

REPORT NUMBER: R&D-CAL-14-008

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

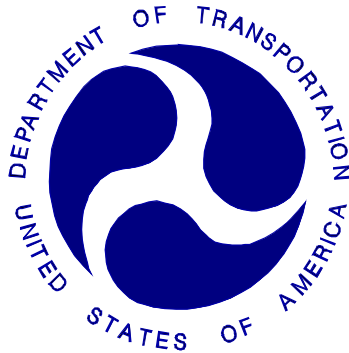
2014 Subaru Impreza

90.1KPH, 15 DEGREE ANGLE, 35% OVERLAP

TEST DATE: 07/18/2014

NHTSA No: R20145508

**CALSPAN CORPORATION
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FINAL REPORT SUBMITTED:

February 24, 2015

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

Date: _____

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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 Impreza four door sedan. 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 July 18, 2014. The RMDB impact velocity was 89.66 kph and the ambient temperature at the test vehicle at the time of impact was 21°C. The target vehicle post-test maximum crush was 462 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>398.40</td> <td>700</td> <td>538.68</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-49.88</td> <td>63</td> <td>-45.39</td> </tr> <tr> <td>Neck Injury Criteria (Nij)</td> <td>N/A</td> <td>1</td> <td>0.30</td> <td>1</td> <td>0.40</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>1962.01</td> <td>4,170</td> <td>1934.84</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-56.39</td> <td>4,000</td> <td>-185.21</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-3036.96</td> <td>10,008</td> <td>-4763.01</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-2380.95</td> <td>10,008</td> <td>-5981.82</td> </tr> </tbody> </table>					Measurement Description	Units	Driver ATD		Pass. ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	398.40	700	538.68	Maximum Chest Compression	mm	63	-49.88	63	-45.39	Neck Injury Criteria (Nij)	N/A	1	0.30	1	0.40	Neck Tension	N	4,170	1962.01	4,170	1934.84	Neck Compression	N	4,000	-56.39	4,000	-185.21	Left Femur Force	N	10,008	-3036.96	10,008	-4763.01	Right Femur Force	N	10,008	-2380.95	10,008	-5981.82
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DISCLAIMER

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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Date: February 24, 2015

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Test Program:	<u>R&D 90.1kph, 15° / 35% Left Oblique Offset</u>	Test Date:	<u>7/18/2014</u>

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SECTION 1
PURPOSE OF TEST

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

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.

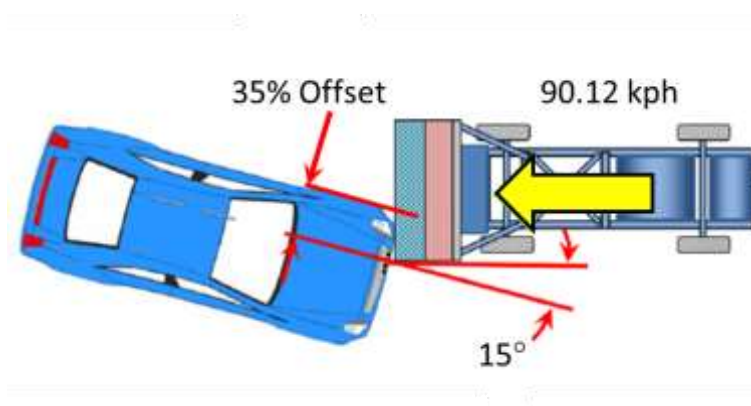
This test was conducted in accordance with the instructions set forth for a 15° angle, 35% offset moving barrier to vehicle impact, outlined in Contract No. DTNH22-10-D-00155, TO 0002. Data was obtained indicant of Federal Motor Vehicle Safety Standard FMVSS 208-Occupant Crash Protection, FMVSS 212 – 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 Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

A 2014 Subaru Impreza four door sedan 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 1,663.5 kg (3,666.4 lbs), and the RMDB's mass was 2490.2 kg (5490 lbs). The test was conducted by Calspan Corporation on July 18, 2014.



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. 015) was seated in the left, front (P1 -Driver's) seating position and one 50% adult male THOR-NT adult male ATD (Serial No. 016) 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 airbags. 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 Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

Two hundred and thirty seven (237) 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 91.2% total windshield retention, with 82.4% 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 462 mm at C2 to the left of the vehicle's centerline. The maximum crush of the structural bumper beam was 414 mm at B3, 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:

- 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, and side headliner
- Torso contacted the frontal airbag, and driver's door, and driver's shoulder contacted the side door
- Knees contacted the knee bolster and knee airbag

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

- Head contacted the frontal airbag, center instrument panel, interior target bar, visor, and head liner
- Torso contacted the frontal airbag, and left shoulder contacted the center instrument panel
- Knees contacted the glove box

SECTION 2 (CONTINUED) CRASH VEHICLE SUMMARY

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

Primary Impact Data

Measured Parameter	Units	Value
RMDB Velocity at Impact	kph	89.66
RMDB Test Weight	kg	2490.2
RMDB Maximum Static Crush	mm	435
Vehicle Test Weight	kg	1663.5
Actual Vehicle Angle	degrees	15
Vehicle Maximum Static Crush	mm	462
Vertical Offset from Target Point (+ down / - up)*	mm	-16
Lateral Offset from Target Point (+ left / - right)*	mm	-2
Number of Data Channels		237
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: 015		THOR, S/N: 016	
Head Contact	Frontal and curtain airbag, and side headliner	A49-A51	Frontal airbag, center instrument panel, interior target bar, visor, and head liner	A70-A72
Left Shoulder Contact	Driver's Door	N/A	Center Instrument Panel	N/A
Upper Torso Contact	Front Airbag and side torso and arm contacted, Driver's door	N/A	Frontal airbag	N/A
Lower Torso Contact	None	N/A	None	N/A
Left Knee Contact	Knee Bolster	A28	Glove Box	A52
Left Outside Leg Contact	None	N/A	None	N/A
Right Knee Contact	Knee Airbag	A28	Glove Box	A52

Data Anomalies:

- Driver Acetabular Left X Force, Questionable spike from 54 to 55 ma
- Driver Acetabular Right Z Force, Questionable data after 57 ms
- Driver Lower Tibia Right Z Force, Channel failed

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2014 Subaru Impreza NHTSA No.: R20145508
Test Program: Research and Development Left Oblique Offset Test Date: 7/18/2014

Driver: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	5.48	-70.63
	Head CG Y	g	1000	74.61	-6.73
	Head CG Z	g	1000	36.88	-8.90
	Head Resultant	g	Compute	99.42	
	36 ms HIC		Compute	685.42	
	15 ms HIC		Compute	398.40	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	80.15	
	Head Rotational Velocity X	deg/s	60	798.15	-1068.06
	Head Rotational Velocity Y	deg/s	60	488.95	-1892.68
	Head Rotational Velocity Z	deg/s	60	1319.86	-1001.03
	Head Rotational Velocity Resultant	deg/s	Compute	2009.52	
	Brain Injury Criteria		Compute	0.84	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	58.60	-527.36
	UNLC Neck System Tension, FZ	N	1000	1962.01	
	UNLC Neck System Compression, FZ	N	1000		
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	0.50	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-13.54
	NIJ		Compute	0.30	
	On head acting through total neck section, FX	N	Thortest	18.35	-733.59
	On head acting through total neck section, FY	N	Thortest	430.91	-54.61
	On head acting through total neck section, FZ	N	Thortest	1964.32	-56.93
	On head acting through total neck section, MX	N-m	Thortest	29.48	-25.22
	On head acting through total neck section, MY	N-m	Thortest	20.06	-15.40
	On head acting through total neck section, MZ	N-m	Thortest	6.57	-21.59
	On head acting through O.C. joint only, FX	N	Thortest	27.16	-808.89
	On head acting through O.C. joint only, FZ	N	Thortest	1945.23	-79.08
	On head acting through O.C. joint only, MY	N-m	Thortest	29.48	-25.22
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	0.06	-21.36
	Upper Left IR-TRACC Y - deflection	mm	Thortest	12.50	-6.75
	Upper Left IR-TRACC Z - deflection	mm	Thortest	8.38	-20.84
	Upper Left IR-TRACC D - deflection	mm	Thortest	4.58	-17.82
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.56	-49.14
	Upper Right IR-TRACC Y - deflection	mm	Thortest	11.61	-5.65
	Upper Right IR-TRACC Z - deflection	mm	Thortest	17.33	-12.34
	Upper Right IR-TRACC D - deflection	mm	Thortest	0.52	-49.88
	Lower Left IR-TRACC X - deflection	mm	Thortest	11.77	-7.79
	Lower Left IR-TRACC Y - deflection	mm	Thortest	5.20	-6.72

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2014 Subaru Impreza NHTSA No.: R20145508

Test Program: Research and Development Left Oblique Offset Test Date: 7/18/2014

Driver: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	0.24	-15.25
	Lower Left IR-TRACC D - deflection	mm	Thortest	14.46	-1.95
	Lower Right IR-TRACC X - deflection	mm	Thortest	1.28	-38.25
	Lower Right IR-TRACC Y - deflection	mm	Thortest	3.20	-18.97
	Lower Right IR-TRACC Z - deflection	mm	Thortest	15.22	-3.64
	Lower Right IR-TRACC D - deflection	mm	Thortest	1.44	-36.43
	Chest CG Acceleration, 3 ms clip	g	Compute	36.47	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	0.15	-59.70
	Lower Left IR-TRACC Y - deflection	mm	Thortest	0.12	-8.47
	Lower Left IR-TRACC Z - deflection	mm	Thortest	16.78	-0.03
	Lower Left IR-TRACC D - deflection	mm	Thortest	0.15	-60.53
	Left Viscous Criterion Based on X - deflection		Compute	0.75	
	Lower Right IR-TRACC X - deflection	mm	Thortest	7.29	-64.75
	Lower Right IR-TRACC Y - deflection	mm	Thortest	12.27	-2.91
	Lower Right IR-TRACC Z - deflection	mm	Thortest	14.34	-1.79
	Lower Right IR-TRACC D - deflection	mm	Thortest	7.17	-64.33
	Right Viscous Criterion Based on X - deflection		Compute	1.60	
Spine	Upper Spine (T1) AX	g	180	9.23	-44.42
	Upper Spine (T1) AY	g	180	10.98	-31.08
	Upper Spine (T1) AZ	g	180	16.28	-6.82
	Upper Spine (T1) Resultant	g	Compute	47.89	
	Middle Spine (T6) AX	g	180	18.38	-35.05
	Middle Spine (T6) AY	g	180	21.63	-4.48
	Middle Spine (T6) AZ	g	180	4.13	-15.28
	Middle Spine (T6) Resultant	g	Compute	37.46	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	59.55	
Acetabulum	Left FX force	N	600	8496.86 ⁽¹⁾	-1441.85 ⁽¹⁾
	Left FY force	N	600	699.53	-866.02
	Left FZ force	N	600	548.04	-1079.24
	Left Acetabulum Resultant	N	Compute	8507.68 ⁽¹⁾	
	Right FX force	N	600	992.40	-1763.78
	Right FY force	N	600	288.89	-1185.04
	Right FZ force	N	600	13909.89 ⁽²⁾	-773.97 ⁽²⁾
	Right Acetabulum Resultant	N	Compute	13935.14 ⁽²⁾	
Anomalies					
(1) Questionable spike from 54 to 55 ms					
(2) Questionable data after 57 ms					

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver Legs

Test Vehicle: 2014 Subaru Impreza NHTSA No.: R20145508
Test Program: Research and Development Left Oblique Offset Test Date: 7/18/2014

Driver: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	0.26	-9.04
	Right Knee Displacement, DX	mm	180	0.77	-14.62
Femur	Left Femur Force, FZ	N	600	250.34	-3036.96
	Left Femur Moment, MX	N-m	600	57.20	-150.89
	Left Femur Moment, MY	N-m	600	56.65	-113.94
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	185.42	
	Right Femur Force, FZ	N	600	151.60	-2380.95
	Right Femur Moment, MX	N-m	600	55.12	-121.35
	Right Femur Moment, MY	N-m	600	96.82	-48.03
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	125.78	
Tibia	Left Upper Tibia, FZ	N	600	127.15	-1018.54
	Left Upper Tibia, MY	N-m	600	46.35	-118.18
	Left Upper Tibia, Index		Compute	0.82	
	Right Upper Tibia, FZ	N	600	198.83	-2221.79
	Right Upper Tibia, MY	N-m	600	145.77	-21.56
	Right Upper Tibia, Index		Compute	0.72	
	Left Lower Tibia, FZ	N	600	45.05	-1646.29
	Left Lower Tibia, MY	N-m	600	26.42	-80.53
	Left Lower Tibia, Index		Compute	0.77	
	Right Lower Tibia, FZ	N	600	3626.09 ⁽³⁾	-4872.17 ⁽³⁾
	Right Lower Tibia, MY	N-m	600	82.50	-23.57
	Right Lower Tibia, Index		Compute	0.71 ⁽³⁾	
Ankle	Left Ankle Rotation, RX	Deg	180	5.06	-29.88
	Left Ankle Rotation, RY	Deg	180	19.84	-5.24
	Right Ankle Rotation, RX	Deg	180	18.42	-35.77
	Right Ankle Rotation, RY	Deg	180	12.01	-8.83
Anomalies					
(3) Channel failed					

SECTION 2 (CONTINUED)

PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: 2014 Subaru Impreza NHTSA No.: R20145508
 Test Program: Research and Development Left Oblique Offset Test Date: 7/18/2014

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	49.38	-23.10
	Head CG Y	g	1000	99.14	-5.04
	Head CG Z	g	1000	44.05	-2.14
	Head Resultant	g	Compute	109.34	
	36 ms HIC		Compute	538.68	
	15 ms HIC		Compute	538.68	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	88.17	
	Head Rotational Velocity X	deg/s	60	643.29	-1974.28
	Head Rotational Velocity Y	deg/s	60	984.85	-1517.07
	Head Rotational Velocity Z	deg/s	60	3083.28	-1644.06
	Head Rotational Velocity Resultant	deg/s	Compute	3606.06	
	Brain Injury Criteria		Compute	1.44	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	512.36	-68.26
	UNLC Neck System Tension, FZ	N	1000	1934.84	
	UNLC Neck System Compression, FZ	N	1000		-185.21
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	18.97	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-8.07
	NIJ		Compute	0.40	
	On head acting through total neck section, FX	N	Thortest	806.14	-134.69
	On head acting through total neck section, FY	N	Thortest	734.57	-85.81
	On head acting through total neck section, FZ	N	Thortest	2066.21	-140.05
	On head acting through total neck section, MX	N-m	Thortest	25.88	-27.35
	On head acting through total neck section, MY	N-m	Thortest	26.58	-17.50
	On head acting through total neck section, MZ	N-m	Thortest	16.17	-42.51
	On head acting through O.C. joint only, FX	N	Thortest	727.11	-112.79
	On head acting through O.C. joint only, FZ	N	Thortest	1856.33	-184.58
	On head acting through O.C. joint only, MY	N-m	Thortest	18.97	-8.07
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	0.04	-33.24
	Upper Left IR-TRACC Y - deflection	mm	Thortest	8.62	-5.04
	Upper Left IR-TRACC Z - deflection	mm	Thortest	19.81	-3.14
	Upper Left IR-TRACC D - deflection	mm	Thortest	0.04	-31.16
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.19	-20.75
	Upper Right IR-TRACC Y - deflection	mm	Thortest	8.59	-6.83
	Upper Right IR-TRACC Z - deflection	mm	Thortest	11.06	-5.01
	Upper Right IR-TRACC D - deflection	mm	Thortest	0.18	-21.02
	Lower Left IR-TRACC X - deflection	mm	Thortest	2.90	-48.65
	Lower Left IR-TRACC Y - deflection	mm	Thortest	18.19	-0.20

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

Test Vehicle: 2014 Subaru Impreza NHTSA No.: R20145508

Test Program: Research and Development Left Oblique Offset Test Date: 7/18/2014

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	10.90	-8.97
	Lower Left IR-TRACC D - deflection	mm	Thortest	7.54	-45.39
	Lower Right IR-TRACC X - deflection	mm	Thortest	3.67	-8.99
	Lower Right IR-TRACC Y - deflection	mm	Thortest	10.70	-10.57
	Lower Right IR-TRACC Z - deflection	mm	Thortest	18.49	-7.26
	Lower Right IR-TRACC D - deflection	mm	Thortest	2.97	-8.90
	Chest CG Acceleration, 3 ms clip	g	Compute	30.57	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	1.14	-71.67
	Lower Left IR-TRACC Y - deflection	mm	Thortest	10.53	-1.60
	Lower Left IR-TRACC Z - deflection	mm	Thortest	8.81	-3.96
	Lower Left IR-TRACC D - deflection	mm	Thortest	1.14	-70.00
	Left Viscous Criterion Based on X - deflection		Compute	1.85	
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.02	-65.77
	Lower Right IR-TRACC Y - deflection	mm	Thortest	11.71	-0.42
	Lower Right IR-TRACC Z - deflection	mm	Thortest	12.74	-3.61
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.02	-65.57
	Right Viscous Criterion Based on X - deflection		Compute	1.07	
Spine	Upper Spine (T1) AX	g	180	30.95	-27.69
	Upper Spine (T1) AY	g	180	78.77	-30.02
	Upper Spine (T1) AZ	g	180	21.29	-4.06
	Upper Spine (T1) Resultant	g	Compute	84.65	
	Middle Spine (T6) AX	g	180	8.85	-30.66
	Middle Spine (T6) AY	g	180	22.93	-2.25
	Middle Spine (T6) AZ	g	180	13.75	-5.04
	Middle Spine (T6) Resultant	g	Compute	31.15	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	68.29	
Acetabulum	Left FX force	N	600	2171.69	-2339.93
	Left FY force	N	600	1390.57	-1217.17
	Left FZ force	N	600	548.11	-2012.70
	Left Acetabulum Resultant	N	Compute	2464.21	
	Right FX force	N	600	1282.32	-1310.57
	Right FY force	N	600	382.54	-2065.36
	Right FZ force	N	600	1845.87	-284.65
	Right Acetabulum Resultant	N	Compute	2696.88	
Anomalies					
None					

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

Test Vehicle: 2014 Subaru Impreza NHTSA No.: R20145508
Test Program: Research and Development Left Oblique Offset Test Date: 7/18/2014

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	0.95	-4.48
	Right Knee Displacement, DX	mm	180	0.62	-0.96
Femur	Left Femur Force, FZ	N	600	222.45	-4763.01
	Left Femur Moment, MX	N-m	600	76.70	-135.35
	Left Femur Moment, MY	N-m	600	61.85	-90.84
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	151.71	
	Right Femur Force, FZ	N	600	429.51	-5981.82
	Right Femur Moment, MX	N-m	600	61.40	-181.14
	Right Femur Moment, MY	N-m	600	169.81	-66.65
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	211.34	
Tibia	Left Upper Tibia, FZ	N	600	127.02	-3078.98
	Left Upper Tibia, MY	N-m	600	15.15	-66.54
	Left Upper Tibia, Index		Compute	0.76	
	Right Upper Tibia, FZ	N	600	356.17	-3463.20
	Right Upper Tibia, MY	N-m	600	28.67	-35.61
	Right Upper Tibia, Index		Compute	0.75	
	Left Lower Tibia, FZ	N	600	1.99	-2204.73
	Left Lower Tibia, MY	N-m	600	34.40	-117.52
	Left Lower Tibia, Index		Compute	0.89	
	Right Lower Tibia, FZ	N	600	232.77	-2376.36
	Right Lower Tibia, MY	N-m	600	45.50	-40.62
	Right Lower Tibia, Index		Compute	0.65	
Ankle	Left Ankle Rotation, RX	Deg	180	25.43	-12.44
	Left Ankle Rotation, RY	Deg	180	-2.47	-22.92
	Right Ankle Rotation, RX	Deg	180	13.89	-37.79
	Right Ankle Rotation, RY	Deg	180	-3.29	-33.88
Anomalies					
None					

SECTION 3 DATA SHEETS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

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4	Dummy Lateral Clearance Dimensions	3-10
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DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

VEHICLE INFORMATION

NHTSA No.	R20145508
Model Year	2014
Make	Subaru
Model	Impreza
Body Style	Four Door Sedan
VIN	JF1GPAC65E8268217
Body Color	Silver
Odometer Reading (km/mi)	249.5 km / 155 mi
Engine Displacement. (L)	2.0
Type/No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	CVT
Overdrive	Yes
Final Drive	All Wheel Drive
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
All-Wheel Drive (AWD)	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	Yes
Driver Torso/Pelvis Airbag	No
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Pass. Front Airbag	Yes
Pass. Curtain Airbag	Yes
Pass. Head/Torso Airbag	No
Pass. Torso Airbag	Yes
Pass. Torso/Pelvis Airbag	No
Pass. Pelvis Airbag	No
Pass. Knee Airbag	No
Driver Seat Belt Pretensioner	Yes
Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Pass. Load Limiter	Yes
Other Safety Restraint	-

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

N/A

DATA FROM CERTIFICATION LABEL

Manufactured By	FUJI Heavy Industries LTD
Date of Manufacture	01/14

GWR (kg)	1950
GAWR Front (kg)	990
GAWR Rear (kg)	1000

VEHICLE SEATING AND WEIGHT CAPACITY

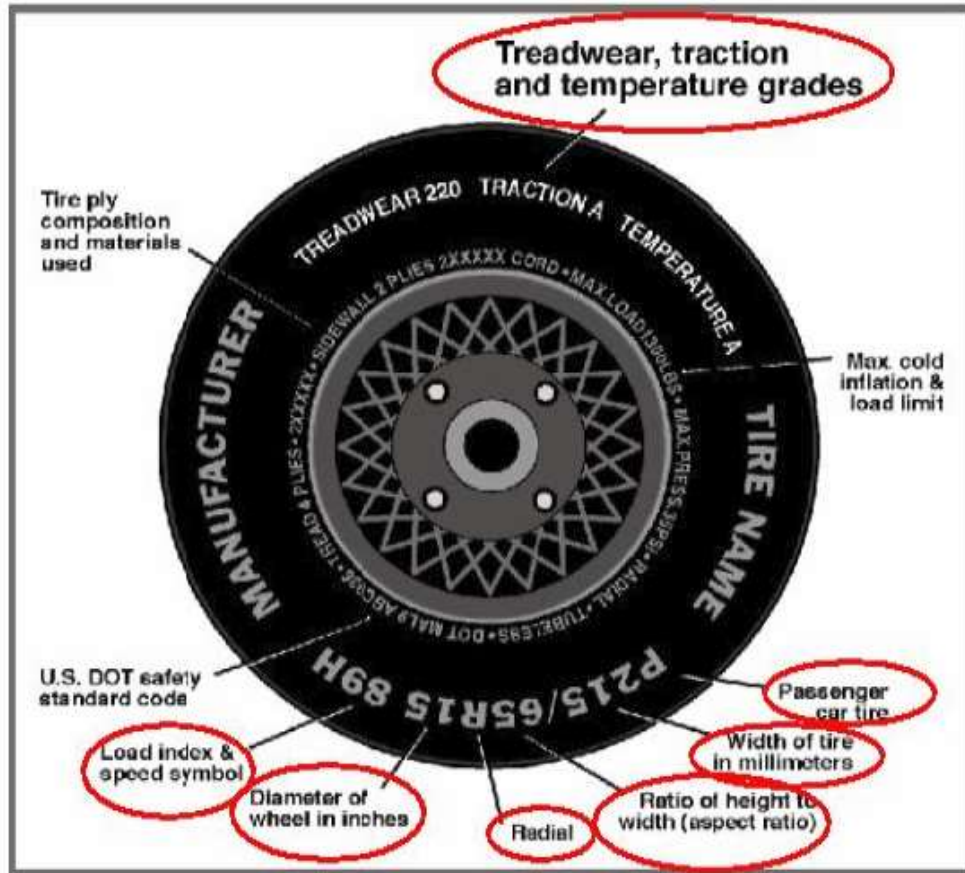
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	--	
Number of Occupants	2	3	--	5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				44.8

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

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

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



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	220
Recommended Tire Size	P205/55R16	P205/55R16
Tire Size on Vehicle	P205/55R16	P205/55R16
Tire Manufacturer	Yokohama	Yokohama
Tire Model	AVID S30	AVID S30
Treadwear	320	320
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Nylon	1 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	89V	89V
Tire Material	Rubber	Rubber
DOT Safety Code Right	FD8KPEM0314	FD8KPEM0314
DOT Safety Code Left	FD8KPEM0314	FD8KPEM0314

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

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	423	290		461.5	382.5	
Right	kg	418	266		460	359.5	
Ratio	%	60%	40%		55%	45%	
Totals	kg	841	556	1397	921.5	742	1663.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1397
Weight of 2 P572E ATDs	kg	197.8
Rated Cargo/Luggage Weight (RCLW)	kg	67.8
Calculated Vehicle Target Weight (TVTW)	kg	1662.6

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	683	690	675	677	1053
As Tested	mm	667	675	635	636	1181
Post Test	mm	628	668	586	704	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2647
Total Vehicle Length at Left Side	mm	4333
Total Vehicle Length at Centerline	mm	4416
Total Vehicle Length at Right Side	mm	4333
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	60
Amount of Stoddard Solvent in Fuel Tank	L	51

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting, spare tire, jack, rear speaker, tail light, rear seats, and muffler

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

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements		Pre-Test
1	Total Length	mm	4416
2	Total Width	mm	1738
3*	Bumper Top Height	mm	523
4*	Bumper Bottom Height	mm	434
5*	Longitudinal Member Top Height	mm	543
6	Distance Between Longitudinal Members	mm	1034
7	Longitudinal Member Width	mm	80
8*	Engine Top Height	mm	867
9*	Engine Bottom Height	mm	202
10	Engine and Gearbox Width	mm	735
11	Front Bumper-Engine Distance	mm	457
12*	Front Shock Absorber Fixing Height	mm	854
13*	Bonnet Leading Edge Height	mm	767
14	Front Shock Absorber Fixing Width	mm	1113
15	Front Bumper – Front Axle Distance	mm	940
16	Front Axle – A Pillar Distance	mm	472
17	A-Pillar – B-Pillar Distance	mm	1128
18	B-Pillar – Rear Axle Distance	mm	1050
19	B-Pillar – C-Pillar Distance	mm	1023
20*	Roof Sill Bottom Height	mm	1354
21*	Roof Sill Top Height	mm	1462
22*	Floor Sill Bottom Height	mm	256
23*	Floor Sill Top Height	mm	361

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

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

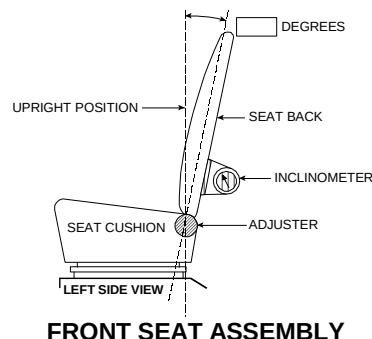
NHTSA No.: R20145508
 Test Date: 7/18/2014

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	-1.3
Passenger Seat Back Angle	-3.0

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.

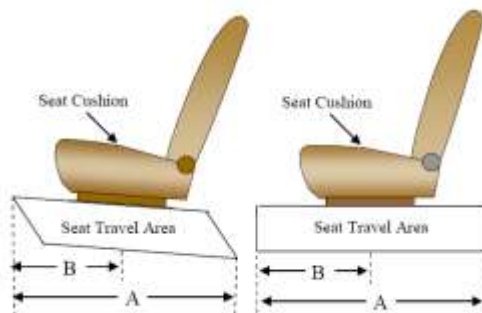
	Total Fore/Aft Travel	Placed in Position #
Driver Seat	25 (0-24)	10
Passenger Seat	25 (0-24)	12

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 Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

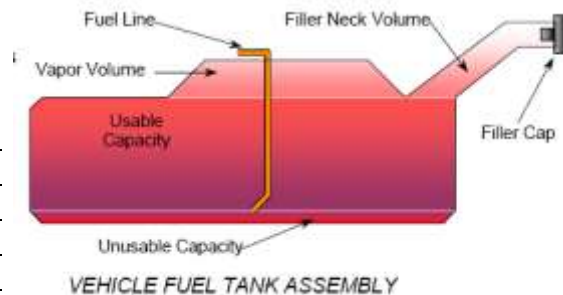
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	54.9
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	51.0
Actual Amount of Solvent Used	51.0
1/3 of Usable Capacity	18.1

FUEL PUMP

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

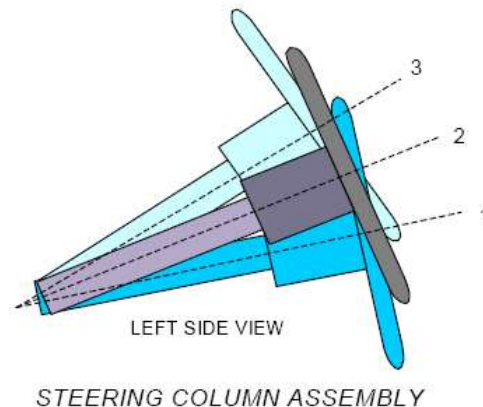
Fuel evacuated according to the specifications provided by the manufacturer in Form 1. Electric fuel pump operates when the ignition is in the 'on' position and the engine is running. The fuel filler neck is located above the left rear wheel.



STEERING COLUMN ADJUSTMENT

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

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



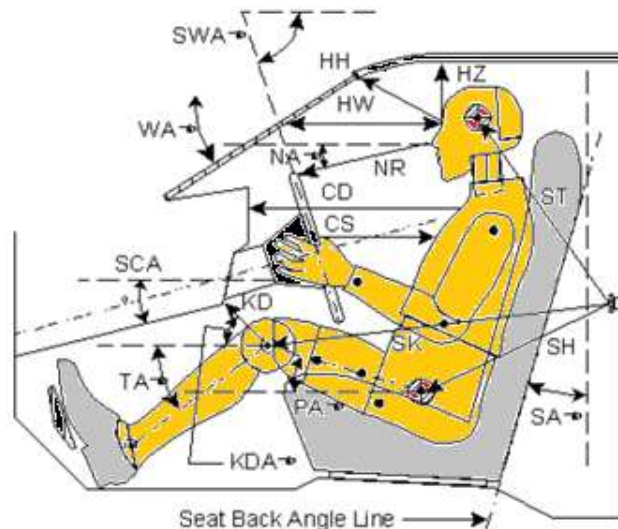
STEERING COLUMN POSITIONS

	Tilt (degrees)	Fore/Aft Position (mm)
Lowermost position No. 1	22.0	
Geometric center position No. 2	23.5	
Uppermost position No. 3	25.0	
Telescoping Steering Wheel Travel		40
Test Position	23.5	20

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014



Code	Measurement Description	Driver (Serial # THOR 015)		Passenger (Serial # THOR 016)	
		Length (mm)	Angle(°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.5		
SWA°	Steering Wheel Angle		23.5		
SCA°	Steering Column Angle		66.5		
SA°	Seat Back Angle (on headrest post)		-1.2		-2.7
HZ	Head to Roof (Z)	200	90	156	90
HH	Head to Header	396	19.1	370	15.2
HW	Head to Windshield	665	0	597	0
NR	Nose to Rim	501	17.6	737	-34.2
CD	Chest to Dash	578		584	
CS	Chest to Steering Hub	350	-1.9		
RA	Rim to Abdomen	190	0		
KDL	Left Knee to Dash	158	29.3	133	29.3
KDR	Right Knee to Dash	122	31.2	143	30.8
PA°	Pelvic Angle		24.3		24.3
TA°	Tibia Angle		-43.0		39.7
SK	Striker to Knee	615	-6.0	638	-7.8
ST	Striker to Head	465	-87.7	504	-86.7
SH	Striker to H-Point	314	-42.1	289	-41.1
HAX°	Head Angle (X)		0.1		0.2
HAY°	Head Angle (Y)		0.3		0.2
NAX°	Neck Angle (X)		N/A		N/A
NAY°	Neck Angle (Y)		N/A		N/A
TAX°	T6 Angle (X)		-1.4		0.8
TAY°	T6 Angle (Y)		20.7		14.5
LAX°	T1 (X)		0.6		-1.3
LAY°	T1 (Y)		2.4		0.8

DATA SHEET NO.3 (CONTINUED)
DUMMY CMM MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

Description	Units	Driver			Passenger		
		X	Y	Z	X	Y	Z
Striker	mm	1211	-763	676	1212	764	676
Head CG	mm	1263	-437	224	1273	427	185
Bridge of Nose	mm	1354	-355	215	1370	354	175
Tip of Nose	mm	1355	-355	249	1371	356	214
Shoulder Bolt	mm	1300	-545	480	1318	540	455
Tip of Chin	mm	1350	-356	353	1368	354	313
H-Point	mm	1476	-593	901	1461	601	879
Left Knee	mm	1855	-572	754	1873	299	768
Right Knee	mm	1869	-295	758	1875	521	776
Left Ankle	mm	2164	-588	1040	2195	297	1036
Right Ankle	mm	2188	-276	1036	2206	503	1032
Left Heel	mm	2181	-577	1175	2180	266	1170
Right Heel	mm	2208	-237	1169	2181	470	1168
Head Bolt 1 – Top Left	mm	1190	-397	177	1210	309	143
Head Bolt 2 – Lower Left	mm	1199	-387	262	1219	320	225
Head Bolt 3 – Top Right	mm	1189	-326	179	1207	378	141
Head Bolt 4 – Lower Right	mm	1197	-338	262	1216	369	224
Driver's Outboard Seat Anchor Bolt	mm	1718	-567	1127	1717	569	1126
Outboard Head Restraint Post	mm	1094	-413	389	1102	416	353
Top of Head Restraint	mm	1141	-351	96	1164	351	62
Center of Steering Wheel	mm	1757	-343	511			

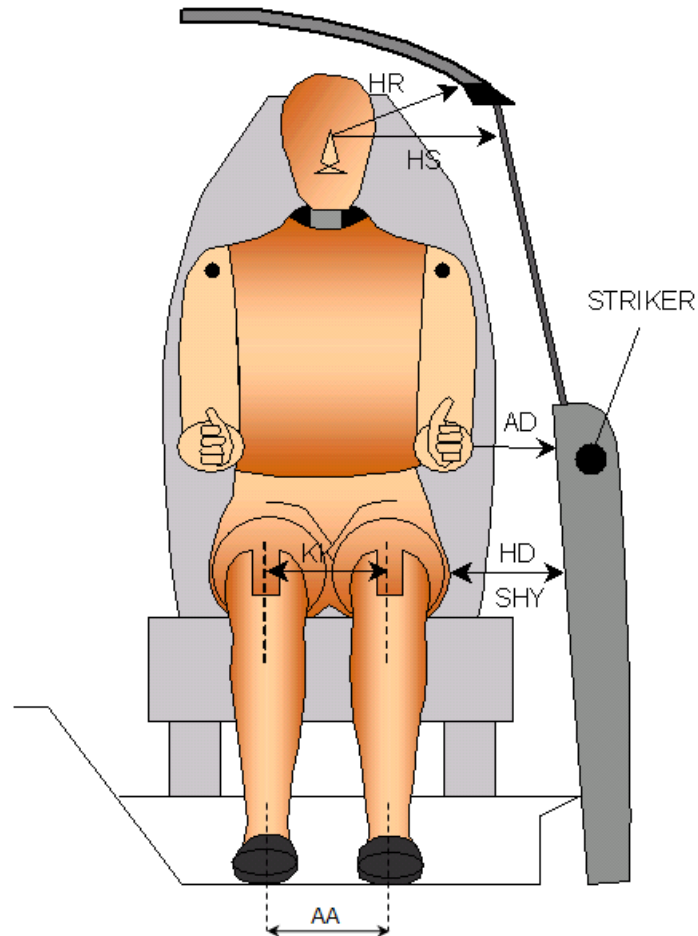
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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 Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

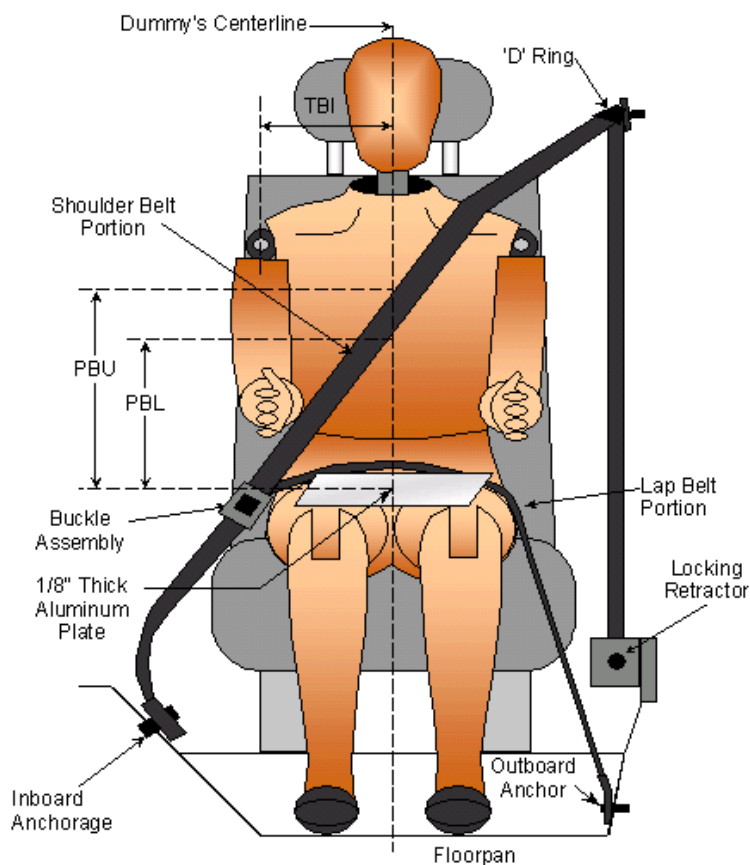


Code	Description	Units	Driver	Passenger
AD	Arm to Door	mm	130	51
HD	H-Point to Door	mm	127	128
HR	Head to Side Header	mm	215	200
HS	Head to Side Window	mm	330	315
KK	Knee to Knee	mm	321	270
SHY	Striker to H-Point (Y Direction)	mm	225	225
AA	Ankle to Ankle	mm	315	210

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	375	375
PBL — Top surface of reference to belt lower edge	mm	300	300

BELT LENGTH DATA

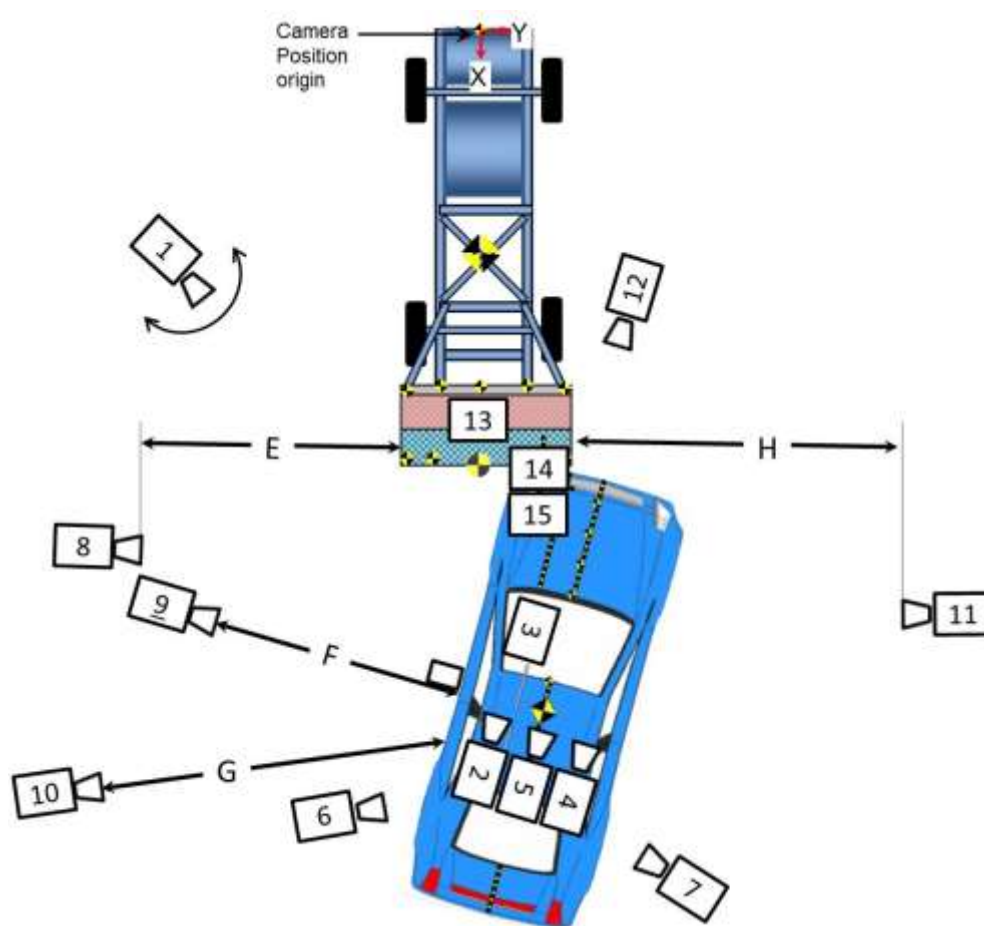
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	805	880
Lap Belt Length as measured on ATD	mm	815	890
Remainder of belt on reel	mm	880	730
Total belt length for continuous webbing systems	mm	2500	2500

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

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

HORIZONTAL LOCATION



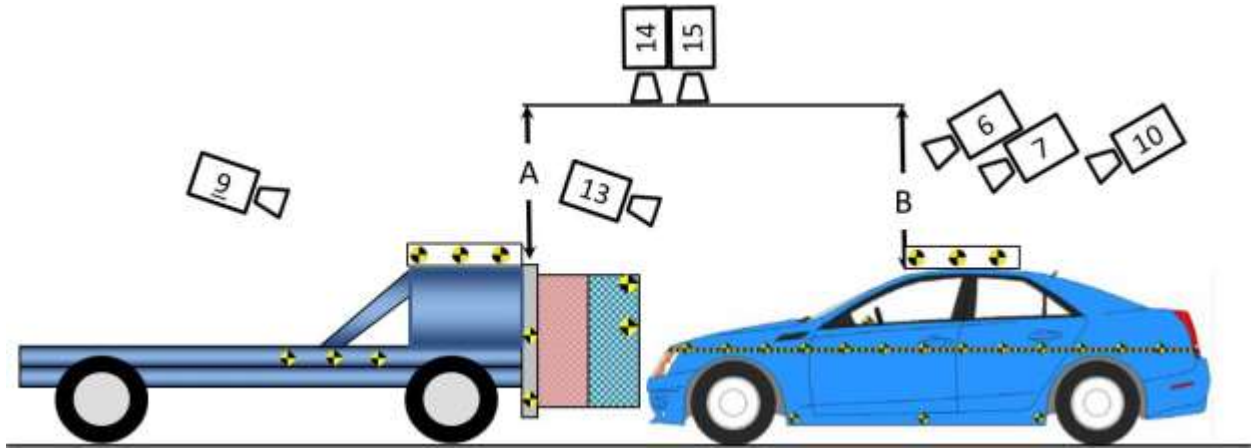
E	mm	6721
F	mm	7442
G	mm	8856
H	mm	6605

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

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

VERTICAL LOCATION



A	mm	4069
B	mm	3784

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

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

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	7852	-84	1208	12.5	1000
3	Onboard Driver Lower Leg	6494	-469	201	6.5	1000
4	Onboard Driver Movement	7984	-845	1208	12.5	1000
5	Onboard Centerline	7910	-452	1208	6.5	1000
6	Driver Interaction	7957	2535	3419	8	1000
7	Passenger Interaction	10957	-9153	2529	24-70	1000
8	Target Vehicle Left Side Perpendicular (High)	4839	7862	1174	24	1000
9	Target Vehicle Driver Motion	6310	7595	1128	24	1000
10	Target Vehicle Passenger Motion	9684	8798	2904	24-70	1000
11	Target Vehicle Right Side	4821	-7647	1246	24	1000
12	Target Vehicle Left Side (High)	656	-2814	1150	28	1000
13	RMDB/Target Vehicle Interaction	4824	-993	4685	28	1000
14	Close-up Impact Point	6950	-561	5246	15	1000
15	Overall Impact	4501	-150	5246	15	1000

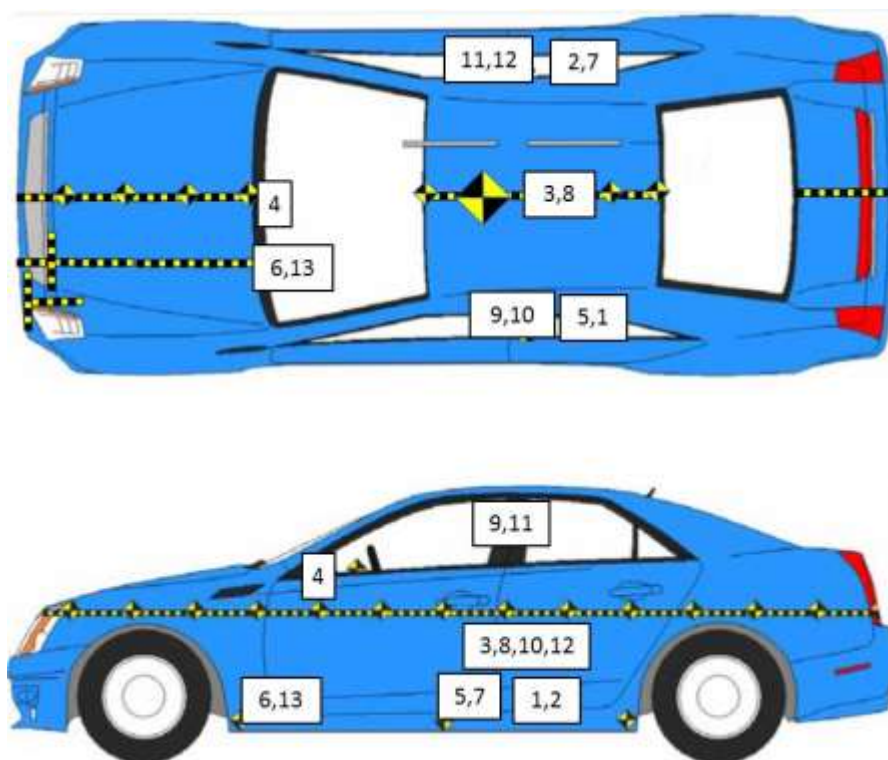
Reference Point: Center most rearward point of the RMDB when in contact with the target vehicle:

- +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 Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Axes	Units	Measurements (mm)		
				X	Y	Z
1	Left Rear Sill	X,Y	mm	993	-690	1098
2	Right Rear Sill	X,Y	mm	992	699	1096
3	Vehicle CG	X,Y,Z	mm	972	0	1033
4	Instrument Panel	X	mm	1931	3	612
5	Driver Seat Track	X,Y,Z	mm	1211	-566	1201
6	Behind Brake Pedal	X,Y,Z	mm	2504	-357	923
7	Passenger Seat Track	X,Y,Z	mm	1226	567	1206
8	Angular Rate Sensors	X	mm	983	1	1039
		Y	mm	972	11	1040
		Z,	mm	972	0	1033

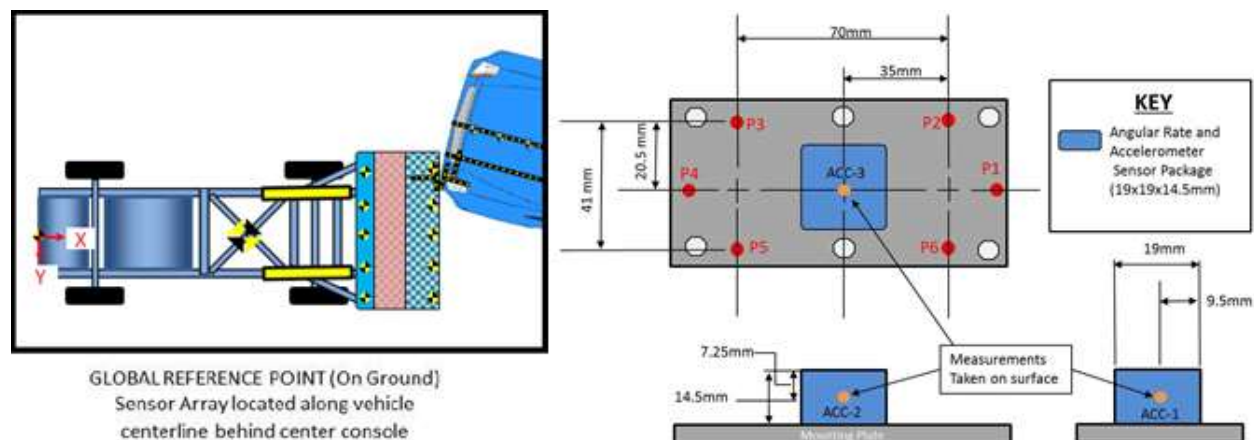
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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 **VEHICLE INSTRUMENTATION DATA**

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014



VEHICLE COORDINATE SYSTEM					
No.	Accelerometer Location	Units	Measurements (mm)		
			X	Y	Z
ACC-1	Accelerometer CG – X Direction	mm	983	1	1039
ACC-2	Accelerometer CG – Y Direction	mm	972	11	1040
ACC-3	Accelerometer CG – Z Direction	mm	972	0	1033
M1	Mounting Bolt 1	mm	980	8	1034
M2	Mounting Bolt 2	mm	965	-7	1034
P1	Plate Point 1	mm	1018	1	1048
P2	Plate Point 2	mm	1007	-20	1048
P3	Plate Point 3	mm	937	-21	1049
P4	Plate Point 4	mm	926	-1	1048
P5	Plate Point 5	mm	937	20	1048
P6	Plate Point 6	mm	1006	21	1048

GLOBAL COORDINATE SYSTEM					
No.	Accelerometer Location	Units	Measurements (mm)		
			X	Y	Z
ACC-1	Accelerometer CG – X Direction	mm	7307	-658	-357
ACC-2	Accelerometer CG – Y Direction	mm	7320	-665	-356
ACC-3	Accelerometer CG – Z Direction	mm	7317	-655	-363
M1	Mounting Bolt 1	mm	7312	-664	-363
M2	Mounting Bolt 2	mm	7322	-645	-362
P1	Plate Point 1	mm	7273	-667	-348
P2	Plate Point 2	mm	7278	-644	-348
P3	Plate Point 3	mm	7345	-625	-347
P4	Plate Point 4	mm	7361	-642	-348
P5	Plate Point 5	mm	7356	-664	-348
P6	Plate Point 6	mm	7289	-684	-348

DATA SHEET NO. 7 (CONTINUED)
VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

VEHICLE INSTRUMENTATION DATA

Loc.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Max	Time (ms)
1	Left Rear Sill	X	g	9.61	12.85	-35.65	42.40
		Y	g	26.79	44.80	-3.90	72.00
2	Right Rear Sill	X	g	2.42	121.60	-48.53	44.70
		Y	g	22.88	44.30	-2.48	99.35
3	Vehicle CG	X	g	13.61	12.35	-39.72	42.75
		Y	g	24.05	44.05	-2.46	99.35
		Z	g	13.11	32.65	-22.99	12.25
4	Instrument Panel	X	g	27.86	100.40	-65.97	66.35
5	Driver Seat Track	X	g	10.96	12.65	-39.57	42.30
		Y	g	29.30	43.75	-6.33	70.00
		Z	g	18.67	33.05	-14.35	75.30
6	Behind Brake Pedal	X	g	21.47	11.35	-73.78	34.00
		Y	g	56.90	42.05	-11.96	10.55
		Z	g	22.78	10.45	-24.73	54.50
7	Passenger Seat Track	X	g	2.21	121.55	-45.93	44.55
		Y	g	26.40	43.35	-3.09	98.35
		Z	g	9.99	43.00	-7.33	70.20
8	Angular Rate Sensors	X	Deg/s	125.75	50.95	-442.52	44.20
		Y	Deg/s	55.76	32.30	-181.37	54.40
		Z	Deg/s	28.73	43.30	-122.44	63.30
9	Driver Shoulder Belt		N	5085.56	68.50	-14.35	17.00
10	Driver Lap Belt		N	5016.55	58.65	-1.41	1.25
11	Passenger Shoulder Belt		N	3557.33	47.65	-8.49	300.00
12	Passenger Lap Belt		N	5617.62	61.45	-0.49	2.75
13	Driver Floor Pan String Pot		mm	0.06	0.80	-51.46	63.95

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	*	A	17.40
2	Driver Air Bag Squib 2	*	A	17.35
3	Driver Curtain Airbag	*	A	25.35
4	Driver Torso Airbag	*	A	Did Not Fire
5	Driver Knee Airbag	*	A	17.35
6	Driver Pretensioner	*	A	17.40
7	Passenger Air Bag Squib 1	*	A	17.35
8	Passenger Air Bag Squib 2	*	A	27.35
9	Passenger Curtain Airbag	*	A	Disabled
10	Passenger Torso Airbag	*	A	Disabled
11	Passenger Knee Airbag	*	A	N/A
12	Passenger Pretensioner	*	A	17.35

* The measurement indicates the time the voltage changed

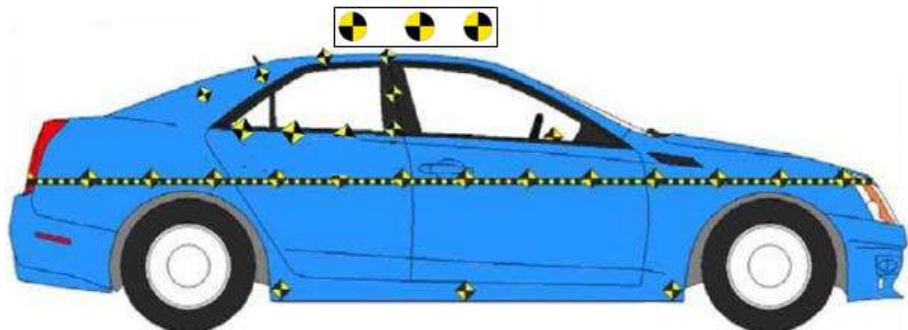
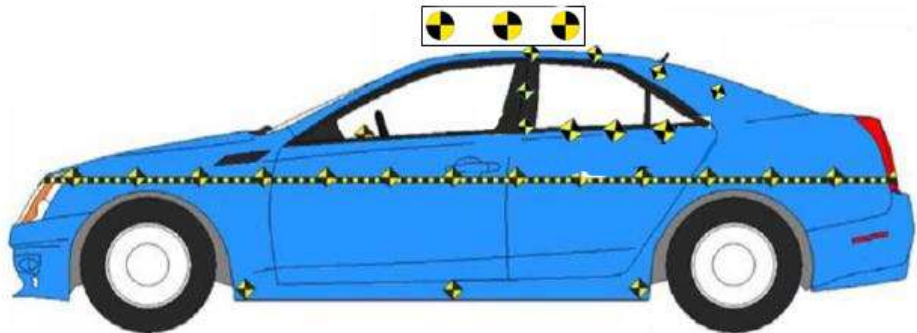
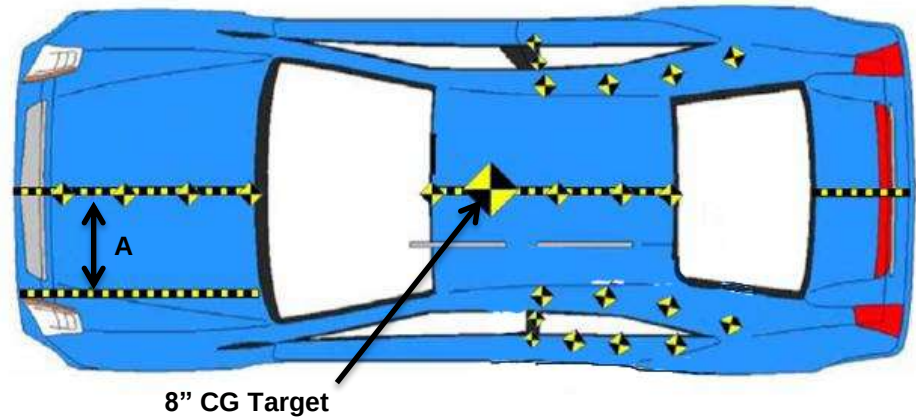
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

Item	Units	Value
A	mm	261

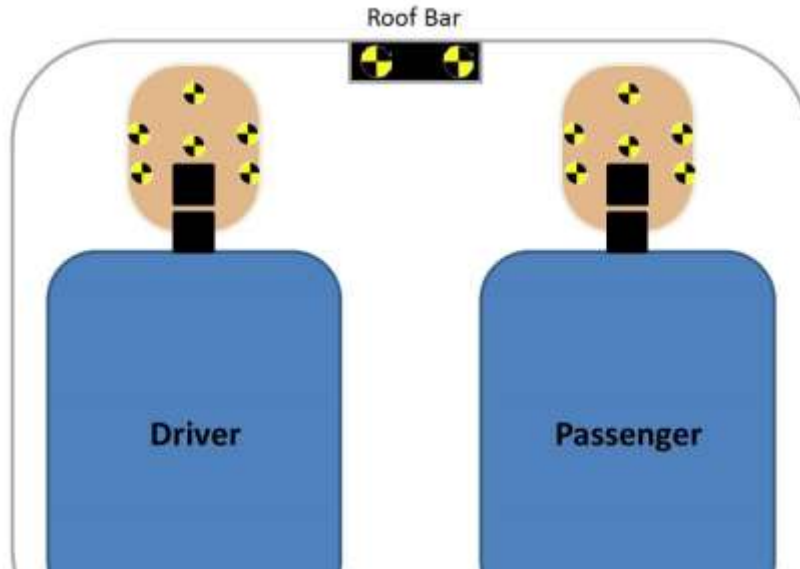
Note: All 6" targets on vehicle are 450 mm apart.



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

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014



Point	Pre-Test		
	X	Y	Z
Roof Bar Driver	1662	-59	109
Roof Bar Passenger	1662	74	106

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

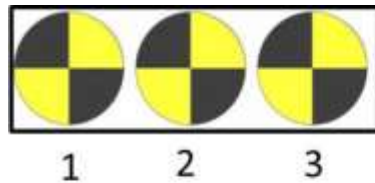
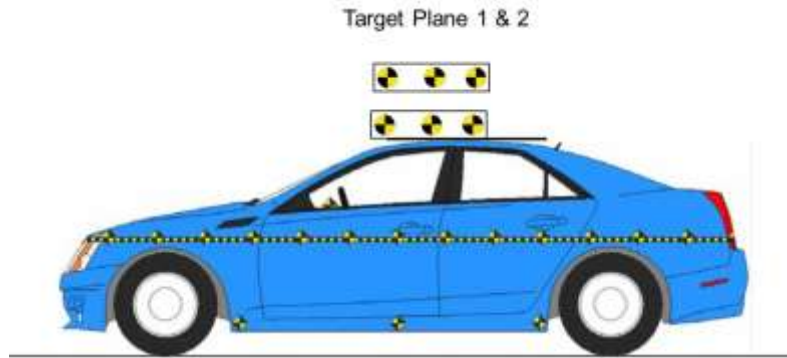
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

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

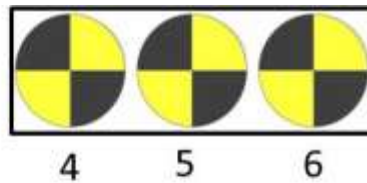
Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

OVERHEAD TARGET BARS



Vertical Target
Plane 1
(Driver's Side)



Vertical Target
Plane 2
(Passenger Side)

Target	Units	X	Y	Z
1	mm	1551	-358	-400
2	mm	1098	-356	-401
3	mm	641	-347	-401
4	mm	1571	342	-387
5	mm	1119	348	-393
6	mm	666	353	-395

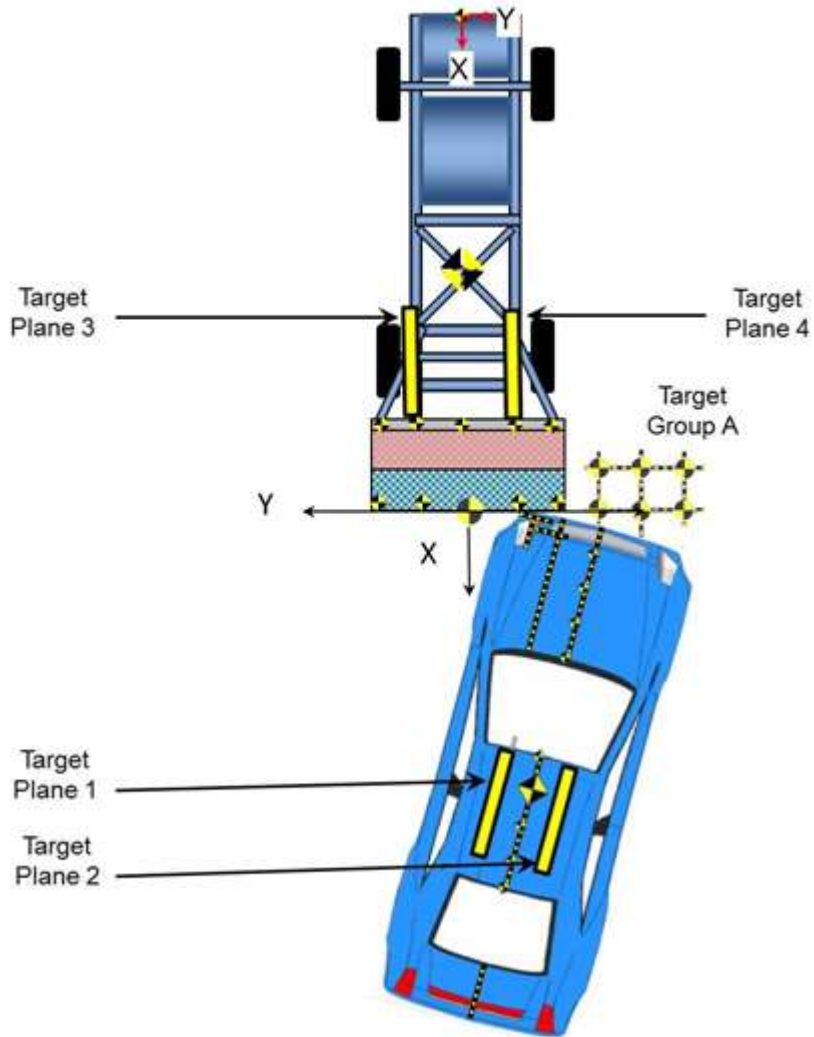
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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 Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014



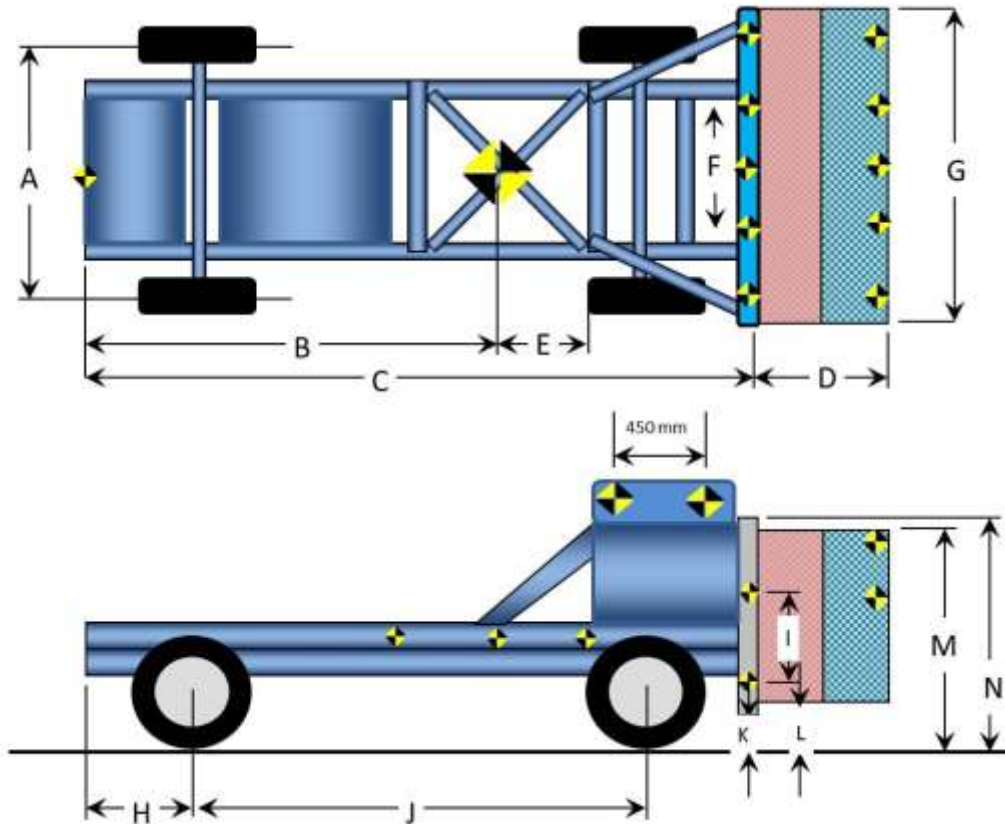
GROUND TARGET LOCATIONS

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 Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014



Item	Units	Value	Item	Units	Value
A	mm	1930	H	mm	800
B	mm	2449	I	mm	450
C	mm	3995	J	mm	2555
D	mm	605	K	mm	77
E	mm	907	L	mm	71
F	mm	900	M	mm	1024
G	mm	2205	N	mm	1177

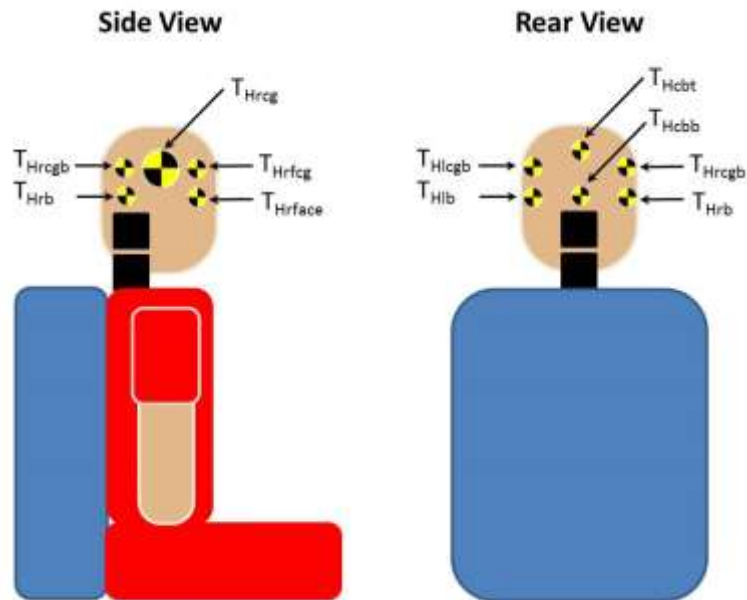
	Units	Front Axle	Rear Axle	Total
Left	kg	804.2	435	1239.2
Right	kg	801.5	449.5	1251
Ratio	%	64.5	35.5	100
Total	kg	1605.7	884.5	2490.2
CG Aft of Front Axle	mm			907

Note: All targets on the RMDB honeycomb are 450mm apart unless otherwise noted.

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

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014



Driver Dummy Head Targets (S/N 016)

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 015)

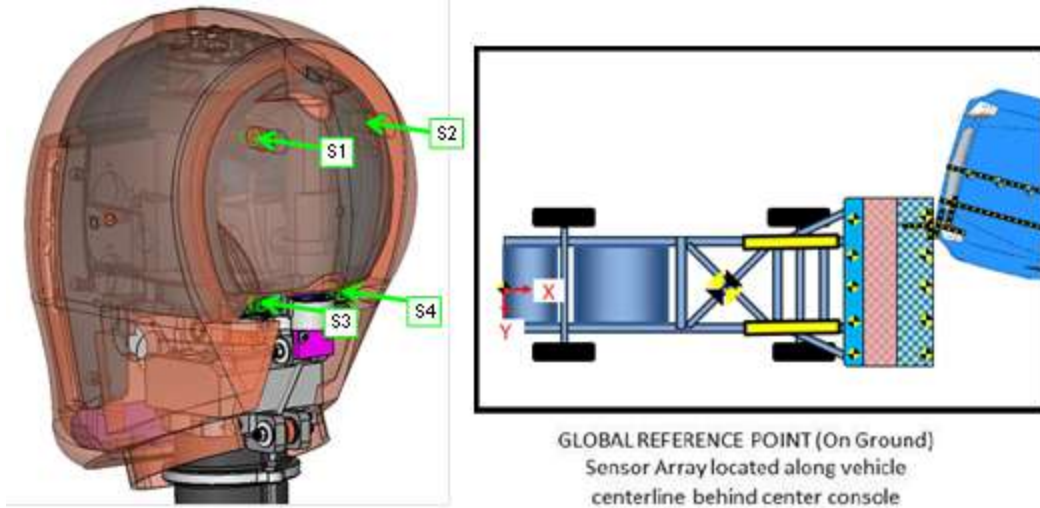
Measurement	Units	Value
Distance between T _{Hrcg} & T _{Hrfcg}	mm	38
Distance between T _{Hrcg} & T _{Hrcgb}	mm	38
Distance between T _{Hrcgb} & T _{Hrb}	mm	70
Distance between T _{Hrfcg} & T _{Hrface}	mm	70
Distance between T _{Hlcbg} & T _{Hlfcg}	mm	38
Distance between T _{Hlcbg} & T _{Hlcb}	mm	38
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 Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

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



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	7004	-327	-1219
S3	6998	-339	-1134
S2	7024	-395	-1217
S4	7012	-386	-1134

FRONT PASSENGER HEAD BOLT POINTS

Target	X	Y	Z
S1	7168	-1014	-1254
S3	7161	-1027	-1171
S2	7188	-1080	-1256
S4	7177	-1074	-1172

**See Datasheet 3 for head bolt locations in reference to the vehicle coordinate system.*

DATA SHEET NO. 9
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	93
Passenger Dummy Accelerometers	93
Vehicle Structure Accelerometers	45
RMDB Cart Accelerometers	6
Total	237

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 Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Right Front Passenger
Dummy Type/Serial No.	THOR015	THOR016
Lower Leg Type	LX	LX
Lower Leg Serial No.	LX0038/LX0039	LX0018/ LX0019
Head Contact	Front & Curtain Airbag & Headliner	Front Airbag, center instrument panel, interior target bar, visor and headliner
Upper Torso Contact	Front Airbag & side/arm contacted driver's door	Front Airbag, Shoulder contacted Center Instrument Panel
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Airbag	Glove Box

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	Remained in good condition	Y
Windshield Damage	Cracks throughout with minor separation	Y
Window Damage	None	Y
Other Notable Effects	None	--

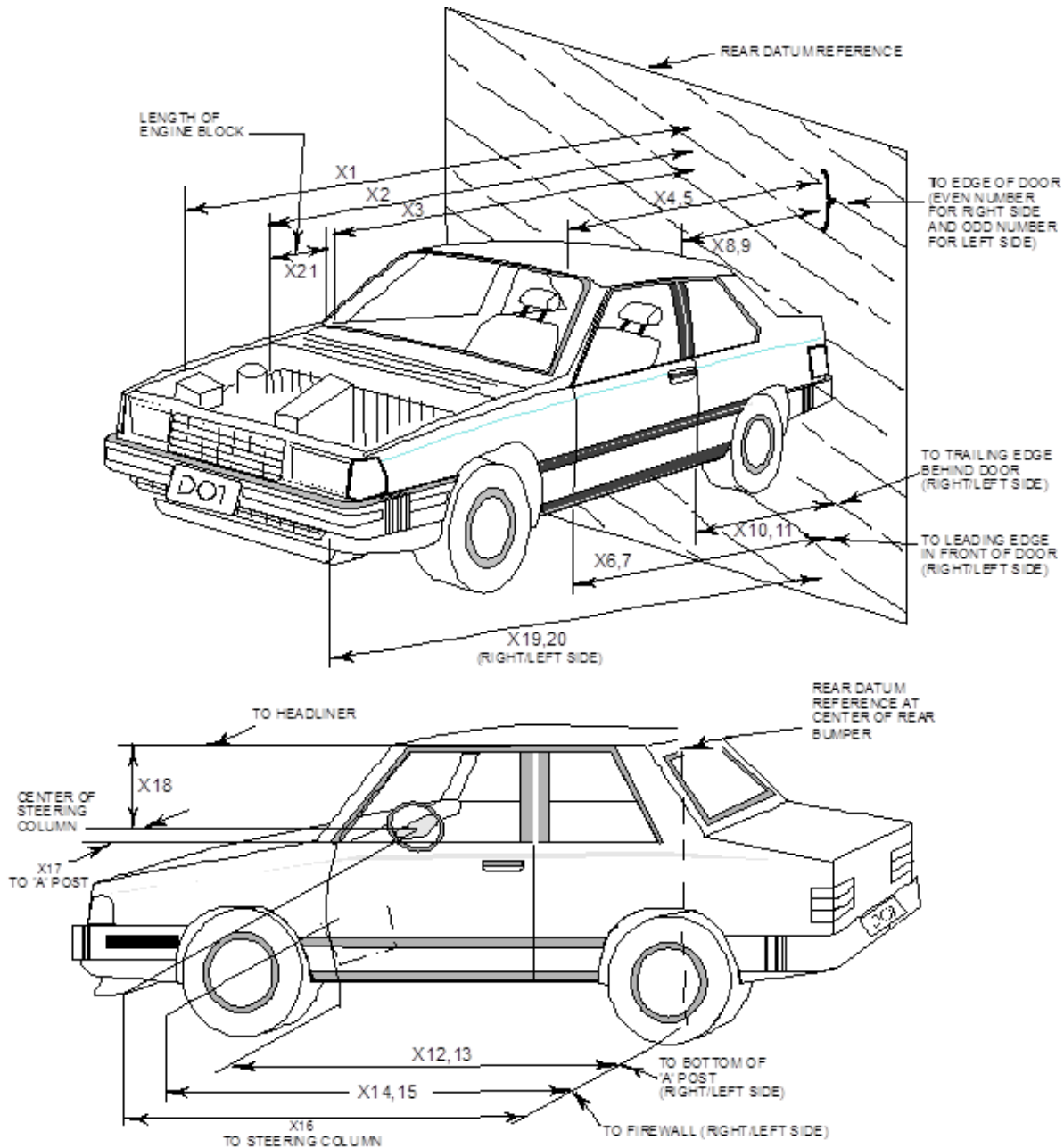
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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 Airbag	Yes	No	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 Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014



DATA SHEET NO. 11 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	3680	3399	281
2	Rear Surface of Vehicle (RSOV) to Front of Engine	mm	3223	3089	134
3	RSOV to Firewall	mm	2547	2527	20
4	RSOV to Upper Leading Edge of Right Door	mm	2268	2270	-2
5	RSOV to Upper Leading Edge of Left Door	mm	2268	2265	3
6	RSOV to Lower Leading Edge of Right Door	mm	2234	2234	0
7	RSOV to Lower Leading Edge of Left Door	mm	2234	2232	2
8	RSOV to Upper Trailing Edge of Right Door	mm	1145	1148	-3
9	RSOV to Upper Trailing Edge of Left Door	mm	1145	1144	1
10	RSOV to Lower Trailing Edge of Right Door	mm	1181	1182	-1
11	RSOV to Lower Trailing Edge of Left Door	mm	1181	1179	2
12	RSOV to Bottom of "A" Post of Right Side	mm	2279	2282	-3
13	RSOV to Bottom of "A" Post of Left Side	mm	2278	2276	2
14	RSOV to Firewall, Right Side	mm	2775	2781	-7
15	RSOV to Firewall, Left Side	mm	2773	2572	201
16	RSOV to Steering Column	mm	1757	1808	-51
17	Center of Steering Column to "A" Post	mm	296	242	54
18	Center of Steering Column to Headliner	mm	421	399	23
19	RSOV to Right Side of Front Bumper	mm	3633	3648	-16
20	RSOV to Left Side of Front Bumper	mm	3632	3073	559
21	Length of Engine Block	mm	407	421	-14
RD	RSOV to Right Side of Dash Panel	mm	1986	1986	0
CD	RSOV to Center of Dash Panel	mm	1992	1975	17
LD	RSOV to Left Side of Dash Panel	mm	1987	1982	5

UR* = Unrecoverable Data Point

DATA SHEET NO. 12
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

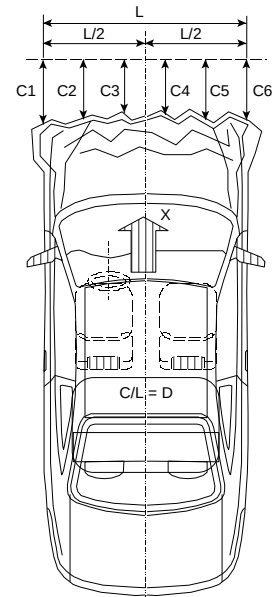
NHTSA No.: R20145508
Test Date: 7/18/2014

VEHICLE INFORMATION

VIN: JF1GPAC65E8268217 Wheelbase (mm): 2647
Vehicle Size Category: Passenger Test Weight (kg): 1663.5

ACCELEROMETER DATA

Accelerometer Locations: As Described in Data Sheet No. 7
Cal. Procedure/Interval: Calspan Procedure / 6 month
Integration Algorithm: Trapezoidal
Linearity: > 99%
Impact Velocity (kph): 89.66
Velocity Change (kph): 89.66



CRUSH PROFILE

Collision Deformation Classification: 12FYEW3
Midpoint of Damage: C2
Damage Region Length (mm): 1033
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	3611	3157	454
C2	Crush zone 2 at left side	mm	3668	3206	462
C3	Crush zone 3 at left side	mm	3675	3327	348
C4	Crush zone 4 at right side	mm	3675	3451	224
C5	Crush zone 5 at right side	mm	3669	3573	96
C6	Crush zone 6 at right side	mm	3613	3657	-44
L	C1 to C6	mm	1033	825	209

Crush Measurements: Bumper Cover Removed

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
B1	Bumper Beam 1 at left side	mm	3511	3130	-381
B2	Bumper Beam 2 at left side	mm	3584	3190	-394
B3	Bumper Beam 3 at left side	mm	3594	3180	-414
B4	Bumper Beam 4 at left side	mm	3598	3270	-328
B5	Bumper Beam 5 at right side	mm	3600	3337	-263
B6	Bumper Beam 6 at right side	mm	3599	3413	-186
B7	Bumper Beam 7 at right side	mm	3594	3484	-110
B8	Bumper Beam 8 at right side	mm	3584	3560	-24
B9	Bumper Beam 9 at right side	mm	3511	3566	55
L	B1 to B9	mm	1219	1078	141

DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

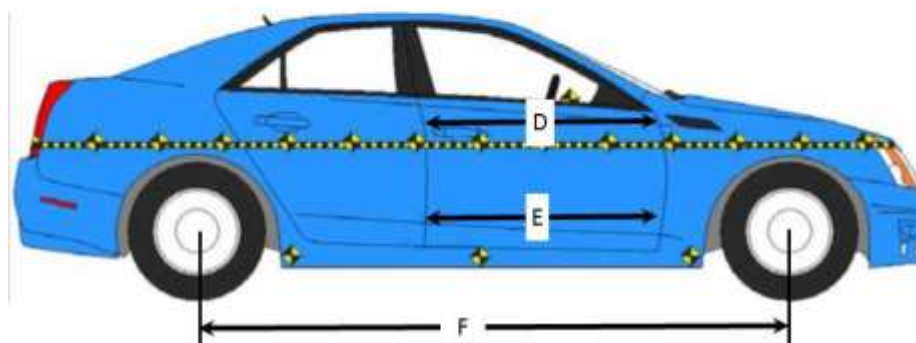
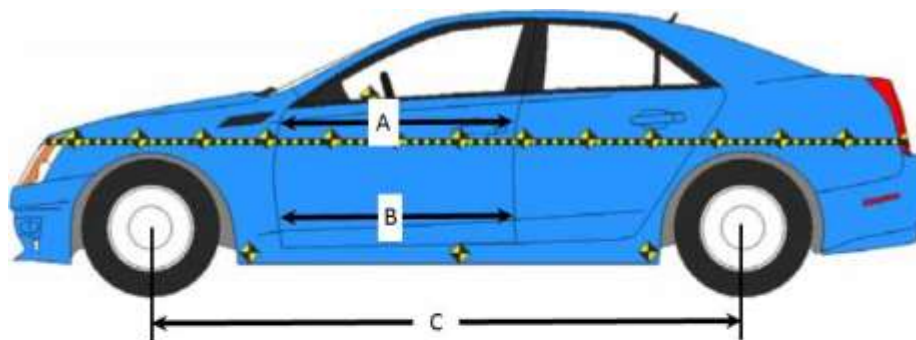
NHTSA No.: R20145508
 Test Date: 7/18/2014

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1033	1030	-3
B	Left Side Lower	mm	880	878	-2
D	Right Side Upper	mm	1033	1033	0
E	Right Side Lower	mm	885	885	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2647	2737	90
F	Right Side Wheelbase	mm	2647	2660	13



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

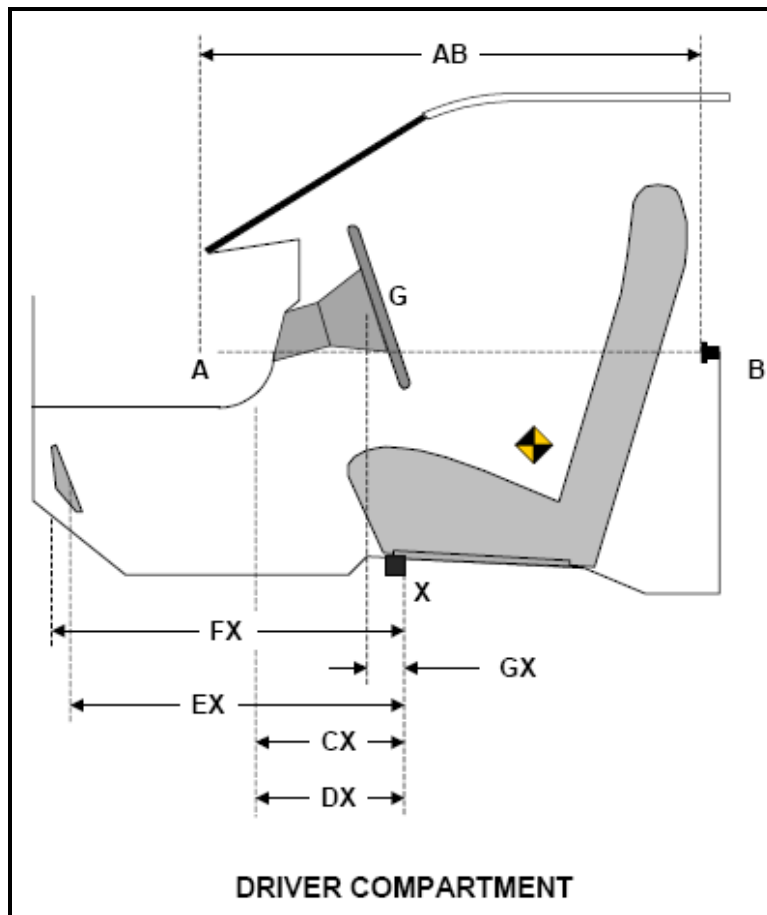
Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	741	742	1
CX	Left Knee Bolster to X	mm	291	277	-14
DX	Right Knee Bolster to X	mm	285	286	1
EX	Brake Pedal to X	mm	564	477	-87
FX	Foot Rest to X	mm	648	611	-37
GX	Center of Steering Column Wheel Hub to X	mm	39	92	53

X = Front of Seat Track (Stationary)

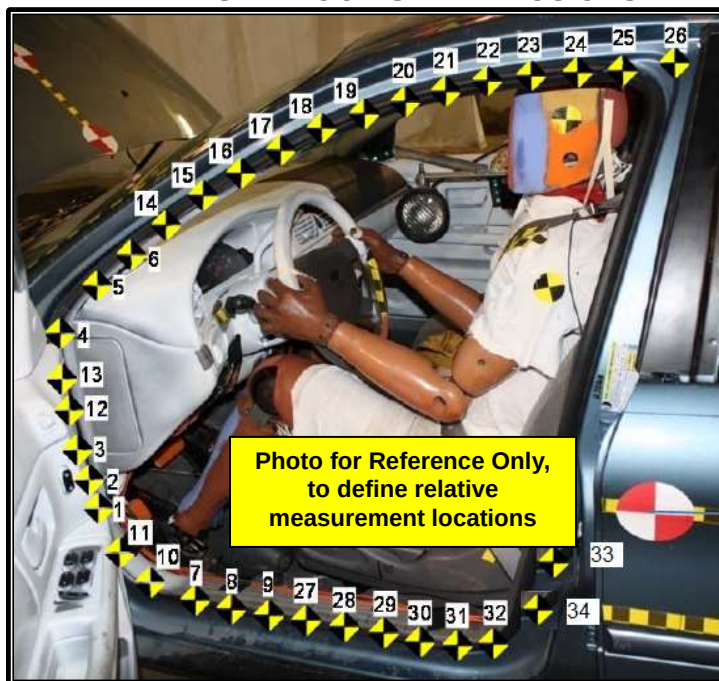


DATA SHEET NO.13 (CONTINUED) **VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

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	2167	-730	977	2162	-731	982	-5	-1	5
2	2165	-721	903	2159	-728	908	-6	-7	5
3	2138	-716	826	2132	-730	831	-6	-14	5
4	2201	-716	528	2199	-720	534	-2	-4	6
5	2185	-710	452	2183	-713	458	-2	-3	6
6	2106	-694	377	2104	-697	382	-2	-3	5
7	2083	-735	1073	2080	-734	1081	-3	1	8
8	1933	-735	1086	1930	-735	1093	-3	0	7
9	1784	-737	1084	1781	-737	1091	-3	0	7
10	2121	-735	1050	2117	-734	1057	-4	1	7
11	2149	-733	1015	2144	-733	1023	-5	0	8
12	2101	-716	722	2095	-727	727	-6	-11	5
13	2120	-717	624	2116	-724	629	-4	-7	5
14	2041	-685	342	2040	-688	347	-1	-3	5
15	1975	-675	307	1974	-677	312	-1	-2	5
16	1907	-665	273	1907	-667	277	0	-2	4

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	1840	-655	241	1840	-656	246	0	-1	5
18	1773	-644	212	1773	-644	217	0	0	5
19	1703	-634	185	1703	-634	190	0	0	5
20	1633	-624	161	1633	-625	165	0	-1	4
21	1561	-614	139	1562	-612	145	1	2	6
22	1486	-609	125	1487	-609	129	1	0	4
23	1422	-605	115	1422	-604	119	0	1	4
24	1348	-598	104	1348	-598	108	0	0	4
25	1271	-597	97	1272	-596	102	1	1	5
26	1197	-594	92	1197	-593	96	0	1	4
27	1732	-736	1084	1730	-736	1091	-2	0	7
28	1678	-736	1084	1676	-735	1091	-2	1	7
29	1624	-735	1084	1621	-735	1090	-3	0	6
30	1569	-735	1084	1567	-734	1090	-2	1	6
31	1513	-735	1081	1512	-735	1087	-1	0	6
32	1463	-736	1067	1460	-736	1072	-3	0	5
33	1304	-722	823	1304	-722	827	-1	0	5
34	1352	-732	974	1350	-731	979	-2	1	5

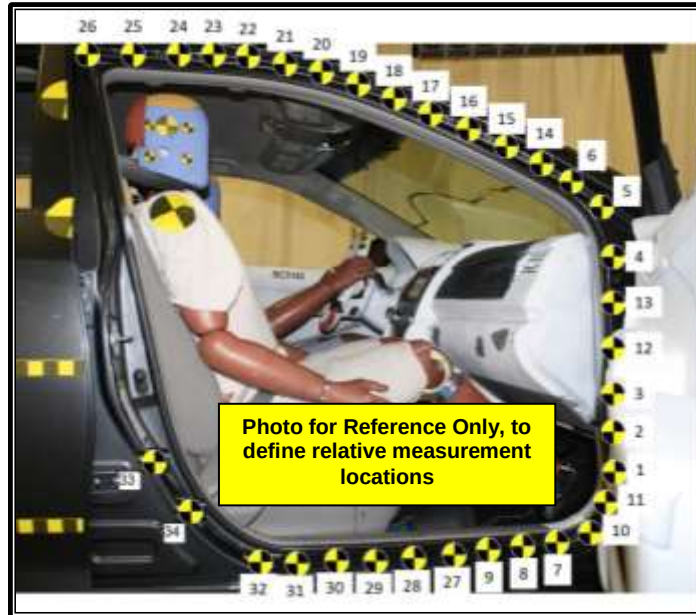
Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

DATA SHEET NO.13 (CONTINUED) VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

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	2168	733	975	2165	741	974	-3	8	-1
2	2165	725	900	2161	732	900	-4	7	0
3	2137	719	825	2134	725	825	-3	6	0
4	2201	720	527	2199	724	526	-2	4	-1
5	2184	714	453	2183	717	452	-1	3	-1
6	2107	699	377	2105	701	377	-2	2	0
7	2082	739	1074	2080	745	1074	-2	6	0
8	1932	739	1086	1928	745	1086	-4	6	0
9	1783	739	1084	1780	746	1085	-3	7	1
10	2120	739	1049	2117	746	1049	-3	7	0
11	2150	737	1014	2147	745	1014	-3	8	0
12	2102	719	728	2099	723	727	-3	4	-1
13	2116	721	630	2114	722	629	-2	1	-1
14	2043	689	343	2042	692	343	-1	3	0
15	1978	679	308	1976	681	308	-2	2	0
16	1912	668	275	1911	670	275	-1	2	0

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	1845	657	243	1844	659	244	-1	2	1
18	1776	647	212	1775	649	213	-1	2	1
19	1708	636	185	1707	638	186	-1	2	1
20	1638	629	161	1636	628	162	-2	-1	1
21	1568	617	141	1567	618	141	-1	1	0
22	1496	613	126	1494	613	127	-2	0	1
23	1421	608	113	1420	609	114	-1	1	1
24	1346	602	104	1345	603	104	-1	1	0
25	1272	600	97	1270	600	97	-2	0	0
26	1197	596	91	1196	597	92	-1	1	1
27	1729	739	1084	1727	745	1085	-2	6	1
28	1674	739	1084	1672	744	1084	-2	5	0
29	1621	738	1083	1618	744	1084	-3	6	1
30	1577	739	1083	1575	742	1084	-2	3	1
31	1524	738	1081	1521	742	1082	-3	4	1
32	1464	739	1066	1462	742	1067	-2	3	1
33	1305	725	827	1303	728	827	-3	3	0
34	1352	735	973	1349	738	974	-3	3	1

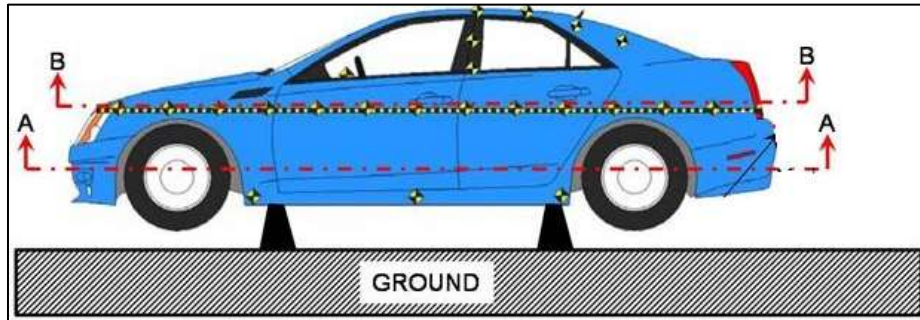
Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A



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			Point	Post-Test		
	X	Y	Z		X	Y	Z
1	3077	-865	971	1	2884	-767	972
2	3236	-842	972	2	3014	-679	972
3	3329	-824	972	3	3109	-646	972
4	3409	-812	972	4	3075	-554	972
5	3458	-767	971	5	3135	-510	971
6	3518	-679	971	6	3164	-387	972
7	3549	-625	971	7	3161	-261	971
8	3611	-517	971	8	3195	-197	971
9	3657	-419	972	9	3275	-115	972
10	3667	-331	972	10	3375	-55	972
11	3672	-205	971	11	3450	44	972
12	3676	-3	972	12	3515	133	972
13	3675	69	971	13	3572	212	972
14	3673	207	971	14	3624	293	972
15	3668	325	971	15	3643	417	972
16	3658	420	971	16	3642	549	972
17	3620	501	971	17	3553	577	972
18	3578	579	971	18	3533	637	972
19	3550	626	972	19	3127	786	972
20	3519	678	971	20	3065	843	972
21	3454	775	972	21	3002	854	972
22	3424	804	972	22	2861	838	972
23	3339	822	971	23	2613	871	972
24	3257	840	972	24	2493	882	972
25	3169	856	972	25	2376	880	971

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	3075	868	971	26	2263	875	972
27	2379	864	972	27	2162	869	972
28	2286	863	971	28	1990	867	972
29	2216	859	972	29	1753	868	972
30	1925	857	971	30	1550	868	972
31	1656	858	971	31	1370	868	972
32	1412	859	971	32	1279	867	971
33	1239	858	972	33	1185	867	972
34	1122	858	972	34	1155	865	971
35	948	859	971	35	998	867	972
36	761	861	972	36	819	869	972
37	611	864	971	37	624	872	971
38	521	864	972	38	514	873	962
39	438	864	971	39	504	871	972
40	-258	862	972	40	447	871	972
41	-391	834	971	41	-258	859	972
42	-525	787	972	42	-326	849	972
43	-547	775	972	43	-455	816	972
44	-595	715	971	44	-545	778	972
45	-637	652	971	45	-593	716	972
46	-677	573	971	46	-652	628	972
47	-705	450	972	47	-692	522	972
48	-720	319	971	48	-719	338	972
49	-730	146	971	49	-731	165	972
50	-734	1	972	50	-733	49	971
51	-731	-176	972	51	-733	-2	972
52	-719	-362	971	52	-733	-73	971
53	-717	-385	971	53	-730	-197	972
54	-691	-531	971	54	-721	-346	972
55	-641	-646	972	55	-701	-490	972
56	-580	-735	971	56	-656	-620	971
57	-553	-770	971	57	-581	-733	972
58	-450	-817	972	58	-551	-772	972
59	-349	-843	972	59	-442	-818	972
60	-256	-856	972	60	-333	-844	972
61	438	-865	971	61	-259	-856	972
62	506	-864	971	62	442	-866	972
63	561	-865	971	63	497	-865	972
64	749	-862	971	64	561	-865	972
65	913	-860	972	65	768	-861	972
66	1097	-858	971	66	948	-859	971

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
67	1171	-858	971	67	1129	-857	972
68	1253	-858	971	68	1189	-855	971
69	1422	-859	971	69	1361	-857	972
70	1580	-858	971	70	1546	-858	972
71	1768	-857	971	71	1740	-858	972
72	2014	-856	971	72	1954	-857	971
73	2224	-858	971	73	2106	-858	972
74	2377	-863	972	74	2248	-860	972
75	3077	-865	971	75	2251	-895	972
				76	2249	-929	971
				77	2330	-925	971
				78	2495	-847	972
				79	2540	-933	972
				80	2600	-982	972
				81	2779	-844	972

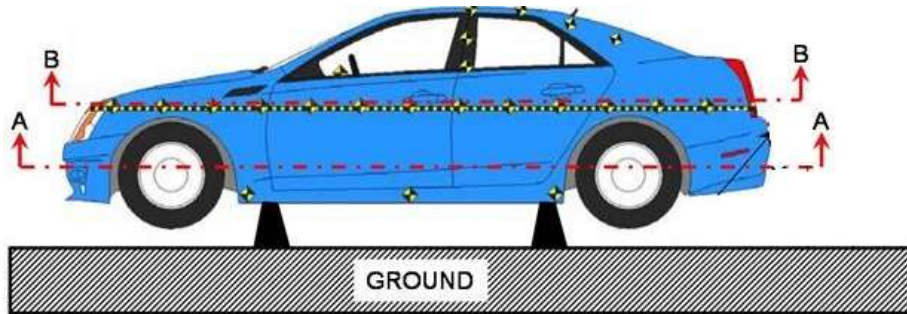
Note: See Appendix D for detailed procedure on how to measure vehicle exterior crush profile

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B



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			Point	Post-Test		
	X	Y	Z		X	Y	Z
1	2410	-866	737	1	2930	-743	737
2	2537	-870	737	2	2848	-660	737
3	2812	-870	736	3	2888	-544	736
4	2954	-864	736	4	2897	-413	737
5	3103	-843	737	5	2947	-355	736
6	3245	-810	737	6	2999	-337	737
7	3298	-801	737	7	3093	-324	737
8	3402	-730	736	8	3118	-330	737
9	3458	-636	736	9	3135	-258	737
10	3501	-535	736	10	3146	-204	737
11	3525	-475	737	11	3137	-169	736
12	3549	-439	736	12	3190	-92	736
13	3553	-344	736	13	3234	-5	737
14	3557	-200	737	14	3260	21	737
15	3587	-129	736	15	3382	-43	737
16	3622	-58	737	16	3442	38	736
17	3627	-2	736	17	3490	124	736
18	3605	68	737	18	3517	250	737
19	3603	110	737	19	3549	379	737
20	3569	188	736	20	3522	478	736
21	3558	299	736	21	3477	591	737
22	3549	368	737	22	3416	711	736
23	3555	409	736	23	3343	787	737
24	3547	449	737	24	3234	818	737
25	3515	505	736	25	3203	819	736

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	3471	607	736	26	3034	862	737
27	3401	732	737	27	2886	890	736
28	3320	793	736	28	2775	897	737
29	3247	807	737	29	2641	894	736
30	3111	841	736	30	2494	889	736
31	2957	865	737	31	2360	878	737
32	2628	872	737	32	2293	874	736
33	2534	873	736	33	2179	871	737
34	2337	865	736	34	2011	873	736
35	2242	862	737	35	1828	875	737
36	2047	864	736	36	1638	877	737
37	1813	867	736	37	1467	877	737
38	1599	868	737	38	1340	876	737
39	1401	869	736	39	1224	876	737
40	1228	868	737	40	1185	875	737
41	1119	867	737	41	1117	874	736
42	958	866	736	42	954	873	737
43	749	864	737	43	790	872	737
44	575	863	737	44	593	871	737
45	397	867	737	45	417	874	736
46	273	870	736	46	334	876	737
47	146	871	736	47	275	878	737
48	-25	869	736	48	276	873	737
49	-201	855	736	49	176	874	737
50	-255	848	736	50	10	873	737
51	-361	828	736	51	-127	867	737
52	-499	795	736	52	-261	847	739
53	-557	776	736	53	-418	816	737
54	-610	700	737	54	-525	788	737
55	-653	612	736	55	-556	778	737
56	-671	551	736	56	-614	693	737
57	-594	528	736	57	-654	608	737
58	-630	388	736	58	-670	556	737
59	-644	302	736	59	-598	524	737
60	-654	211	737	60	-629	401	737
61	-660	66	736	61	-645	304	737
62	-661	0	736	62	-657	175	737
63	-659	-115	736	63	-660	-1	736
64	-653	-233	736	64	-658	-112	737
65	-642	-323	736	65	-652	-228	736
66	-633	-372	737	66	-639	-331	736
67	-614	-456	736	67	-614	-453	736

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
68	-596	-524	736	68	-594	-524	737
69	-671	-550	737	69	-672	-551	737
70	-648	-626	737	70	-641	-641	737
71	-602	-713	736	71	-581	-745	737
72	-560	-774	736	72	-558	-775	737
73	-430	-812	736	73	-409	-817	736
74	-250	-849	736	74	-203	-856	736
75	-114	-867	737	75	-9	-870	736
76	2	-871	736	76	183	-871	737
77	191	-871	736	77	265	-870	737
78	319	-869	736	78	410	-866	737
79	526	-863	737	79	596	-862	737
80	711	-864	736	80	806	-864	737
81	905	-866	736	81	997	-866	737
82	1053	-867	737	82	1167	-866	737
83	1173	-867	736	83	1310	-868	736
84	1305	-868	736	84	1394	-868	737
85	1466	-868	736	85	1555	-868	737
86	1666	-867	736	86	1722	-867	737
87	1845	-866	736	87	1944	-865	737
88	2037	-863	737	88	2117	-862	737
89	2205	-860	736	89	2282	-863	737
90	2369	-864	737	90	2256	-916	737
91	2410	-866	737	91	2290	-926	737
				92	2307	-963	737
				93	2414	-965	736
				94	2471	-975	737
				95	2661	-914	737
				96	2751	-884	737

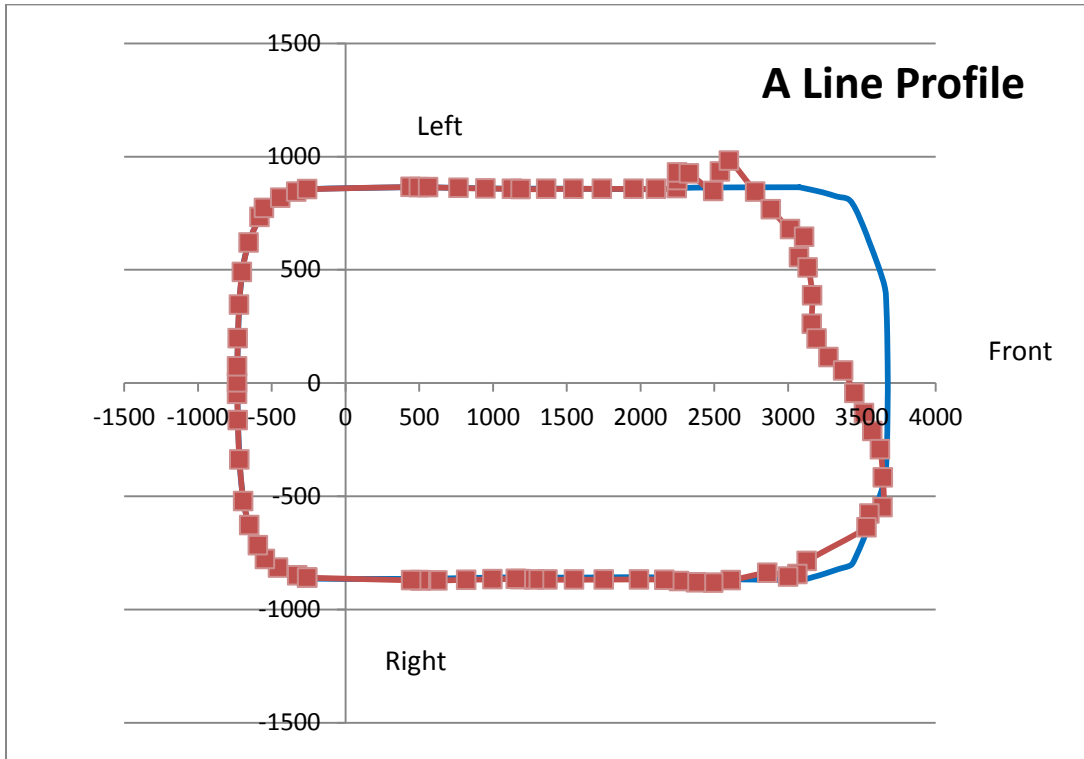
Note: See Appendix D for detailed procedure on how to measure vehicle exterior crush profile

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

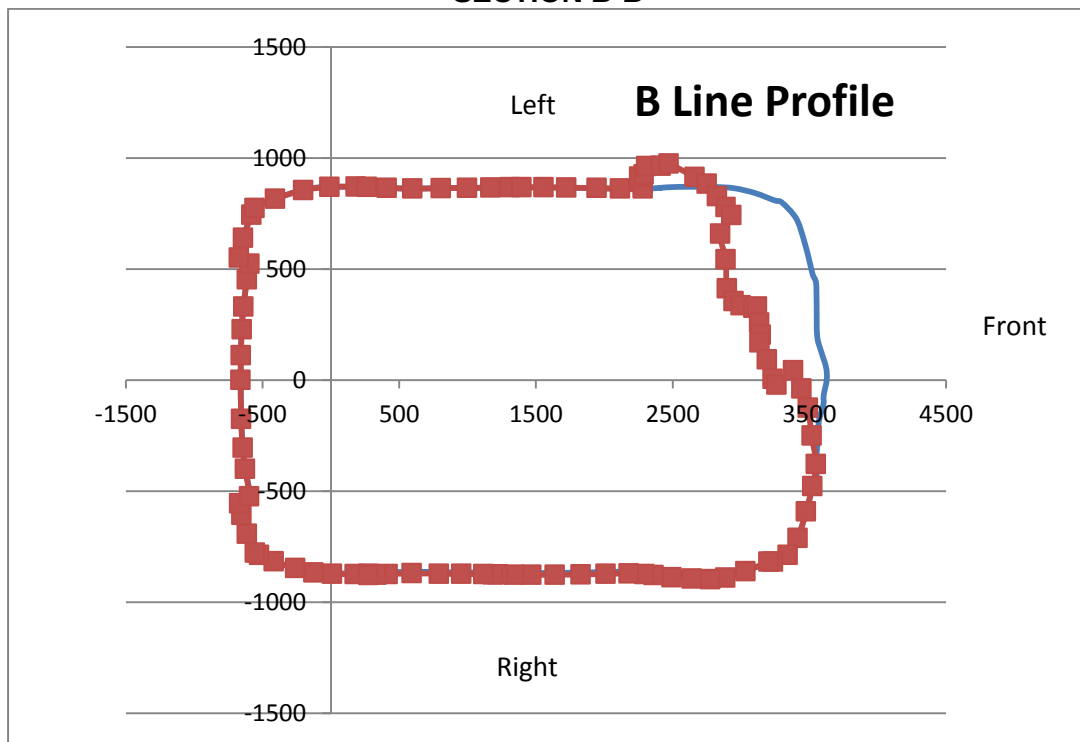
Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A



SECTION B-B



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

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	B1	3512	-607	945	3150	-513	937	-362	94	-8
	B2	3584	-457	945	3205	-356	931	-379	101	-14
	B3	3600	-305	947	3203	-222	879	-397	83	-68
	B4	3608	-154	947	3280	-123	855	-328	31	-92
	B5	3609	-2	946	3351	9	877	-258	11	-69
	B6	3608	153	947	3428	140	903	-180	-13	-44
	B7	3602	305	945	3502	271	927	-100	-34	-18
	B8	3584	456	948	3564	408	947	-20	-48	-1
	B9	3512	608	947	3566	572	963	54	-36	16
Center Structural Bumper Beam	B1	3511	-609	971	3130	-506	949	-381	103	-22
	B2	3584	-458	968	3190	-351	948	-394	107	-20
	B3	3594	-302	970	3180	-211	888	-414	91	-82
	B4	3598	-153	971	3270	-122	881	-328	31	-90
	B5	3600	1	972	3337	15	903	-263	14	-69
	B6	3599	151	971	3413	142	926	-186	-9	-45
	B7	3594	302	971	3484	275	949	-110	-27	-22
	B8	3584	455	971	3560	405	970	-24	-50	-1
	B9	3511	610	970	3566	572	987	55	-38	17
Upper Radiator Support	1	3477	-381	741	3136	-264	640	-341	117	-101
	2	3476	-286	739	3157	-172	639	-319	114	-100
	3	3475	-191	738	3186	-93	651	-289	98	-87
	4	3476	-95	738	3243	-15	652	-233	80	-86
	5	3466	1	737	3288	71	659	-178	70	-78
	6	3476	95	738	3342	146	667	-134	51	-71
	7	3476	190	738	3389	226	687	-87	36	-51
	8	3478	283	739	3436	305	706	-42	22	-33
	9	3479	381	739	3474	393	721	-5	12	-18

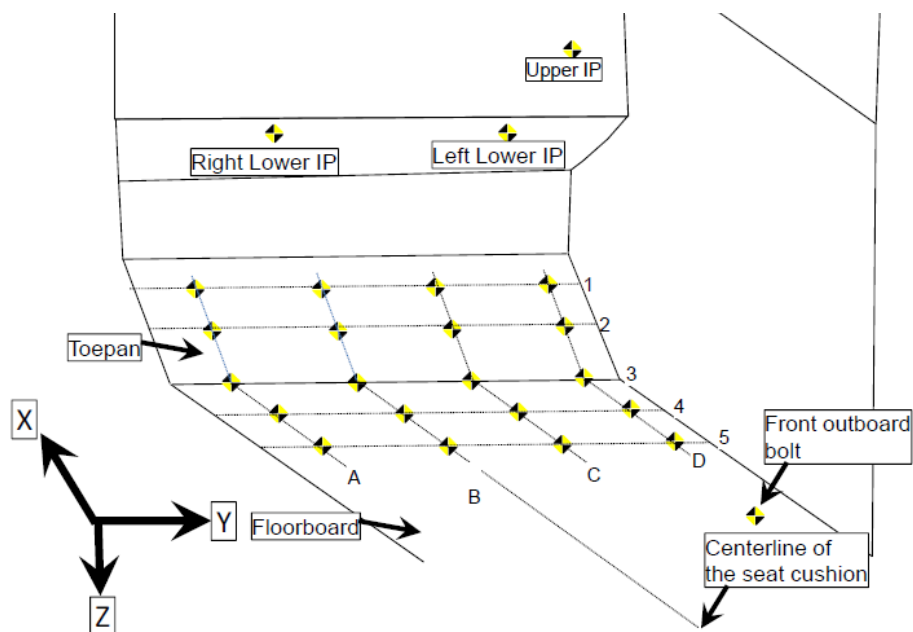
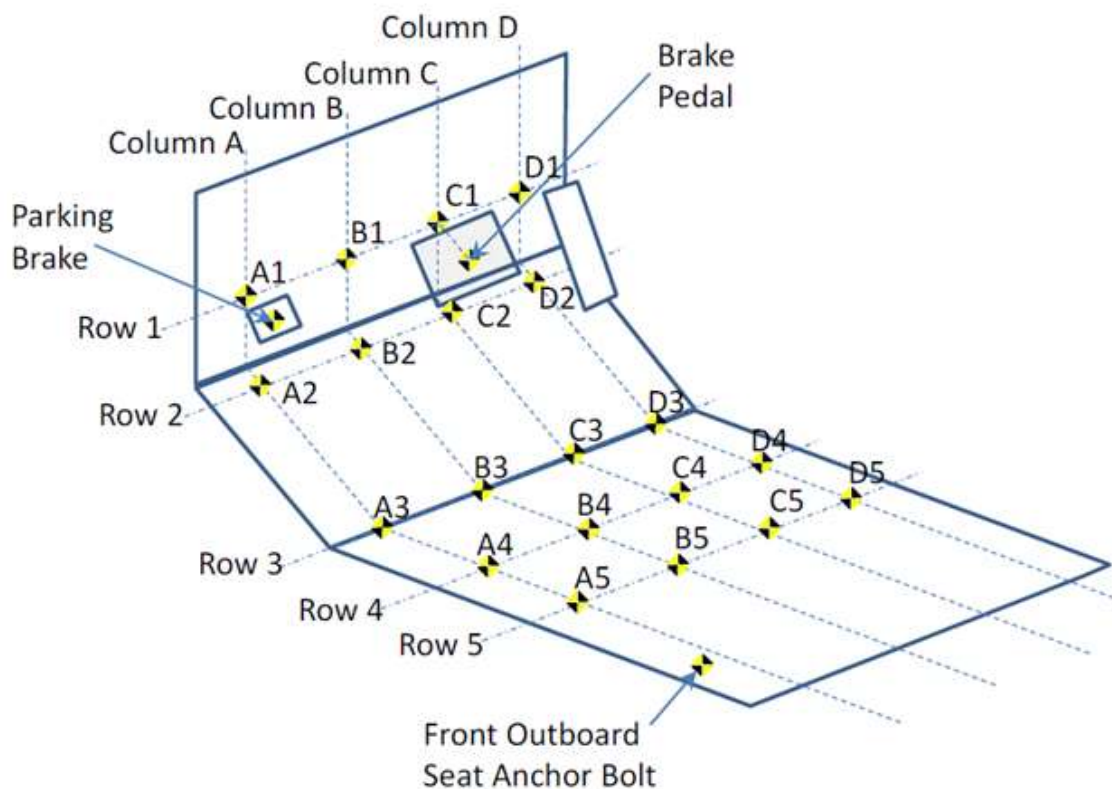
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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 Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014



Note: See Appendix D for toe pan measuring procedure

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Subaru Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014

DRIVER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2347	-616	974	2324	-606	979	-23	10	5
B1	2422	-519	974	2378	-495	974	-44	24	0
C1	2501	-367	974	2399	-339	975	-102	28	1
D1	2478	-214	974	2411	-191	984	-67	23	10
A2	2334	-616	1036	2314	-606	1042	-20	10	6
B2	2404	-517	1036	2367	-497	1037	-37	20	1
C2	2445	-367	1035	2401	-345	1041	-44	22	6
D2	2441	-218	1035	2387	-199	1049	-54	19	14
A3	2326	-616	1111	2312	-606	1117	-14	10	6
B3	2339	-515	1110	2320	-505	1121	-19	10	11
C3	2351	-367	1109	2323	-356	1130	-28	11	21
D3	2351	-215	1109	2328	-209	1146	-23	6	37
A4	2252	-617	1168	2249	-614	1180	-3	3	12
B4	2253	-516	1172	2250	-513	1196	-3	3	24
C4	2250	-369	1168	2246	-366	1215	-4	3	47
D4	2252	-216	1172	2247	-217	1214	-5	-1	42
A5	2153	-618	1183	2149	-616	1195	-4	2	12
B5	2154	-518	1184	2150	-516	1205	-4	2	21
C5	2151	-367	1175	2148	-366	1210	-3	1	35
D5	2150	-218	1168	2147	-219	1208	-3	-1	40
Brake Pedal	2282	-369	974	2193	-404	995	-89	-35	21
Driver IP Left	2009	-493	648	1993	-508	660	-16	-15	12
Driver IP Right	2003	-191	647	2002	-194	669	-1	-3	22
DOLP	1995	-592	672	1982	-610	683	-13	-18	11
Steering Column	1757	-343	511	1808	-392	496	51	-49	-15
Front Outboard Bolt	1718	-567	1127	1716	-564	1137	-2	3	10
Emergency Brake									

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 Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

PASSENGER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2434	202	971	2402	238	963	-32	36	-8
B1	2499	353	976	2494	362	976	-5	9	0
C1	2438	503	974	2433	513	975	-5	10	1
D1	2352	599	973	2349	610	974	-3	11	1
A2	2402	200	1033	2378	230	1022	-24	30	-11
B2	2444	348	1035	2440	359	1036	-4	11	1
C2	2418	501	1035	2413	510	1034	-5	9	-1
D2	2351	602	1034	2347	613	1034	-4	11	0
A3	2350	202	1109	2341	213	1102	-9	11	-7
B3	2349	351	1110	2348	361	1112	-1	10	2
C3	2349	502	1108	2344	512	1108	-5	10	0
D3	2340	602	1108	2336	610	1107	-4	8	-1
A4	2253	200	1157	2252	209	1164	-1	9	7
B4	2251	351	1169	2250	360	1172	-1	9	3
C4	2251	500	1177	2250	508	1179	-1	8	2
D4	2252	600	1175	2251	609	1178	-1	9	3
A5	2151	199	1149	2150	206	1160	-1	7	11
B5	2154	350	1183	2152	358	1188	-2	8	5
C5	2153	500	1186	2150	508	1189	-3	8	3
D5	2152	601	1186	2148	609	1189	-4	8	3
Pass IP Left	1988	202	714	2002	198	722	14	-4	8
Pass IP Right	2009	504	714	2015	500	717	6	-4	3
PORP	1992	602	674	1995	597	675	3	-5	1
Front Outboard Bolt	1717	569	1126	1715	573	1129	-2	4	3

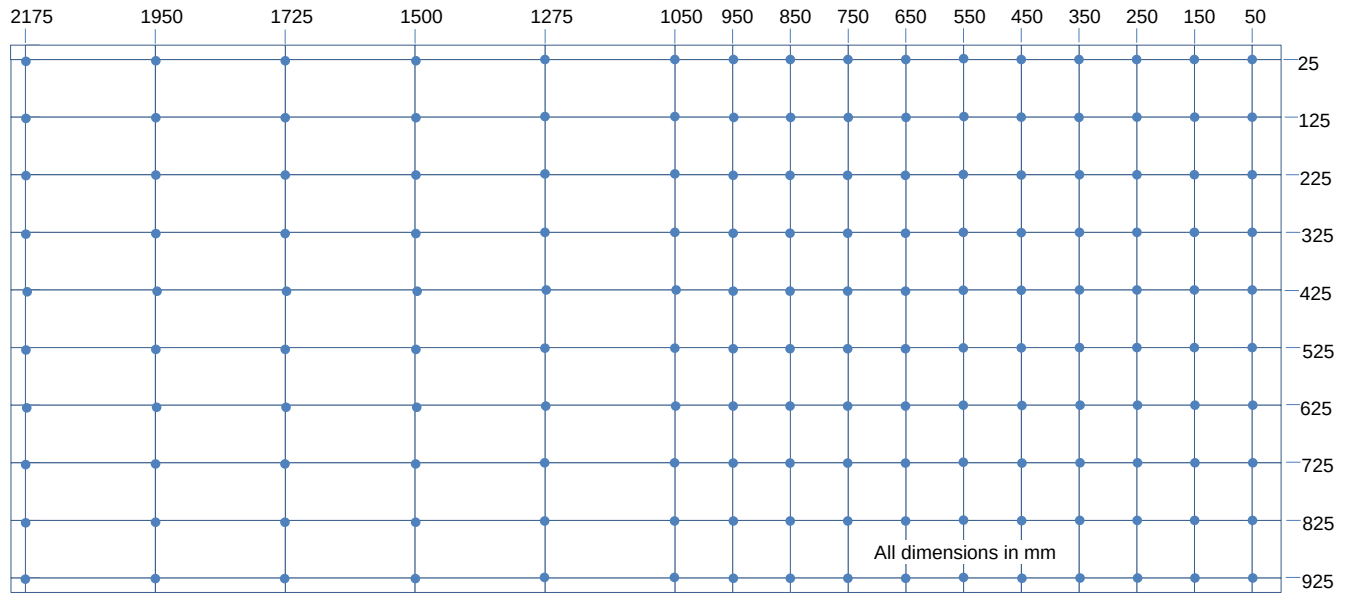
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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 Impreza four door sedan
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
Test Date: 7/18/2014



	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
R10	-0.3	-0.3	-0.5	-0.5	-0.7	-0.9	-0.8	-1.0	-0.9	-1.0	-0.9	-0.7	-0.4	0.0	0.3	0.8
R9	-0.3	-0.4	-0.3	-0.5	-0.7	-0.8	-0.8	-0.7	-0.7	-0.7	1.2	0.4	1.6	2.1	3.0	8.8
R8	-0.2	0.0	-0.3	-0.4	-0.6	-0.7	-0.6	-0.5	-0.7	6.8	0.8	1.3	4.2	5.4	13.9	43.6
R7	0.1	0.0	-0.1	-0.3	-0.5	-0.6	2.0	-0.2	30.9	67.5	42.1	17.2	16.5	35.9	82.0	125.6
R6	0.4	0.3	-0.2	-0.3	-0.3	-0.5	-0.4	-0.4	0.1	11.3	18.0	44.9	76.4	120.6	171.1	212.5
R5	0.4	0.2	0.3	0.1	-0.1	-0.2	-0.2	0.5	25.5	15.5	52.6	134.4	213.2	426.0	434.7	408.6
R4	0.8	0.8	0.6	0.4	0.1	0.1	0.1	13.4	106.6	43.2	19.4	89.5	331.3	351.3	354.7	337.5
R3	1.0	0.9	0.9	0.5	0.4	0.3	0.1	29.5	164.8	92.3	28.0	43.6	237.4	258.0	270.4	299.7
R2	1.4	1.3	1.0	0.7	0.4	0.3	0.3	44.6	195.9	122.4	54.4	33.4	62.3	159.3	212.4	249.3
R1	1.9	1.6	1.2	1.0						139.8	78.3	28.2	20.4	23.8	144.8	185.5

*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 Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014

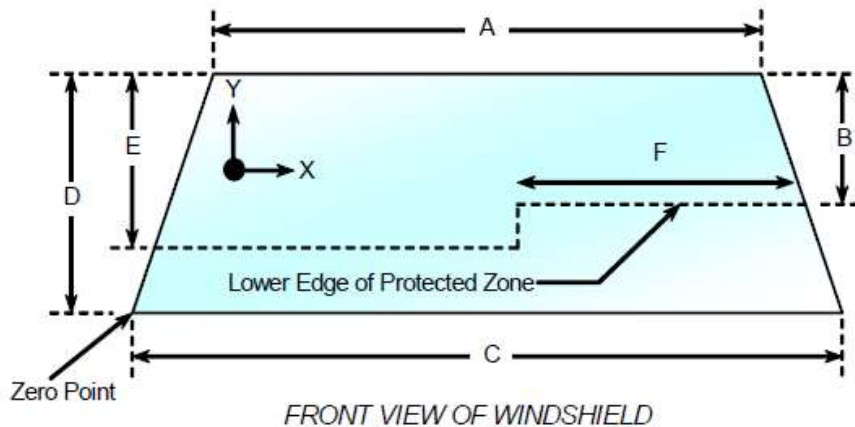
Please provide windshield mounting details. A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2210	1820	82.4%
Right Side	2210	2210	100%
Total	4420	4030	91.2%



Item	Units	Value
A	mm	1210
B	mm	568
C	mm	1450
D	mm	880
E	mm	575
F	mm	510

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:	<u>2014 Subaru Impreza four door sedan</u>	NHTSA No.:	<u>R20145508</u>
Test Program:	<u>R&D 90.1kph, 15° / 35% Left Oblique Offset</u>	Test Date:	<u>7/18/2014</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

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

Test Time: 12:00 PM

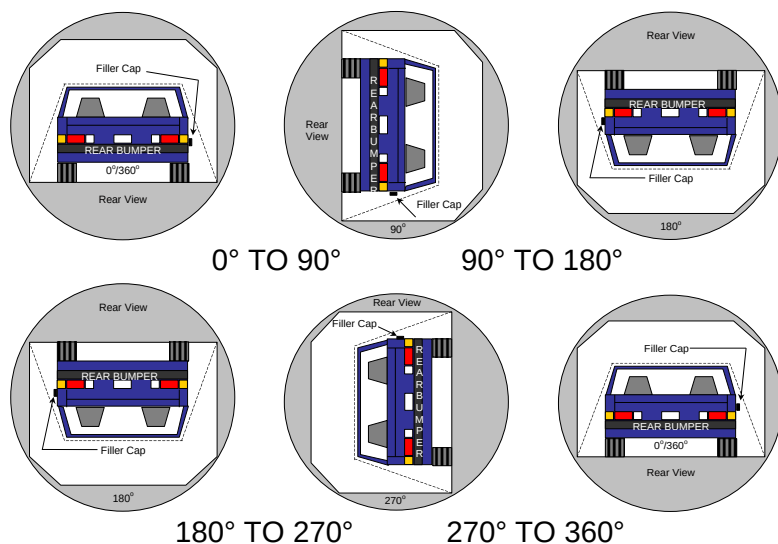
Stoddard Solvent Spillage Measurements

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

DATA SHEET NO. 16 **FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2014 Subaru Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014



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°	68	300	368
90° to 180°	64	300	364
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	

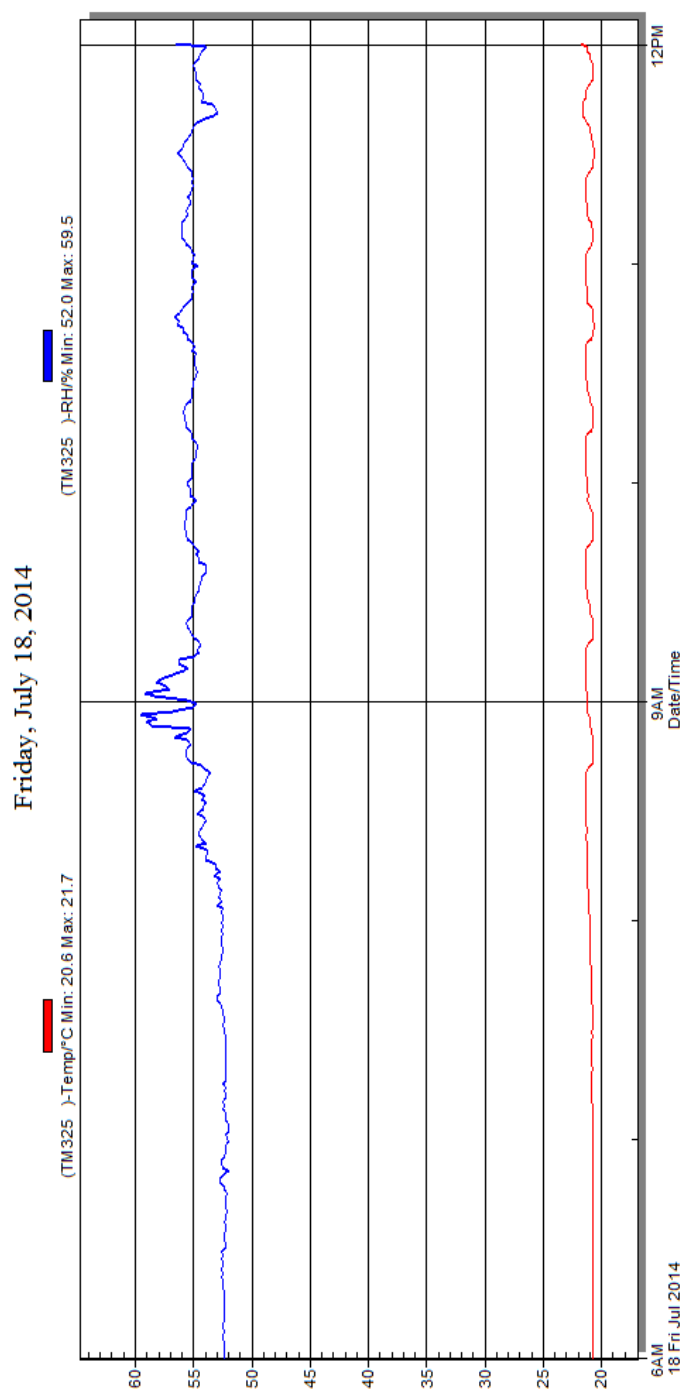
SOLVENT SPILLAGE LOCATION TABLE

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 Impreza four door sedan
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

NHTSA No.: R20145508
 Test Date: 7/18/2014



Temperature Stabilization Chart/Data

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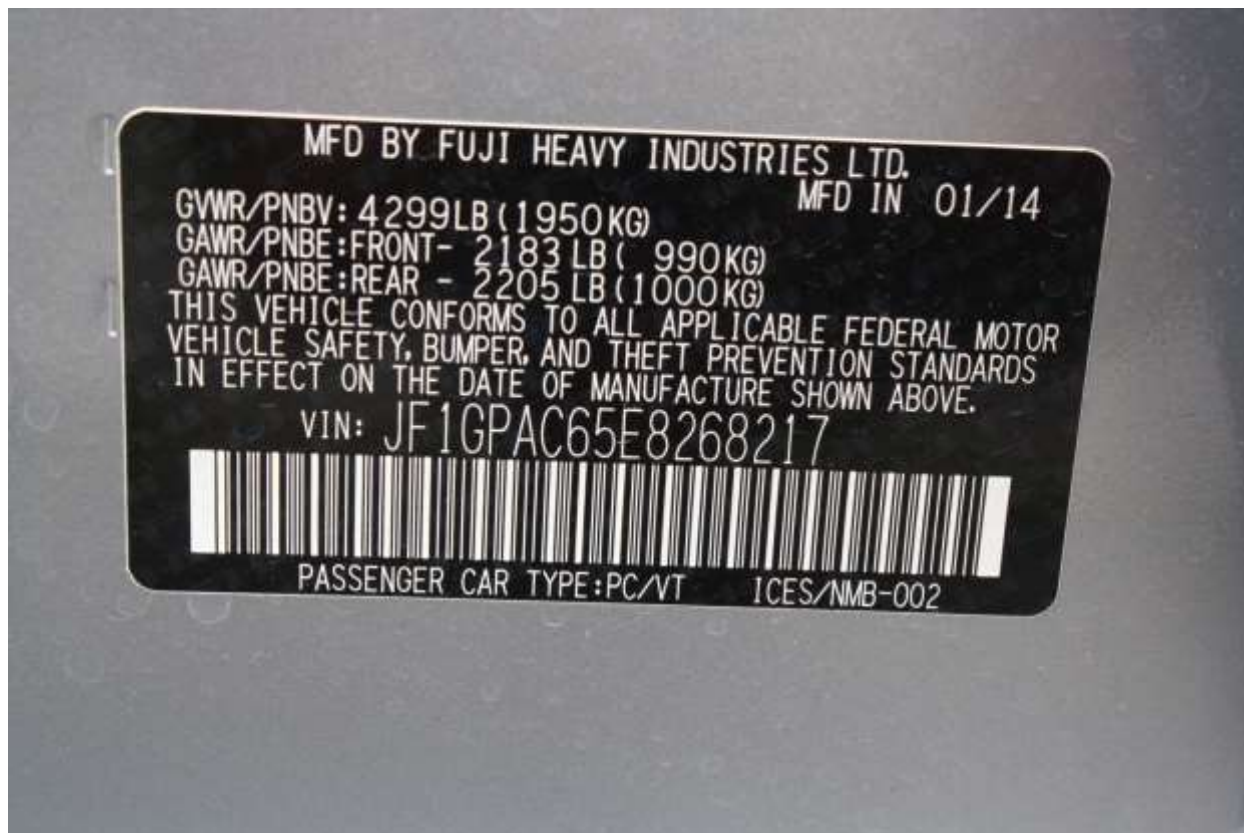
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No. 001 As Delivered Right Front 3-4 View of Test Vehicle



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

IMPREZA

MSRP: \$24,999
Destination: \$799
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Delivery by: 1st Carrier

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2014 Subaru Impreza 2.5i Premium
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 Side Curtain Air Bags
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 Anti-Lock Braking System (ABS)
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 Tire Pressure Monitoring System (TPMS)
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PERFORMANCE AND EXTERIOR
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 Daytime Running Lights (DRL)
 2.5L Horizontally-Engineered DOHC Engine
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COMFORT, CONVENIENCE AND INTERIOR
 Air Conditioning with Filtration System
 1600 WCD Audio System w/ Six Input Jack
 Steering Wheel Mounted Audio Controls
 Bluetooth Hands-Free Phone Connectivity
 USB Port with iPod Connectivity
 Driver Control: iD+ Steering Assist
 Power Door Locks & Dual Power Mirrors
 Remote Keyless Entry System
 Power Windows w/ Driver's Auto Up/Down
 Height Adjustable Driver's Seat
 10-Adjustable Front Passenger Seats
 60/40 Split-Fold-Over Rear Seatback
 Multi-Function Trip Computer
 Dual Map Lights

OPTIONAL EQUIPMENT AND OTHER ITEMS

Manufacturer's Suggested Retail Price
Option Package: 02
 All-Weather Package
 Heated Front Seats, Heated Side Mirrors
 Woodgrain Silver-Clad
 Leatherette Continuously Variable
 Transmission w/ 6-Speed Manual Mode
 Full Tank of Gas
 Partial Zone Exterior (Paint)
 17-inch Certified Wheels Required
 Super-Ultra Low Emission Valve
 5-Year Warranty (State Specific)
 Power Windows, All Weather
 Cargo Tray (2 Box)
 Splash Guards for Ice Silver Metallic

Manufacturer's Suggested Retail Price
 \$19,785.00
 \$500.00
 \$1,000.00
 INCLD
 INCLD
 \$75.00
 \$75.00
 \$147.00

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score NOT RATED
 Based on the combined range of frontal, side and rollover
 (NHTSA's 5 is the highest rating for all vehicles of similar size and weight)

Frontal Crash NOT RATED
 Driver Passenger NOT RATED
 Based on the risk of injury in a frontal crash
 (NHTSA's 5 is the highest rating for all vehicles of similar size and weight)

Side Crash Front Seat *****
 Rear Seat *****
 Based on the risk of injury in a side crash

Rollover *****
 Based on the risk of rollover in a single-vehicle crash

Star ratings range from 1 to 5 stars (*****), with 5 being the highest.
 Source: National Highway Traffic Safety Administration (NHTSA)
www.safercar.gov or 1-888-327-4265

Scan this code to learn more about this model at www.safercar.gov

Fuel Economy and Environment

EPA DOT
Fuel Economy
30 MPG
 27 city 36 highway
 3.3 gallons per 100 miles
Annual fuel cost
\$1,750
 Fuel Economy & Greenhouse Gas Rating (www.epa.gov)

You Save
\$2,750
 in fuel costs
 over 5 years
 compared to the
 average new vehicle

Small Wagon cars range from 14 to 118 MPG. The best vehicle rates 118 MPG.

The vehicle with 28 mpg (100 mpg) is the best. The vehicle with 118 mpg is the best. The vehicle with 118 mpg is the best.

fuel economy.gov
 Calculate personal information and compare vehicles

PARTS CONTENT INFORMATION
 FOR VEHICLES IN THE CARLINE
 U.S. CHASSIS PARTS CONTENT ON
 MAJOR SOURCES OF FOREIGN PARTS
 CONTENT: JAPANESE
 Note: Parts content does not include final assembly, distribution, or other compatible parts.

FOR THIS VEHICLE:
 FINAL ASSEMBLY POINT: OOTA, SUBARU, JAPAN
 COUNTRY OF ORIGIN: JAPAN
 TRANSMISSION: JAPAN

Gasoline Vehicle
 Transportation (Island Freight Charge & Handling Charge)
 Total Suggested Retail Price \$22,415.00

Always Start on Genuine Subaru Products
 • "Genuine Subaru" products are your investment
 • Performance and maintenance plans available
 • Coverage up to 100,000 miles
 • Genuine Subaru replacement parts
 • Training & Repair on benefits
 • New information and the latest benefits available
 • No restrictions

THE ONLY AUTHORIZED SERVICE PLAN BACKED AND ENDORSED BY SUBARU FOR OWNER OF VEHICLE

No. 021 Monroney Label Photograph



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



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



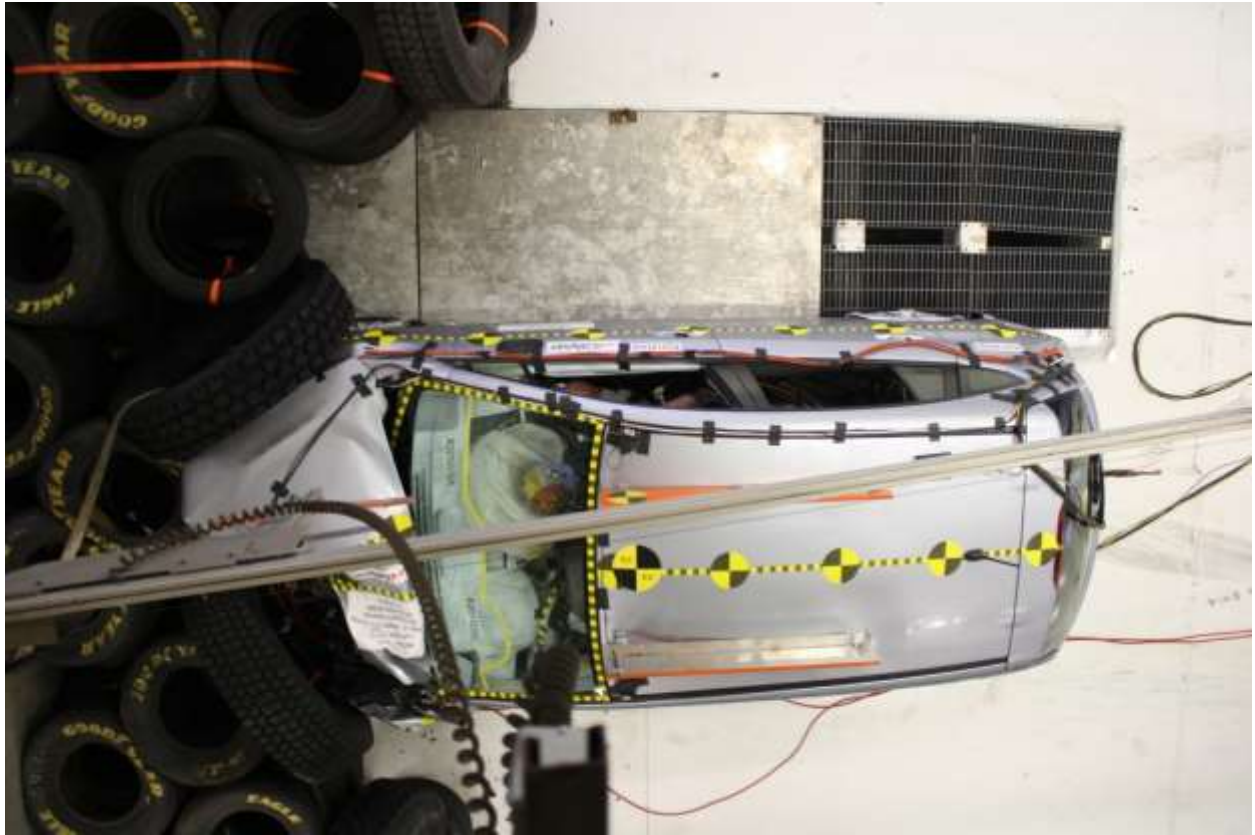
No. 024 Pre-Test Right Side View of RMDB against target vehicle at ideal Impact Point



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



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



No. 027 Post-Test Vehicle Overhead View



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



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



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



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



No. 032 Pre-Test Windshield View



No. 033 Post-Test Windshield View



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



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



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



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



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



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



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



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



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



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



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



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



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



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



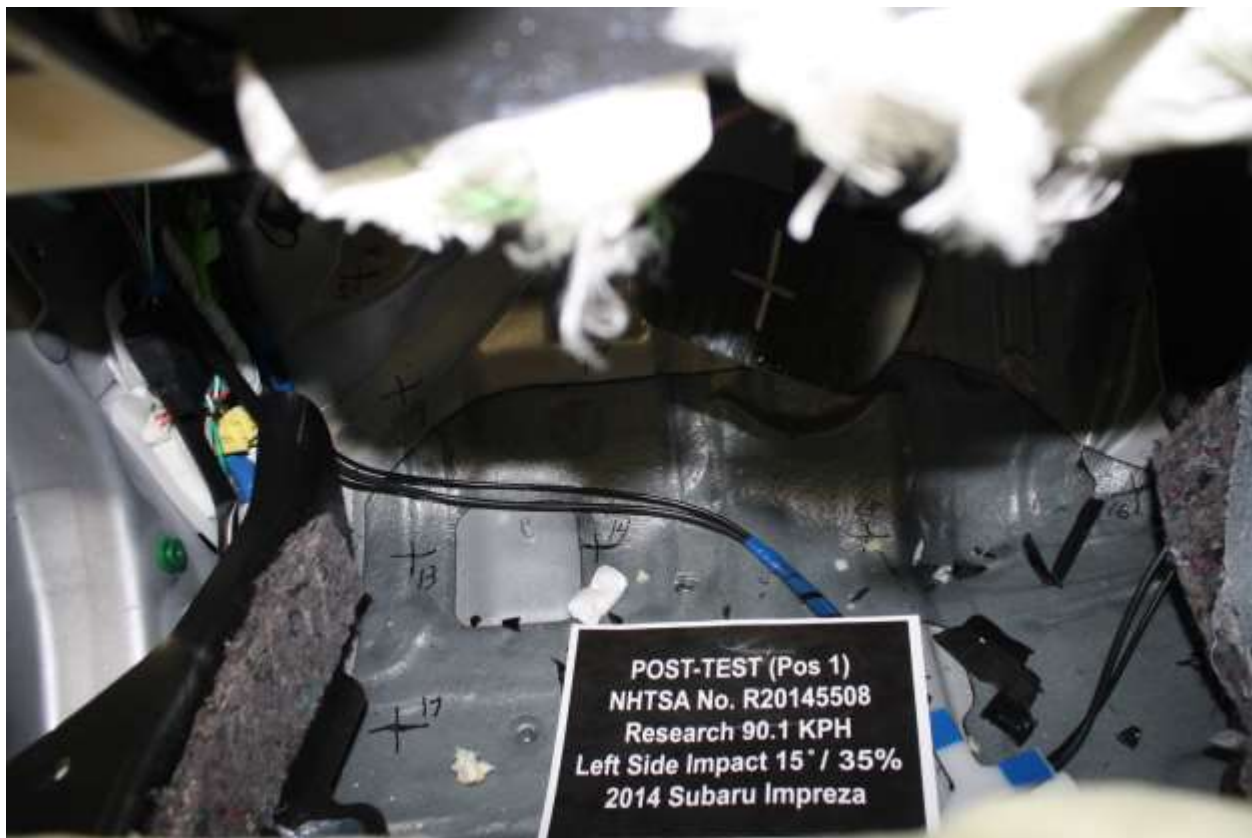
No. 048 Pre-Test View of Driver Floor pan at Left sill level, w/o carpet



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



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



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



No. 052 Pre-Test Driver Front Windshield View



No. 053 Post-Test Driver Front Windshield View



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



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



No. 056 Pre-Test Left Side Driver Window View



No. 057 Post-Test Left Side Driver Window View



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



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



No. 060 Pre-Test View of Driver Door Clearance



No. 061 Post-Test View of Driver Door Clearance



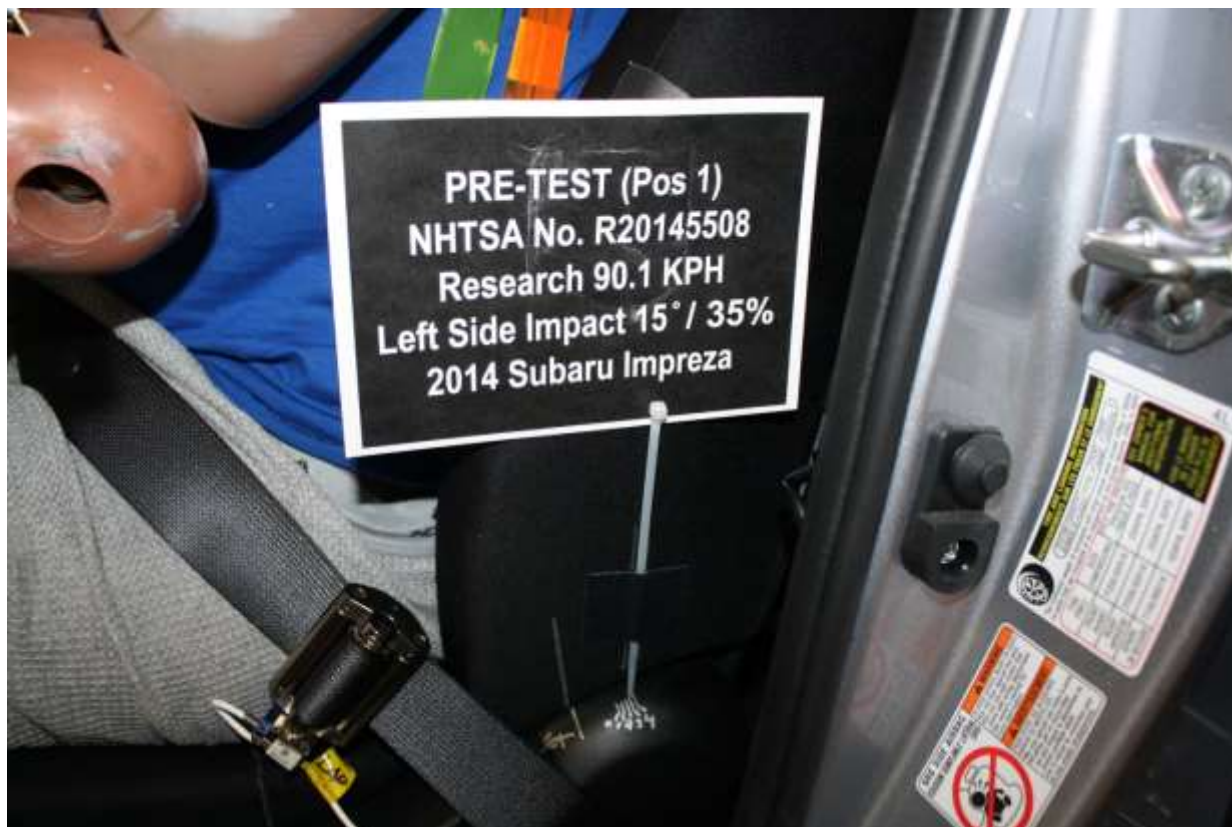
No. 062 Pre-Test View of Parking Brake



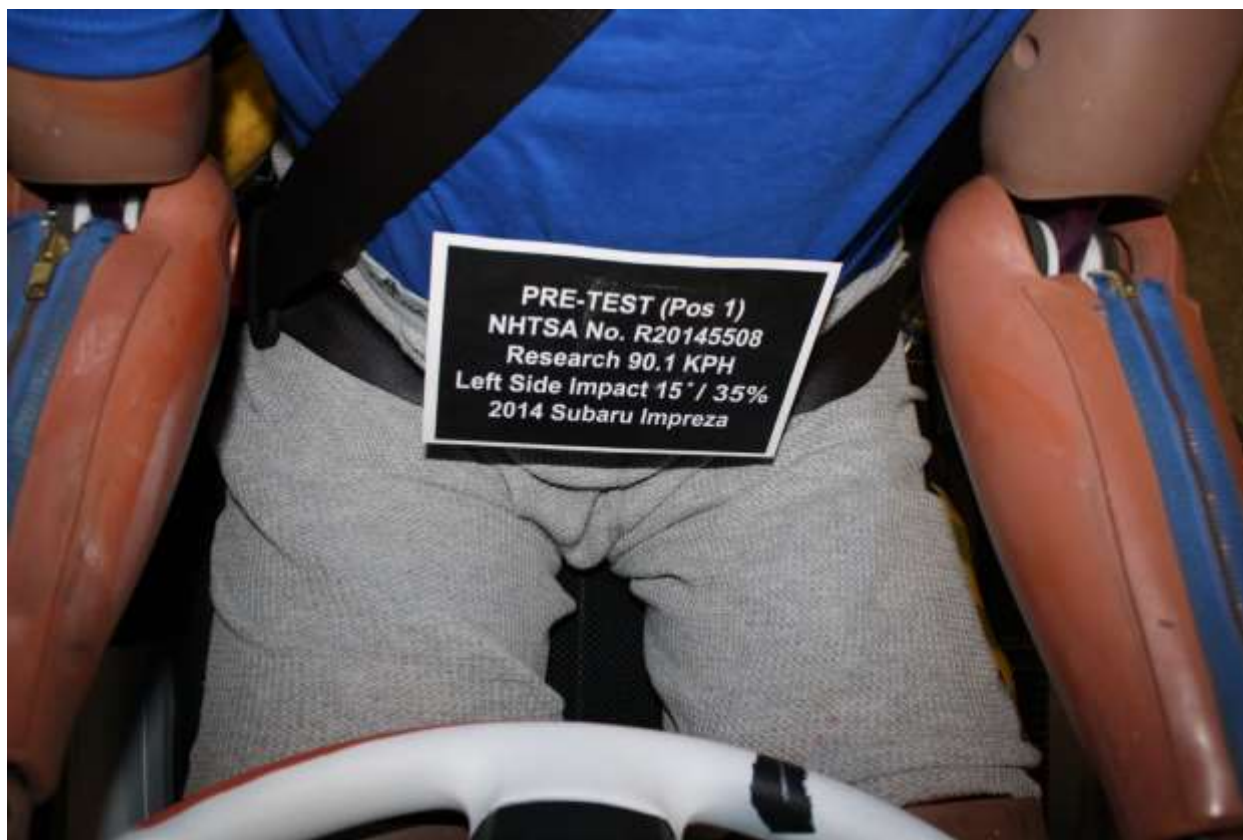
No. 063 Pre-Test Driver Seat Fore Aft Markings



No. 064 Post-Test Driver Seat Fore Aft Markings



No. 065 Pre-Test Driver Seat Back Markings



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



No. 067 Pre-Test Driver Adjustable D-Ring



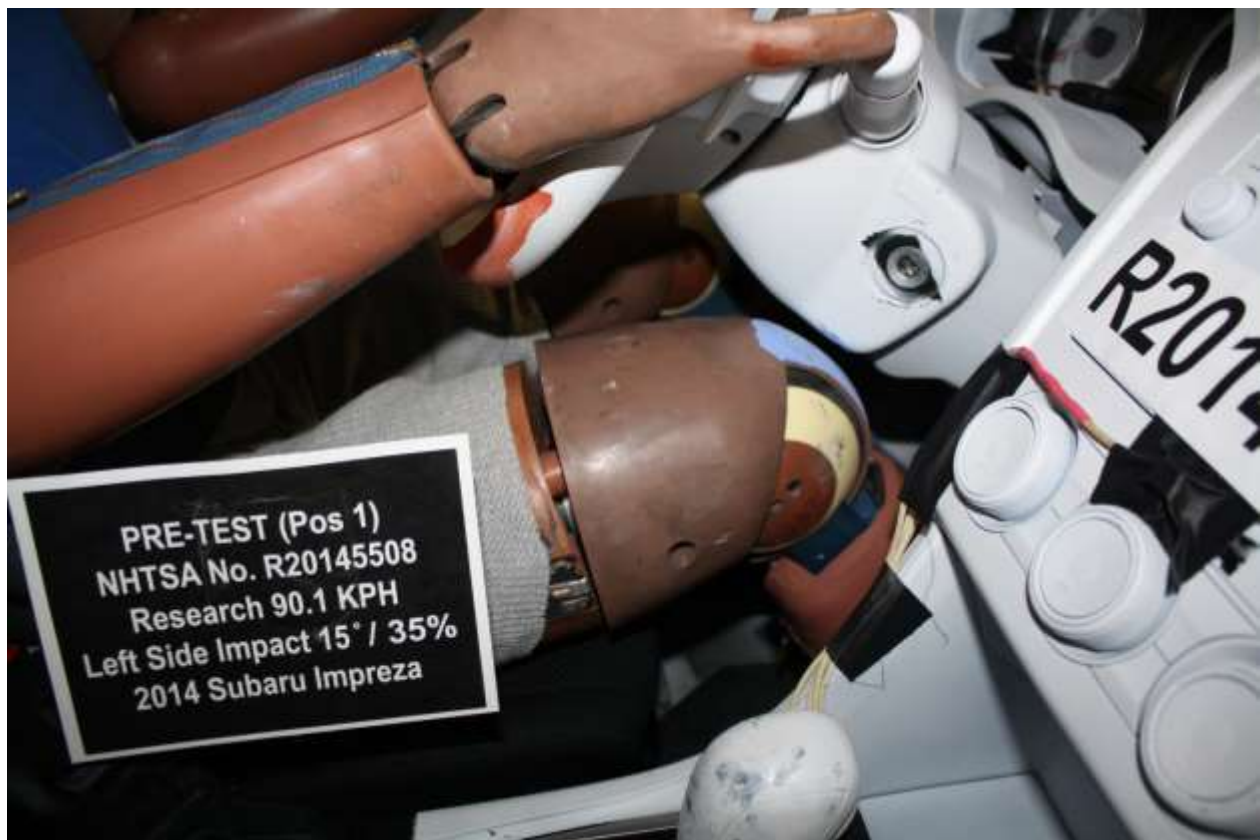
No. 068 Post-Test Driver Adjustable D-Ring



No. 069 Pre-Test Driver Feet



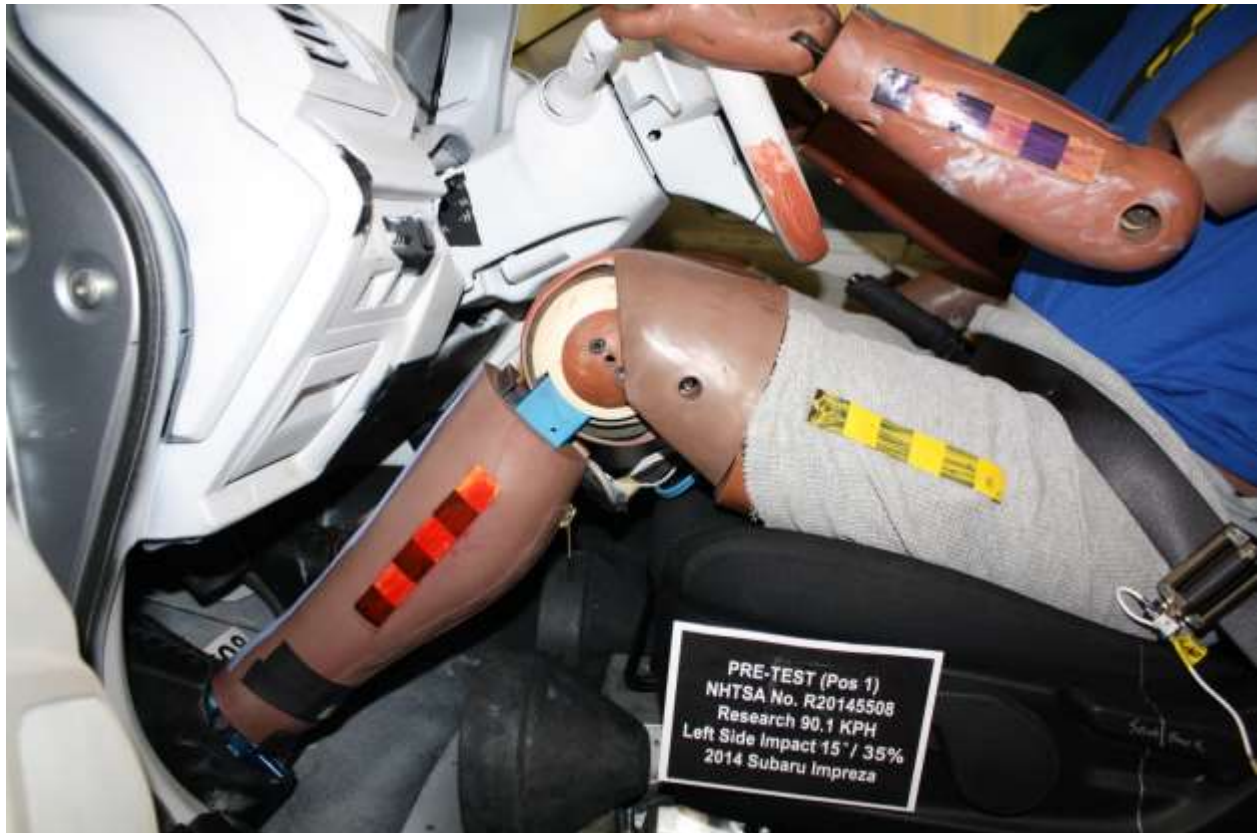
No. 070 Post-Test Driver Feet



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



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



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



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



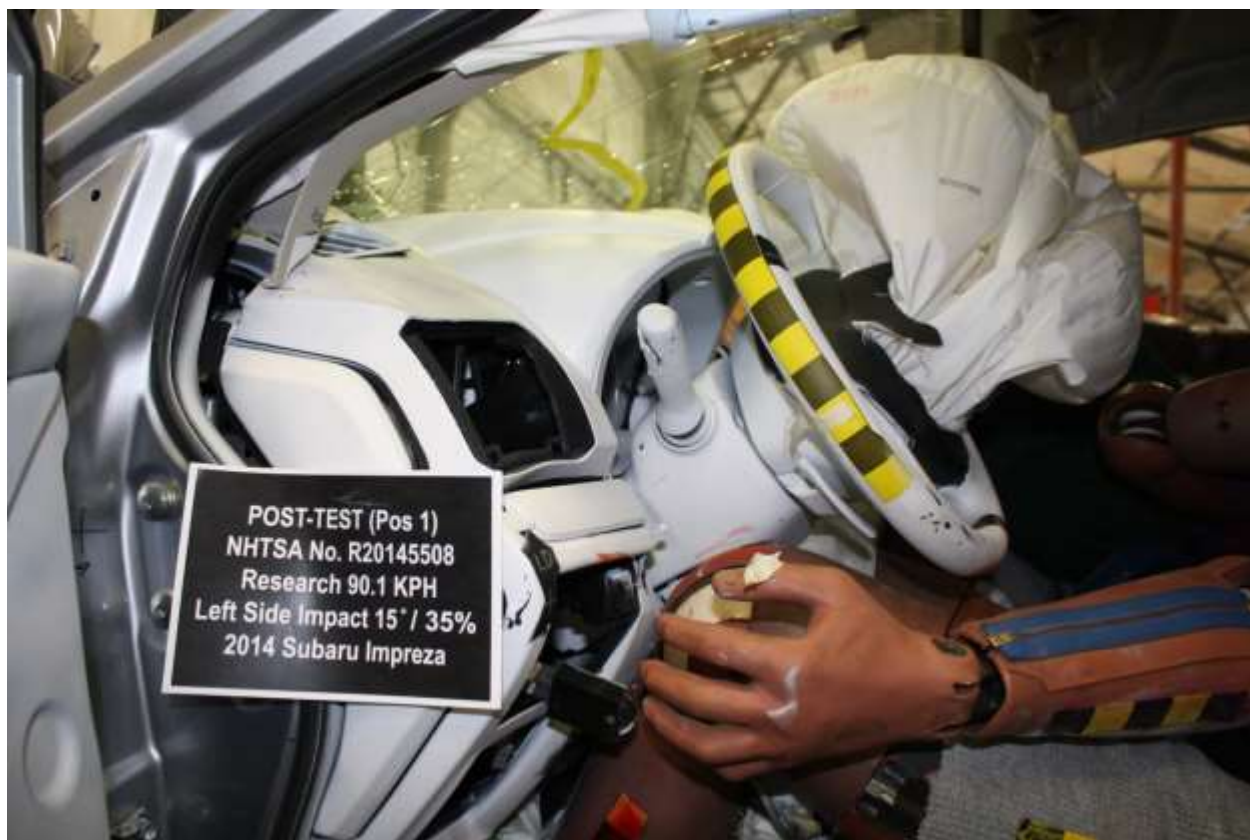
No. 075 Pre-Test View of Driver Abdomen



No. 076 Post-Test View of Driver Abdomen



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



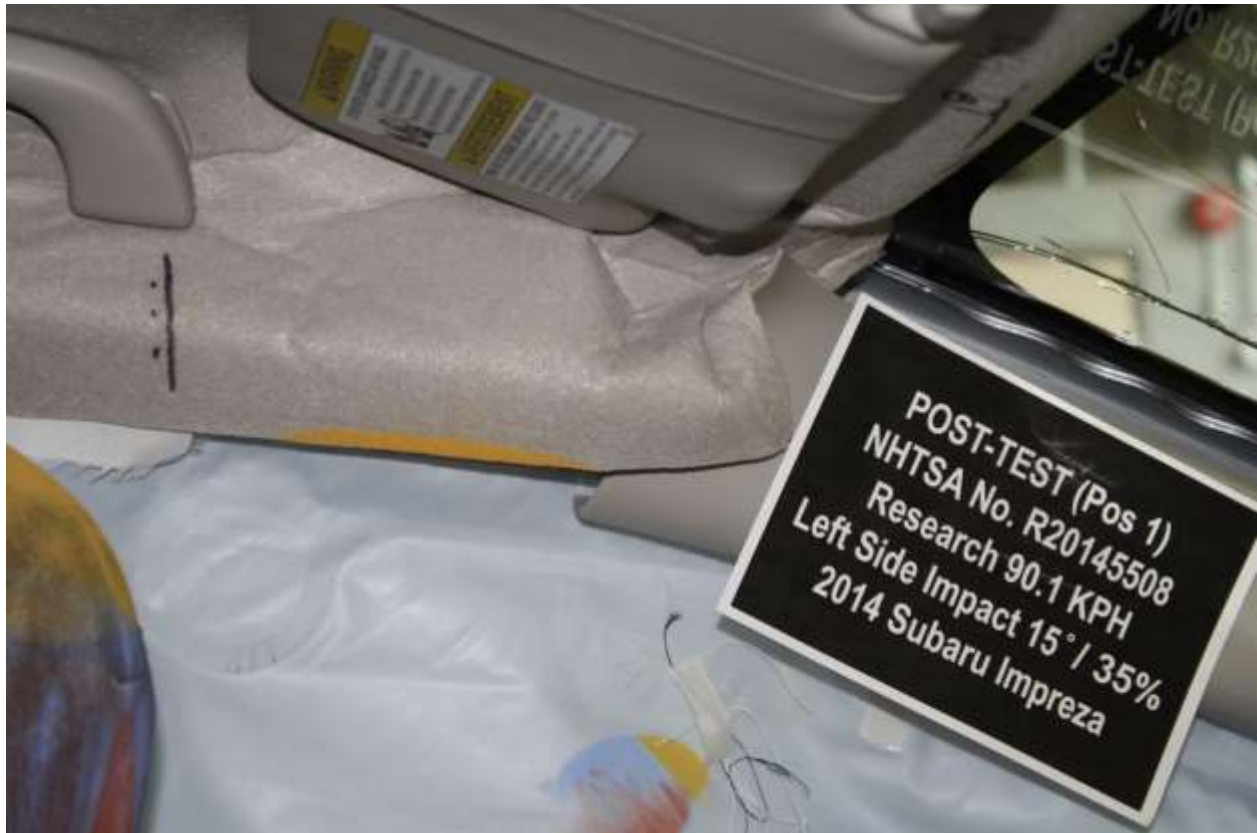
No. 078 Post-Test Left Side View of Steering Wheel set position



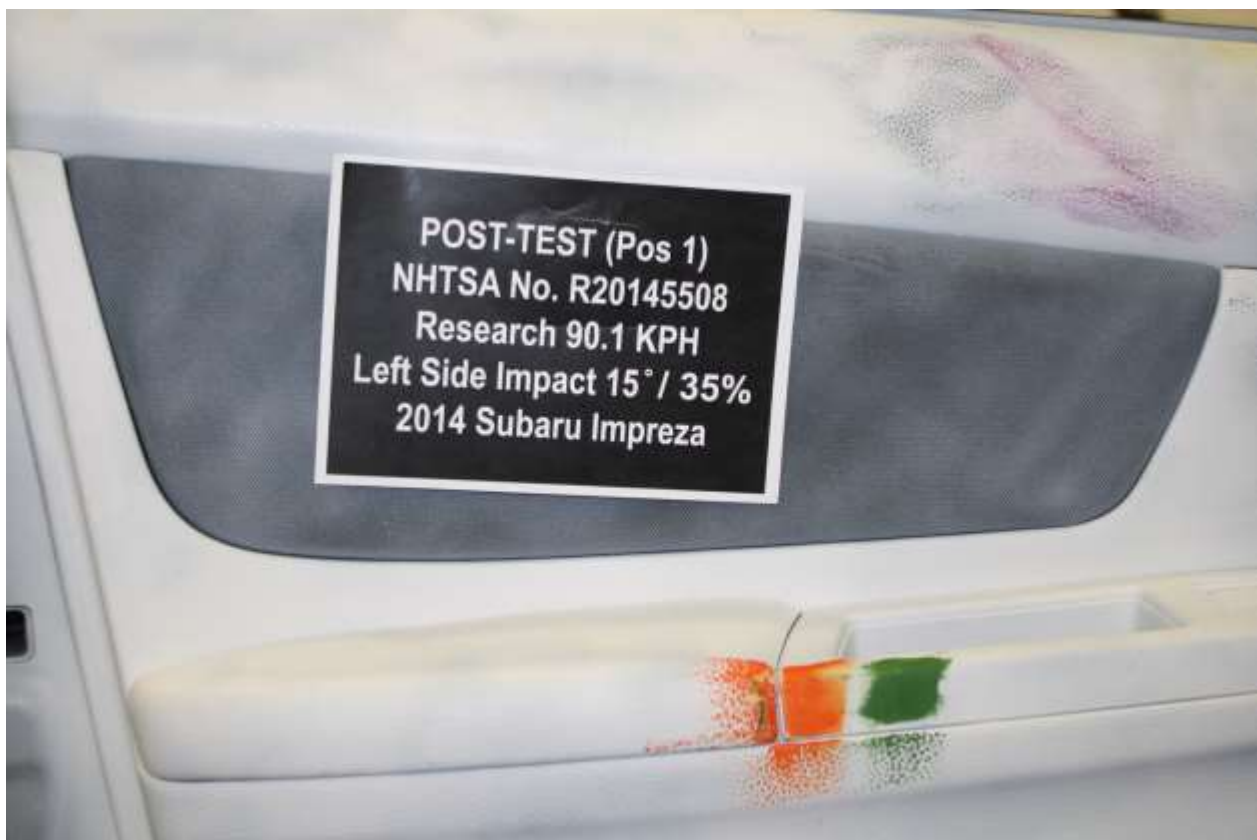
No. 079 Post-Test View of Driver Head Contact with Front Airbag



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



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



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 Left sill level, w/carpet



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



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



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



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



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



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



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



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



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



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



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



No. 100 Pre-Test Right Side Passenger Window View



No. 101 Post-Test Right Side Passenger Window View



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



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



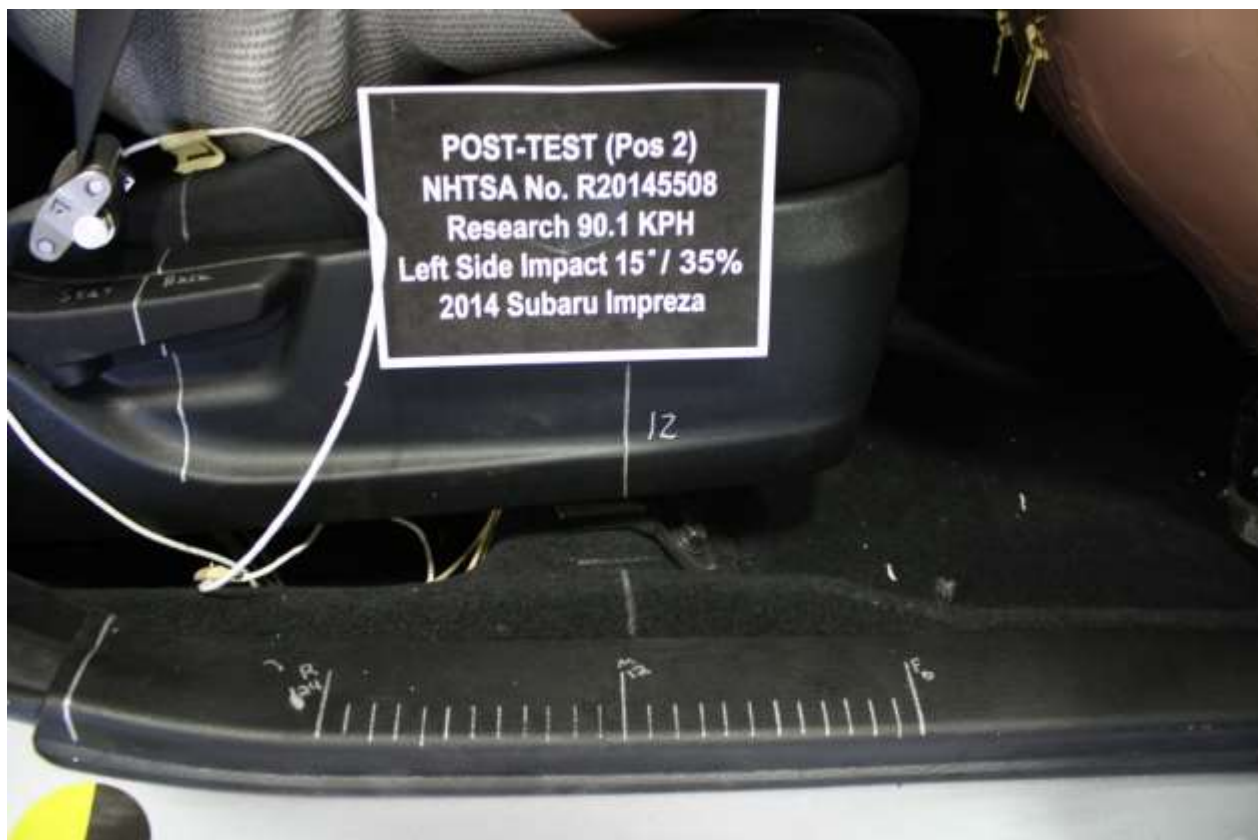
No. 104 Pre-Test View of Passenger Door Clearance



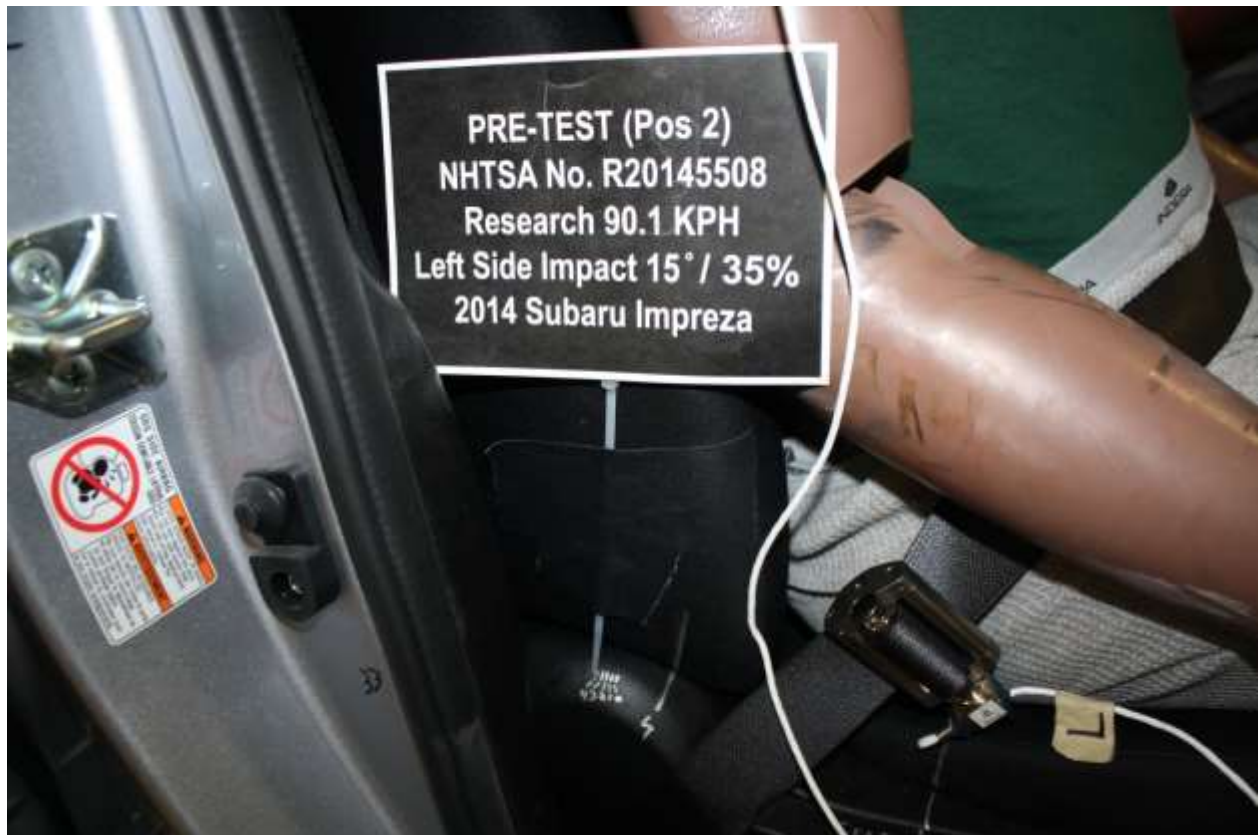
No. 105 Post-Test View of Passenger Door Clearance



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



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



No. 108 Pre-Test Passenger Seat Back Markings



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



No. 110 Pre-Test Passenger Adjustable D-ring



No. 111 Post-Test Passenger Adjustable D-ring



No. 112 Pre-Test View of Passenger Feet



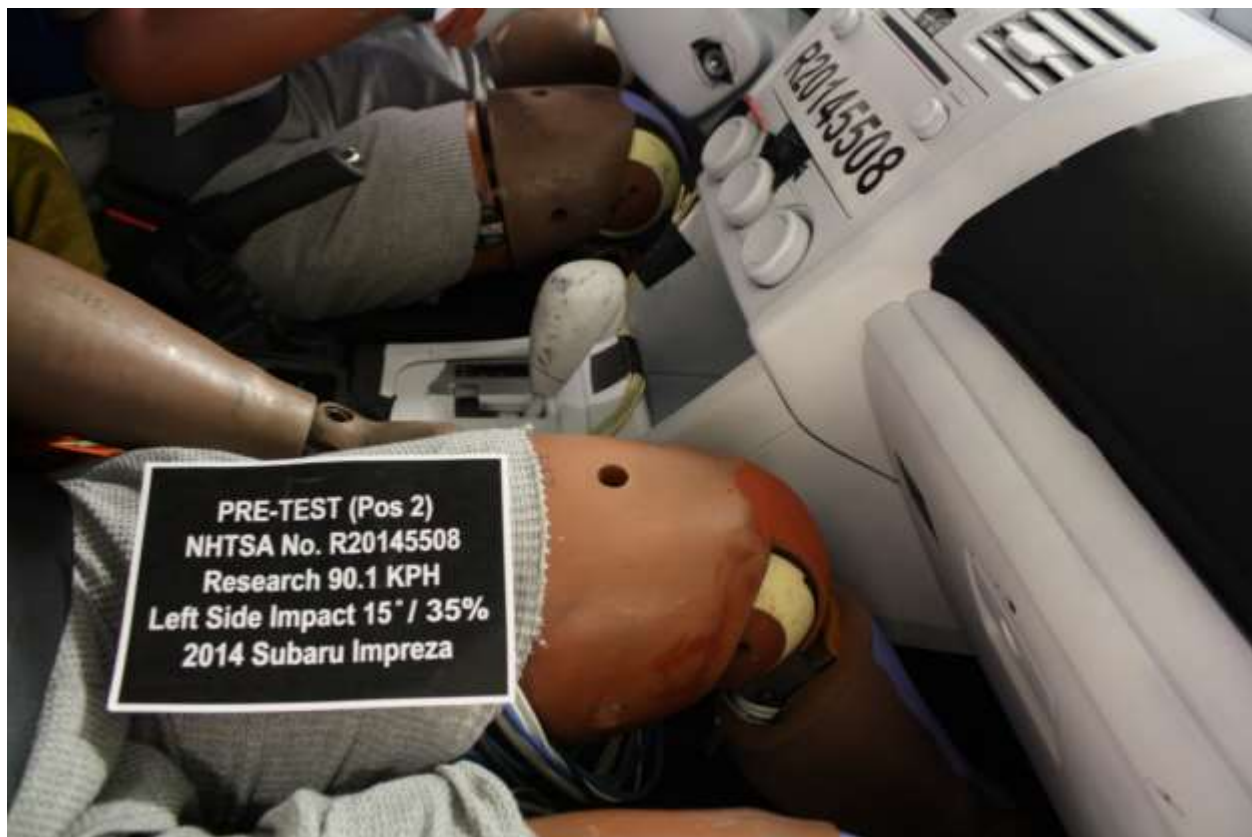
No. 113 Post-Test View of Passenger Feet



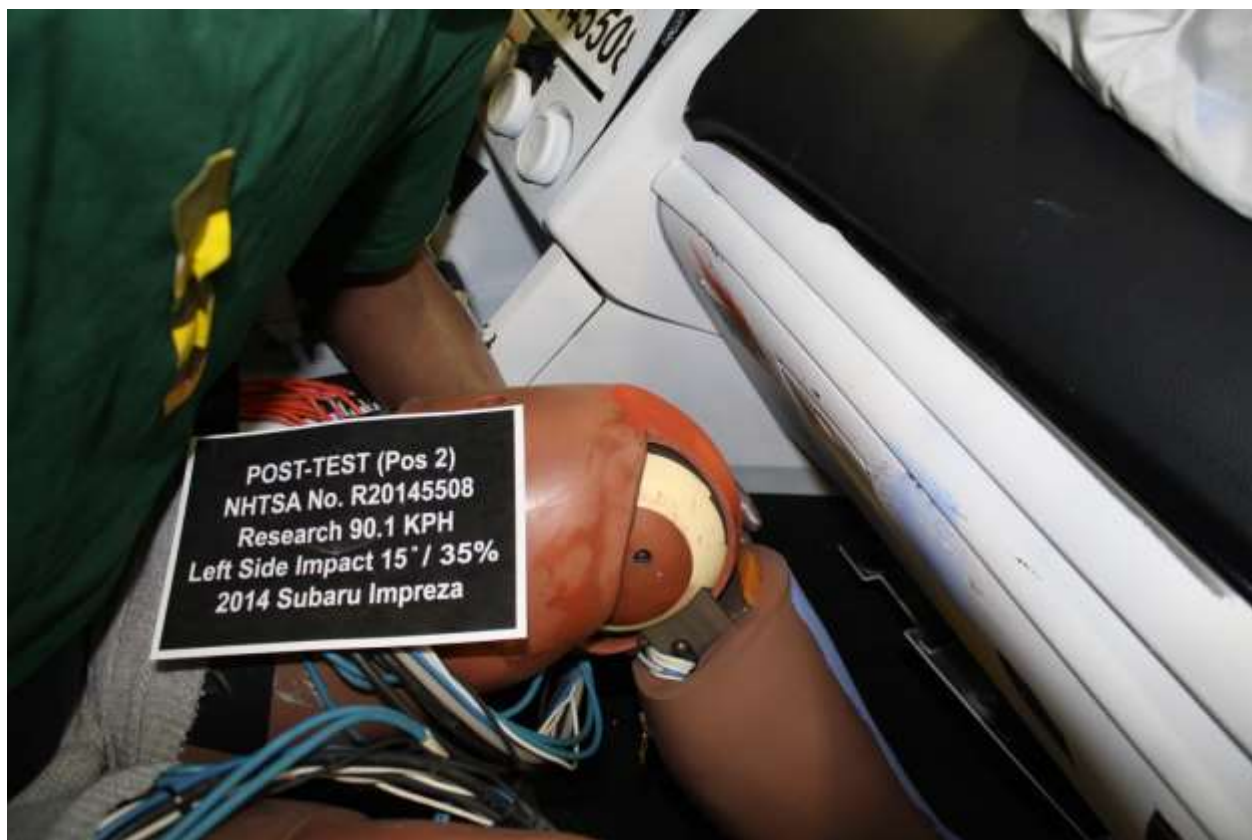
No. 114 Pre-Test View of Passenger Right Knee and Bolster



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



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



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



No. 118 Pre-Test View of Passenger Abdomen



No. 119 Post-Test View of Passenger Abdomen



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

Photo Not Applicable

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



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



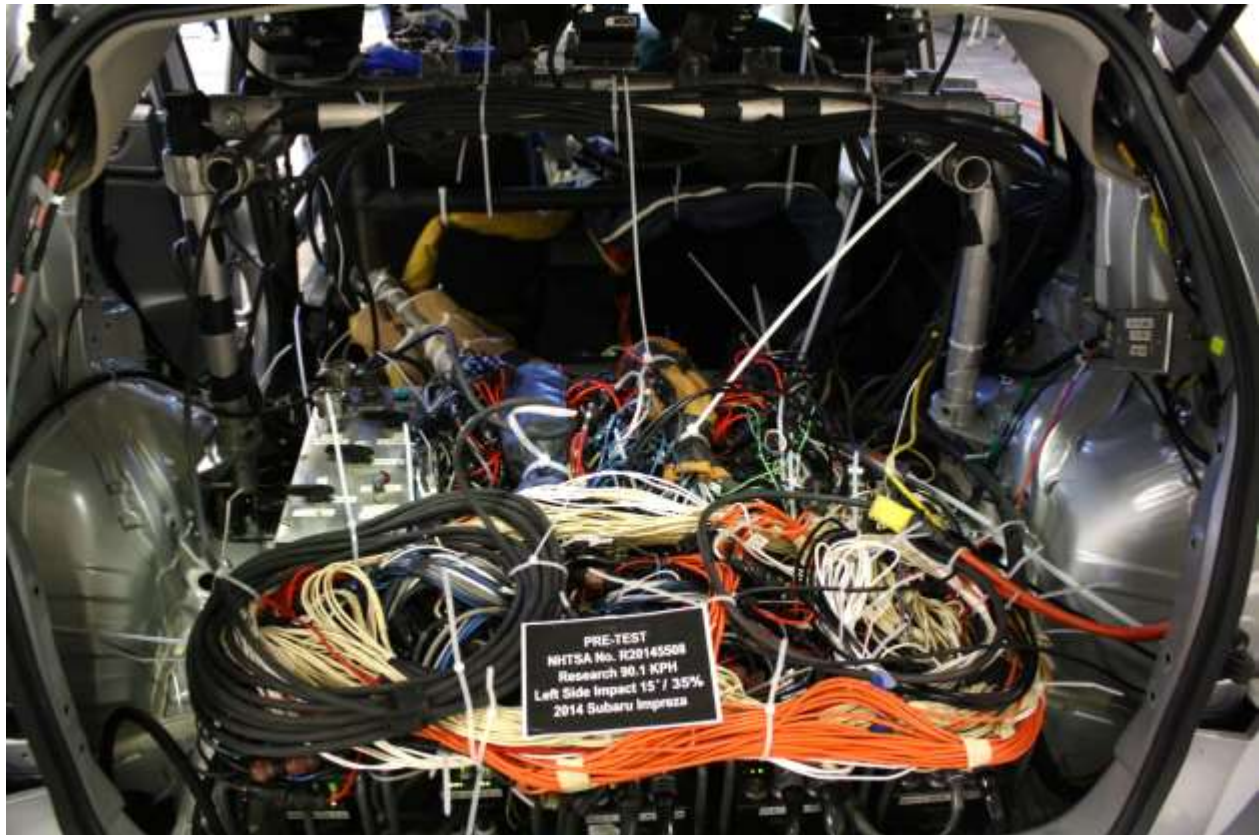
No. 121a Post-Test View of Passenger Head contact with Interior



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



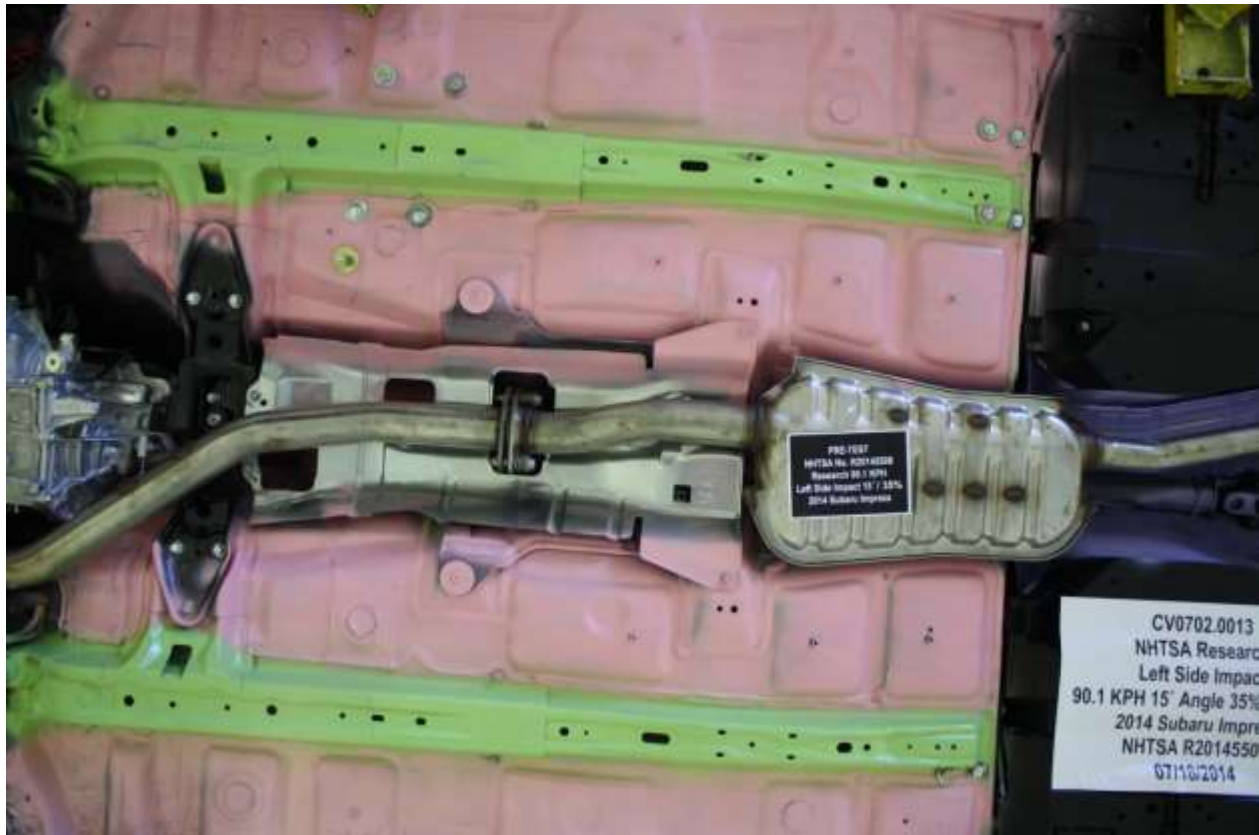
No. 128 Post-Test Engine Compartment View



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



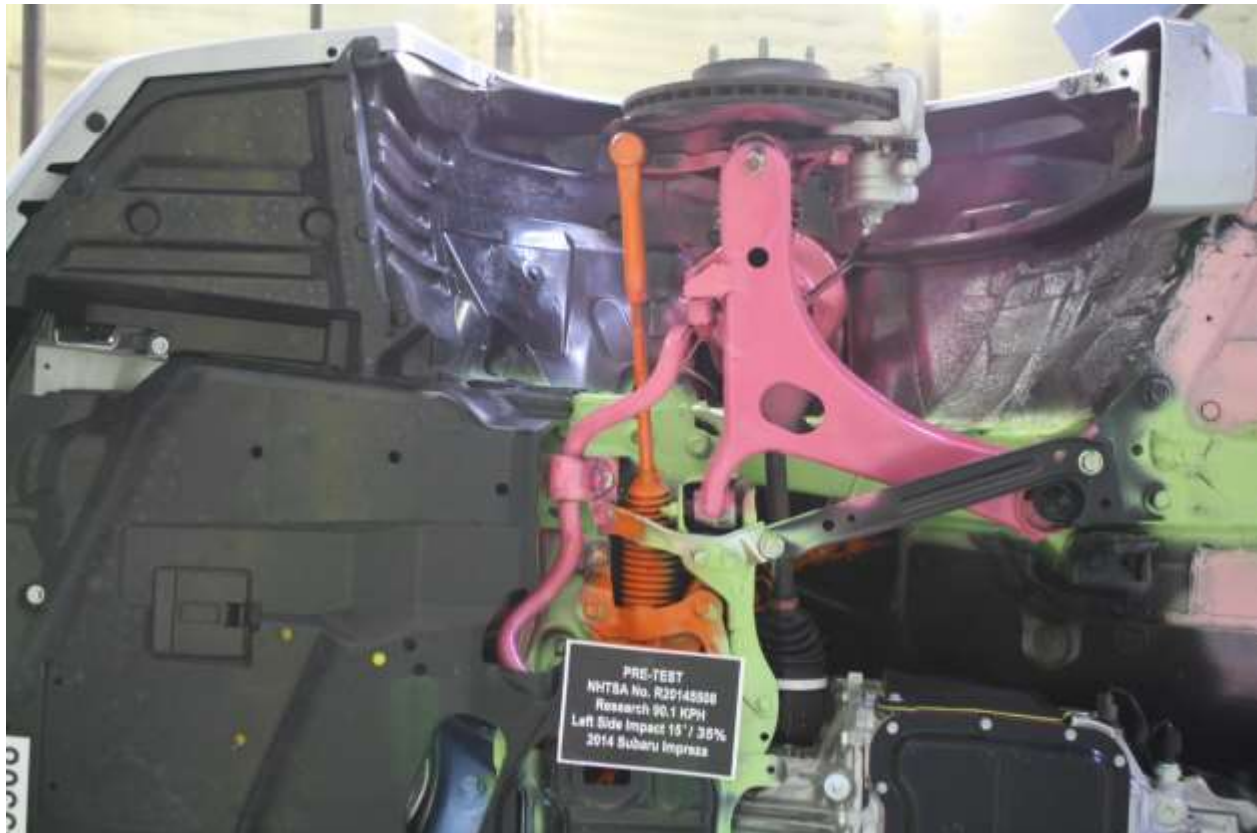
No. 137 Pre-Test Bumper to Rail Attachments and Crush Initiators



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



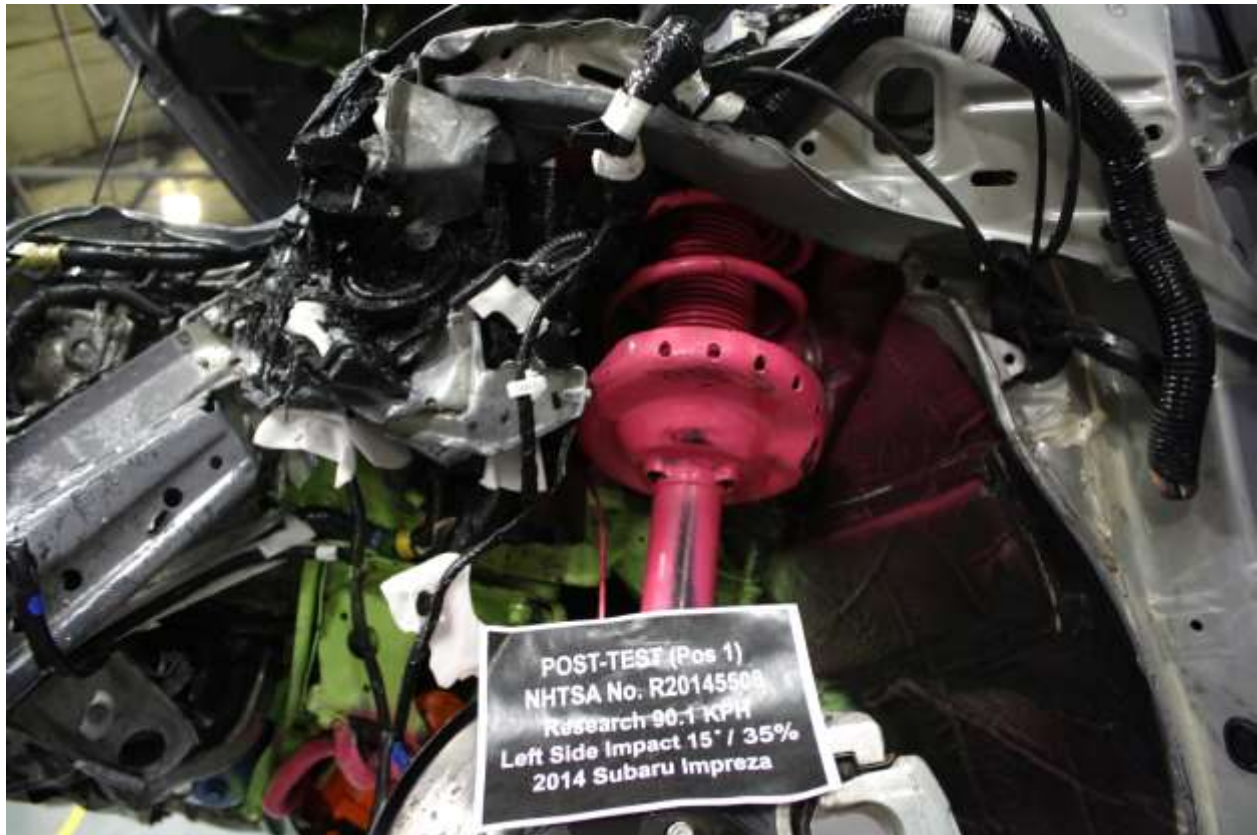
No. 145 Post-Test Right Side 3/4 Rear View of the Front Driver Wheel Well w/ Tire Removed



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



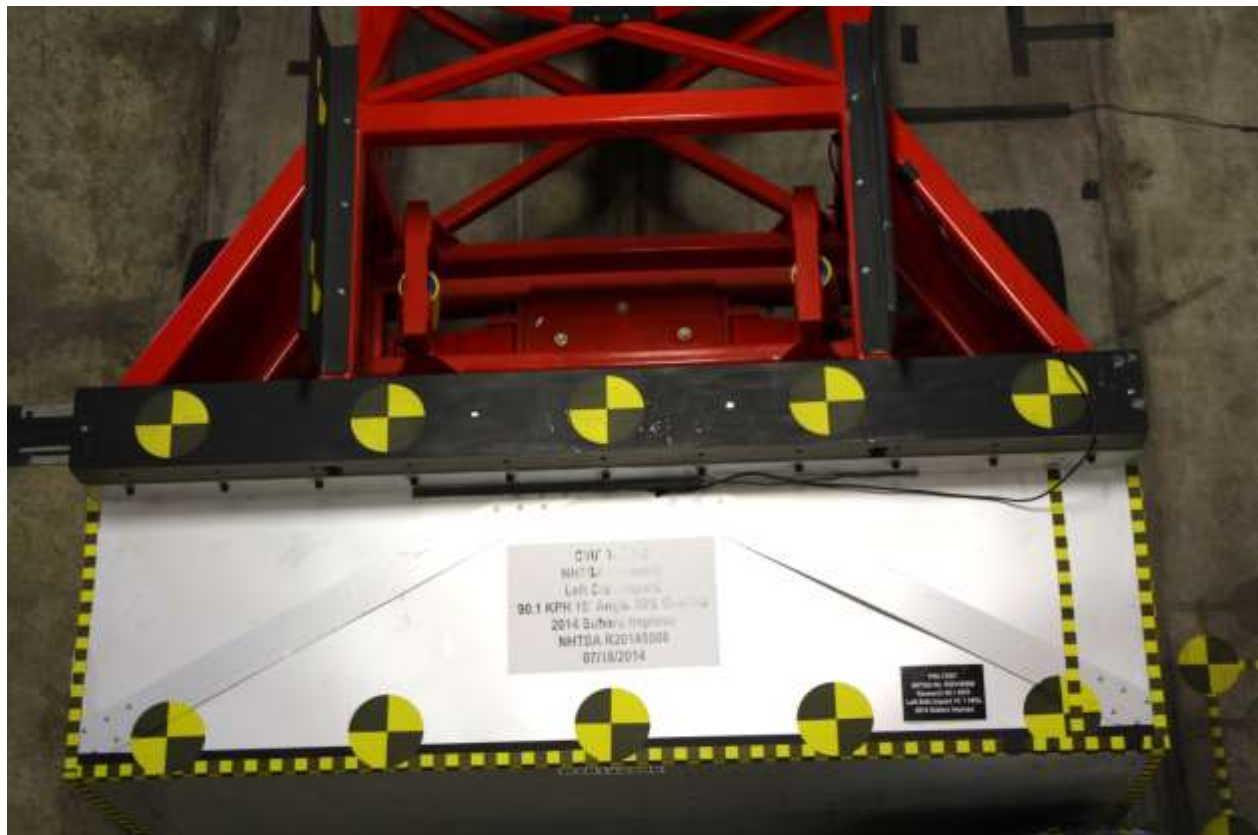
No. 163 Post-Test Left Side View of RMDB



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



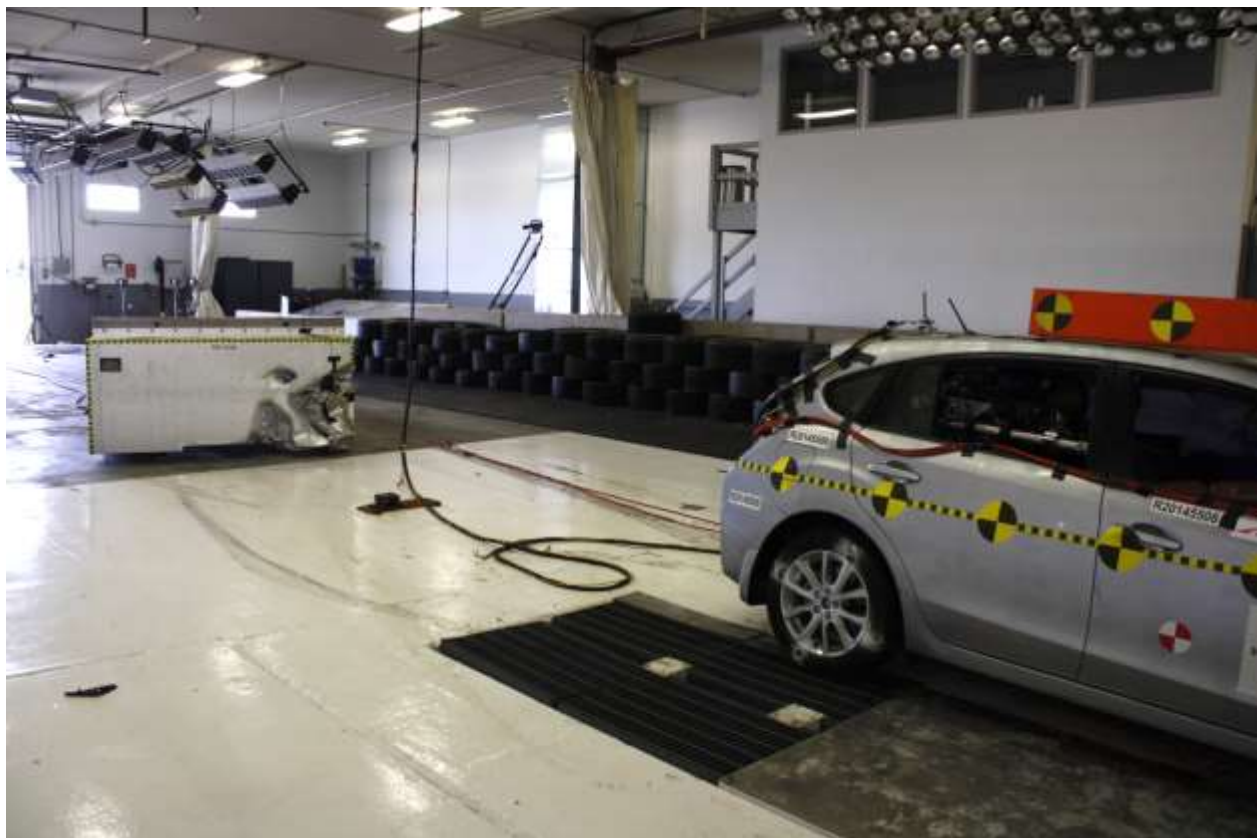
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No. 177 Post-Test RMDB & Vehicle, Rear View



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

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VEHICLE & DUMMY RESPONSE DATA TRACES

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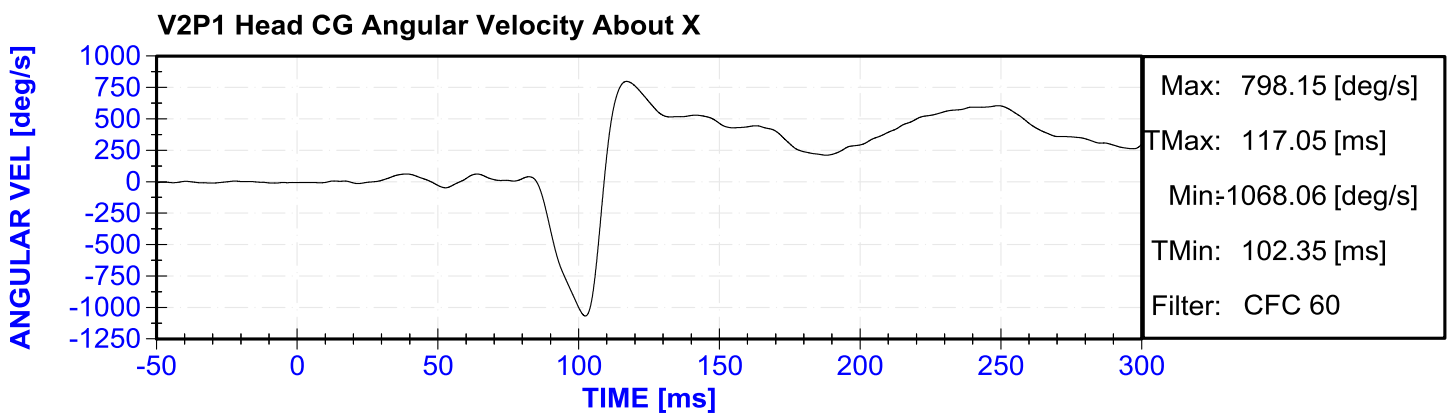
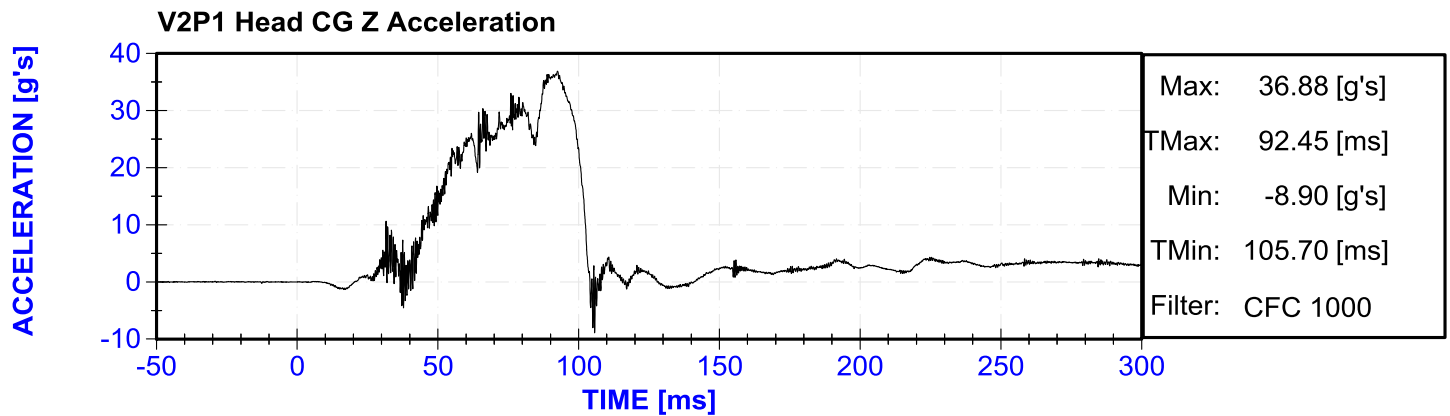
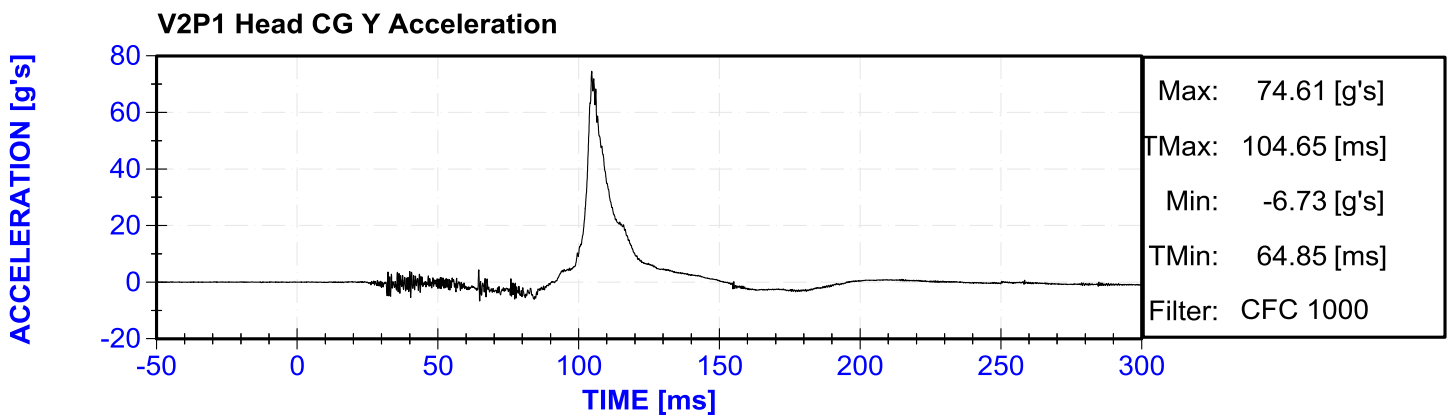
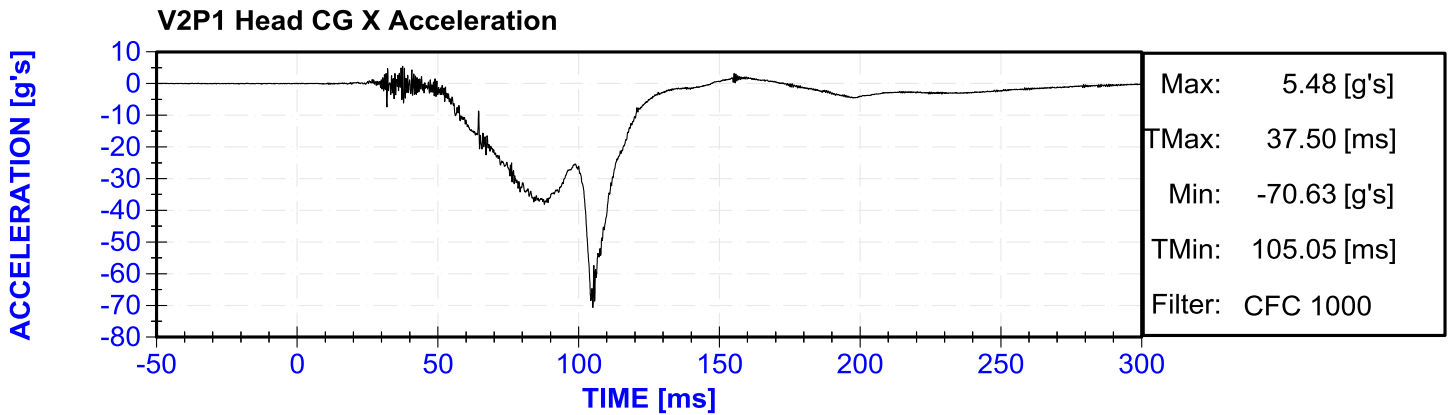
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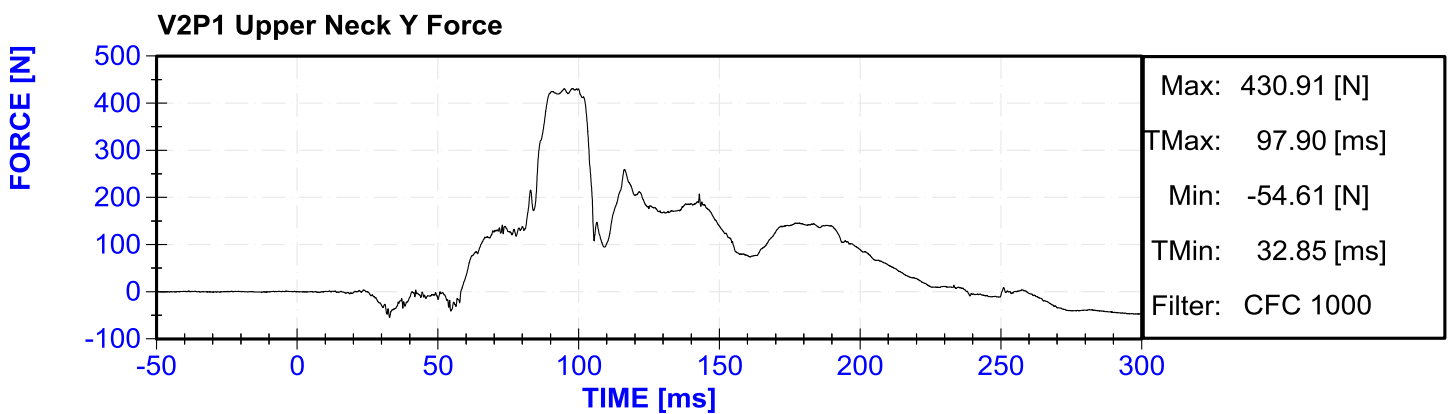
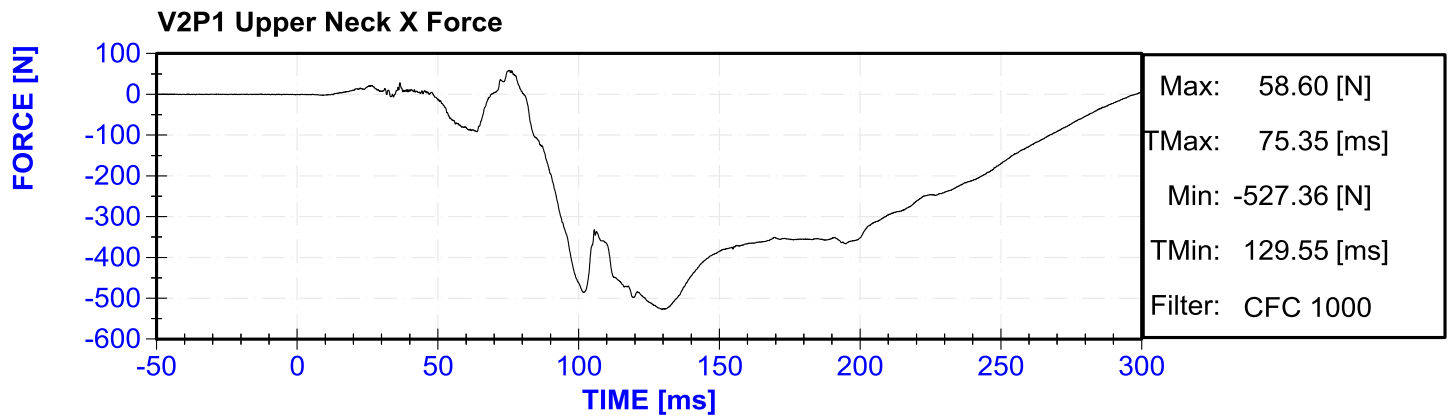
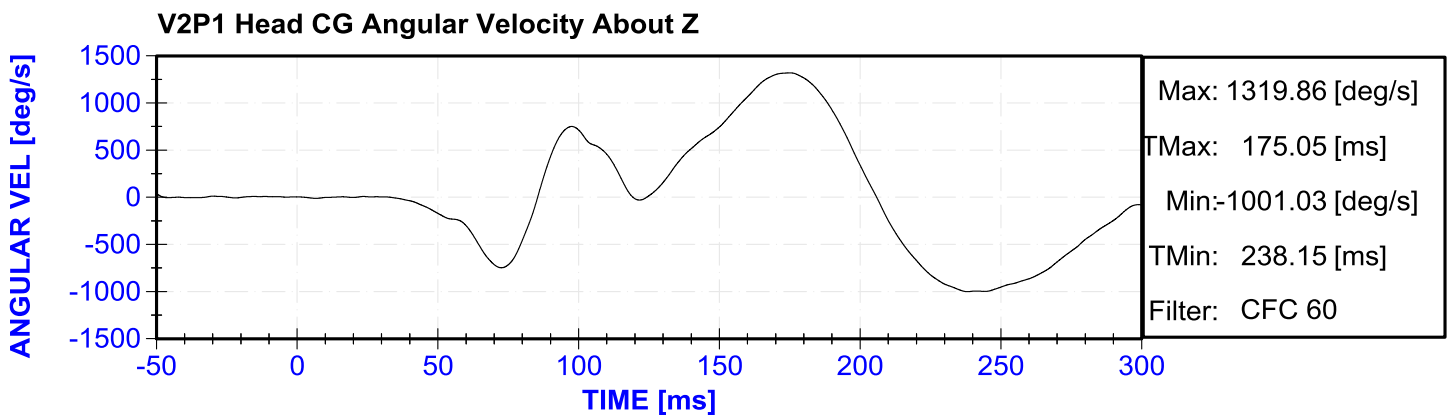
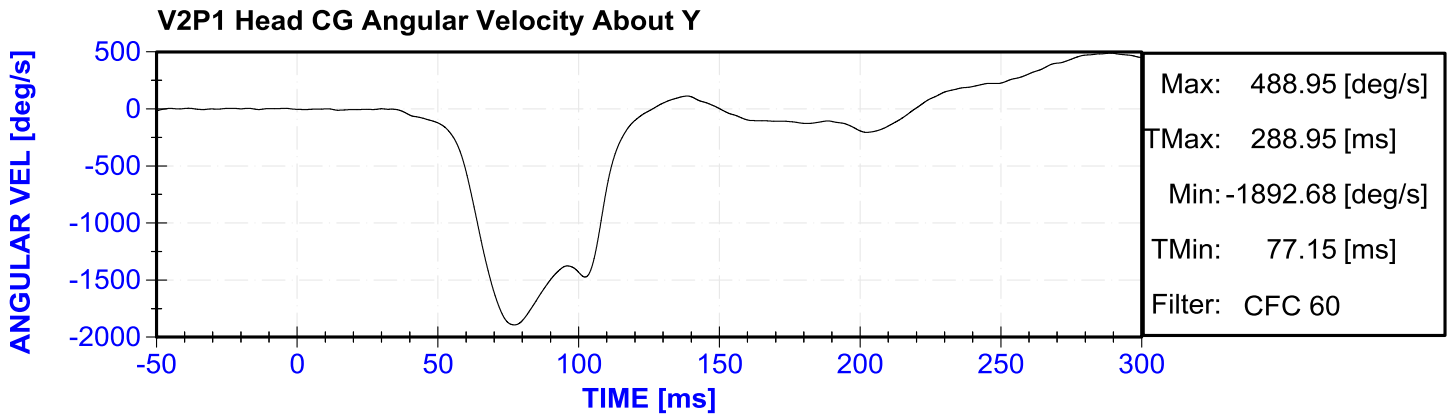
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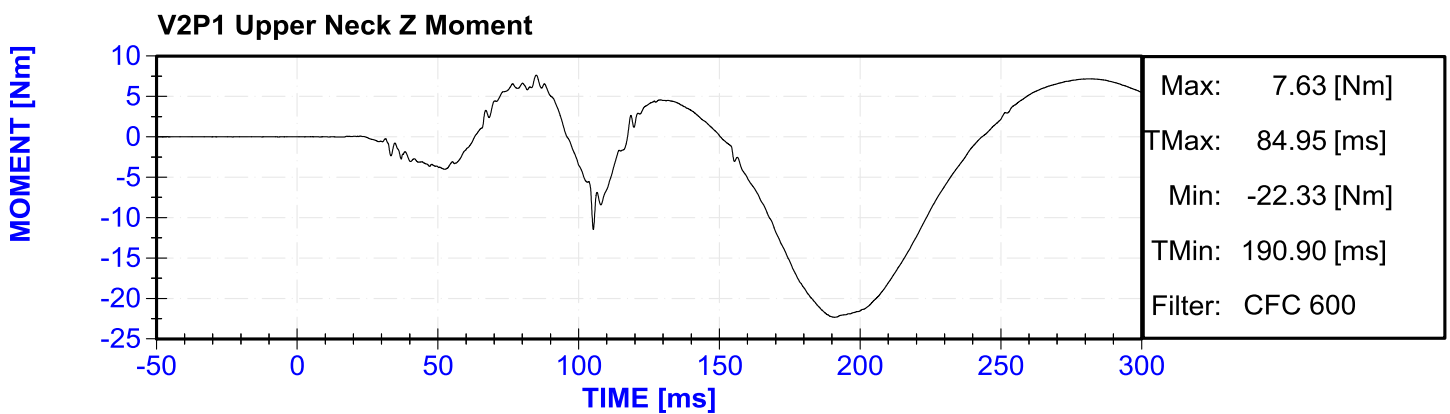
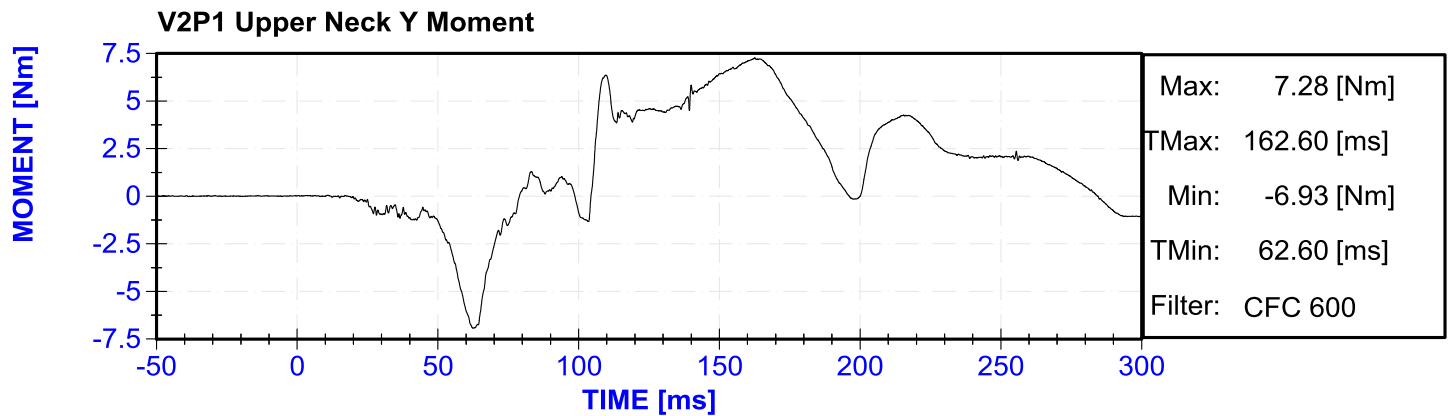
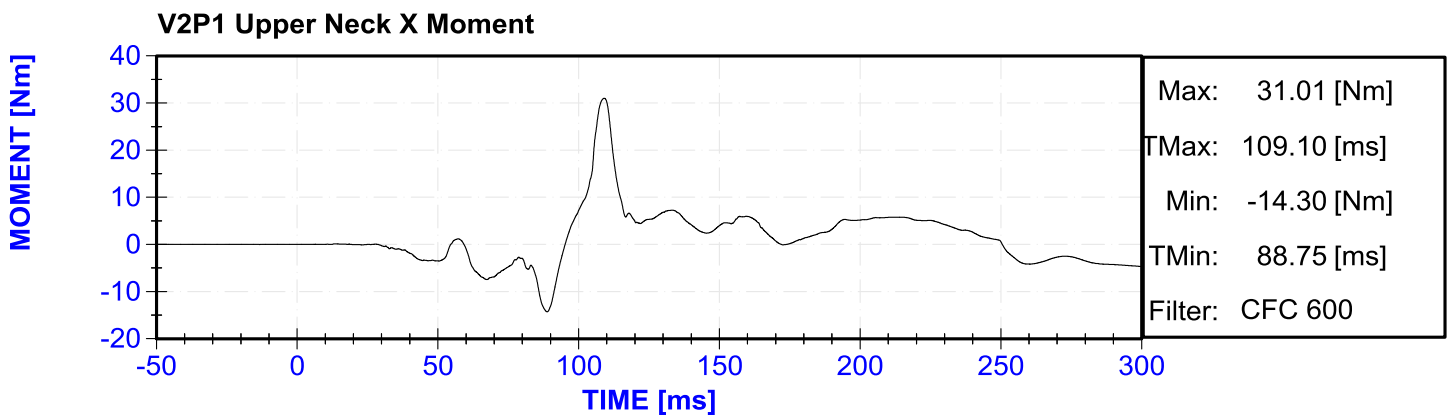
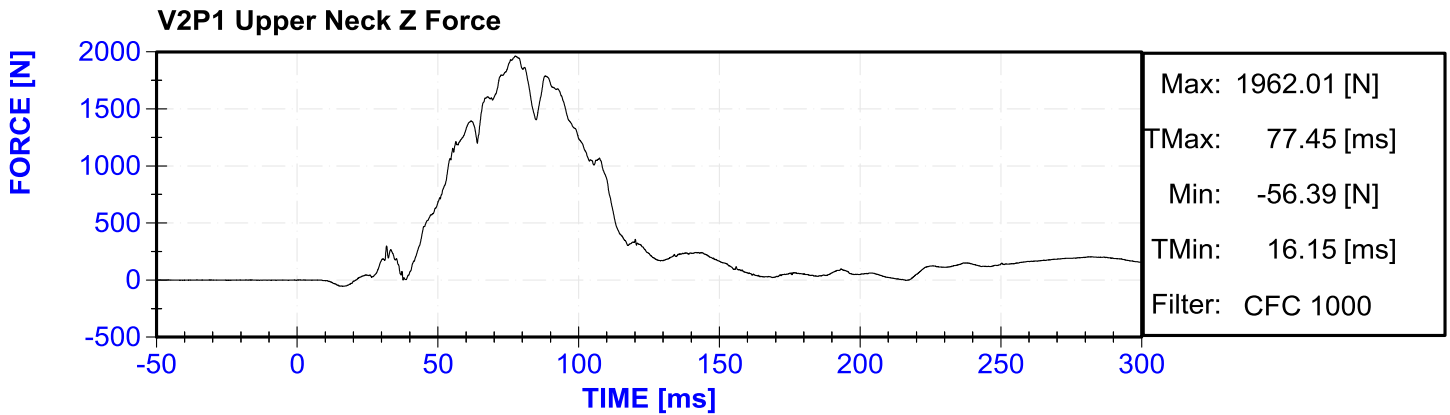
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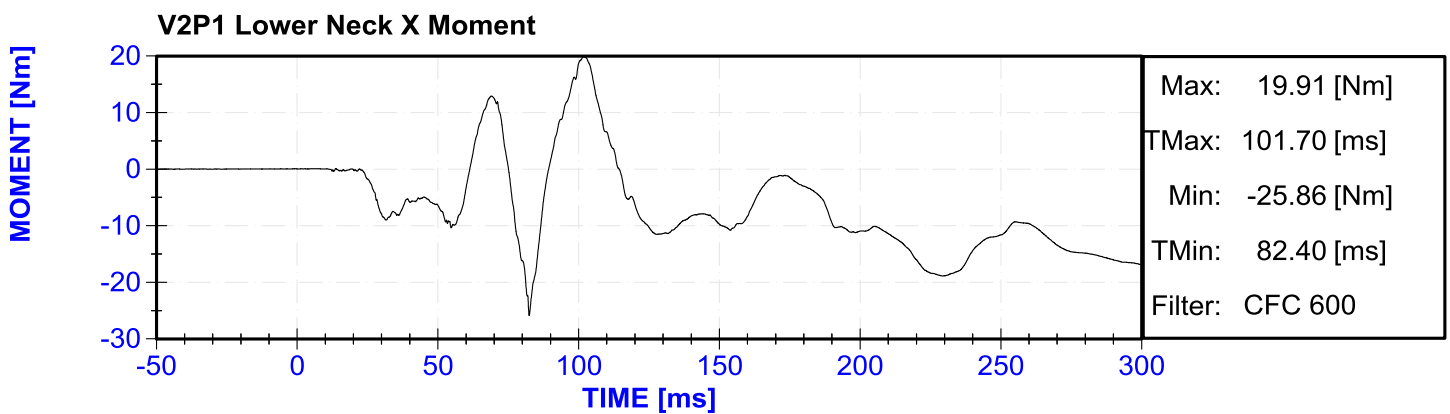
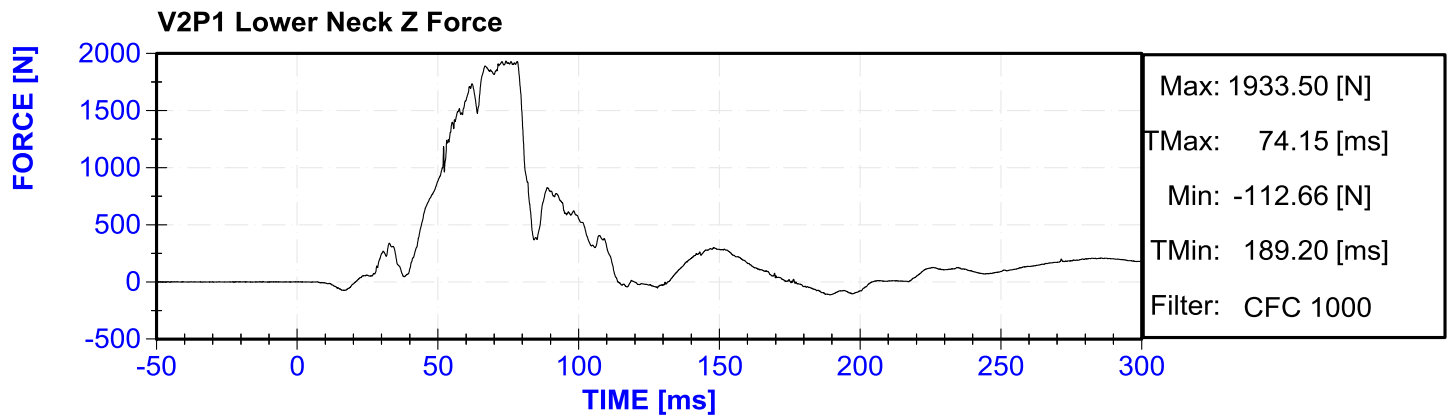
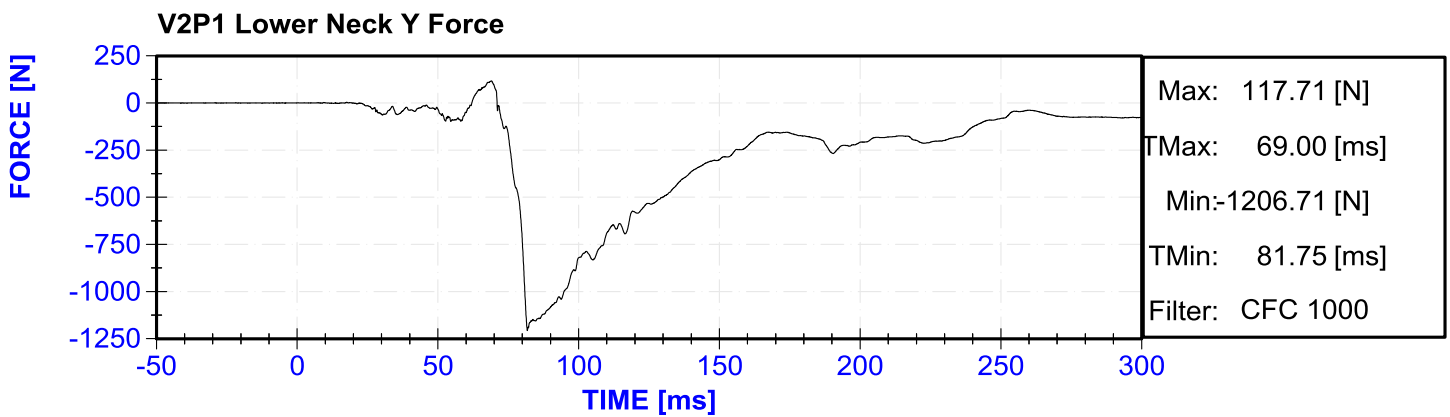
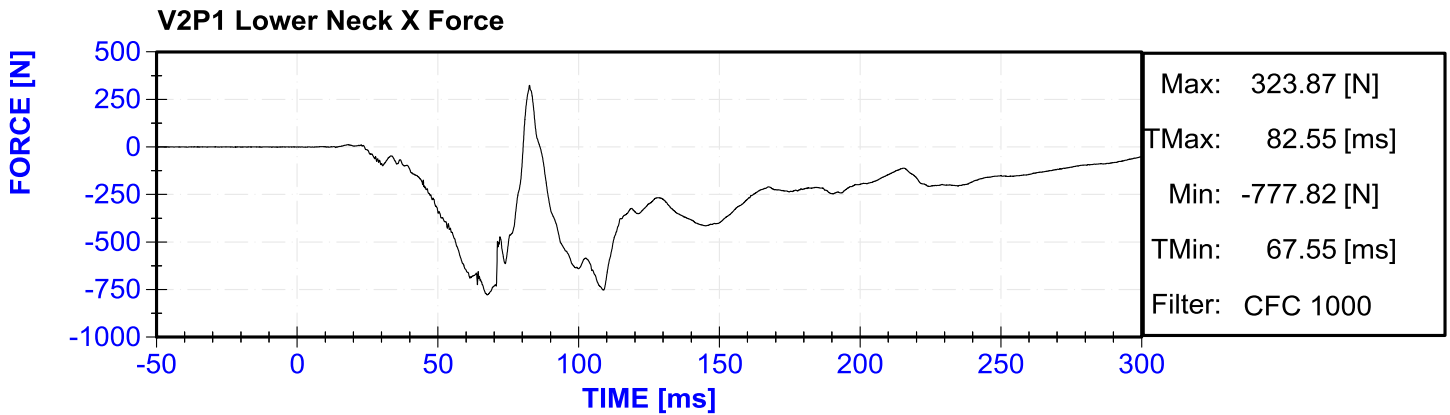
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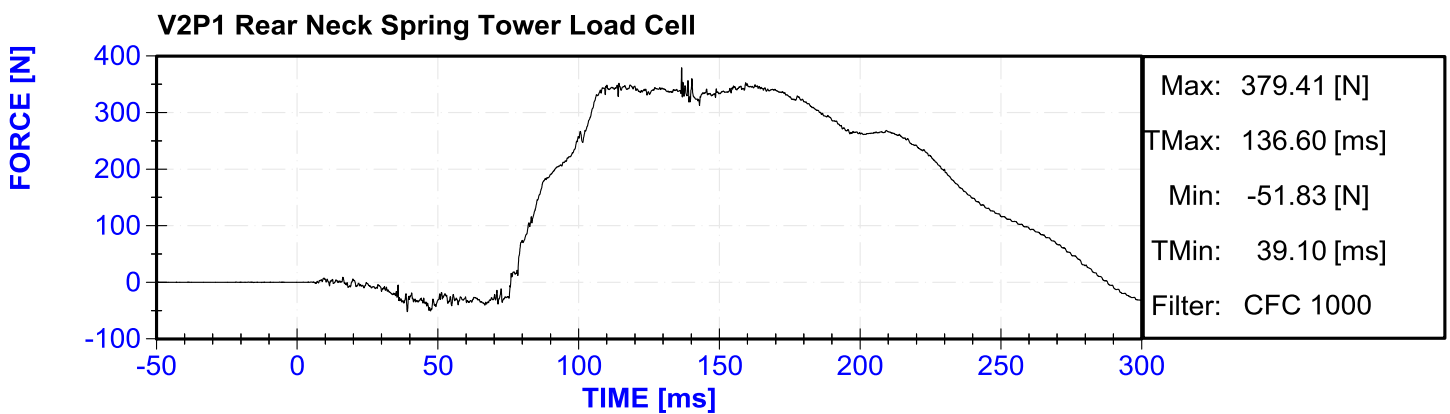
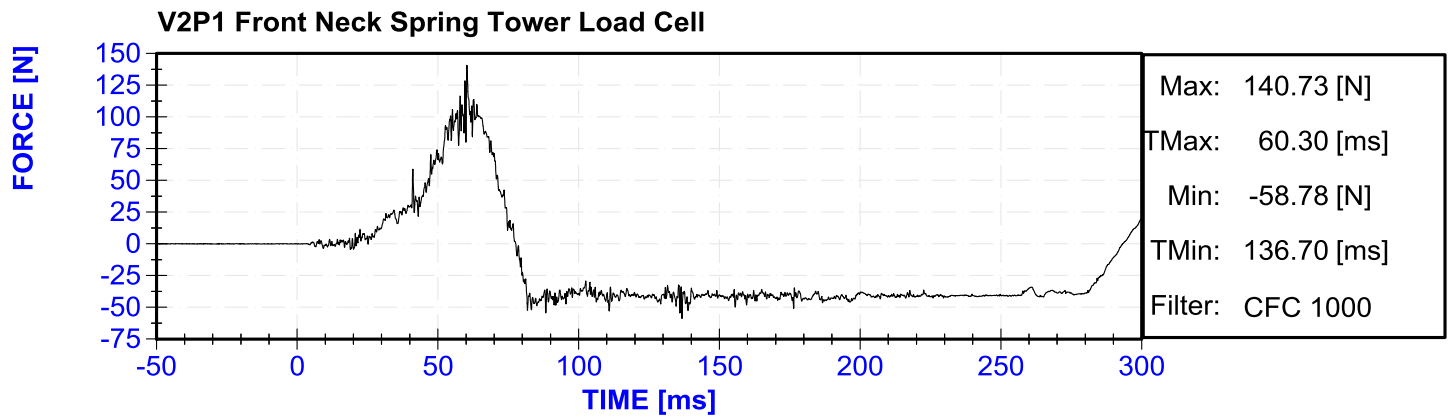
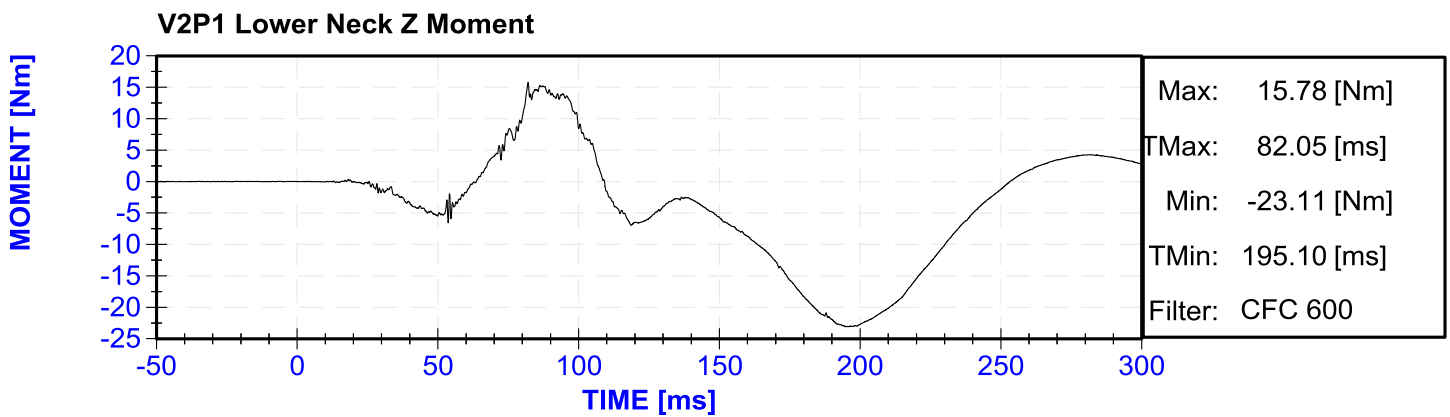
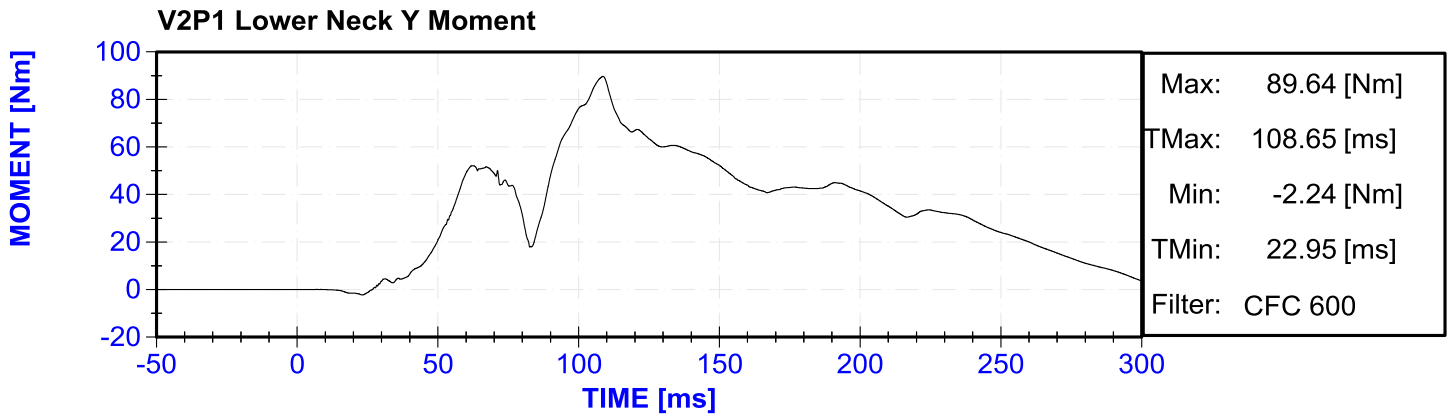
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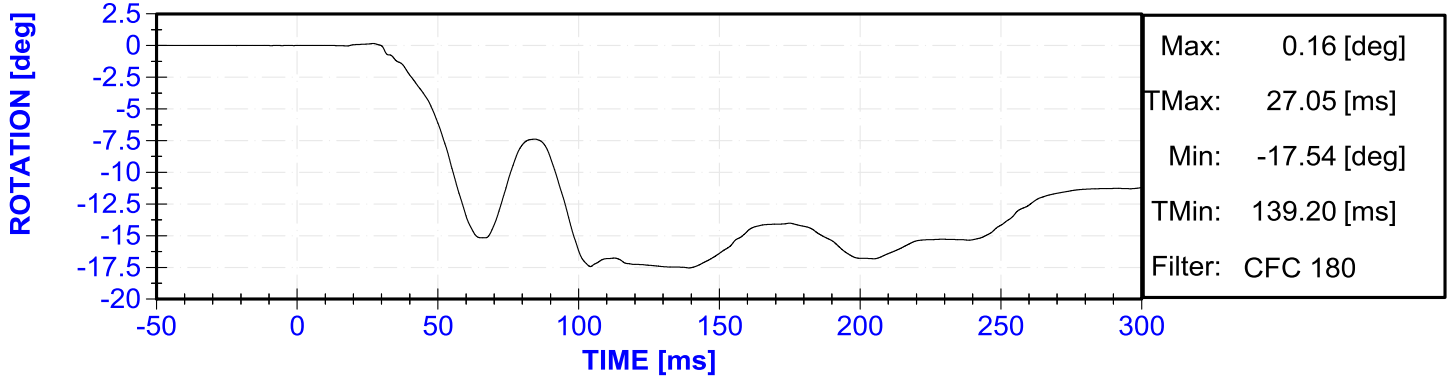




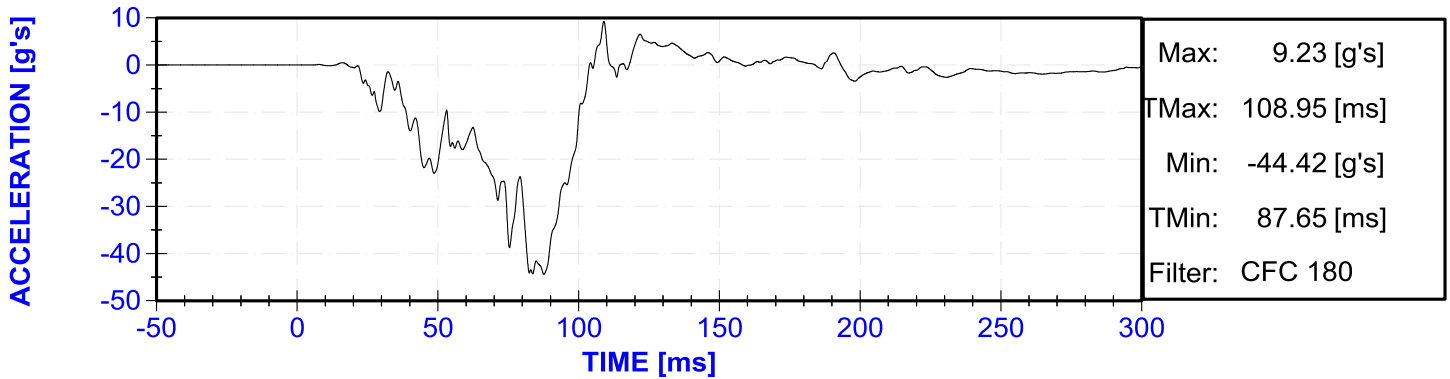




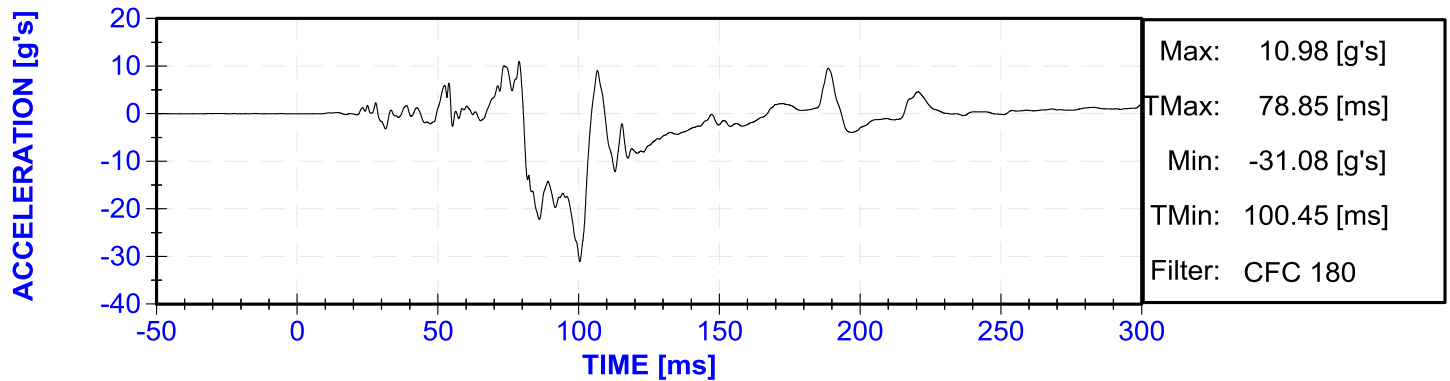
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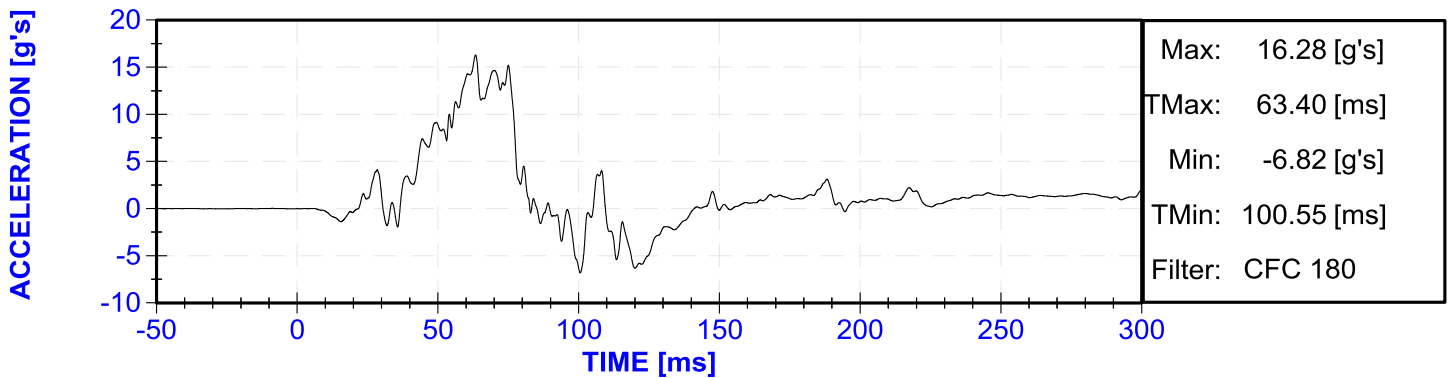
V2P1 T1 X Acceleration

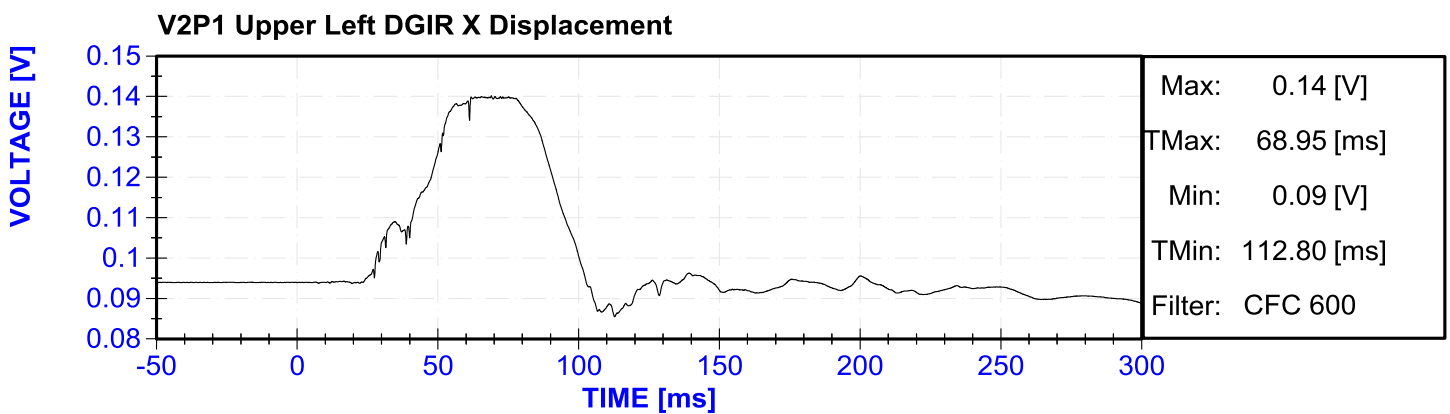
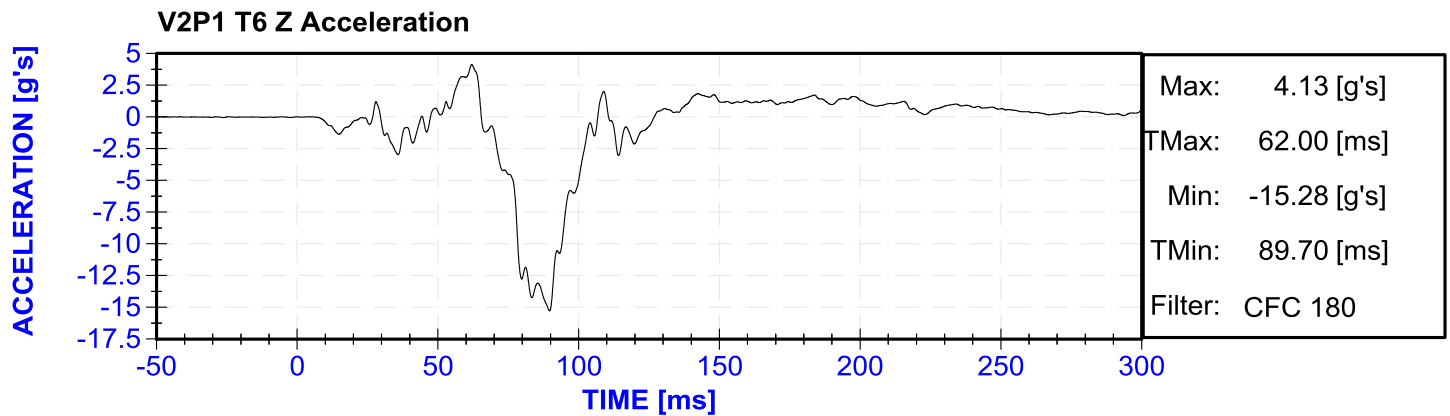
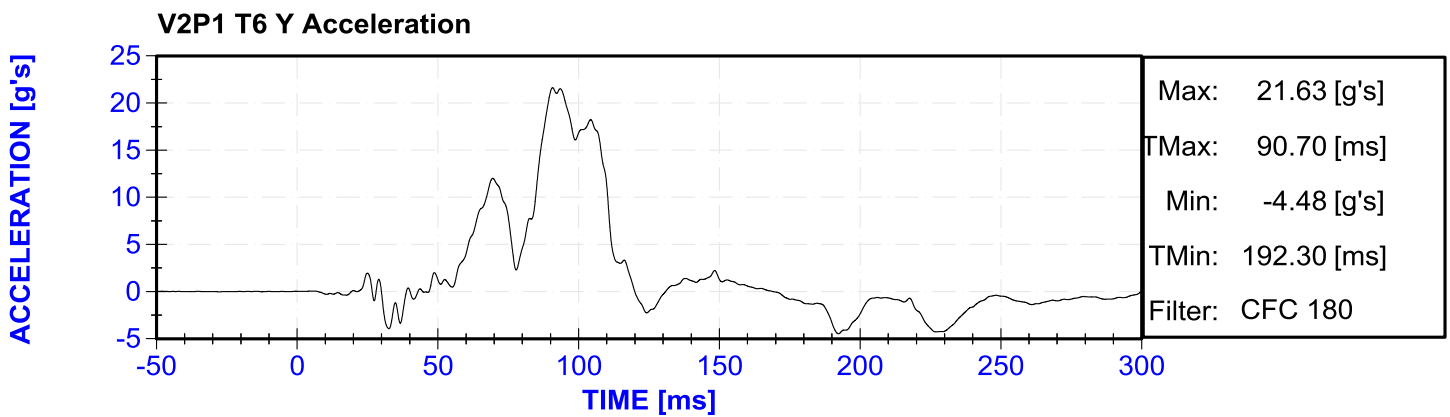
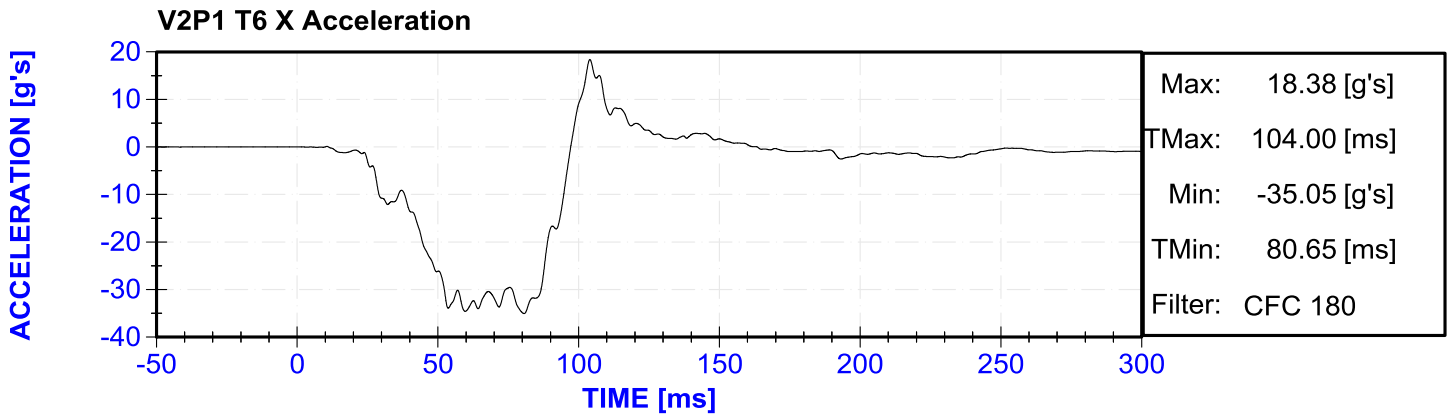


V2P1 T1 Y Acceleration

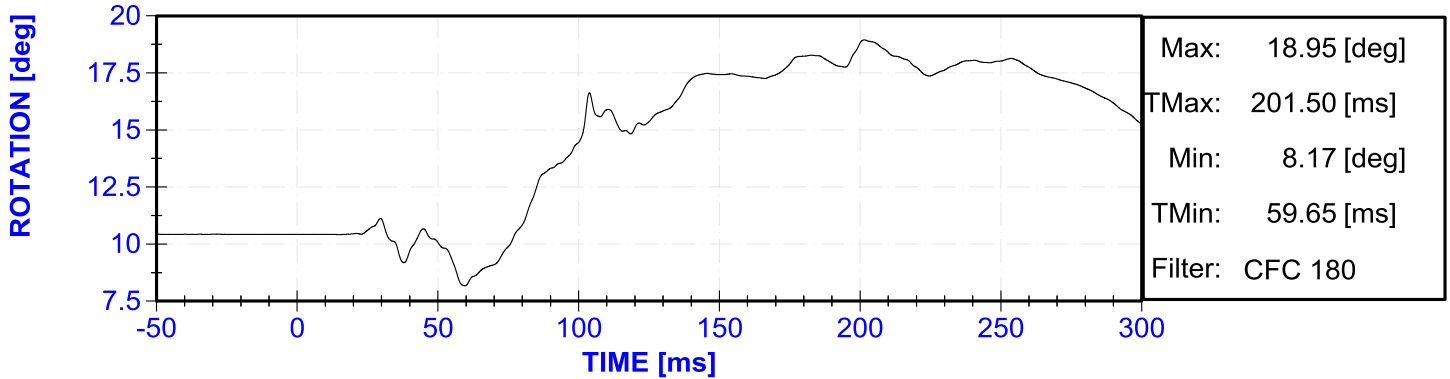


V2P1 T1 Z Acceleration

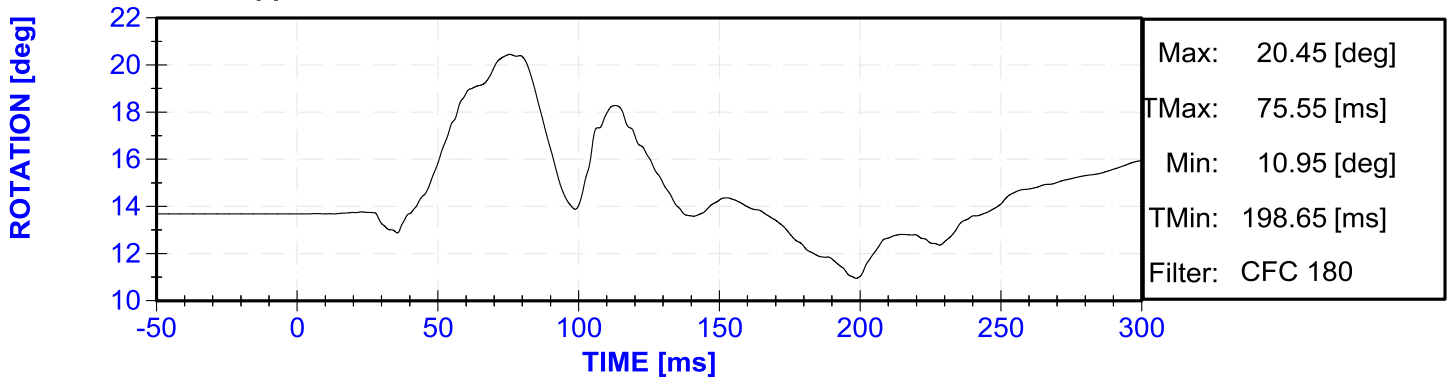




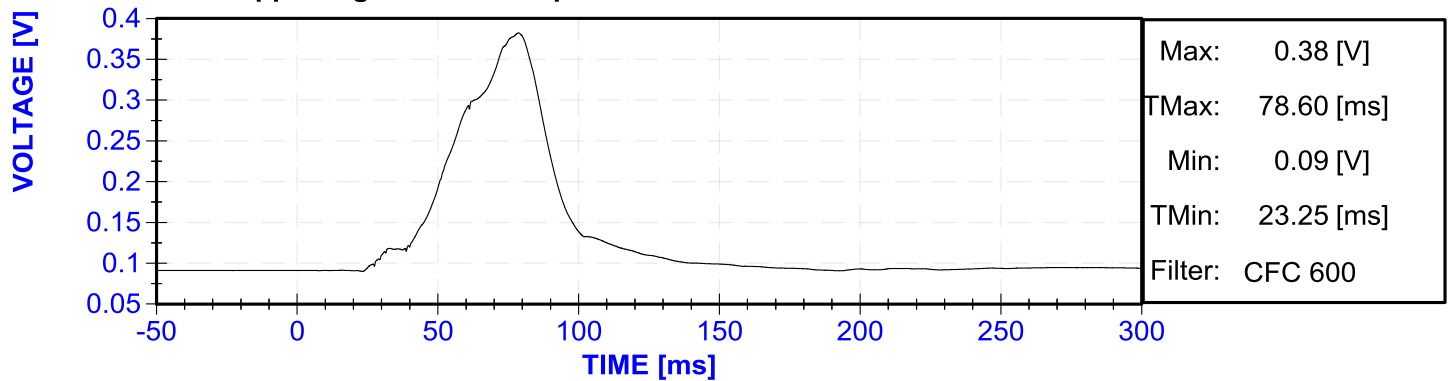
V2P1 Upper Left DGIR Y Rotation



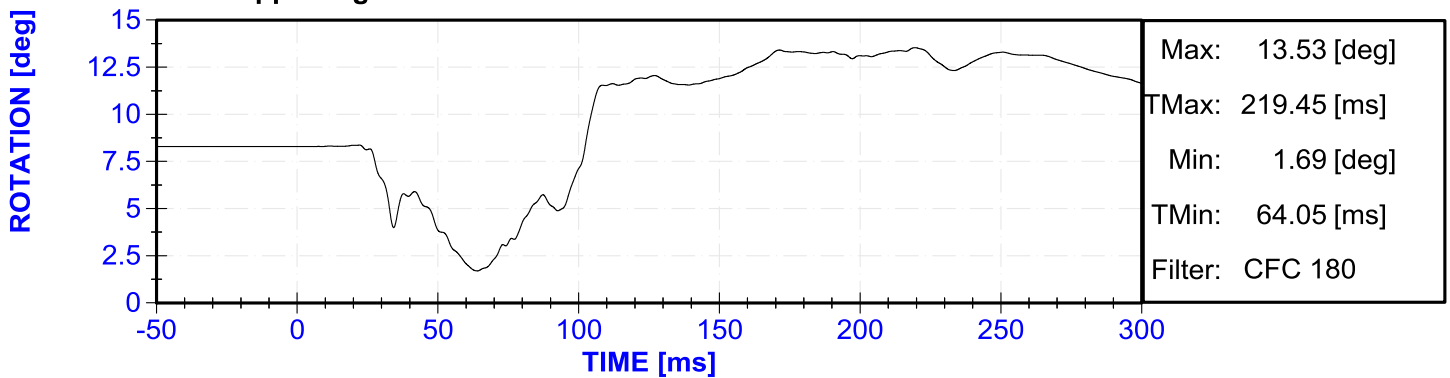
V2P1 Upper Left DGIR Z Rotation



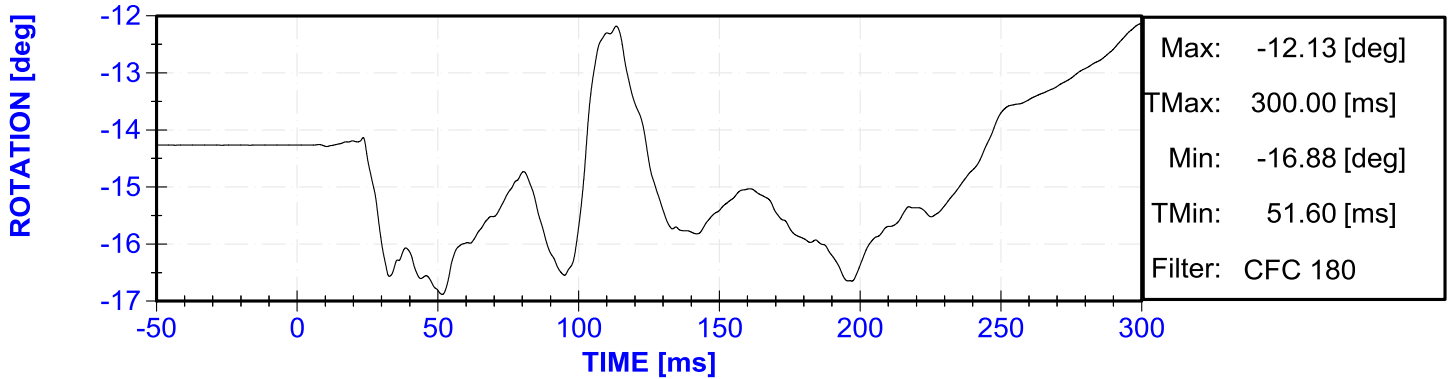
V2P1 Upper Right DGIR X Displacement



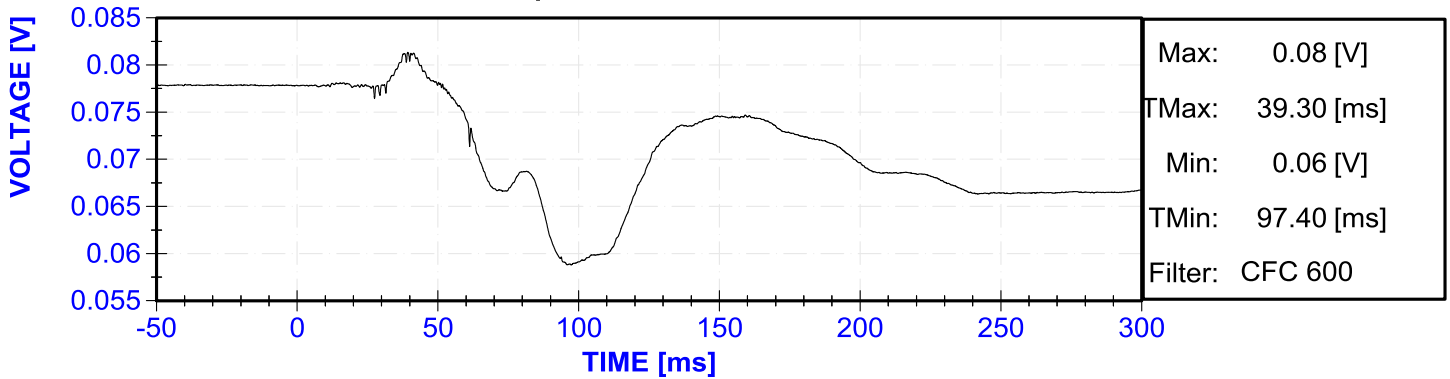
V2P1 Upper Right DGIR Y Rotation



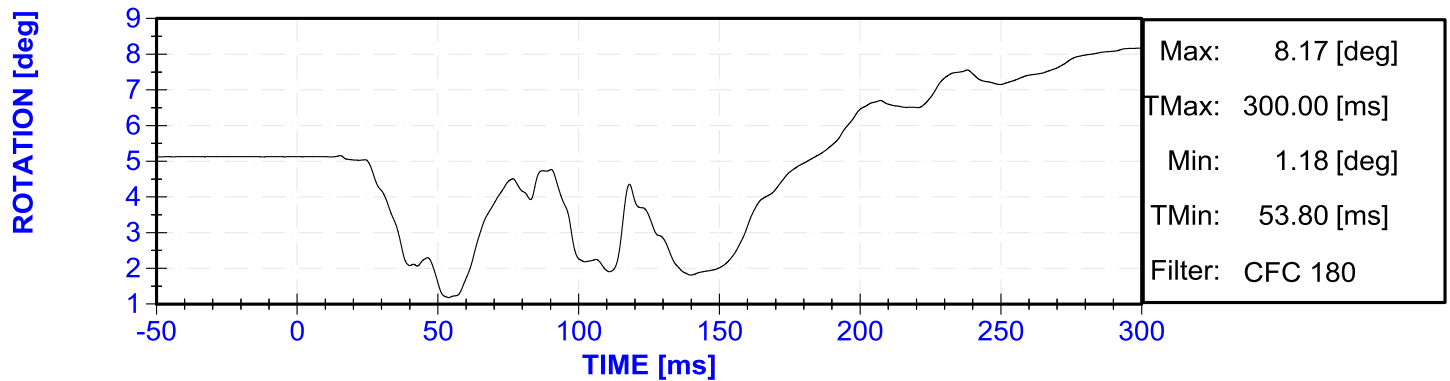
V2P1 Upper Right DGIR Z Rotation



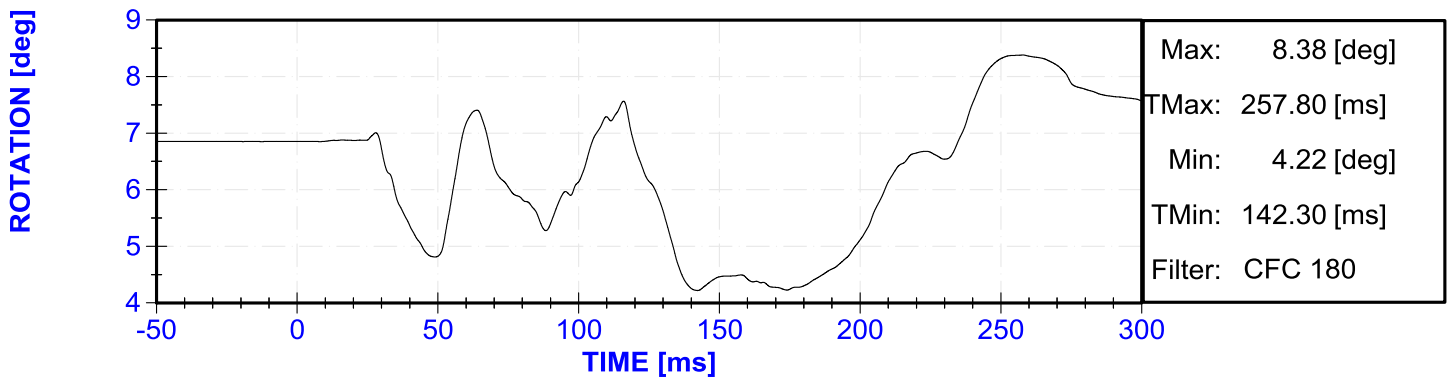
V2P1 Lower Left DGIR X Displacement



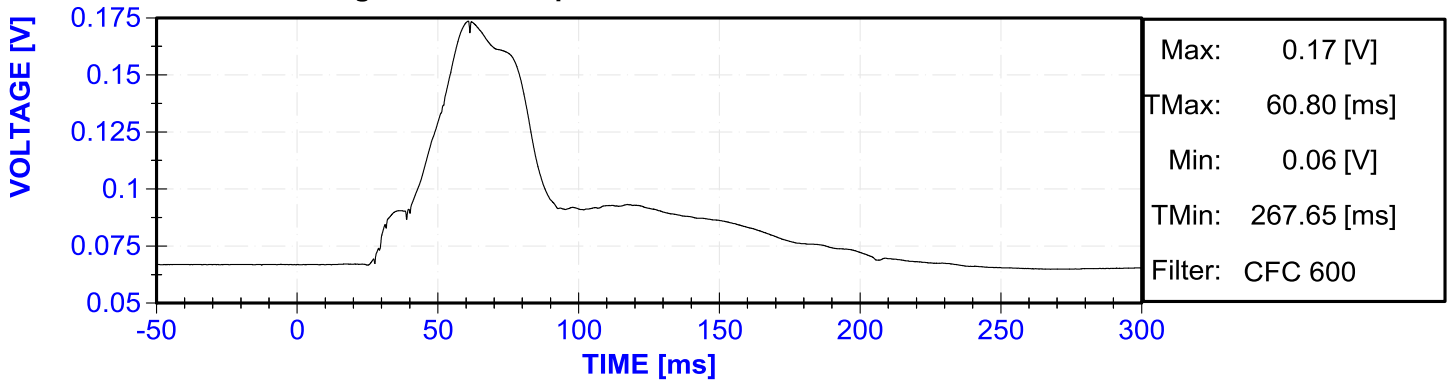
V2P1 Lower Left DGIR Y Rotation



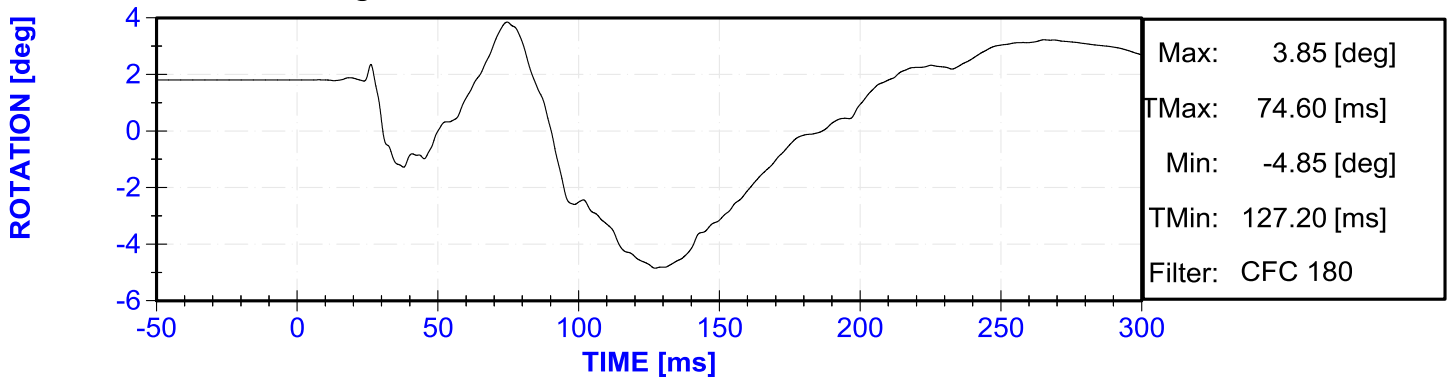
V2P1 Lower Left DGIR Z Rotation



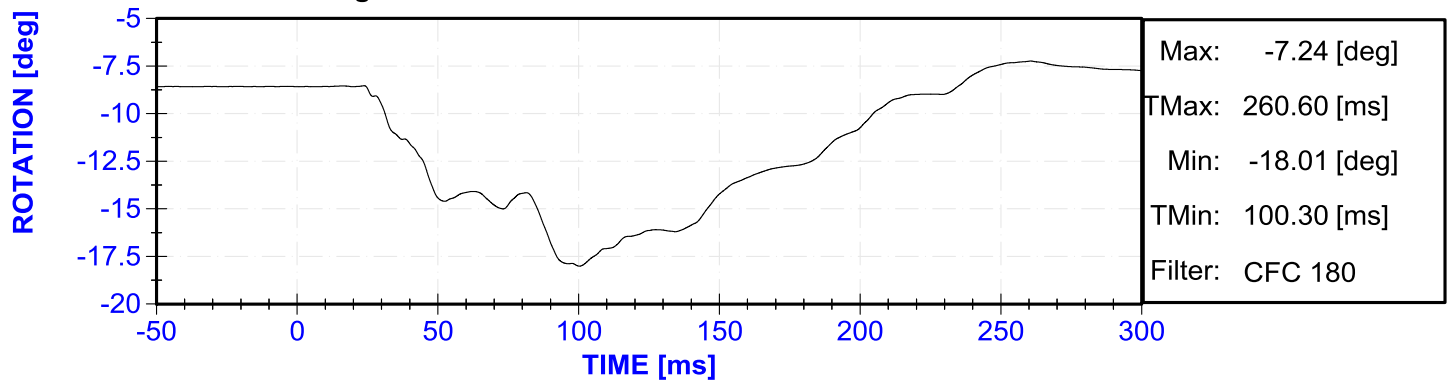
V2P1 Lower Right DGIR X Displacement



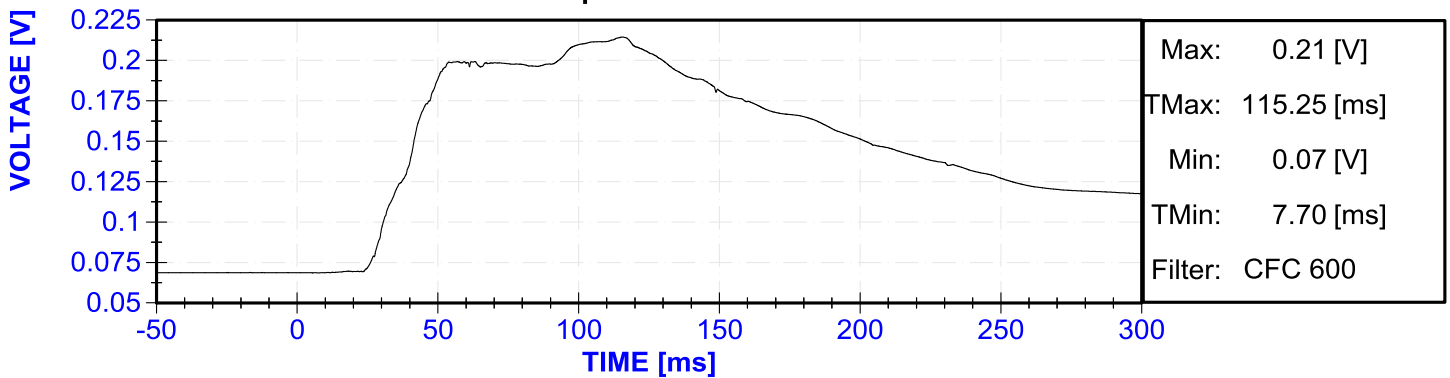
V2P1 Lower Right DGIR Y Rotation



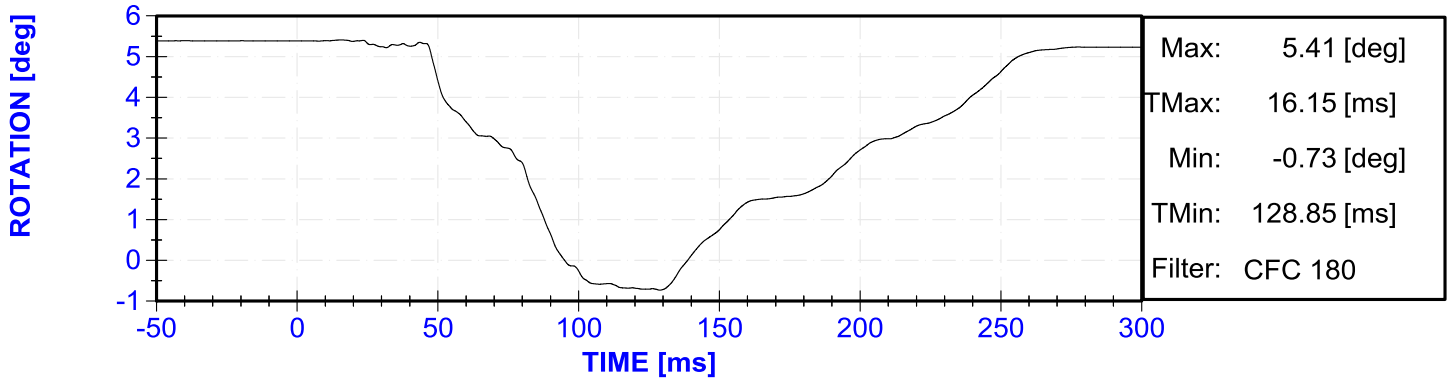
V2P1 Lower Right DGIR Z Rotation



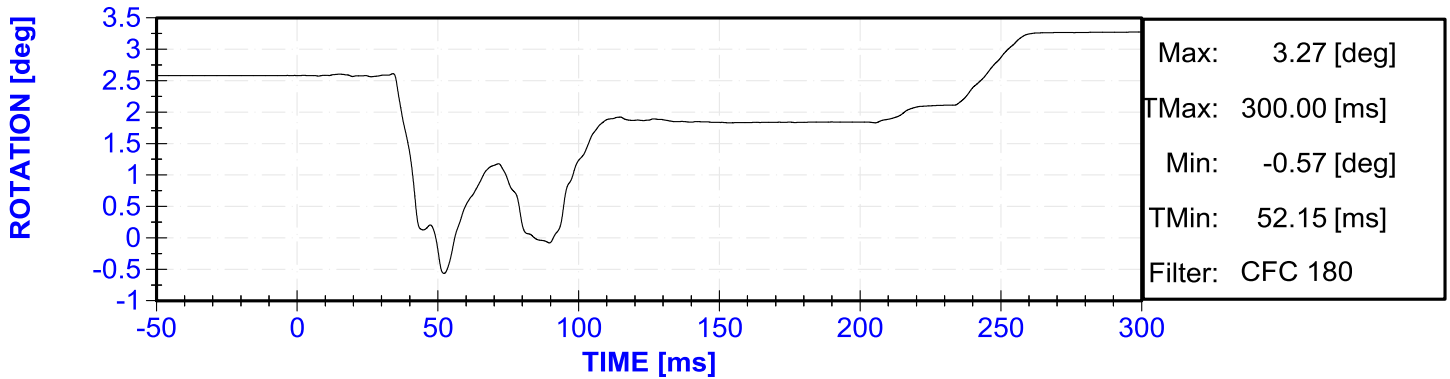
V2P1 Abdomen Left DGIR X Displacement



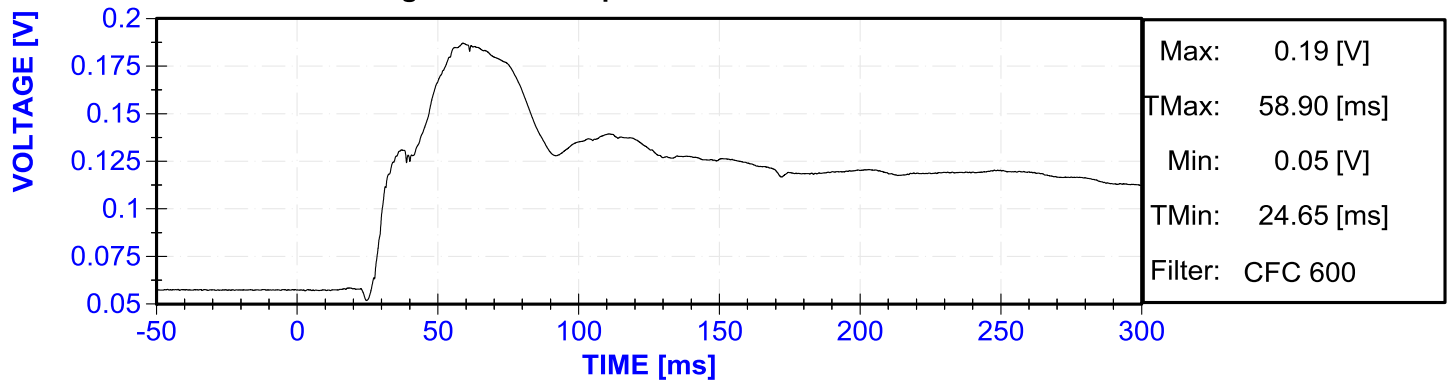
V2P1 Abdomen Left DGIR Y Rotation



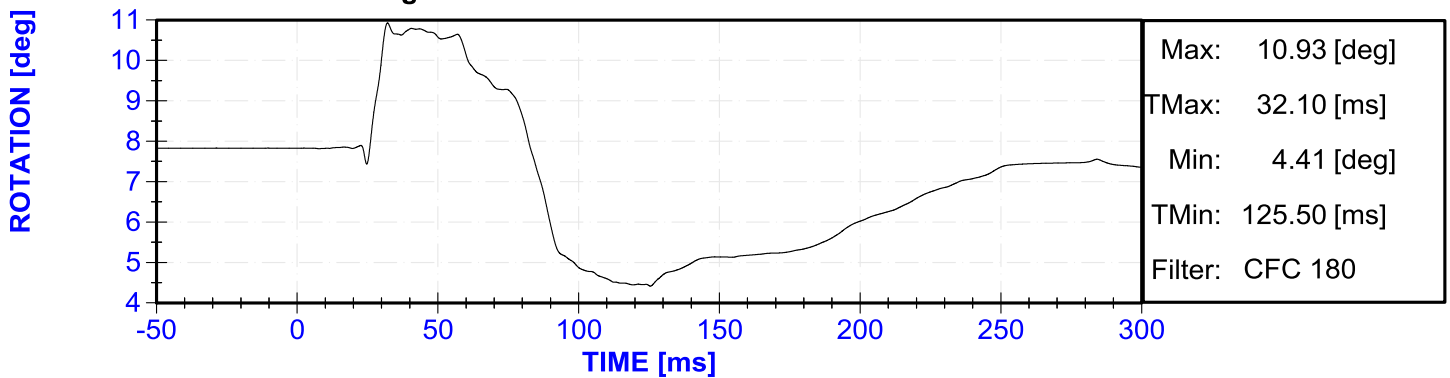
V2P1 Abdomen Left DGIR Z Rotation



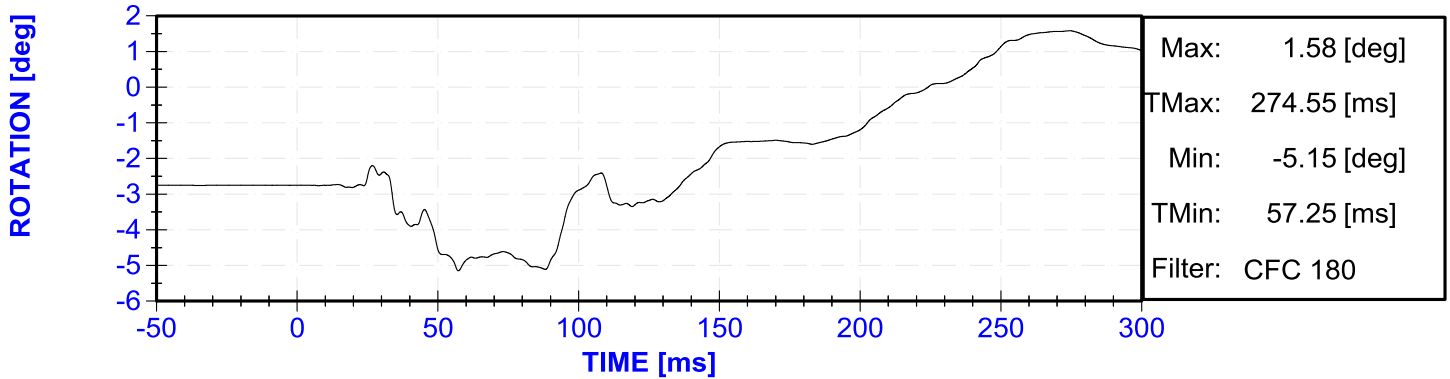
V2P1 Abdomen Right DGIR X Displacement



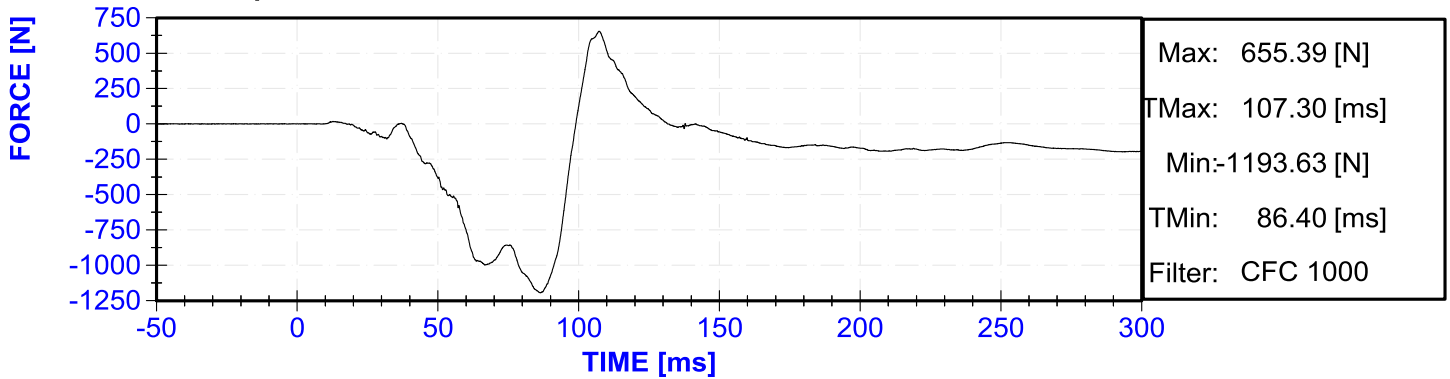
V2P1 Abdomen Right DGIR Y Rotation



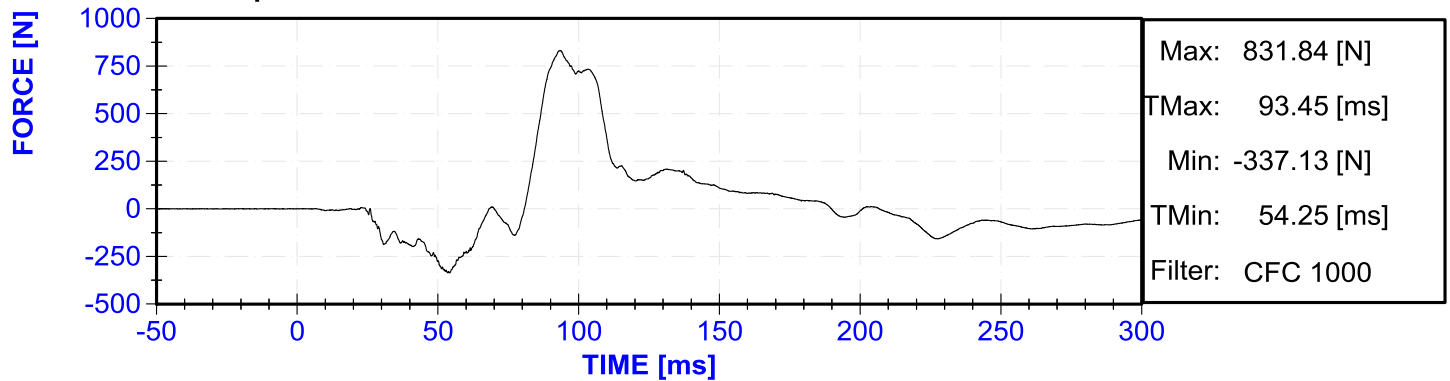
V2P1 Abdomen Right DGIR Z Rotation



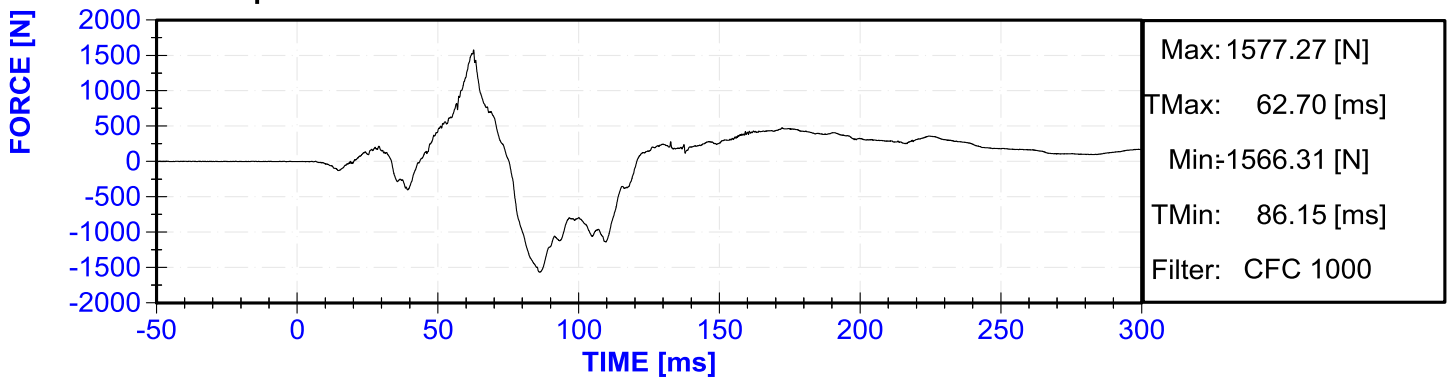
V2P1 Spine Force X

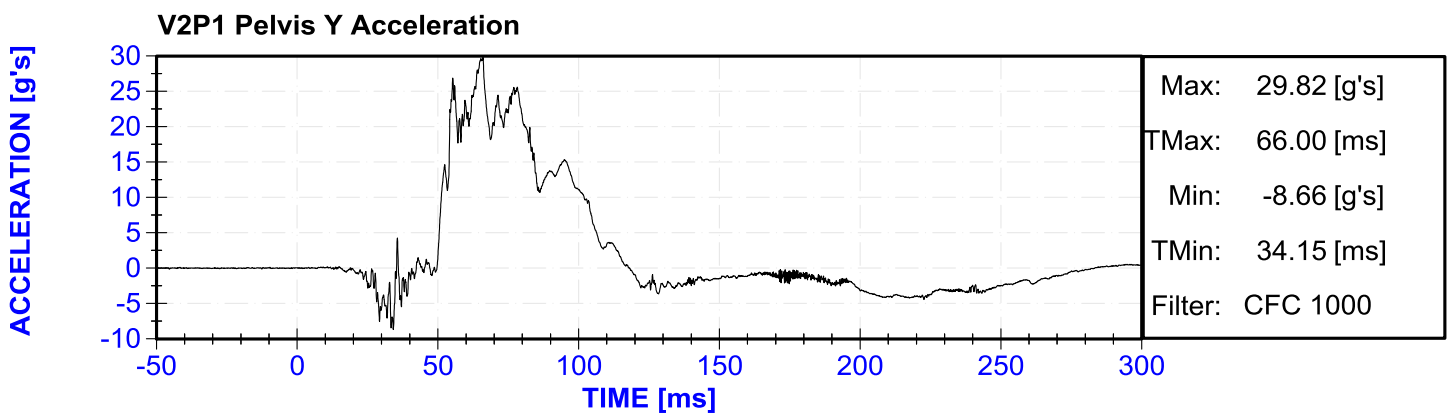
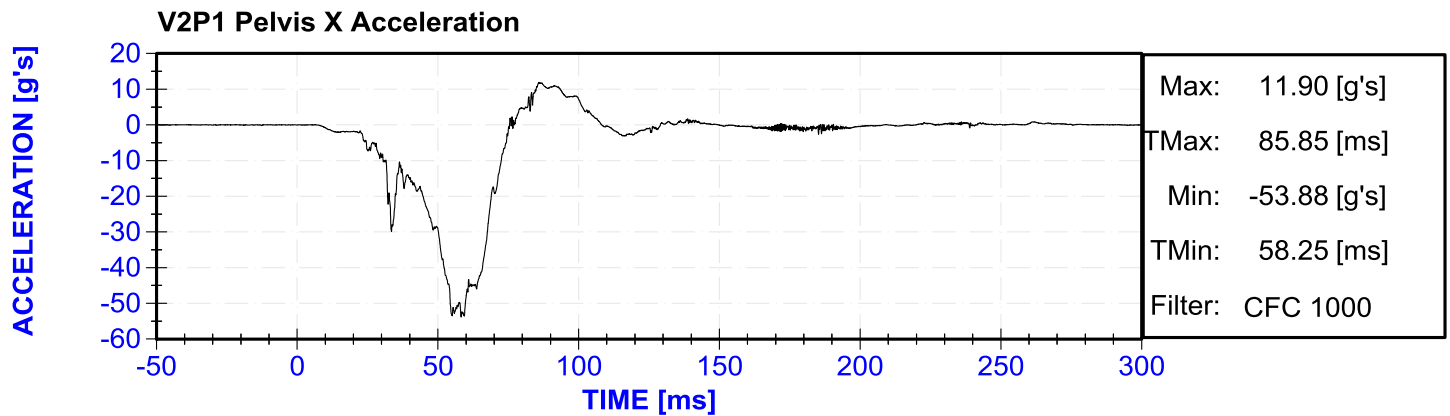
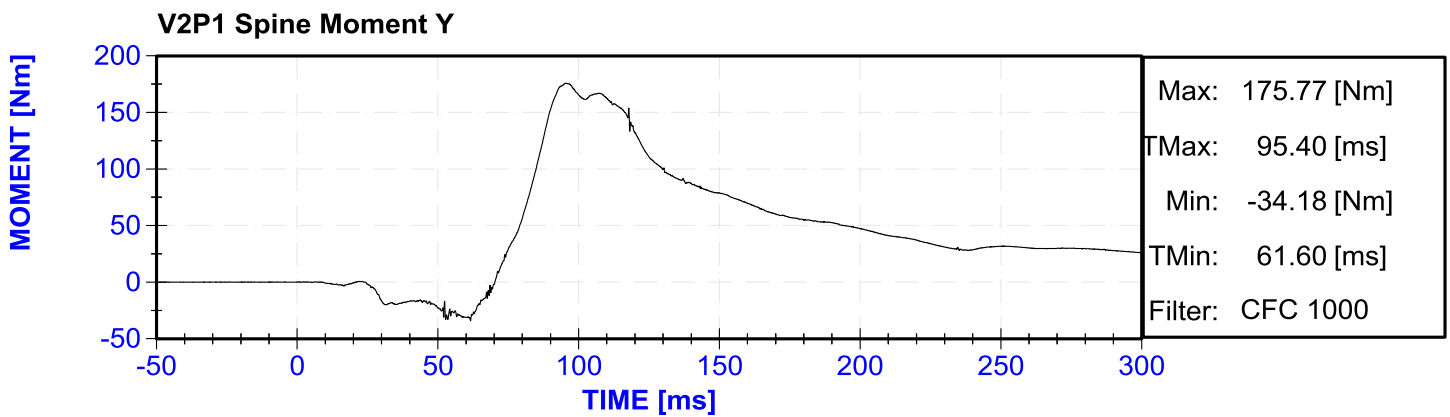
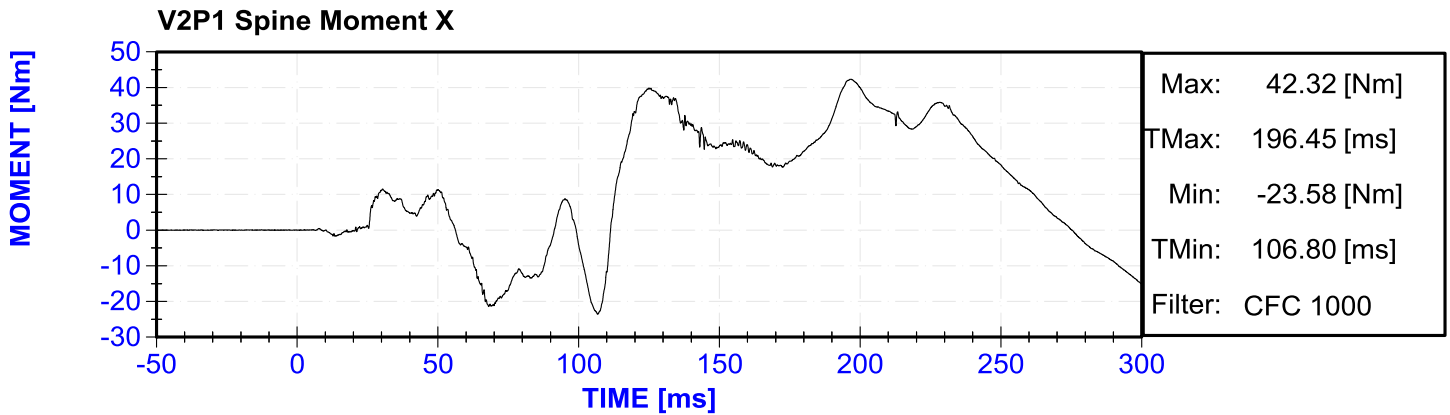


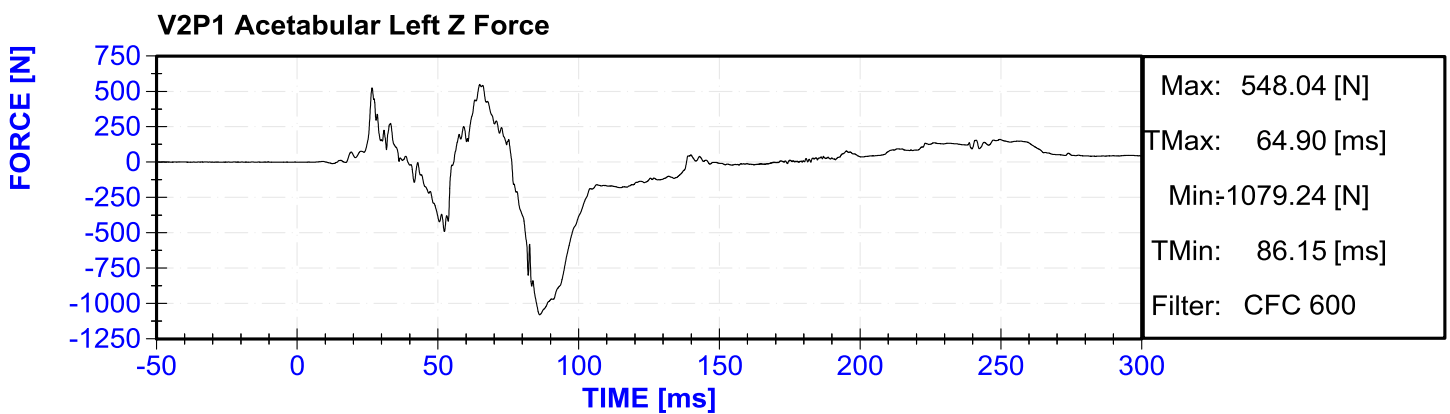
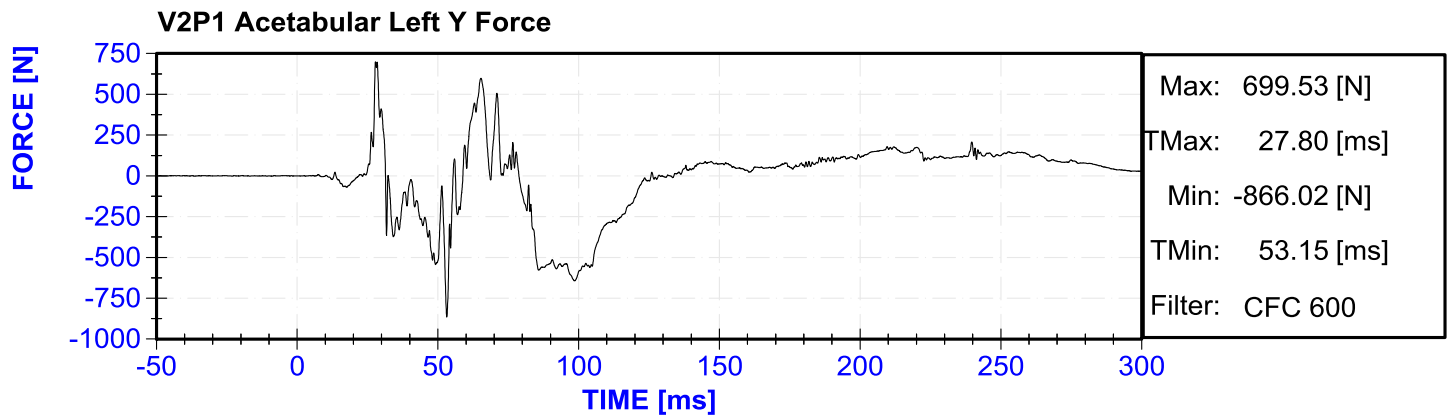
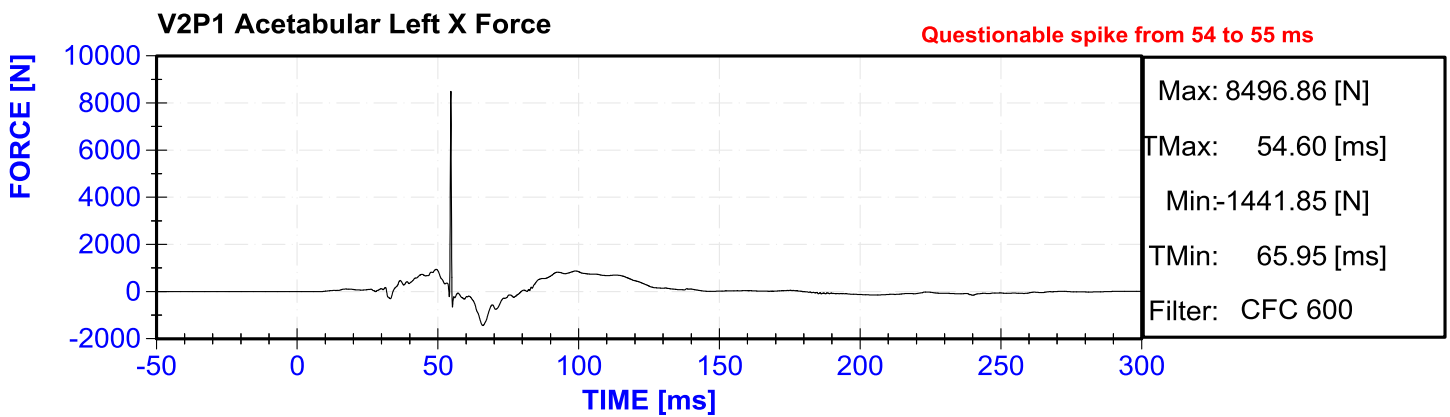
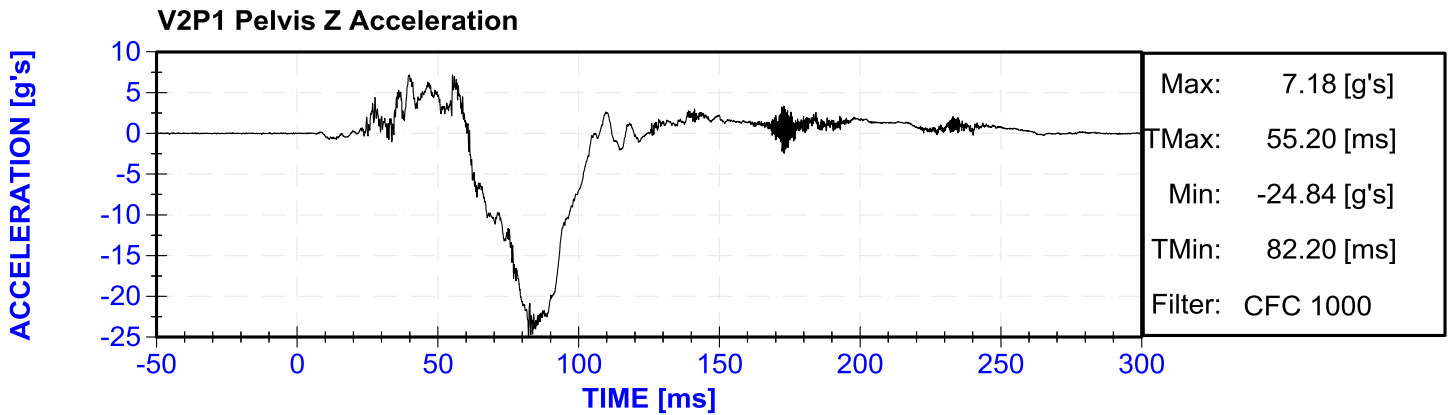
V2P1 Spine Force Y

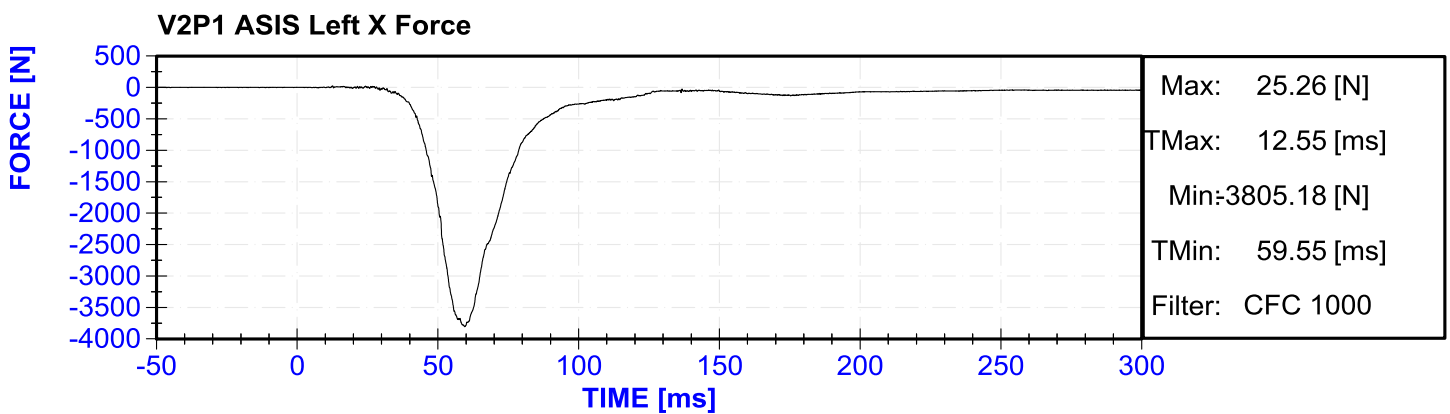
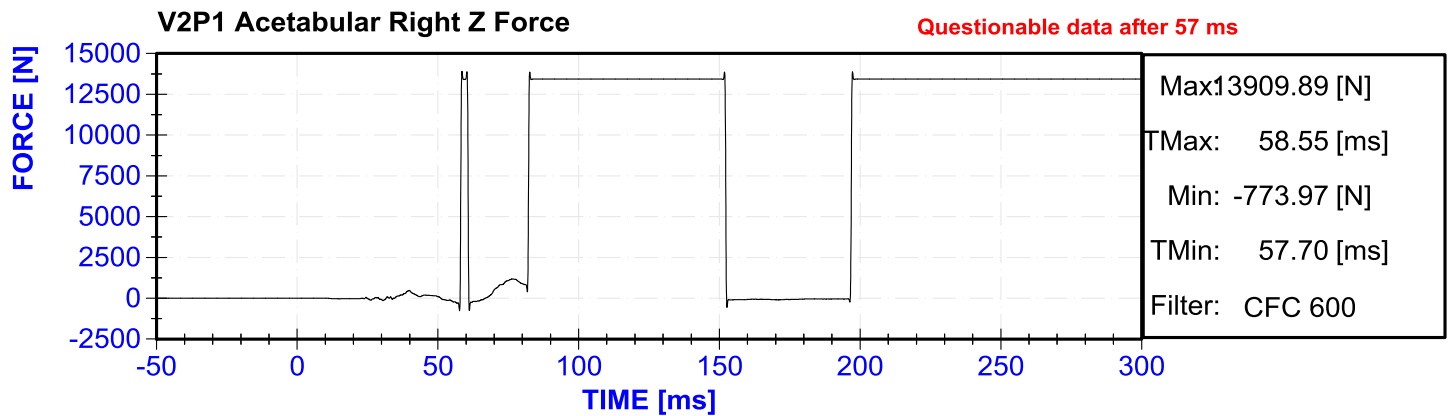
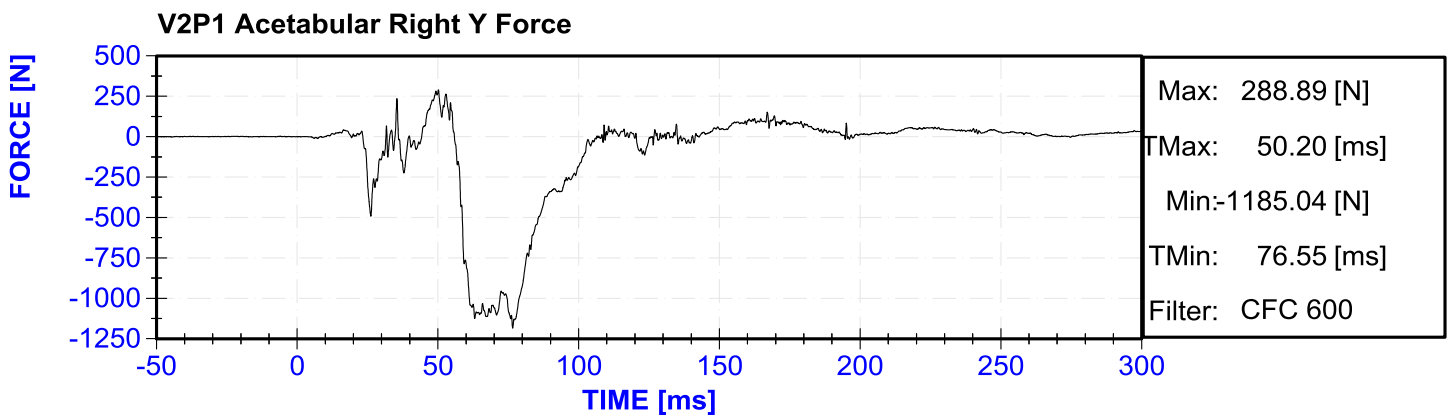
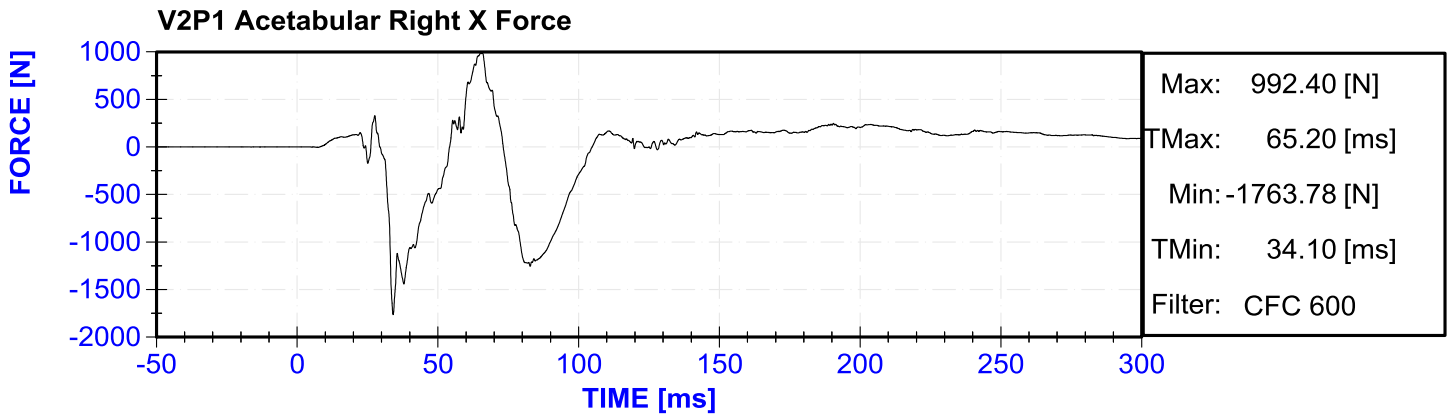


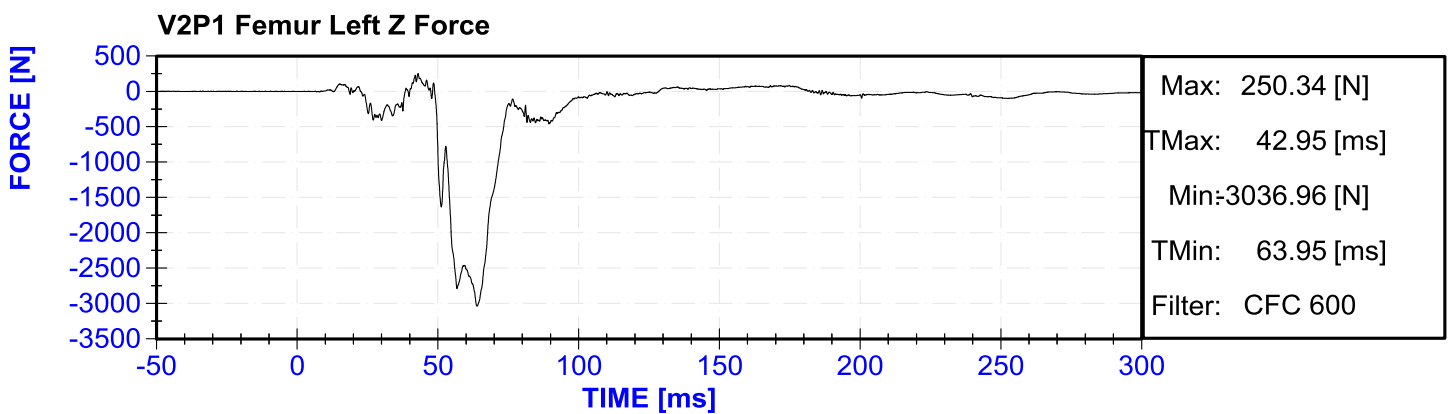
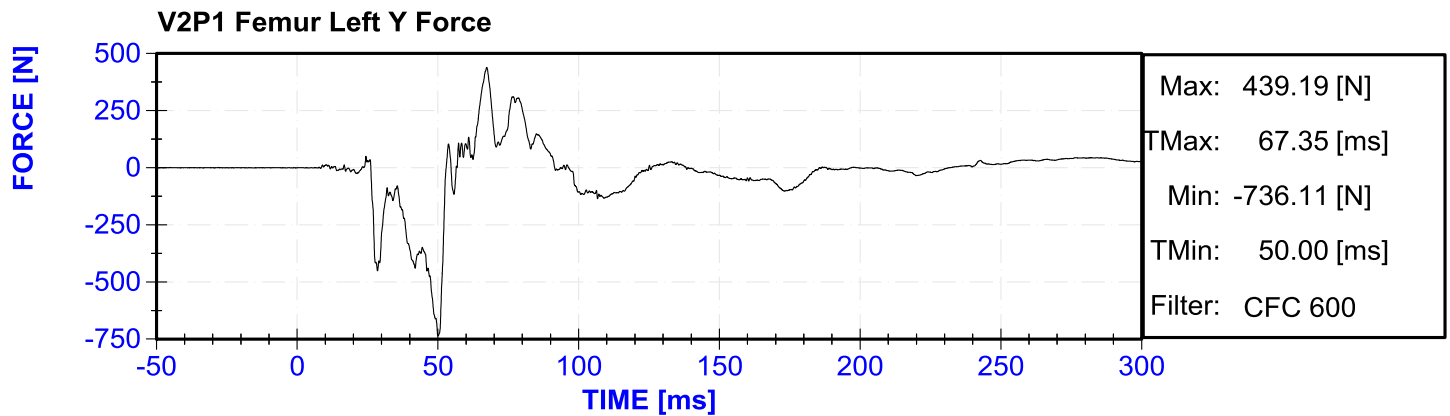
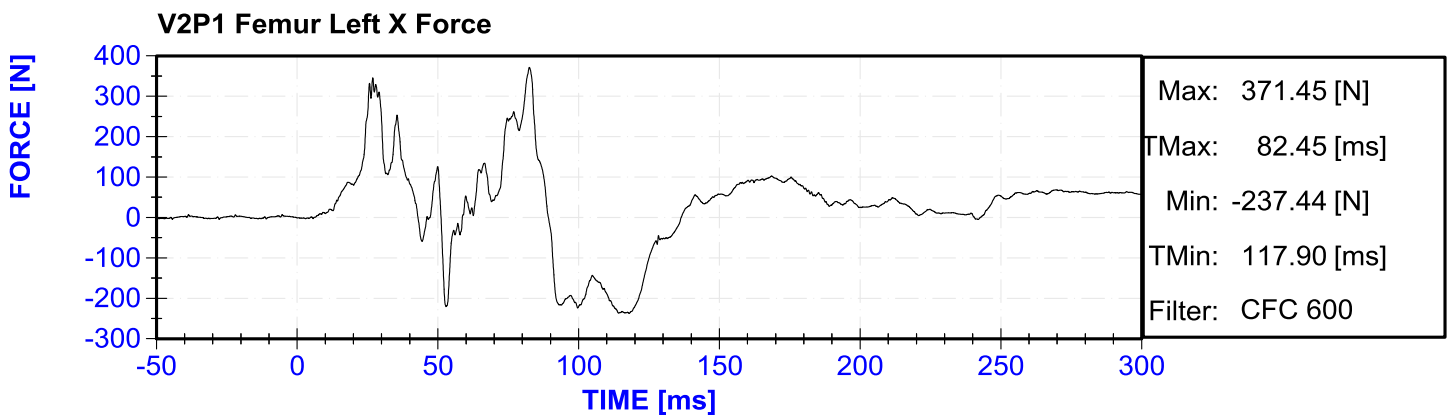
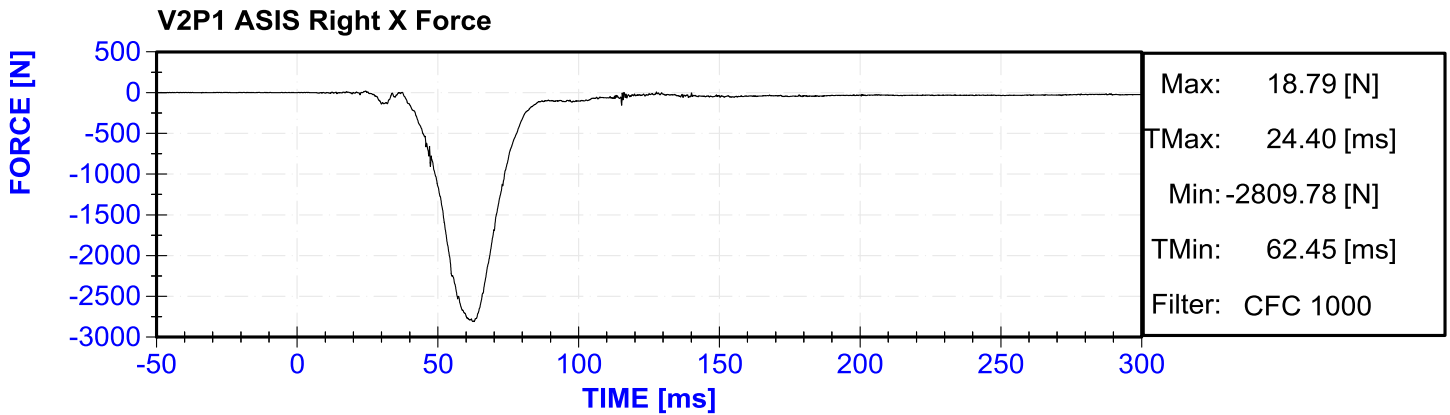
V2P1 Spine Force Z

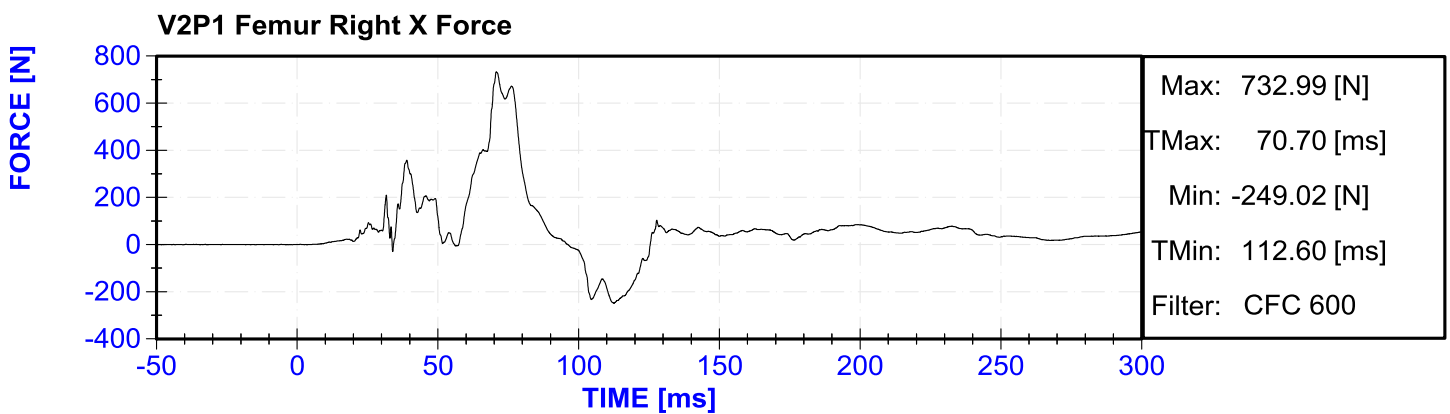
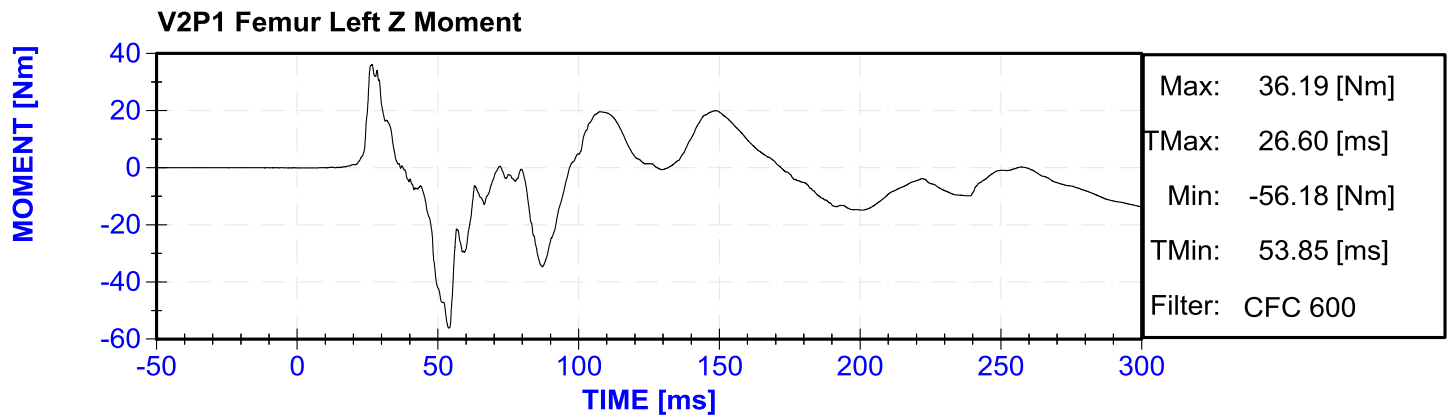
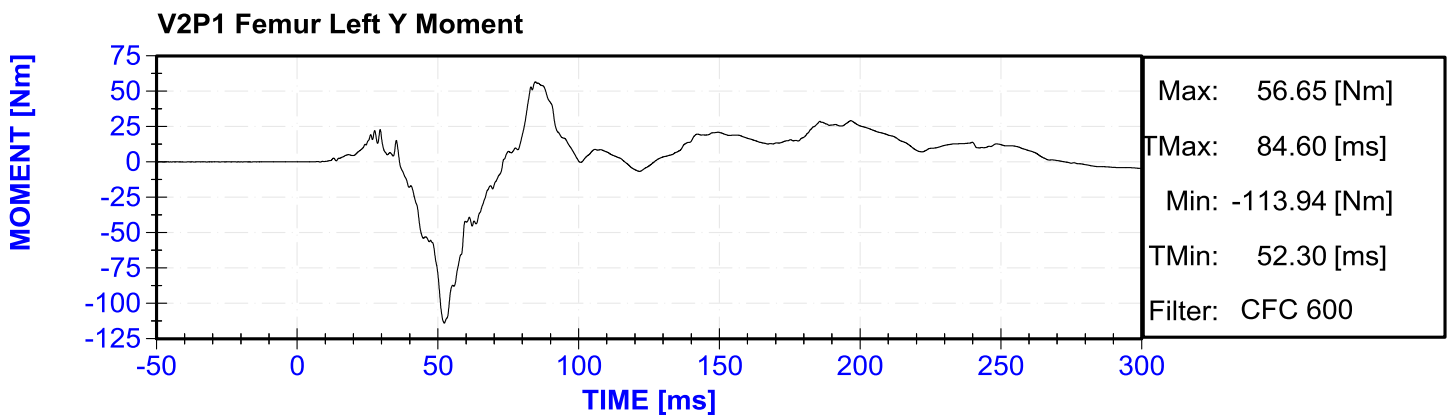
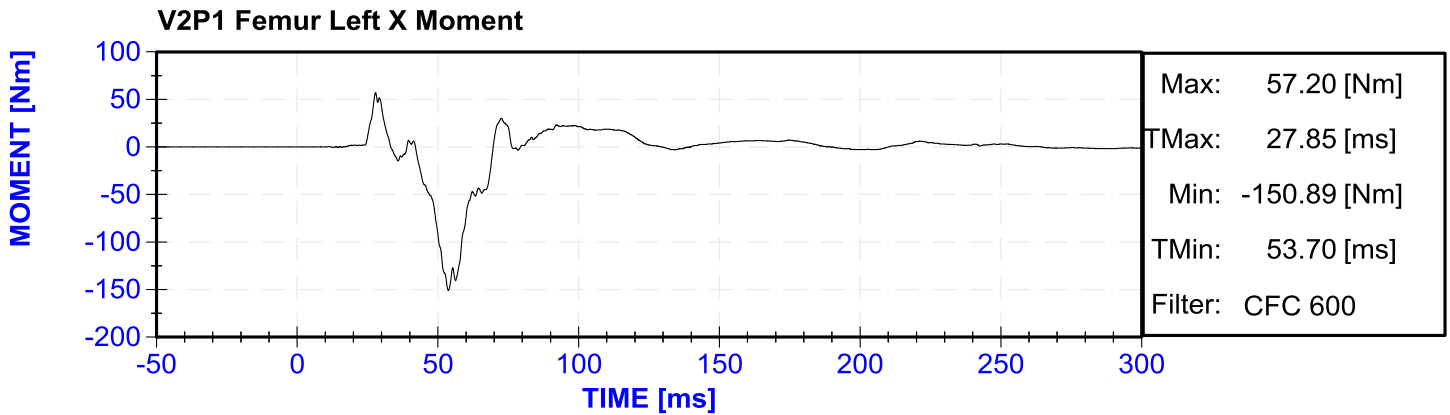


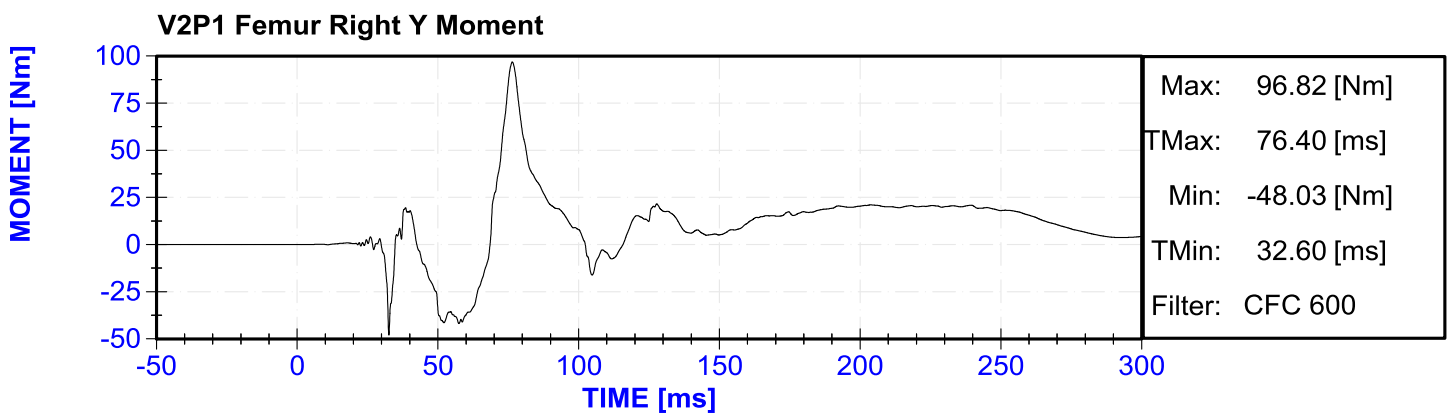
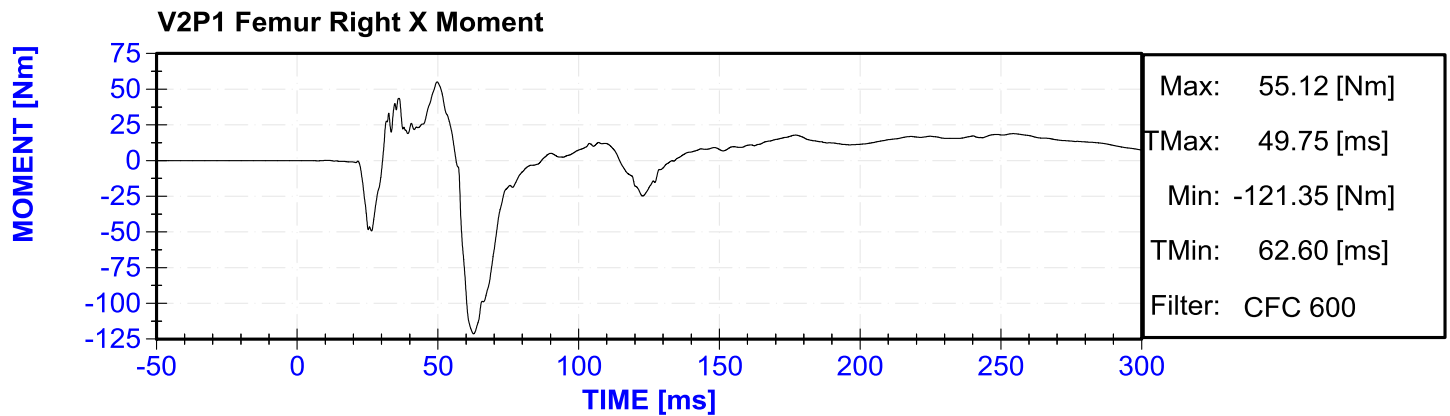
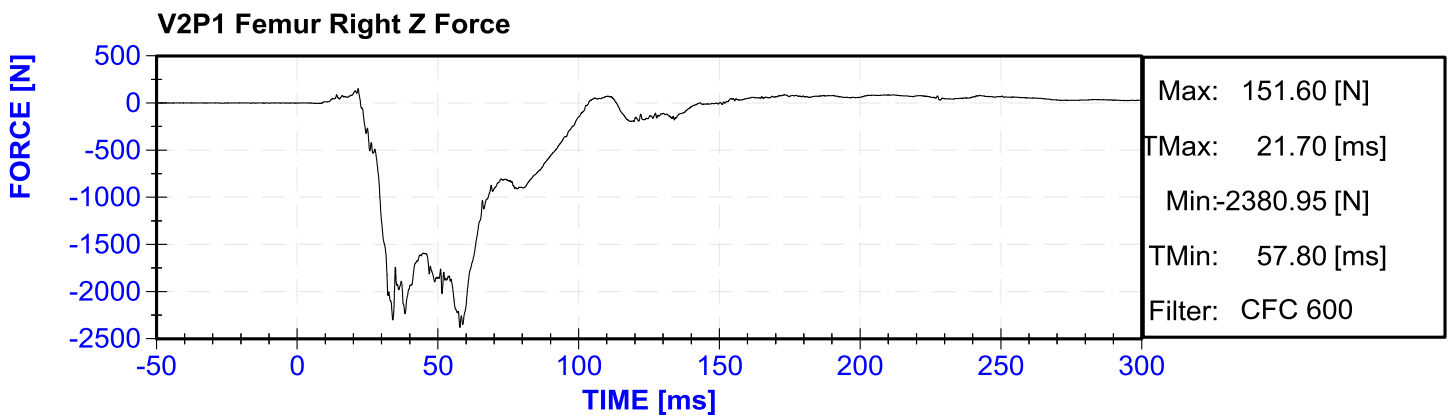
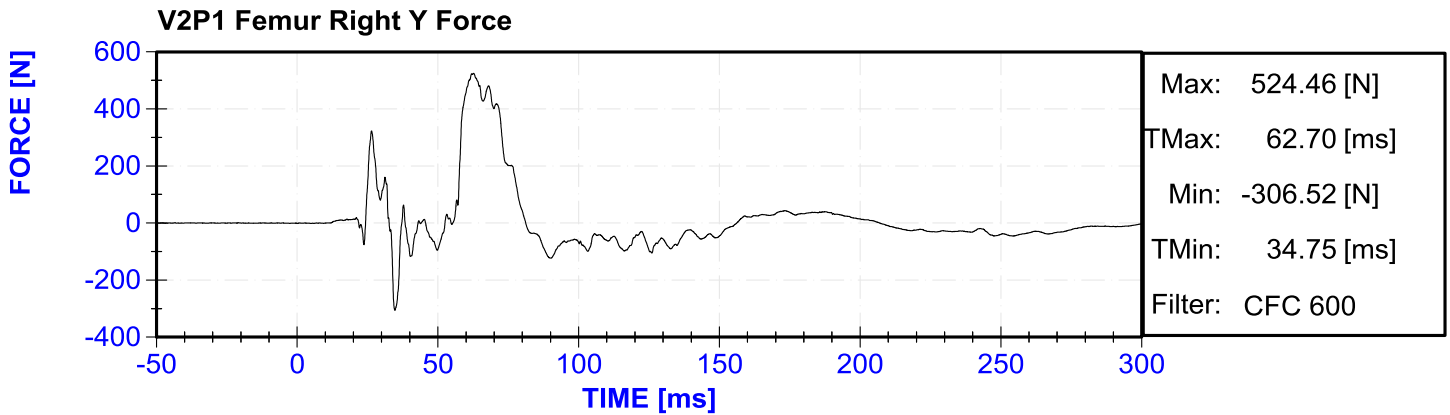


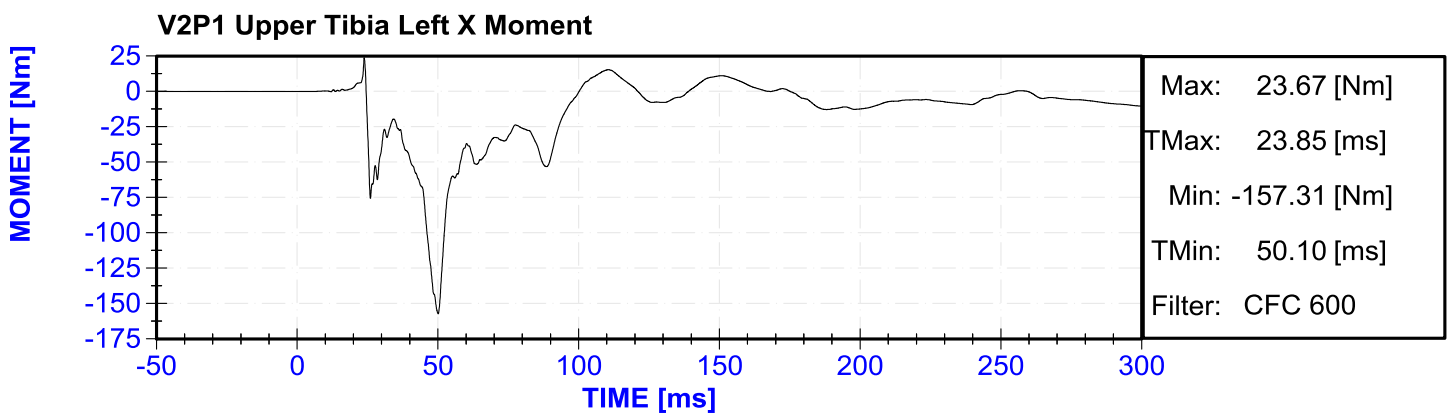
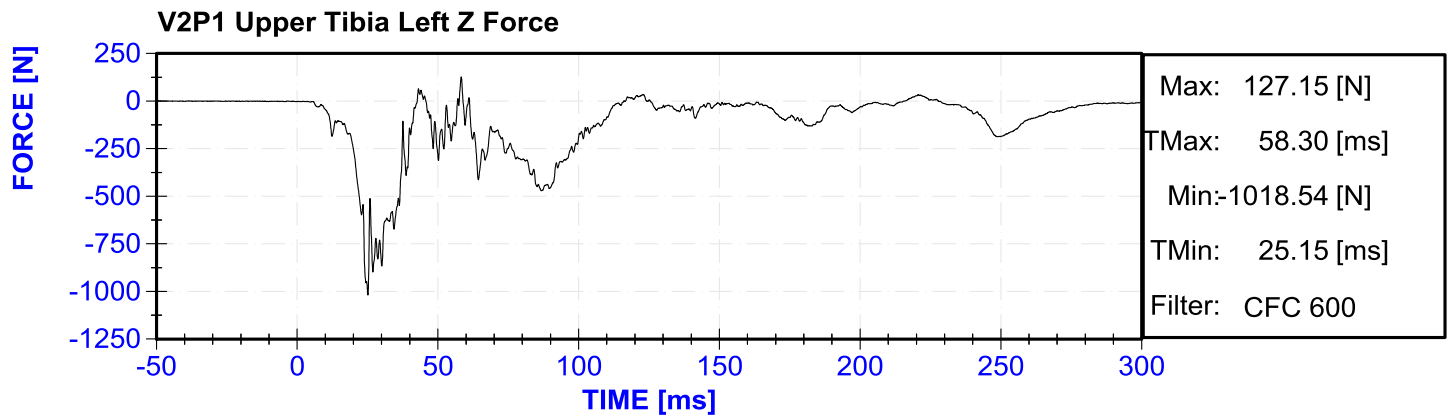
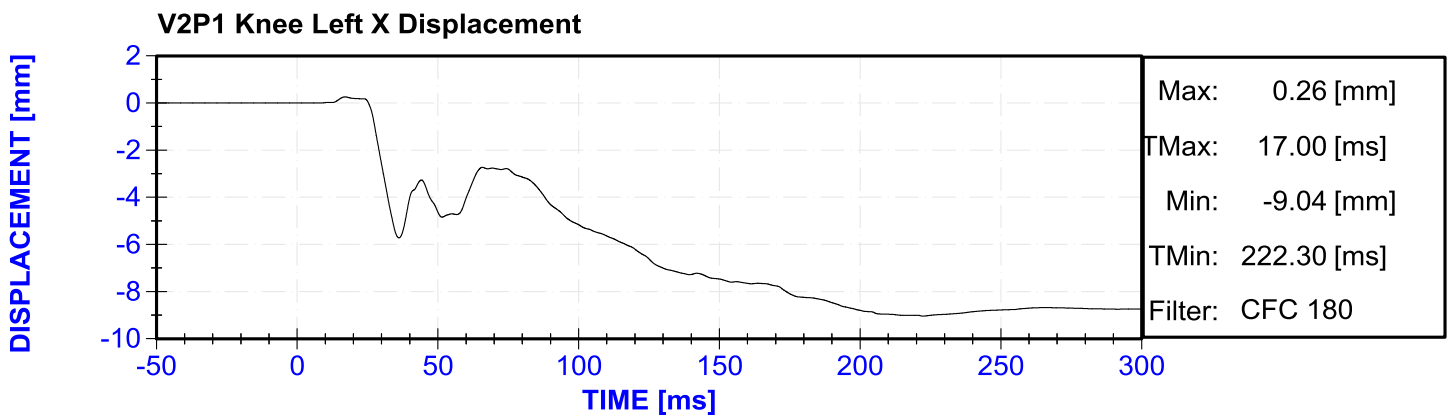
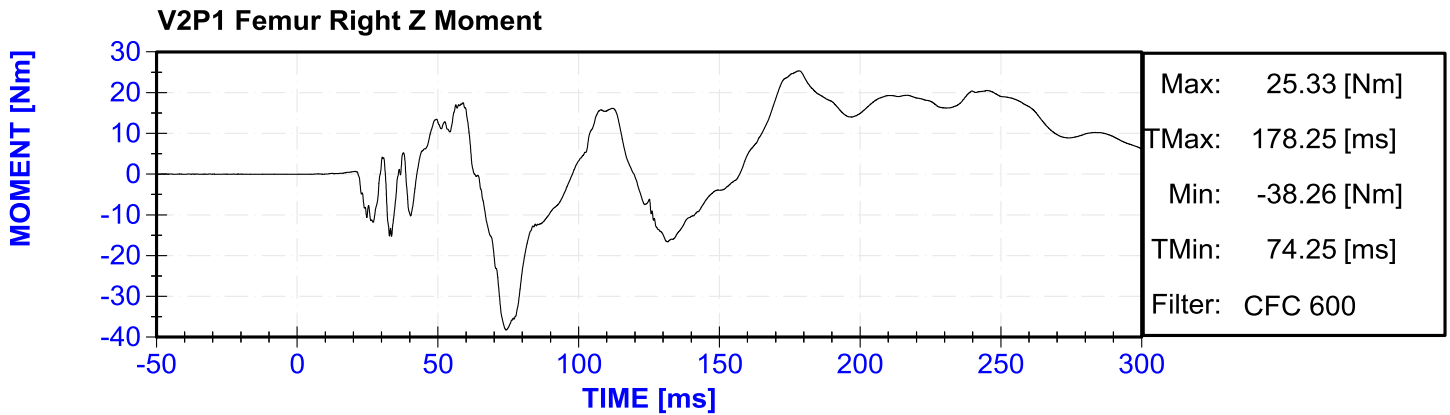




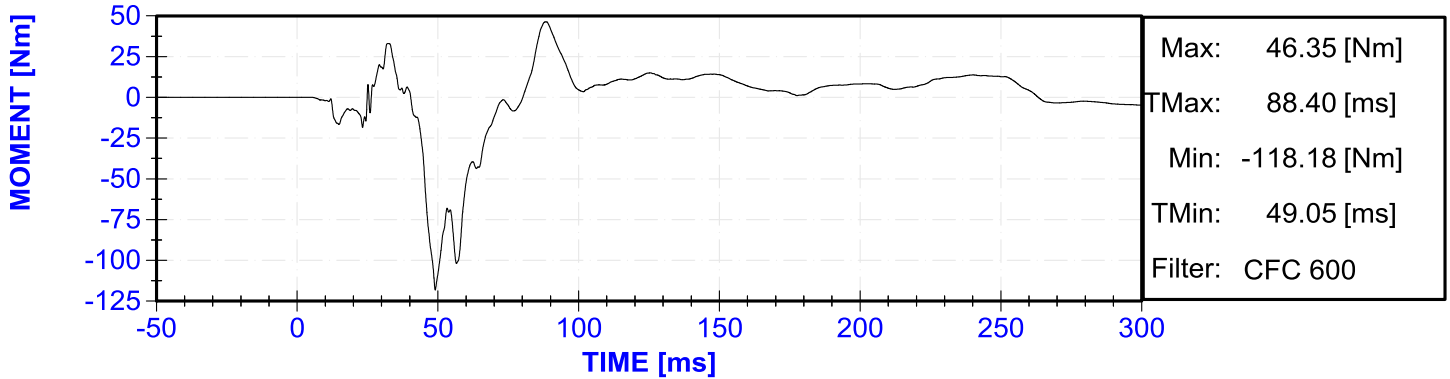




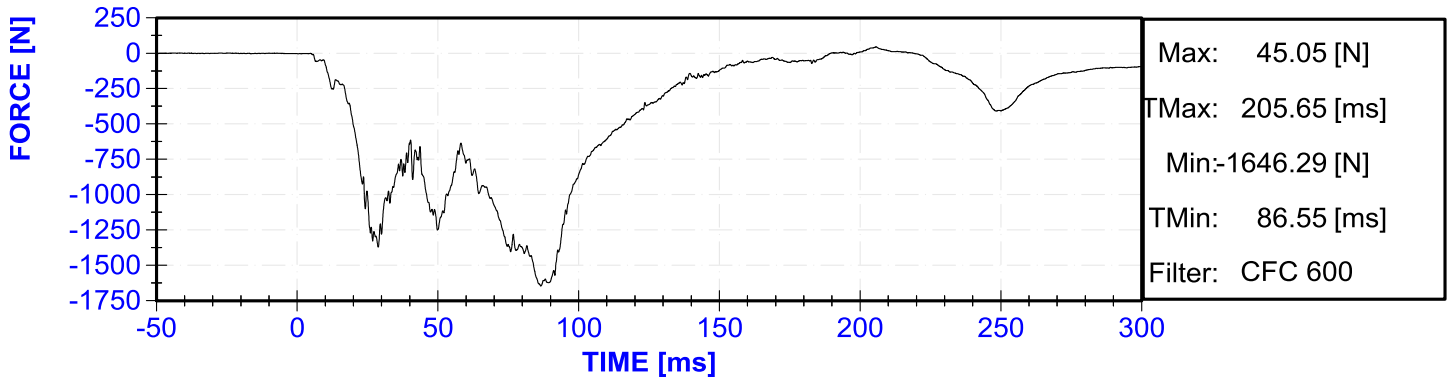




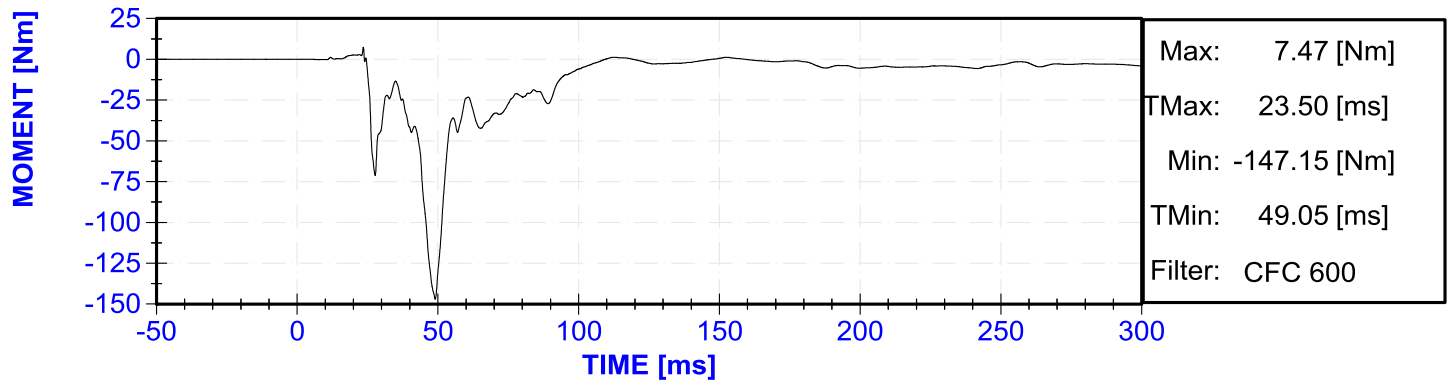
V2P1 Upper Tibia Left Y Moment



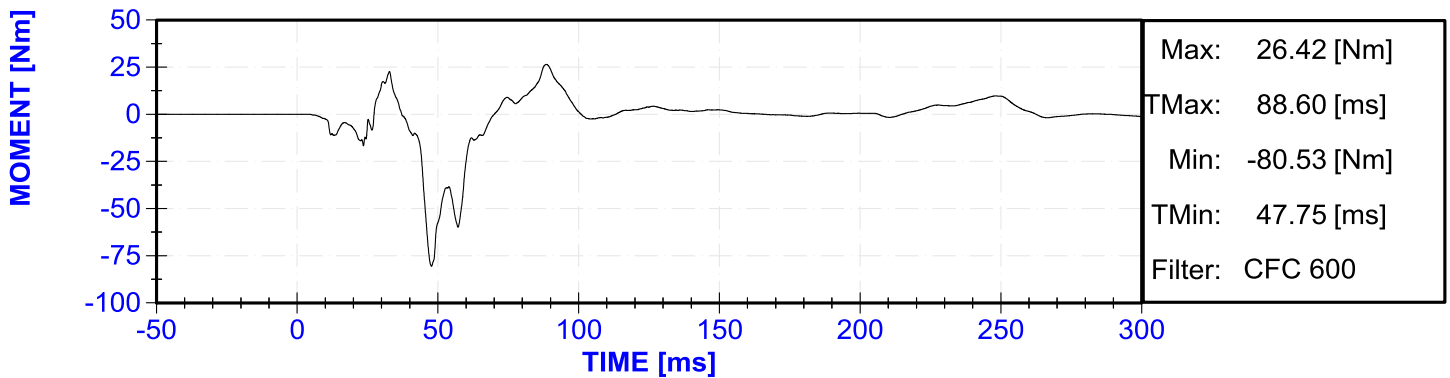
V2P1 Lower Tibia Left Z Force

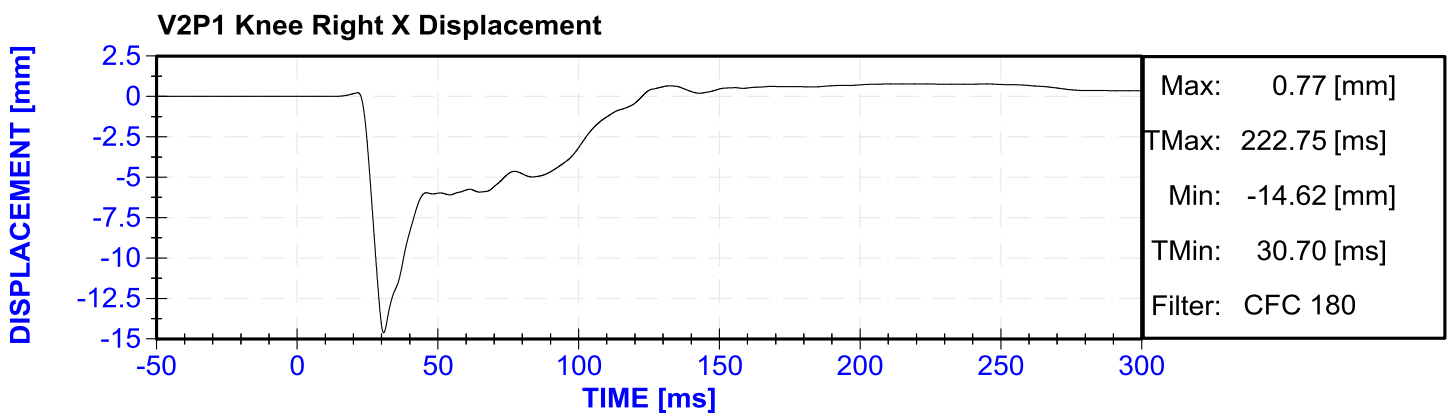
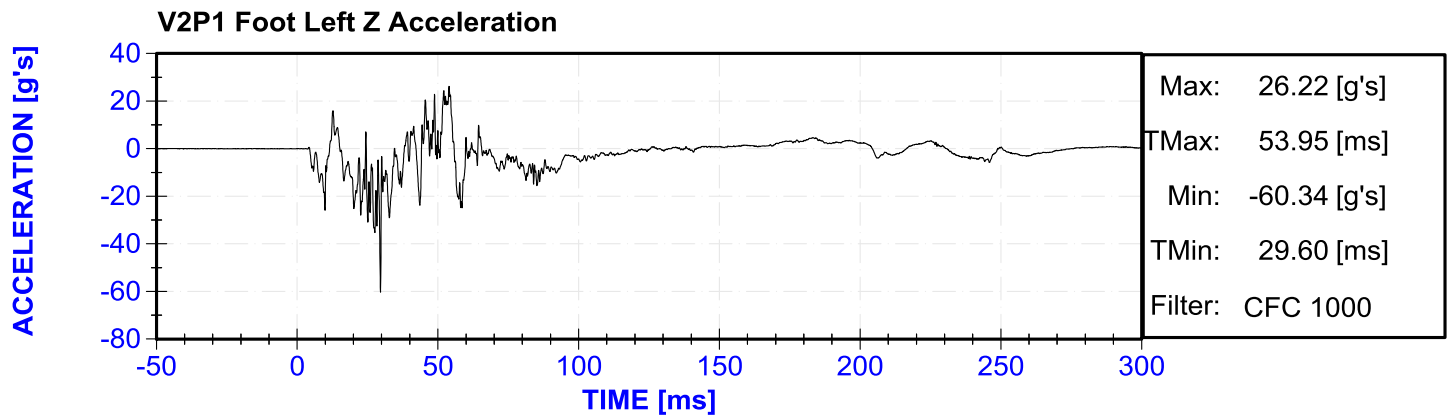
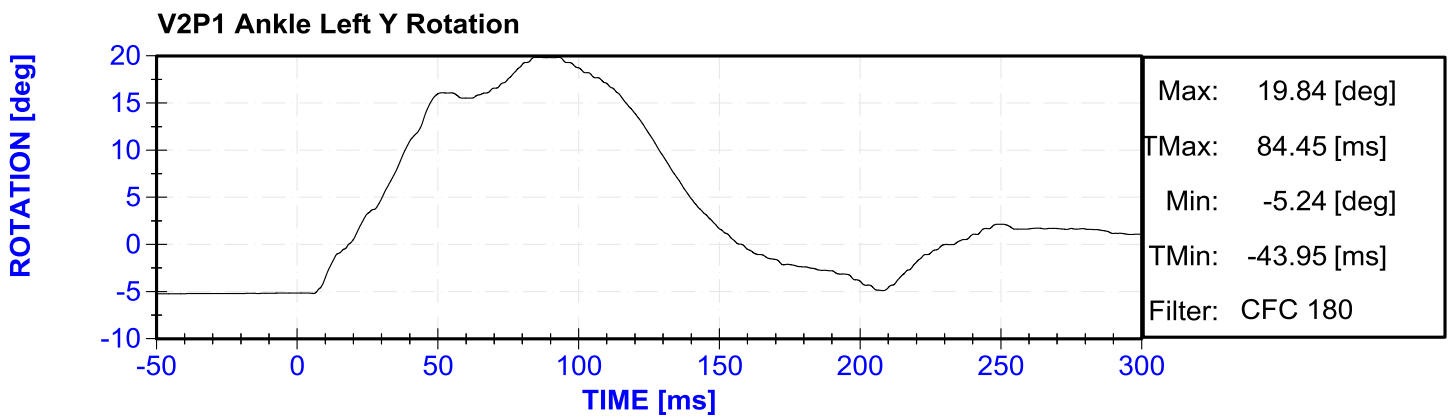
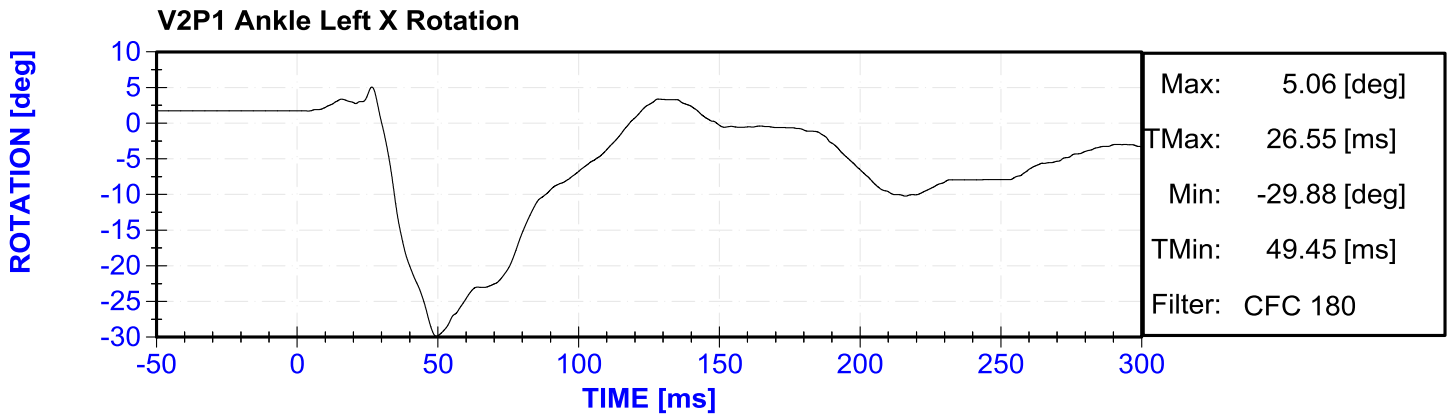


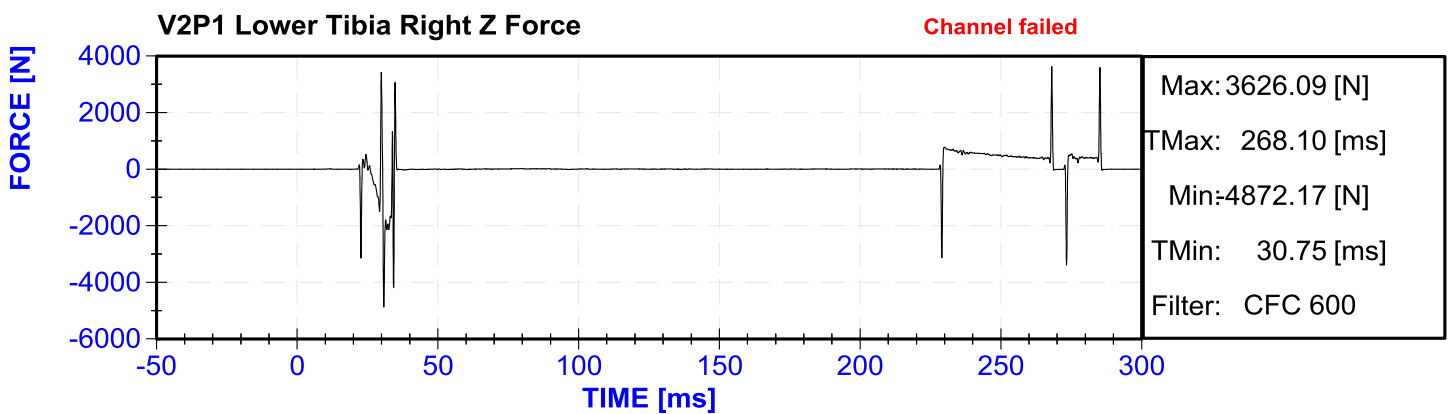
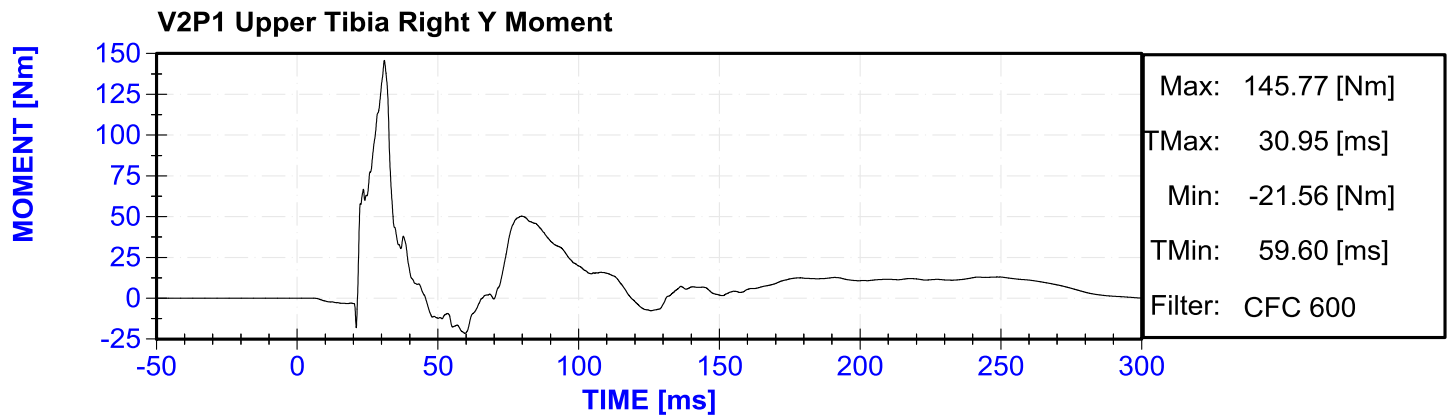
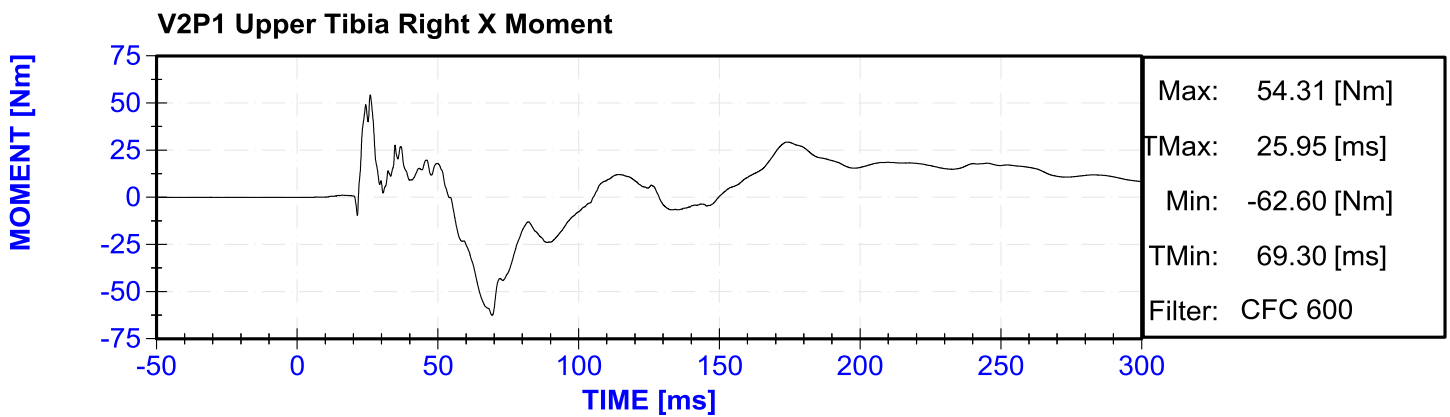
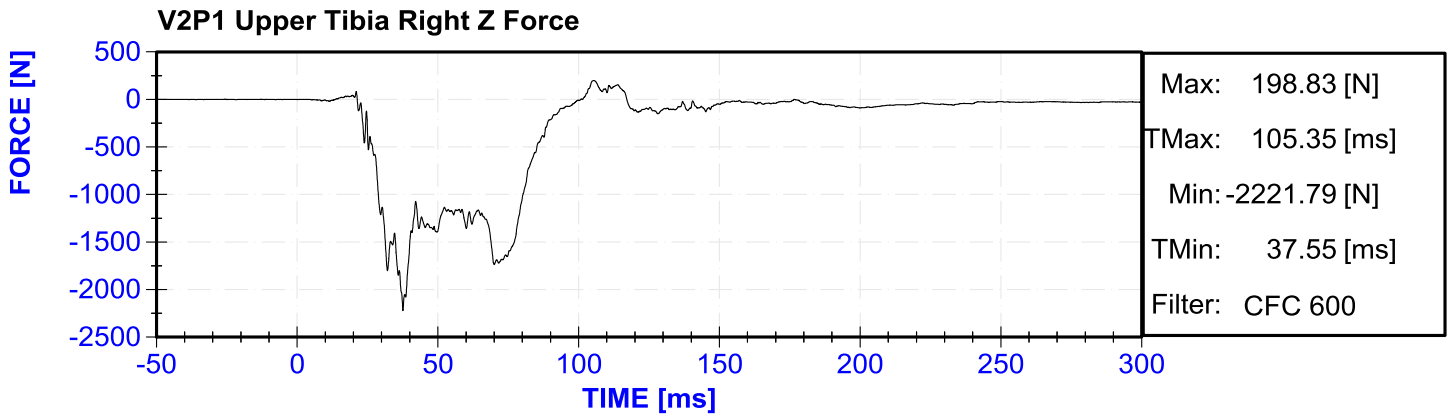
V2P1 Lower Tibia Left X Moment



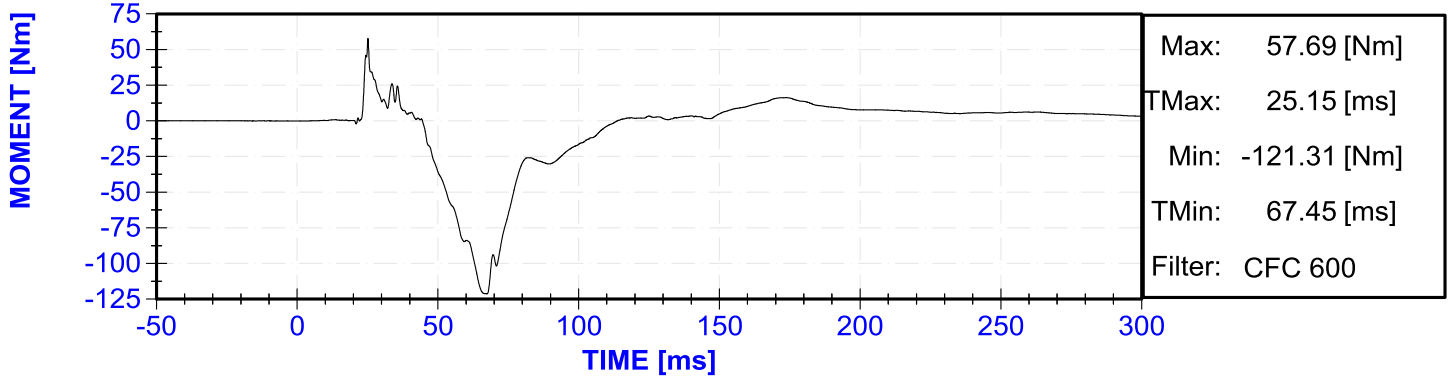
V2P1 Lower Tibia Left Y Moment



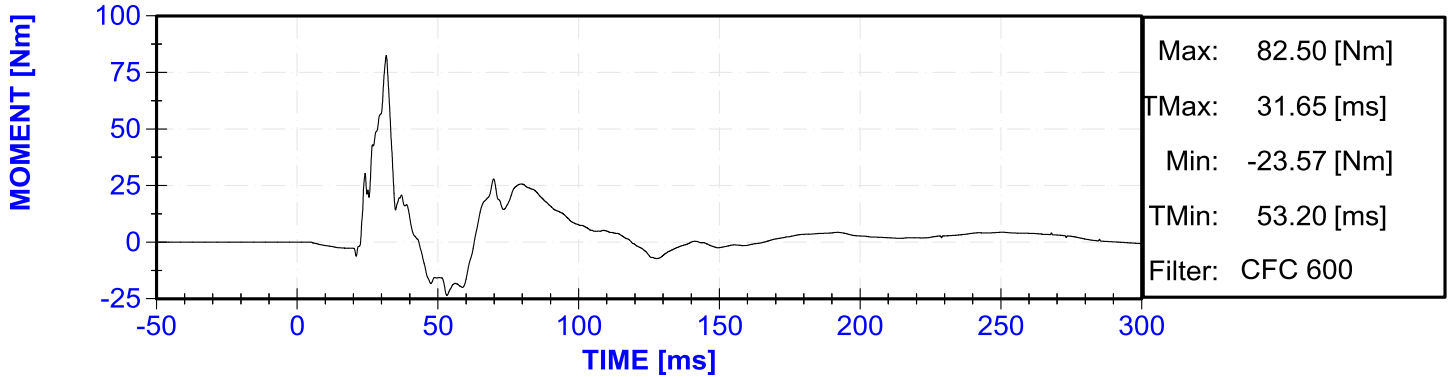




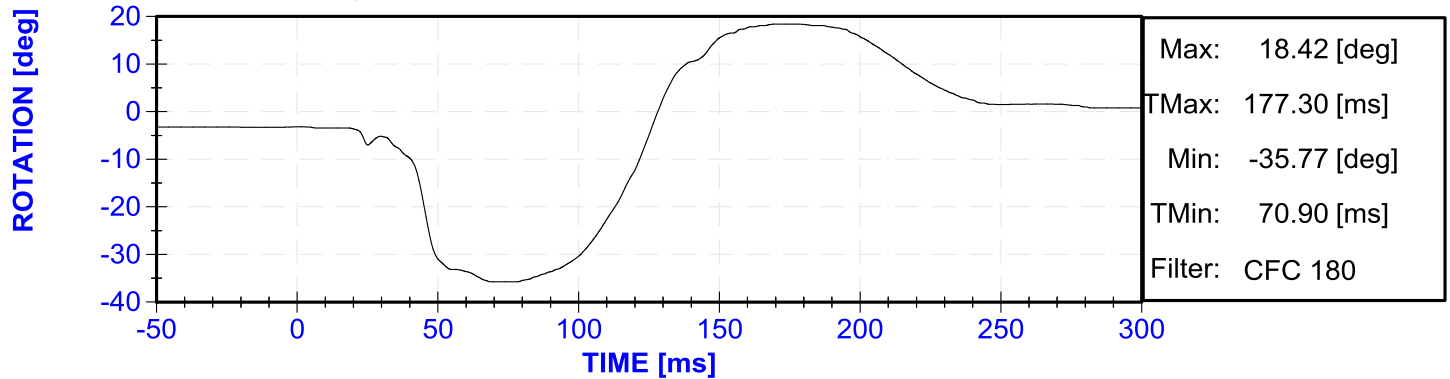
V2P1 Lower Tibia Right X Moment



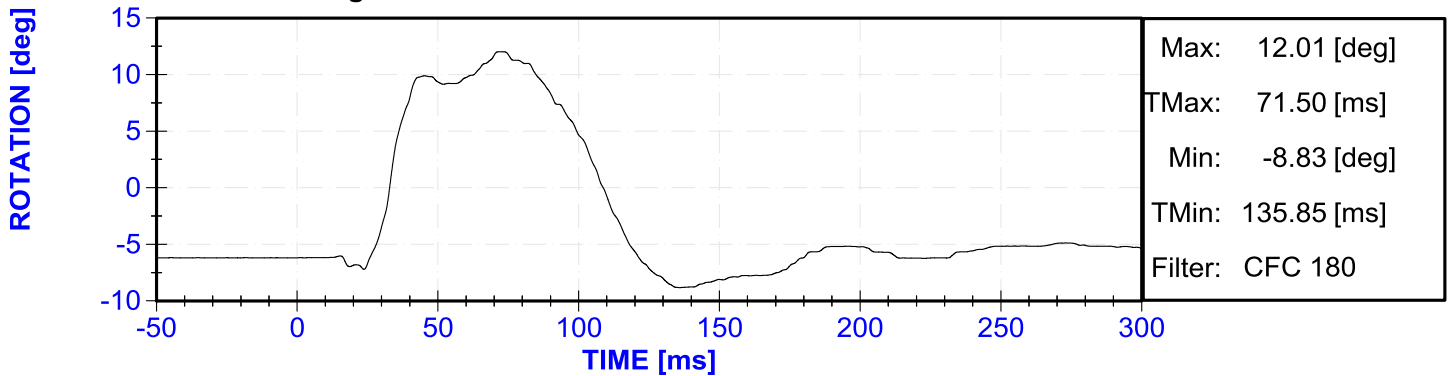
V2P1 Lower Tibia Right Y Moment



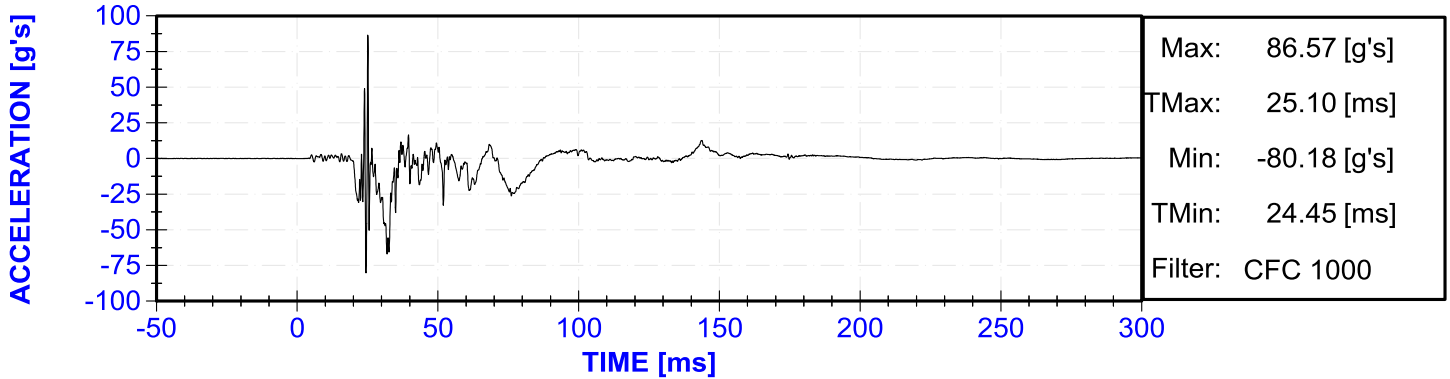
V2P1 Ankle Right X Rotation



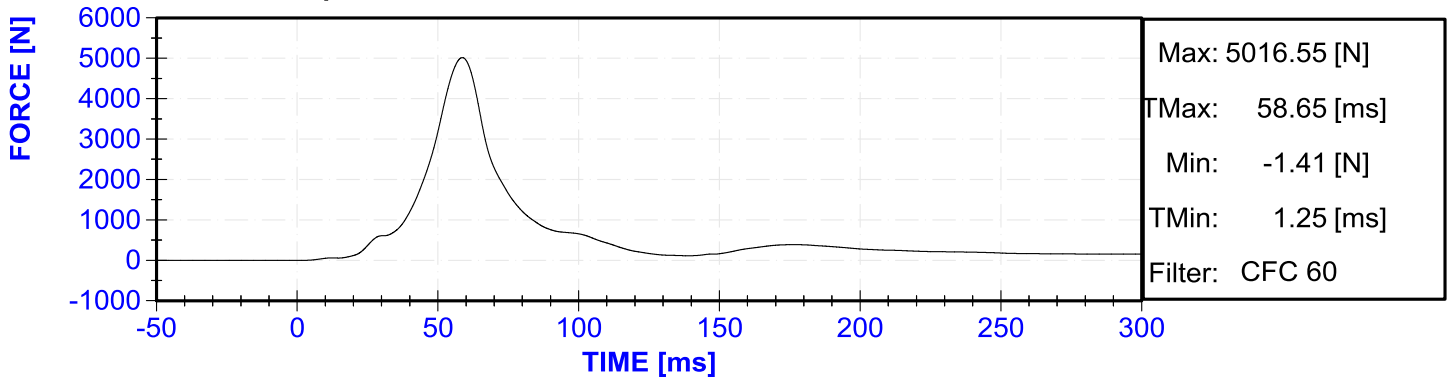
V2P1 Ankle Right Y Rotation



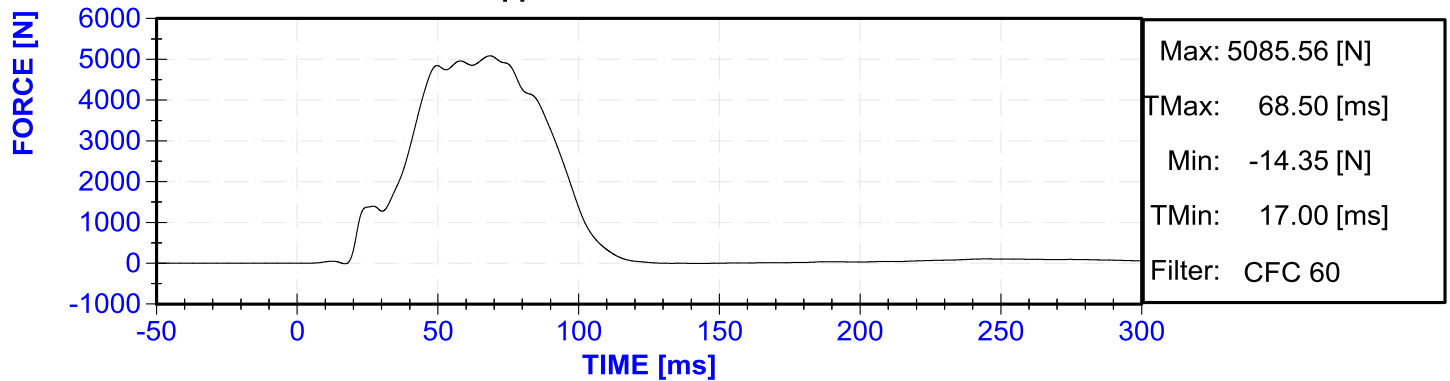
V2P1 Foot Right Z Acceleration



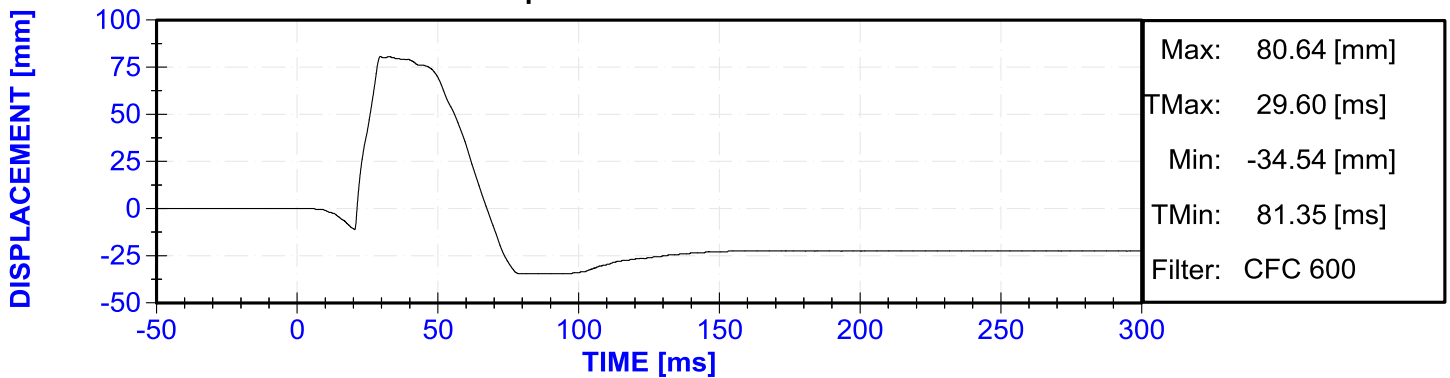
V2 Driver Lap Belt Force

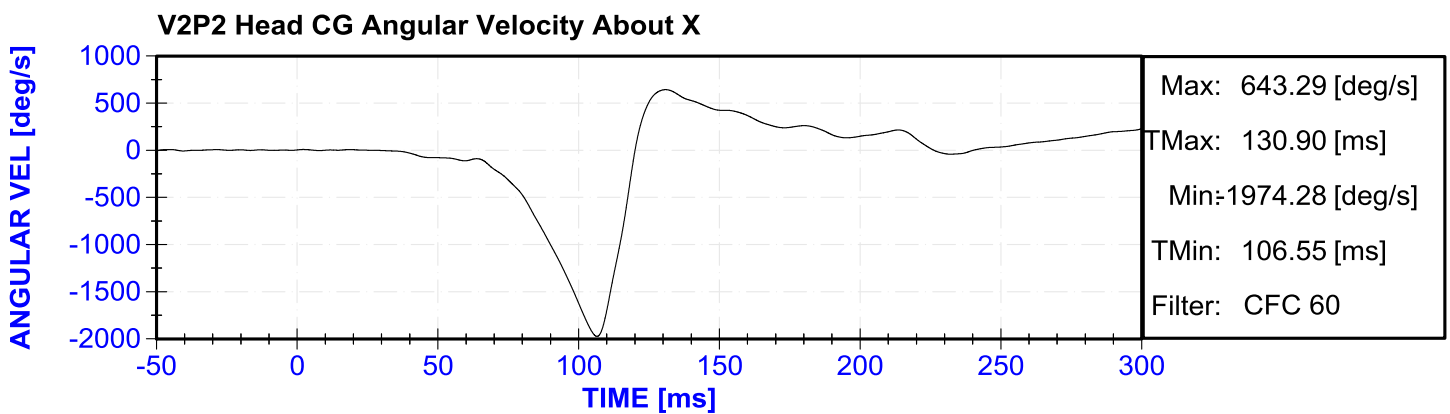
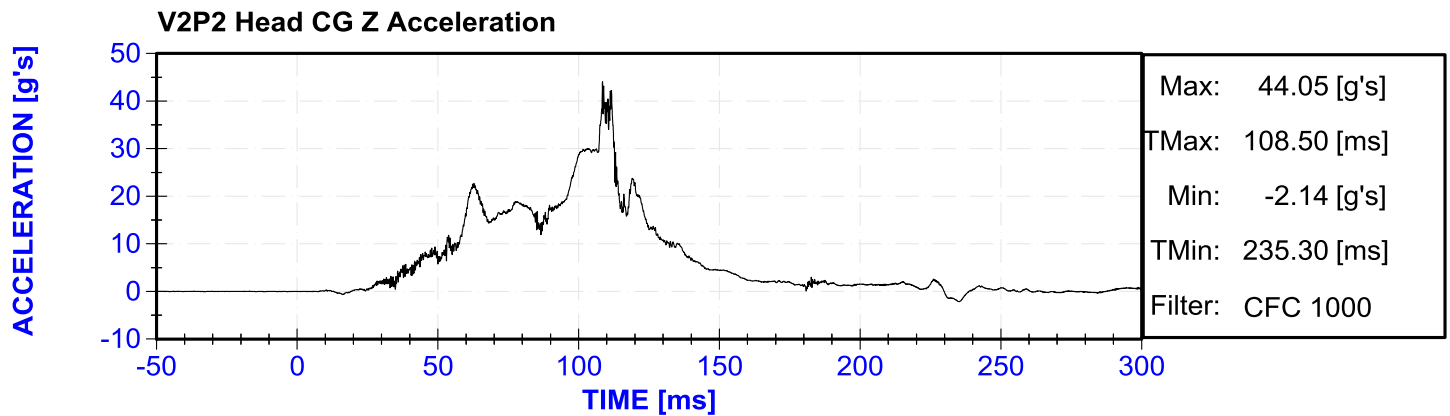
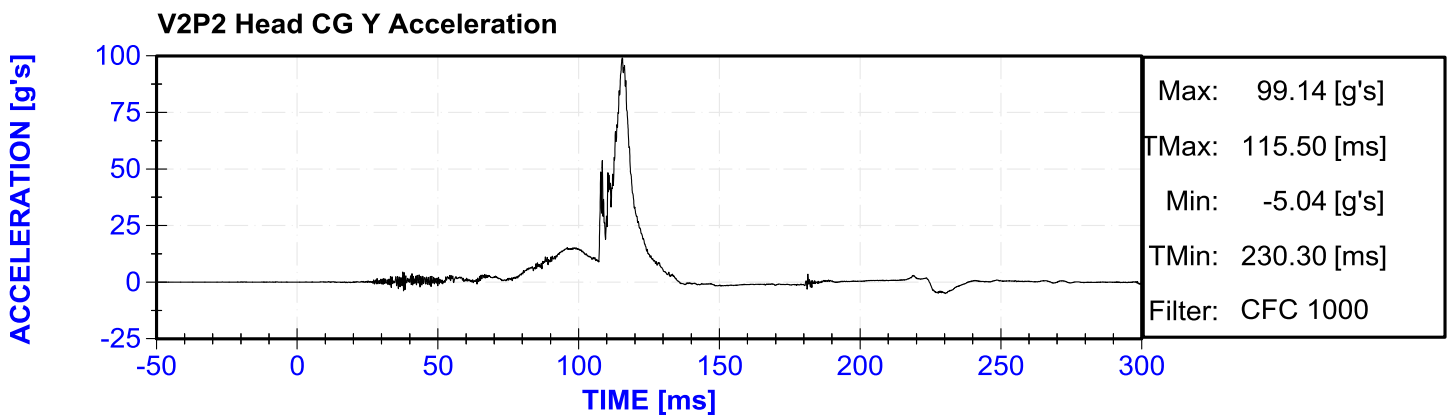
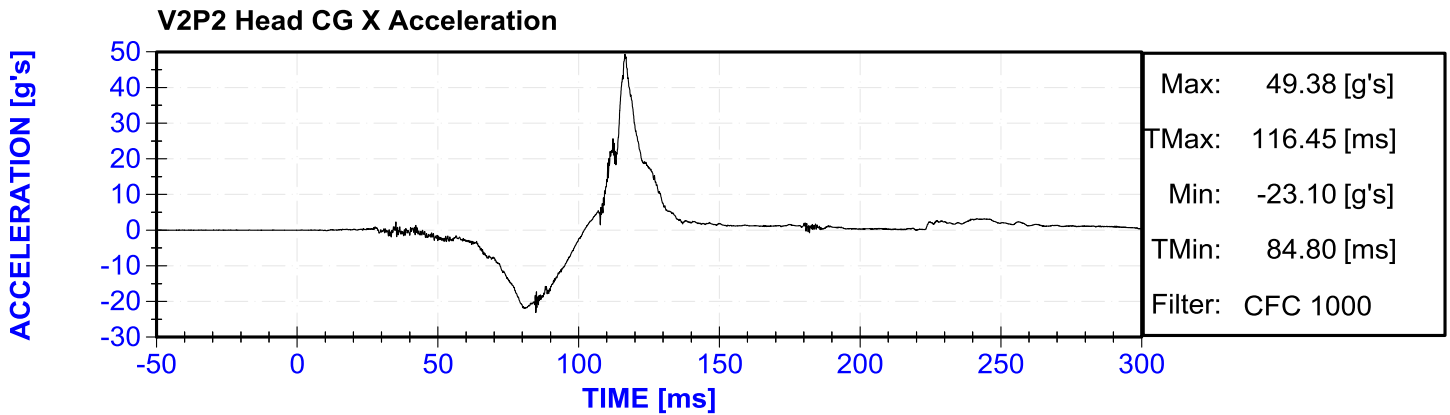


V2 Driver Shoulder Belt Upper Force

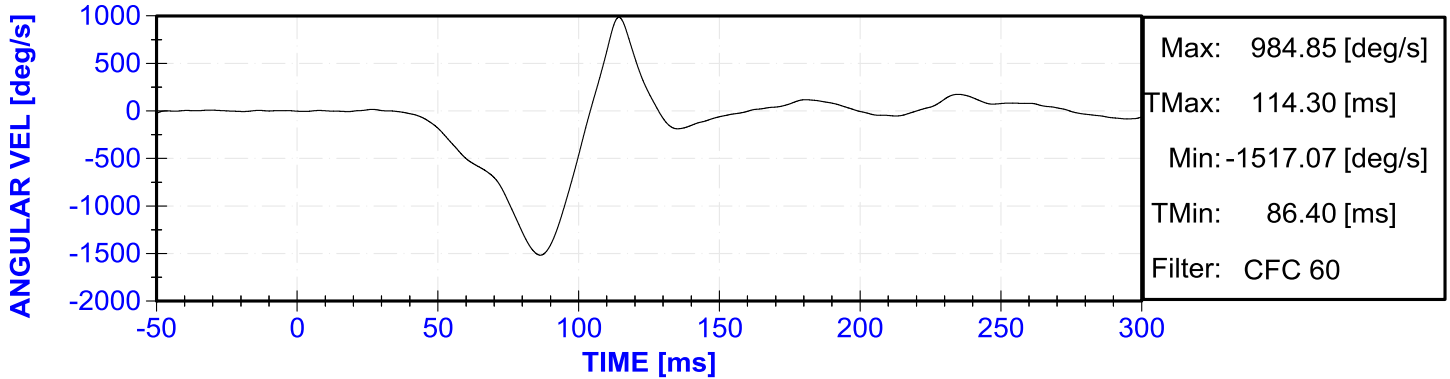


V2 Driver Shoulder Belt Displacement

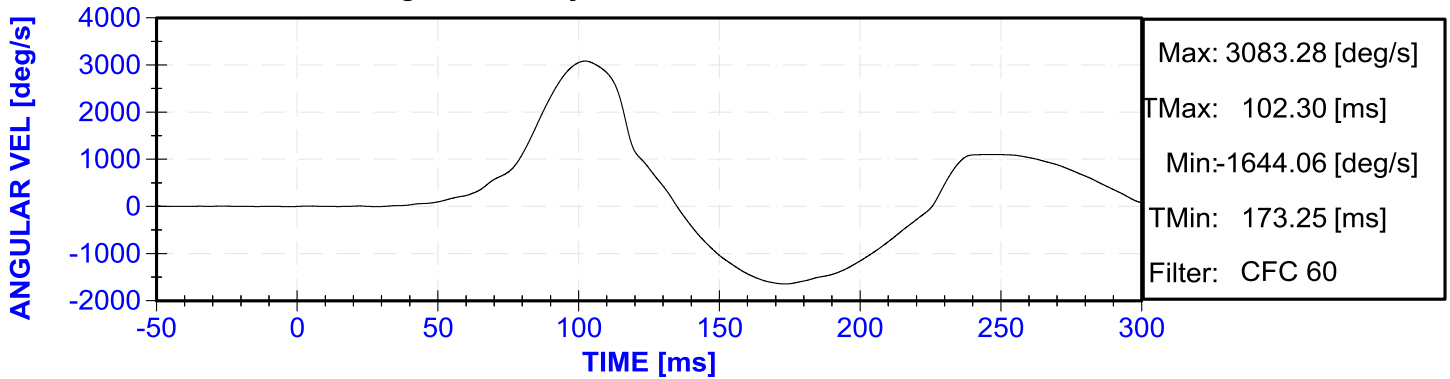




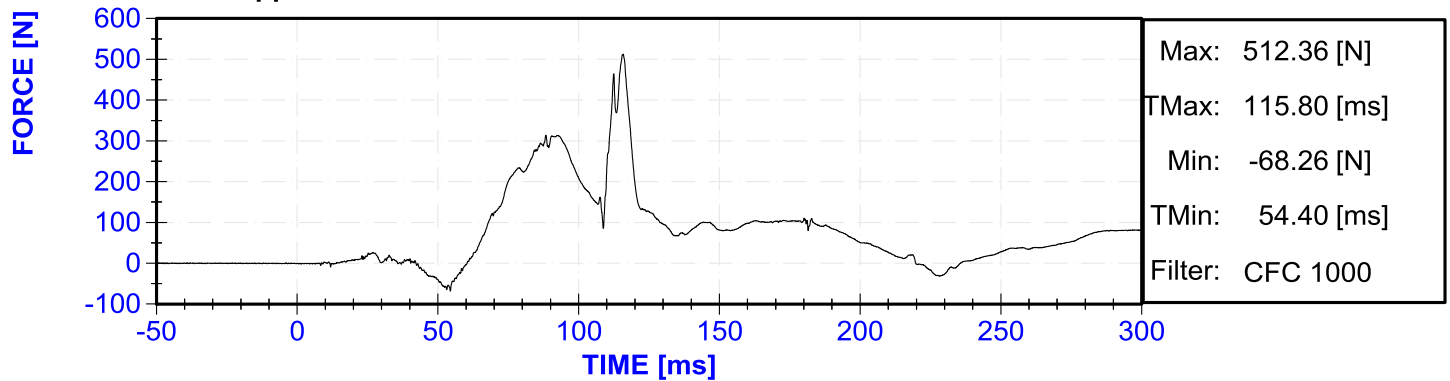
V2P2 Head CG Angular Velocity About Y



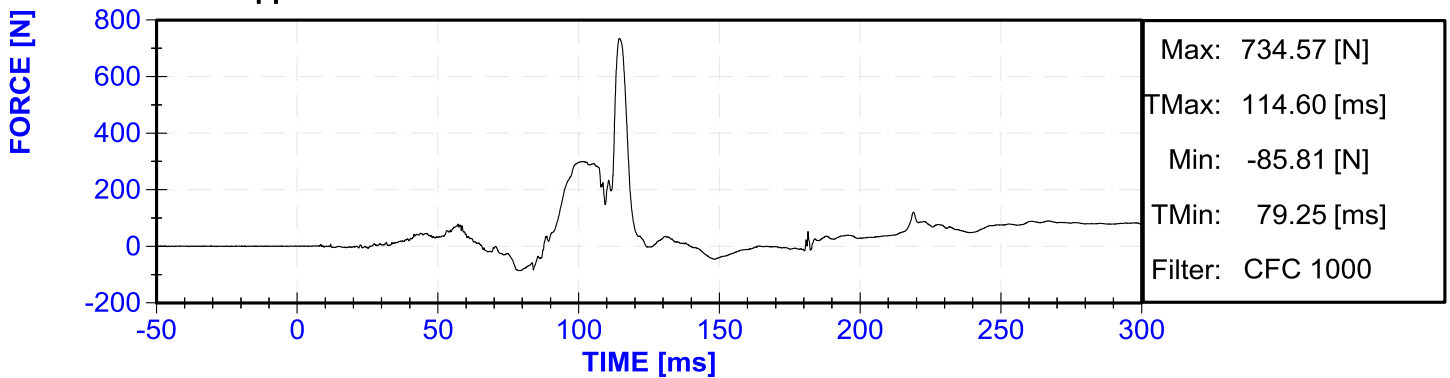
V2P2 Head CG Angular Velocity About Z

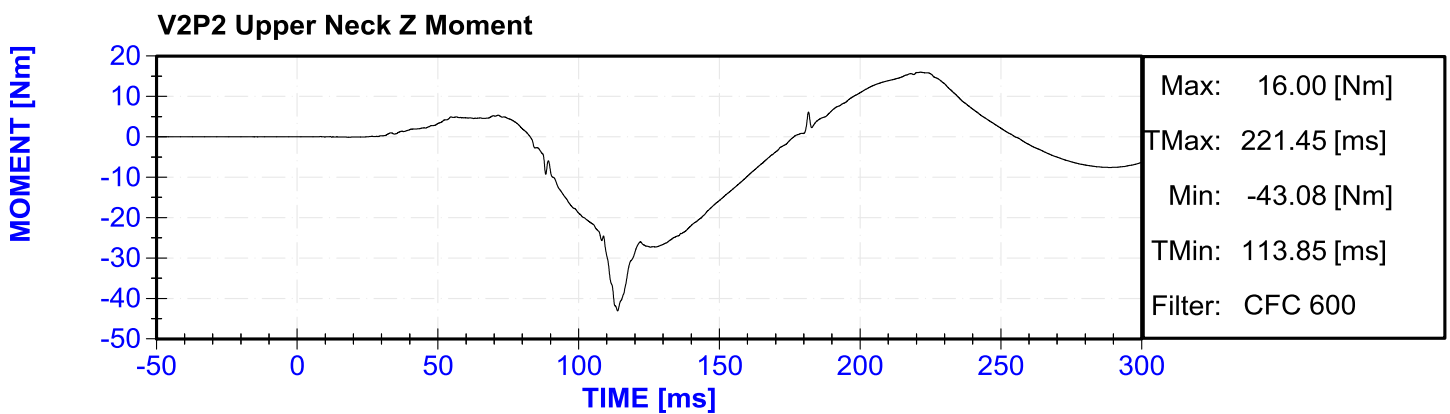
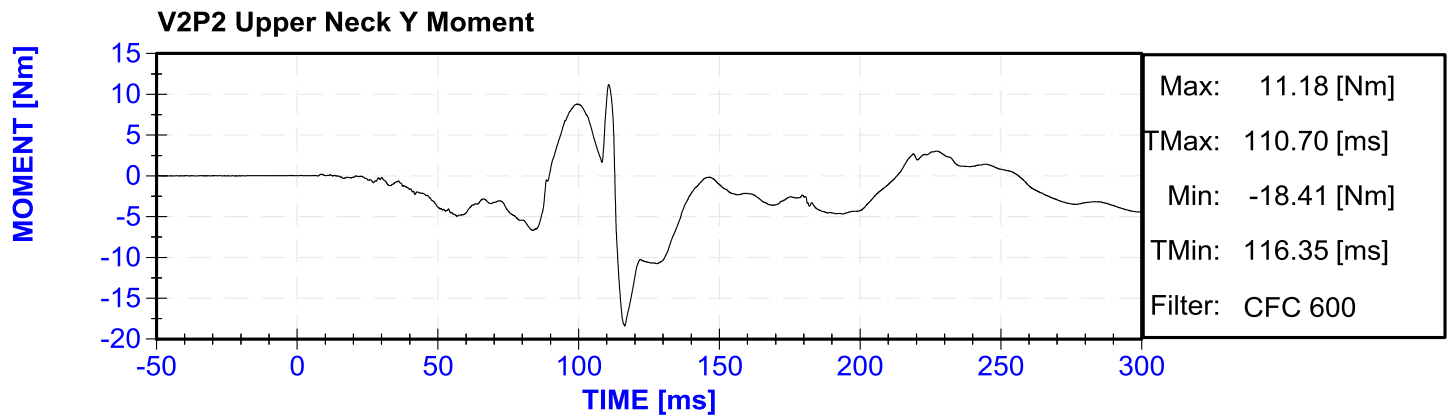
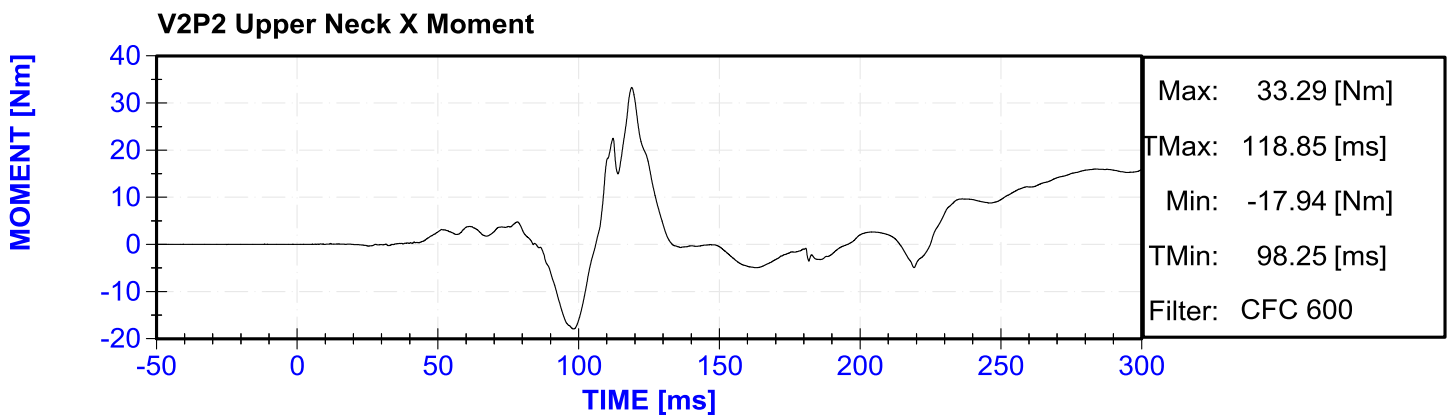
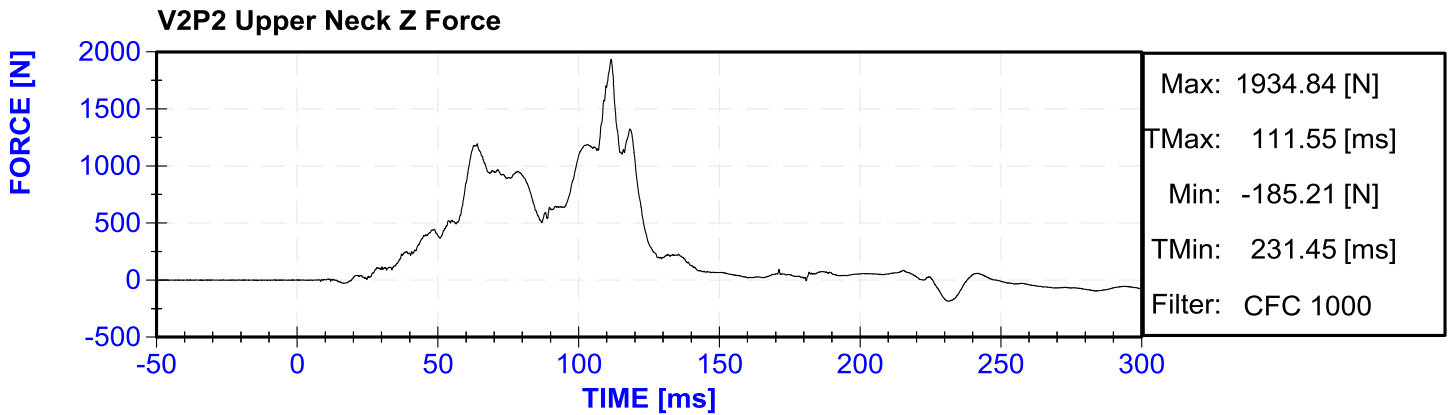


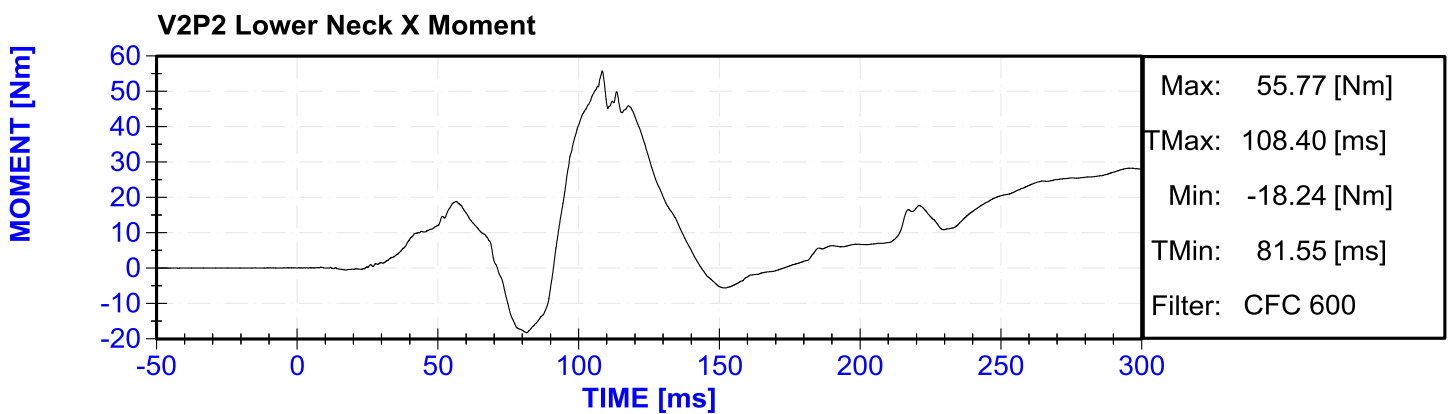
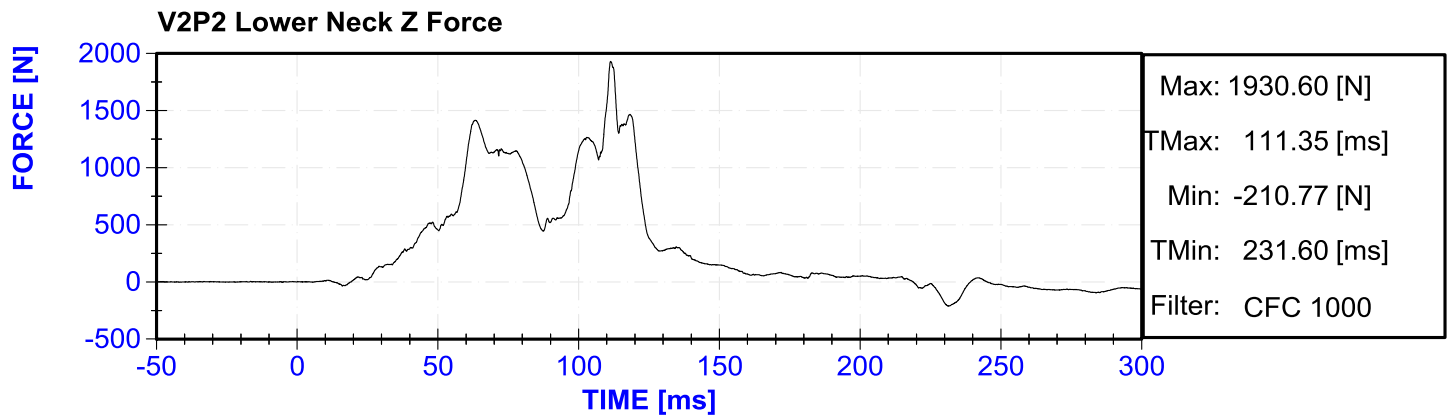
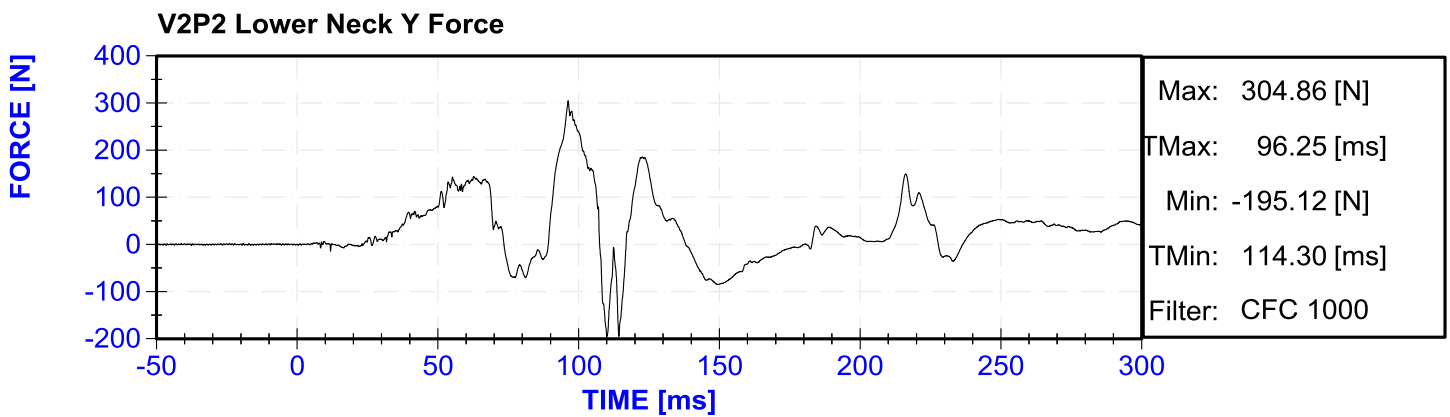
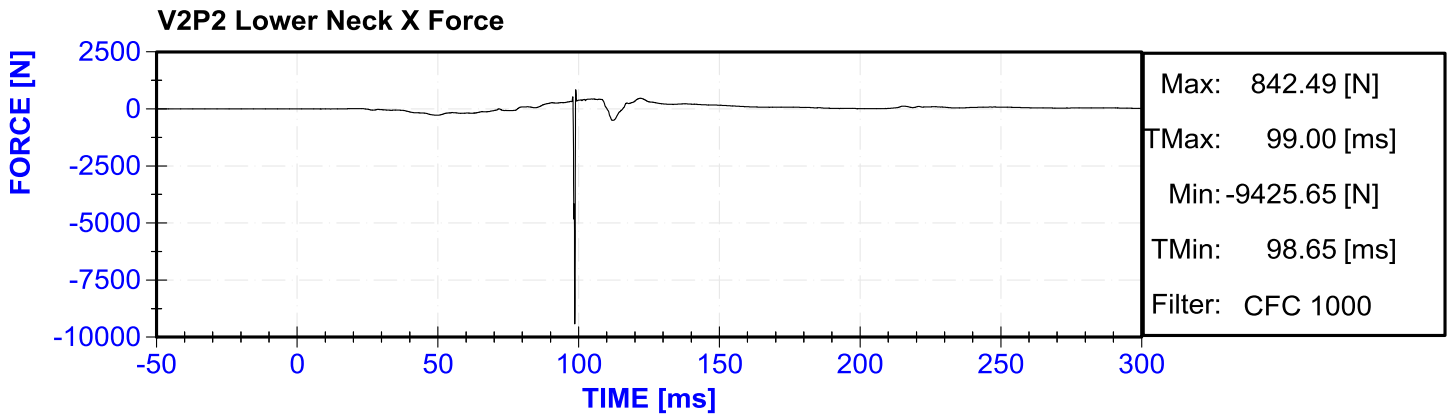
V2P2 Upper Neck X Force

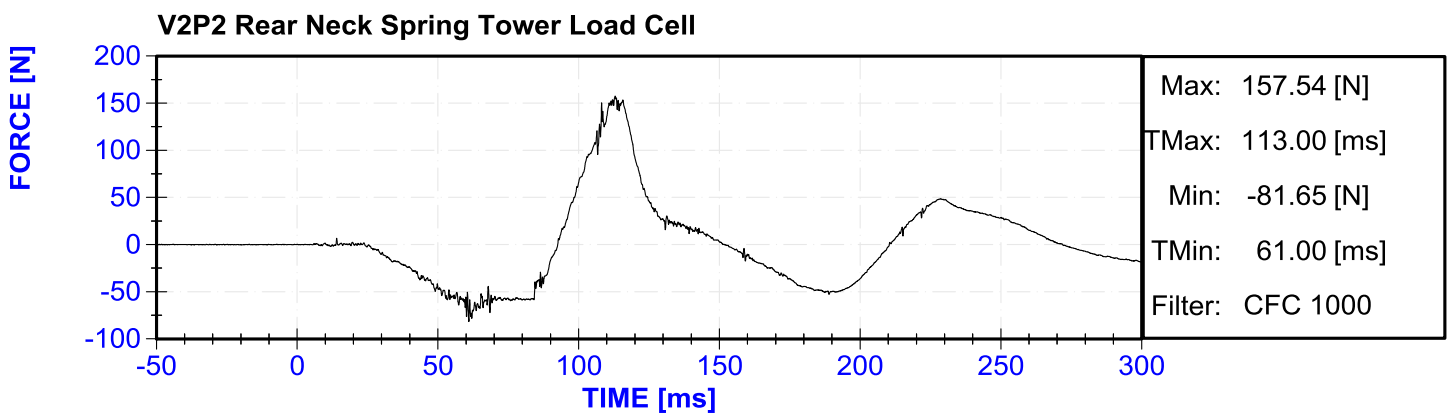
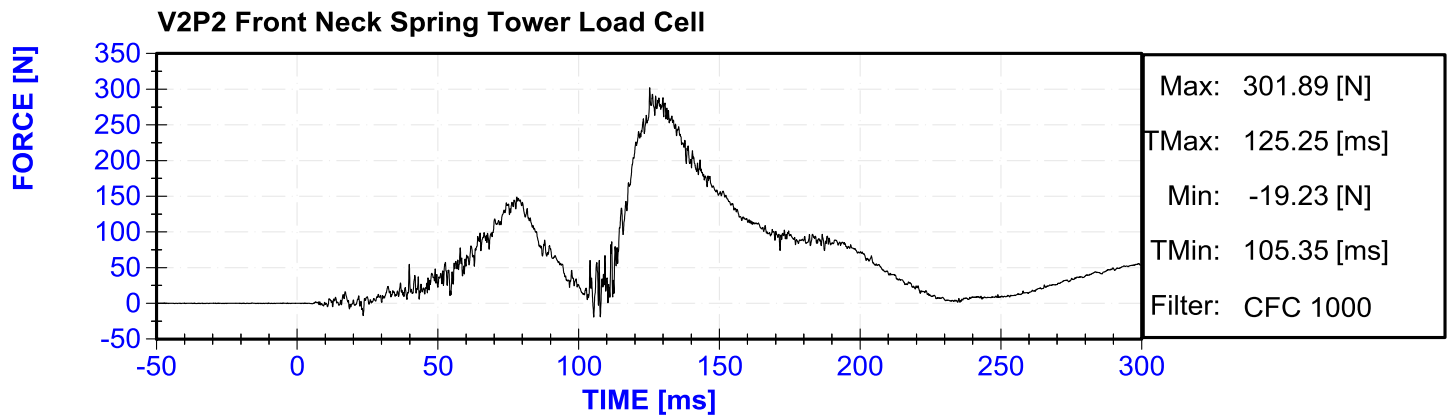
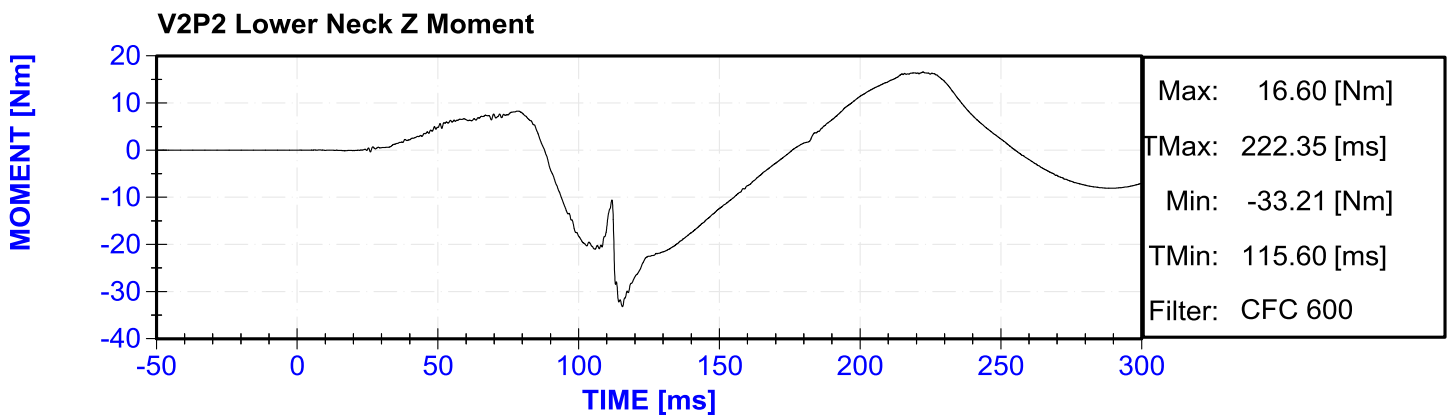
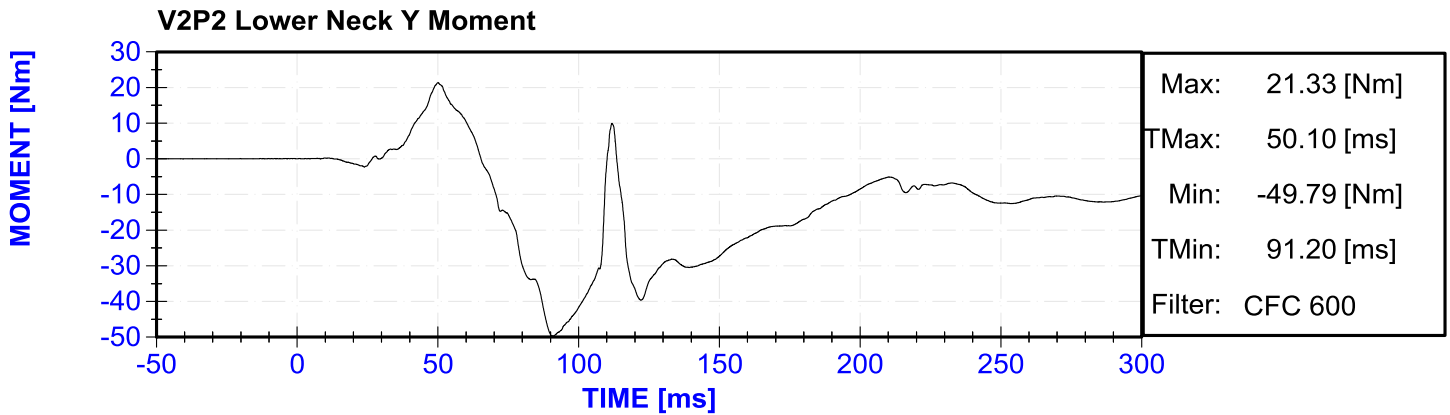


V2P2 Upper Neck Y Force

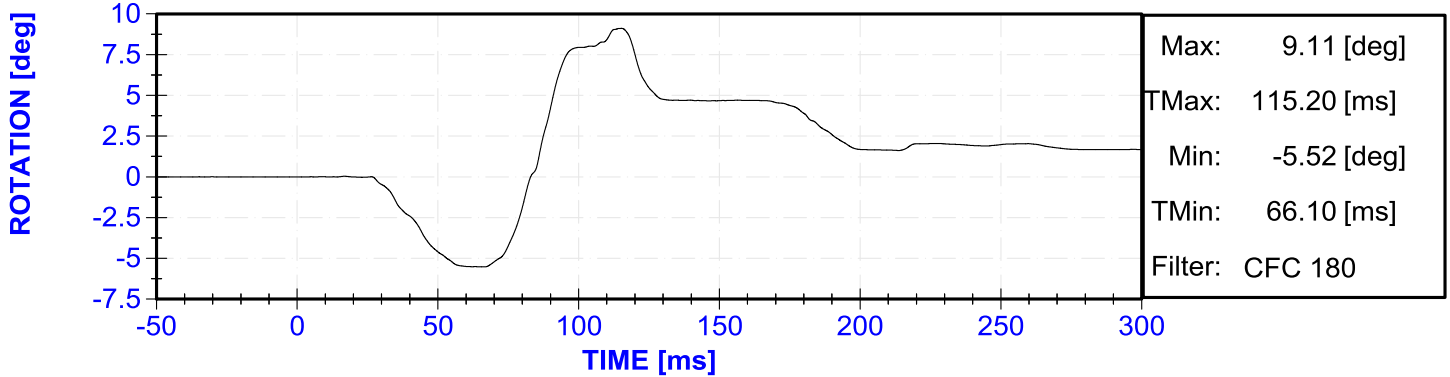




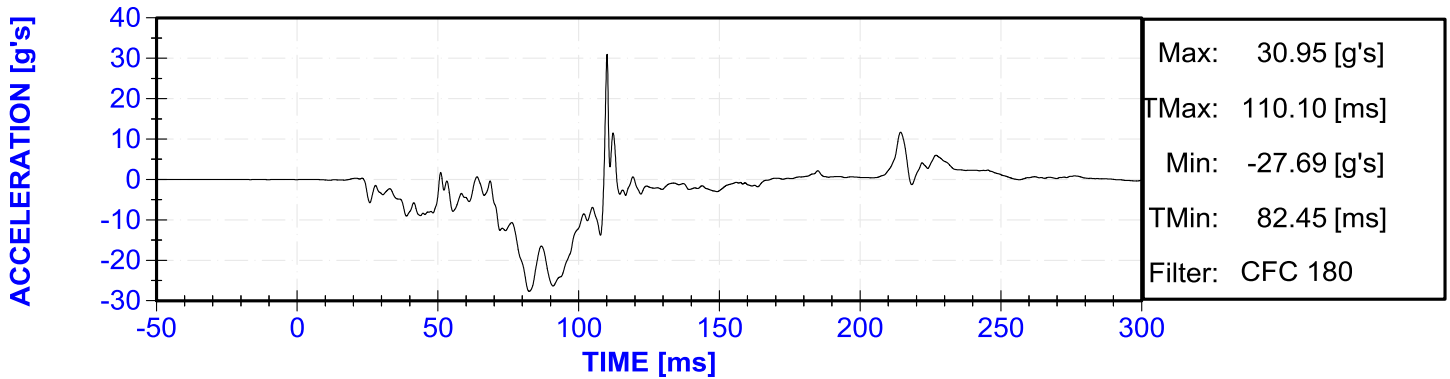




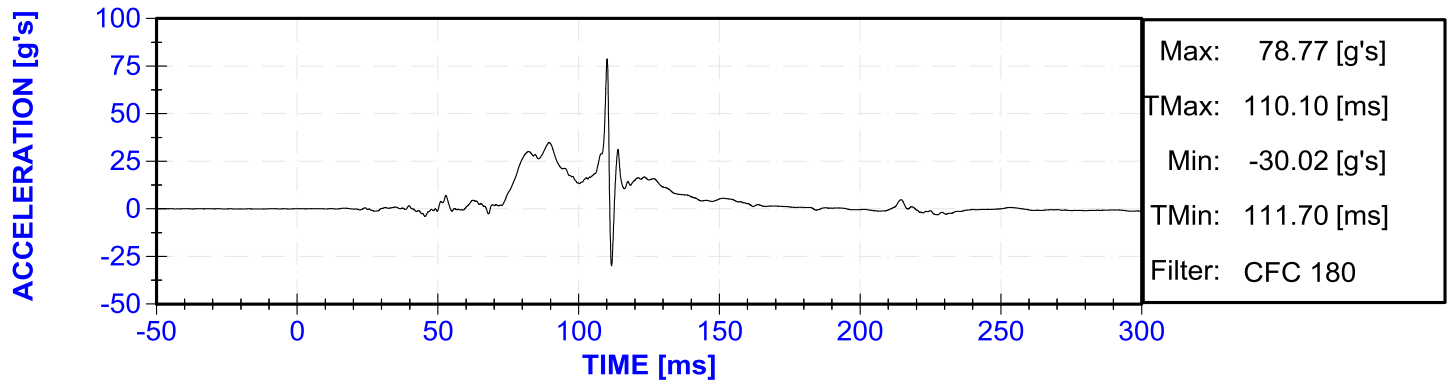
V2P2 Occipital Condyle Rotation Potentiometer



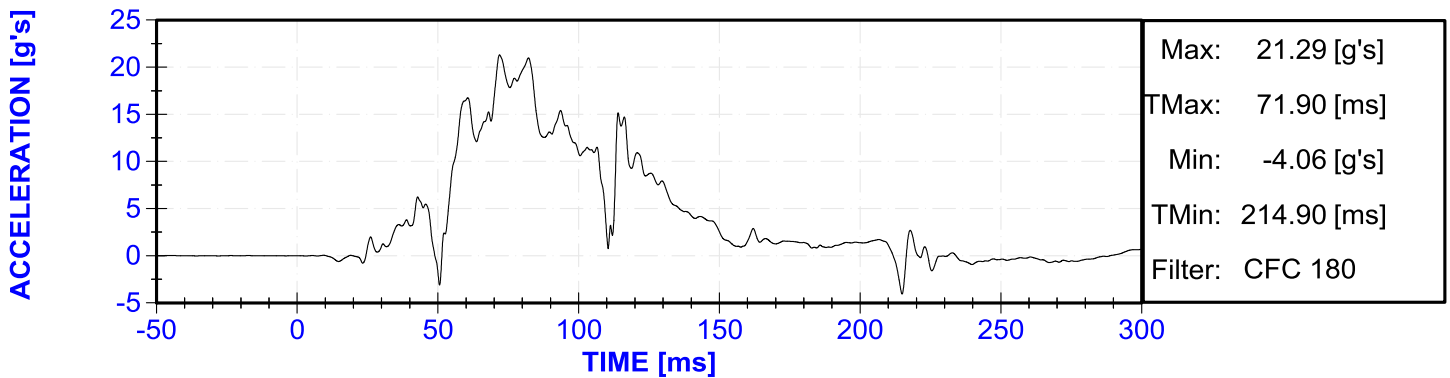
V2P2 T1 X Acceleration

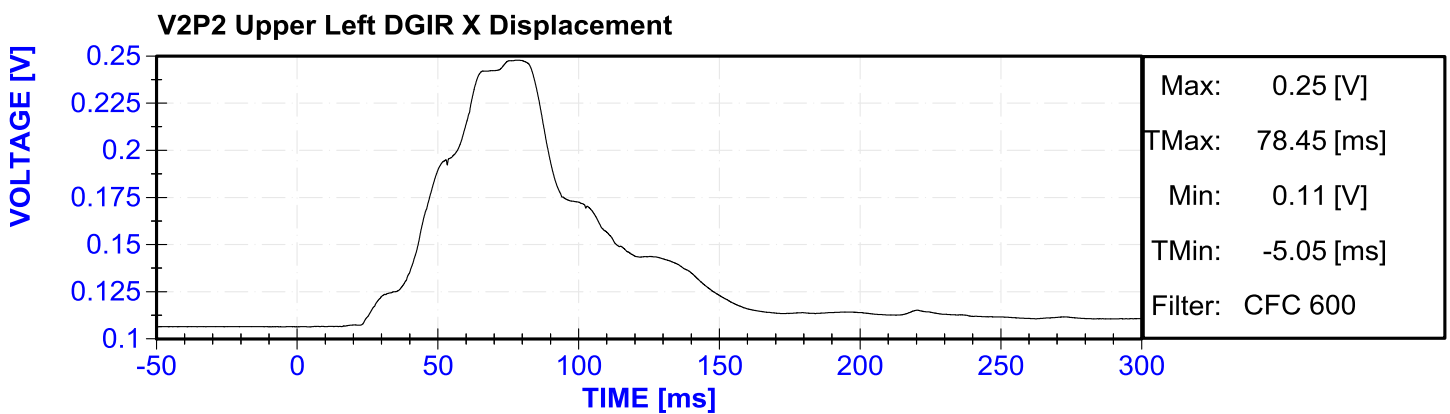
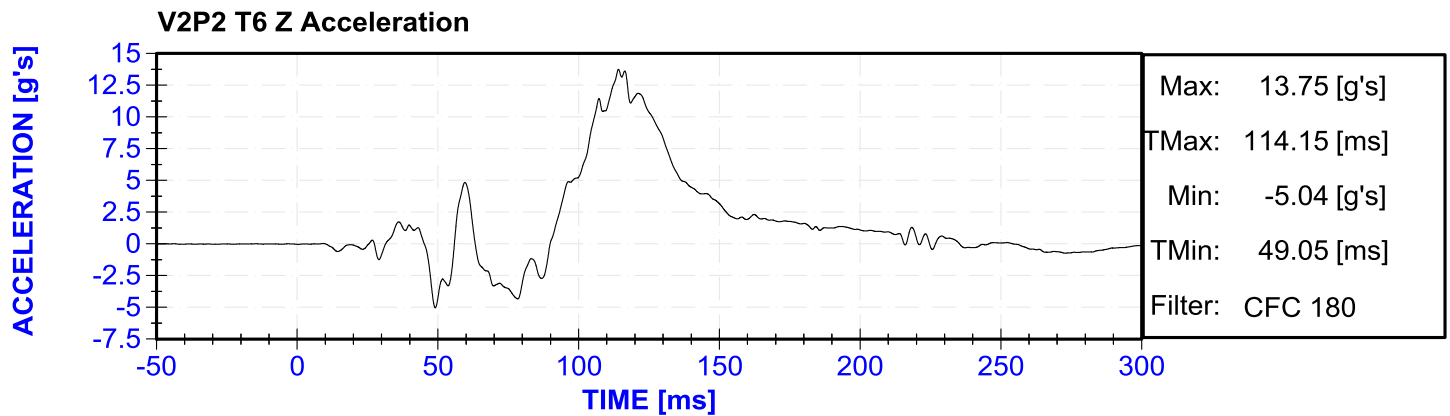
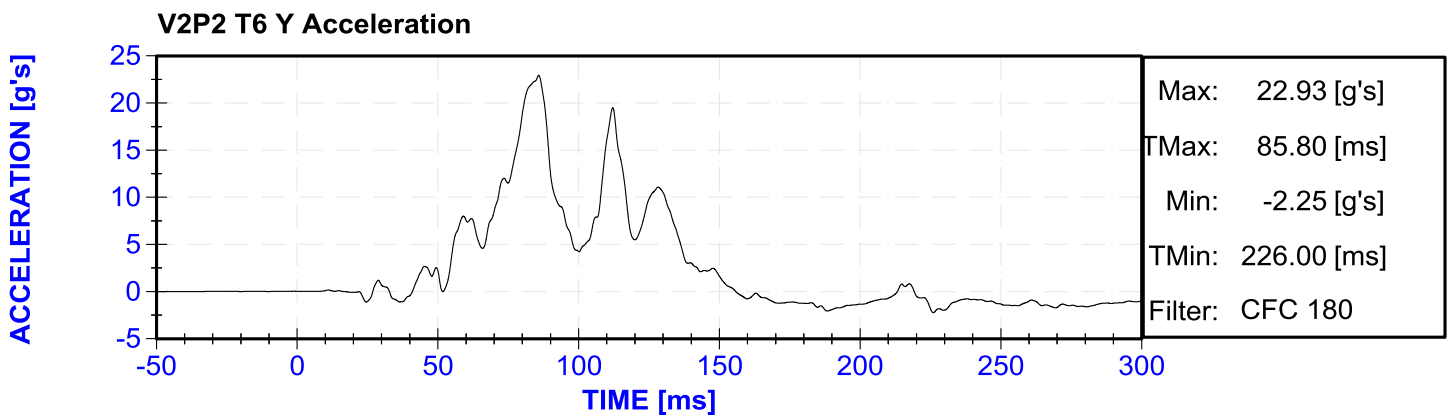
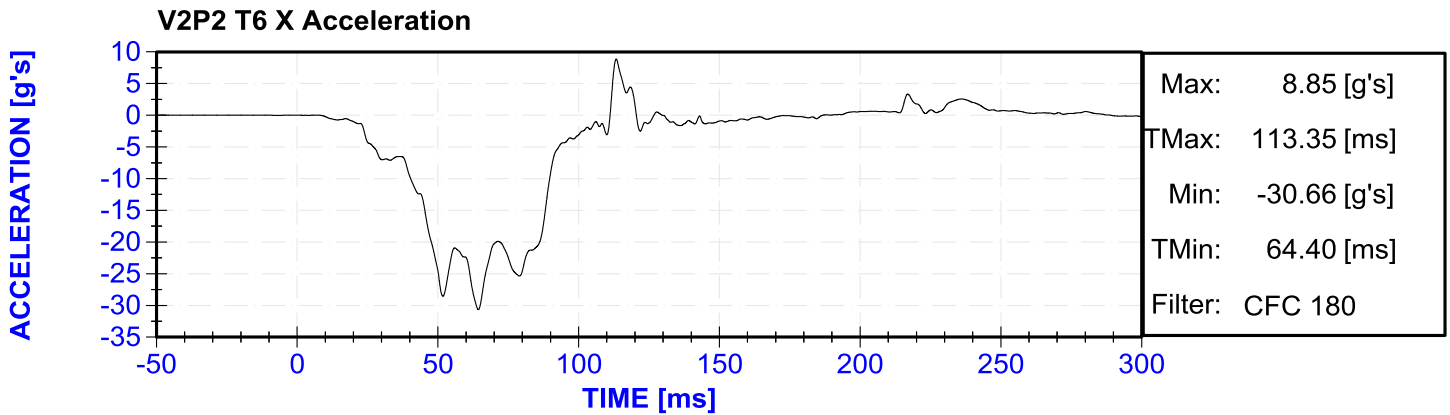


V2P2 T1 Y Acceleration

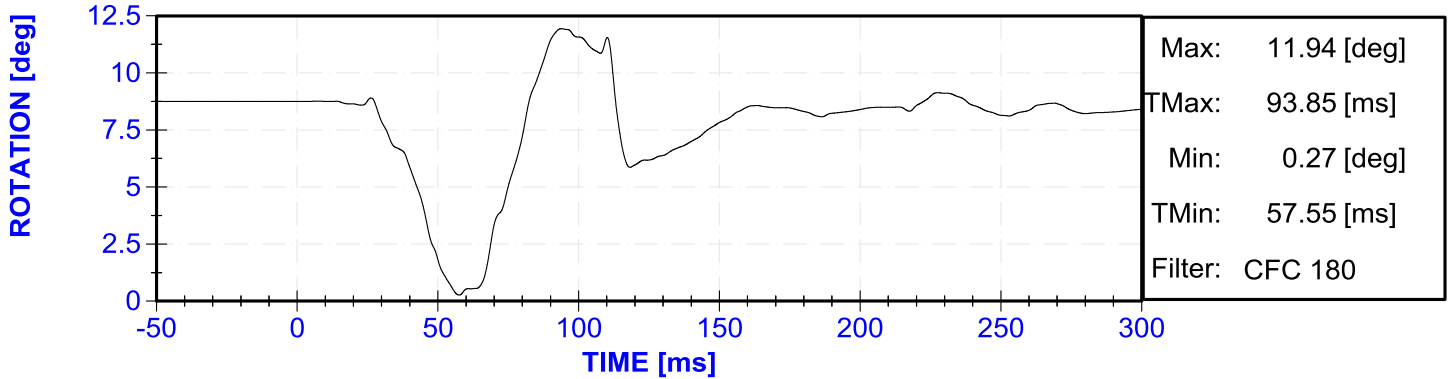


V2P2 T1 Z Acceleration

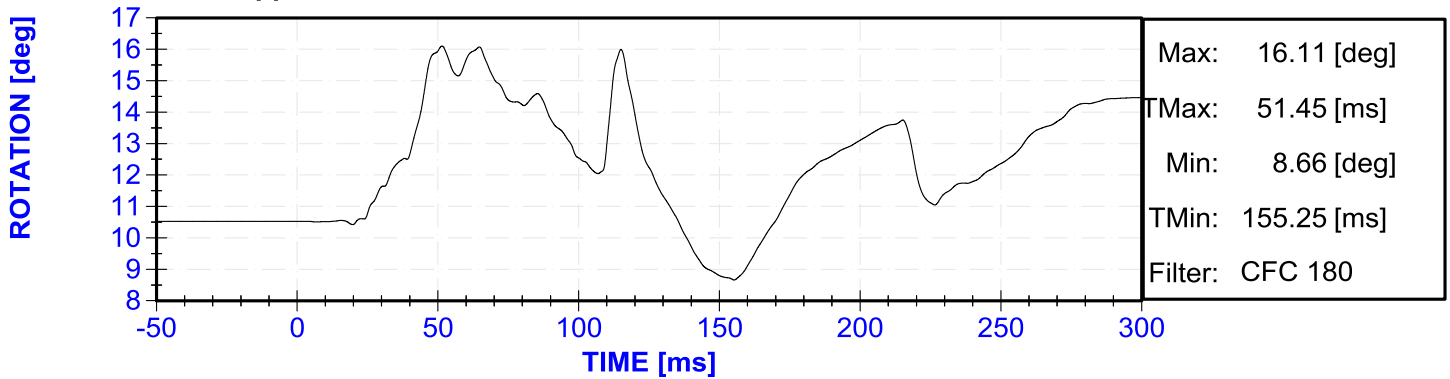




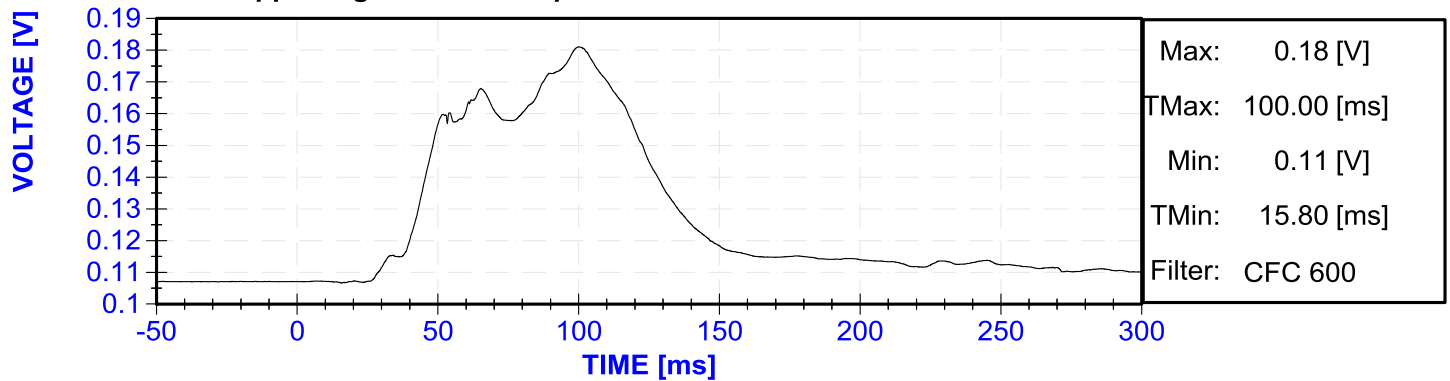
V2P2 Upper Left DGIR Y Rotation



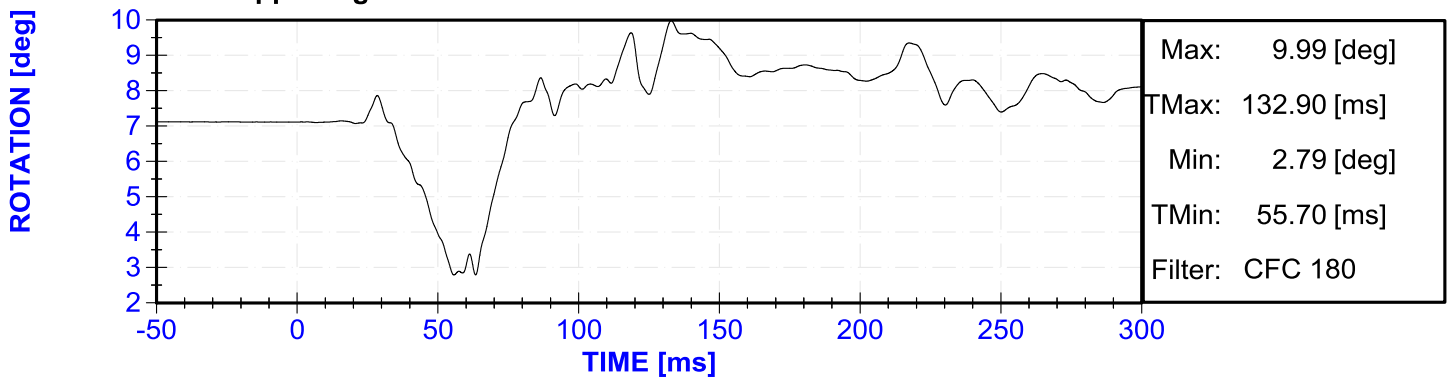
V2P2 Upper Left DGIR Z Rotation



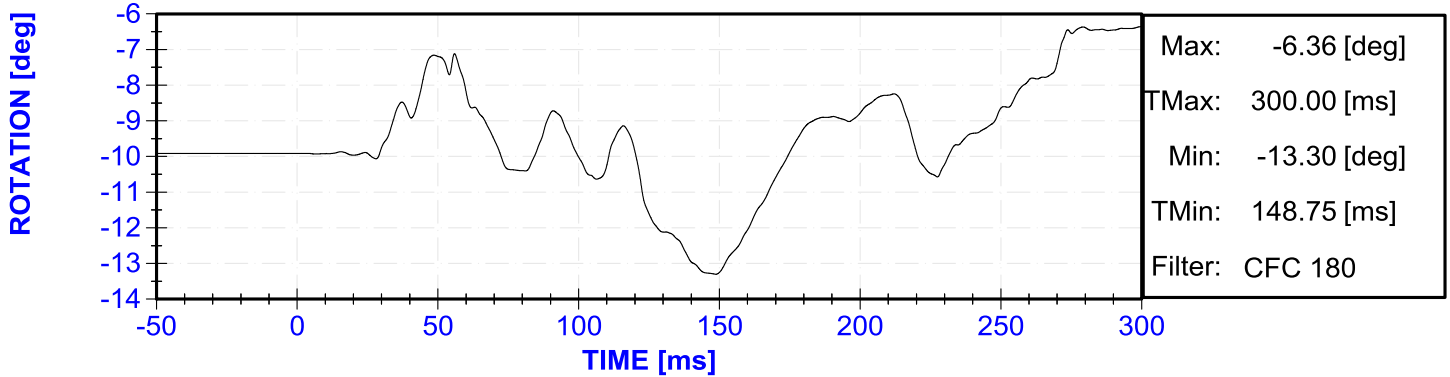
V2P2 Upper Right DGIR X Displacement



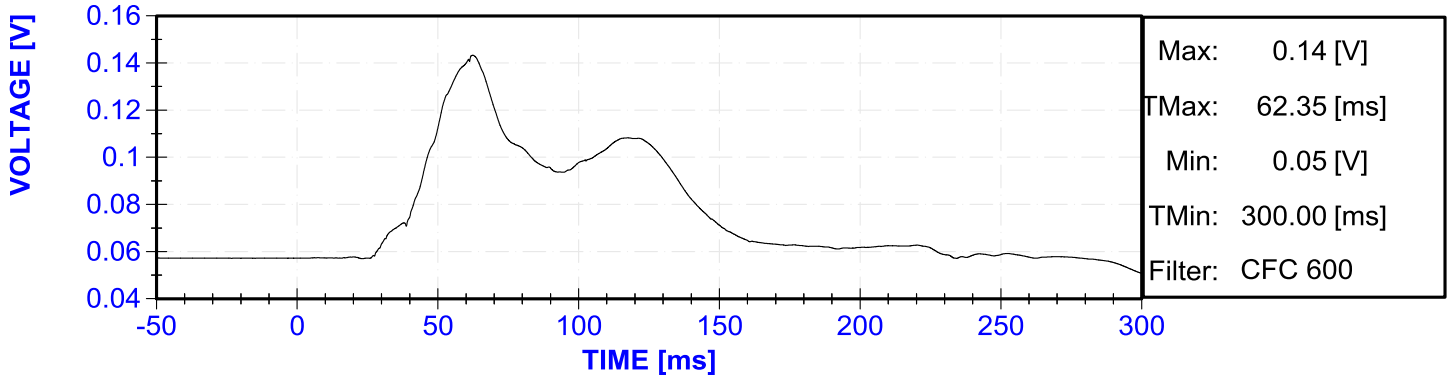
V2P2 Upper Right DGIR Y Rotation



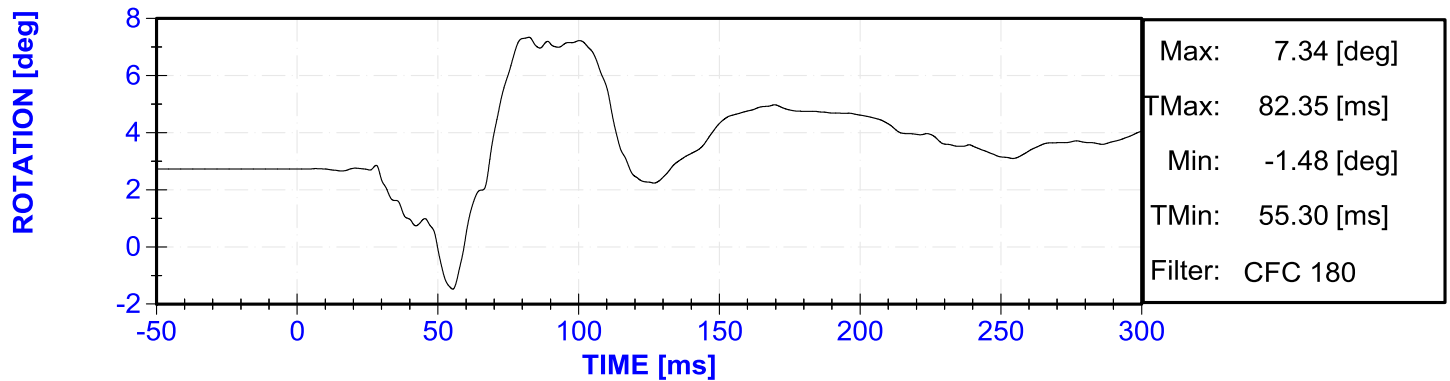
V2P2 Upper Right DGIR Z Rotation



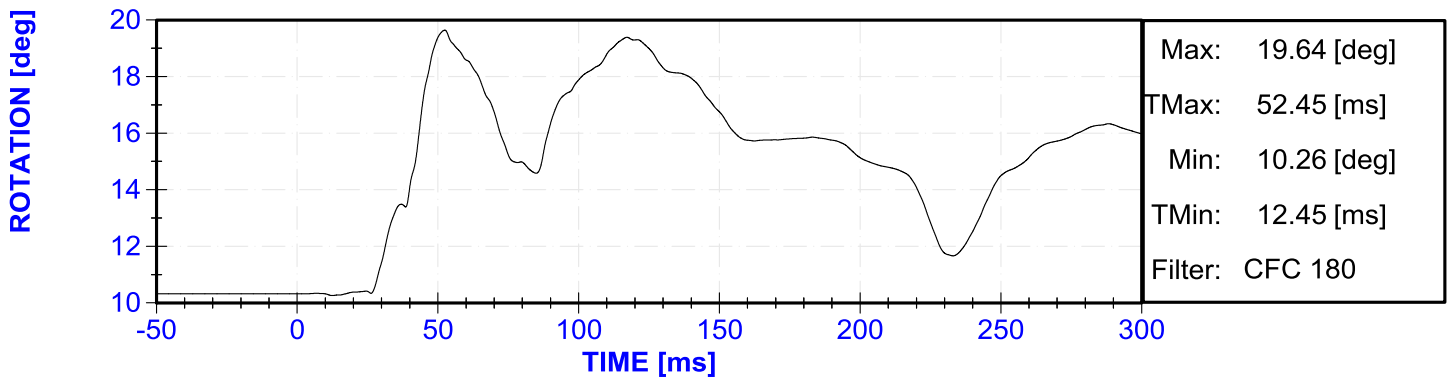
V2P2 Lower Left DGIR X Displacement



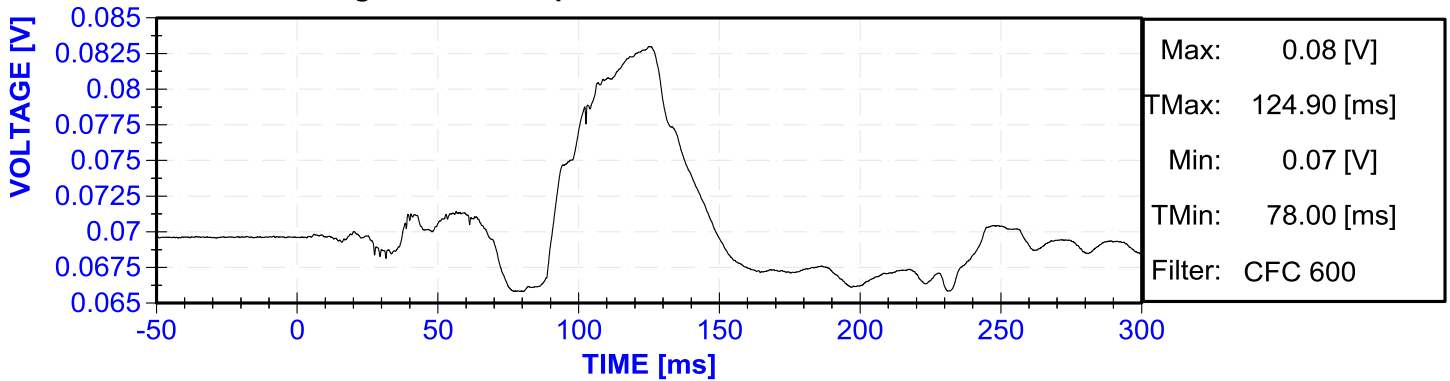
V2P2 Lower Left DGIR Y Rotation



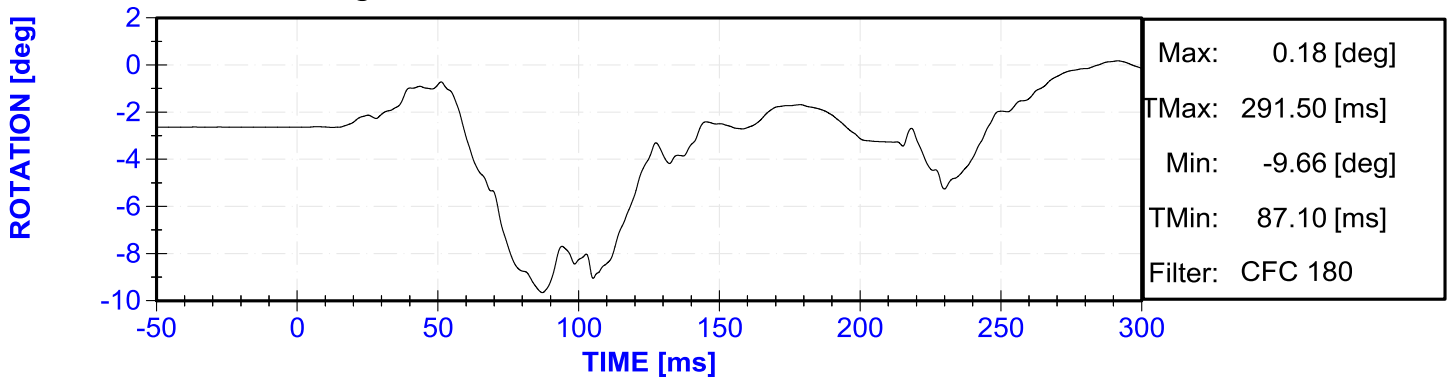
V2P2 Lower Left DGIR Z Rotation



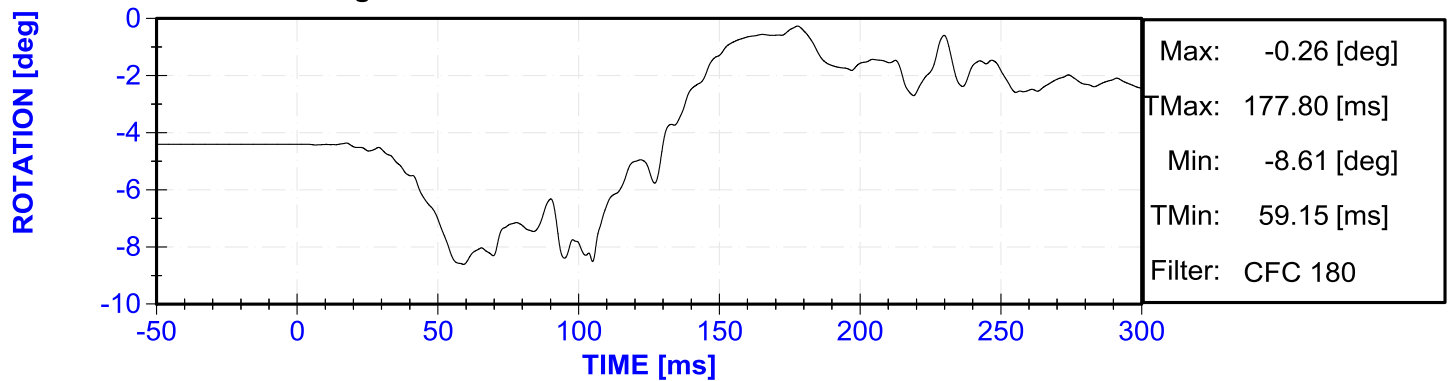
V2P2 Lower Right DGIR X Displacement



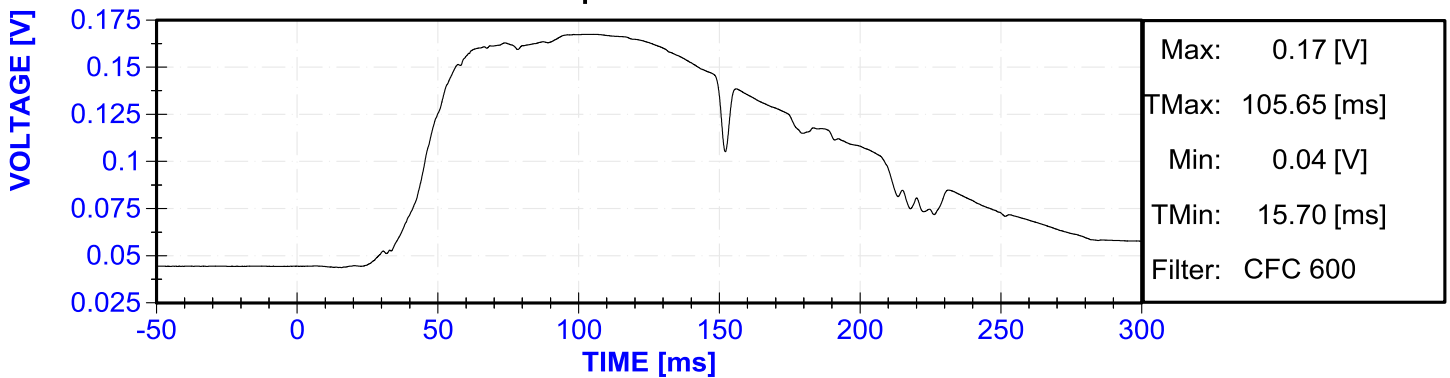
V2P2 Lower Right DGIR Y Rotation



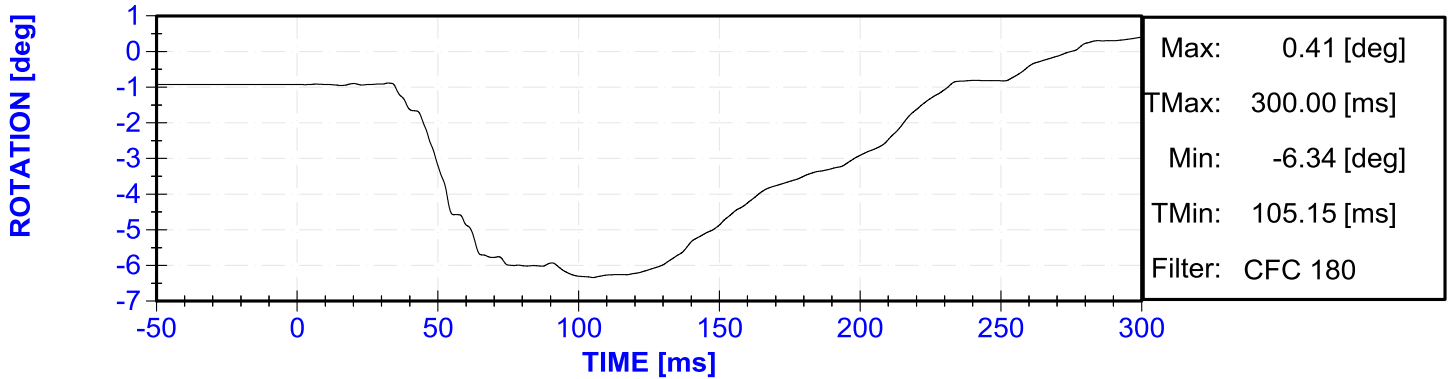
V2P2 Lower Right DGIR Z Rotation



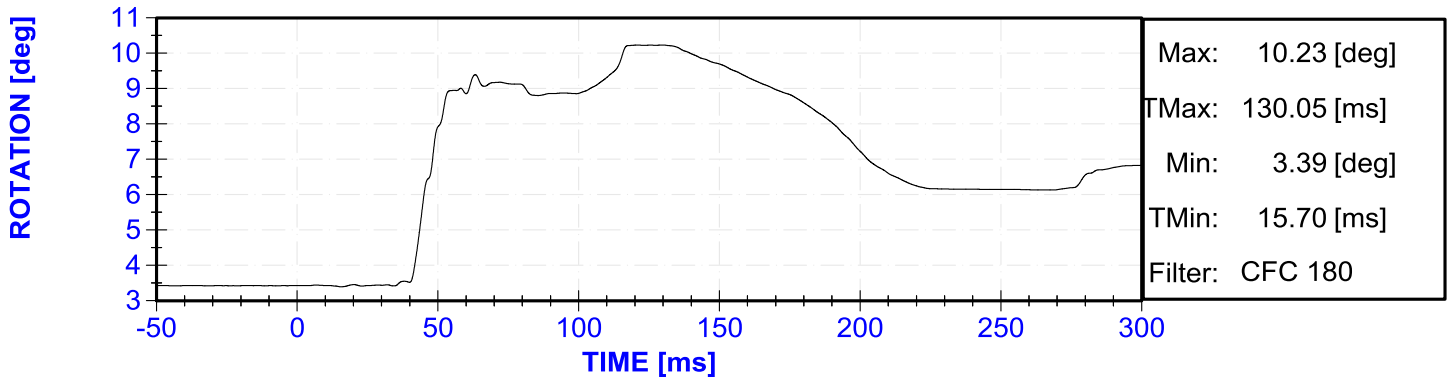
V2P2 Abdomen Left DGIR X Displacement



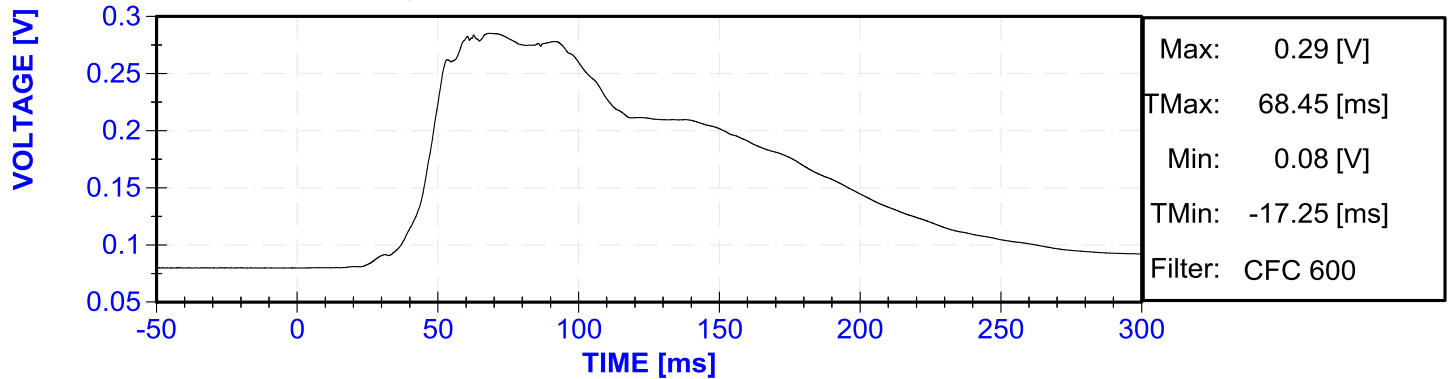
V2P2 Abdomen Left DGIR Y Rotation



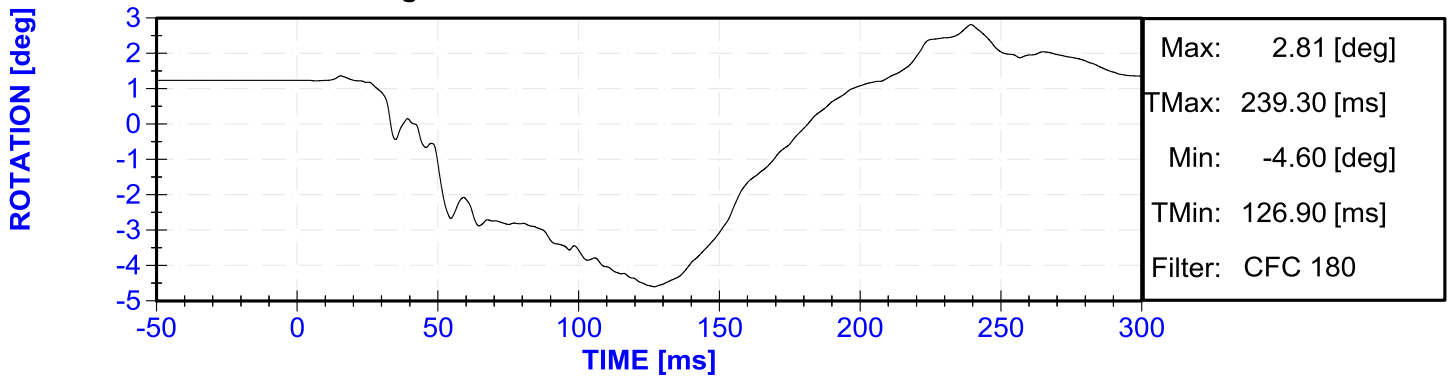
V2P2 Abdomen Left DGIR Z Rotation



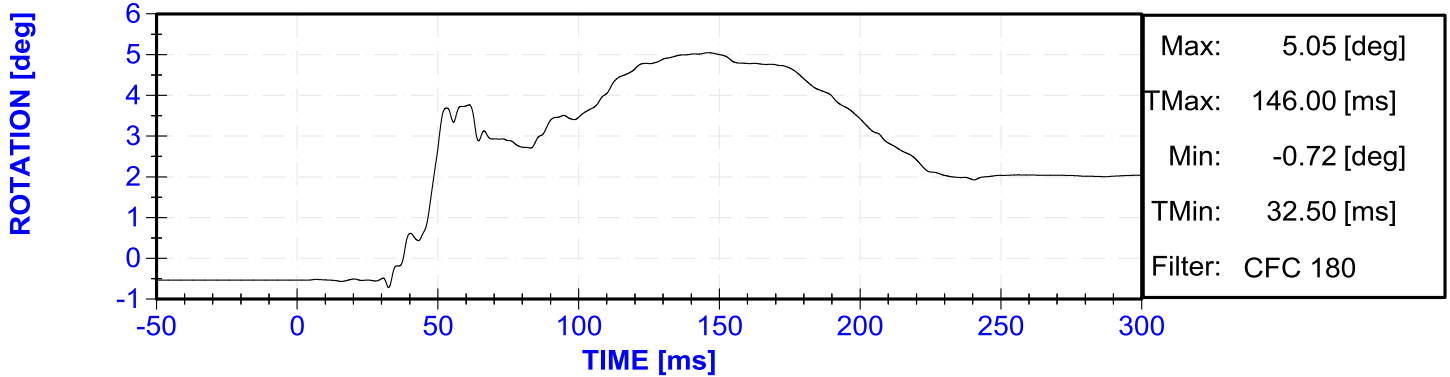
V2P2 Abdomen Right DGIR X Displacement



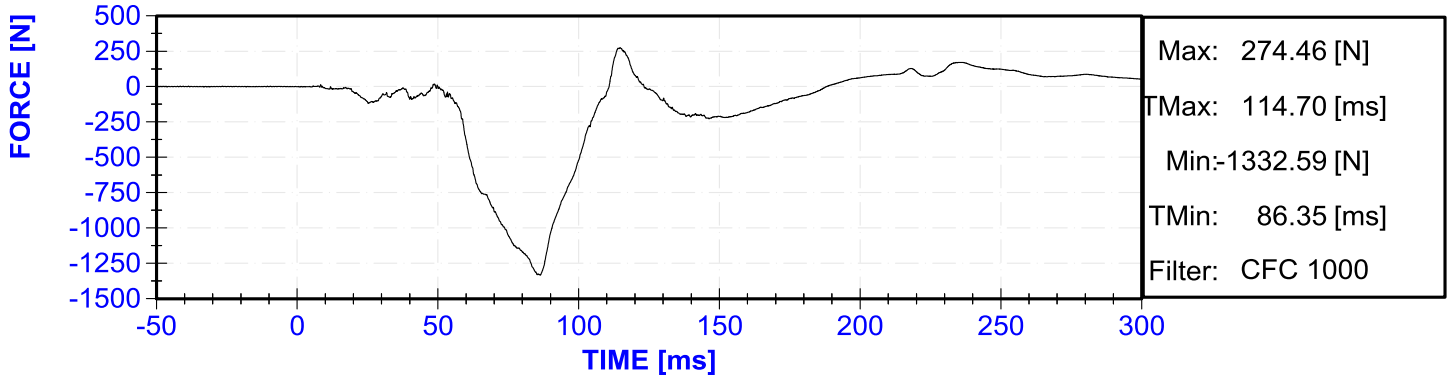
V2P2 Abdomen Right DGIR Y Rotation



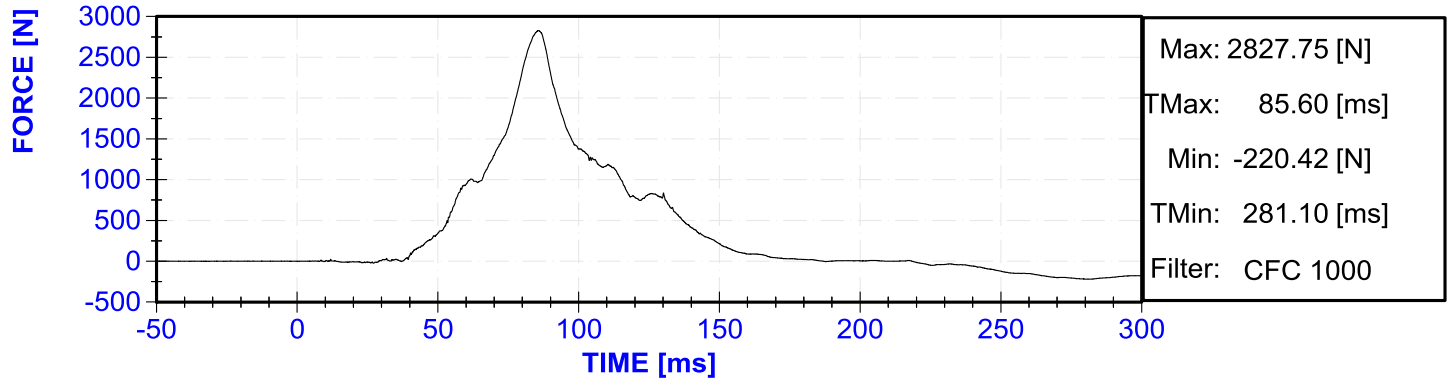
V2P2 Abdomen Right DGIR Z Rotation



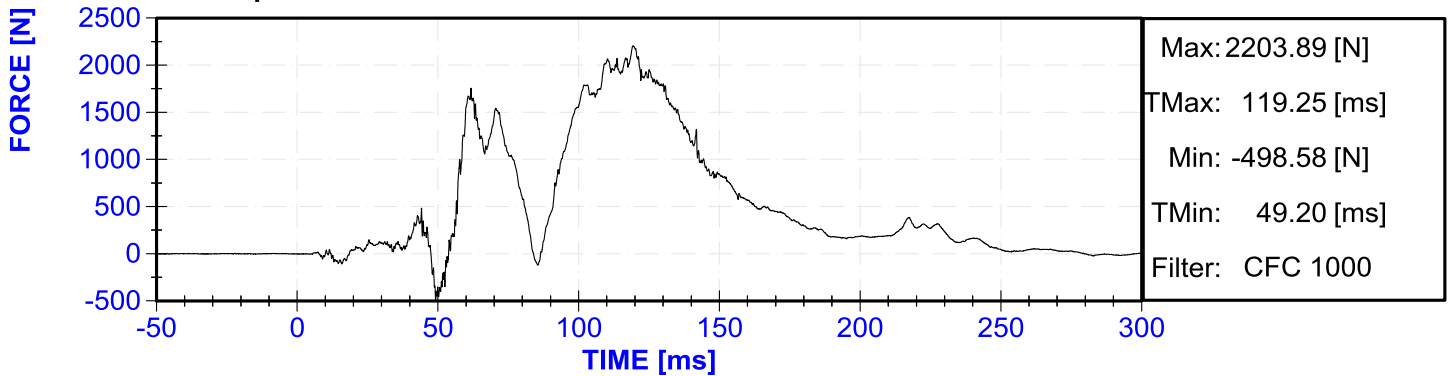
V2P2 Spine Force X

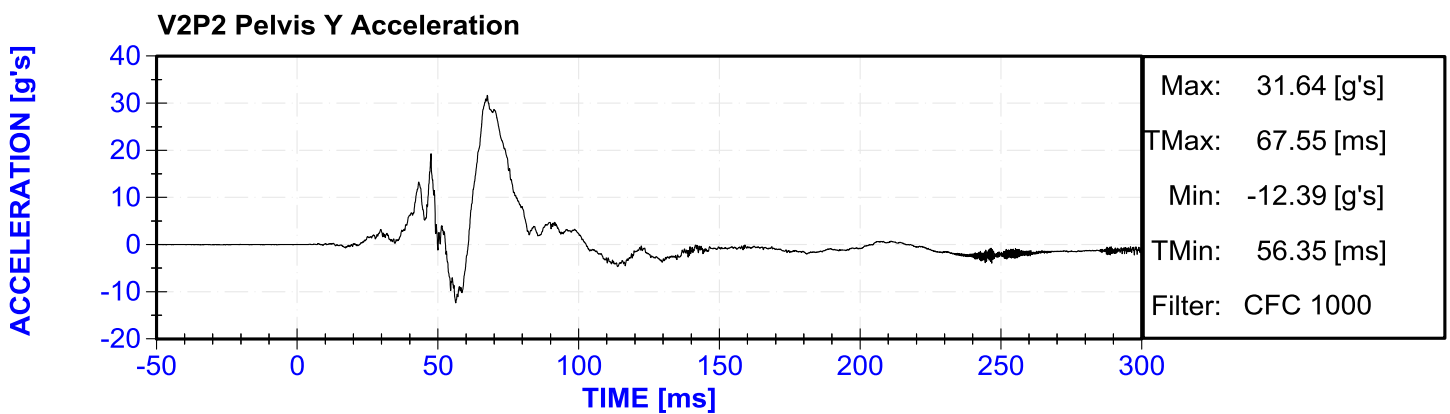
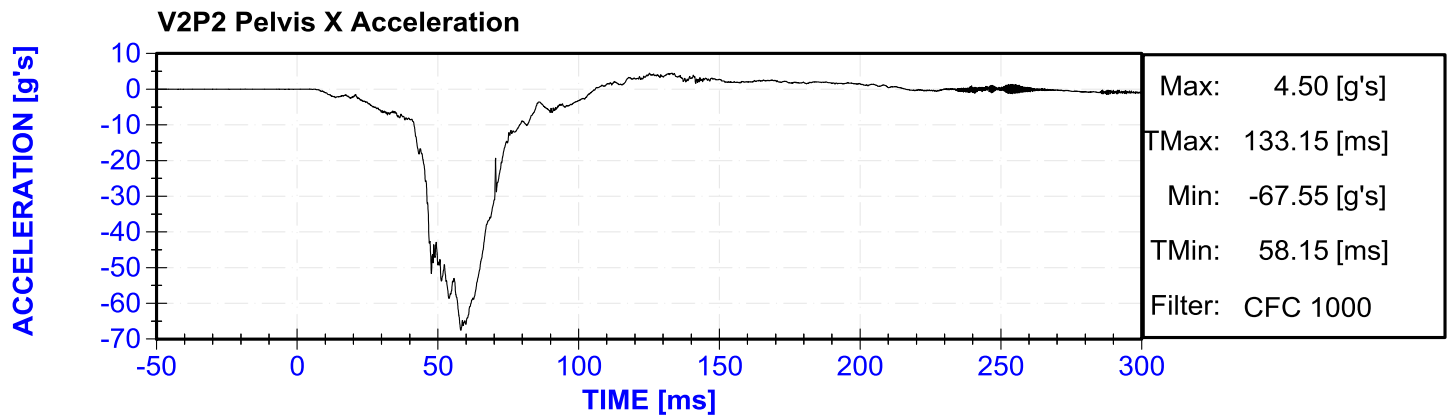
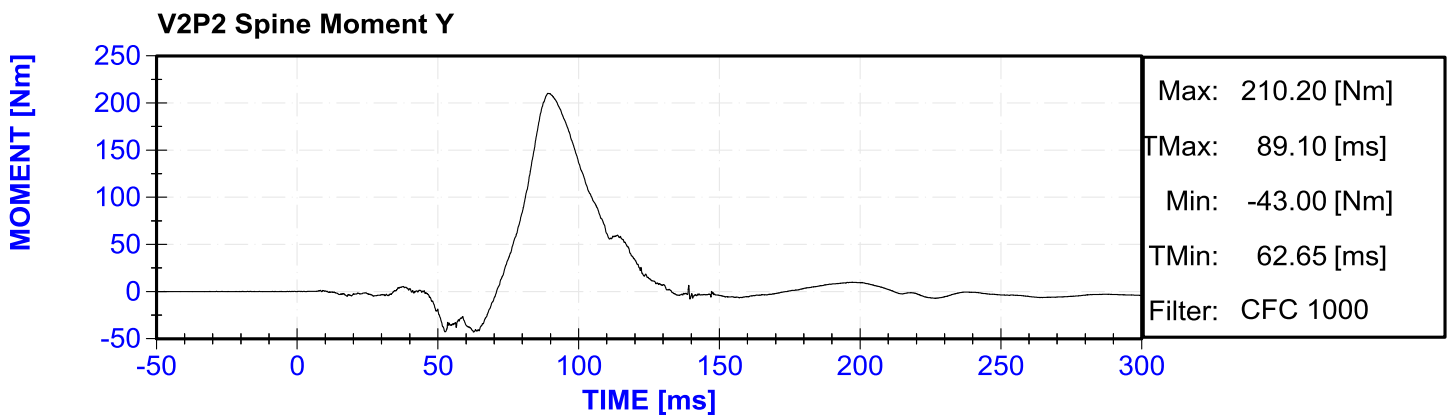
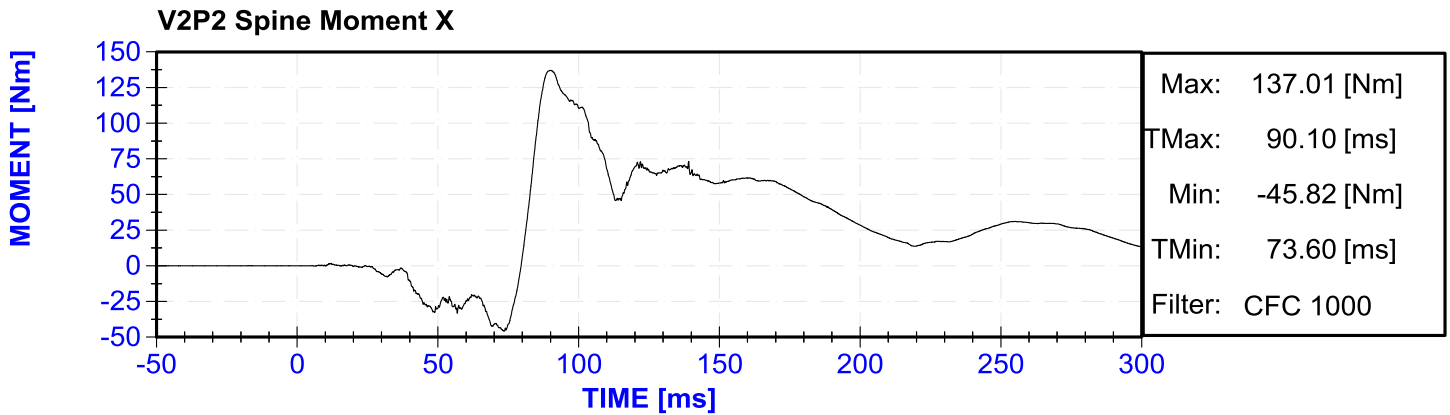


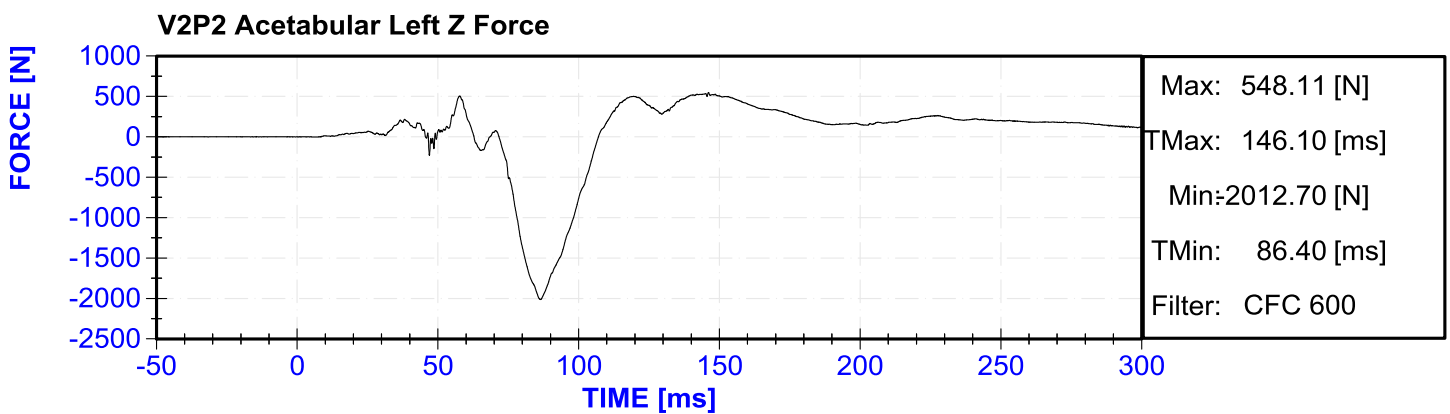
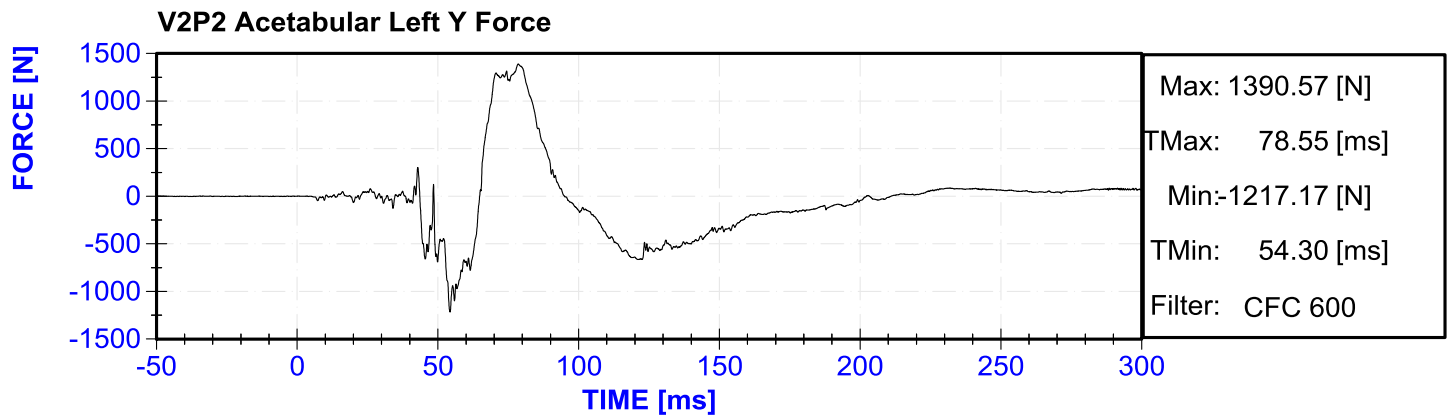
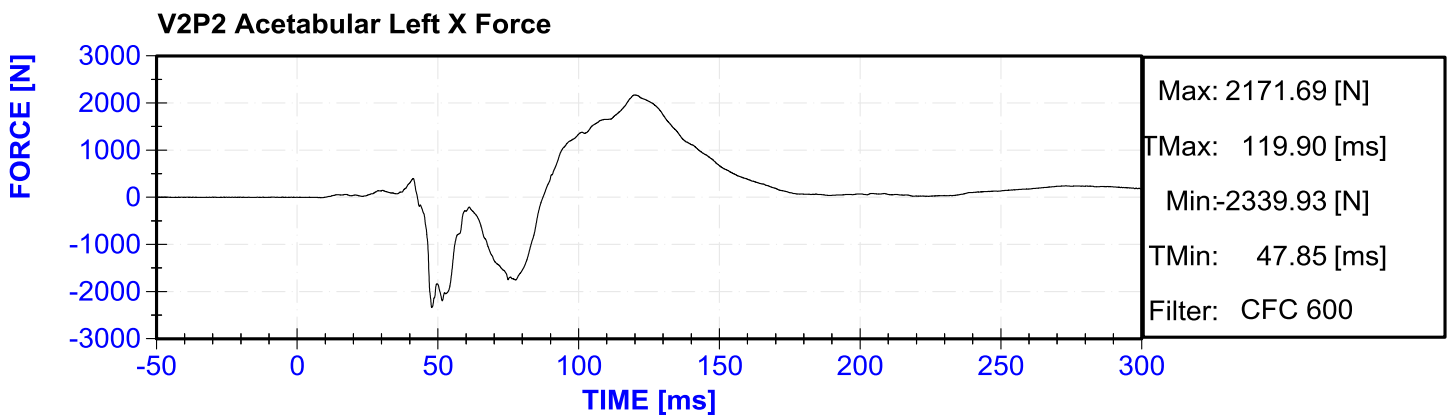
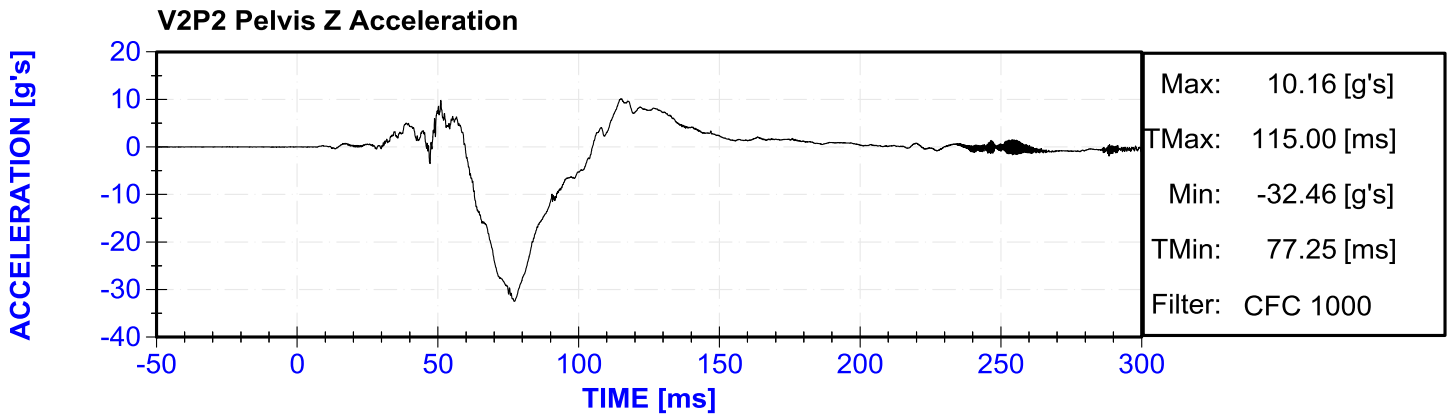
V2P2 Spine Force Y

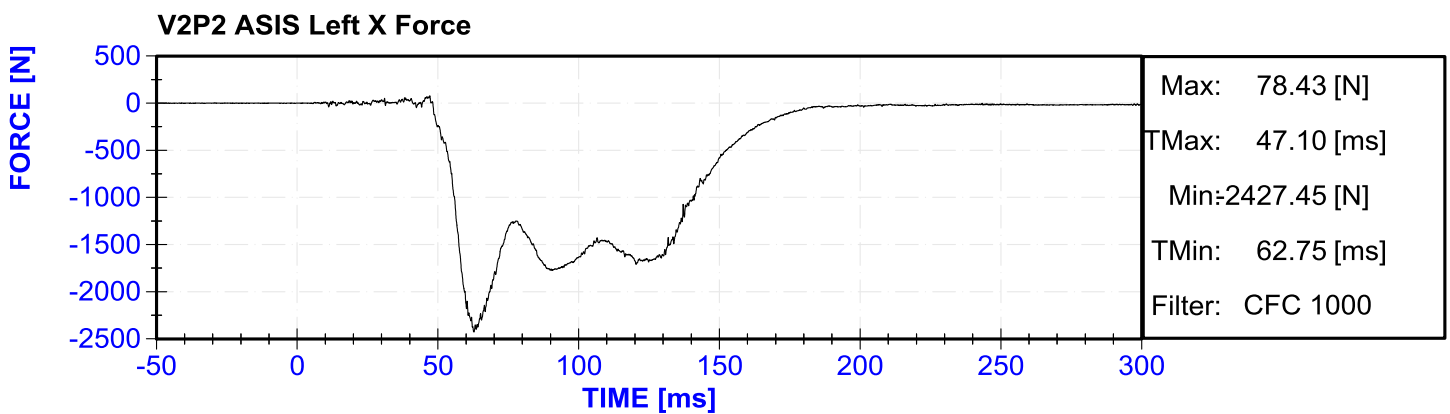
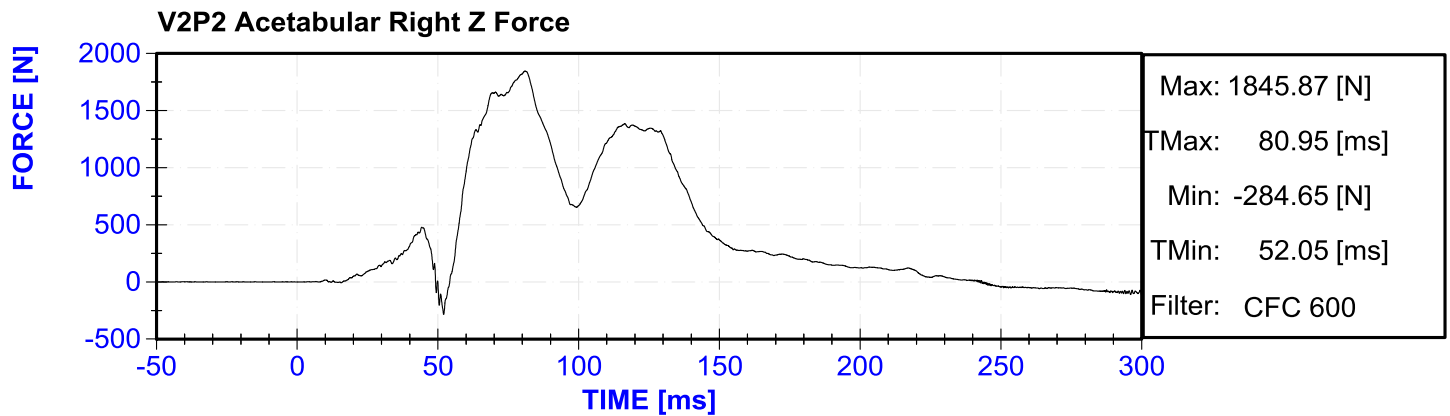
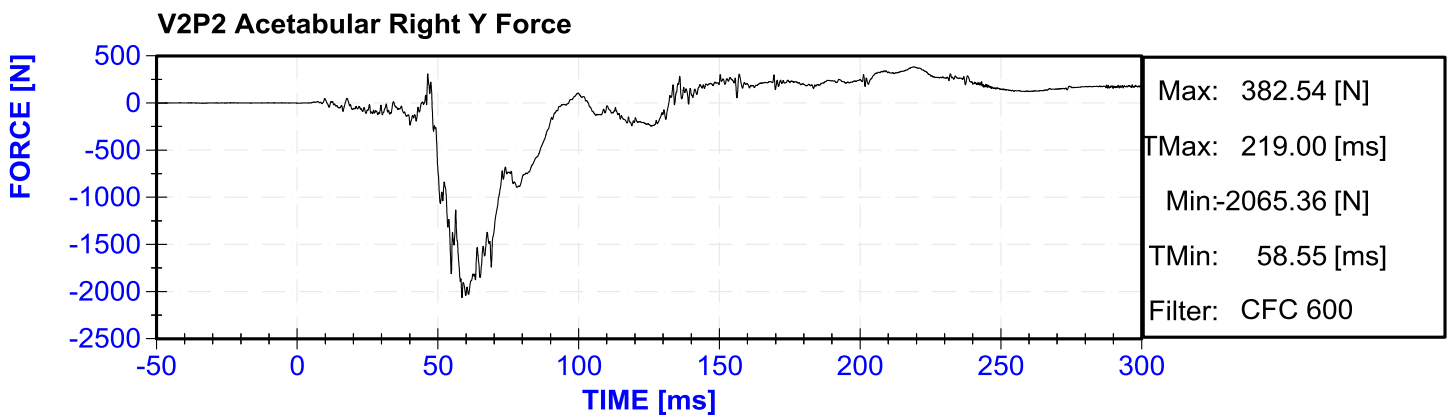
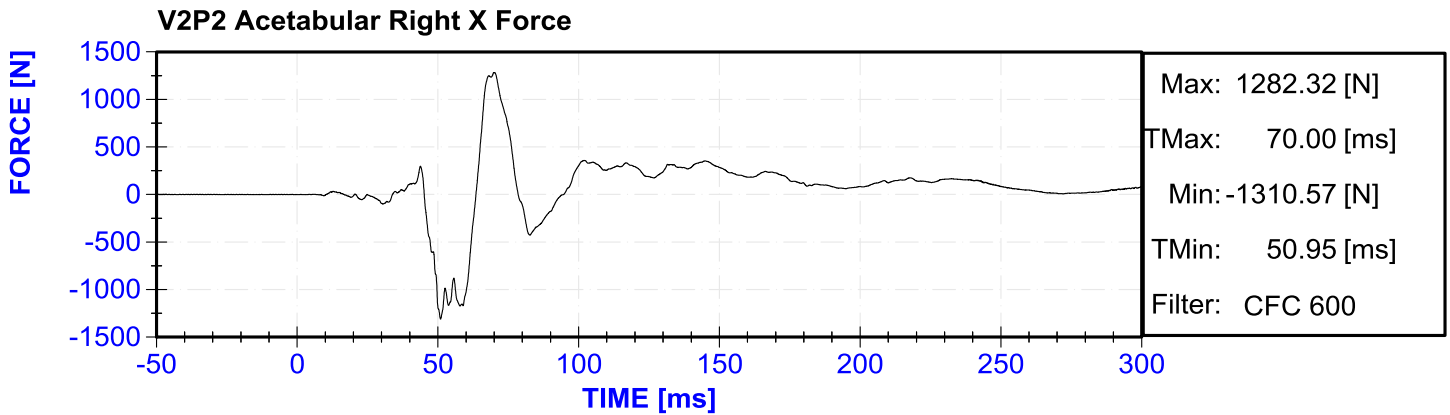


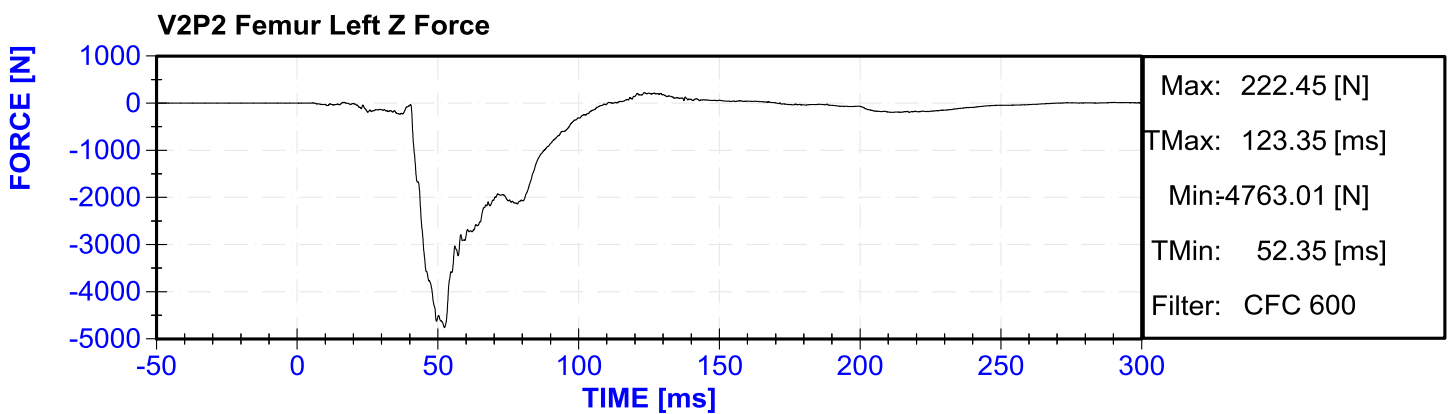
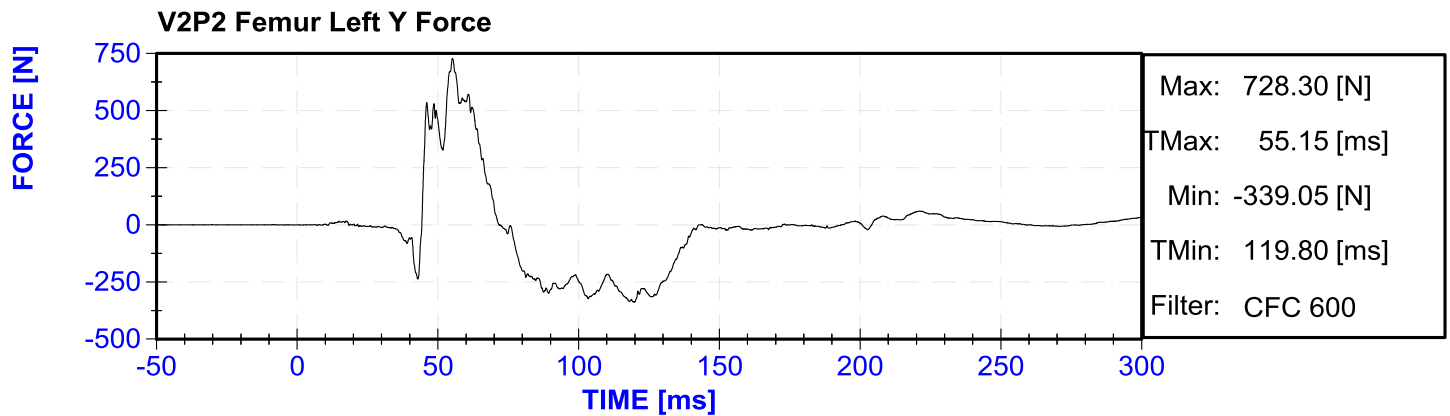
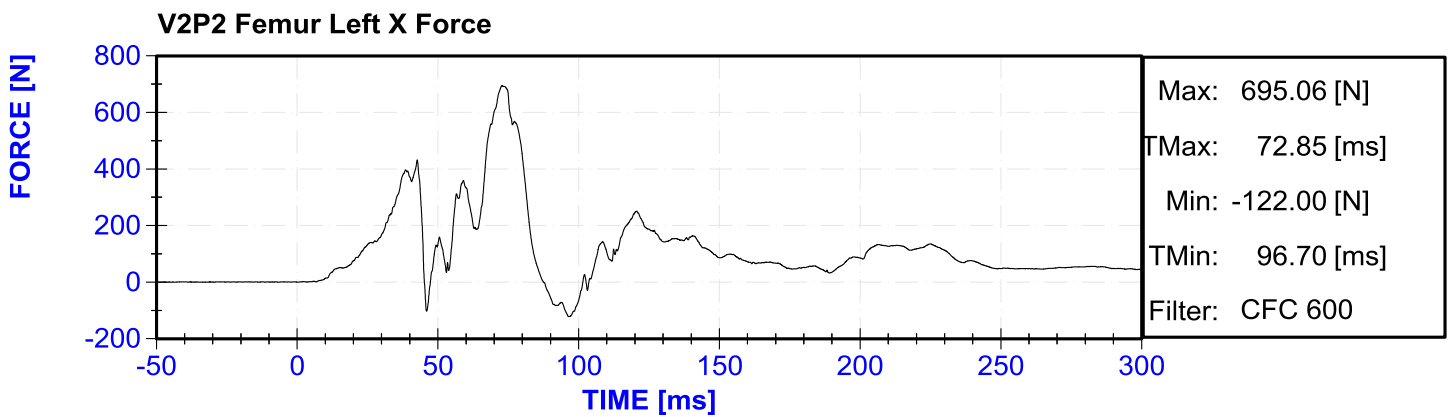
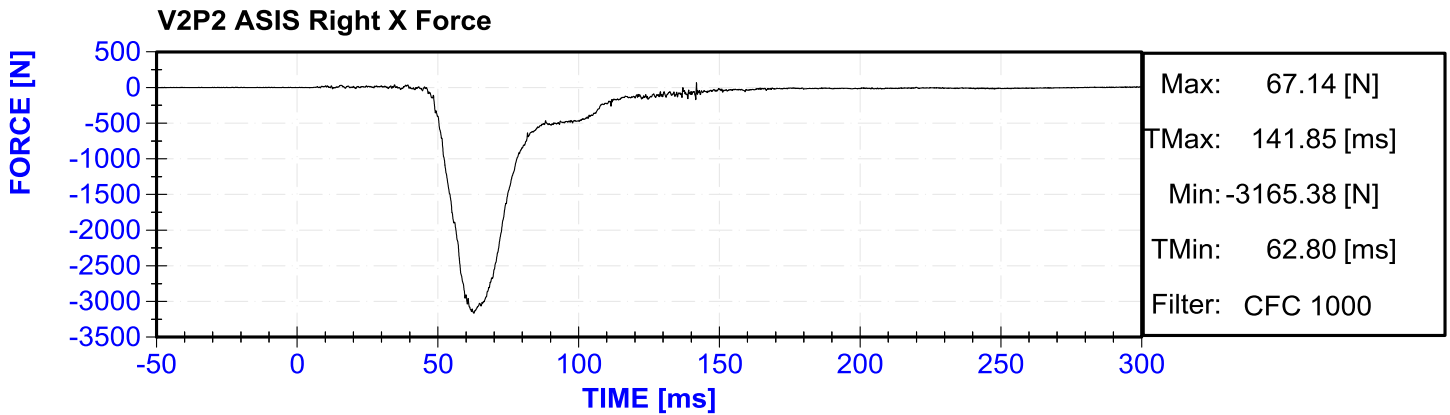
V2P2 Spine Force Z

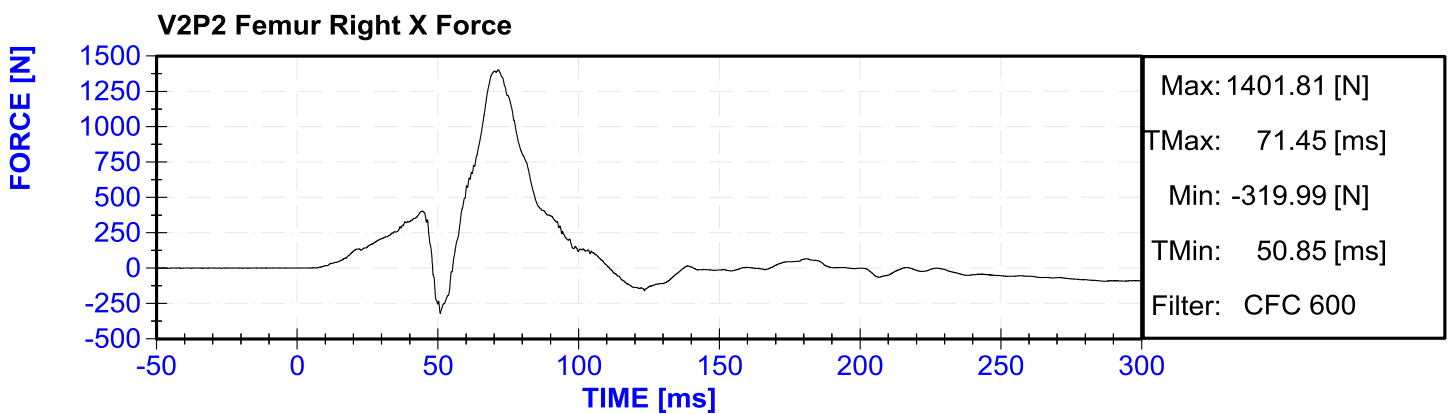
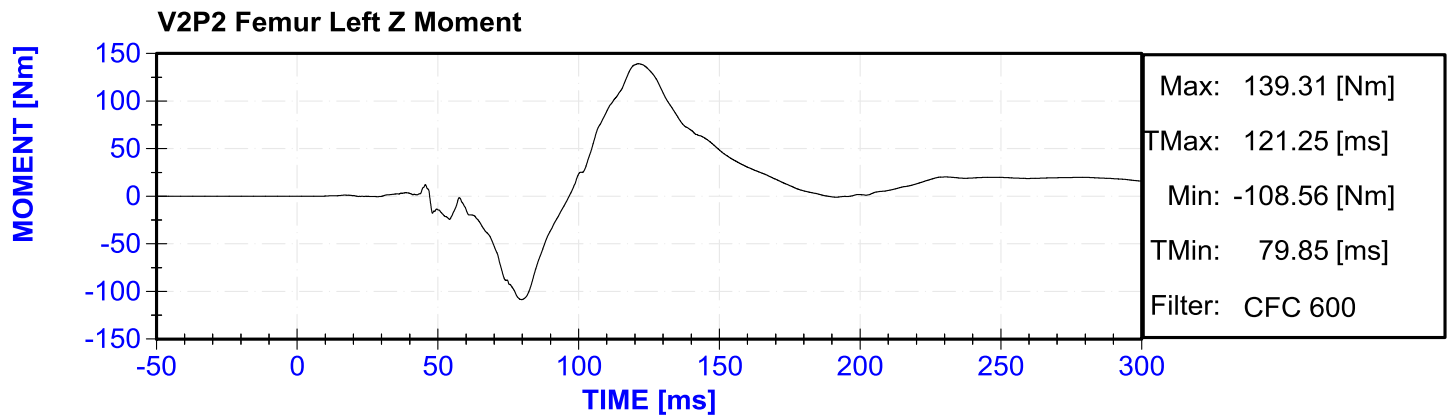
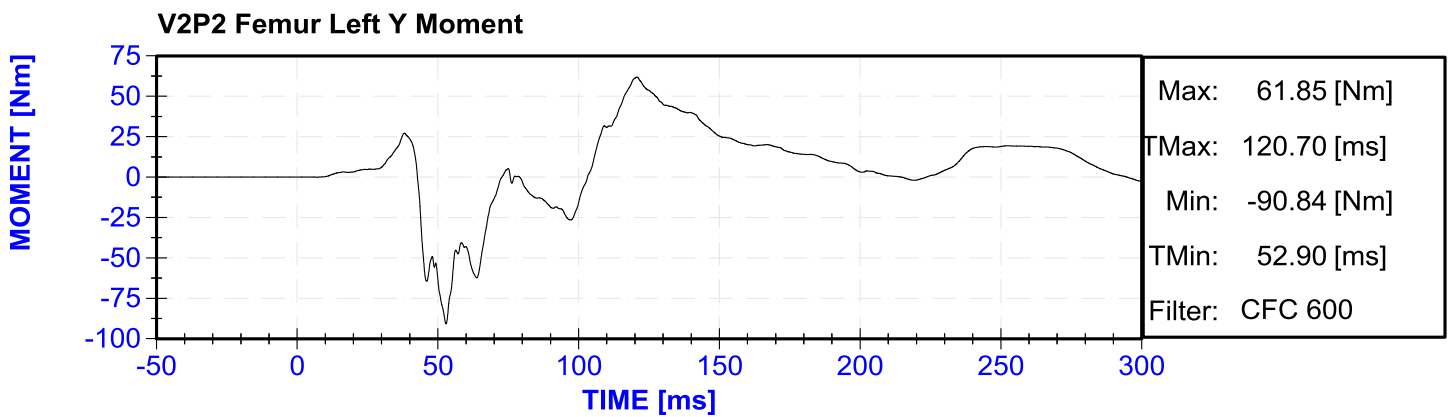
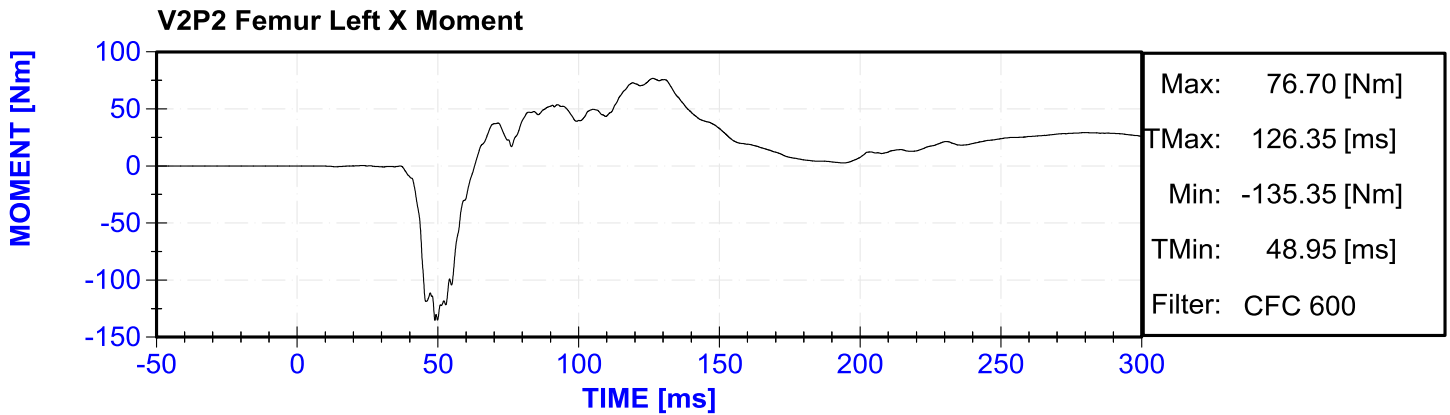


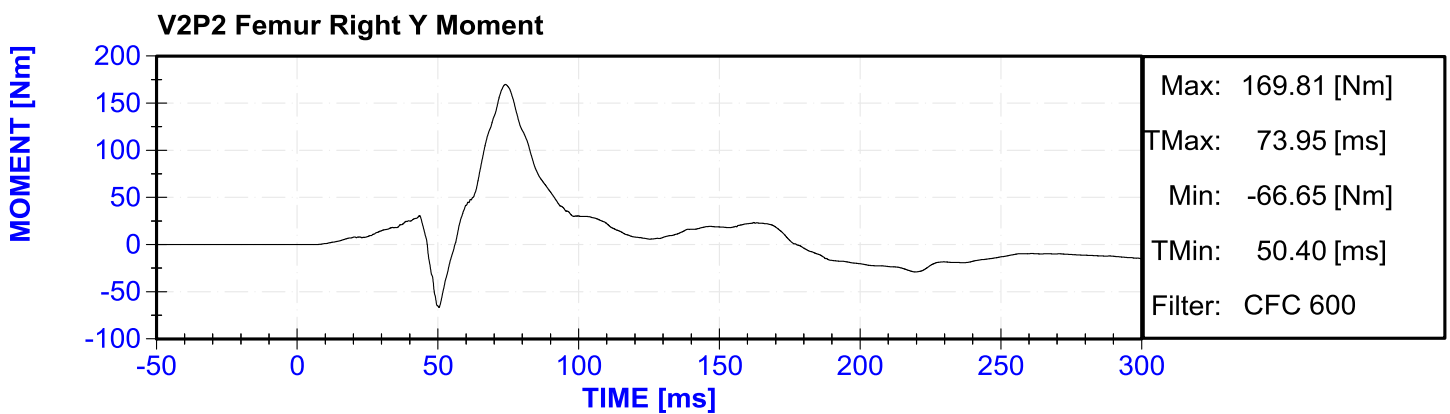
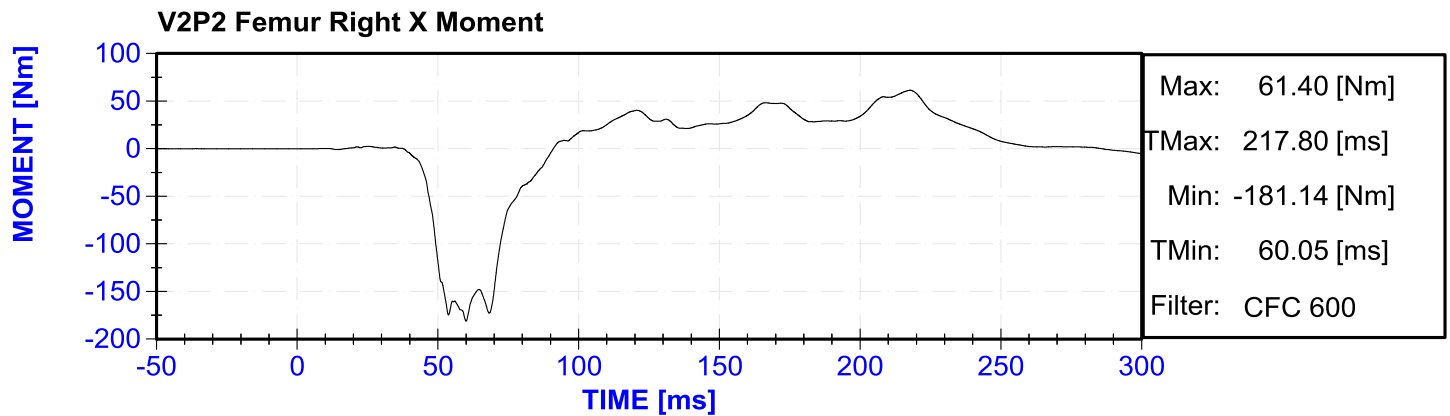
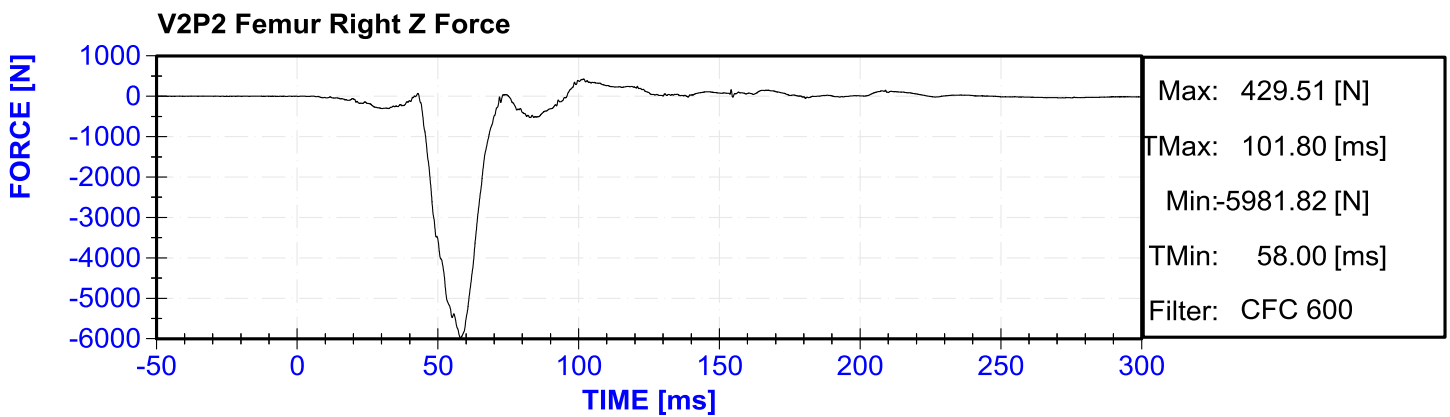
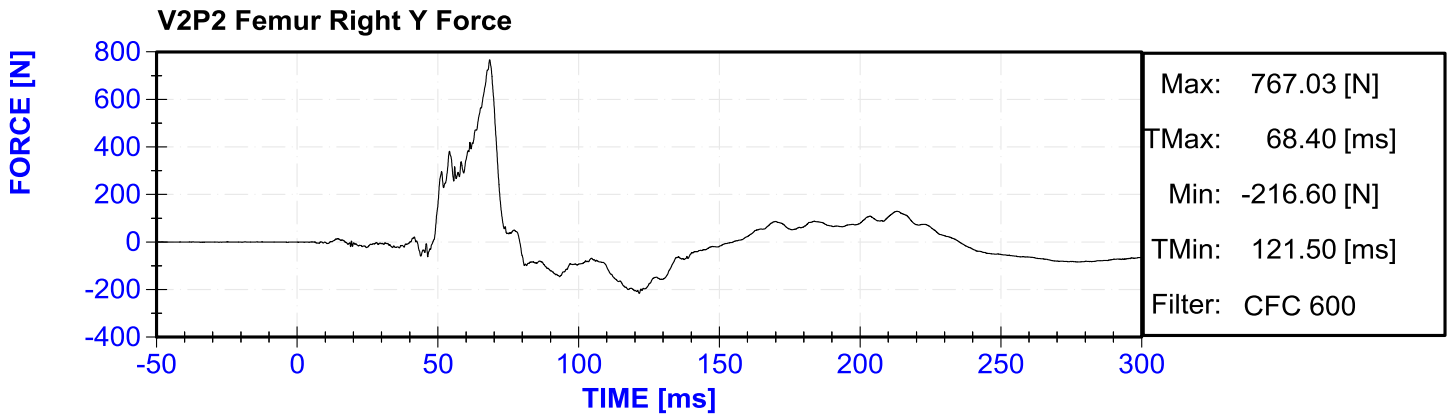


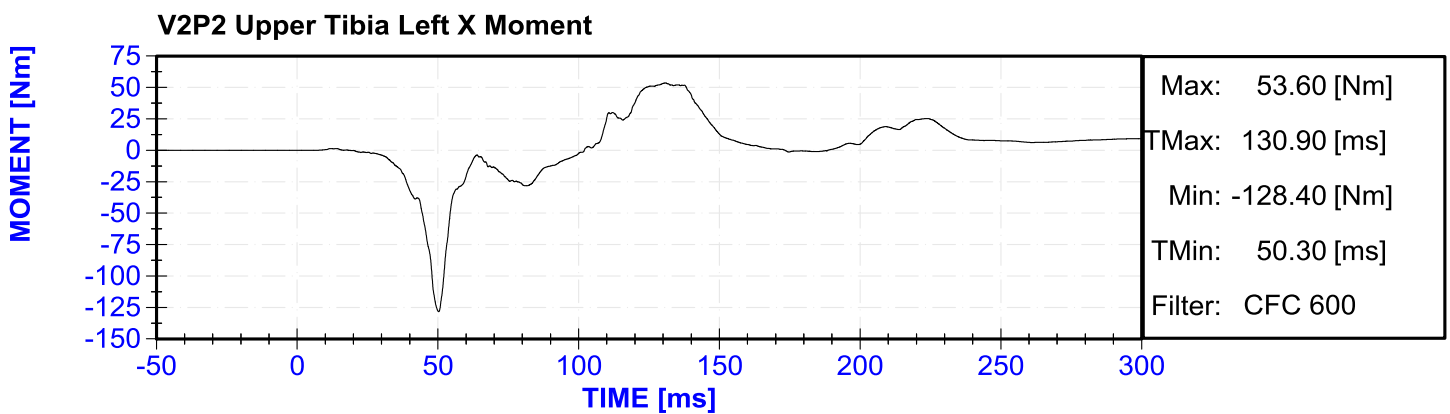
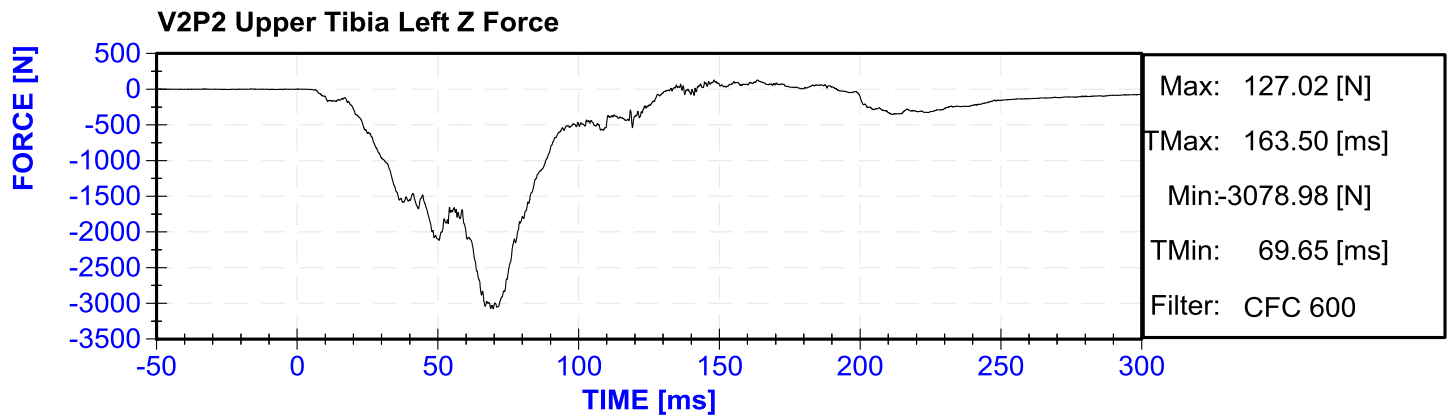
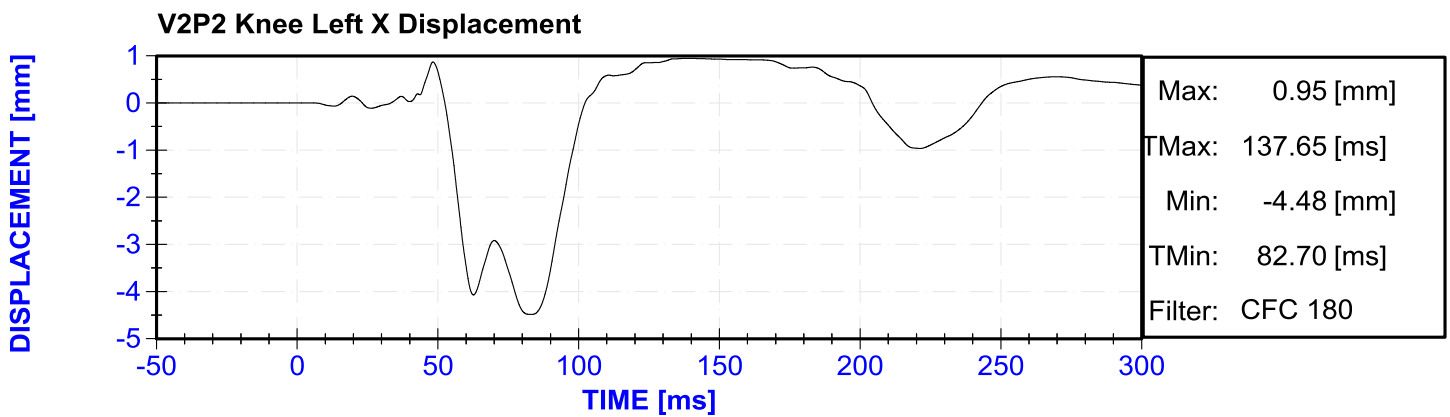
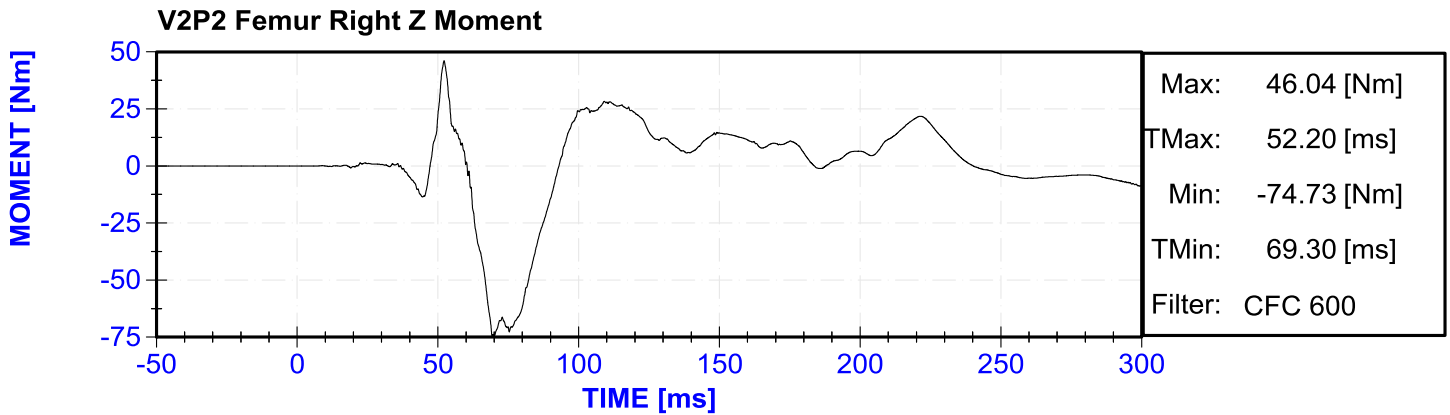


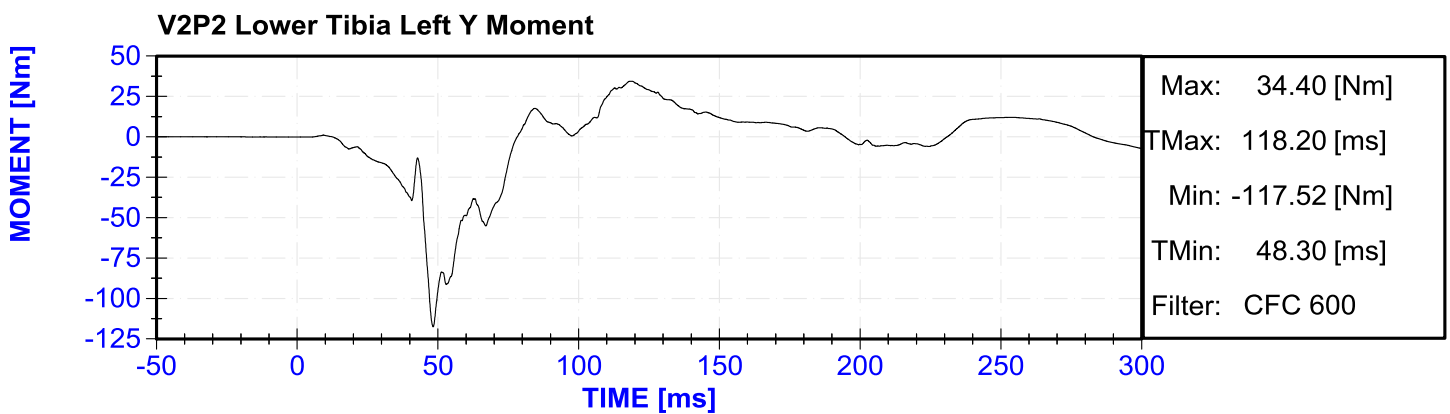
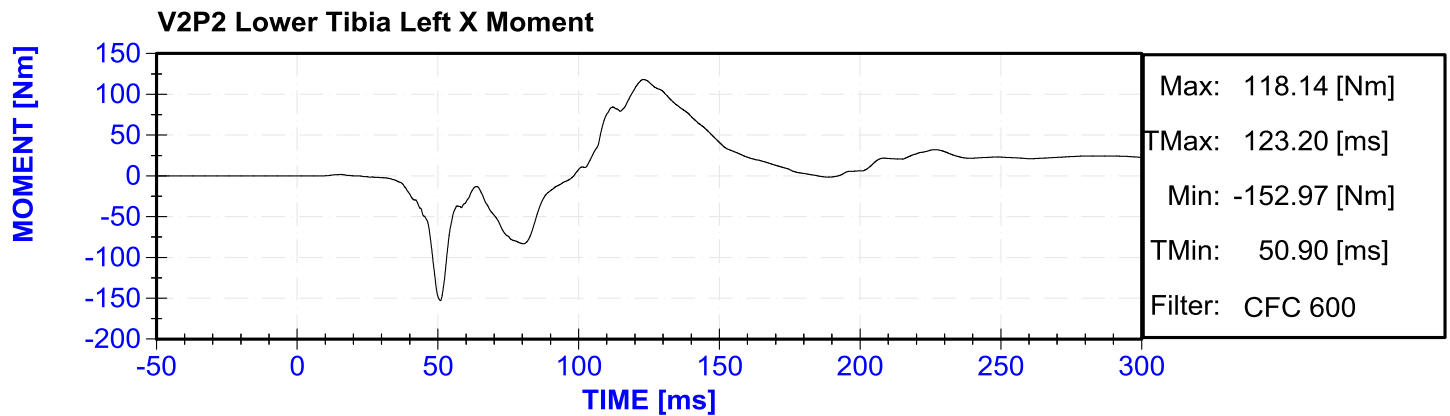
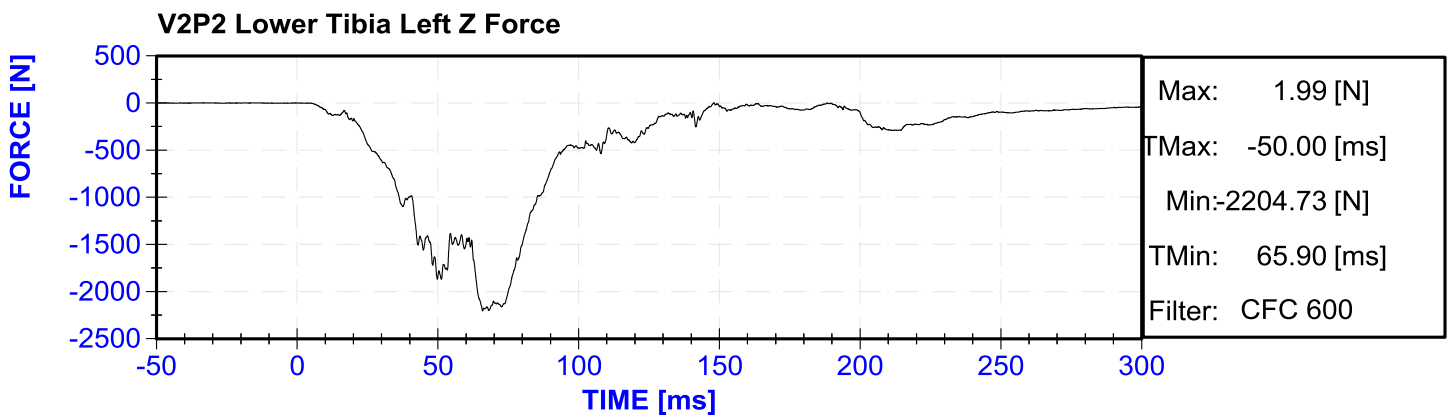
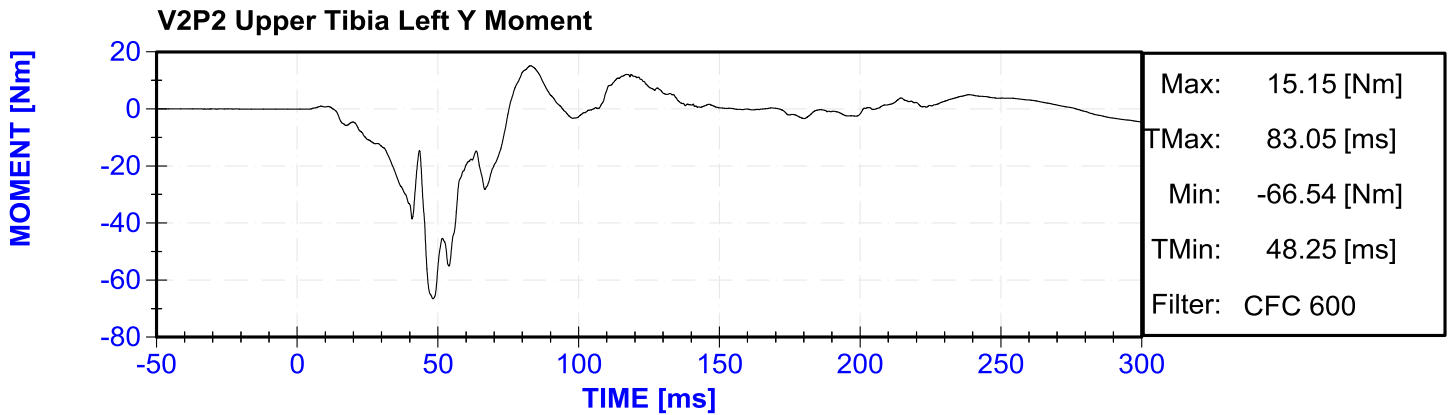




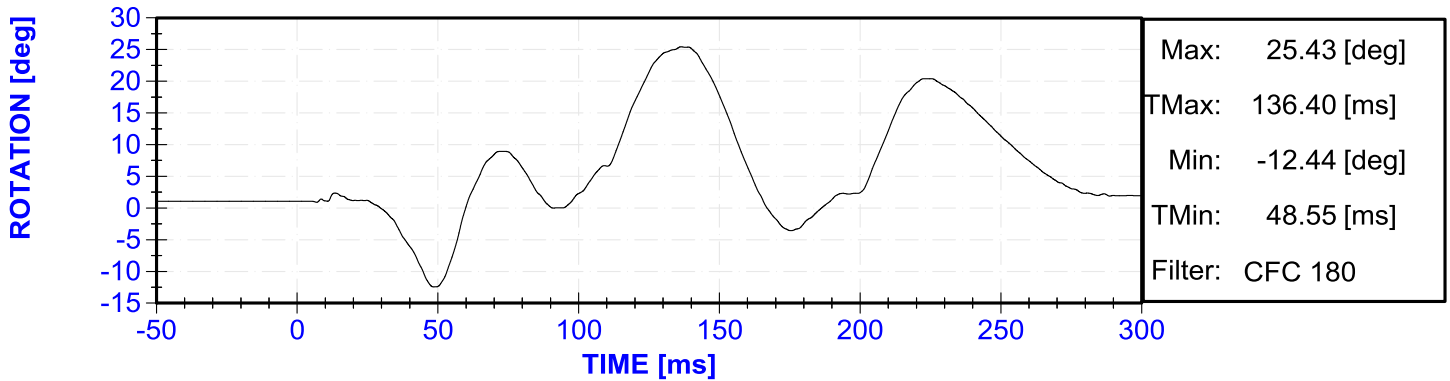




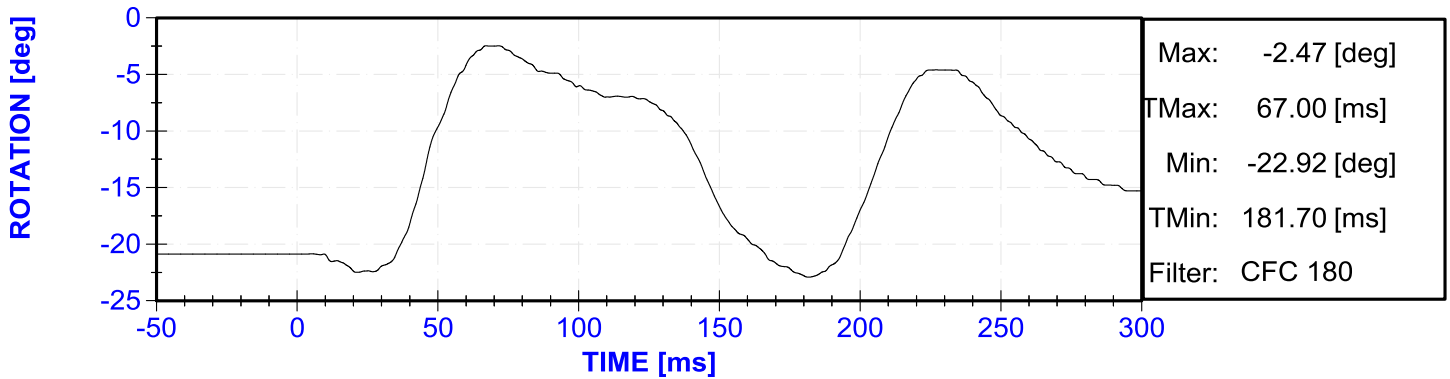




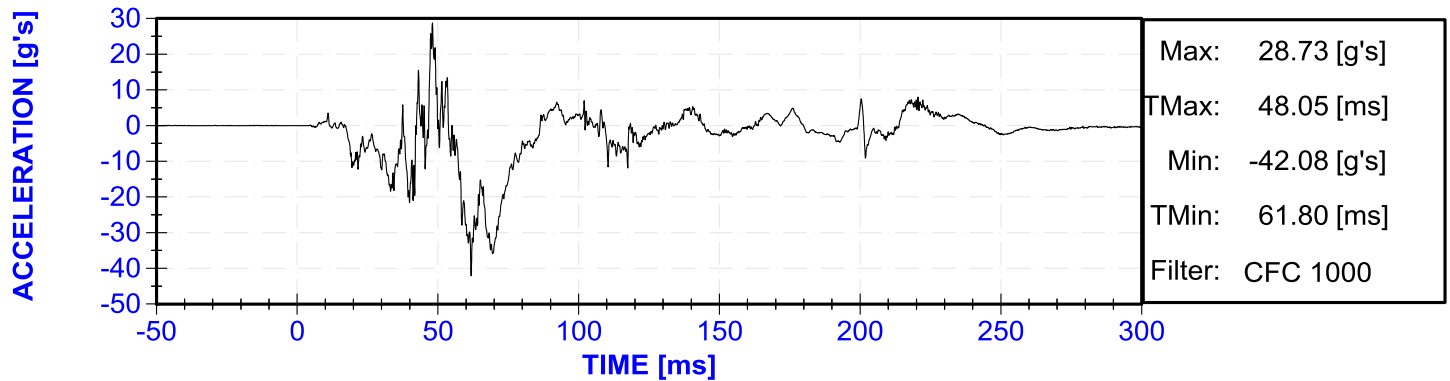
V2P2 Ankle Left X Rotation



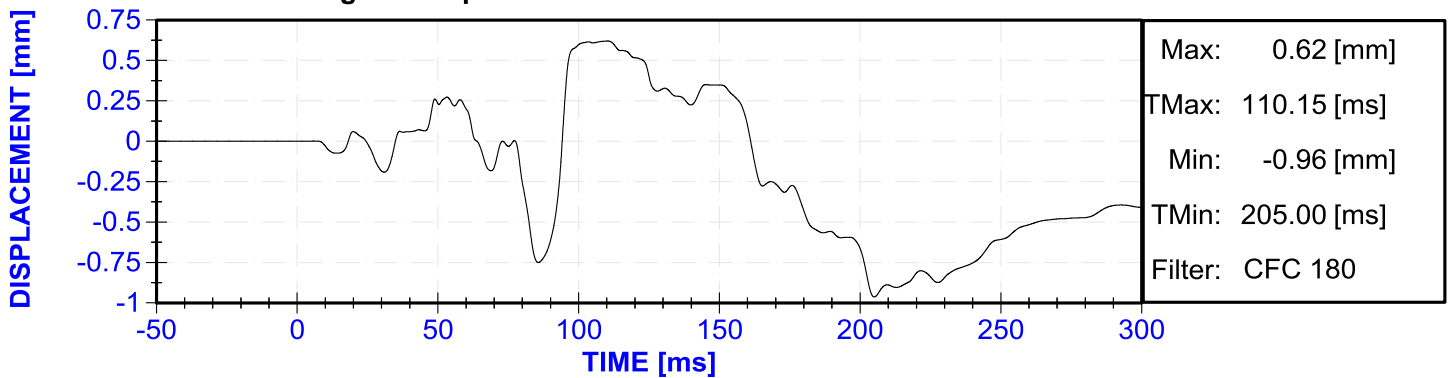
V2P2 Ankle Left Y Rotation

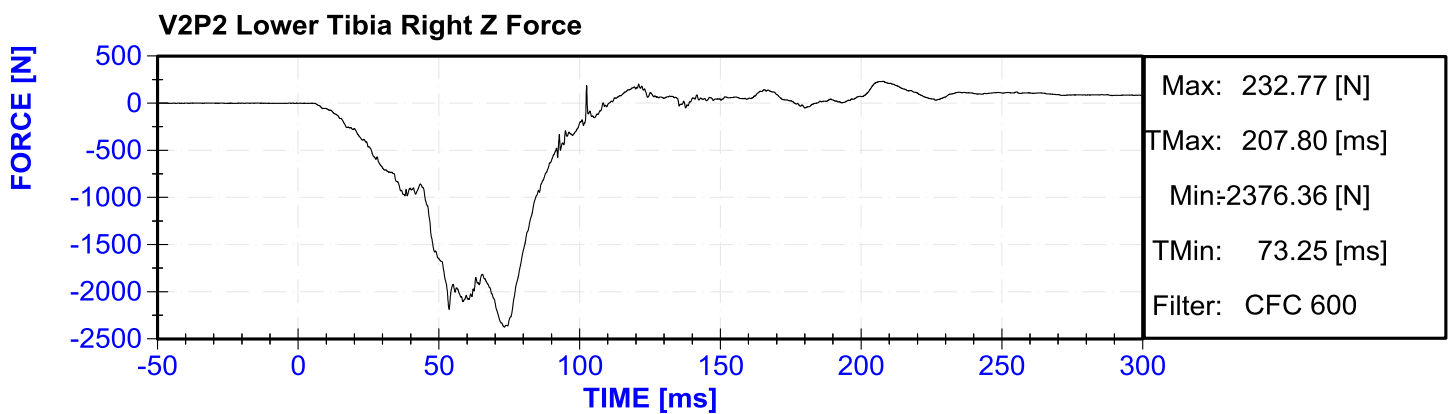
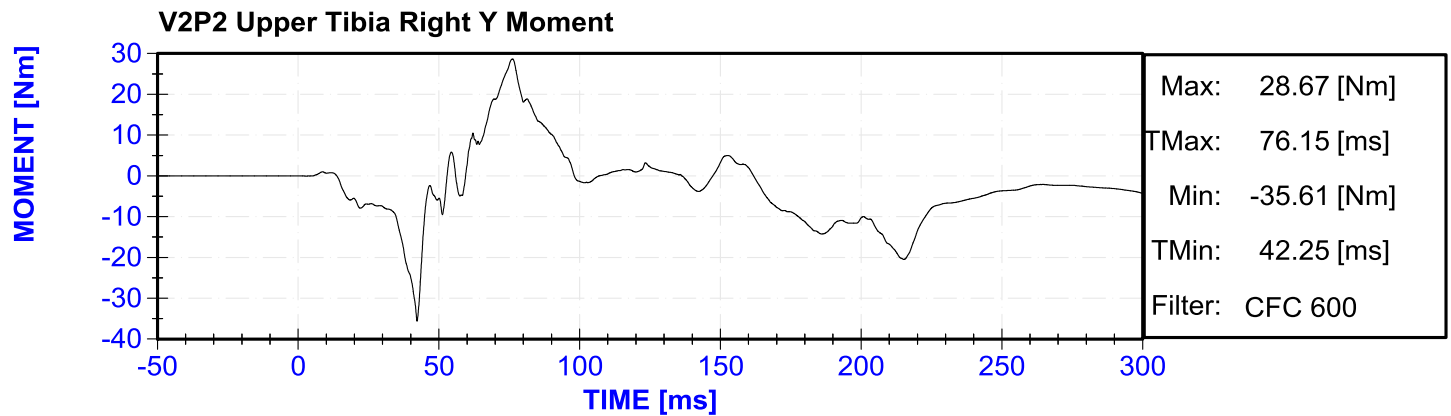
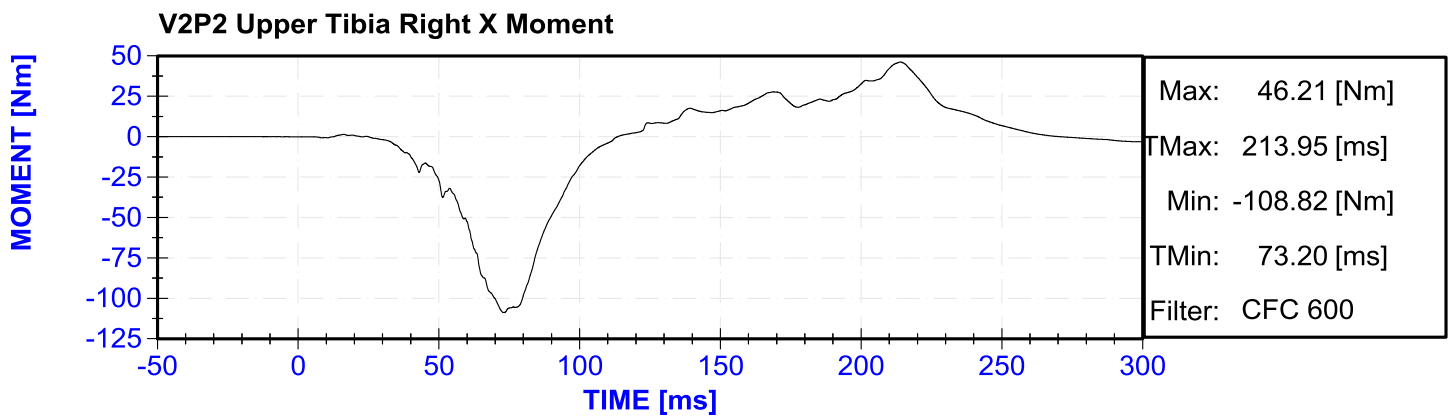
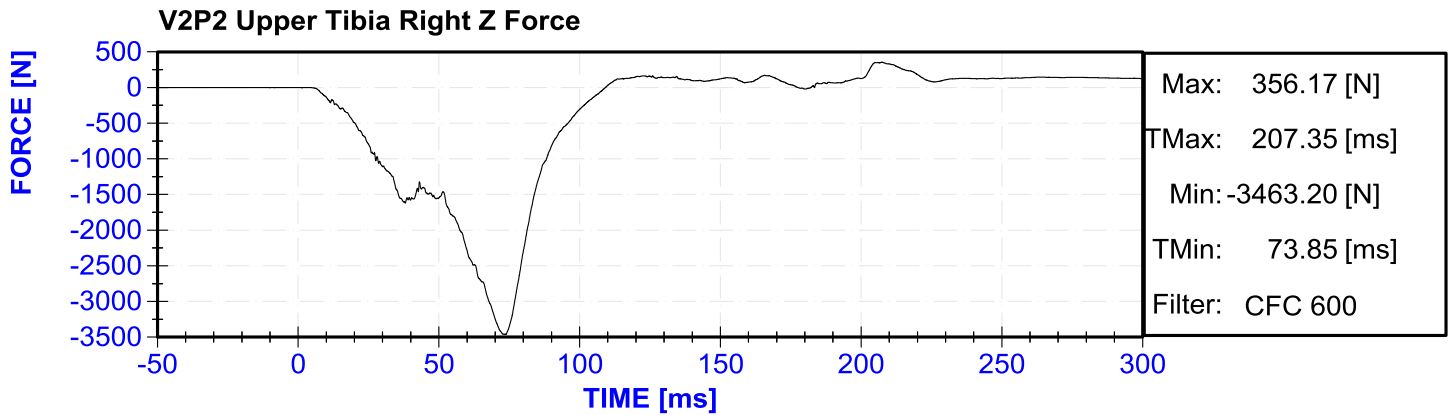


V2P2 Foot Left Z Acceleration

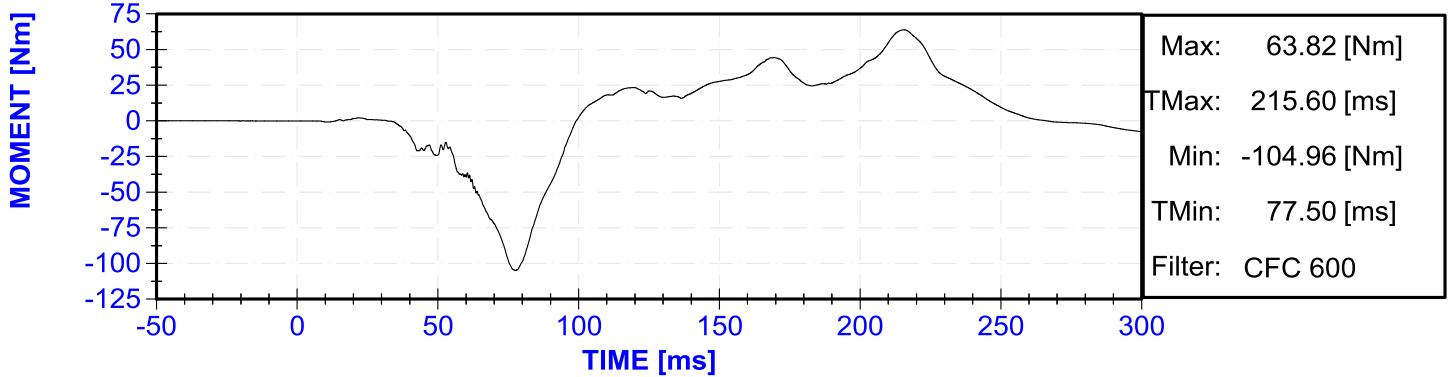


V2P2 Knee Right X Displacement

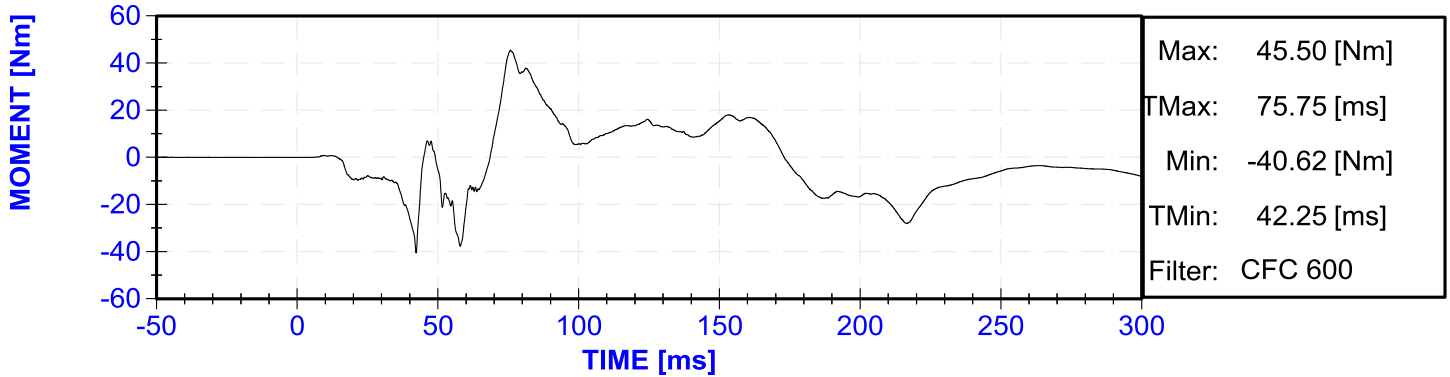




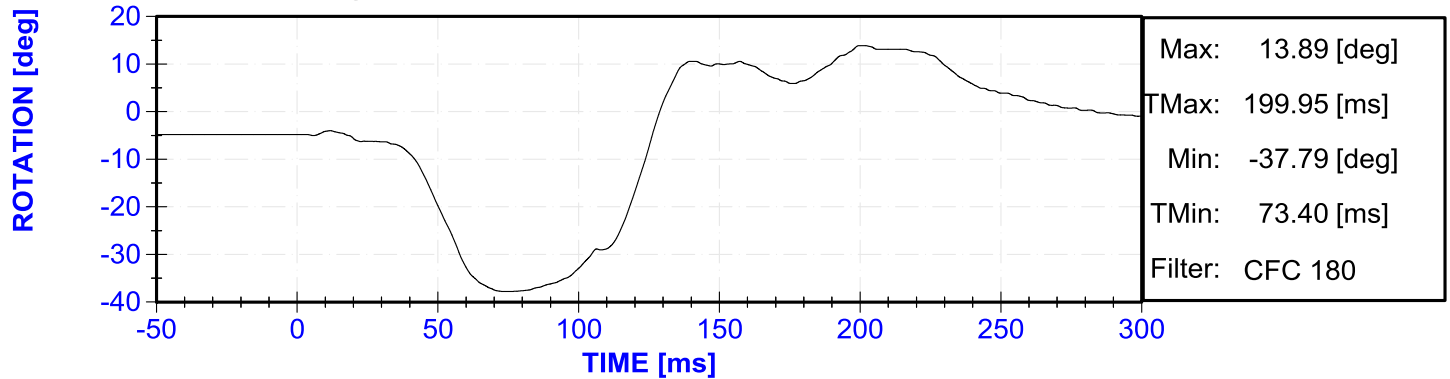
V2P2 Lower Tibia Right X Moment



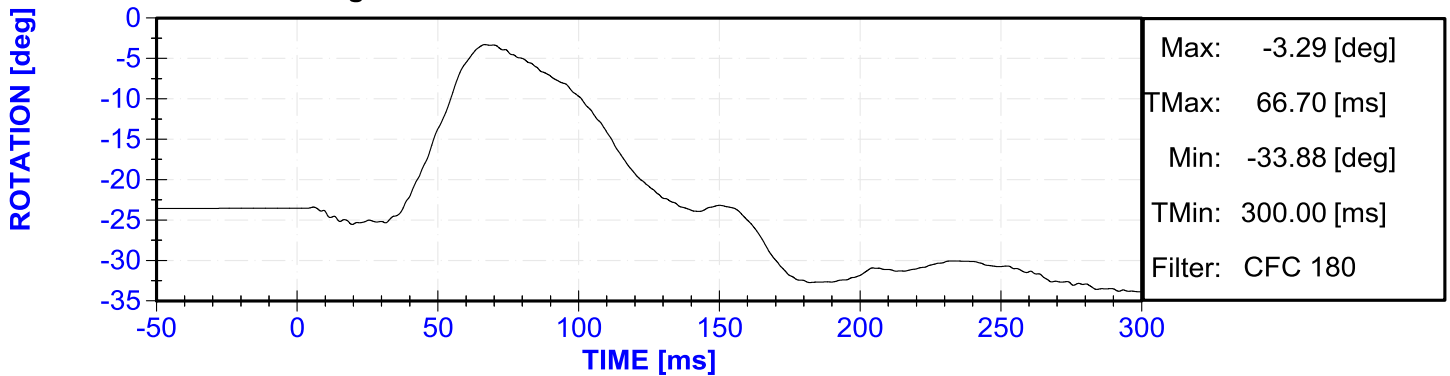
V2P2 Lower Tibia Right Y Moment



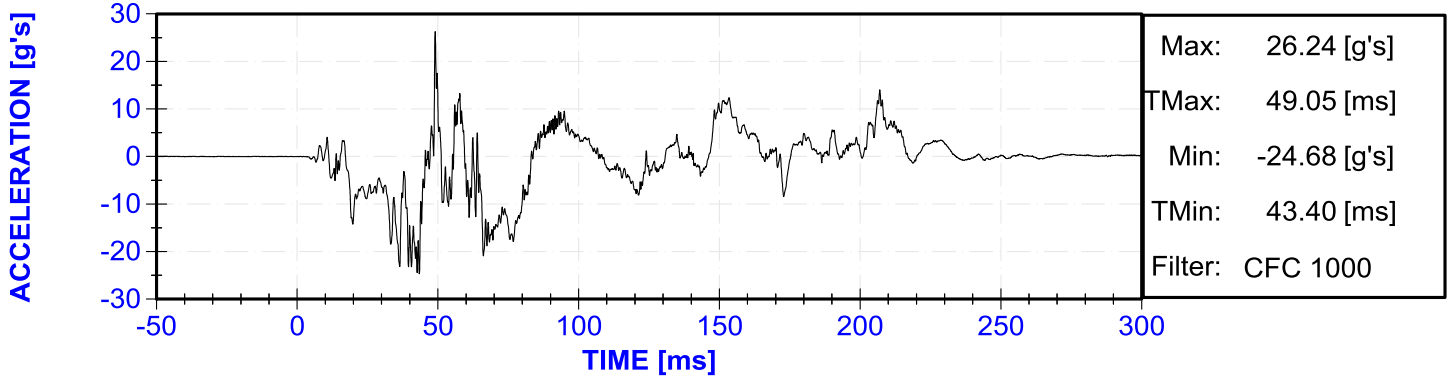
V2P2 Ankle Right X Rotation



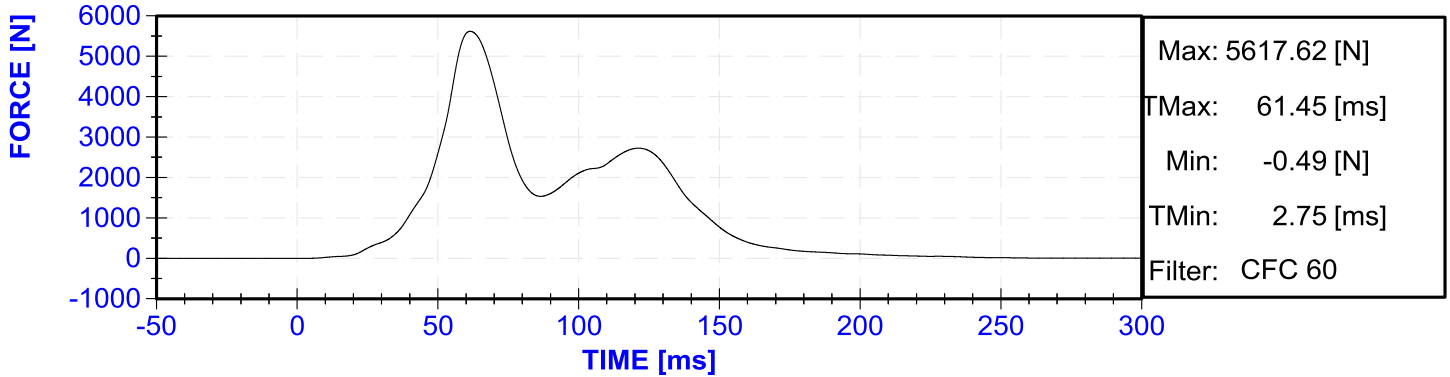
V2P2 Ankle Right Y Rotation



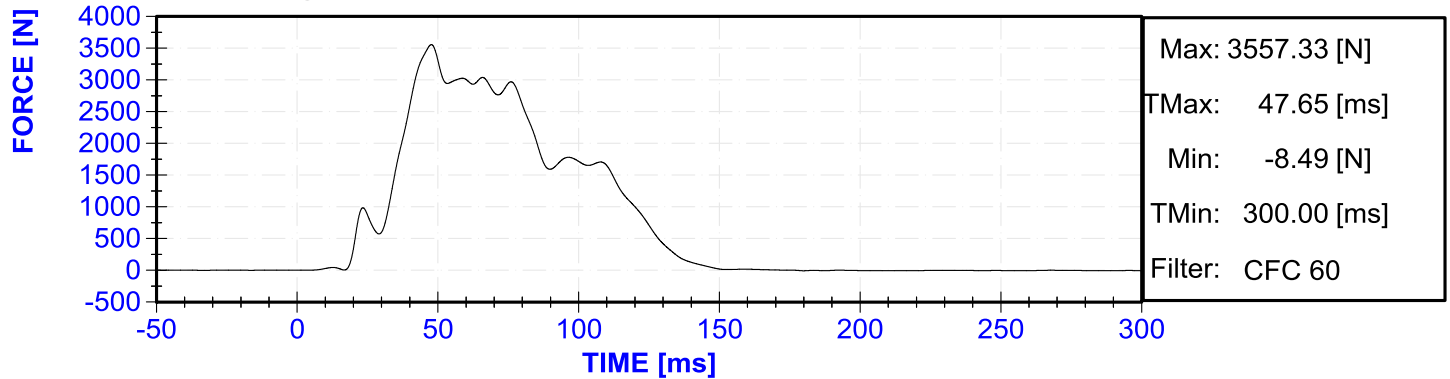
V2P2 Foot Right Z Acceleration



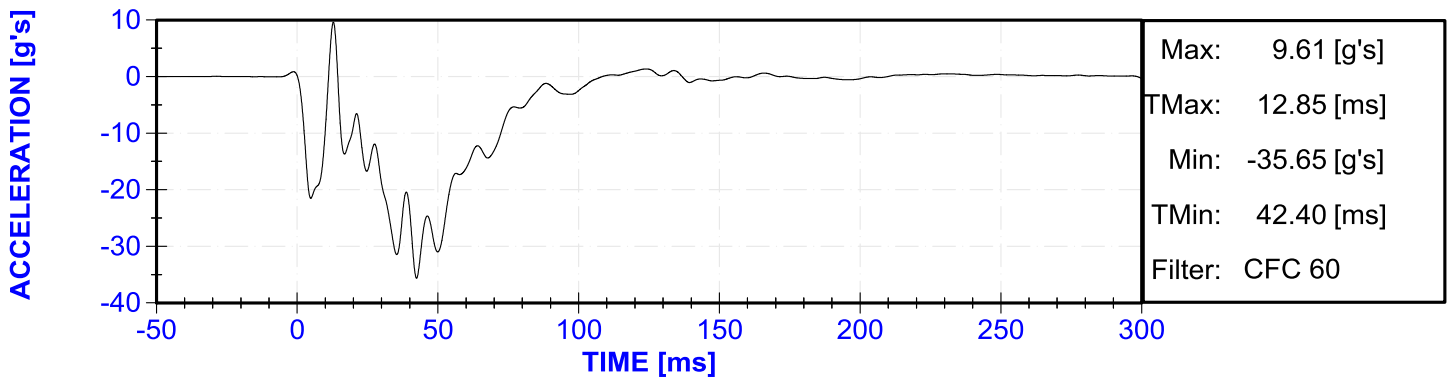
V2 Passenger Lap Belt Force



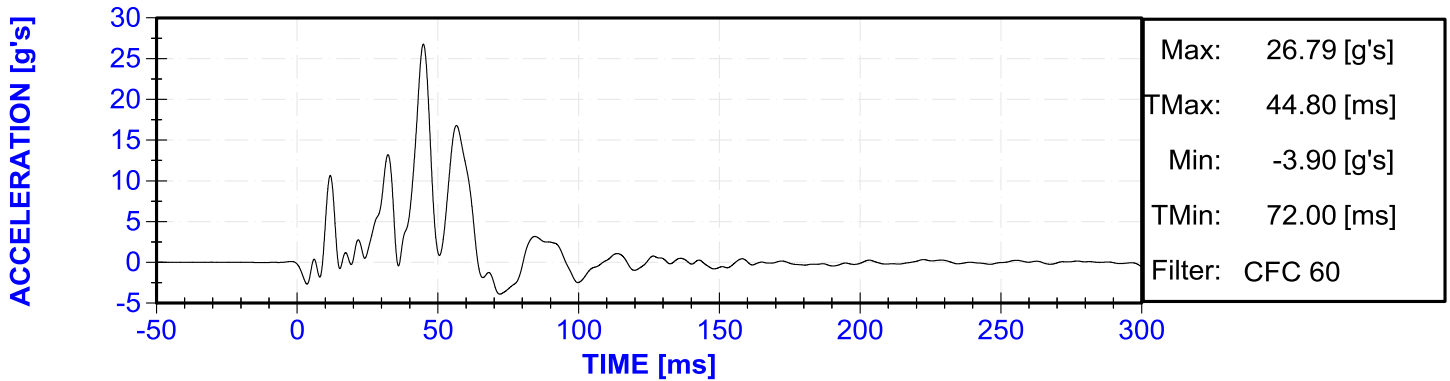
V2 Passenger Shoulder Belt Upper Force



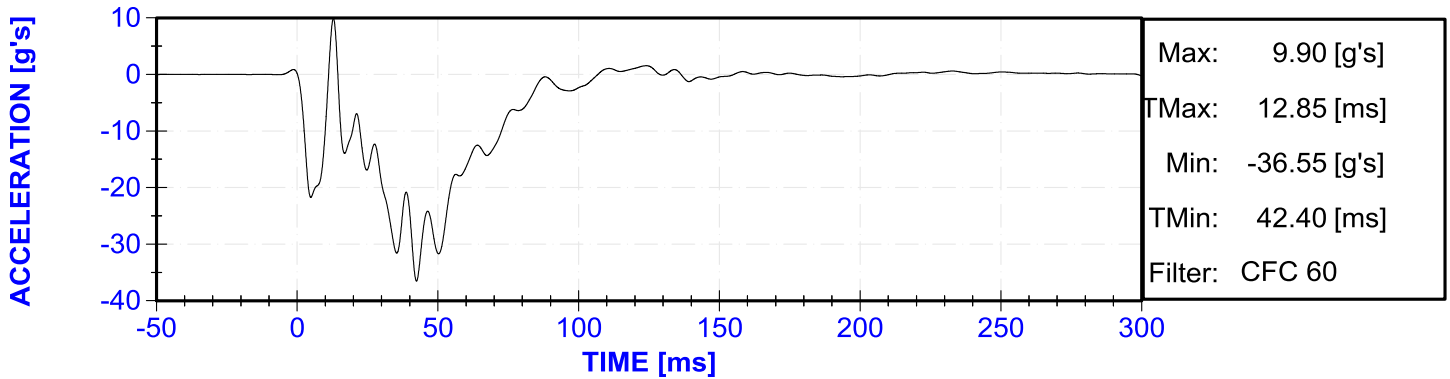
V2 Left Rear Sill X Acceleration



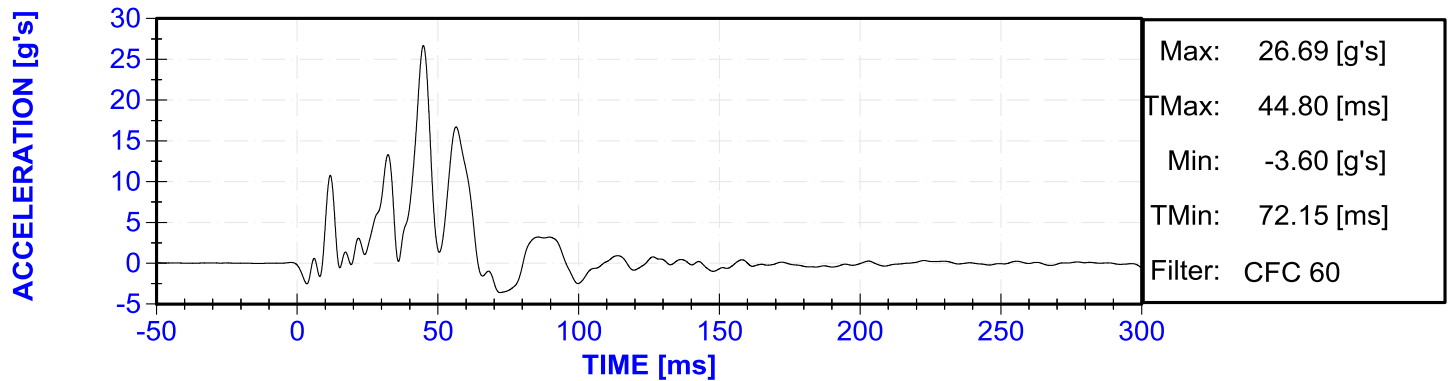
V2 Left Rear Sill Y Acceleration



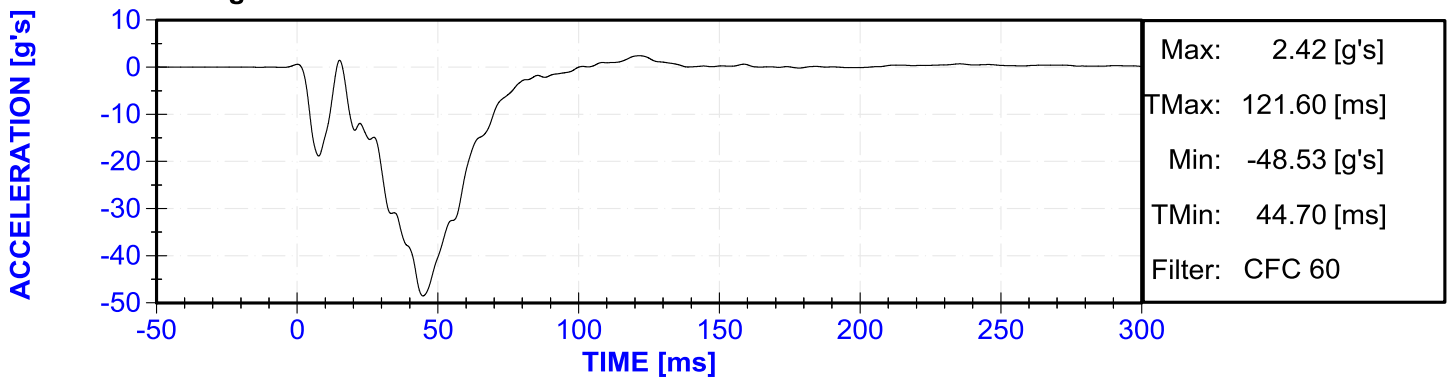
V2 Left Rear Sill Redundant X Acceleration

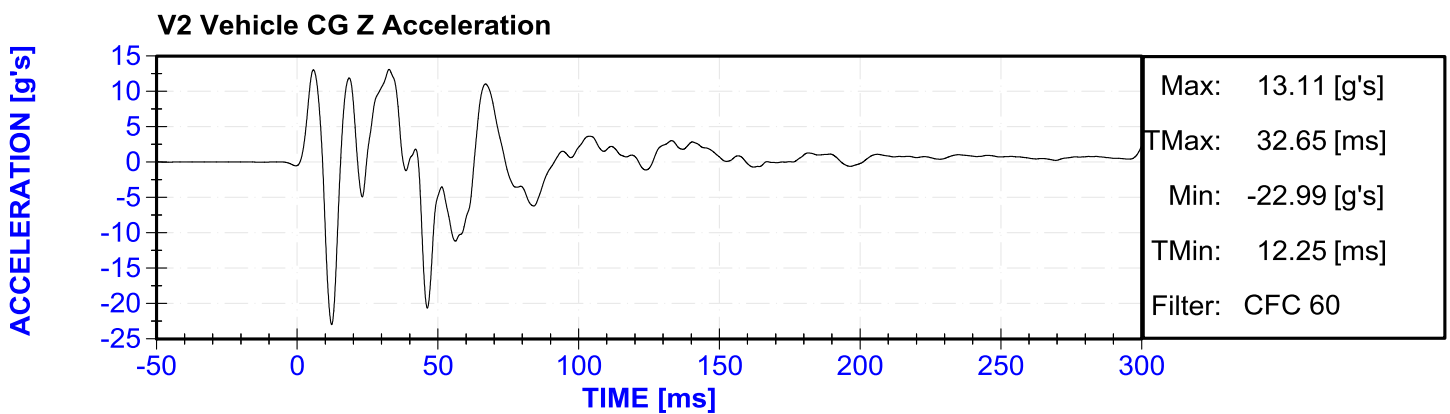
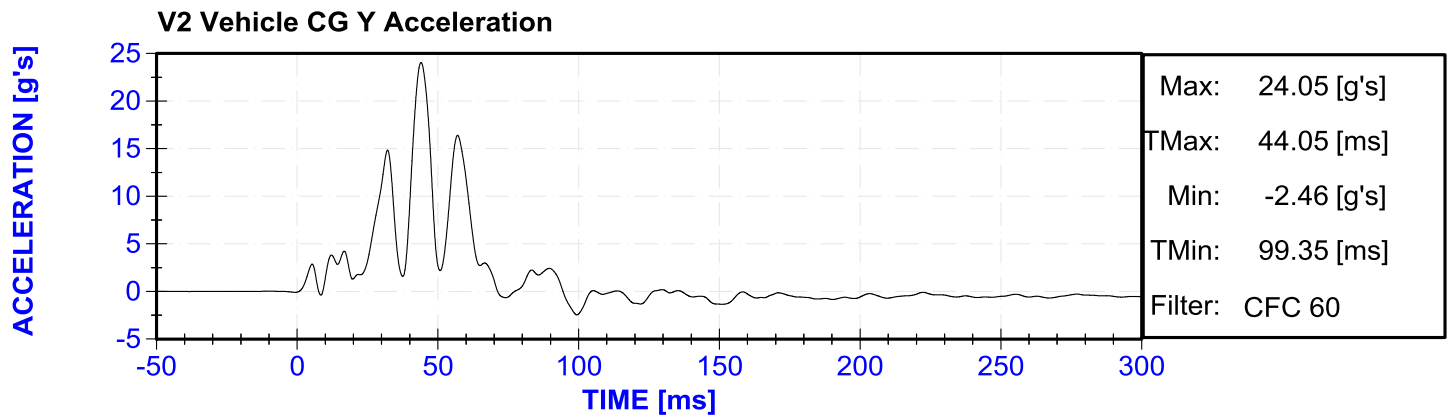
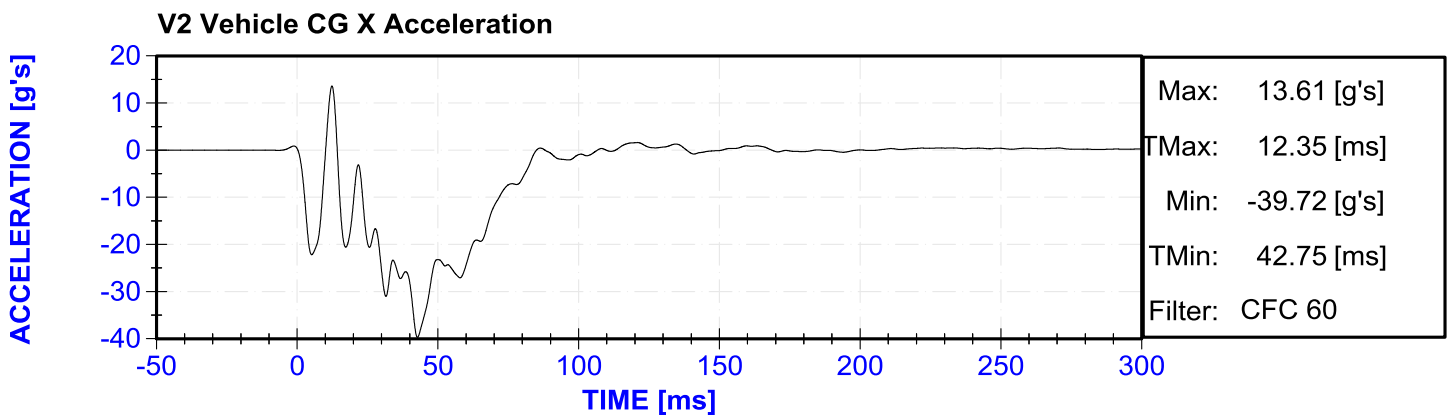
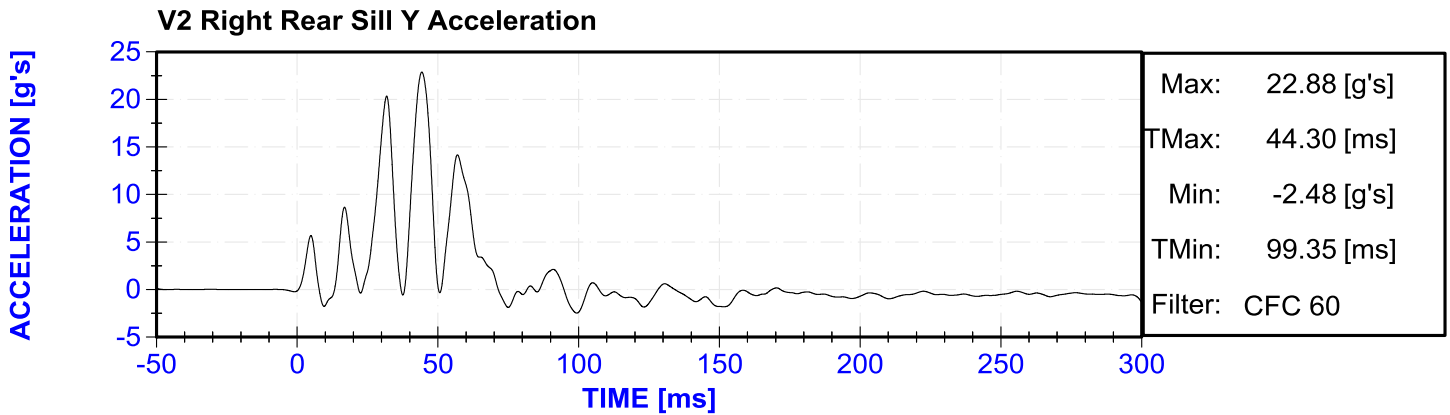


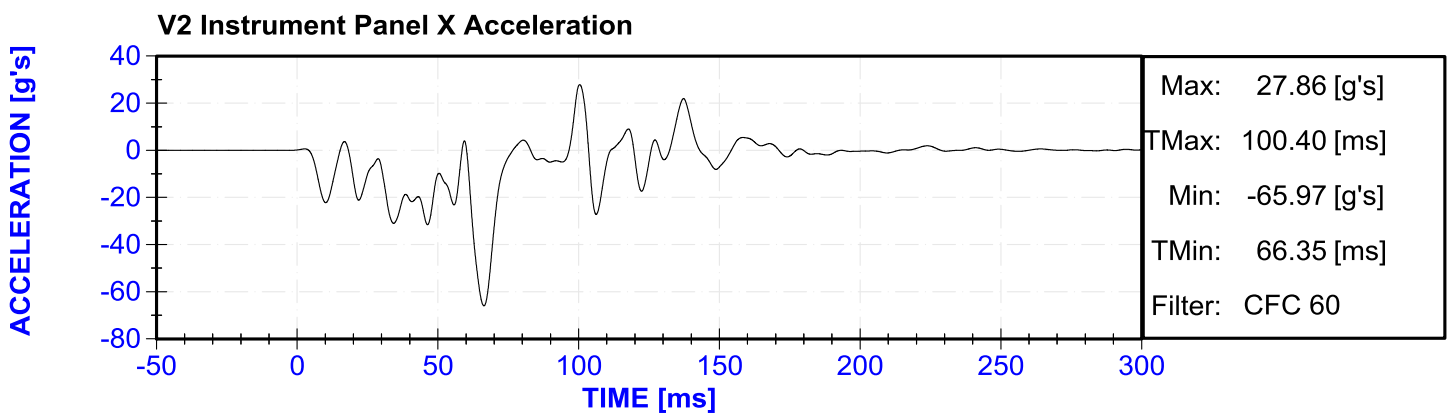
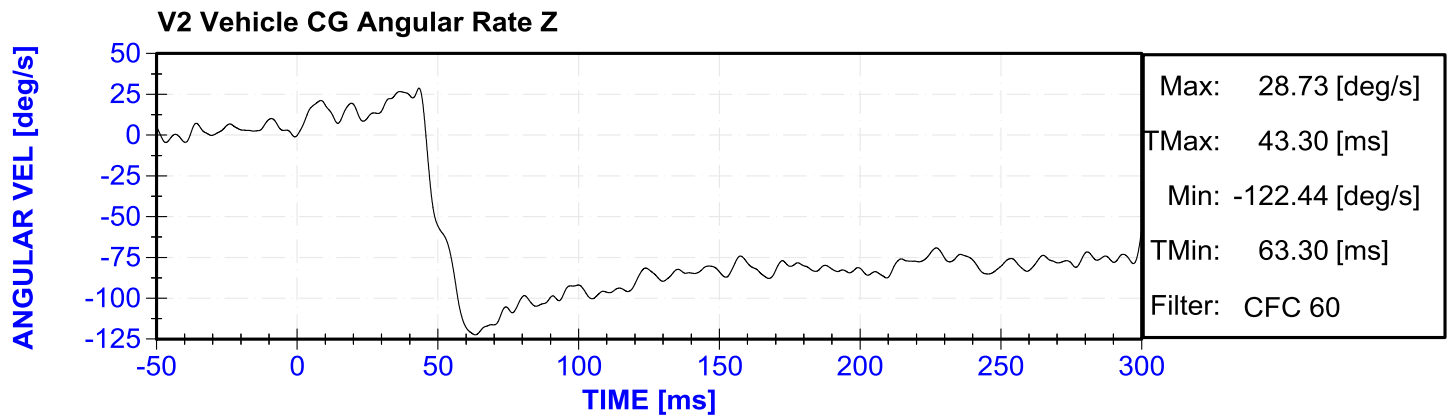
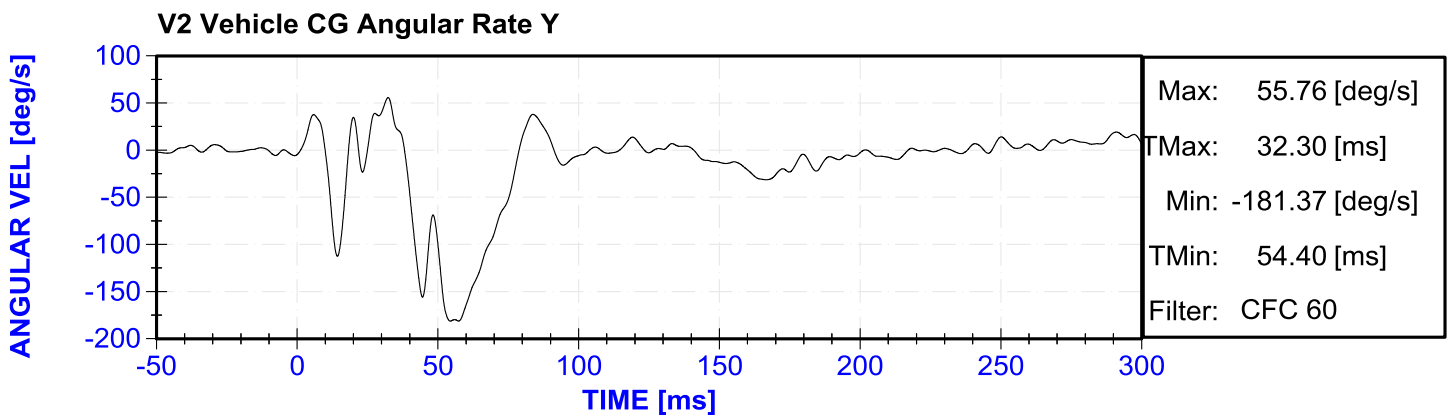
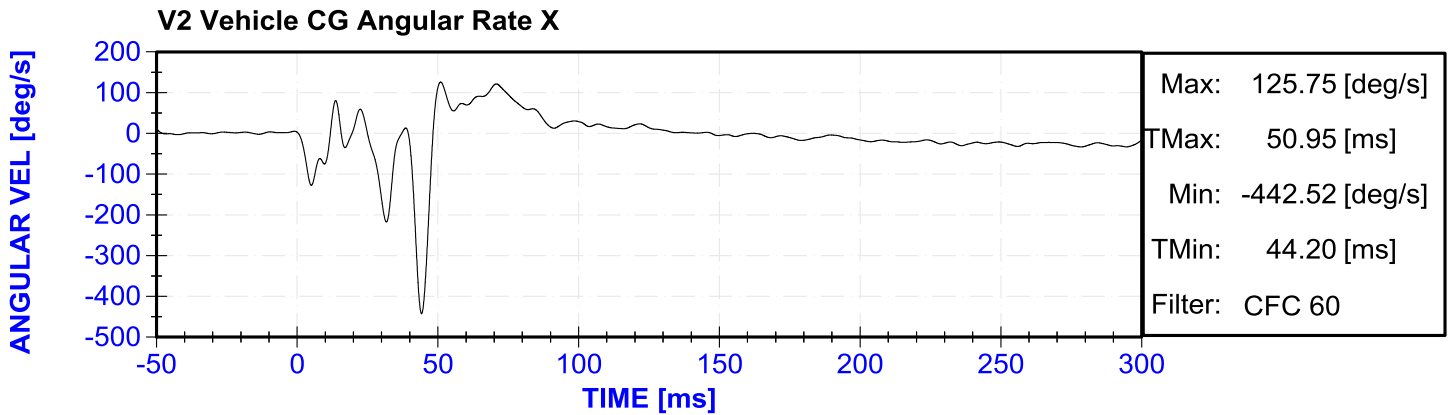
V2 Left Rear Sill Redundant Y Acceleration



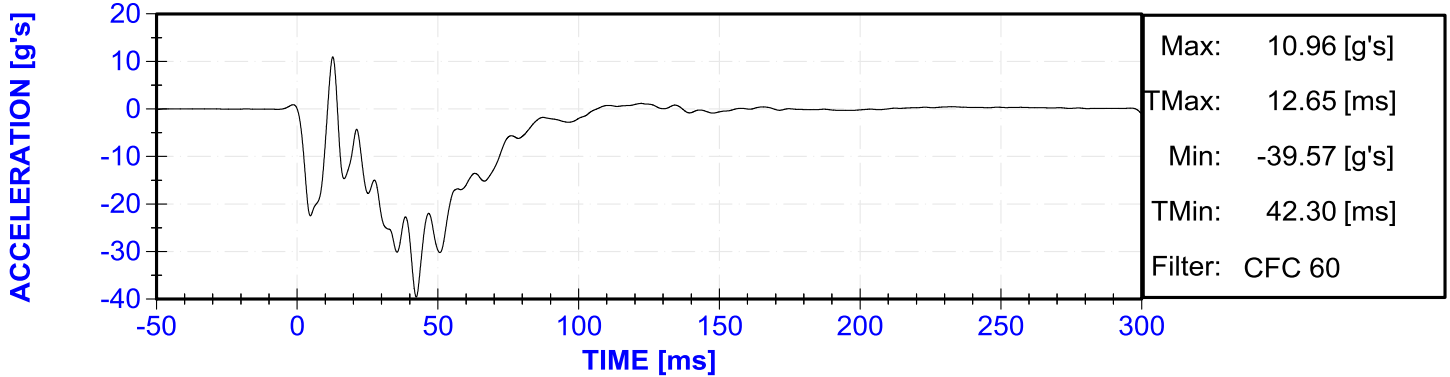
V2 Right Rear Sill X Acceleration



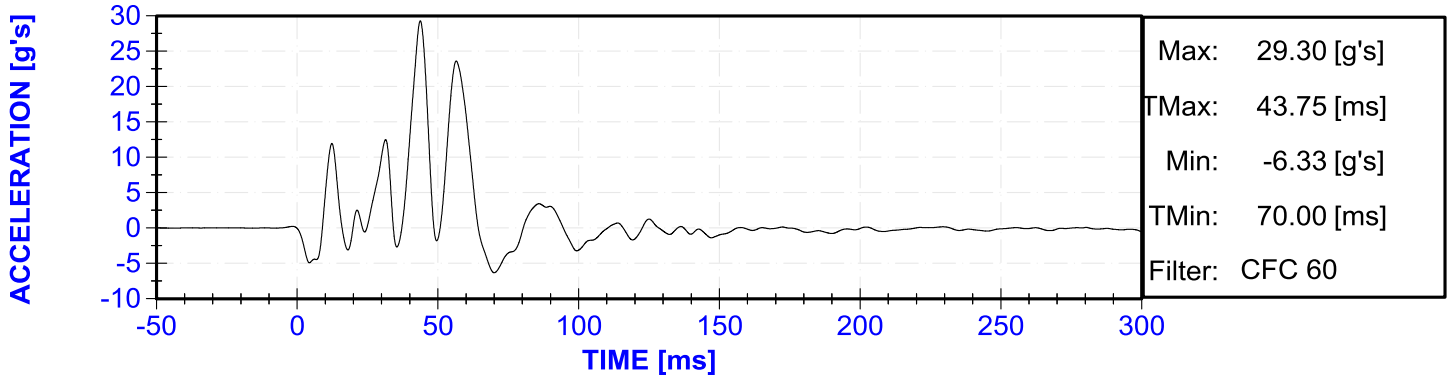




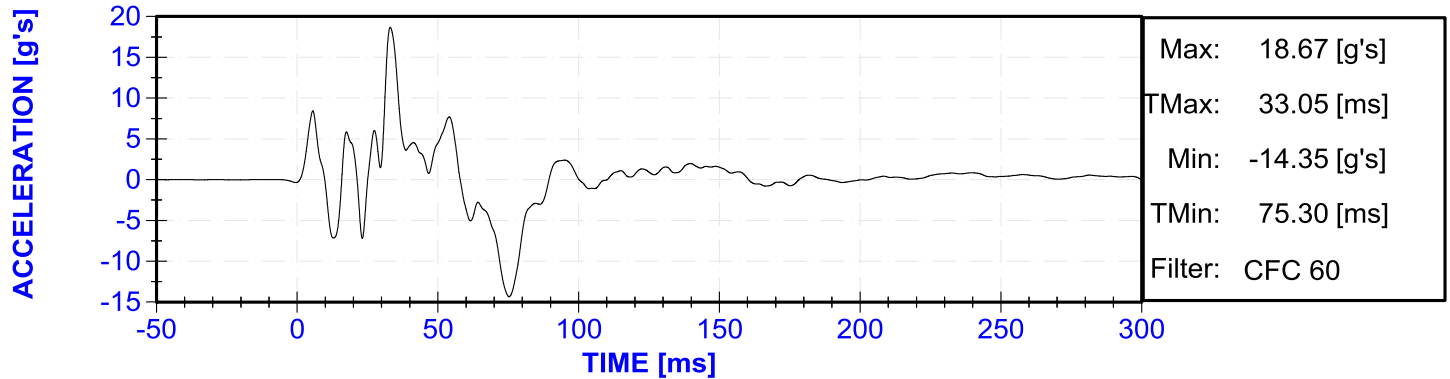
V2 Driver Seat Track X Acceleration



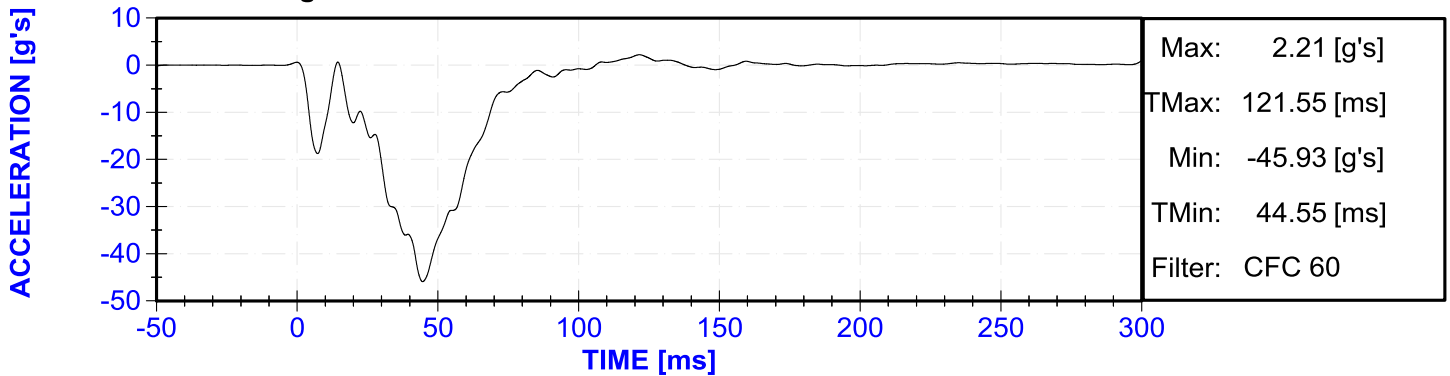
V2 Driver Seat Track Y Acceleration



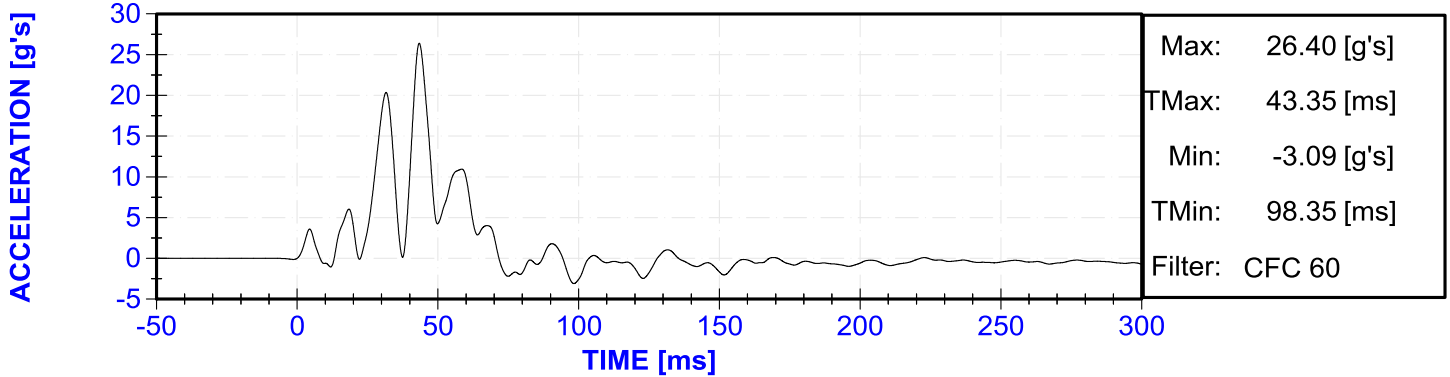
V2 Driver Seat Track Z Acceleration



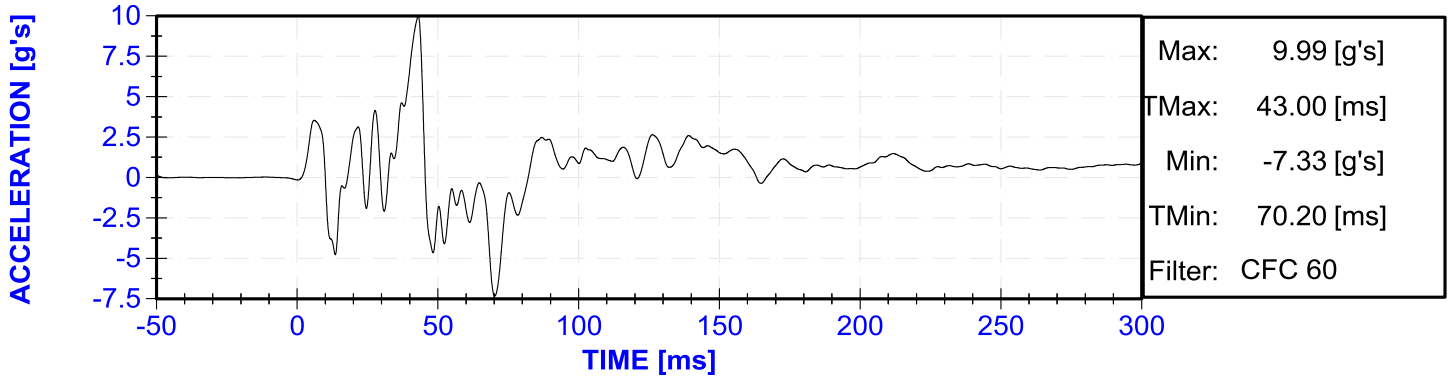
V2 Passenger Seat Track X Acceleration



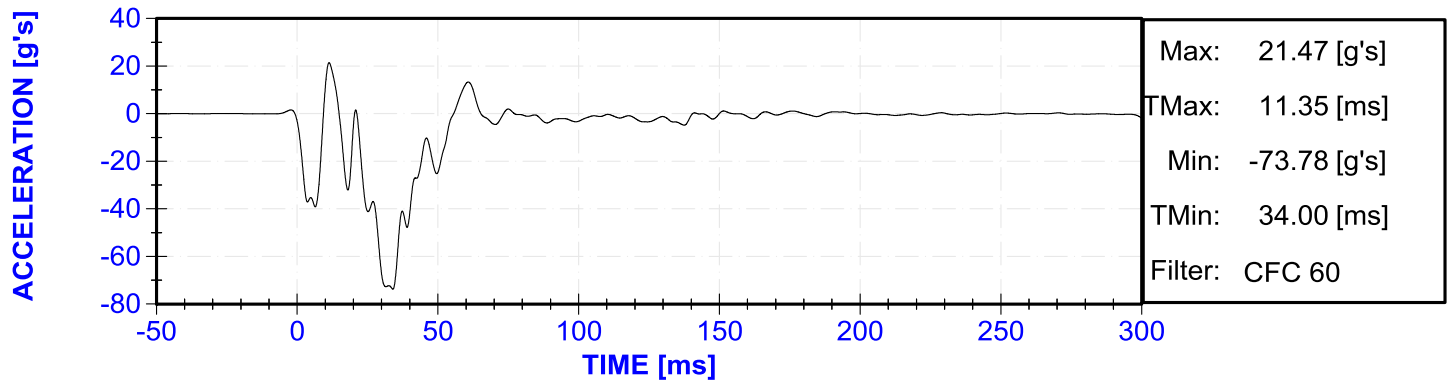
V2 Passenger Seat Track Y Acceleration



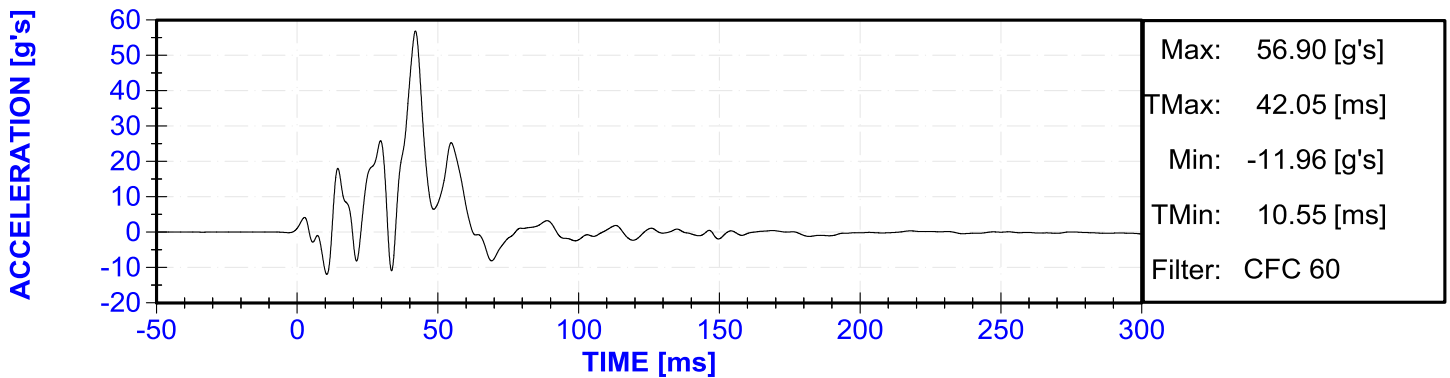
V2 Passenger Seat Track Z Acceleration



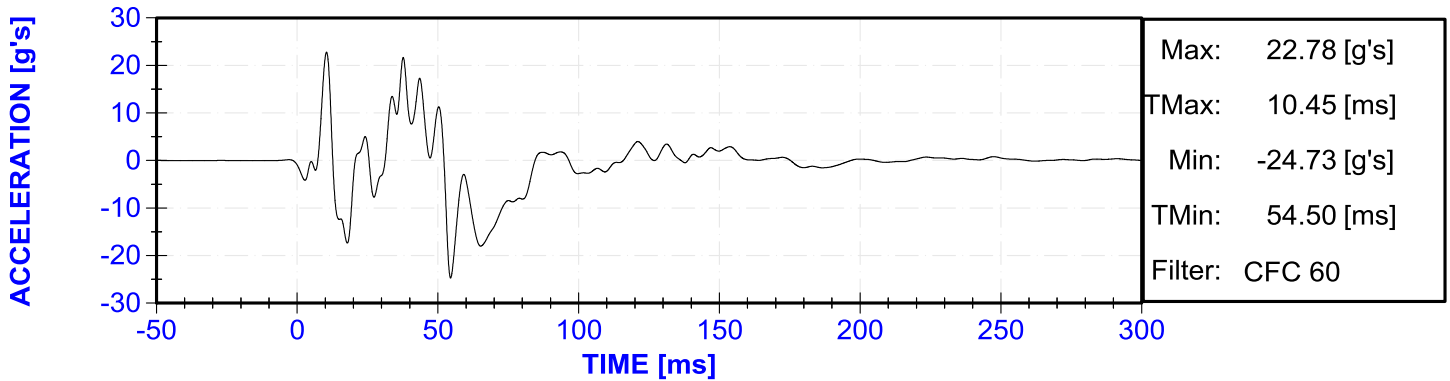
V2 Driver Floor Pan X Acceleration



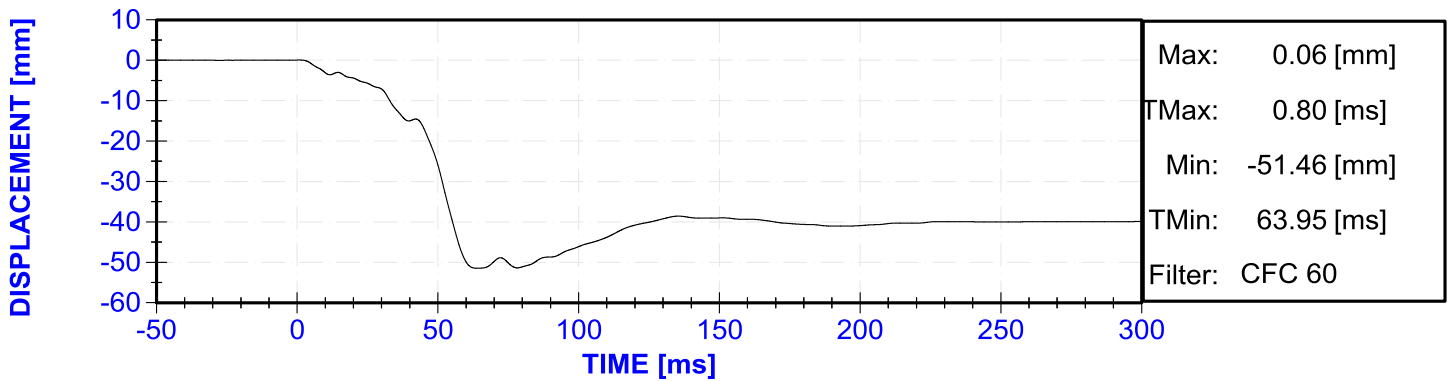
V2 Driver Floor Pan Y Acceleration



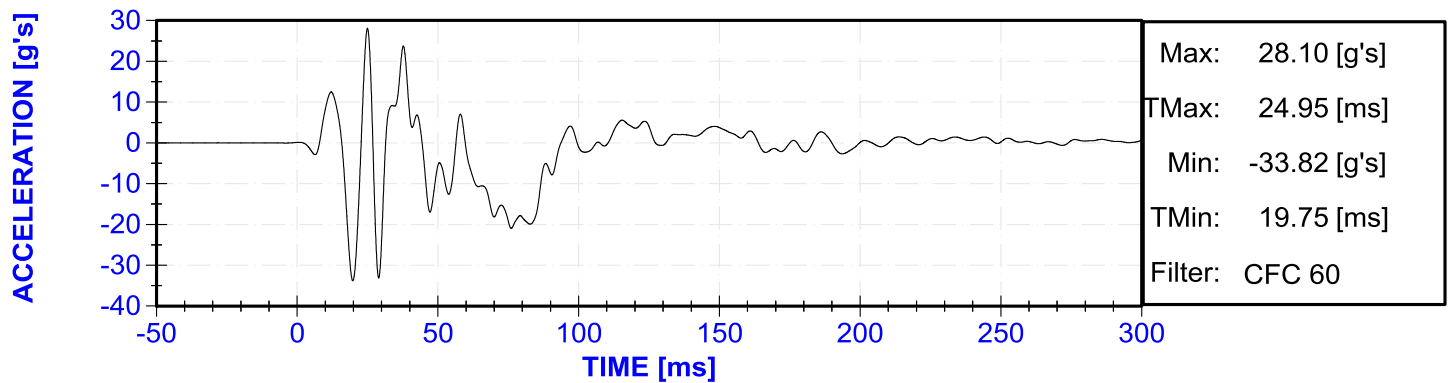
V2 Driver Floor Pan Z Acceleration



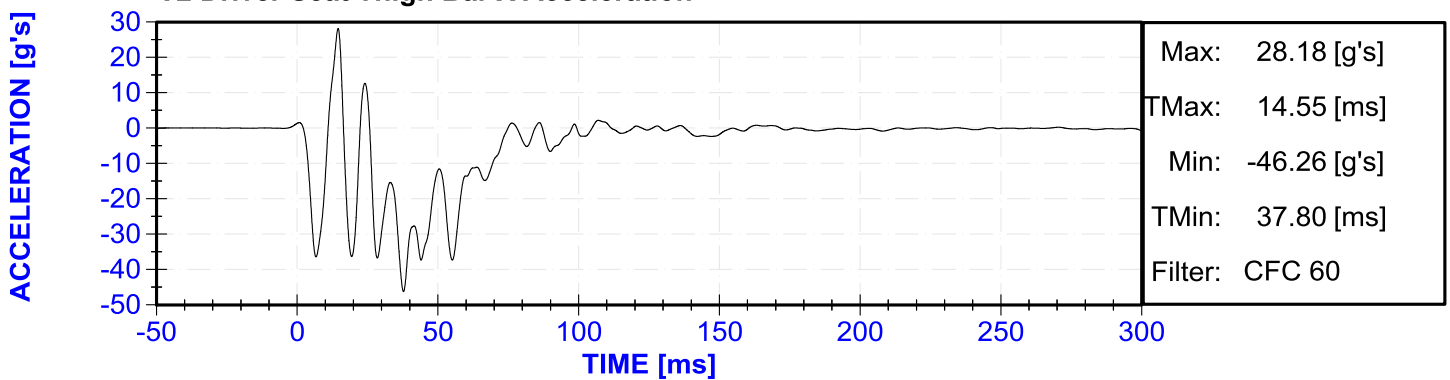
V2 Driver Floor Pan X Deflection



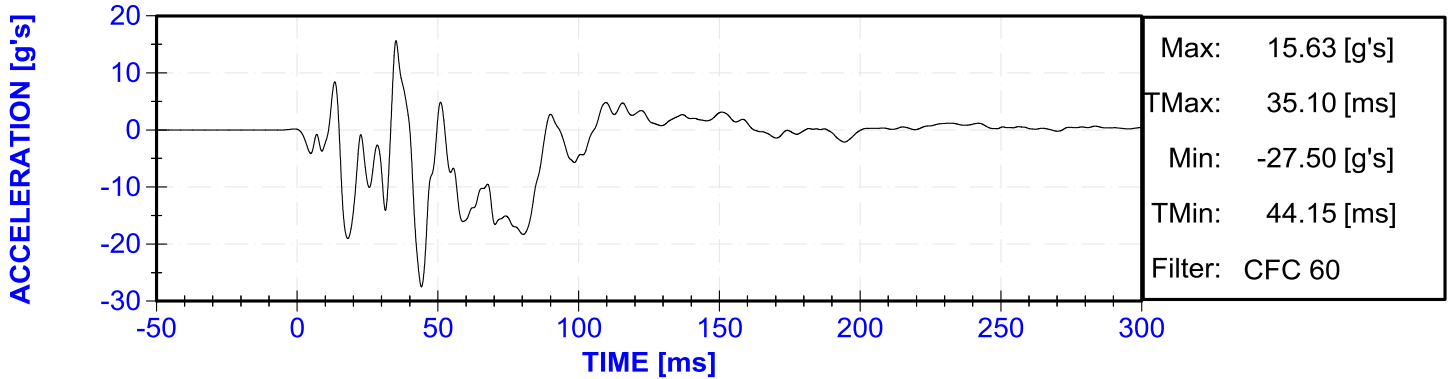
V2 Driver Seat Pan Z Acceleration



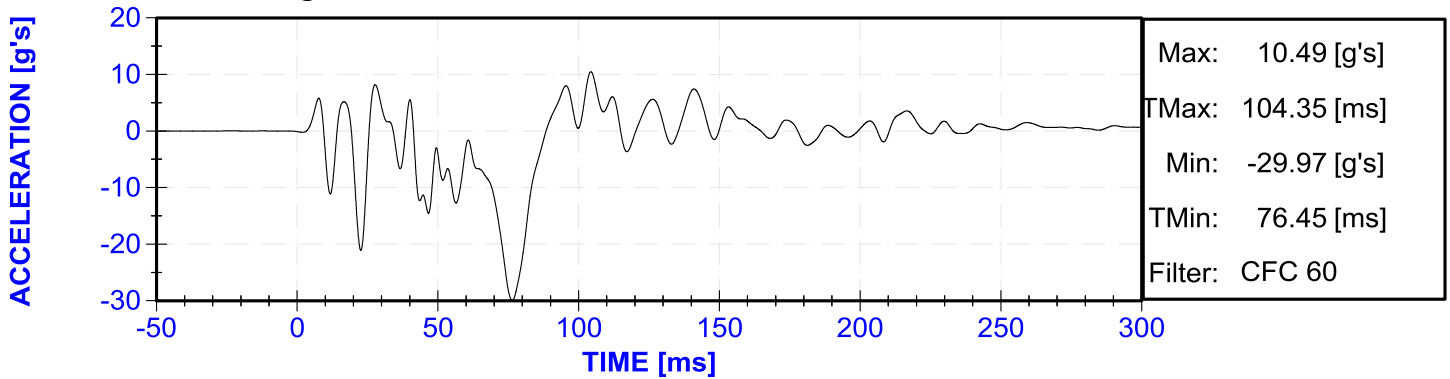
V2 Driver Seat Thigh Bar X Acceleration



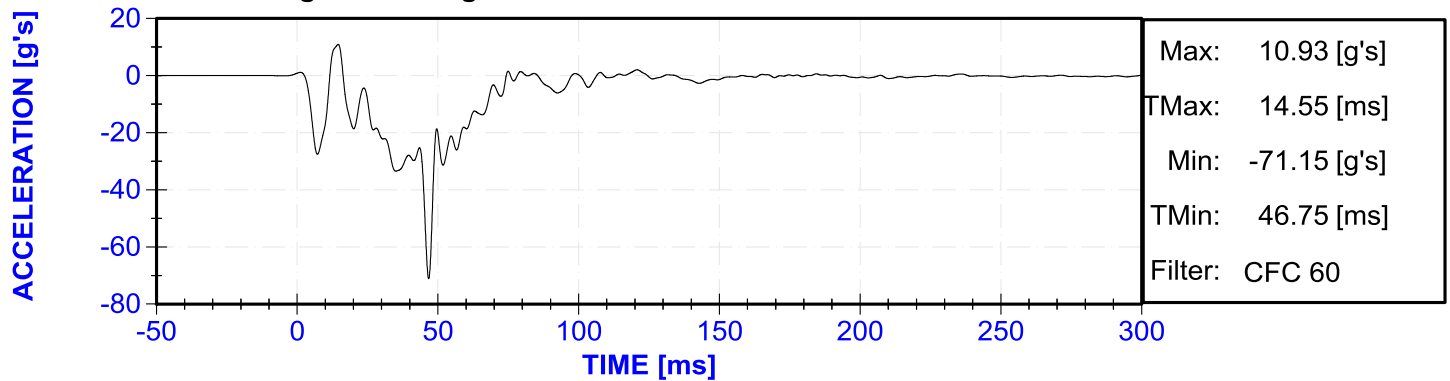
V2 Driver Seat Thigh Bar Z Acceleration



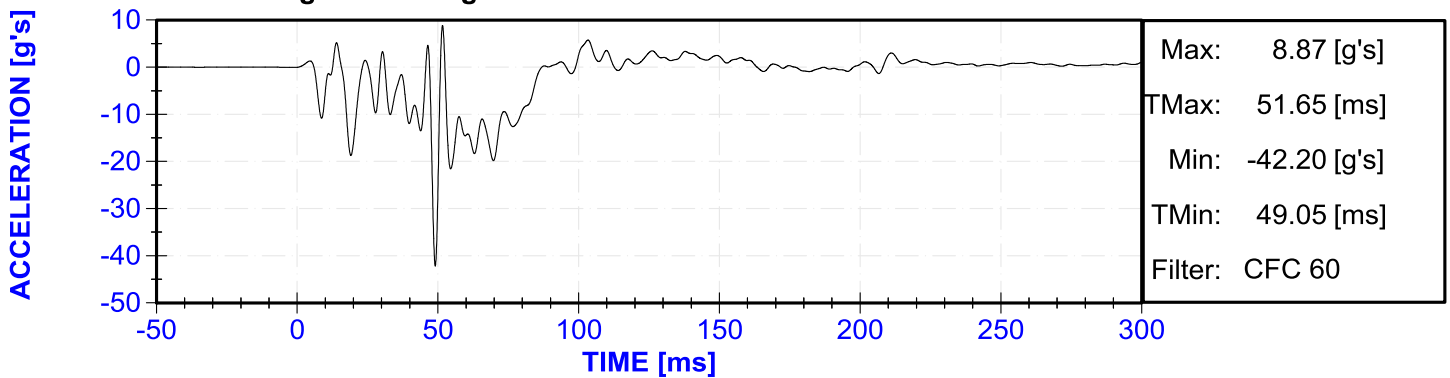
V2 Passenger Seat Pan Z Acceleration



V2 Passenger Seat Thigh Bar X Acceleration

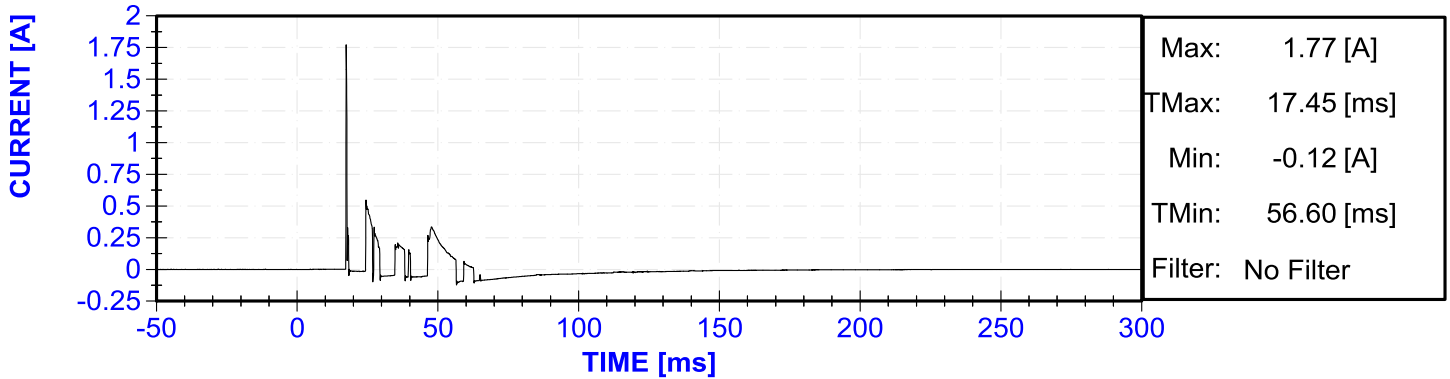


V2 Passenger Seat Thigh Bar Z Acceleration



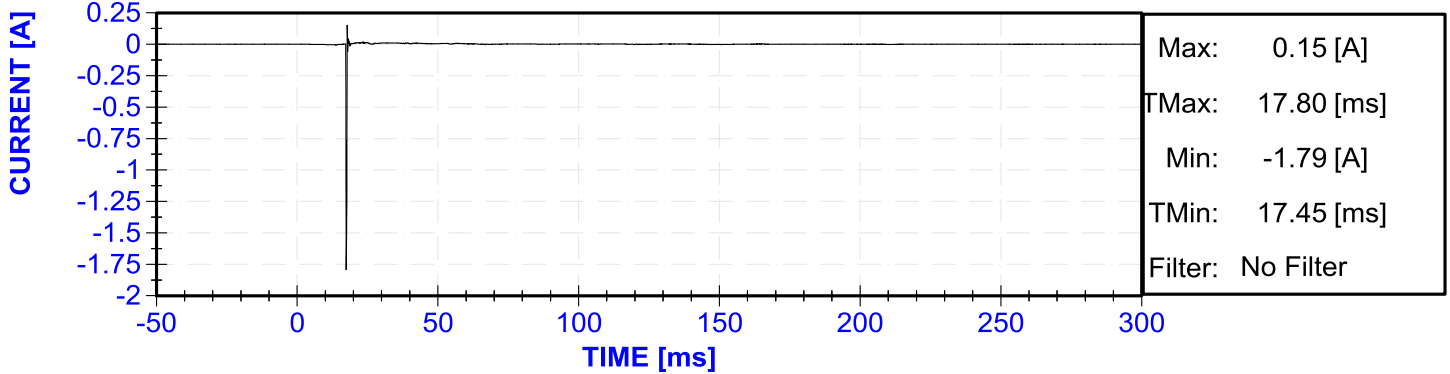
V2 Driver Front Airbag Stage 1 Monitor

Time to fire: 17.40 ms



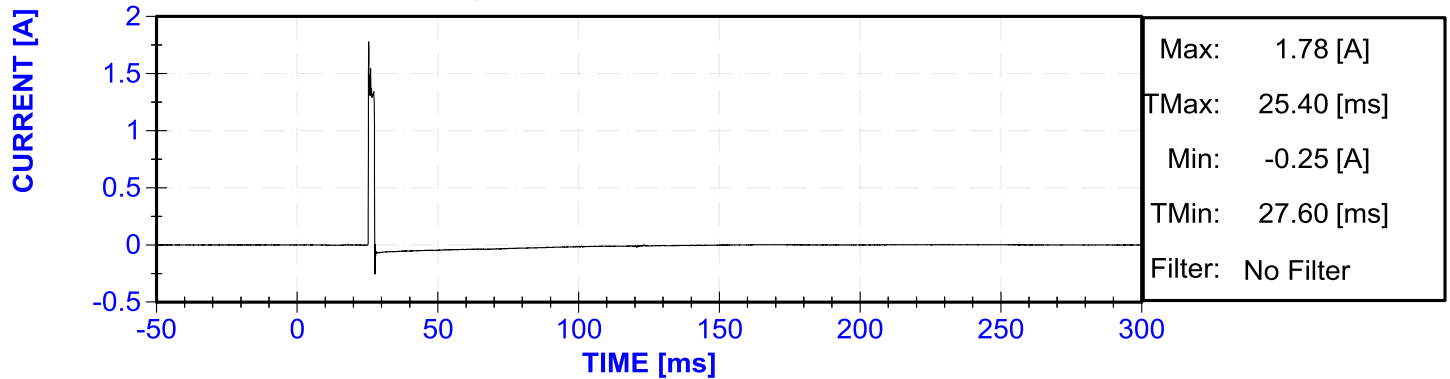
V2 Driver Front Airbag Stage 2 Monitor

Time to fire: 17.35 ms



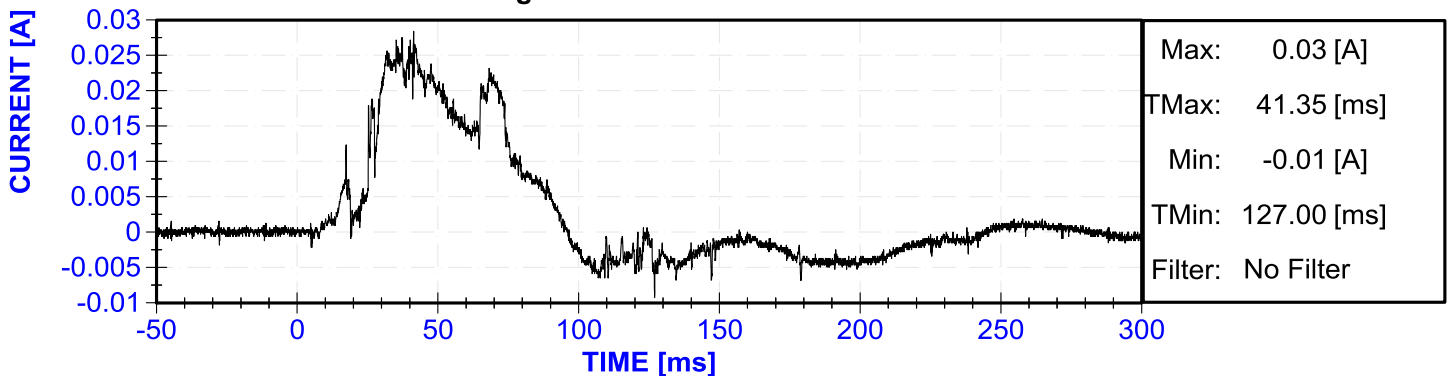
V2 Driver Curtain Airbag Monitor

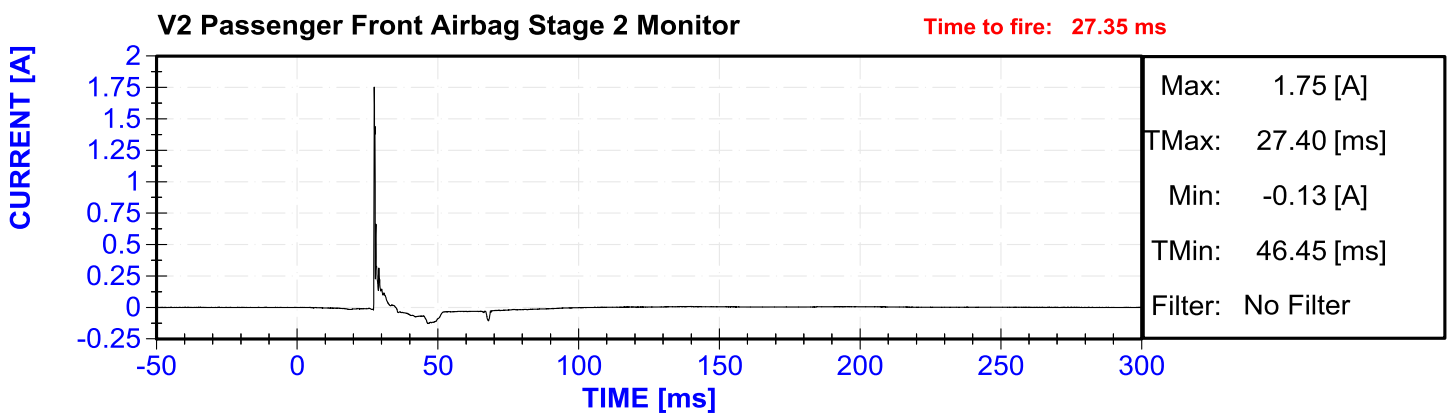
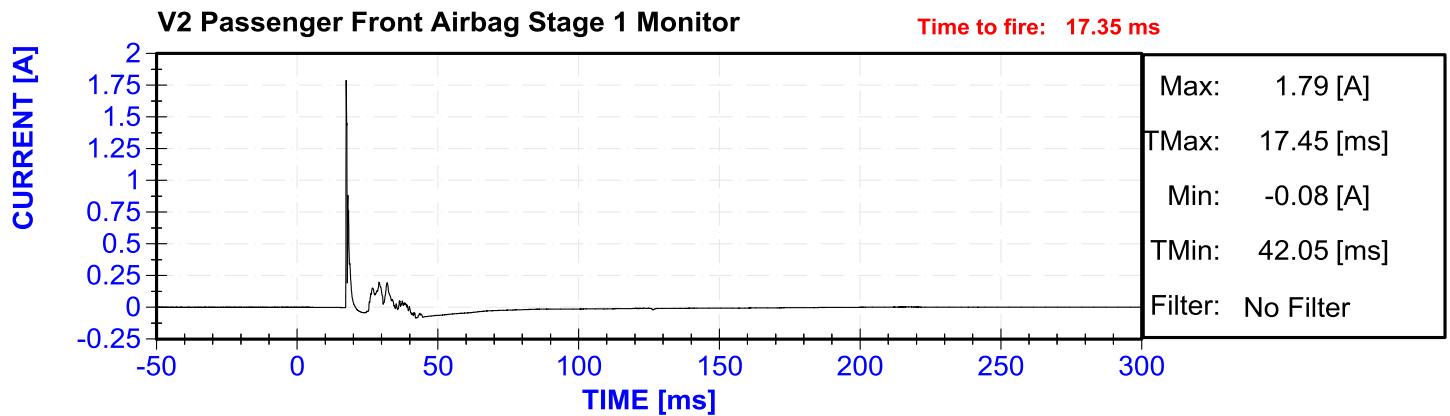
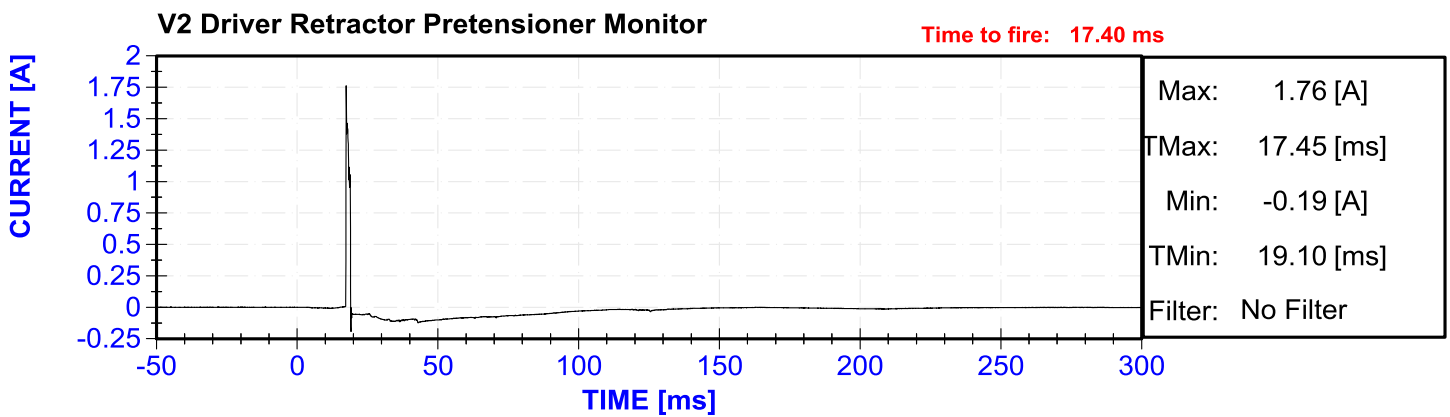
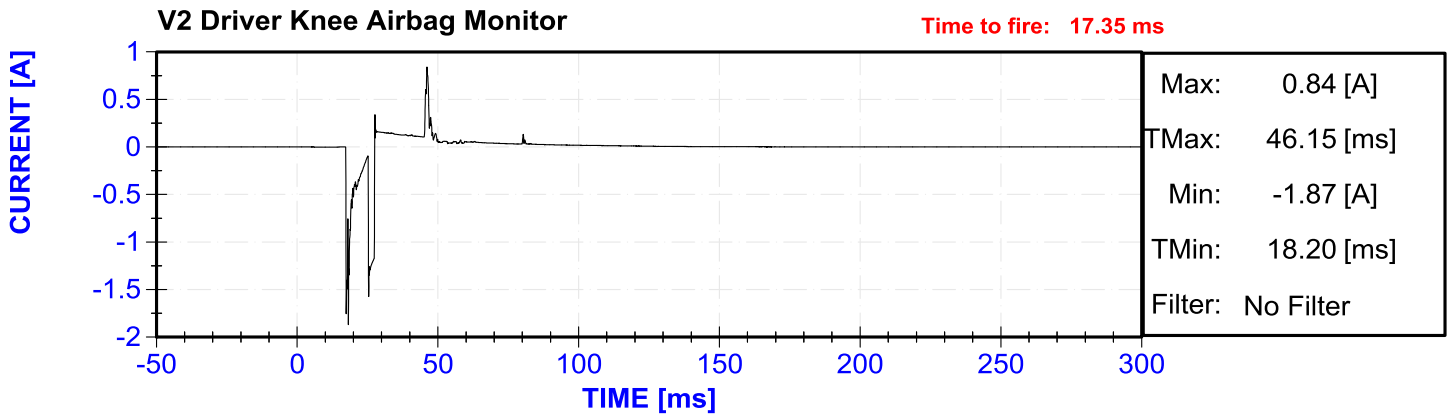
Time to fire: 25.35 ms

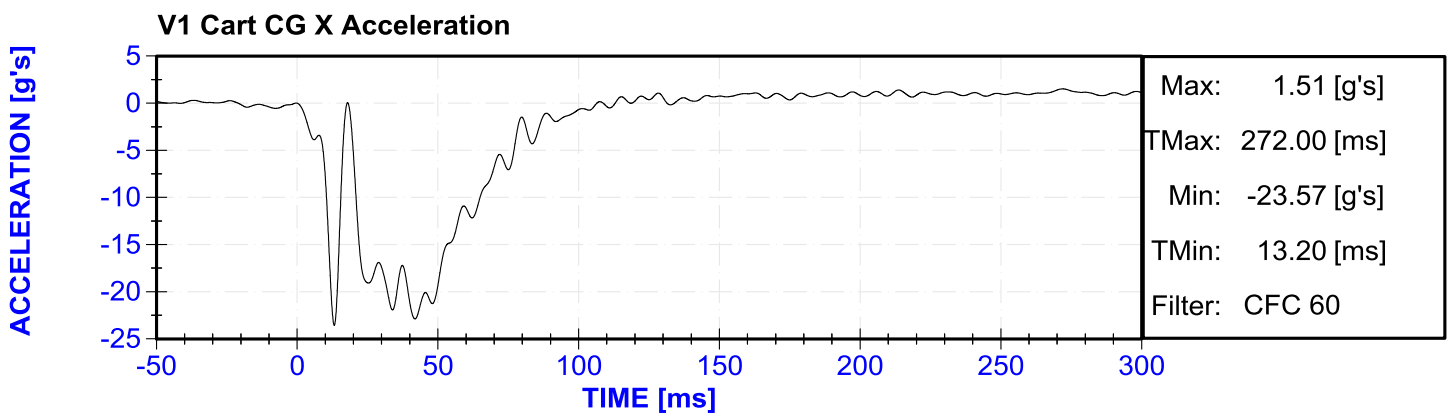
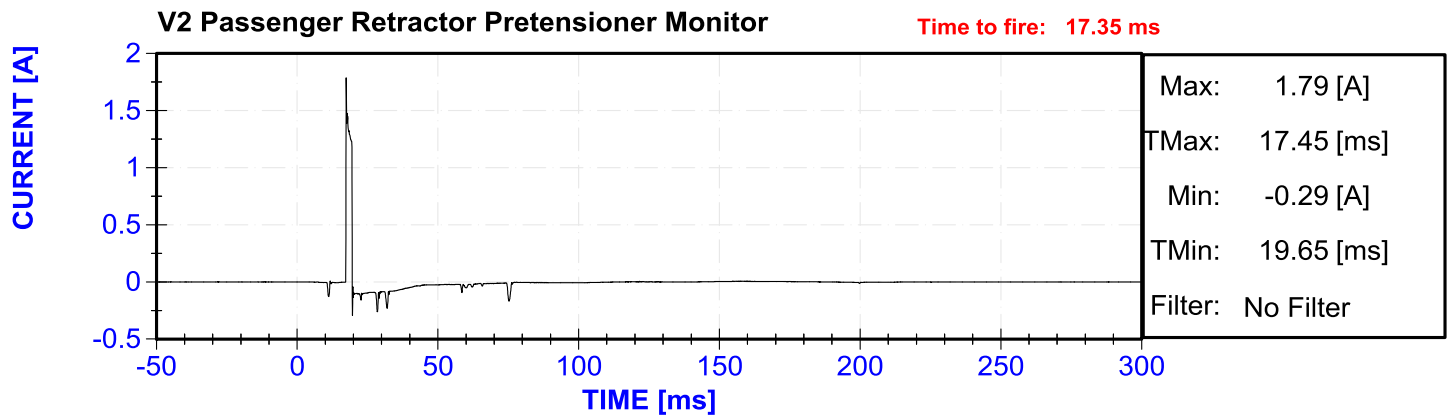
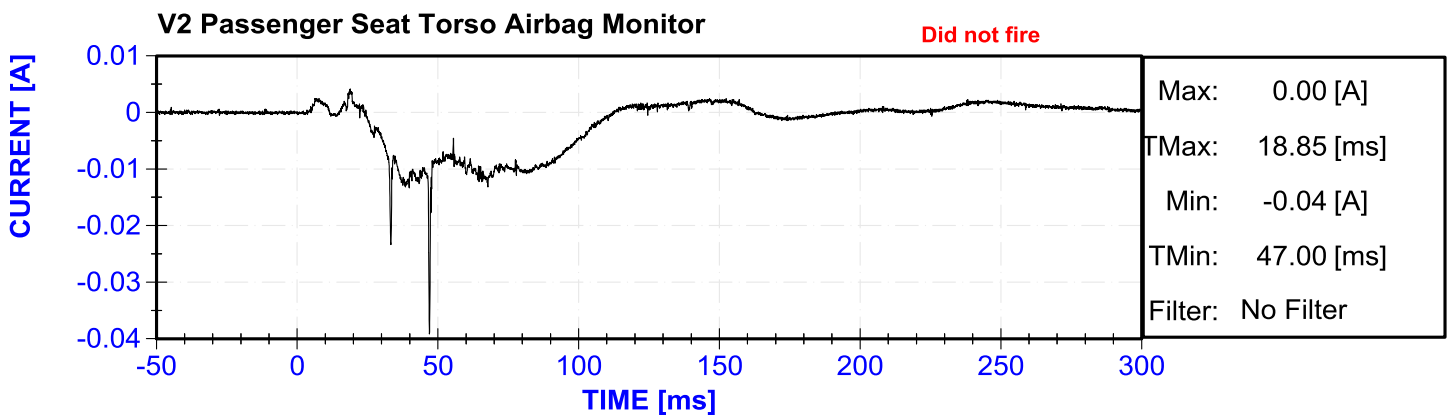
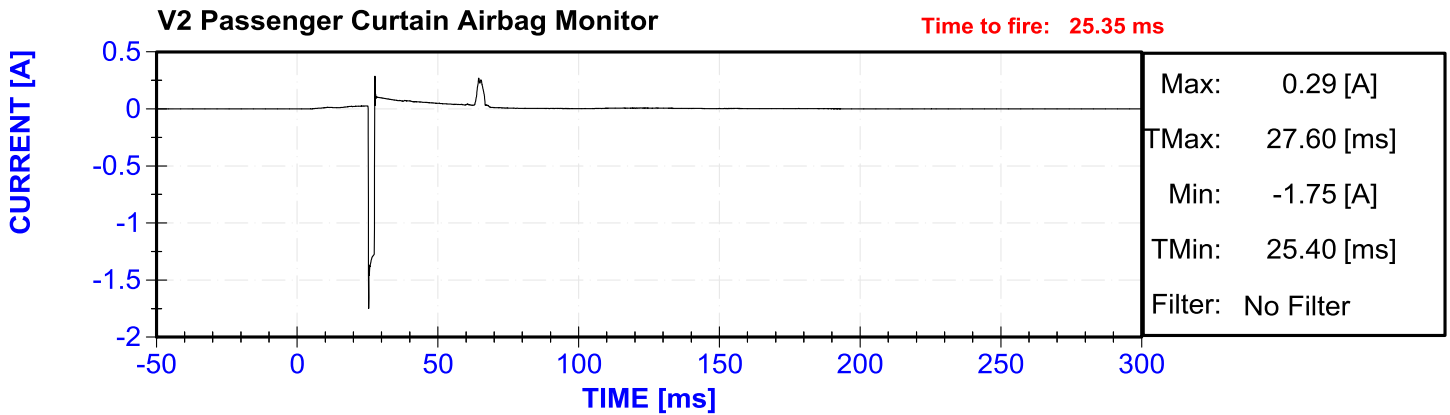


V2 Driver Seat Torso Airbag Monitor

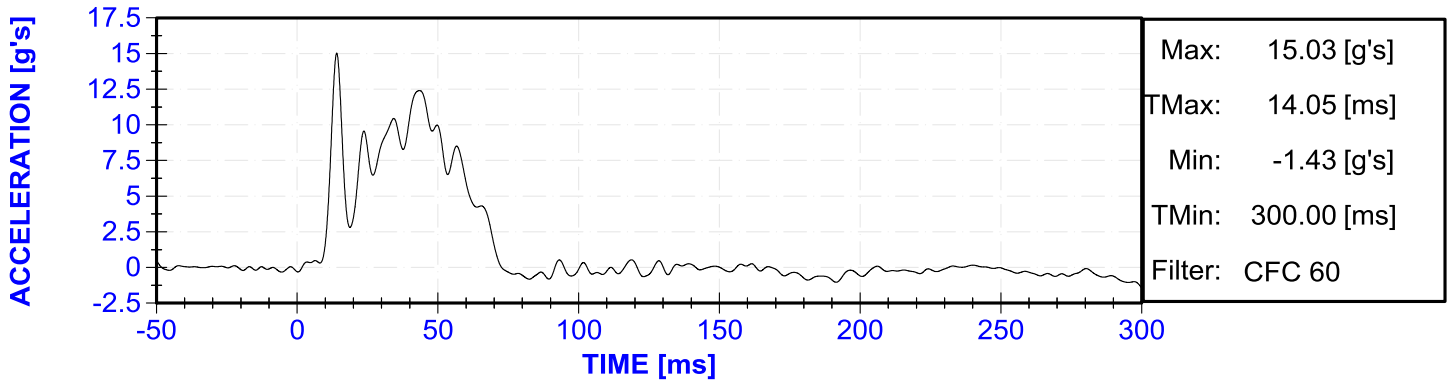
Did not fire



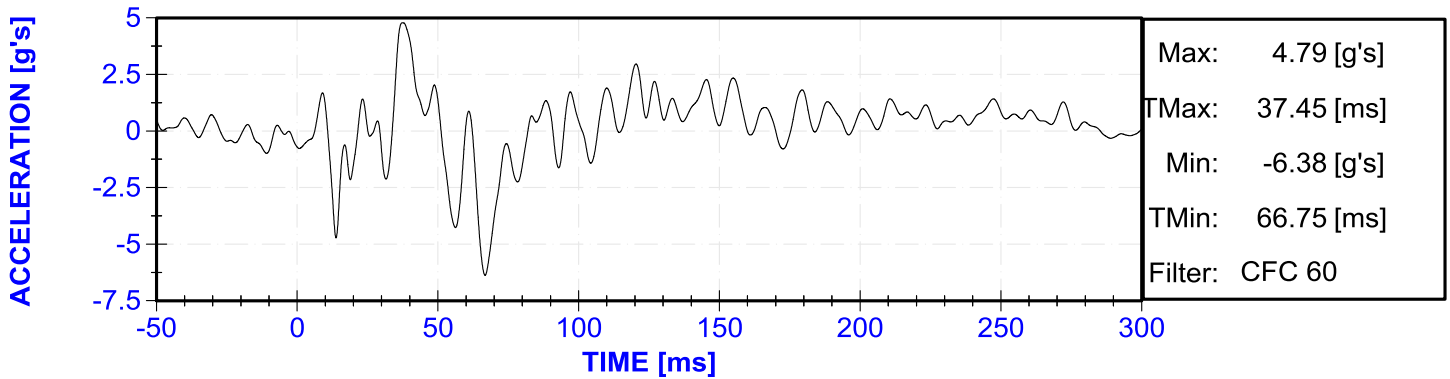




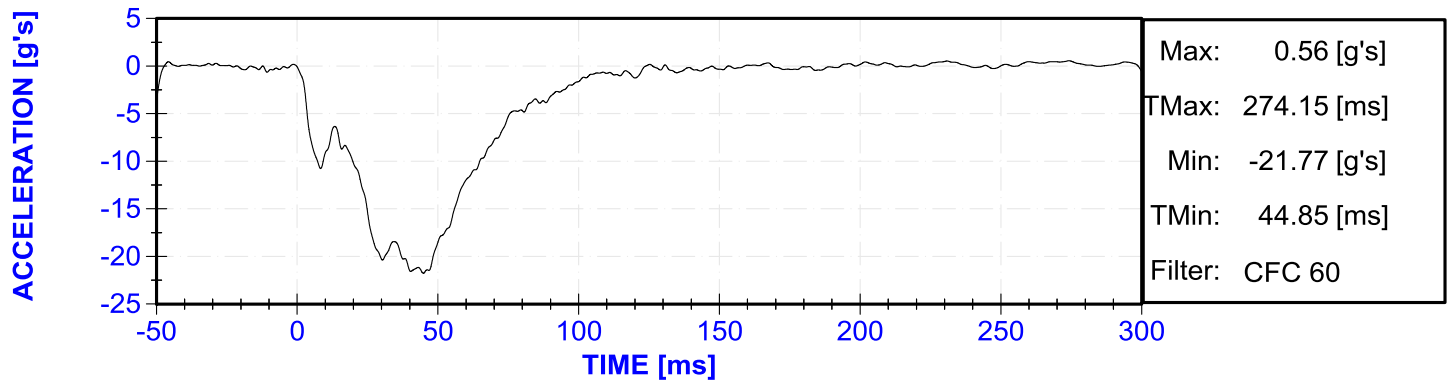
V1 Cart CG Y Acceleration



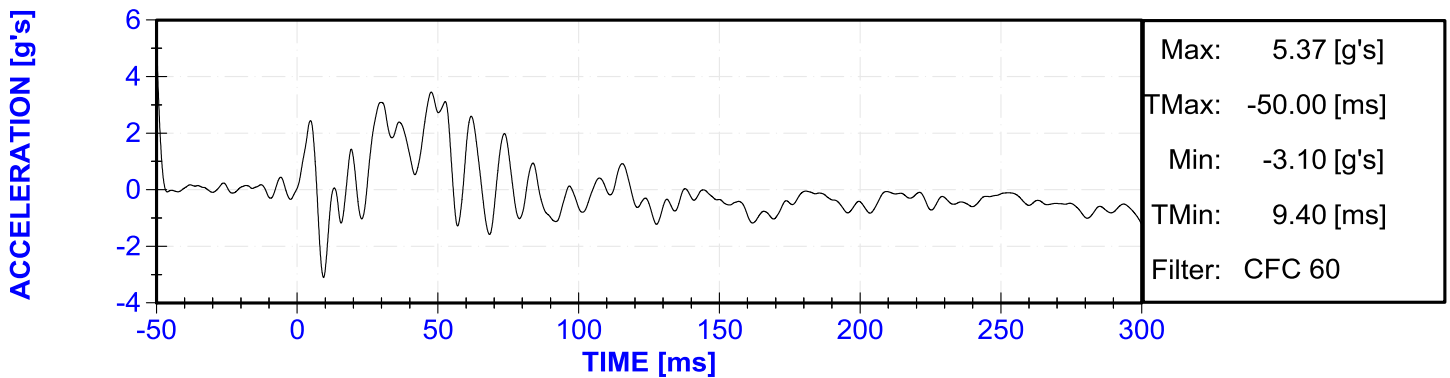
V1 Cart CG Z Acceleration



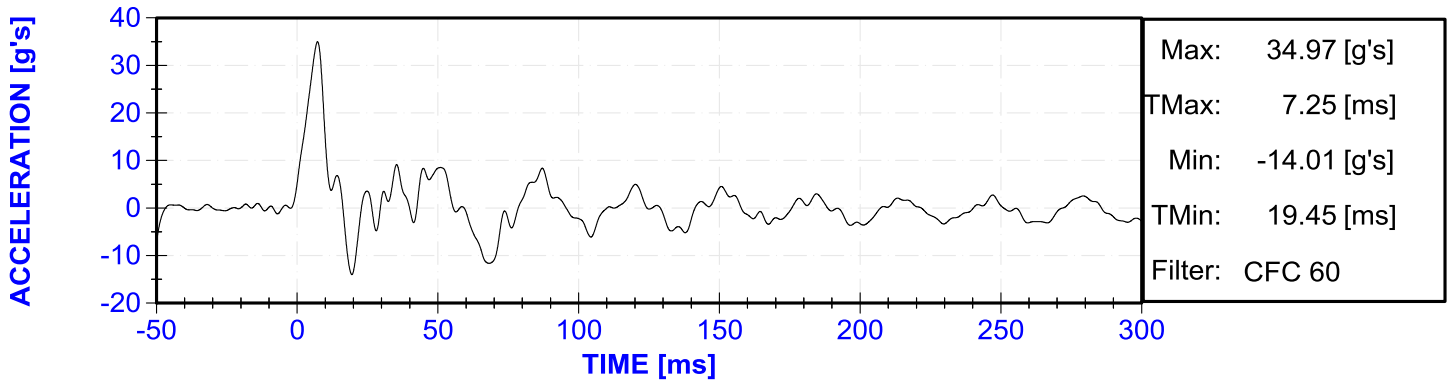
V1 Cart Rear C/L X Acceleration



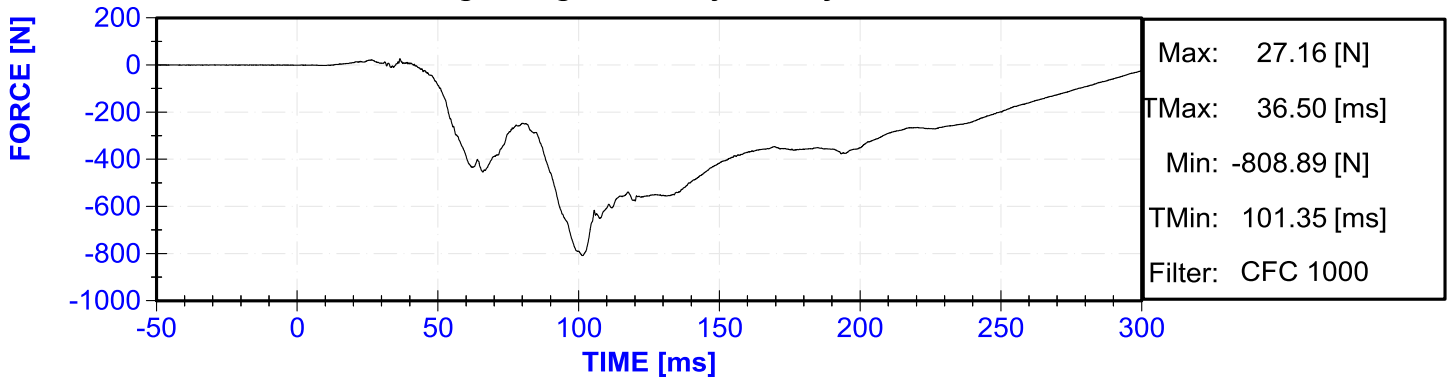
V1 Cart Rear C/L Y Acceleration



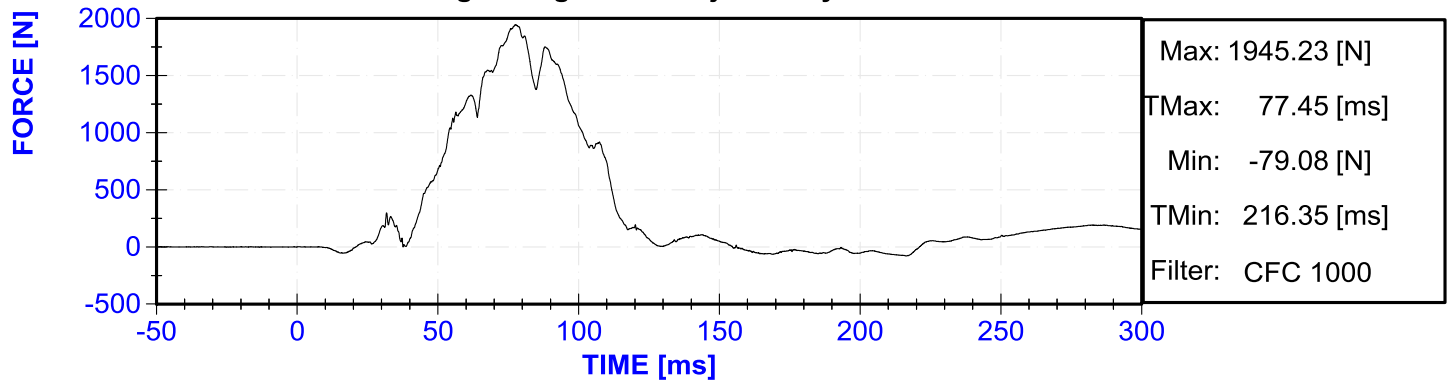
V1 Cart Rear C/L Z Acceleration



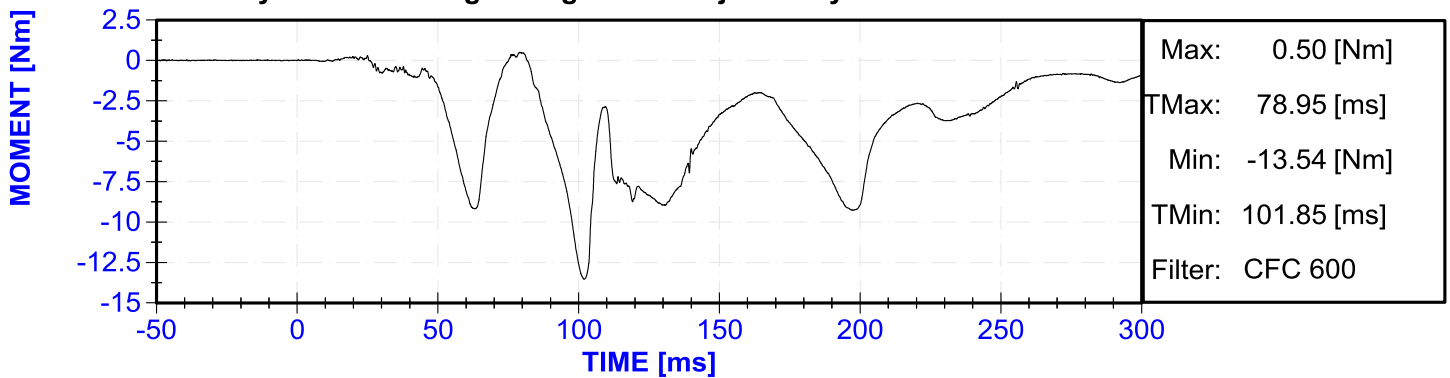
V2P1 Fx on head acting through the O.C. joint only



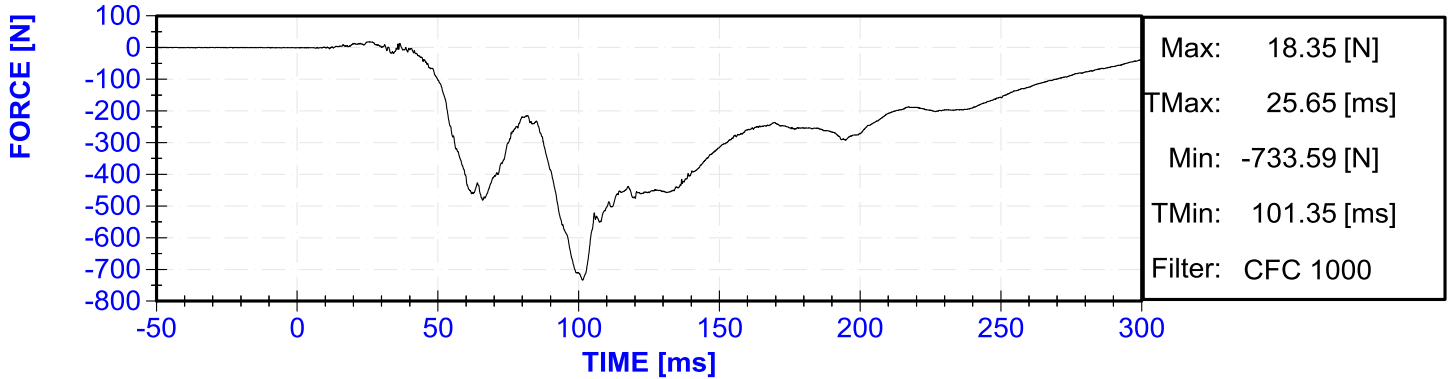
V2P1 Fz on head acting through the O.C. joint only



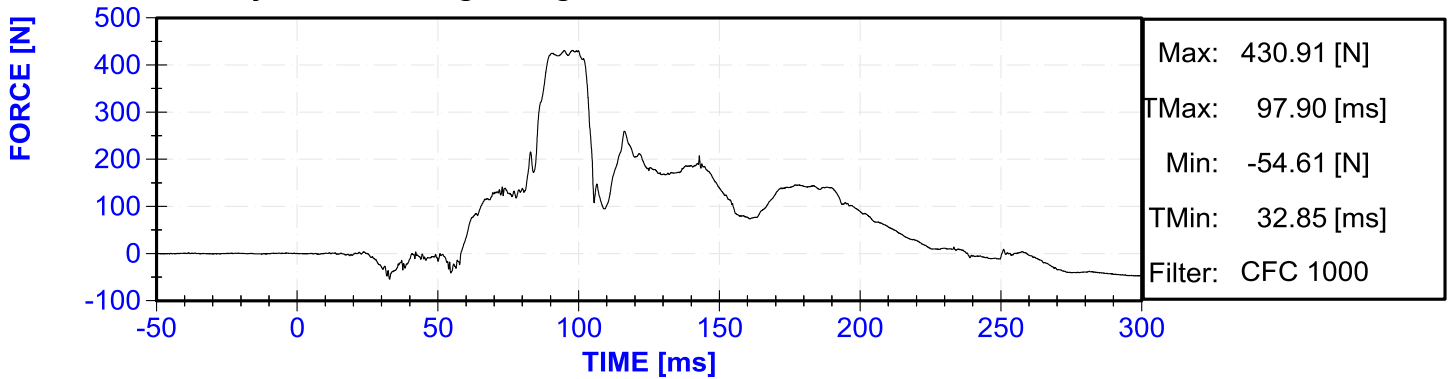
V2P1 My on head acting through the O.C. joint only



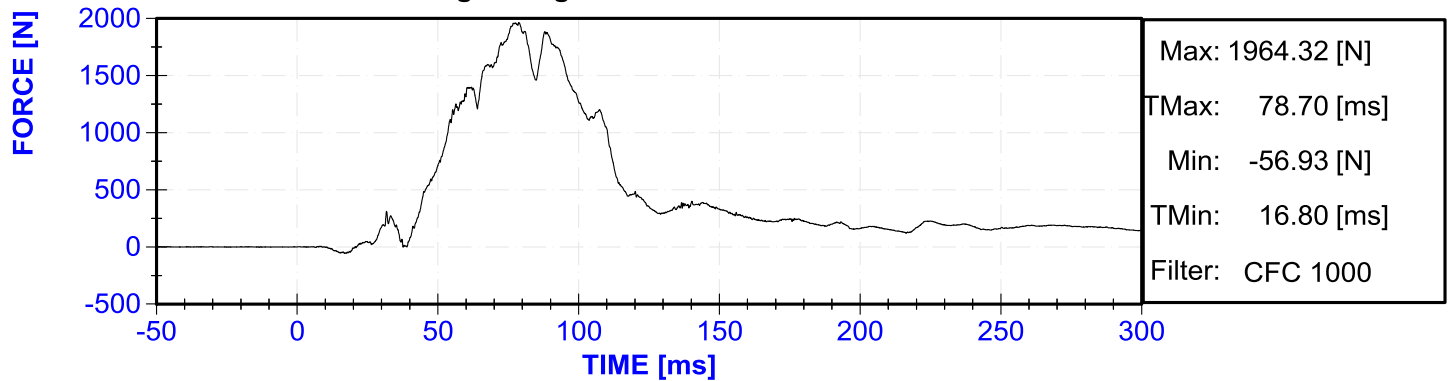
V2P1 Fx on head acting through the total neck section



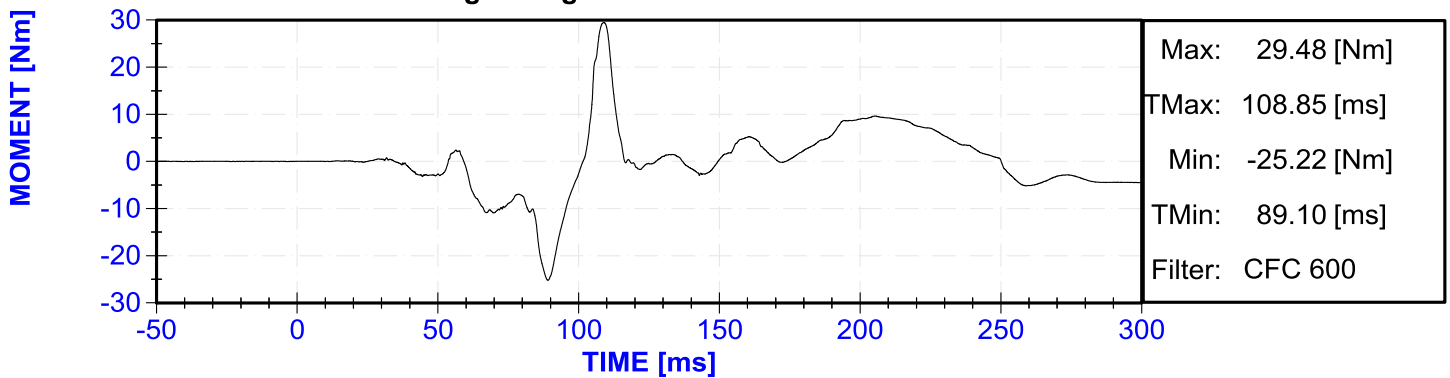
V2P1 Fy on head acting through the total neck section



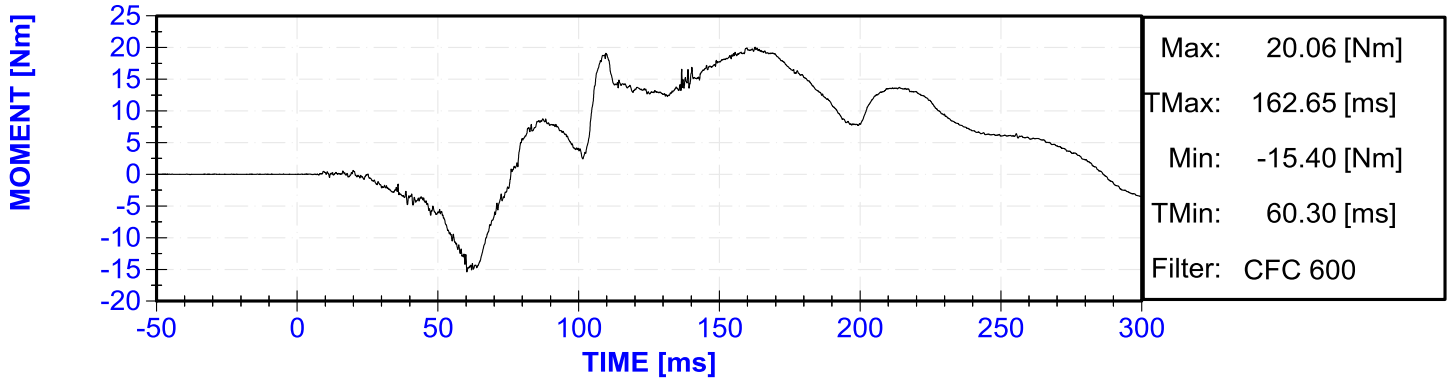
V2P1 Fz on head acting through the total neck section



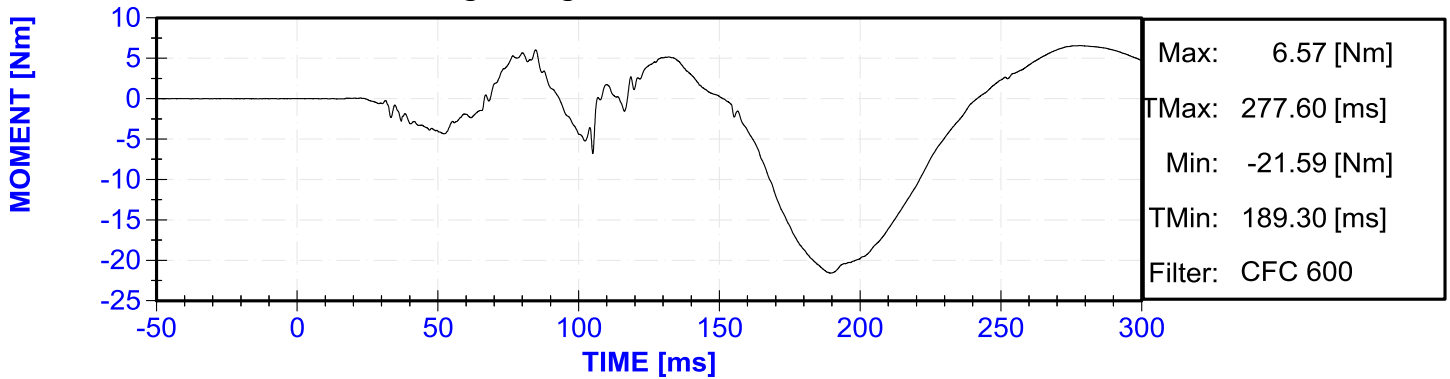
V2P1 Mx on head acting through the total neck section



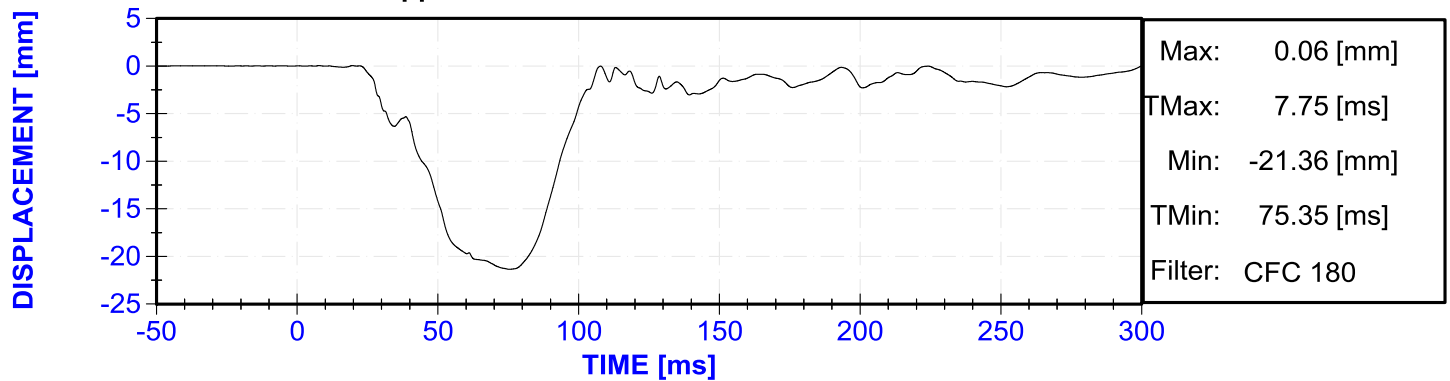
V2P1 My on head acting through the total neck section



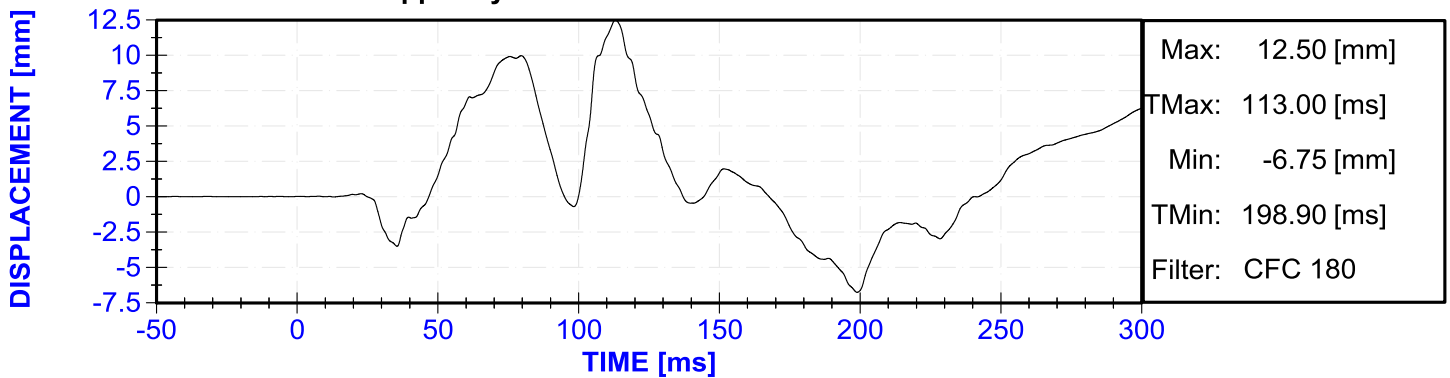
V2P1 Mz on head acting through the total neck section

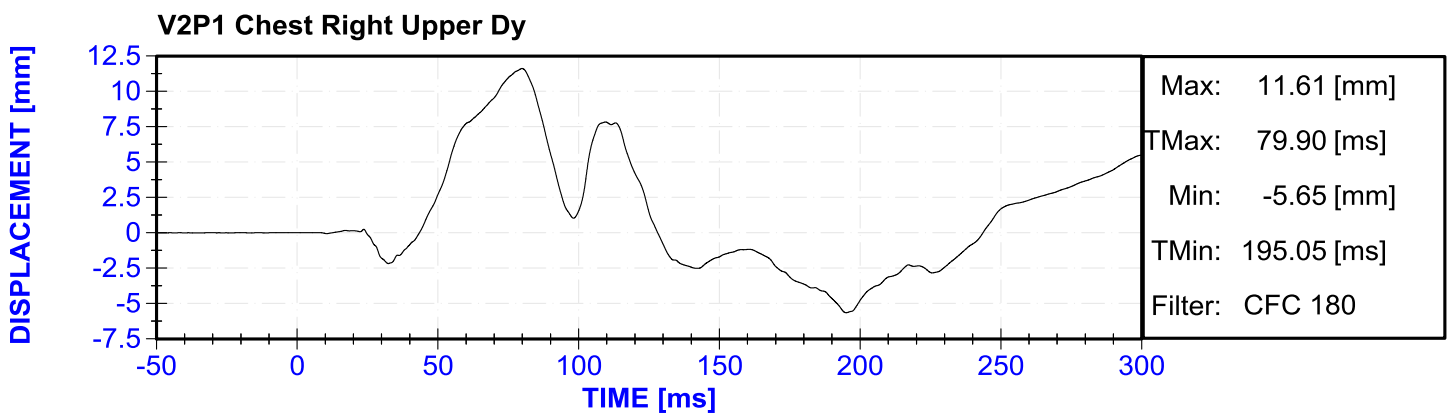
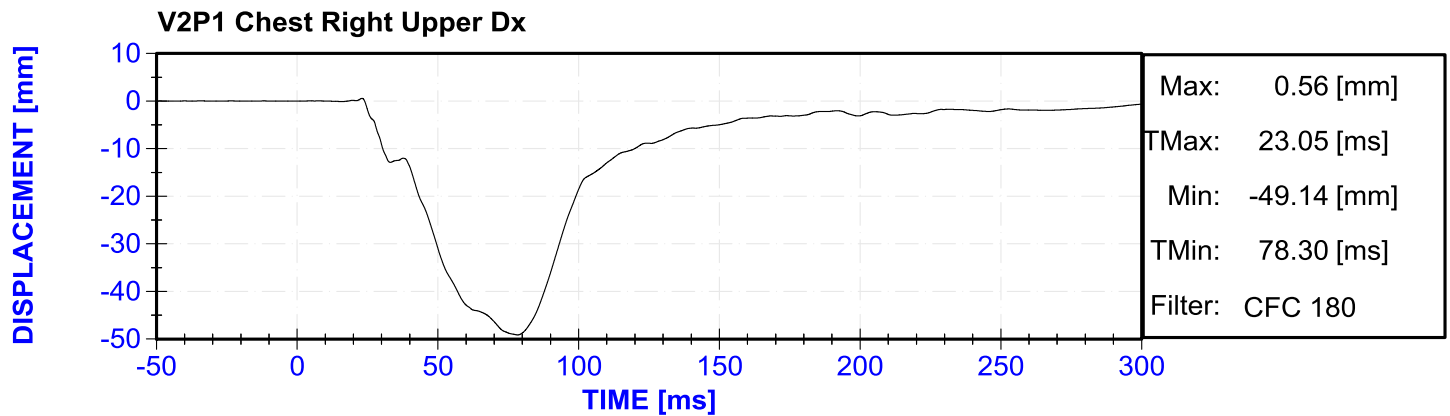
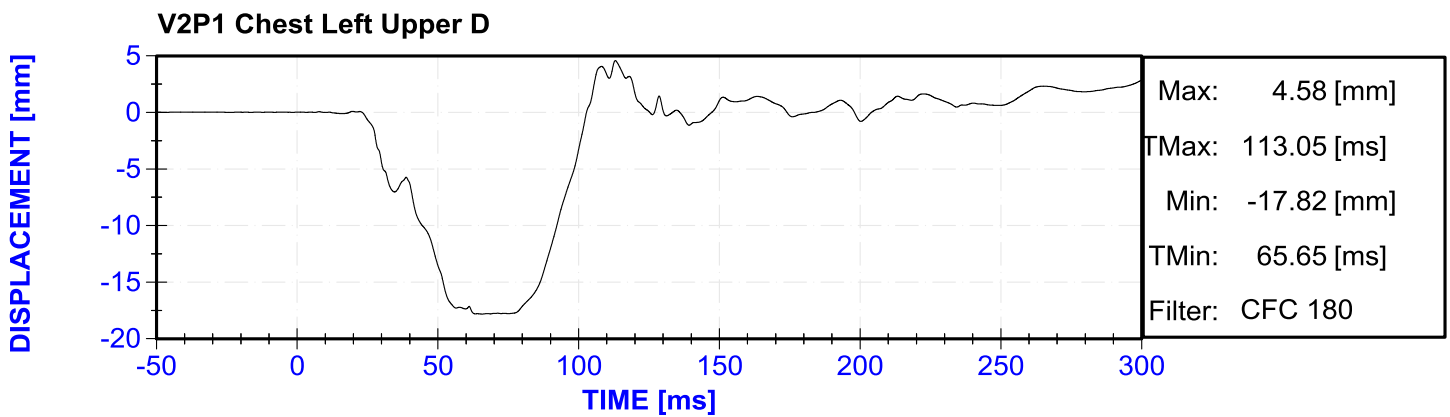
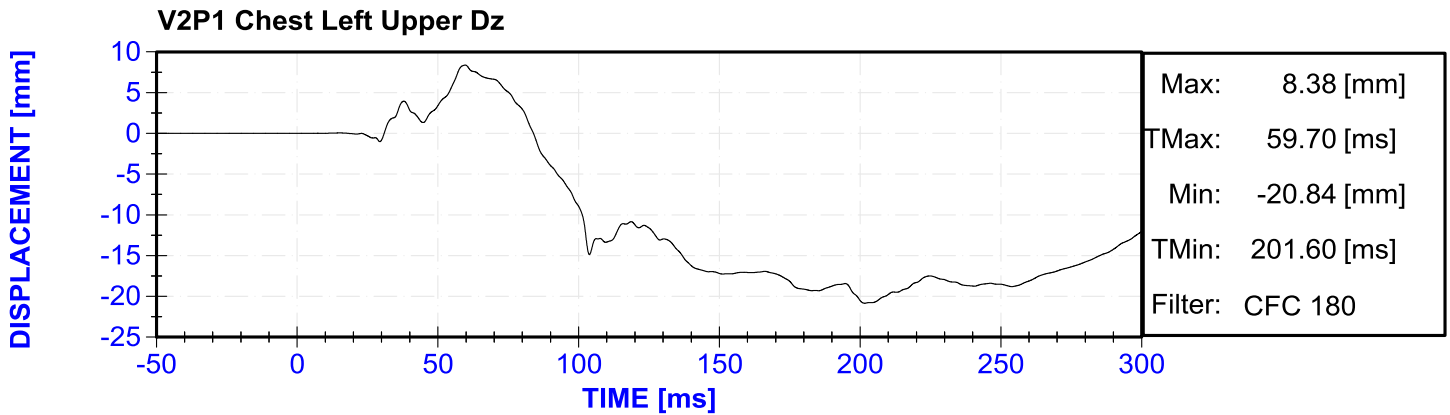


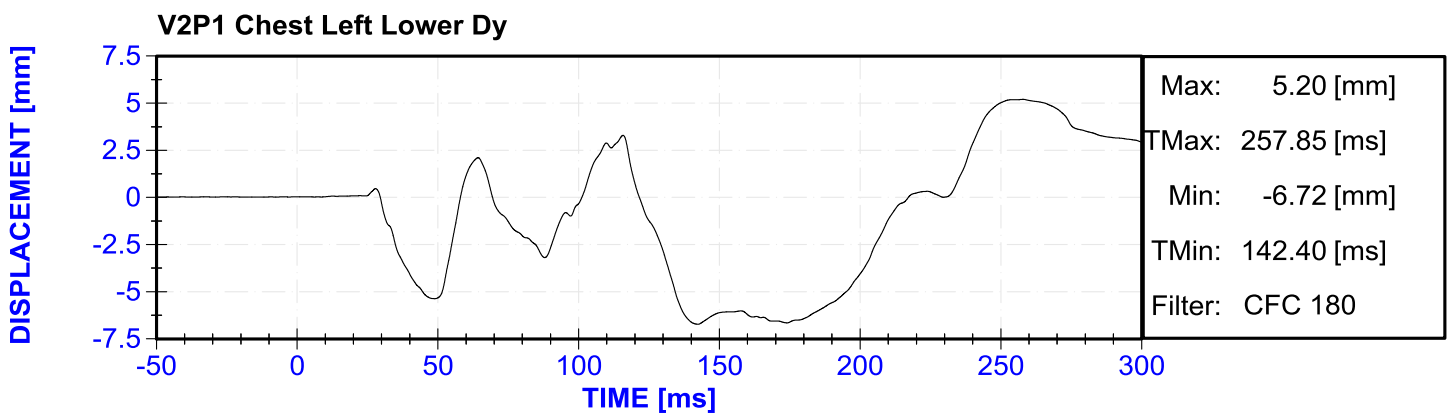
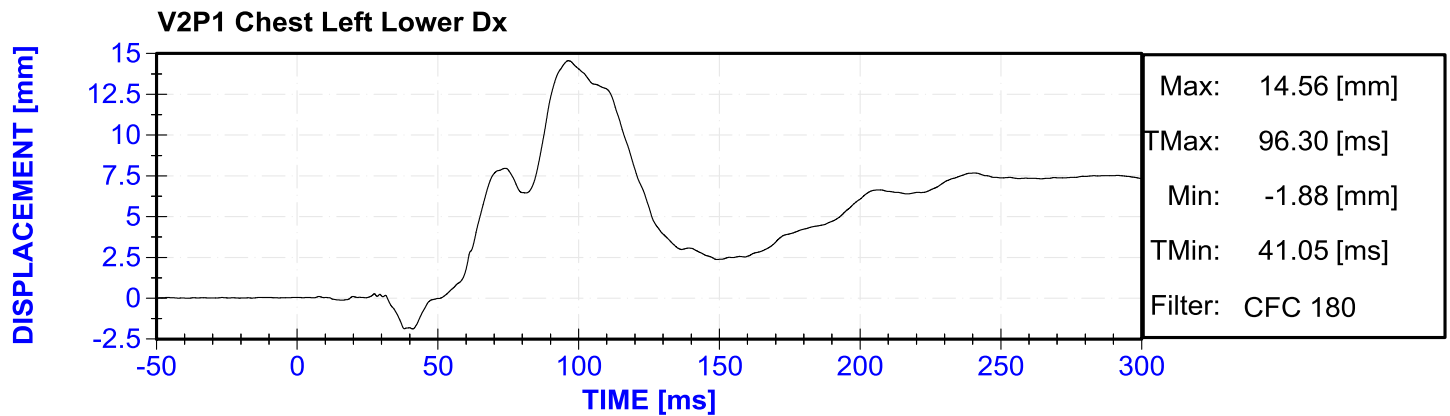
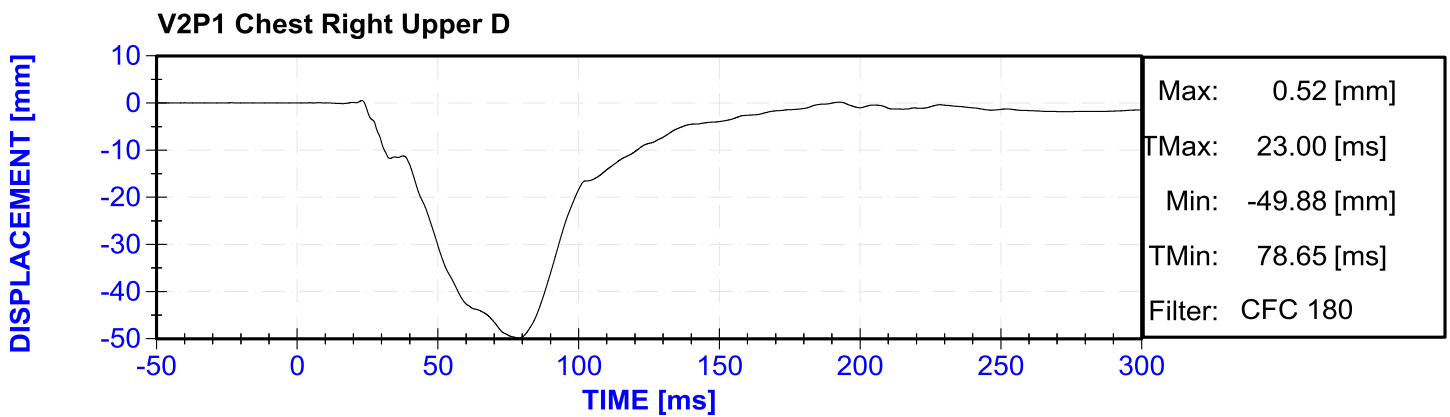
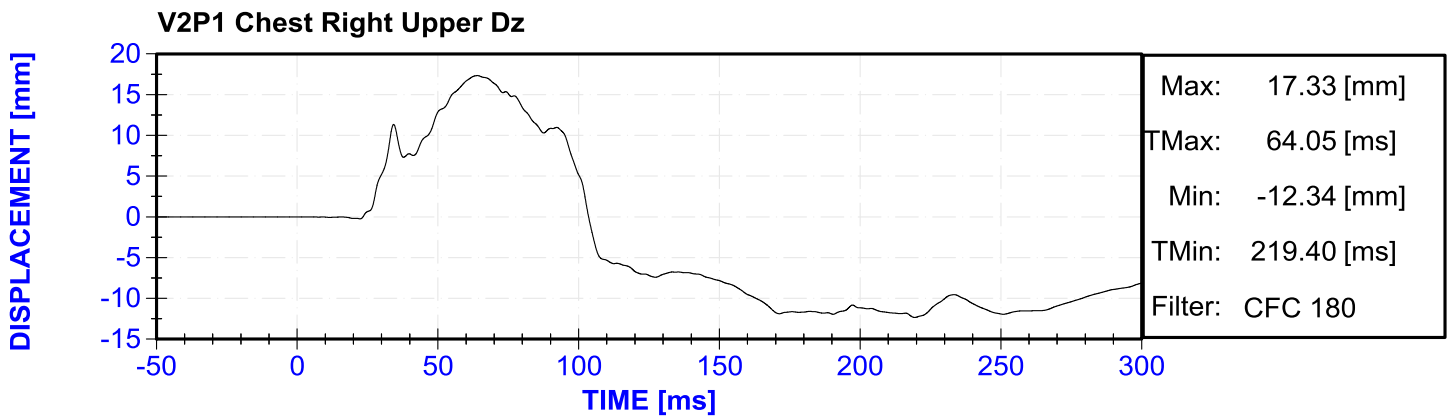
V2P1 Chest Left Upper Dx



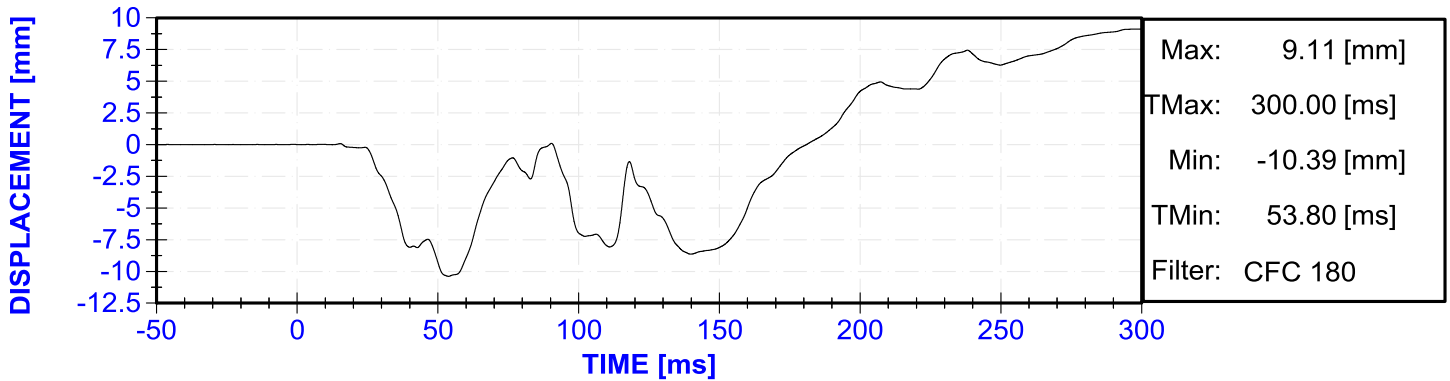
V2P1 Chest Left Upper Dy



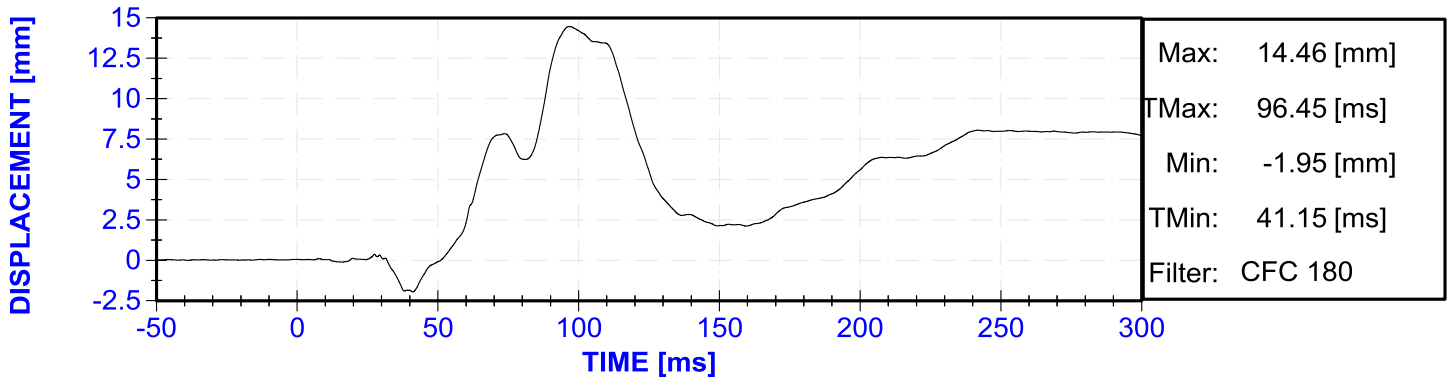




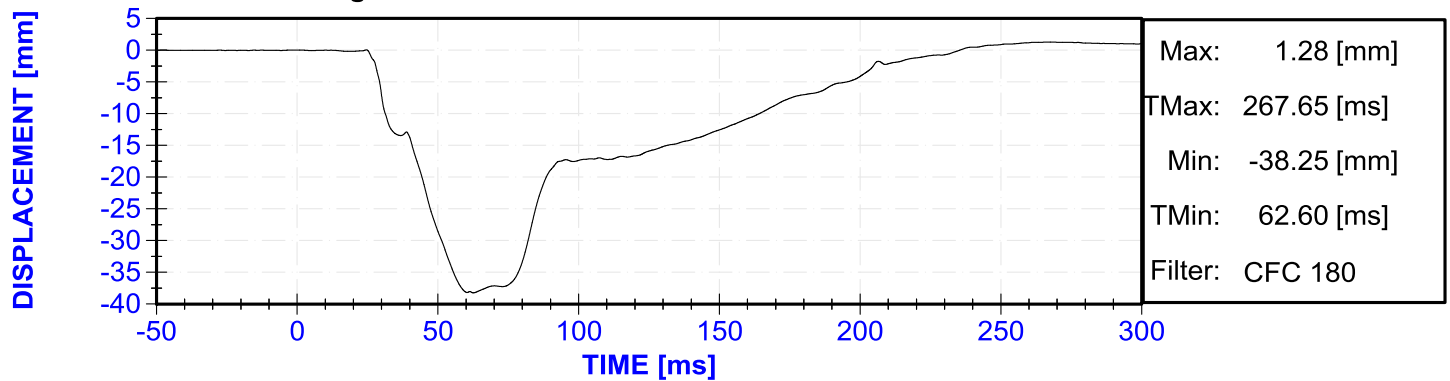
V2P1 Chest Left Lower Dz



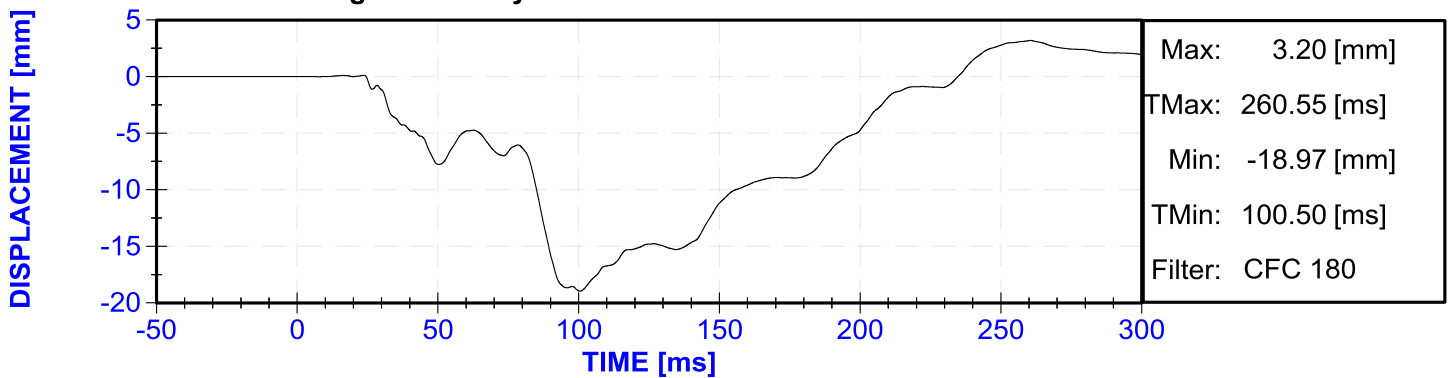
V2P1 Chest Left Lower D

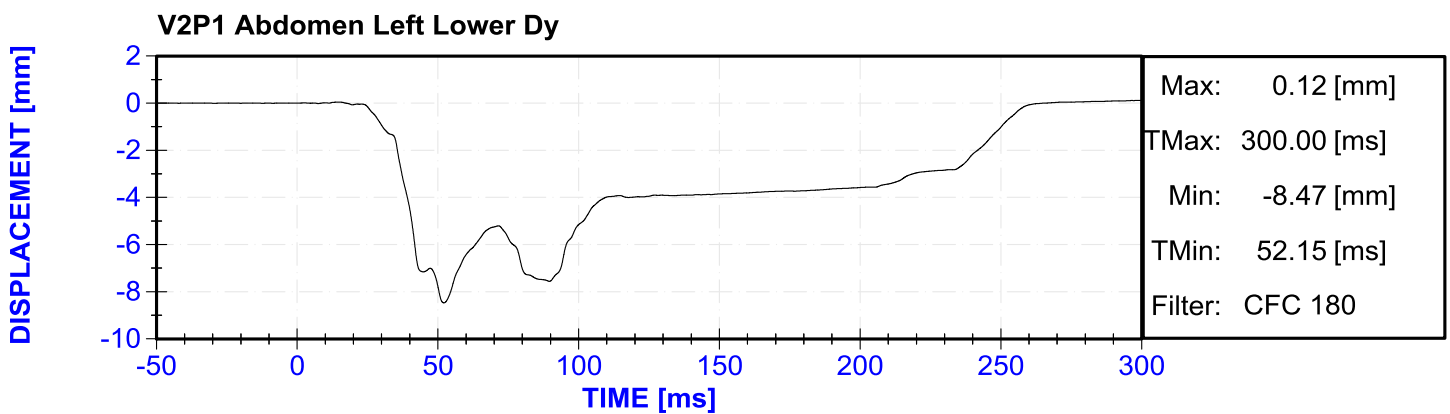
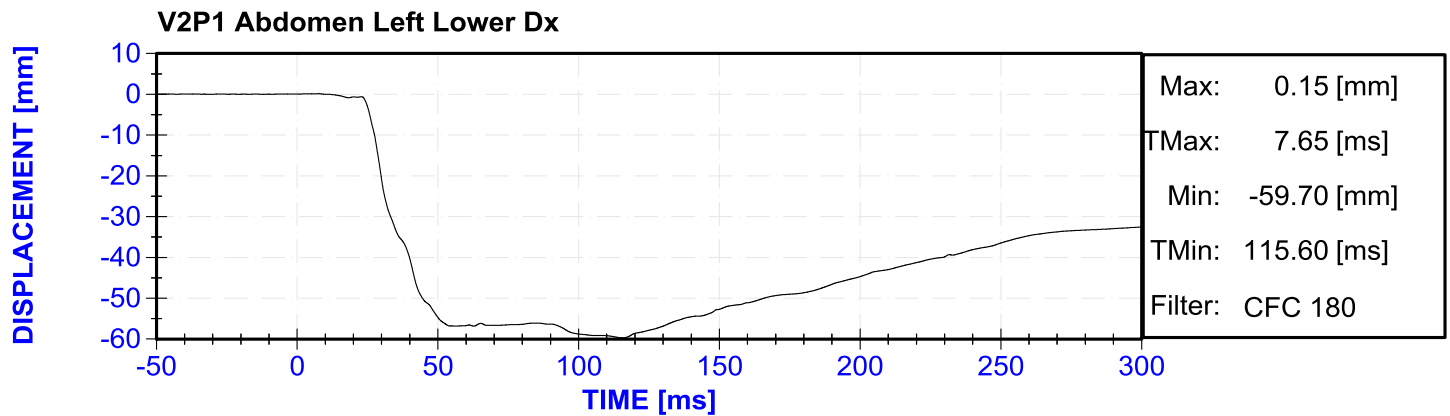
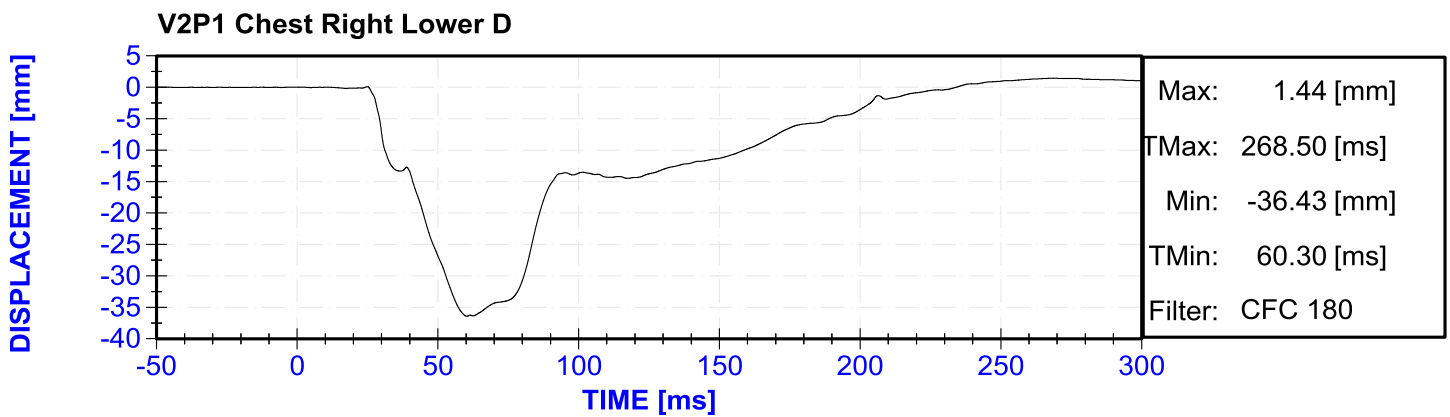
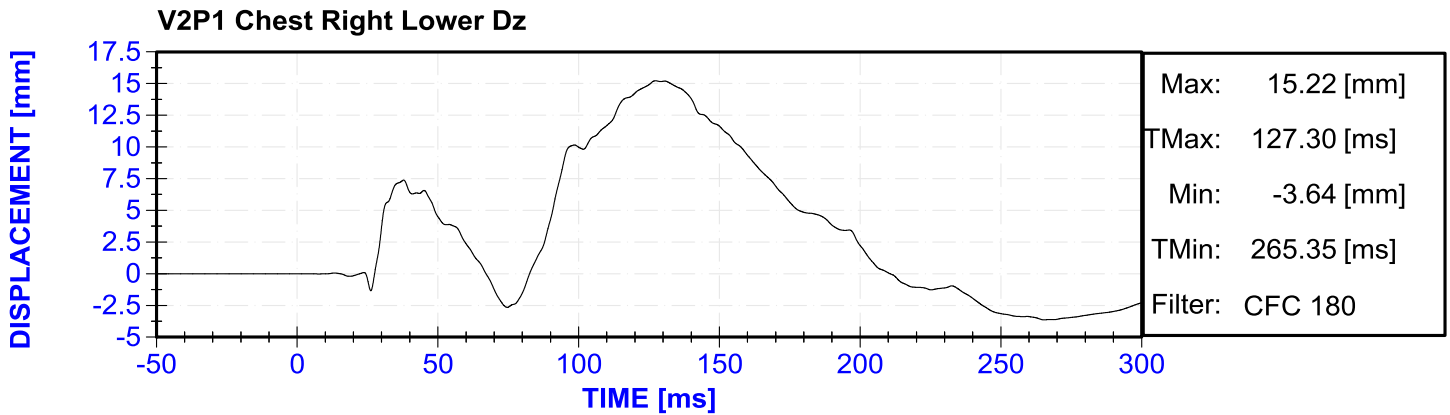


V2P1 Chest Right Lower Dx

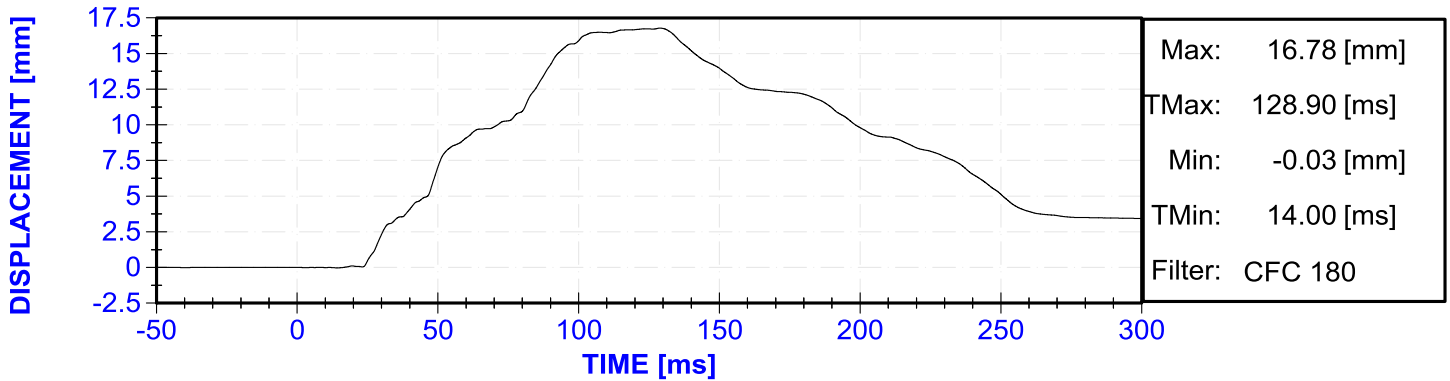


V2P1 Chest Right Lower Dy

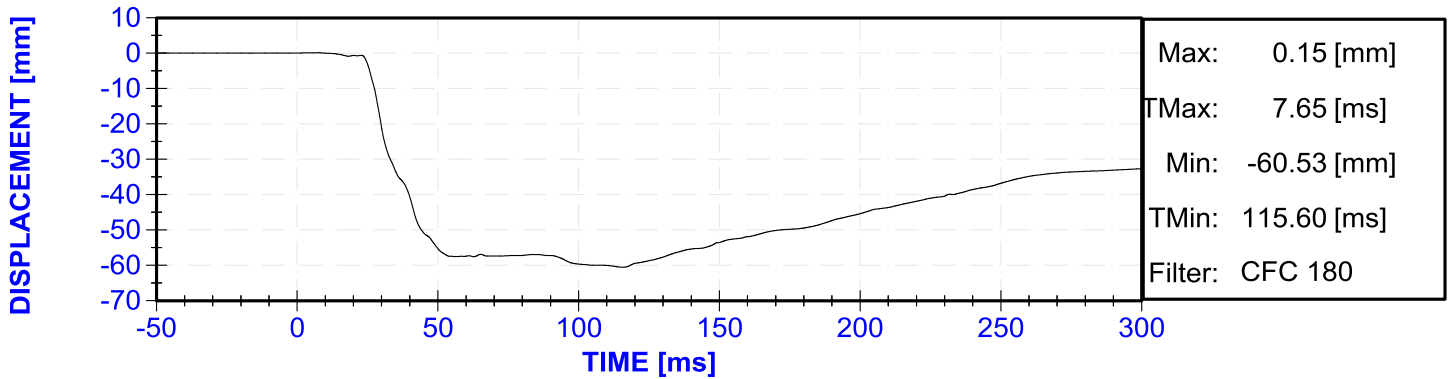




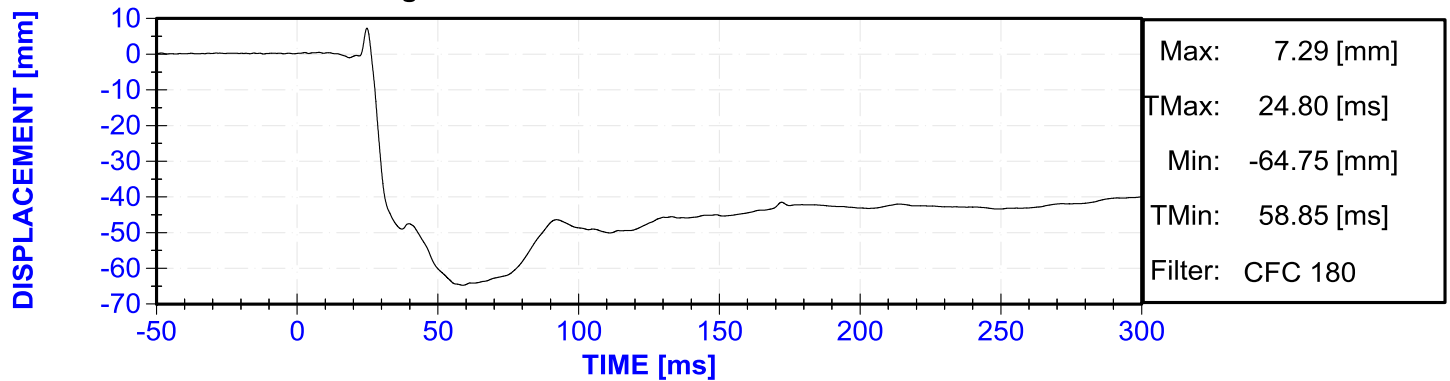
V2P1 Abdomen Left Lower Dz



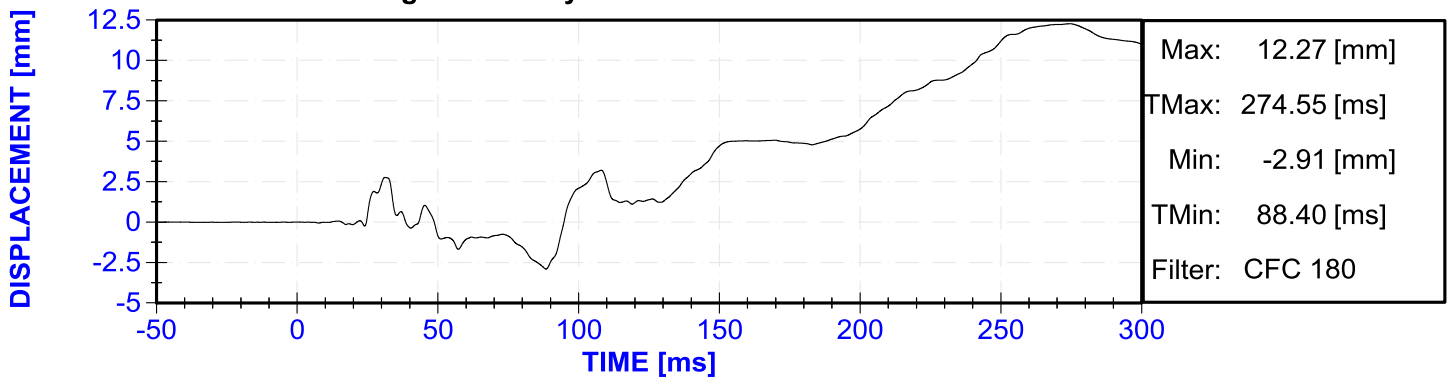
V2P1 Abdomen Left Lower D



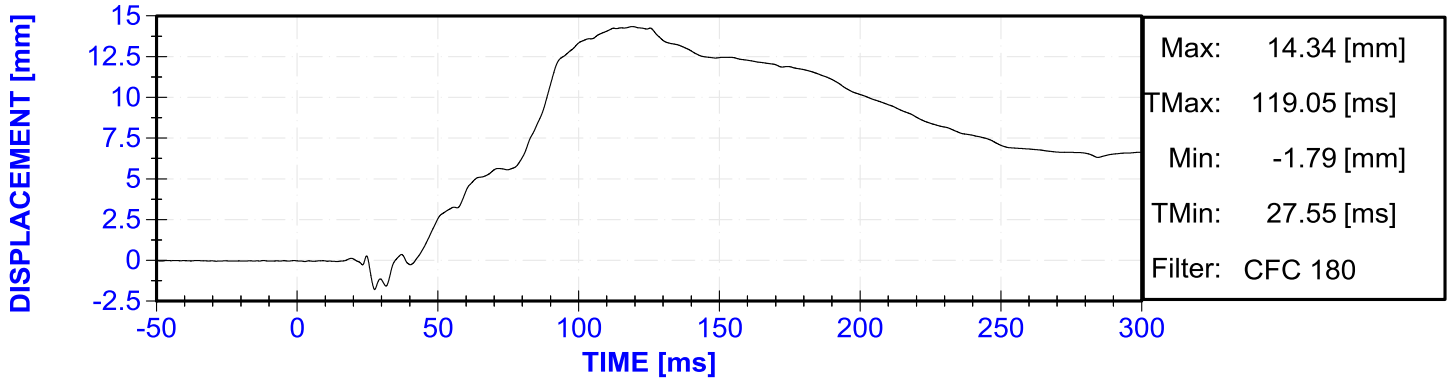
V2P1 Abdomen Right Lower Dx



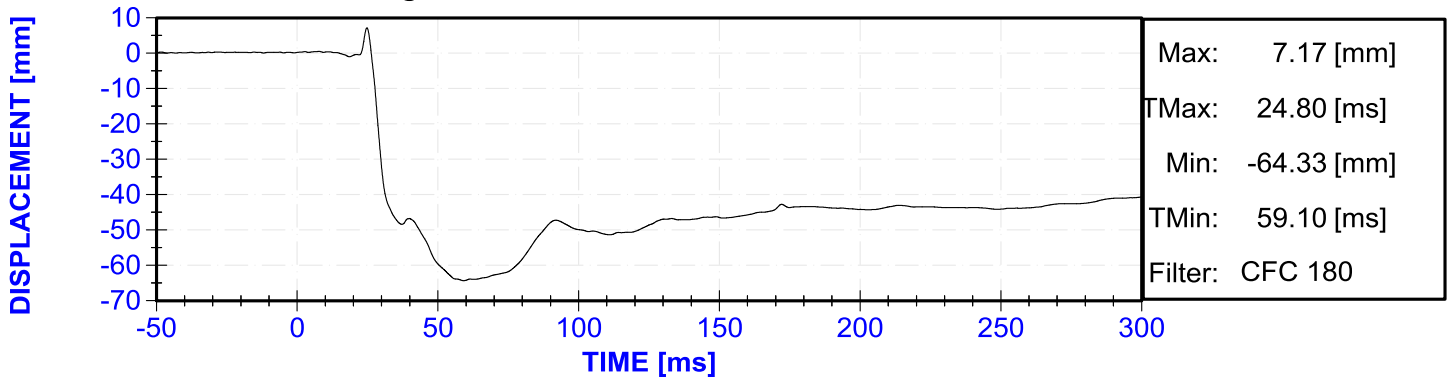
V2P1 Abdomen Right Lower Dy



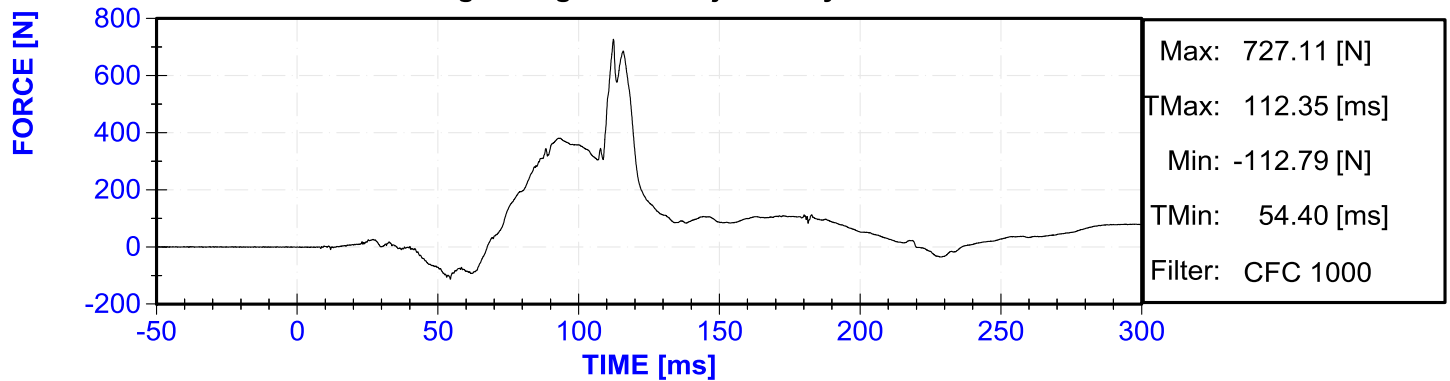
V2P1 Abdomen Right Lower Dz



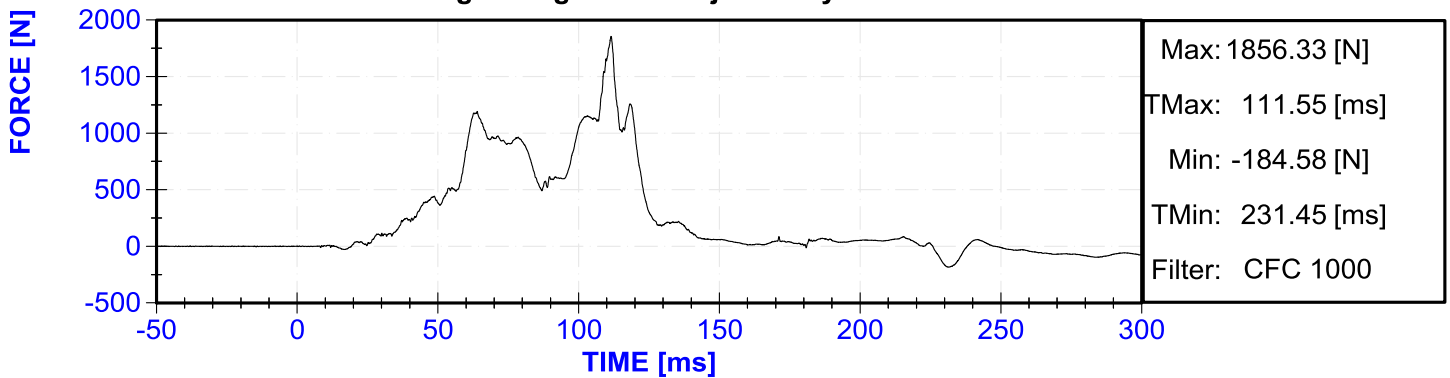
V2P1 Abdomen Right Lower D



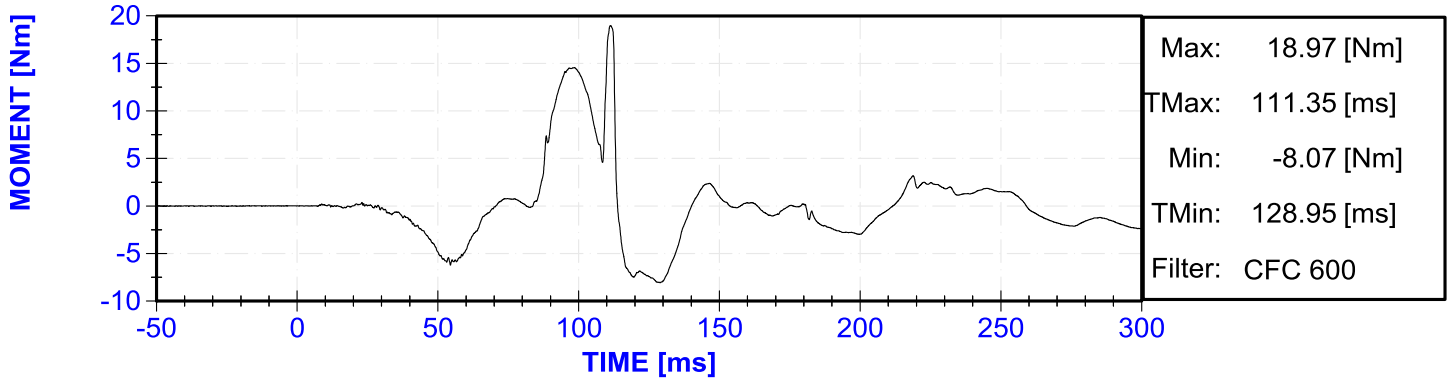
V2P2 Fx on head acting through the O.C. joint only



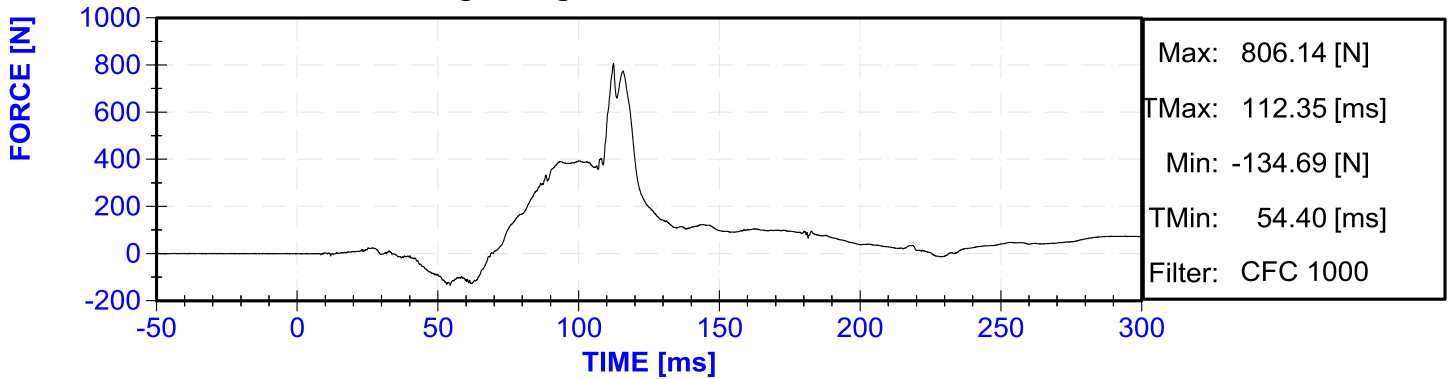
V2P2 Fz on head acting through the O.C. joint only



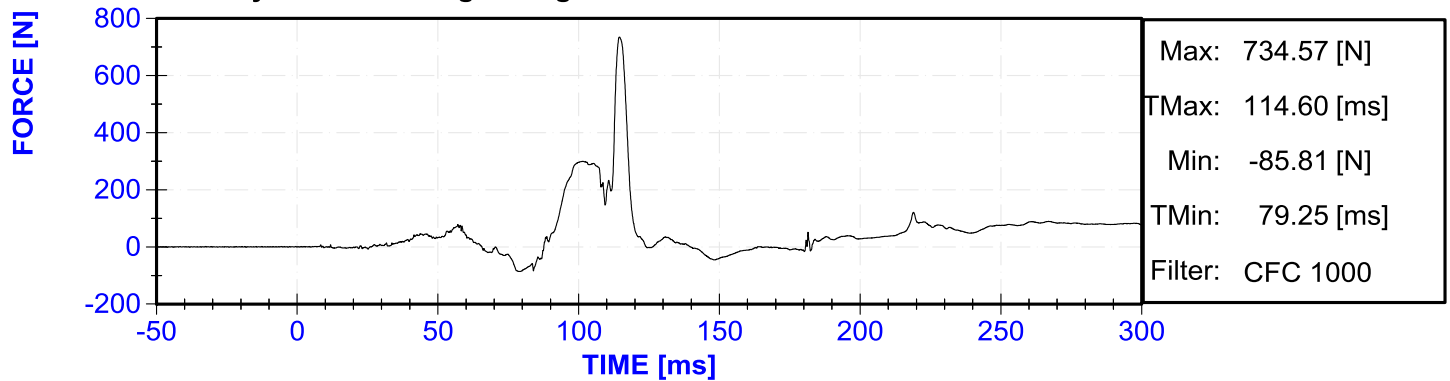
V2P2 My on head acting through the O.C. joint only



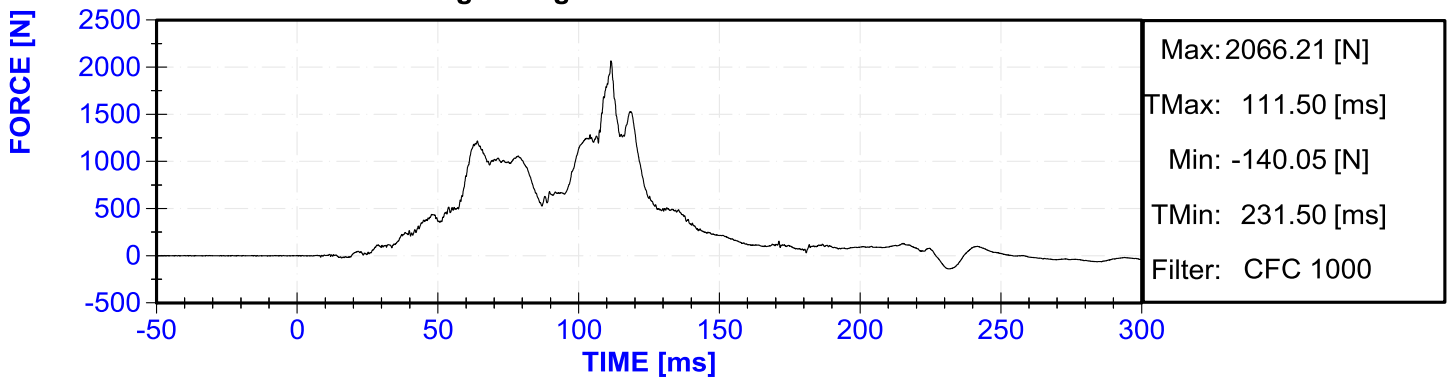
V2P2 Fx on head acting through the total neck section



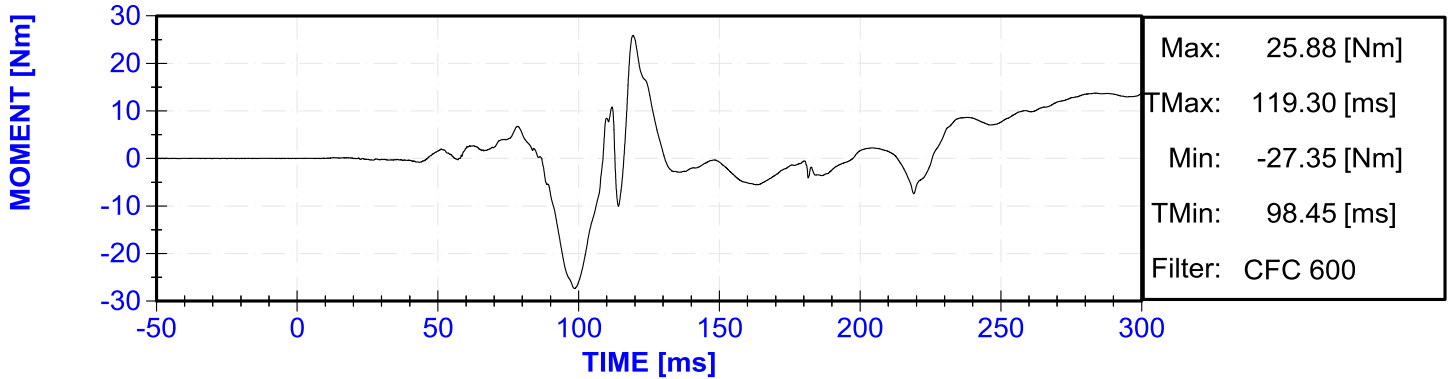
V2P2 Fy on head acting through the total neck section



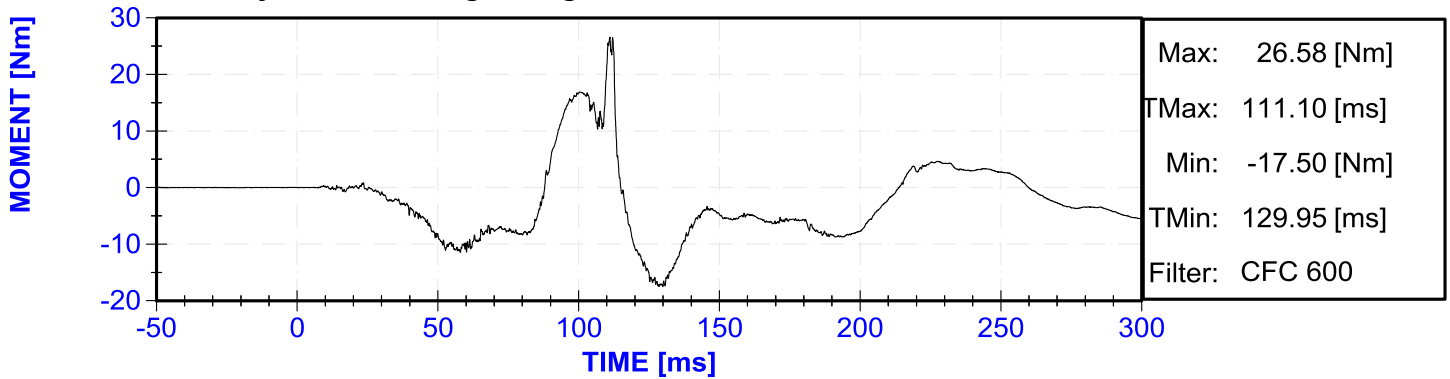
V2P2 Fz on head acting through the total neck section



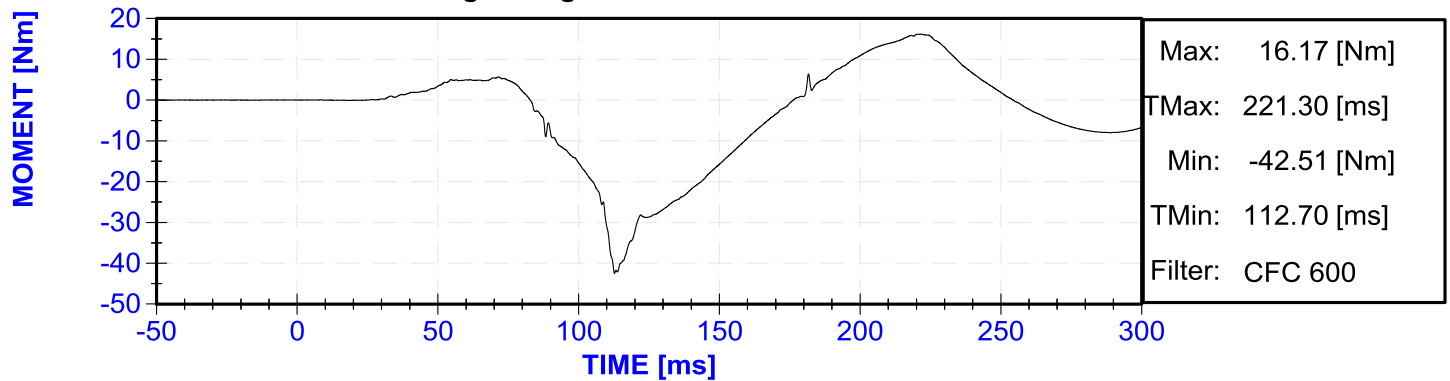
V2P2 Mx on head acting through the total neck section



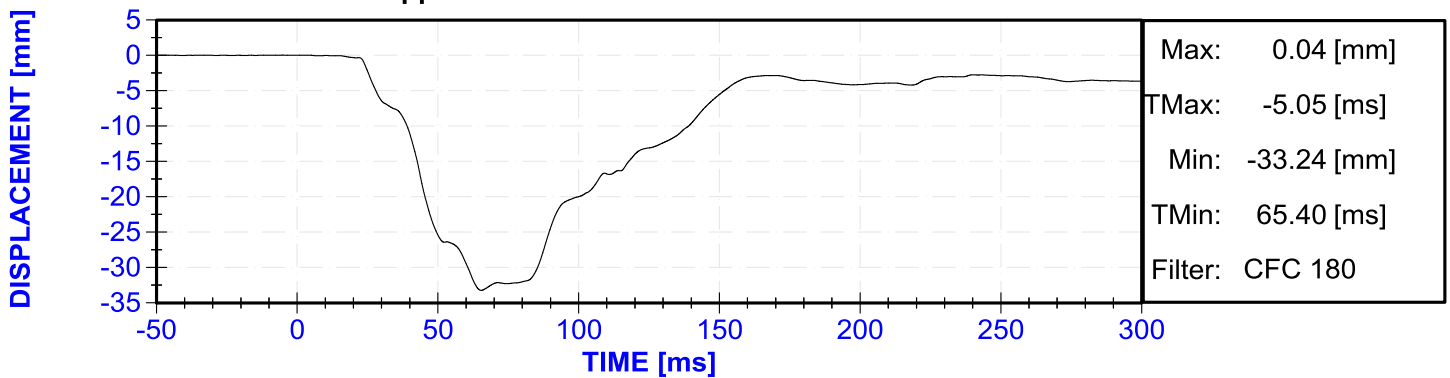
V2P2 My on head acting through the total neck section

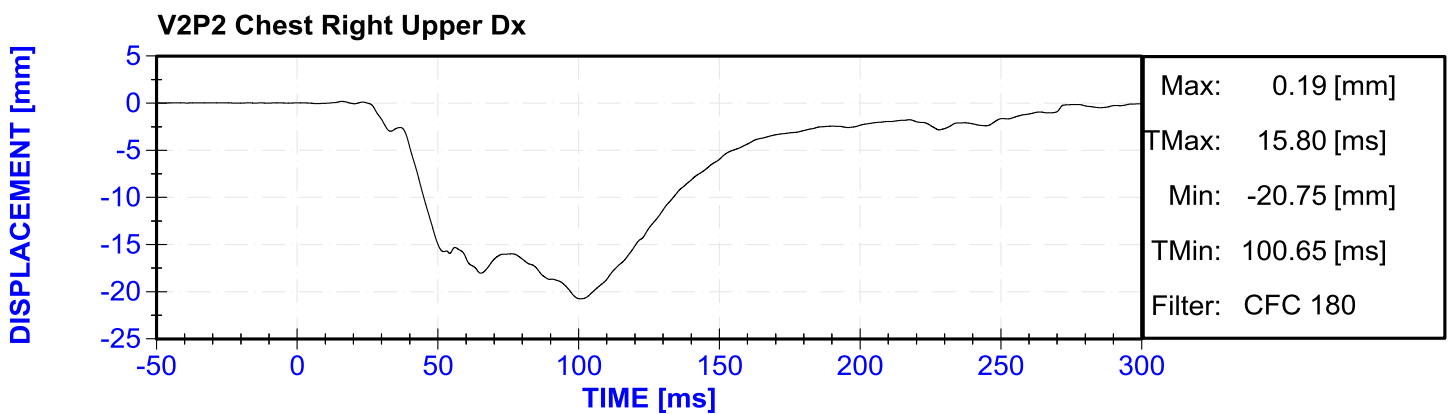
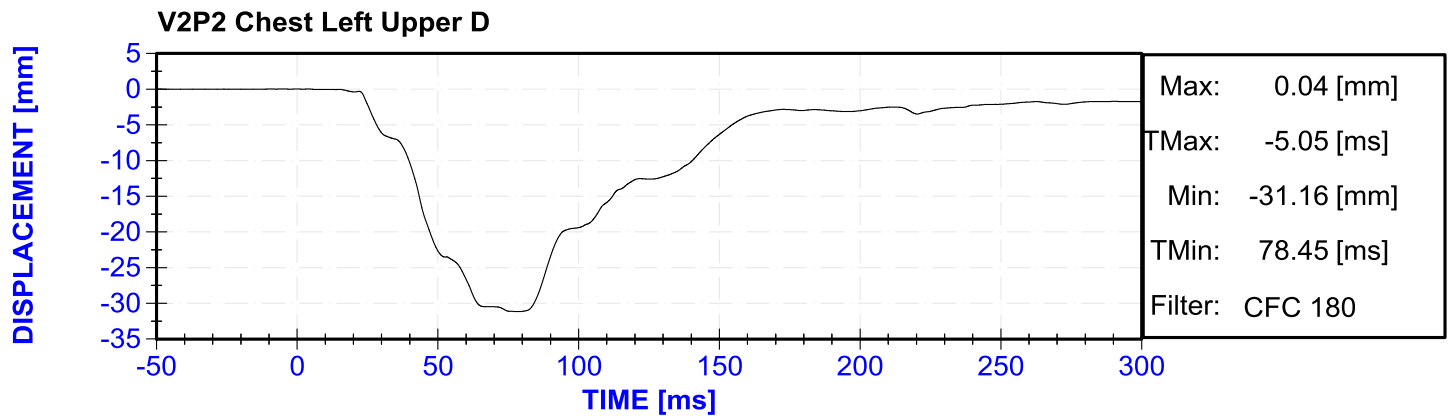
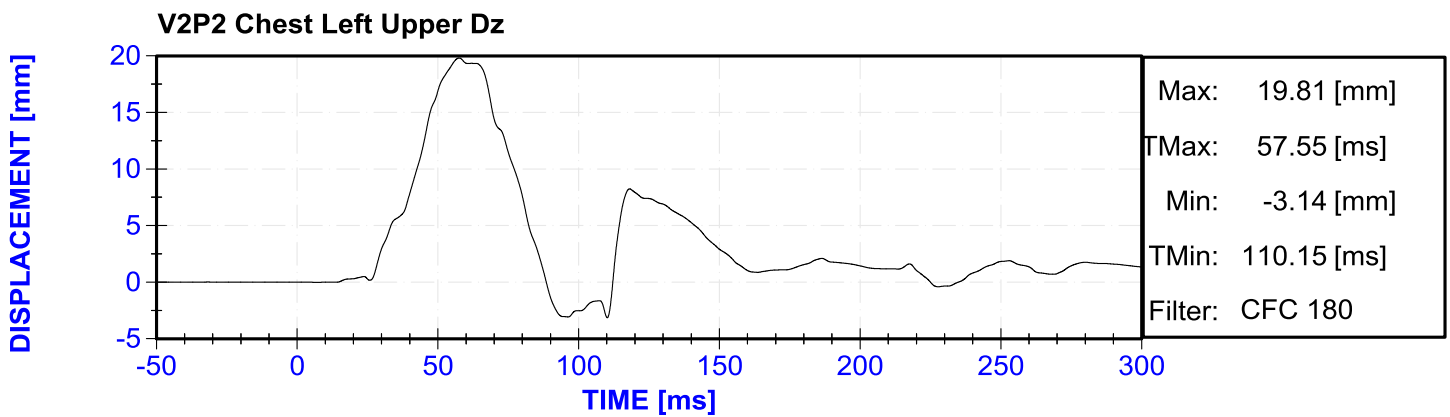
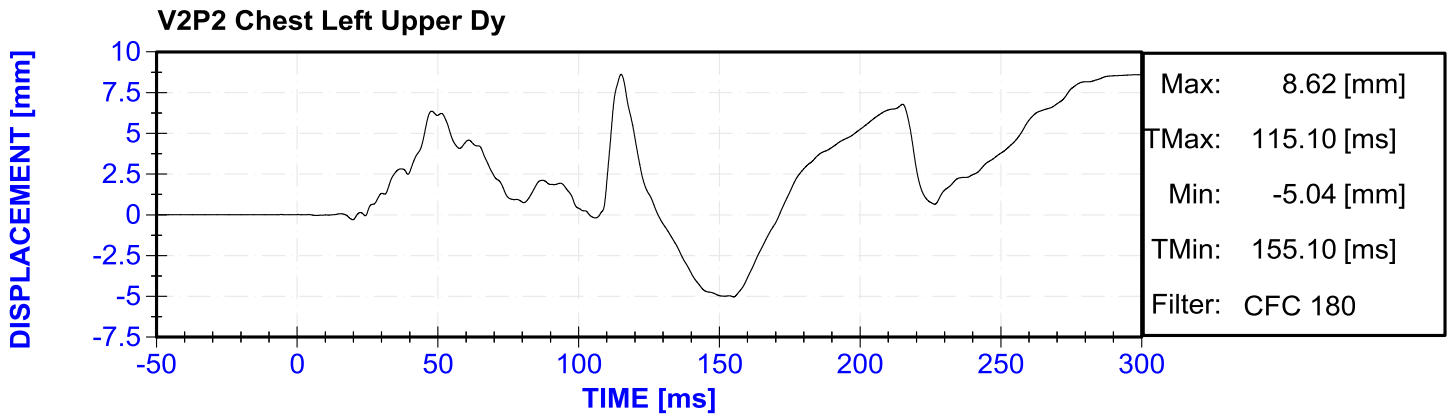


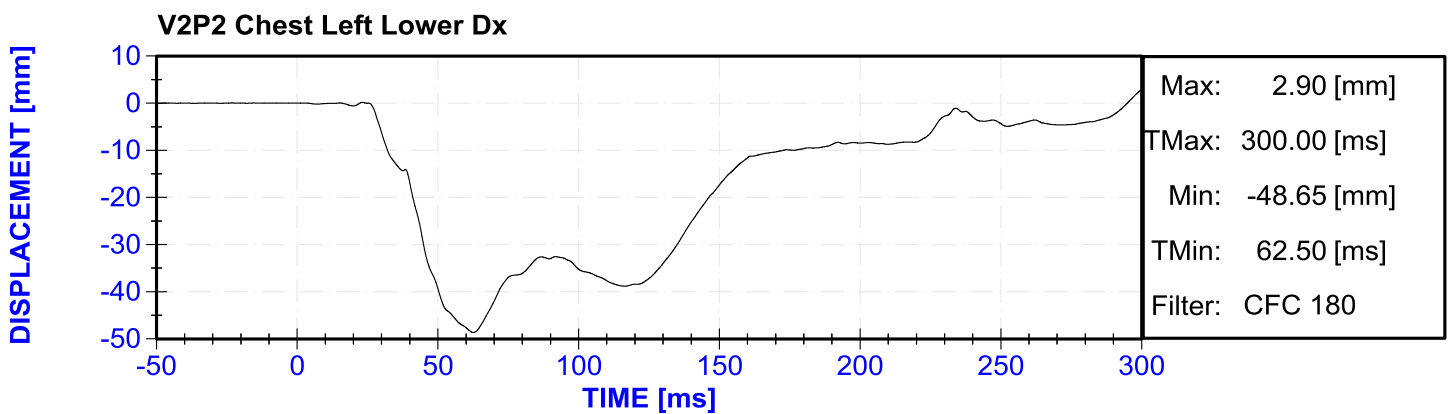
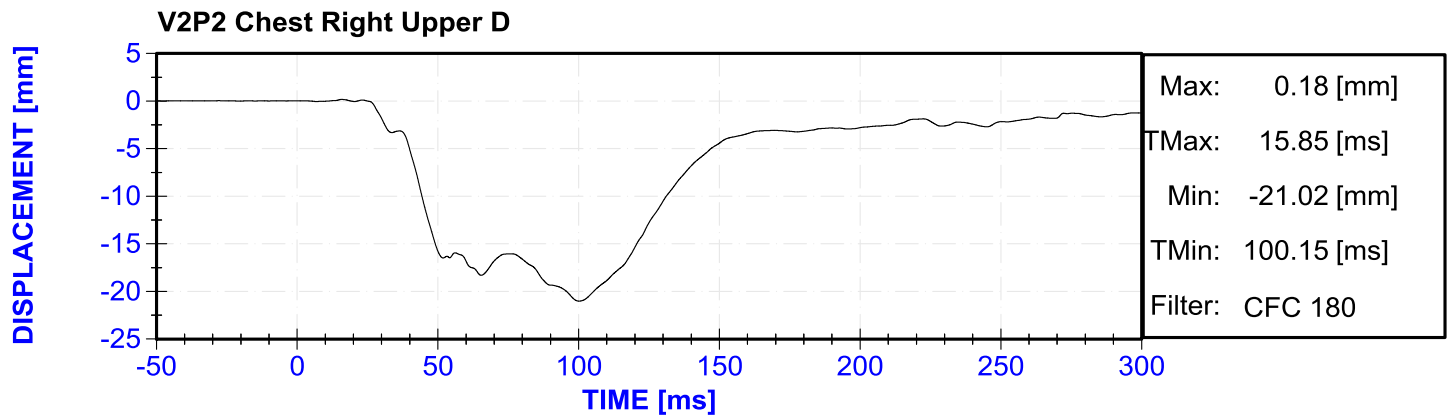
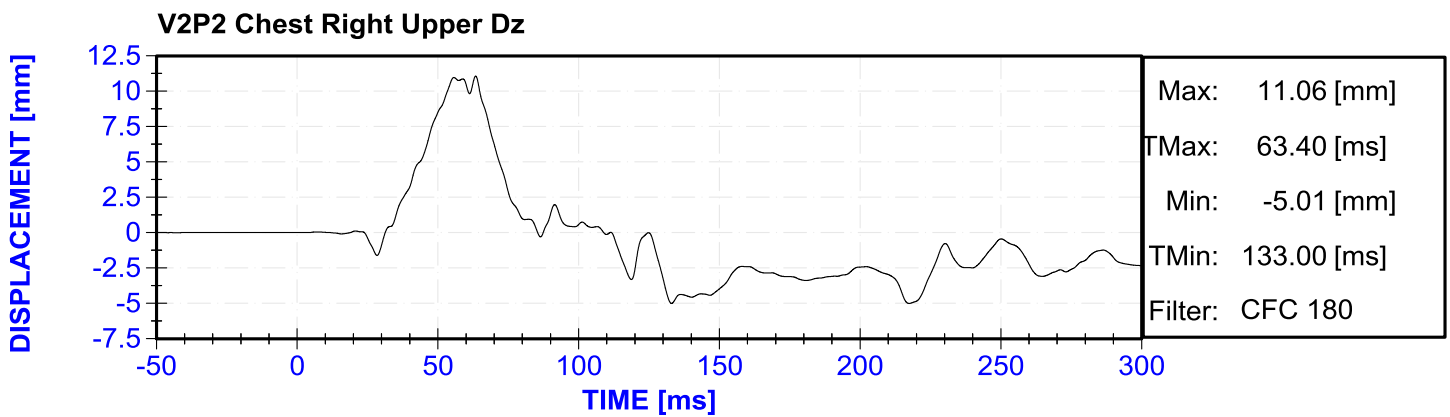
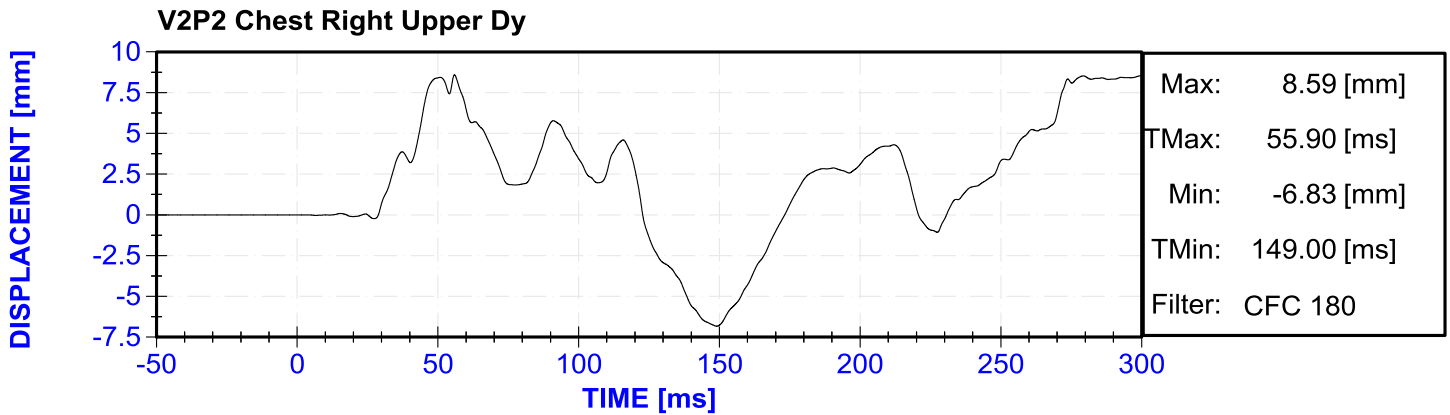
V2P2 Mz on head acting through the total neck section



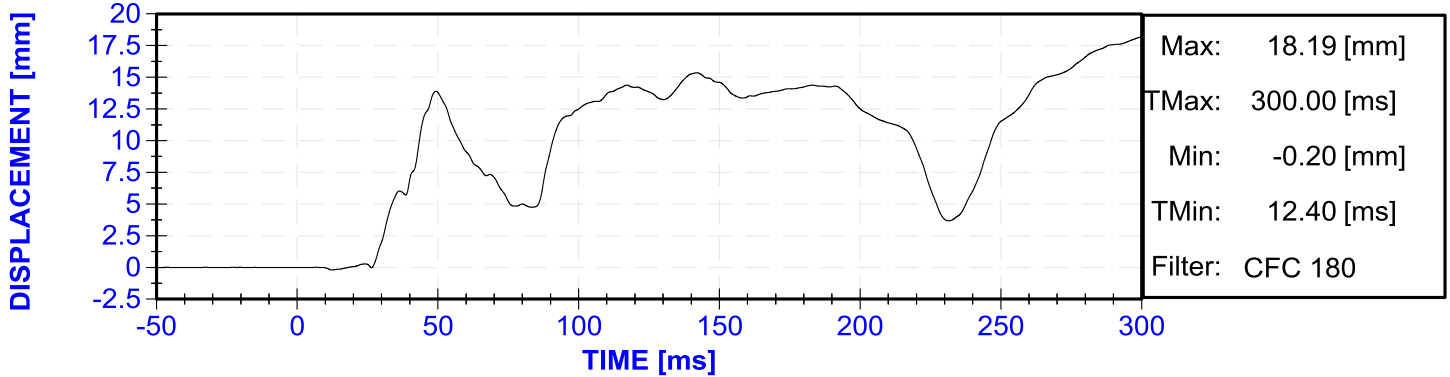
V2P2 Chest Left Upper Dx



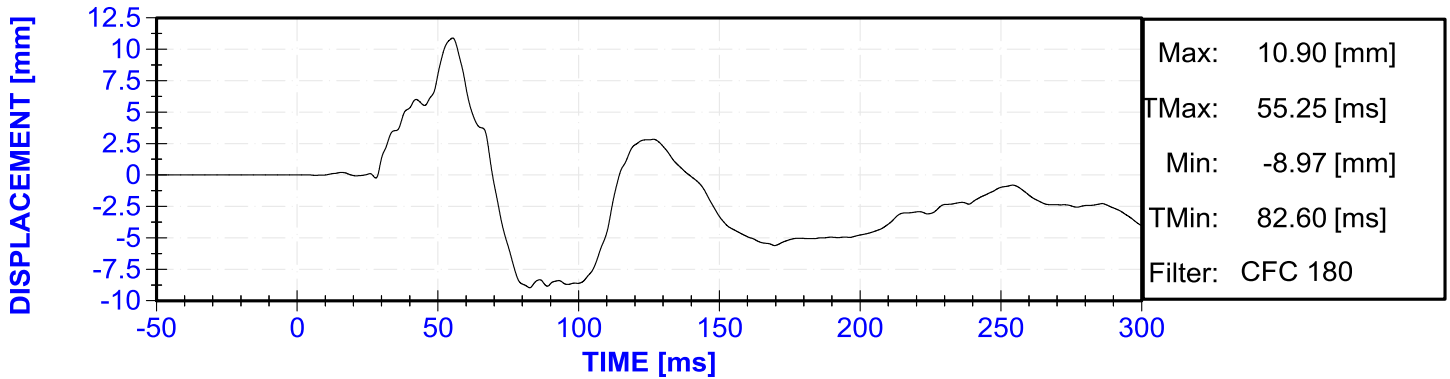




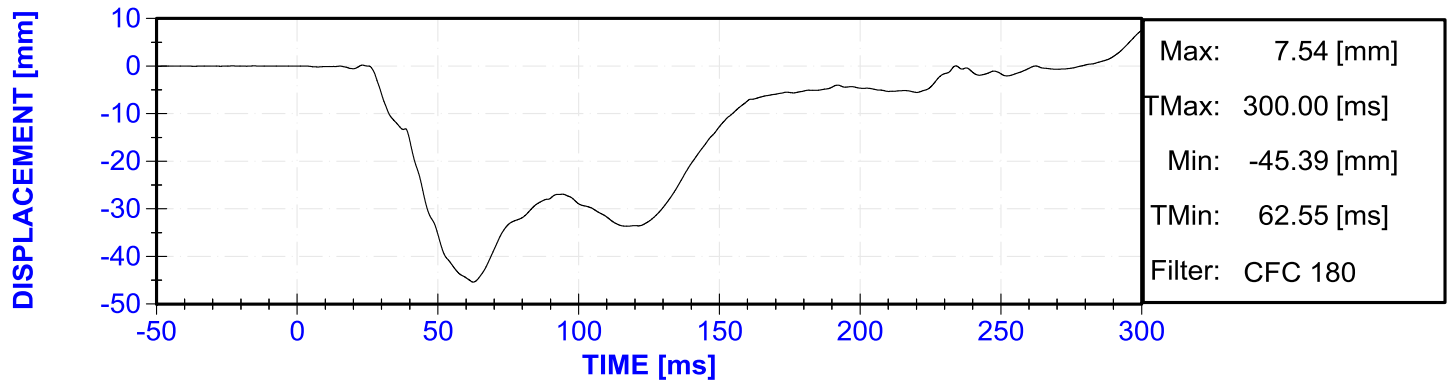
V2P2 Chest Left Lower Dy



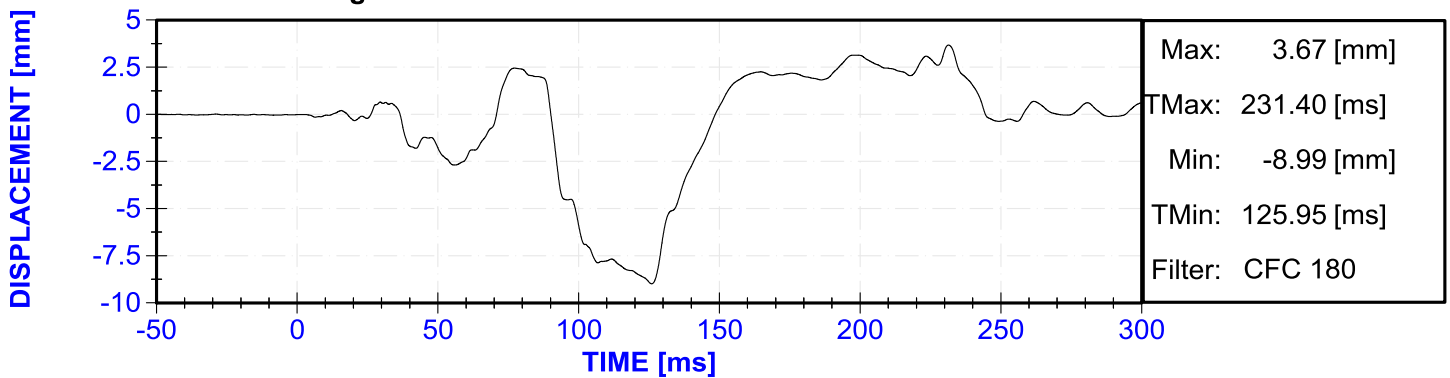
V2P2 Chest Left Lower Dz

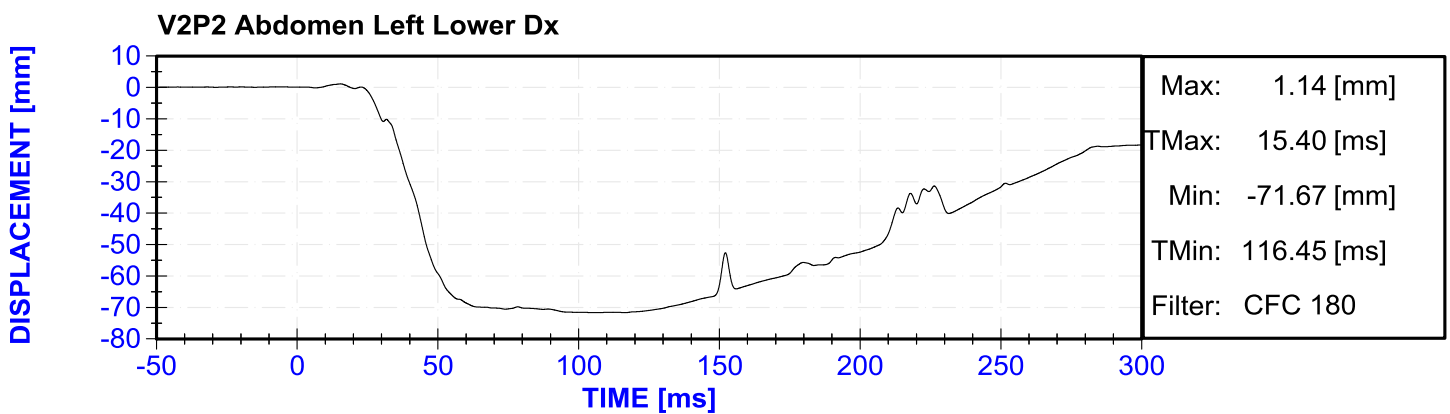
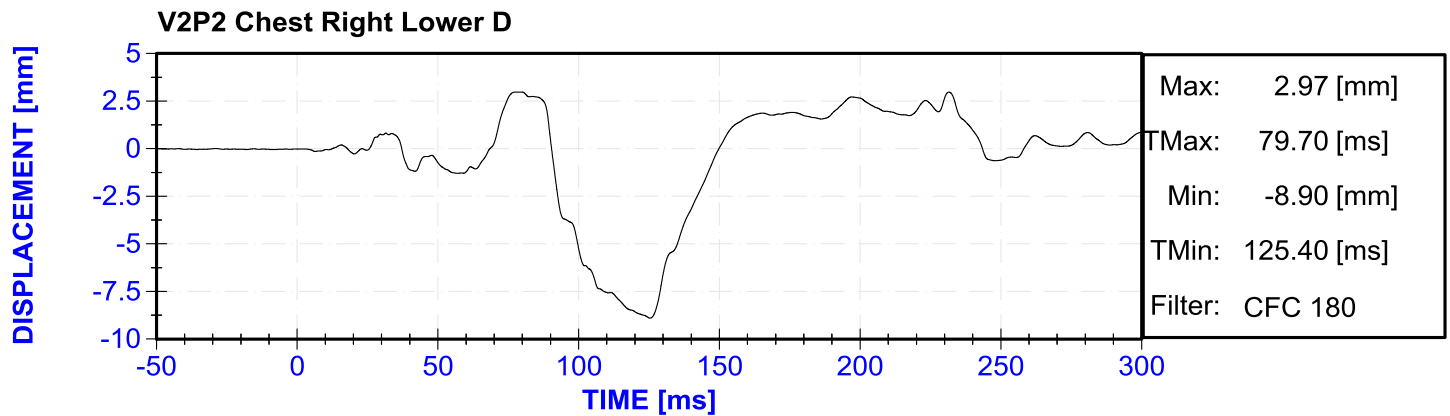
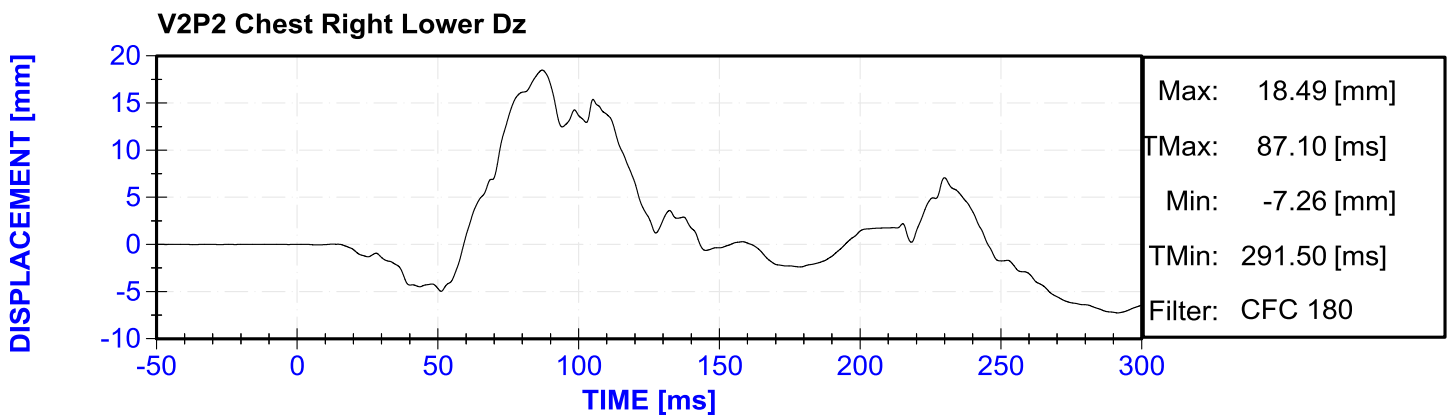
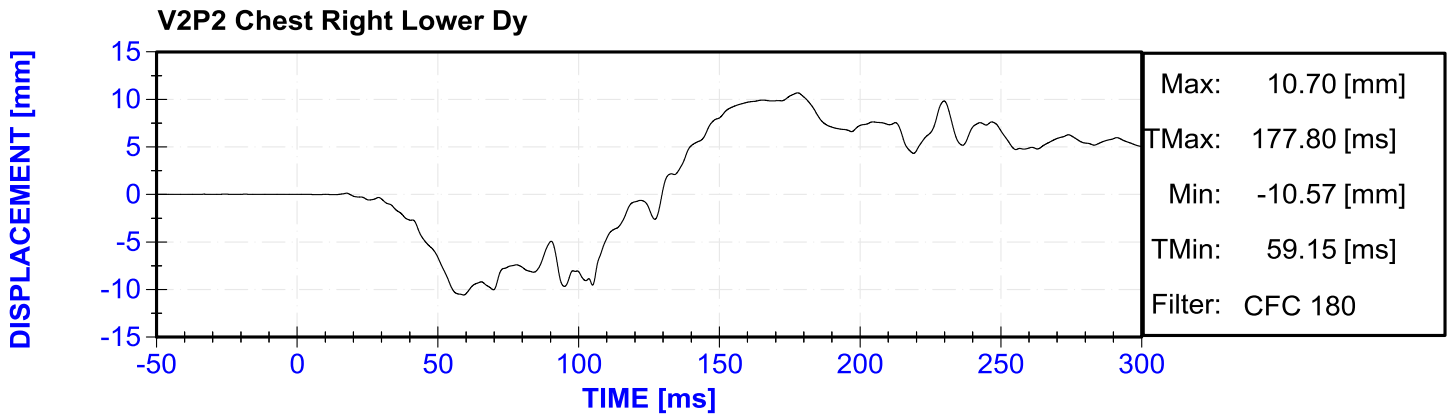


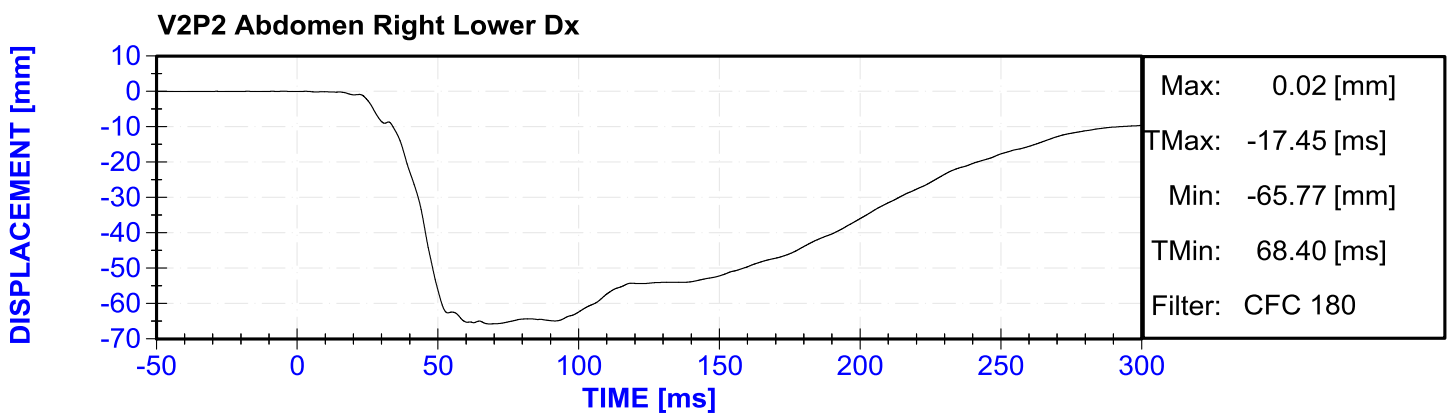
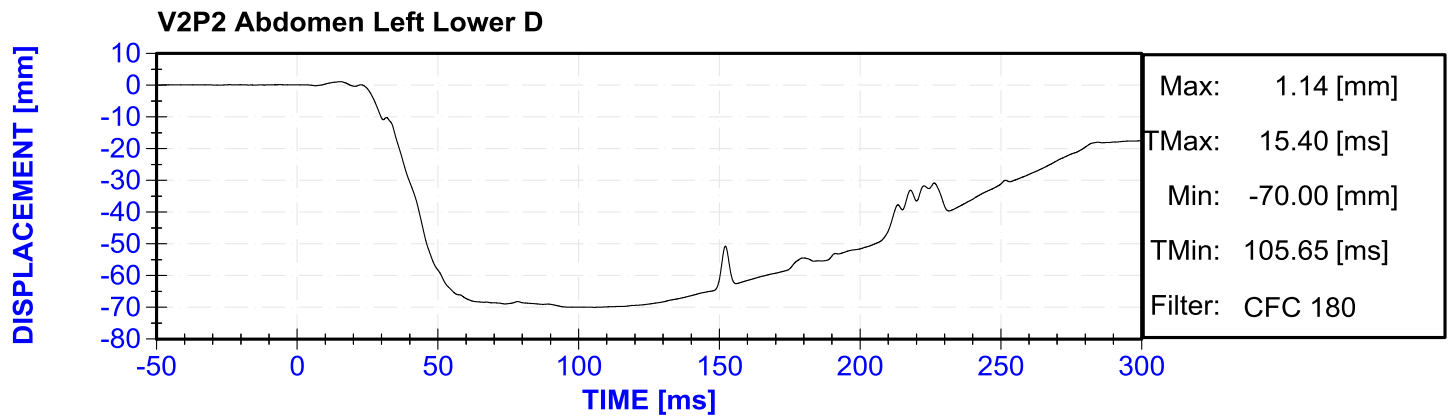
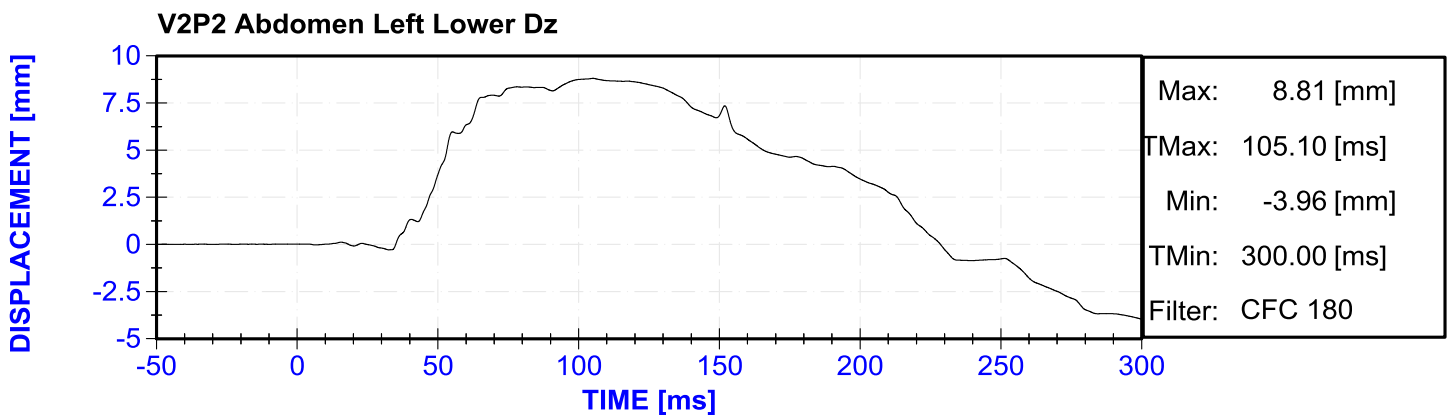
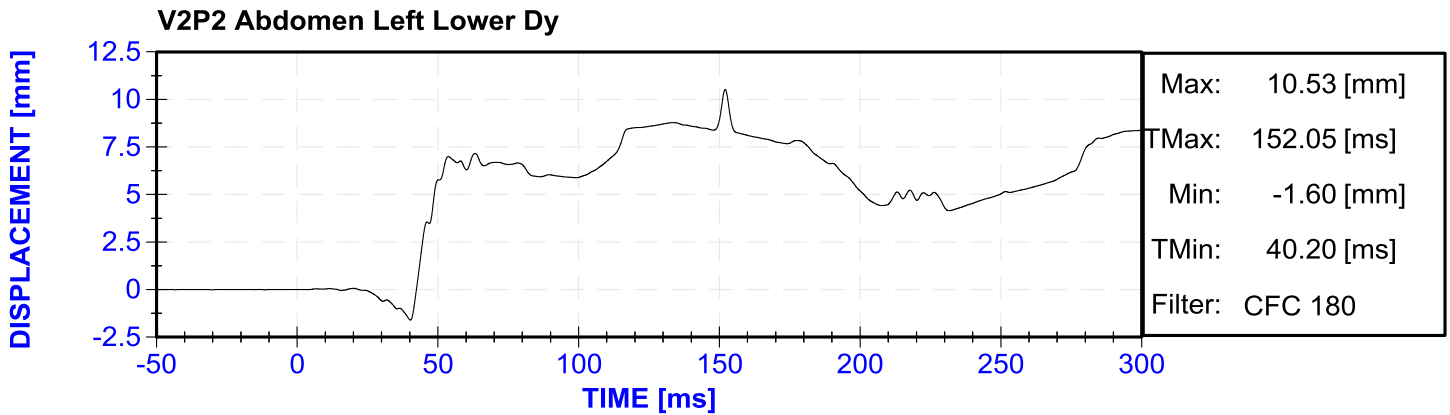
V2P2 Chest Left Lower D



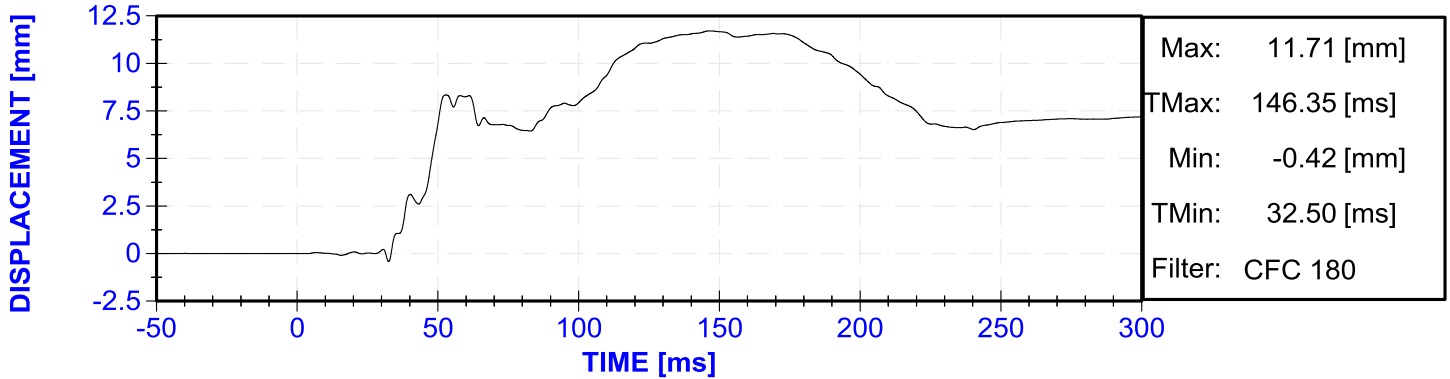
V2P2 Chest Right Lower Dx



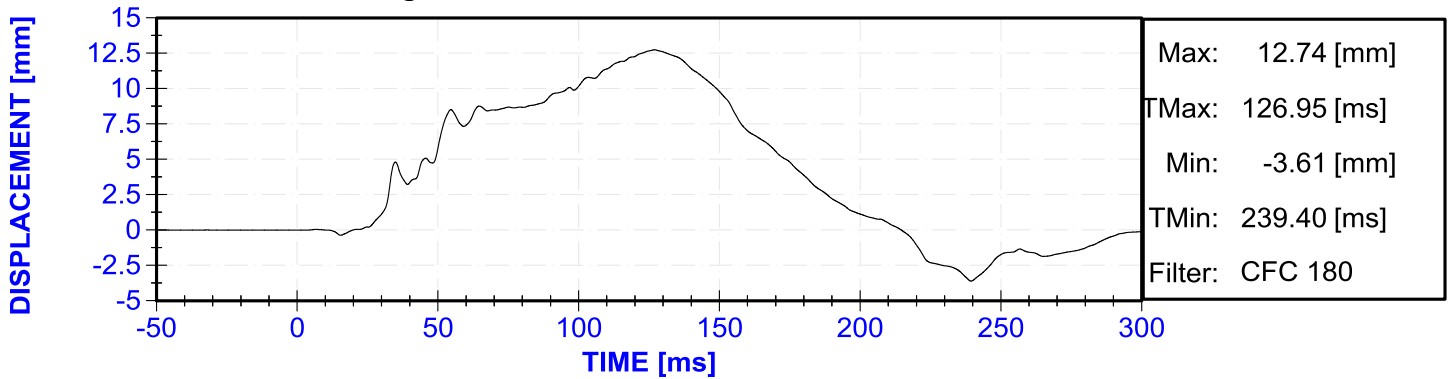




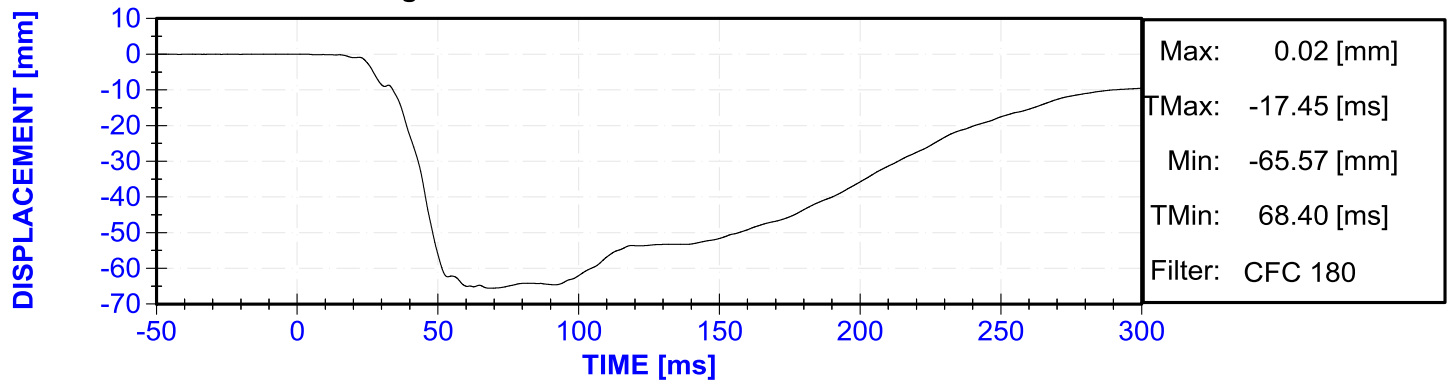
V2P2 Abdomen Right Lower Dy



V2P2 Abdomen Right Lower Dz



V2P2 Abdomen Right Lower D



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

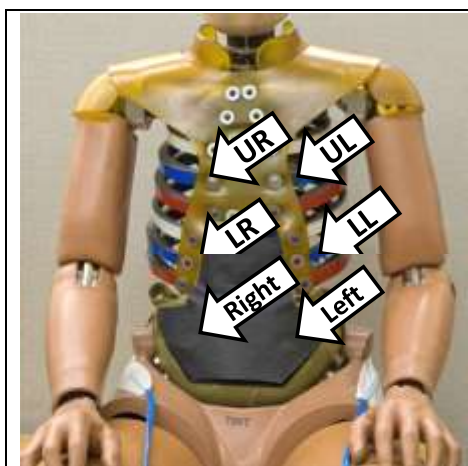


Figure 1. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

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

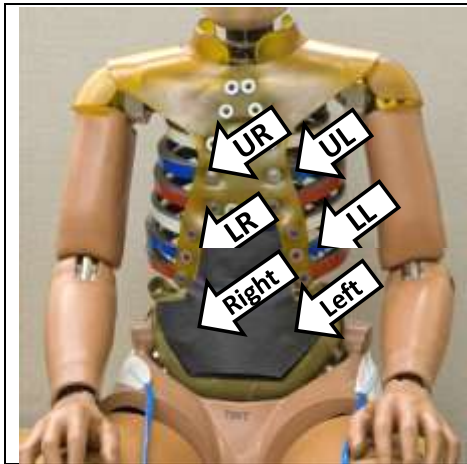


Figure 2. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

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: 07/15/2014	
NHTSA Representative: James Saunders	
Inspection Reporter: Mary Geesey	
Inspection type (check one): ☒ Pre-Test ☐ Post-Test	
Dummy S/N: 0015	Legs S/N: LX0038/LX0039
Dummy Description: THOR NT 50th Male	
Date of last Certification: Certification performed in May 2014	
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RD0529 – Hyundai Elantra <u>Since last certification:</u> R20145400 – Mazda 3 R20145401 – Mazda CX-5 CAL2712 - Research Vehicle 2712 R20145372 – Honda Accord R20144143 – 2014 Toyota Camry R20145373 – Honda Odyssey RD0529 – Hyundai Elantra	
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> -None New	
<u>Physical evidence of damage:</u> See Report – Light scuffing, right leg	
<u>Anecdotal evidence of damage:</u> None	
<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

Note: New Damage is Noted in Red

HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage Horizontal cut in face flesh goes all the way through 
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates
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	Rear upper neck stop is missing rubber 

SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops Left softstop is missing. 
OTHER	Right hand has a cut. 

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	

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	IRTRACC securely attached to anterior ribs
Y / N	IRTRACC 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	Hole in chest damper foam on the left side  Right lower Dx IRTRACC cable broke at front end. Test data (300ms) was not affected. IRTRACC swapped with left lower tube per Dan/James' email approval on 6/26/14.  IRTRACC Replaced and is functional

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 Holes on both sides of lower abdomen bag 
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
OTHER	Lower right abdomen IRTRACC Y-Axis potentiometer cable insulation has detached. 

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	Multiple cuts and pitting in pelvis flesh  Cuts on the right side of pelvis, pitting on left side of pelvis and hole on the inside right side of pelvis all worsening: 

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 Knees are scuffed  Right knee flesh is torn.  Right knee insert has been cut all the way through: 
OTHER	

LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
Y / N	No cuts, tears, or scuffing of leg flesh Right leg flesh is torn at zipper attachment.  Right leg flesh is much more torn after CAL2712. Repair was made with Gaffer's tape.  Right leg scuffing  Right leg flesh has multiple small cuts:  Left leg zipper is pulling away from leg flesh: 
OTHER	

JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation Note: Bent, but can be corrected 
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers Multiple holes, tears in lining, frayed seams, back foam insert is falling apart  Holes forming in jacket: 
OTHER	

THOR Inspection Checklist

Date: 07/18/2014	
NHTSA Representative: James Saunders	
Inspection Reporter: Mary Geesey, Matthew Goehle	
Inspection type (check one): ☐ Pre-Test ☒ Post-Test	
Dummy S/N: 0015	Legs S/N: LX0038/LX0039
Dummy Description: THOR NT 50th Male	
Date of last Certification: Certification performed in May 2014	
<u>Tests conducted since last full certification or inspection:</u> Since last inspection: R20145508 – Subaru Impreza <u>Since last certification:</u> R20145400 – Mazda 3 R20145401 – Mazda CX-5 CAL2712 - Research Vehicle 2712 R20145372 – Honda Accord	<i>Continued</i> R20144143 – 2014 Toyota Camry R20145373 – Honda Odyssey RD0529 – Hyundai Elantra R20145508 – Subaru Impreza
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> -11ACTBLE00THFOXP, Acetabular Left X Force, Questionable spike from 54 to 55 ms, - Pins on THOR-side Amp pins were loose. We removed and tightened. -11ACTBRI00THFOZP, Acetabular Right Z Force, Questionable data after 57 ms, - 1 wire pulled out of THOR-side Amp pin. We resoldered. -11TIBIRLLXTHFOZP, Lower Tibia Right Z Force, Channel failed, - Cable was stretched thin causing an open circuit about 1 foot towards THOR from the Amp connector. We cut and spliced.	
<u>Physical evidence of damage:</u> See Report –Pelvis Flesh	
<u>Anecdotal evidence of damage:</u> None	
<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

Note: New Damage is Noted in Red

HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage Horizontal cut in face flesh goes all the way through 
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates
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	Rear upper neck stop is missing rubber 

SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops Left softstop is missing. 
OTHER	Right hand has a cut. 

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	

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	IRTRACC securely attached to anterior ribs
Y / N	IRTRACC 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	Hole in chest damper foam on the left side  Right lower Dx IRTRACC cable broke at front end. Test data (300ms) was not affected. IRTRACC swapped with left lower tube per Dan/James' email approval on 6/26/14.  IRTRACC Replaced and is functional

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 Holes on both sides of lower abdomen bag 
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
OTHER	Lower right abdomen IRTRACC Y-Axis potentiometer cable insulation has detached. 

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	Multiple cuts and pitting in pelvis flesh  Left of pelvis has small whole near Iliac load cell.  Cuts on the right side of pelvis, pitting on left side of pelvis and hole on the inside right side of pelvis all worsening: 

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 Knees are scuffed. Right knee flesh is torn.  Right knee insert has been cut all the way through: 
OTHER	

LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
Y / N	No cuts, tears, or scuffing of leg flesh Right leg flesh is torn at zipper attachment.  Right leg flesh is much more torn after CAL2712. Repair was made with Gaffer's tape.  Right leg scuffing and multiple small cuts.  Left leg zipper is pulling away from leg flesh. 
OTHER	

JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation Note: Bent, but can be corrected 
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers Multiple holes, tears in lining, frayed seams, back foam insert is falling apart. Holes forming in jacket. 
OTHER	

THOR Inspection Checklist

Date: 07-15-2014	
NHTSA Representative: James Saunders	
Inspection Reporter: Rick Weil, Mary Geesey	
Inspection type (check one): ☒ Pre-Test ☐ Post-Test	
Dummy S/N: 0016	Legs S/N: LX0019/LX0018
Dummy Description: THOR NT 50th Male	
Date of last Certification: Certification performed in June 2014	
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RD0529 – 2013 Hyundai Elantra <u>Since last certification:</u> R20145400 – Mazda 3 R20145401 – Mazda CX-5 CAL2712 - Research Vehicle 2712 R20145372 – Honda Accord R20144143 – 2014 Toyota Camry R201445373 – Honda Odyssey RD0529 – 2013 Hyundai Elantra	
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> - 13NECKLO00THFOYP, Lower Neck Y Force, Questionable data after 36 ms, SN:LC-85 Fy – Found broken wire for –Exe and repaired.	
<u>Physical evidence of damage:</u> None	
<u>Anecdotal evidence of damage:</u> None	
<u>Equipment delivered to Borrower:</u> THOR 0016 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

Note: New Damage is Noted in Red

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

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates
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	

SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact Both shoulder pads are torn. We used Gaffer's tape to prevent further damage.  More nick damage found to urethane shoulder pads 
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops
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	

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 is still torn in the center near clavicle attachment.

		
Y / N	Ribs securely attached to posterior spine	
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)	
OTHER	T6 Accelerometer cable is torn at accelerometer. 	

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 Lower abdomen bag has a number of ribs and tears. 	
Y / N	Lower abdomen insert securely attached to spine	
Y / N	Lower abdomen insert shows no evidence of permanent set	
OTHER		

PELVIS		
Y / N	Pelvis flesh fits securely over pelvis bones	
Y / N	H-point tool fits securely into hole on both sides of pelvis	
OTHER	Pelvis Instrumentation protective cover is missing. 	

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 Knees are both cut. Left insert is slightly cut.  More knee cuts found with damage going all the way through. No new damage to inserts 
OTHER	

LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached Ankle assemblies are both marked up but functional. 
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 tibia flesh has mild scuffing. 
OTHER	Inside left and right knee covers were swapped resulting in permanent markings in the rear knee stops. I  swapped.

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 a number of tears throughout.
OTHER	

THOR Inspection Checklist

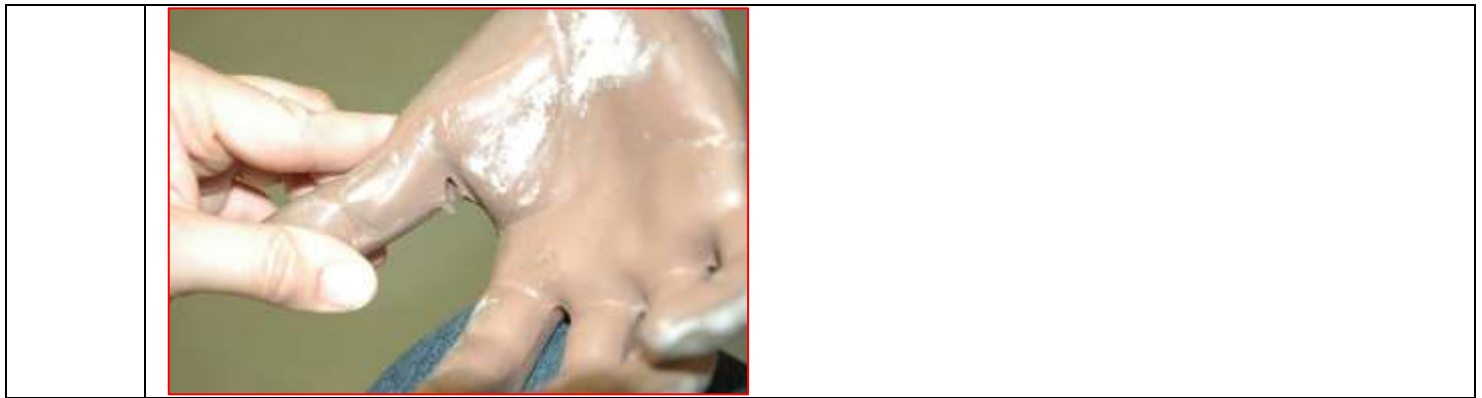
Date: 07-18-2014	
NHTSA Representative: James Saunders	
Inspection Reporter: Mary Geesey, Matthew Goehle	
Inspection type (check one): ☐ Pre-Test ☒ Post-Test	
Dummy S/N: 0016	Legs S/N: LX0019/LX0018
Dummy Description: THOR NT 50th Male	
Date of last Certification: Certification performed in June 2014	
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> R20145508 – Subaru Impreza <u>Since last certification:</u> R20145400 – Mazda 3 R20145401 – Mazda CX-5 CAL2712 - Research Vehicle 2712 R20145372 – Honda Accord R20144143 – 2014 Toyota Camry R201445373 – Honda Odyssey RD0529 – 2013 Hyundai Elantra R20145508 – Subaru Impreza \	
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> -None	
<u>Physical evidence of damage:</u> -See Report – Minor knee, cut hand, shoulder stop	
<u>Anecdotal evidence of damage:</u> None	
<u>Equipment delivered to Borrower:</u> THOR 0016 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

Note: New Damage is Noted in Red

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

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates
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	

SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact Both shoulder pads are torn. We used Gaffer's tape to prevent further damage.  More nick damage found to urethane shoulder pads 
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops Left shoulder is missing the soft stop 
OTHER	Right hand has a cut thumb.



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	

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 is still torn in the center near clavicle attachment.
	
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)
OTHER	T6 Accelerometer cable is torn at accelerometer.
	

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 Lower abdomen bag has a number of ribs and tears.
	
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
OTHER	

PELVIS	
Y / N	Pelvis flesh fits securely over pelvis bones
Y / N	H-point tool fits securely into hole on both sides of pelvis
OTHER	Pelvis Instrumentation protective cover is missing. 

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 Knees are both cut.  Left knee damage after CAL2717 
OTHER	

LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached Ankle assemblies are both marked up but functional. 
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 tibia flesh has mild scuffing. 
OTHER	Inside left and right knee covers were swapped resulting in permanent markings in the rear knee stops. I swapped.

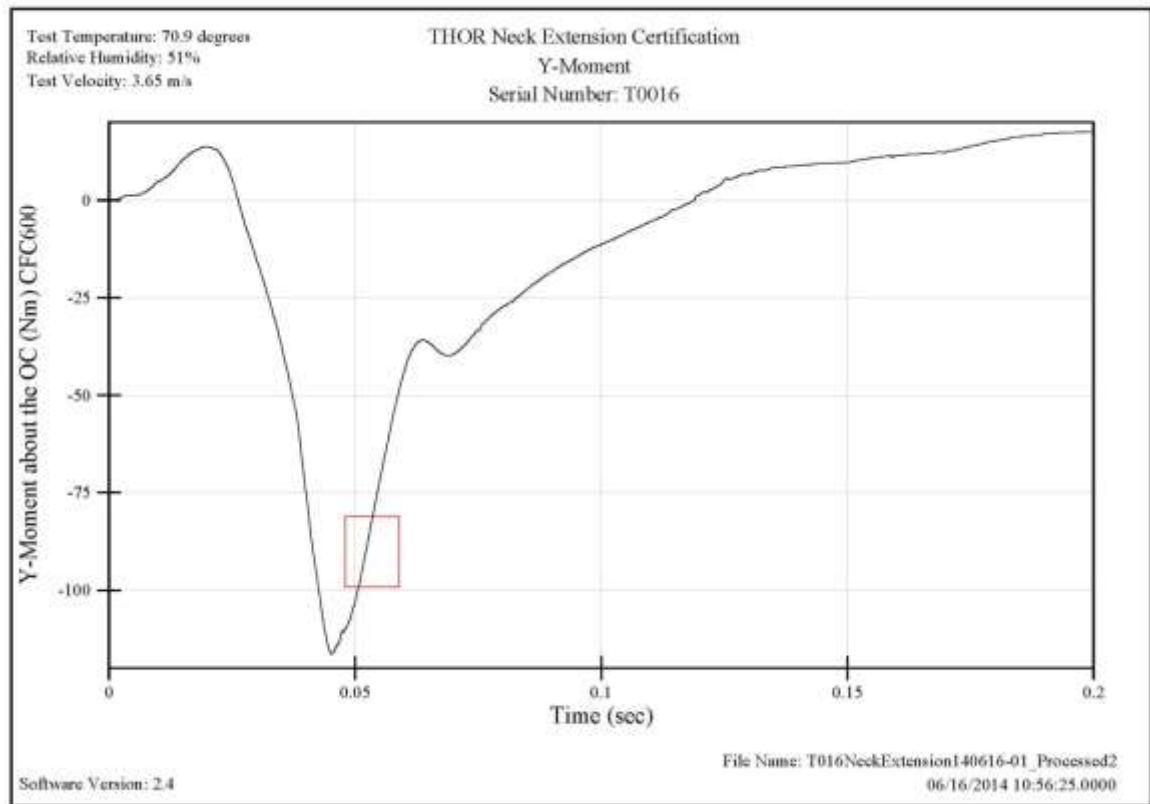
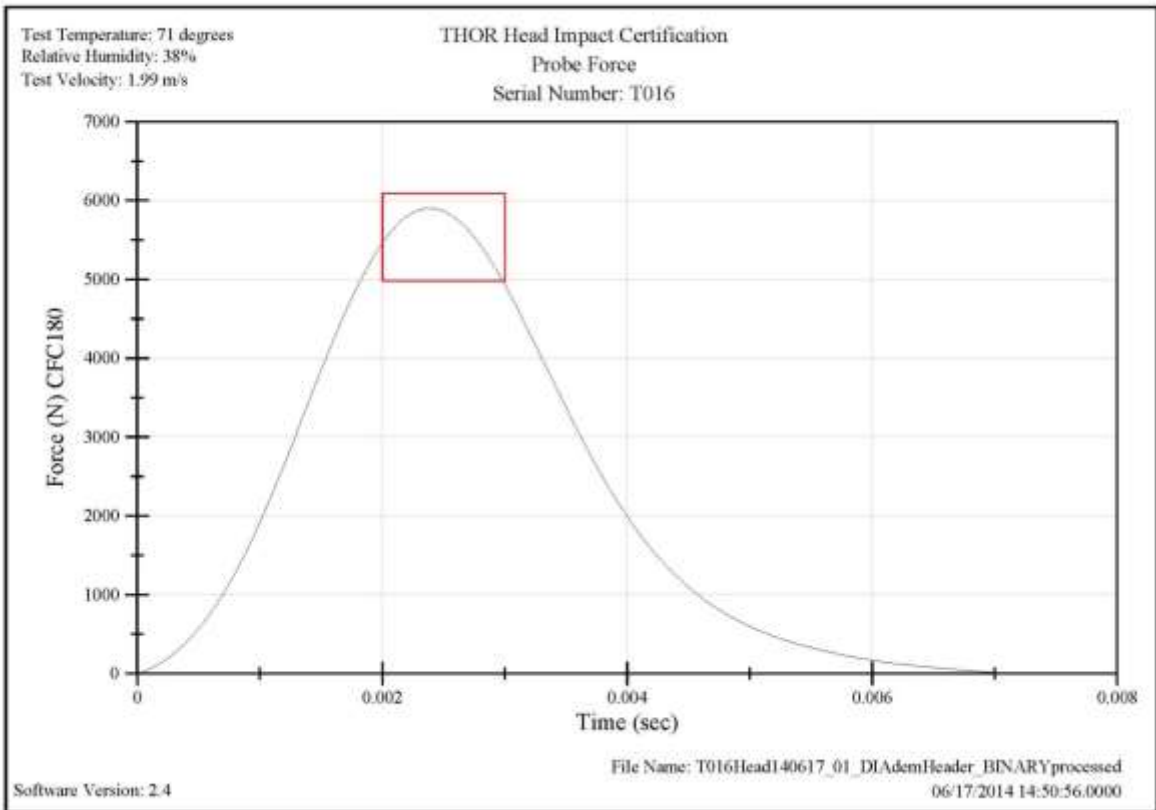


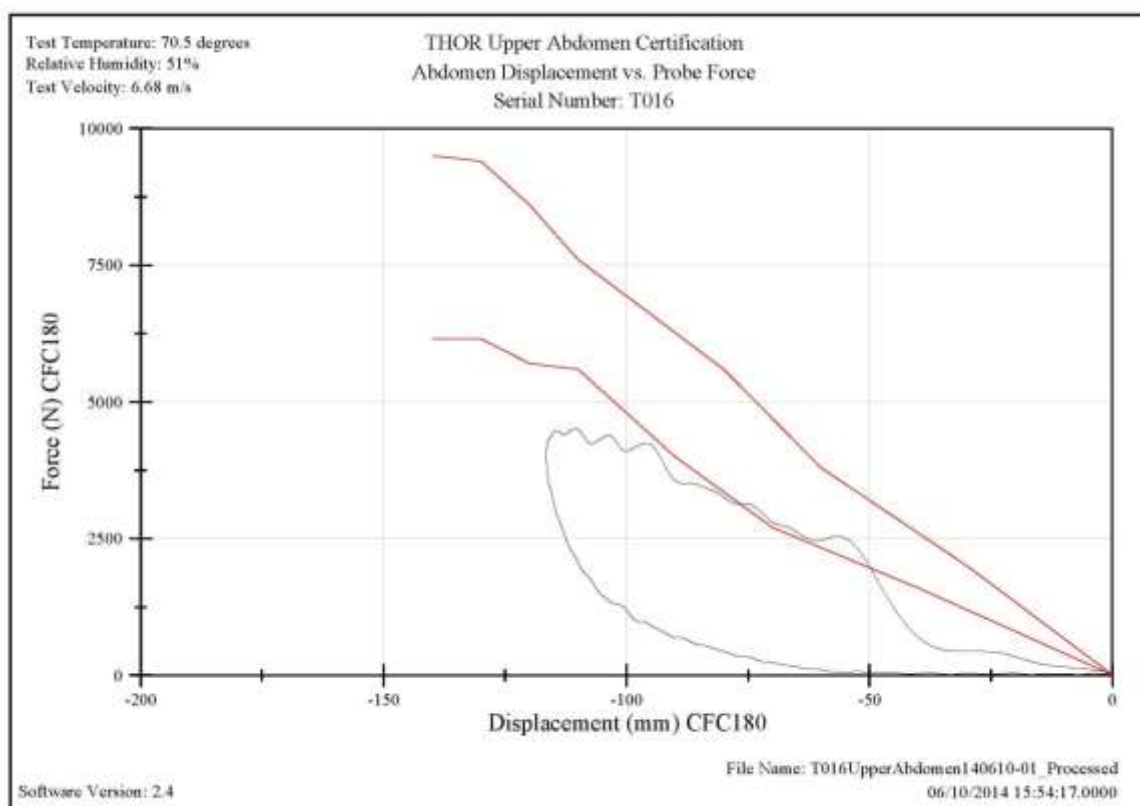
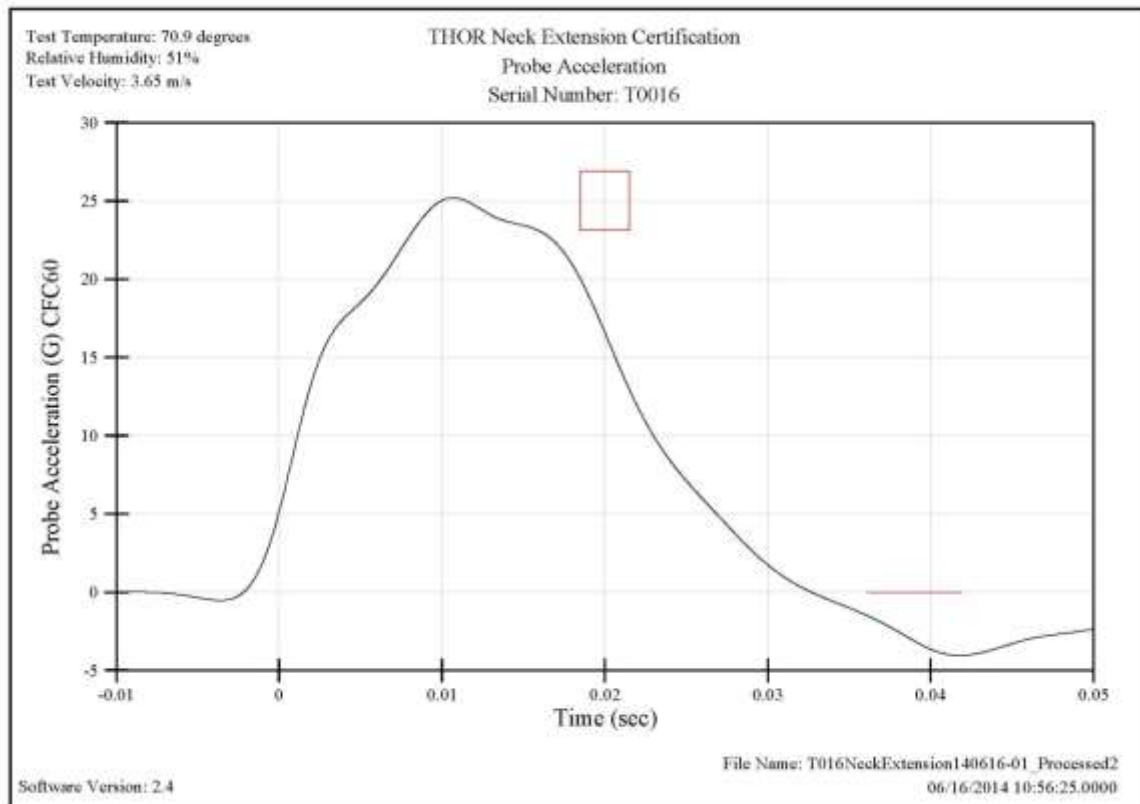
JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers Jacket has a number of tears throughout.
OTHER	

Test Data/Sensor Repair Notes

DUMMY CALIBRATIONS

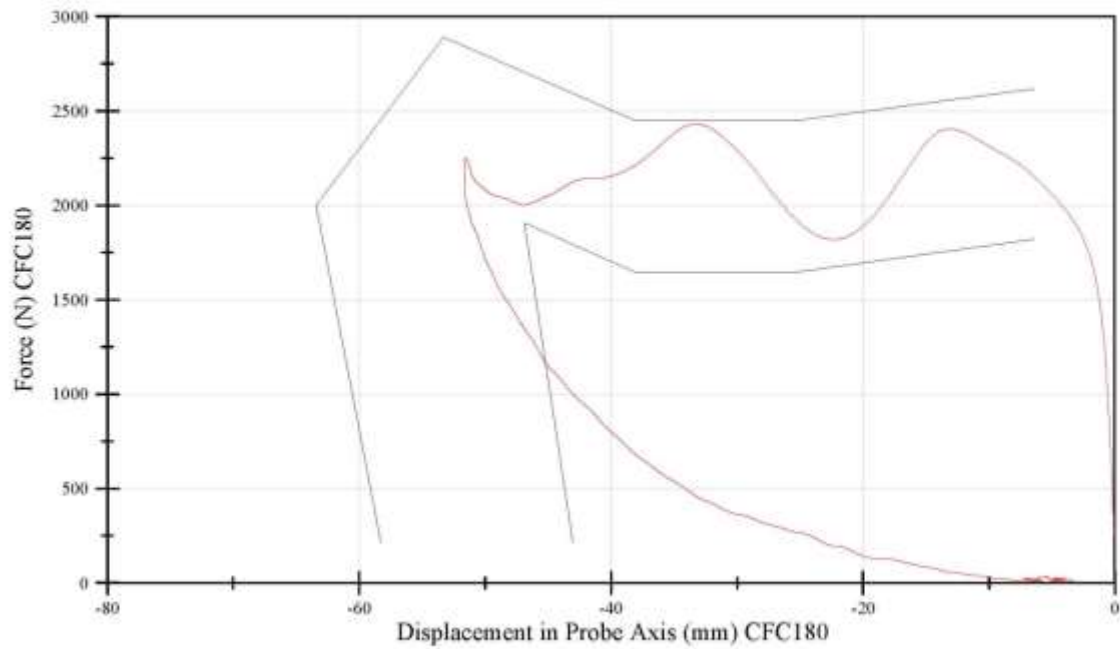
50% ADULT MALE THOR016 DUMMY CALIBRATIONS





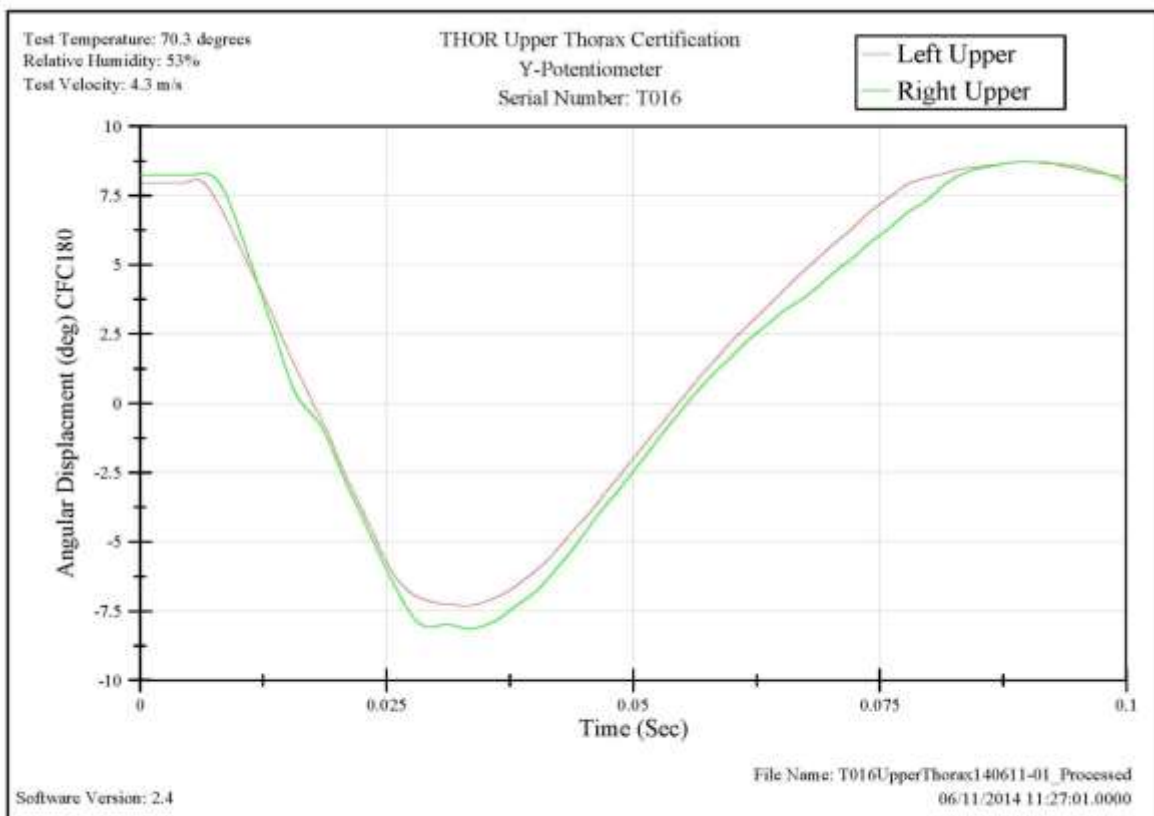
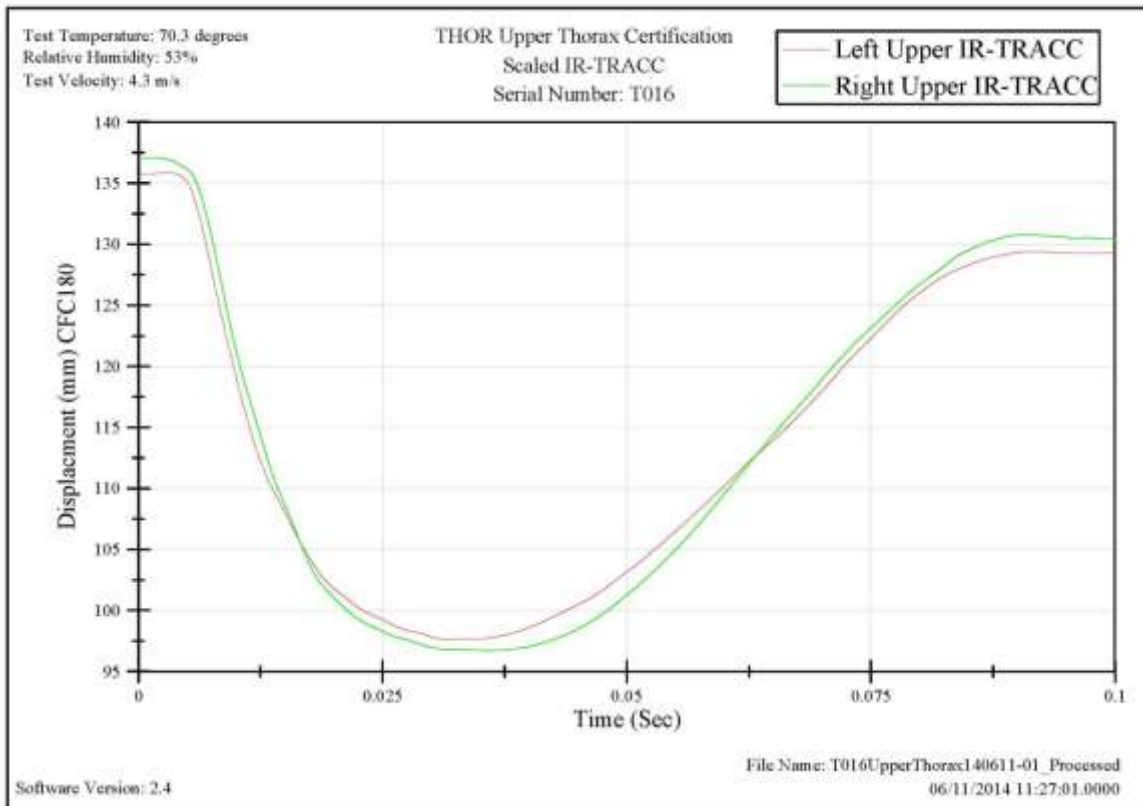
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Relative Humidity: 53%
Test Velocity: 4.3 m/s

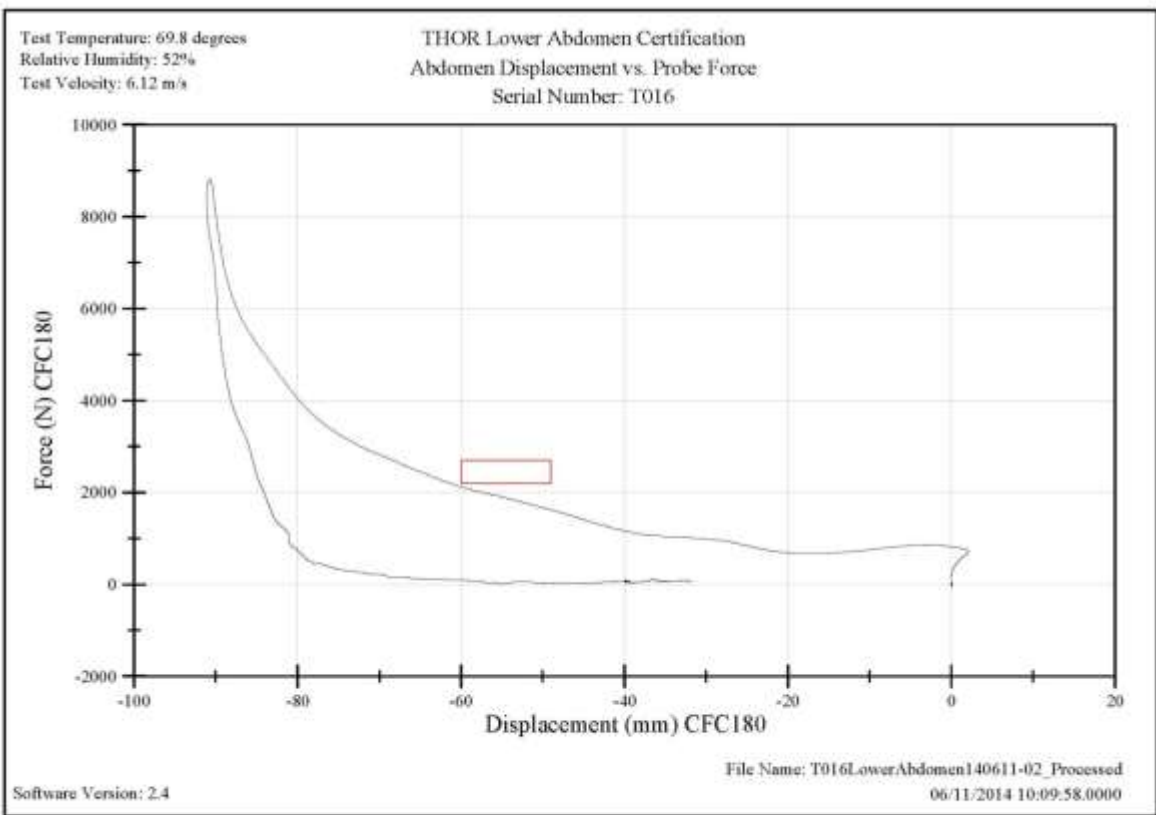
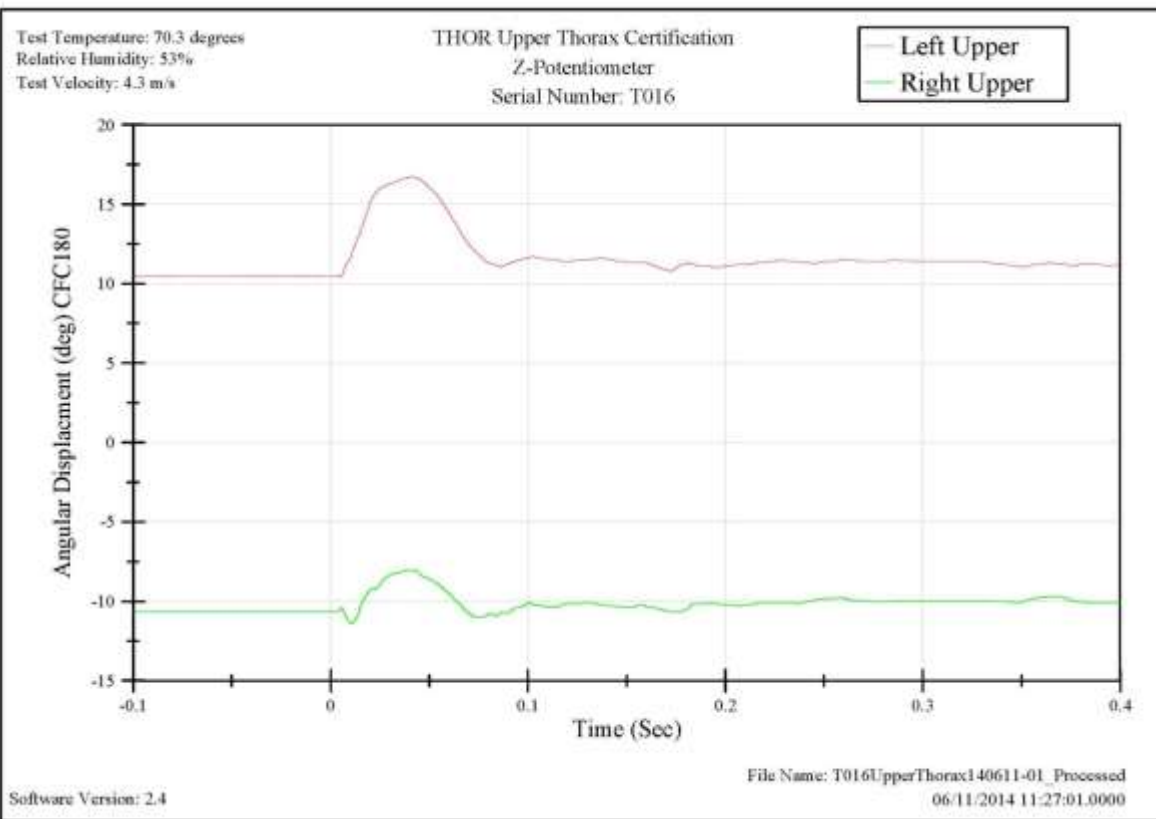
THOR Upper Thorax Certification
Thorax Response With Kroell Corridor
Serial Number: T016

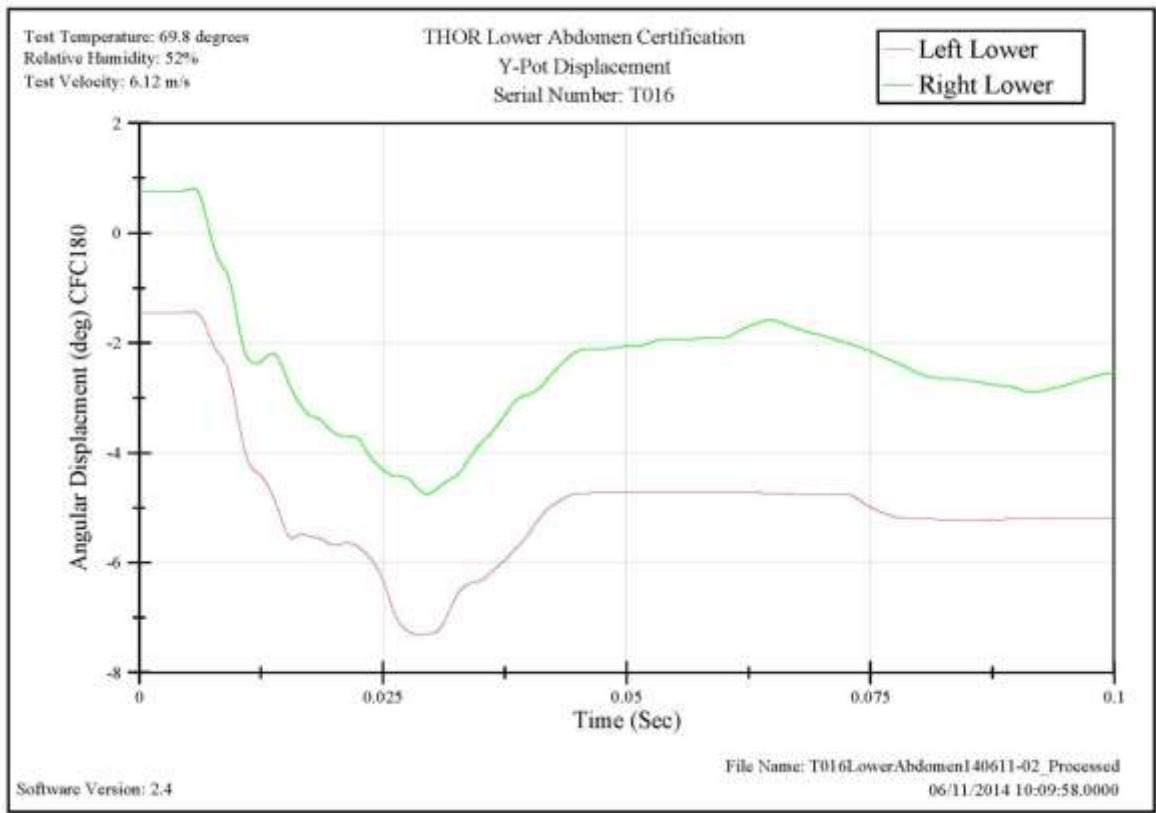
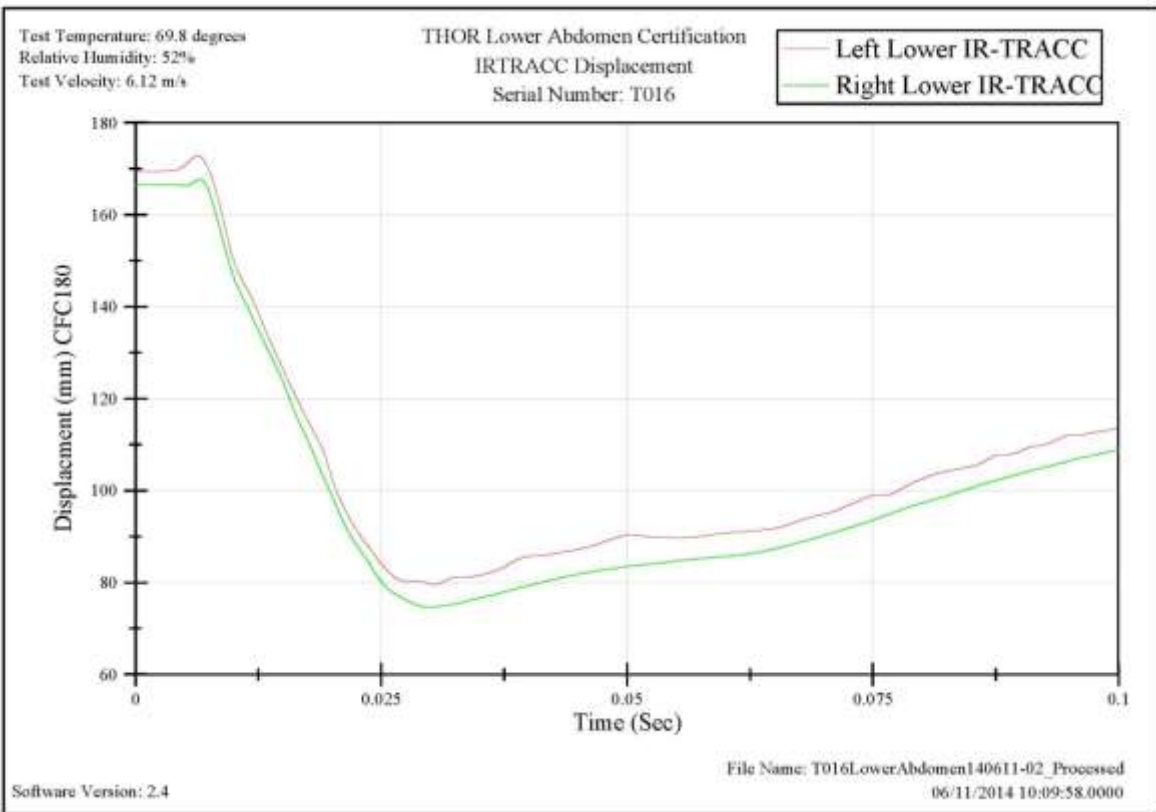


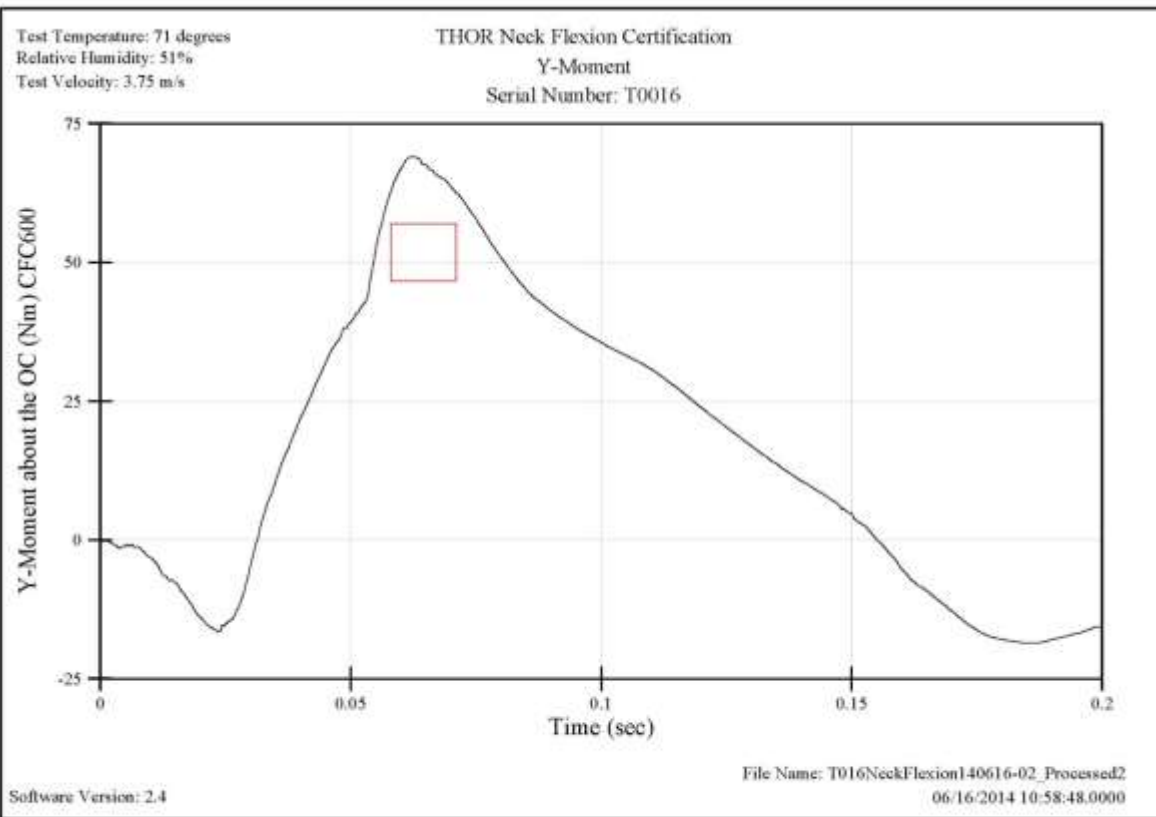
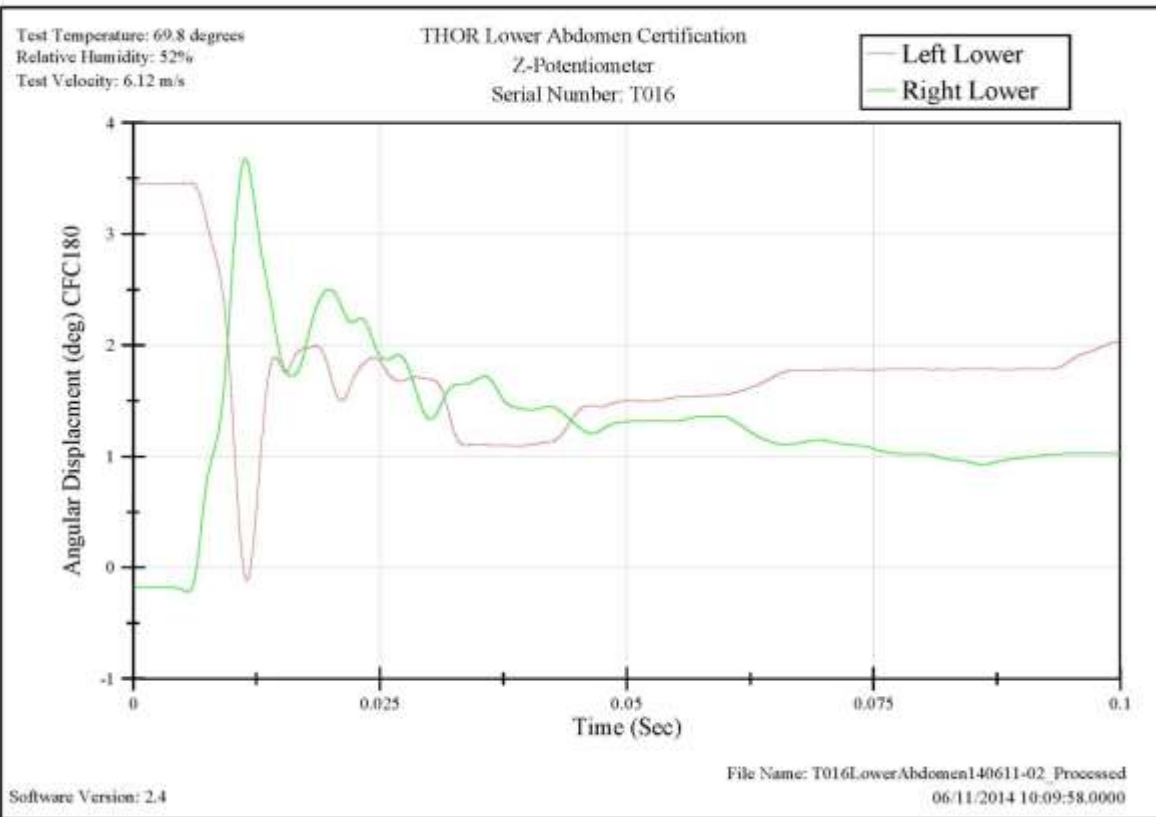
Software Version: 2.4

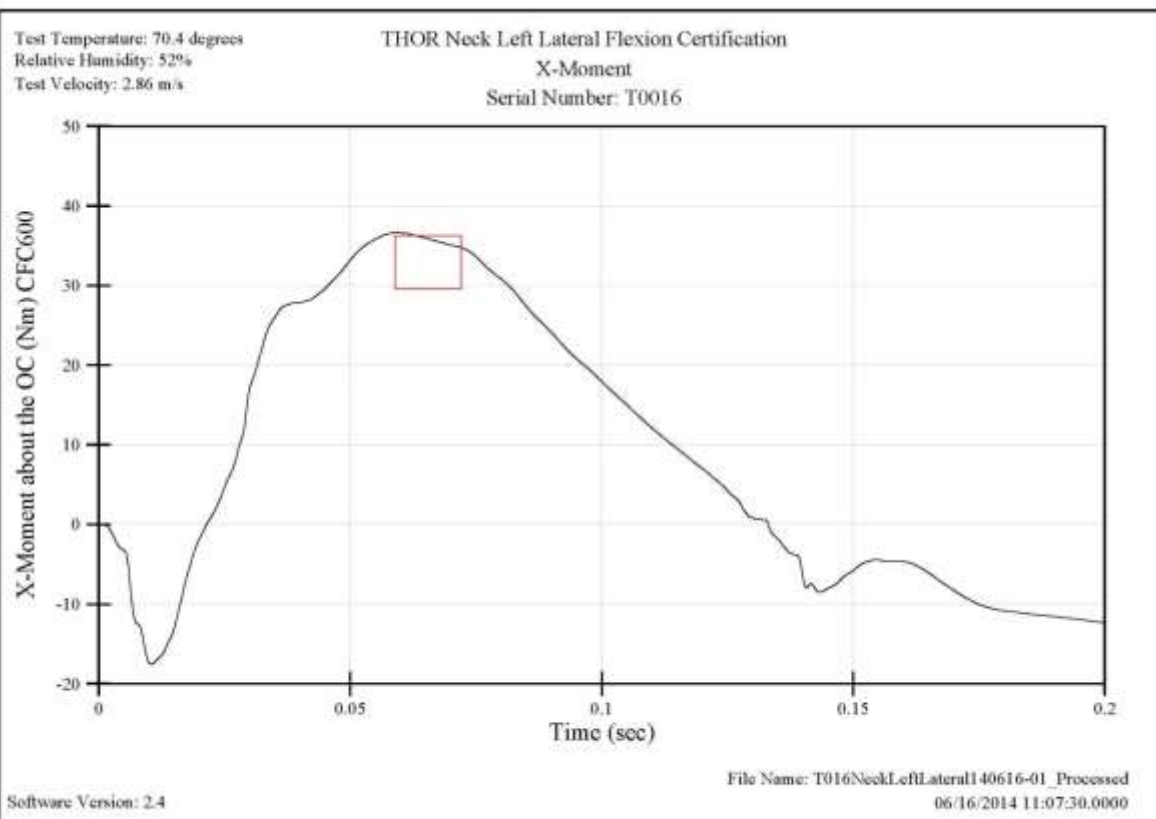
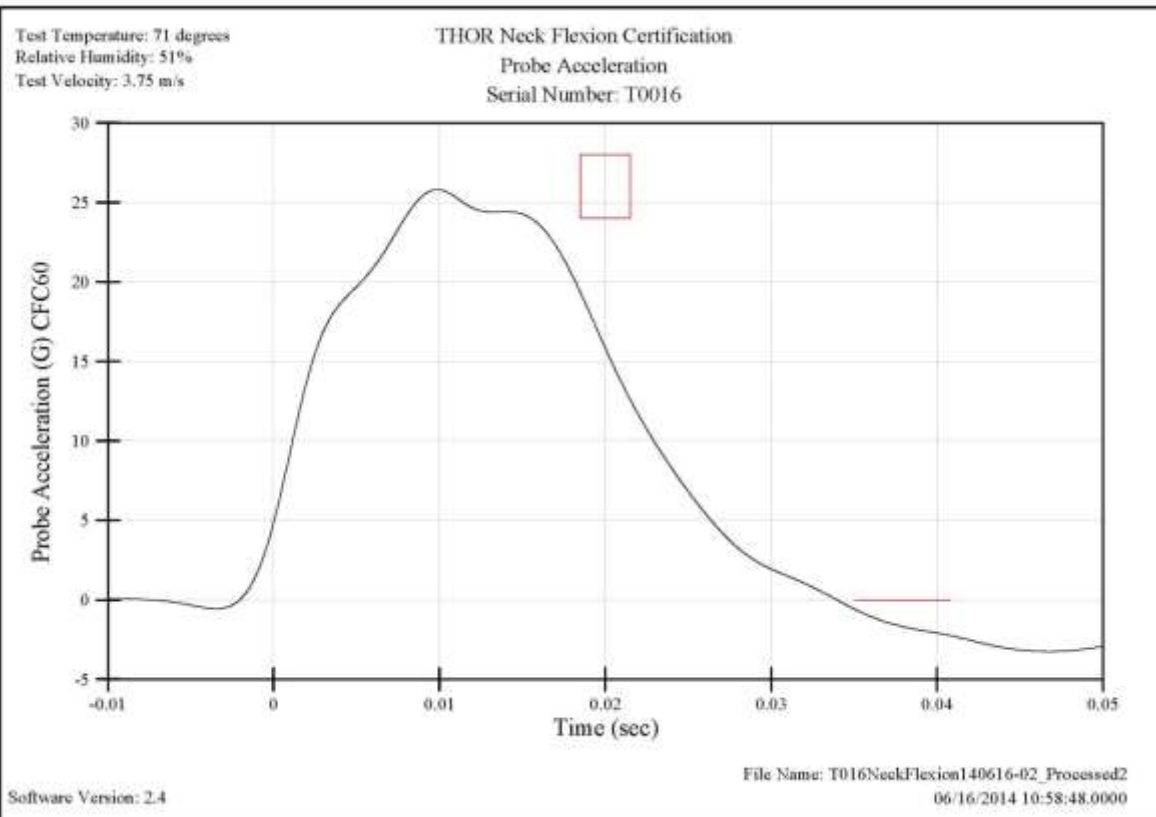
File Name: T016UpperThorax140611-01_Processed
06/11/2014 11:27:01.0000

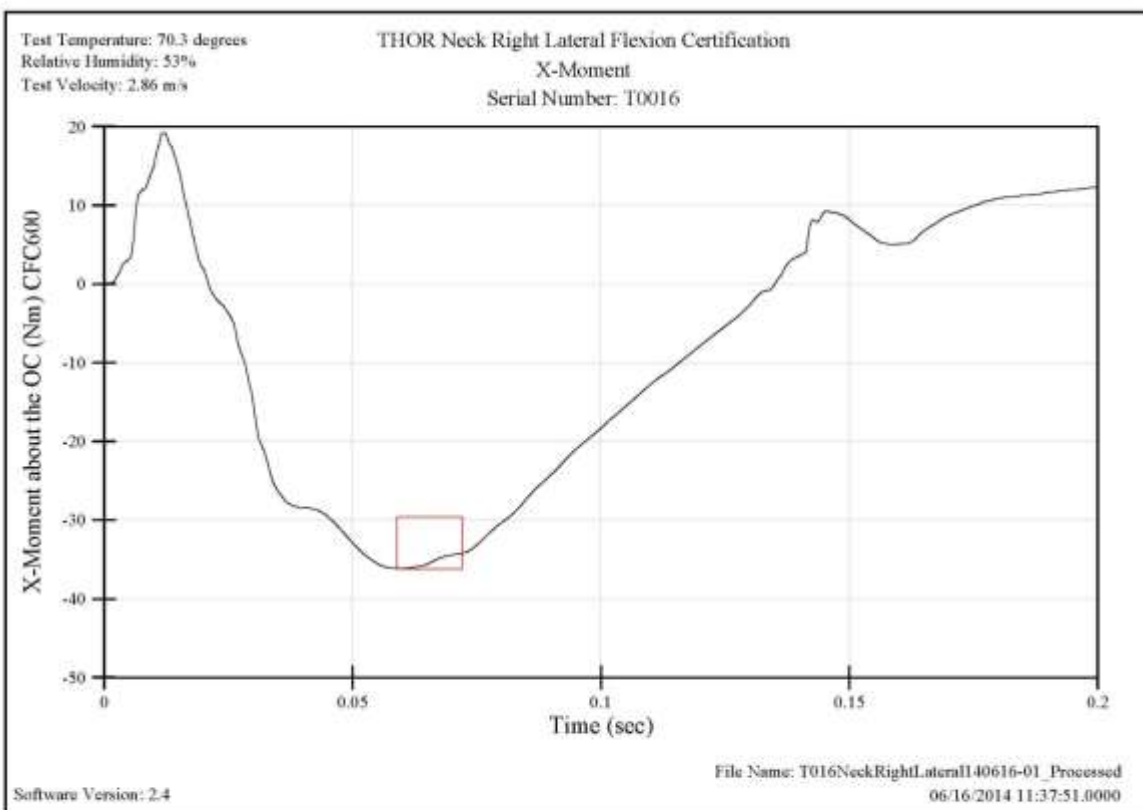
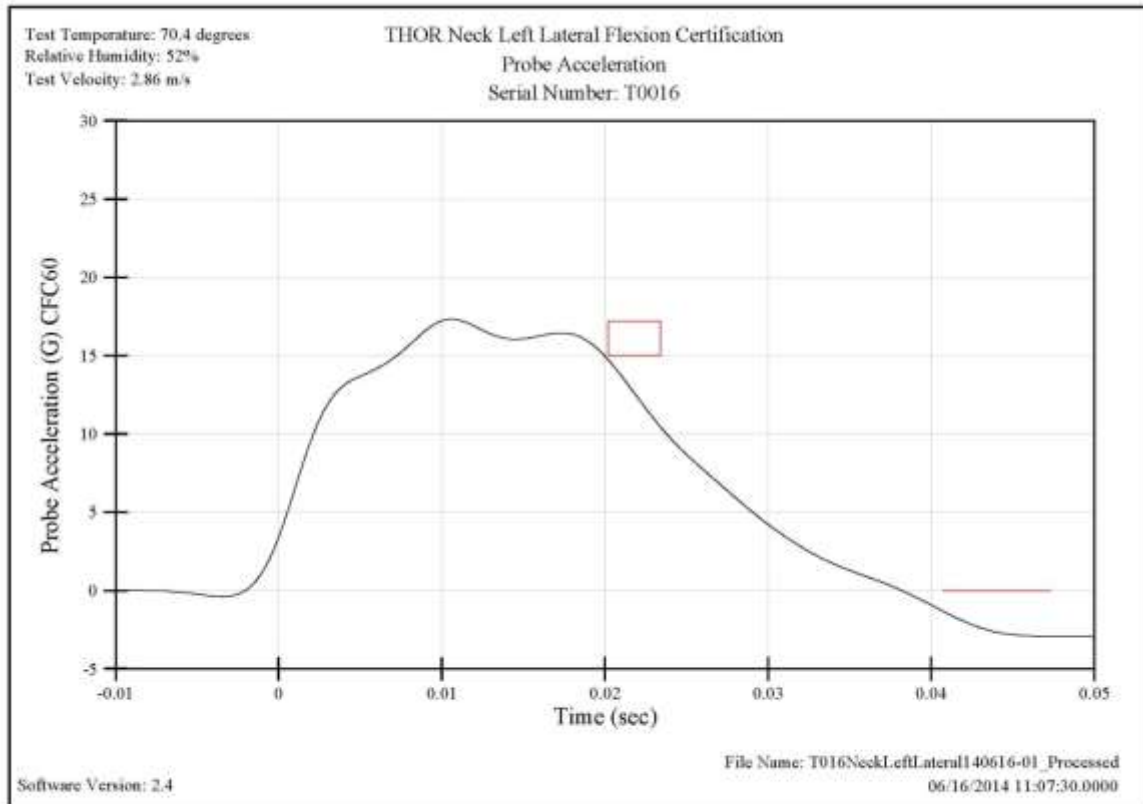






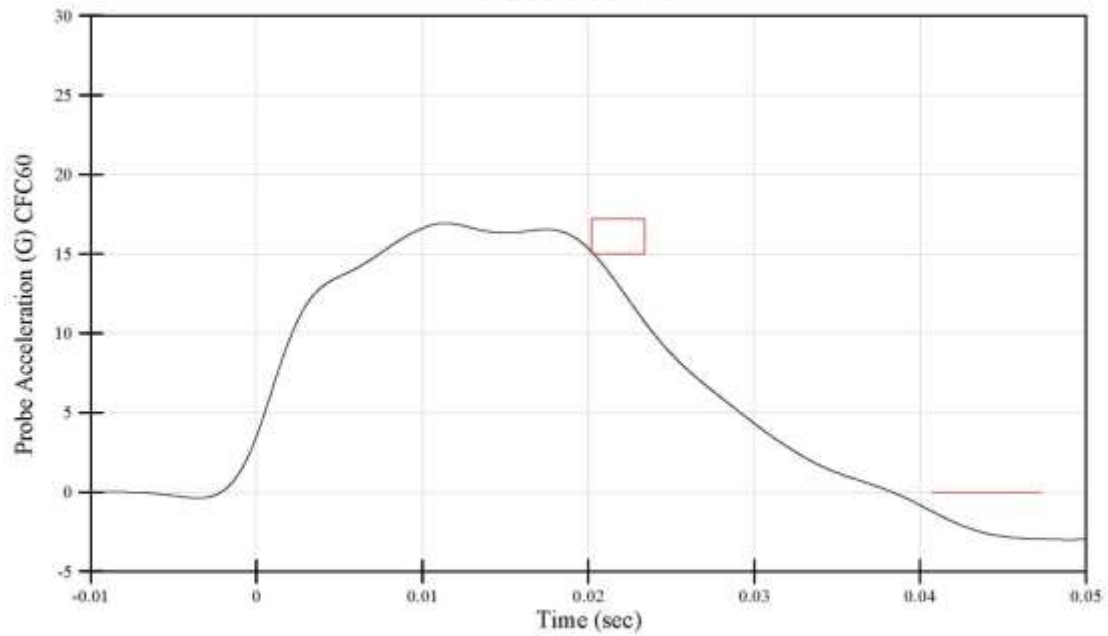






Test Temperature: 70.3 degrees
Relative Humidity: 53%
Test Velocity: 2.86 m/s

THOR Neck Right Lateral Flexion Certification
Probe Acceleration
Serial Number: T0016

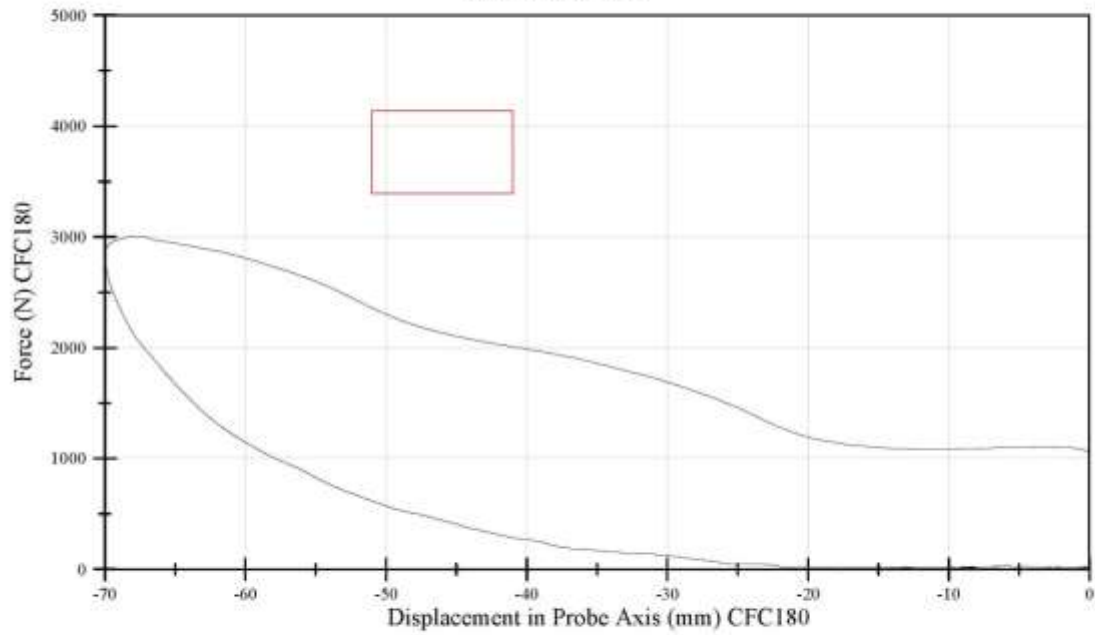


Software Version: 2.4

File Name: T016NeckRightLateral140616-01_Processed
06/16/2014 11:37:51.0000

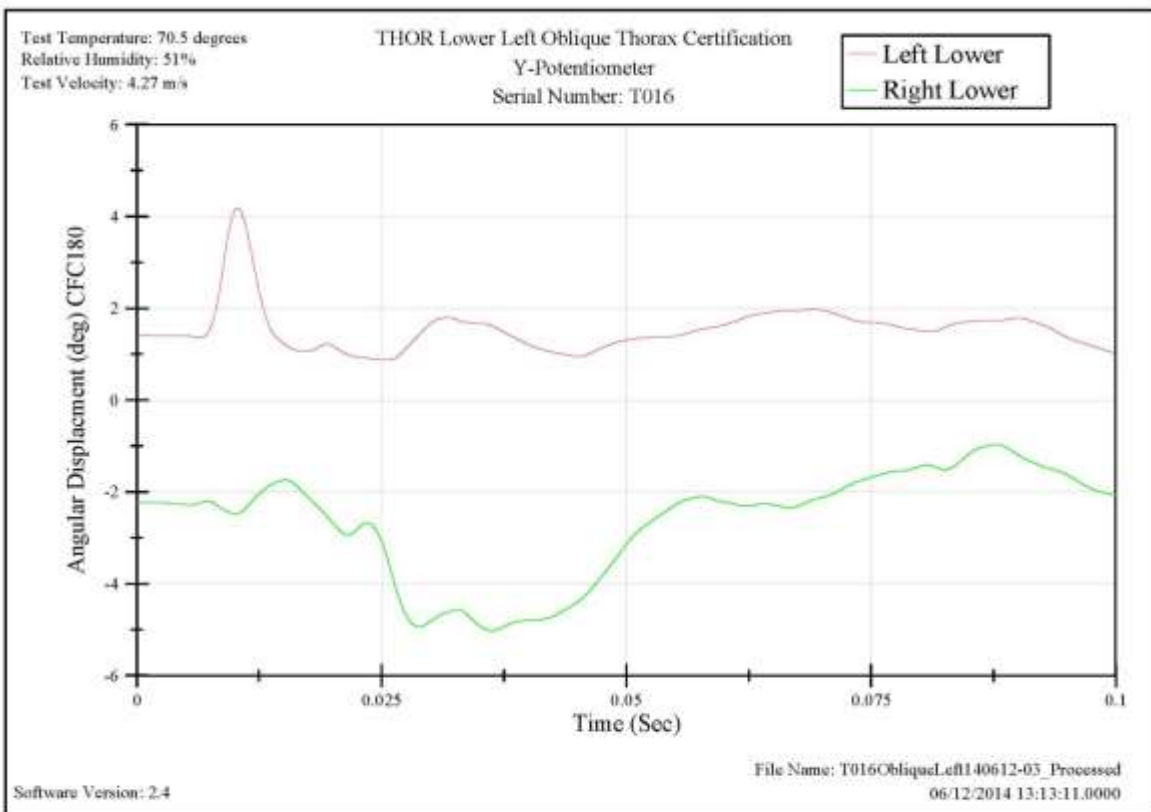
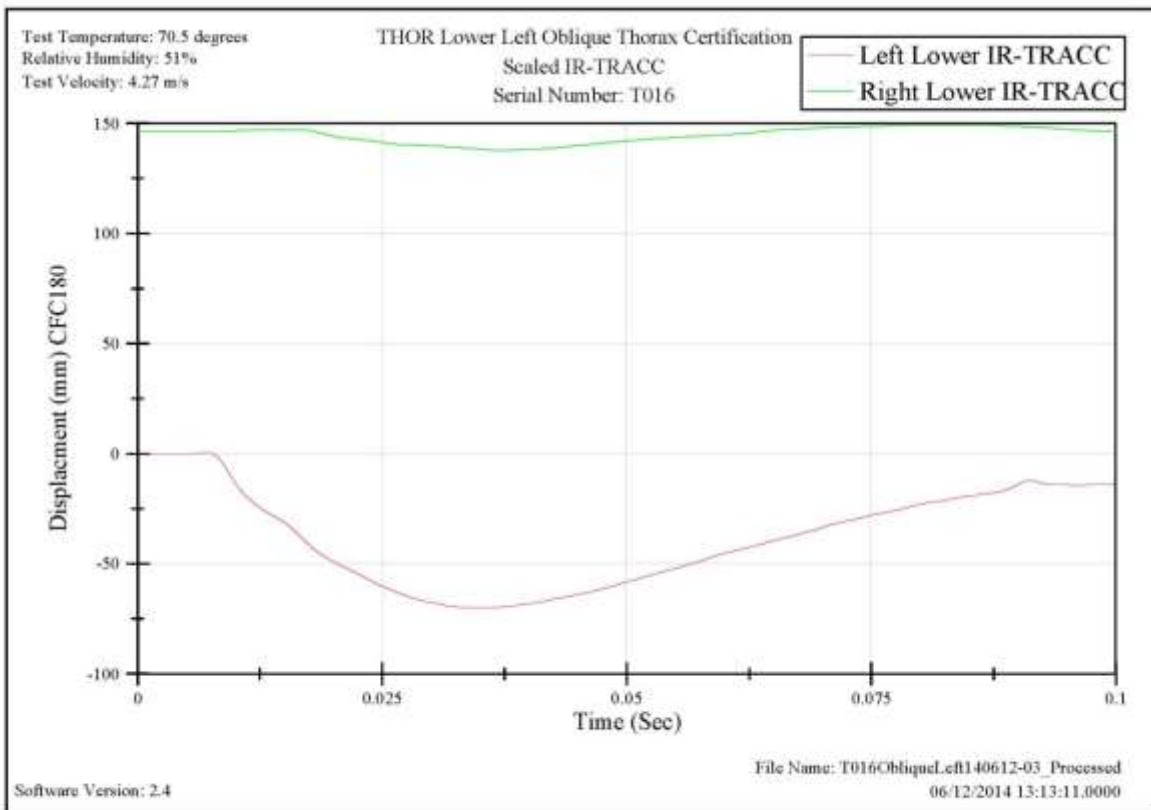
Test Temperature: 70.5 degrees
Relative Humidity: 51%
Test Velocity: 4.27 m/s

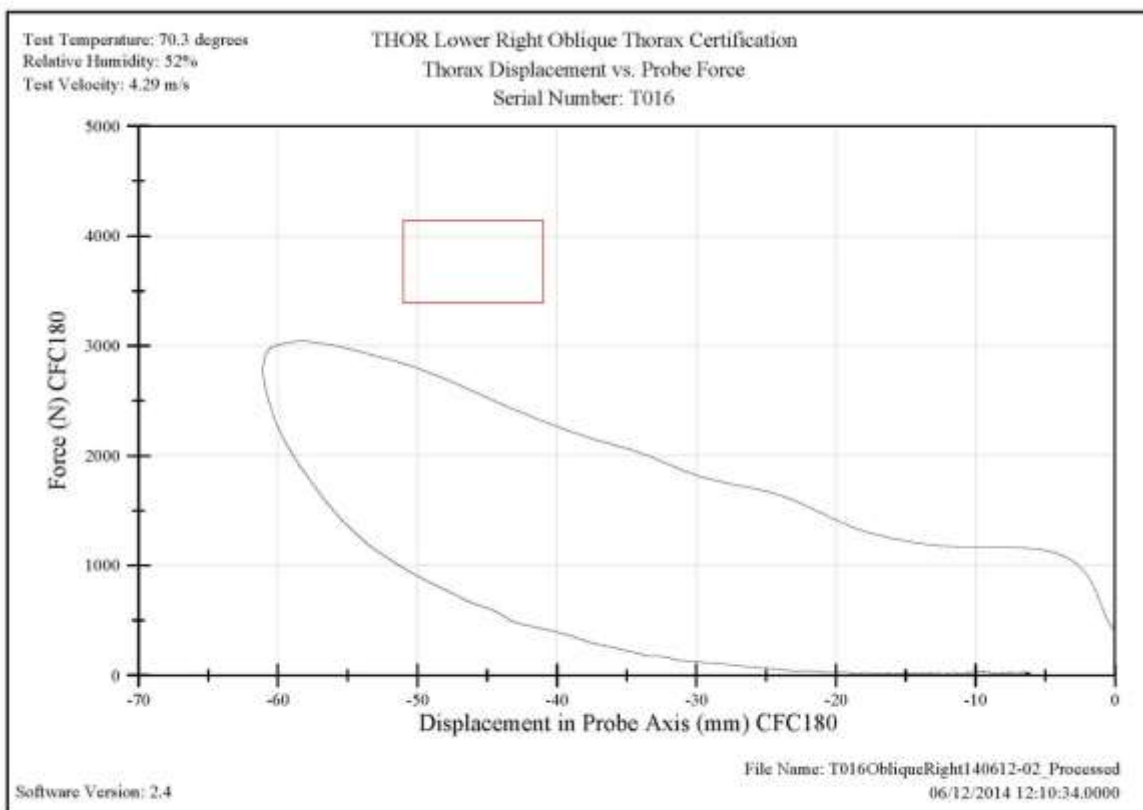
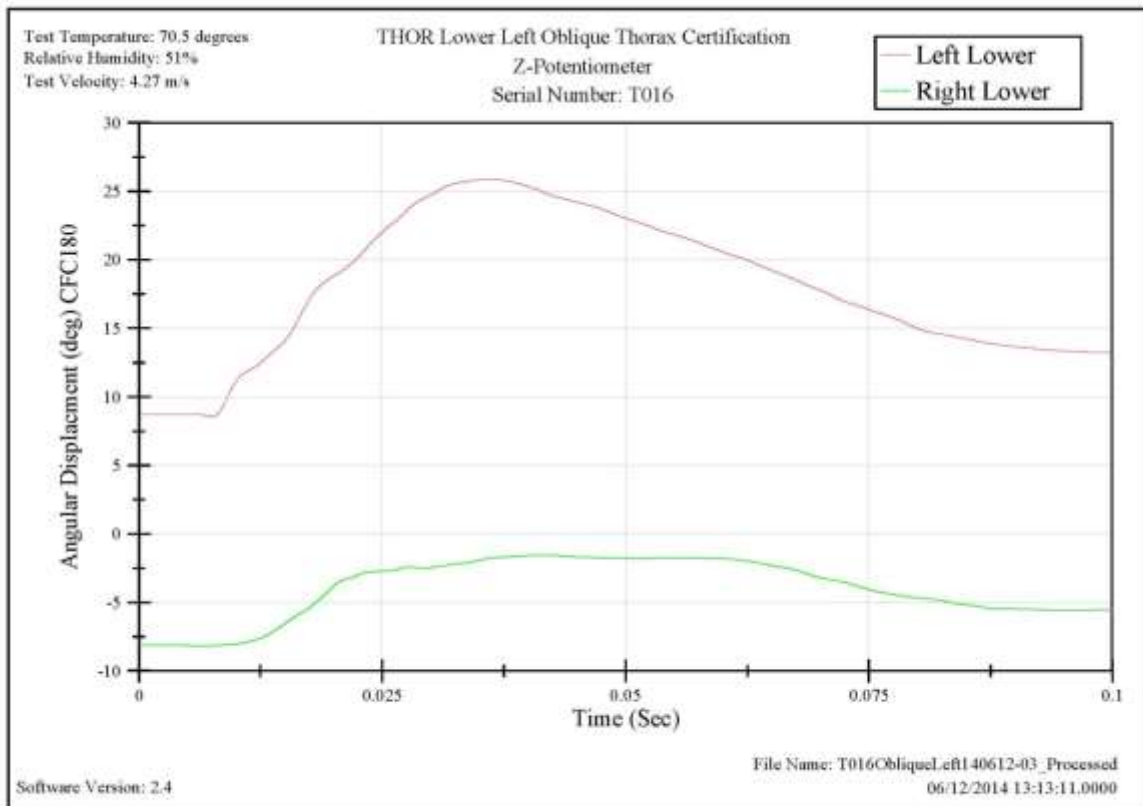
THOR Lower Left Oblique Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T016

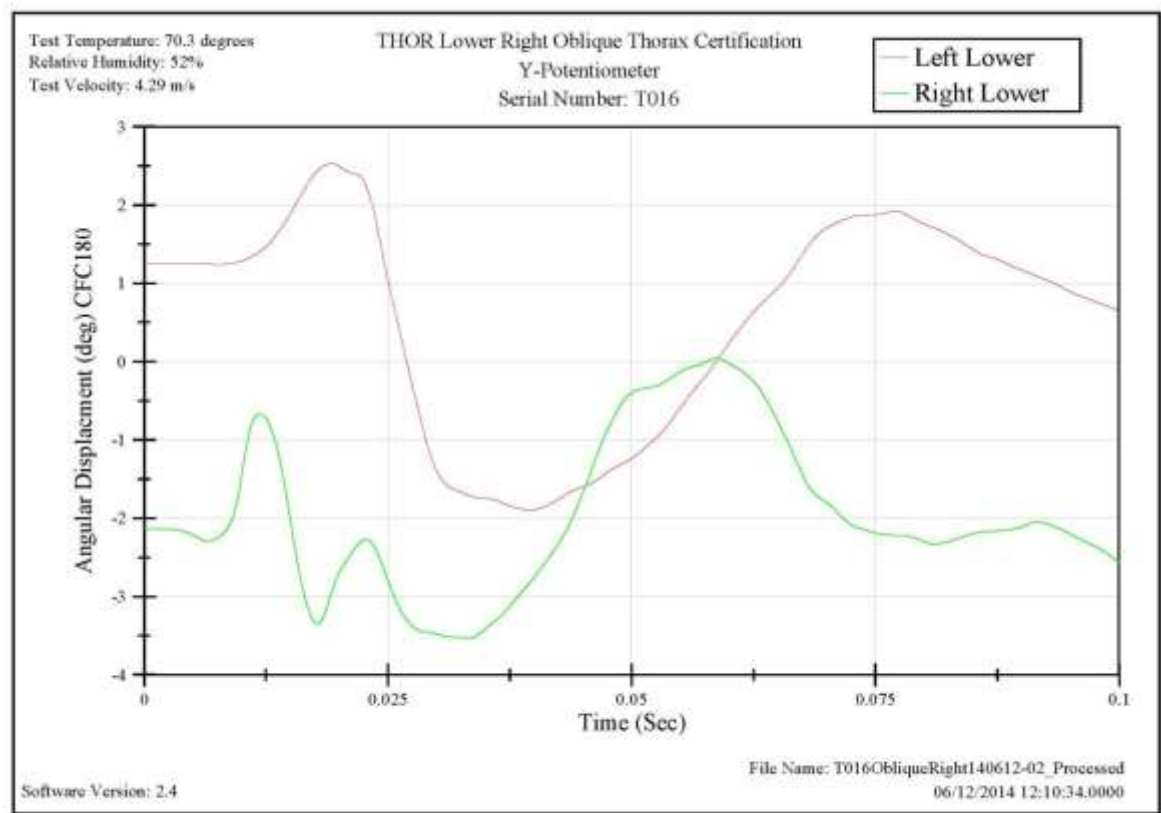
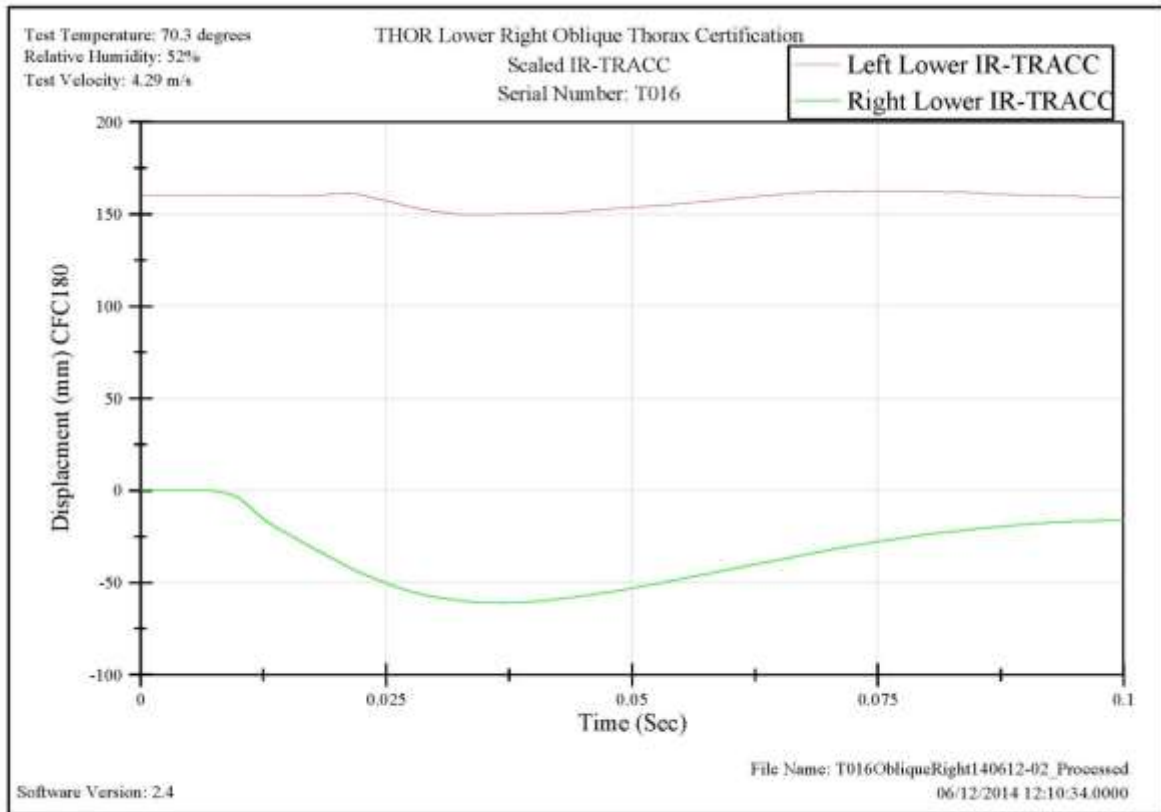


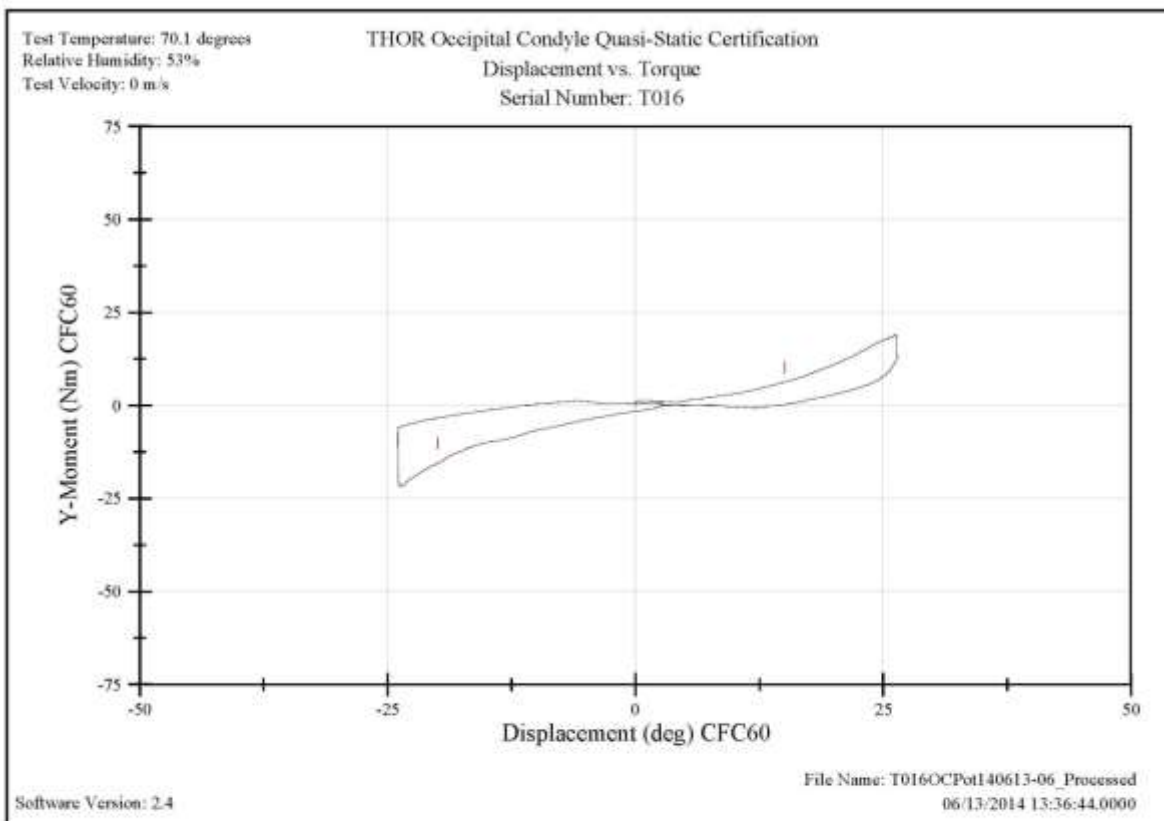
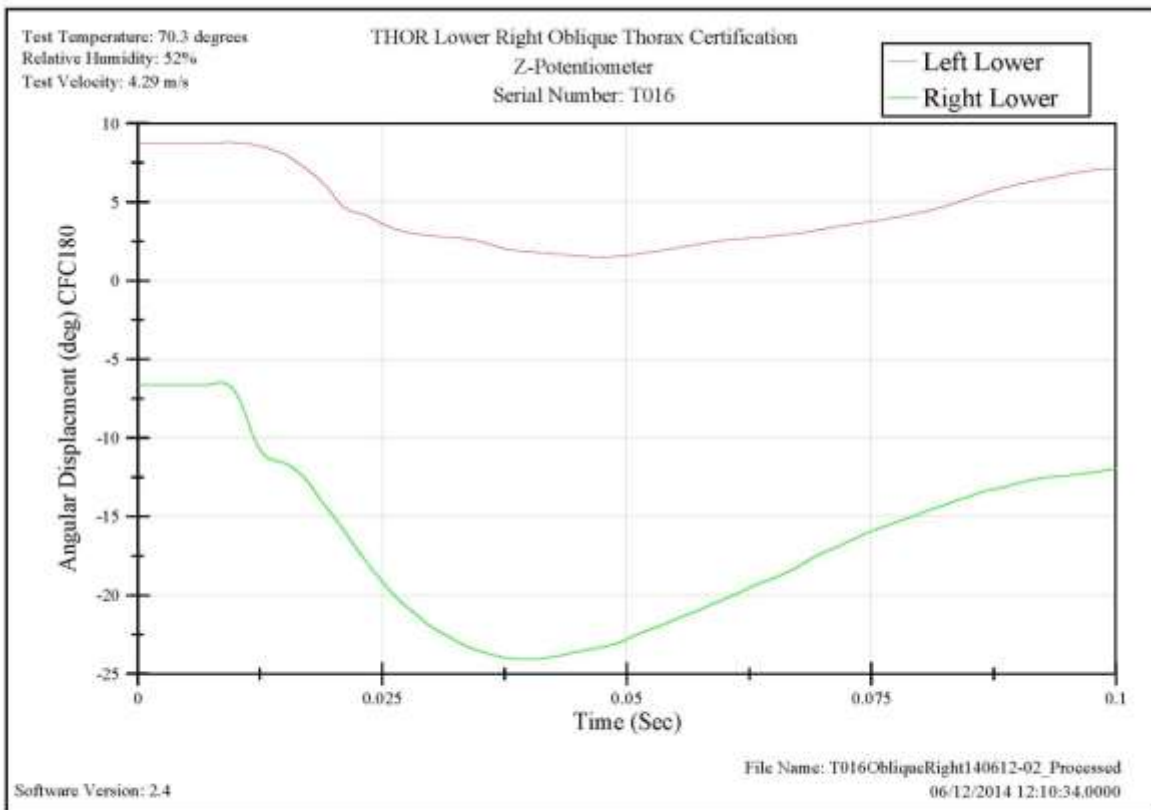
Software Version: 2.4

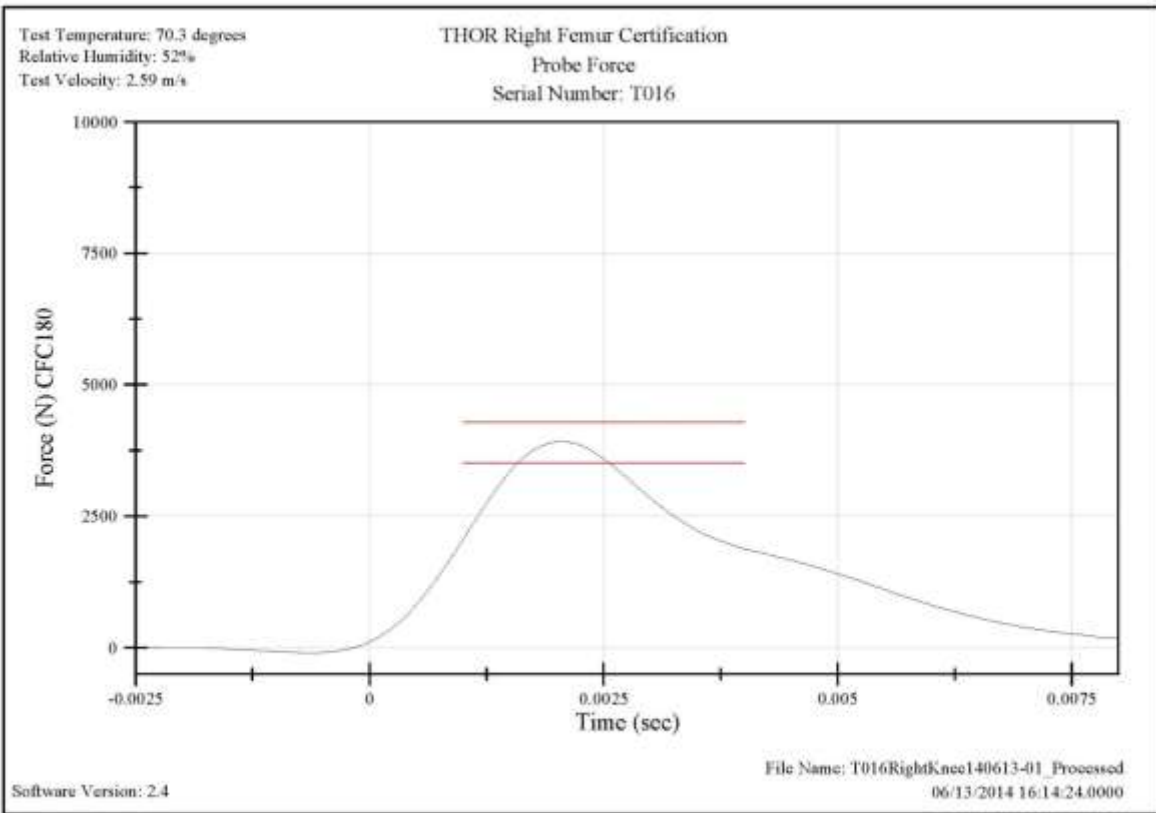
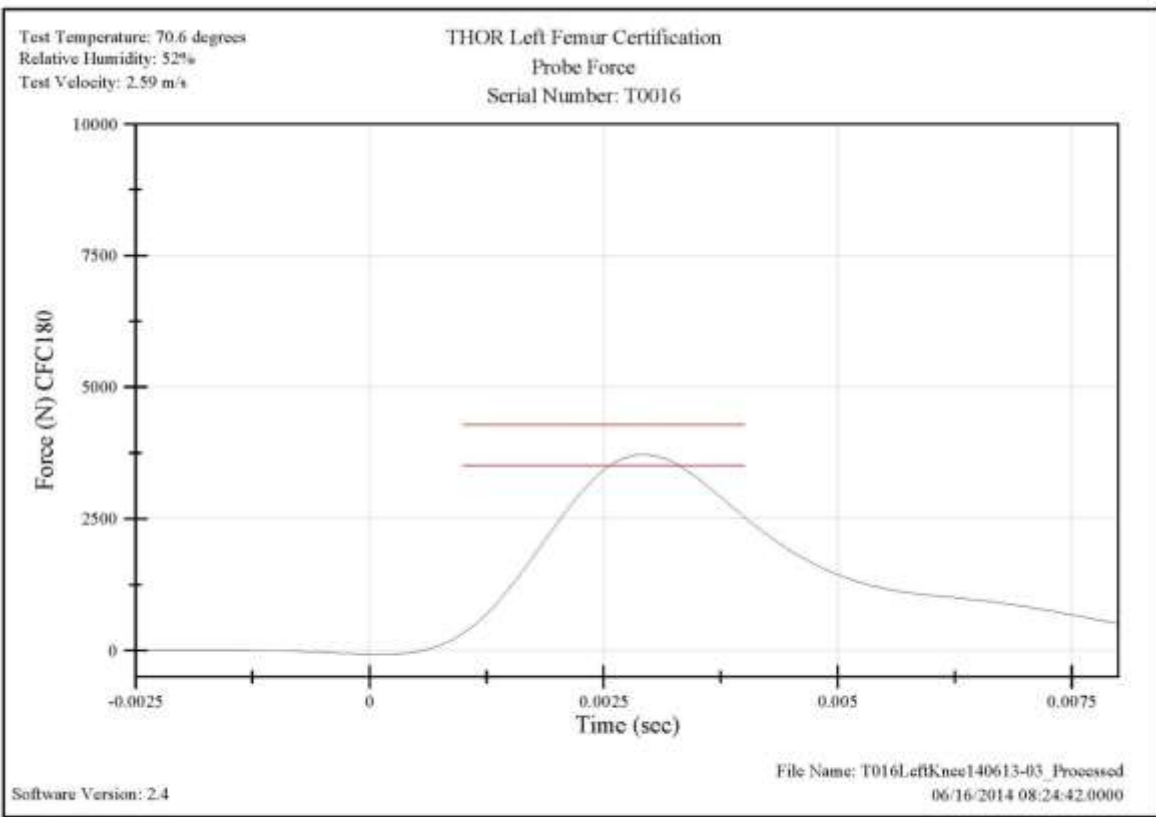
File Name: T016ObliqueLeft140612-03_Processed
06/12/2014 13:13:11.0000



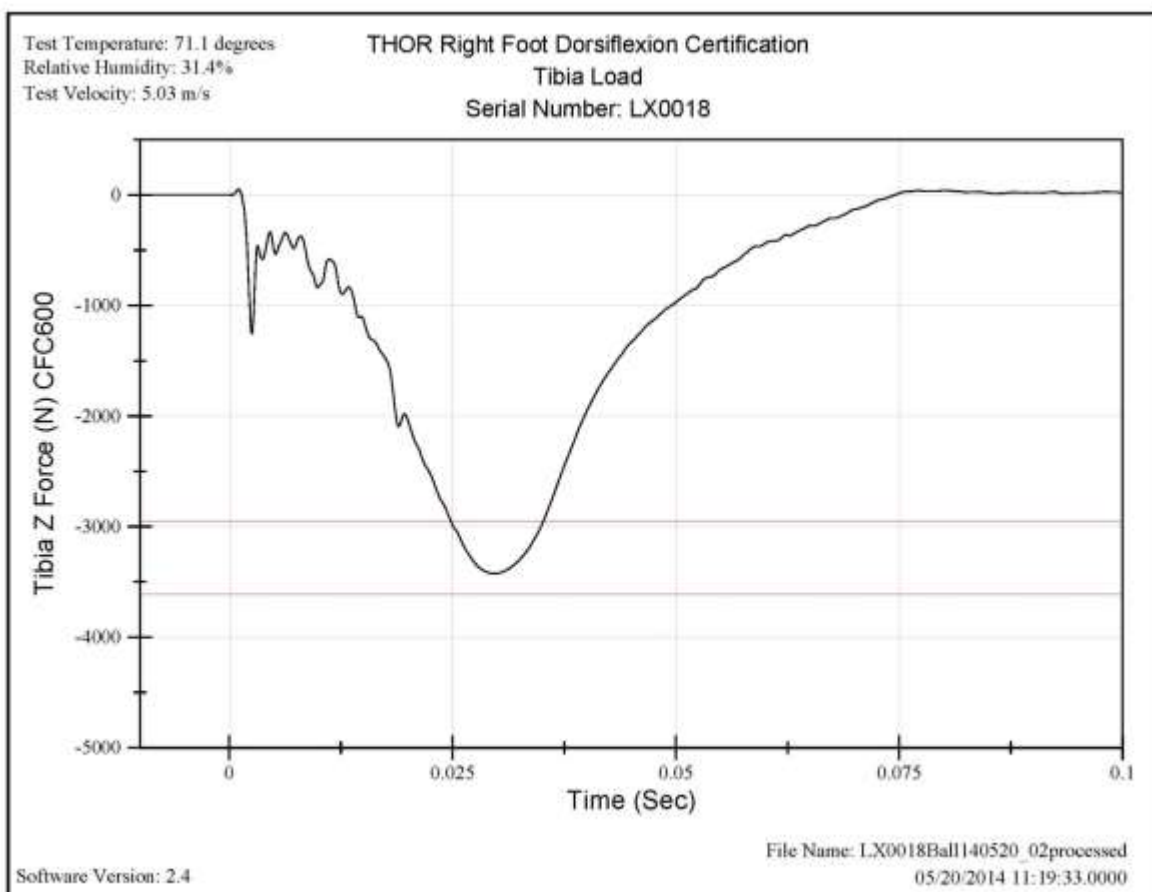
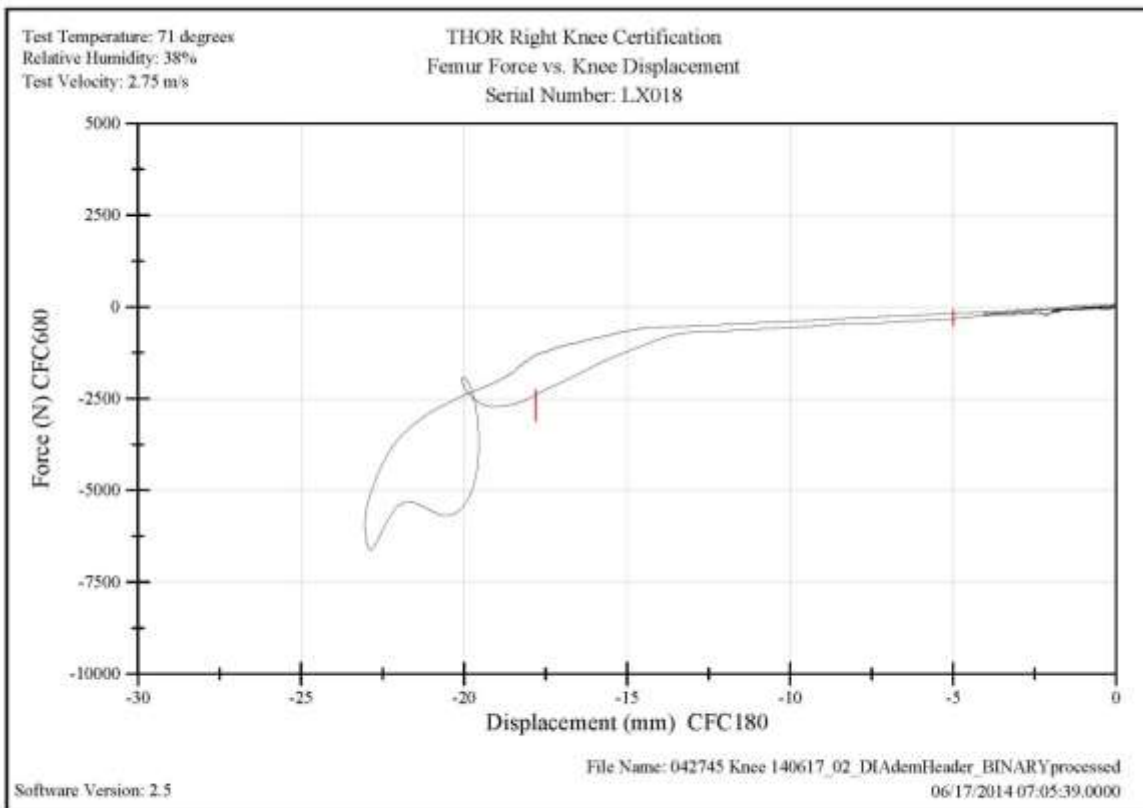






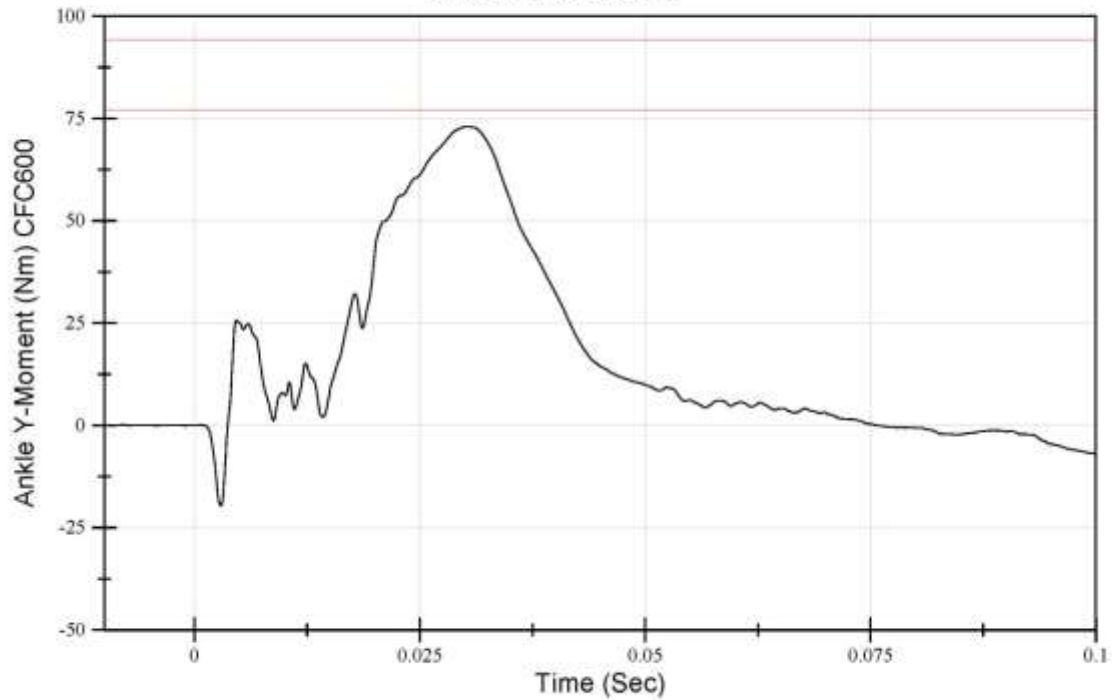


THOR 016 LEG CALIBRATIONS
LX0018/ LX0019



Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 5.03 m/s

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

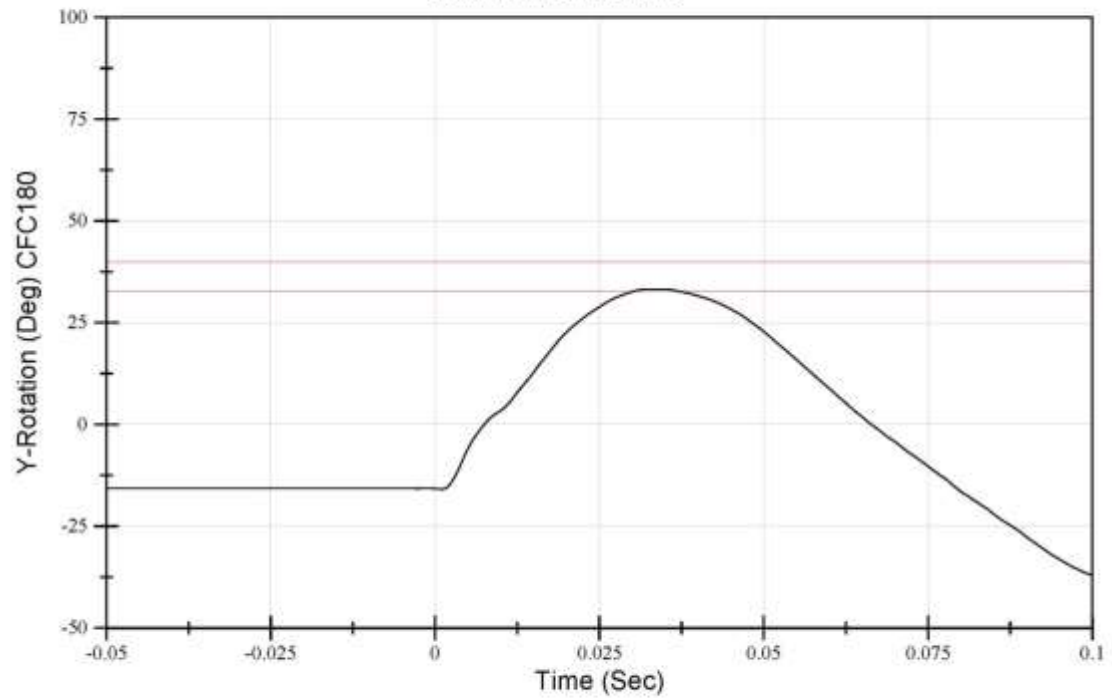


Software Version: 2.4

File Name: LX0018Ball140520_02processed
05/20/2014 11:19:33.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 5.03 m/s

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

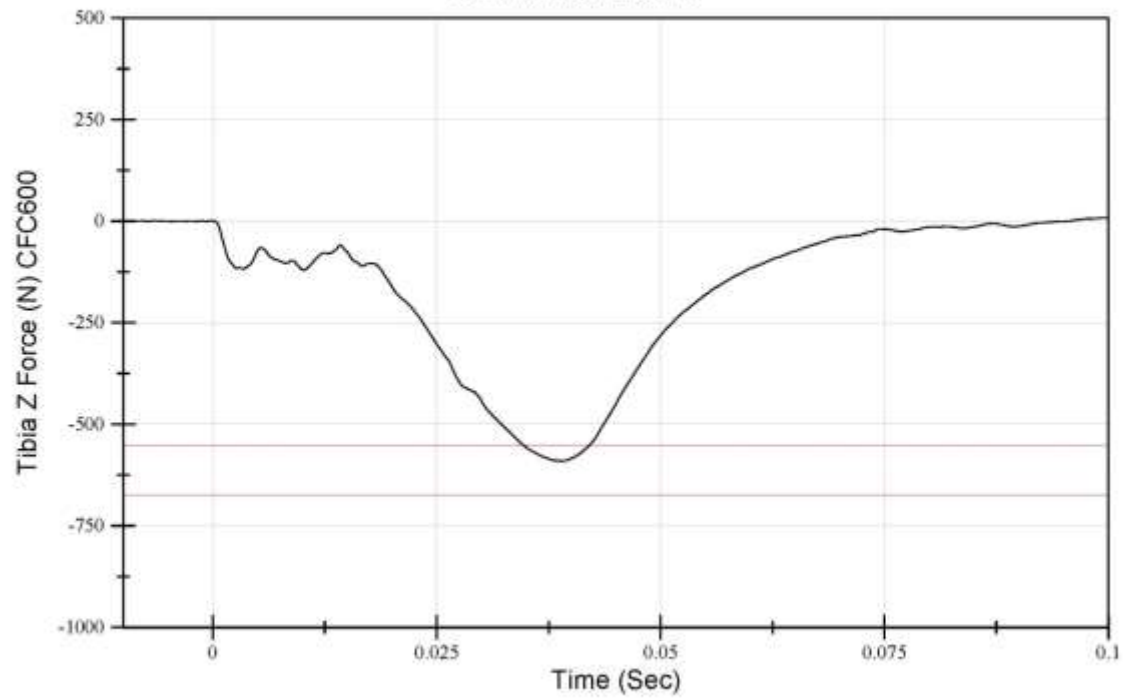


Software Version: 2.4

File Name: LX0018Ball140520_02processed
05/20/2014 11:19:33.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 2 m/s

THOR Right Foot Eversion Certification
Tibia Load
Serial Number: LX0018

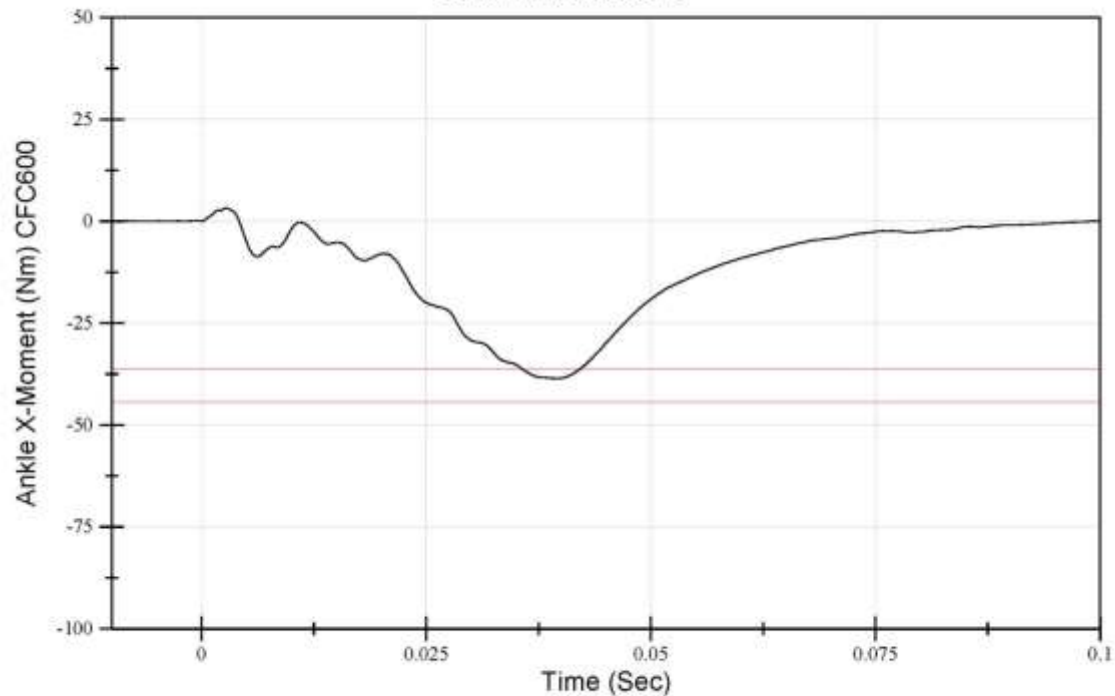


Software Version: 2.4

File Name: LX0018Eversion140520_01processed
05/20/2014 10:15:43.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 2 m/s

THOR Right Foot Eversion Certification
Ankle Moment
Serial Number: LX0018

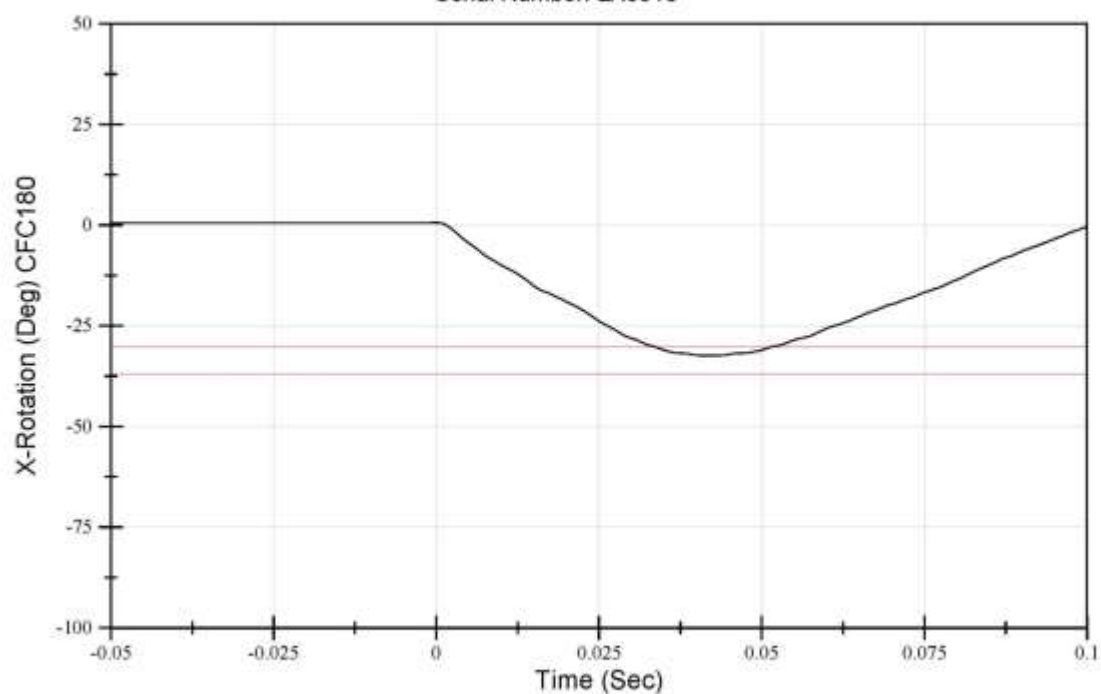


Software Version: 2.4

File Name: LX0018Eversion140520_01processed
05/20/2014 10:15:43.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 2 m/s

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

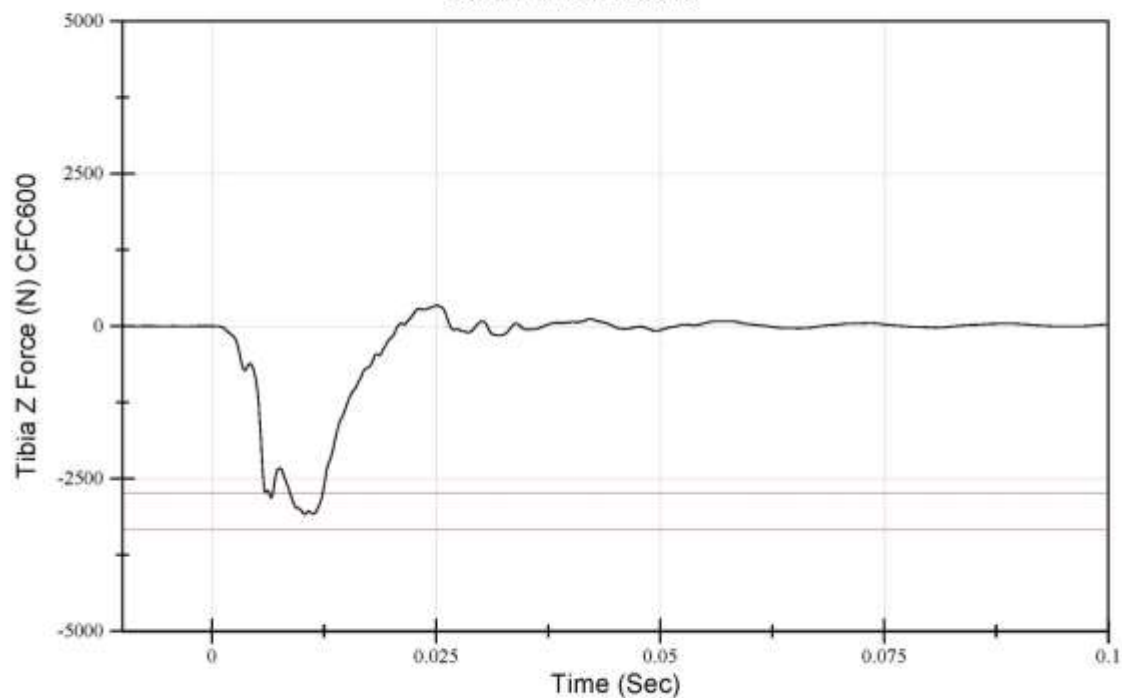


Software Version: 2.4

File Name: LX0018Eversion140520_01processed
05/20/2014 10:15:43.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 3.94 m/s

THOR Right Foot Heel Certification
Tibia Load
Serial Number: LX0018

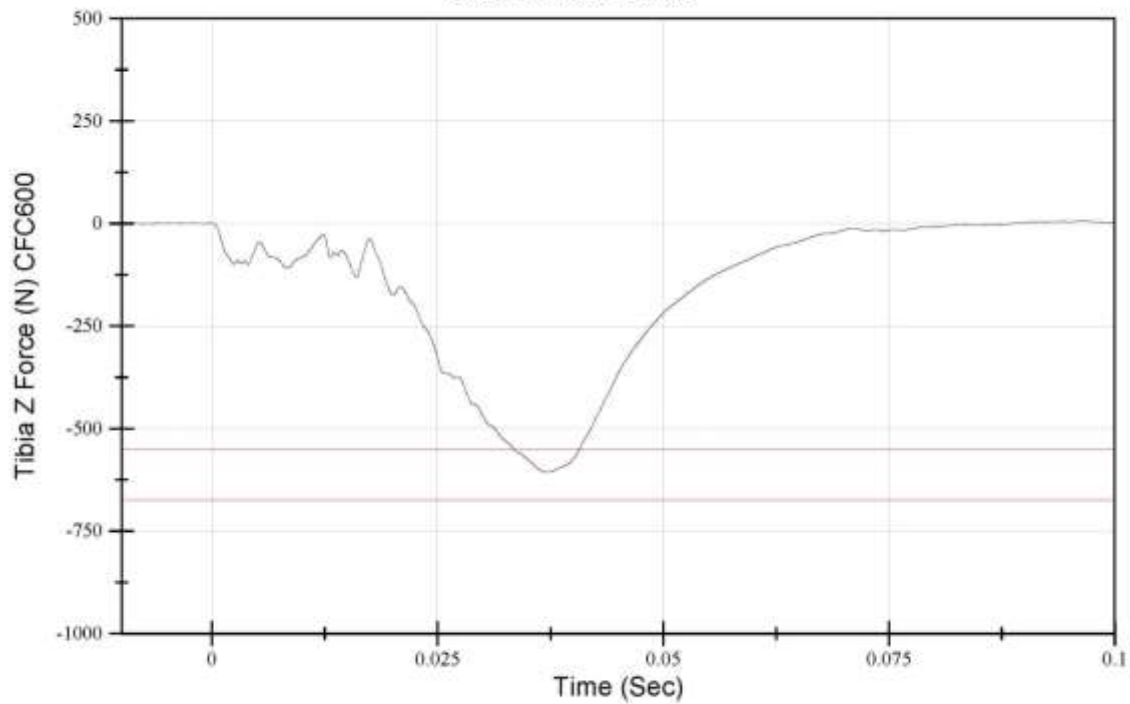


Software Version: 2.4

File Name: LX0018Heel140520_01processed
05/20/2014 12:59:01.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 2 m/s

THOR Right Foot Inversion Certification
Tibia Load
Serial Number: LX0018

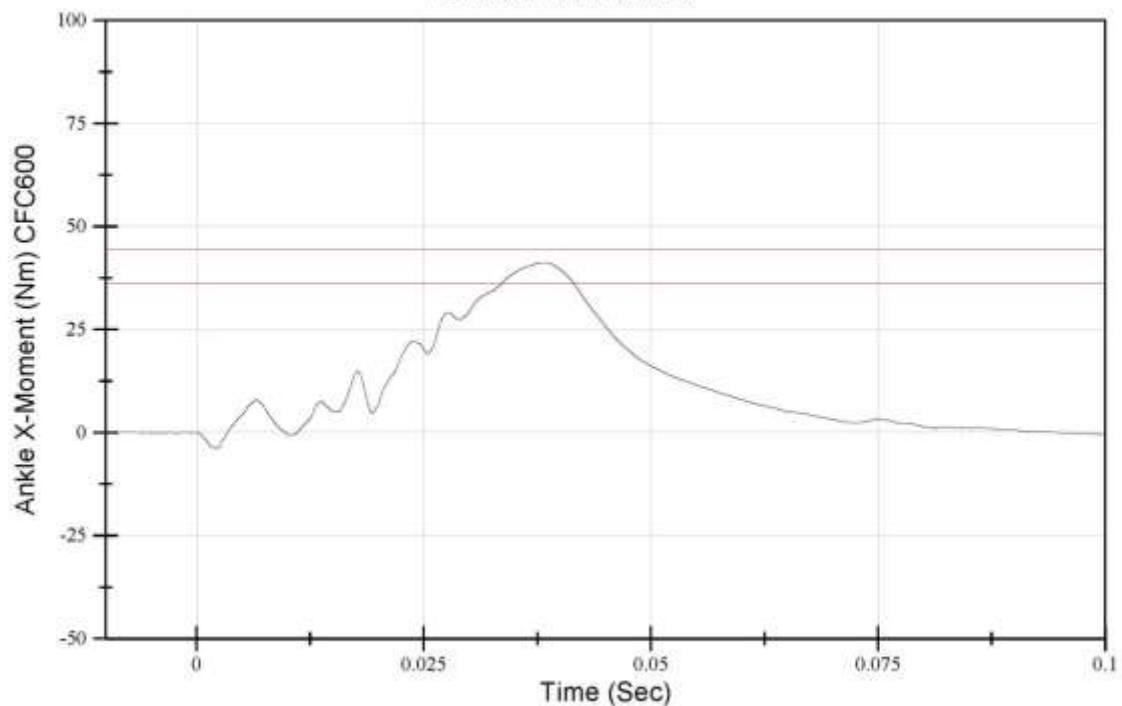


Software Version: 2.4

File Name: LX0018Inversion140520_04processed
05/20/2014 09:27:22.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 2 m/s

THOR Right Foot Inversion Certification
Ankle Moment
Serial Number: LX0018

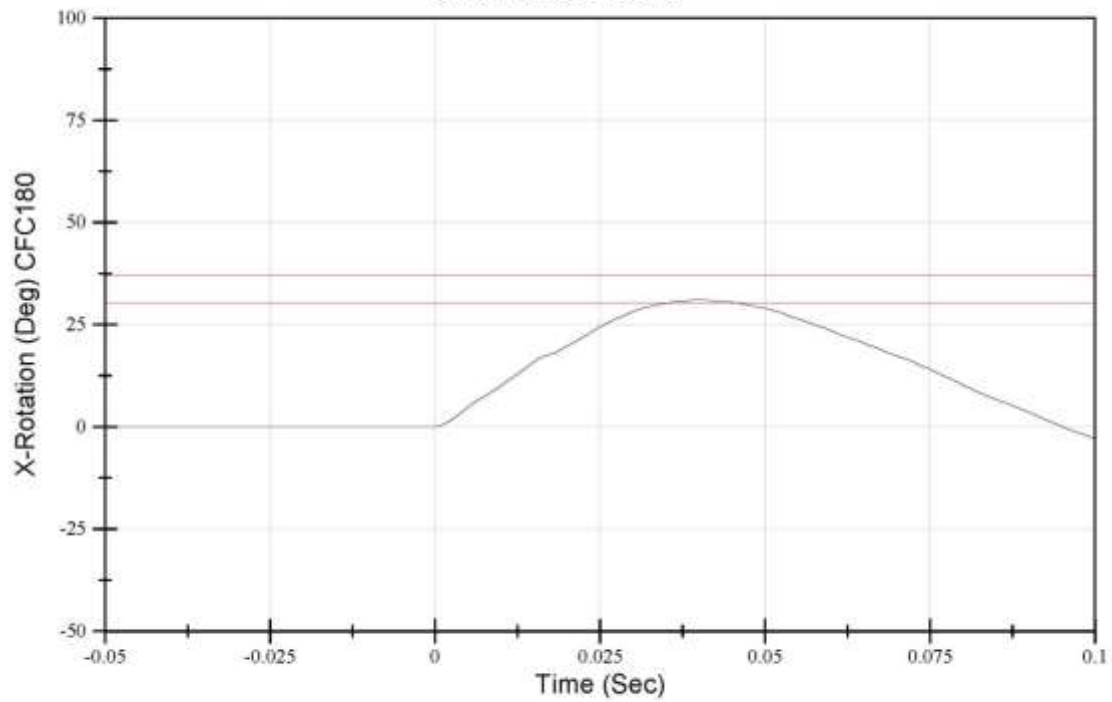


Software Version: 2.4

File Name: LX0018Inversion140520_04processed
05/20/2014 09:27:22.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 2 m/s

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

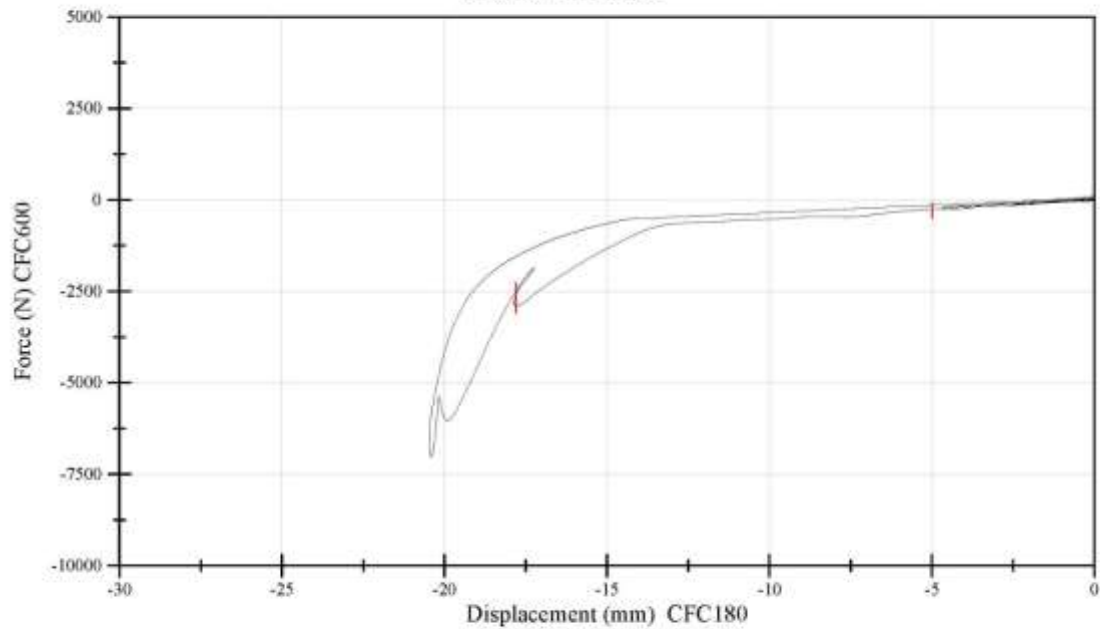


Software Version: 2.4

File Name: LX0018Inversion140520_04processed
05/20/2014 09:27:22.0000

Test Temperature: 71 degrees
Relative Humidity: 38%
Test Velocity: 2.75 m/s

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

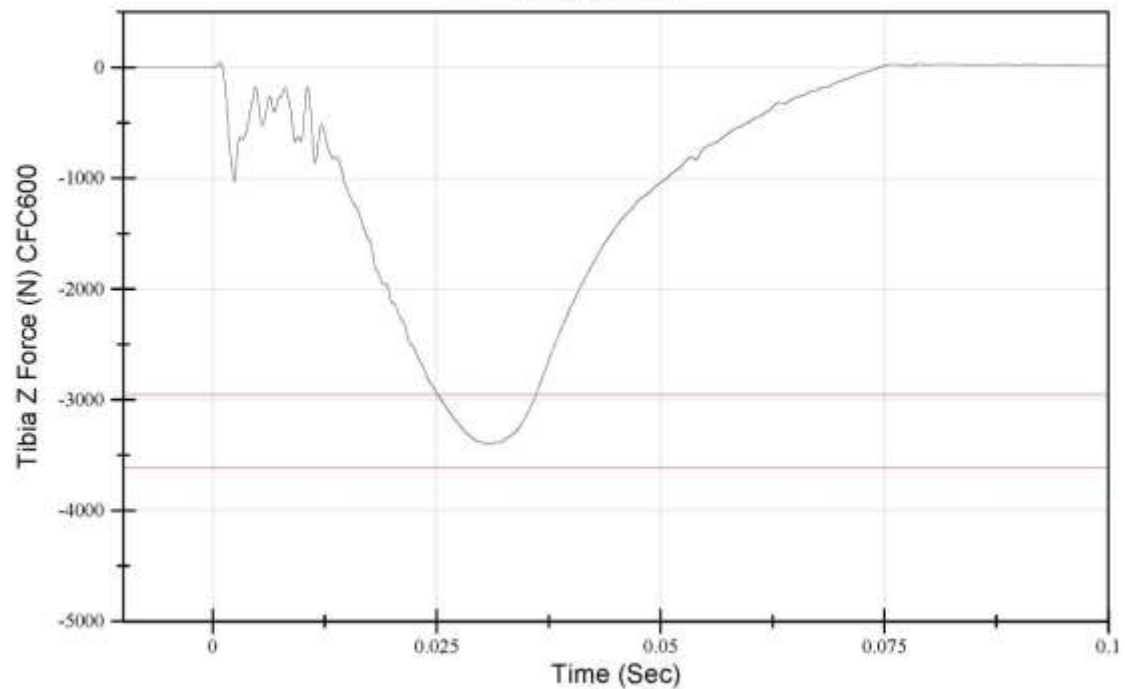


Software Version: 2.5

File Name: 13074235Knee140617_01_DiAdemHeader_BINARYprocessed
06/17/2014 10:50:02.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 5.03 m/s

THOR Left Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0019

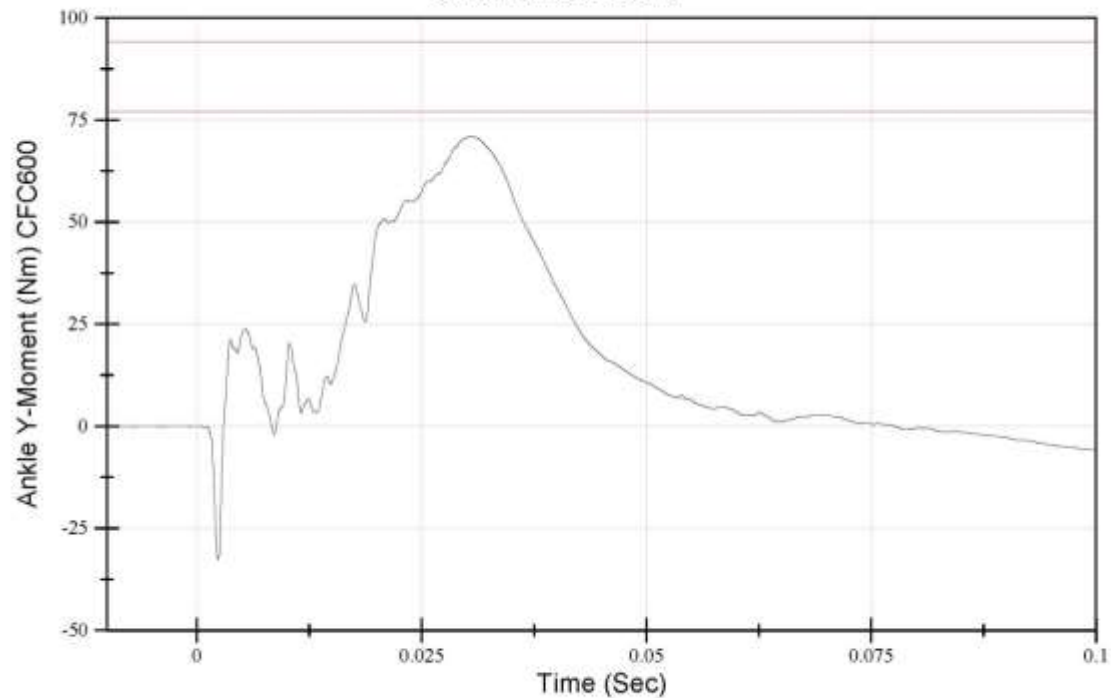


Software Version: 2.4

File Name: LX0019Ball140521_03processed
05/21/2014 13:20:28.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 5.03 m/s

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

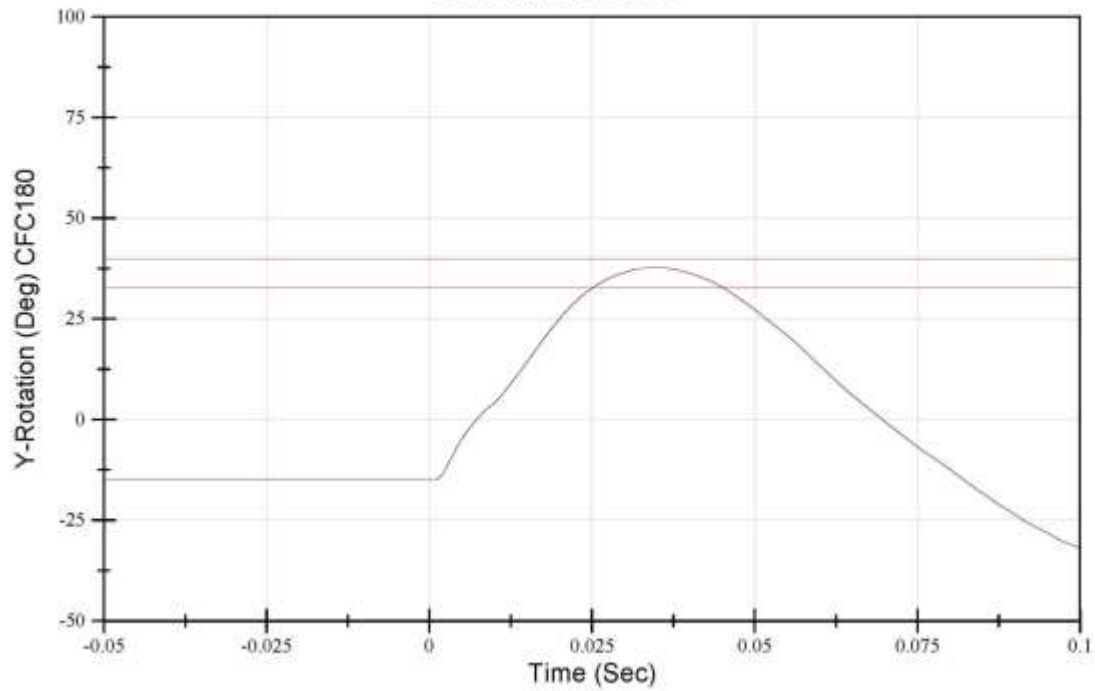


Software Version: 2.4

File Name: LX0019Ball140521_03processed
05/21/2014 13:20:28.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 5.03 m/s

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

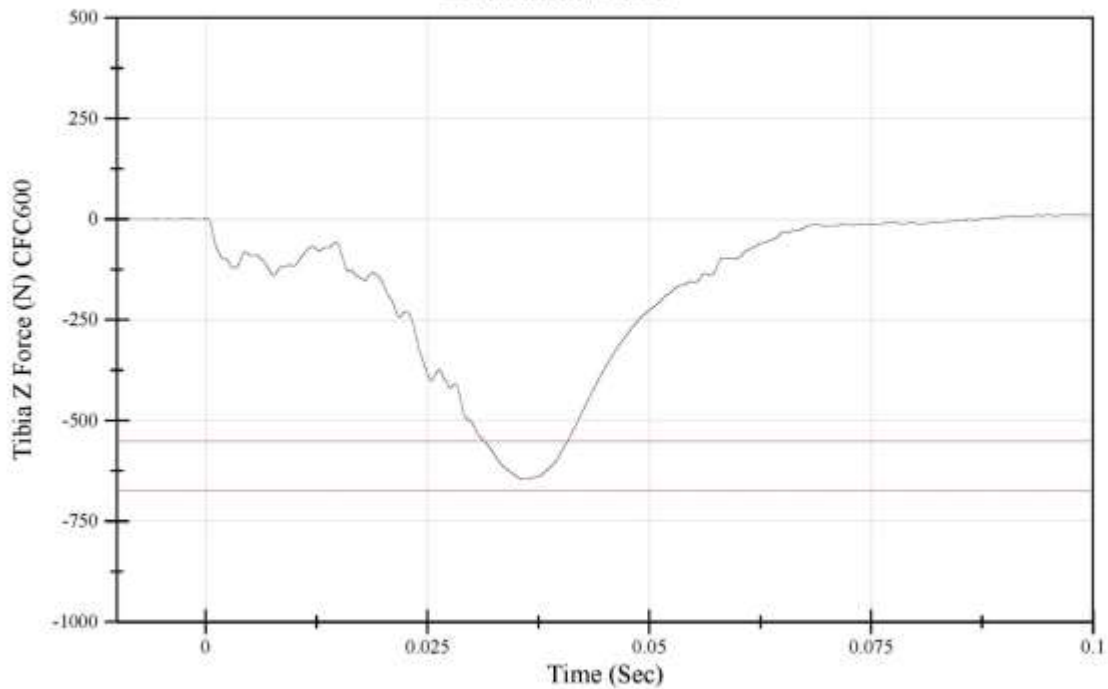


Software Version: 2.4

File Name: LX0019Ball140521_03processed
05/21/2014 13:20:28.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 1.97 m/s

THOR Left Foot Eversion Certification
Tibia Load
Serial Number: LX0019

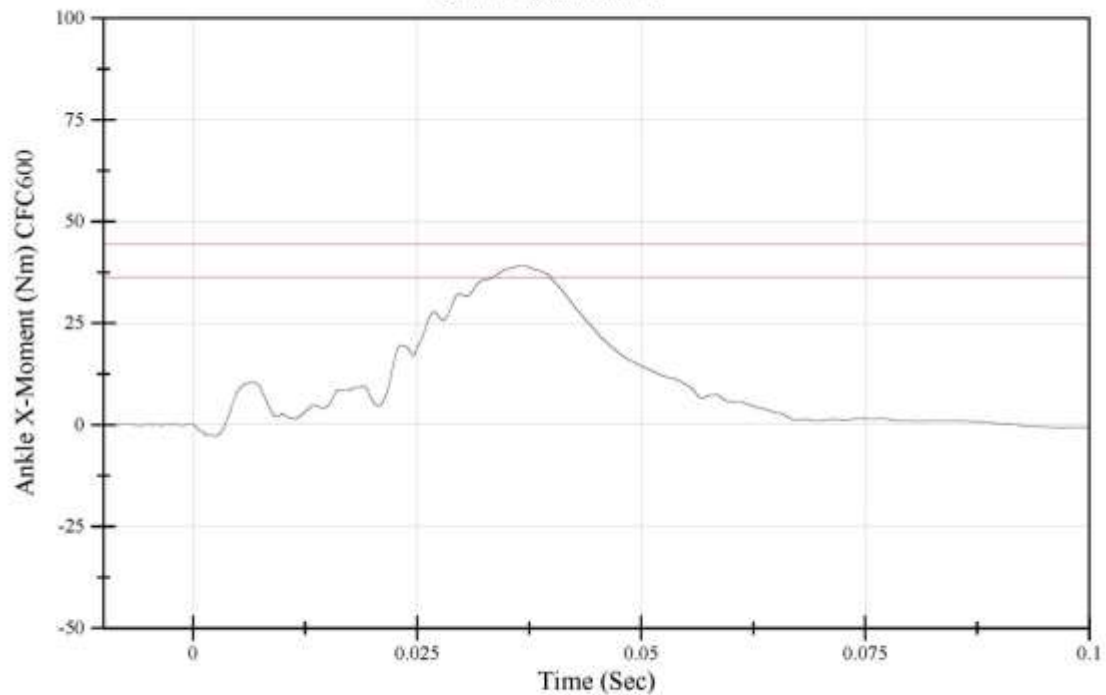


Software Version: 2.4

File Name: LX0019Eversion140521_02processed
05/21/2014 09:58:27.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 1.97 m/s

THOR Left Foot Eversion Certification
Ankle Moment
Serial Number: LX0019

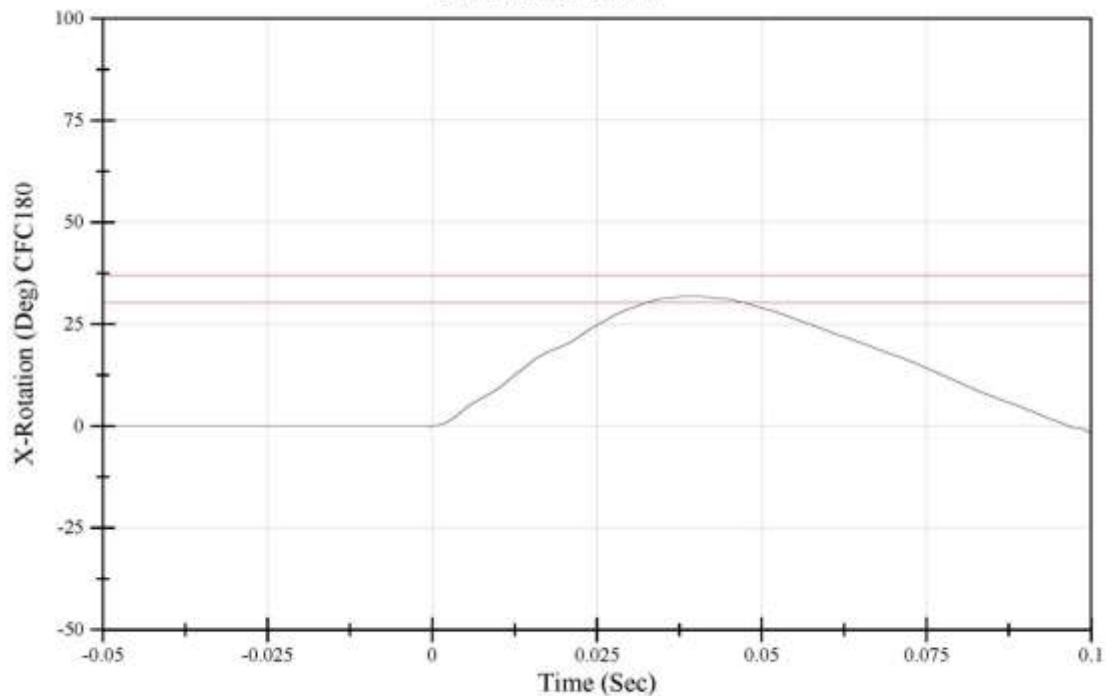


Software Version: 2.4

File Name: LX0019Eversion140521_02processed
05/21/2014 09:58:27.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 1.97 m/s

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

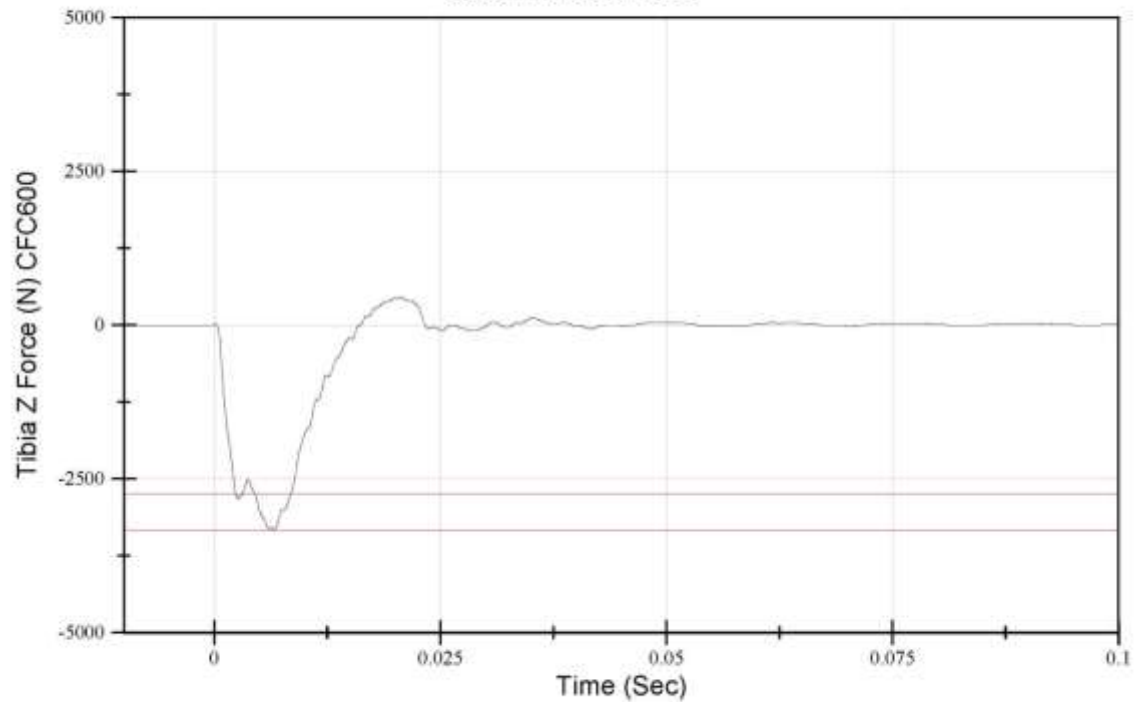


Software Version: 2.4

File Name: LX0019Eversion140521_02processed
05/21/2014 09:58:27.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 4 m/s

THOR Left Foot Heel Certification
Tibia Load
Serial Number: LX0019

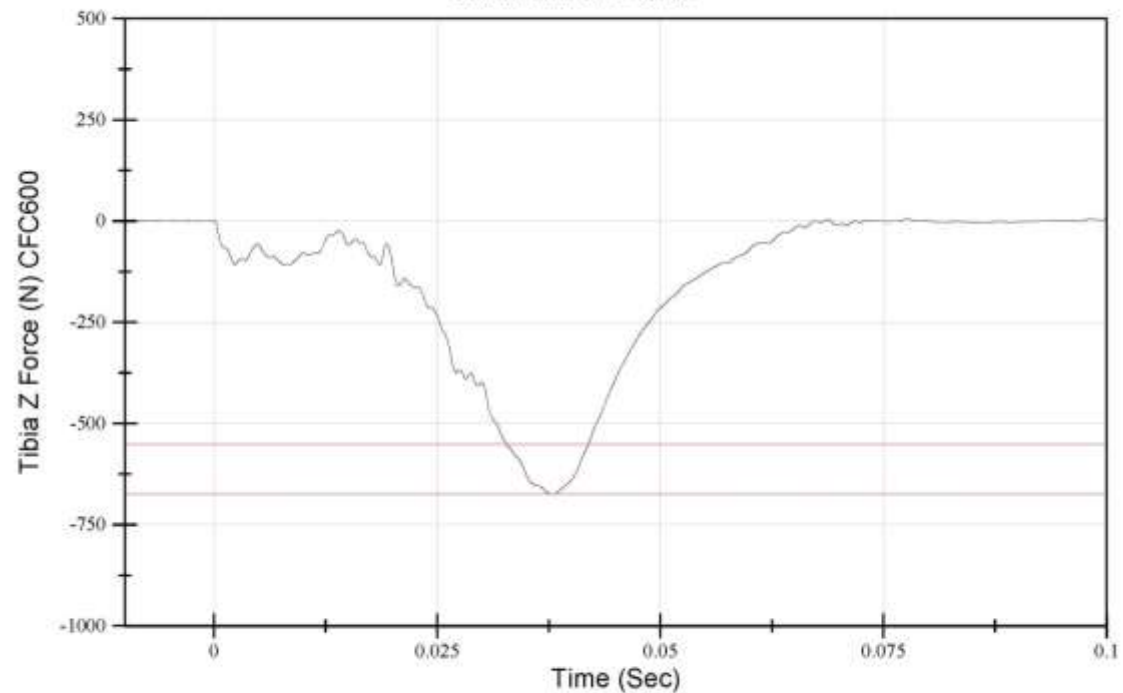


Software Version: 2.4

File Name: LX0019Heel140521_01processed
05/21/2014 14:19:36.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 1.96 m/s

THOR Left Foot Inversion Certification
Tibia Load
Serial Number: LX0019

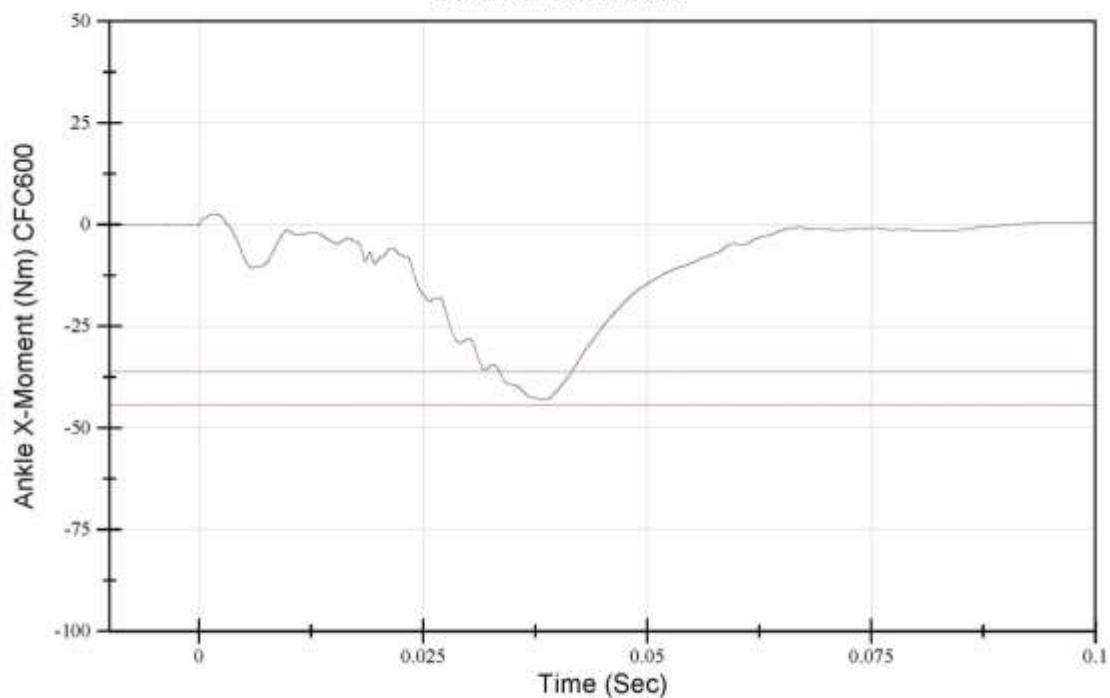


Software Version: 2.4

File Name: LX0019Inversion140521_03processed
05/21/2014 08:53:35.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 1.96 m/s

THOR Left Foot Inversion Certification
Ankle Moment
Serial Number: LX0019

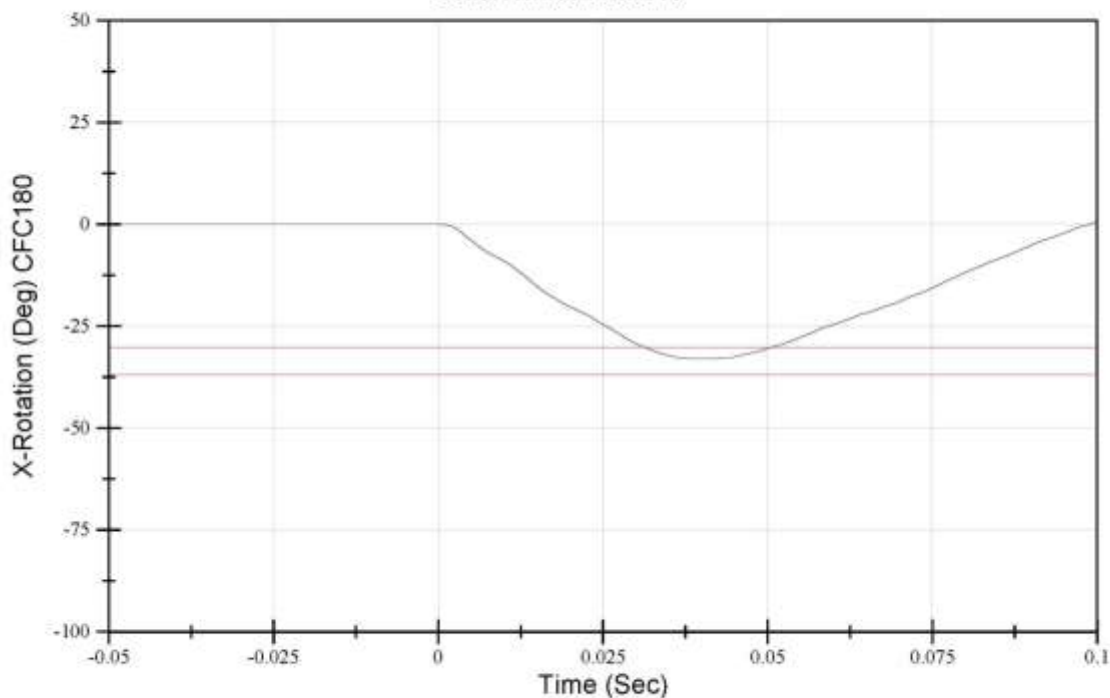


Software Version: 2.4

File Name: LX0019Inversion140521_03processed
05/21/2014 08:53:35.0000

Test Temperature: 71.1 degrees
Relative Humidity: 31.4%
Test Velocity: 1.96 m/s

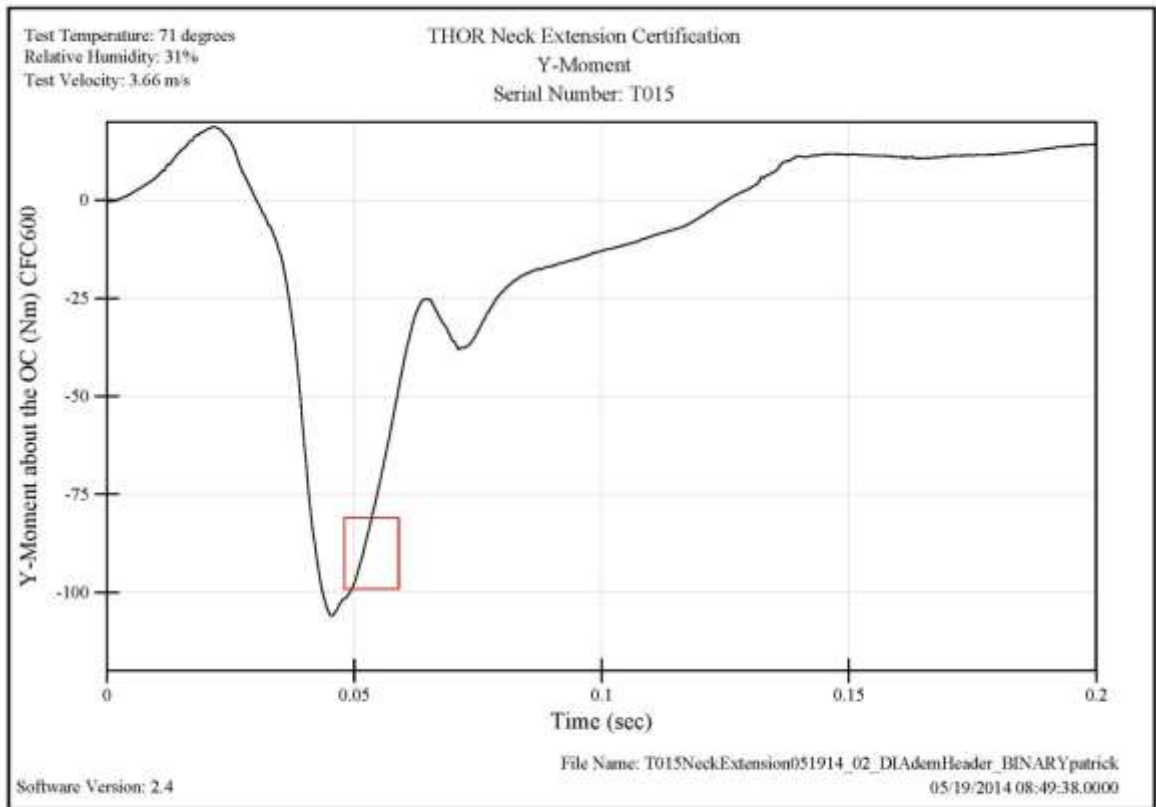
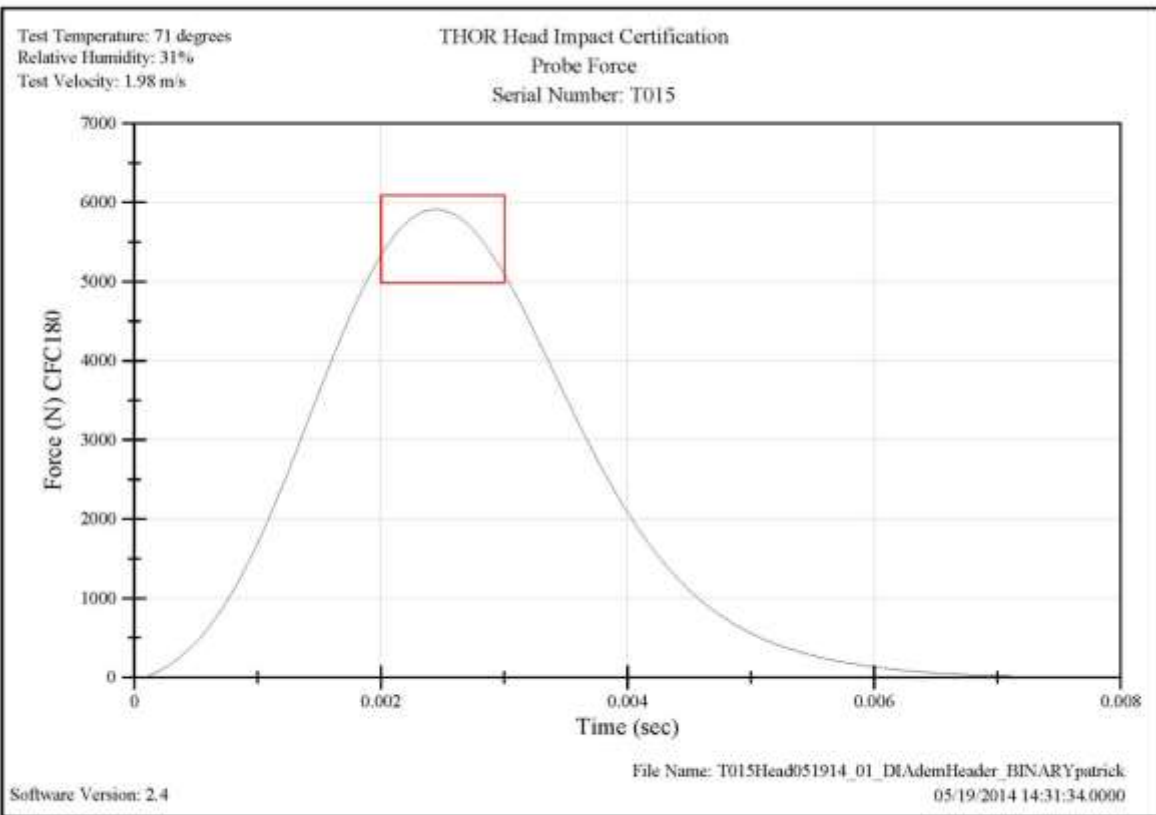
THOR Left Foot Inversion Certification
Ankle X-Rotation
Serial Number: LX0019



Software Version: 2.4

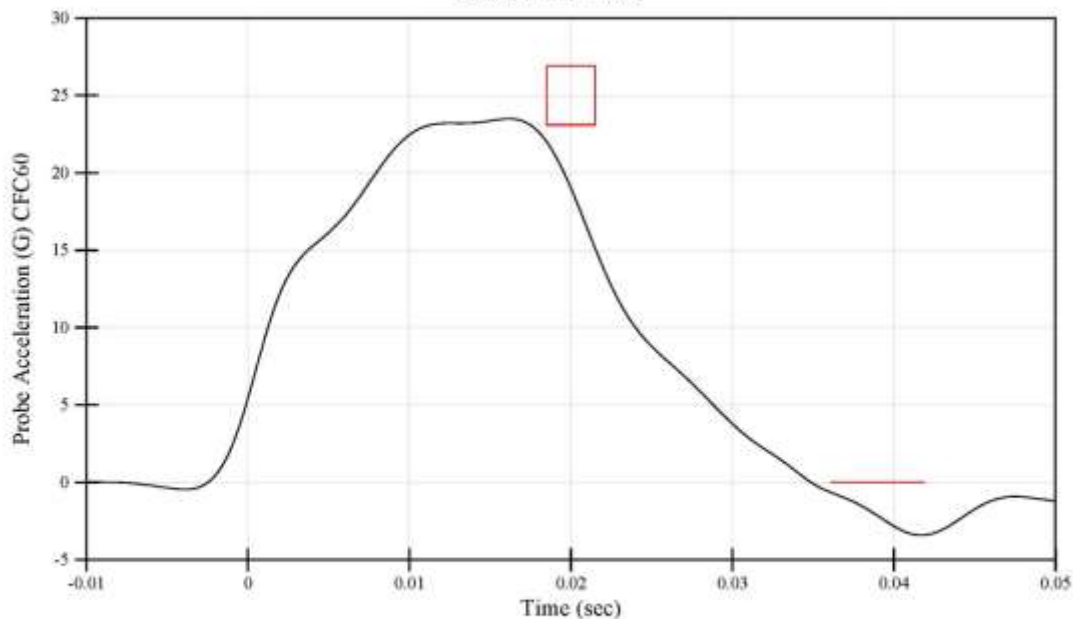
File Name: LX0019Inversion140521_03processed
05/21/2014 08:53:35.0000

50% ADULT MALE THOR015 DUMMY CALIBRATIONS



Test Temperature: 71 degrees
Relative Humidity: 31%
Test Velocity: 3.66 m/s

THOR Neck Extension Certification
Probe Acceleration
Serial Number: T015

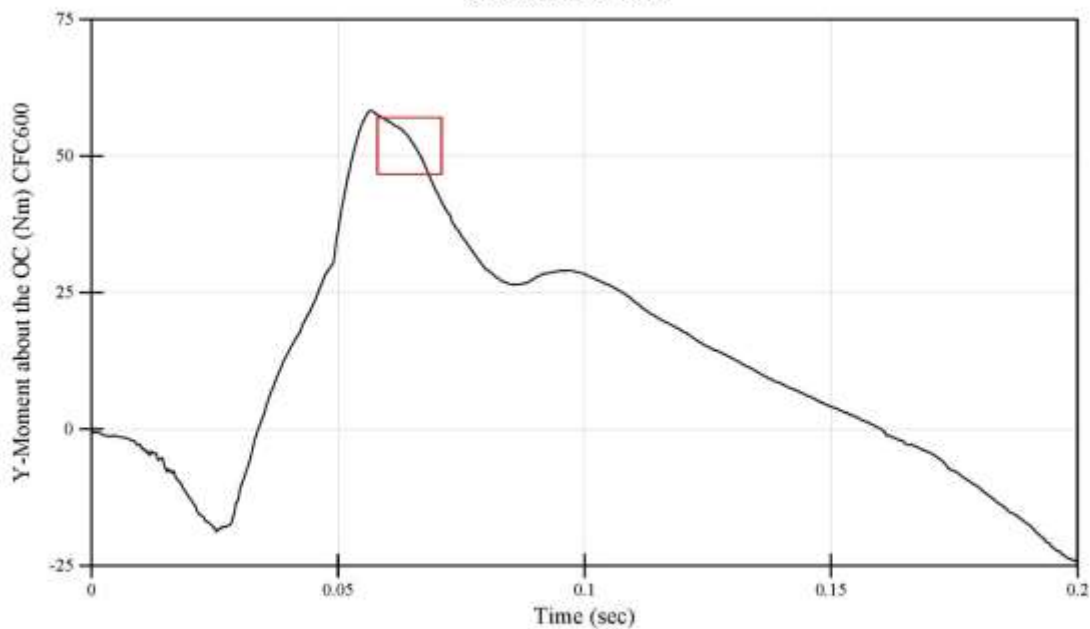


Software Version: 2.4

File Name: T015NeckExtension051914_02_DiAdemHeader_BINARYpatrick
05/19/2014 08:49:38.0000

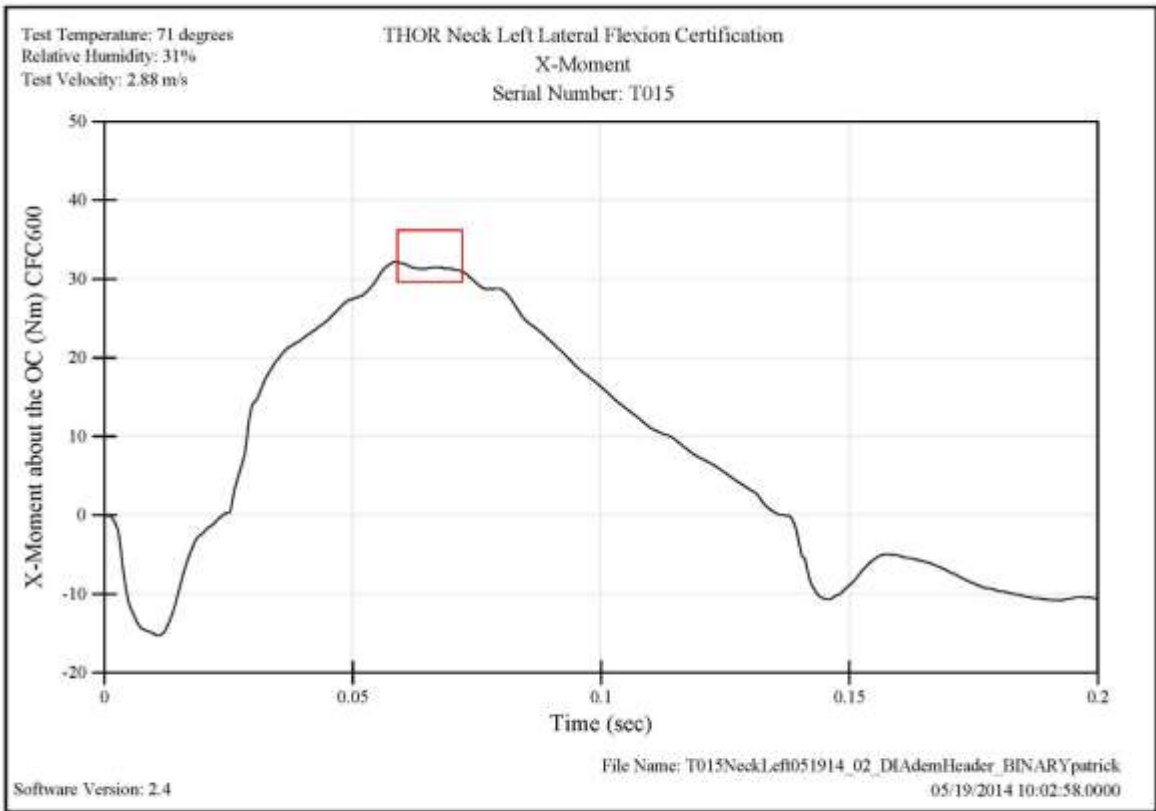
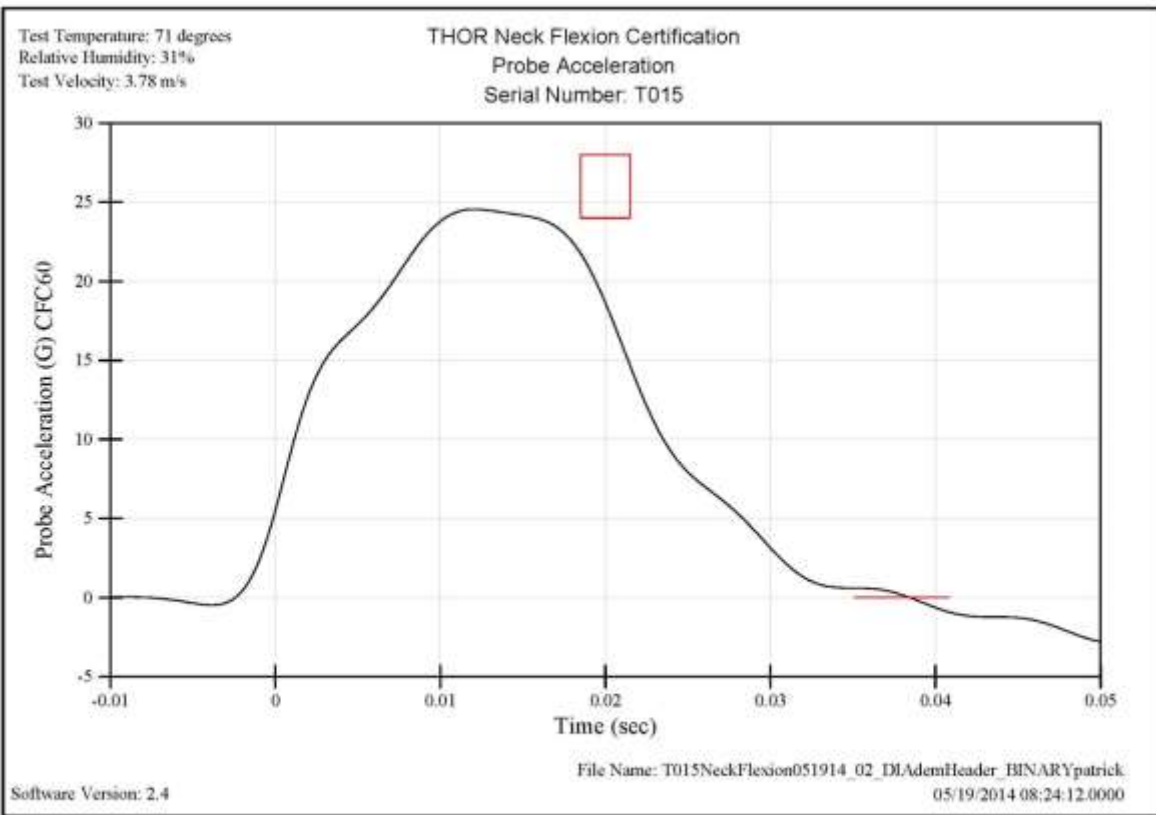
Test Temperature: 71 degrees
Relative Humidity: 31%
Test Velocity: 3.78 m/s

THOR Neck Flexion Certification
Y-Moment
Serial Number: T015



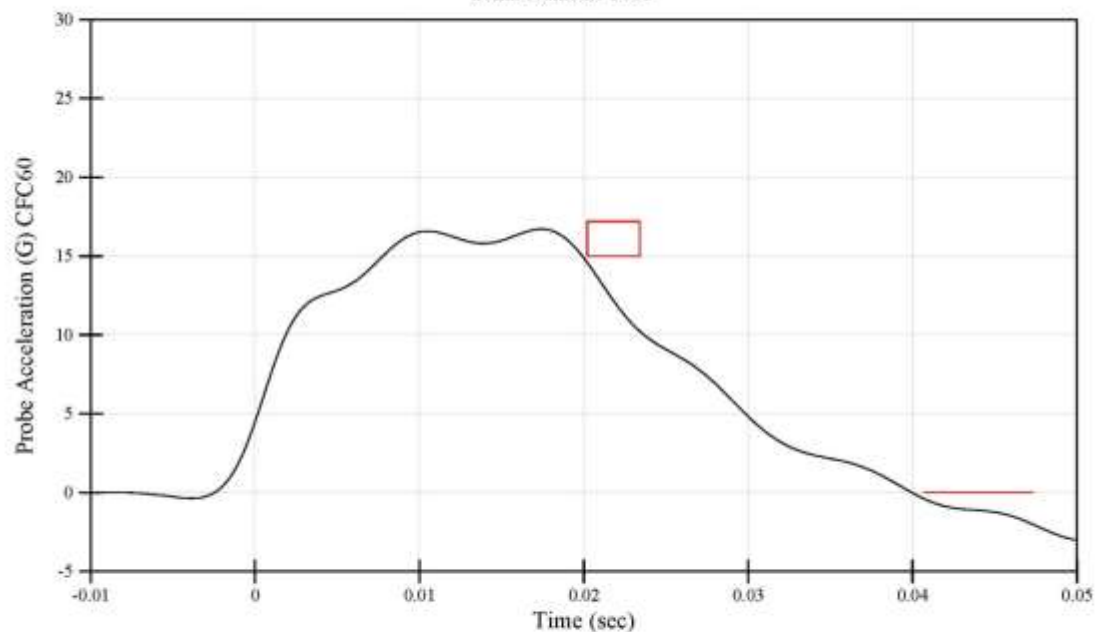
Software Version: 2.4

File Name: T015NeckFlexion051914_02_DiAdemHeader_BINARYpatrick
05/19/2014 08:24:12.0000



Test Temperature: 71 degrees
Relative Humidity: 31%
Test Velocity: 2.88 m/s

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

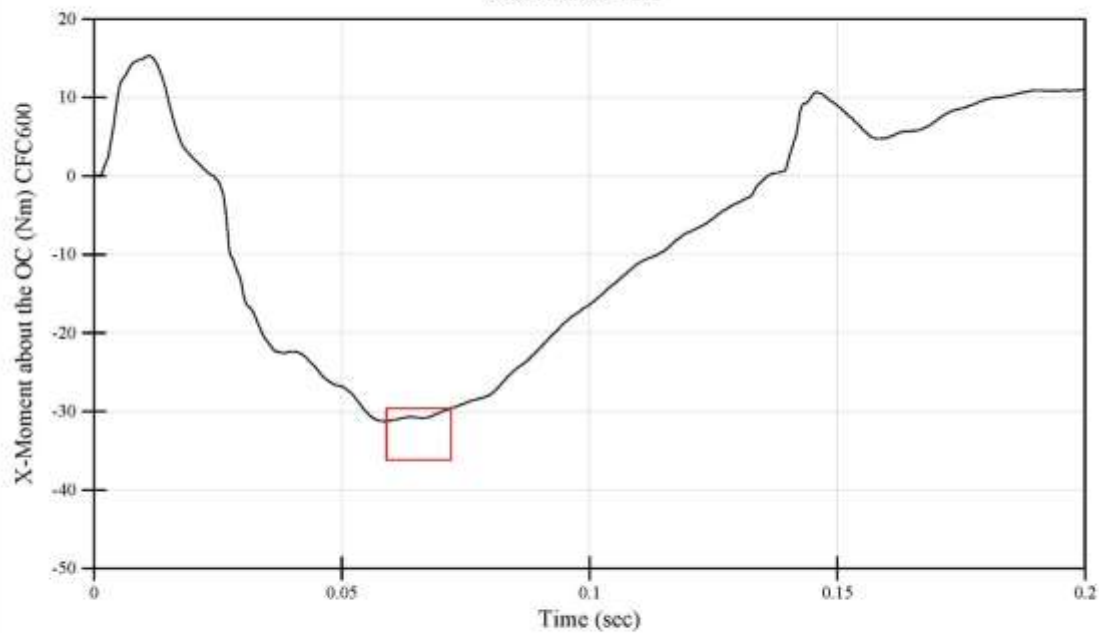


Software Version: 2.4

File Name: T015NeckLeft051914_02_DLAdemHeader_BINARYpatrick
05/19/2014 10:02:58.0000

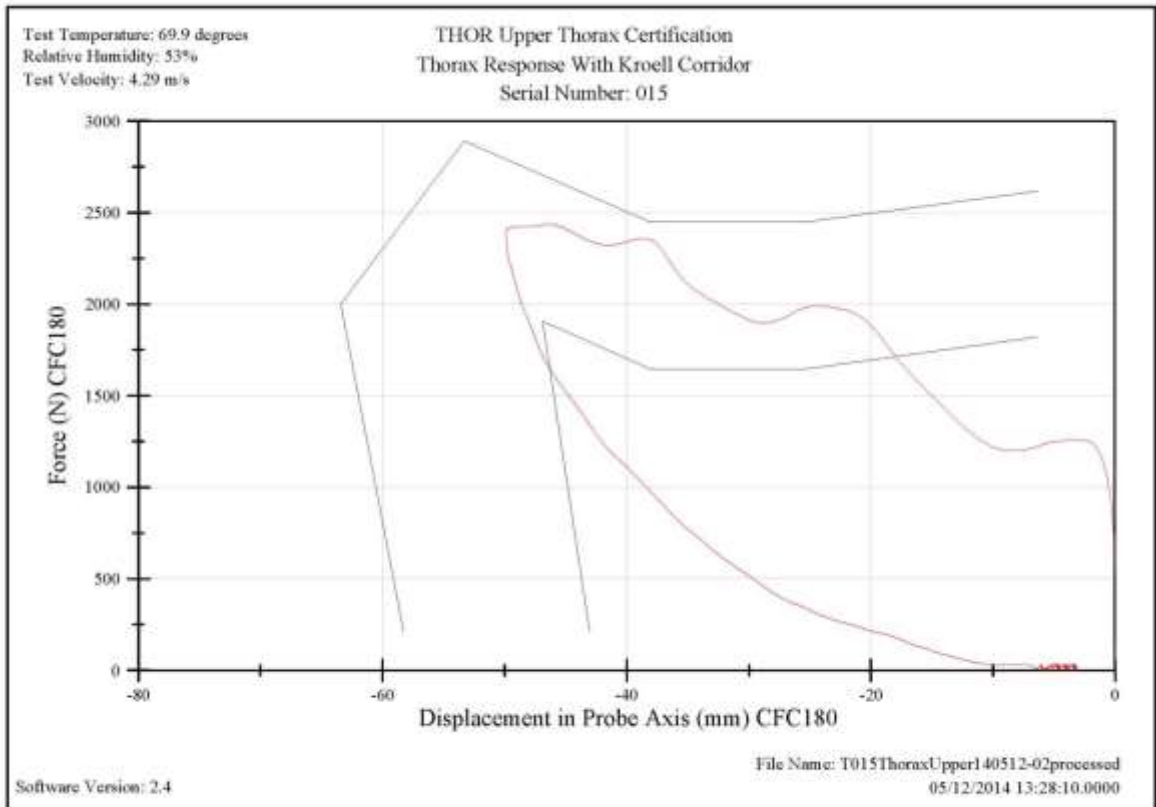
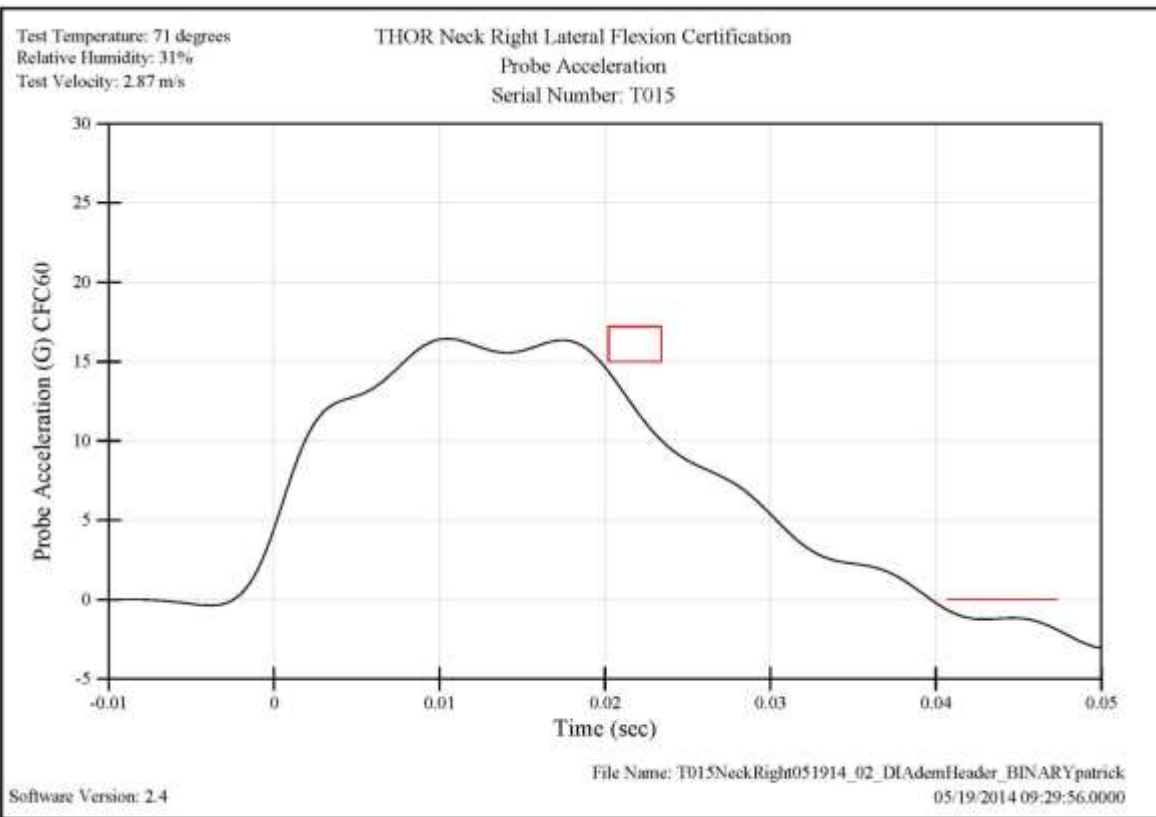
Test Temperature: 71 degrees
Relative Humidity: 31%
Test Velocity: 2.87 m/s

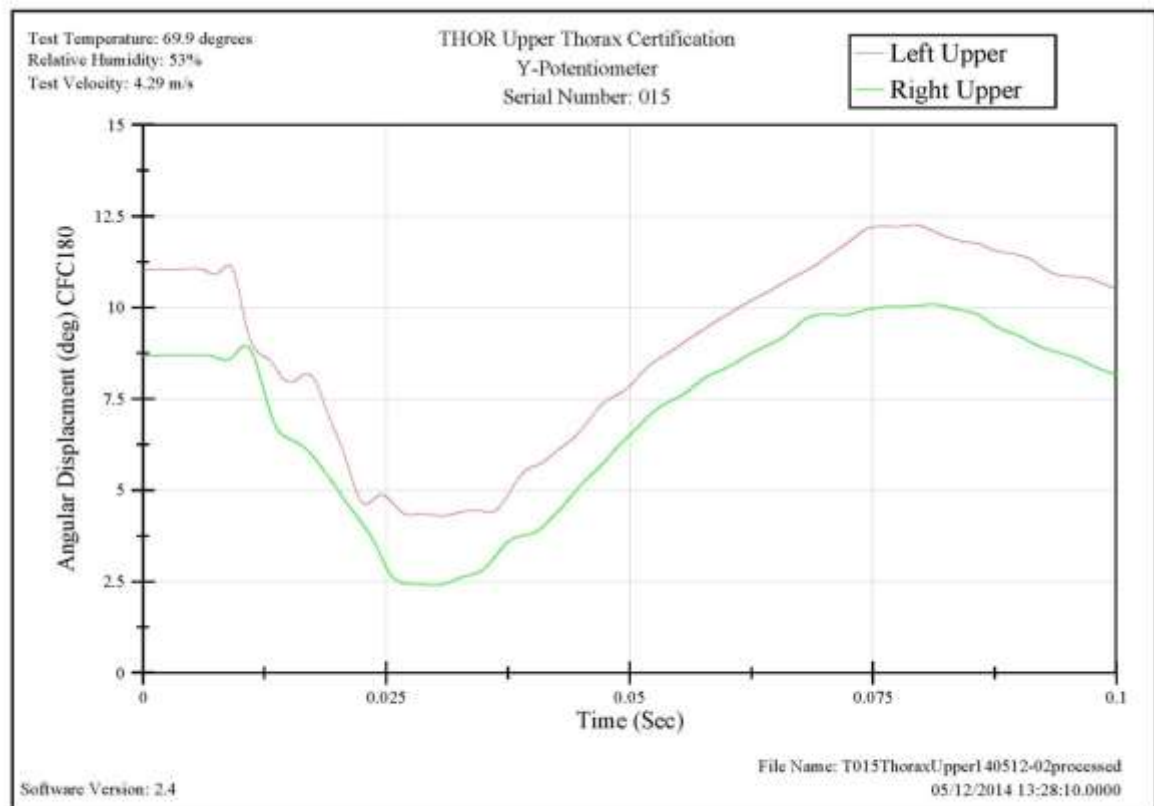
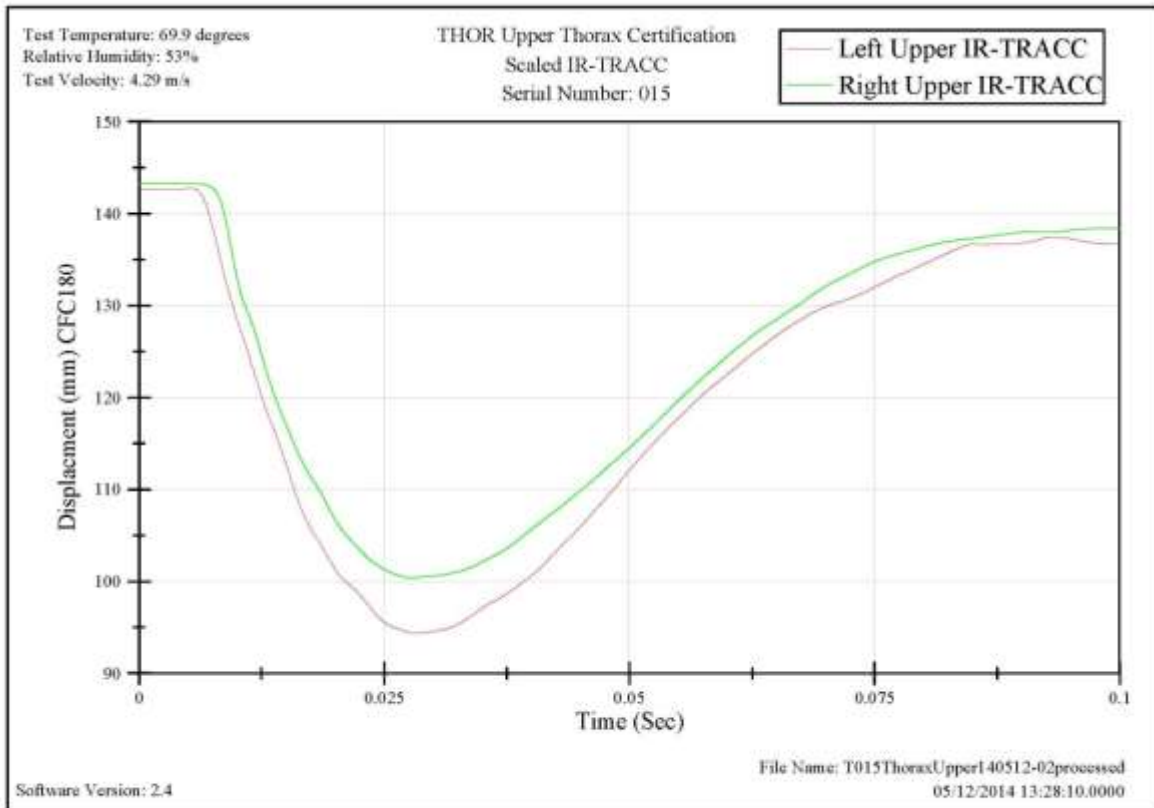
THOR Neck Right Lateral Flexion Certification
X-Moment
Serial Number: T015

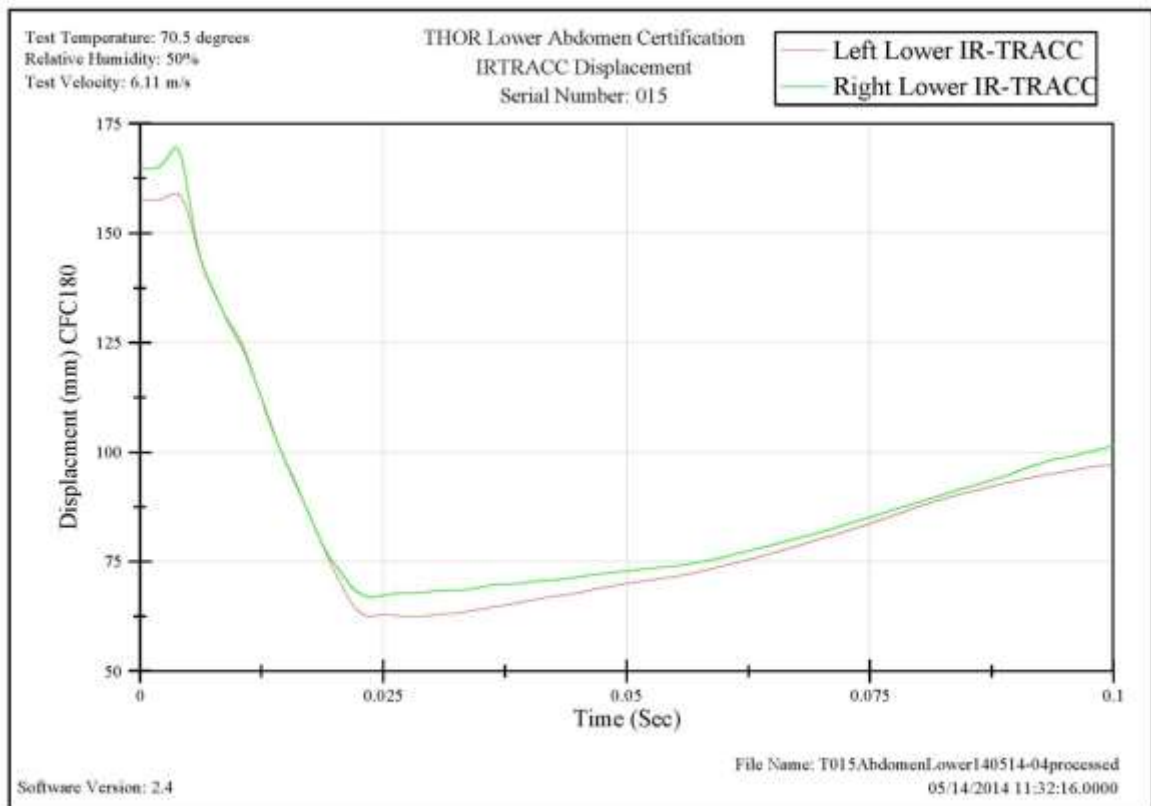
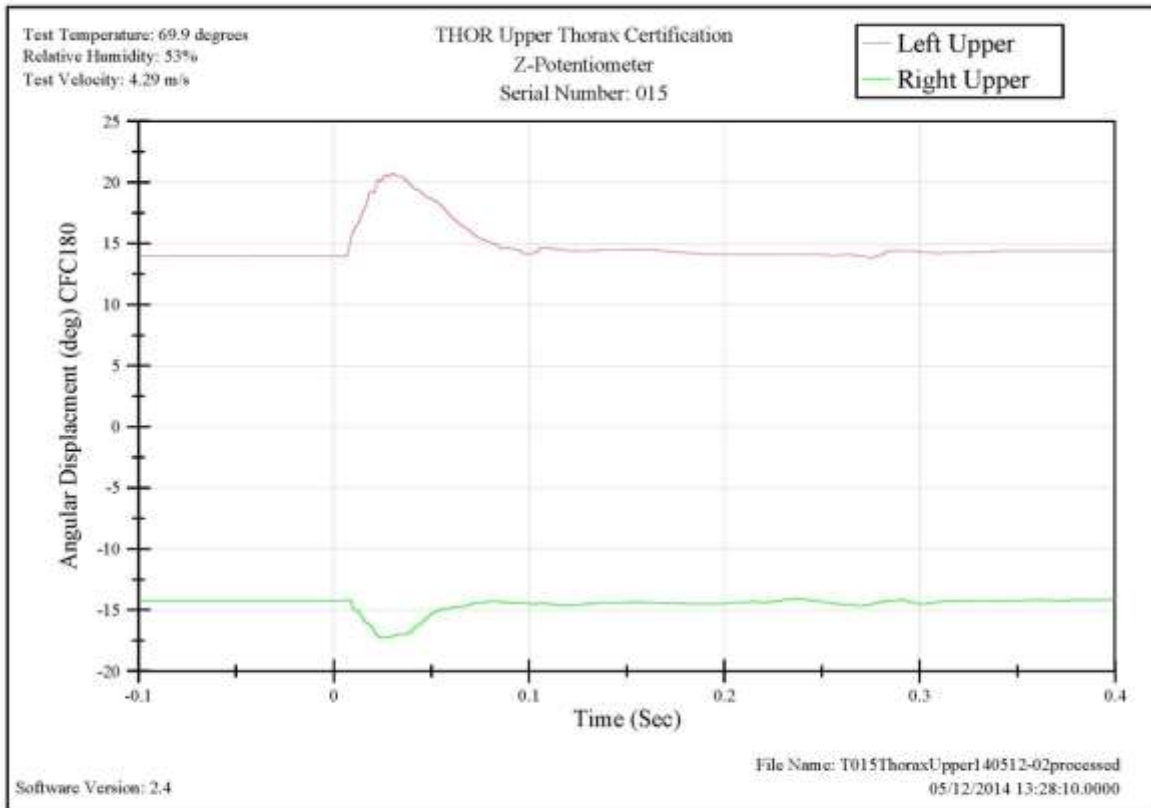


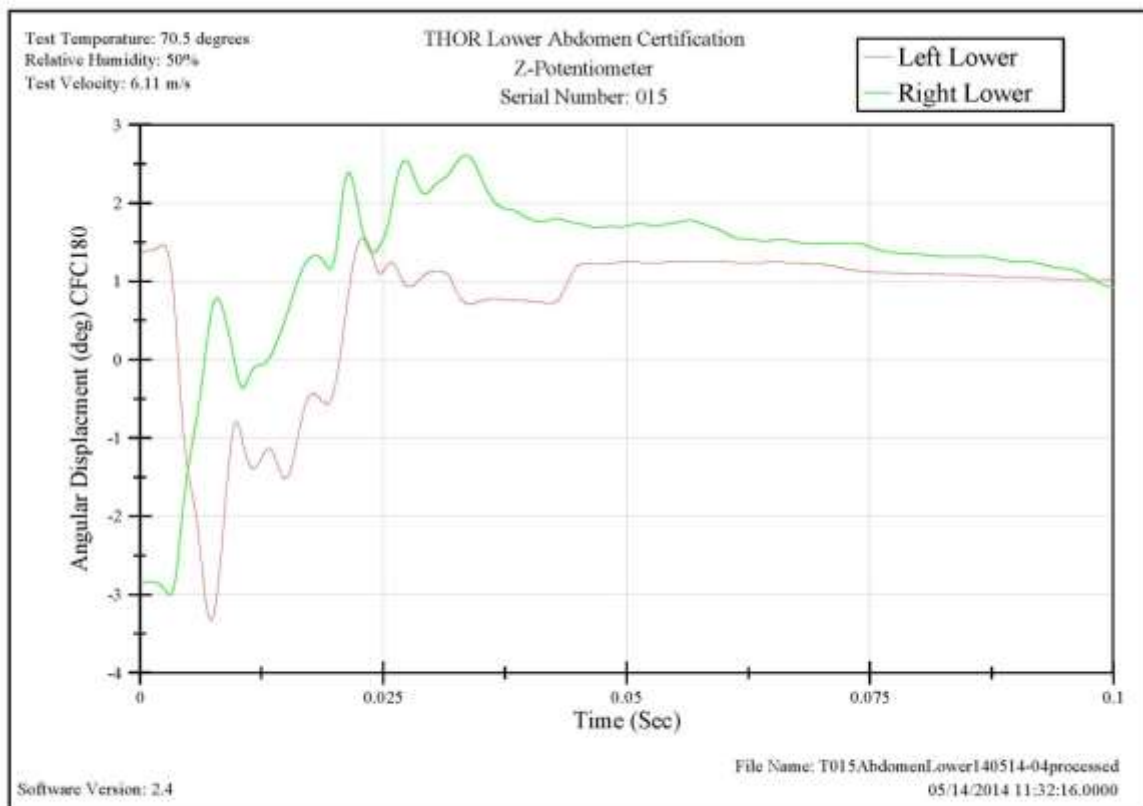
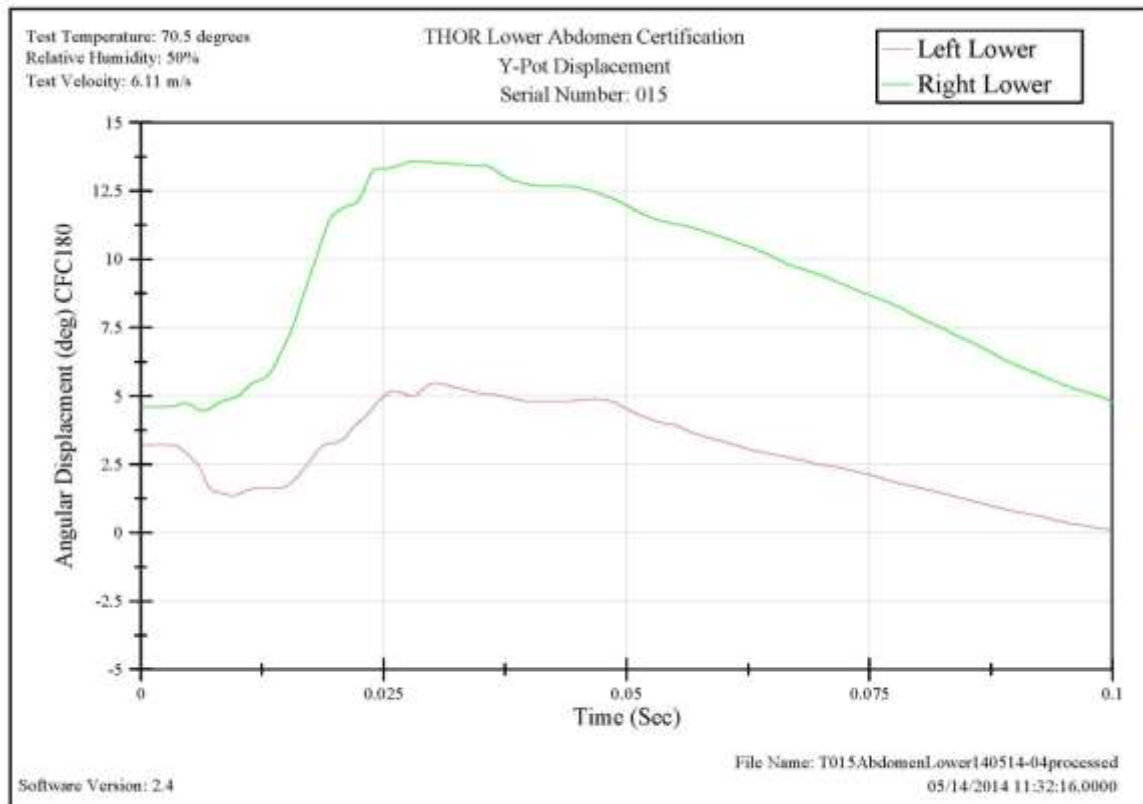
Software Version: 2.4

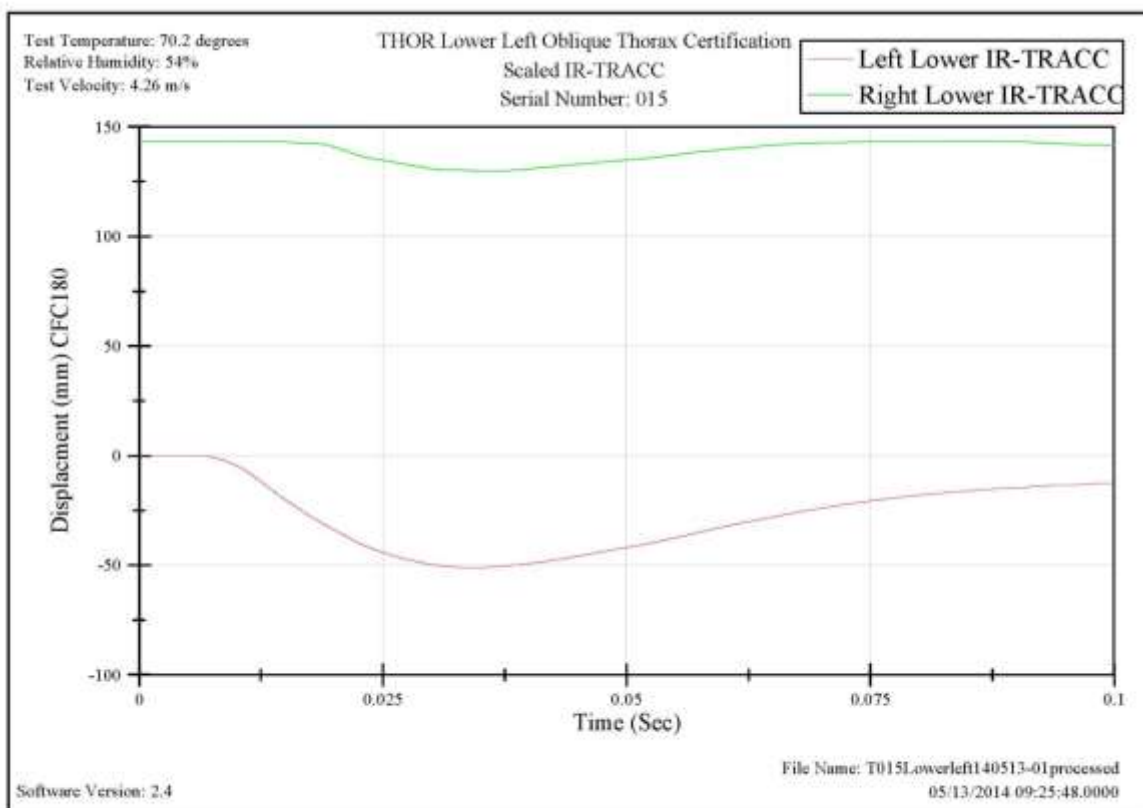
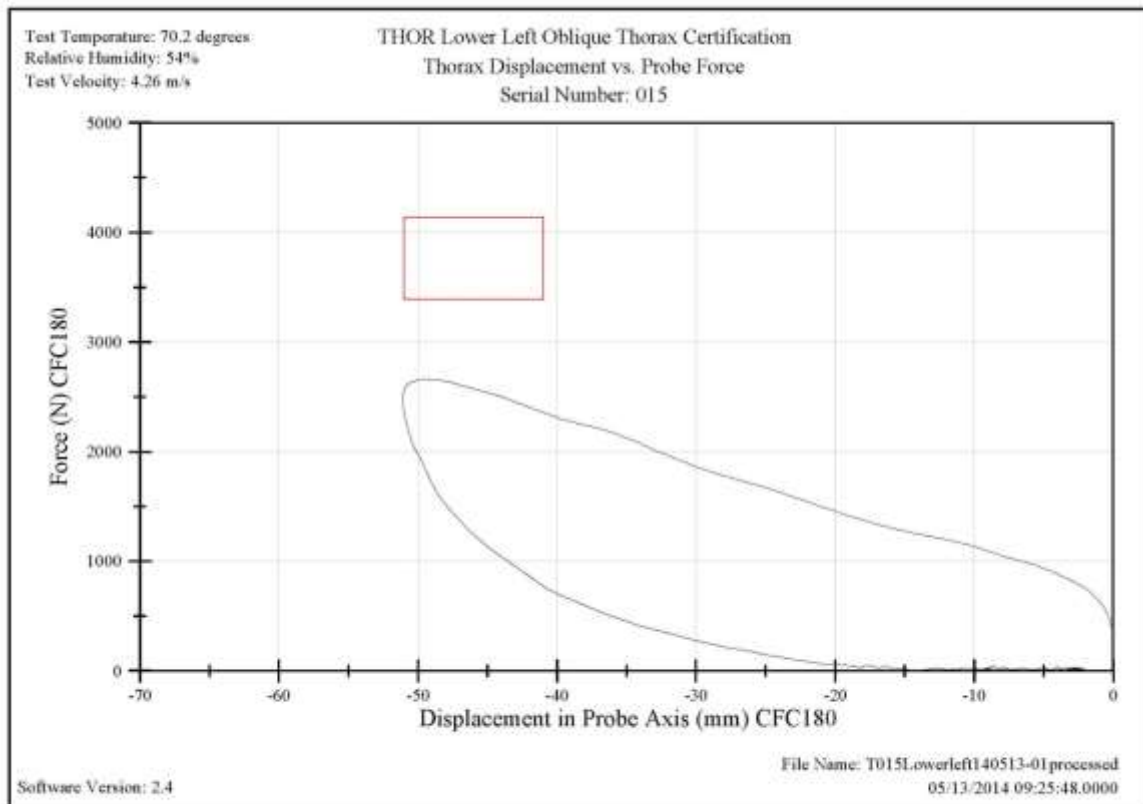
File Name: T015NeckRight051914_02_DLAdemHeader_BINARYpatrick
05/19/2014 09:29:56.0000

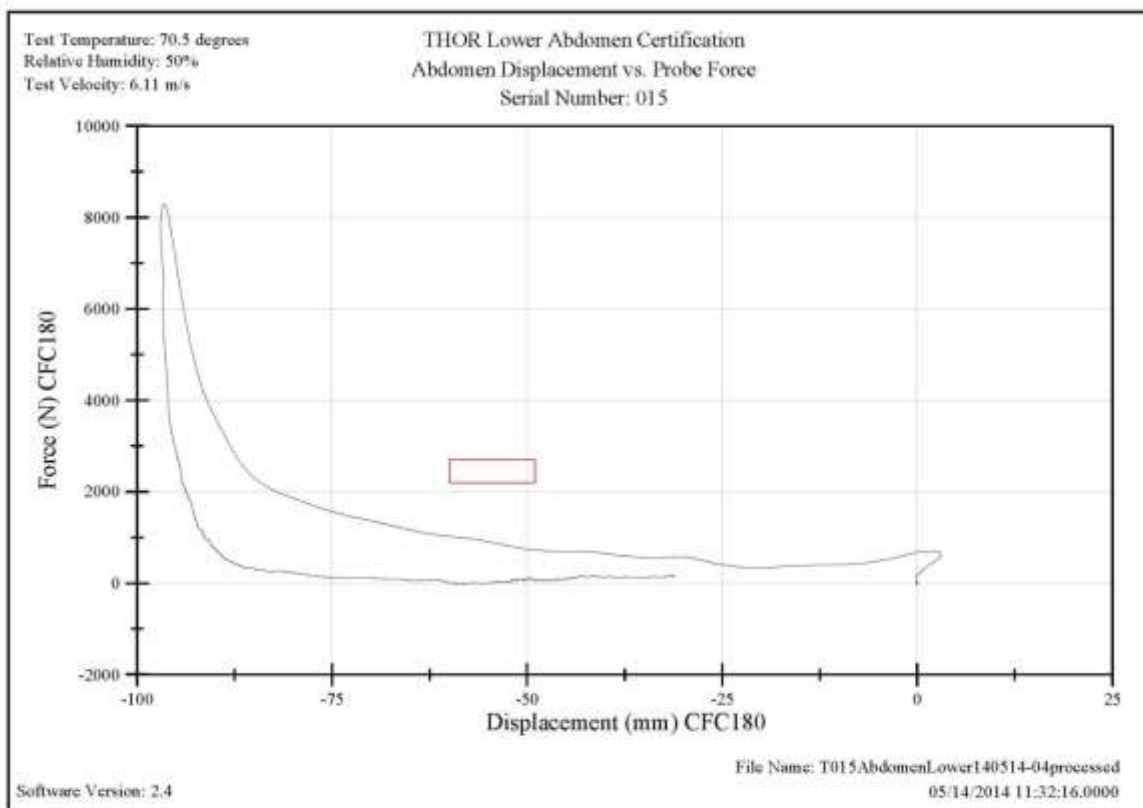
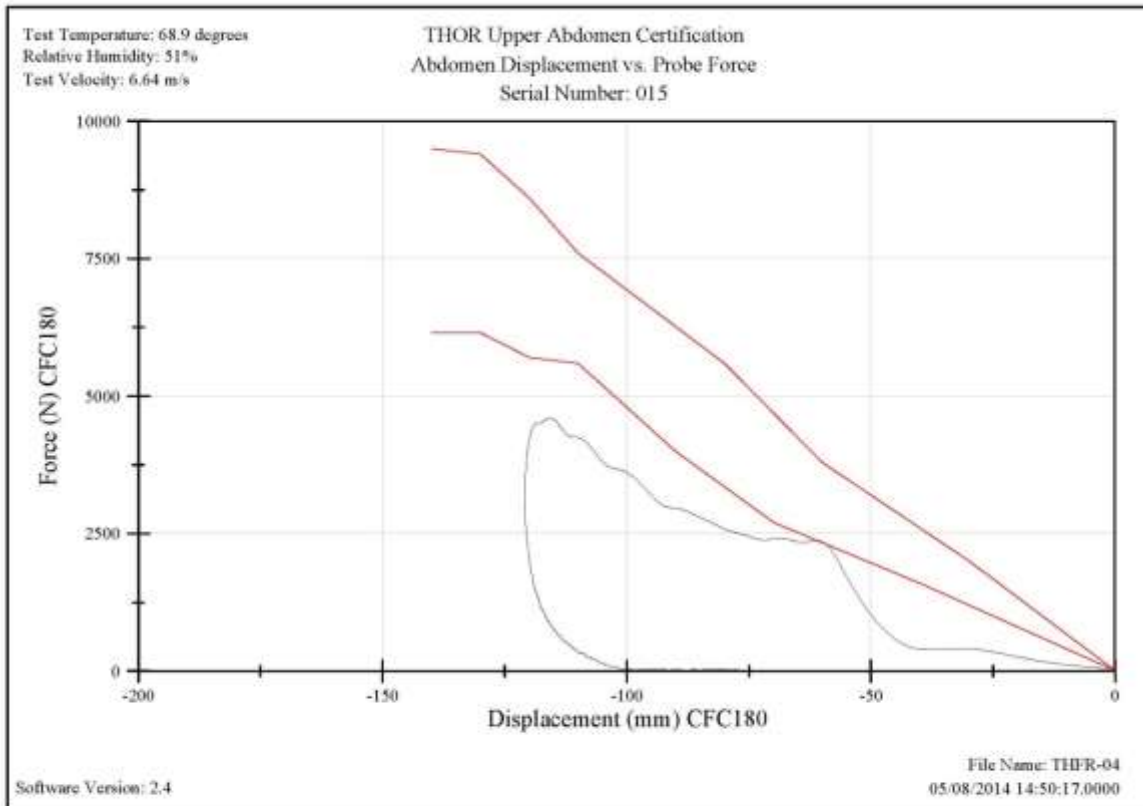


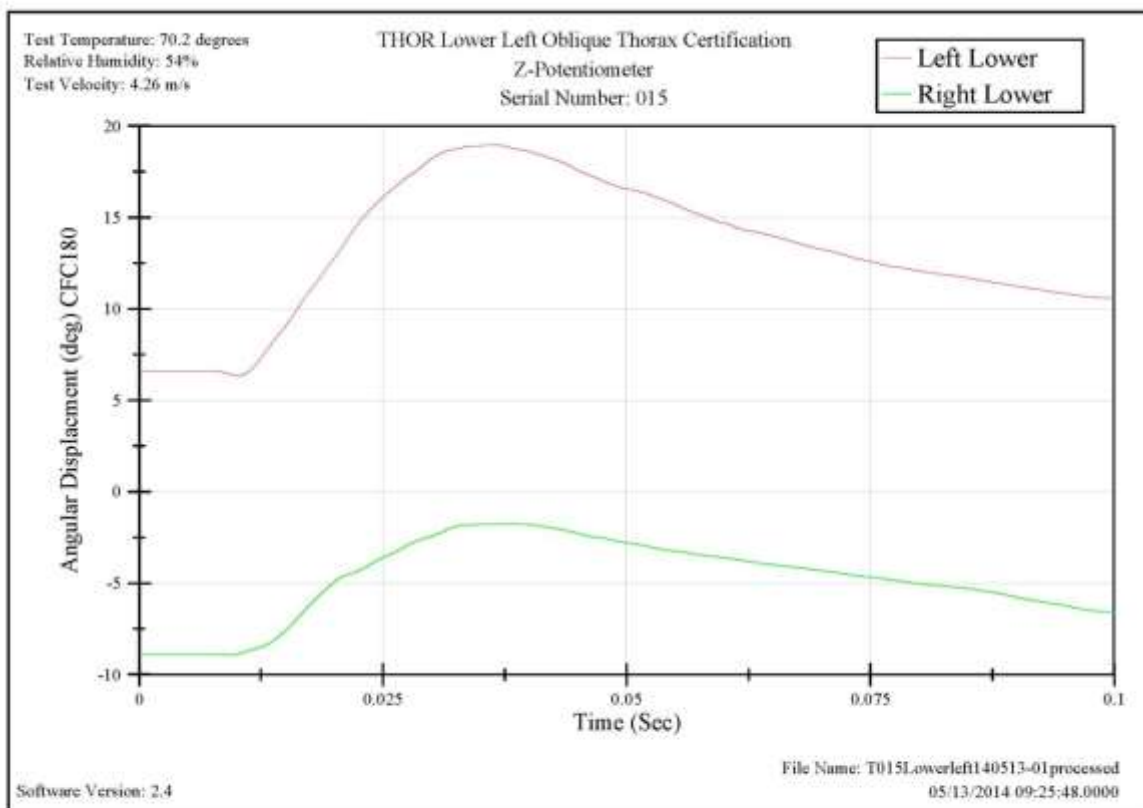
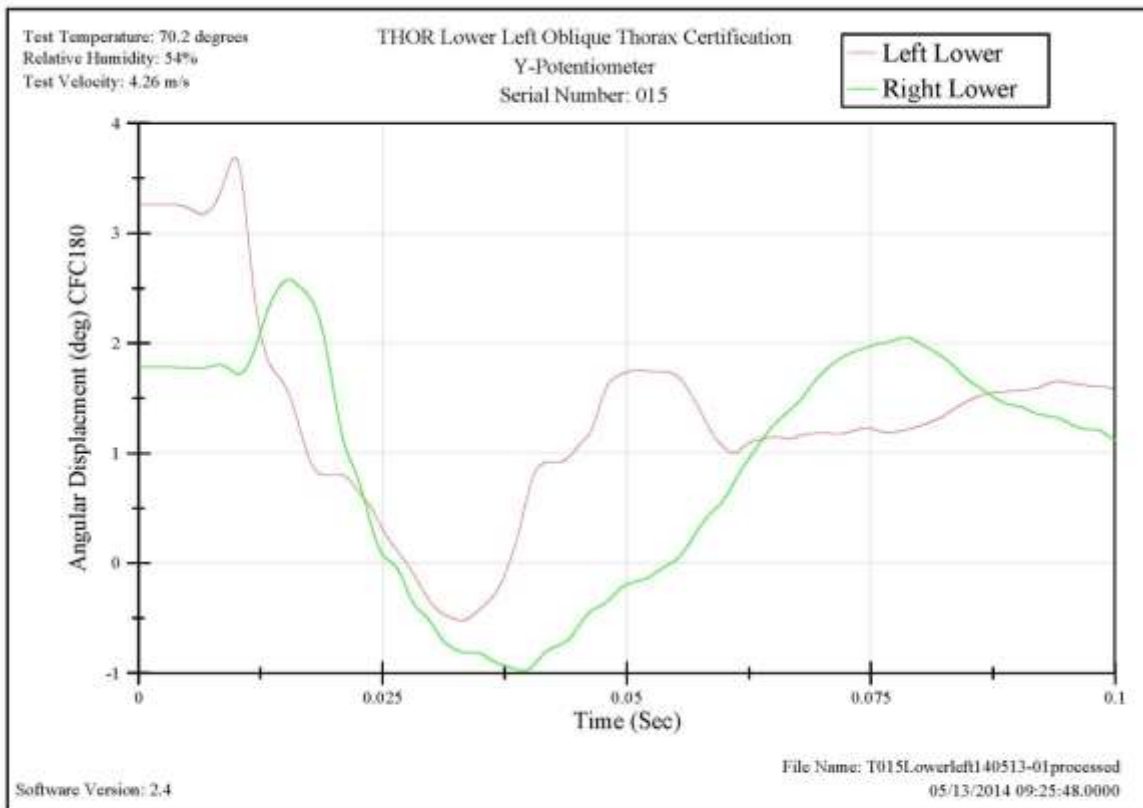


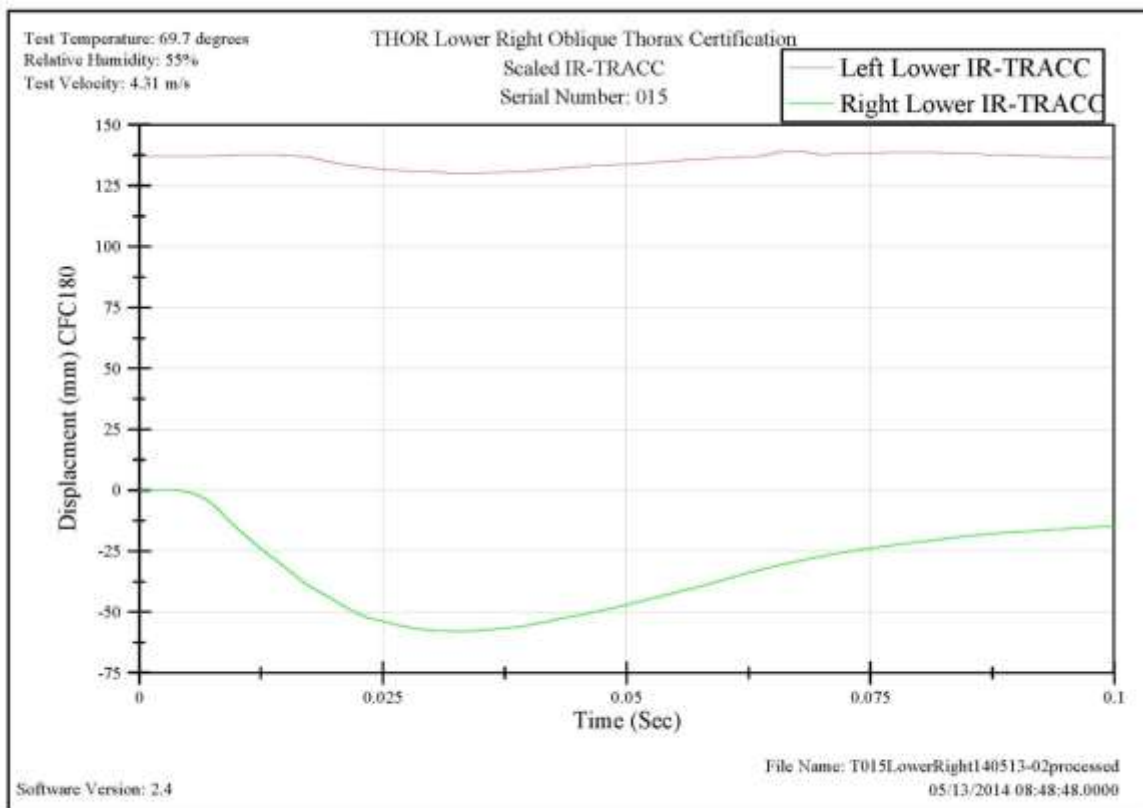
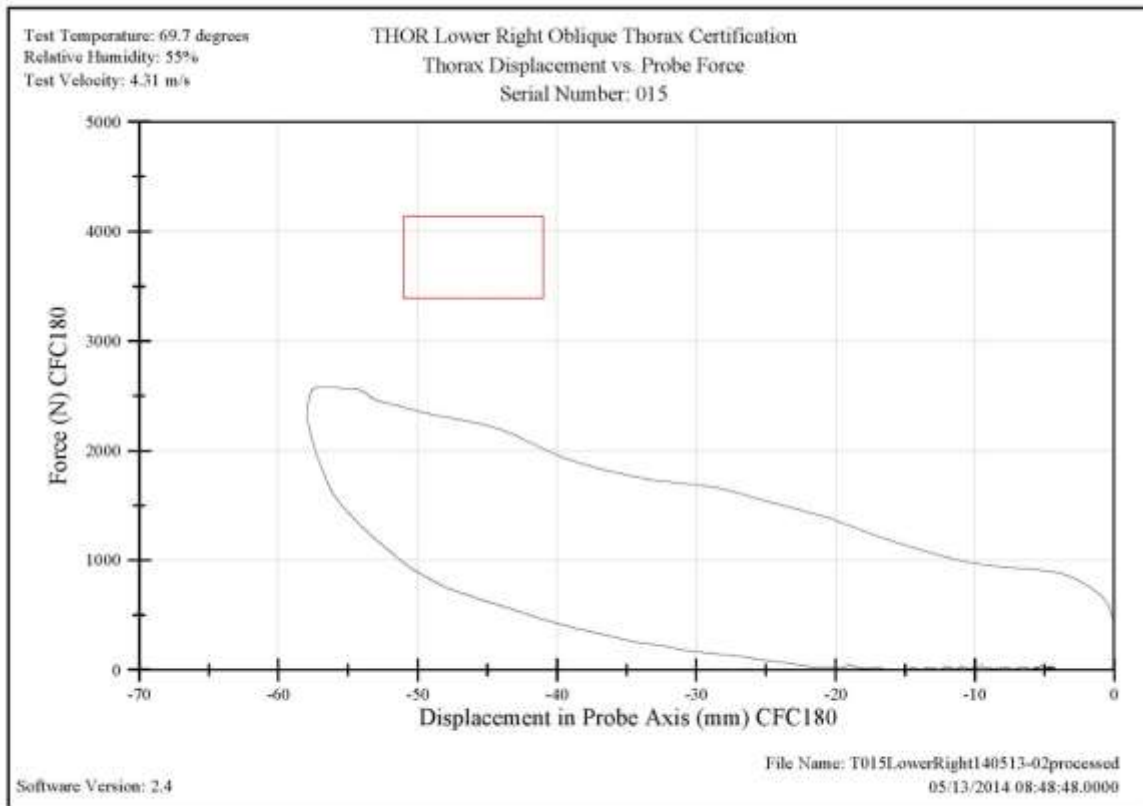


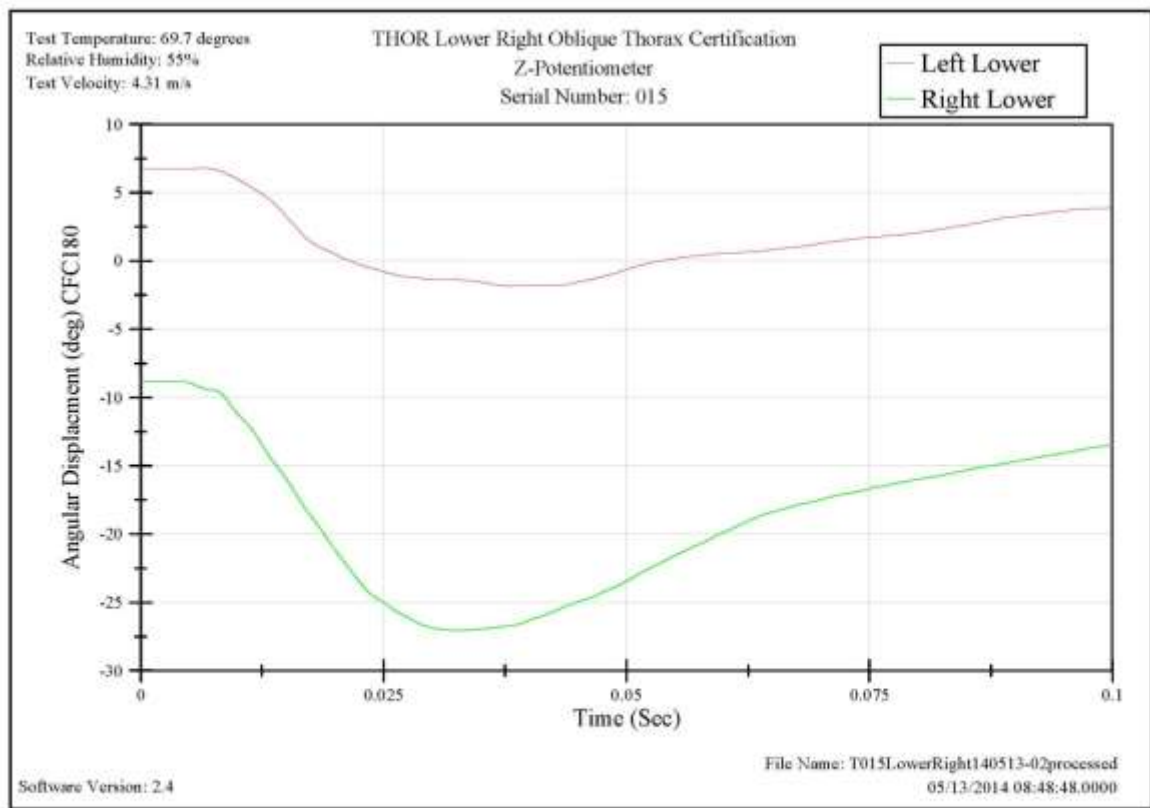
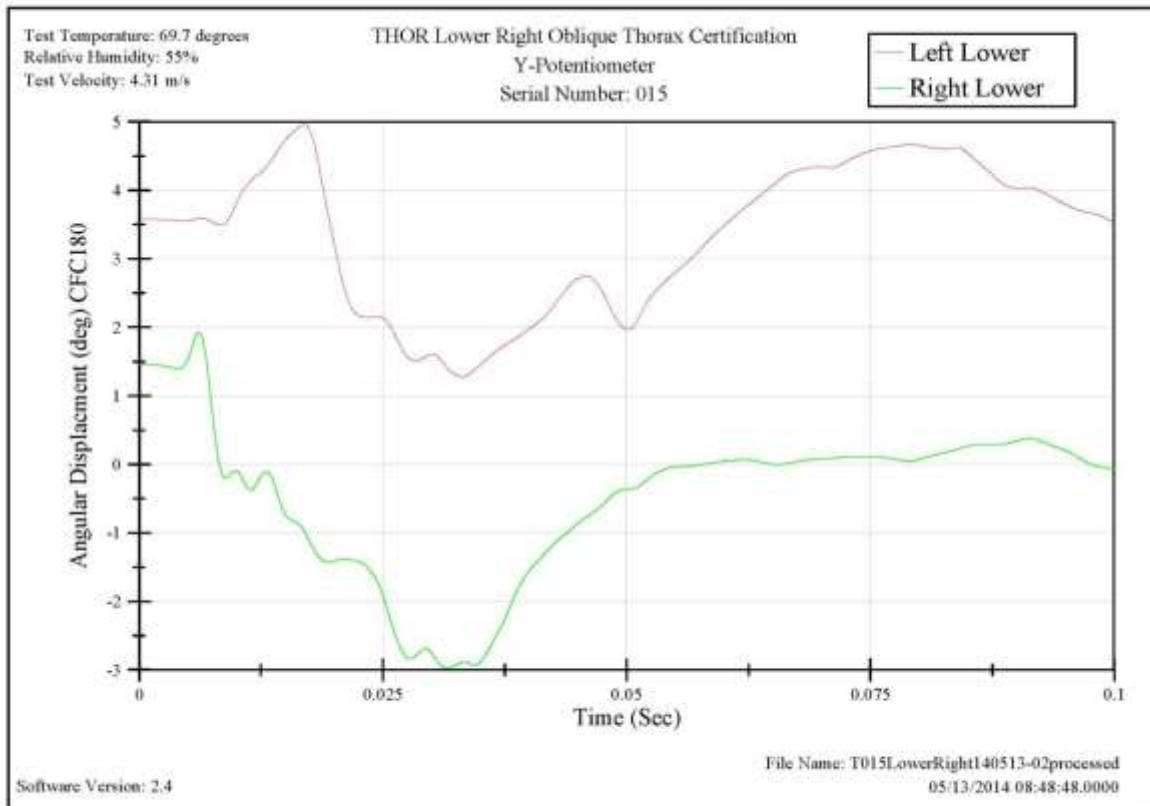


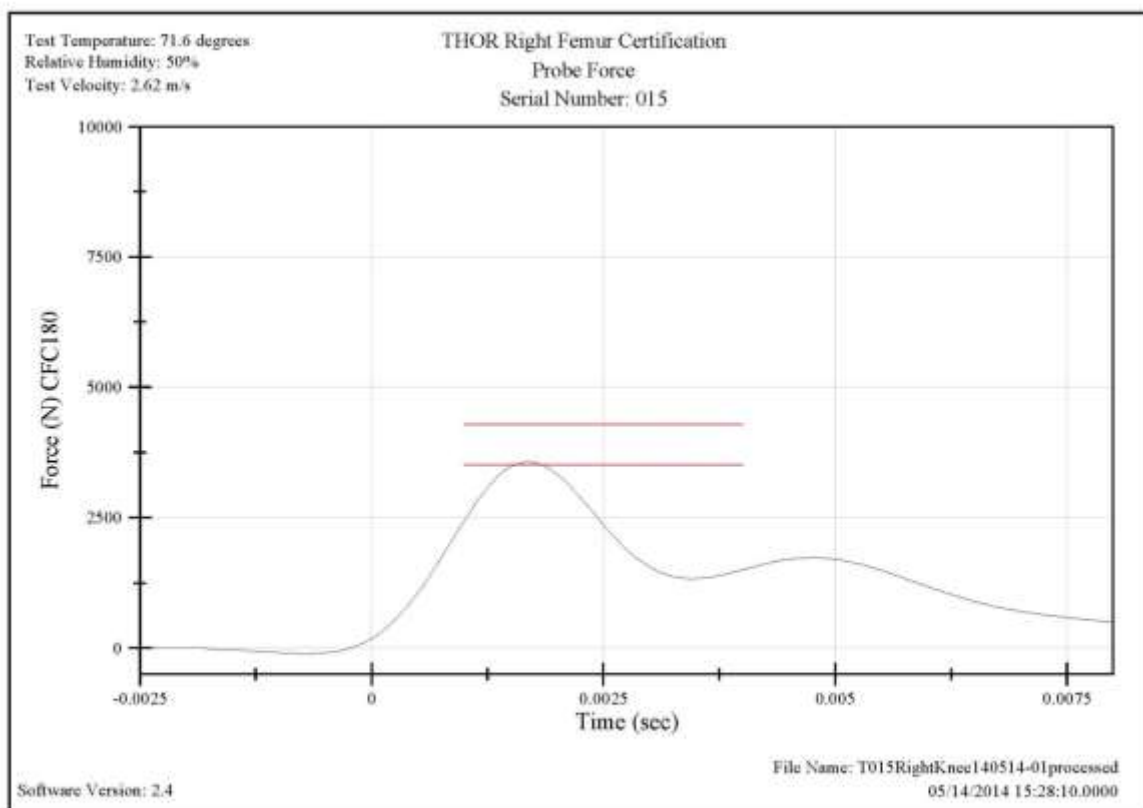
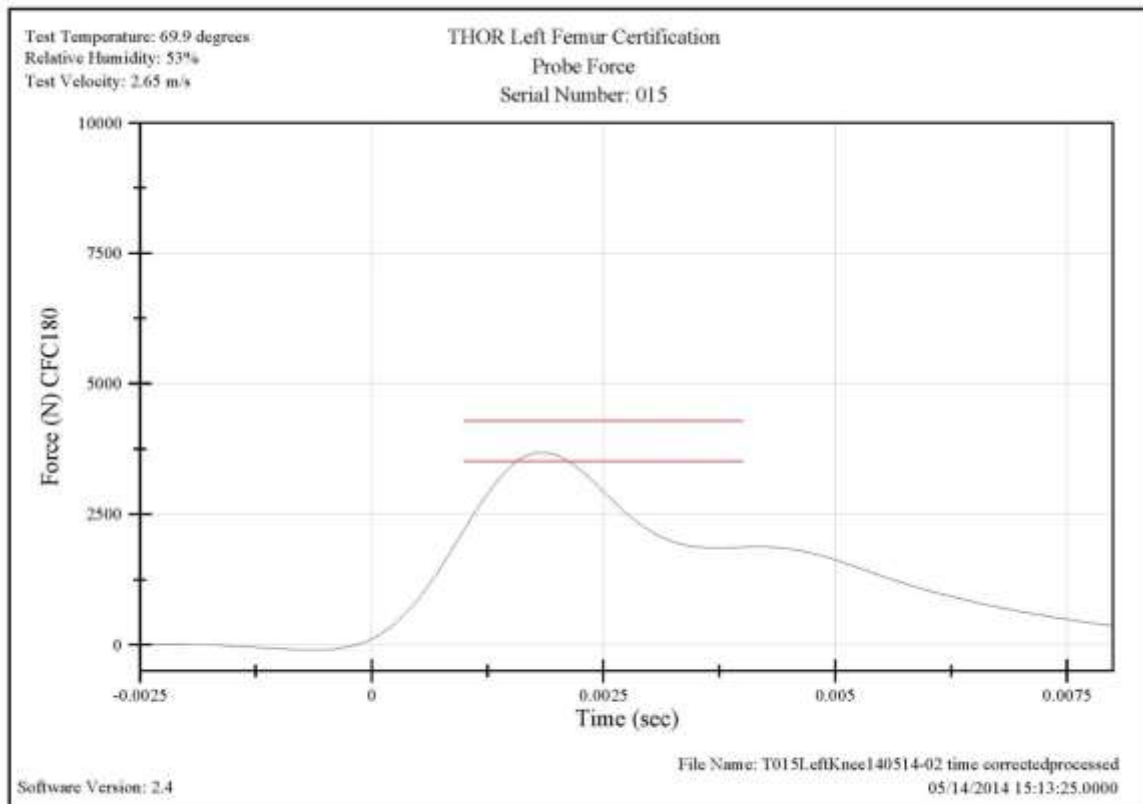






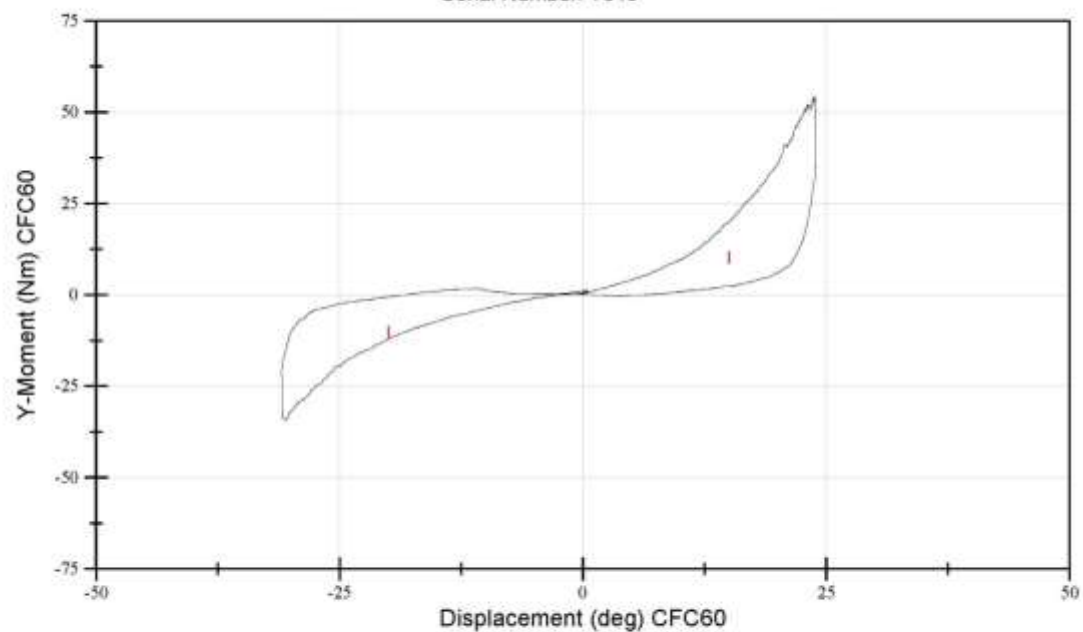






Test Temperature: 71 degrees
Relative Humidity: 35%
Test Velocity: 0 m/s

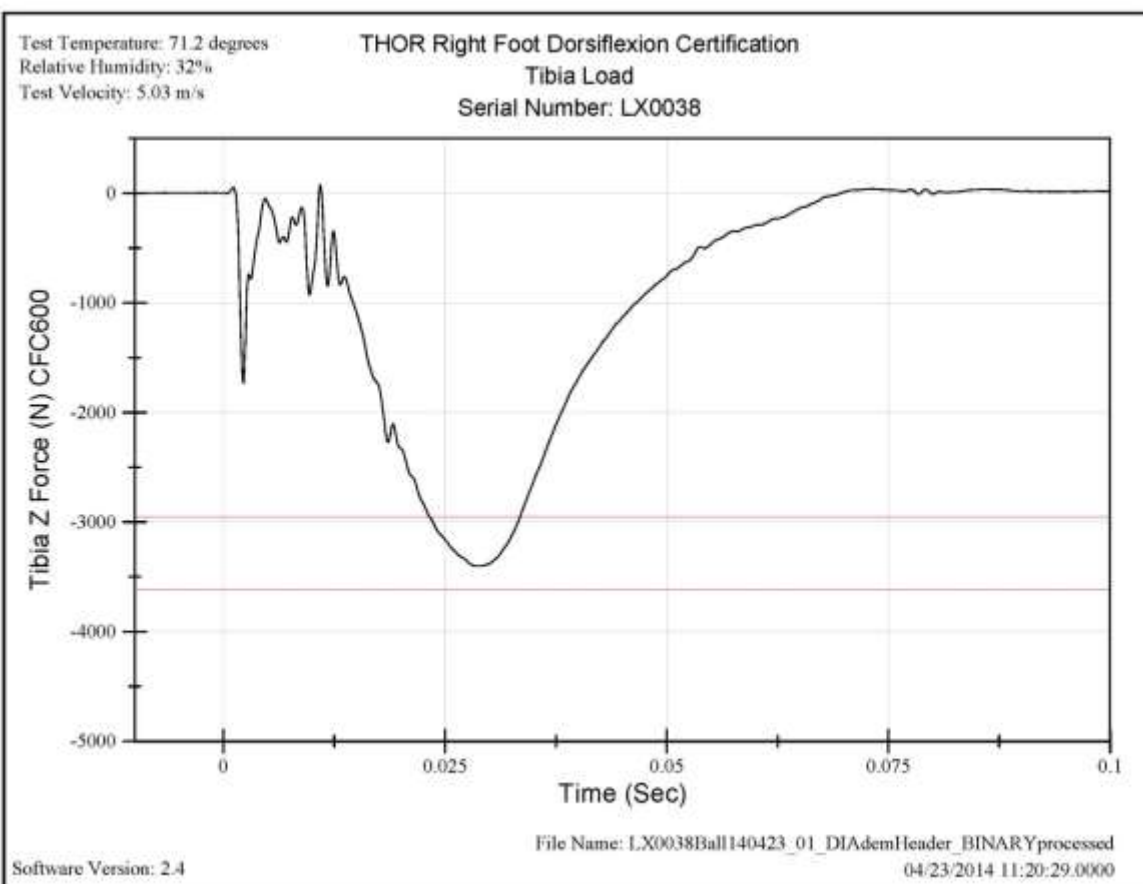
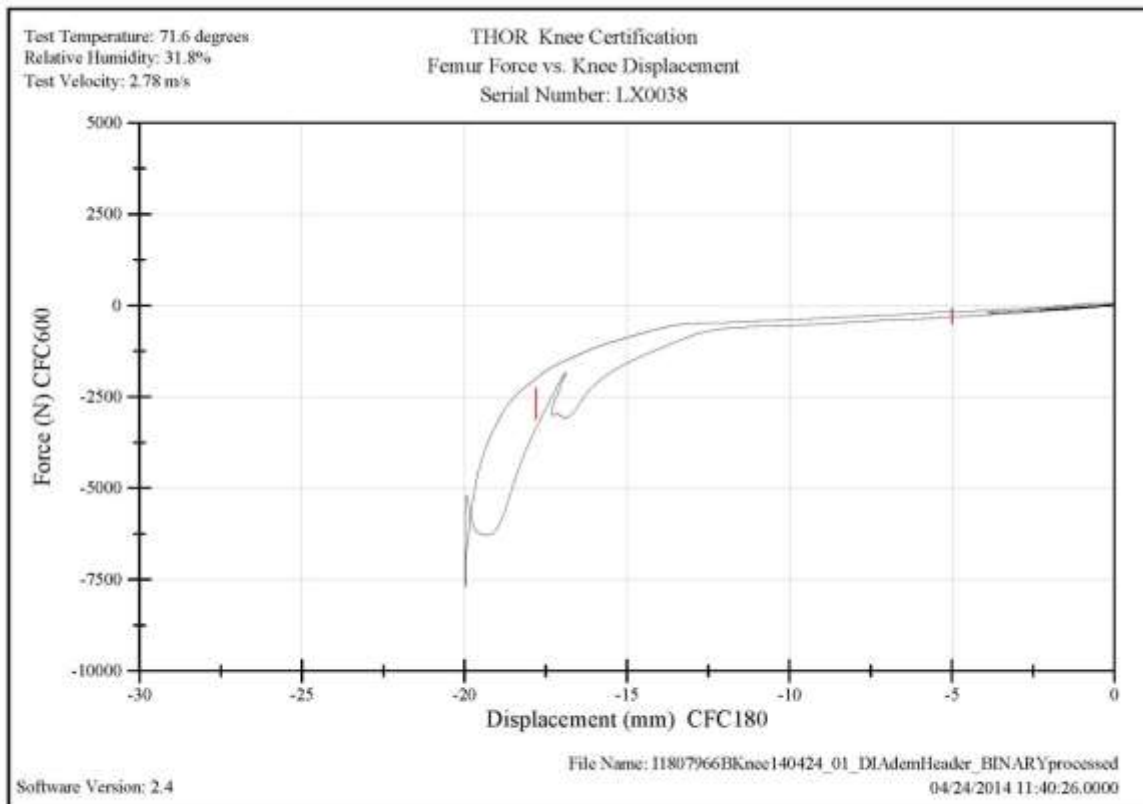
THOR Occipital Condyle Quasi-Static Certification
Displacement vs. Torque
Serial Number: T015



Software Version: 2.4

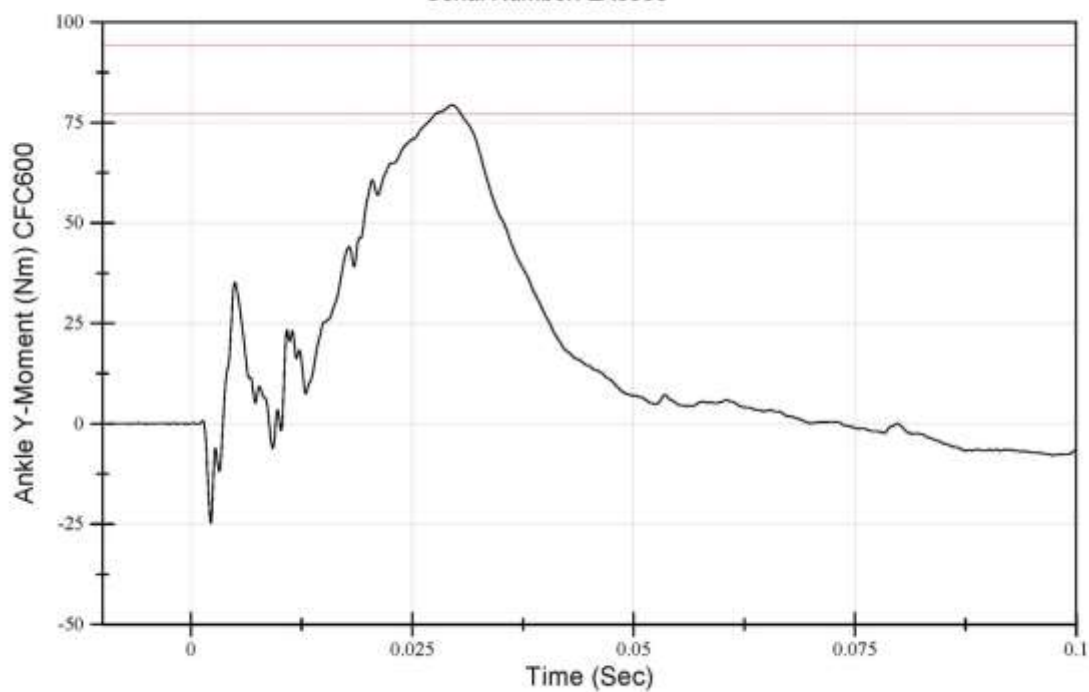
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THOR 015 LEG CALIBRATIONS
LX0039 / LX0038



Test Temperature: 71.2 degrees
Relative Humidity: 32%
Test Velocity: 5.03 m/s

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

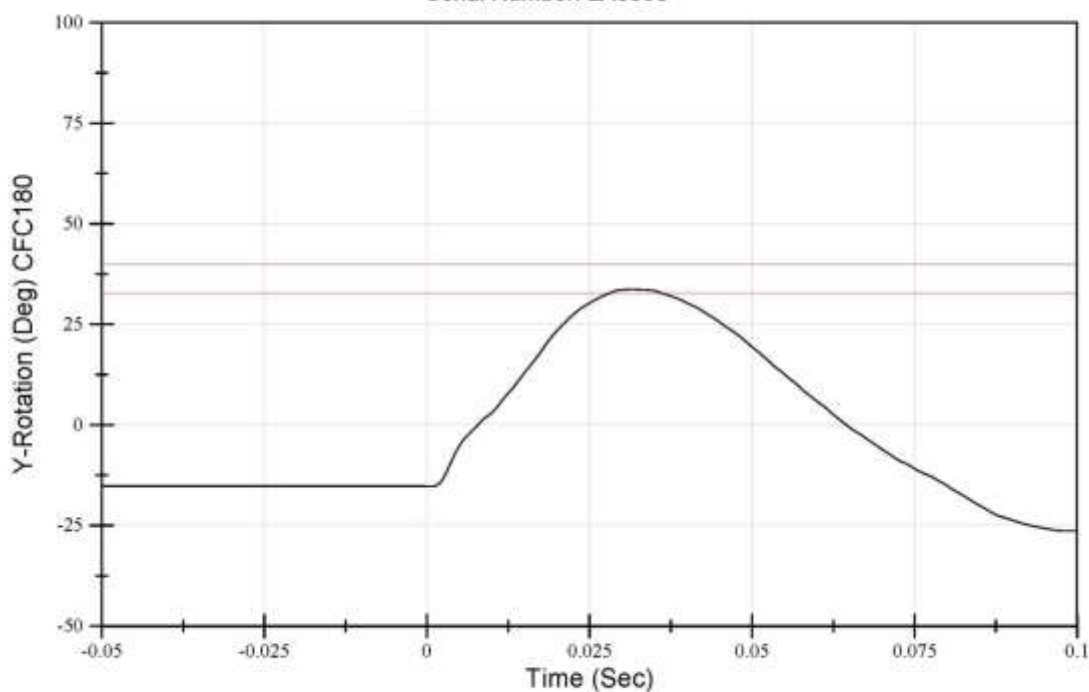


Software Version: 2.4

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Test Temperature: 71.2 degrees
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Test Velocity: 5.03 m/s

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

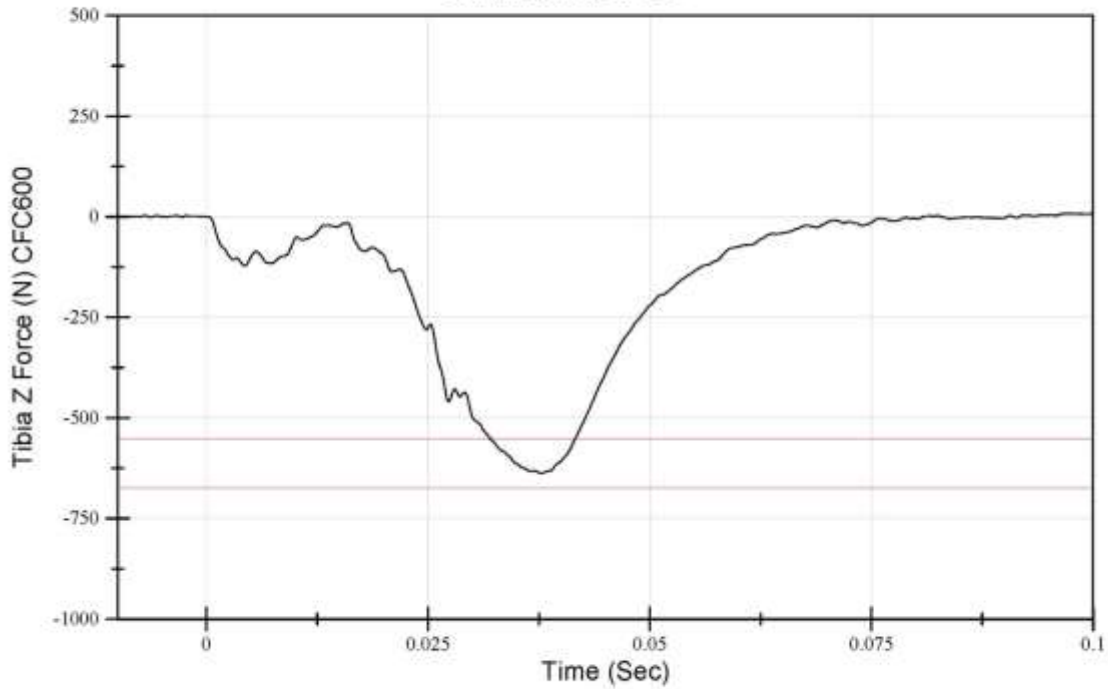


Software Version: 2.4

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Test Temperature: 71.2 degrees
Relative Humidity: 32%
Test Velocity: 2 m/s

THOR Right Foot Eversion Certification
Tibia Load
Serial Number: LX0038

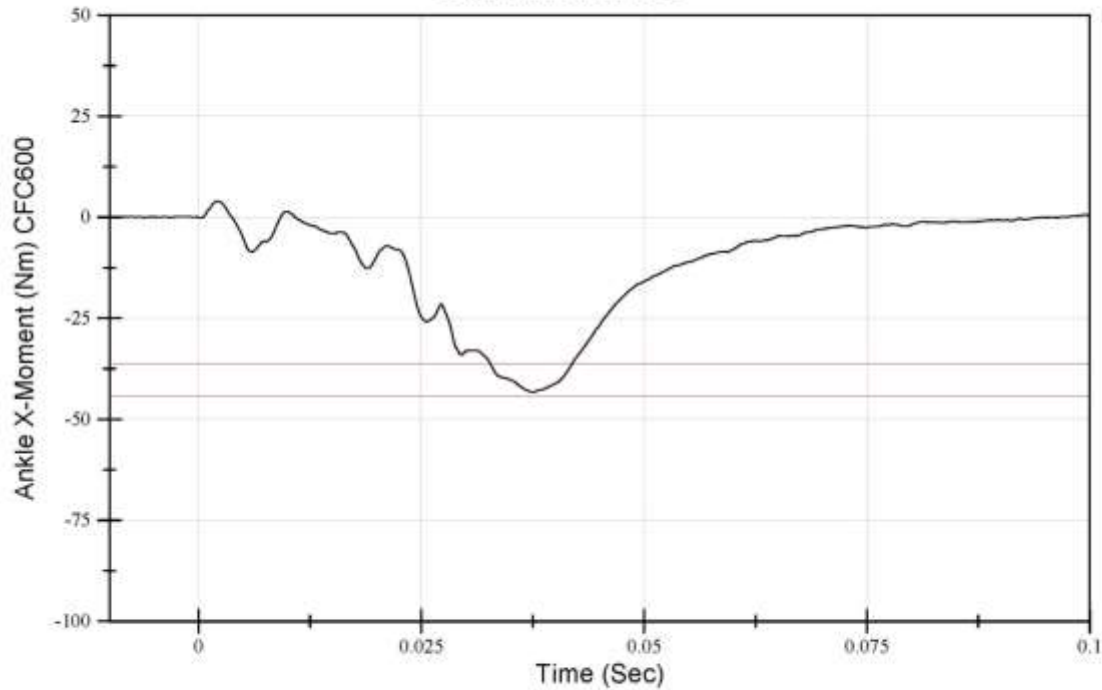


Software Version: 2.4

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Test Temperature: 71.2 degrees
Relative Humidity: 32%
Test Velocity: 2 m/s

THOR Right Foot Eversion Certification
Ankle Moment
Serial Number: LX0038

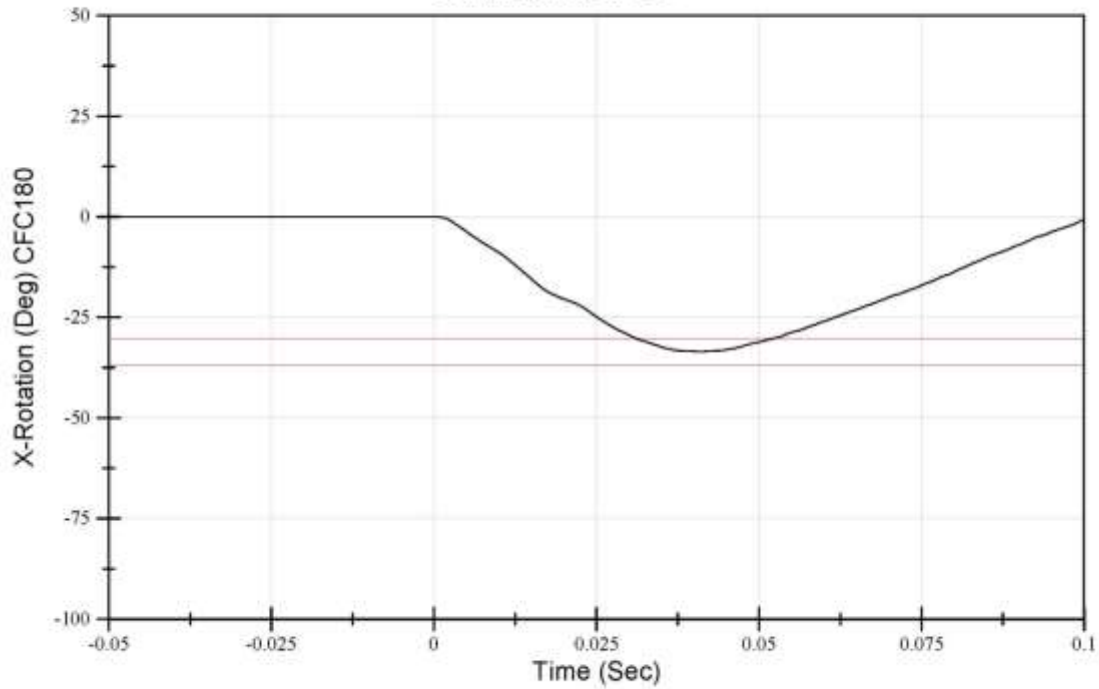


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Test Velocity: 2 m/s

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

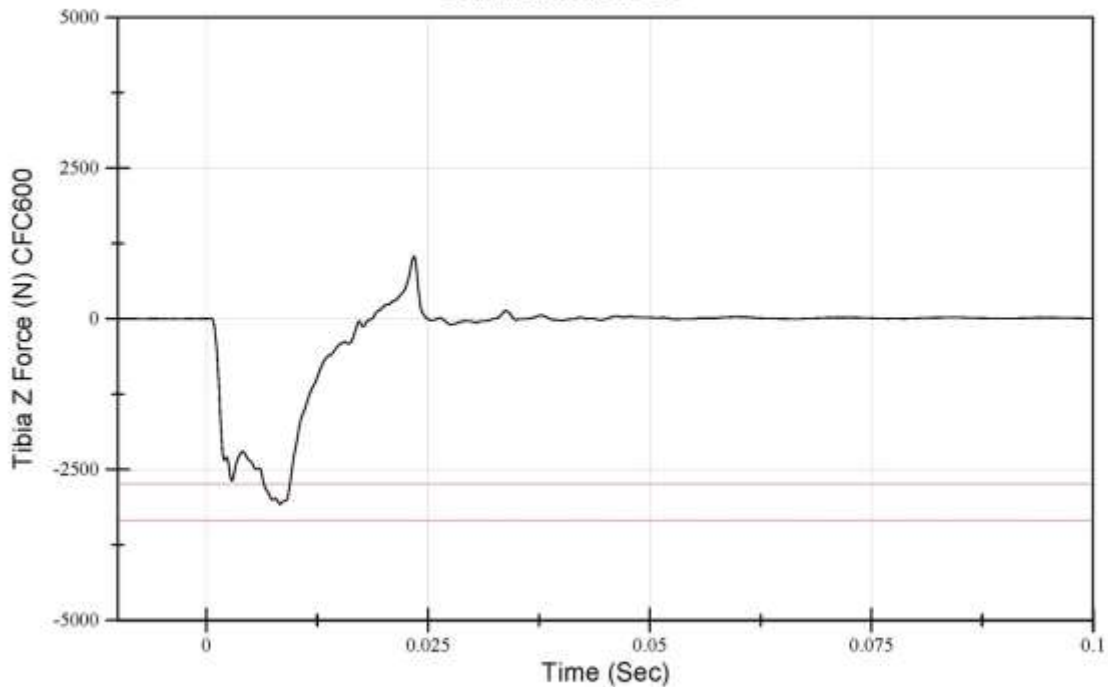


Software Version: 2.4

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Test Temperature: 71.2 degrees
Relative Humidity: 32%
Test Velocity: 4.03 m/s

THOR Right Foot Heel Certification
Tibia Load
Serial Number: LX0038

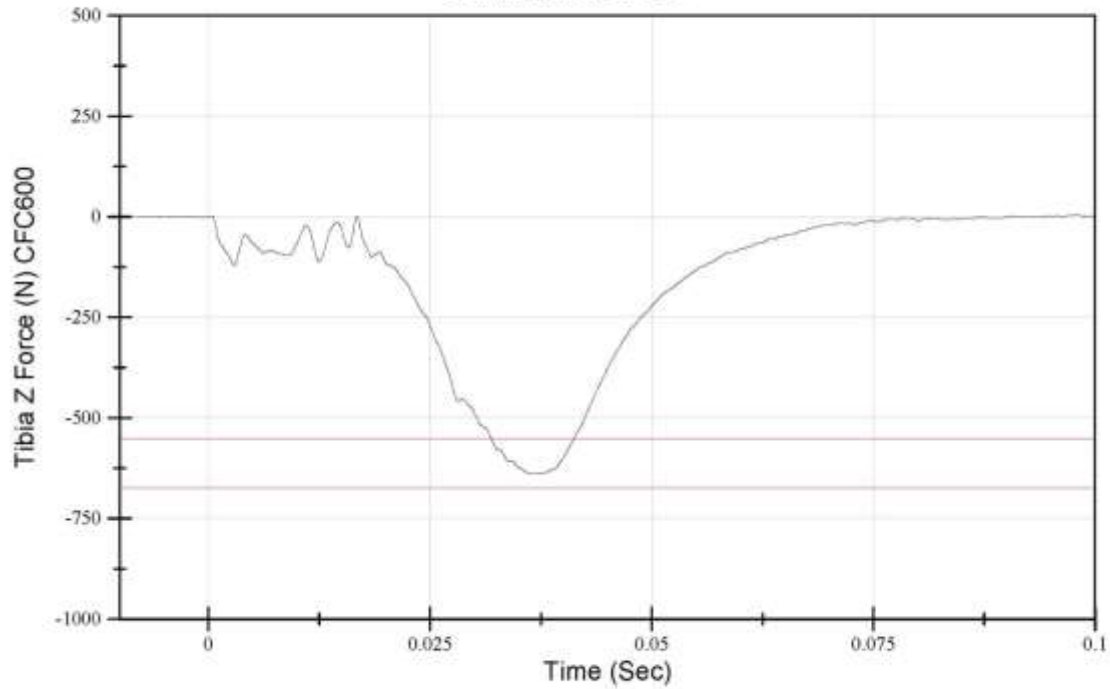


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Test Velocity: 2 m/s

THOR Right Foot Inversion Certification
Tibia Load
Serial Number: LX0038

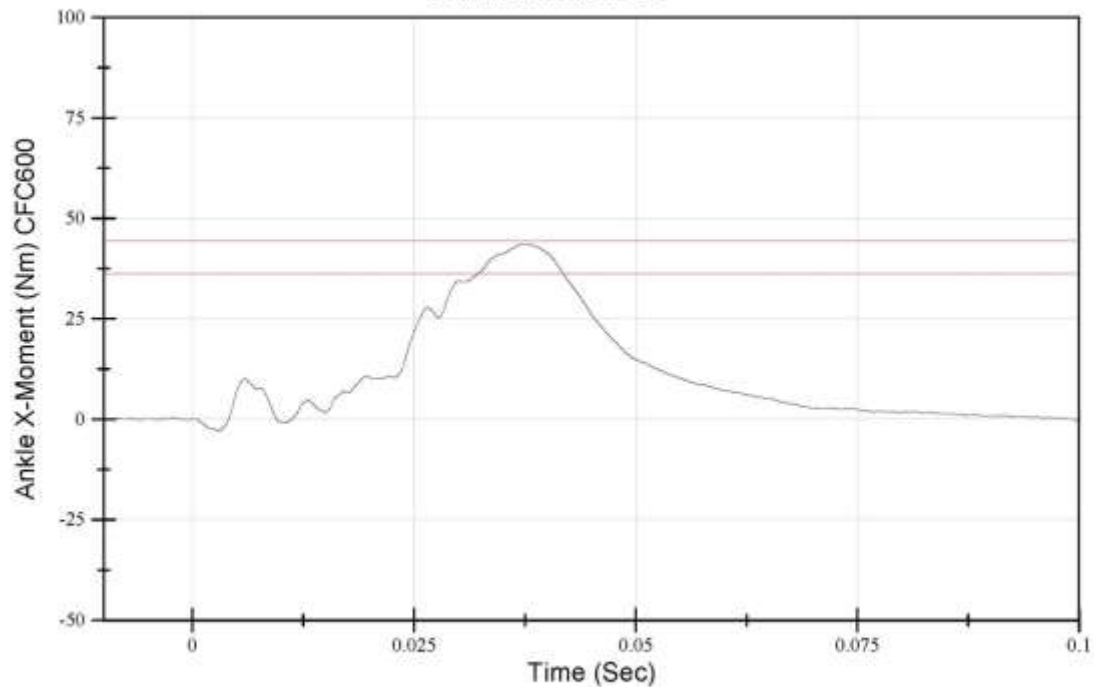


Software Version: 2.4

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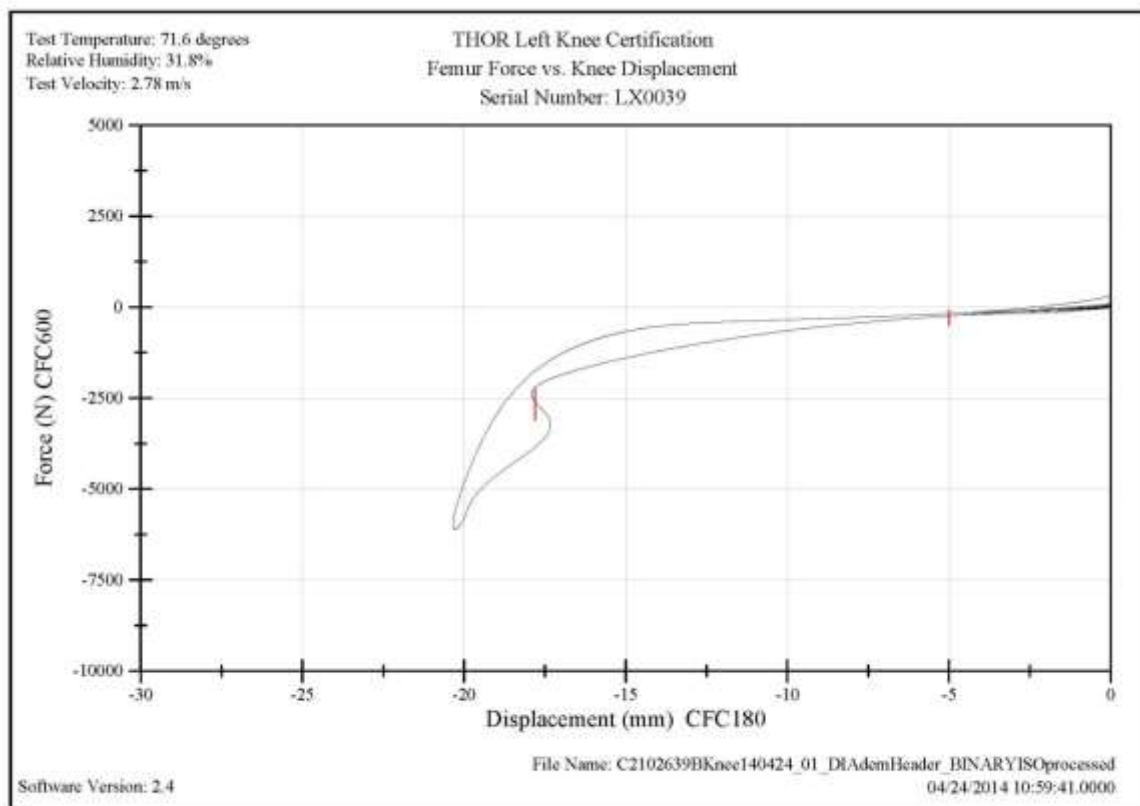
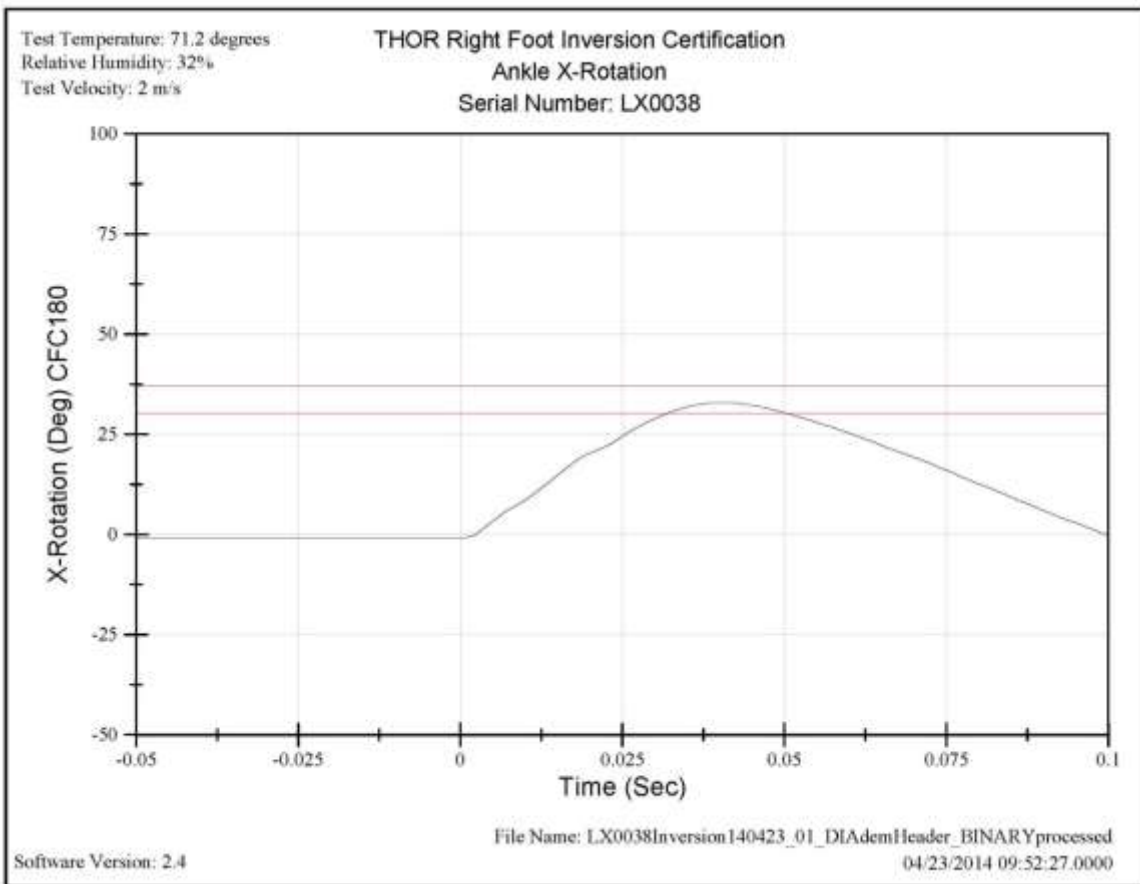
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THOR Right Foot Inversion Certification
Ankle Moment
Serial Number: LX0038



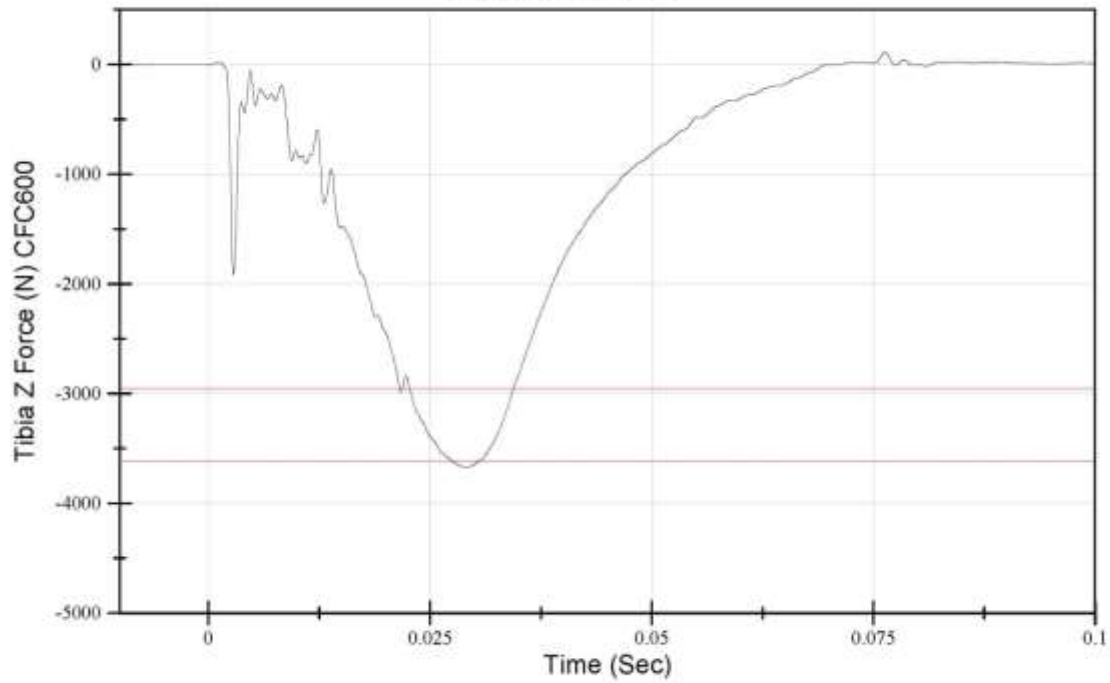
Software Version: 2.4

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Test Temperature: 70.4 degrees
Relative Humidity: 30.1%
Test Velocity: 5.03 m/s

THOR Left Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0039

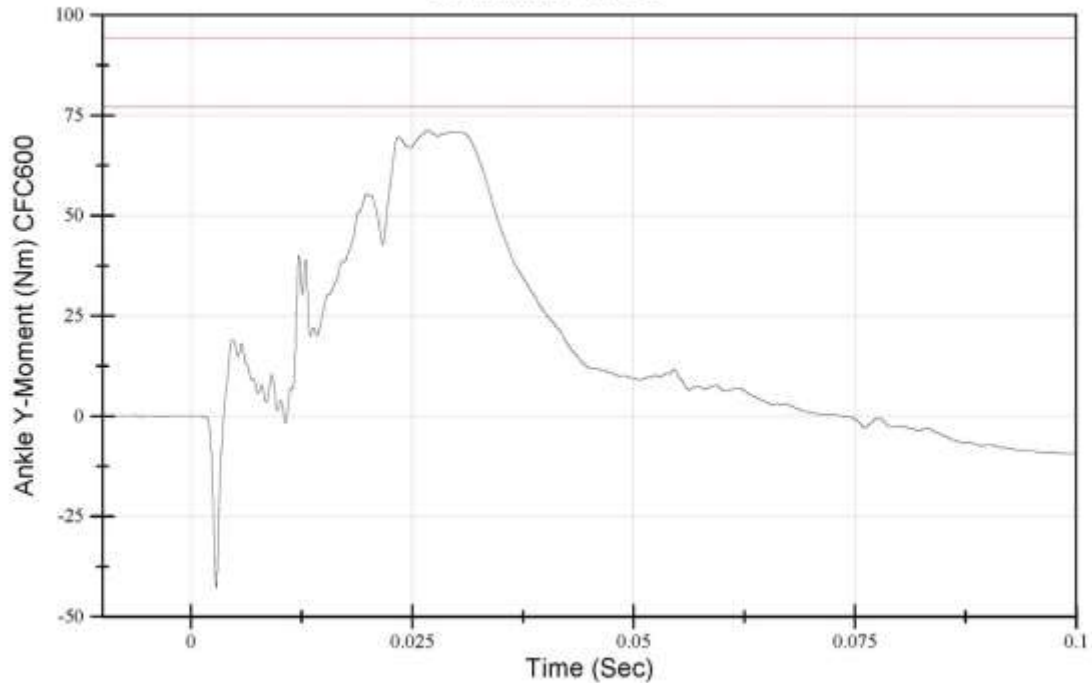


Software Version: 2.4

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04/22/2014 15:55:44.0000

Test Temperature: 70.4 degrees
Relative Humidity: 30.1%
Test Velocity: 5.03 m/s

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

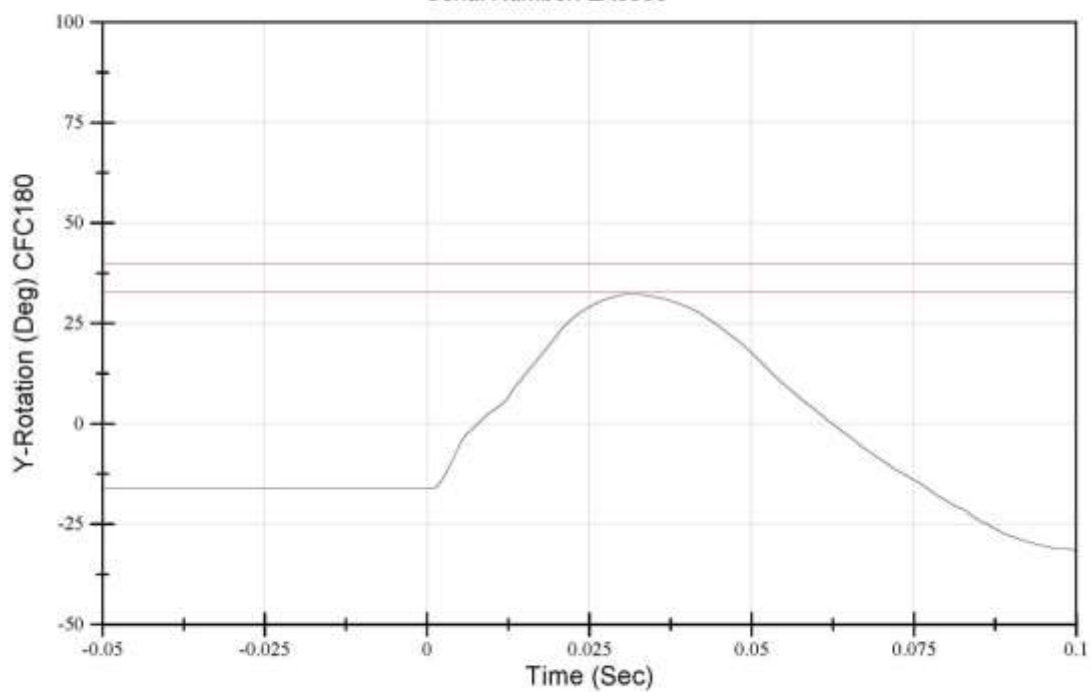


Software Version: 2.4

File Name: LX0039Ball140422_01_DIAdemHeader_BINARYprocessed
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Test Temperature: 70.4 degrees
Relative Humidity: 30.1%
Test Velocity: 5.03 m/s

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

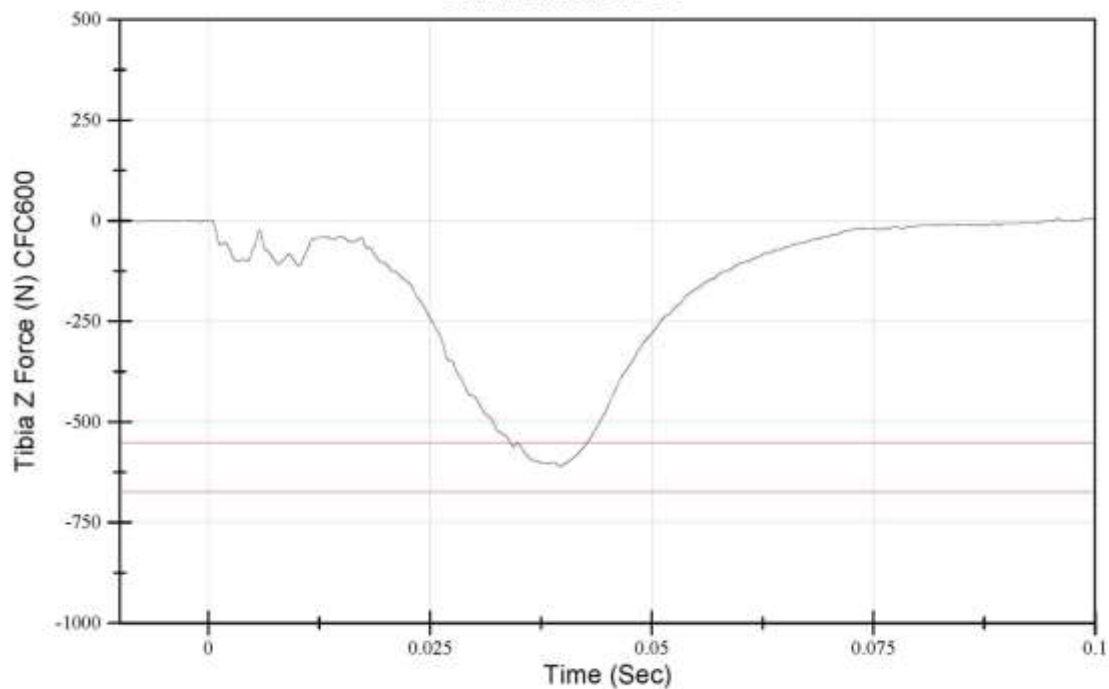


Software Version: 2.4

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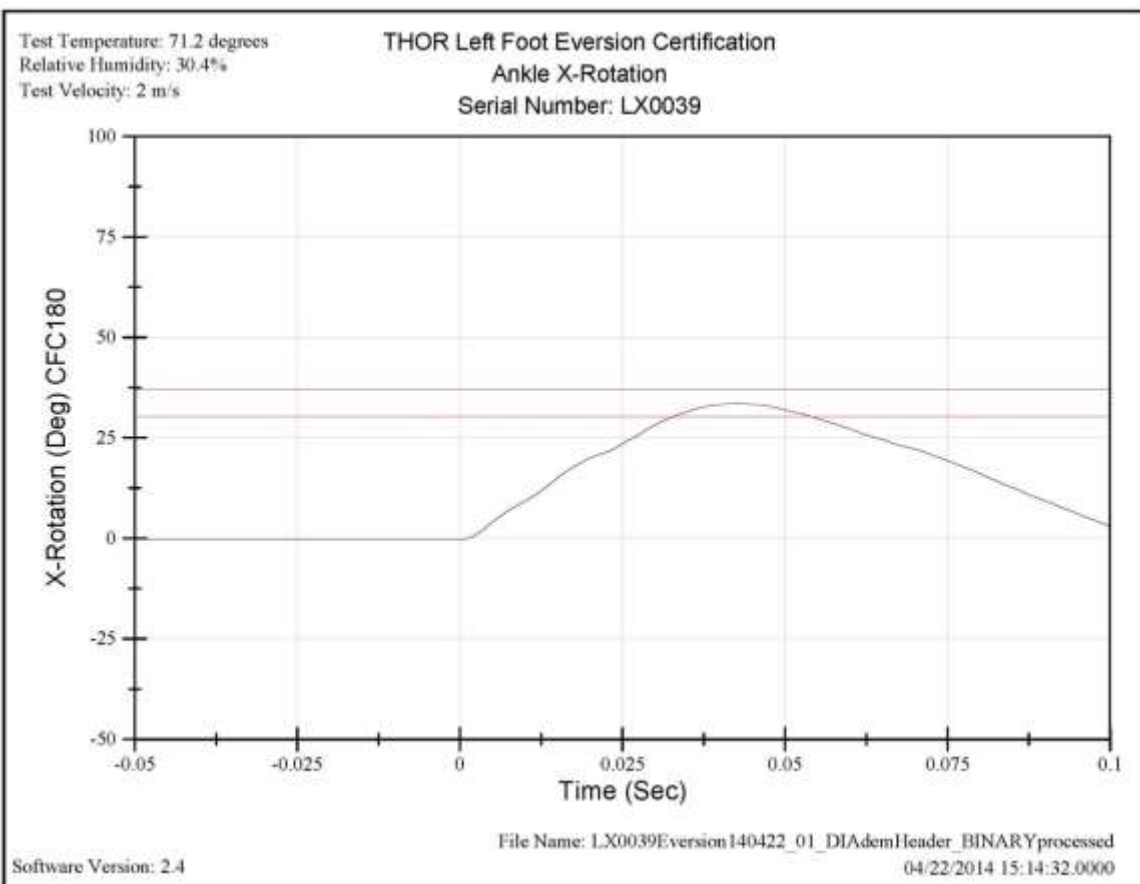
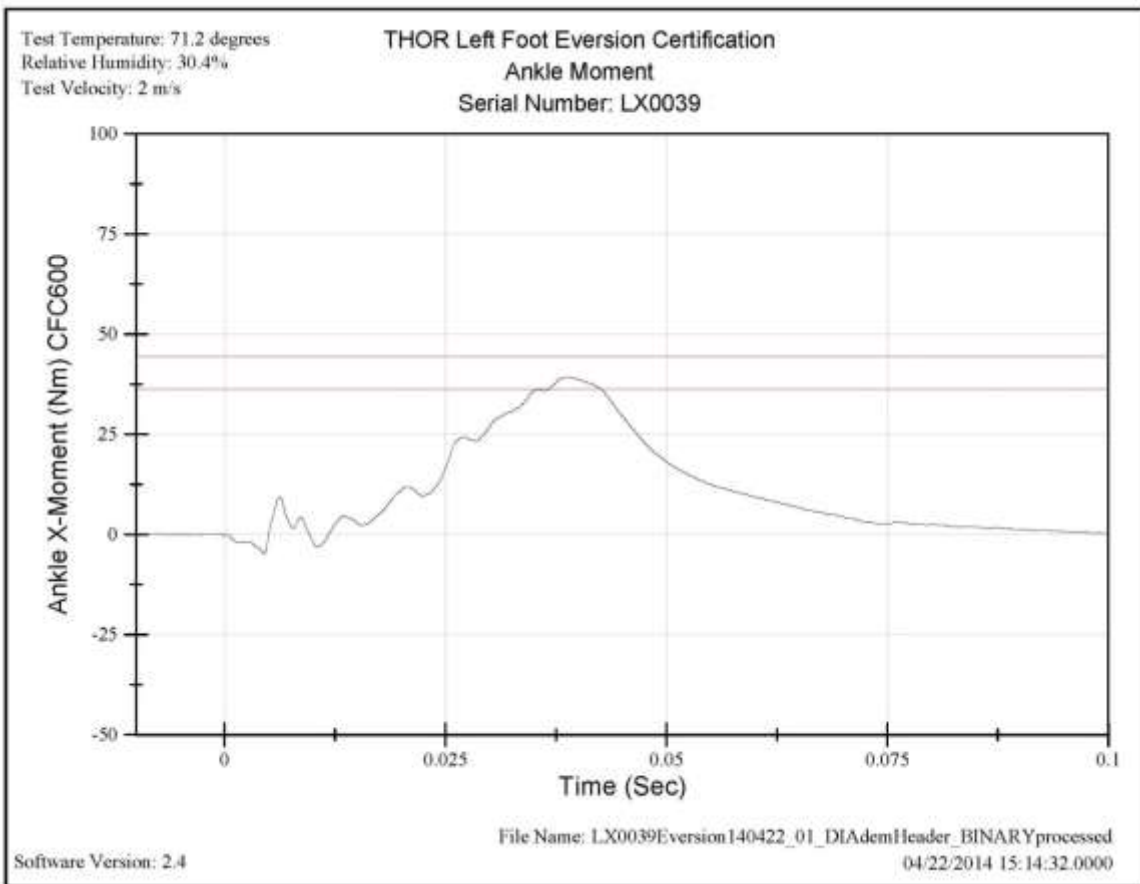
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Test Velocity: 2 m/s

THOR Left Foot Eversion Certification
Tibia Load
Serial Number: LX0039



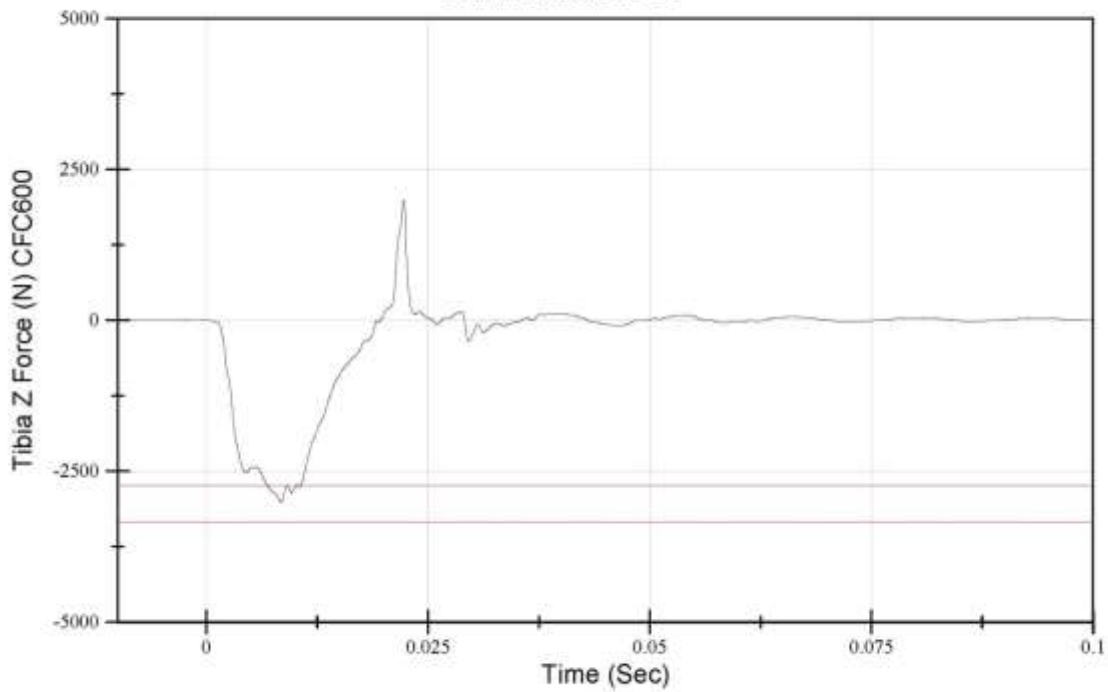
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Test Temperature: 71 degrees
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Test Velocity: 4.03 m/s

THOR Left Foot Heel Certification
Tibia Load
Serial Number: LX0039

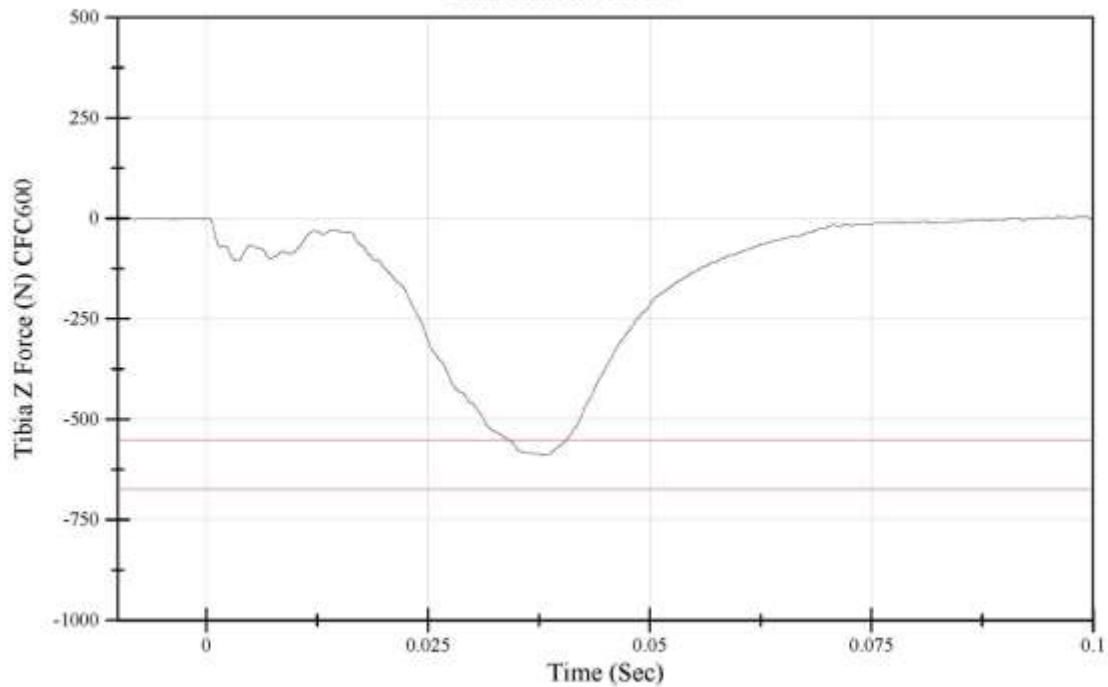


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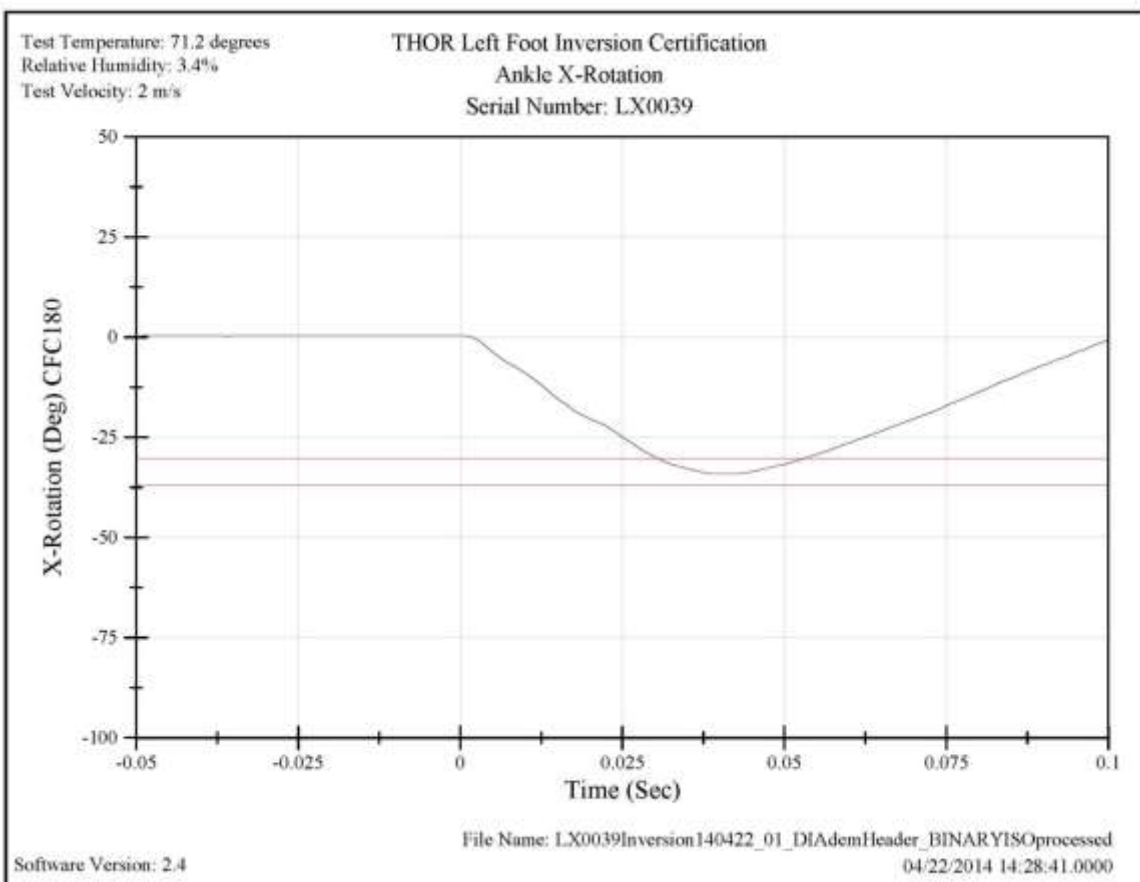
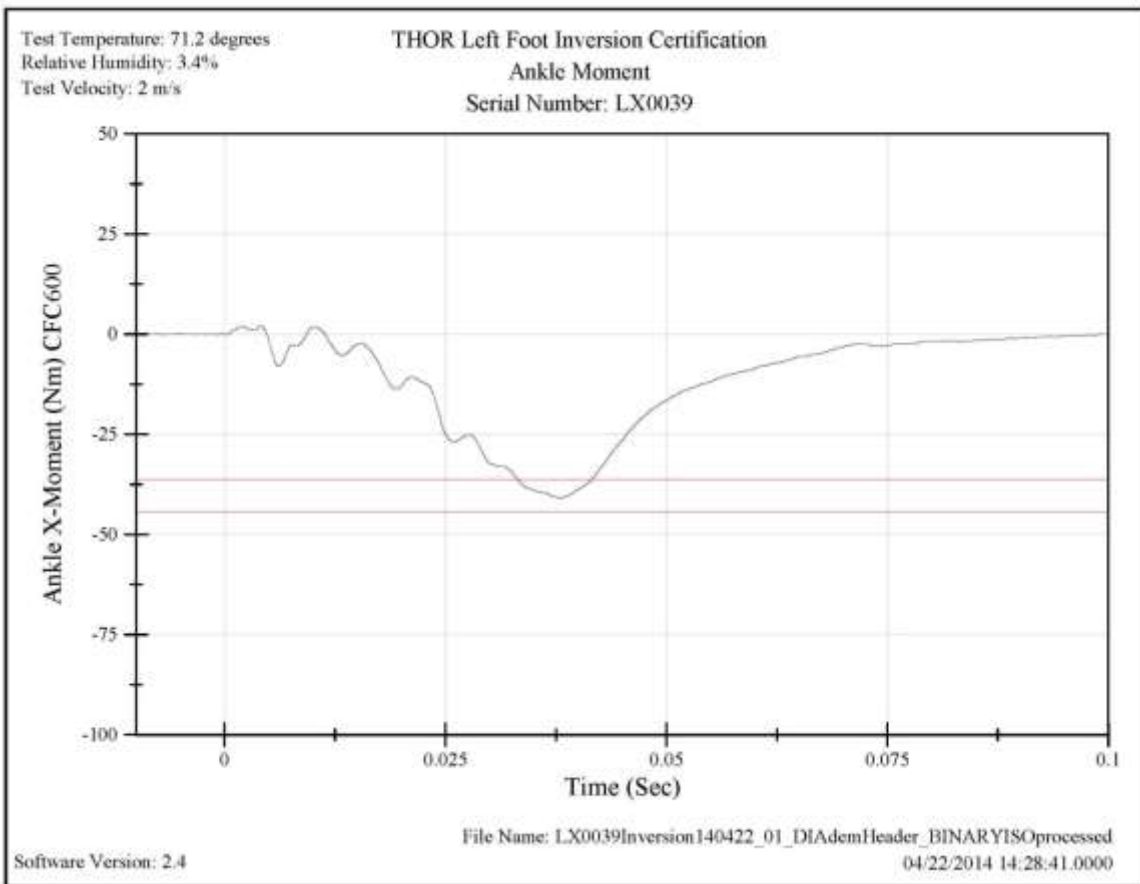
Test Temperature: 71.2 degrees
Relative Humidity: 3.4%
Test Velocity: 2 m/s

THOR Left Foot Inversion Certification
Tibia Load
Serial Number: LX0039



Software Version: 2.4

File Name: LX0039Inversion140422_01_DiAdemHeader_BINARYISOprocessed
04/22/2014 14:28:41.0000



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

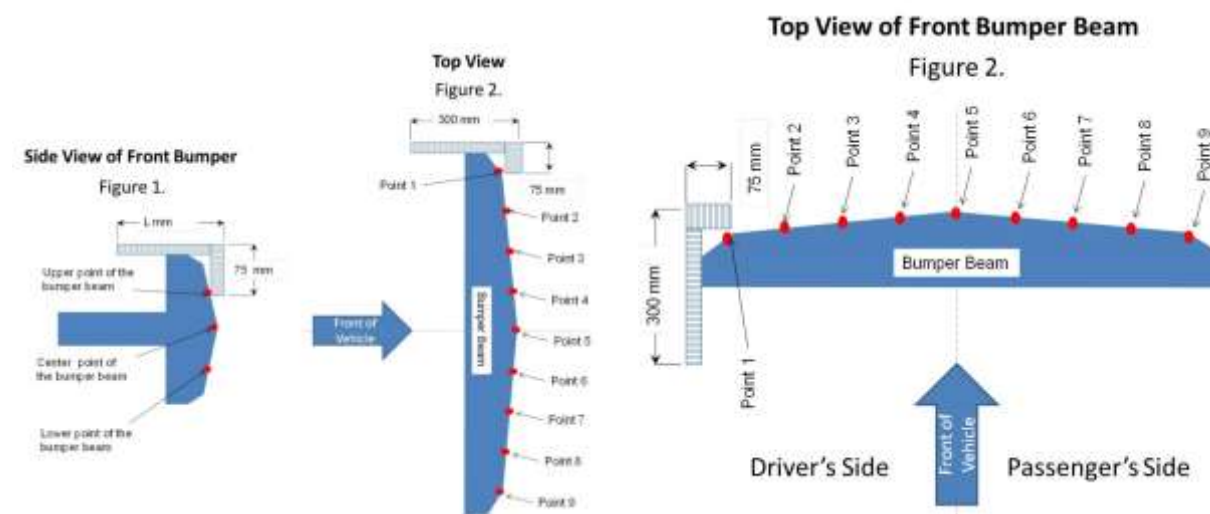
The Brake Pedal Reference Point is the x, y, and z location of the geometric center of the brake pedal pad (top surface) in the VCS.

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 toe pan/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.

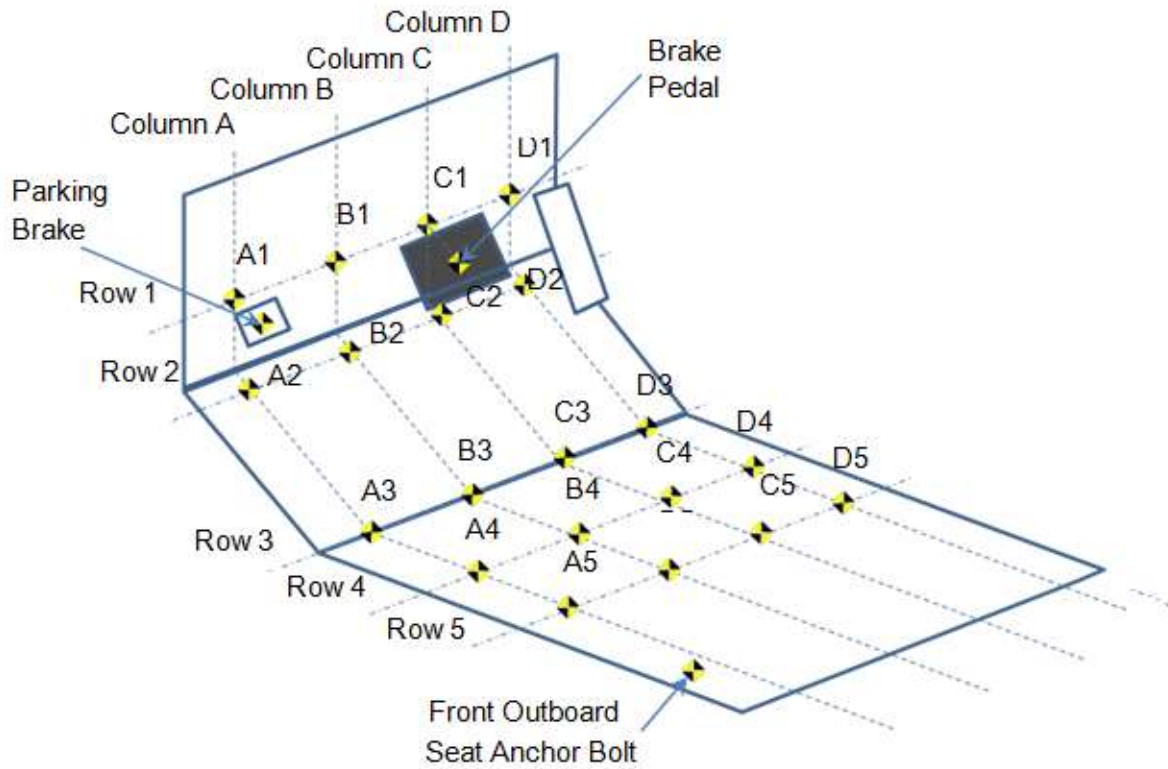
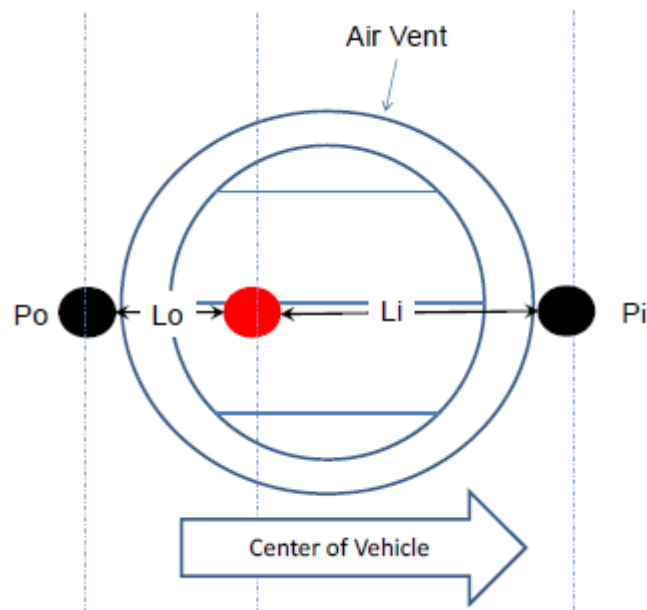


Figure 22: Lower interior intrusion measurements

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.

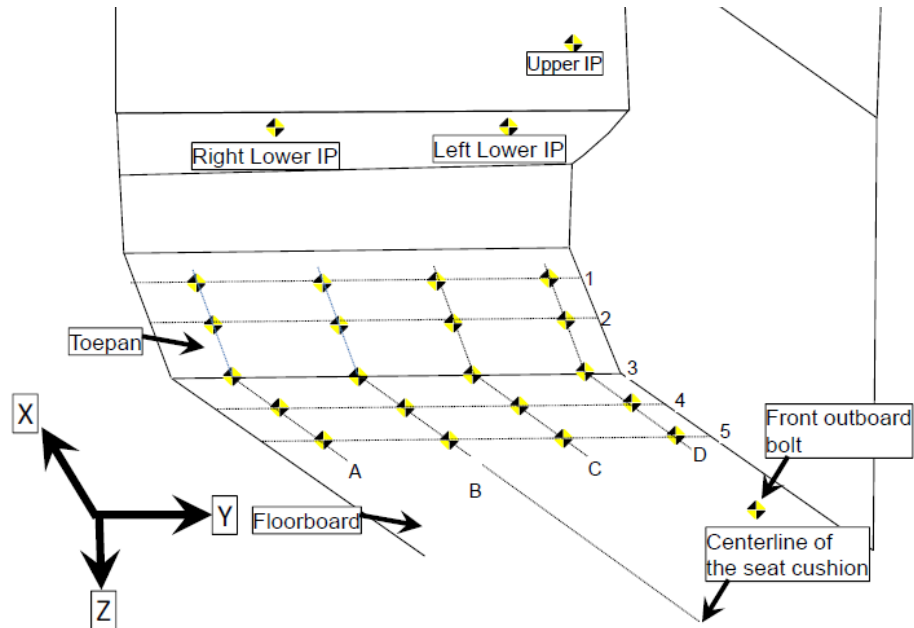


Figure 24: Passenger side lower interior measurements

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

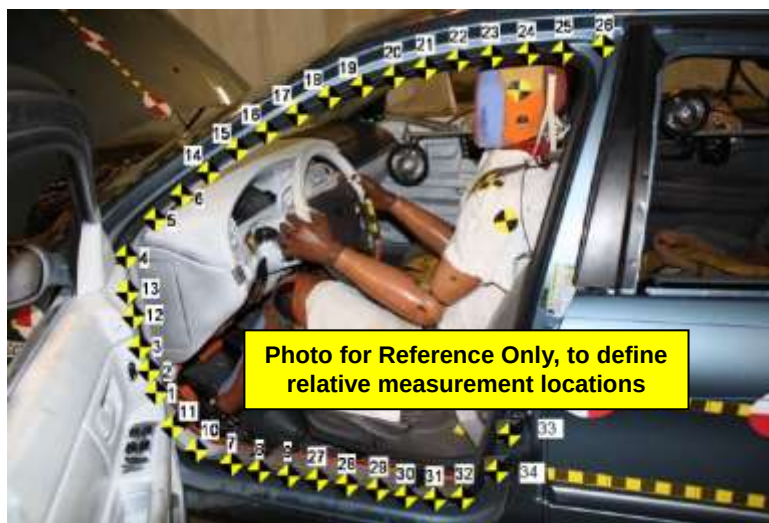


Figure 25: Driver Door Measurements

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.

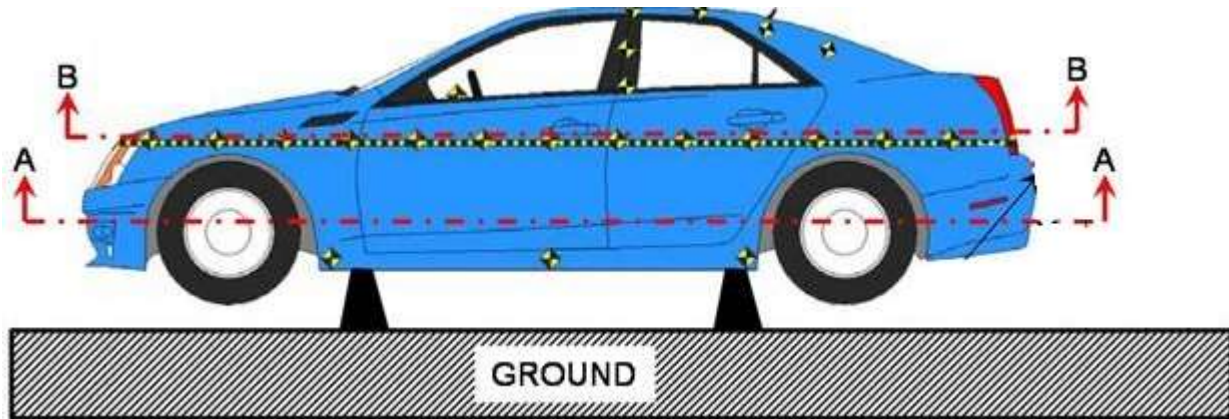


Figure 26: Pre-Test Vehicle Profile

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.

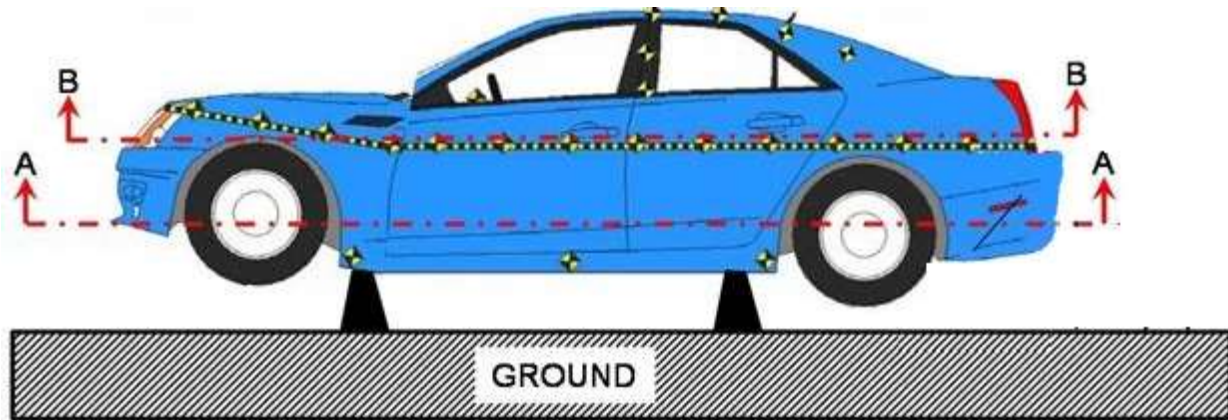
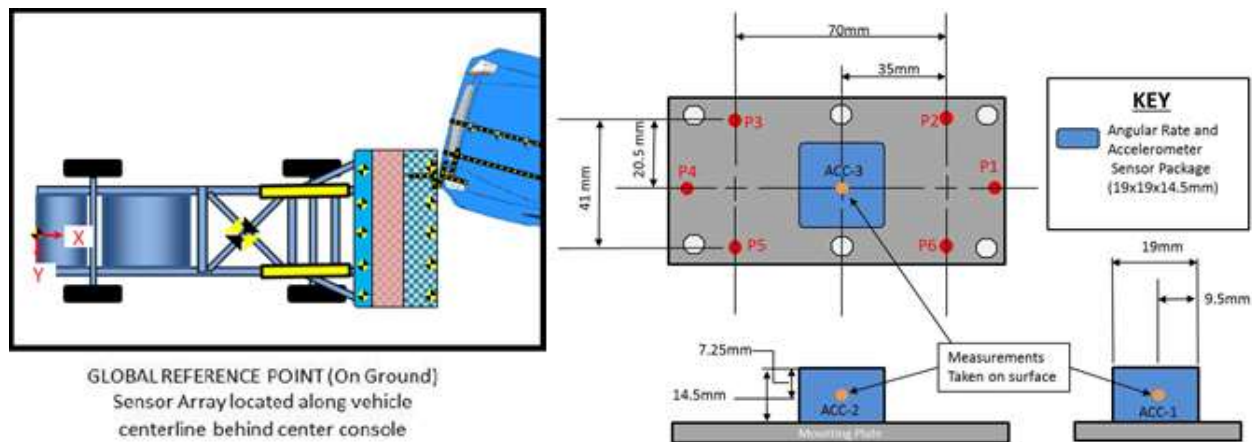


Figure 27: Post-Test Vehicle Profile

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 front of RMDB
 - Positive Y is from the center of RMDB towards the right 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