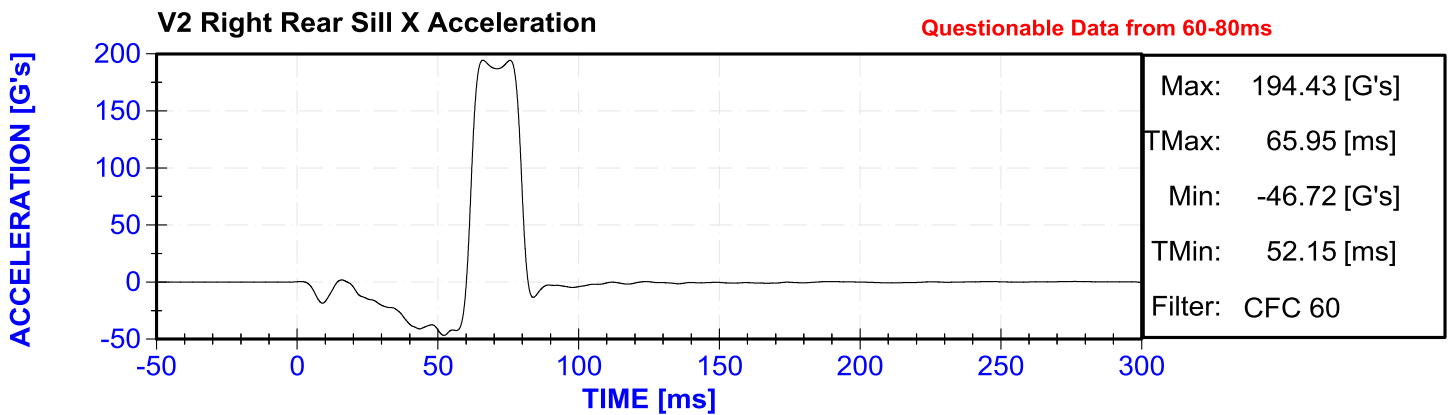


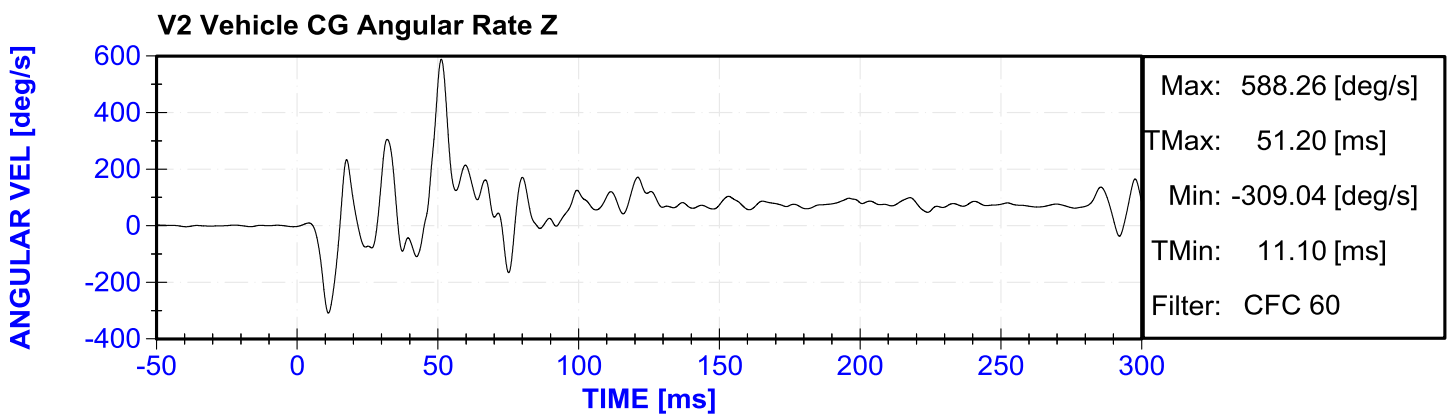
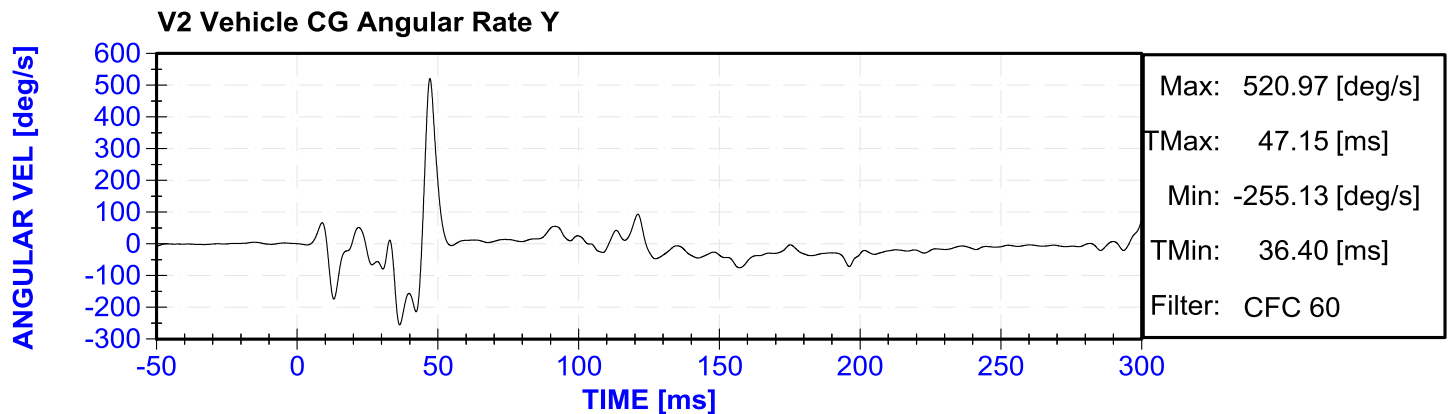
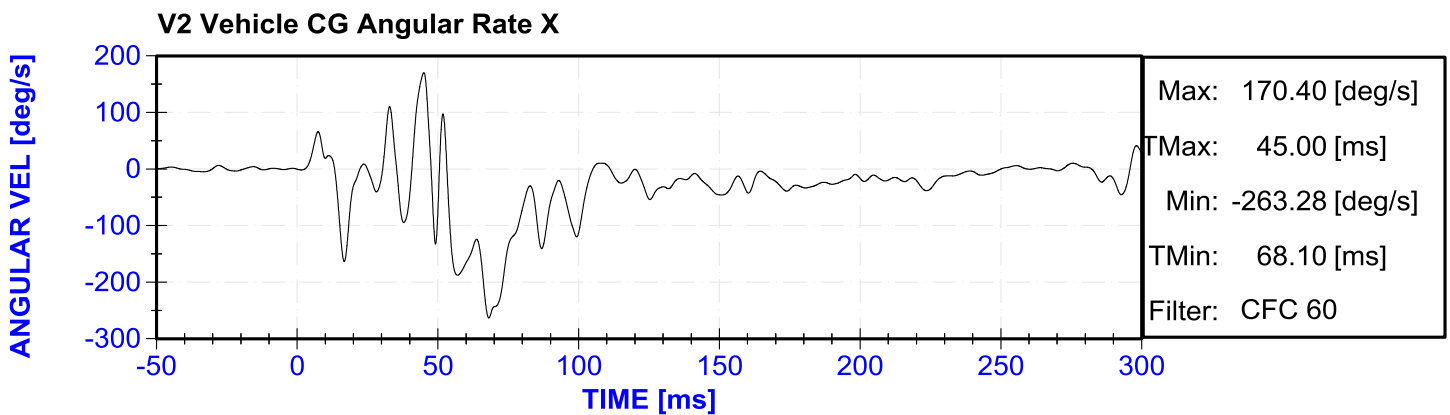
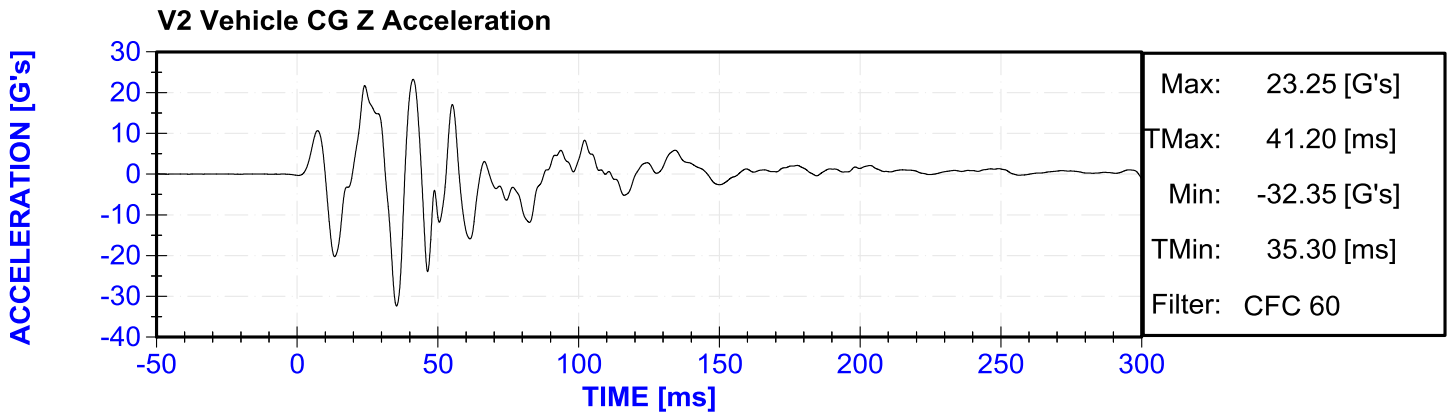




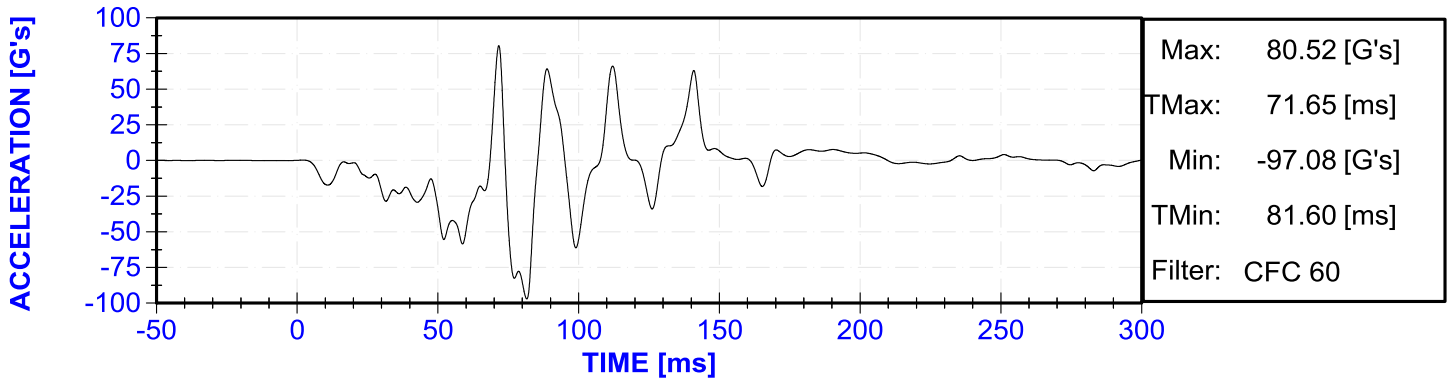




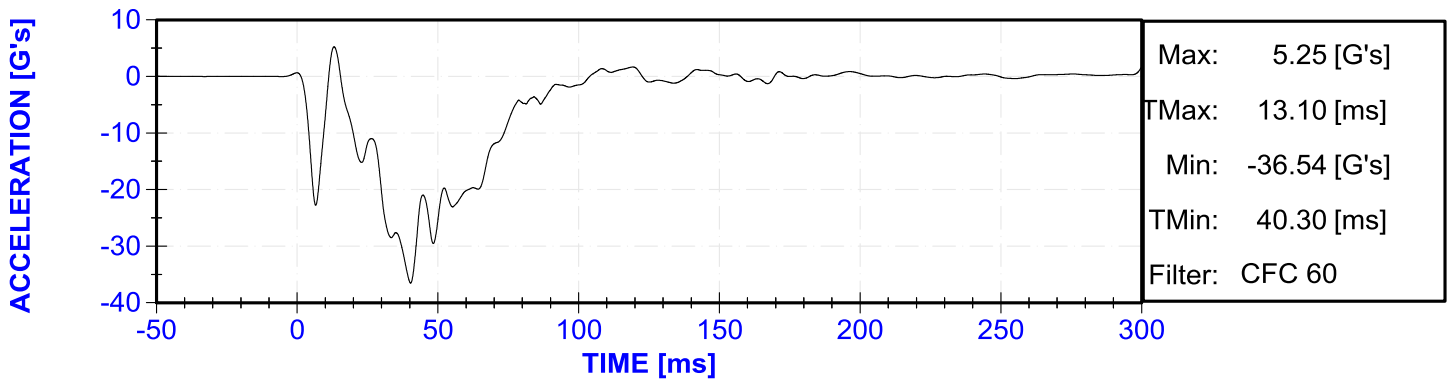




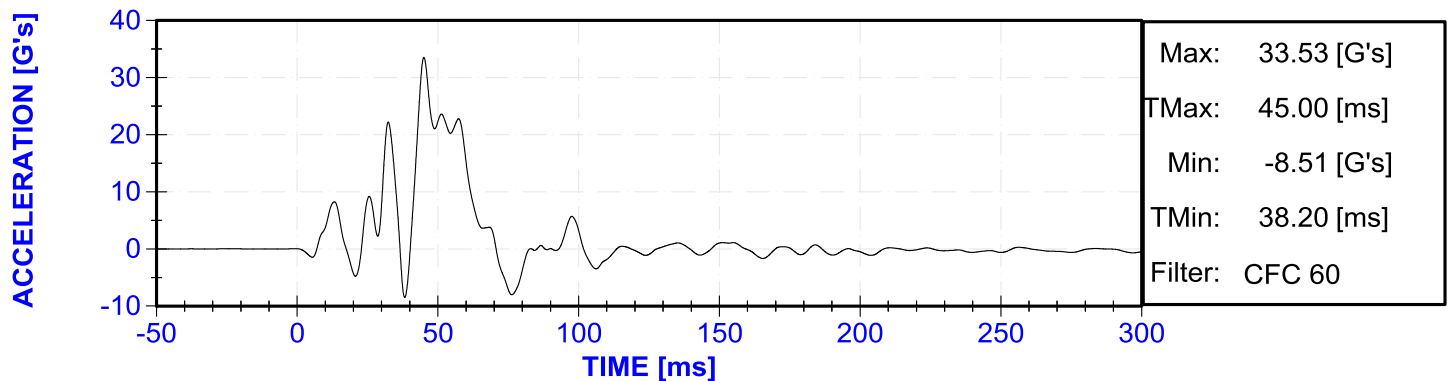
V2 Instrument Panel X Acceleration



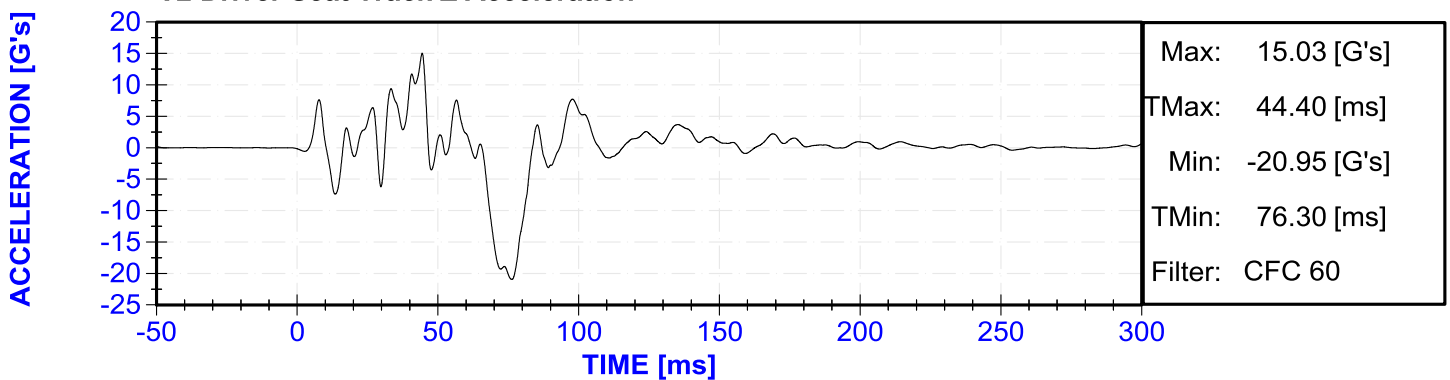
V2 Driver Seat Track X Acceleration



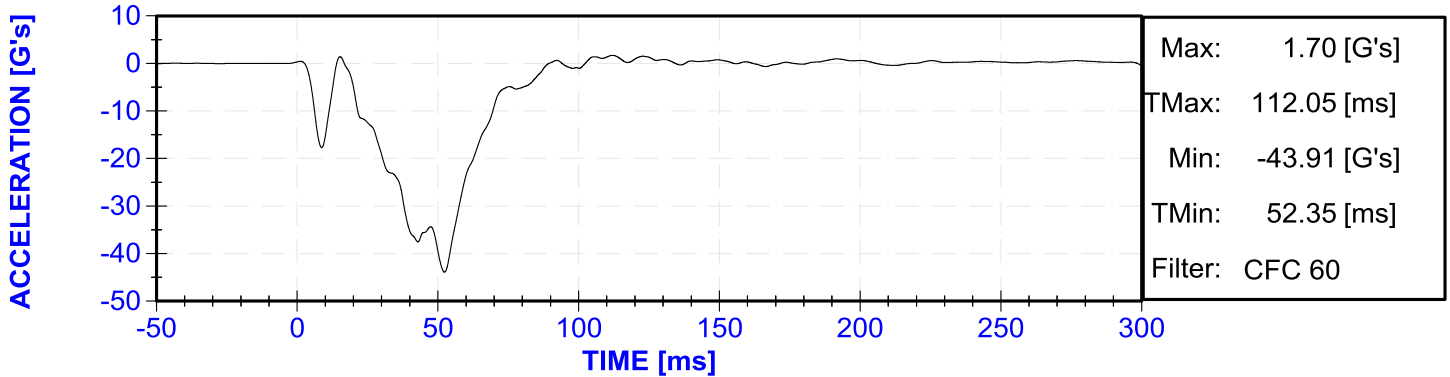
V2 Driver Seat Track Y Acceleration



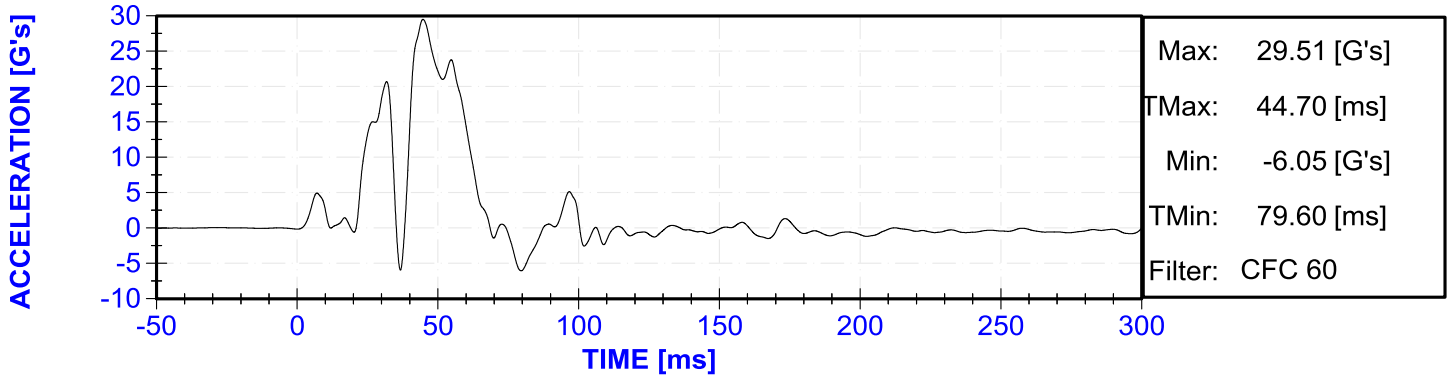
V2 Driver Seat Track Z Acceleration



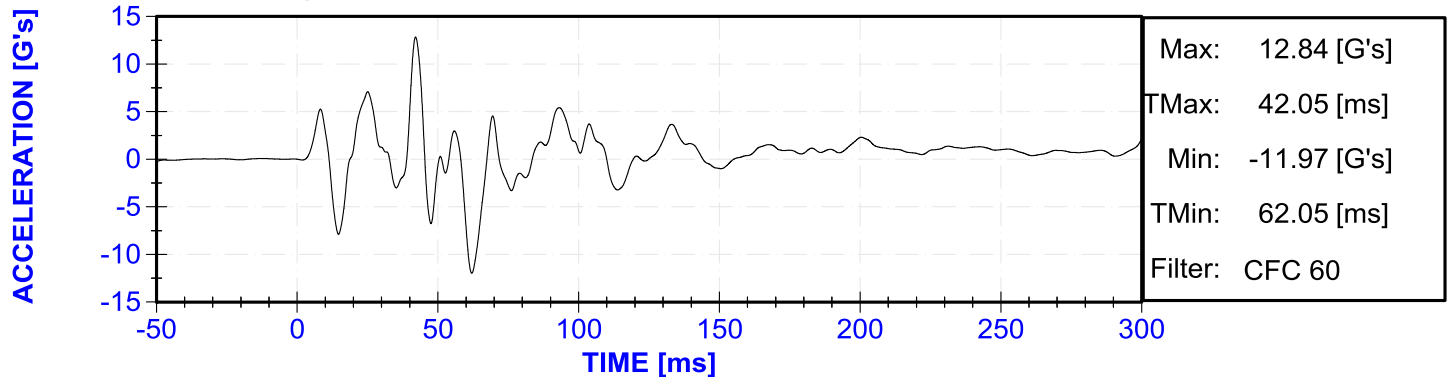
V2 Passenger Seat Track X Acceleration



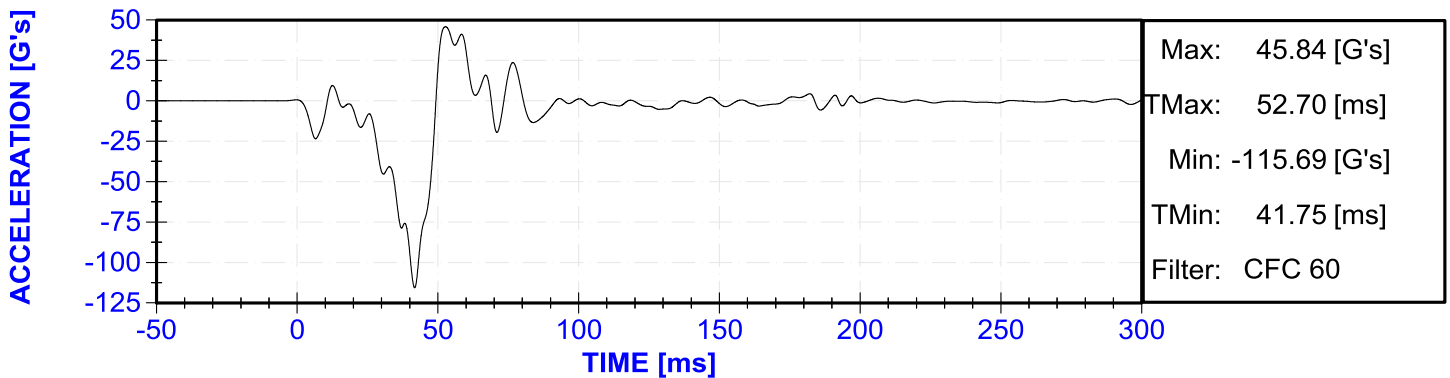
V2 Passenger Seat Track Y Acceleration



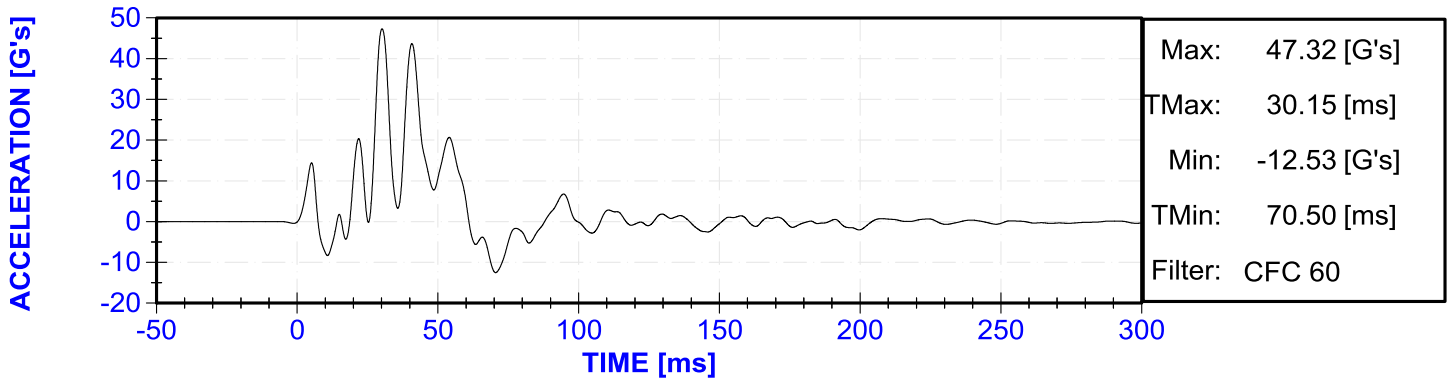
V2 Passenger Seat Track Z Acceleration



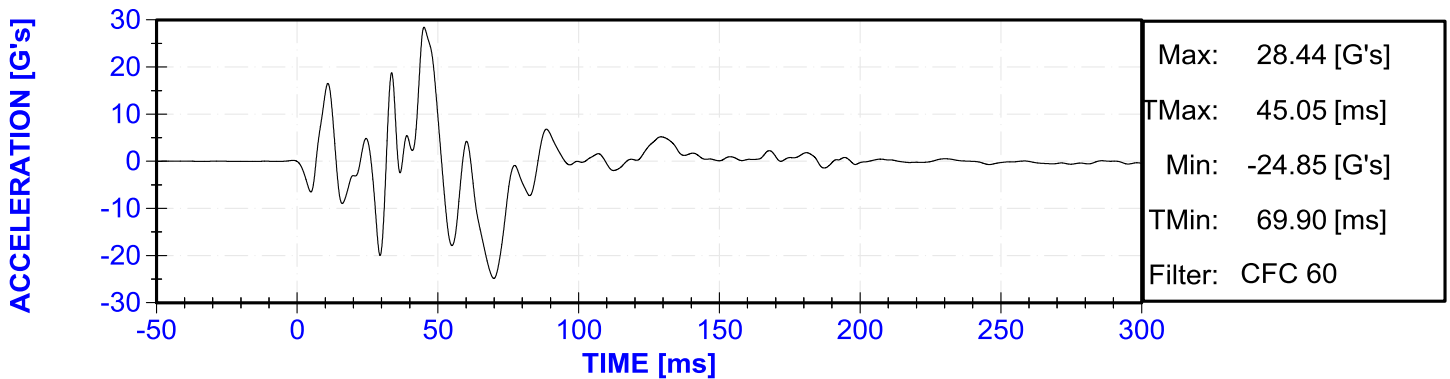
V2 Driver Floor Pan X Acceleration



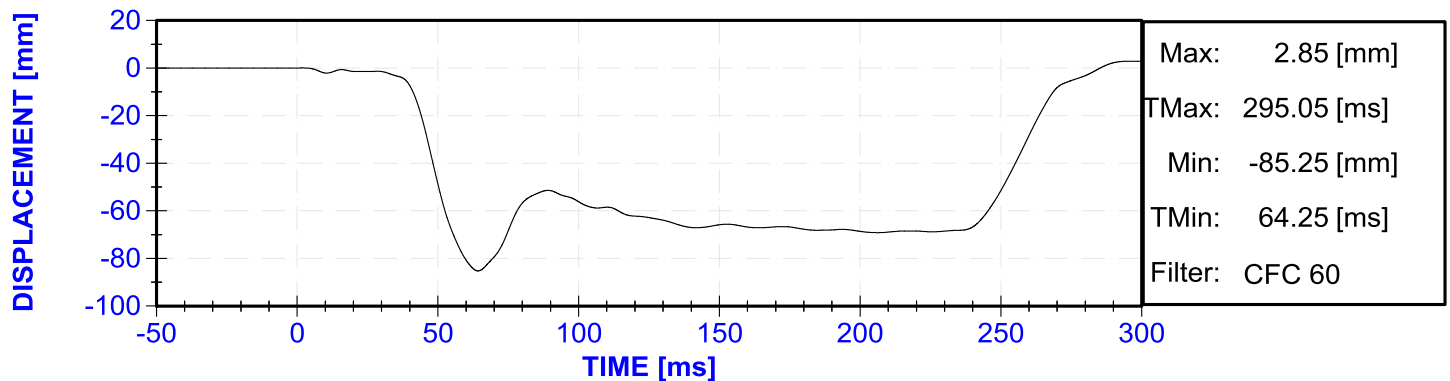
V2 Driver Floor Pan Y Acceleration



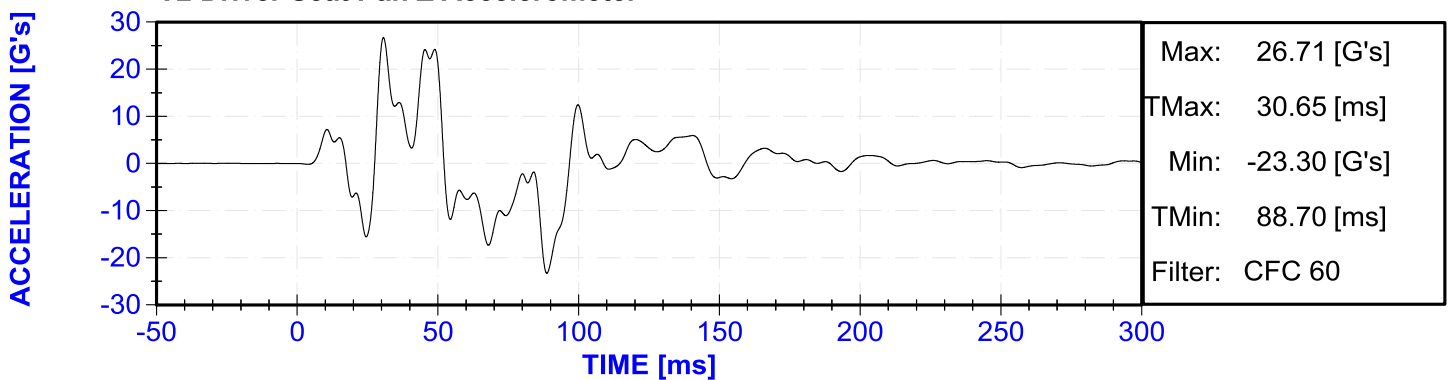
V2 Driver Floor Pan Z Acceleration



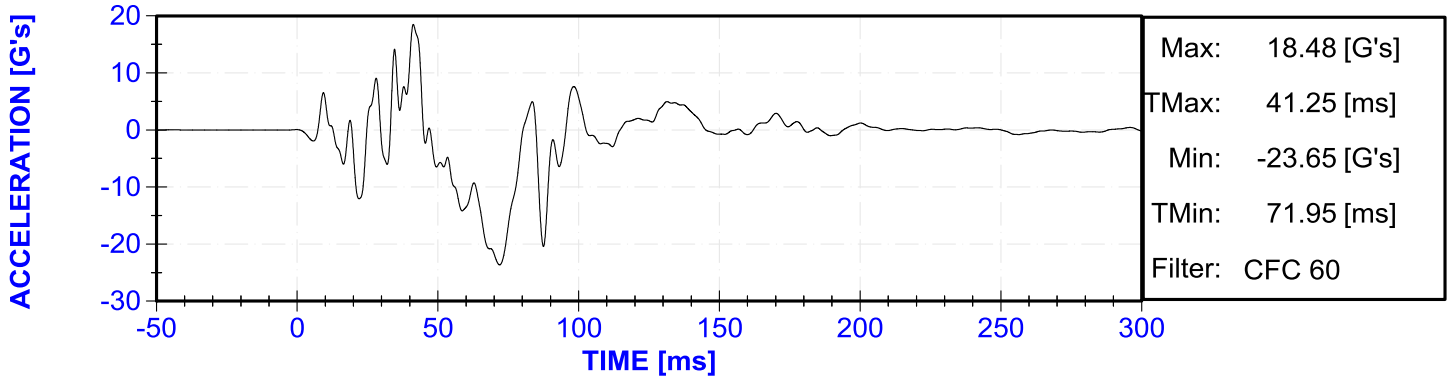
V2 Driver Floor Pan X Deflection



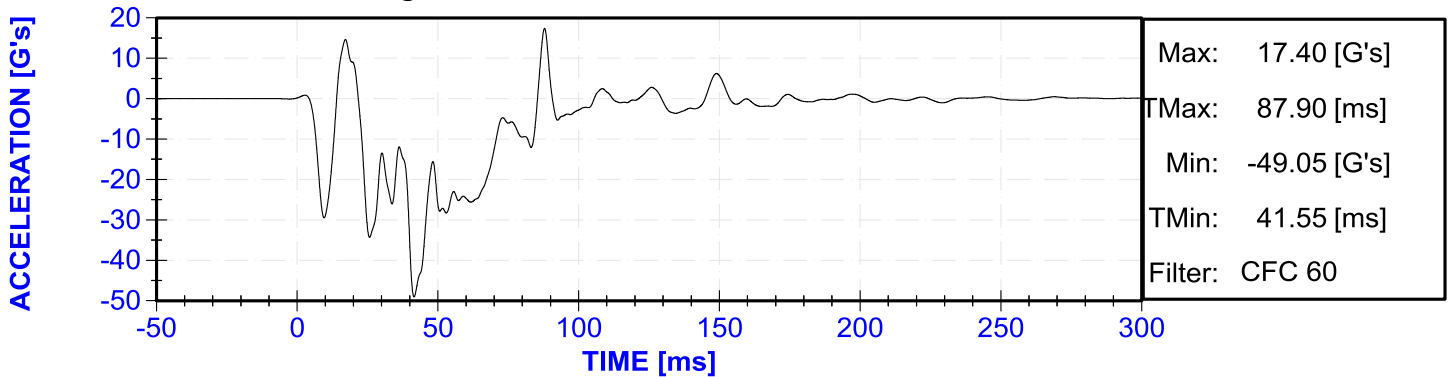
V2 Driver Seat Pan Z Accelerometer



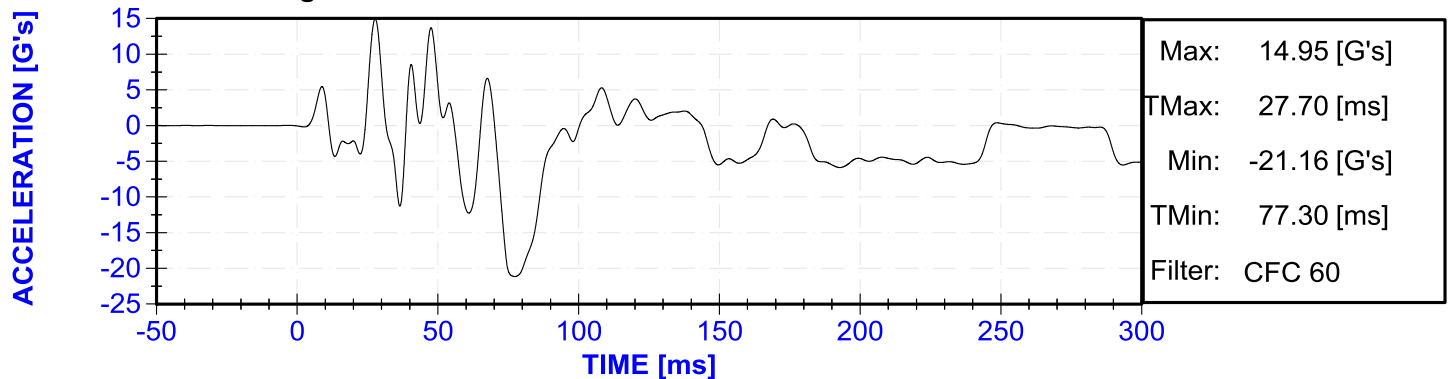
V2 Driver Seat Thigh Bar X Acceleration



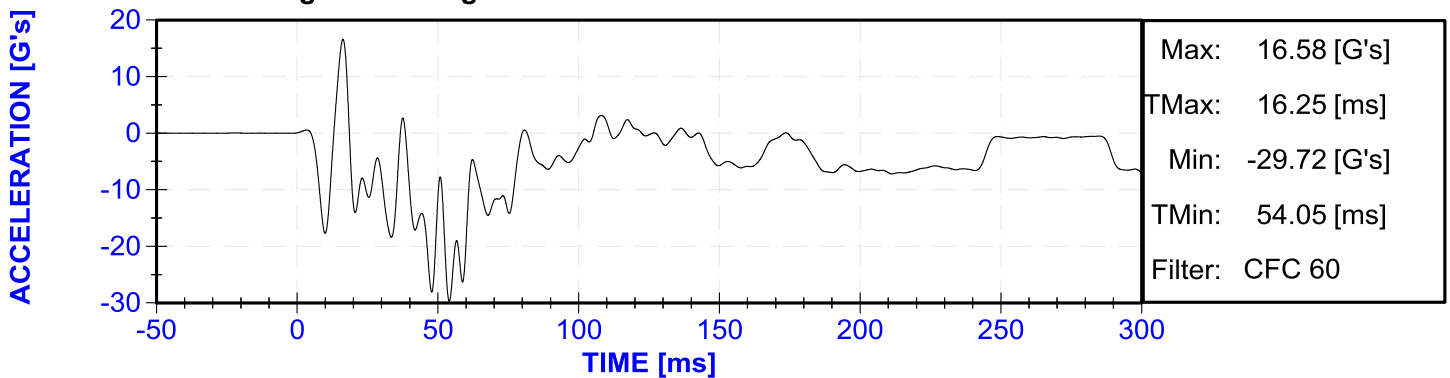
V2 Driver Seat Thigh Bar Z Acceleration



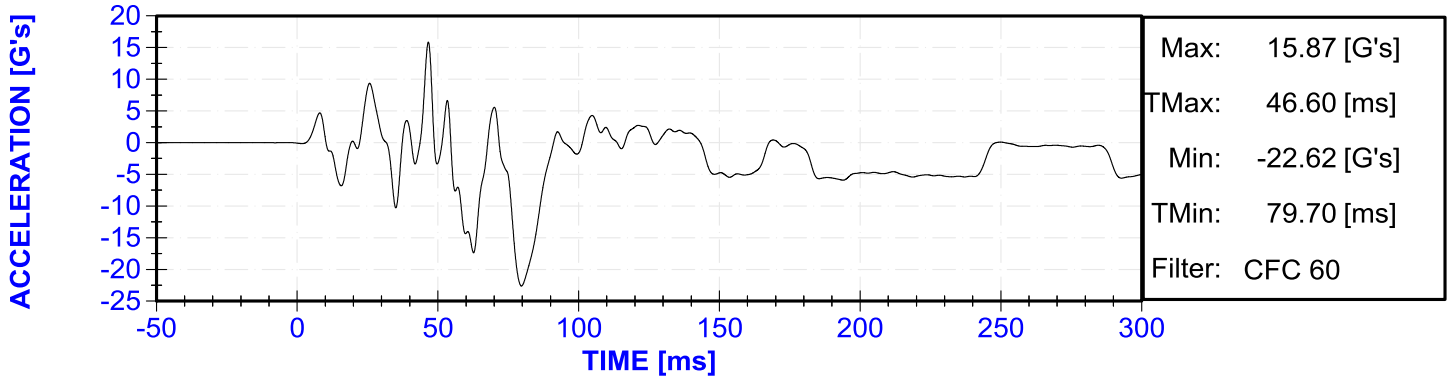
V2 Passenger Seat Pan Z Accelerometer



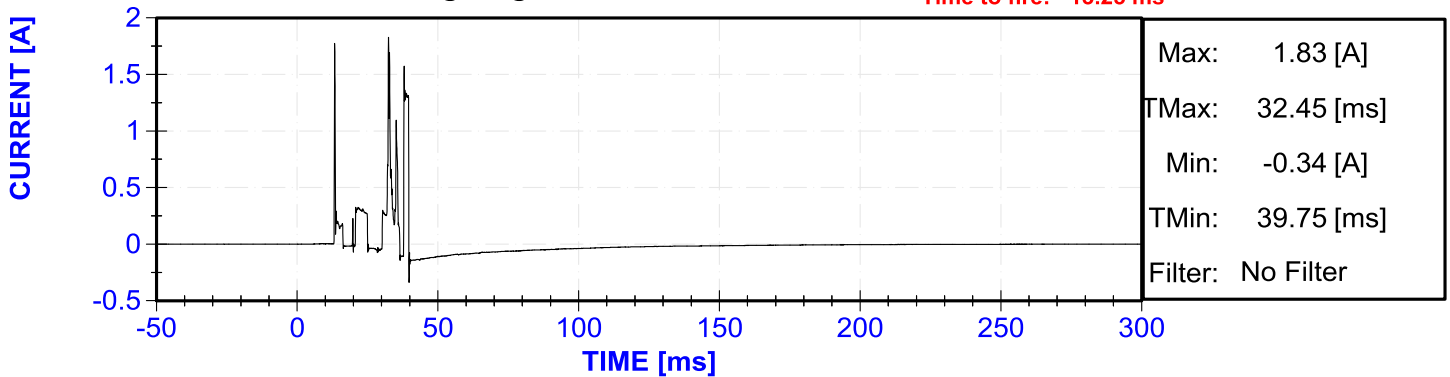
V2 Passenger Seat Thigh Bar X Accelerometer



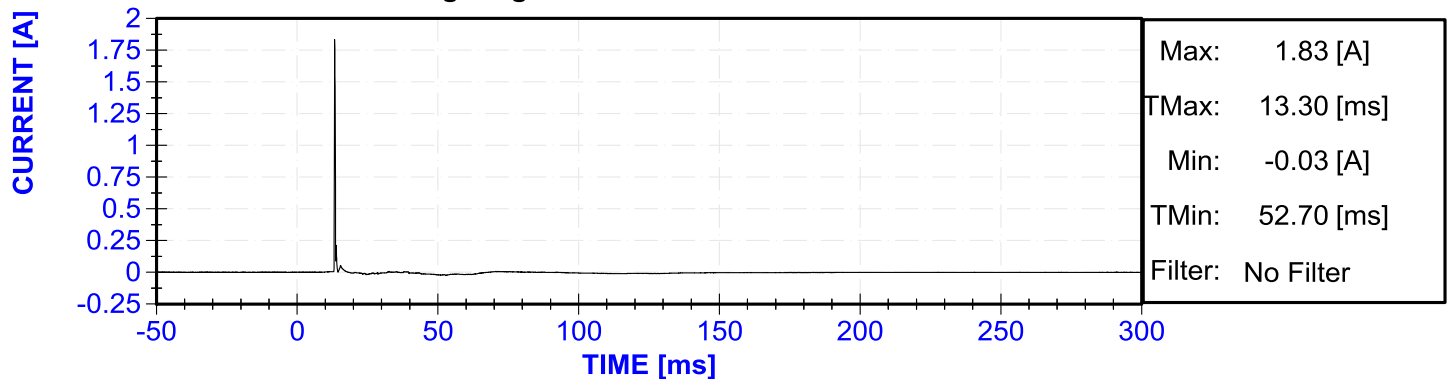
V2 Passenger Seat Thigh Bar Z Accelerometer



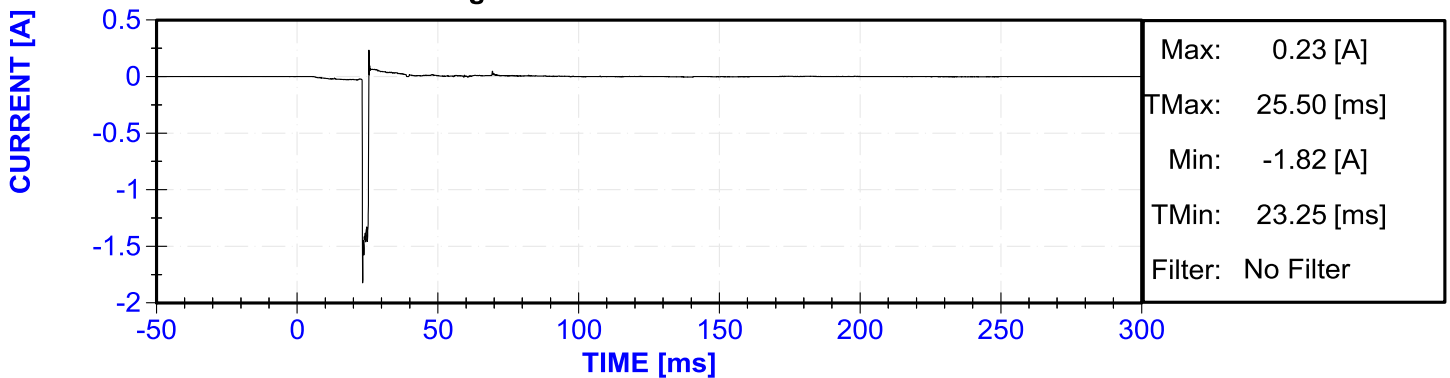
V2 Driver Front Airbag Stage 1 Monitor

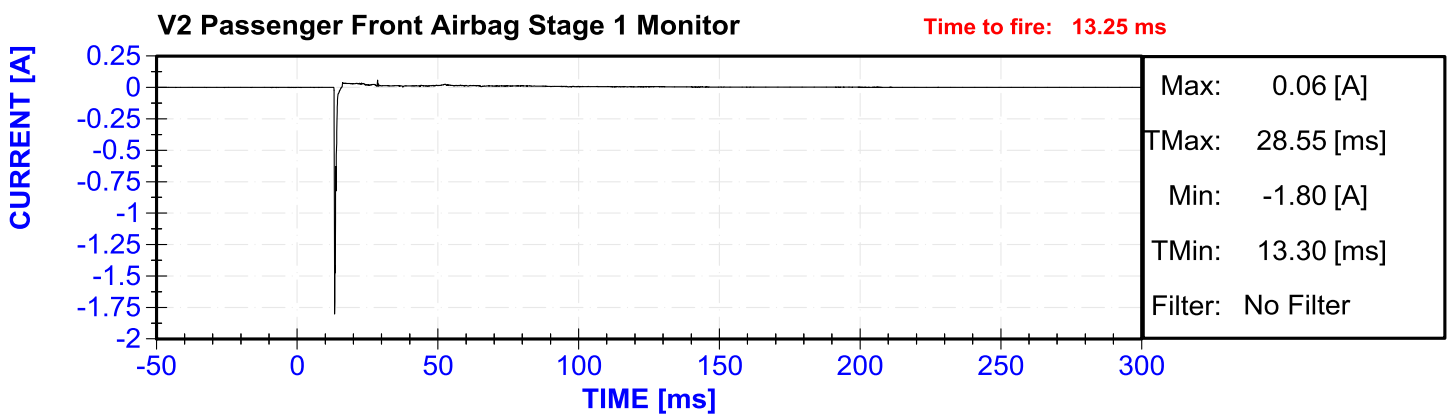
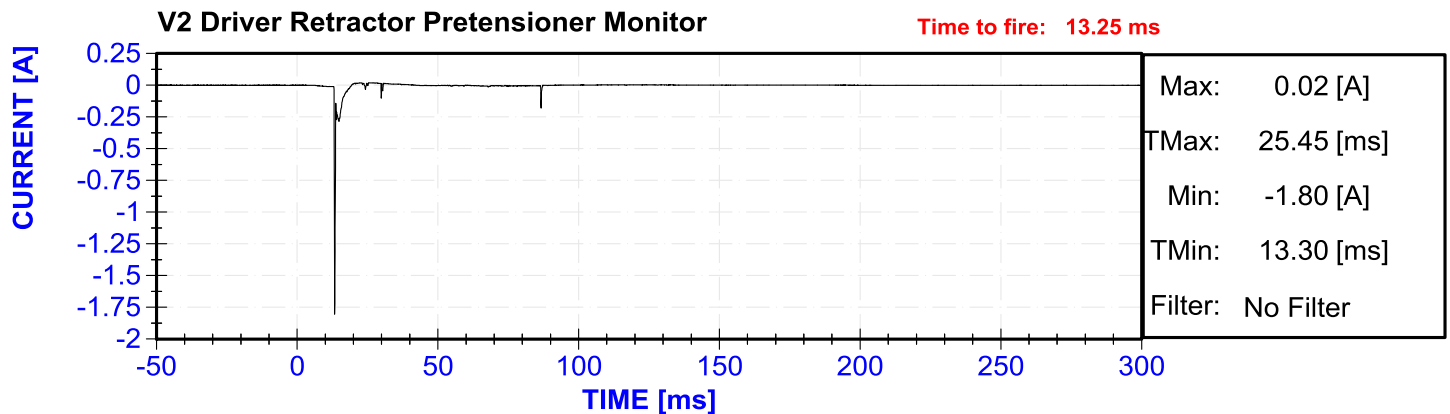
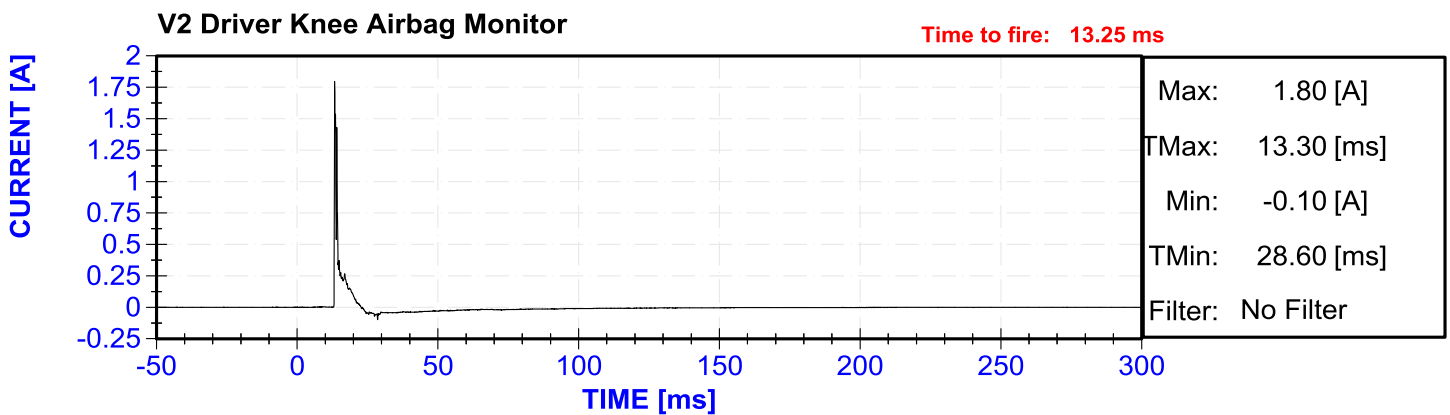
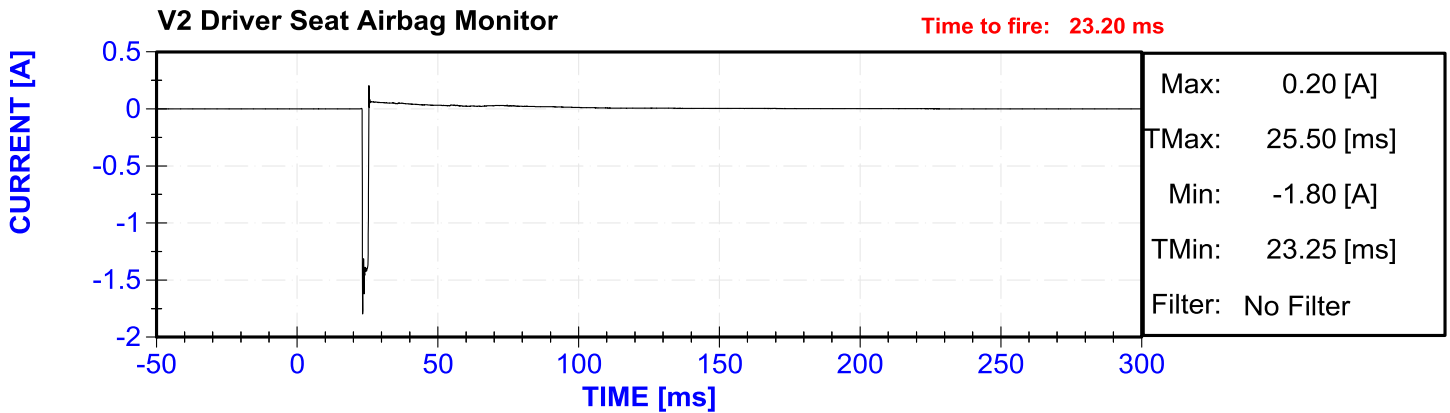


V2 Driver Front Airbag Stage 2 Monitor



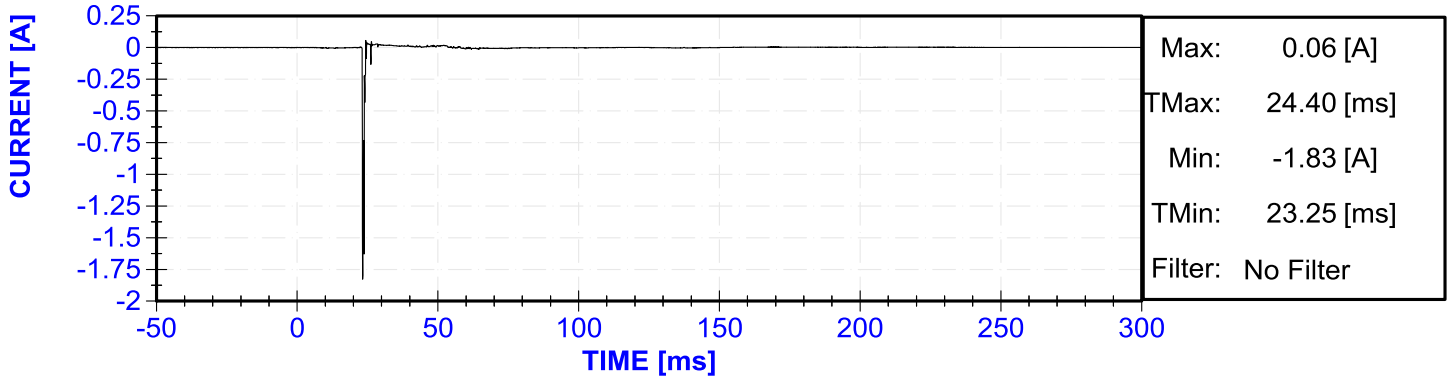
V2 Driver Curtain Airbag Monitor





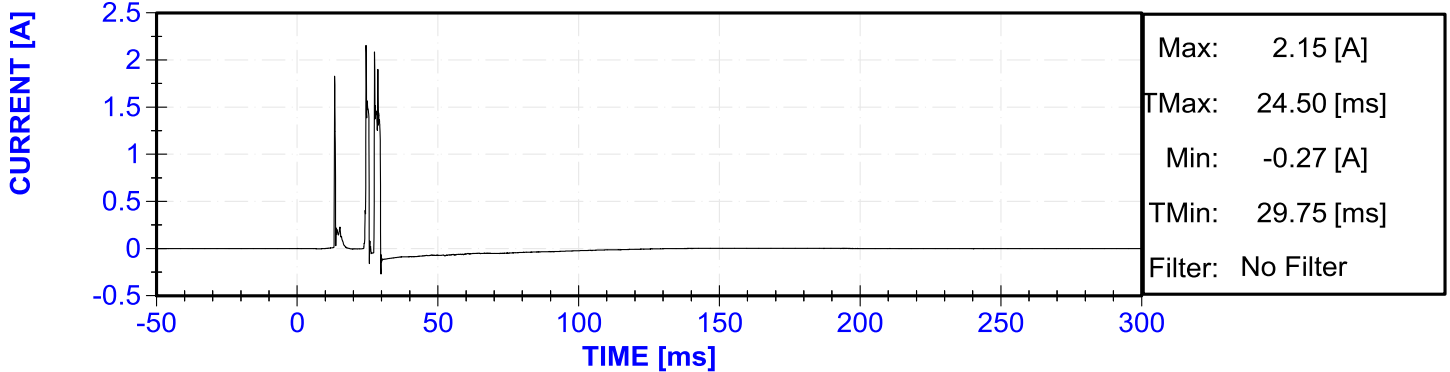
V2 Passenger Front Airbag Stage 2 Monitor

Time to fire: 23.20 ms

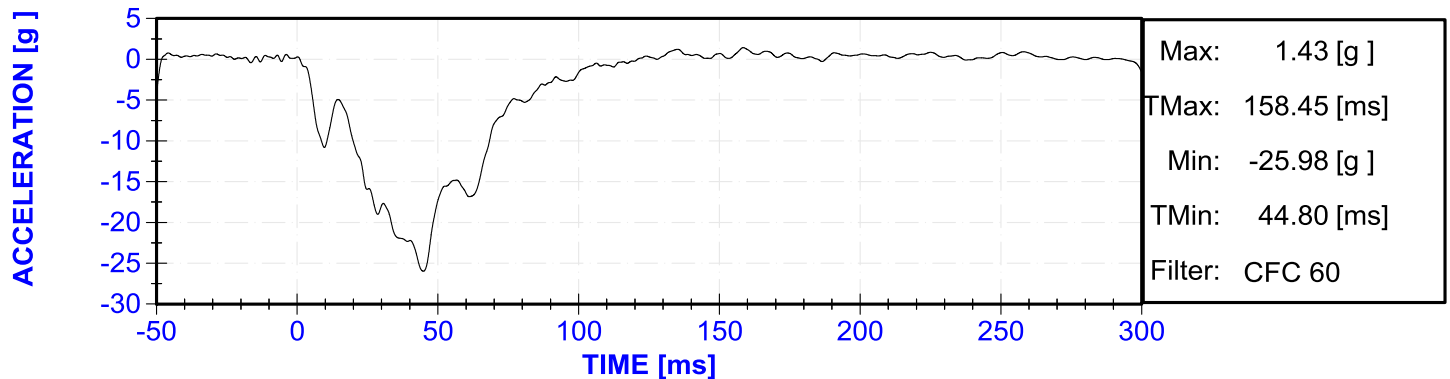


V2 Passenger Retractor Pretensioner Monitor

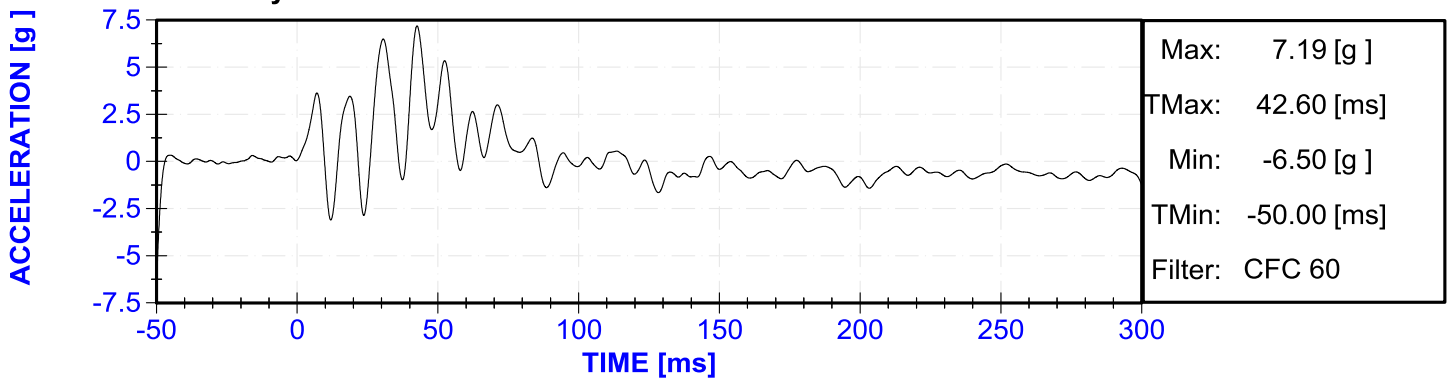
Time to fire: 13.25 ms

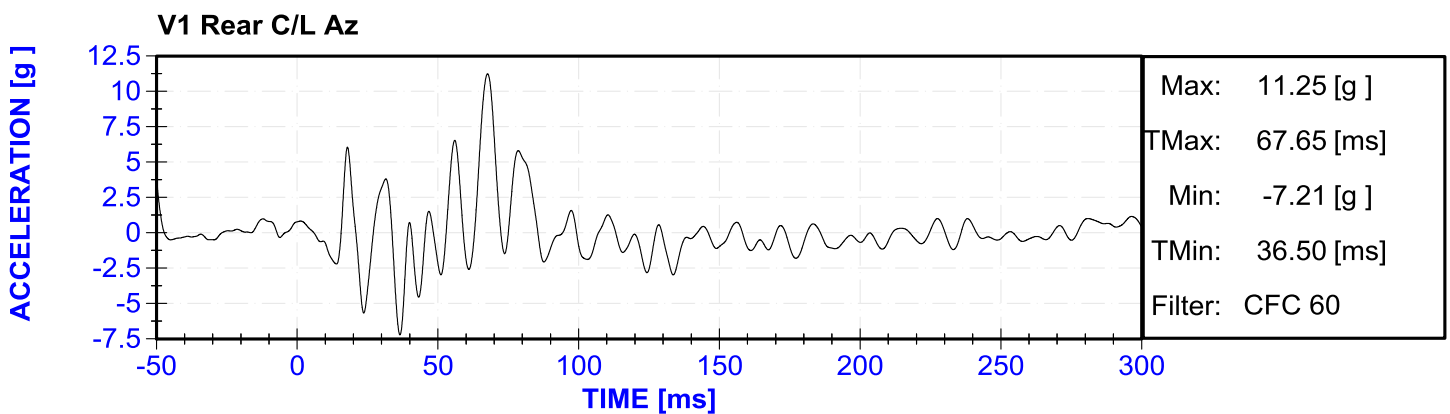
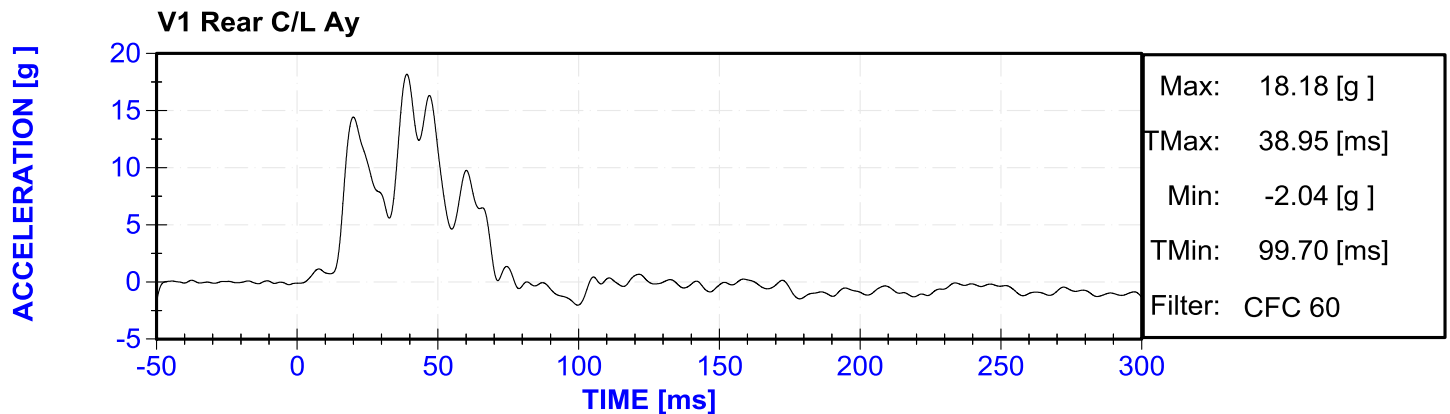
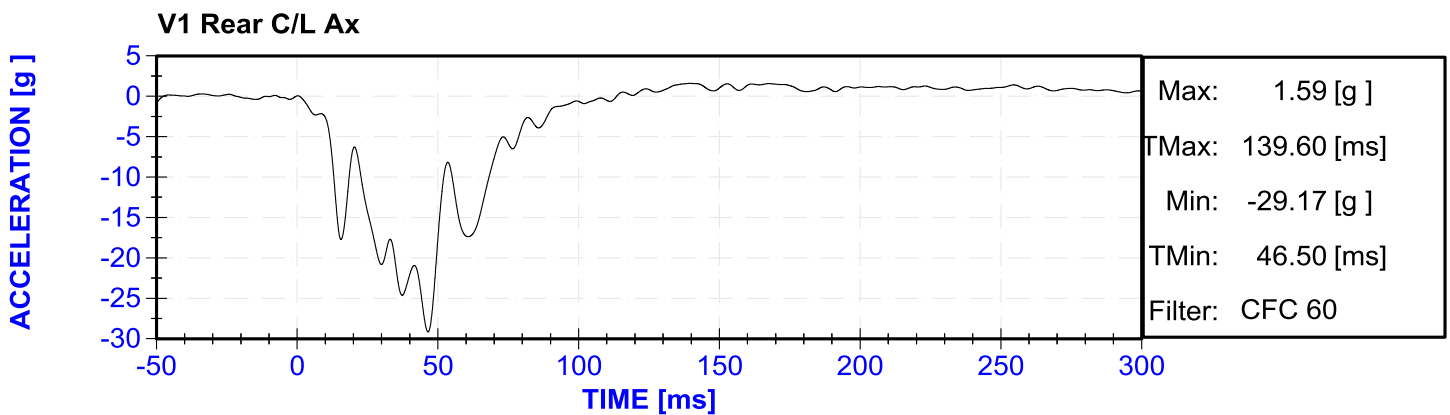
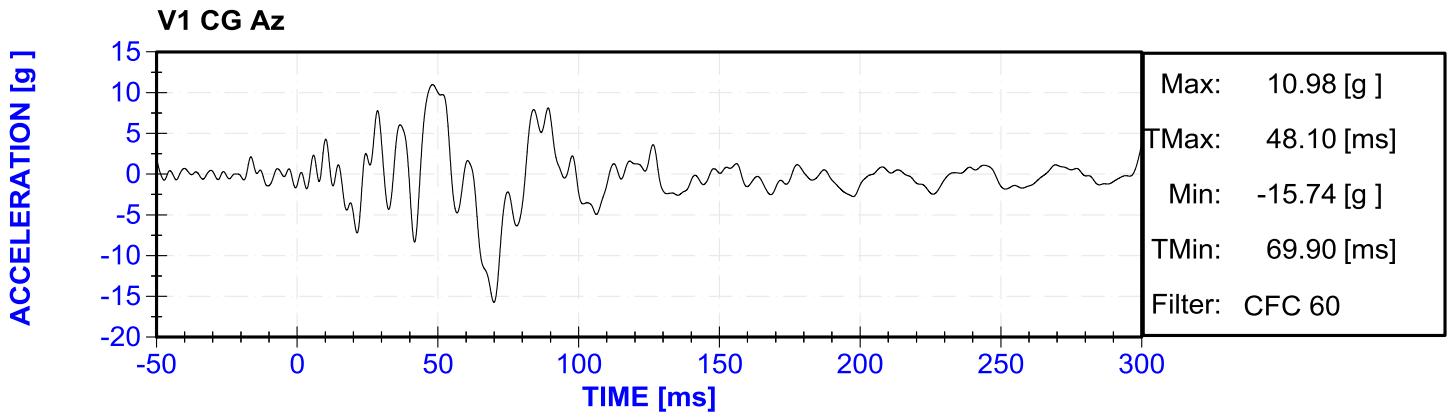


V1 CG Ax

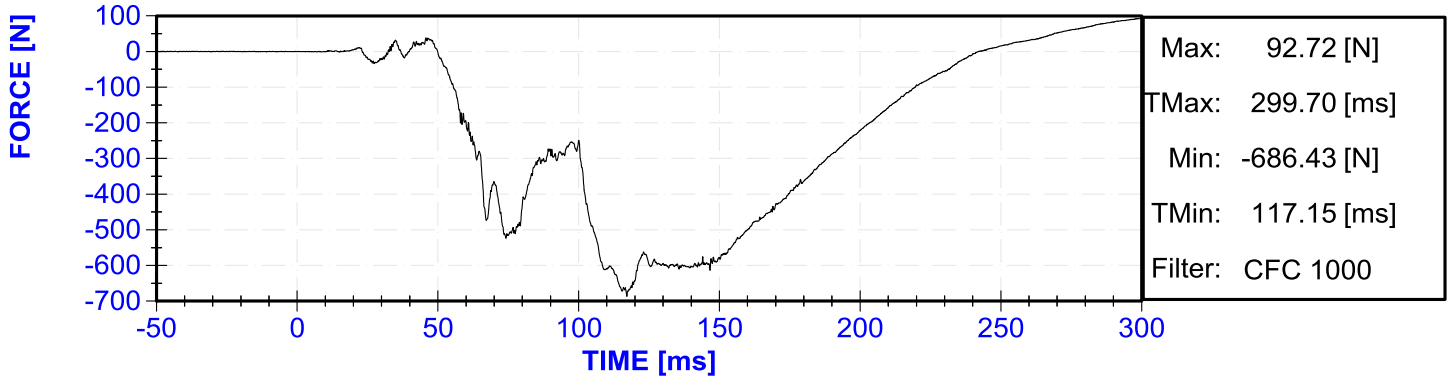


V1 CG Ay

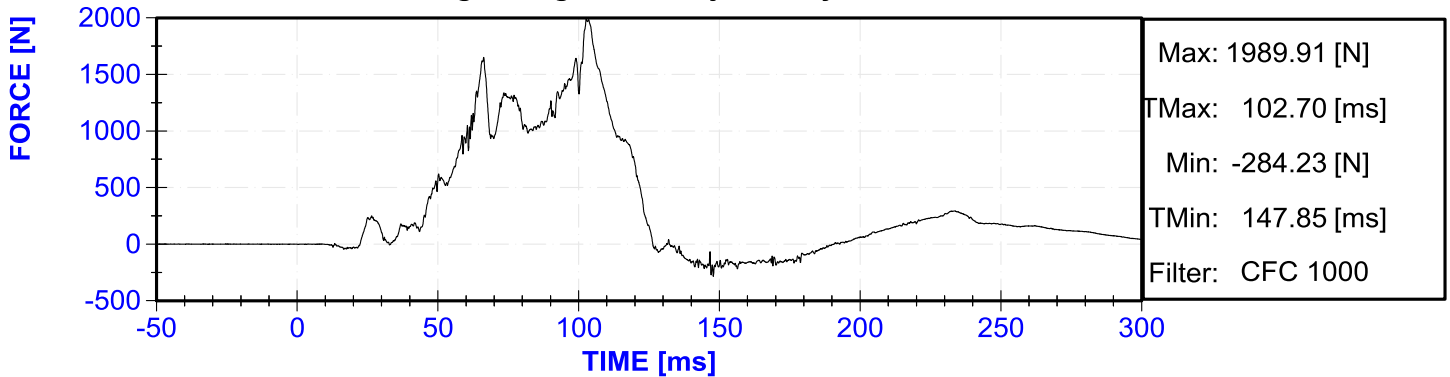




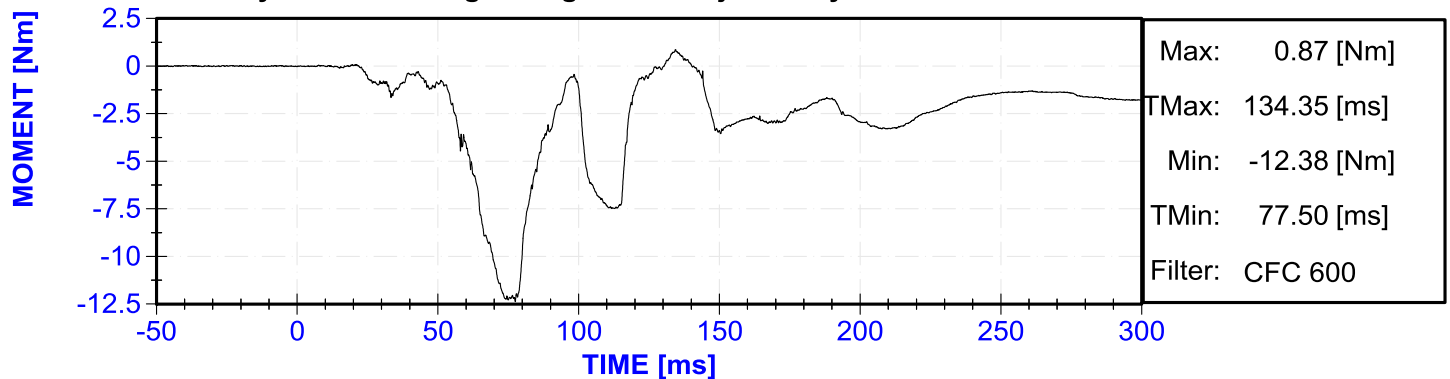
V2P1 Fx on head acting through the O.C. joint only



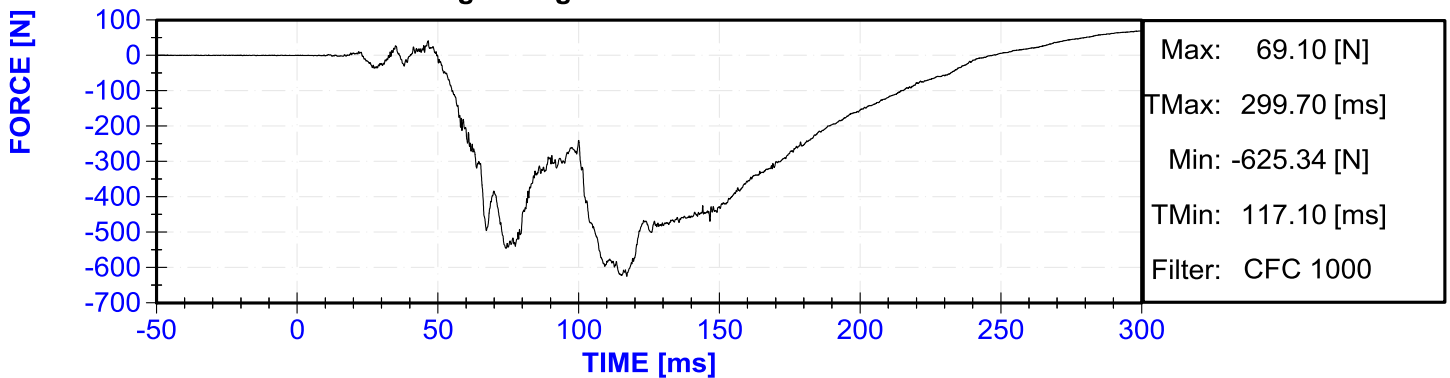
V2P1 Fz on head acting through the O.C. joint only

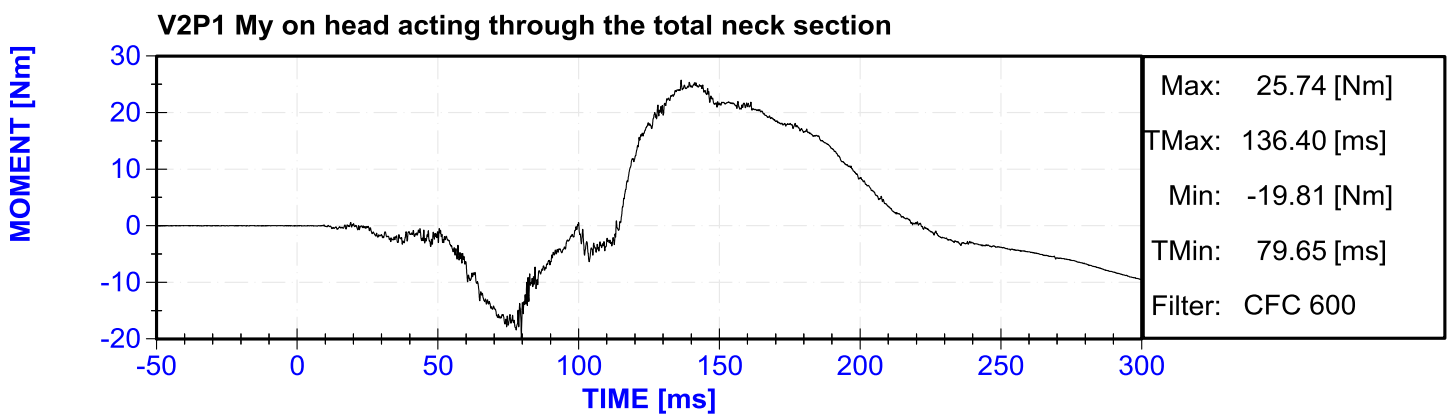
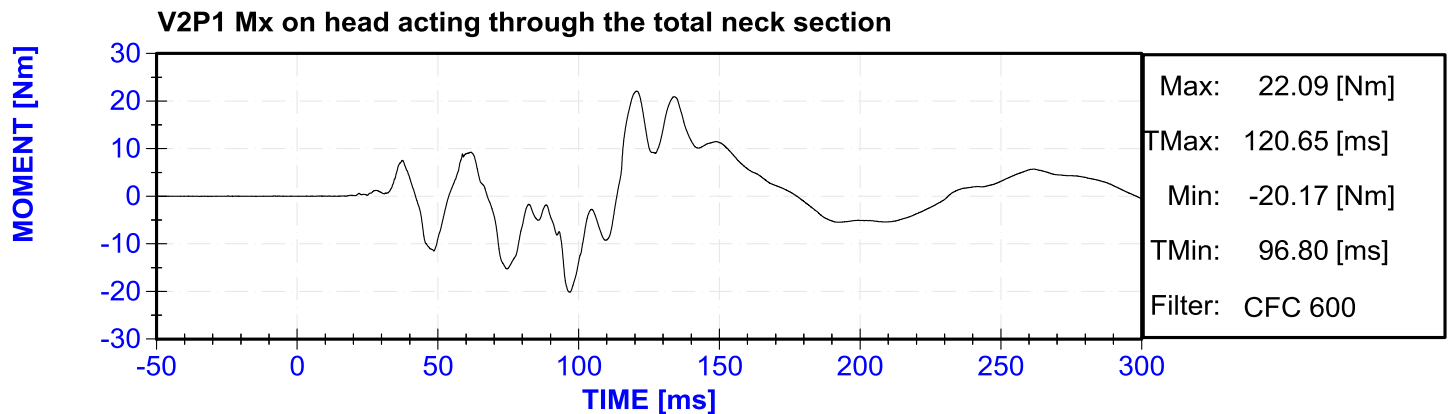
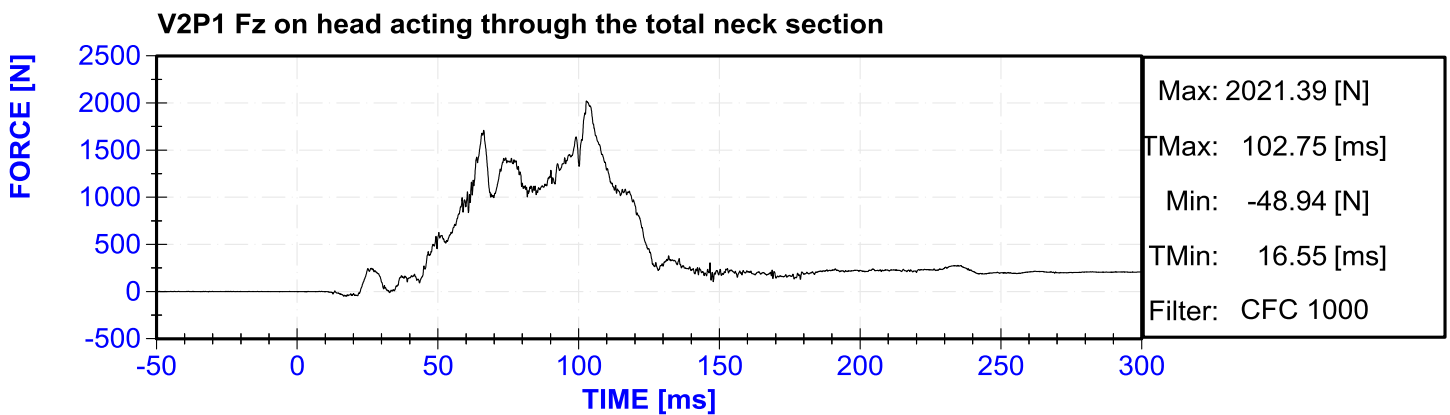
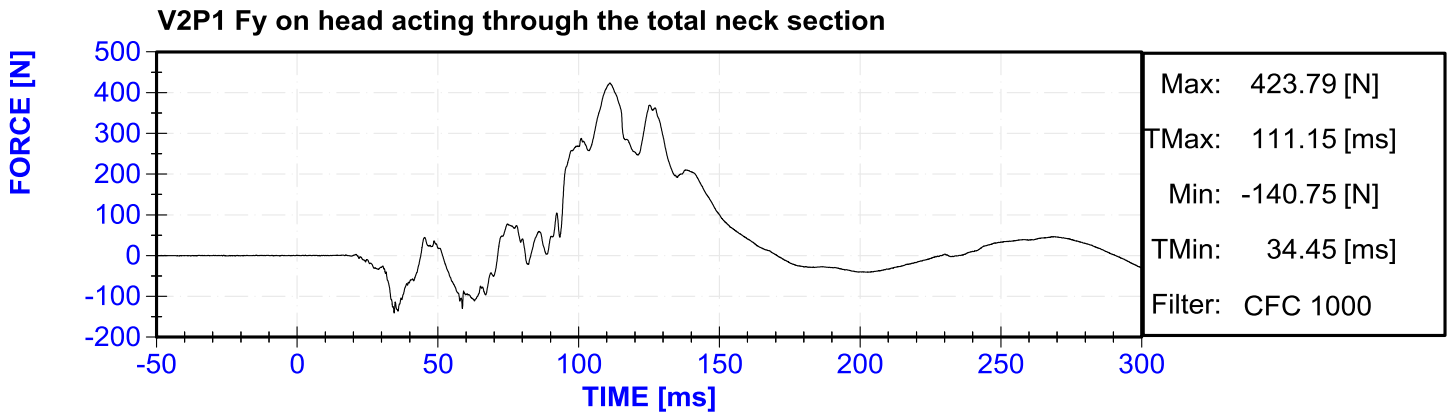


V2P1 My on head acting through the O.C. joint only

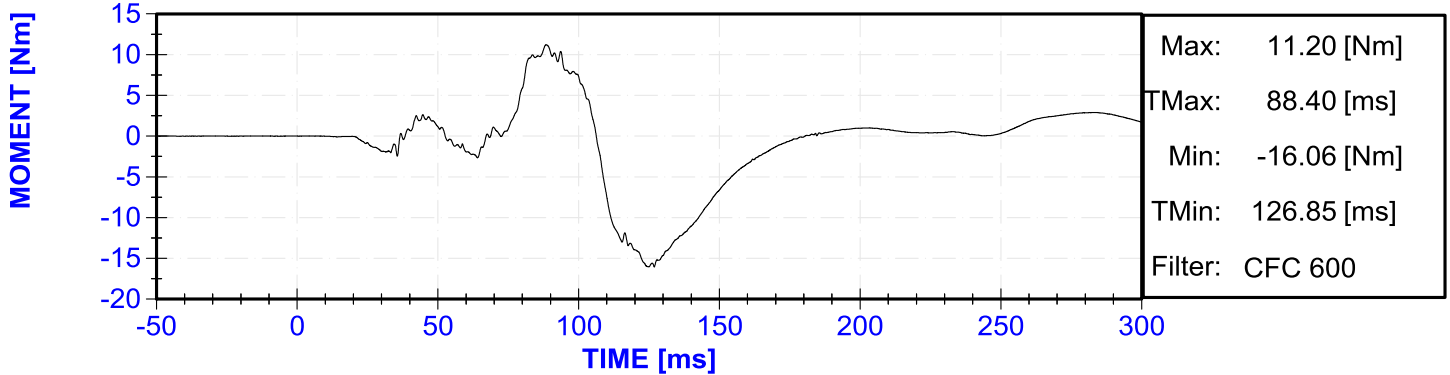


V2P1 Fx on head acting through the total neck section

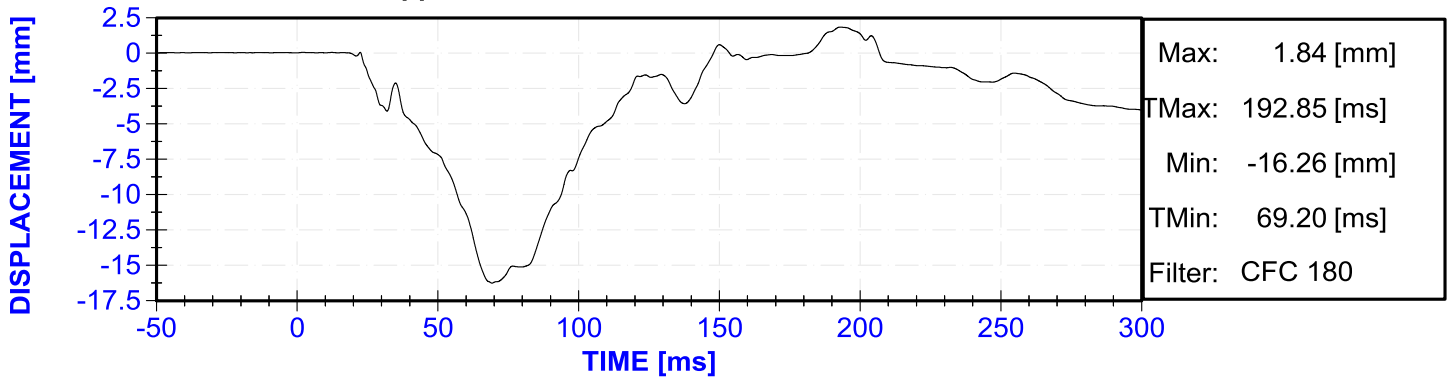




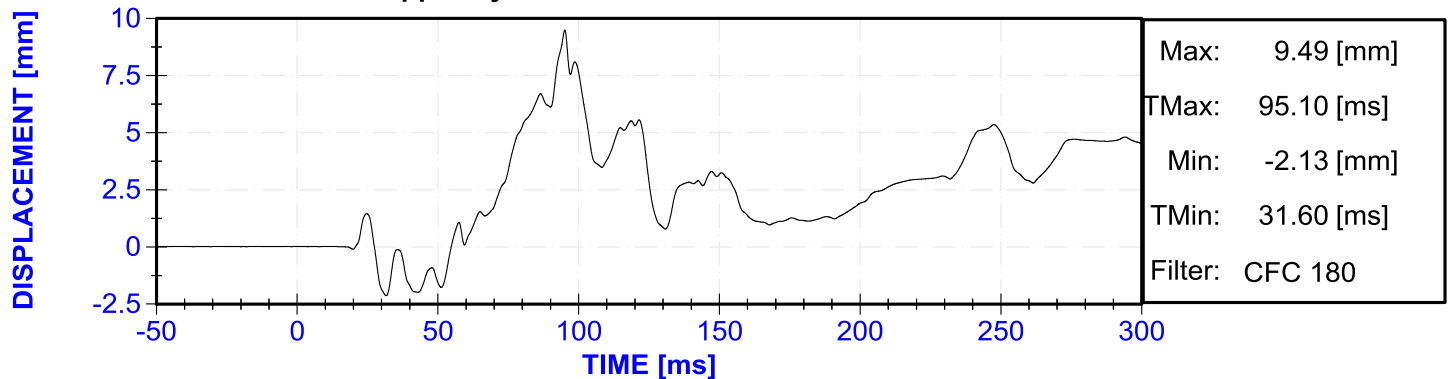
V2P1 Mz on head acting through the total neck section



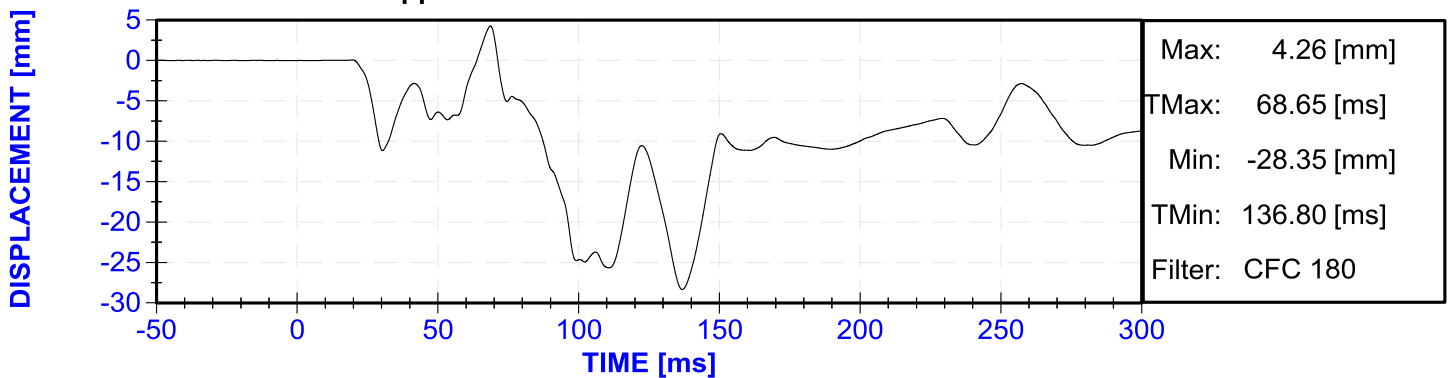
V2P1 Chest Left Upper Dx

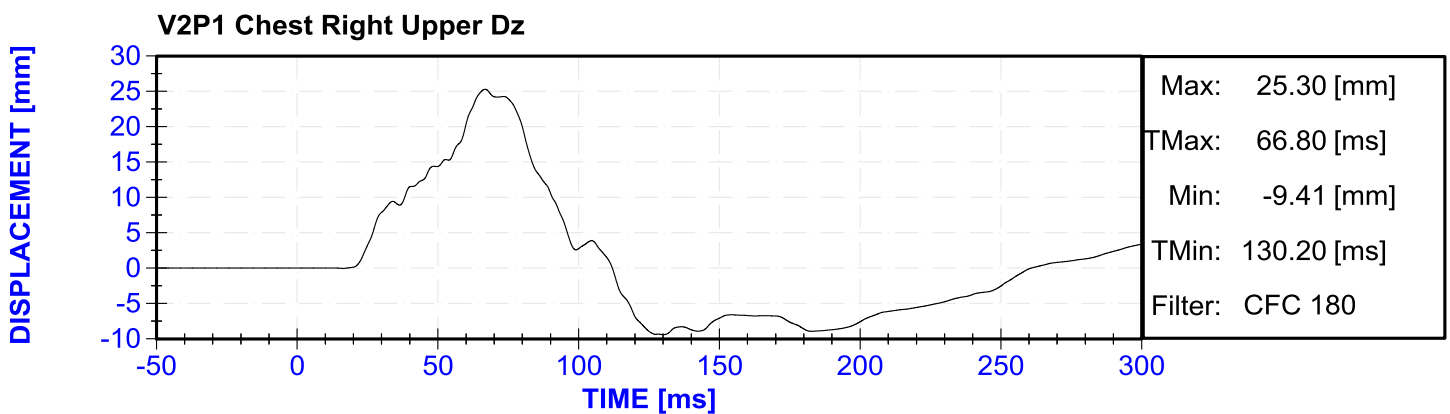
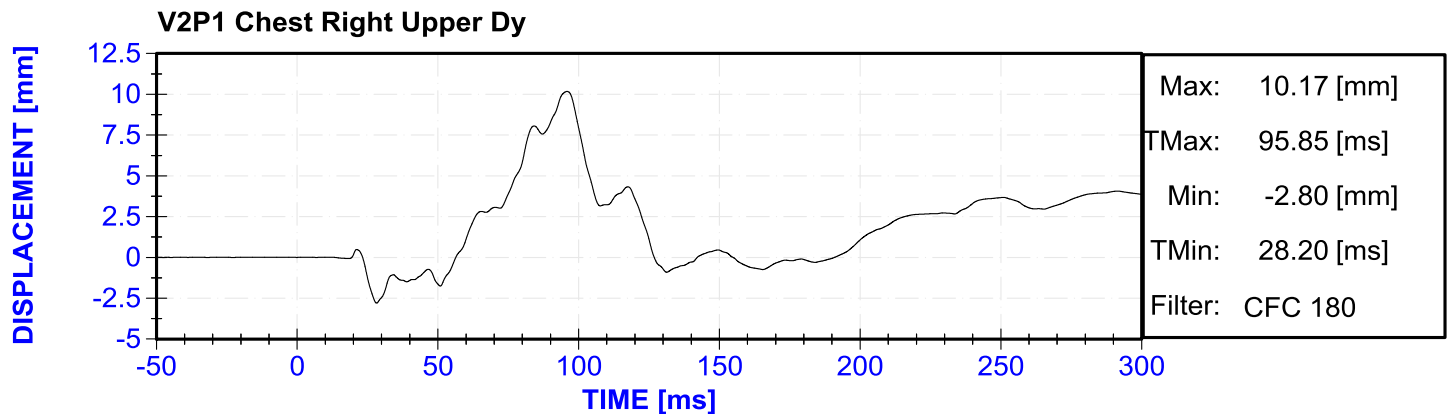
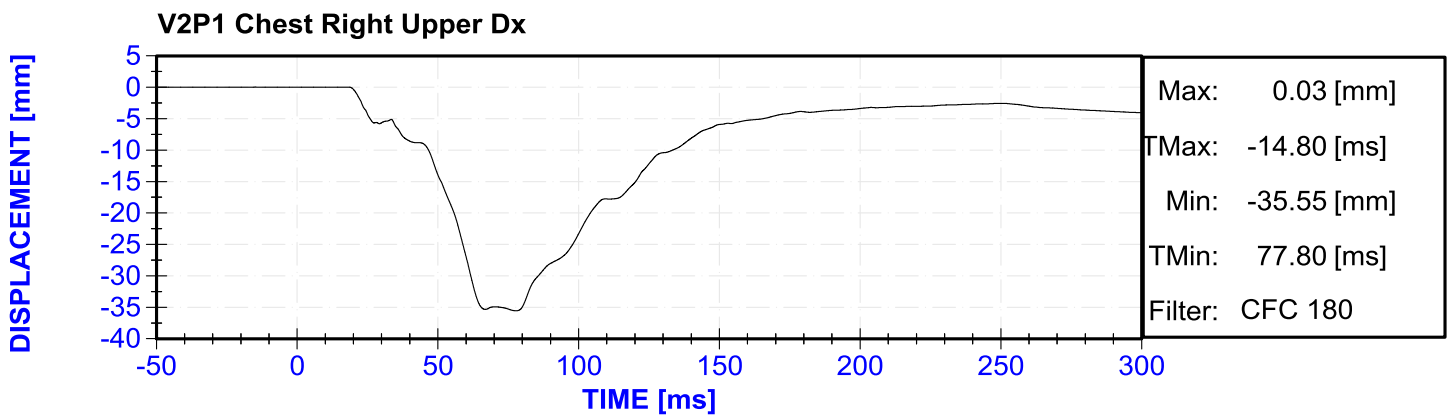
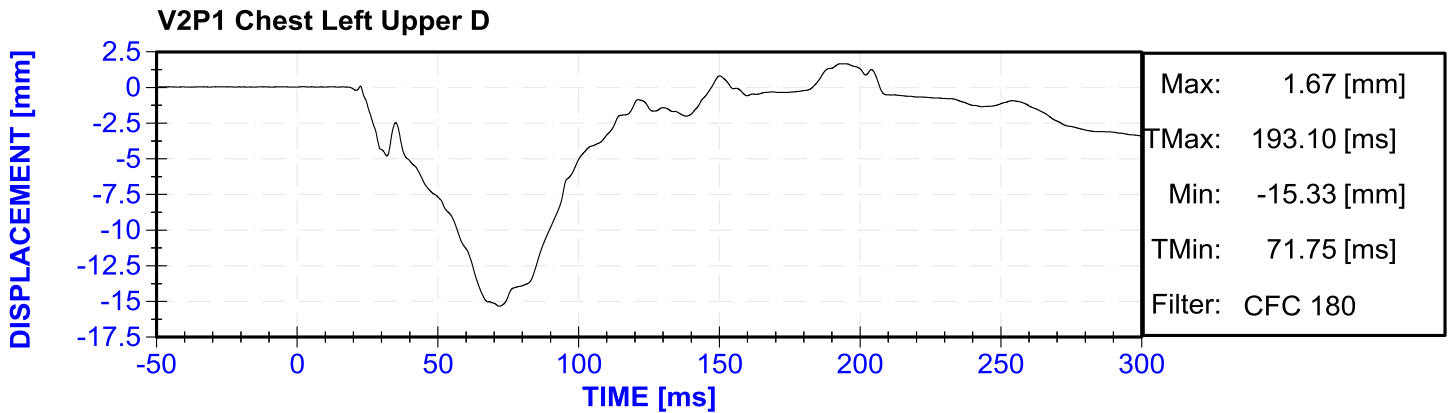


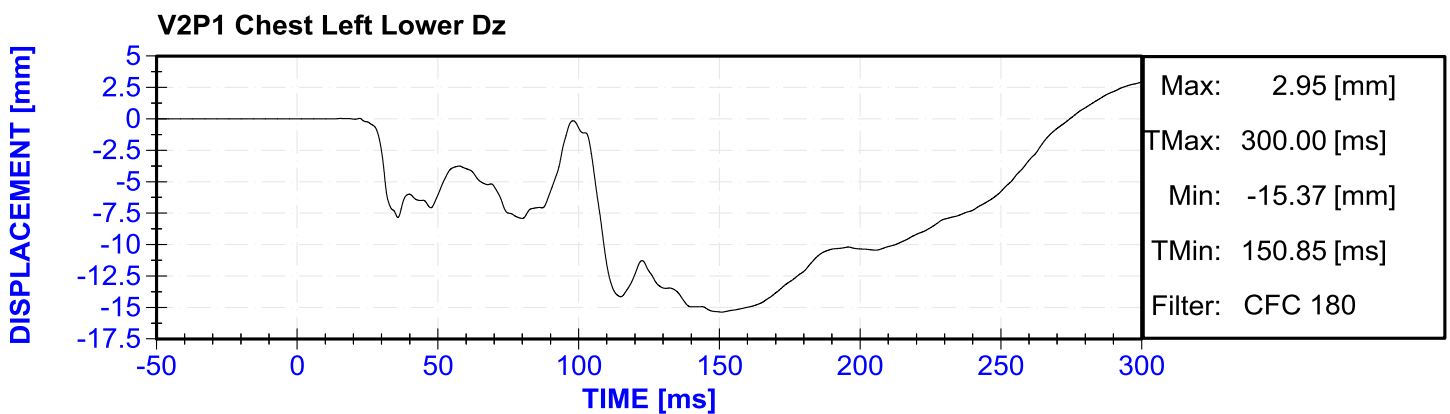
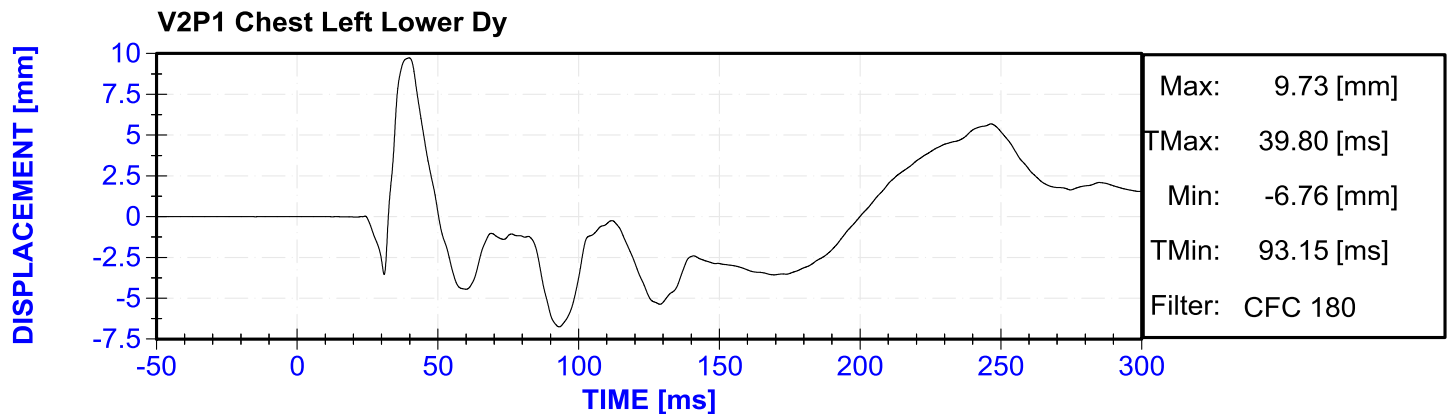
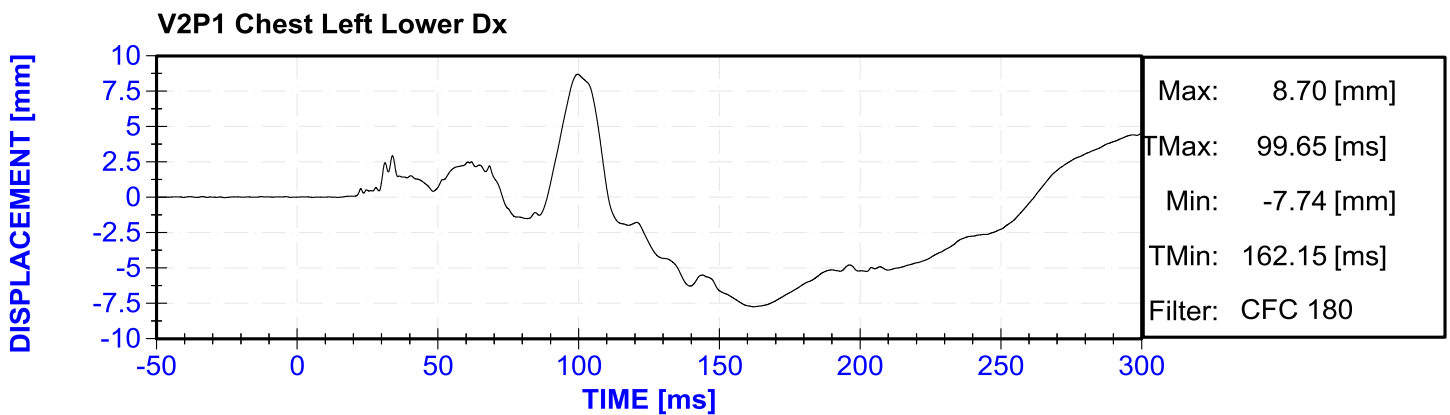
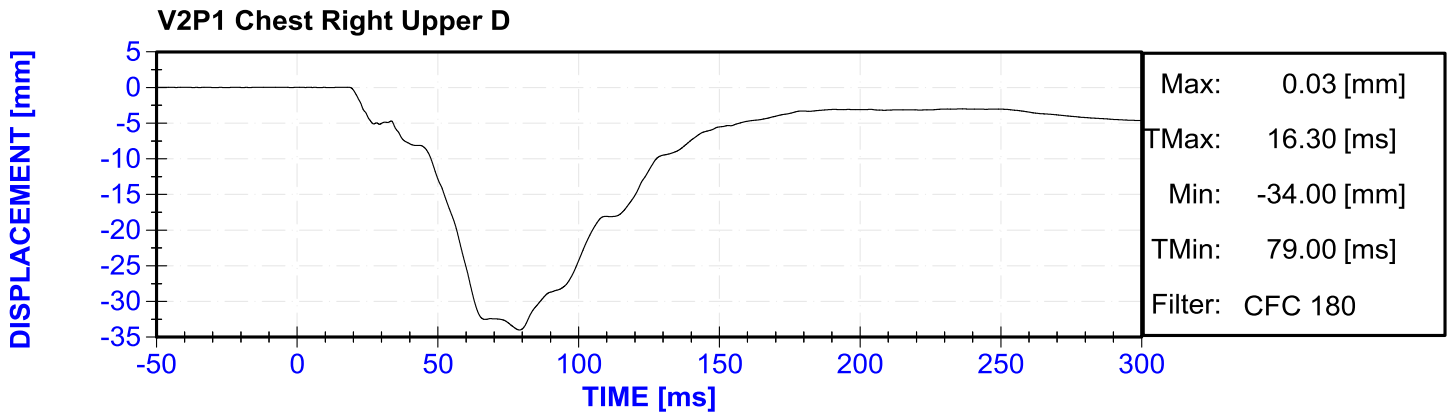
V2P1 Chest Left Upper Dy

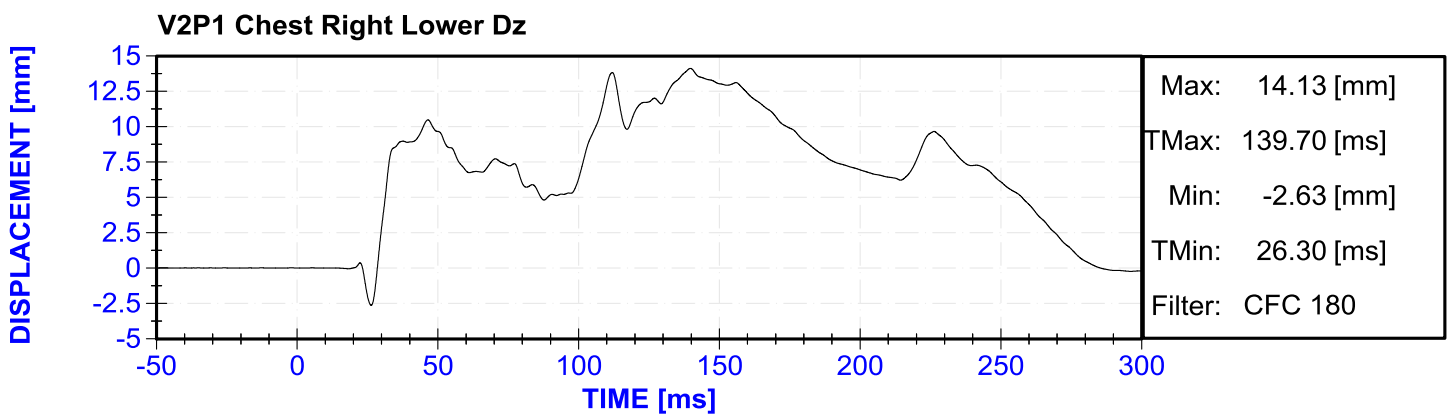
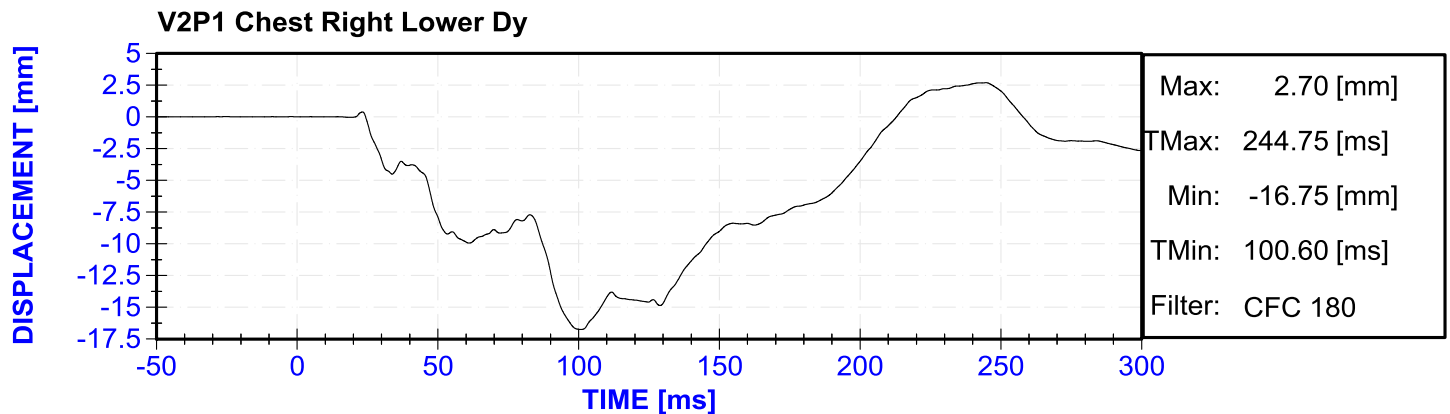
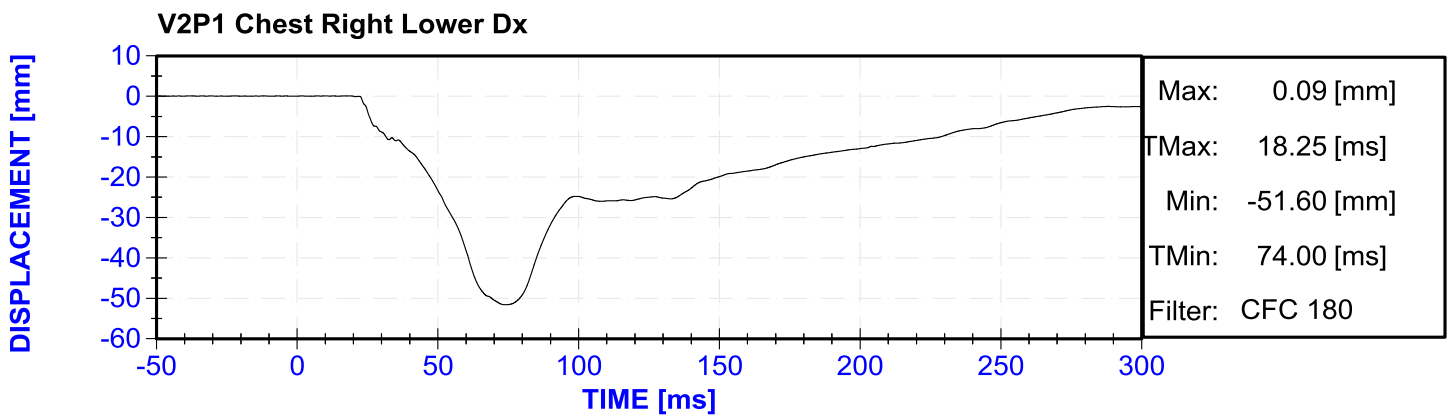
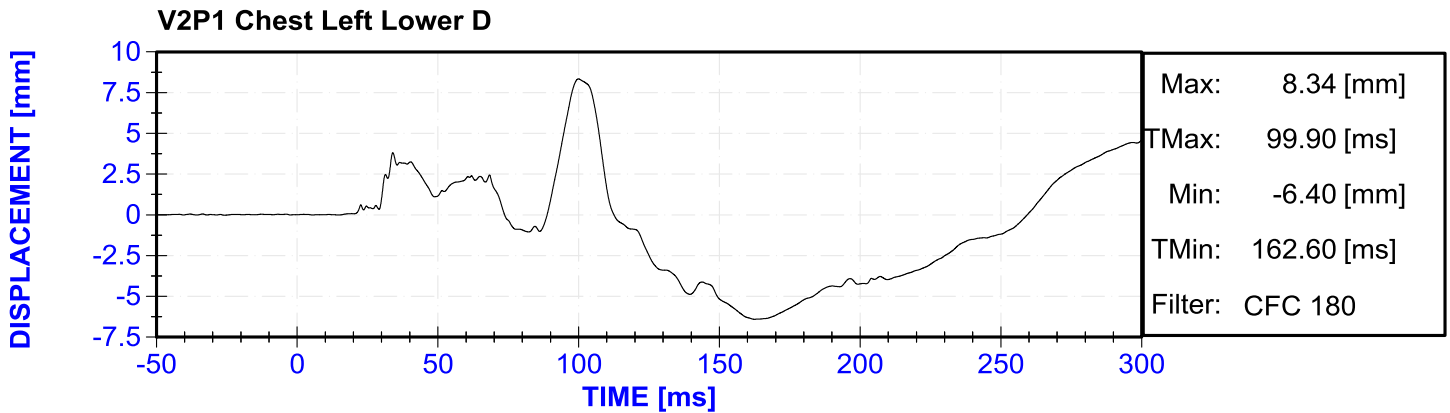


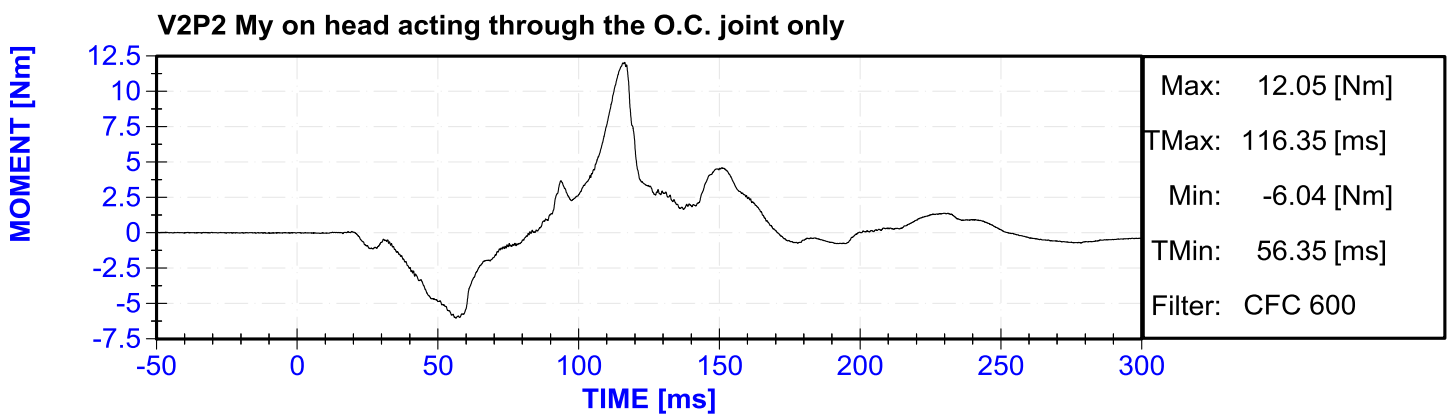
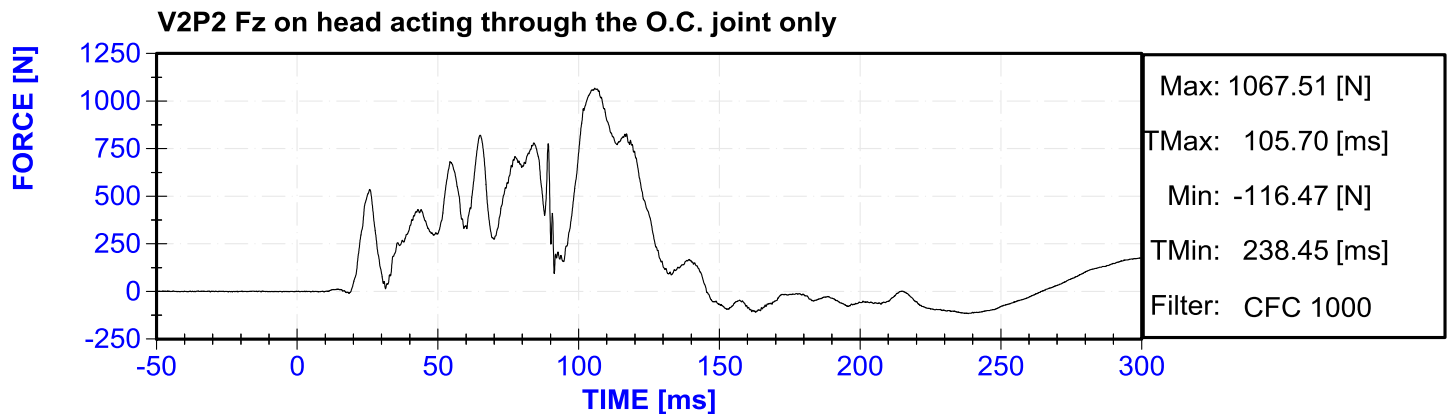
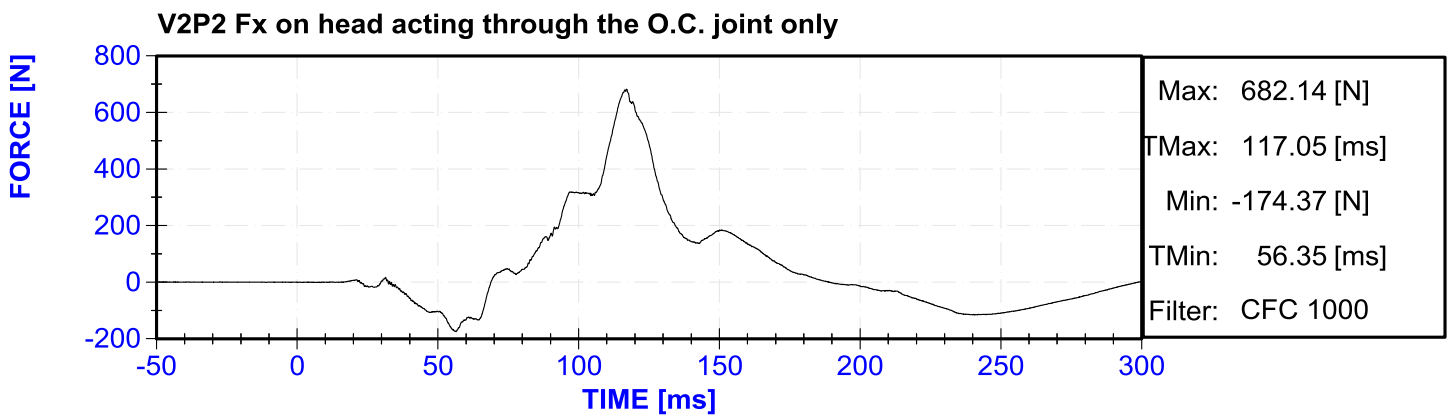
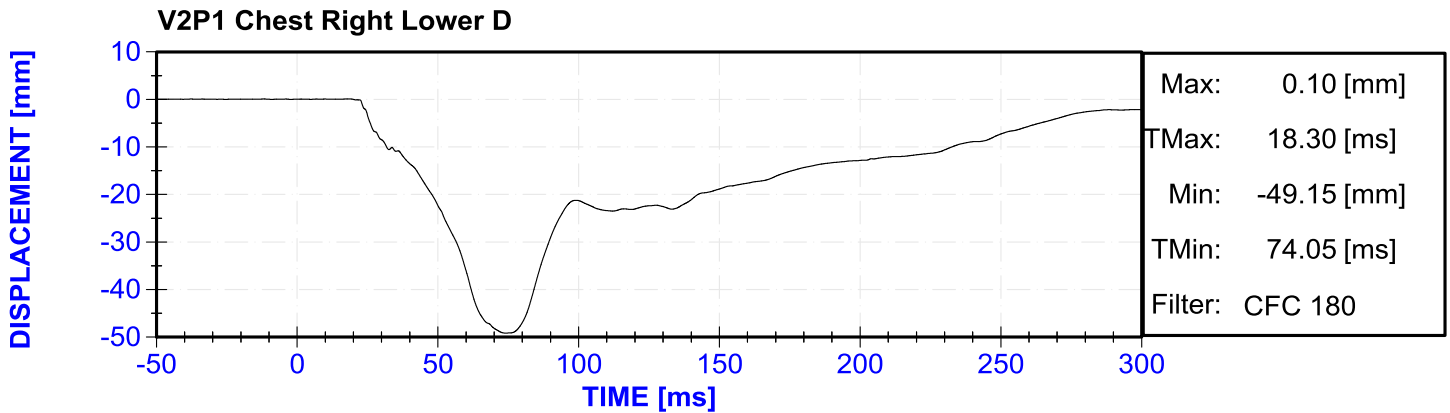
V2P1 Chest Left Upper Dz



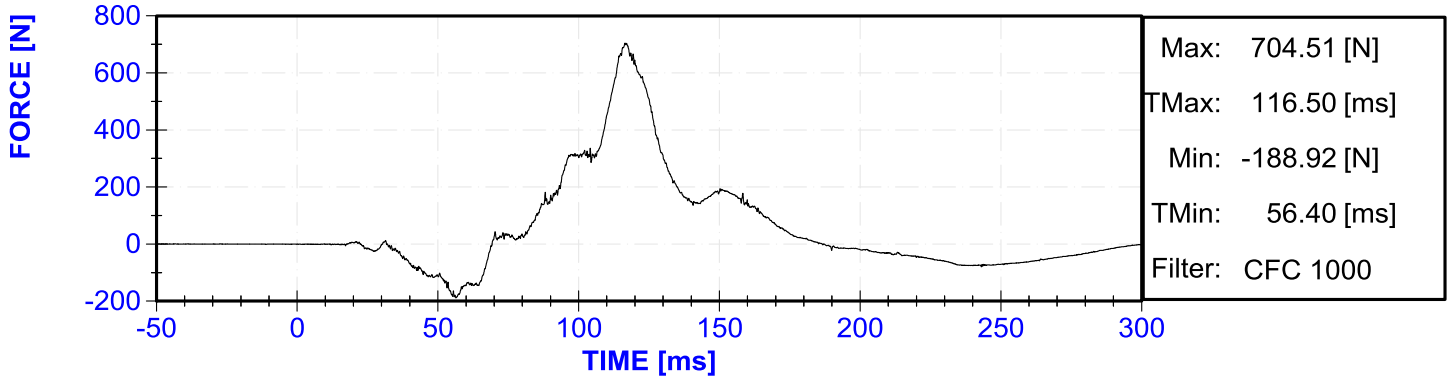




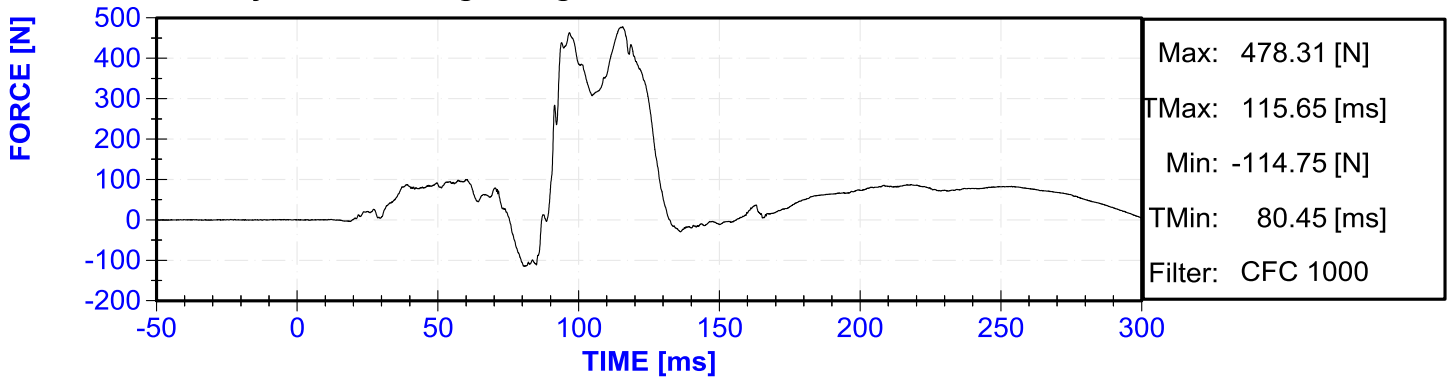




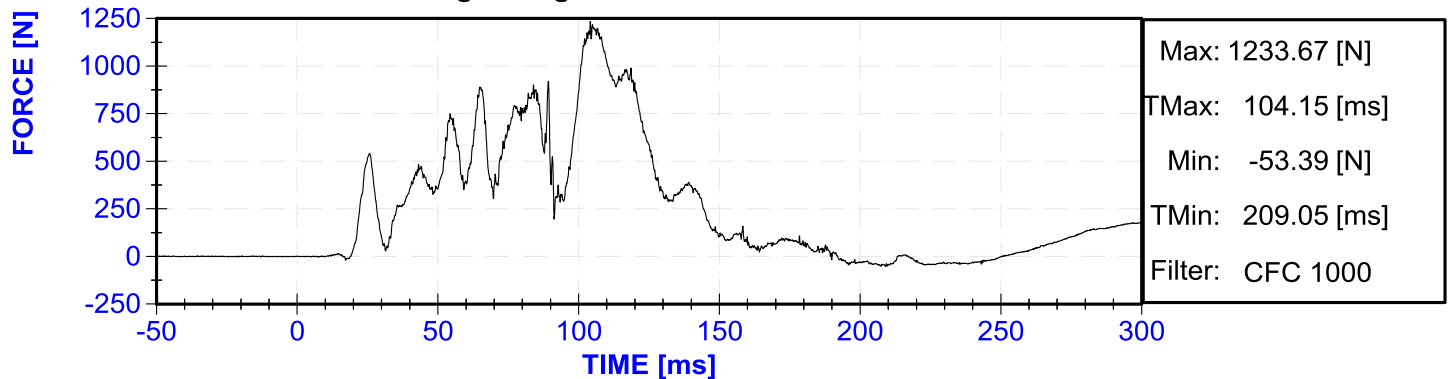
V2P2 Fx on head acting through the total neck section



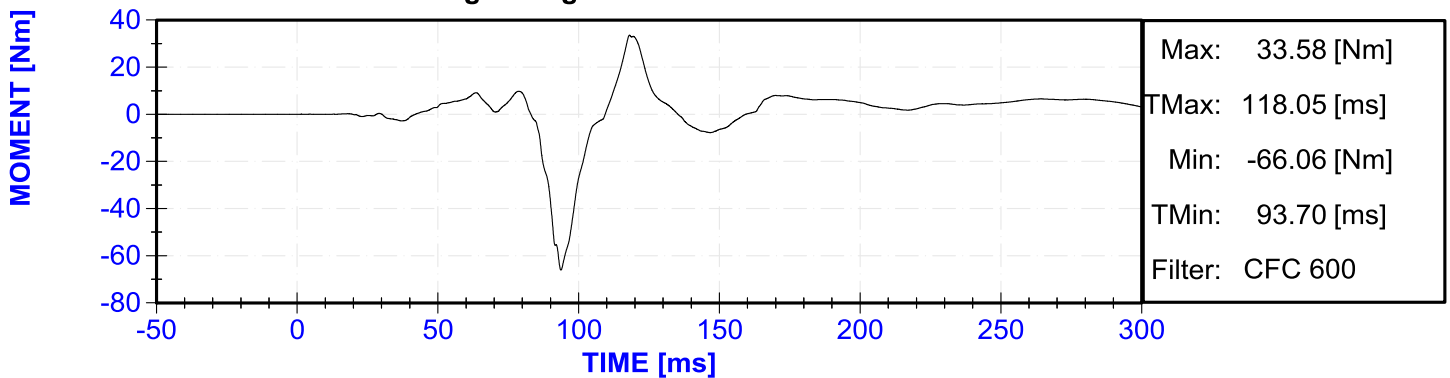
V2P2 Fy on head acting through the total neck section



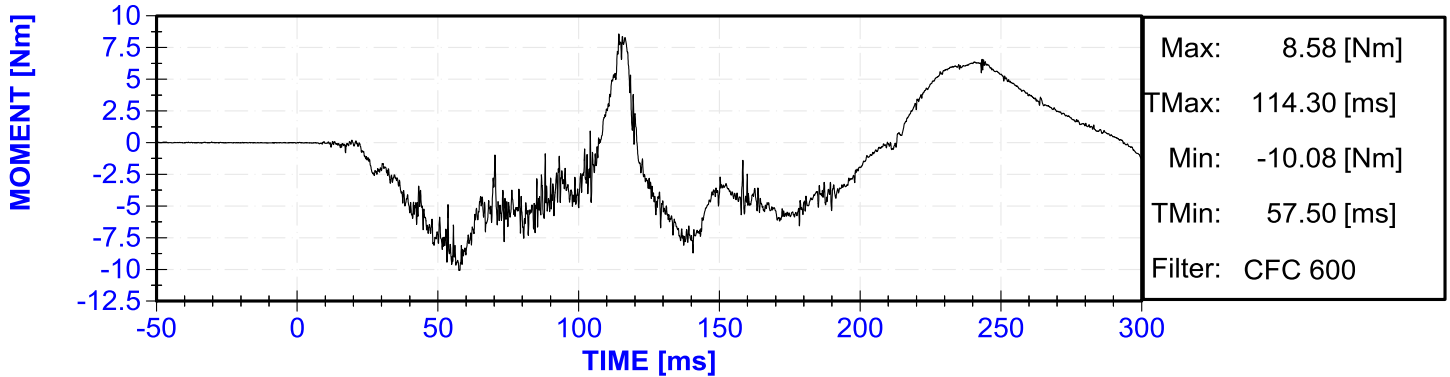
V2P2 Fz on head acting through the total neck section



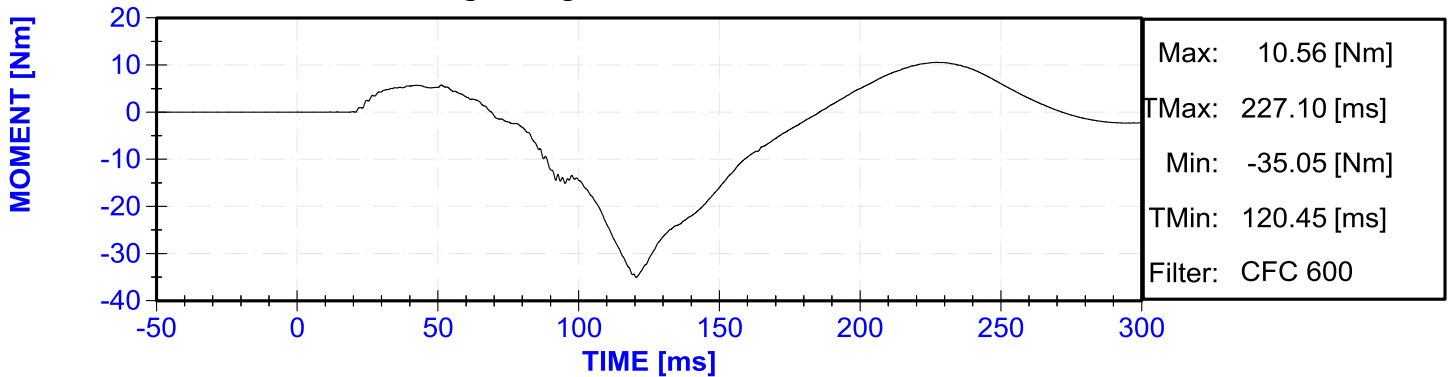
V2P2 Mx on head acting through the total neck section



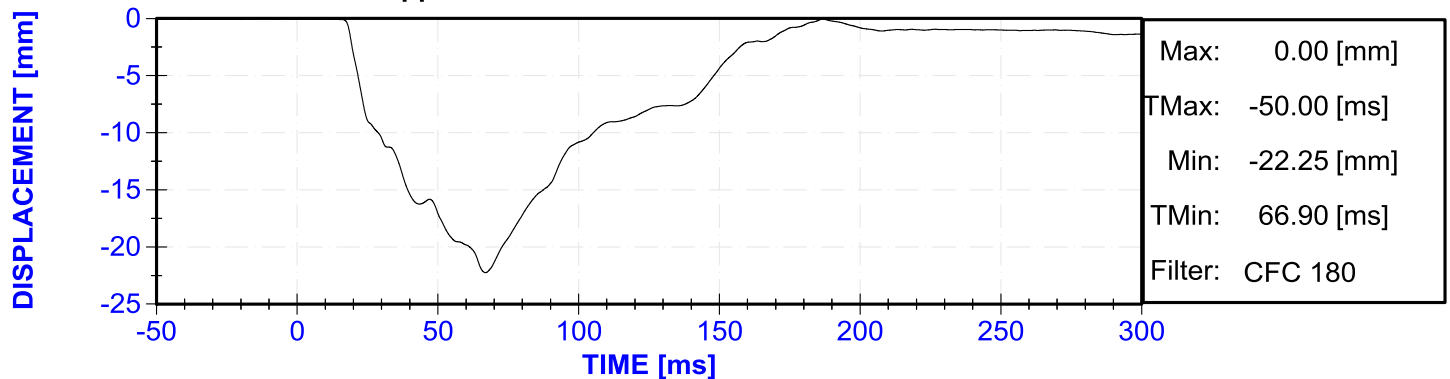
V2P2 My on head acting through the total neck section



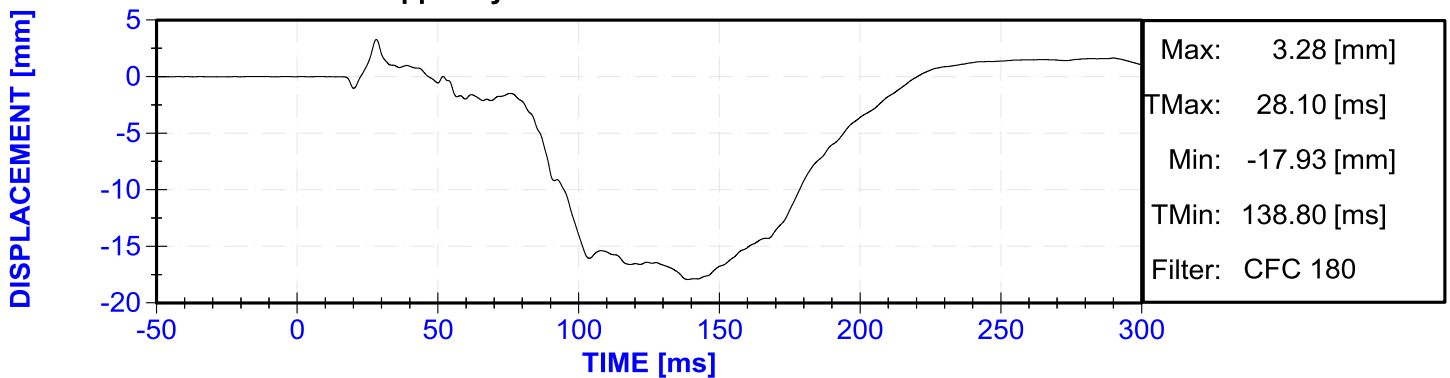
V2P2 Mz on head acting through the total neck section

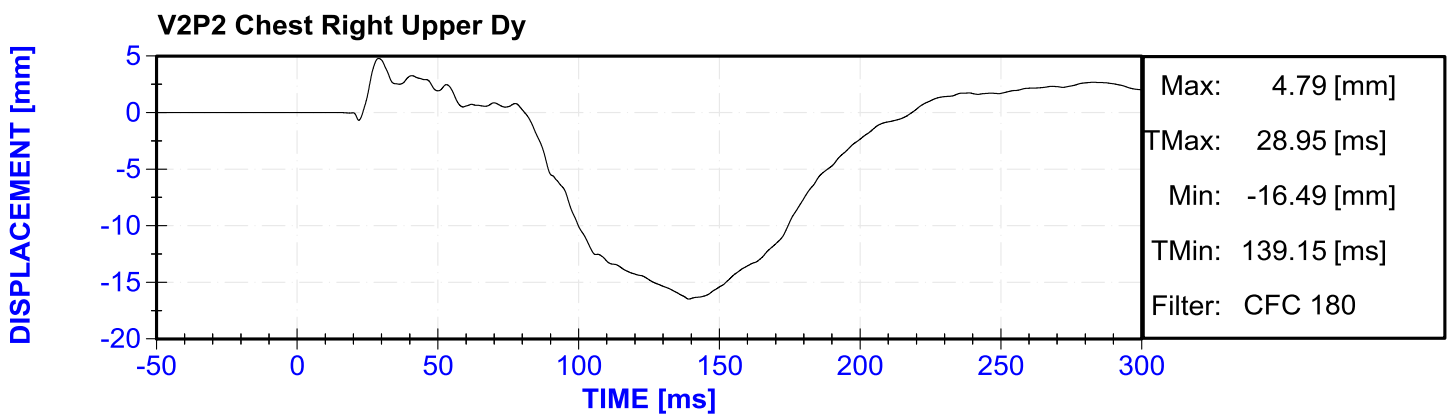
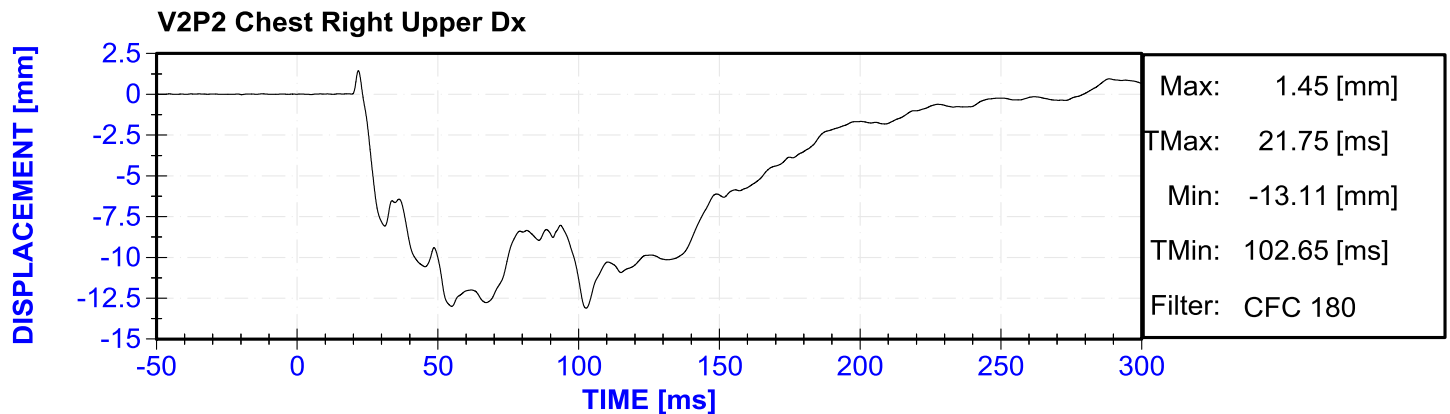
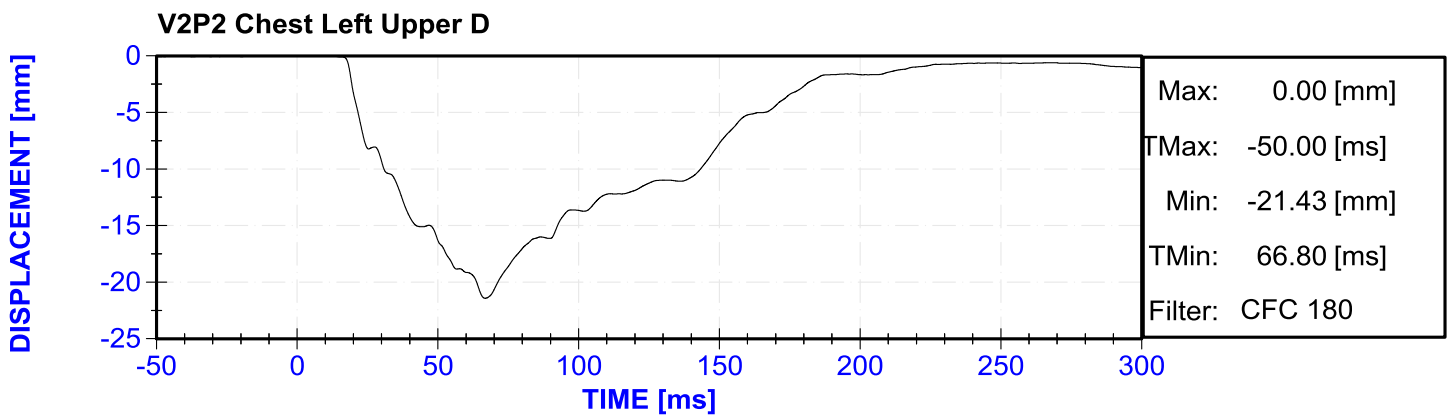
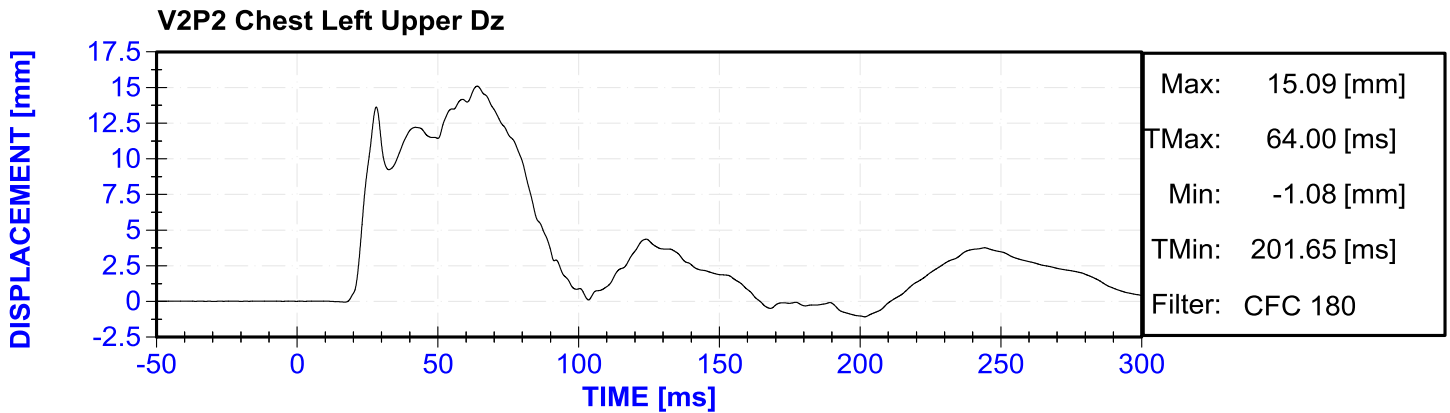


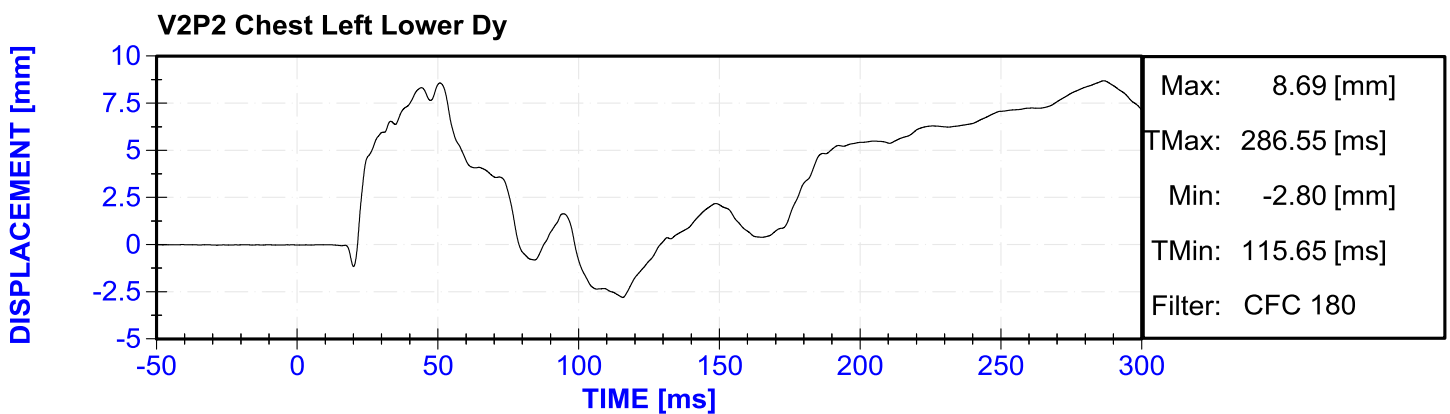
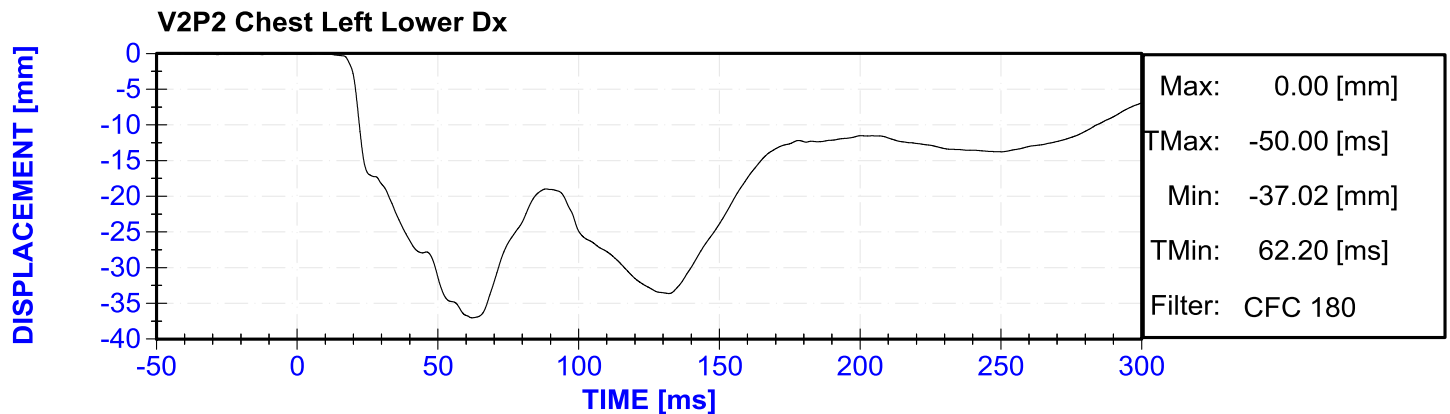
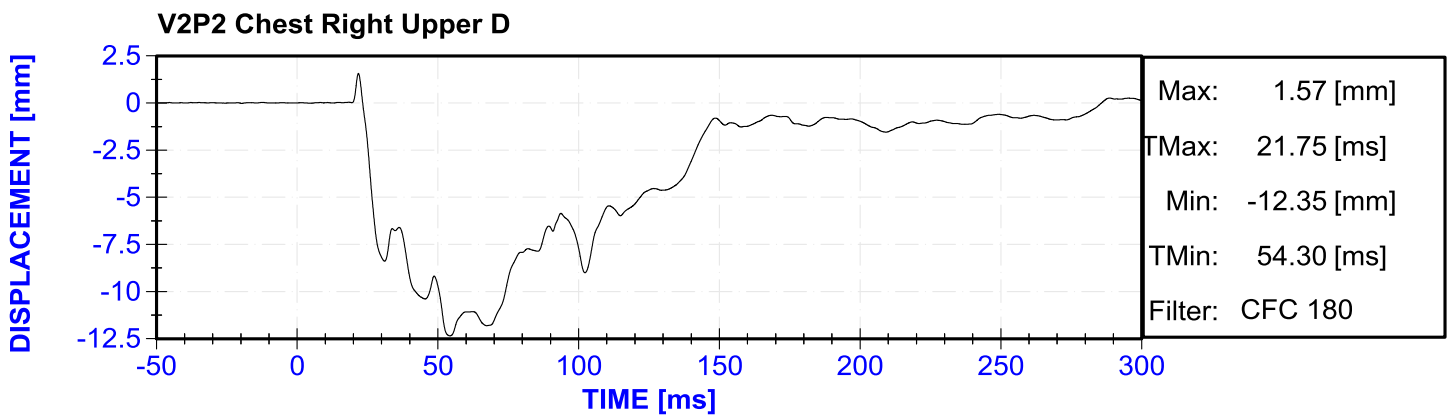
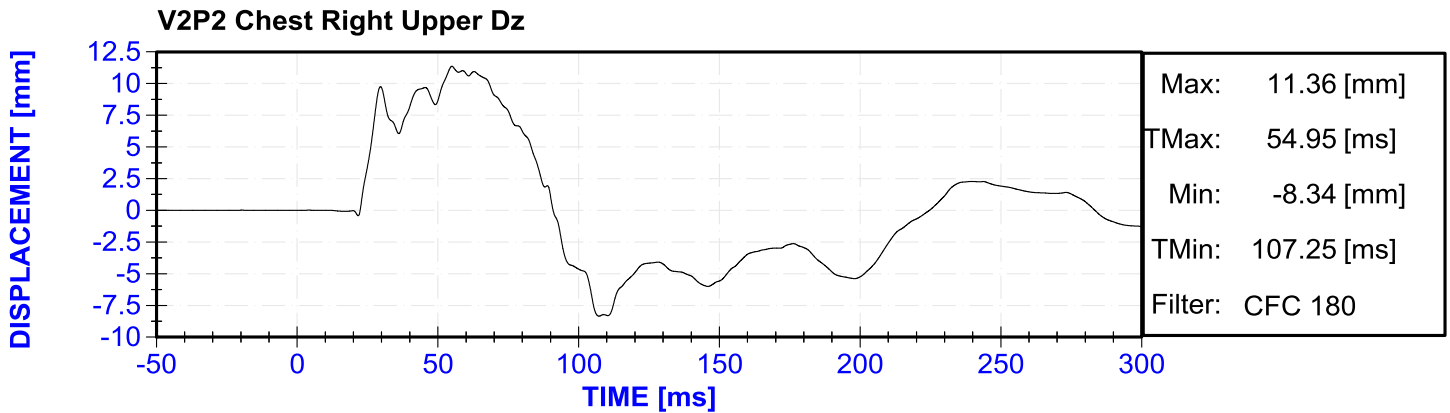
V2P2 Chest Left Upper Dx

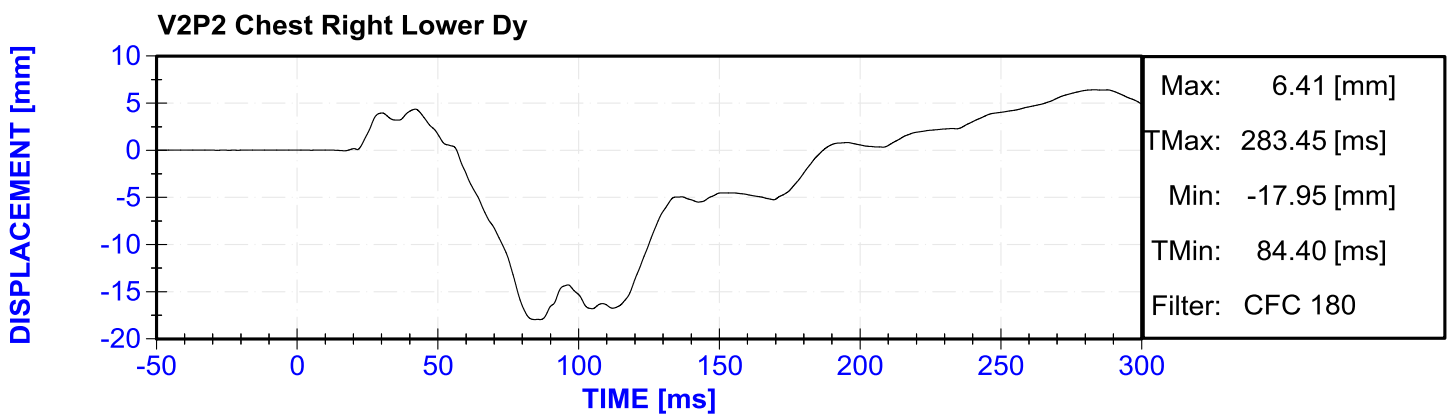
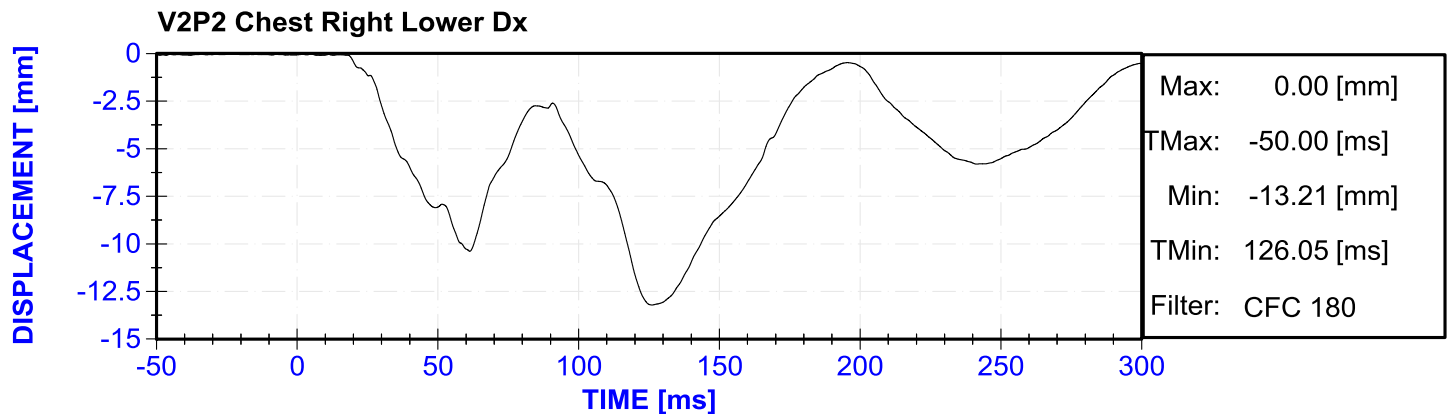
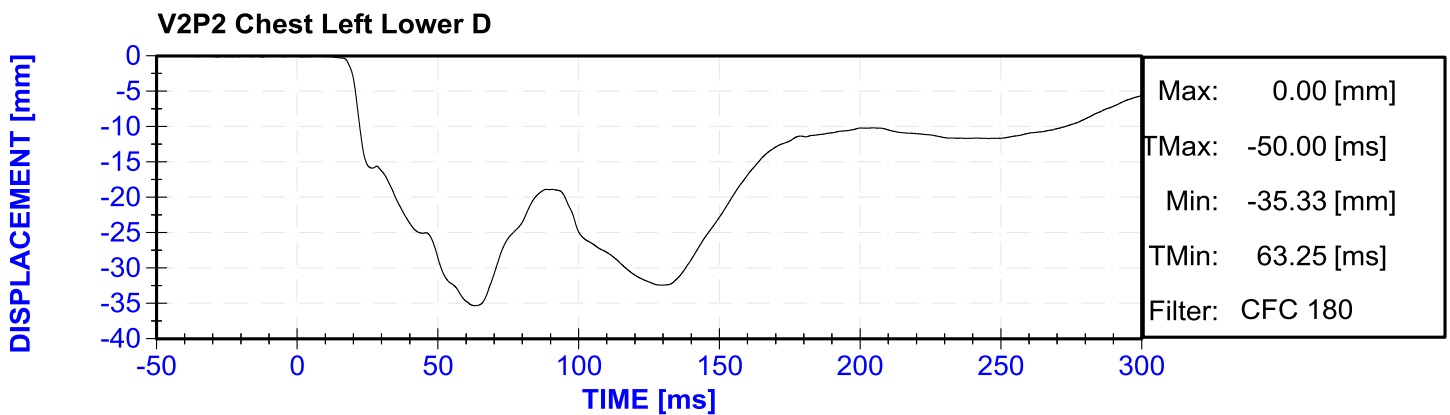
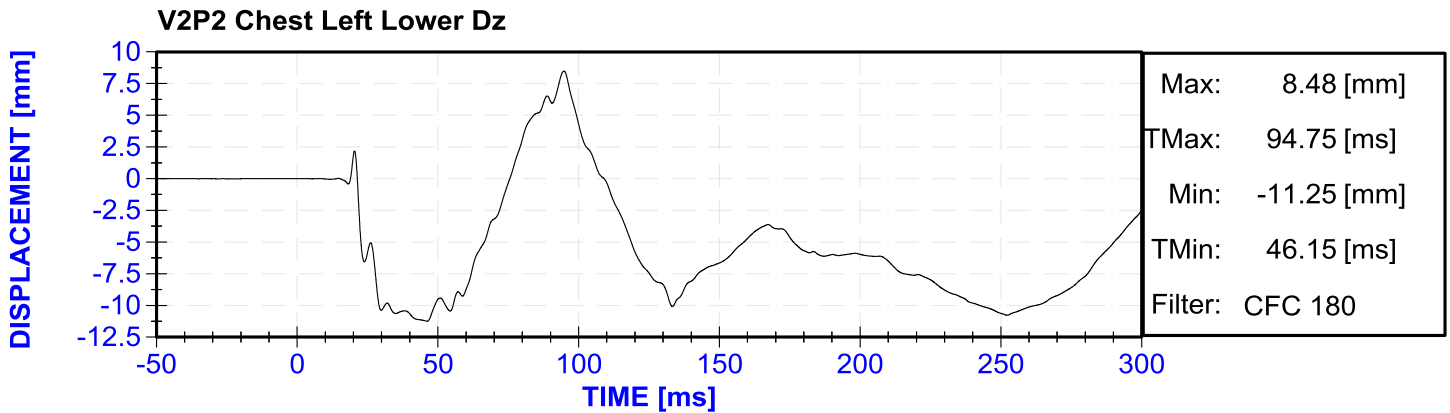


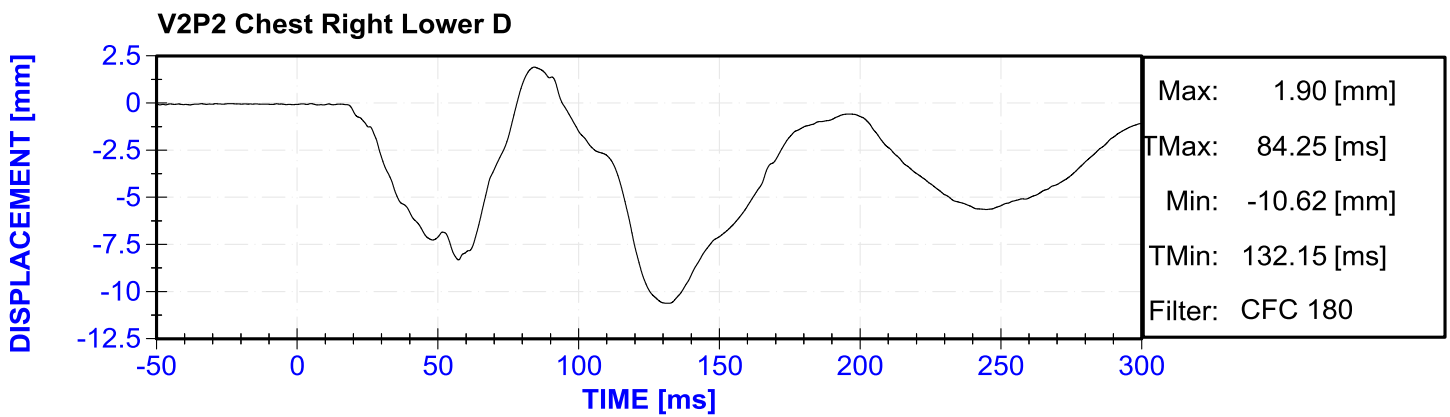
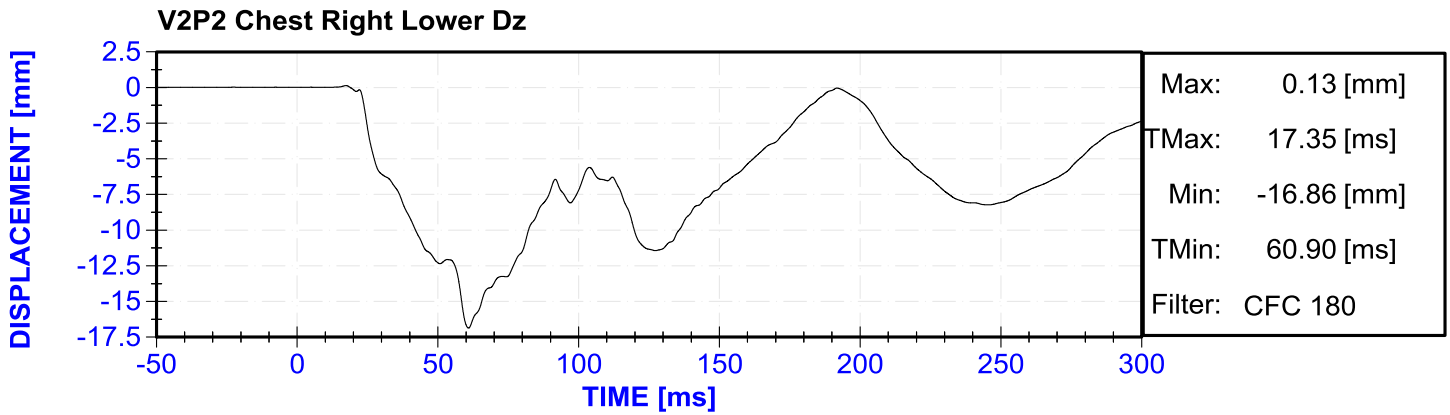
V2P2 Chest Left Upper Dy











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	016
THOR TK	50 TH Male	015

Table C-2: Ankle Offset Files

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
-0.281010	13.9793		-0.926255	17.6868	
THOR – TK S/N: 015					
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
.762525	14.9331		-1.31005	13.7803	

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

THOR – TK S/N: 016								
Sensor	Manufacturer	Serial #	Capacity	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
HEAD CG X	Endevco	AC-P74956	2000	g	2000	1000	0.01851	0.415576
HEAD CG Y	Endevco	AC-P51933	2000	g	2000	1000	0.01927	0
HEAD CG Z	Endevco	AC-P52069	2000	g	2000	1000	0.01904	0
HDCG Wx	DTS	ARS-5928	18000	deg/s	18000	1000	0.09340	-47.3992
HDCG Wy	DTS	ARS-5950	18000	deg/s	18000	1000	0.09373	-82.2398
HDCG Wz	DTS	ARS-5990	18000	deg/s	18000	1000	0.09396	-27.7157
NEKU Fx	Denton	LC-3454J-76Fx	8896	N	8896	1000	0.000231531	-1.74156
NEKU Fy	Denton	LC-3454J-76Fy	8896	N	8896	1000	0.000233790	-1.73876
NEKU Fz	Denton	LC-3454J-76Fz	13345	N	13345	1000	0.000088380	-7.82127
NEKU Mx	Denton	LC-3454J-76Mx	282	N-m	282	600	0.006027005	0
NEKU My	Denton	LC-3454J-76My	282	N-m	282	600	0.005967528	-0.165369
NEKU Mz	Denton	LC-3454J-76Mz	282	N-m	282	600	0.009944701	-0.0552506
NEKL Fx	Denton	LC-DM4552FX	13345	N	13345	1000	0.000170802	0
NEKL Fy	Denton	LC-DM4552FY	13345	N	13345	1000	0.000170203	0
NEKL Fz	Denton	LC-DM4552FZ	13345	N	13345	1000	0.000071152	0
NEKL Mx	Denton	LC-DM4552MX	452	N-m	452	600	0.004108075	-0.0885175
NEKL My	Denton	LC-DM4552MY	452	N-m	452	600	0.004134627	-0.0885933
NEKL Mz	Denton	LC-DM4552MZ	226	N-m	226	600	0.006758431	0
NKCF Fz	Denton	LC-6005J-77Fz	4448	N	4448	1000	0.000850317	-0.871135

THOR – TK (Continued)

S/N: 016

Sensor	Manufacturer	Serial #	Capacity	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
NKCR Fz	Denton	LC-6005J-78Fz	4448	N	4448	1000	0.000862839	0
HDOT RDy	Sfernice	DS-007	180	deg	160	180	3.045	0.0328407
SPNU Ax	Endevco	AC-P64099	2000	g	2000	180	0.02212	-0.821963
SPNU Ay	Endevco	AC-P58838	2000	g	2000	180	0.01904	-0.404008
SPNU Az	Entran	AC-02I02I05-F14	2000	g	2000	180	0.02184	0
SPNM Ax	Endevco	AC-P64002	2000	g	2000	180	0.01993	0.41813
SPNM Ay	Endevco	AC-P58735	2000	g	2000	180	0.01954	0.39367
SPNM Az	Entran	AC-03D03D16-F12	2000	g	2000	180	0.02265	0
CHLU Dx	Humanetics	DS-DM1151	3.3	V	3.3	600	Raw	0.144062
CHLU Ry	Humanetics	DS-DJ4106	180	deg	160	180	3.074	0
CHLU Rz	Humanetics	DS-DJ4108	180	deg	160	180	2.995	0.033389
CHRU Dx	Humanetics	DS-DI4716	3.3	V	3.3	600	Raw	0.125521
CHRU Ry	Humanetics	DS-DI2381	180	deg	160	180	3.029	0
CHRU Rz	Humanetics	DS-DI2380	180	deg	160	180	3.064	0
CHLL Dx	Humanetics	DS-DM1152	3.3	V	3.3	600	Raw	0.0989583
CHLL Ry	Humanetics	DS-DI7903	180	deg	160	180	2.997	0
CHLL Rz	Humanetics	DS-DJ0023	180	deg	160	180	3.065	-0.0326264
CHRL Dx	Humanetics	DS-DI4717	3.3	V	3.3	600	Raw	0.08
CHRL Ry	Humanetics	DS-DI2385	180	deg	160	180	2.584	0.0322497
CHRL Rz	Humanetics	DS-DI2384	180	deg	160	180	3.007	0
SPNL Fx	Denton	LC-92Fx	13345	N	13345	1000	0.000137463	2.60741
SPNL Fy	Denton	LC-92Fy	13345	N	13345	1000	0.000138198	-2.61227
SPNL Fz	Denton	LC-92Fz	17793	N	13345	1000	0.000052639	-5.21904
SPNL Mx	Denton	LC-92Mx	678	N-m	678	1000	0.002164893	0
SPNL My	Denton	LC-92My	904	N-m	904	1000	0.001775128	2.68257
PVCG Ax	Endevco	AC-P64087	2000	g	2000	1000	0.02017	0
PVCG Ay	Endevco	AC-P50065	2000	g	2000	1000	0.01704	0
PVCG Az	Endevco	AC-P64123	2000	g	2000	1000	0.01961	-0.392265
PVAL Fx	Humanetics	LC-84Fx	22241	N	22241	600	0.0001229300	8.70164
PVAL Fy	Humanetics	LC-84Fy	13345	N	13345	600	0.0000607883	0
PVAL Fz	Humanetics	LC-84Fz	13345	N	13345	600	0.0001661788	0
PVAR Fx	Humanetics	LC-77Fx	22241	N	22241	600	0.0001216936	-4.34865
PVAR Fy	Humanetics	LC-77Fy	13345	N	13345	600	0.0000598142	0
PVAR Fz	Humanetics	LC-77Fz	13345	N	13345	600	0.0001651371	2.61043
PILL Fx	Humanetics	LC-DI4774 Fx	13000	N	13000	600	0.000067785	5.07945
PILR Fx	Humanetics	LC-DI4775 Fx	13000	N	13000	600	0.000067854	12.7074
FMRL Fx	Humanetics	LC-108Fx	15000	N	15000	600	0.0001449	0
FMRL Fy	Humanetics	LC-108Fy	15000	N	15000	600	0.0001457	2.93308
FMRL Fz	Humanetics	LC-108Fz	15000	N	15000	600	0.0000750	-2.9304
FMRL Mx	Humanetics	LC-108Mx	350	N-m	350	600	0.0065318	-0.0686534
FMRL My	Humanetics	LC-108My	350	N-m	350	600	0.0065158	13.0026
FMRL Mz	Humanetics	LC-108Mz	350	N-m	350	600	0.0093691	-0.0684191
KNEL Dx	Space Age	DS-D2103665B	30	mm	20	180	23.87593	0.00418832
TBLU Fz	Denton	LC-4509J-110Fz	11120	N	11120	600	0.0000923	-6.52665
TBLU Mx	Denton	LC-4509J-110Mx	395	N-m	395	600	0.0073903	-0.0773214
TBLU My	Denton	LC-4509J-110My	395	N-m	395	600	0.0073054	0
TBLL Fz	Denton	LC-76Fz	11120	N	11120	600	0.0000948	-6.52486

THOR – TK (Continued) S/N: 016								
Sensor	Manufacturer	Serial #	Capacity	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
TBLL Mx	Denton	LC-76Mx	395	N	395	600	0.0074420	0
TBLL My	Denton	LC-76My	395	N	395	600	0.0073706	-0.0775281
ANKL Rx	Contelec	DS-001x	180	deg	150	180	3.20532	-0.28101
ANKL Ry	Contelec	DS-002y	180	deg	150	180	3.16119	13.9793
FOTL Az	Endevco	AC-J19244	2000	g	2000	1000	0.02590	2.36388
FMRR Fx	Humanetics	LC-DJ1045Fx	15000	N	15000	600	0.0001450	-2.9347
FMRR Fy	Humanetics	LC-DJ1045Fy	15000	N	15000	600	0.0001452	-2.93066
FMRR Fz	Humanetics	LC-DJ1045Fz	15000	N	15000	600	0.0000732	0
FMRR Mx	Humanetics	LC-DJ1045Mx	350	N-m	350	600	0.0065293	-0.0683731
FMRR My	Humanetics	LC-DJ1045My	350	N-m	350	600	0.0065638	0.0686265
FMRR Mz	Humanetics	LC-DJ1045Mz	350	N-m	350	600	0.0088260	0
KNER Dx	Space Age	DS-D2103657B	30	mm	20	180	24.06200	0.00415593
TBRU Fz	Denton	LC-4509J-107Fz	11120	N	11120	600	0.0000923	-6.52665
TBRU Mx	Denton	LC-4509J-107Mx	395	N-m	395	600	0.0073875	-0.0773507
TBRU My	Denton	LC-4509J-107My	395	N-m	395	600	0.0073329	0
TBRL Fz	Denton	LC-75Fz	11120	N	11120	600	0.0000958	0
TBRL Mx	Denton	LC-75Mx	395	N-m	395	600	0.0072968	0.0774273
TBRL My	Denton	LC-75My	395	N-m	395	600	0.0073137	0
ANKR Rx	Contelec	DS-004X	180	deg	150	180	3.16542	-0.92625
ANKR Ry	Contelec	DS-0534Y	180	deg	150	180	3.17825	17.6868
FOTR Az	Endevco	AC-P74773	2000	g	2000	1000	0.01818	-0.392896

THOR – TK S/N: 015								
Sensor	Manufacturer	Serial #	Capacity	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
HEAD CG X	Endevco	P63926	2000	g	2000	1000	0.01887	0
HEAD CG Y	Endevco	P64084	2000	g	2000	1000	0.02366	-1.95673
HEAD CG Z	Endevco	P51732	2000	g	2000	1000	0.01901	-0.404645
HDCG Wx	DTS	ARS4727	18000	deg/s	18000	1000	0.09212	-98.9425
HDCG Wy	DTS	ARS4712	18000	deg/s	18000	1000	0.09309	-11.7494
HDCG Wz	DTS	ARS4714	18000	deg/s	18000	1000	0.09443	-14.892
NEKU Fx	Denton	77	8896	N	8896	1000	0.000231857	-5.6069
NEKU Fy	Denton	77	8896	N	8896	1000	0.000228428	-0.875549
NEKU Fz	Denton	77	13345	N	13345	1000	0.000086454	2.31337
NEKU Mx	Denton	77	282	N-m	282	600	0.005888226	-0.0509491
NEKU My	Denton	77	282	N-m	282	600	0.005997267	-0.0333485
NEKU Mz	Denton	77	282	N-m	282	600	0.009965588	0.100345
NKCF Fz	Denton	LC-6005J-77Fz	80	N	4448	1000	0.000868639	0
NKCR Fz	Denton	LC-6005J-78Fz	75	N	4448	1000	0.000709137	0
HDOT RDy	Humanetics	DS-007	160	deg	160	180	3.036	0
SPNU Ax	Endevco	AC-P64099	2000	g	2000	180	0.01736	0
SPNU Ay	Entran	AC-P58838	2000	g	2000	180	0.02330	-1.18124
SPNU Az	Endevco	AC-02I02I05-F14	2000	g	2000	180	0.01914	0
SPNM Ax	Endevco	AC-P64002	2000	g	2000	180	0.01819	0.39268

THOR – TK (Continued)

S/N: 015

Sensor	Manufacturer	Serial #	Capacity	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
SPNM Ay	Endevco	P58717	2000	g	2000	180	0.01797	0
SPNM Az	Endevco	P63843	2000	g	2000	180	0.02361	-0.784351
CHLU Dx	Humanetics	DK3867	3.3	V	3.3	600	Raw	0.112292
CHLU Ry	Humanetics	DJ5448	180	deg	160	180	3.074	-0.0325309
CHLU Rz	Humanetics	DJ5449	180	deg	160	180	3.042	0
CHRU Dx	Humanetics	DK3868	3.3	V	3.3	600	Raw	0.10875
CHRU Ry	Humanetics	DJ5451	180	deg	160	180	3.045	0
CHRU Rz	Humanetics	DJ5450	180	deg	160	180	3.032	0
CHLL Dx	Humanetics	DI4718	3.3	V	3.3	600	Raw	0.0783333
CHLL Ry	Humanetics	DI2386	180	deg	160	180	2.958	0
CHLL Rz	Humanetics	DI6129	180	deg	160	180	3.053	0.0327547
CHRL Dx	Humanetics	DJ2614	3.3	V	3.3	600	Raw	0.0870833
CHRL Ry	Humanetics	DJ4107	180	deg	160	180	2.978	0.0335796
CHRL Rz	Humanetics	DJ4109	180	deg	160	180	3.045	0
SPNL Fx	Denton	125	13345	N	13345	1000	0.000142439	-2.80822
SPNL Fy	Denton	125	13345	N	13345	1000	0.000142551	0.701503
SPNL Fz	Denton	125	17793	N	13345	1000	0.000061260	4.89716
SPNL Mx	Denton	125	678	N-m	678	1000	0.002138341	-0.420887
SPNL My	Denton	125	904	N-m	904	1000	0.001834428	0.272565
PVCG Ax	Endevco	P51294	2000	g	2000	1000	0.02201	0
PVCG Ay	Endevco	P63857	2000	g	2000	1000	0.02371	1.57668
PVCG Az	Endevco	P59011	2000	g	2000	1000	0.01781	0
PVAL Fx	Humanetics	83	22241	N	22241	600	0.0001206055	9.12061
PVAL Fy	Humanetics	83	13345	N	13345	600	0.0000591322	15.2284
PVAL Fz	Humanetics	83	13345	N	13345	600	0.0001630614	-5.51941
PVAR Fx	Humanetics	79	22241	N	22241	600	0.0001206190	-9.94868
PVAR Fy	Humanetics	79	13345	N	13345	600	0.0000595968	-6.71141
PVAR Fz	Humanetics	79	13345	N	13345	600	0.0001636234	2.44464
PILL Fx	Humanetics	DJ5524	13000	N	13000	600	0.000070654	-10.1641
PILR Fx	Humanetics	77	13000	N	13000	600	0.000068416	-7.62598
FMRL Fx	Humanetics	DM4951	15000	N	15000	600	0.000142057	-2.93309
FMRL Fy	Humanetics	DM4951	15000	N	15000	600	0.000142086	-2.9325
FMRL Fz	Humanetics	DM4951	15000	N	15000	600	0.000071741	5.86907
FMRL Mx	Humanetics	DM4951	350	N-m	350	600	0.006425656	-0.137116
FMRL My	Humanetics	DM4951	350	N-m	350	600	0.006432760	-0.0684821
FMRL Mz	Humanetics	DM4951	350	N-m	350	600	0.009035044	0
KNEL Dx	Space Age	C2102639B	30	mm	20	180	24.03214	0.00832219
TBLU Fz	Denton	106	11120	N	11120	600	0.00009360	-6.52776
TBLU Mx	Denton	106	395	N-m	395	600	0.00741550	-0.155003
TBLU My	Denton	106	395	N-m	395	600	0.00742091	0
TBLL Fz	Denton	139	11120	N	11120	600	0.00009648	4.34585

THOR – TK (Continued) S/N: 015								
Sensor	Manufacturer	Serial #	Capacity	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
TBLL Mx	Denton	139	395	N	395	600	0.00749952	-0.0775243
TBLL My	Denton	139	395	N	395	600	0.00754555	-0.077502
ANKL Rx	Contelec	7921-0382	180	deg	150	180	3.18215	0.762525
ANKL Ry	Contelec	7921-0386	180	deg	150	180	3.17717	14.9331
FOTL Az	Endevco	J27525	2000	g	2000	1000	0.02143	6.36321
FMRR Fx	Humanetics	DM4950	15000	N	15000	600	0.000141110	0
FMRR Fy	Humanetics	DM4950	15000	N	15000	600	0.000141643	0
FMRR Fz	Humanetics	DM4950	15000	N	15000	600	0.000071653	-8.79589
FMRR Mx	Humanetics	DM4950	350	N-m	350	600	0.006388454	0.0686546
FMRR My	Humanetics	DM4950	350	N-m	350	600	0.006411979	-0.136805
FMRR Mz	Humanetics	DM4950	350	N-m	350	600	0.008857852	0
KNER Dx	Space Age	I1807966B	30	mm	20	180	23.38064	0
TBRU Fz	Denton	88	11120	N	11120	600	0.00009280	-4.34511
TBRU Mx	Denton	88	395	N-m	395	600	0.00726490	0
TBRU My	Denton	88	395	N-m	395	600	0.00725530	0
TBRL Fz	Denton	140	11120	N	11120	600	0.00009658	0
TBRL Mx	Denton	140	395	N-m	395	600	0.00760594	0
TBRL My	Denton	140	395	N-m	395	600	0.00764658	0
ANKR Rx	Contelec	7921-0385	180	deg	150	180	3.18522	-1.31005
ANKR Ry	Contelec	7921-0383	180	deg	150	180	3.18949	13.7803
FOTR Az	Endevco	P58616	2000	g	2000	1000	0.01995	0

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

THOR – TK S/N: 016			
Sensor	IR-TRACC Exponent	IR-TRACC Slope	IR-TRACC Intercept
CHLU Dx	-0.54440	26.4269	N/A
CHRU Dx	-0.4872	31.6935	N/A
CHLL Dx	-0.49197	31.3308	N/A
CHRL Dx	-0.4865	30.3707	N/A
ABDL Dx	N/A	N/A	N/A
ABDR Dx	N/A	N/A	N/A
THOR – TK S/N: 015			
Sensor	IR-TRACC Exponent	IR-TRACC Slope	IR-TRACC Intercept
CHLU Dx	-0.5268	28.0630	N/A
CHRU Dx	-0.4888	31.4311	N/A
CHLL Dx	-0.4500	34.0200	N/A
CHRL Dx	-0.4647	34.5897	N/A
ABDL Dx	N/A	N/A	N/A
ABDR Dx	N/A	N/A	N/A

Table 5 – THOR IR-TRACC Polarity

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

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

THOR 016

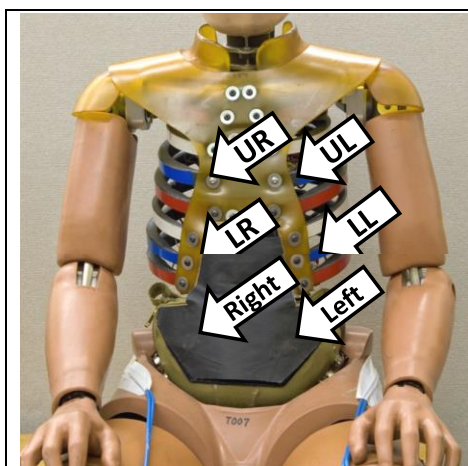


Figure 1. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

Channel	Motion
DX	Push inward
RY	Push upward
RZ	Push rightward

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

THOR 015

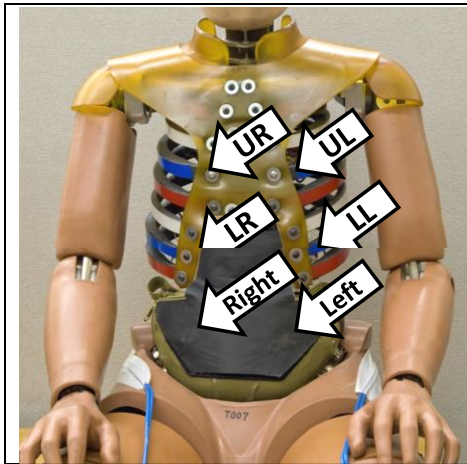


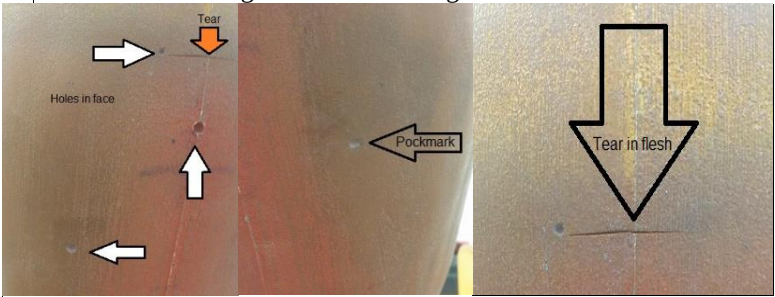
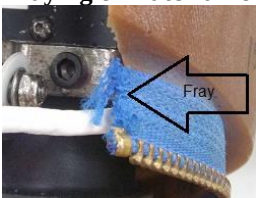
Figure 2. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

Channel	Motion
DX	Push inward
RY	Push upward
RZ	Push rightward

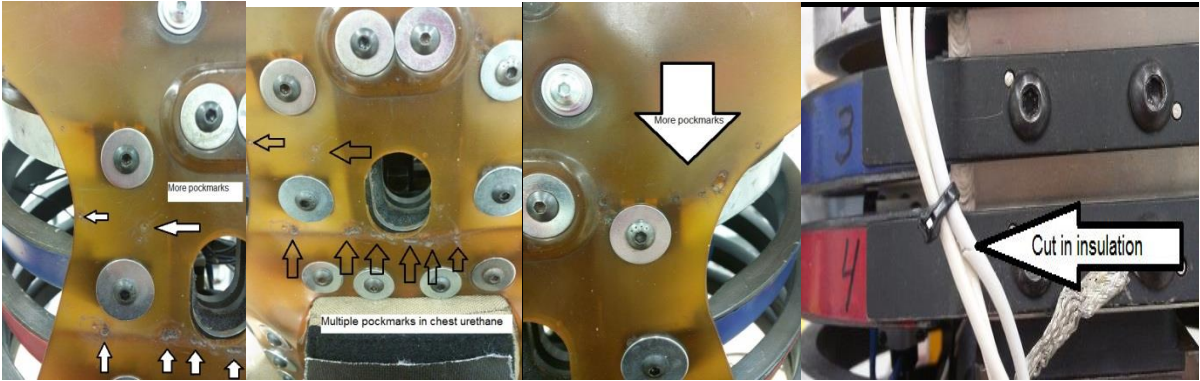
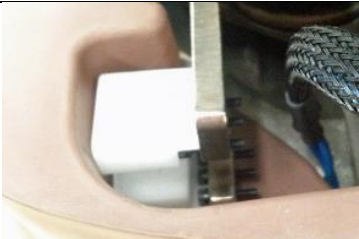
Upper Right Thorax				Upper Left Thorax			
Channel	Initial Value	Expected Polarity	Recorded Polarity	Channel	Initial Value	Expected Polarity	Recorded Polarity
DX (V)	0.10823	+	+	DX (V)	0.11271	+	+
RY (Deg)	6.54762	+	+	RY (Deg)	8.5546	+	+
RZ (Deg)	-16.135	+	+	RZ (Deg)	14.2536	+	+
Lower Right Thorax				Lower Left Thorax			
Channel	Initial Value	Expected Polarity	Recorded Polarity	Channel	Initial Value	Expected Polarity	Recorded Polarity
DX (V)	0.07854	+	+	DX (V)	0.07073	+	+
RY (Deg)	3.8564	+	+	RY (Deg)	4.5322	+	+
RZ (Deg)	-9.8420	+	+	RZ (Deg)	6.39228	+	+
Abdomen Right				Abdomen Left			
Channel	Initial Value	Expected Polarity	Recorded Polarity	Channel	Initial Value	Expected Polarity	Recorded Polarity
DX (V)	N/A	+	N/A	DX (V)	N/A	+	N/A
RY (Deg)	N/A	+	N/A	RY (Deg)	N/A	+	N/A
RZ (Deg)	N/A	+	N/A	RZ (Deg)	N/A	+	N/A

THOR Inspection Checklist

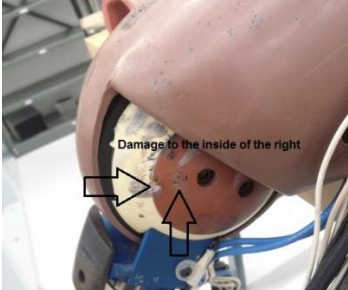
Date: 10/31/2013	
NHTSA Representative: James Saunders	
Inspection Reporter: Matthew Goehle	
Witness(es):	
Inspection type (check one): ☒ PRE ☐ POST	
Dummy S/N: 0015	Legs S/N: LX0038/LX0039
Dummy Description: Thor NT 50th Male	
Date of last Certification or Inspection: 10/29/2013	
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RD5371 Honda Civic <u>Since last certification:</u> RD0332 Dodge Dart RD5371 Honda Civic	
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> None	
<u>Physical evidence of damage:</u> See report – Leg damage	
<u>Anecdotal evidence of damage:</u> N/A	
<u>Equipment delivered to Borrower:</u> Thor 0015 ATD 26 Accelerometers 3 Angular Rate Sensors 2 Skull Spring LC 1 Condyle Pot 1 Upper Neck LC 4 IRTraccs 8 Rotational Pots 1 Spine LC 2 Acetabulum LC 2 ASIS LC 2 Femur LC	<i>Continued</i> 2 LX Leg Assemblies 2 Upper Tibia LC 2 Lower Tibia LC 6 Ank1e Potentiometers 2 Knee Sliders 1 Neck Skin 1 Neck Foam 1 Tiltview Interface Cable 4 Tilt Sensors 1 H-Point Tool 1 Tool Box 1 Laptop 1 LX Zeroing Bracket

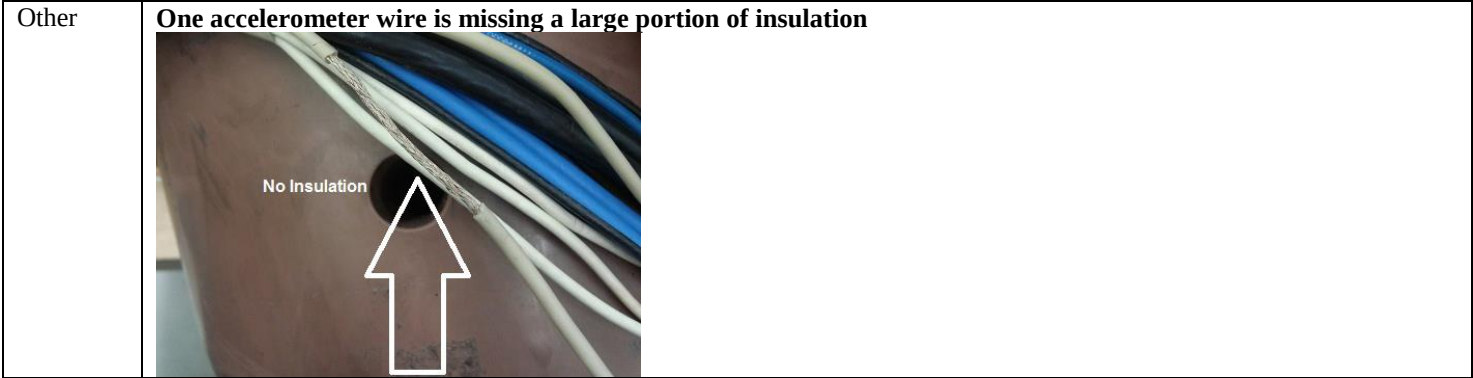
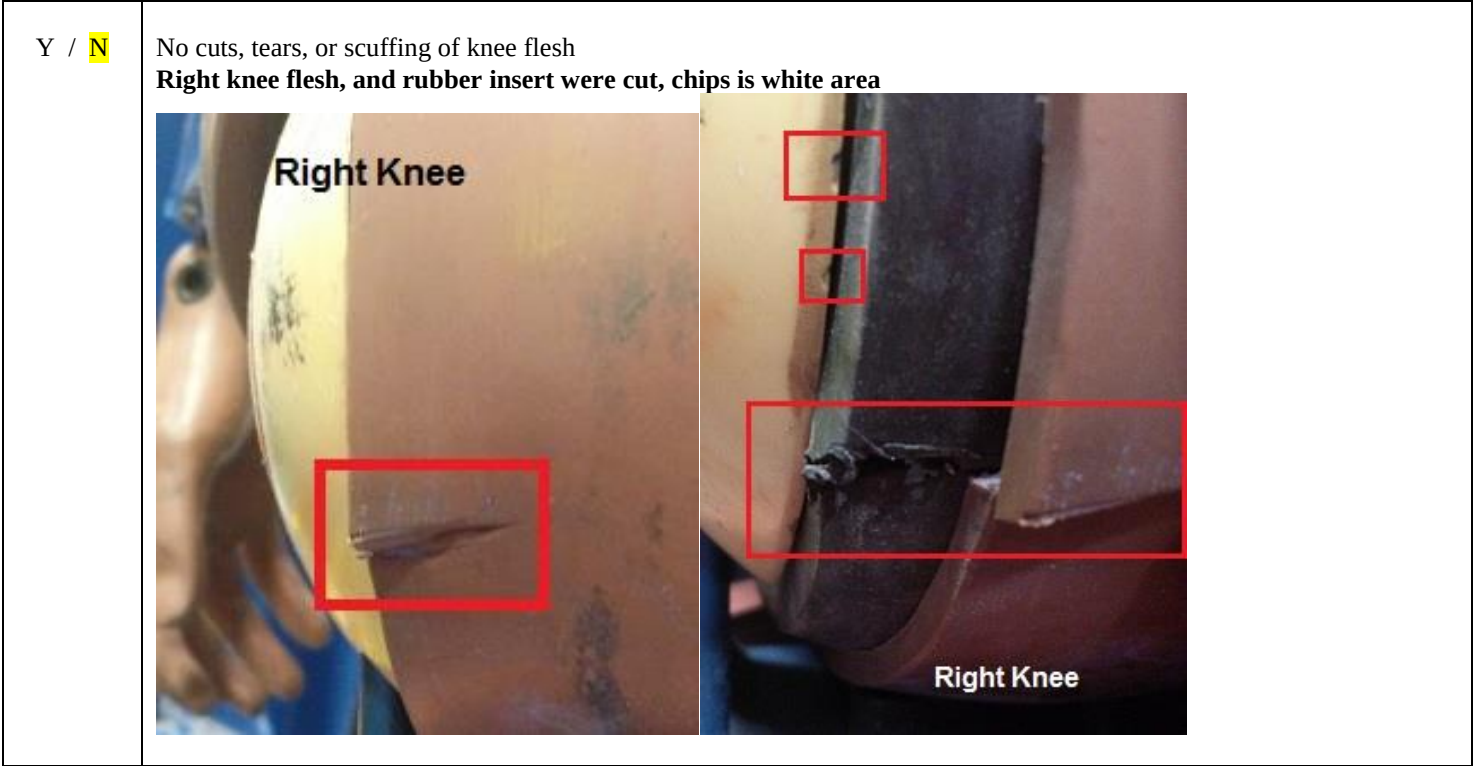
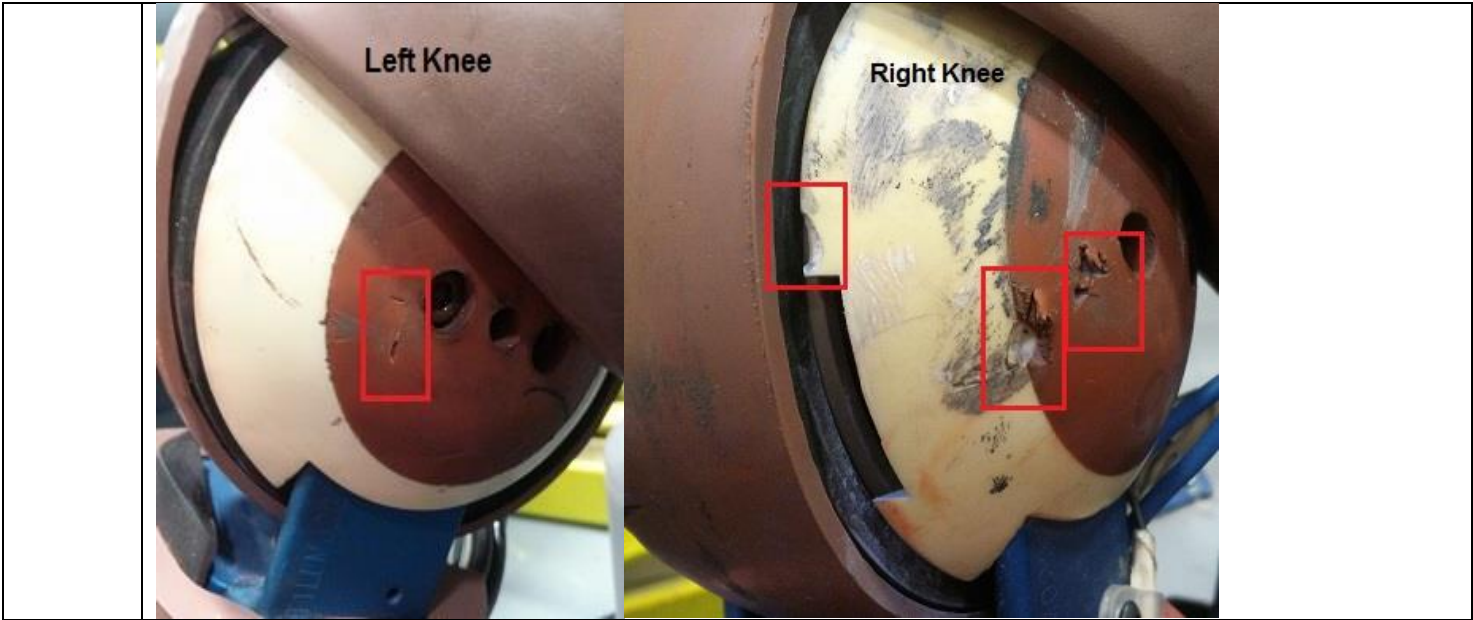
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage  Thor has holes/pockmarks in his head skin, along with a tear
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	Fraying of material for zipper at the back of the head  Head CG Y Accelerometer wire damaged 

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):
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 THOR 0015 does not have a 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
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops
OTHER	

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
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	There are multiple pockmarks in the chest urethane, and at the back there is a cut in the insulation to one of the accelerometer wires 
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
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
Other	 Both lower abdomen IRTracc screws are inserted, but the IRTraccs are not installed.

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	Small tear in pelvis flesh on the left side 

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 Damage to the inside of the right knee  Some damage done to the outer left knee, inside right knee sustained more damage



LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
Y / N	No cuts, tears, or scuffing of leg flesh Right leg flesh shows separation at rear upper seam 
Other	

JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation One of the left rib stiffeners has damage to the outer coating that goes all the way around, also, the rib stiffeners were severely bent when we received 0015. 
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers Many of the seams of the jacket are coming undone, and there is a hole on the bottom left side along with stains all over the jacket. 

	
OTHER	

THOR Inspection Checklist

Date: 11/07/2013	
NHTSA Representative: James Saunders	
Inspection Reporter: Mary Geesey	
Witness(es):	
Inspection type (check one): ☐ PRE ☒ POST	
Dummy S/N: 0016	Legs S/N: LX019/LX018
Dummy Description: Thor NT 50th Male	
Date of last Certification or Inspection: 10/31/2013	
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RE5507 Subaru Forester <u>Since last certification:</u> RD0332 Dodge Dart RD5371 Honda Civic RE5507 Subaru Forester	
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> - Right knee displacement – Questionable maximum – We verified this is a physical stop in the knee. This maximum data is expected.	
<u>Physical evidence of damage:</u> See Report – Abdomen Tears, Pelvis Tears, Leg Tear	
<u>Anecdotal evidence of damage:</u> N/A	
<u>Equipment delivered to Borrower:</u> Thor 16 ATD 26 Accelerometers 3 Angular Rate Sensors 2 Skull Spring LC 1 Condyle Pot 1 Upper Neck LC 1 Lower Neck LC 4 IRTraccs 8 Rotational Pots 1 Spine LC 2 Acetabulum LC 2 ASIS LC 2 Femur LC	<i>Continued</i> 2 LX Leg Assemblies 2 Upper Tibia LC 2 Lower Tibia LC 6 Ank1e Potentiometers 2 Knee Sliders 1 Neck Skin 1 Neck Foam 1 Tiltview Interface Cable 4 Tilt Sensors 1 H-Point Tool 1 Tool Box 1 Laptop

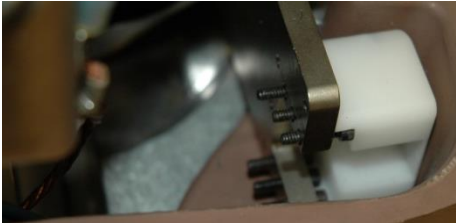
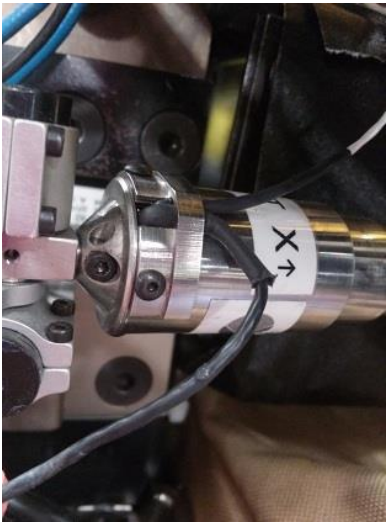
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	Small tear in the insulation 

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):
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  Debonding has occurred at bottom of thoracic spine rubber
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates  Debonding has occurred at bottom of lumbar spine rubber
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged
OTHER	

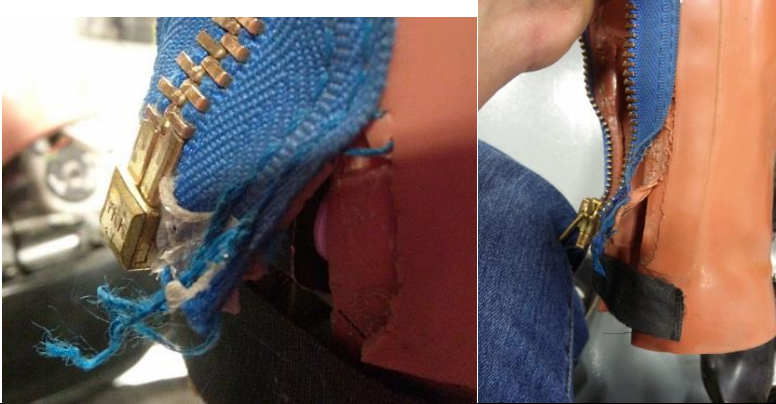
SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops
OTHER	

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
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  Bib has torn in the center of sternum
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)
OTHER	 Lower Neck LC Cable has been repaired where it passes through the upper rear spine box.  T6 X Accelerometer missing insulation at transducer. Electrical tape covers this.
ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper  Upper abdomen came held together with black tape
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  Abdomen bag has many broken stitches forming, but no tears occurring.  Both sides of the Abdomen Bag have torn where the stitches had broke
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
Other	 Both lower abdomen IRTracc screws are inserted, but the IRTraccs are not installed.  Wire seems to have been pinched

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	 Rear of pelvis has torn flesh  Tears have formed to the front of the pelvis

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 -Left ankle Y pot has intermittent failure in cable close to amp connector. –Repaired by cutting back cable and reinstalling on connector.
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
Y / N	No cuts, tears, or scuffing of leg flesh Numerous minor cuts

	 Zipper on right ankle is pulling away from the flesh – This became much worse during the RE5507 test. (See second photo) 
Other	
JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers  Jacket has tears around neck and at most seam ends as seen here on the front left shoulder.
OTHER	 Lifting strap torn

THOR Inspection Checklist

Date: 10/31/2013	
NHTSA Representative: James Saunders	
Inspection Reporter: Matthew Goehle	
Witness(es):	
Inspection type (check one): ☒ PRE ☐ POST	
Dummy S/N: 0016	Legs S/N: LX019/LX018
Dummy Description: Thor NT 50th Male	
Date of last Certification or Inspection: 10/29/2013	
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RD5371 Honda Civic <u>Since last certification:</u> RD0332 Dodge Dart RD5371 Honda Civic	
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> - Pelvis X Acceleration - Questionable spike after 100ms –This channel traces normal with no issues while shaking the wire/adaptor. Area surrounding accelerometer is free of debris and transducer is properly mounted. - Acetabular Left Y Force – Questionable max and min throughout – This channel exhibits an intermittent spike while squeezing the cable near the channel breakout. Cable needs repair.	
<u>Physical evidence of damage:</u> No new physical damage	
<u>Anecdotal evidence of damage:</u> N/A	
<u>Equipment delivered to Borrower:</u> Thor 16 ATD 26 Accelerometers 3 Angular Rate Sensors 2 Skull Spring LC 1 Condyle Pot 1 Upper Neck LC 1 Lower Neck LC 4 IRTraccs 8 Rotational Pots 1 Spine LC 2 Acetabulum LC 2 ASIS LC 2 Femur LC	<i>Continued</i> 2 LX Leg Assemblies 2 Upper Tibia LC 2 Lower Tibia LC 6 Ank1e Potentiometers 2 Knee Sliders 1 Neck Skin 1 Neck Foam 1 Tiltview Interface Cable 4 Tilt Sensors 1 H-Point Tool 1 Tool Box 1 Laptop

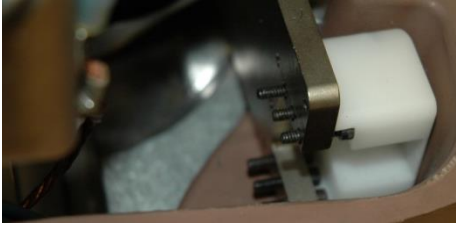
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	Small tear in the insulation 

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):
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  Debonding has occurred at bottom of thoracic spine rubber
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates  Debonding has occurred at bottom of lumbar spine rubber
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
OTHER	

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
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  Bib has torn in the center of sternum
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)
OTHER	 Lower Neck LC Cable has been repaired where it passes through the upper rear spine box.  T6 X Accelerometer missing insulation at transducer. Electrical tape covers this.

ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper  Upper abdomen came held together with black tape
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  Abdomen bag has many broken stitches forming, but no tears occurring.
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
Other	 Both lower abdomen IRTracc screws are inserted, but the IRTraccs are not installed.

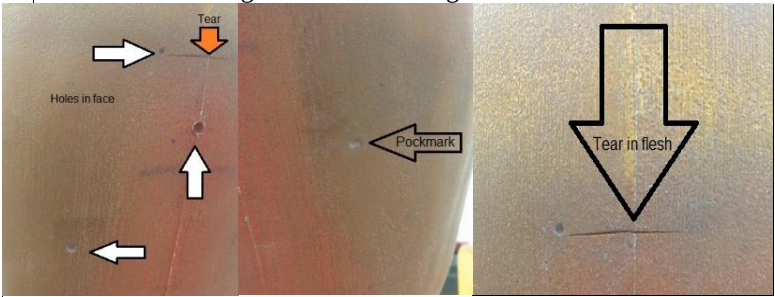
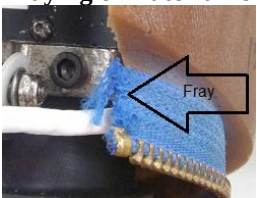
PELVIS	
Y / N	Pelvis flesh fits securely over pelvis bones
Y / N	H-point tool fits securely into hole on both sides of pelvis
OTHER	 Rear of pelvis has torn flesh

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 -Left ankle Y pot has intermittent failure in cable close to amp connector. –Repaired by cutting back cable and reinstalling on connector.
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
Y / N	No cuts, tears, or scuffing of leg flesh Numerous minor cuts  Zipper on right ankle is pulling away from the flesh 
Other	

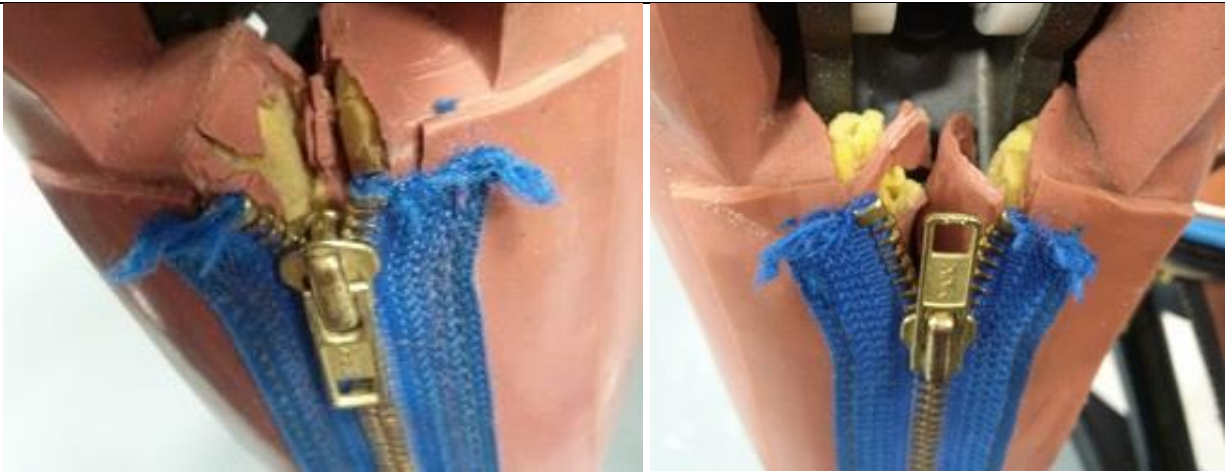
JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers  Jacket has tears around neck and at most seam ends as seen here on the front left shoulder.
OTHER	 Lifting strap torn

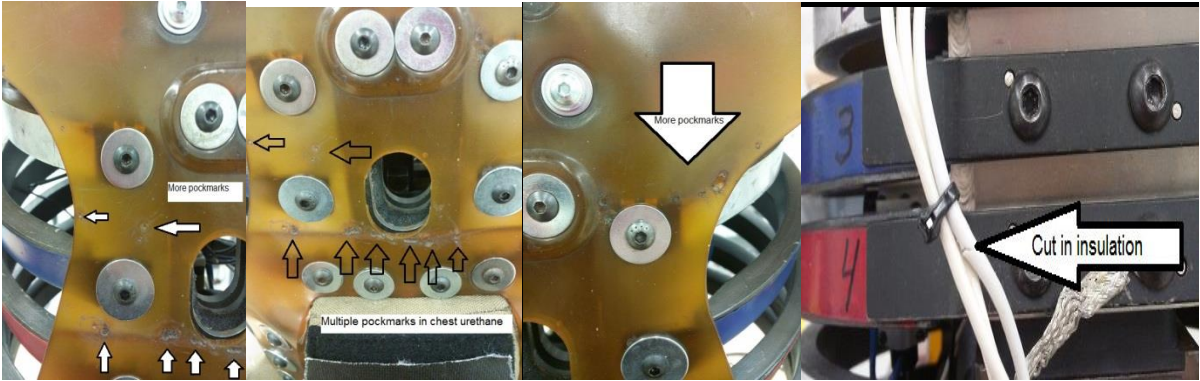
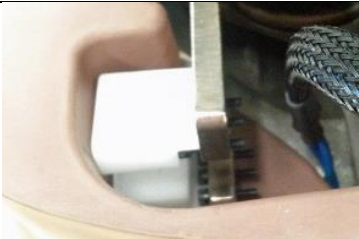
THOR Inspection Checklist

Date: 11/07/2013	
NHTSA Representative: James Saunders	
Inspection Reporter: Mary Geesey	
Witness(es):	
Inspection type (check one): ☐ PRE ☒ POST	
Dummy S/N: 0015	Legs S/N: LX0038/LX0039
Dummy Description: Thor NT 50th Male	
Date of last Certification or Inspection: 10/31/2013	
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RE5507 Subaru Forester <u>Since last certification:</u> RD0332 Dodge Dart RD5371 Honda Civic RE5507 Subaru Forester	
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> - Ankle left X rotation – Questionable data throughout – The Amp connector had a couple wires pull out during the test. Pins were repairs and retested okay.	
<u>Physical evidence of damage:</u> See report – Arm damage	
<u>Anecdotal evidence of damage:</u> N/A	
<u>Equipment delivered to Borrower:</u> Thor 0015 ATD 26 Accelerometers 3 Angular Rate Sensors 2 Skull Spring LC 1 Condyle Pot 1 Upper Neck LC 4 IRTraccs 8 Rotational Pots 1 Spine LC 2 Acetabulum LC 2 ASIS LC 2 Femur LC	<i>Continued</i> 2 LX Leg Assemblies 2 Upper Tibia LC 2 Lower Tibia LC 6 Ank1e Potentiometers 2 Knee Sliders 1 Neck Skin 1 Neck Foam 1 Tiltview Interface Cable 4 Tilt Sensors 1 H-Point Tool 1 Tool Box 1 Laptop 1 LX Zeroing Bracket

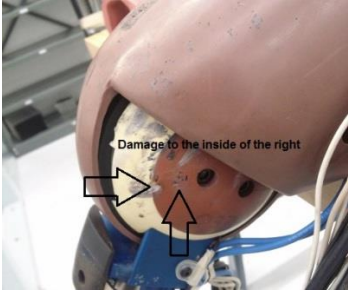
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage  Thor has holes/pockmarks in his head skin, along with a tear
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	Fraying of material for zipper at the back of the head  Head CG Y Accelerometer wire damaged 

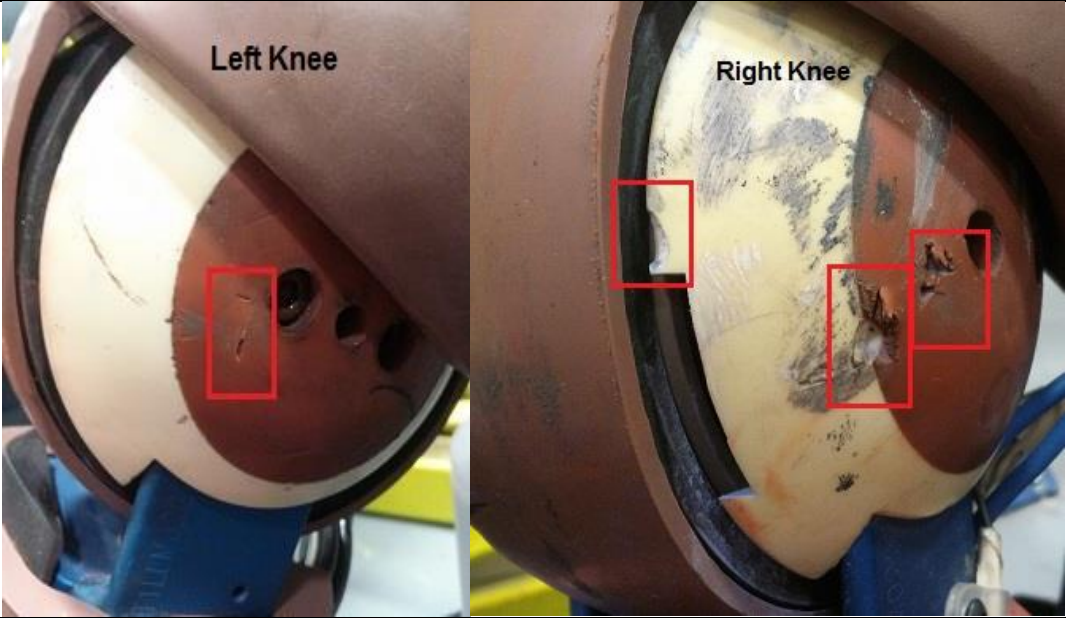
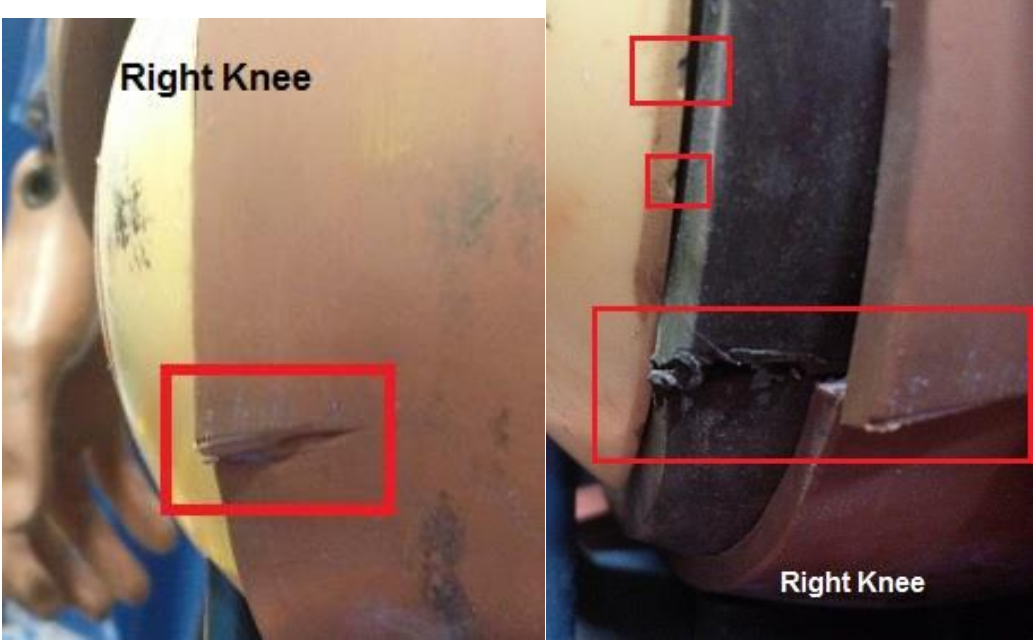
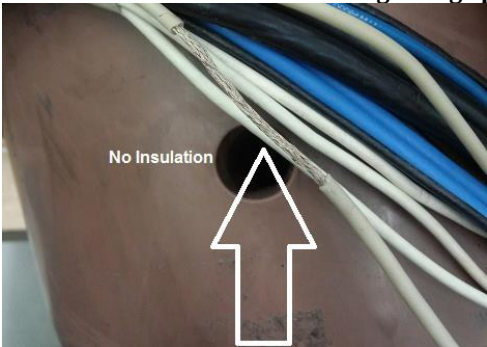
NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell):
Y / N	No evidence of 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
	THOR 0015 does not have a 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
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops
OTHER	 Both left and right arms show signs of internal tearing

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
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	There are multiple pockmarks in the chest urethane, and at the back there is a cut in the insulation to one of the accelerometer wires  The images show four different views of the thorax assembly. The first three images show the chest urethane with multiple pockmarks indicated by arrows and labels. The fourth image shows a cut in the insulation of an accelerometer wire.
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
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
Other	 Both lower abdomen IRTracc screws are inserted, but the IRTraccs are not installed.

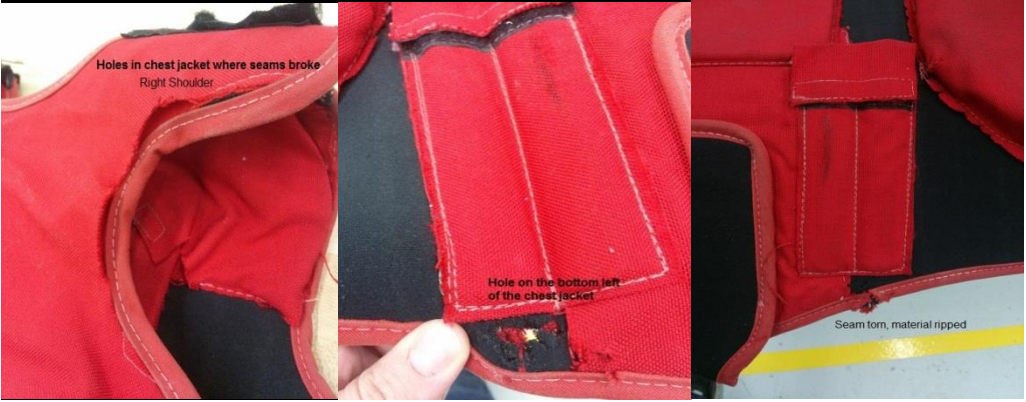
PELVIS	
Y / N	Pelvis flesh fits securely over pelvis bones
Y / N	H-point tool fits securely into hole on both sides of pelvis
OTHER	Small tear in pelvis flesh on the left side 

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 Damage to the inside of the right knee  Some damage done to the outer left knee, inside right knee sustained more damage

	
Y / N	No cuts, tears, or scuffing of knee flesh Right knee flesh, and rubber insert were cut, chips is white area 
Other	One accelerometer wire is missing a large portion of insulation 

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
Y / N	No cuts, tears, or scuffing of leg flesh Right leg flesh shows separation at rear upper seam 
Other	

JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation One of the left rib stiffeners has damage to the outer coating that goes all the way around, also, the rib stiffeners were severely bent when we received 0015. 
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers Many of the seams of the jacket are coming undone, and there is a hole on the bottom left side along with stains all over the jacket. 

	 Holes in chest jacket where seams broke Right Shoulder Hole on the bottom left of the chest jacket Seam torn, material ripped
OTHER	

Test Data/Sensor Repair Notes

DUMMY CALIBRATIONS

50% ADULT MALE THOR016 DUMMY CALIBRATIONS

Summary of Thor 16 Certification Test Results

Reported by: Calspan

Technician: M. Goehle

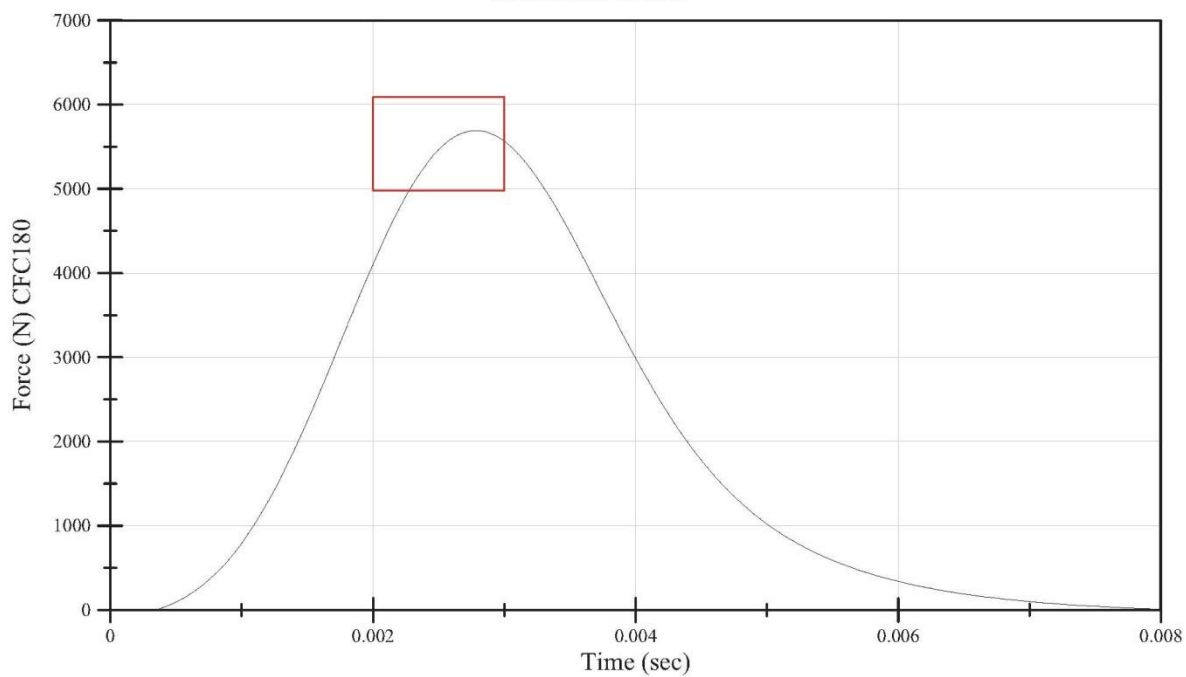
Date: 10/21/2013

Head Impact	Passed
Occipital Condyle Quasi-Static	Failed
Neck Left Lateral Flexion	Failed
Neck Right Lateral Flexion	Failed
Neck Flexion	Failed
Neck Extension	Failed
Upper Thorax	Failed
Lower Left Oblique Thorax	Failed
Lower Right Oblique Thorax	Failed
Upper Abdomen	Failed
Lower Abdomen	Failed
Left Femur	Passed
Right Femur	Passed
Left Knee	Passed
Right Knee	Passed
Left Foot Inversion	Passed
Left Foot Eversion	Passed
Left Heel of Foot	Failed
Left Ball of Foot	Failed
Right Foot Inversion	Failed
Right Foot Eversion	Passed
Right Heel of Foot	Passed
Right Ball of Foot	Passed

Certifications performed by VRTC
Instructed by NHTSA to use "as is"

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 1.98 m/s

THOR Head Impact Certification
Probe Force
Serial Number: T016

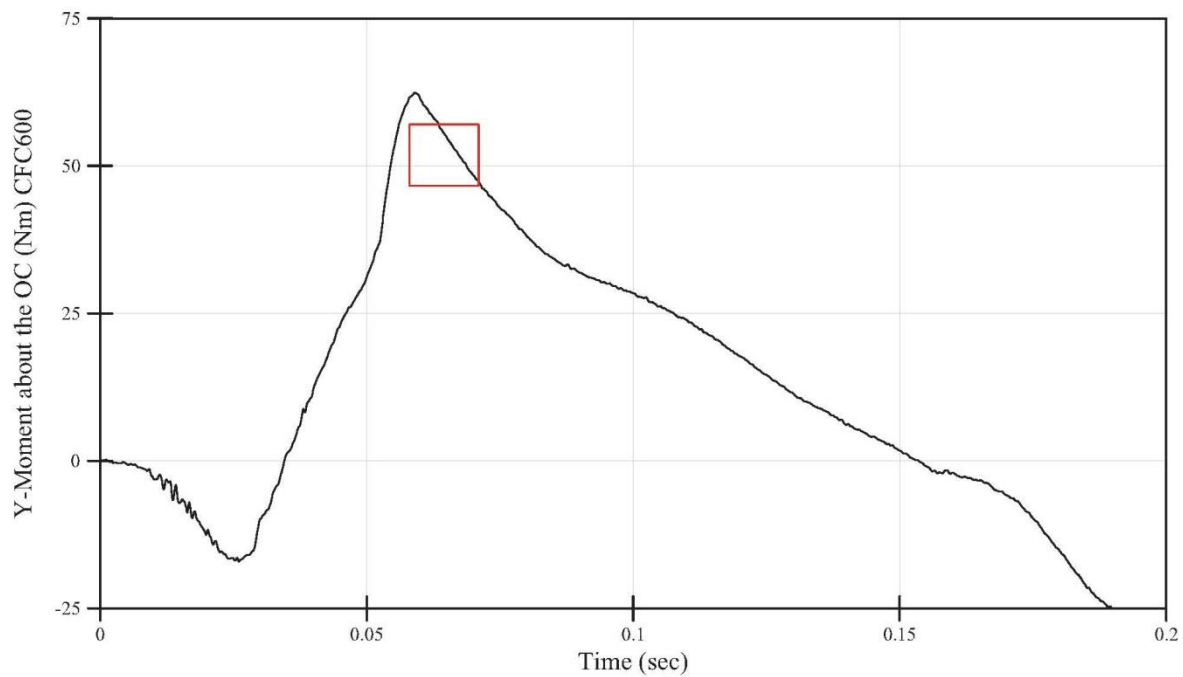


Software Version: 2.2

File Name: T016HEAD092513_01_DIADEMHeader_BINARYpp
09/25/2013 11:10:29.0000

Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 3.83 m/s

THOR Neck Flexion Certification
Y-Moment
Serial Number: T016



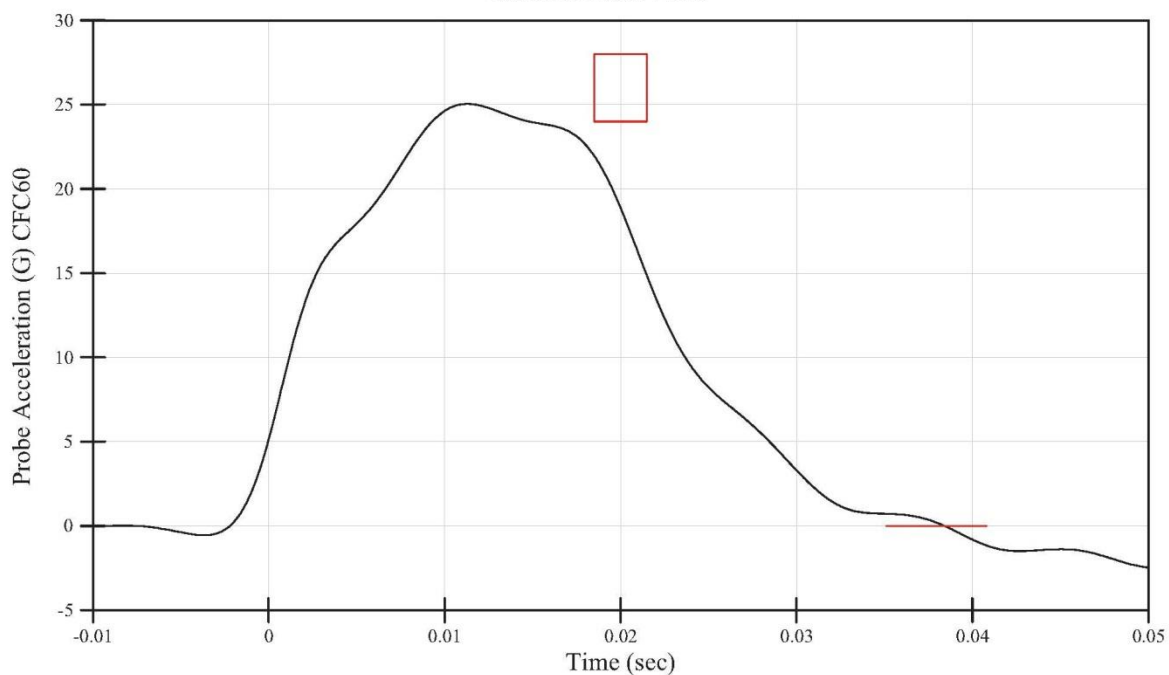
Software Version: 2.2

File Name: T016NECKFLEX092313_01_DIADEMHeader_BINARYpp
09/24/2013 07:01:32.0000

Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 3.83 m/s

THOR Neck Flexion Certification

Probe Acceleration
Serial Number: T016



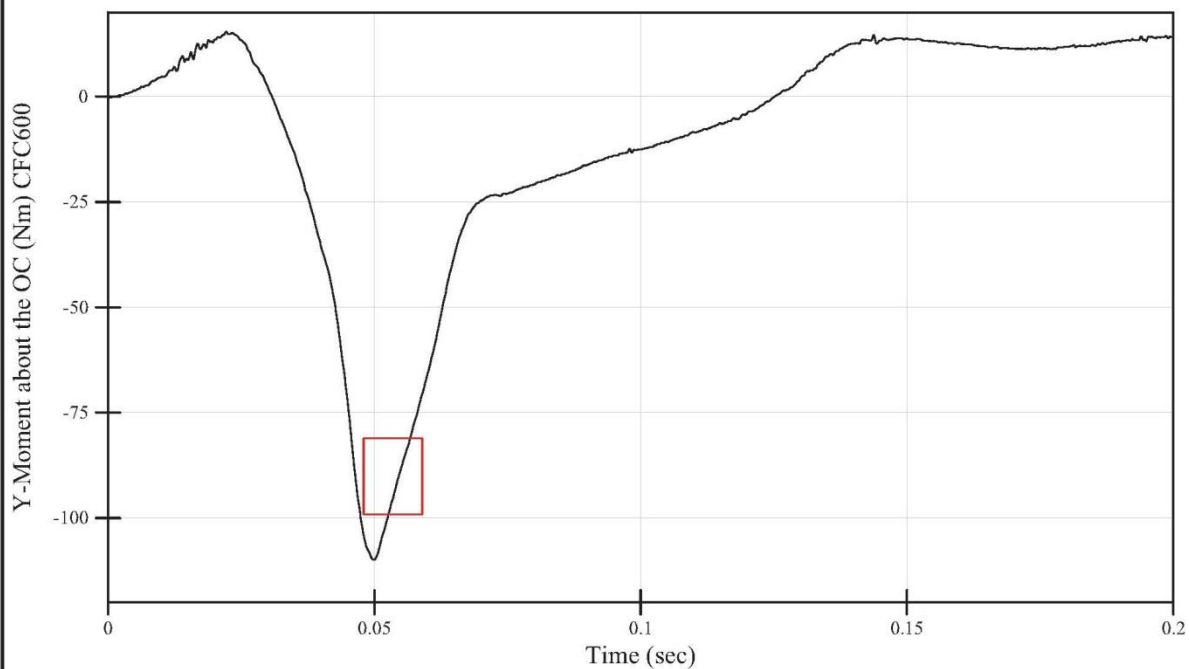
Software Version: 2.2

File Name: T016NECKFLEX092313_01_DiAdemHeader_BINARYpp
09/24/2013 07:01:32.0000

Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 3.73 m/s

THOR Neck Extension Certification

Y-Moment
Serial Number: T016

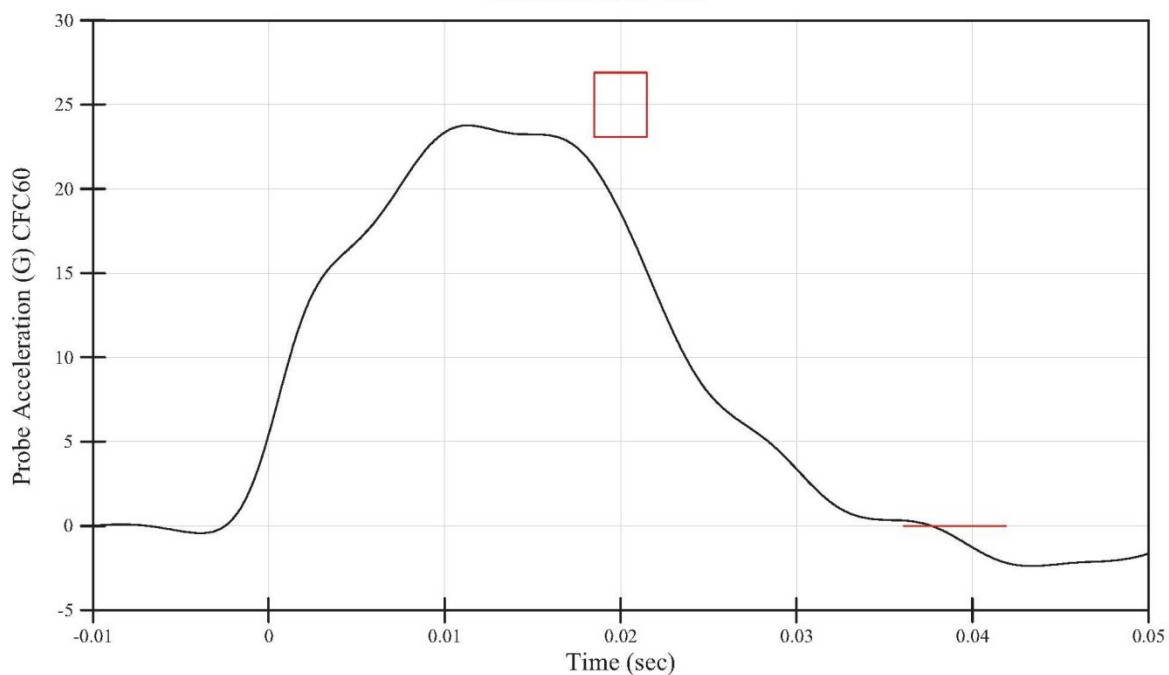


Software Version: 2.2

File Name: T016NECKEXT092413_01_DiAdemHeader_BINARYpp
09/24/2013 07:46:19.0000

Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 3.73 m/s

THOR Neck Extension Certification
Probe Acceleration
Serial Number: T016

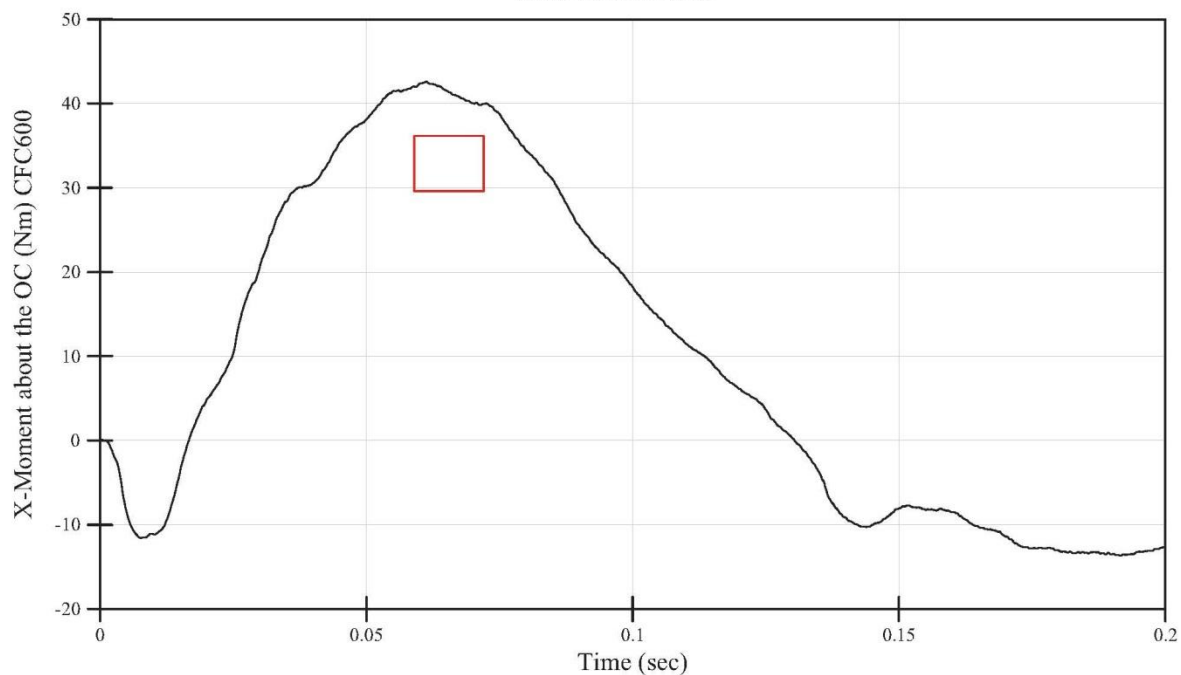


Software Version: 2.2

File Name: T016NECKEXT092413_01_DIADEMHeader_BINARYpp
09/24/2013 07:46:19.0000

Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 2.91 m/s

THOR Neck Left Lateral Flexion Certification
X-Moment
Serial Number: T016



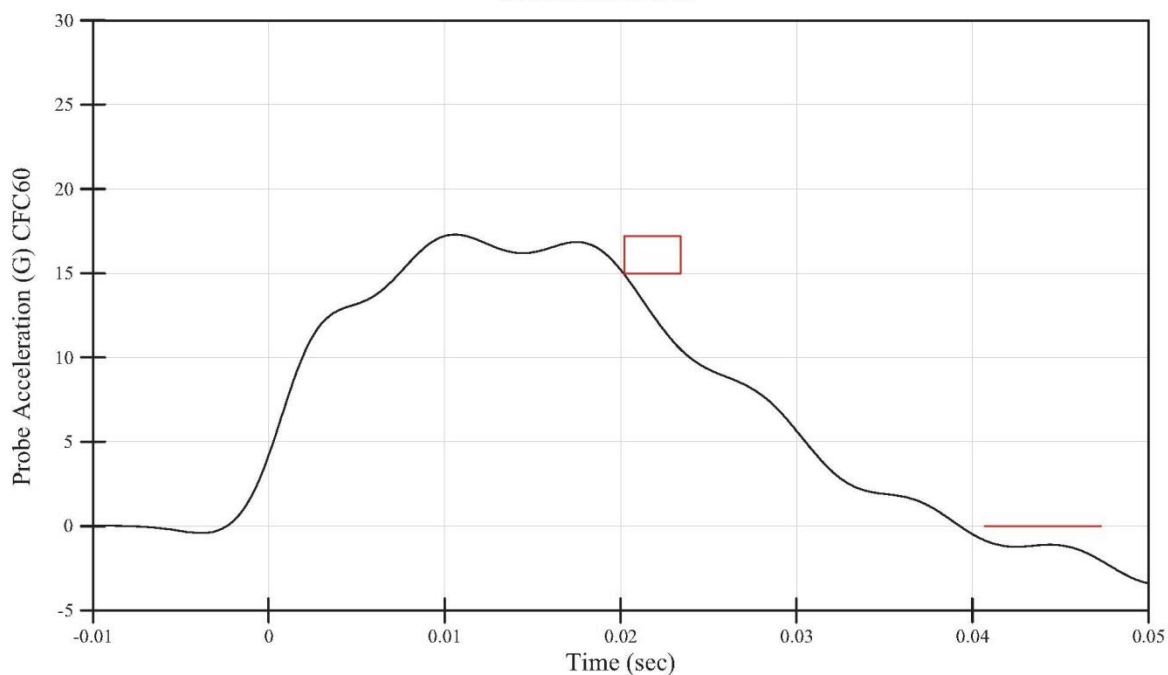
Software Version: 2.2

File Name: T016NECKLEFT092413_01_DIADEMHeader_BINARYpp
09/24/2013 08:59:19.0000

Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 2.91 m/s

THOR Neck Left Lateral Flexion Certification

Probe Acceleration
Serial Number: T016



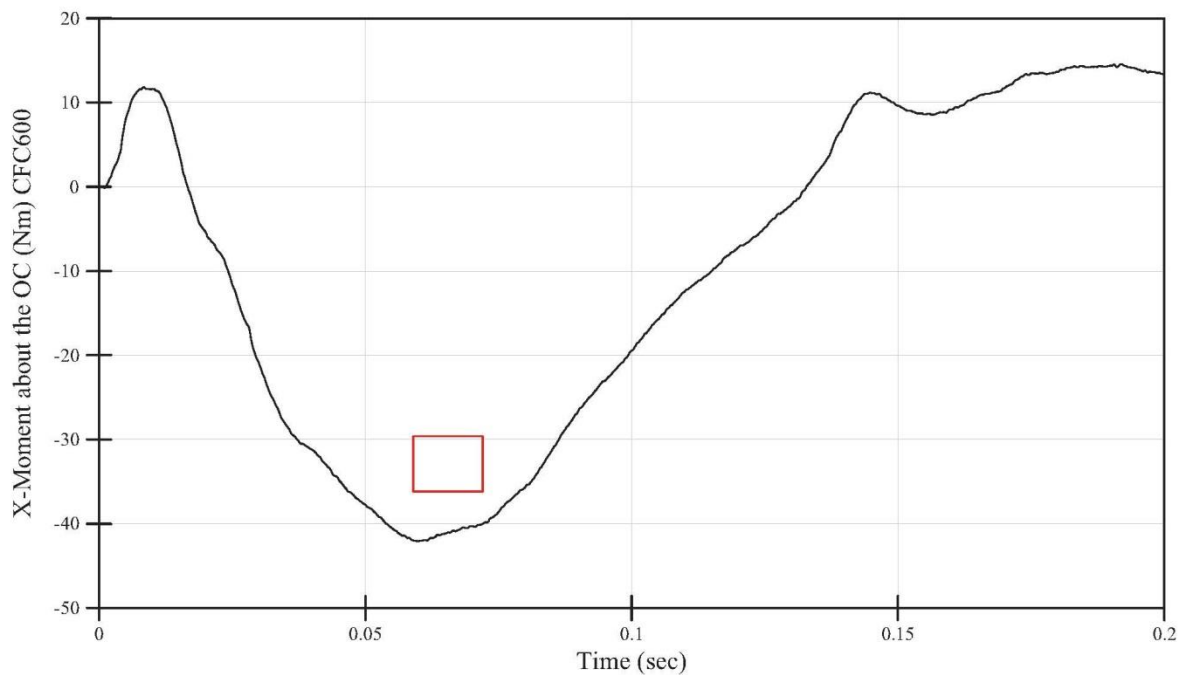
Software Version: 2.2

File Name: T016NECKLEFT092413_01_DiAdemHeader_BINARYpp
09/24/2013 08:59:19.0000

Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 2.94 m/s

THOR Neck Right Lateral Flexion Certification

X-Moment
Serial Number: T016



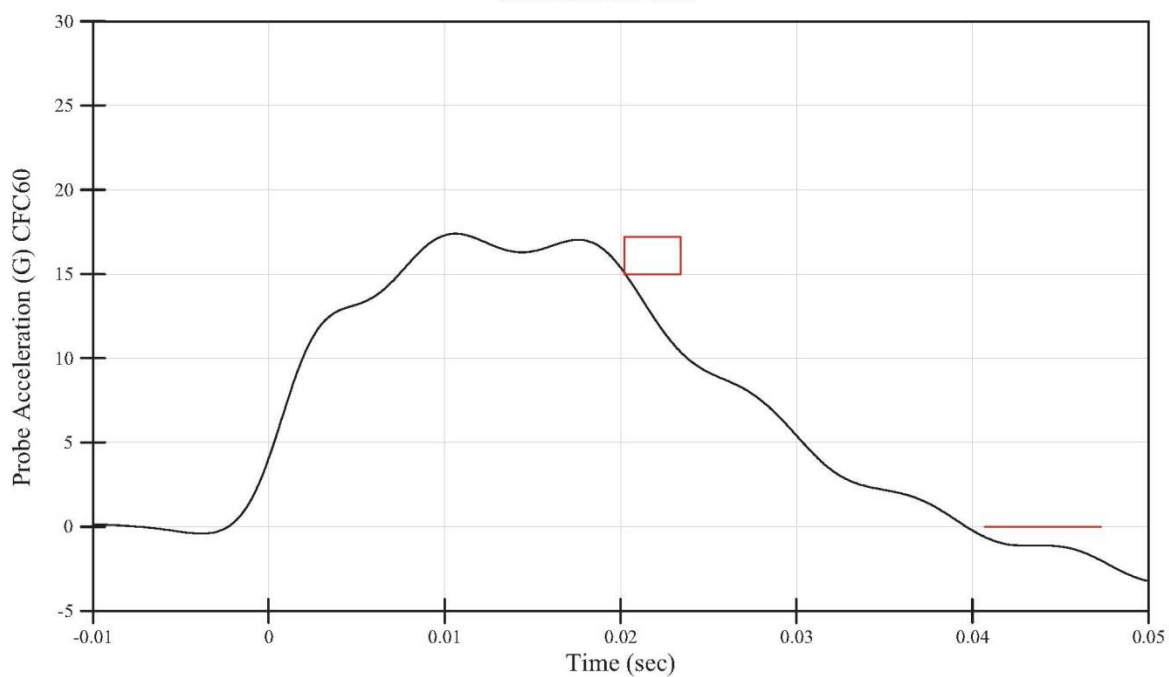
Software Version: 2.2

File Name: T016NECKRIGHT092413_01_DiAdemHeader_BINARYpp
09/24/2013 08:23:43.0000

Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 2.94 m/s

THOR Neck Right Lateral Flexion Certification

Probe Acceleration
Serial Number: T016



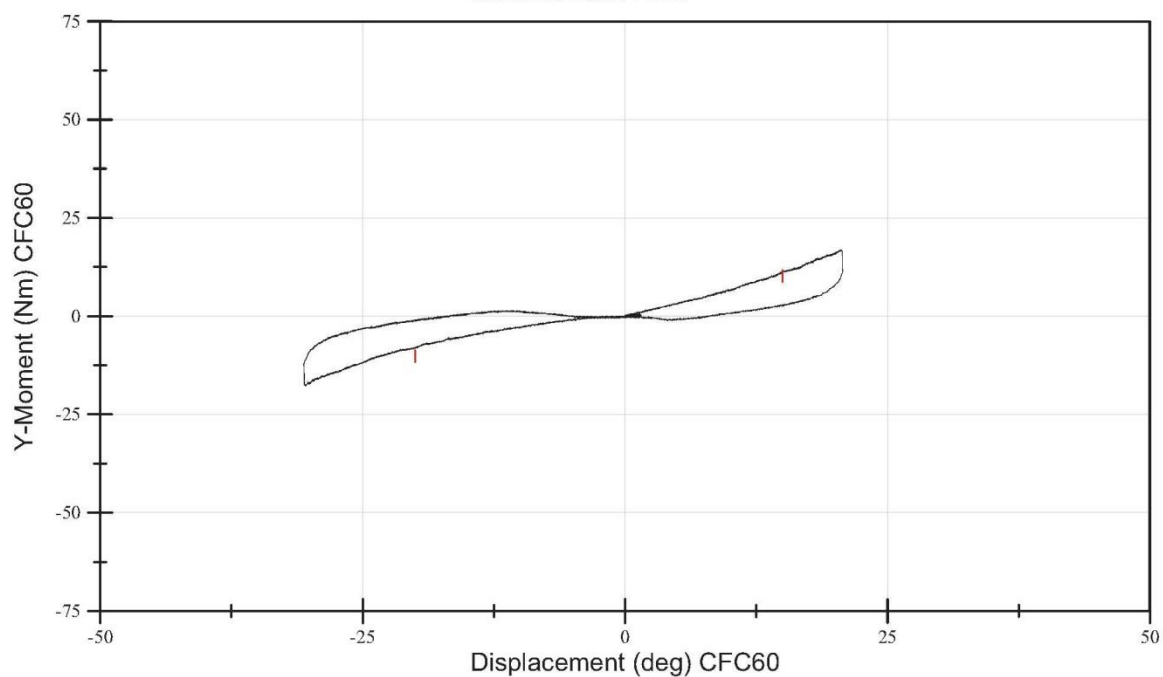
Software Version: 2.2

File Name: T016NECKRIGHT092413_01_DIAdemHeader_BINARYpp
09/24/2013 08:23:43.0000

Test Temperature: 72 degrees
Relative Humidity: 51%
Test Velocity: 0 m/s

THOR Occipital Condyle Quasi-Static Certification

Displacement vs. Torque
Serial Number: T016

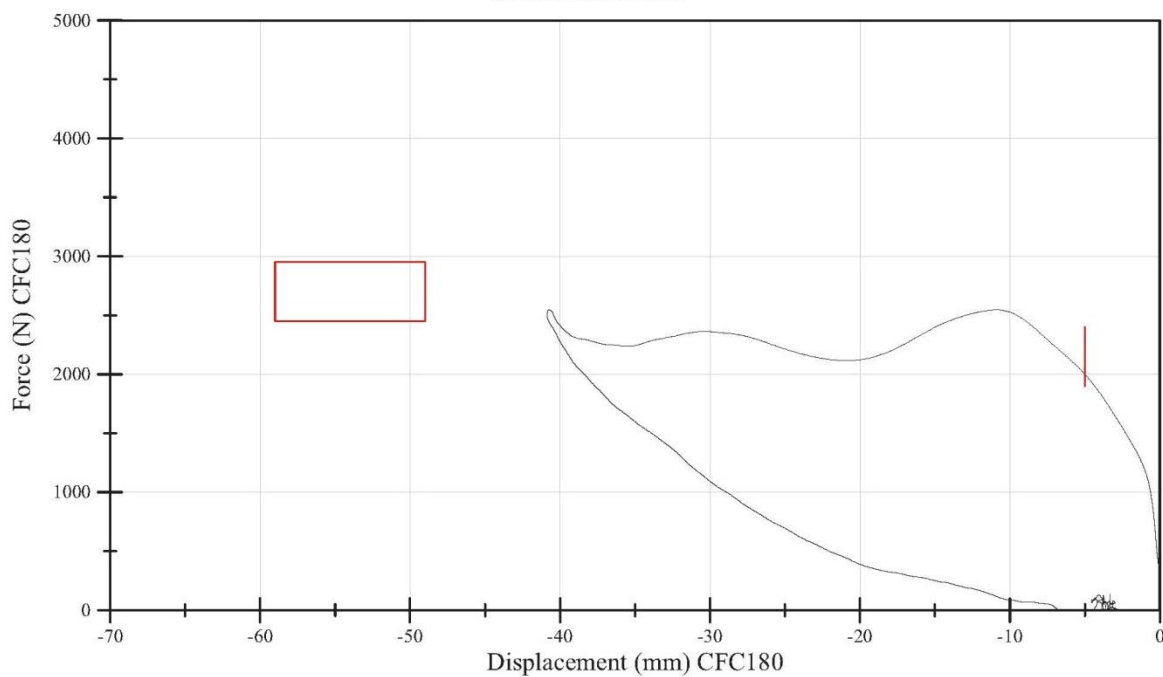


Software Version: 2.2

File Name: T016 OC 091813_01
09/19/2013 14:51:47.0000

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 4.31 m/s

THOR Upper Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T016

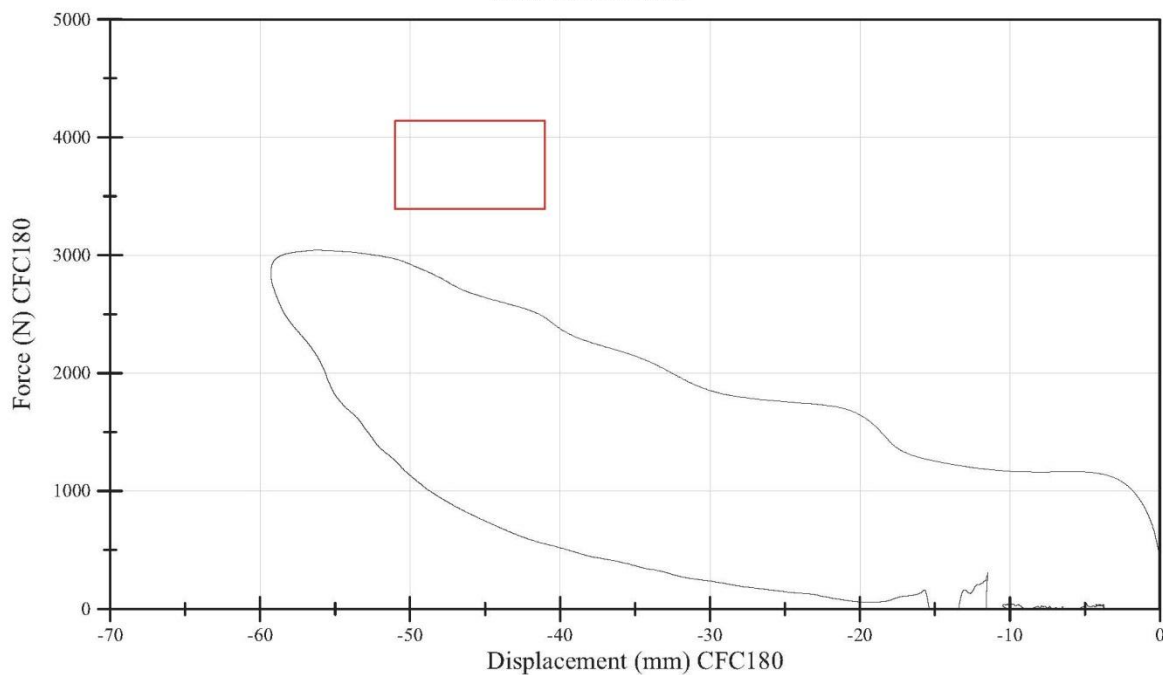


Software Version: 2.2

File Name: T016THORAXUPPER092513_01_DIADEMHeader_BINARYpp
09/25/2013 10:28:40.0000

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 4.31 m/s

THOR Lower Left Oblique Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T016

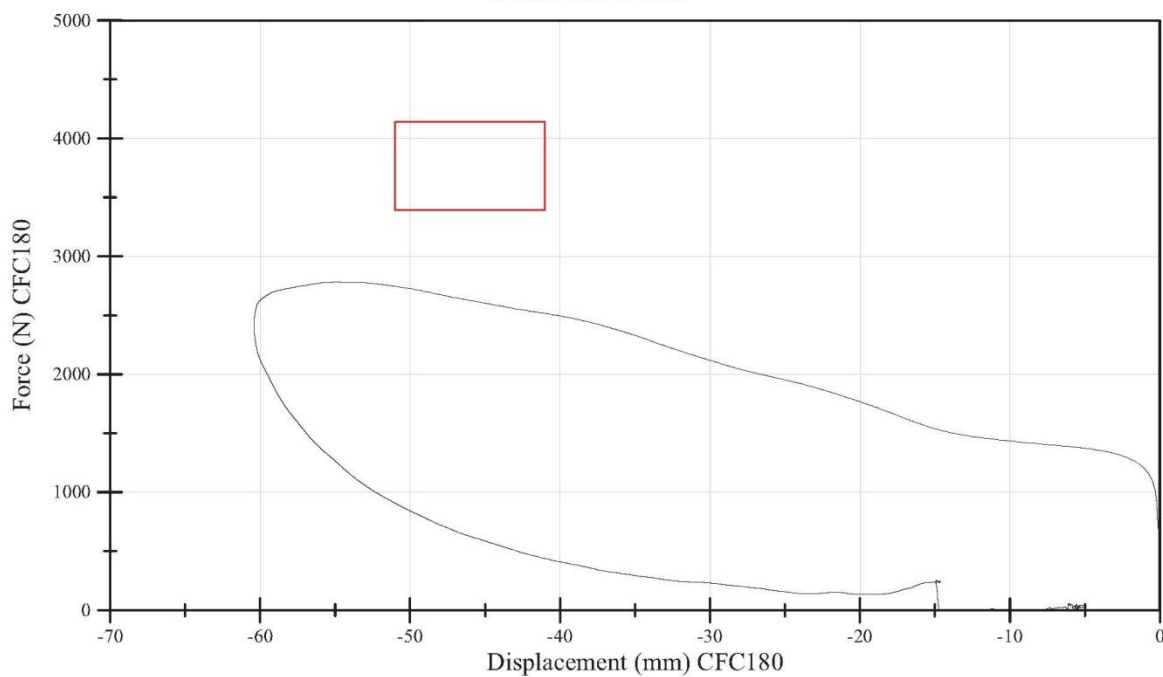


Software Version: 2.2

File Name: T016THORAXLEFT092513_01_DIADEMHeader_BINARYpp
09/25/2013 09:37:54.0000

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 4.31 m/s

THOR Lower Right Oblique Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T016

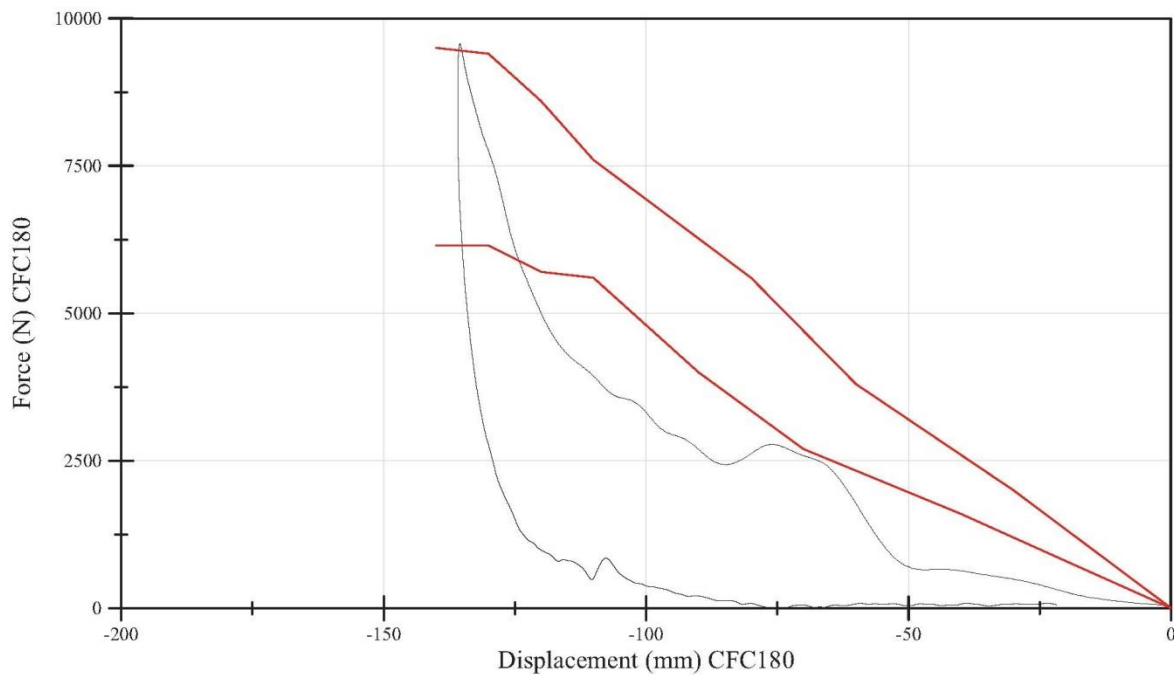


Software Version: 2.2

File Name: T016THORAXRIGHT092513_01_DIADEMHeader_BINARYpp
09/25/2013 09:39:26.0000

Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 7.94 m/s

THOR Upper Abdomen Certification
Abdomen Displacement vs. Probe Force
Serial Number: T016

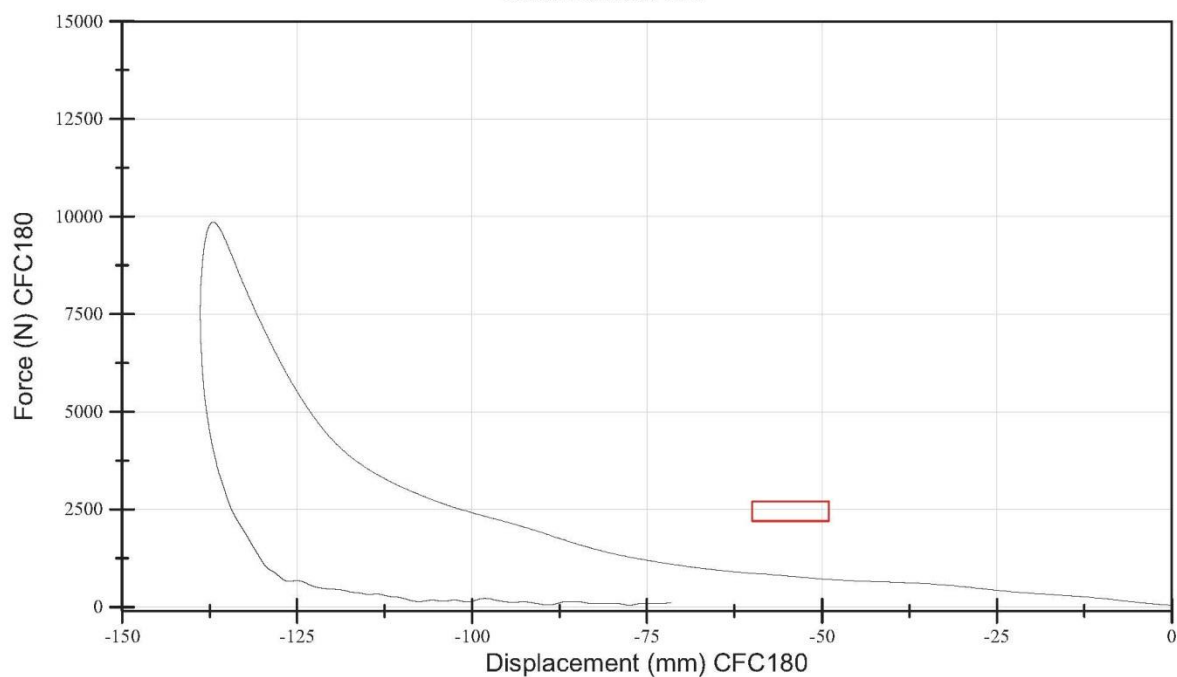


Software Version: 2.2

File Name: T016ABDOMENUPPER092413_01_DIADEMHeader_BINARYpp
09/24/2013 14:27:18.0000

Test Temperature: degrees
Relative Humidity: %
Test Velocity: m/s

THOR Lower Abdomen Certification
Lower Abdomen Deflection (via PENXG and T12XG) vs. Probe Force
Serial Number: 016



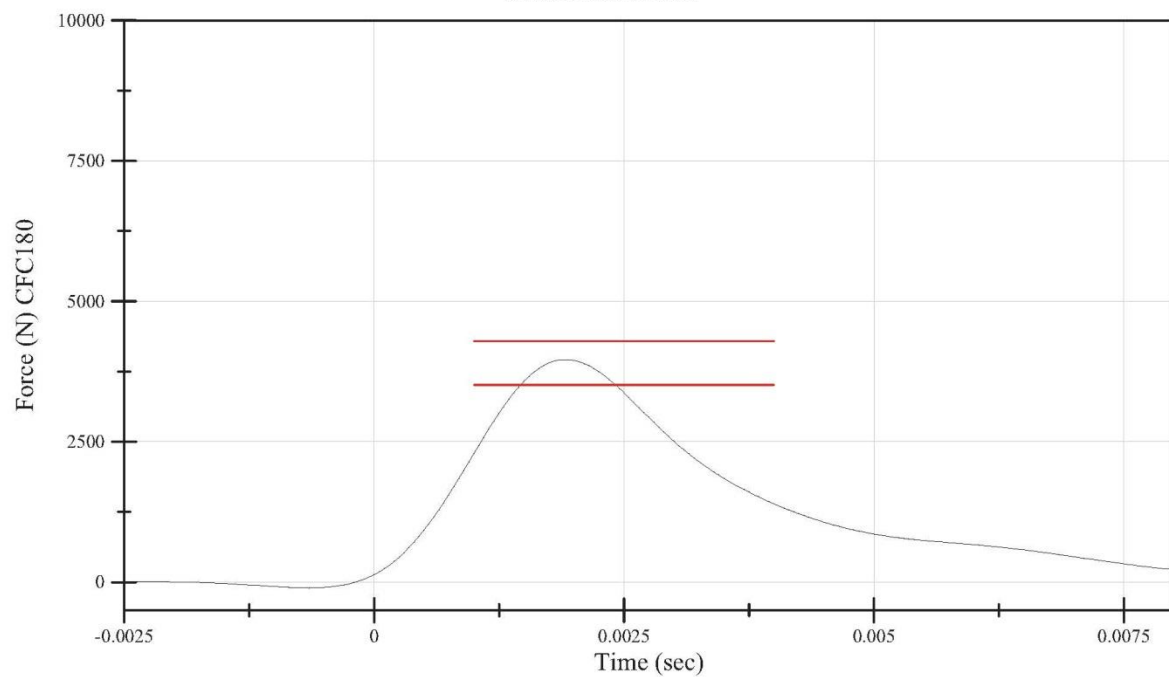
Software Version:

File Name: T016ABDOMENLOWER092413_01_DIADEMHeader_BINARYp

09/24/2013 13:10:11.0000

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 2.55 m/s

THOR Left Femur Certification
Probe Force
Serial Number: T015



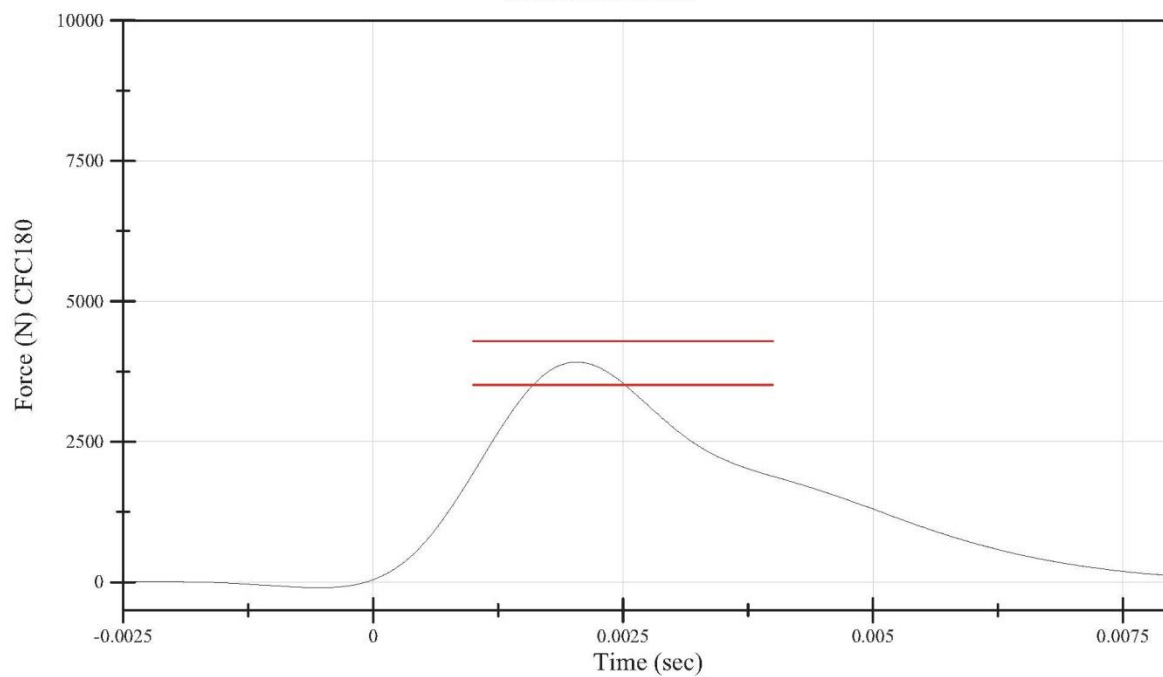
Software Version: 2.2

File Name: T016FEMURLEFT092613_01_DIADEMHeader_BINARYpp

09/26/2013 13:23:16.0000

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 2.55 m/s

THOR Right Femur Certification
Probe Force
Serial Number: T015



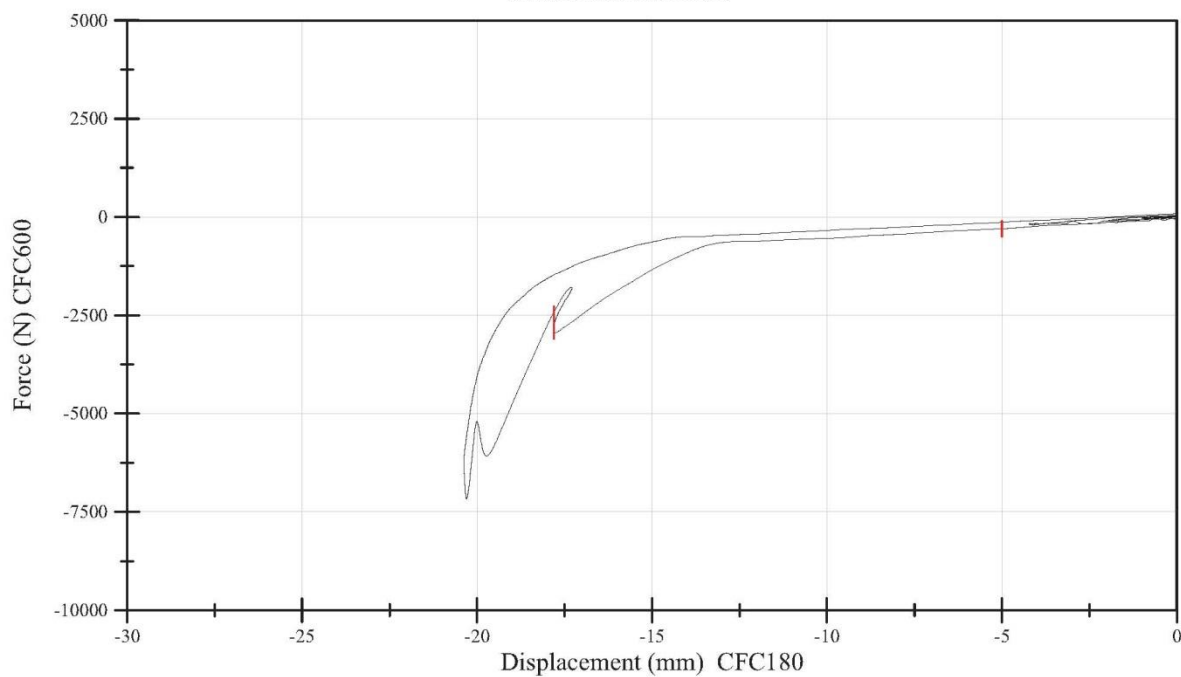
Software Version: 2.2

File Name: T016FEMURRIGHT092613_01_DIAdemHeader_BINARYpp
09/26/2013 13:25:13.0000

THOR 016 LEG CALIBRATIONS
LX0018/ LX0019

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 2.72 m/s

THOR Left Knee Certification
Femur Force vs. Knee Displacement
Serial Number: LX0019

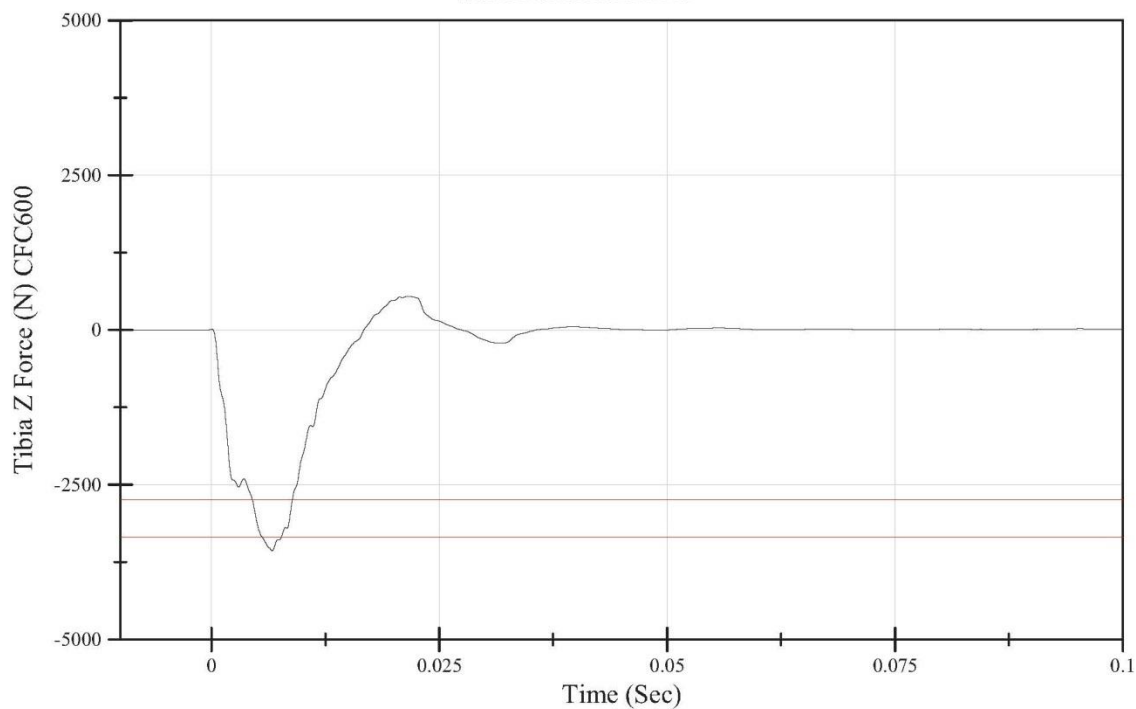


Software Version: 2.2

File Name: D2103665B_092613_01_DIADEMHeader_BINARYpp
09/26/2013 09:33:48.0000

Test Temperature: 70.4 degrees
Relative Humidity: 39.8%
Test Velocity: 4.00 m/s

THOR Left Foot Heel Certification
Tibia Load
Serial Number: LX0019

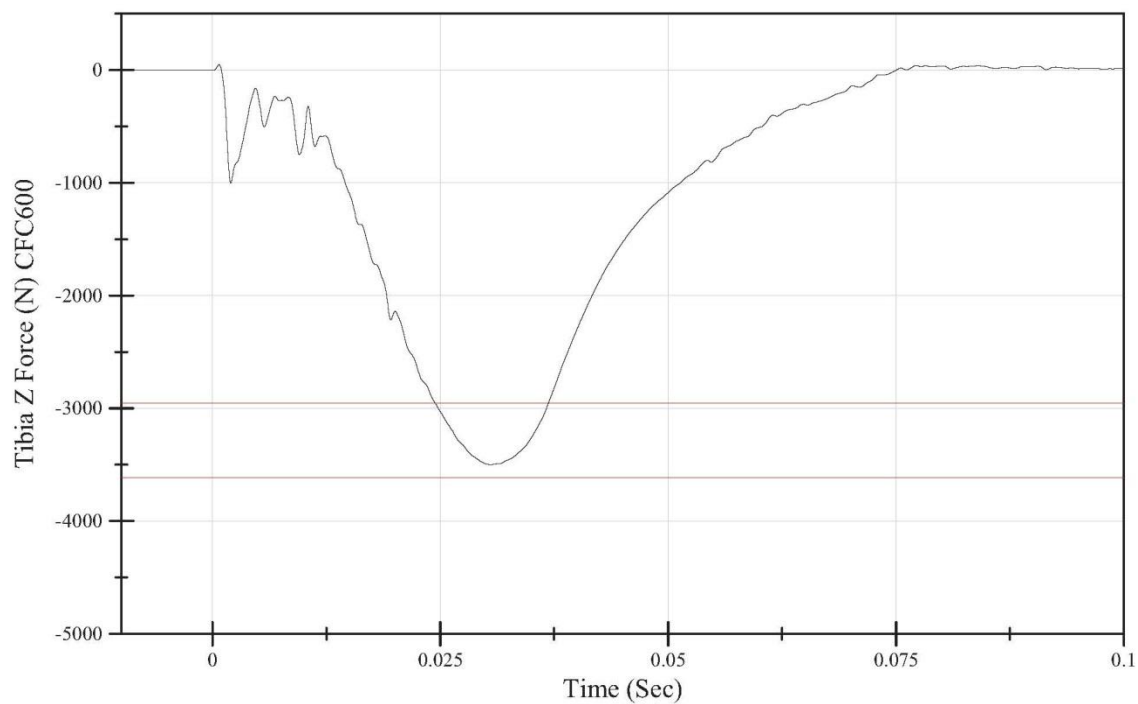


Software Version: 2.2

File Name: Heel_LX0019_2013_09_24 01 processed
09/24/2013 14:14:17.0000

Test Temperature: 70.8 degrees
Relative Humidity: 36.6%
Test Velocity: 5.03 m/s

THOR Left Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0019

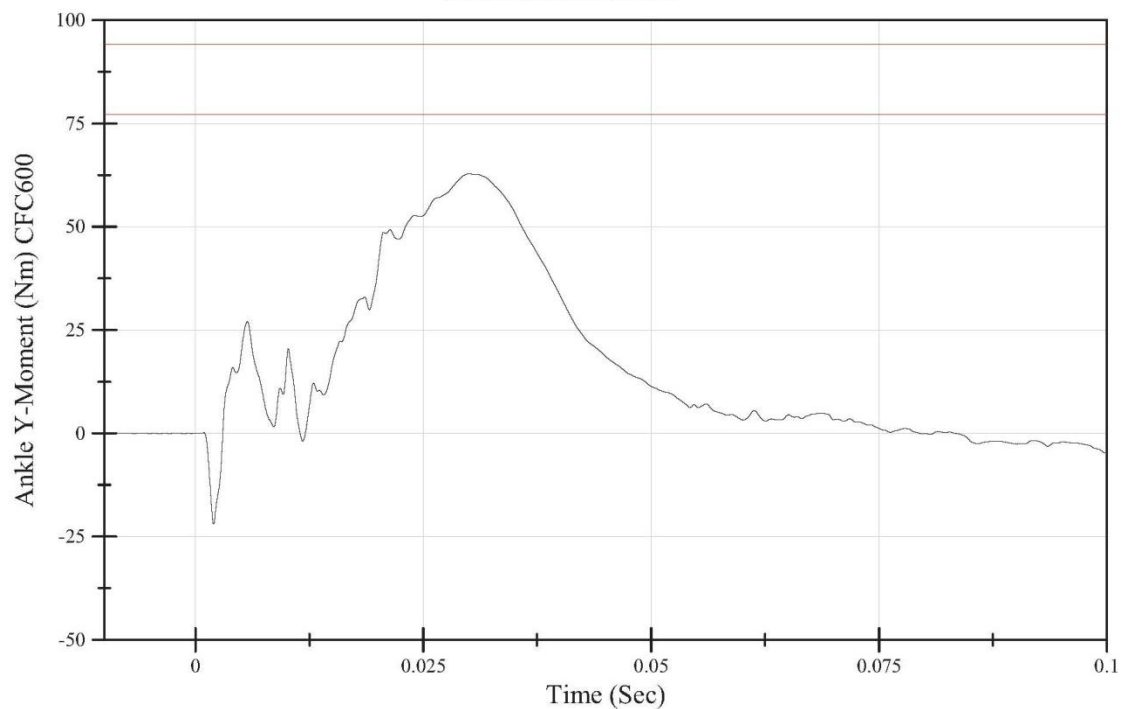


Software Version: 2.2

File Name: Ball_LX0019_2013_09_23 01 processed
09/24/2013 10:51:15.0000

Test Temperature: 70.8 degrees
Relative Humidity: 36.6%
Test Velocity: 5.03 m/s

THOR Left Foot Dorsiflexion Certification
Ankle Y-Moment
Serial Number: LX0019

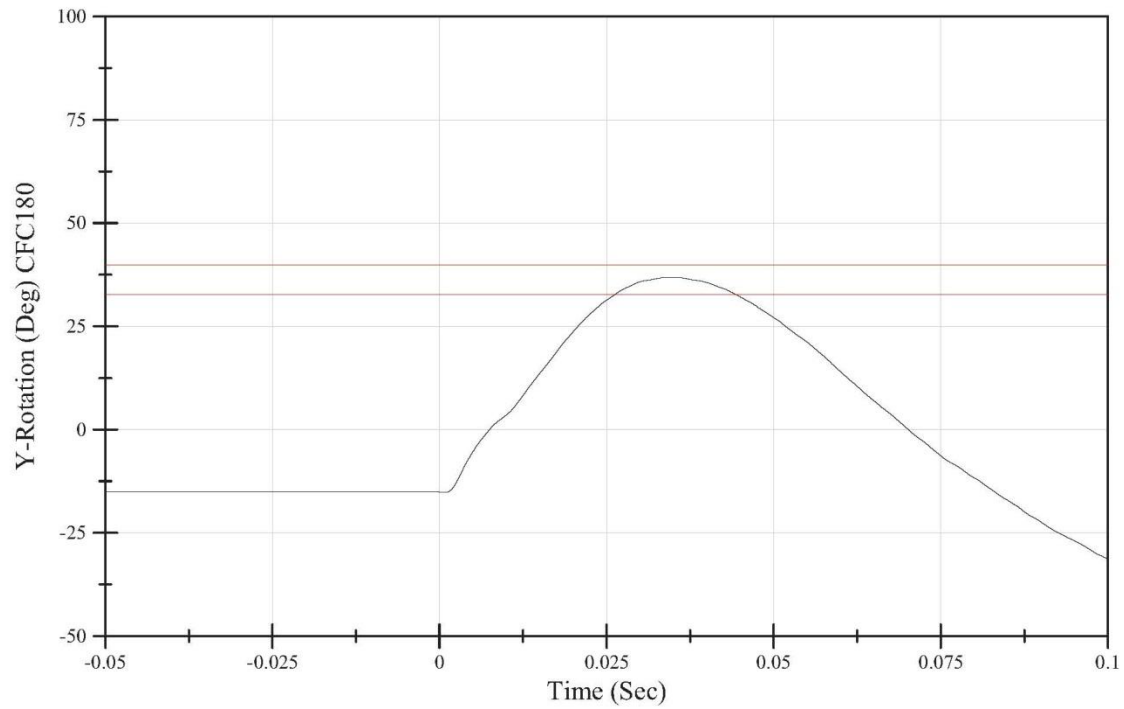


Software Version: 2.2

File Name: Ball_LX0019_2013_09_23 01 processed
09/24/2013 10:51:15.0000

Test Temperature: 70.8 degrees
Relative Humidity: 36.6%
Test Velocity: 5.03 m/s

THOR Left Foot Dorsiflexion Certification
Ankle Y-Rotation
Serial Number: LX0019

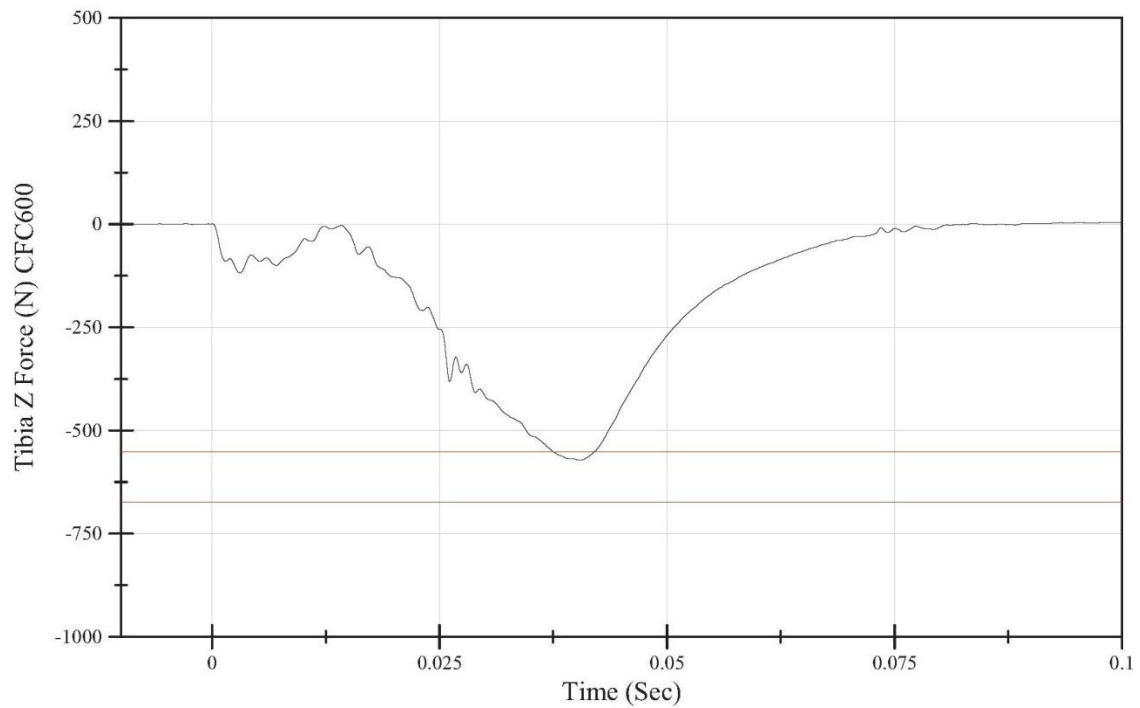


Software Version: 2.2

File Name: Ball_LX0019_2013_09_23 01 processed
09/24/2013 10:51:15.0000

Test Temperature: 71.1 degrees
Relative Humidity: 38.4%
Test Velocity: 1.98 m/s

THOR Left Foot Eversion Certification
Tibia Load
Serial Number: LX0019

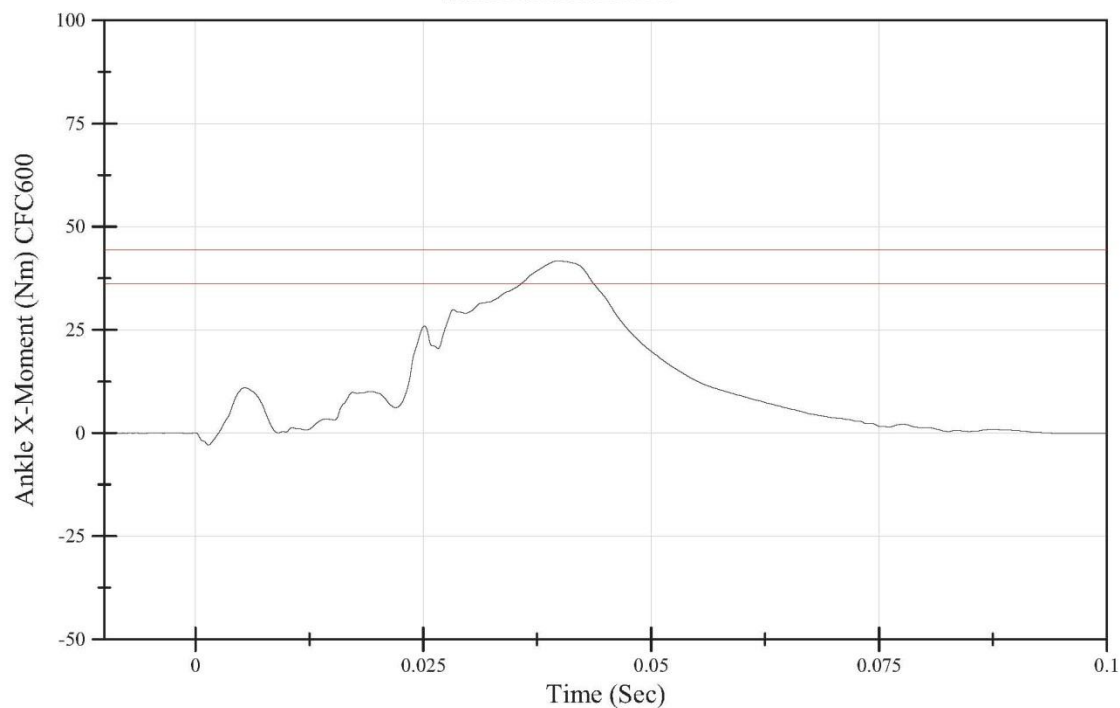


Software Version: 2.2

File Name: Ever_LX0019_2013_09_24 02 processed
09/24/2013 13:30:02.0000

Test Temperature: 71.1 degrees
Relative Humidity: 38.4%
Test Velocity: 1.98 m/s

THOR Left Foot Eversion Certification
Ankle Moment
Serial Number: LX0019

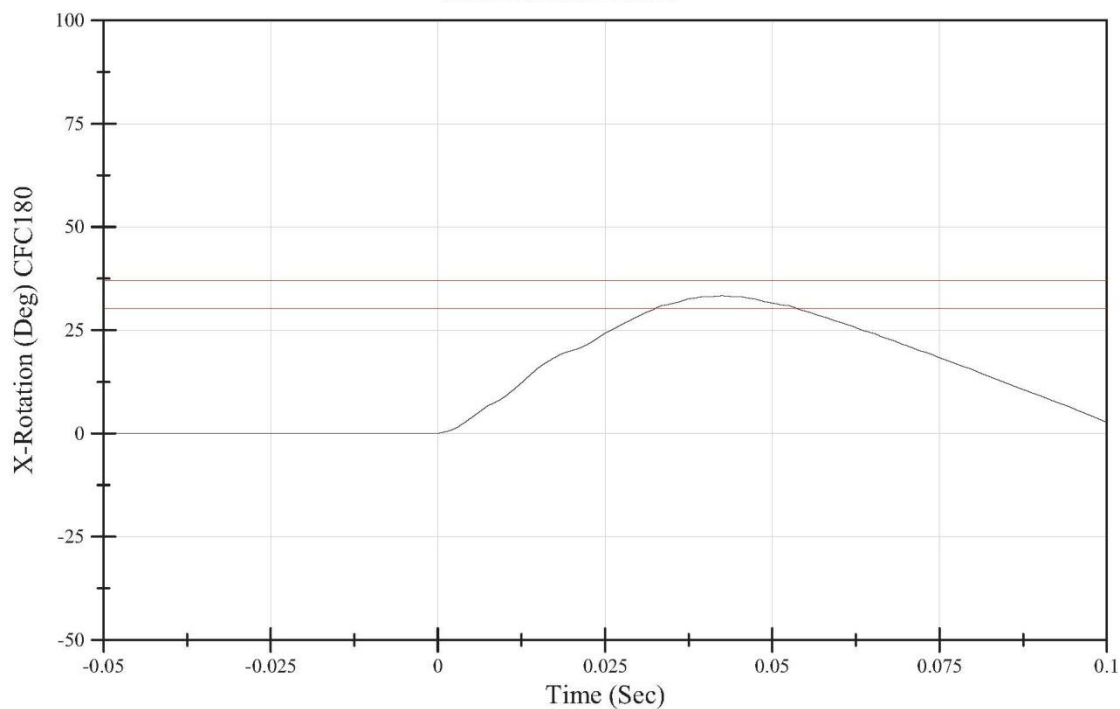


Software Version: 2.2

File Name: Ever_LX0019_2013_09_24 02 processed
09/24/2013 13:30:02.0000

Test Temperature: 71.1 degrees
Relative Humidity: 38.4%
Test Velocity: 1.98 m/s

THOR Left Foot Eversion Certification
Ankle X-Rotation
Serial Number: LX0019

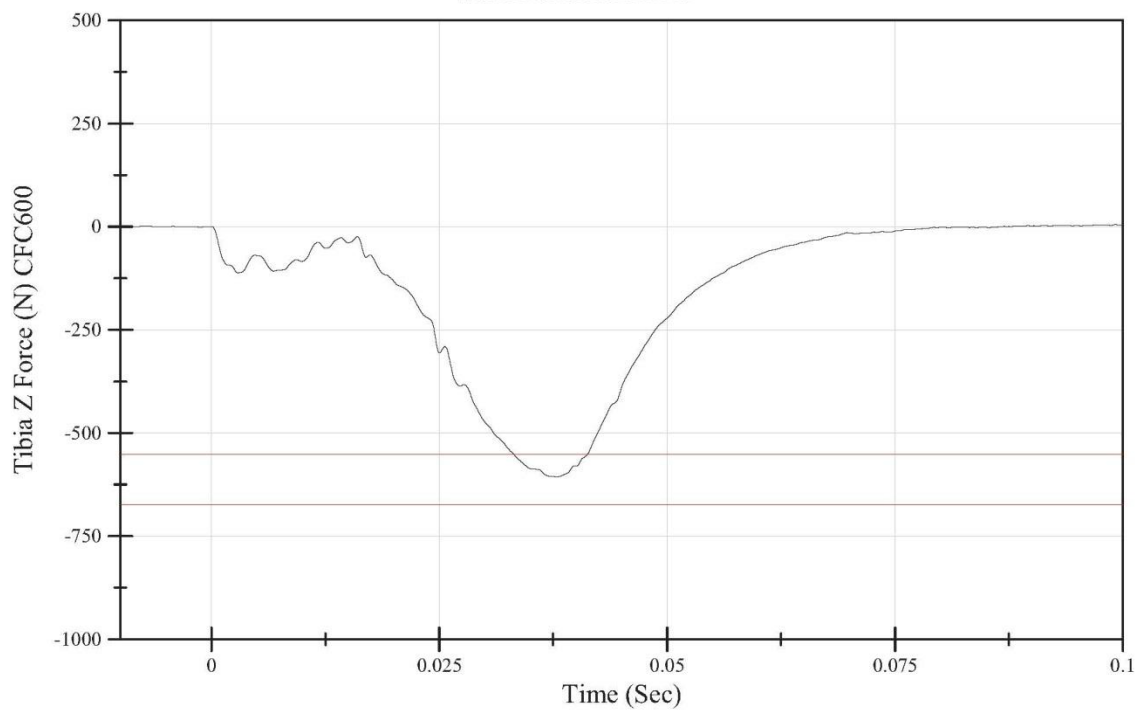


Software Version: 2.2

File Name: Ever_LX0019_2013_09_24 02 processed
09/24/2013 13:30:02.0000

Test Temperature: 70.7 degrees
Relative Humidity: 37.7%
Test Velocity: 1.95 m/s

THOR Left Foot Inversion Certification
Tibia Load
Serial Number: LX0019

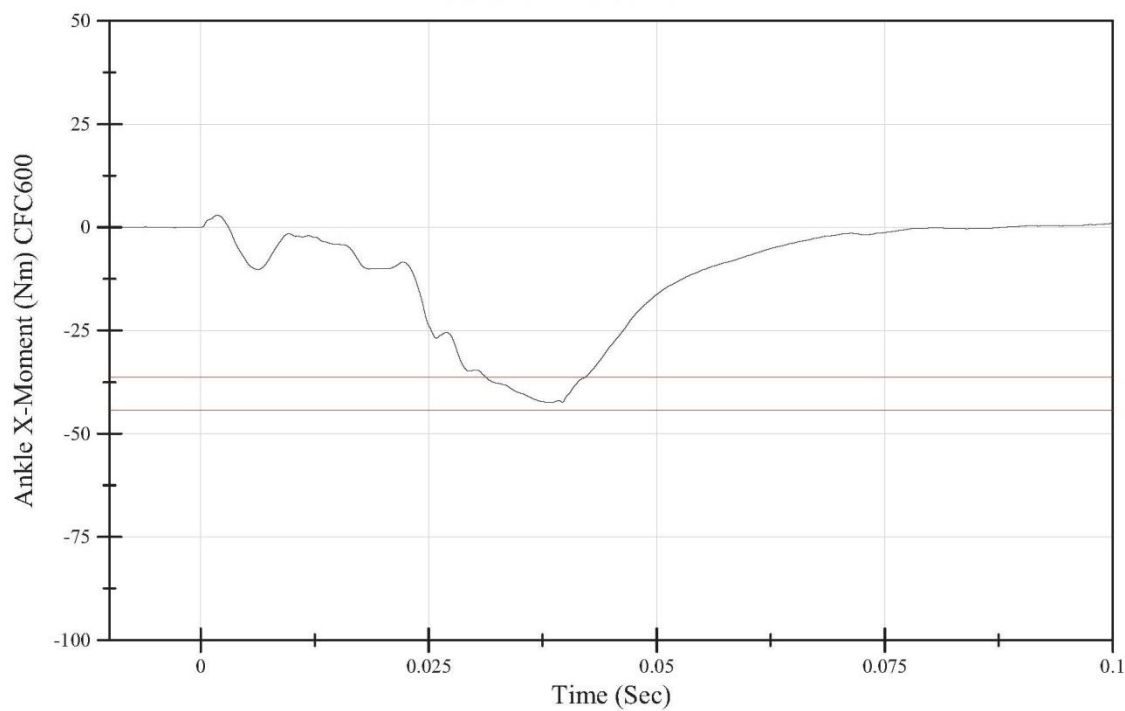


Software Version: 2.2

File Name: Inver_LX0019_2013_09_24 01 processed.dat
09/24/2013 12:25:35.0000

Test Temperature: 70.7 degrees
Relative Humidity: 37.7%
Test Velocity: 1.95 m/s

THOR Left Foot Inversion Certification
Ankle Moment
Serial Number: LX0019

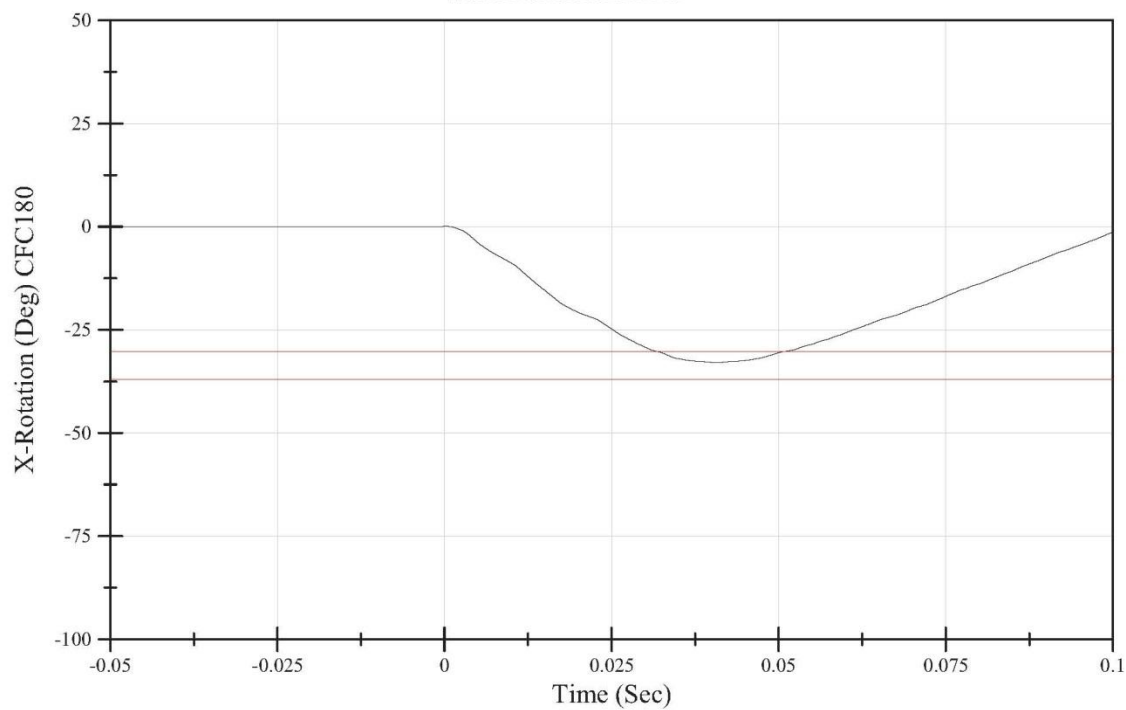


Software Version: 2.2

File Name: Inver_LX0019_2013_09_24 01 processed.dat
09/24/2013 12:25:35.0000

Test Temperature: 70.7 degrees
Relative Humidity: 37.7%
Test Velocity: 1.95 m/s

THOR Left Foot Inversion Certification
Ankle X-Rotation
Serial Number: LX0019

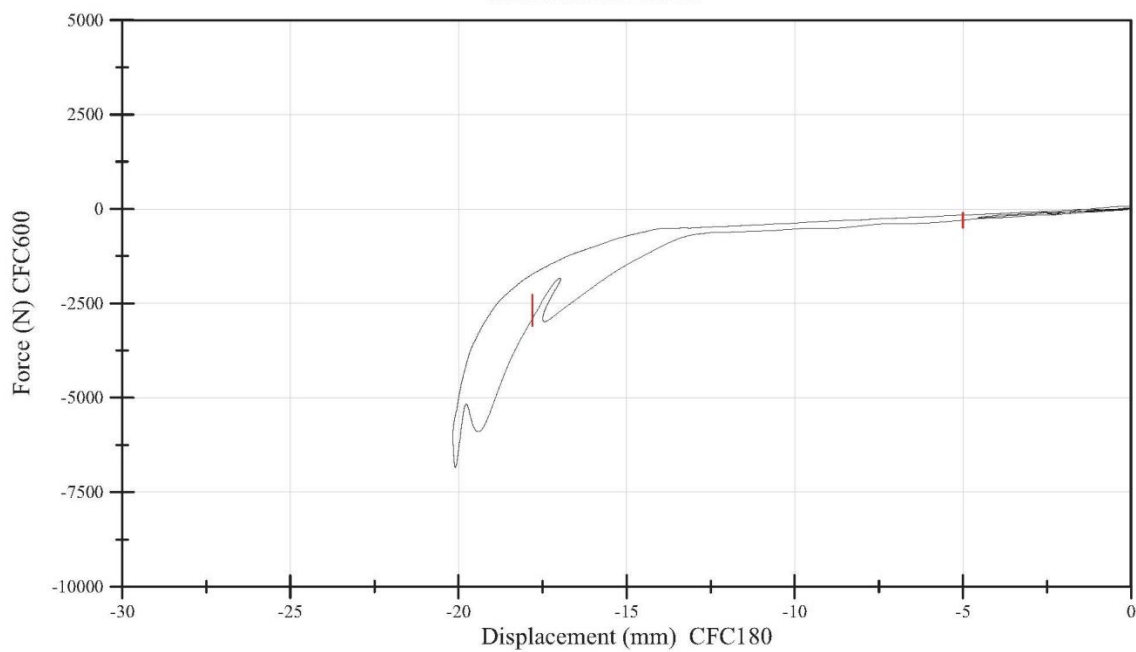


Software Version: 2.2

File Name: Inver_LX0019_2013_09_24 01 processed.dat
09/24/2013 12:25:35.0000

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 2.72 m/s

THOR Right Knee Certification
Femur Force vs. Knee Displacement
Serial Number: LX0018

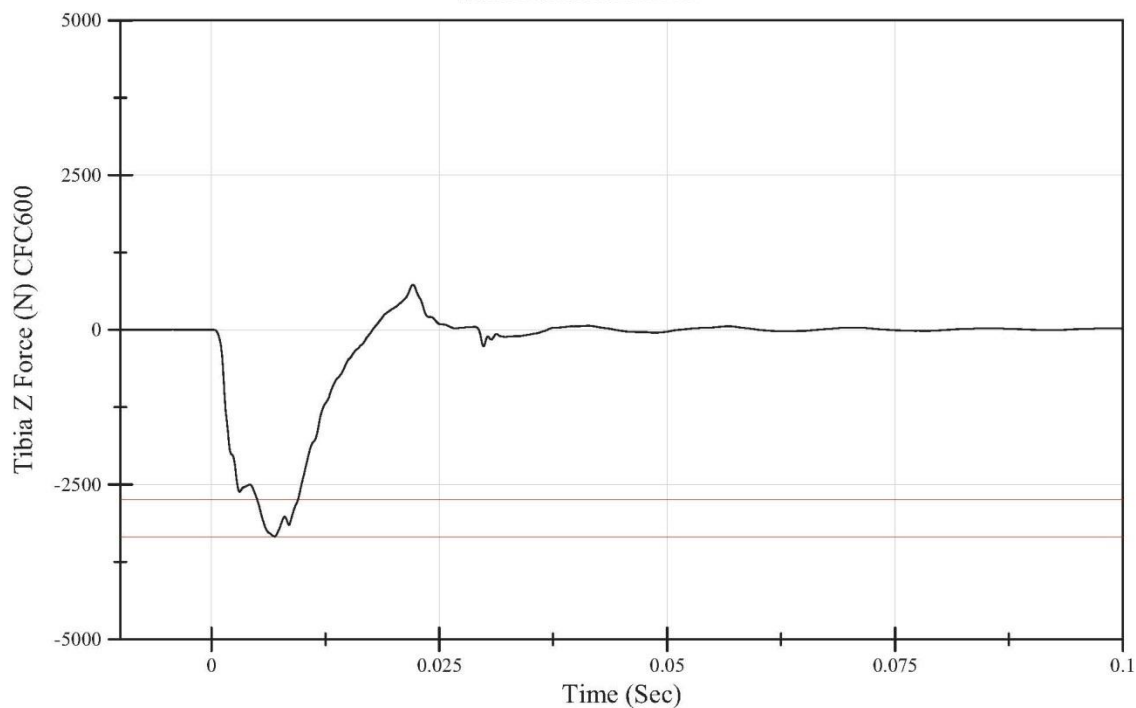


Software Version: 2.2

File Name: D2103657B_092613_01_DIADEMHeader_BINARYpp
09/26/2013 08:54:58.0000

Test Temperature: 70.2 degrees
Relative Humidity: 42.6%
Test Velocity: 4.03 m/s

THOR Right Foot Heel Certification
Tibia Load
Serial Number: LX0018

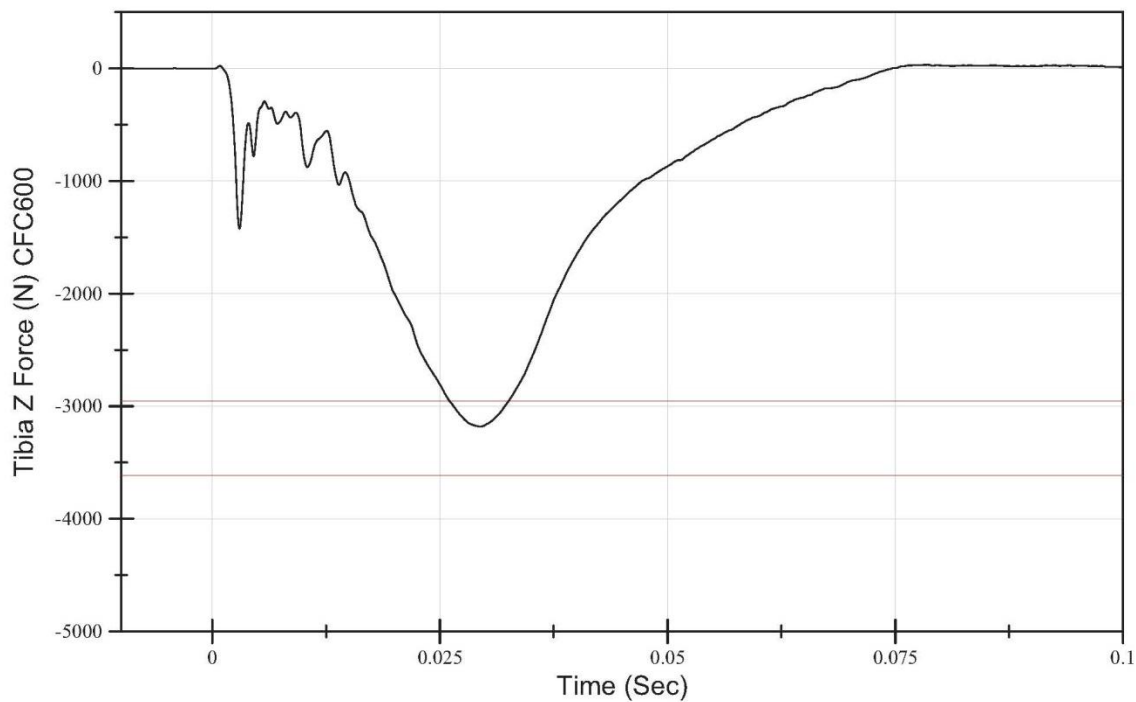


Software Version: 2.2

File Name: Heel_LX0018_2013_09_25 01 processed
09/25/2013 15:41:20.0000

Test Temperature: 70.7 degrees
Relative Humidity: 41.3%
Test Velocity: 5.03 m/s

THOR Right Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0018

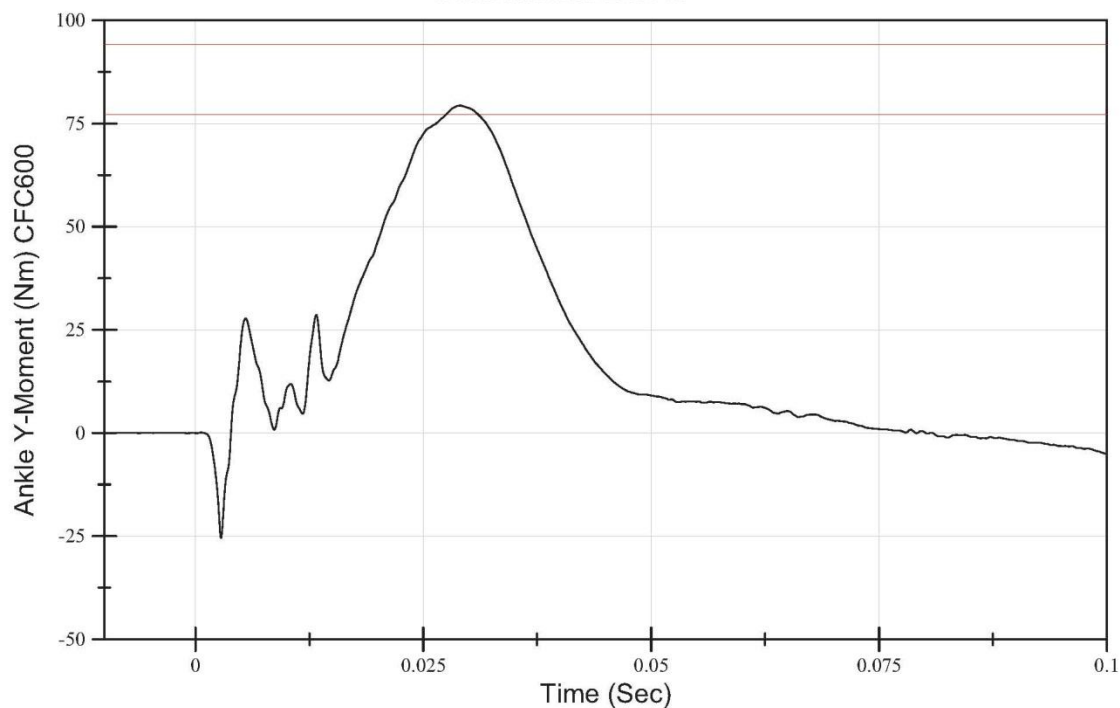


Software Version: 2.2

File Name: Ball_LX0018_2013_09_25 01 processed
09/25/2013 13:53:31.0000

Test Temperature: 70.7 degrees
Relative Humidity: 41.3%
Test Velocity: 5.03 m/s

THOR Right Foot Dorsiflexion Certification
Ankle Y-Moment
Serial Number: LX0018

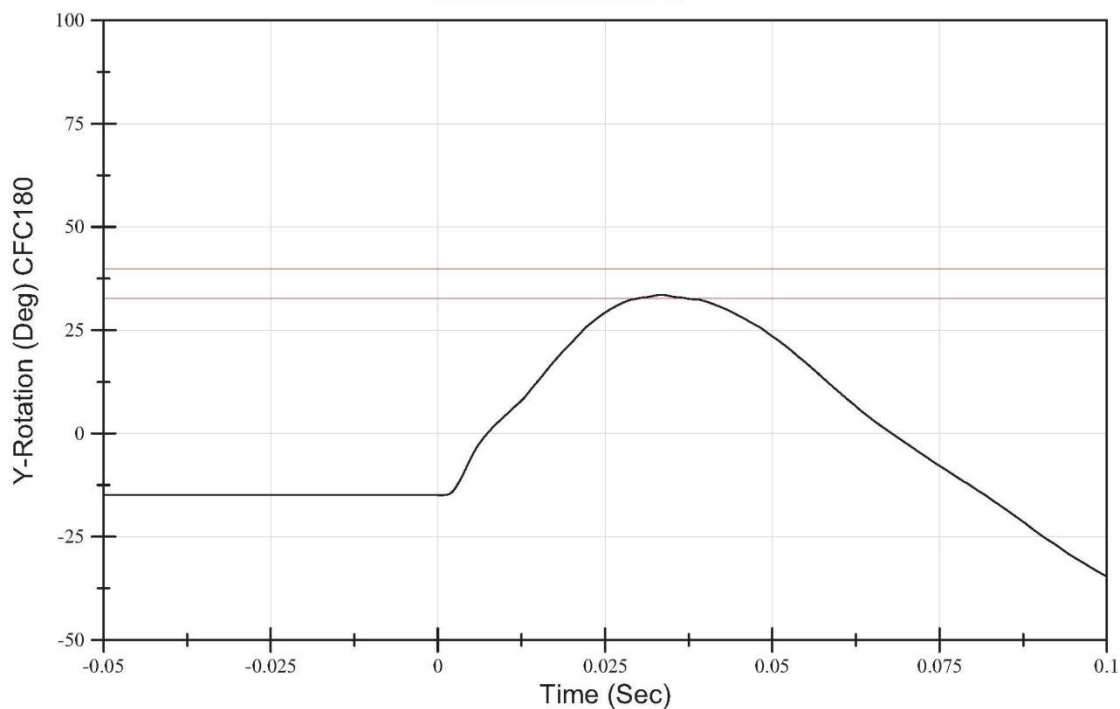


Software Version: 2.2

File Name: Ball_LX0018_2013_09_25 01 processed
09/25/2013 13:53:31.0000

Test Temperature: 70.7 degrees
Relative Humidity: 41.3%
Test Velocity: 5.03 m/s

THOR Right Foot Dorsiflexion Certification
Ankle Y-Rotation
Serial Number: LX0018

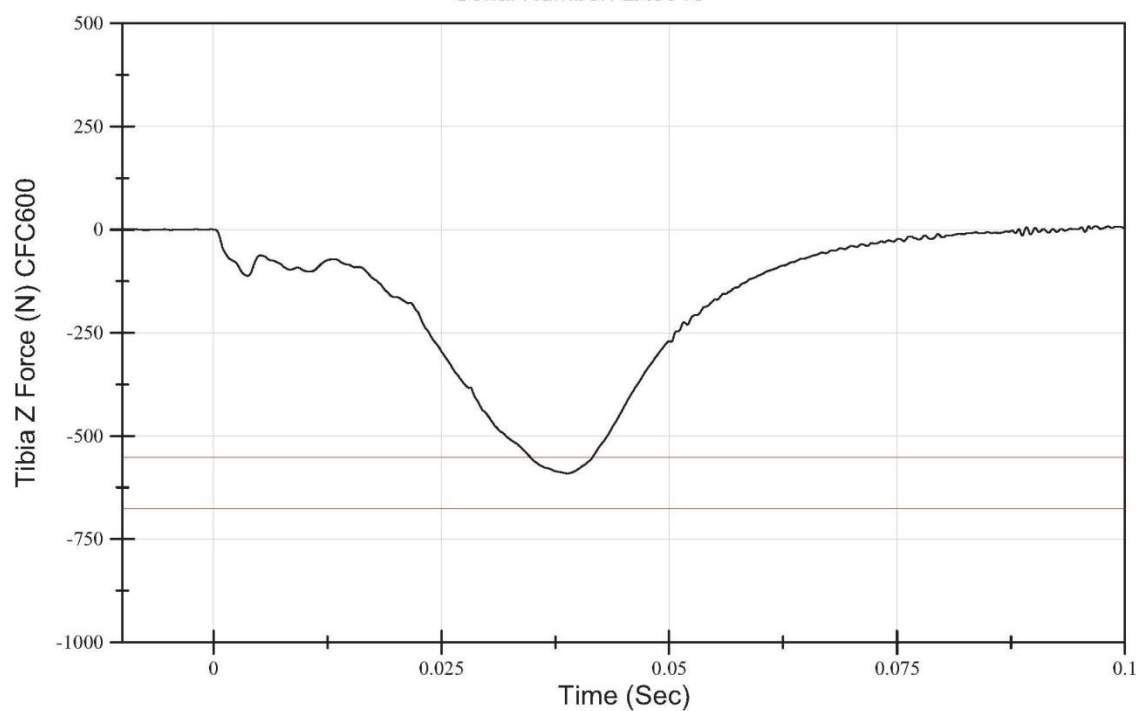


Software Version: 2.2

File Name: Ball_LX0018_2013_09_25 01 processed
09/25/2013 13:53:31.0000

Test Temperature: 70.2 degrees
Relative Humidity: 41.7%
Test Velocity: 1.96 m/s

THOR Right Foot Eversion Certification
Tibia Load
Serial Number: LX0018

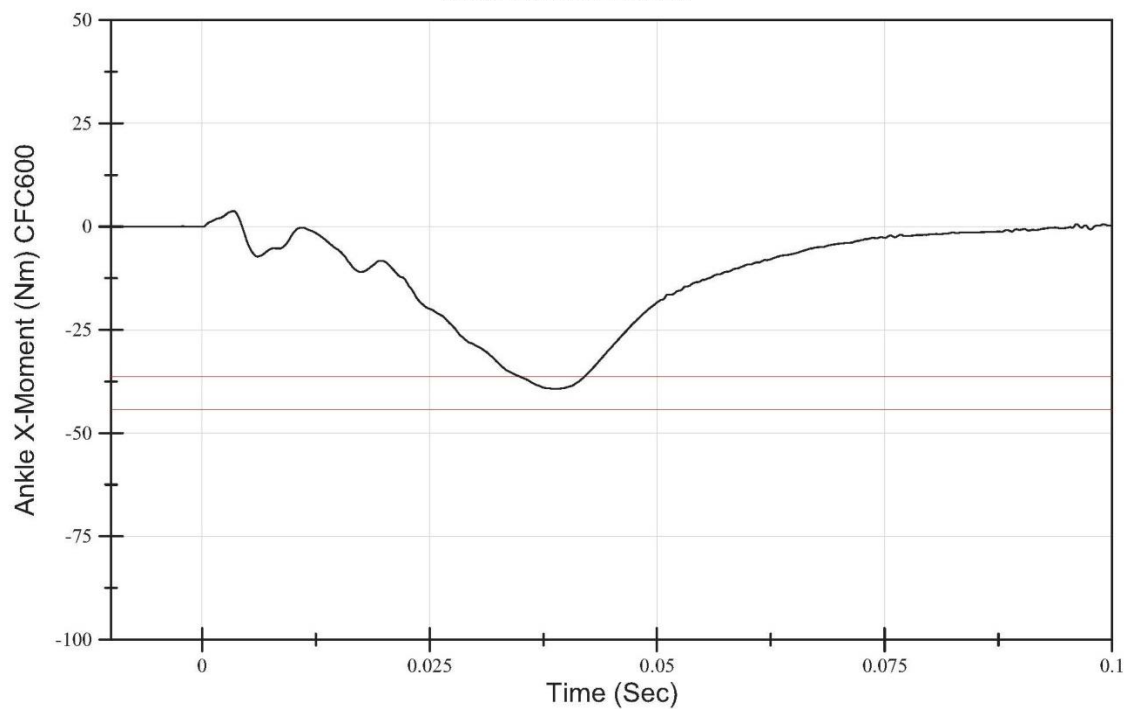


Software Version: 2.2

File Name: Ever_LX0018_2013_09_25 01
01/01/0000 00:00:00.0000

Test Temperature: 70.2 degrees
Relative Humidity: 41.7%
Test Velocity: 1.96 m/s

THOR Right Foot Eversion Certification
Ankle Moment
Serial Number: LX0018

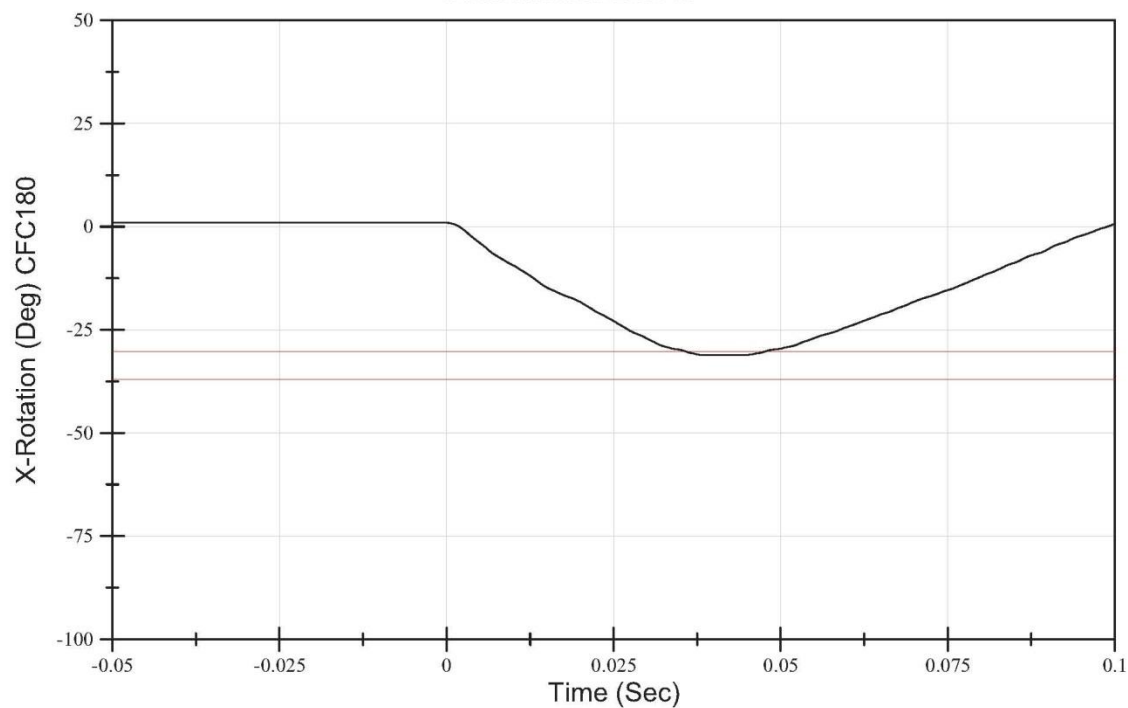


Software Version: 2.2

File Name: Ever_LX0018_2013_09_25 01
01/01/0000 00:00:00.0000

Test Temperature: 70.2 degrees
Relative Humidity: 41.7%
Test Velocity: 1.96 m/s

THOR Right Foot Eversion Certification
Ankle X-Rotation
Serial Number: LX0018

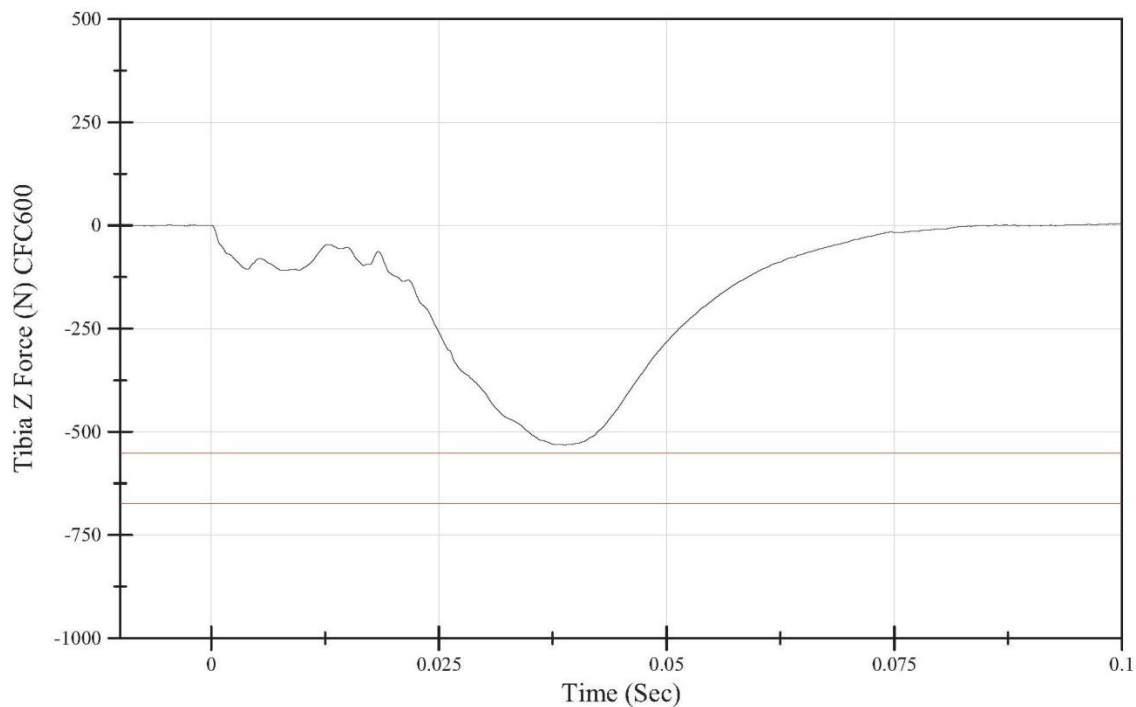


Software Version: 2.2

File Name: Ever_LX0018_2013_09_25 01
01/01/0000 00:00:00.0000

Test Temperature: 70.4 degrees
Relative Humidity: 41.7%
Test Velocity: 1.95 m/s

THOR Right Foot Inversion Certification
Tibia Load
Serial Number: LX0018



Software Version: 2.2

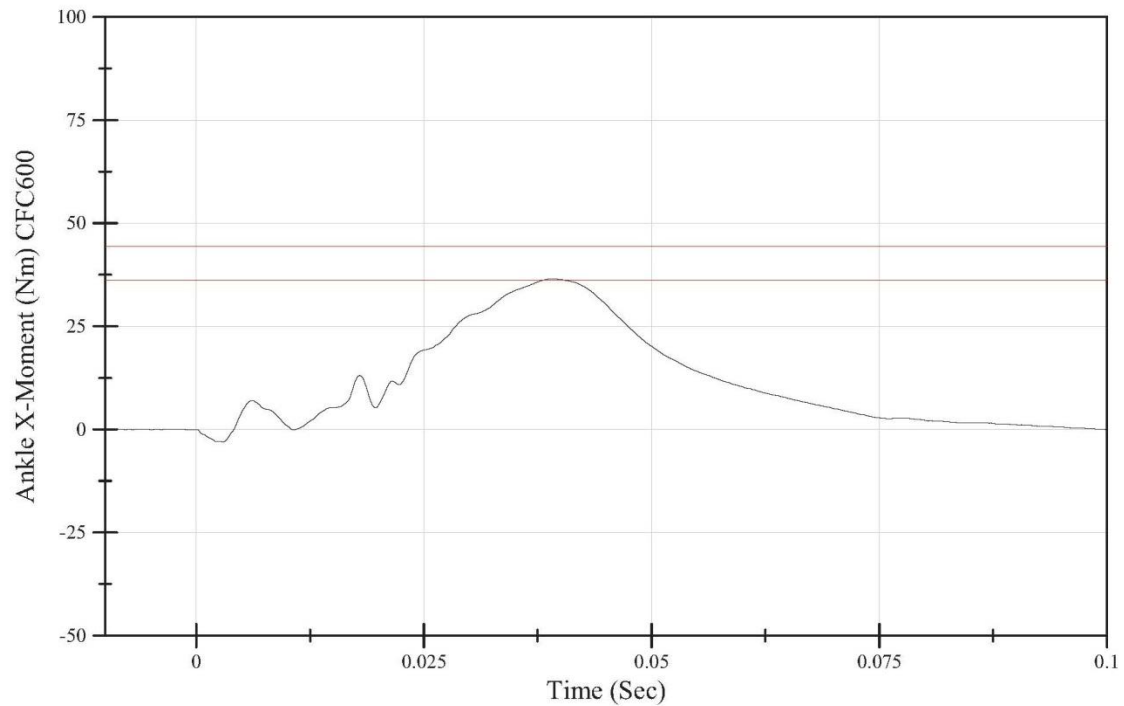
File Name: Inver_LX0018_2013_09_25 01 processed
09/25/2013 14:22:55.0000

Test Temperature: 70.4 degrees
Relative Humidity: 41.7%
Test Velocity: 1.95 m/s

THOR Right Foot Inversion Certification

Ankle Moment

Serial Number: LX0018



Software Version: 2.2

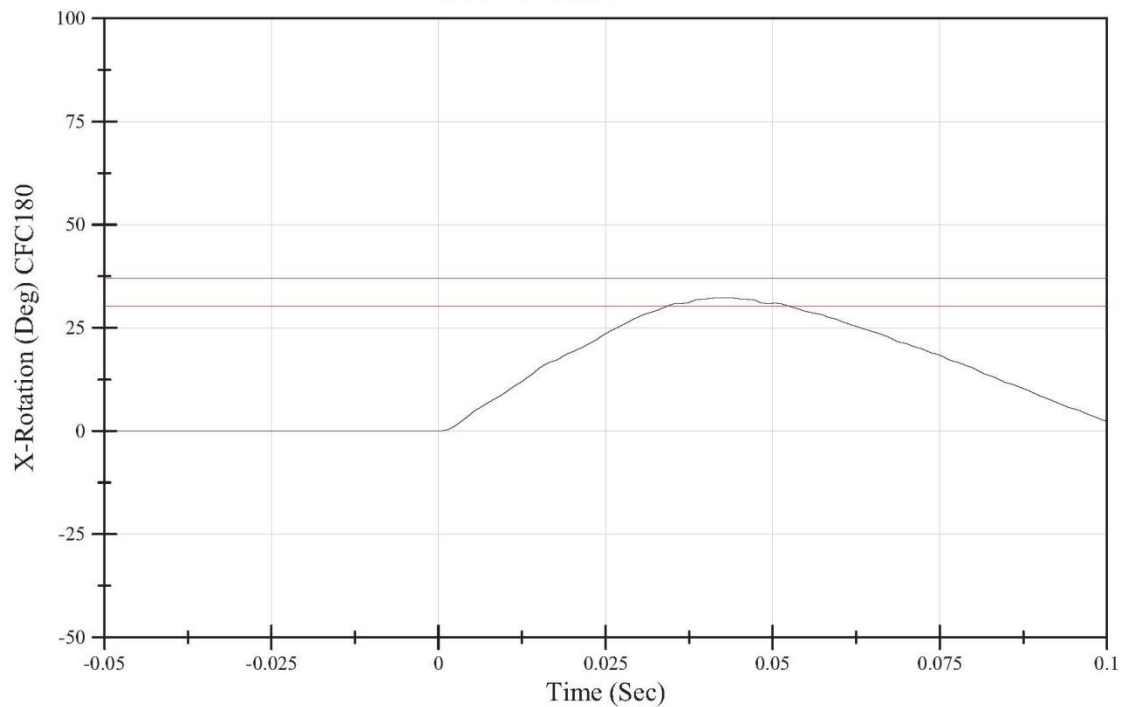
File Name: Inver_LX0018_2013_09_25 01 processed
09/25/2013 14:22:55.0000

Test Temperature: 70.4 degrees
Relative Humidity: 41.7%
Test Velocity: 1.95 m/s

THOR Right Foot Inversion Certification

Ankle X-Rotation

Serial Number: LX0018



Software Version: 2.2

File Name: Inver_LX0018_2013_09_25 01 processed
09/25/2013 14:22:55.0000

50% ADULT MALE THOR015 DUMMY CALIBRATIONS

Summary of Thor 15 Certification Test Results

Reported by: Calspan

Technician: M. Goehle

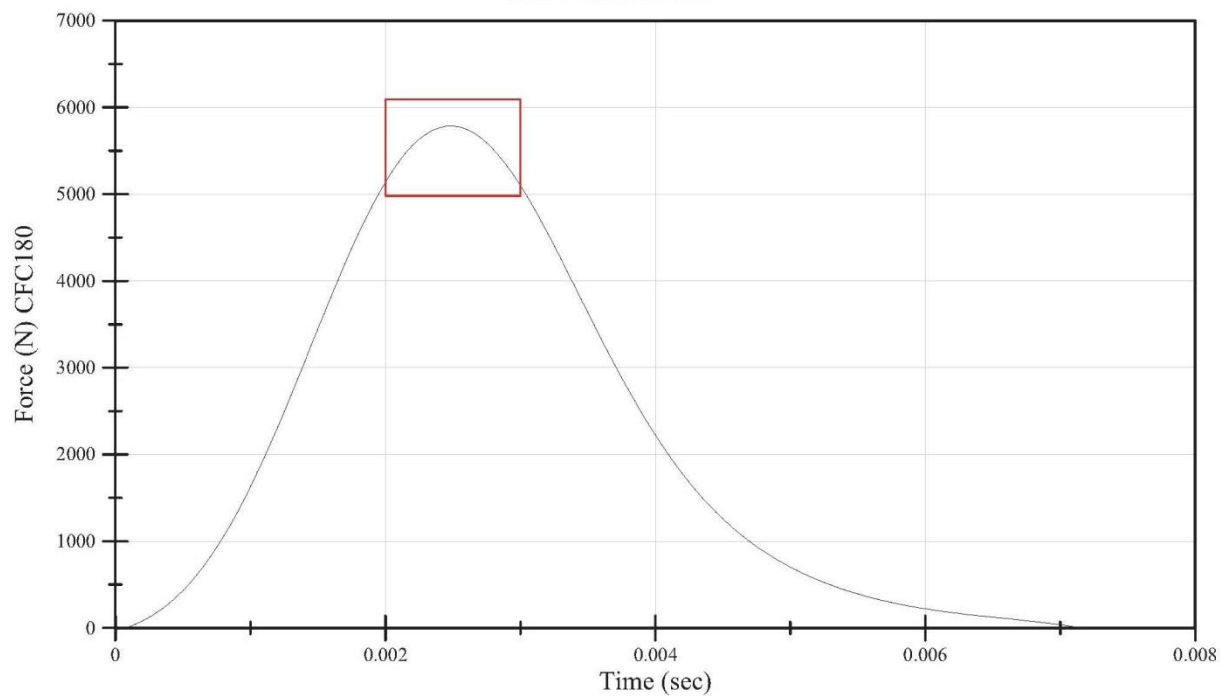
Date: 10/28/2013

Head Impact	Passed
Occipital Condyle Quasi-Static	Failed
Neck Left Lateral Flexion	Failed
Neck Right Lateral Flexion	Failed
Neck Flexion	Failed
Neck Extension	Failed
Upper Thorax	Failed
Lower Left Oblique Thorax	Failed
Lower Right Oblique Thorax	Failed
Upper Abdomen	Failed
Lower Abdomen	Failed
Left Femur	Passed
Right Femur	Passed
Left Knee	Passed
Right Knee	Passed
Left Foot Inversion	Passed
Left Foot Eversion	Passed
Left Heel of Foot	Failed
Left Ball of Foot	Failed
Right Foot Inversion	Failed
Right Foot Eversion	Passed
Right Heel of Foot	Passed
Right Ball of Foot	Passed

Certifications performed by VRTC

Test Temperature: 72 degrees
Relative Humidity: 51%
Test Velocity: 1.98 m/s

THOR Head Impact Certification
Probe Force
Serial Number: T015

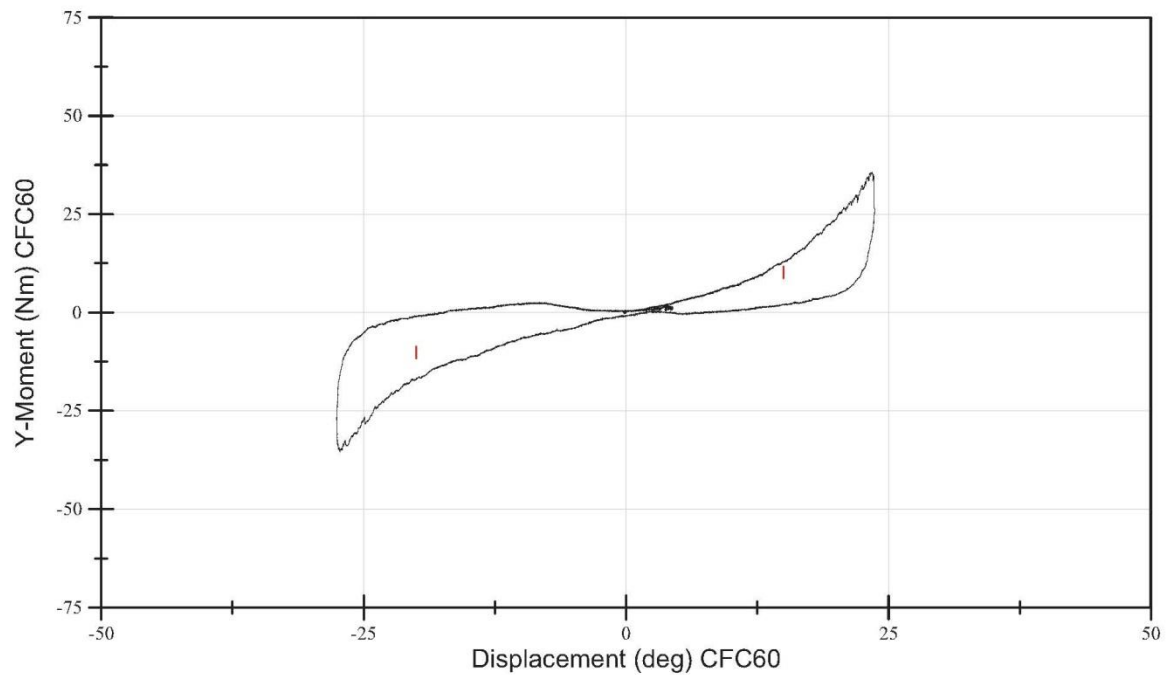


Software Version: 2.2

File Name: T015HEAD102113_01_DIADEMHeader_BINARYpp
10/21/2013 14:14:18.0000

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 0 m/s

THOR Occipital Condyle Quasi-Static Certification
Displacement vs. Torque
Serial Number: T015

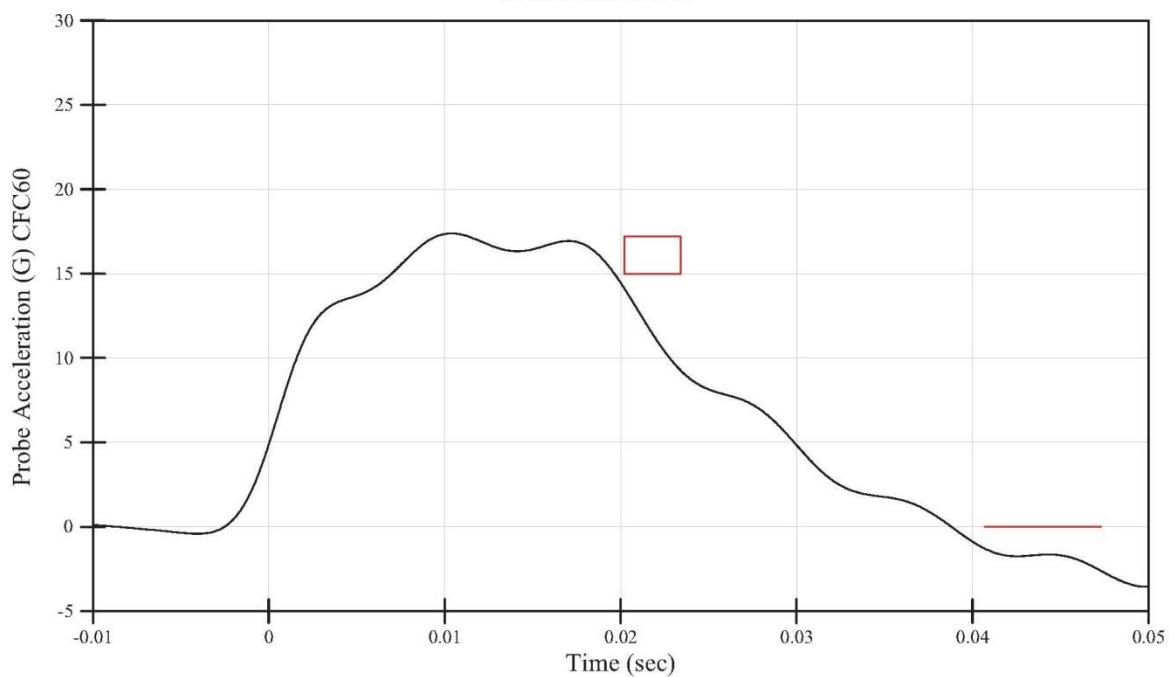


Software Version: 2.2

File Name: T015OC092513_01_DIADEMHeader_BINARYpp
09/25/2013 12:51:25.0000

Test Temperature: 70 degrees
Relative Humidity: 53%
Test Velocity: 2.90 m/s

THOR Neck Left Lateral Flexion Certification
Probe Acceleration
Serial Number: T015

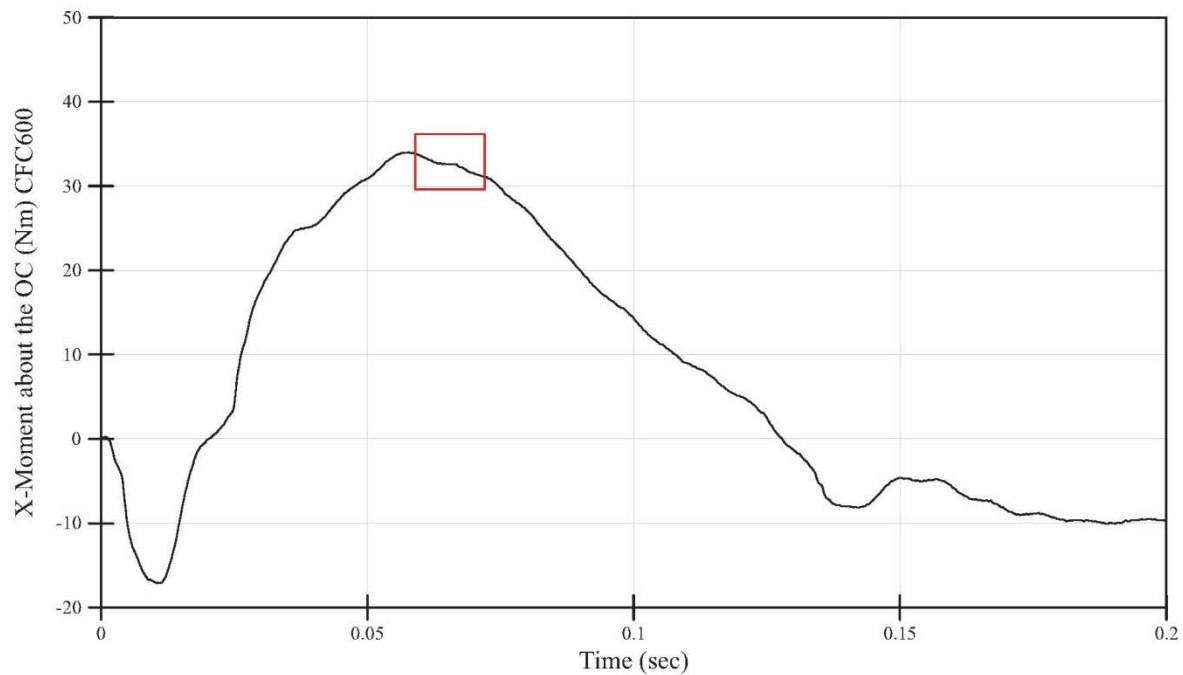


Software Version: 2.2

File Name: T015NECKLEFT093013_01_DIADEMHeader_BINARYpp
09/30/2013 13:01:45.0000

Test Temperature: 70 degrees
Relative Humidity: 53%
Test Velocity: 2.90 m/s

THOR Neck Left Lateral Flexion Certification
X-Moment
Serial Number: T015



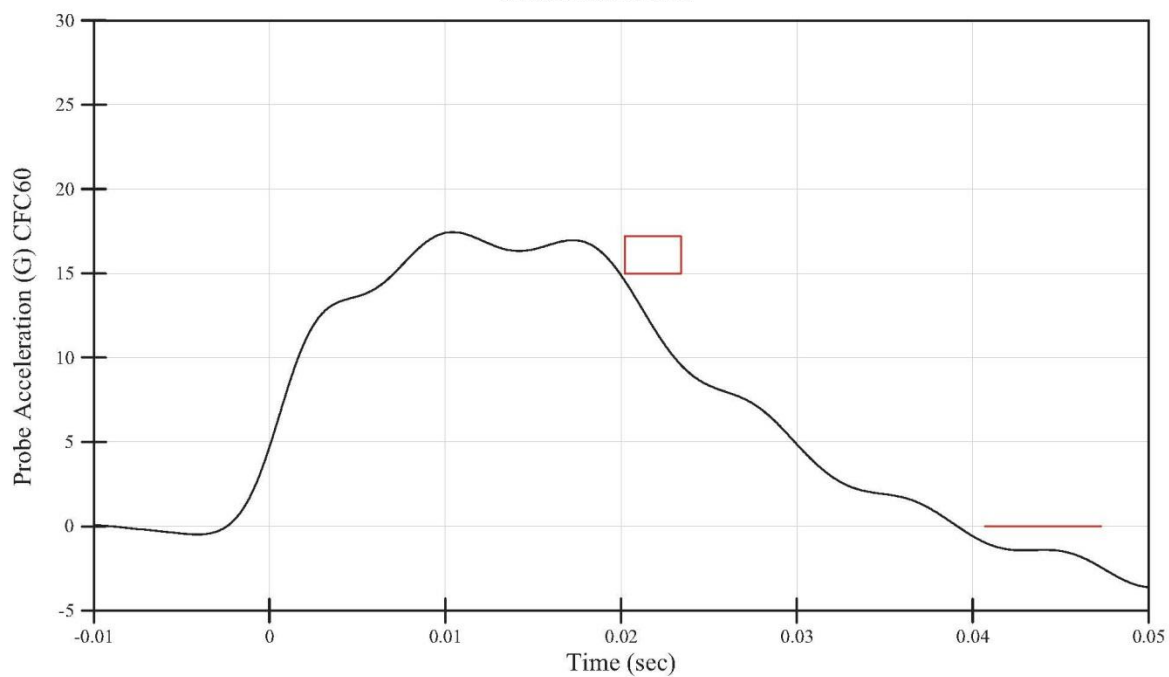
Software Version: 2.2

File Name: T015NECKLEFT093013_01_DIADEMHeader_BINARYpp
09/30/2013 13:01:45.0000

Test Temperature: 70 degrees
Relative Humidity: 53%
Test Velocity: 2.91 m/s

THOR Neck Right Lateral Flexion Certification

Probe Acceleration
Serial Number: T015



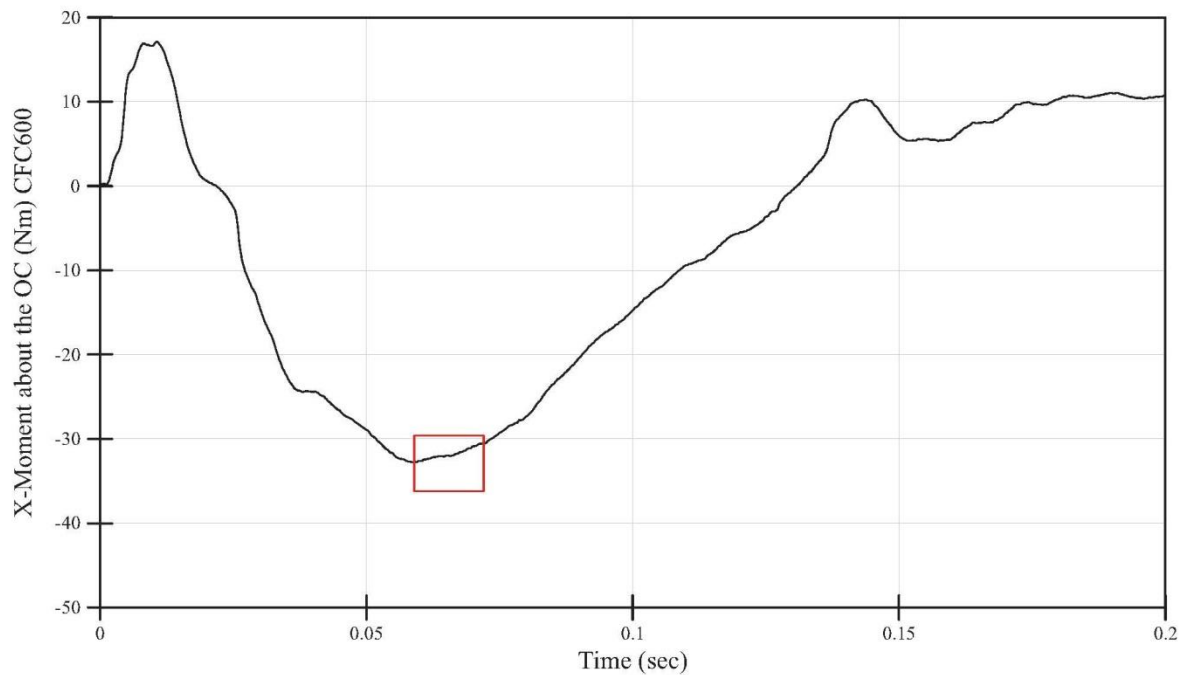
Software Version: 2.2

File Name: T015NECKRIGHT093013_01_DIAdemHeader_BINARYpp
09/30/2013 12:10:08.0000

Test Temperature: 70 degrees
Relative Humidity: 53%
Test Velocity: 2.91 m/s

THOR Neck Right Lateral Flexion Certification

X-Moment
Serial Number: T015

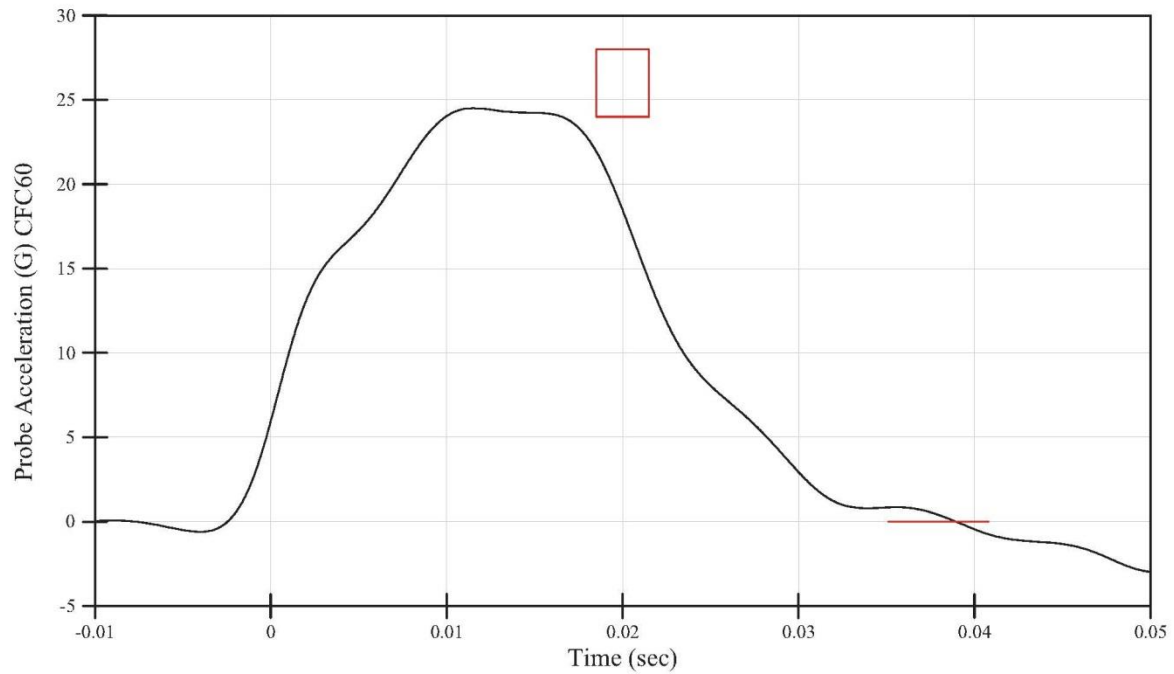


Software Version: 2.2

File Name: T015NECKRIGHT093013_01_DIAdemHeader_BINARYpp
09/30/2013 12:10:08.0000

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 3.81 m/s

THOR Neck Flexion Certification
Probe Acceleration
Serial Number: T015

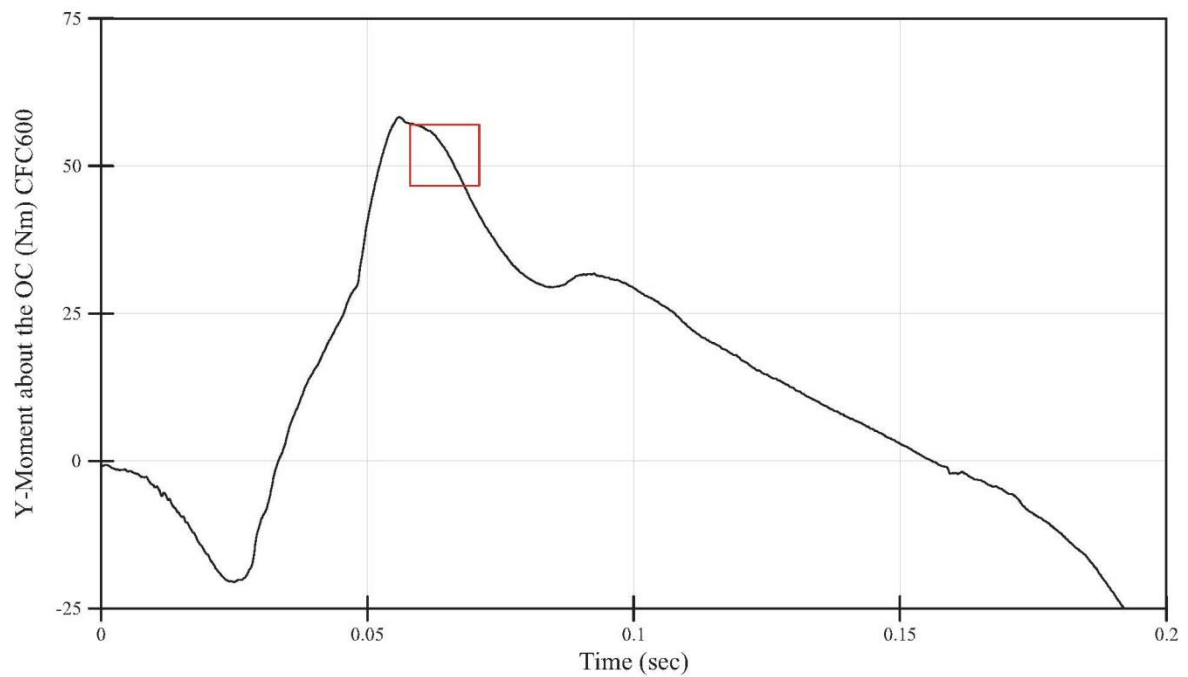


Software Version: 2.2

File Name: T015FLEX093013_01_DIADEMHeader_BINARYpp
09/30/2013 08:55:22.0000

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 3.81 m/s

THOR Neck Flexion Certification
Y-Moment
Serial Number: T015

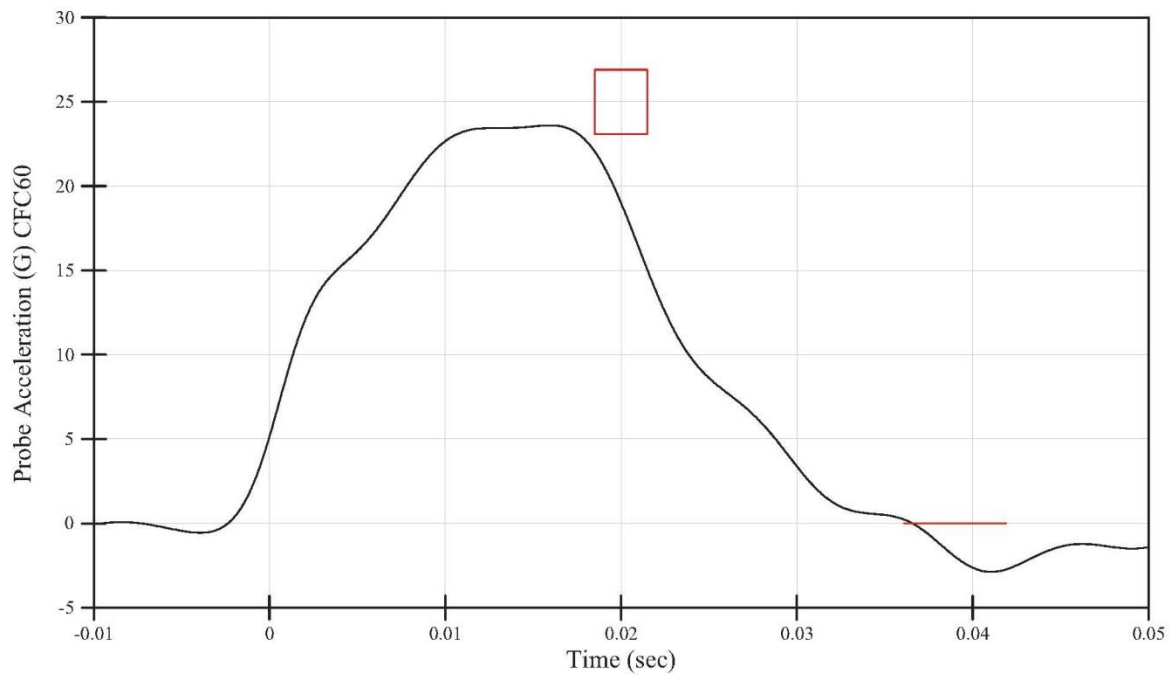


Software Version: 2.2

File Name: T015FLEX093013_01_DIADEMHeader_BINARYpp
09/30/2013 08:55:22.0000

Test Temperature: 70 degrees
Relative Humidity: 52%
Test Velocity: 3.68 m/s

THOR Neck Extension Certification
Probe Acceleration
Serial Number: T015

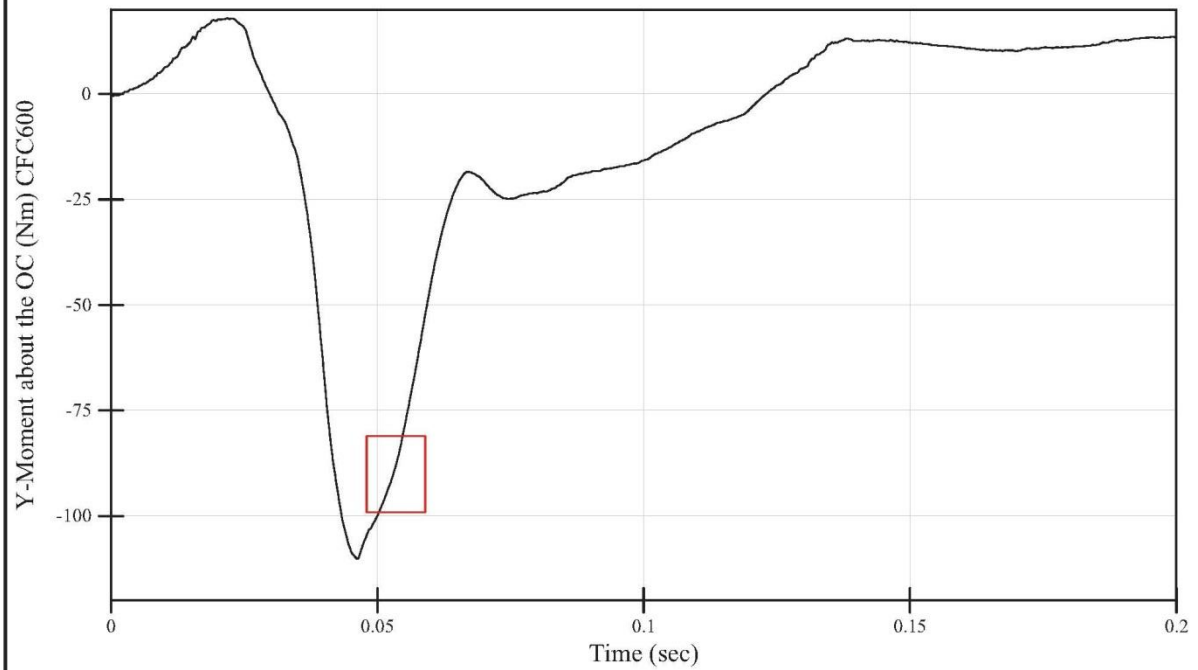


Software Version: 2.2

File Name: T015NECKEXT093013_01_DIADEMHeader_BINARYpp
09/30/2013 09:28:21.0000

Test Temperature: 70 degrees
Relative Humidity: 52%
Test Velocity: 3.68 m/s

THOR Neck Extension Certification
Y-Moment
Serial Number: T015

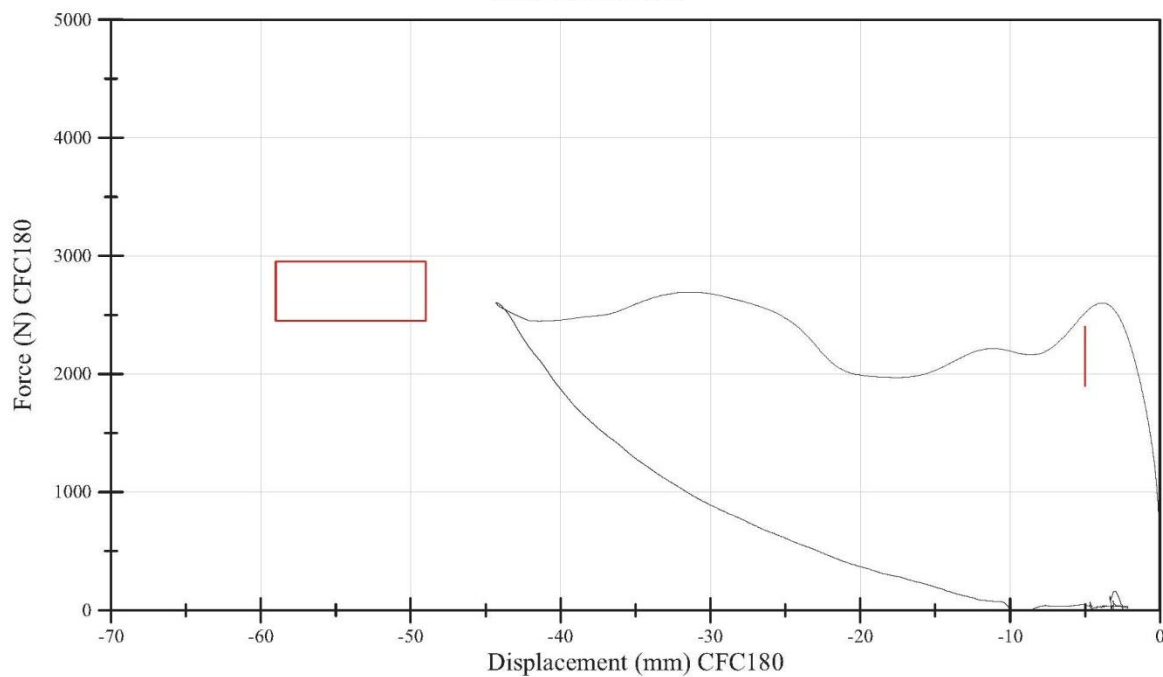


Software Version: 2.2

File Name: T015NECKEXT093013_01_DIADEMHeader_BINARYpp
09/30/2013 09:28:21.0000

Test Temperature: 72 degrees
Relative Humidity: 51%
Test Velocity: 4.31 m/s

THOR Upper Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T015

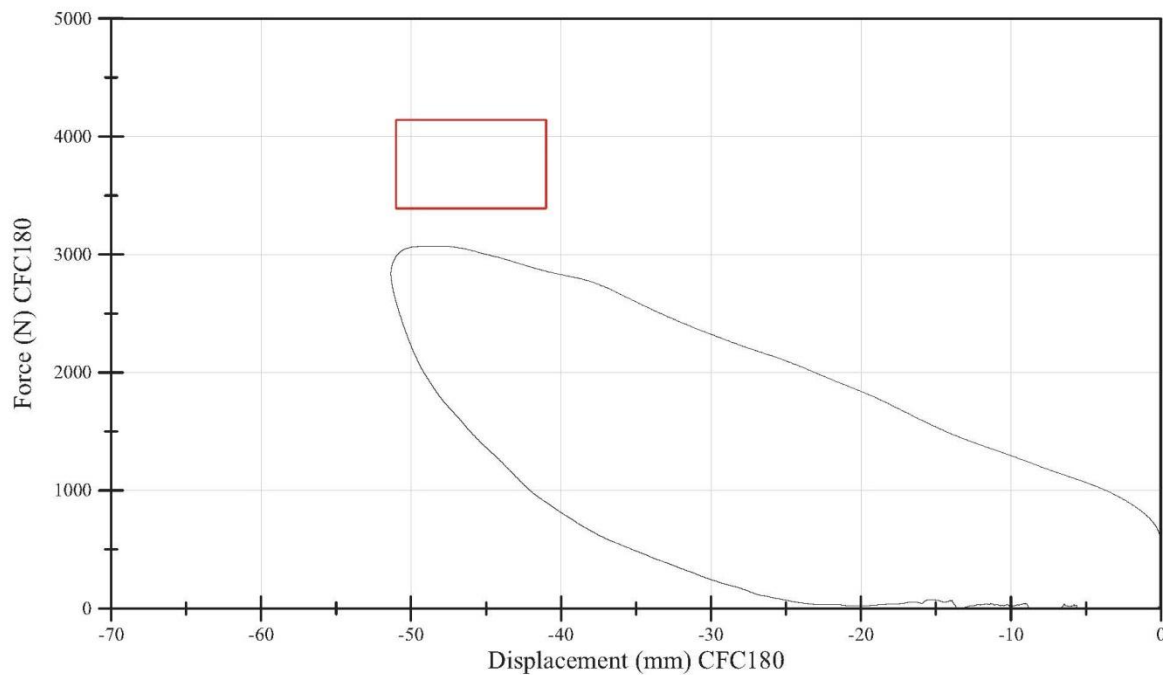


Software Version: 2.2

File Name: T015THORAXUPPER102113_01_DIADEMHeader_BINARYpp
10/21/2013 09:00:19.0000

Test Temperature: 72 degrees
Relative Humidity: 55%
Test Velocity: 4.27 m/s

THOR Lower Left Oblique Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T015

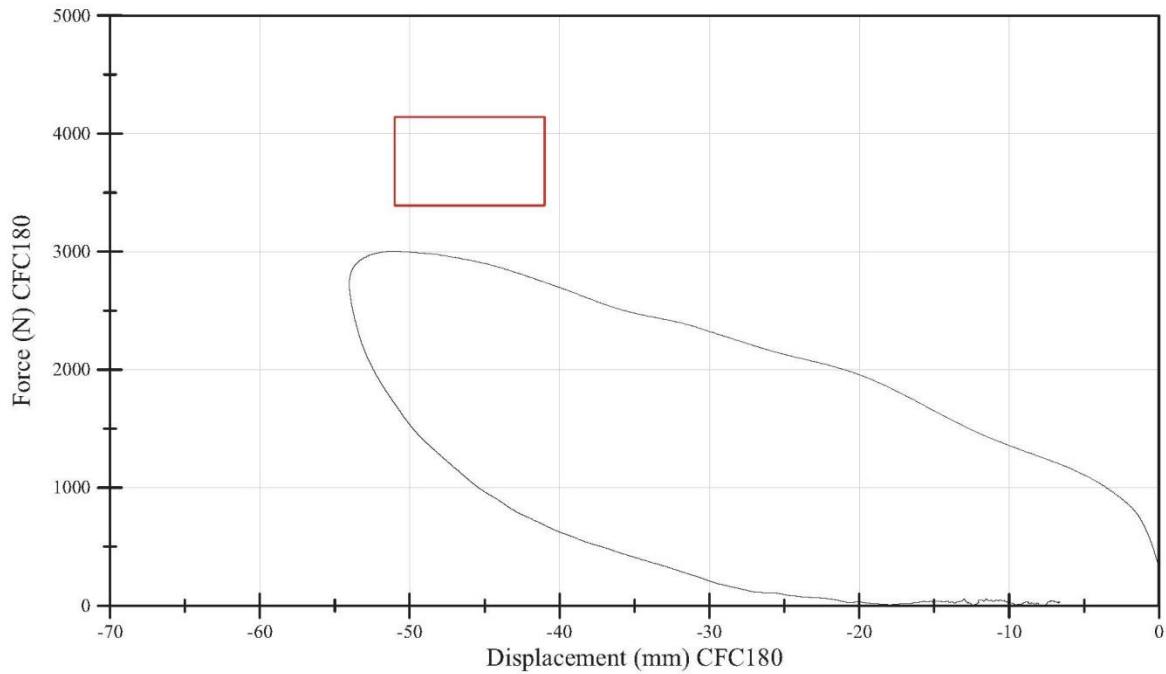


Software Version: 2.2

File Name: T015THORAXLEFT101713_01_DIADEMHeader_BINARYpp
10/17/2013 14:07:04.0000

Test Temperature: 70 degrees
Relative Humidity: 53%
Test Velocity: 4.31 m/s

THOR Lower Right Oblique Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T015

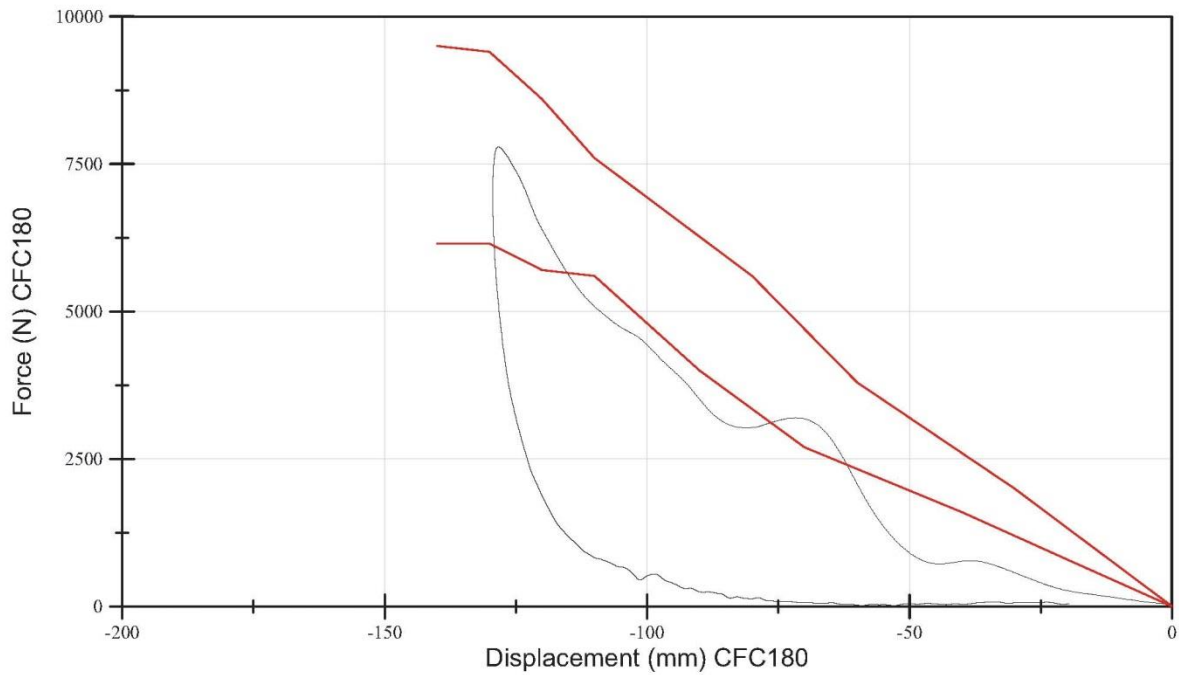


Software Version: 2.2

File Name: T015THORAXRIGHT100113_01_DIAdemHeader_BINARYpp
10/01/2013 08:29:25.0000

Test Temperature: 71 degrees
Relative Humidity: 51%
Test Velocity: 8.06 m/s

THOR Upper Abdomen Certification
Abdomen Displacement vs. Probe Force
Serial Number: T015

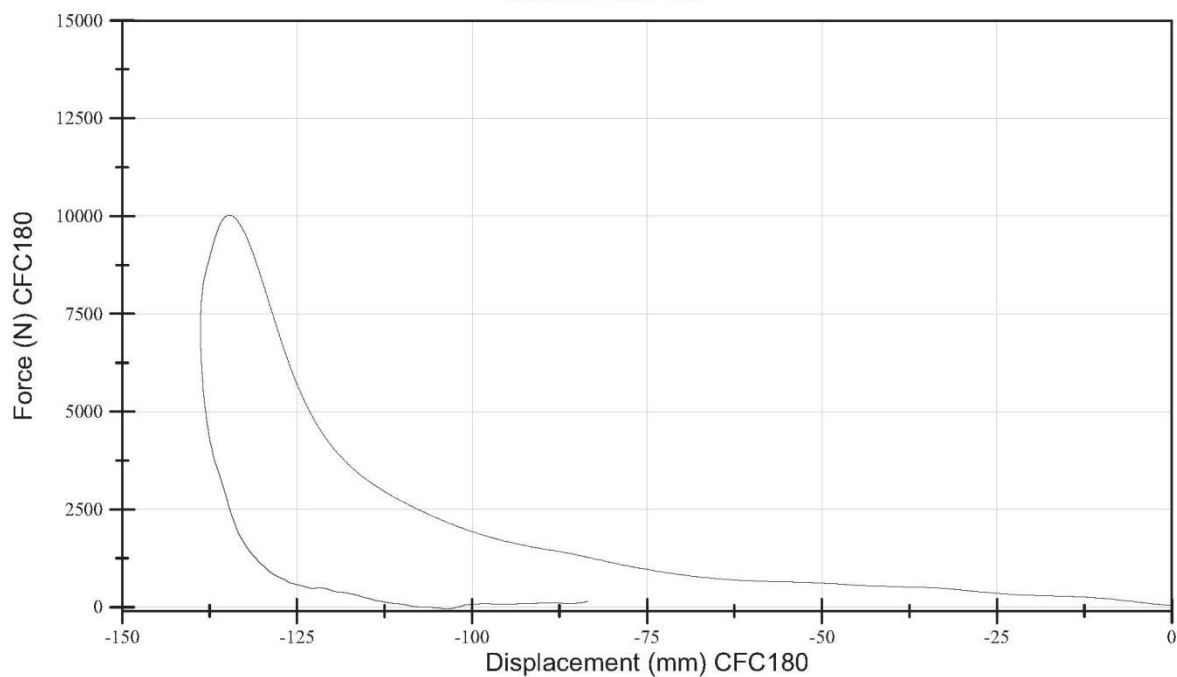


Software Version: 2.2

File Name: T015ABDOMENUPPER101713_01_DIAdemHeader_BINARYpp
10/17/2013 16:20:04.0000

Test Temperature: 71 degrees
Relative Humidity: 51%
Test Velocity: 6.1 m/s

THOR Lower Abdomen Certification
Lower Abdomen Deflection (via PENXG and T12XG) vs. Probe Force
Serial Number: 015



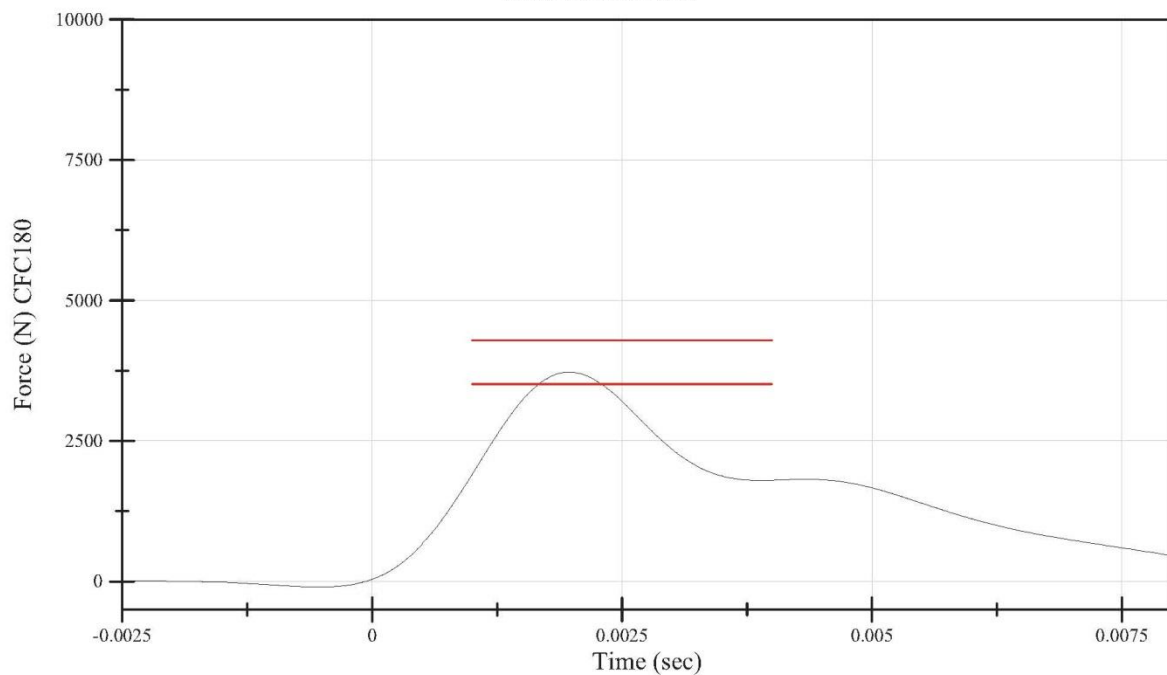
Software Version:

File Name: T015ABDOMENLOWER102113_01_DIADEMHeader_BINARY

01/01/0000 00:00:00.0000

Test Temperature: 72 degrees
Relative Humidity: 51%
Test Velocity: 2.58 m/s

THOR Left Femur Certification
Probe Force
Serial Number: T015



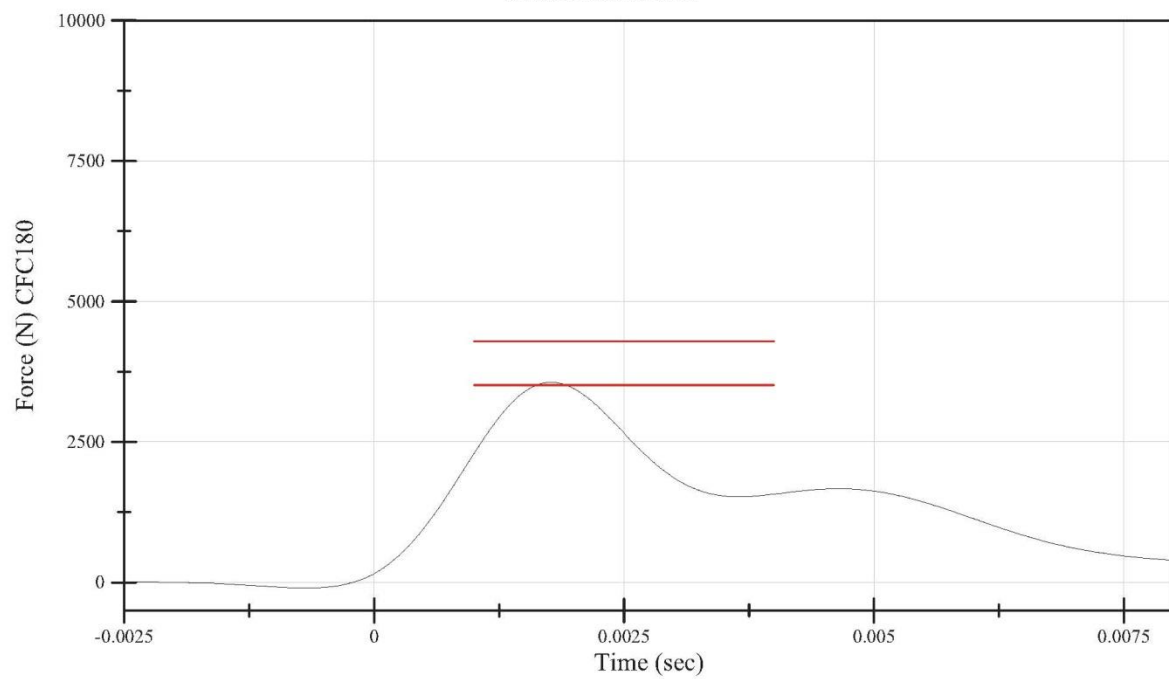
Software Version: 2.2

File Name: T015FEMURLEFT102213_01_DIADEMHeader_BINARYpp

10/22/2013 14:06:02.0000

Test Temperature: 72 degrees
Relative Humidity: 51%
Test Velocity: 2.58 m/s

THOR Right Femur Certification
Probe Force
Serial Number: T015



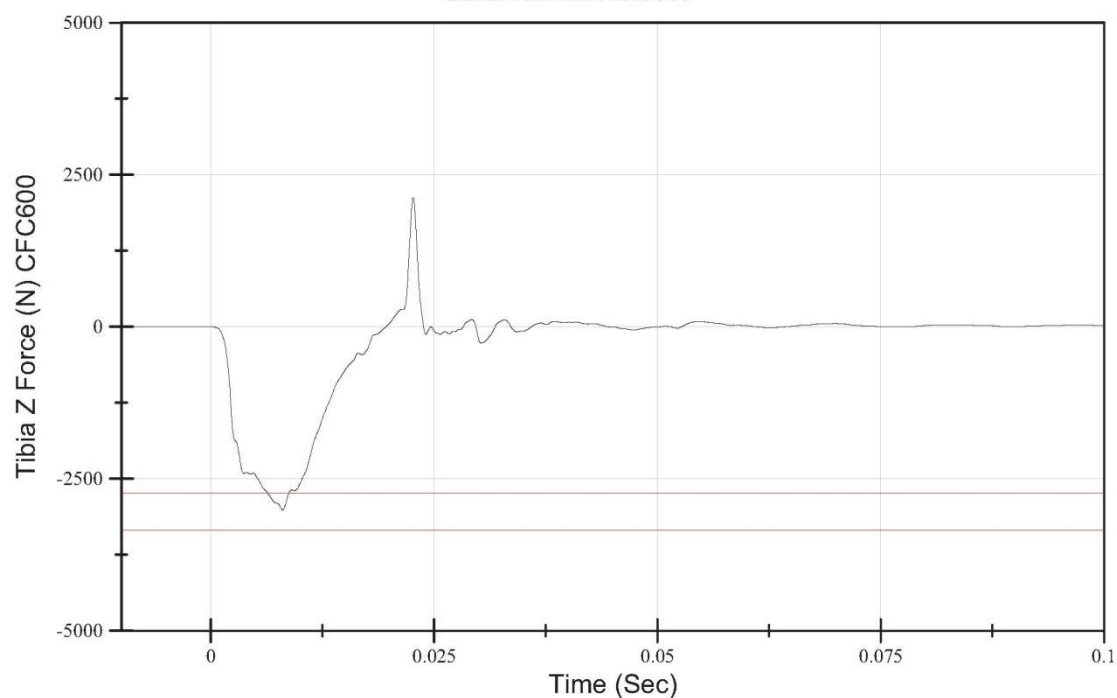
Software Version: 2.2

File Name: T015FEMURRIGHT102213_01_DIAdemHeader_BINARYpp
10/22/2013 14:07:36.0000

THOR 015 LEG CALIBRATIONS
LX0039 / LX0038

Test Temperature: 71.4 degrees
Relative Humidity: 35.9%
Test Velocity: 3.97 m/s

THOR Left Foot Heel Certification
Tibia Load
Serial Number: LX0039

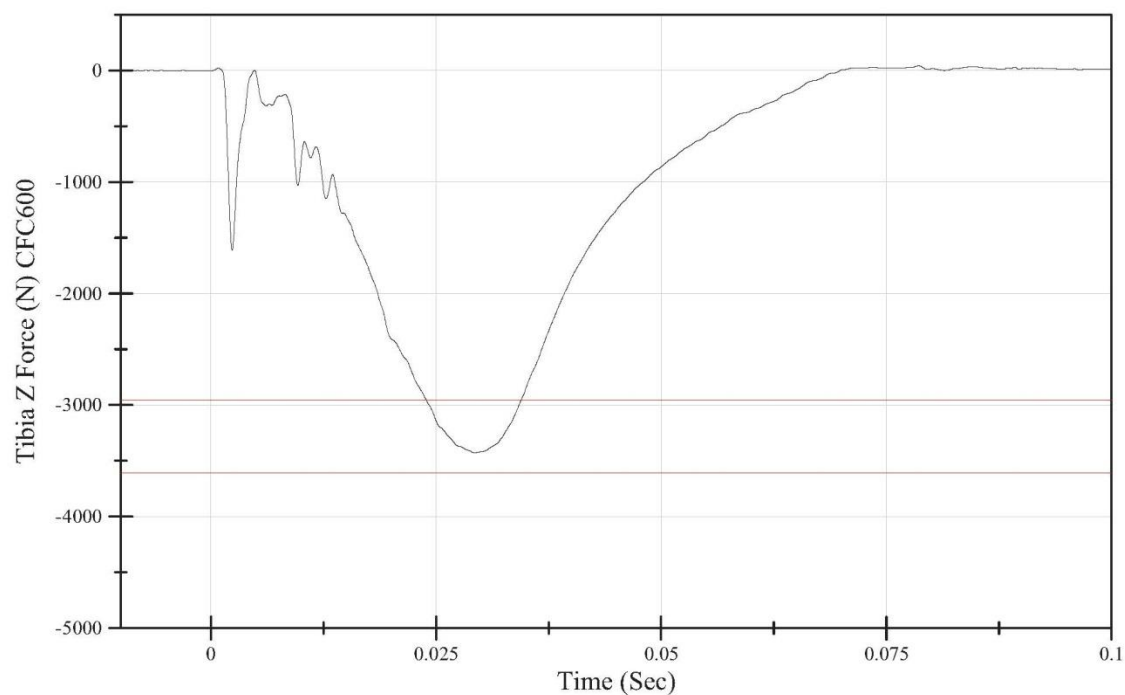


Software Version: 2.2

File Name: Heel_LX0039_2013_10_22 01 processed
10/22/2013 07:59:48.0000

Test Temperature: 70.2 degrees
Relative Humidity: 32.6%
Test Velocity: 5.03 m/s

THOR Left Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0039

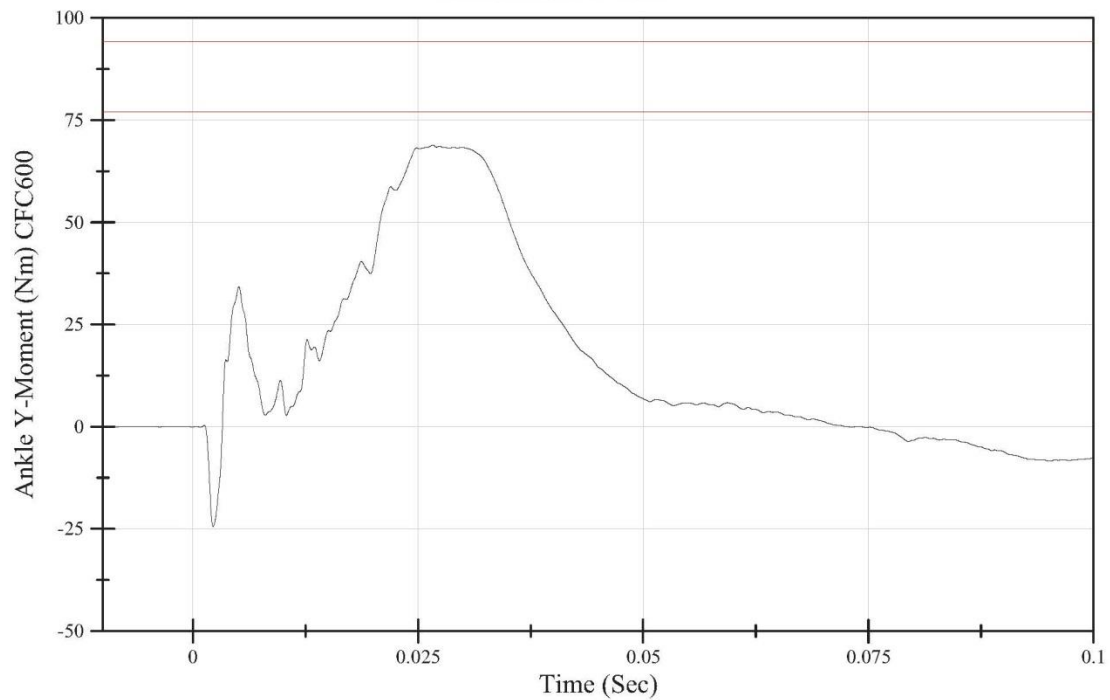


Software Version: 2.2

File Name: Ball_LX0039_2013_10_21 01 processed
10/29/2013 13:51:35.0000

Test Temperature: 70.2 degrees
Relative Humidity: 32.6%
Test Velocity: 5.03 m/s

THOR Left Foot Dorsiflexion Certification
Ankle Y-Moment
Serial Number: LX0039

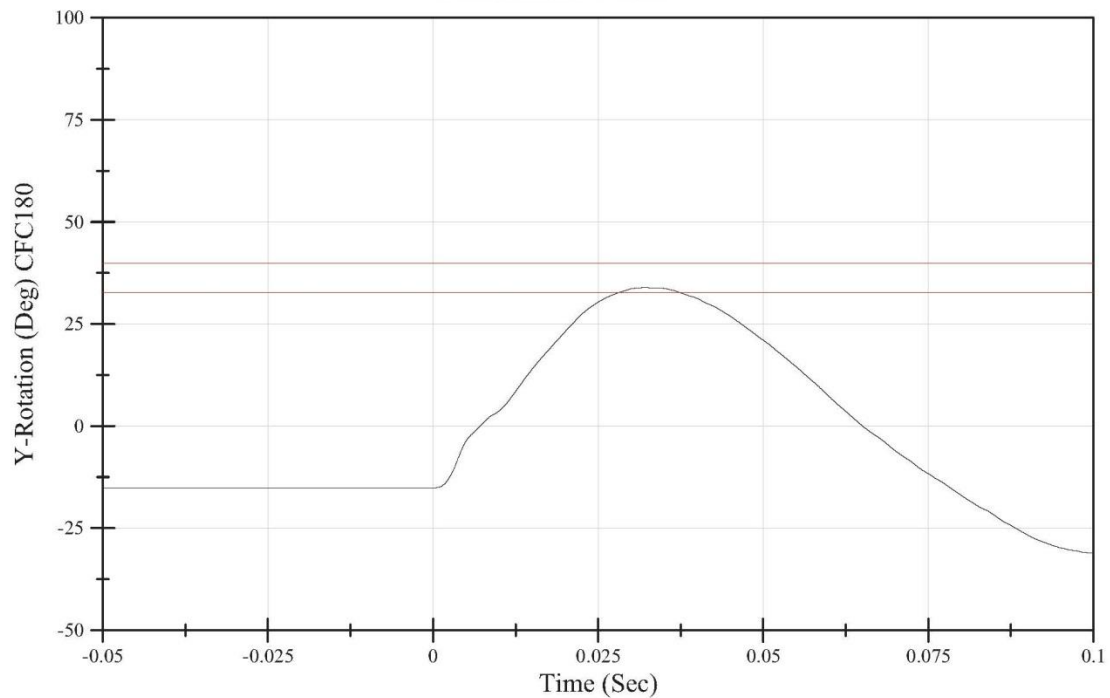


Software Version: 2.2

File Name: Ball_LX0039_2013_10_21 01 processed
10/29/2013 13:51:35.0000

Test Temperature: 70.2 degrees
Relative Humidity: 32.6%
Test Velocity: 5.03 m/s

THOR Left Foot Dorsiflexion Certification
Ankle Y-Rotation
Serial Number: LX0039

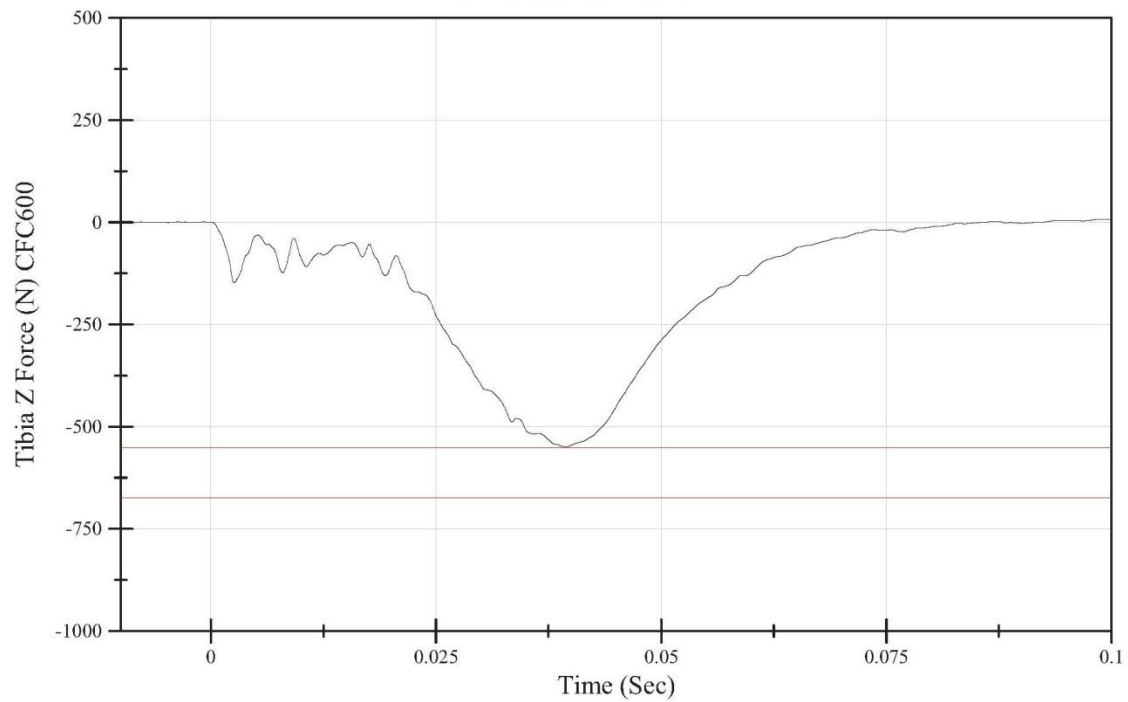


Software Version: 2.2

File Name: Ball_LX0039_2013_10_21 01 processed
10/29/2013 13:51:35.0000

Test Temperature: 71.3 degrees
Relative Humidity: 32.5%
Test Velocity: 1.96 m/s

THOR Left Foot Eversion Certification
Tibia Load
Serial Number: LX0039

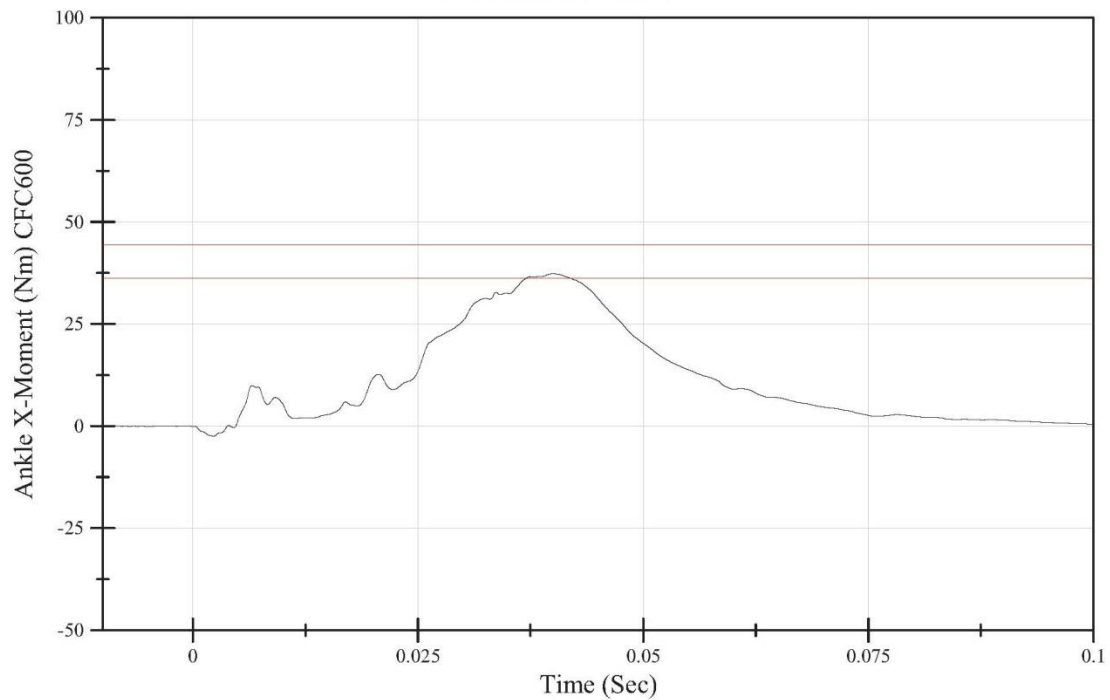


Software Version: 2.2

File Name: Ever_LX0039_2013_10_21 02 processed
10/21/2013 15:38:14.0000

Test Temperature: 71.3 degrees
Relative Humidity: 32.5%
Test Velocity: 1.96 m/s

THOR Left Foot Eversion Certification
Ankle Moment
Serial Number: LX0039

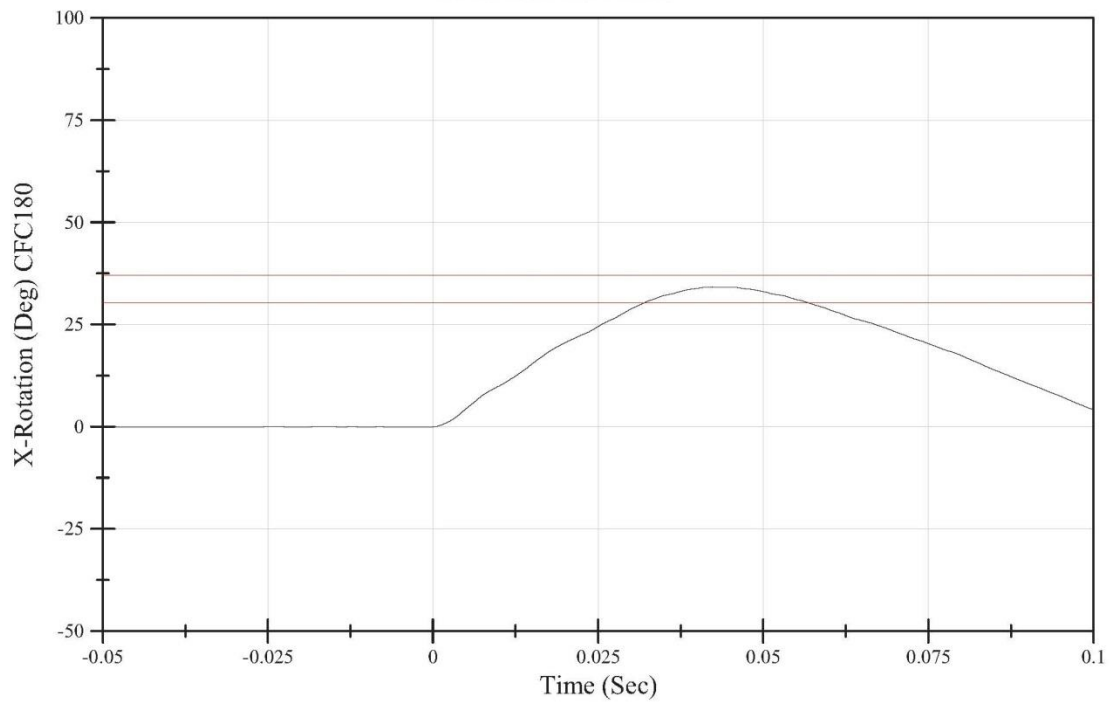


Software Version: 2.2

File Name: Ever_LX0039_2013_10_21 02 processed
10/21/2013 15:38:14.0000

Test Temperature: 71.3 degrees
Relative Humidity: 32.5%
Test Velocity: 1.96 m/s

THOR Left Foot Eversion Certification
Ankle X-Rotation
Serial Number: LX0039

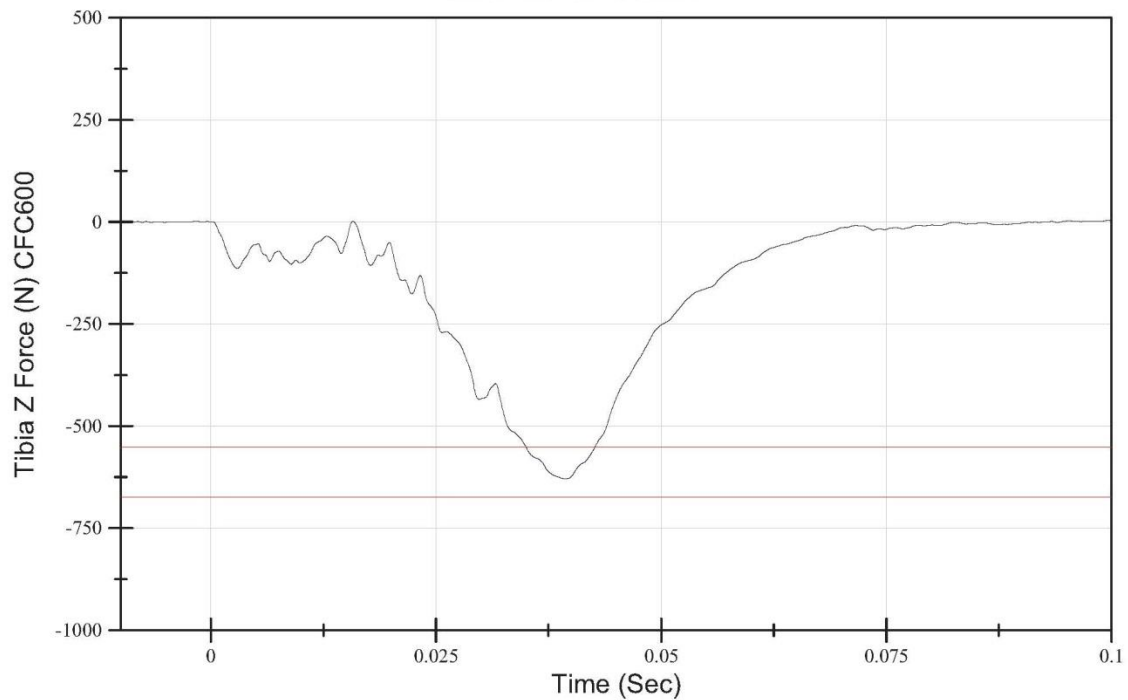


Software Version: 2.2

File Name: Ever_LX0039_2013_10_21 02 processed
10/21/2013 15:38:14.0000

Test Temperature: 70.7 degrees
Relative Humidity: 33.4%
Test Velocity: 1.95 m/s

THOR Left Foot Inversion Certification
Tibia Load
Serial Number: LX0039

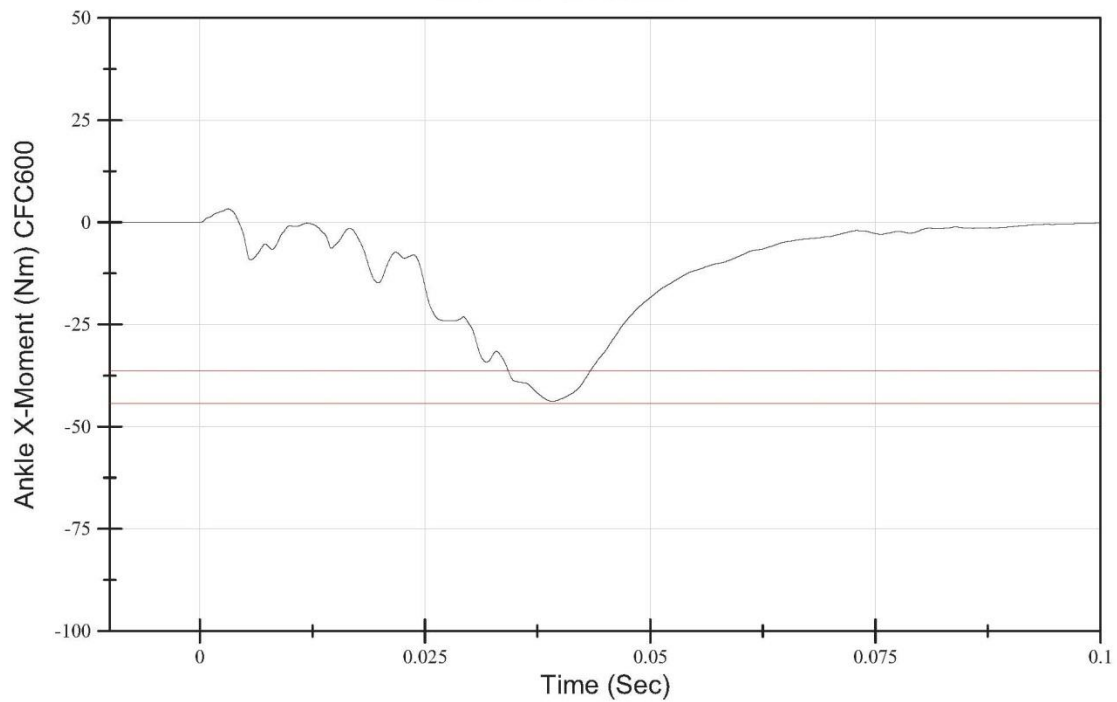


Software Version: 2.2

File Name: Inver_LX0039_2013_10_21 02 processed
10/21/2013 15:09:24.0000

Test Temperature: 70.7 degrees
Relative Humidity: 33.4%
Test Velocity: 1.95 m/s

THOR Left Foot Inversion Certification
Ankle Moment
Serial Number: LX0039

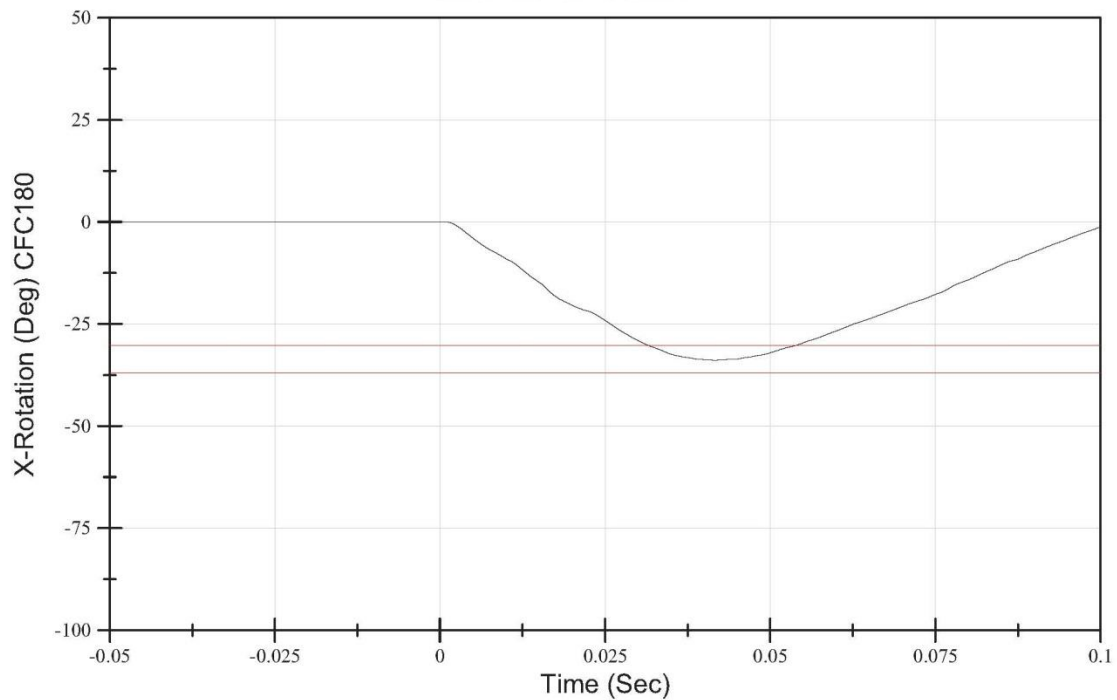


Software Version: 2.2

File Name: Inver_LX0039_2013_10_21 02 processed
10/21/2013 15:09:24.0000

Test Temperature: 70.7 degrees
Relative Humidity: 33.4%
Test Velocity: 1.95 m/s

THOR Left Foot Inversion Certification
Ankle X-Rotation
Serial Number: LX0039

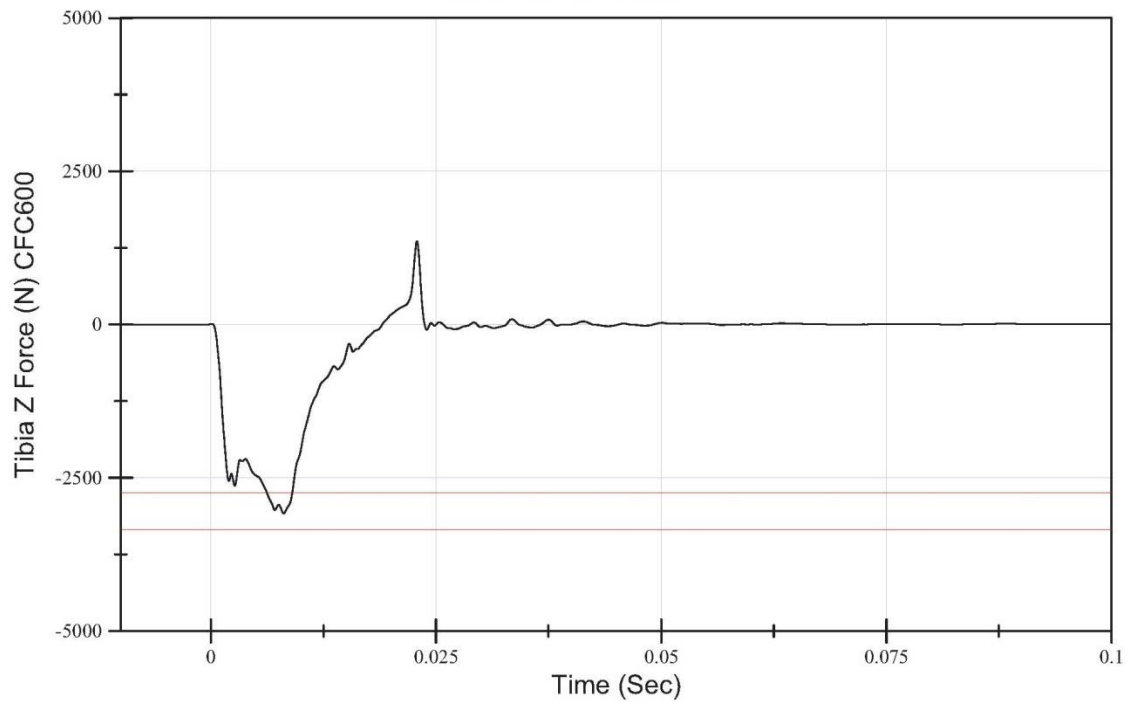


Software Version: 2.2

File Name: Inver_LX0039_2013_10_21 02 processed
10/21/2013 15:09:24.0000

Test Temperature: 71 degrees
Relative Humidity: 37.5%
Test Velocity: 4 m/s

THOR Right Foot Heel Certification
Tibia Load
Serial Number: LX0038

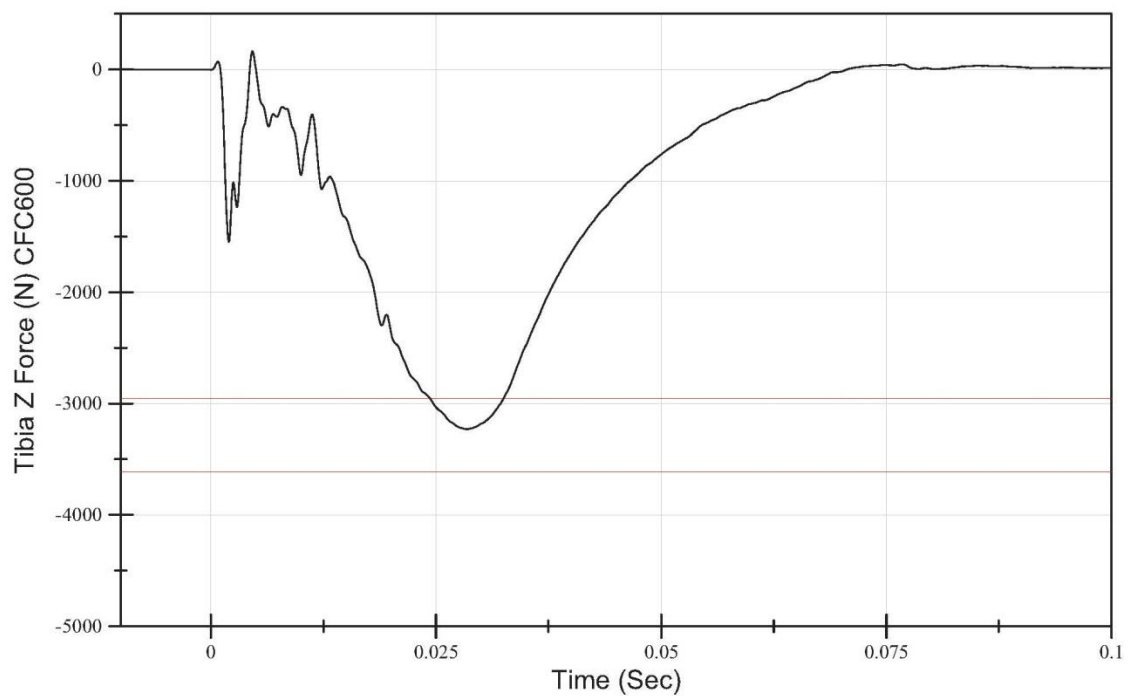


Software Version: 2.2

File Name: Heel_LX0038_2013_10_17 01 processed
10/17/2013 10:13:04.0000

Test Temperature: 68.9 degrees
Relative Humidity: 47%
Test Velocity: 5.03 m/s

THOR Right Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0038

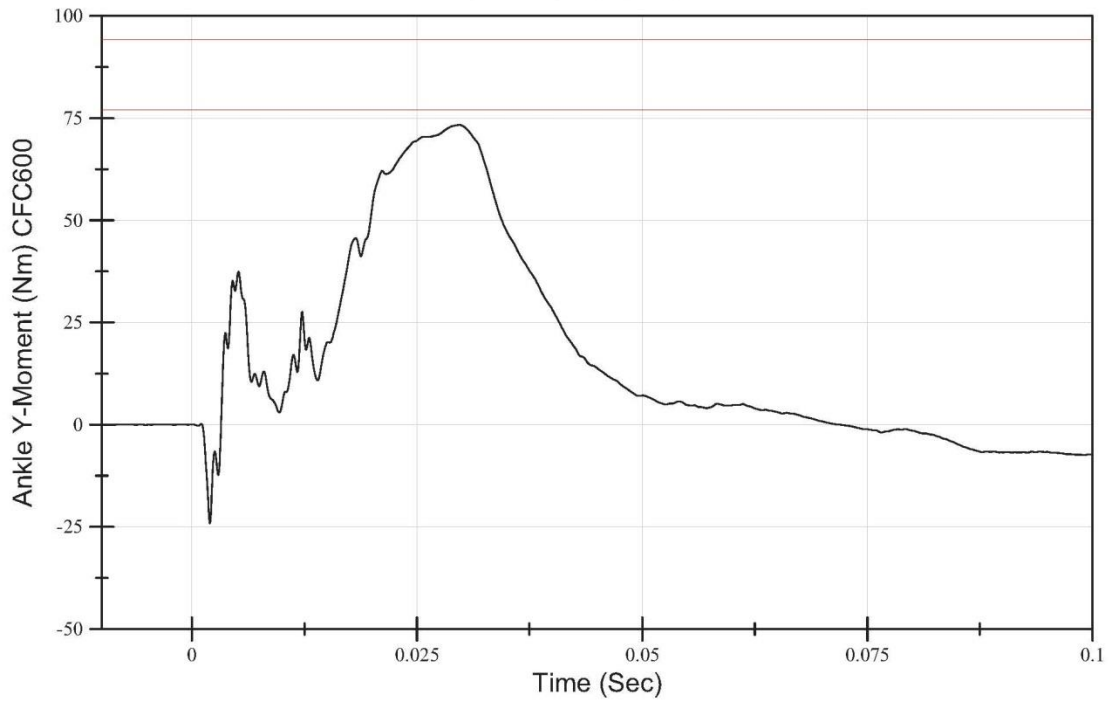


Software Version: 2.2

File Name: Ball_LX0038_2013_09_30 01 processed
09/30/2013 16:14:07.0000

Test Temperature: 68.9 degrees
Relative Humidity: 47%
Test Velocity: 5.03 m/s

THOR Right Foot Dorsiflexion Certification
Ankle Y-Moment
Serial Number: LX0038

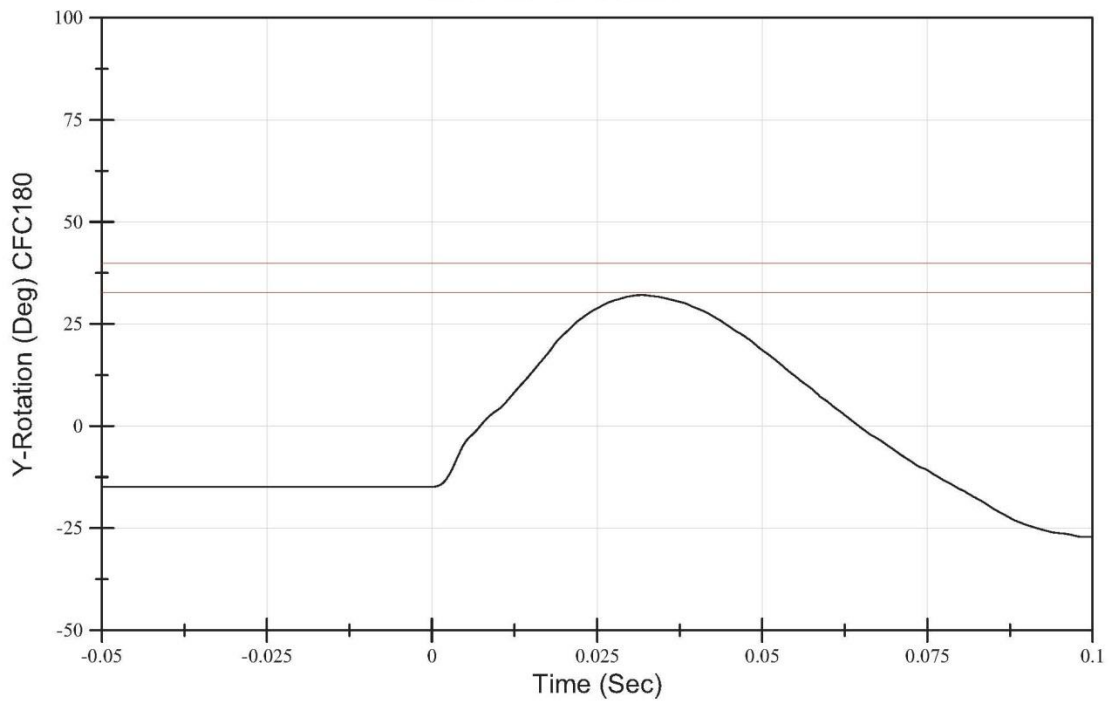


Software Version: 2.2

File Name: Ball_LX0038_2013_09_30 01 processed
09/30/2013 16:14:07.0000

Test Temperature: 68.9 degrees
Relative Humidity: 47%
Test Velocity: 5.03 m/s

THOR Right Foot Dorsiflexion Certification
Ankle Y-Rotation
Serial Number: LX0038

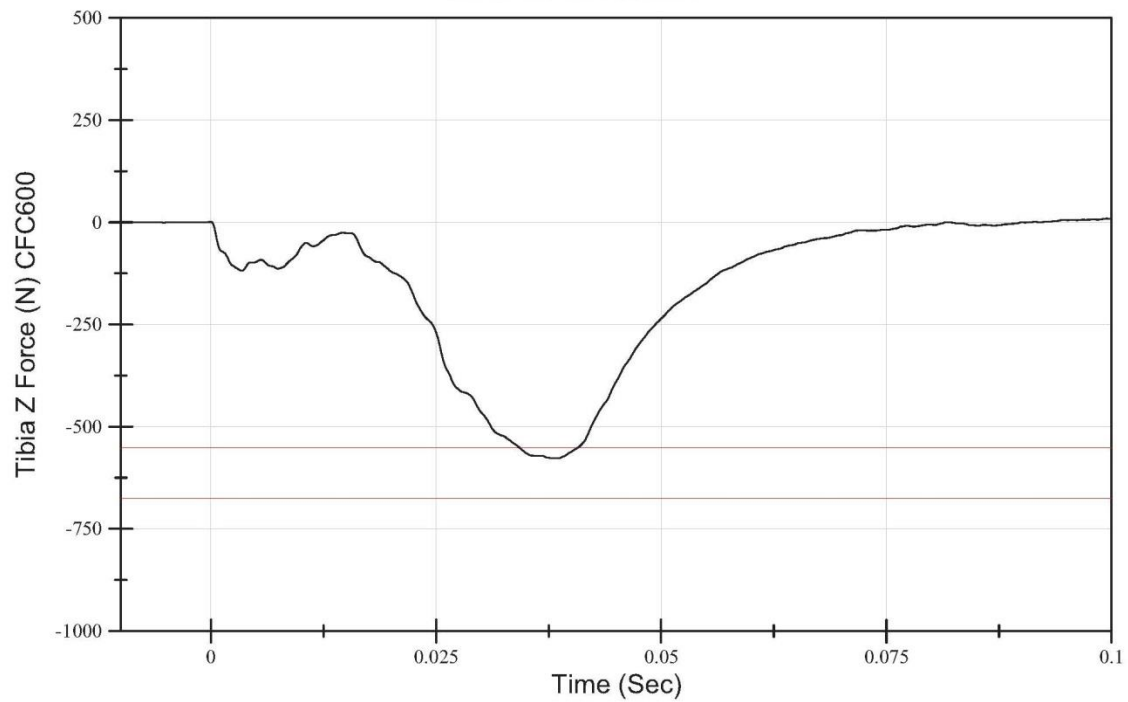


Software Version: 2.2

File Name: Ball_LX0038_2013_09_30 01 processed
09/30/2013 16:14:07.0000

Test Temperature: 69.2 degrees
Relative Humidity: 50.6%
Test Velocity: 1.95 m/s

THOR Right Foot Eversion Certification
Tibia Load
Serial Number: LX0038

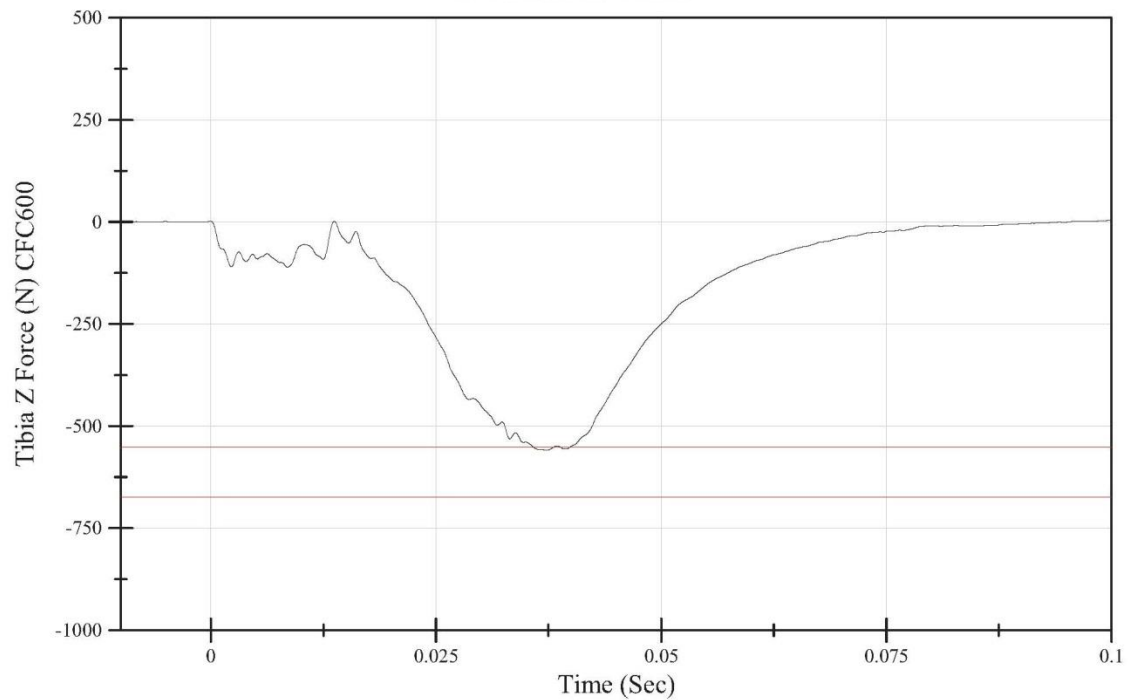


Software Version: 2.2

File Name: Ever_LX0038_2013_10_01 01 processed
10/01/2013 10:12:11.0000

Test Temperature: 69.2 degrees
Relative Humidity: 50.9%
Test Velocity: 1.96 m/s

THOR Right Foot Inversion Certification
Tibia Load
Serial Number: LX0038

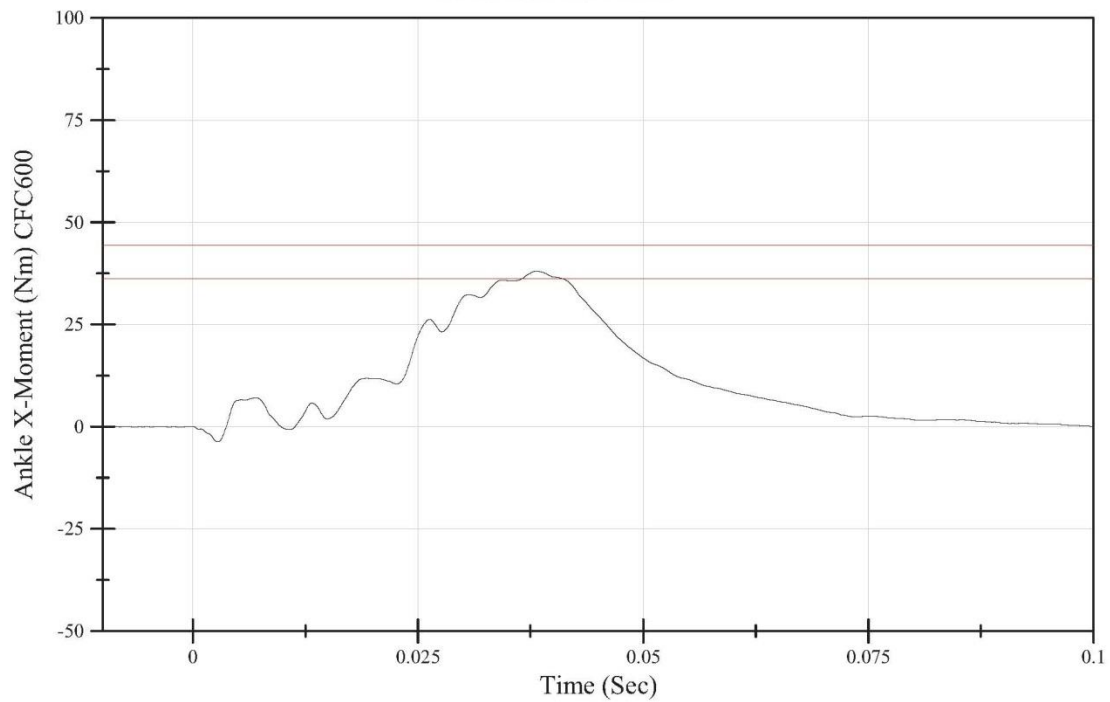


Software Version: 2.2

File Name: Inver_LX0038_2013_10_01 01 processed
10/01/2013 08:27:23.0000

Test Temperature: 69.2 degrees
Relative Humidity: 50.9%
Test Velocity: 1.96 m/s

THOR Right Foot Inversion Certification
Ankle Moment
Serial Number: LX0038

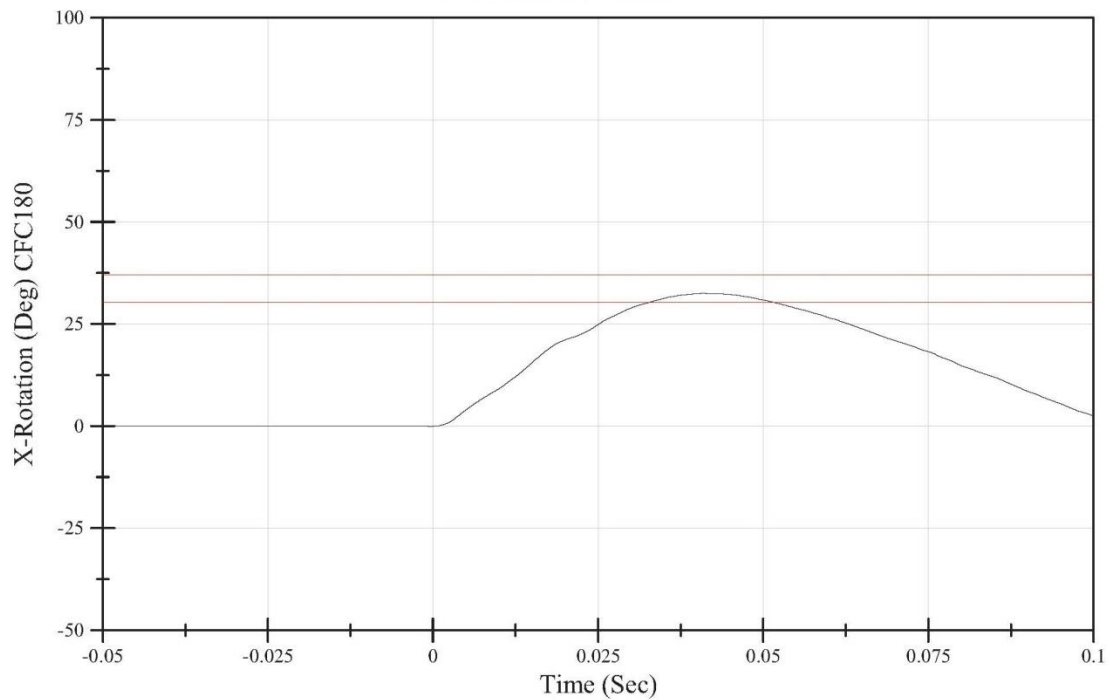


Software Version: 2.2

File Name: Inver_LX0038_2013_10_01 01 processed
10/01/2013 08:27:23.0000

Test Temperature: 69.2 degrees
Relative Humidity: 50.9%
Test Velocity: 1.96 m/s

THOR Right Foot Inversion Certification
Ankle X-Rotation
Serial Number: LX0038

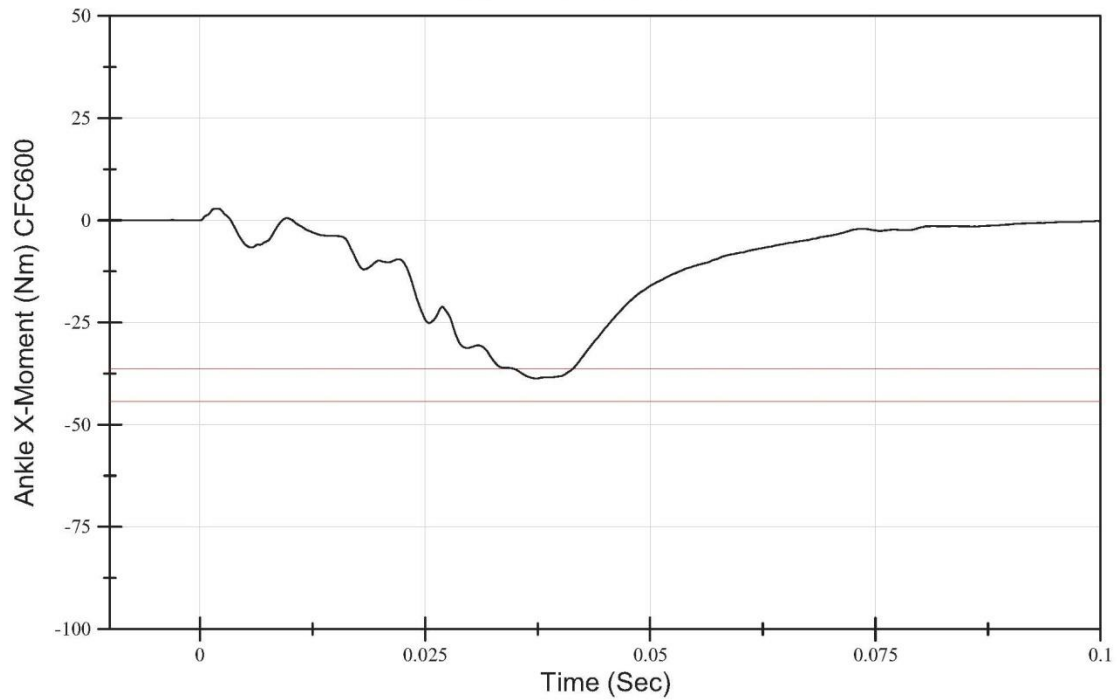


Software Version: 2.2

File Name: Inver_LX0038_2013_10_01 01 processed
10/01/2013 08:27:23.0000

Test Temperature: 69.2 degrees
Relative Humidity: 50.6%
Test Velocity: 1.95 m/s

THOR Right Foot Eversion Certification
Ankle Moment
Serial Number: LX0038

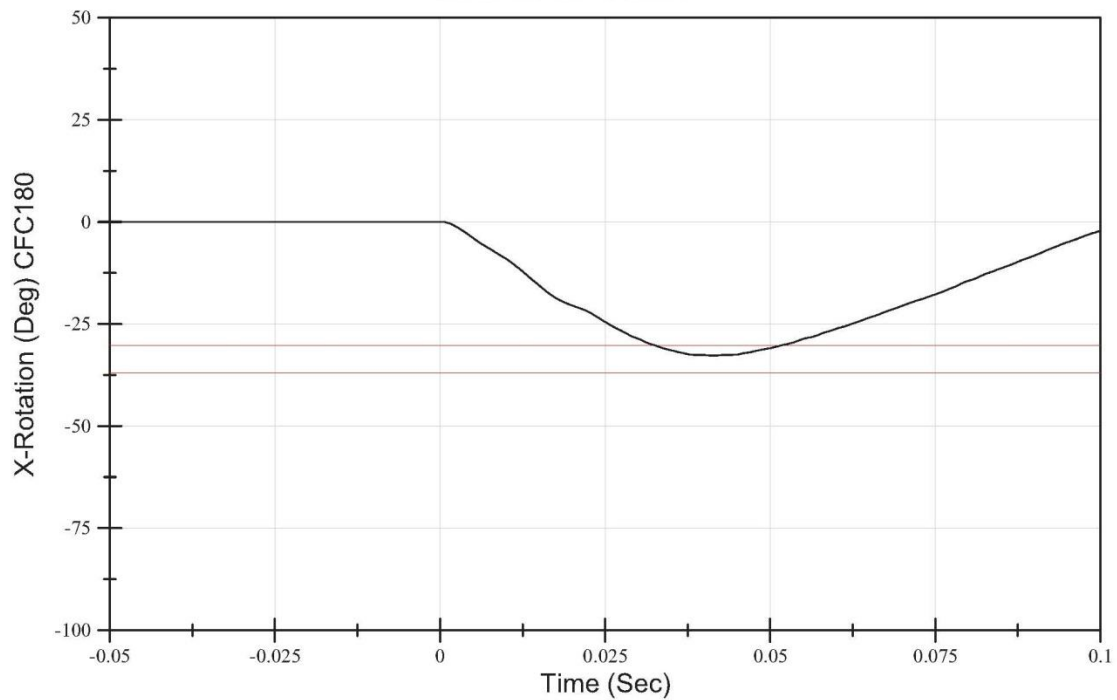


Software Version: 2.2

File Name: Ever_LX0038_2013_10_01 01 processed
10/01/2013 10:12:11.0000

Test Temperature: 69.2 degrees
Relative Humidity: 50.6%
Test Velocity: 1.95 m/s

THOR Right Foot Eversion Certification
Ankle X-Rotation
Serial Number: LX0038



Software Version: 2.2

File Name: Ever_LX0038_2013_10_01 01 processed
10/01/2013 10:12:11.0000

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

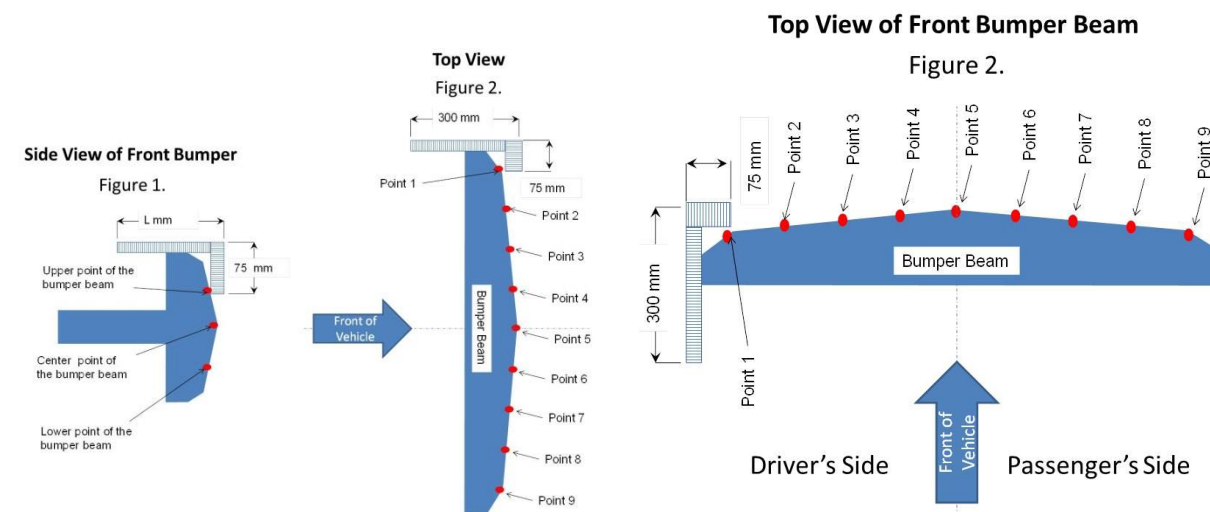
The Brake Pedal Reference Point is the x, y, and z location of the geometric center of the brake pedal pad (top surface) in the VCS.

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 plane 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 D2 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 10 cm from the D3 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 10 cm from the D3 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 10 cm from the D3 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 10 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 10 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 10 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 10 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 10 cm from the D4 reference. The lateral coordinate of the D5 is obtained by adding 15 cm from the brake pedal reference lateral coordinate.

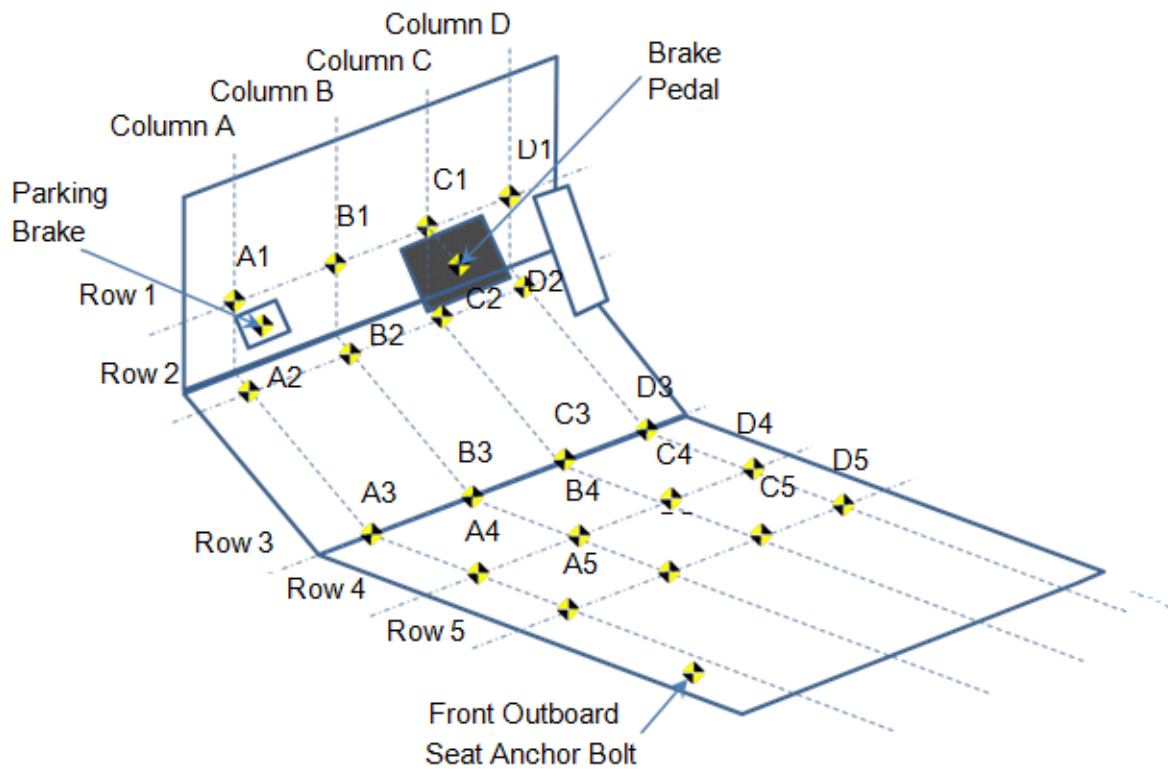
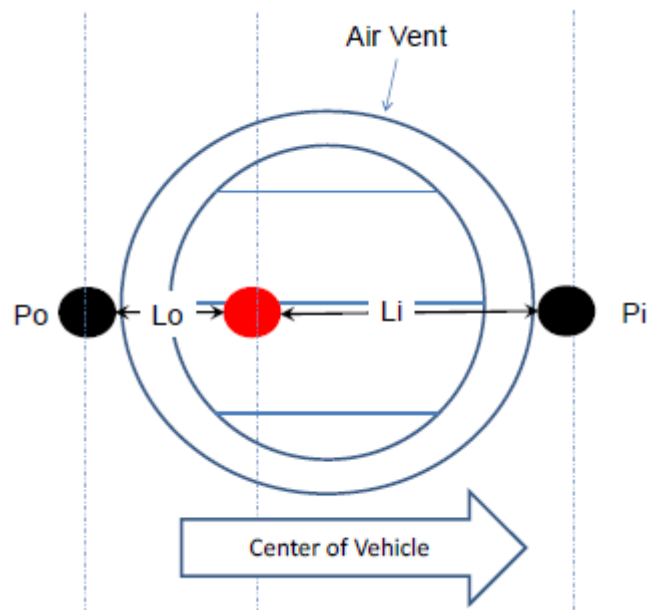


Figure 22: Lower interior intrusion measurements

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.



$$dp = \frac{L_i}{L_o + L_i} [X_o, Y_o, Z_o] + \frac{L_o}{L_o + L_i} [X_i, Y_i, Z_i]$$

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 15 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 0 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 adding 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER 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 25 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 15 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 0 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 adding 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT D2

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 D2 is obtained by adding 25 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 driver's floor reference. The lateral coordinate of the A3 is obtained by subtracting 15 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 driver's floor reference. The lateral coordinate of the B3 is obtained by subtracting 0 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 driver's floor reference. The lateral coordinate of the C3 is obtained by adding 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT D3

The vertical coordinate of the D3 measurement location is obtained by subtracting 1 cm from the driver's floor reference. The lateral coordinate of the D3 is obtained by adding 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT A4

The longitudinal coordinate of the A4 measurement location is obtained by subtracting 10 cm from the A3 reference. The lateral coordinate of the A4 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B4

The longitudinal coordinate of the B4 measurement location is obtained by subtracting 10 cm from the A3 reference. The lateral coordinate of the B4 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C4

The longitudinal coordinate of the C4 measurement location is obtained by subtracting 10 cm from the A3 reference. The lateral coordinate of the C4 is obtained by adding 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT D4

The longitudinal coordinate of the D4 measurement location is obtained by subtracting 10 cm from the A3 reference. The lateral coordinate of the D4 is obtained by adding 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT A5

The longitudinal coordinate of the A5 measurement location is obtained by subtracting 10 cm from the A4 reference. The lateral coordinate of the A5 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B5

The longitudinal coordinate of the B5 measurement location is obtained by subtracting 10 cm from the B4 reference. The lateral coordinate of the B5 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C5

The longitudinal coordinate of the C5 measurement location is obtained by subtracting 10 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.

PASSENGER POINT D5

The longitudinal coordinate of the D5 measurement location is obtained by subtracting 10 cm from the D4 reference. The lateral coordinate of the D5 is obtained by adding 25 cm from the center passenger seat reference lateral coordinate.

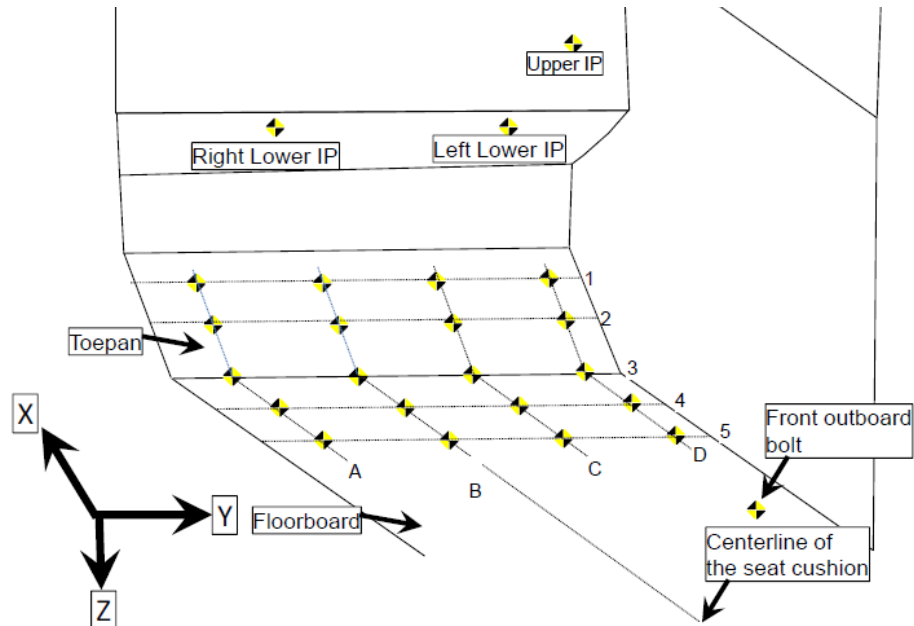


Figure 24: Passenger side lower interior measurements

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
- 16) **Point 33:** Subtract 150mm from the vertical coordinate of the brake pedal reference point
- 17) **Point 34:** Subtract 0mm from the vertical coordinate of the brake pedal reference point

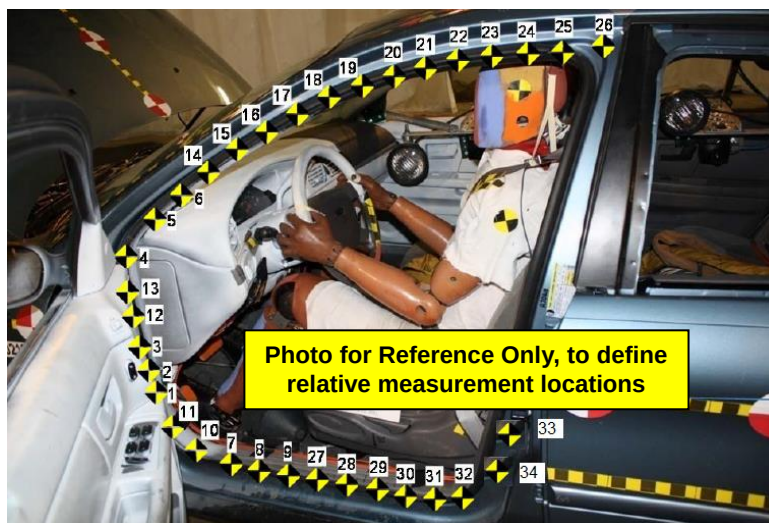


Figure 25: Driver Door Measurements

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.

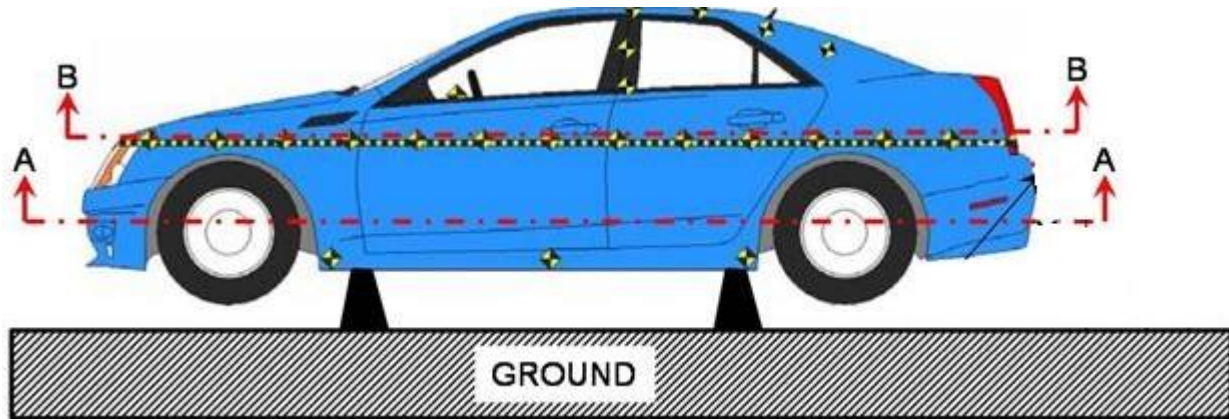


Figure 26: Pre-Test Vehicle Profile

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.

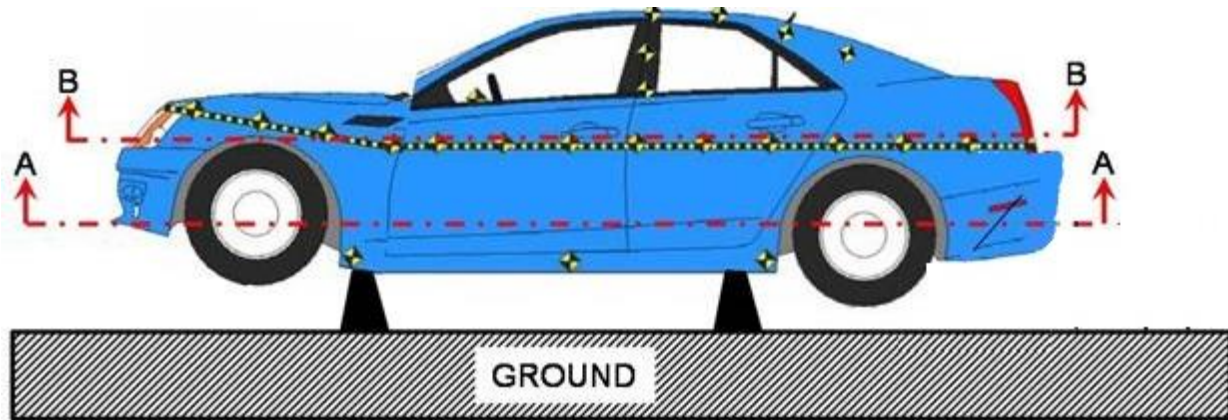
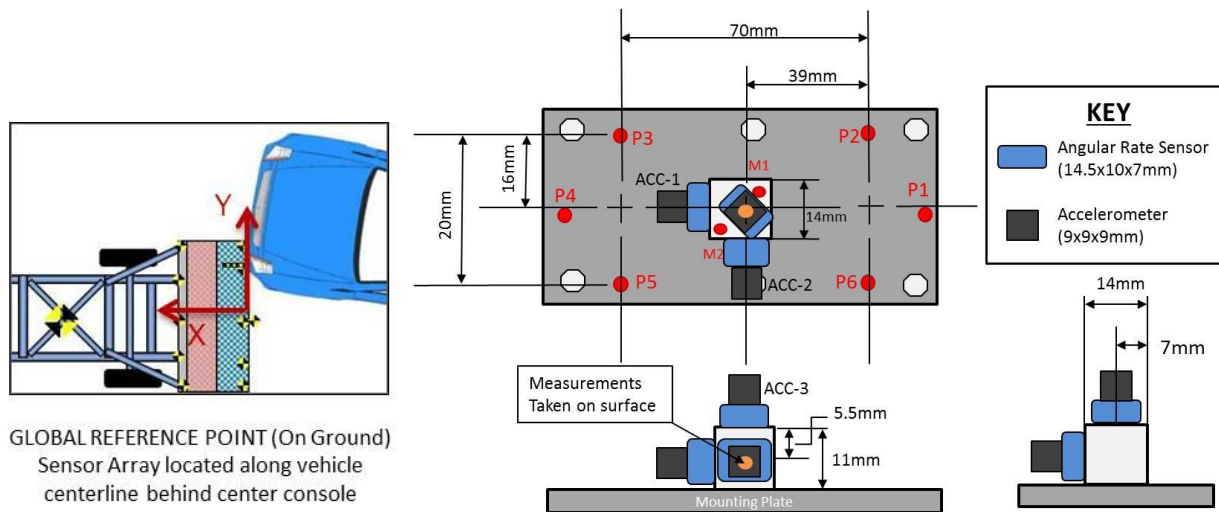


Figure 27: Post-Test Vehicle Profile

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.

Angular Rate Sensor Mounting & Dimensions:



- 1) Make sure the vehicle is in the **LVC** condition by placing jacks under each jack point and leveling the sill as previously described.
- 2) The ARS sensors and vehicle CG accelerometers were installed directly behind the center console on the floor board using the above pictured mounting block.
- 3) The block was mounted at the longitudinal centerline such that the x, y, and z axis of the block align with the vehicle coordinate system.
 - a. P1 and P4 were placed along the lateral centerline of the vehicle
 - b. P4 is mounted toward the front of the vehicle
 - c. The mounting plate is parallel to the horizontal plan of the vehicle coordinate system

Note: the block shall not move relative to the vehicle during the test

- 4) CMM each position alignment point (P1-P6) while the vehicle is level.
- 5) CMM the middle of the top surface of each direction of the CG accelerometer while the vehicle is level. (ie. Accelerometer CGx will be taken on the surface in the x-direction)
- 6) Transport the vehicle to test area and align with the RMDB barrier
- 7) Once vehicle is aligned with the barrier and all dummies are positioned, create a global coordinate system on the ground (GCS). The origin of the GCS is located at the front most point at the centerline of the RMDB.
 - Positive X is from the GCS origin point to the rear of RMDB
 - Positive Y is from the center of RMDB towards the left of RMDB when looking from the back of the RMDB
 - Positive Z is from the GCS origin point downward into the ground
- 8) Measure and record all points described above