

REPORT NUMBER: R&D-CAL-14-011

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

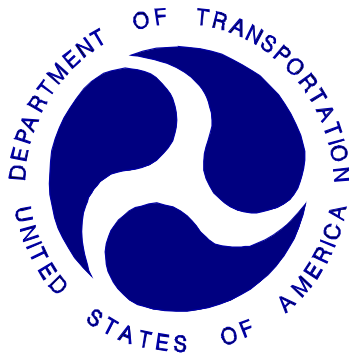
2014 MAZDA CX-5

90.1KPH, 15 DEGREE ANGLE, 35% OVERLAP

TEST DATE: 010/15/2014

NHTSA No: R20145402

**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
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Washington, DC 20590**

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

Date: _____

TOM, Vehicle Crash Testing
NHTSA, Office of Structures and Restraints Research

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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 Mazda CX-5 SUV. The struck vehicle was positioned 15 degrees relative to the moving barrier and impacted 35% of the right 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 October 15, 2014. The RMDB impact velocity was 90.37 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 559 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>452.34</td> <td>700</td> <td>246.63</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-42.93</td> <td>63</td> <td>-43.93</td> </tr> <tr> <td>Neck Injury Criteria (Nij)</td> <td>N/A</td> <td>1</td> <td>0.54</td> <td>1</td> <td>0.36</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>2896.69</td> <td>4,170</td> <td>2224.96</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-30.41</td> <td>4,000</td> <td>-71.72</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-859.10</td> <td>10,008</td> <td>-3519.62</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-2732.56</td> <td>10,008</td> <td>-2254.89</td> </tr> </tbody> </table>					Measurement Description	Units	Driver ATD		Pass. ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	452.34	700	246.63	Maximum Chest Compression	mm	63	-42.93	63	-43.93	Neck Injury Criteria (Nij)	N/A	1	0.54	1	0.36	Neck Tension	N	4,170	2896.69	4,170	2224.96	Neck Compression	N	4,000	-30.41	4,000	-71.72	Left Femur Force	N	10,008	-859.10	10,008	-3519.62	Right Femur Force	N	10,008	-2732.56	10,008	-2254.89
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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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Edward J. Dutton, Test Engineer Director
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Date: February 24, 2015

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Test Program:	<u>R&D 90.1kph, 15° / 35% Right Oblique Offset</u>	Test Date:	<u>10/15/2014</u>

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SECTION 1
PURPOSE OF TEST

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

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. The purpose of this test is to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

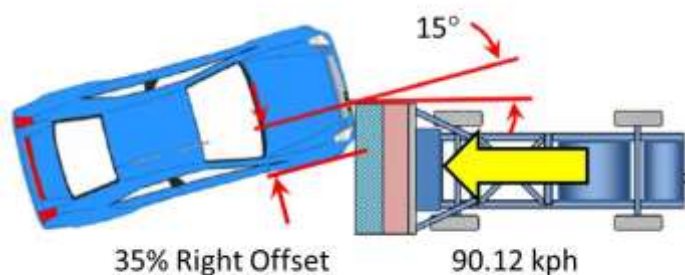
This test was conducted in accordance with the instructions set forth for a 15° angle, 35% offset moving barrier to vehicle impact, outlined in Contract No. DTNH22-10-D-00155. Data was obtained indicant of Federal Motor Vehicle Safety Standard FMVSS 208-Occupant Crash Protection, FMVSS 212 – Windshield 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.

SECTION 2 SUMMARY OF TEST

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

A 2014 Mazda CX-5 SUV was impacted on the right 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 1,777 kg (3,916.5 lbs), and the RMDB's mass was 2490.2 kg (5490 lbs). The test was conducted by Calspan Corporation on October 15, 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, and frontal airbag. The passenger was restrained with a 3 – point seat belt, a frontal, curtain, and torso airbags. The driver's curtain and torso airbags were disabled.

SECTION 2 (CONTINUED)

SUMMARY OF TEST

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

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 84.9% total windshield retention, with 100% and 69.9% 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 559 mm at C6 to the right of the vehicle's centerline. The maximum crush of the structural bumper beam was 428 mm at B9, to the right 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
- Passenger A-Pillar and B-Pillar slightly buckled during impact
- Hood bent inwards and exposed part of the engine compartment

The driver ATD's visible contact points were:

- Head contacted the frontal airbag, visor and driver's right hand.
- Torso contacted the frontal airbag
- Knees contacted the knee bolster

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

- Head contacted the frontal and curtain airbag, and headliner
- Torso contacted the frontal and torso airbag
- Knees contacted the glove box

SECTION 2 (CONTINUED)
CRASH VEHICLE SUMMARY

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

Primary Impact Data

Measured Parameter	Units	Value
RMDB Velocity at Impact	kph	90.37
RMDB Test Weight	kg	2490.2
RMDB Maximum Static Crush	mm	267
Vehicle Test Weight	kg	1777
Actual Vehicle Angle	degrees	15
Vehicle Maximum Static Crush	mm	559
Vertical Offset from Target Point (+ down / - up)*	mm	-20
Lateral Offset from Target Point (+ left / - right)*	mm	+3
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	Front Airbag, Visor, and Driver's right hand	A49-A51	Front & Curtain Airbag, & Side Headliner	A70-A72
Left Shoulder Contact	None	N/A	None	N/A
Upper Torso Contact	Front Airbag	N/A	Front 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 Bolster	A28	Glove Box	A52

Data Anomalies:

- Driver Right Lower FZ channel data was not collected.

PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: R20145402 - Mazda CX-5 Right Side Overlap 15/35 NHTSA No.: R20145402
 Test Program: Research and Development Right Oblique Offset Test Date: 10/15/2014

Driver: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	5.45	-25.41
	Head CG Y	g	1000	4.07	-47.85
	Head CG Z	g	1000	70.38	-1.69
	Head Resultant	g	Compute	82.96	
	36 ms HIC		Compute	522.49	
	15 ms HIC		Compute	452.34	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	64.06	
	Head Rotational Velocity X	deg/s	60	3100.56	-904.21
	Head Rotational Velocity Y	deg/s	60	563.69	-1827.18
	Head Rotational Velocity Z	deg/s	60	853.35	-2104.12
	Head Rotational Velocity Resultant	deg/s	Compute	3546.00	
	Brain Injury Criteria		Compute	1.31	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	303.91	-342.70
	UNLC Neck System Tension, FZ	N	1000	2896.69	
	UNLC Neck System Compression, FZ	N	1000		-30.41
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	16.59	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-5.66
	NIJ		Compute	0.54	
	On head acting through total neck section, FX	N	Thortest	703.76	-245.00
	On head acting through total neck section, FY	N	Thortest	21.12	-812.19
	On head acting through total neck section, FZ	N	Thortest	3044.00	-43.32
	On head acting through total neck section, MX	N-m	Thortest	17.20	-54.00
	On head acting through total neck section, MY	N-m	Thortest	25.02	-22.06
	On head acting through total neck section, MZ	N-m	Thortest	41.81	-5.10
	On head acting through O.C. joint only, FX	N	Thortest	610.34	-352.88
	On head acting through O.C. joint only, FZ	N	Thortest	2847.19	-37.52
	On head acting through O.C. joint only, MY	N-m	Thortest	16.59	-5.66
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	3.43	-22.07
	Upper Left IR-TRACC Y - deflection	mm	Thortest	5.74	-14.32
	Upper Left IR-TRACC Z - deflection	mm	Thortest	11.39	-10.47
	Upper Left IR-TRACC D - deflection	mm	Thortest	1.47	-20.37
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.05	-43.55
	Upper Right IR-TRACC Y - deflection	mm	Thortest	6.17	-17.13
	Upper Right IR-TRACC Z - deflection	mm	Thortest	21.35	-13.09
	Upper Right IR-TRACC D - deflection	mm	Thortest	3.80	-42.93
	Lower Left IR-TRACC X - deflection	mm	Thortest	5.42	-11.79
	Lower Left IR-TRACC Y - deflection	mm	Thortest	14.57	-18.88

PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: R20145402 - Mazda CX-5 Right Side Overlap 15/35 NHTSA No.: R20145402
 Test Program: Research and Development Right Oblique Offset Test Date: 10/15/2014

Driver: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	12.17	-1.13
	Lower Left IR-TRACC D - deflection	mm	Thortest	6.29	-12.94
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.09	-33.02
	Lower Right IR-TRACC Y - deflection	mm	Thortest	2.20	-19.36
	Lower Right IR-TRACC Z - deflection	mm	Thortest	15.28	-1.76
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.07	-31.52
	Chest CG Acceleration, 3 ms clip	g	Compute	N/A	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	1.47	-43.33
	Lower Left IR-TRACC Y - deflection	mm	Thortest	0.13	-14.85
	Lower Left IR-TRACC Z - deflection	mm	Thortest	9.44	-7.60
	Lower Left IR-TRACC D - deflection	mm	Thortest	1.47	-42.82
	Left Viscous Criterion Based on X - deflection		Compute	0.99	
	Lower Right IR-TRACC X - deflection	mm	Thortest	7.46	-52.60
	Lower Right IR-TRACC Y - deflection	mm	Thortest	4.92	-6.39
	Lower Right IR-TRACC Z - deflection	mm	Thortest	28.70	-3.29
	Lower Right IR-TRACC D - deflection	mm	Thortest	7.40	-53.01
	Right Viscous Criterion Based on X - deflection		Compute	1.56	
Spine	Upper Spine (T1) AX	g	180	10.63	-299.08
	Upper Spine (T1) AY	g	180	8.11	-40.16
	Upper Spine (T1) AZ	g	180	16.46	-2.97
	Upper Spine (T1) Resultant	g	Compute	299.51	
	Middle Spine (T6) AX	g	180	3.61	-29.41
	Middle Spine (T6) AY	g	180	2.21	-26.29
	Middle Spine (T6) AZ	g	180	8.60	-9.32
	Middle Spine (T6) Resultant	g	Compute	34.15	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	60.71	
Acetabulum	Left FX force	N	600	2896.37	-204.27
	Left FY force	N	600	1718.12	-266.64
	Left FZ force	N	600	739.02	-336.75
	Left Acetabulum Resultant	N	Compute	2931.13	
	Right FX force	N	600	2101.85	-1858.23
	Right FY force	N	600	986.20	-395.86
	Right FZ force	N	600	1186.02	-783.51
	Right Acetabulum Resultant	N	Compute	2271.89	
Anomalies None					

PRELIMINARY INJURY SUMMARY: Driver Legs

Test Vehicle: R20145402 - Mazda CX-5 Right Side Overlap 15/35 NHTSA No.: R20145402
 Test Program: Research and Development Right Oblique Offset Test Date: 10/15/2014

Driver: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	2.09	-5.87
	Right Knee Displacement, DX	mm	180	1.56	-10.49
Femur	Left Femur Force, FZ	N	600	862.96	-859.10
	Left Femur Moment, MX	N-m	600	202.53	-33.08
	Left Femur Moment, MY	N-m	600	112.53	-34.32
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	208.40	
	Right Femur Force, FZ	N	600	911.88	-2732.56
	Right Femur Moment, MX	N-m	600	87.69	-67.55
	Right Femur Moment, MY	N-m	600	91.80	-100.09
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	126.53	
Tibia	Left Upper Tibia, FZ	N	600	383.04	-1384.77
	Left Upper Tibia, MY	N-m	600	107.65	-45.49
	Left Upper Tibia, Index		Compute	0.52	
	Right Upper Tibia, FZ	N	600	243.75	-1353.63
	Right Upper Tibia, MY	N-m	600	68.27	-33.28
	Right Upper Tibia, Index		Compute	0.36	
	Left Lower Tibia, FZ	N	600	451.15	-1728.69
	Left Lower Tibia, MY	N-m	600	48.03	-54.17
	Left Lower Tibia, Index		Compute	0.64	
	Right Lower Tibia, FZ	N	600	_(1)	_(1)
	Right Lower Tibia, MY	N-m	600	41.38	-26.90
	Right Lower Tibia, Index		Compute	_(1)	
Ankle	Left Ankle Rotation, RX	Deg	180	34.71	-22.58
	Left Ankle Rotation, RY	Deg	180	4.79	-21.22
	Right Ankle Rotation, RX	Deg	180	24.79	-27.56
	Right Ankle Rotation, RY	Deg	180	10.95	-12.70

Anomalies

(1) Right Lower FZ channel data was not collected.

PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: R20145402 - Mazda CX-5 Right Side Overlap 15/35 NHTSA No.: R20145402
 Test Program: Research and Development Right Oblique Offset Test Date: 10/15/2014

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	4.20	-37.17
	Head CG Y	g	1000	9.14	-21.88
	Head CG Z	g	1000	34.91	-2.29
	Head Resultant	g	Compute	53.23	
	36 ms HIC		Compute	428.35	
	15 ms HIC		Compute	246.63	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	50.91	
	Head Rotational Velocity X	deg/s	60	299.42	
	Head Rotational Velocity Y	deg/s	60	950.66	-2311.25
	Head Rotational Velocity Z	deg/s	60	848.45	-318.74
	Head Rotational Velocity Resultant	deg/s	Compute	2454.16	
	Brain Injury Criteria		Compute	0.81	
	Neck	UNLC Transferred to OC, Neck System, FX	N	1000	258.26
UNLC Neck System Tension, FZ		N	1000	2224.96	
UNLC Neck System Compression, FZ		N	1000		-71.72
UNLC Transferred to OC, Neck System Flexion, MY		N-m	Thortest	7.39	
UNLC Transferred to OC, Neck System Extension, MY		N-m	Thortest		-19.87
NIJ			Compute	0.36	
On head acting through total neck section, FX		N	Thortest	217.73	-842.36
On head acting through total neck section, FY		N	Thortest	375.43	-183.17
On head acting through total neck section, FZ		N	Thortest	2146.93	-67.39
On head acting through total neck section, MX		N-m	Thortest	27.32	-30.16
On head acting through total neck section, MY		N-m	Thortest	37.77	-24.45
On head acting through total neck section, MZ		N-m	Thortest	5.61	-20.63
On head acting through O.C. joint only, FX		N	Thortest	258.61	-872.23
On head acting through O.C. joint only, FZ		N	Thortest	2061.11	-70.74
On head acting through O.C. joint only, MY		N-m	Thortest	7.39	-19.87
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	0.03	-43.17
	Upper Left IR-TRACC Y - deflection	mm	Thortest	12.93	-6.41
	Upper Left IR-TRACC Z - deflection	mm	Thortest	25.16	-7.20
	Upper Left IR-TRACC D - deflection	mm	Thortest	0.03	-41.14
	Upper Right IR-TRACC X - deflection	mm	Thortest	1.32	-11.96
	Upper Right IR-TRACC Y - deflection	mm	Thortest	14.27	-9.13
	Upper Right IR-TRACC Z - deflection	mm	Thortest	14.07	-14.11
	Upper Right IR-TRACC D - deflection	mm	Thortest	0.05	-10.63
	Lower Left IR-TRACC X - deflection	mm	Thortest	1.56	-47.71
	Lower Left IR-TRACC Y - deflection	mm	Thortest	34.75	-0.20

PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: R20145402 - Mazda CX-5 Right Side Overlap 15/35 NHTSA No.: R20145402

Test Program: Research and Development Right Oblique Offset Test Date: 10/15/2014

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	15.60	-1.52
	Lower Left IR-TRACC D - deflection	mm	Thortest	3.37	-43.93
	Lower Right IR-TRACC X - deflection	mm	Thortest	9.19	-2.64
	Lower Right IR-TRACC Y - deflection	mm	Thortest	9.05	-15.57
	Lower Right IR-TRACC Z - deflection	mm	Thortest	4.11	-17.95
	Lower Right IR-TRACC D - deflection	mm	Thortest	10.06	-2.70
	Chest CG Acceleration, 3 ms clip	g	Compute	N/A	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	0.10	-66.11
	Lower Left IR-TRACC Y - deflection	mm	Thortest	4.70	-6.11
	Lower Left IR-TRACC Z - deflection	mm	Thortest	1.98	-2.30
	Lower Left IR-TRACC D - deflection	mm	Thortest	0.10	-65.86
	Left Viscous Criterion Based on X - deflection		Compute	1.21	
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.07	-62.15
	Lower Right IR-TRACC Y - deflection	mm	Thortest	12.89	-0.03
	Lower Right IR-TRACC Z - deflection	mm	Thortest	6.64	-10.99
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.07	-62.07
	Right Viscous Criterion Based on X - deflection		Compute	1.29	
Spine	Upper Spine (T1) AX	g	180	4.98	-49.75
	Upper Spine (T1) AY	g	180	10.07	-33.32
	Upper Spine (T1) AZ	g	180	19.99	-24.95
	Upper Spine (T1) Resultant	g	Compute	61.84	
	Middle Spine (T6) AX	g	180	3.92	-42.30
	Middle Spine (T6) AY	g	180	6.27	-27.18
	Middle Spine (T6) AZ	g	180	8.79	-17.74
	Middle Spine (T6) Resultant	g	Compute	52.98	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	50.12	
Acetabulum	Left FX force	N	600	507.15	-1891.23
	Left FY force	N	600	1751.49	-241.33
	Left FZ force	N	600	1002.96	-420.21
	Left Acetabulum Resultant	N	Compute	2065.66	
	Right FX force	N	600	798.04	-1589.67
	Right FY force	N	600	1032.79	-287.82
	Right FZ force	N	600	1423.48	-601.45
	Right Acetabulum Resultant	N	Compute	2181.32	
Anomalies None					

PRELIMINARY INJURY SUMMARY: Right Front Passenger Legs

Test Vehicle: R20145402 - Mazda CX-5 Right Side Overlap 15/35 NHTSA No.: R20145402
 Test Program: Research and Development Right Oblique Offset Test Date: 10/15/2014

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	1.35	-3.85
	Right Knee Displacement, DX	mm	180	0.84	-7.75
Femur	Left Femur Force, FZ	N	600	319.97	-3519.62
	Left Femur Moment, MX	N-m	600	174.64	-12.78
	Left Femur Moment, MY	N-m	600	79.72	-61.06
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	178.05	
	Right Femur Force, FZ	N	600	341.07	-2254.89
	Right Femur Moment, MX	N-m	600	220.83	-9.68
	Right Femur Moment, MY	N-m	600	59.09	-85.98
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	236.74	
Tibia	Left Upper Tibia, FZ	N	600	81.65	-2930.69
	Left Upper Tibia, MY	N-m	600	30.74	-96.69
	Left Upper Tibia, Index		Compute	0.69	
	Right Upper Tibia, FZ	N	600	108.23	-2273.99
	Right Upper Tibia, MY	N-m	600	19.70	-58.83
	Right Upper Tibia, Index		Compute	0.32	
	Left Lower Tibia, FZ	N	600	47.29	-2187.87
	Left Lower Tibia, MY	N-m	600	89.26	-27.64
	Left Lower Tibia, Index		Compute	0.45	
	Right Lower Tibia, FZ	N	600	50.02	-1419.64
	Right Lower Tibia, MY	N-m	600	66.99	-16.34
	Right Lower Tibia, Index		Compute	0.42	
Ankle	Left Ankle Rotation, RX	Deg	180	36.99	-15.37
	Left Ankle Rotation, RY	Deg	180	10.22	-32.79
	Right Ankle Rotation, RX	Deg	180	16.90	-12.73
	Right Ankle Rotation, RY	Deg	180	8.75	-23.08
Anomalies					
None					

SECTION 3 DATA SHEETS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

Data Sheet No.		Page No.
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DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

VEHICLE INFORMATION

NHTSA No.	R20145402
Model Year	2014
Make	Mazda
Model	CX-5
Body Style	SUV
VIN	JM3KE4BE0E0424514
Body Color	Silver
Odometer Reading (km/mi)	25.7 km / 16 mi
Engine Displacement. (L)	2.0
Type/No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6-Speed
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)	Yes
Power Window Auto-Reverse	No
Other Optional Feature	-
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	Yes
Driver Torso/Pelvis Airbag	No
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Pass. Front Airbag	Yes
Pass. Curtain Airbag	Yes
Pass. Head/Torso Airbag	No
Pass. Torso Airbag	Yes
Pass. Torso/Pelvis Airbag	No
Pass. Pelvis Airbag	No
Pass. Knee Airbag	No
Driver Seat Belt Pretensioner	Yes
Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Pass. Load Limiter	Yes
Other Safety Restraint	-

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

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Mazda Motor Corporation
Date of Manufacture	12/13

GWR (kg)	2043
GAWR Front (kg)	1026
GAWR Rear (kg)	1020

VEHICLE SEATING AND WEIGHT CAPACITY

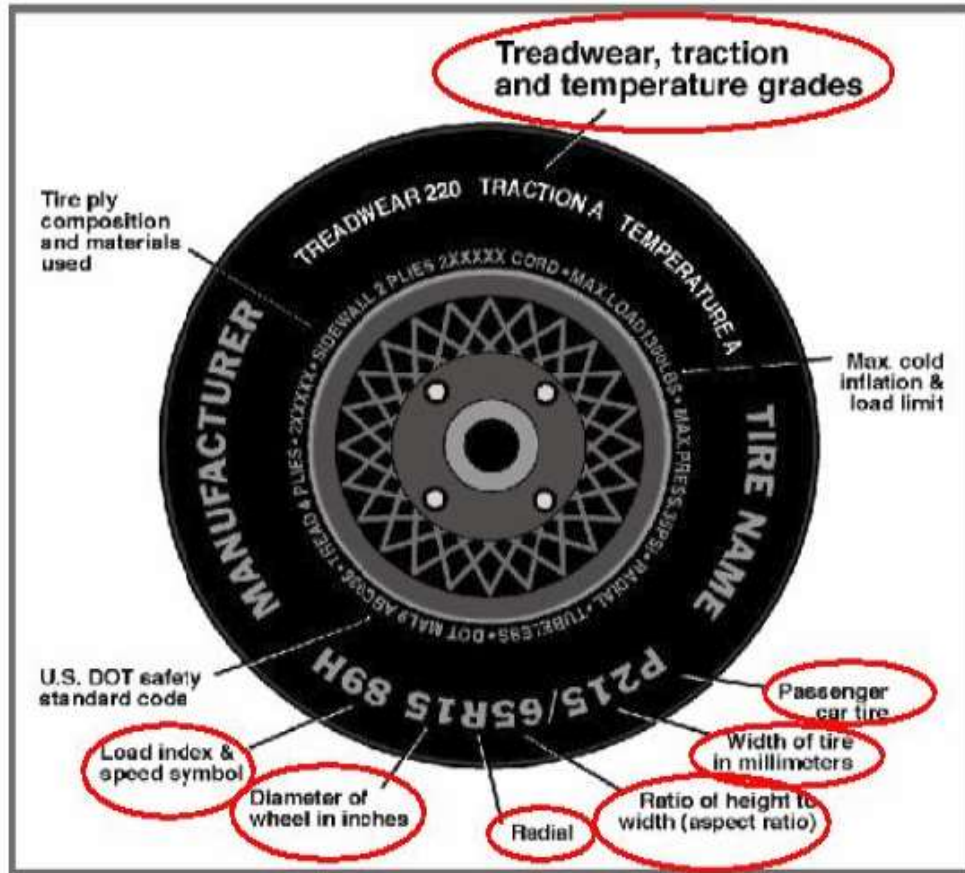
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	--	
Number of Occupants	2	3	--	5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				44.8

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

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

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



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	P225/65R17	P225/65R17
Tire Size on Vehicle	P225/65R17	P225/65R17
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Geolander G91	Geolander G91
Treadwear	280	280
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	100H	100H
Tire Material	Rubber	Rubber
DOT Safety Code Right	FDF5PC54813	FDF5PC54813
DOT Safety Code Left	FDF5PC54813	FDF5PC54813

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

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	458	326		518	390	
Right	kg	427	329		452	417	
Ratio	%	57%	43%		55%	45%	
Totals	kg	885	655	1540	970	807	1777

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1540
Weight of 2 P572E ATDs	kg	197.8
Rated Cargo/Luggage Weight (RCLW)	kg	44.8
Calculated Vehicle Target Weight (TVTW)	kg	1782.6

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	814	811	829	838	1147
As Tested	mm	793	795	797	798	1225
Post Test	mm	767	815	897	757	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2697
Total Vehicle Length at Left Side	mm	4399
Total Vehicle Length at Centerline	mm	4541
Total Vehicle Length at Right Side	mm	4403
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	77
Amount of Stoddard Solvent in Fuel Tank	L	53.94

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Muffler, trunk carpeting, rear view mirror, spare tire, jack, rear seats, tail light, lower
Splash guard.

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

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements		Pre-Test
1	Total Length	mm	4541
2	Total Width	mm	1846
3*	Bumper Top Height	mm	627
4*	Bumper Bottom Height	mm	540
5*	Longitudinal Member Top Height	mm	642
6	Distance Between Longitudinal Members	mm	1077
7	Longitudinal Member Width	mm	98
8*	Engine Top Height	mm	902
9*	Engine Bottom Height	mm	265
10	Engine and Gearbox Width	mm	544
11	Front Bumper-Engine Distance	mm	687
12*	Front Shock Absorber Fixing Height	mm	1026
13*	Bonnet Leading Edge Height	mm	905
14	Front Shock Absorber Fixing Width	mm	1181
15	Front Bumper – Front Axle Distance	mm	935
16	Front Axle – A Pillar Distance	mm	522
17	A-Pillar – B-Pillar Distance	mm	1115
18	B-Pillar – Rear Axle Distance	mm	1058
19	B-Pillar – C-Pillar Distance	mm	951
20*	Roof Sill Bottom Height	mm	1546
21*	Roof Sill Top Height	mm	1659
22*	Floor Sill Bottom Height	mm	367
23*	Floor Sill Top Height	mm	484

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

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

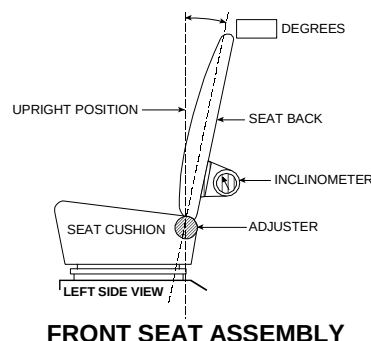
NHTSA No.: R20145402
 Test Date: 10/15/2014

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	6.8
Passenger Seat Back Angle	5.8

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.

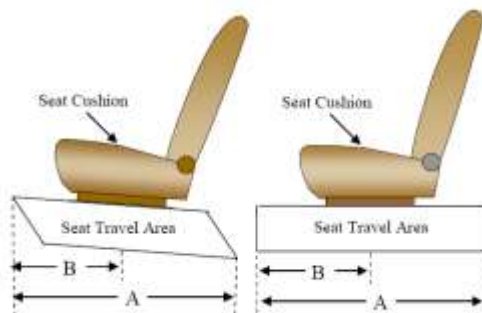
	Total Fore/Aft Travel	Placed in Position #
Driver Seat	27 (0-26)	10
Passenger Seat	27 (0-26)	13

SEAT BELT UPPER ANCHORAGES

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

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

	Total # of Positions	Placed in Position #
Driver Seat	4	0
Passenger Seat	4	0



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

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

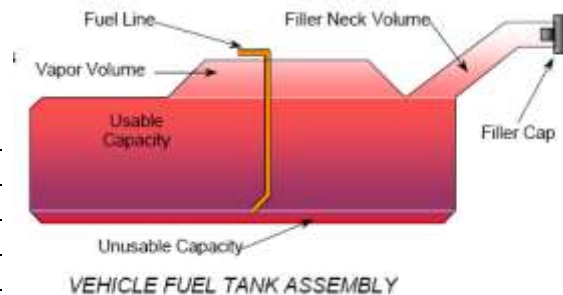
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	58.0
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	53.9
Actual Amount of Solvent Used	53.9
1/3 of Usable Capacity	19.3

FUEL PUMP

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

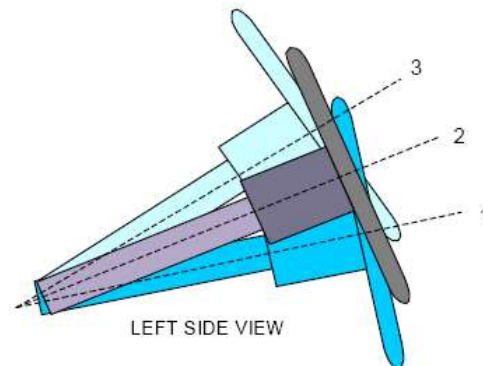
Fuel evacuated according to the specifications provided by the manufacturer in Form 1. Electric fuel pump operates when the ignition is in the 'on' position and the engine is running. The fuel filler neck is located above the left rear wheel.



STEERING COLUMN ADJUSTMENT

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

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



STEERING COLUMN ASSEMBLY

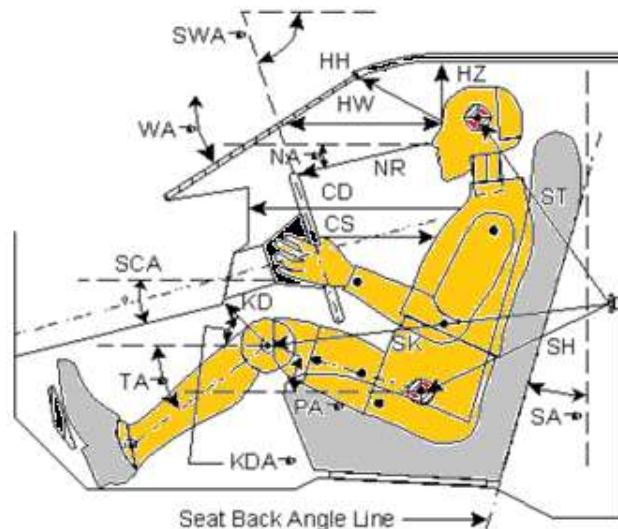
STEERING COLUMN POSITIONS

	Tilt (degrees)	Fore/Aft Position (mm)
Lowermost position No. 1	22.6	
Geometric center position No. 2	25.0	
Uppermost position No. 3	27.4	
Telescoping Steering Wheel Travel		48
Test Position	25.0	24

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014



Code	Measurement Description	Driver (Serial # THOR 015)		Passenger (Serial # THOR 016)	
		Length (mm)	Angle(°)	Length (mm)	Angle (°)
WA°	Windshield Angle		-30.2		
SWA°	Steering Wheel Angle		25.0		
SCA°	Steering Column Angle		65.0		
SA°	Seat Back Angle (on headrest post)		8.2		5.7
HZ	Head to Roof (Z)	220	90	189	90
HH	Head to Header	443	19.1	435	13.2
HW	Head to Windshield	708	0	591	0
NR	Nose to Rim	524	-19.1	713	34.2
CD	Chest to Dash	600		543	
CS	Chest to Steering Hub	384	-7.8		
RA	Rim to Abdomen	184	0		
KDL	Left Knee to Dash	135	17.1	95	28.4
KDR	Right Knee to Dash	86	41.2	123	23.6
PA°	Pelvic Angle		23.9		24.2
TA°	Tibia Angle		-50.1		-46.1
SK	Striker to Knee	619	-4.1	646	-5.9
ST	Striker to Head	512	-88.8	541	-89.8
SH	Striker to H-Point	283	-35.2	262	-30.3
HAX°	Head Angle (X)		0.1		0.0
HAY°	Head Angle (Y)		-0.1		0.4
TAX°	T6 Angle (X)		-0.5		-0.6
TAY°	T6 Angle (Y)		20.9		16.5
LAX°	T1 (X)		0.1		-0.1
LAY°	T1 (Y)		1.9		0.3

DATA SHEET NO.3 (CONTINUED)
DUMMY CMM MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

Description	Units	Driver			Passenger		
		X	Y	Z	X	Y	Z
Striker	mm	1248	-801	756	1249	799	759
Head CG	mm	1292	-443	260	1282	454	231
Bridge of Nose	mm	1384	-362	245	1377	379	216
Tip of Nose	mm	1386	-363	287	1379	372	253
Shoulder Bolt	mm	1316	-557	507	1380	553	507
Tip of Chin	mm	1386	-362	379	1382	370	350
H-Point	mm	1512	-609	934	1506	611	904
Left Knee	mm	1899	-588	815	1924	316	832
Right Knee	mm	1919	-288	825	1924	541	838
Left Ankle	mm	2169	-588	1136	2228	312	1121
Right Ankle	mm	2195	-257	1140	2216	544	1134
Left Heel	mm	2185	-569	1274	2191	280	1260
Right Heel	mm	2192	-232	1274	2192	504	1269
Head Bolt 1 – Top Left	mm	1218	-406	216	1217	339	186
Head Bolt 2 – Lower Left	mm	1229	-392	297	1231	342	269
Head Bolt 3 – Top Right	mm	1217	-333	214	1216	403	187
Head Bolt 4 – Lower Right	mm	1229	-343	298	1228	394	270
Driver's Outboard Seat Anchor Bolt	mm	1752	-610	1173	1751	610	1175
Outboard Head Restraint Post	mm	1119	-446	418	1118	456	382
Top of Head Restraint	mm	1156	-361	152	1166	371	112
Center of Steering Wheel	mm	1799	-370	555			

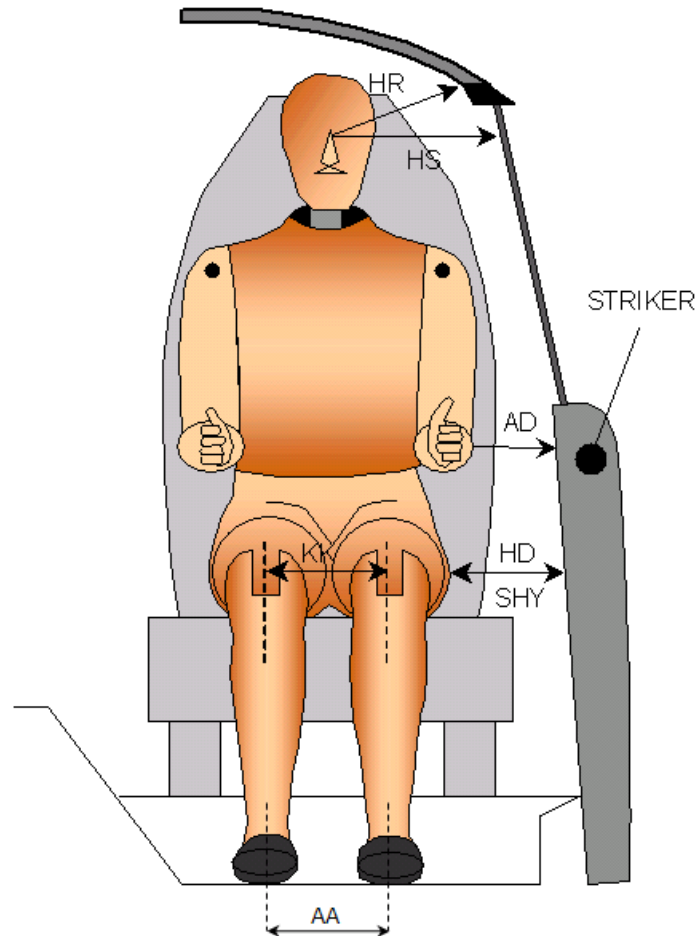
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

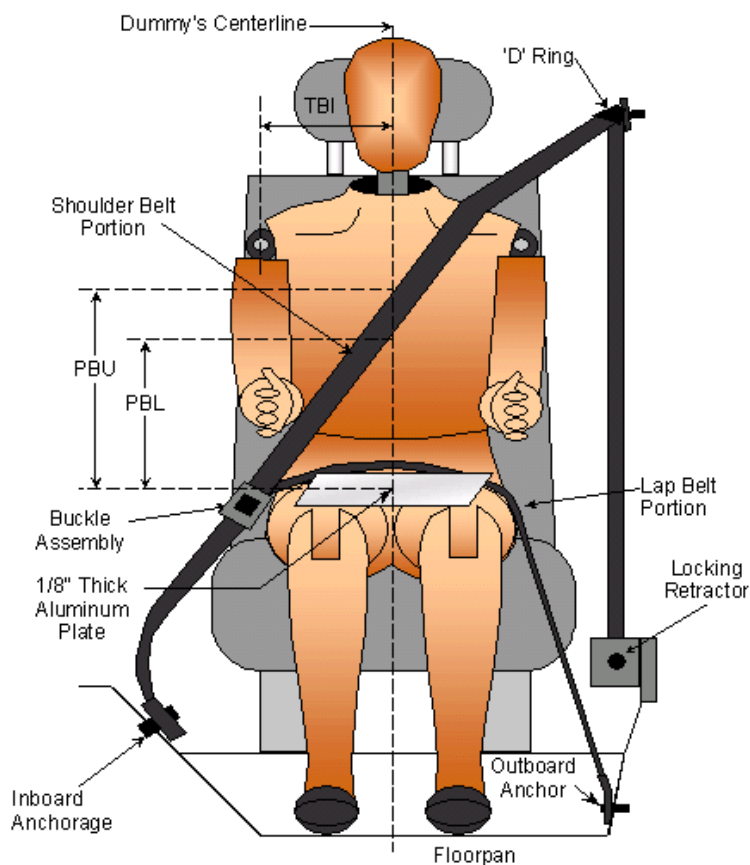


Code	Description	Units	Driver	Passenger
AD	Arm to Door	mm	142	52
HD	H-Point to Door	mm	143	138
HR	Head to Side Header	mm	238	215
HS	Head to Side Window	mm	345	325
KK	Knee to Knee	mm	354	270
SHY	Striker to H-Point (Y Direction)	mm	255	240
AA	Ankle to Ankle	mm	329	230

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	375	400
PBL — Top surface of reference to belt lower edge	mm	300	325

BELT LENGTH DATA

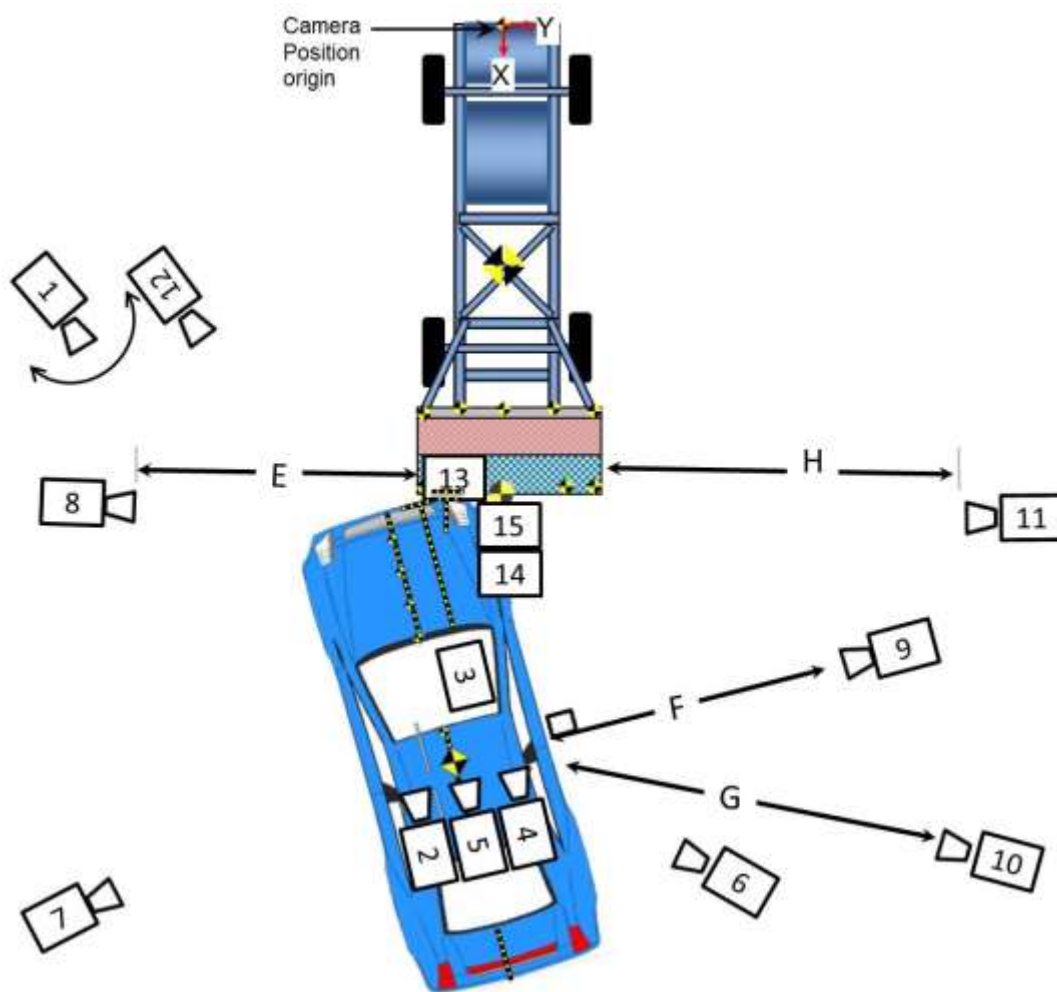
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	870	890
Lap Belt Length as measured on ATD	mm	770	830
Remainder of belt on reel	mm	960	930
Total belt length for continuous webbing systems	mm	2600	2650

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

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

HORIZONTAL LOCATION



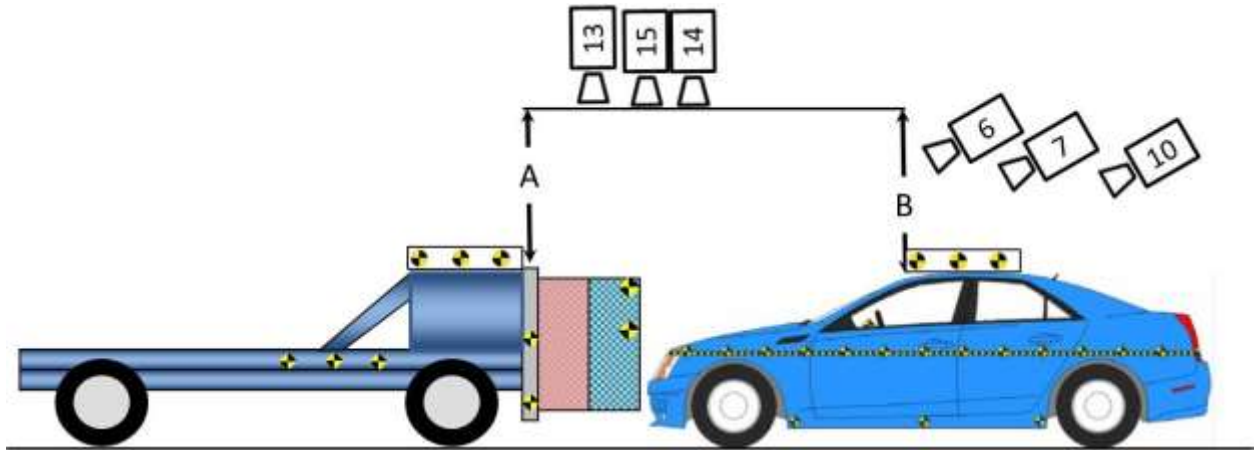
E	mm	6200
F	mm	7106
G	mm	10357
H	mm	6200

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

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

VERTICAL LOCATION



A	mm	4087
B	mm	3615

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

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

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	8041	955	1406	12.5	1000
3	Onboard Passenger Lower Leg	6557	502	389	6.5	1000
4	Onboard Driver Movement	7882	259	1406	12.5	1000
5	Onboard Centerline	7938	601	1406	8	1000
6	Passenger Interaction	7966	-2318	3511	28	1000
7	Driver Interaction	11109	8359	2160	24-70	1000
8	Target Vehicle Left Side Perpendicular (High)	4900	7285	1116	24	1000
9	Target Vehicle Driver Motion	5765	-7067	1445	28	1000
10	Rear View of Vehicle and RMDB	10494	-10127	2620	24-70	1000
11	Right Side Target Vehicle and RMDB	4925	-7244	1076	24	1000
12	Front of Vehicle and RMDB	1619	3534	1209	28	1000
13	Close-Up Impact Point	4930	953	4677	28	1000
14	Overhead Overall View	6834	162	5274	15	1000
15	Overhead Vehicle and RMDB	4874	273	5274	15	1000

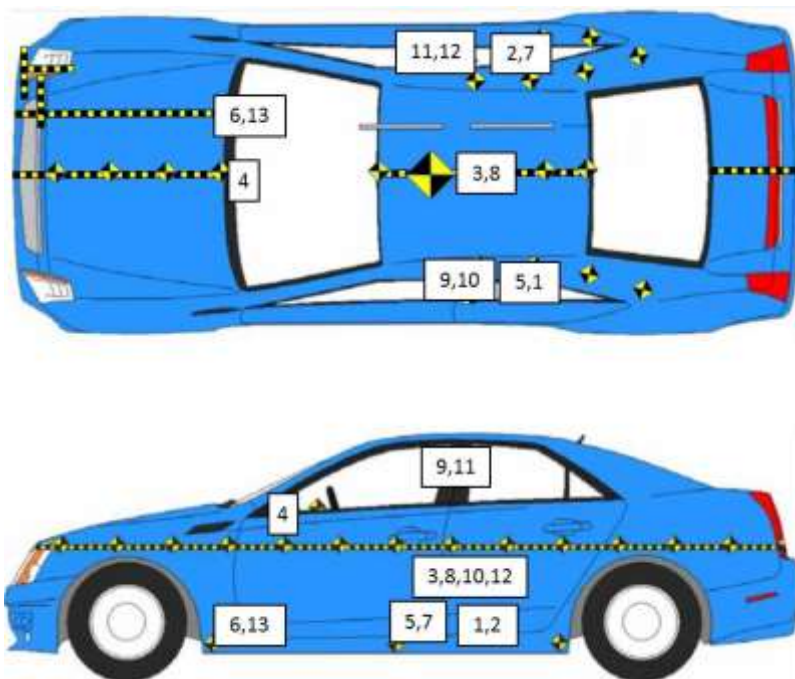
Reference Point: Center most rearward point of the RMDB when in contact with the target vehicle:

- +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 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Axes	Units	Measurements (mm)		
				X	Y	Z
1	Left Rear Sill	X,Y	mm	985	-687	1198
2	Right Rear Sill	X,Y	mm	989	697	1200
3	Vehicle CG	X,Y,Z	mm	978	1	1138
4	Instrument Panel	X	mm	1925	3	703
5	Driver Seat Track	X,Y,Z	mm	1272	-609	1249
6	Passenger Toe Pan	X,Y,Z	mm	2543	397	1000
7	Passenger Seat Track	X,Y,Z	mm	1275	605	1255
8	Angular Rate Sensors	X	mm	989	1	1146
		Y	mm	978	11	1144
		Z,	mm	978	0	1138

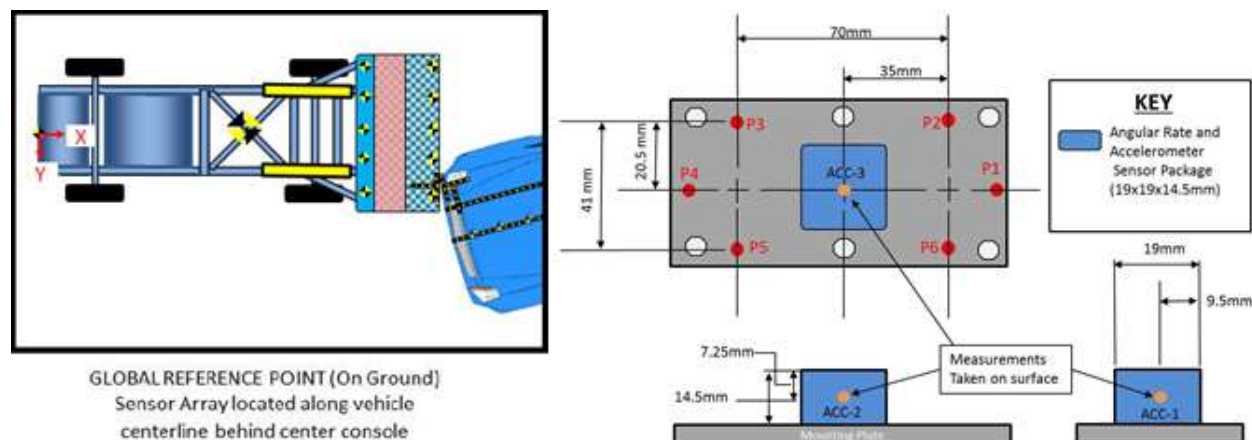
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014



VEHICLE COORDINATE SYSTEM					
No.	Accelerometer Location	Units	Measurements (mm)		
			X	Y	Z
ACC-1	Accelerometer CG – X Direction	mm	989	1	1146
ACC-2	Accelerometer CG – Y Direction	mm	978	11	1144
ACC-3	Accelerometer CG – Z Direction	mm	978	0	1138
M1	Mounting Bolt 1	mm	986	8	1138
M2	Mounting Bolt 2	mm	970	-7	1138
P1	Plate Point 1	mm	1024	0	1153
P2	Plate Point 2	mm	1012	-21	1153
P3	Plate Point 3	mm	943	-21	1152
P4	Plate Point 4	mm	931	0	1152
P5	Plate Point 5	mm	943	20	1152
P6	Plate Point 6	mm	1013	20	1153

GLOBAL COORDINATE SYSTEM					
No.	Accelerometer Location	Units	Measurements (mm)		
			X	Y	Z
ACC-1	Accelerometer CG – X Direction	mm	7334	660	-464
ACC-2	Accelerometer CG – Y Direction	mm	7341	648	-466
ACC-3	Accelerometer CG – Z Direction	mm	7344	658	-472
M1	Mounting Bolt 1	mm	7335	653	-471
M2	Mounting Bolt 2	mm	7354	663	-472
P1	Plate Point 1	mm	7300	670	-456
P2	Plate Point 2	mm	7317	687	-457
P3	Plate Point 3	mm	7384	669	-458
P4	Plate Point 4	mm	7389	646	-458
P5	Plate Point 5	mm	7373	629	-457
P6	Plate Point 6	mm	7306	648	-456

DATA SHEET NO. 7 (CONTINUED)
VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

VEHICLE INSTRUMENTATION DATA

Loc.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Max	Time (ms)
1	Left Rear Sill	X	g	3.36	138.20	-42.01	38.45
		Y	g	5.28	121.85	-20.62	34.00
2	Right Rear Sill	X	g	3.10	149.25	-33.75	41.60
		Y	g	5.79	10.75	-21.06	34.35
3	Vehicle CG	X	g	2.03	133.20	-33.49	38.70
		Y	g	5.45	10.90	-21.75	34.15
		Z	g	16.89	39.45	-18.53	44.60
4	Instrument Panel	X	g	54.69	83.35	-74.22	51.85
5	Driver Seat Track	X	g	3.45	138.10	-40.81	38.60
		Y	g	4.96	121.55	-25.86	33.05
		Z	g	5.79	16.80	-8.52	59.80
6	Passenger Floor Pan	X	g	22.30	19.00	-92.13	35.10
		Y	g	60.74	41.40	-31.52	33.70
		Z	g	122.08	40.05	-22.86	69.65
7	Passenger Seat Track	X	g	2.85	149.15	-35.18	41.65
		Y	g	4.35	10.80	-22.79	34.30
		Z	g	17.41	38.85	-15.82	59.65
8	Angular Rate Sensors	X	Deg/s	301.73	42.25	-123.64	53.75
		Y	Deg/s	407.30	45.90	-313.82	60.95
		Z	Deg/s	179.87	45.60	-24.27	10.85
9	Driver Shoulder Belt		N	4156.34	47.70	-42.29	6.60
10	Driver Lap Belt		N	8176.08	56.35	-22.73	10.10
11	Passenger Shoulder Belt		N	3852.72	54.70	-37.69	6.55
12	Passenger Lap Belt		N	5156.39	60.15	-36.56	10.45
13	Passenger Floor String Pot		mm	17.38	300.00	-41.40	82.25

Note: See Appendix B for all additional vehicle channel data

TIME TO FIRE RESTRAINT TIMING

Loc.	Description	Axes	Units	Time to Fire (ms)
1	Driver Air Bag Squib 1	*	A	6.90
2	Driver Air Bag Squib 2	*	A	11.90
3	Driver Curtain Airbag	*	A	Did Not Fire
4	Driver Torso Airbag	*	A	Did Not Fire
5	Driver Knee Airbag	*	A	N/A
6	Driver Pretensioner	*	A	6.90
7	Passenger Air Bag Squib 1	*	A	6.90
8	Passenger Air Bag Squib 2	*	A	11.90
9	Passenger Curtain Airbag	*	A	39.50
10	Passenger Torso Airbag	*	A	39.50
11	Passenger Knee Airbag	*	A	N/A
12	Passenger Pretensioner	*	A	6.90

* The measurement indicates the time the voltage changed

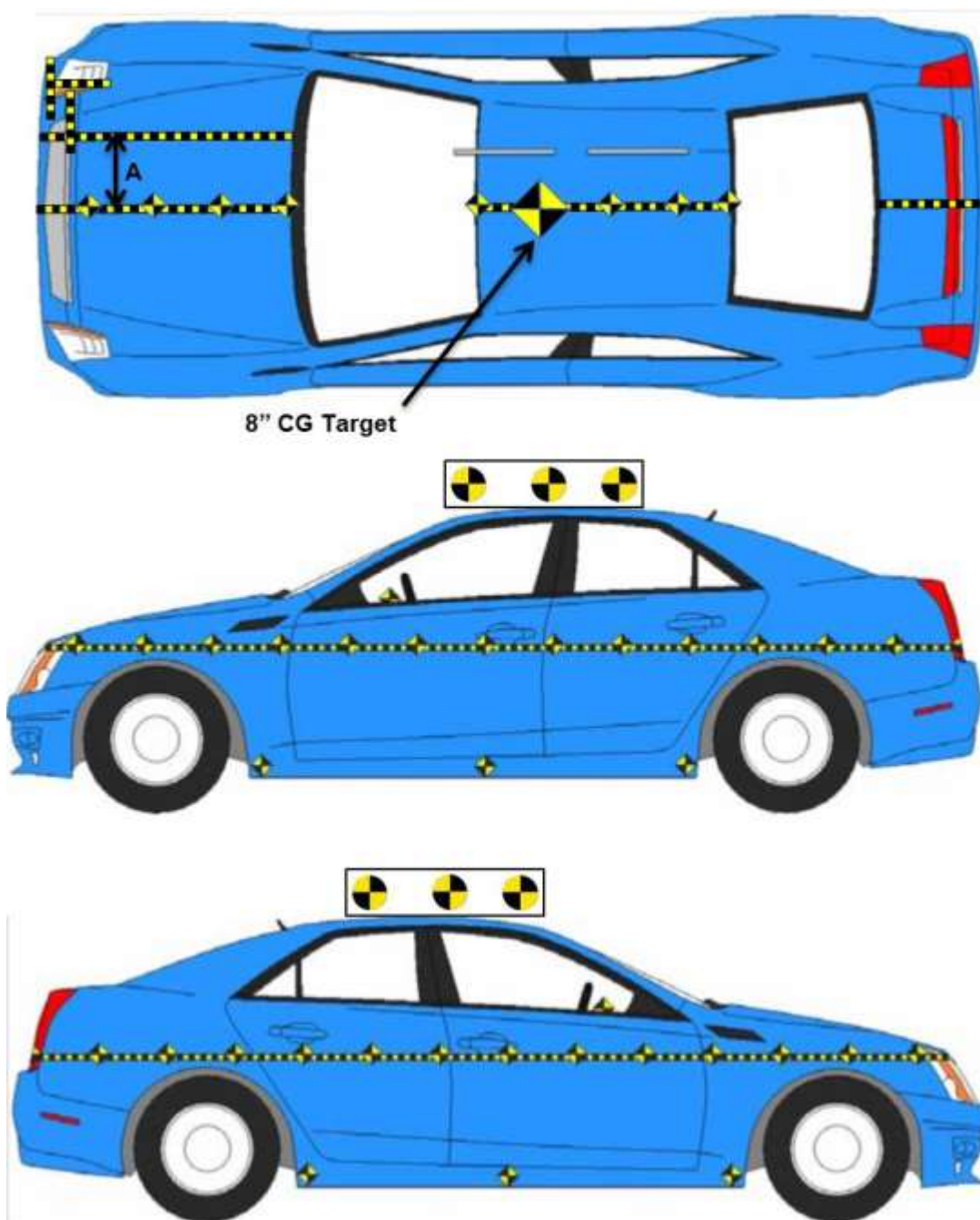
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

Item	Units	Value
A	mm	276

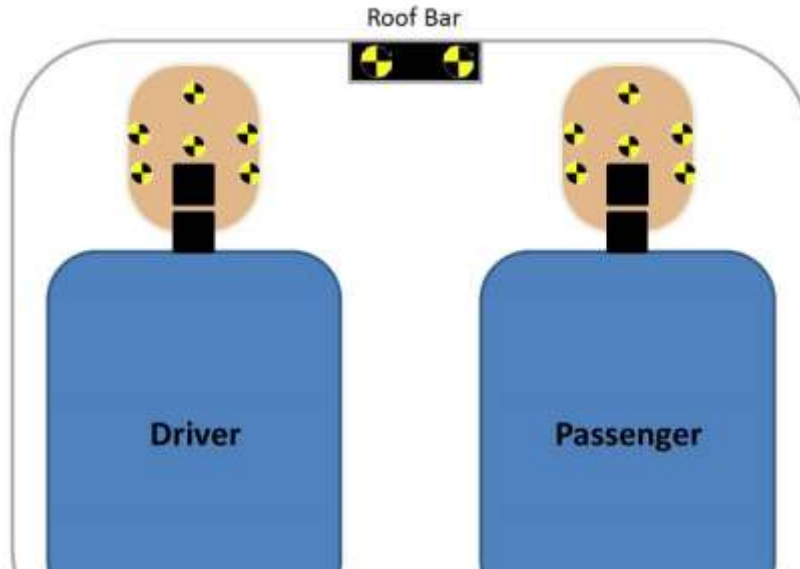
Note: All 6" targets on vehicle are 450 mm apart.



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

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014



Point	Pre-Test		
	X	Y	Z
Roof Bar Driver	1728	-71	133
Roof Bar Passenger	1733	56	135

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

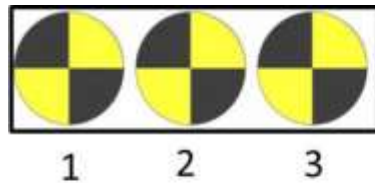
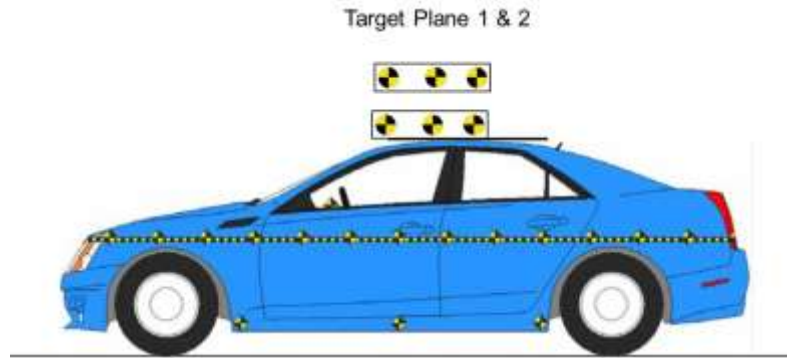
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

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

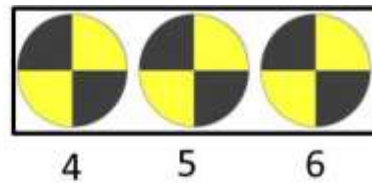
Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

OVERHEAD TARGET BARS



Vertical Target
Plane 1
(Driver's Side)



Vertical Target
Plane 2
(Passenger Side)

Target	Units	X	Y	Z
1	mm	1674	-384	-400
2	mm	1218	-372	-400
3	mm	768	-358	-396
4	mm	1683	392	-395
5	mm	1229	390	-392
6	mm	781	386	-387

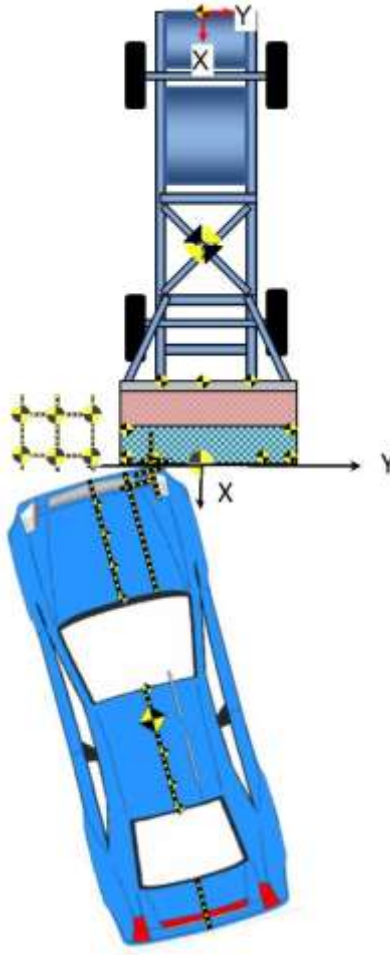
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014



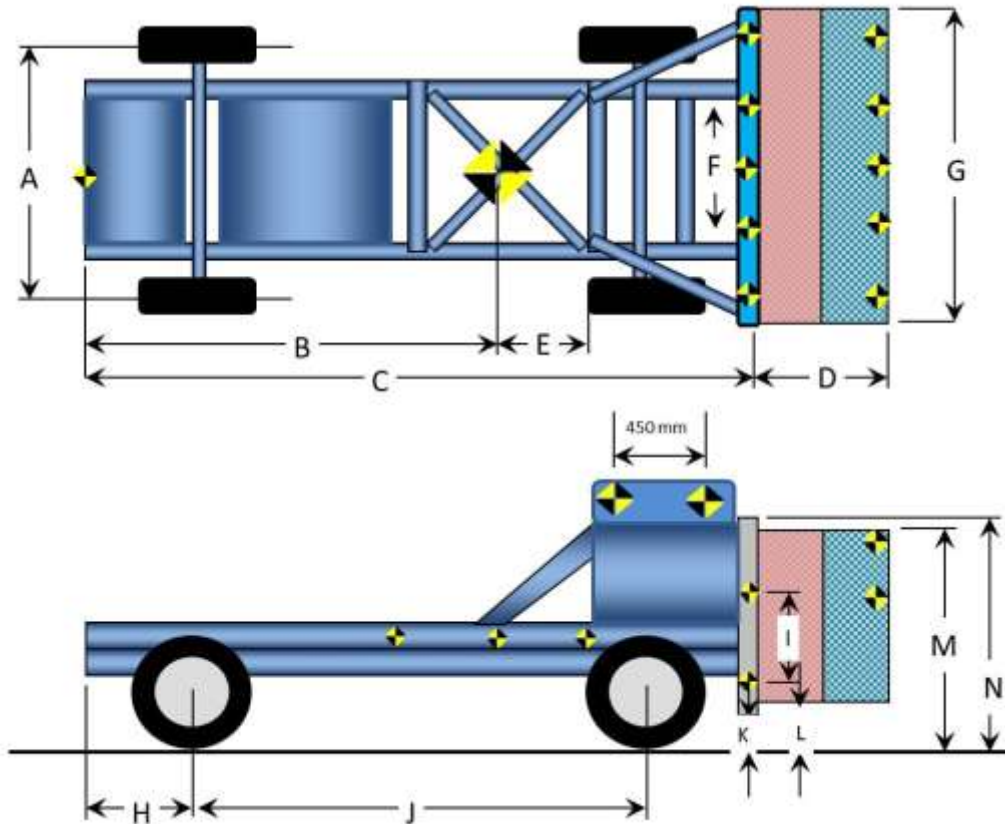
GROUND TARGET LOCATIONS

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 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014



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	88
E	mm	907	L	mm	77
F	mm	900	M	mm	1033
G	mm	2207	N	mm	1187

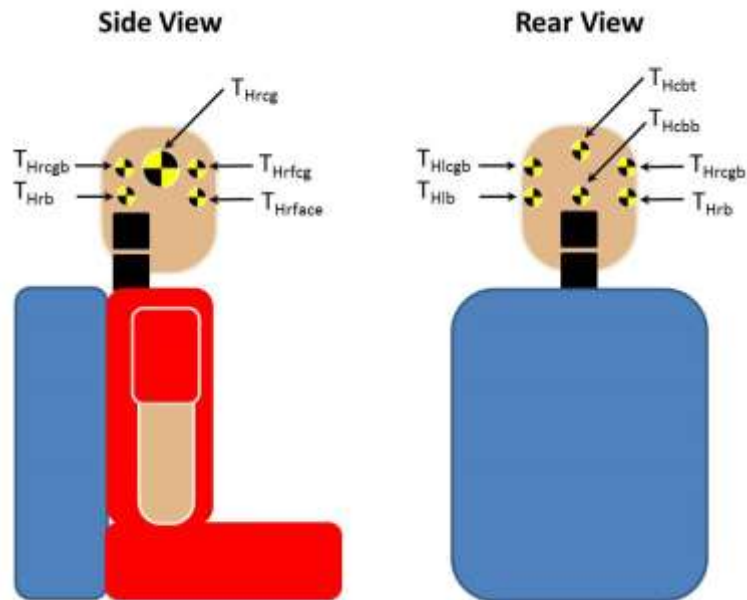
	Units	Front Axle	Rear Axle	Total
Left	kg	804.2	435	1239.2
Right	kg	801.5	449.5	1251
Ratio	%	64.5	35.5	100
Total	kg	1605.7	884.5	2490.2
CG Aft of Front Axle	mm			907

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 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014



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 _{Hlb}	mm	70
Distance between T _{Hlfcg} & T _{Hlface}	mm	70
Distance between T _{Hcbt} & T _{Hcbb}	mm	72

Passenger Dummy Head Targets (S/N 015)

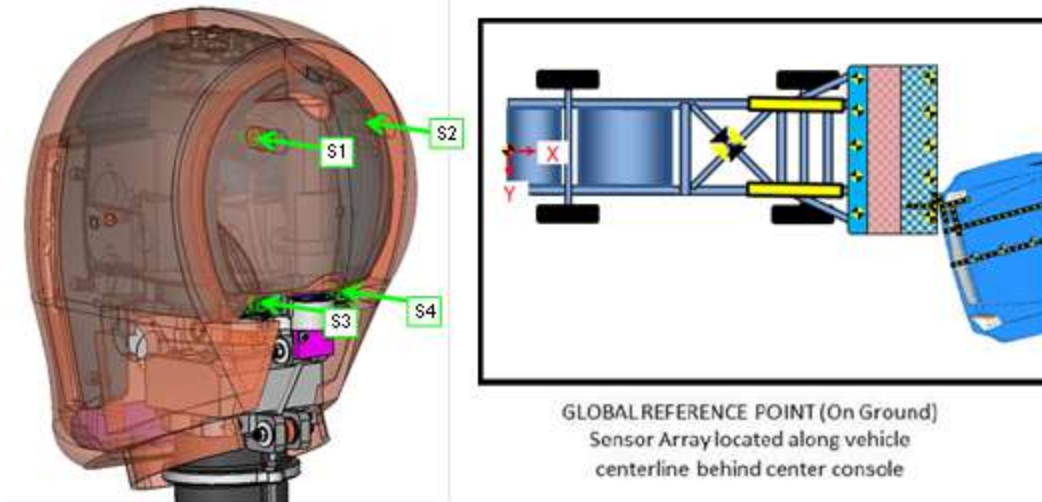
Measurement	Units	Value
Distance between T _{Hrcg} & T _{Hrfcg}	mm	38
Distance between T _{Hrcg} & T _{Hrcgb}	mm	38
Distance between T _{Hrcgb} & T _{Hrb}	mm	70
Distance between T _{Hrfcg} & T _{Hrface}	mm	70
Distance between T _{Hlcbg} & T _{Hlfcg}	mm	38
Distance between T _{Hlcbg} & T _{Hlcb}	mm	38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

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

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

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	7218	1113	-1394
S3	7203	1103	-1313
S2	7200	1042	-1395
S4	7191	1055	-1312

FRONT PASSENGER HEAD BOLT POINTS

Target	X	Y	Z
S1	7026	393	-1423
S3	7011	394	-1341
S2	7010	331	-1422
S4	7000	342	-1339

**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 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	92
Passenger Dummy Accelerometers	93
Vehicle Structure Accelerometers	46
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 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

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 Airbag, Visor & Driver's right hand	Front & Curtain Airbag, Side Headliner
Upper Torso Contact	Front Airbag	Front & Side Torso Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Right Front Passenger
Locked/Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed & Operational	Closed & Operational
Rear Door Opening	Closed & Operational	Closed & Operational
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None
Glazing Damage	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions	Photo Taken (Y/N)
Pillar Performance	A-Pillar & B-Pillar slightly buckled	Y
Windshield Damage	Cracks throughout with minor separation	Y
Window Damage	None	Y
Other Notable Effects	None	--

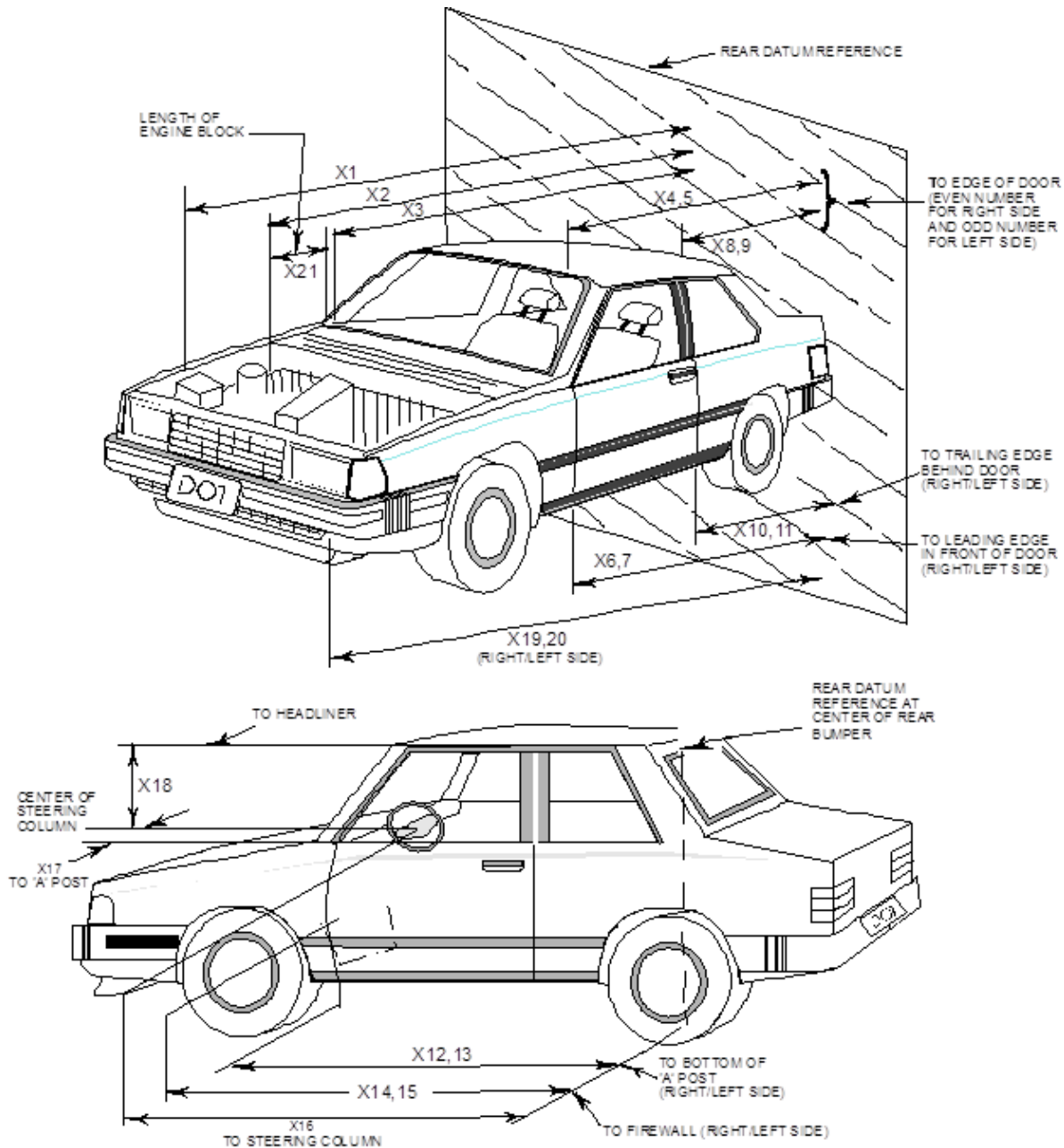
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver (Occupant 1)		Right Front Passenger (Occupant 2)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Curtain Airbag	Yes	No	Yes	Yes
Torso Airbag	Yes	No	Yes	Yes
Knee Airbag	No	N/A	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 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014



DATA SHEET NO. 11 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	3738	3380	358
2	Rear Surface of Vehicle (RSOV) to Front of Engine	mm	3050	2802	249
3	RSOV to Firewall	mm	2772	2656	117
4	RSOV to Upper Leading Edge of Right Door	mm	2255	2249	6
5	RSOV to Upper Leading Edge of Left Door	mm	2259	2256	3
6	RSOV to Lower Leading Edge of Right Door	mm	2275	2273	2
7	RSOV to Lower Leading Edge of Left Door	mm	2276	2269	7
8	RSOV to Upper Trailing Edge of Right Door	mm	1169	1165	5
9	RSOV to Upper Trailing Edge of Left Door	mm	1172	1167	5
10	RSOV to Lower Trailing Edge of Right Door	mm	1224	1223	1
11	RSOV to Lower Trailing Edge of Left Door	mm	1226	1223	2
12	RSOV to Bottom of "A" Post of Right Side	mm	2282	2274	8
13	RSOV to Bottom of "A" Post of Left Side	mm	2285	2283	2
14	RSOV to Firewall, Right Side	mm	2805	UR	UR
15	RSOV to Firewall, Left Side	mm	2805	2811	-6
16	RSOV to Steering Column	mm	1799	1844	-45
17	Center of Steering Column to "A" Post	mm	287	295	-7
18	Center of Steering Column to Headliner	mm	442	435	6
19	RSOV to Right Side of Front Bumper	mm	3670	3070	600
20	RSOV to Left Side of Front Bumper	mm	3668	3630	39
21	Length of Engine Block	mm	218	206	12
RD	RSOV to Right Side of Dash Panel	mm	2014	1995	20
CD	RSOV to Center of Dash Panel	mm	1941	1947	-6
LD	RSOV to Left Side of Dash Panel	mm	2014	2012	2

UR* = Unrecoverable Data Point

DATA SHEET NO. 12
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

VEHICLE INFORMATION

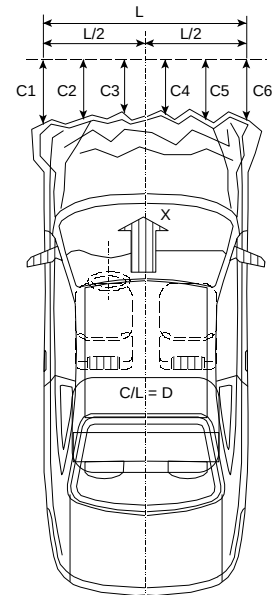
VIN: JM3KE4BE0E0424514 Wheelbase (mm): 2697
Vehicle Size Category: Passenger Test Weight (kg): 1777

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): 90.37
Velocity Change (kph): 90.37

CRUSH PROFILE

Collision Deformation Classification: 12FZEE03
Midpoint of Damage: C5
Damage Region Length (mm): 1075
Impact Mode: Frontal 15° Angle, 35% Right Offset



Crush Measurements: Bumper Cover

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	3627	3650	-23
C2	Crush zone 2 at left side	mm	3690	3554	136
C3	Crush zone 3 at left side	mm	3726	3441	285
C4	Crush zone 4 at right side	mm	3725	3304	421
C5	Crush zone 5 at right side	mm	3690	3175	515
C6	Crush zone 6 at right side	mm	3628	3069	559
L	C1 to C6	mm	1075	921	155

Crush Measurements: Bumper Cover Removed

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
B1	Bumper Beam 1 at left side	mm	3565	3561	-4
B2	Bumper Beam 2 at left side	mm	3590	3519	-71
B3	Bumper Beam 3 at left side	mm	3611	3475	-136
B4	Bumper Beam 4 at left side	mm	3622	3419	-203
B5	Bumper Beam 5 at right side	mm	3626	3356	-270
B6	Bumper Beam 6 at right side	mm	3622	3288	-334
B7	Bumper Beam 7 at right side	mm	3612	3215	-397
B8	Bumper Beam 8 at right side	mm	3590	3172	-418
B9	Bumper Beam 9 at right side	mm	3566	3138	-428
L	B1 to B9	mm	960	817	143

DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

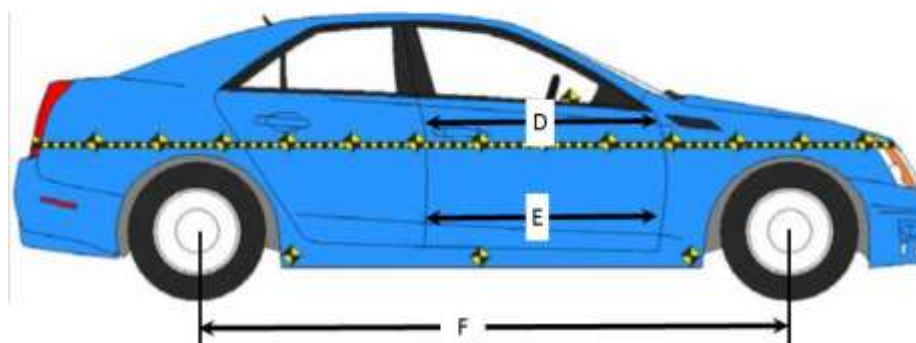
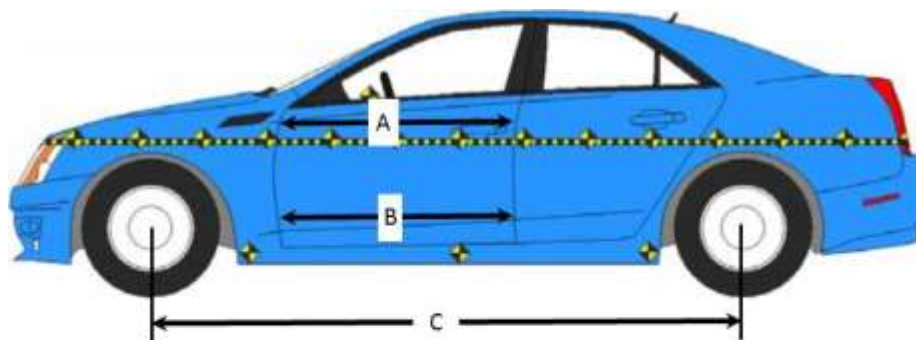
NHTSA No.: R20145402
 Test Date: 10/15/2014

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	980	979	-1
B	Left Side Lower	mm	845	845	0
D	Right Side Upper	mm	981	966	-15
E	Right Side Lower	mm	846	840	-6

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2697	2751	54
F	Right Side Wheelbase	mm	2697	2498	-199



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

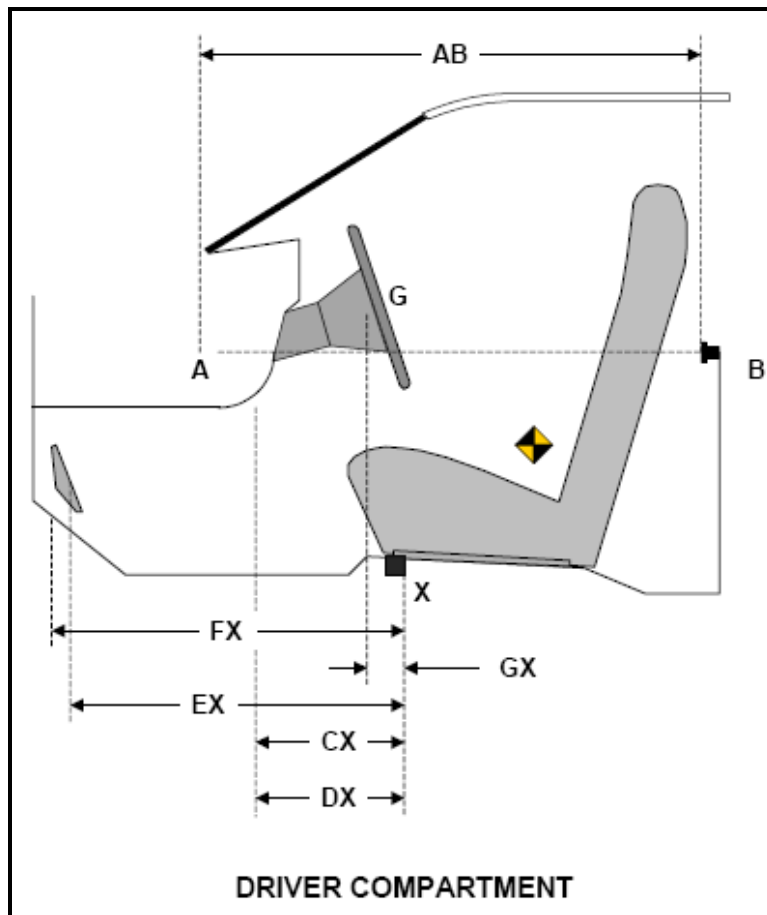
Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	778	780	2
CX	Left Knee Bolster to X	mm	279	292	13
DX	Right Knee Bolster to X	mm	276	300	24
EX	Brake Pedal to X	mm	529	513	-16
FX	Foot Rest to X	mm	582	587	5
GX	Center of Steering Column Wheel Hub to X	mm	48	93	45

X = Front of Seat Track (Stationary)

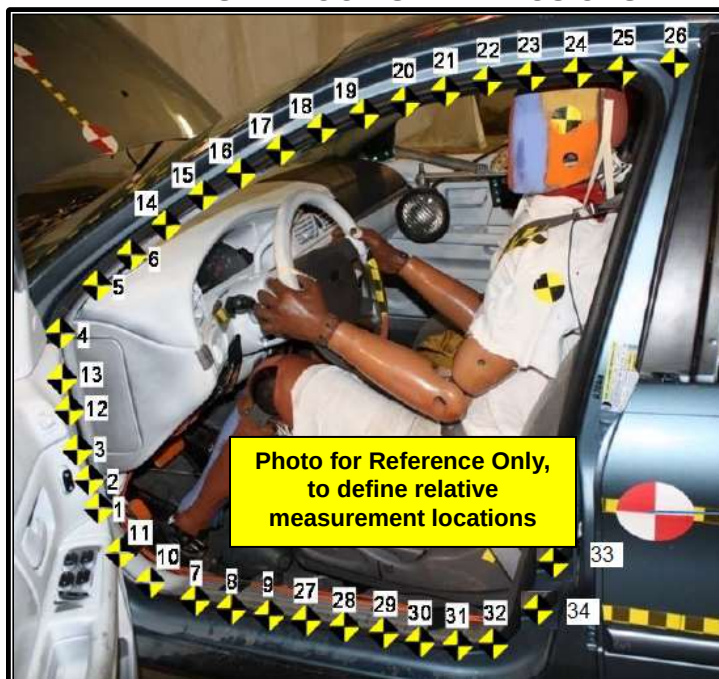


DATA SHEET NO.13 (CONTINUED) **VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

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	2152	-756	1106	2150	-775	1109	-2	-19	3
2	2163	-749	1031	2162	-768	1034	-1	-19	3
3	2159	-747	956	2157	-766	959	-2	-19	3
4	2136	-745	655	2135	-758	659	-1	-13	4
5	2130	-749	583	2128	-759	586	-2	-10	3
6	2122	-750	507	2120	-761	510	-2	-11	3
7	2078	-759	1165	2077	-777	1168	-1	-18	3
8	1930	-758	1171	1928	-774	1173	-2	-16	2
9	1780	-760	1170	1777	-774	1172	-3	-14	2
10	2111	-759	1153	2109	-777	1156	-2	-18	3
11	2137	-758	1131	2134	-776	1134	-3	-18	3
12	2151	-743	856	2149	-759	859	-2	-16	3
13	2143	-743	756	2142	-756	760	-1	-13	4
14	2084	-739	438	2083	-748	441	-1	-9	3
15	2023	-726	393	2022	-733	396	-1	-7	3
16	1961	-712	349	1960	-717	352	-1	-5	3

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	1897	-698	307	1896	-701	310	-1	-3	3
18	1832	-682	267	1831	-684	271	-1	-2	4
19	1764	-667	230	1763	-668	235	-1	-1	5
20	1694	-652	198	1693	-651	202	-1	1	4
21	1621	-639	169	1621	-637	174	0	2	5
22	1547	-627	147	1547	-625	150	0	2	3
23	1472	-617	129	1471	-616	133	-1	1	4
24	1394	-610	116	1393	-608	120	-1	2	4
25	1314	-604	107	1315	-603	110	1	1	3
26	1226	-605	109	1225	-603	113	-1	2	4
27	1734	-761	1169	1732	-774	1172	-2	-13	3
28	1689	-760	1169	1687	-774	1172	-2	-14	3
29	1644	-760	1169	1642	-773	1171	-2	-13	2
30	1599	-760	1166	1597	-772	1168	-2	-12	2
31	1554	-760	1158	1552	-772	1161	-2	-12	3
32	1518	-760	1146	1516	-771	1149	-2	-11	3
33	1366	-754	954	1364	-762	956	-2	-8	2
34	1452	-759	1104	1450	-768	1106	-2	-8	2

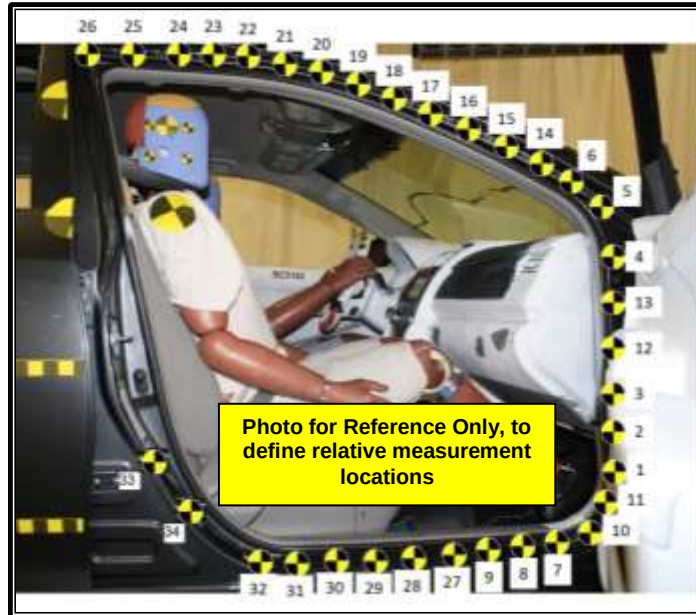
Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

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

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

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	2151	757	1105	2147	739	1100	-4	-18	-5
2	2161	752	1031	2154	734	1026	-7	-18	-5
3	2157	750	957	2144	751	948	-13	1	-9
4	2134	748	655	2120	769	647	-14	21	-8
5	2128	751	581	2118	773	573	-10	22	-8
6	2119	752	506	2112	774	498	-7	22	-8
7	2079	760	1167	2077	740	1165	-2	-20	-2
8	1931	759	1174	1930	745	1171	-1	-14	-3
9	1778	760	1172	1778	750	1170	0	-10	-2
10	2111	760	1154	2110	742	1156	-1	-18	2
11	2136	760	1133	2133	740	1128	-3	-20	-5
12	2149	746	856	2135	757	850	-14	11	-6
13	2141	745	757	2127	761	750	-14	16	-7
14	2082	741	440	2077	759	432	-5	18	-8
15	2021	727	395	2017	745	387	-4	18	-8
16	1956	713	350	1953	729	341	-3	16	-9

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	1892	698	308	1890	714	299	-2	16	-9
18	1827	683	268	1824	695	260	-3	12	-8
19	1759	668	232	1757	678	222	-2	10	-10
20	1688	653	198	1687	663	187	-1	10	-11
21	1616	639	171	1616	649	161	0	10	-10
22	1541	627	148	1541	634	139	0	7	-9
23	1464	617	130	1464	624	123	0	7	-7
24	1387	611	118	1387	617	112	0	6	-6
25	1308	605	108	1308	610	104	0	5	-4
26	1227	604	111	1226	609	109	-1	5	-2
27	1742	759	1172	1741	751	1170	-1	-8	-2
28	1696	759	1172	1696	751	1171	0	-8	-1
29	1651	760	1171	1651	751	1170	0	-9	-1
30	1608	760	1170	1608	751	1169	0	-9	-1
31	1563	759	1163	1563	751	1162	0	-8	-1
32	1520	759	1150	1520	753	1150	0	-6	0
33	1363	752	954	1363	748	953	0	-4	-1
34	1447	758	1103	1447	751	1103	0	-6	0

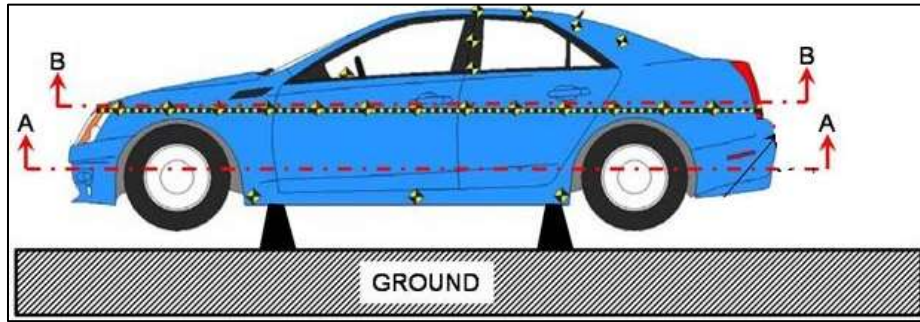
Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

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	3216	-909	1070	1	2943	-899	1071
2	3266	-899	1071	2	3020	-894	1071
3	3323	-886	1070	3	3099	-901	1070
4	3400	-854	1070	4	3151	-881	1071
5	3434	-826	1070	5	3180	-861	1072
6	3493	-682	1071	6	3203	-769	1071
7	3526	-651	1070	7	3177	-681	1071
8	3583	-602	1070	8	3220	-582	1072
9	3625	-543	1070	9	3210	-517	1073
10	3661	-439	1071	10	3228	-503	1074
11	3686	-337	1071	11	3299	-500	1073
12	3703	-252	1070	12	3401	-485	1073
13	3723	-125	1070	13	3481	-476	1073
14	3735	-22	1071	14	3566	-499	1074
15	3735	-3	1071	15	3578	-484	1074
16	3727	95	1071	16	3546	-384	1074
17	3711	210	1071	17	3428	-222	1075
18	3691	314	1071	18	3364	-135	1075
19	3682	355	1071	19	3286	-28	1076
20	3658	451	1070	20	3200	60	1077
21	3613	571	1070	21	3053	142	1076
22	3556	626	1071	22	2980	293	1076
23	3507	673	1070	23	2994	384	1076
24	3464	741	1071	24	3047	389	1078
25	3432	827	1071	25	3041	472	1079

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	3410	848	1070	26	2929	491	1078
27	3330	882	1071	27	2917	536	1079
28	3280	894	1071	28	2983	606	1079
29	3212	909	1071	29	3030	659	1080
30	2400	917	1071	30	3028	711	1080
31	2303	911	1071	31	2999	793	1080
32	2206	907	1071	32	2982	814	1080
33	2031	908	1071	33	2783	756	1080
34	1796	910	1071	34	2566	844	1070
35	1591	912	1071	35	2449	888	1070
36	1396	915	1071	36	2386	934	1070
37	1246	914	1071	37	2358	971	1070
38	1223	913	1071	38	2276	913	1071
39	1156	911	1070	39	2203	891	1071
40	1023	906	1070	40	2036	895	1070
41	894	903	1071	41	1917	897	1070
42	755	902	1071	42	1722	899	1070
43	647	907	1071	43	1557	900	1071
44	573	909	1071	44	1368	902	1070
45	538	913	1070	45	1222	901	1070
46	504	913	1071	46	1211	905	1071
47	-299	906	1071	47	1082	902	1070
48	-363	886	1071	48	943	899	1071
49	-424	870	1070	49	828	896	1070
50	-543	801	1070	50	680	901	1070
51	-564	797	1070	51	601	905	1070
52	-631	729	1070	52	558	908	1070
53	-622	743	1070	53	504	910	1071
54	-680	640	1070	54	-304	905	1071
55	-729	491	1071	55	-304	905	1071
56	-755	375	1070	56	-346	890	1070
57	-777	221	1070	57	-400	876	1071
58	-789	53	1070	58	-463	852	1070
59	-787	-91	1070	59	-526	813	1070
60	-777	-220	1070	60	-565	795	1071
61	-753	-378	1070	61	-614	749	1070
62	-720	-519	1071	62	-682	635	1070
63	-679	-641	1070	63	-722	522	1071
64	-648	-703	1070	64	-749	404	1070
65	-599	-769	1070	65	-774	242	1070
66	-557	-803	1070	66	-785	106	1070

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
67	-528	-815	1070	67	-787	4	1070
68	-460	-857	1070	68	-788	-43	1071
69	-417	-874	1070	69	-780	-179	1071
70	-369	-887	1070	70	-761	-328	1071
71	-305	-908	1071	71	-735	-458	1070
72	505	-913	1070	72	-694	-602	1070
73	556	-912	1070	73	-607	-759	1071
74	569	-910	1071	74	-555	-805	1071
75	651	-907	1070	75	-520	-821	1070
76	626	-909	1071	76	-441	-868	1070
77	686	-905	1070	77	-366	-891	1070
78	737	-903	1071	78	-302	-912	1070
79	821	-902	1071	79	506	-915	1070
80	923	-904	1071	80	550	-915	1071
81	990	-906	1071	81	612	-911	1071
82	1034	-907	1070	82	772	-905	1070
83	1086	-909	1071	83	916	-906	1071
84	1126	-910	1071	84	1080	-909	1070
85	1187	-912	1070	85	1210	-911	1071
86	1278	-914	1070	86	1265	-914	1071
87	1396	-915	1071	87	1394	-912	1071
88	1470	-914	1070	88	1530	-908	1070
89	1545	-913	1070	89	1655	-906	1071
90	1596	-912	1071	90	1809	-900	1070
91	1675	-911	1070	91	1969	-886	1070
92	1824	-910	1071	92	2118	-894	1070
93	1914	-909	1071	93	2224	-919	1070
94	2084	-907	1070	94	2278	-931	1071
95	2156	-906	1071	95	2311	-916	1071
96	2212	-906	1071	96	2390	-874	1070
97	2273	-907	1071	97	2722	-916	1070
98	2323	-909	1071				
99	2355	-913	1071				
100	2379	-914	1071				
101	2400	-914	1071				
102	3216	-909	1070				

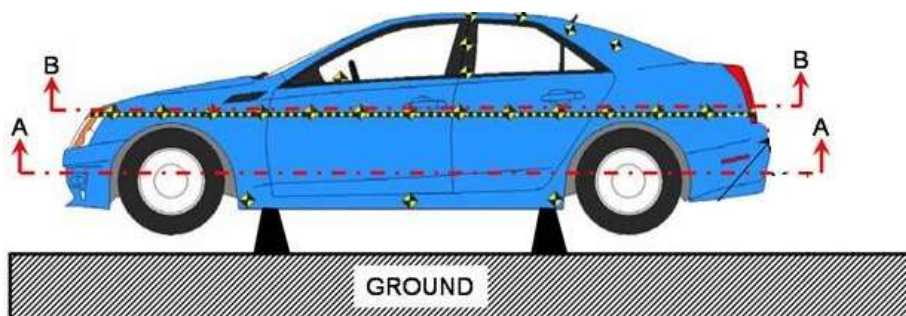
Note: See Appendix D for detailed procedure on how to measure vehicle exterior crush profile

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

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	2934	-911	779	1	2792	-910	779
2	3033	-906	780	2	2910	-919	780
3	3113	-901	779	3	3041	-918	779
4	3206	-879	779	4	3142	-903	780
5	3270	-864	779	5	3219	-876	780
6	3366	-827	779	6	3193	-598	781
7	3415	-789	780	7	3220	-578	782
8	3493	-682	780	8	3285	-568	782
9	3551	-573	779	9	3340	-546	782
10	3600	-485	780	10	3362	-406	783
11	3647	-409	779	11	3430	-358	783
12	3668	-322	780	12	3455	-316	783
13	3691	-196	780	13	3426	-258	783
14	3703	-81	779	14	3377	-199	784
15	3728	1	779	15	3303	-112	784
16	3701	92	779	16	3243	-30	784
17	3689	199	780	17	3249	152	786
18	3669	312	779	18	3194	276	787
19	3638	426	780	19	3172	372	787
20	3599	480	779	20	3142	453	787
21	3567	536	779	21	3048	447	787
22	3526	617	779	22	2966	443	787
23	3475	707	780	23	2930	483	787
24	3409	791	779	24	2827	560	788
25	3328	844	779	25	2791	670	788

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	3255	865	780	26	2706	753	789
27	3158	890	779	27	2594	778	788
28	3087	903	780	28	2508	806	789
29	2973	909	780	29	2403	844	779
30	2840	917	779	30	2388	891	780
31	2676	919	780	31	2370	927	780
32	2543	916	780	32	2354	961	779
33	2380	910	779	33	2330	900	779
34	2305	911	780	34	2297	913	779
35	2261	911	780	35	2279	923	779
36	2098	910	780	36	2169	922	780
37	1867	910	779	37	1998	920	779
38	1661	911	780	38	1834	918	780
39	1476	911	780	39	1659	917	779
40	1316	911	780	40	1485	916	779
41	1219	911	779	41	1328	914	779
42	1093	910	780	42	1213	913	779
43	926	907	779	43	1202	907	780
44	770	905	780	44	1099	906	780
45	709	904	780	45	988	906	779
46	562	907	780	46	867	904	779
47	416	918	779	47	710	902	779
48	324	919	780	48	619	903	780
49	220	918	779	49	514	910	779
50	42	920	779	50	402	918	779
51	-118	913	780	51	257	917	780
52	-249	905	780	52	220	916	779
53	-338	874	780	53	160	918	779
54	-470	817	779	54	65	918	779
55	-583	725	779	55	-53	917	779
56	-627	648	779	56	-146	910	779
57	-631	635	779	57	-240	904	779
58	-683	505	780	58	-282	895	780
59	-705	430	780	59	-391	851	780
60	-697	389	780	60	-482	812	779
61	-713	253	779	61	-557	755	780
62	-720	128	779	62	-602	693	780
63	-718	66	779	63	-626	649	780
64	-718	-58	779	64	-630	636	779
65	-718	-110	780	65	-662	563	779
66	-717	-203	780	66	-696	462	780
67	-700	-354	779	67	-707	416	779

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
68	-698	-394	779	68	-696	373	780
69	-707	-423	779	69	-713	249	779
70	-680	-516	779	70	-718	153	779
71	-646	-605	779	71	-718	112	779
72	-629	-642	779	72	-718	8	780
73	-624	-656	779	73	-718	-53	780
74	-583	-725	780	74	-721	-119	780
75	-514	-793	779	75	-717	-198	780
76	-416	-843	780	76	-708	-302	779
77	-338	-877	780	77	-697	-382	780
78	-272	-902	779	78	-706	-420	780
79	-190	-911	779	79	-686	-499	780
80	-123	-914	779	80	-648	-602	780
81	-7	-919	780	81	-630	-641	780
82	182	-921	780	82	-599	-701	780
83	331	-918	779	83	-520	-789	780
84	478	-914	779	84	-395	-853	779
85	619	-904	780	85	-288	-899	779
86	613	-905	780	86	-152	-915	779
87	683	-904	779	87	-5	-922	779
88	761	-904	779	88	148	-923	780
89	870	-906	780	89	173	-921	780
90	960	-908	780	90	275	-920	780
91	1035	-909	779	91	399	-920	779
92	1116	-910	780	92	609	-905	779
93	1175	-911	780	93	755	-905	780
94	1236	-910	780	94	930	-909	780
95	1307	-911	780	95	1075	-911	779
96	1399	-911	780	96	1201	-913	779
97	1502	-911	780	97	1327	-916	779
98	1608	-910	780	98	1488	-918	780
99	1741	-910	779	99	1642	-919	779
100	1862	-909	779	100	1827	-920	779
101	1988	-908	780	101	2044	-923	780
102	2103	-908	779	102	2205	-919	779
103	2231	-909	779	103	2286	-925	779
104	2292	-909	779	104	2332	-890	779
105	2408	-913	780	105	2445	-898	779
106	2521	-916	779	106	2581	-911	779
107	2641	-919	780	107	2715	-908	779
108	2823	-917	779				

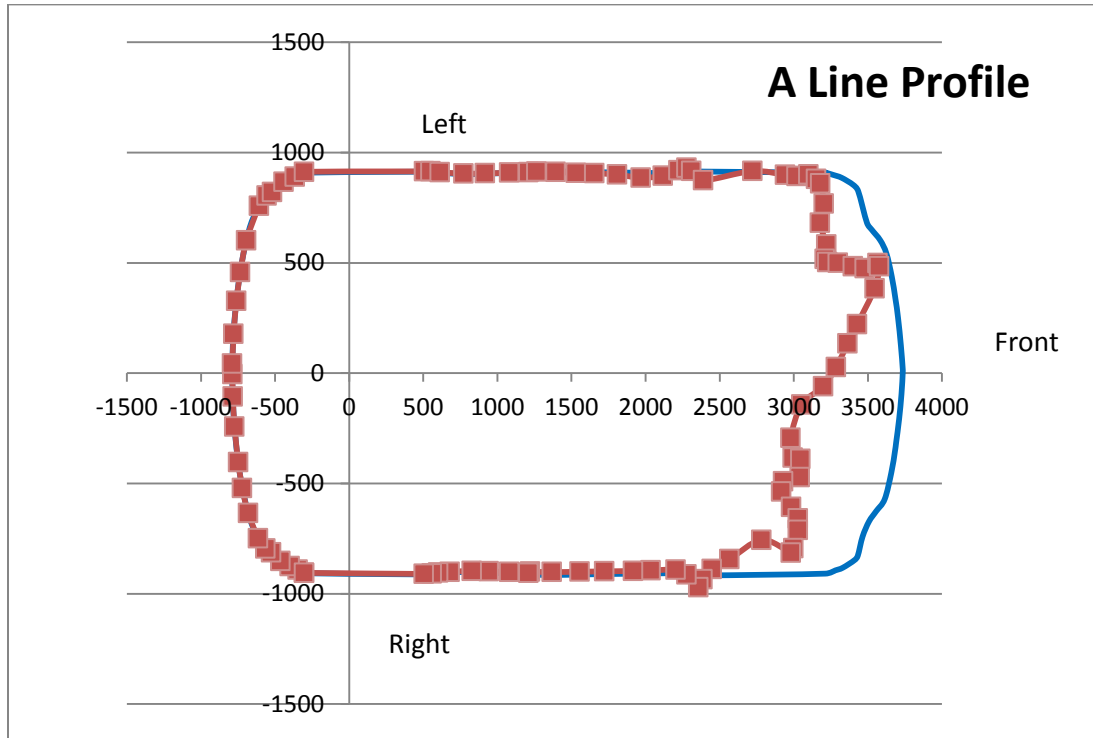
Note: See Appendix D for detailed procedure on how to measure vehicle exterior crush profile

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

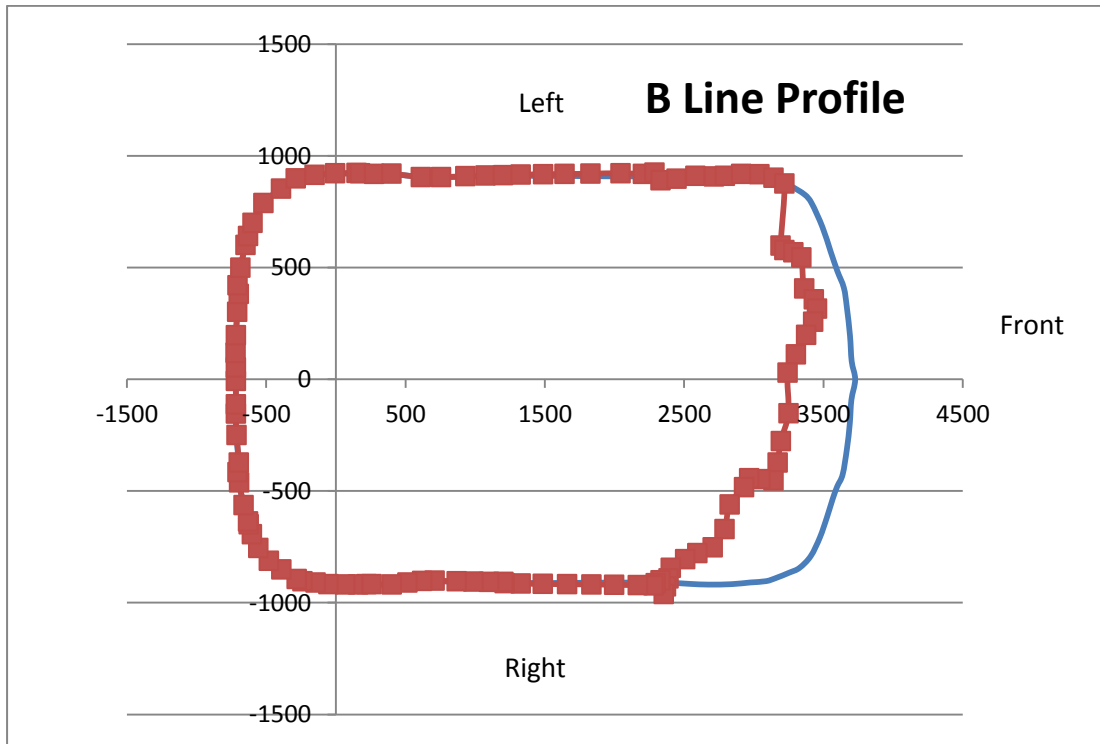
Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A



SECTION B-B



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

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	B10	3565	-482	1044	3562	-436	995	-3	46	-49
	B11	3589	-366	1045	3521	-329	964	-68	37	-81
	B12	3611	-247	1045	3477	-222	932	-134	25	-113
	B13	3623	-126	1045	3422	-117	901	-201	9	-144
	B14	3627	-4	1046	3361	-16	870	-266	-12	-176
	B15	3624	119	1044	3293	80	837	-331	-39	-207
	B16	3612	238	1045	3226	162	815	-386	-76	-230
	B17	3590	359	1045	3182	275	816	-408	-84	-229
	B18	3566	477	1046	3148	390	817	-418	-87	-229
Center Structural Bumper Beam	B1	3565	-483	1071	3561	-430	1021	-4	53	-50
	B2	3590	-363	1070	3519	-320	987	-71	43	-83
	B3	3611	-245	1068	3475	-214	954	-136	31	-114
	B4	3622	-126	1071	3419	-112	926	-203	14	-145
	B5	3626	-2	1077	3356	-8	900	-270	-6	-177
	B6	3622	120	1070	3288	86	861	-334	-34	-209
	B7	3612	240	1071	3215	161	838	-397	-79	-233
	B8	3590	360	1069	3172	273	837	-418	-87	-232
	B9	3566	477	1069	3138	387	838	-428	-90	-231
Upper Radiator Support	1	3492	-424	767	3418	-396	612	-74	28	-155
	2	3538	-317	769	3411	-290	565	-127	27	-204
	3	3541	-211	771	3339	-210	554	-202	1	-217
	4	3592	-106	774	3300	-100	540	-292	6	-234
	5	3599	-1	779	3229	-20	548	-370	-19	-231
	6	3588	107	772	3144	44	555	-444	-63	-217
	7	3539	213	769	3034	77	582	-505	-136	-187
	8	3537	318	769	2965	153	593	-572	-165	-176
	9	3490	424	765	2862	203	598	-628	-221	-167

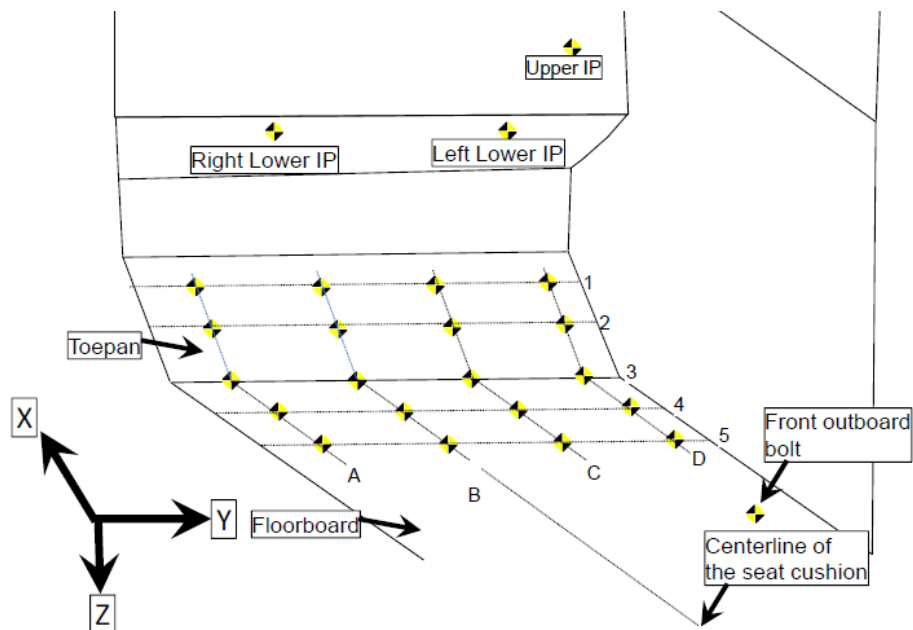
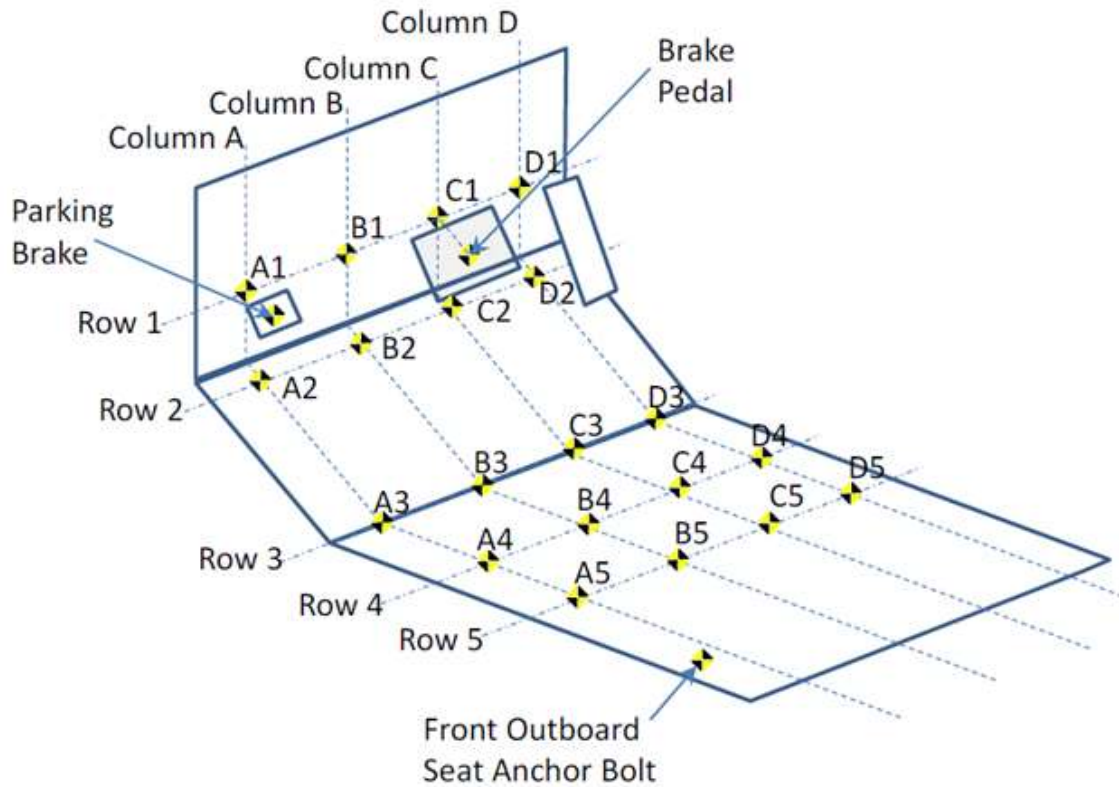
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014



Note: See Appendix D for toe pan measuring procedure

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

DRIVER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2422	-580	1103	2425	-604	1108	3	-24	5
B1	2514	-480	1104	2518	-508	1111	4	-28	7
C1	2567	-331	1105	2562	-354	1105	-5	-23	0
D1	2558	-177	1104	2498	-256	1083	-60	-79	-21
A2	2410	-580	1180	2409	-604	1185	-1	-24	5
B2	2488	-479	1180	2489	-502	1185	1	-23	5
C2	2486	-329	1181	2488	-353	1187	2	-24	6
D2	2490	-177	1182	2480	-209	1172	-10	-32	-10
A3	2356	-579	1267	2357	-602	1271	1	-23	4
B3	2340	-480	1267	2342	-504	1273	2	-24	6
C3	2345	-329	1268	2349	-352	1276	4	-23	8
D3	2340	-178	1267	2345	-201	1279	5	-23	12
A4	2243	-581	1299	2242	-603	1303	-1	-22	4
B4	2241	-479	1301	2242	-502	1307	1	-23	6
C4	2241	-328	1303	2243	-350	1312	2	-22	9
D4	2241	-179	1298	2246	-201	1309	5	-22	11
A5	2141	-580	1303	2141	-600	1308	0	-20	5
B5	2142	-481	1303	2144	-502	1309	2	-21	6
C5	2139	-330	1305	2142	-350	1313	3	-20	8
D5	2138	-180	1300	2143	-202	1310	5	-22	10
Brake Pedal	2280	-331	1105	2264	-375	1129	-16	-44	24
Driver IP Left	2031	-519	804	2043	-525	802	12	-6	-2
Driver IP Right	2028	-219	804	2051	-225	803	23	-6	-1
DOLP	2047	-618	806	2054	-624	803	7	-6	-3
Steering Column	1799	-370	555	1844	-360	566	45	10	11
Front Outboard Bolt	1752	-610	1173	1751	-623	1176	-1	-13	3
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 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

PASSENGER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2548	221	1102	2483	177	1079	-65	-44	-23
B1	2569	371	1104	2472	305	1069	-97	-66	-35
C1	2460	522	1103	2394	469	1079	-66	-53	-24
D1	2405	622	1102	2351	574	1083	-54	-48	-19
A2	2480	220	1179	2446	180	1173	-34	-40	-6
B2	2489	372	1180	2450	330	1158	-39	-42	-22
C2	2443	523	1181	2409	479	1155	-34	-44	-26
D2	2383	621	1181	2358	582	1162	-25	-39	-19
A3	2348	222	1266	2314	192	1261	-34	-30	-5
B3	2338	370	1266	2314	339	1258	-24	-31	-8
C3	2353	521	1267	2336	488	1249	-17	-33	-18
D3	2348	622	1266	2339	589	1250	-9	-33	-16
A4	2250	222	1301	2227	198	1313	-23	-24	12
B4	2251	371	1301	2232	344	1301	-19	-27	0
C4	2249	522	1302	2234	494	1291	-15	-28	-11
D4	2248	621	1303	2238	594	1287	-10	-27	-16
A5	2151	221	1303	2129	200	1314	-22	-21	11
B5	2150	370	1304	2131	348	1313	-19	-22	9
C5	2151	521	1305	2137	499	1307	-14	-22	2
D5	2153	620	1305	2144	598	1304	-9	-22	-1
Pass IP Left	2010	223	816	2026	214	810	16	-9	-6
Pass IP Right	2047	523	814	2042	515	810	-5	-8	-4
PORP	2055	622	804	2042	615	800	-13	-7	-4
Front Outboard Bolt	1751	610	1175	1752	602	1178	1	-8	3

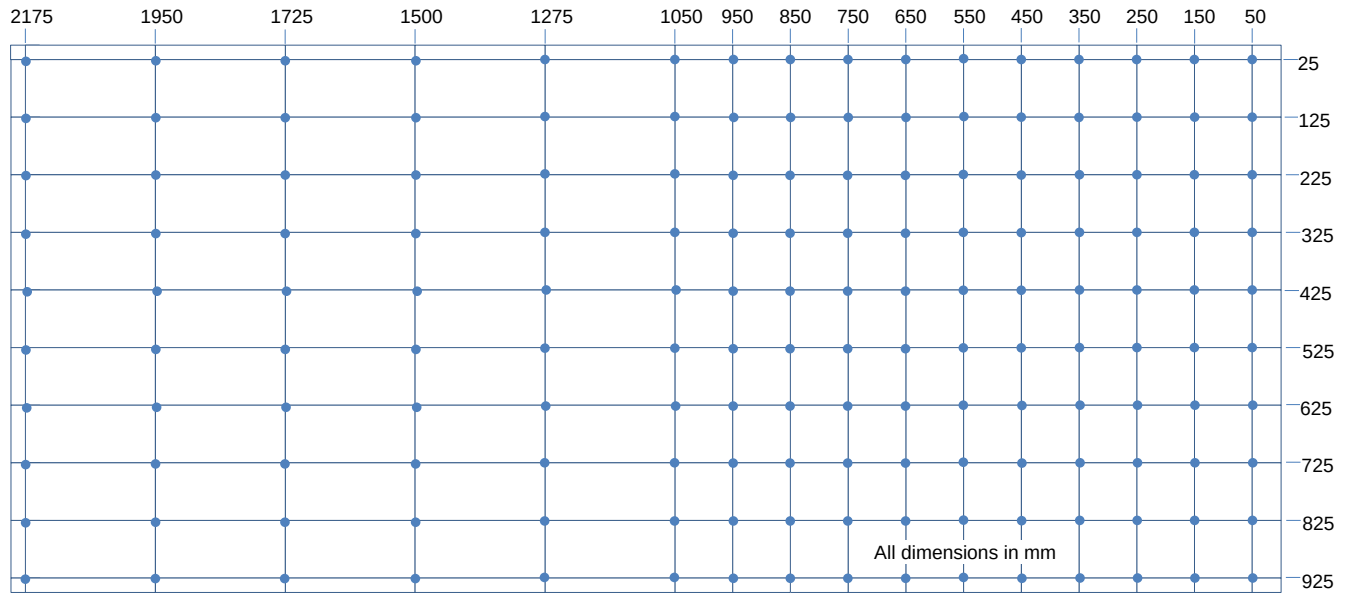
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014



	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
R10	25.1	10.2	5.6	3.6	0.6	-0.4	4.4	4.5	-0.7	-0.7	-0.7	-0.6	-0.5	-0.9	-1.6	-2.7
R9	48.7	23.3	7.8	7.1	1.3	12.7	32.0	16.0	0.8	-0.5	-0.8	-0.9	-1.0	-1.2	-1.5	-2.0
R8	95.2	73.8	56.1	26.9	-0.2	9.6	13.1	4.9	6.9	-0.4	-0.6	-0.9	-1.0	-1.0	-1.4	-2.0
R7	127.1	110.9	93.3	79.0	10.6	4.4	3.1	1.5	5.8	-0.4	-0.7	-0.6	-0.8	-0.9	-1.3	-1.8
R6	185.0	167.6	157.5	137.3	21.9	5.1	-0.2	4.4	0.0	-0.5	-0.4	-0.7	-0.7	-1.1	-1.2	-1.6
R5	229.9	242.7	266.9	236.3	39.6	5.3	18.6	57.3	14.0	-0.3	-0.3	-0.4	-0.7	-0.9	-0.9	-1.3
R4	190.7	205.8	212.2	80.8	34.7	17.2	42.3	145.0	32.4	0.1	-0.2	-0.3	-0.3	-0.5	-0.6	-1.1
R3	169.4	154.6	182.7	93.5	25.8	32.0	69.5	145.1	54.7	0.1	0.1	0.0	-0.1	-0.3	-0.6	-0.9
R2	150.0	120.5	73.4	32.2	62.8	59.5	105.1	177.4	75.4	16.8	0.2	0.1	0.0	0.0	-0.2	-0.8
R1	115.2	77.9	55.7	38.9						85.9	100.0	140.6	0.0	0.0	-0.2	-1.6

*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 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014

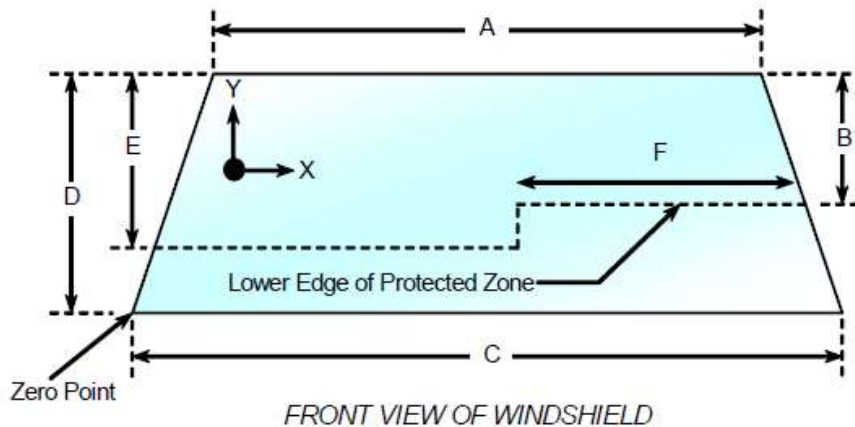
Please provide windshield mounting details. A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2240	2240	100%
Right Side	2240	1565	69.9%
Total	4480	3805	84.9%



Item	Units	Value
A	mm	1250
B	mm	518
C	mm	1510
D	mm	860
E	mm	527
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: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Ambient Temperature at Test Vehicle Time of Impact: 20° C

Test Time: 5:00 PM

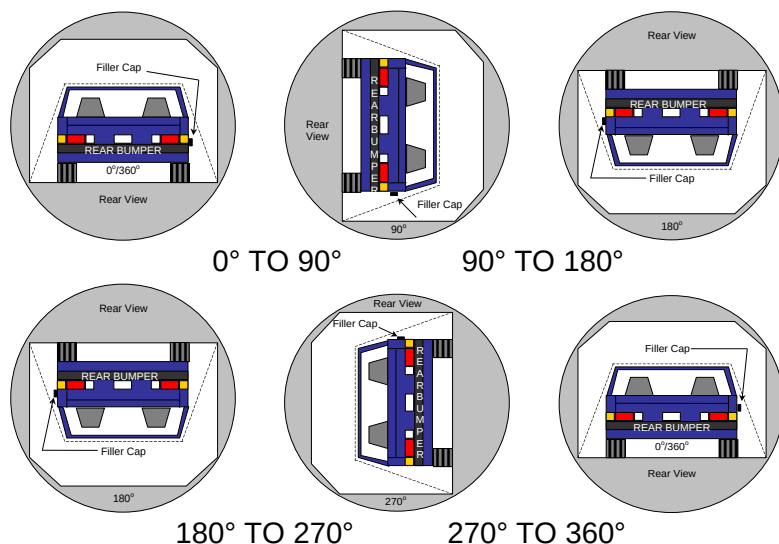
Stoddard Solvent Spillage Measurements

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 Mazda CX-5 SUV
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
 Test Date: 10/15/2014



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°	66	300	366
90° to 180°	64	300	364
180° to 270°	62	300	362
270° to 360°	67	300	367

FMVSS 301 SPILLAGE TABLE

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

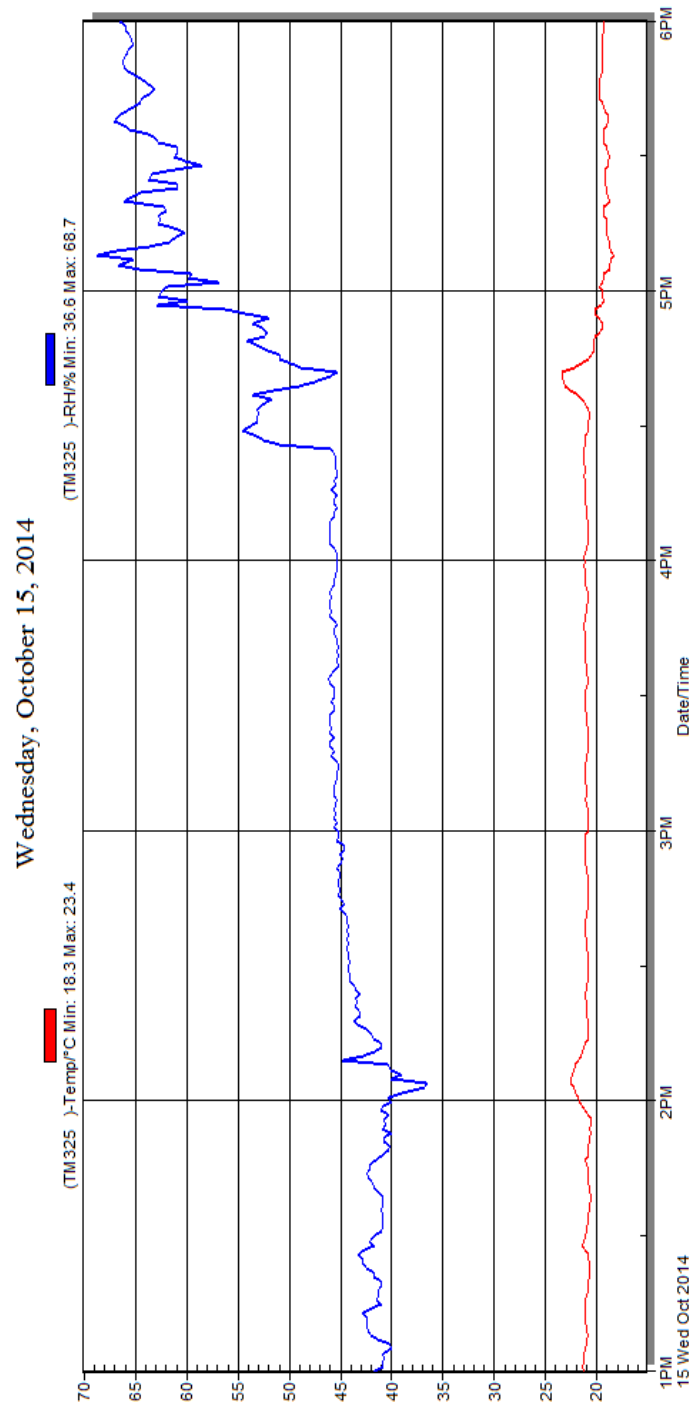
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2014 Mazda CX-5 SUV
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145402
Test Date: 10/15/2014



Temperature Stabilization Chart/Data

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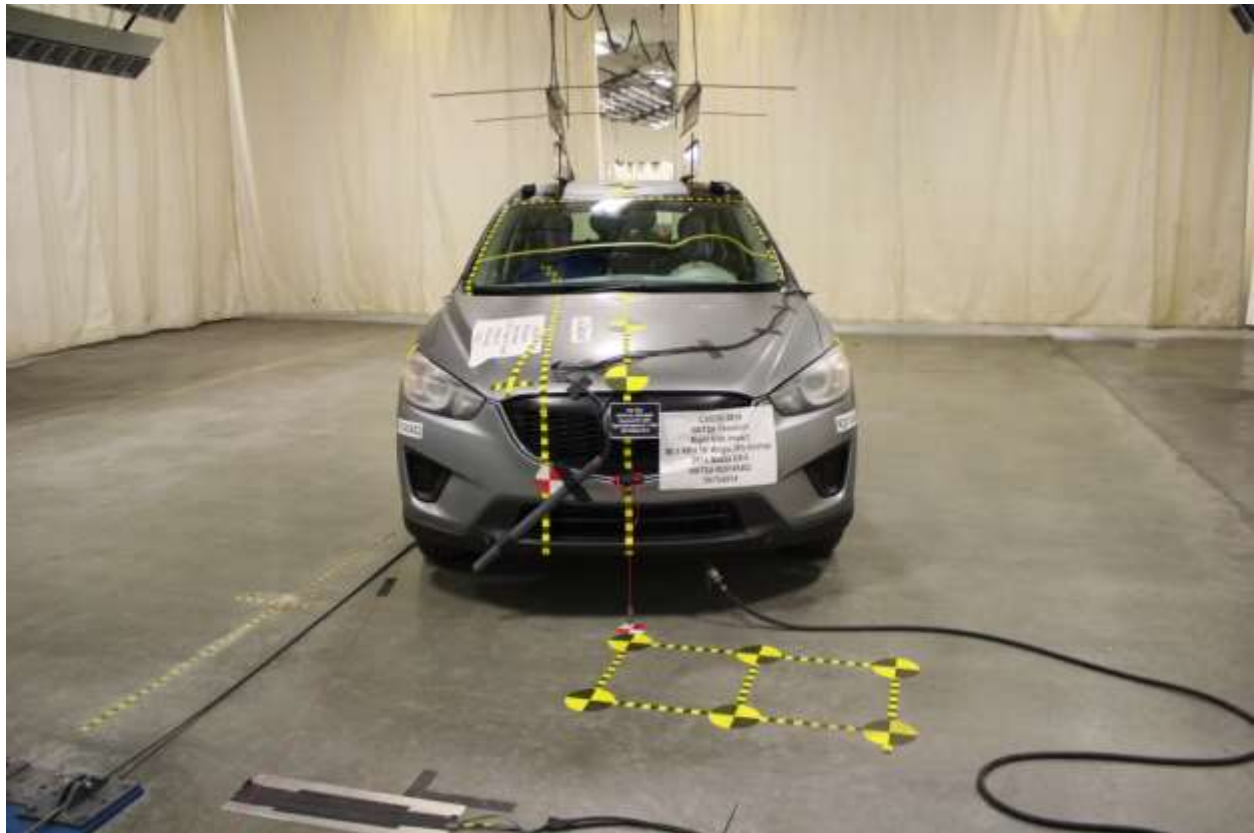
No. 002 As Delivered Left Rear 3-4 View of Test Vehicle



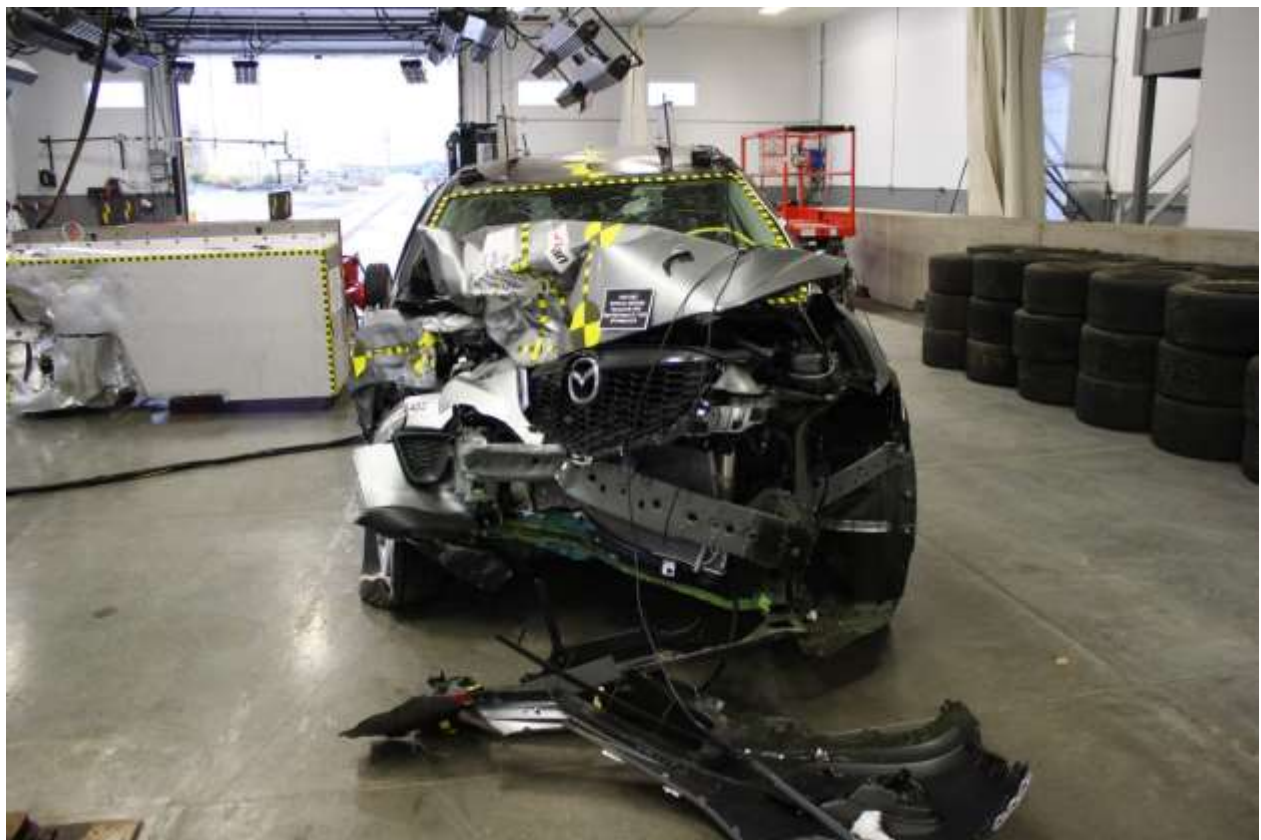
No. 003 Test Vehicle Certification Label



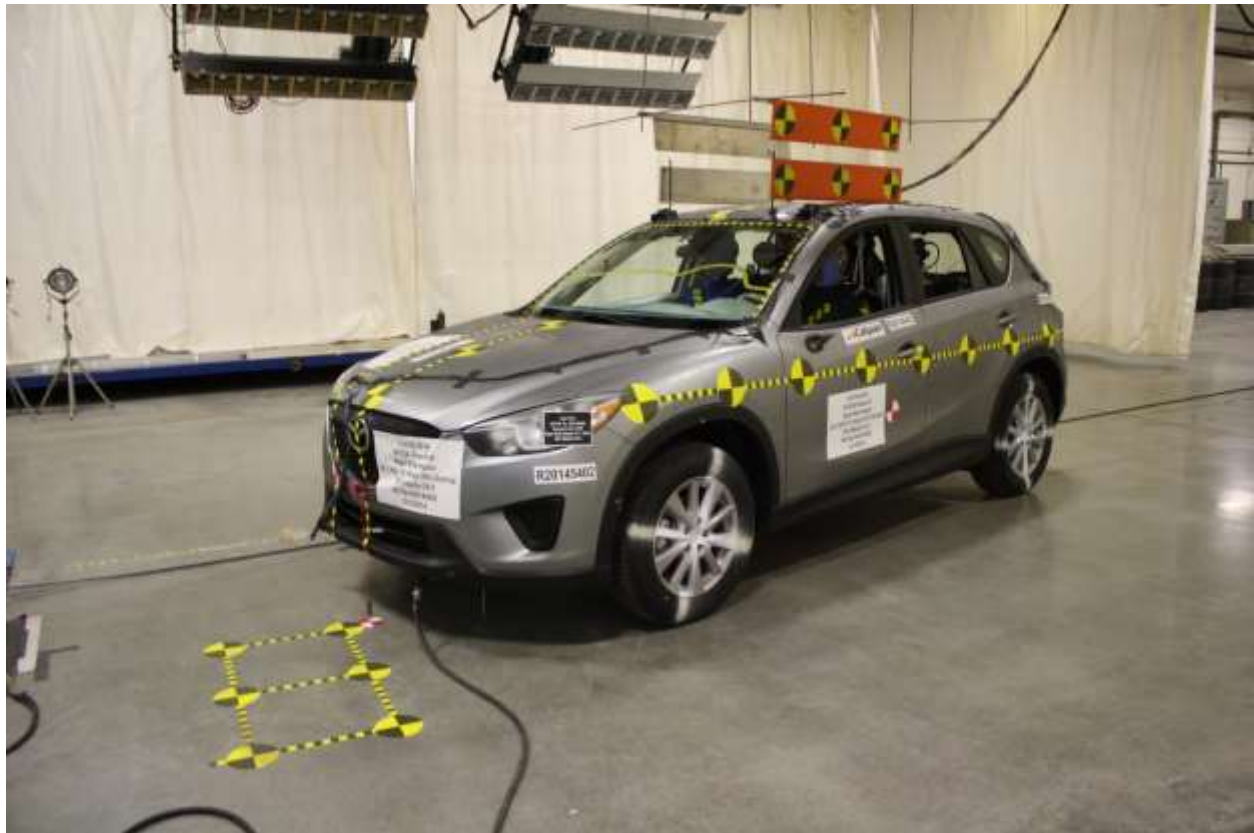
No. 004 Test Vehicle Tire Placard



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



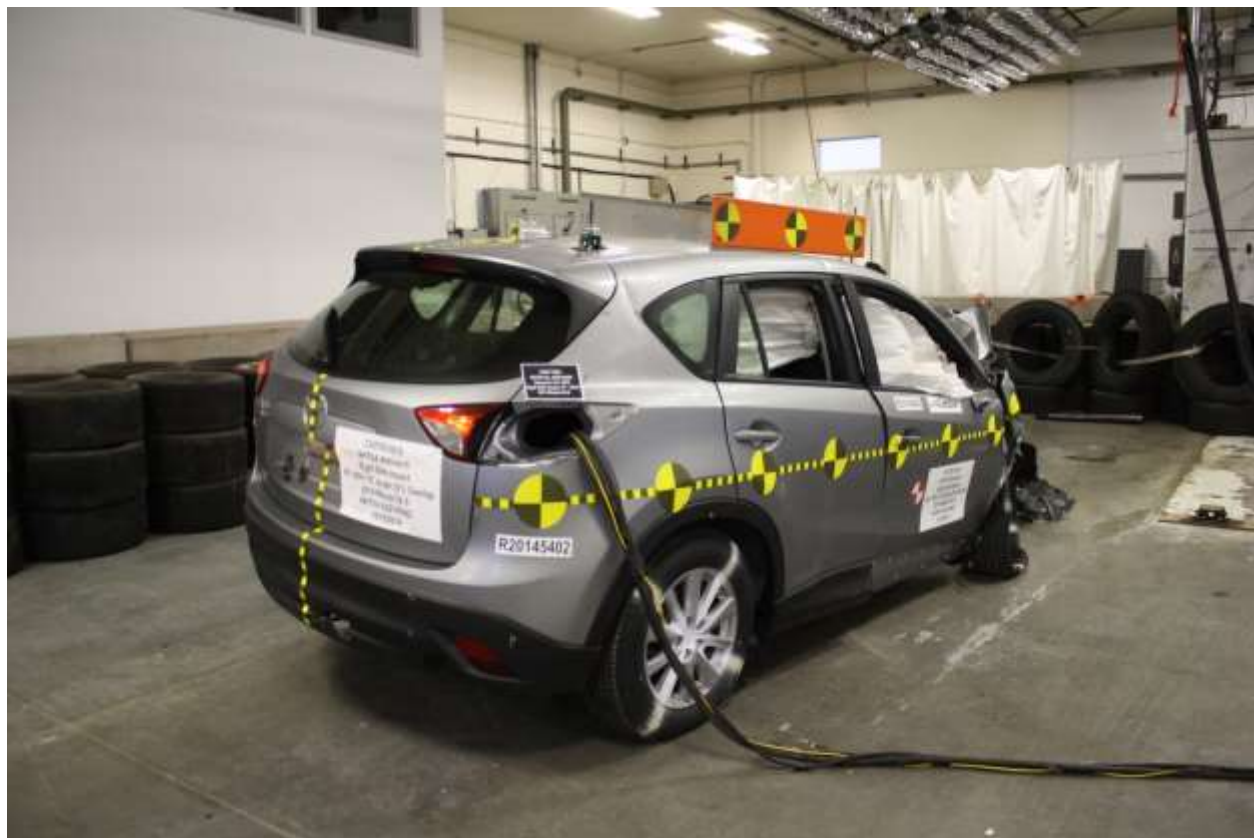
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No. 027 Post-Test Vehicle Overhead View



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



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



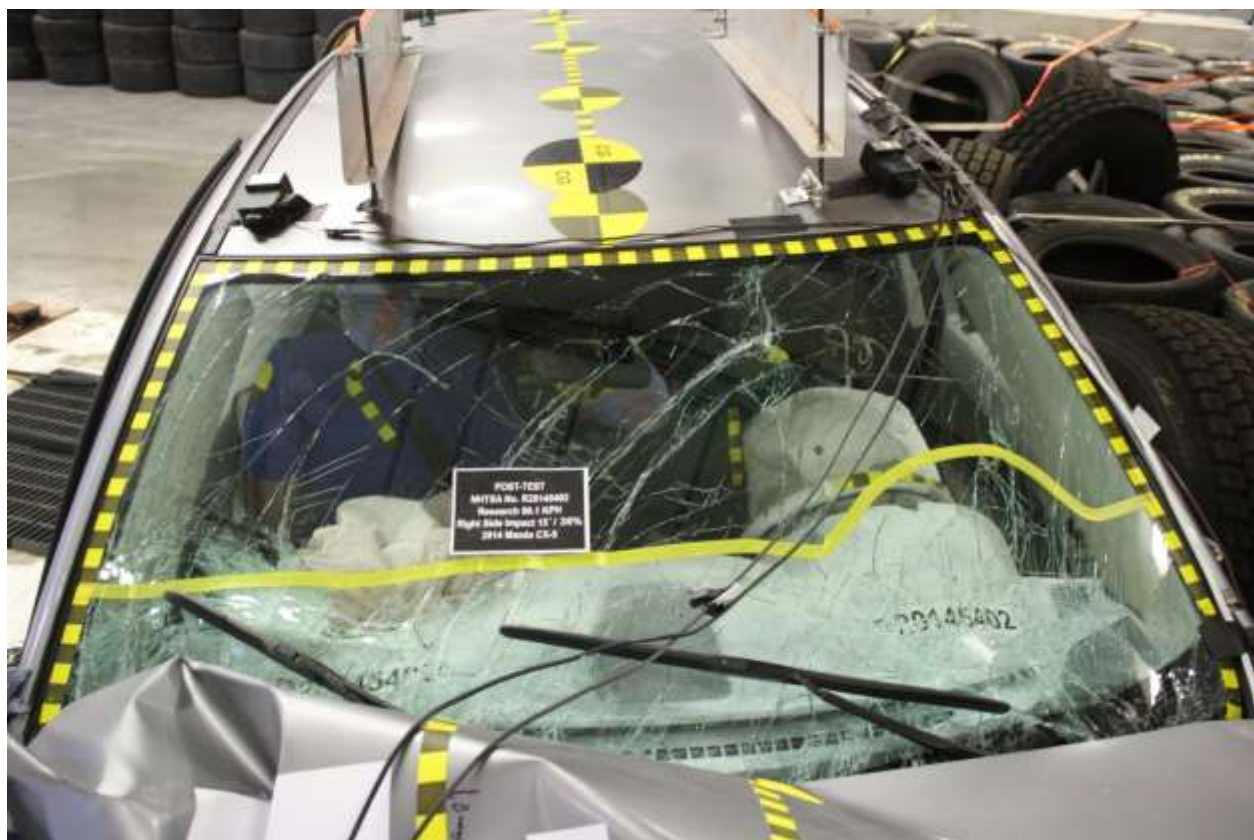
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No. 034 Pre-Test View of Driver Inner Door Panel



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



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



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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



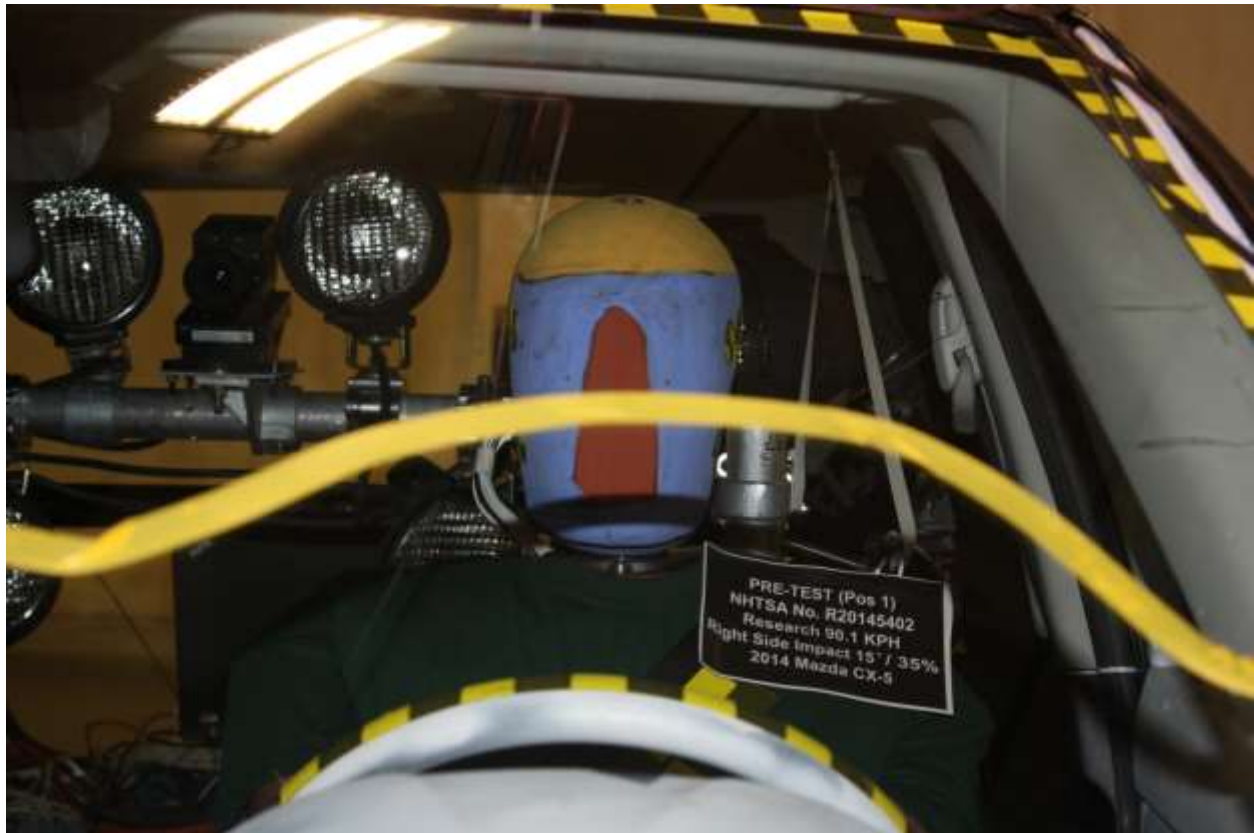
No. 049 Post-Test View of Driver Floor pan at Left sill level, w/o carpet



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



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No. 053 Post-Test Driver Front Windshield View



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



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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



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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



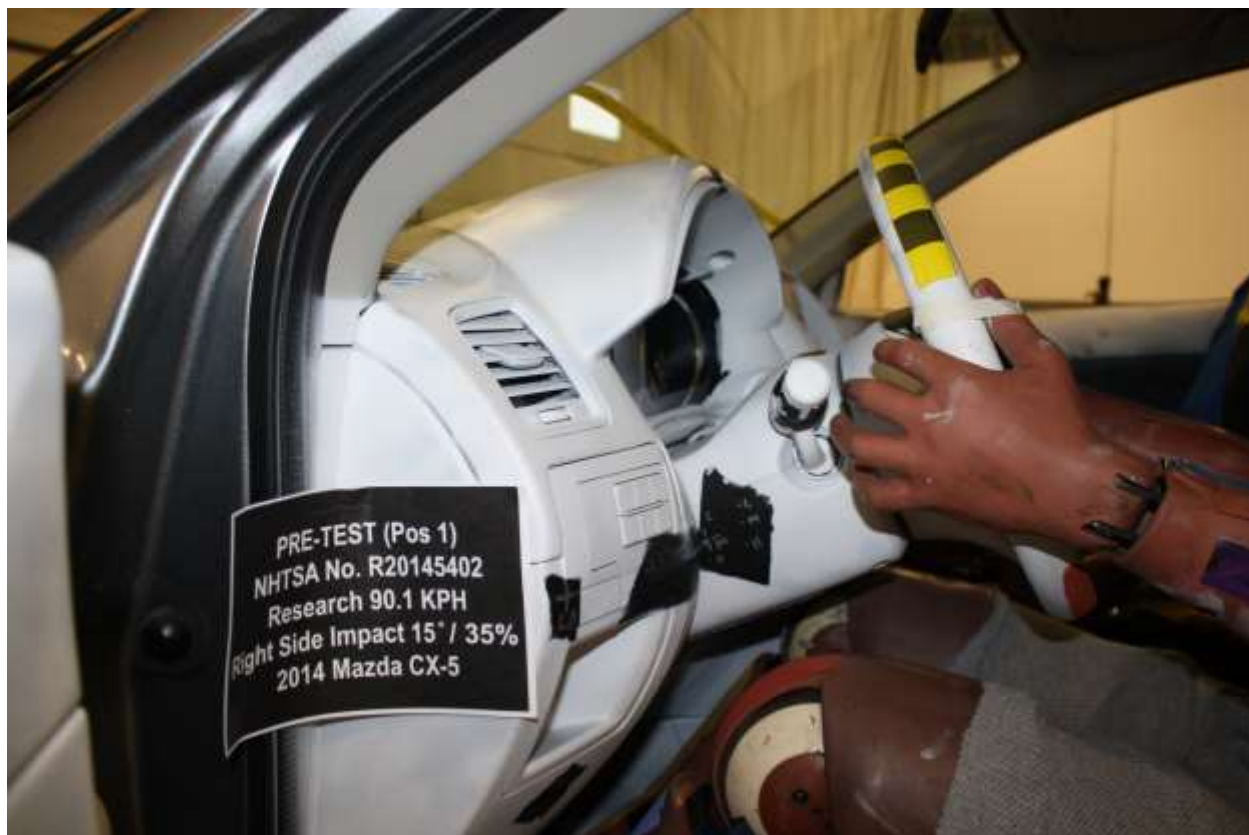
No. 074 Post-Test View of Driver Left Knee and Bolster



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

Photo Not Applicable

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

Photo Not Applicable

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

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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



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



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



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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



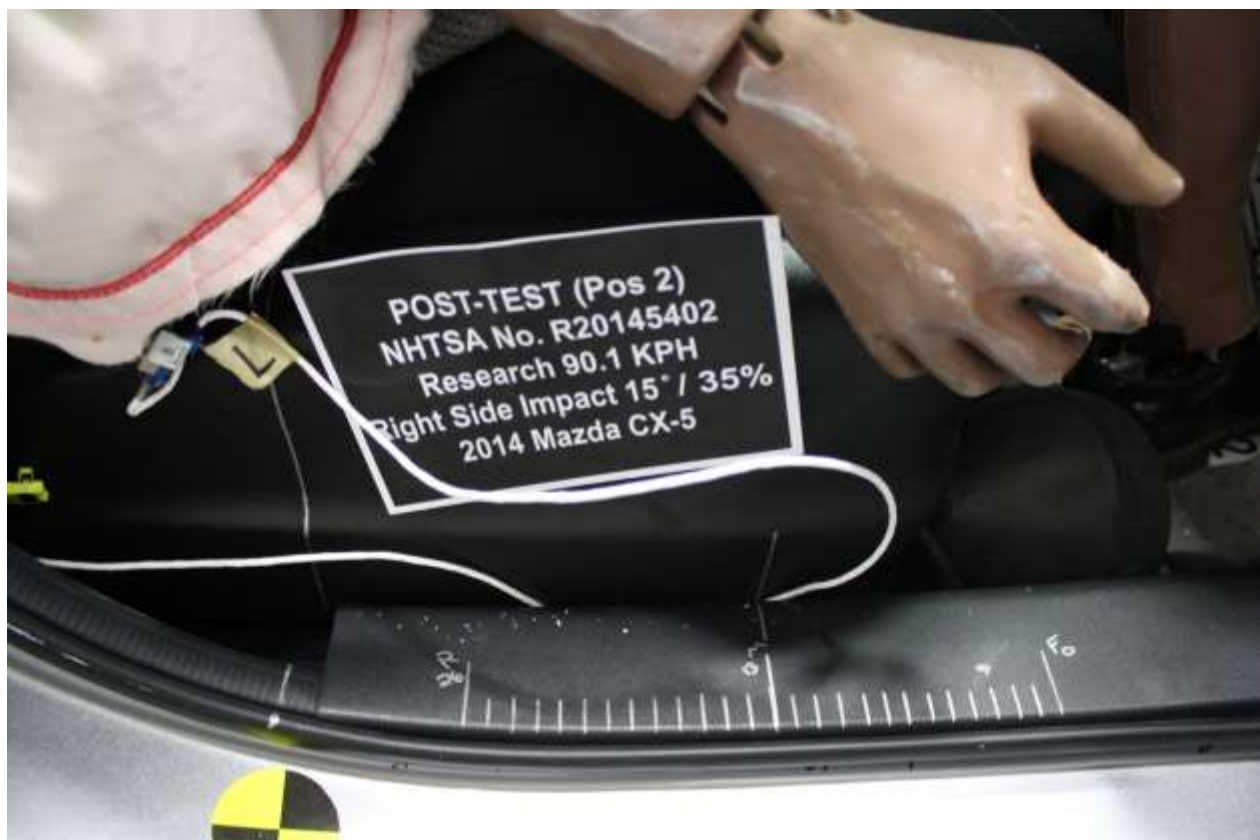
No. 104 Pre-Test View of Passenger Door Clearance



No. 105 Post-Test View of Passenger Door Clearance



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



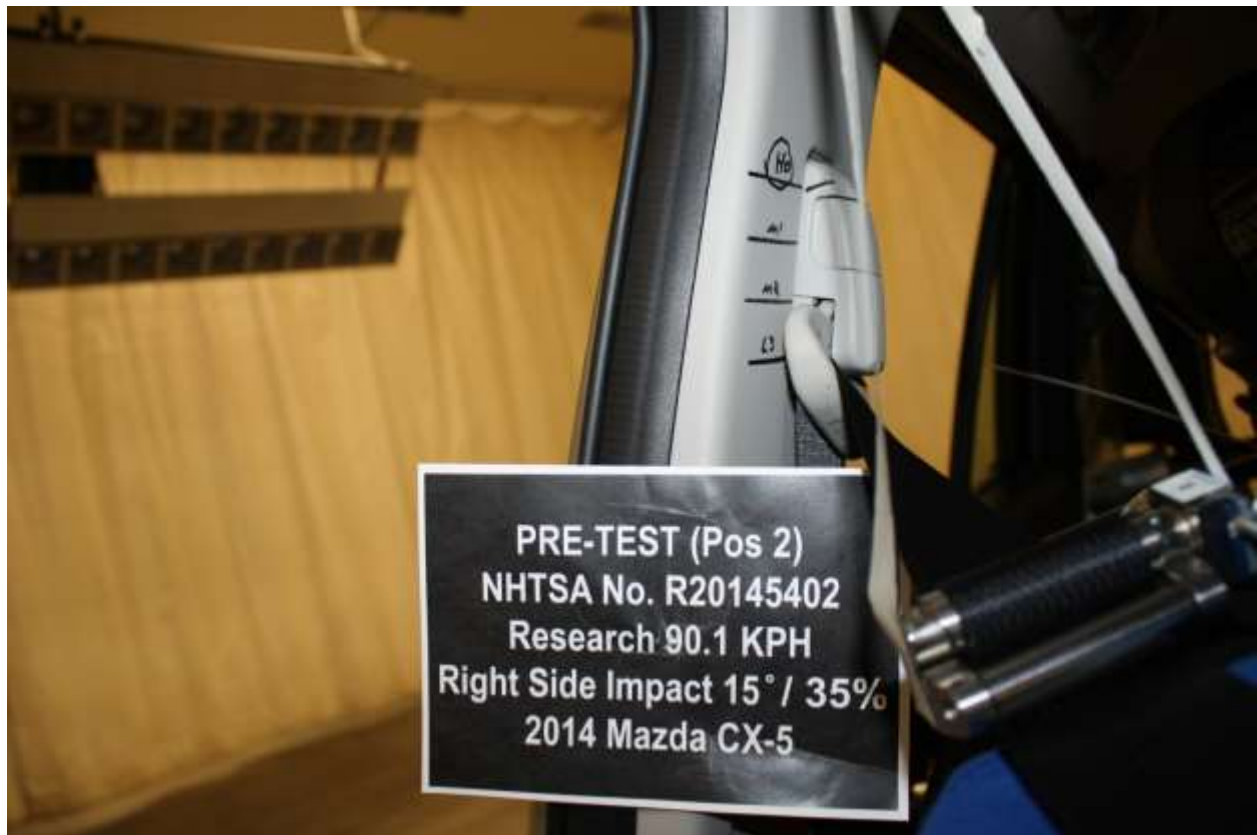
No. 107 Post-Test Passenger Seat Fore-Aft Markings



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



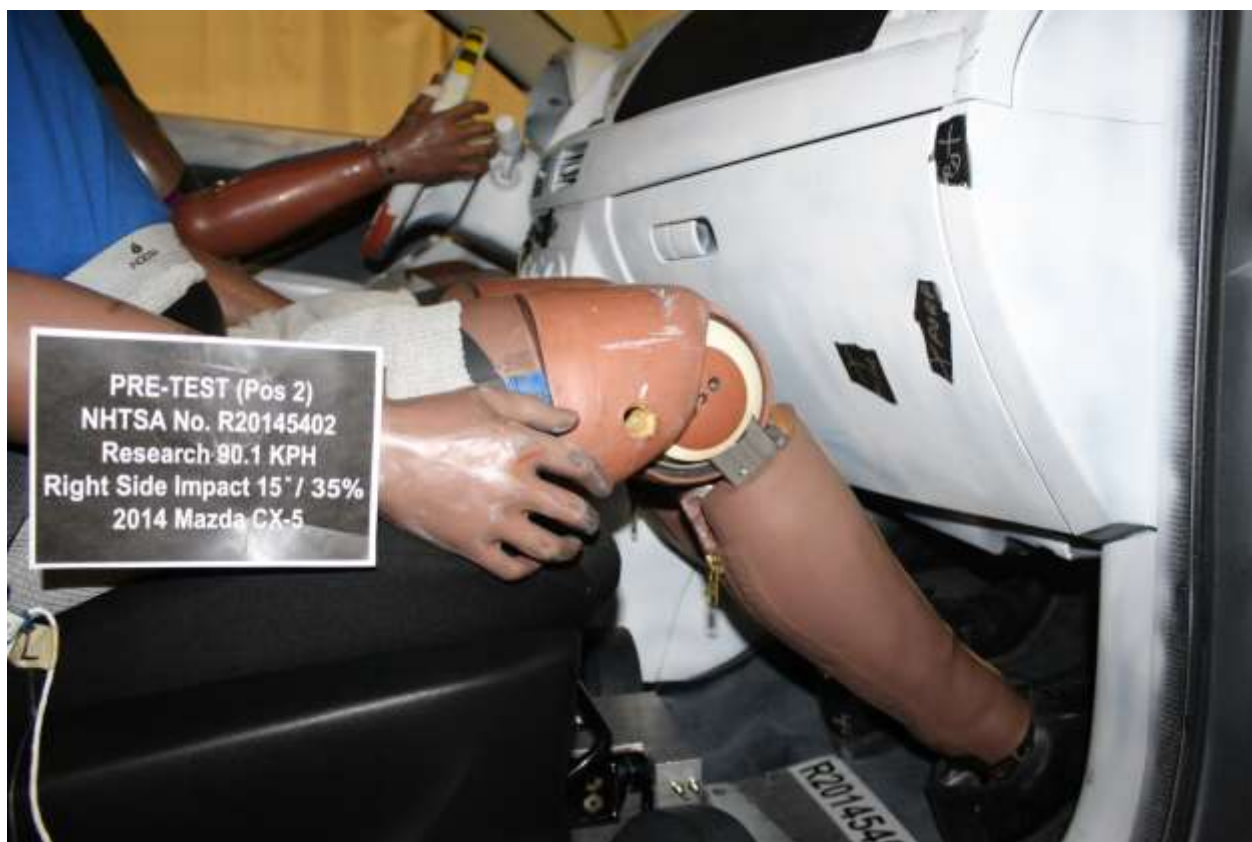
No. 111 Post-Test Passenger Adjustable D-ring



No. 112 Pre-Test View of Passenger Feet



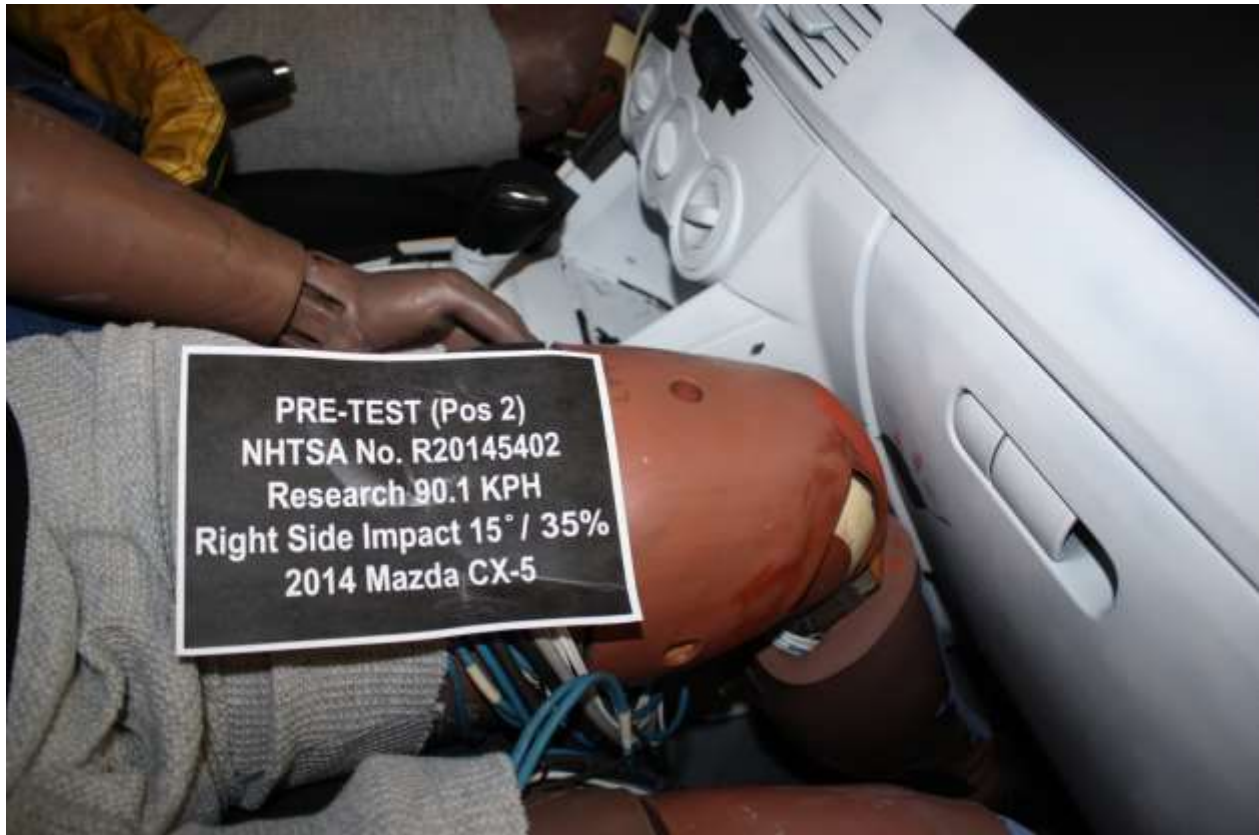
No. 113 Post-Test View of Passenger Feet



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



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



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

Photo Not Applicable

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

Photo Not Applicable

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



No. 122 Post-Test Passenger Contact With Glovebox



No. 123 Pre-Test Ballast Locations



No. 124 Post-Test Speed Trap Readout



No. 125 Pre-Test View of Fuel Filler Cap



No. 126 Post-Test View of Fuel Filler Cap



No. 127 Pre-Test Engine Compartment View



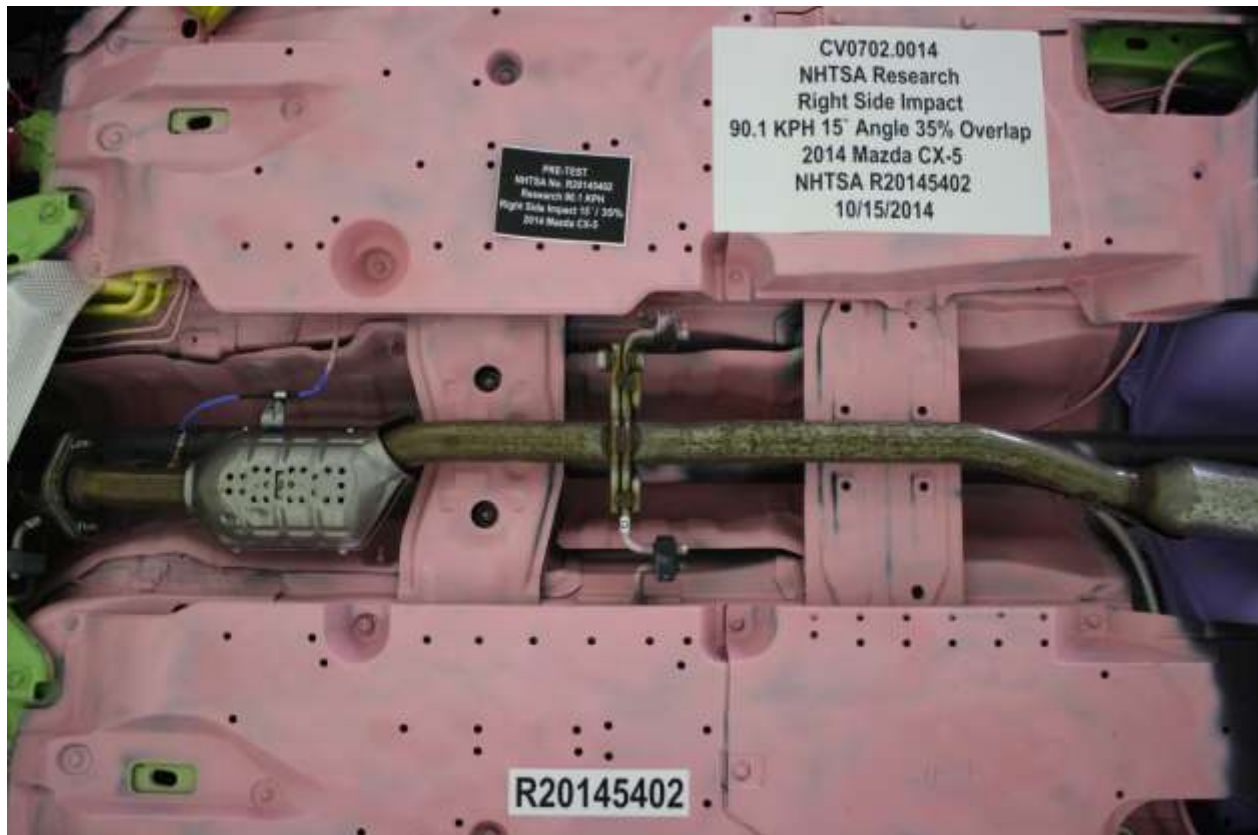
No. 128 Post-Test Engine Compartment View



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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



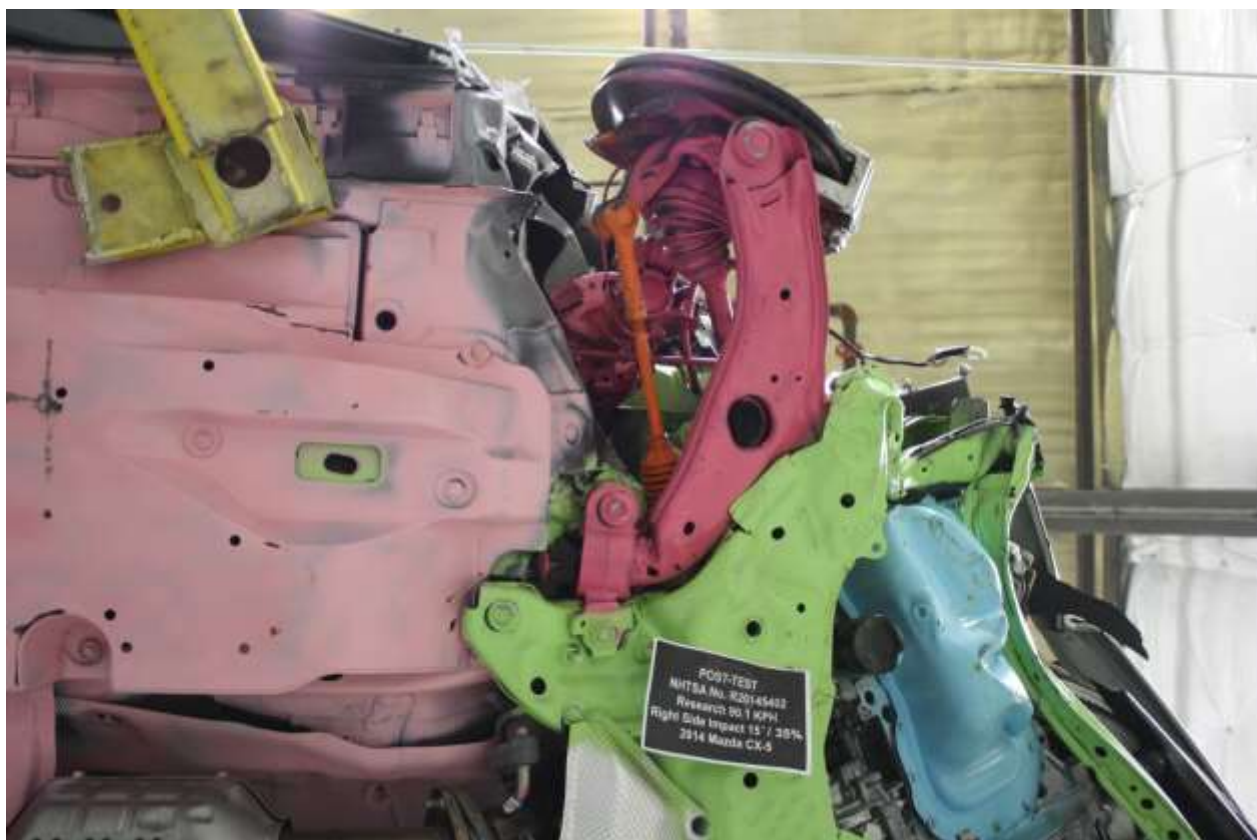
No. 138 Post-Test Bumper to Rail Attachments and Crush Initiators



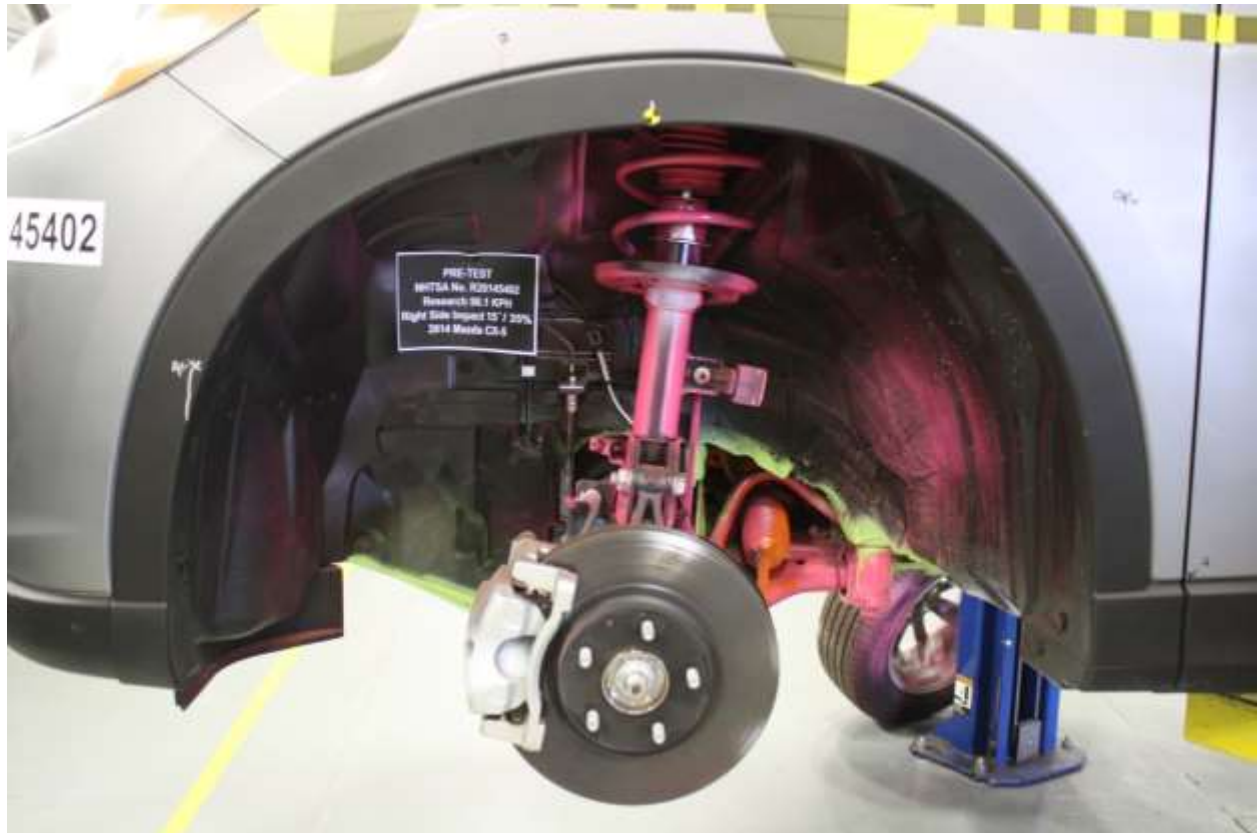
No. 139 Post-Test View of Front Sub-Frame Deformation



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



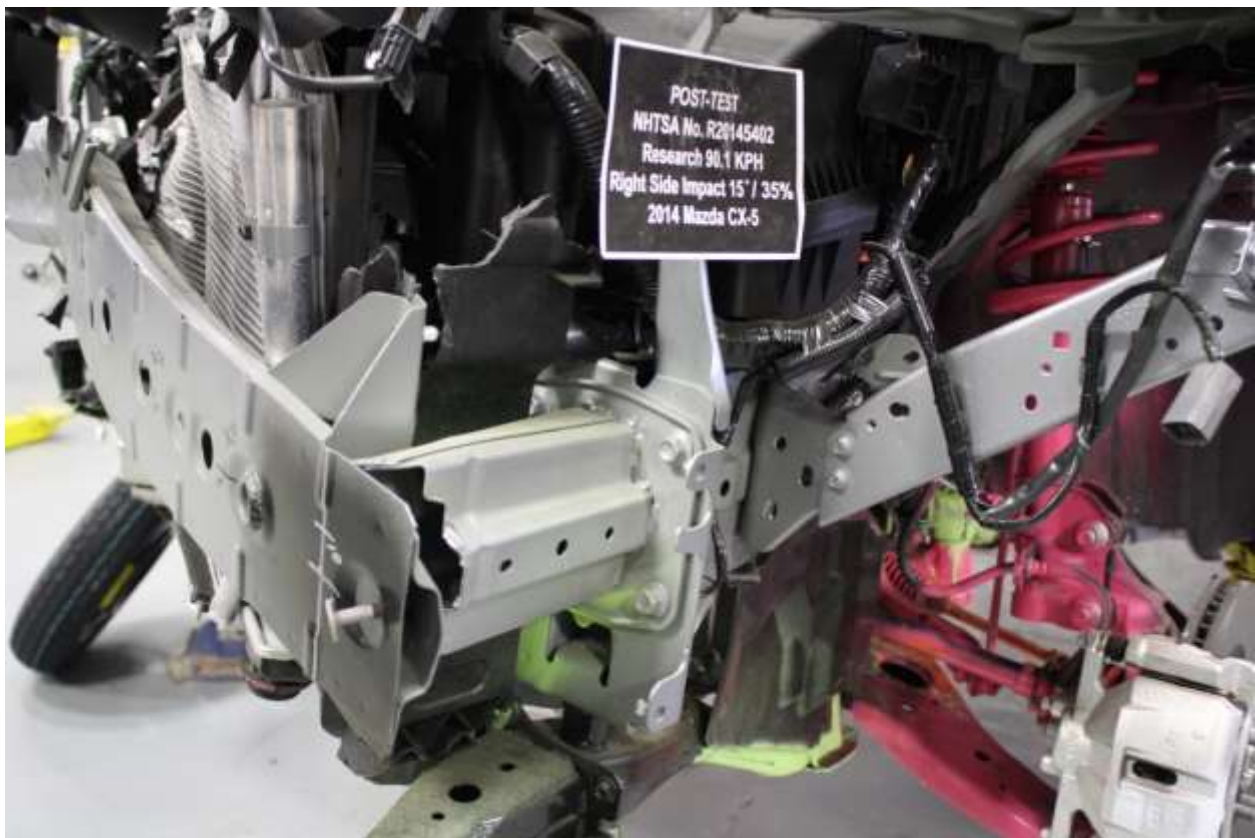
No. 144 Post-Test Side View of Front Driver Wheel Well w/ Tire Removed



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



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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



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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



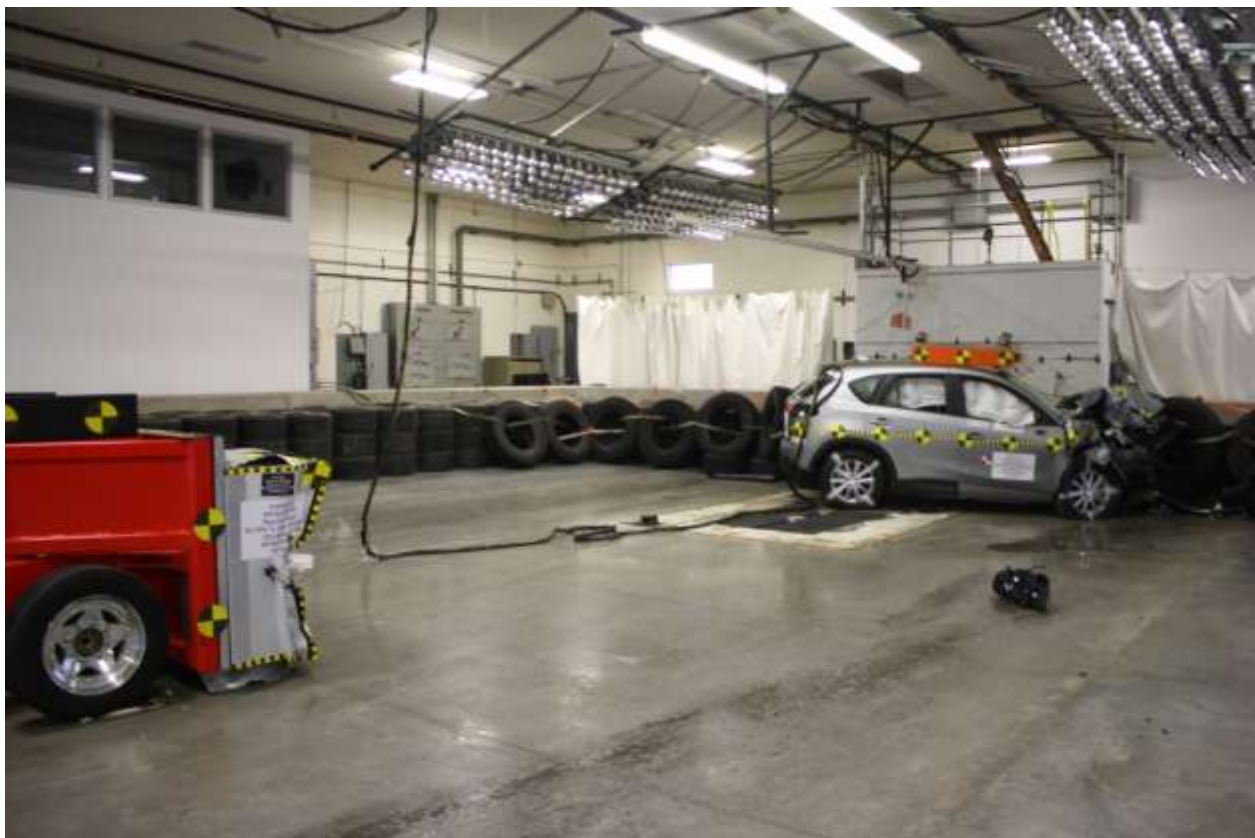
No. 168 Pre-Test Front View of RMDB



No. 169 Post-Test Front View of RMDB



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



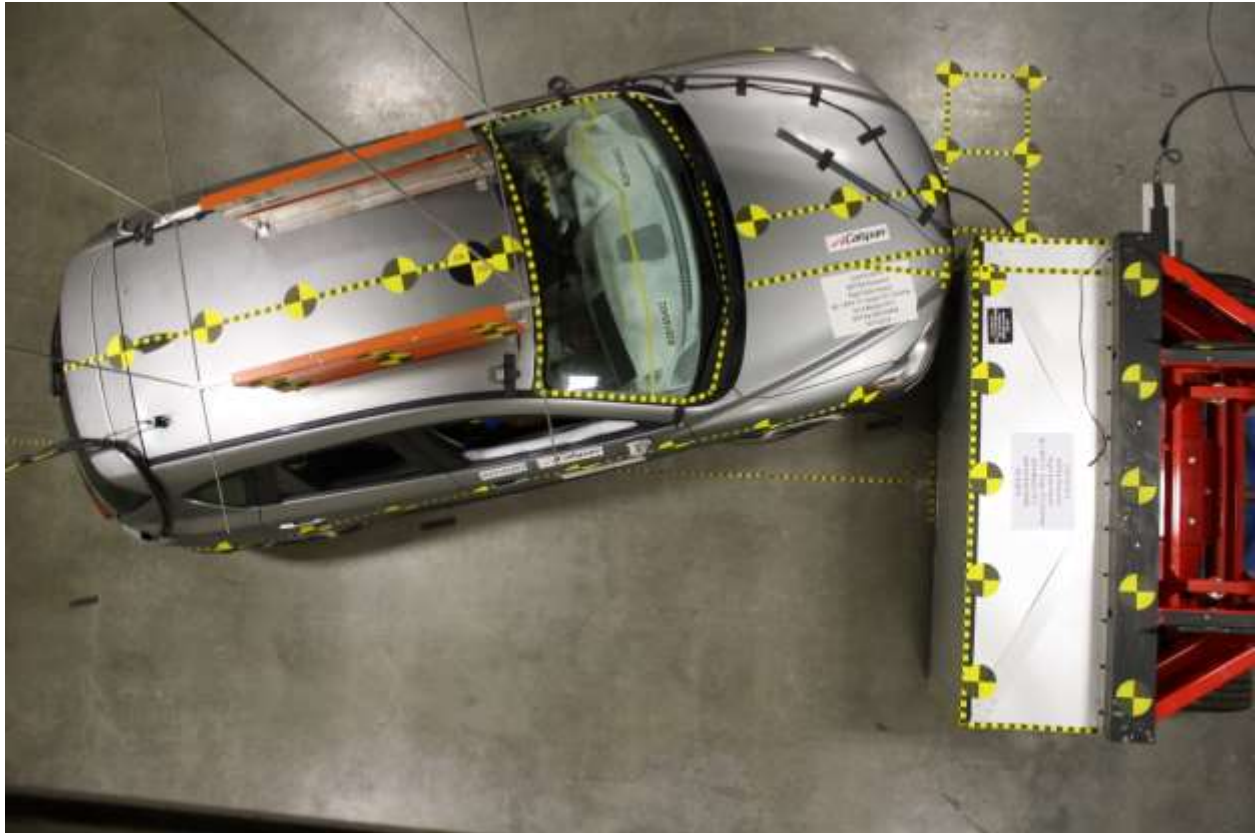
No. 171 Post-Test RMD & Vehicle, Right Side



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



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



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



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



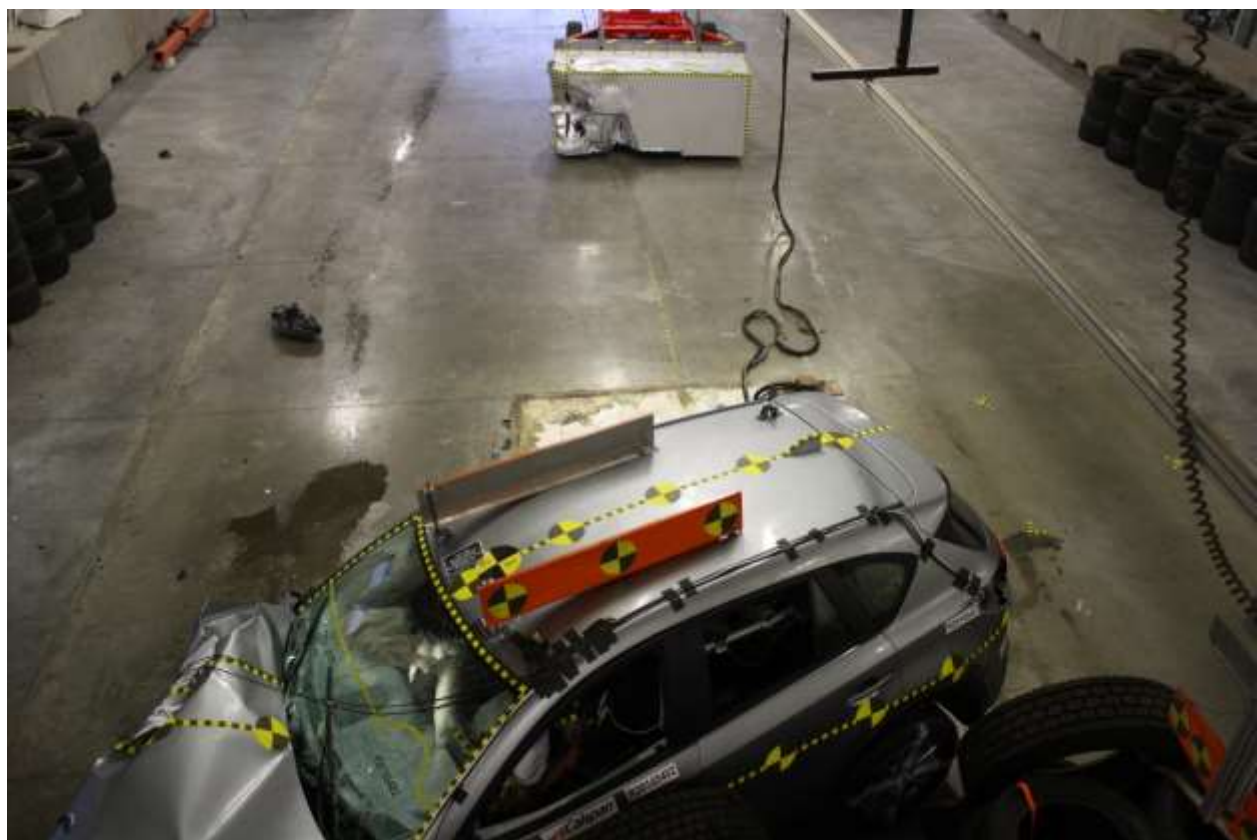
No. 176 Pre-Test RMDB & Vehicle, Rear View



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



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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



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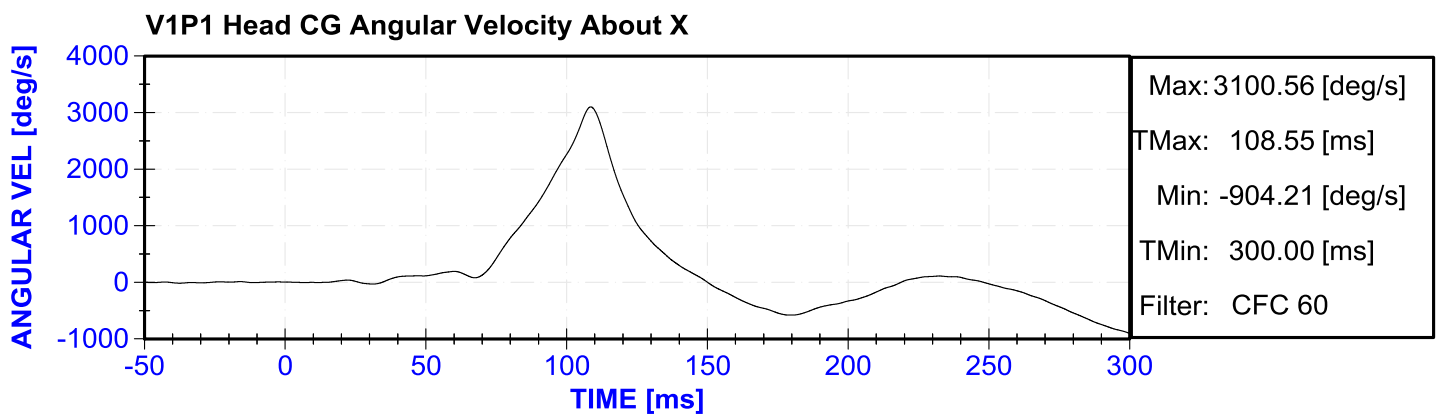
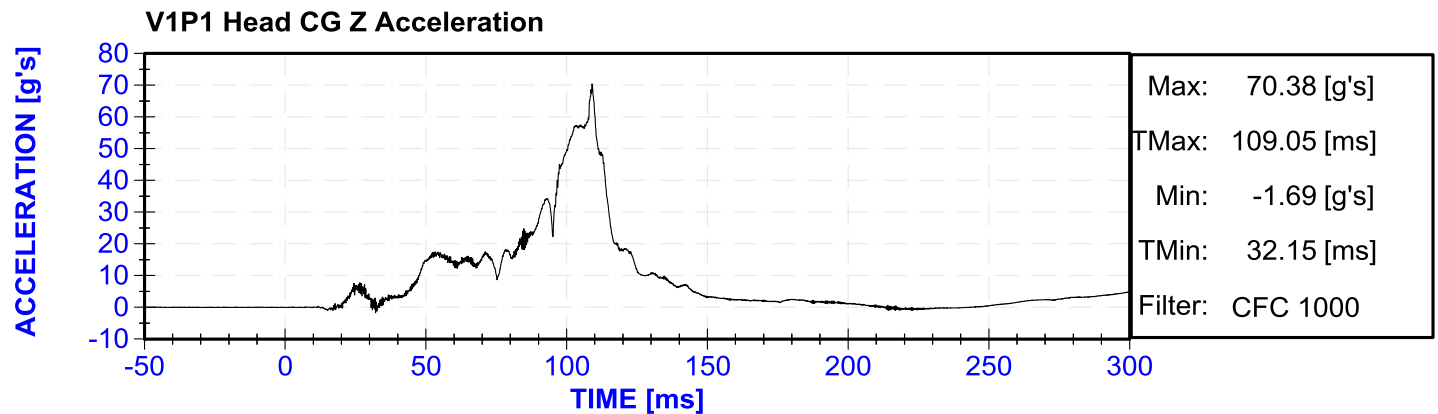
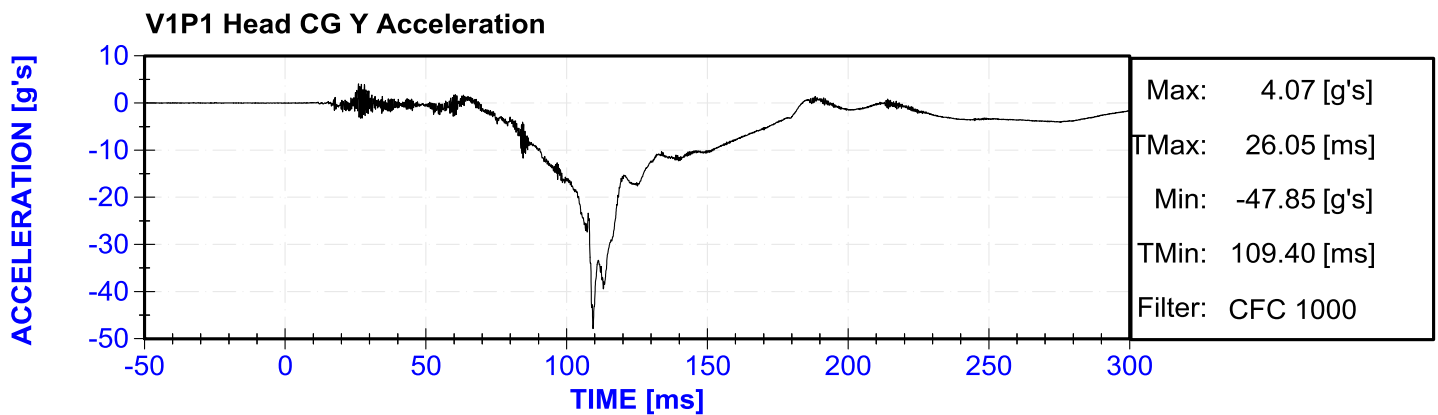
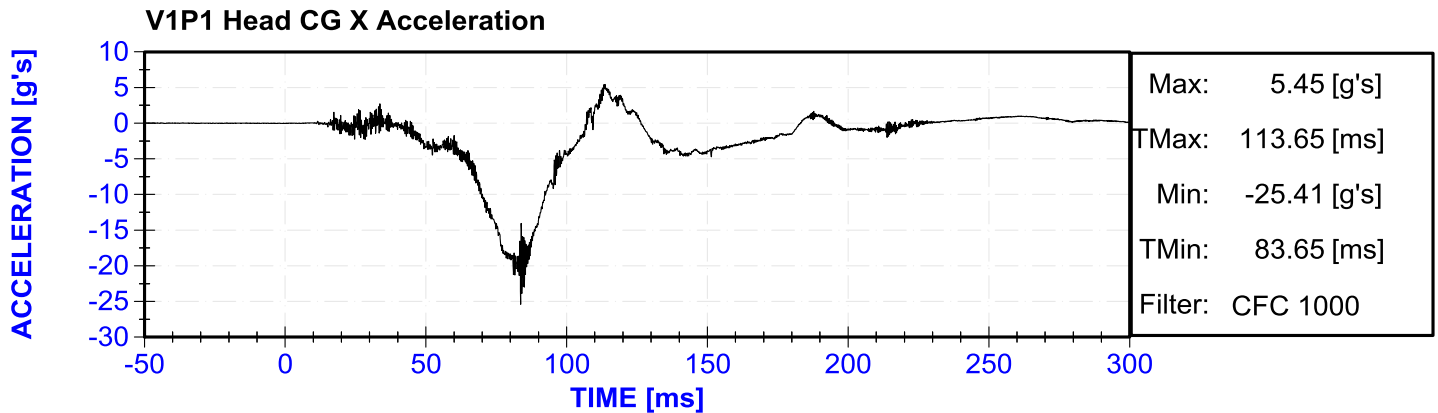
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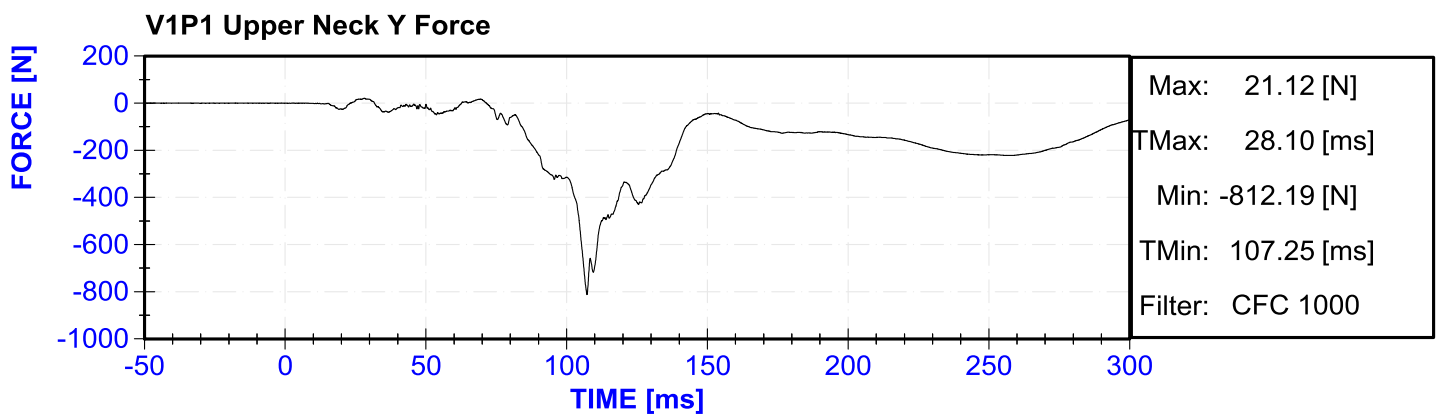
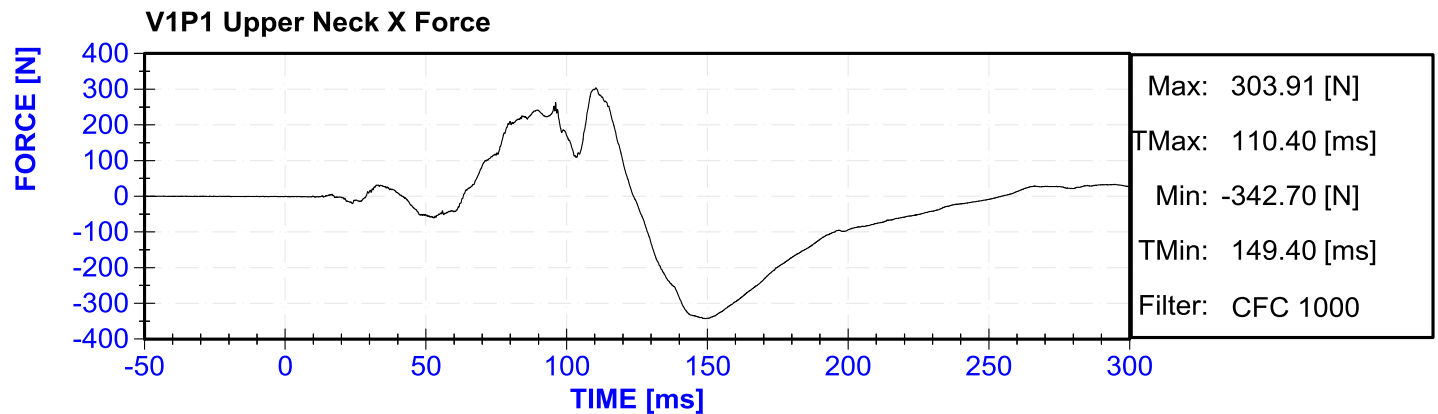
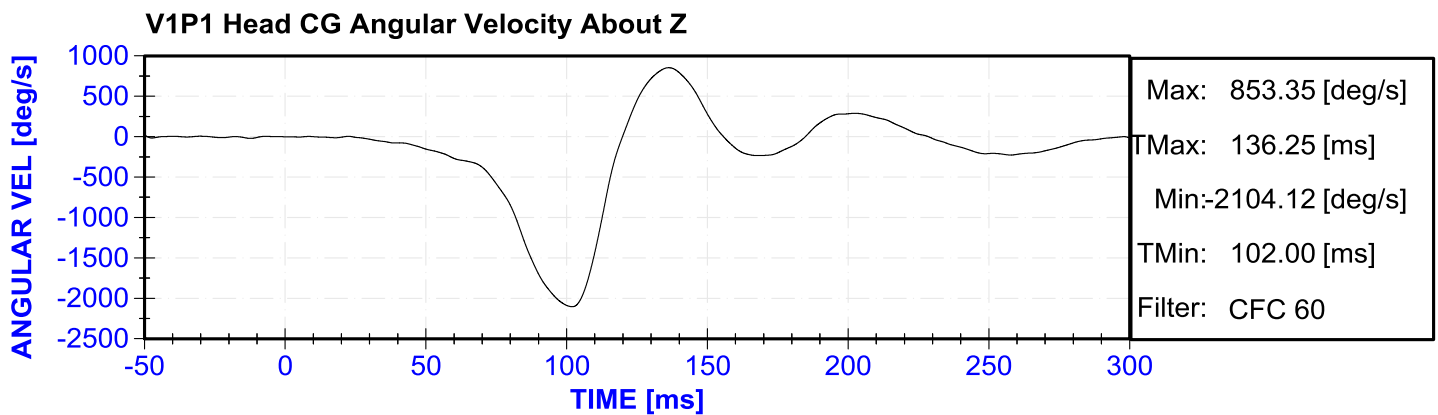
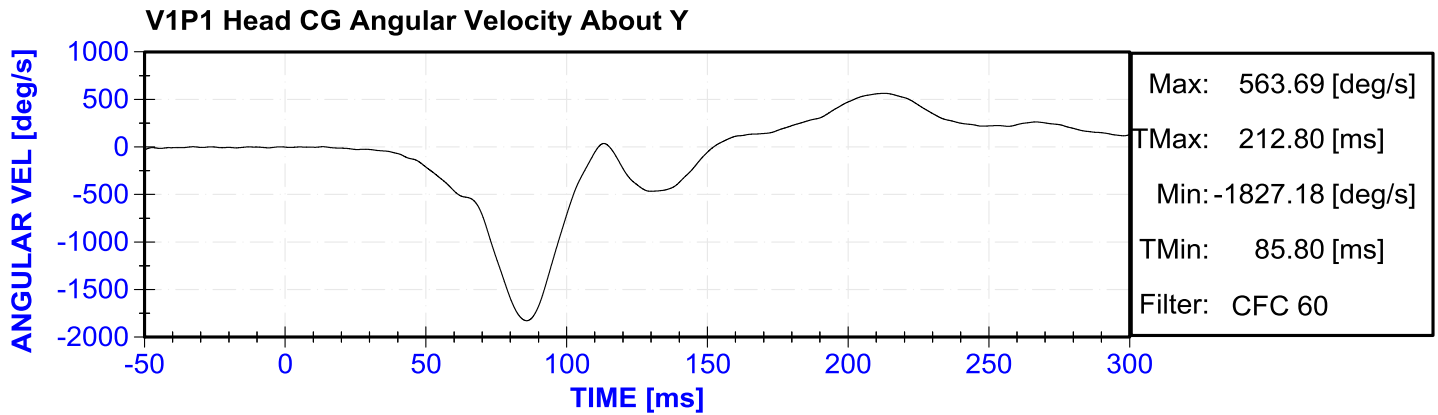
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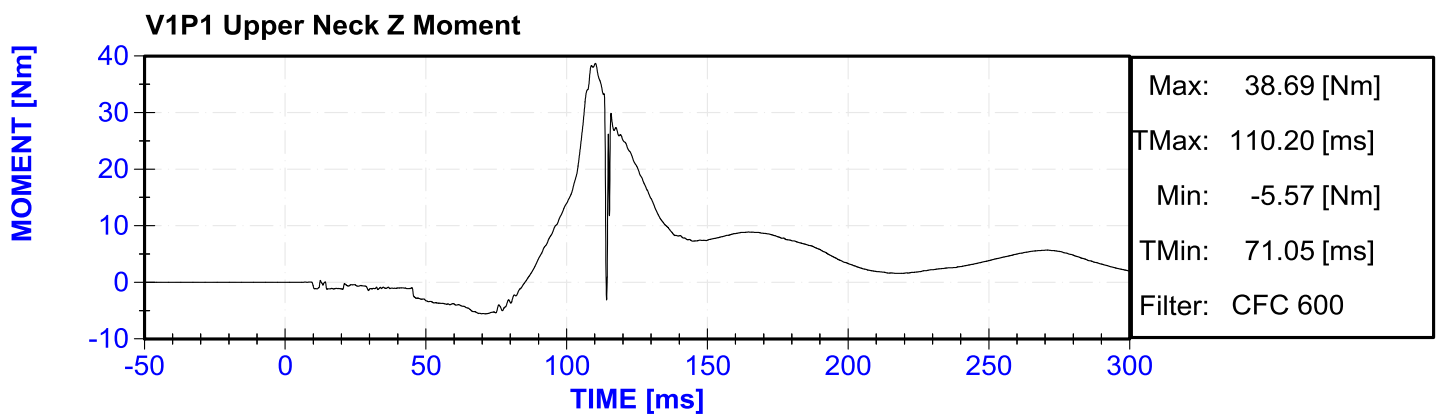
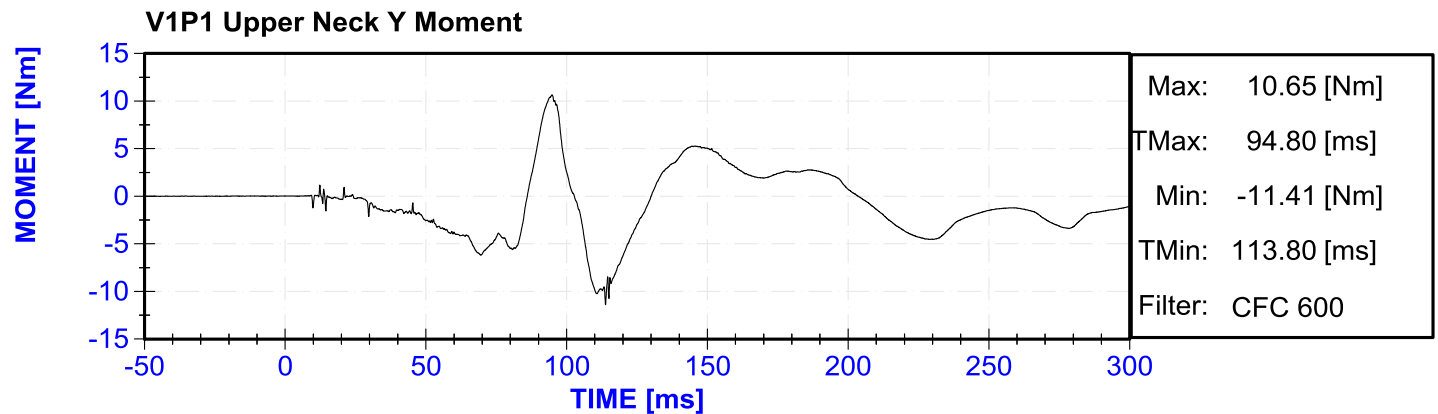
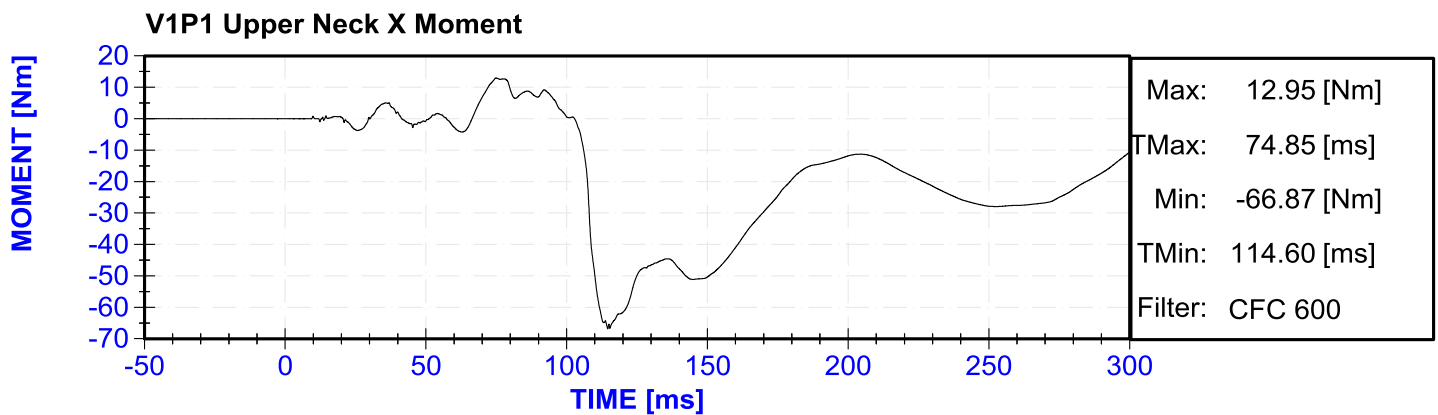
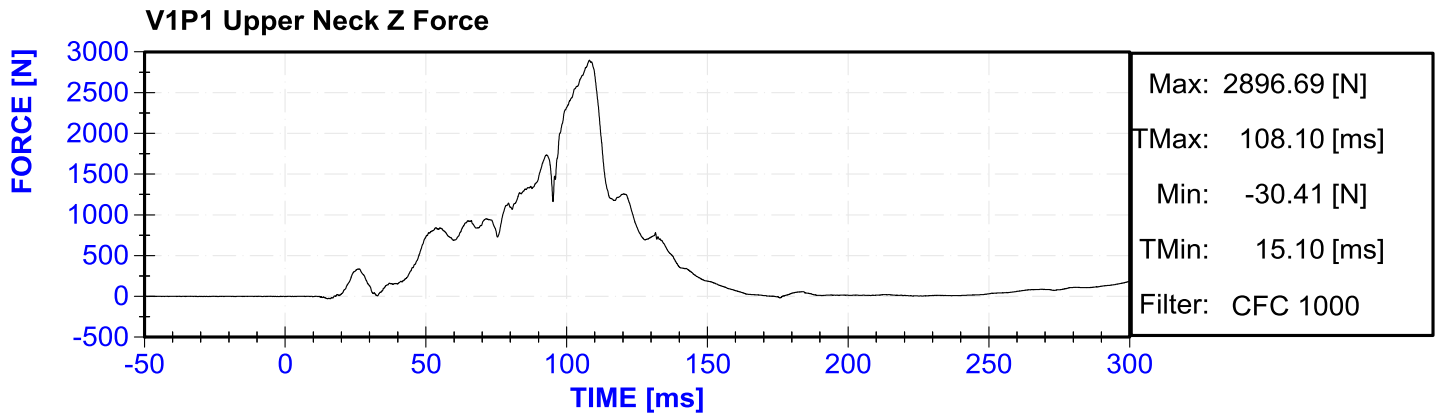
Plot 176	V1P2 Ankle Left X Rotation	B-51
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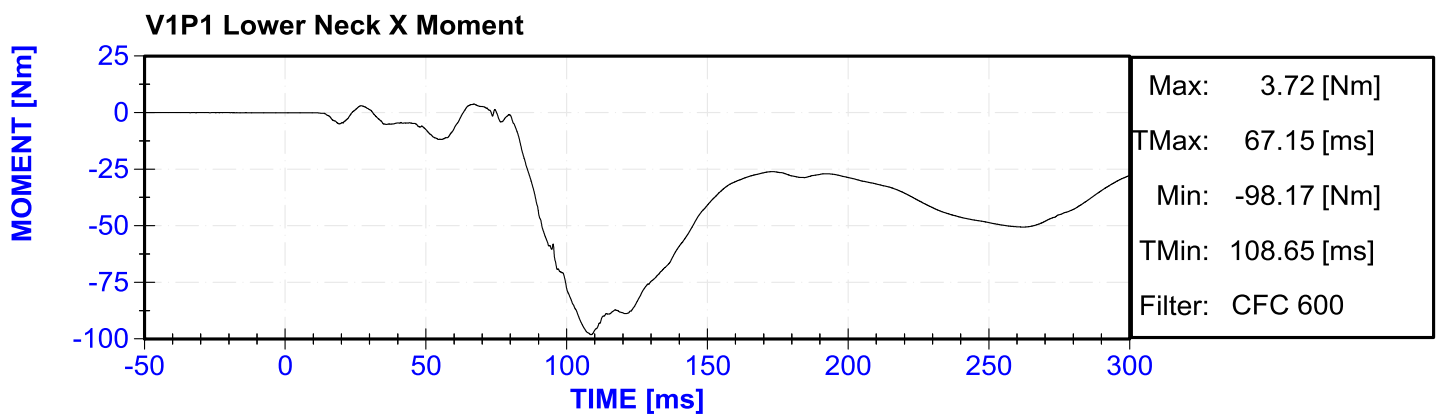
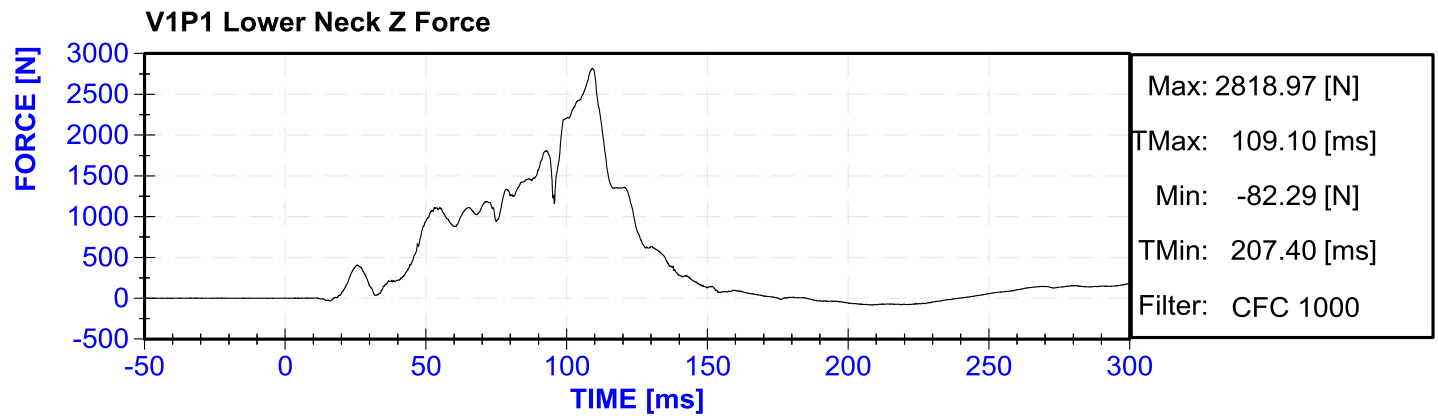
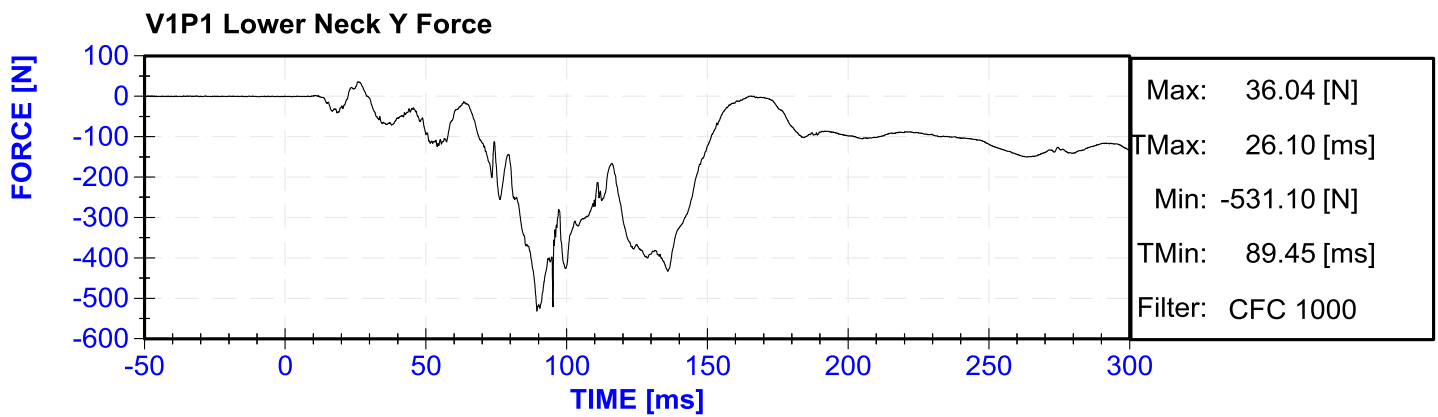
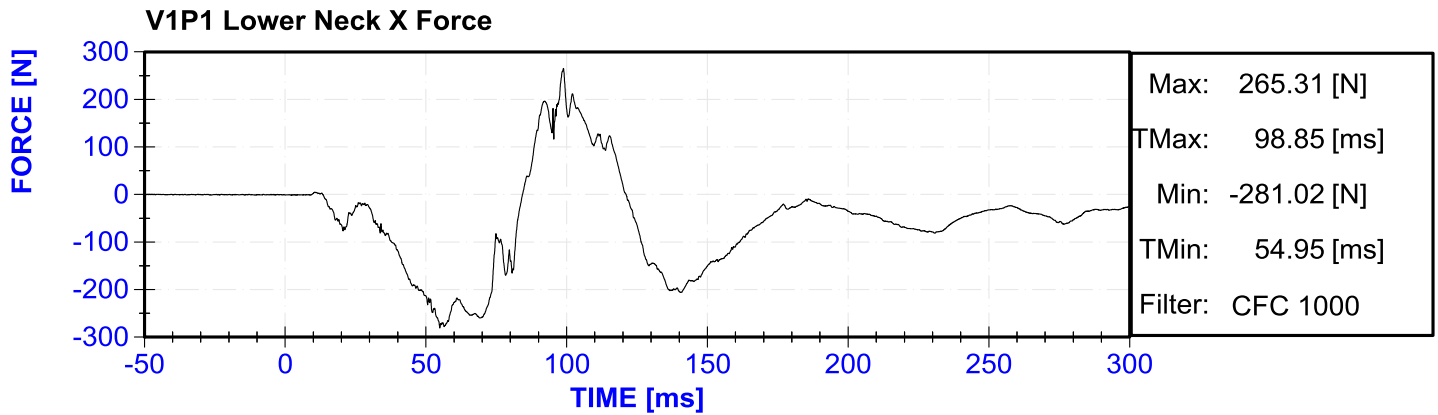
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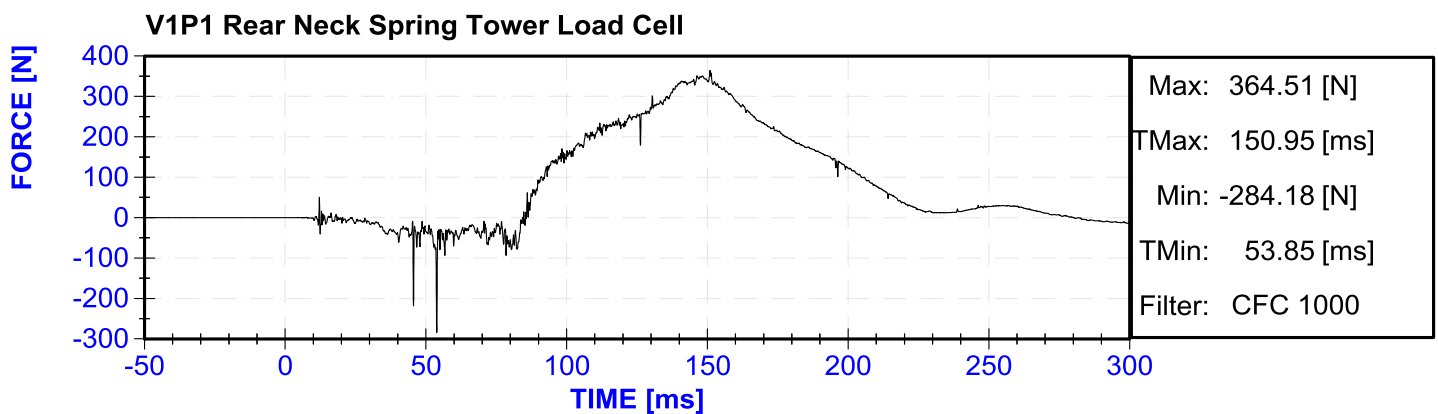
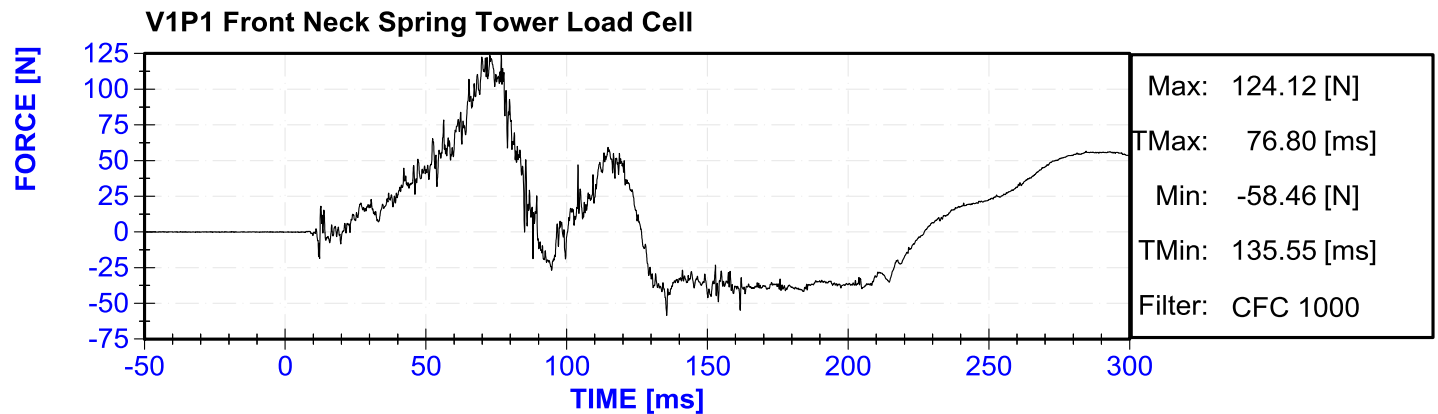
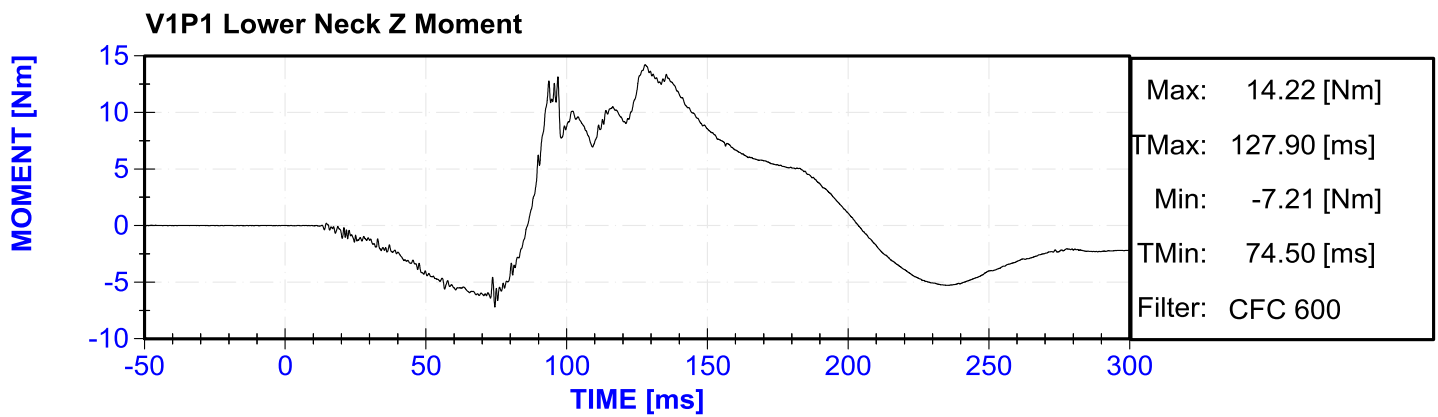
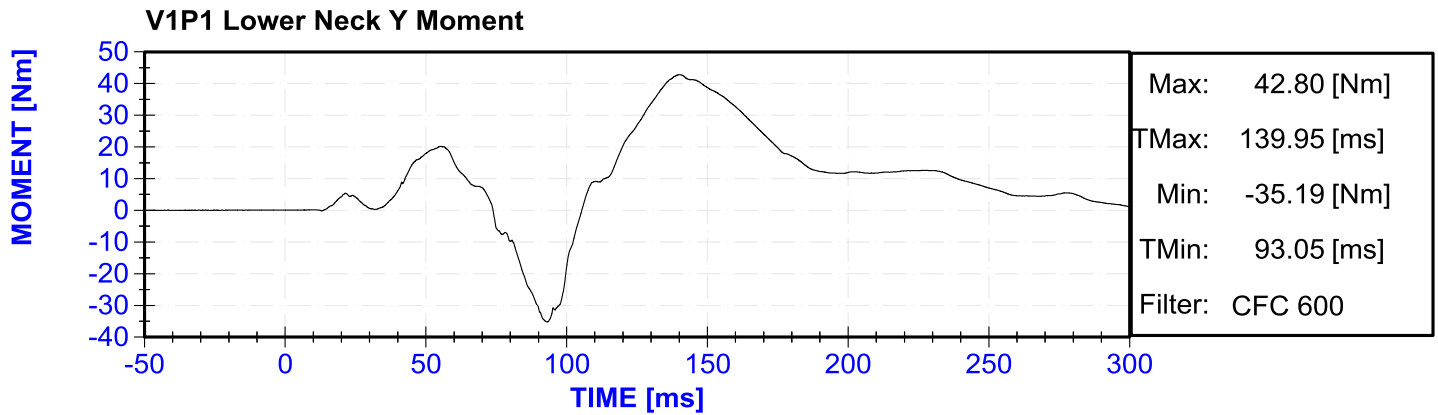
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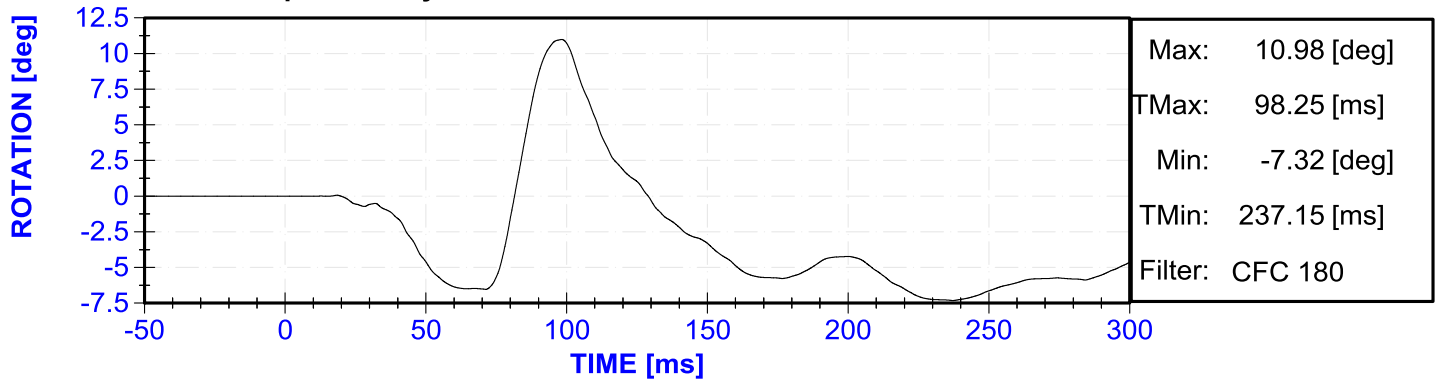




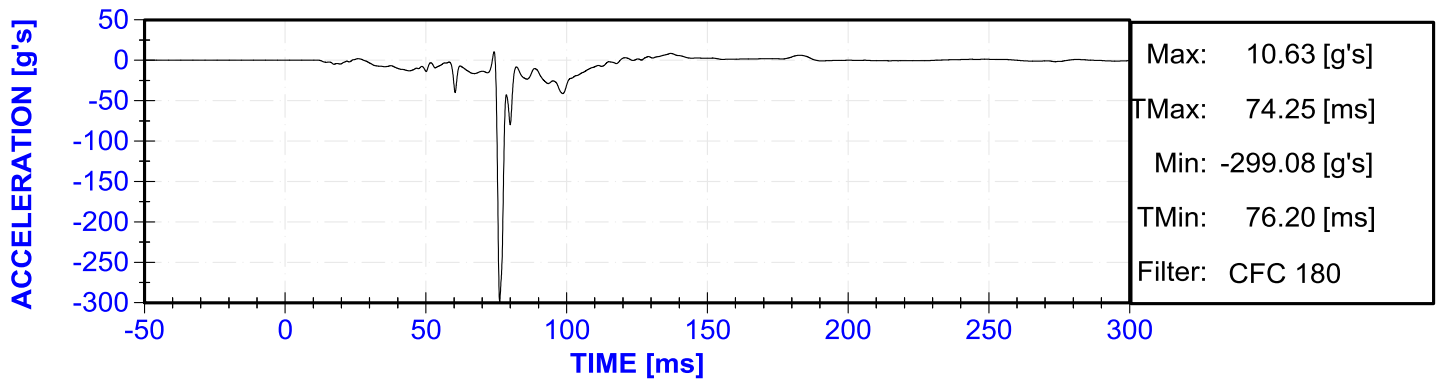




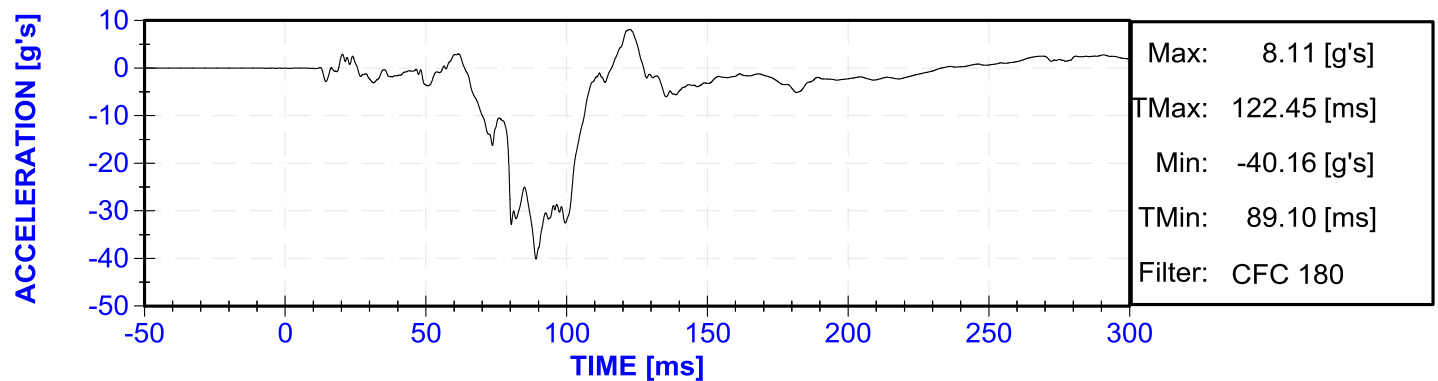
V1P1 Occipital Condyle Rotation Potentiometer



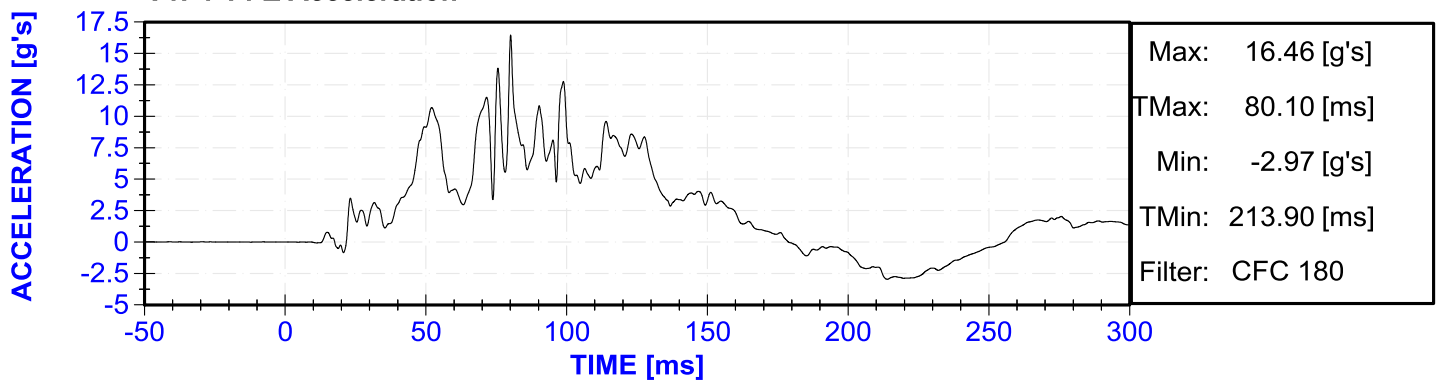
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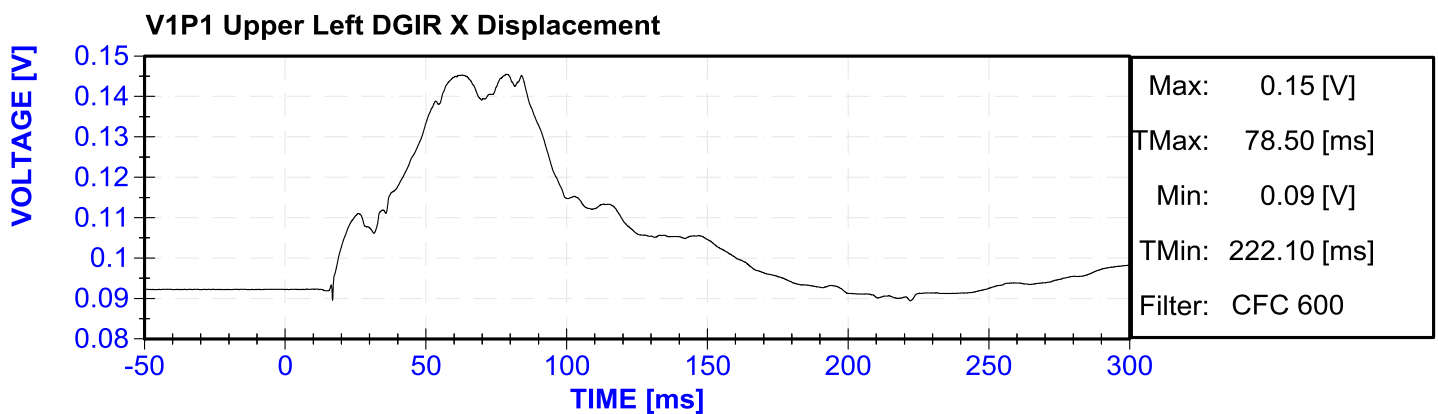
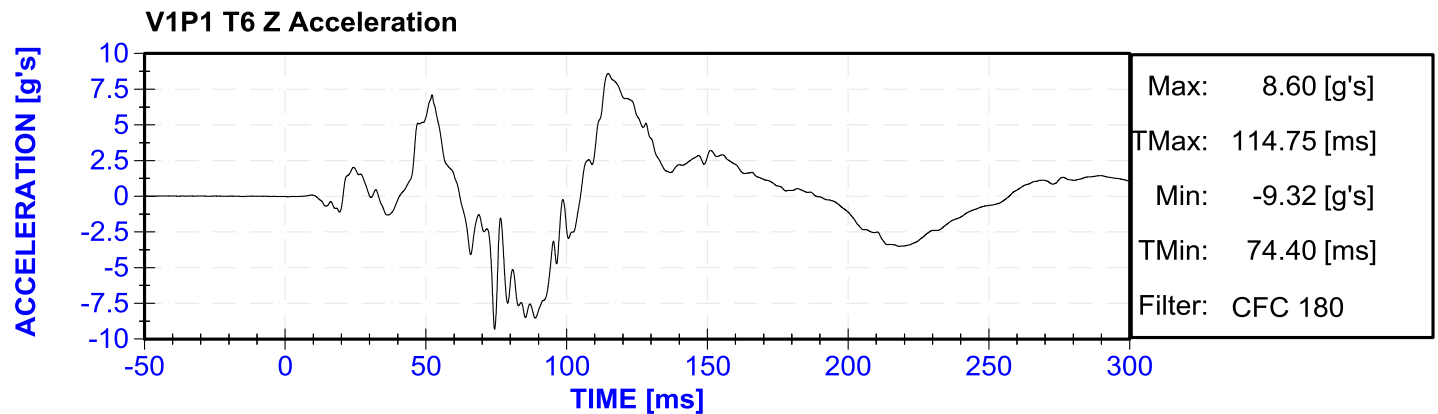
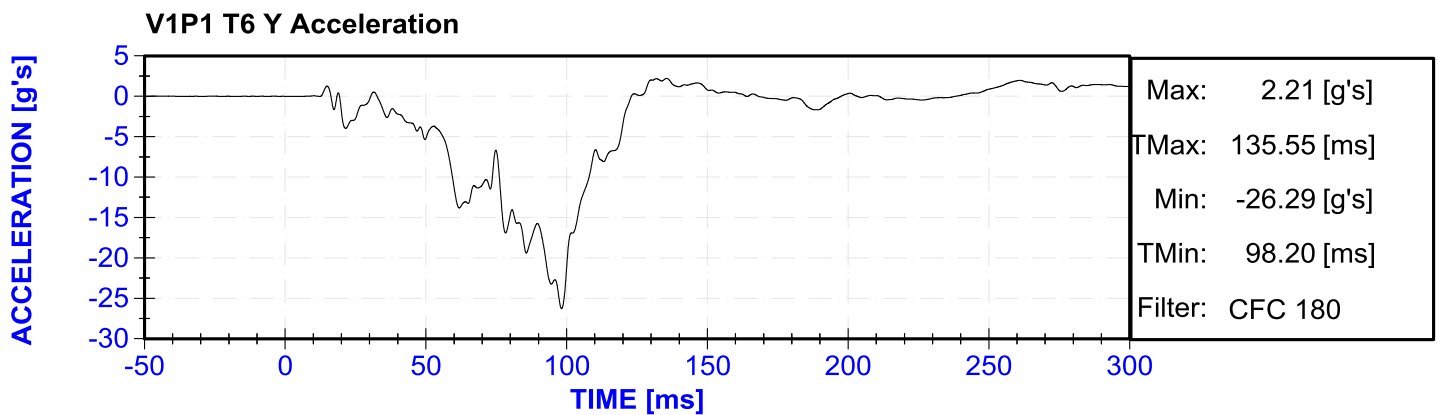
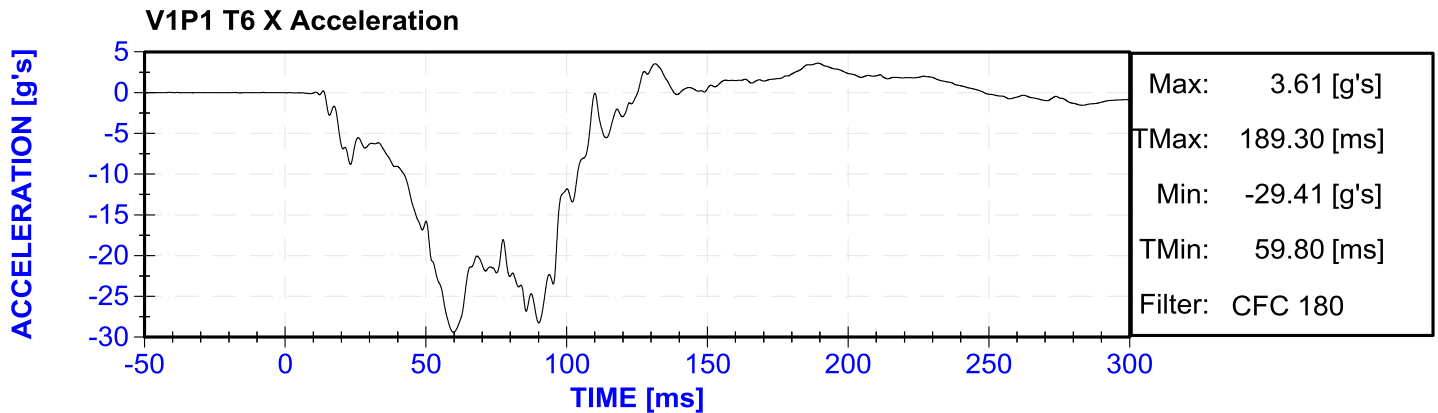


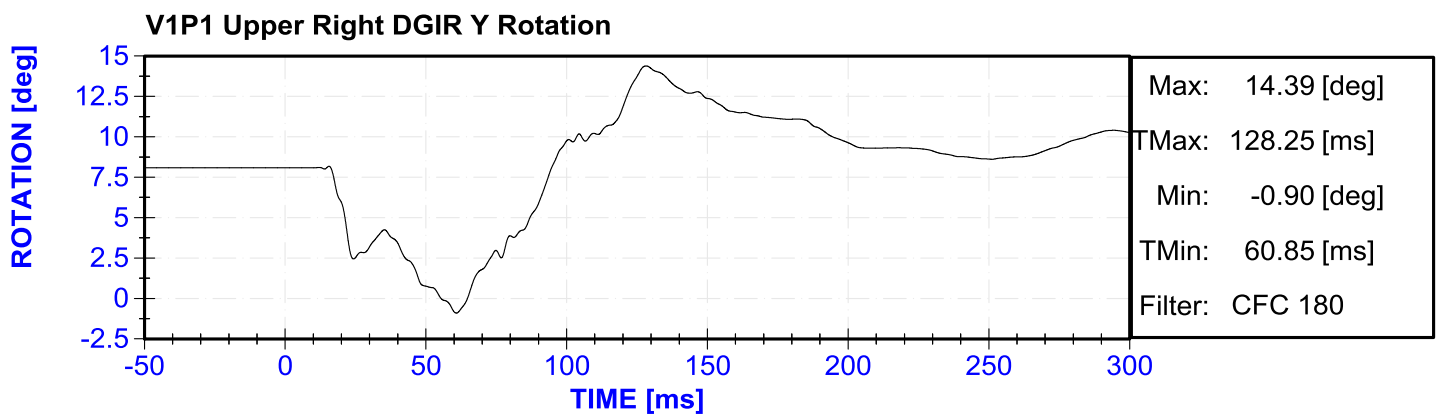
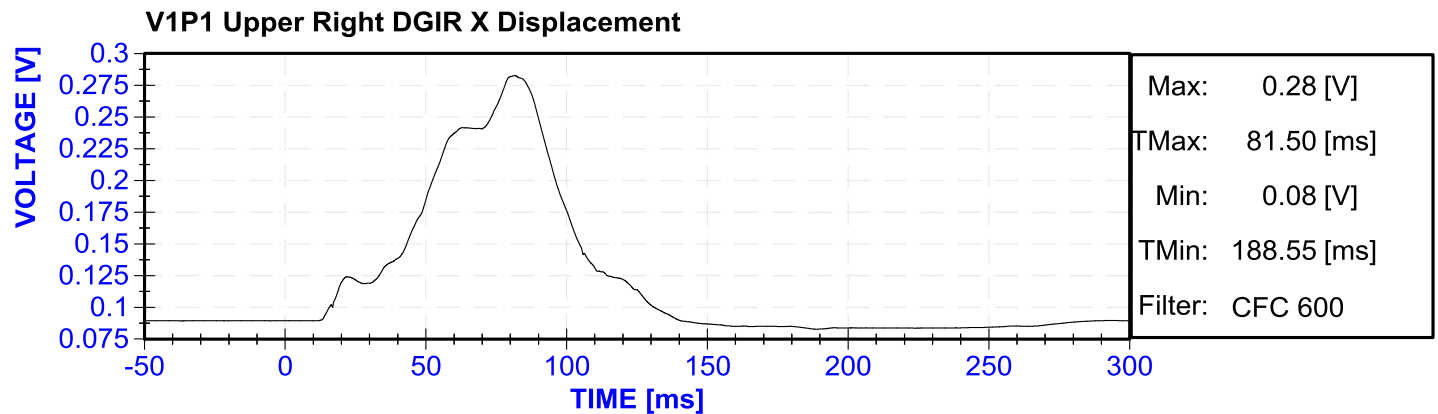
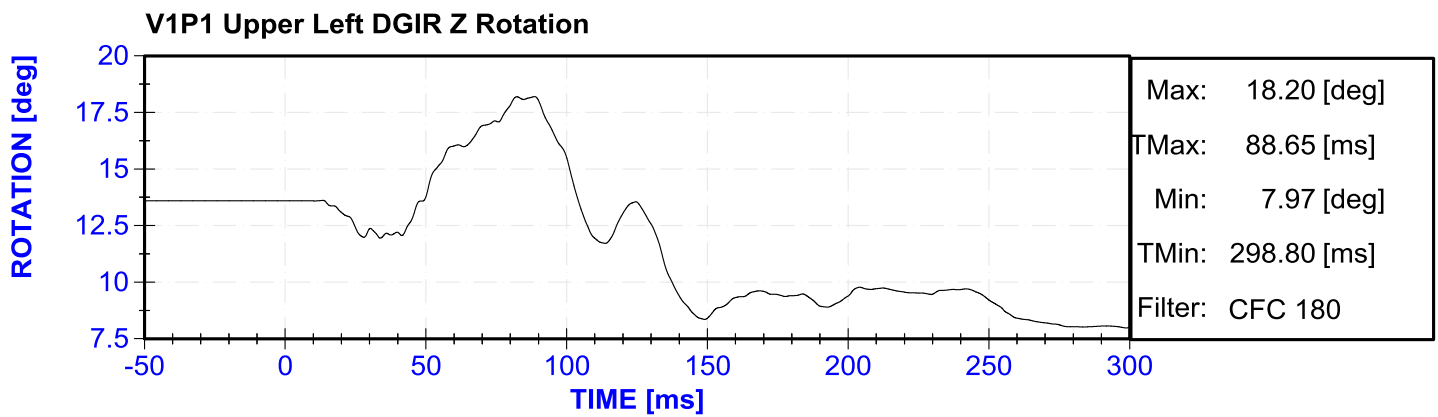
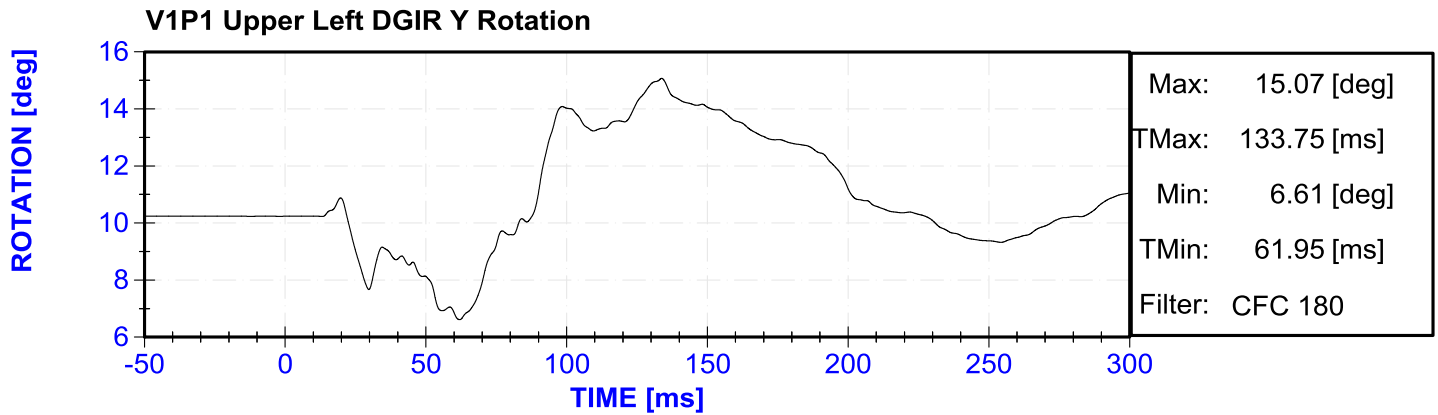
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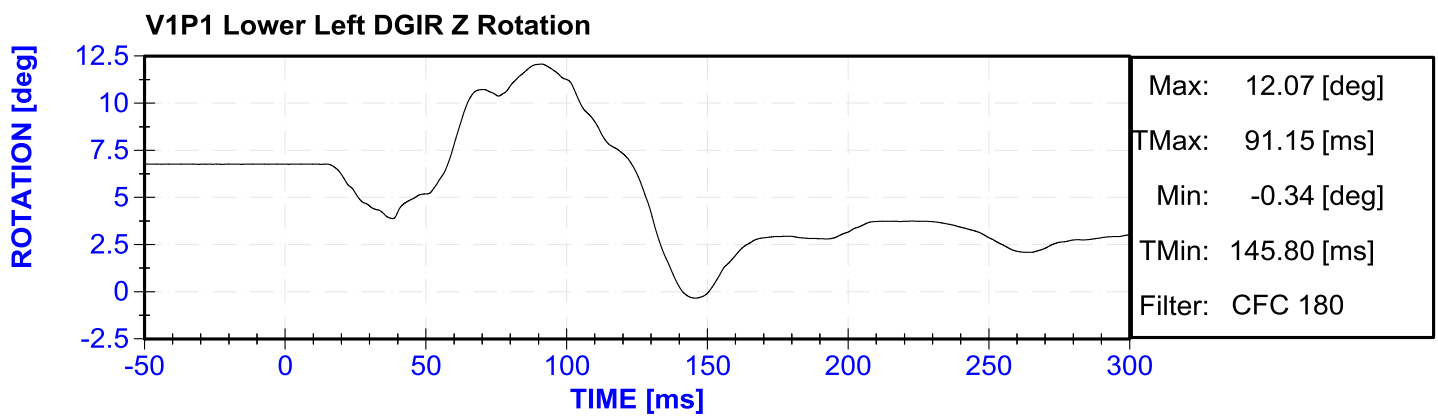
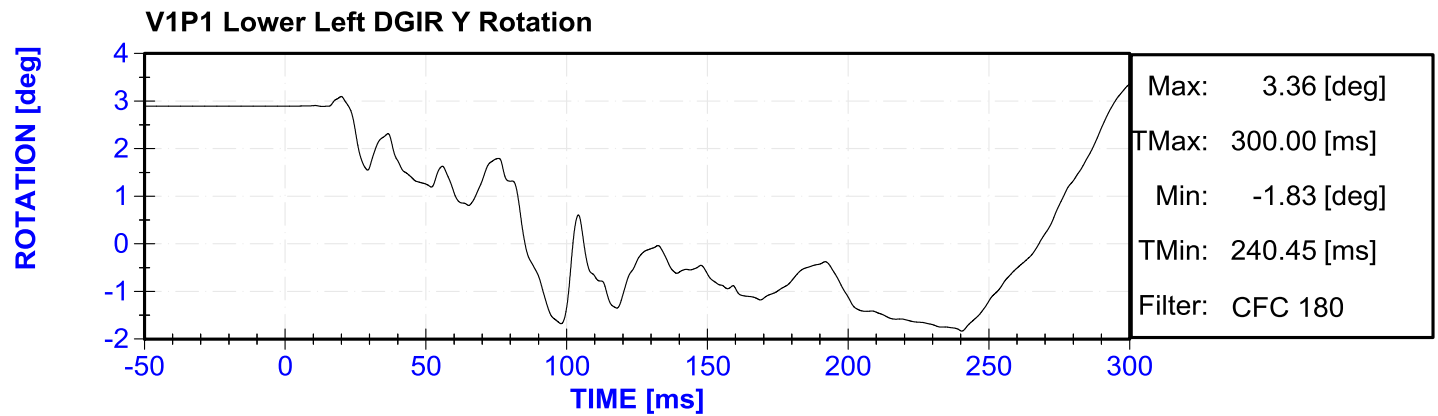
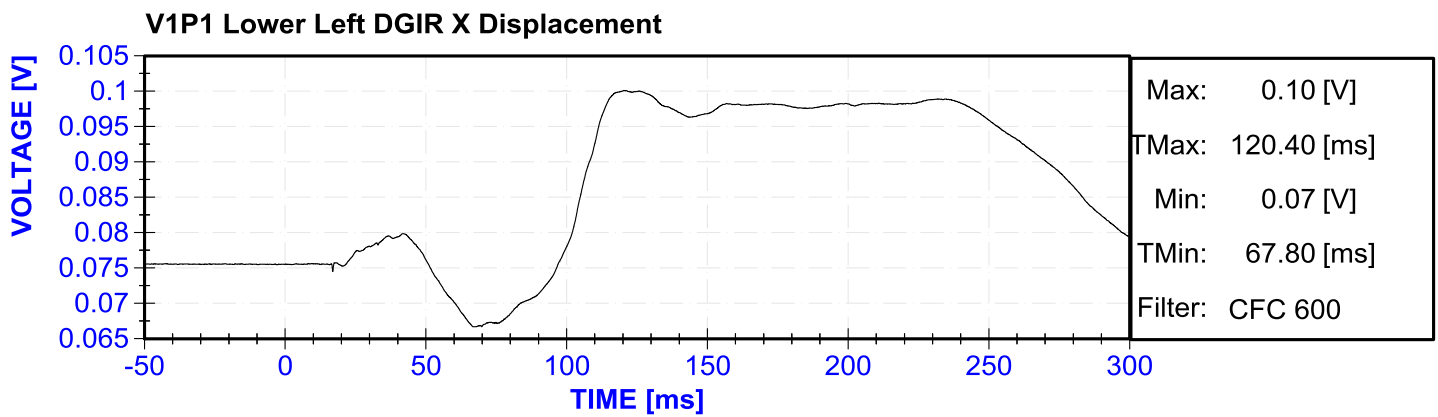
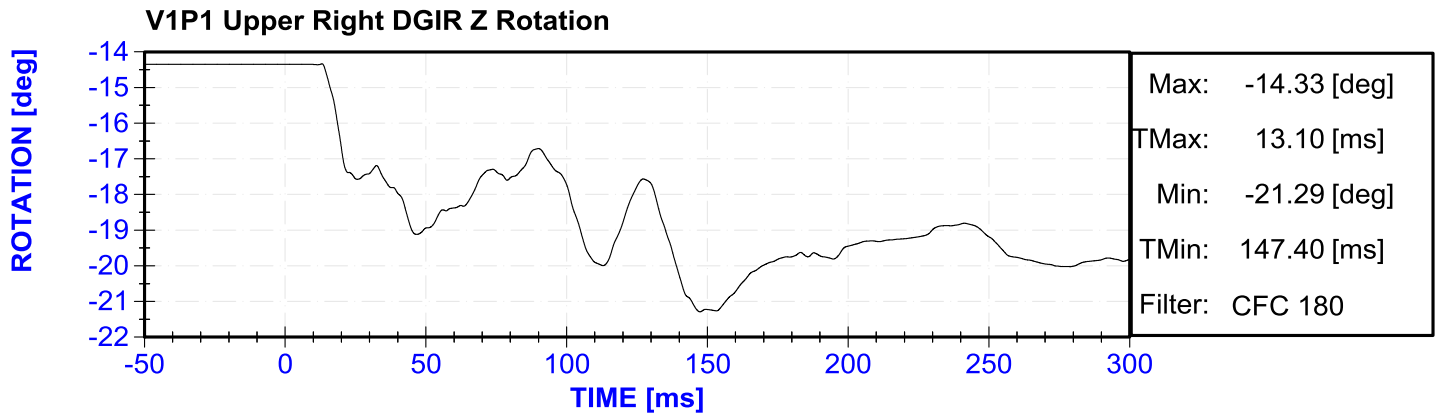


V1P1 T1 Z Acceleration

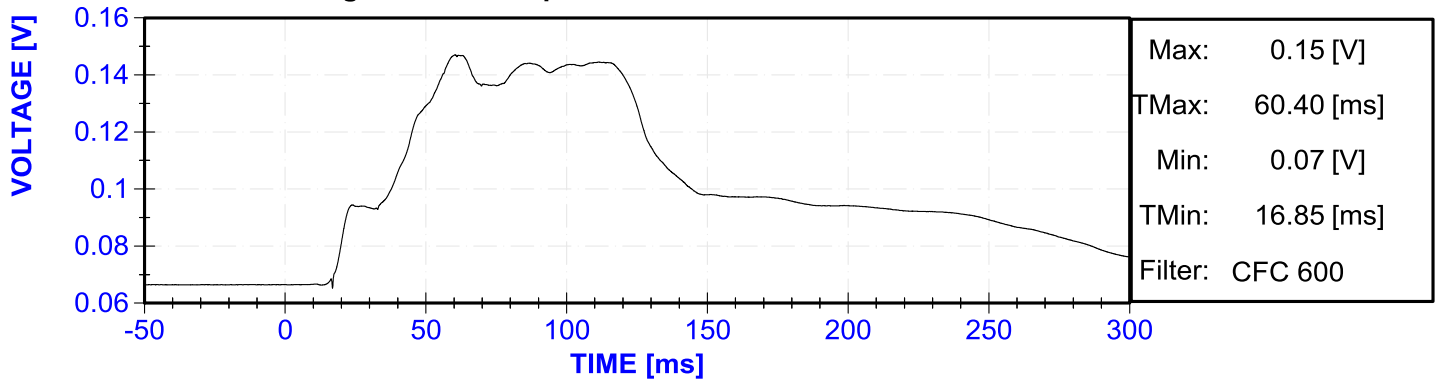




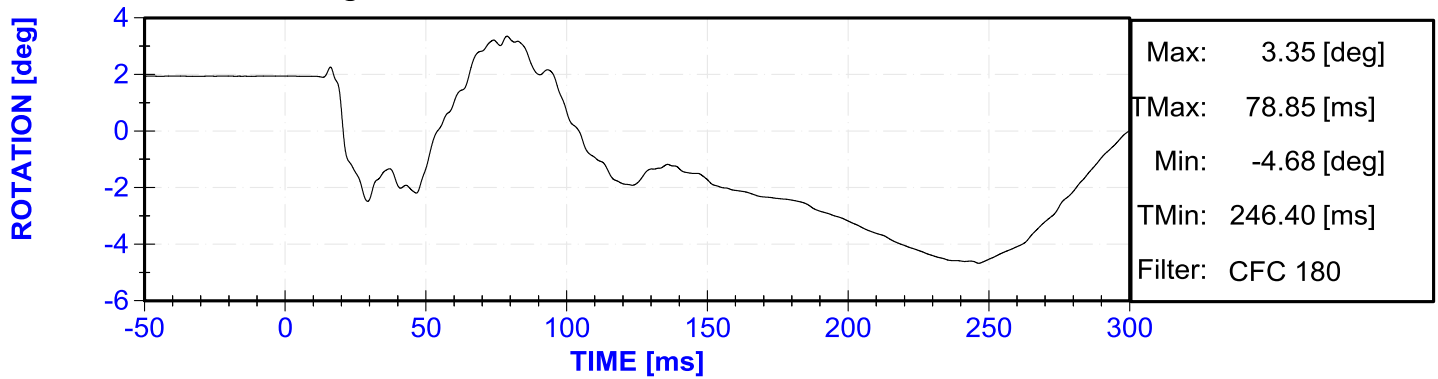




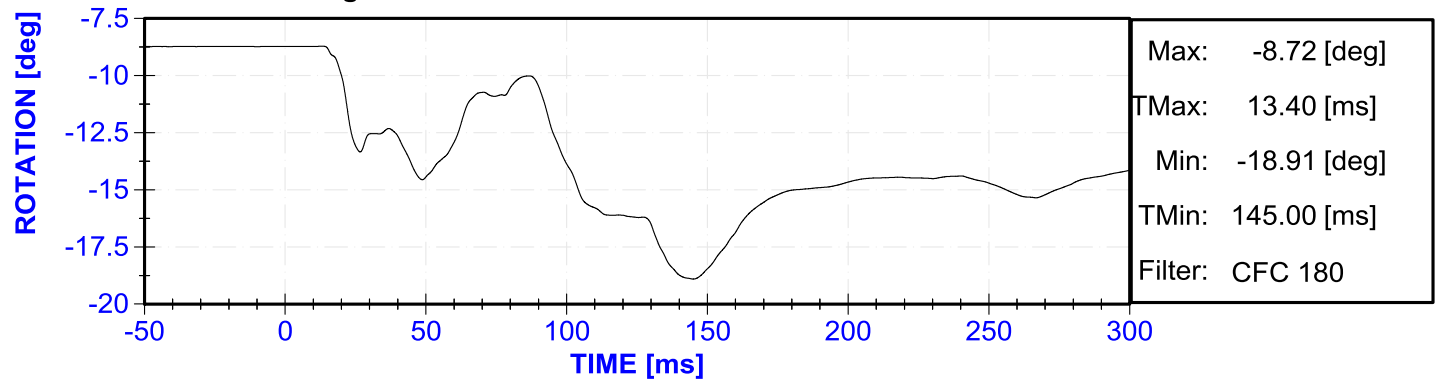
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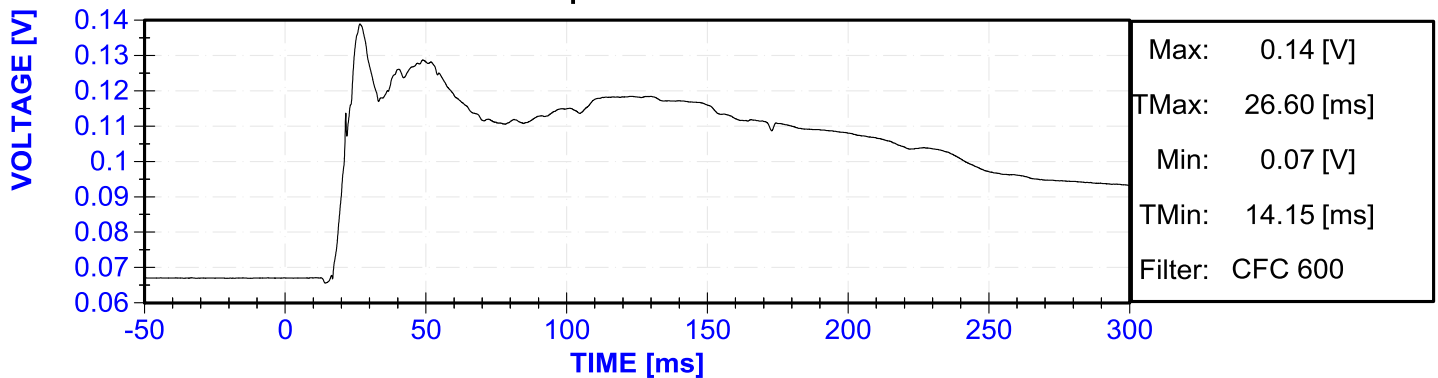
V1P1 Lower Right DGIR Y Rotation



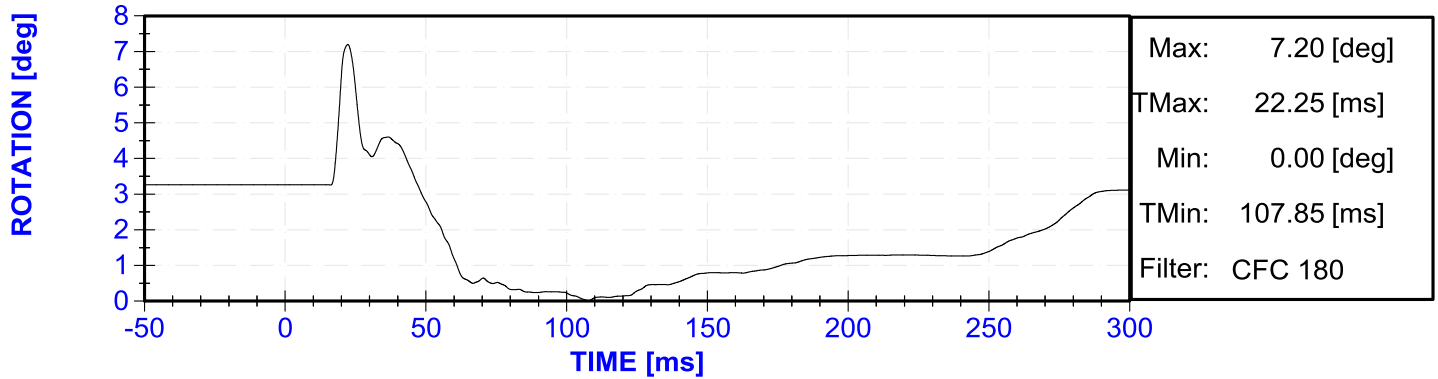
V1P1 Lower Right DGIR Z Rotation



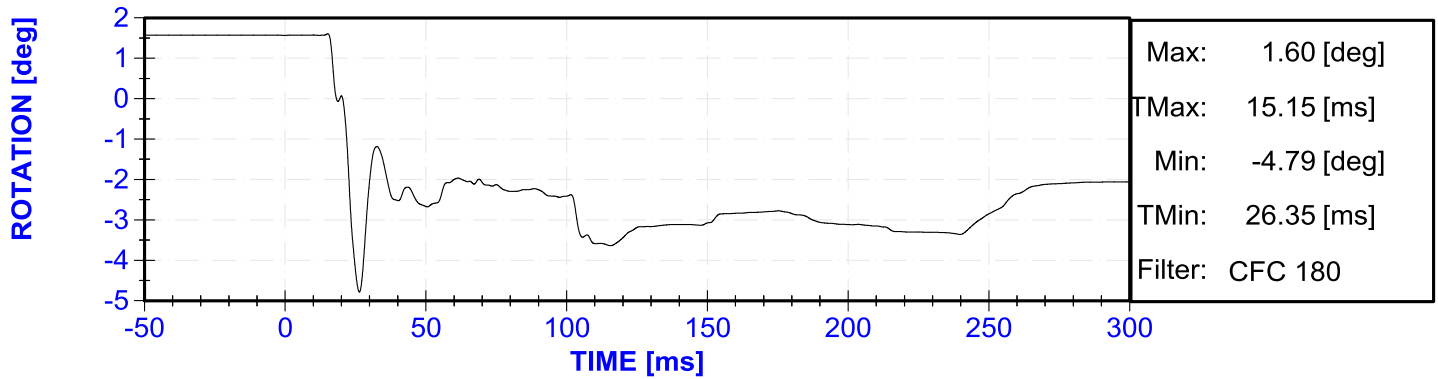
V1P1 Abdomen Left DGIR X Displacement



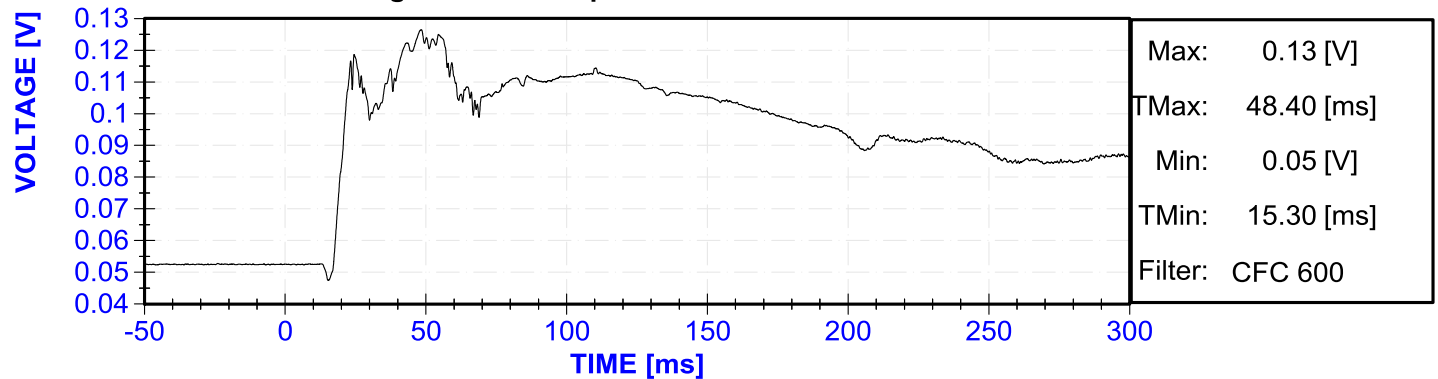
V1P1 Abdomen Left DGIR Y Rotation



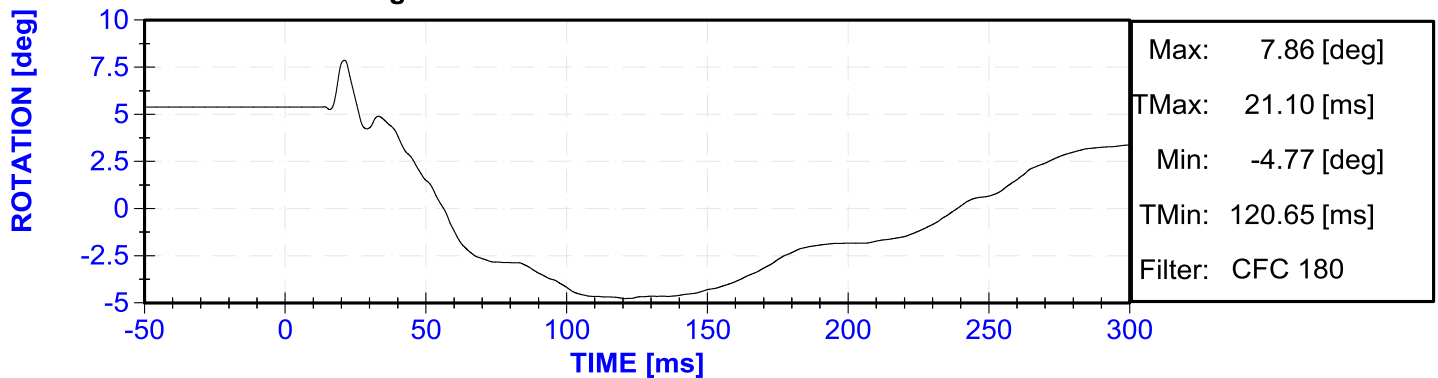
V1P1 Abdomen Left DGIR Z Rotation



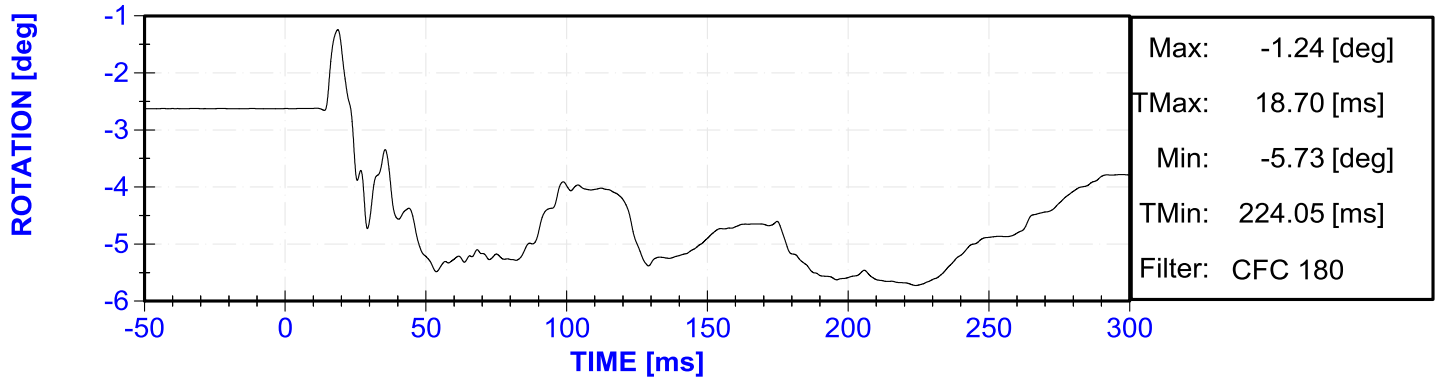
V1P1 Abdomen Right DGIR X Displacement



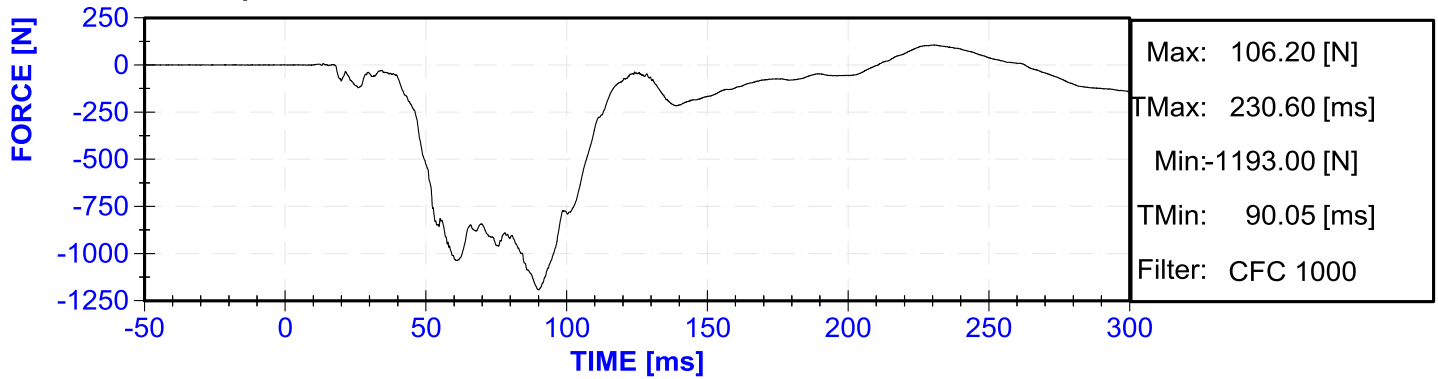
V1P1 Abdomen Right DGIR Y Rotation



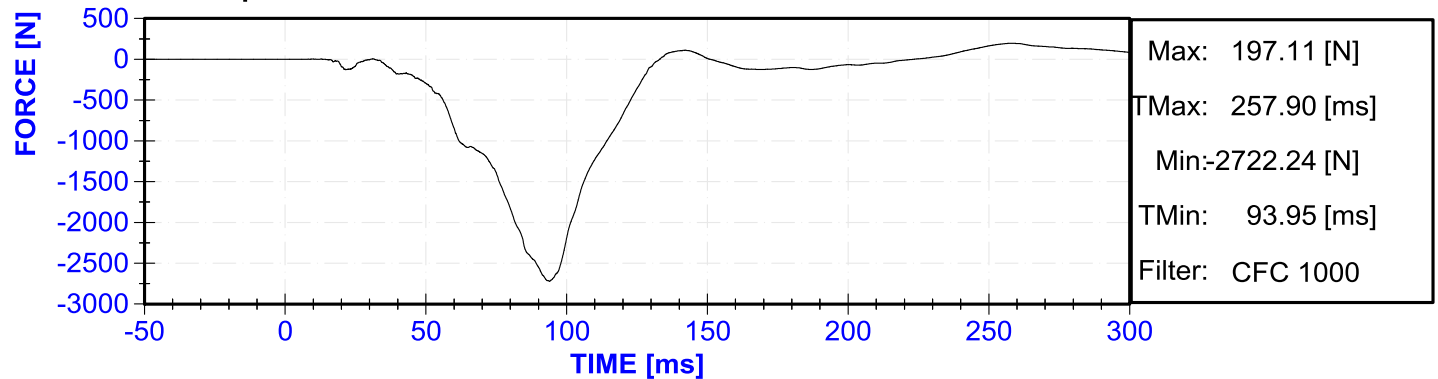
V1P1 Abdomen Right DGIR Z Rotation



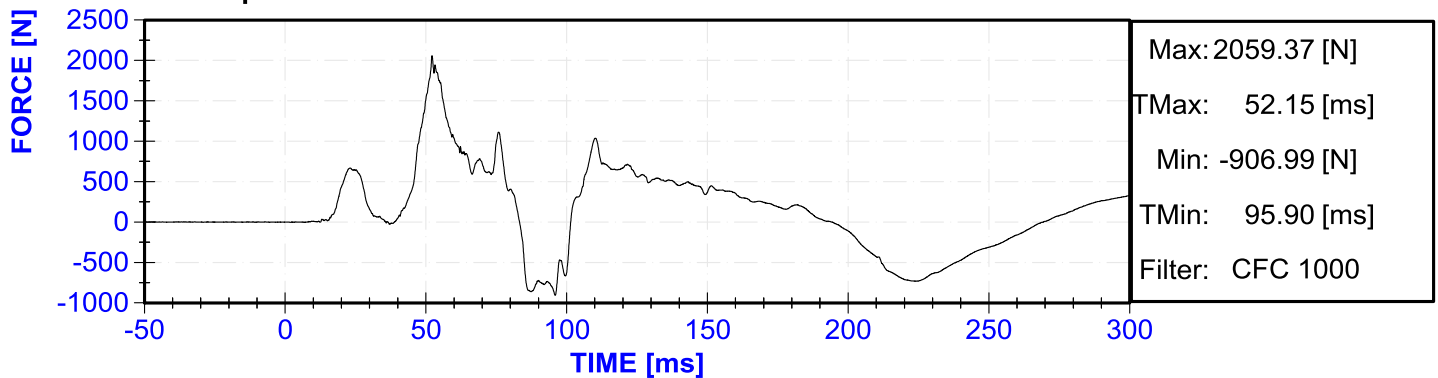
V1P1 Spine Force X

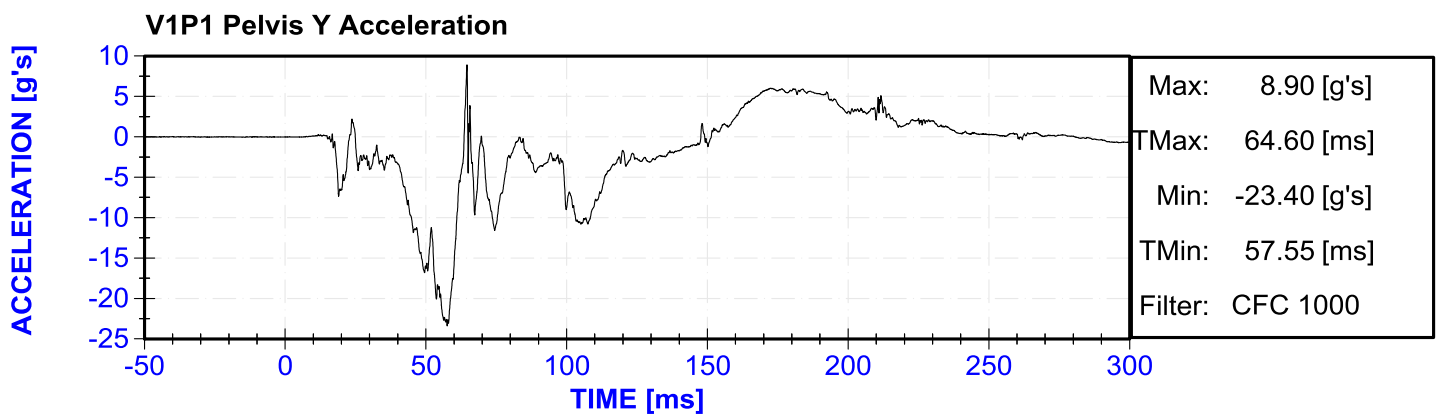
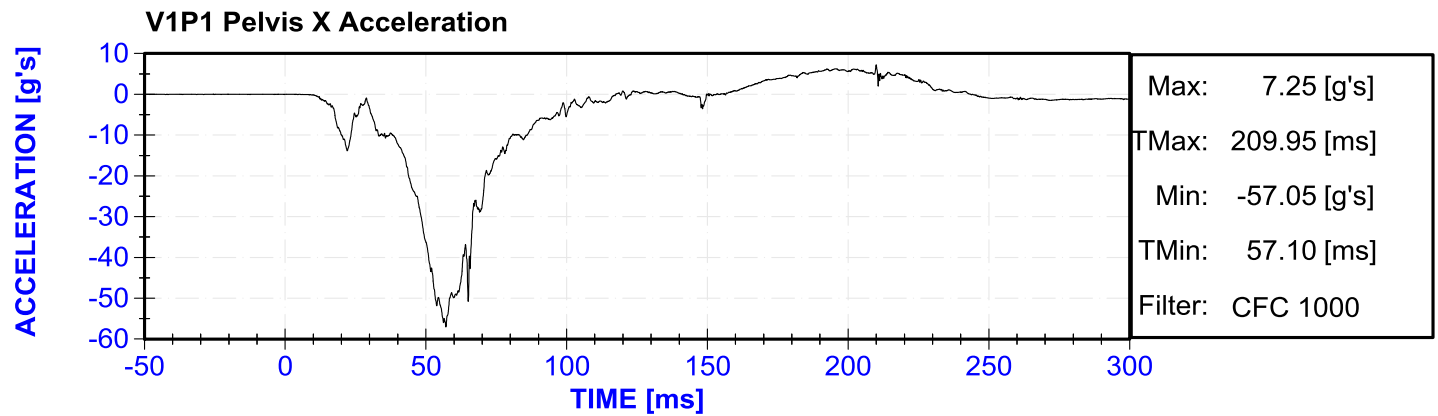
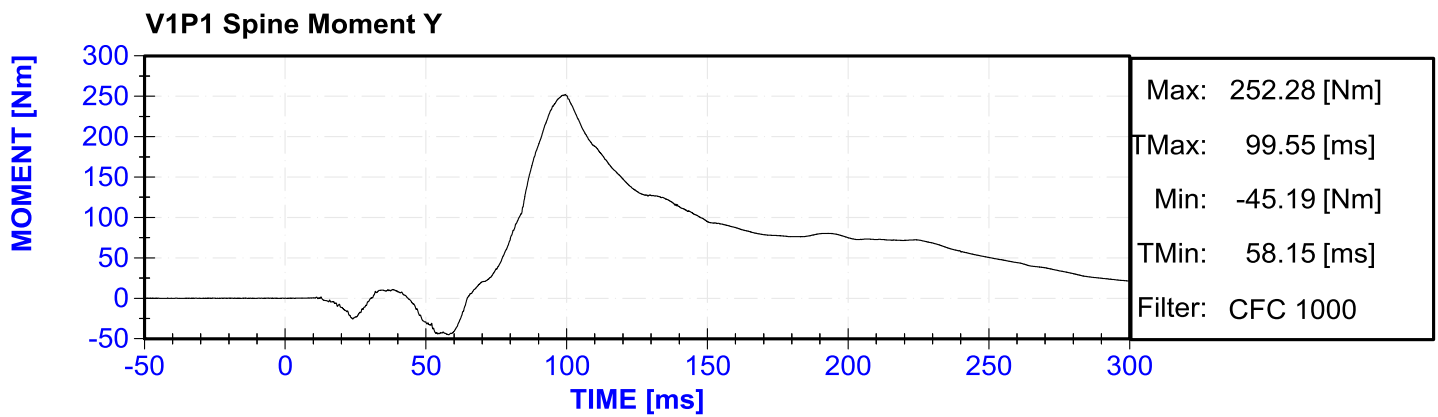
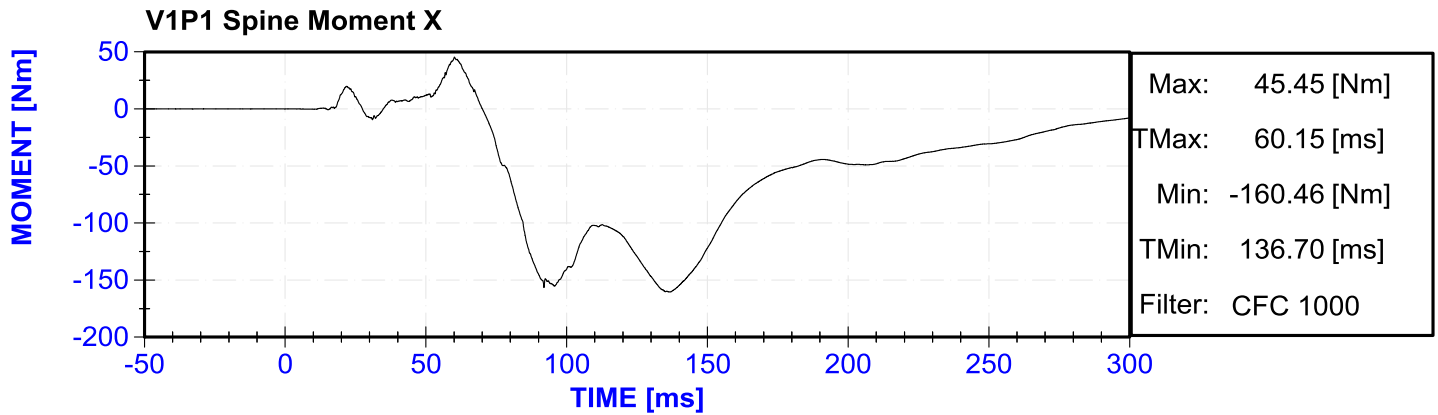


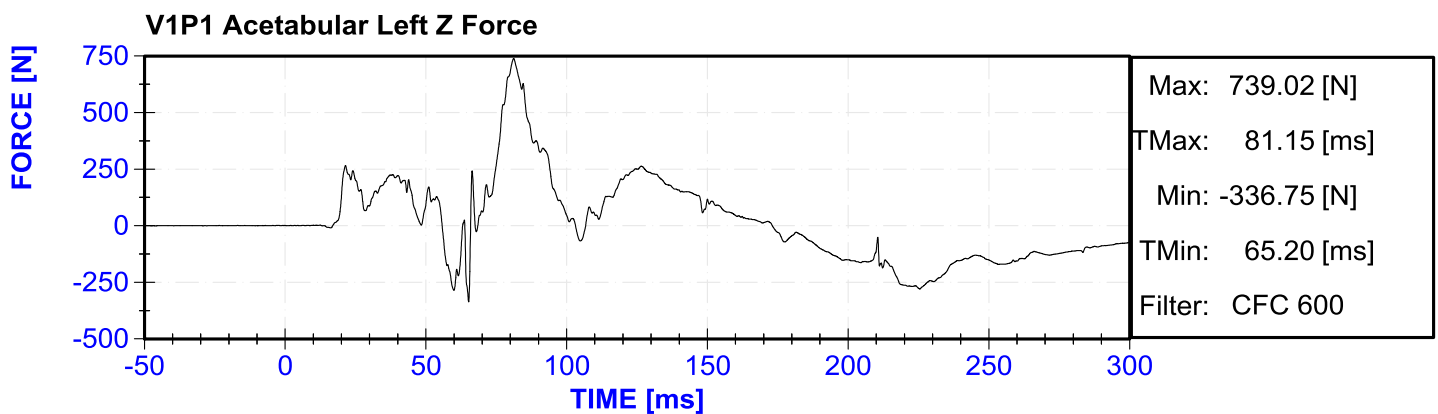
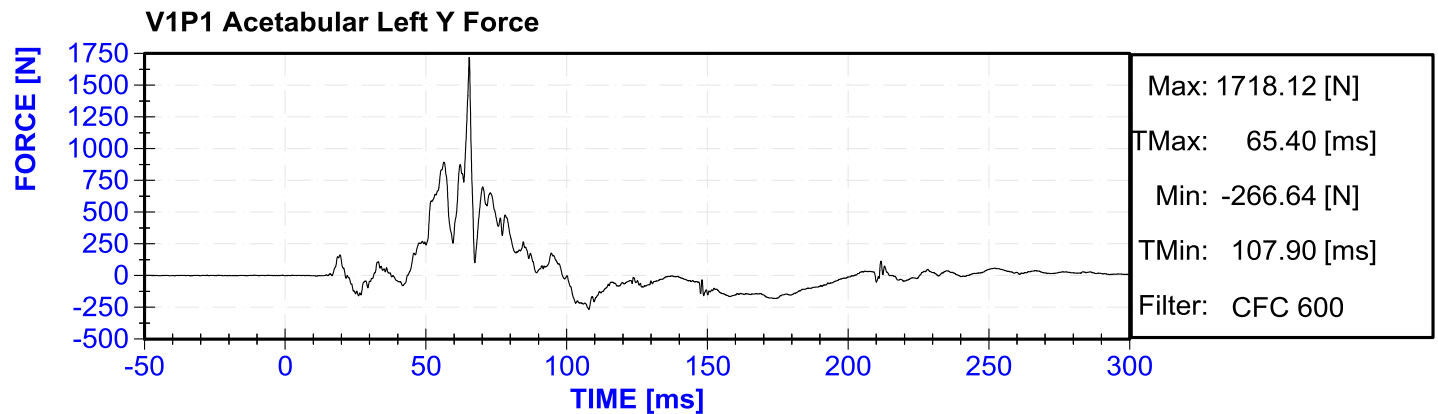
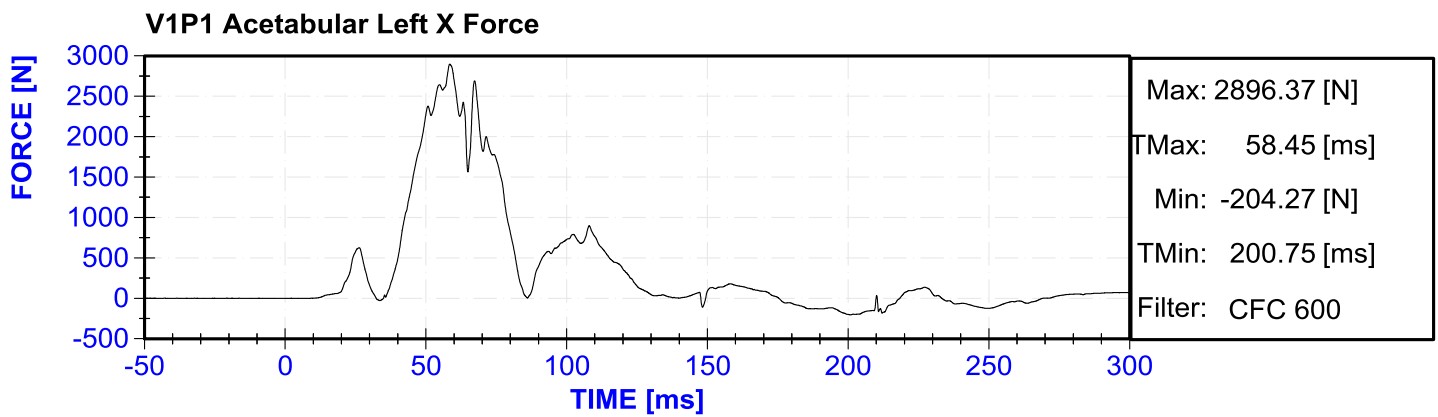
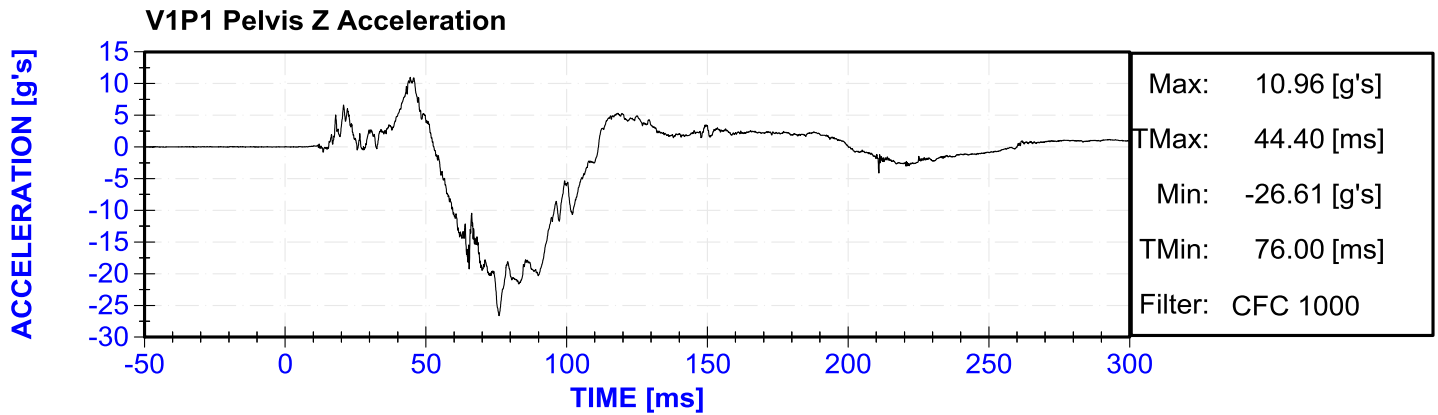
V1P1 Spine Force Y

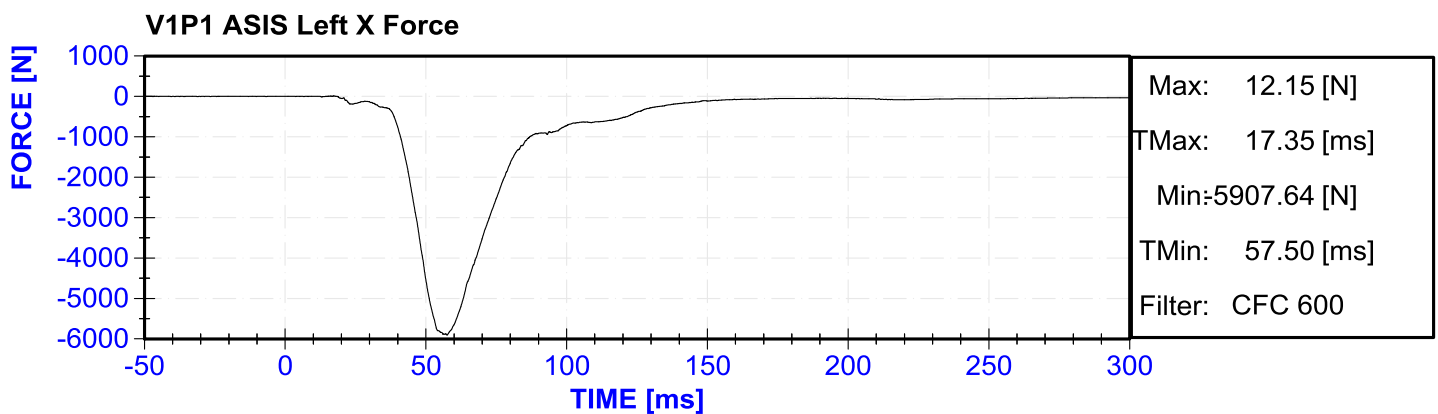
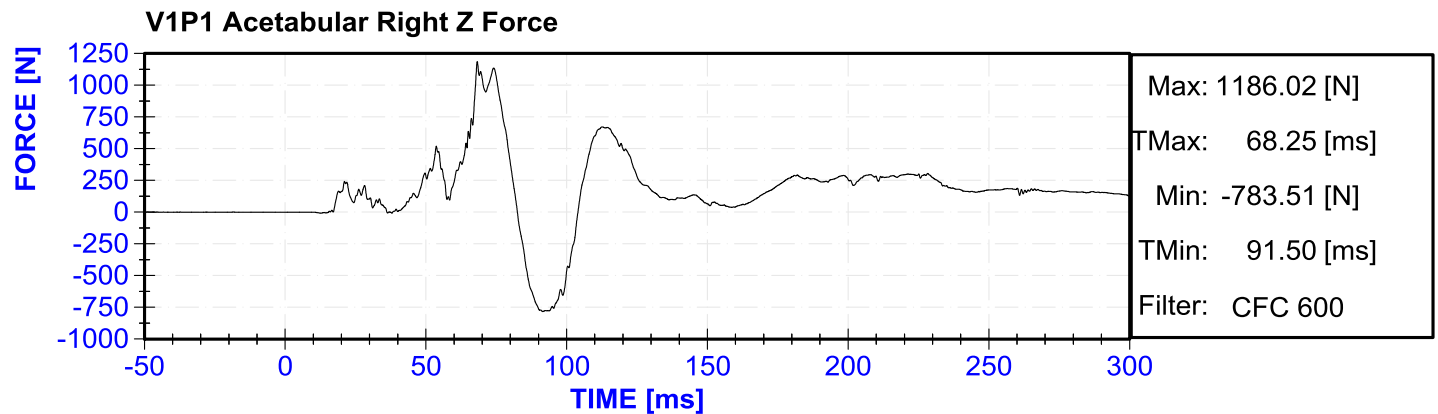
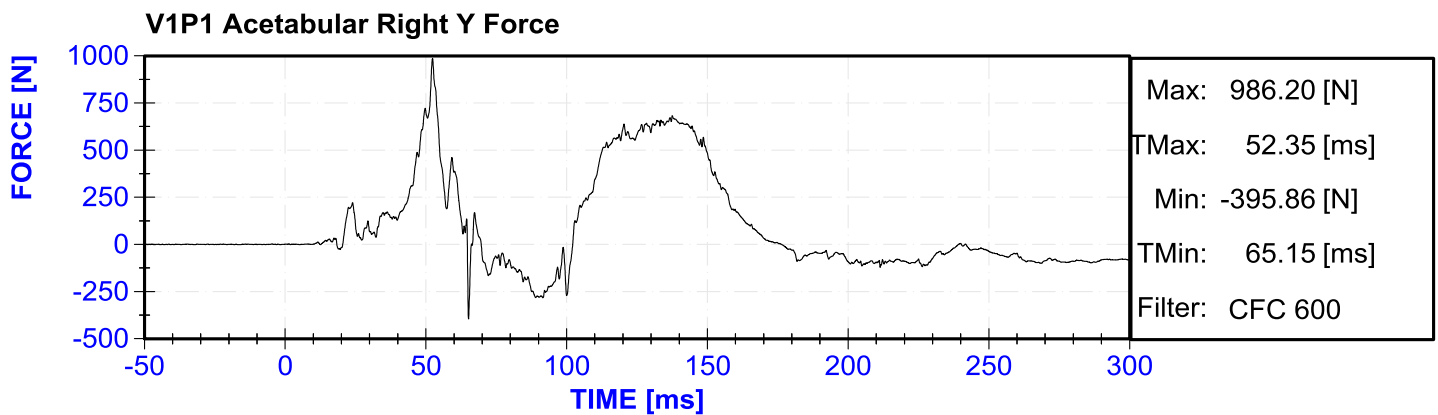
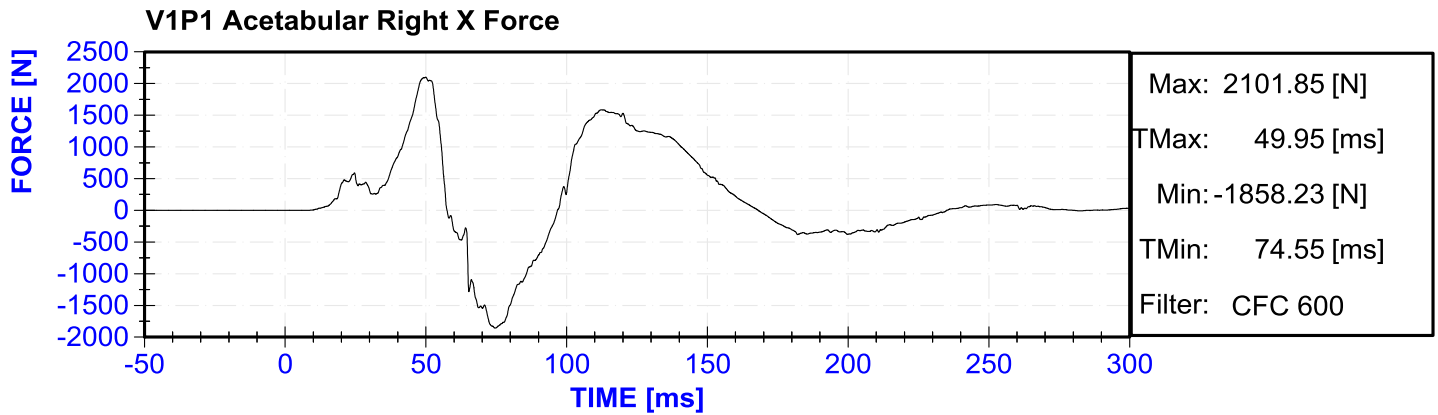


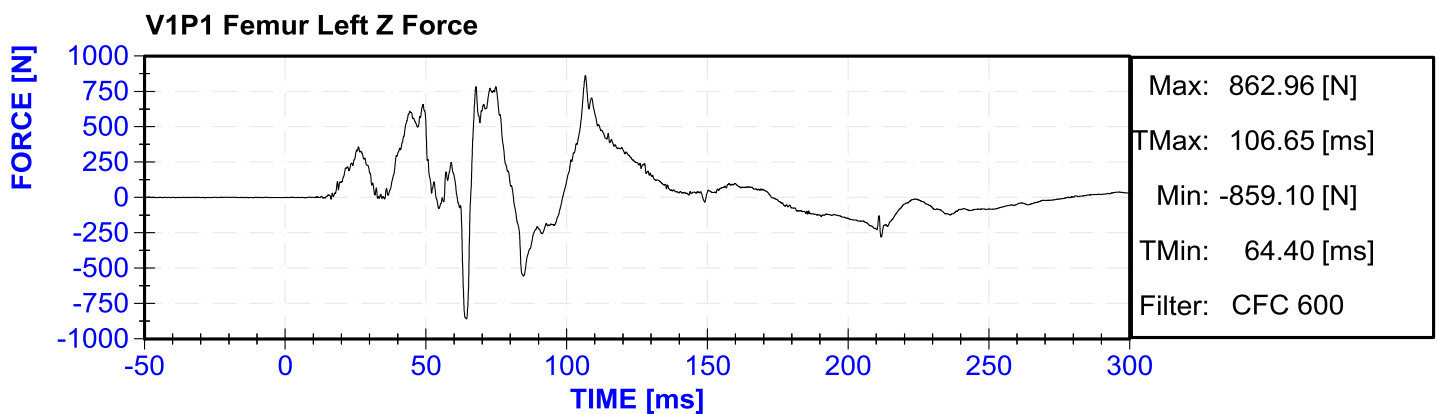
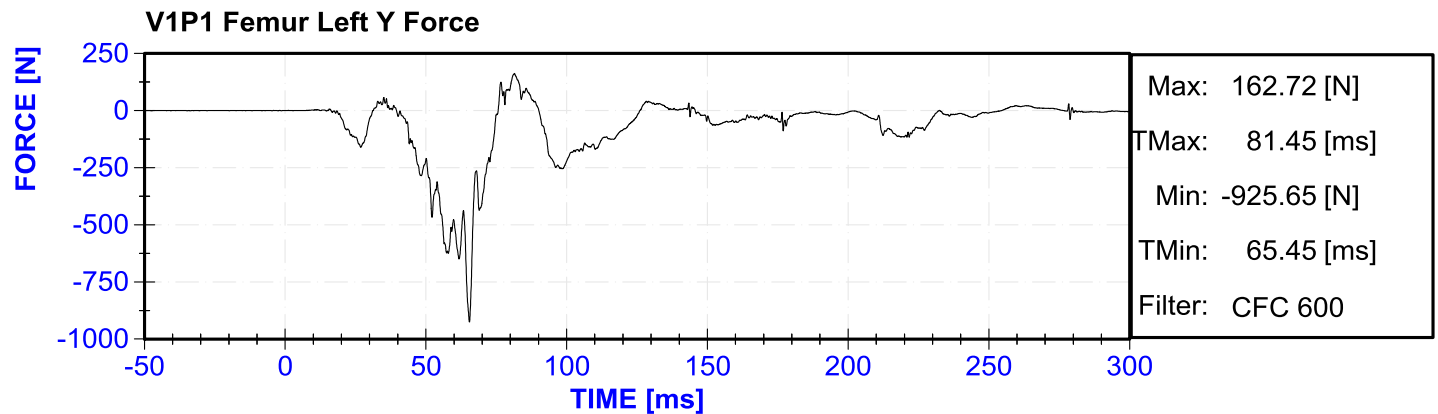
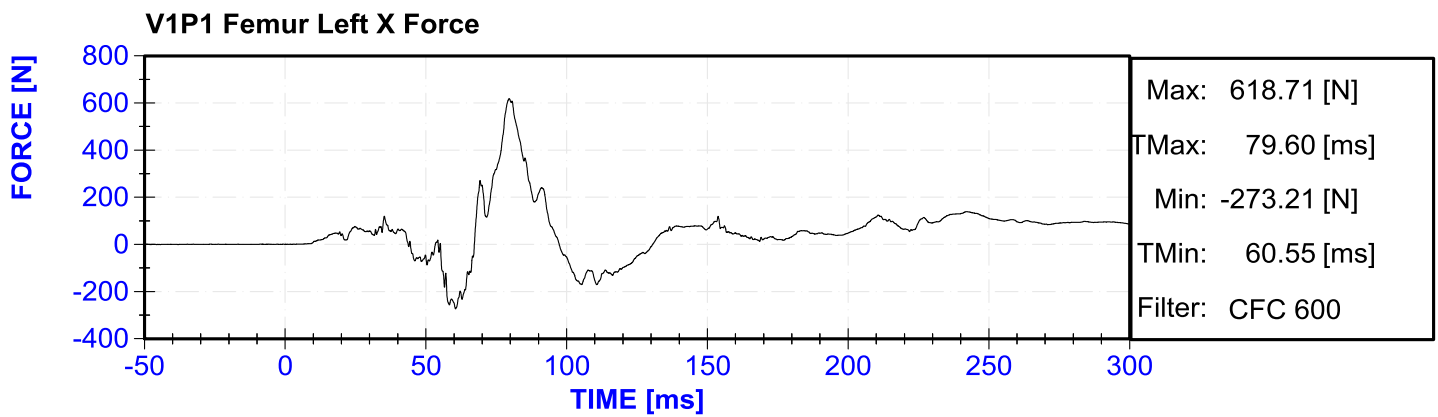
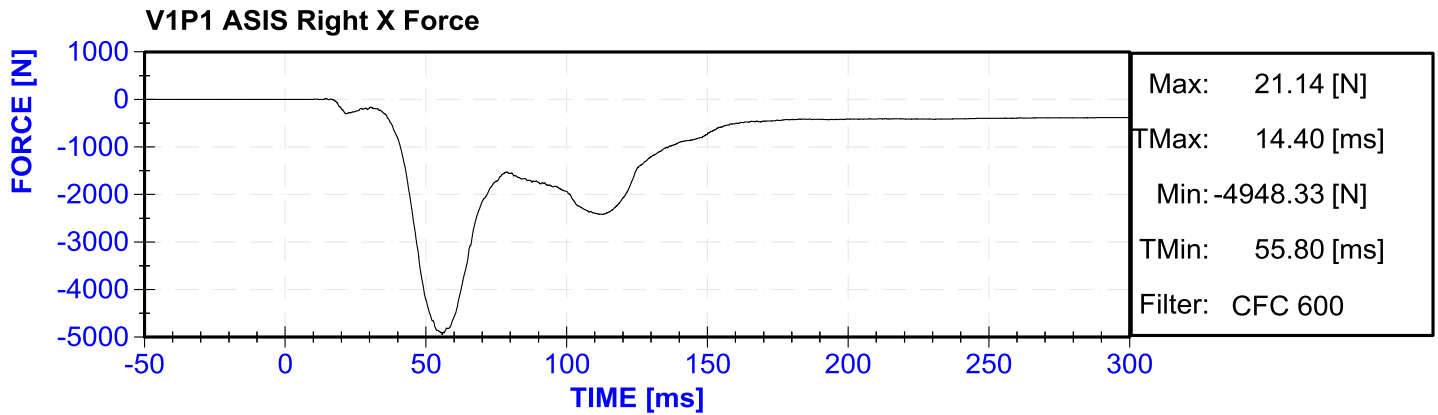
V1P1 Spine Force Z

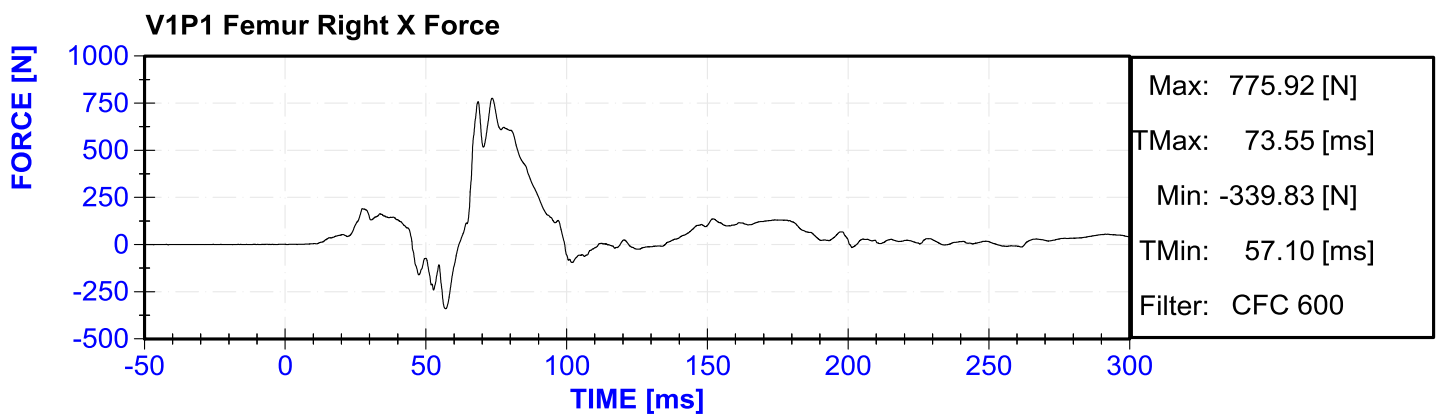
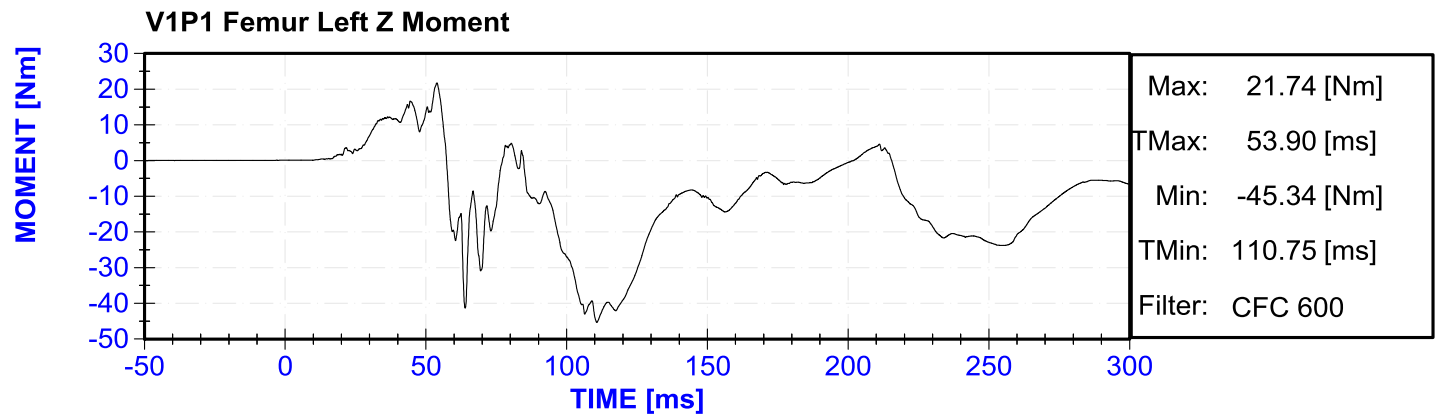
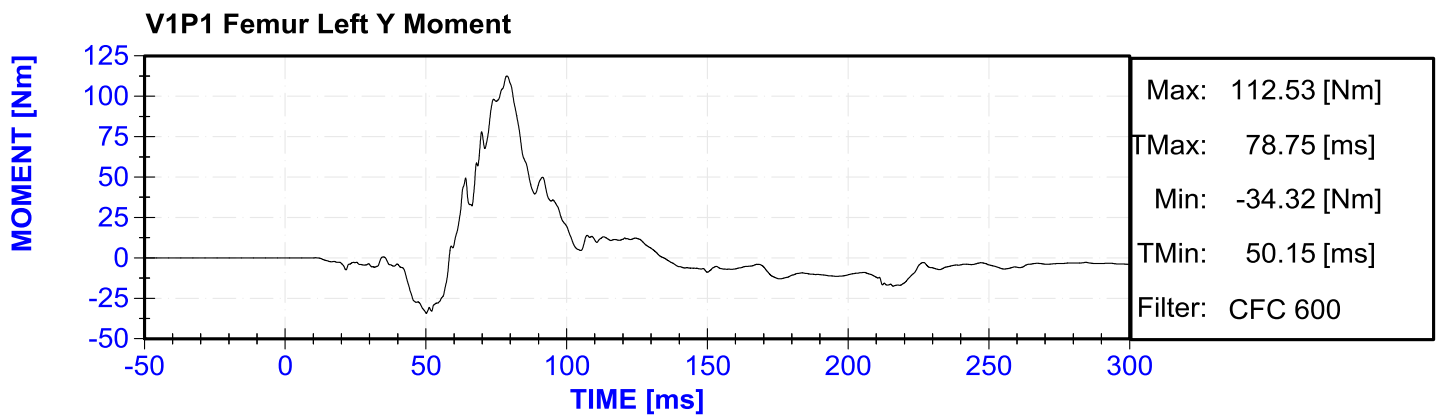
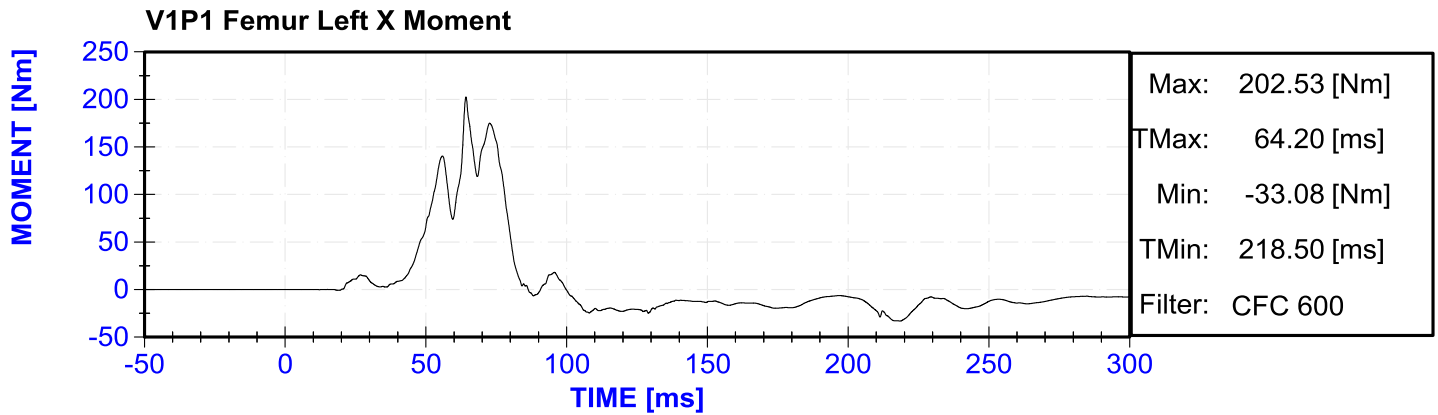


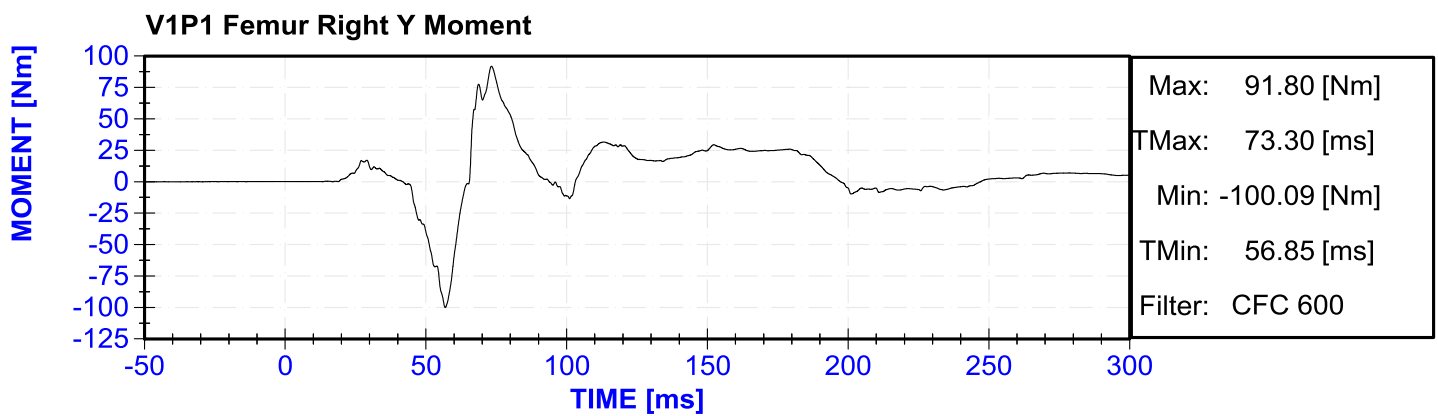
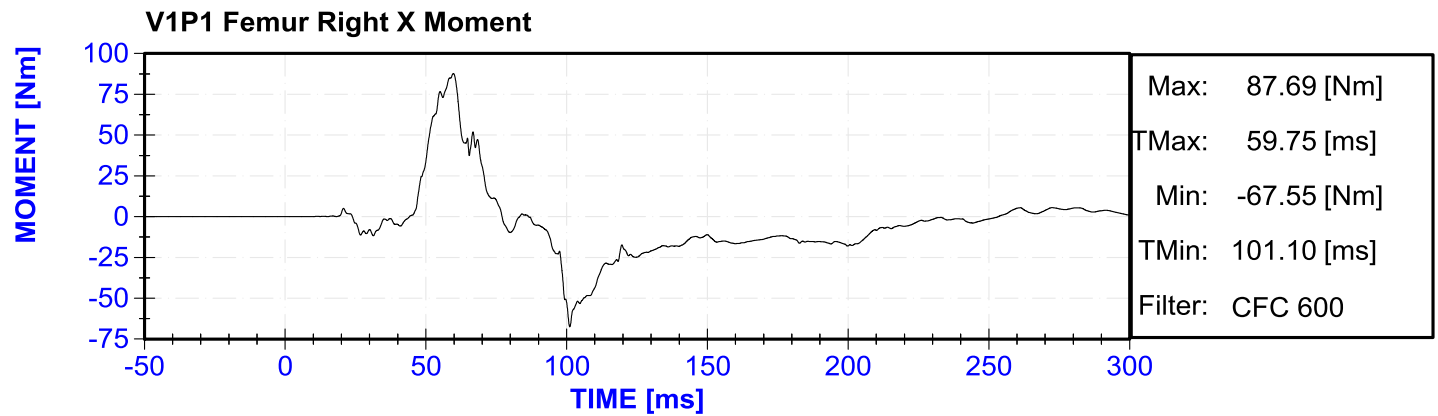
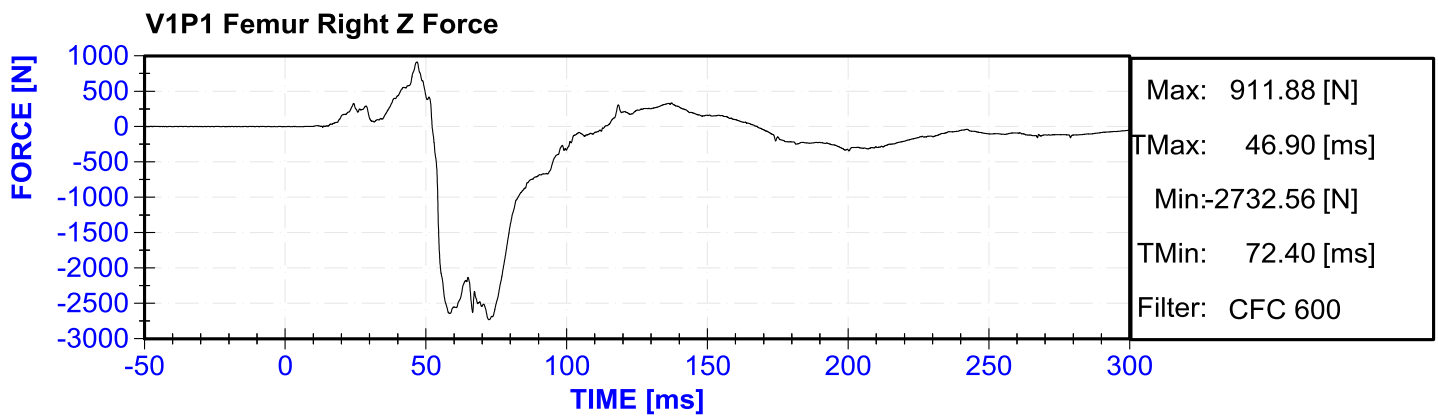
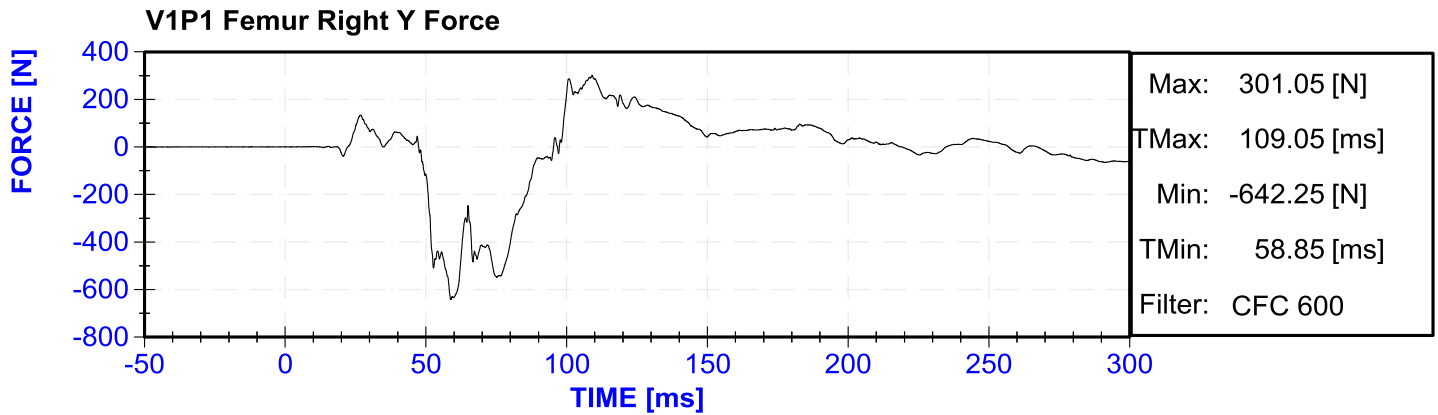


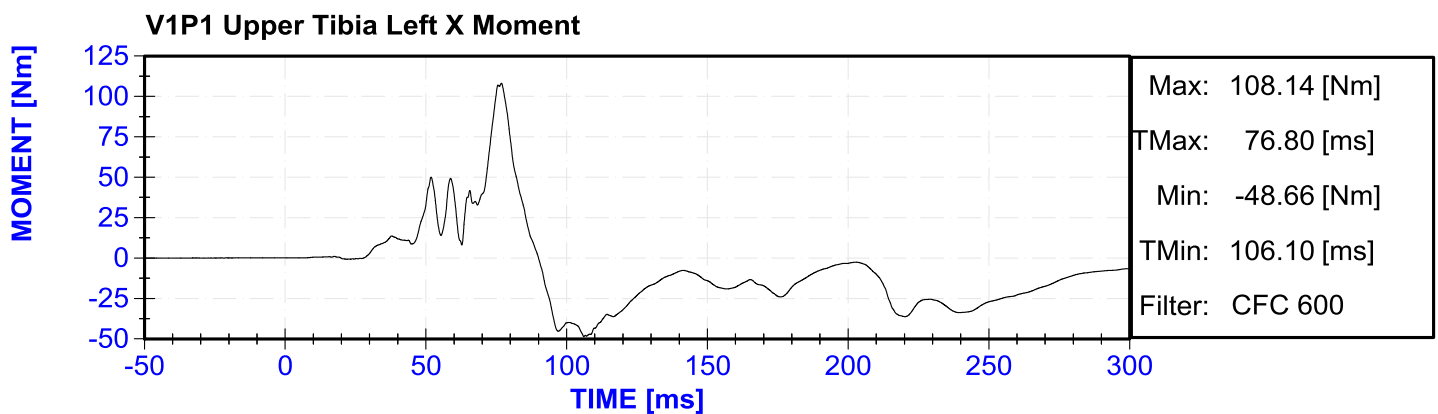
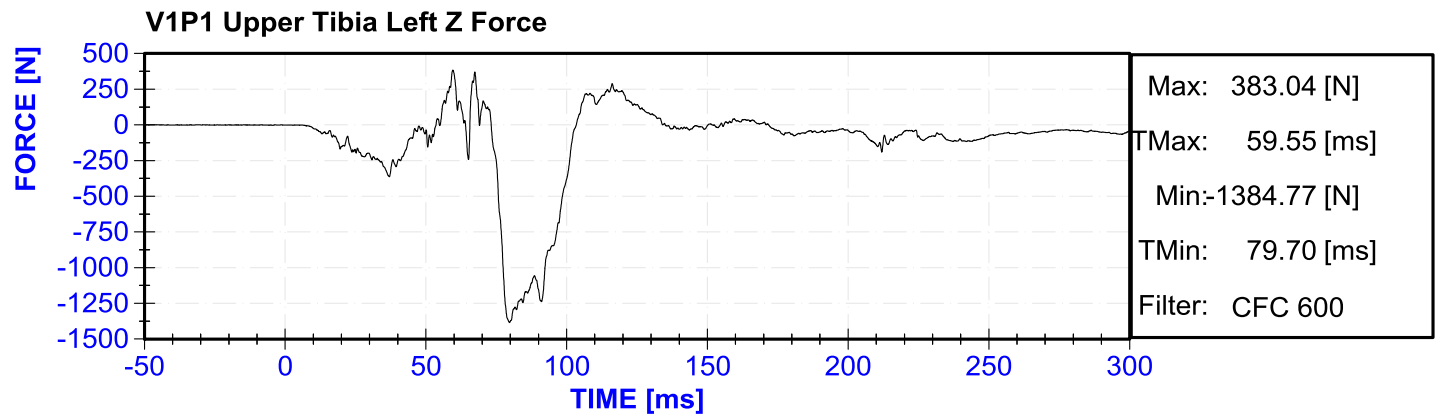
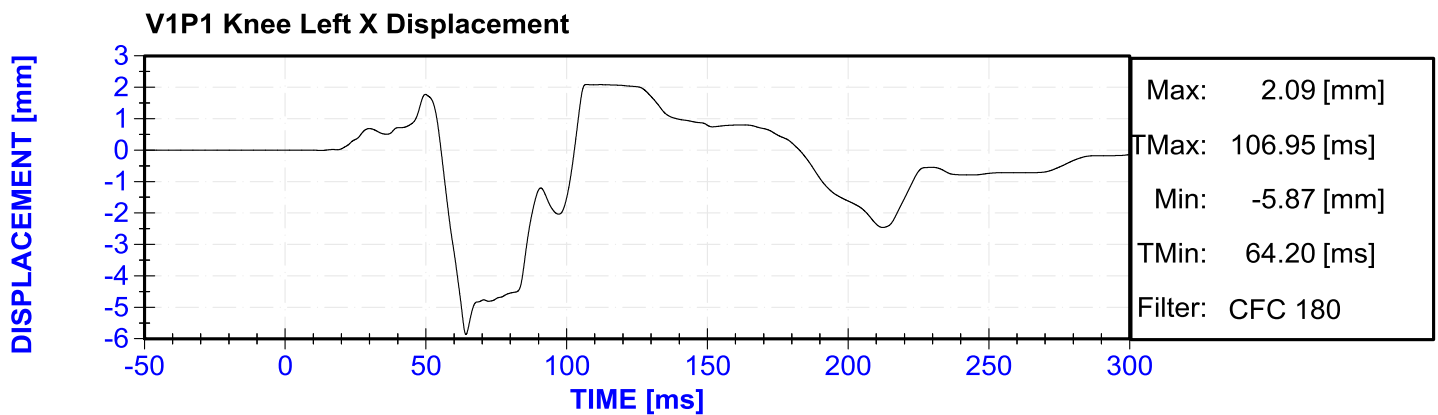
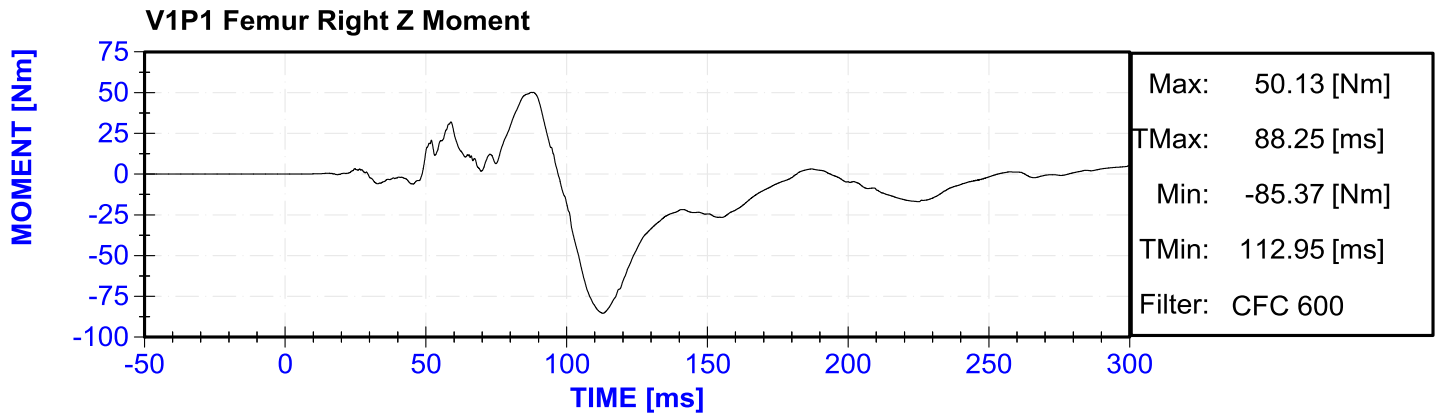




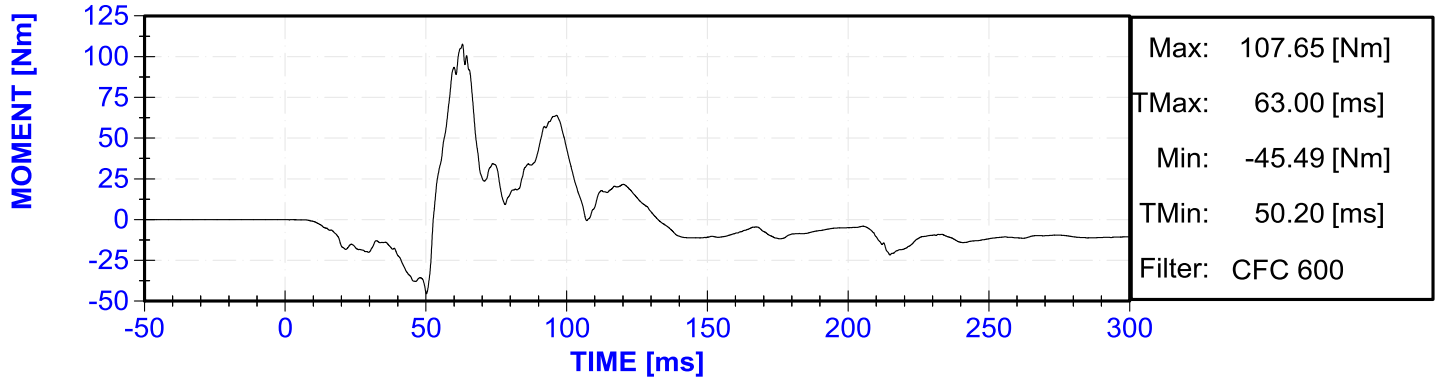




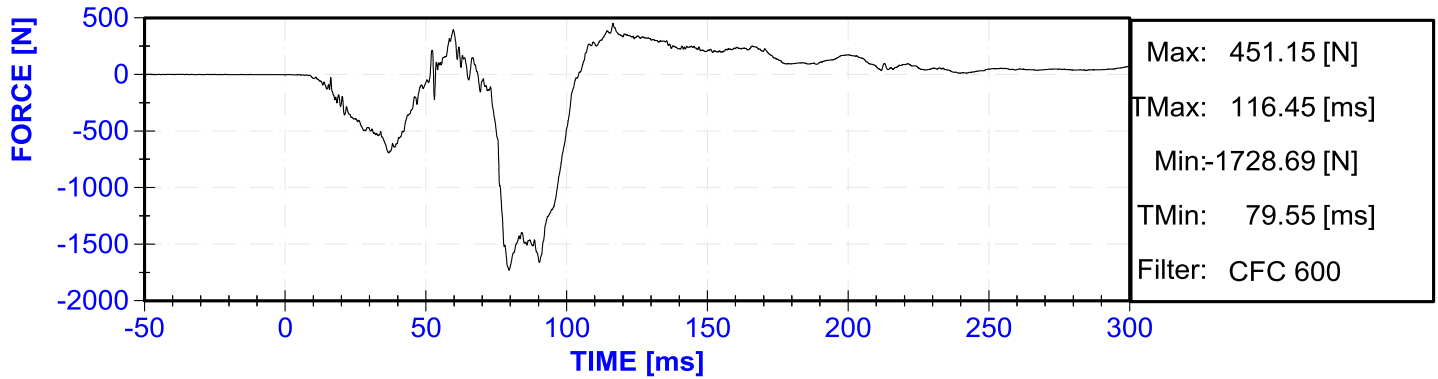




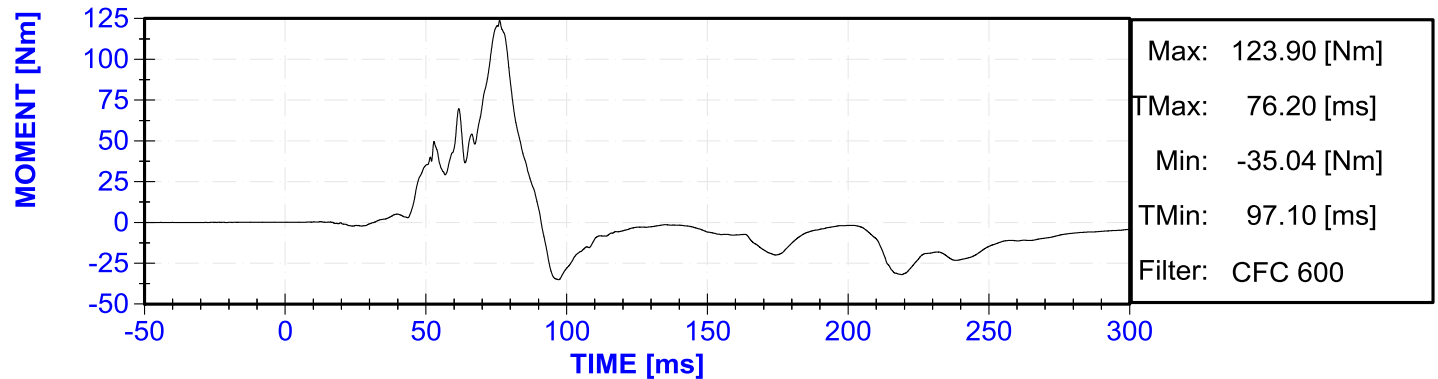
V1P1 Upper Tibia Left Y Moment



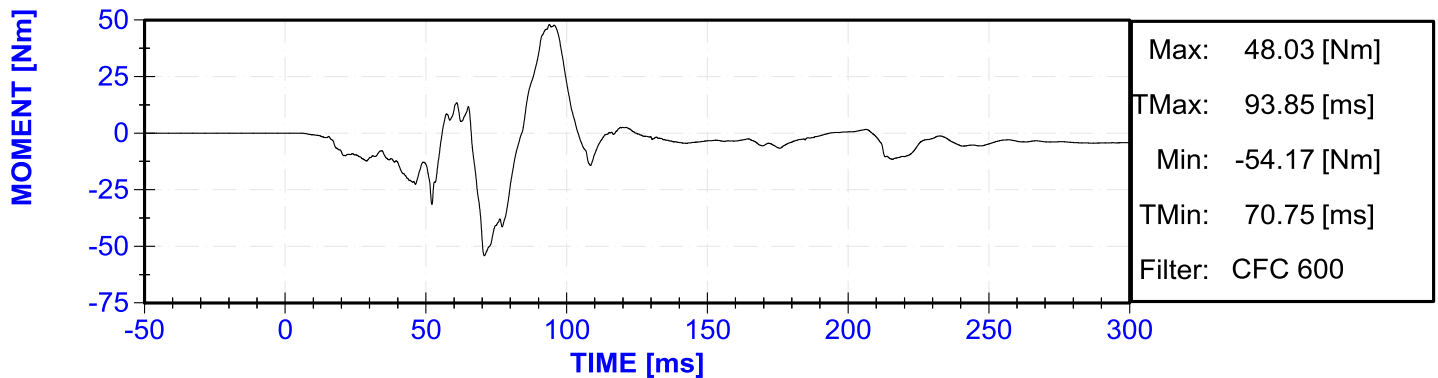
V1P1 Lower Tibia Left Z Force

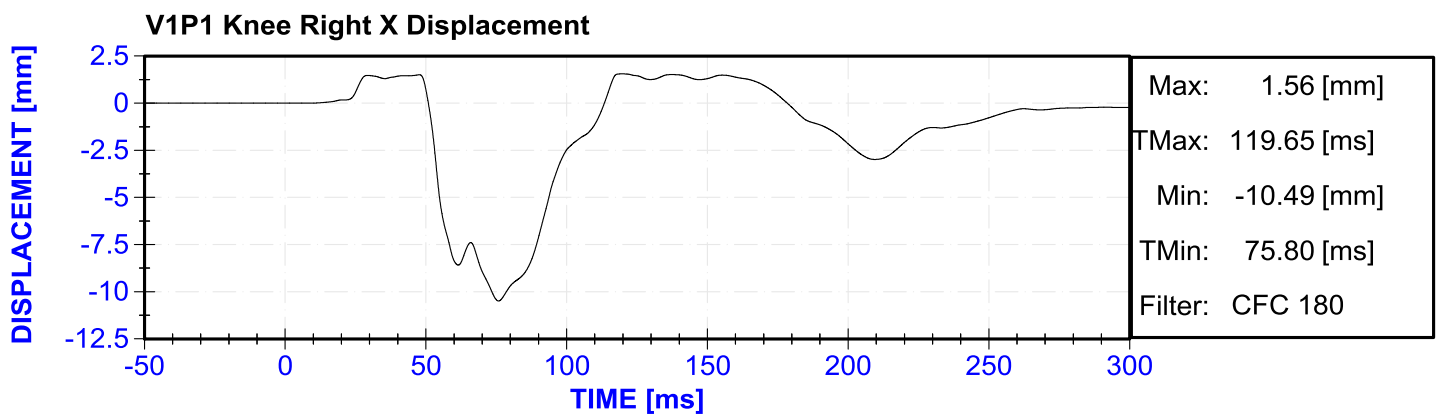
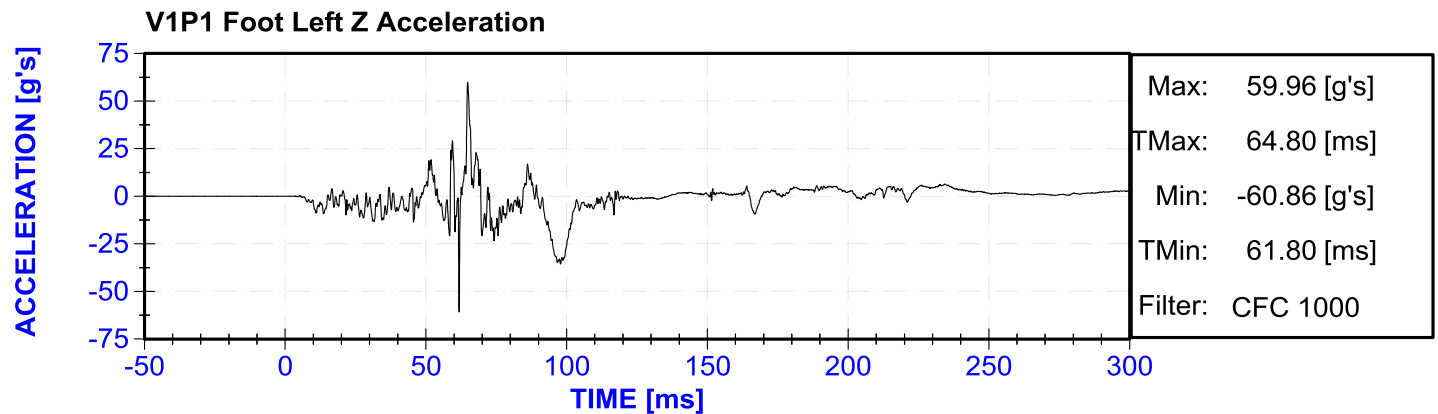
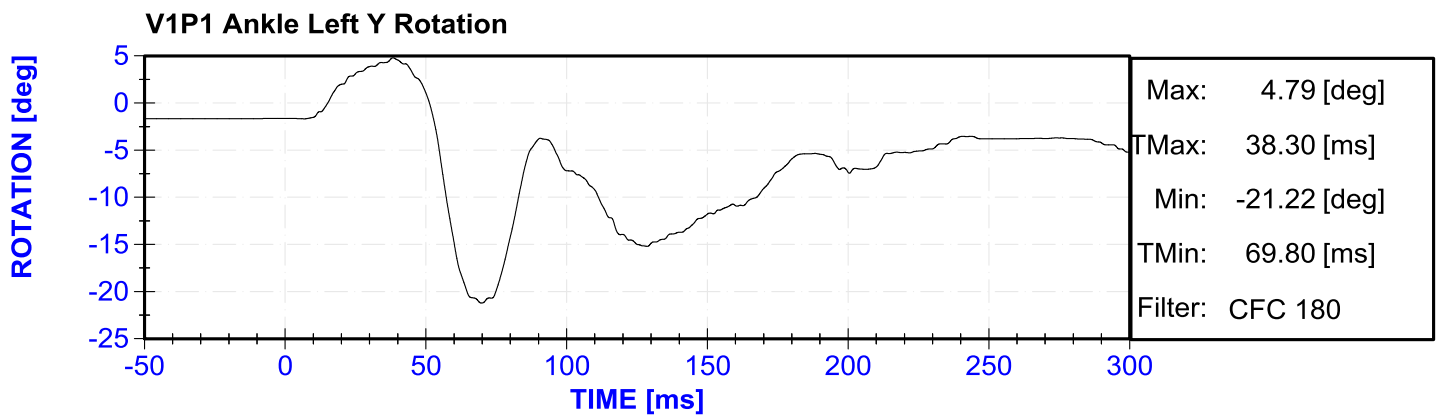
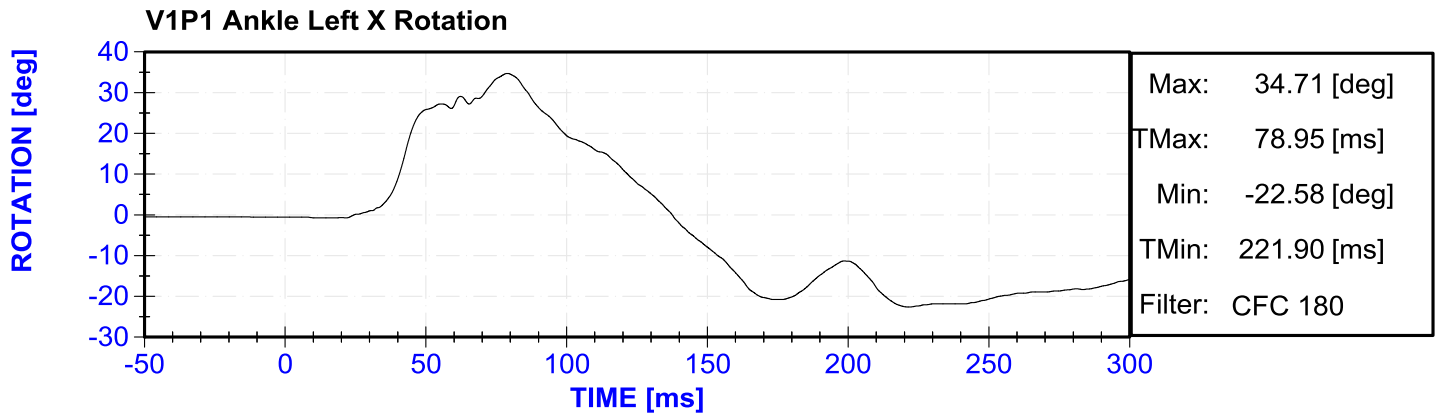


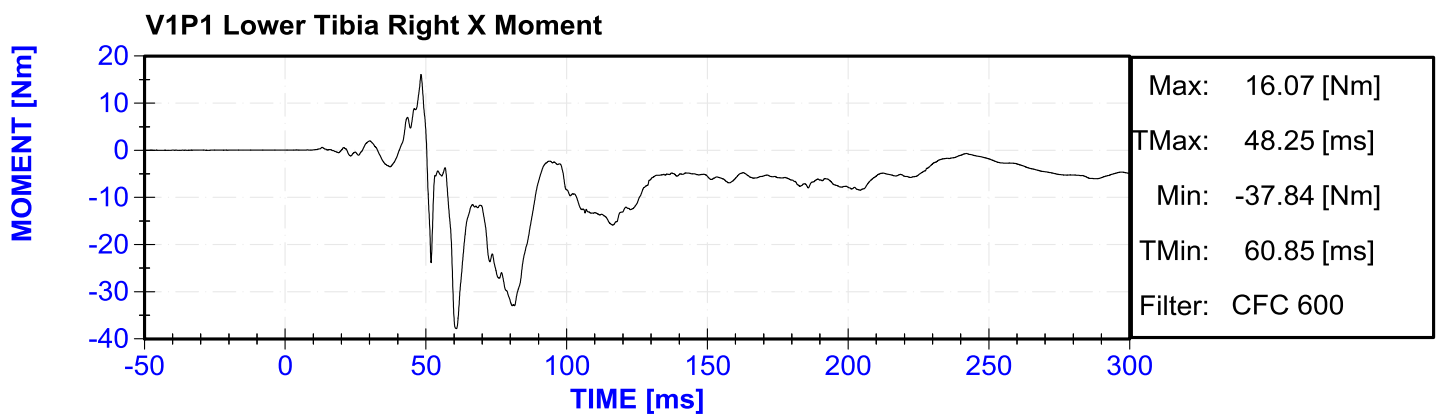
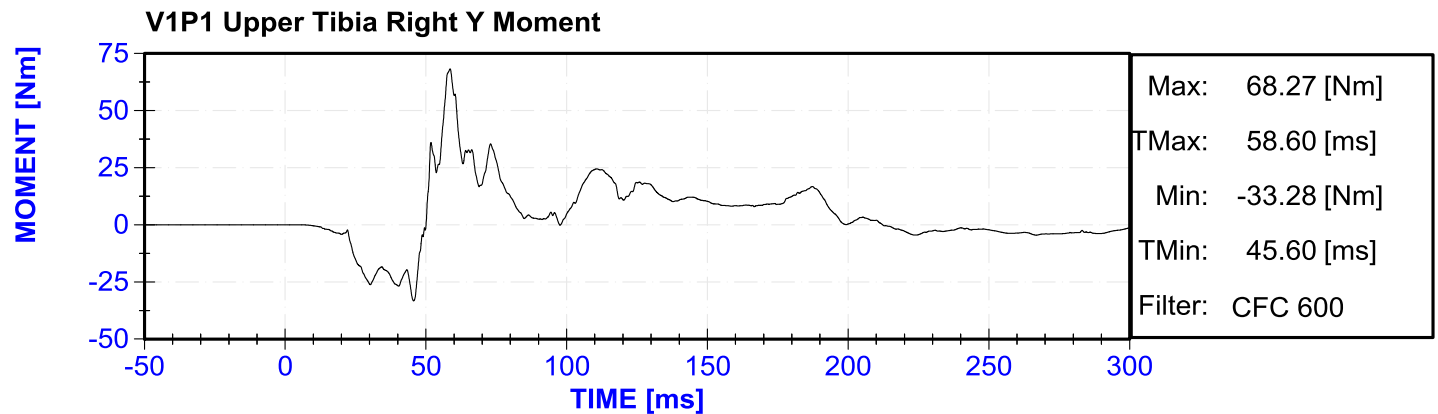
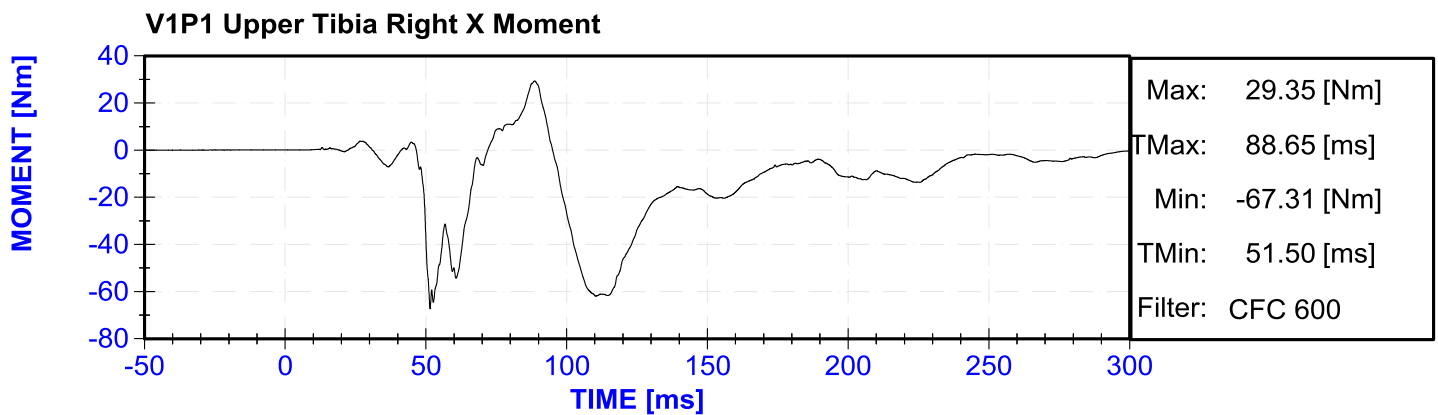
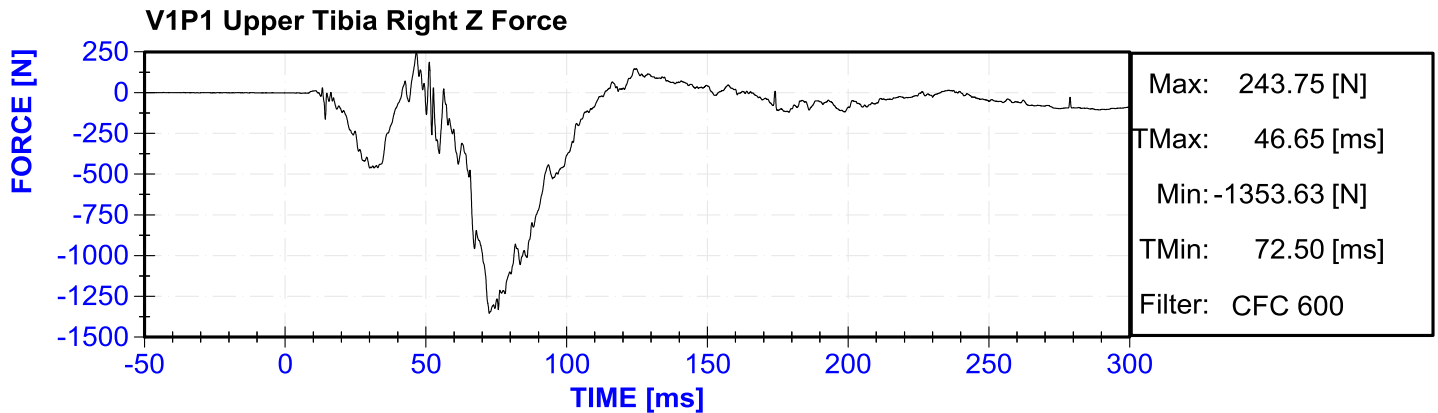
V1P1 Lower Tibia Left X Moment

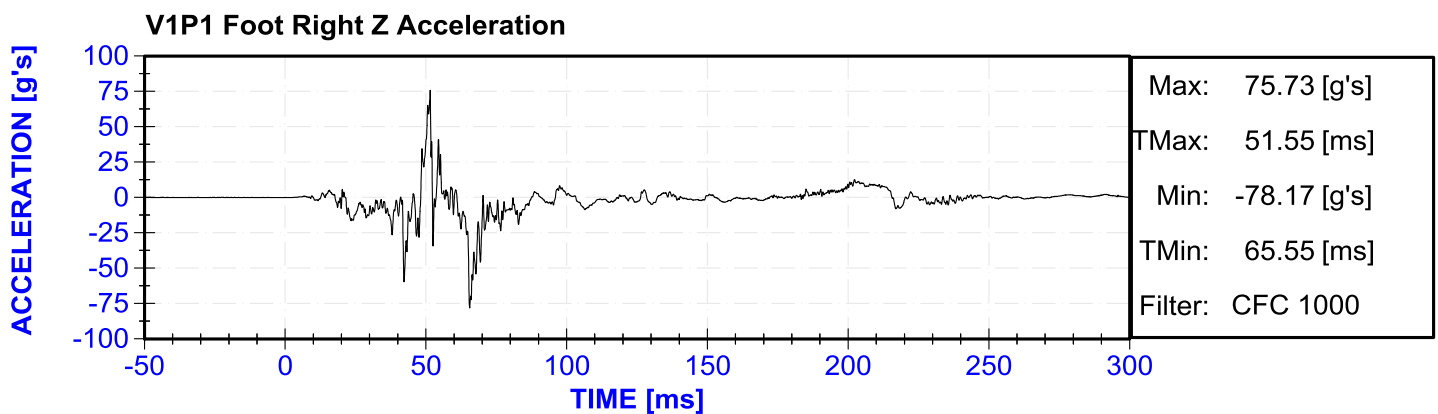
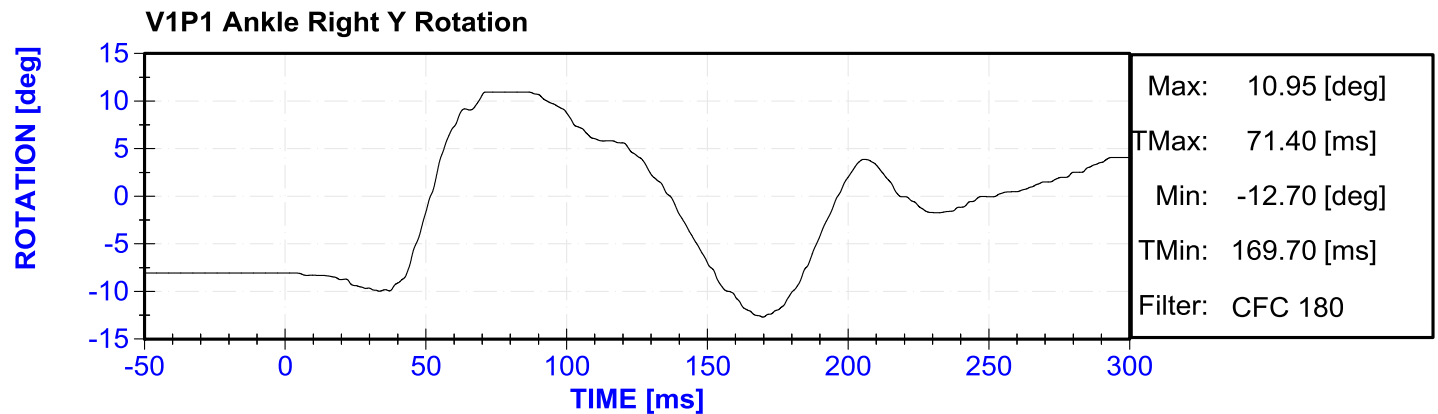
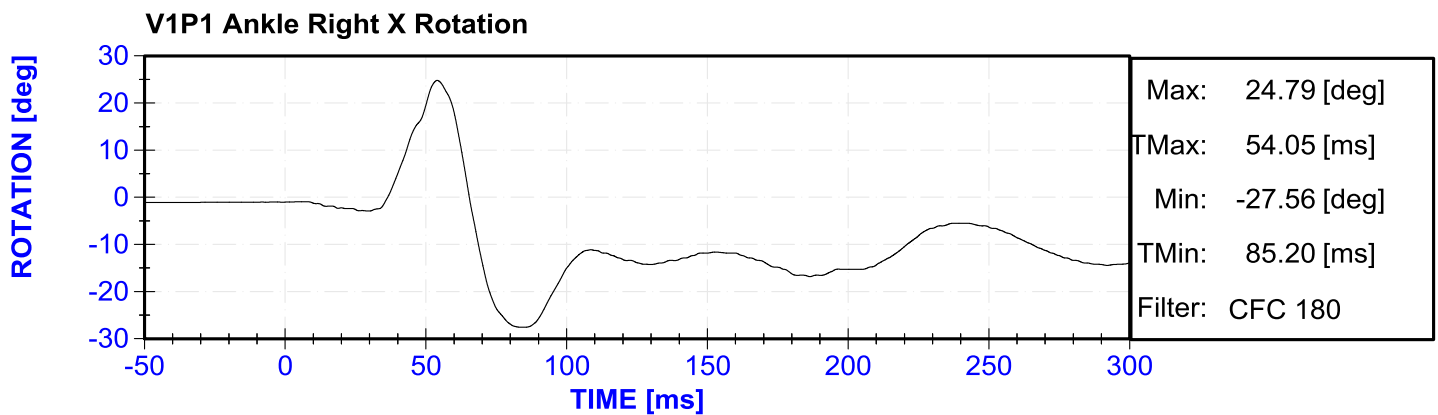
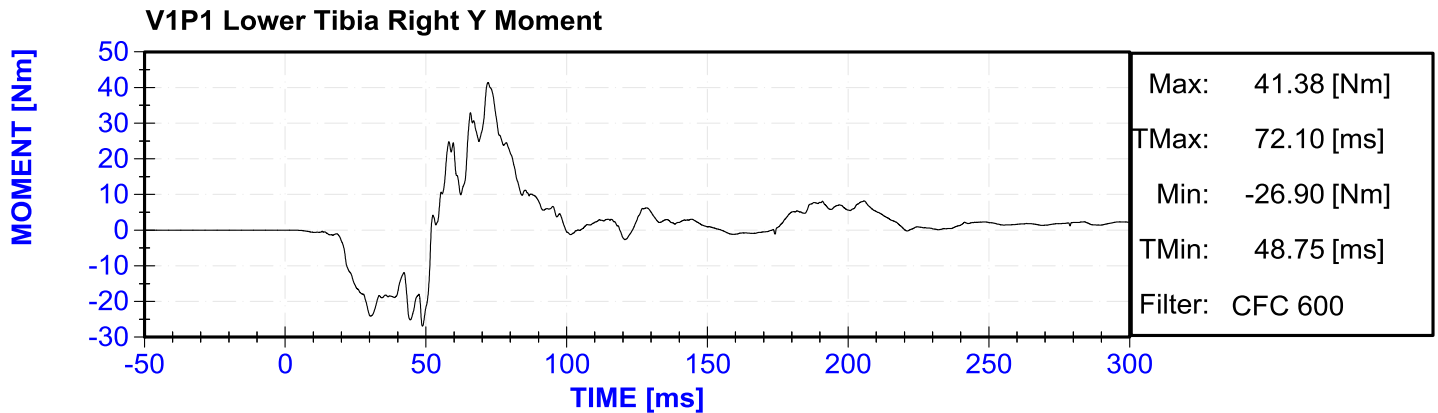


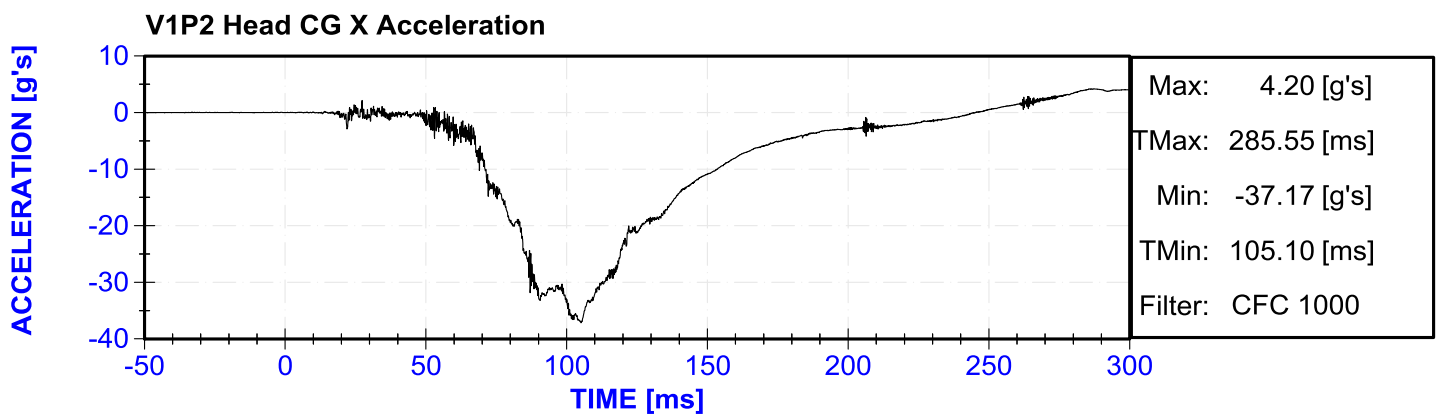
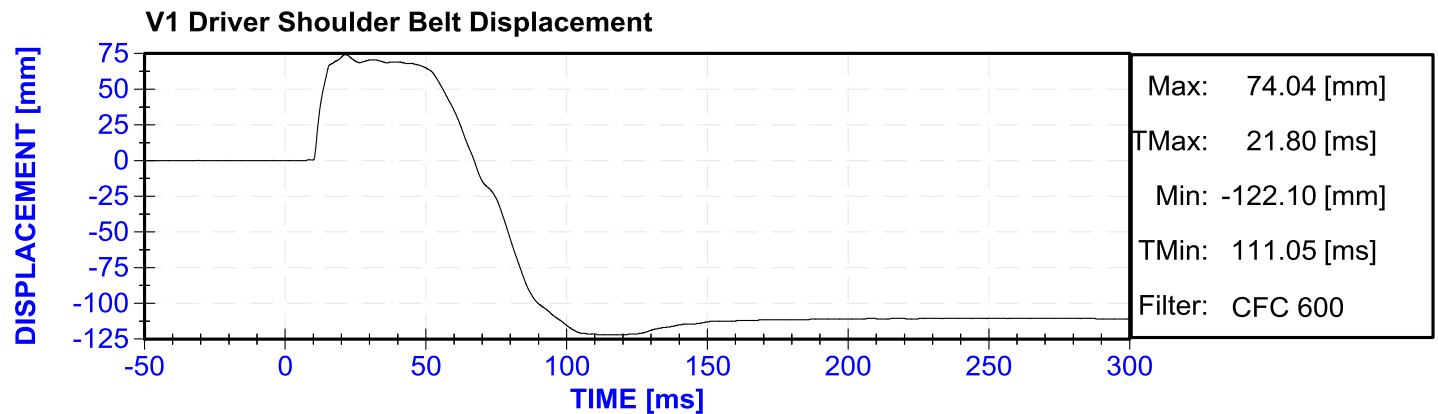
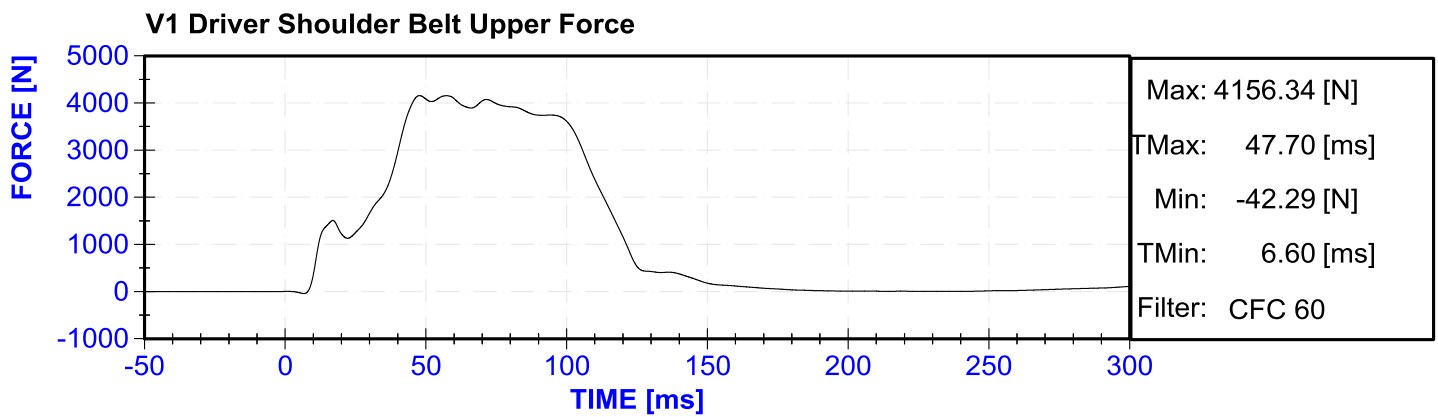
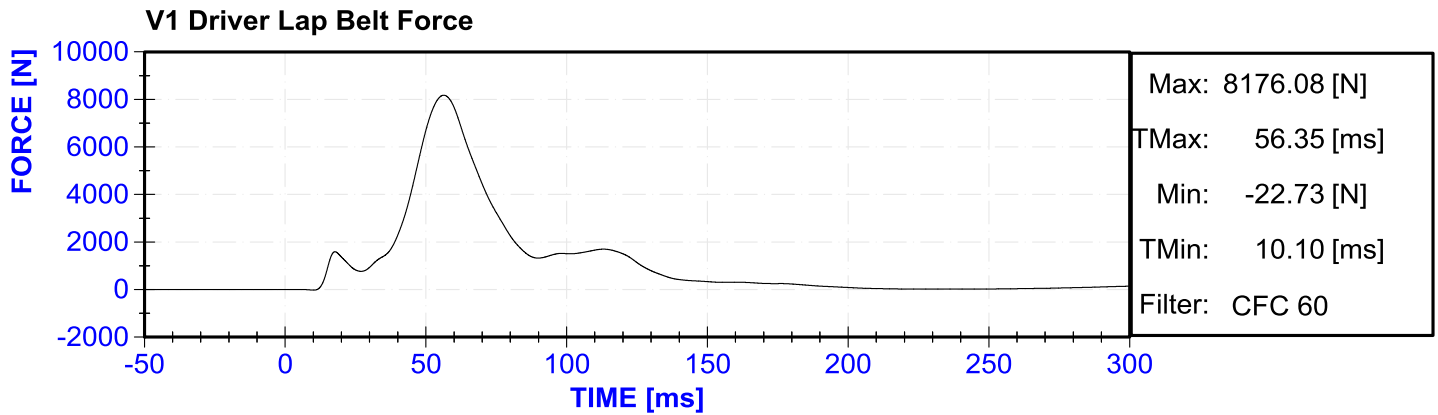
V1P1 Lower Tibia Left Y Moment

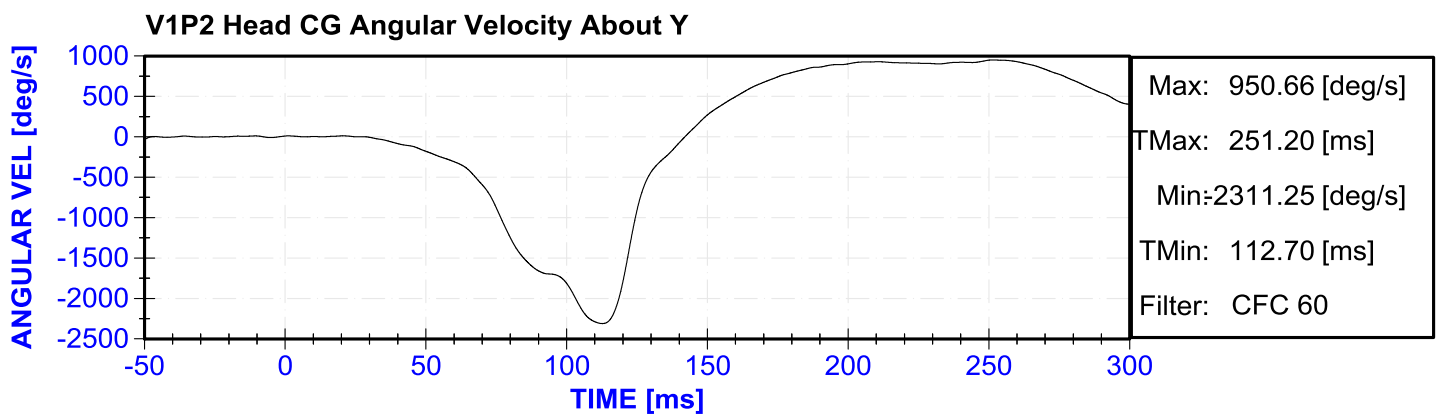
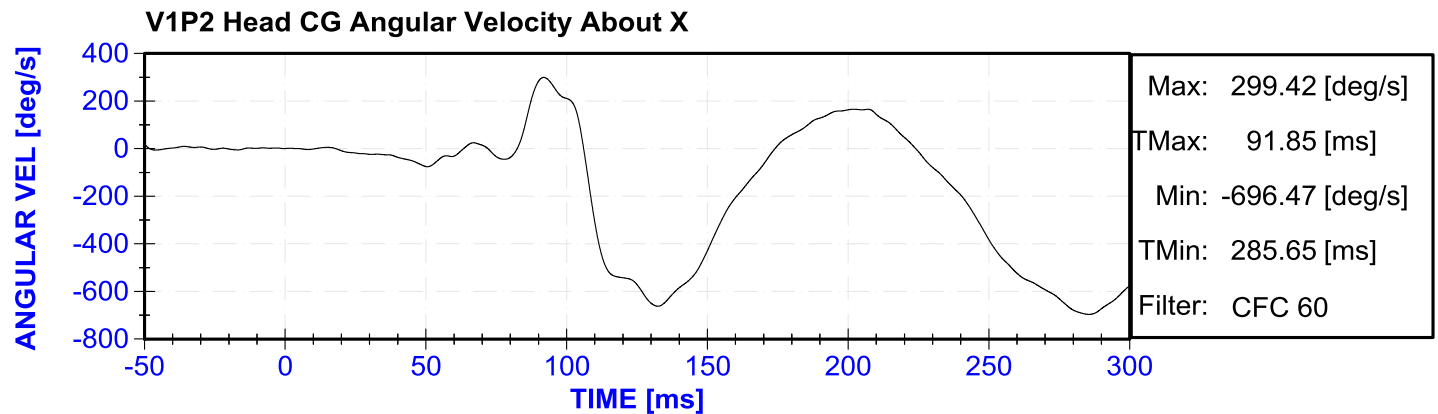
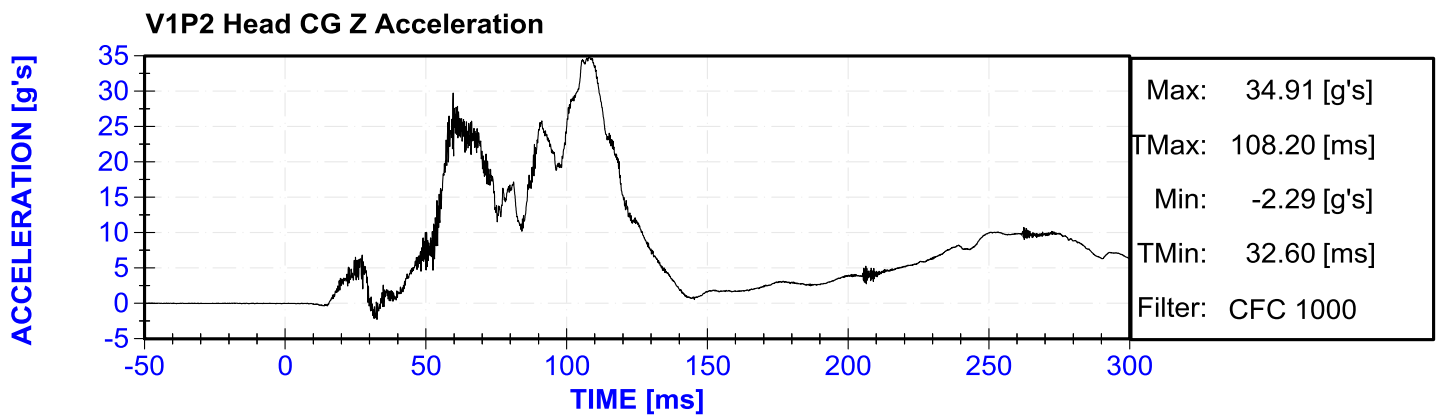
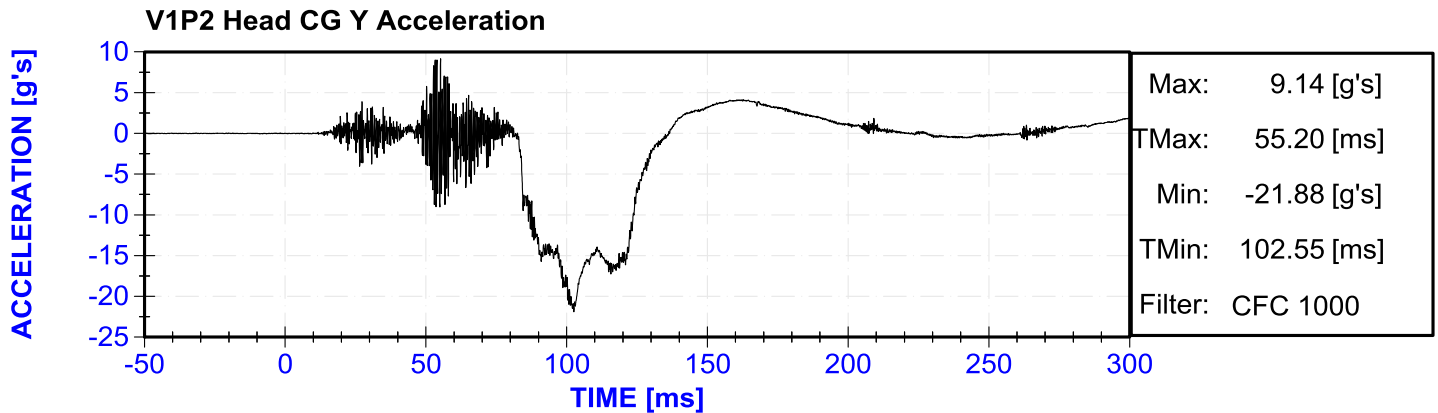


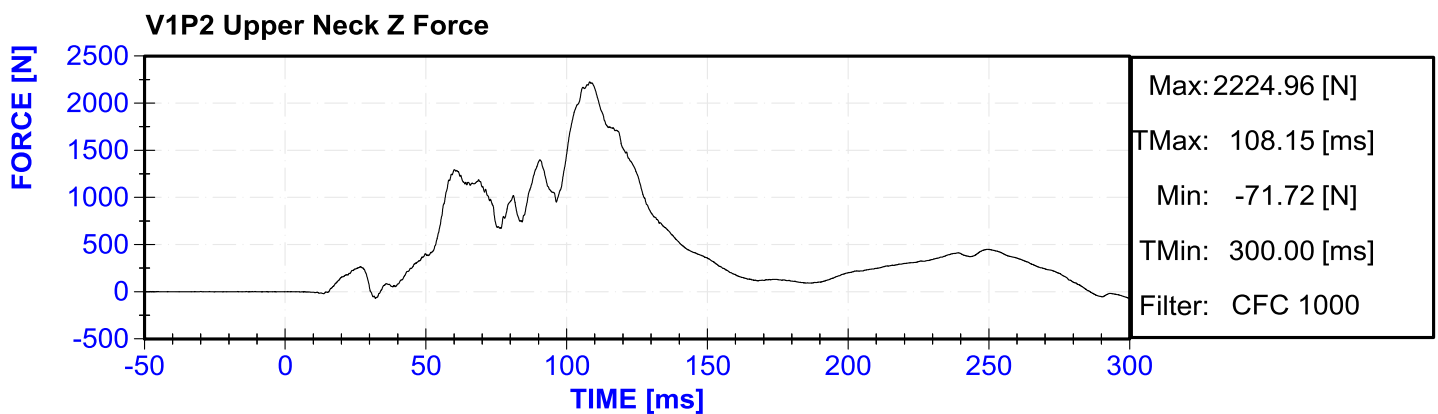
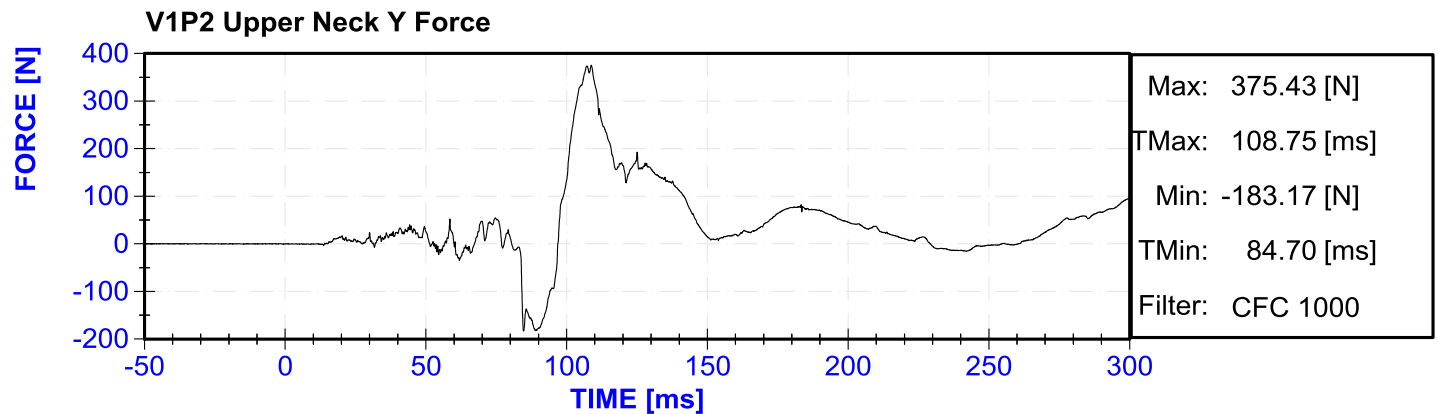
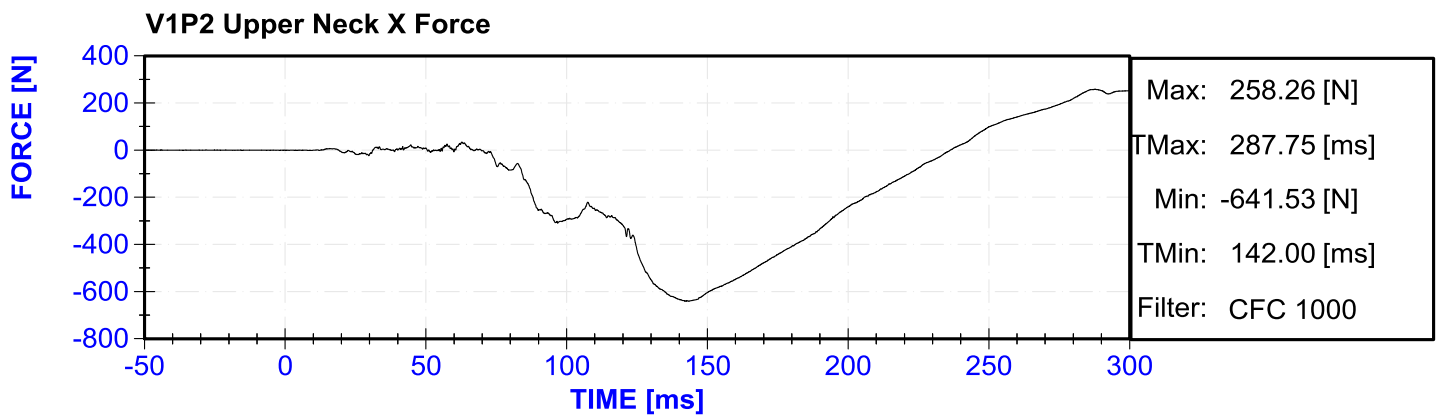
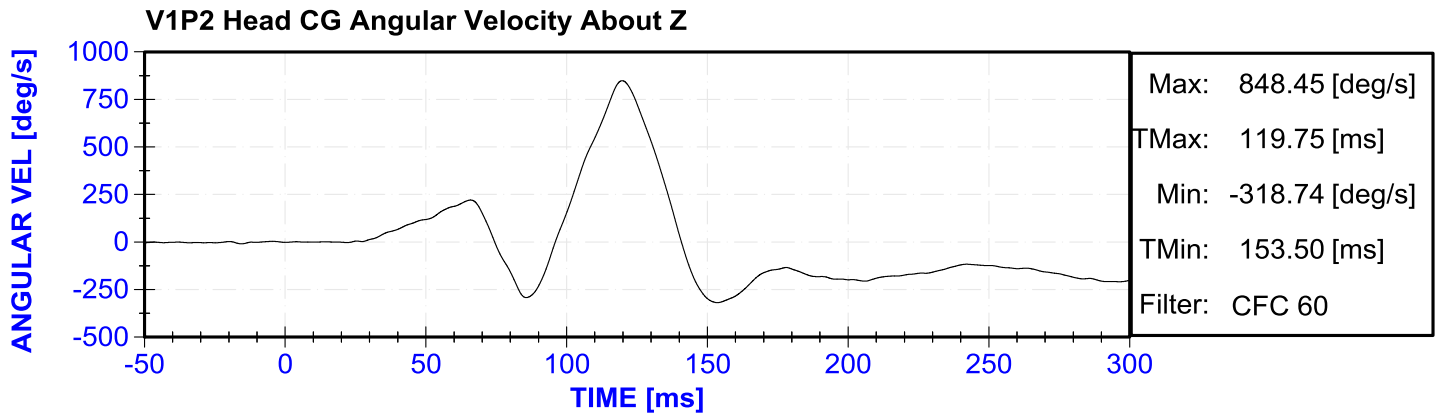


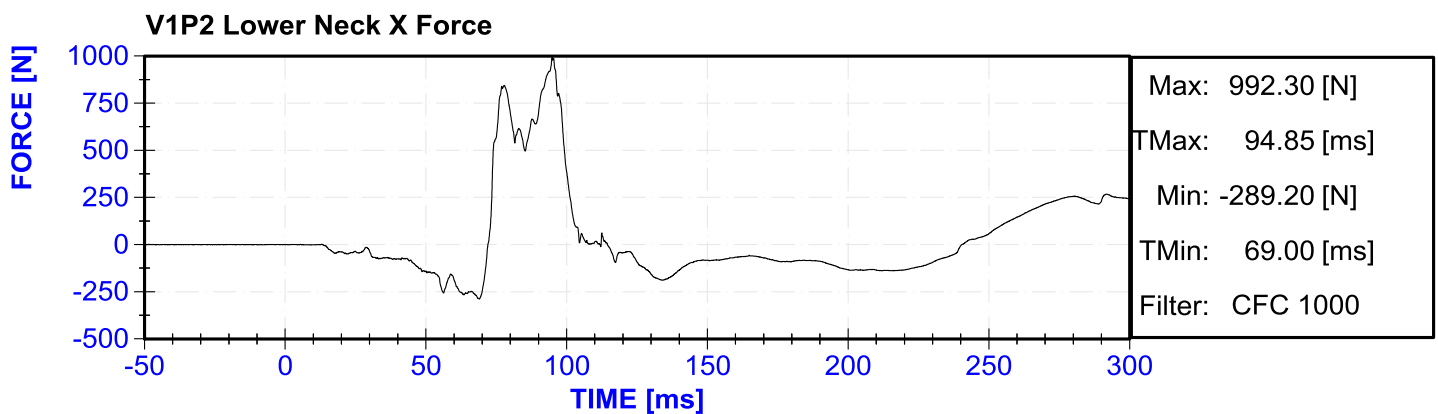
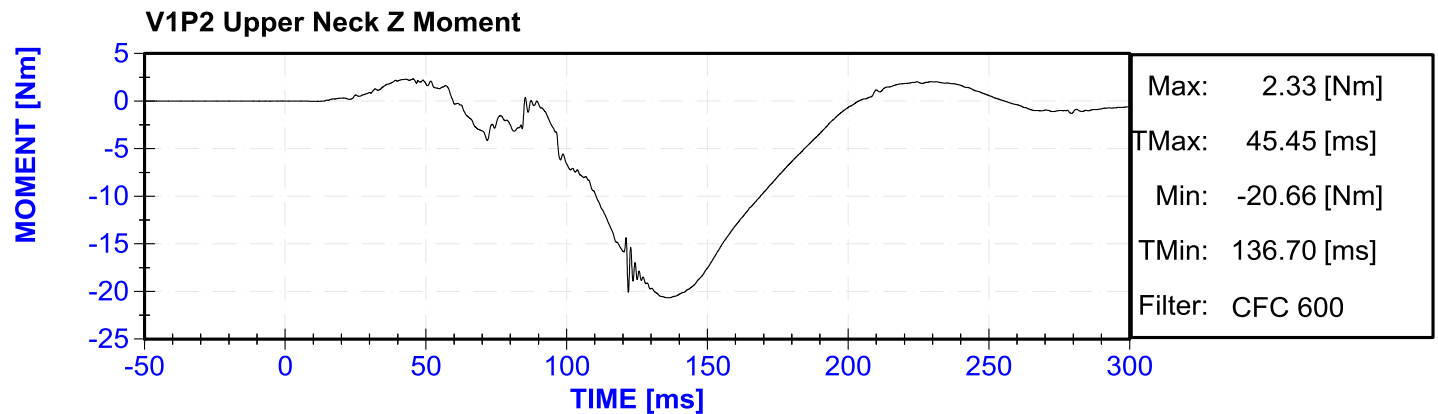
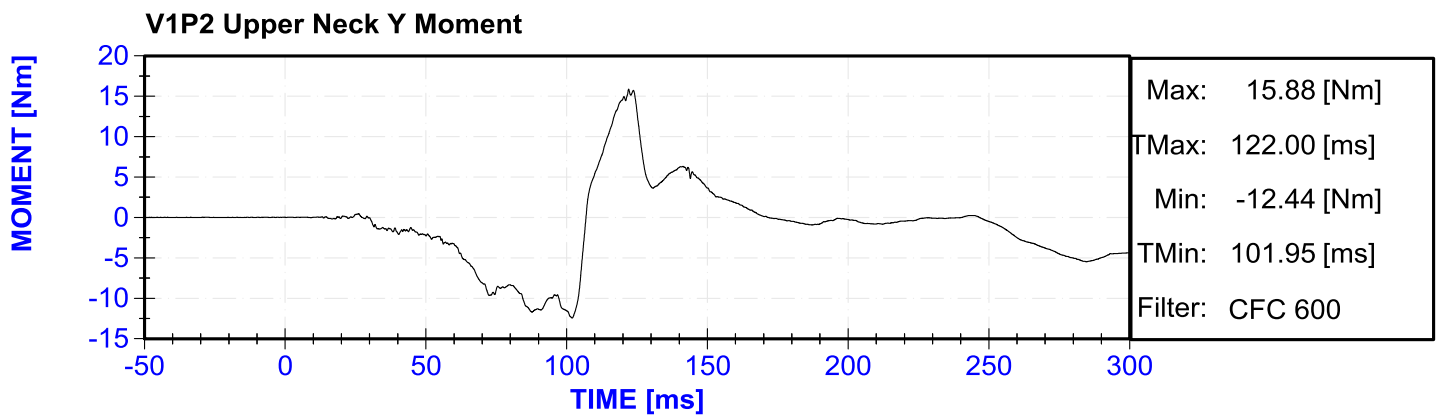
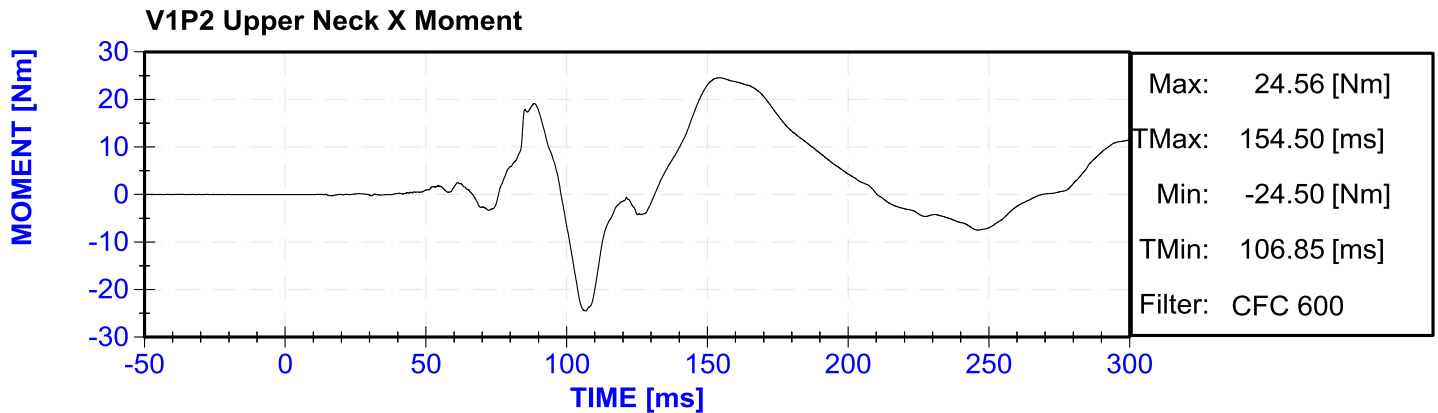


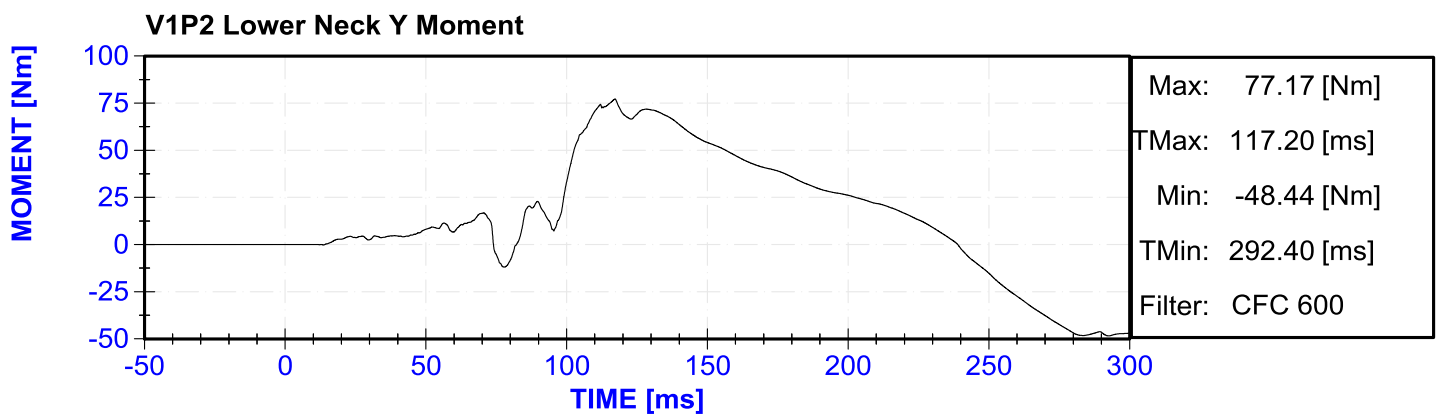
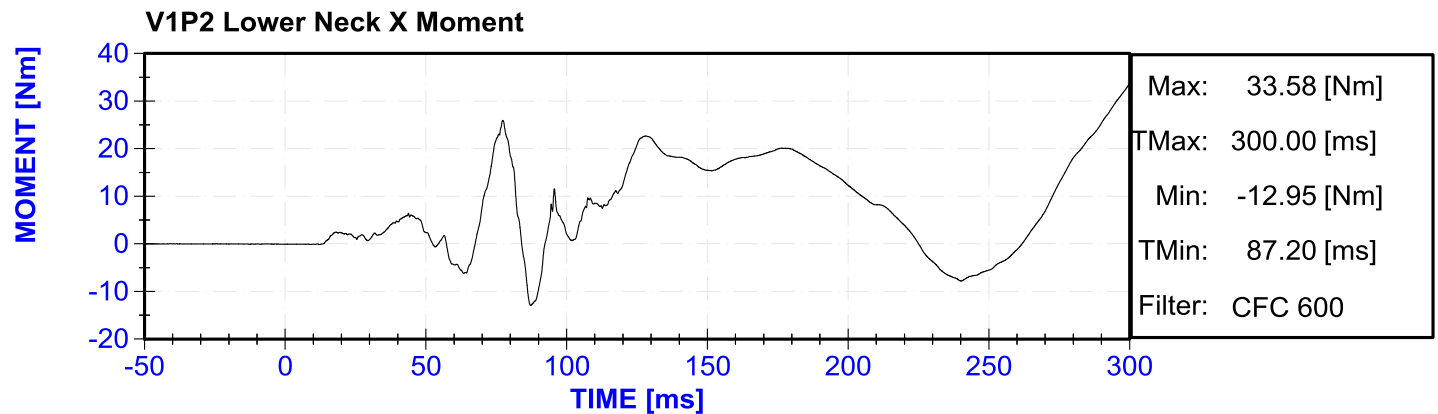
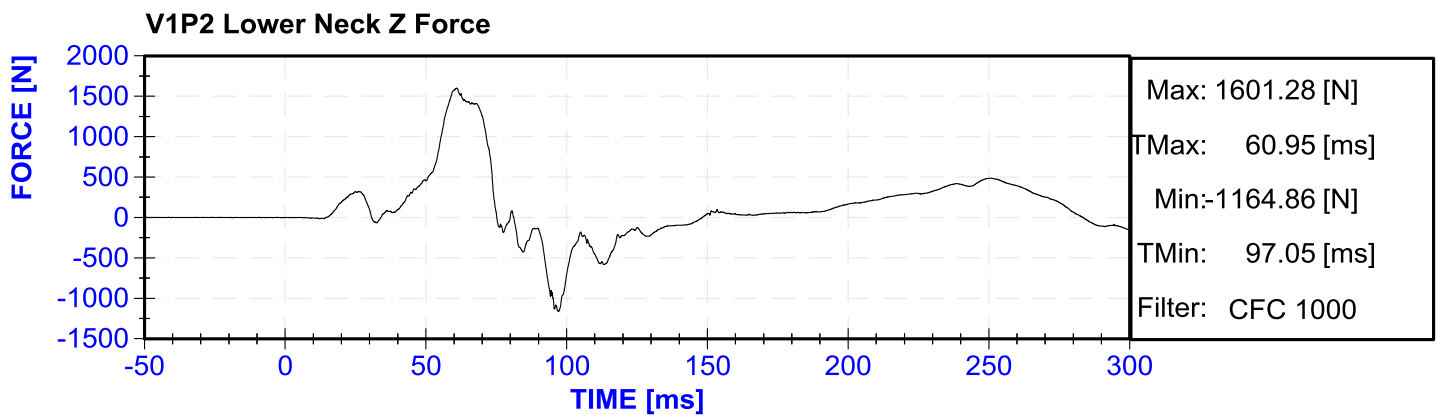
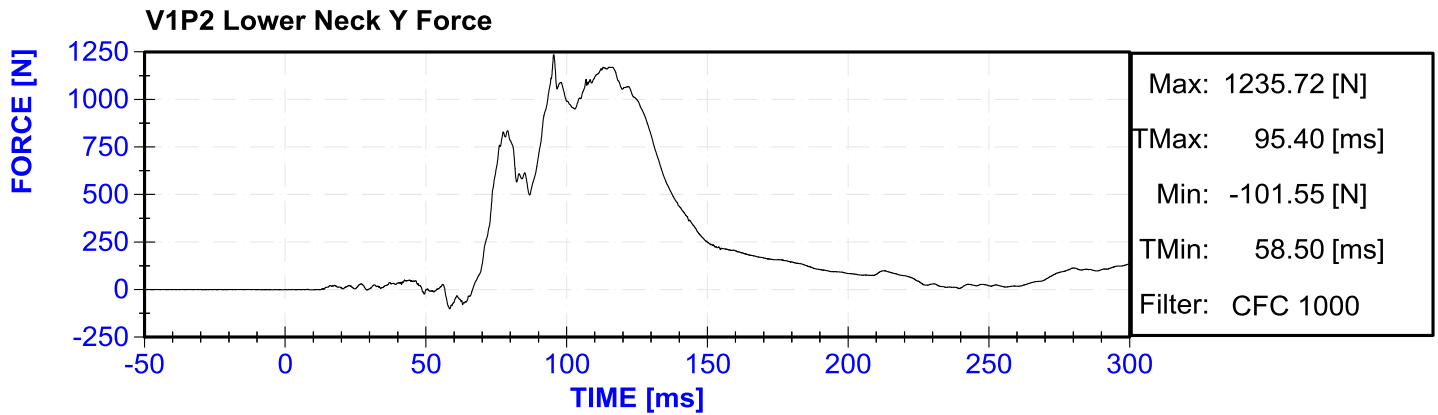


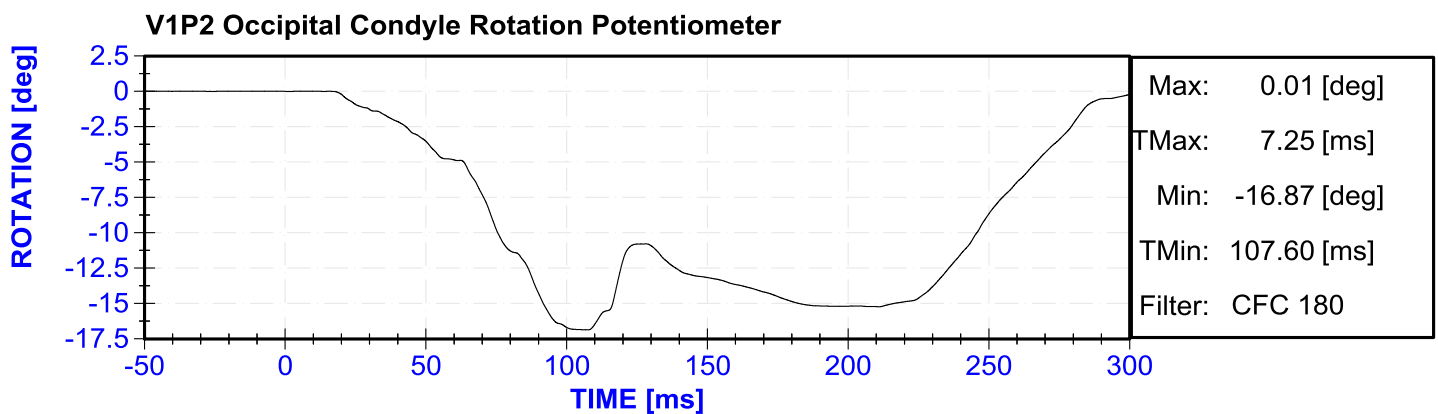
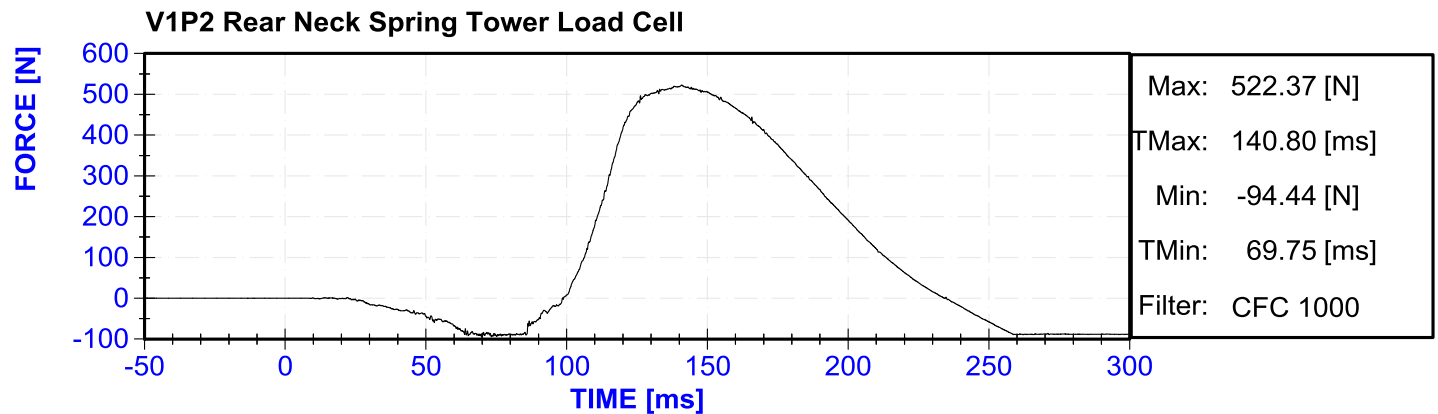
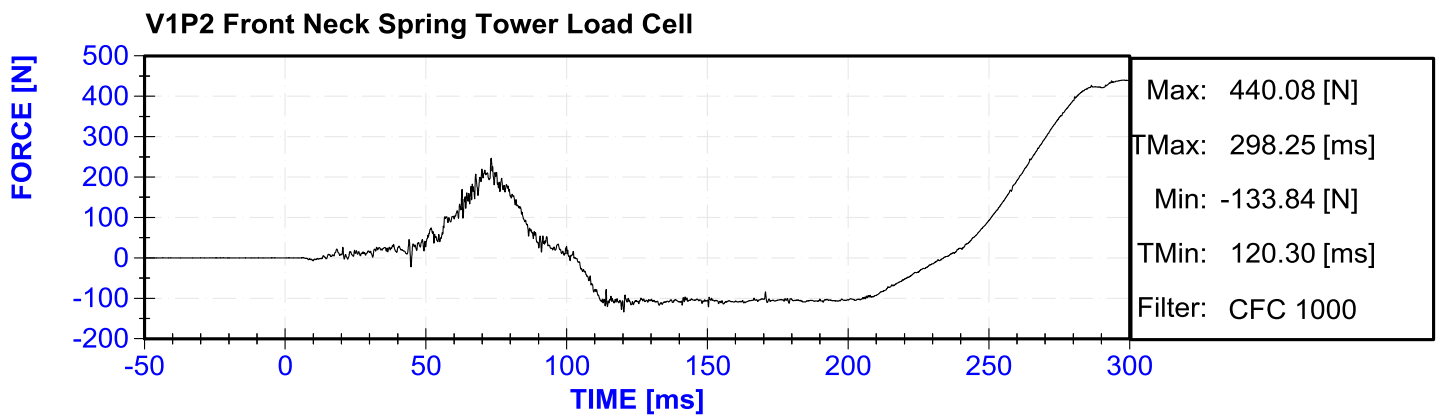
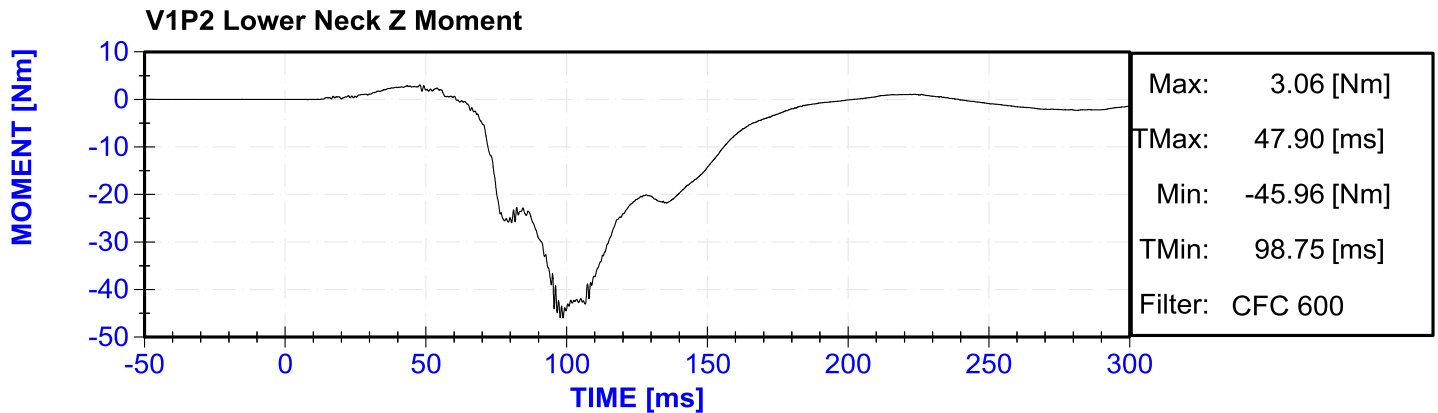


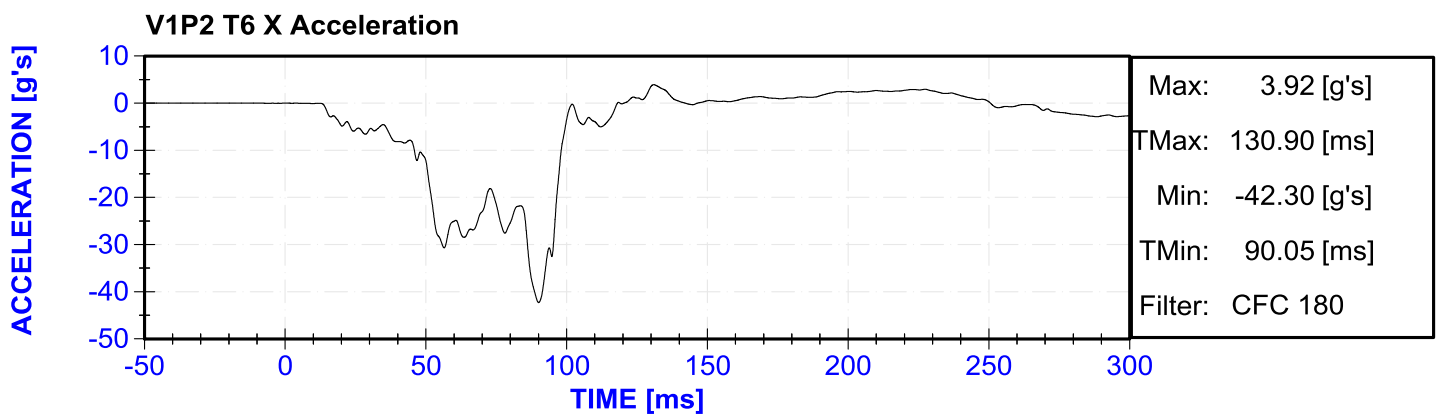
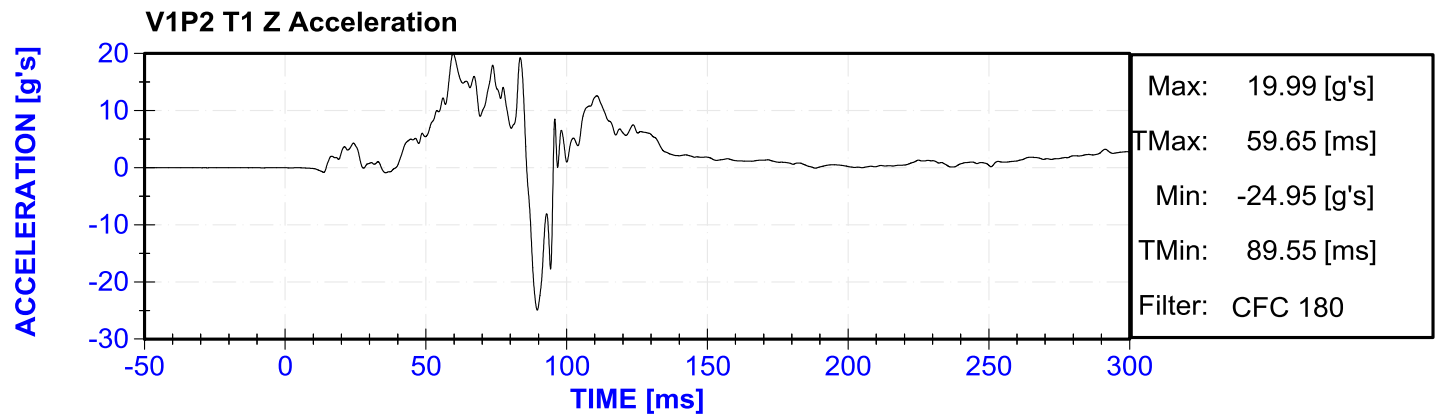
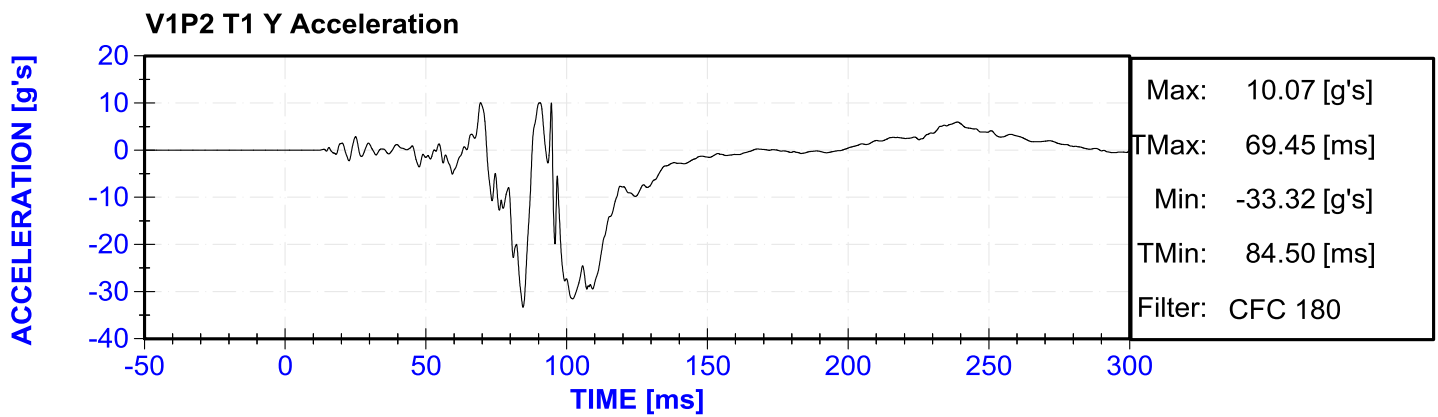
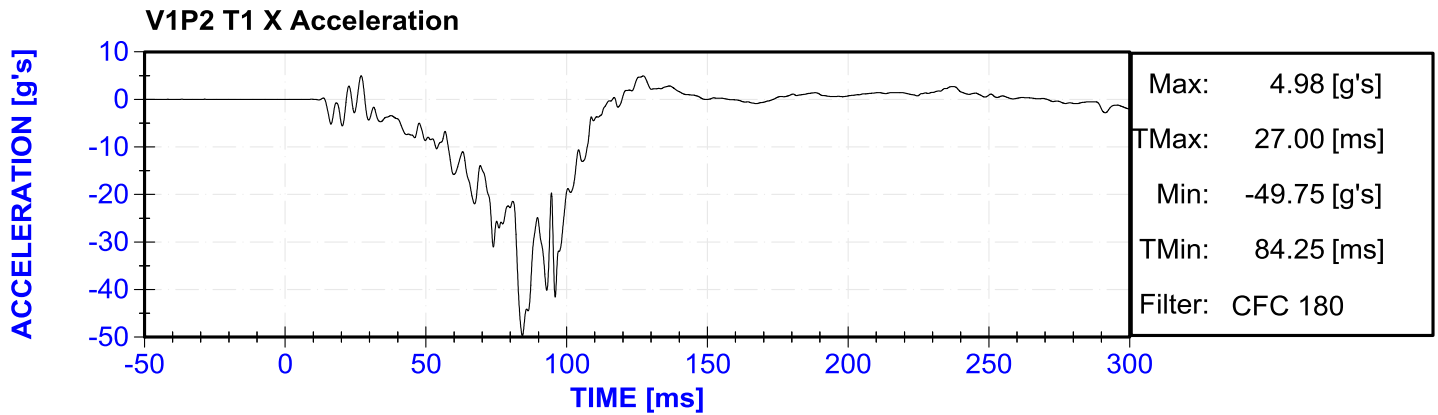


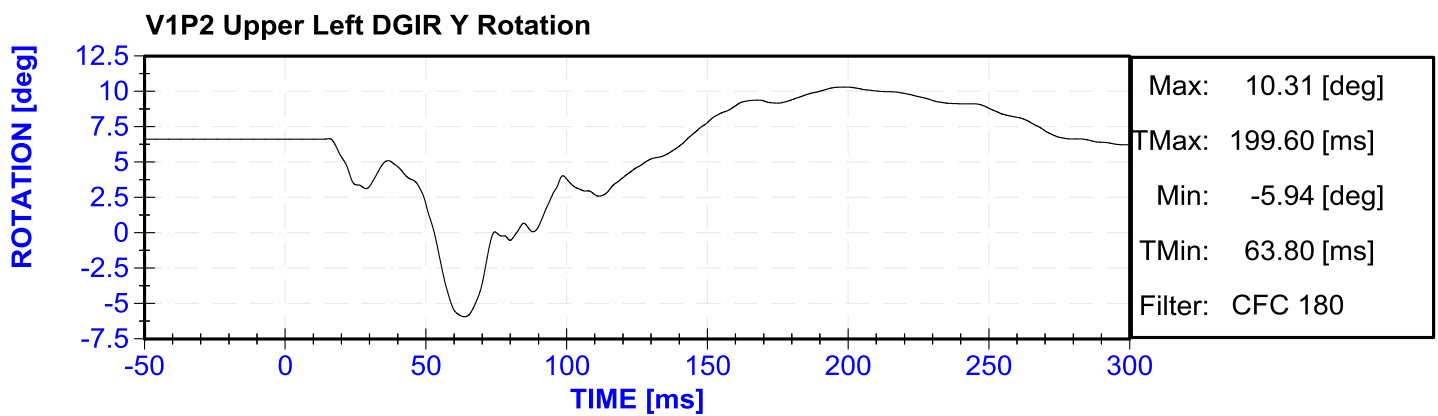
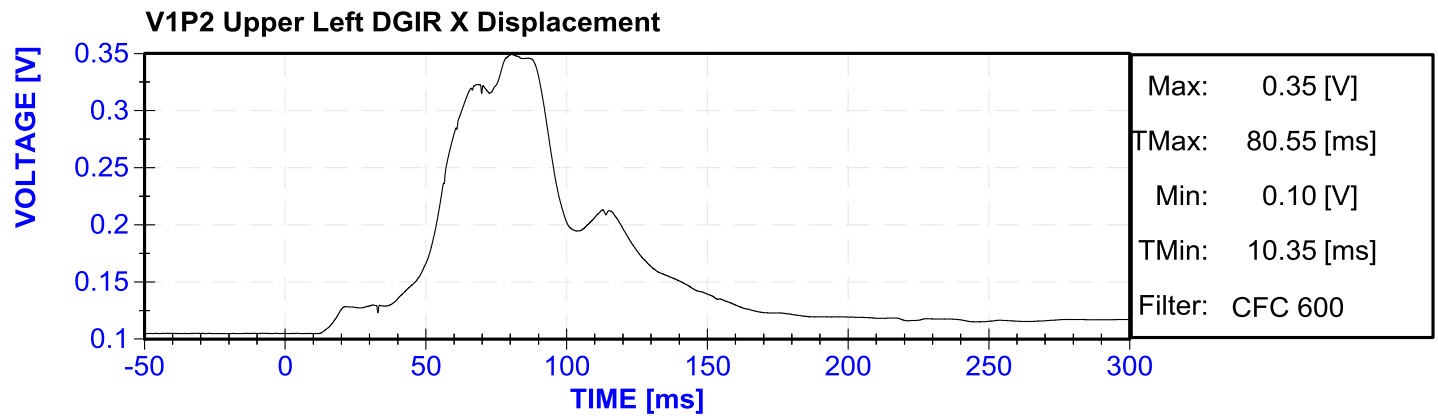
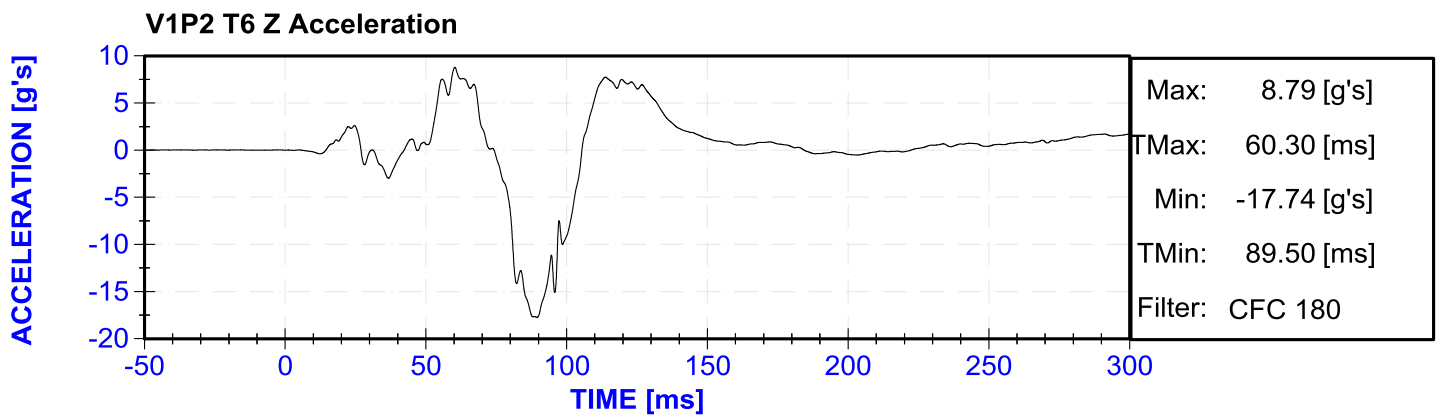
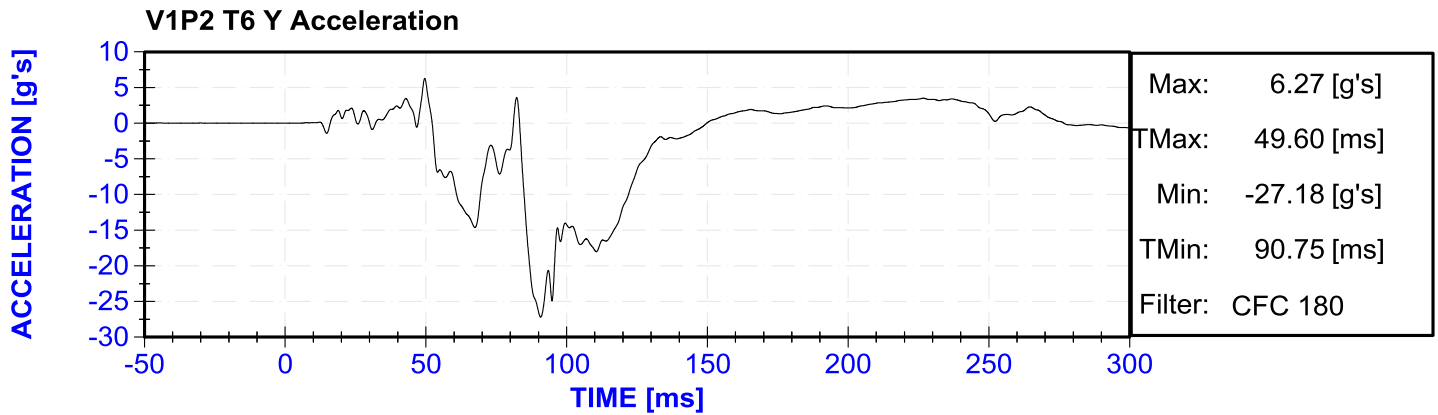


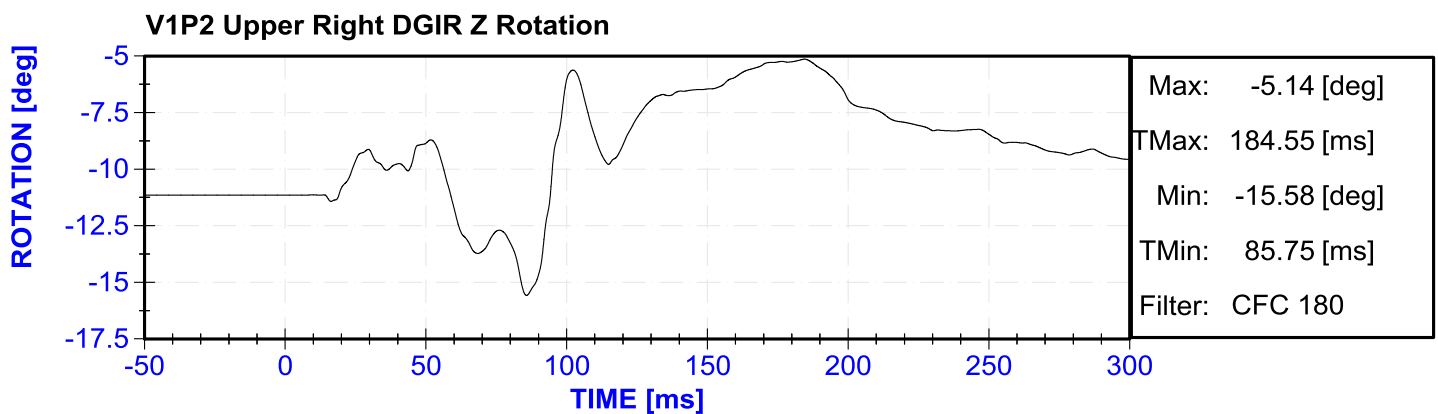
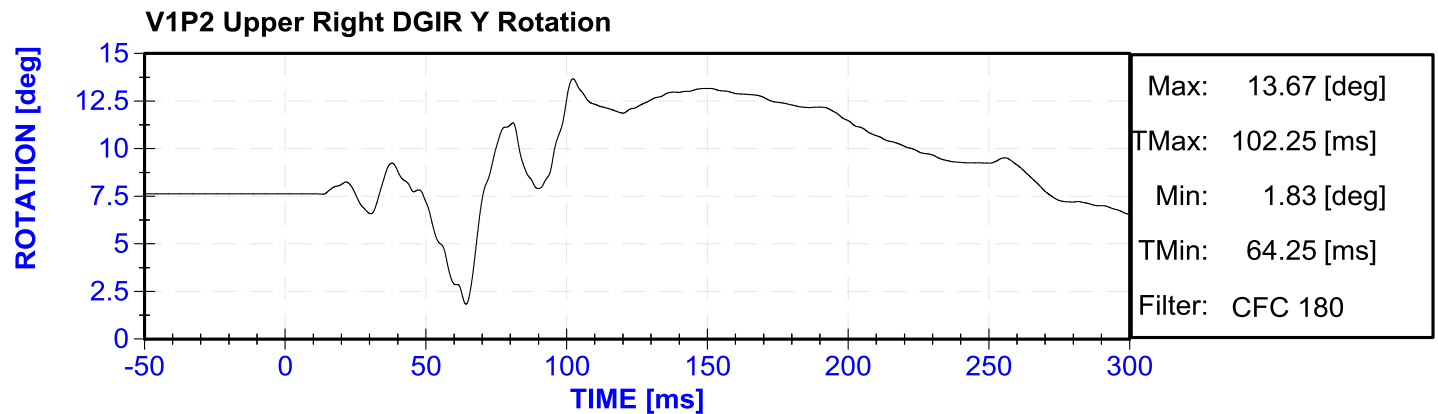
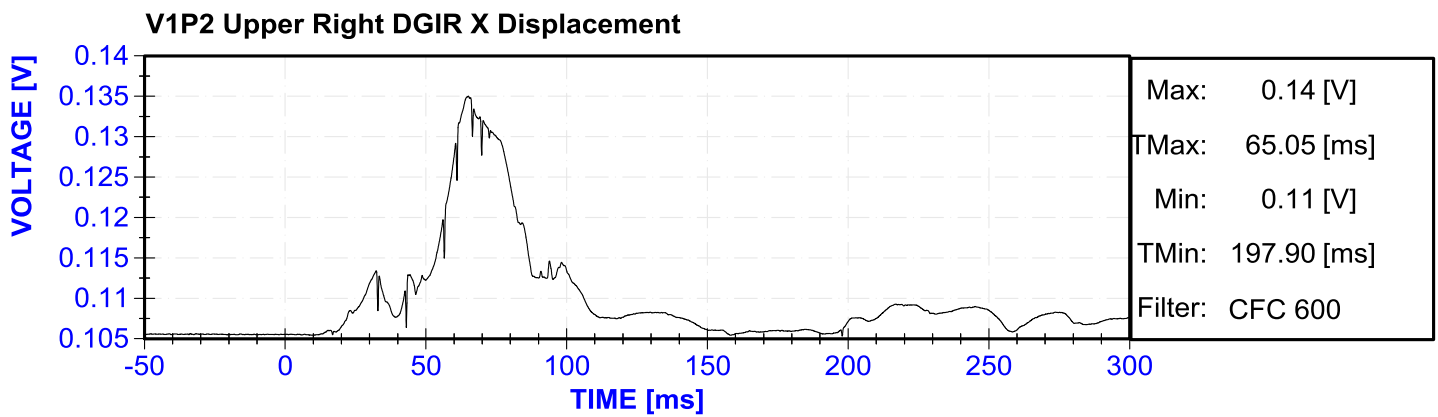
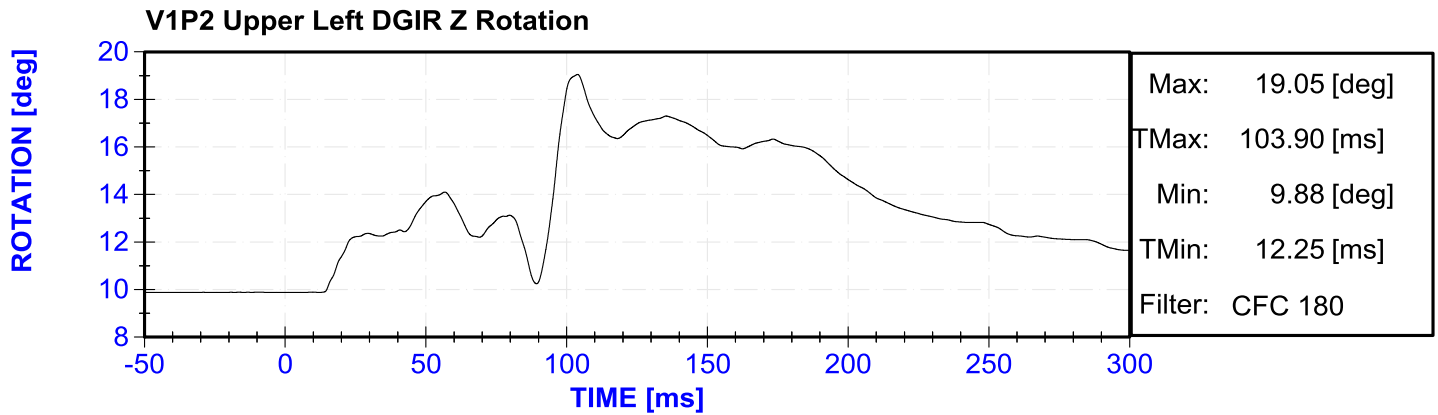




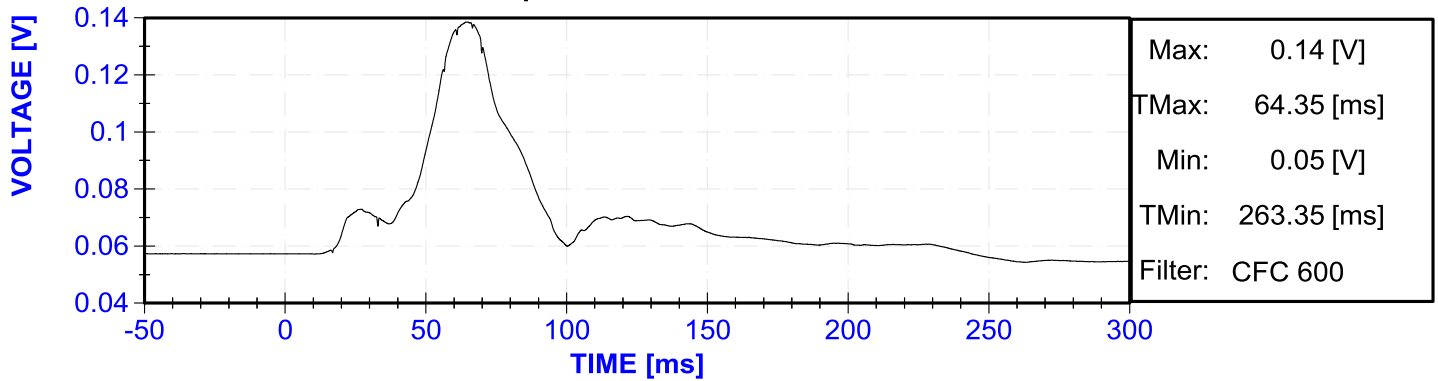




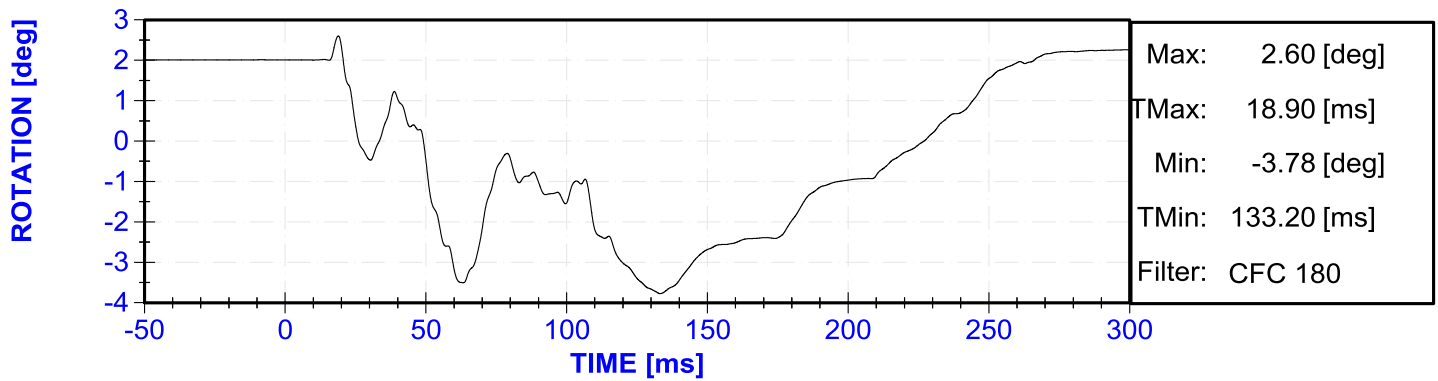




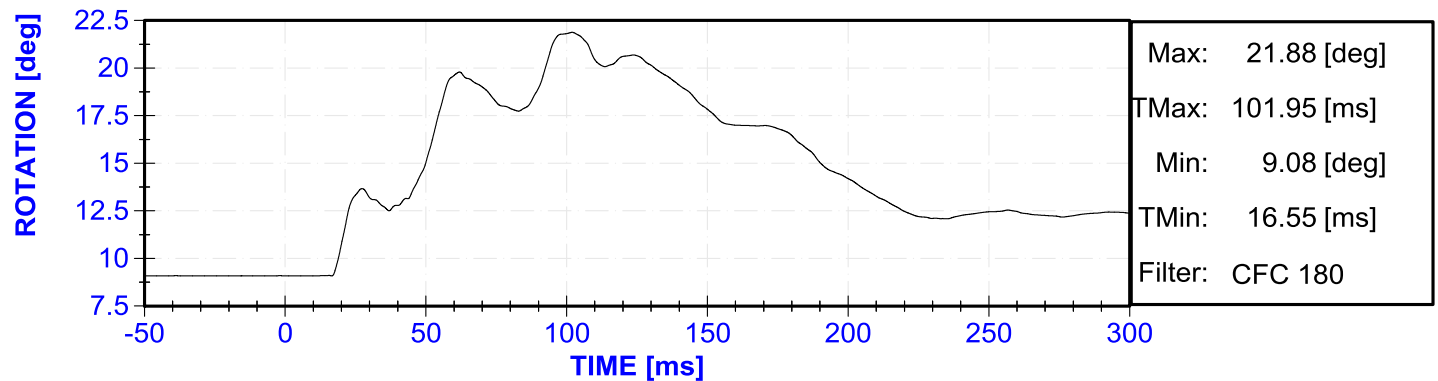
V1P2 Lower Left DGIR X Displacement



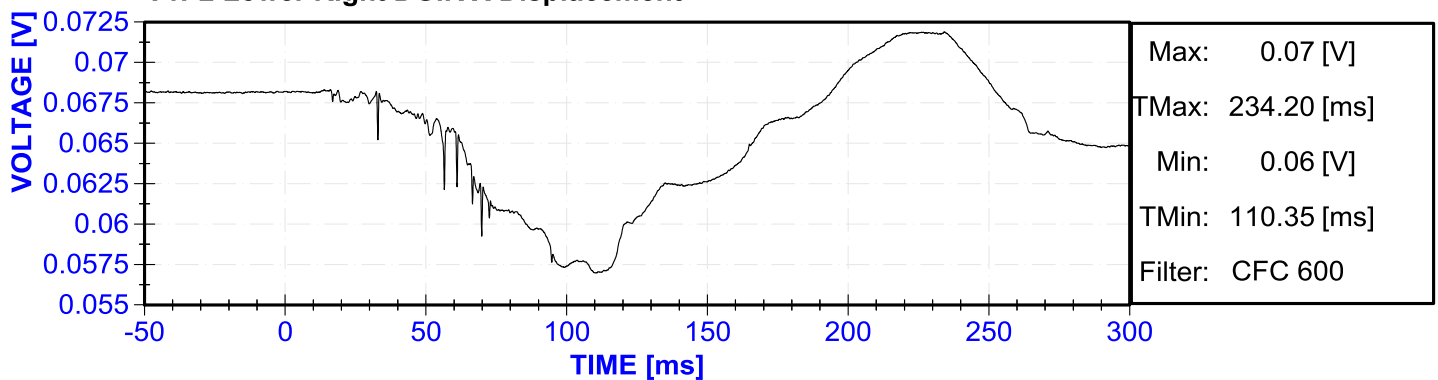
V1P2 Lower Left DGIR Y Rotation

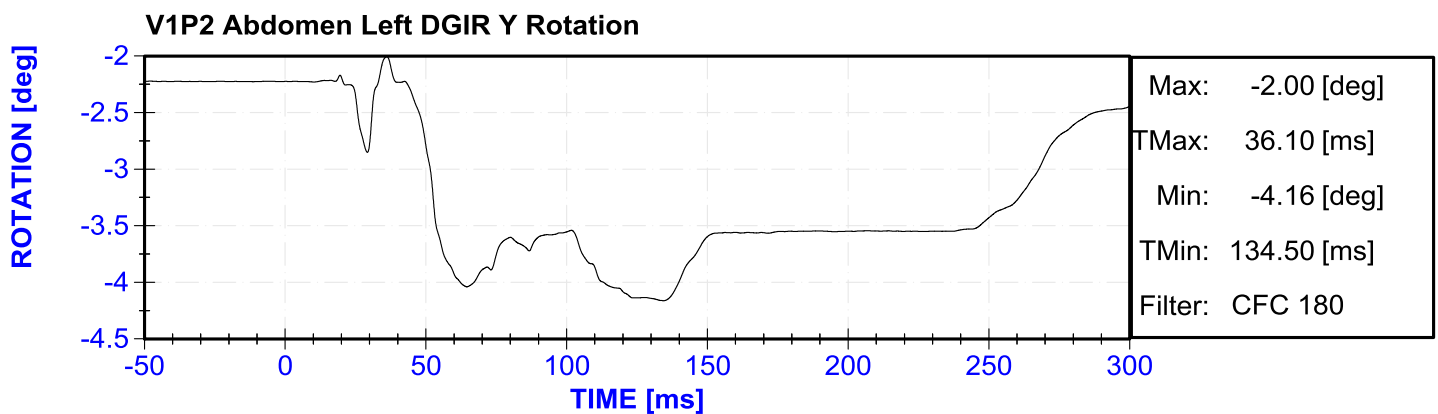
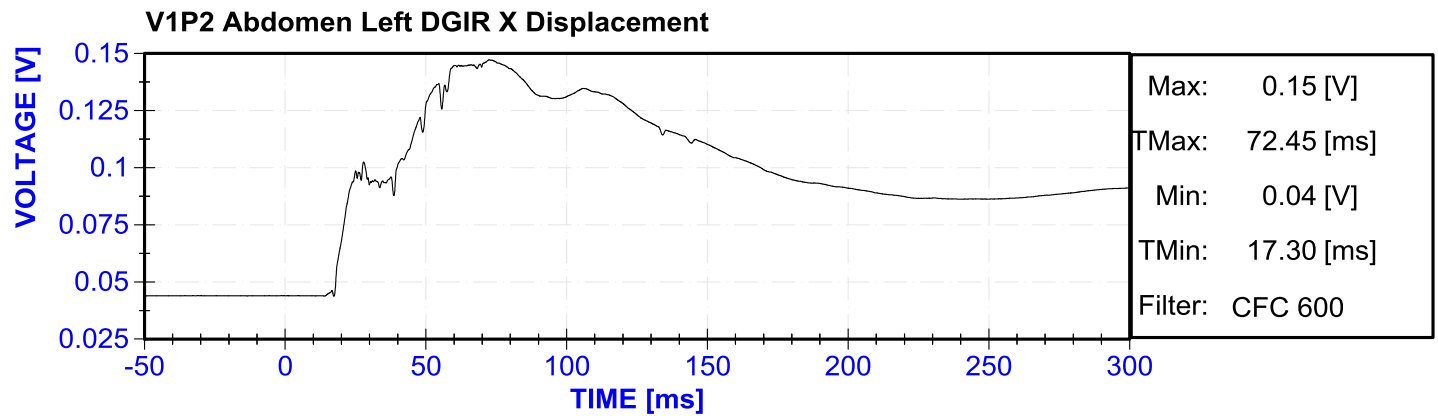
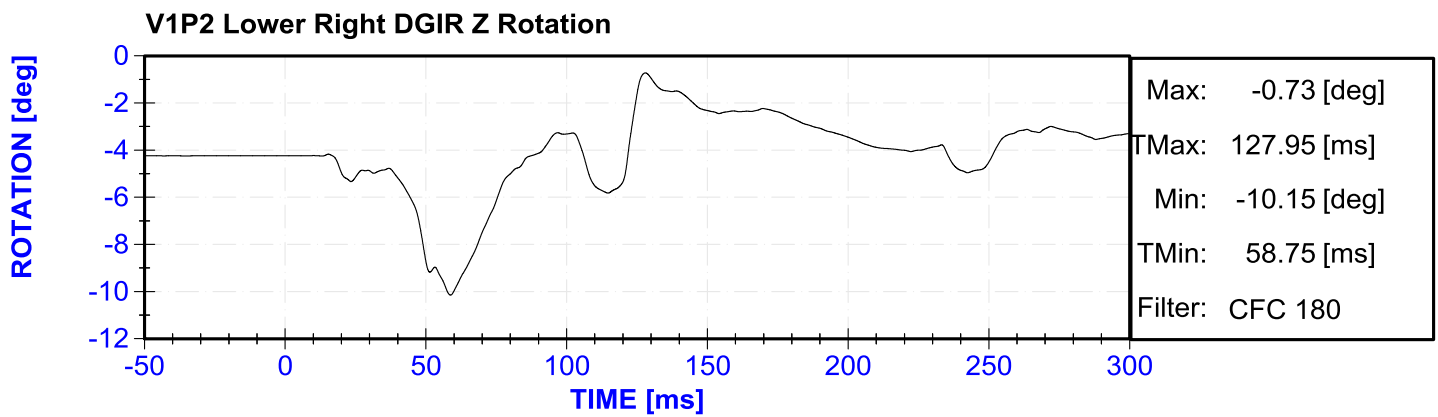
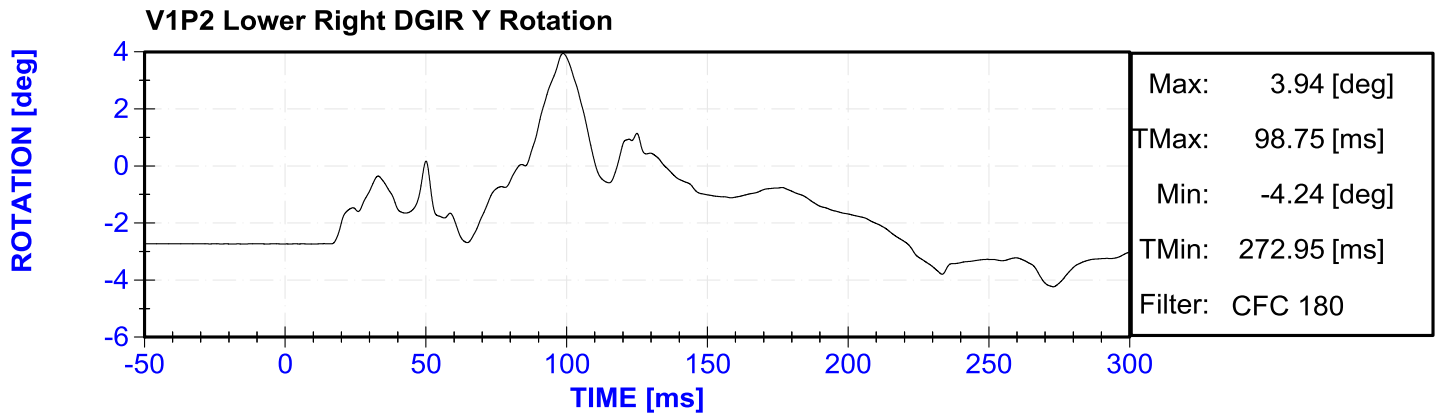


V1P2 Lower Left DGIR Z Rotation

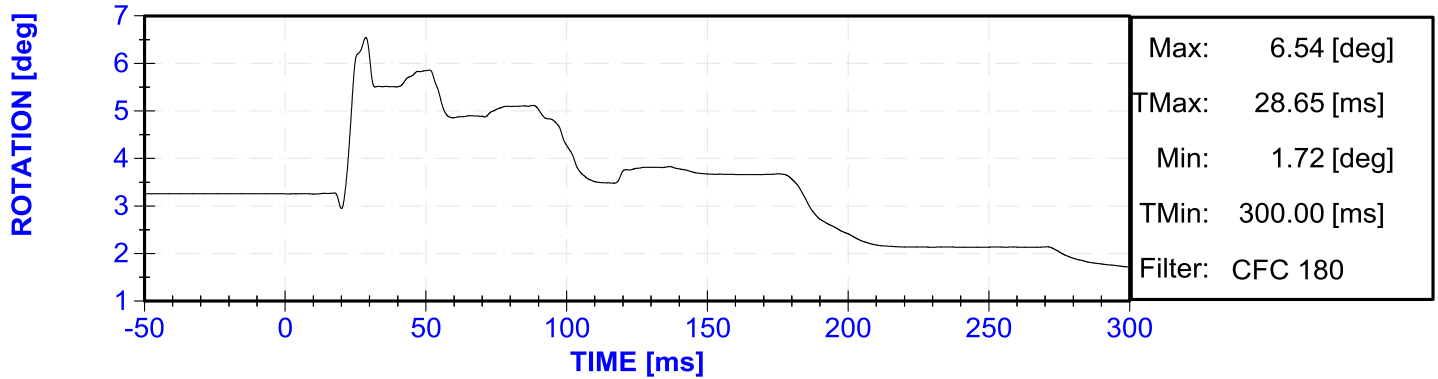


V1P2 Lower Right DGIR X Displacement

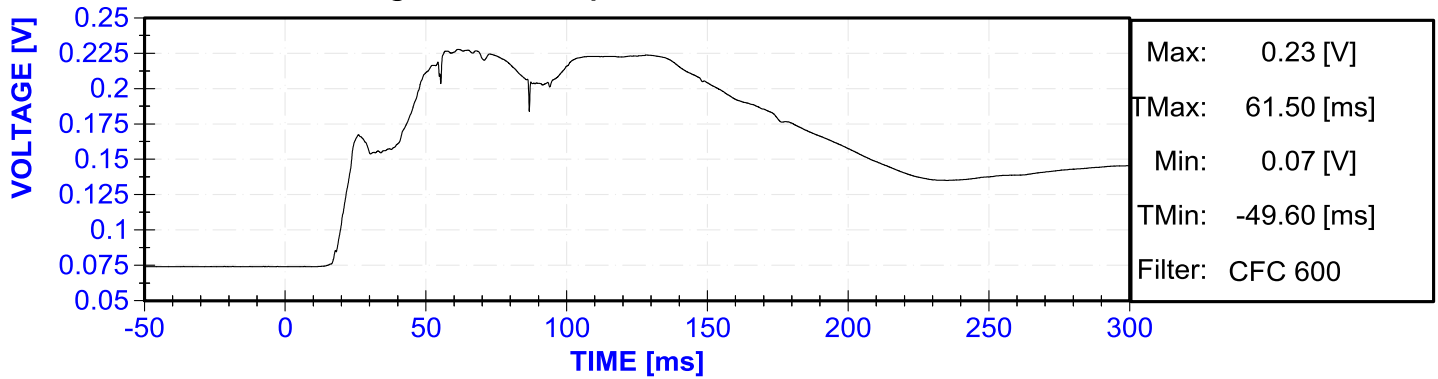




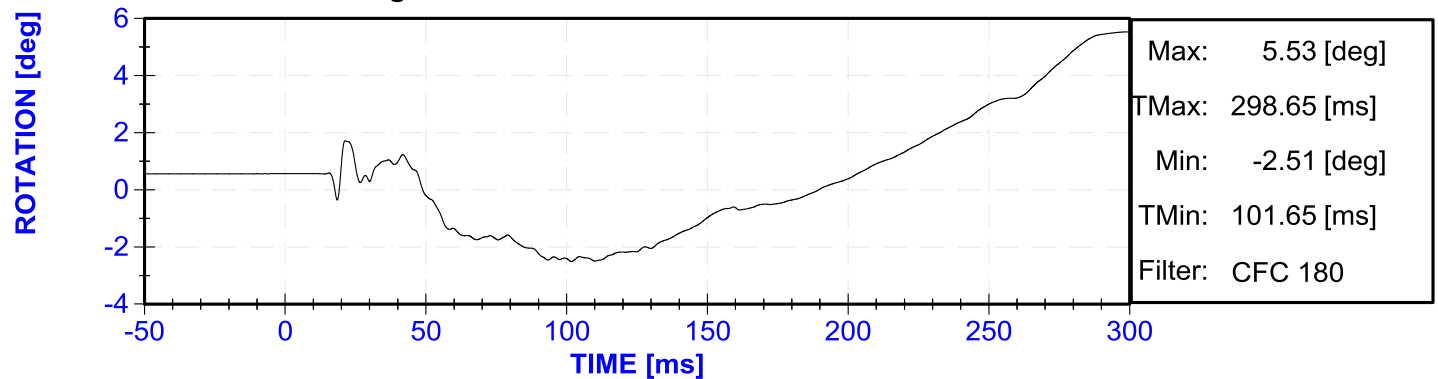
V1P2 Abdomen Left DGIR Z Rotation



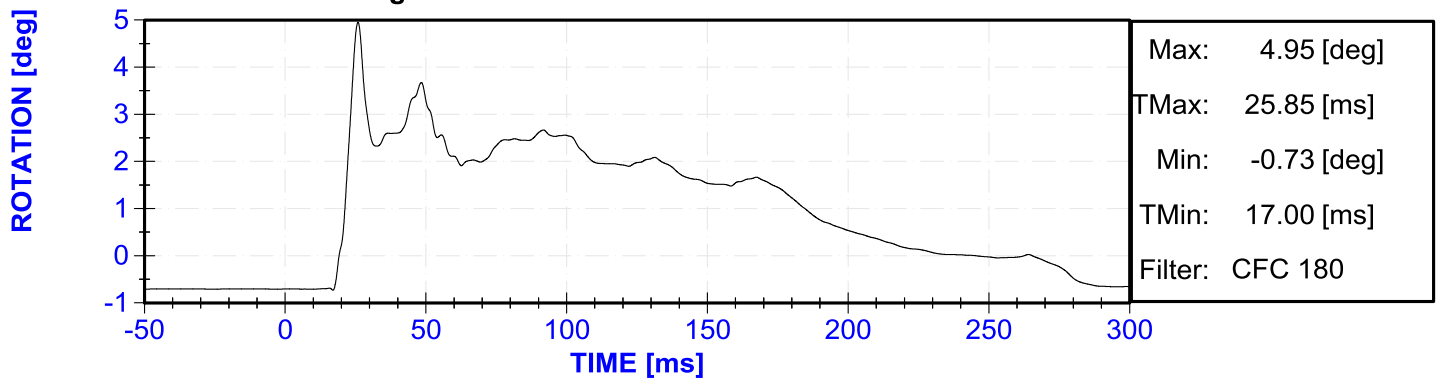
V1P2 Abdomen Right DGIR X Displacement

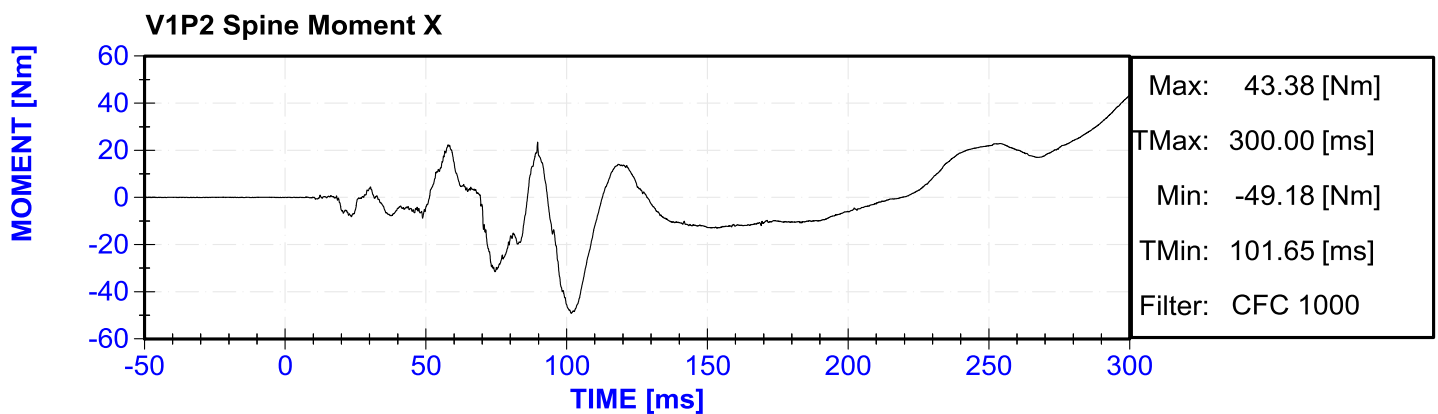
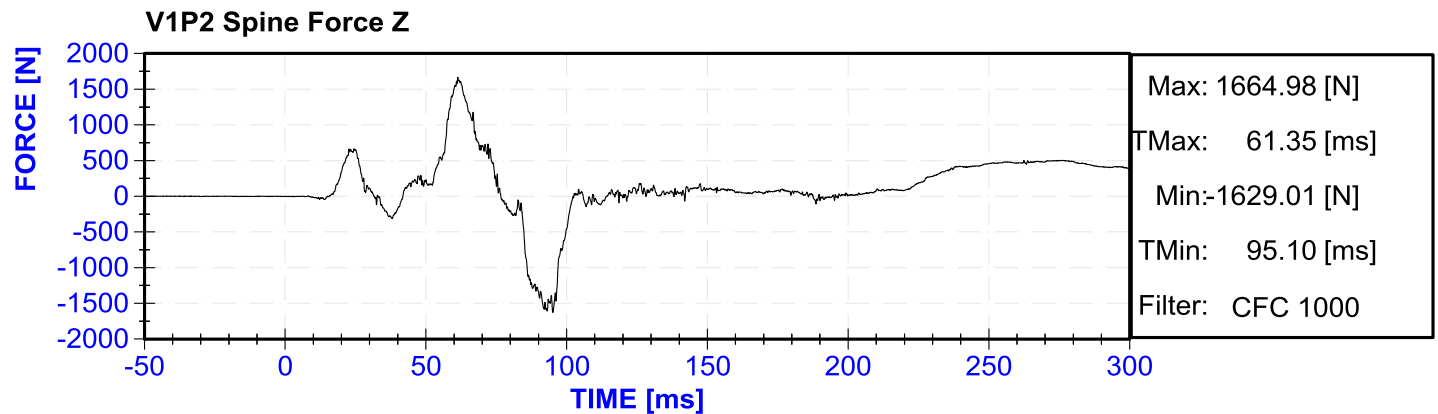
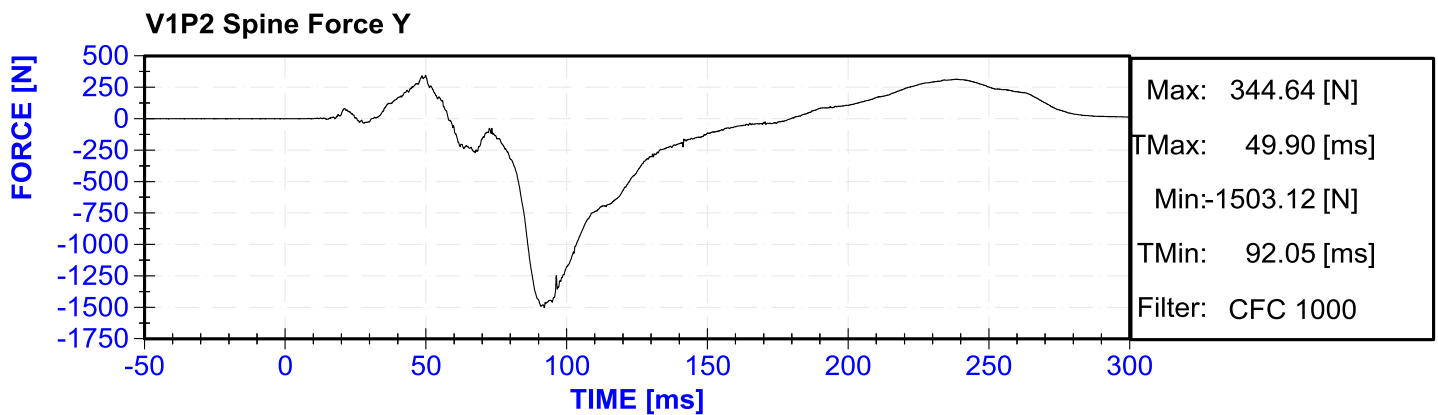
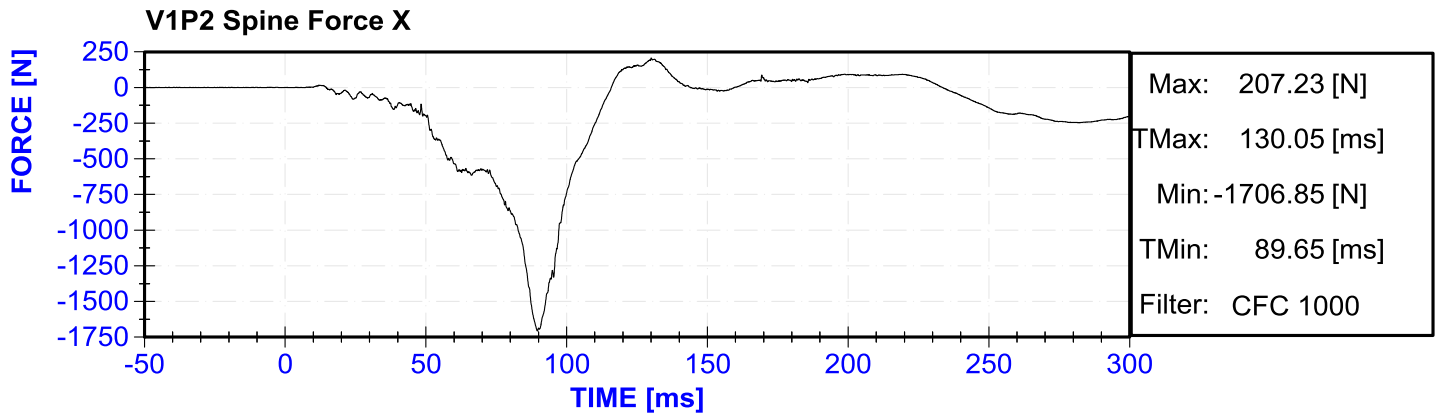


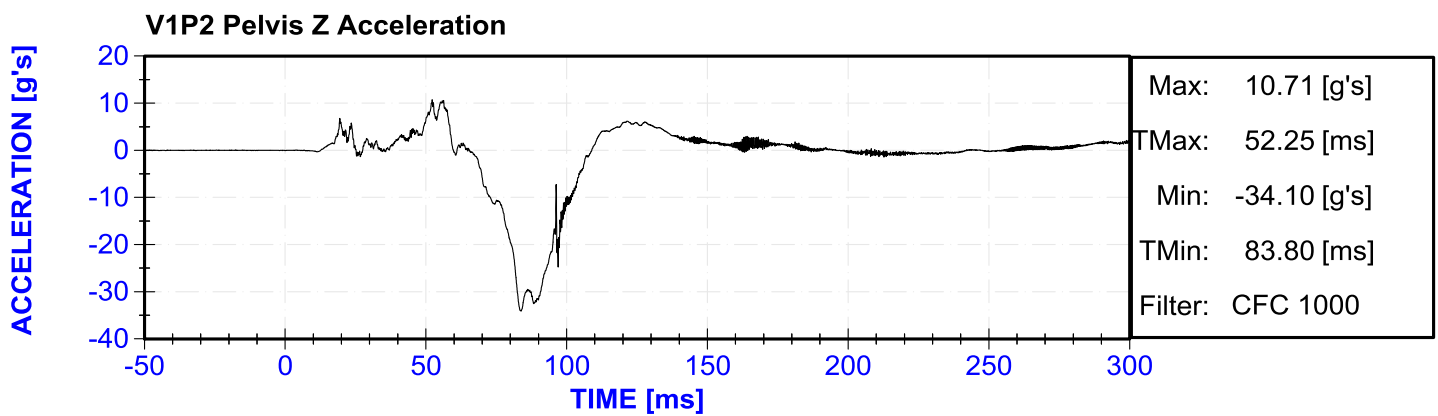
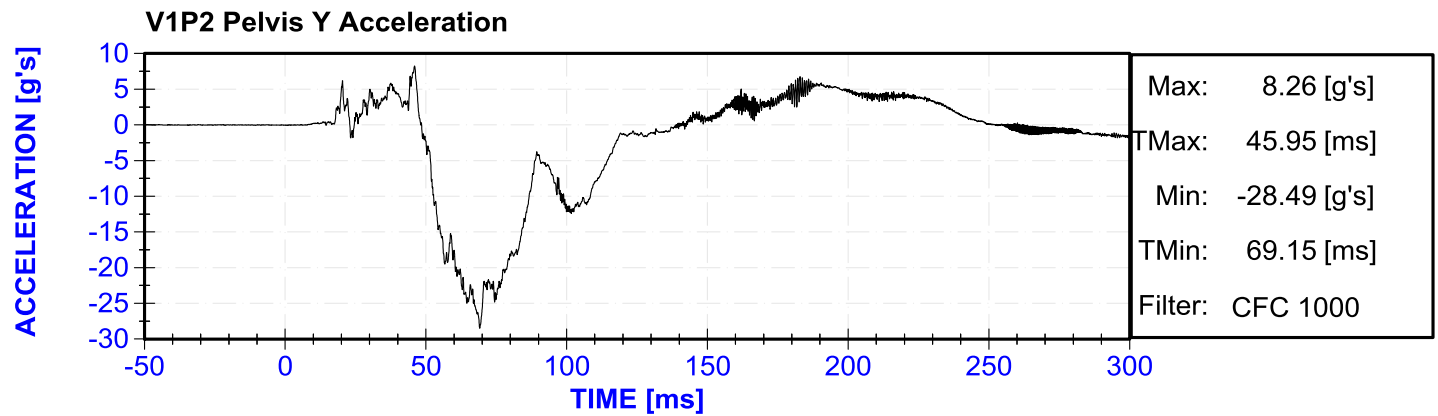
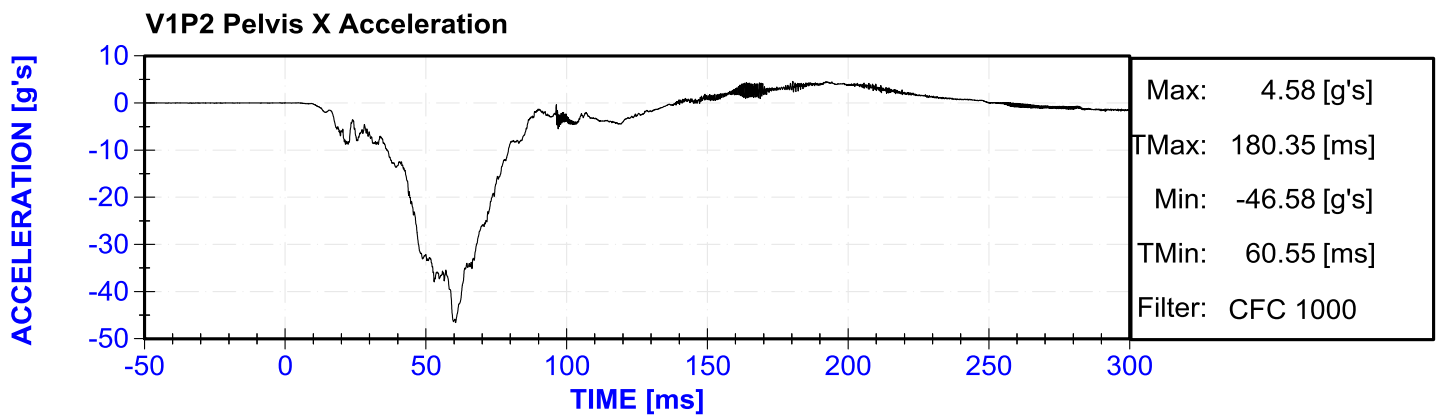
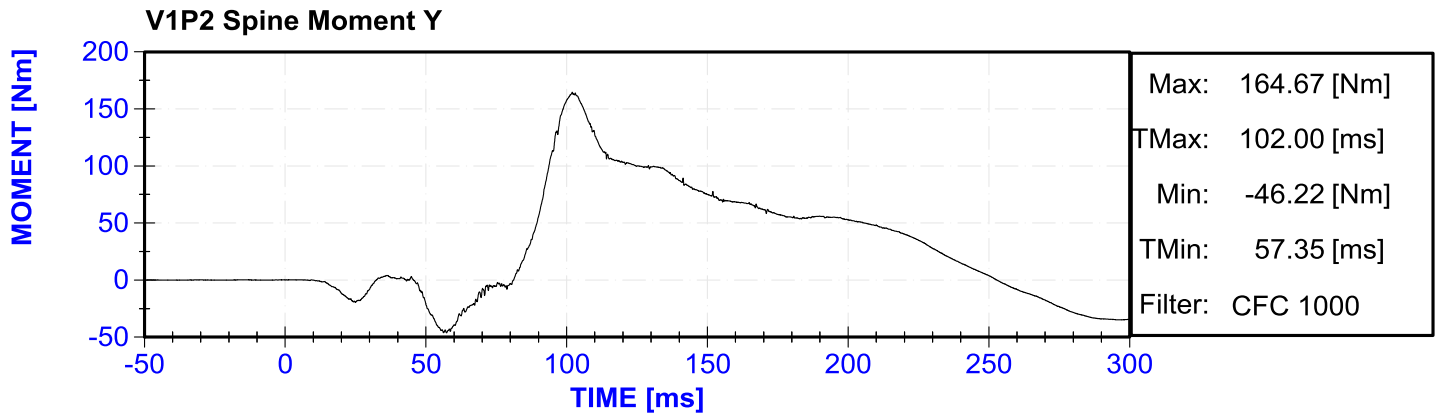
V1P2 Abdomen Right DGIR Y Rotation

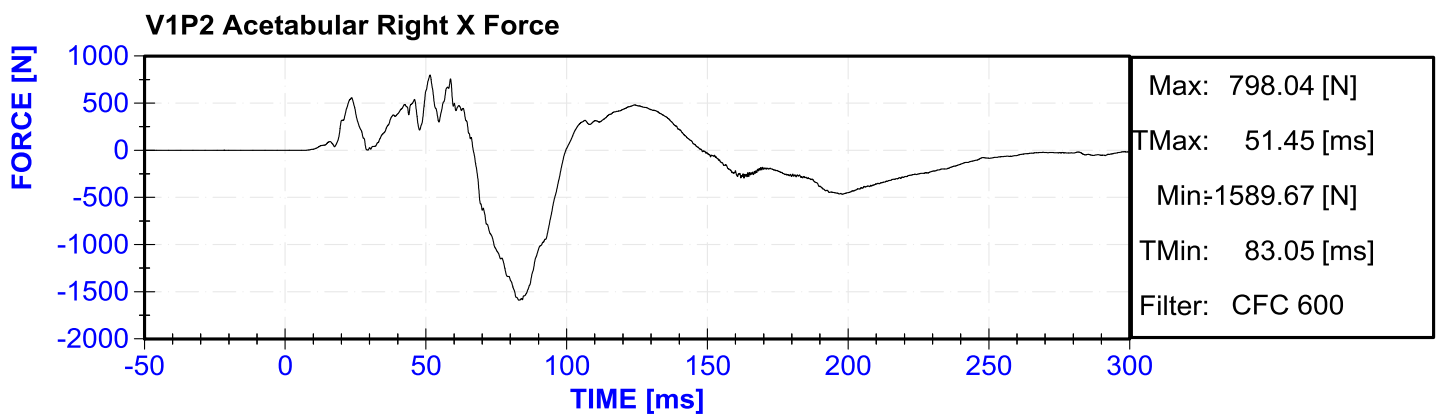
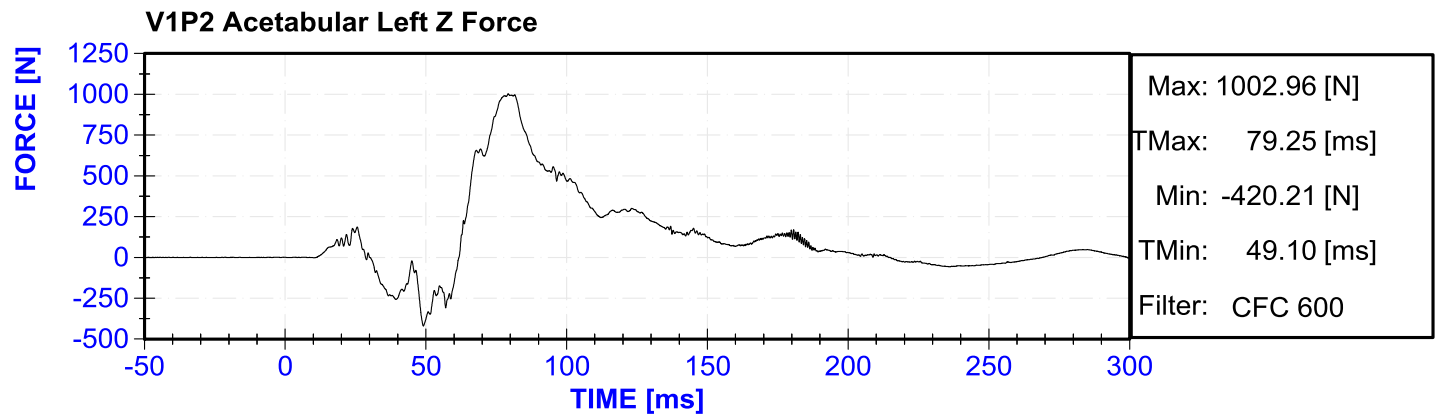
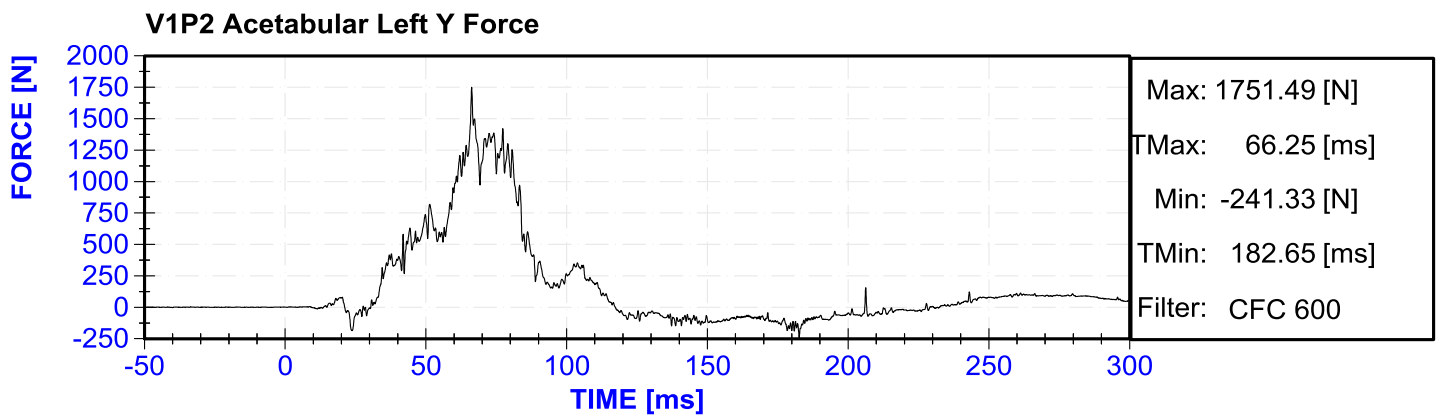
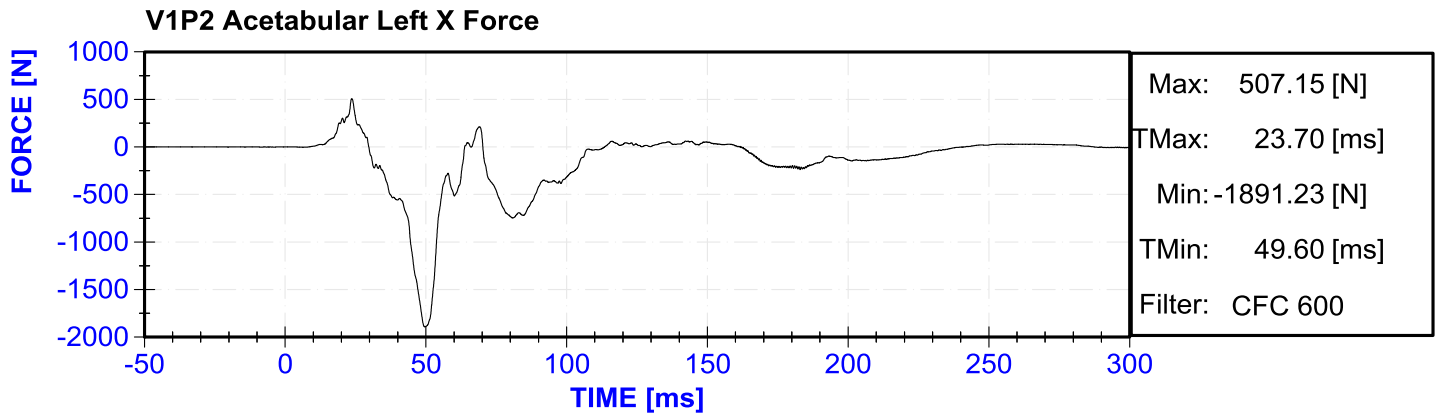


V1P2 Abdomen Right DGIR Z Rotation

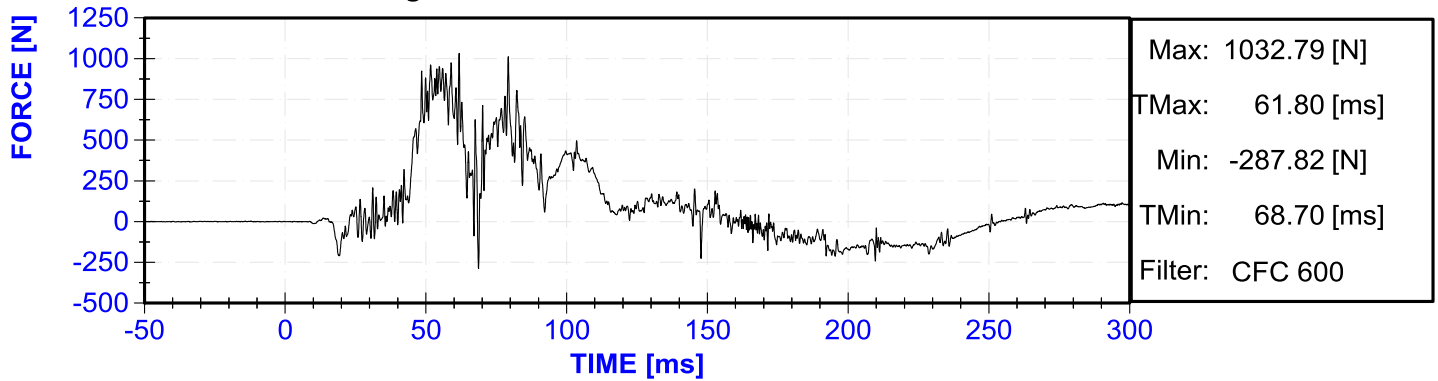




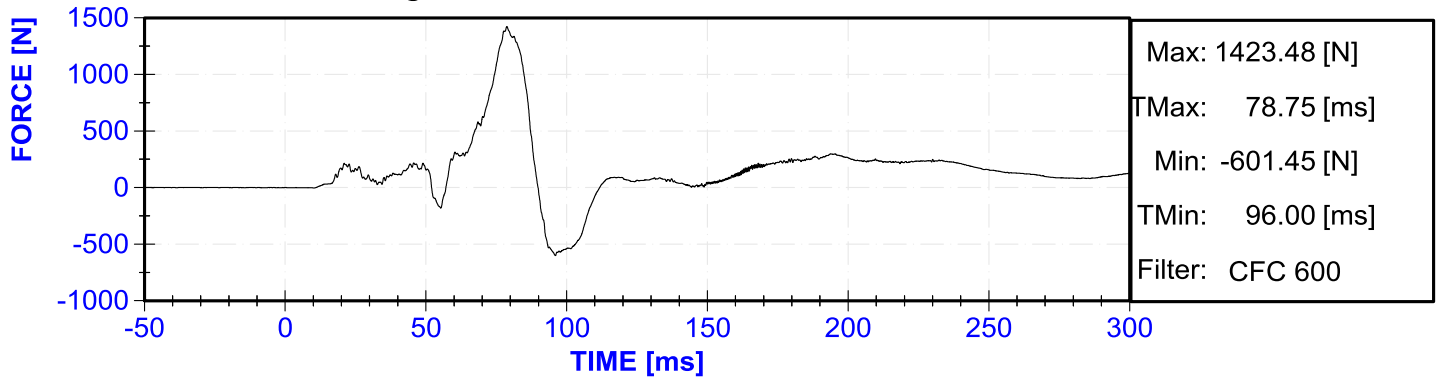




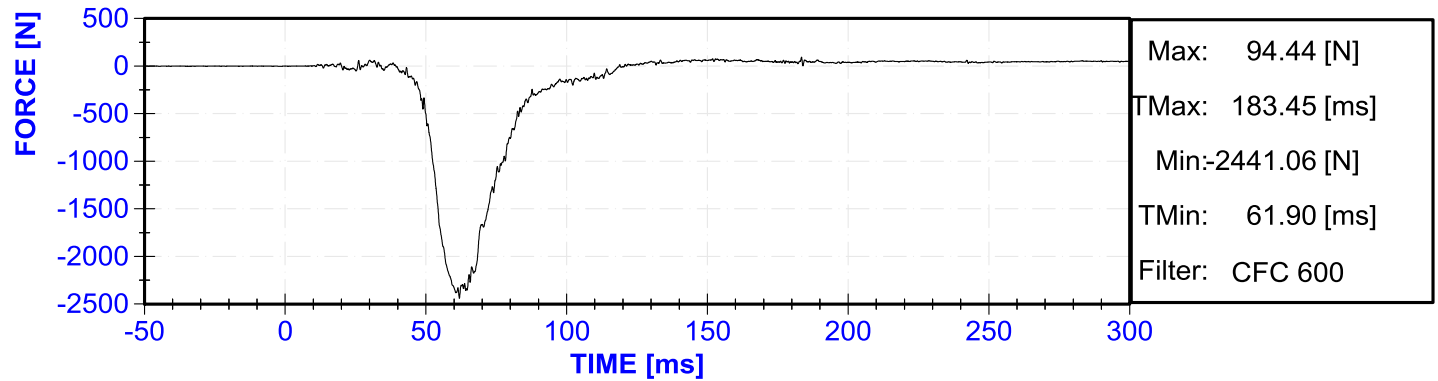
V1P2 Acetabular Right Y Force



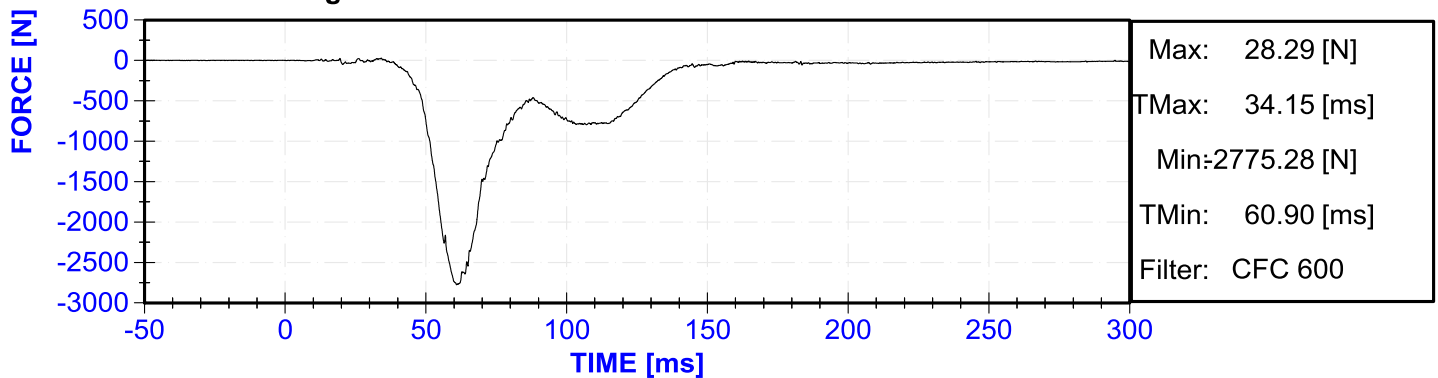
V1P2 Acetabular Right Z Force

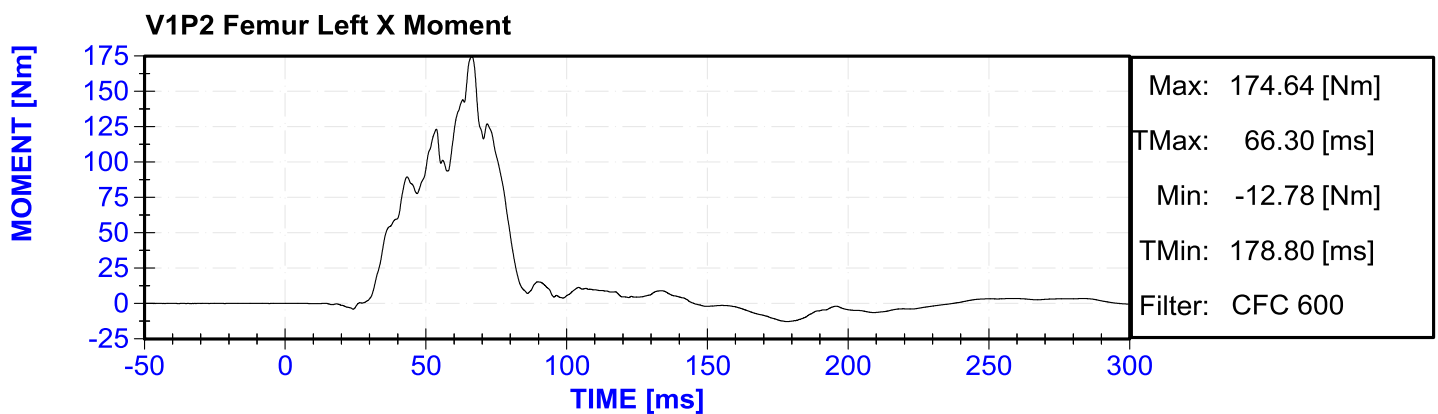
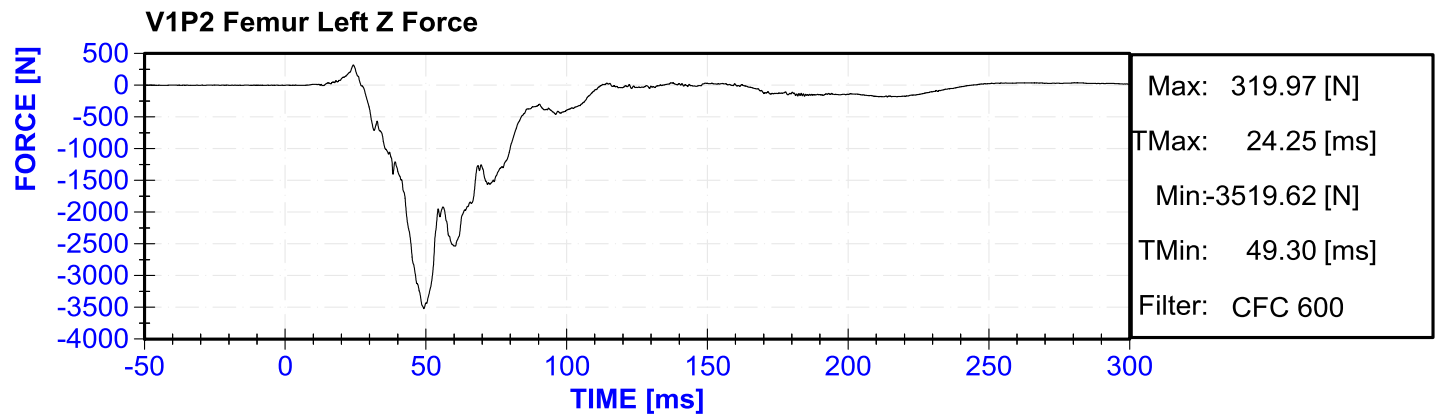
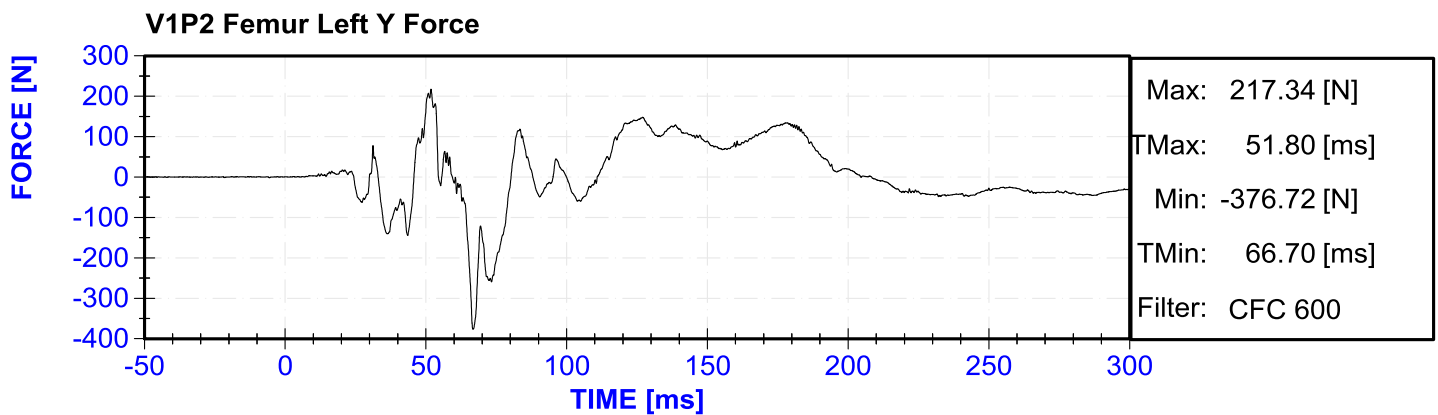
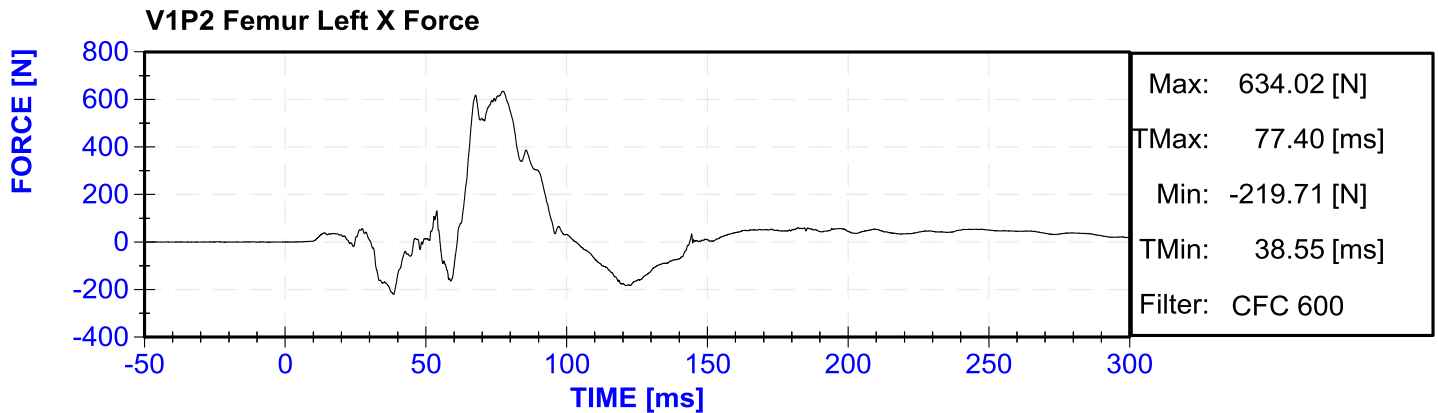


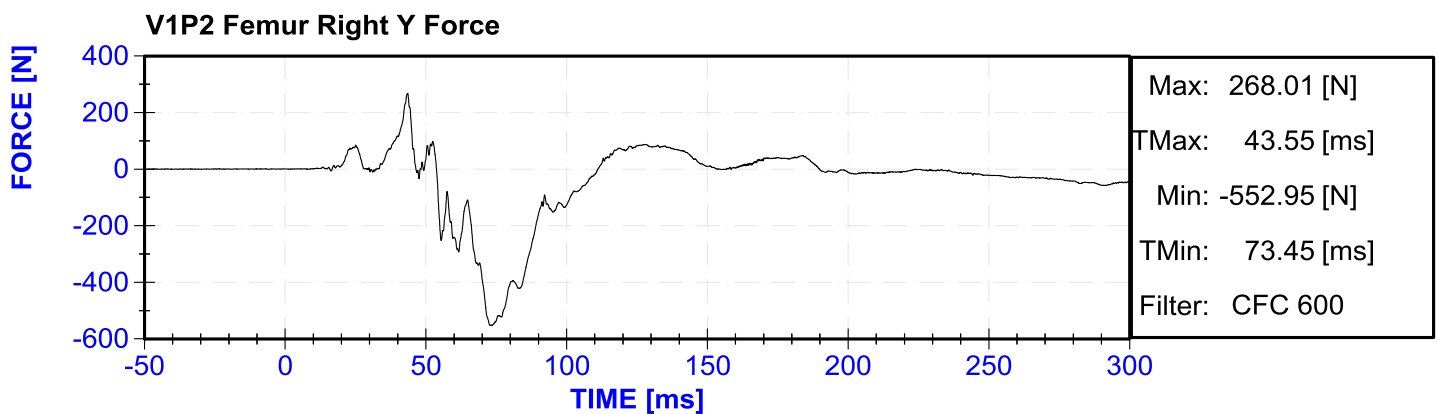
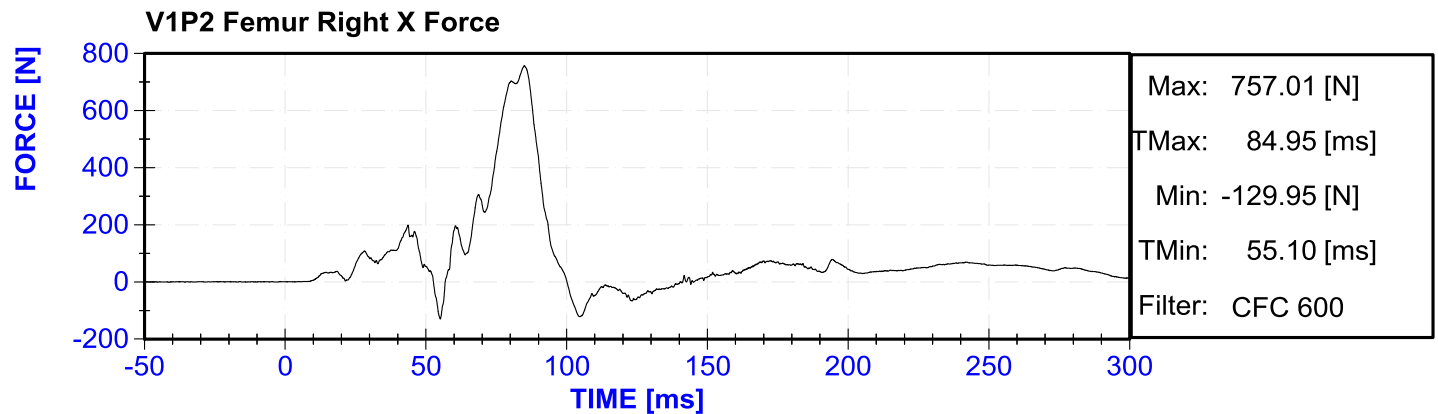
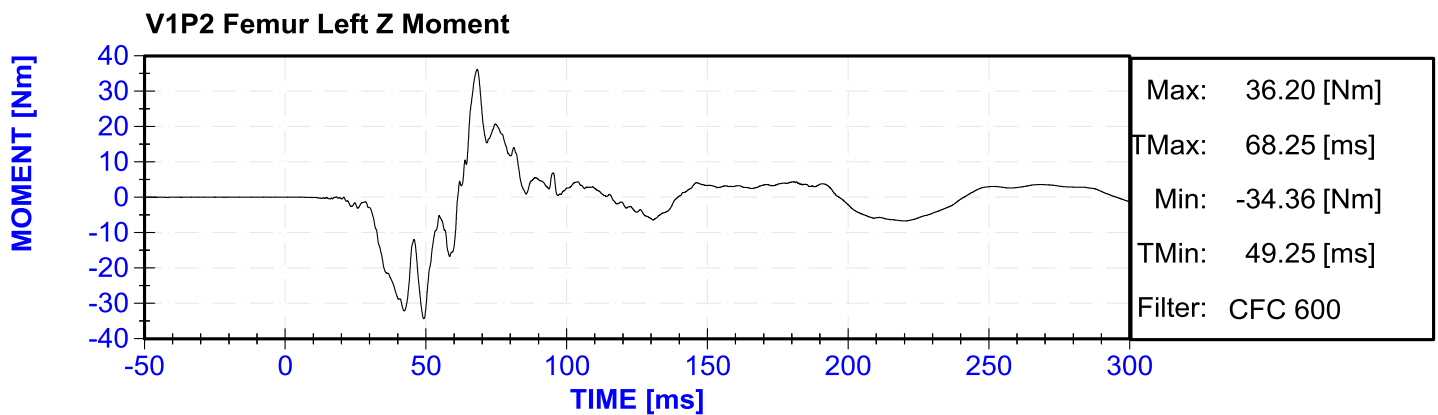
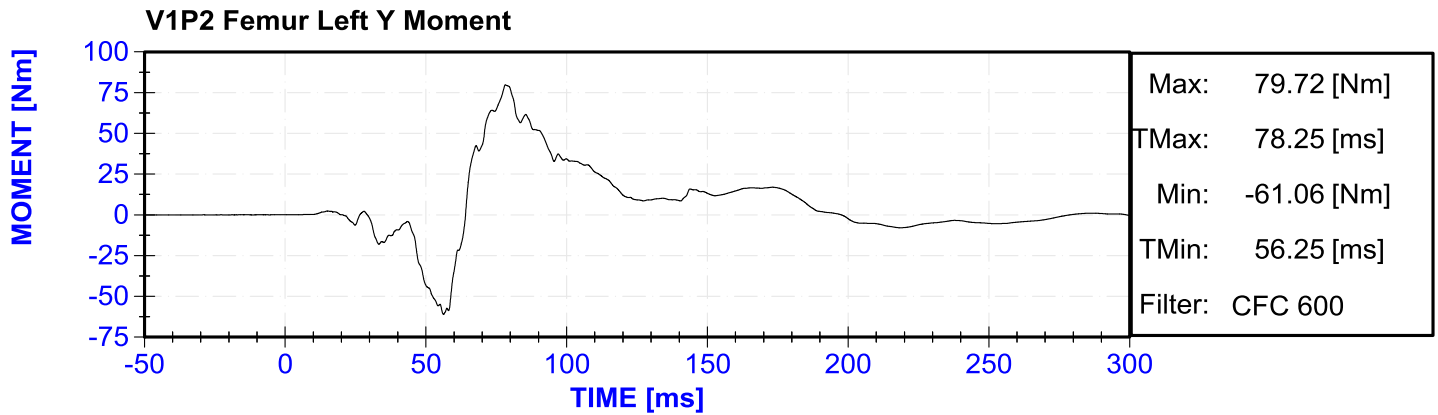
V1P2 ASIS Left X Force

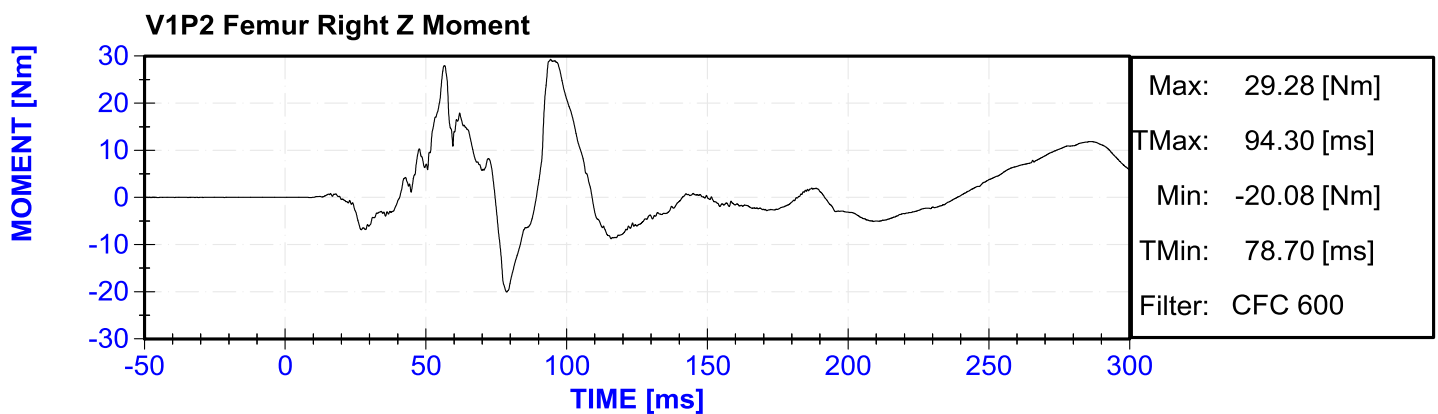
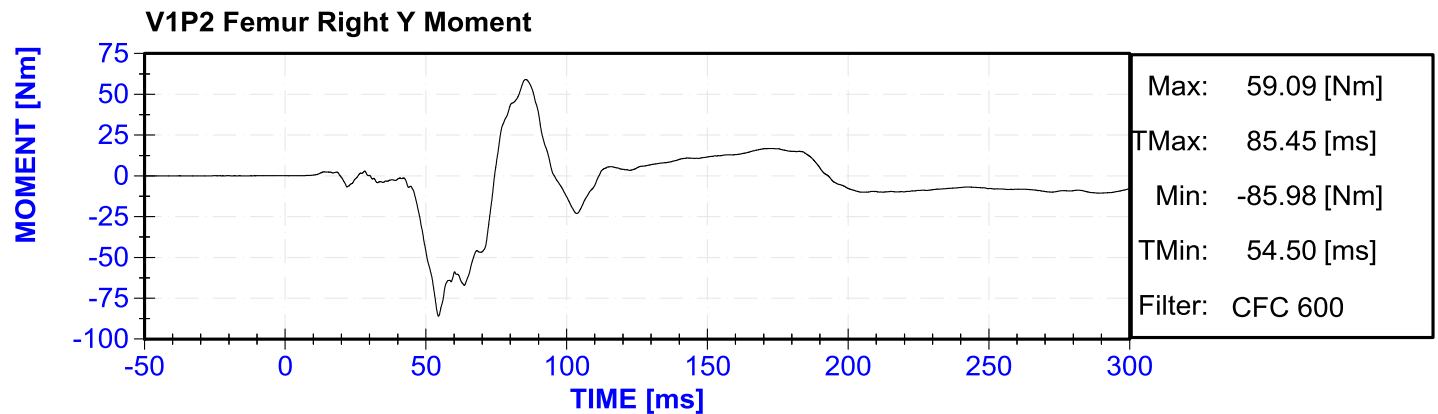
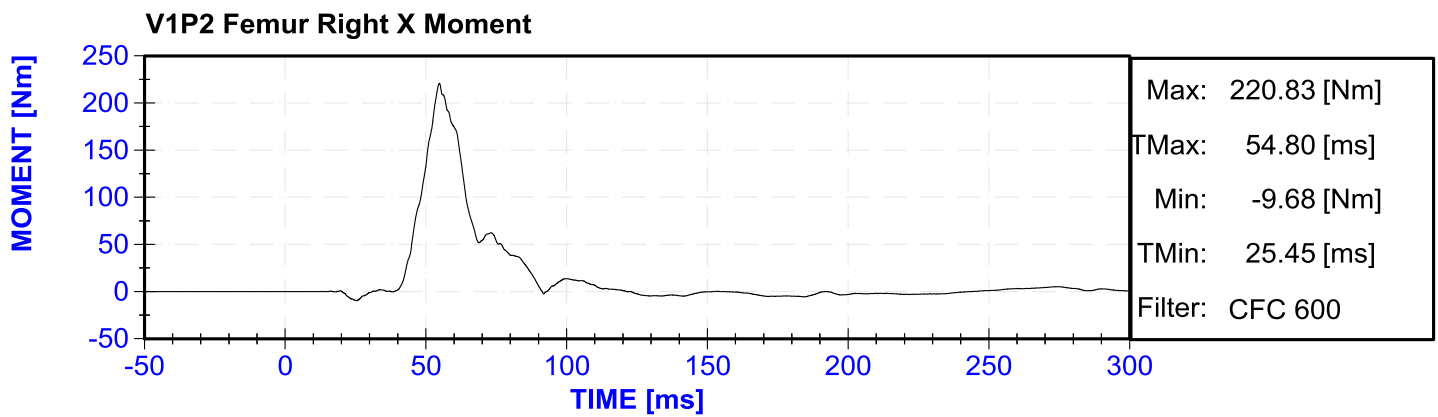
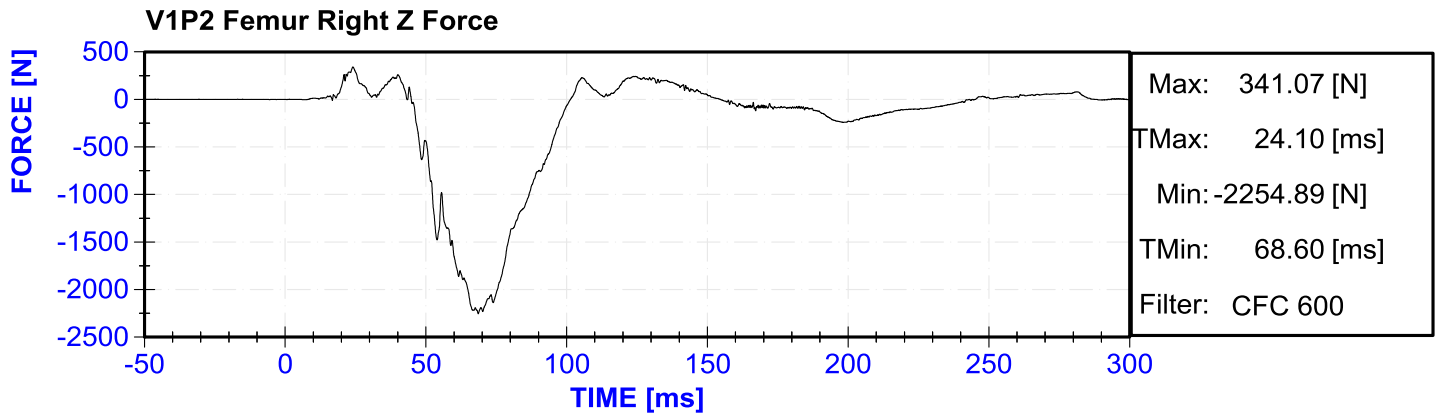


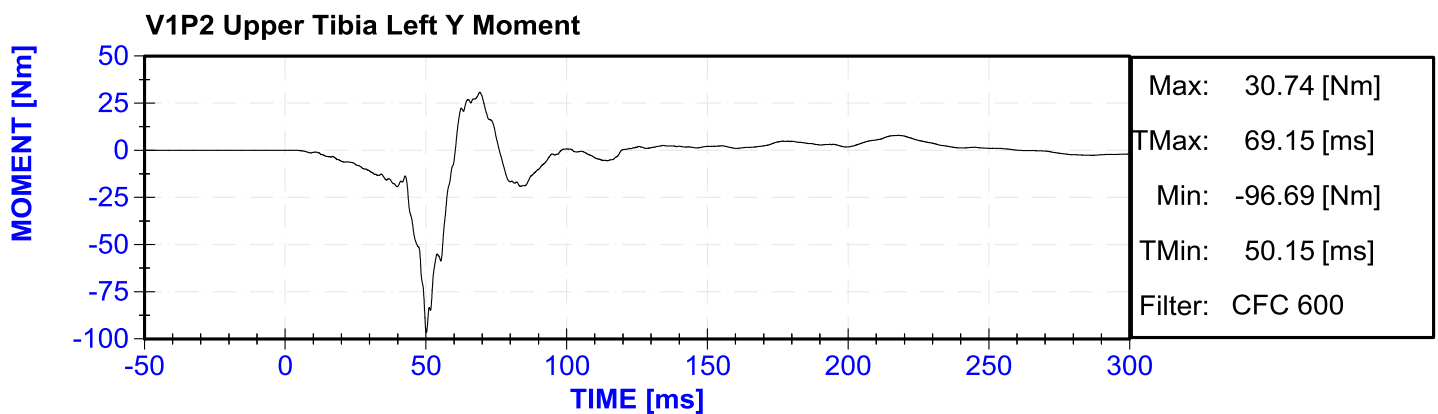
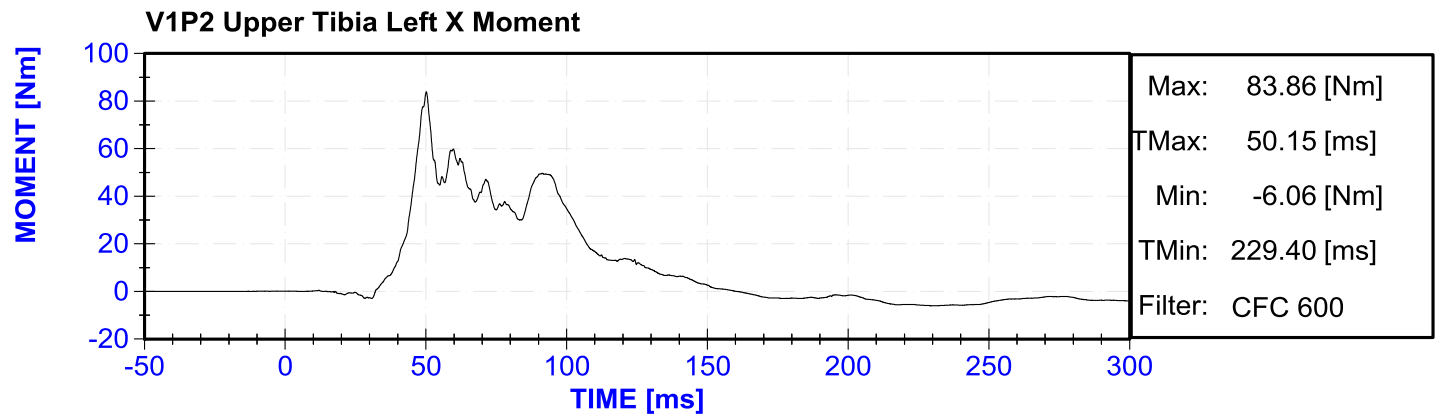
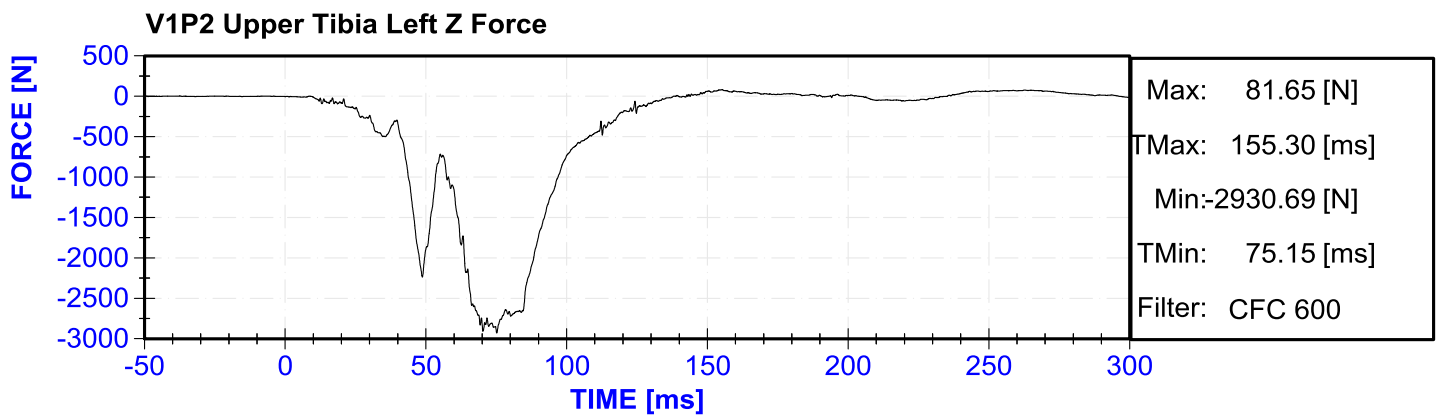
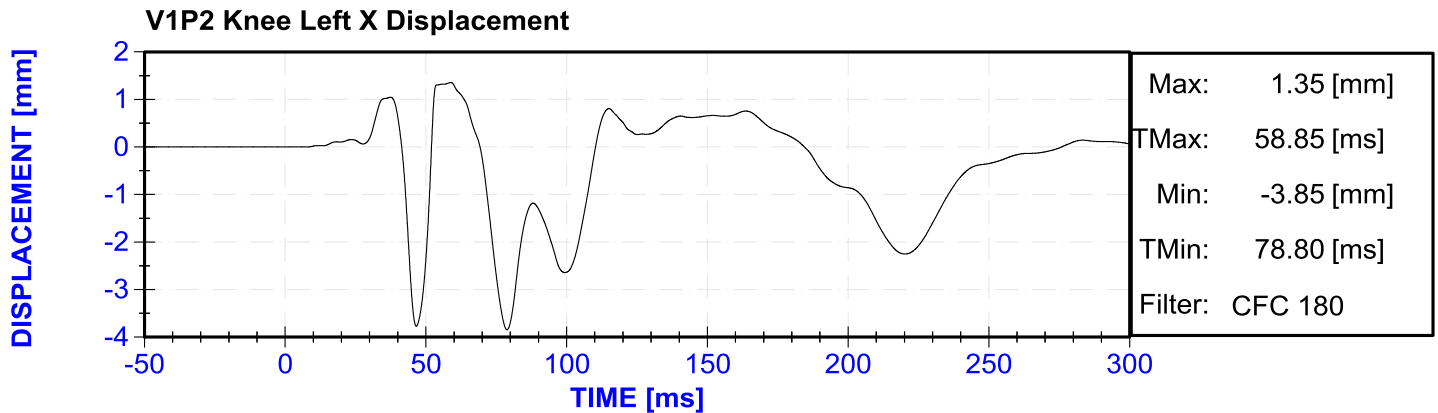
V1P2 ASIS Right X Force

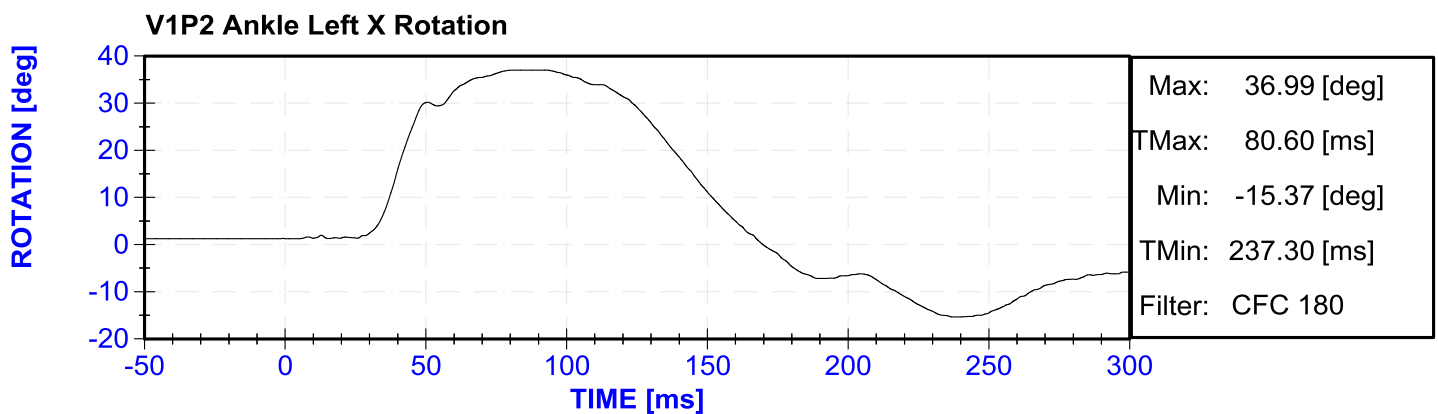
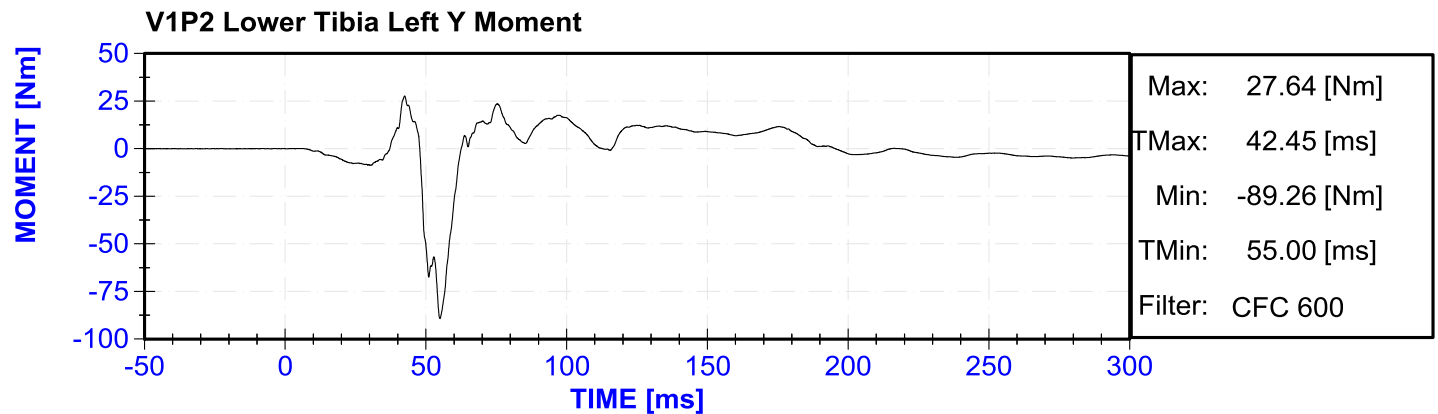
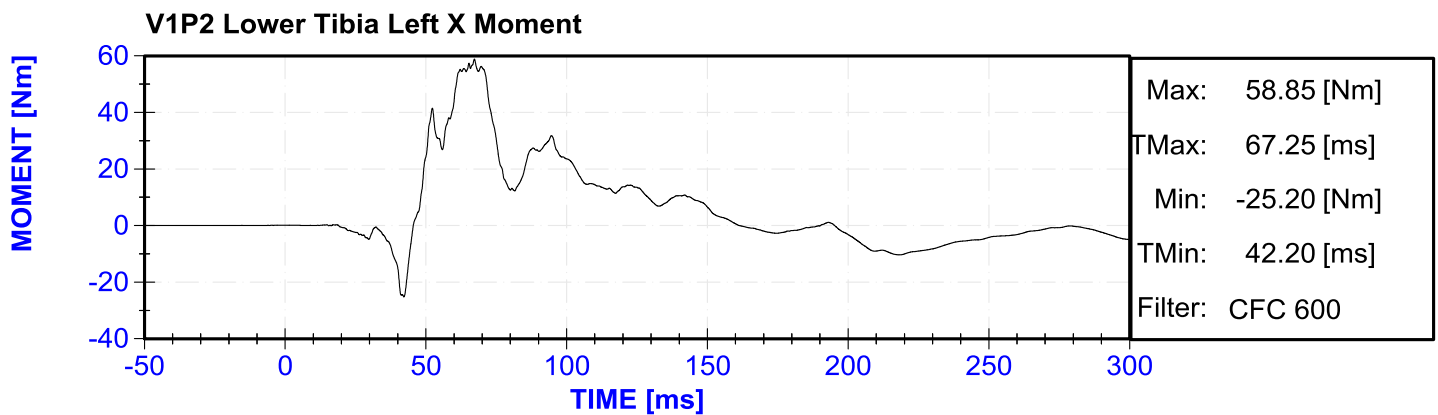
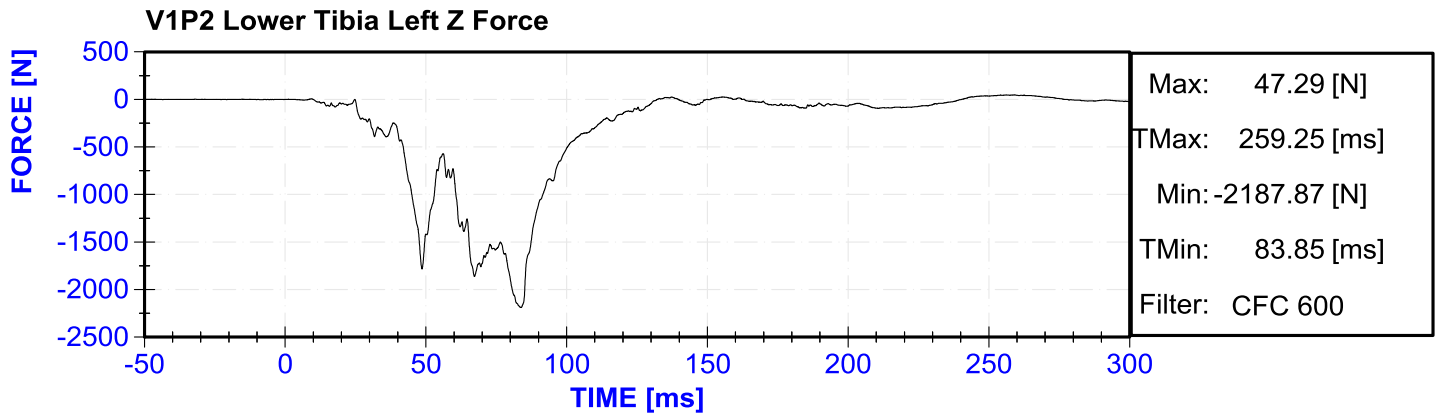


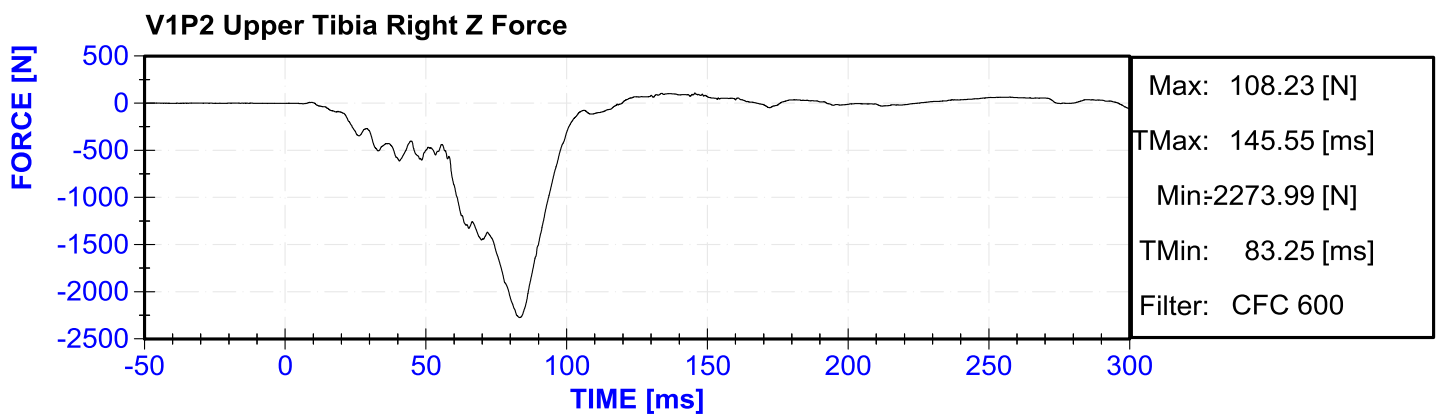
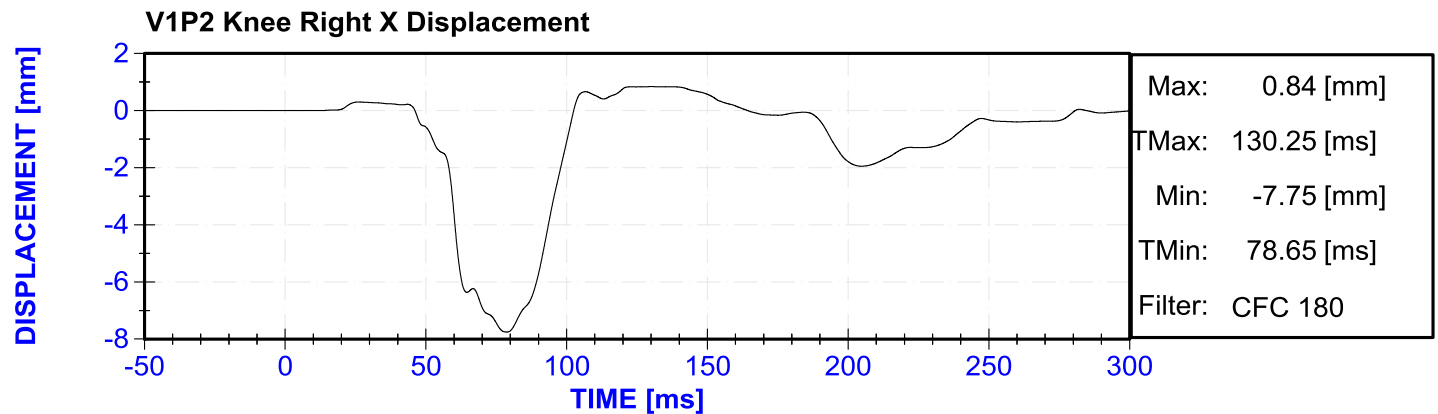
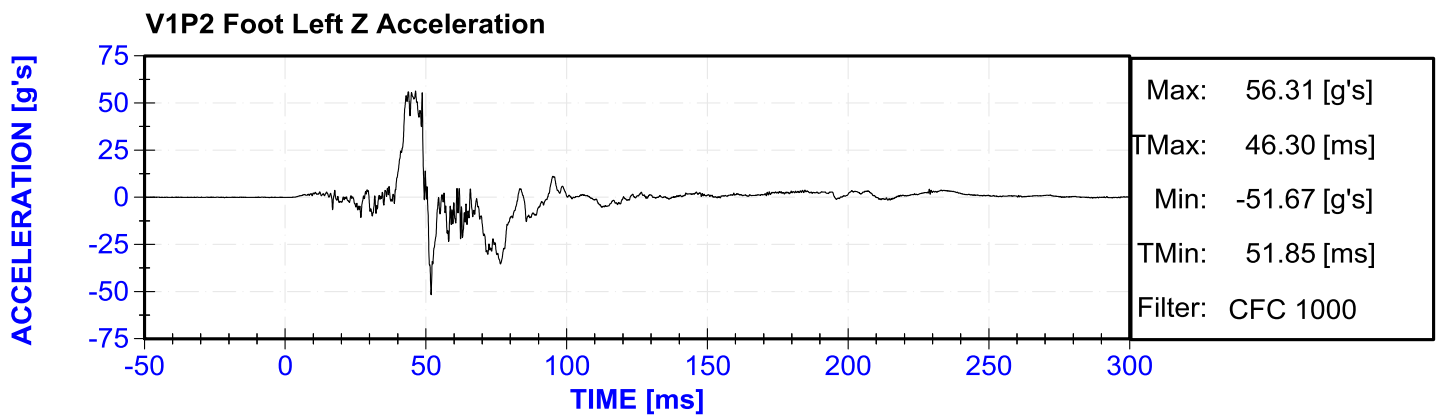
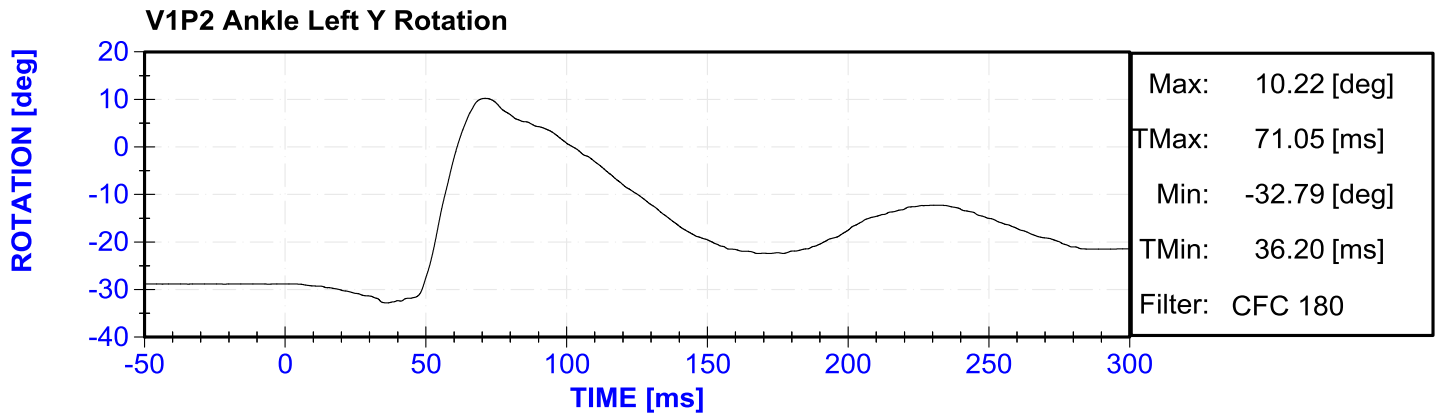


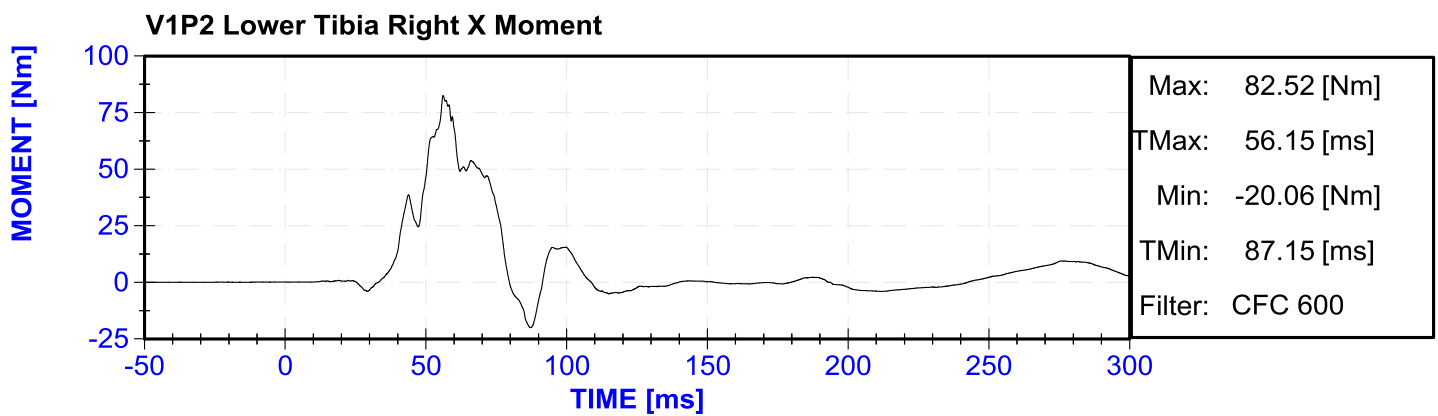
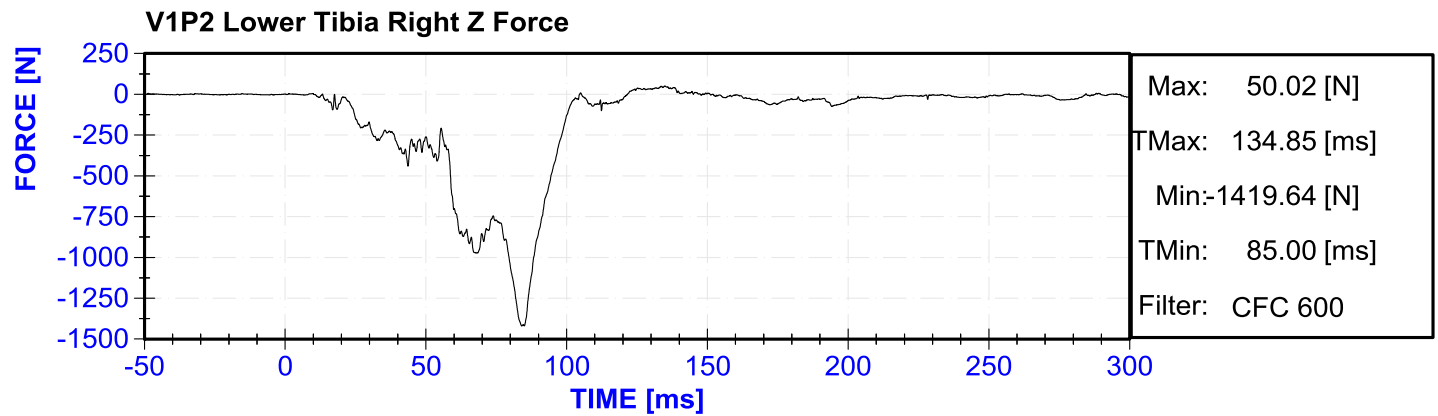
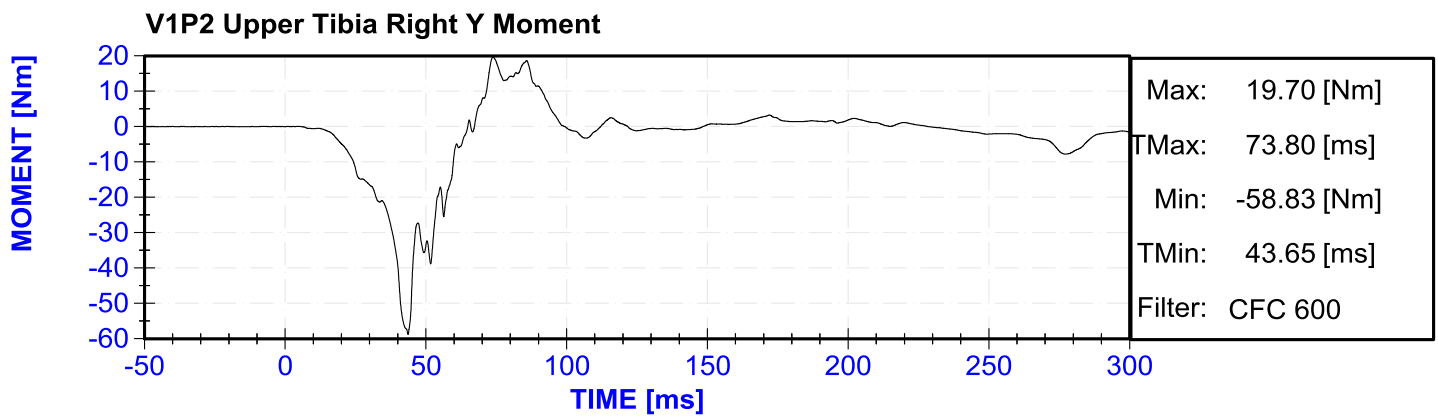
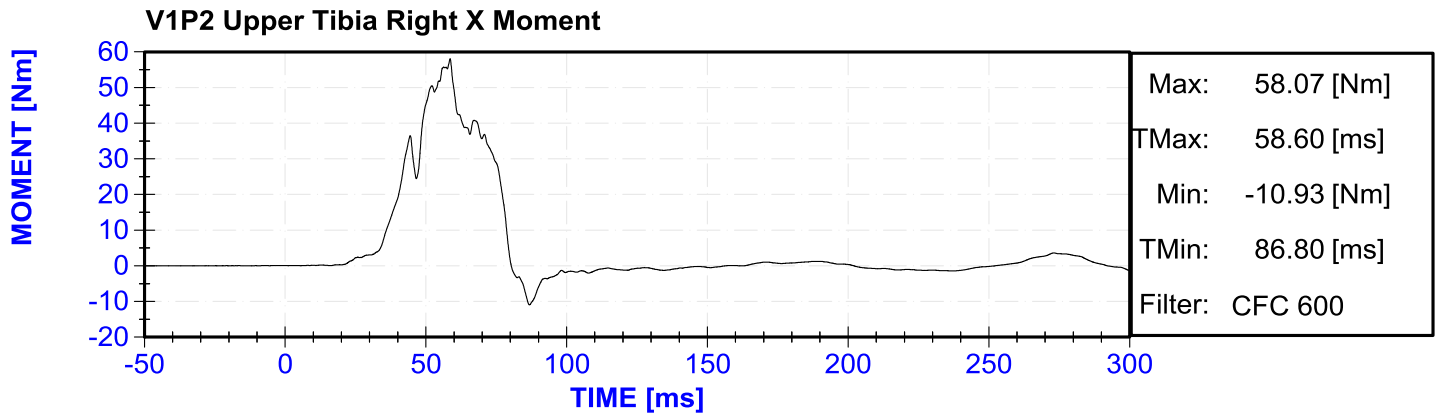


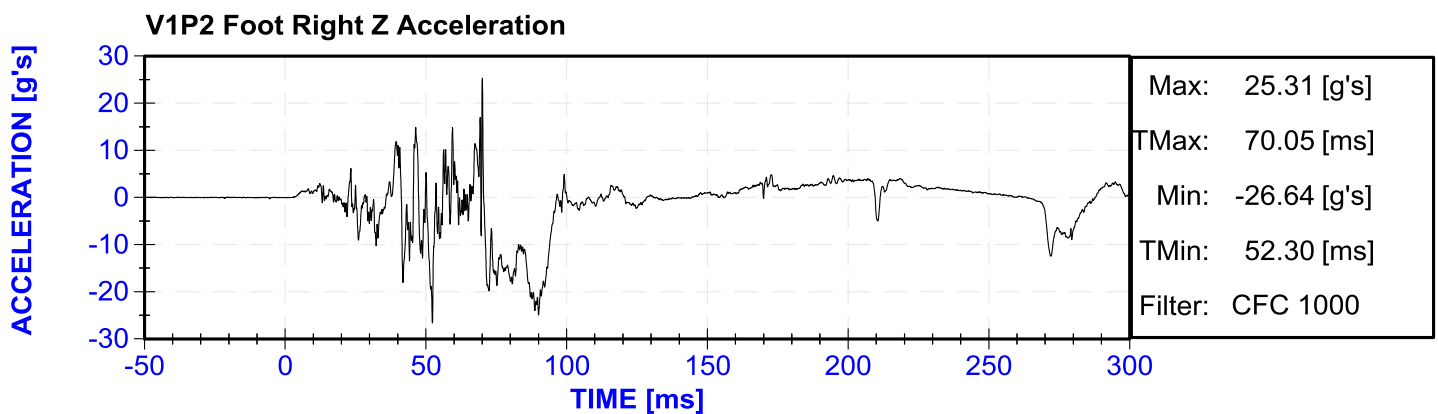
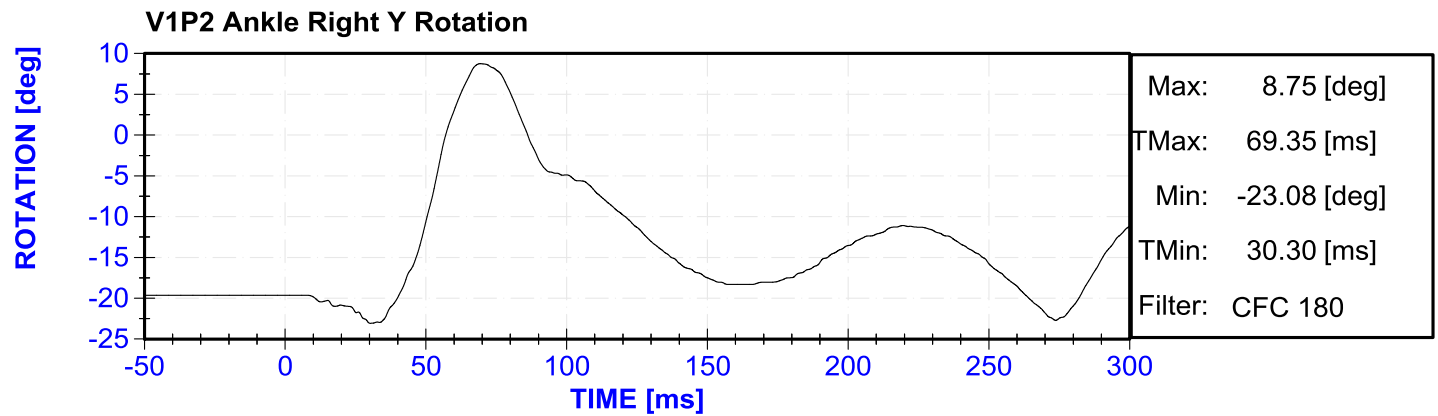
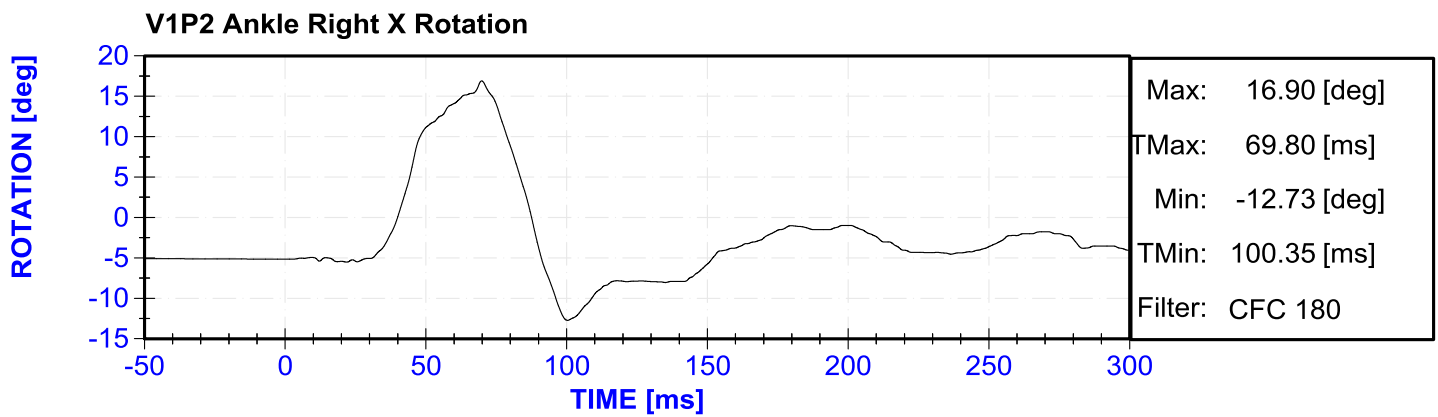
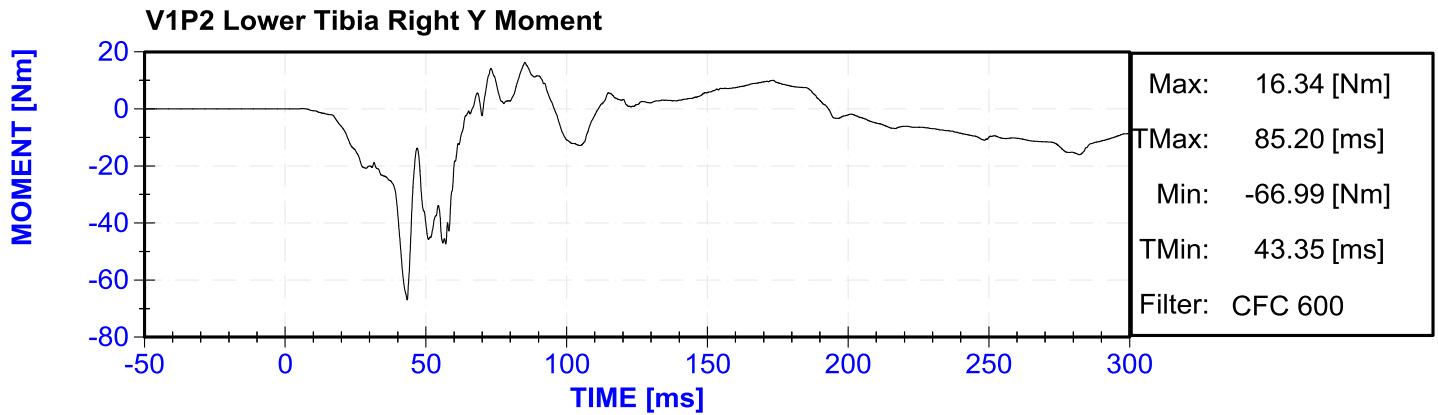




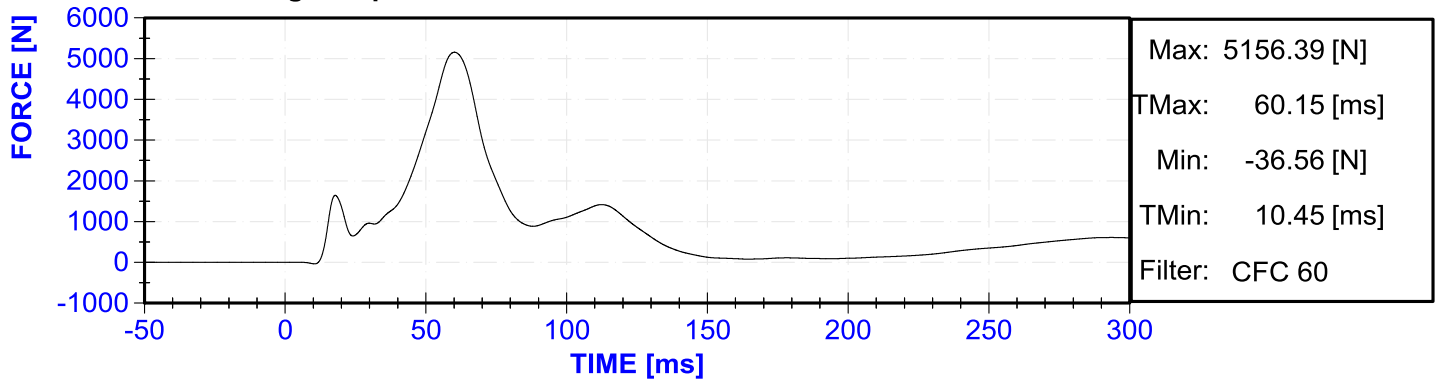




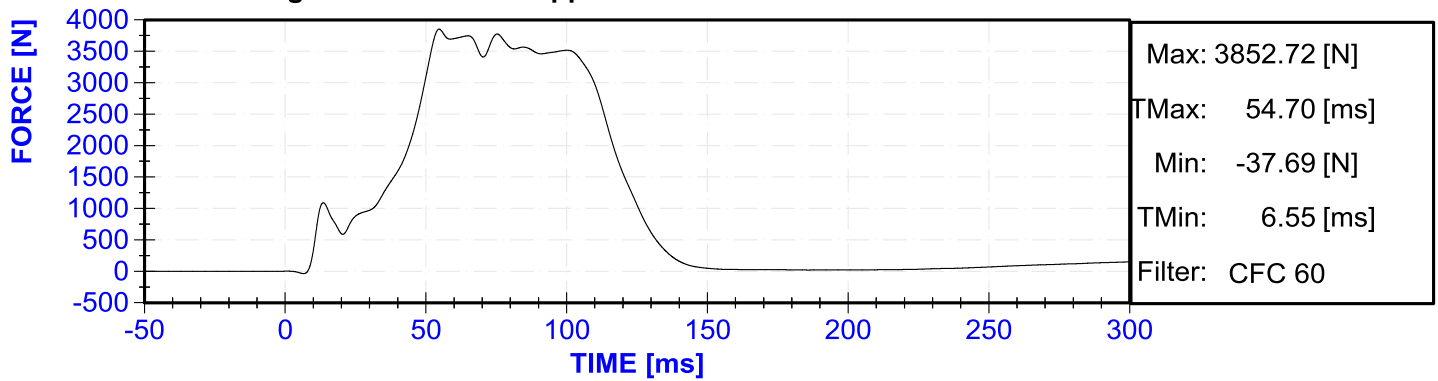




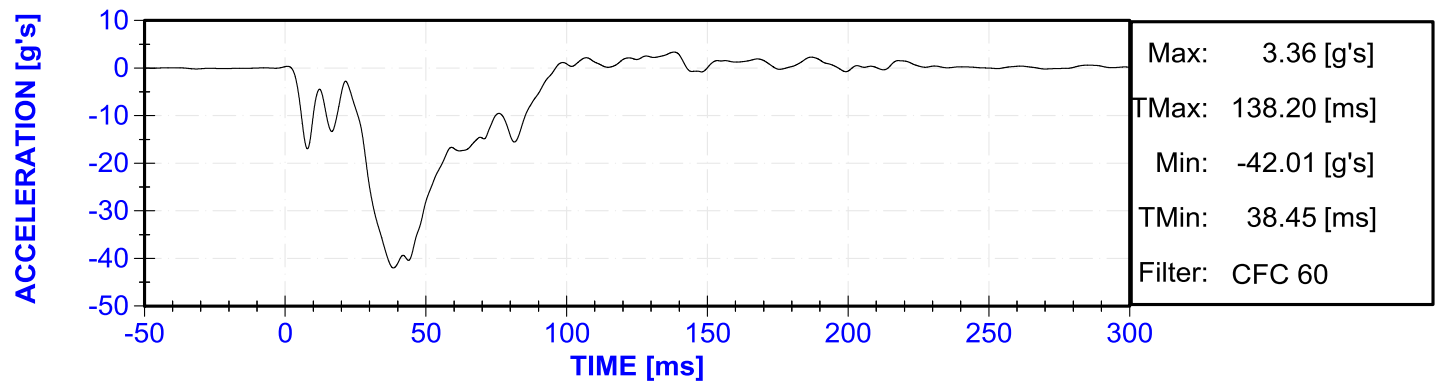
V1 Passenger Lap Belt Force



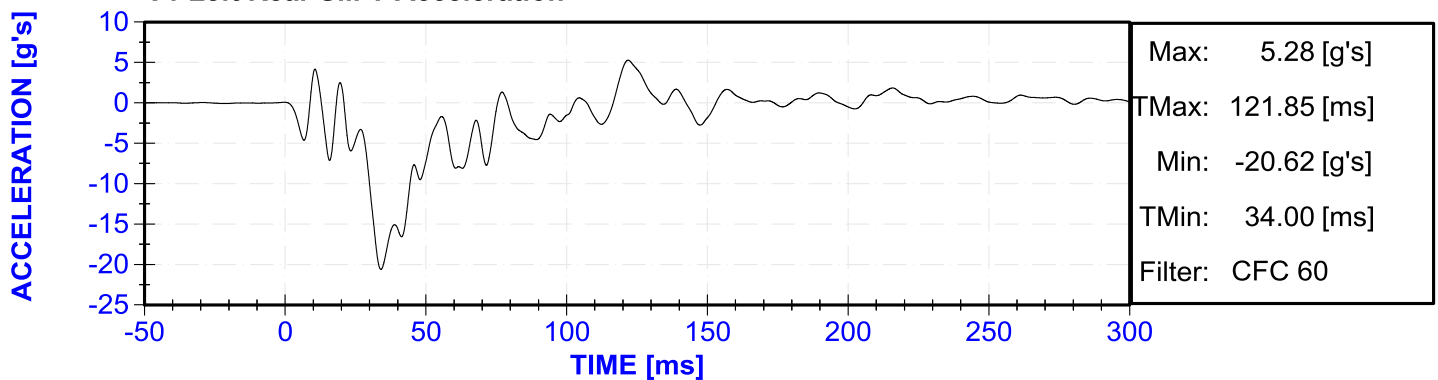
V1 Passenger Shoulder Belt Upper Force

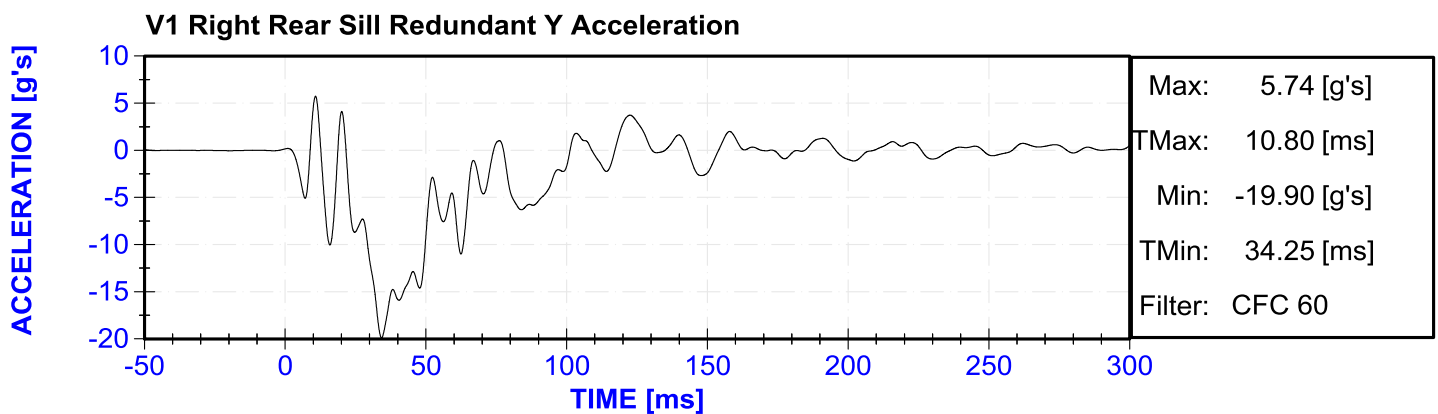
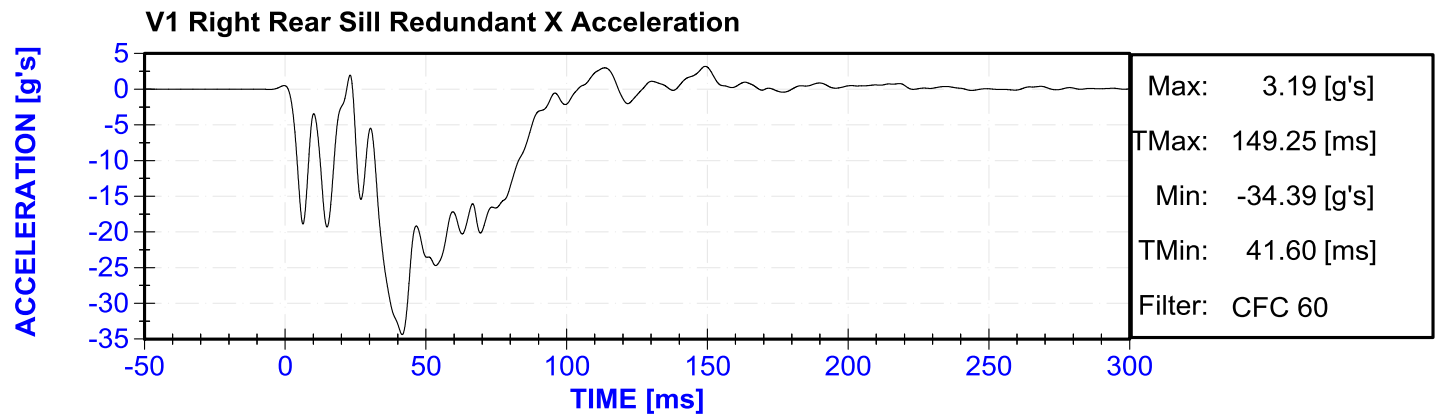
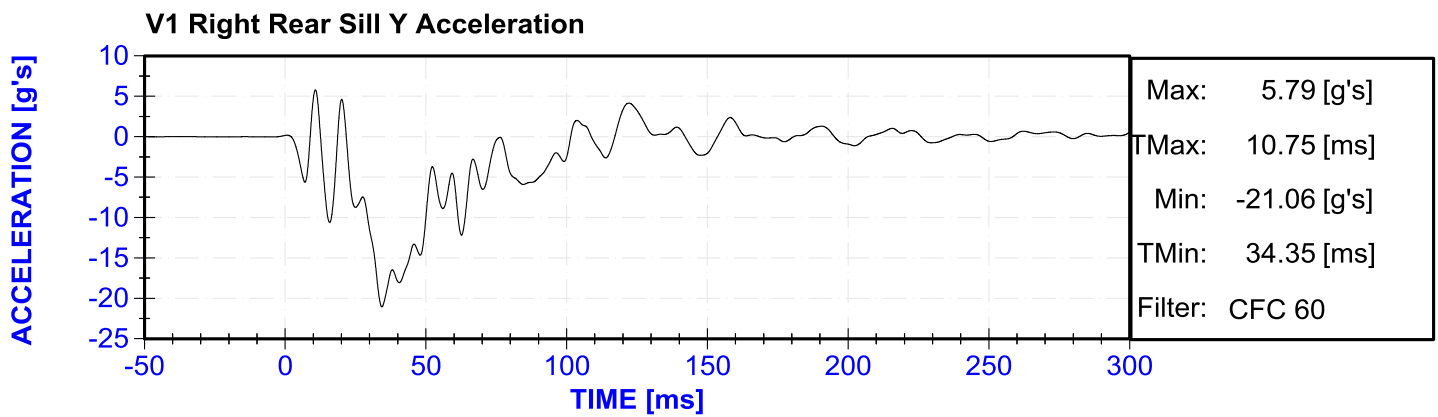
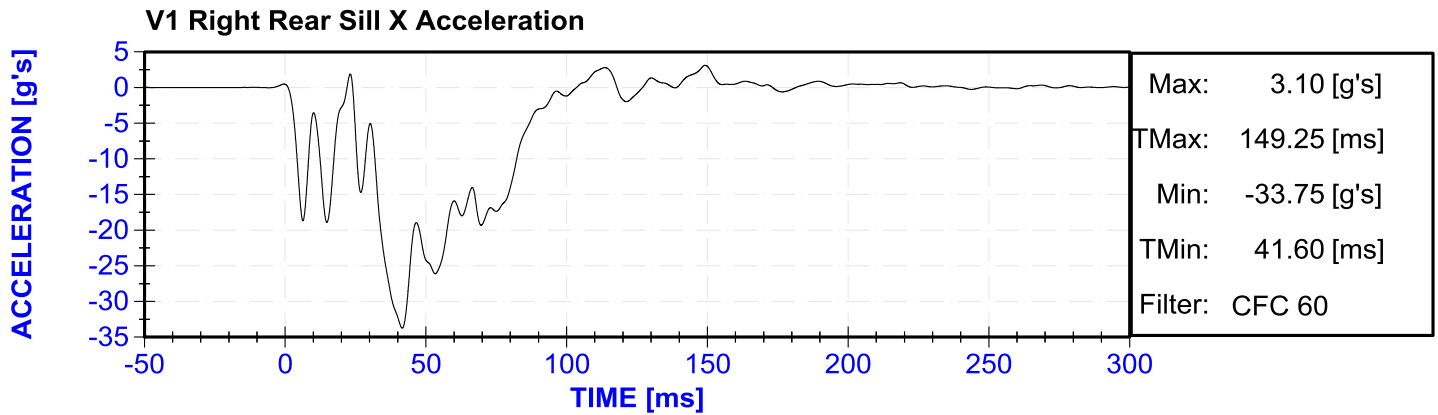


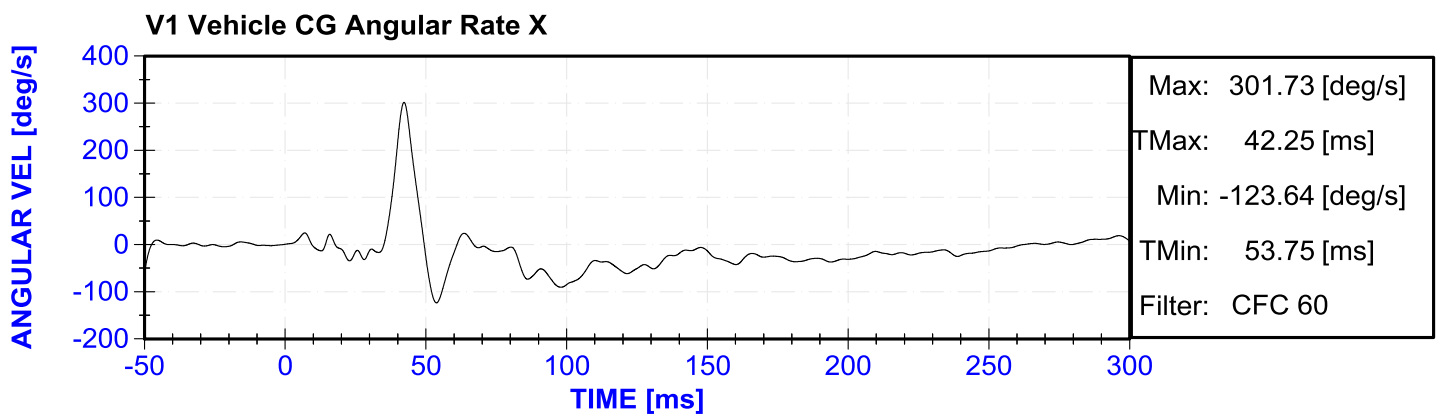
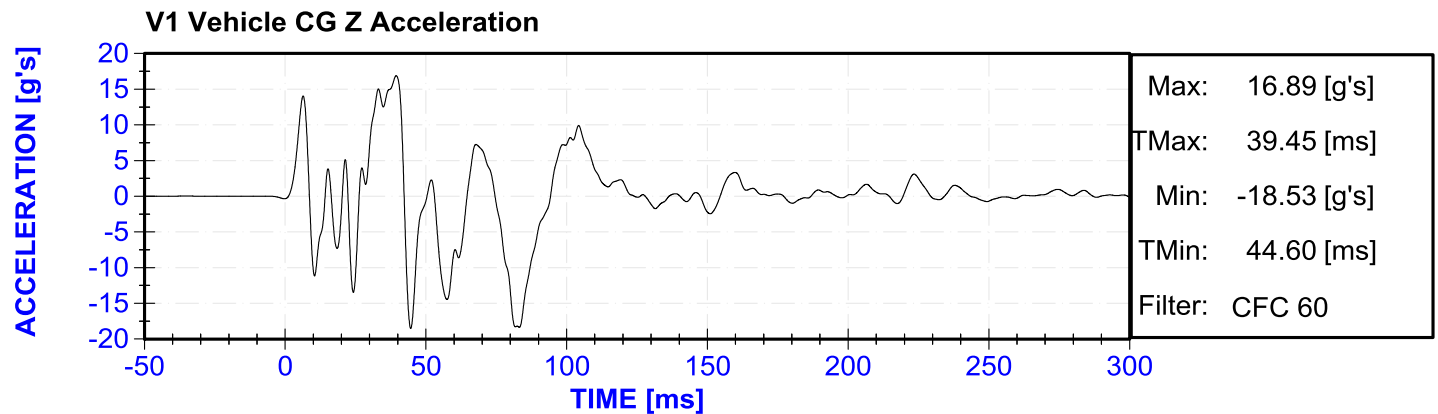
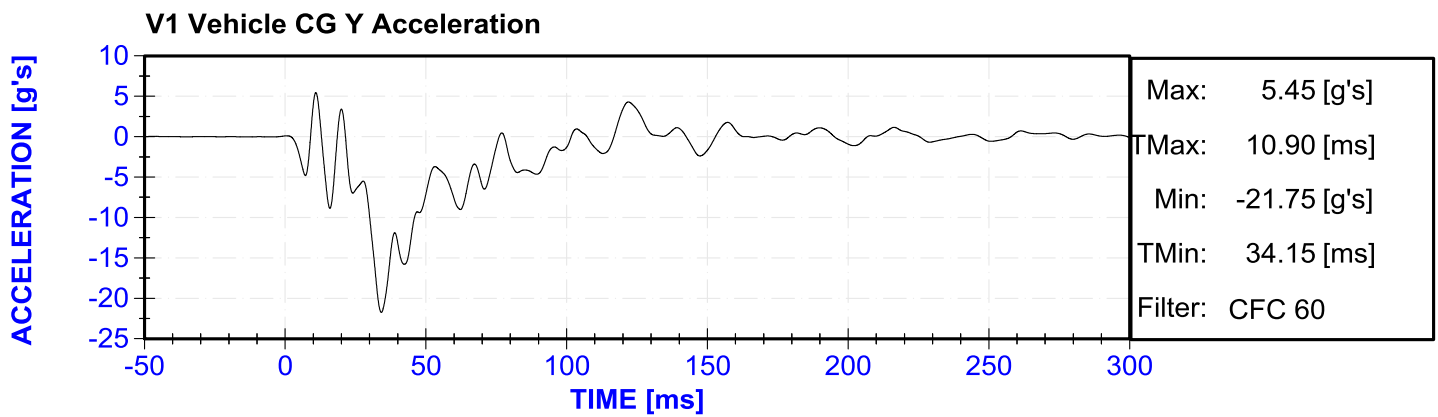
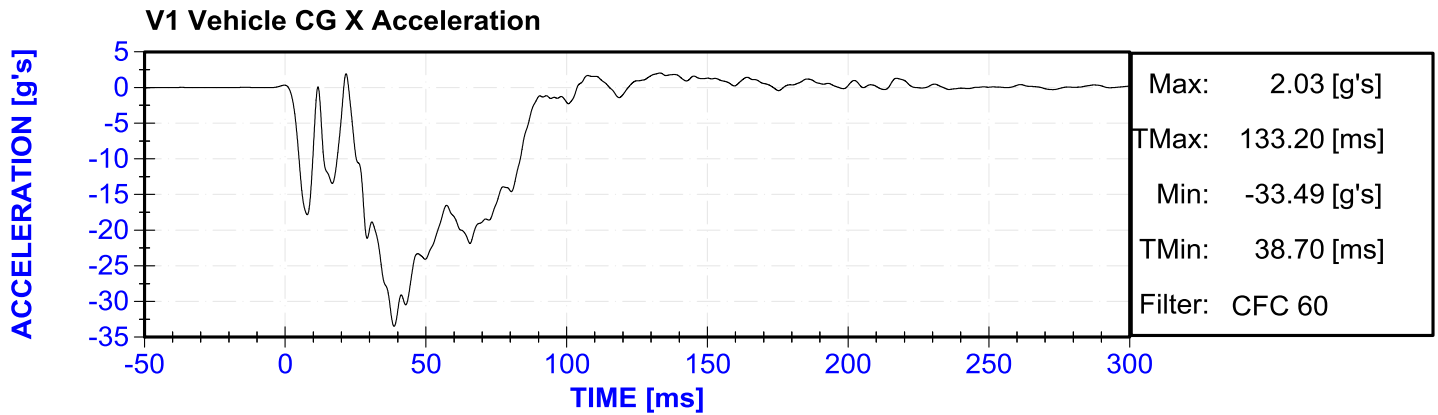
V1 Left Rear Sill X Acceleration

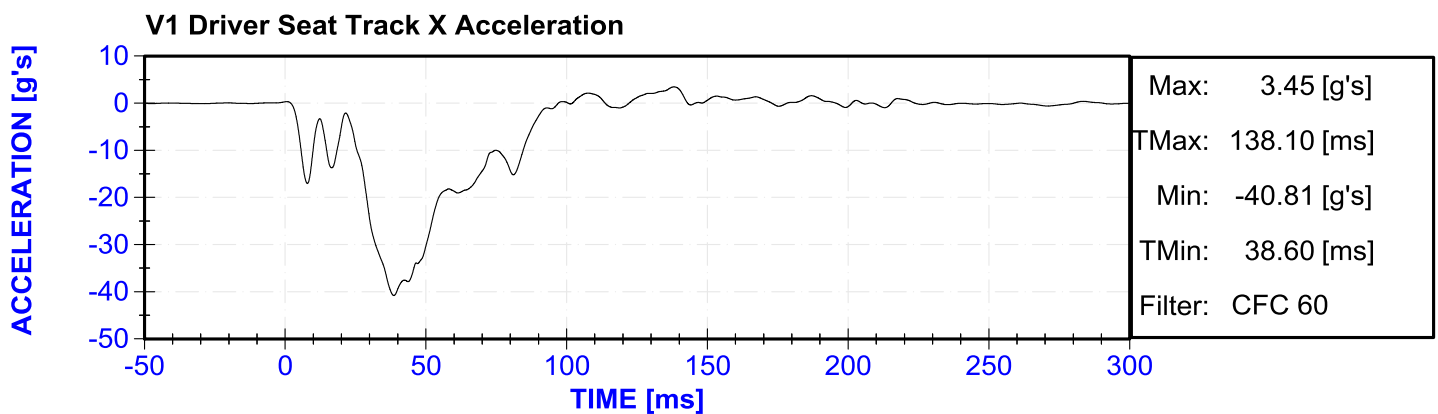
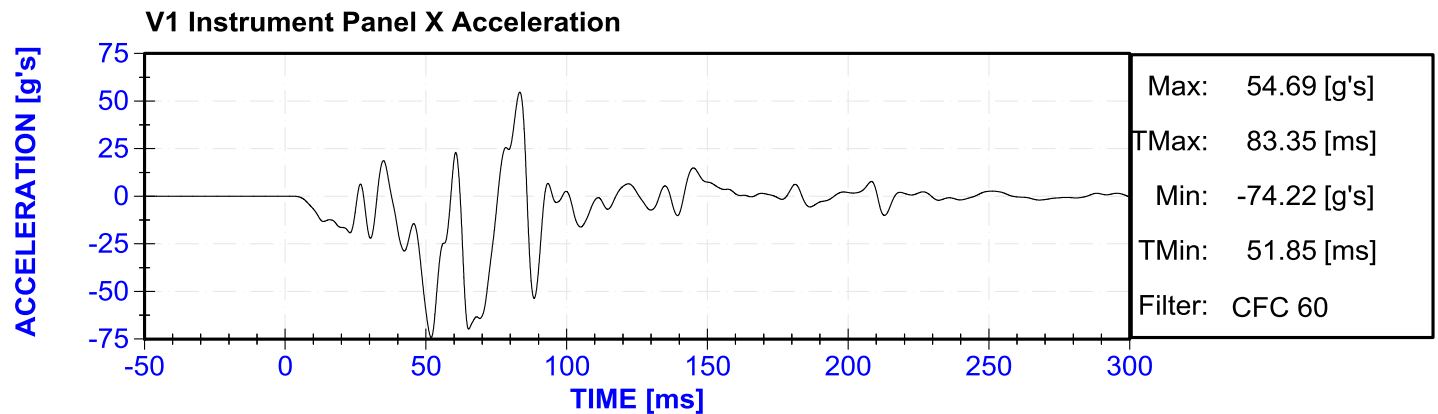
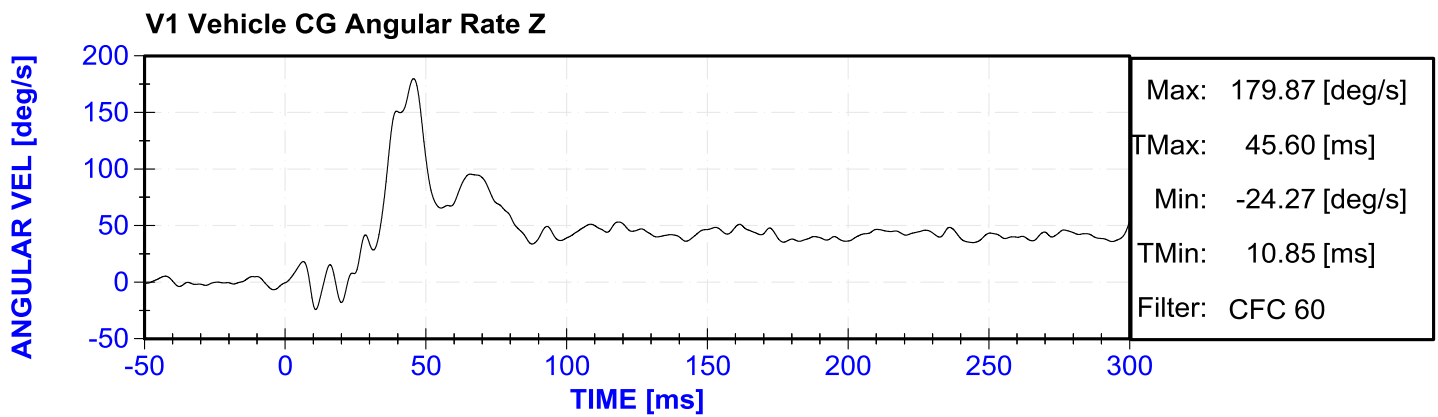
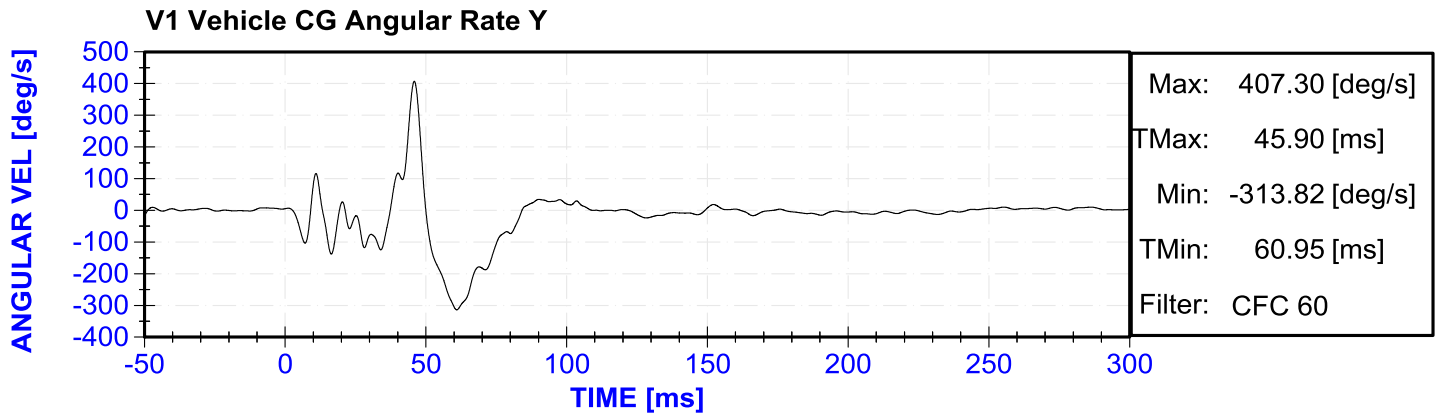


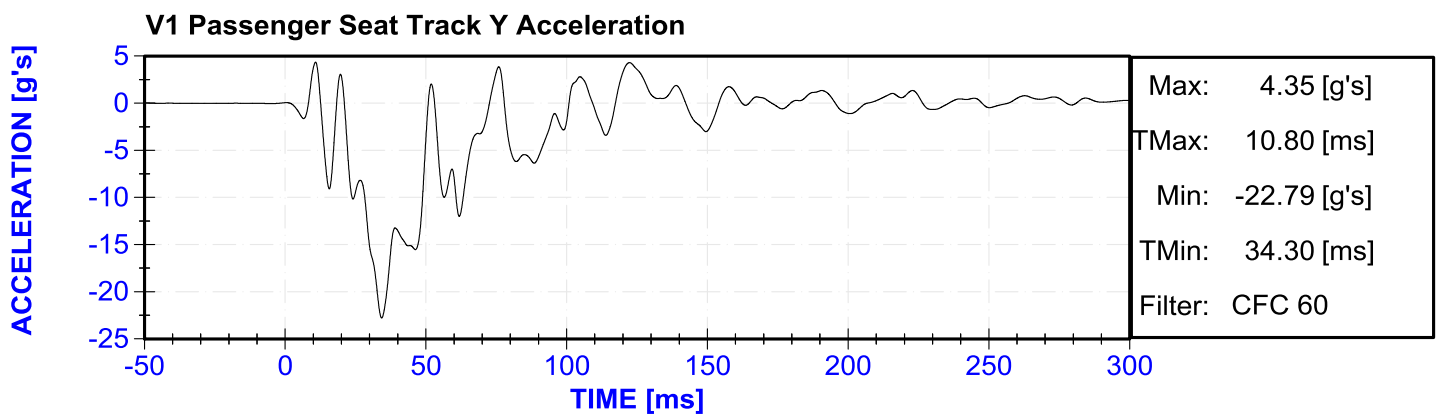
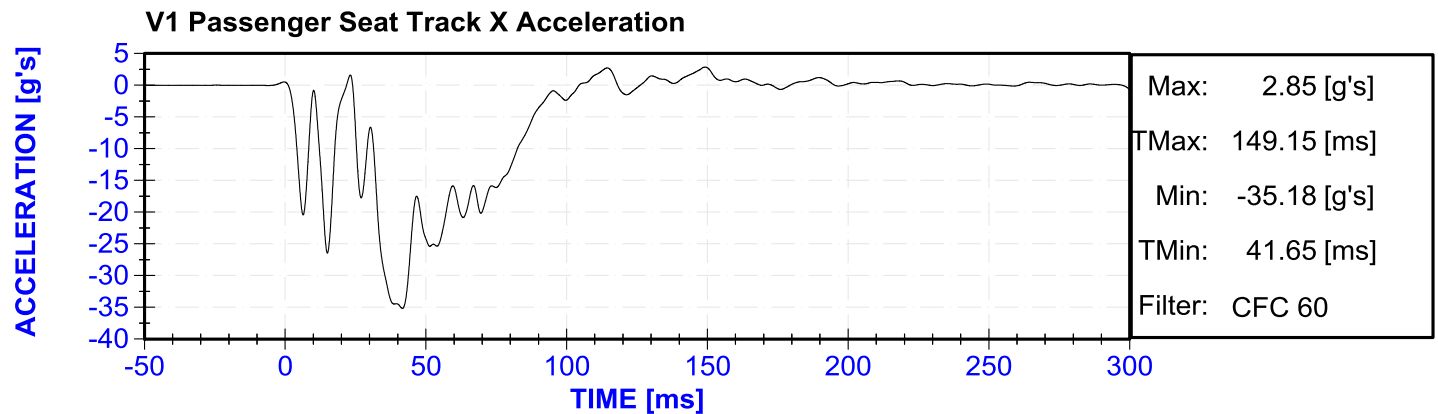
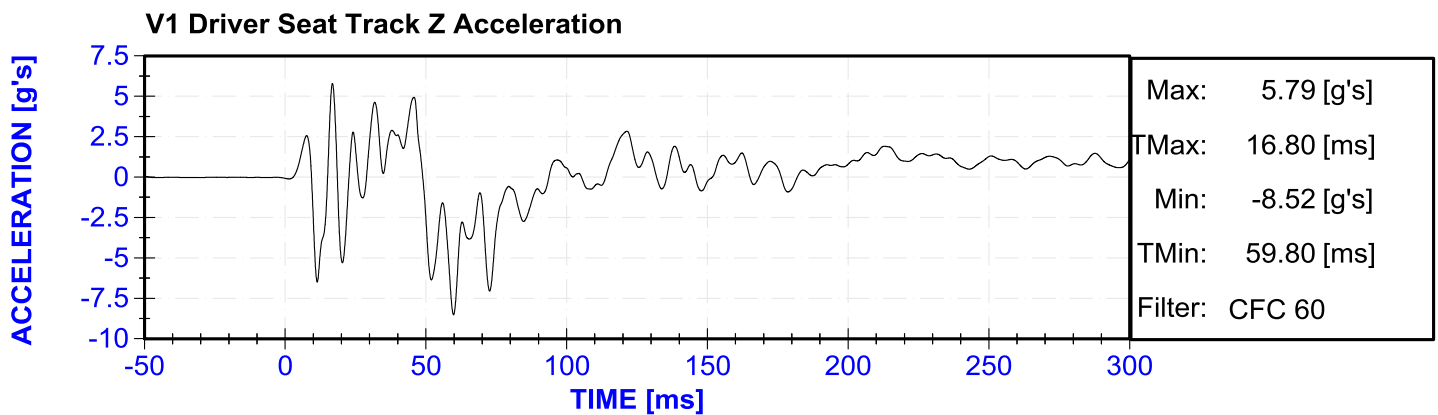
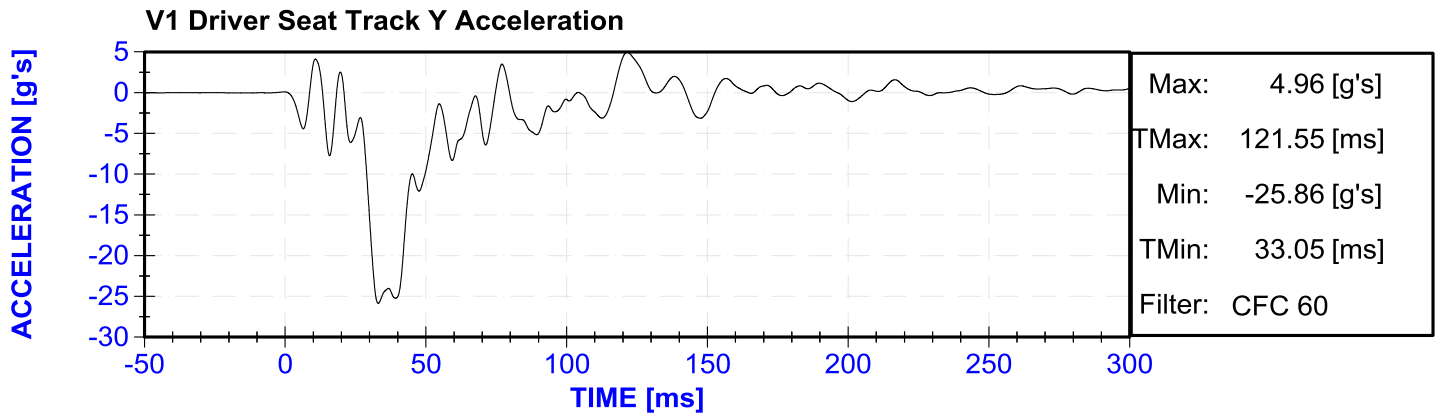
V1 Left Rear Sill Y Acceleration



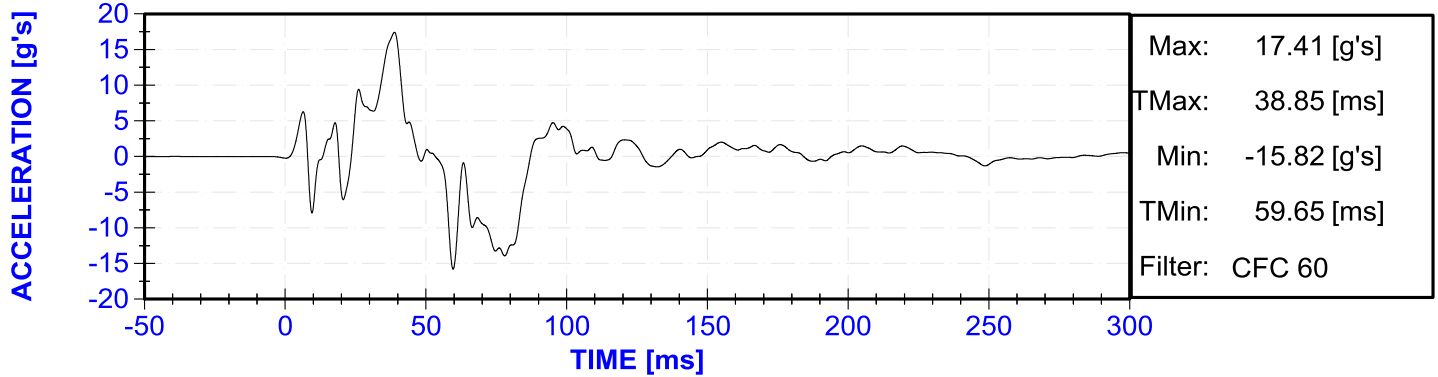




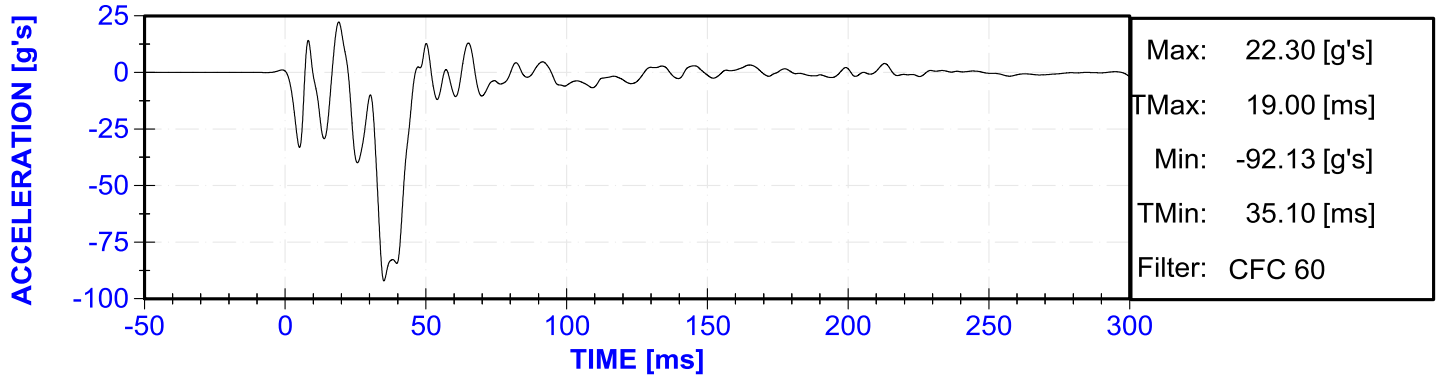




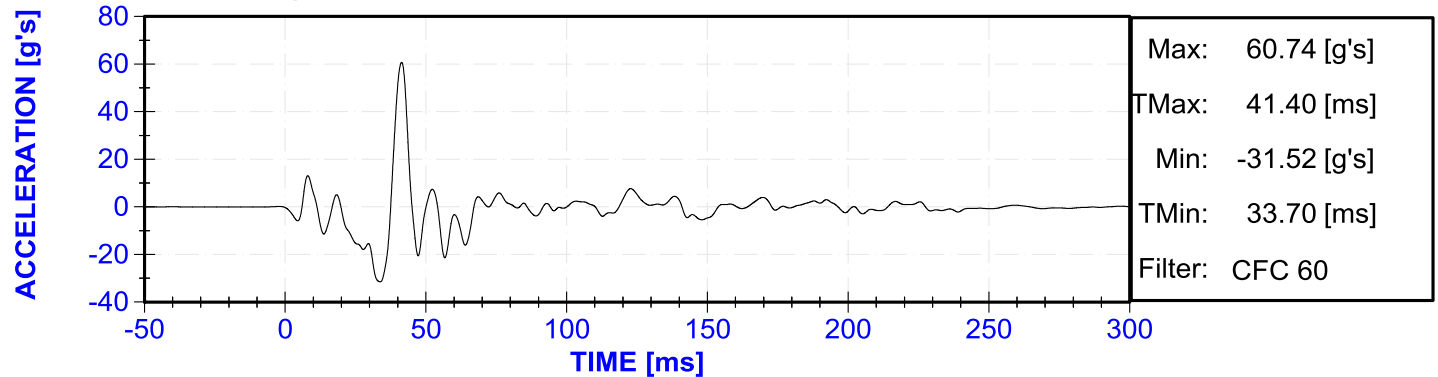
V1 Passenger Seat Track Z Acceleration



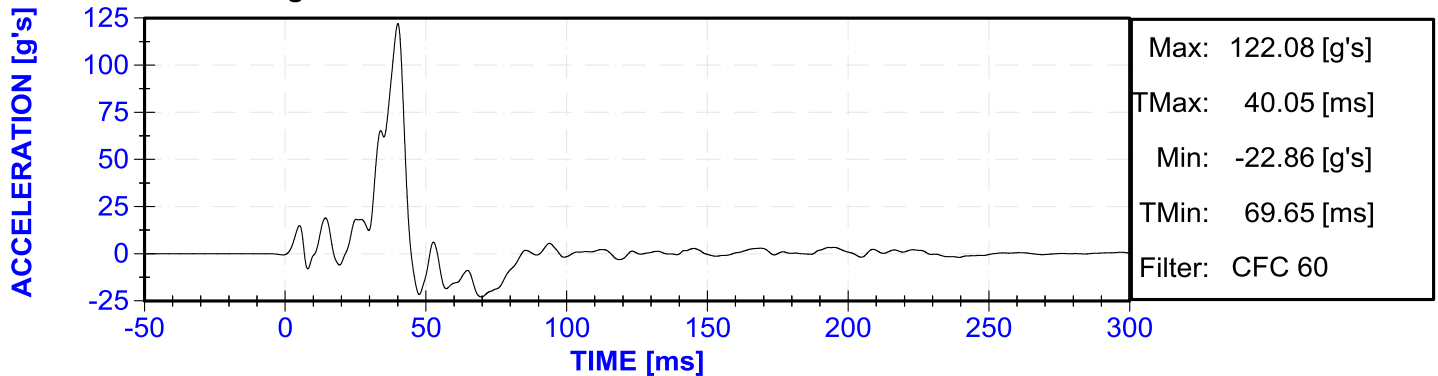
V1 Passenger Floor Pan X Acceleration



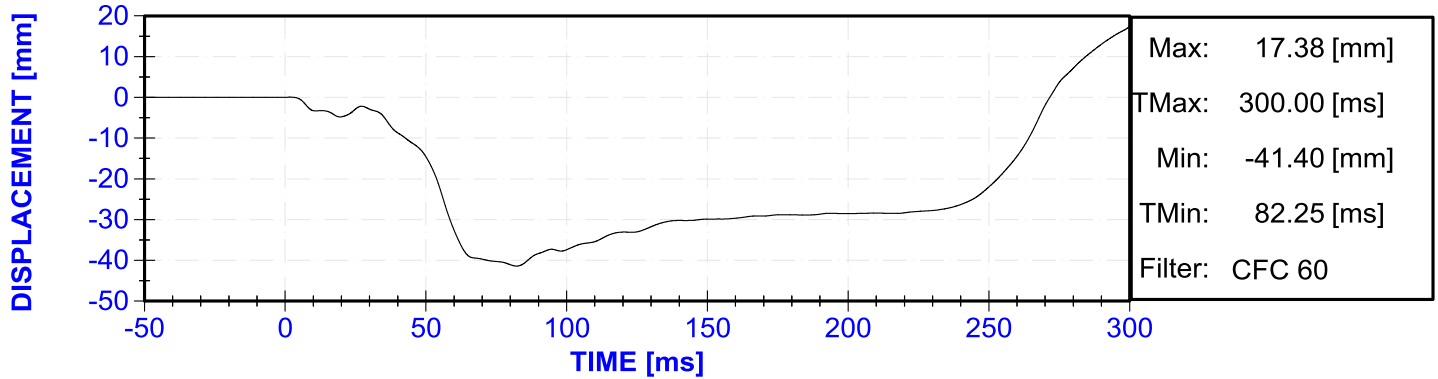
V1 Passenger Floor Pan Y Acceleration



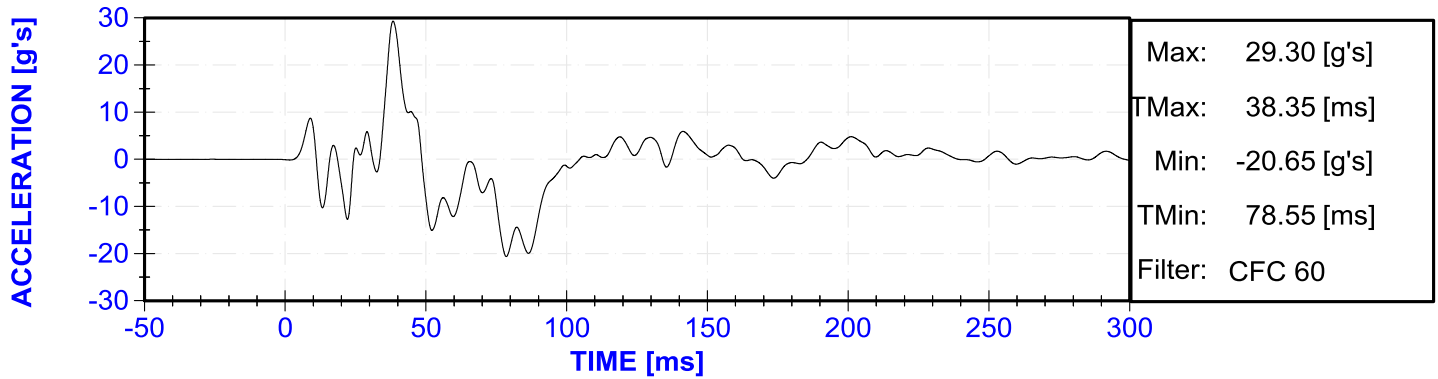
V1 Passenger Floor Pan Z Acceleration



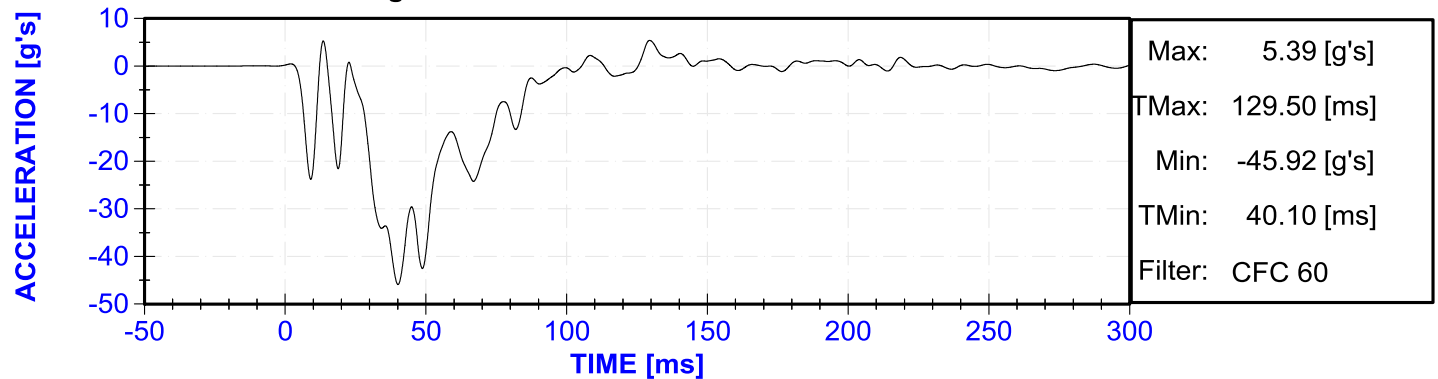
V1 Passenger Floor Pan X Deflection



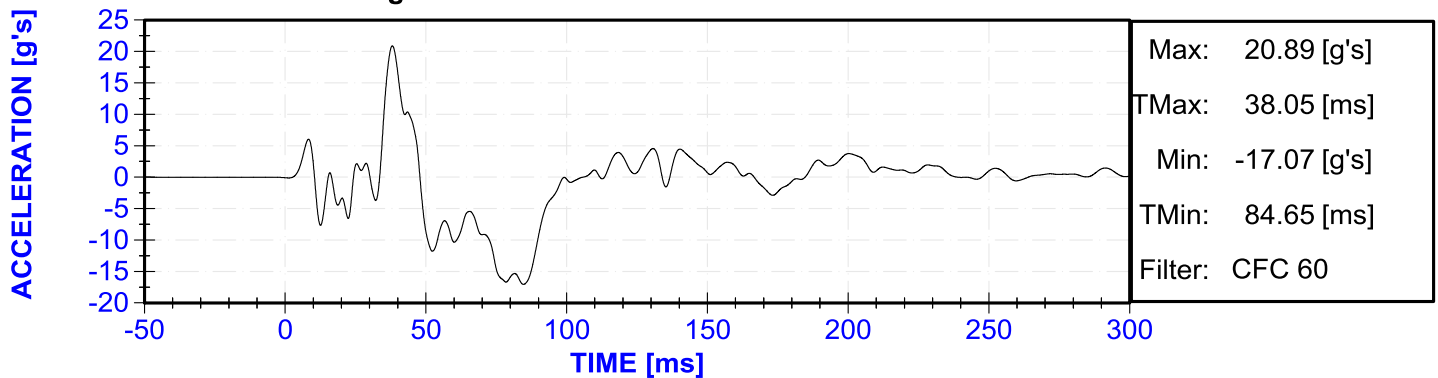
V1 Driver Seat Pan Z Acceleration

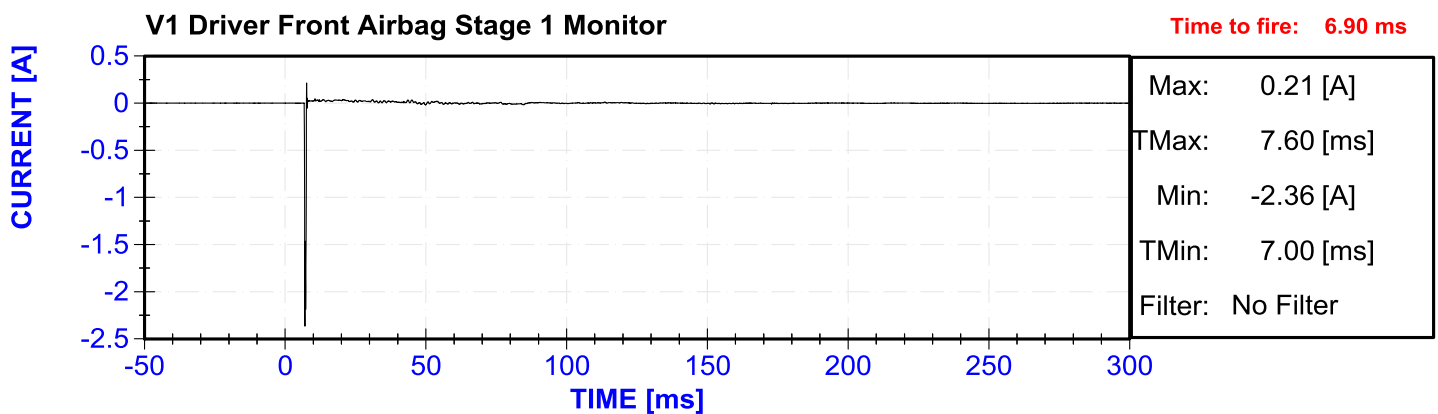
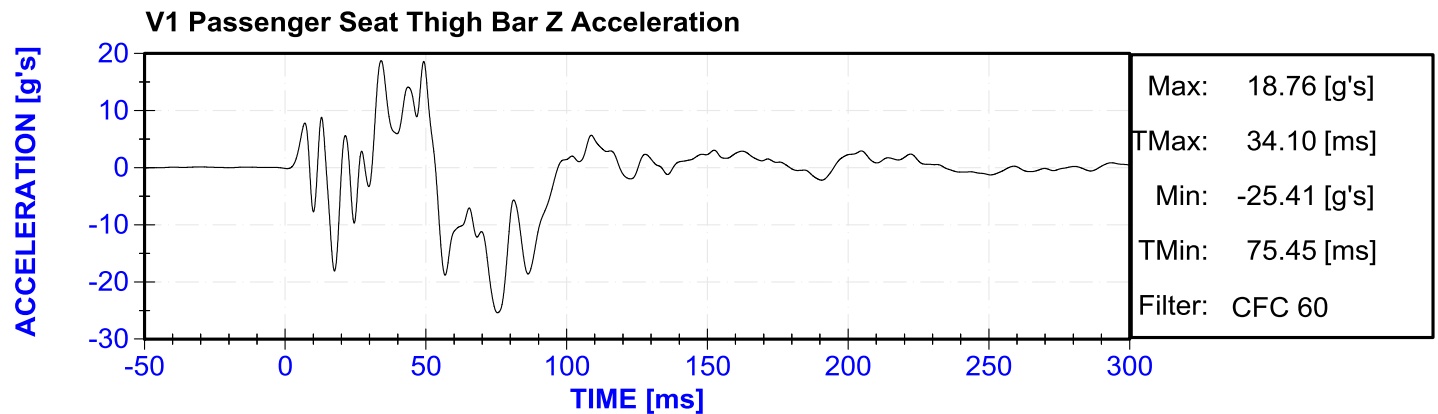
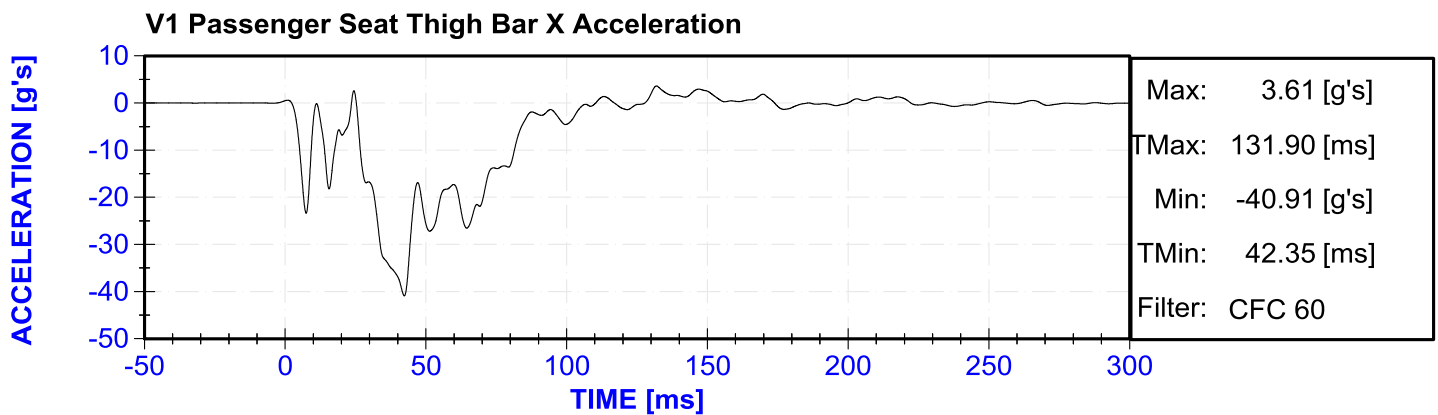
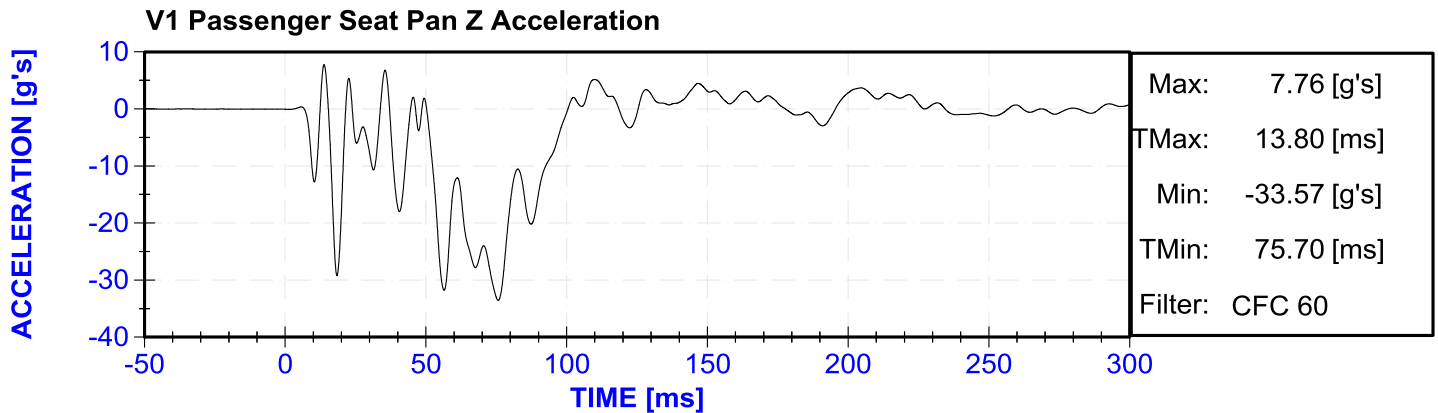


V1 Driver Seat Thigh Bar X Acceleration



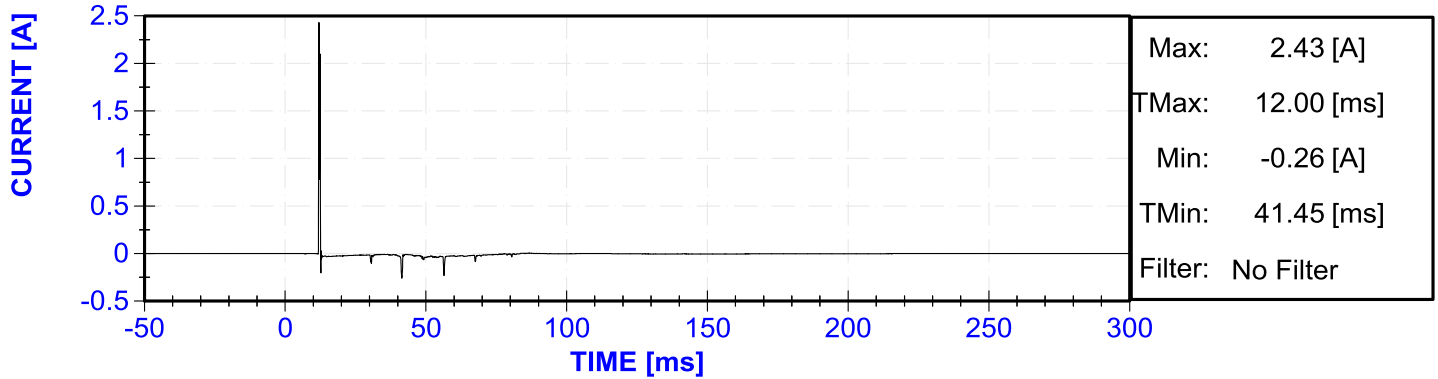
V1 Driver Seat Thigh Bar Z Acceleration





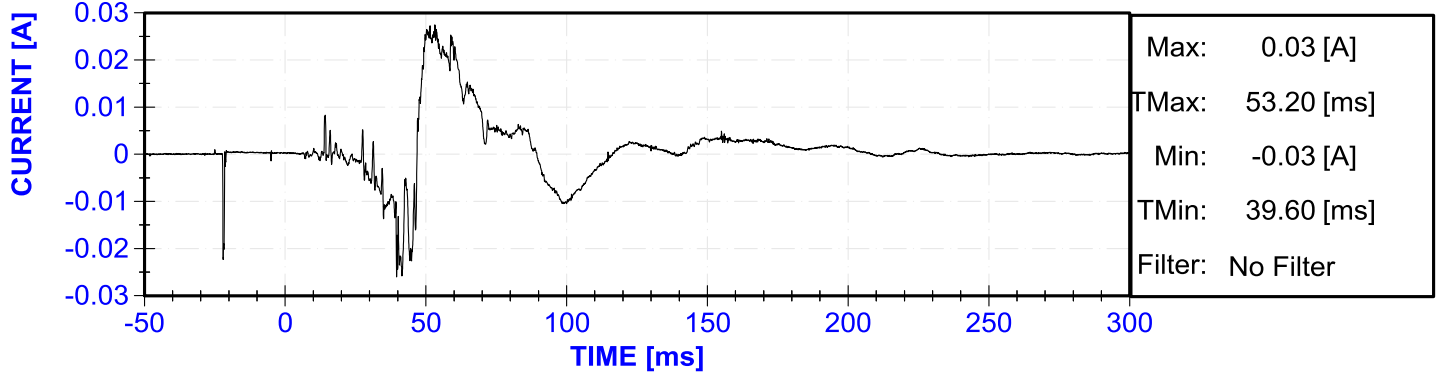
V1 Driver Front Airbag Stage 2 Monitor

Time to fire: 11.90 ms



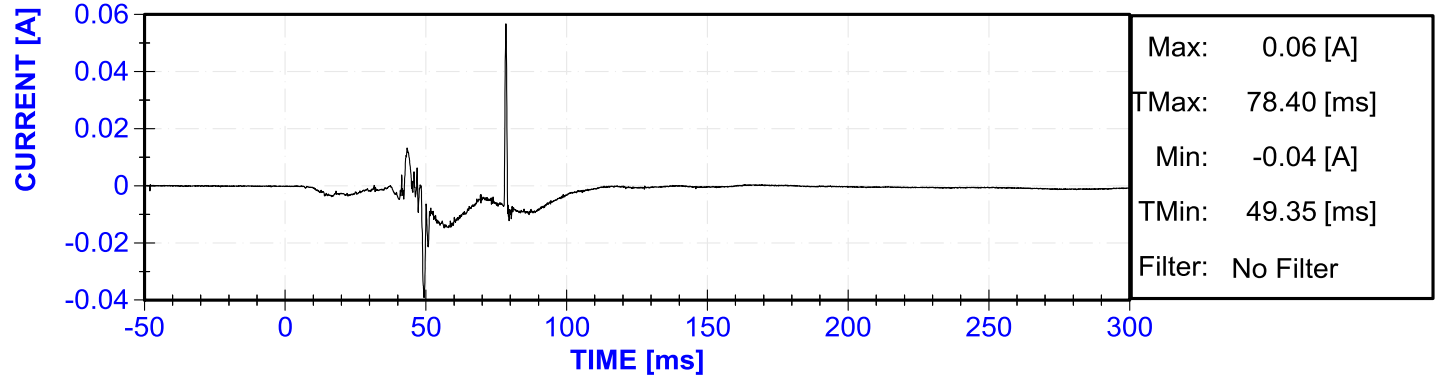
V1 Driver Curtain Airbag Monitor

Did not fire



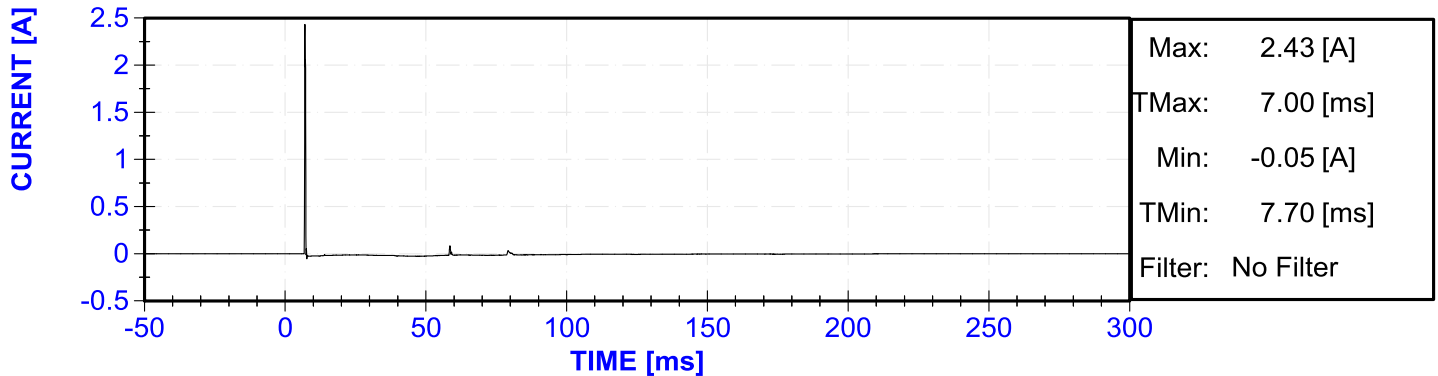
V1 Driver Seat Torso Airbag Monitor

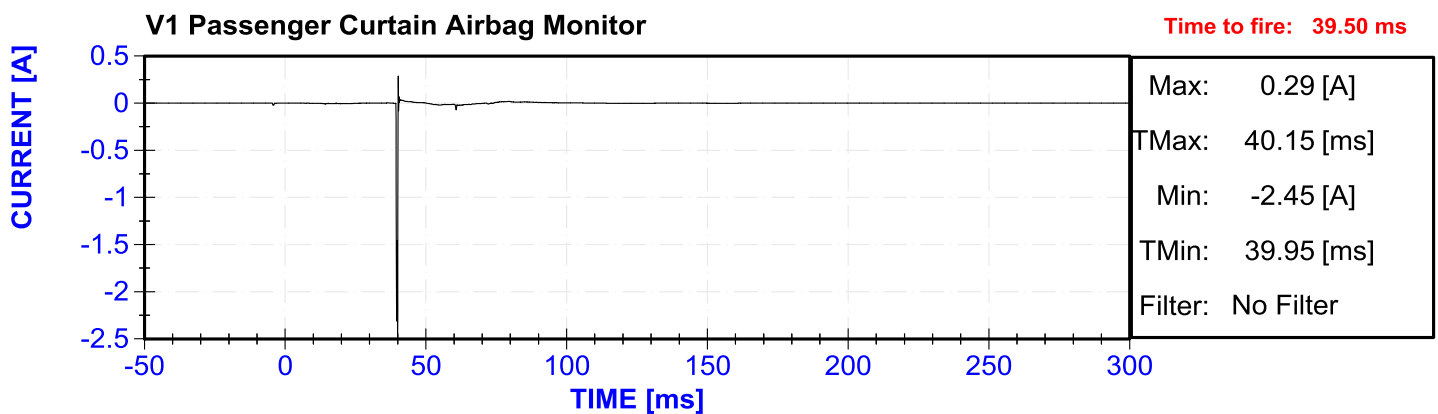
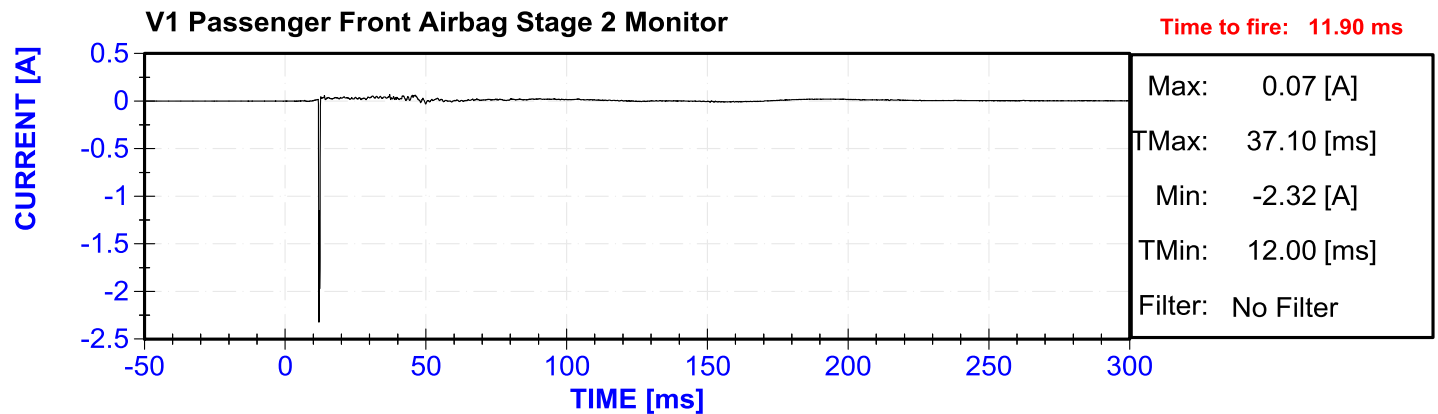
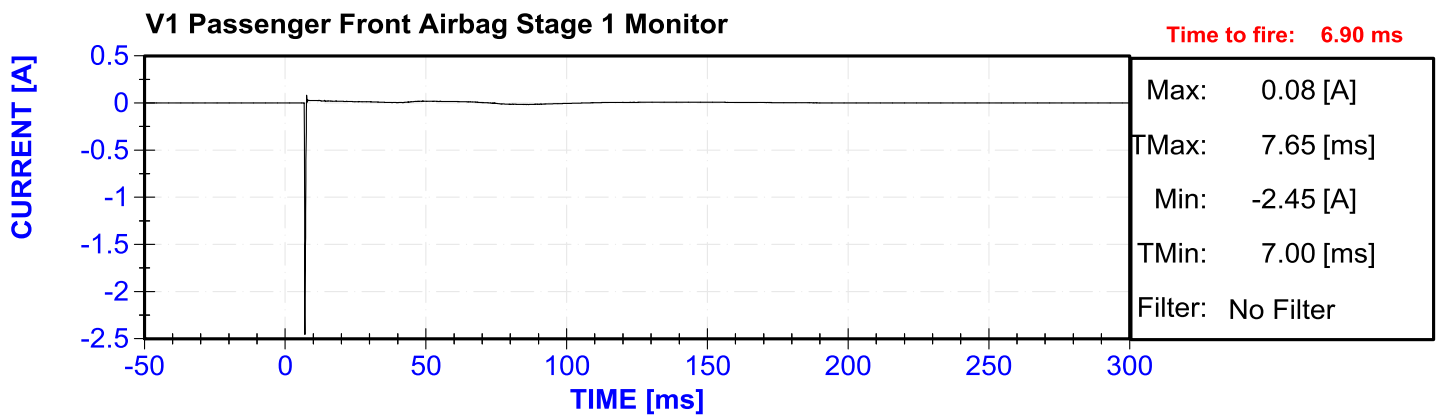
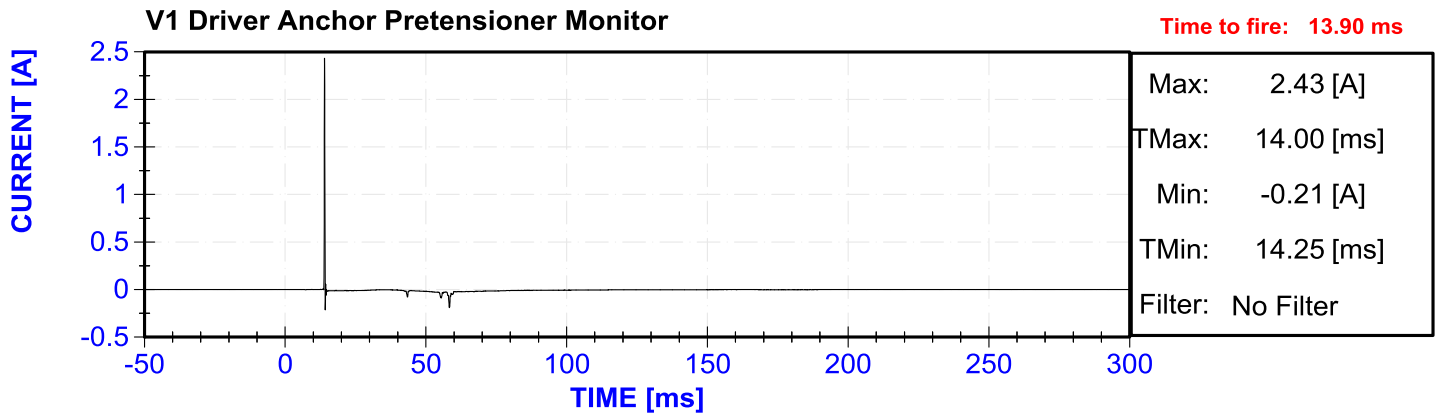
Did not fire



V1 Driver Retractor Pretensioner Monitor

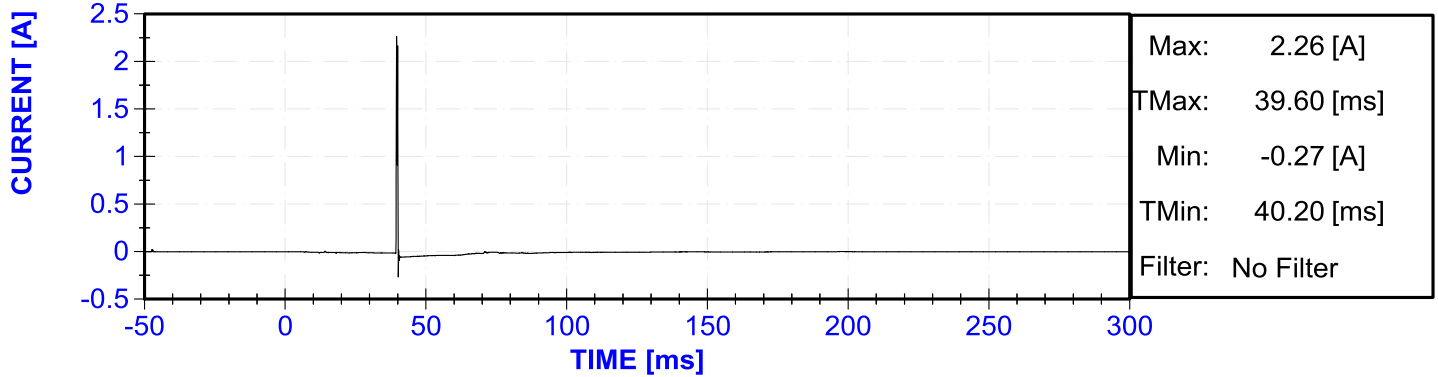
Time to fire: 6.90 ms





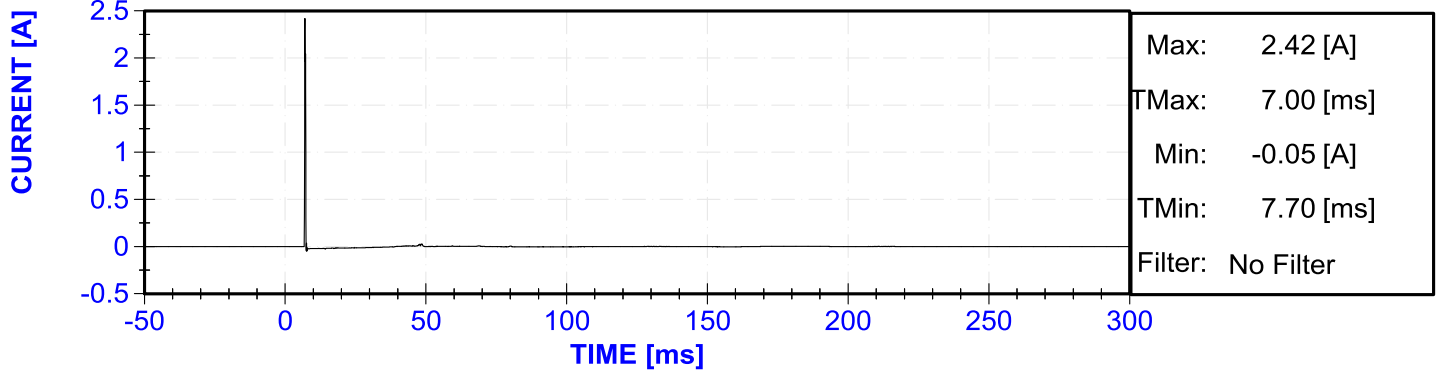
V1 Passenger Seat Torso Airbag Monitor

Time to fire: 39.50 ms



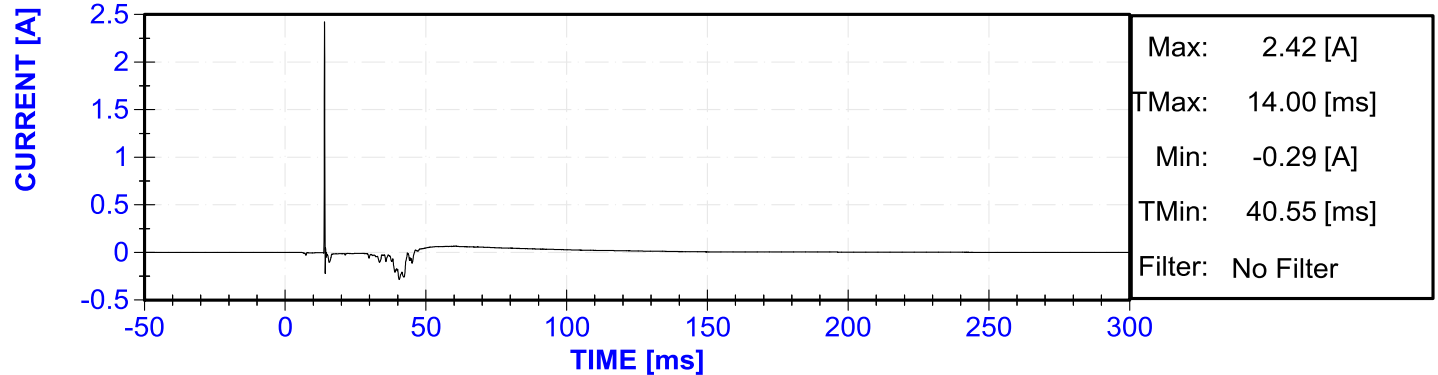
V1 Passenger Retractor Pretensioner Monitor

Time to fire: 6.90 ms

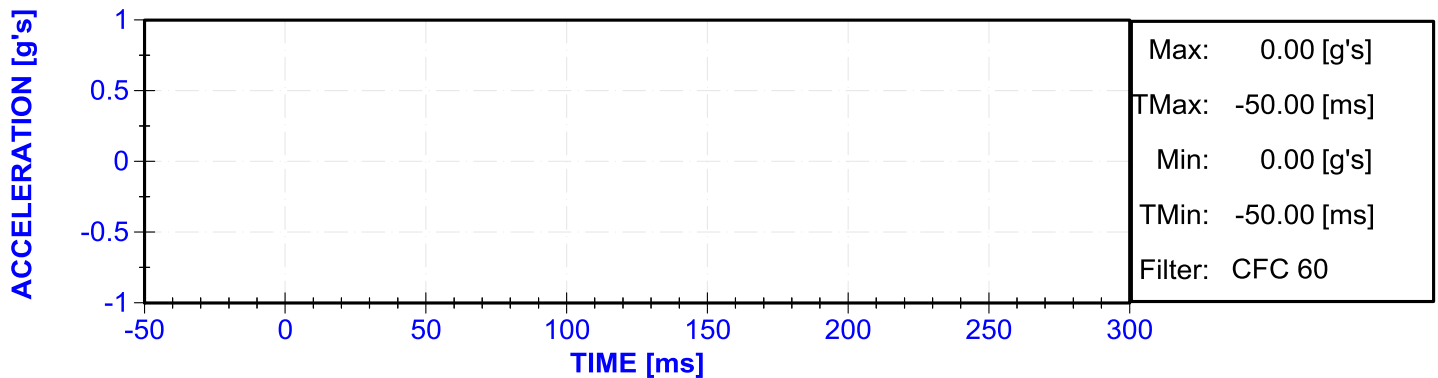


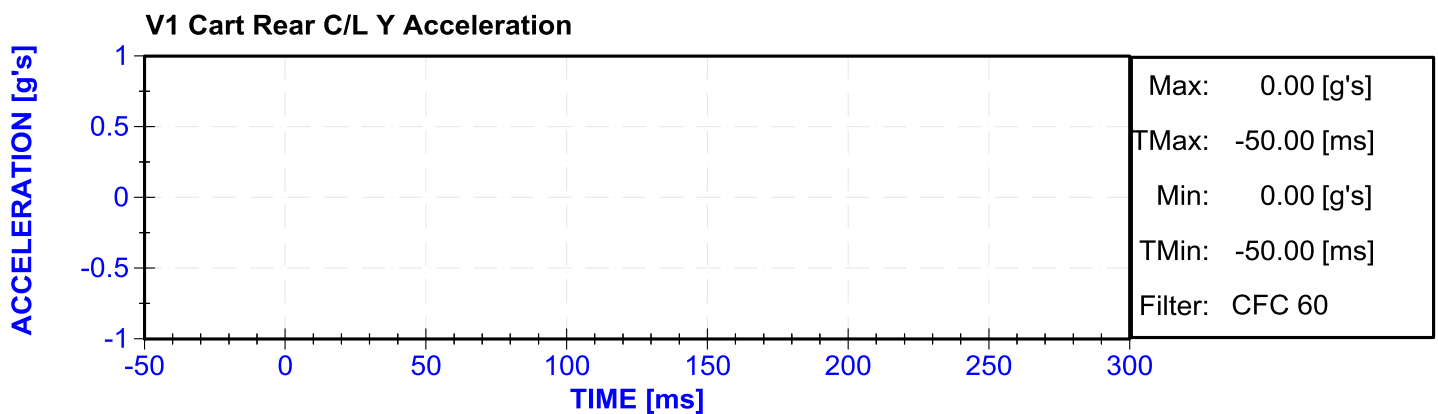
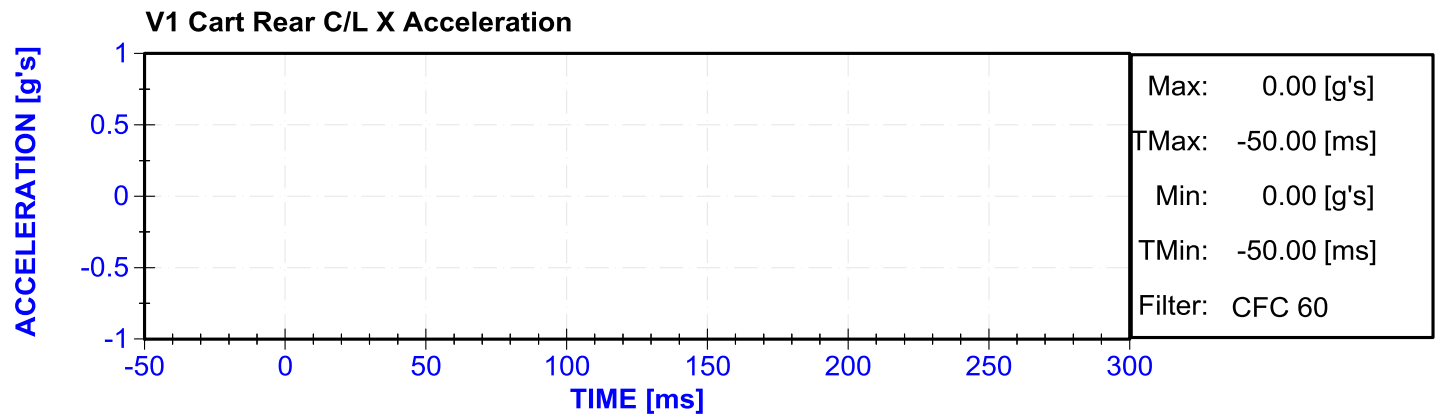
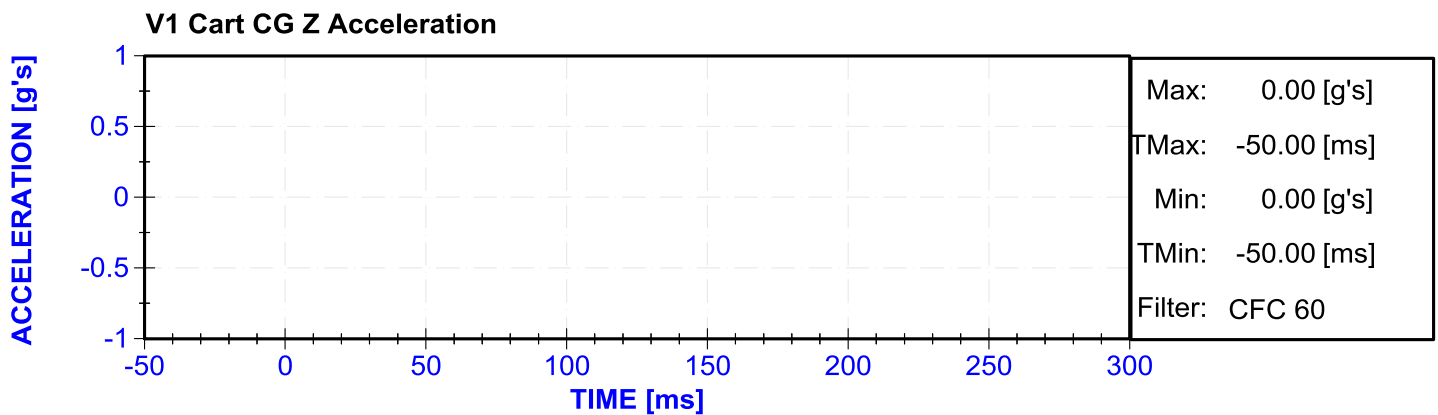
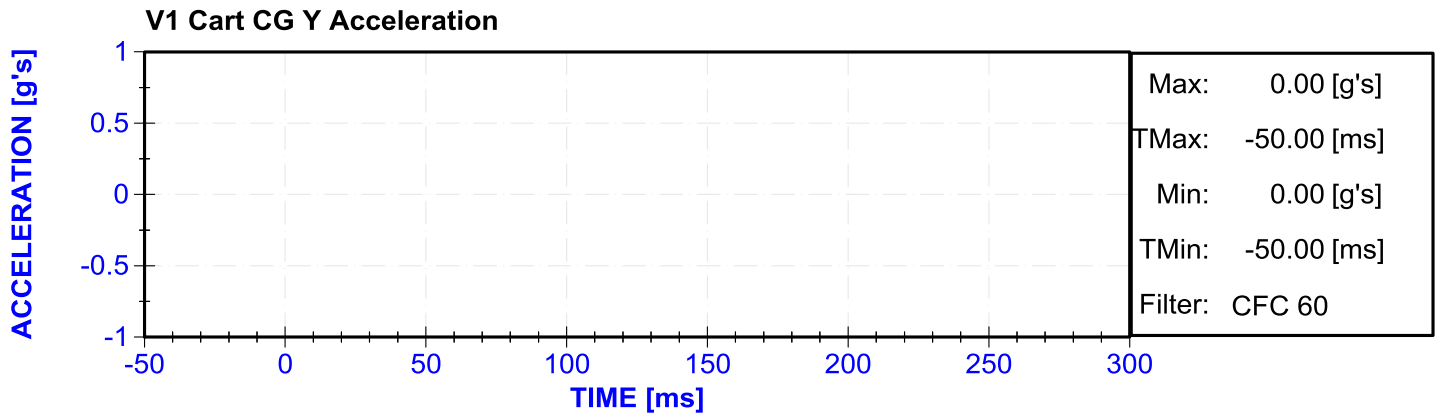
V1 Passenger Anchor Pretensioner Monitor

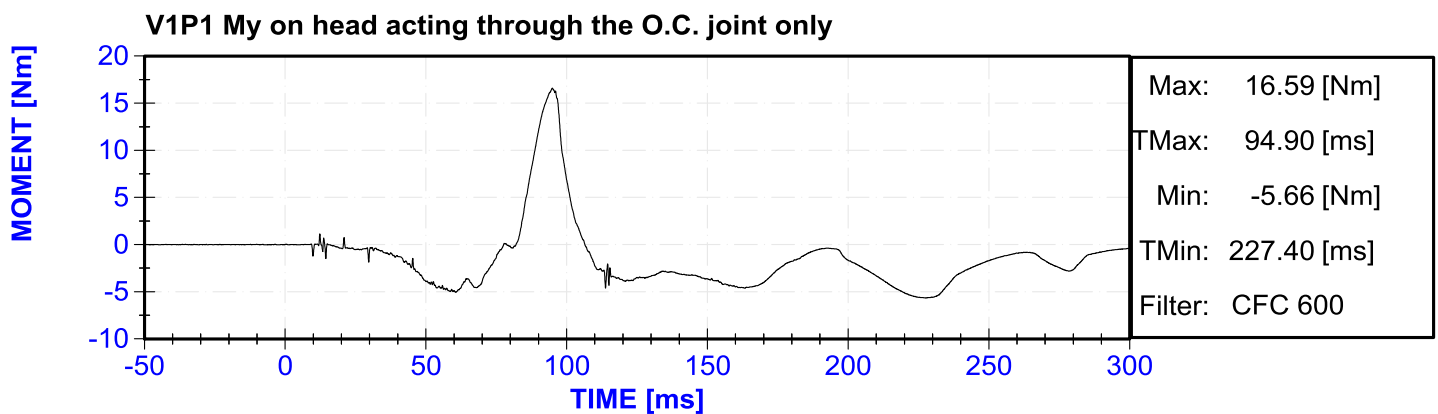
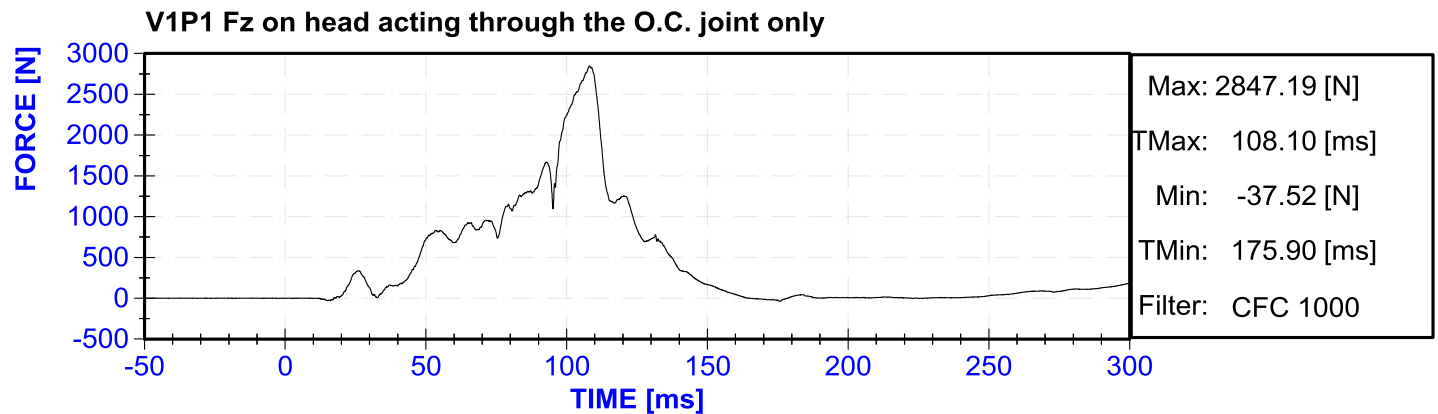
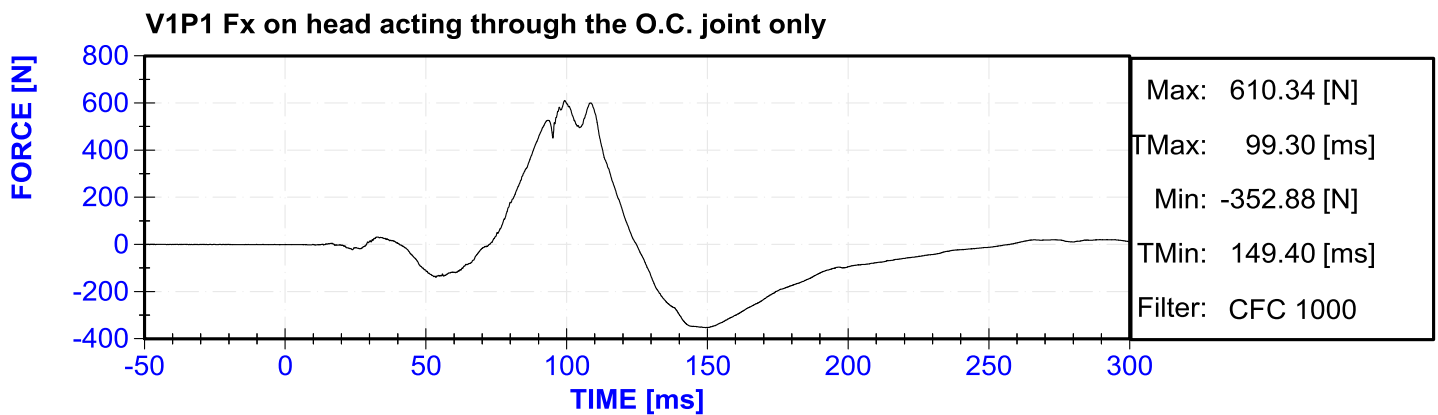
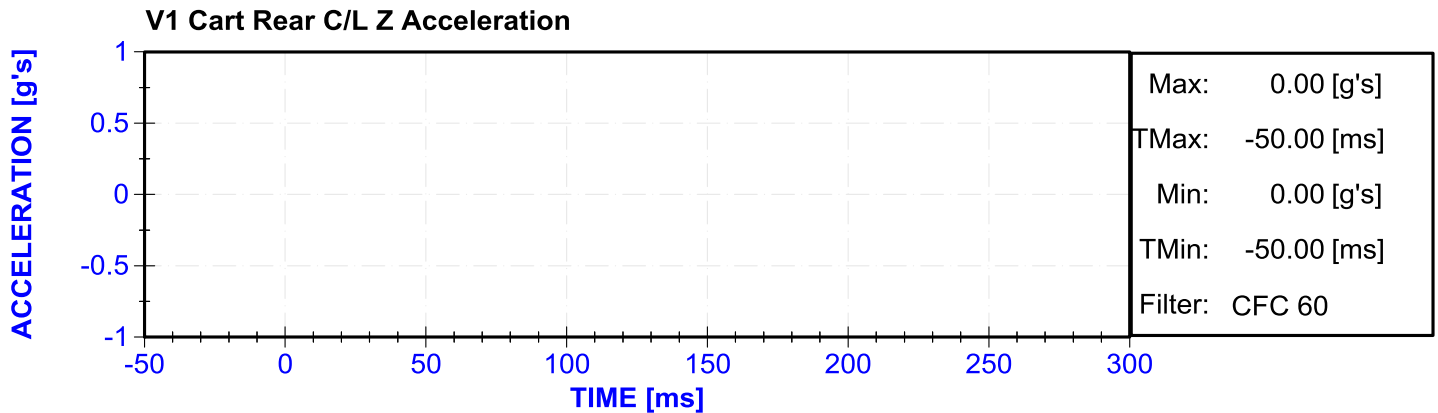
Time to fire: 13.90 ms



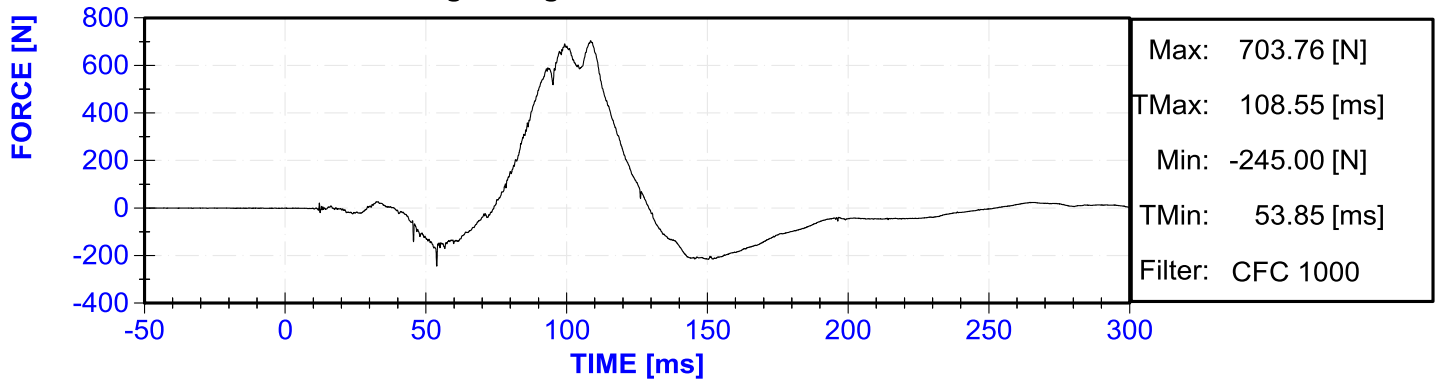
V1 Cart CG X Acceleration



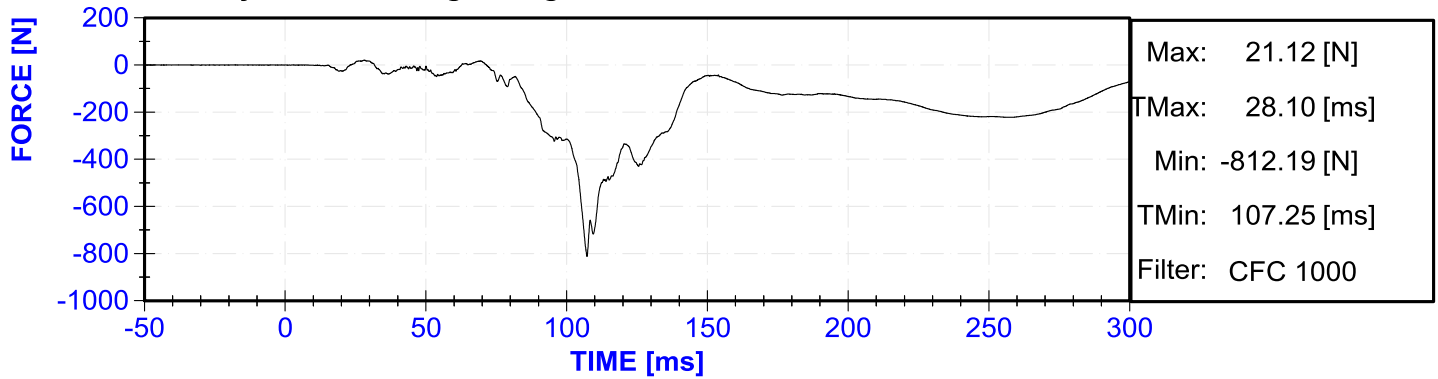




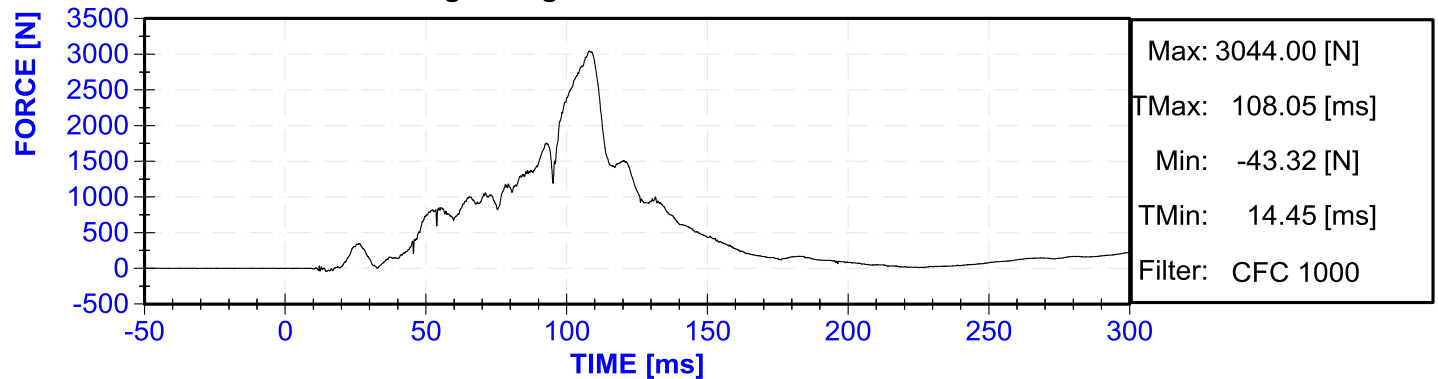
V1P1 Fx on head acting through the total neck section



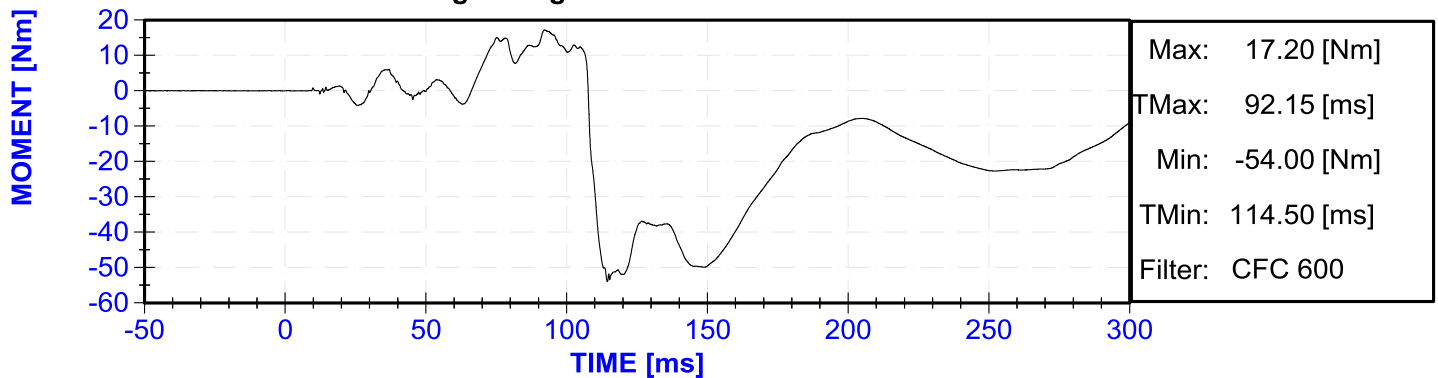
V1P1 Fy on head acting through the total neck section



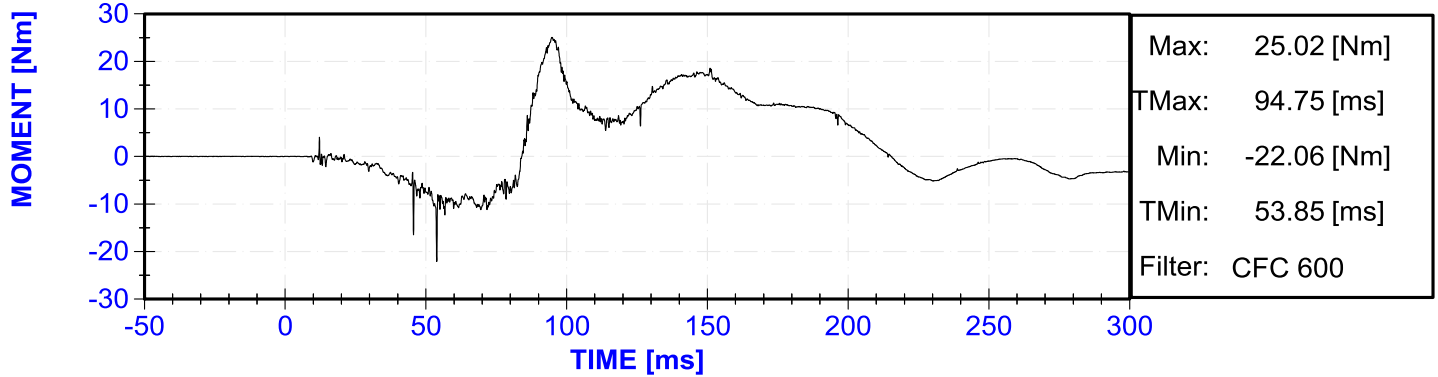
V1P1 Fz on head acting through the total neck section



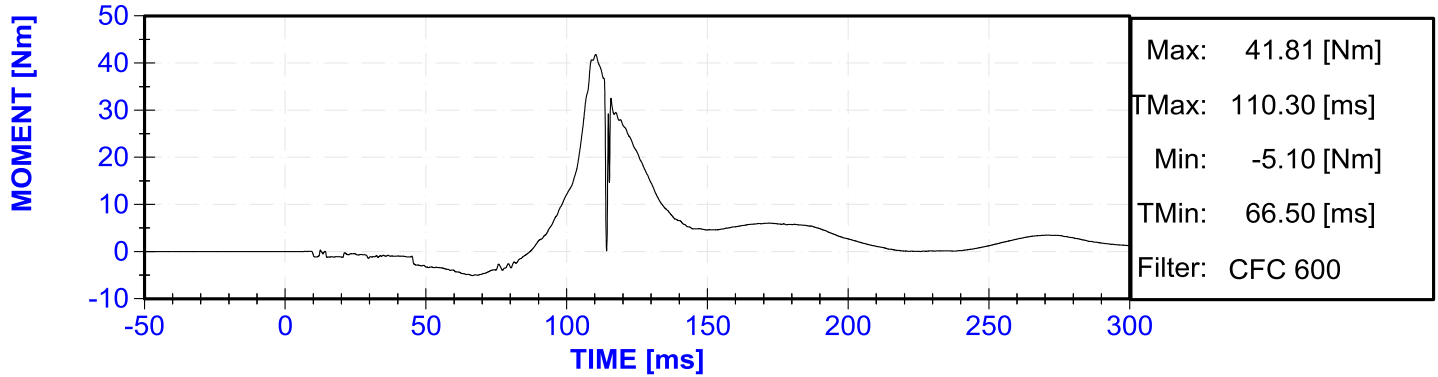
V1P1 Mx on head acting through the total neck section



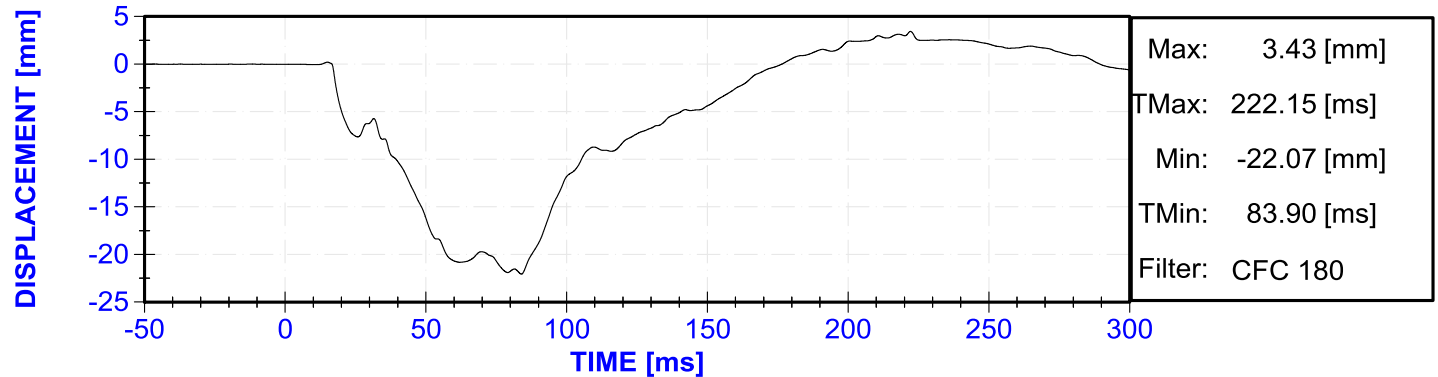
V1P1 My on head acting through the total neck section



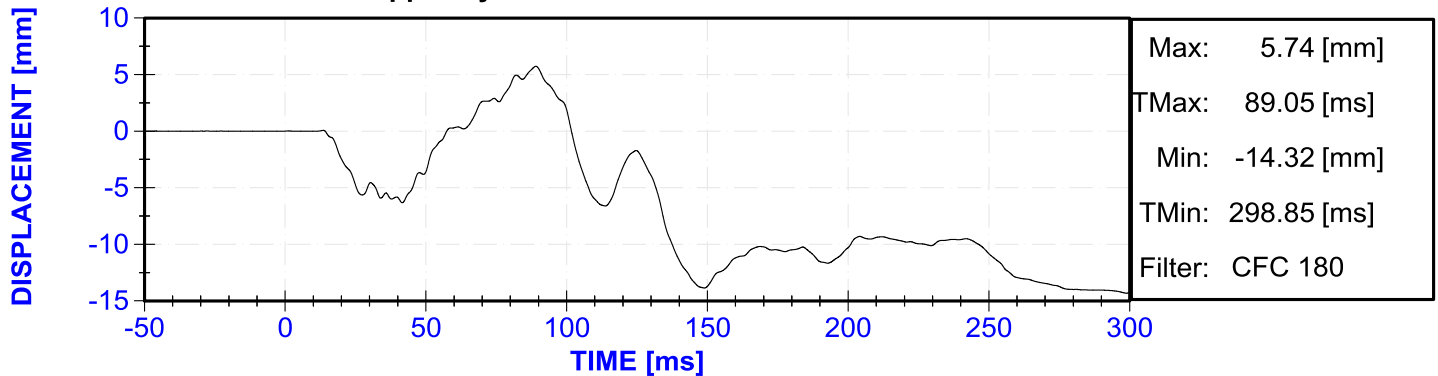
V1P1 Mz on head acting through the total neck section

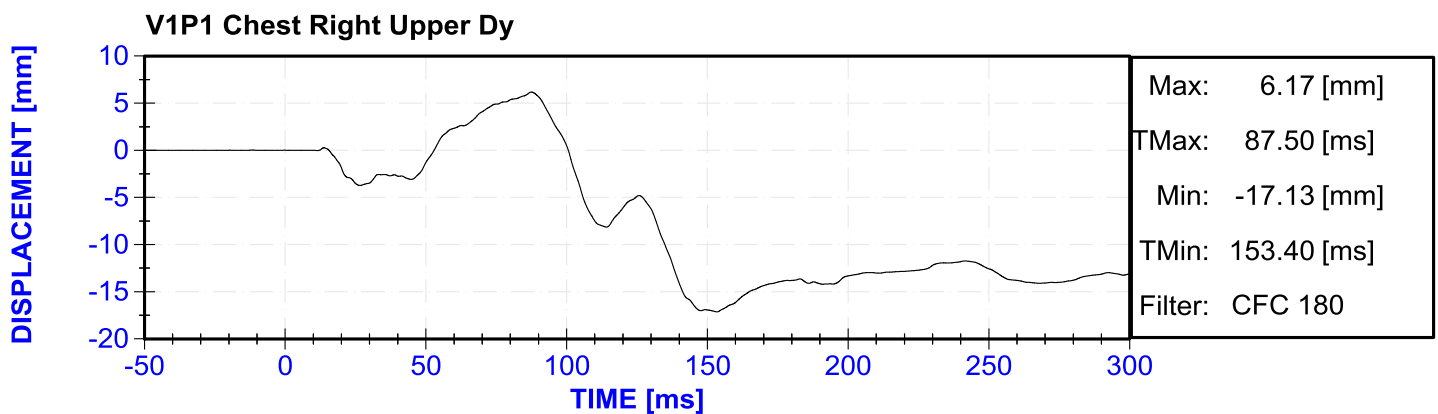
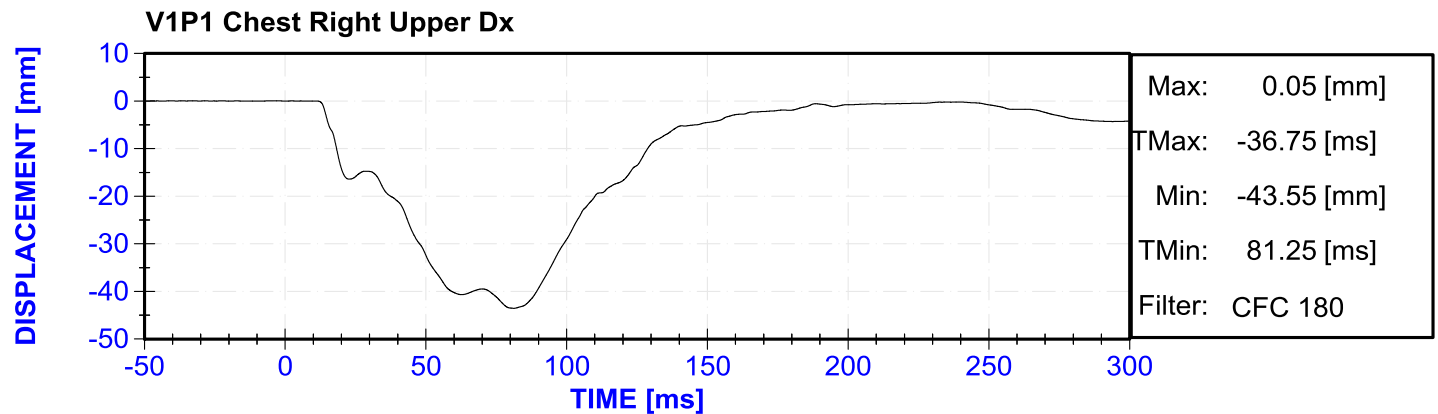
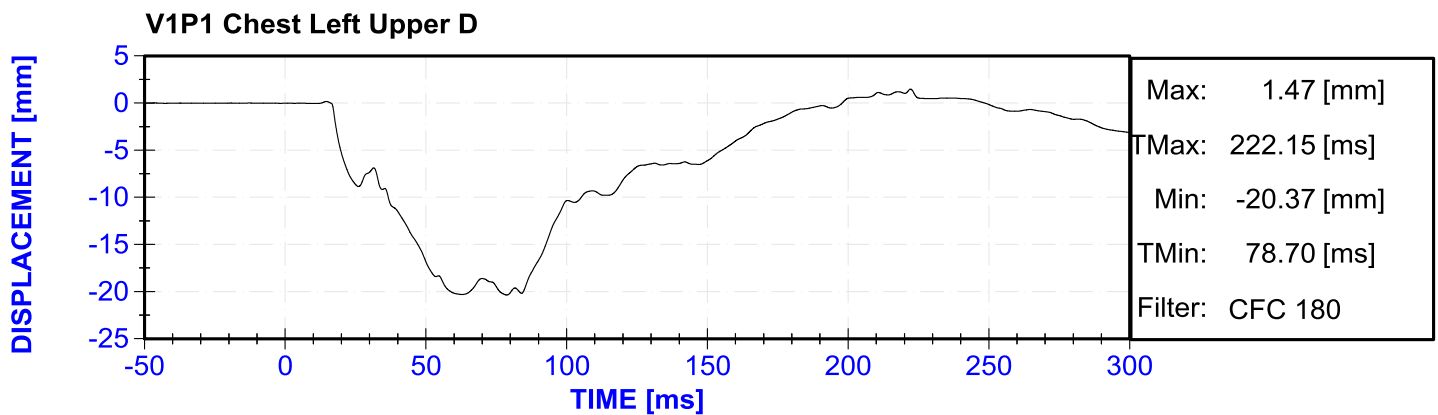
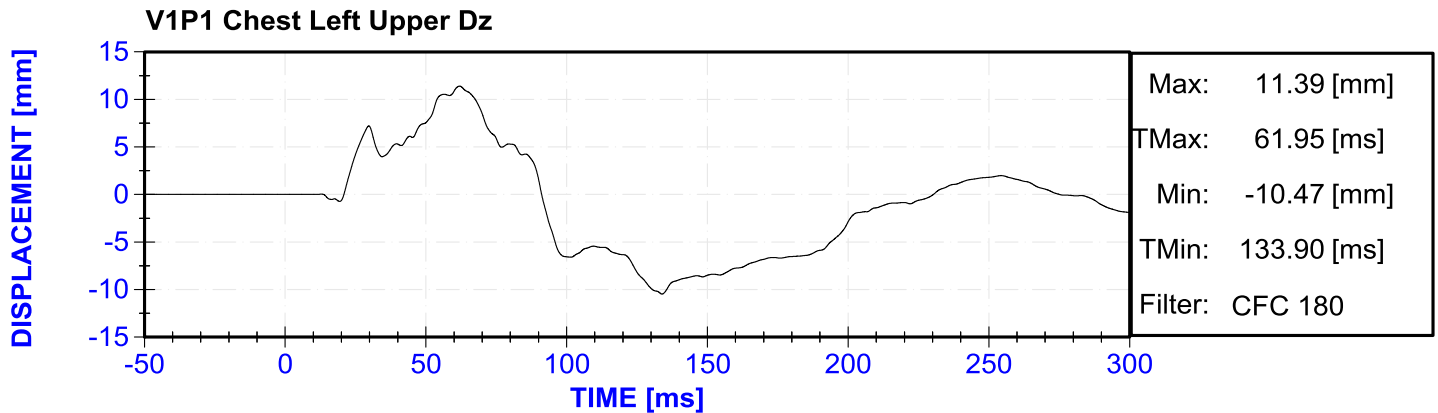


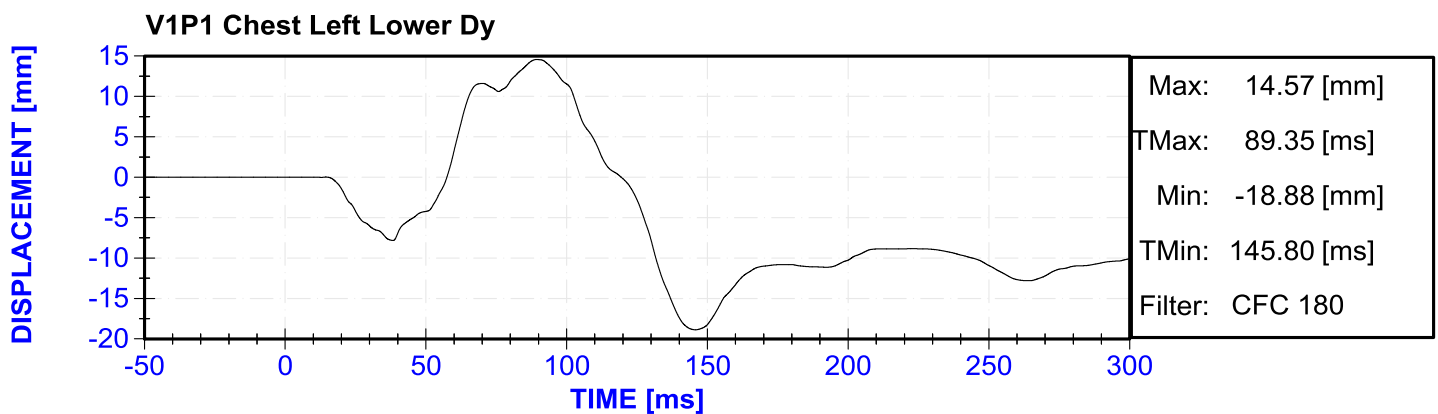
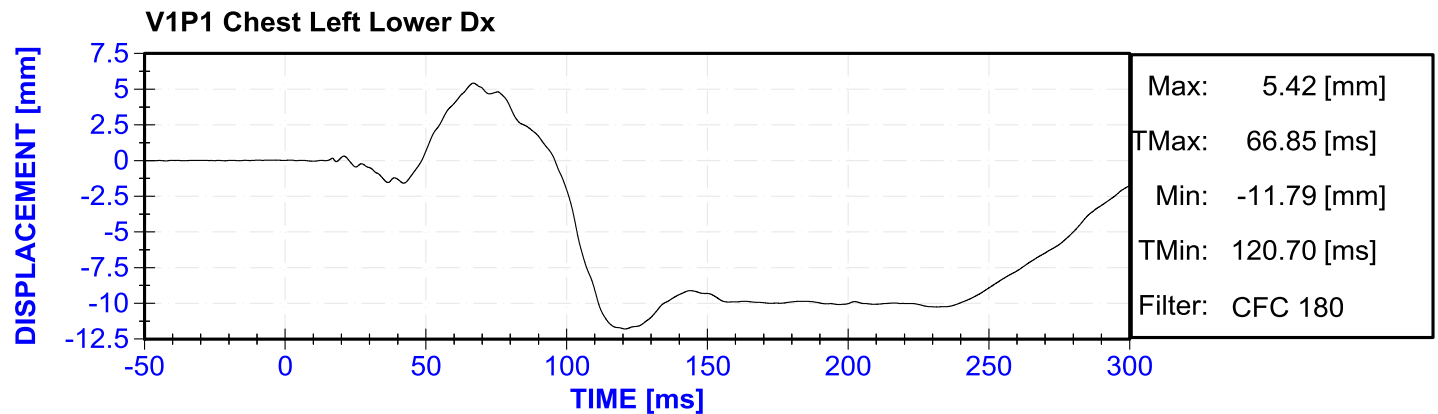
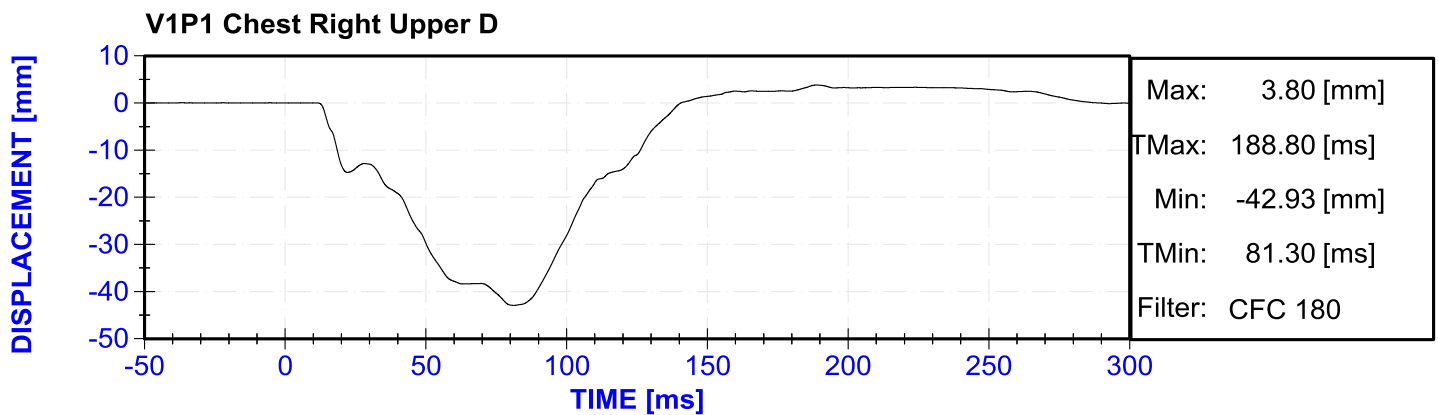
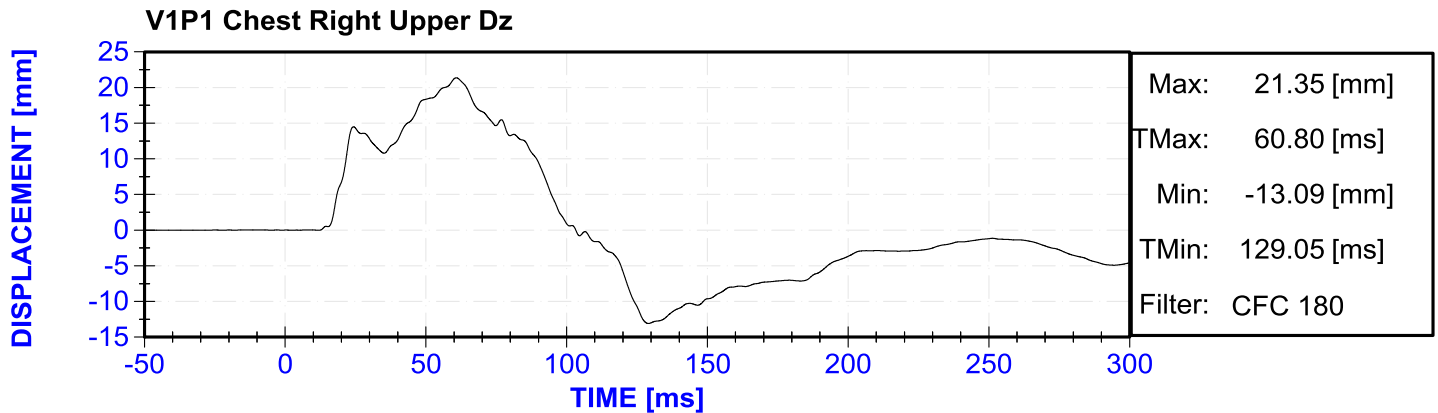
V1P1 Chest Left Upper Dx

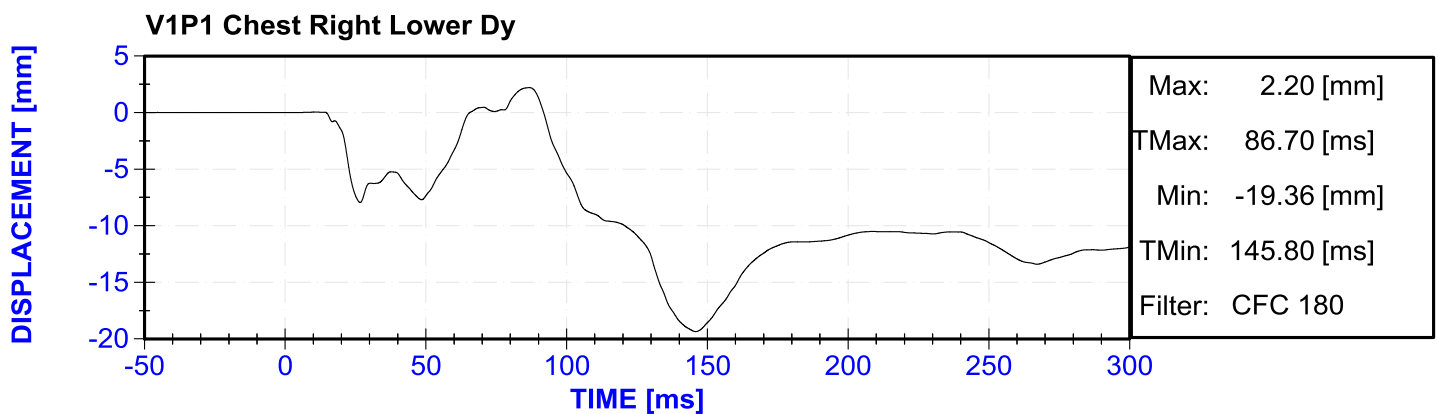
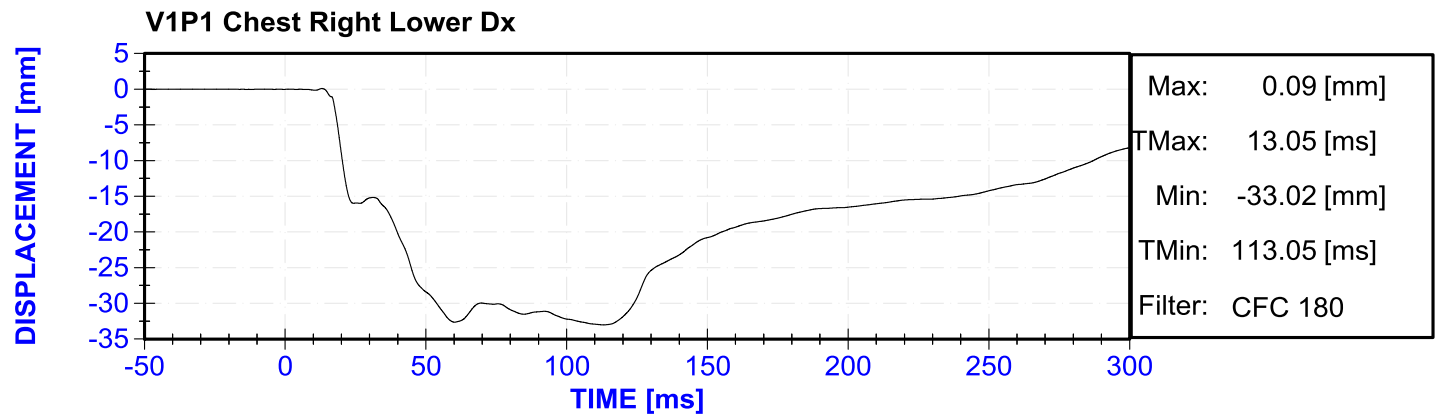
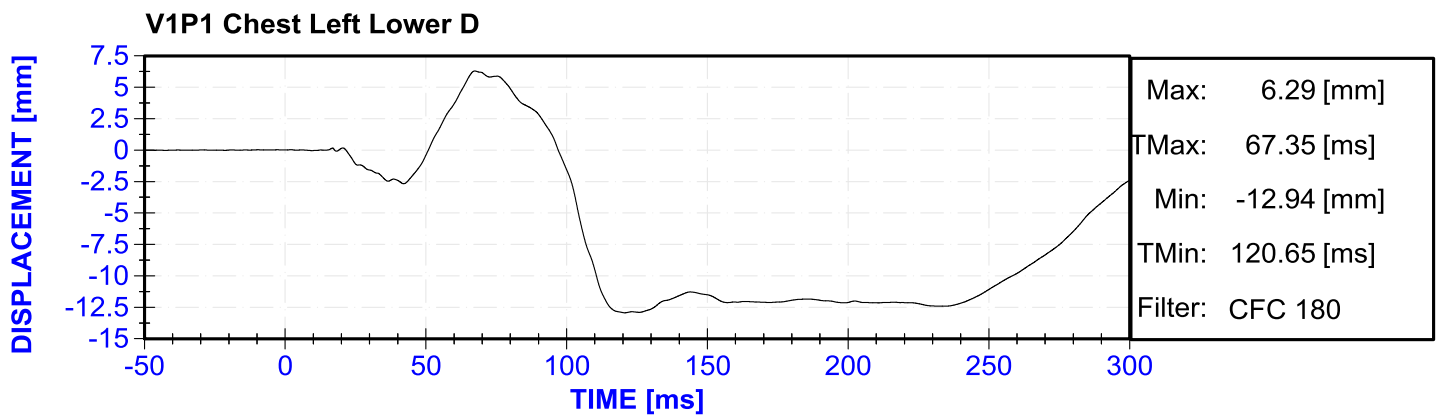
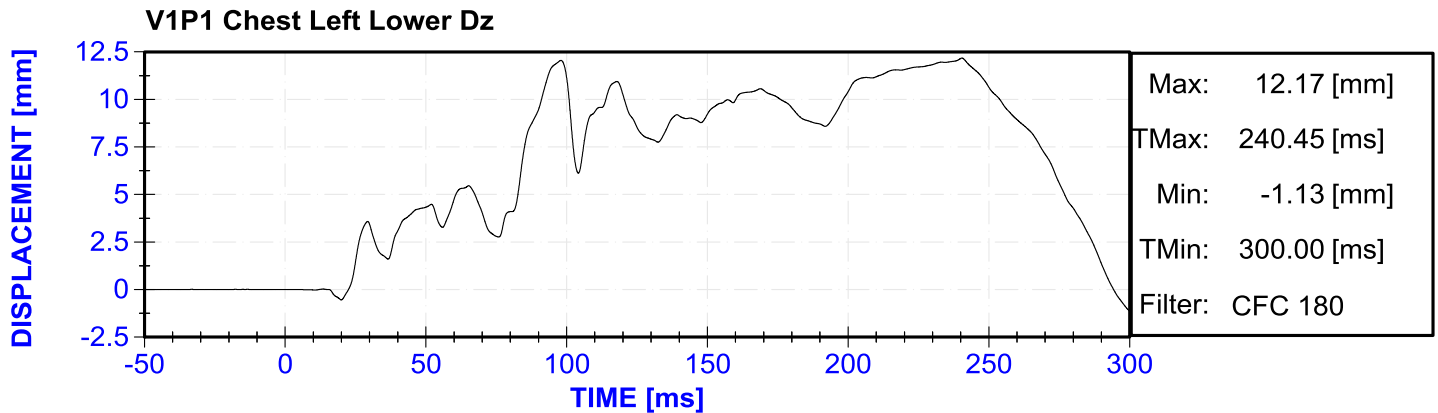


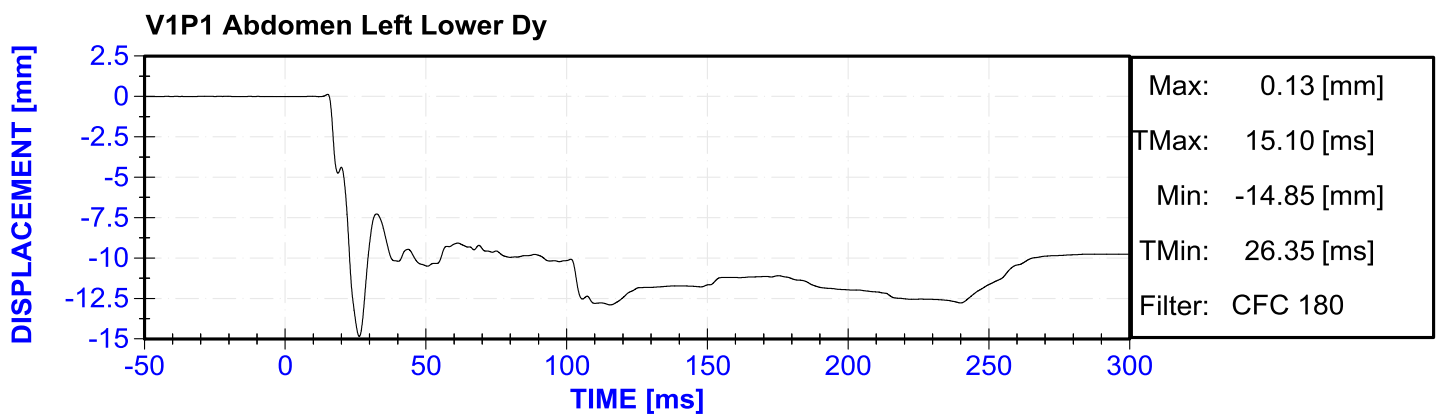
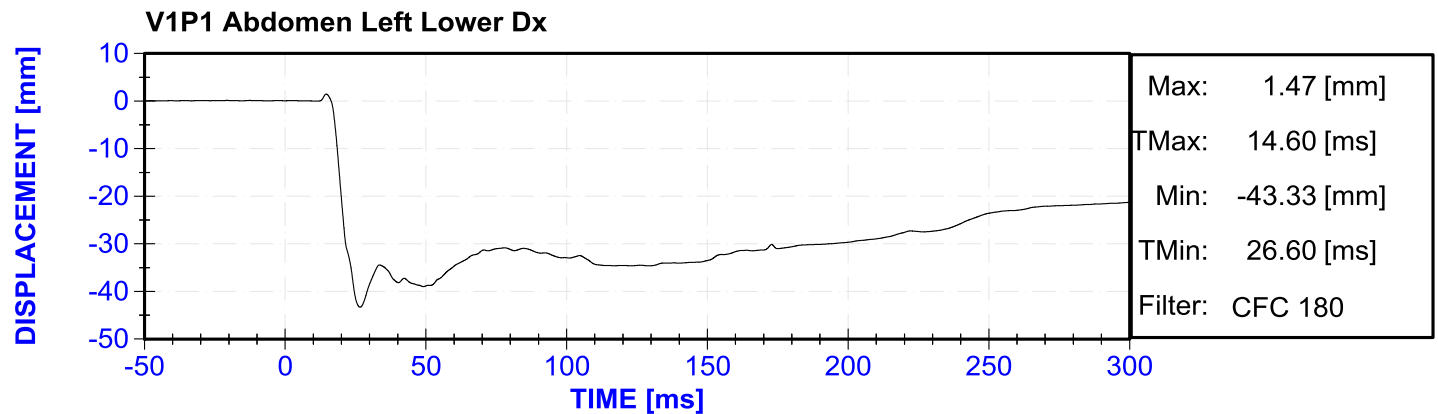
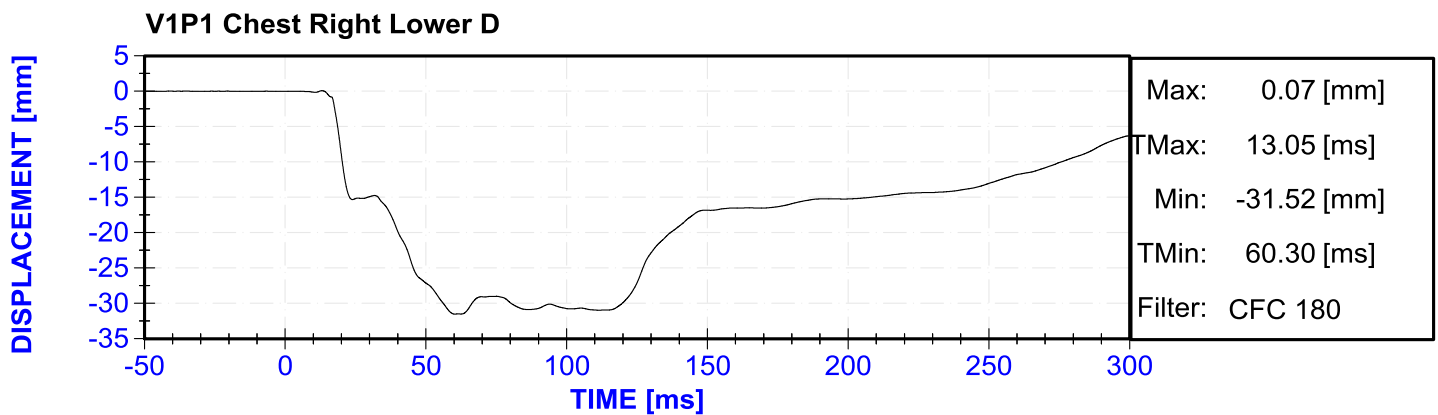
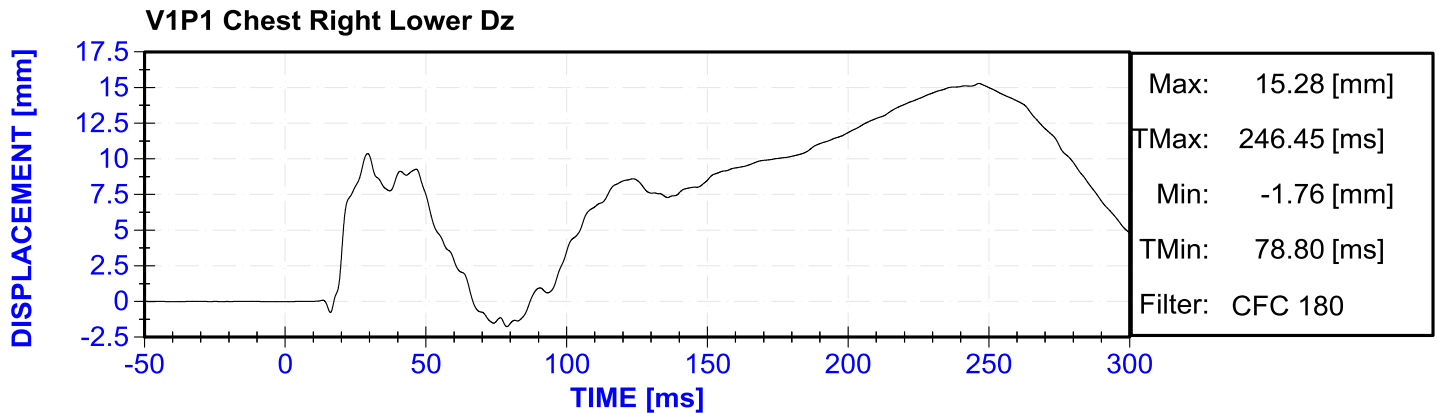
V1P1 Chest Left Upper Dy

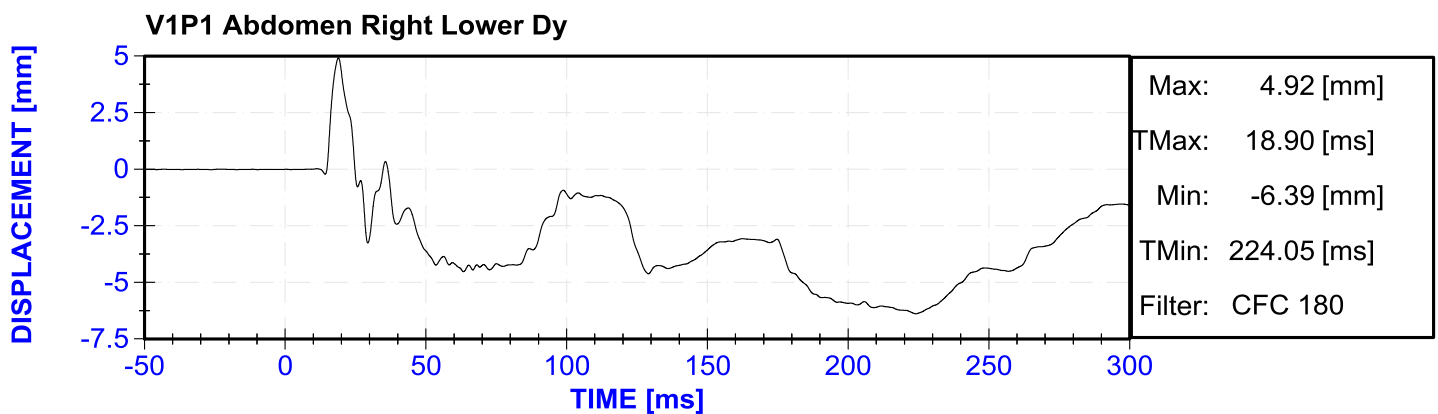
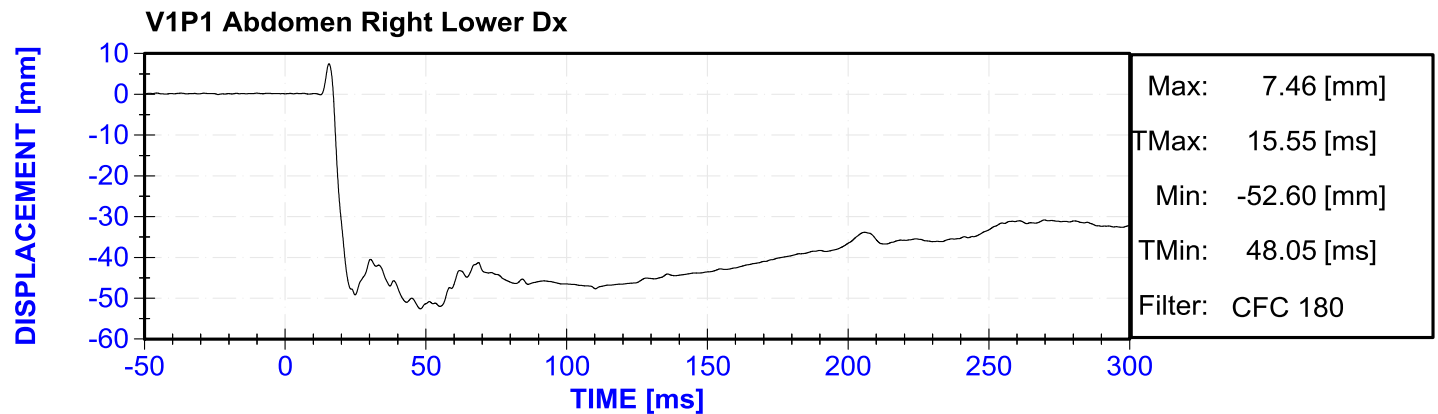
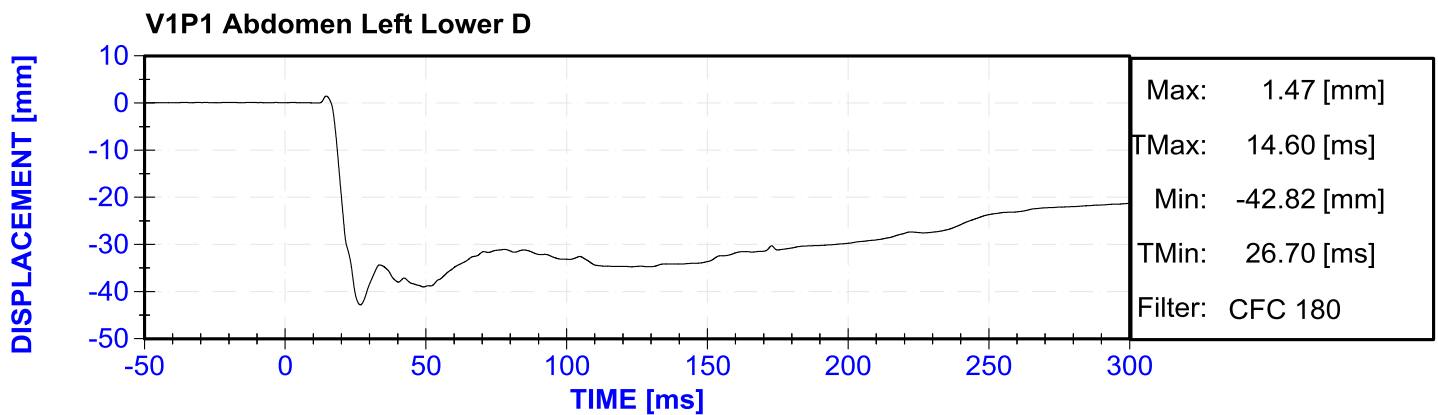
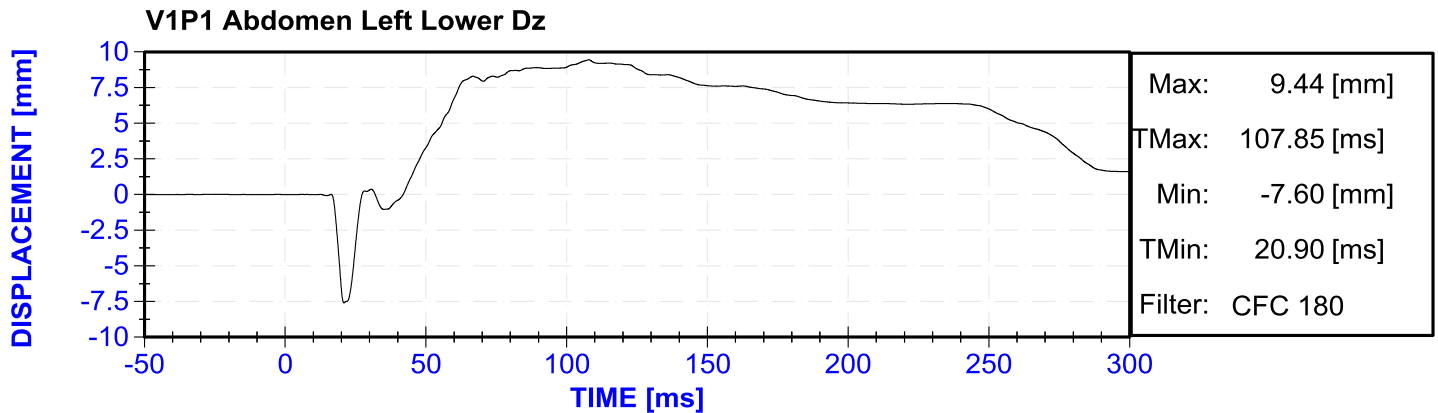


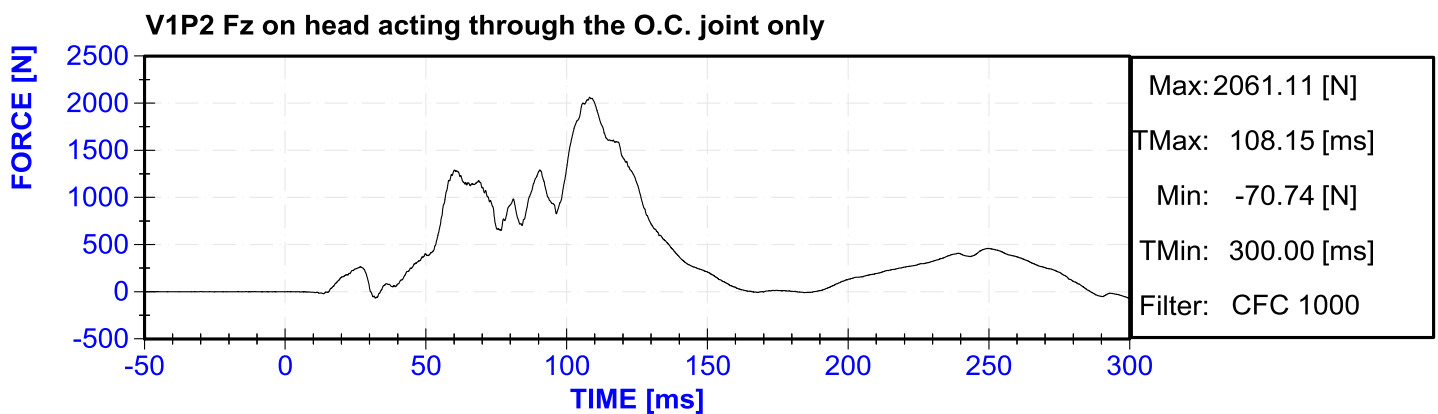
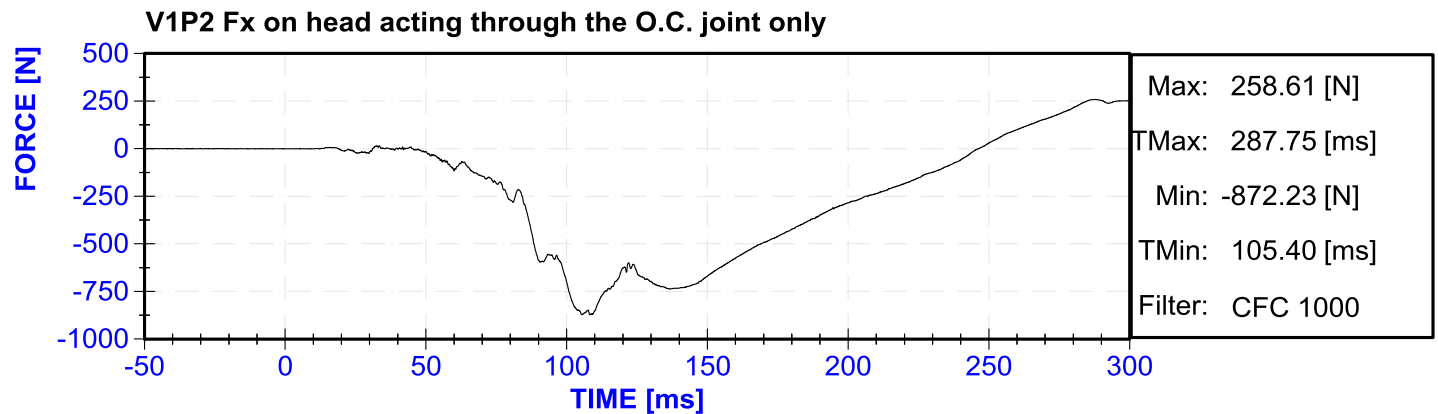
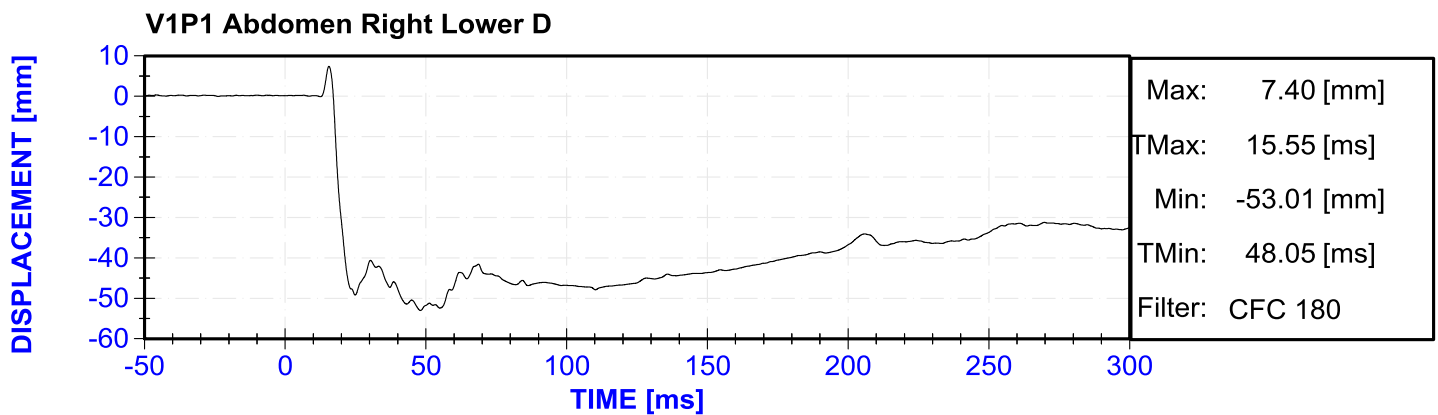
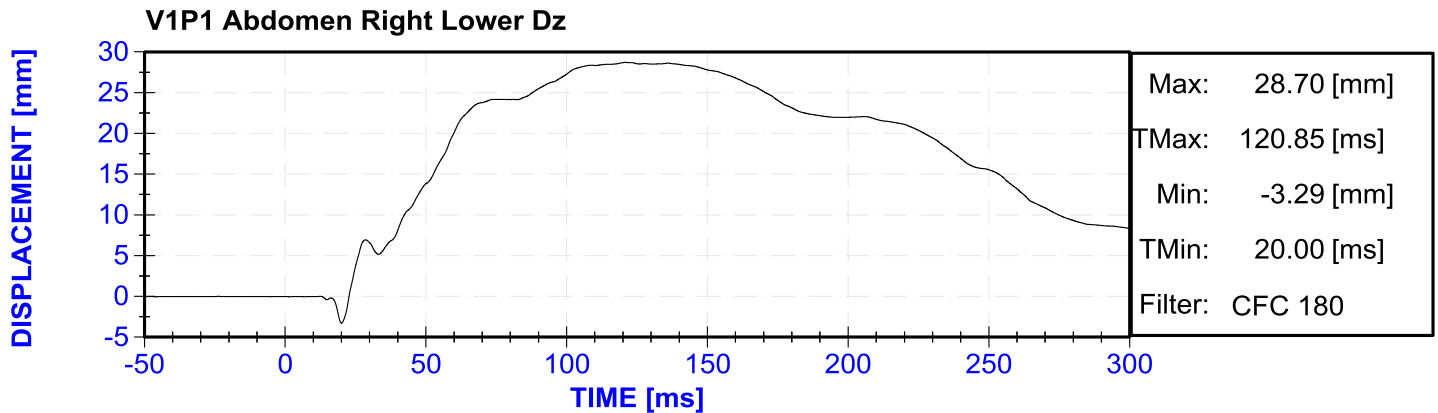


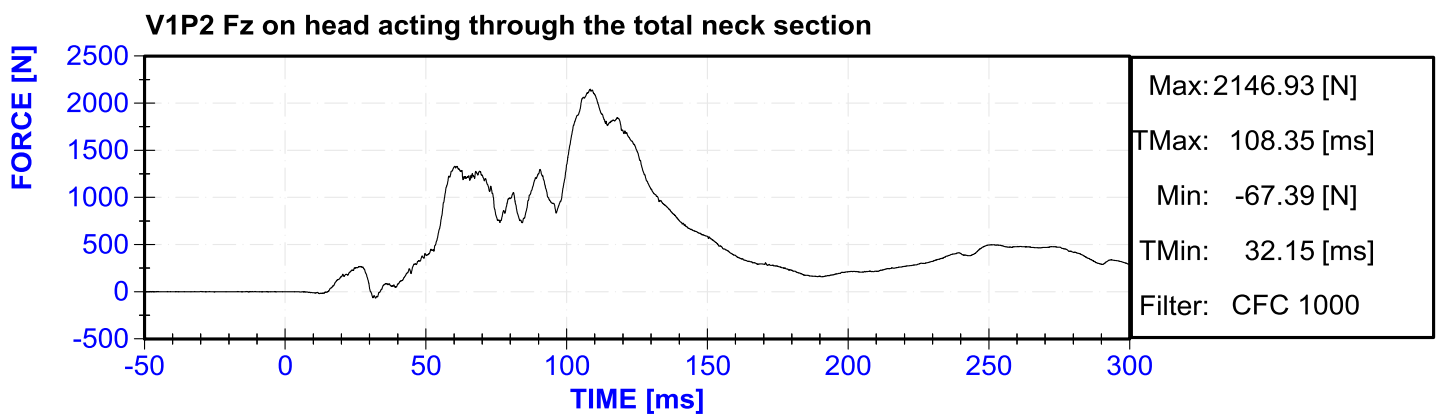
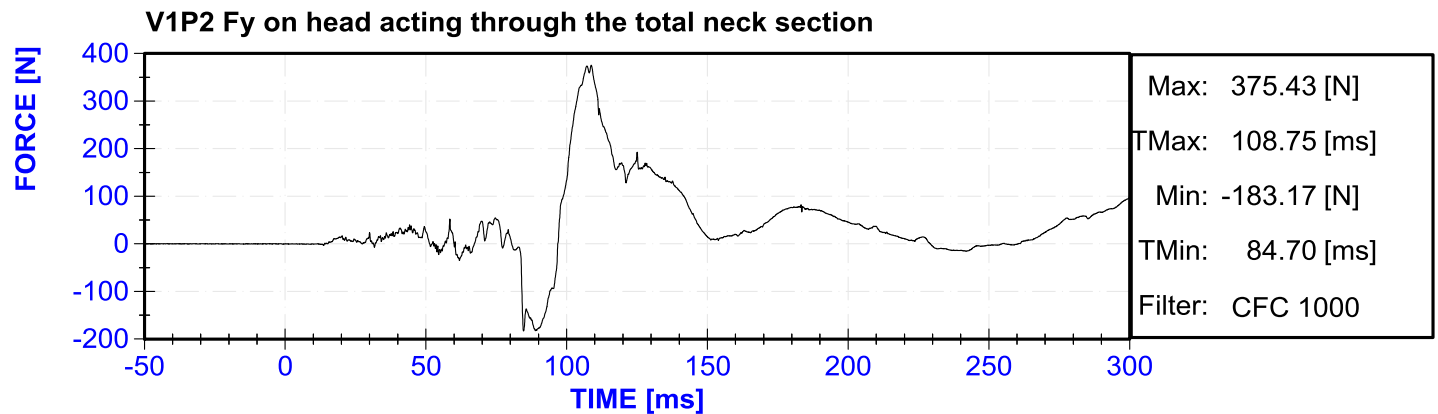
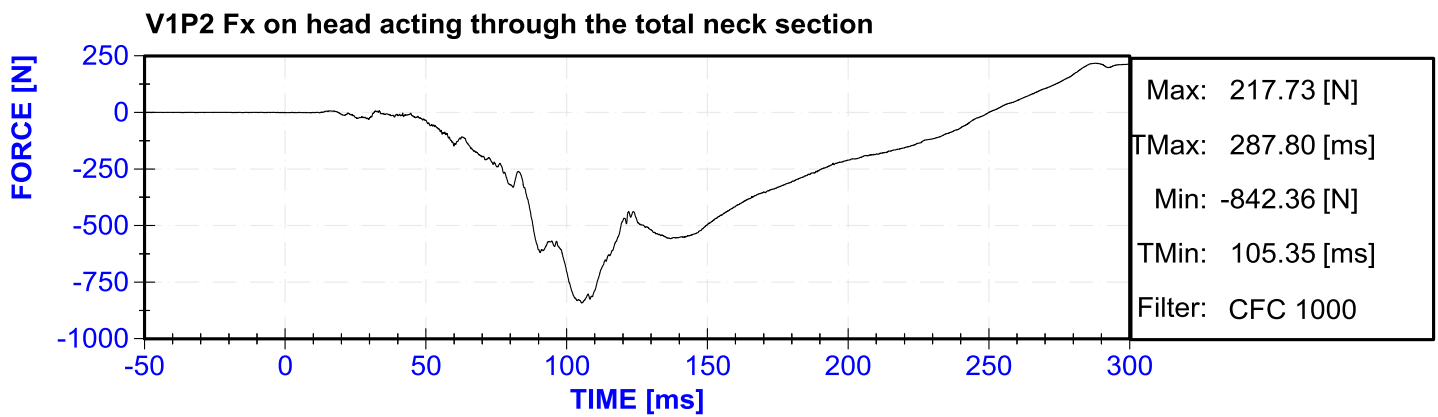
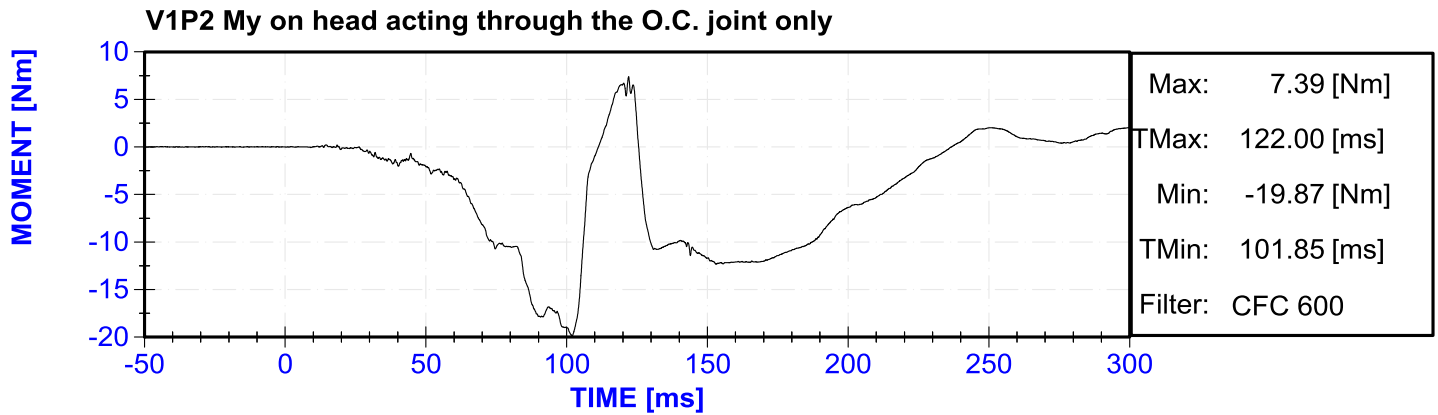




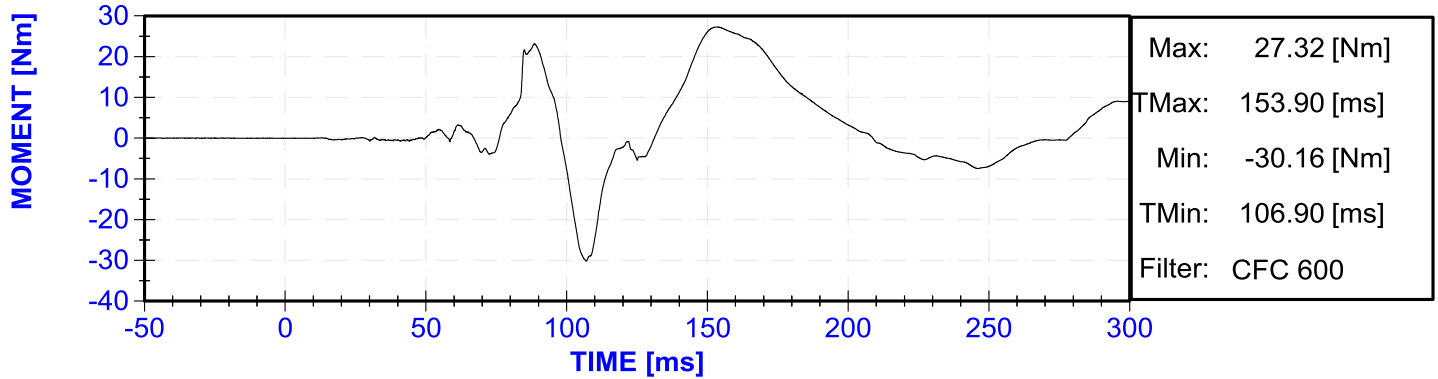




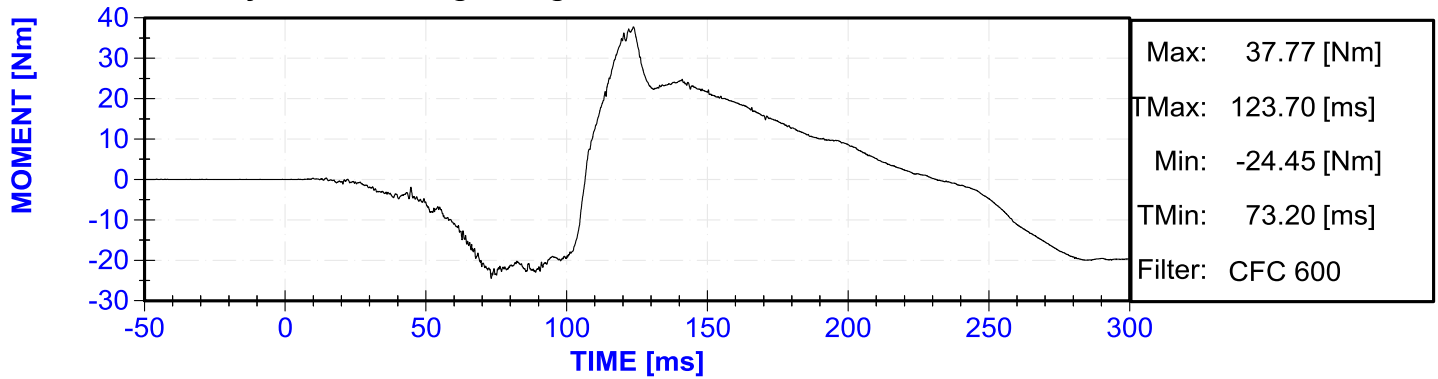




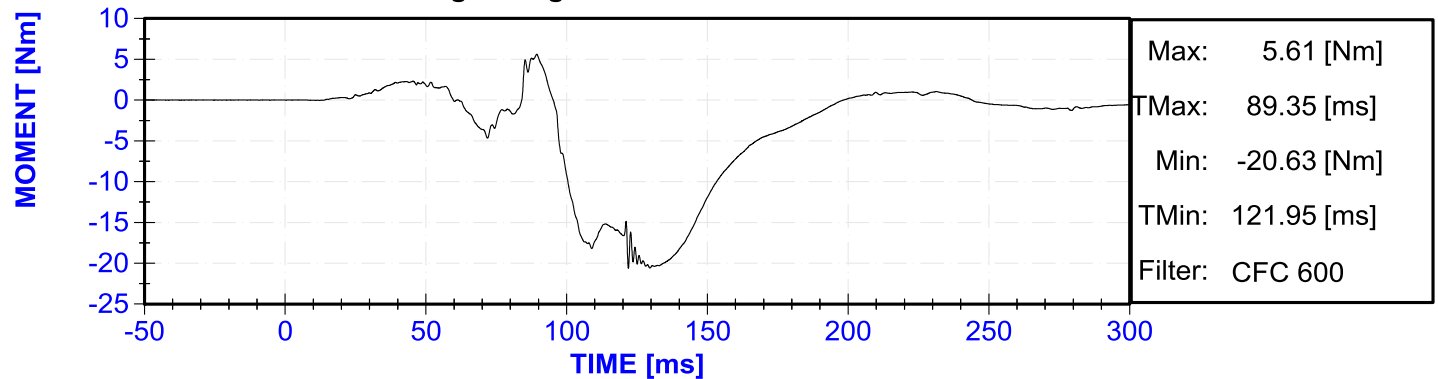
V1P2 Mx on head acting through the total neck section



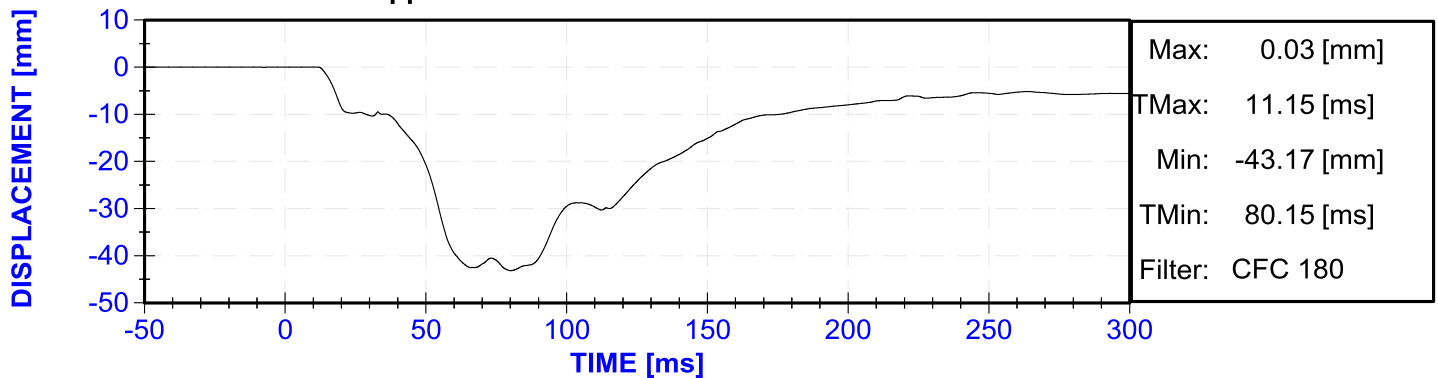
V1P2 My on head acting through the total neck section

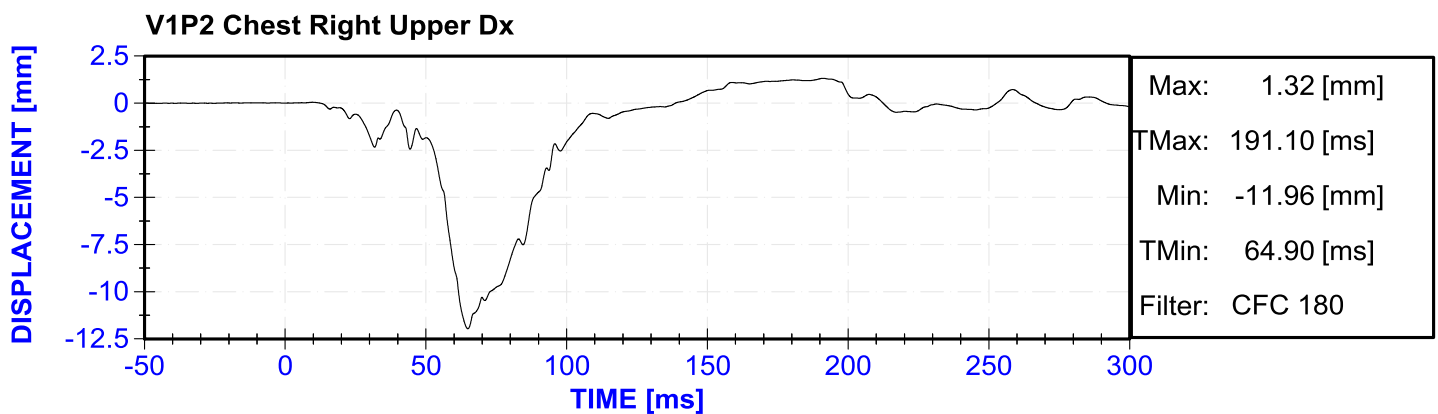
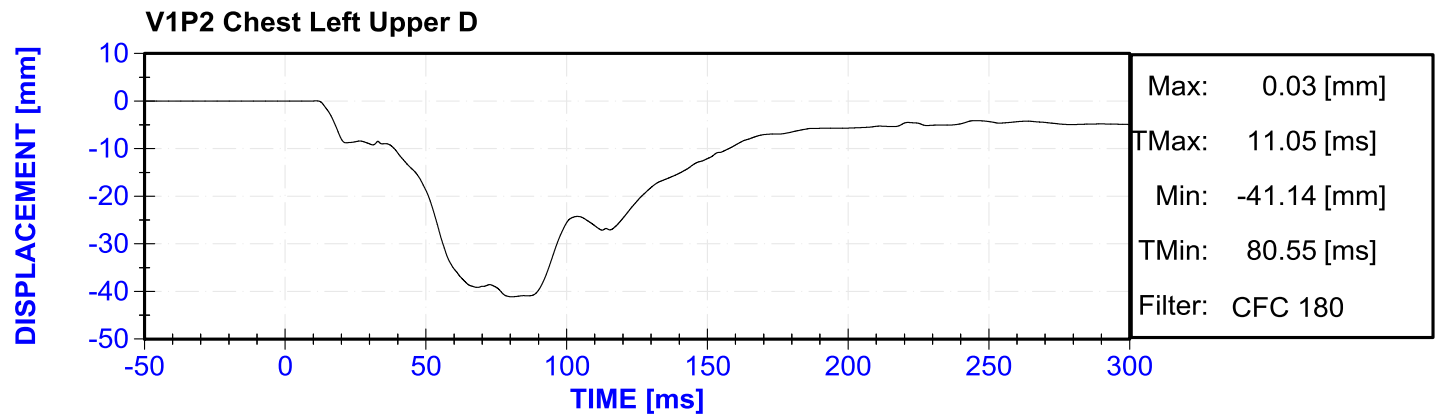
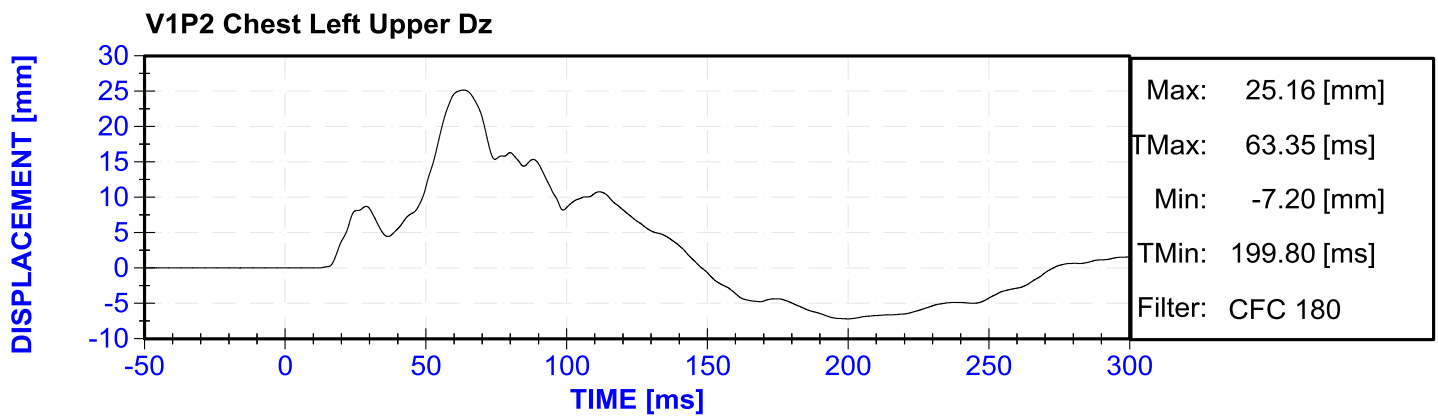
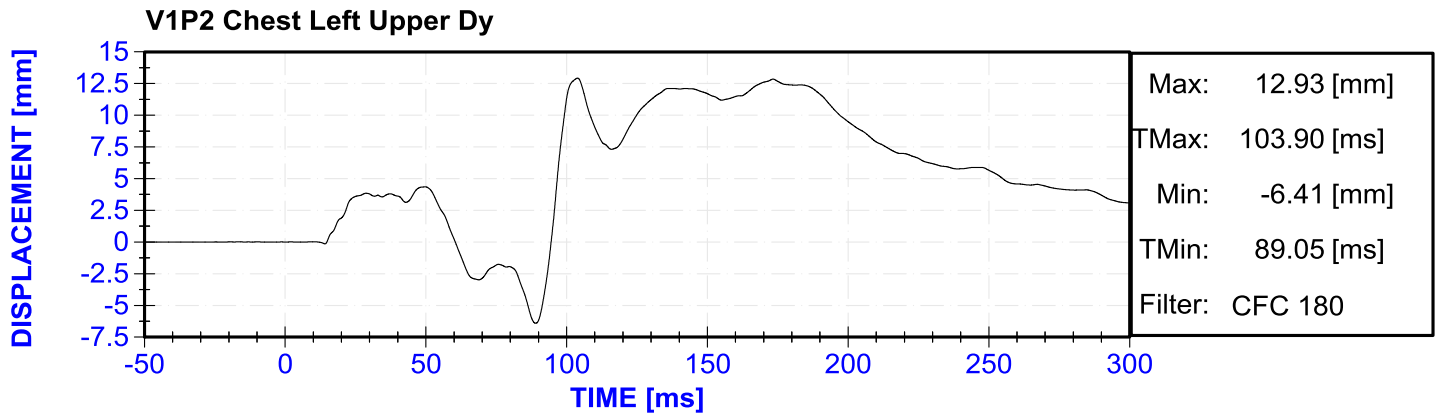


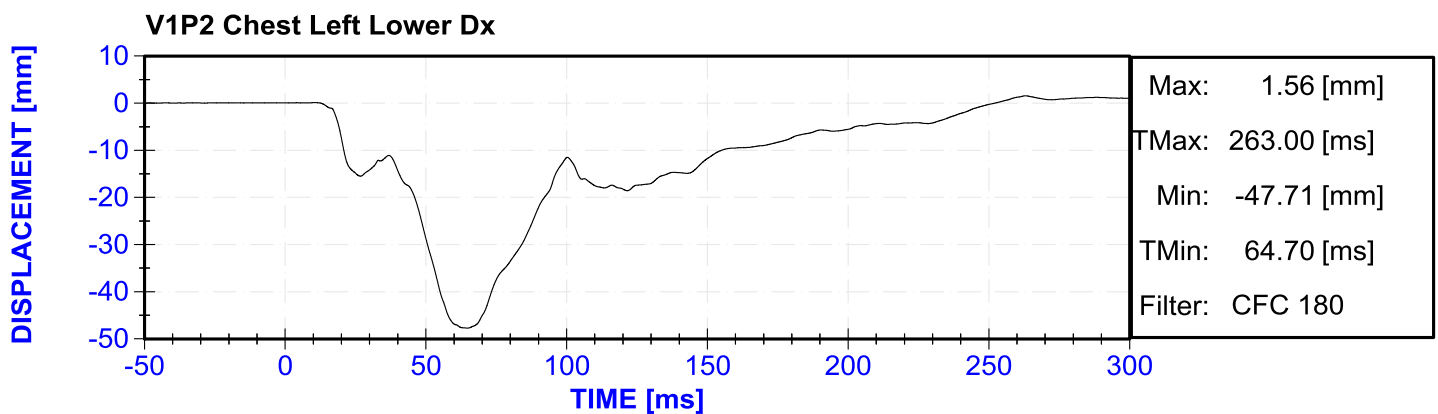
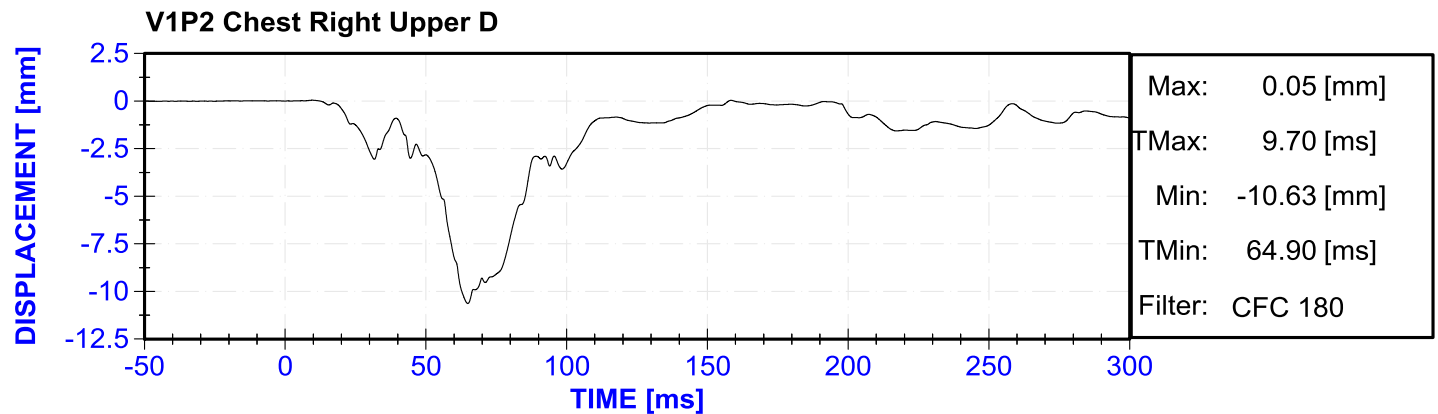
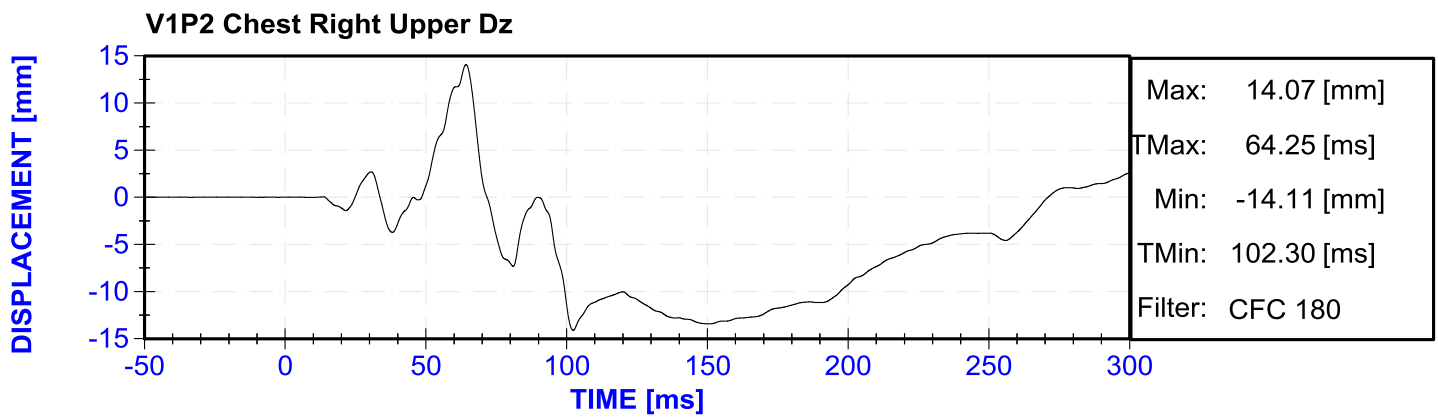
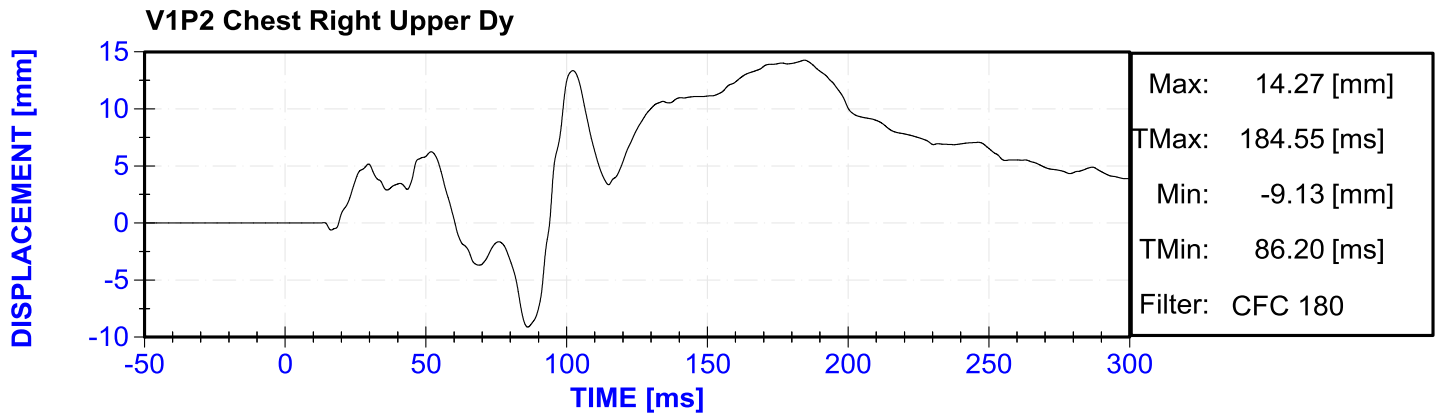
V1P2 Mz on head acting through the total neck section

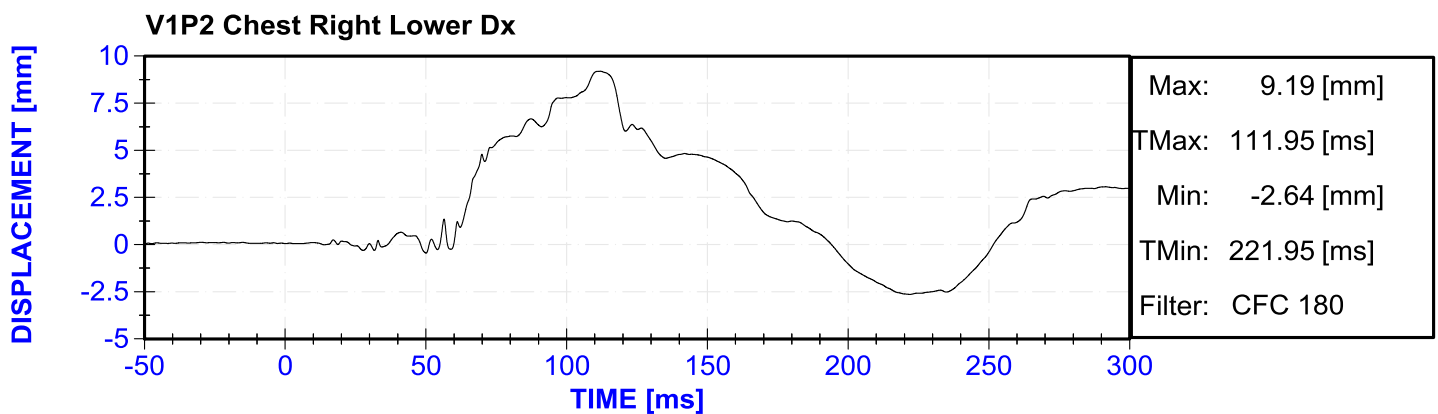
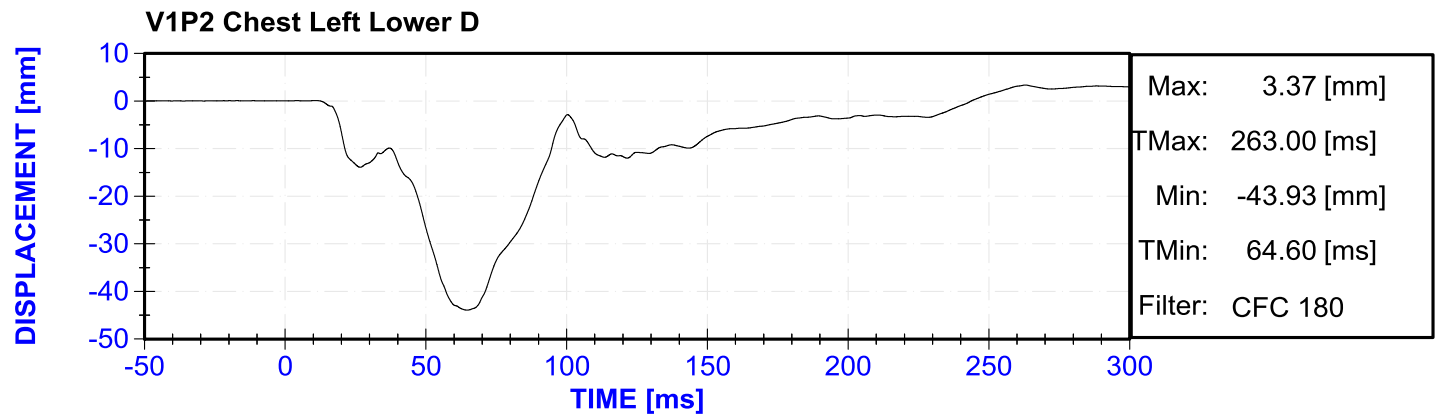
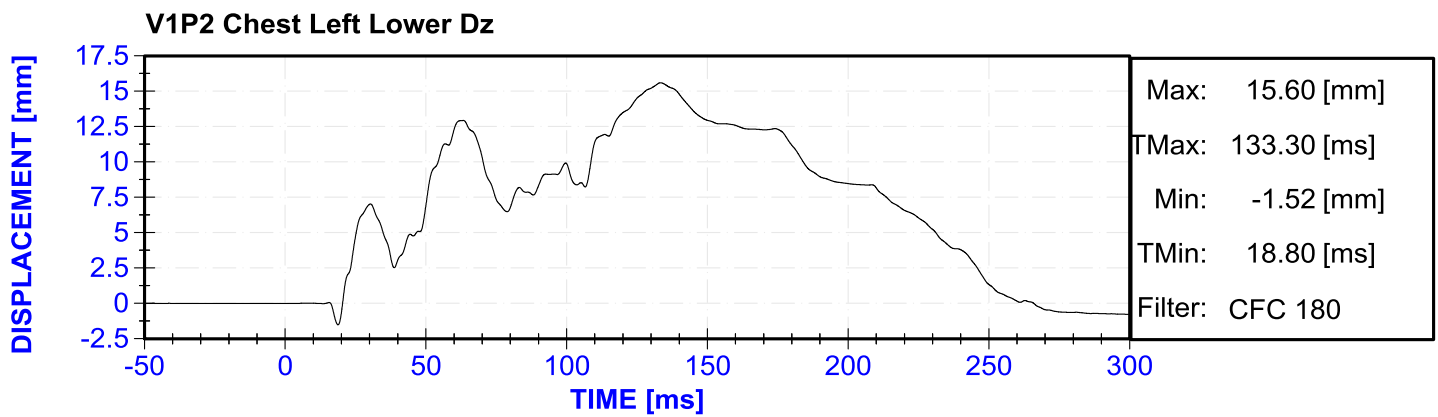
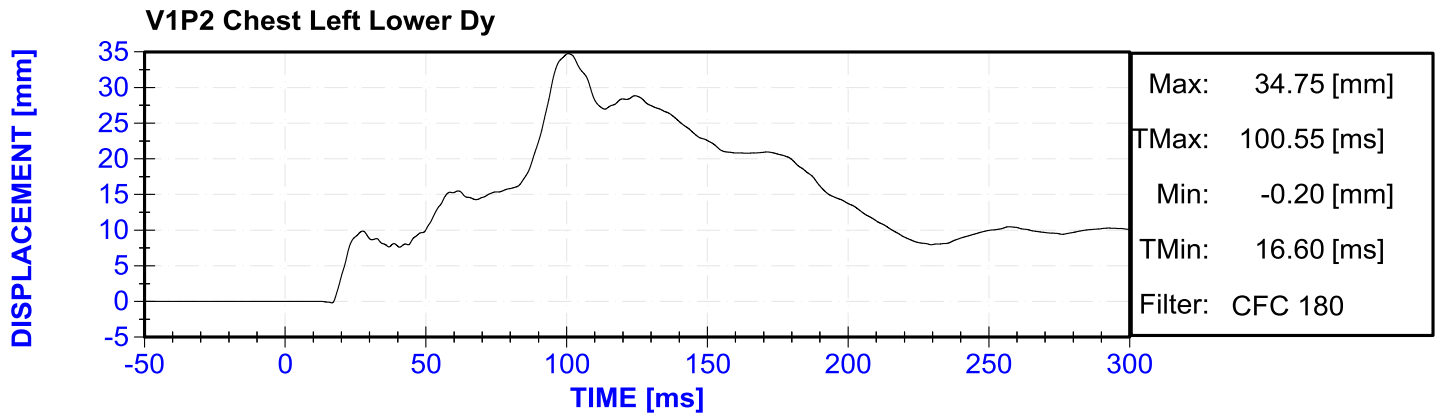


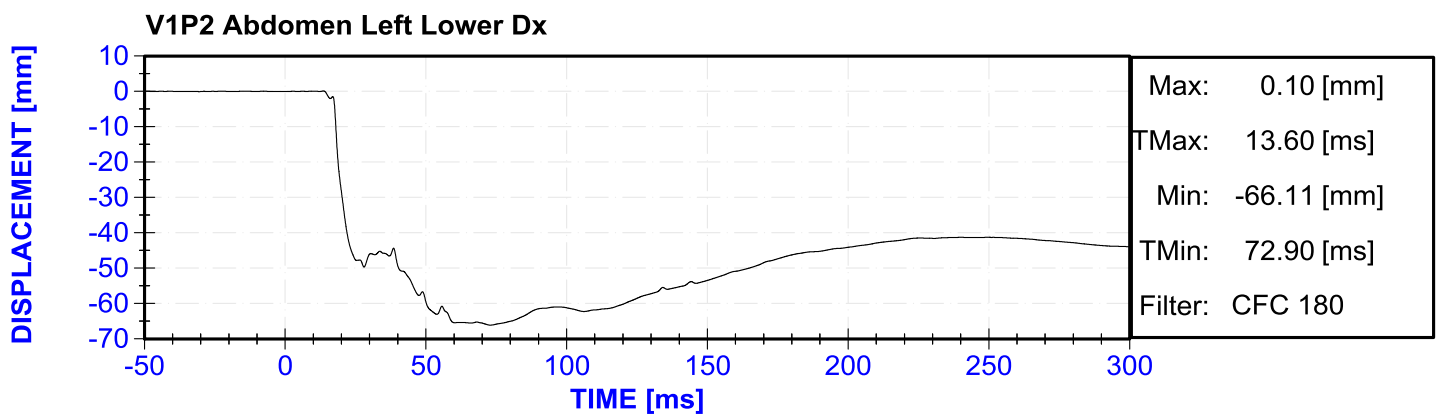
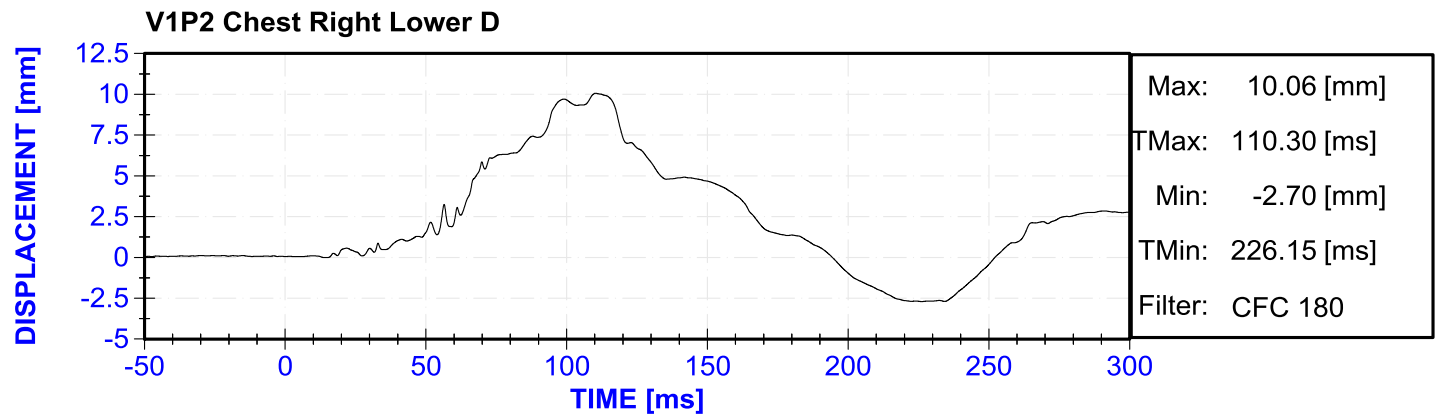
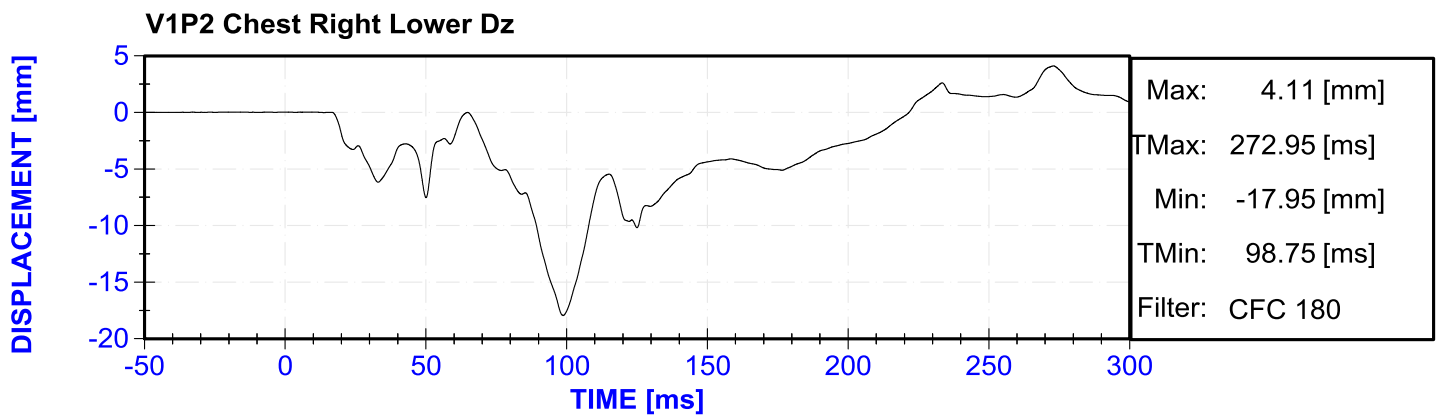
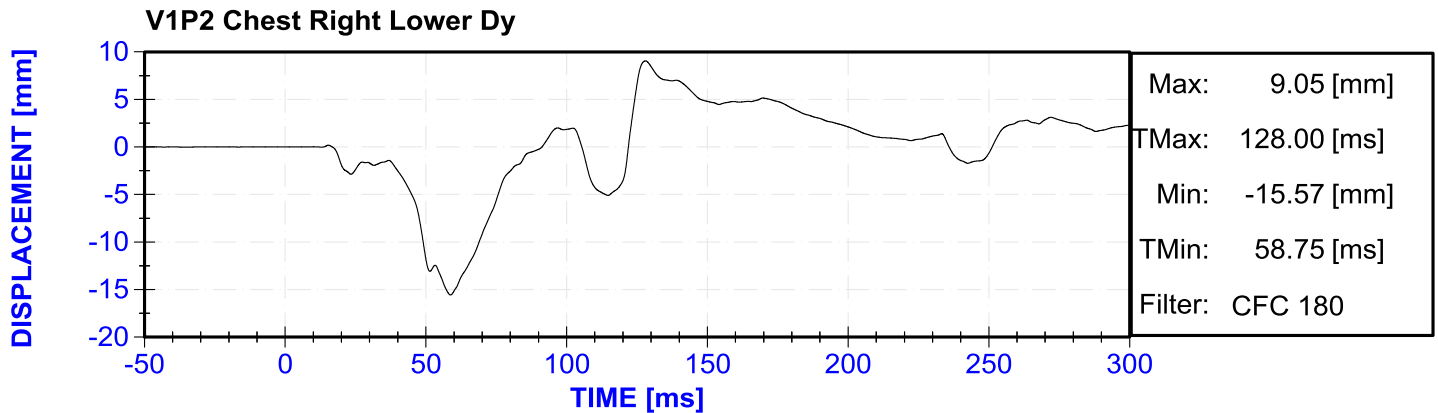
V1P2 Chest Left Upper Dx

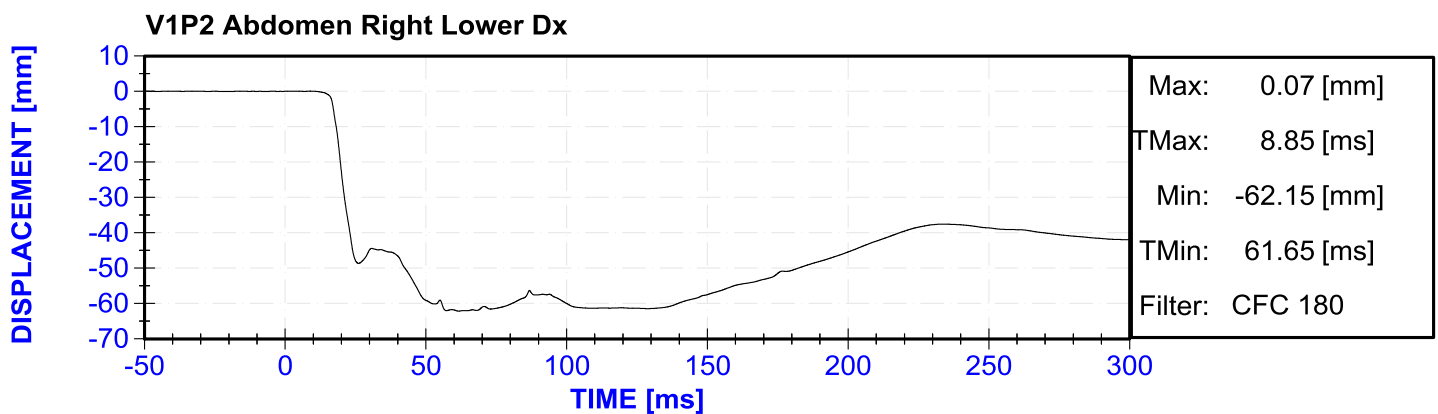
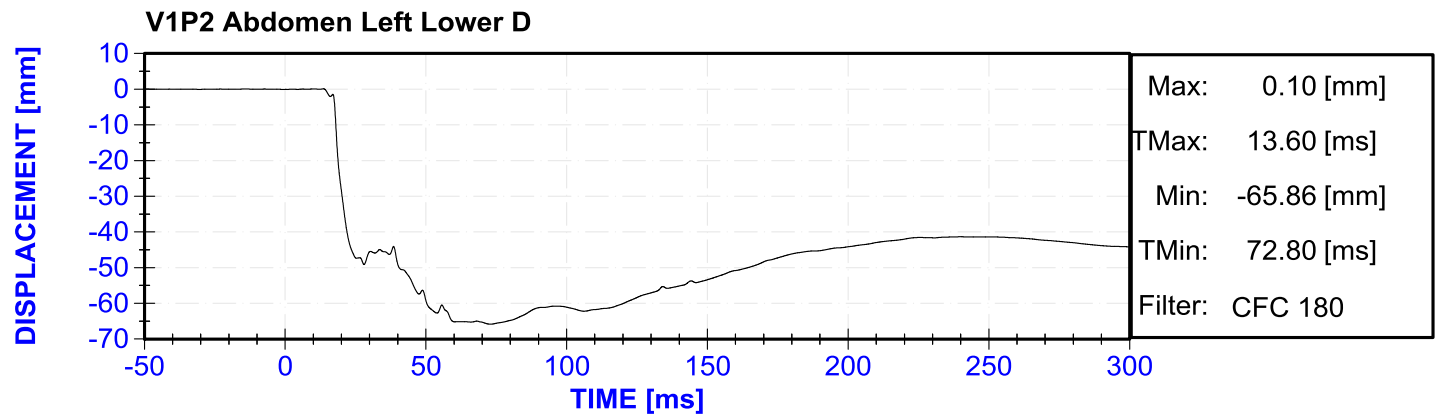
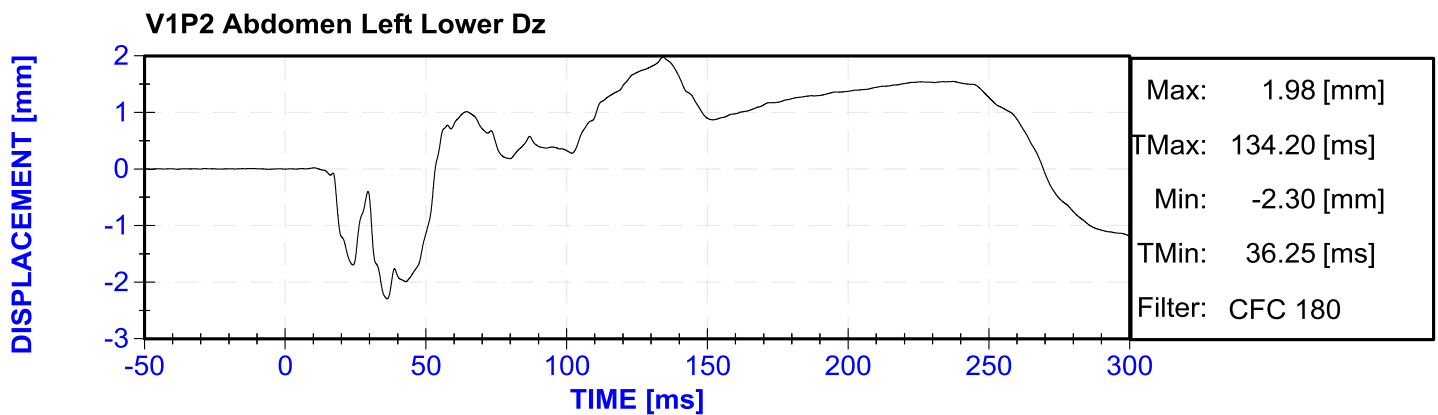
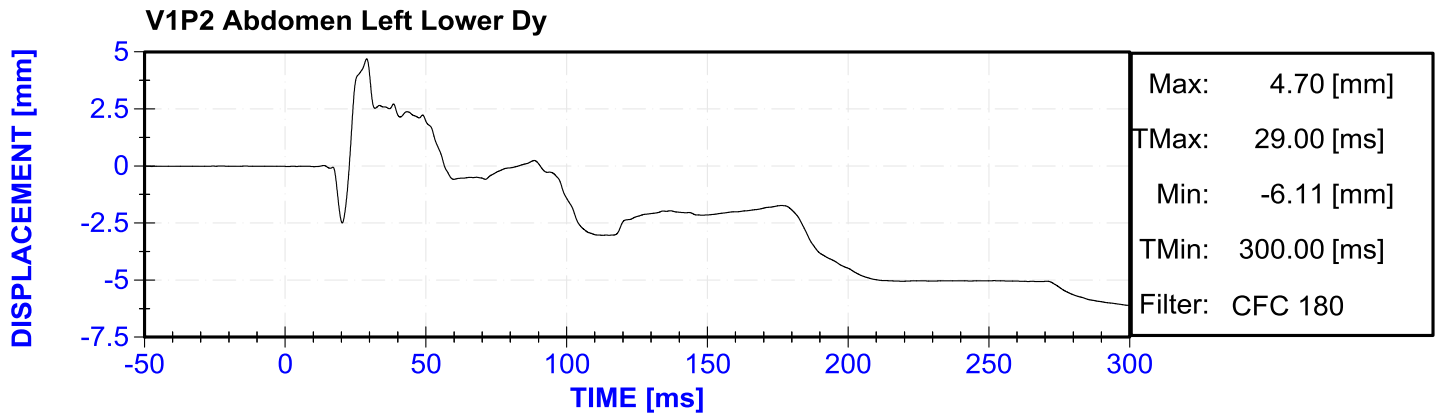


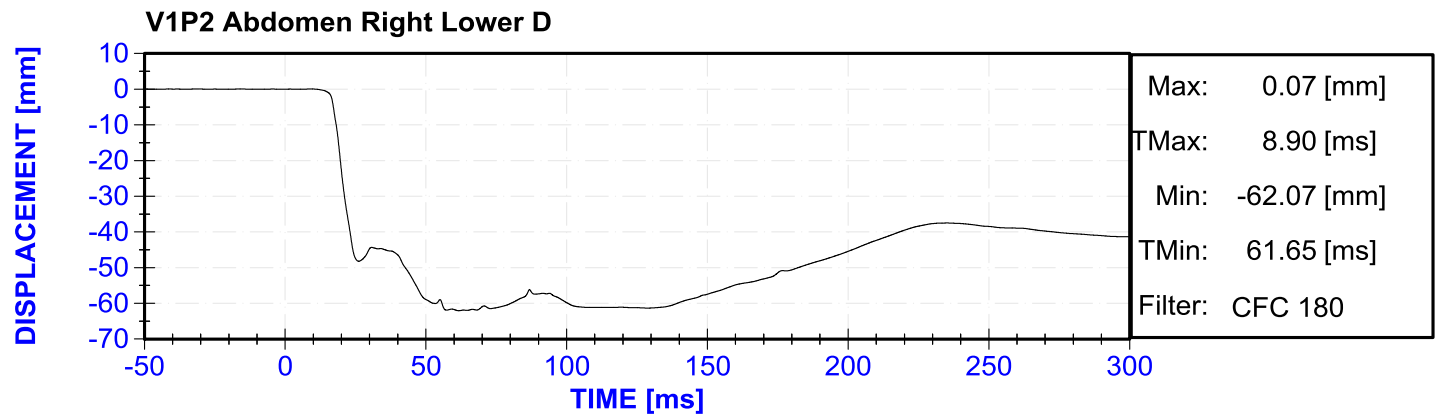
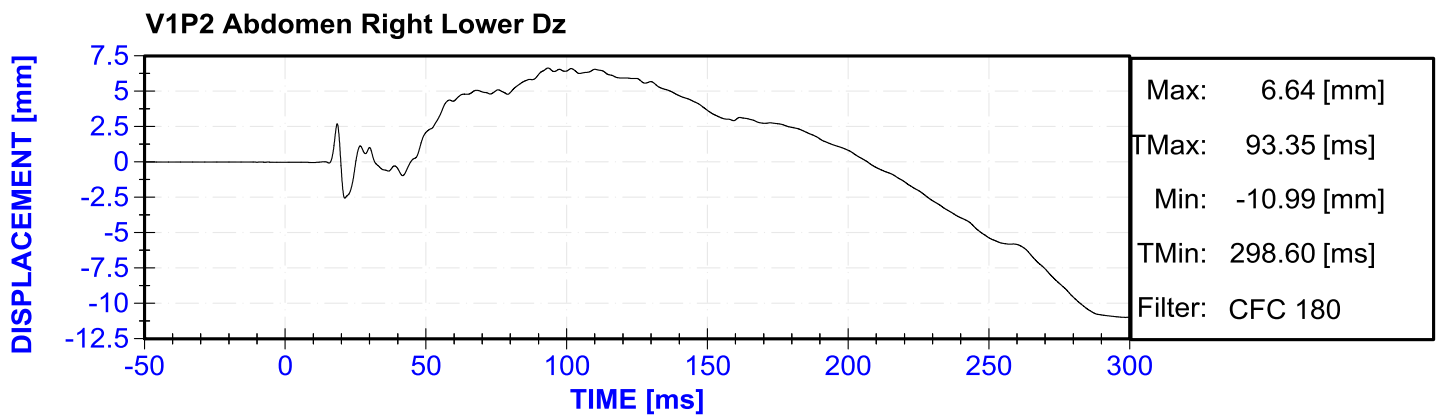
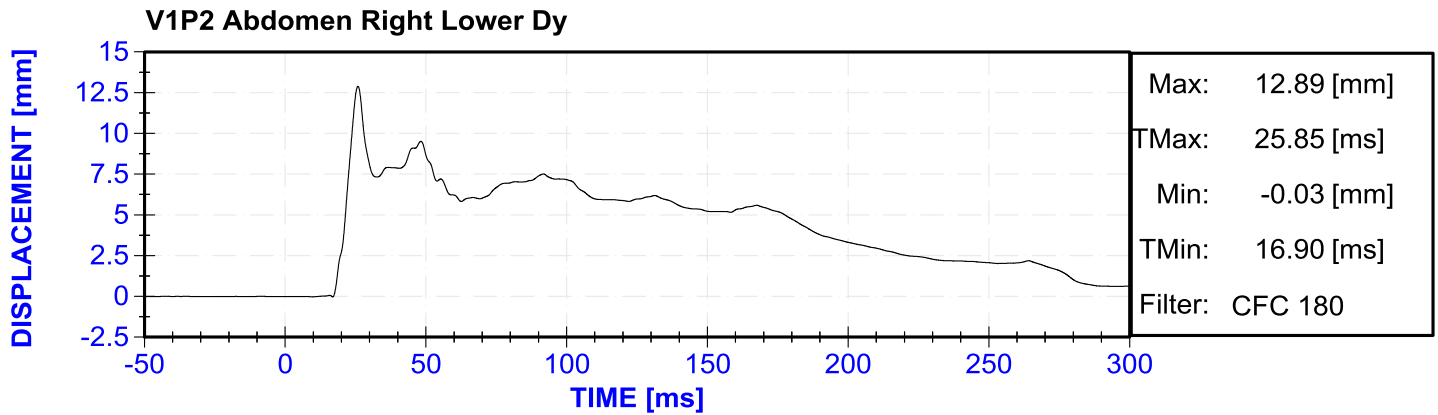












APPENDIX C

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

Table C-1: Dummy Information

TYPE	DESCRIPTION	SERIAL NUMBER
THOR TK	50 TH Male	016
THOR TK	50 TH Male	015

Table C-2: Ankle Offset Files

THOR – TK S/N: 016					
LFTX	LFTY	LFTZ	RFTX	RFTY	RFTZ
Left Ankle X Rotation	Left Ankle Y Rotation	Left Ankle Z Rotation	Right Ankle X Rotation	Right Ankle Y Rotation	Right Ankle Z Rotation
-0.281010	13.9793		-0.926255	17.6868	
THOR – TK S/N: 015					
LFTX	LFTY	LFTZ	RFTX	RFTY	RFTZ
Left Ankle X Rotation	Left Ankle Y Rotation	Left Ankle Z Rotation	Right Ankle X Rotation	Right Ankle Y Rotation	Right Ankle Z Rotation
.762525	14.9331		-1.31005	13.7803	

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

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

THOR – TK (Continued)

S/N: 016

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

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

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

THOR – TK (Continued)

S/N: 015

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

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

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

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

Table 5 – THOR IR-TRACC Polarity

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

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

THOR 016

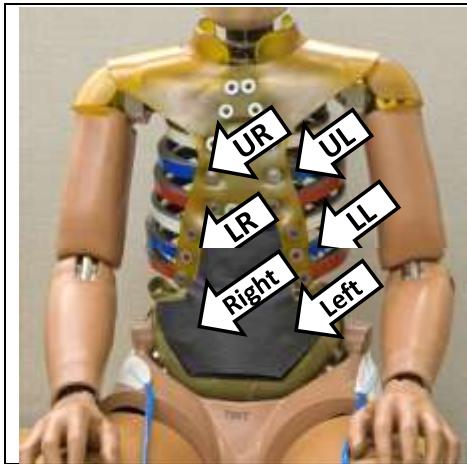


Figure 1. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

Channel	Motion
DX	Push inward
RY	Push upward
RZ	Push rightward

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

THOR 015

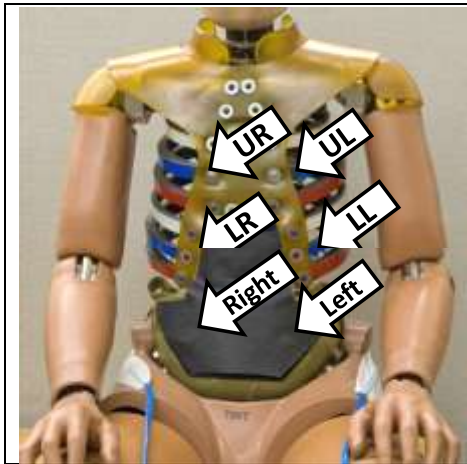


Figure 2. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

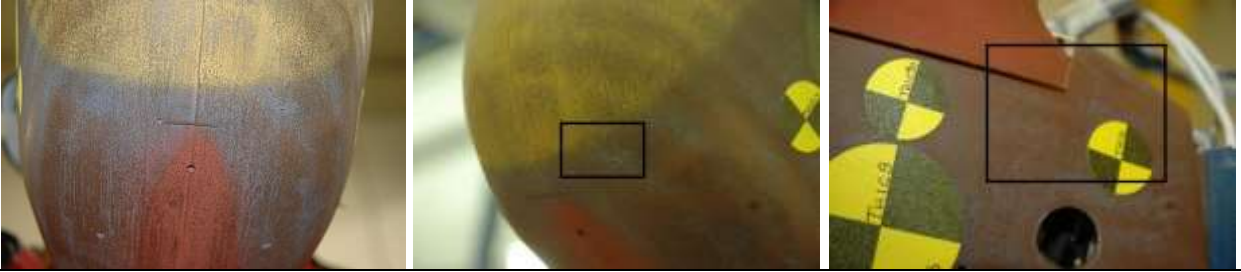
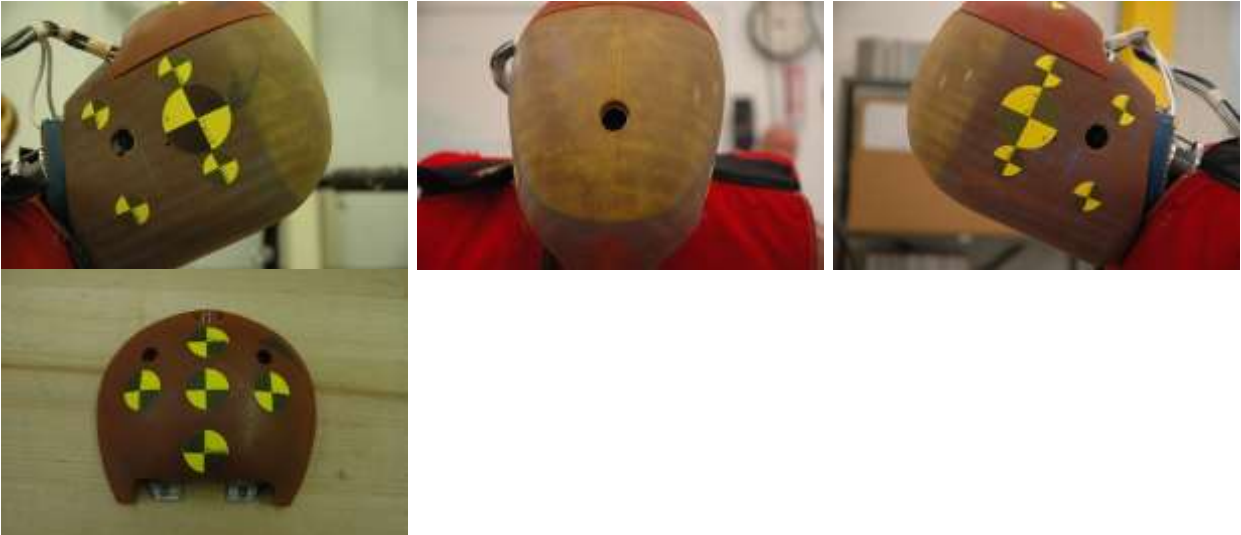
Channel	Motion
DX	Push inward
RY	Push upward
RZ	Push rightward

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

THOR Inspection Checklist

Date: 10/10/2014	
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> Since last inspection: CAL2722 – Research Vehicle 3698 <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 R20140185 – Chevrolet Spark CAL2722 – Research Vehicle 3698
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> – 11ACTBRI00THFOZP,Acetabular Right Z Force,Questionable magnitude 63-75ms, SN:LC-87 Fz Found intermittent connections due to internal cable/wire failures, repaired cable and channel functions properly	
<u>Physical evidence of damage:</u> See Report –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 Head has a horizontal cut that goes all the way through. There is a scrape on the upper left side of the face. There are Scrapes to the left side of the head towards the rear. 
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	Heavy scuffing to multiple areas of the head 

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 

SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact The left shoulder urethane is tearing in multiple spots 
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops Left soft stop is missing 
OTHER	The right arm has some damage and heavy scuffing. The flesh is ripping on the inside exposing the filling. There are small cuts on the underside of the arm and the right hand has a cut on the palm.  The left arm is heavily scuffed, the zipper is pulling away from the flesh, and the inside is ripped exposing the filling. There is also a piece of flesh overlay that was torn off, and the thumb and pinky are beginning to tear where they connect to the hand. There are also small cuts on the underside of the arm near the elbow. 

		
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SPINE		
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates Thoracic spine is beginning to show evidence of debonding, and there is a hole	
		
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	Lumbar spine shows signs of wear due to rubbing on both the left and right sides	
		

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material Both sides of the top rib show signs of contact Right Side  Left Side 
Y / N	No evidence of debonding between rib damping material and ribs Ribs 4 and 6 show signs of debonding on the right side  
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 Urethane bib has pitting  
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)
OTHER	There is a hole on the left side of the chest damping foam 

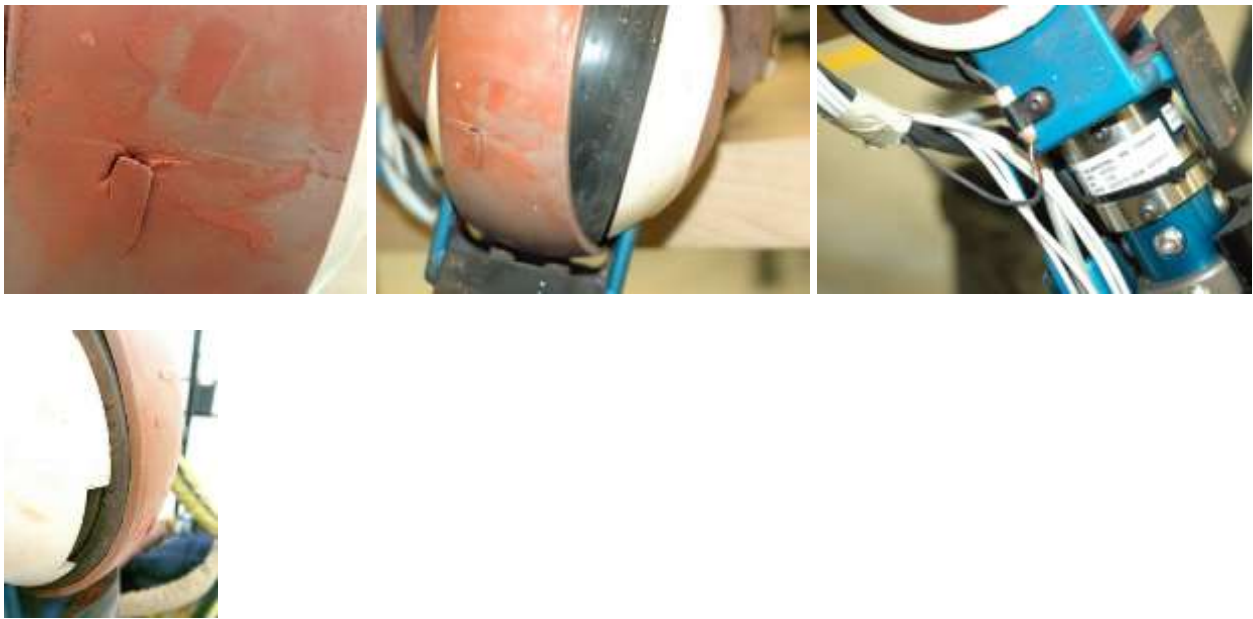
ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper
Y / N	Upper abdomen insert securely attached to spine
Y / N	Upper abdomen insert shows no evidence of permanent set
Y / N	No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper Both the left and right side of the bag are torn
	
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	Both the left and right side of the pelvis flesh had holes. The zip tie was used to show that the holes go all the way through
	

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 Both knees are in pretty rough shape: The right knee has a cut that starts at the outside and goes half way through the knee flesh. The inside of the right knee is chipped and pitted, and the insert is also cut all the way through

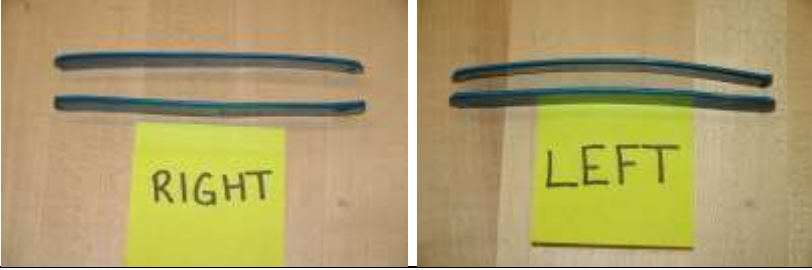


The left knee is also damaged. There is a cut in the front of the knee that goes all the way through the flesh to the insert. Also, the insert is getting damaged on in inside of the knee. The insulation to the knee slider has torn.



OTHER

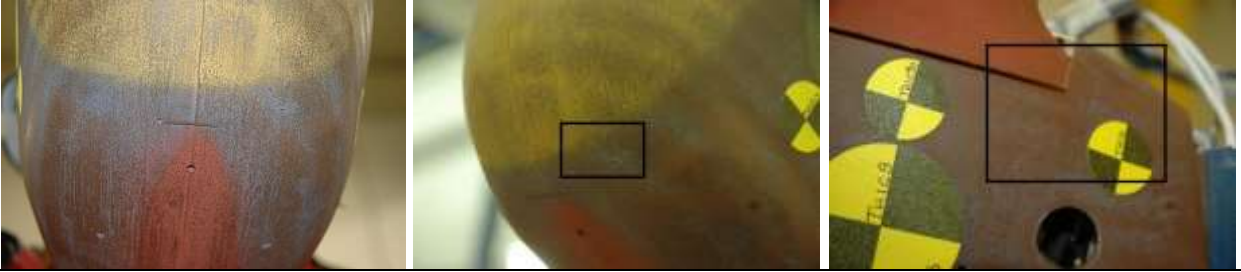
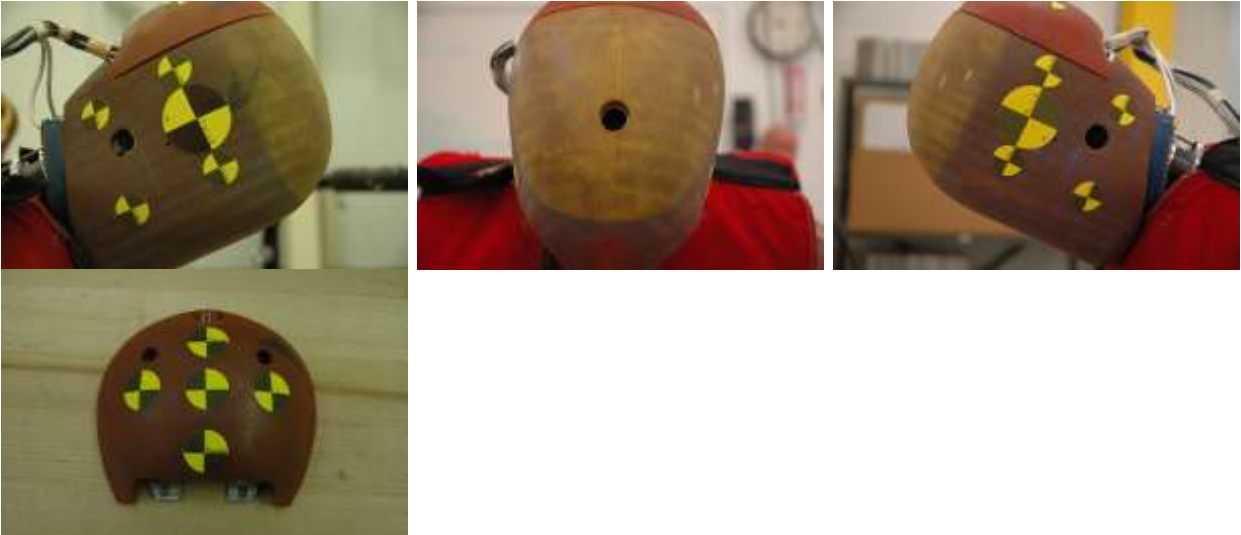
LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
Y / N	No cuts, tears, or scuffing of leg flesh The legs are badly damaged. The right leg flesh is torn badly at the zipper. It is currently being held on with graffer's tape. There is also a cut in the flesh on the inside of the right leg.   The left leg flesh is damaged as well. It looks as if the leg flesh has begun to melt due to the friction against it during testing. 
OTHER	

JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation They are bent, but can be corrected 
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers There are multiple holes, tears in lining, frayed seams, back foam insert has disintegrated, holes in jacket that go all the way through 
OTHER	

THOR Inspection Checklist

Date: 10/15/2014	
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> Since last inspection: R20145402 – Mazda CX-5 <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 R20140185 – Chevrolet Spark CAL2722 – Research Vehicle 3698 R20145402 – Mazda CX-5
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> None	
<u>Physical evidence of damage:</u> None New	
<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

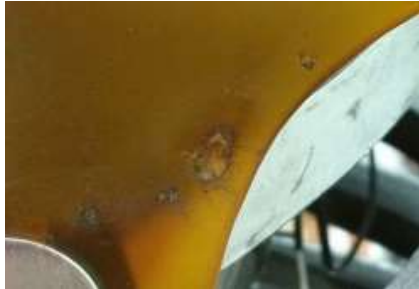
Note: New Damage is Noted in Red

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 Head has a horizontal cut that goes all the way through. There is a scrape on the upper left side of the face. There are Scrapes to the left side of the head towards the rear. 
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	Heavy scuffing to multiple areas of the head 

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 

SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact The left shoulder urethane is tearing in multiple spots 
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops Left soft stop is missing 
OTHER	The right arm has some damage and heavy scuffing. The flesh is ripping on the inside exposing the filling. There are small cuts on the underside of the arm and the right hand has a cut on the palm.  The left arm is heavily scuffed, the zipper is pulling away from the flesh, and the inside is ripped exposing the filling. There is also a piece of flesh overlay that was torn off, and the thumb and pinky are beginning to tear where they connect to the hand. There are also small cuts on the underside of the arm near the elbow. 

		
SPINE		
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates Thoracic spine is beginning to show evidence of debonding, and there is a hole	
		
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	Lumbar spine shows signs of wear due to rubbing on both the left and right sides	
		

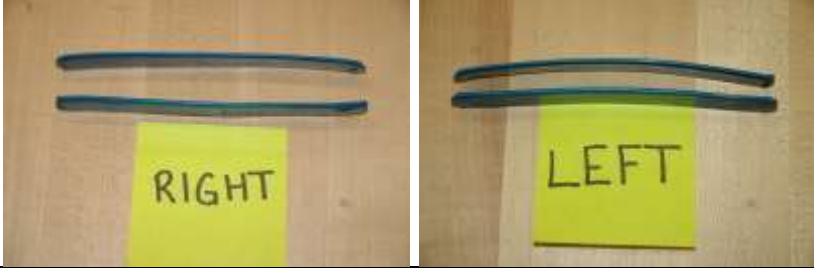
THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material Both sides of the top rib show signs of contact Right Side  Left Side 
Y / N	No evidence of debonding between rib damping material and ribs Ribs 4 and 6 show signs of debonding on the right side  
Y / N	IRTRACC 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 Urethane bib has pitting  
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)
OTHER	There is a hole on the left side of the chest damping foam 

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 Both the left and right side of the bag are torn 
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	Both the left and right side of the pelvis flesh had holes. The zip tie was used to show that the holes go all the way through 

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 Both knees are in pretty rough shape: The right knee has a cut that starts at the outside and goes half way through the knee flesh. The inside of the right knee is chipped and pitted, and the insert is also cut all the way through The left knee is also damaged. There is a cut in the front of the knee that goes all the way through the flesh to the insert. Also, the insert is getting damaged on in inside of the knee. The insulation to the knee slider has torn.
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 The legs are badly damaged. The right leg flesh is torn badly at the zipper. It is currently being held on with graffer's tape. There is also a cut in the flesh on the inside of the right leg.   The left leg flesh is damaged as well. It looks as if the leg flesh has begun to melt due to the friction against it during testing. 
OTHER	

JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation They are bent, but can be corrected 
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers There are multiple holes, tears in lining, frayed seams, back foam insert has disintegrated, holes in jacket that go all the way through 
OTHER	

THOR Inspection Checklist

Date: 10/13/2014	
NHTSA Representative: James Saunders	
Inspection Reporter: 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> CAL2722 – Research Vehicle 3698 <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 R20140185 – Chevrolet Spark CAL2722 – Research Vehicle 3698
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> – 13NECKLO00THFOXP, Lower Neck X Force, Questionable spikes 50-150ms, SN:LC-85 Fx Found multiple intermittent pin connections. Tightened pins and rectified problem. Channel functions properly.	
<u>Physical evidence of damage:</u> See Report – Jacket	
<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	

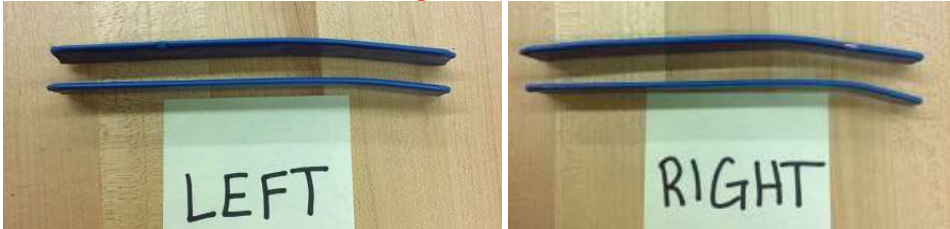
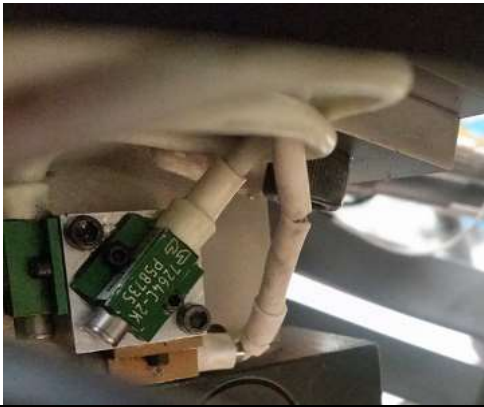
SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact Right shoulder urethane is torn along with small cuts-gaffing tape to correct  Left shoulder urethane is also torn along with one small cut- gaffing tape to correct 
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops Right shoulder is missing the soft stop 
OTHER	The left arm and hand has heavy scuffing, cuts on the outside of the wrist, cuts to the outside of the hand near the wrist, a cut where the thumb meets the hand, and a small cut at the elbow.

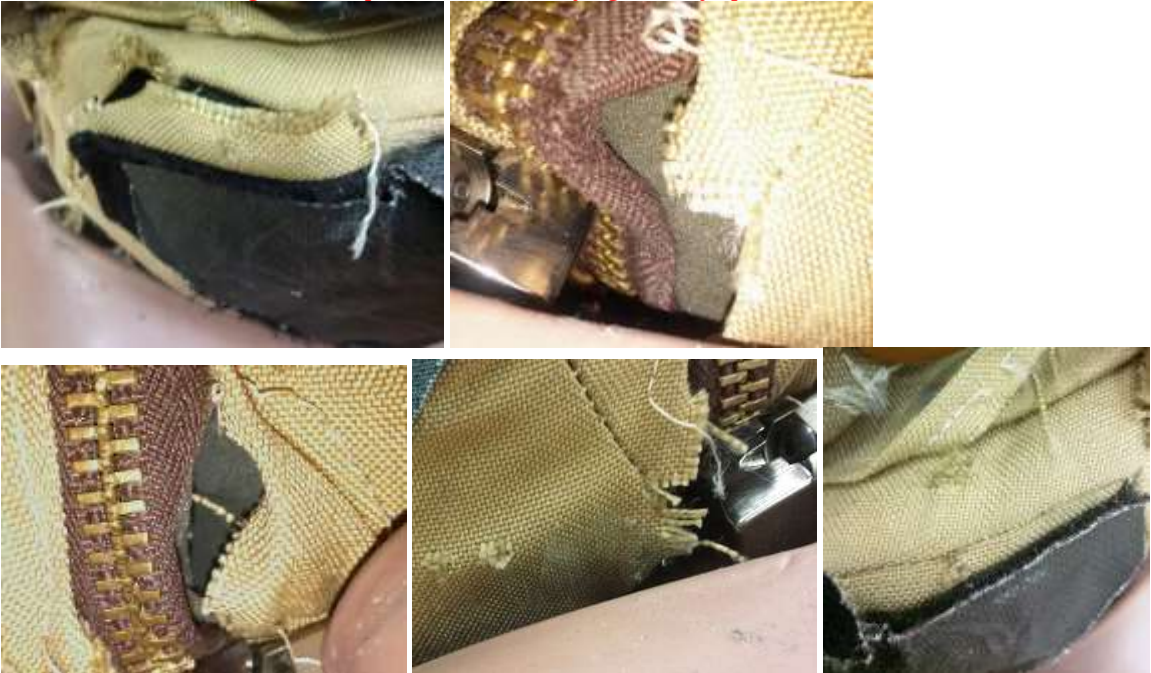


The right arm and hand has heavy scuffing, a tear where the thumb meets the hand, and small cuts on the inside of the hand near the thumb.

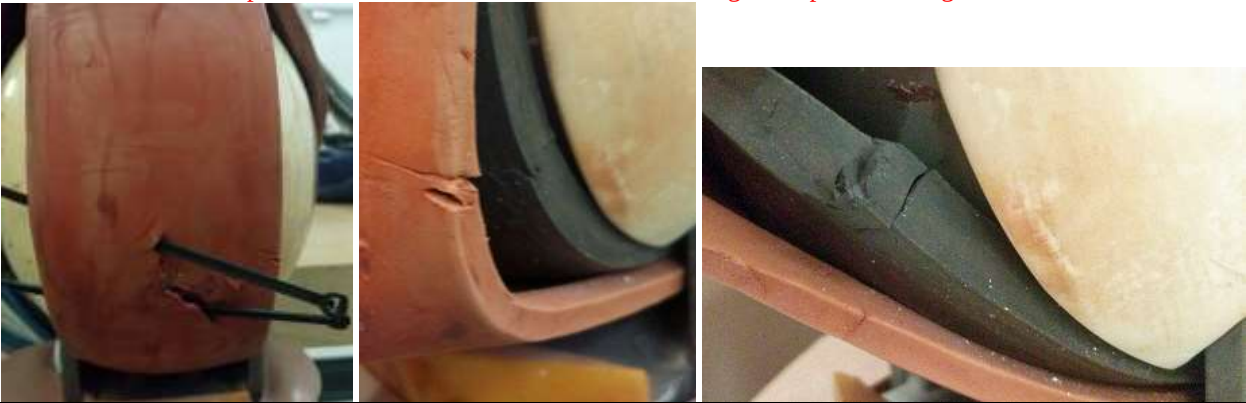


SPINE	
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged
OTHER	

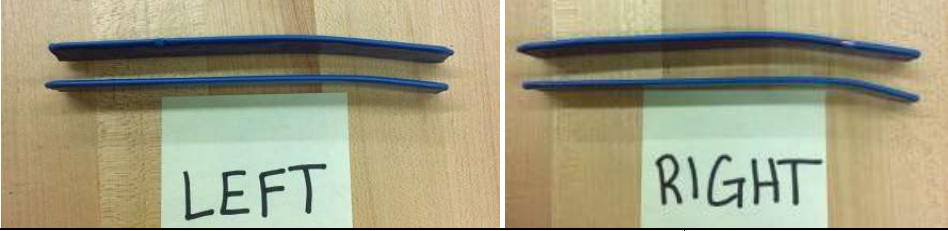
THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material Both the left and right top rib show evidence of damage from rubbing 
Y / N	No evidence of debonding between rib damping material and ribs
Y / N	CRUX anterior arms securely attached to anterior ribs
Y / N	CRUX 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 The bib has tearing at the center and the center hole seems to have been roughly widened 
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners) Rib stiffeners are bent, but can be straightened 
OTHER	One of the T6 accelerometers cable insulation has been cut at the accelerometer and further down the cable 

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 The lower abdomen bag has multiple holes, and is fraying in many spots
	
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	Cuts to the inside right and outside left of the pelvis flesh, also missing the instrumentation protective cover
	

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 Right knee has multiple cuts and tears along with heavy scuffing. Hole on the outside of the knee is ripping. Zip ties used to show what cuts go all the way through.  The left knee has multiple cuts, and tears. The insert was also damaged. Zip ties used again 
OTHER	

LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached Ankle assemblies are marked, but still 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 Scuffing to the right leg  Scuffing to the left leg, zipper skin beginning to pull away from the leg – gaffer's tape to correct 
OTHER	

JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation Bent, but straightened 
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers The chest jacket is beginning to fall apart. There are many holes, fraying seams, and the back padding is disintegrating causing it to bunch up and the bottom of the jacket, and fall out. 

	
OTHER	

THOR Inspection Checklist

Date: 10/15/2014	
NHTSA Representative: James Saunders	
Inspection Reporter: 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> R20145402 – Mazda CX-5 <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 R20140185 – Chevrolet Spark CAL2722 – Research Vehicle 3698 R20145402 – Mazda CX-5
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> None	
<u>Physical evidence of damage:</u> See Report – 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

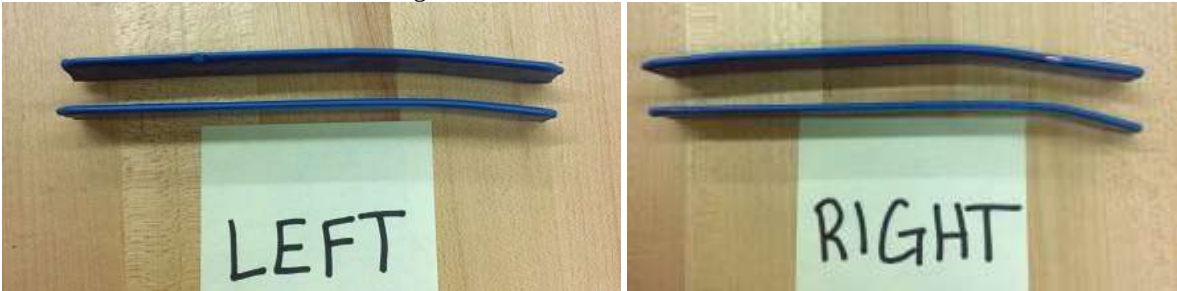
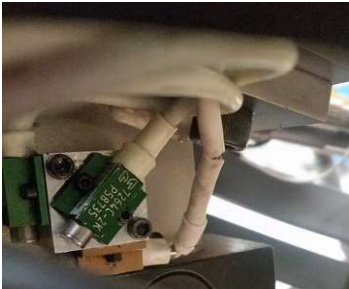
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	

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 Right shoulder urethane is torn along with small cuts-gaffing tape to correct  Left shoulder urethane is also torn along with one small cut- gaffing tape to correct 
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  Right Shoulder soft stop damaged

	
OTHER	The left arm and hand has heavy scuffing, cuts on the outside of the wrist, cuts to the outside of the hand near the wrist, a cut where the thumb meets the hand, and a small cut at the elbow.      The right arm and hand has heavy scuffing, a tear where the thumb meets the hand, and small cuts on the inside of the hand near the thumb.    Tear where the thumb meets the hand is deeper 

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 Both the left and right top rib show evidence of damage from rubbing 
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 The bib has tearing at the center and the center hole seems to have been roughly widened 
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners) Rib stiffeners are bent, but can be straightened 
OTHER	One of the T6 accelerometers cable insulation has been cut at the accelerometer and further down the cable. 

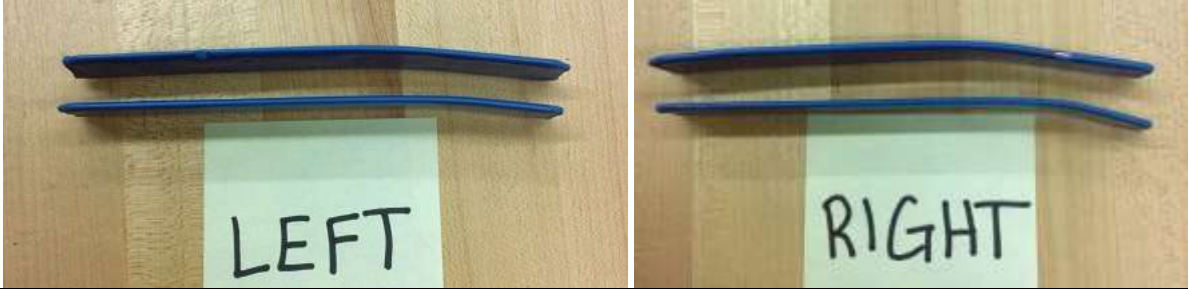
ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper
Y / N	Upper abdomen insert securely attached to spine
Y / N	Upper abdomen insert shows no evidence of permanent set
Y / N	No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper The lower abdomen bag has multiple holes, and is fraying in many spots 
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	Cuts to the inside right and outside left of the pelvis flesh, also missing the instrumentation protective cover 

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 Right knee has multiple cuts and tears along with heavy scuffing. Hole on the outside of the knee is ripping. Zip ties used to show what cuts go all the way through.

	 The left knee has multiple cuts, and tears. The insert was also damaged. Zip ties used again 
OTHER	

LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached Ankle assemblies are marked, but still 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 Scuffing to the right leg  Scuffing to the left leg, zipper skin beginning to pull away from the leg – gaffer’s tape to correct 
OTHER	

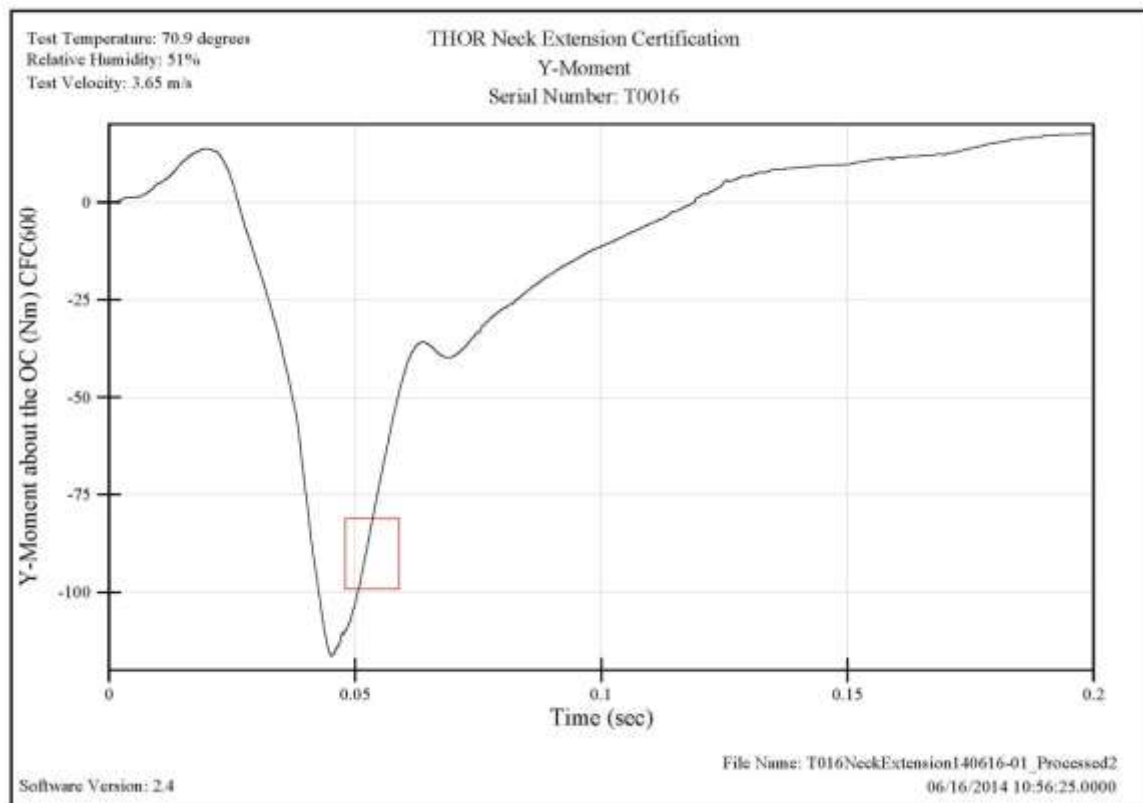
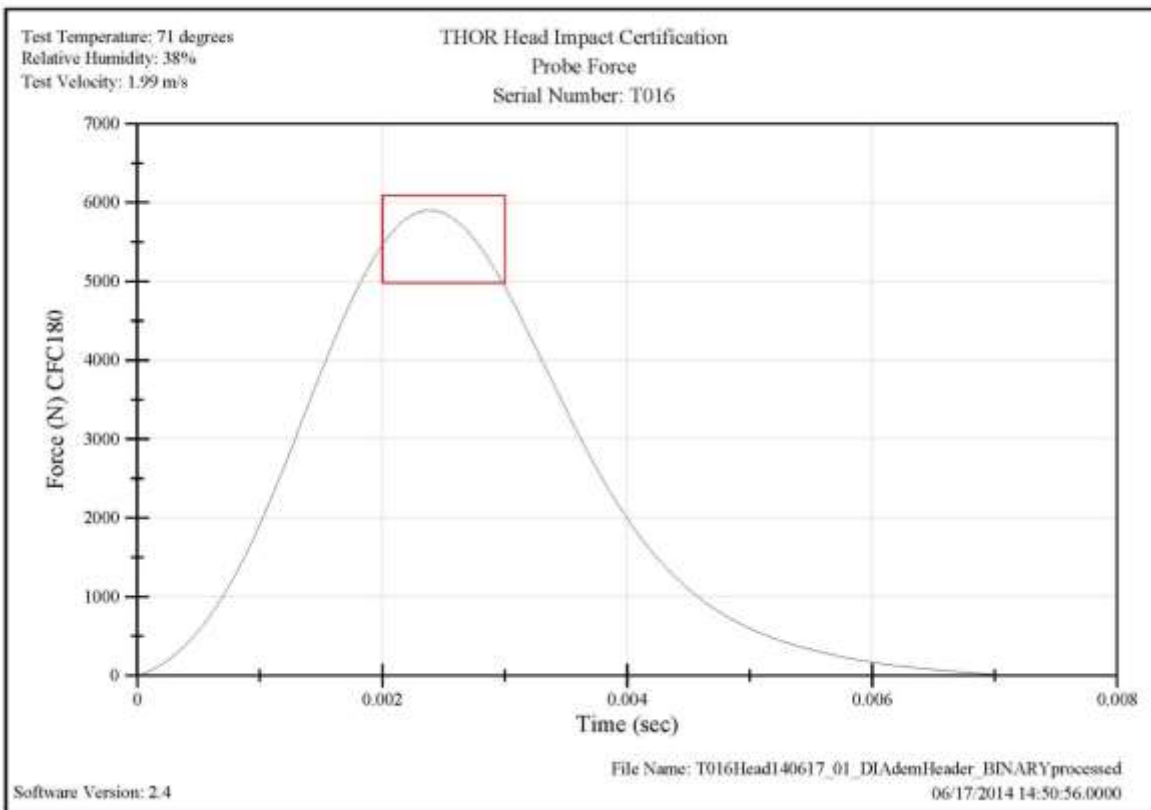
JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation Bent, but straightened 
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers The chest jacket is beginning to fall apart. There are many holes, fraying seams, and the back padding is disintegrating causing it to bunch up and the bottom of the jacket, and fall out. 

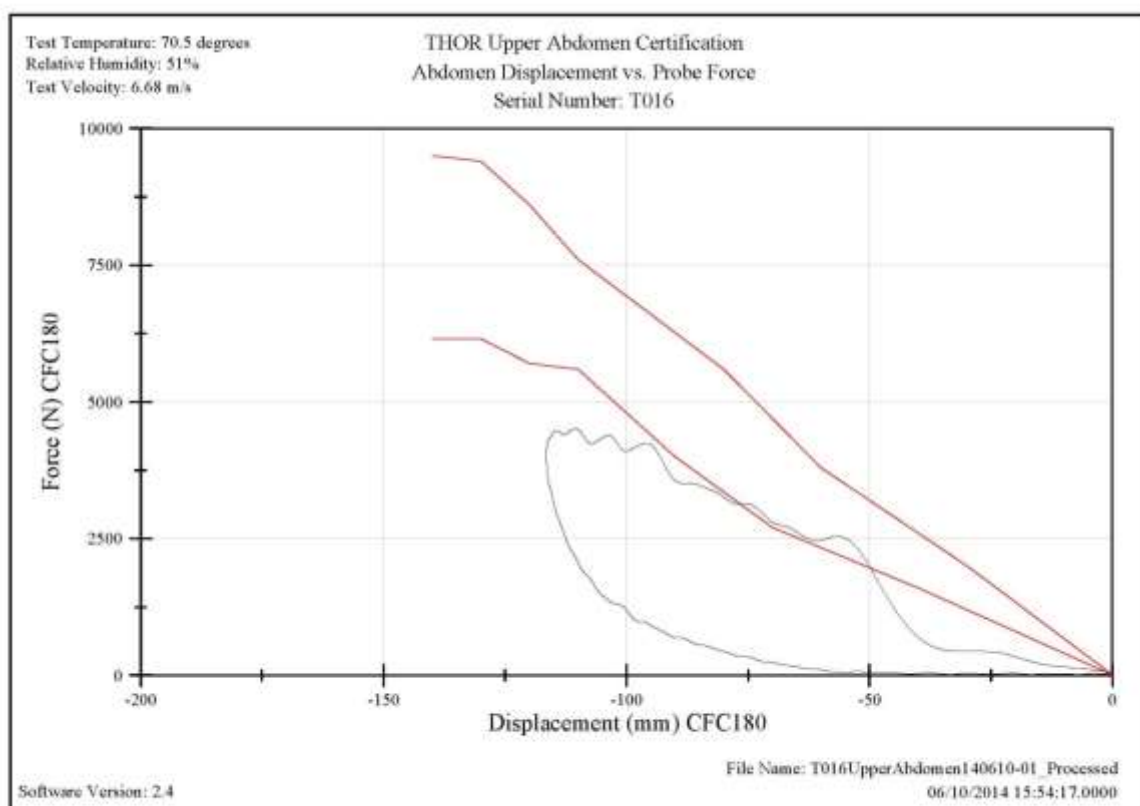
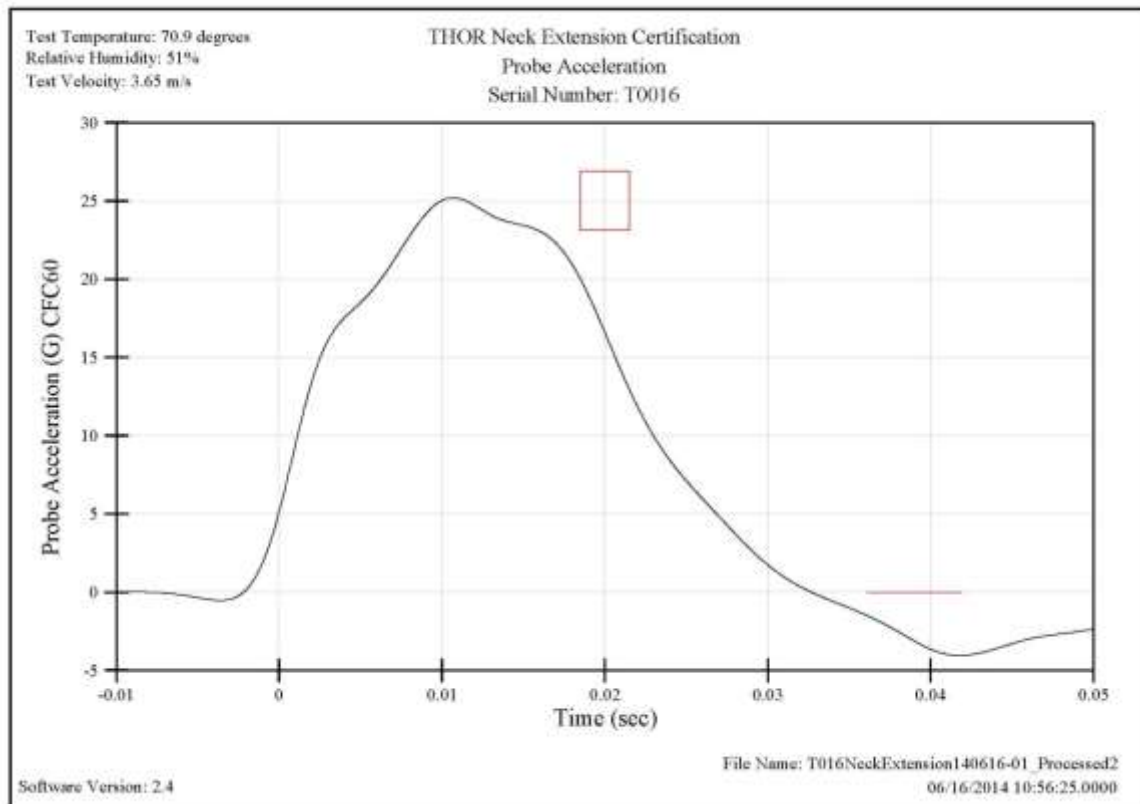
	
OTHER	The hoist strap has broken, we are currently using zip ties in its place 

Test Data/Sensor Repair Notes

DUMMY CALIBRATIONS

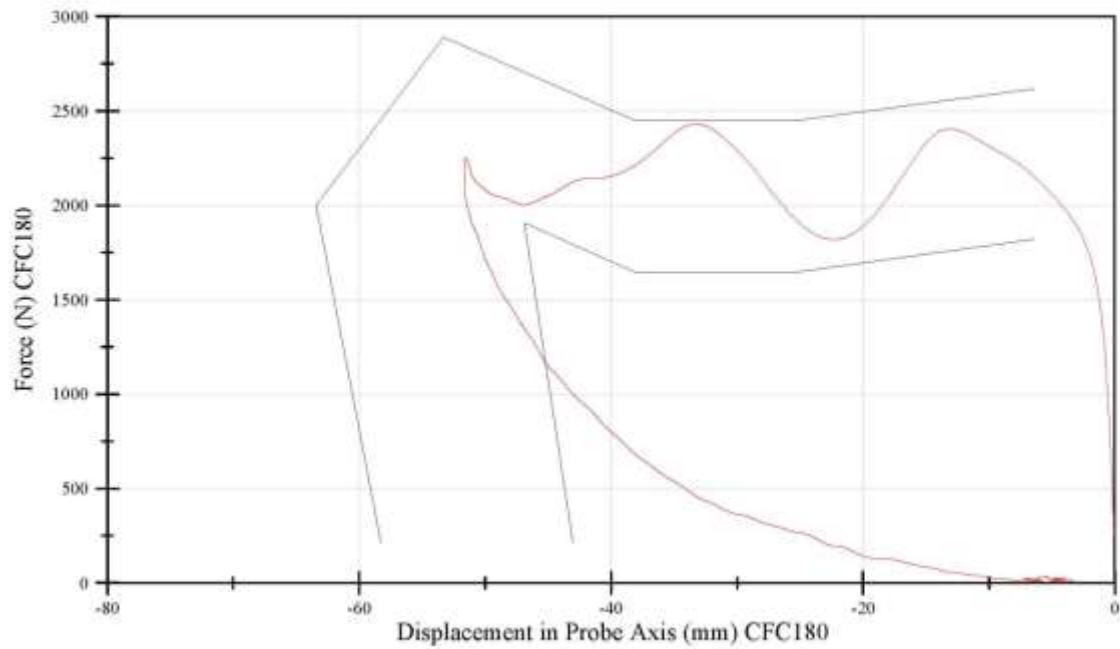
50% ADULT MALE THOR016 DUMMY CALIBRATIONS





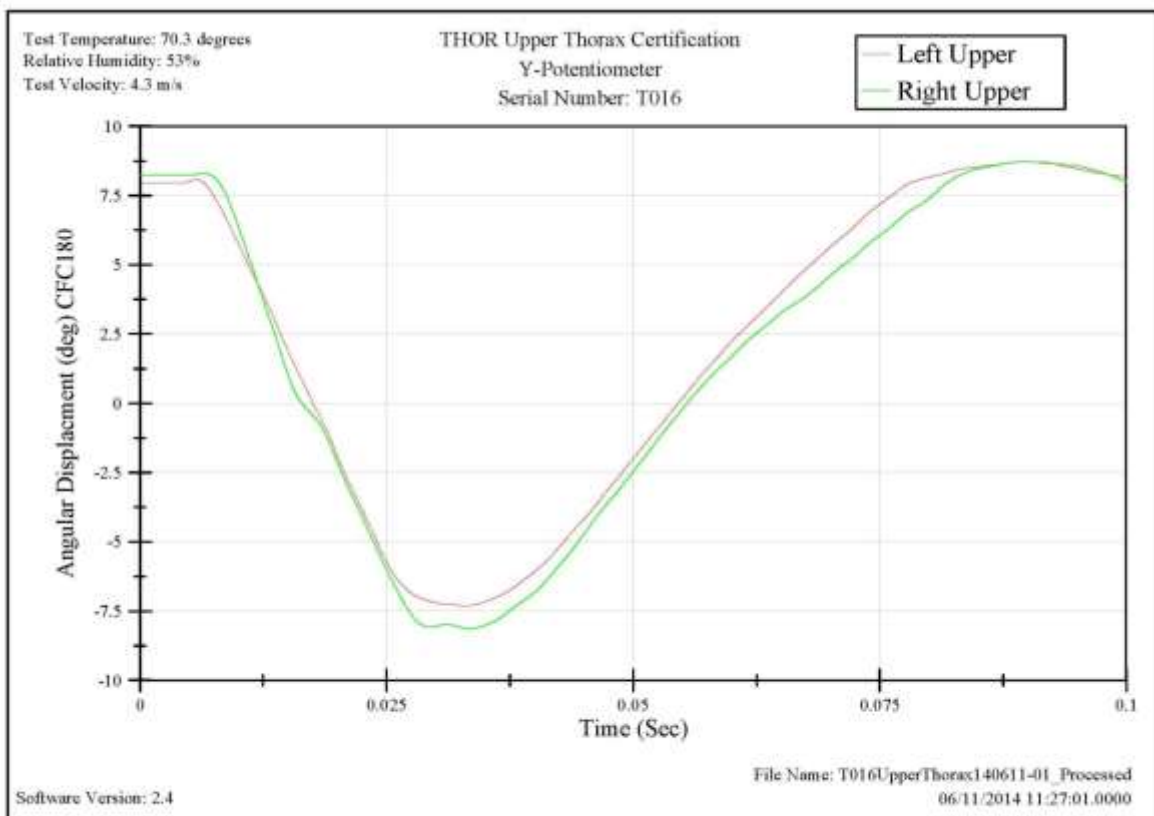
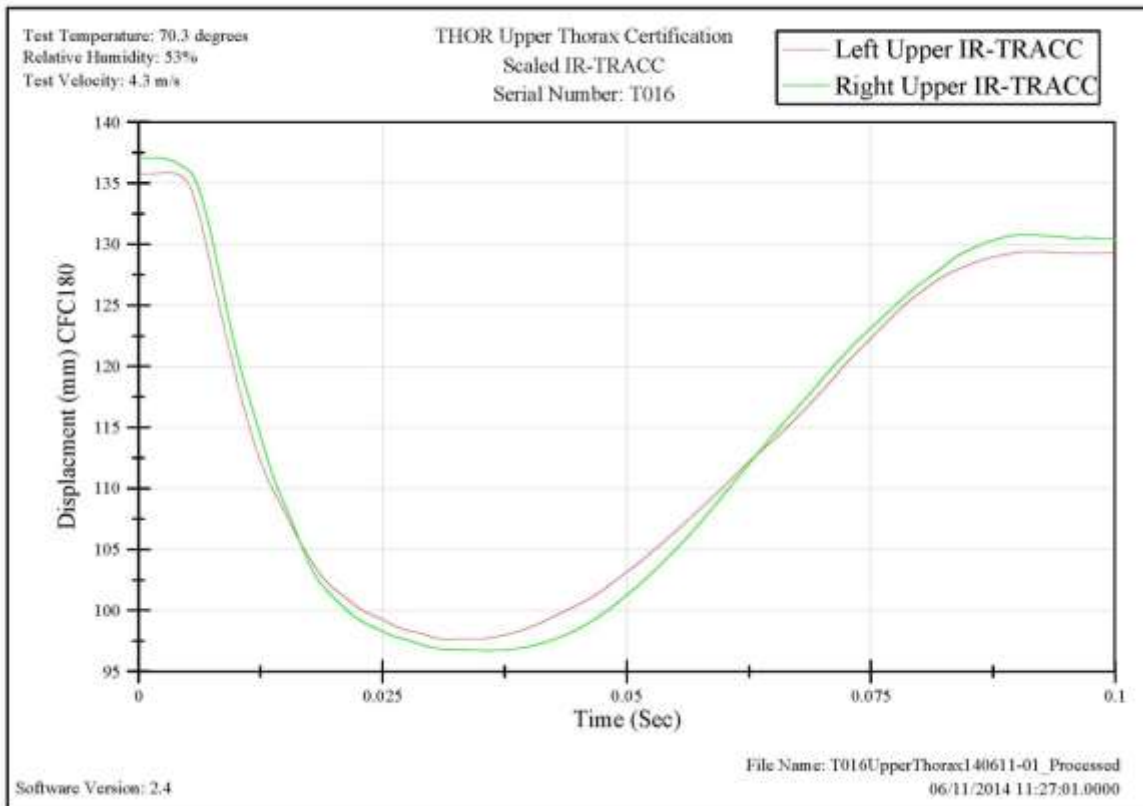
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Relative Humidity: 53%
Test Velocity: 4.3 m/s

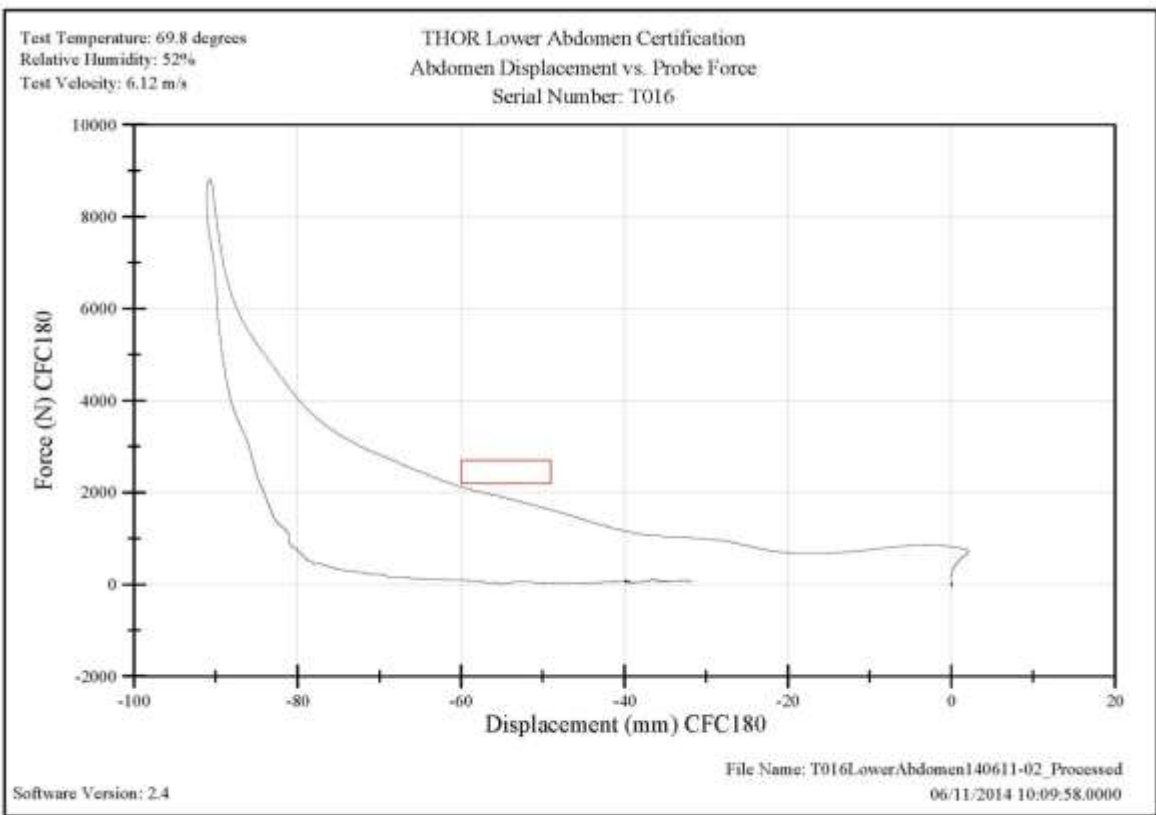
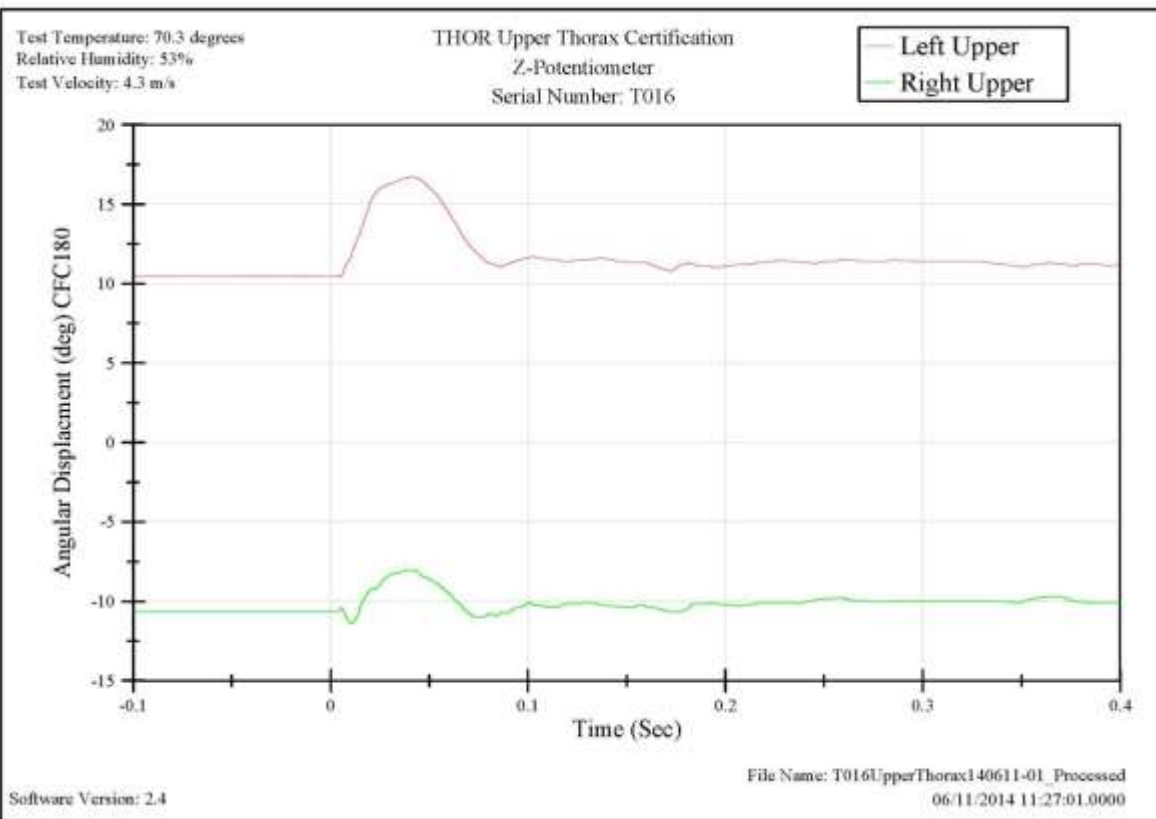
THOR Upper Thorax Certification
Thorax Response With Kroell Corridor
Serial Number: T016

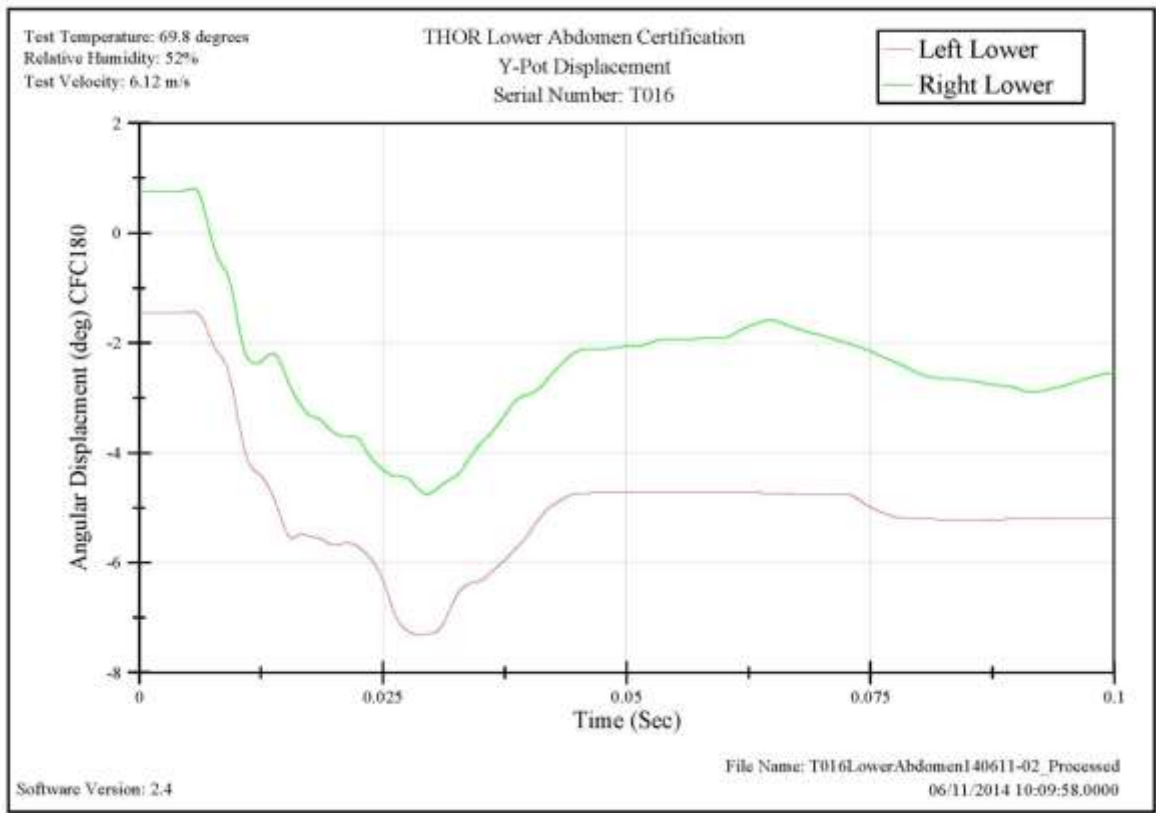
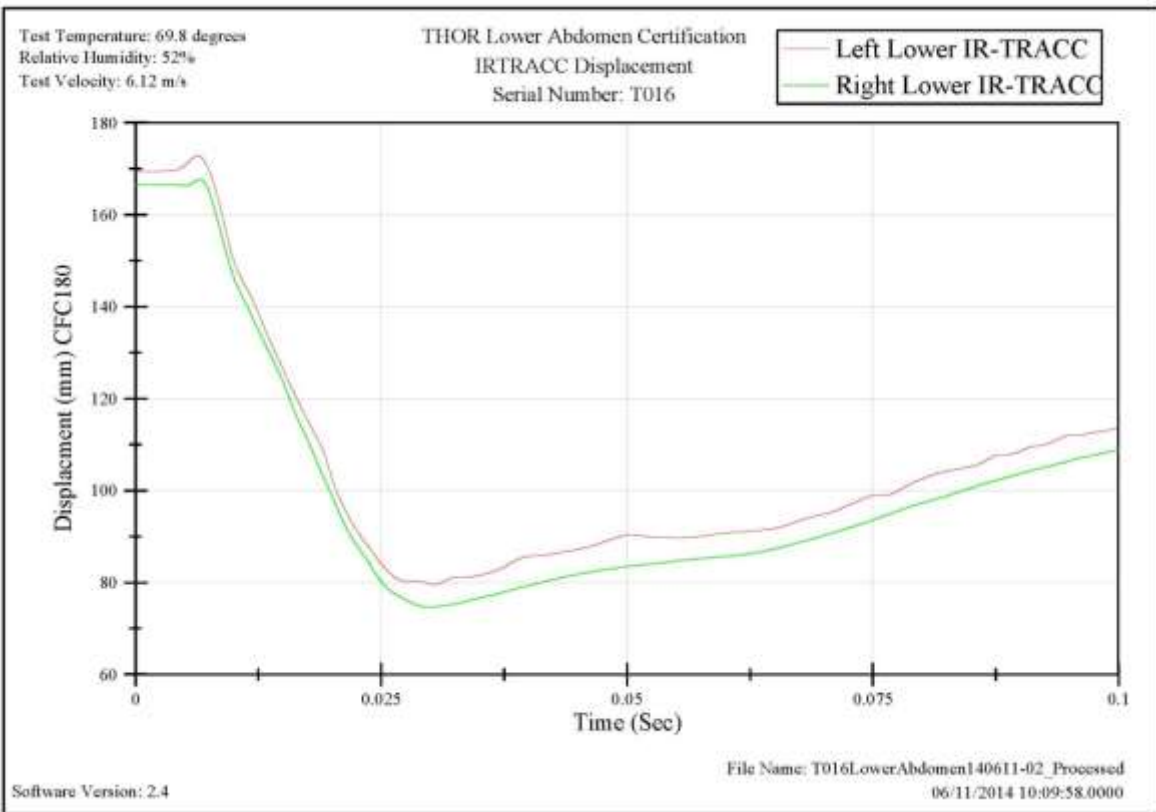


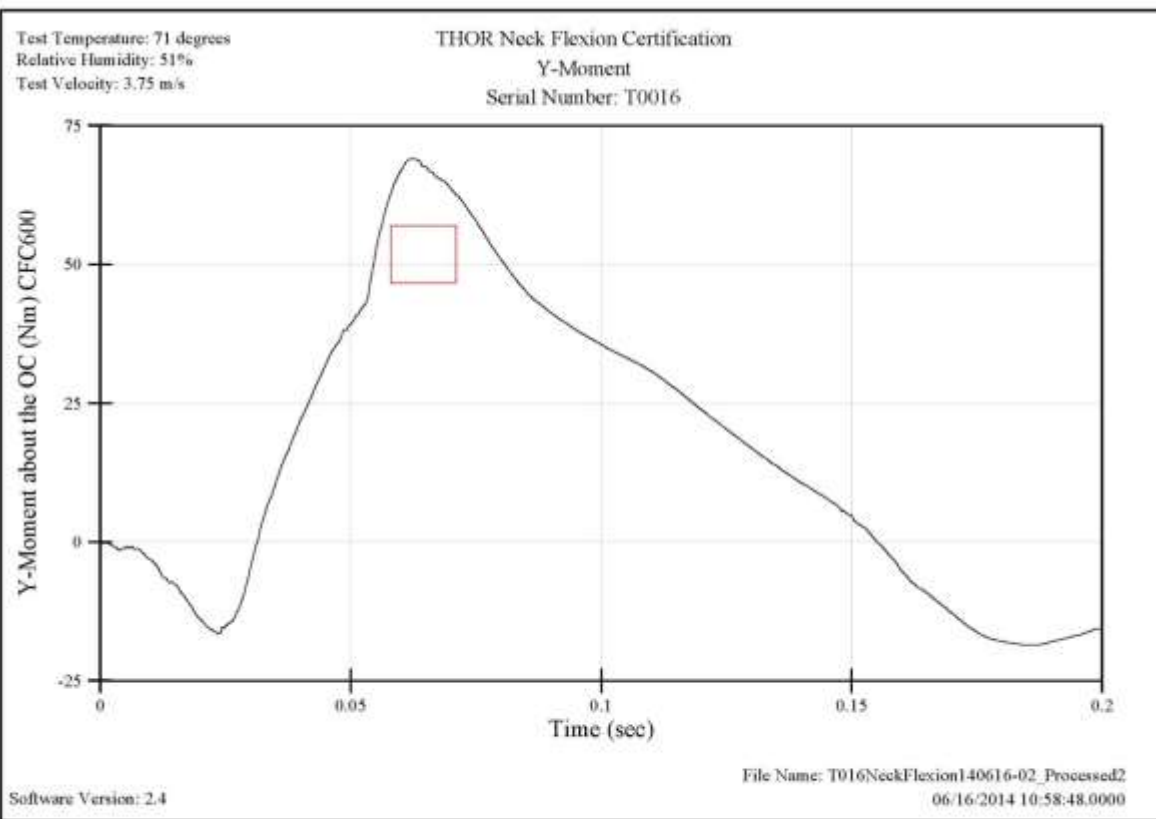
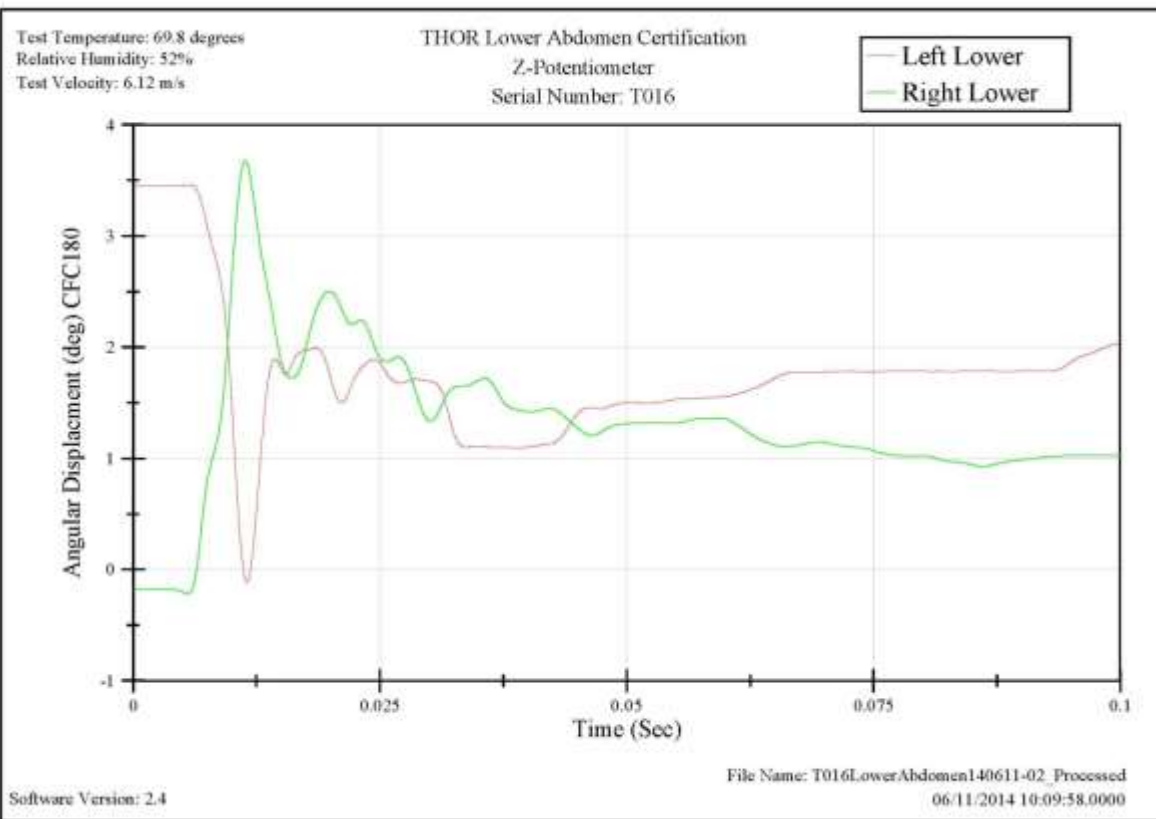
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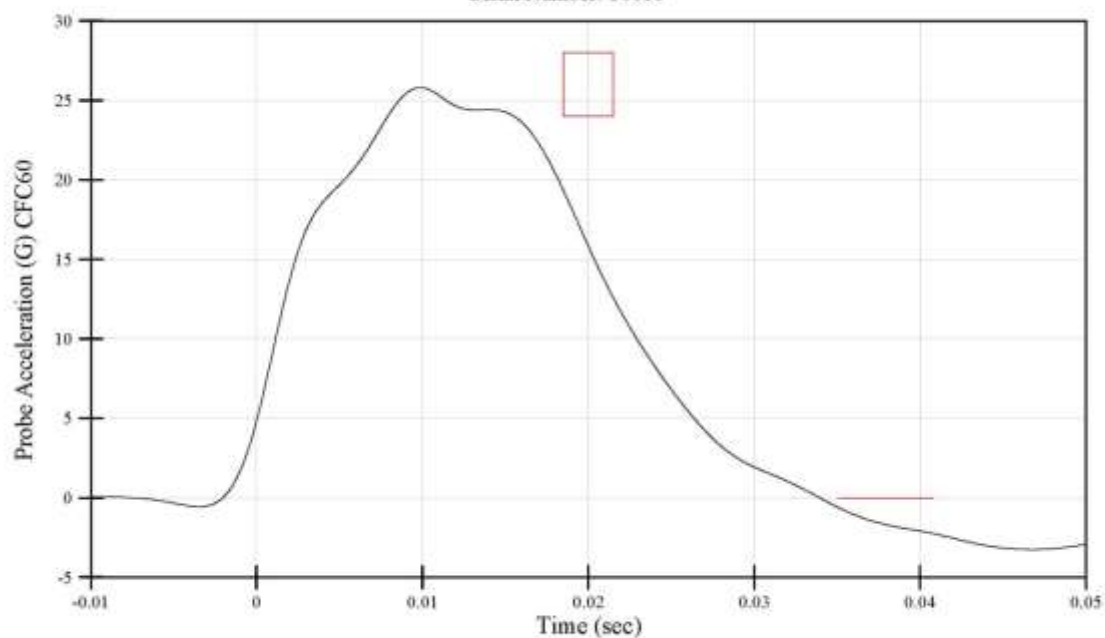






Test Temperature: 71 degrees
Relative Humidity: 51%
Test Velocity: 3.75 m/s

THOR Neck Flexion Certification
Probe Acceleration
Serial Number: T0016

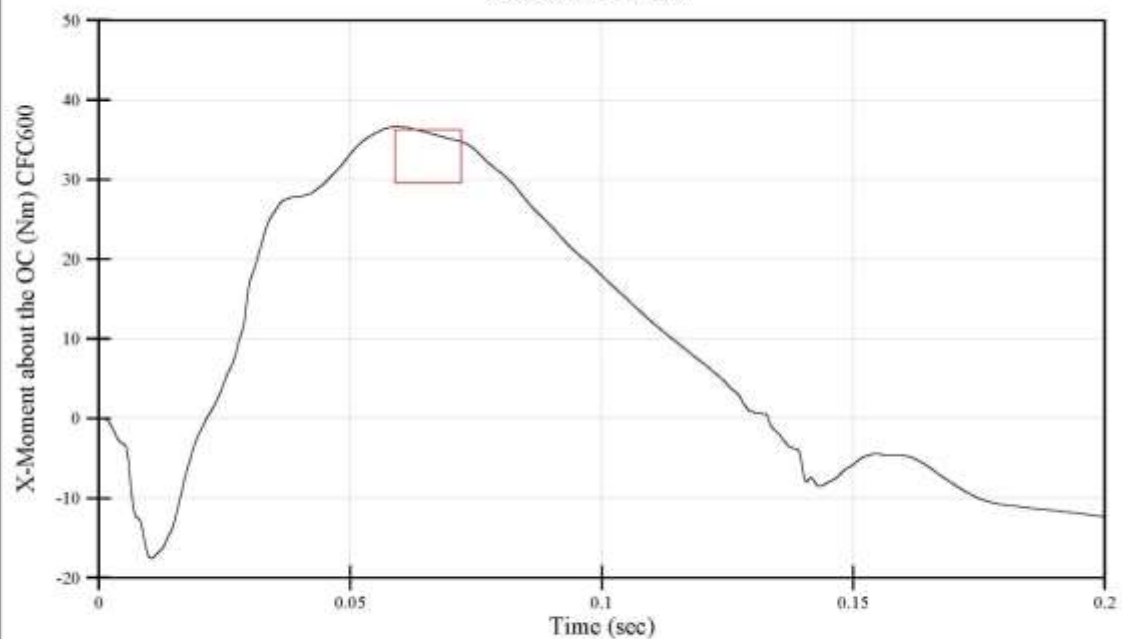


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06/16/2014 10:58:48.0000

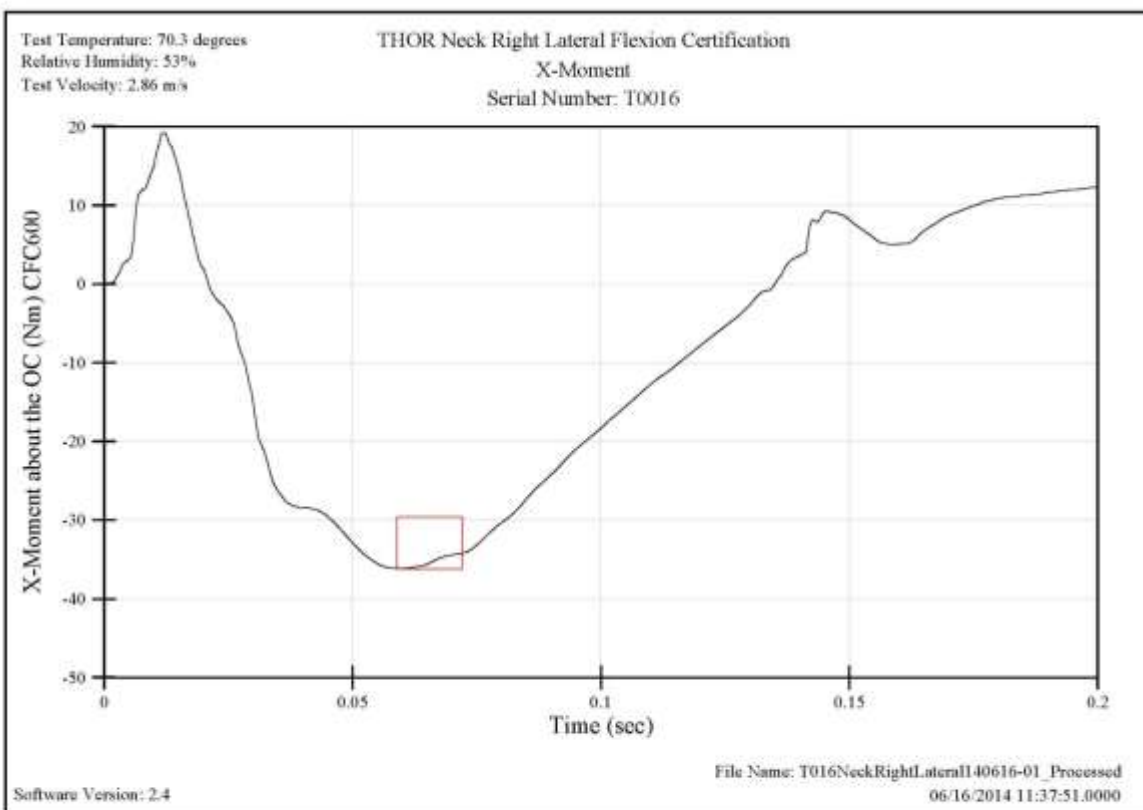
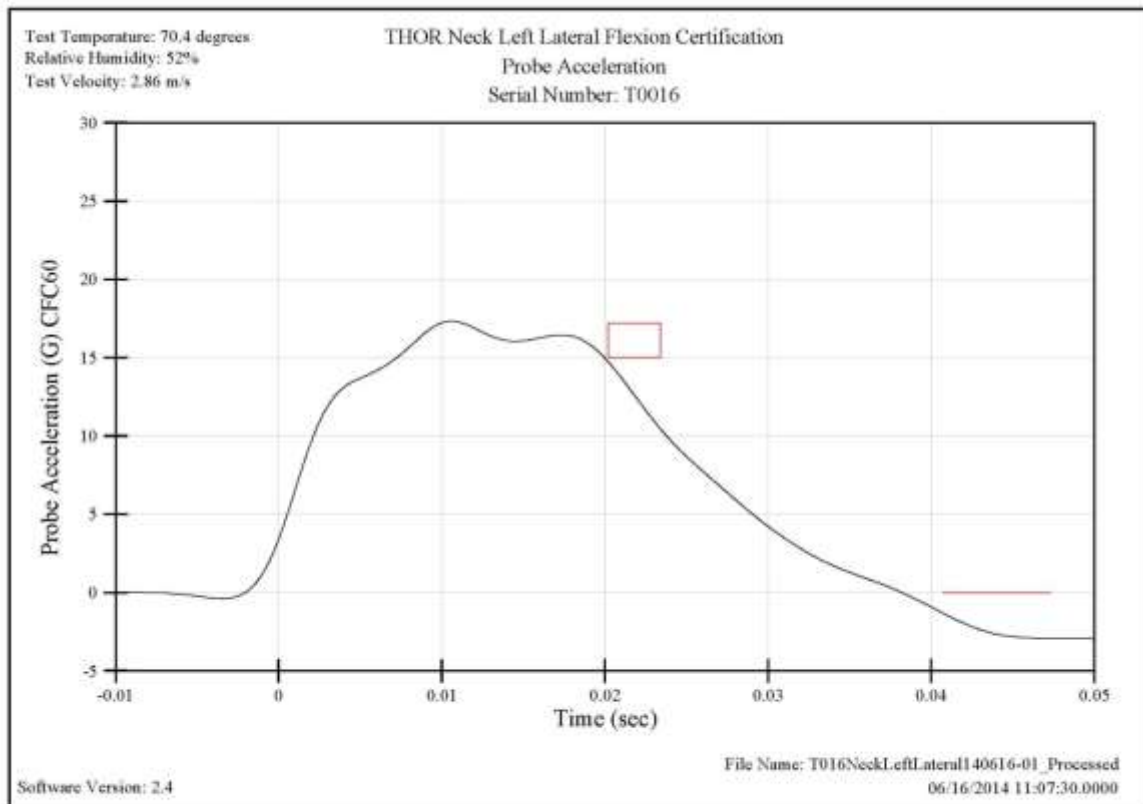
Test Temperature: 70.4 degrees
Relative Humidity: 52%
Test Velocity: 2.86 m/s

THOR Neck Left Lateral Flexion Certification
X-Moment
Serial Number: T0016



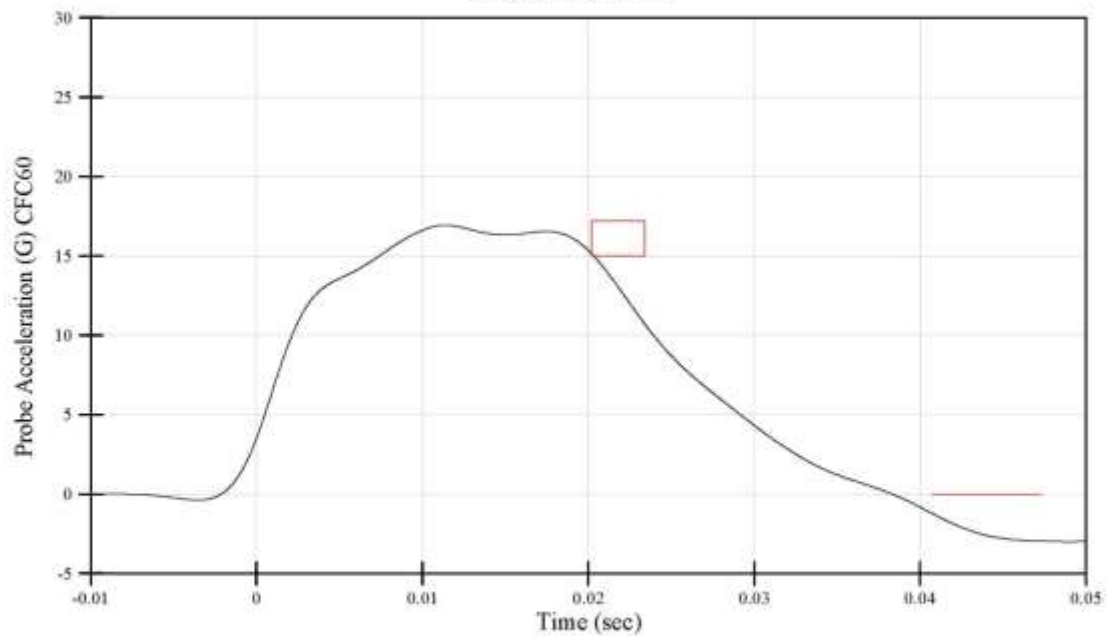
Software Version: 2.4

File Name: T016NeckLeftLateral140616-01_Processed
06/16/2014 11:07:30.0000



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

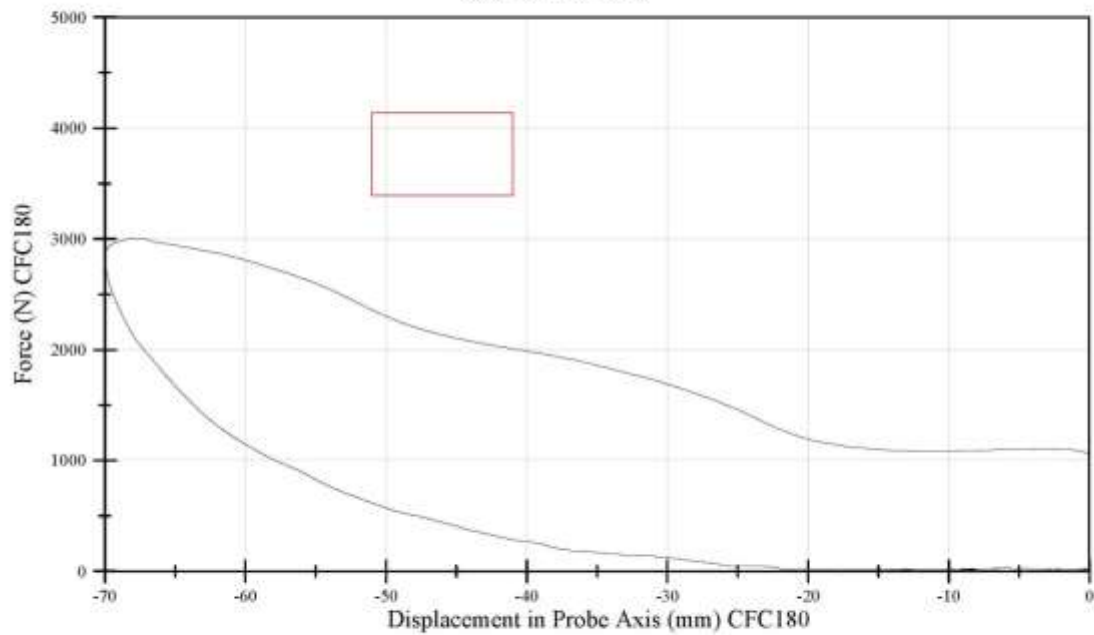


Software Version: 2.4

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

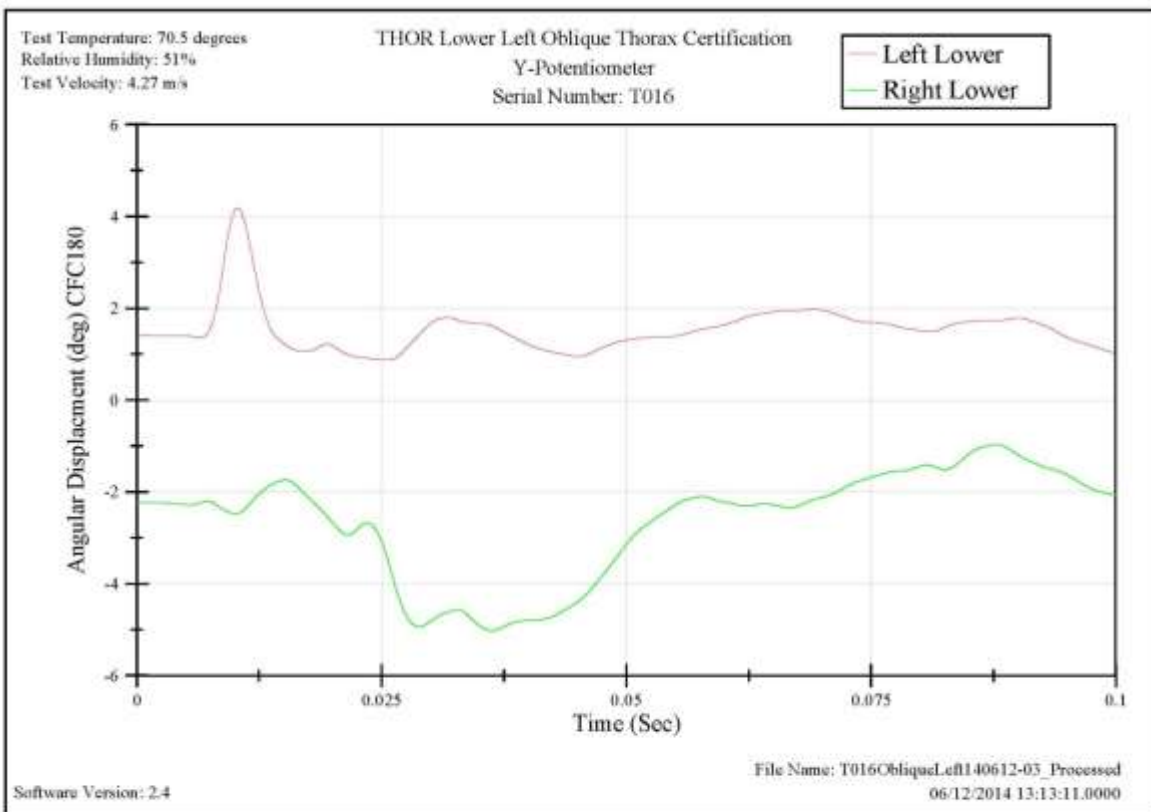
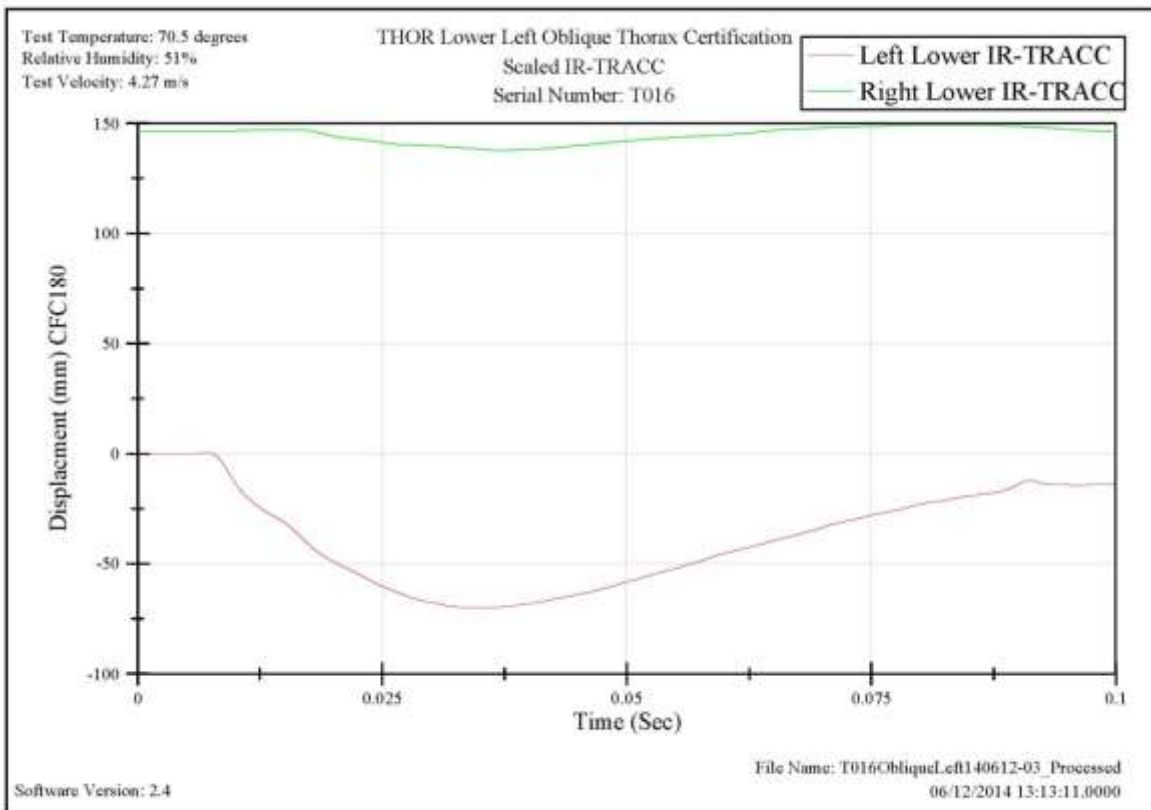
Test Temperature: 70.5 degrees
Relative Humidity: 51%
Test Velocity: 4.27 m/s

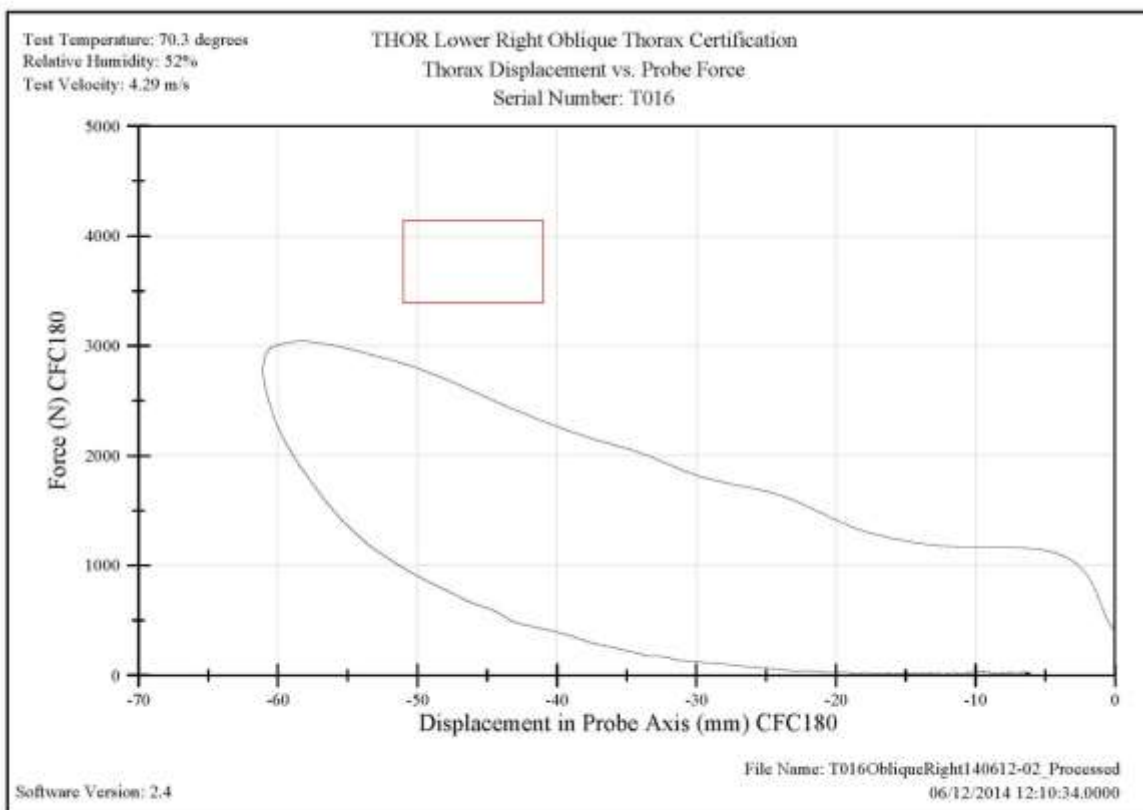
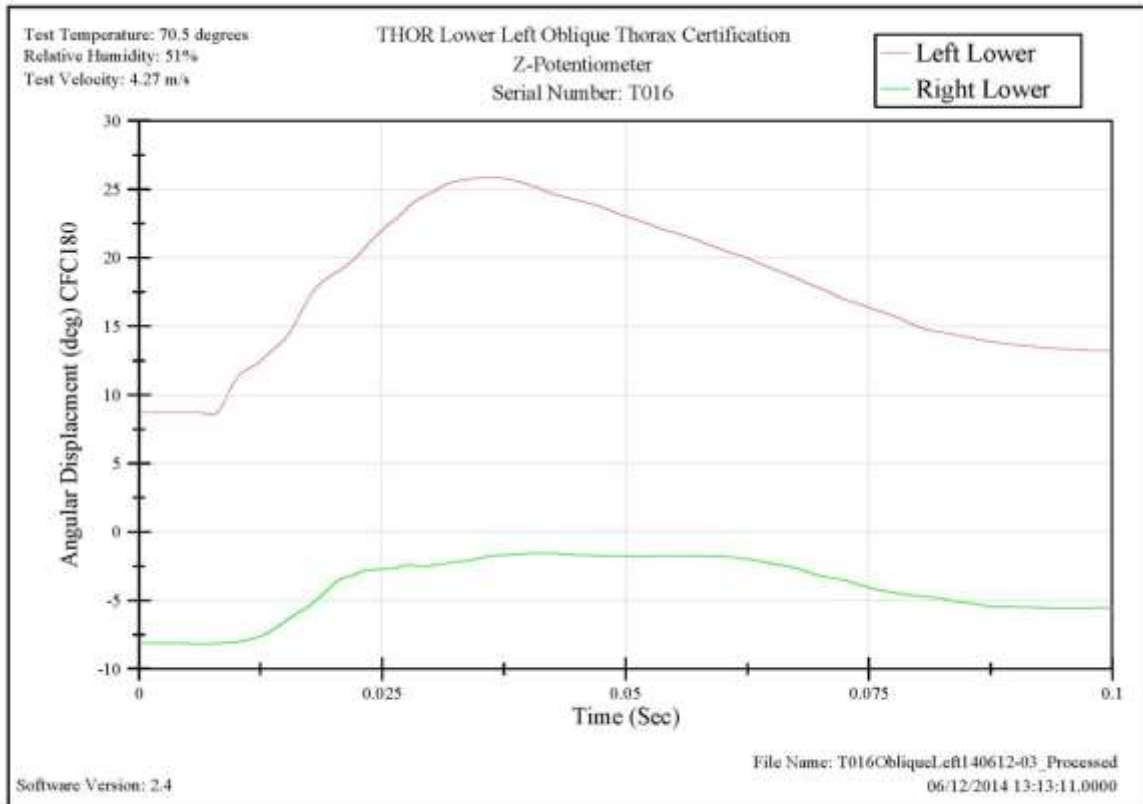
THOR Lower Left Oblique Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T016

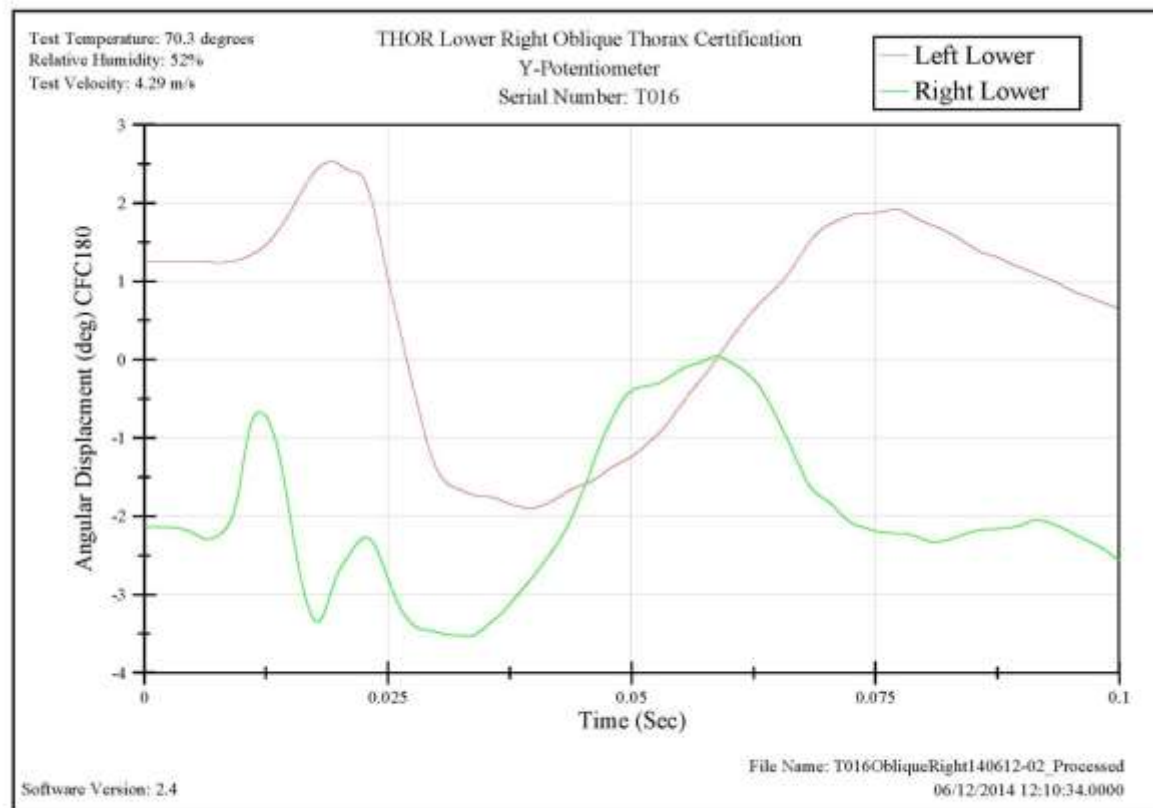
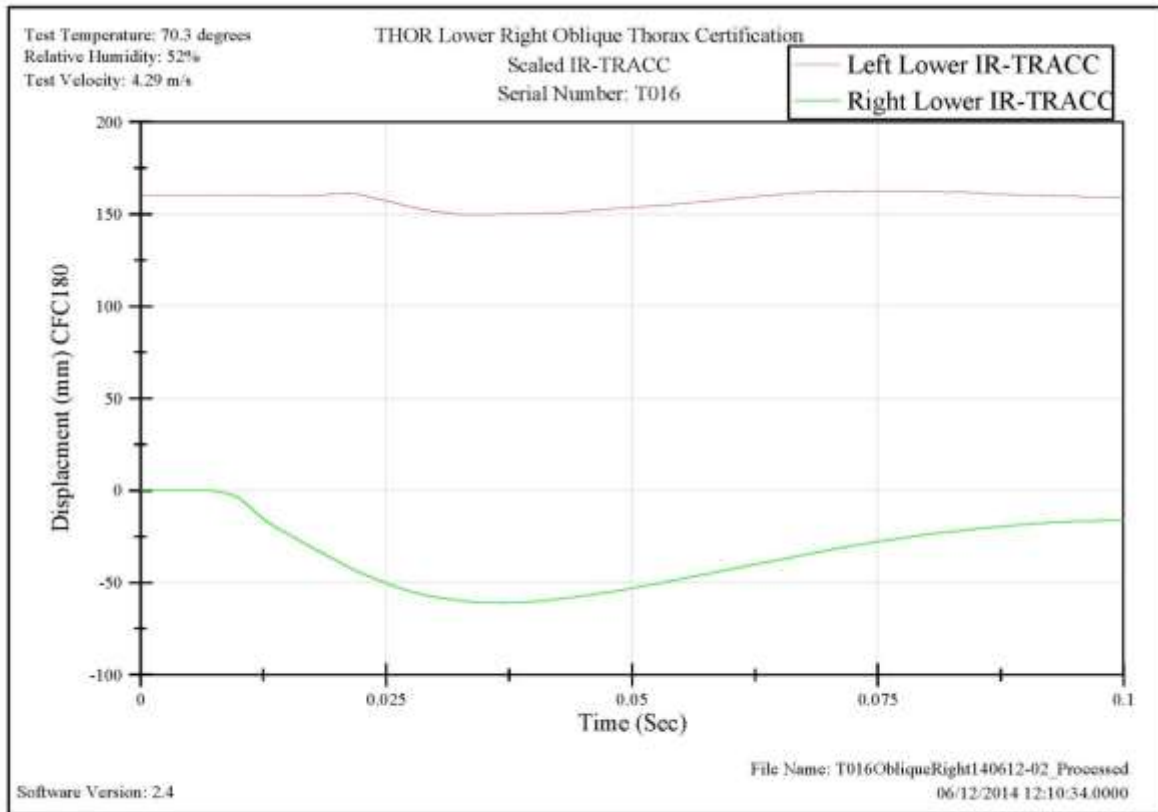


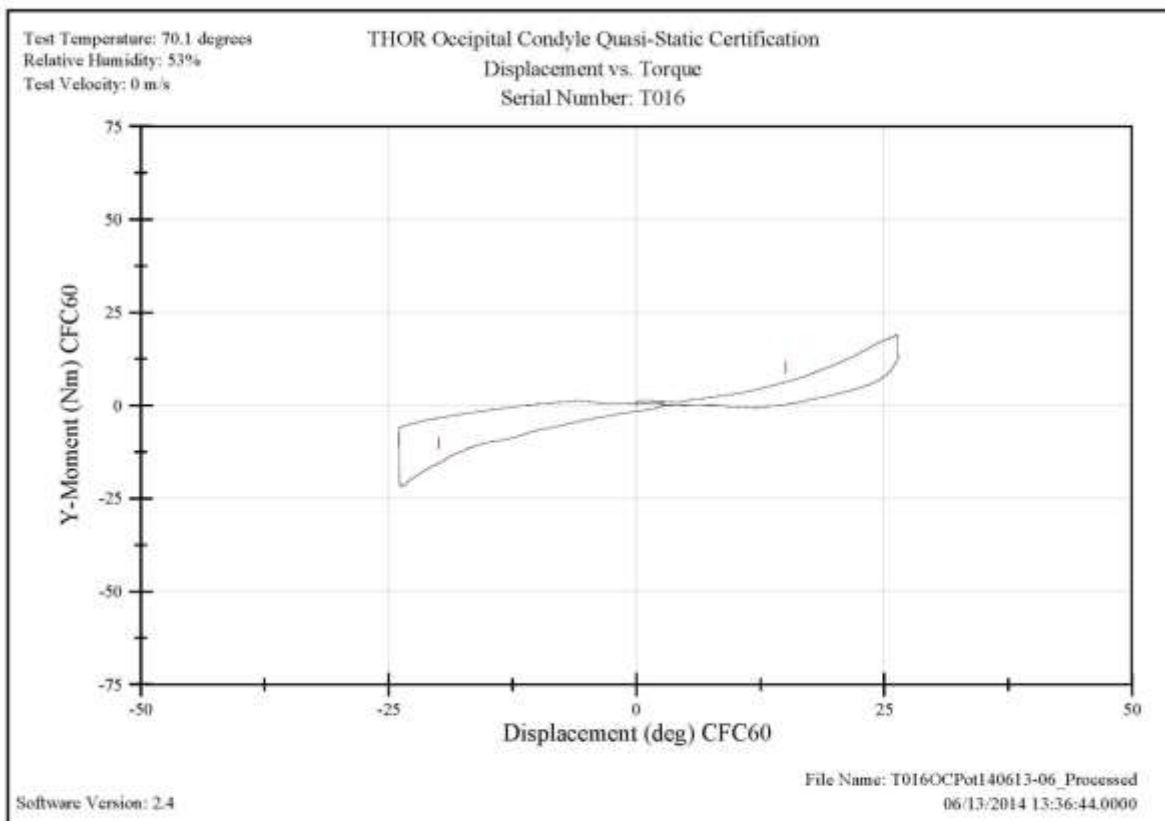
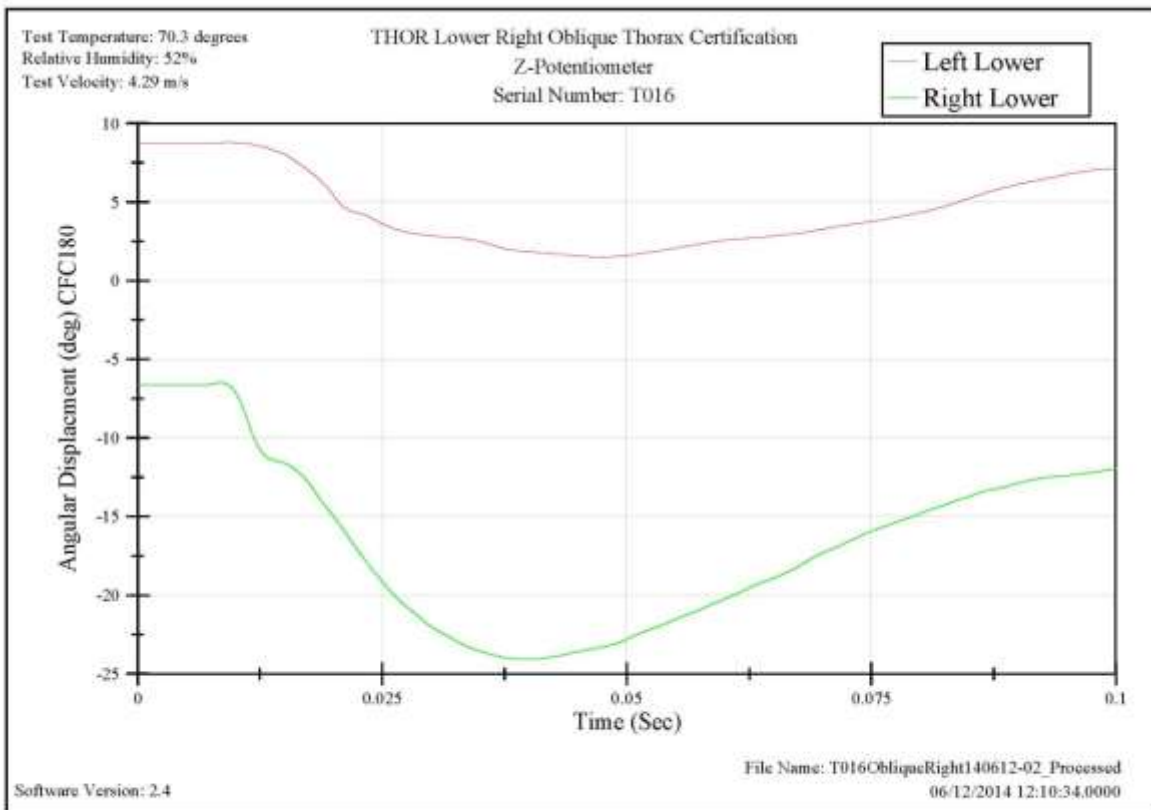
Software Version: 2.4

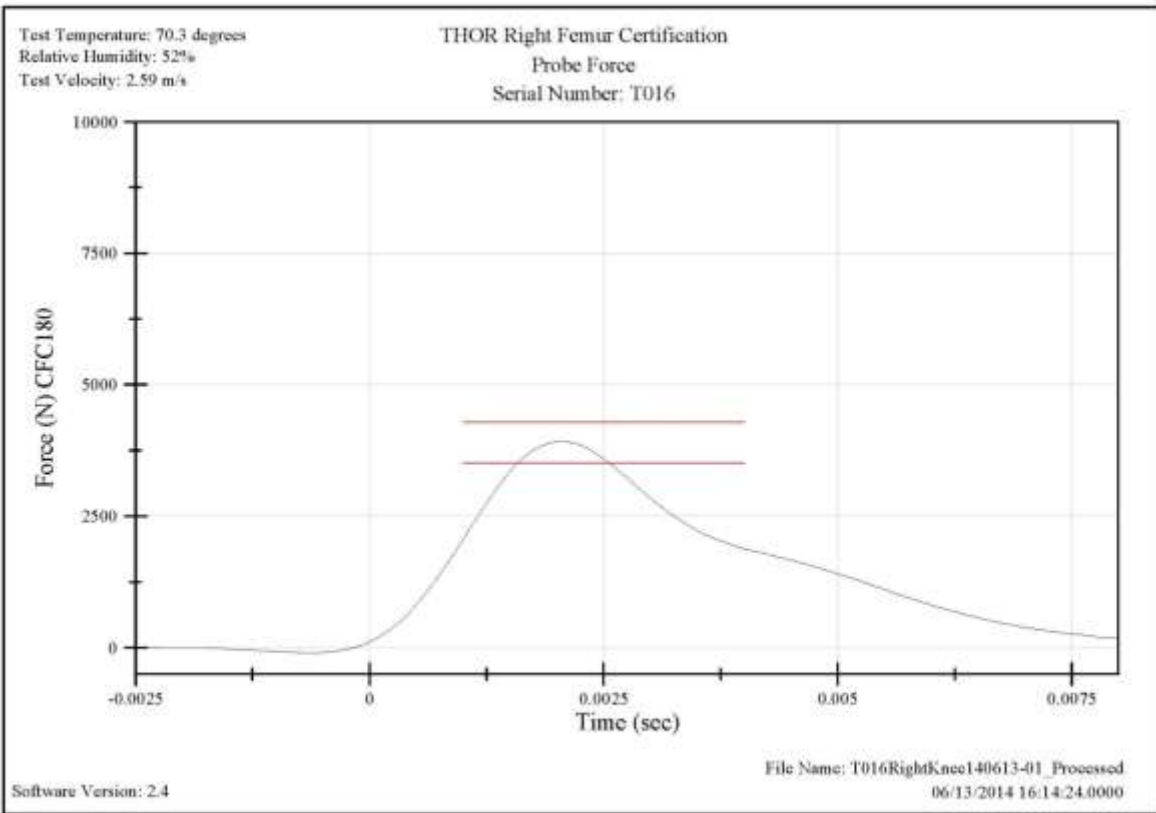
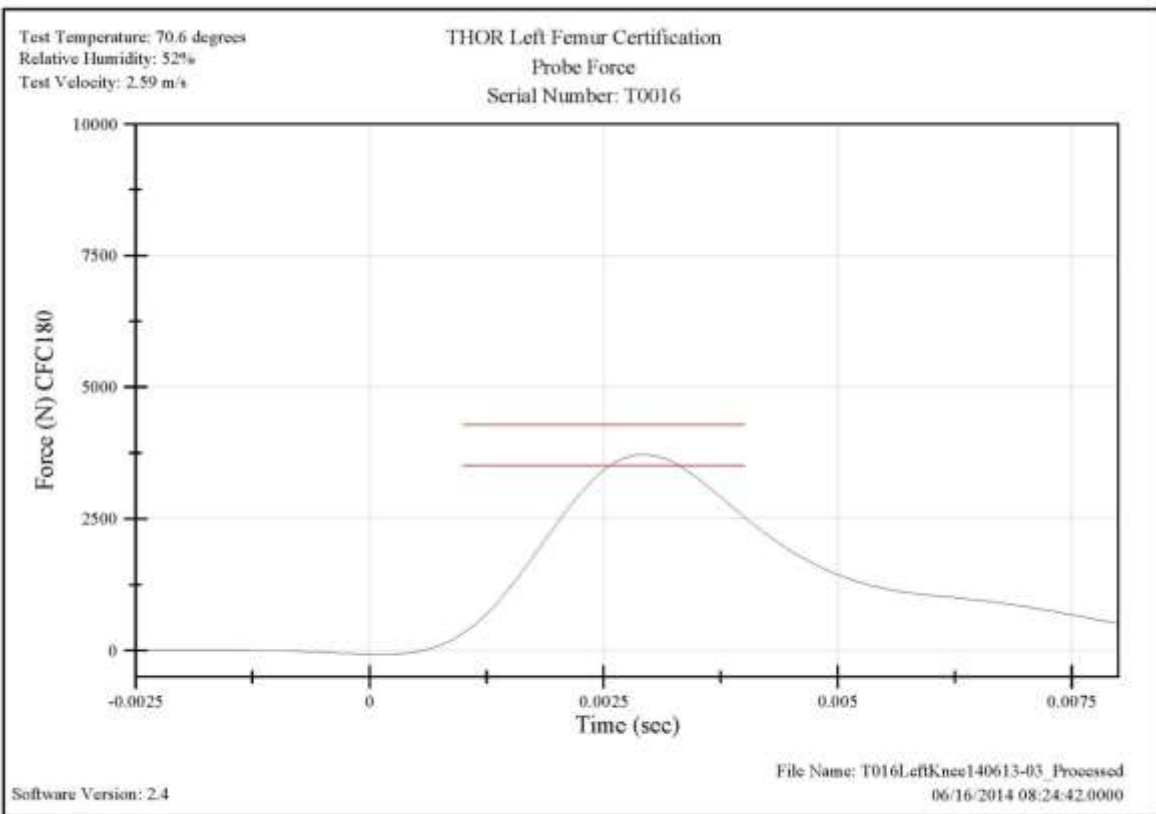
File Name: T016ObliqueLeft140612-03_Processed
06/12/2014 13:13:11.0000



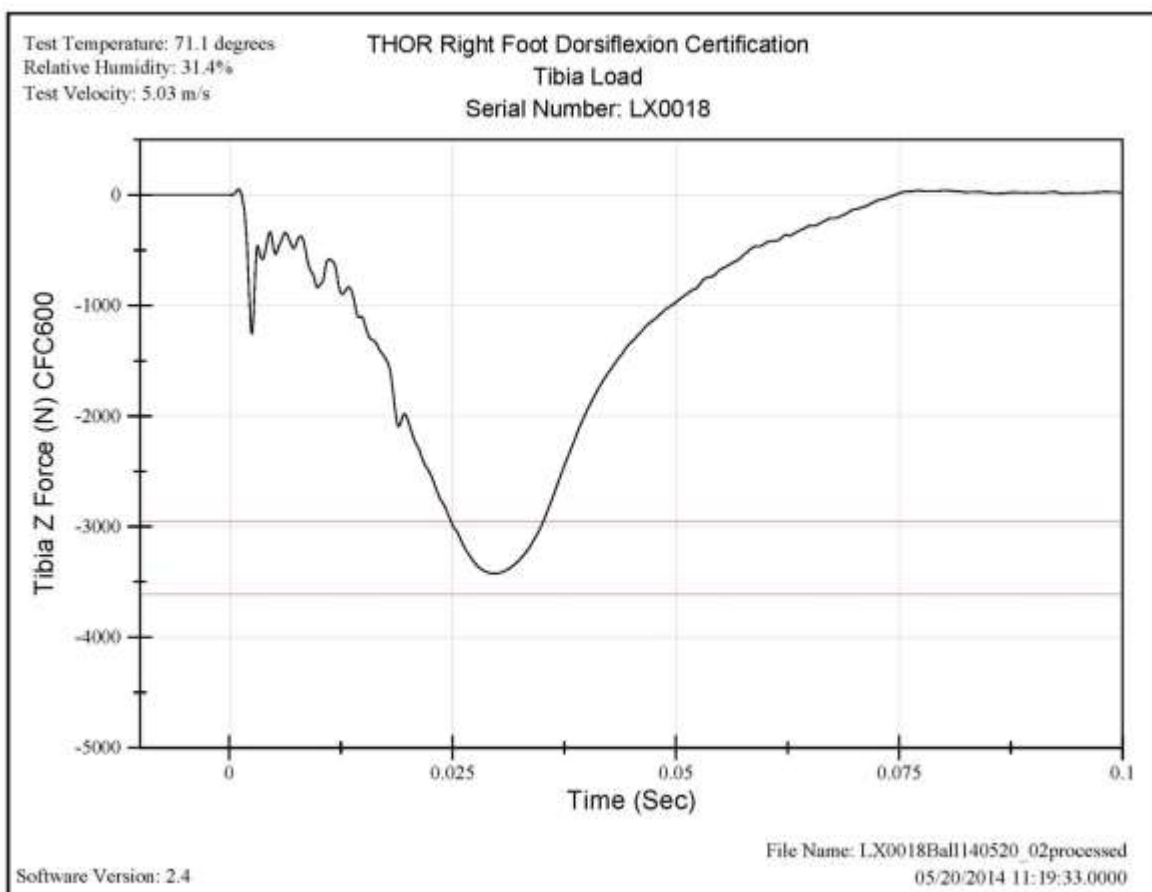
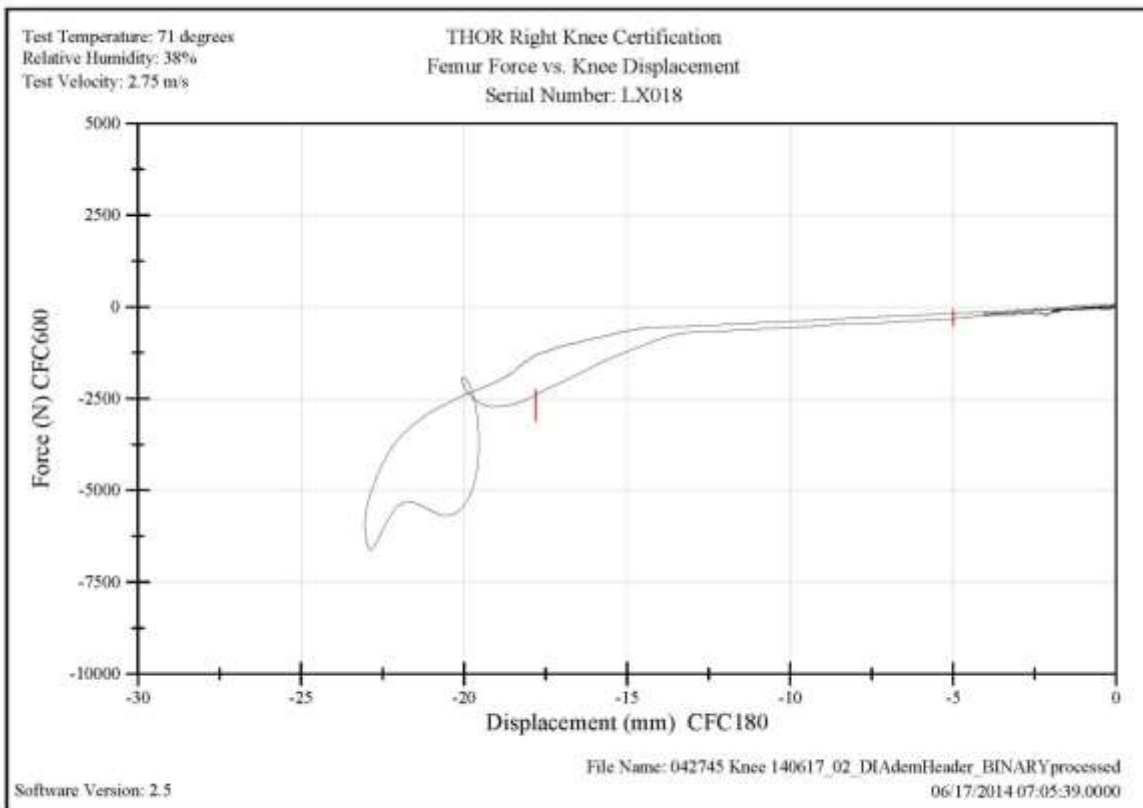






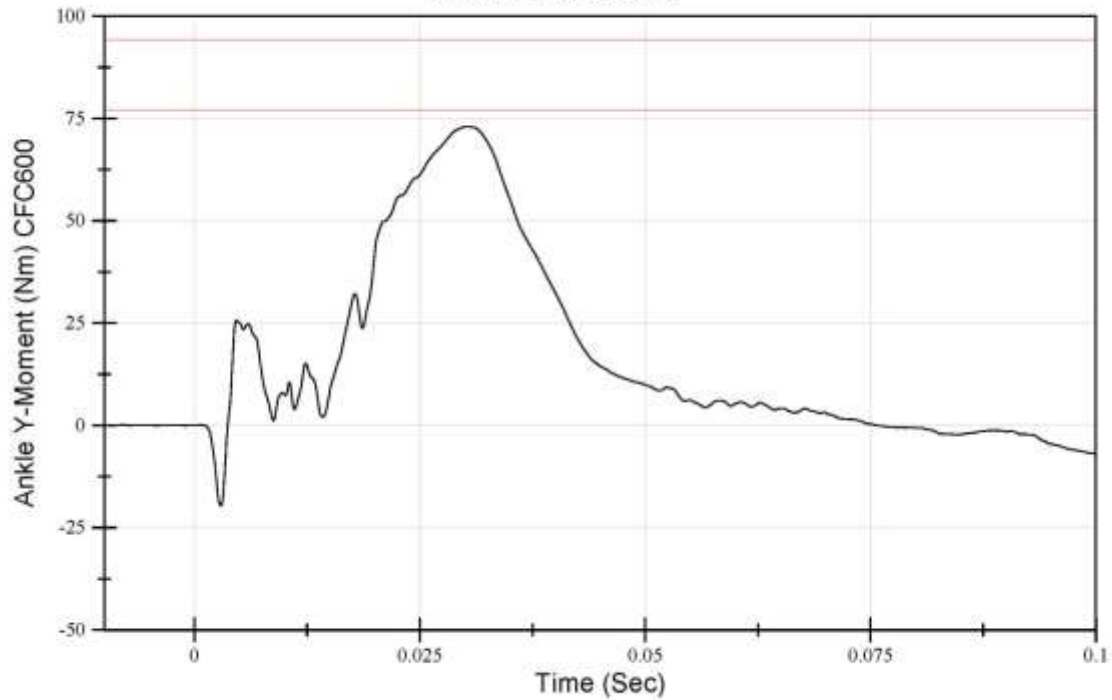


THOR 016 LEG CALIBRATIONS
LX0018/ LX0019



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

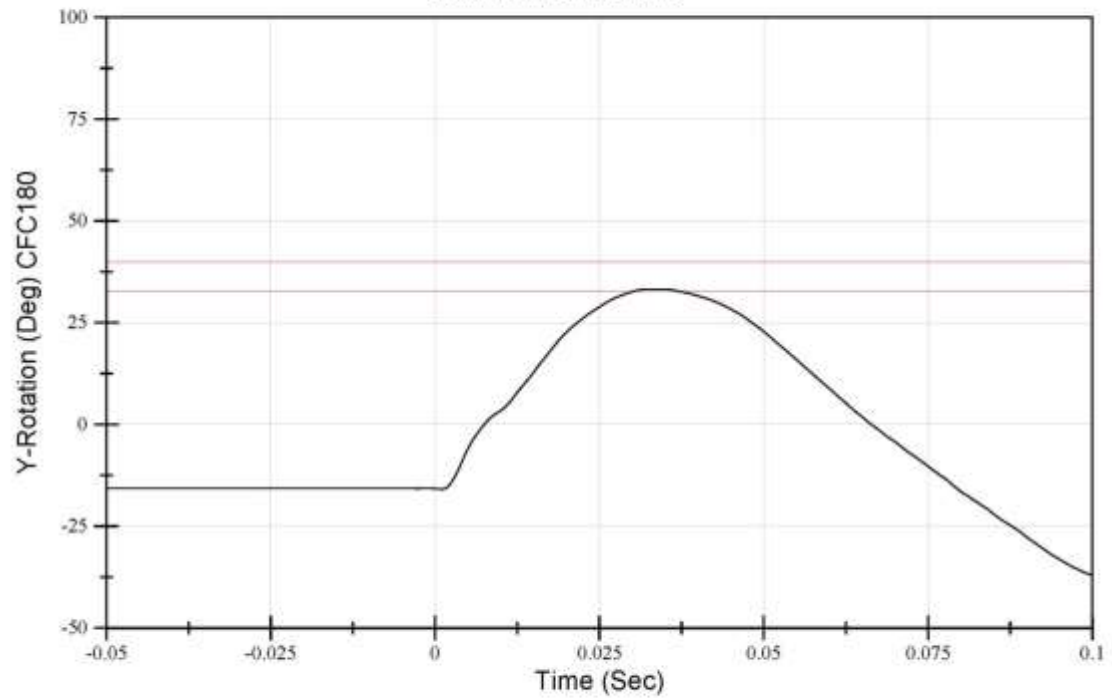


Software Version: 2.4

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

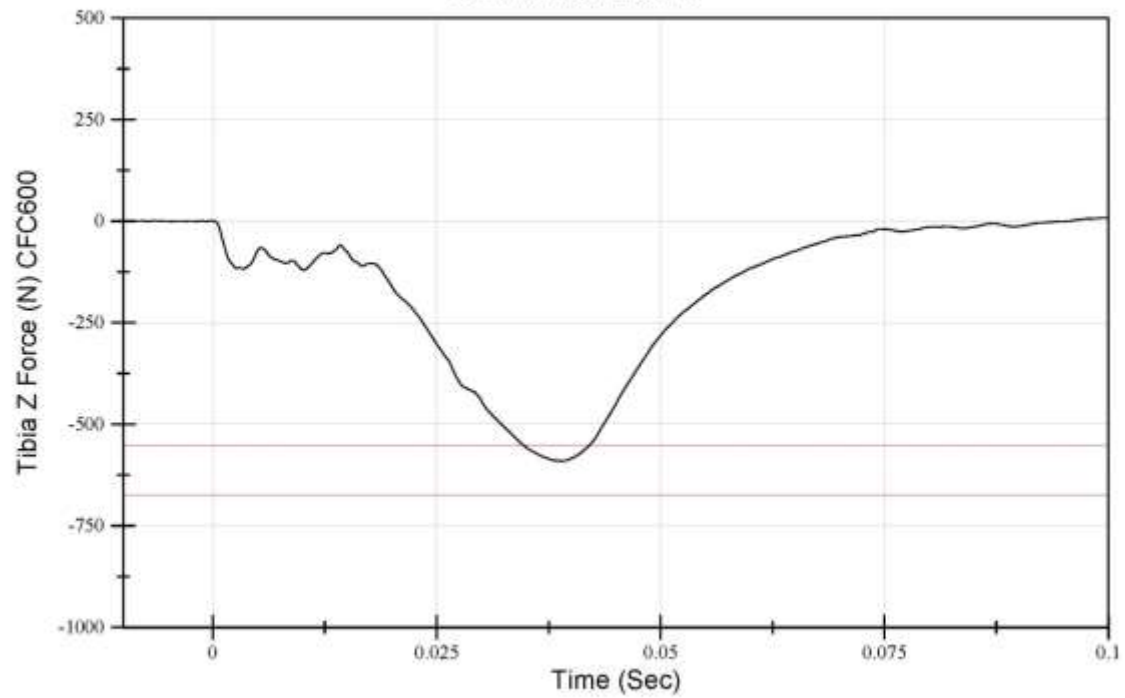


Software Version: 2.4

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

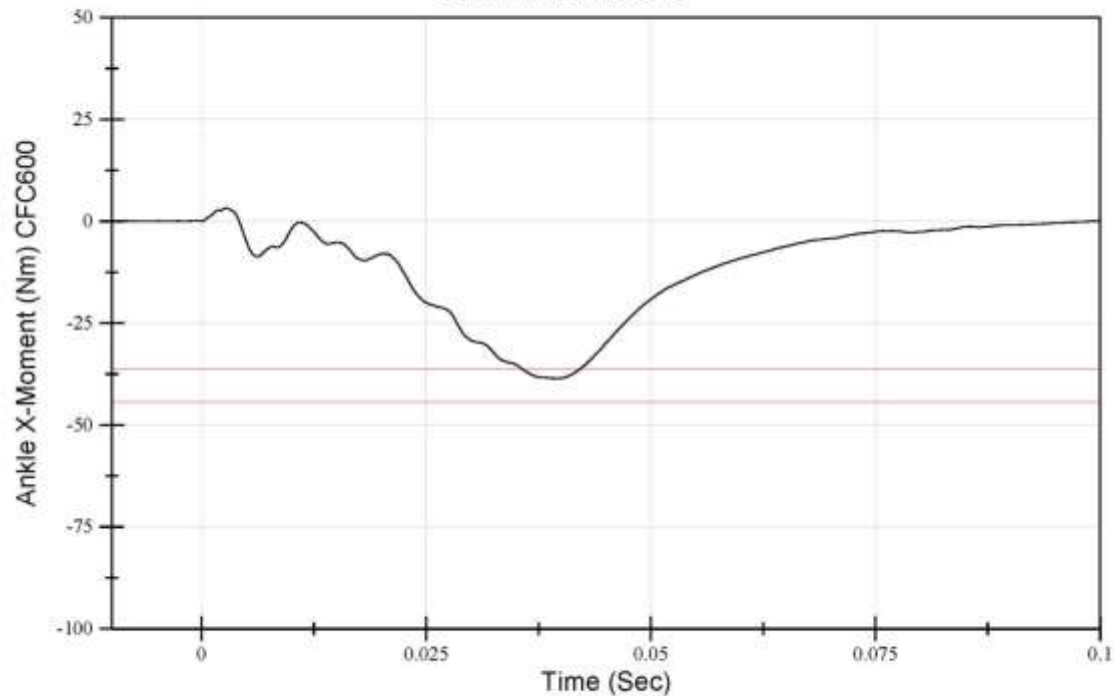


Software Version: 2.4

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

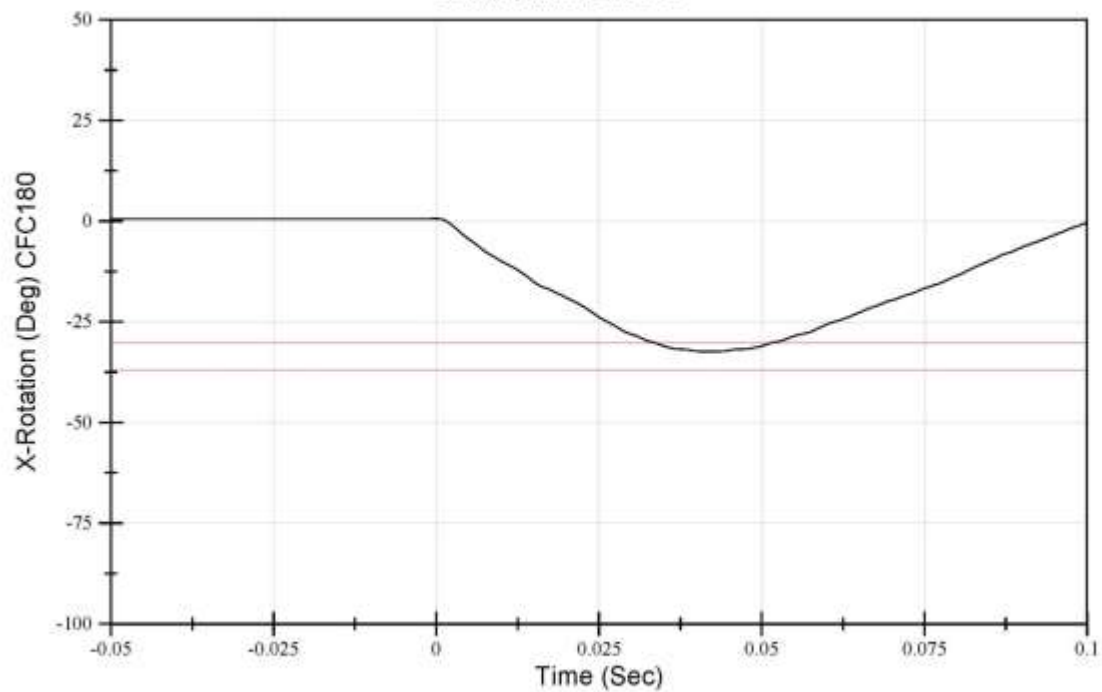


Software Version: 2.4

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

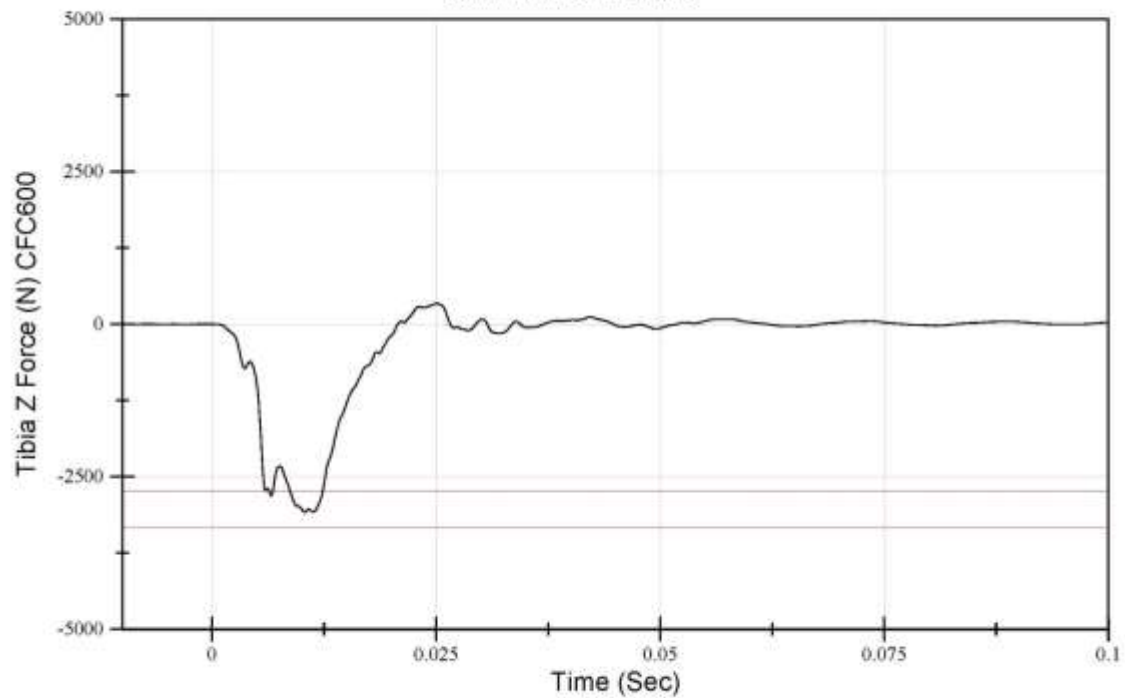


Software Version: 2.4

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

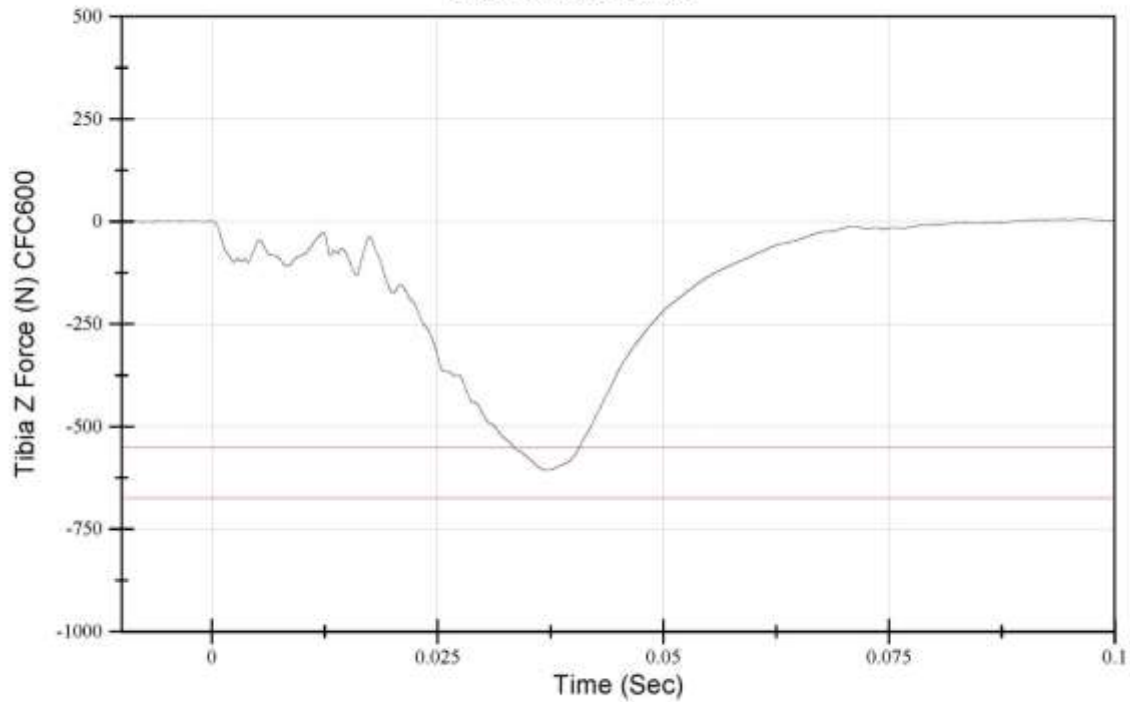


Software Version: 2.4

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

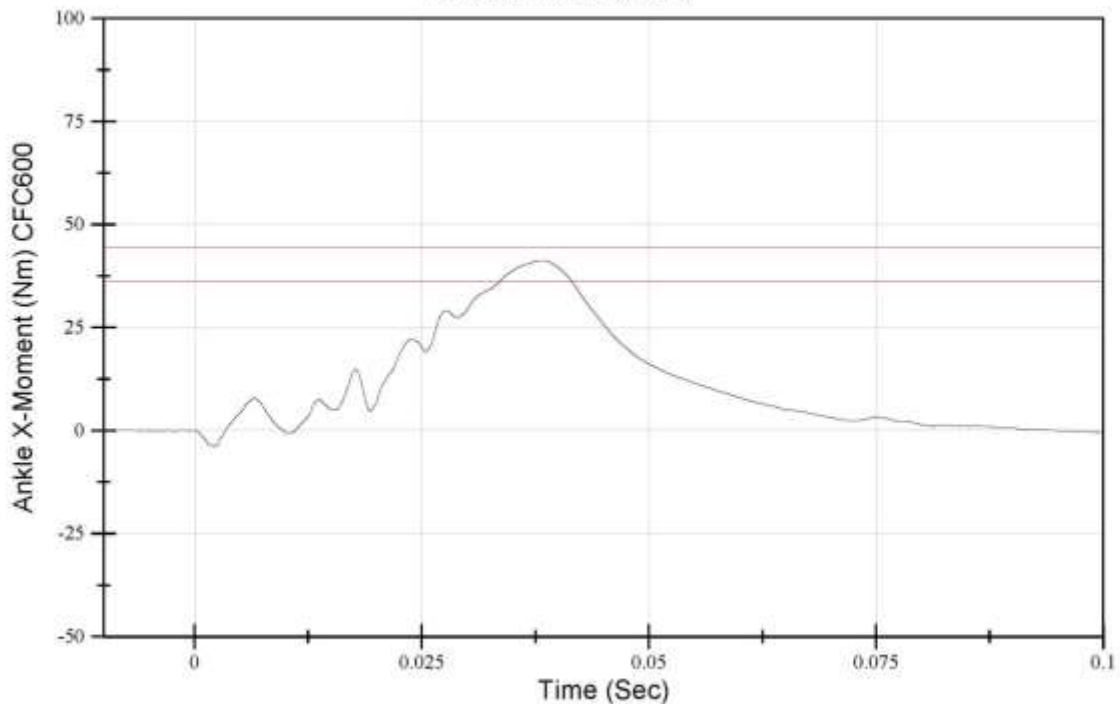


Software Version: 2.4

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

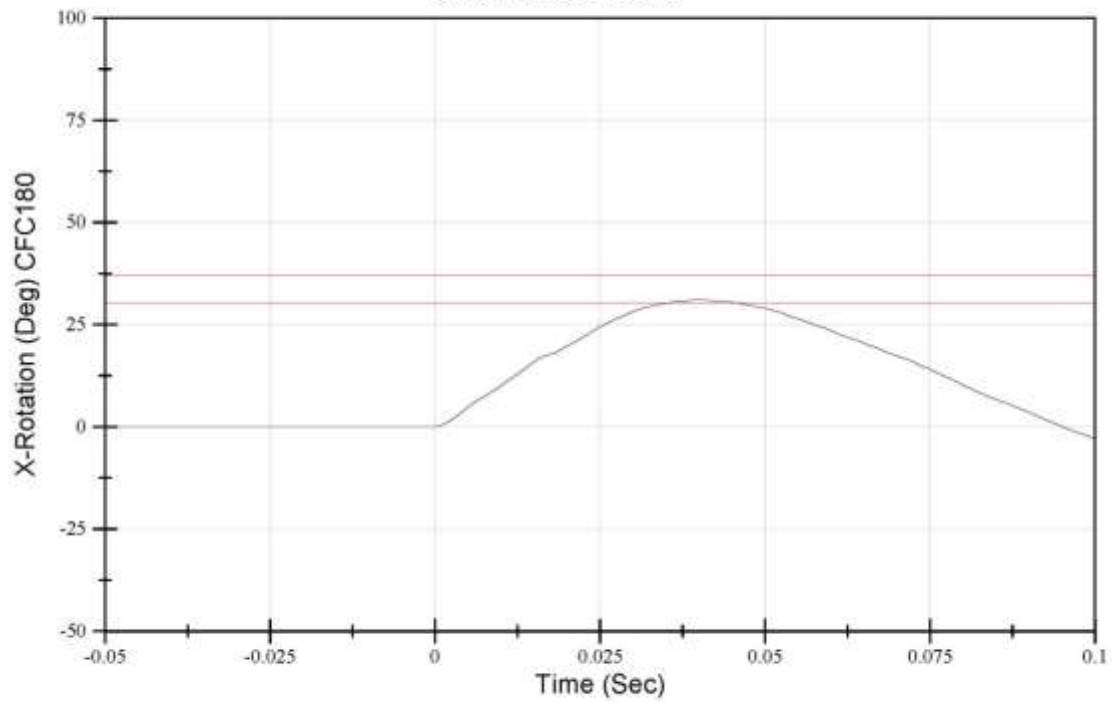


Software Version: 2.4

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

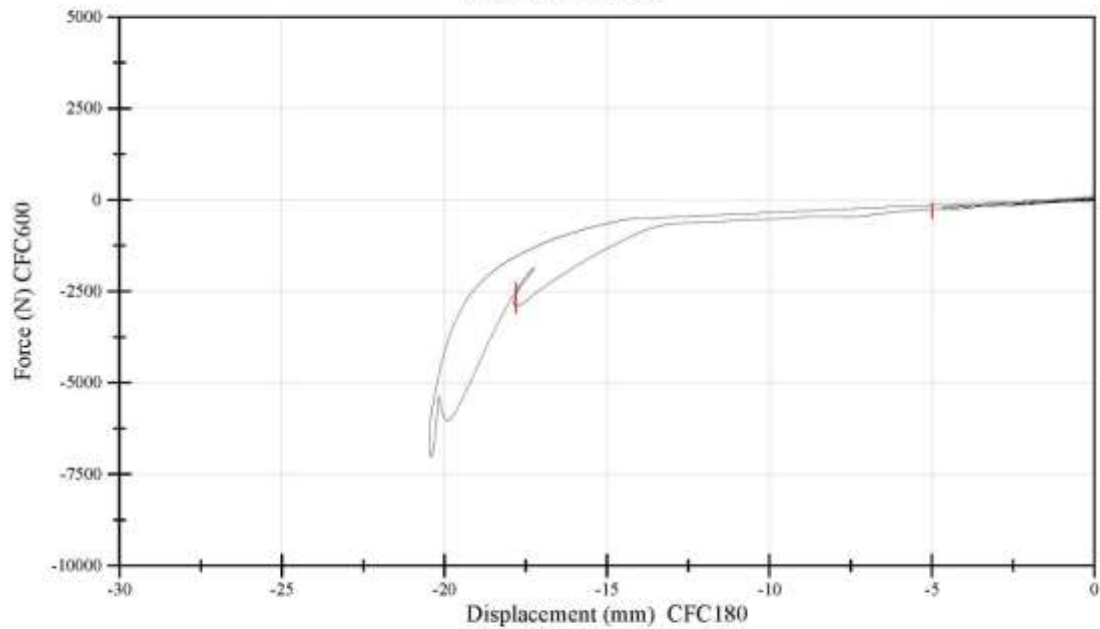


Software Version: 2.4

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

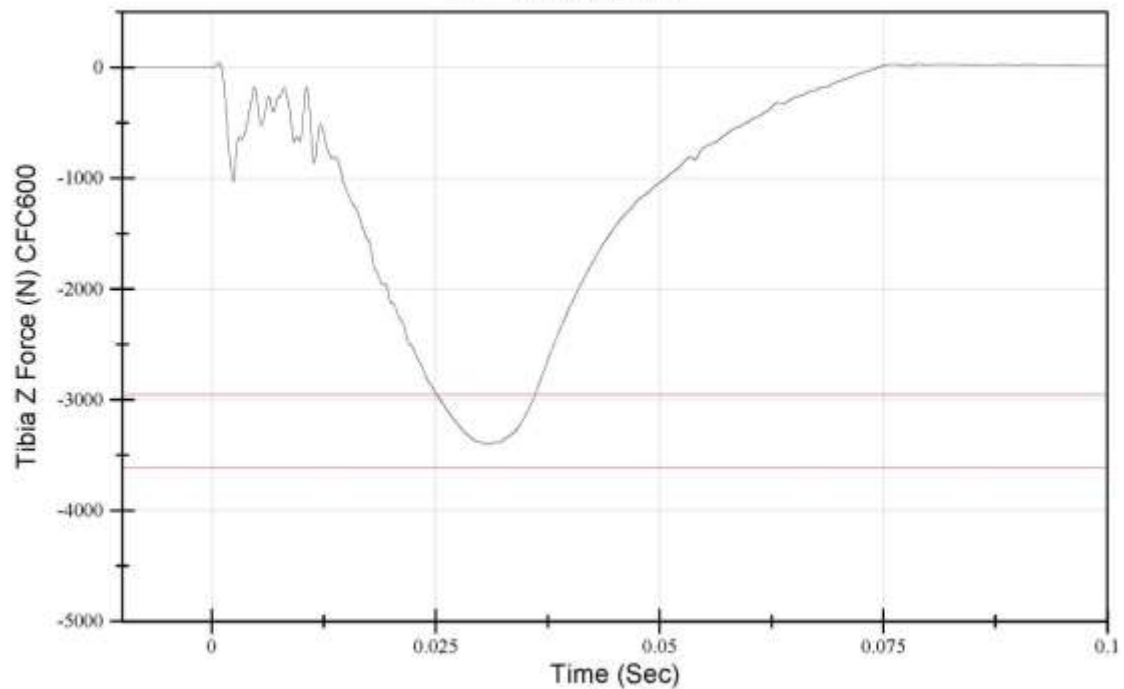


Software Version: 2.5

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

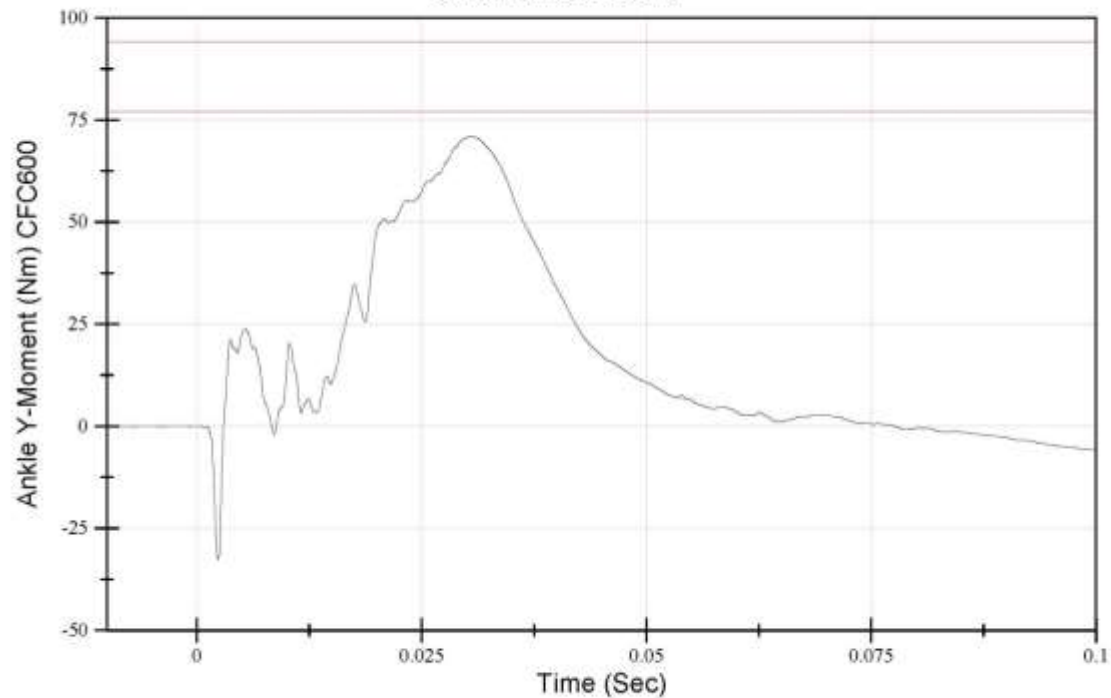


Software Version: 2.4

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

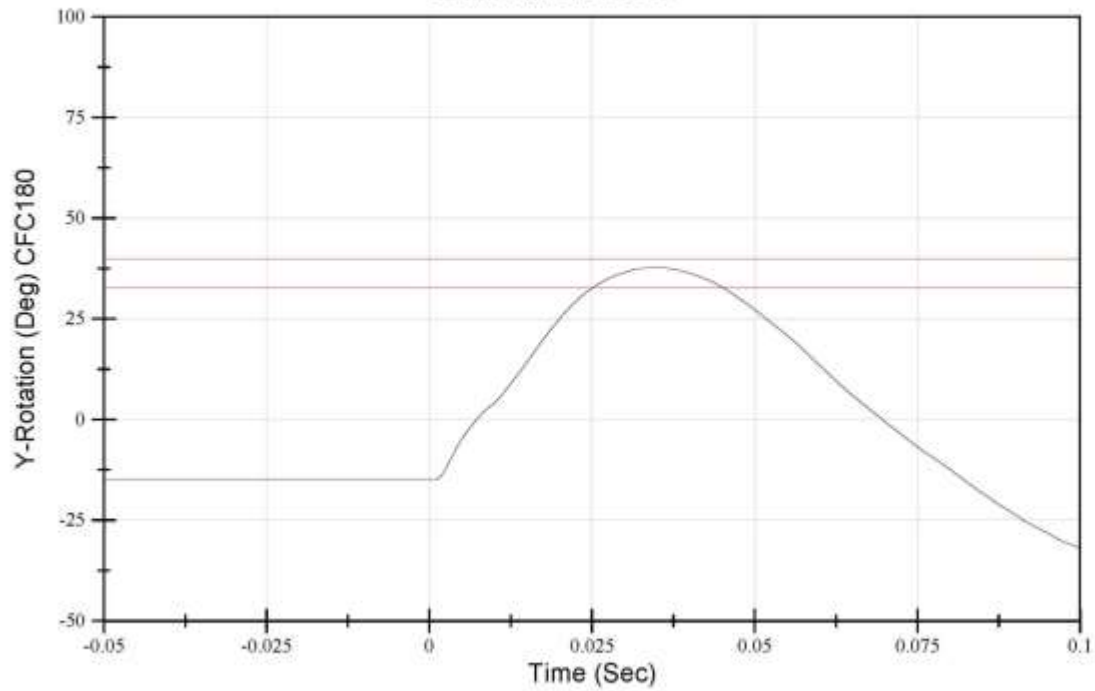


Software Version: 2.4

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

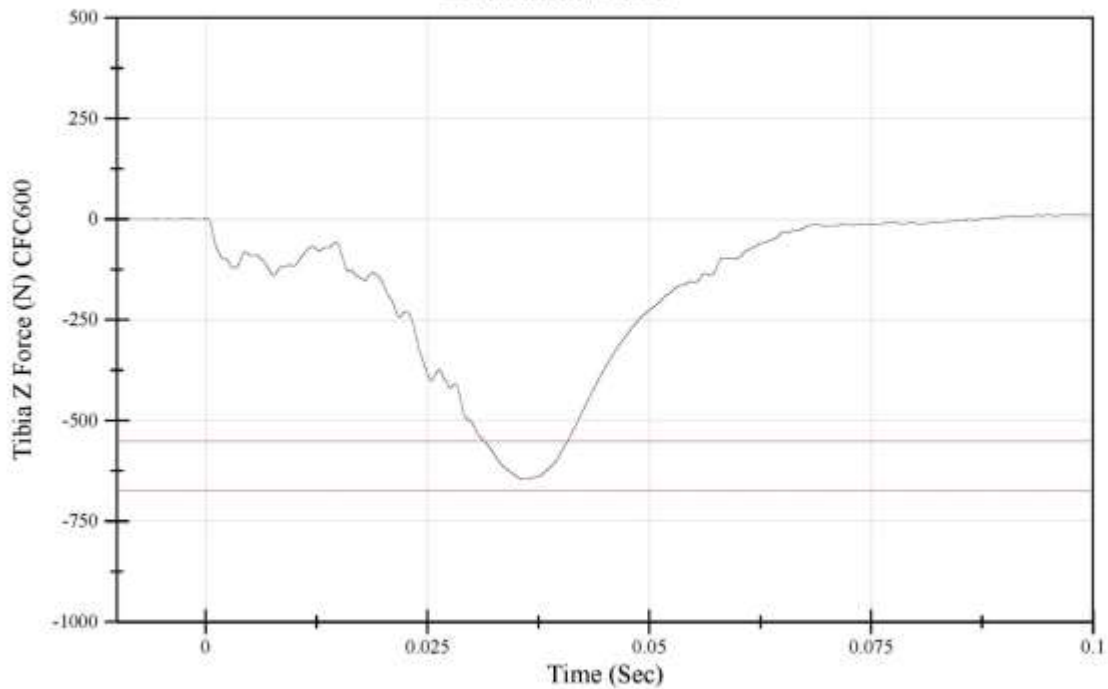


Software Version: 2.4

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

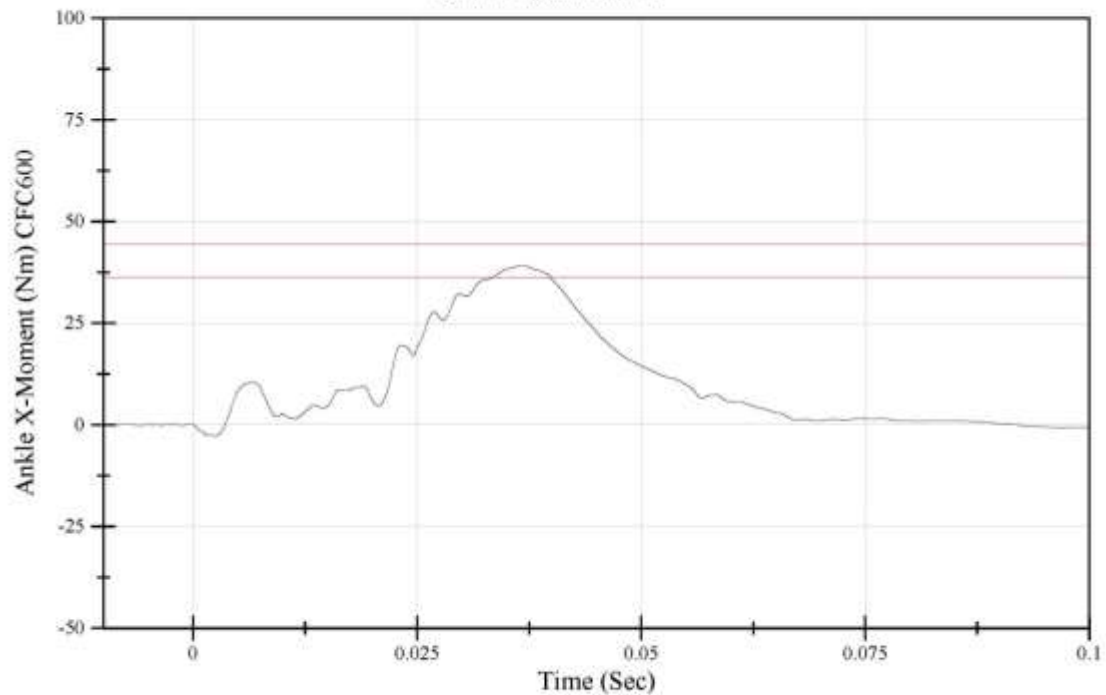


Software Version: 2.4

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

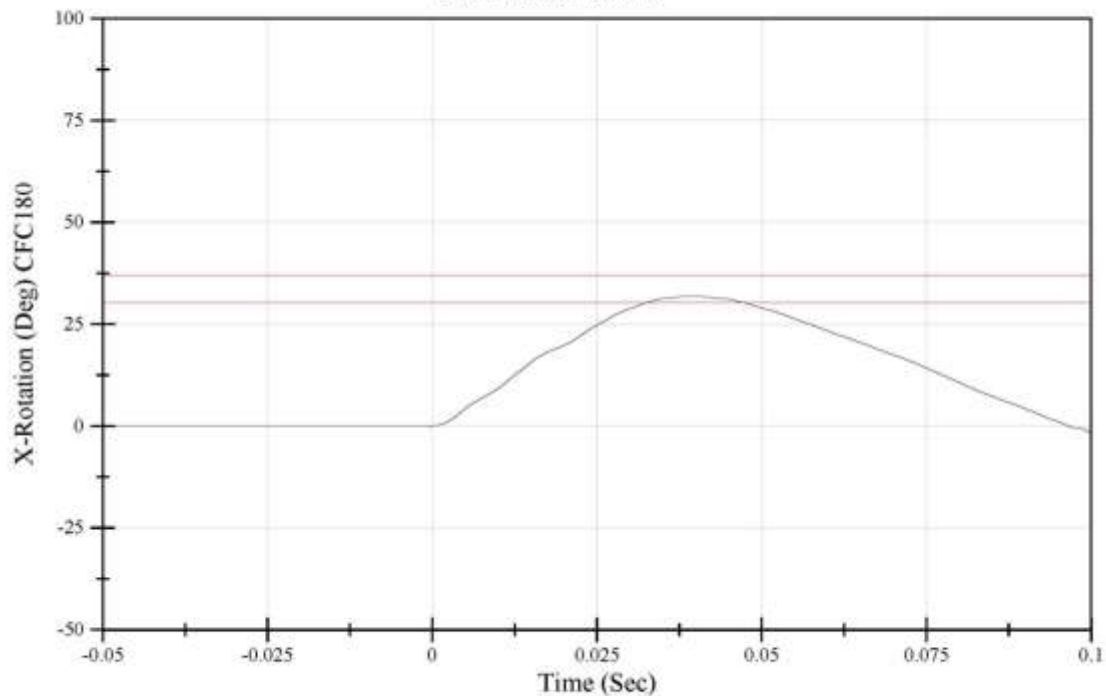


Software Version: 2.4

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

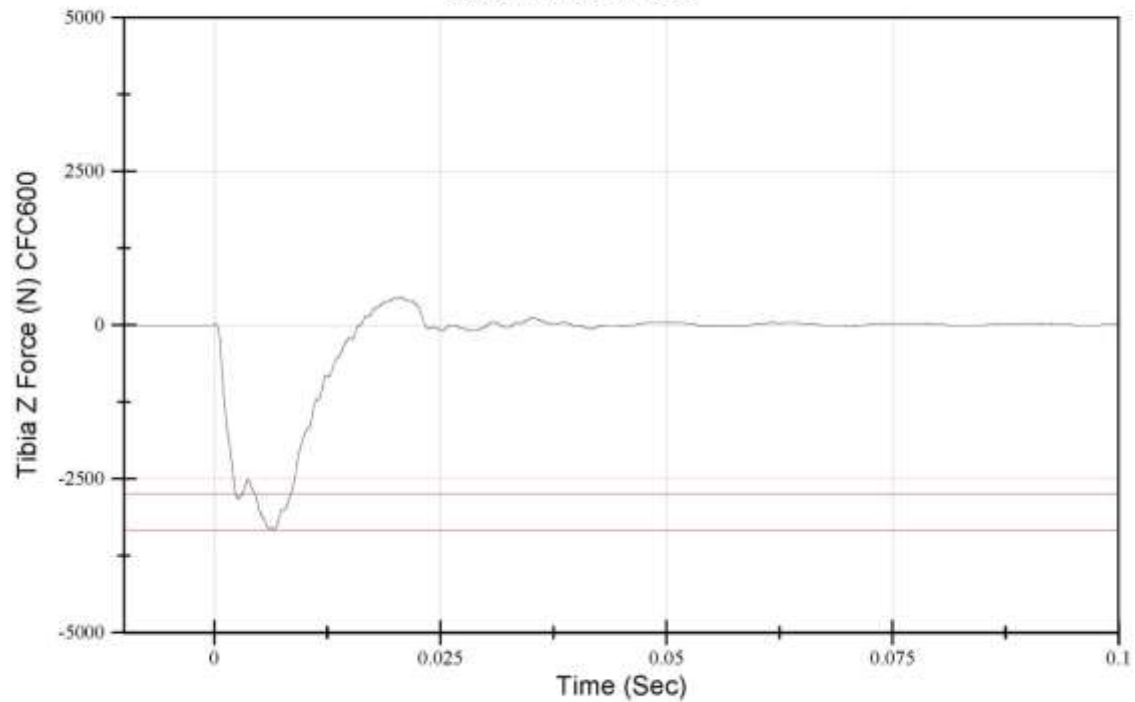


Software Version: 2.4

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

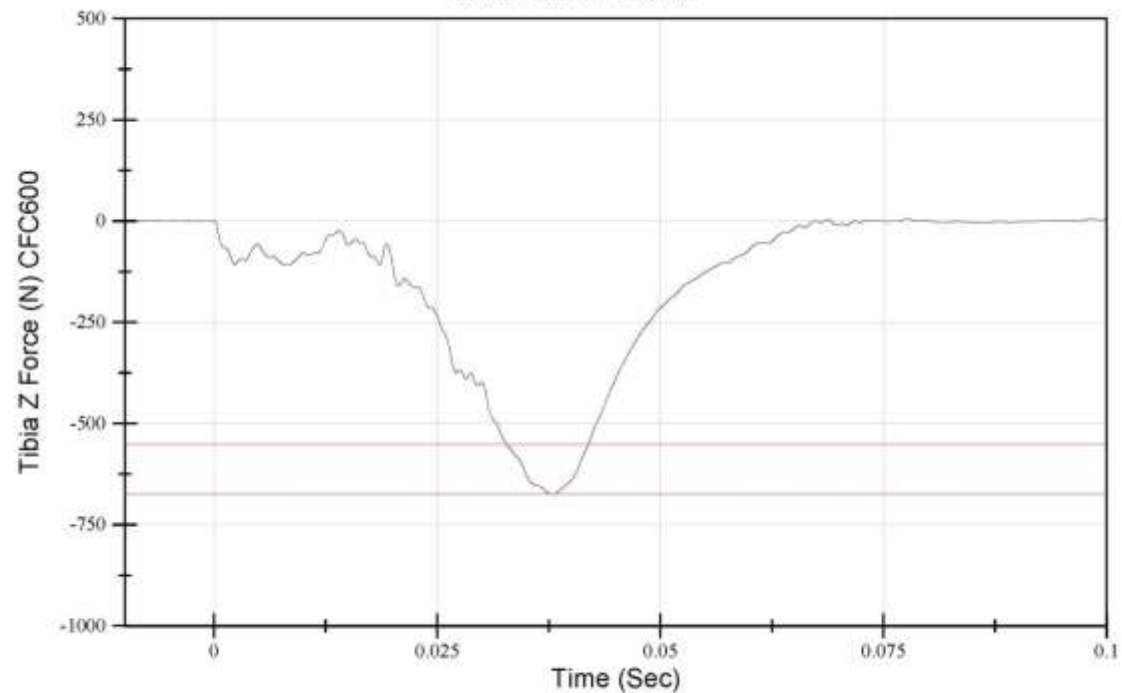


Software Version: 2.4

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

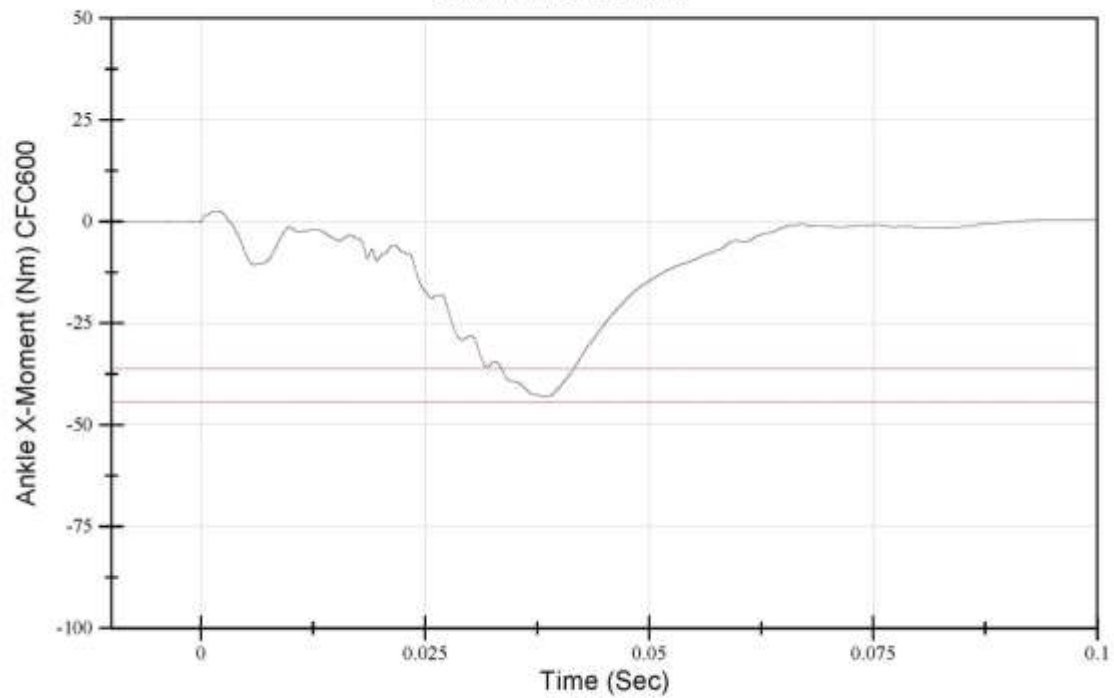


Software Version: 2.4

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

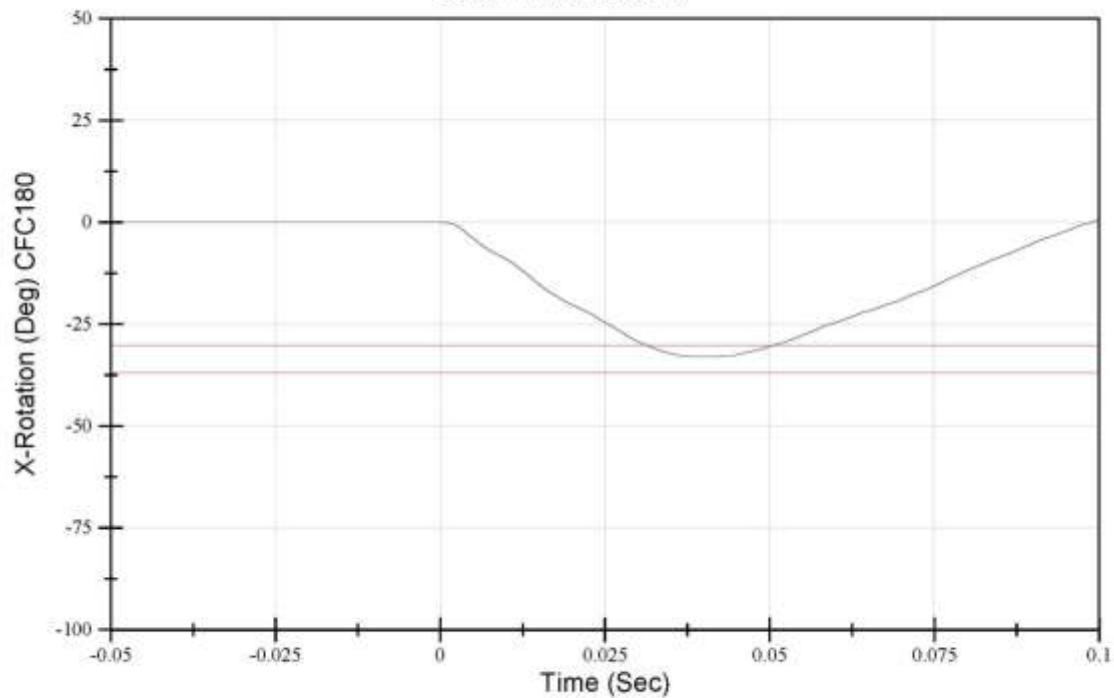


Software Version: 2.4

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

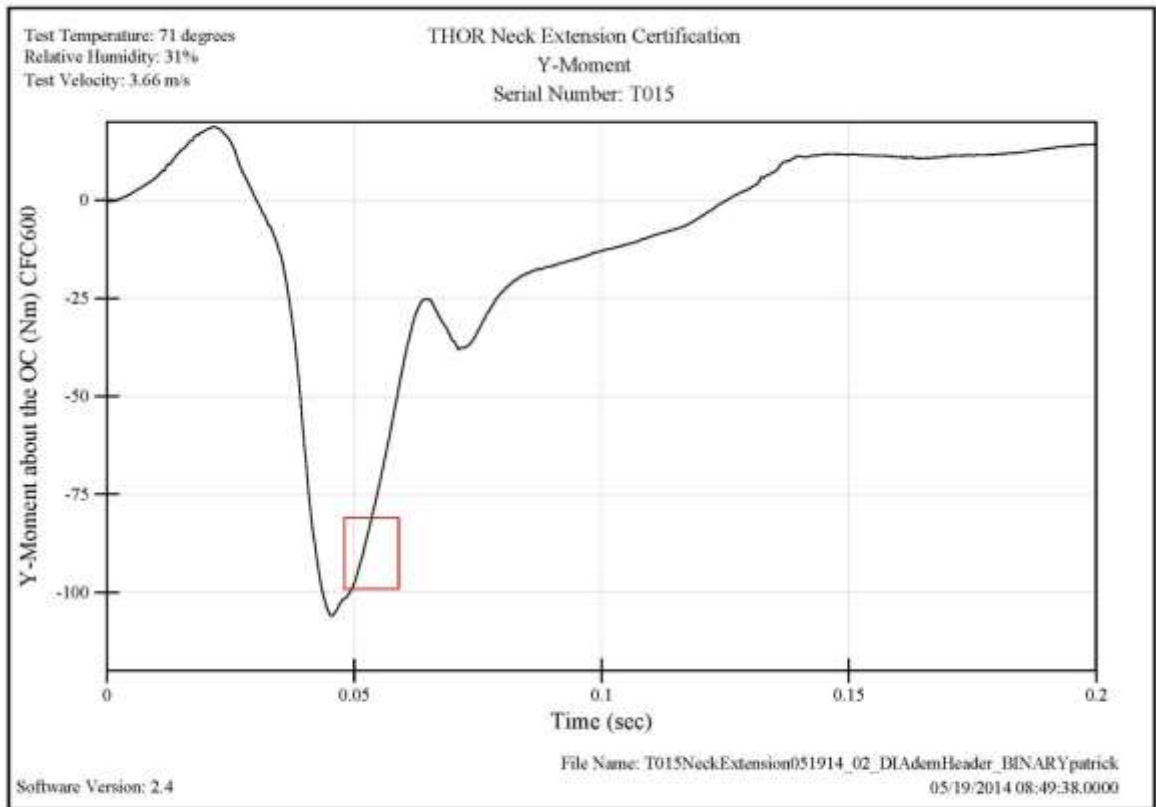
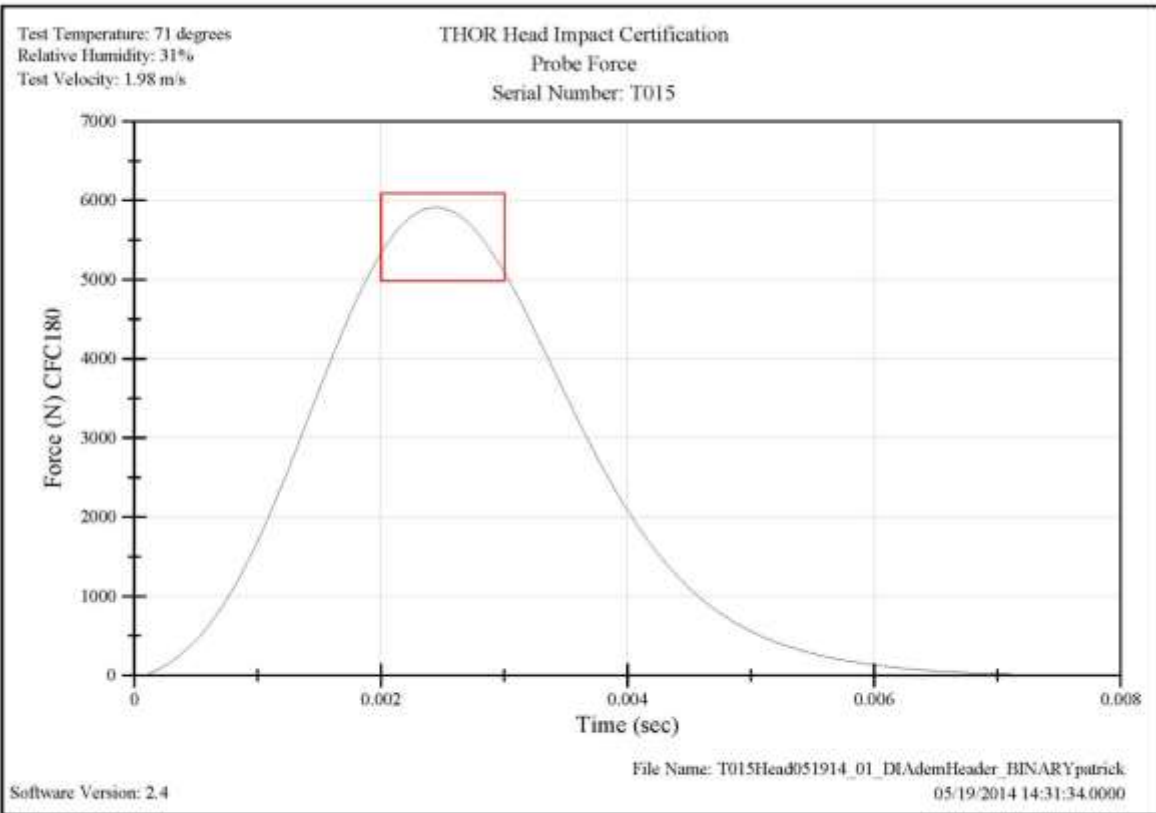
THOR Left Foot Inversion Certification
Ankle X-Rotation
Serial Number: LX0019



Software Version: 2.4

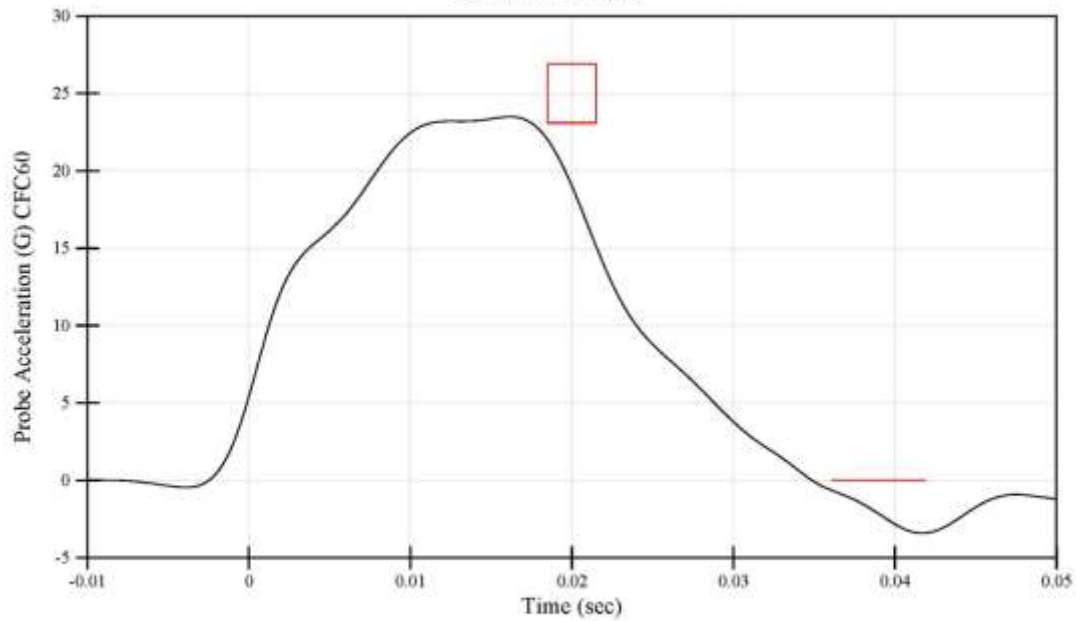
File Name: LX0019Inversion140521_03processed
05/21/2014 08:53:35.0000

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

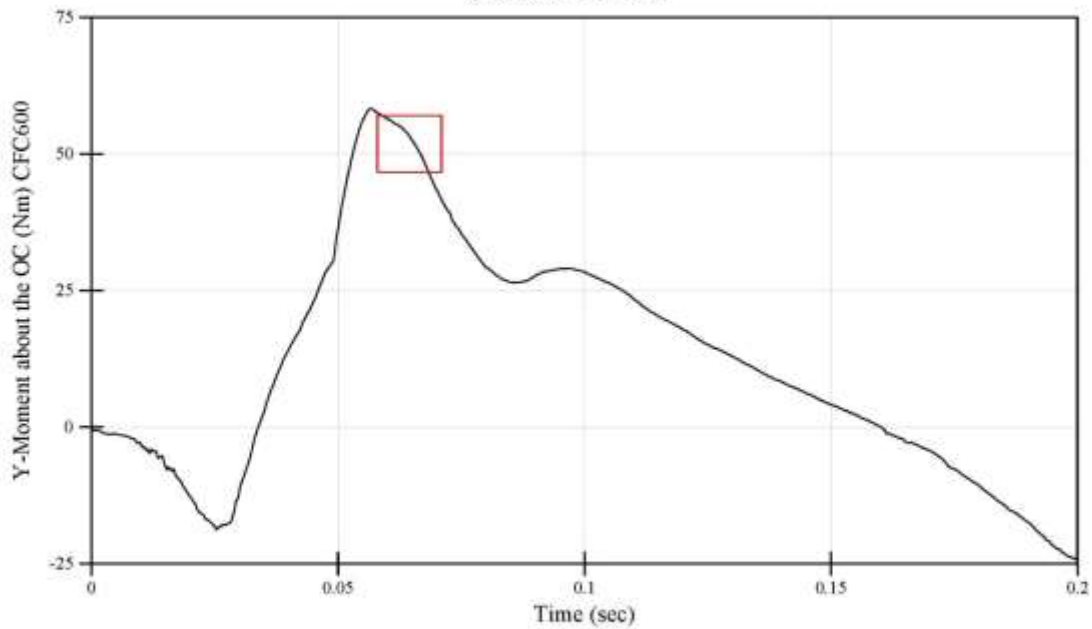


Software Version: 2.4

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

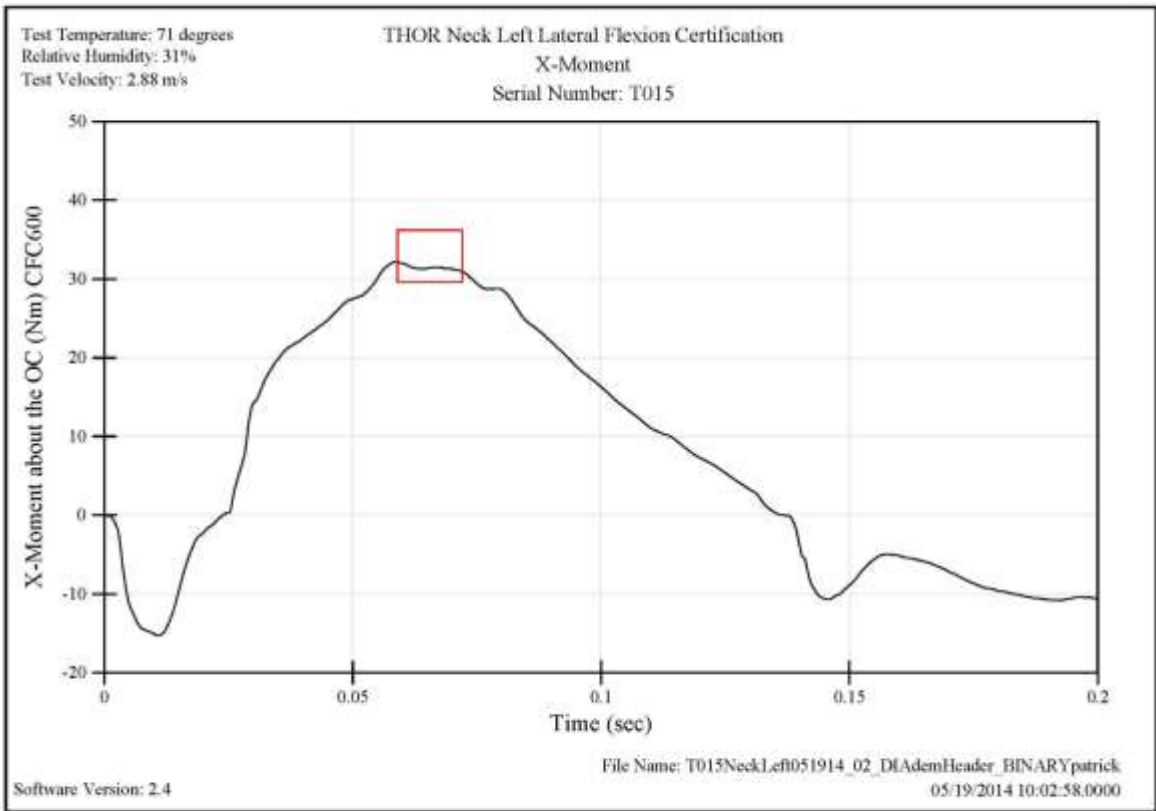
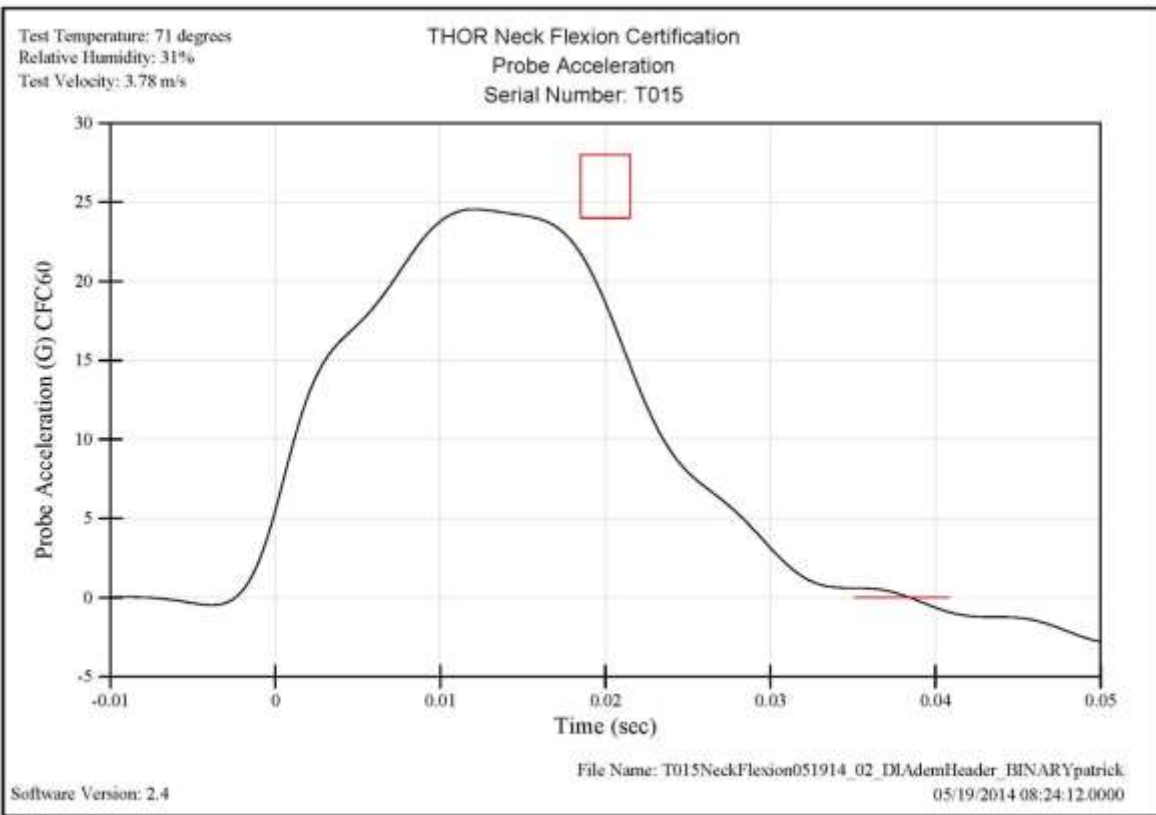
Test Temperature: 71 degrees
Relative Humidity: 31%
Test Velocity: 3.78 m/s

THOR Neck Flexion Certification
Y-Moment
Serial Number: T015



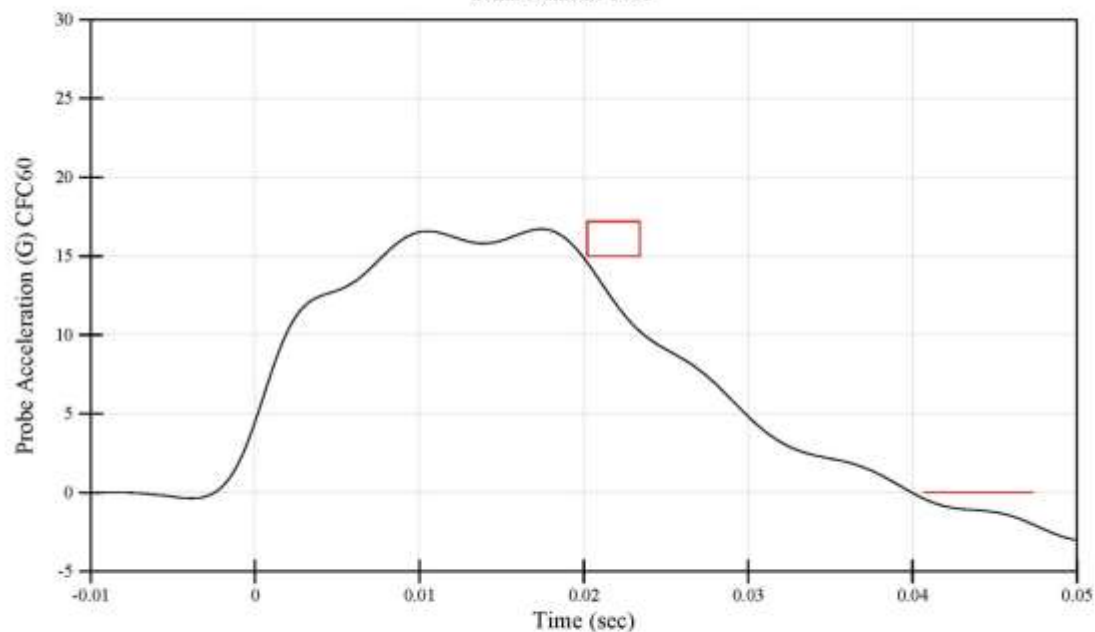
Software Version: 2.4

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

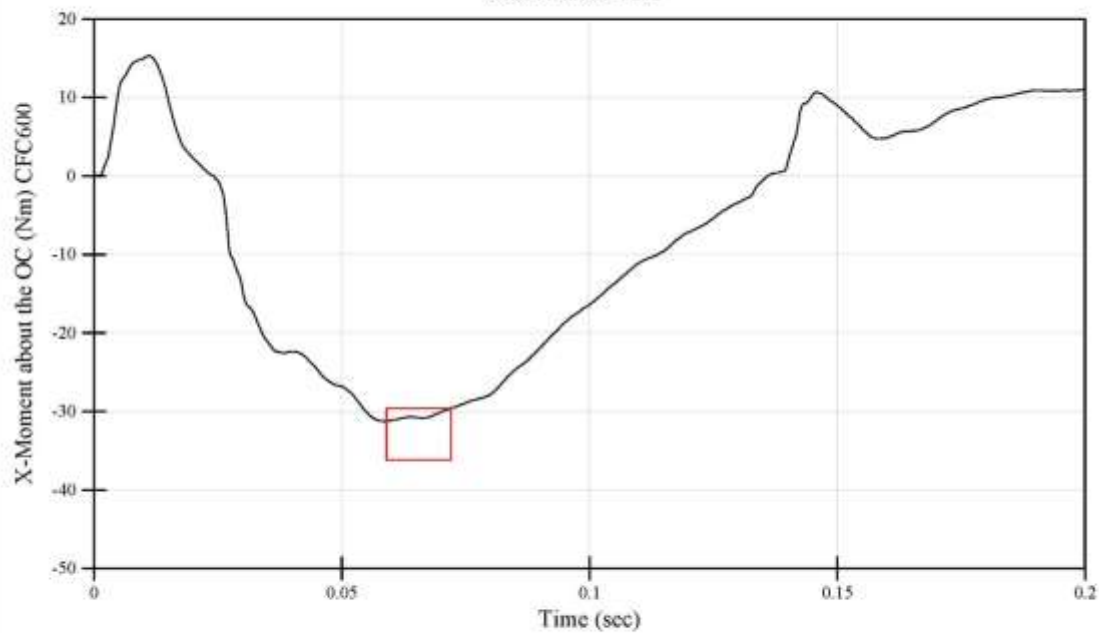


Software Version: 2.4

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

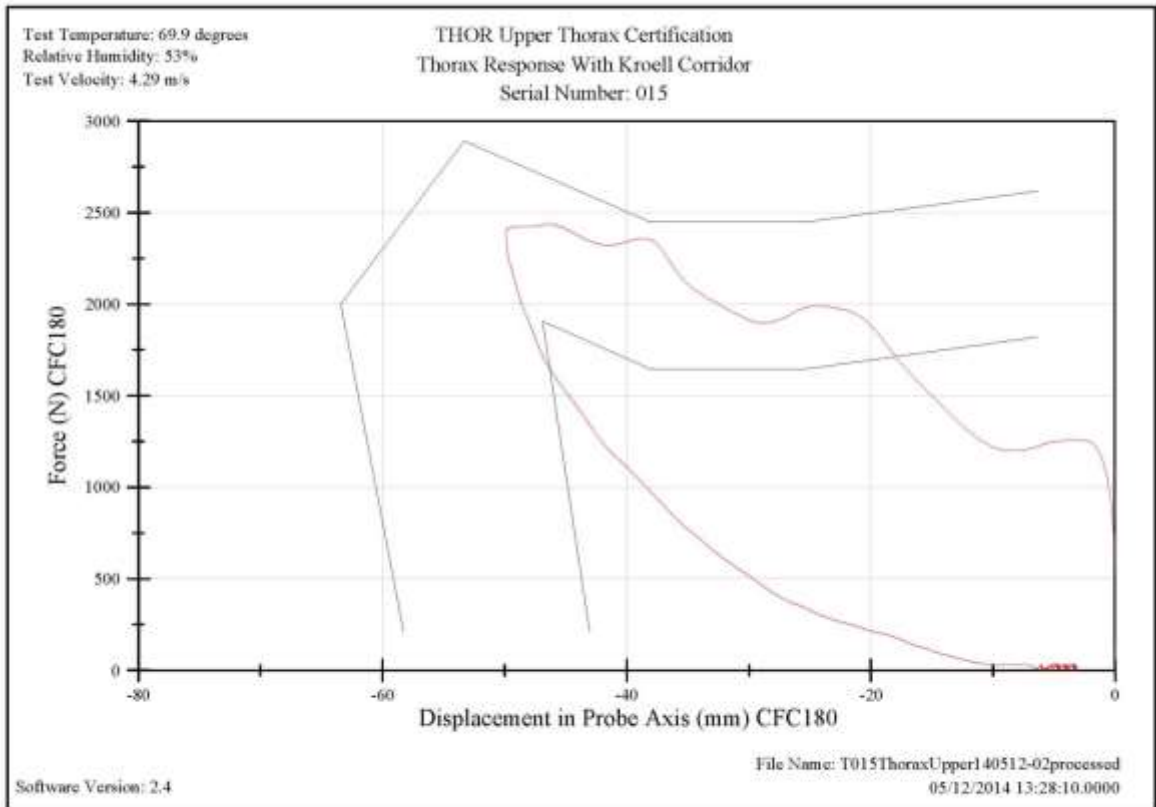
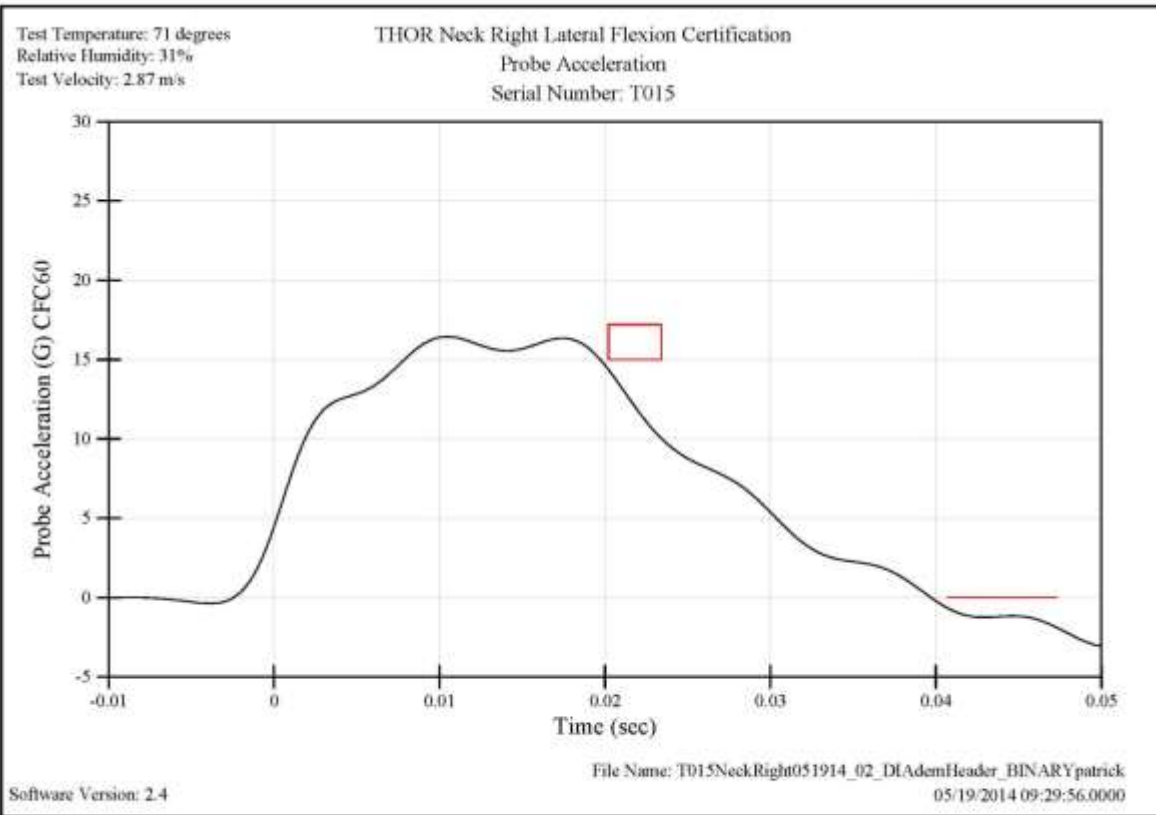
Test Temperature: 71 degrees
Relative Humidity: 31%
Test Velocity: 2.87 m/s

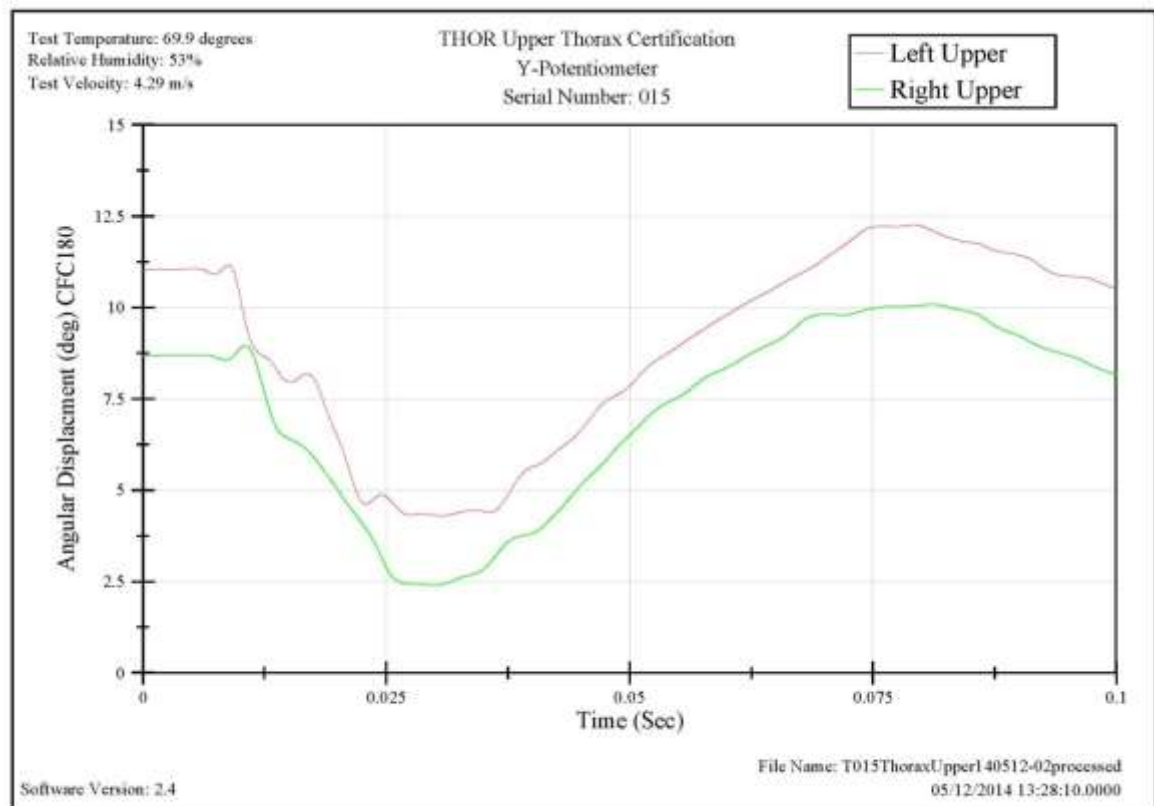
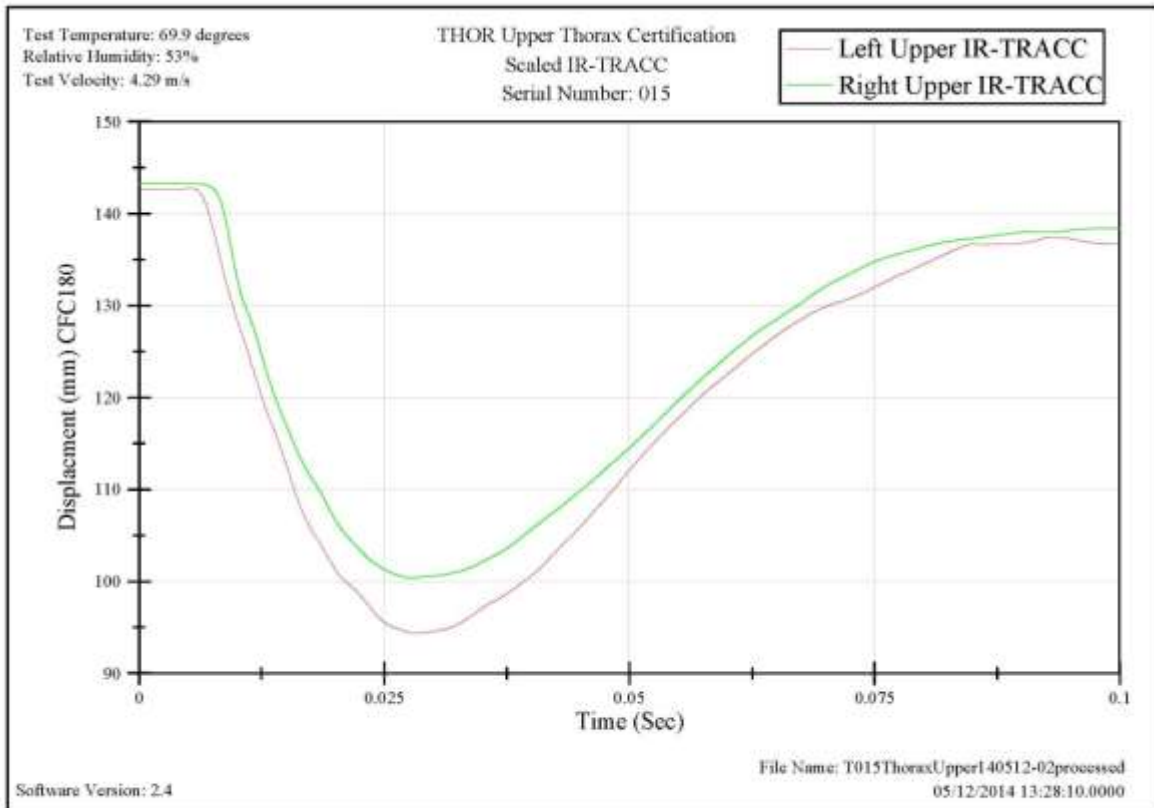
THOR Neck Right Lateral Flexion Certification
X-Moment
Serial Number: T015

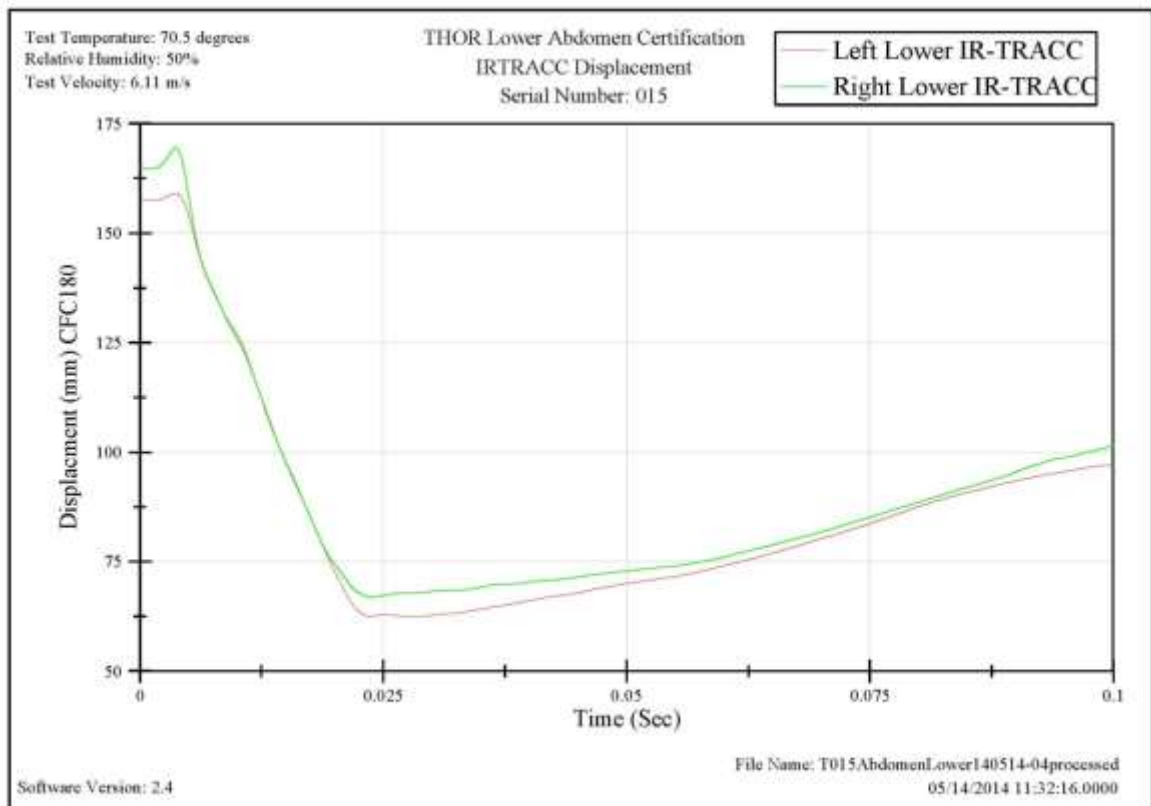
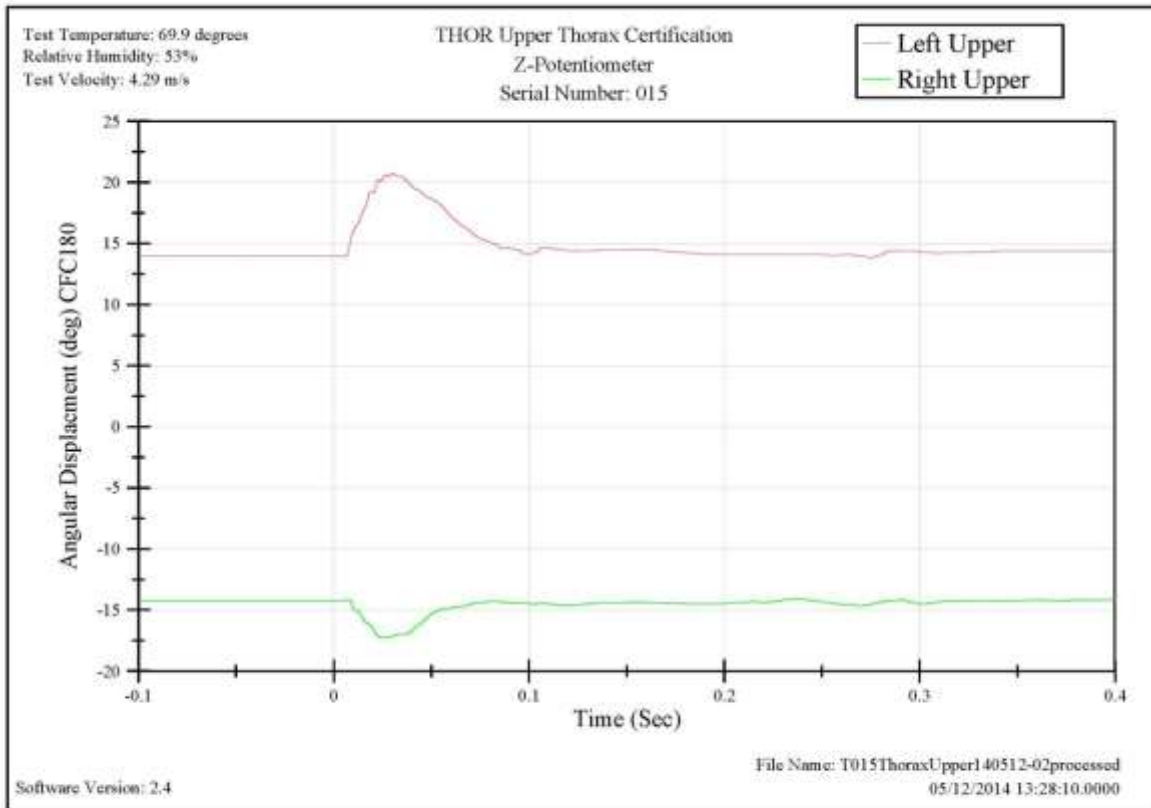


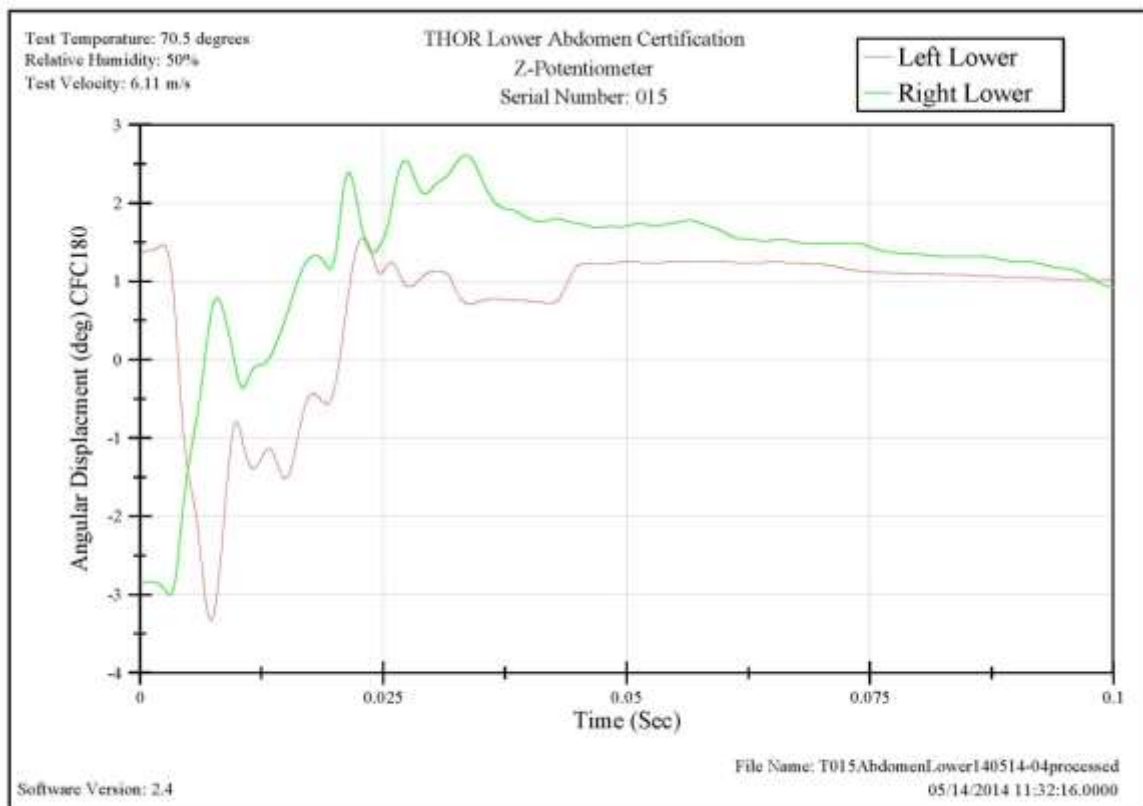
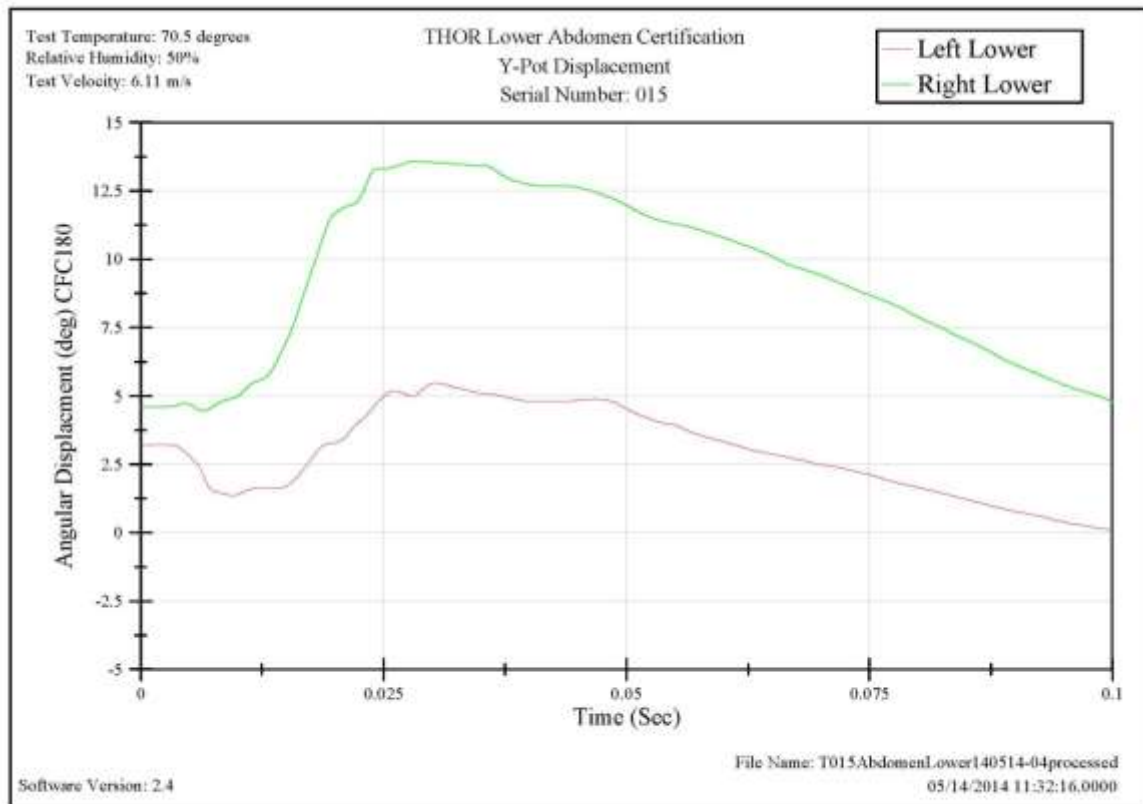
Software Version: 2.4

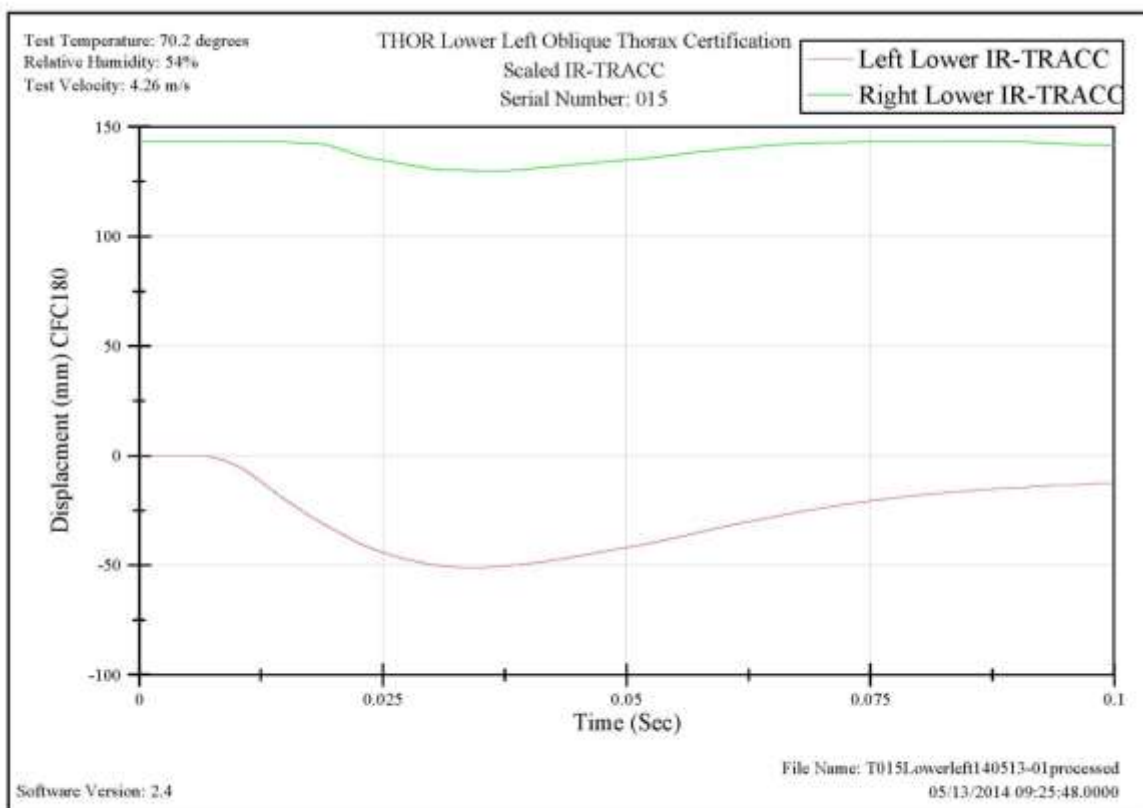
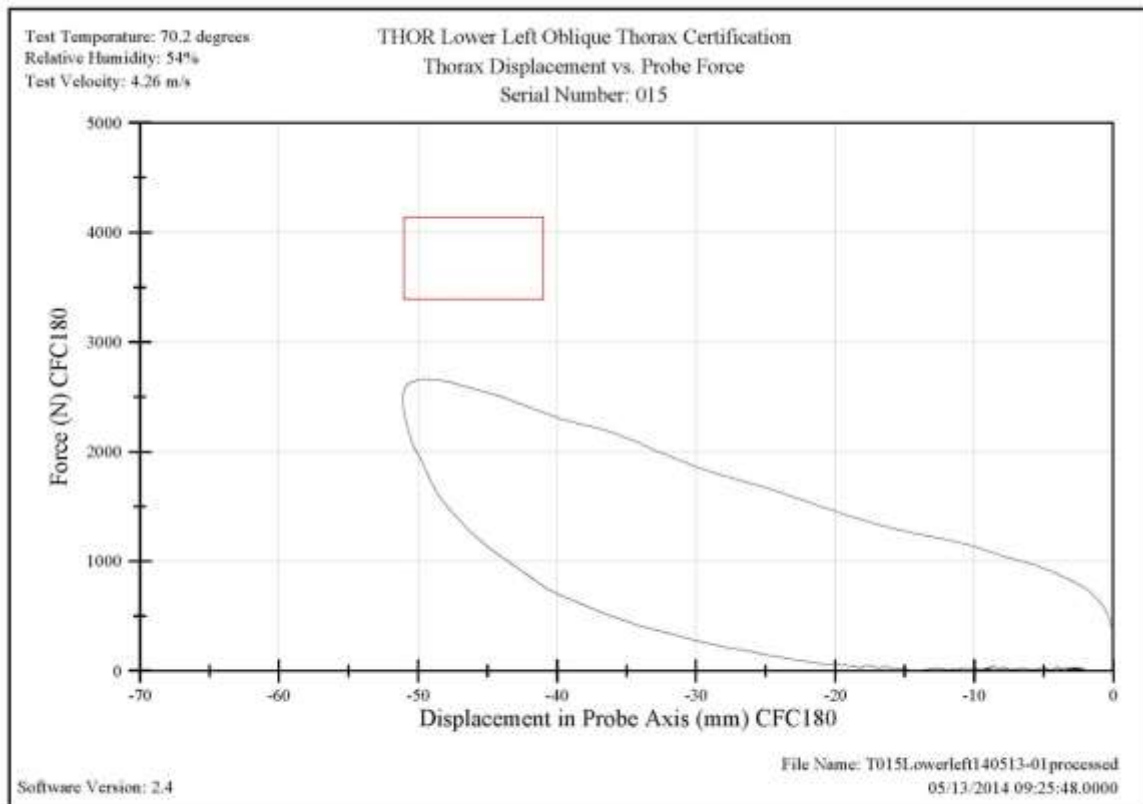
File Name: T015NeckRight051914_02_DLAdemHeader_BINARYpatrick
05/19/2014 09:29:56.0000

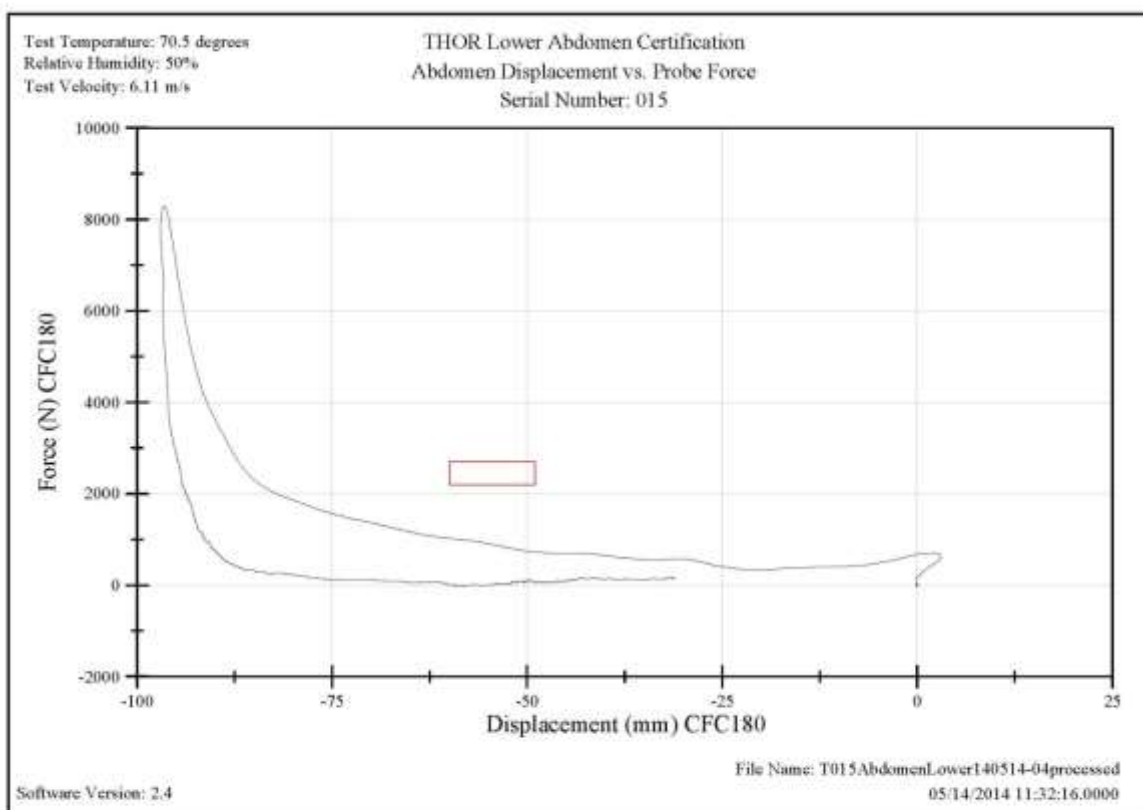
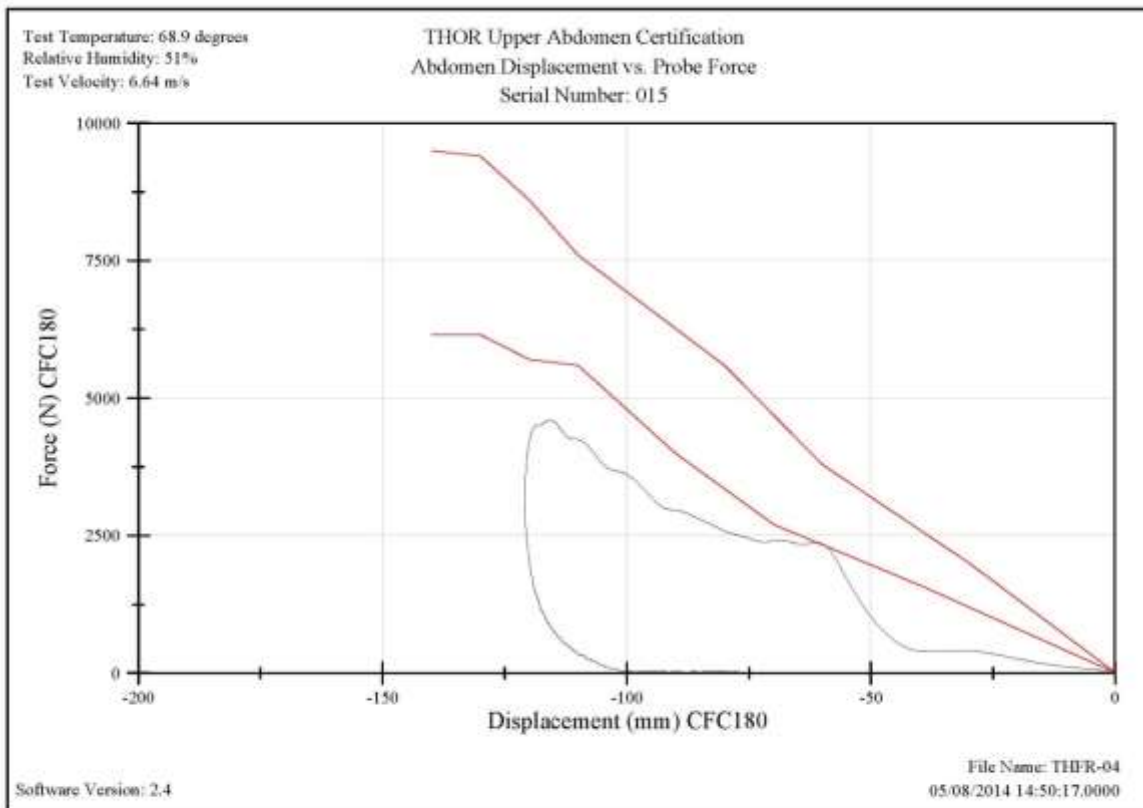


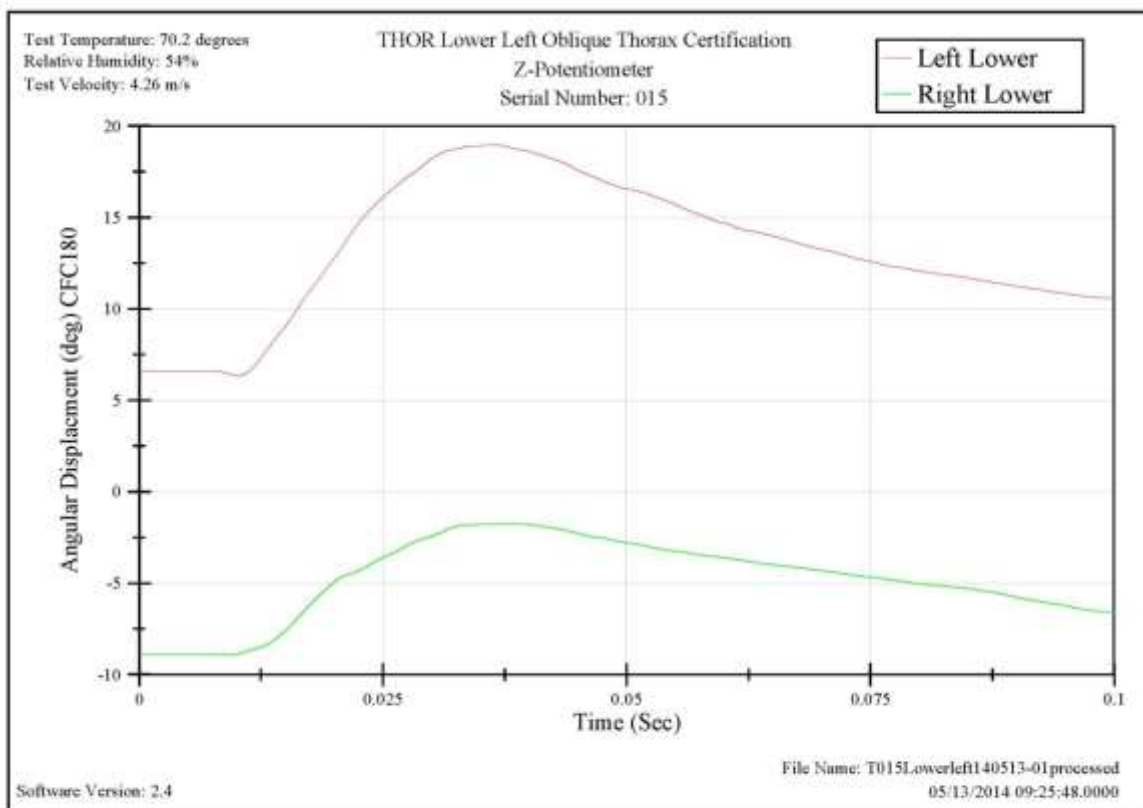
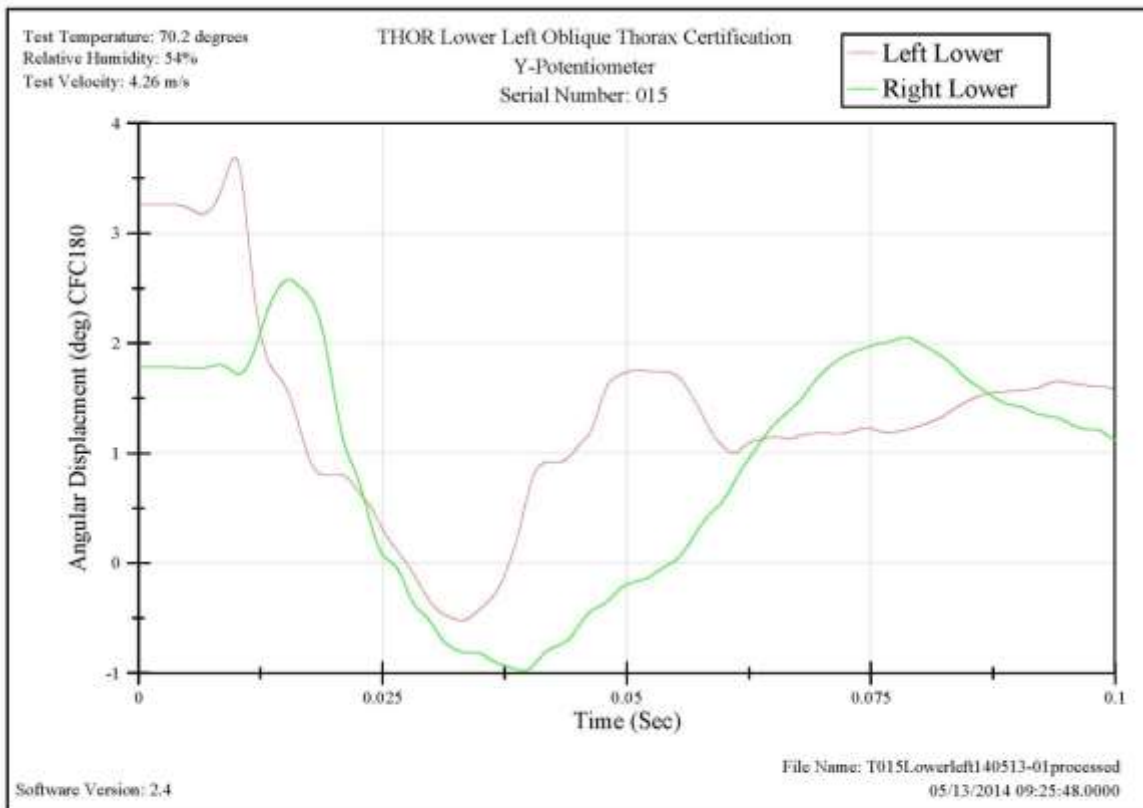


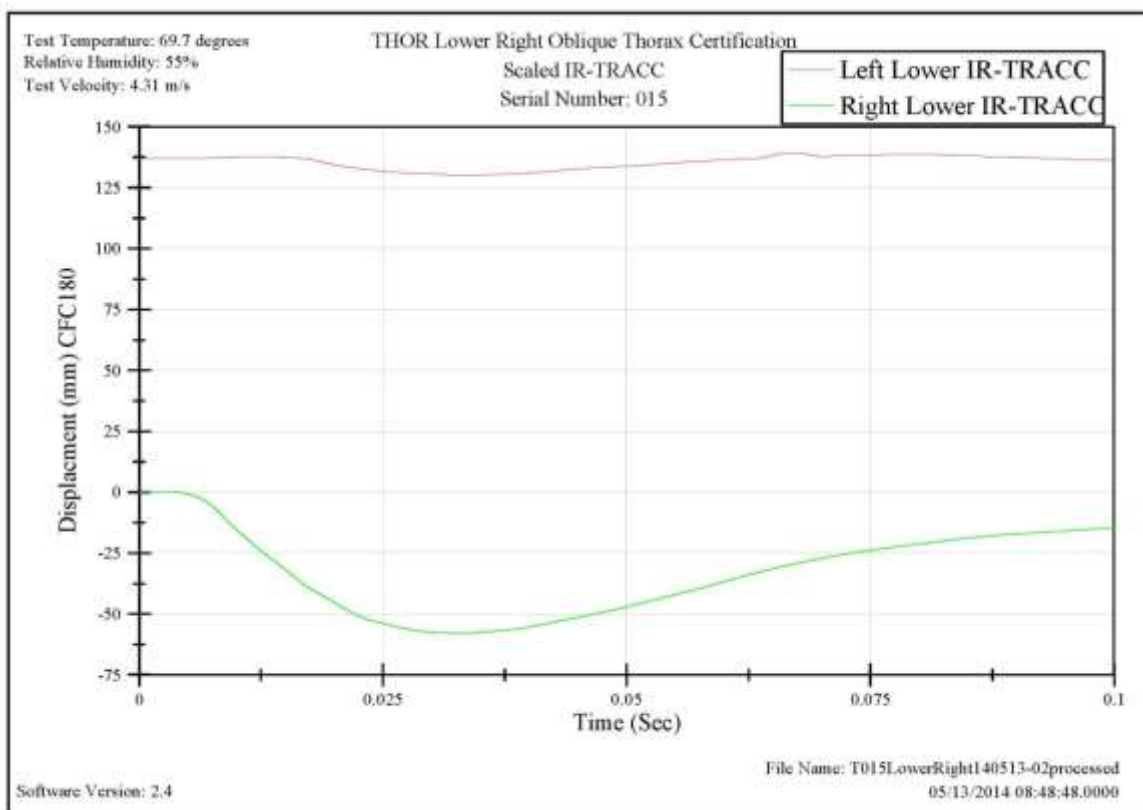
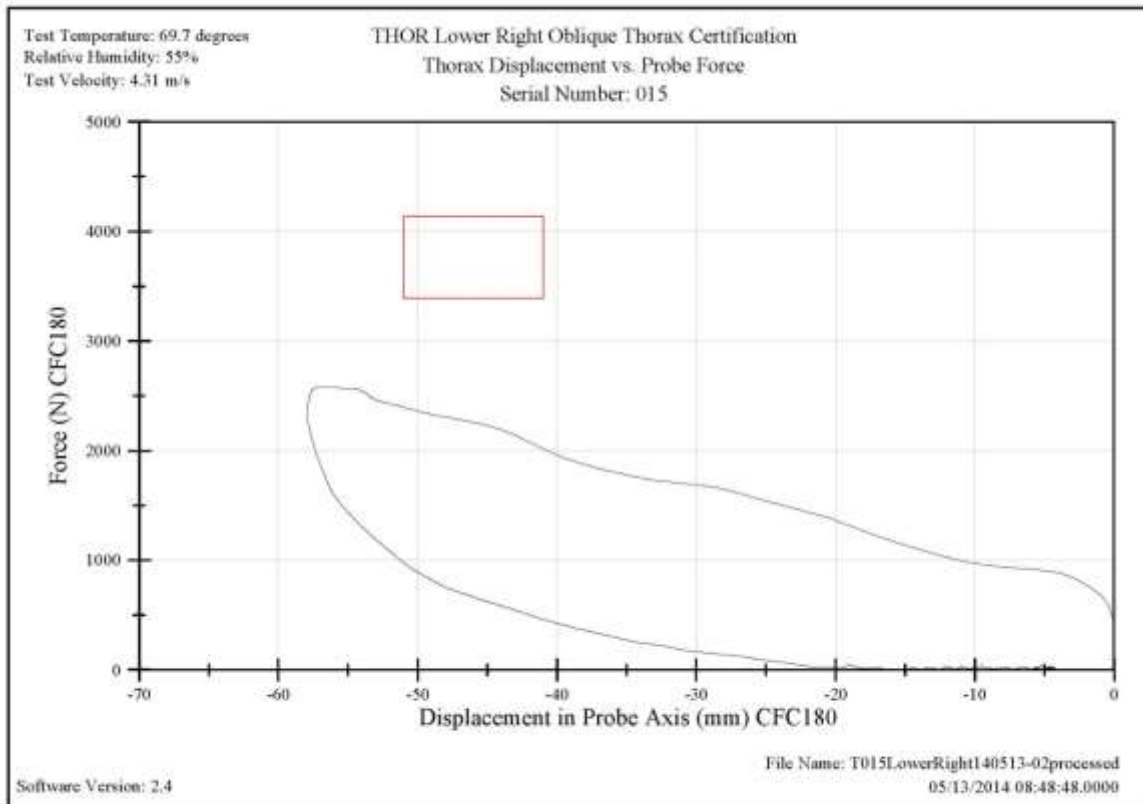


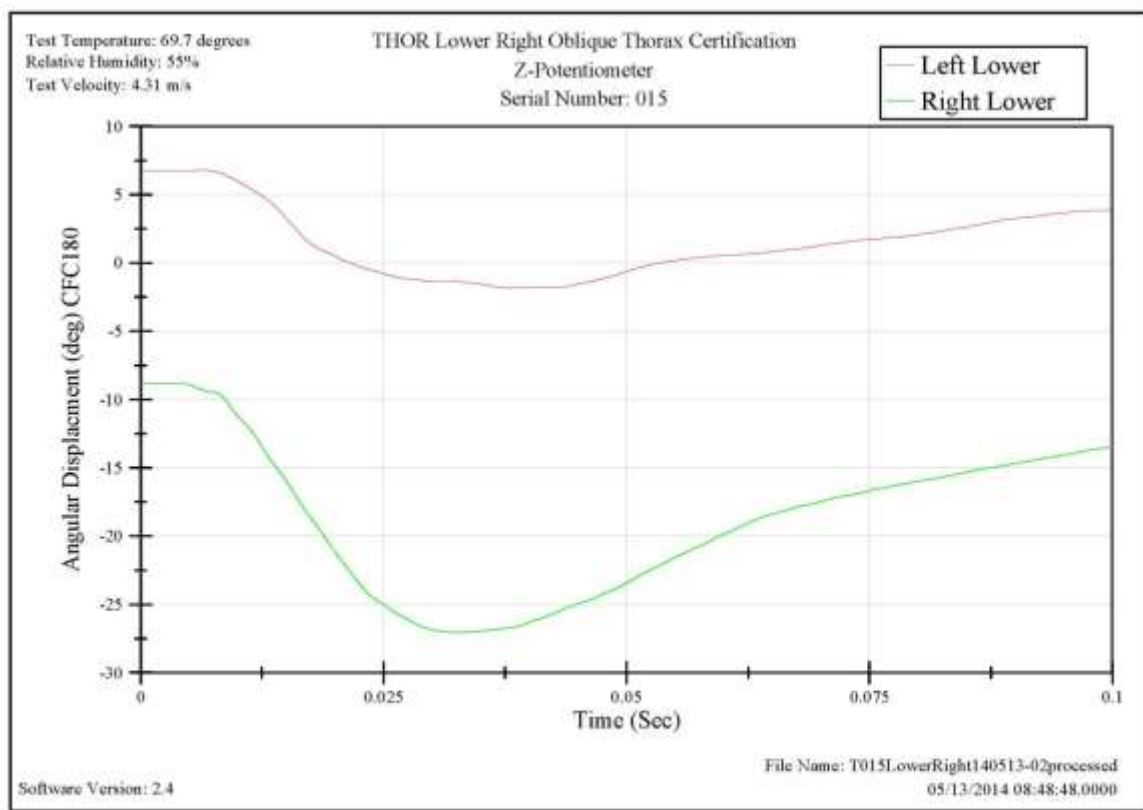
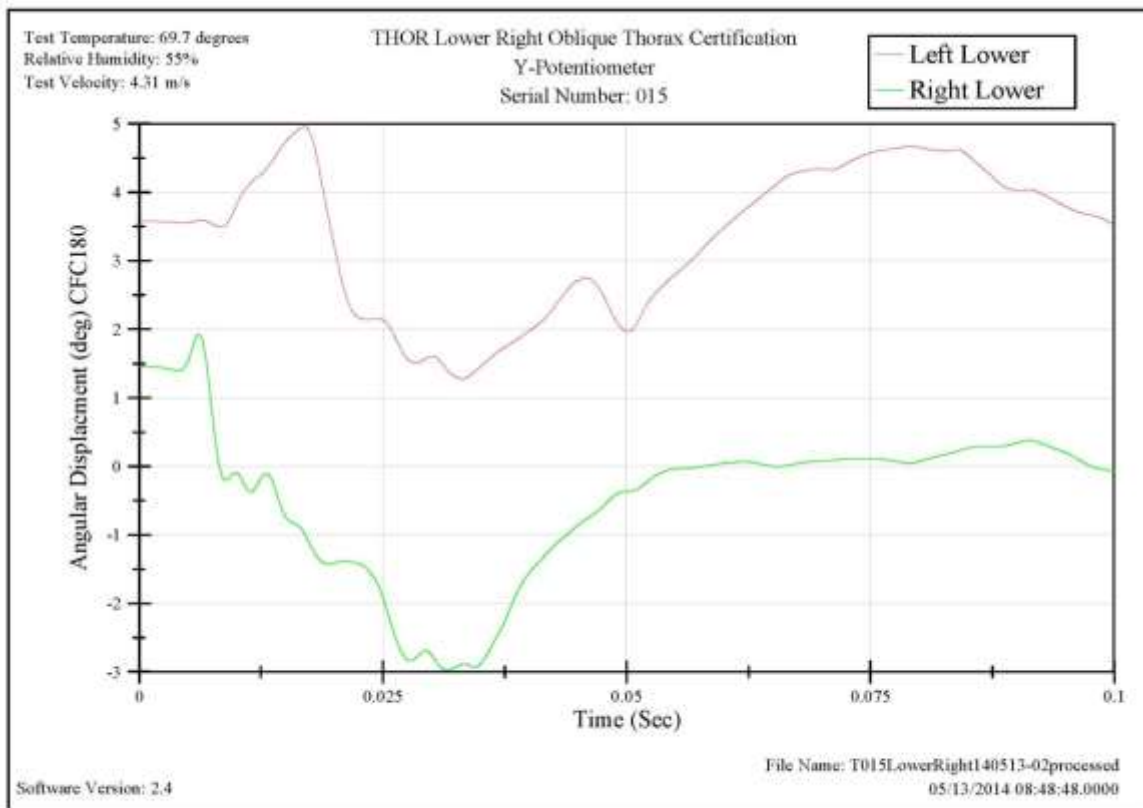


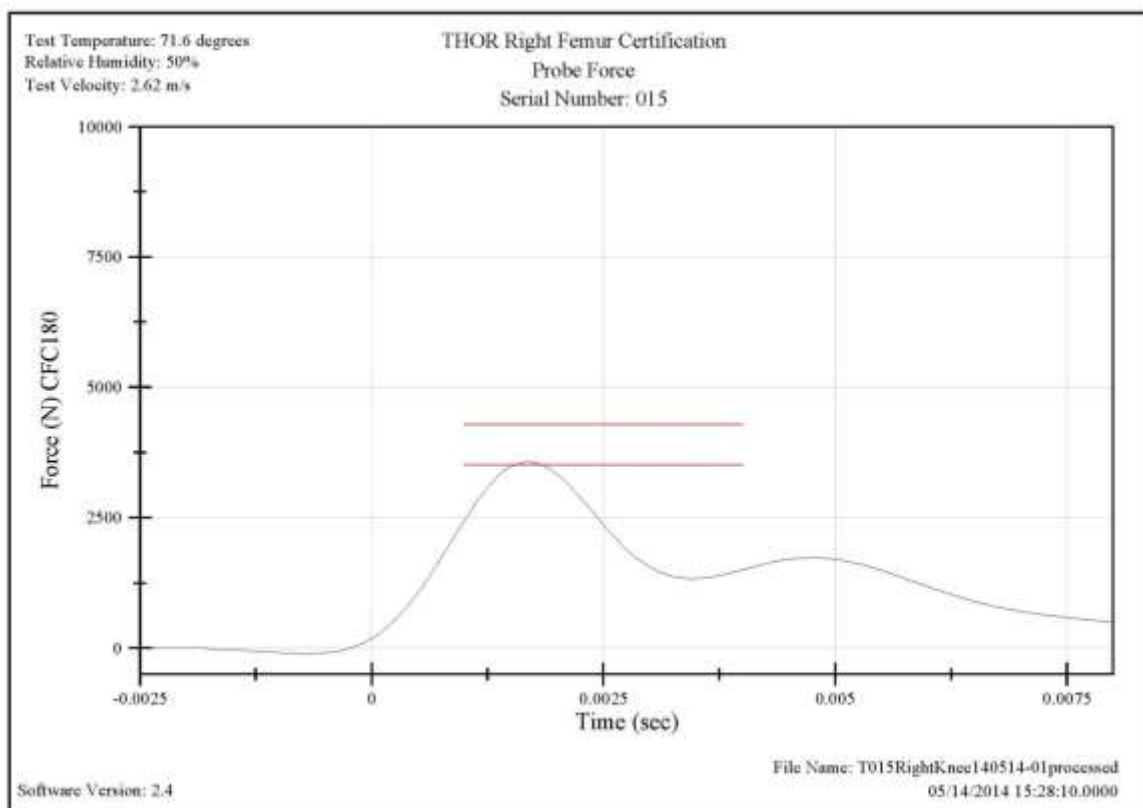
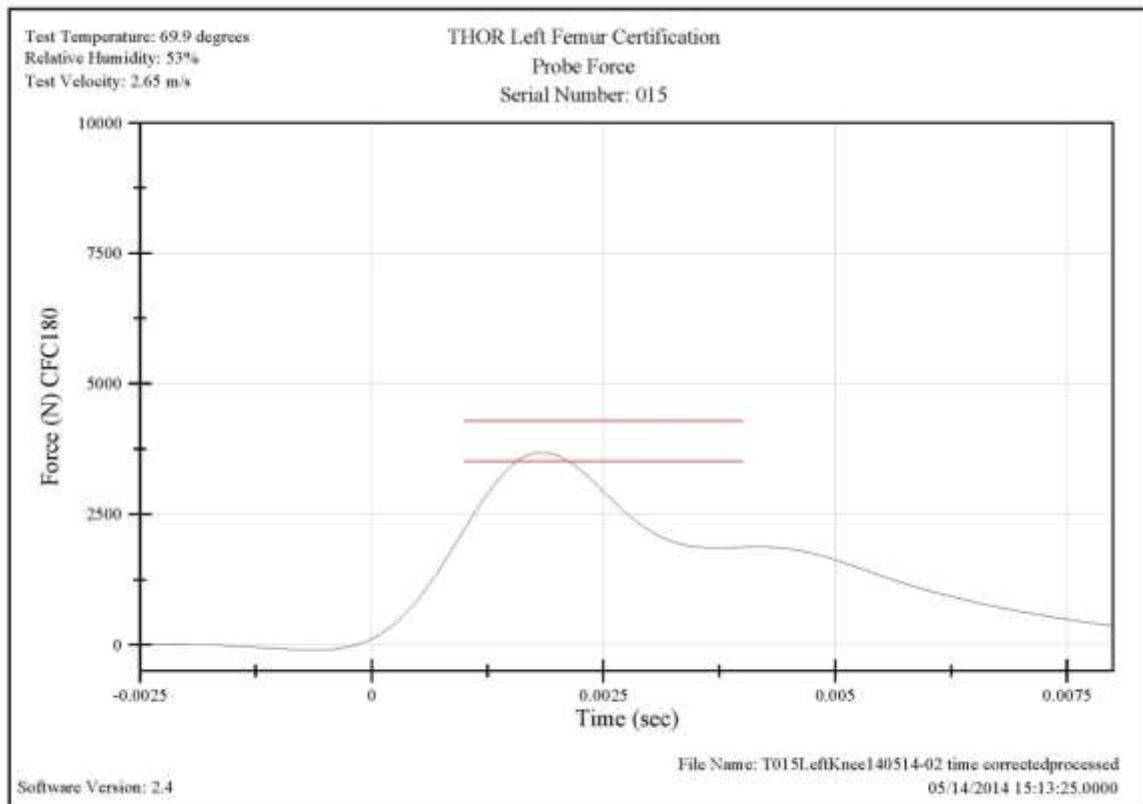






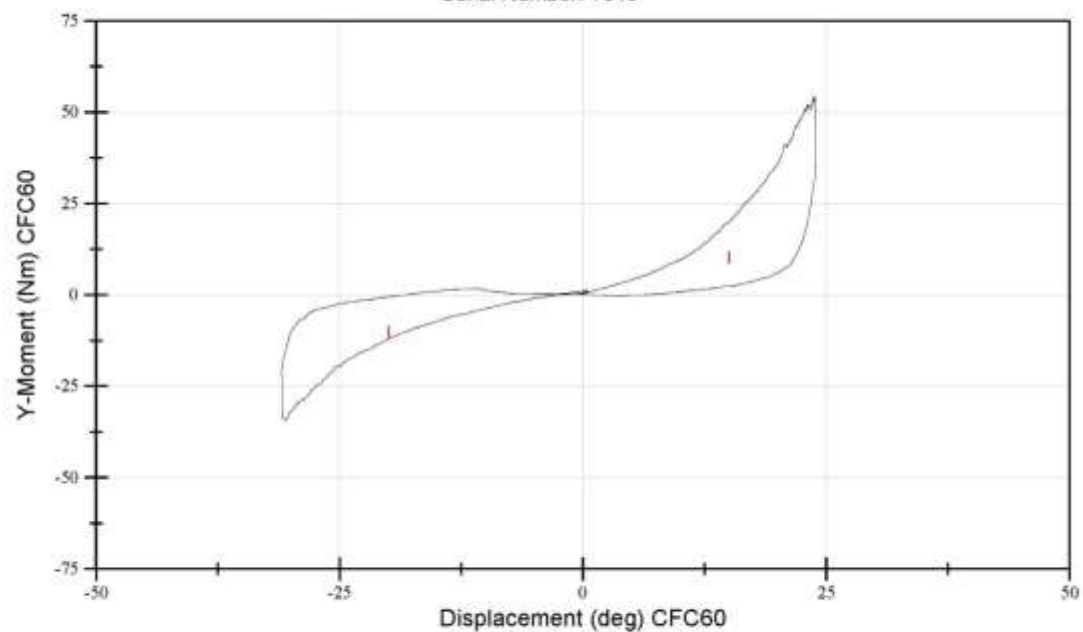






Test Temperature: 71 degrees
Relative Humidity: 35%
Test Velocity: 0 m/s

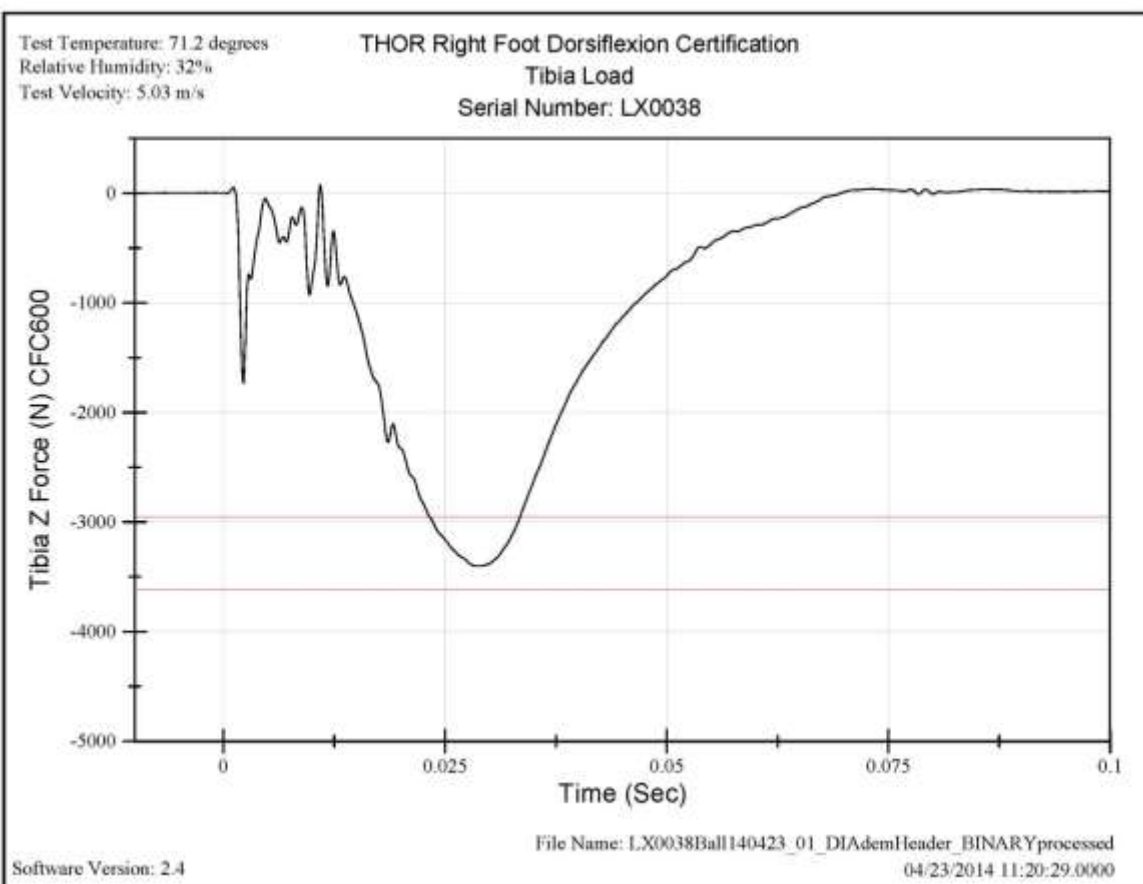
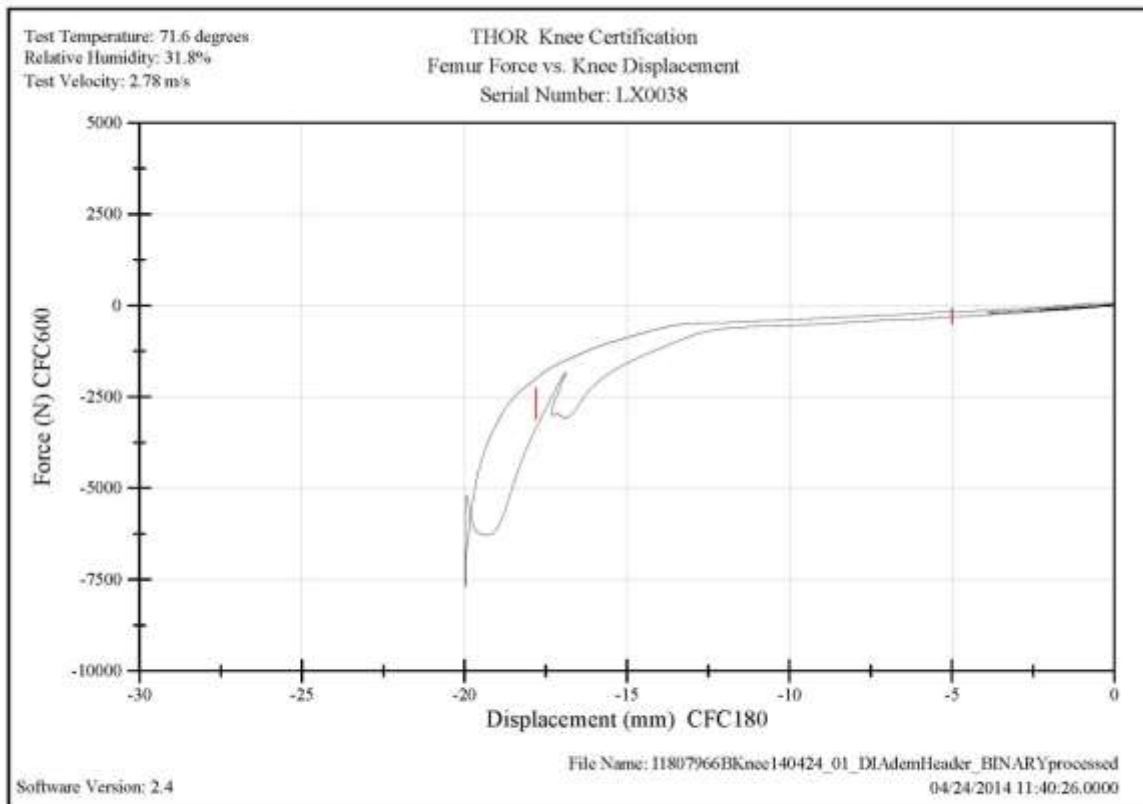
THOR Occipital Condyle Quasi-Static Certification
Displacement vs. Torque
Serial Number: T015



Software Version: 2.4

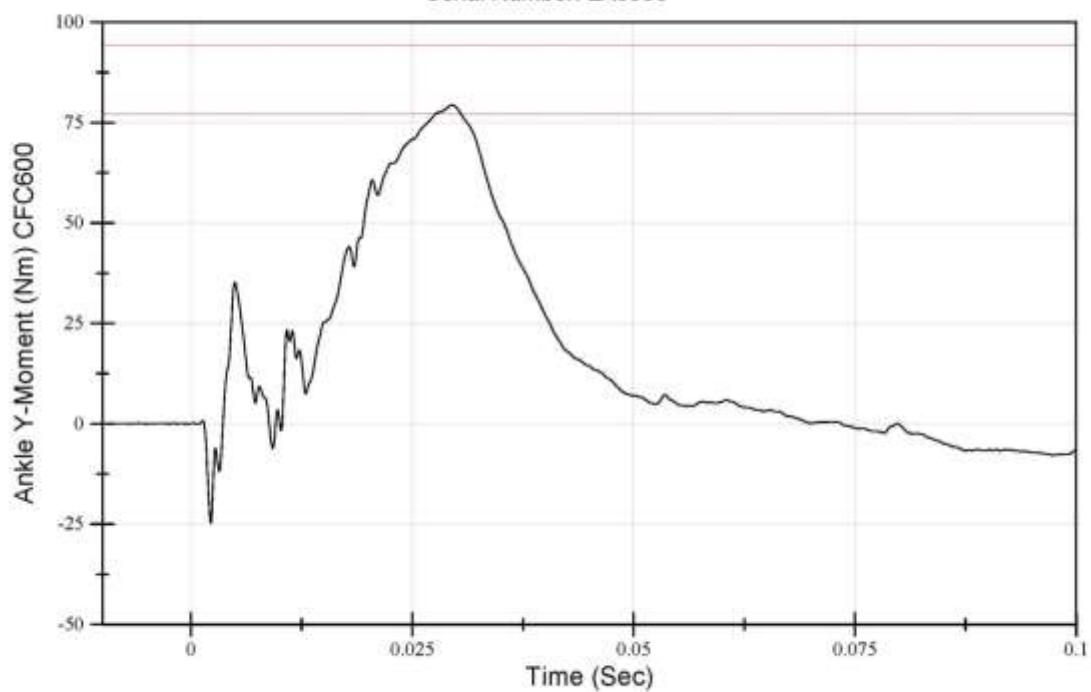
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THOR 015 LEG CALIBRATIONS
LX0039 / LX0038



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

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

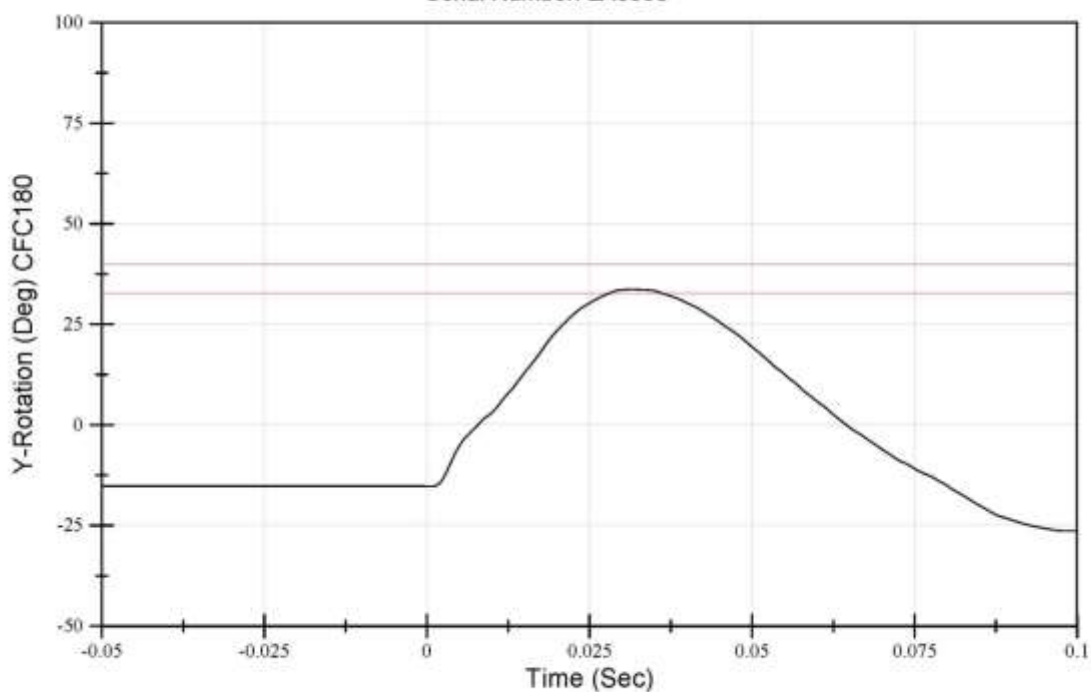


Software Version: 2.4

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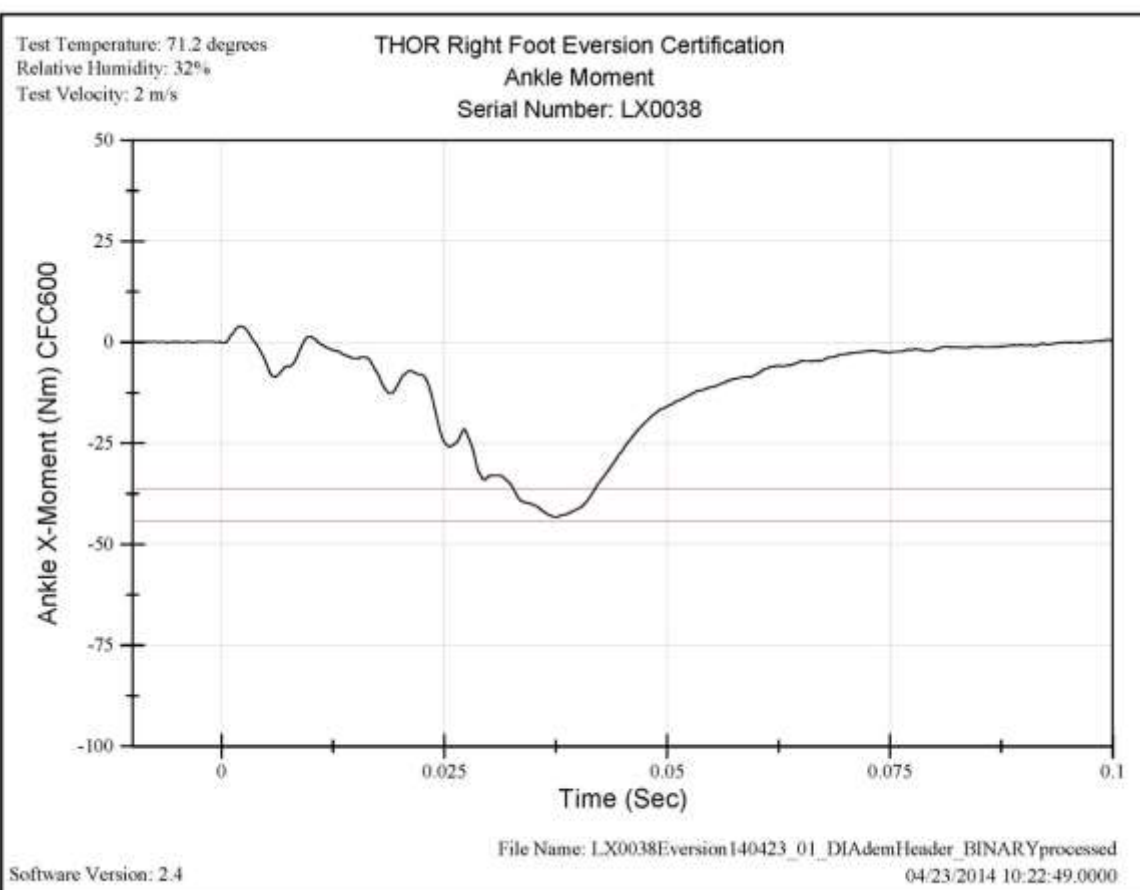
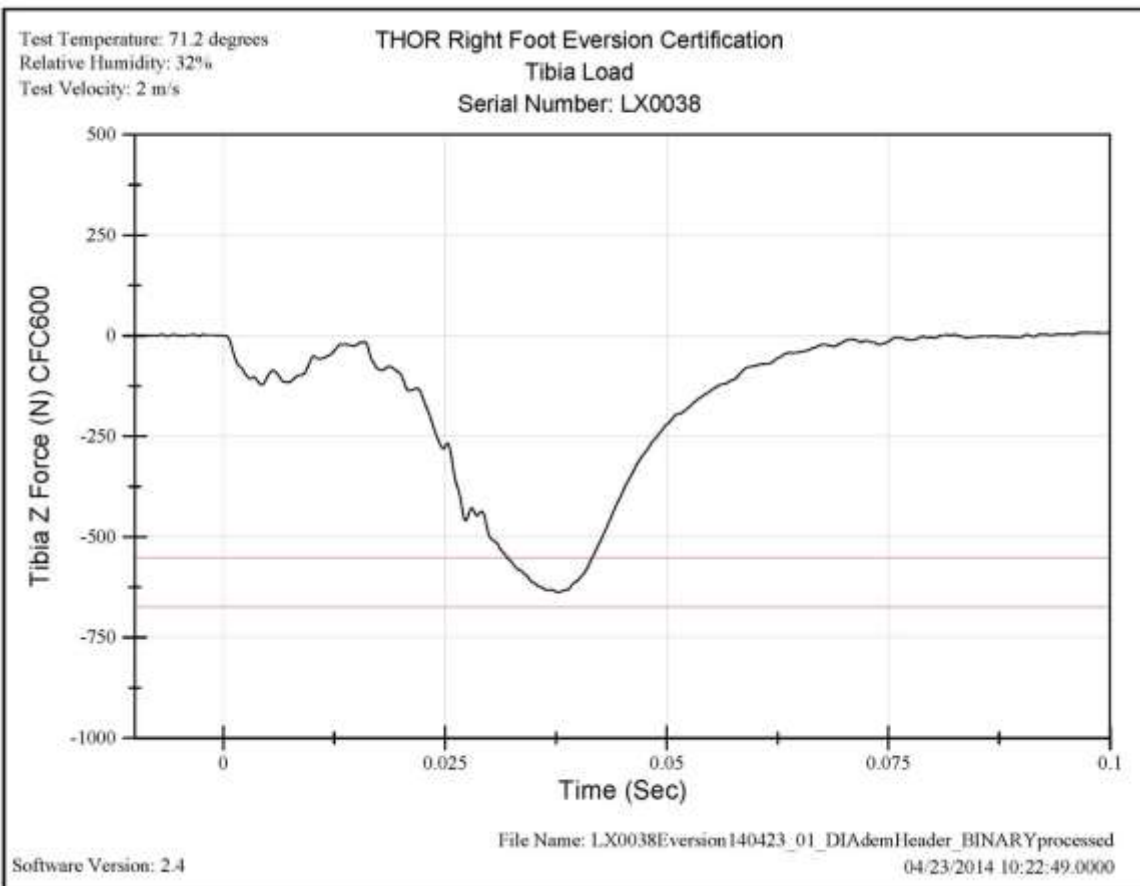
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THOR Right Foot Dorsiflexion Certification
Ankle Y-Rotation
Serial Number: LX0038



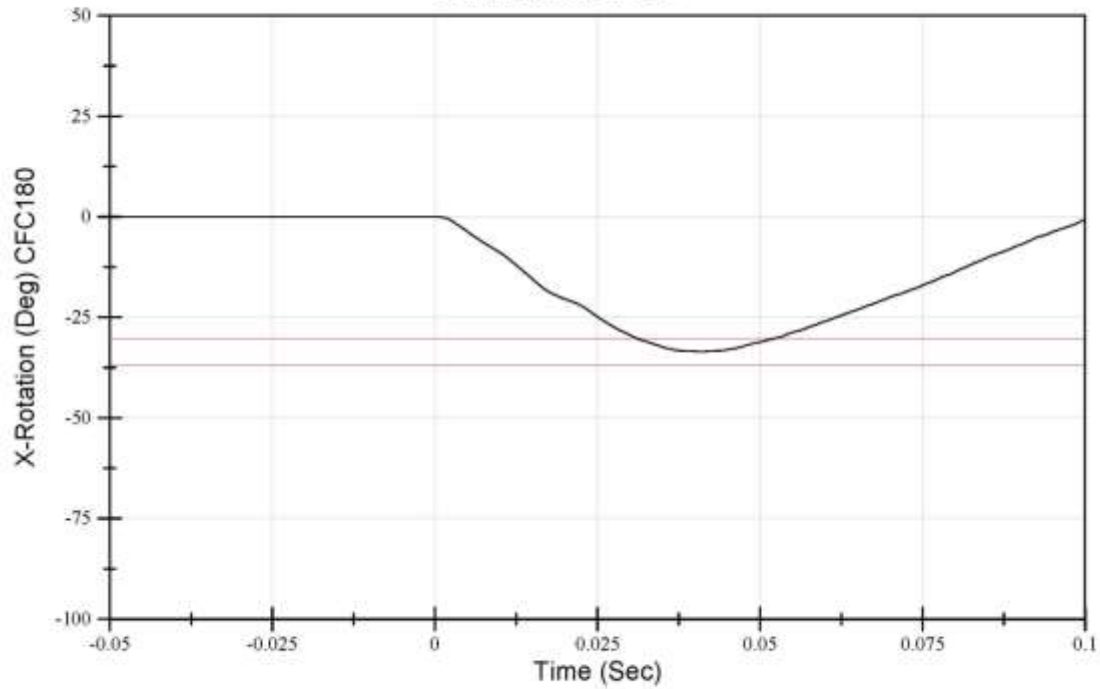
Software Version: 2.4

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Test Velocity: 2 m/s

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

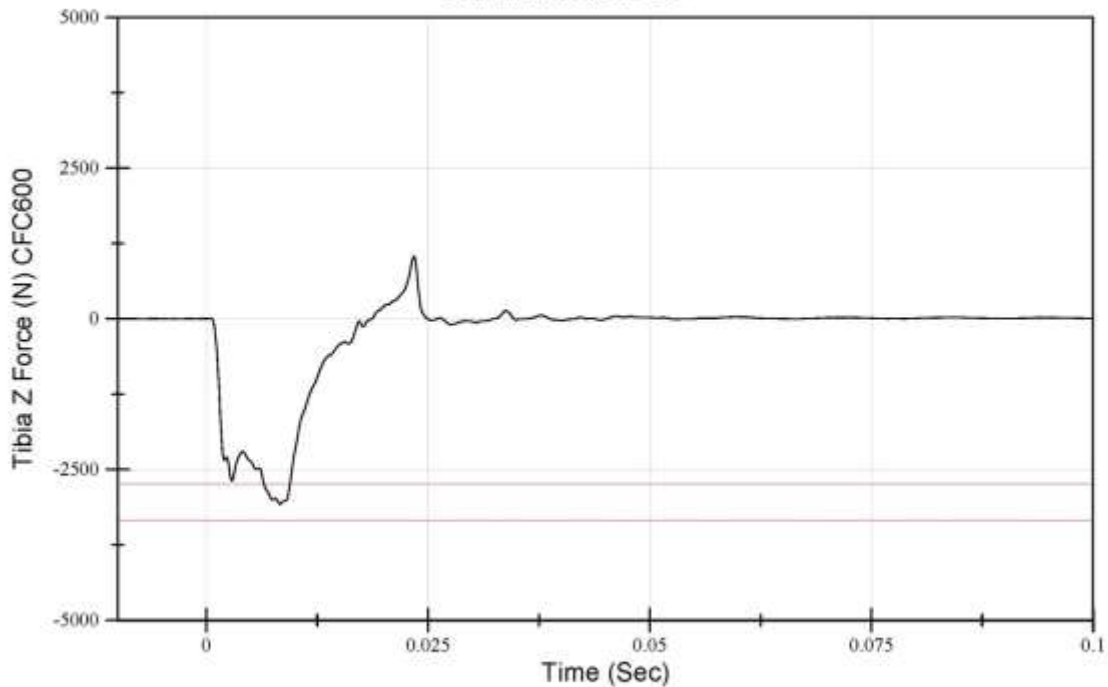


Software Version: 2.4

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Test Velocity: 4.03 m/s

THOR Right Foot Heel Certification
Tibia Load
Serial Number: LX0038

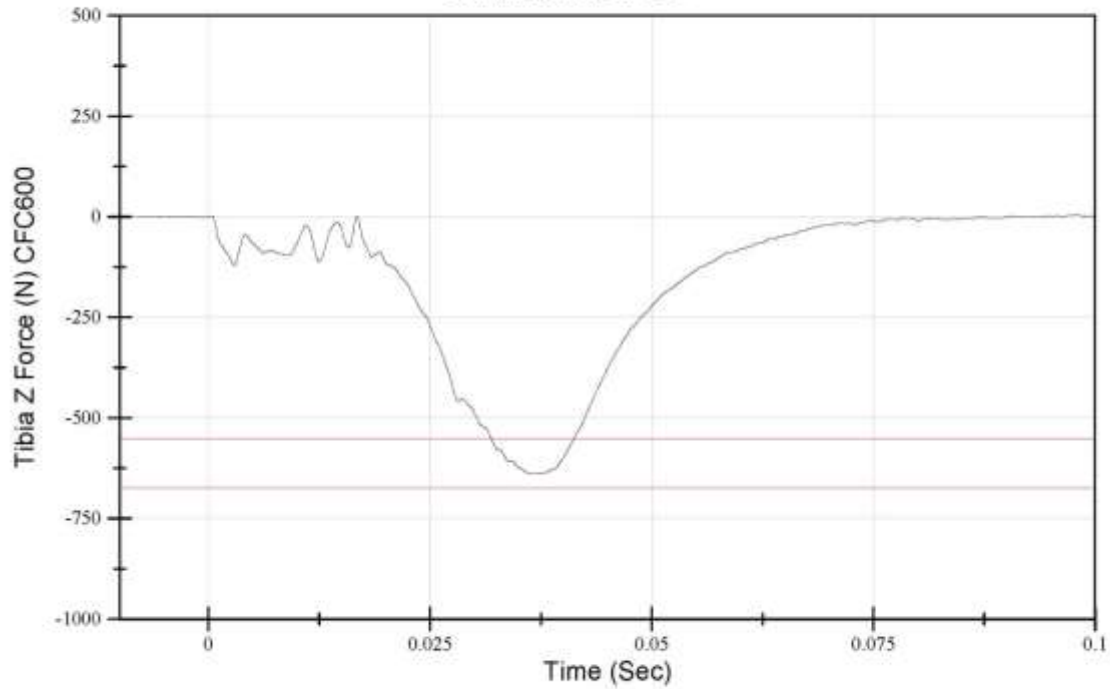


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THOR Right Foot Inversion Certification
Tibia Load
Serial Number: LX0038

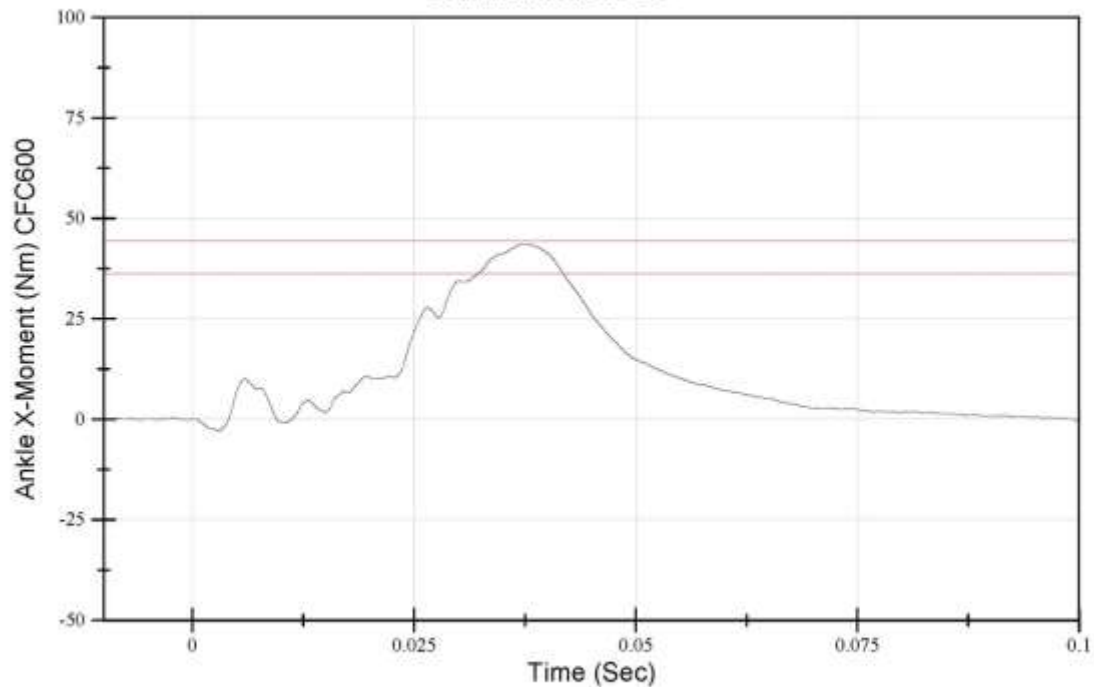


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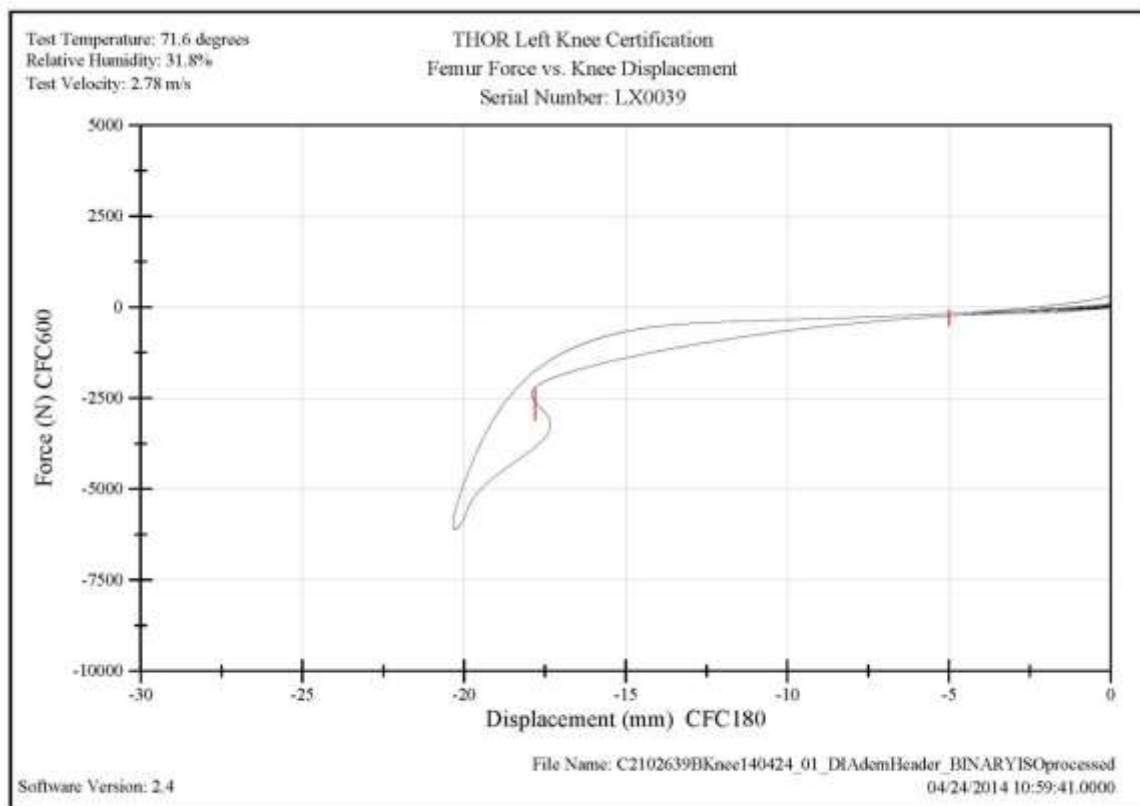
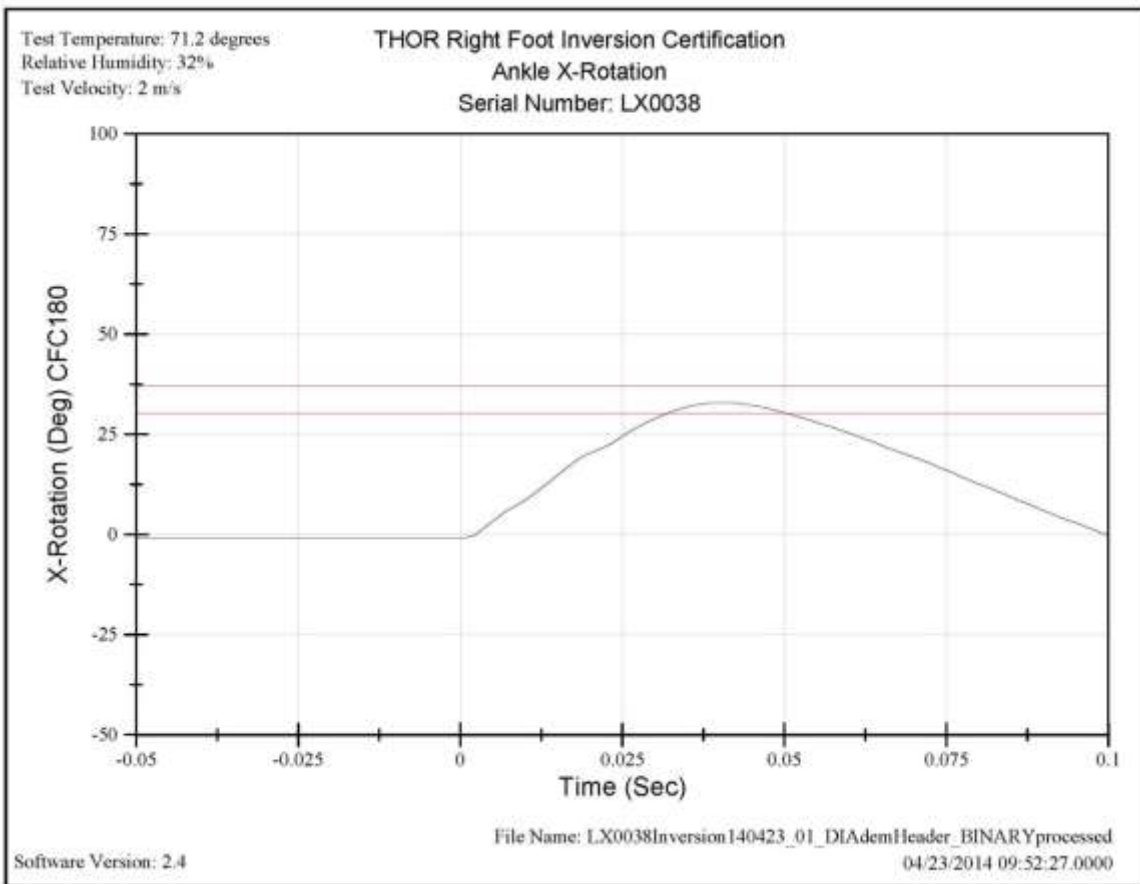
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THOR Right Foot Inversion Certification
Ankle Moment
Serial Number: LX0038



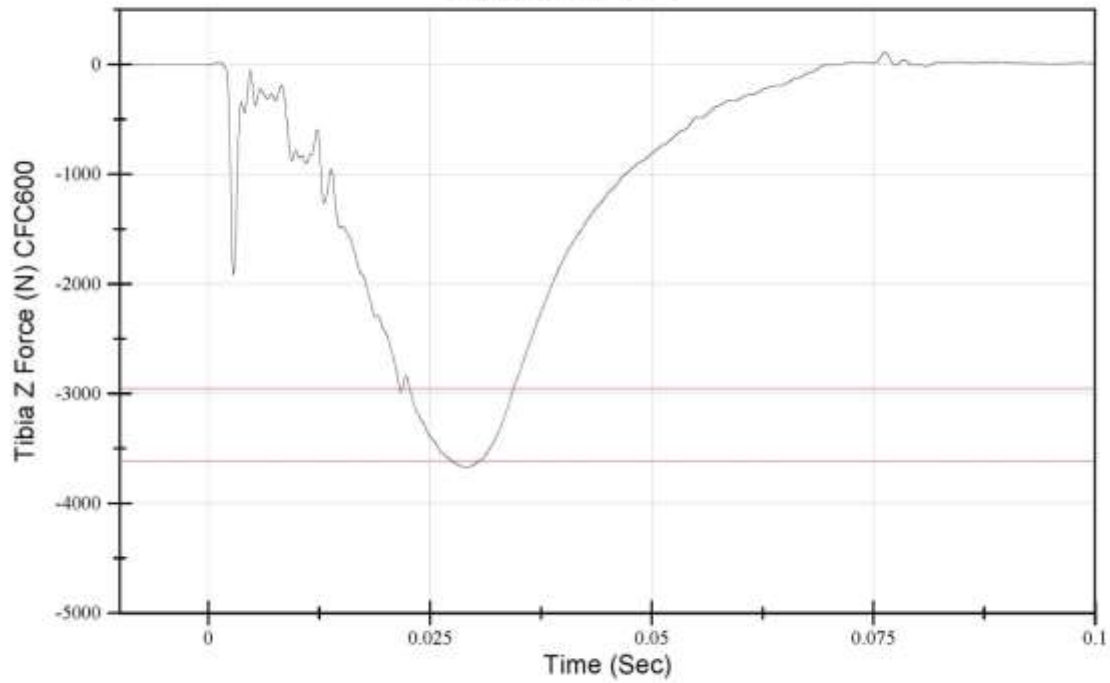
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Test Velocity: 5.03 m/s

THOR Left Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0039

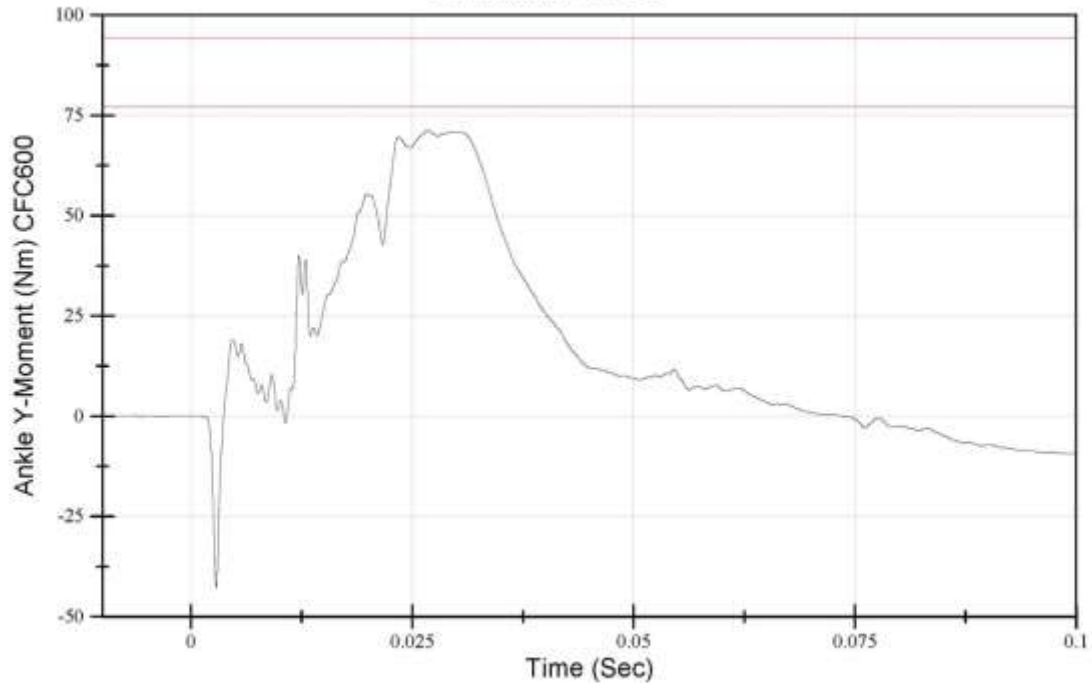


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THOR Left Foot Dorsiflexion Certification
Ankle Y-Moment
Serial Number: LX0039

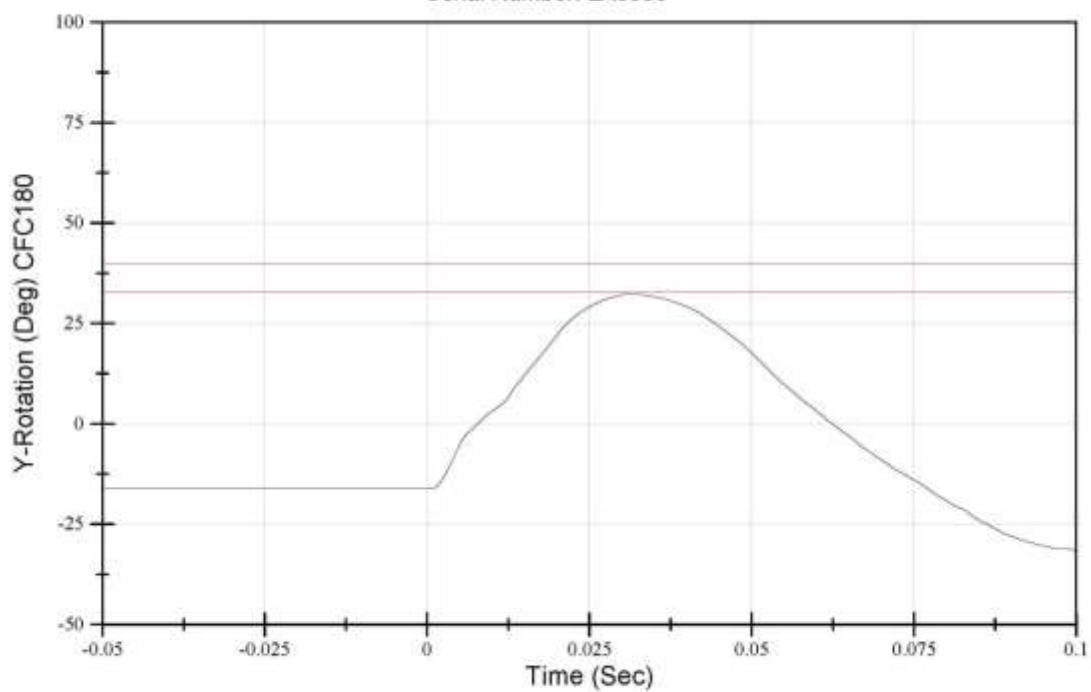


Software Version: 2.4

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Test Velocity: 5.03 m/s

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

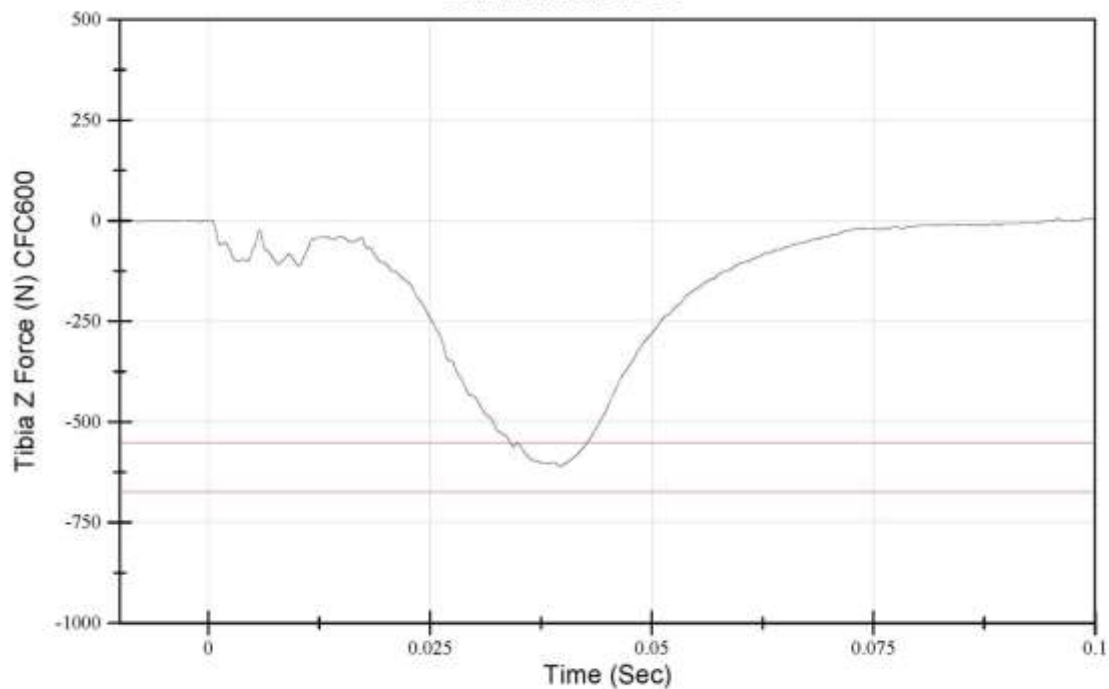


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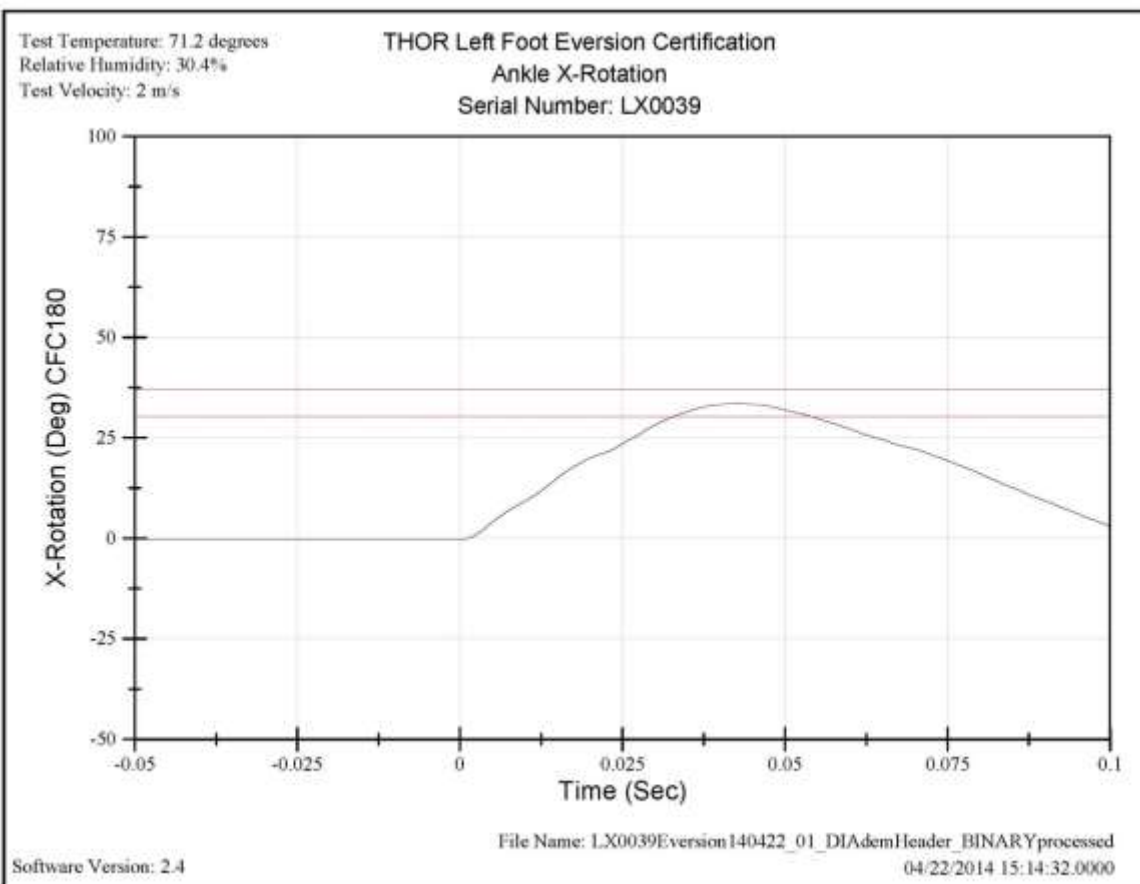
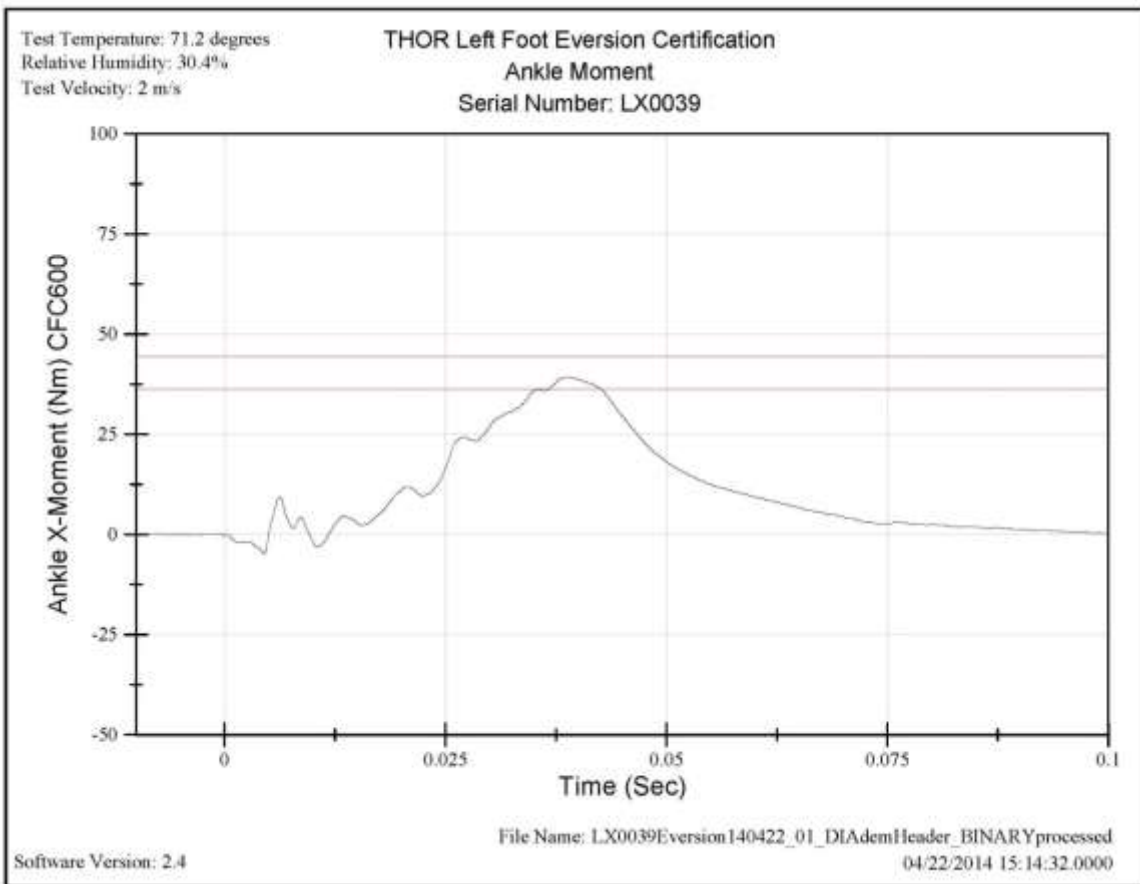
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Test Velocity: 2 m/s

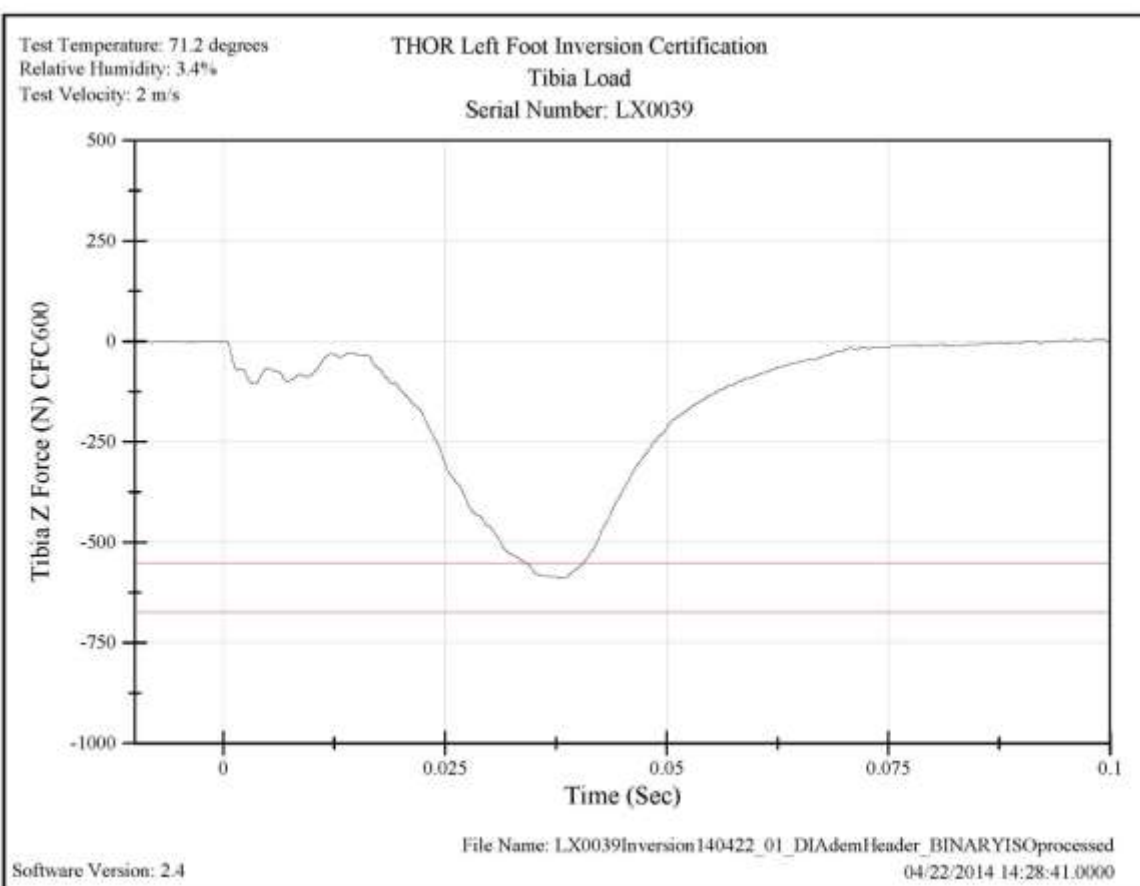
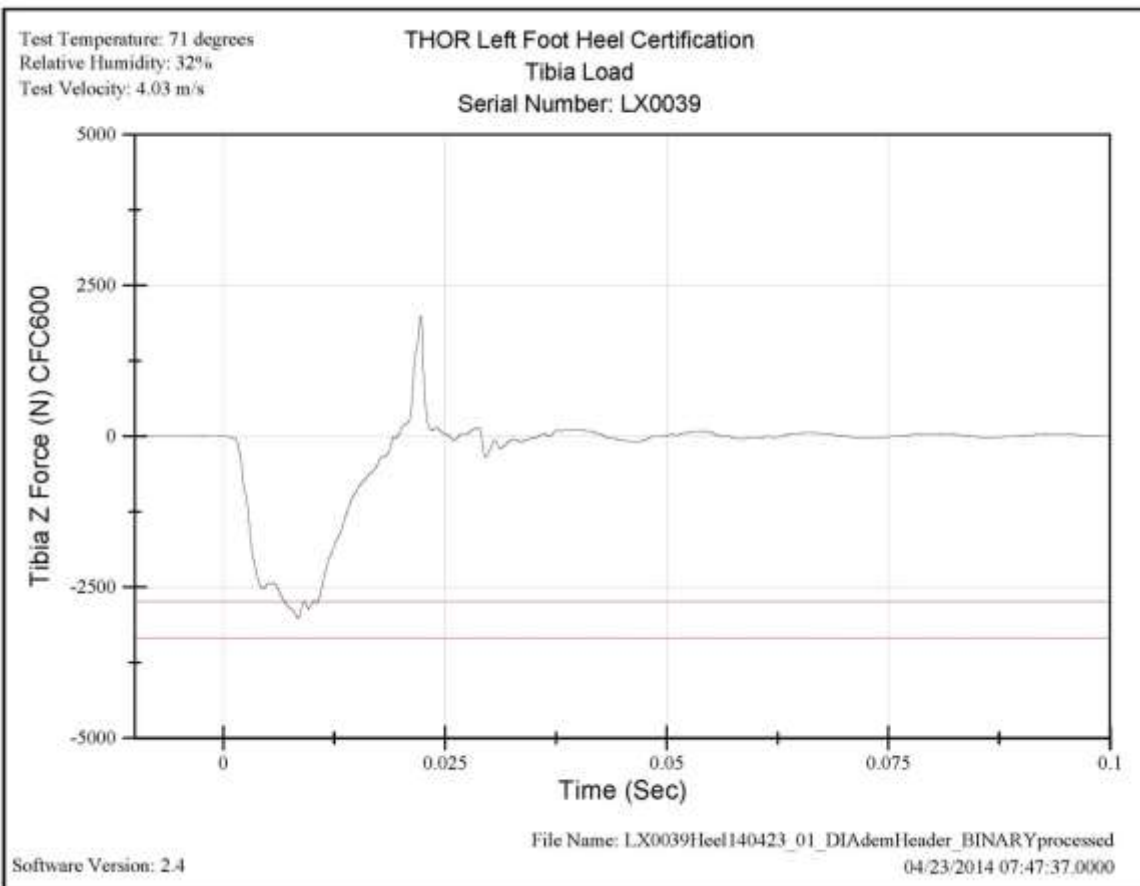
THOR Left Foot Eversion Certification
Tibia Load
Serial Number: LX0039

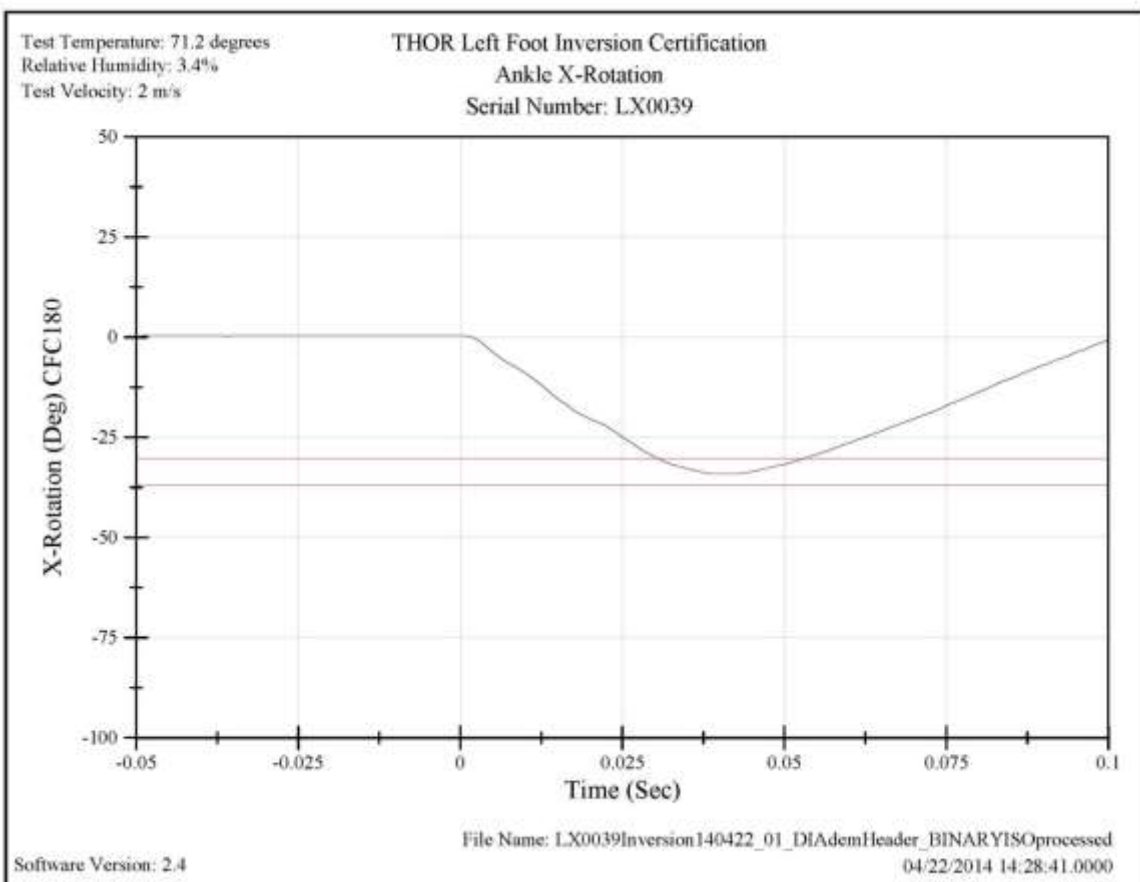
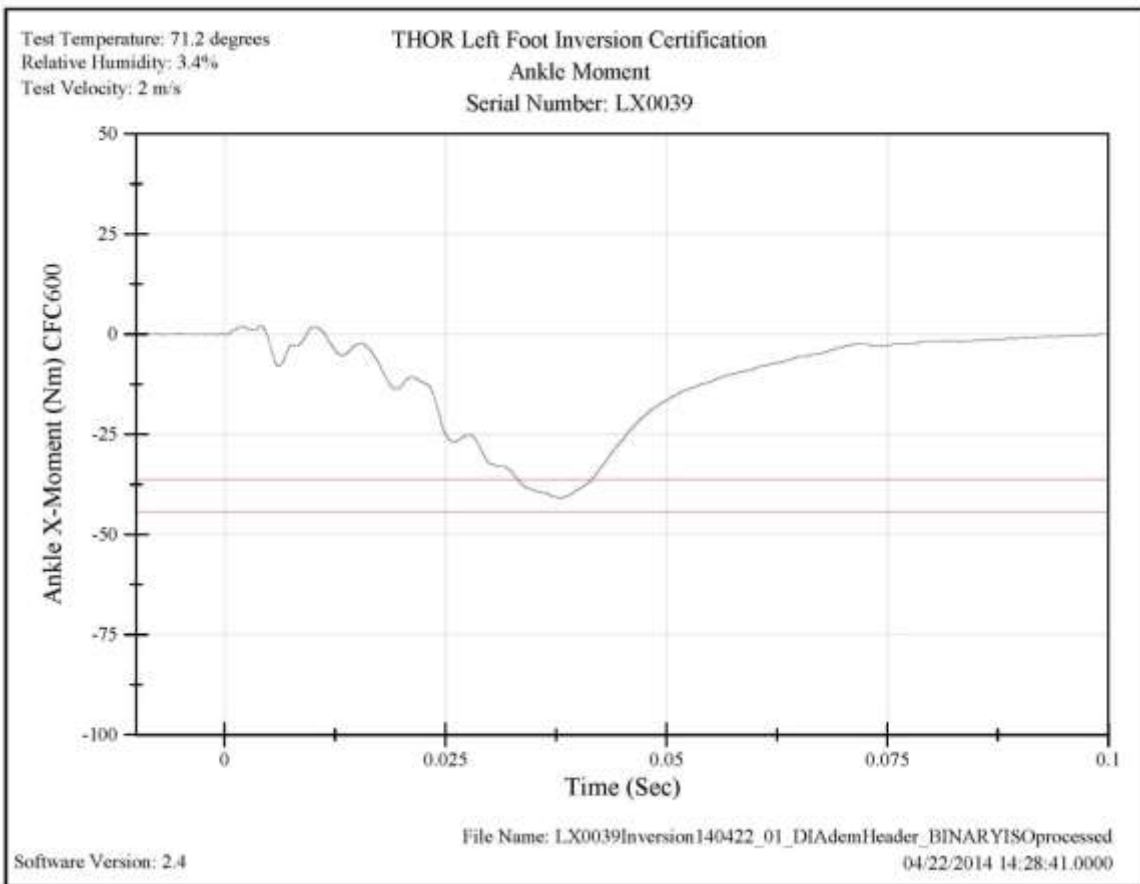


Software Version: 2.4

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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

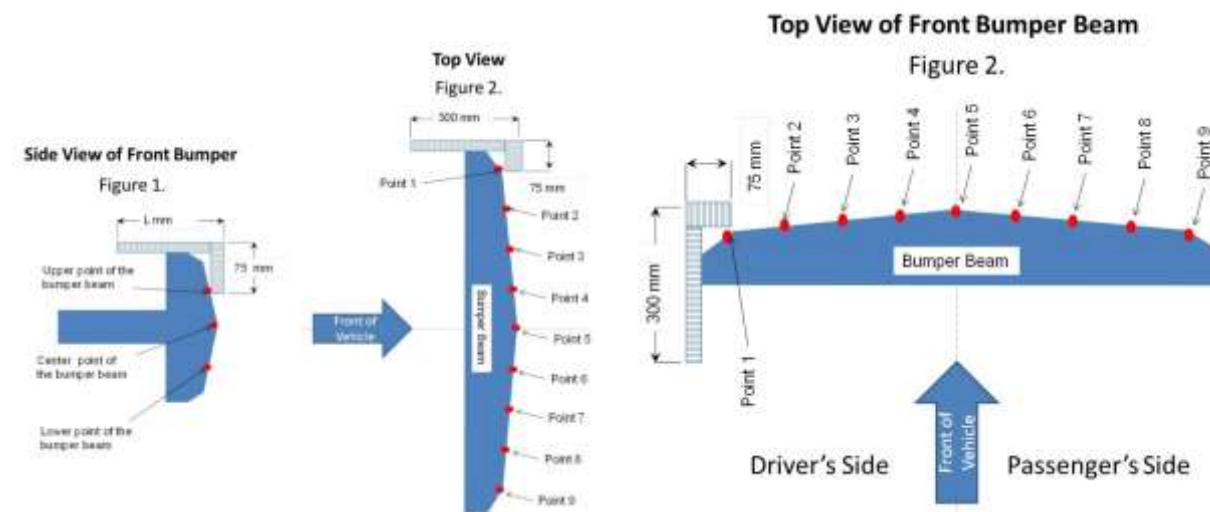
The Brake Pedal Reference Point is the x, y, and z location of the geometric center of the brake pedal pad (top surface) in the VCS.

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.

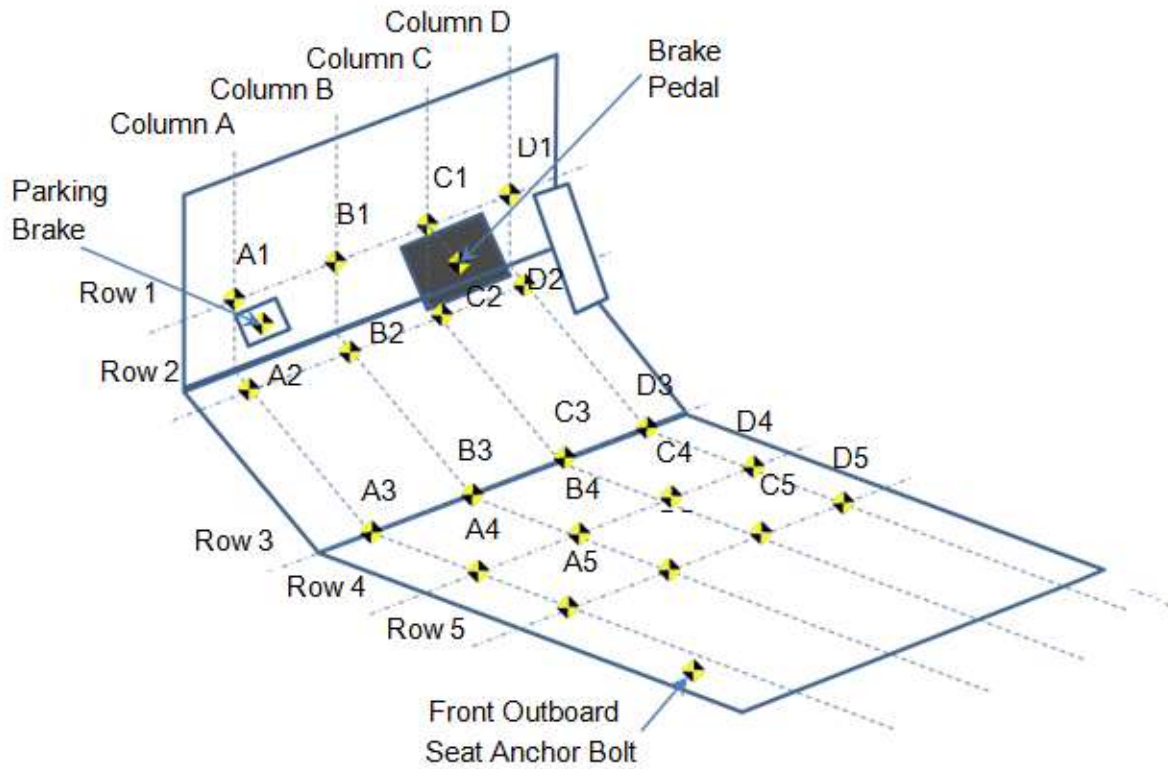
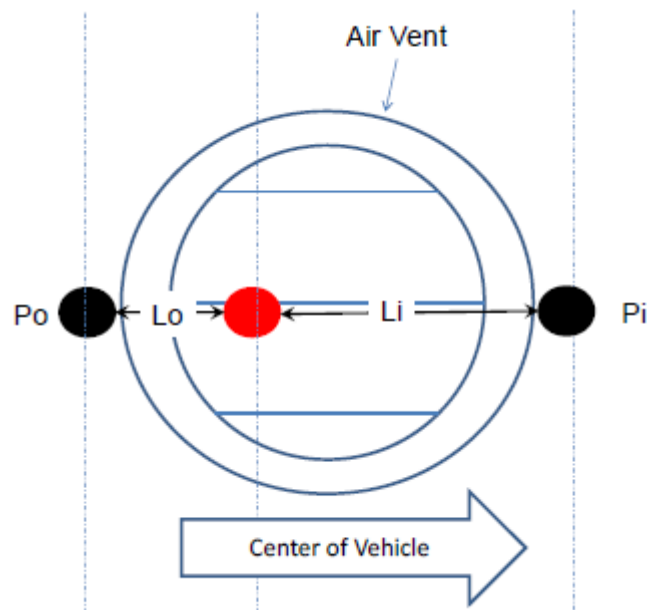


Figure 22: Lower interior intrusion measurements

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.

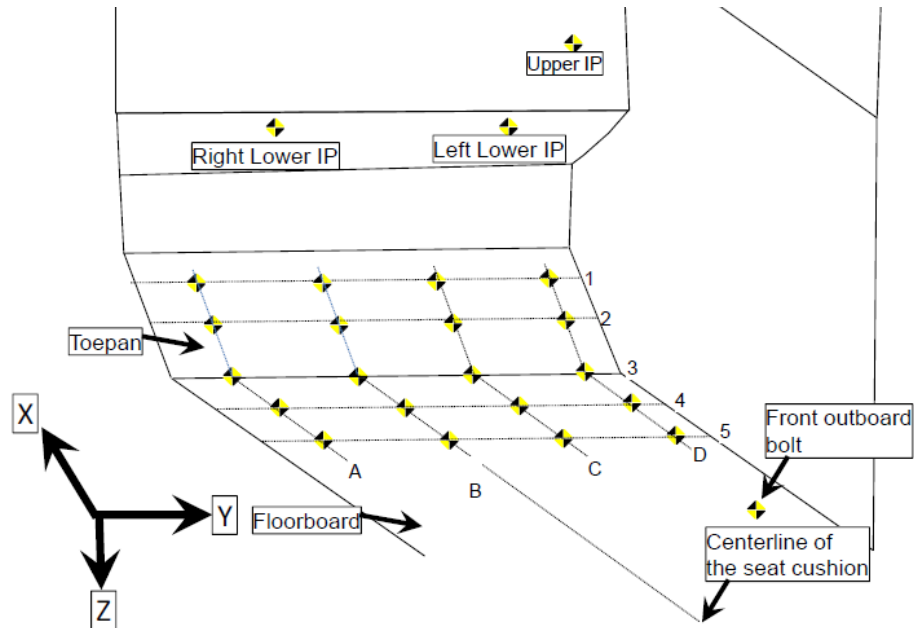


Figure 24: Passenger side lower interior measurements

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

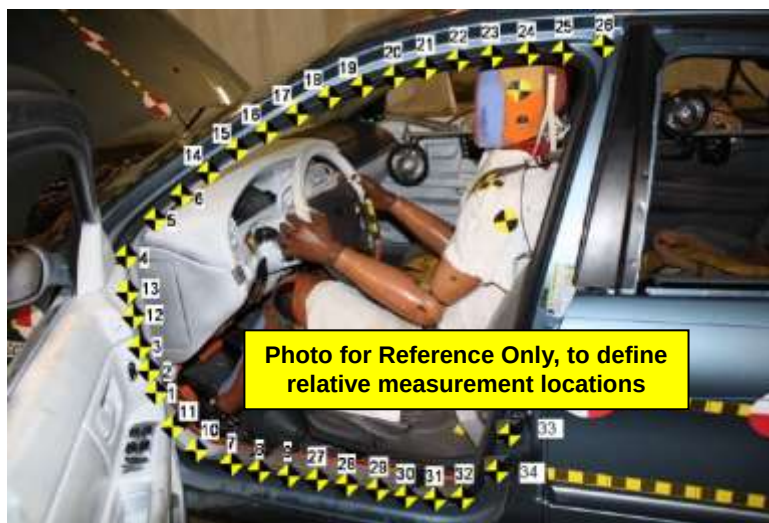


Figure 25: Driver Door Measurements

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.

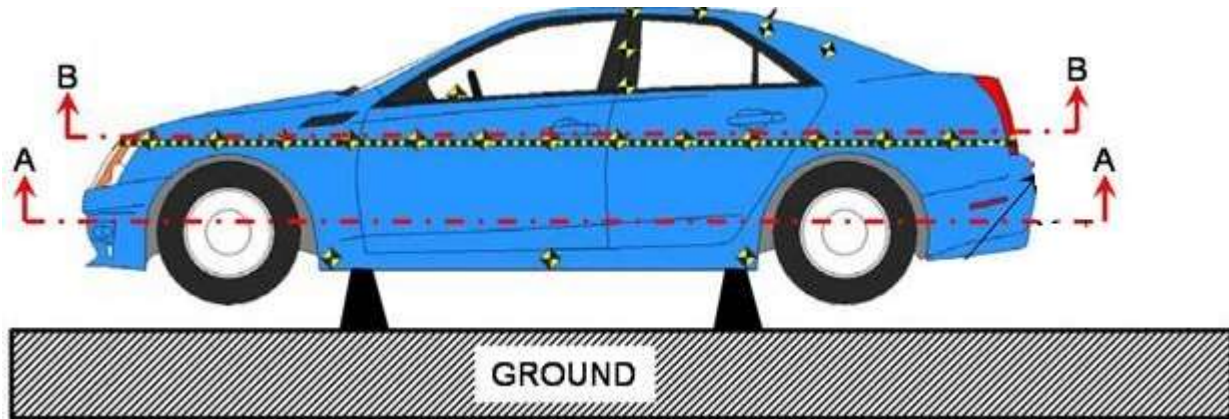


Figure 26: Pre-Test Vehicle Profile

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.

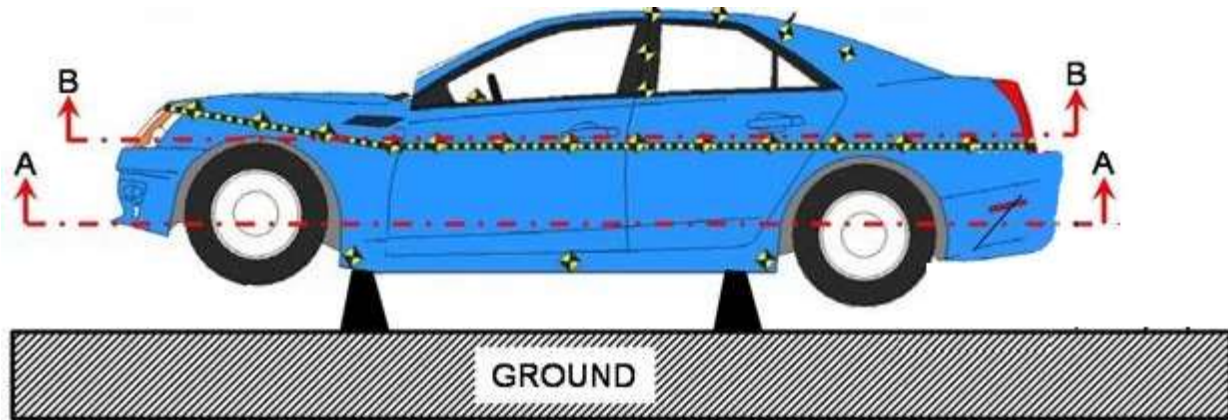
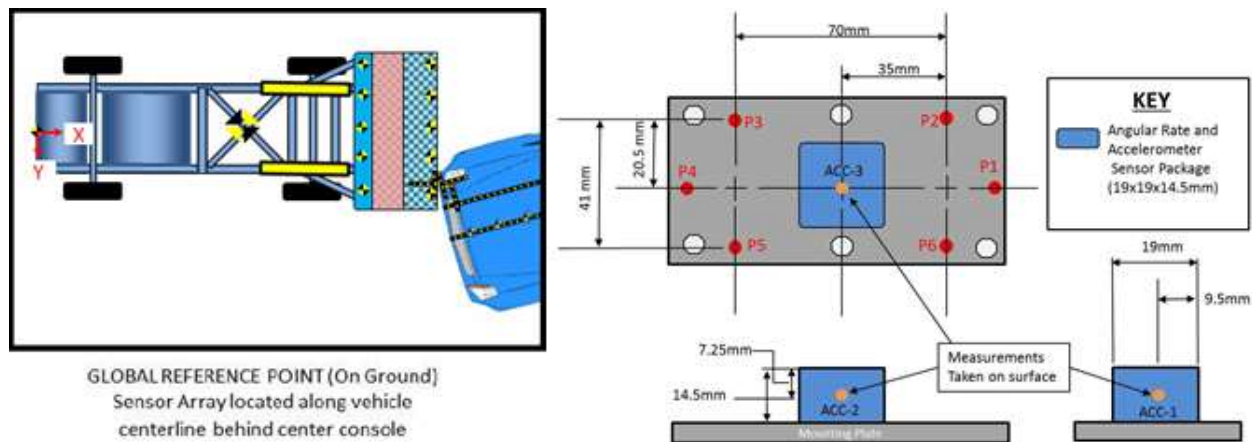


Figure 27: Post-Test Vehicle Profile

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 rear of RMDB
 - Positive Y is from the center of RMDB towards the left of RMDB when looking from the back of the RMDB
 - Positive Z is from the GCS origin point downward into the ground
- 8) Measure and record all points described above