

REPORT NUMBER: R&D-CAL-14-012

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

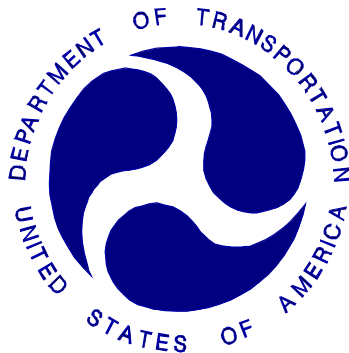
2014 MAZDA 3

90.1KPH, 15 DEGREE ANGLE, 35% OVERLAP

TEST DATE: 010/17/2014

NHTSA No: R20145403

**CALSPAN CORPORATION
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FINAL REPORT SUBMITTED:

February 24, 2015

PREPARED FOR:

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

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Date: February 24, 2015

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Transportation Test Operations

Date: February 24, 2015

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STRUCTURAL AND RESTRAINTS RESEARCH DIVISION:

Date: _____

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16. Abstract A test was conducted in accordance with 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 Mazda 3 four door hatchback. 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 17, 2014. The RMDB impact velocity was 90.28 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 582 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>746.96</td> <td>700</td> <td>355.82</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-41.04</td> <td>63</td> <td>-56.12</td> </tr> <tr> <td>Neck Injury Criteria (Nij)</td> <td>N/A</td> <td>1</td> <td>0.46</td> <td>1</td> <td>0.44</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>2549.42</td> <td>4,170</td> <td>2140.14</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-492.41</td> <td>4,000</td> <td>-20.56</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-2105.62</td> <td>10,008</td> <td>-2068.84</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-2987.19</td> <td>10,008</td> <td>-1835.93</td> </tr> </tbody> </table>					Measurement Description	Units	Driver ATD		Pass. ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	746.96	700	355.82	Maximum Chest Compression	mm	63	-41.04	63	-56.12	Neck Injury Criteria (Nij)	N/A	1	0.46	1	0.44	Neck Tension	N	4,170	2549.42	4,170	2140.14	Neck Compression	N	4,000	-492.41	4,000	-20.56	Left Femur Force	N	10,008	-2105.62	10,008	-2068.84	Right Femur Force	N	10,008	-2987.19	10,008	-1835.93
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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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Test Program:	<u>R&D 90.1kph, 15° / 35% Right Oblique Offset</u>	Test Date:	<u>10/17/2014</u>

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SECTION 1
PURPOSE OF TEST

Test Vehicle: Mazda 3 four door hatchback
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
Test Date: 10/17/2014

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.

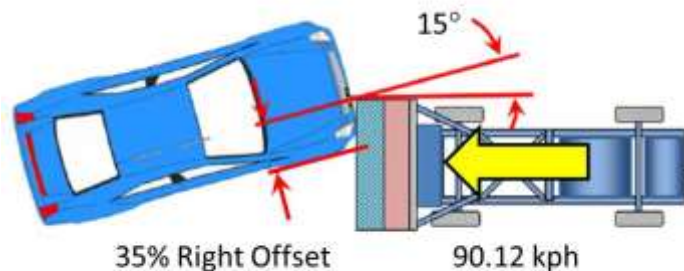
This test was conducted in accordance with the instructions set forth for a 15° angle, 35% offset moving barrier to vehicle impact, outlined in Contract No. DTNH22-10-D-00155. Data was obtained indicant of Federal Motor Vehicle Safety Standard FMVSS 208-Occupant Crash Protection, FMVSS 212 – Windshield 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, TO 0002.

SECTION 2 SUMMARY OF TEST

Test Vehicle: Mazda 3 four door hatchback
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
Test Date: 10/17/2014

A Mazda 3 four door hatchback 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 1,582 kg (3,487.7 lbs), and the RMDB's mass was 2490.2 kg (5490 lbs). The test was conducted by Calspan Corporation on October 17, 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: Mazda 3 four door hatchback
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
Test Date: 10/17/2014

Two hundred and thirty eight (238) channels of data from the two ATD's, test vehicle and RMDB were collected using Kayser – Threde and DTS data acquisition systems. Appendix B contains dummy data plots, as well as vehicle and RMDB response data plots.

There was 95.3% total windshield retention, with 100% and 90.6% 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 582 mm at C6 to the right of the vehicle's centerline. The maximum crush of the structural bumper beam was 469 mm at B8, 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
- C-Pillar Buckled
- Hood bent inwards and exposed part of the engine compartment

The driver ATD's visible contact points were:

- Head contacted the frontal airbag and driver's right hand.
- Torso contacted the frontal airbag
- Driver's right hand contacted the center instrument panel
- Knees contacted the knee bolster

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

- Head contacted the frontal and curtain airbag
- Torso contacted the frontal and torso airbag, and right shoulder/arm contacted the passenger door
- Knees contacted the glove box

SECTION 2 (CONTINUED) CRASH VEHICLE SUMMARY

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

Primary Impact Data

Measured Parameter	Units	Value
RMDB Velocity at Impact	kph	90.28
RMDB Test Weight	kg	2490.2
RMDB Maximum Static Crush	mm	312
Vehicle Test Weight	kg	1582
Actual Vehicle Angle	degrees	15
Vehicle Maximum Static Crush	mm	582
Vertical Offset from Target Point (+ down / - up)*	mm	-17
Lateral Offset from Target Point (+ left / - right)*	mm	+4
Number of Data Channels		238
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 & Driver's Right Hand	A49-A51	Front & Curtain Airbag	A70-A72
Left Shoulder Contact	None	N/A	Torso Airbag & Passenger Door	N/A
Upper Torso Contact	Front Airbag	N/A	Front & Torso Airbag	N/A
Lower Torso Contact	None	N/A	None	N/A
Left Knee Contact	None	A28	Glove Box	A52
Right Outside Leg Contact	Knee Bolster	N/A	None	N/A
Right Knee Contact	Knee Bolster	A28	Glove Box	A52

Data Anamolies:

- Passenger Floor Pan Y Acceleration - Channel Failed After 40ms
- Passenger Abdomen Right DGIR X Displacement - Questionable Spikes from 48ms to 80ms

PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: R20145403 - Mazda 3 NHTSA No.: R20145403
 Test Program: Research and Development Right Oblique Offset 15/35 Test Date: 10/17/2014

Driver: THOR Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	29.14	-19.46
	Head CG Y	g	1000	3.35	-73.23
	Head CG Z	g	1000	60.82	-1.00
	Head Resultant	g	Compute	94.48	
	36 ms HIC		Compute	816.58	
	15 ms HIC		Compute	746.96	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	76.80	
	Head Rotational Velocity X	deg/s	60	2805.09	-767.89
	Head Rotational Velocity Y	deg/s	60	1140.73	-1738.72
	Head Rotational Velocity Z	deg/s	60	1890.05	-2832.33
	Head Rotational Velocity Resultant	deg/s	Compute	3735.29	
	Brain Injury Criteria		Compute	1.47	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	441.25	-287.43
	UNLC Neck System Tension, FZ	N	1000	2549.42	
	UNLC Neck System Compression, FZ	N	1000		-492.41
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	18.86	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-18.02
	NIJ		Compute	0.46	
	On head acting through total neck section, FX	N	Thortest	781.90	-321.02
	On head acting through total neck section, FY	N	Thortest	116.86	-782.98
	On head acting through total neck section, FZ	N	Thortest	2680.08	-308.99
	On head acting through total neck section, MX	N-m	Thortest	36.74	-44.79
	On head acting through total neck section, MY	N-m	Thortest	25.23	-23.71
	On head acting through total neck section, MZ	N-m	Thortest	76.29	-12.15
	On head acting through O.C. joint only, FX	N	Thortest	664.72	-298.95
	On head acting through O.C. joint only, FZ	N	Thortest	2480.06	-493.17
	On head acting through O.C. joint only, MY	N-m	Thortest	18.86	-18.02
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	-0.00	-27.40
	Upper Left IR-TRACC Y - deflection	mm	Thortest	11.57	-8.51
	Upper Left IR-TRACC Z - deflection	mm	Thortest	6.69	-12.88
	Upper Left IR-TRACC D - deflection	mm	Thortest	0.00	-24.49
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.02	-40.21
	Upper Right IR-TRACC Y - deflection	mm	Thortest	14.94	-7.05
	Upper Right IR-TRACC Z - deflection	mm	Thortest	13.80	-20.32
	Upper Right IR-TRACC D - deflection	mm	Thortest	0.02	-41.04
	Lower Left IR-TRACC X - deflection	mm	Thortest	4.70	-8.58
	Lower Left IR-TRACC Y - deflection	mm	Thortest	17.69	-8.46

PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: R20145403 - Mazda 3 NHTSA No.: R20145403

Test Program: Research and Development Right Oblique Offset 15/35 Test Date: 10/17/2014

Driver: THOR Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	11.36	-6.27
	Lower Left IR-TRACC D - deflection	mm	Thortest	6.49	-6.74
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.05	-29.52
	Lower Right IR-TRACC Y - deflection	mm	Thortest	4.77	-10.33
	Lower Right IR-TRACC Z - deflection	mm	Thortest	7.77	-13.02
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.63	-28.71
	Chest CG Acceleration, 3 ms clip	g	Compute	N/A	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	0.00	-59.76
	Lower Left IR-TRACC Y - deflection	mm	Thortest	0.01	-13.35
	Lower Left IR-TRACC Z - deflection	mm	Thortest	10.11	-5.60
	Lower Left IR-TRACC D - deflection	mm	Thortest	0.00	-60.10
	Left Viscous Criterion Based on X - deflection		Compute	2.05	
	Lower Right IR-TRACC X - deflection	mm	Thortest	5.61	-73.72
	Lower Right IR-TRACC Y - deflection	mm	Thortest	5.50	-4.07
	Lower Right IR-TRACC Z - deflection	mm	Thortest	18.62	-10.26
	Lower Right IR-TRACC D - deflection	mm	Thortest	5.60	-74.32
	Right Viscous Criterion Based on X - deflection		Compute	2.48	
Spine	Upper Spine (T1) AX	g	180	4.74	-44.35
	Upper Spine (T1) AY	g	180	4.68	-44.37
	Upper Spine (T1) AZ	g	180	20.49	-1.44
	Upper Spine (T1) Resultant	g	Compute	56.79	
	Middle Spine (T6) AX	g	180	2.57	-31.42
	Middle Spine (T6) AY	g	180	1.53	-27.41
	Middle Spine (T6) AZ	g	180	12.71	-10.07
	Middle Spine (T6) Resultant	g	Compute	36.72	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	60.08	
Acetabulum	Left FX force	N	600	2973.65	-156.97
	Left FY force	N	600	1582.78	-455.08
	Left FZ force	N	600	1436.46	-457.73
	Left Acetabulum Resultant	N	Compute	3021.36	
	Right FX force	N	600	1902.30	-1658.29
	Right FY force	N	600	590.13	-881.82
	Right FZ force	N	600	1589.95	-289.38
	Right Acetabulum Resultant	N	Compute	2234.66	
Anomalies None					

PRELIMINARY INJURY SUMMARY: Driver Legs

Test Vehicle: R20145403 - Mazda 3 NHTSA No.: R20145403
 Test Program: Research and Development Right Oblique Offset 15/35 Test Date: 10/17/2014

Driver: THOR Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	2.32	-5.01
	Right Knee Displacement, DX	mm	180	1.08	-12.49
Femur	Left Femur Force, FZ	N	600	843.79	-2105.62
	Left Femur Moment, MX	N-m	600	199.00	-55.62
	Left Femur Moment, MY	N-m	600	130.77	-28.99
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	210.45	
	Right Femur Force, FZ	N	600	405.94	-2987.19
	Right Femur Moment, MX	N-m	600	22.12	-64.60
	Right Femur Moment, MY	N-m	600	91.00	-106.41
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	107.13	
	Left Upper Tibia, FZ	N	600	261.80	-2587.91
	Left Upper Tibia, MY	N-m	600	128.16	-47.71
Tibia	Left Upper Tibia, Index		Compute	0.65	
	Right Upper Tibia, FZ	N	600	129.55	-1816.74
	Right Upper Tibia, MY	N-m	600	37.87	-31.88
	Right Upper Tibia, Index		Compute	0.50	
	Left Lower Tibia, FZ	N	600	624.31	-3285.24
	Left Lower Tibia, MY	N-m	600	68.01	-26.15
	Left Lower Tibia, Index		Compute	0.58	
	Right Lower Tibia, FZ	N	600	77.17	-3045.40
	Right Lower Tibia, MY	N-m	600	27.57	-31.79
	Right Lower Tibia, Index		Compute	0.38	
Ankle	Left Ankle Rotation, RX	Deg	180	35.98	-22.21
	Left Ankle Rotation, RY	Deg	180	-4.82	-26.75
	Right Ankle Rotation, RX	Deg	180	23.07	-19.96
	Right Ankle Rotation, RY	Deg	180	7.19	-16.38
Anomalies					
None					

PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: R20145403 - Mazda 3 NHTSA No.: R20145403
 Test Program: Research and Development Right Oblique Offset 15/35 Test Date: 10/17/2014

Right Front Passenger: THOR Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	2.63	-52.85
	Head CG Y	g	1000	4.62	-17.83
	Head CG Z	g	1000	33.62	-1.38
	Head Resultant	g	Compute	61.27	
	36 ms HIC		Compute	529.26	
	15 ms HIC		Compute	355.82	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	59.98	
	Head Rotational Velocity X	deg/s	60	994.44	
	Head Rotational Velocity Y	deg/s	60	773.49	-2319.75
	Head Rotational Velocity Z	deg/s	60	521.08	-780.84
	Head Rotational Velocity Resultant	deg/s	Compute	2547.13	
	Brain Injury Criteria		Compute	0.83	
	Neck	UNLC Transferred to OC, Neck System, FX	N	1000	179.72
UNLC Neck System Tension, FZ		N	1000	2140.14	
UNLC Neck System Compression, FZ		N	1000		-20.56
UNLC Transferred to OC, Neck System Flexion, MY		N-m	Thortest	4.45	
UNLC Transferred to OC, Neck System Extension, MY		N-m	Thortest		-40.01
NIJ			Compute	0.44	
On head acting through total neck section, FX		N	Thortest	128.36	-1287.95
On head acting through total neck section, FY		N	Thortest	196.15	-120.36
On head acting through total neck section, FZ		N	Thortest	2125.92	-42.01
On head acting through total neck section, MX		N-m	Thortest	16.02	-33.97
On head acting through total neck section, MY		N-m	Thortest	34.27	-52.25
On head acting through total neck section, MZ		N-m	Thortest	14.23	-4.32
On head acting through O.C. joint only, FX		N	Thortest	171.01	-1230.91
On head acting through O.C. joint only, FZ		N	Thortest	1903.33	-20.56
On head acting through O.C. joint only, MY		N-m	Thortest	4.45	-40.01
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	0.06	-47.50
	Upper Left IR-TRACC Y - deflection	mm	Thortest	4.46	-18.58
	Upper Left IR-TRACC Z - deflection	mm	Thortest	27.26	-13.25
	Upper Left IR-TRACC D - deflection	mm	Thortest	0.07	-45.42
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.66	-20.89
	Upper Right IR-TRACC Y - deflection	mm	Thortest	4.49	-17.63
	Upper Right IR-TRACC Z - deflection	mm	Thortest	24.78	-15.44
	Upper Right IR-TRACC D - deflection	mm	Thortest	0.56	-18.50
	Lower Left IR-TRACC X - deflection	mm	Thortest	0.62	-58.65
	Lower Left IR-TRACC Y - deflection	mm	Thortest	14.10	-0.46

PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: R20145403 - Mazda 3 NHTSA No.: R20145403
 Test Program: Research and Development Right Oblique Offset 15/35 Test Date: 10/17/2014

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	11.08	-3.46
	Lower Left IR-TRACC D - deflection	mm	Thortest	3.65	-56.12
	Lower Right IR-TRACC X - deflection	mm	Thortest	6.17	-3.31
	Lower Right IR-TRACC Y - deflection	mm	Thortest	8.68	-10.54
	Lower Right IR-TRACC Z - deflection	mm	Thortest	0.10	-10.32
	Lower Right IR-TRACC D - deflection	mm	Thortest	6.63	-2.97
	Chest CG Acceleration, 3 ms clip	g	Compute	N/A	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	0.35	-58.76
	Lower Left IR-TRACC Y - deflection	mm	Thortest	6.70	-3.92
	Lower Left IR-TRACC Z - deflection	mm	Thortest	6.93	-0.19
	Lower Left IR-TRACC D - deflection	mm	Thortest	0.36	-58.38
	Left Viscous Criterion Based on X - deflection		Compute	1.26	
	Lower Right IR-TRACC X - deflection	mm	Thortest	20474.52 ⁽¹⁾	-50.48 ⁽¹⁾
	Lower Right IR-TRACC Y - deflection	mm	Thortest	705.81 ⁽¹⁾	-0.04 ⁽¹⁾
	Lower Right IR-TRACC Z - deflection	mm	Thortest	1292.89 ⁽¹⁾	-0.40 ⁽¹⁾
	Lower Right IR-TRACC D - deflection	mm	Thortest	20499.40 ⁽¹⁾	-50.38 ⁽¹⁾
	Right Viscous Criterion Based on X - deflection		Compute	4096755 ⁽¹⁾	
Spine	Upper Spine (T1) AX	g	180	3.66	-56.52
	Upper Spine (T1) AY	g	180	9.82	-12.06
	Upper Spine (T1) AZ	g	180	22.45	-5.31
	Upper Spine (T1) Resultant	g	Compute	57.65	
	Middle Spine (T6) AX	g	180	2.55	-37.30
	Middle Spine (T6) AY	g	180	2.53	-17.11
	Middle Spine (T6) AZ	g	180	14.79	-25.49
	Middle Spine (T6) Resultant	g	Compute	45.62	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	55.74	
Acetabulum	Left FX force	N	600	1655.61	-1022.58
	Left FY force	N	600	1345.37	-329.50
	Left FZ force	N	600	1989.94	-148.81
	Left Acetabulum Resultant	N	Compute	2243.78	
	Right FX force	N	600	1571.02	-719.45
	Right FY force	N	600	823.70	-245.87
	Right FZ force	N	600	2186.60	-88.04
	Right Acetabulum Resultant	N	Compute	2275.02	

Anomalies

(1) Abdomen Right DGIR X Displacement, Questionable Spikes from ~48ms to 80ms

PRELIMINARY INJURY SUMMARY: Right Front Passenger Legs

Test Vehicle: R20145403 - Mazda 3 NHTSA No.: R20145403
 Test Program: Research and Development Right Oblique Offset 15/35 Test Date: 10/17/2014

Right Front Passenger: THOR Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	1.38	-6.70
	Right Knee Displacement, DX	mm	180	0.98	-3.54
Femur	Left Femur Force, FZ	N	600	298.34	-2068.84
	Left Femur Moment, MX	N-m	600	182.50	-15.16
	Left Femur Moment, MY	N-m	600	105.74	-73.09
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	192.43	
	Right Femur Force, FZ	N	600	558.39	-1835.93
	Right Femur Moment, MX	N-m	600	204.81	-10.91
	Right Femur Moment, MY	N-m	600	159.37	-85.55
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	210.11	
	Left Upper Tibia, FZ	N	600	129.03	-3639.83
	Left Upper Tibia, MY	N-m	600	52.51	-83.76
Tibia	Left Upper Tibia, Index		Compute	0.89	
	Right Upper Tibia, FZ	N	600	29.38	-3645.19
	Right Upper Tibia, MY	N-m	600	44.17	-76.01
	Right Upper Tibia, Index		Compute	0.50	
	Left Lower Tibia, FZ	N	600	73.61	-2607.99
	Left Lower Tibia, MY	N-m	600	88.93	-83.27
	Left Lower Tibia, Index		Compute	0.90	
	Right Lower Tibia, FZ	N	600	13.93	-2057.55
	Right Lower Tibia, MY	N-m	600	67.41	-32.65
	Right Lower Tibia, Index		Compute	0.42	
Ankle	Left Ankle Rotation, RX	Deg	180	36.76	2.27
	Left Ankle Rotation, RY	Deg	180	21.35	-32.59
	Right Ankle Rotation, RX	Deg	180	20.23	-4.31
	Right Ankle Rotation, RY	Deg	180	15.11	-26.99
Anomalies					
None					

SECTION 3 DATA SHEETS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

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3	Dummy Longitudinal Clearance Dimensions	3-8
4	Dummy Lateral Clearance Dimensions	3-10
5	Seat Belt Positioning Data	3-11
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DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

VEHICLE INFORMATION

NHTSA No.	R20145403
Model Year	2014
Make	Mazda
Model	3
Body Style	4 Door Hatchback
VIN	JM1BM1L70E1190718
Body Color	Silver
Odometer Reading (km/mi)	260.7 km / 162 mi
Engine Displacement. (L)	2.0
Type/No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6-Speed
Overdrive	Yes
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
All-Wheel Drive (AWD)	No
Traction Control System (TCS)	Yes

VEHICLE OPTIONS

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

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

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Mazda Motor Corporation
Date of Manufacture	03/14

GVWR (kg)	1815
GAWR Front (kg)	975
GAWR Rear (kg)	848

VEHICLE SEATING AND WEIGHT CAPACITY

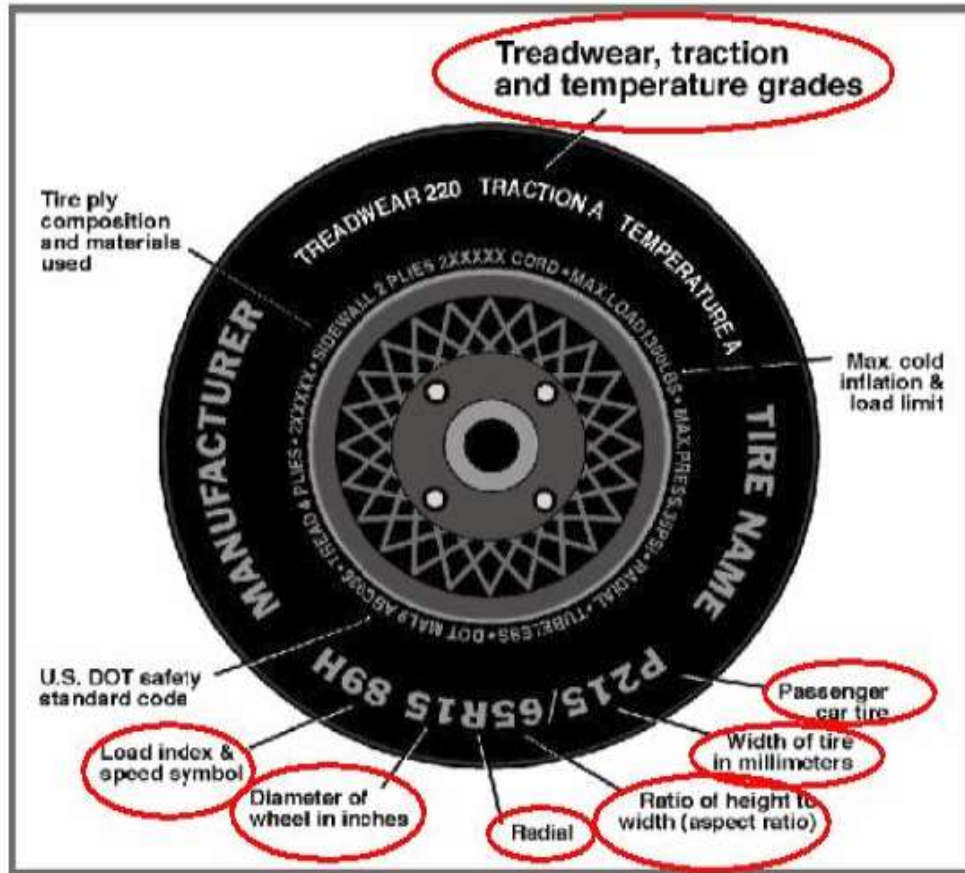
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	--	
Number of Occupants	2	3	--	5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				44.8

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

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

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



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	250
Recommended Tire Size	P205/60R16	P205/60R16
Tire Size on Vehicle	P205/60R16	P205/60R16
Tire Manufacturer	Yokohama	Yokohama
Tire Model	AVID S34	AVID S34
Treadwear	320	320
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel,	1 Polyester, 2 Steel,
Load Index/Speed Symbol	91H	91H
Tire Material	Rubber	Rubber
DOT Safety Code Right	FD20PHY0814	FD20PHY0814
DOT Safety Code Left	FD20PHY0814	FD20PHY0814

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

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	425	247		445	368	
Right	kg	373	273		434	335	
Ratio	%	61%	39%		56%	44%	
Totals	kg	798	520	1318	879	703	1582

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1318
Weight of 2 P572E ATDs	kg	197.8
Rated Cargo/Luggage Weight (RCLW)	kg	44.8
Calculated Vehicle Target Weight (TVTW)	kg	1560.6

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	697	704	720	729	1064
As Tested	mm	683	688	674	683	1198
Post Test	mm	598	803	768	667	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2697
Total Vehicle Length at Left Side	mm	4328
Total Vehicle Length at Centerline	mm	4462
Total Vehicle Length at Right Side	mm	4331
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	59
Amount of Stoddard Solvent in Fuel Tank	L	46.5

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpet, spare tire, jack, tail light, rear seats, splash guards.

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

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements		Pre-Test
1	Total Length	mm	4462
2	Total Width	mm	1798
3*	Bumper Top Height	mm	577
4*	Bumper Bottom Height	mm	494
5*	Longitudinal Member Top Height	mm	594
6	Distance Between Longitudinal Members	mm	1081
7	Longitudinal Member Width	mm	99
8*	Engine Top Height	mm	922
9*	Engine Bottom Height	mm	241
10	Engine and Gearbox Width	mm	580
11	Front Bumper-Engine Distance	mm	677
12*	Front Shock Absorber Fixing Height	mm	931
13*	Bonnet Leading Edge Height	mm	819
14	Front Shock Absorber Fixing Width	mm	1134
15	Front Bumper – Front Axle Distance	mm	926
16	Front Axle – A Pillar Distance	mm	535
17	A-Pillar – B-Pillar Distance	mm	1119
18	B-Pillar – Rear Axle Distance	mm	1042
19	B-Pillar – C-Pillar Distance	mm	1004
20*	Roof Sill Bottom Height	mm	1338
21*	Roof Sill Top Height	mm	1448
22*	Floor Sill Bottom Height	mm	268
23*	Floor Sill Top Height	mm	402

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

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

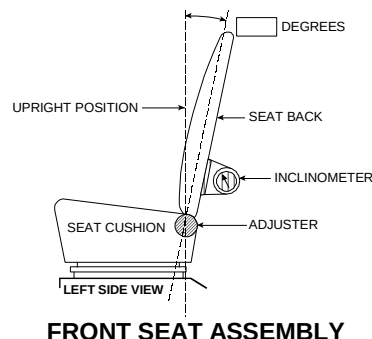
NHTSA No.: R20145403
 Test Date: 10/17/2014

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	5.2
Passenger Seat Back Angle	4.7

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.

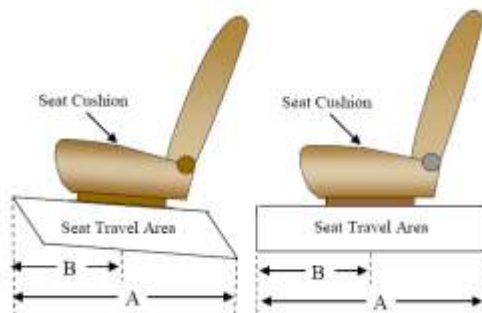
	Total Fore/Aft Travel	Placed in Position #
Driver Seat	27 (0-26)	11
Passenger Seat	27 (0-26)	13

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	3	0
Passenger Seat	3	0



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

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

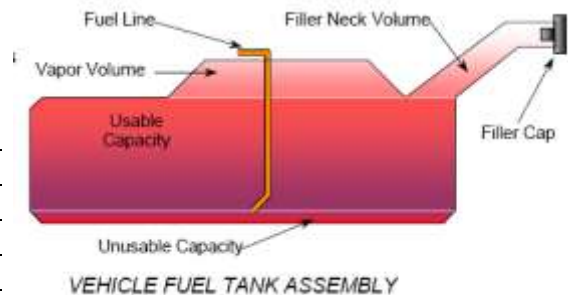
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	50.0
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	46.5
Actual Amount of Solvent Used	46.5
1/3 of Usable Capacity	16.5

FUEL PUMP

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

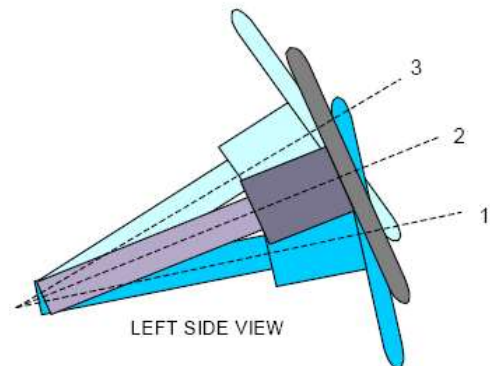
Fuel evacuated according to the specifications provided by the manufacturer in Form 1. Electric fuel pump operates when the ignition is in the 'on' position and the engine is running. The fuel filler neck is located above the left rear wheel.



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

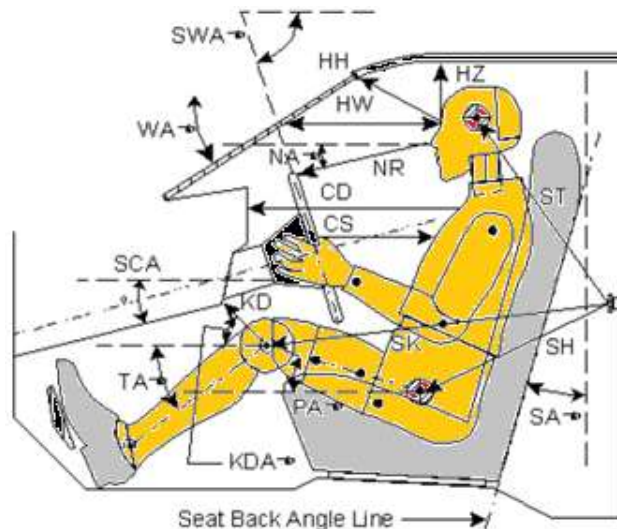
STEERING COLUMN POSITIONS

	Tilt (degrees)	Fore/Aft Position (mm)
Lowermost position No. 1	21.2	
Geometric center position No. 2	23.6	
Uppermost position No. 3	26.0	
Telescoping Steering Wheel Travel		49
Test Position	23.6	25

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



Code	Measurement Description	Driver (Serial # THOR 015)		Passenger (Serial # THOR 016)	
		Length (mm)	Angle(°)	Length (mm)	Angle (°)
WA°	Windshield Angle		-25.3		
SWA°	Steering Wheel Angle		23.6		
SCA°	Steering Column Angle		66.4		
SA°	Seat Back Angle (on headrest post)		6.3		4.4
HZ	Head to Roof (Z)	195	90	169	90
HH	Head to Header	397	19.7	386	16.2
HW	Head to Windshield	685	0	604	0
NR	Nose to Rim	521	-16.0	703	-29.9
CD	Chest to Dash	597		563	
CS	Chest to Steering Hub	381	1.4		
RA	Rim to Abdomen	228	0		
KDL	Left Knee to Dash	170	29.4	135	30.2
KDR	Right Knee to Dash	152	43.4	155	28.5
PA°	Pelvic Angle		24.9		24.7
TA°	Tibia Angle		33.9		35.5
SK	Striker to Knee	562	-6.9	594	-6.3
ST	Striker to Head	475	-84.8	498	85.5
SH	Striker to H-Point	262	-49.0	252	-43.9
HAX°	Head Angle (X)		-0.1		-0.2
HAY°	Head Angle (Y)		0.2		-0.3
TAX°	T6 Angle (X)		-0.6		0.1
TAY°	T6 Angle (Y)		21.1		17.4
LAX°	T1 (X)		0.0		1.3
LAY°	T1 (Y)		1.0		0.9

DATA SHEET NO.3 (CONTINUED)
DUMMY CMM MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
Test Date: 10/17/2014

Description	Units	Driver			Passenger		
		X	Y	Z	X	Y	Z
Striker	mm	1107	-787	681	1105	791	683
Head CG	mm	1099	-450	216	1100	456	193
Bridge of Nose	mm	1191	-371	204	1195	379	180
Tip of Nose	mm	1190	-372	241	1196	381	219
Shoulder Bolt	mm	1130	-555	472	1172	573	457
Tip of Chin	mm	1190	-370	342	1196	378	320
H-Point	mm	1314	-618	887	1321	622	865
Left Knee	mm	1700	-571	757	1726	311	747
Right Knee	mm	1708	-282	755	1730	540	755
Left Ankle	mm	2047	-576	995	2078	308	978
Right Ankle	mm	2051	-244	1002	2078	519	986
Left Heel	mm	2080	-553	1126	2064	271	1122
Right Heel	mm	2073	-217	1132	2063	485	1125
Head Bolt 1 – Top Left	mm	1024	-409	170	1031	334	153
Head Bolt 2 – Lower Left	mm	1036	-401	254	1044	348	234
Head Bolt 3 – Top Right	mm	1017	-340	169	1027	405	150
Head Bolt 4 – Lower Right	mm	1033	-353	255	1043	398	235
Driver's Outboard Seat Anchor Bolt	mm	1589	-609	1066	1588	612	1068
Outboard Head Restraint Post	mm	918	-452	381	943	459	350
Top of Head Restraint	mm	975	-370	118	1010	370	86
Center of Steering Wheel	mm	1613	-364	484			

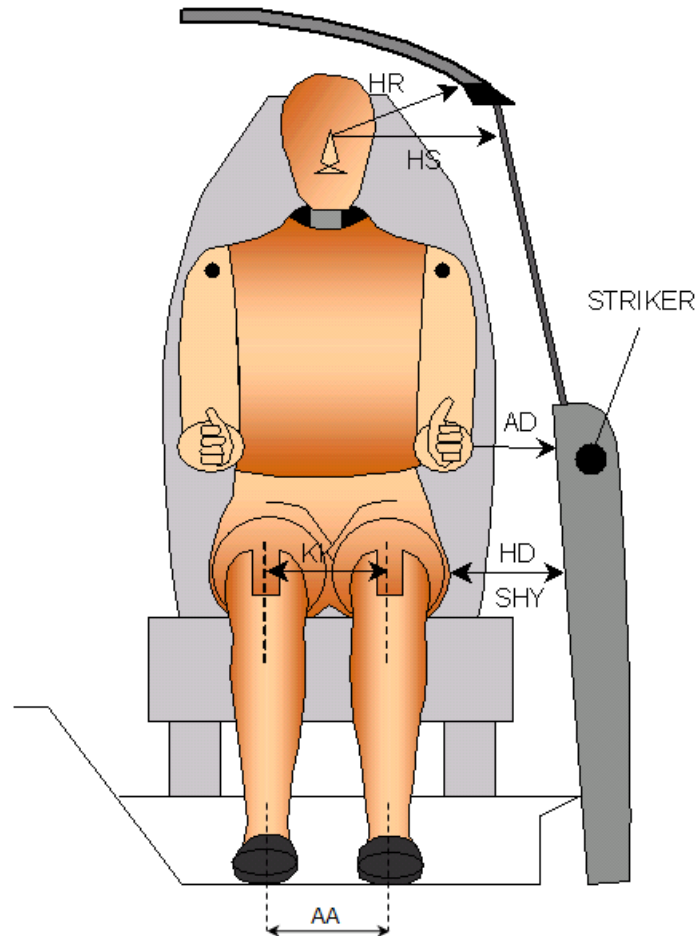
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

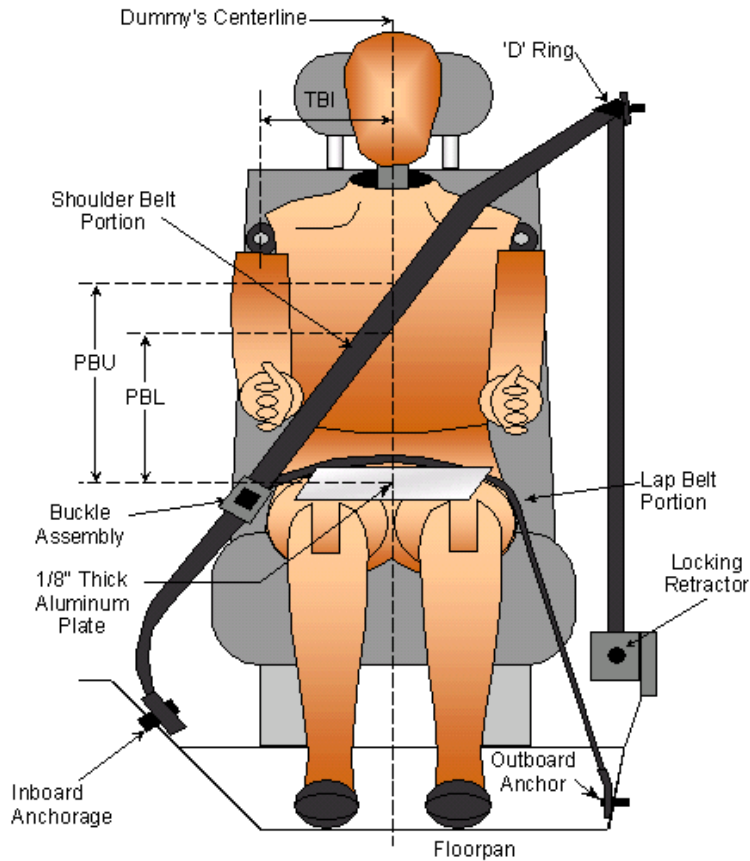


Code	Description	Units	Driver	Passenger
AD	Arm to Door	mm	130	55
HD	H-Point to Door	mm	145	134
HR	Head to Side Header	mm	220	205
HS	Head to Side Window	mm	330	325
KK	Knee to Knee	mm	341	275
SHY	Striker to H-Point (Y Direction)	mm	245	240
AA	Ankle to Ankle	mm	330	209

DATA SHEET NO. 5 **SEAT BELT POSITIONING DATA**

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	375	380
PBL — Top surface of reference to belt lower edge	mm	300	305

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	825	850
Lap Belt Length as measured on ATD	mm	755	730
Remainder of belt on reel	mm	820	870
Total belt length for continuous webbing systems	mm	2400	2450

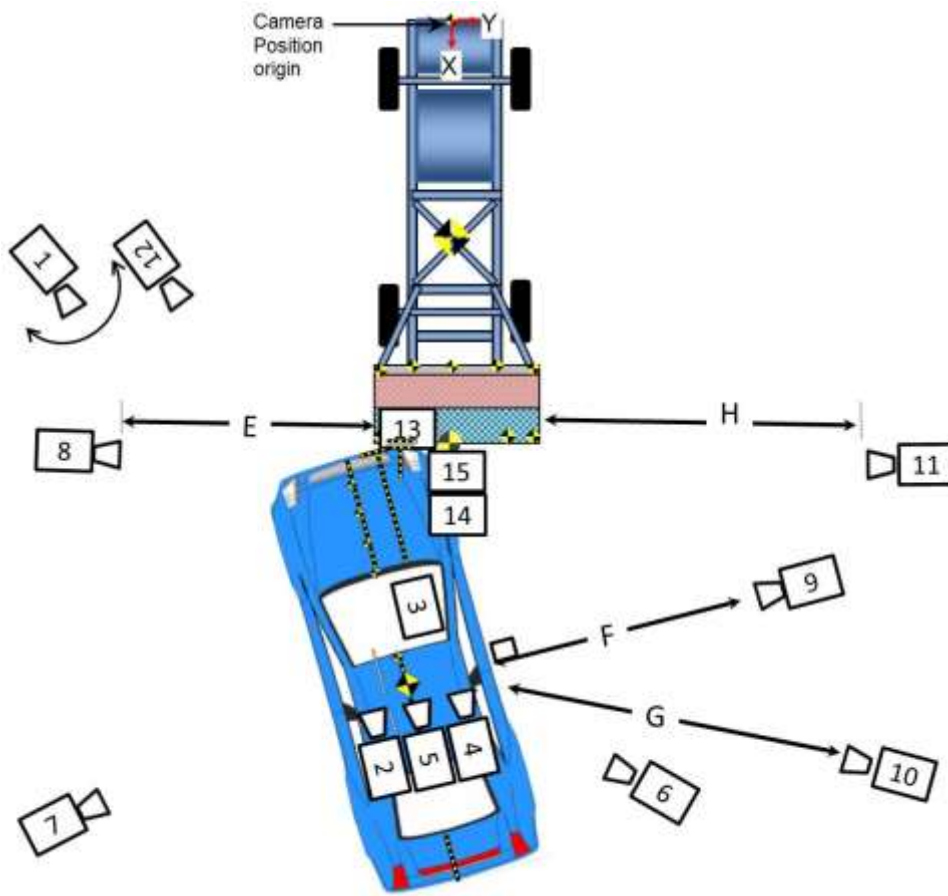
DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle:	Mazda 3 four door hatchback
Test Program:	R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
Test Date: 10/17/2014

HORIZONTAL LOCATION



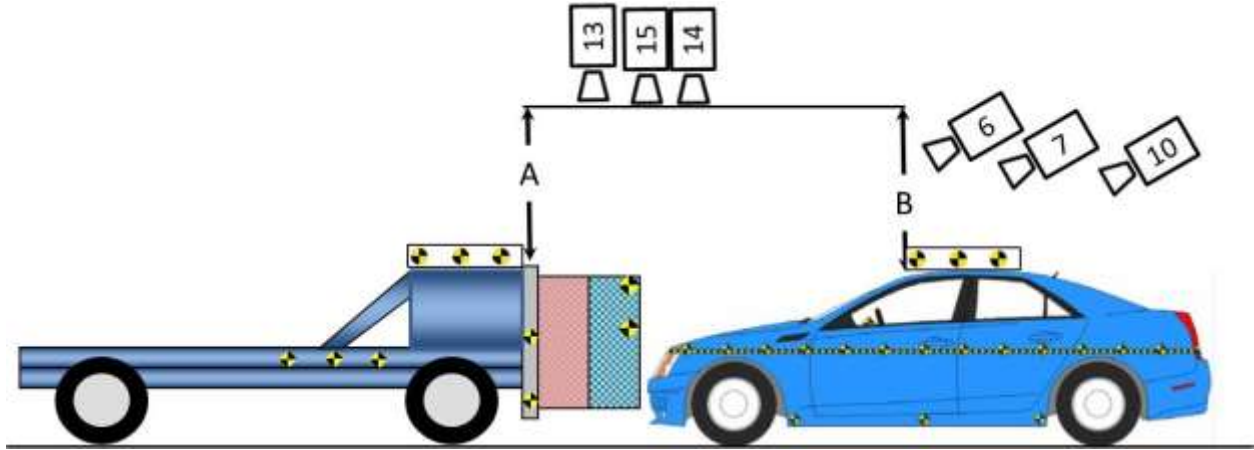
E	mm	6200
F	mm	7143
G	mm	10340
H	mm	6200

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

Test Vehicle: Mazda 3 four door hatchback
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
Test Date: 10/17/2014

VERTICAL LOCATION



A	mm	4087
B	mm	3826

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

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

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	7949	930	1236	12.5	1000
3	Onboard Passenger Lower Leg	6504	474	271	6.5	1000
4	Onboard Driver Movement	7807	173	1236	12.5	1000
5	Onboard Centerline	7872	490	1236	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

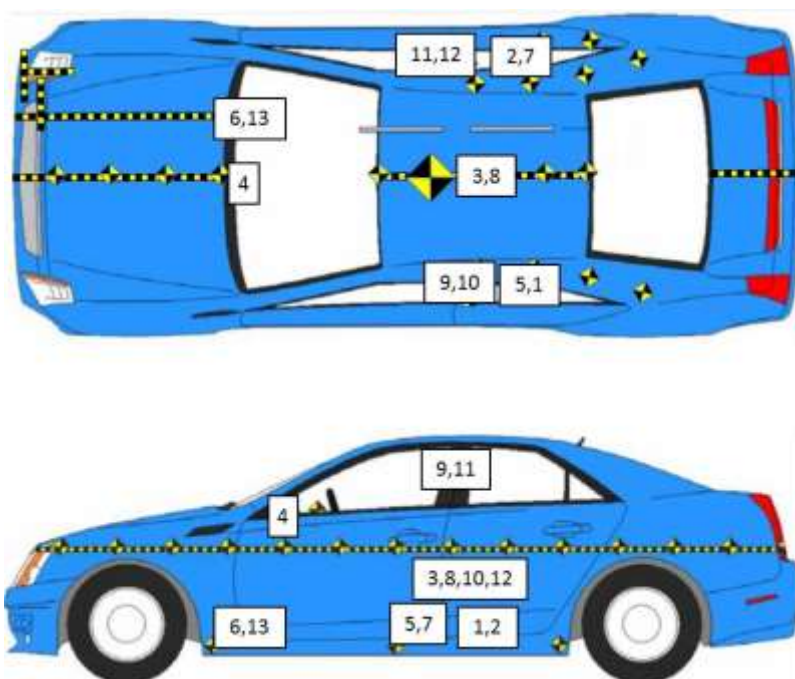
Reference Point: Center most rearward point of the RMDB when in contact with the target vehicle:

- +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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Axes	Units	Measurements (mm)		
				X	Y	Z
1	Left Rear Sill	X,Y	mm	839	-689	1060
2	Right Rear Sill	X,Y	mm	852	699	1064
3	Vehicle CG	X,Y,Z	mm	884	0	1009
4	Instrument Panel	X	mm	1824	-3	765
5	Driver Seat Track	X,Y,Z	mm	1114	-614	1153
6	Passenger Toe Pan	X,Y,Z	mm	2430	413	878
7	Passenger Seat Track	X,Y,Z	mm	1111	617	1157
8	Angular Rate Sensors	X	mm	839	-689	1060
		Y	mm	852	699	1064
		Z,	mm	884	0	1009

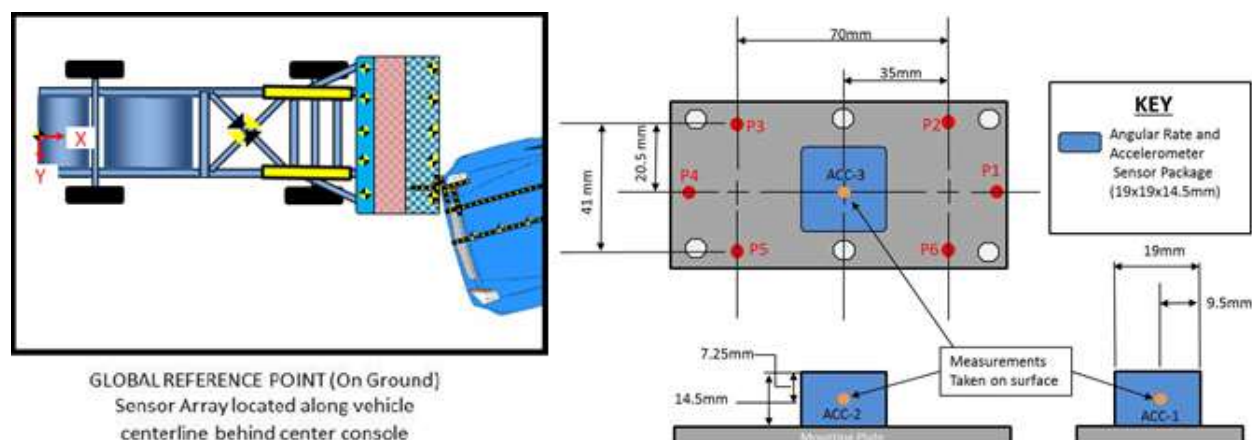
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



VEHICLE COORDINATE SYSTEM					
No.	Accelerometer Location	Units	Measurements (mm)		
			X	Y	Z
ACC-1	Accelerometer CG – X Direction	mm	895	0	1015
ACC-2	Accelerometer CG – Y Direction	mm	881	11	1016
ACC-3	Accelerometer CG – Z Direction	mm	884	0	1009
M1	Mounting Bolt 1	mm	891	8	1010
M2	Mounting Bolt 2	mm	876	-8	1010
P1	Plate Point 1	mm	930	0	1025
P2	Plate Point 2	mm	919	-20	1024
P3	Plate Point 3	mm	849	-22	1024
P4	Plate Point 4	mm	838	-1	1024
P5	Plate Point 5	mm	848	20	1024
P6	Plate Point 6	mm	918	21	1024

GLOBAL COORDINATE SYSTEM					
No.	Accelerometer Location	Units	Measurements (mm)		
			X	Y	Z
ACC-1	Accelerometer CG – X Direction	mm	7281	670	-368
ACC-2	Accelerometer CG – Y Direction	mm	7291	656	-367
ACC-3	Accelerometer CG – Z Direction	mm	7292	667	-374
M1	Mounting Bolt 1	mm	7282	662	-373
M2	Mounting Bolt 2	mm	7301	673	-374
P1	Plate Point 1	mm	7247	679	-359
P2	Plate Point 2	mm	7263	696	-359
P3	Plate Point 3	mm	7331	679	-359
P4	Plate Point 4	mm	7337	656	-359
P5	Plate Point 5	mm	7321	639	-359
P6	Plate Point 6	mm	7253	656	-359

DATA SHEET NO. 7 (CONTINUED)
VEHICLE INSTRUMENTATION DATA

Test Vehicle: Mazda 3 four door hatchback
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
Test Date: 10/17/2014

VEHICLE INSTRUMENTATION DATA

Loc.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Max	Time (ms)
1	Left Rear Sill	X	g	2.59	146.15	-38.84	36.50
		Y	g	4.37	20.15	-26.52	29.75
2	Right Rear Sill	X	g	1.47	163.65	-39.36	43.30
		Y	g	4.64	10.90	-24.73	29.55
3	Vehicle CG	X	g	2.30	162.30	-35.42	55.40
		Y	g	5.02	48.10	-21.95	29.30
		Z	g	20.01	44.15	-50.36	48.55
4	Instrument Panel	X	g	29.81	58.80	-90.72	51.25
5	Driver Seat Track	X	g	2.60	161.90	-41.06	37.30
		Y	g	3.57	20.05	-27.89	29.10
		Z	g	7.11	24.75	-5.01	57.05
6	Passenger Toe Pan	X	g	1648.00	73.95	1947.77	40.05
		Y	g	270.03	40.10	-2263.76	39.35
		Z	g	513.37	40.15	-801.86	38.80
7	Passenger Seat Track	X	g	1.51	162.60	-37.44	43.95
		Y	g	4.89	68.20	-26.76	28.90
		Z	g	25.57	41.15	-18.27	65.90
8	Angular Rate Sensors	X	Deg/s	257.79	28.75	-426.20	47.45
		Y	Deg/s	896.71	45.50	-556.46	52.20
		Z	Deg/s	123.72	45.20	-14.85	11.20
9	Driver Shoulder Belt		N	4465.94	48.00	-32.07	8.85
10	Driver Lap Belt		N	7992.60	58.85	-16.96	12.75
11	Passenger Shoulder Belt		N	4258.70	52.55	-28.79	8.65
12	Passenger Lap Belt		N	6465.13	60.05	-16.83	12.70
13	Passenger Floor String Pot		mm	0.12	-14.30	-61.19	86.85

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	9.80
2	Driver Air Bag Squib 2	*	A	14.75
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	9.75
7	Passenger Air Bag Squib 1	*	A	9.80
8	Passenger Air Bag Squib 2	*	A	14.75
9	Passenger Curtain Airbag	*	A	38.75
10	Passenger Torso Airbag	*	A	38.75
11	Passenger Knee Airbag	*	A	N/A
12	Passenger Pretensioner	*	A	9.75

* The measurement indicates the time the voltage changed

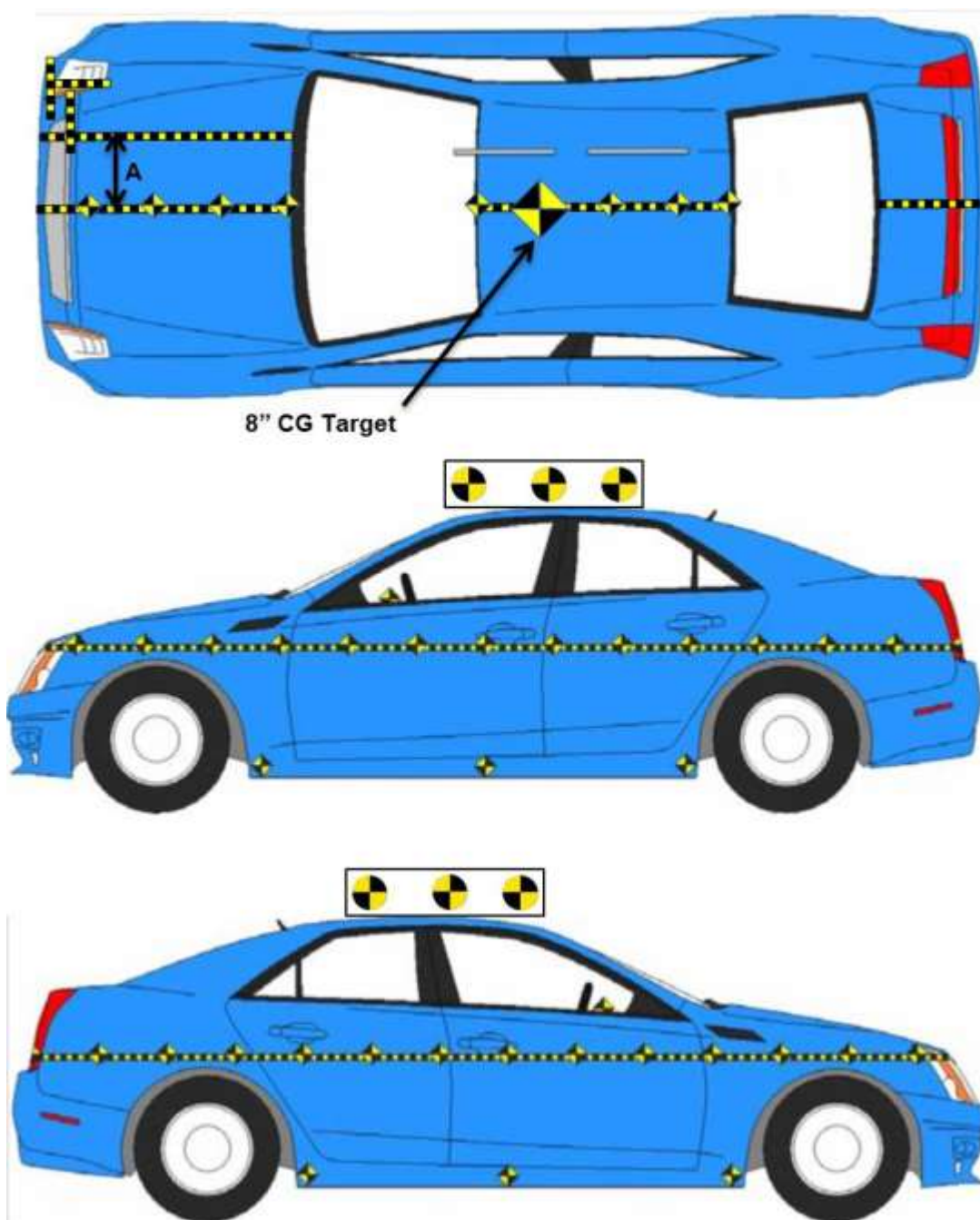
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: Mazda 3 four door hatchback
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
Test Date: 10/17/2014

Item	Units	Value
A	mm	270

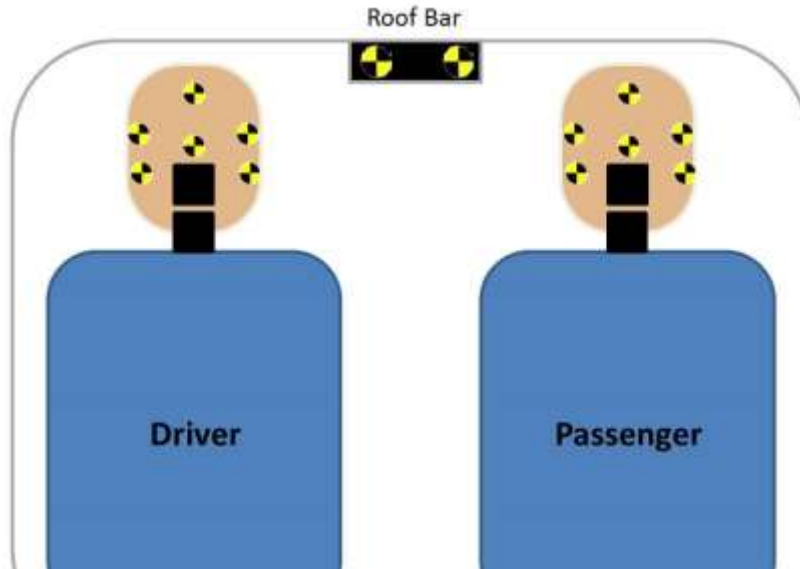
Note: All 6" targets on vehicle are 450 mm apart.



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

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



Point	Pre-Test		
	X	Y	Z
Roof Bar Driver	1479	-56	109
Roof Bar Passenger	1482	70	115

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

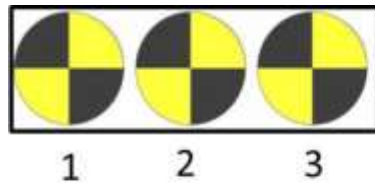
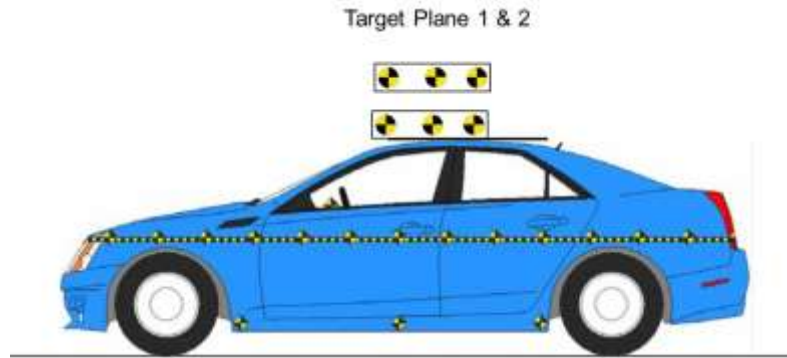
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

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

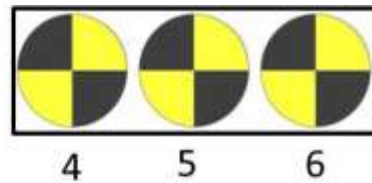
Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

OVERHEAD TARGET BARS



Vertical Target
Plane 1
(Driver's Side)



Vertical Target
Plane 2
(Passenger Side)

Target	Units	X	Y	Z
1	mm	1534	-376	-429
2	mm	1079	-381	-433
3	mm	627	-375	-431
4	mm	1541	366	-443
5	mm	1087	360	-439
6	mm	636	353	-434

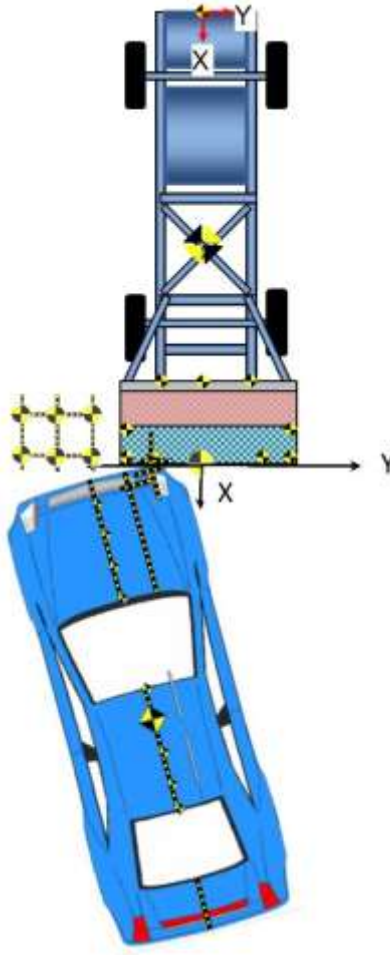
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



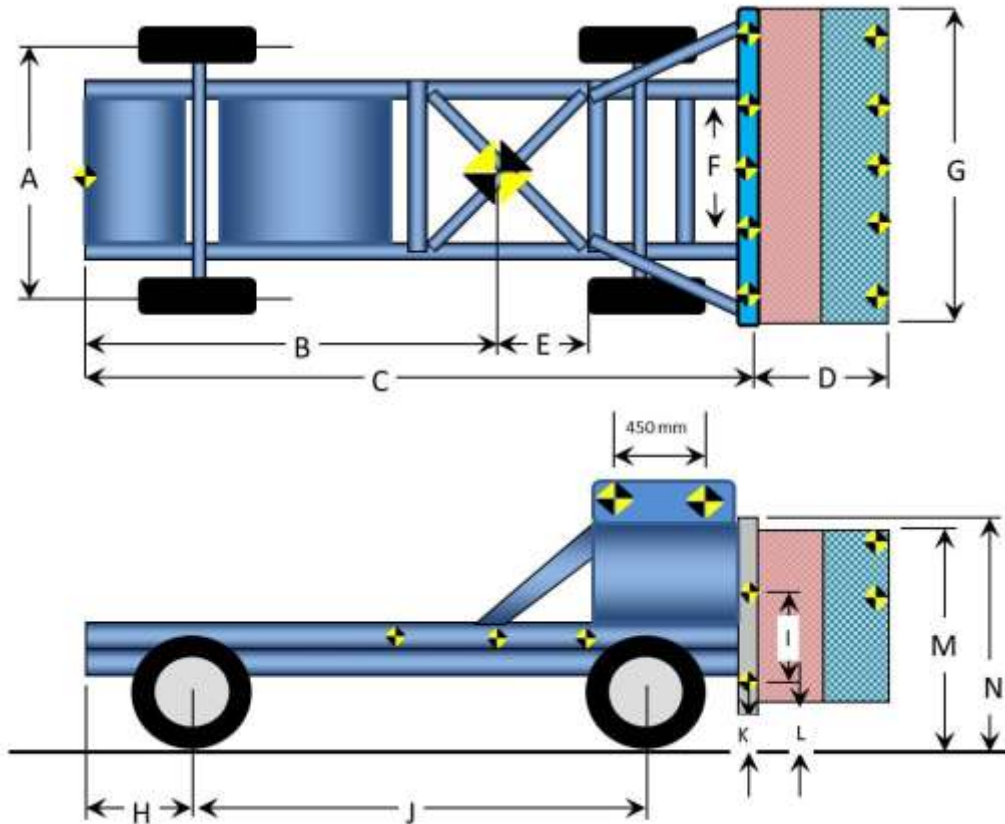
GROUND TARGET LOCATIONS

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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



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	78
F	mm	900	M	mm	1031
G	mm	2207	N	mm	1186

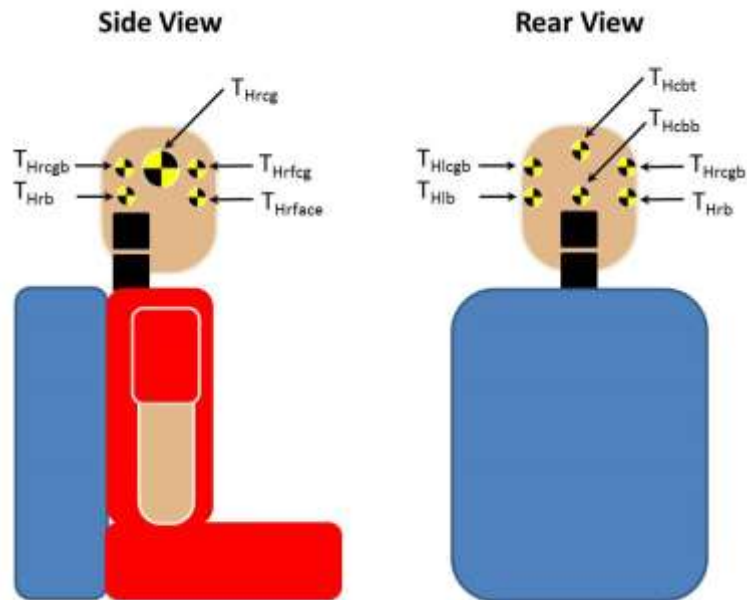
	Units	Front Axle	Rear Axle	Total
Left	kg	804.2	435	1239.2
Right	kg	801.5	449.5	1251
Ratio	%	64.5	35.5	100
Total	kg	1605.7	884.5	2490.2
CG Aft of Front Axle	mm			907

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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



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 _{Hrfce}	mm	70
Distance between T _{Hlcbg} & T _{Hlfcg}	mm	38
Distance between T _{Hlcbg} & T _{Hlcb}	mm	38
Distance between T _{Hlcb} & T _{Hlfb}	mm	70
Distance between T _{Hlfcg} & T _{Hlfce}	mm	70
Distance between T _{Hcgt} & T _{Hcbb}	mm	72

Passenger Dummy Head Targets (S/N 015)

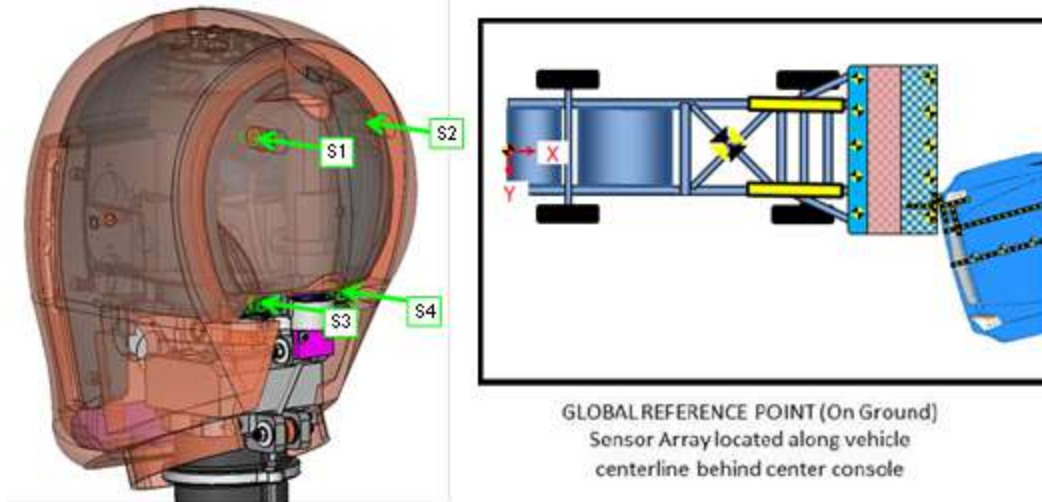
Measurement	Units	Value
Distance between T _{Hrcg} & T _{Hrfcg}	mm	38
Distance between T _{Hrcg} & T _{Hrcgb}	mm	38
Distance between T _{Hrcgb} & T _{Hrb}	mm	70
Distance between T _{Hrfcg} & T _{Hrfce}	mm	70
Distance between T _{Hlcbg} & T _{Hlfcg}	mm	38
Distance between T _{Hlcbg} & T _{Hlcb}	mm	38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

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

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

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	7262	1099	-1213
S3	7249	1094	-1129
S2	7251	1031	-1214
S4	7239	1047	-1128

FRONT PASSENGER HEAD BOLT POINTS

Target	X	Y	Z
S1	7063	383	-1230
S3	7047	373	-1149
S2	7048	313	-1233
S4	7035	324	-1148

**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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	93
Passenger Dummy Accelerometers	93
Vehicle Structure Accelerometers	46
RMDB Cart Accelerometers	6
Total	238

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: Mazda 3 four door hatchback
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
Test Date: 10/17/2014

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 & Driver's Right Hand	Front & Curtain Airbag
Upper Torso Contact	Front Airbag	Front & Torso Airbag, Shoulder/Arm Contacted Passenger Door
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	No	No
Glazing Damage	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions	Photo Taken (Y/N)
Pillar Performance	C-Pillar Buckled	Y
Windshield Damage	Crack throughout with minor separation	Y
Window Damage	None	Y
Other Notable Effects	None	--

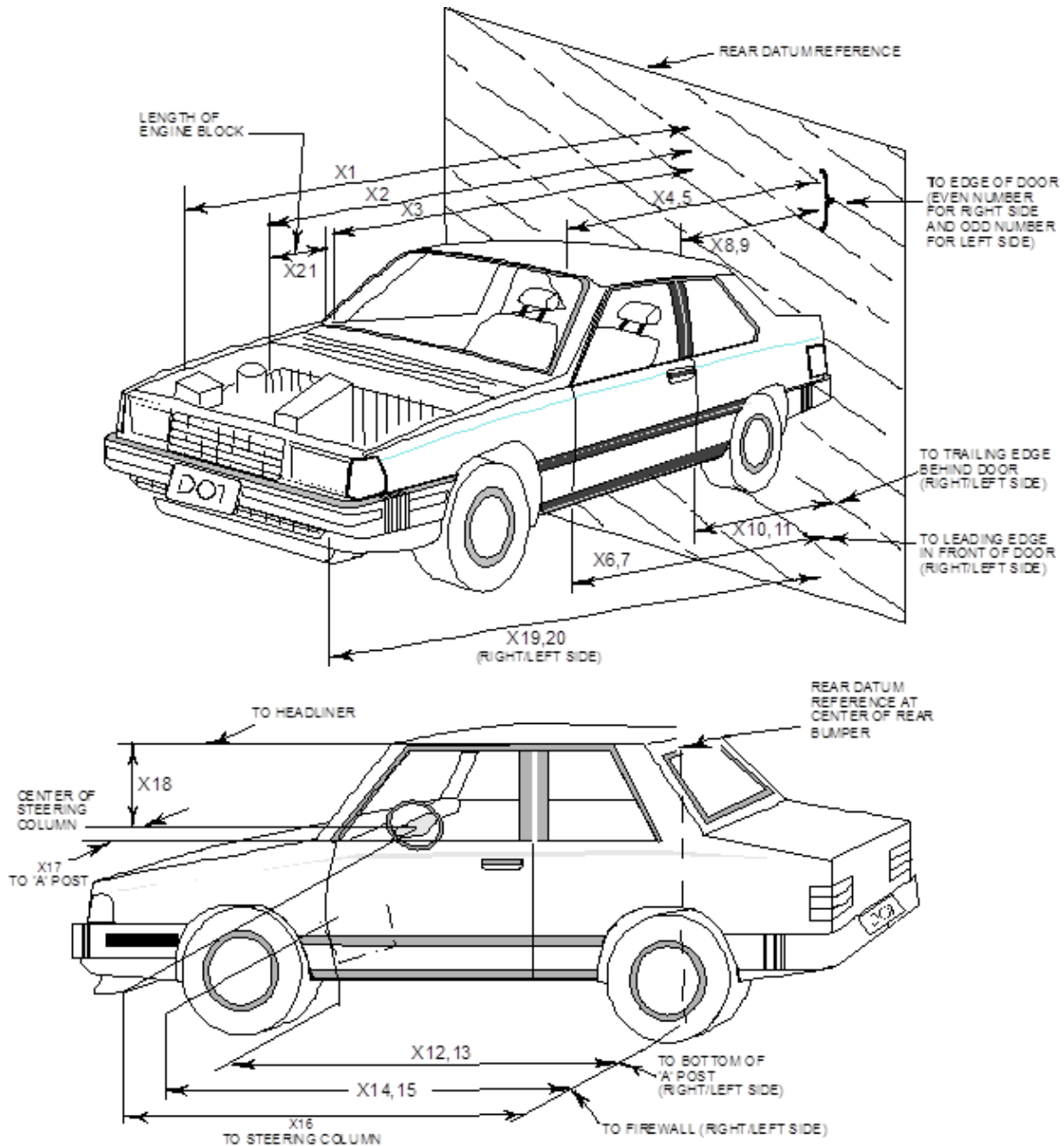
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



DATA SHEET NO. 11 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	3591	3215	376
2	Rear Surface of Vehicle (RSOV) to Front of Engine	mm	2914	2645	270
3	RSOV to Firewall	mm	2520	2406	115
4	RSOV to Upper Leading Edge of Right Door	mm	2085	2087	-2
5	RSOV to Upper Leading Edge of Left Door	mm	2088	2088	0
6	RSOV to Lower Leading Edge of Right Door	mm	2123	2129	-6
7	RSOV to Lower Leading Edge of Left Door	mm	2126	2126	1
8	RSOV to Upper Trailing Edge of Right Door	mm	1012	1015	-3
9	RSOV to Upper Trailing Edge of Left Door	mm	1016	1017	-1
10	RSOV to Lower Trailing Edge of Right Door	mm	1070	1077	-8
11	RSOV to Lower Trailing Edge of Left Door	mm	1074	1076	-2
12	RSOV to Bottom of "A" Post of Right Side	mm	2095	2099	-4
13	RSOV to Bottom of "A" Post of Left Side	mm	2106	2106	0
14	RSOV to Firewall, Right Side	mm	2656	2332	324
15	RSOV to Firewall, Left Side	mm	2658	2646	12
16	RSOV to Steering Column	mm	1613	1659	-45
17	Center of Steering Column to "A" Post	mm	279	255	24
18	Center of Steering Column to Headliner	mm	402	445	-43
19	RSOV to Right Side of Front Bumper	mm	3519	2827	693
20	RSOV to Left Side of Front Bumper	mm	3518	3499	19
21	Length of Engine Block	mm	219	208	11
RD	RSOV to Right Side of Dash Panel	mm	1819	1802	18
CD	RSOV to Center of Dash Panel	mm	1827	1819	7
LD	RSOV to Left Side of Dash Panel	mm	1818	1822	-4

UR* = Unrecoverable Data Point

DATA SHEET NO. 12
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: Mazda 3 four door hatchback
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

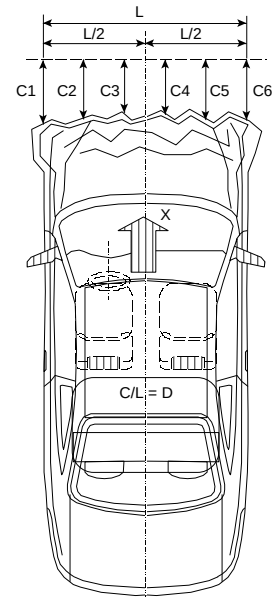
NHTSA No.: R20145403
Test Date: 10/17/2014

VEHICLE INFORMATION

VIN: JM1BM1L70E1190718 Wheelbase (mm): 2697
Vehicle Size Category: Passenger Test Weight (kg): 1582

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): 90.28
Velocity Change (kph): 90.28



CRUSH PROFILE

Collision Deformation Classification: 12FZEE03
Midpoint of Damage: C5
Damage Region Length (mm): 1080
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	3492	3524	-32
C2	Crush zone 2 at left side	mm	3563	3385	178
C3	Crush zone 3 at left side	mm	3547	3245	302
C4	Crush zone 4 at right side	mm	3547	3106	441
C5	Crush zone 5 at right side	mm	3564	2991	573
C6	Crush zone 6 at right side	mm	3495	2913	582
L	C1 to C6	mm	1080	848	231

Crush Measurements: Bumper Cover Removed

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
B1	Bumper Beam 1 at left side	mm	3409	3400	-9
B2	Bumper Beam 2 at left side	mm	3432	3356	-76
B3	Bumper Beam 3 at left side	mm	3455	3310	-145
B4	Bumper Beam 4 at left side	mm	3467	3253	-214
B5	Bumper Beam 5 at right side	mm	3471	3188	-283
B6	Bumper Beam 6 at right side	mm	3467	3118	-349
B7	Bumper Beam 7 at right side	mm	3456	3032	-424
B8	Bumper Beam 8 at right side	mm	3435	2966	-469
B9	Bumper Beam 9 at right side	mm	3410	2972	-438
L	B1 to B9	mm	965	788	177

DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

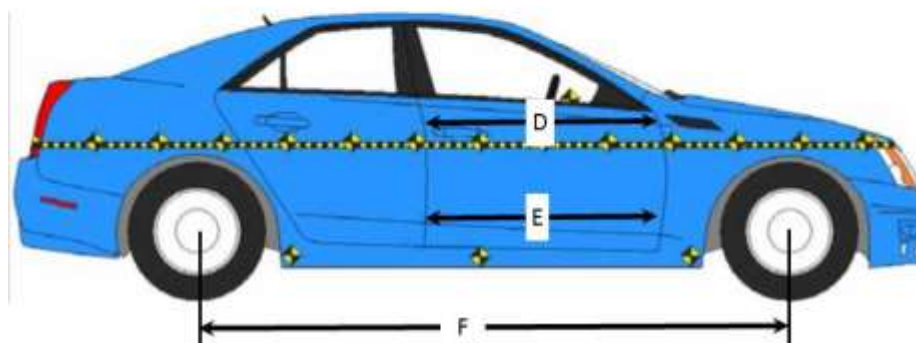
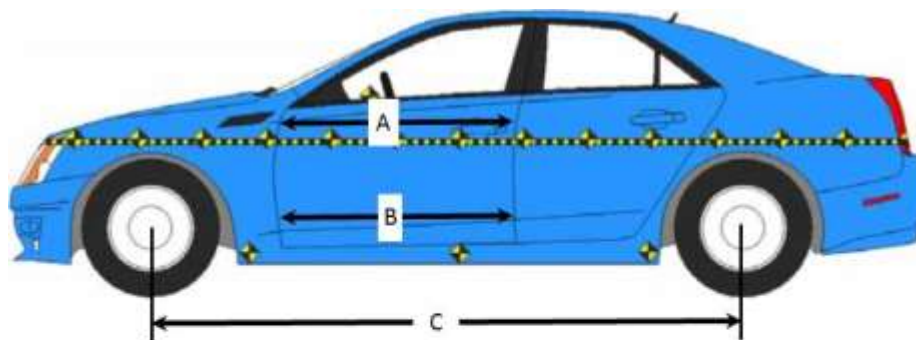
NHTSA No.: R20145403
 Test Date: 10/17/2014

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	983	982	-1
B	Left Side Lower	mm	828	828	0
D	Right Side Upper	mm	984	972	-12
E	Right Side Lower	mm	826	821	-5

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2697	2699	2
F	Right Side Wheelbase	mm	2697	2511	-186



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

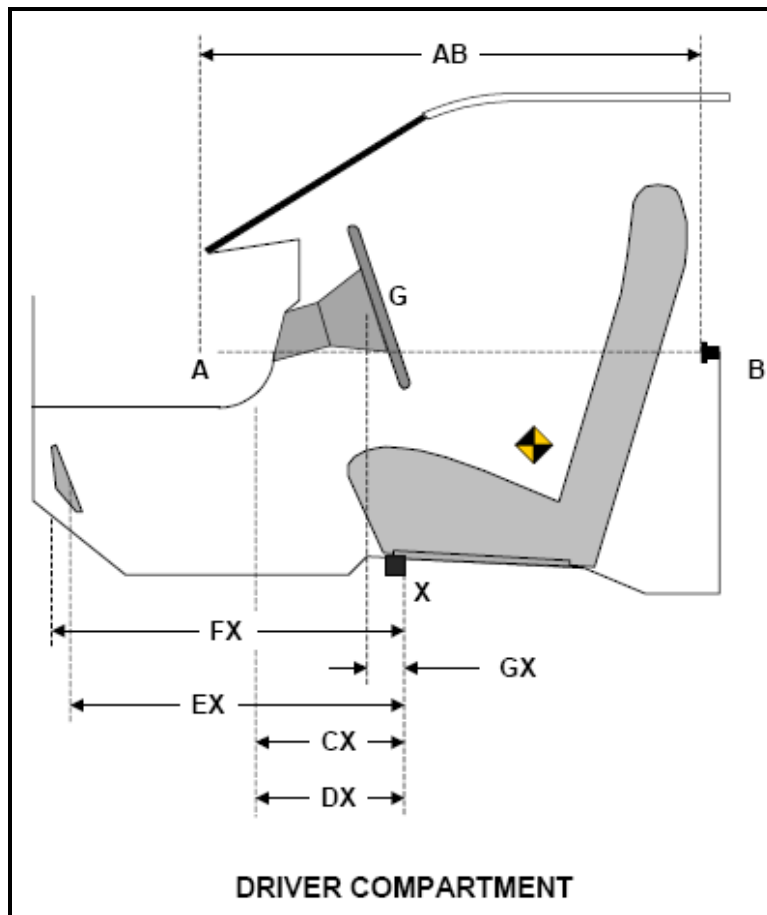
Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	721	722	1
CX	Left Knee Bolster to X	mm	245	241	-4
DX	Right Knee Bolster to X	mm	238	235	-3
EX	Brake Pedal to X	mm	557	592	35
FX	Foot Rest to X	mm	614	608	-6
GX	Center of Steering Column Wheel Hub to X	mm	24	67	43

X = Front of Seat Track (Stationary)

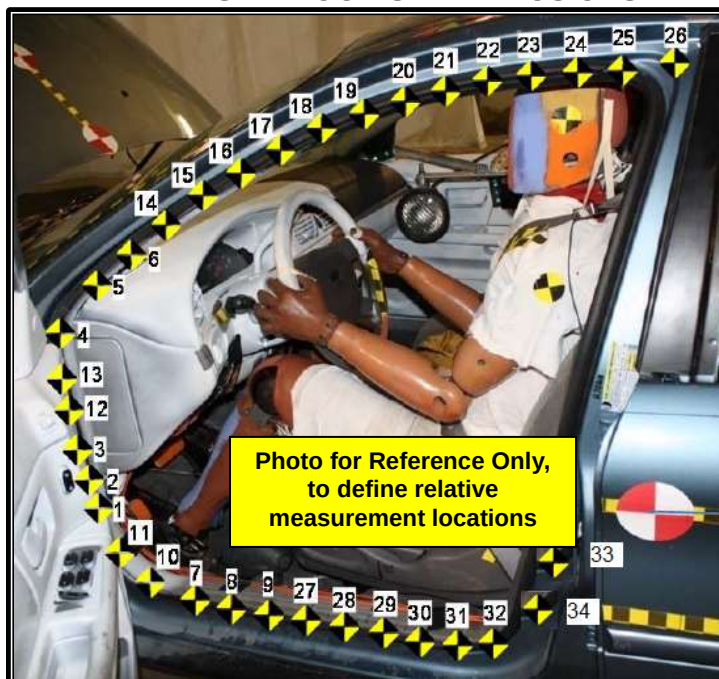


DATA SHEET NO.13 (CONTINUED) **VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

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	2017	-743	956	2019	-760	955	2	-17	-1
2	2044	-734	885	2045	-751	884	1	-17	-1
3	2038	-732	809	2039	-747	808	1	-15	-1
4	1968	-728	507	1968	-738	507	0	-10	0
5	1951	-725	434	1951	-735	433	0	-10	-1
6	1880	-710	357	1881	-717	357	1	-7	0
7	1945	-755	1014	1946	-772	1014	1	-17	0
8	1795	-758	1029	1797	-772	1029	2	-14	0
9	1646	-758	1027	1647	-772	1027	1	-14	0
10	1974	-752	1000	1974	-768	1000	0	-16	0
11	1997	-748	980	1998	-765	979	1	-17	-1
12	2015	-731	712	2016	-744	712	1	-13	0
13	1993	-728	616	1994	-741	615	1	-13	-1
14	1824	-702	323	1825	-708	323	1	-6	0
15	1767	-692	291	1769	-697	292	2	-5	1
16	1710	-682	260	1711	-686	260	1	-4	0

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	1650	-672	230	1652	-674	231	2	-2	1
18	1589	-661	203	1591	-662	204	2	-1	1
19	1528	-652	176	1529	-651	178	1	1	2
20	1465	-642	153	1467	-640	155	2	2	2
21	1401	-633	134	1403	-631	135	2	2	1
22	1337	-626	118	1339	-623	119	2	3	1
23	1271	-620	105	1273	-617	107	2	3	2
24	1205	-615	96	1207	-612	97	2	3	1
25	1139	-610	90	1141	-608	91	2	2	1
26	1073	-609	88	1075	-606	90	2	3	2
27	1598	-759	1027	1600	-772	1026	2	-13	-1
28	1549	-759	1026	1551	-771	1026	2	-12	0
29	1499	-759	1026	1500	-770	1026	1	-11	0
30	1451	-759	1026	1452	-770	1026	1	-11	0
31	1403	-758	1025	1405	-770	1026	2	-12	1
32	1364	-759	1017	1364	-770	1017	0	-11	0
33	1207	-743	807	1208	-750	806	1	-7	0
34	1285	-754	955	1285	-764	954	1	-10	-1

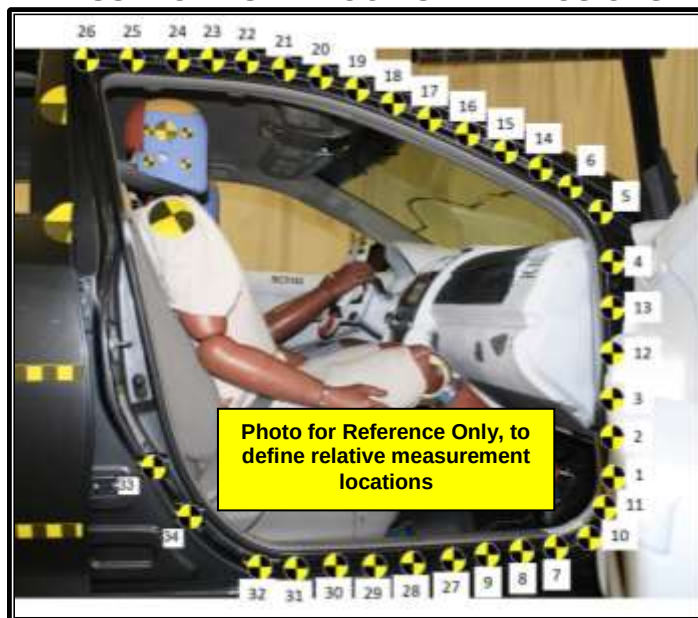
Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

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

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

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	2017	749	956	2014	743	954	-3	-6	-2
2	2043	740	880	2034	735	879	-9	-5	-1
3	2035	739	806	2017	748	804	-18	9	-2
4	1966	736	506	1961	752	498	-5	16	-8
5	1949	734	432	1947	743	425	-2	9	-7
6	1877	718	357	1876	724	352	-1	6	-5
7	1946	761	1016	1945	756	1016	-1	-5	0
8	1796	762	1032	1796	758	1032	0	-4	0
9	1647	763	1030	1647	759	1030	0	-4	0
10	1974	758	1001	1973	752	1000	-1	-6	-1
11	2000	754	978	1997	748	977	-3	-6	-1
12	2011	738	703	1995	752	697	-16	14	-6
13	1989	736	606	1978	753	599	-11	17	-7
14	1817	708	322	1816	715	316	-1	7	-6
15	1758	698	289	1757	705	283	-1	7	-6
16	1700	688	258	1700	694	254	0	6	-4

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	1641	678	229	1641	684	223	0	6	-6
18	1581	667	202	1582	675	196	1	8	-6
19	1519	658	176	1519	664	170	0	6	-6
20	1457	648	153	1458	654	148	1	6	-5
21	1396	639	135	1397	645	129	1	6	-6
22	1332	631	119	1333	637	113	1	6	-6
23	1268	625	107	1268	630	103	0	5	-4
24	1204	620	98	1205	626	95	1	6	-3
25	1139	616	92	1140	622	89	1	6	-3
26	1072	614	90	1073	619	88	1	5	-2
27	1604	763	1030	1603	759	1031	-1	-4	1
28	1556	763	1030	1555	759	1030	-1	-4	0
29	1507	762	1030	1507	759	1030	0	-3	0
30	1460	762	1029	1460	759	1030	0	-3	1
31	1413	762	1029	1412	759	1029	-1	-3	0
32	1366	761	1021	1365	759	1022	-1	-2	1
33	1204	746	804	1203	745	804	-1	0	0
34	1280	757	953	1280	756	954	0	-1	0

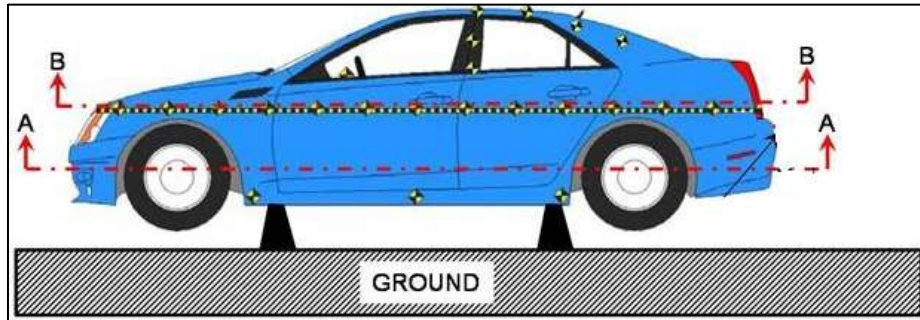
Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

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	3007	-892	892	1	2982	-772	891
2	3065	-886	892	2	3082	-506	892
3	3174	-845	891	3	3150	-505	892
4	3273	-797	891	4	3217	-470	892
5	3358	-730	891	5	3310	-340	891
6	3426	-645	891	6	3286	-264	892
7	3495	-536	891	7	3235	-187	892
8	3539	-440	891	8	3172	-115	892
9	3558	-372	892	9	3118	-45	891
10	3565	-349	892	10	3023	57	892
11	3567	-332	891	11	2897	239	892
12	3524	-300	892	12	2704	450	892
13	3541	-189	891	13	2783	577	892
14	3549	-76	892	14	2863	667	893
15	3563	-3	891	15	2898	734	892
16	3561	63	892	16	2681	793	892
17	3542	189	891	17	2290	905	893
18	3527	298	892	18	2271	879	892
19	3562	324	891	19	2215	901	892
20	3570	342	891	20	2168	911	892
21	3558	357	892	21	2133	890	892
22	3561	367	891	22	2114	887	892
23	3545	428	891	23	1987	891	892
24	3507	516	892	24	1850	892	892
25	3440	628	892	25	1707	891	892

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	3358	732	892	26	1506	887	892
27	3254	808	891	27	1362	885	892
28	3126	864	892	28	1322	885	892
29	3066	885	892	29	1192	883	892
30	3006	891	891	30	1091	881	892
31	2324	900	891	31	1065	879	892
32	2225	899	891	32	884	879	892
33	2148	897	891	33	721	878	892
34	2081	897	891	34	558	879	892
35	1879	896	891	35	452	884	892
36	1724	895	891	36	377	894	892
37	1534	893	891	37	297	894	892
38	1379	891	892	38	-382	880	892
39	1216	888	892	39	-382	880	892
40	1082	886	892	40	-438	868	892
41	1033	886	891	41	-502	841	892
42	895	884	892	42	-588	801	892
43	720	882	891	43	-649	761	892
44	556	882	892	44	-702	712	892
45	425	890	892	45	-748	658	892
46	367	896	892	46	-769	613	892
47	298	895	892	47	-817	470	892
48	-366	886	892	48	-838	367	892
49	-440	870	891	49	-855	244	892
50	-535	829	892	50	-865	118	891
51	-594	801	891	51	-869	-4	892
52	-674	744	891	52	-868	-67	891
53	-738	676	892	53	-862	-159	891
54	-765	627	892	54	-851	-274	891
55	-793	566	892	55	-825	-434	891
56	-830	426	892	56	-787	-577	891
57	-857	252	891	57	-753	-649	891
58	-868	95	891	58	-670	-746	891
59	-871	-2	892	59	-557	-819	891
60	-866	-137	892	60	-445	-868	891
61	-849	-303	891	61	-358	-884	891
62	-824	-447	891	62	303	-900	892
63	-785	-586	891	63	375	-900	892
64	-754	-652	892	64	493	-886	892
65	-701	-717	892	65	698	-884	892
66	-617	-786	892	66	853	-886	892

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
67	-506	-844	891	67	1073	-892	892
68	-447	-870	891	68	1111	-894	892
69	-367	-887	891	69	1277	-898	893
70	301	-894	891	70	1429	-902	892
71	394	-894	892	71	1600	-907	893
72	515	-882	891	72	1804	-913	892
73	595	-881	892	73	1984	-914	893
74	740	-881	891	74	2136	-912	893
75	879	-882	891	75	2214	-916	893
76	1038	-882	892	76	2323	-916	893
77	1081	-882	891				
78	1179	-884	891				
79	1281	-885	892				
80	1415	-886	891				
81	1555	-887	892				
82	1714	-888	891				
83	1884	-889	891				
84	2060	-889	892				
85	2140	-890	892				
86	2227	-891	892				
87	2293	-892	891				
88	2327	-891	891				
89	3007	-892	892				

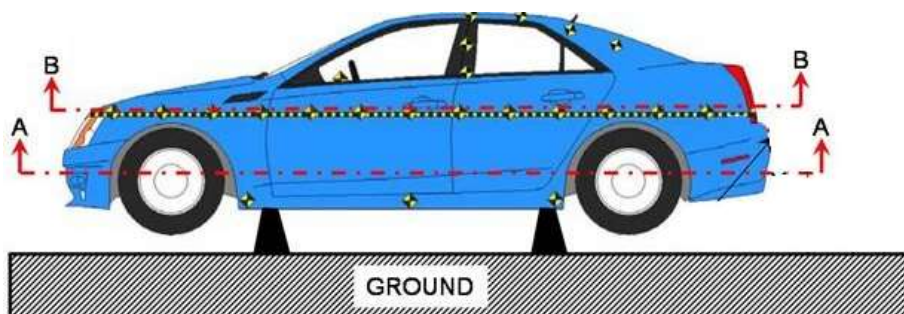
Note: See Appendix D for detailed procedure on how to measure vehicle exterior crush profile

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

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	2412	-885	650	1	2808	-863	650
2	2554	-897	651	2	2884	-842	650
3	2711	-896	650	3	2956	-813	650
4	2829	-888	650	4	3035	-788	651
5	2951	-856	651	5	3168	-764	650
6	3038	-828	650	6	3239	-742	650
7	3110	-804	651	7	3309	-657	651
8	3209	-771	651	8	3373	-562	651
9	3251	-753	651	9	3431	-174	650
10	3287	-685	651	10	3433	-110	650
11	3327	-618	651	11	3365	-87	651
12	3378	-556	651	12	3321	16	650
13	3461	-458	650	13	3215	197	651
14	3498	-388	651	14	3060	207	651
15	3527	-260	651	15	2998	252	651
16	3539	-138	650	16	2981	384	651
17	3545	-3	650	17	2923	471	651
18	3544	45	650	18	2679	524	651
19	3536	185	651	19	2632	547	651
20	3512	325	650	20	2640	646	651
21	3486	414	650	21	2674	755	651
22	3446	474	650	22	2561	750	651
23	3387	545	650	23	2350	834	651
24	3323	619	651	24	2334	879	651
25	3275	701	651	25	2310	897	651

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	3254	741	650	26	2269	842	651
27	3234	760	650	27	2218	877	651
28	3129	797	650	28	2142	896	651
29	3046	821	650	29	2131	887	651
30	2945	856	651	30	2010	889	651
31	2847	882	650	31	1861	891	651
32	2727	897	651	32	1709	892	650
33	2636	898	651	33	1557	893	651
34	2600	903	651	34	1389	892	651
35	2460	896	651	35	1284	890	651
36	2306	888	651	36	1099	888	651
37	2189	889	651	37	1060	886	651
38	2150	890	651	38	1054	883	651
39	1981	893	651	39	964	882	651
40	1769	895	651	40	844	880	651
41	1595	895	651	41	745	879	651
42	1457	894	650	42	589	878	651
43	1306	893	651	43	459	877	651
44	1179	891	651	44	326	881	650
45	1059	888	651	45	218	891	651
46	984	887	650	46	112	900	651
47	838	884	651	47	63	898	651
48	694	882	651	48	-21	898	651
49	525	879	650	49	-146	896	651
50	348	881	651	50	-210	893	651
51	215	892	650	51	-312	869	651
52	111	900	650	52	-423	834	651
53	-40	900	651	53	-534	801	651
54	-169	897	651	54	-630	748	652
55	-280	880	650	55	-694	668	650
56	-406	842	651	56	-718	616	651
57	-528	805	650	57	-688	595	650
58	-574	787	650	58	-720	522	651
59	-685	691	650	59	-741	466	651
60	-722	620	651	60	-733	412	651
61	-691	596	651	61	-753	284	650
62	-734	495	650	62	-758	164	650
63	-744	457	650	63	-761	45	650
64	-732	439	651	64	-761	-1	650
65	-754	313	651	65	-761	-90	651
66	-762	158	650	66	-758	-191	651
67	-764	49	651	67	-753	-304	650

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
68	-765	-5	651	68	-737	-400	650
69	-763	-119	650	69	-740	-469	650
70	-756	-279	650	70	-709	-556	650
71	-741	-391	650	71	-689	-598	651
72	-727	-452	651	72	-718	-623	650
73	-742	-466	651	73	-678	-700	650
74	-714	-544	650	74	-589	-782	650
75	-690	-596	650	75	-436	-834	651
76	-719	-616	650	76	-315	-872	650
77	-721	-624	650	77	-202	-896	650
78	-694	-677	650	78	-53	-902	650
79	-633	-750	650	79	90	-902	650
80	-532	-805	650	80	169	-899	651
81	-411	-841	650	81	247	-889	650
82	-313	-872	650	82	309	-877	651
83	-191	-896	650	83	413	-857	650
84	-9	-899	651	84	631	-854	651
85	151	-899	650	85	800	-863	651
86	314	-882	650	86	1047	-890	651
87	504	-877	651	87	1068	-892	652
88	579	-878	650	88	1157	-895	651
89	679	-879	651	89	1285	-897	651
90	819	-881	650	90	1425	-900	651
91	958	-883	650	91	1598	-902	652
92	1052	-884	650	92	1751	-902	651
93	1136	-886	651	93	1889	-892	651
94	1247	-887	650	94	2069	-903	652
95	1391	-888	650	95	2138	-904	652
96	1561	-889	651	96	2178	-909	652
97	1738	-889	651	97	2340	-904	652
98	1891	-887	650	98	2483	-914	652
99	2034	-885	650	99	2642	-894	652
100	2139	-883	651	100	2788	-866	652
101	2261	-880	651				
102	2379	-881	650				

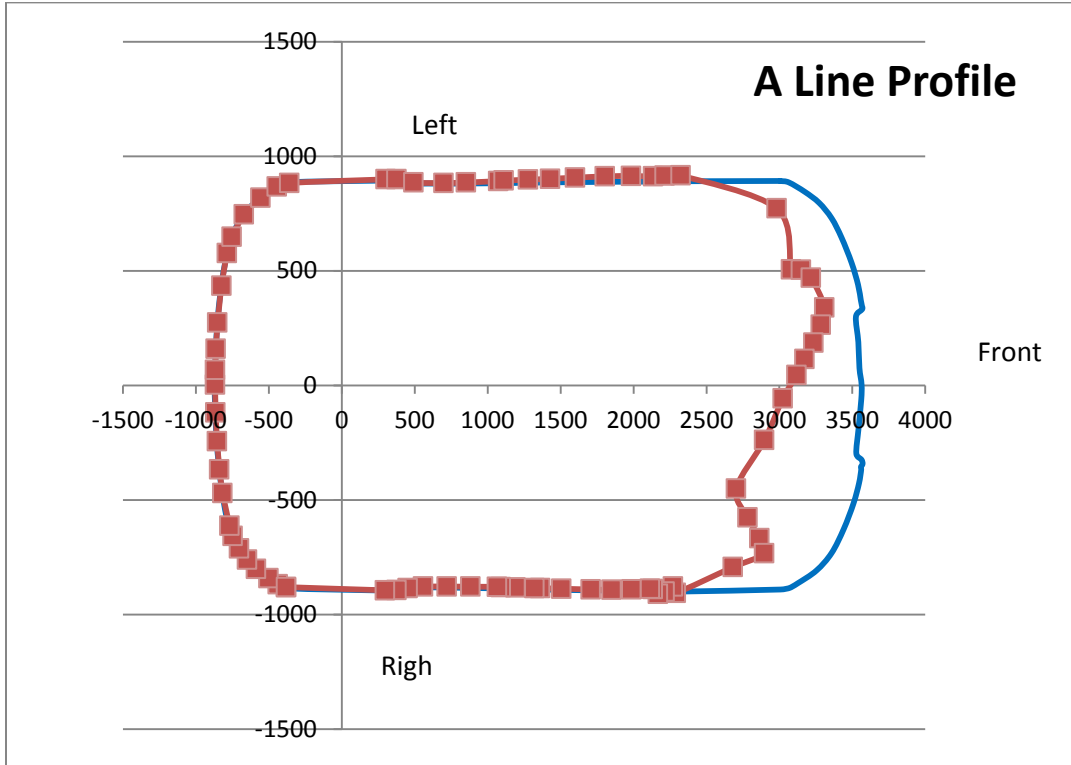
Note: See Appendix D for detailed procedure on how to measure vehicle exterior crush profile

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

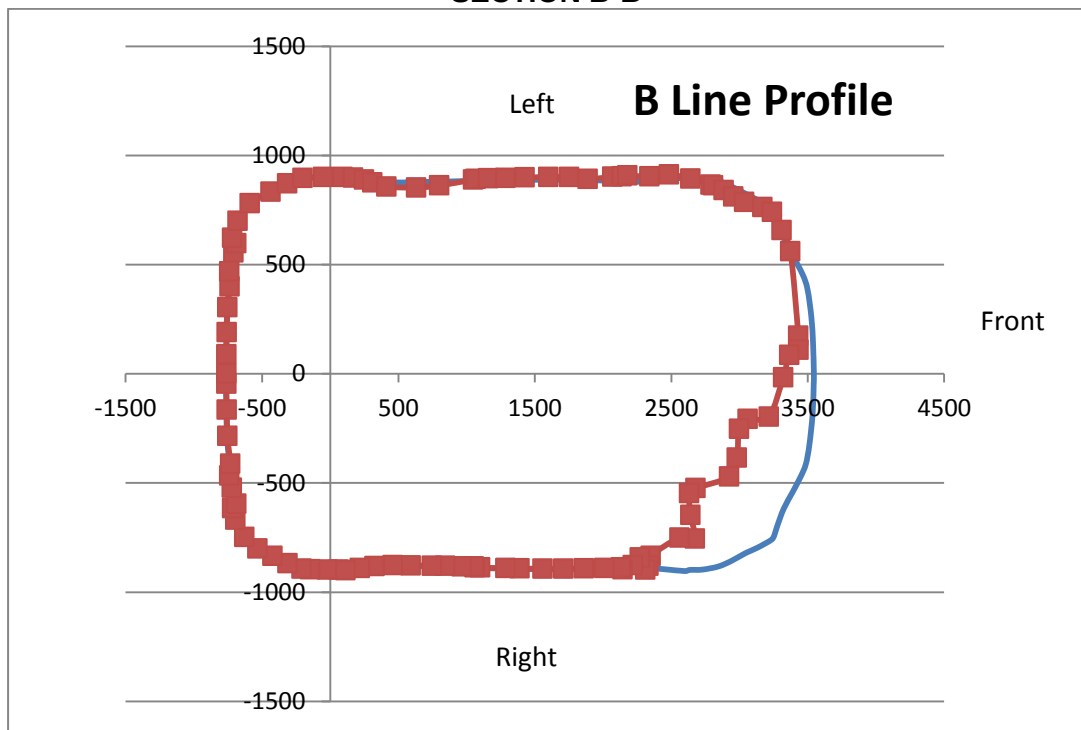
Test Vehicle: Mazda 3 four door hatchback
Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
Test Date: 10/17/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A



SECTION B-B



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

STRUCTURAL BUMPER BEAM POINTS

	Point	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
		X	Y	Z	X	Y	Z	X	Y	Z
Redundant Structural Bumper Beam	B1	3409	-485	866	3401	-444	759	-8	41	-107
	B2	3433	-367	867	3357	-334	737	-76	33	-130
	B3	3455	-249	866	3311	-226	713	-144	23	-153
	B4	3468	-127	867	3256	-120	691	-212	7	-176
	B5	3473	-1	868	3191	-14	669	-282	-13	-199
	B6	3469	117	867	3123	81	648	-346	-36	-219
	B7	3457	238	867	3039	164	630	-418	-74	-237
	B8	3435	359	868	2965	259	621	-470	-100	-247
	B9	3410	480	867	2978	338	599	-432	-142	-268
Center Structural Bumper Beam	B1	3409	-485	890	3400	-440	783	-9	45	-107
	B2	3432	-368	893	3356	-331	763	-76	37	-130
	B3	3455	-247	891	3310	-220	737	-145	27	-154
	B4	3467	-126	892	3253	-115	715	-214	11	-177
	B5	3471	-1	898	3188	-9	699	-283	-8	-199
	B6	3467	122	890	3118	87	670	-349	-35	-220
	B7	3456	240	891	3032	166	651	-424	-74	-240
	B8	3435	359	893	2966	264	645	-469	-95	-248
	B9	3410	480	891	2972	348	621	-438	-132	-270
Upper Radiator Support	1	3362	-417	636	3293	-386	446	-69	31	-190
	2	3395	-315	639	3287	-285	411	-108	30	-228
	3	3394	-211	639	3226	-201	394	-168	10	-245
	4	3446	-106	645	3196	-87	391	-250	19	-254
	5	3453	-1	650	3127	-9	404	-326	-8	-246
	6	3445	106	645	3043	57	411	-402	-49	-234
	7	3392	210	640	2931	87	428	-461	-123	-212
	8	3391	314	640	2864	158	437	-527	-156	-203
	9	3359	418	638	2784	231	425	-575	-187	-213

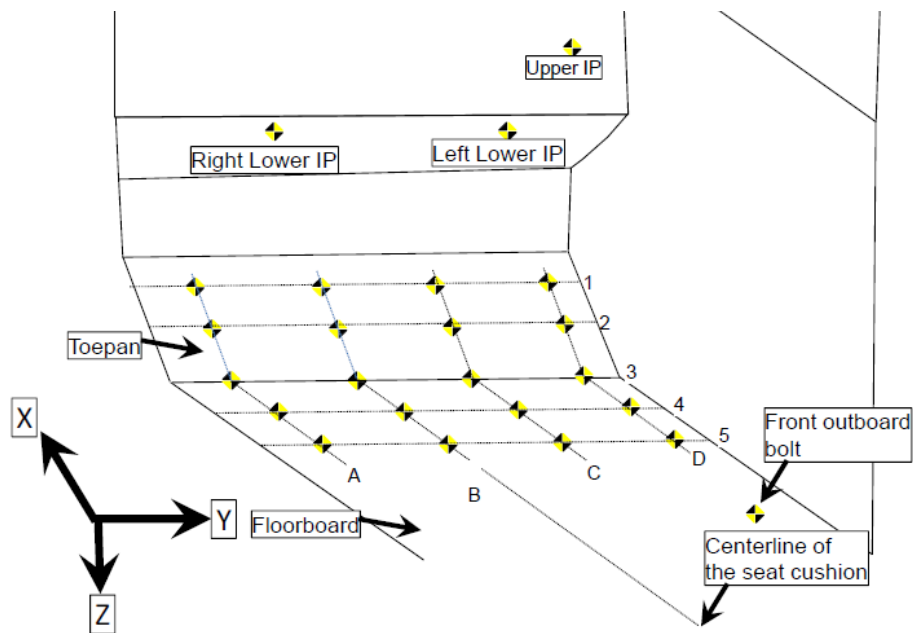
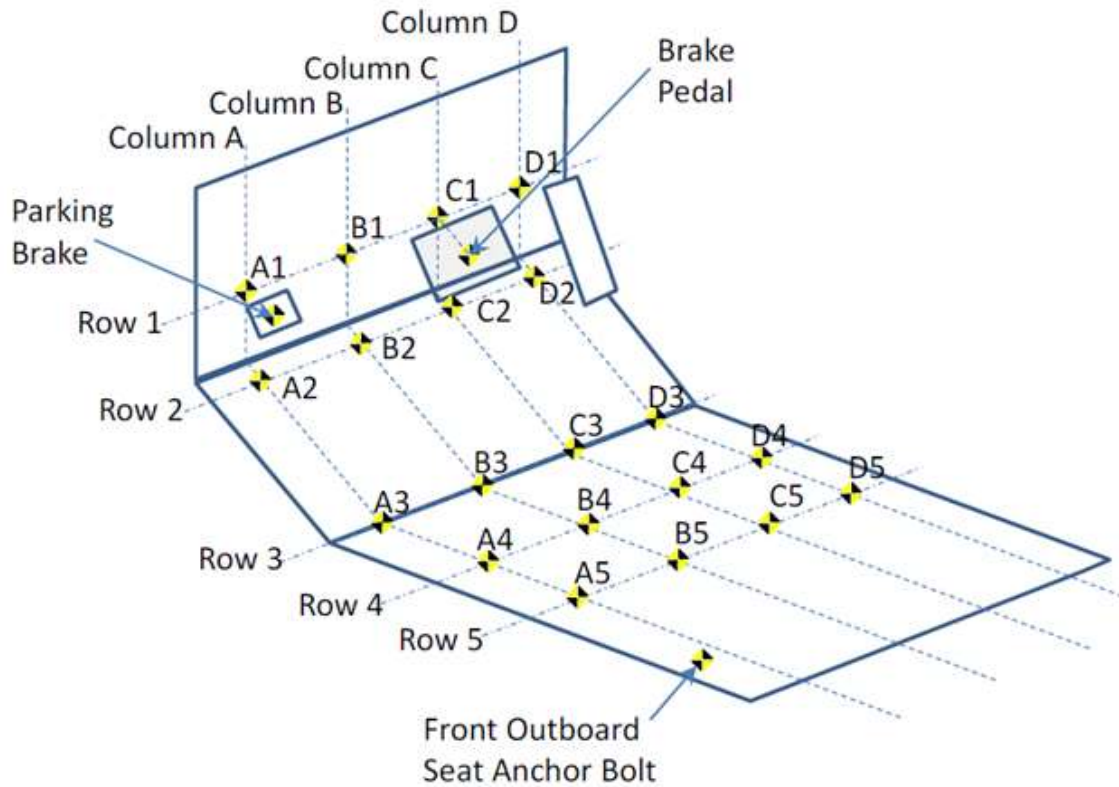
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



Note: See Appendix D for toe pan measuring procedure

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

DRIVER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2278	-576	955	2283	-600	955	5	-24	0
B1	2364	-478	955	2362	-498	955	-2	-20	0
C1	2399	-329	955	2398	-349	959	-1	-20	4
D1	2398	-178	955	2355	-237	936	-43	-59	-19
A2	2269	-576	1037	2271	-596	1038	2	-20	1
B2	2314	-477	1037	2316	-498	1038	2	-21	1
C2	2317	-326	1035	2320	-346	1040	3	-20	5
D2	2316	-176	1037	2312	-201	1035	-4	-25	-2
A3	2202	-577	1131	2203	-598	1132	1	-21	1
B3	2206	-477	1130	2209	-497	1134	3	-20	4
C3	2200	-327	1130	2204	-347	1136	4	-20	6
D3	2210	-176	1129	2216	-197	1137	6	-21	8
A4	2111	-576	1158	2114	-595	1160	3	-19	2
B4	2109	-477	1159	2113	-496	1163	4	-19	4
C4	2111	-328	1164	2117	-348	1170	6	-20	6
D4	2109	-178	1164	2115	-198	1173	6	-20	9
A5	2010	-577	1161	2012	-596	1163	2	-19	2
B5	2010	-478	1162	2013	-497	1167	3	-19	5
C5	2009	-329	1166	2015	-349	1173	6	-20	7
D5	2009	-177	1164	2016	-196	1174	7	-19	10
Brake Pedal	2146	-328	955	2184	-349	991	38	-21	36
Driver IP Left	1834	-516	669	1833	-528	677	-1	-12	8
Driver IP Right	1827	-214	669	1827	-225	678	0	-11	9
DOLP	1839	-615	656	1837	-626	665	-2	-11	9
Steering Column	1613	-364	484	1659	-396	542	46	-32	58
Front Outboard Bolt	1589	-609	1066	1592	-621	1067	3	-12	1
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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

PASSENGER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2391	226	952	2325	196	929	-66	-30	-23
B1	2402	376	953	2322	344	909	-80	-32	-44
C1	2317	526	953	2252	505	926	-65	-21	-27
D1	2254	627	956	2195	605	943	-59	-22	-13
A2	2313	226	1035	2277	208	1031	-36	-18	-4
B2	2308	375	1039	2261	352	1016	-47	-23	-23
C2	2305	527	1035	2262	504	1002	-43	-23	-33
D2	2243	626	1035	2221	612	1018	-22	-14	-17
A3	2211	227	1130	2189	218	1137	-22	-9	7
B3	2203	376	1130	2183	361	1129	-20	-15	-1
C3	2220	523	1129	2204	507	1116	-16	-16	-13
D3	2195	626	1128	2187	612	1115	-8	-14	-13
A4	2114	225	1165	2107	219	1197	-7	-6	32
B4	2115	375	1162	2106	367	1183	-9	-8	21
C4	2115	524	1160	2108	513	1160	-7	-11	0
D4	2115	628	1164	2113	617	1157	-2	-11	-7
A5	2014	225	1164	2008	219	1197	-6	-6	33
B5	2013	374	1166	2006	367	1191	-7	-7	25
C5	2013	525	1165	2007	519	1177	-6	-6	12
D5	2013	626	1166	2011	619	1171	-2	-7	5
Pass IP Left	1833	222	684	1825	223	685	-8	1	1
Pass IP Right	1865	525	684	1850	526	669	-15	1	-15
PORP	1854	625	654	1836	623	632	-18	-2	-22
Front Outboard Bolt	1588	612	1068	1589	604	1073	1	-8	5

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

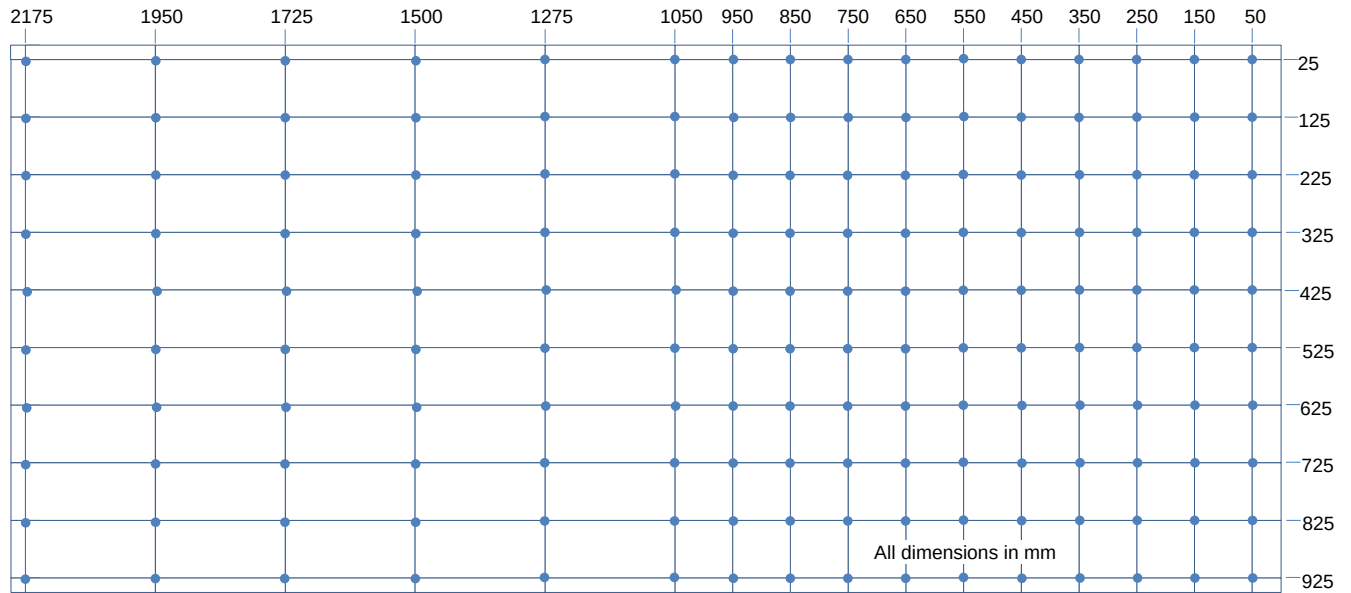
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

DATA SHEET NO.14

RMDB CRUSH MEASUREMENTS

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
R10	12.4	2.6	1.3	-0.7	-1.2	-1.3	-1.4	-1.4	-1.6	-1.6	-1.7	-1.8	-1.9	-2.0	-2.1	-5.0
R9	30.6	11.8	4.8	2.3	0.4	0.1	0.5	-0.5	-1.3	-1.4	-1.6	-1.5	-1.8	-2.0	-1.9	-2.4
R8	68.4	59.3	35.7	17.0	2.6	4.3	20.1	9.5	-0.9	-1.3	-1.2	-1.4	-1.6	-1.9	-1.7	-2.2
R7	114.7	107.8	94.3	83.9	48.0	23.1	17.1	4.7	-0.8	-0.5	-1.1	-1.1	-1.4	-1.4	-1.3	-1.8
R6	160.2	167.4	155.4	143.3	89.8	7.2	4.3	3.3	-0.4	-0.6	-0.7	-1.0	-1.1	-1.2	-1.4	-1.4
R5	262.9	237.0	311.7	140.7	47.7	1.9	33.3	82.5	2.4	-0.4	-0.3	-0.5	-0.6	-0.7	-0.8	-1.0
R4	253.5	228.4	256.8	137.4	44.2	24.7	74.6	134.1	18.3	0.2	-0.1	-0.2	-0.2	-0.2	-0.5	-0.6
R3	216.1	207.6	241.8	133.7	46.2	42.2	116.1	183.8	44.2	1.0	0.4	0.3	0.4	0.2	-0.1	-0.5
R2	203.3	172.0	73.7	38.8	67.7	64.8	148.4	212.2	67.4	0.7	0.9	0.4	0.5	0.7	0.3	0.1
R1	191.6	155.2	42.4	48.8						70.5	86.7	173.5	1.0	1.0	1.0	-1.8

*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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014

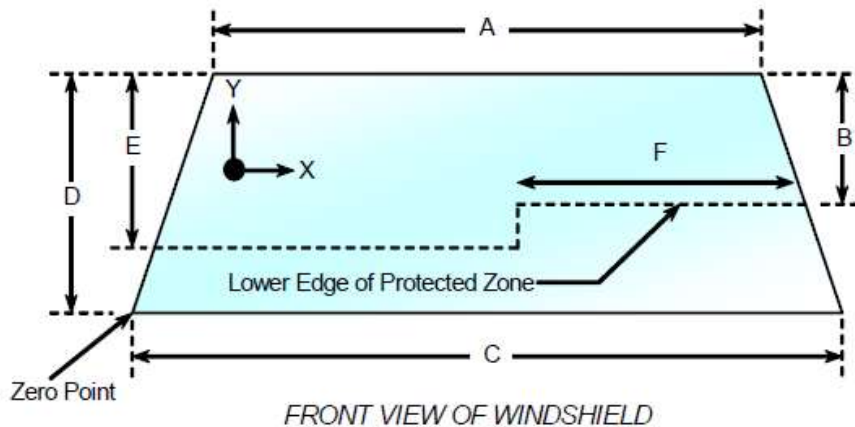
Please provide windshield mounting details. A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2170	2170	100%
Right Side	2170	1965	90.6%
Total	4340	4135	95.3%



Item	Units	Value
A	mm	1230
B	mm	477
C	mm	1430
D	mm	840
E	mm	485
F	mm	570

AREAS OF PROTECTED ZONE FAILURES

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

- No penetration

X	Y

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

- No Penetration

X	Y

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

Test Vehicle:	<u>Mazda 3 four door hatchback</u>	NHTSA No.:	<u>R20145403</u>
Test Program:	<u>R&D 90.1kph, 15° / 35% Right Oblique Offset</u>	Test Date:	<u>10/17/2014</u>

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

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

Test Time: 11:40 AM

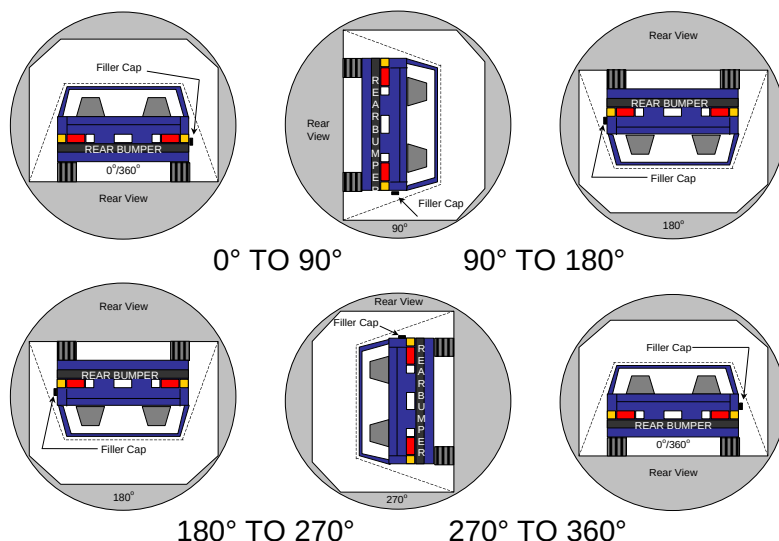
Stoddard Solvent Spillage Measurements

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

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

Test Vehicle: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



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

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

3. Details of Stoddard Solvent spillage: None

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	68	300	368
90° to 180°	65	300	365
180° to 270°	65	300	365
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	

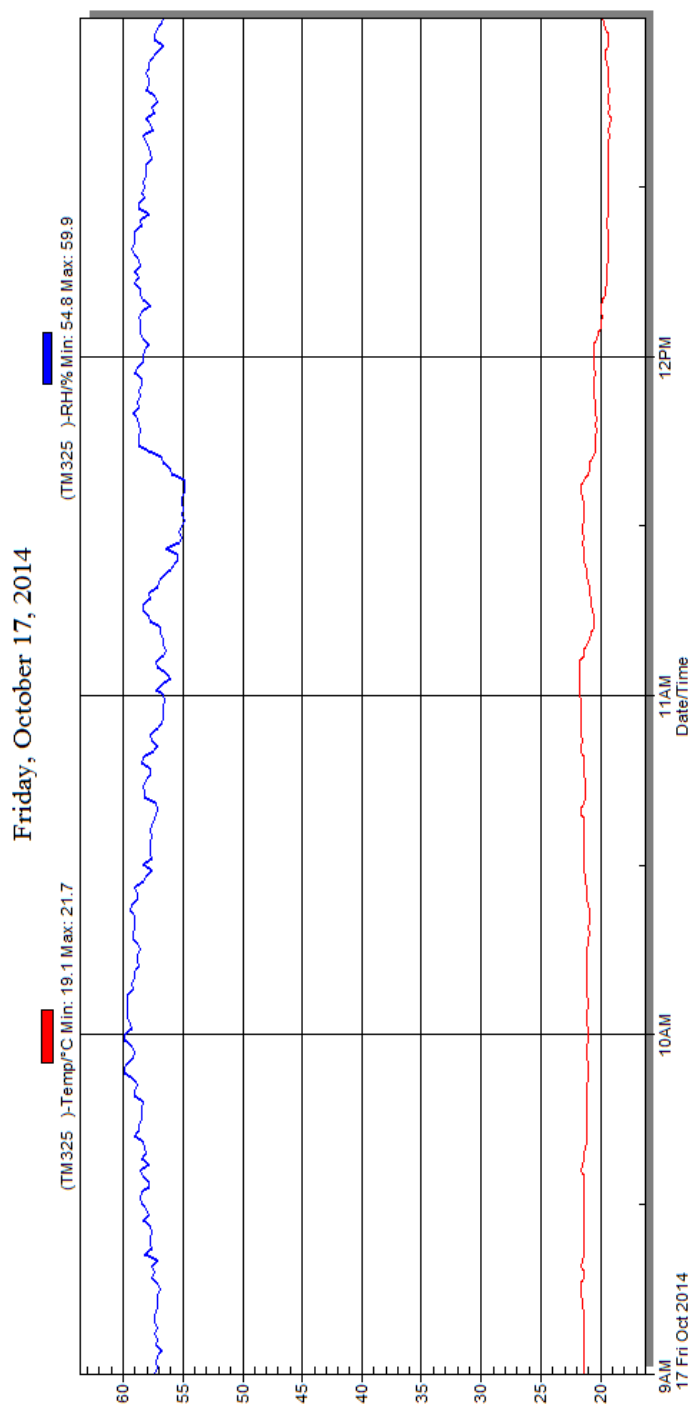
SOLVENT SPILLAGE LOCATION TABLE

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: Mazda 3 four door hatchback
 Test Program: R&D 90.1kph, 15° / 35% Right Oblique Offset

NHTSA No.: R20145403
 Test Date: 10/17/2014



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



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



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



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



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



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



No. 032 Pre-Test Windshield View



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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



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



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



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



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



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



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



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



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



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



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



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



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No. 061 Post-Test View of Driver Door Clearance



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No. 064 Post-Test Driver Seat Fore Aft Markings



No. 065 Pre-Test Driver Seat Back Markings



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



No. 067 Pre-Test Driver Adjustable D-Ring



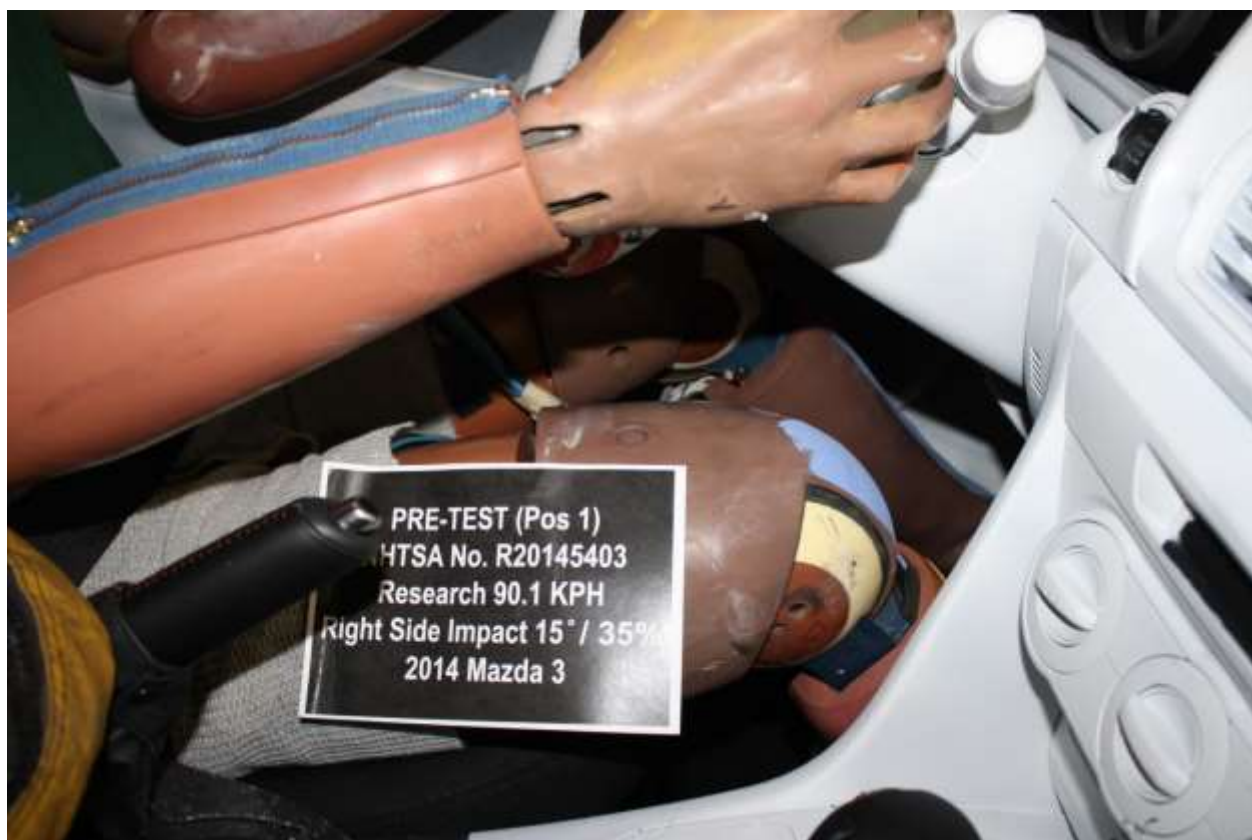
No. 068 Post-Test Driver Adjustable D-Ring



No. 069 Pre-Test Driver Feet



No. 070 Post-Test Driver Feet



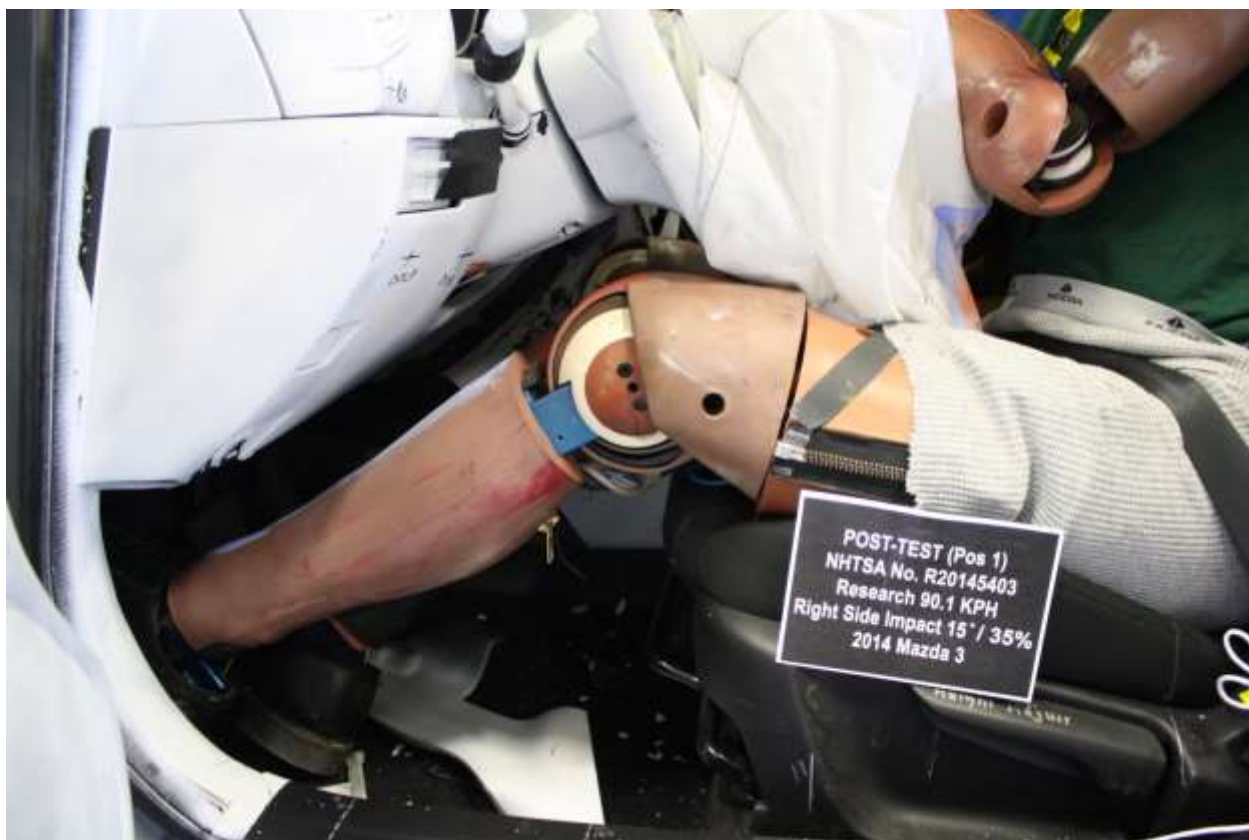
No. 071 Pre-Test View of Driver Right Knee and Bolster



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



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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

Photo Not Applicable

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

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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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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



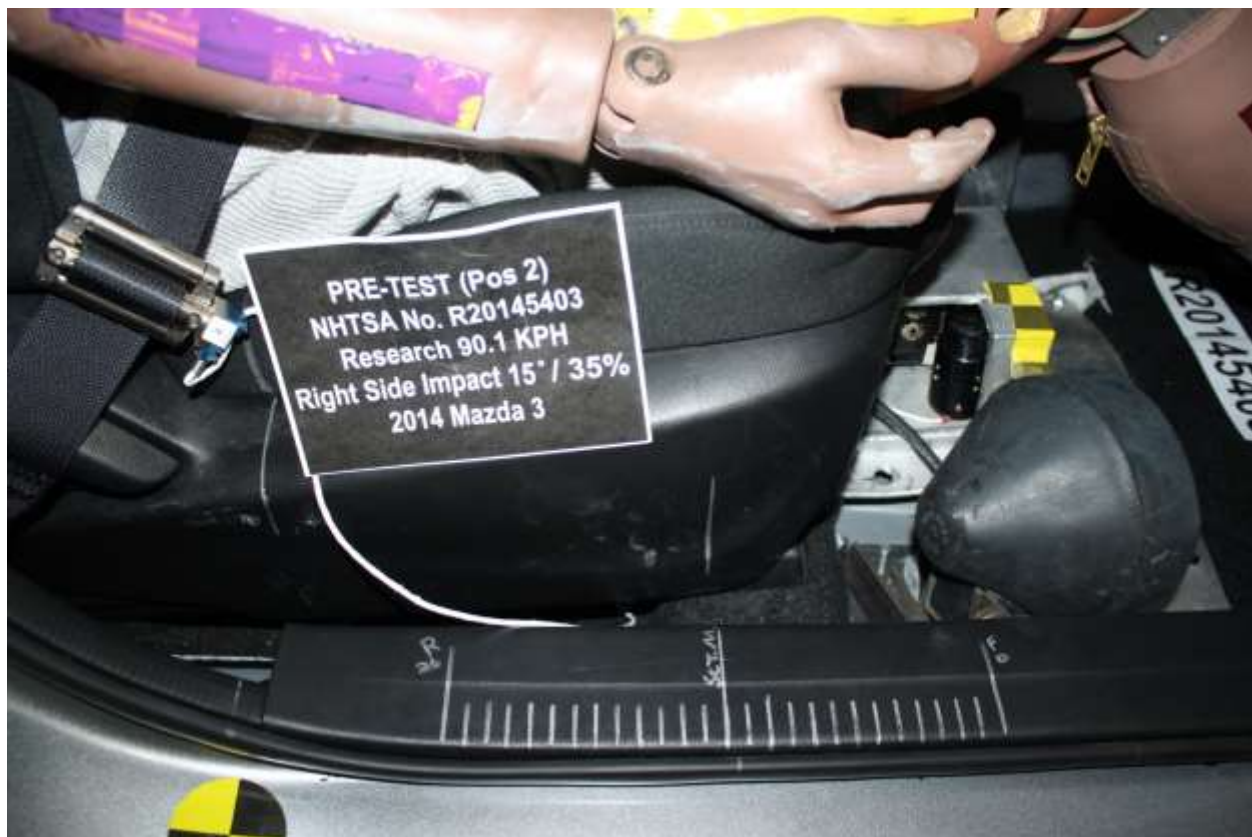
No. 103 Post-Test Right Side Passenger and Interior View



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



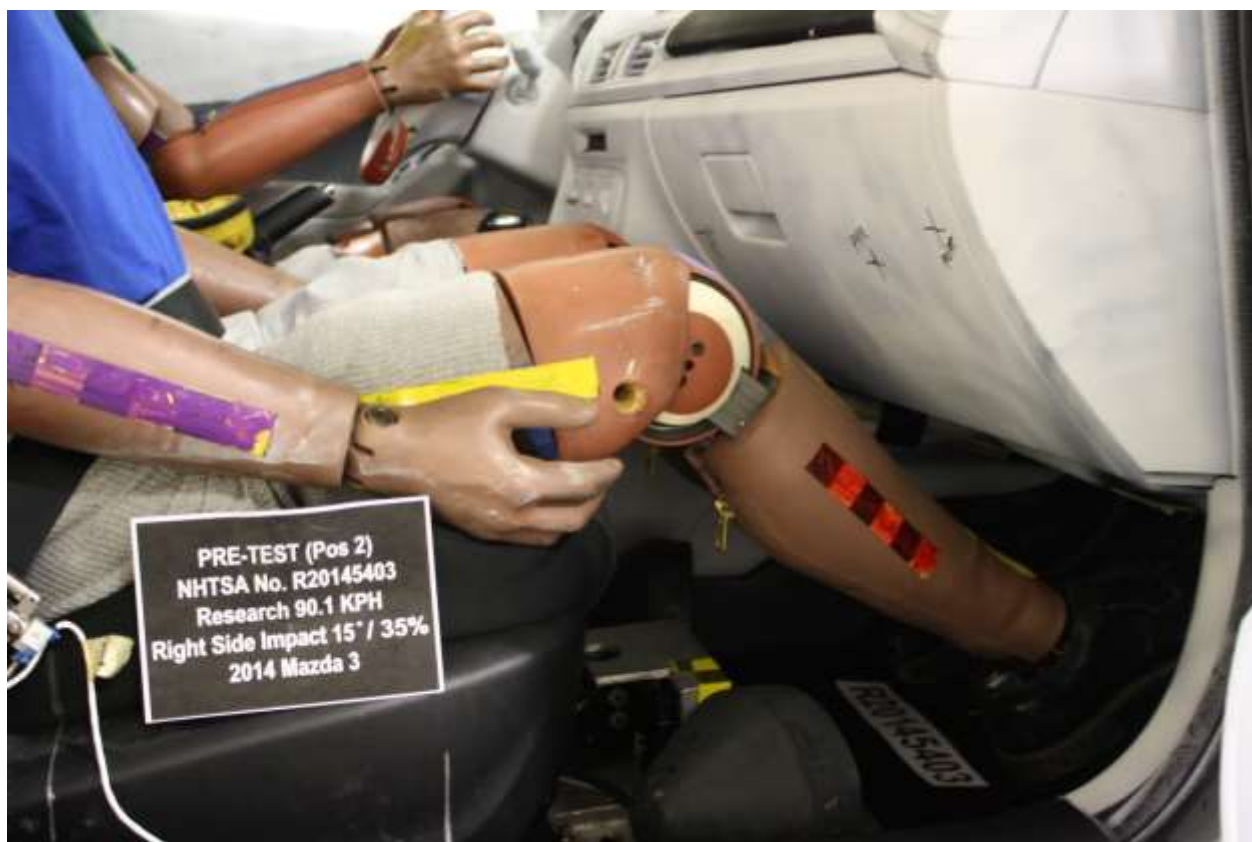
No. 111 Post-Test Passenger Adjustable D-ring



No. 112 Pre-Test View of Passenger Feet



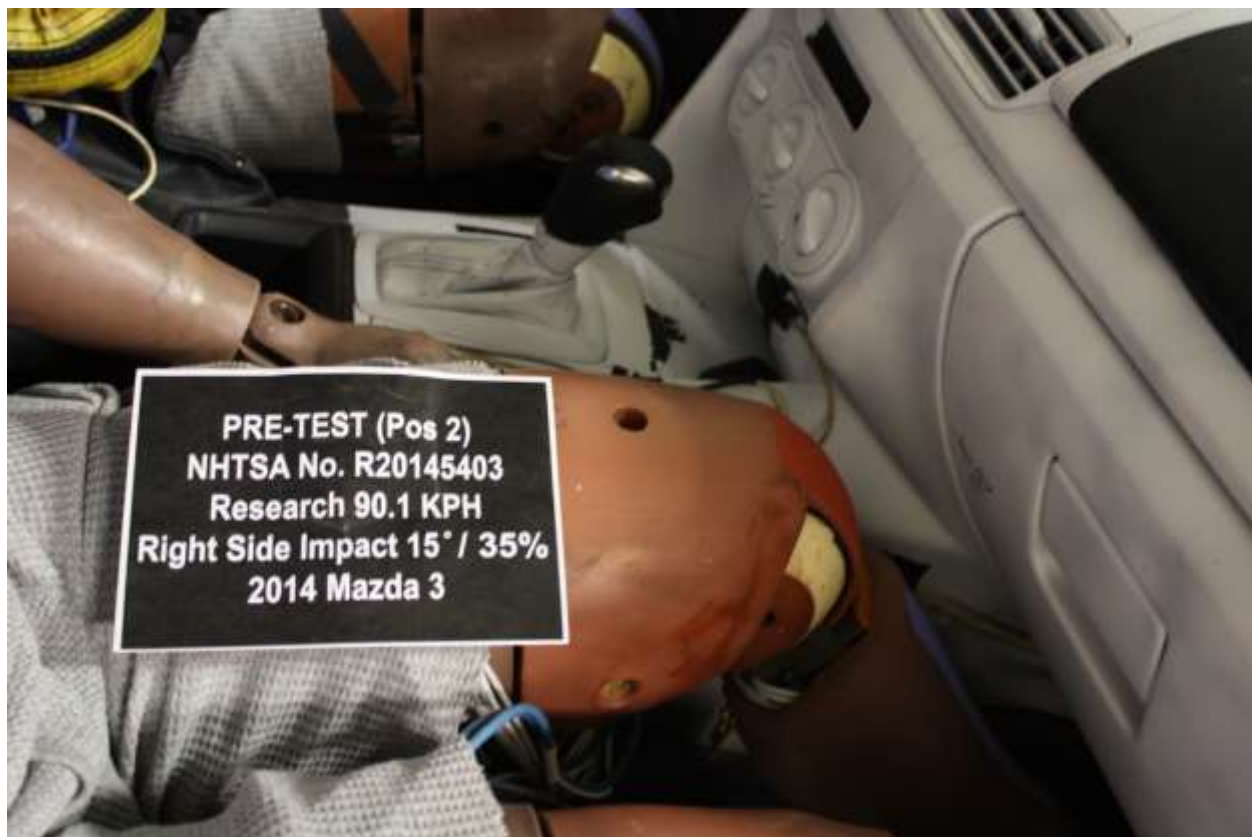
No. 113 Post-Test View of Passenger Feet



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

Photo Not Applicable

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



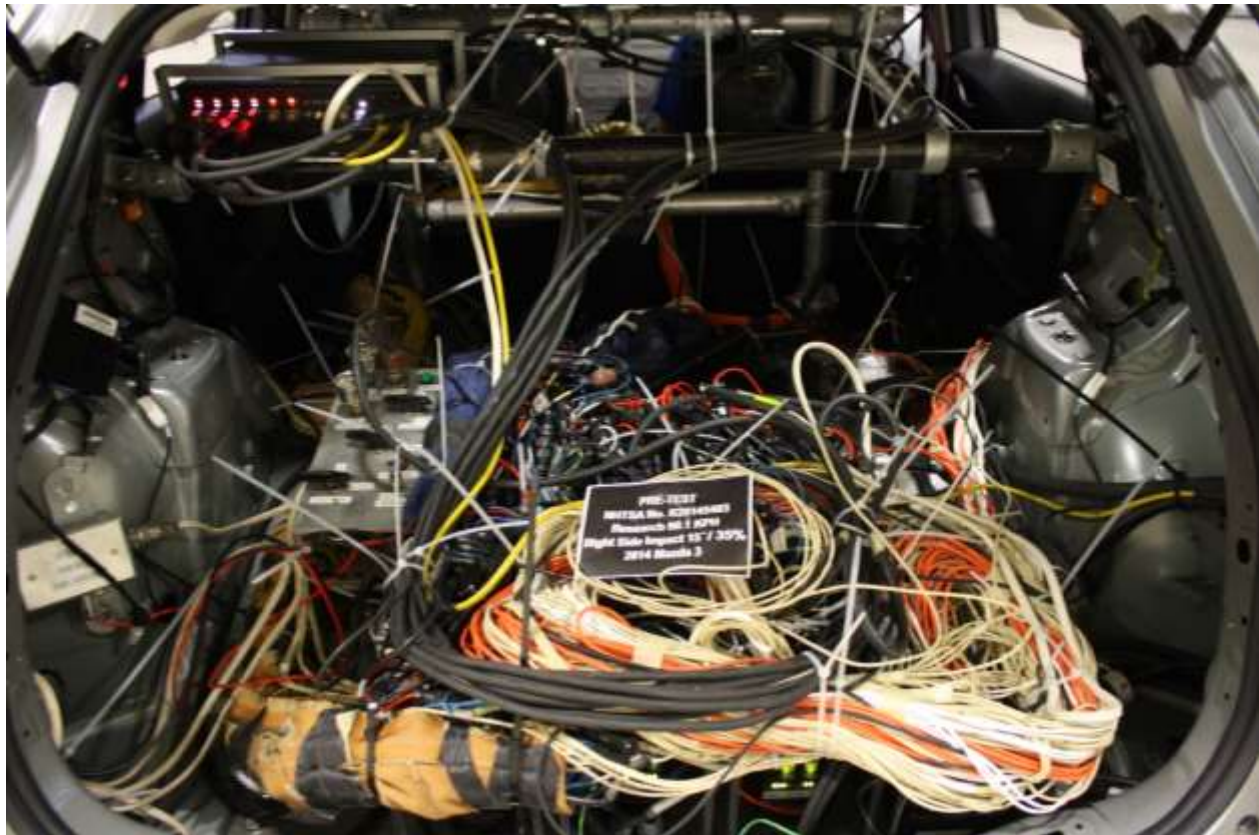
No. 121a Post-Test View of Passenger Body contact with Interior

Photo Not Applicable

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



No. 122 Post-Test Passenger Contact With Glovebox



No. 123 Pre-Test Ballast Locations



No. 124 Post-Test Speed Trap Readout



No. 125 Pre-Test View of Fuel Filler Cap



No. 126 Post-Test View of Fuel Filler Cap



No. 127 Pre-Test Engine Compartment View



No. 128 Post-Test Engine Compartment View



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



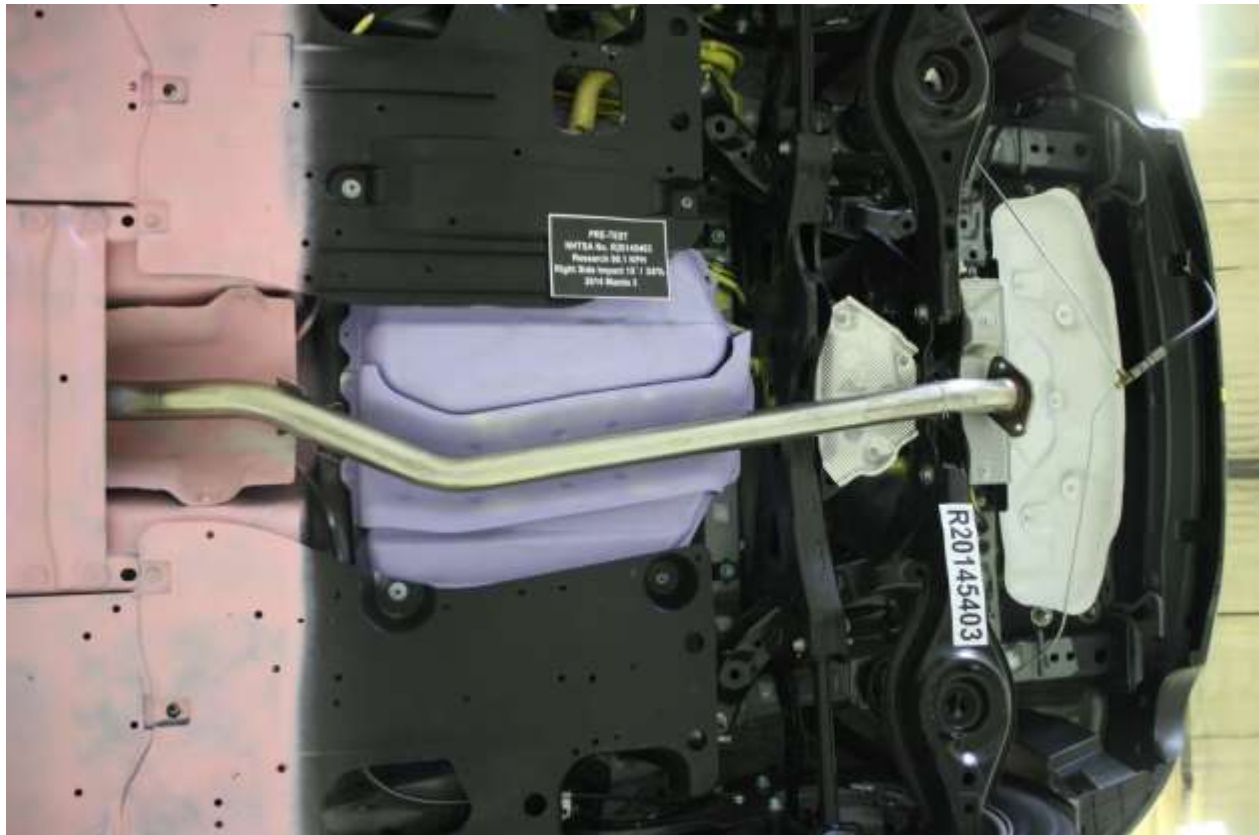
No. 130 Post-Test View of Front Underbody (perpendicular to vehicle)



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



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



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



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



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



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



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



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



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



No. 140 Pre-Test Frame Rail with tire removed



No. 141 Post-Test Frame Rail with tire removed



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



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



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



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



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



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



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



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



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



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



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



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



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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 RMDB & Vehicle, Right Side



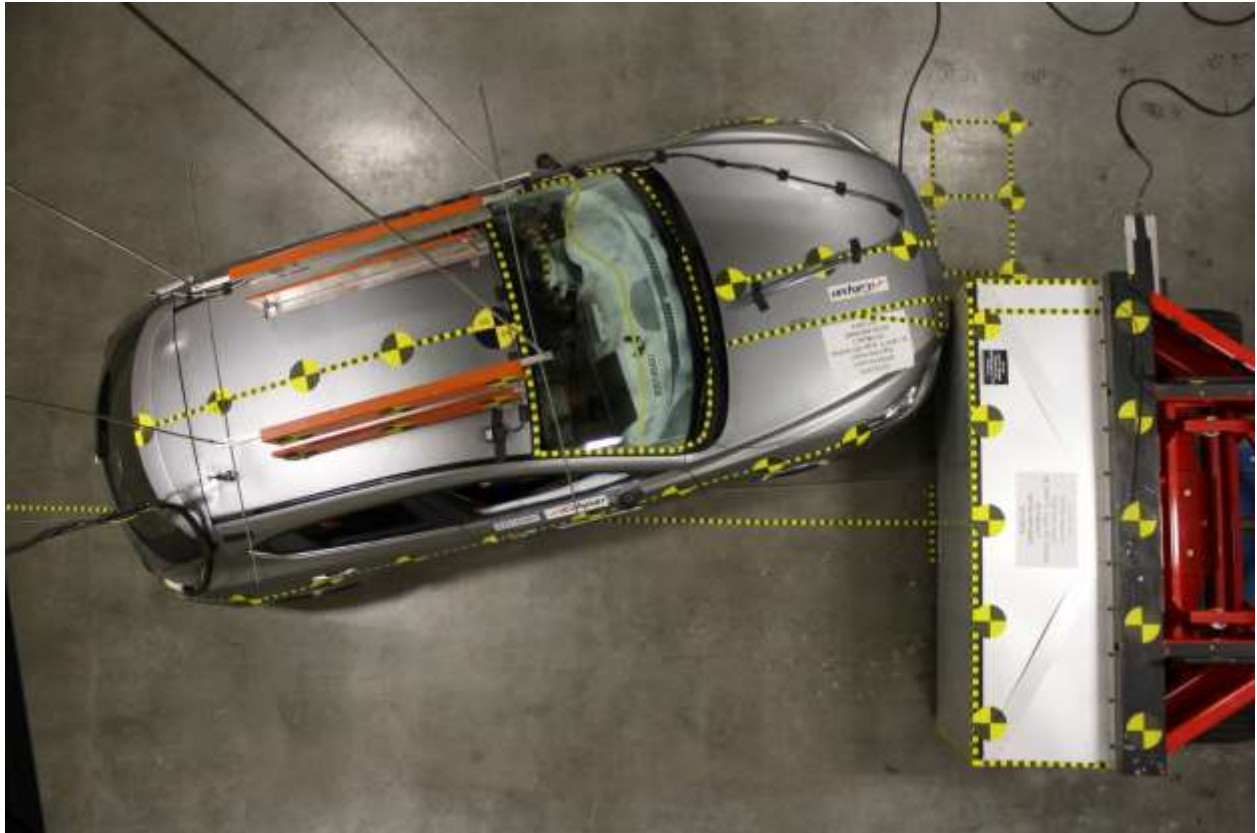
No. 171 Post-Test RMDB & Vehicle, Right Side



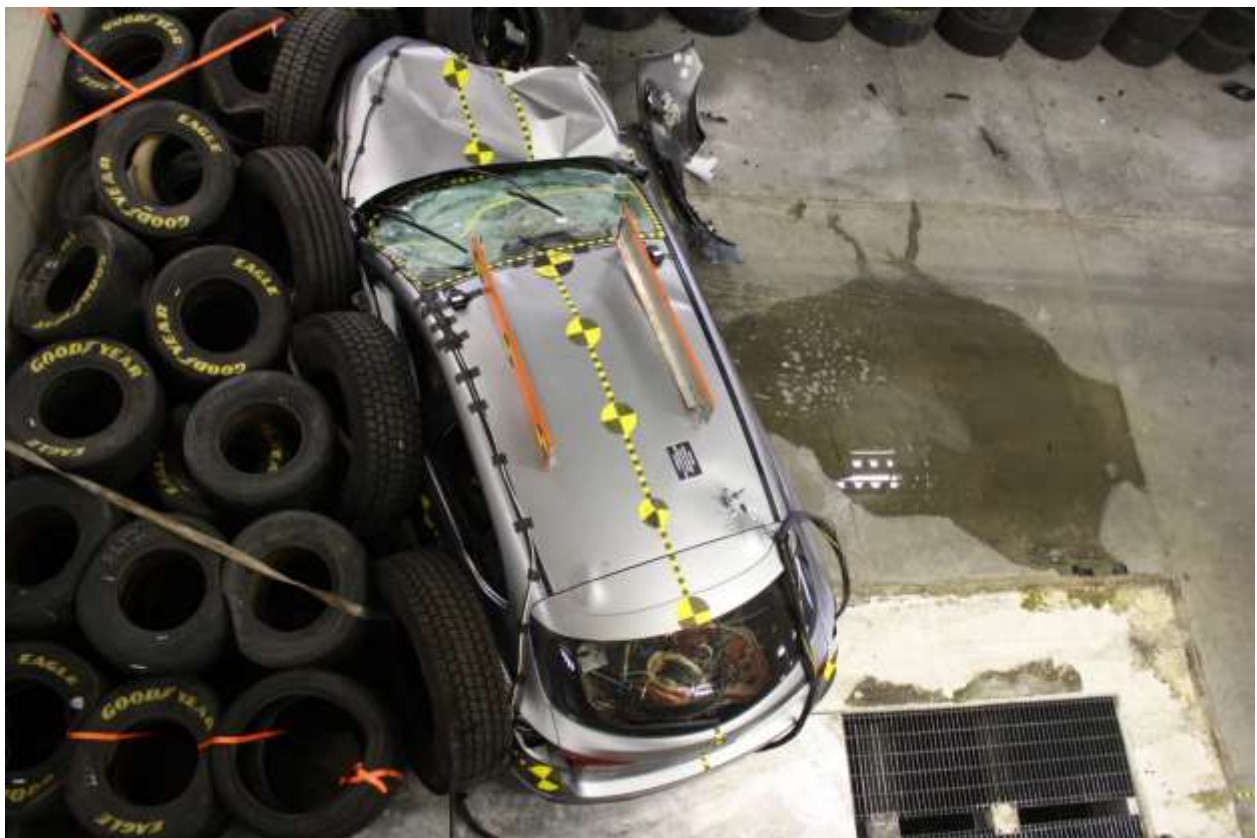
No. 172 Pre-Test RMDB & Vehicle, Left Side



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



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



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



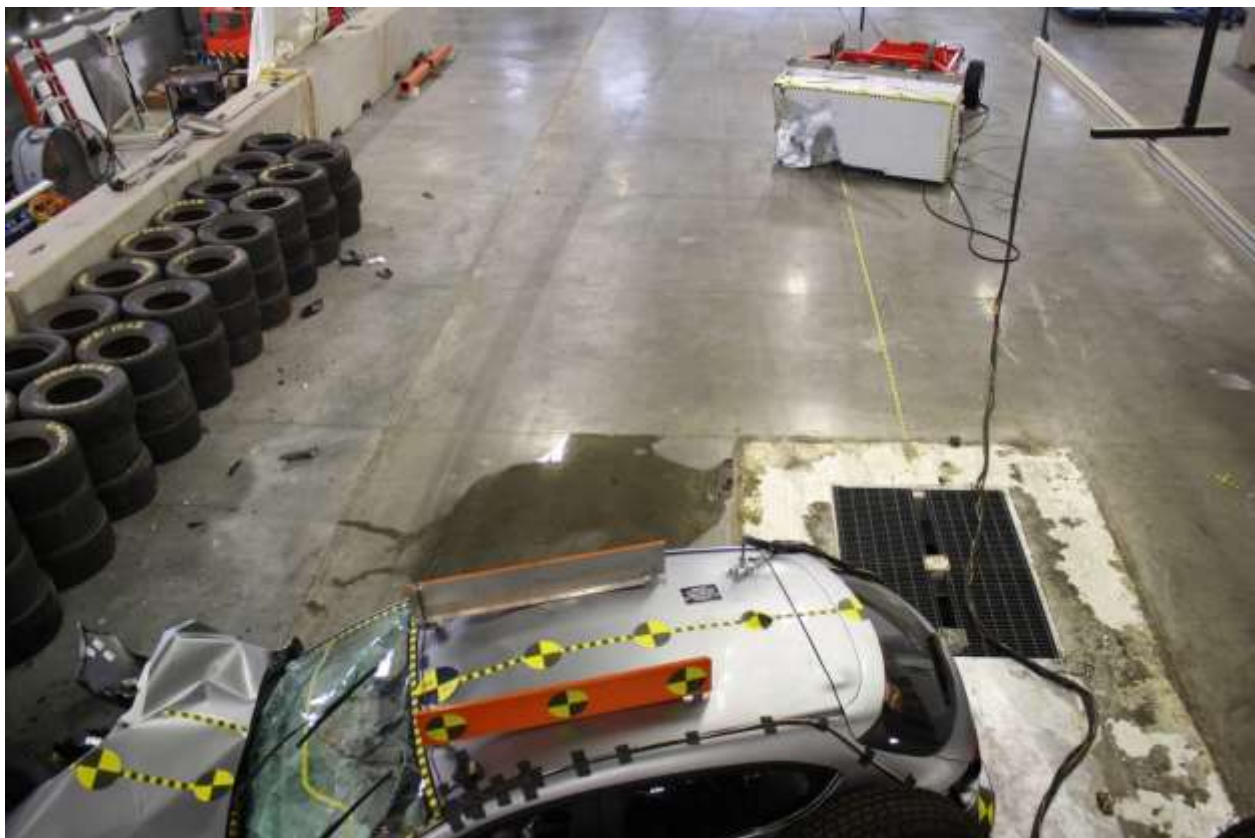
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No. 177 Post-Test RMDB & Vehicle, Rear View



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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



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VEHICLE & DUMMY RESPONSE DATA TRACES

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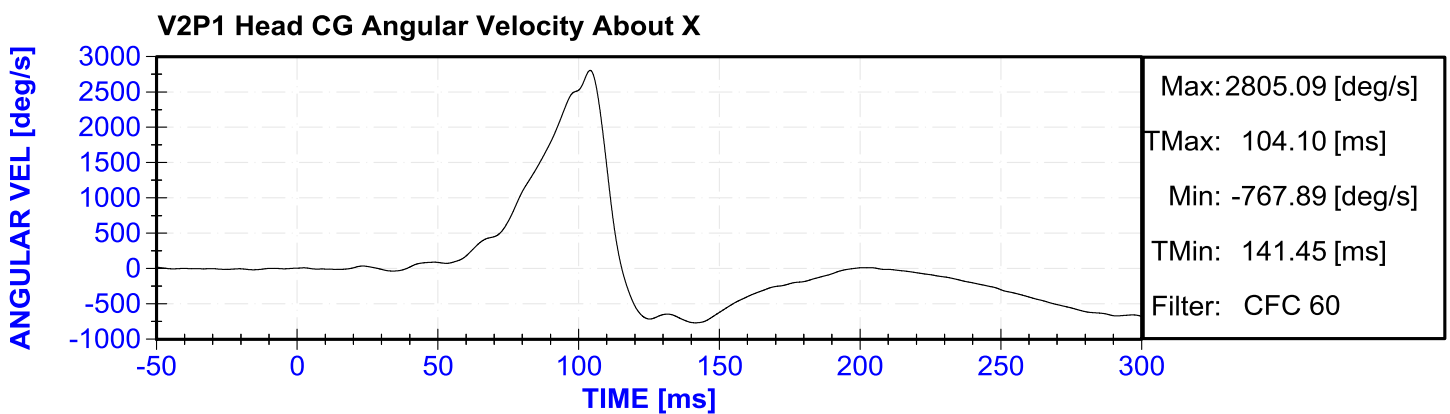
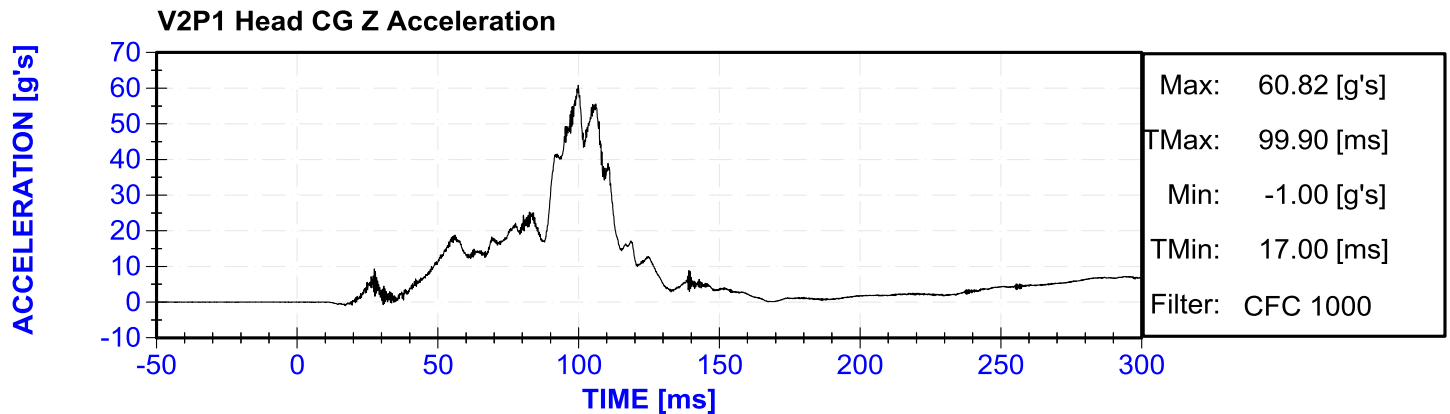
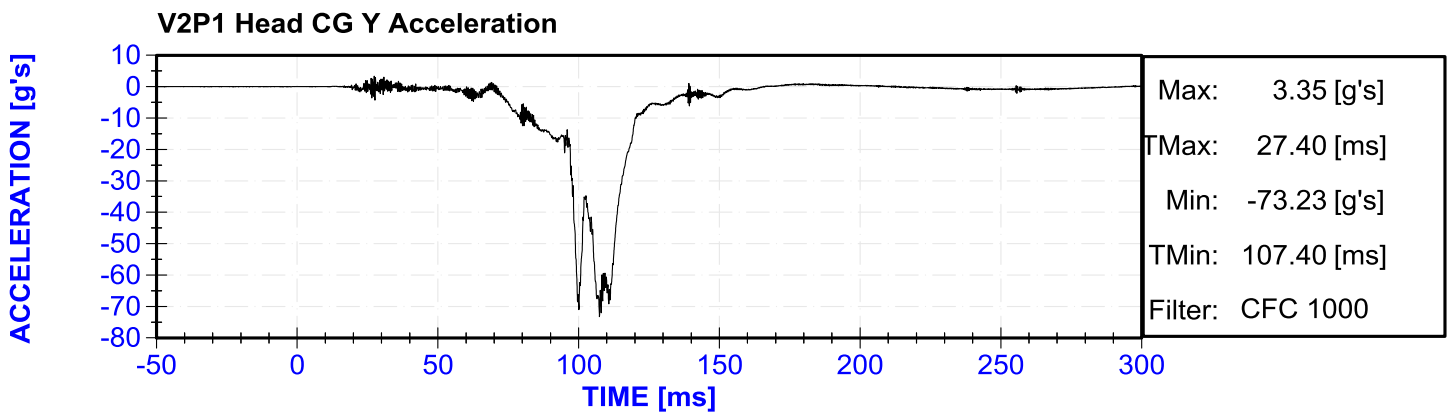
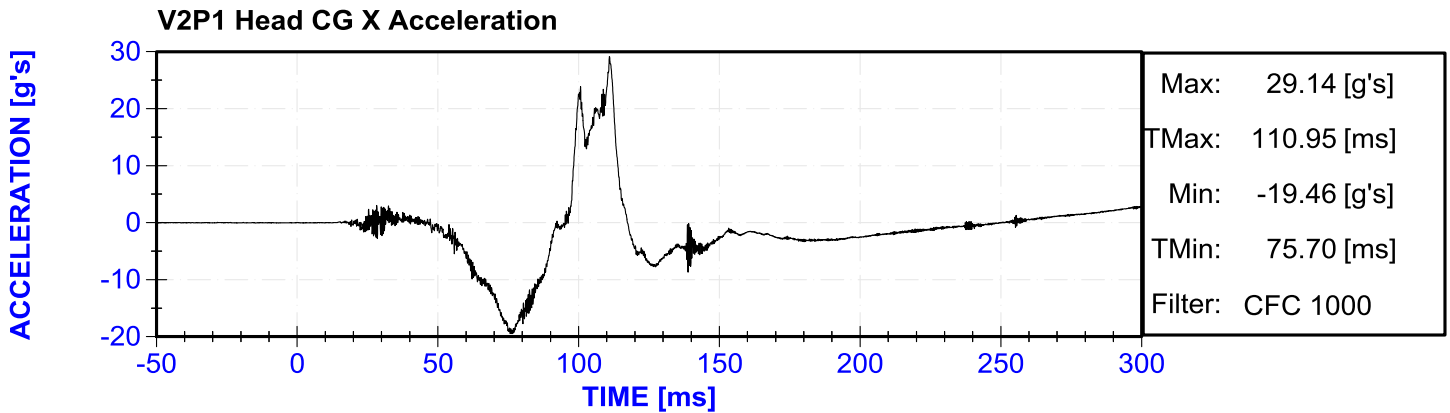
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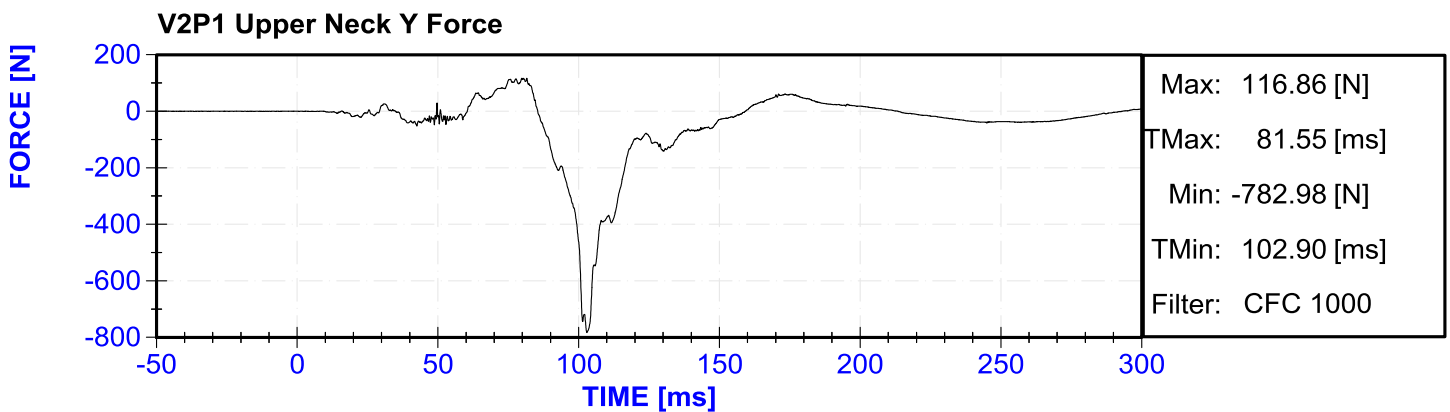
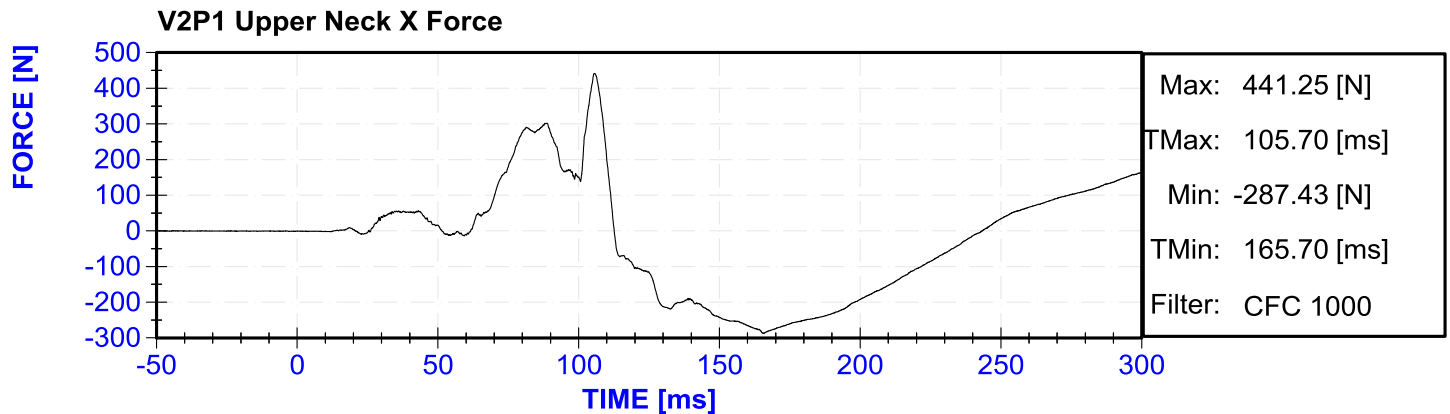
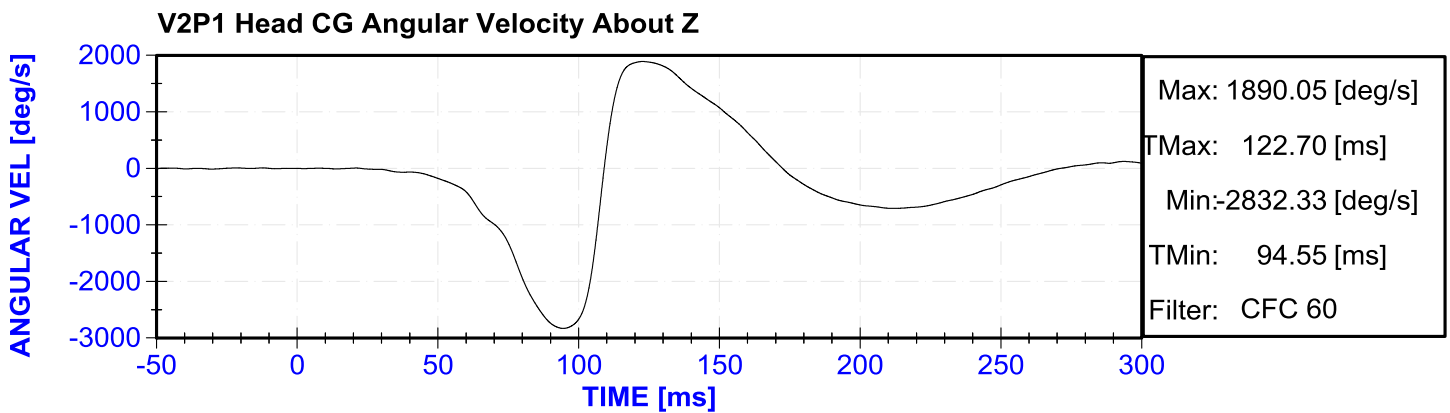
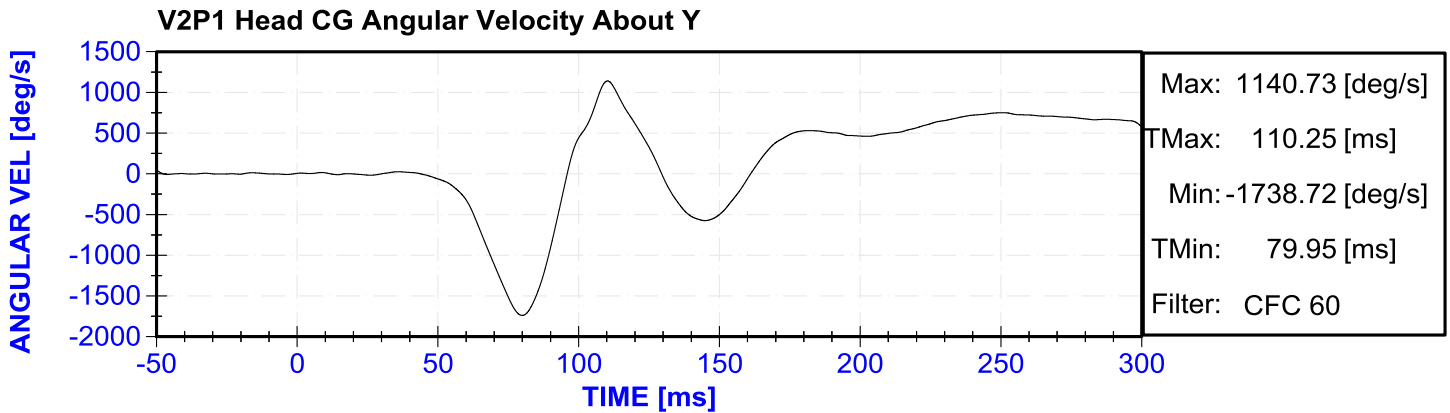
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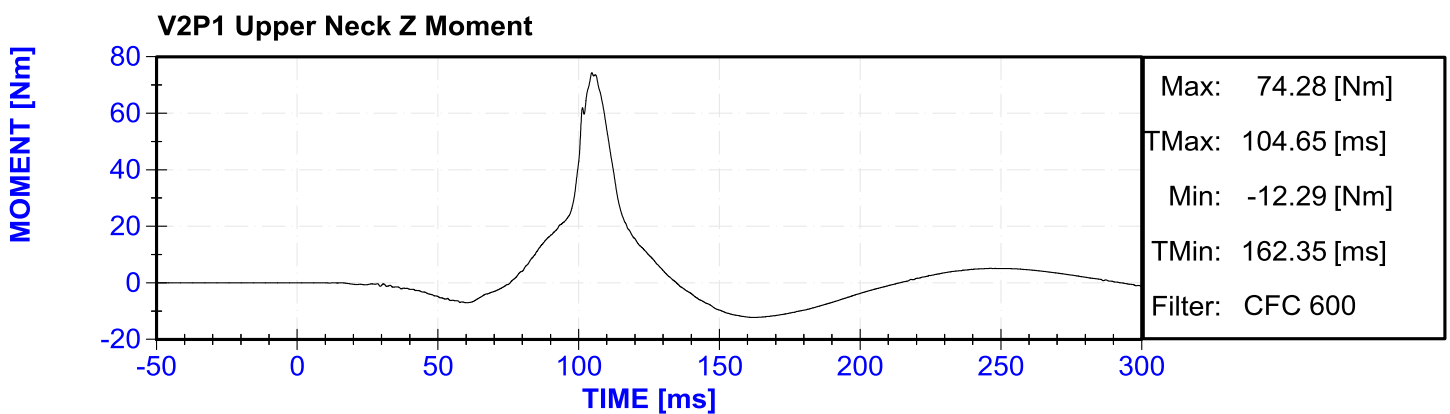
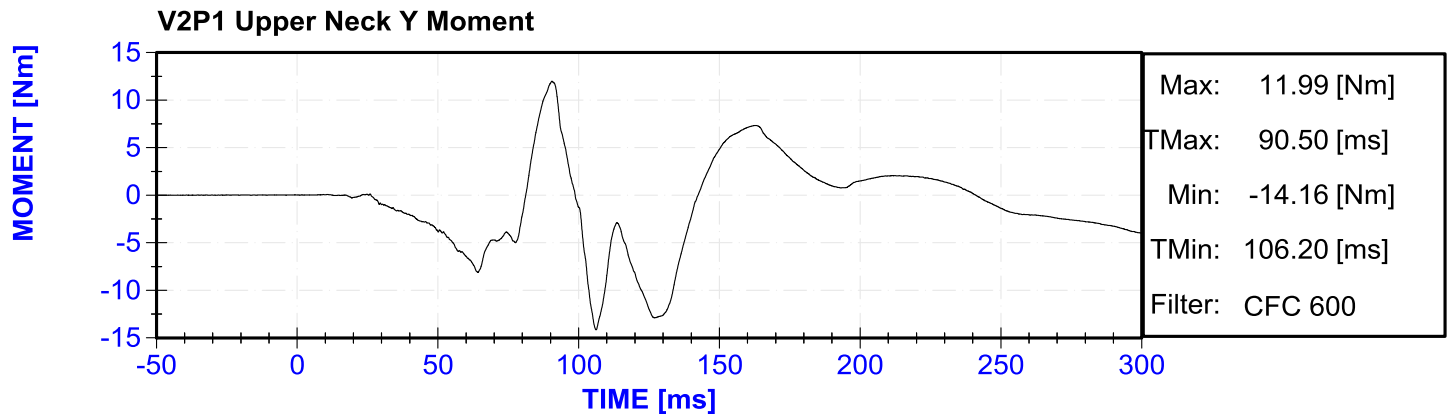
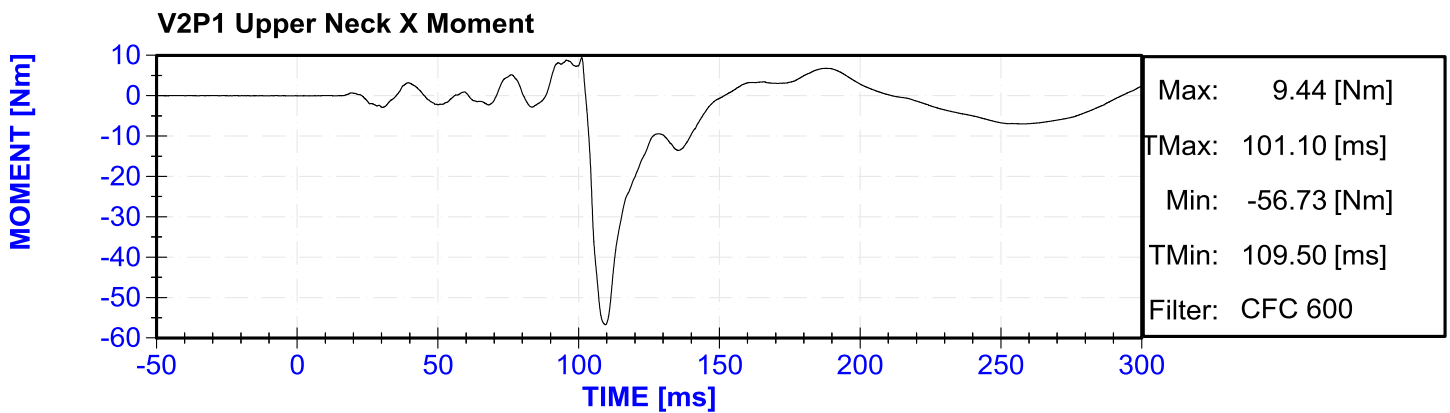
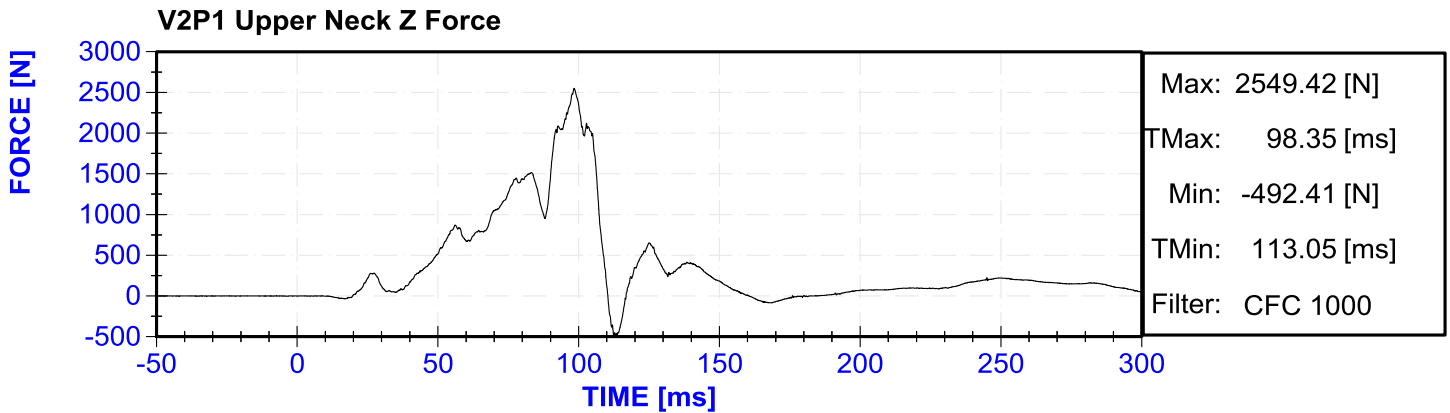
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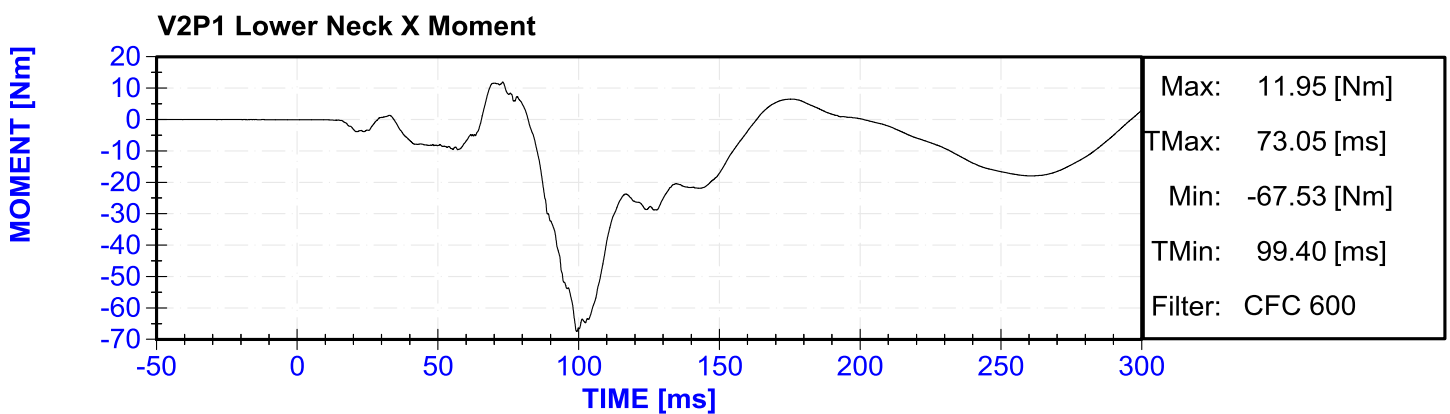
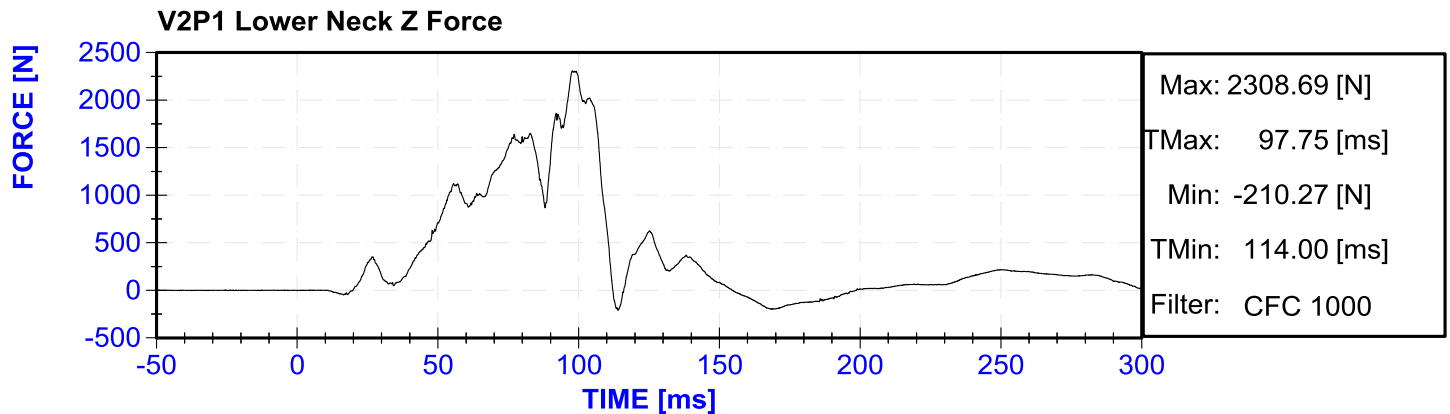
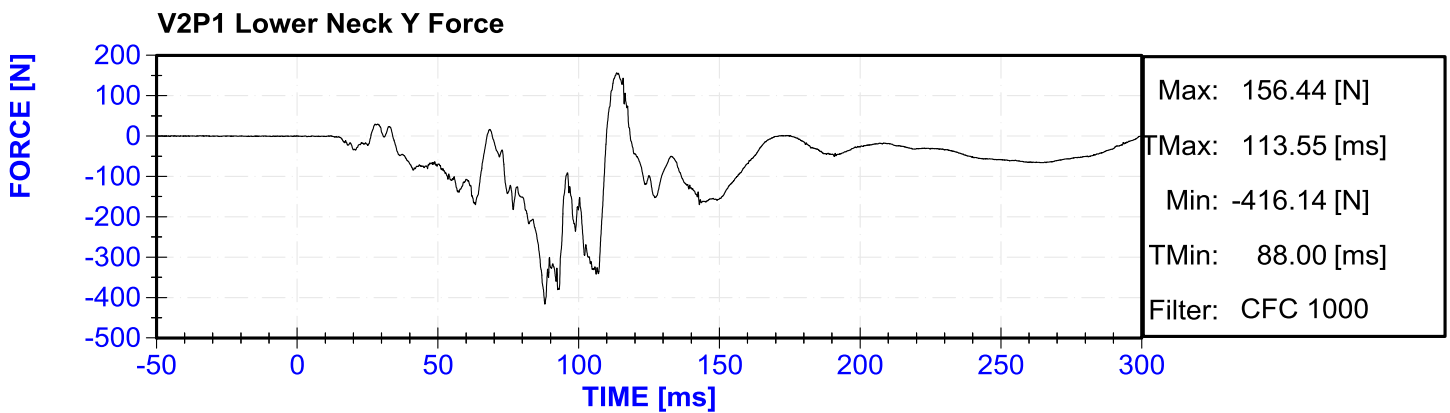
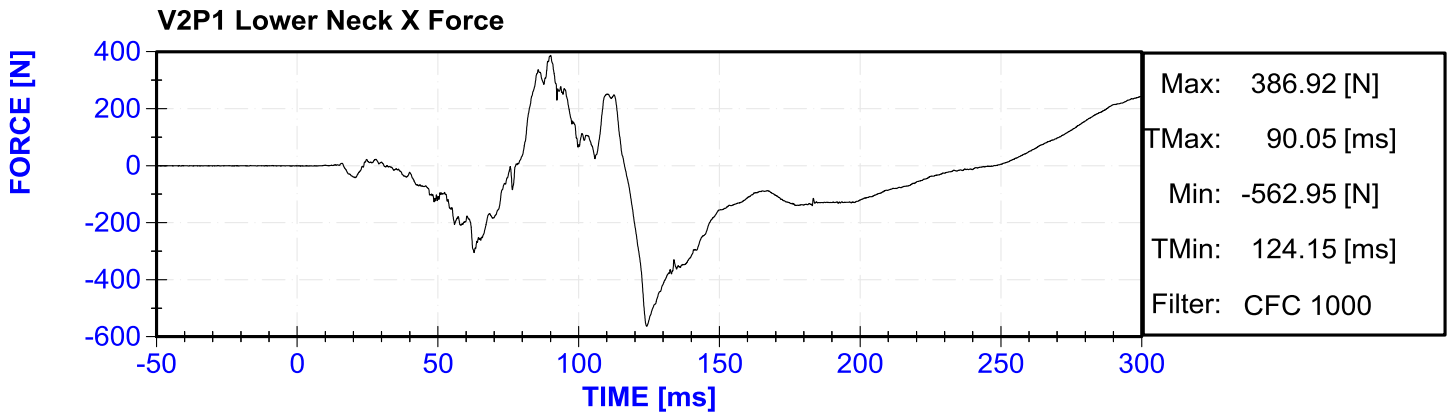
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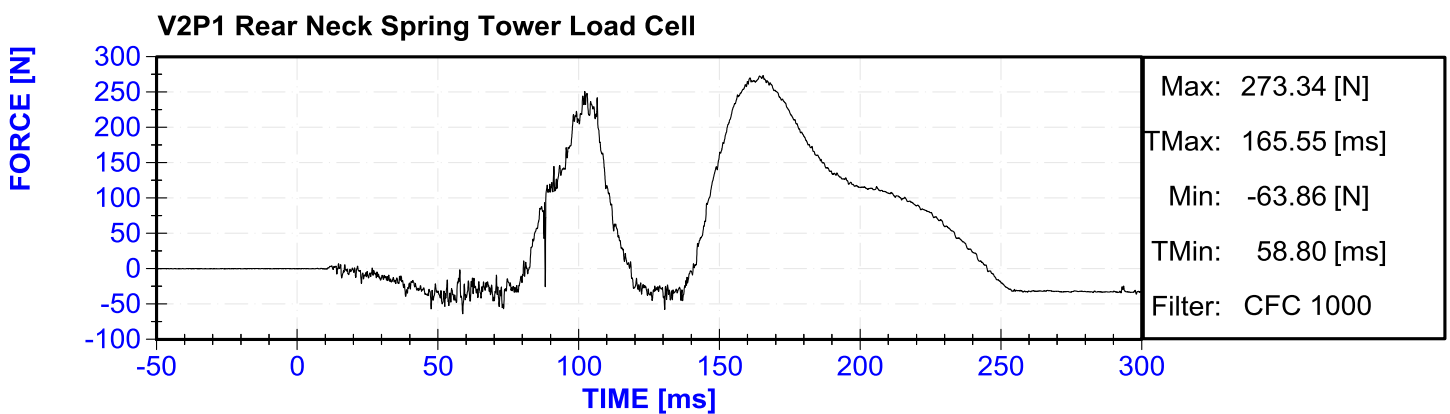
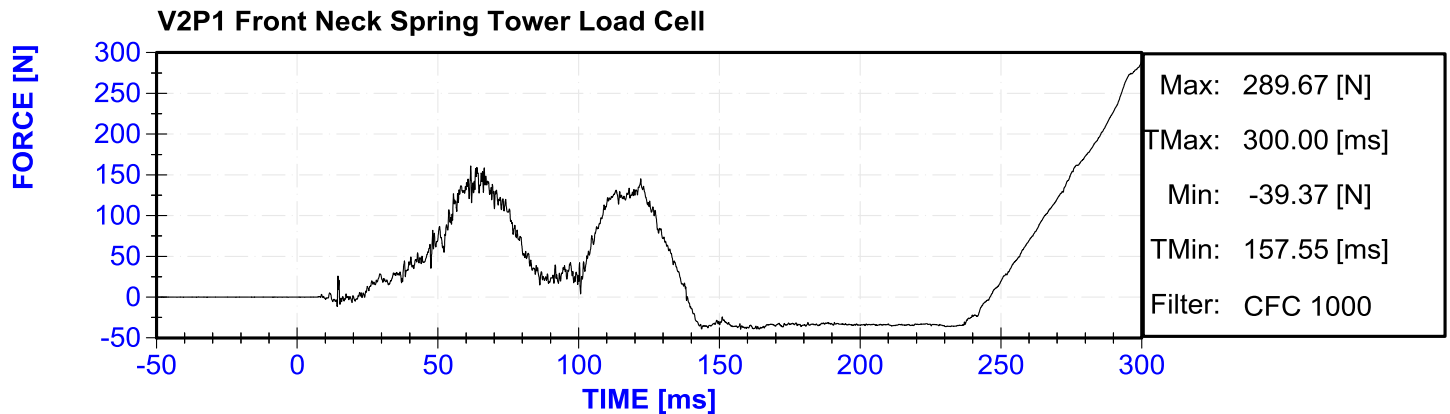
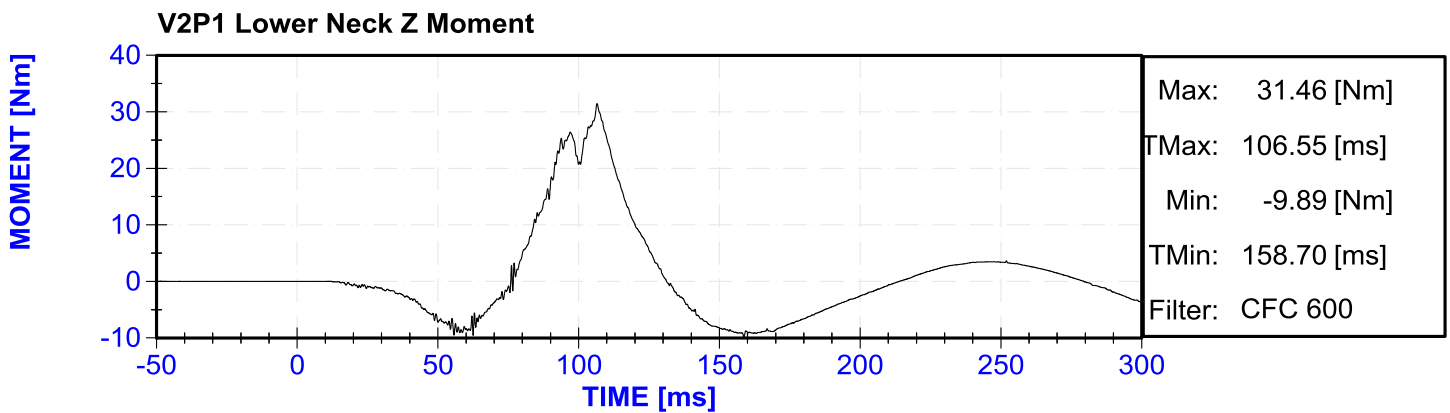
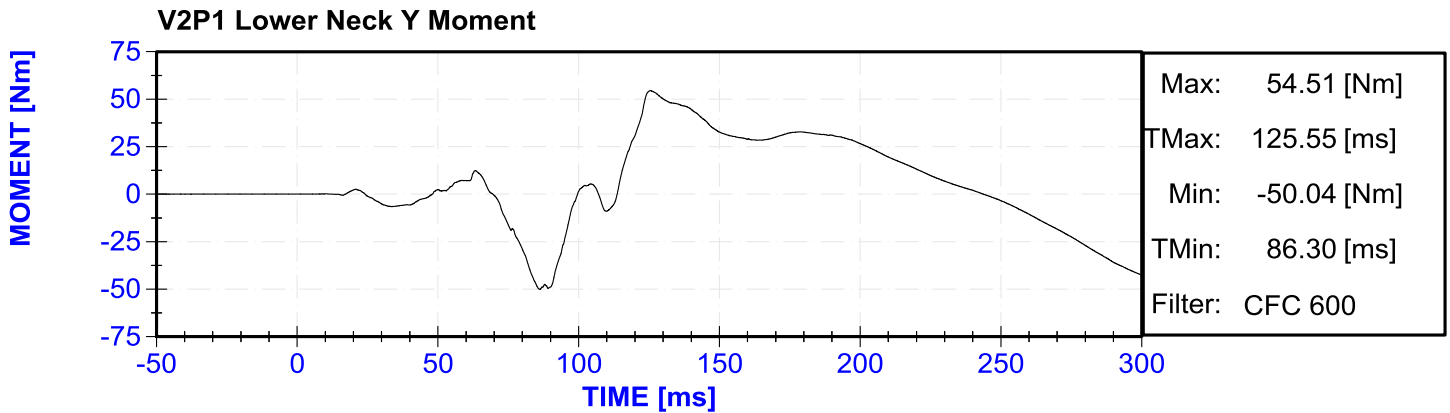
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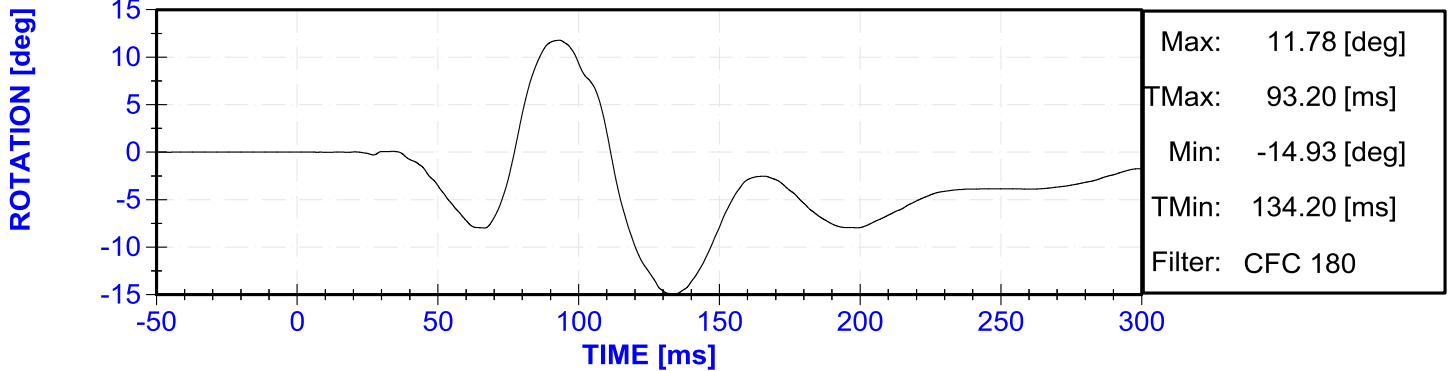




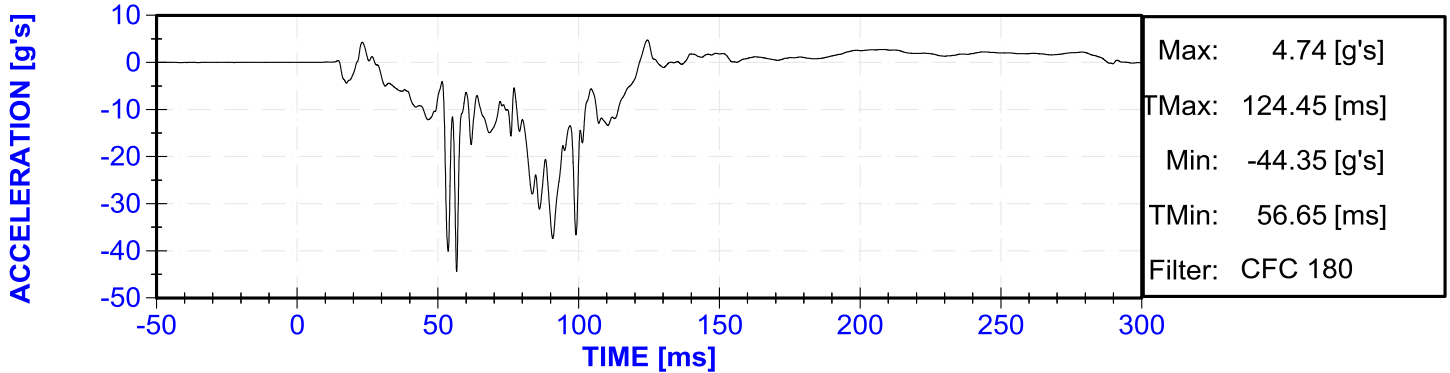




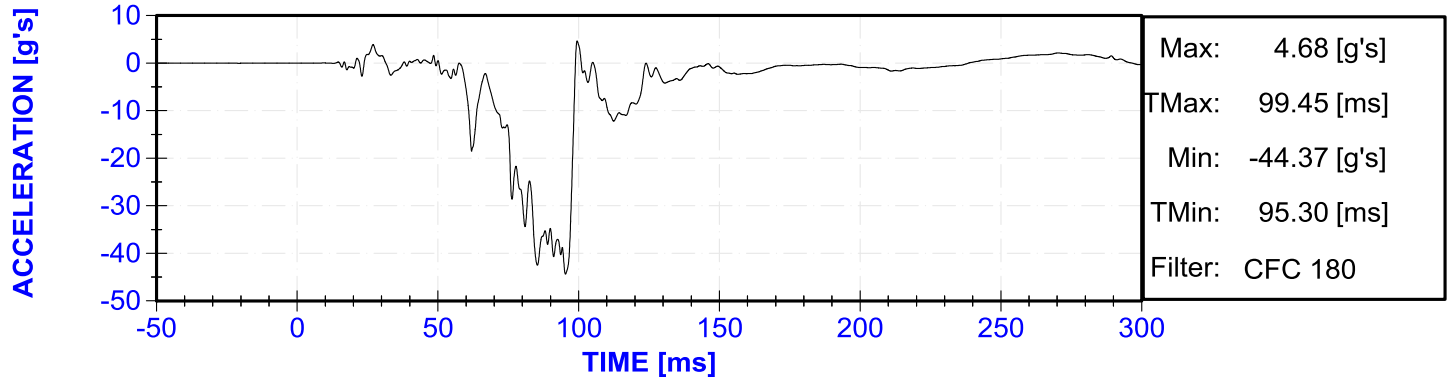
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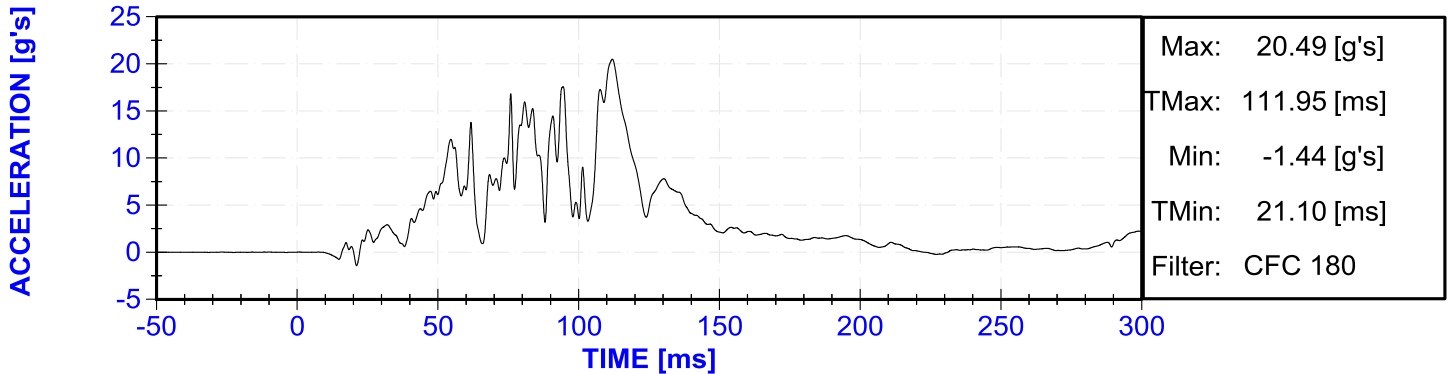
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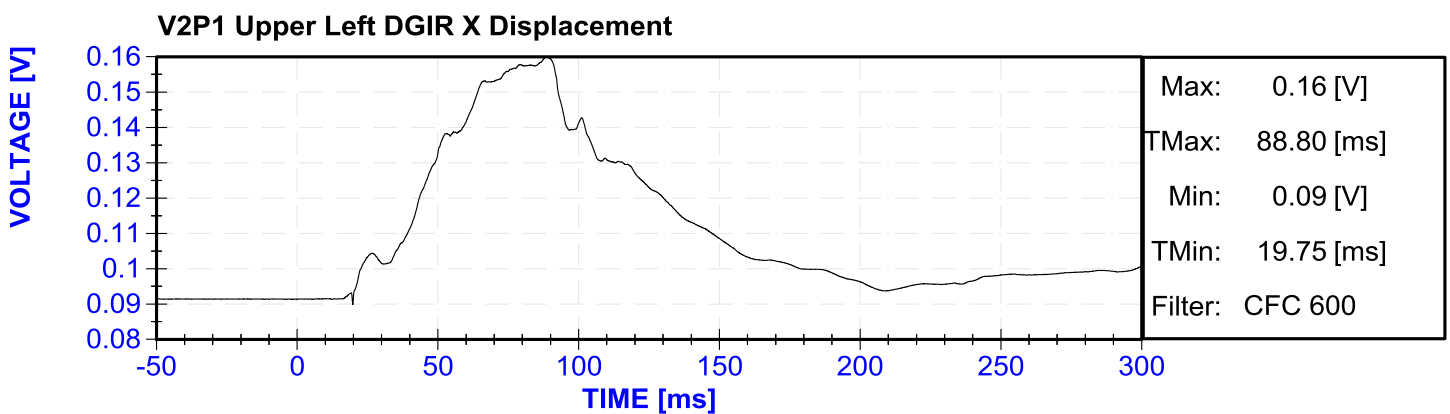
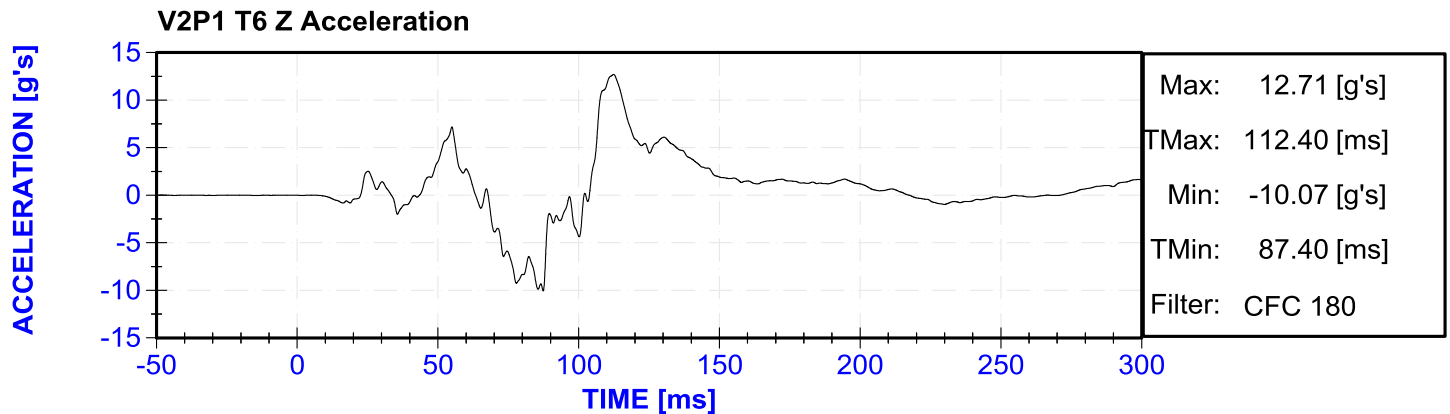
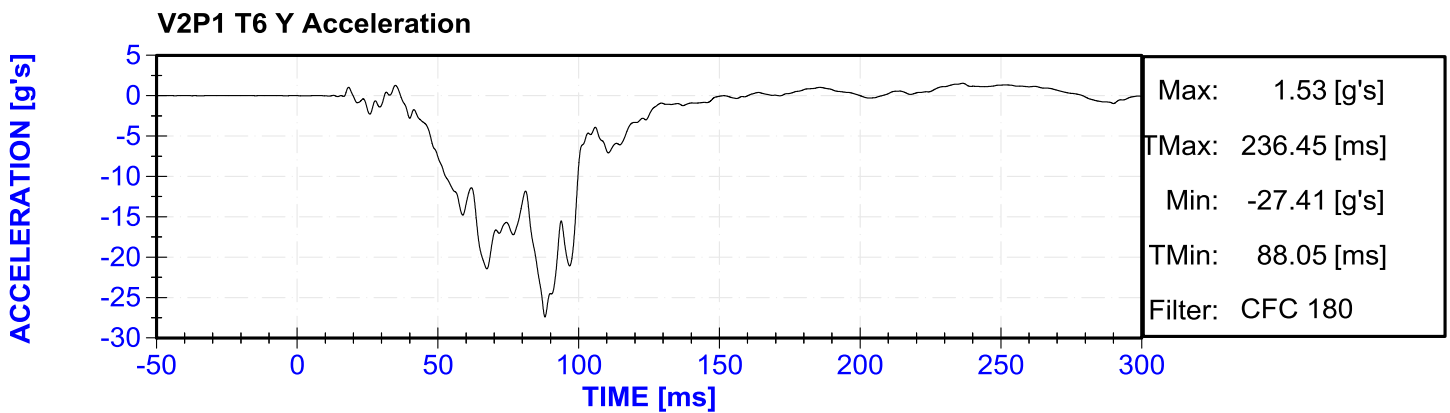
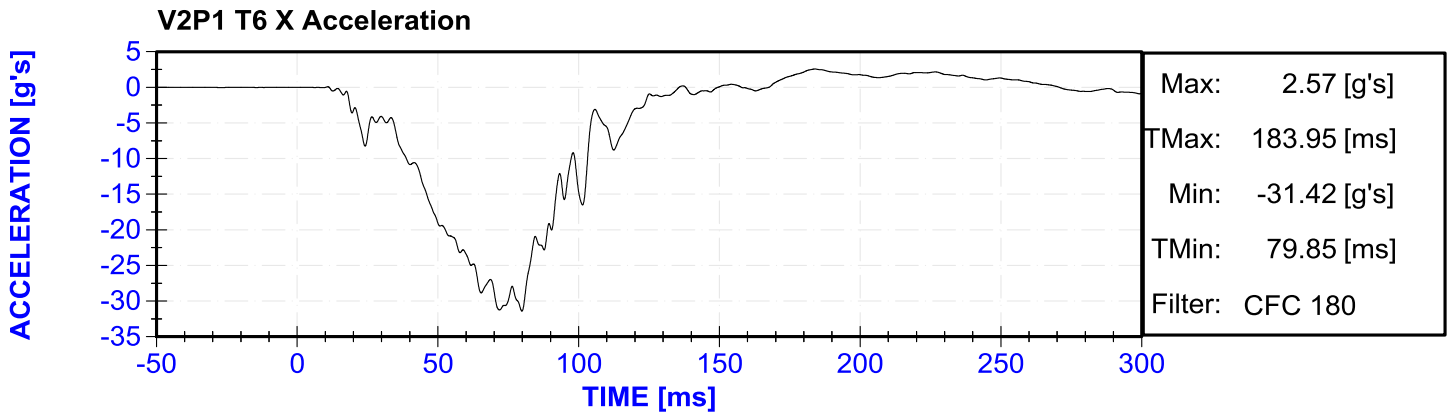


V2P1 T1 Y Acceleration

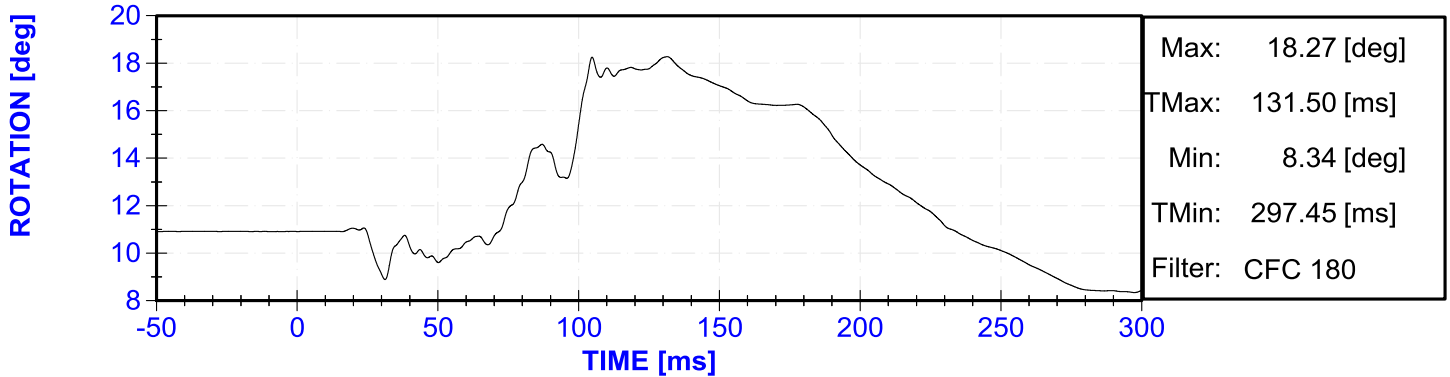


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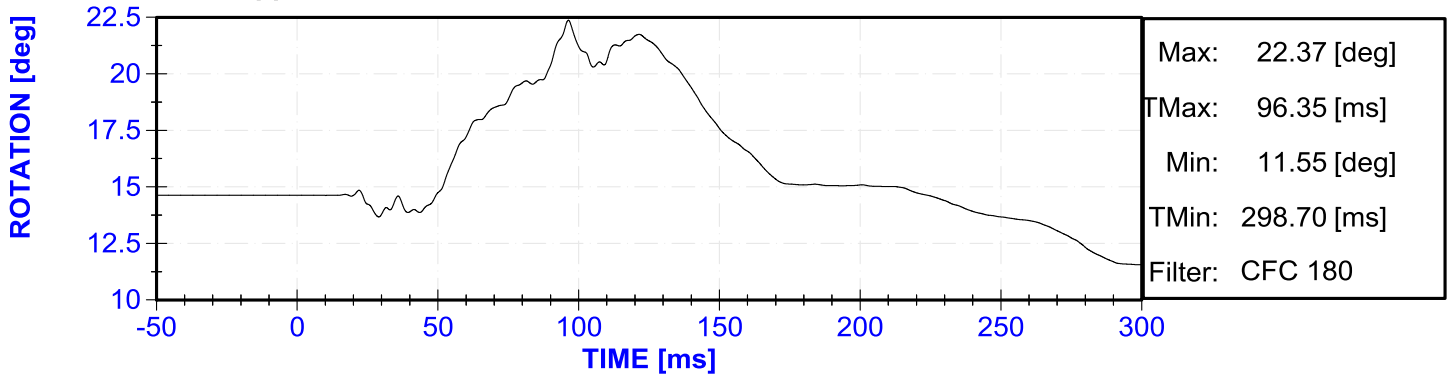




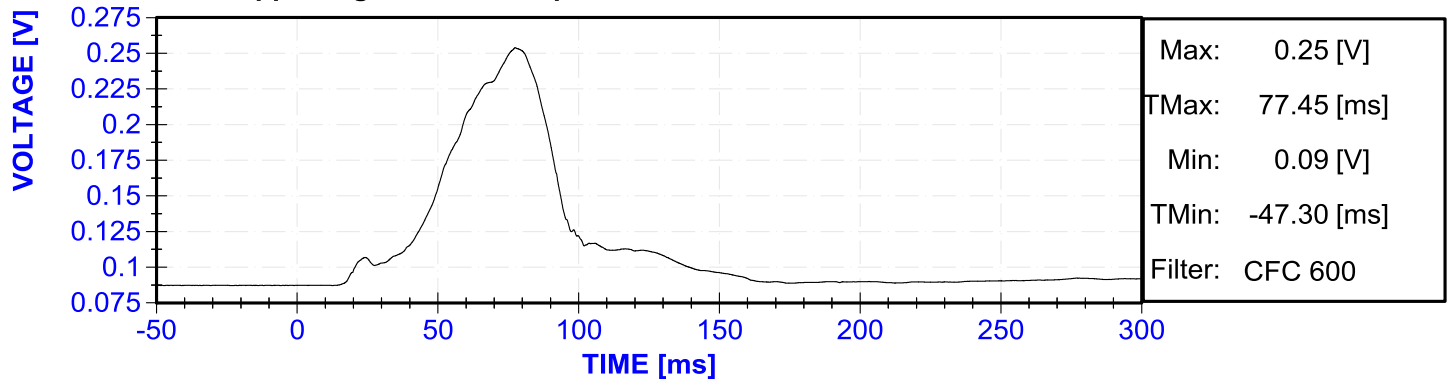
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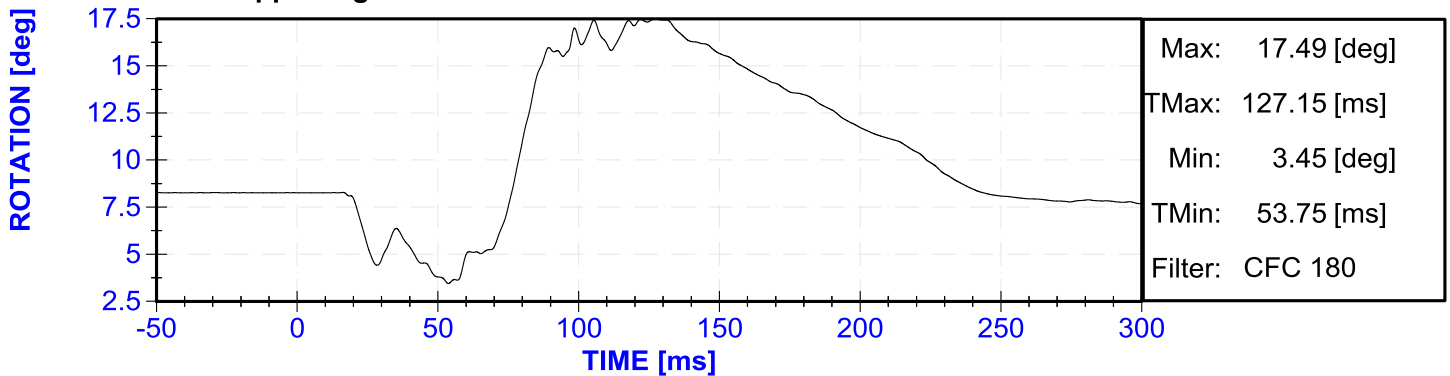
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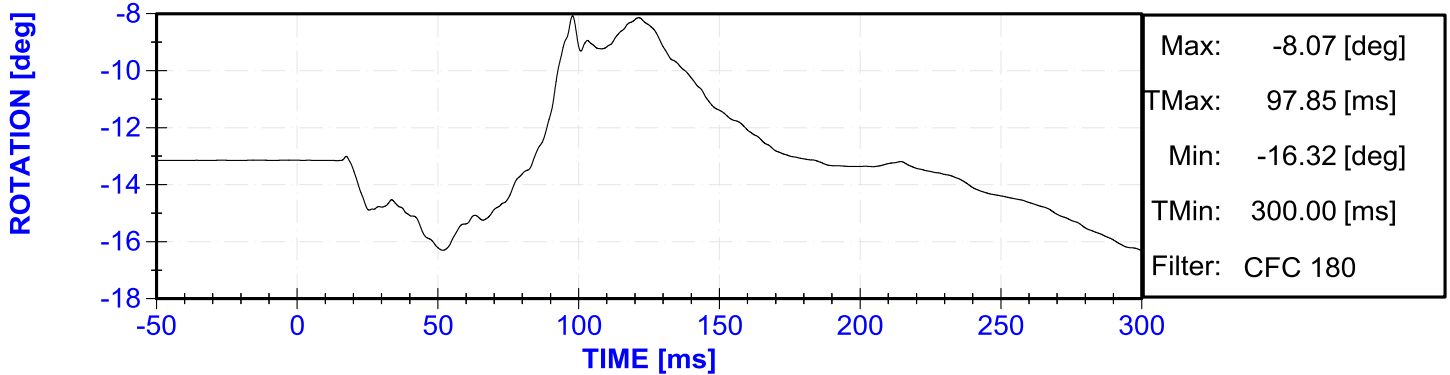
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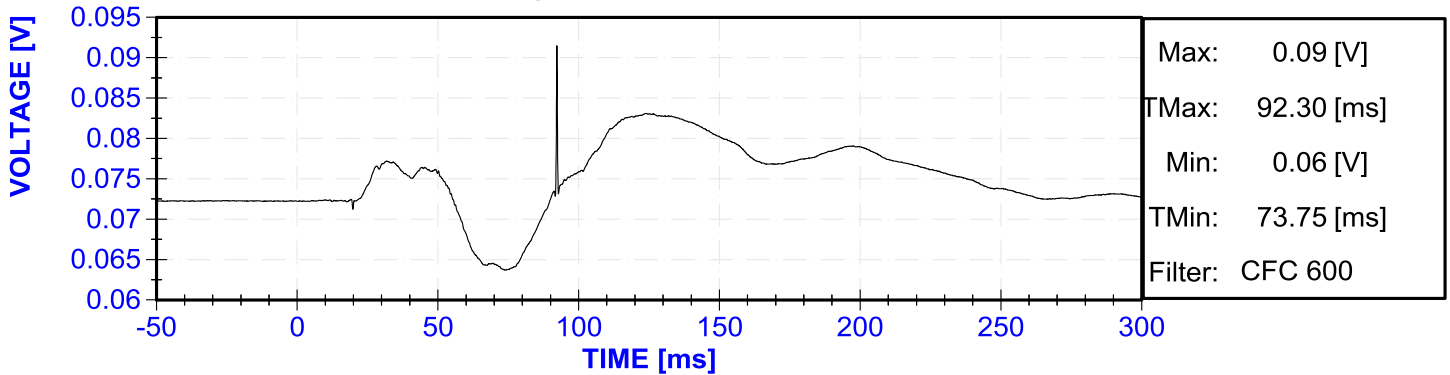
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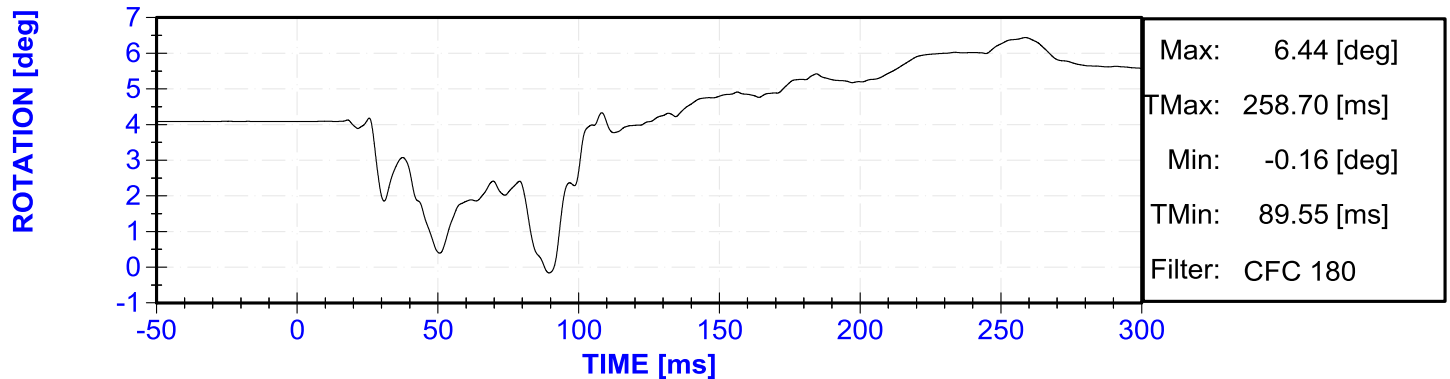
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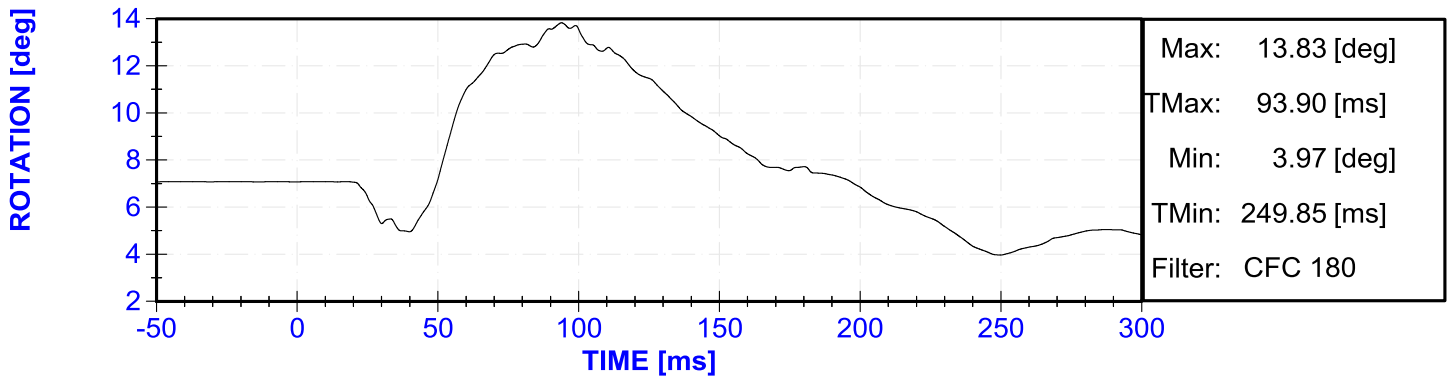
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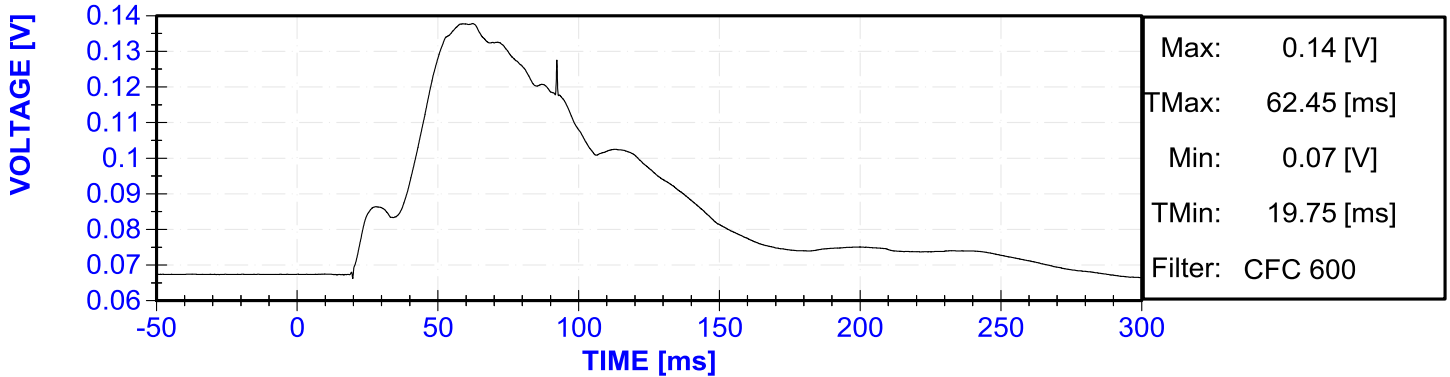
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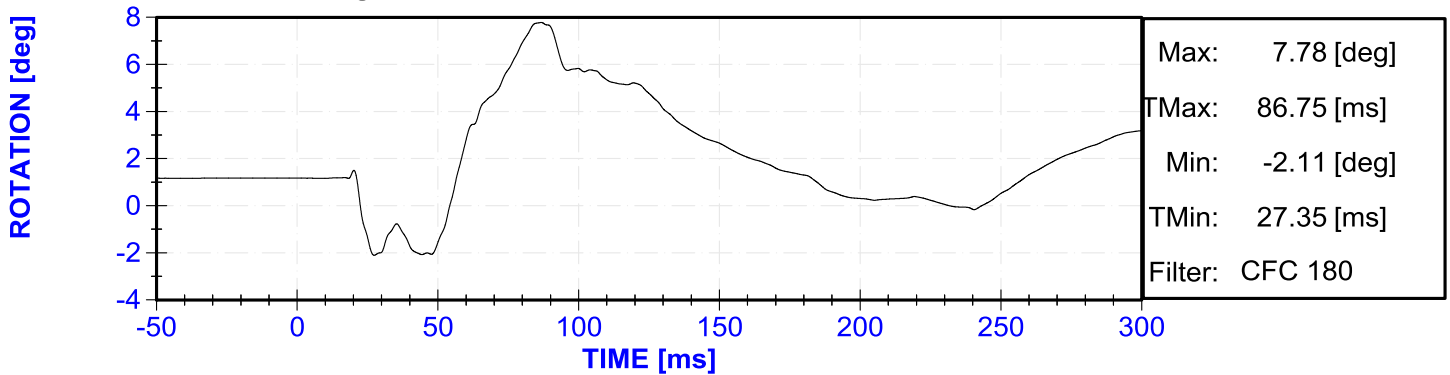
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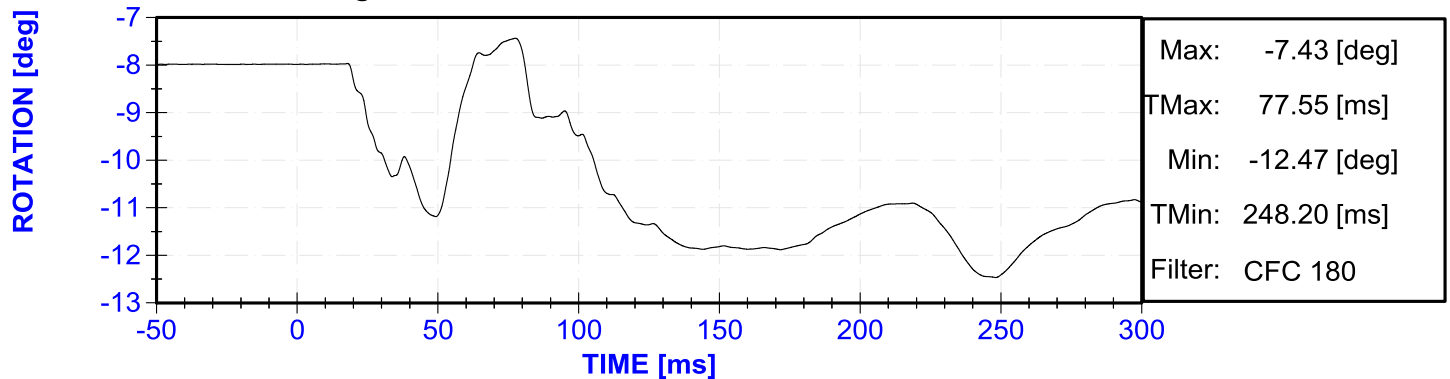
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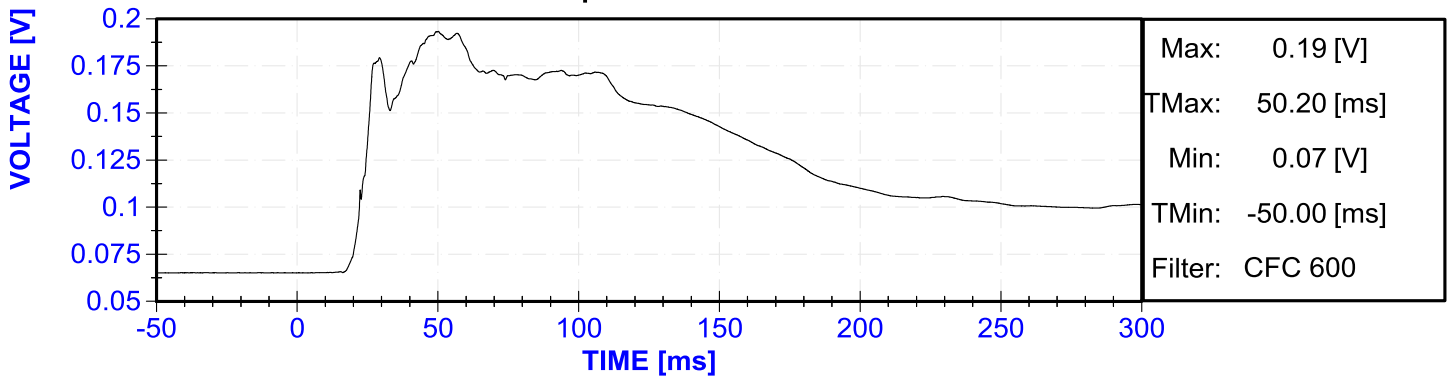
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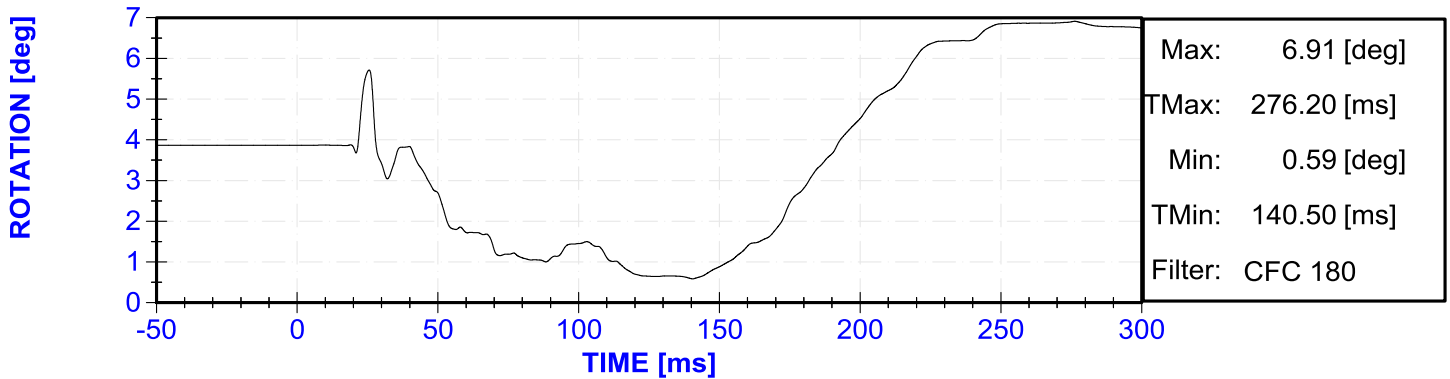
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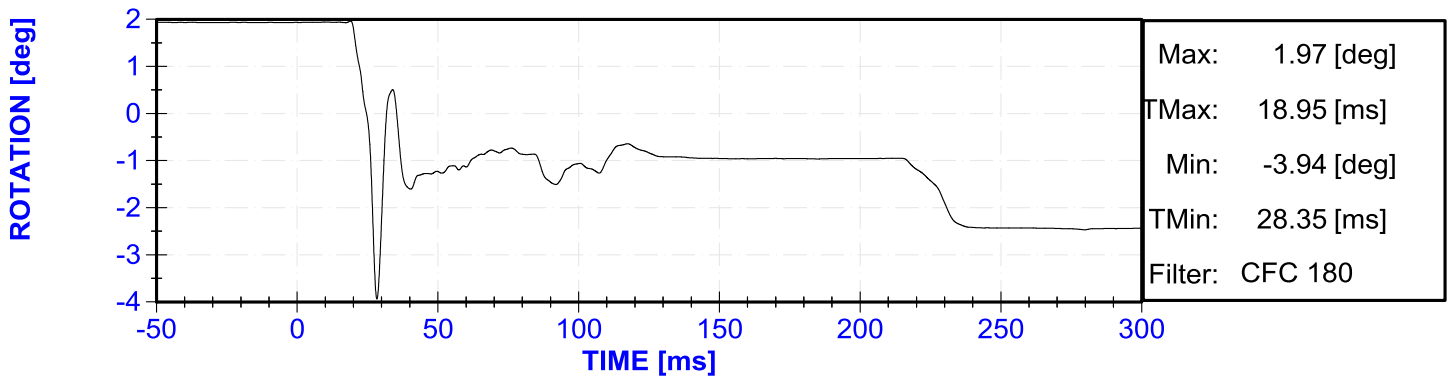
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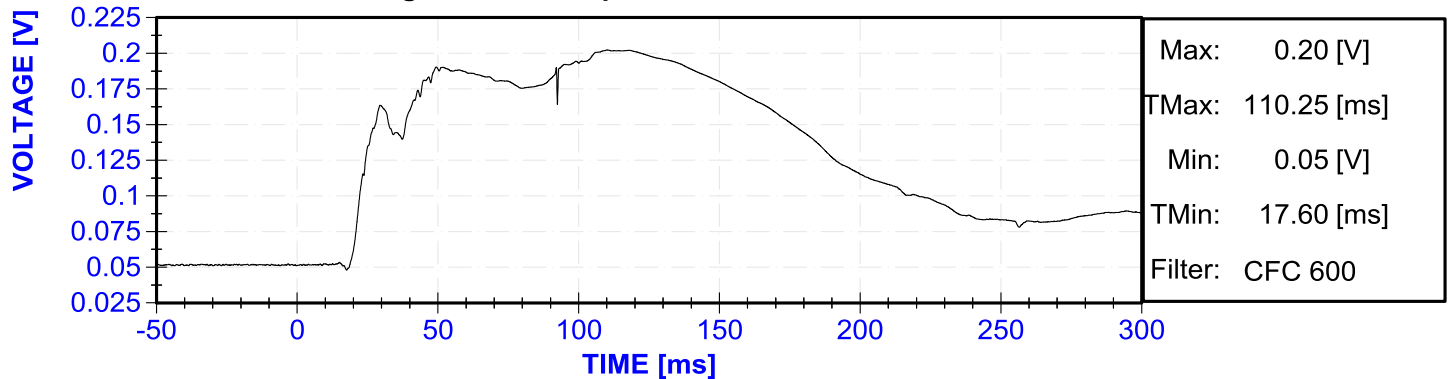
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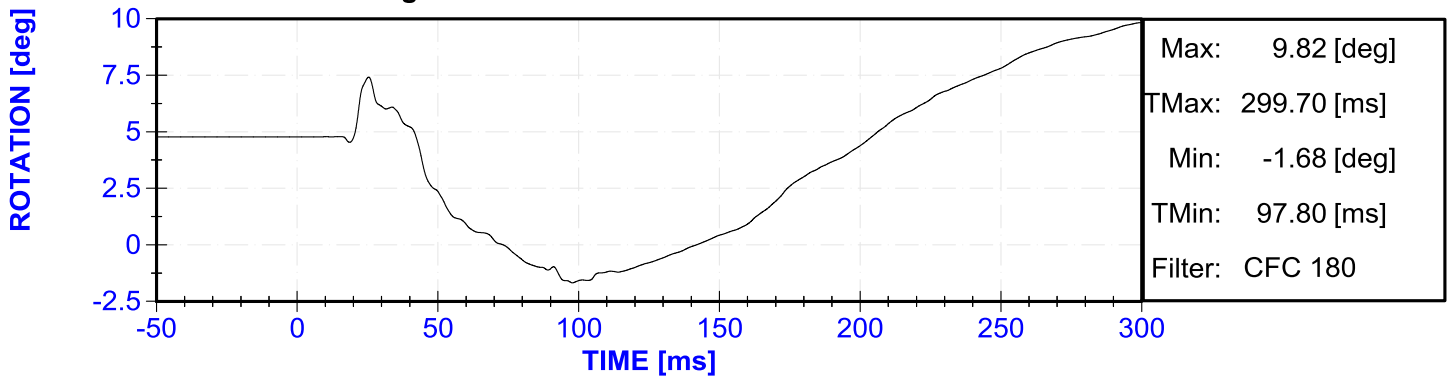
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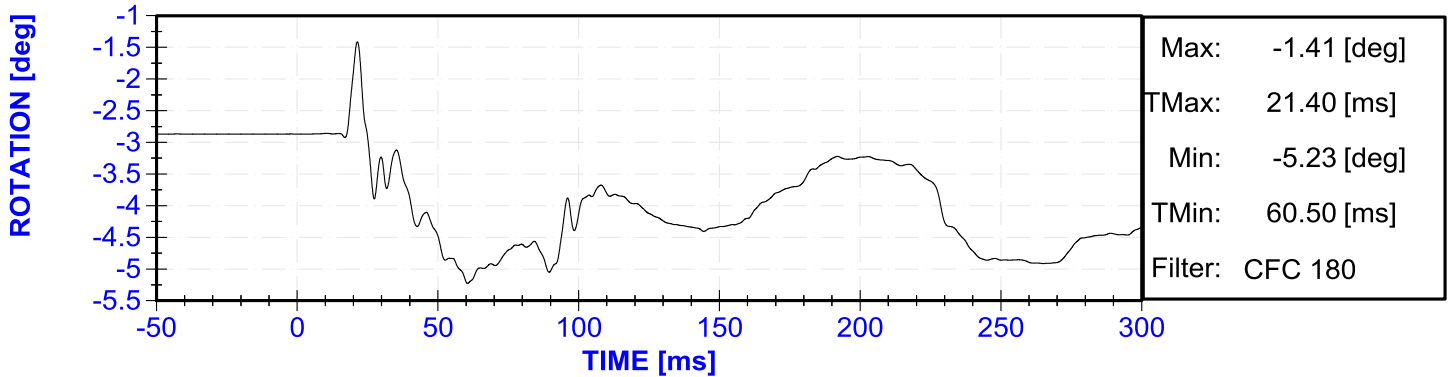
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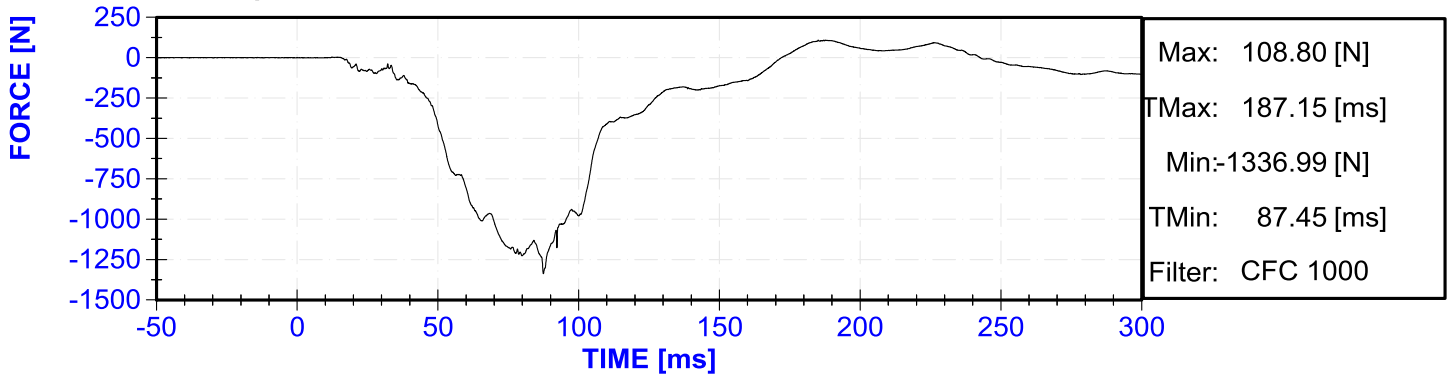
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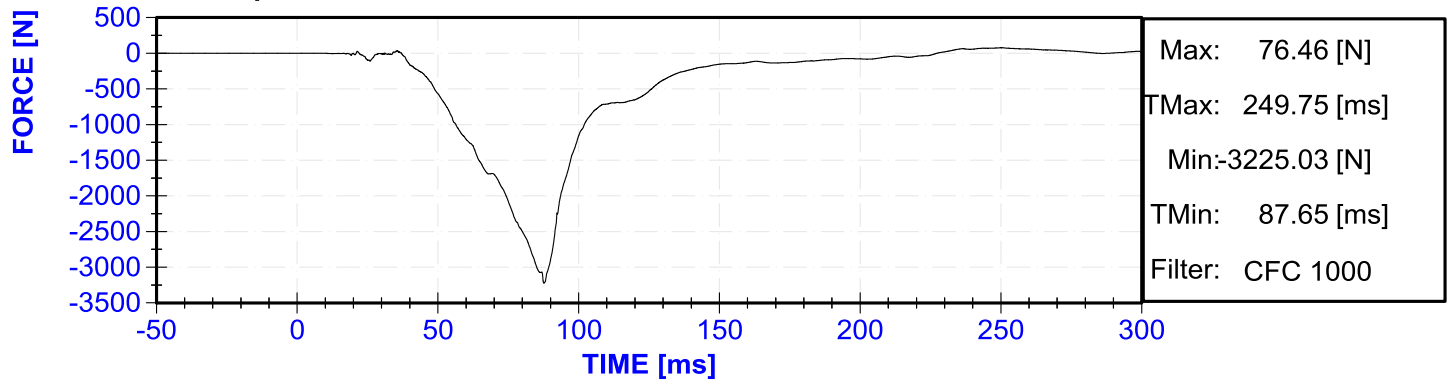
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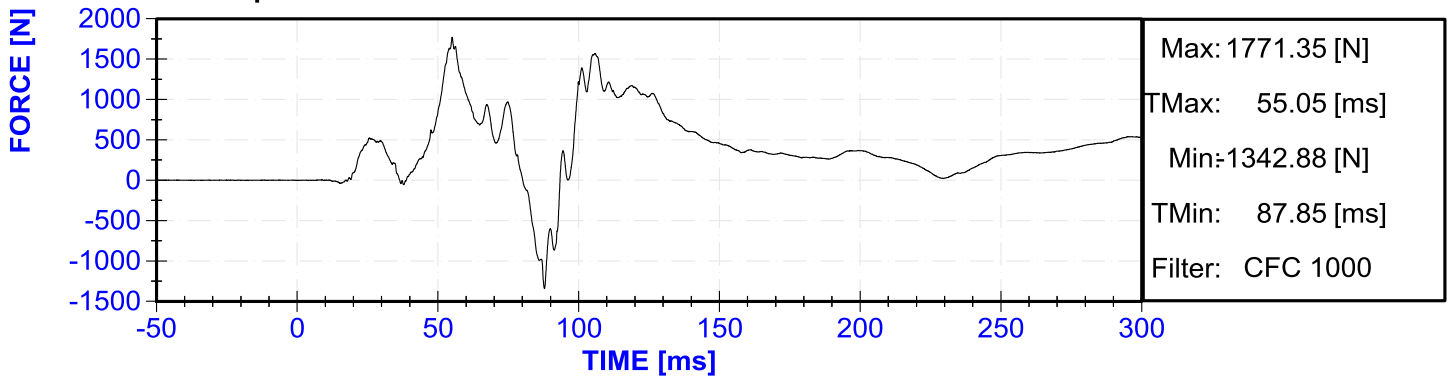
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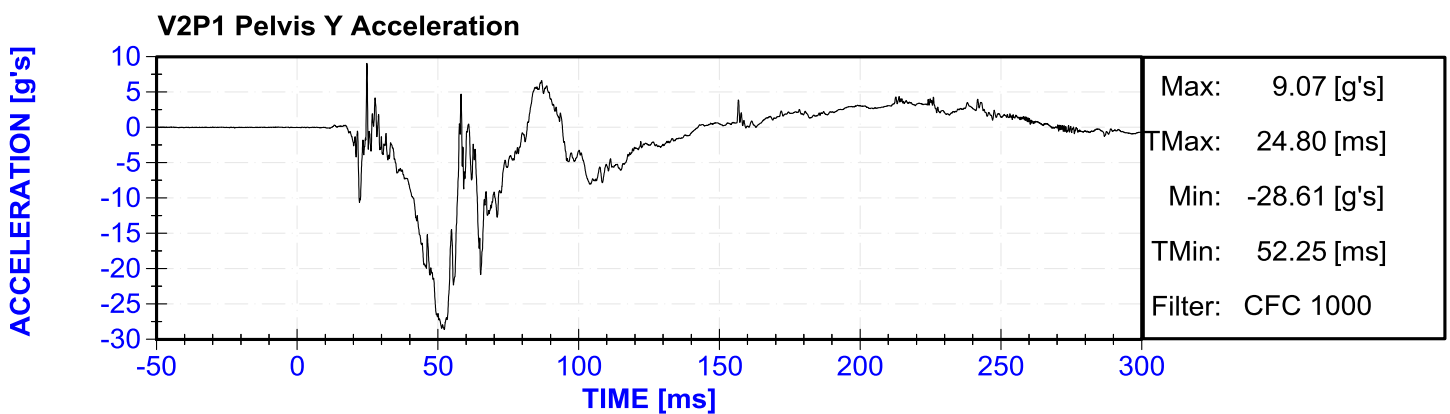
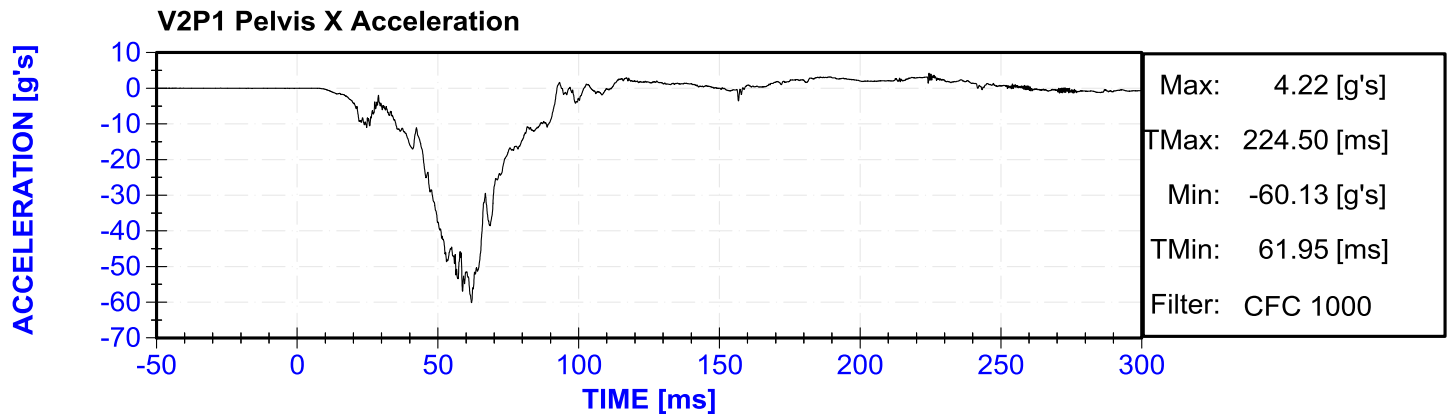
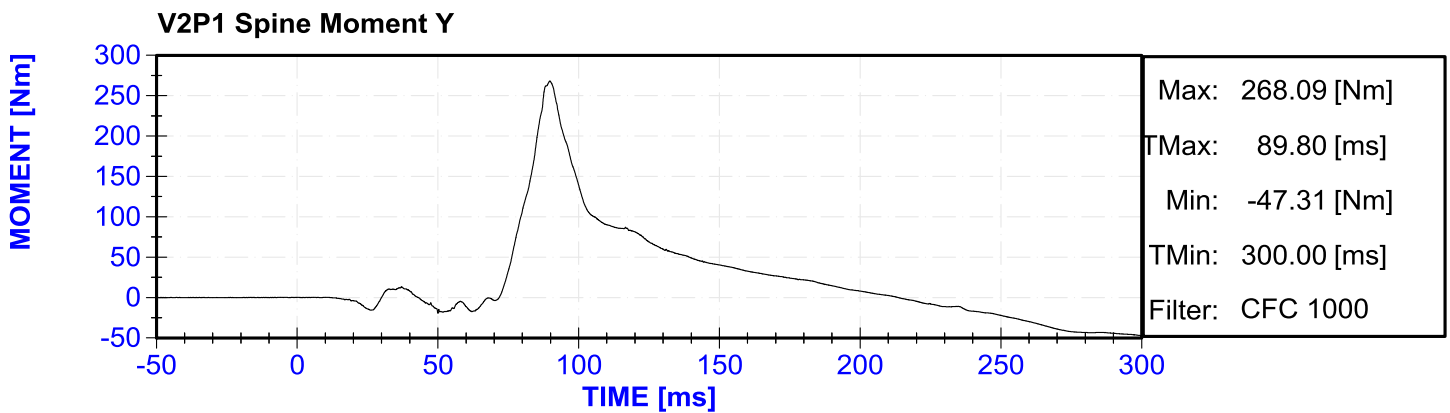
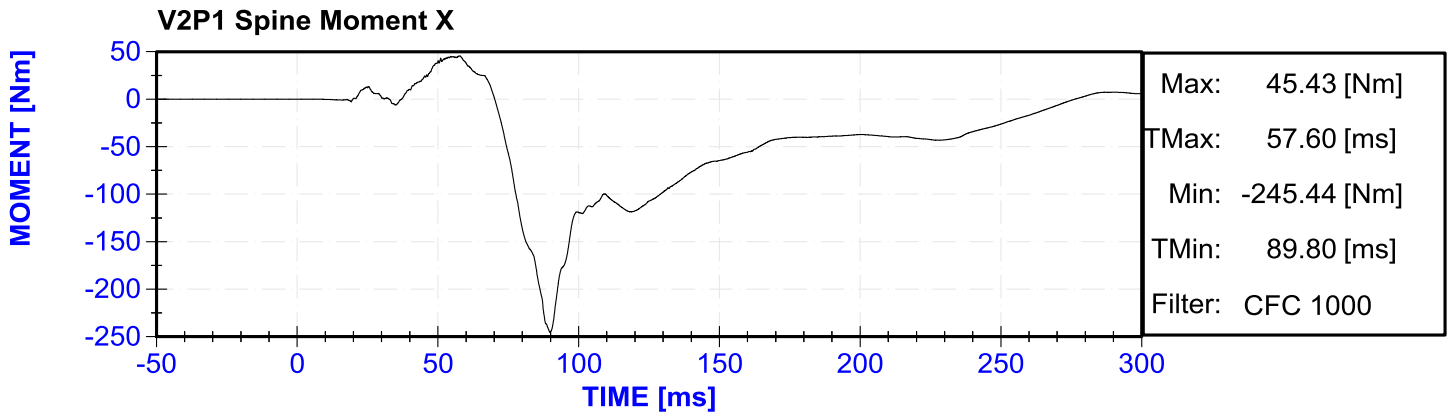


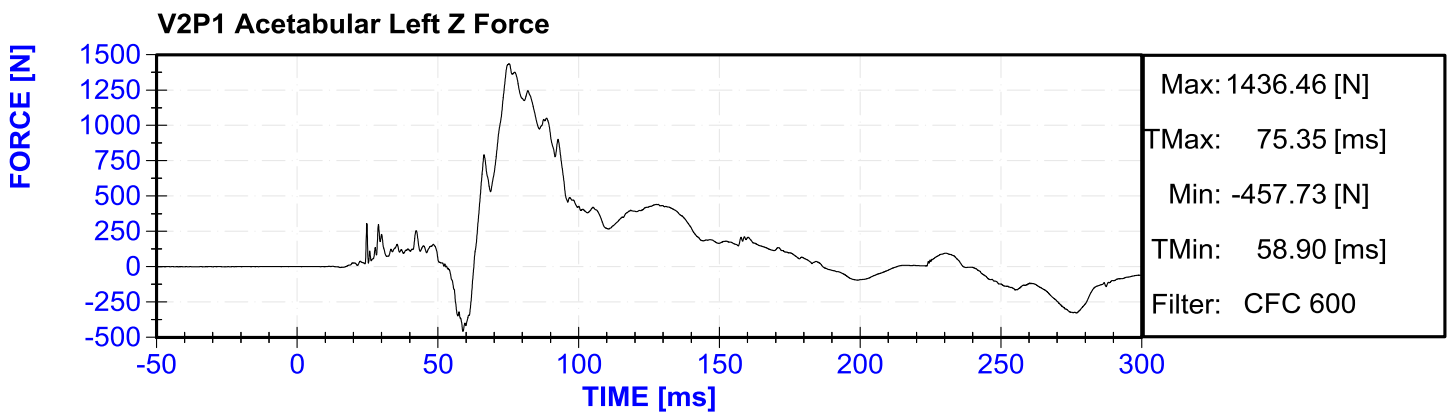
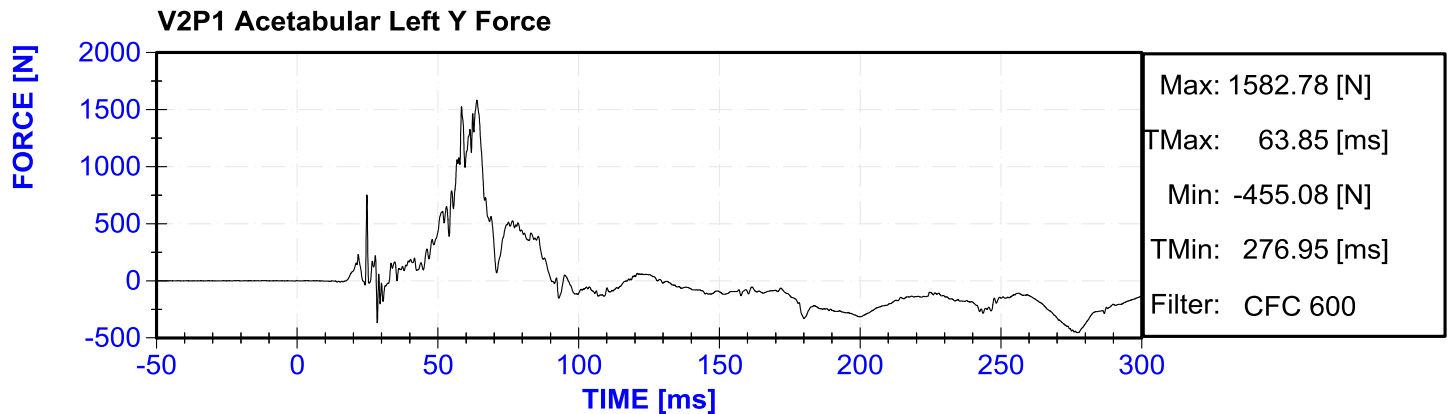
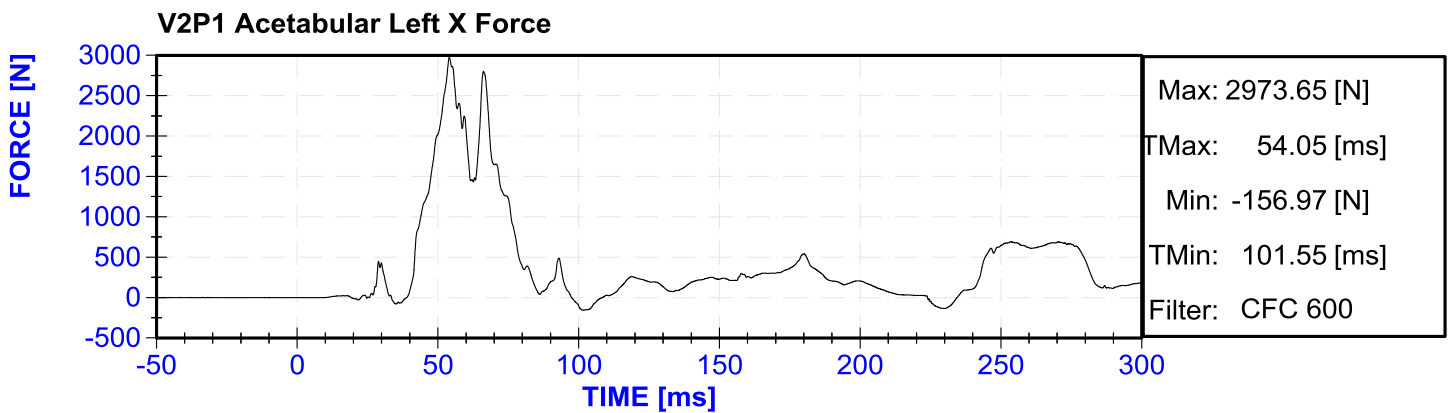
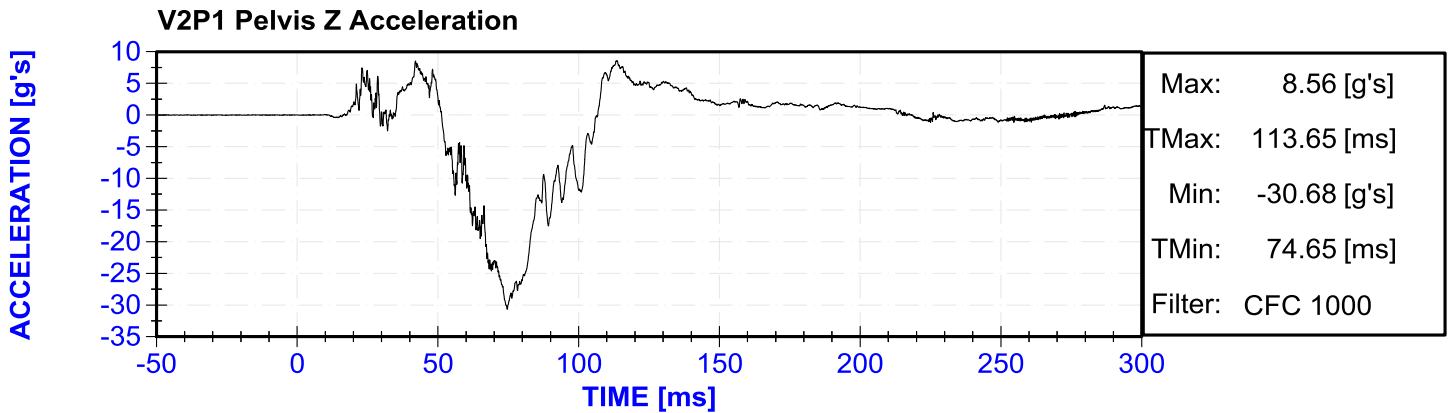
V2P1 Spine Force Y

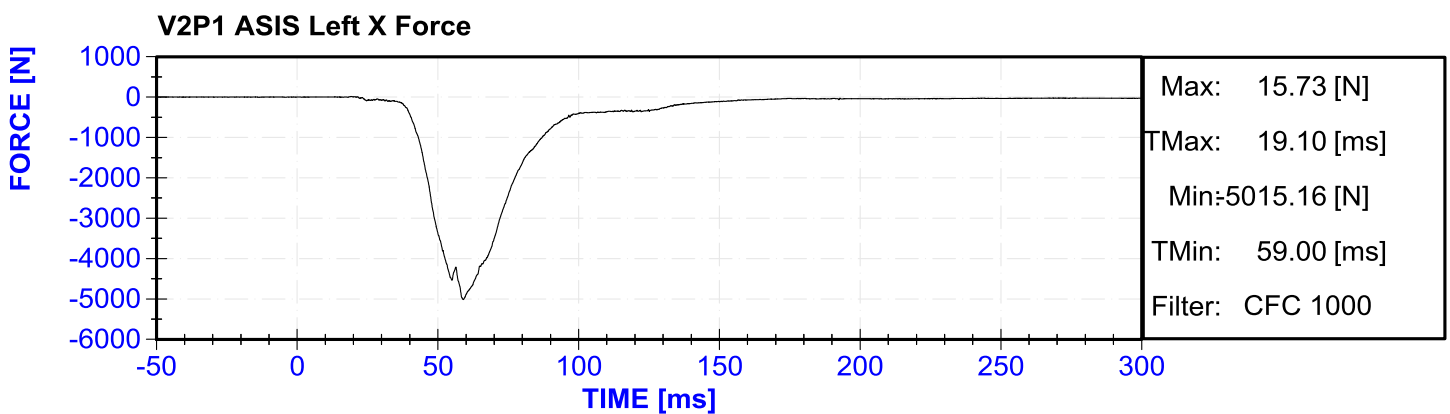
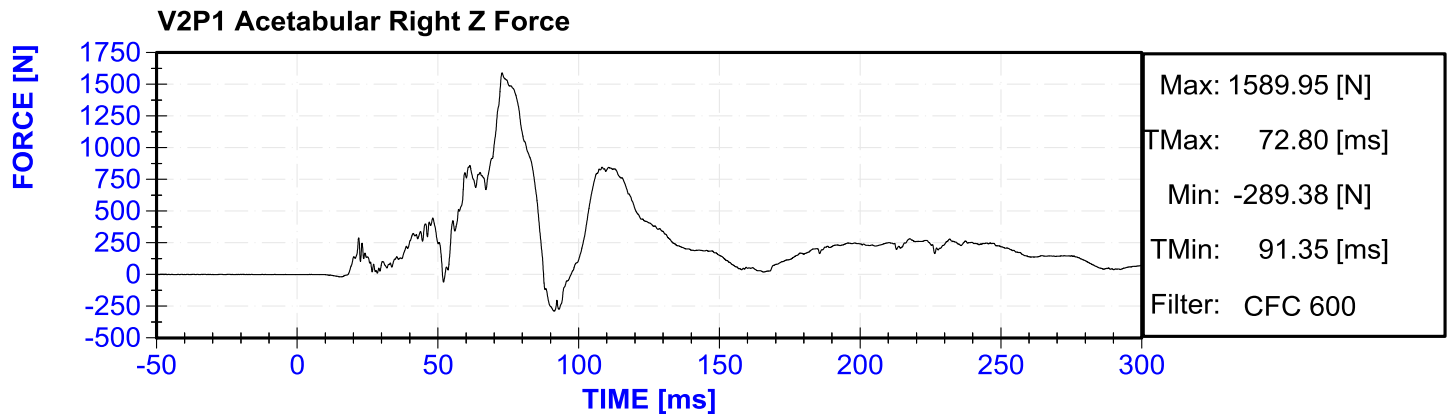
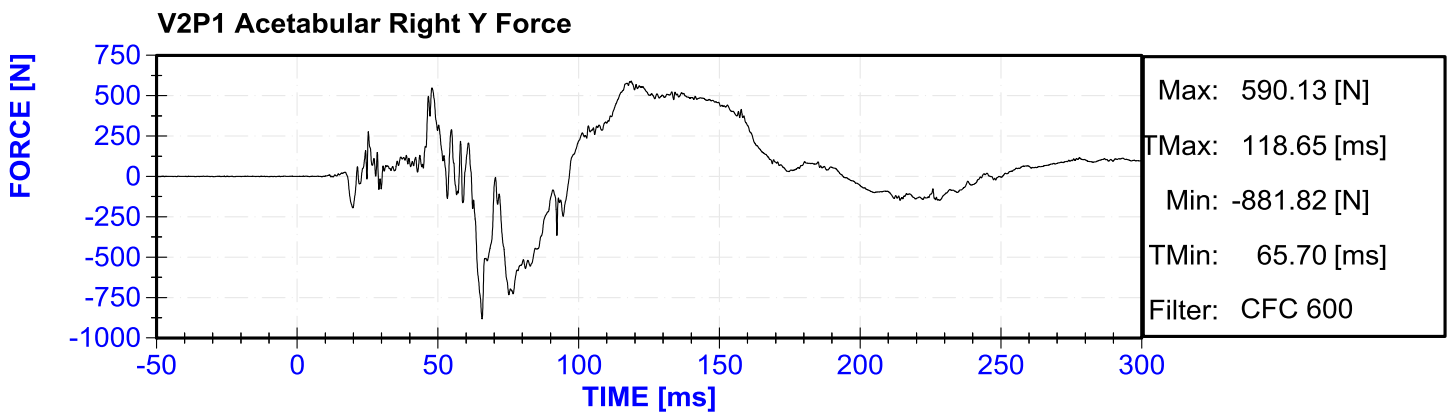
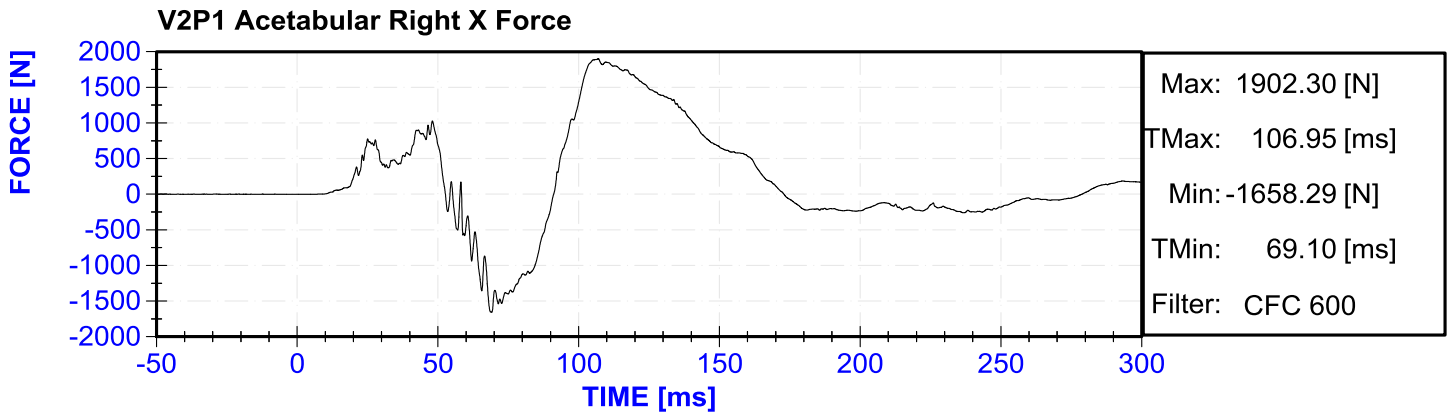


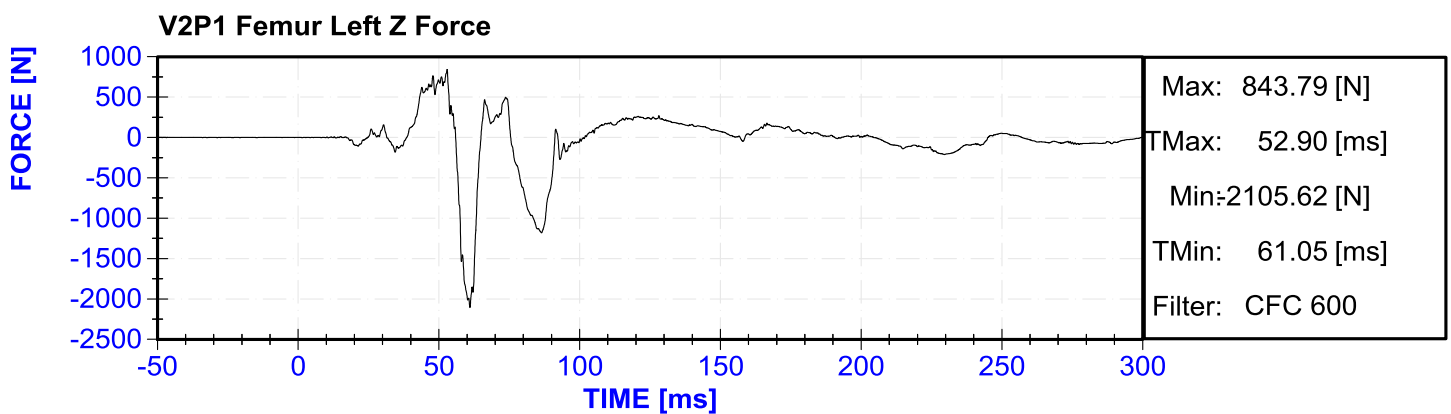
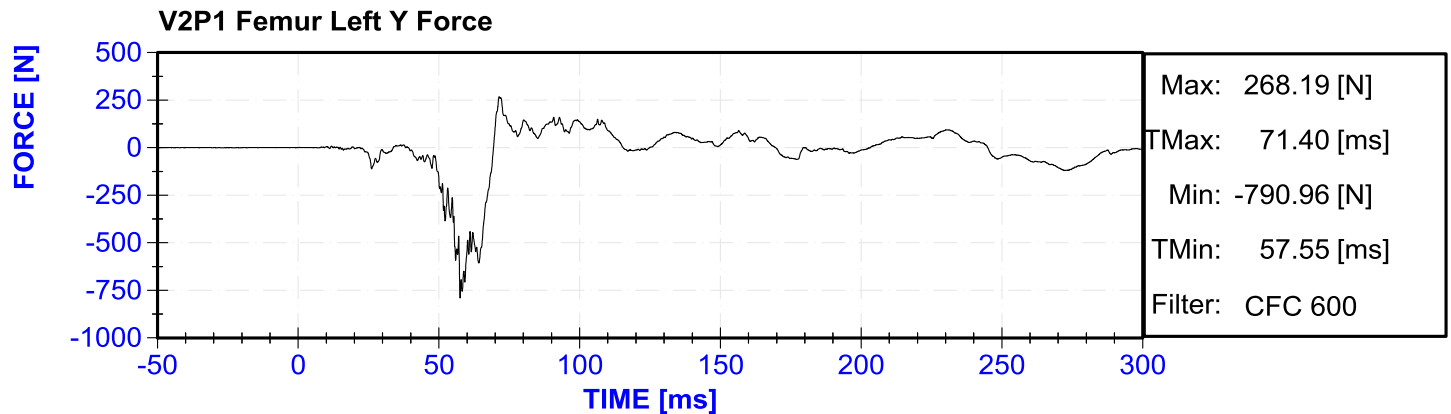
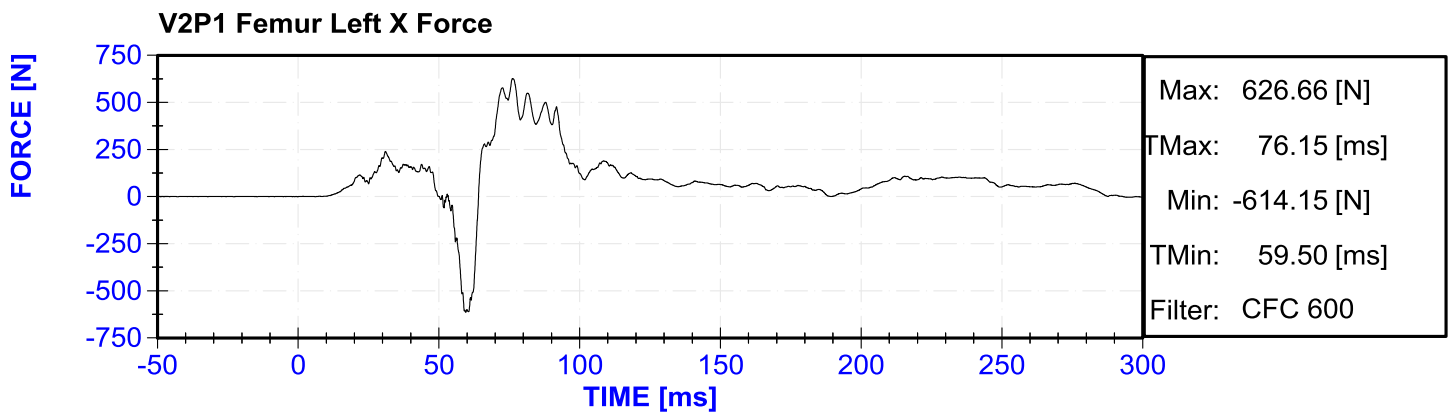
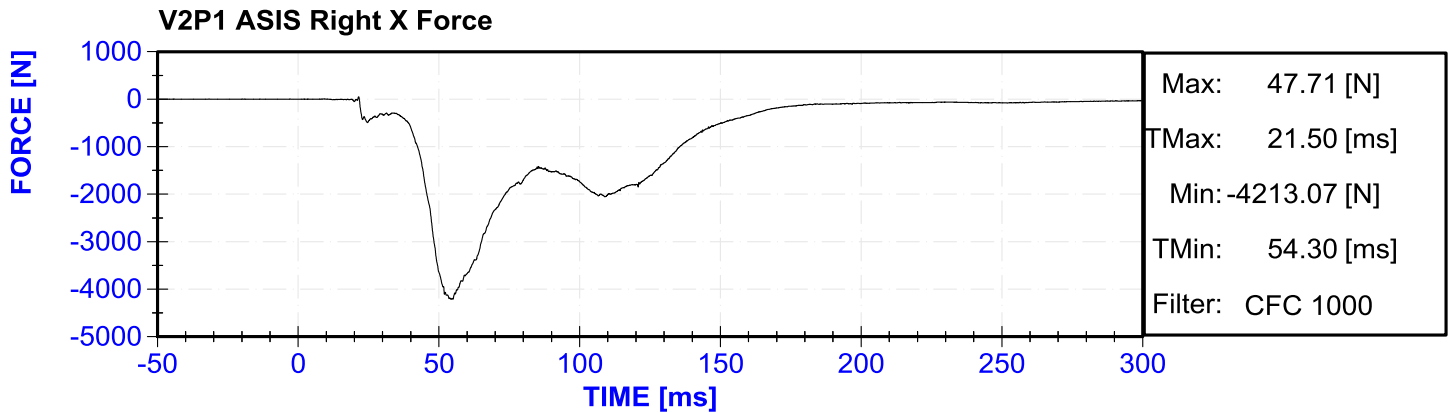
V2P1 Spine Force Z

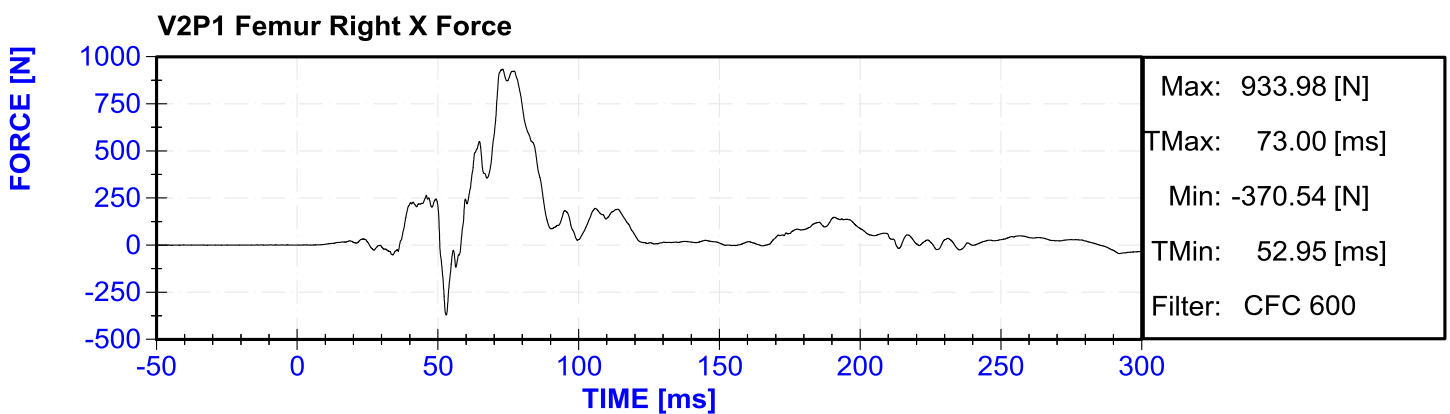
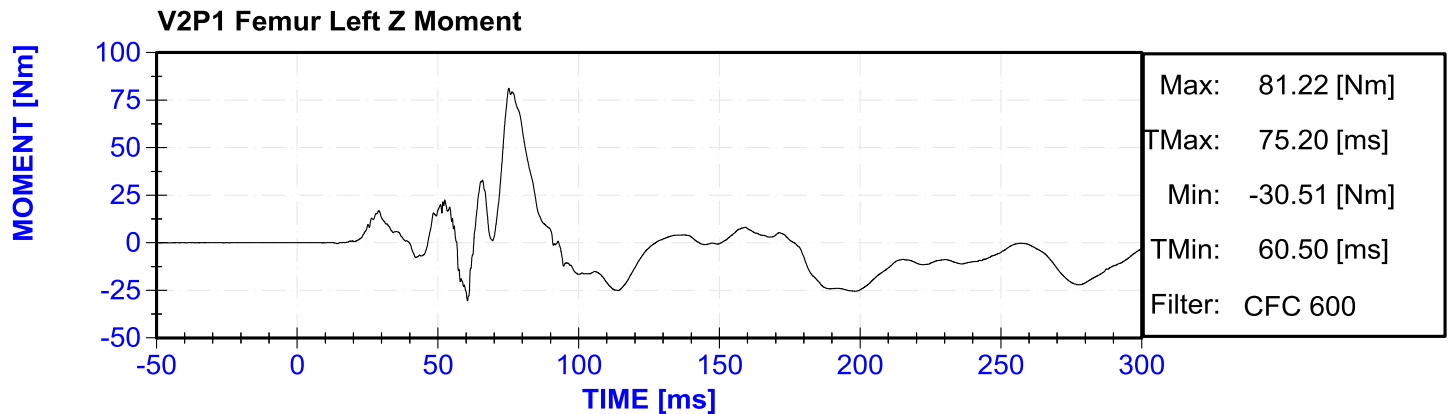
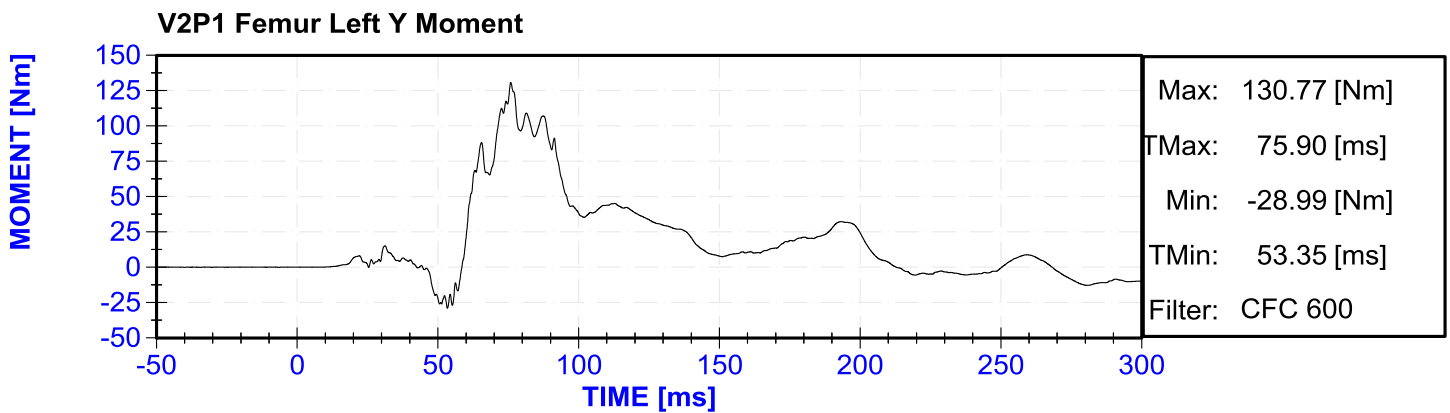
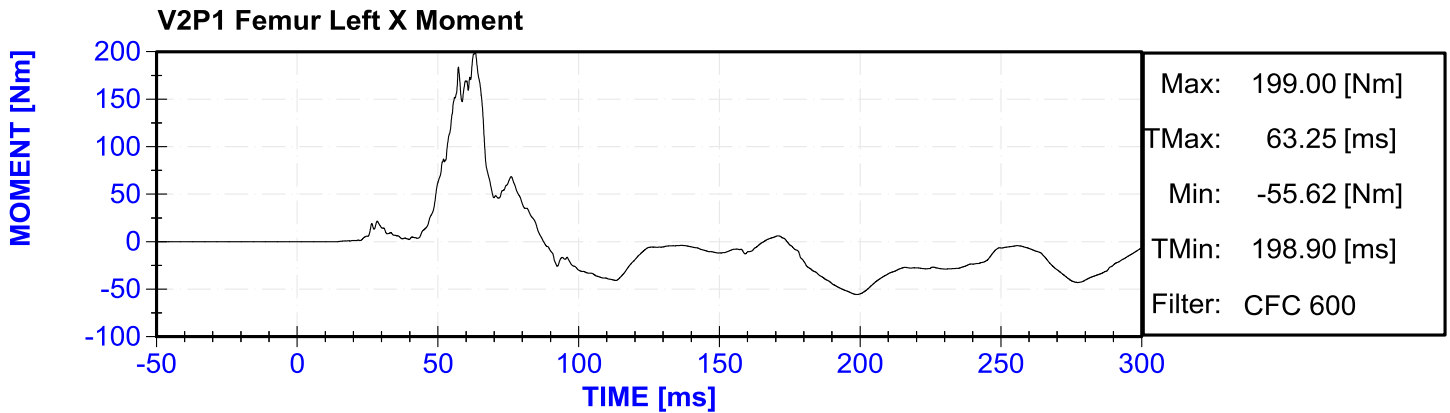


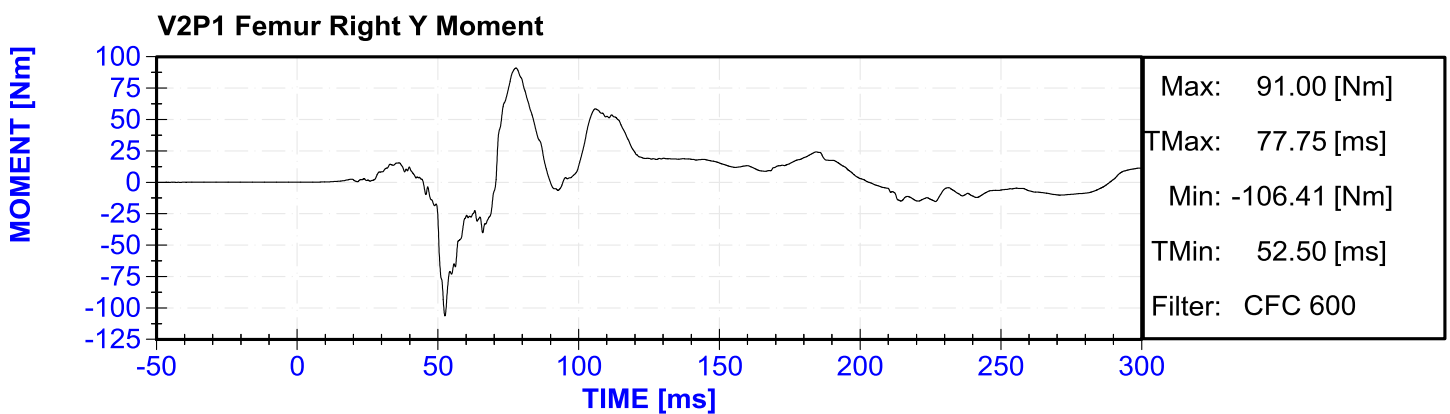
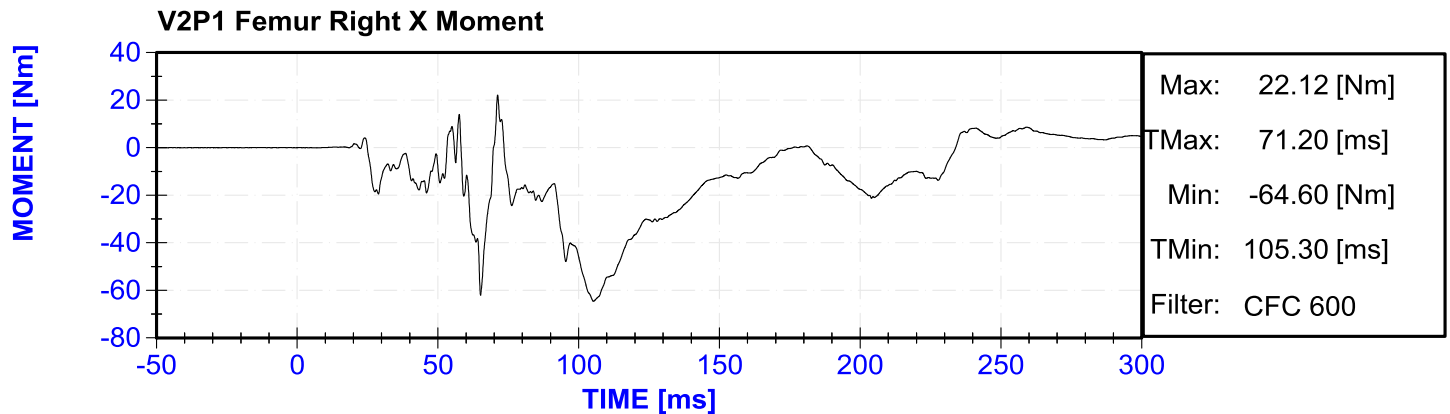
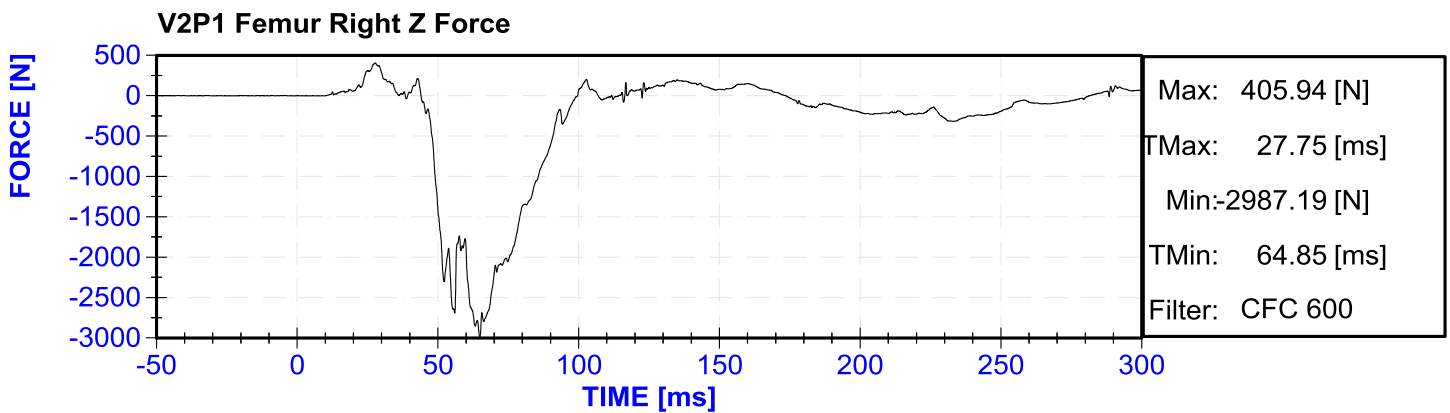
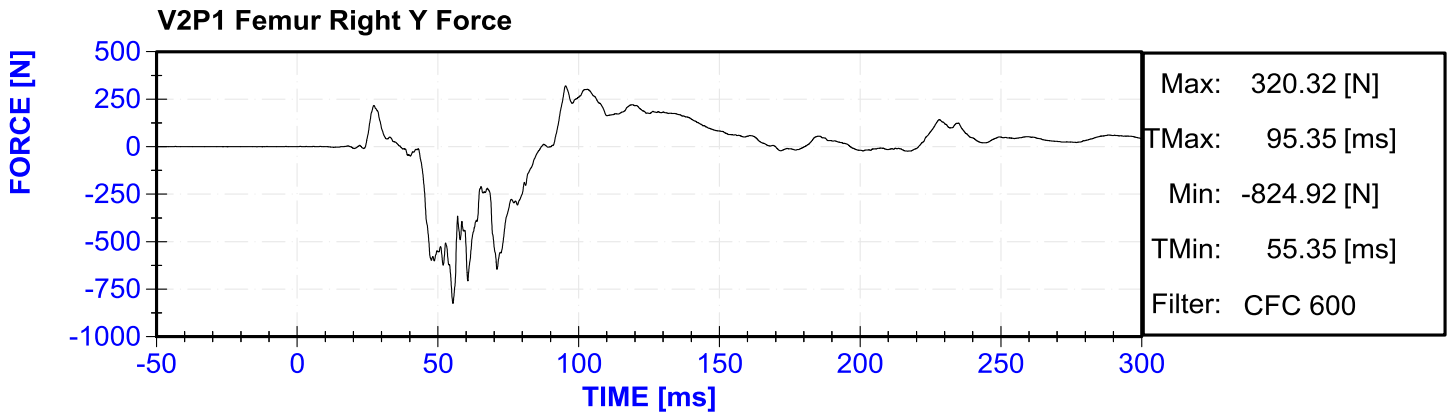


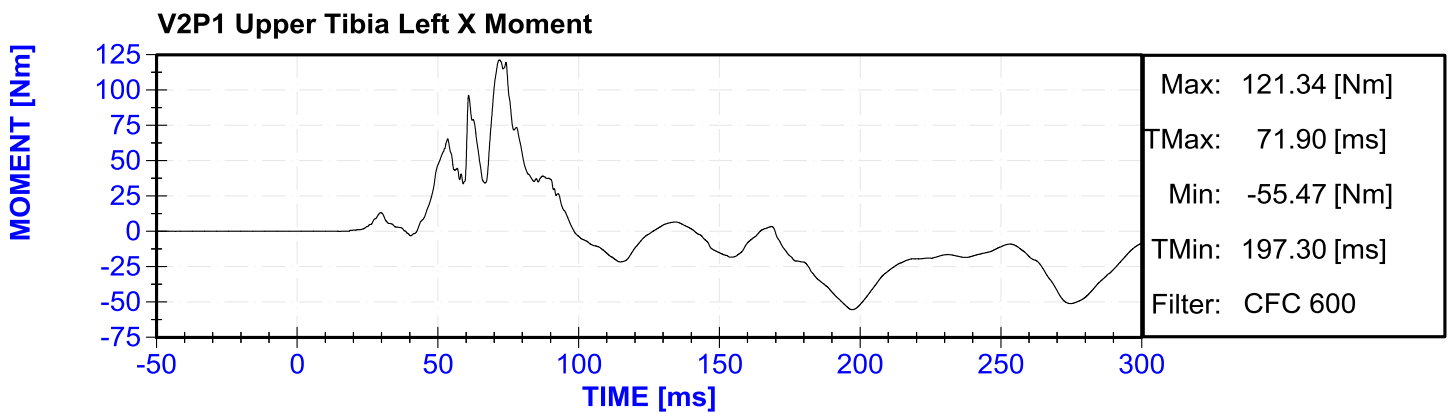
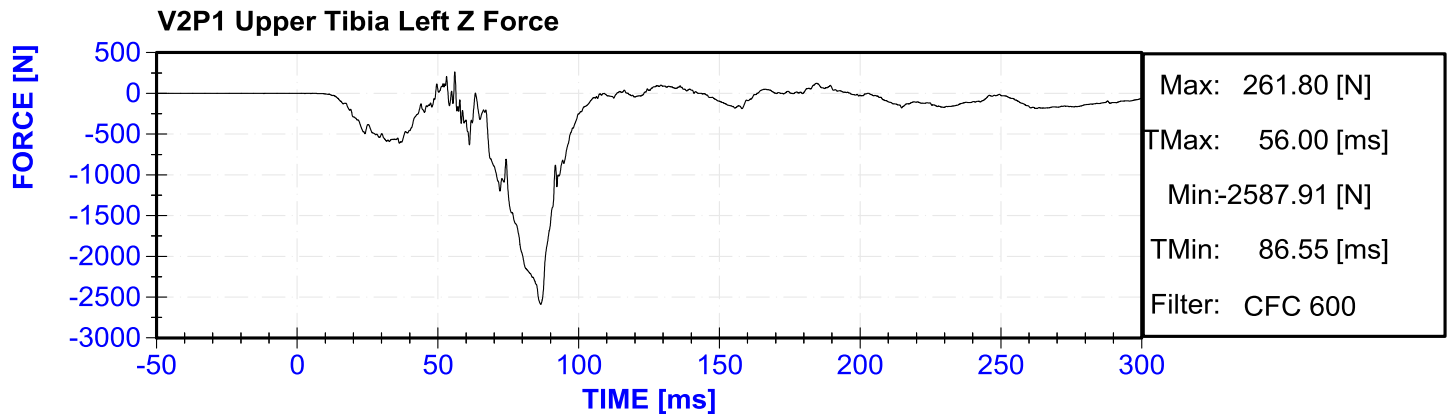
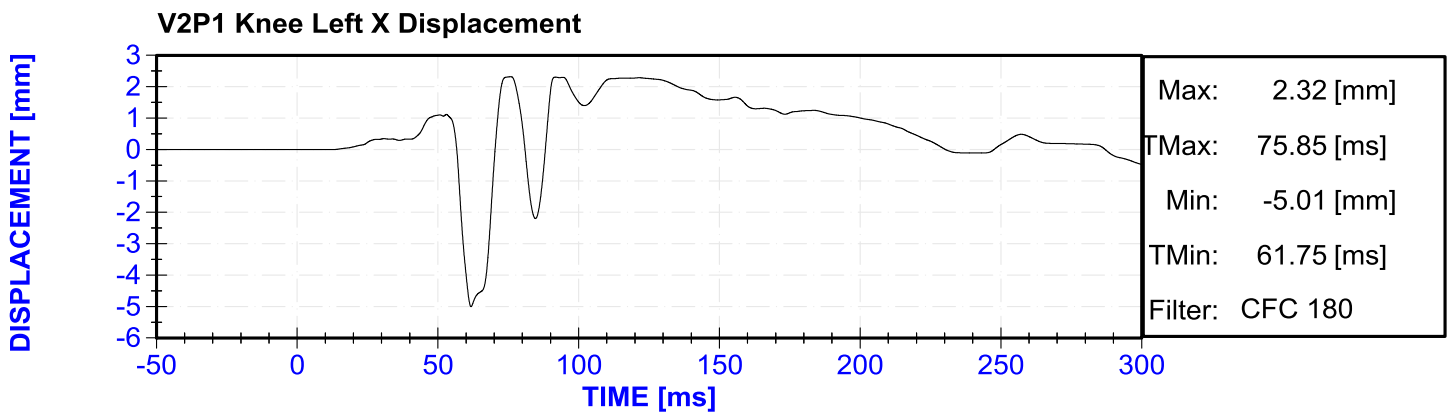
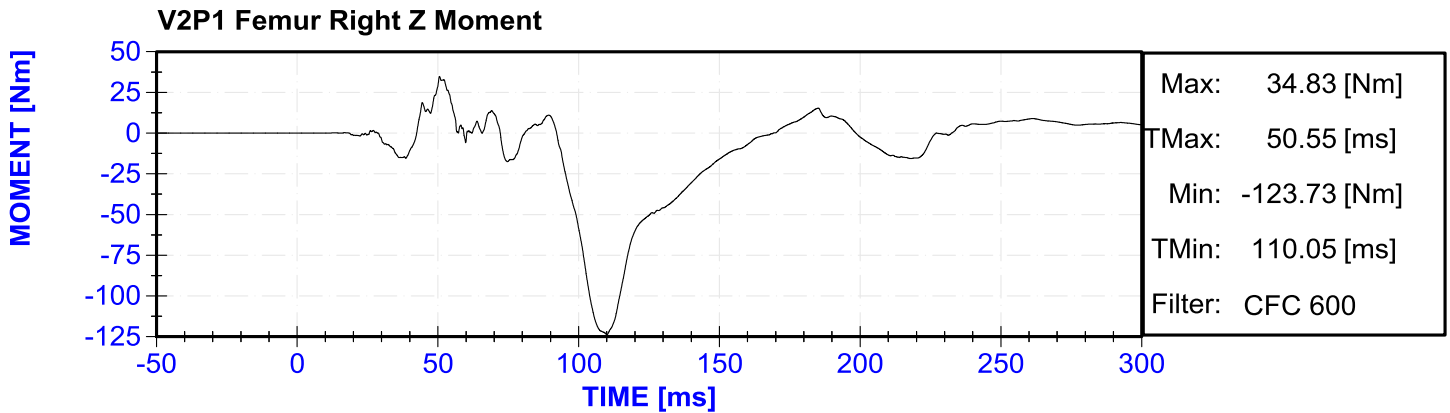




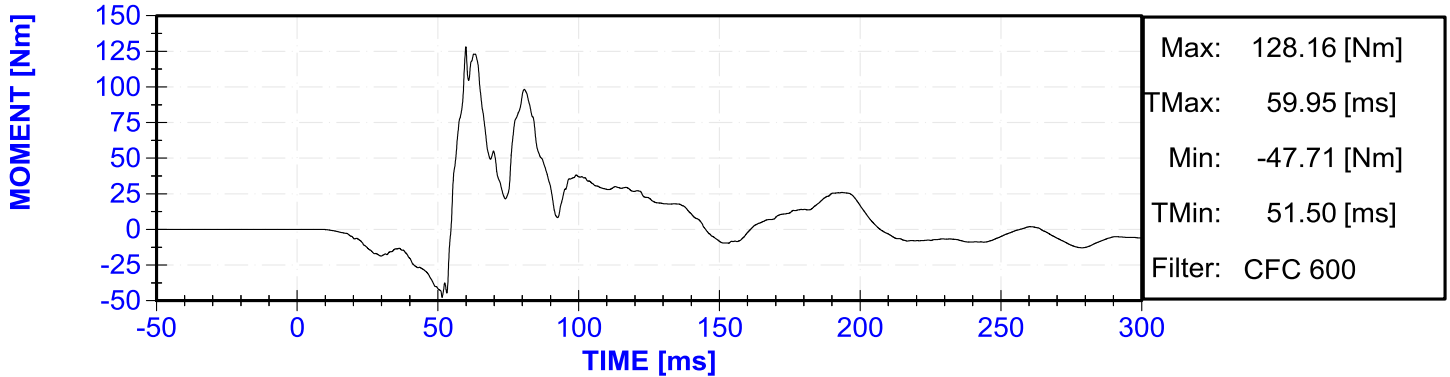




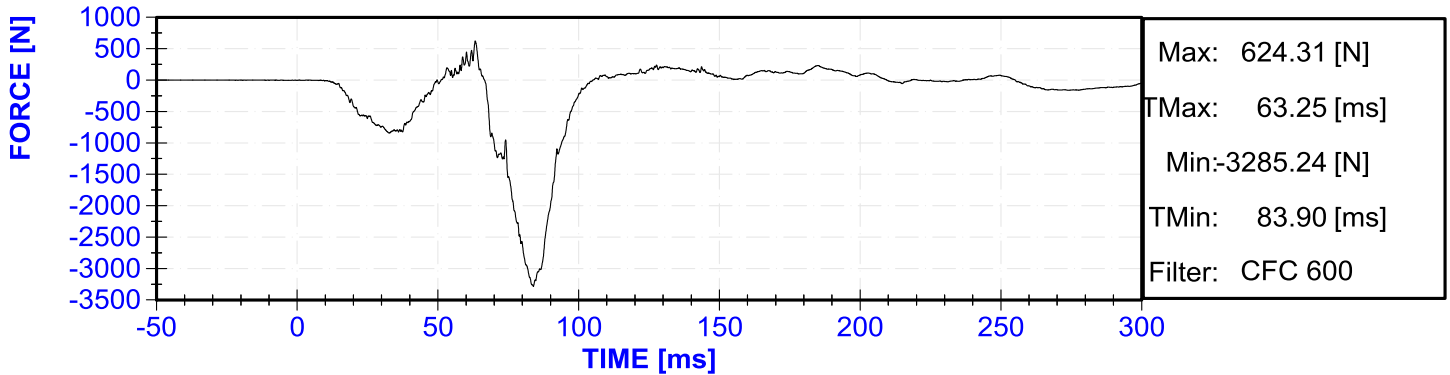




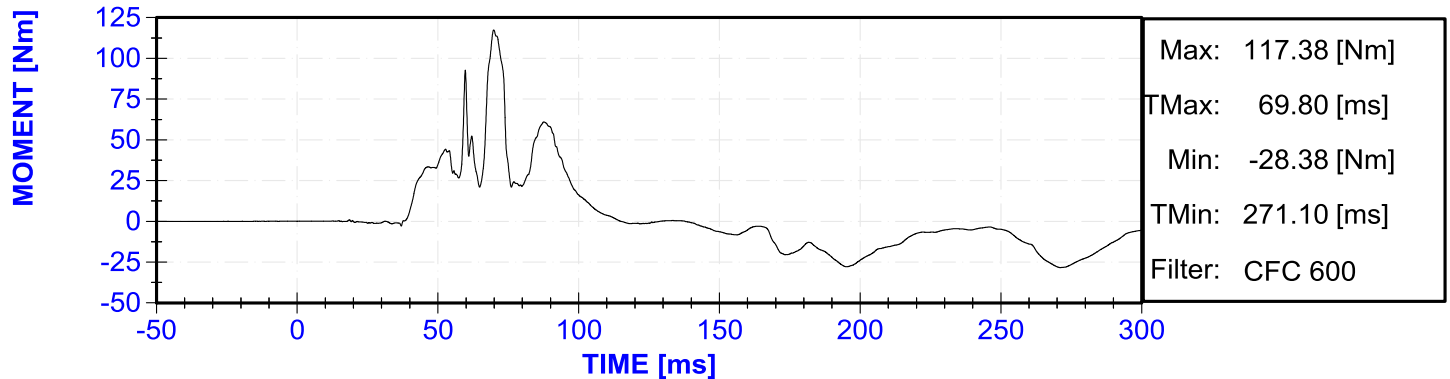
V2P1 Upper Tibia Left Y Moment



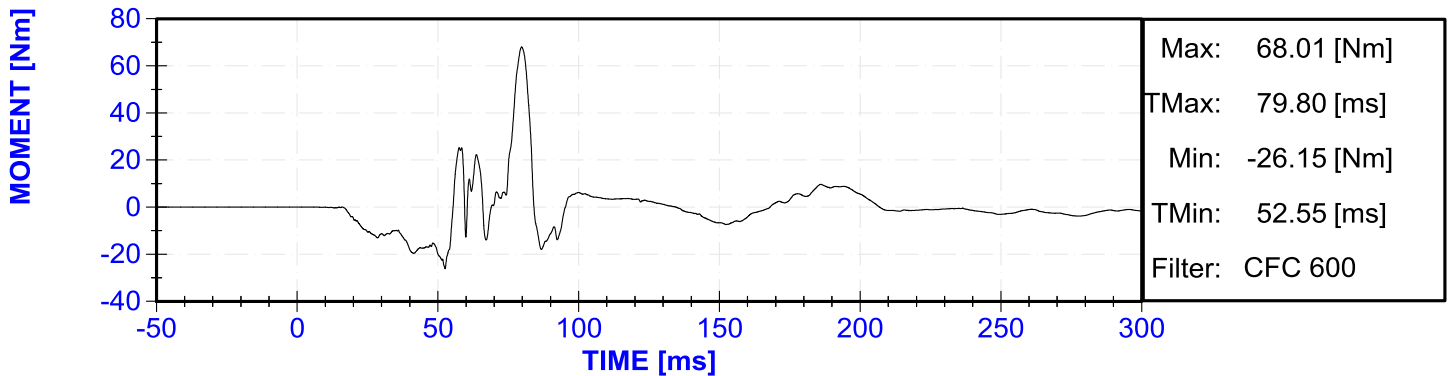
V2P1 Lower Tibia Left Z Force

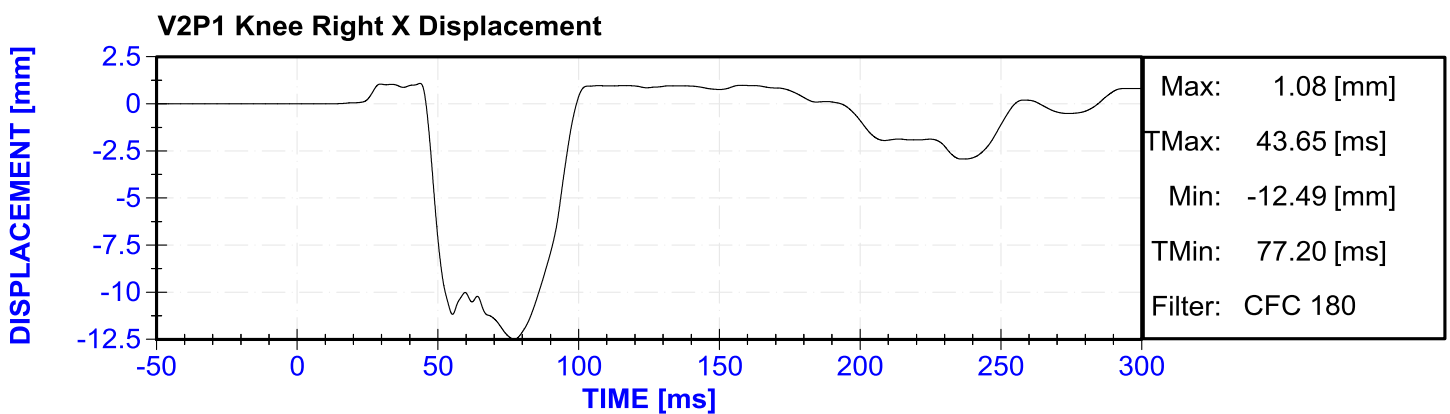
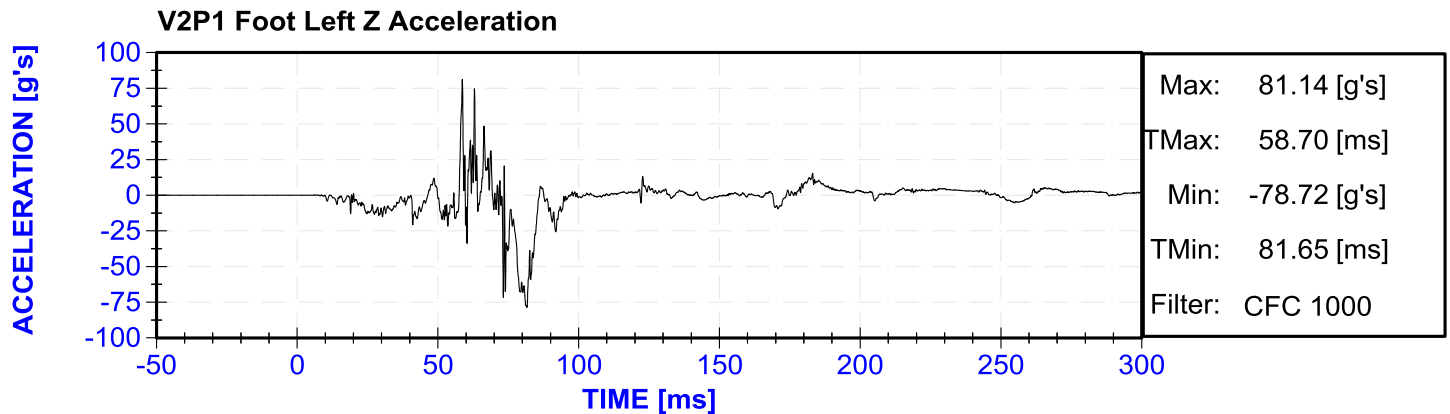
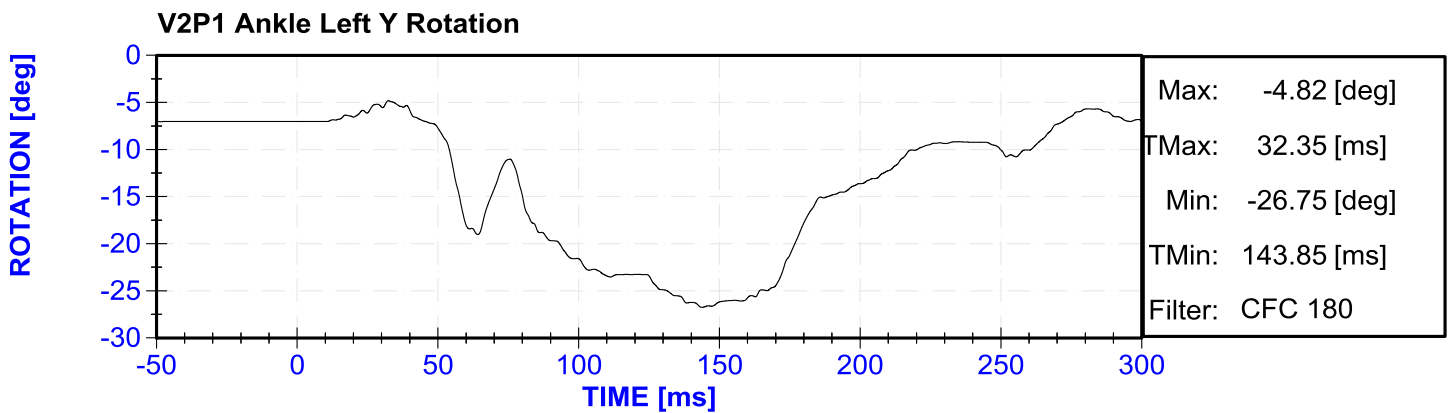
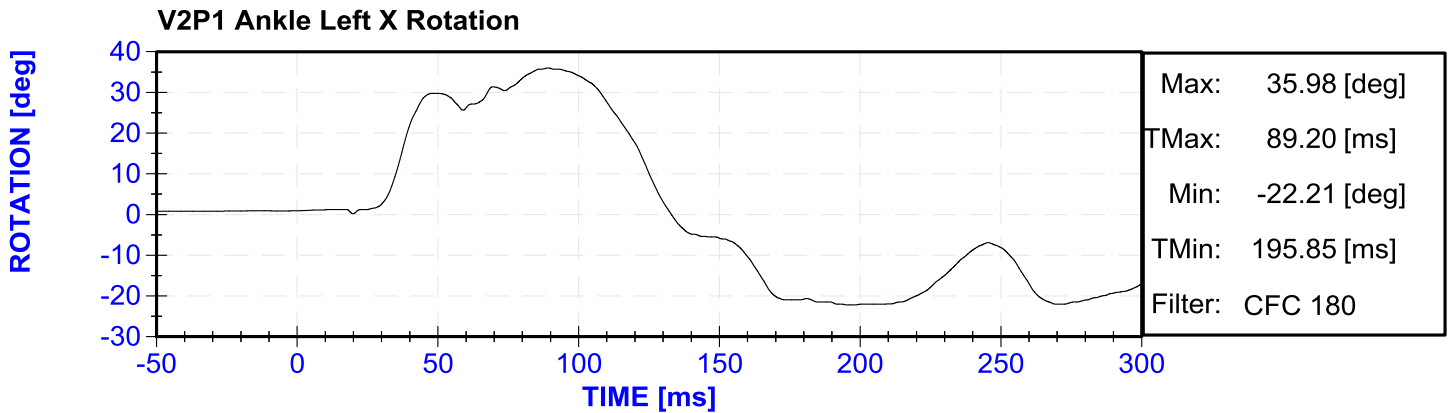


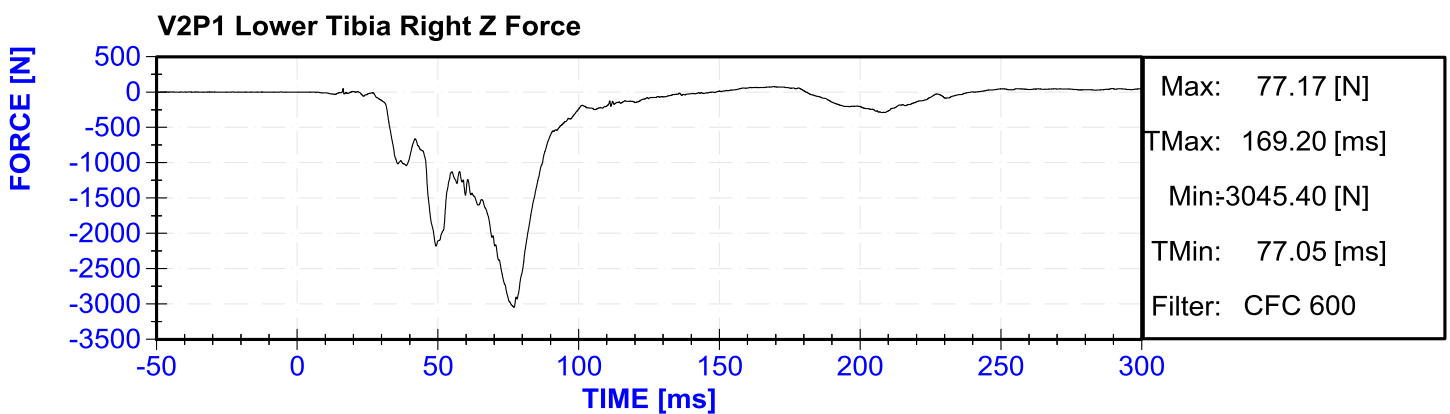
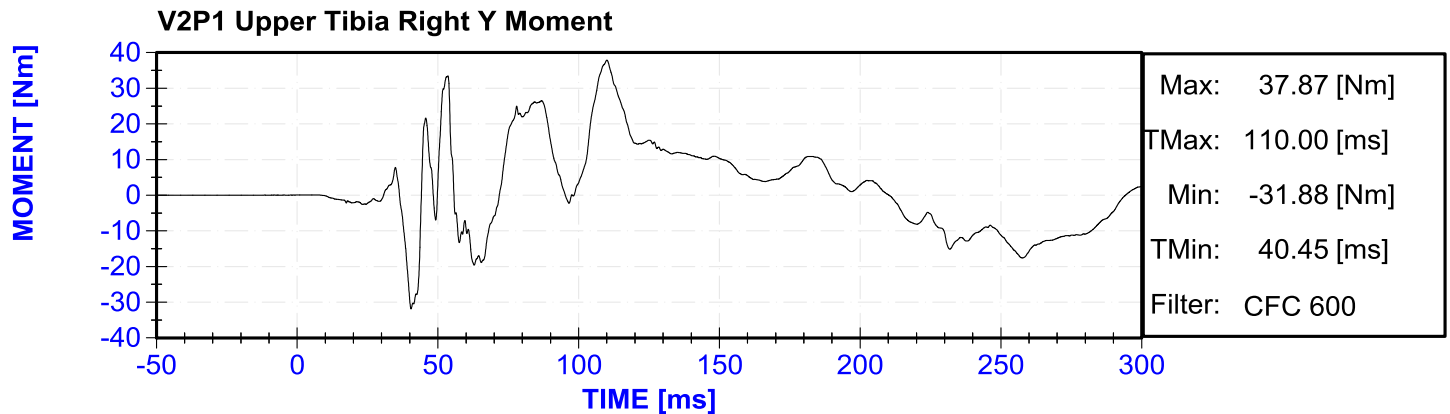
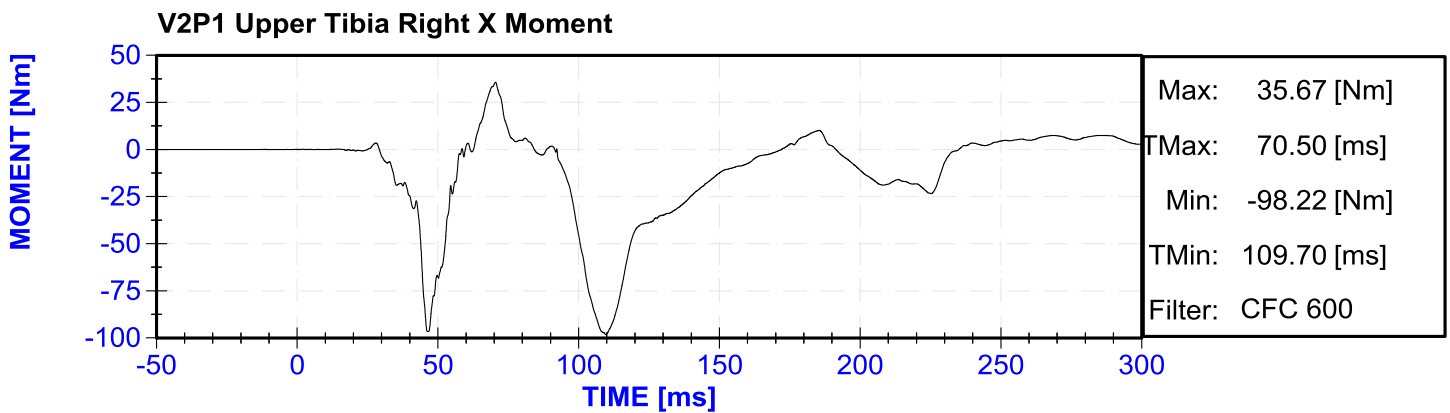
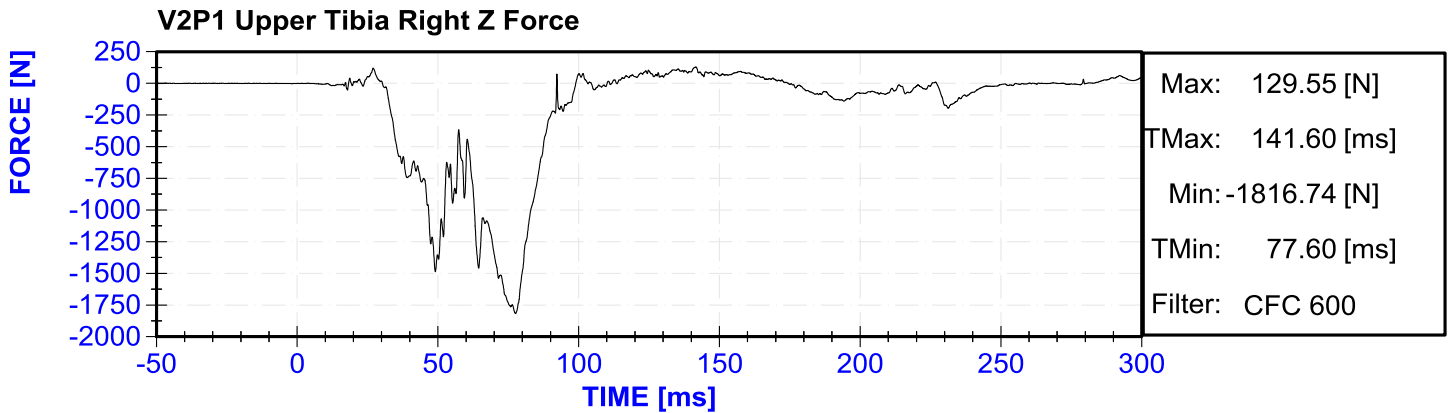
V2P1 Lower Tibia Left X Moment

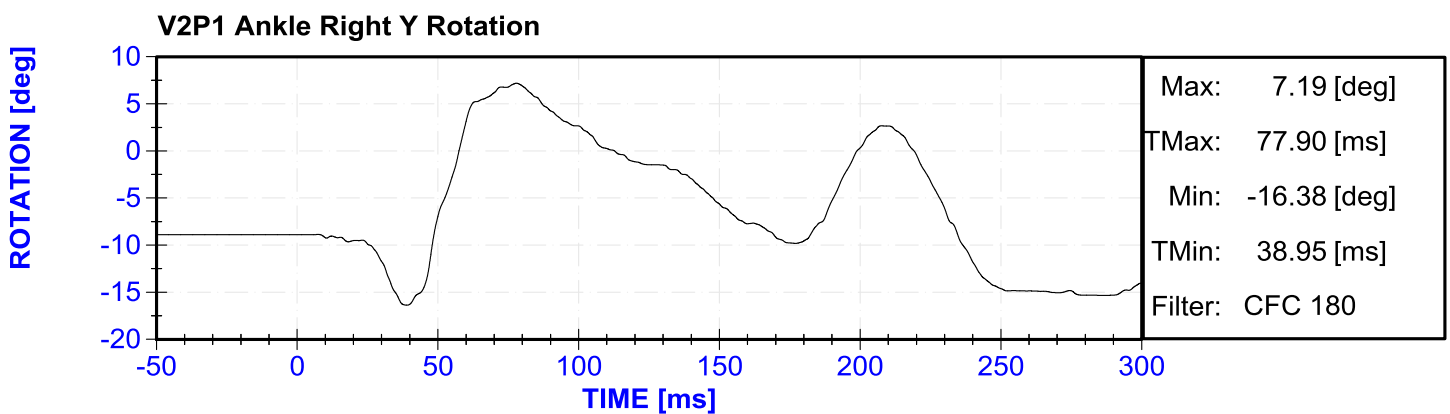
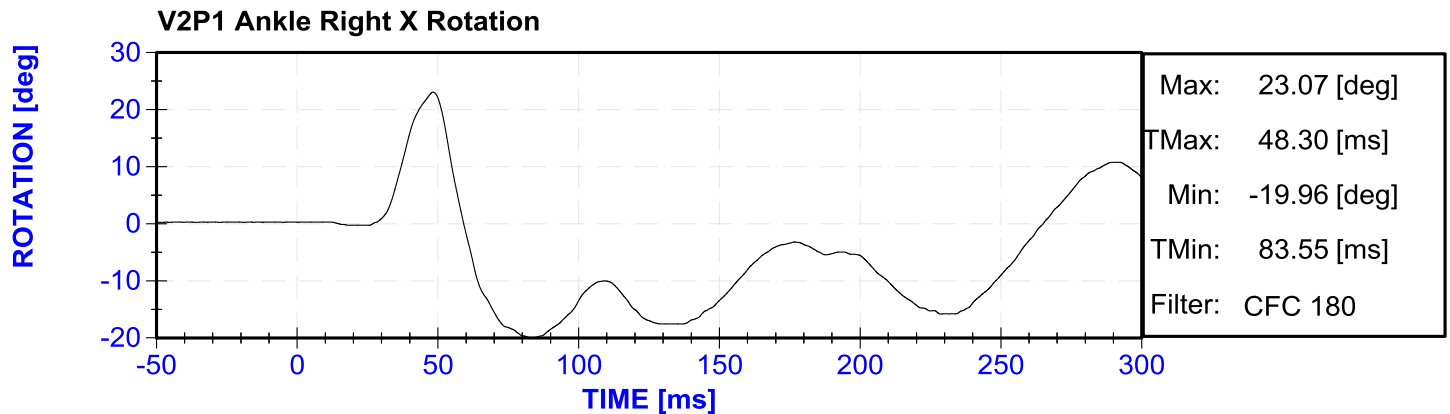
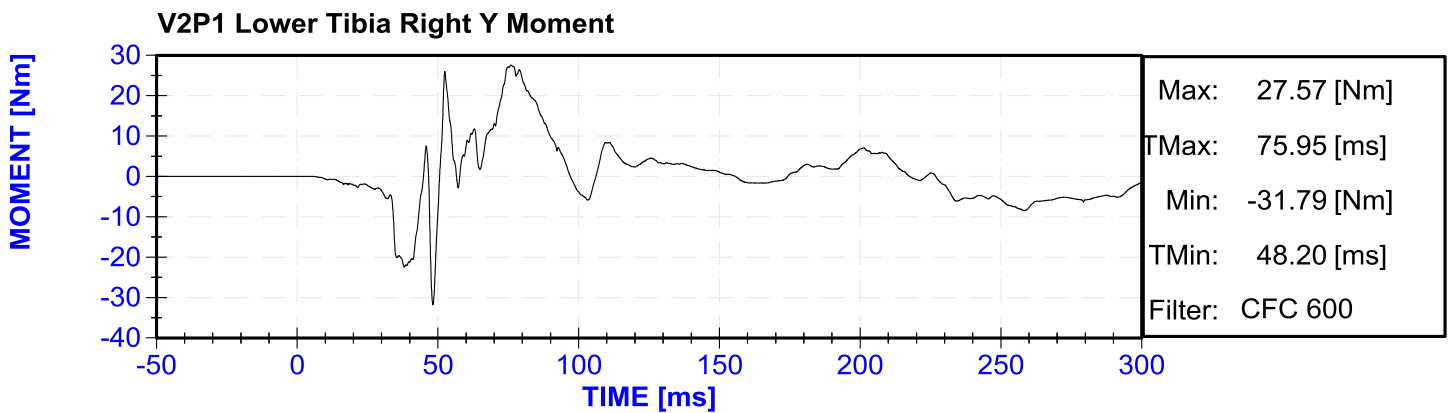
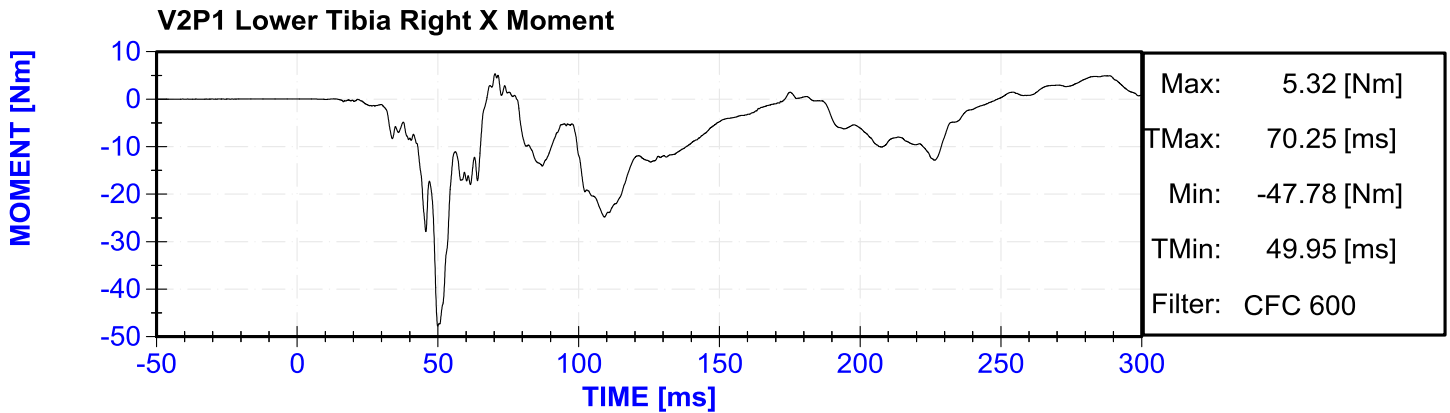


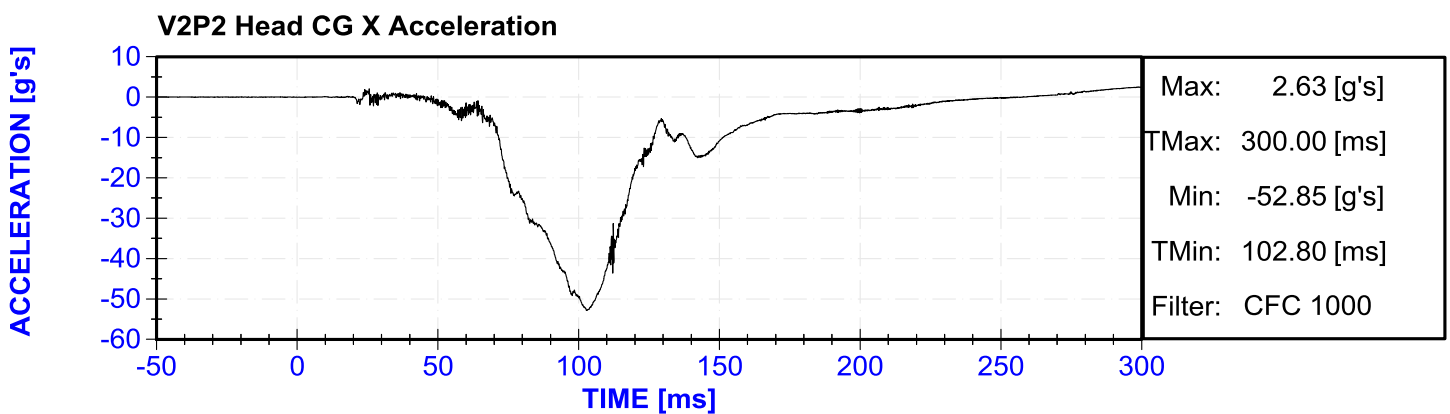
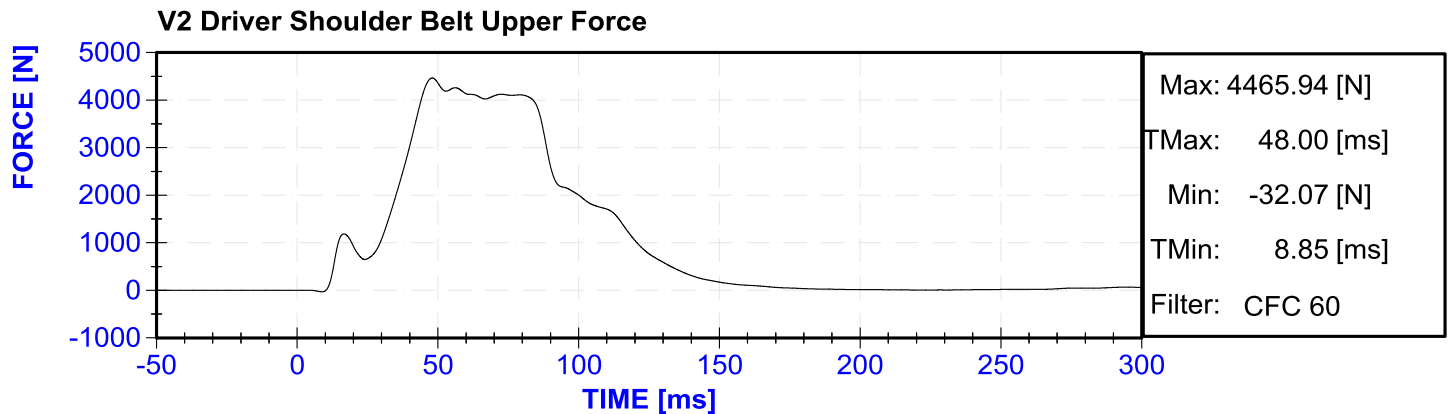
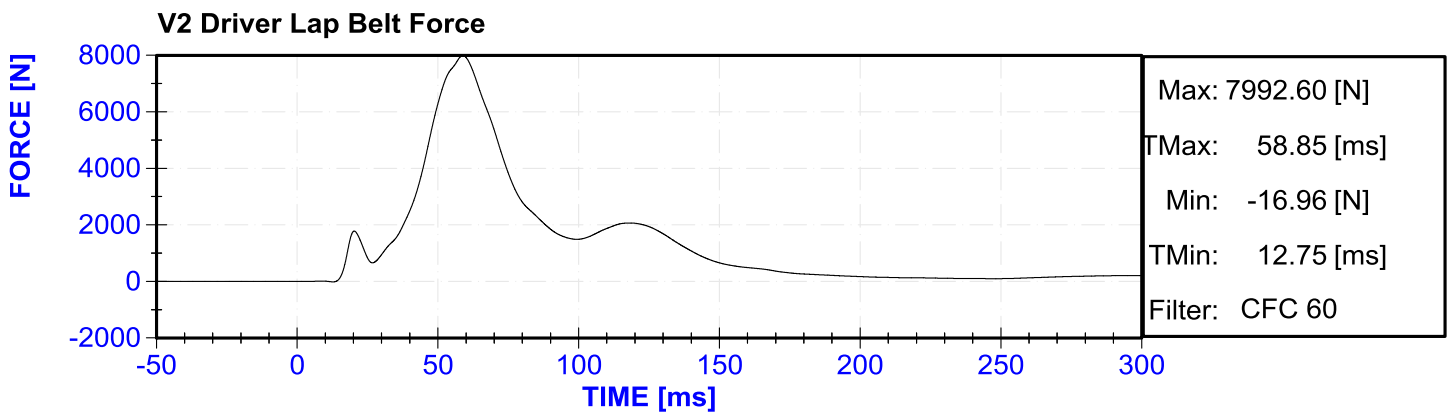
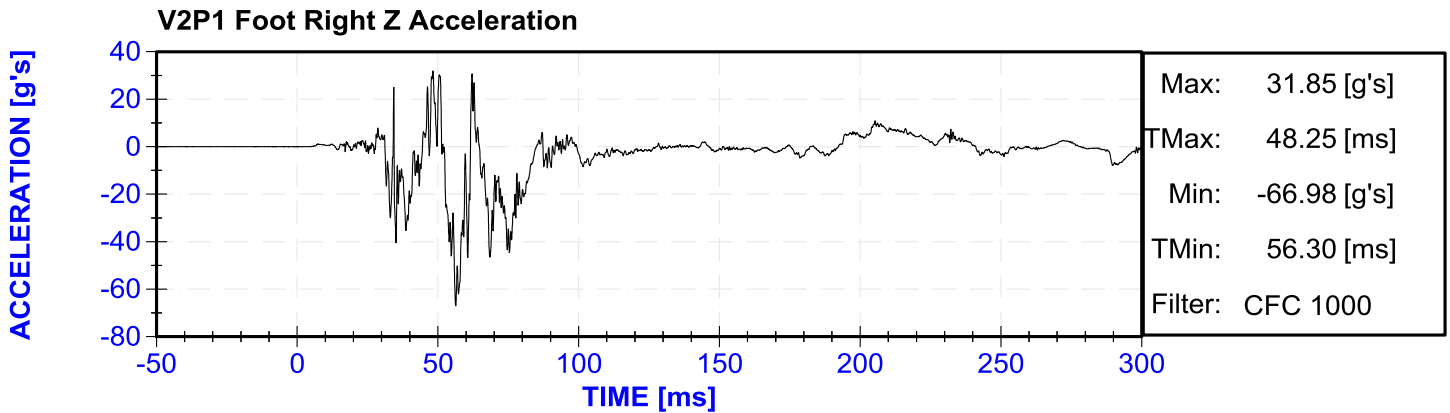
V2P1 Lower Tibia Left Y Moment

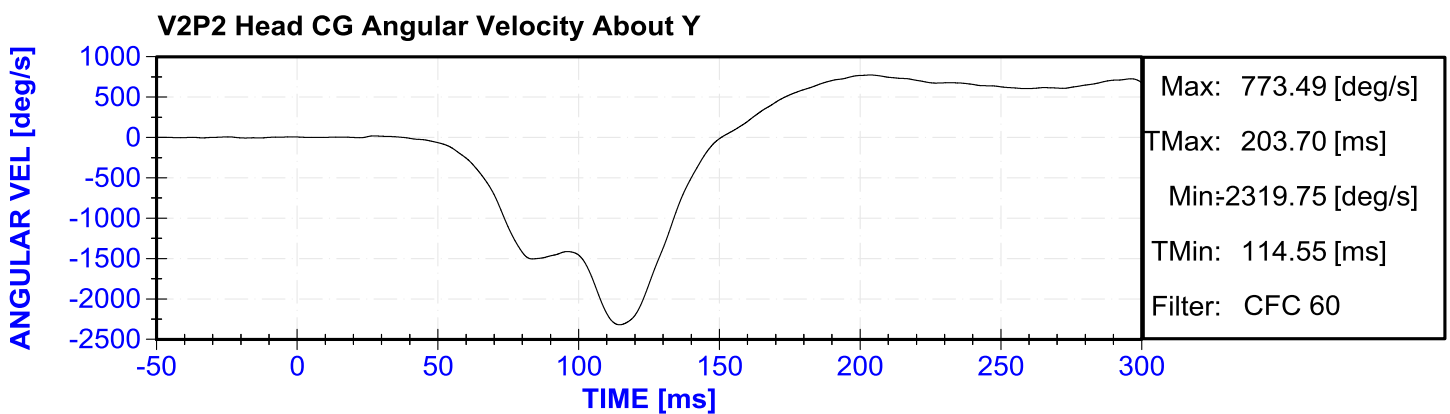
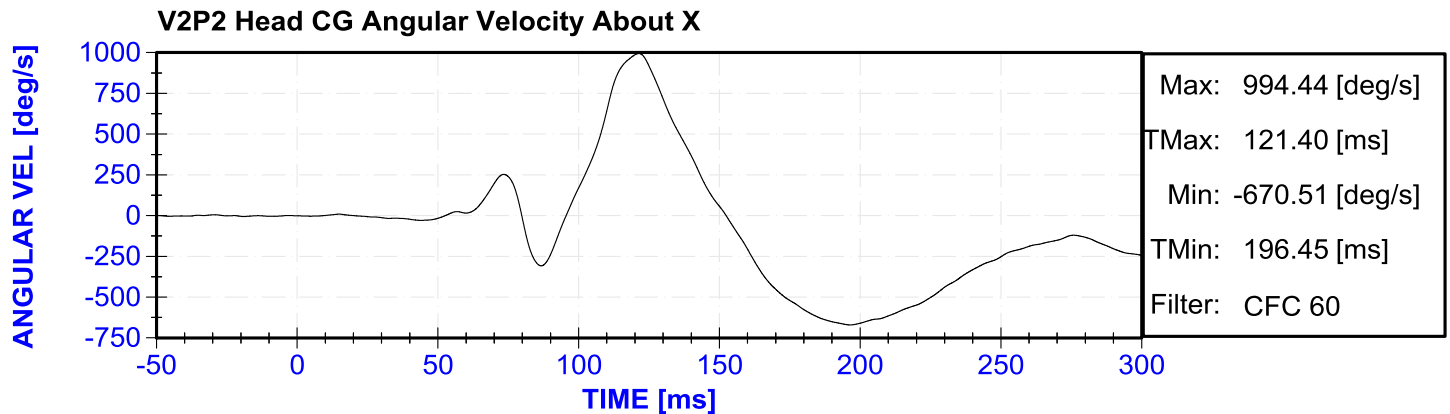
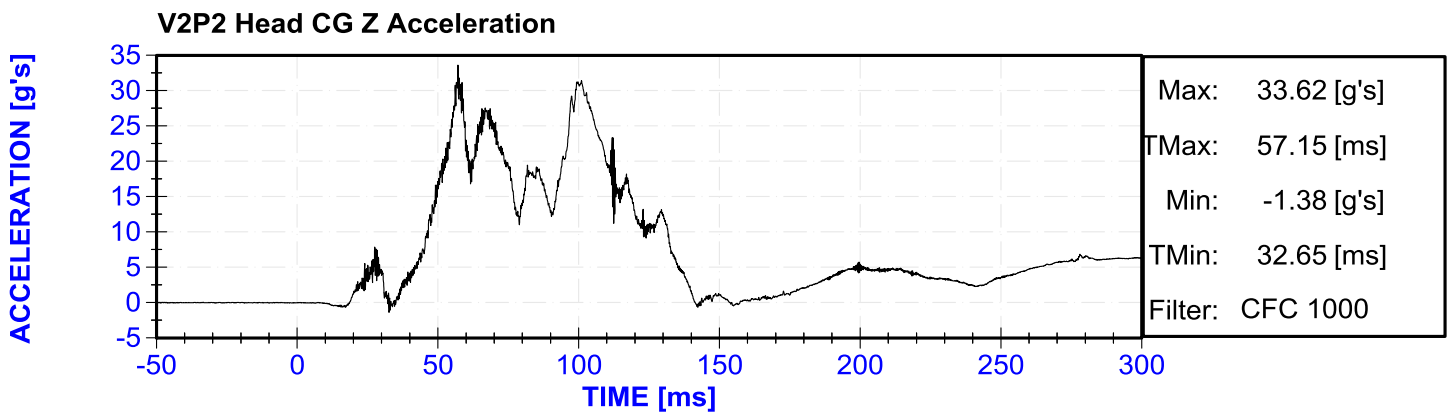
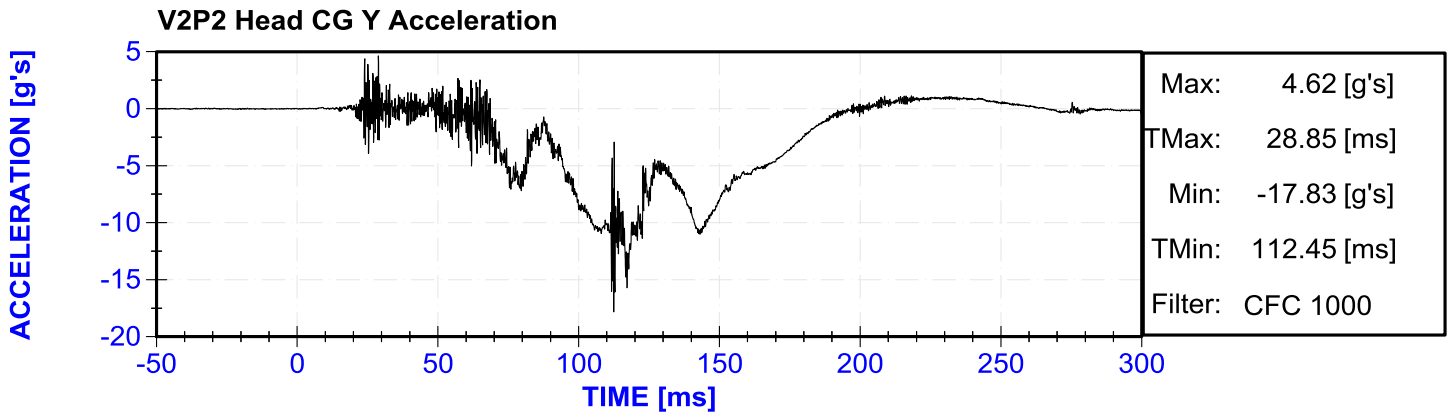


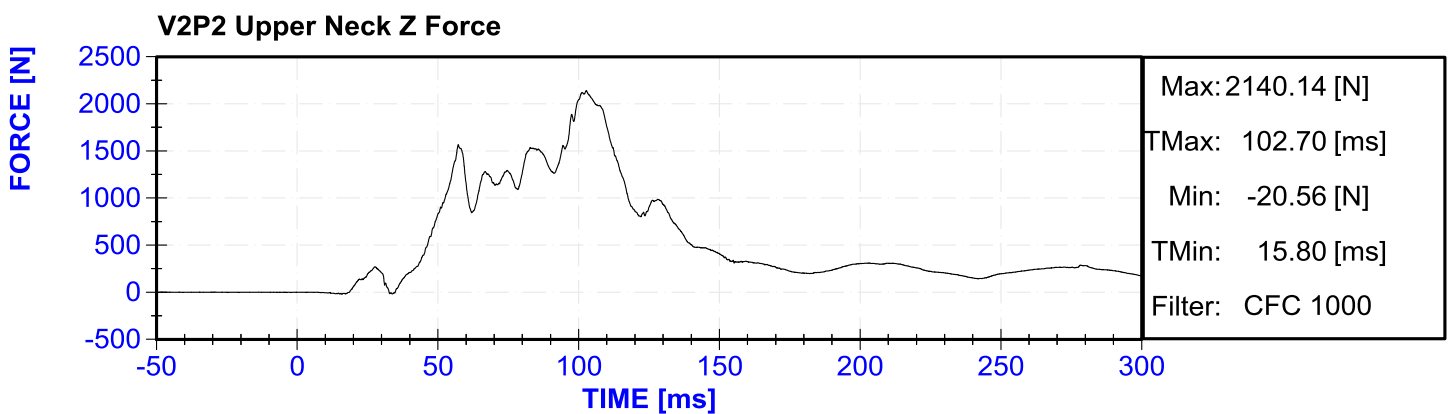
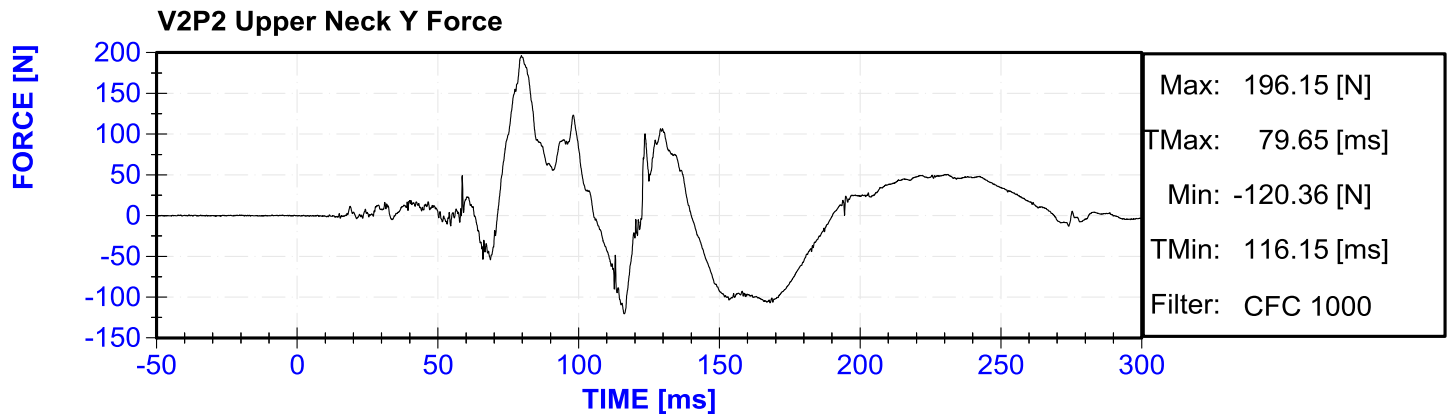
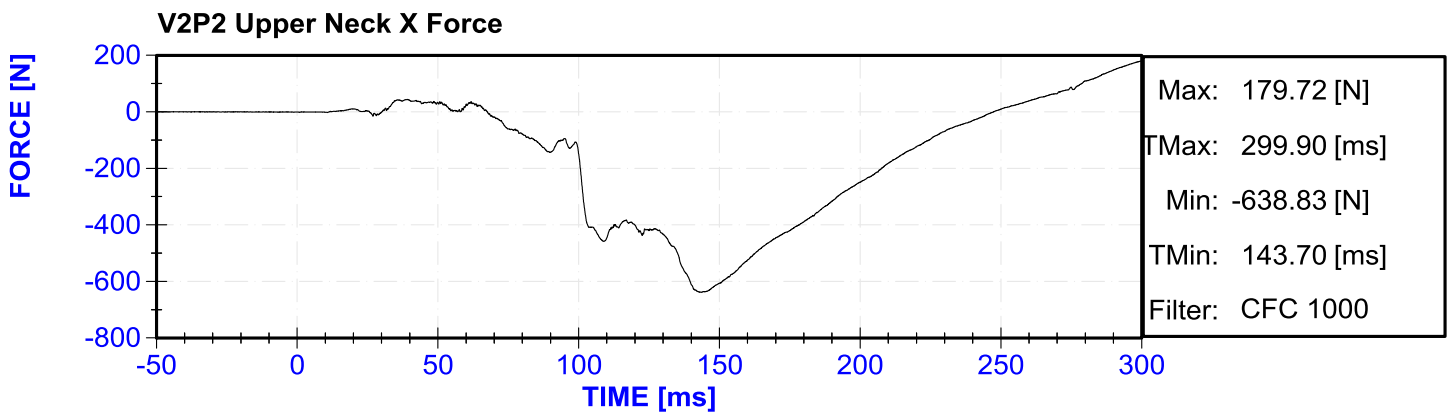
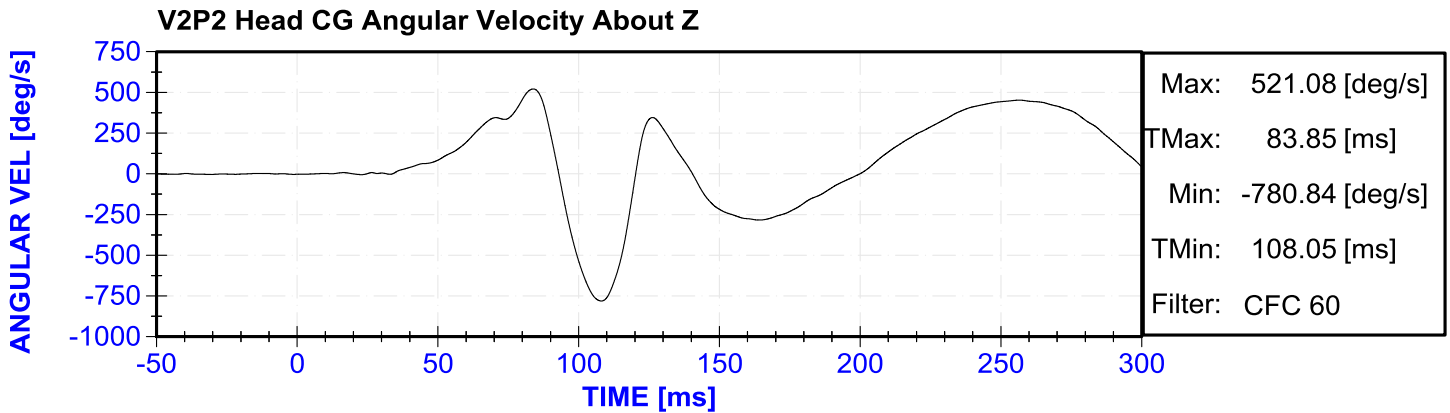


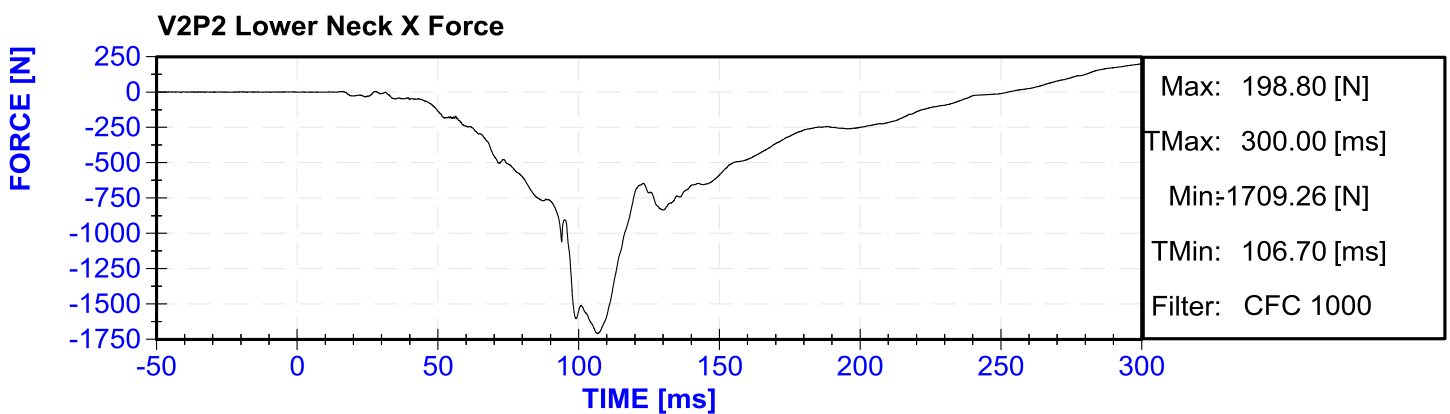
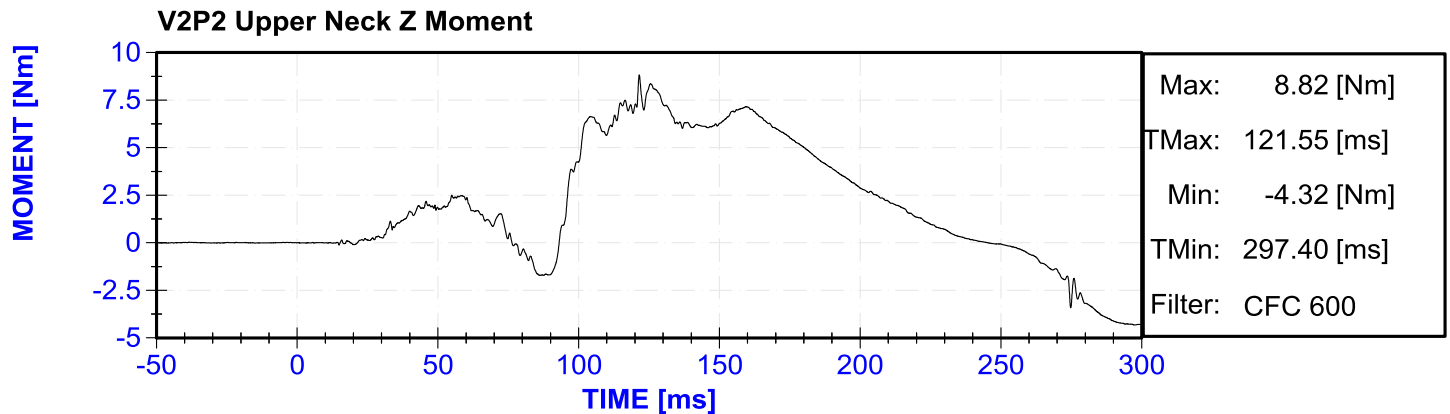
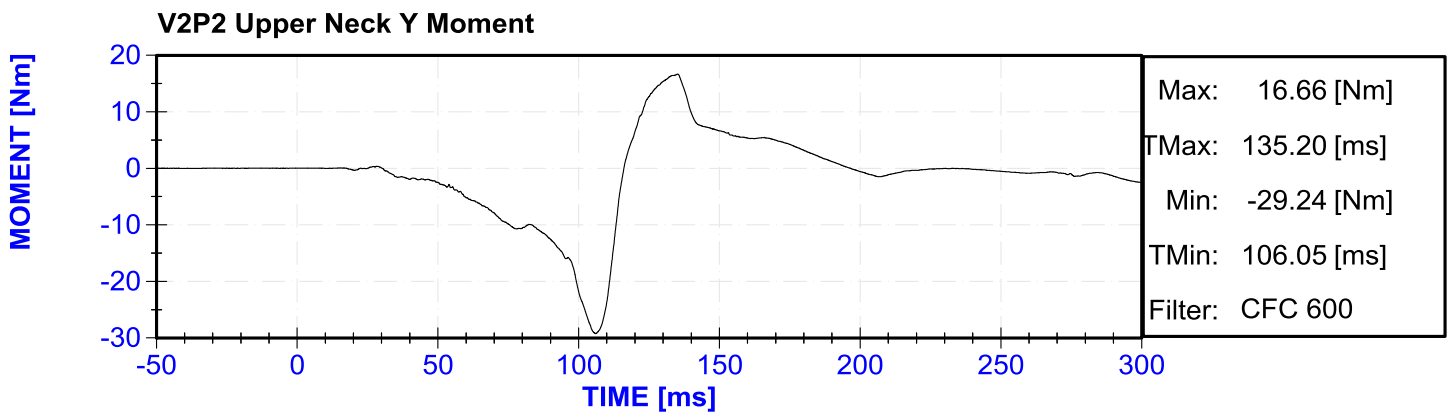
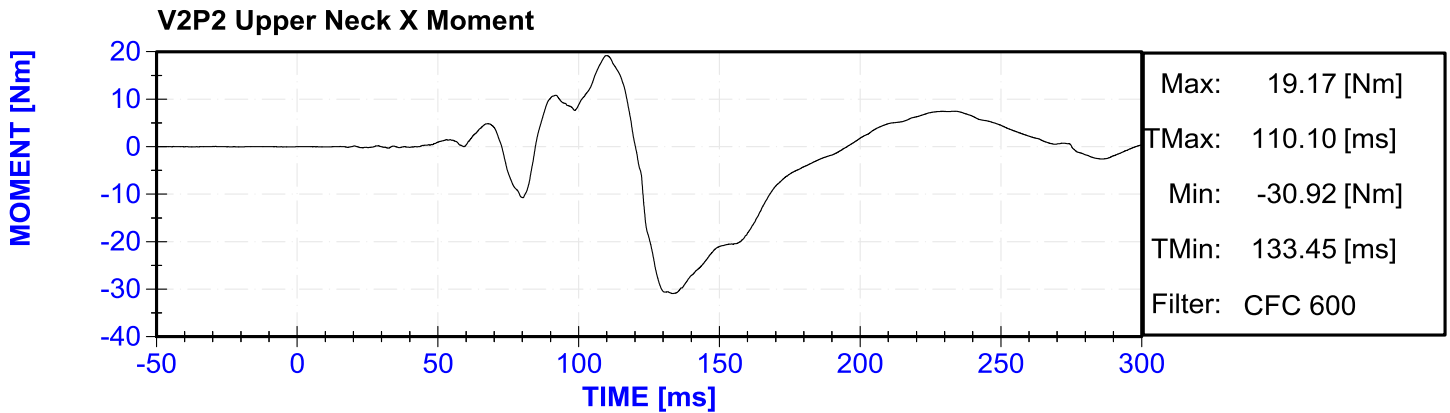


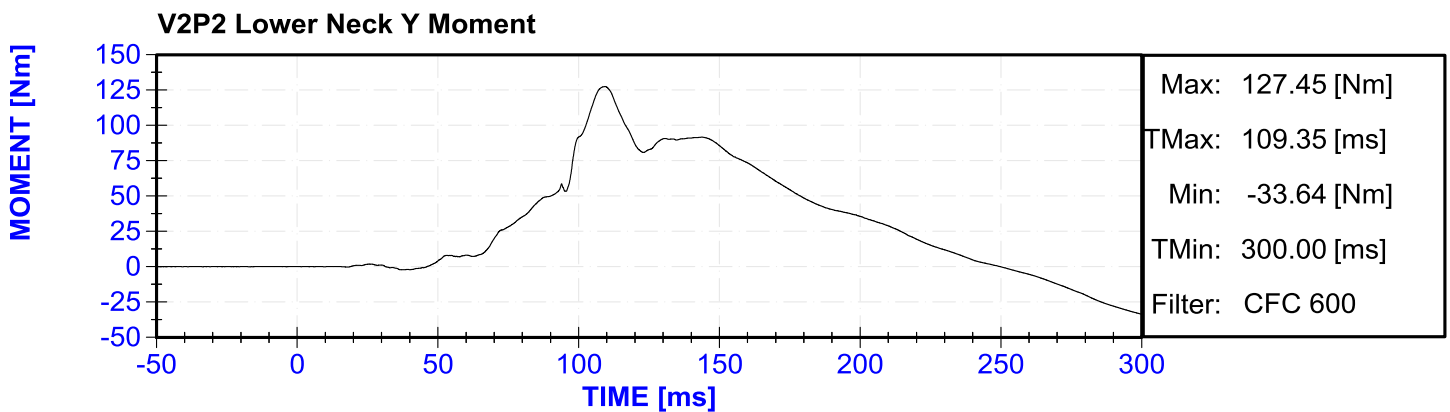
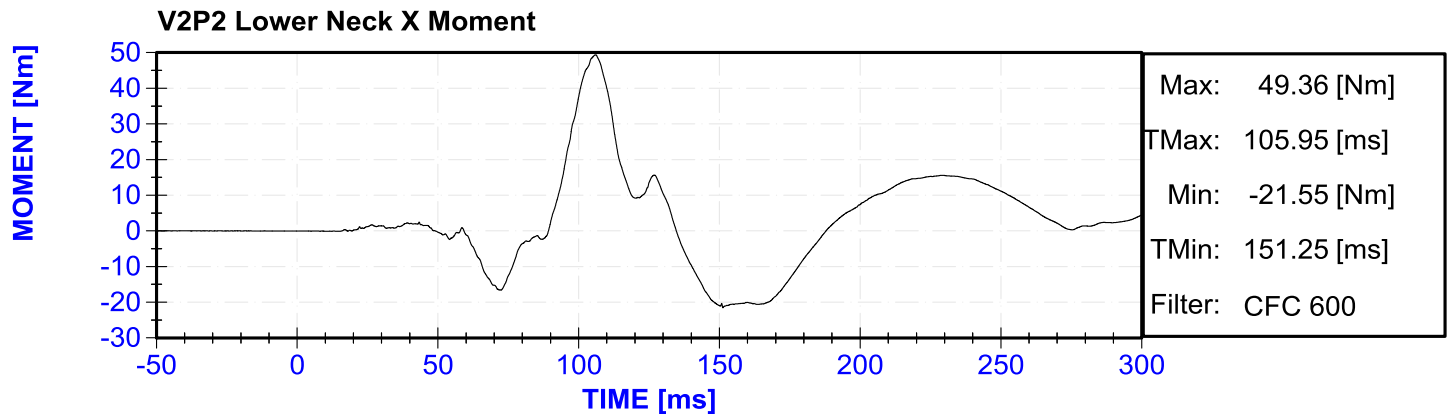
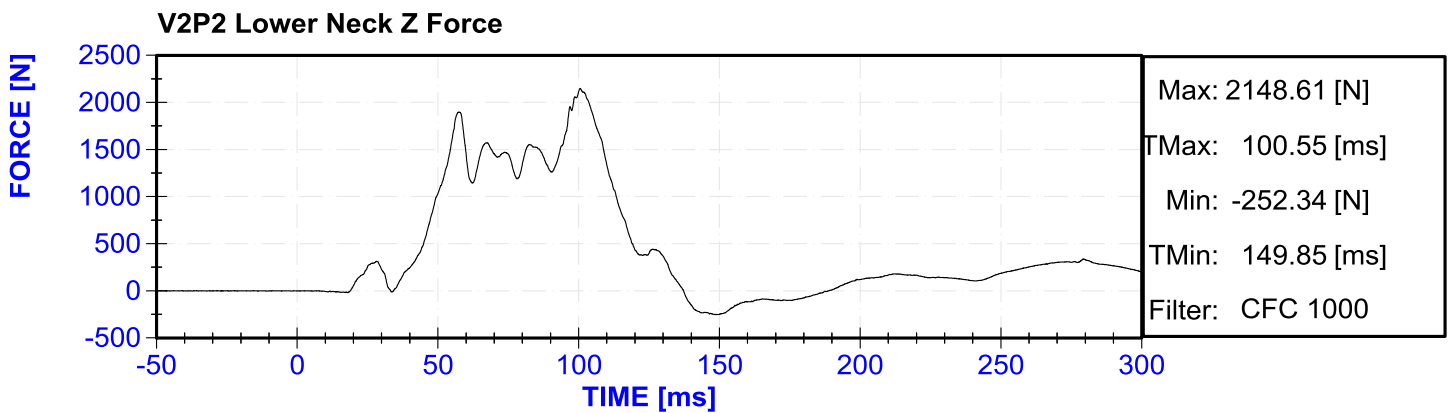
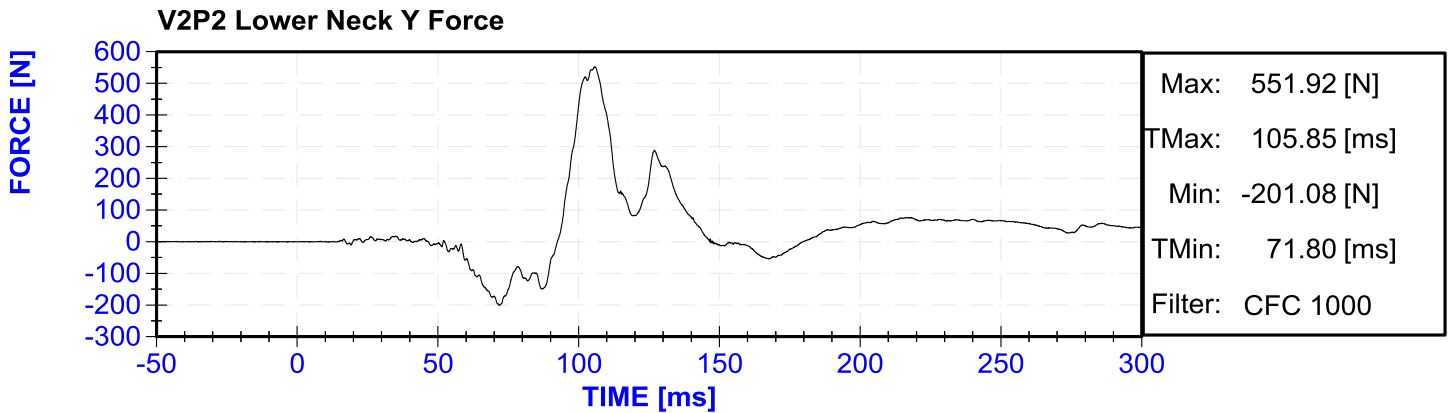


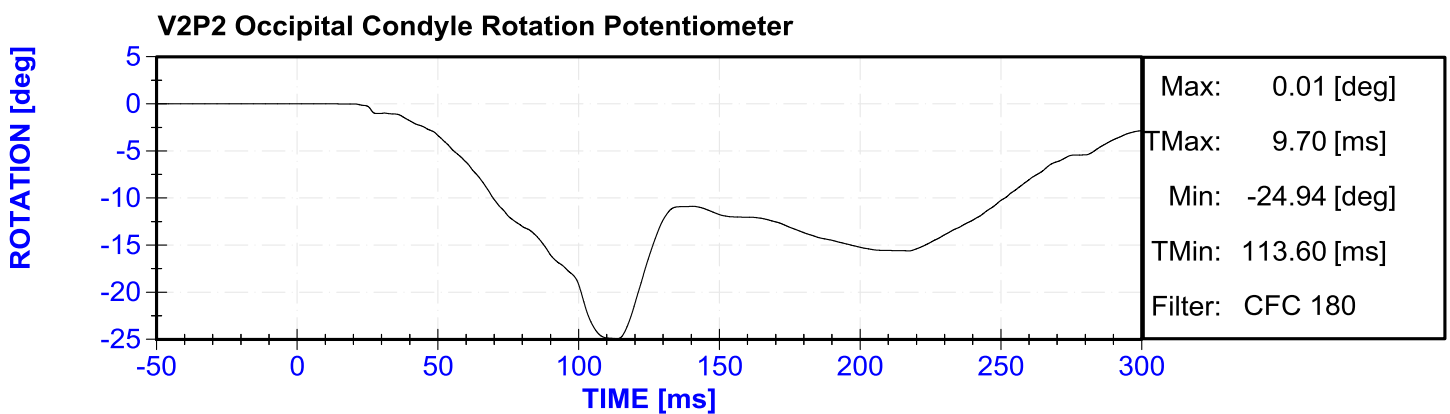
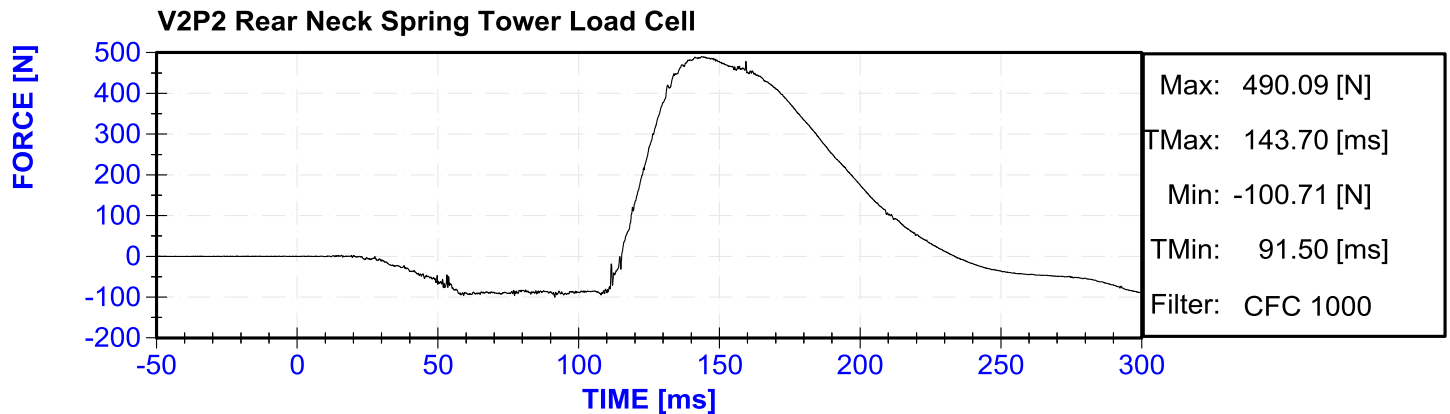
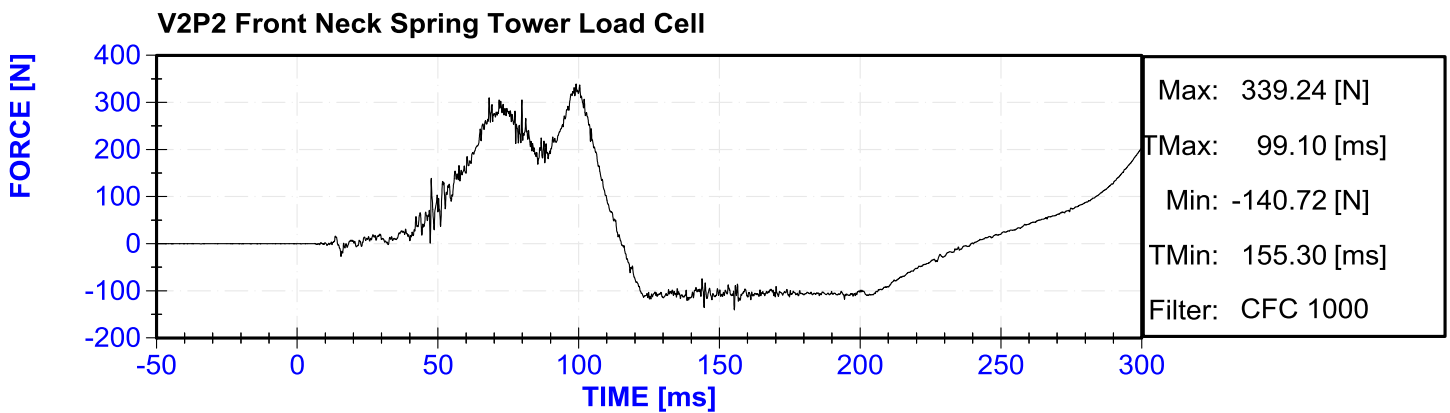
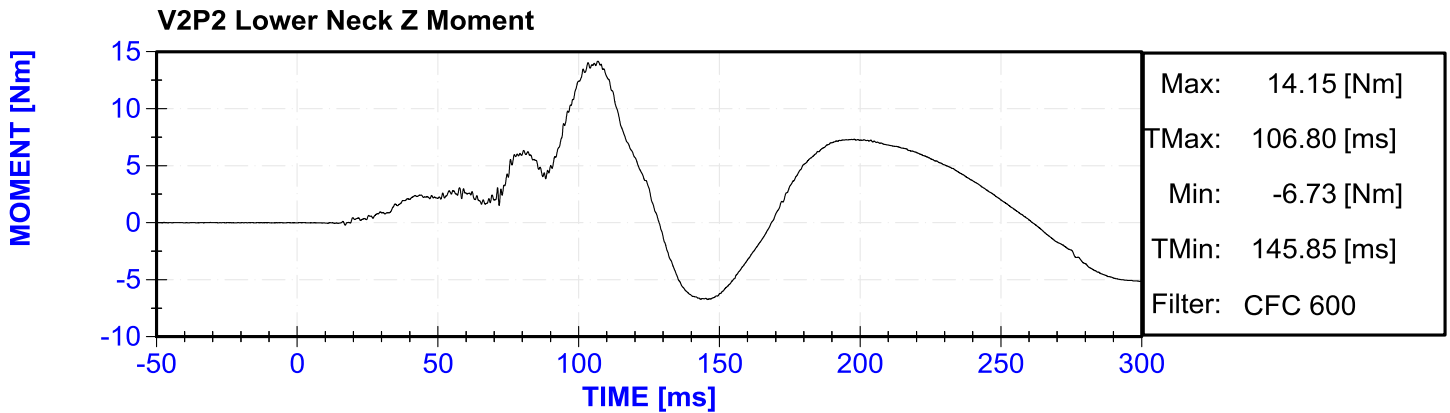


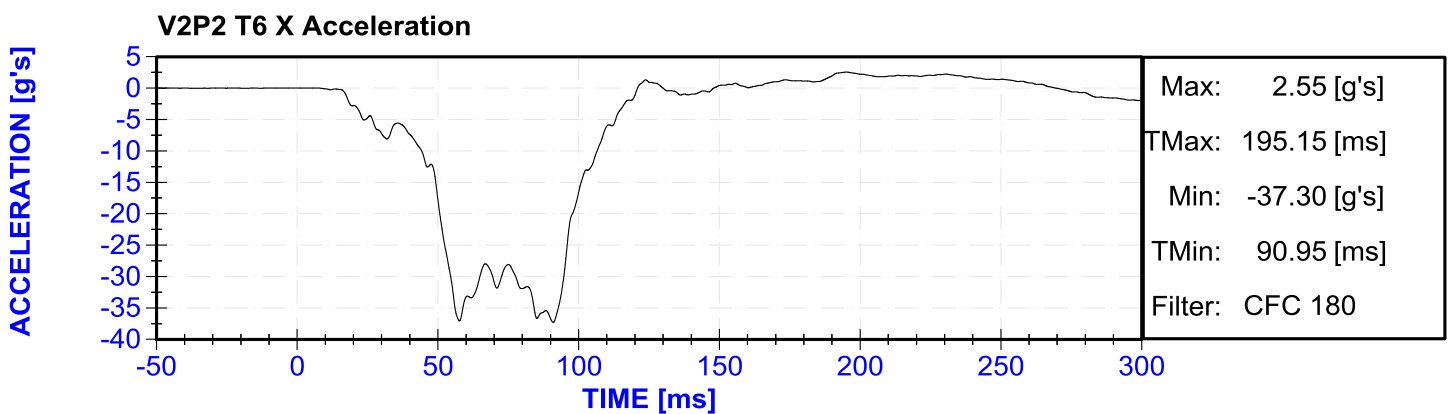
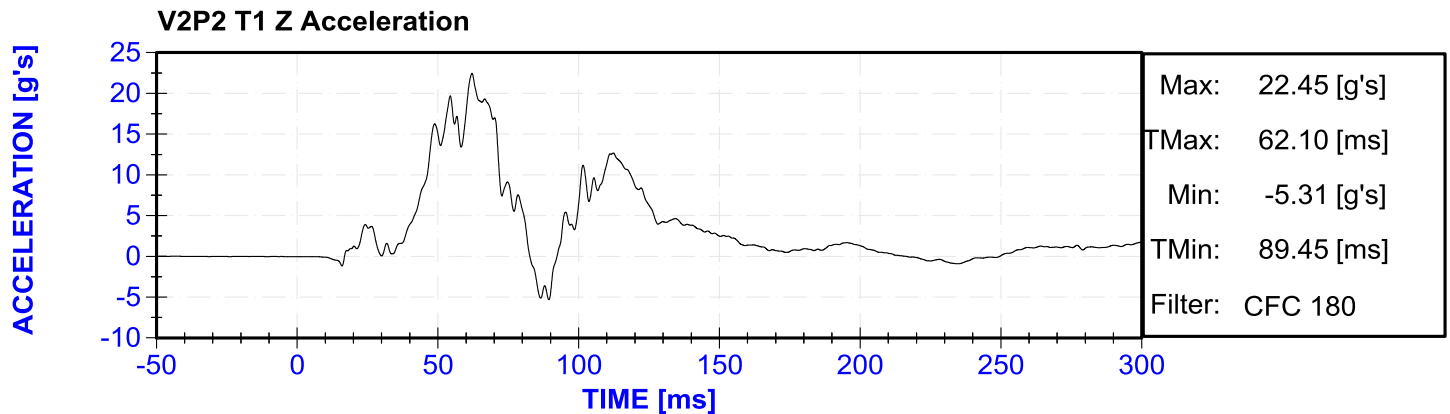
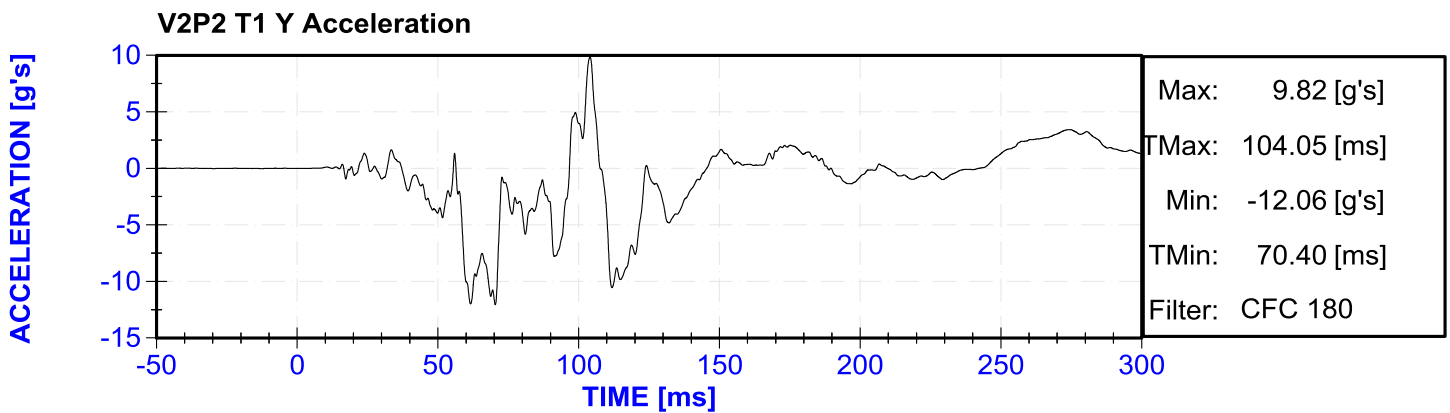
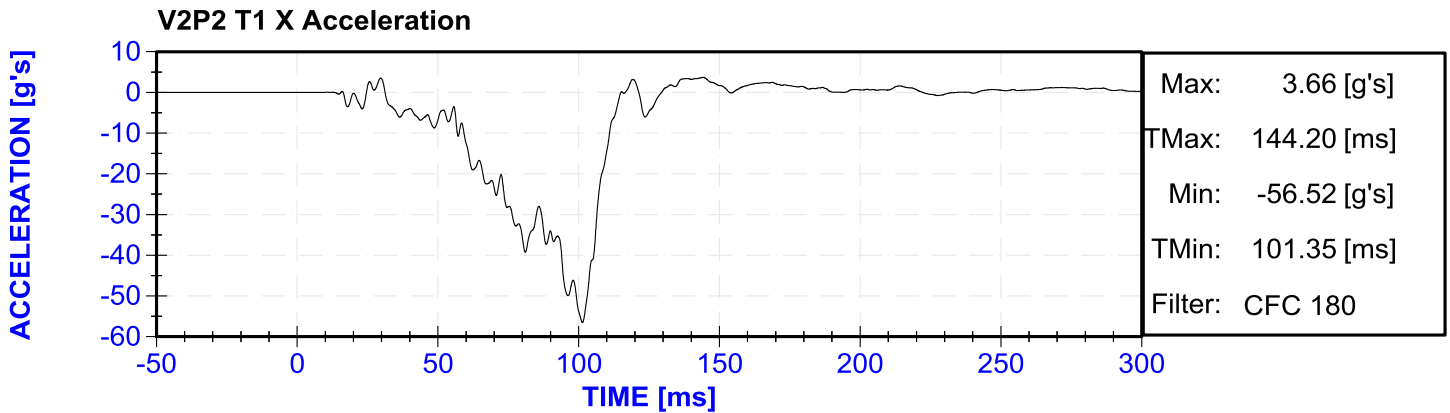


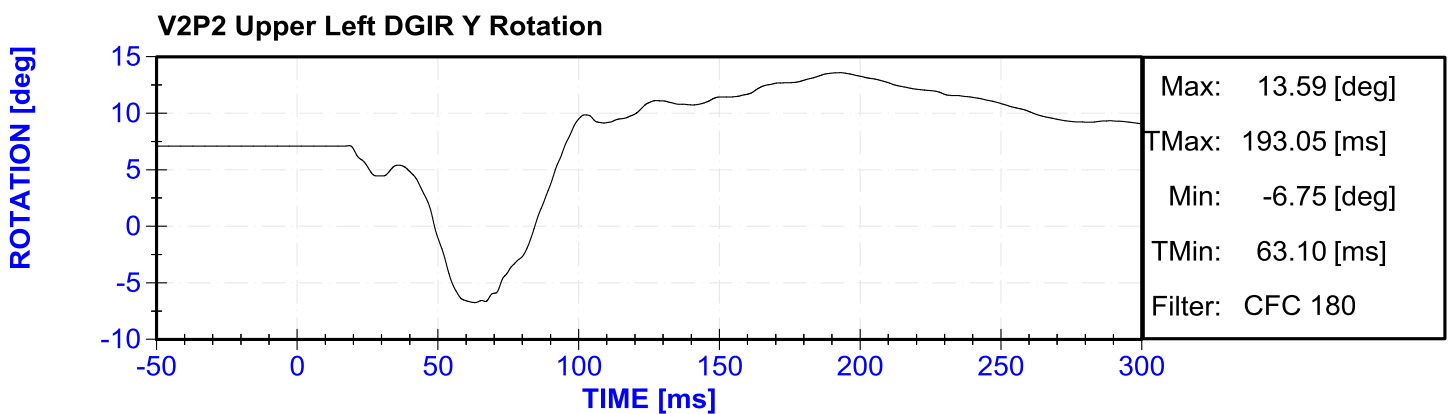
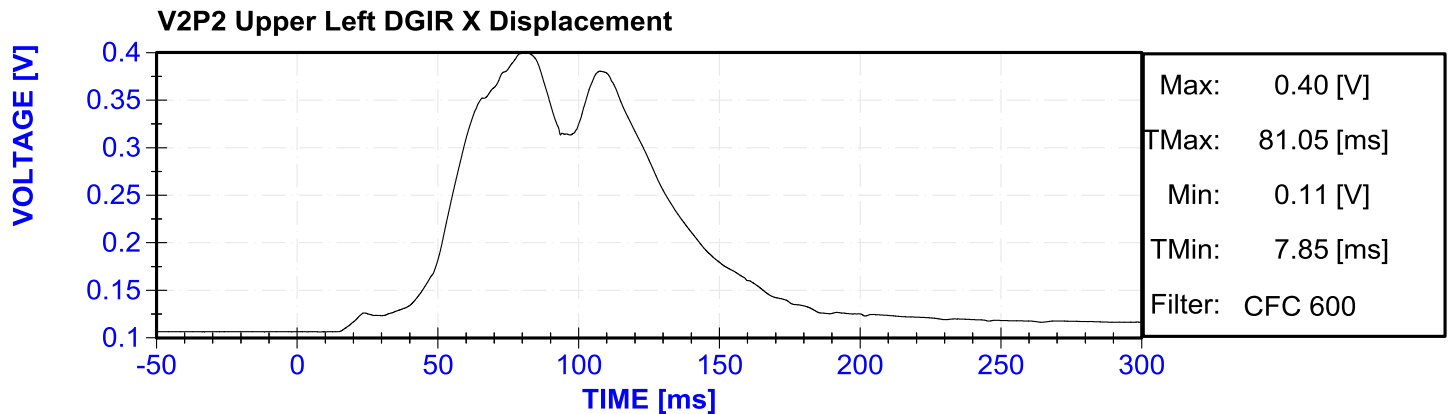
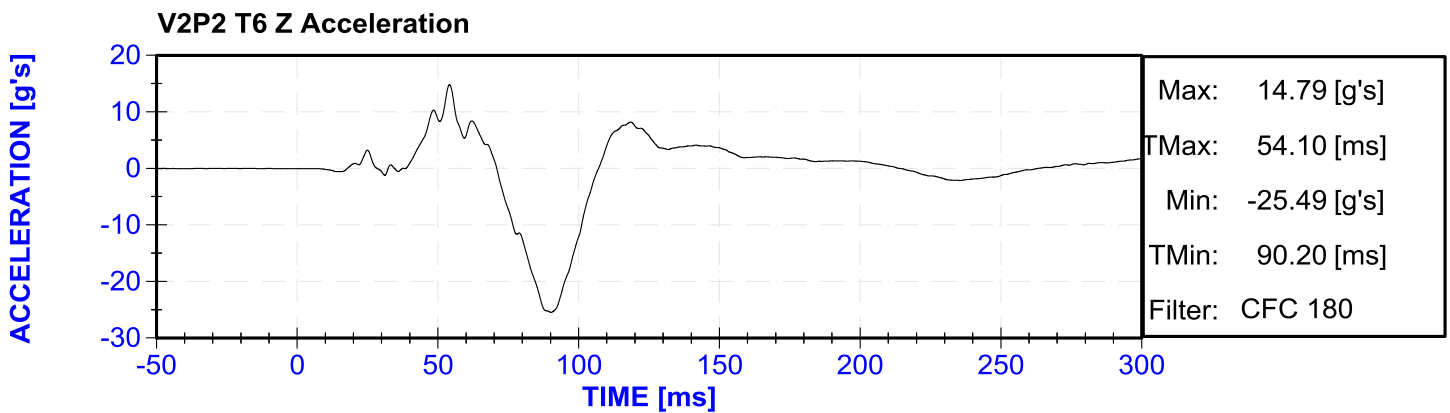
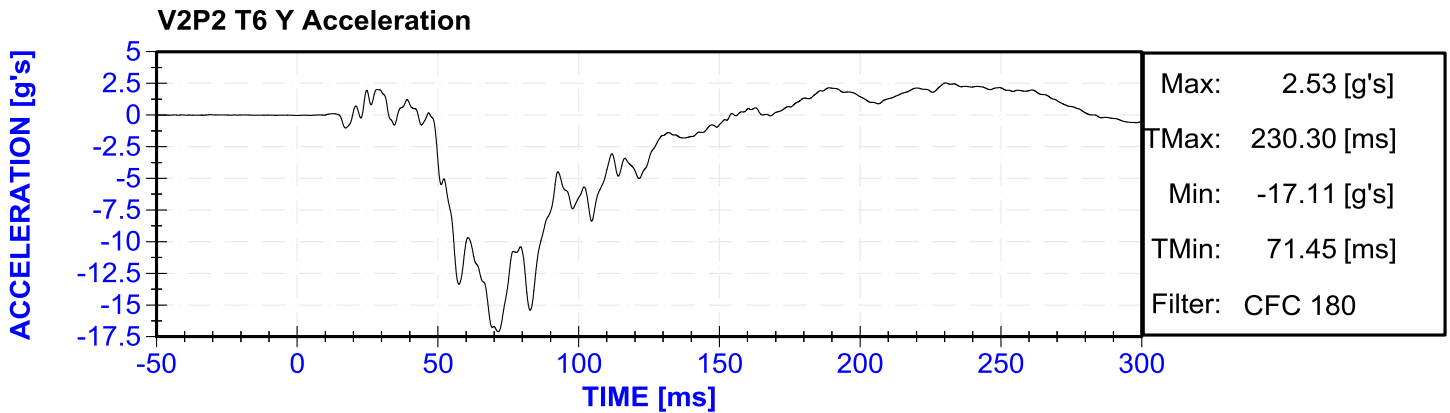




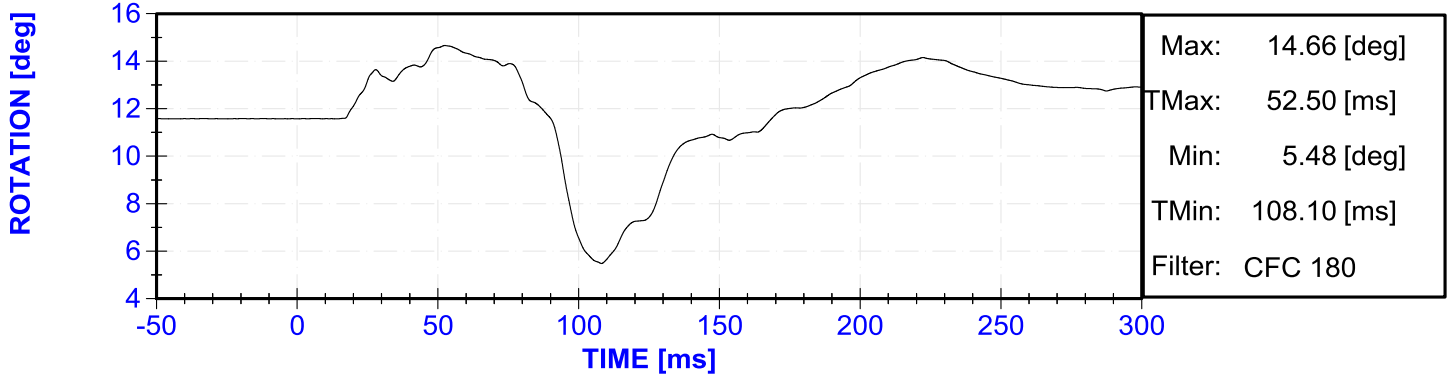




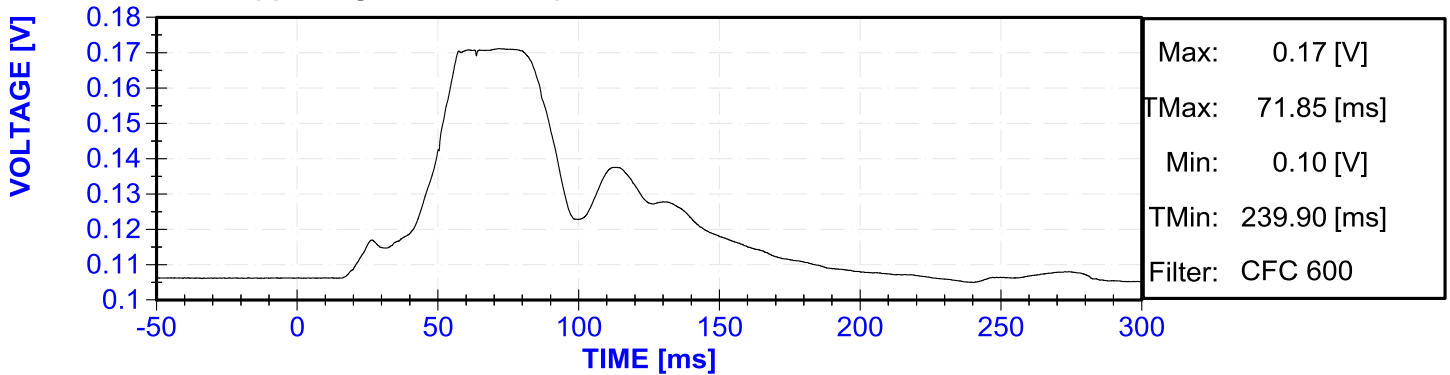




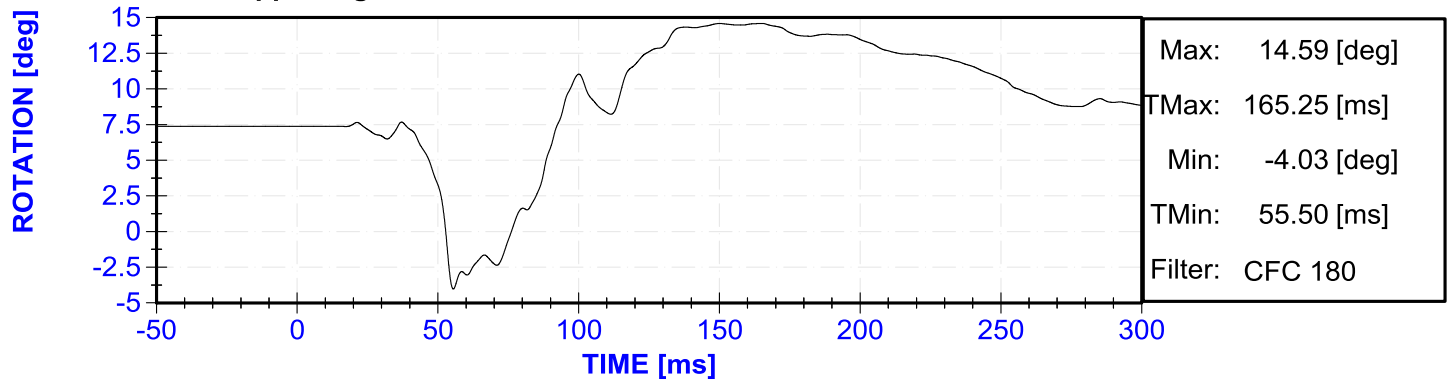
V2P2 Upper Left DGIR Z Rotation



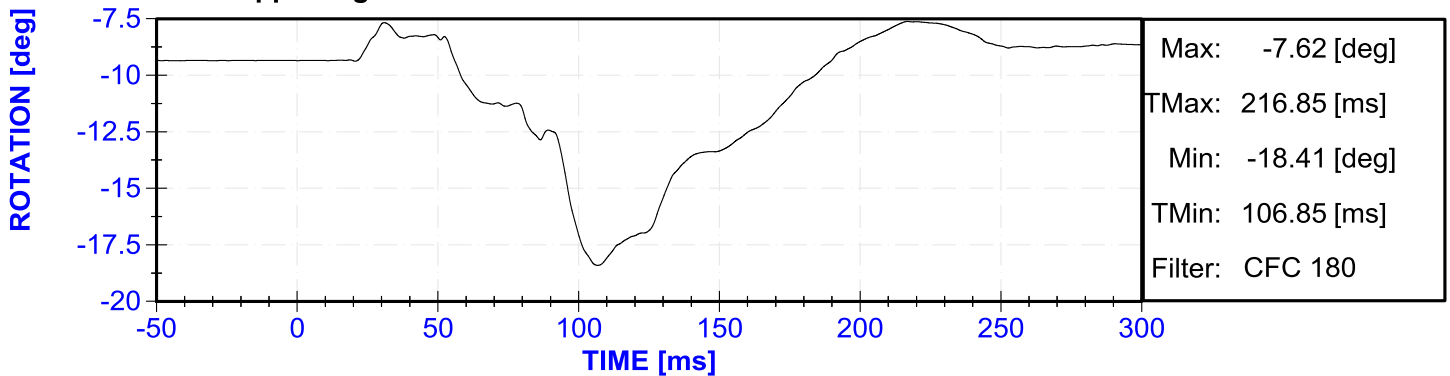
V2P2 Upper Right DGIR X Displacement



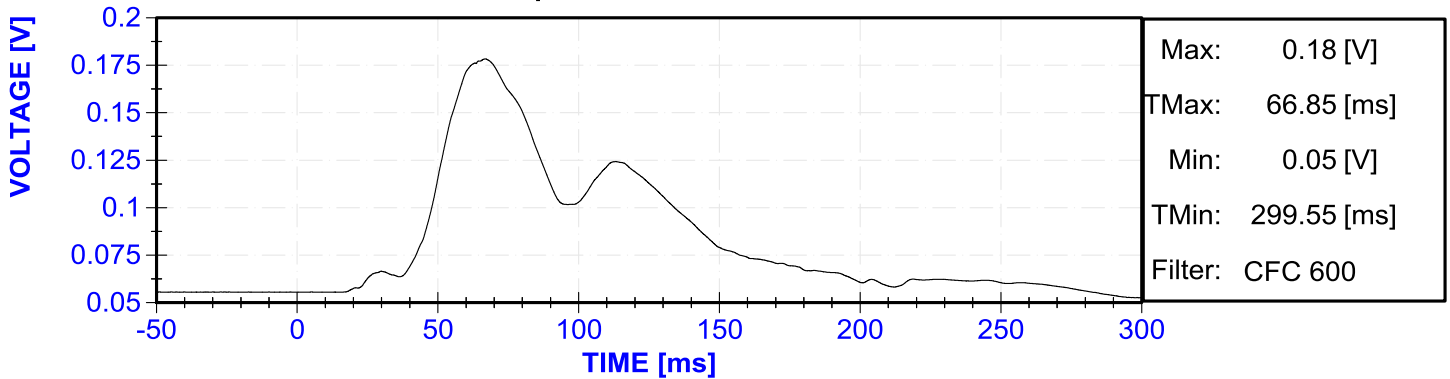
V2P2 Upper Right DGIR Y Rotation



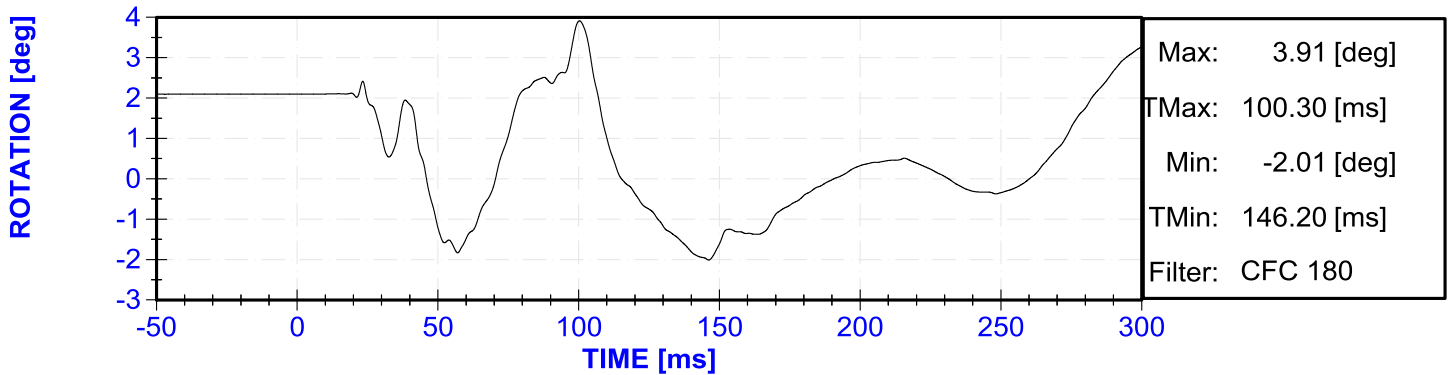
V2P2 Upper Right DGIR Z Rotation



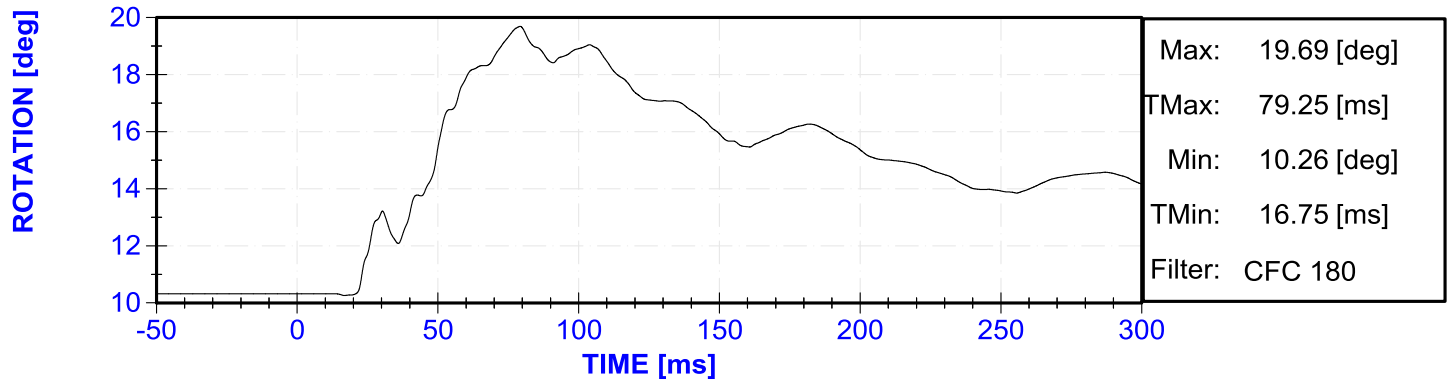
V2P2 Lower Left DGIR X Displacement



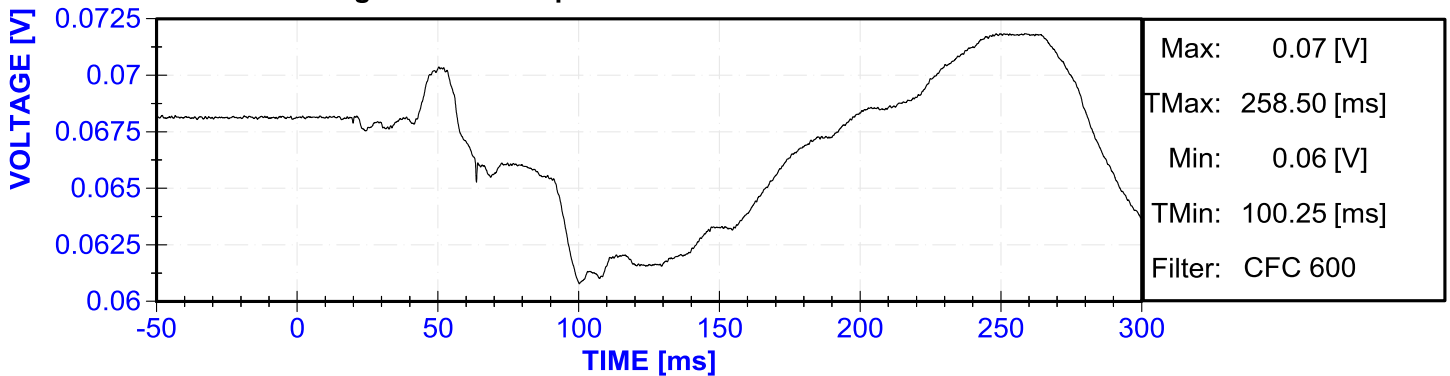
V2P2 Lower Left DGIR Y Rotation



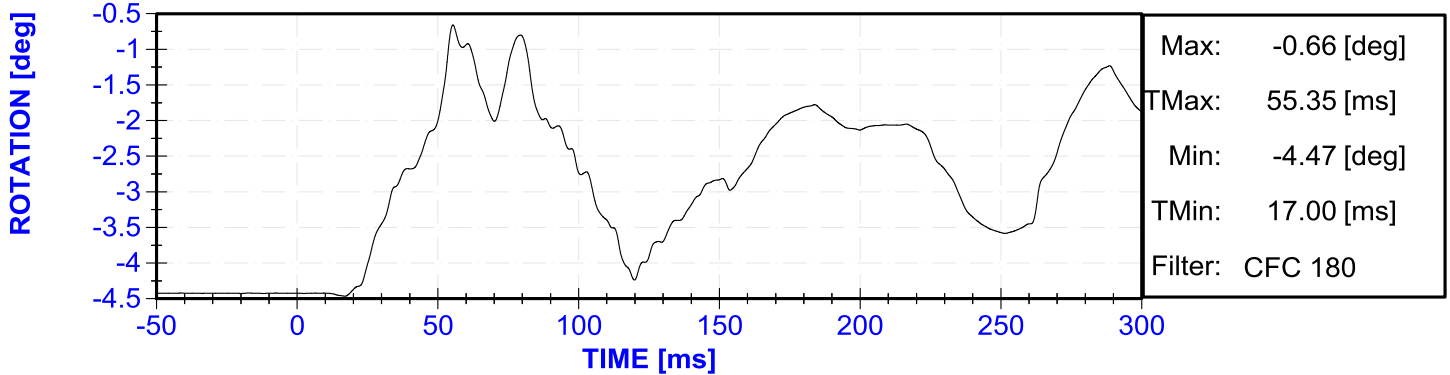
V2P2 Lower Left DGIR Z Rotation



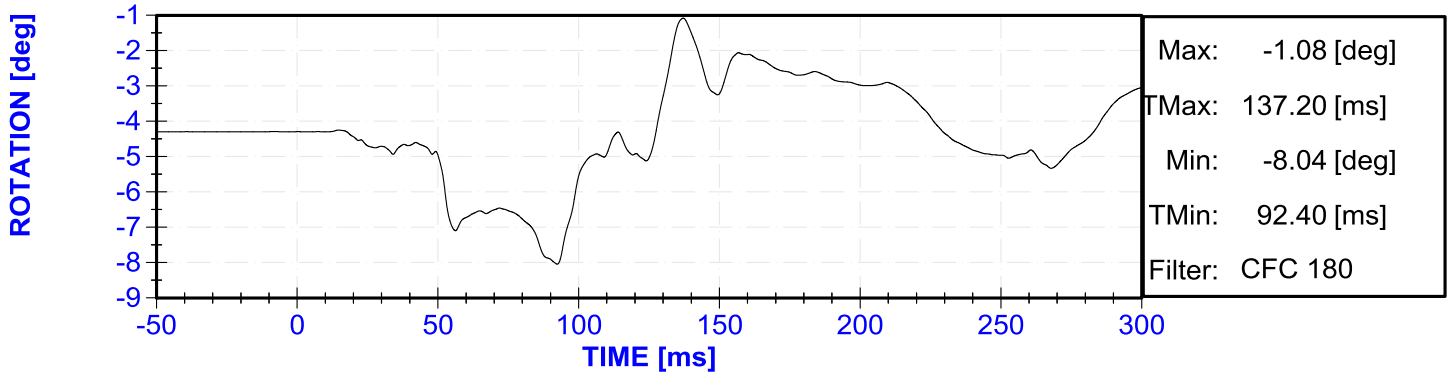
V2P2 Lower Right DGIR X Displacement



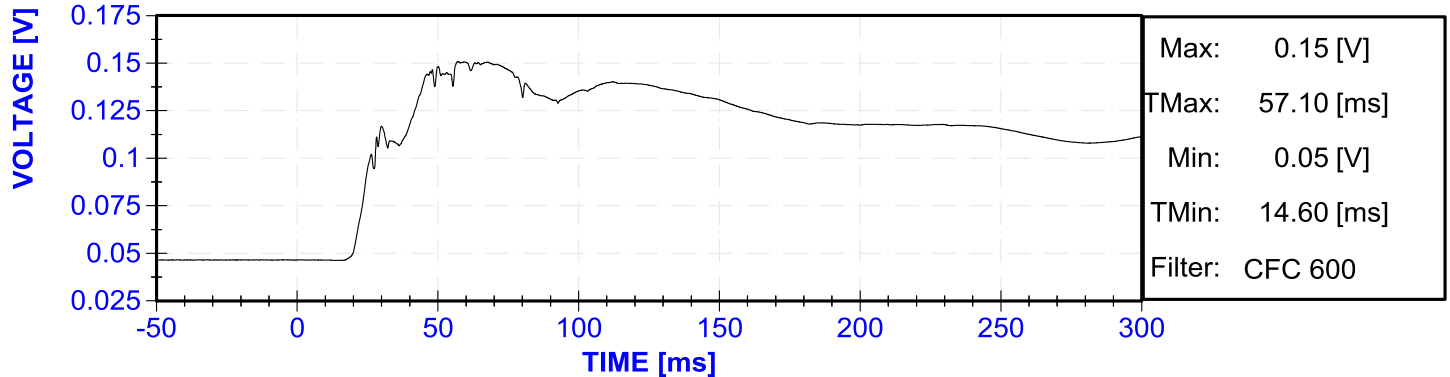
V2P2 Lower Right DGIR Y Rotation



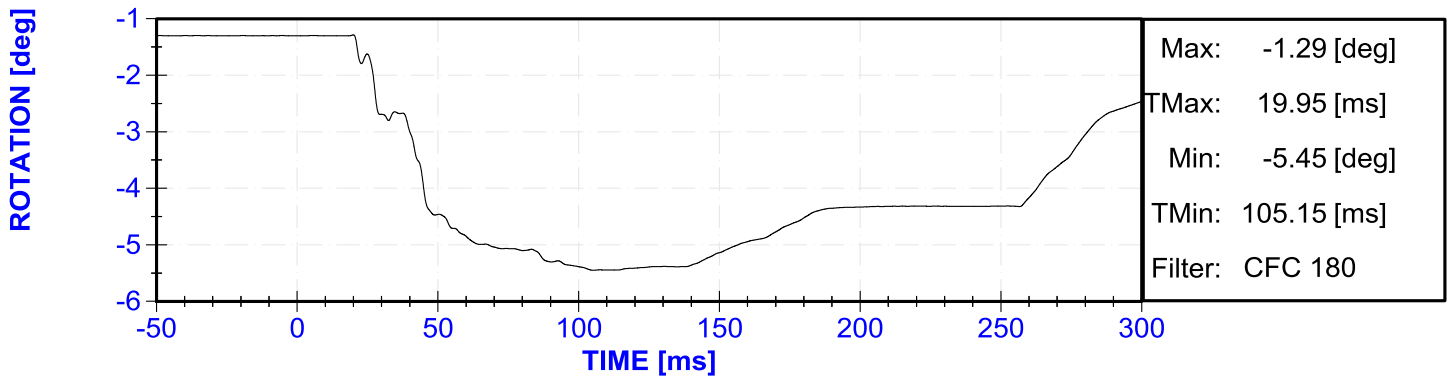
V2P2 Lower Right DGIR Z Rotation



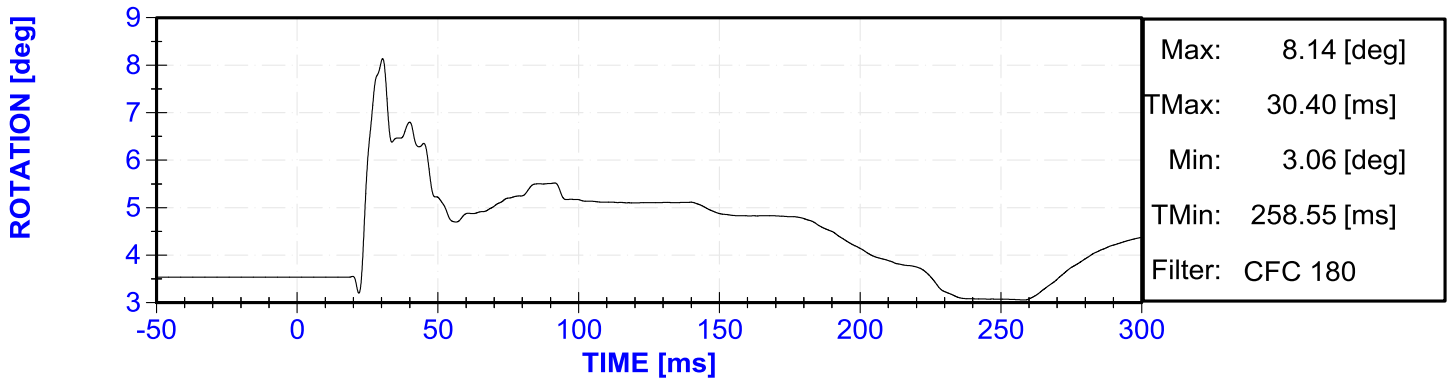
V2P2 Abdomen Left DGIR X Displacement



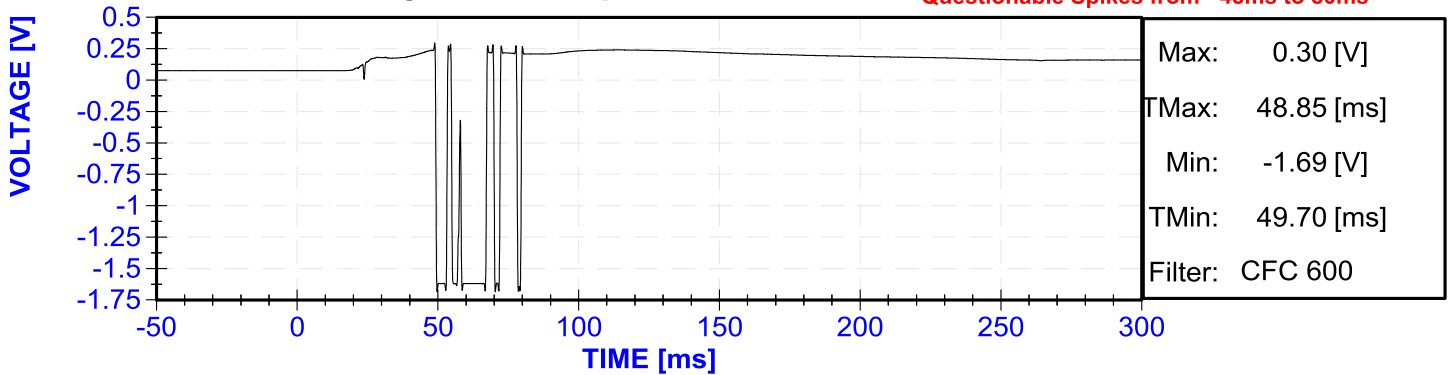
V2P2 Abdomen Left DGIR Y Rotation



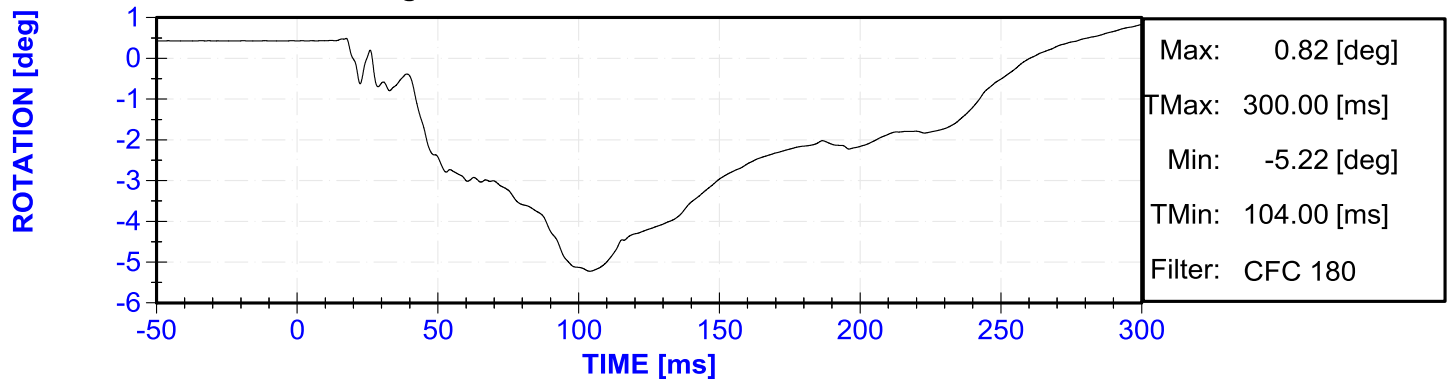
V2P2 Abdomen Left DGIR Z Rotation



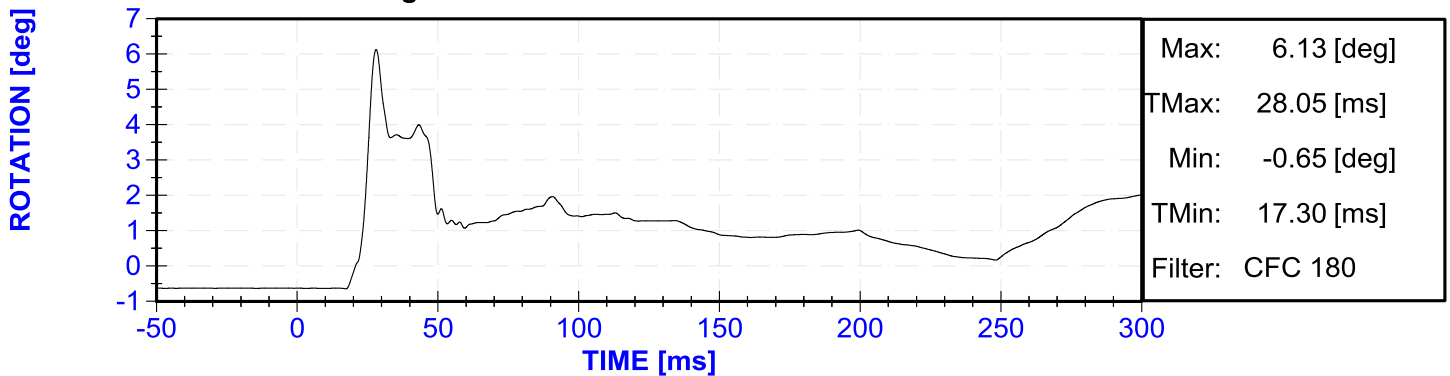
V2P2 Abdomen Right DGIR X Displacement

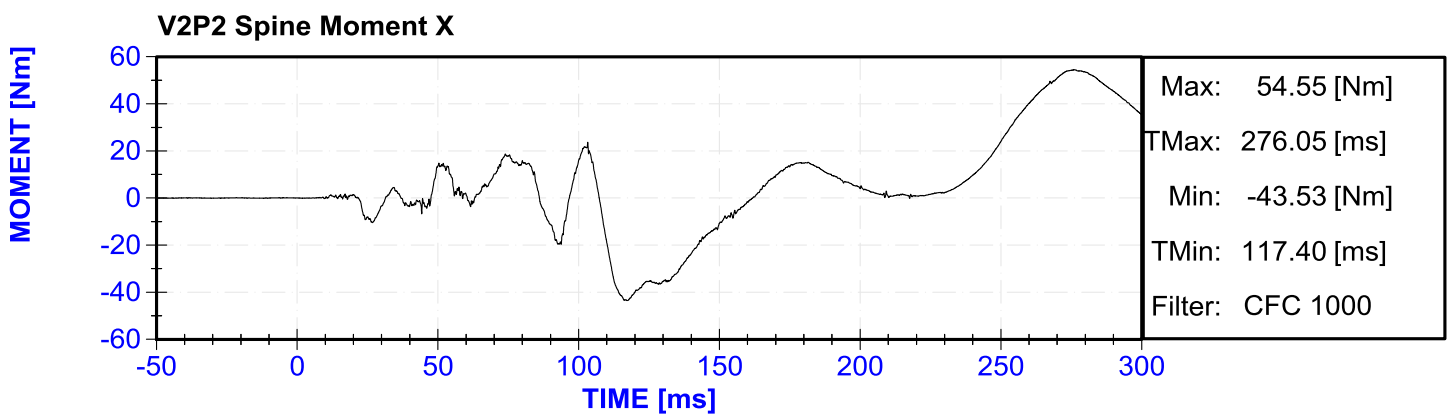
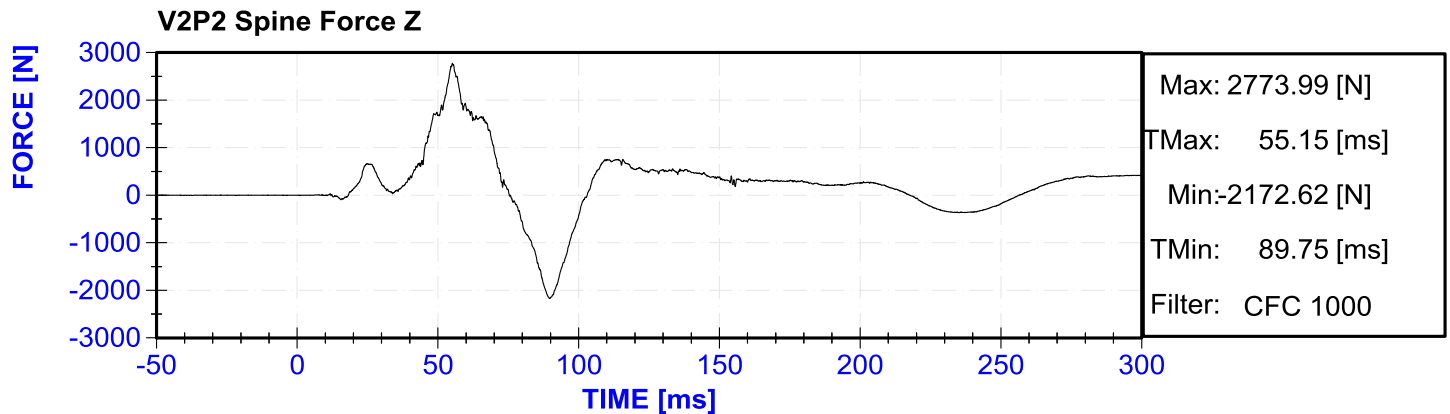
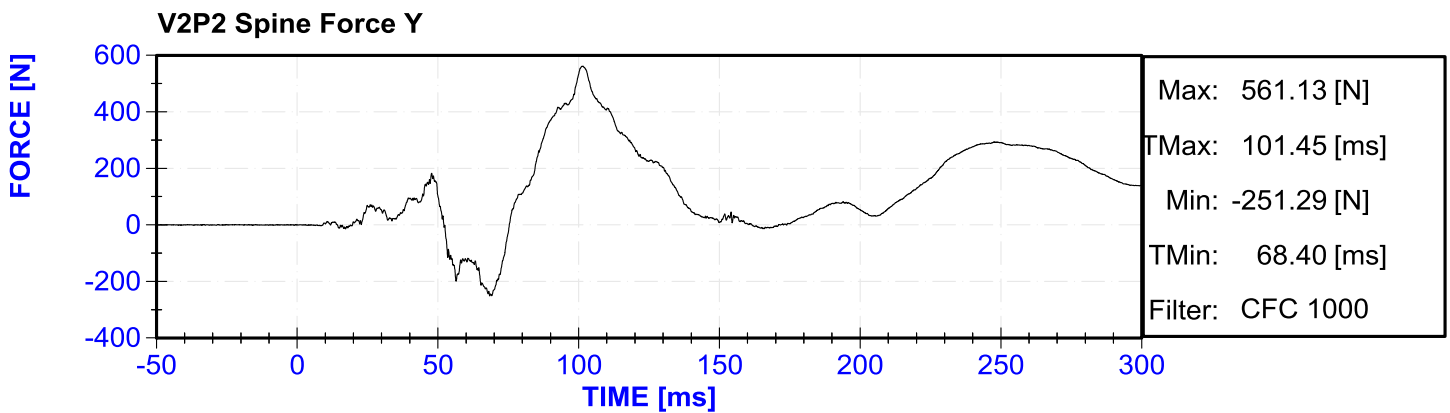
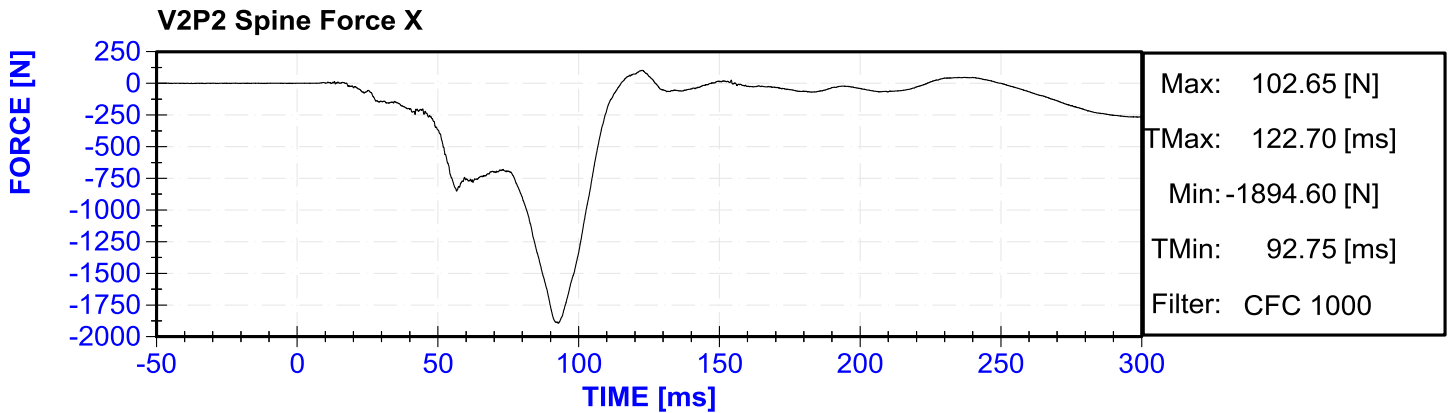


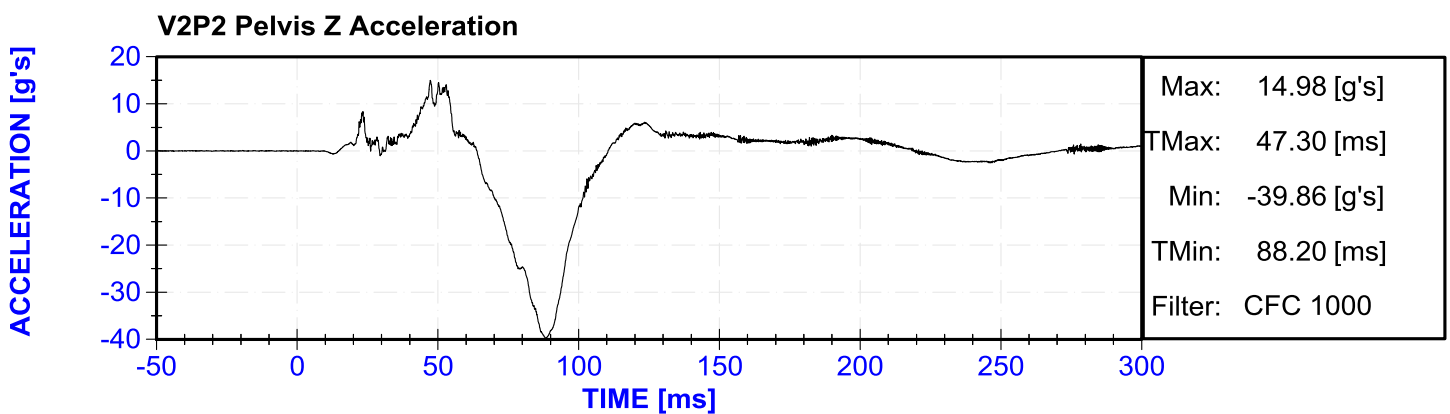
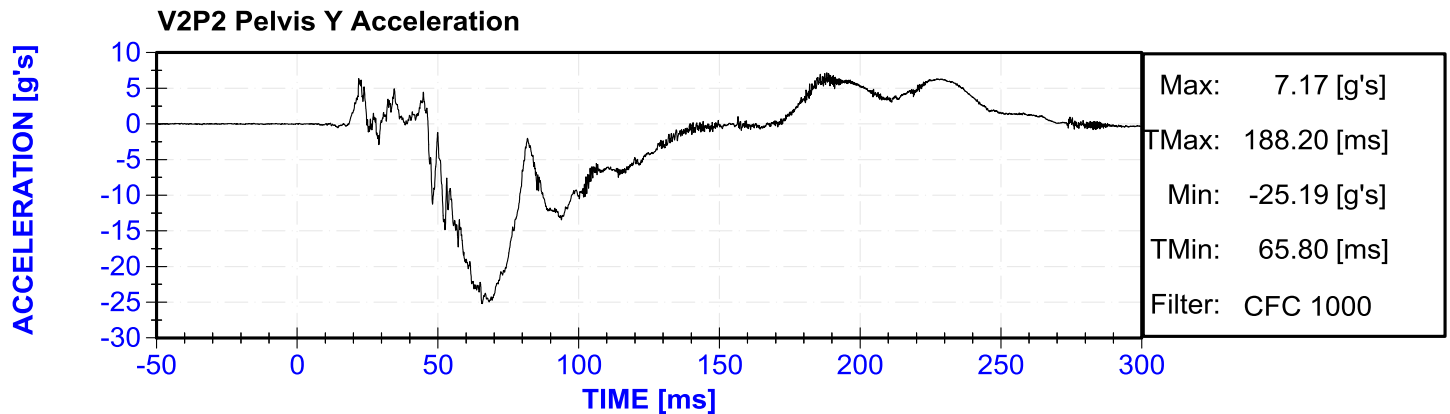
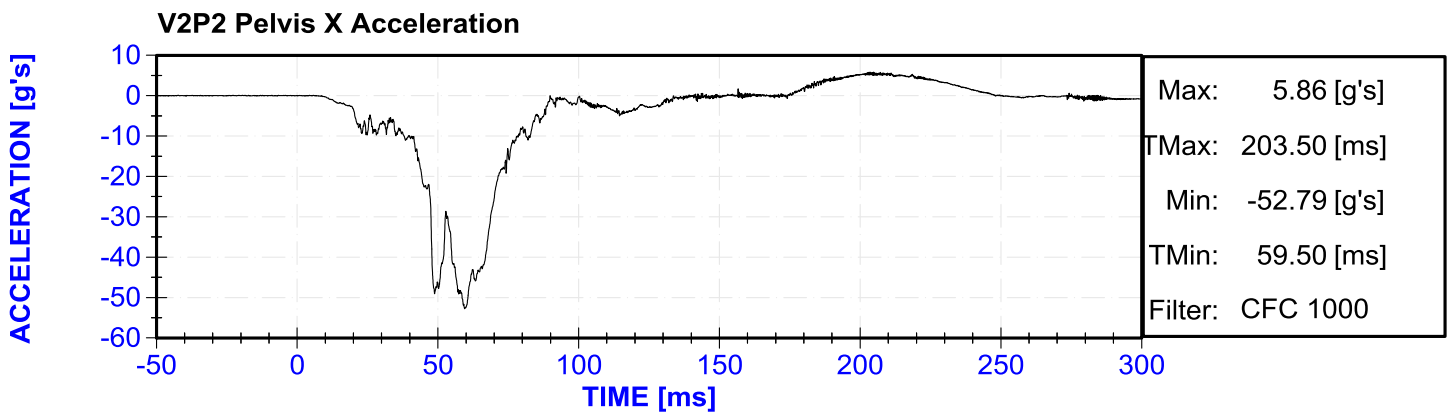
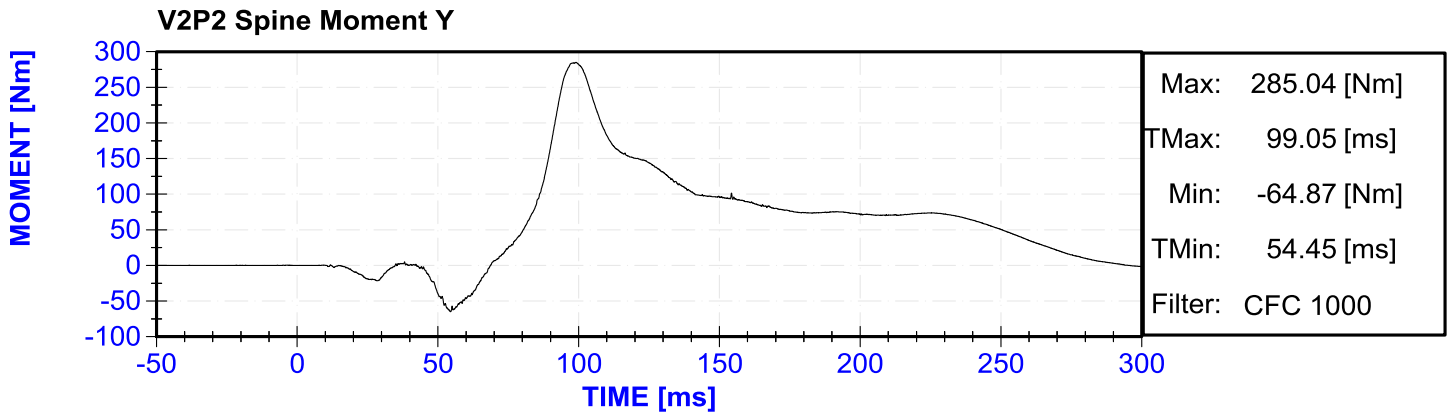
V2P2 Abdomen Right DGIR Y Rotation

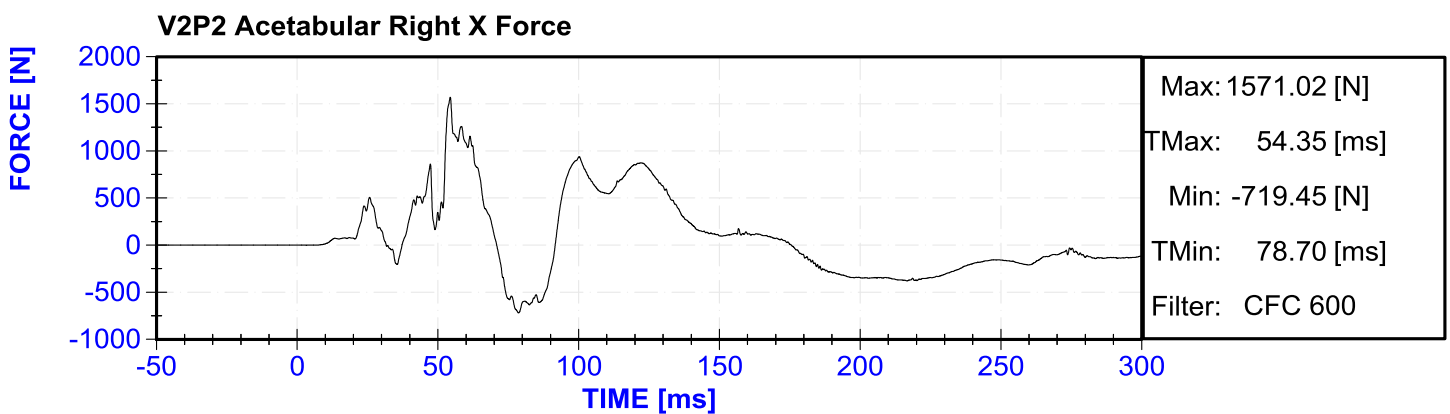
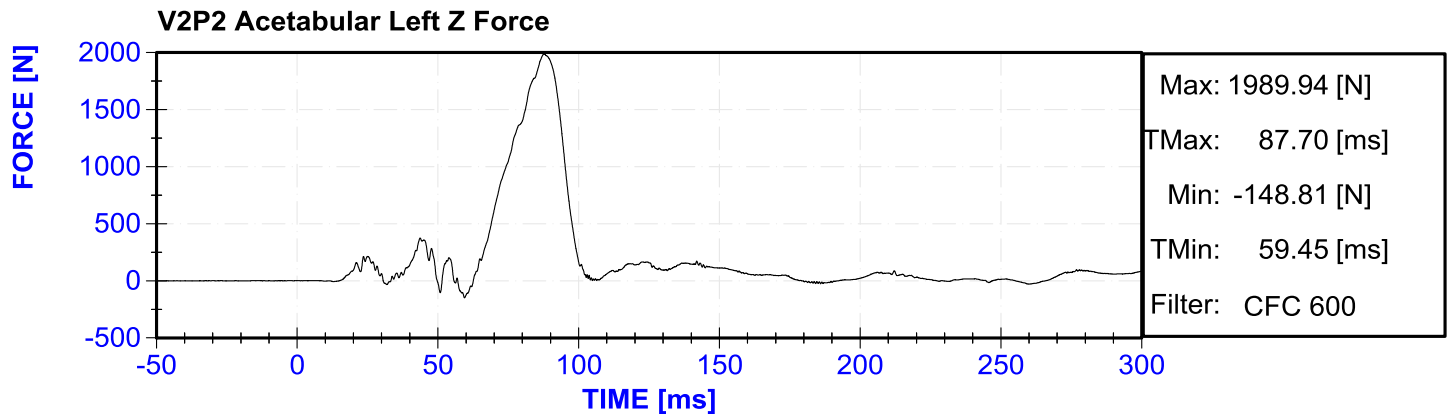
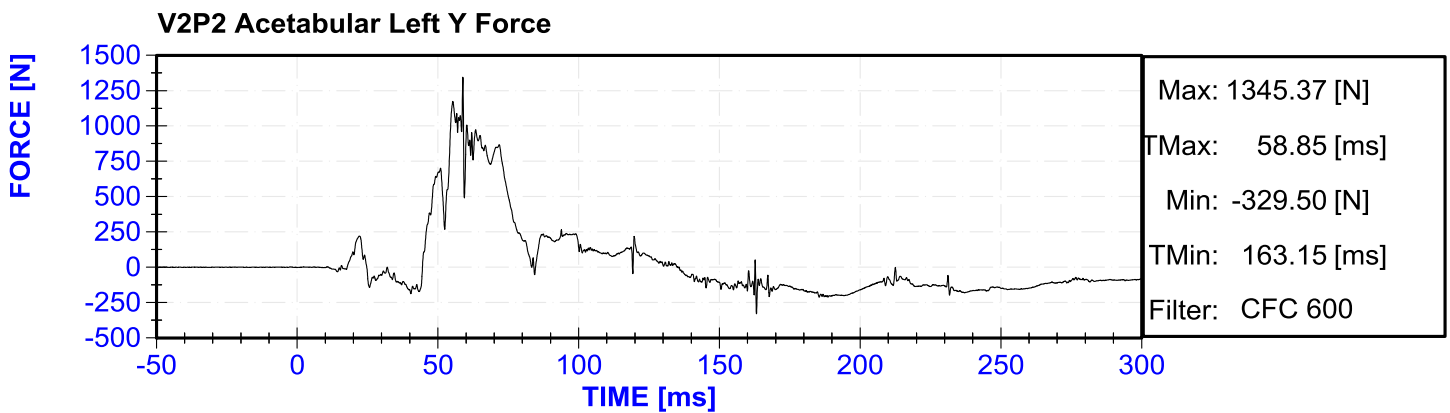
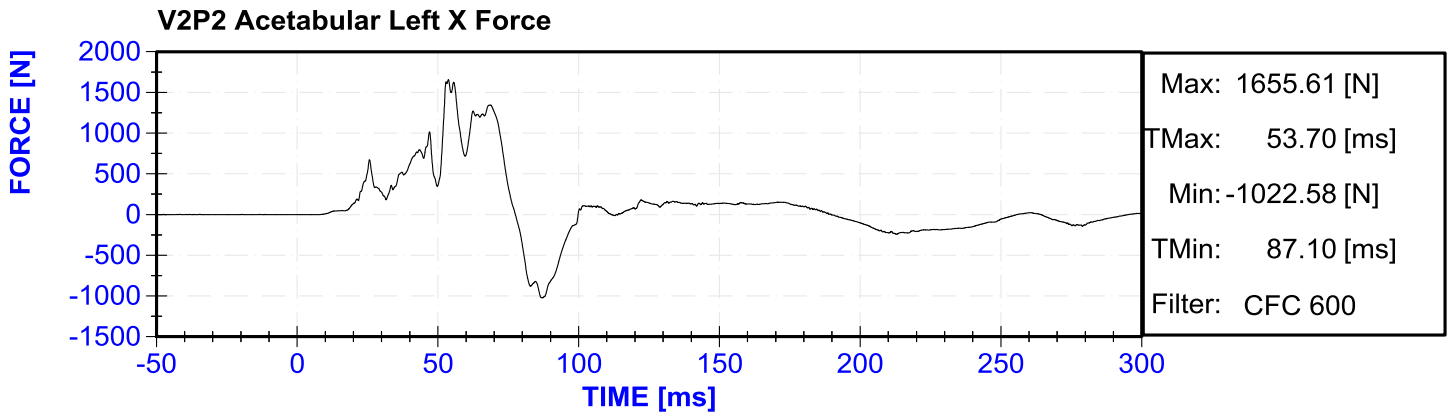


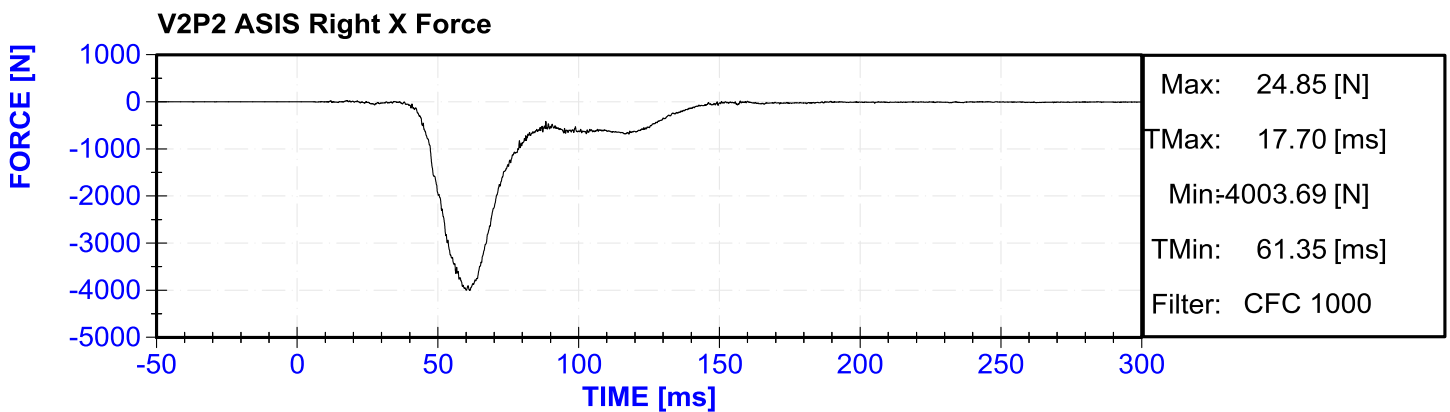
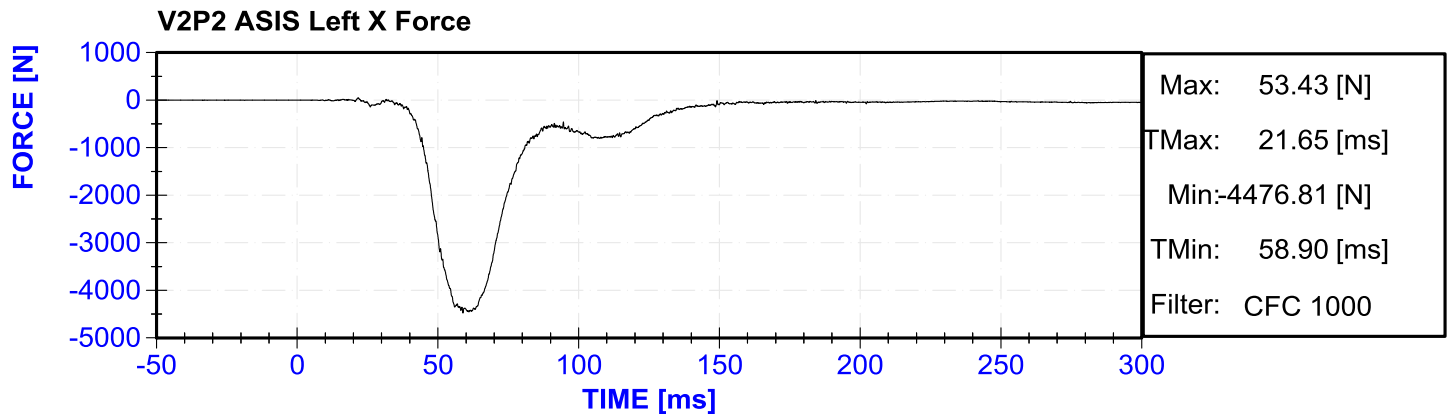
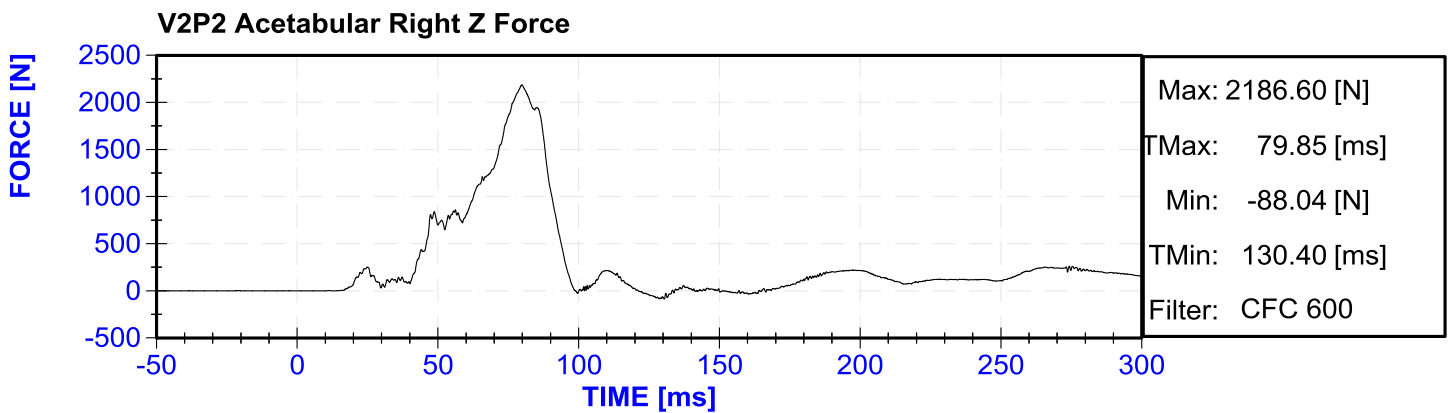
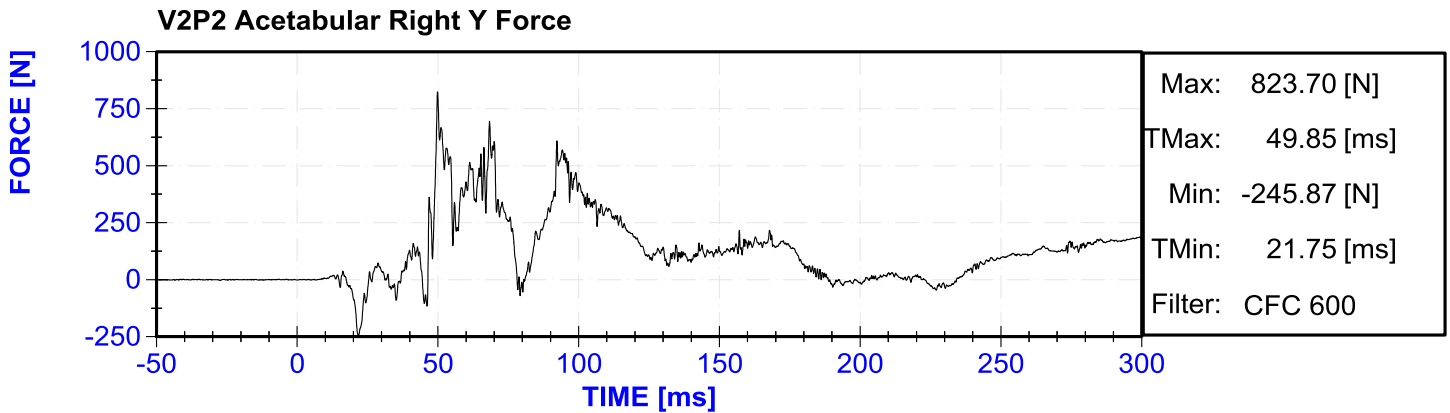
V2P2 Abdomen Right DGIR Z Rotation

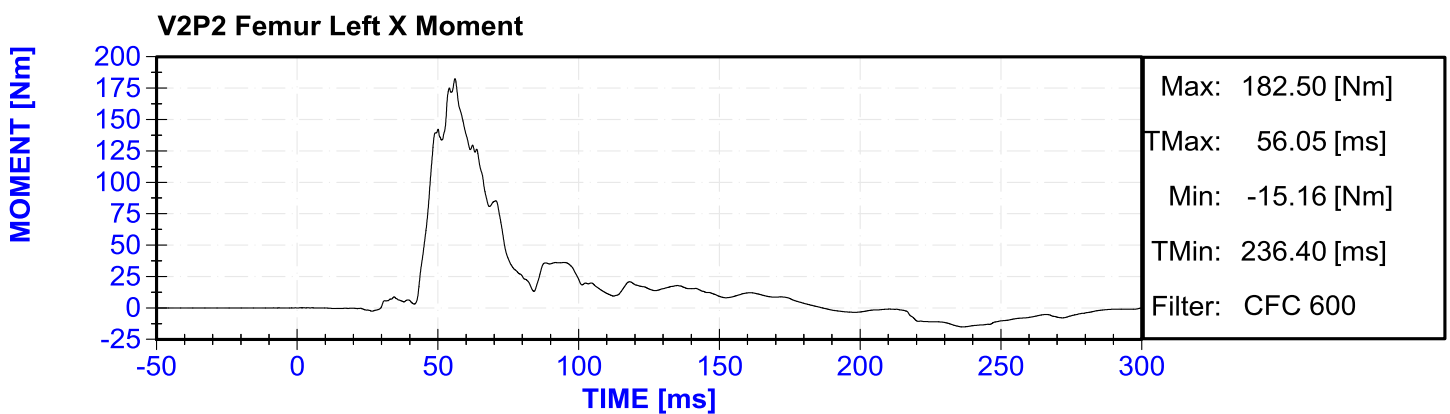
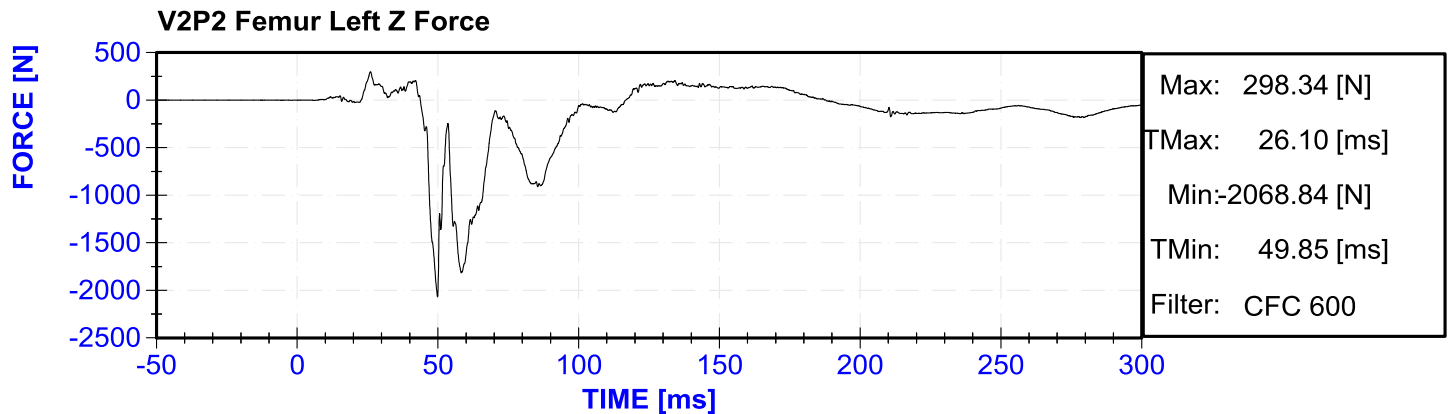
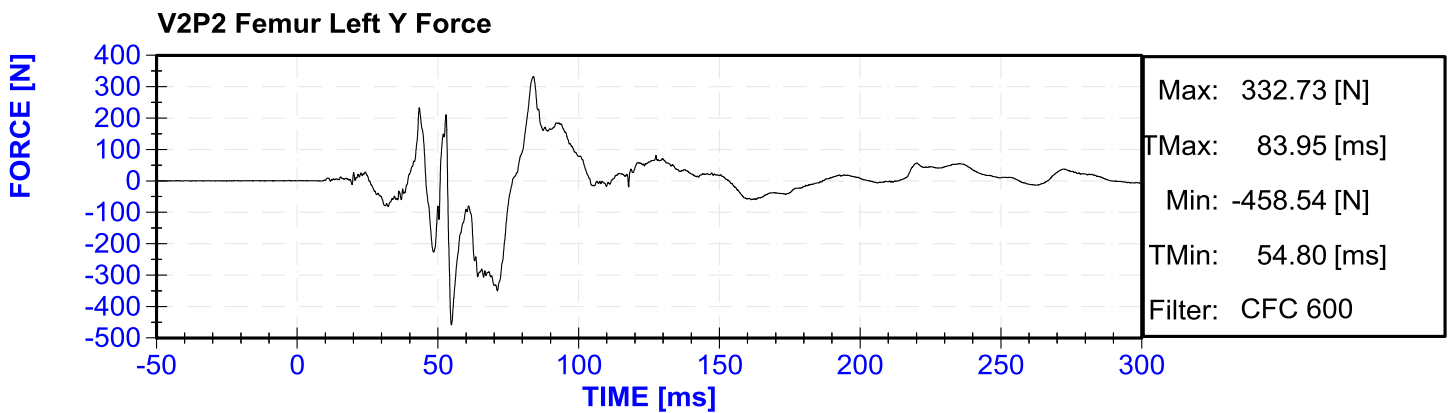
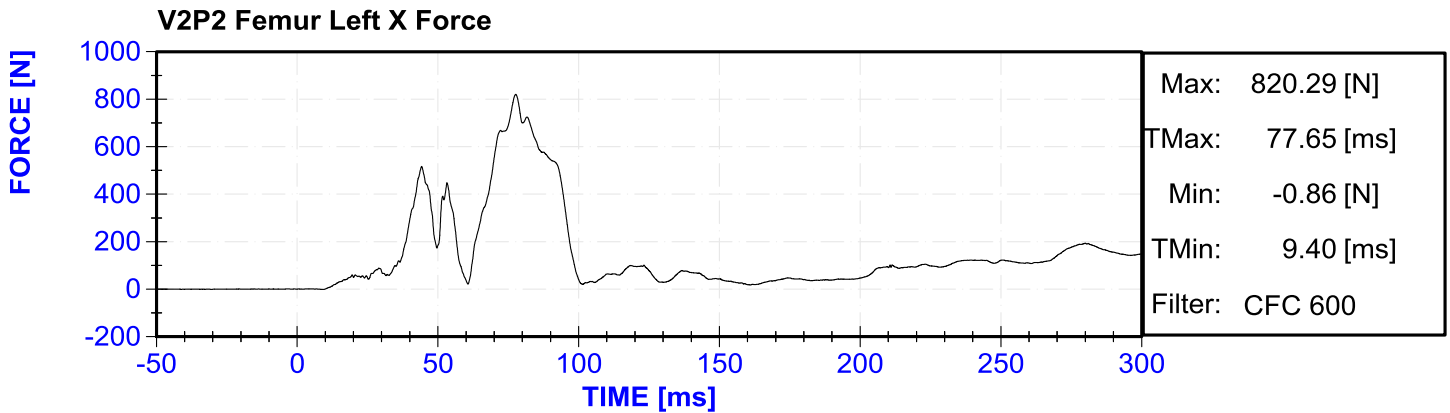


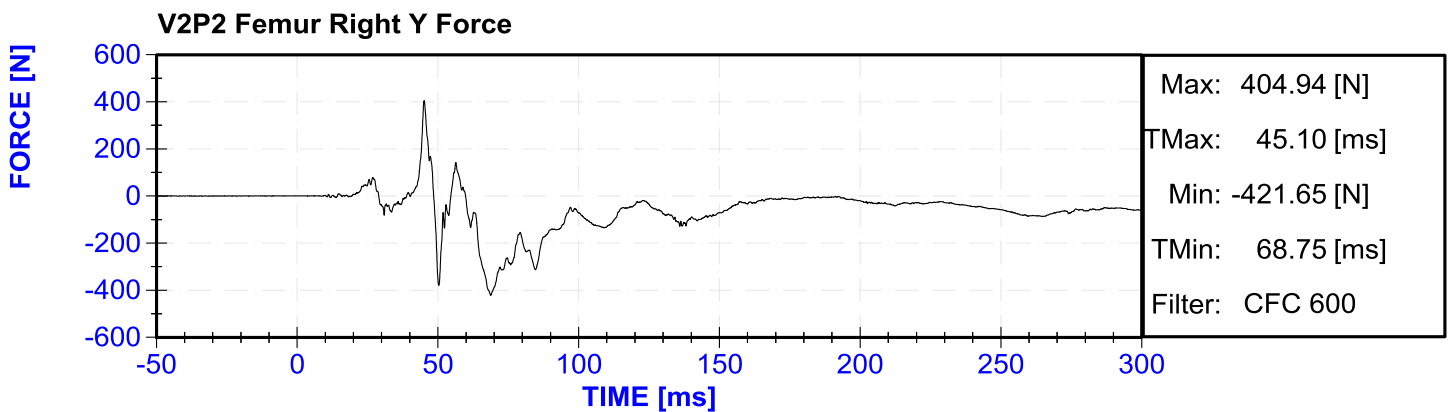
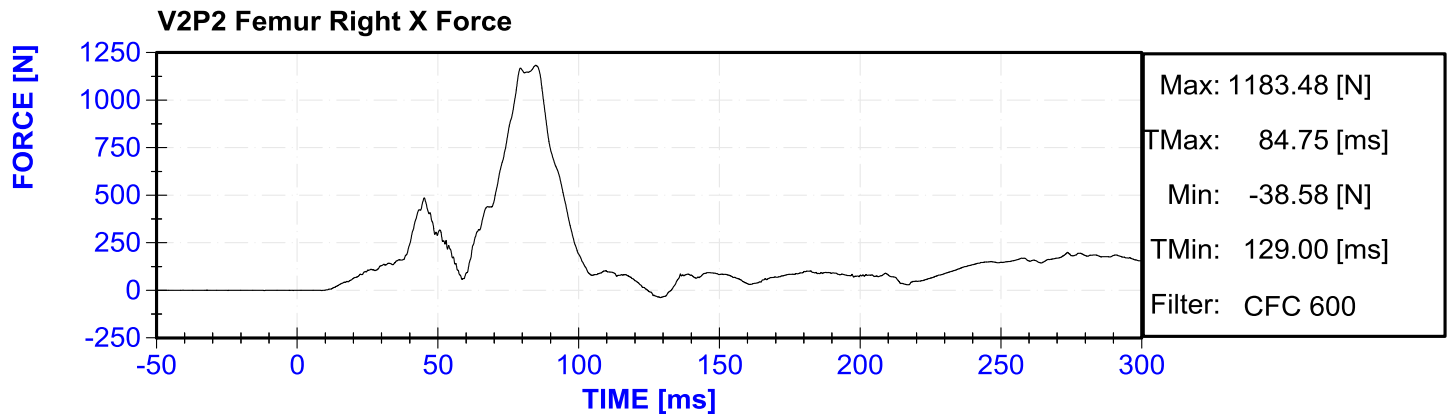
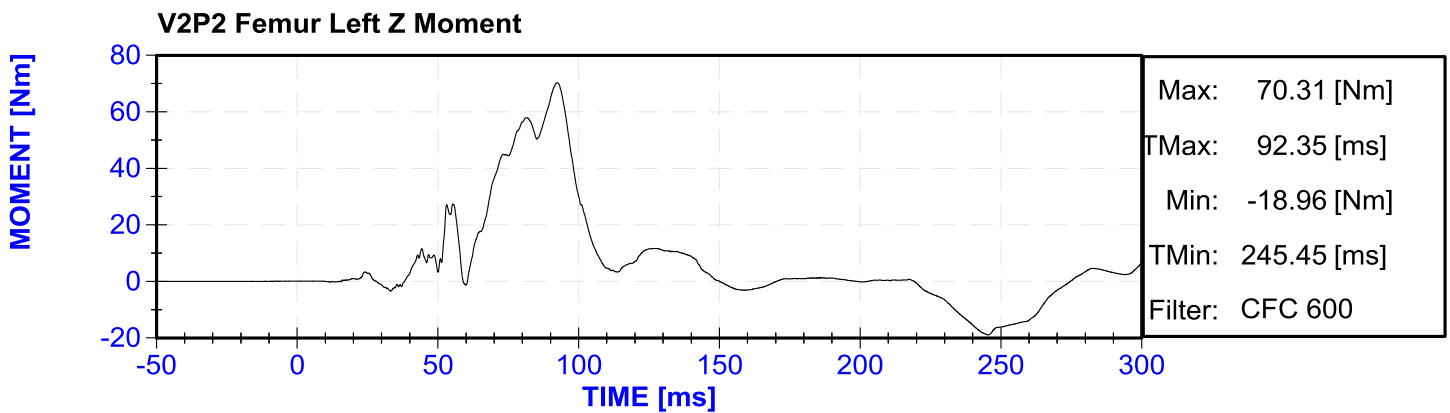
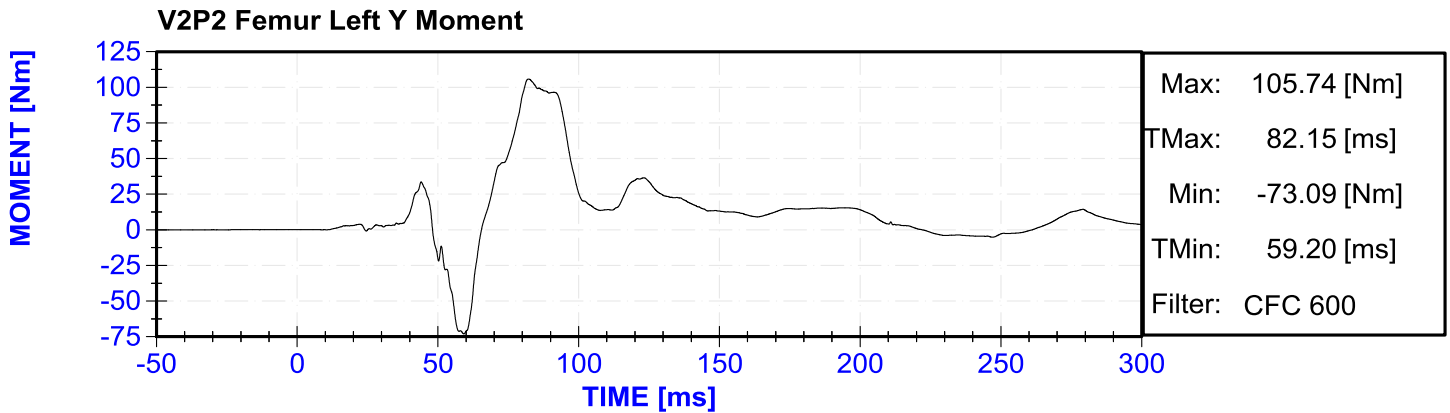


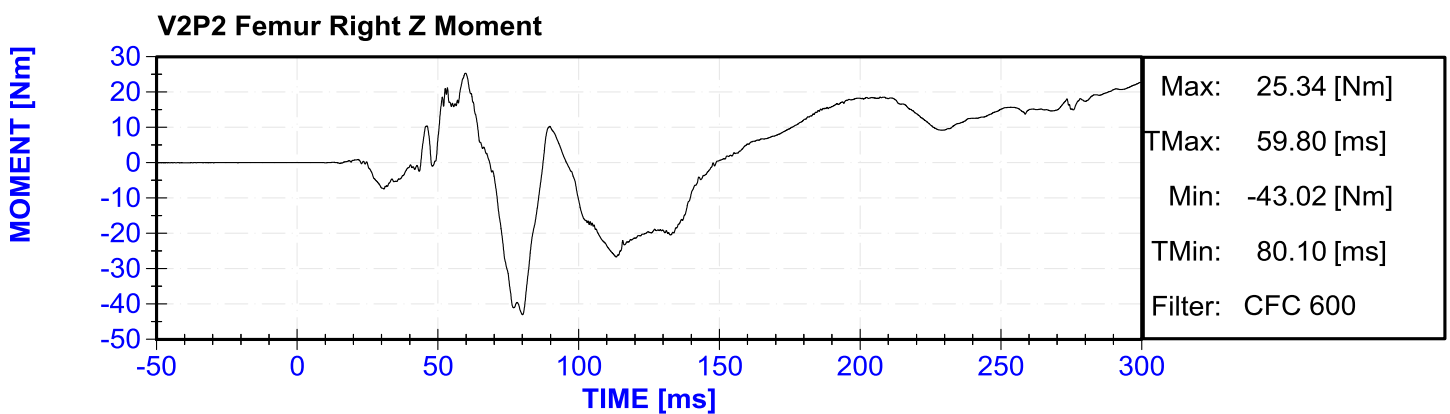
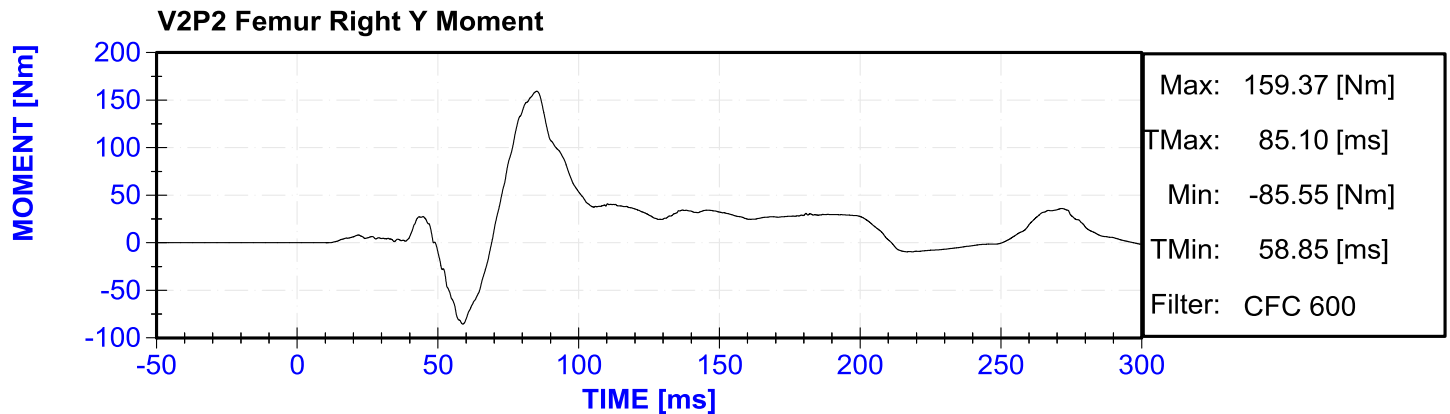
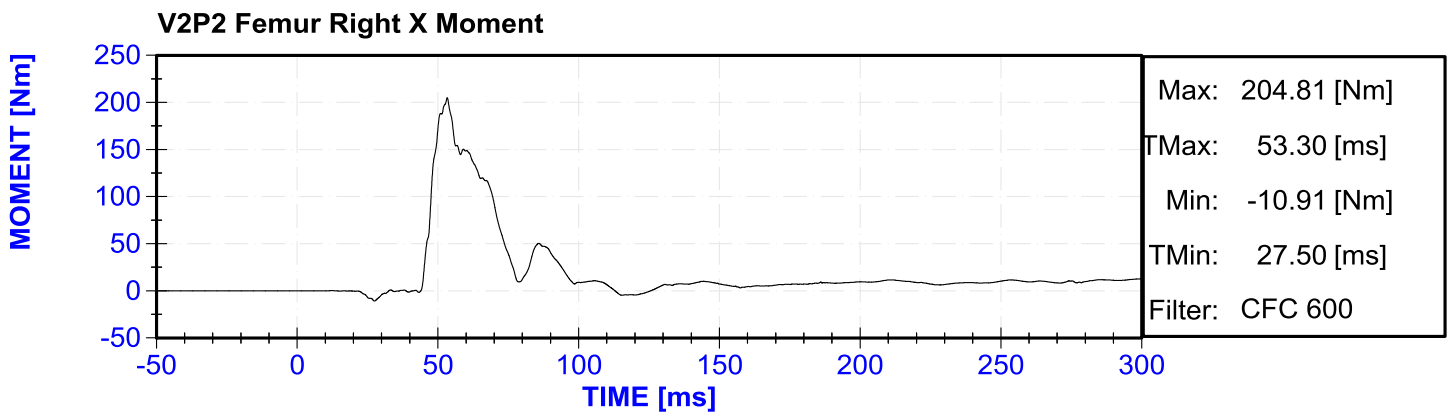
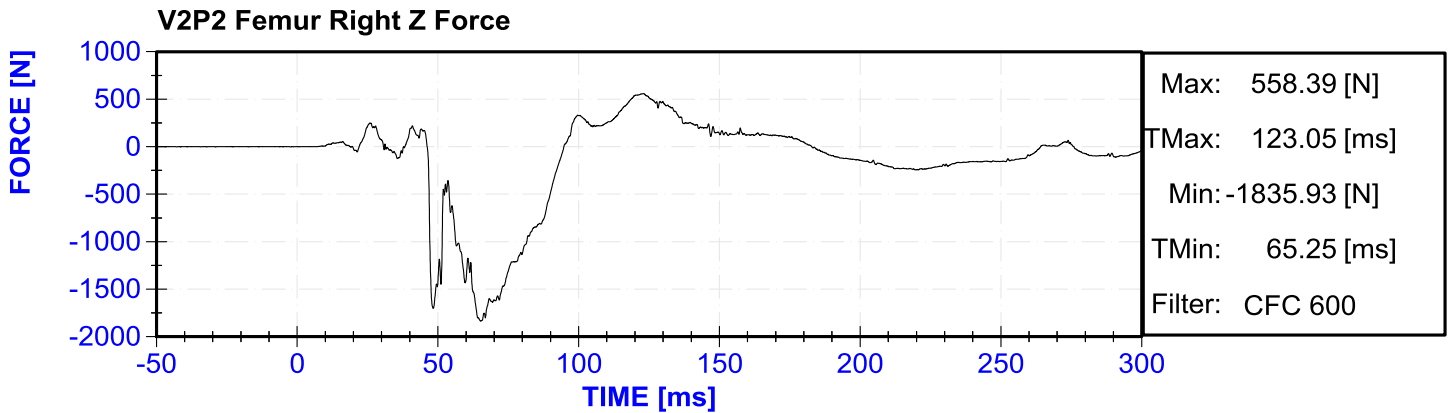


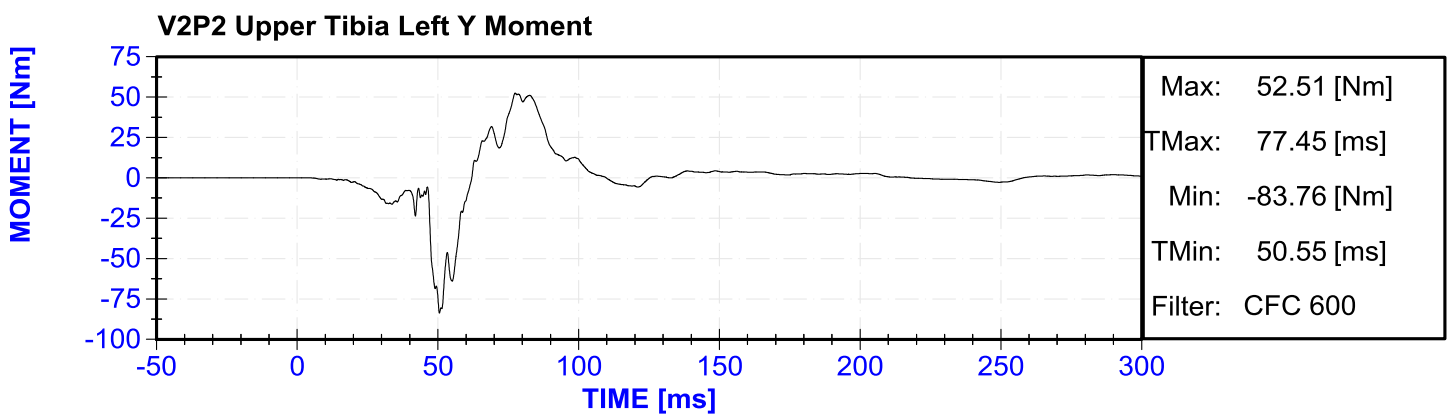
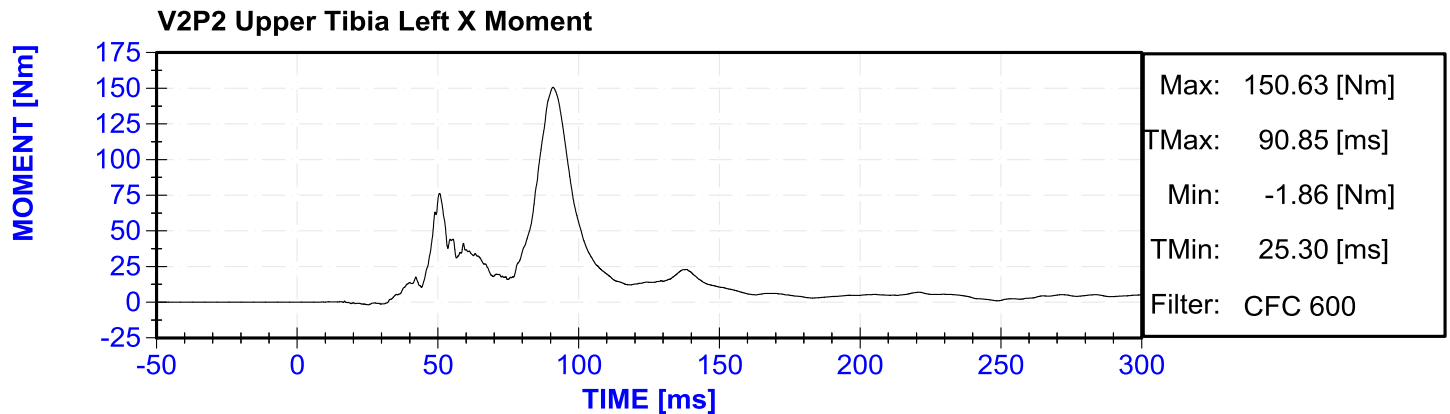
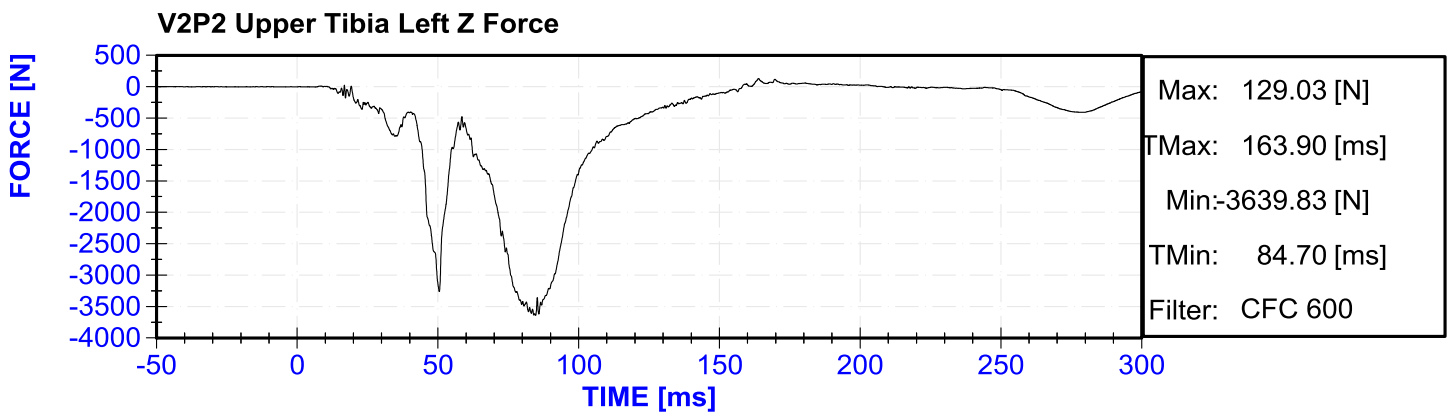
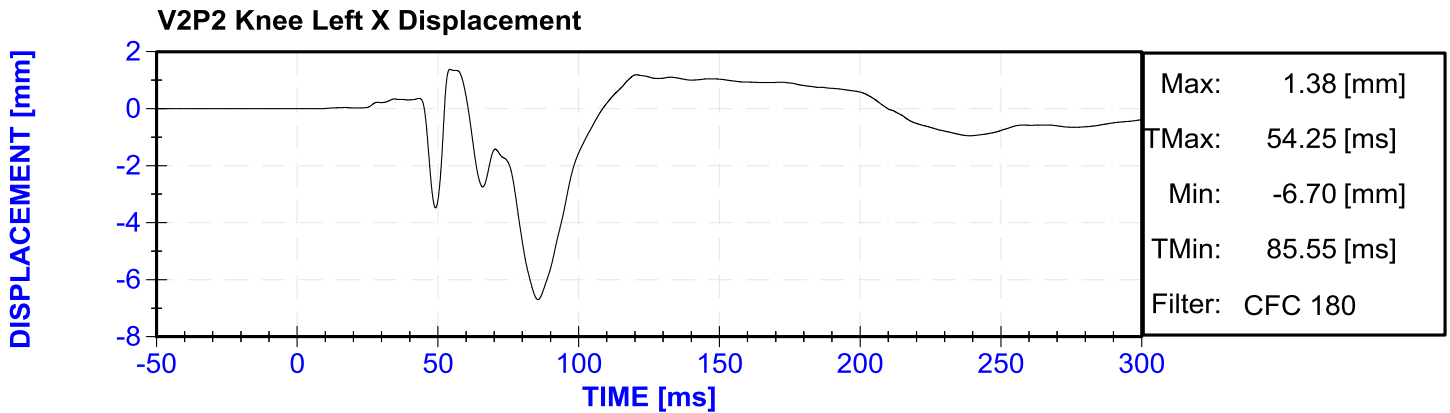


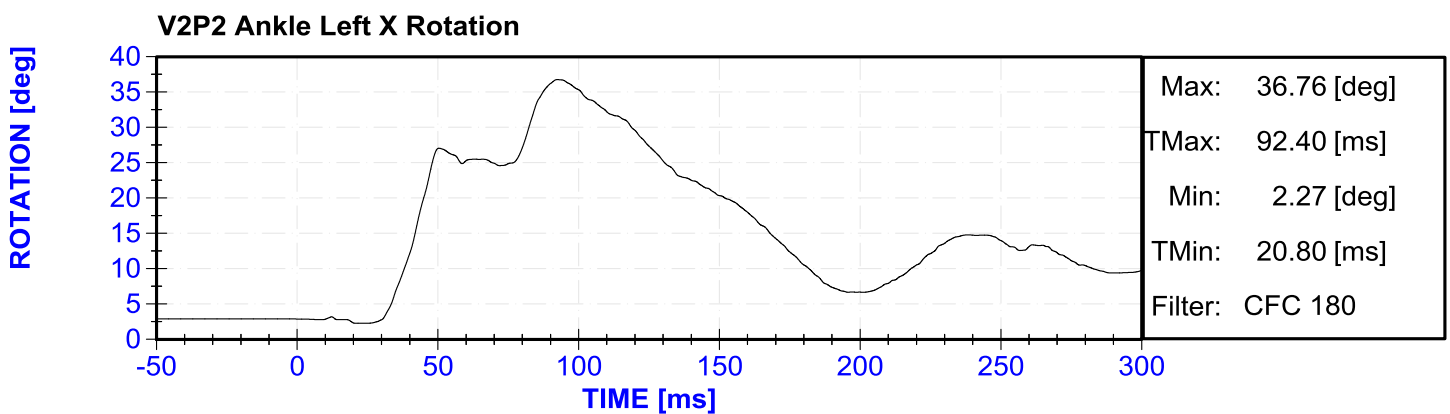
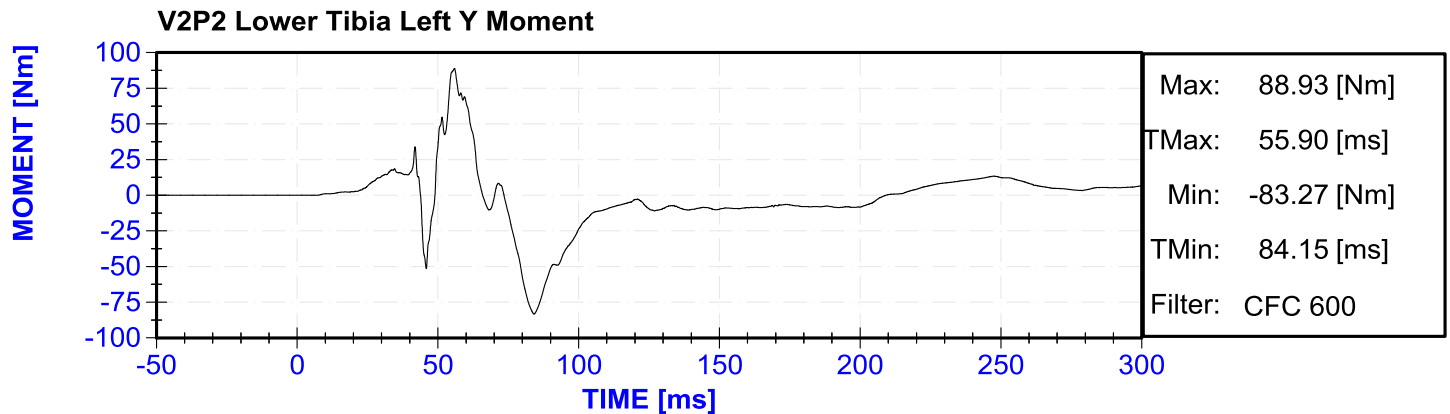
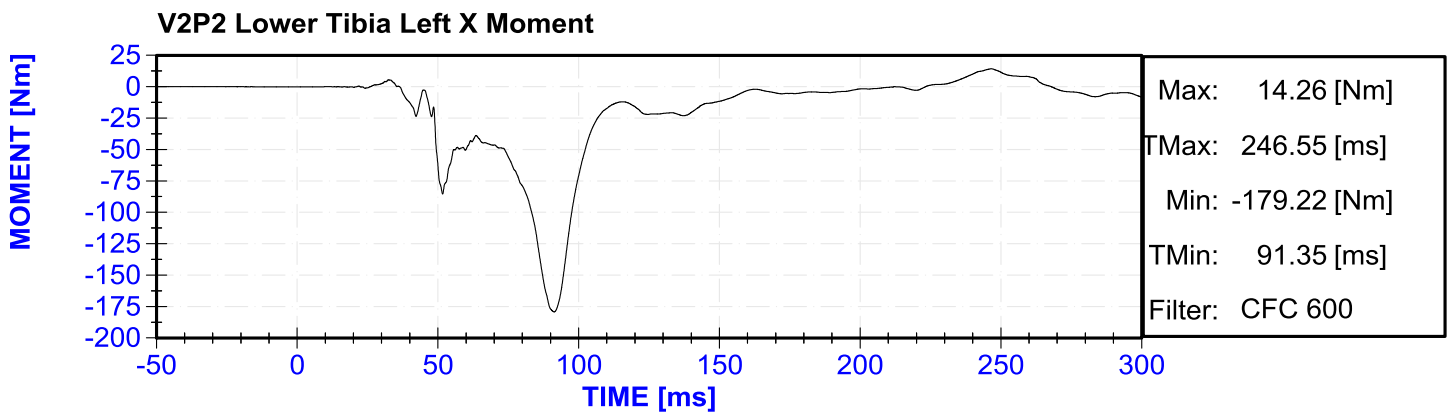
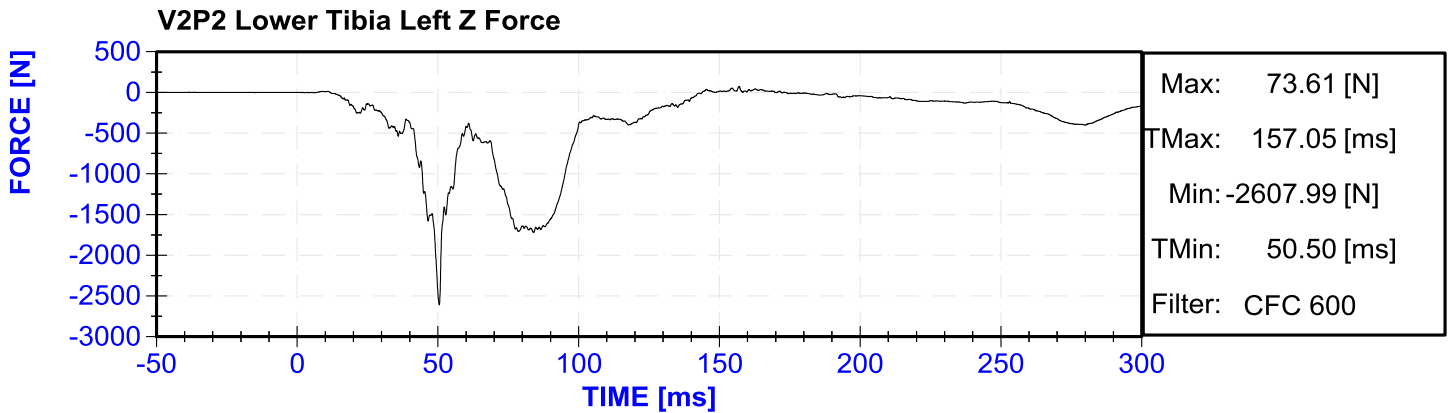


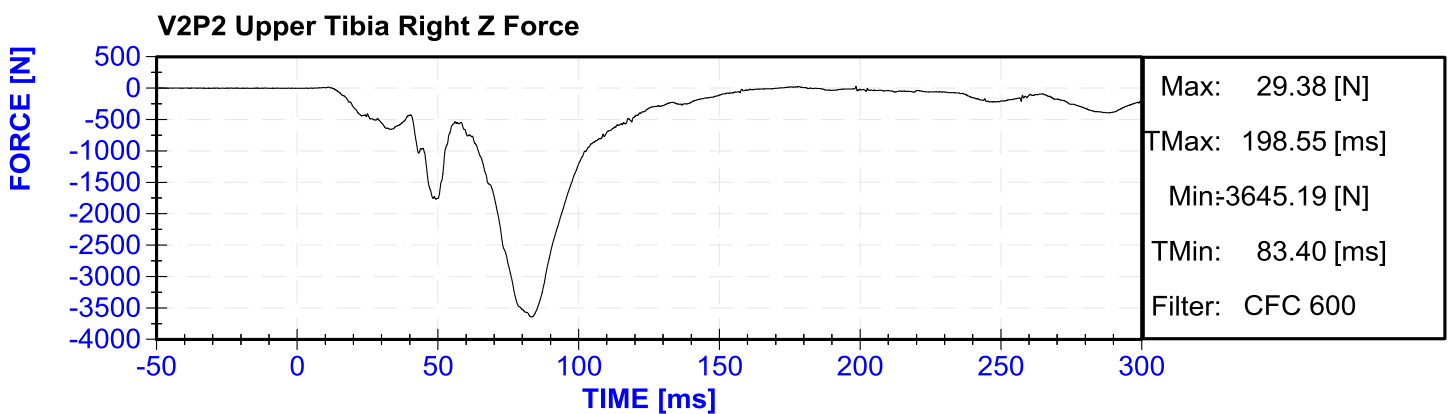
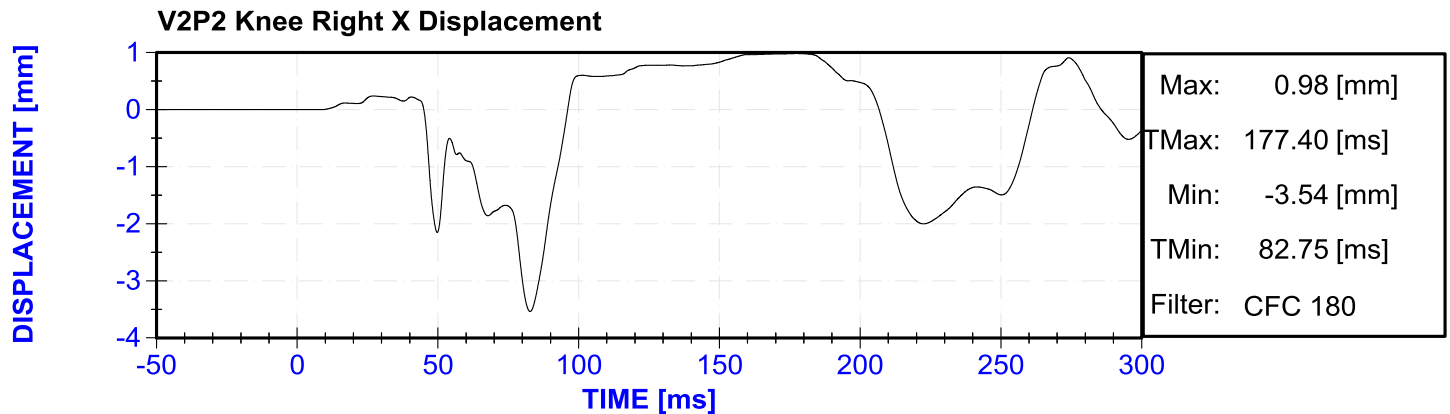
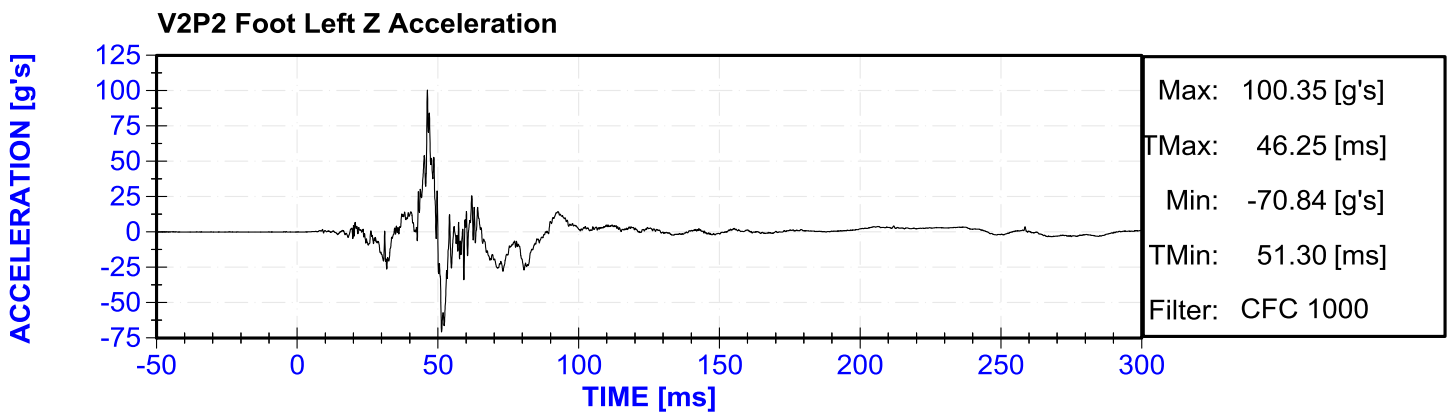
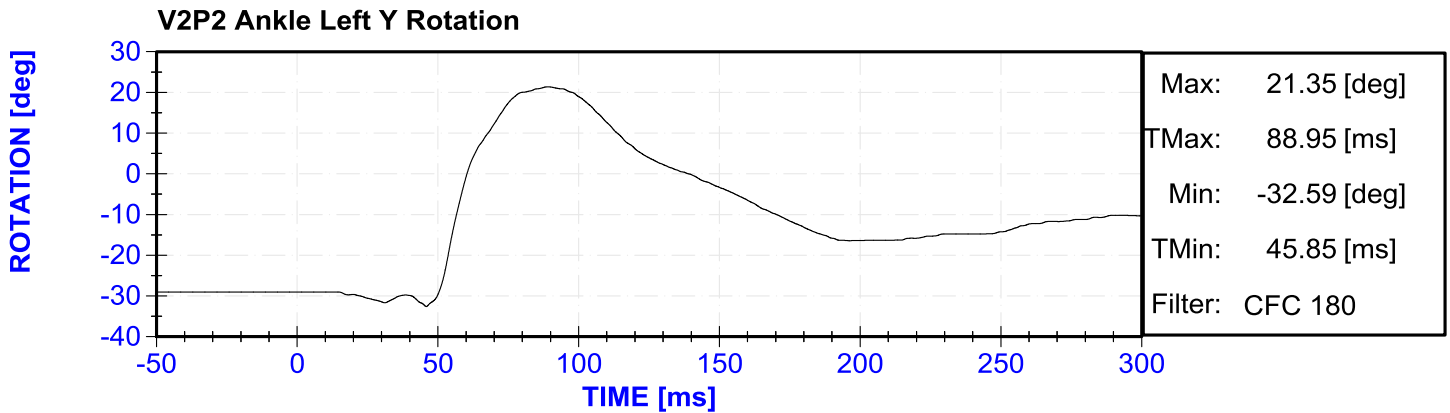


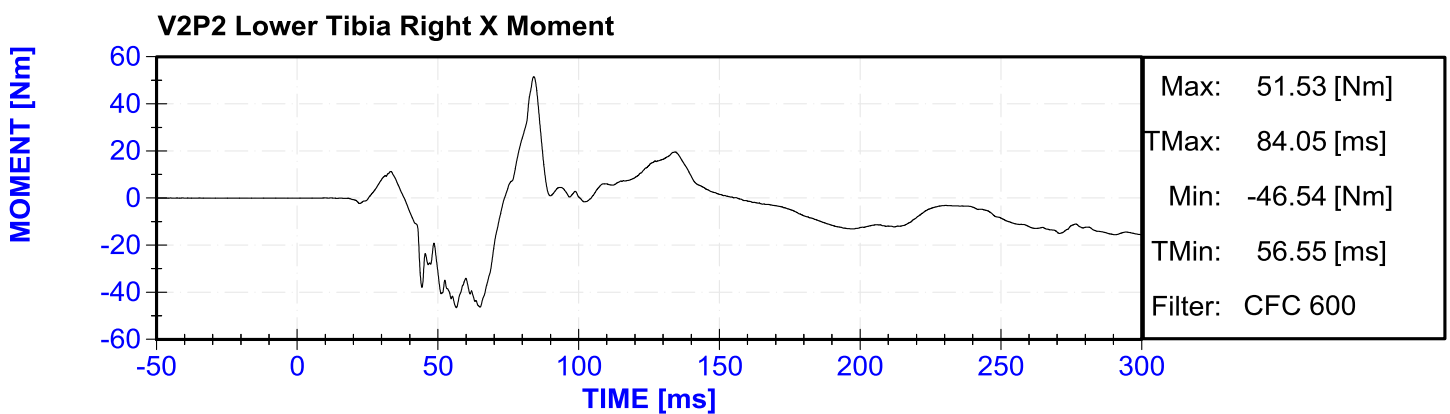
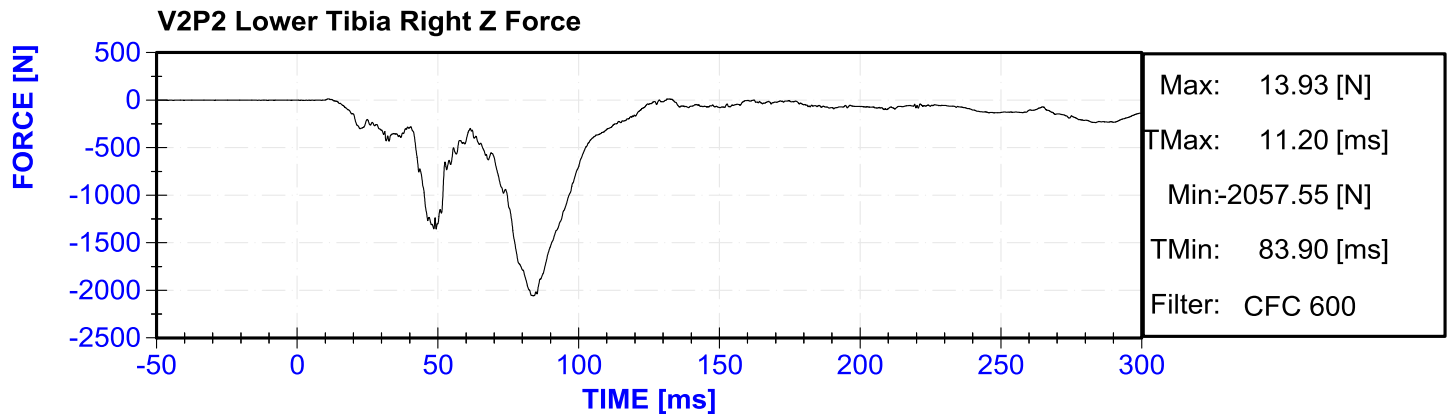
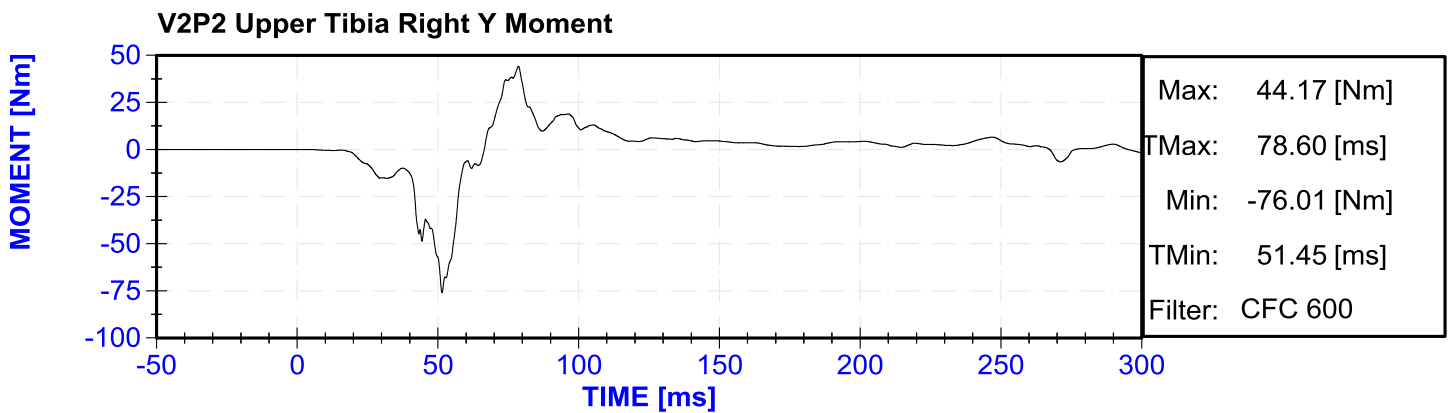
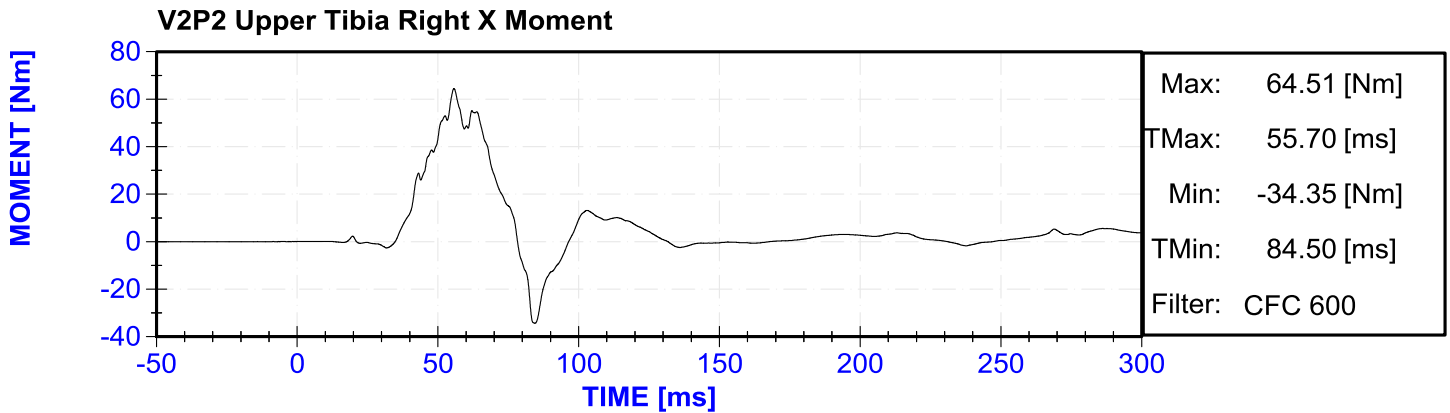


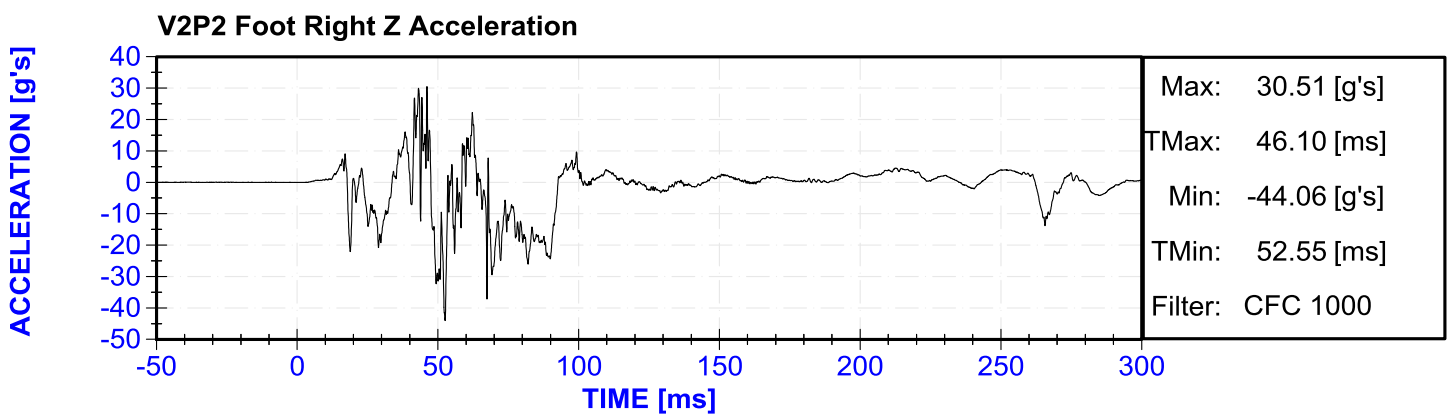
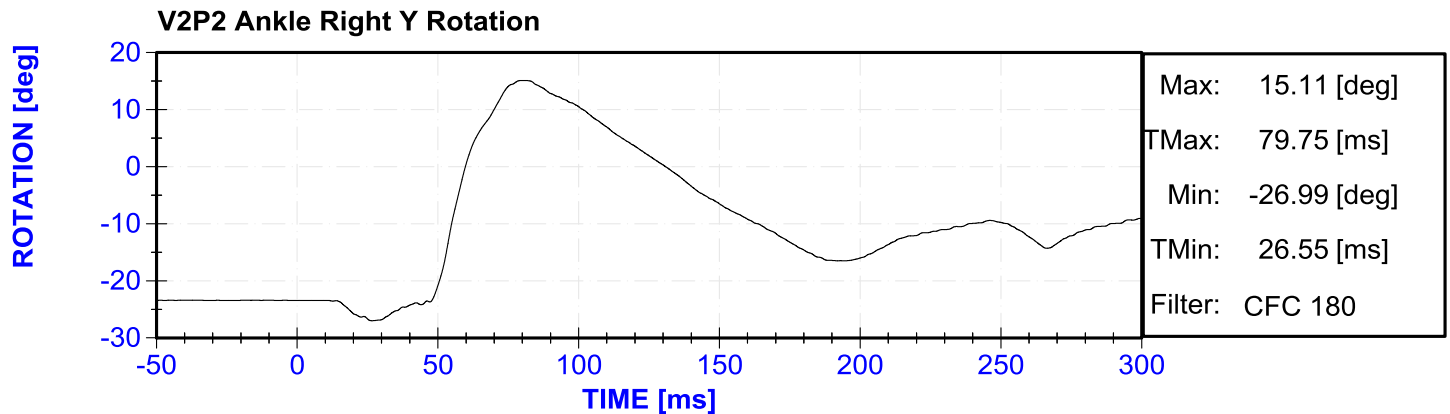
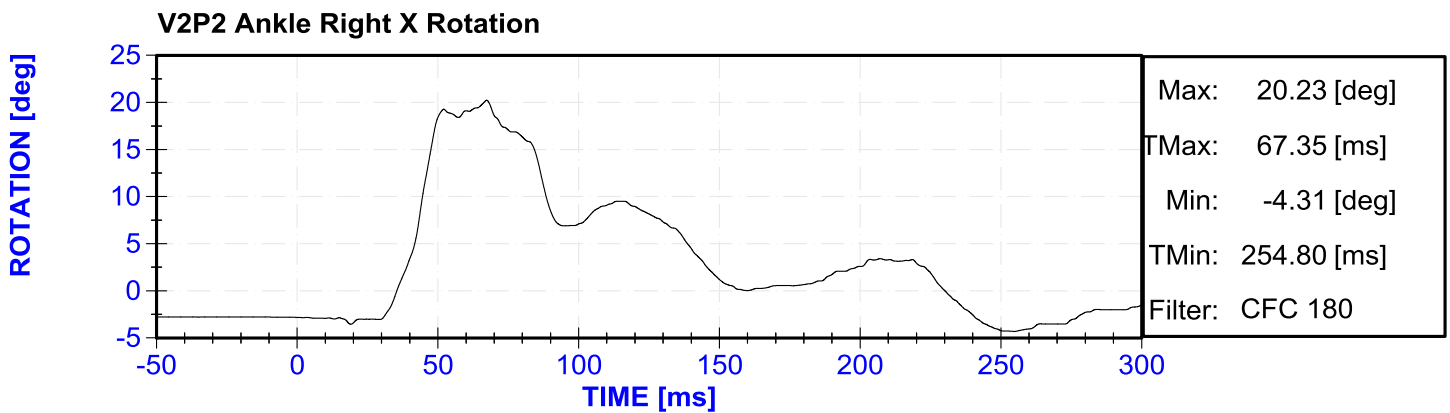
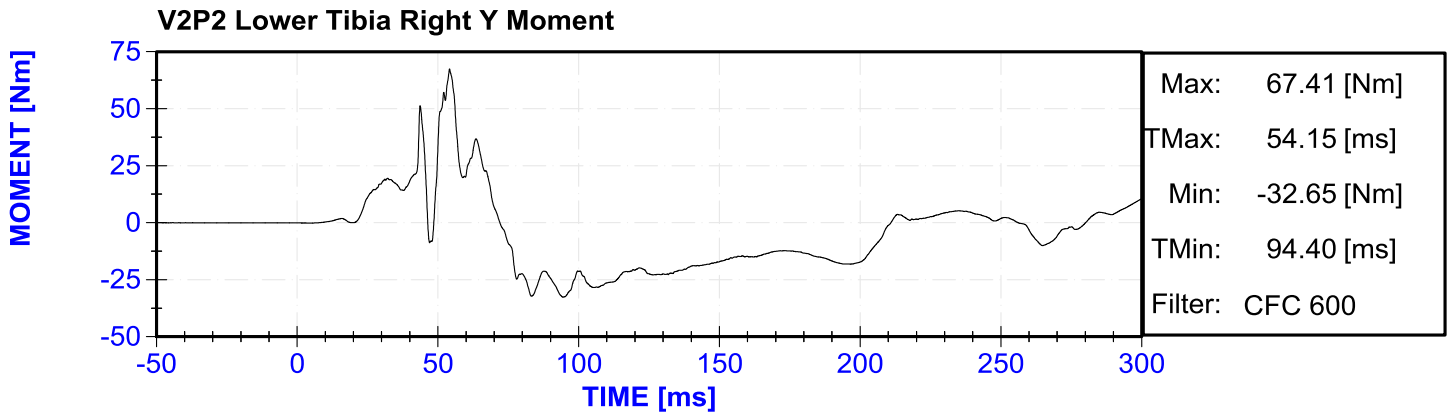




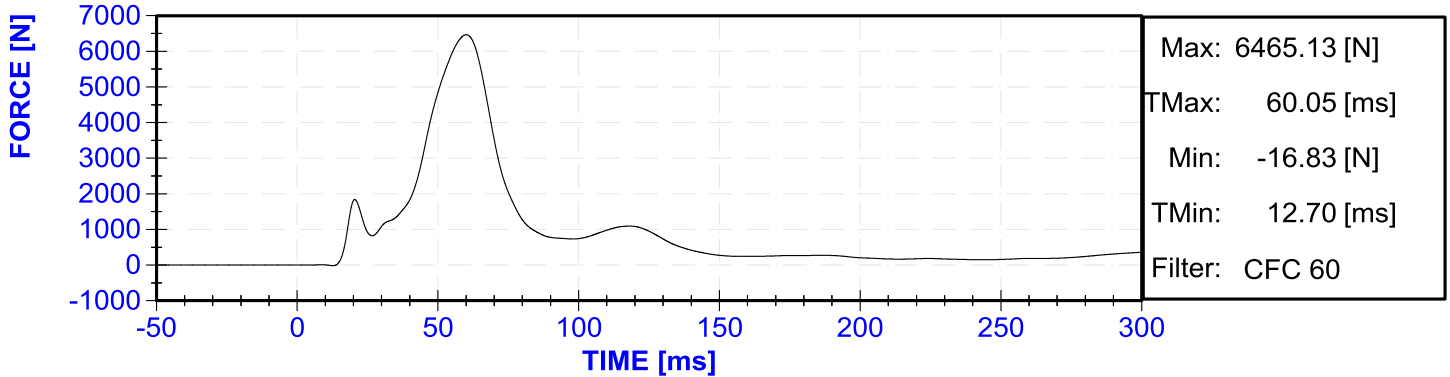




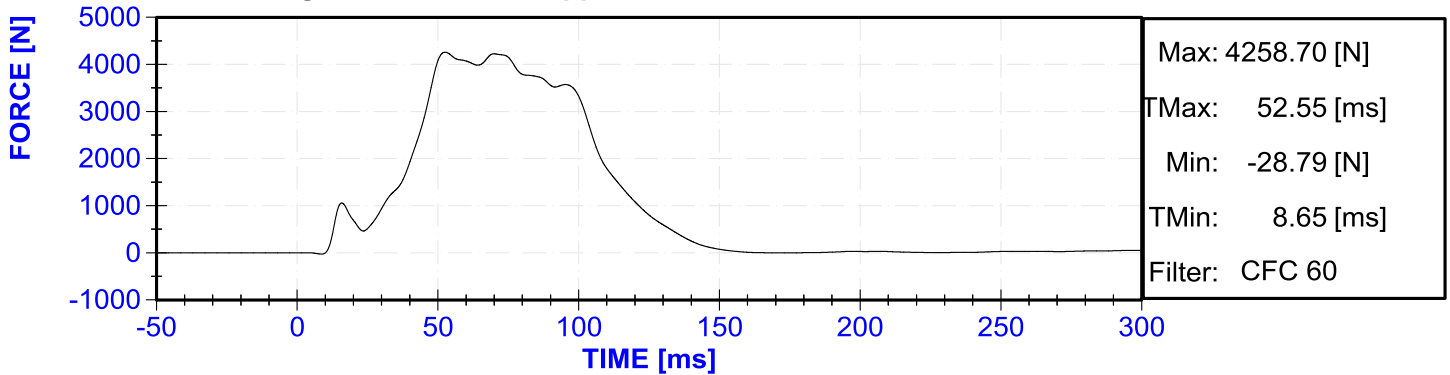




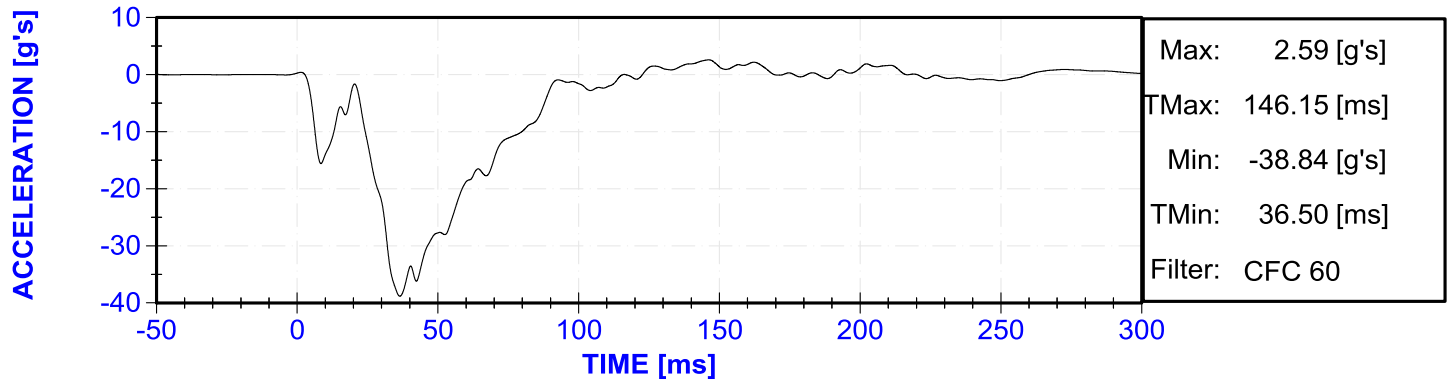
V2 Passenger Lap Belt Force



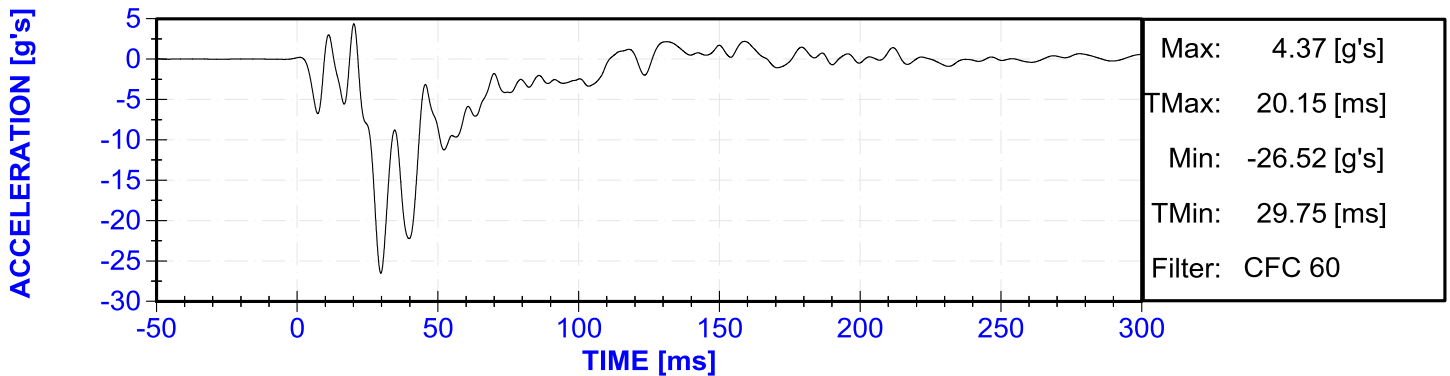
V2 Passenger Shoulder Belt Upper Force

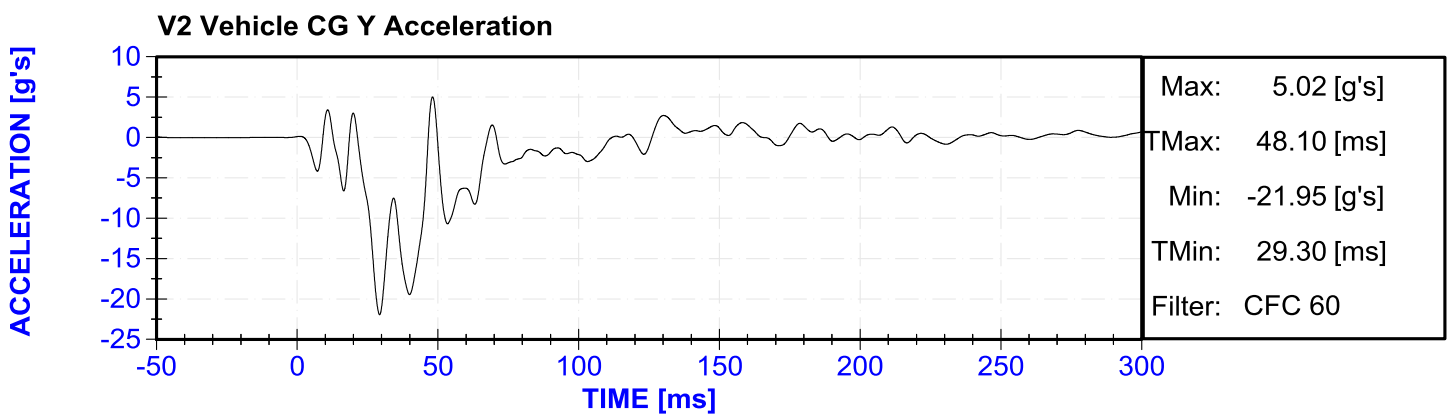
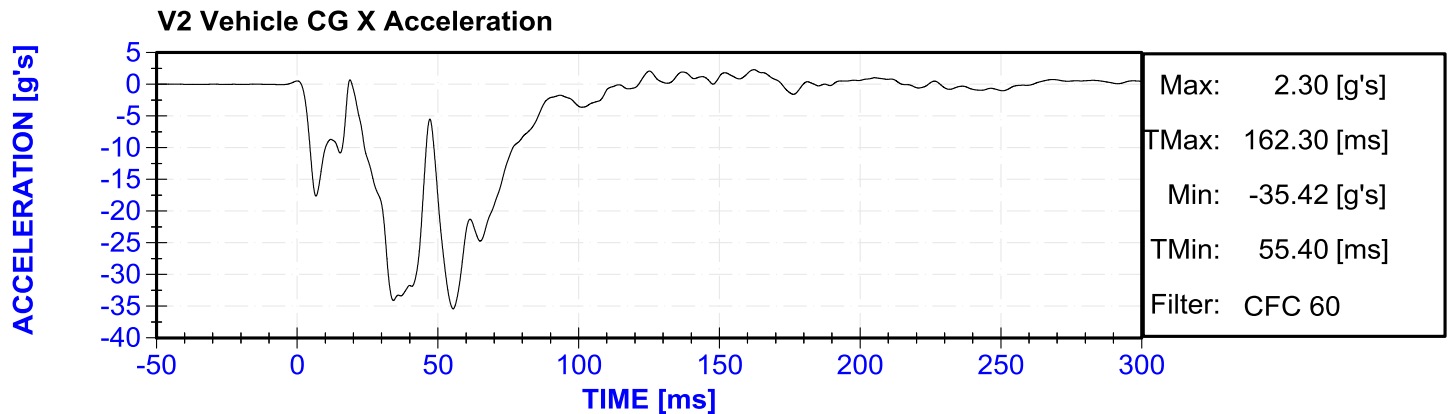
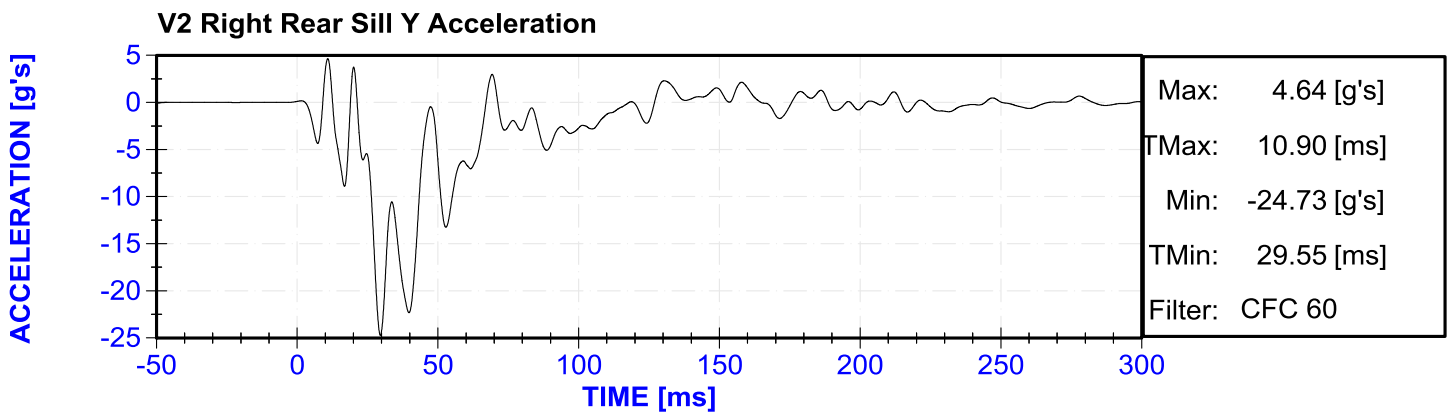
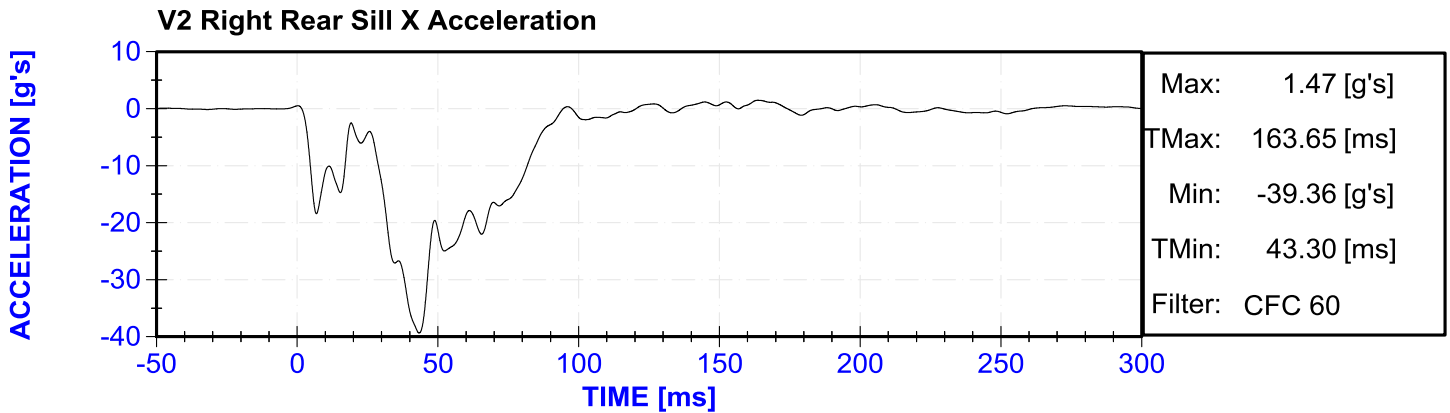


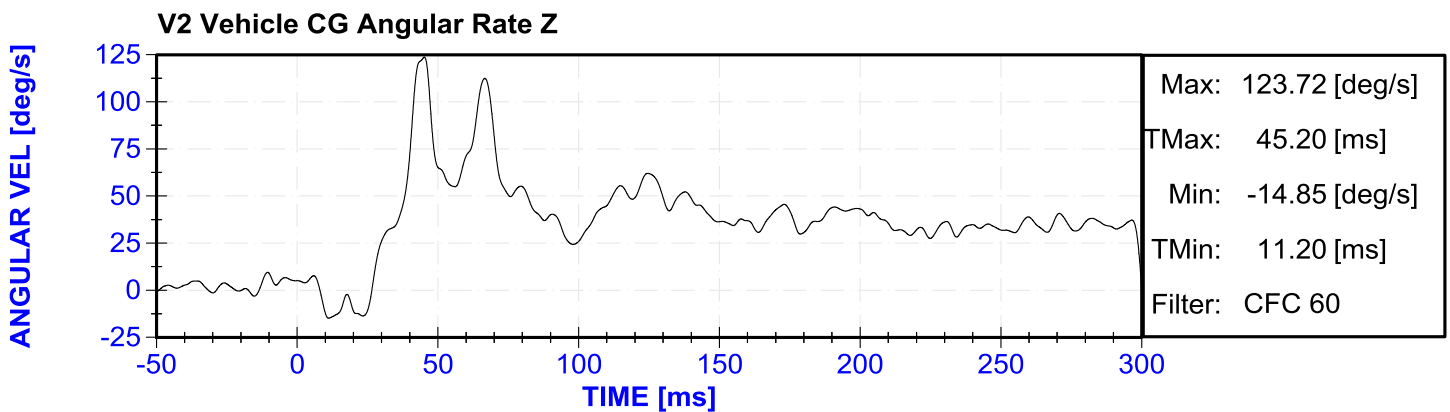
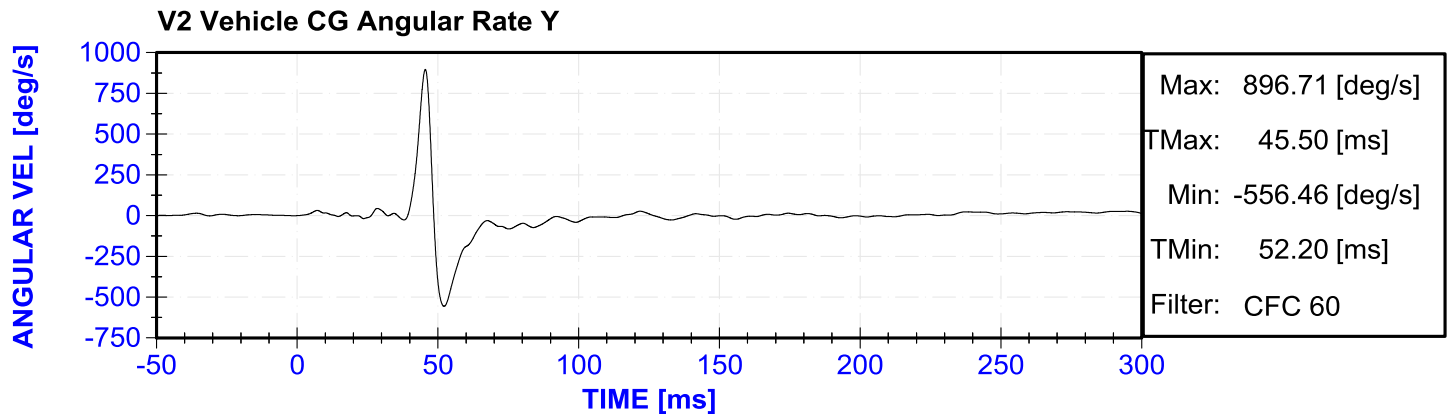
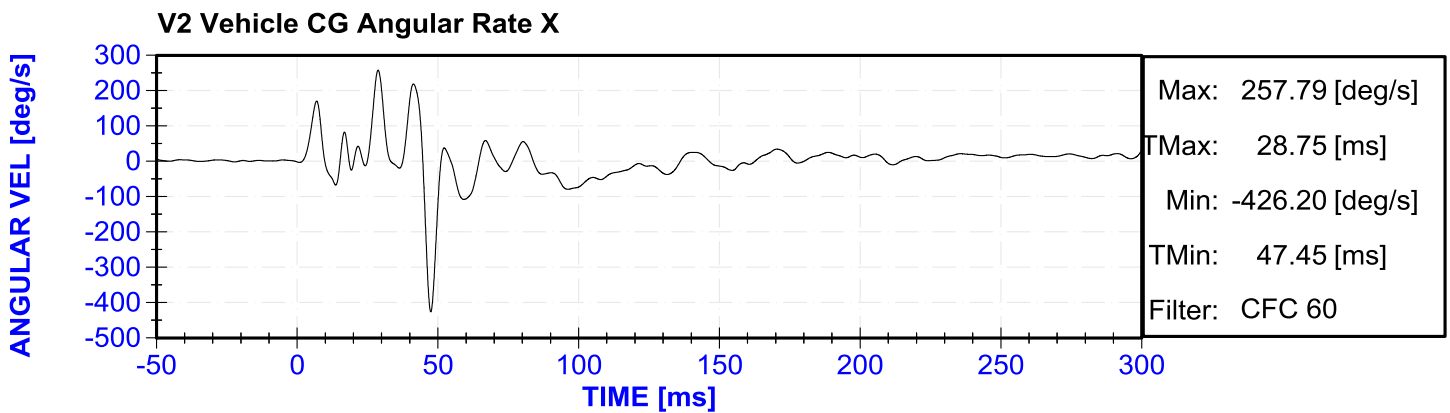
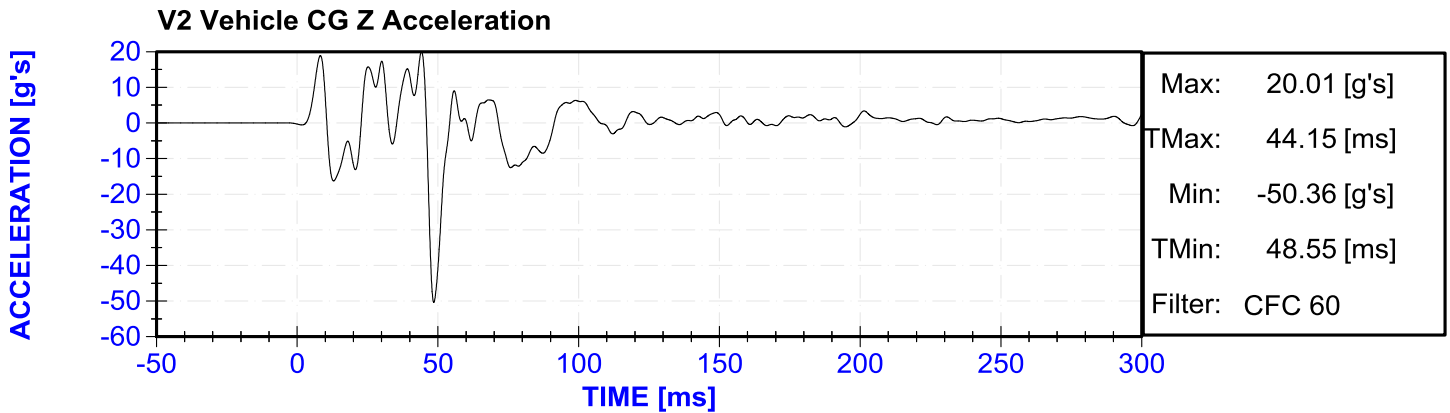
V2 Left Rear Sill X Acceleration



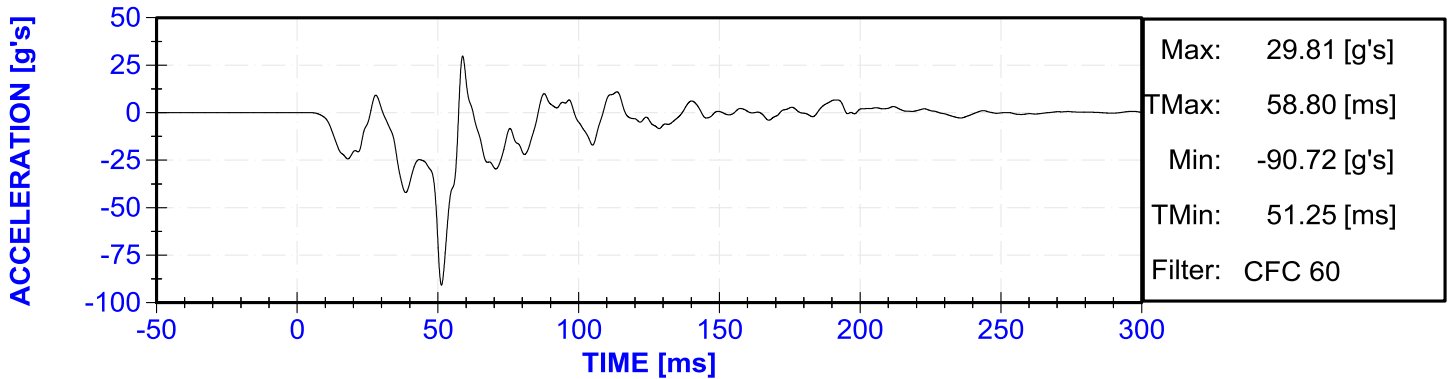
V2 Left Rear Sill Y Acceleration



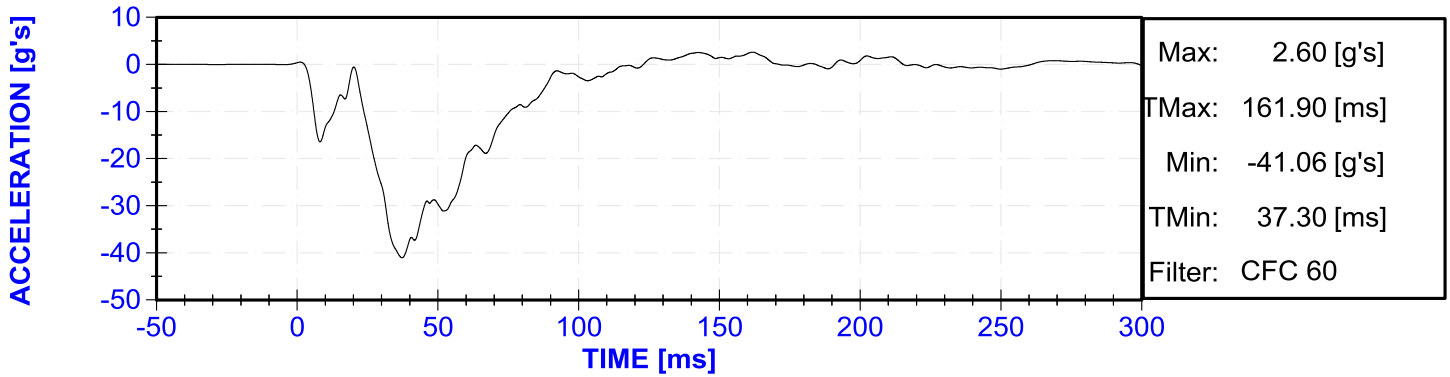




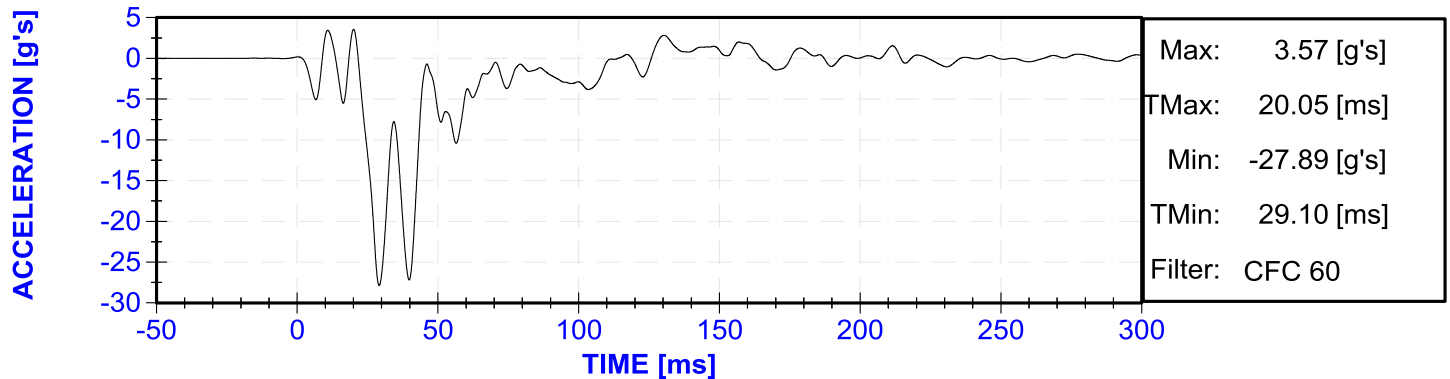
V2 Instrument Panel X Acceleration



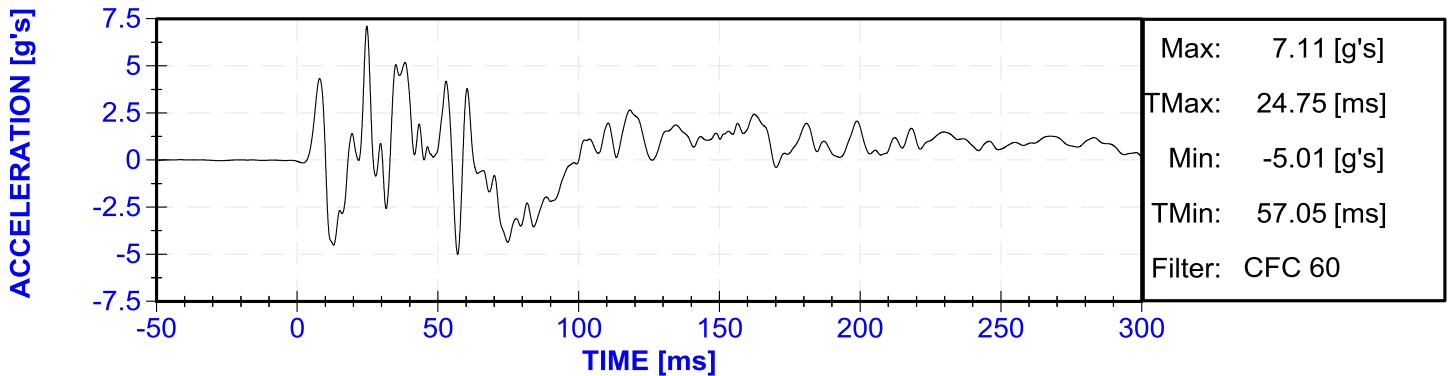
V2 Driver Seat Track X Acceleration



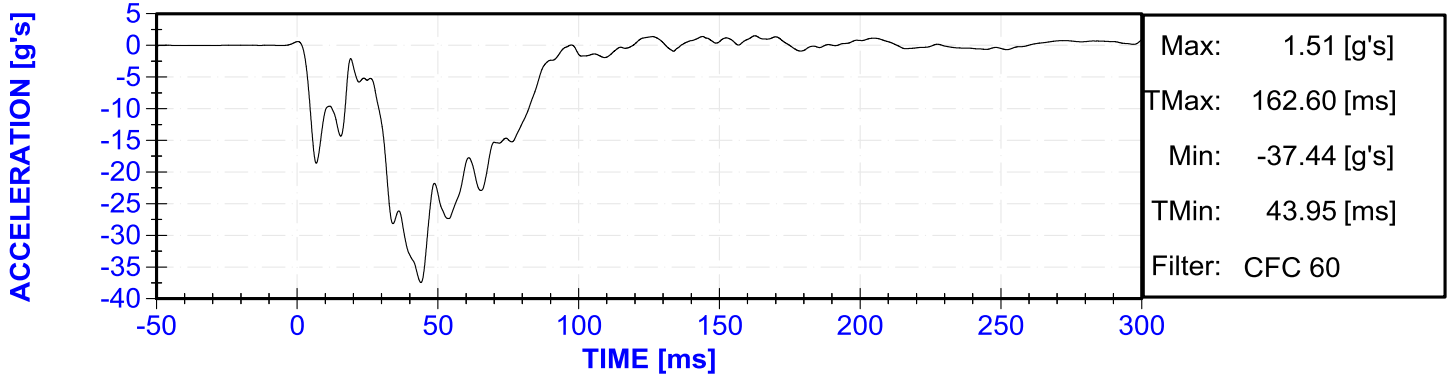
V2 Driver Seat Track Y Acceleration



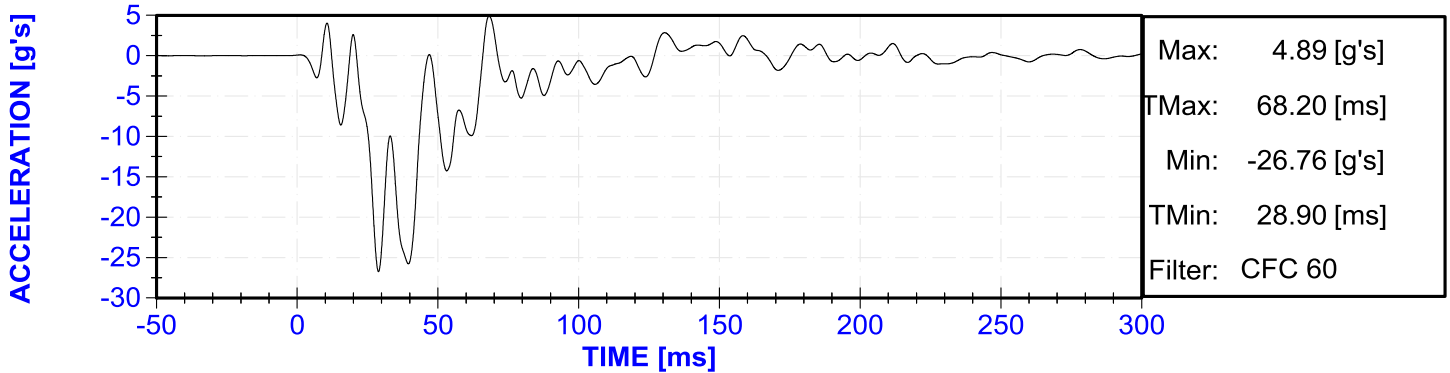
V2 Driver Seat Track Z Acceleration



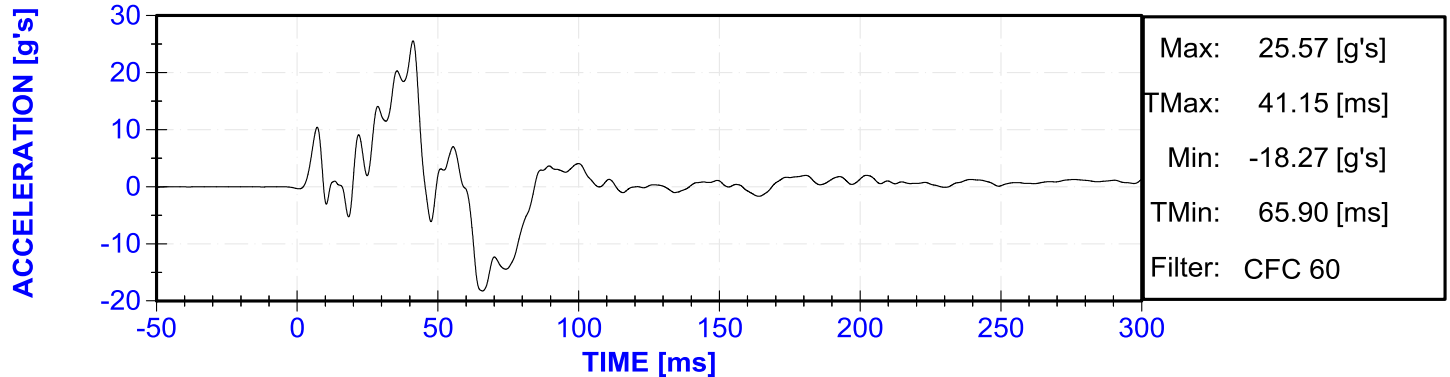
V2 Passenger Seat Track X Acceleration



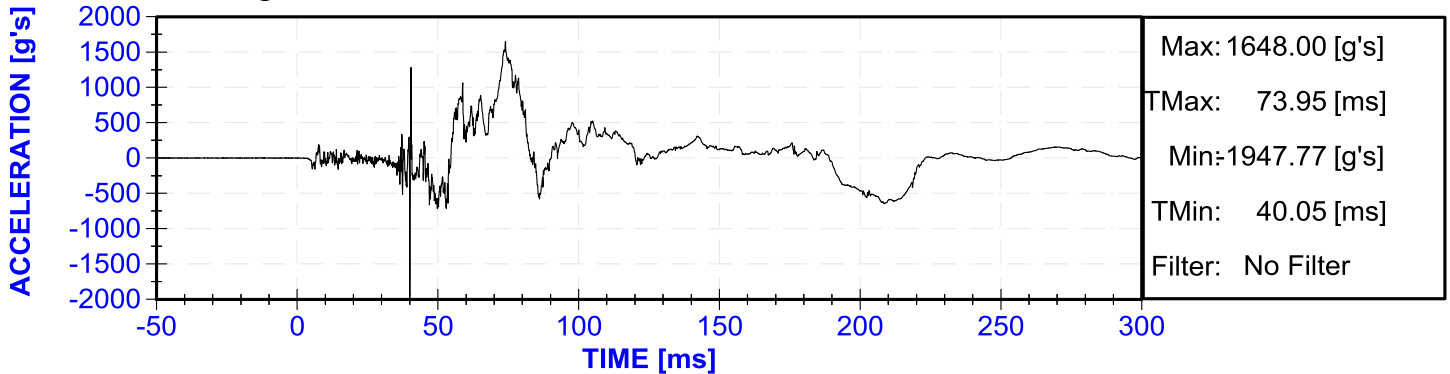
V2 Passenger Seat Track Y Acceleration

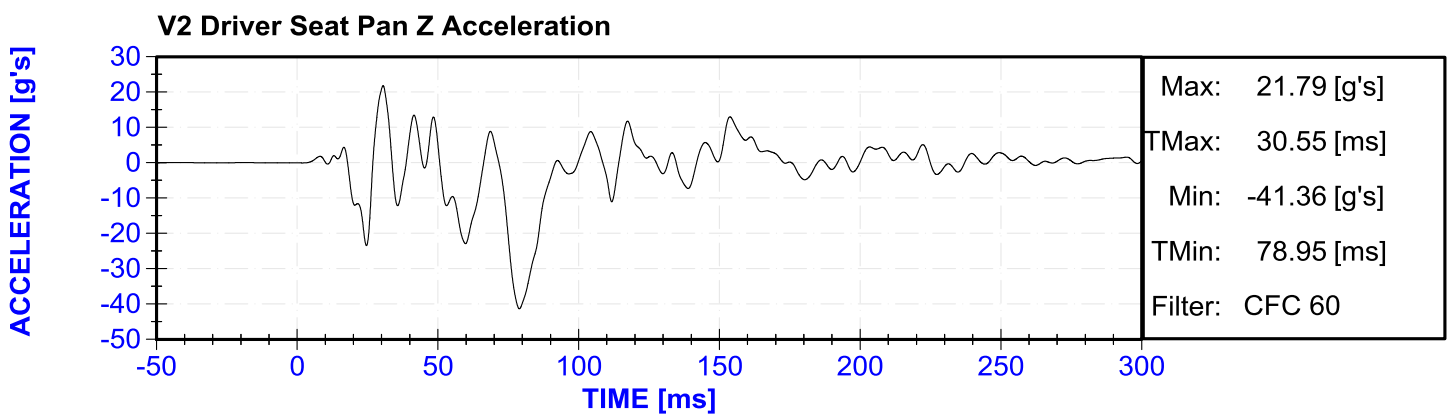
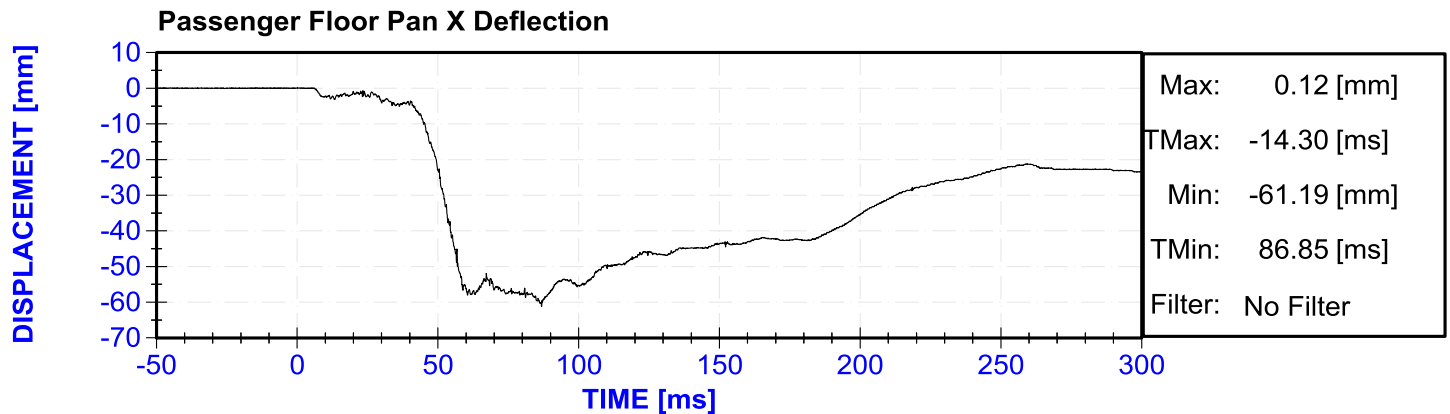
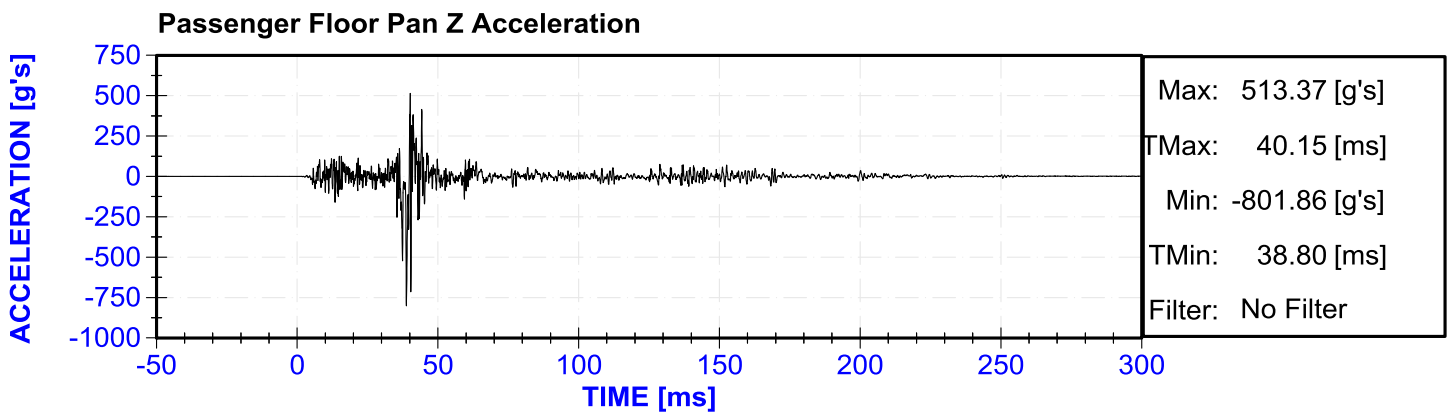
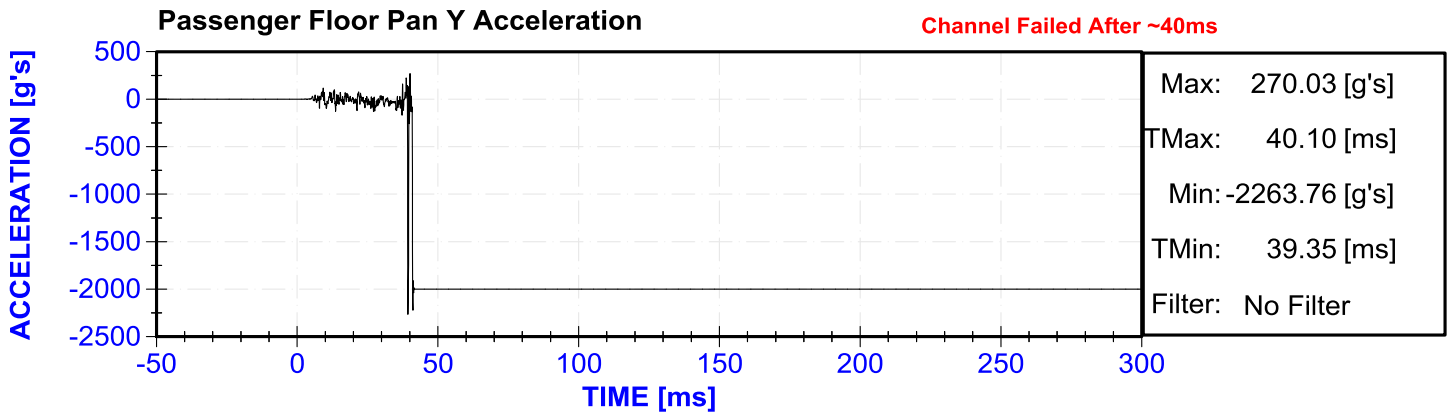


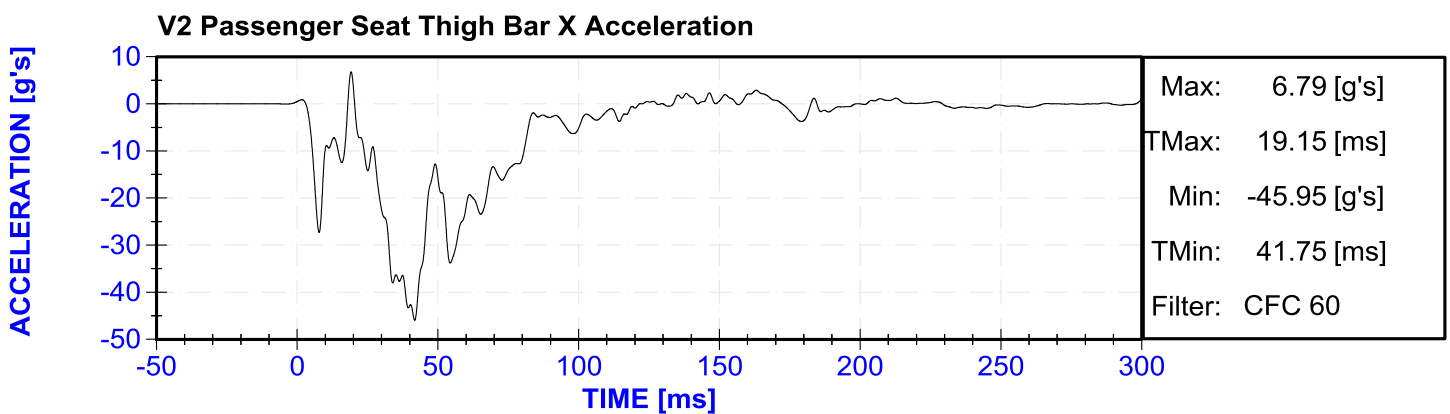
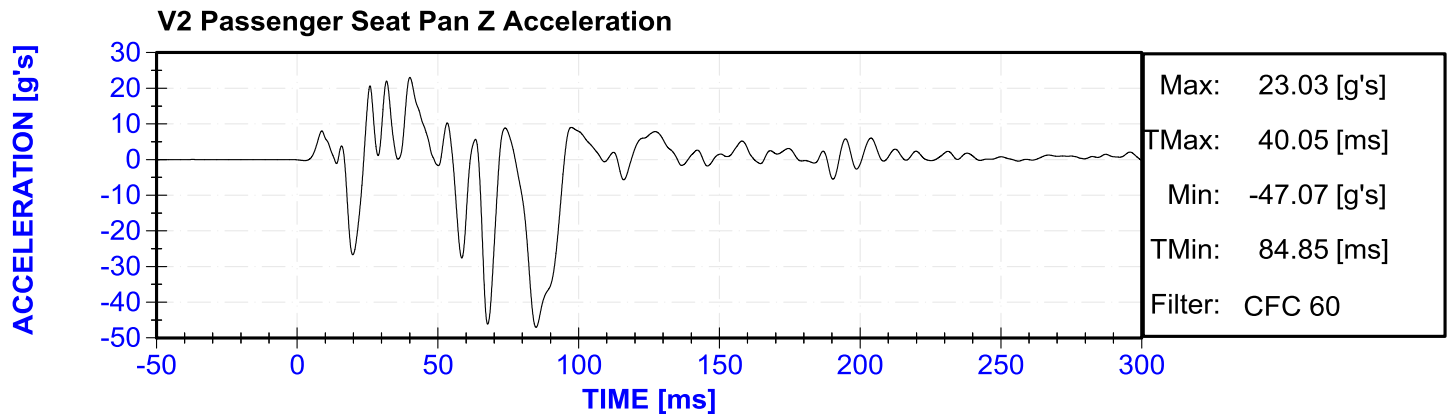
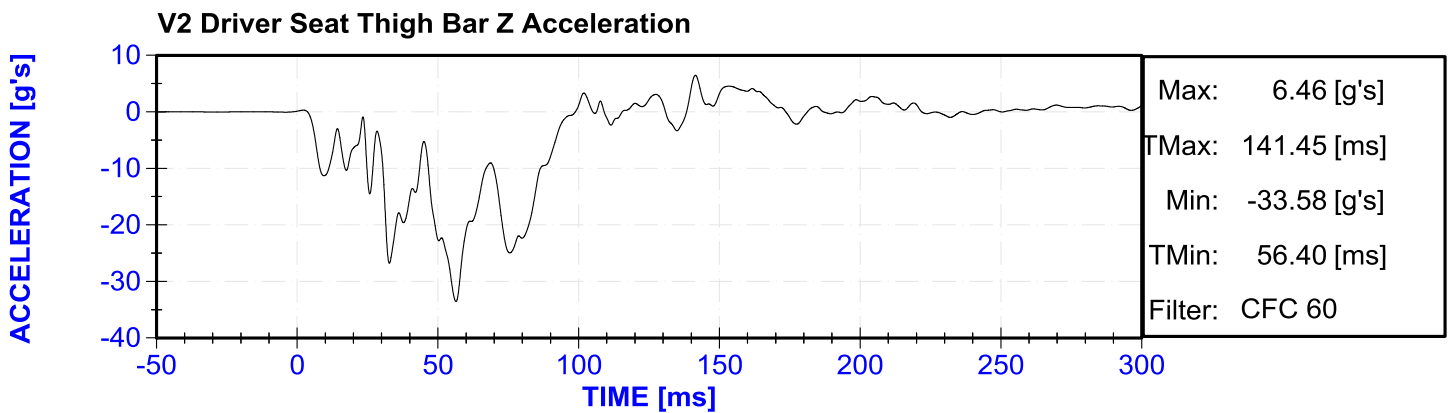
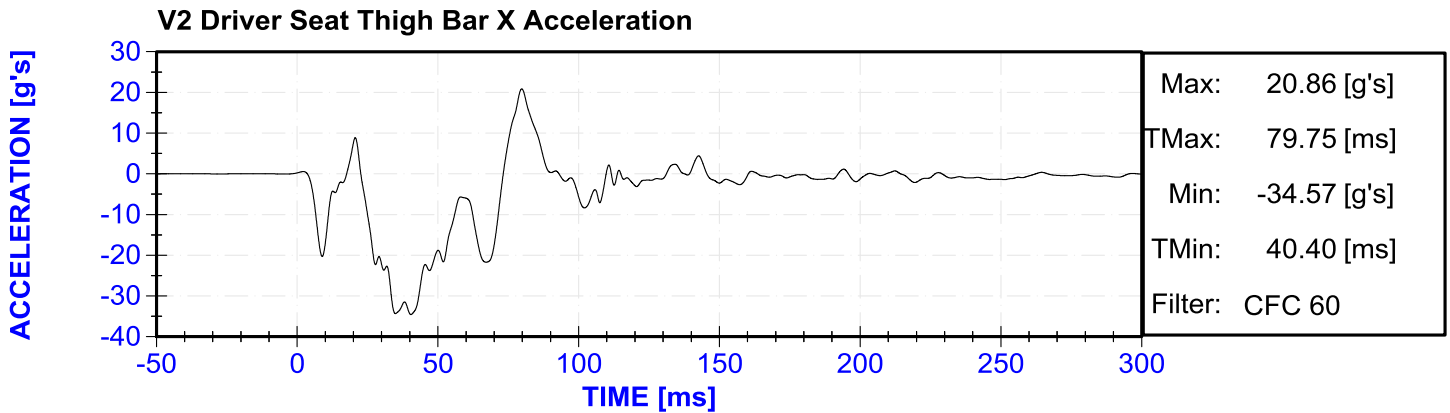
V2 Passenger Seat Track Z Acceleration



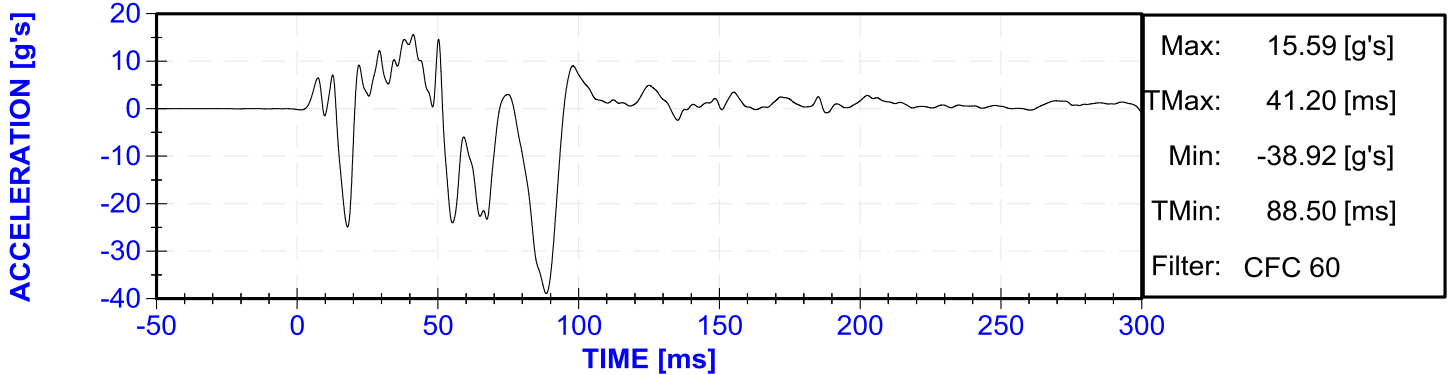
Passenger Floor Pan X Acceleration



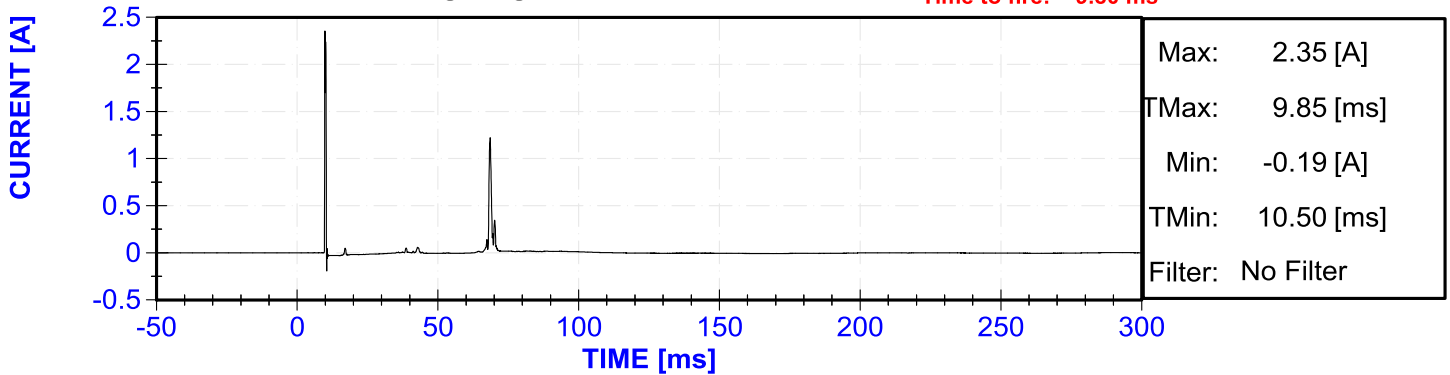




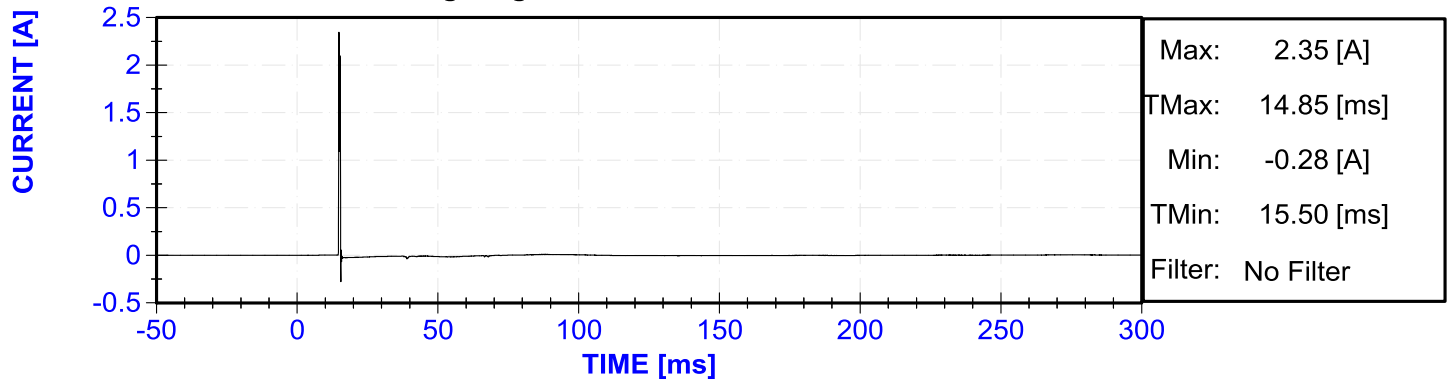
V2 Passenger Seat Thigh Bar Z Acceleration



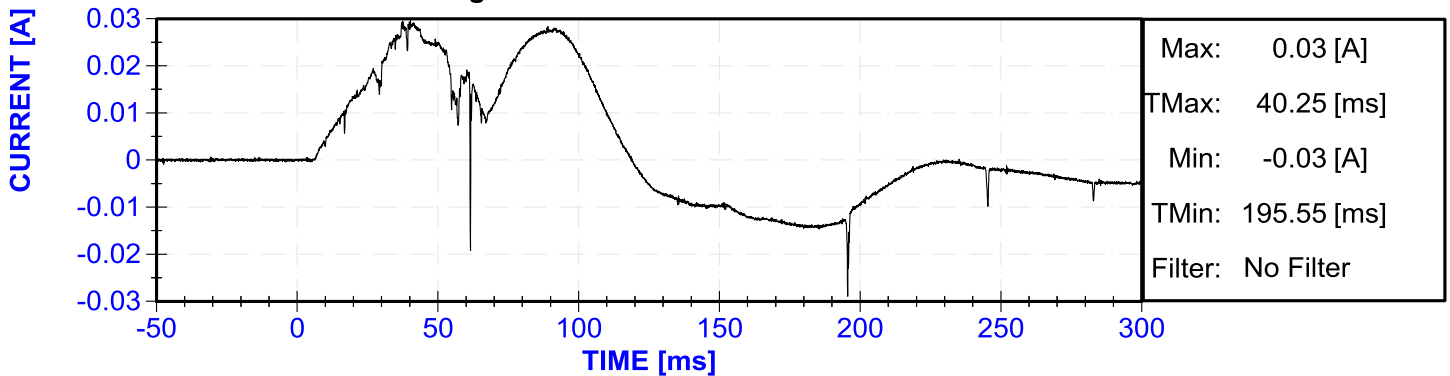
V2 Driver Front Airbag Stage 1 Monitor

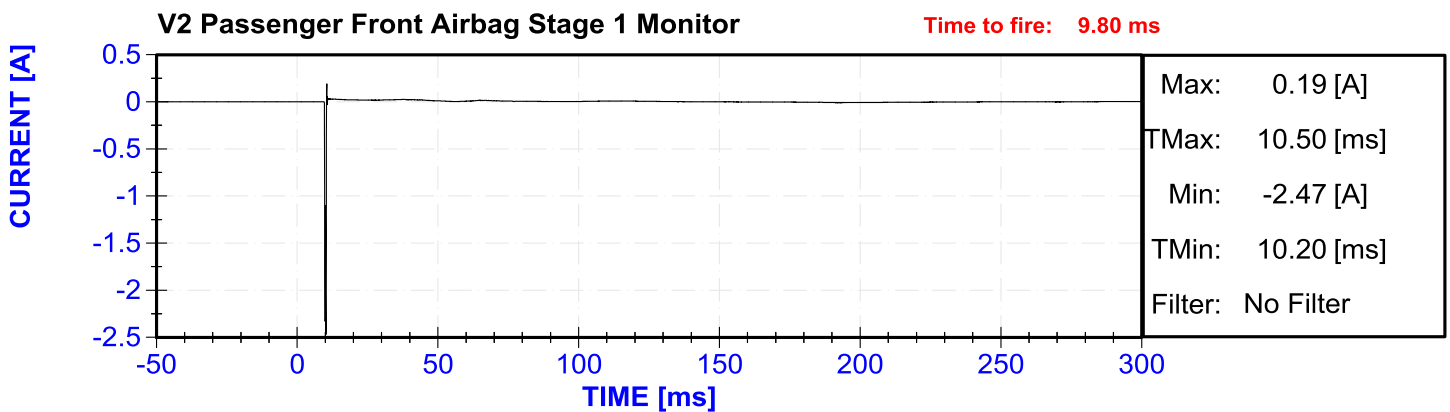
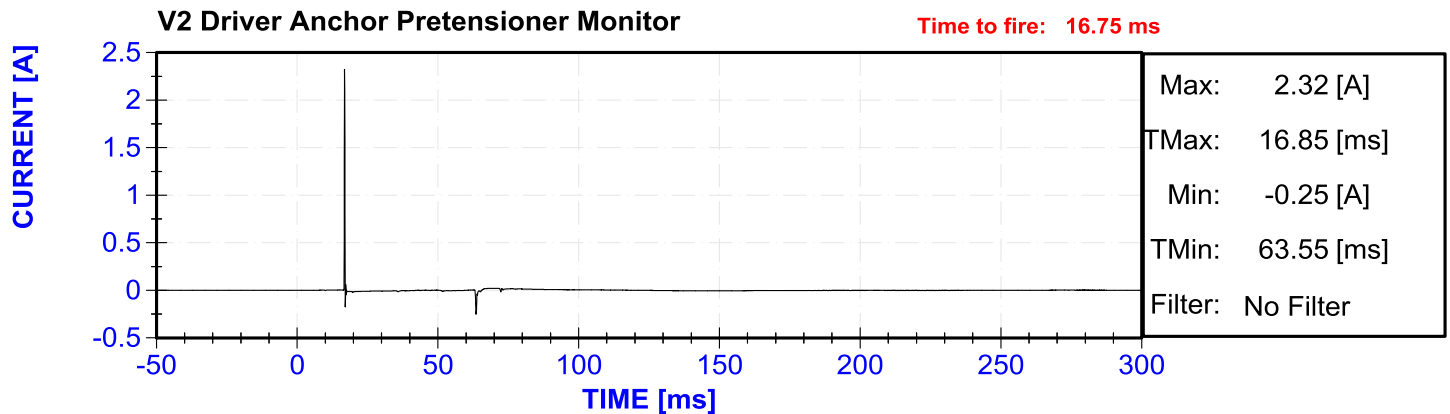
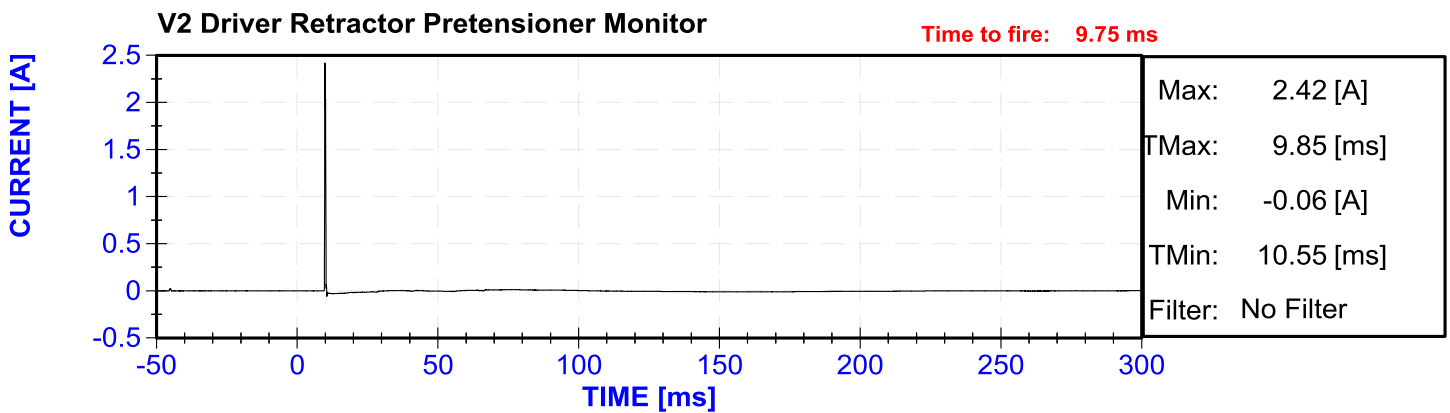
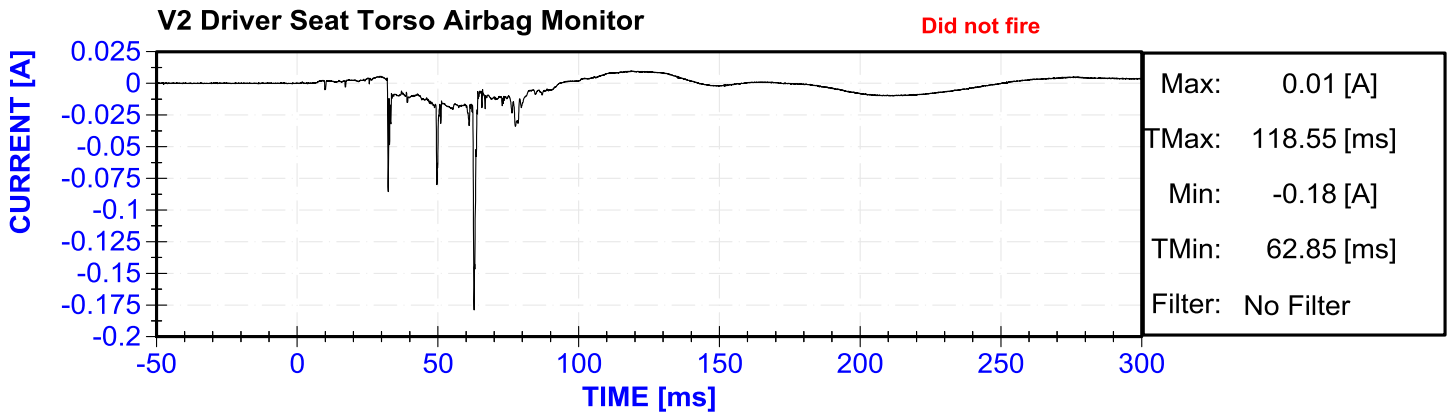


V2 Driver Front Airbag Stage 2 Monitor



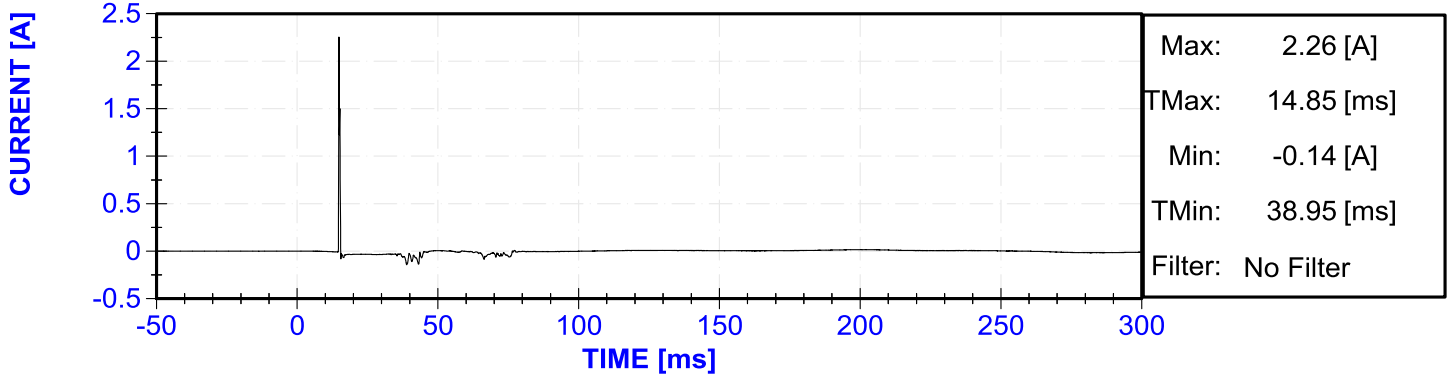
V2 Driver Curtain Airbag Monitor





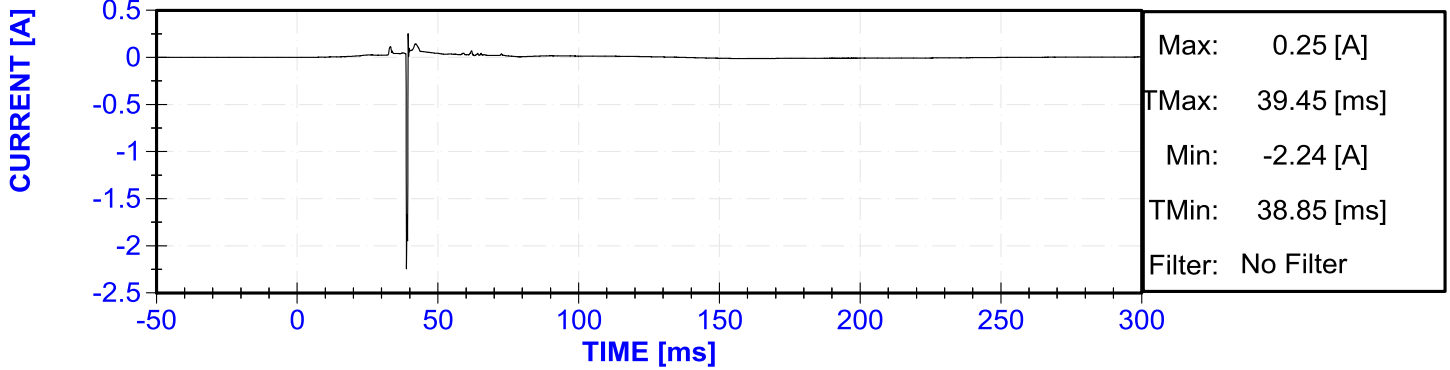
V2 Passenger Front Airbag Stage 2 Monitor

Time to fire: 14.75 ms



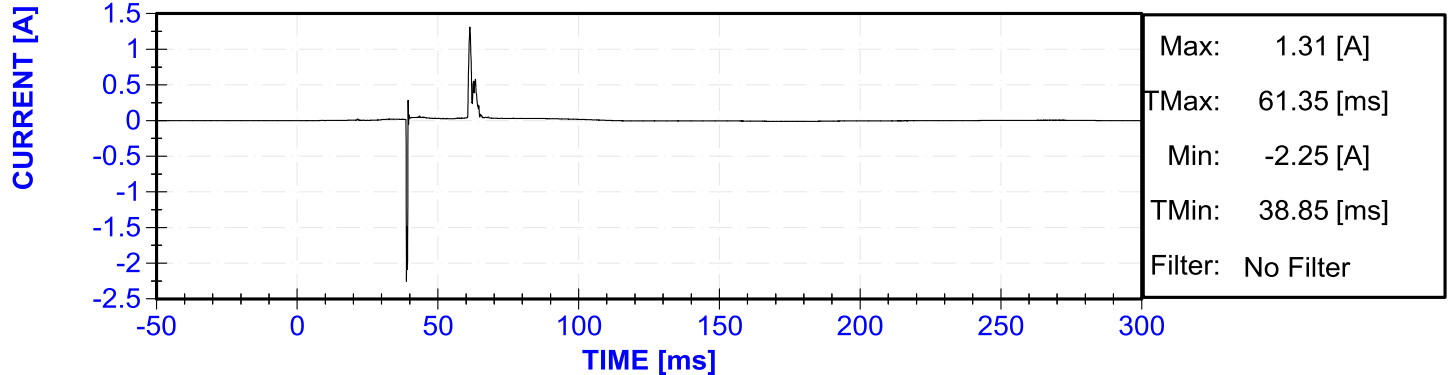
V2 Passenger Curtain Airbag Monitor

Time to fire: 38.75 ms



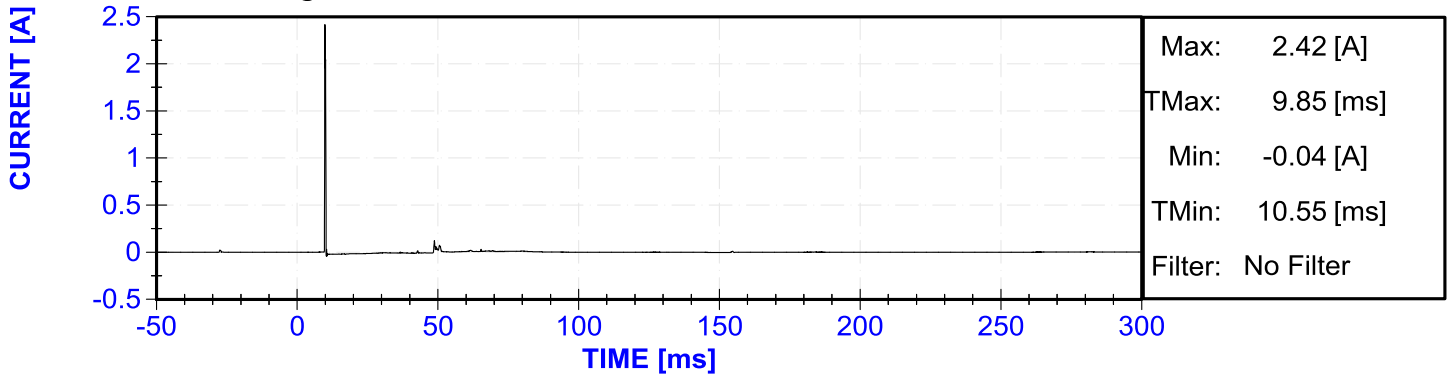
V2 Passenger Seat Torso Airbag Monitor

Time to fire: 38.75 ms



V2 Passenger Retractor Pretensioner Monitor

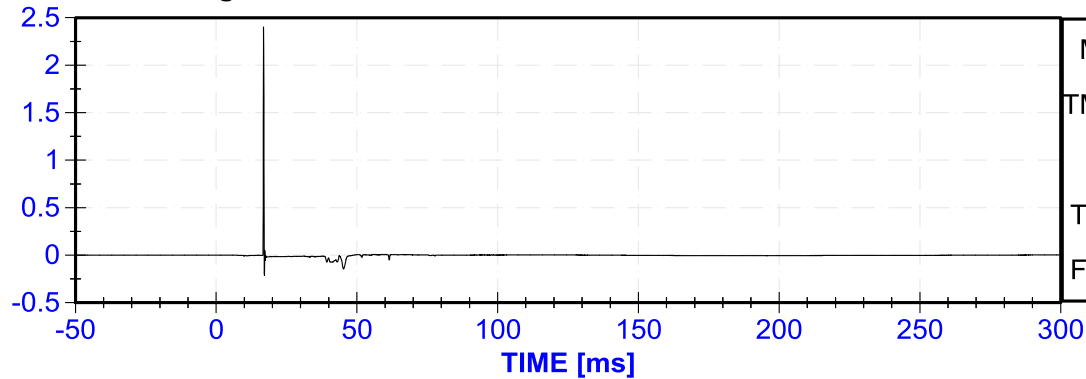
Time to fire: 9.75 ms



V2 Passenger Anchor Pretensioner Monitor

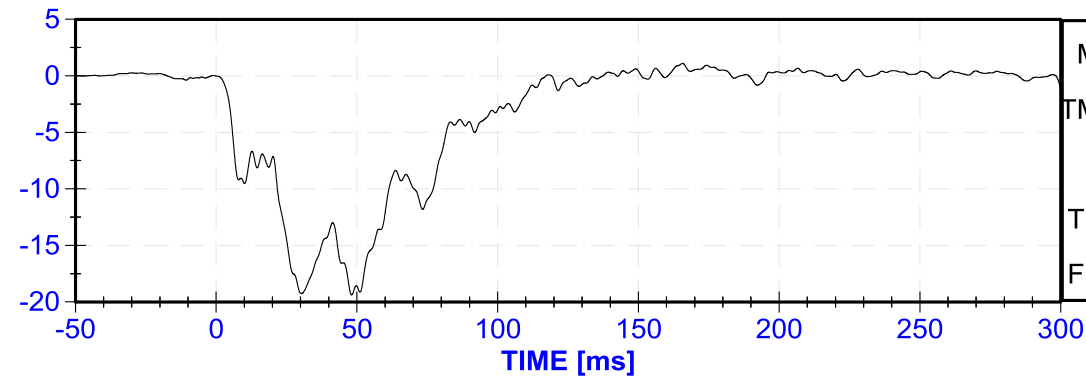
Time to fire: 16.75 ms

CURRENT [A]



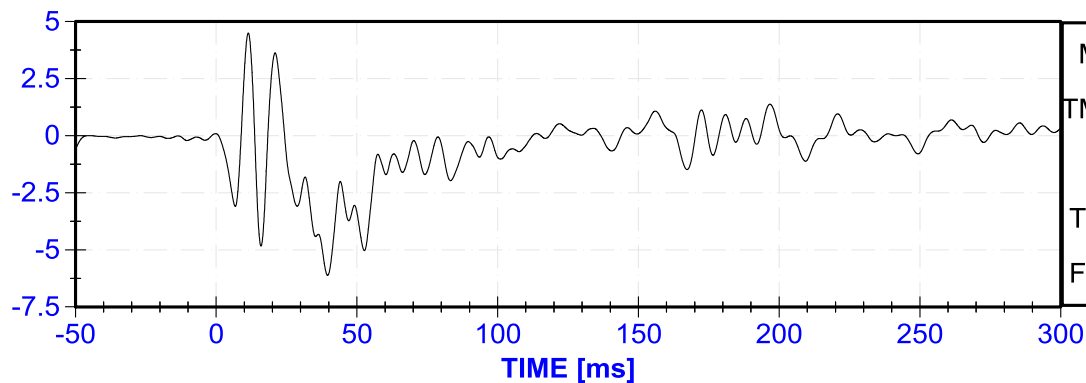
V1 Cart CG X Acceleration

ACCELERATION [g's]



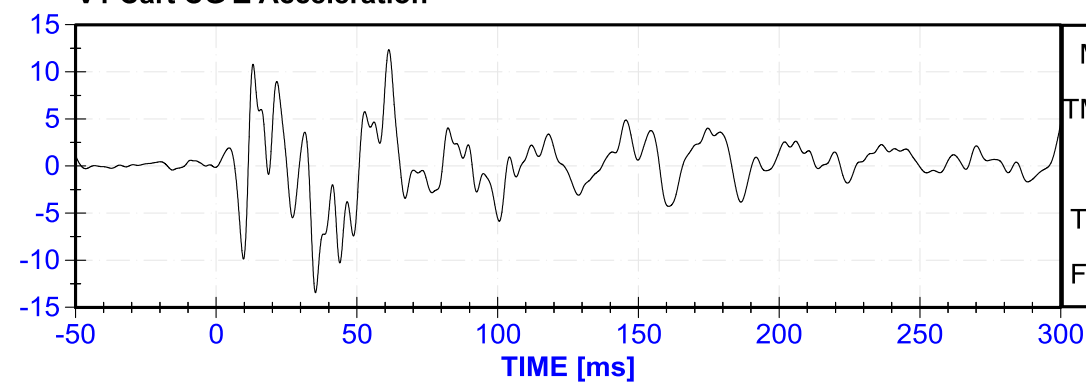
V1 Cart CG Y Acceleration

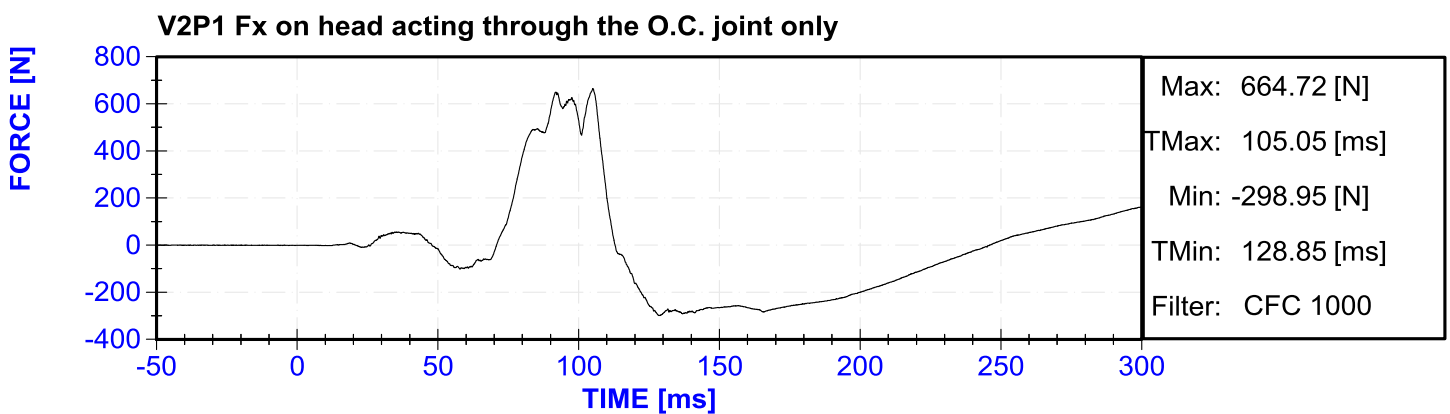
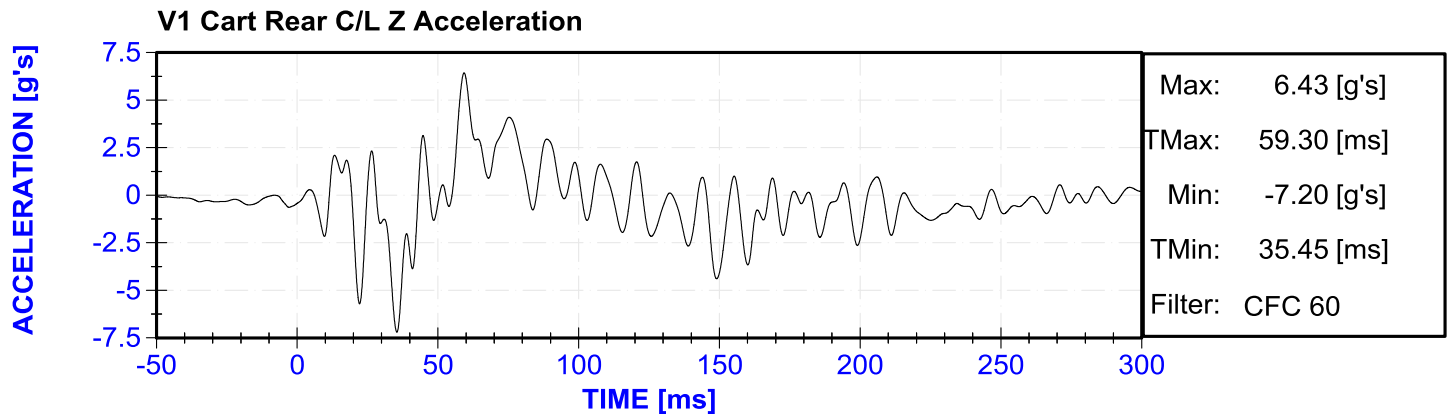
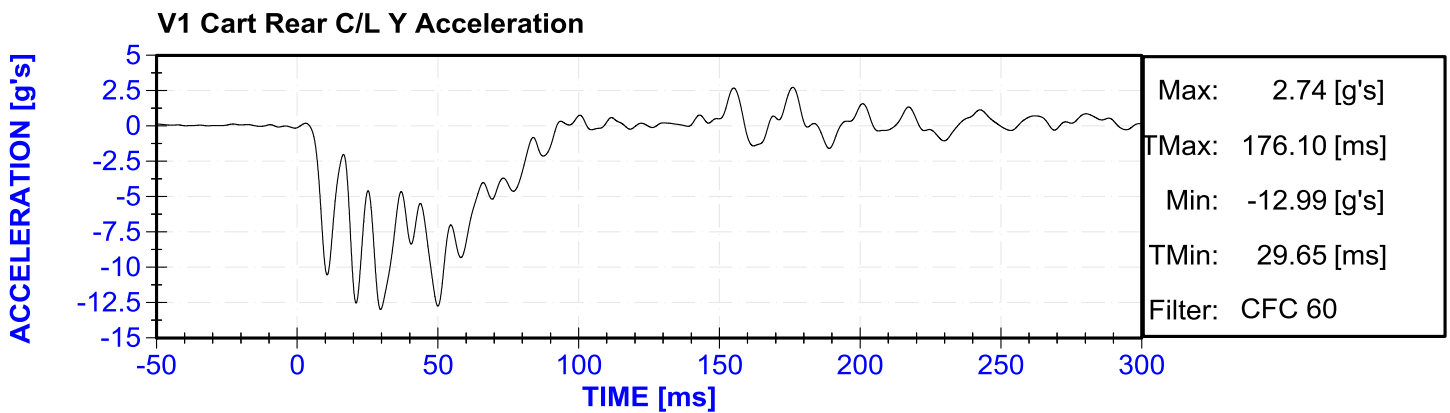
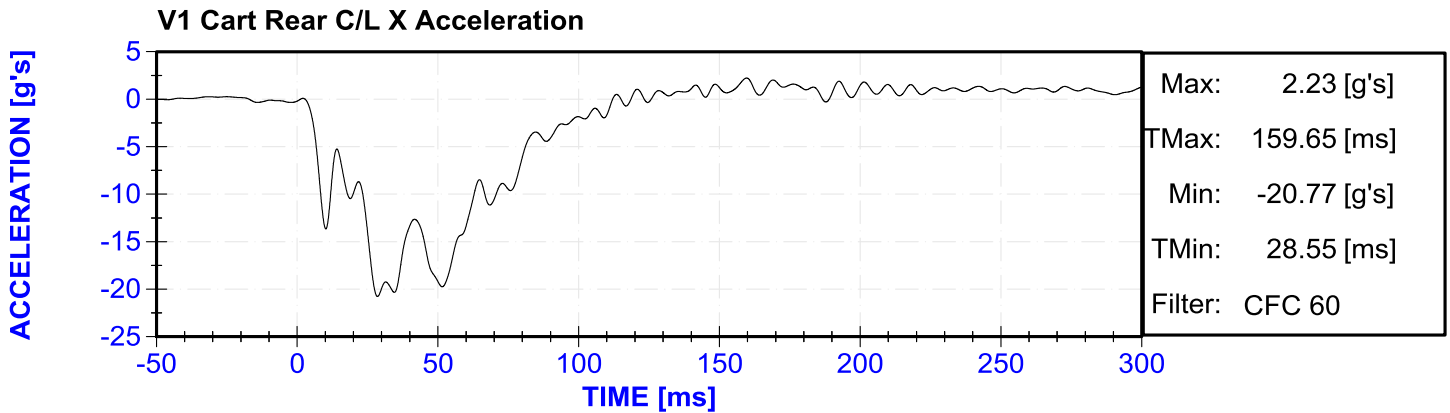
ACCELERATION [g's]



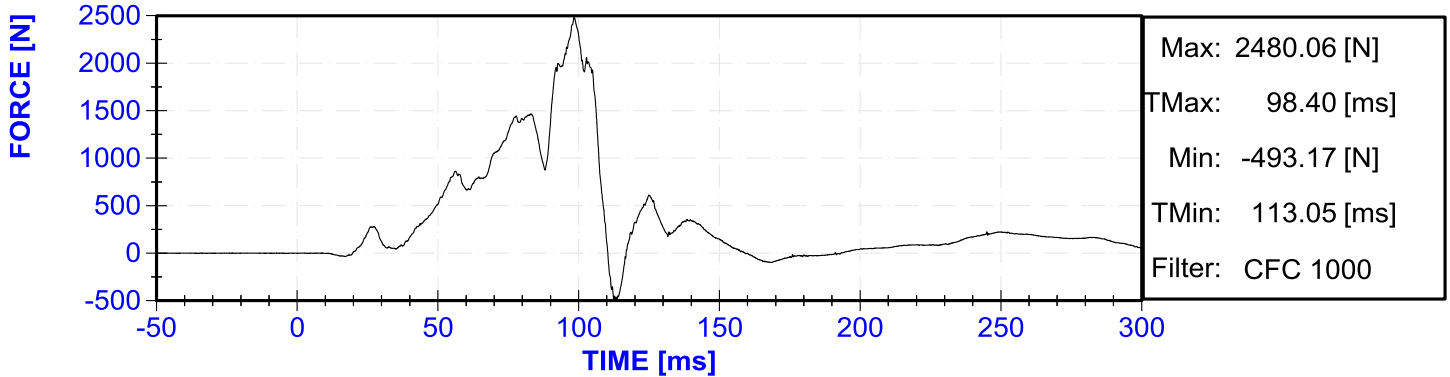
V1 Cart CG Z Acceleration

ACCELERATION [g's]

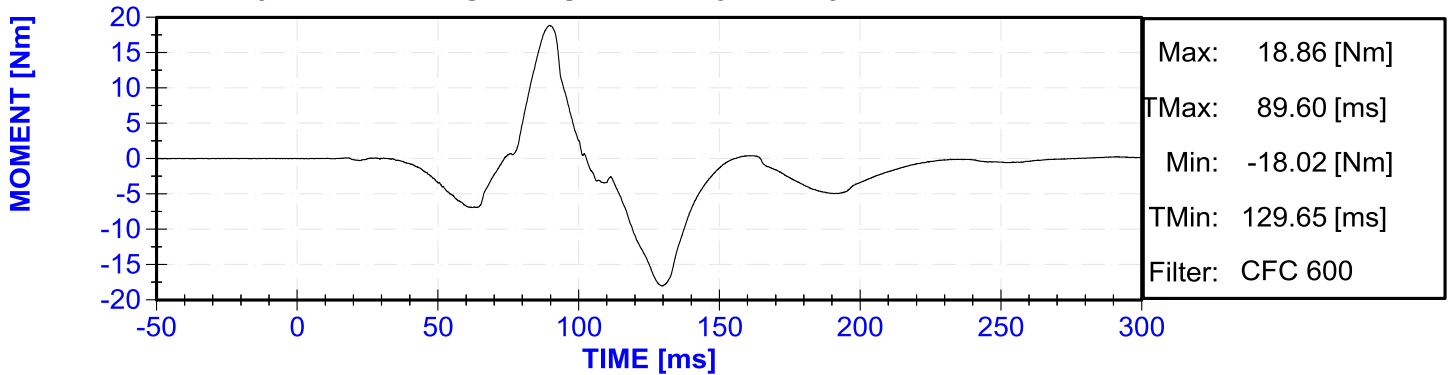




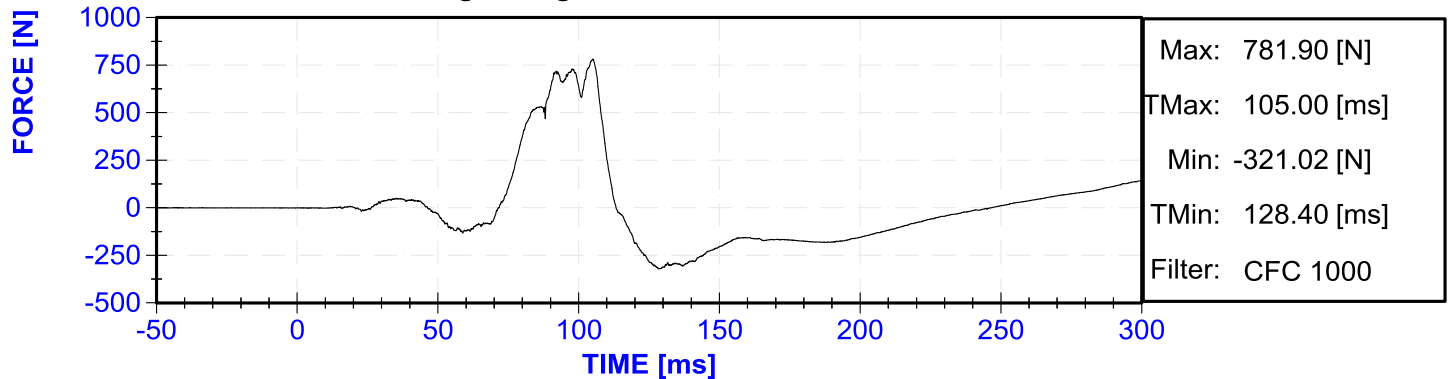
V2P1 Fz on head acting through the O.C. joint only



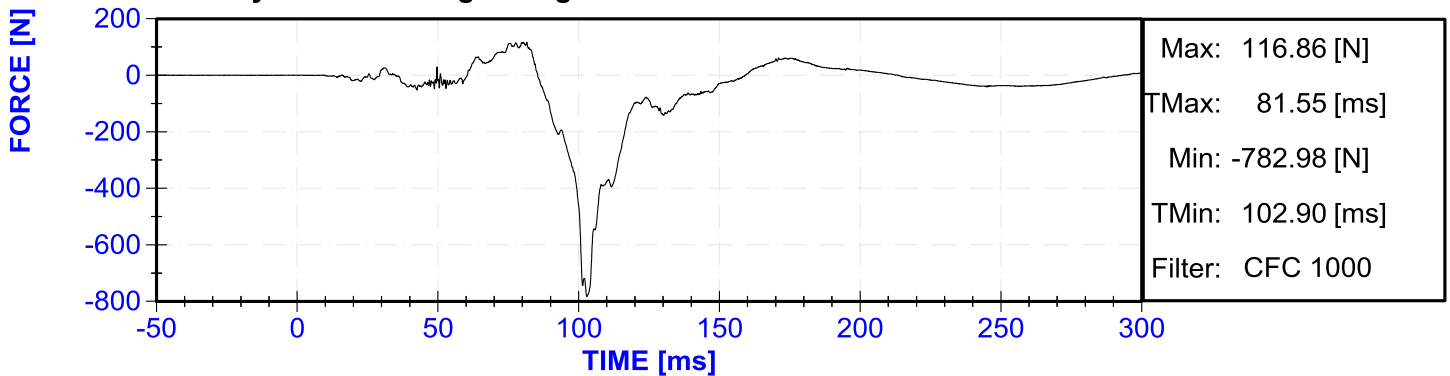
V2P1 My on head acting through the O.C. joint only



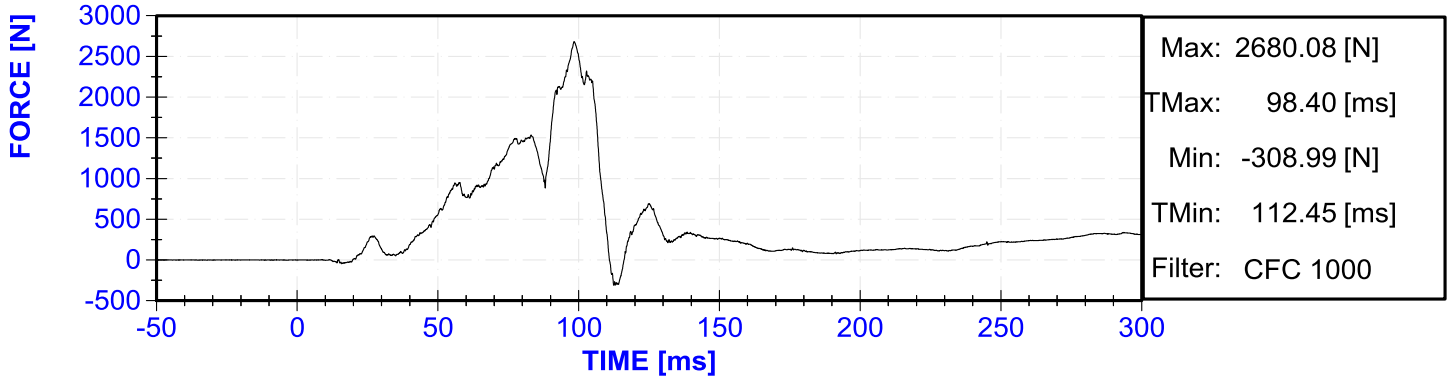
V2P1 Fx on head acting through the total neck section



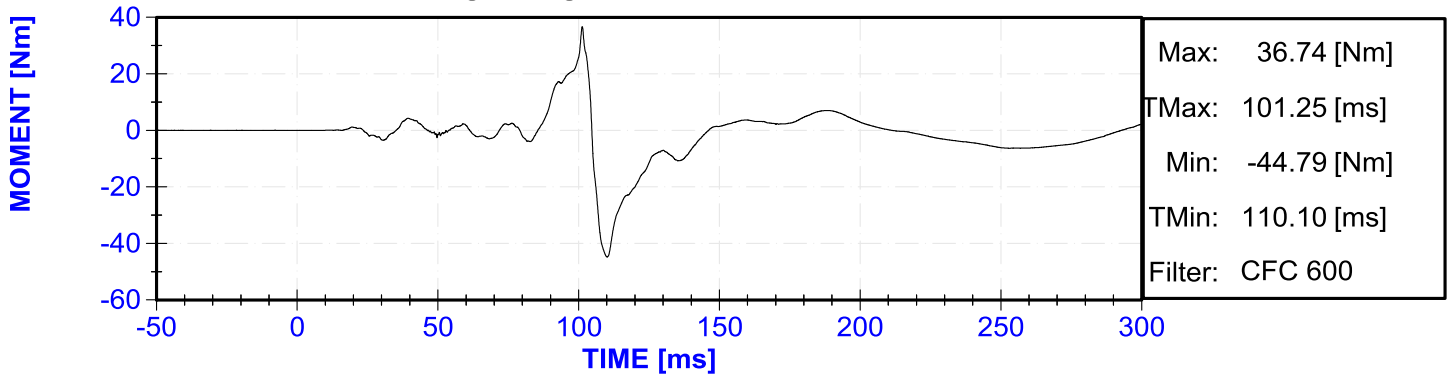
V2P1 Fy on head acting through the total neck section



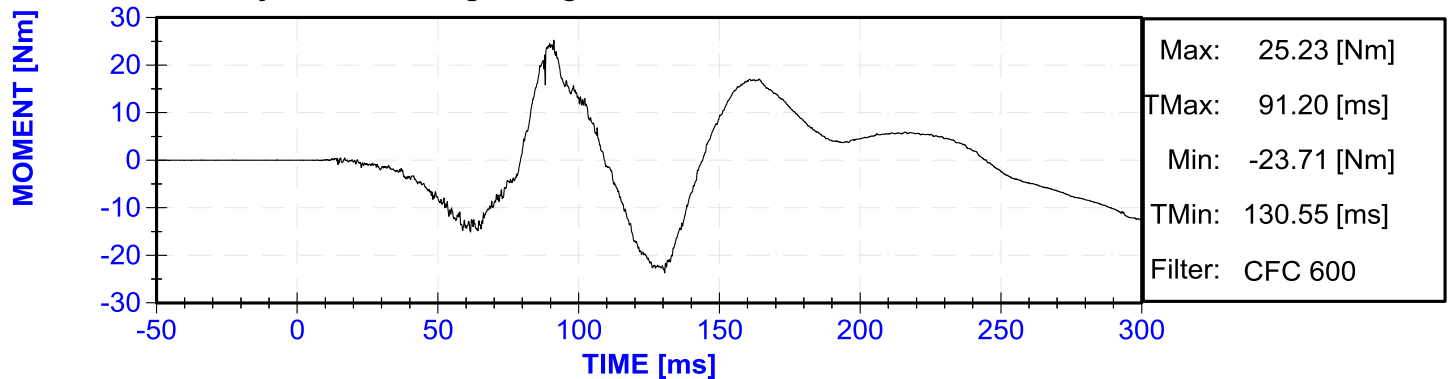
V2P1 Fz on head acting through the total neck section



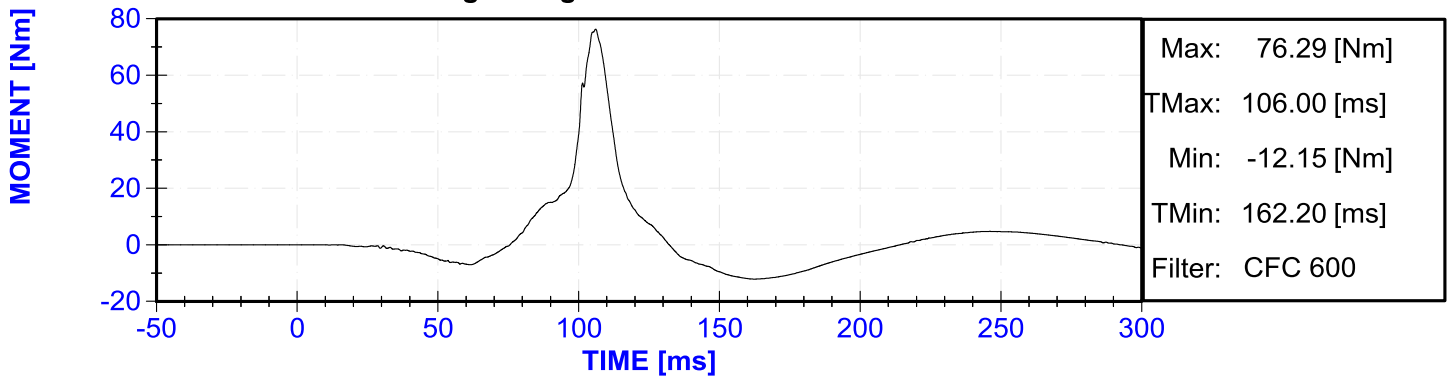
V2P1 Mx on head acting through the total neck section

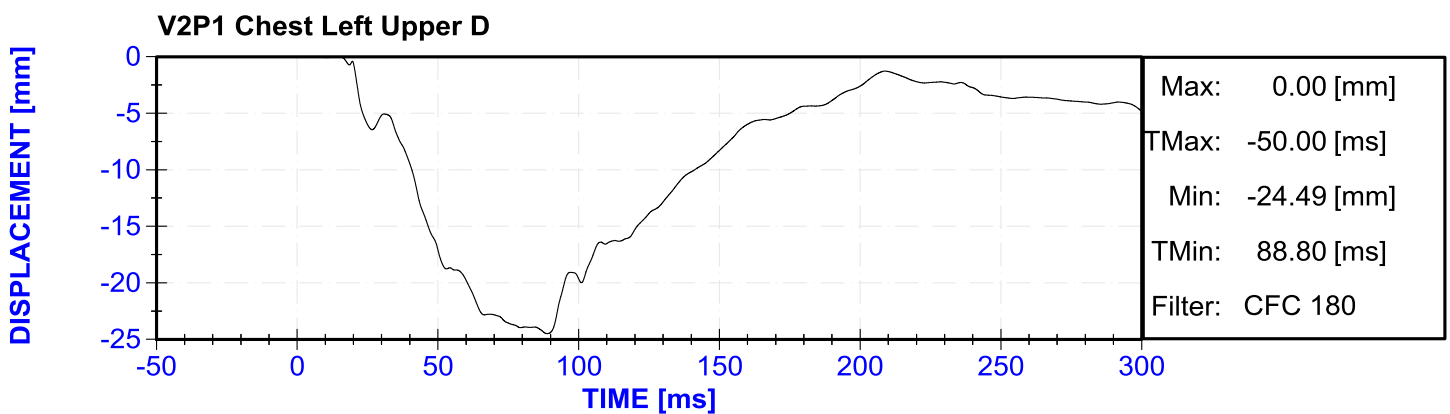
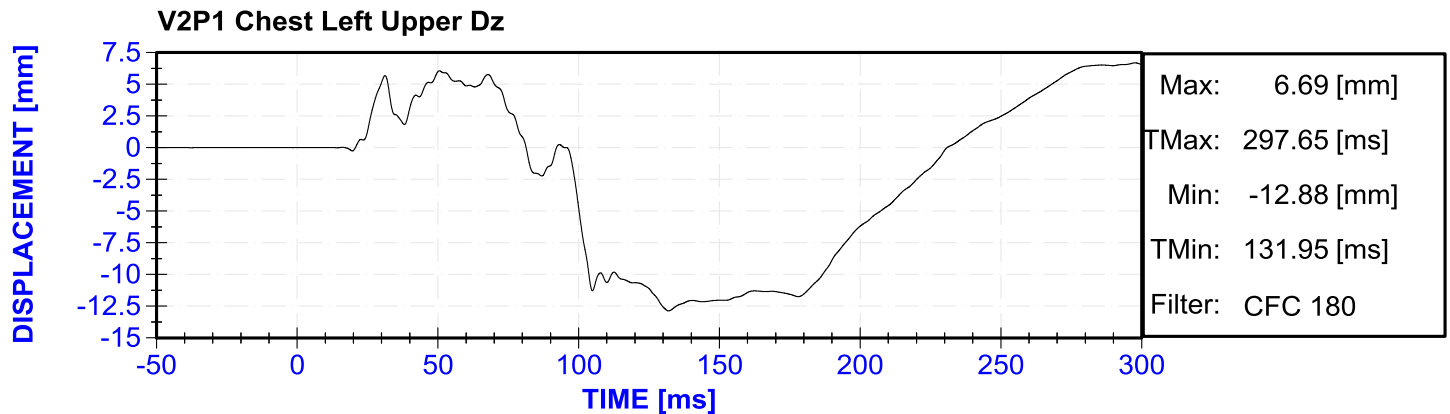
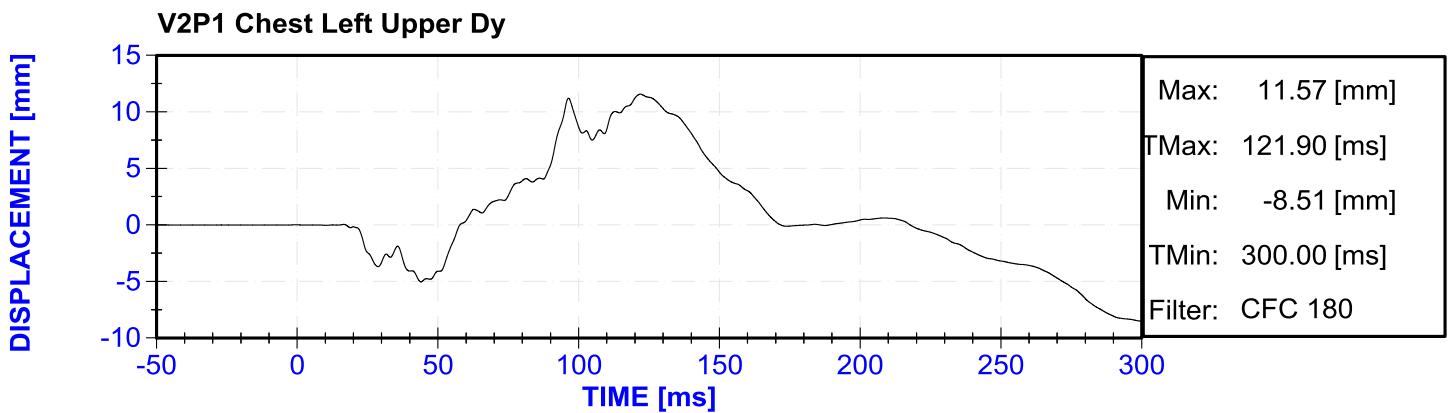
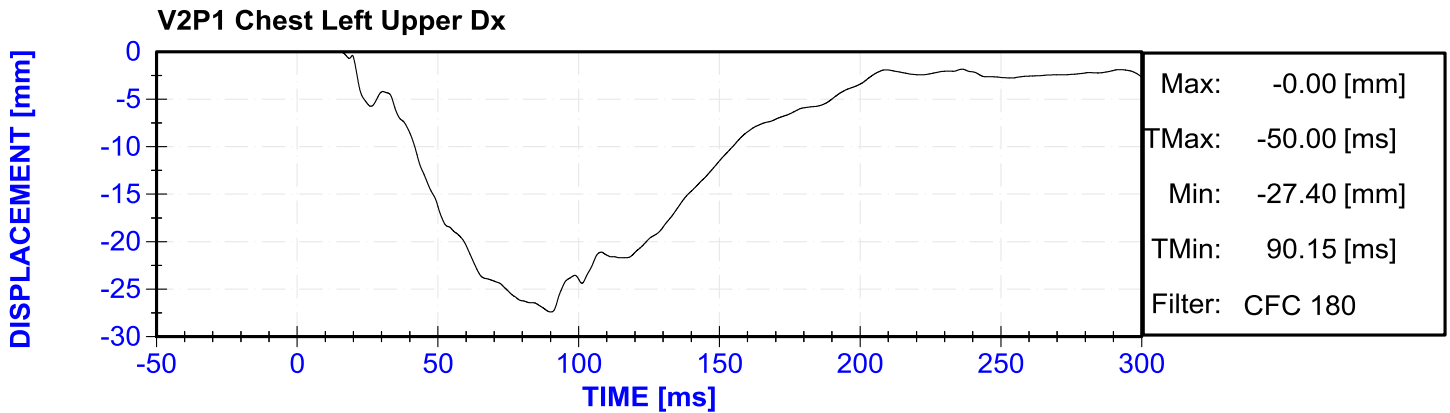


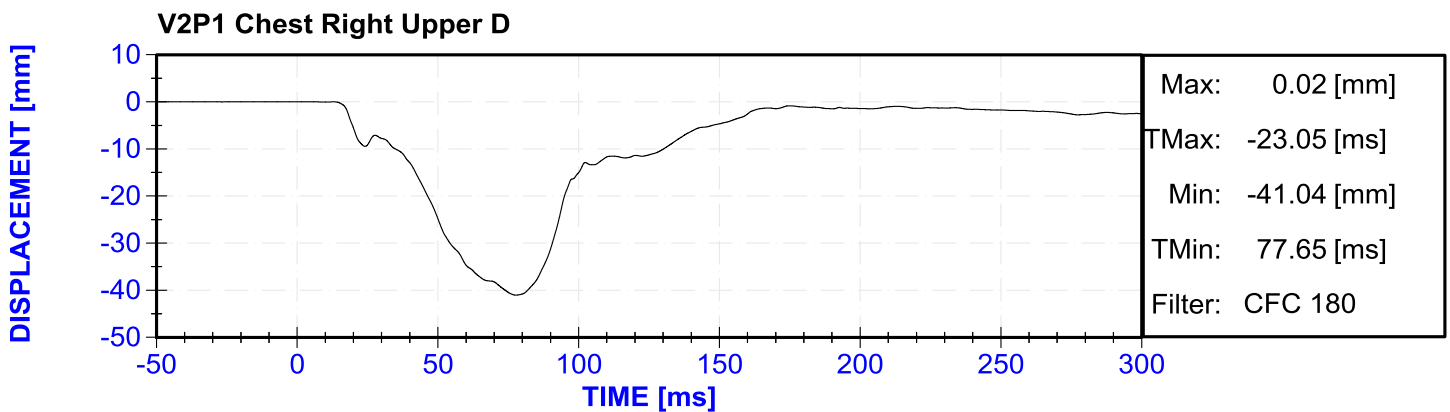
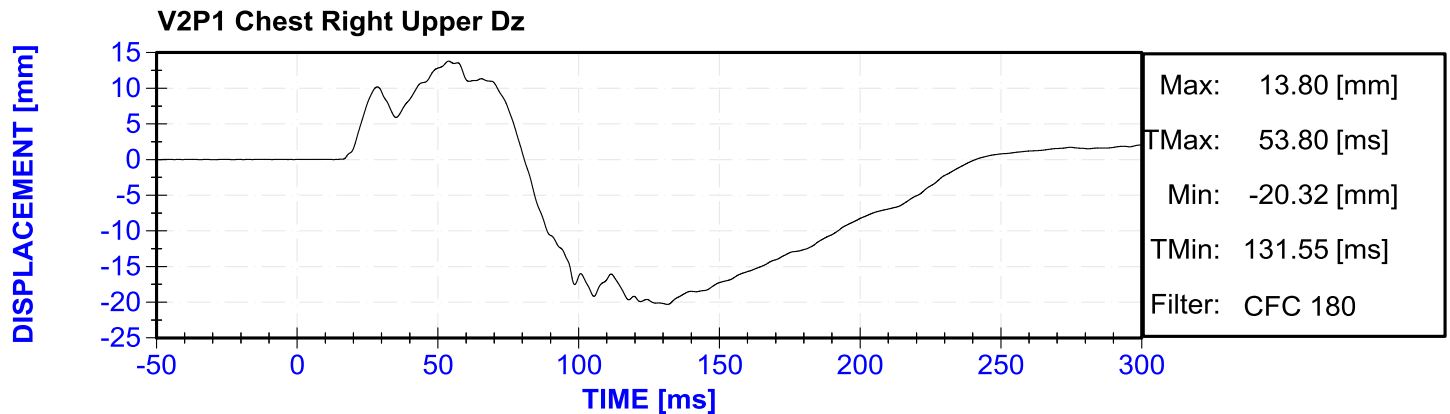
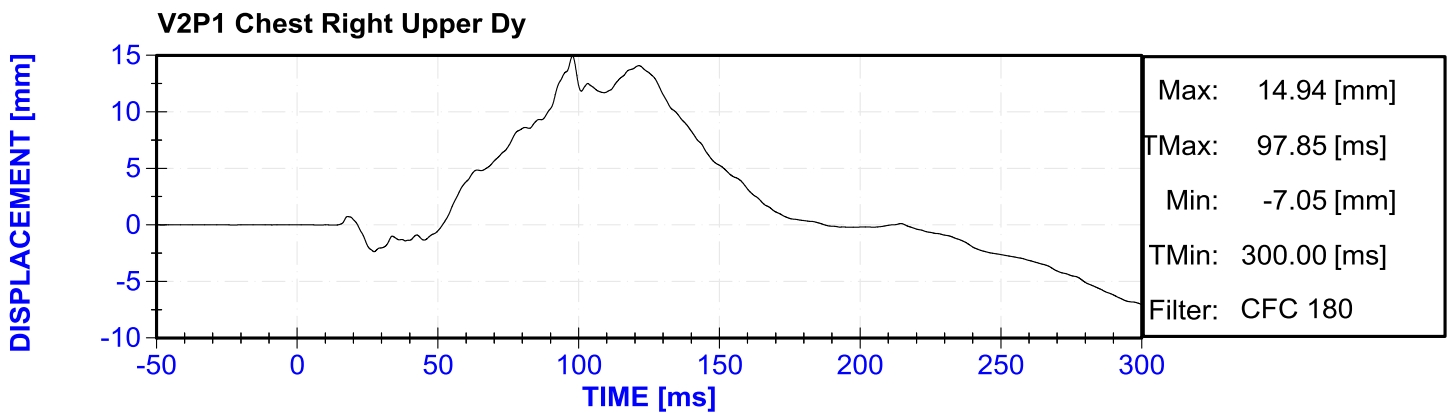
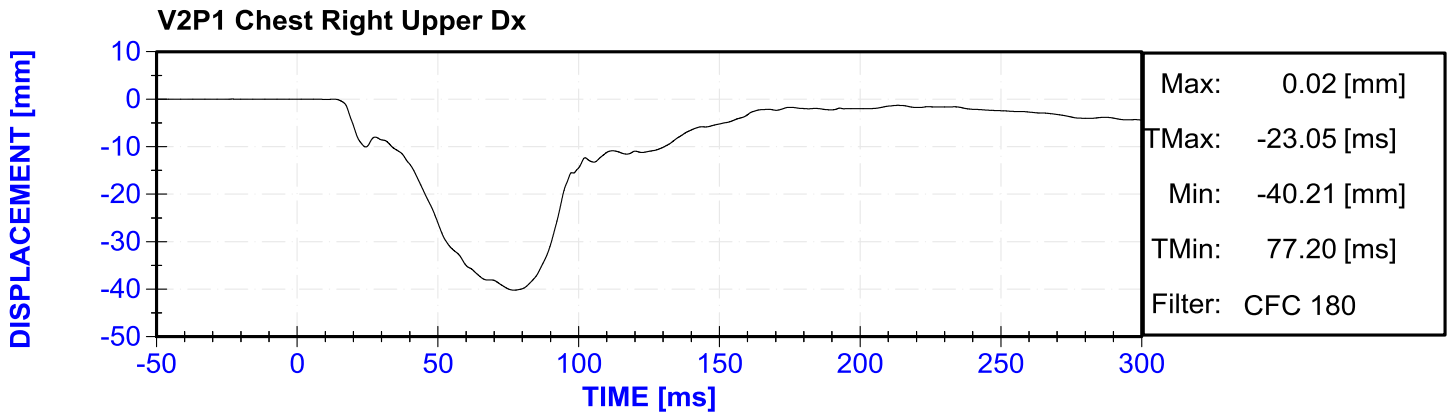
V2P1 My on head acting through the total neck section

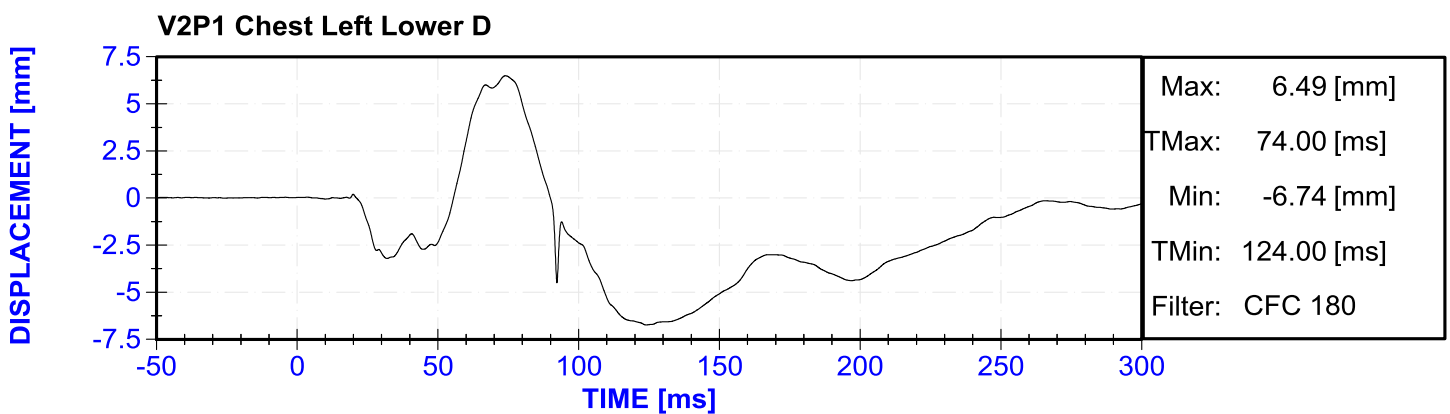
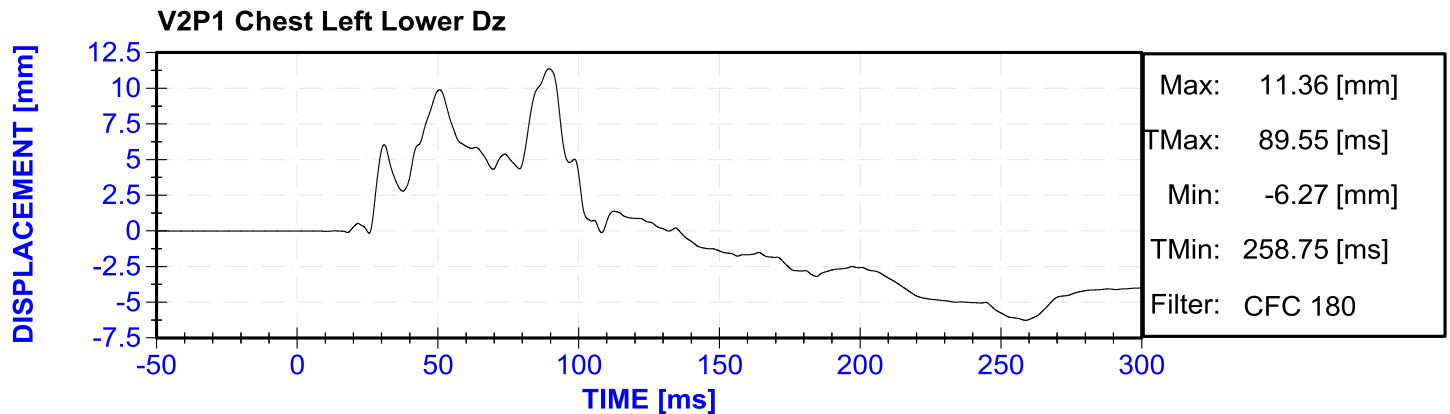
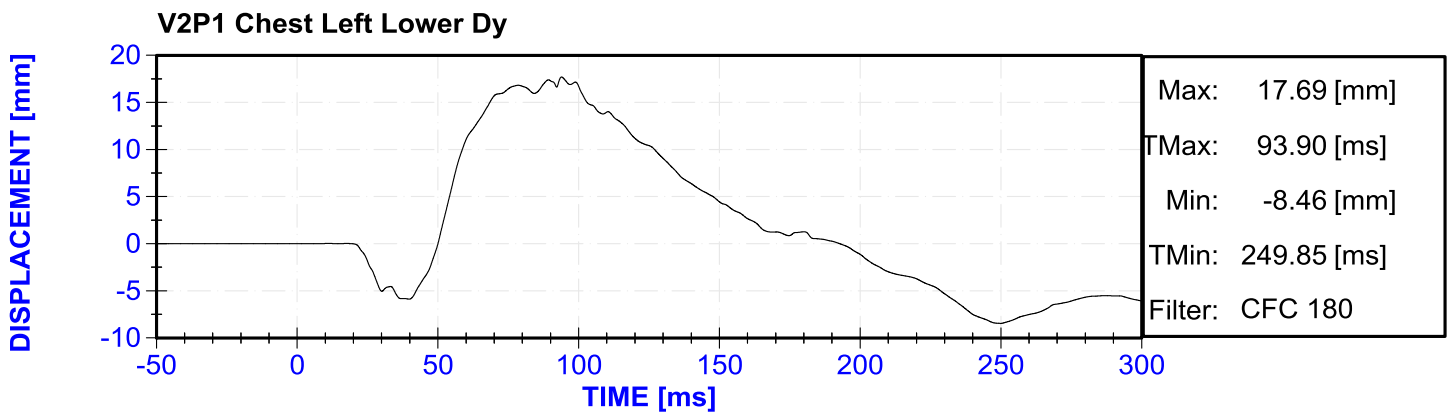
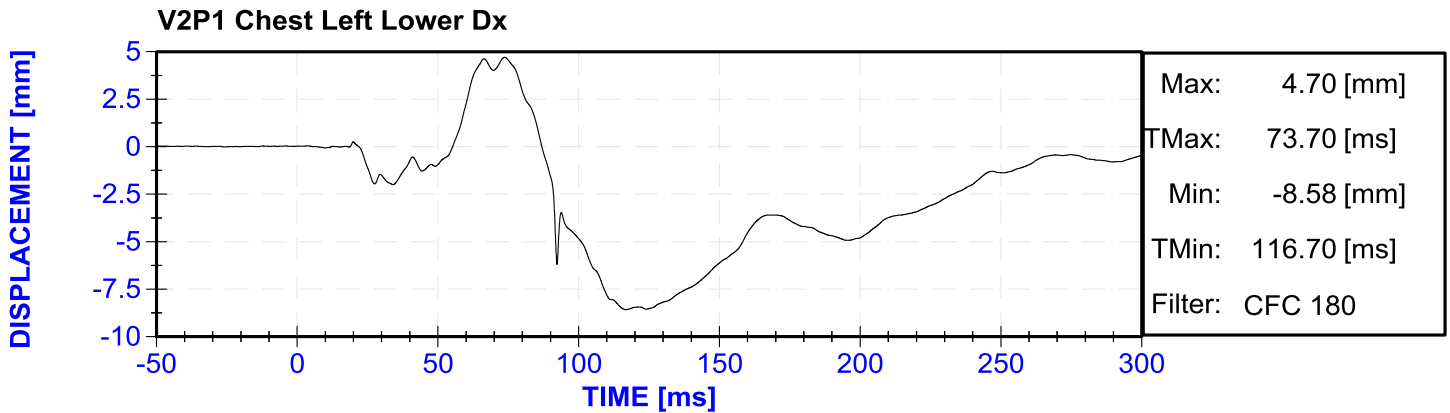


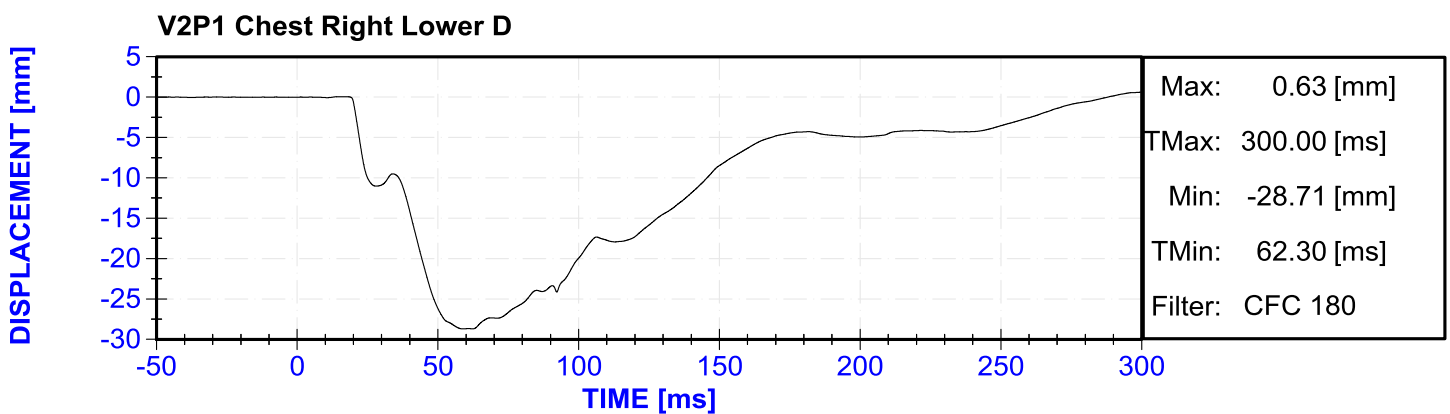
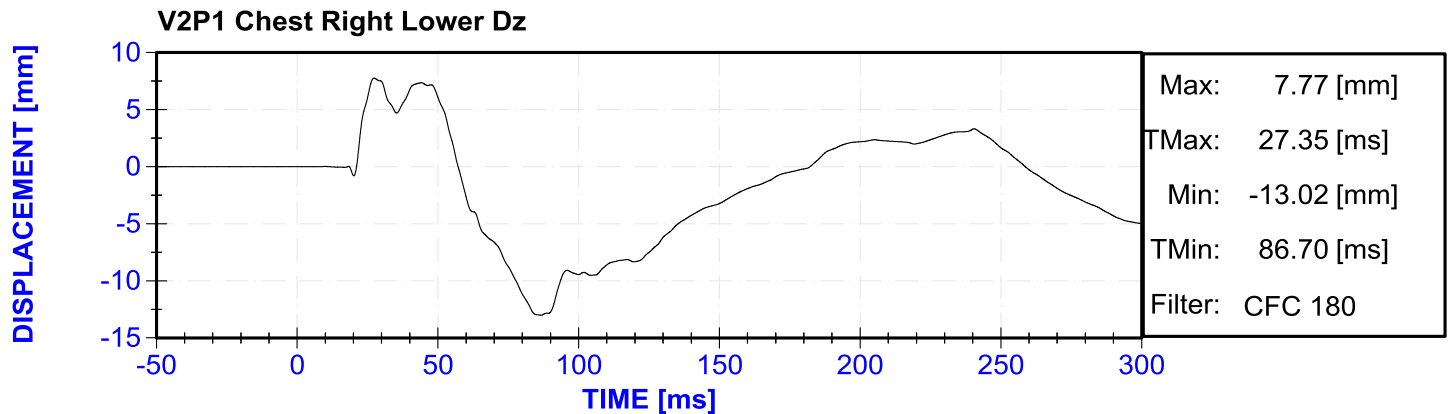
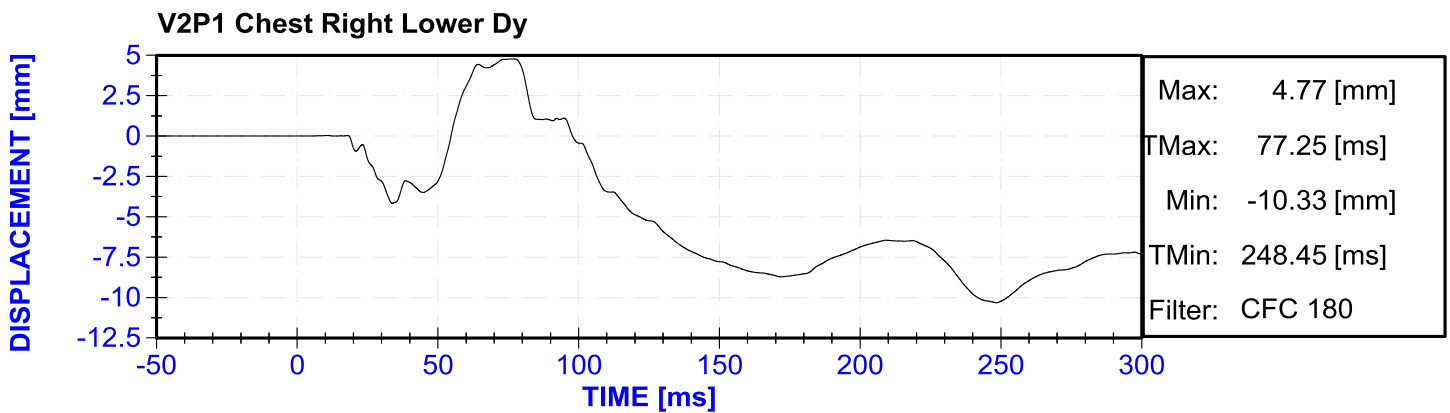
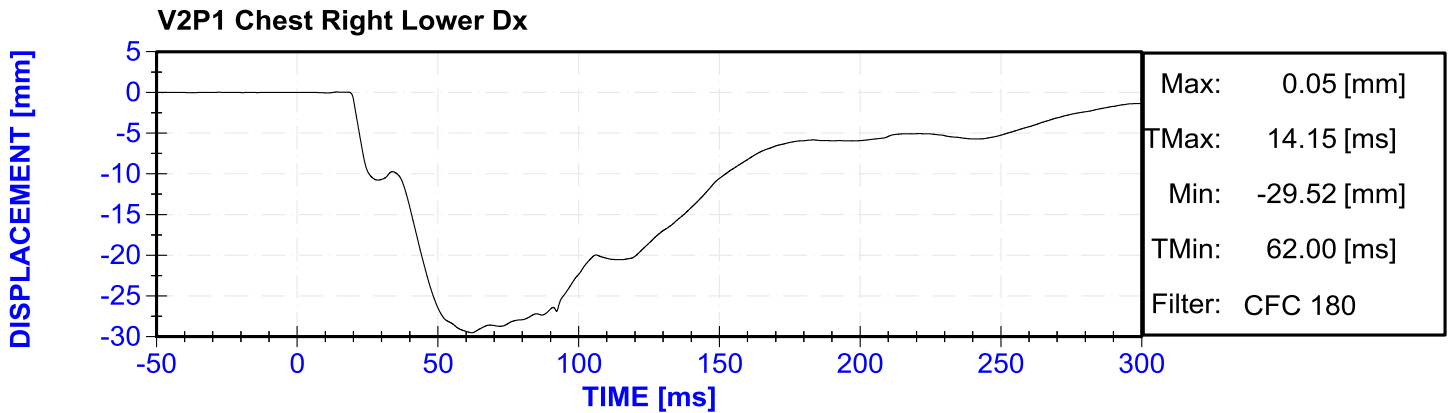
V2P1 Mz on head acting through the total neck section

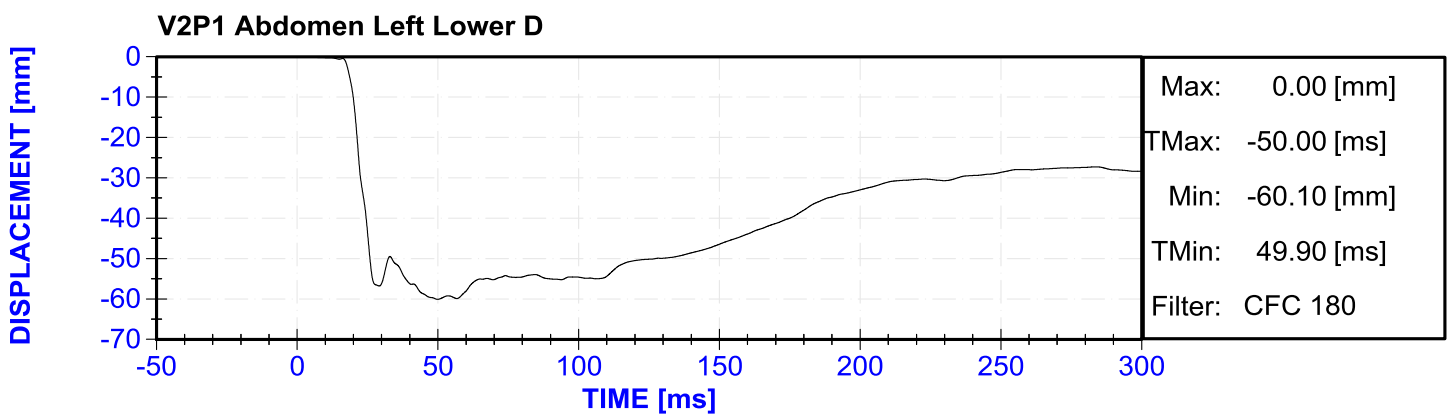
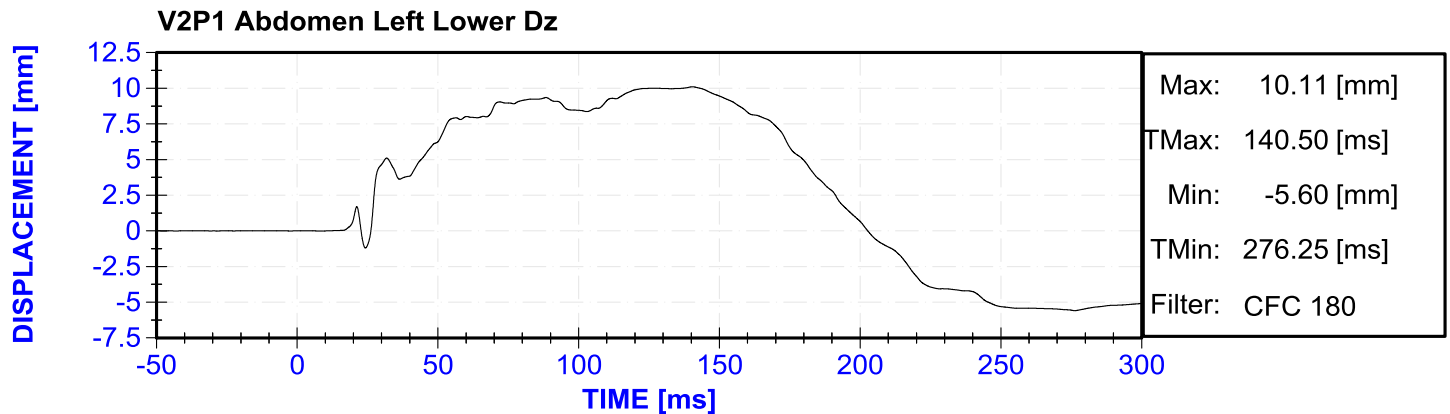
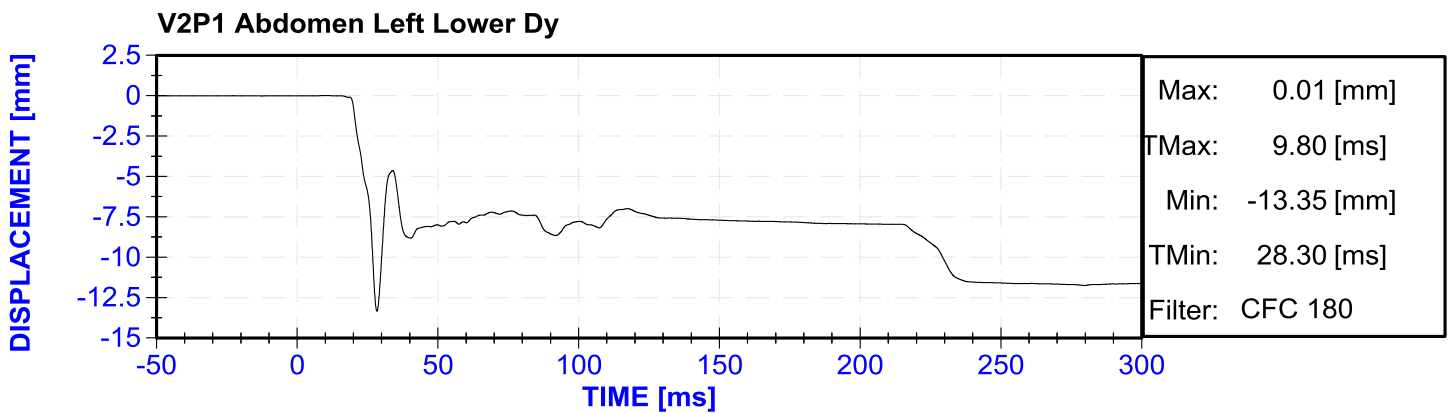
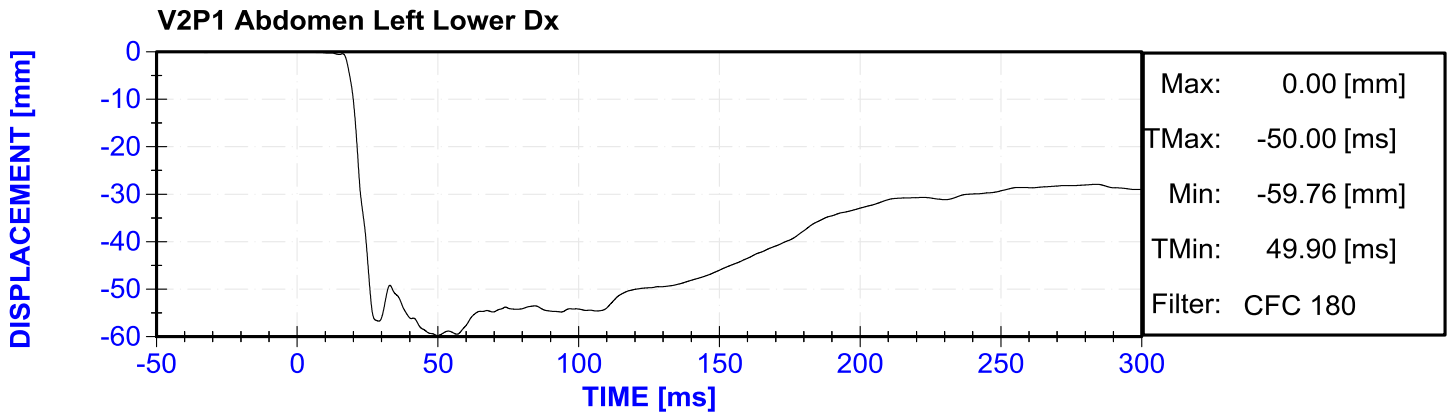




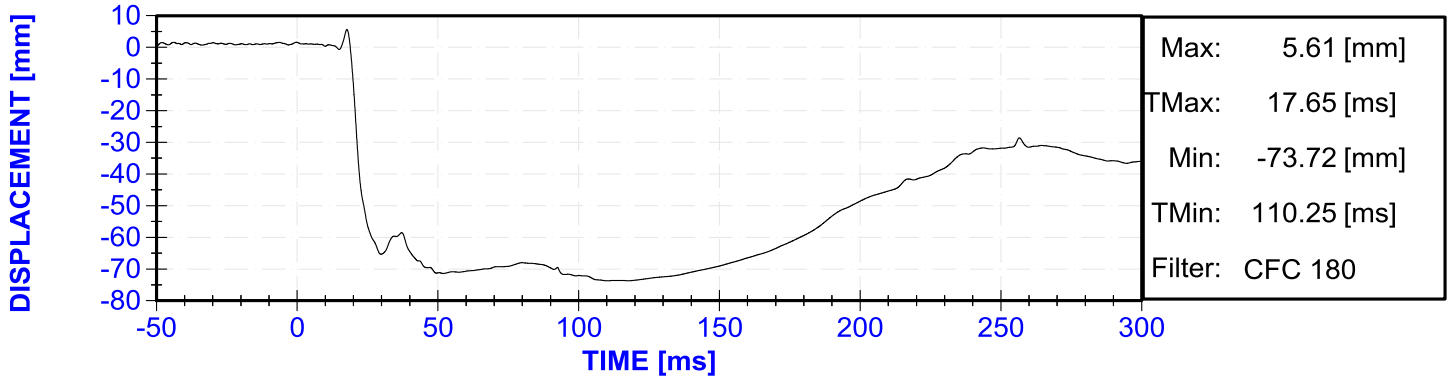




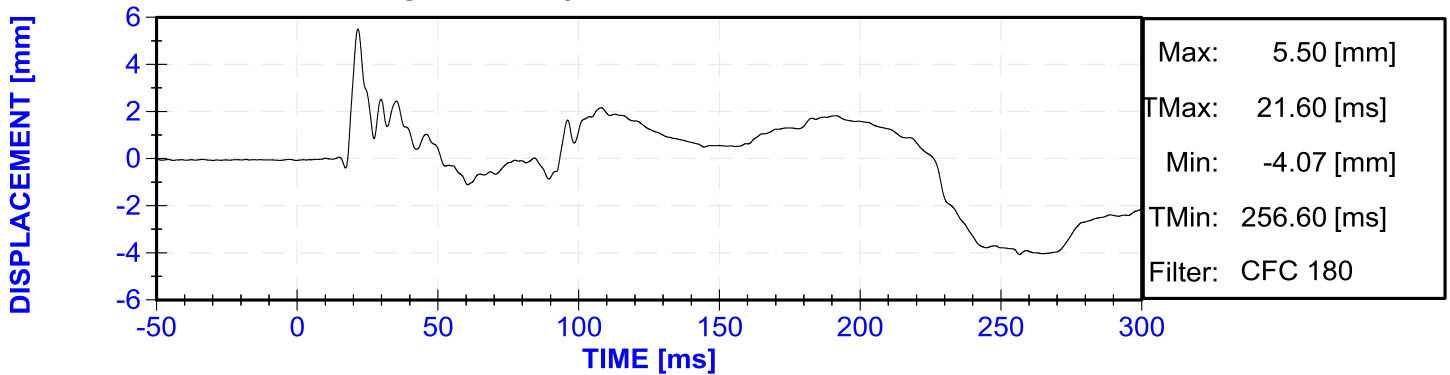




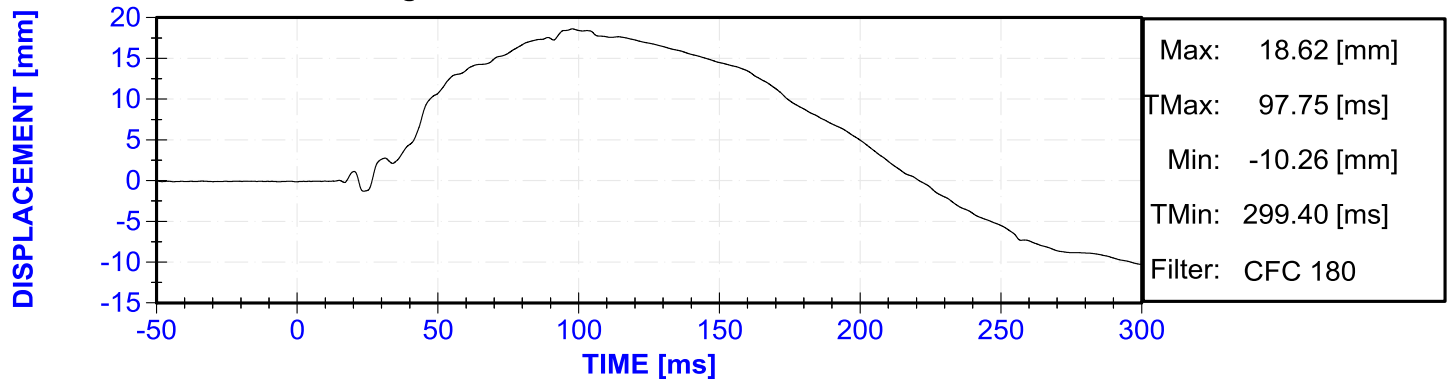
V2P1 Abdomen Right Lower Dx



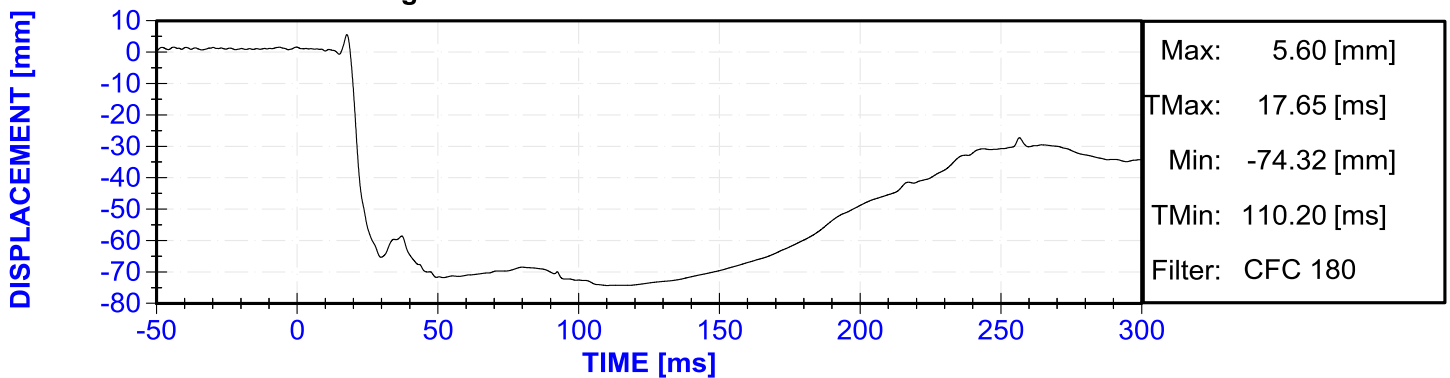
V2P1 Abdomen Right Lower Dy



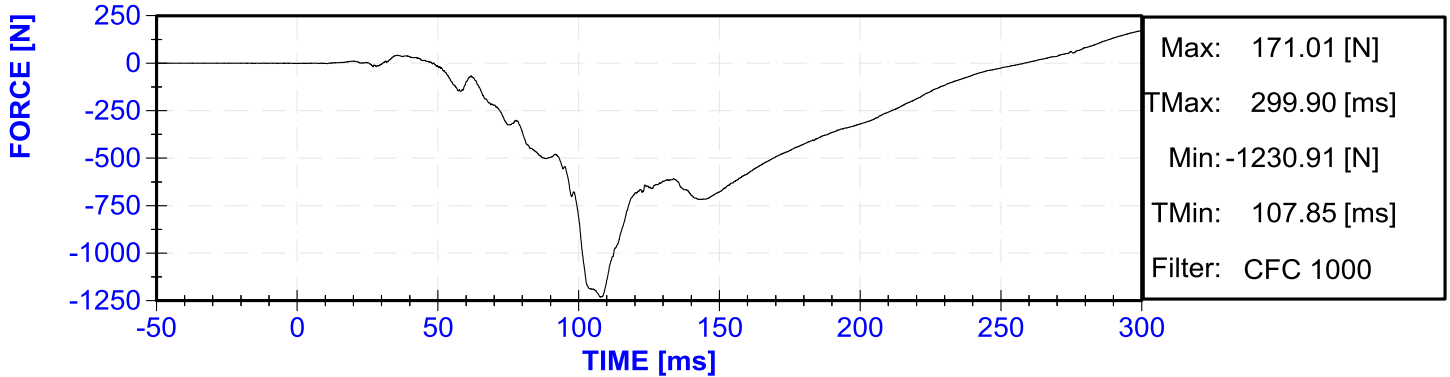
V2P1 Abdomen Right Lower Dz



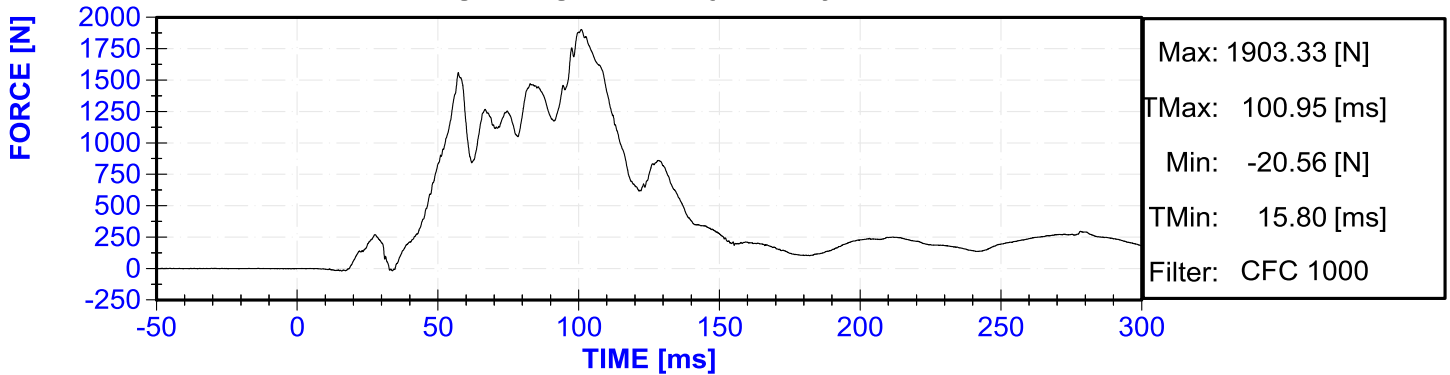
V2P1 Abdomen Right Lower D



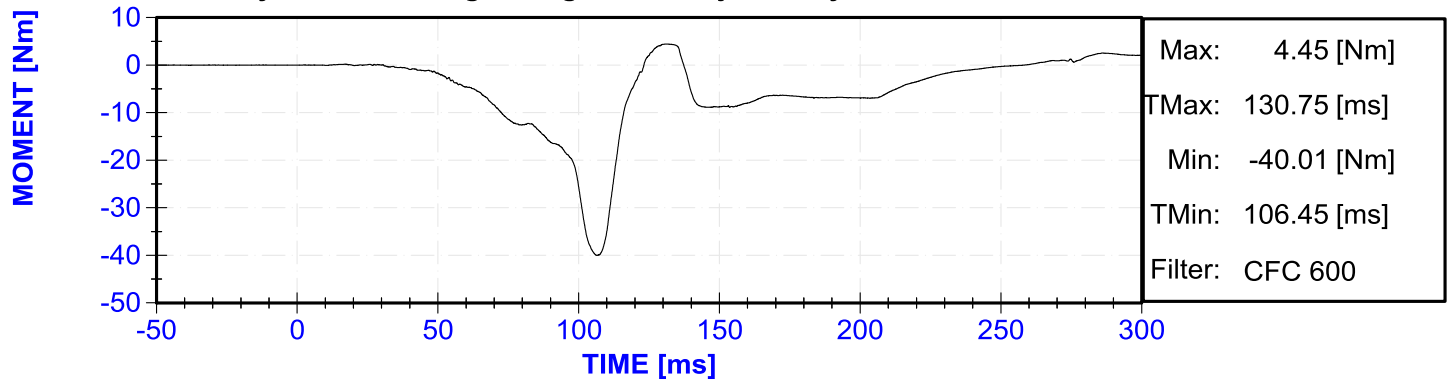
V2P2 Fx on head acting through the O.C. joint only



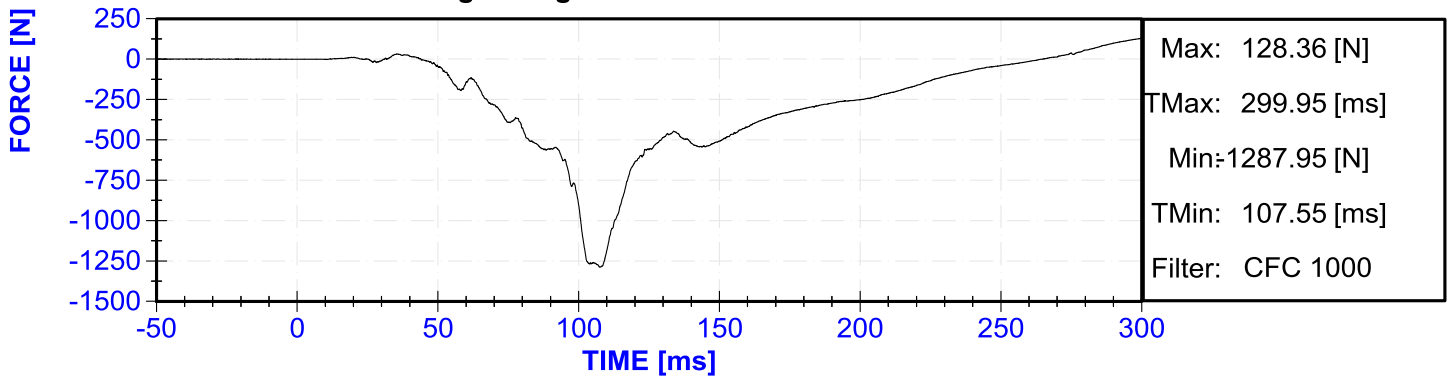
V2P2 Fz on head acting through the O.C. joint only



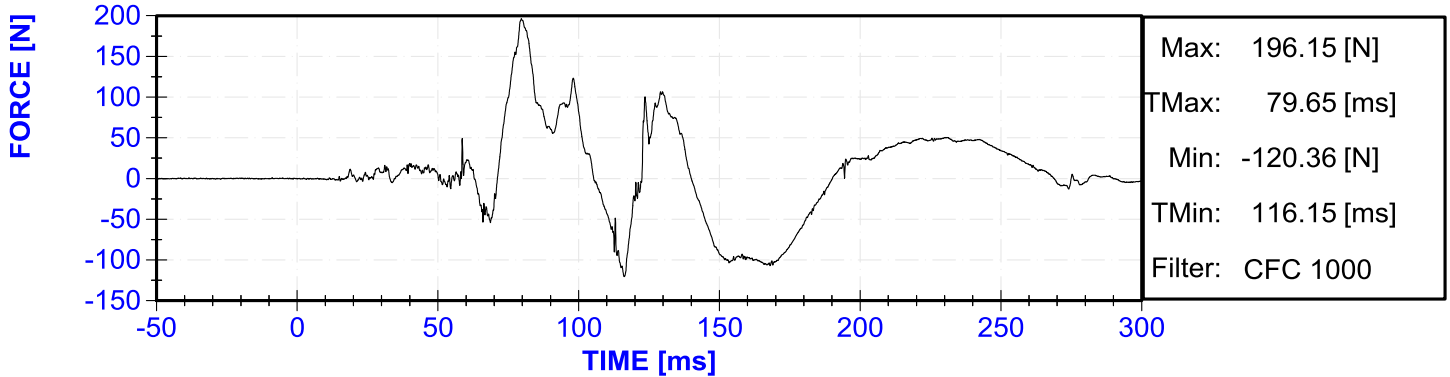
V2P2 My on head acting through the O.C. joint only



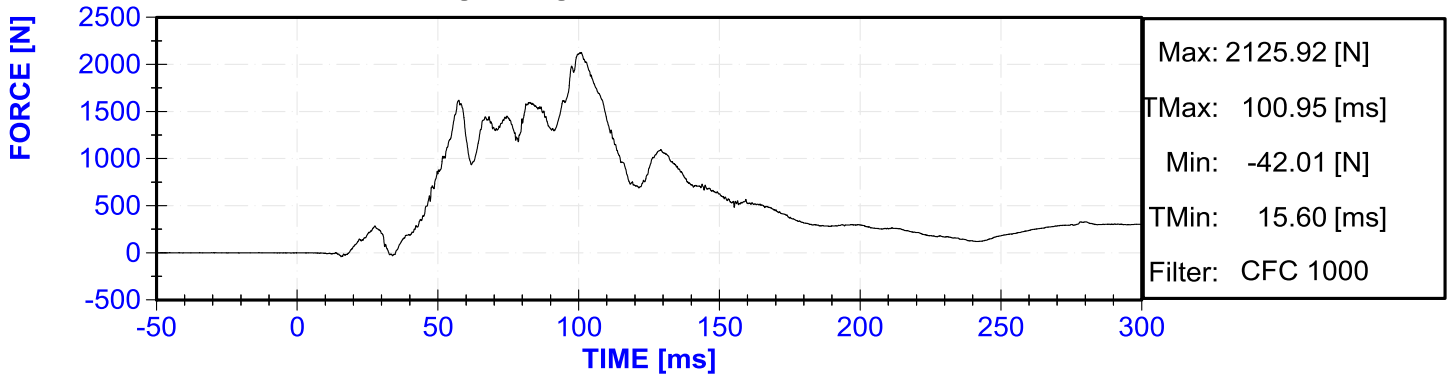
V2P2 Fx on head acting through the total neck section



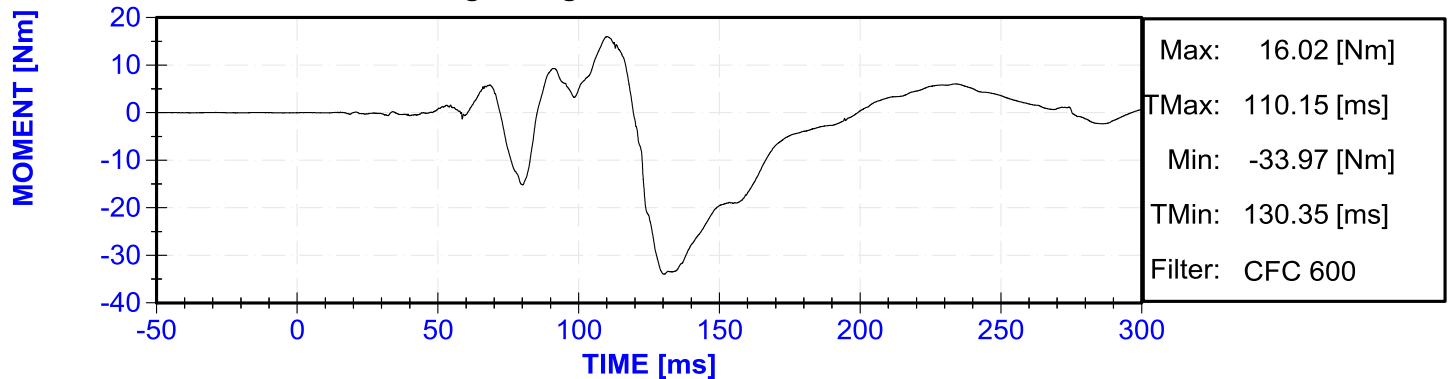
V2P2 Fy on head acting through the total neck section



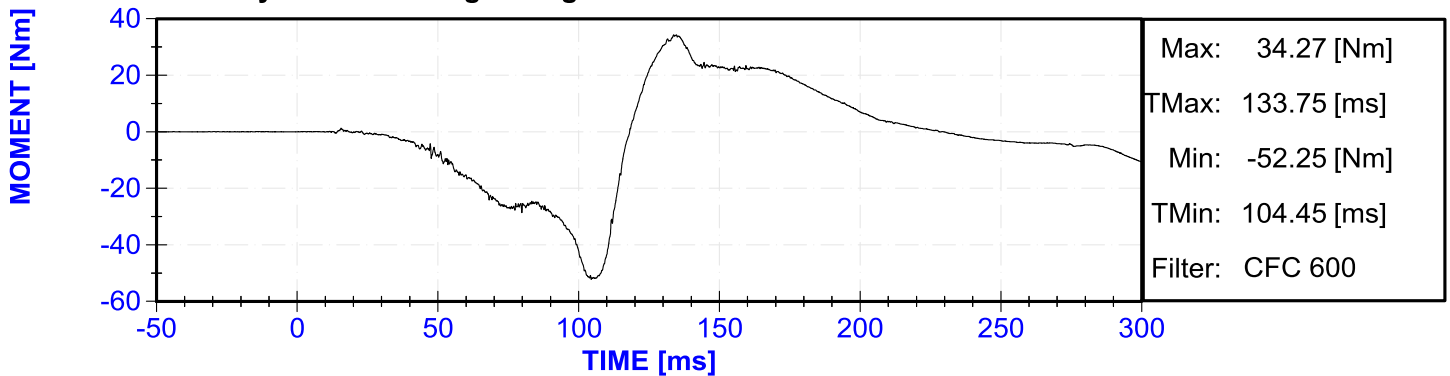
V2P2 Fz on head acting through the total neck section



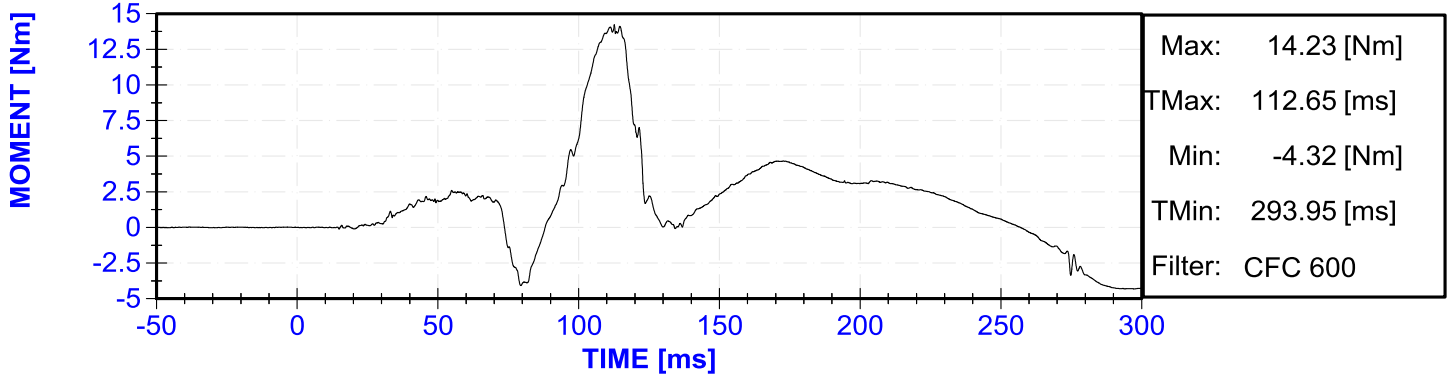
V2P2 Mx on head acting through the total neck section



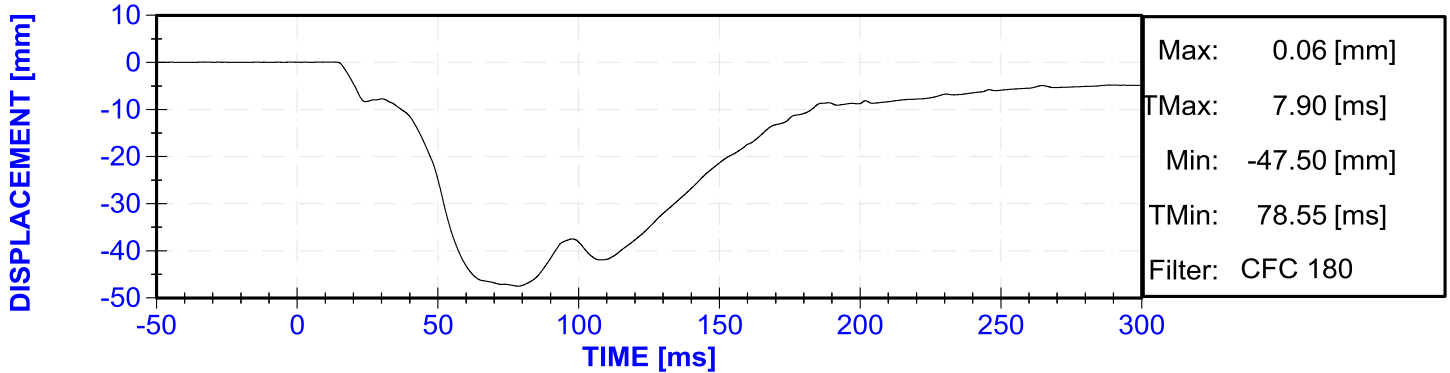
V2P2 My on head acting through the total neck section



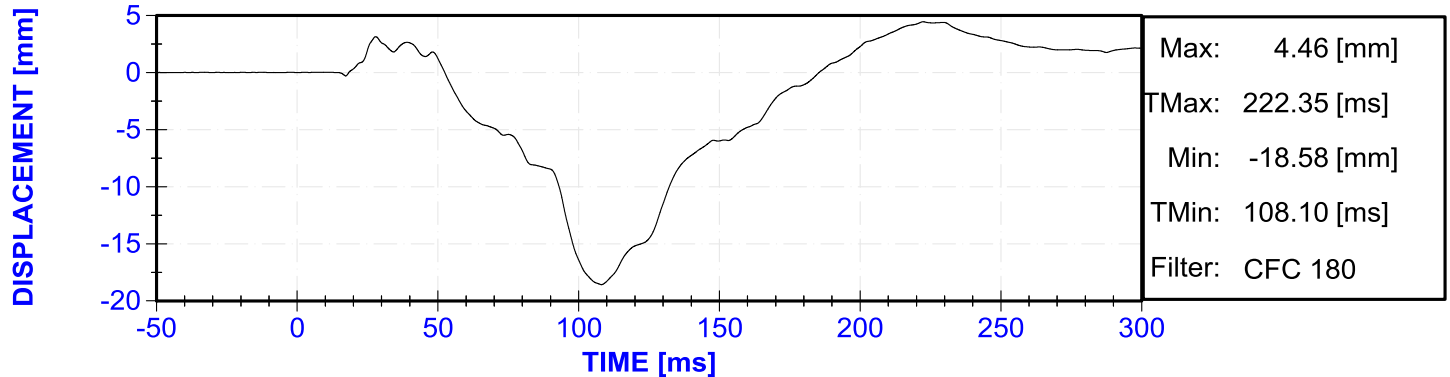
V2P2 Mz on head acting through the total neck section



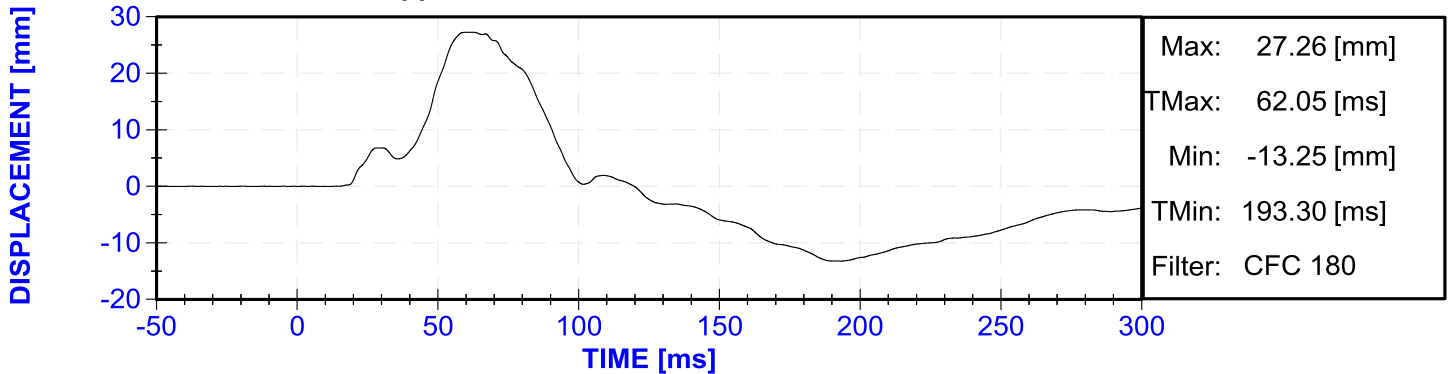
V2P2 Chest Left Upper Dx

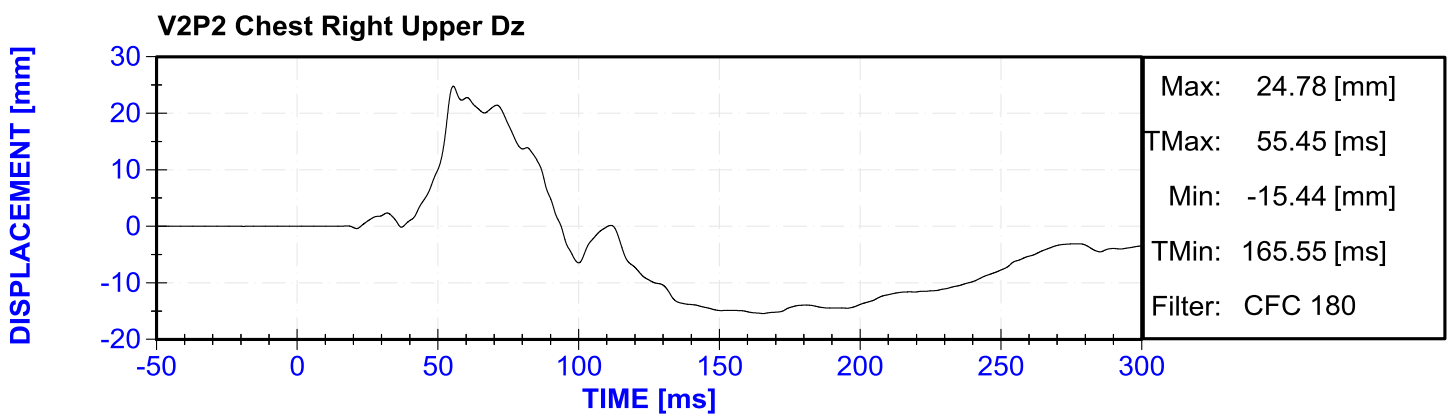
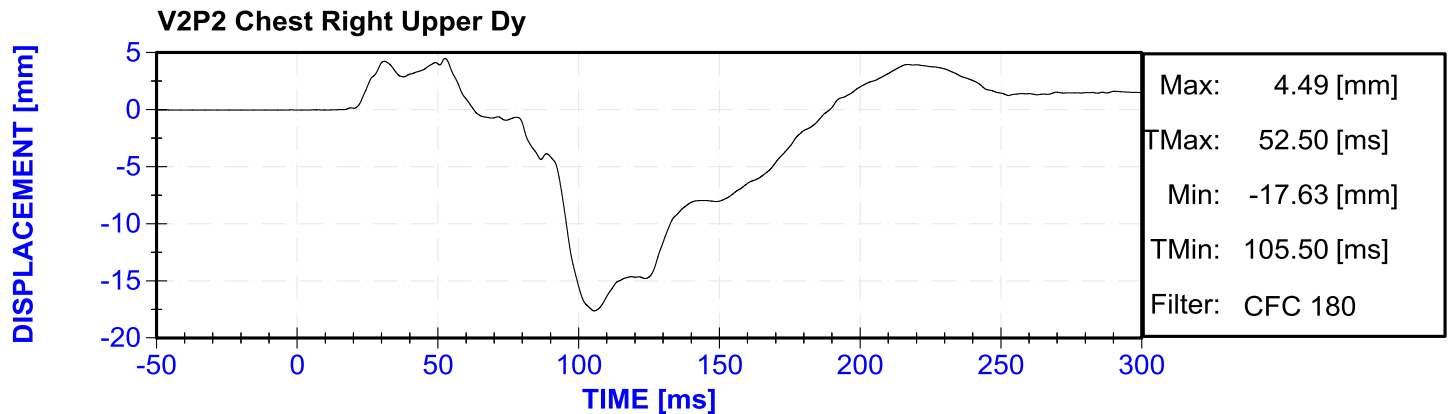
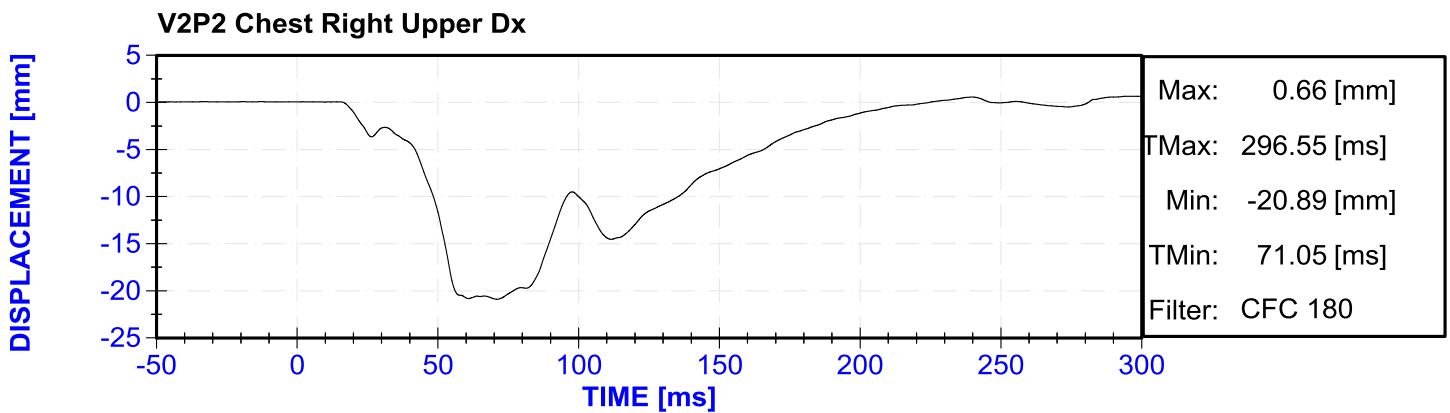
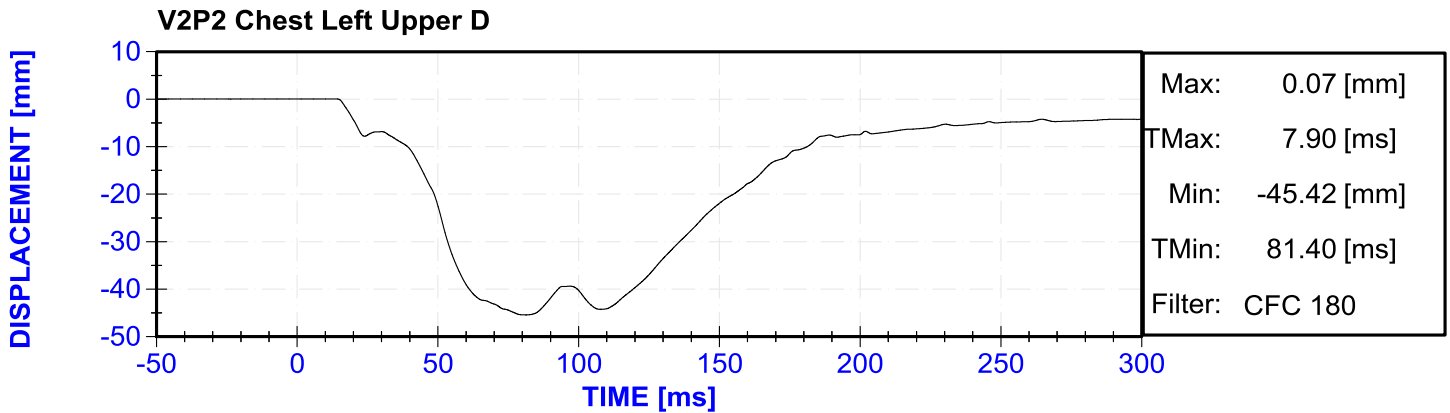


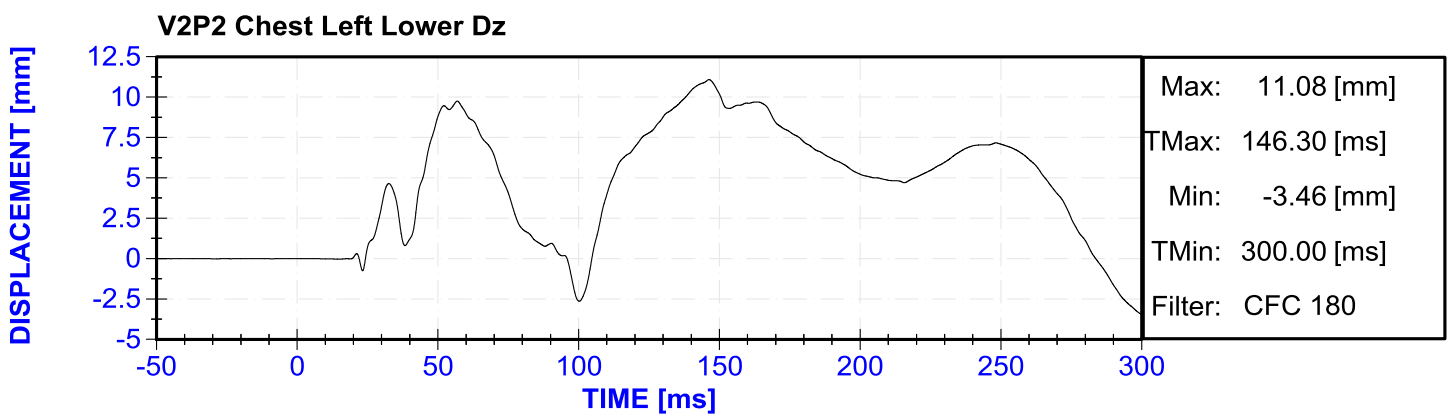
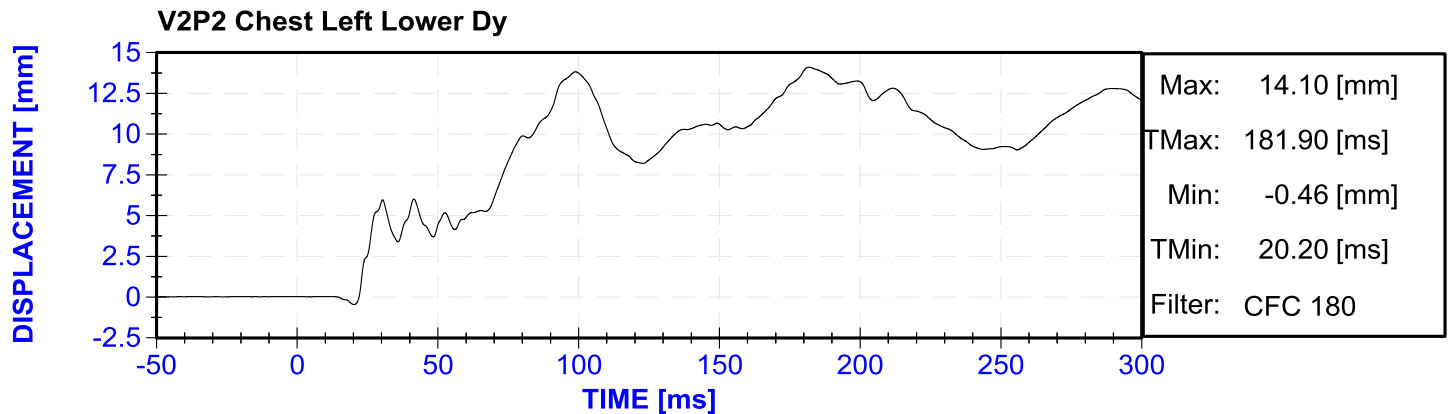
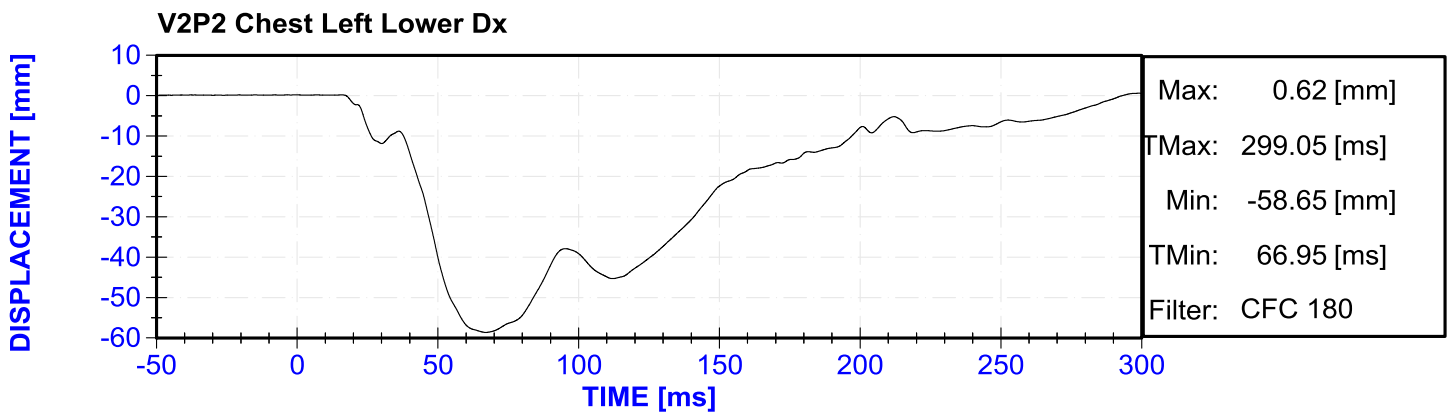
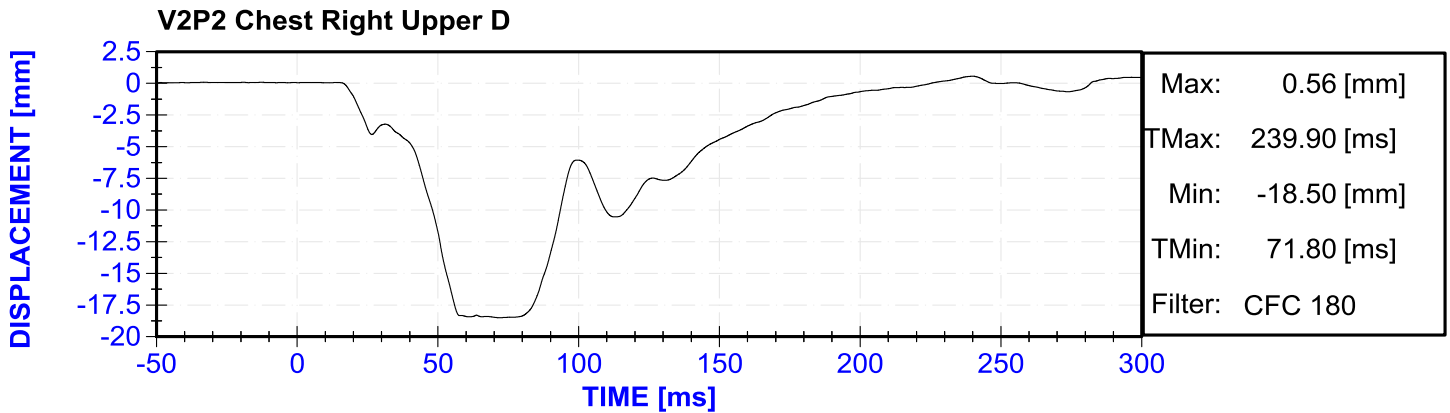
V2P2 Chest Left Upper Dy

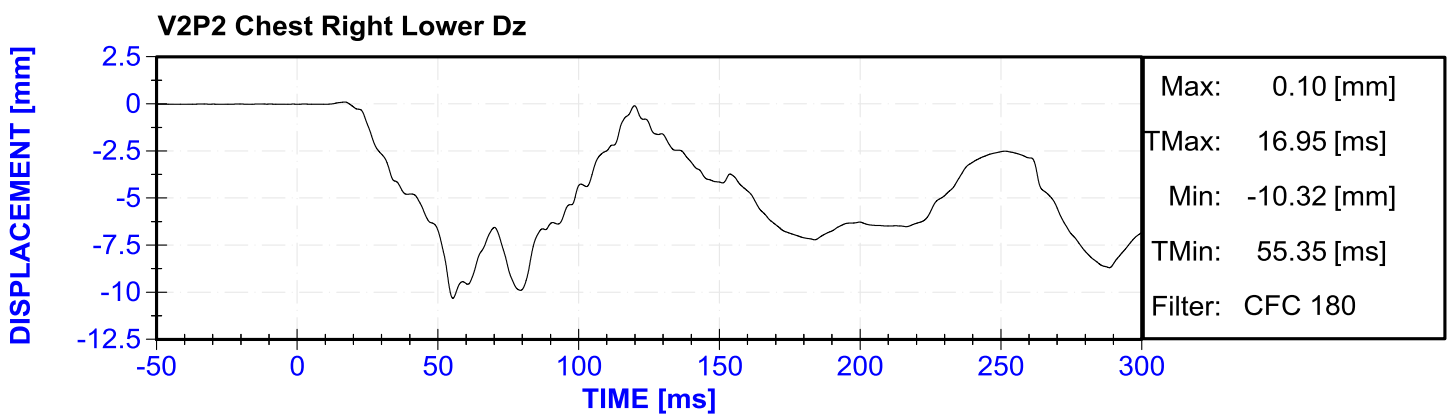
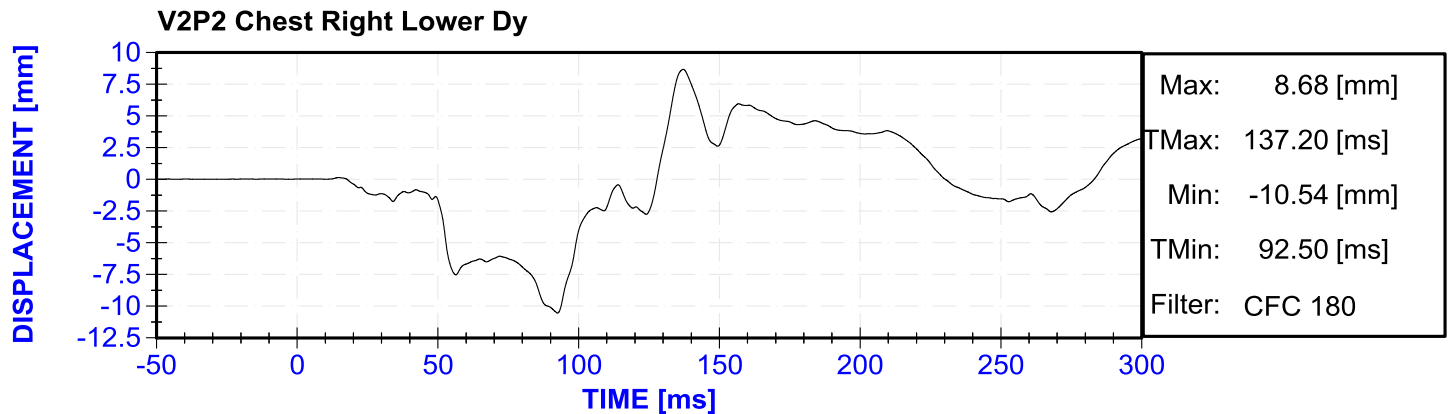
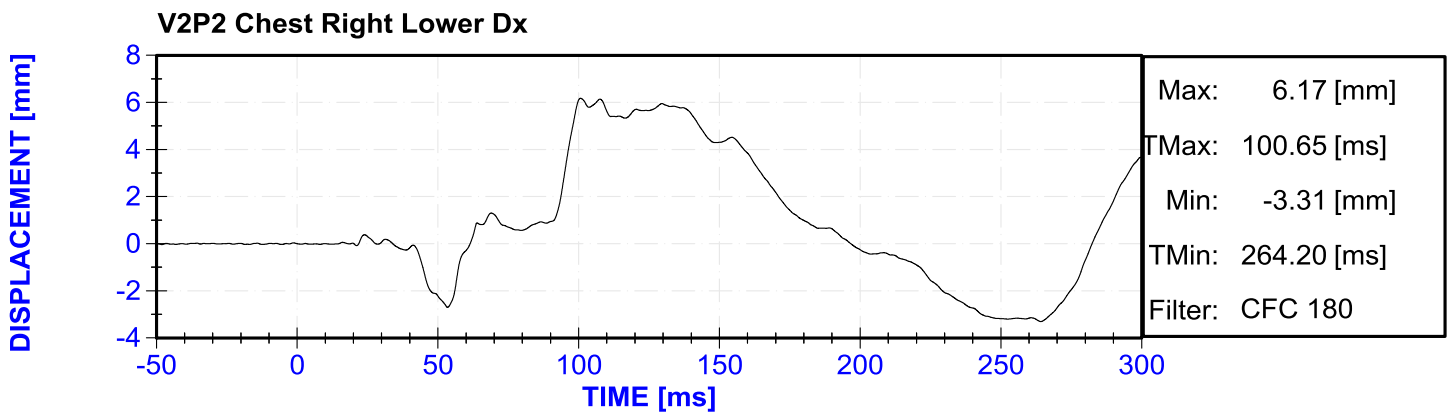
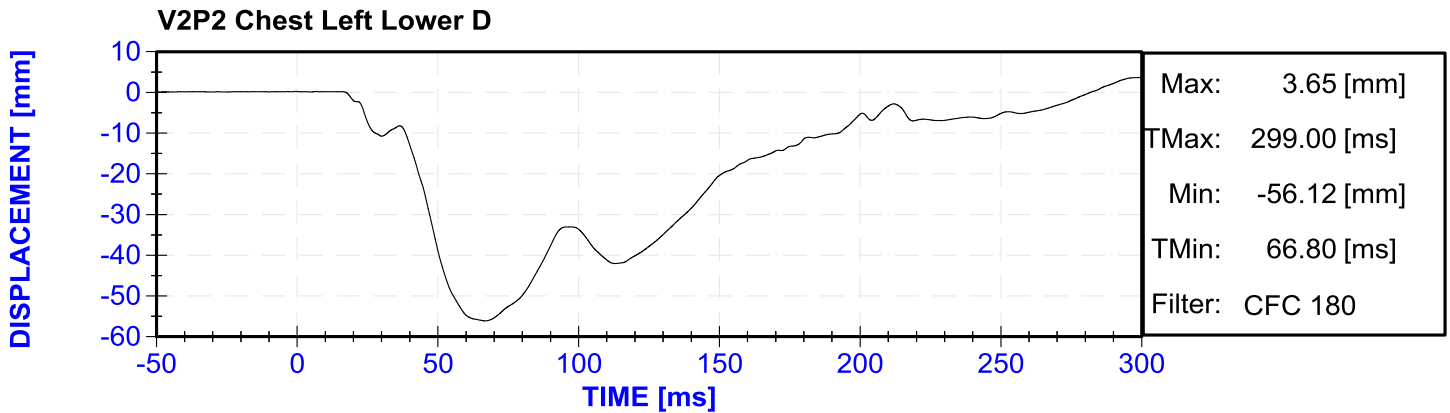


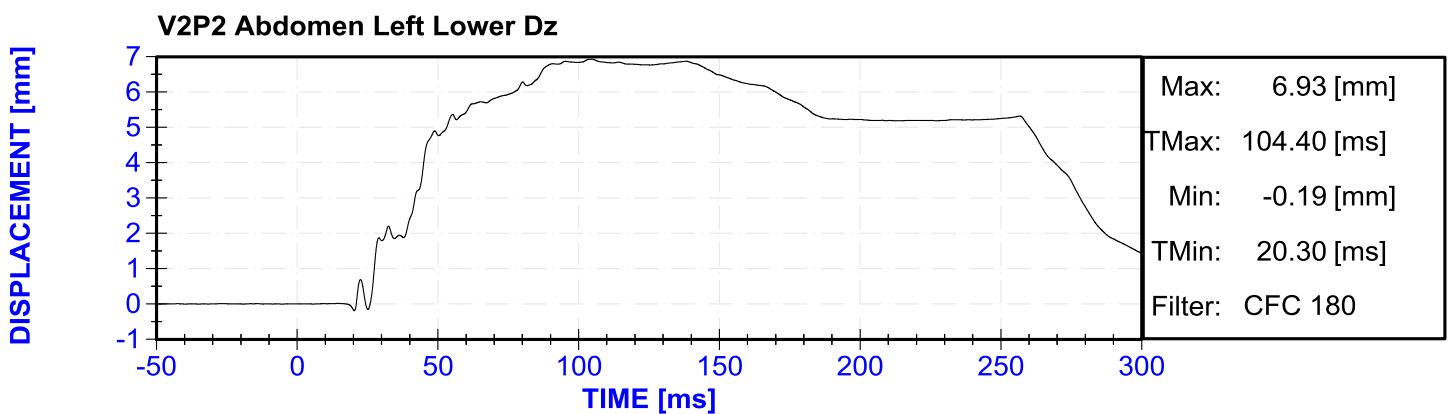
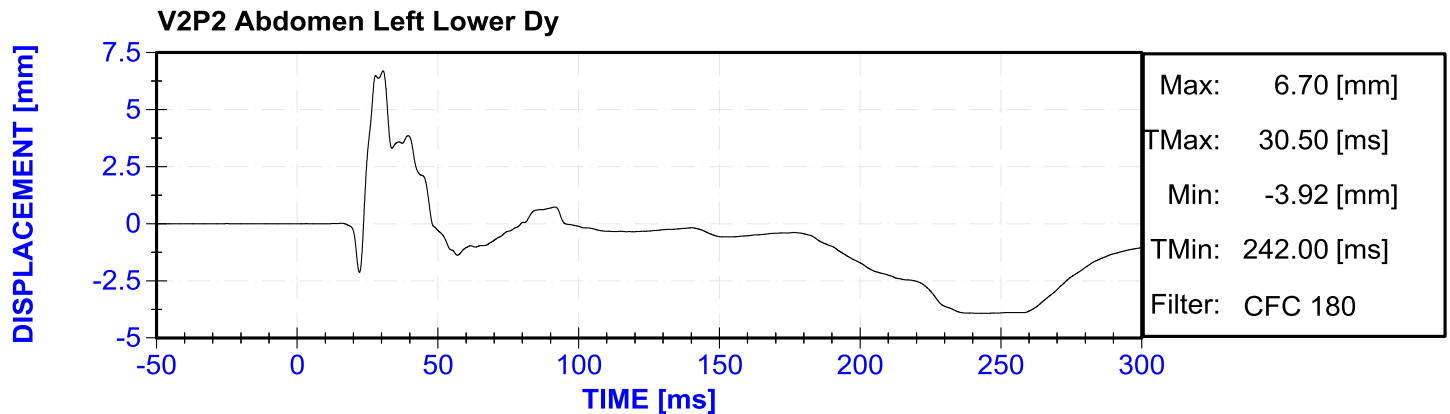
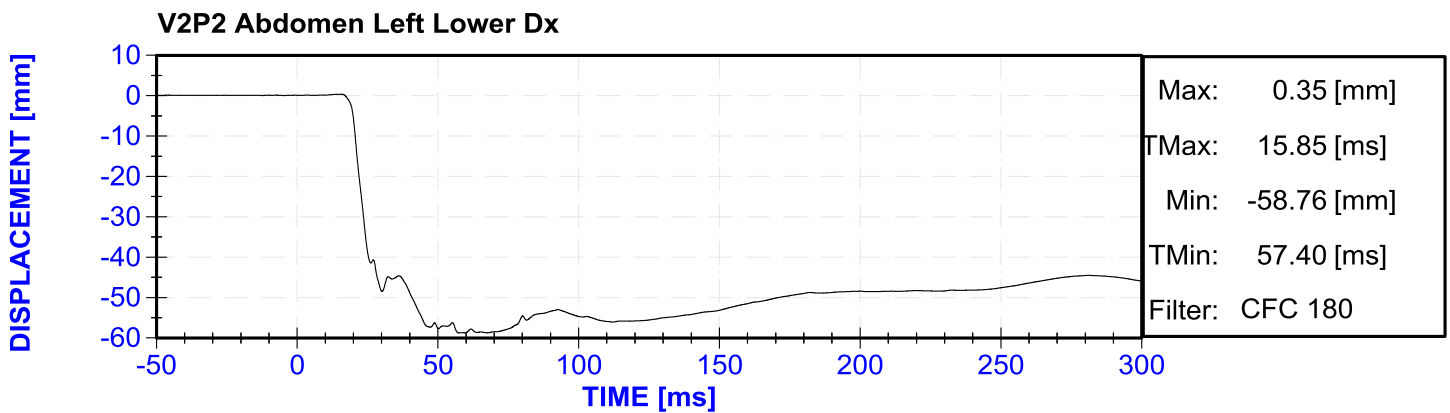
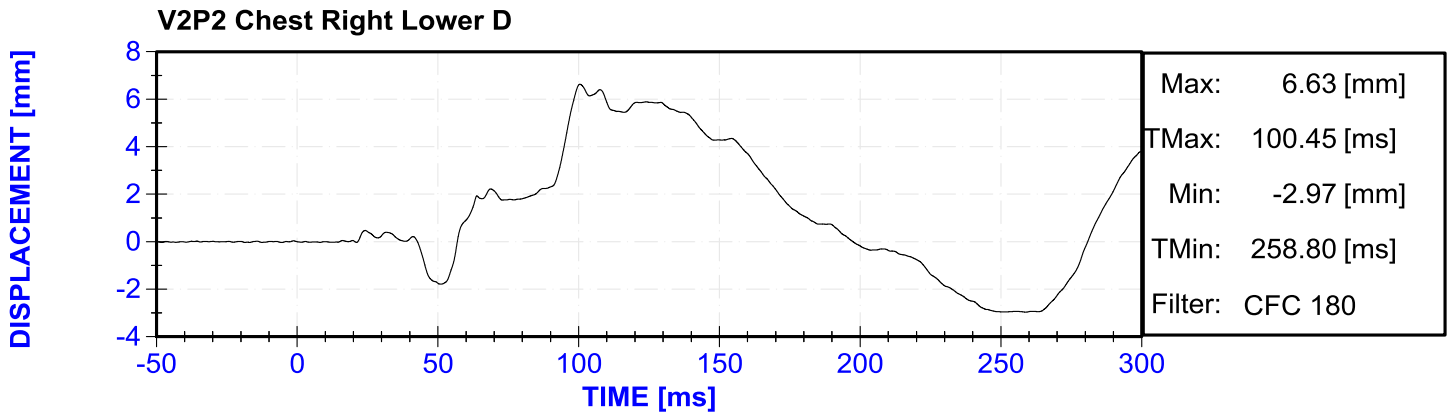
V2P2 Chest Left Upper Dz



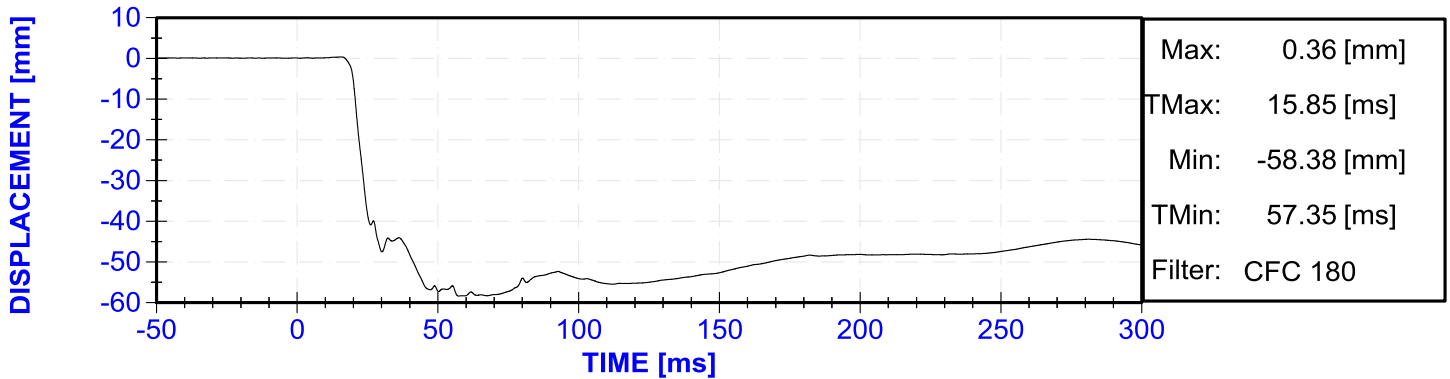




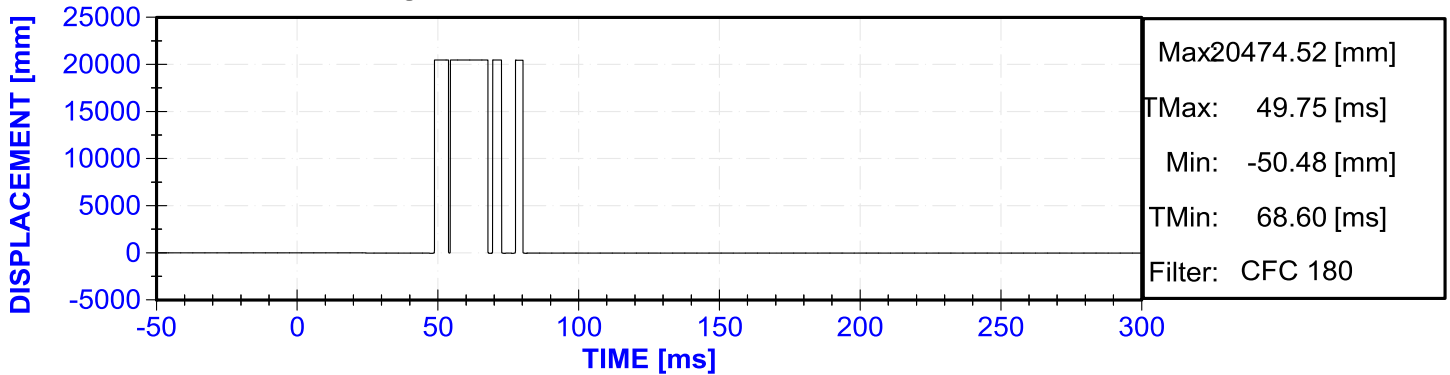




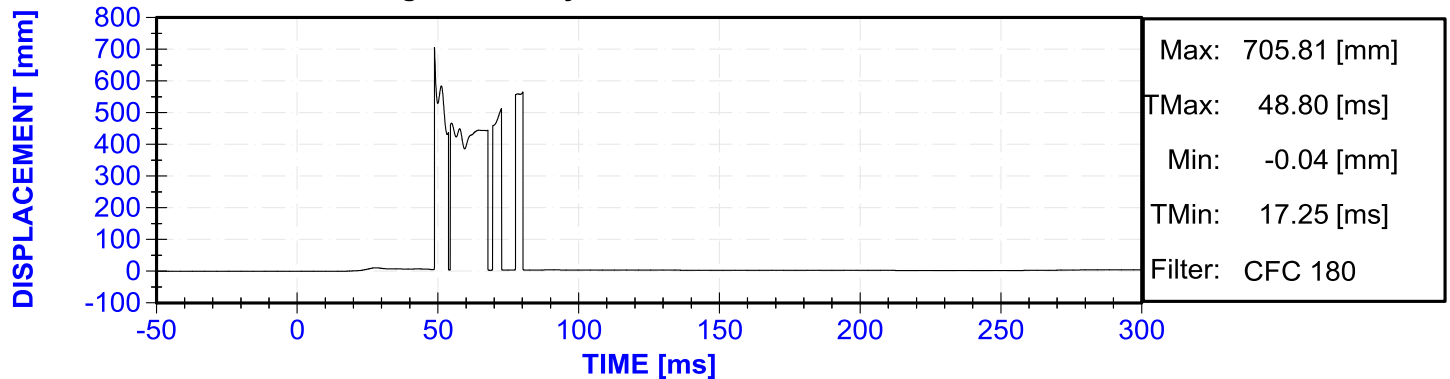
V2P2 Abdomen Left Lower D



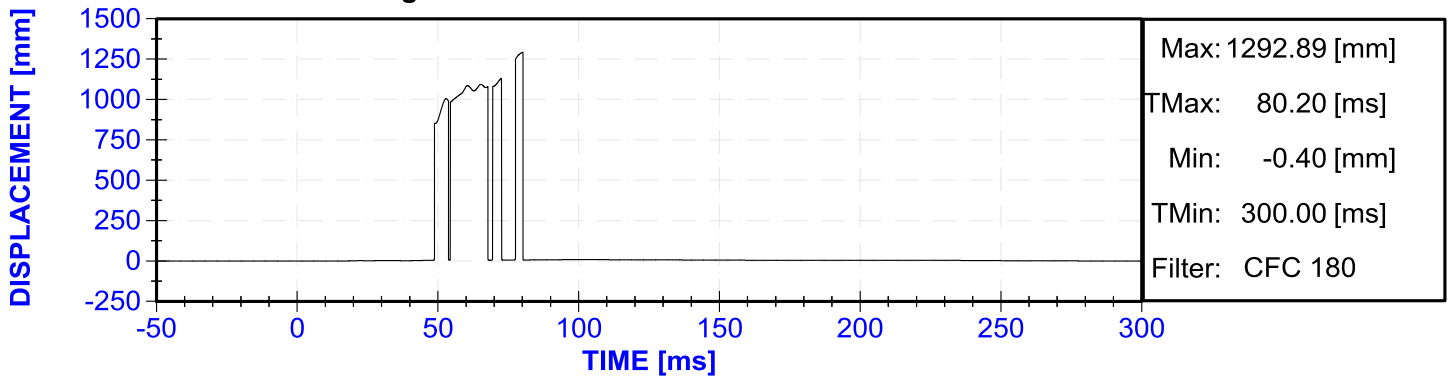
V2P2 Abdomen Right Lower Dx

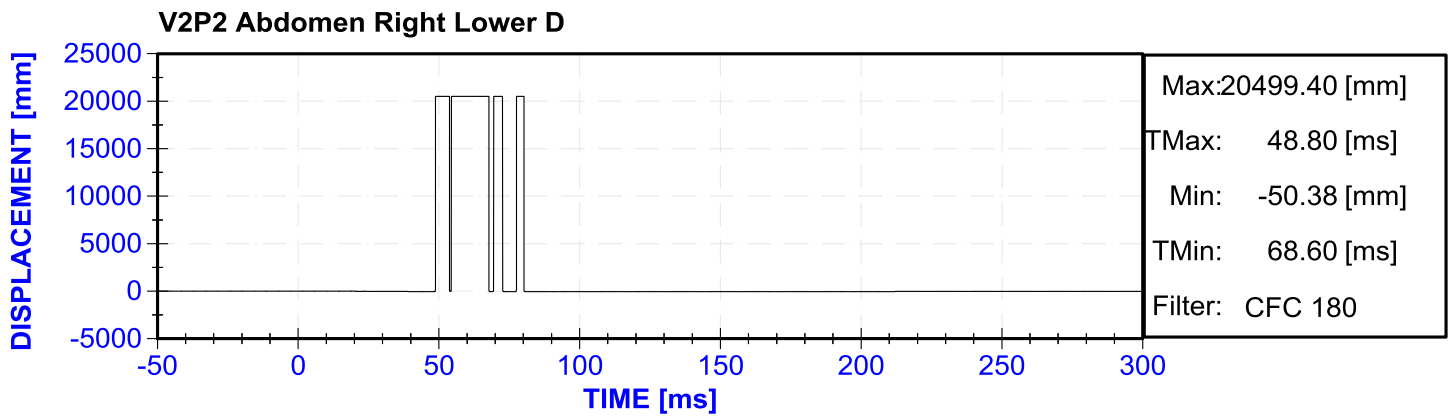


V2P2 Abdomen Right Lower Dy



V2P2 Abdomen Right Lower Dz





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

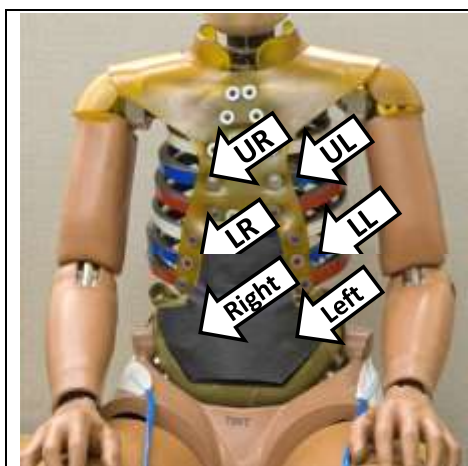


Figure 1. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

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

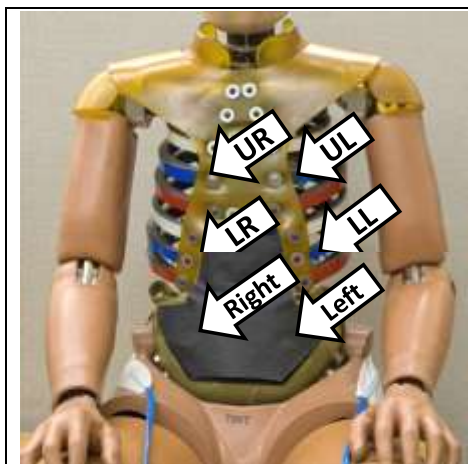


Figure 2. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

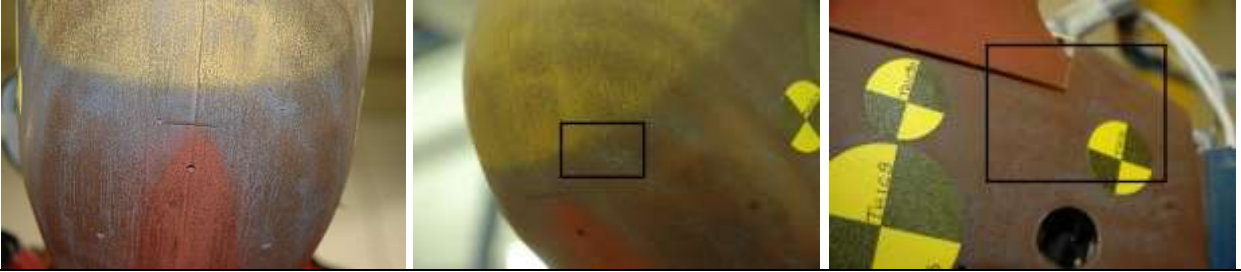
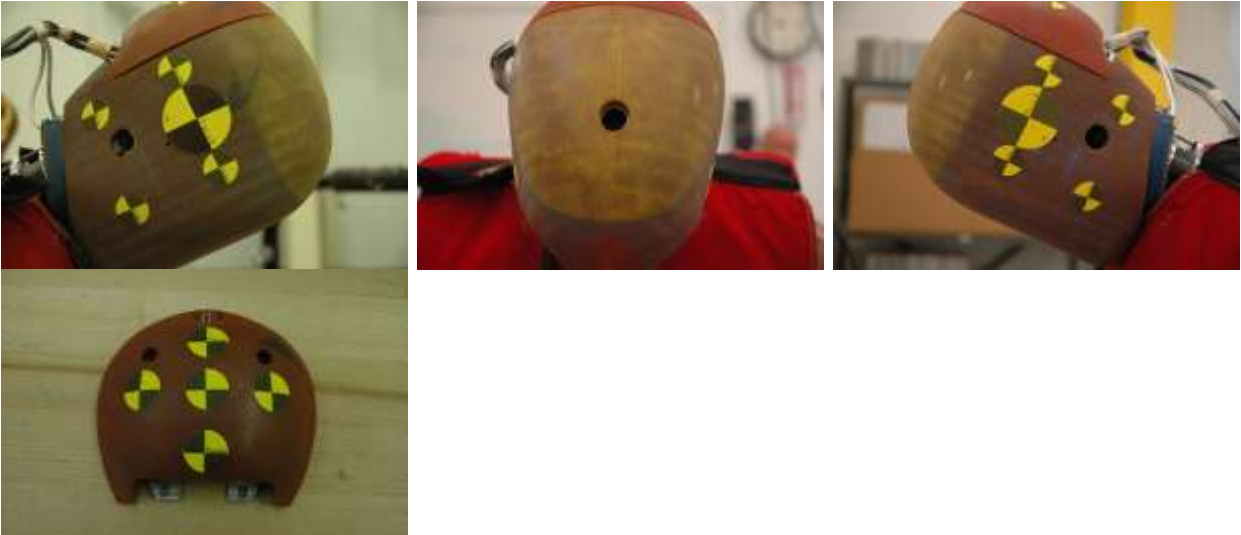
Channel	Motion
DX	Push inward
RY	Push upward
RZ	Push rightward

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: 10/15/2014	
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 

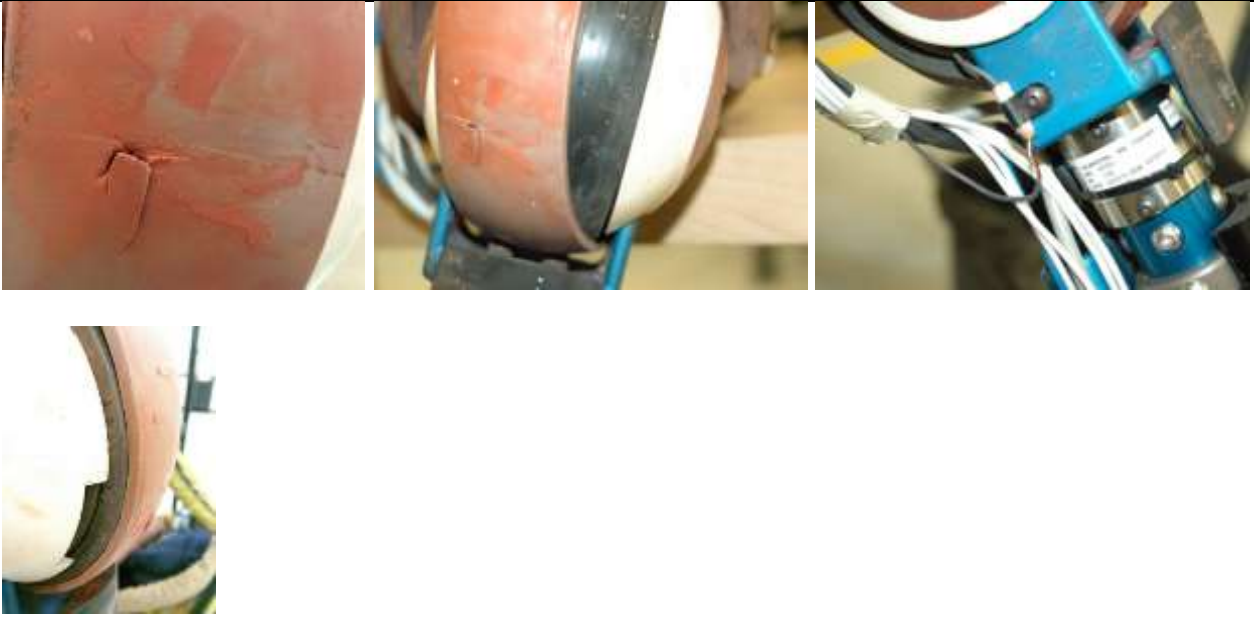
SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact The left shoulder urethane is tearing in multiple spots 
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops Left soft stop is missing 
OTHER	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. 

		
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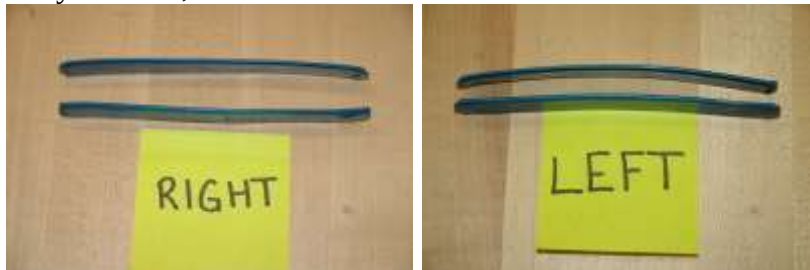
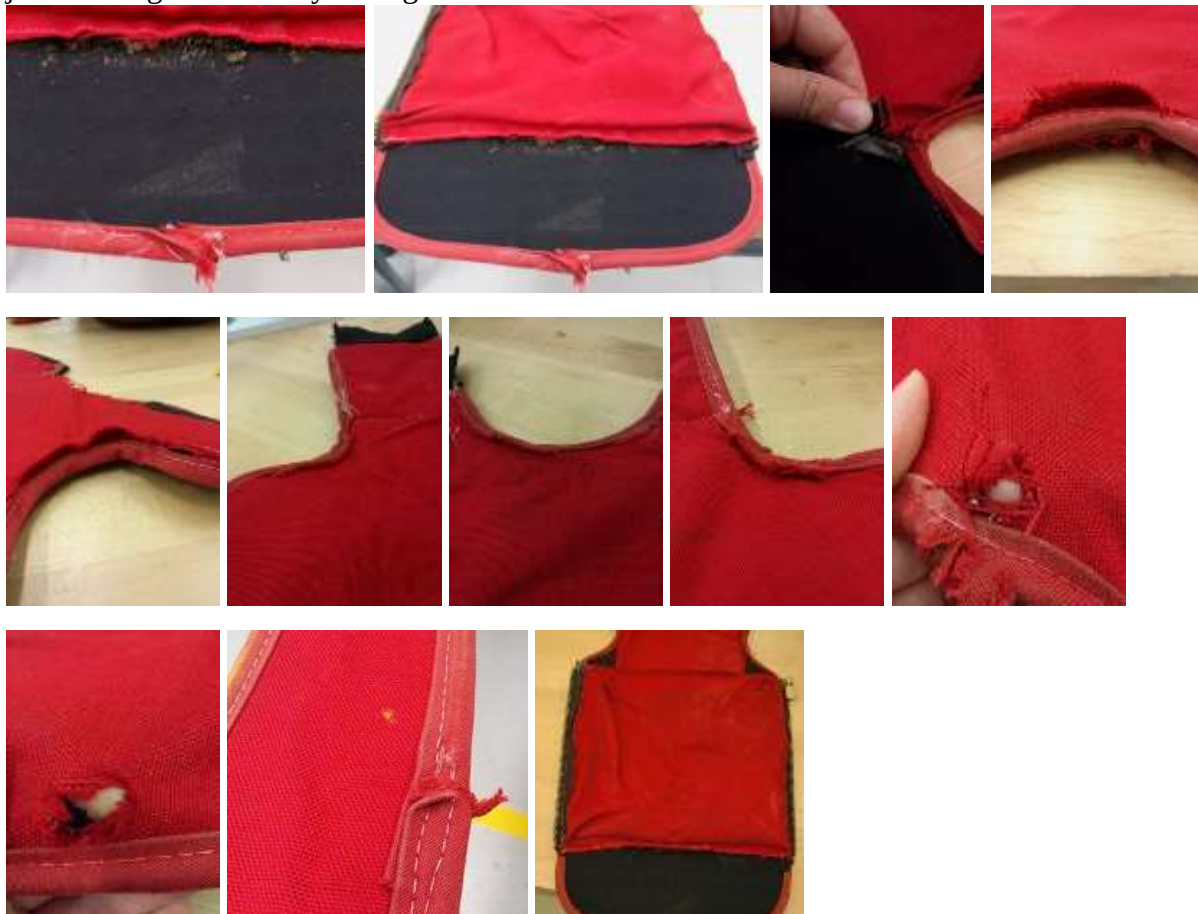
SPINE	
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates Thoracic spine is beginning to show evidence of debonding, and there is a hole 
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates
Y / N	Lumbar spine pitch change joint mechanism mating 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

		
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.

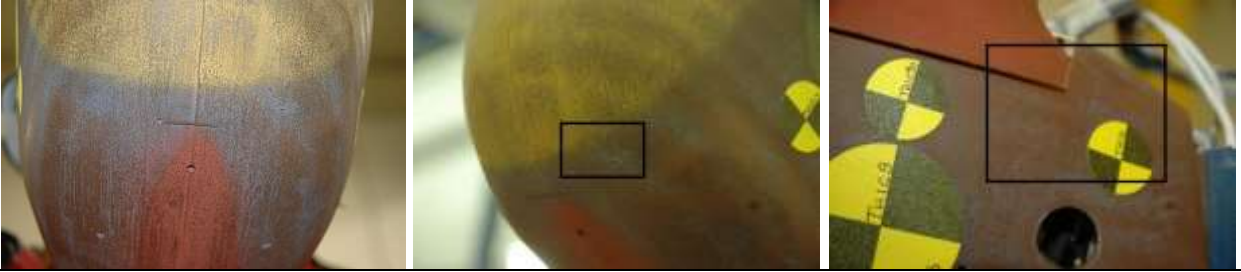
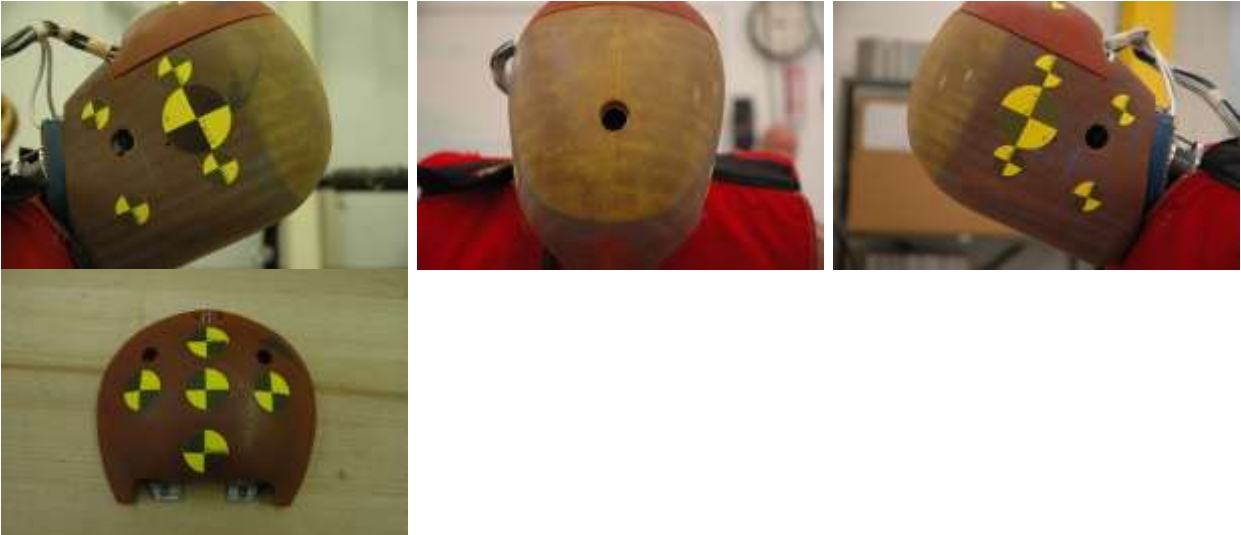
		
OTHER		
JACKET		
Y / N	Rib stiffeners show no sign of permanent deformation They are bent, but can be corrected	
		
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers There are multiple holes, tears in lining, frayed seams, back foam insert has disintegrated, holes in jacket that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

		
OTHER		

THOR Inspection Checklist

Date: 10/17/2014	
NHTSA Representative: James Saunders	
Inspection Reporter: Matt Goehle	
Inspection type (check one): ☐ Pre-Test ☒ Post-Test	
Dummy S/N: 0015	Legs S/N: LX0038/LX0039
Dummy Description: THOR NT 50th Male	
Date of last Certification: Certification performed in May 2014	
<u>Tests conducted since last full certification or inspection:</u> Since last inspection: R20145403 – Mazda 3 <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 R20145403 – Mazda 3
<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

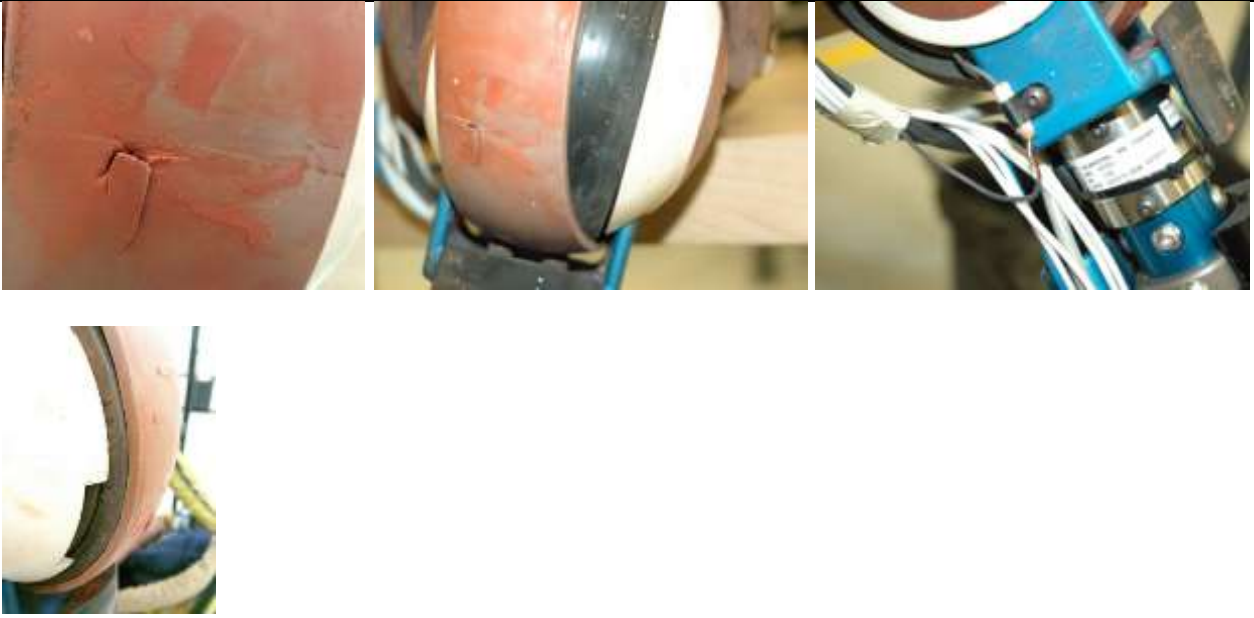


Y / N

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.

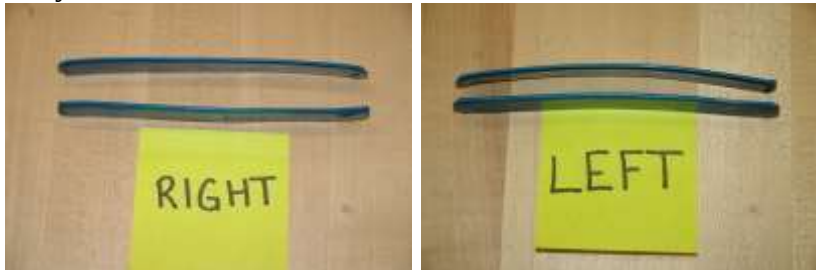
	
OTHER	

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 
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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 
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OTHER		

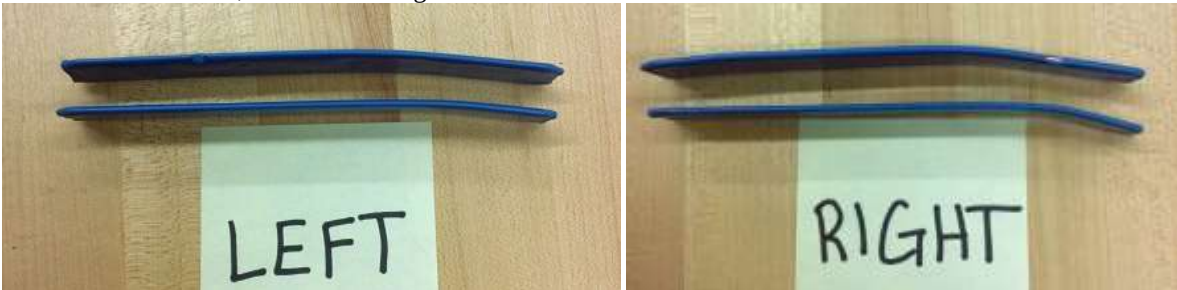
THOR Inspection Checklist

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

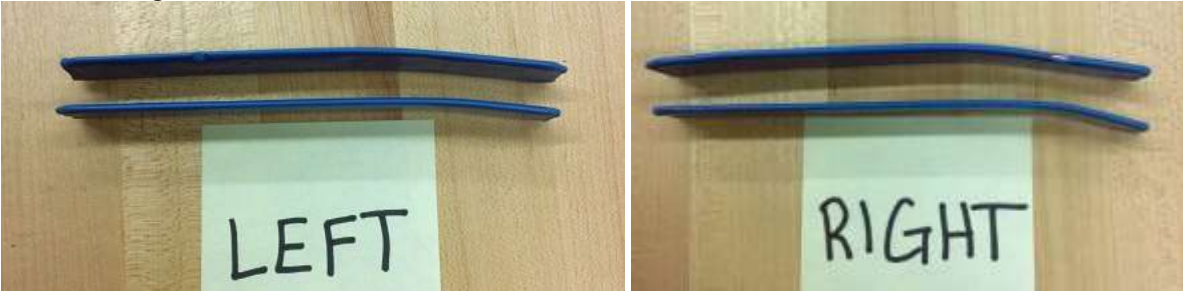
Note: New Damage is Noted in Red

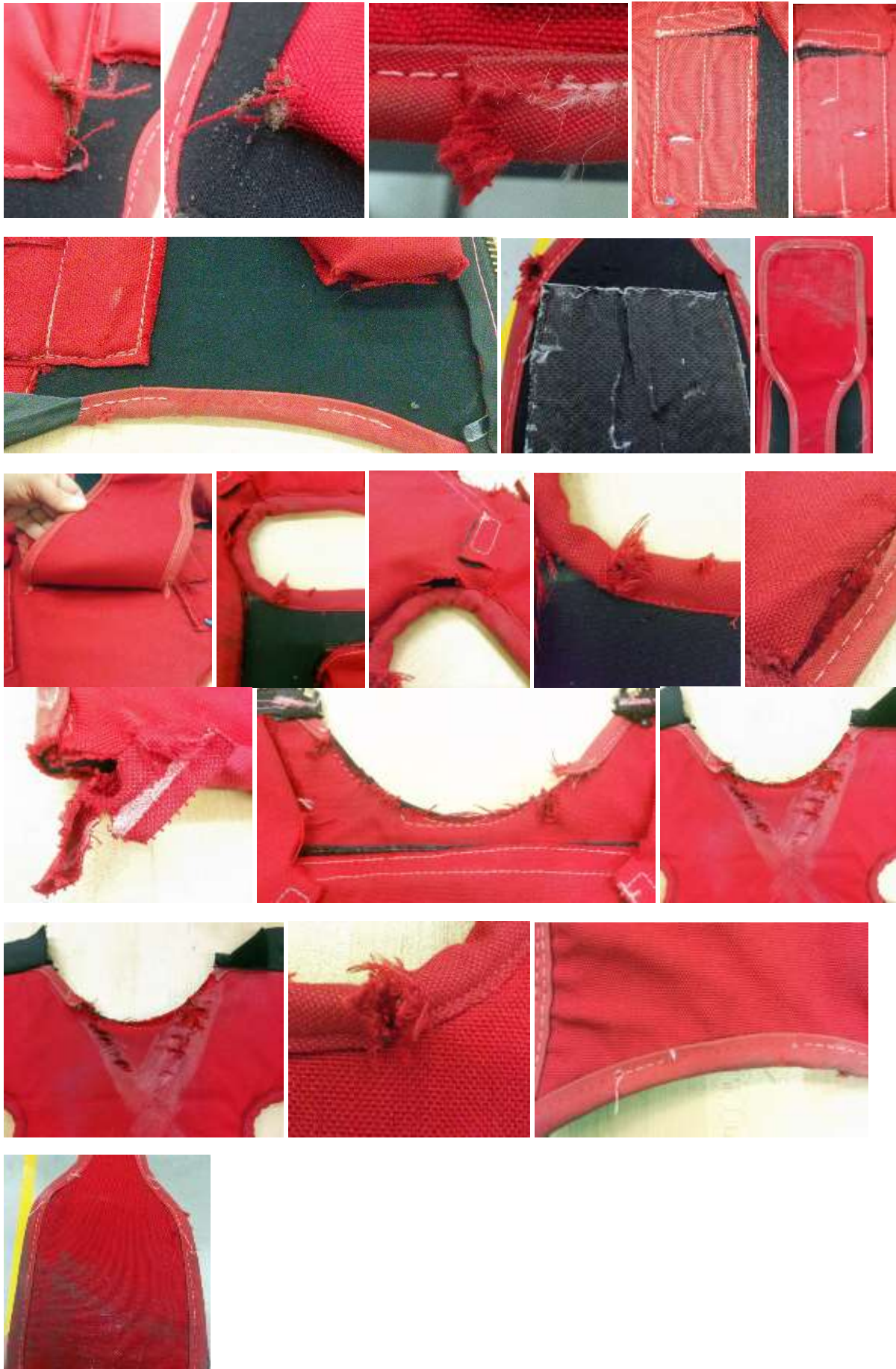
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	
NECK	
Y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



THOR Inspection Checklist

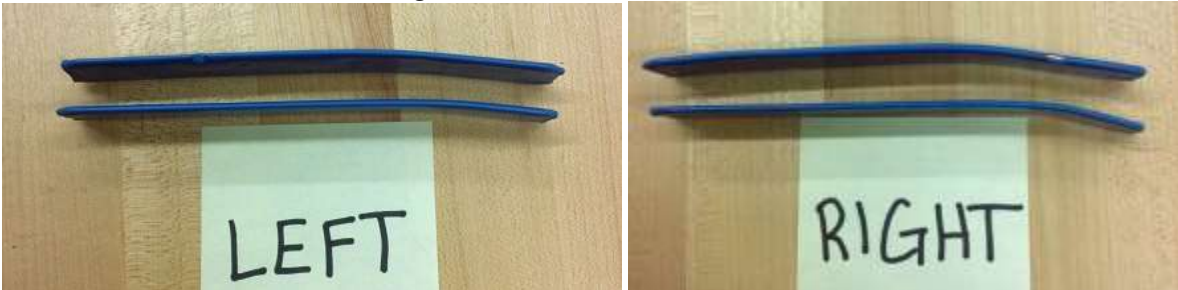
Date: 10/17/2014	
NHTSA Representative: James Saunders	
Inspection Reporter: Matt Goehle	
Inspection type (check one): ☐ Pre-Test ☒ Post-Test	
Dummy S/N: 0016	Legs S/N: LX0019/LX0018
Dummy Description: THOR NT 50th Male	
Date of last Certification: Certification performed in June 2014	
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> R20145403 – Mazda 3 <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 R20145403 – Mazda 3
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> - 13ABDORL00THVO0P - Abdomen Right DGIR X Displacement - Questionable Spikes from ~48ms to 80ms – Cannot reproduce spikes during troubleshooting. We applied additional tape on Amphenol connector to prevent pin movement.	
<u>Physical evidence of damage:</u> None New	
<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

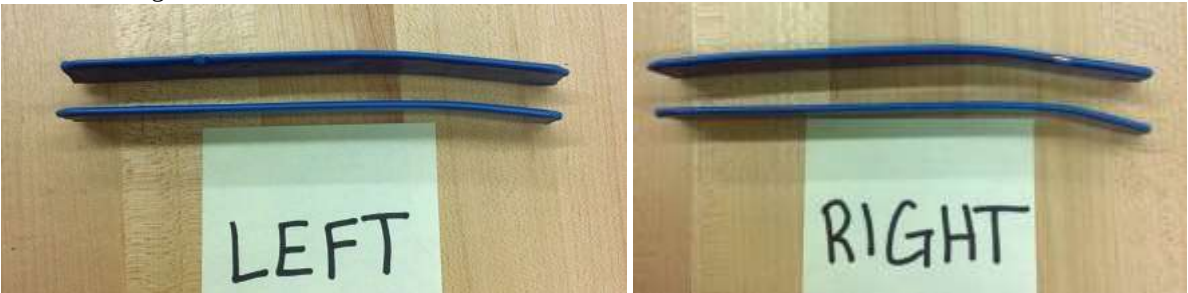
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	
NECK	
Y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

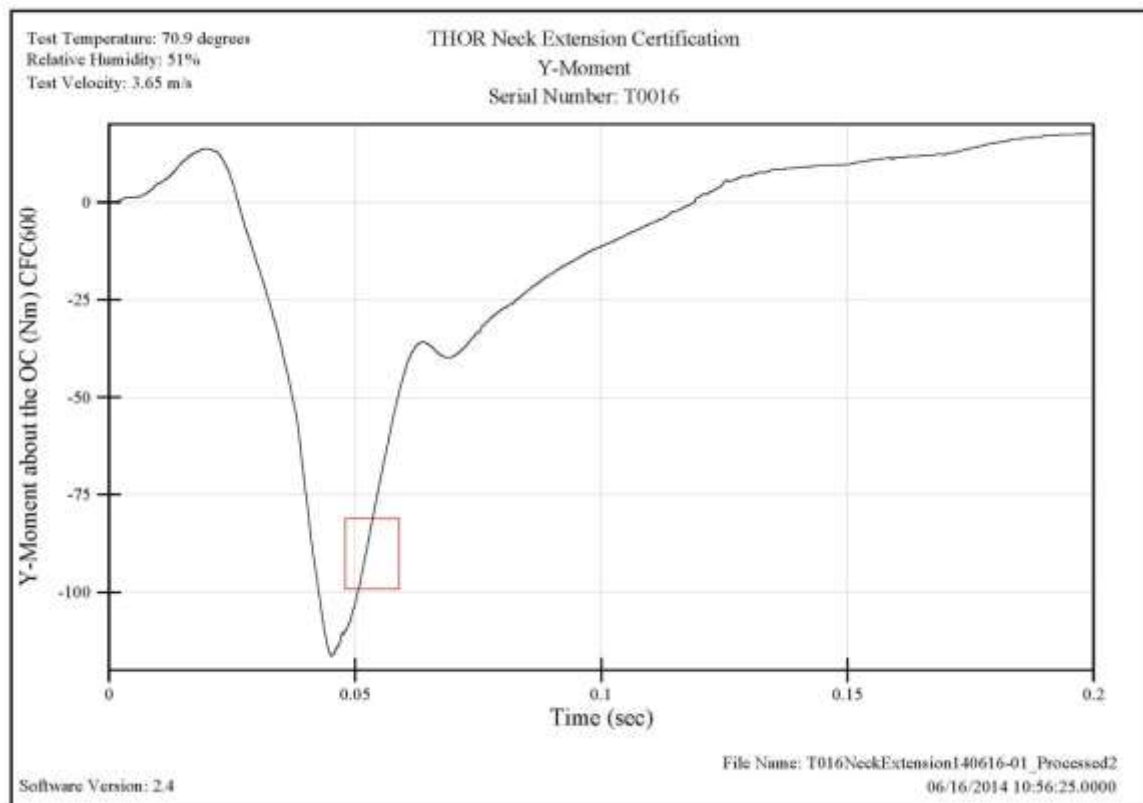
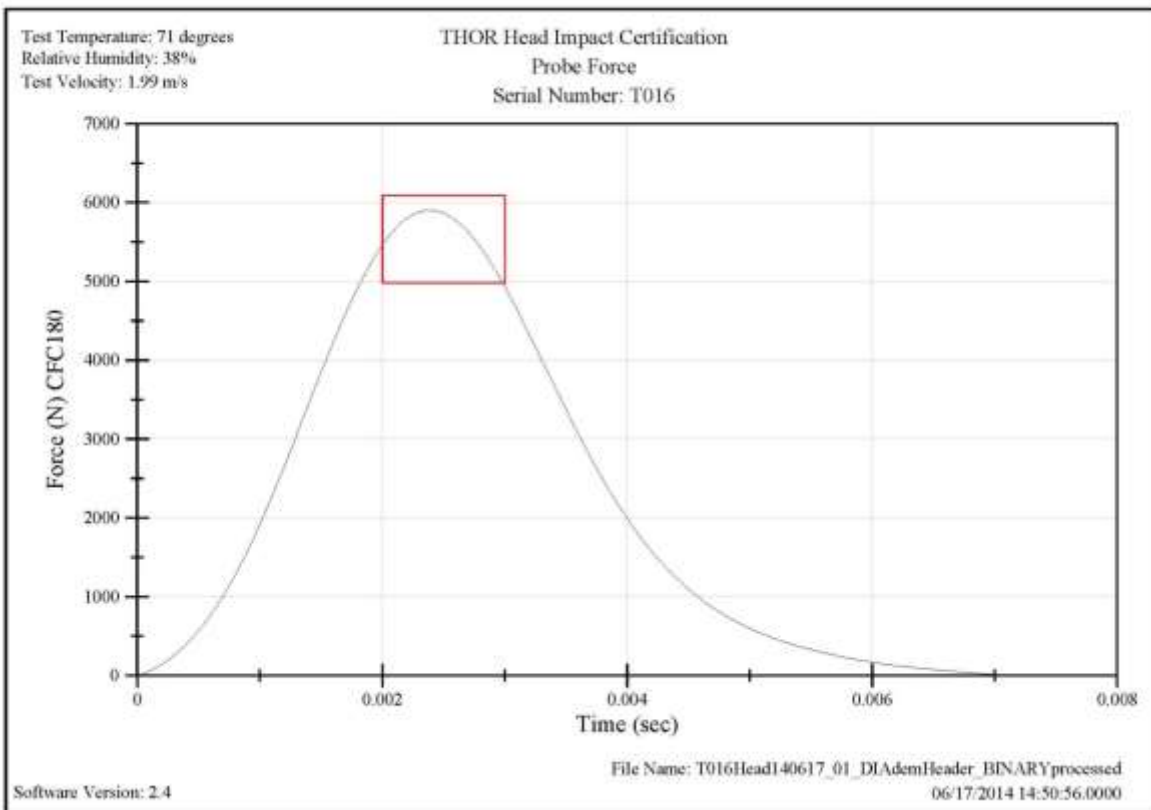


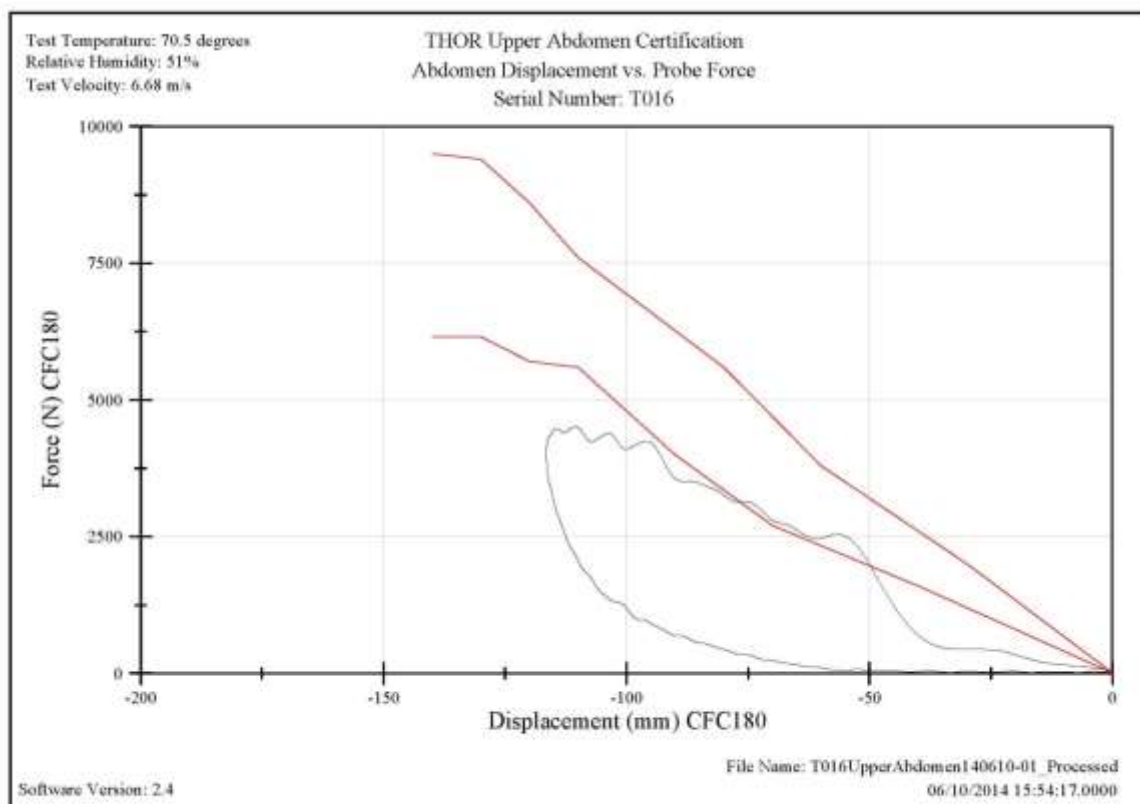
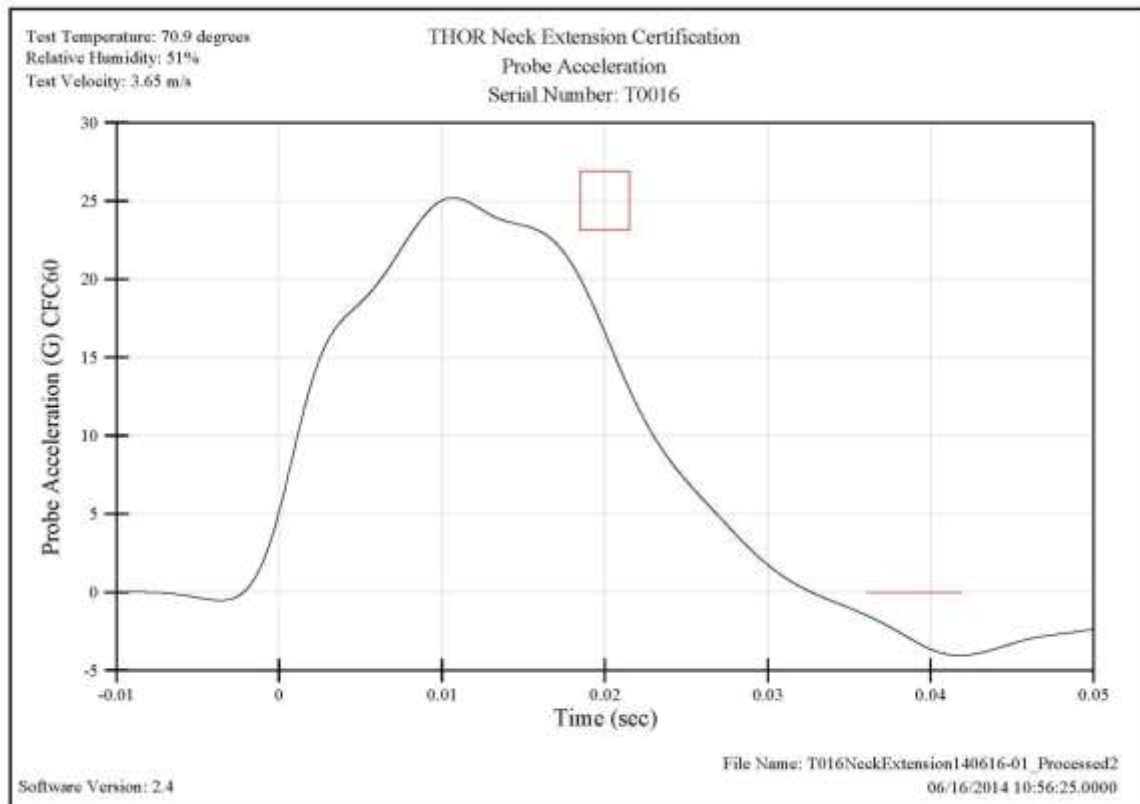
		
OTHER	The hoist strap has broken, we are currently using zip ties in its place 	

Test Data/Sensor Repair Notes

DUMMY CALIBRATIONS

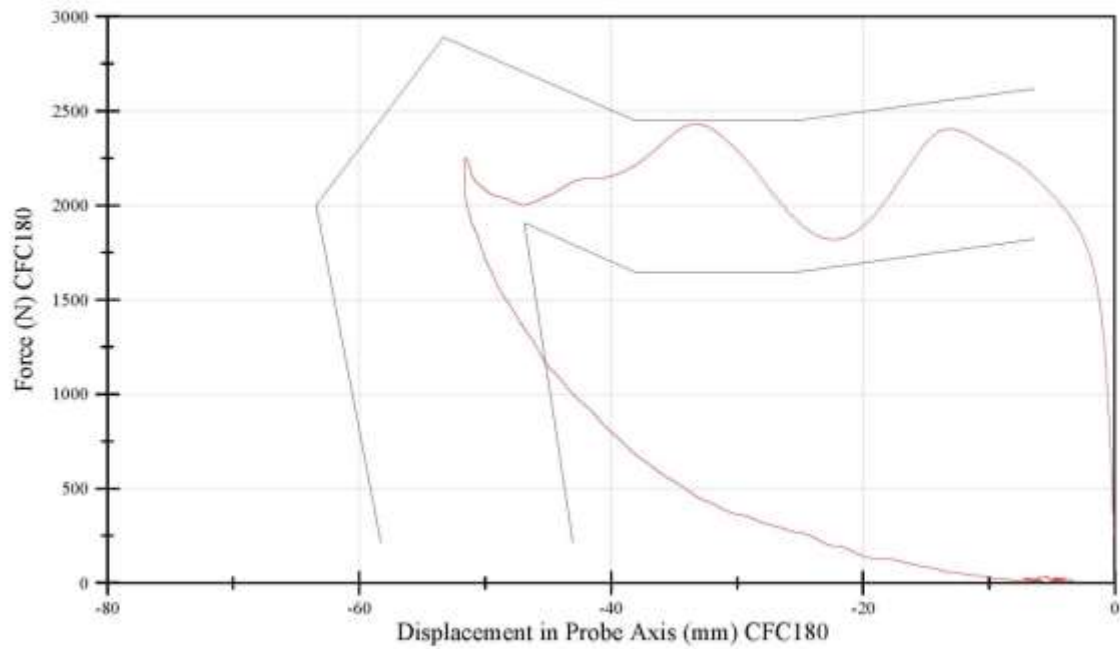
50% ADULT MALE THOR016 DUMMY CALIBRATIONS





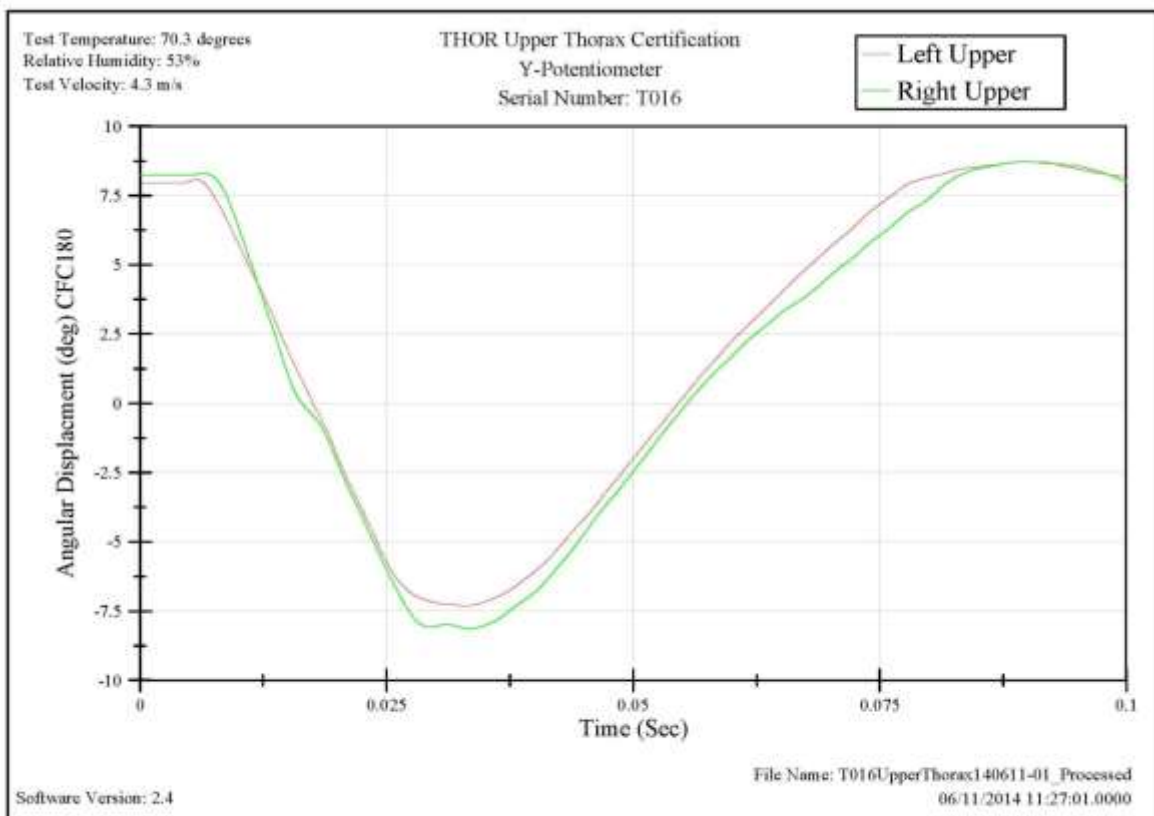
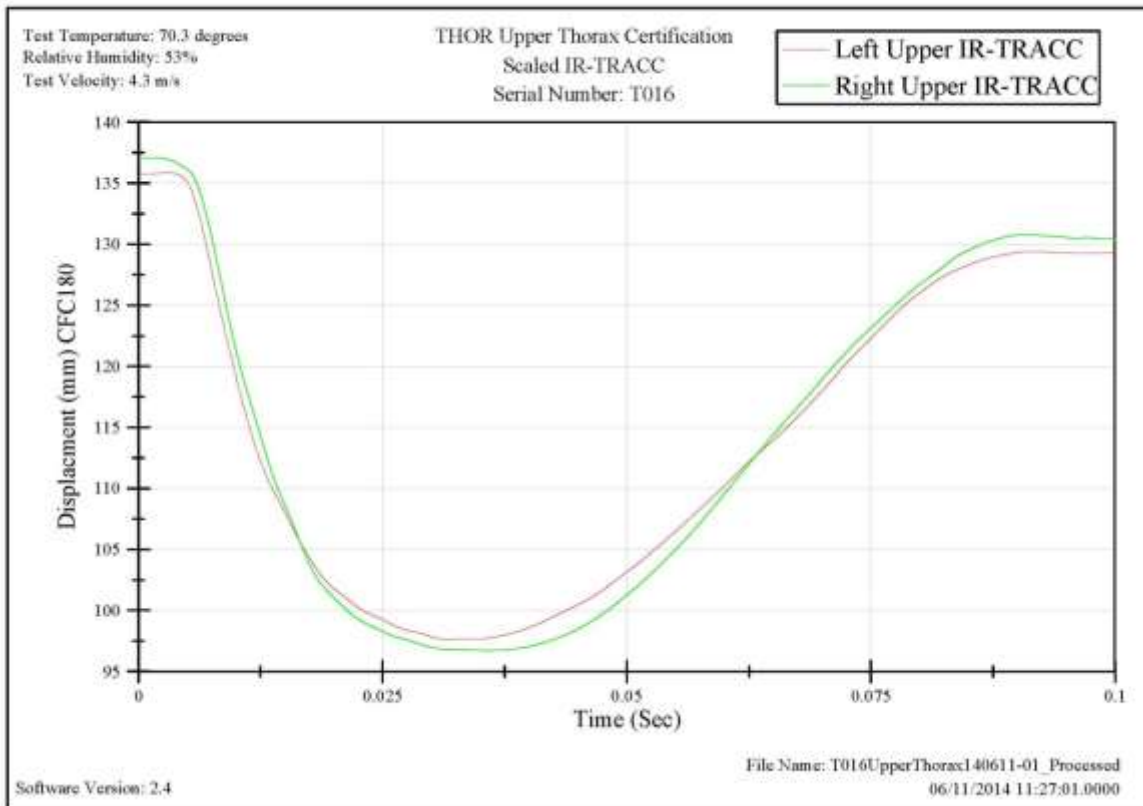
Test Temperature: 70.3 degrees
Relative Humidity: 53%
Test Velocity: 4.3 m/s

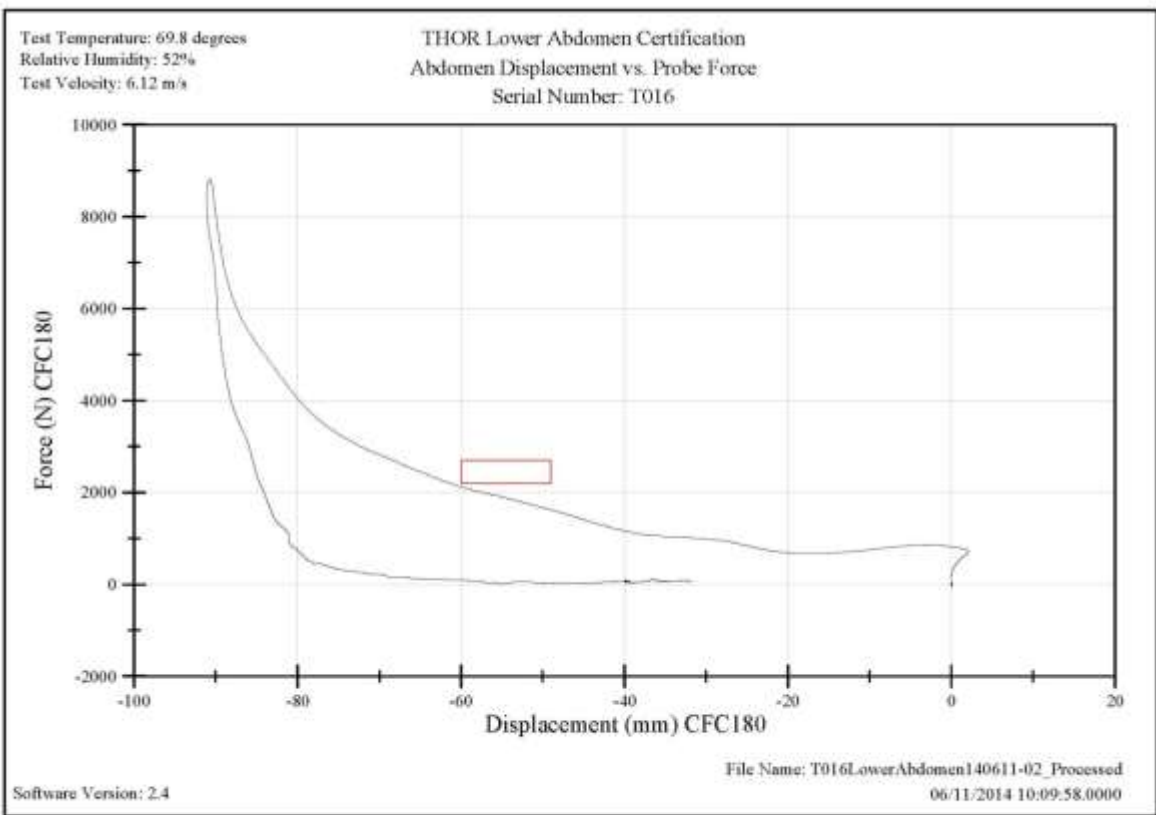
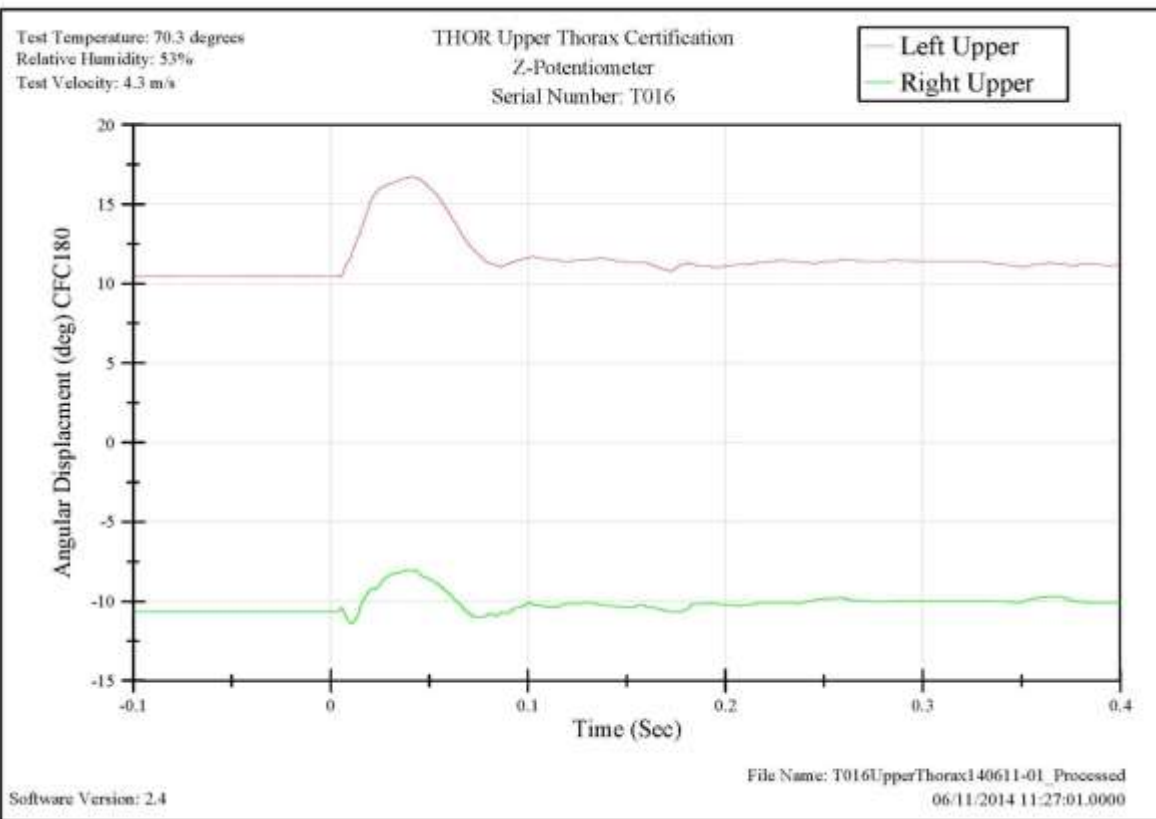
THOR Upper Thorax Certification
Thorax Response With Kroell Corridor
Serial Number: T016

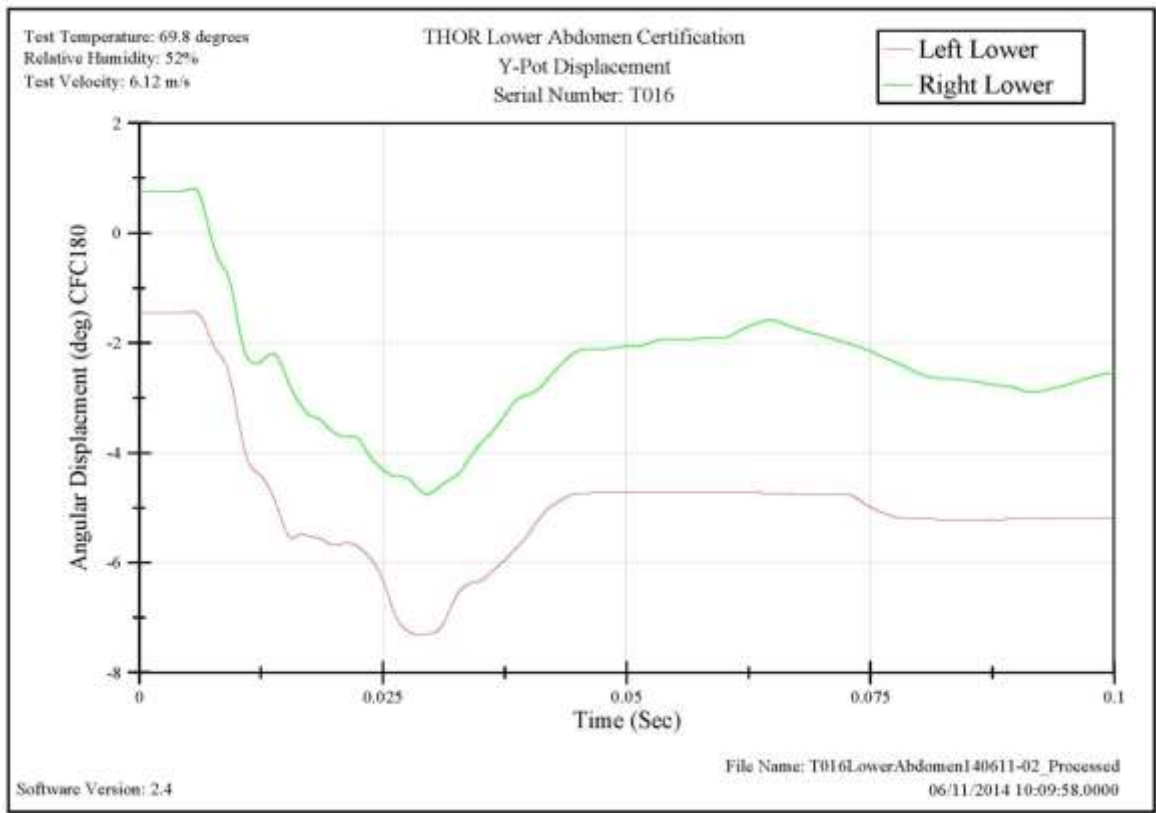
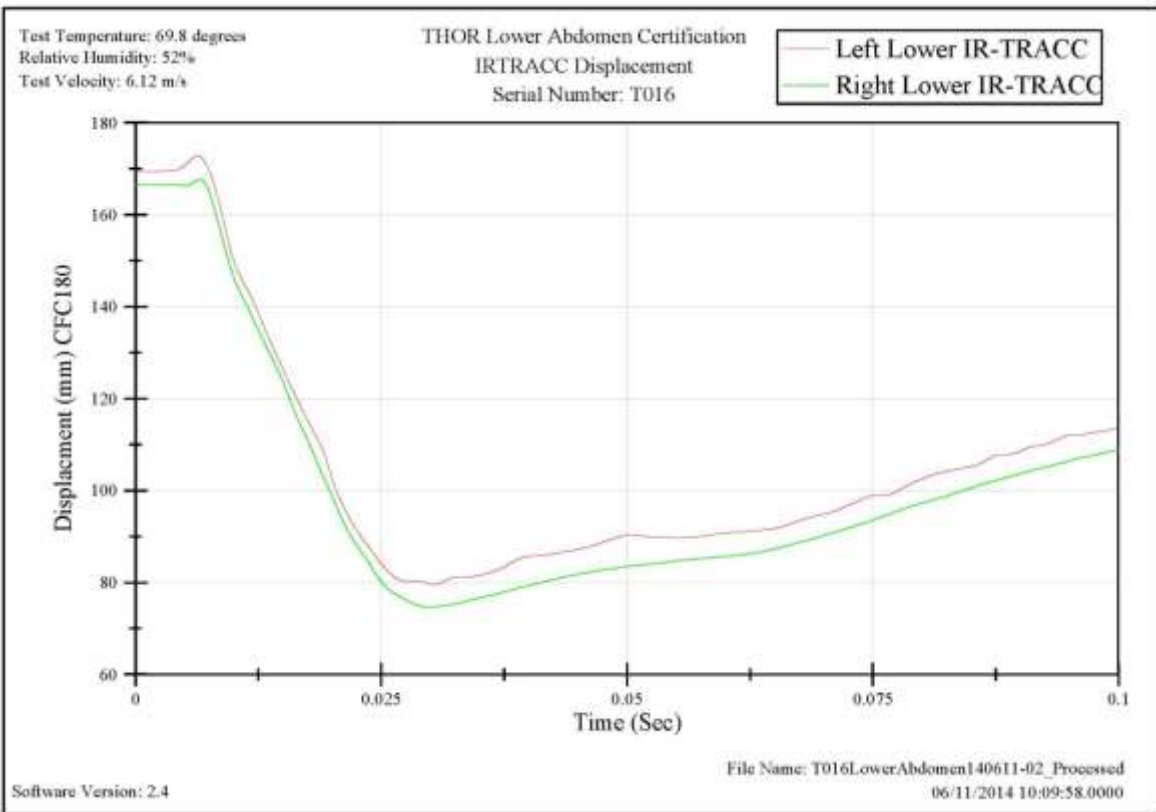


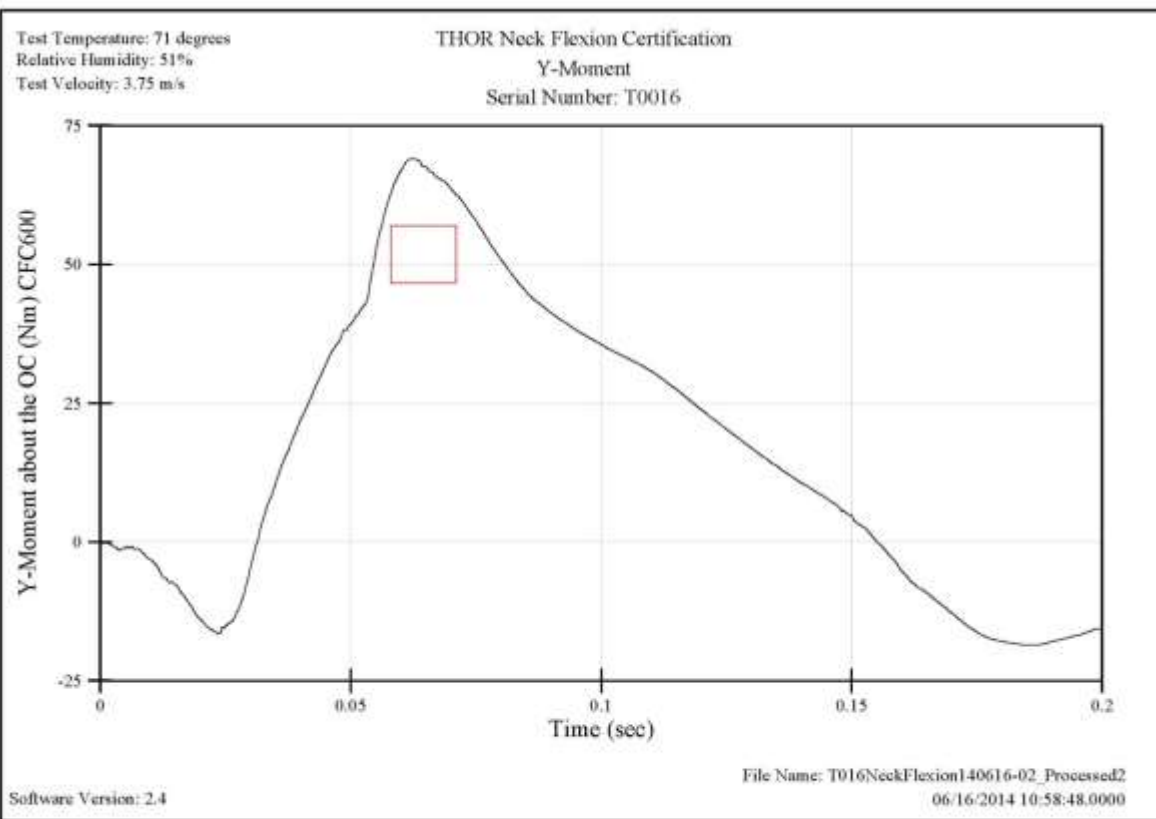
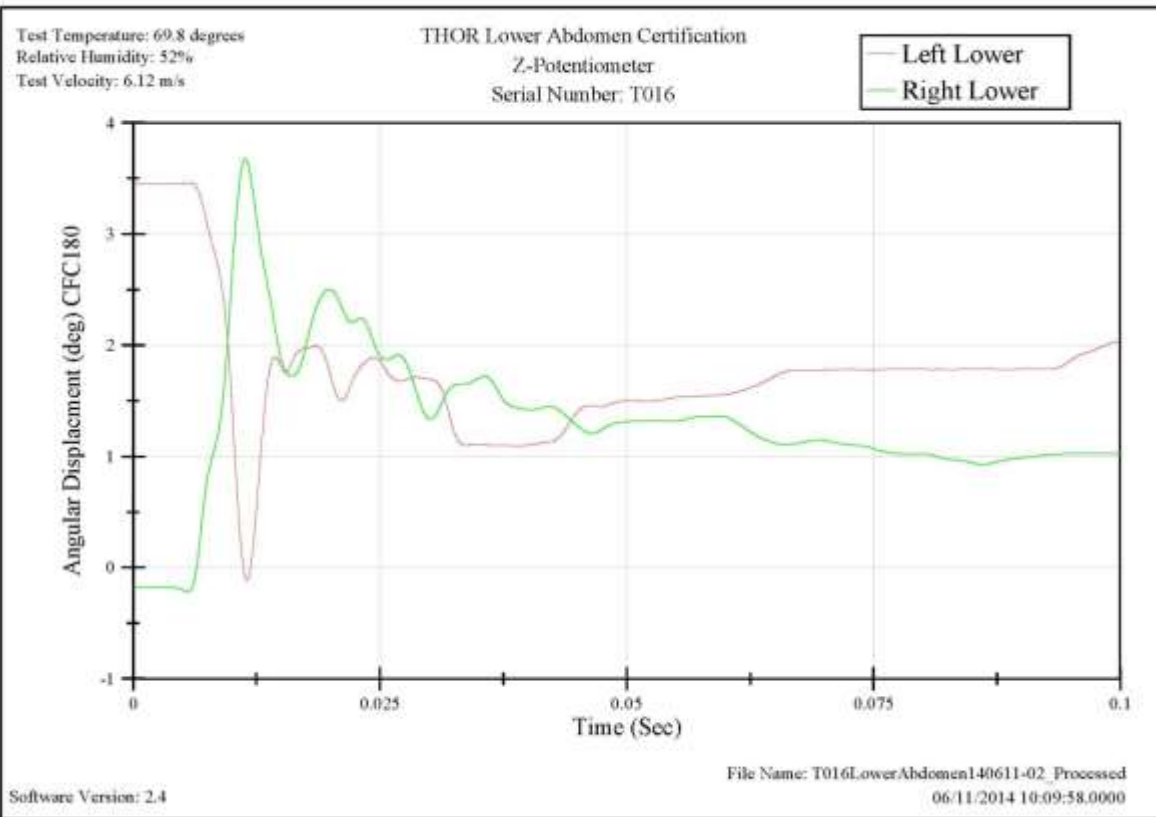
Software Version: 2.4

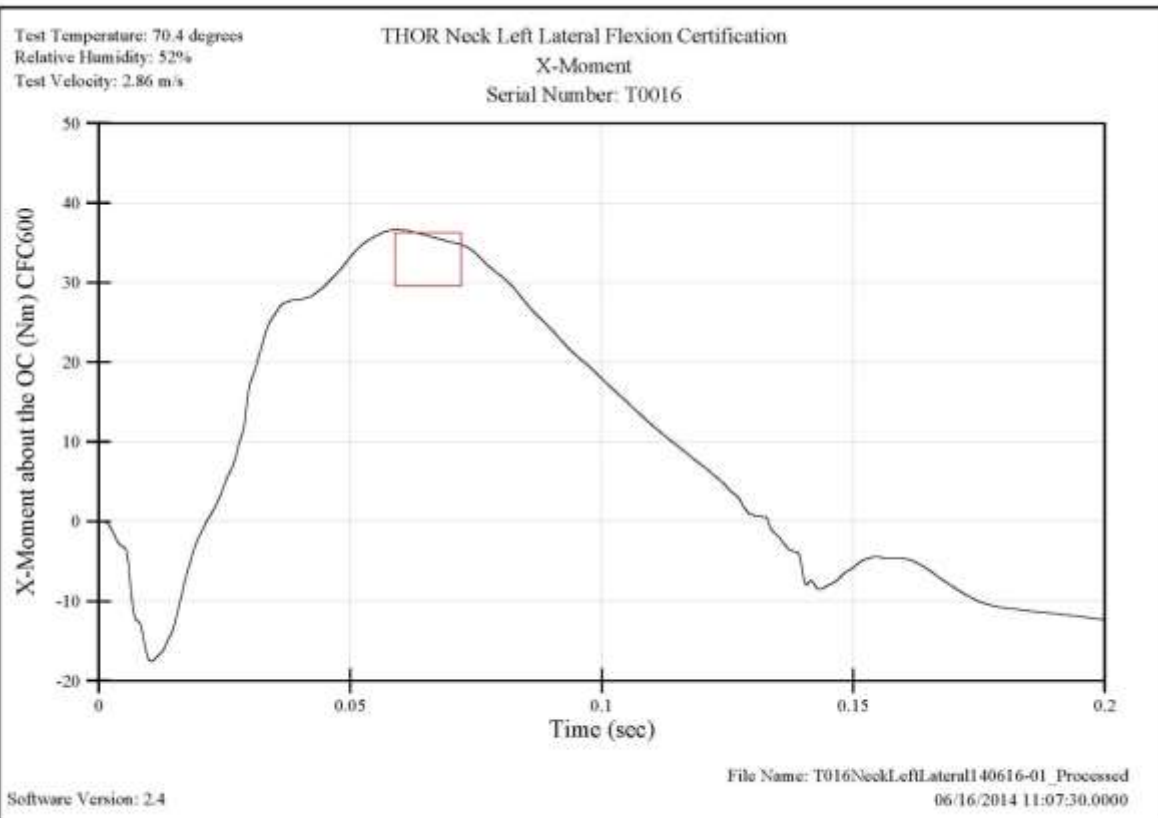
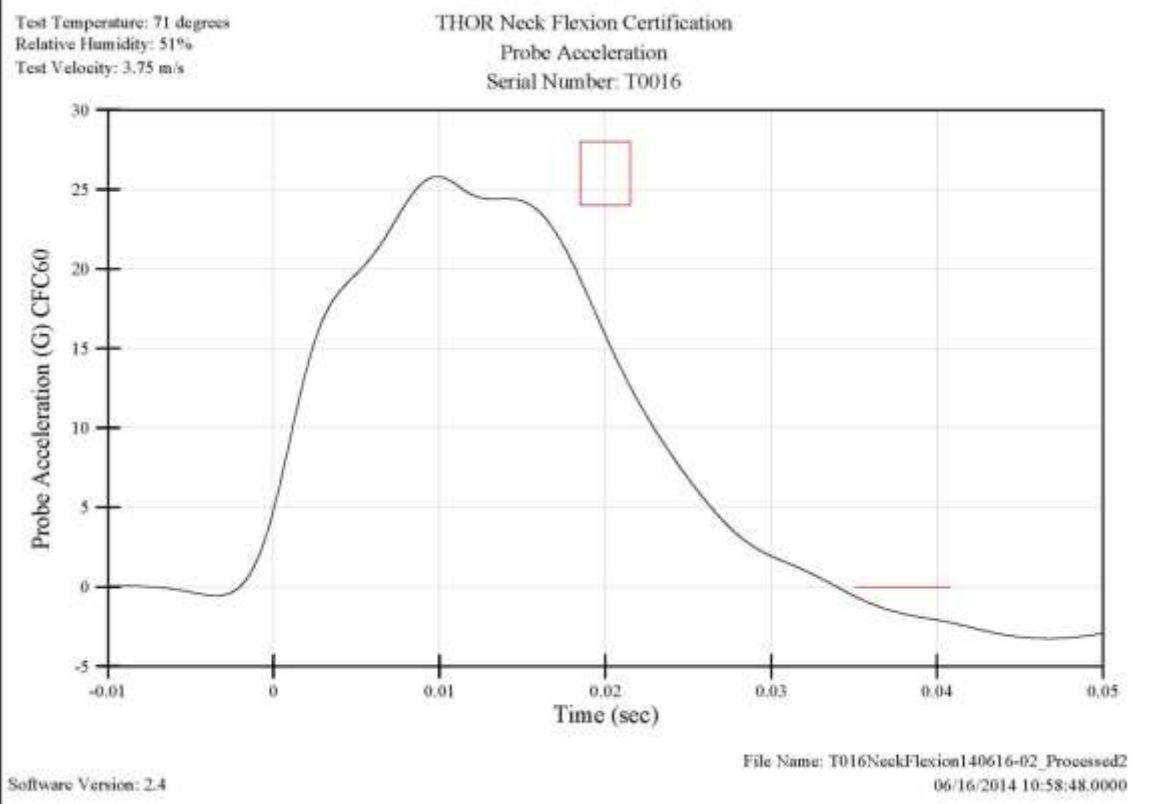
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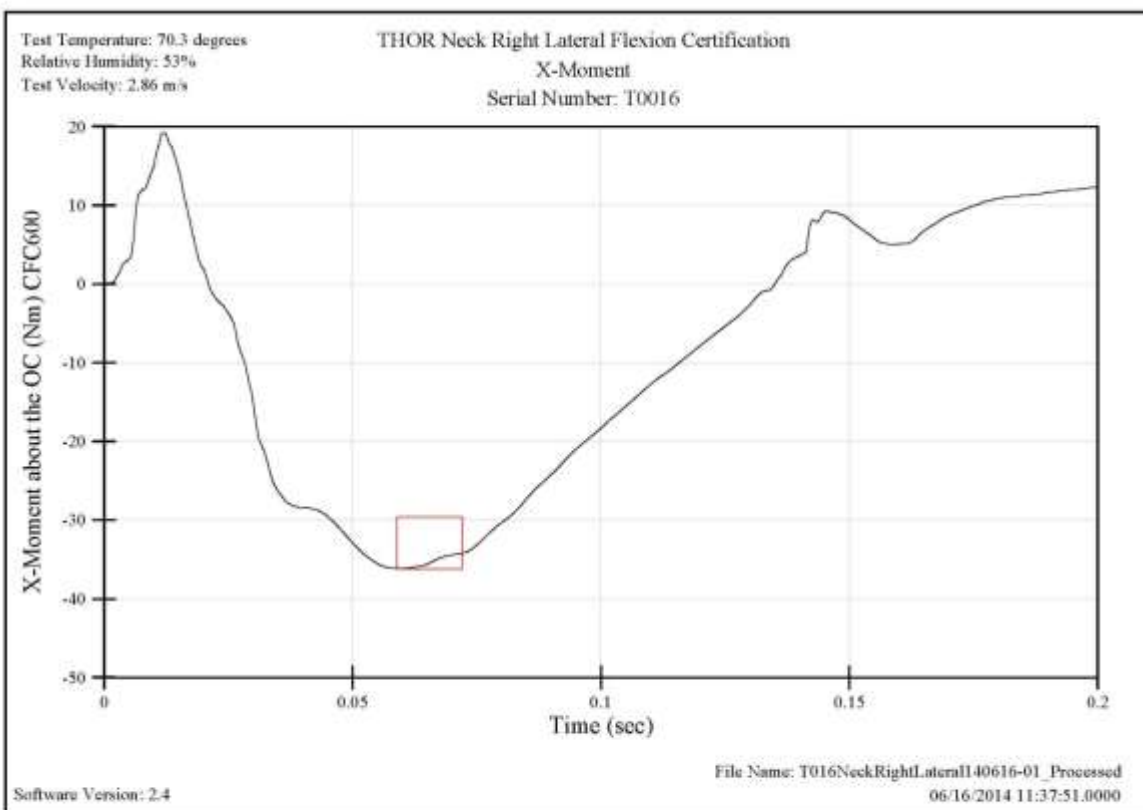
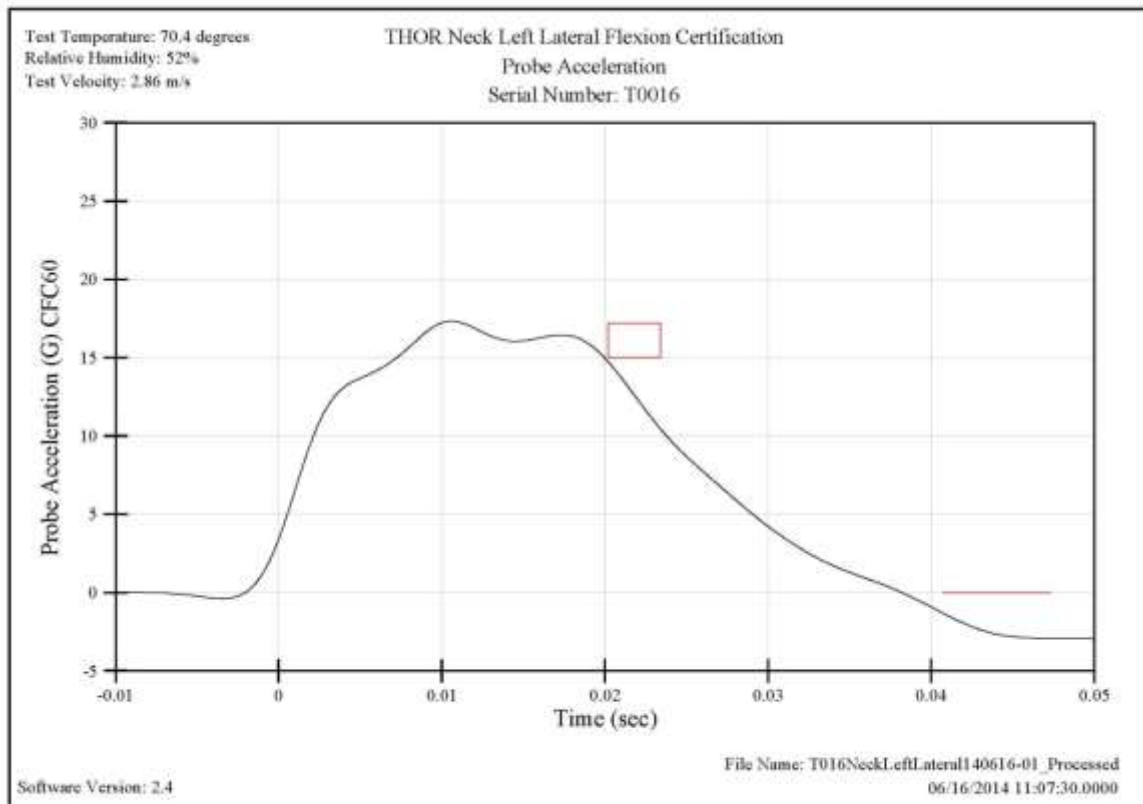






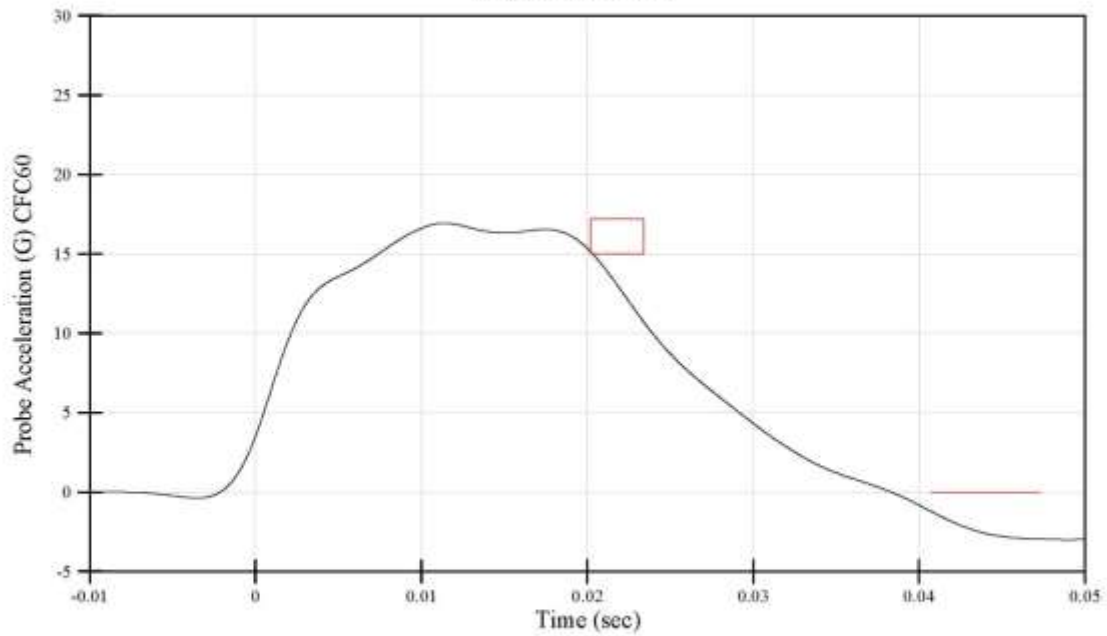






Test Temperature: 70.3 degrees
Relative Humidity: 53%
Test Velocity: 2.86 m/s

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

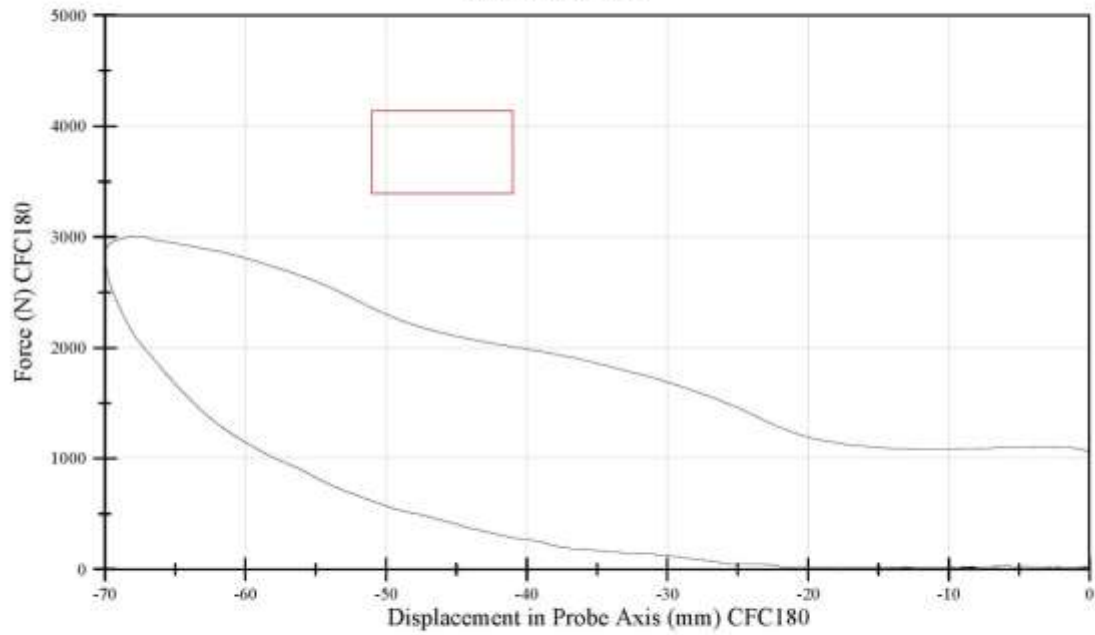


Software Version: 2.4

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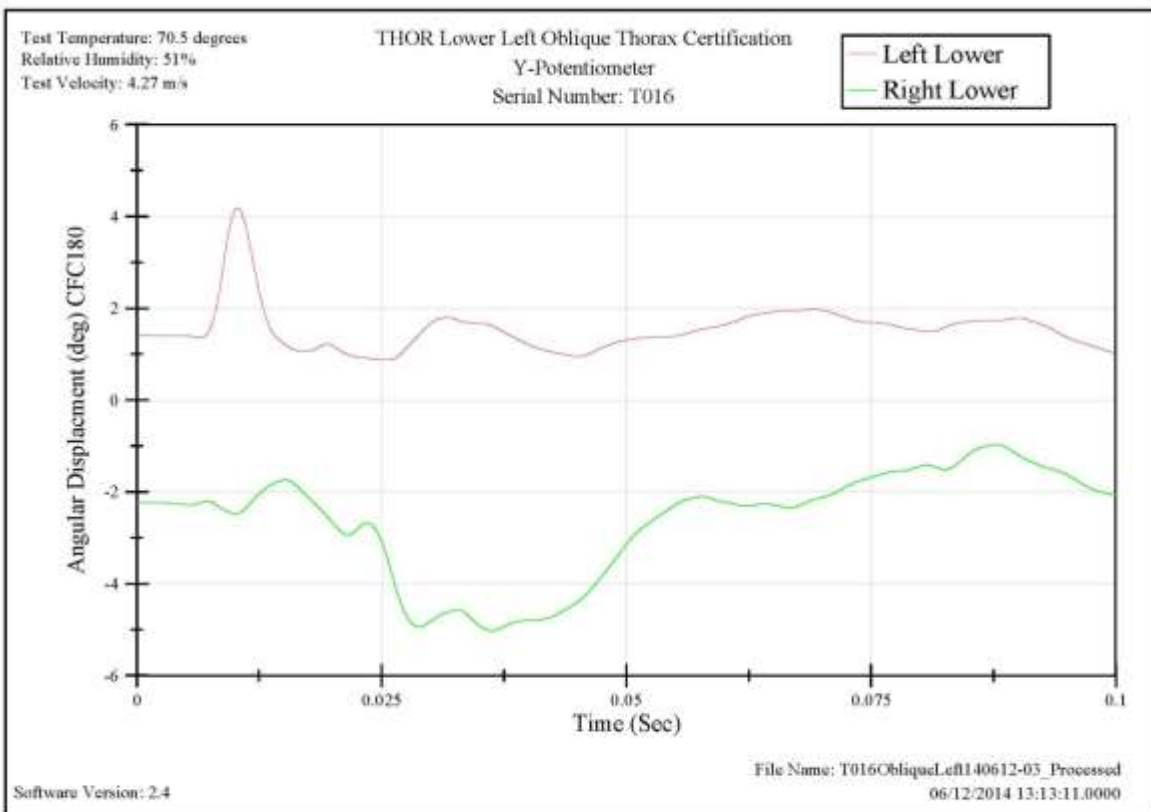
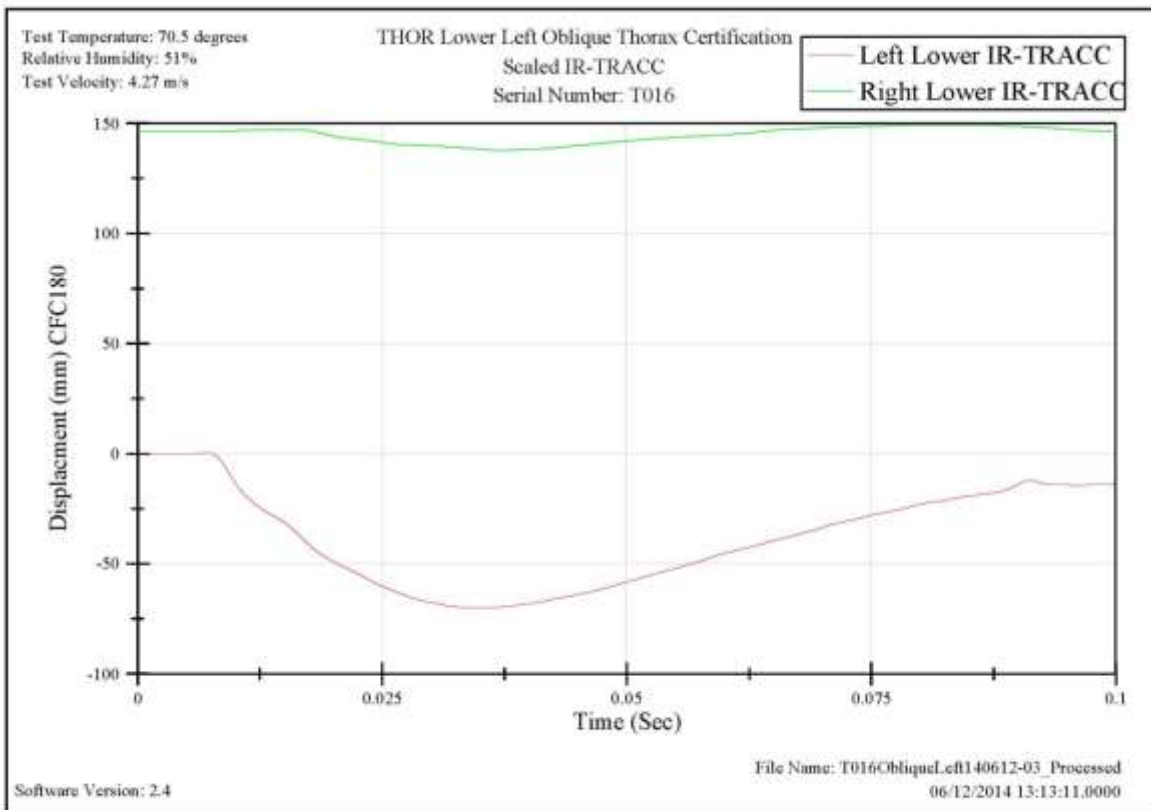
Test Temperature: 70.5 degrees
Relative Humidity: 51%
Test Velocity: 4.27 m/s

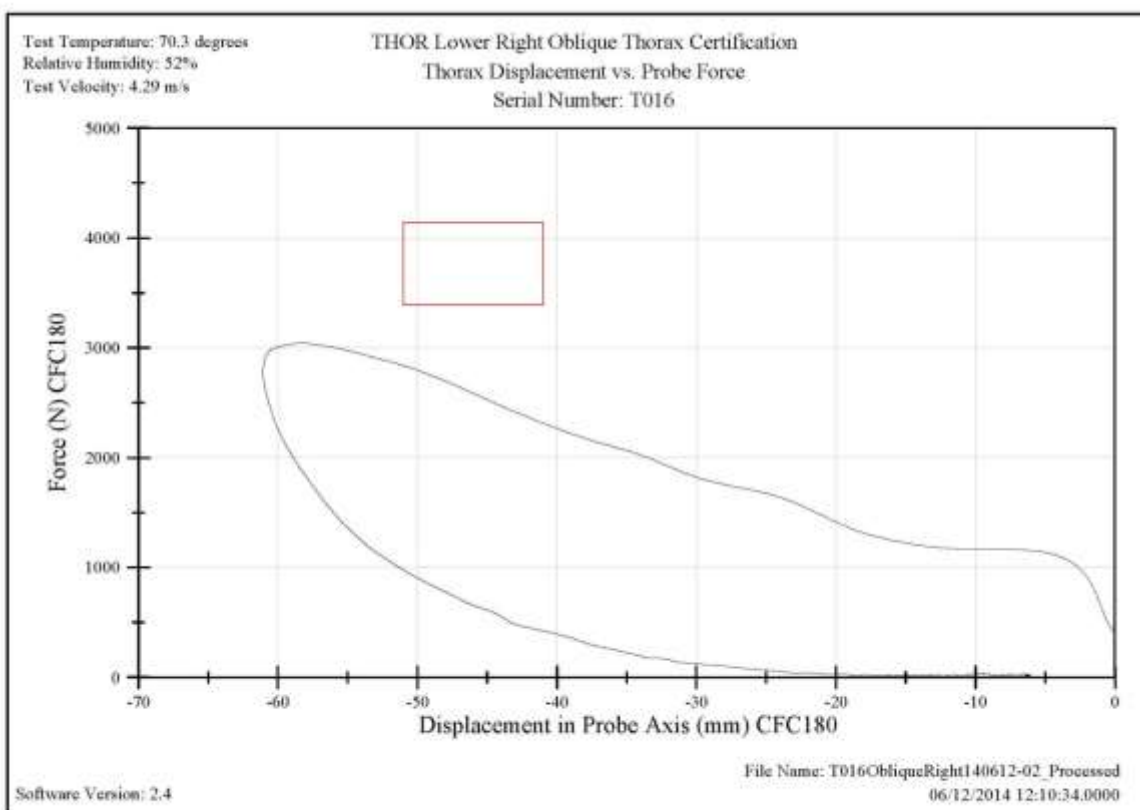
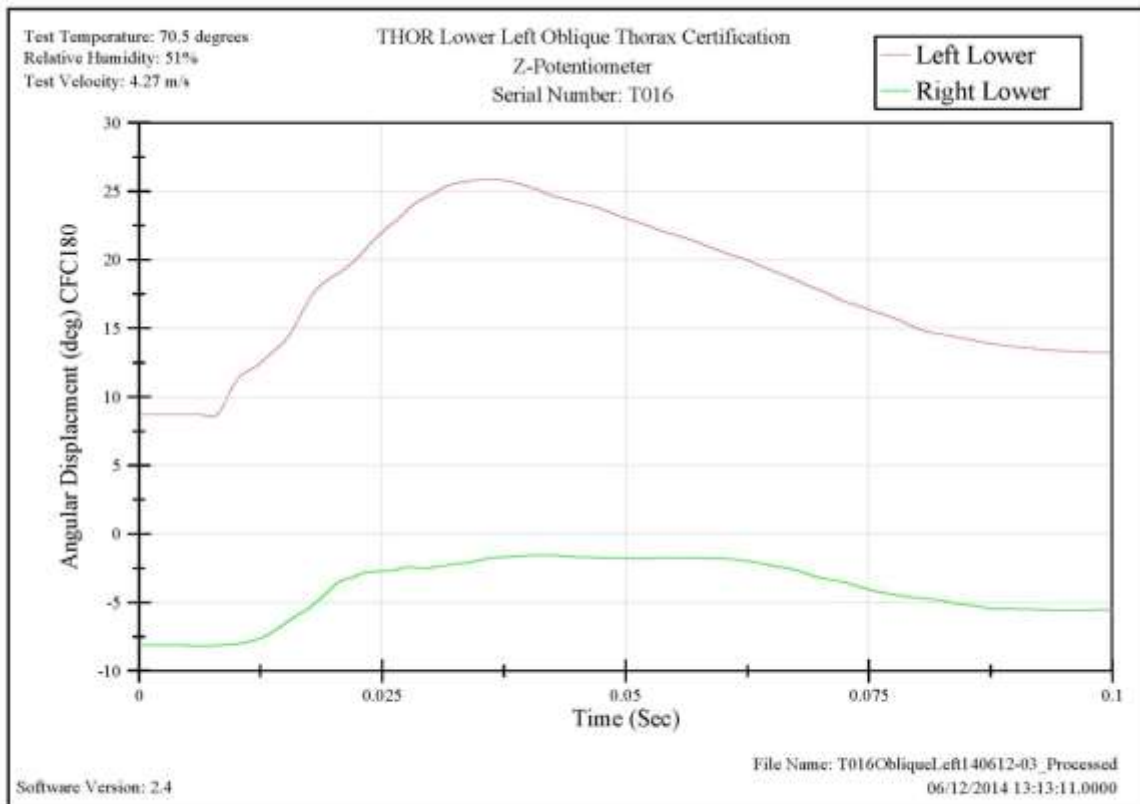
THOR Lower Left Oblique Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T016

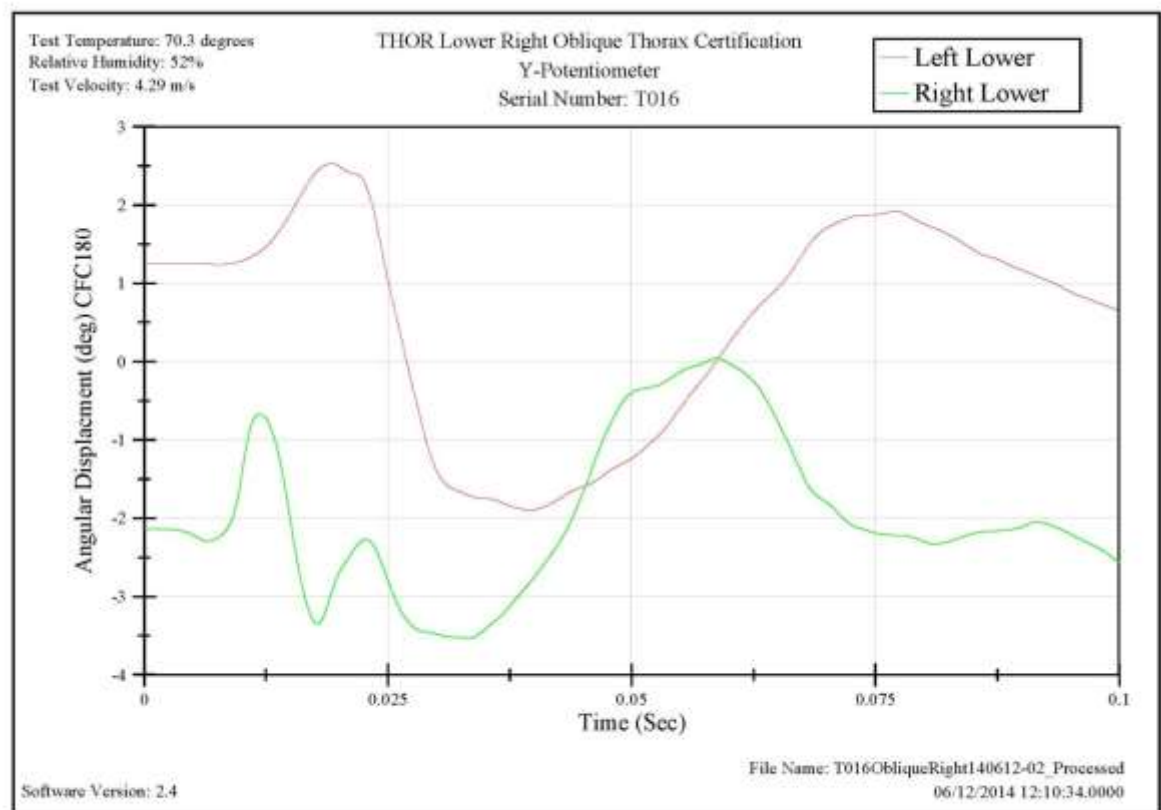
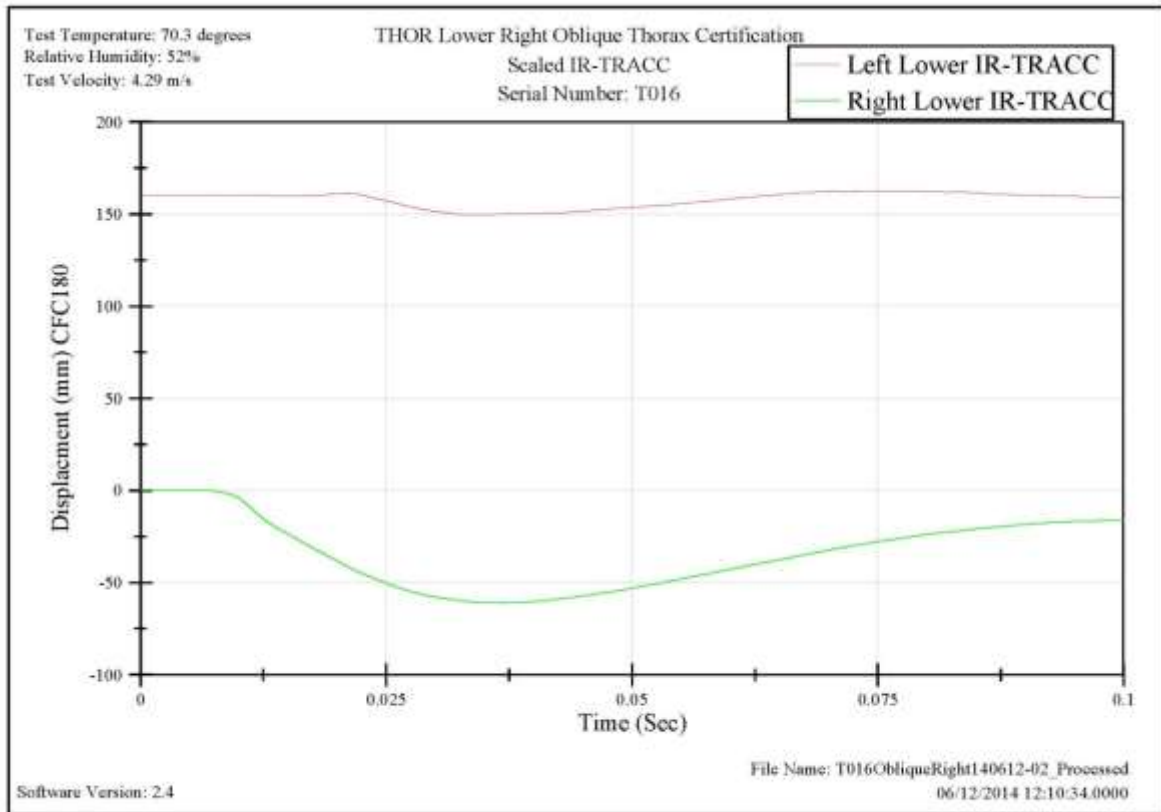


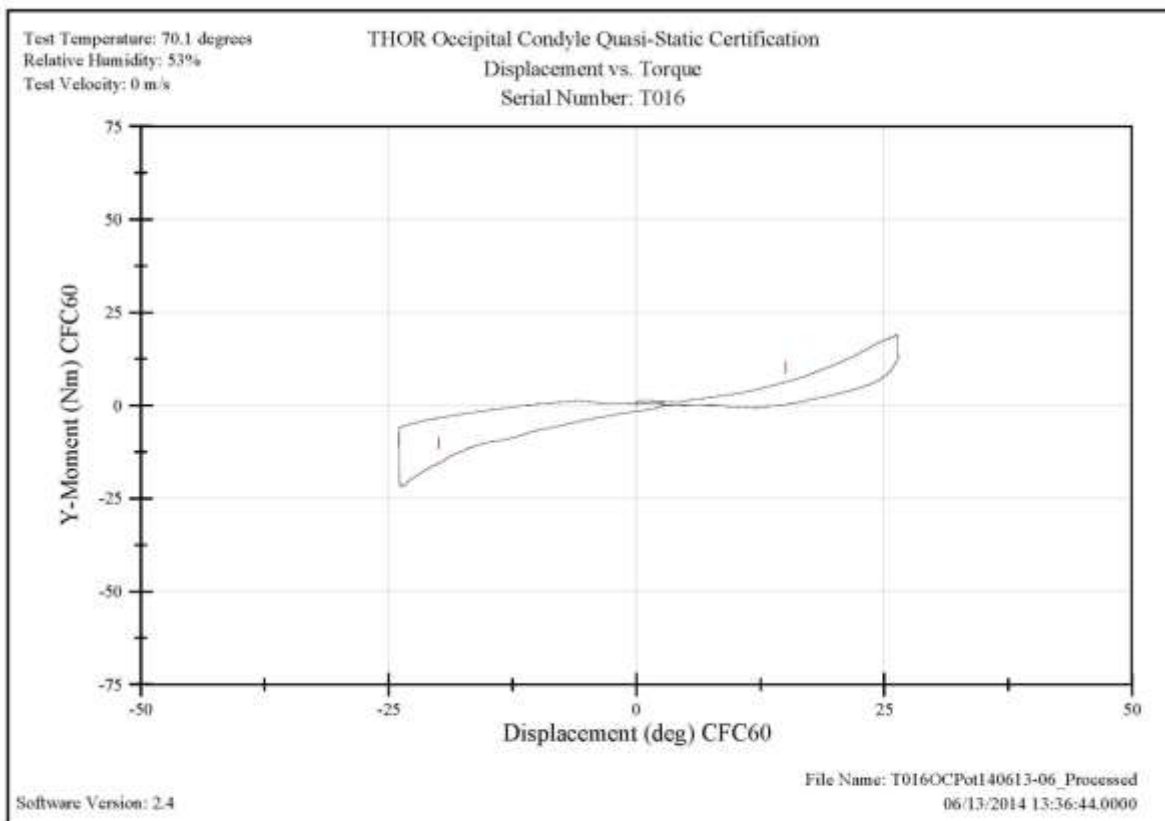
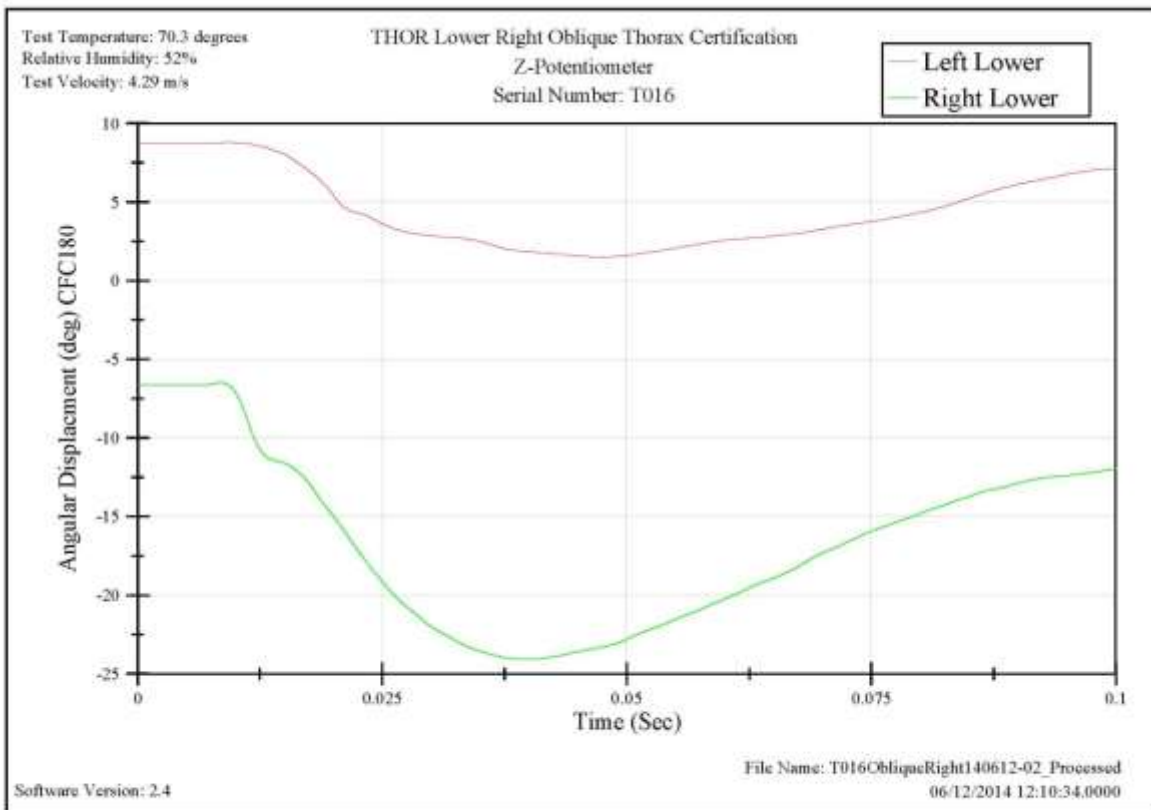
Software Version: 2.4

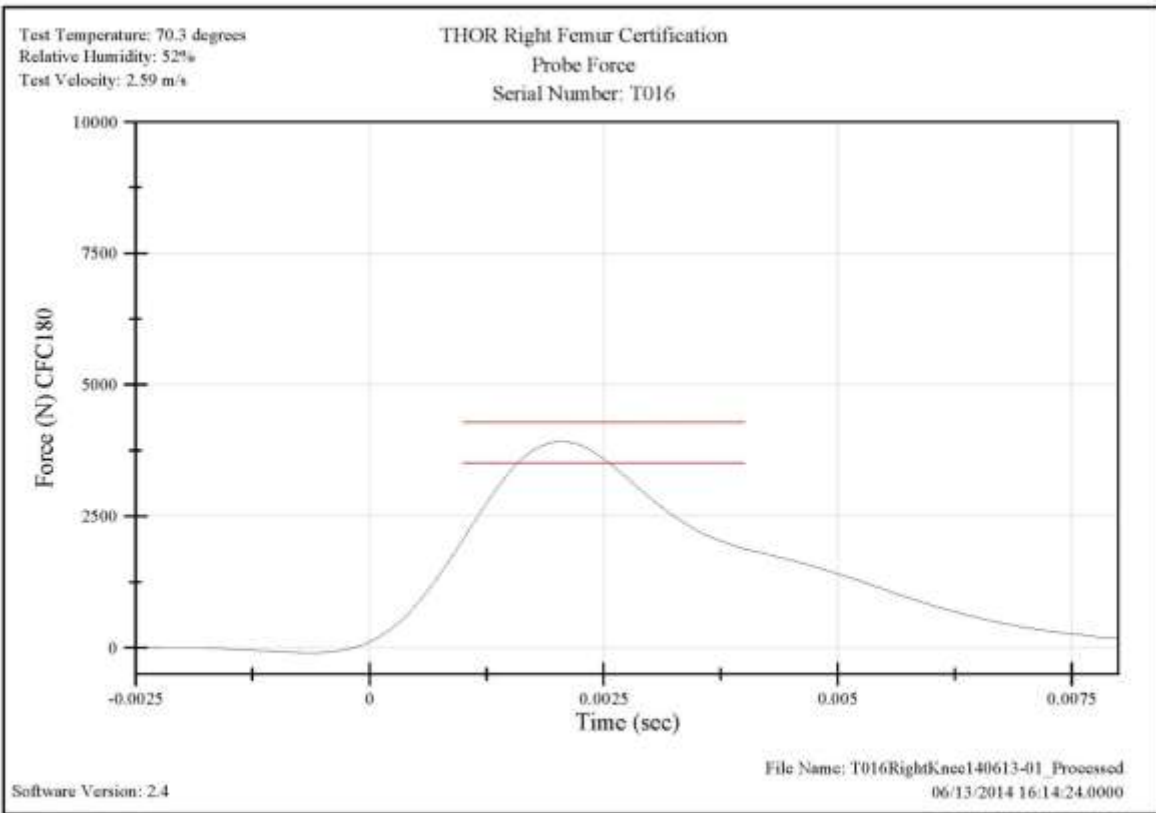
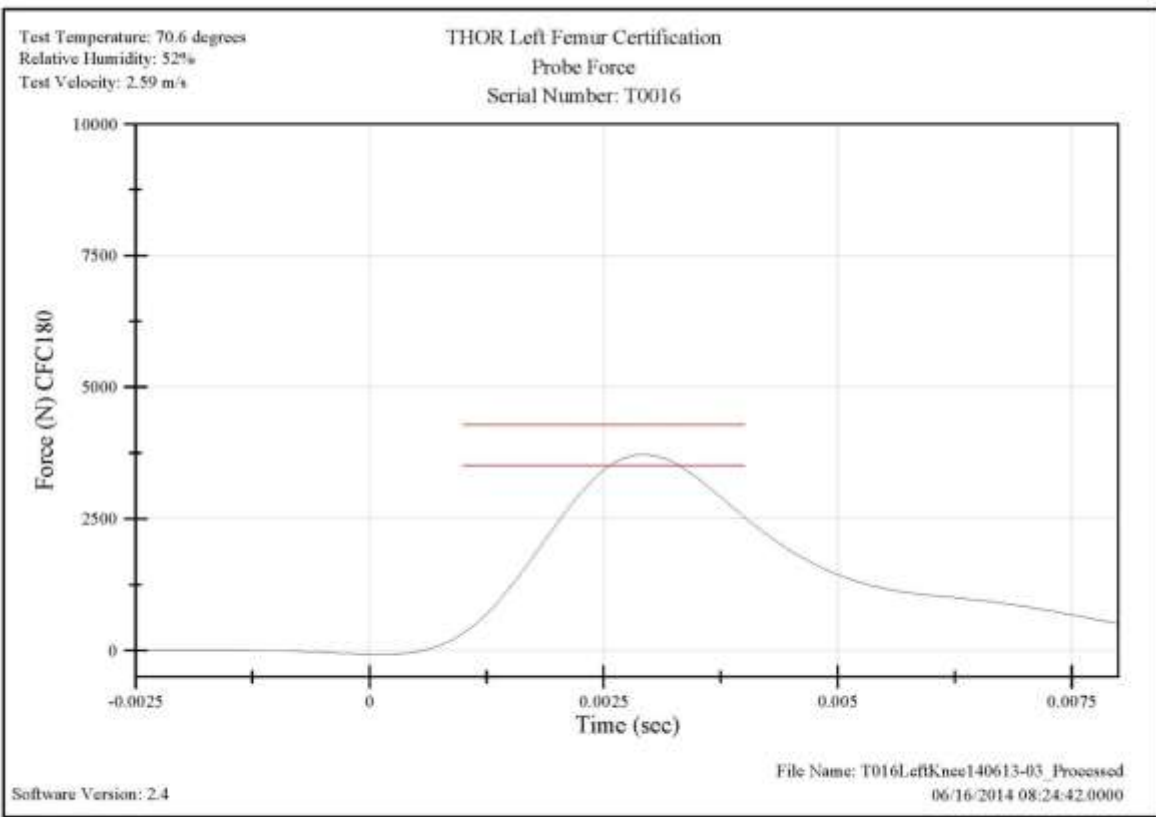
File Name: T016ObliqueLeft140612-03_Processed
06/12/2014 13:13:11.0000



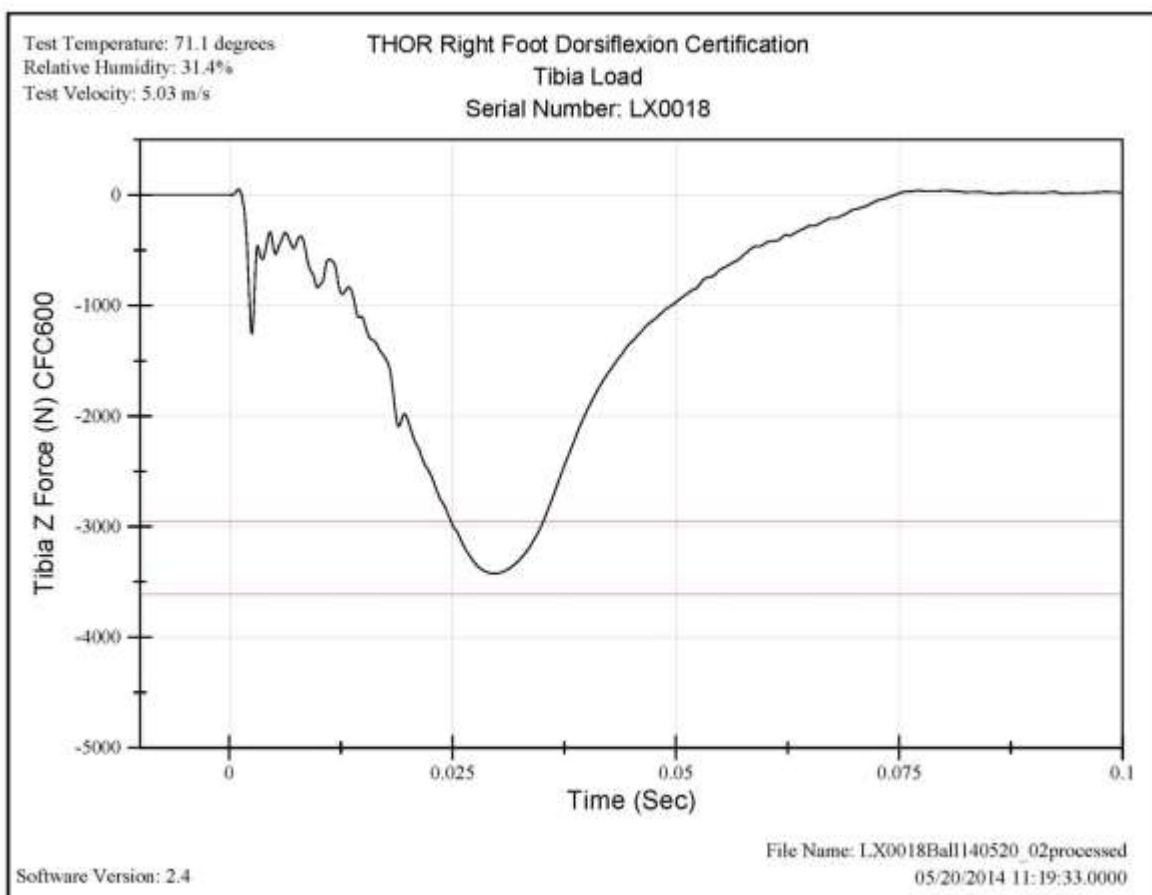
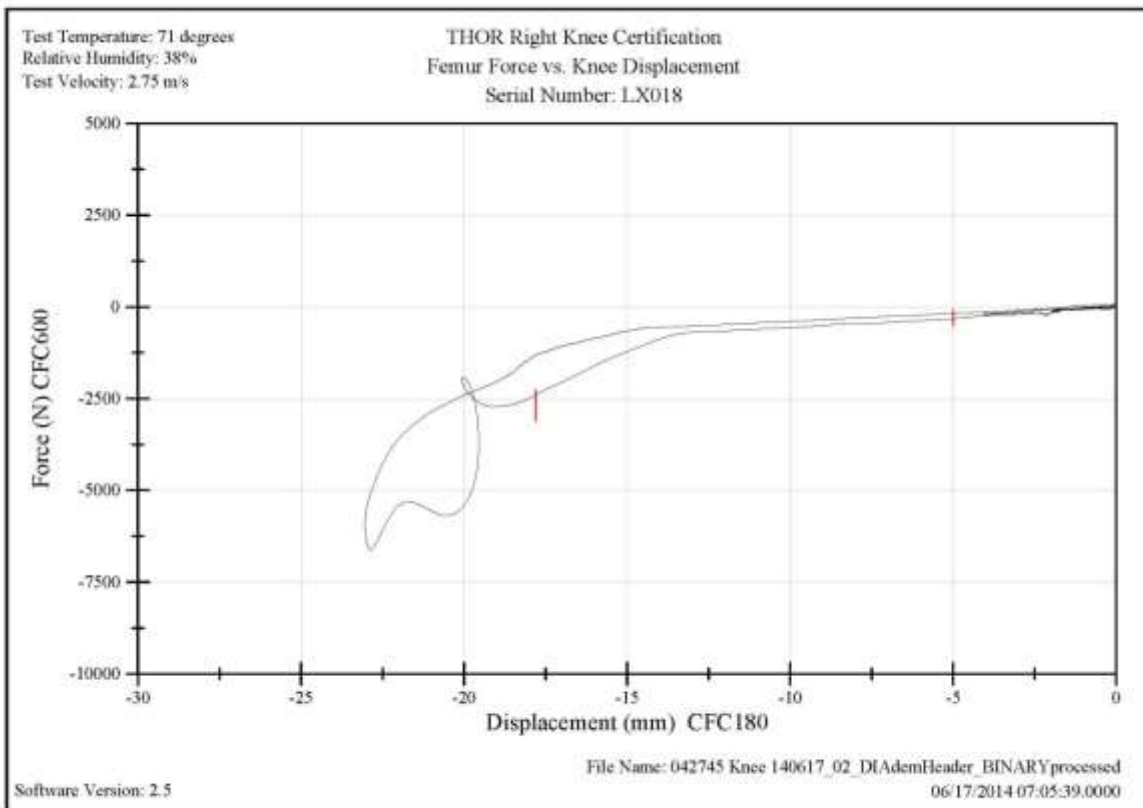






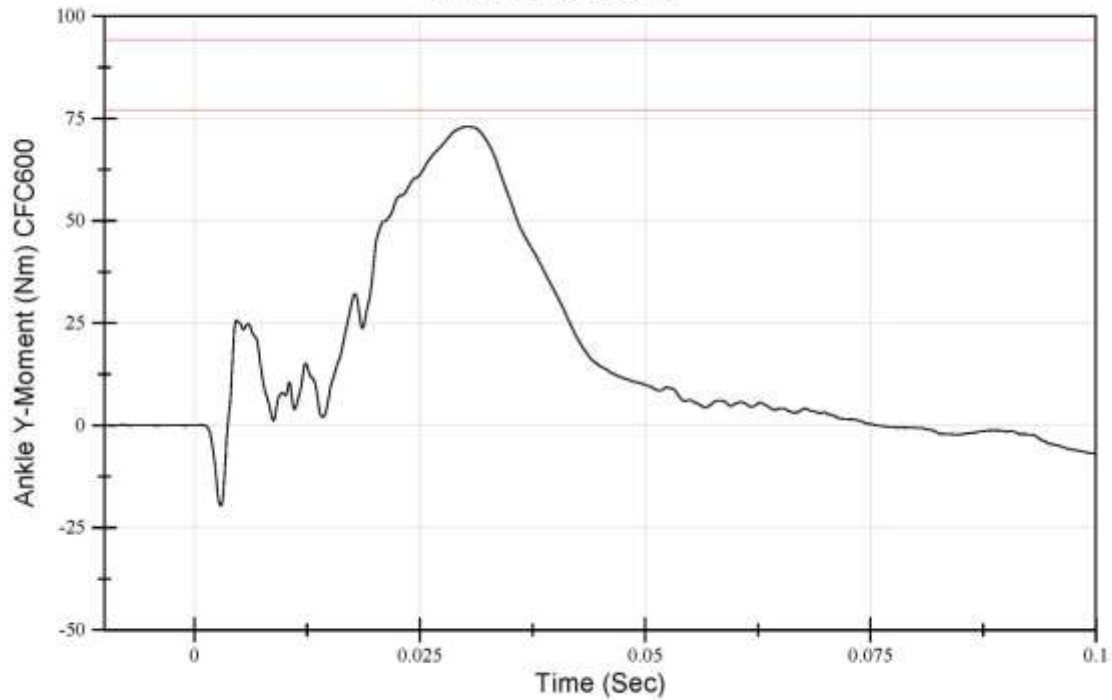


THOR 016 LEG CALIBRATIONS
LX0018/ LX0019



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

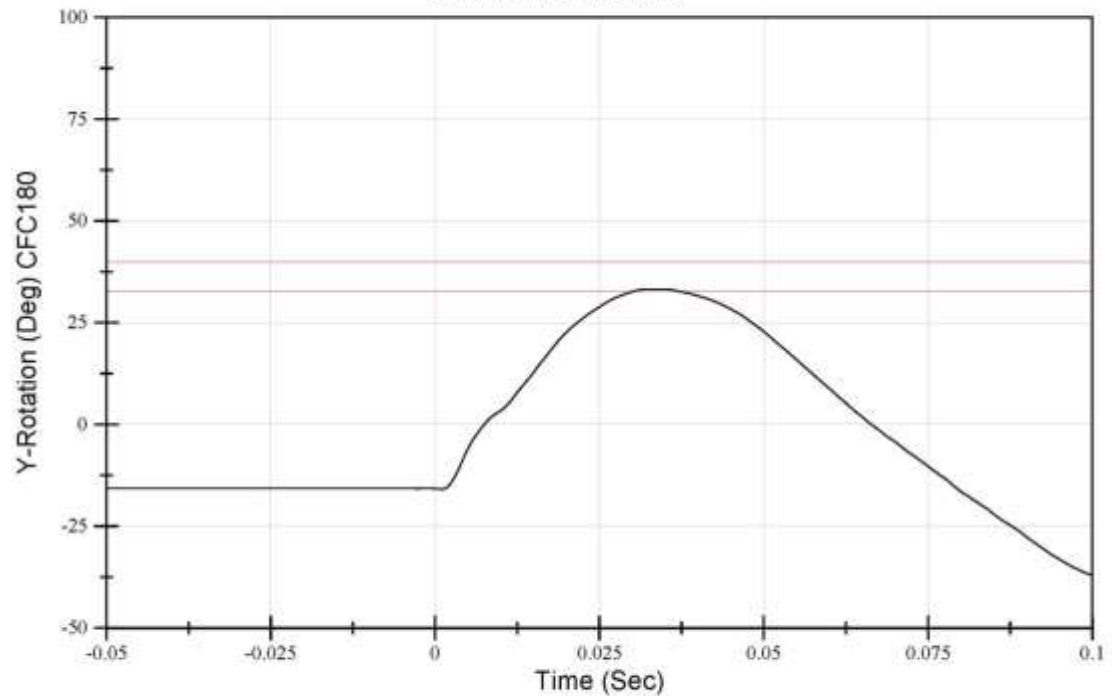


Software Version: 2.4

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

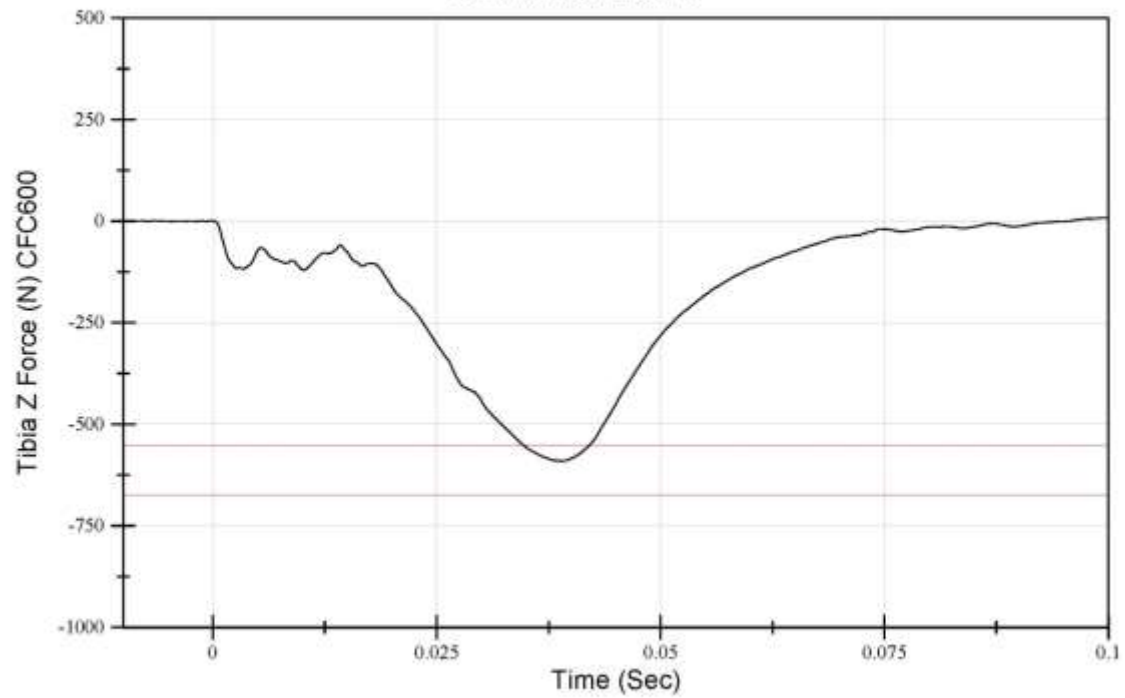


Software Version: 2.4

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

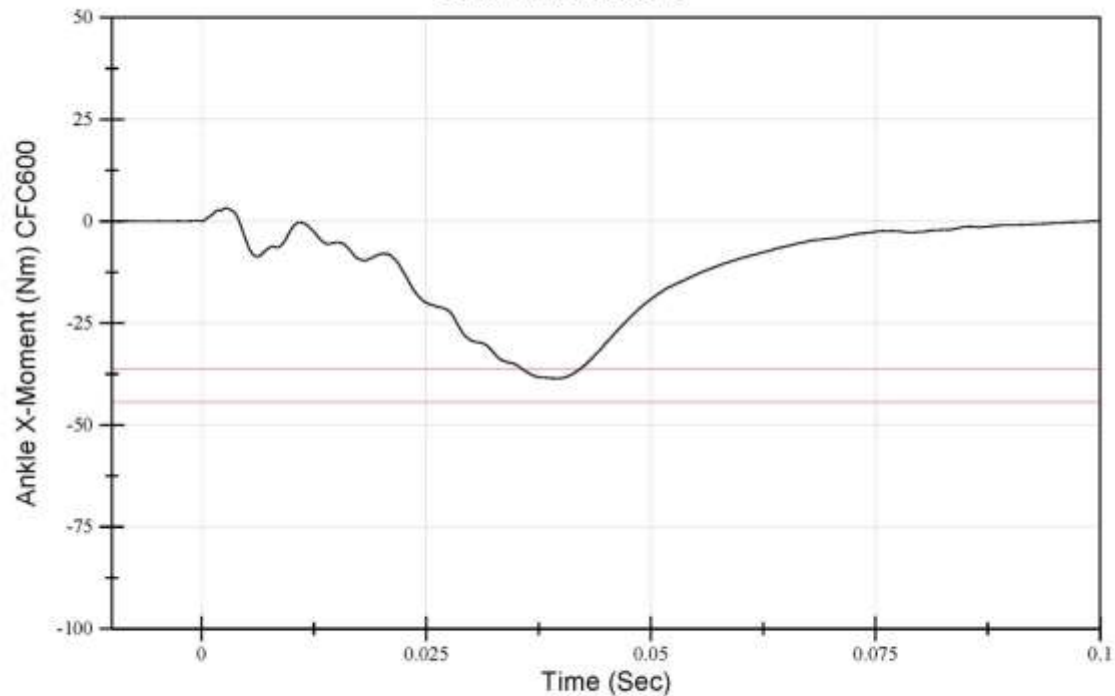


Software Version: 2.4

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

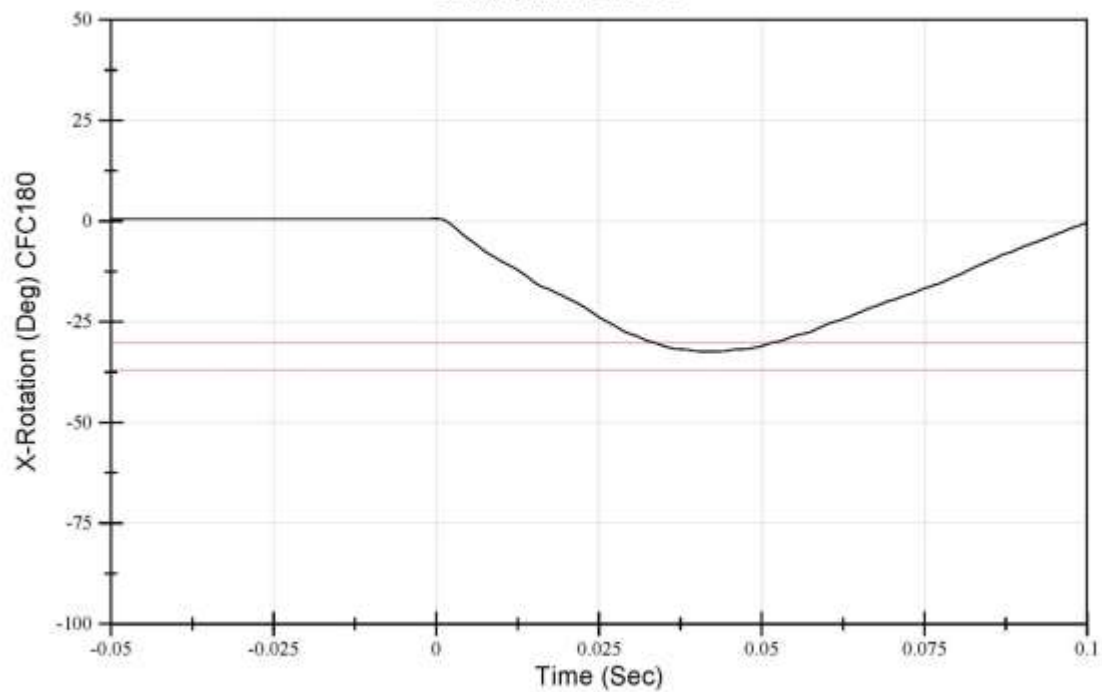


Software Version: 2.4

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

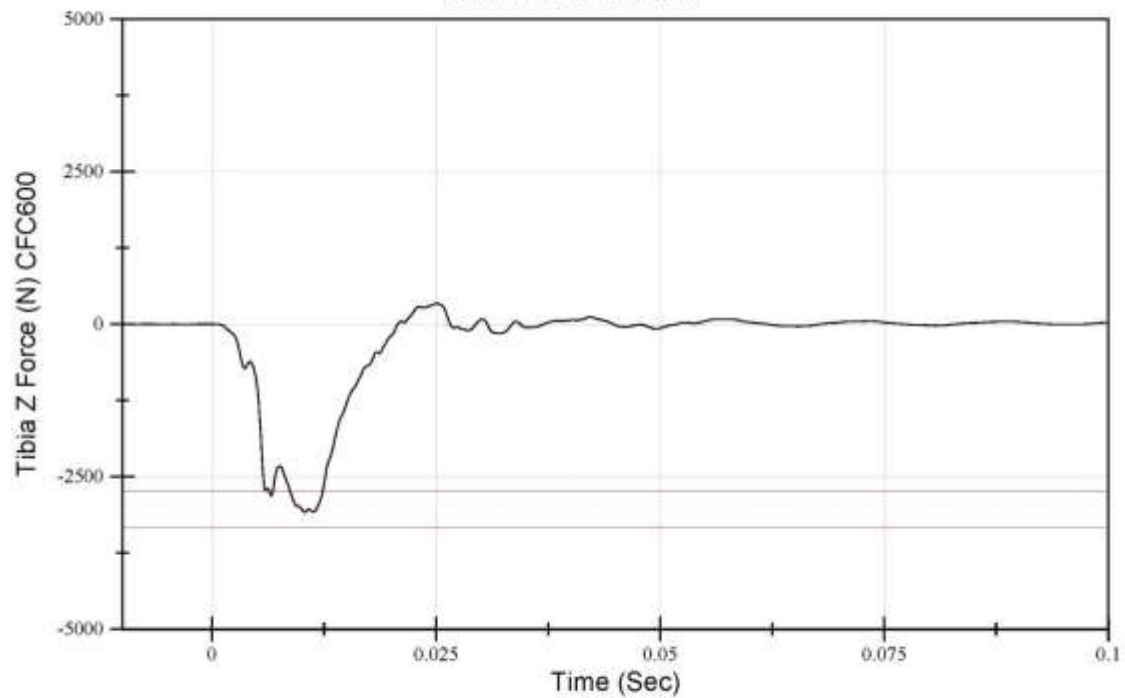


Software Version: 2.4

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

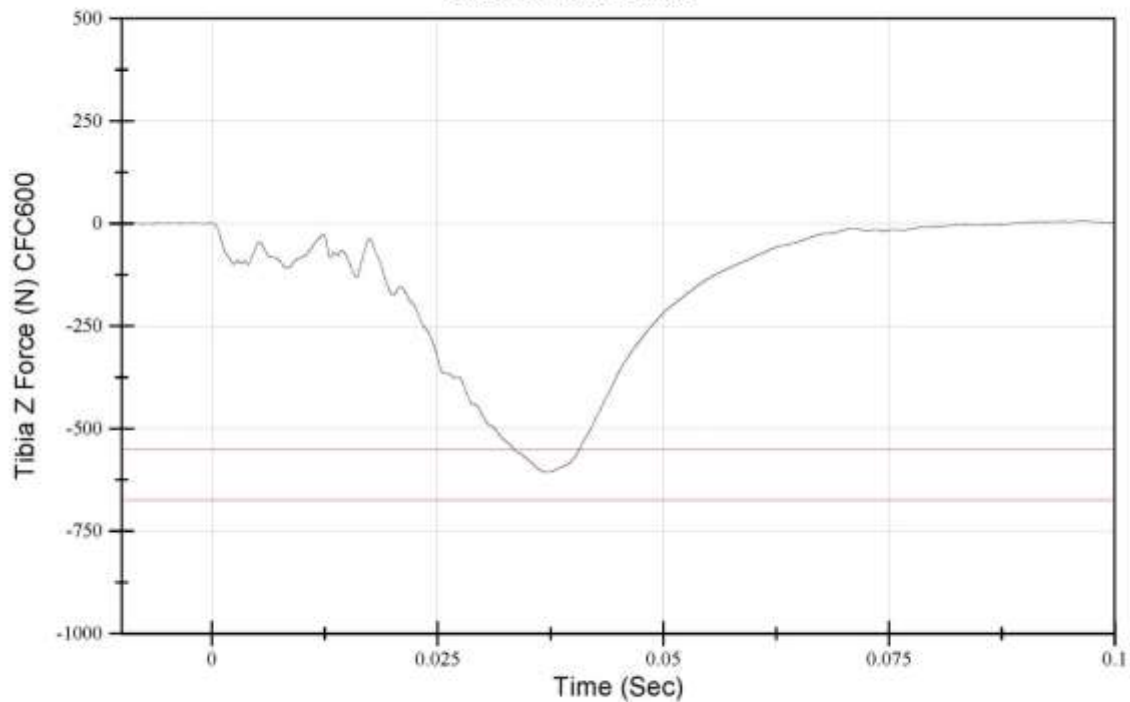


Software Version: 2.4

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

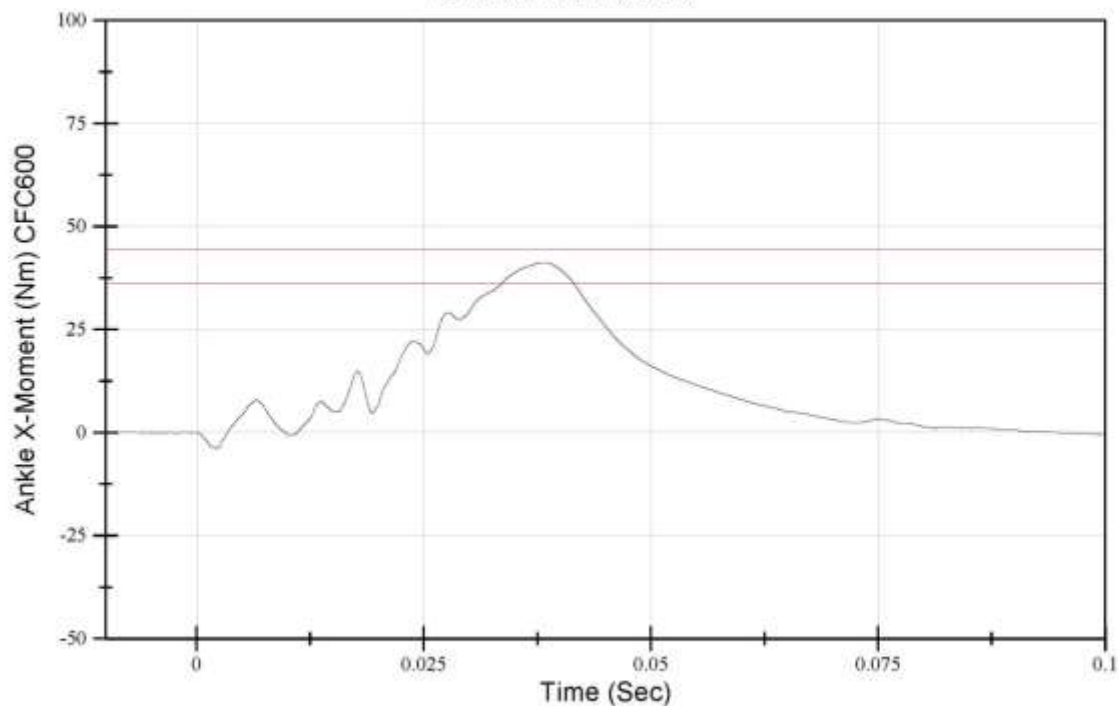


Software Version: 2.4

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

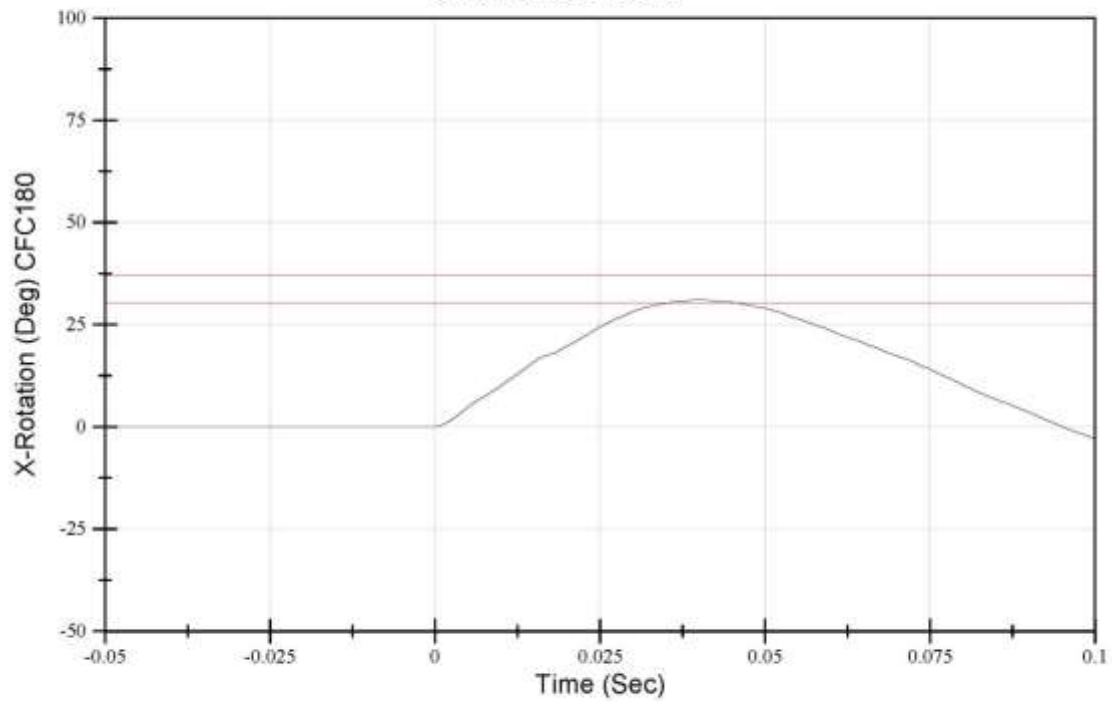


Software Version: 2.4

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

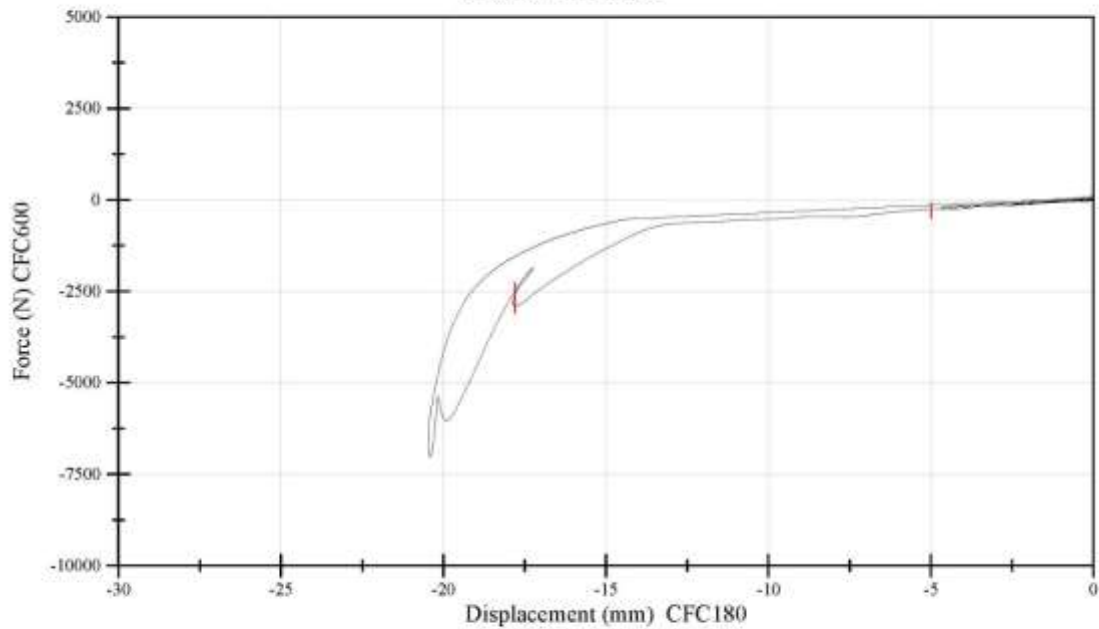


Software Version: 2.4

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

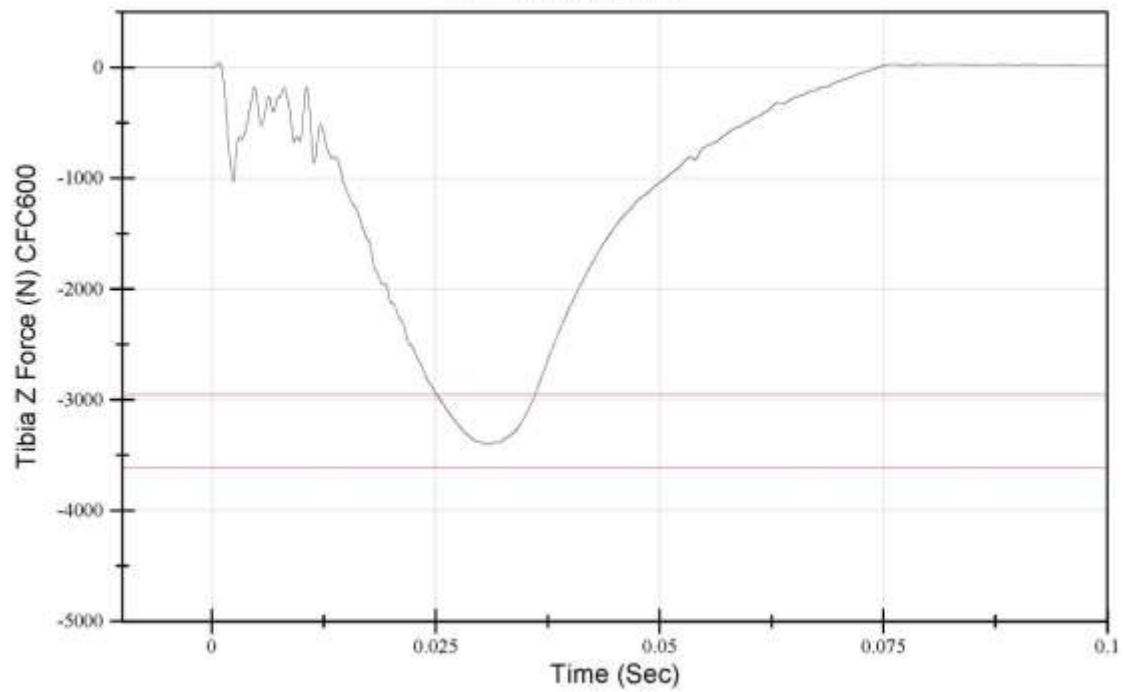


Software Version: 2.5

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

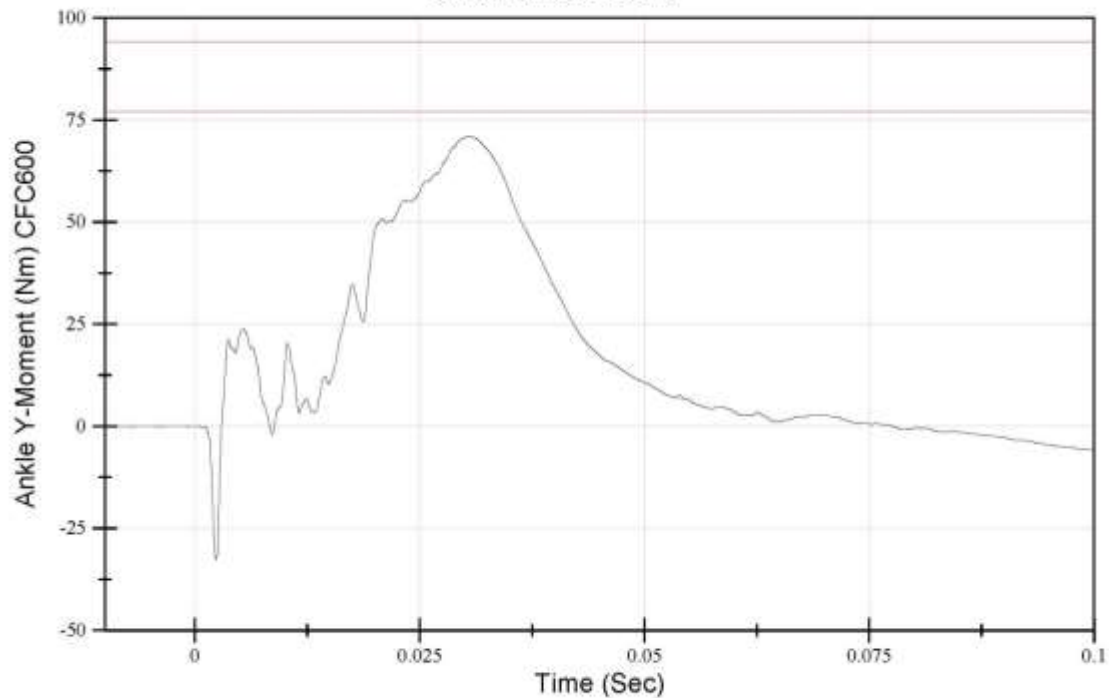


Software Version: 2.4

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

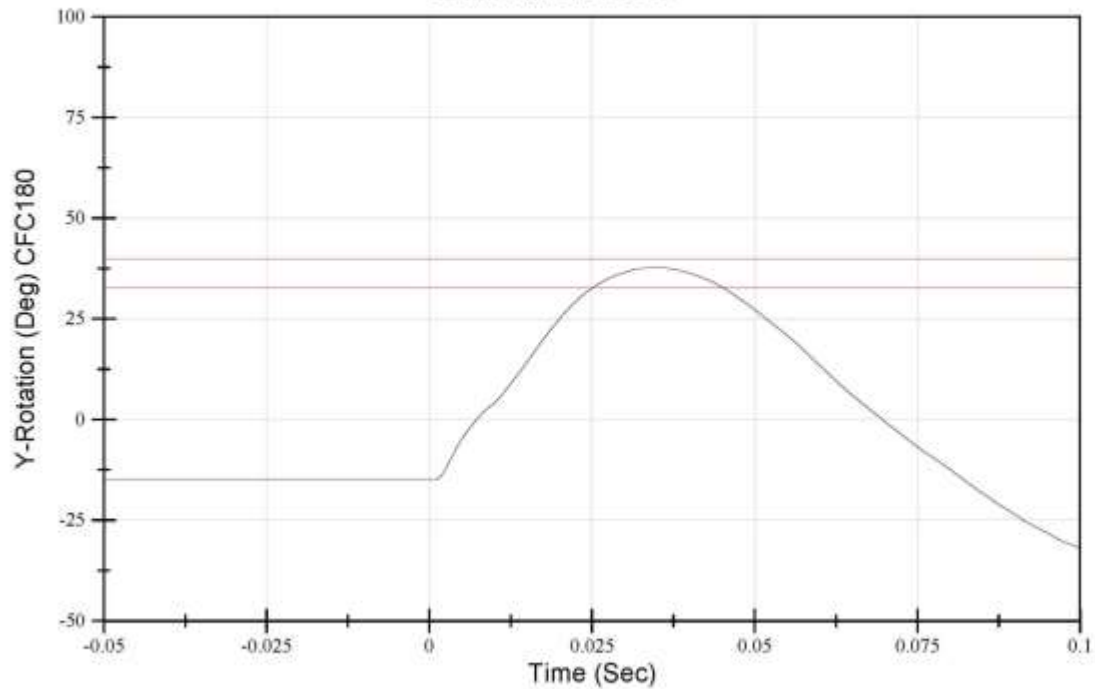


Software Version: 2.4

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

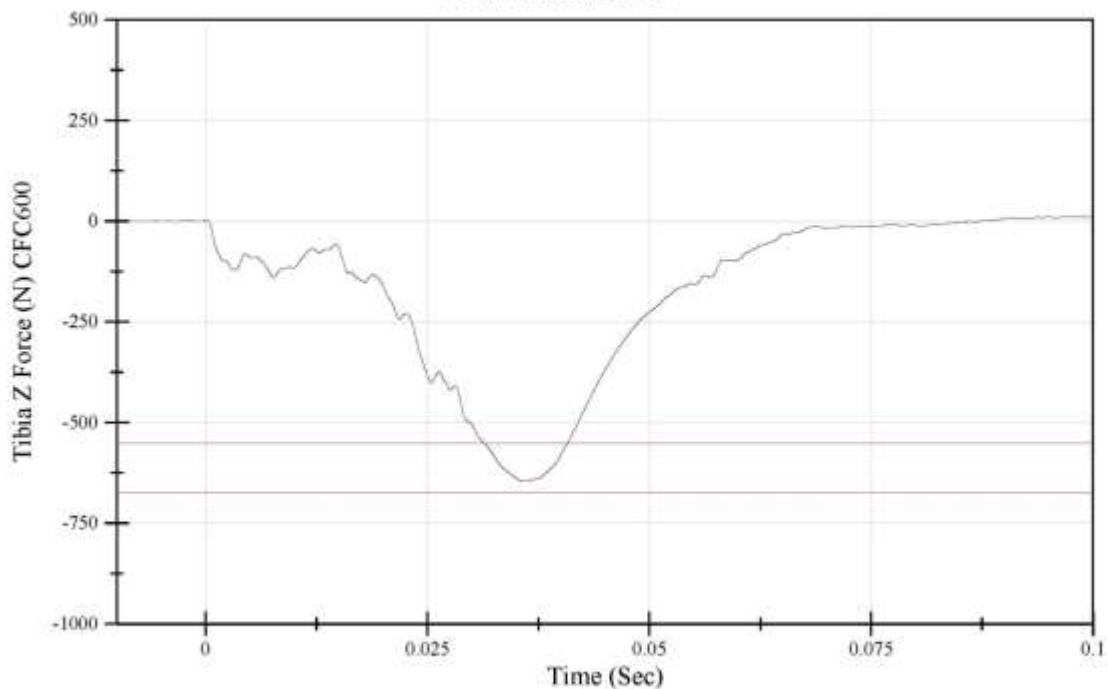


Software Version: 2.4

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

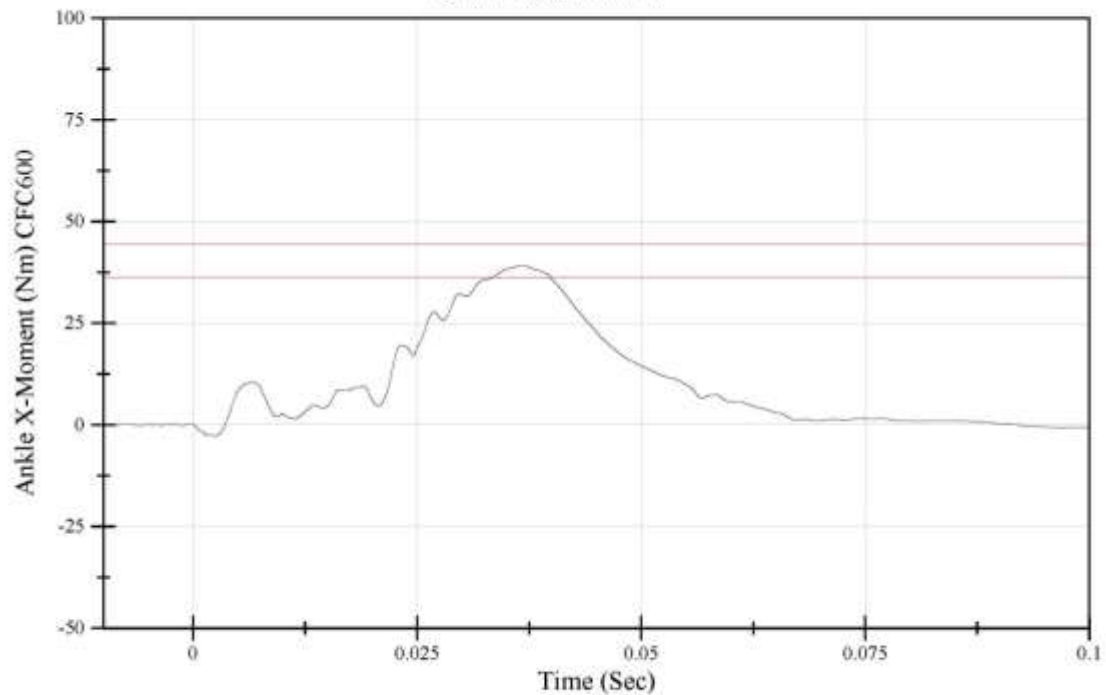


Software Version: 2.4

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

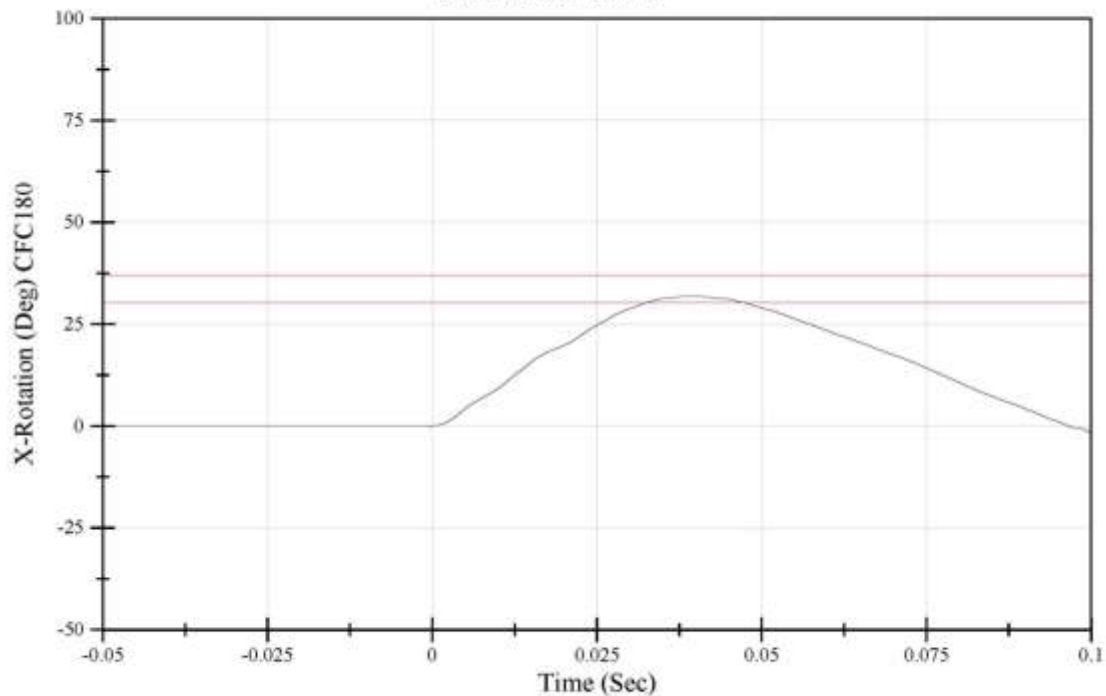


Software Version: 2.4

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

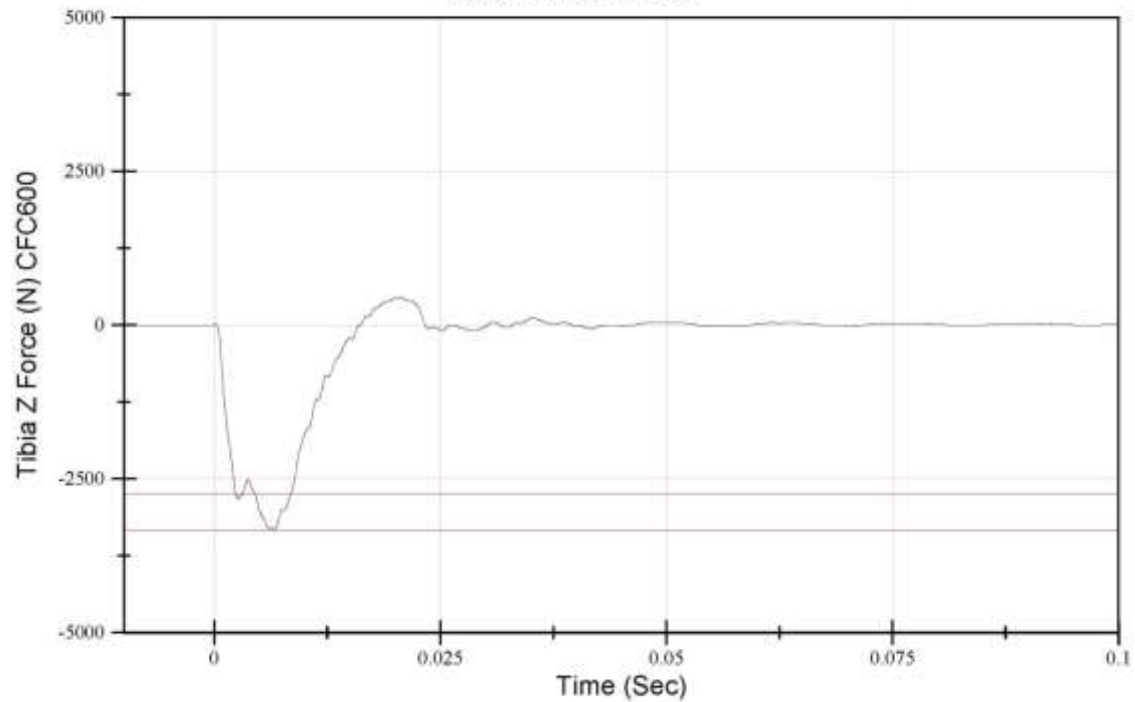


Software Version: 2.4

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

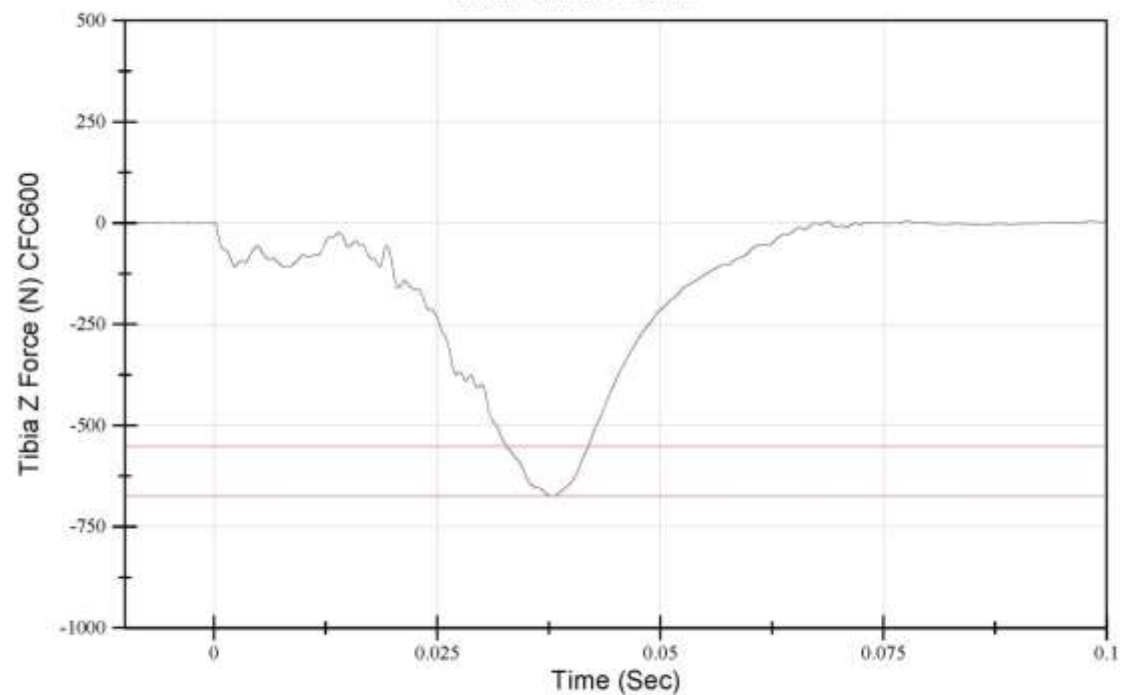


Software Version: 2.4

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

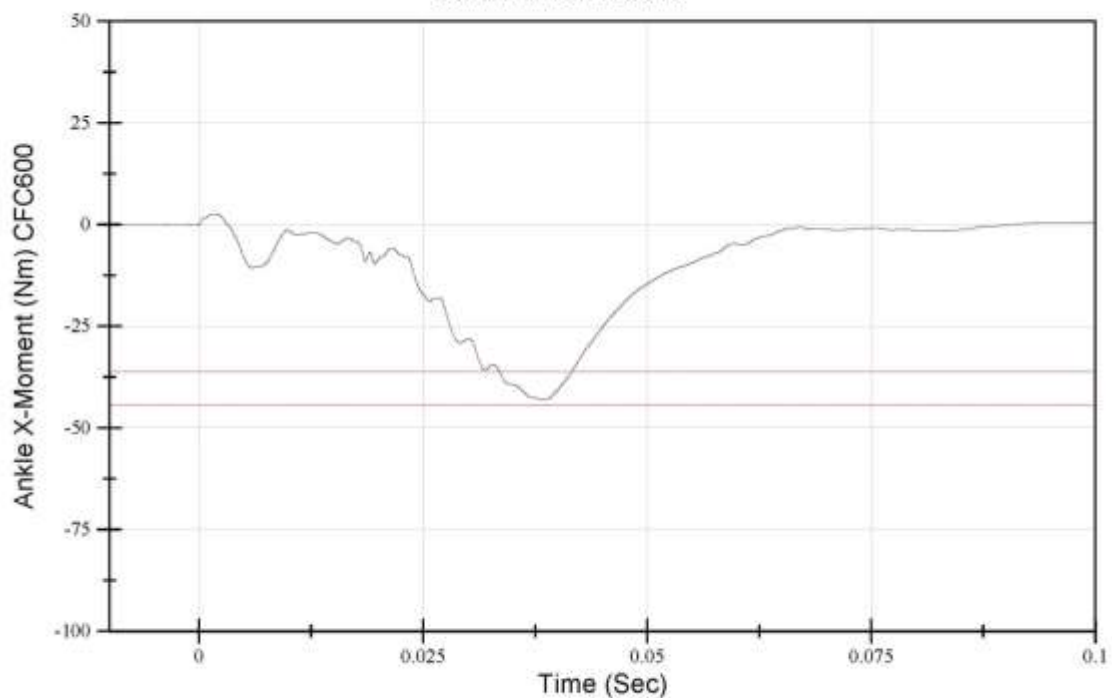


Software Version: 2.4

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

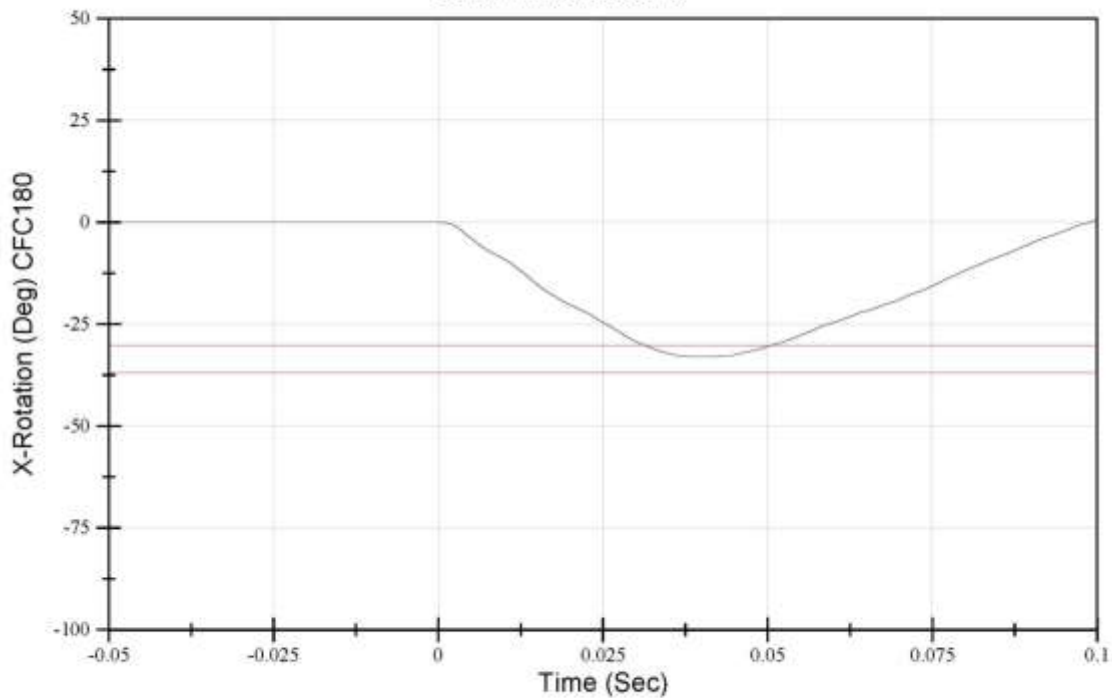


Software Version: 2.4

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

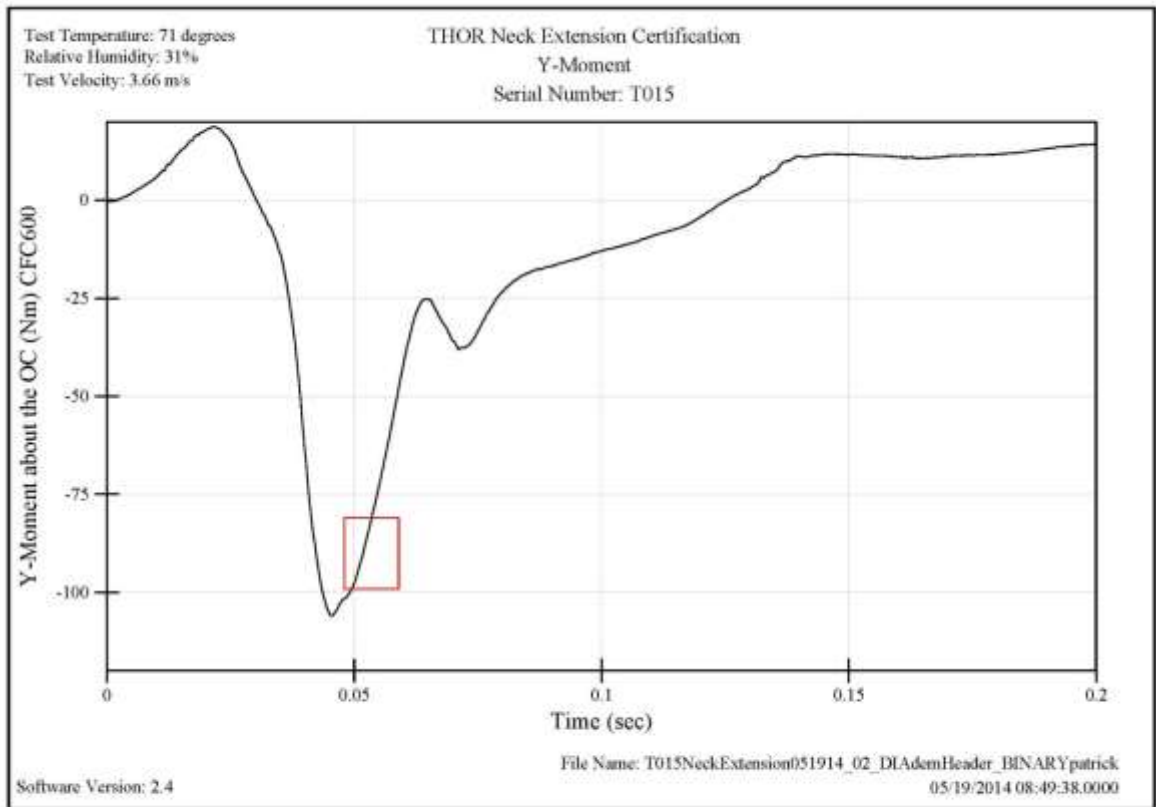
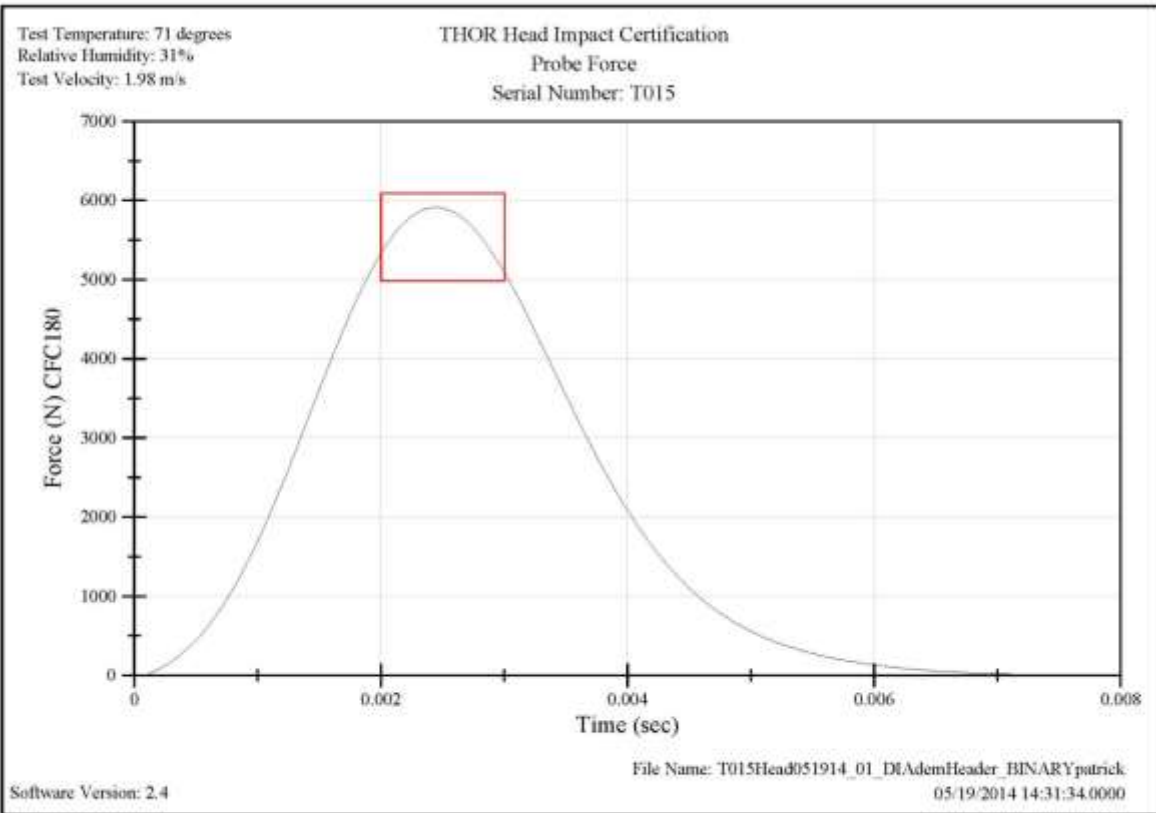
THOR Left Foot Inversion Certification
Ankle X-Rotation
Serial Number: LX0019



Software Version: 2.4

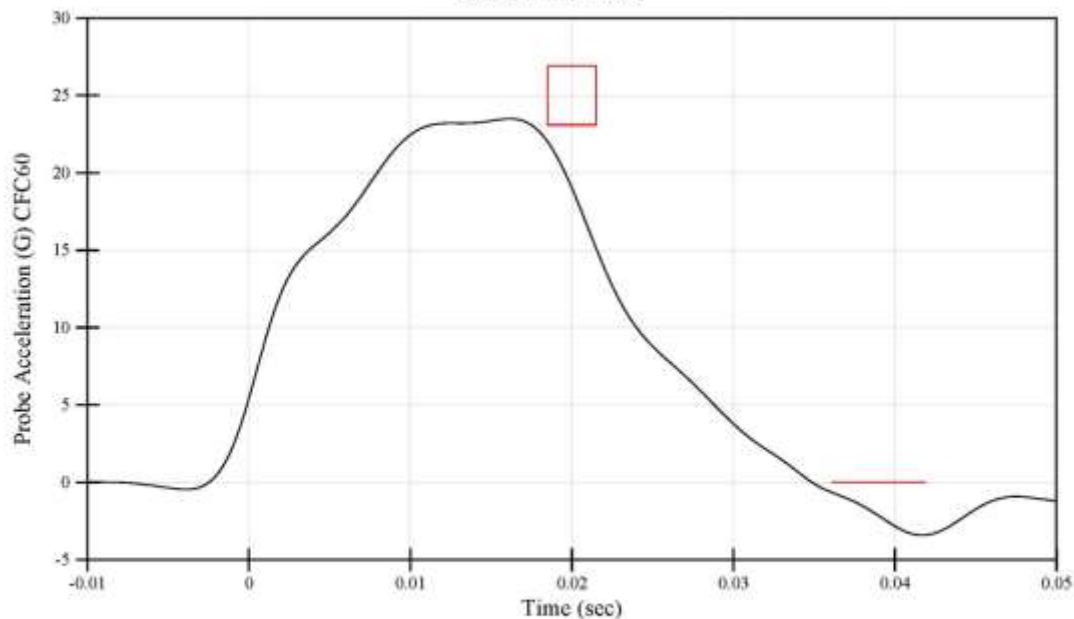
File Name: LX0019Inversion140521_03processed
05/21/2014 08:53:35.0000

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

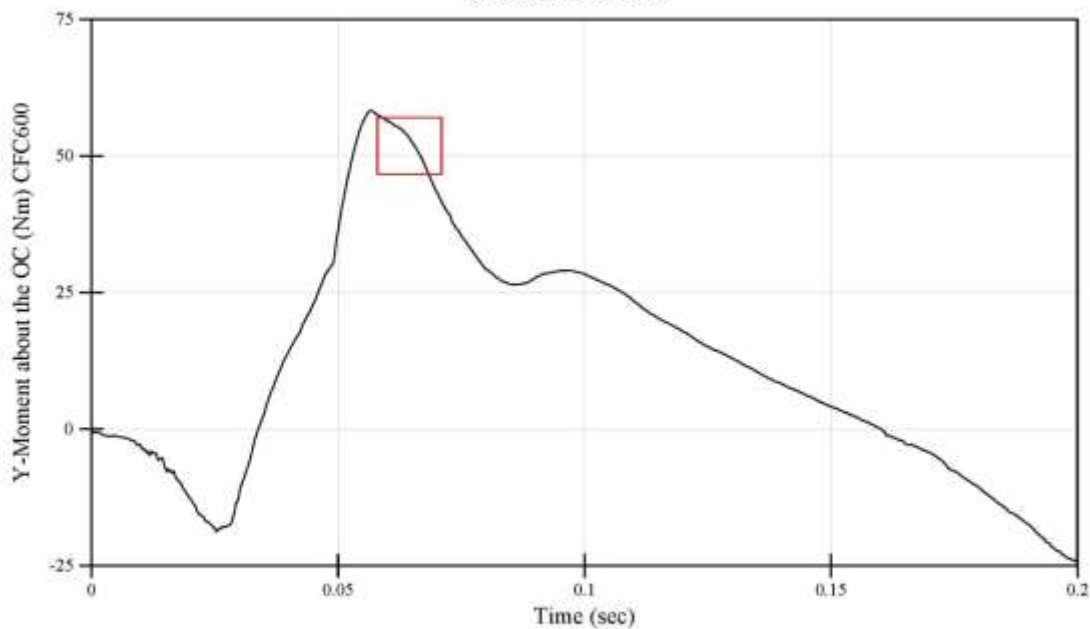


Software Version: 2.4

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

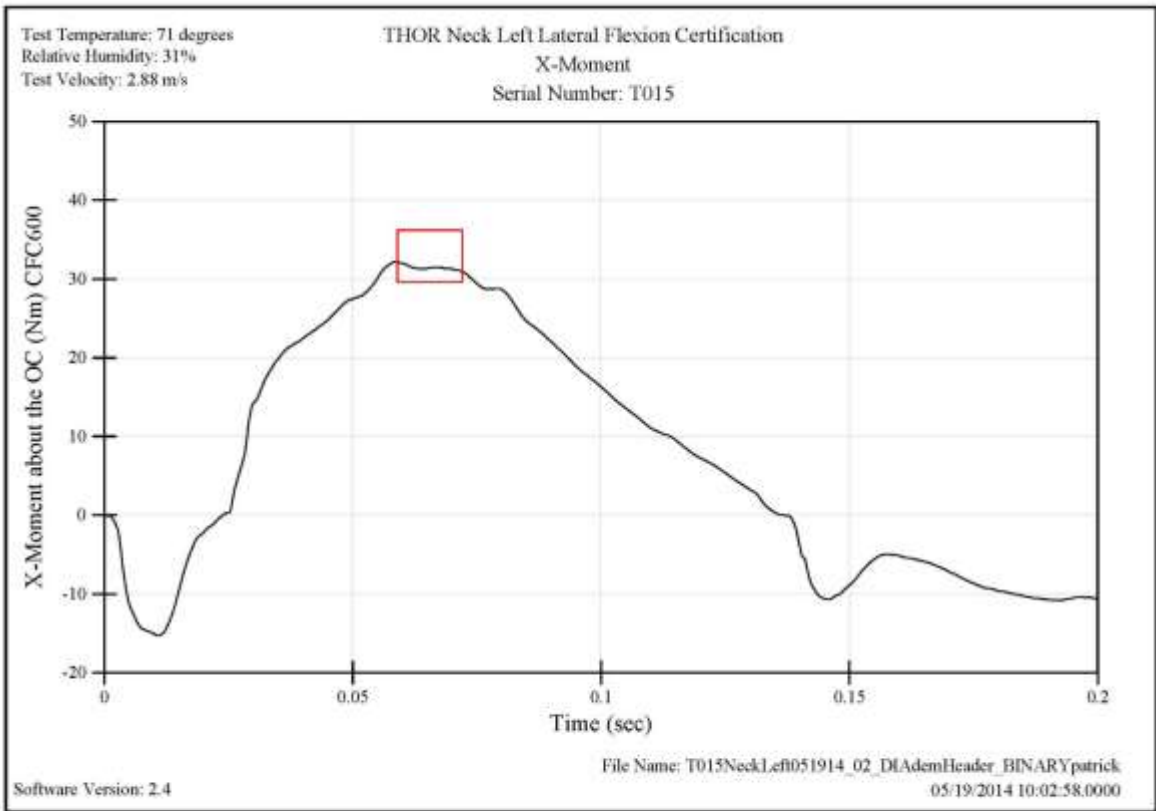
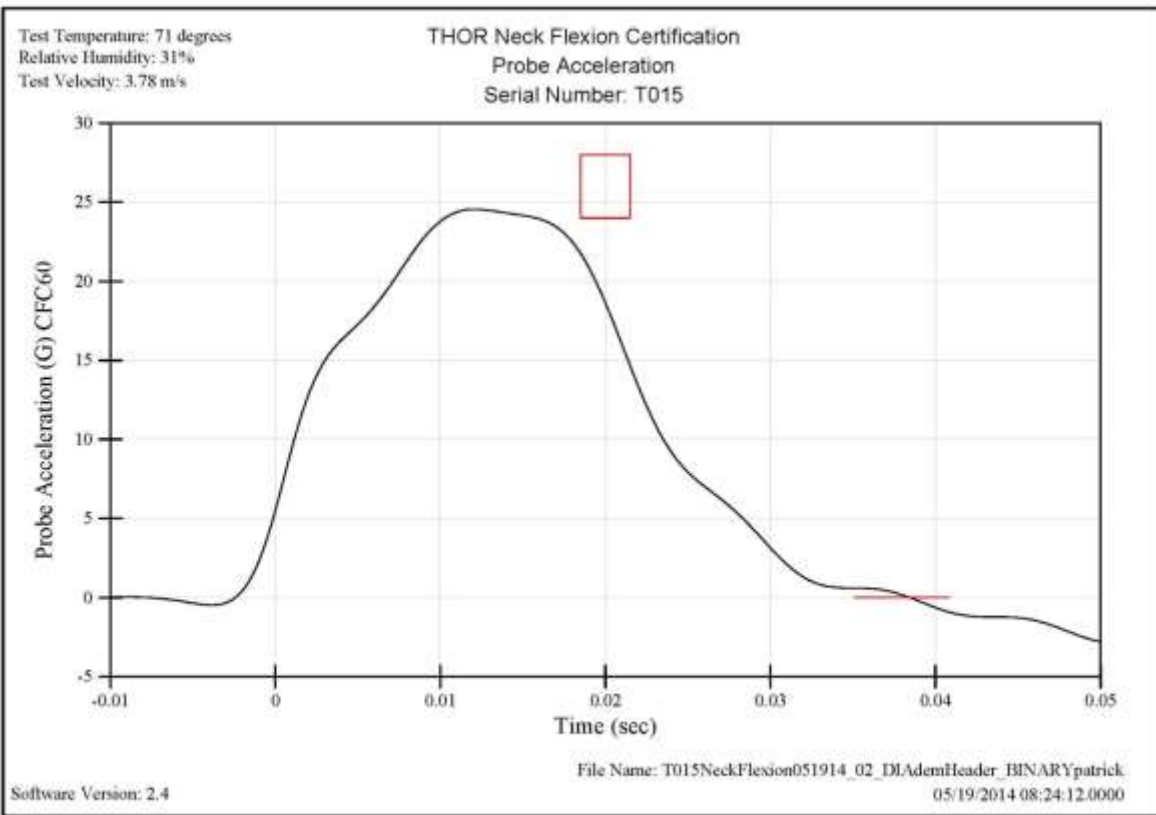
Test Temperature: 71 degrees
Relative Humidity: 31%
Test Velocity: 3.78 m/s

THOR Neck Flexion Certification
Y-Moment
Serial Number: T015



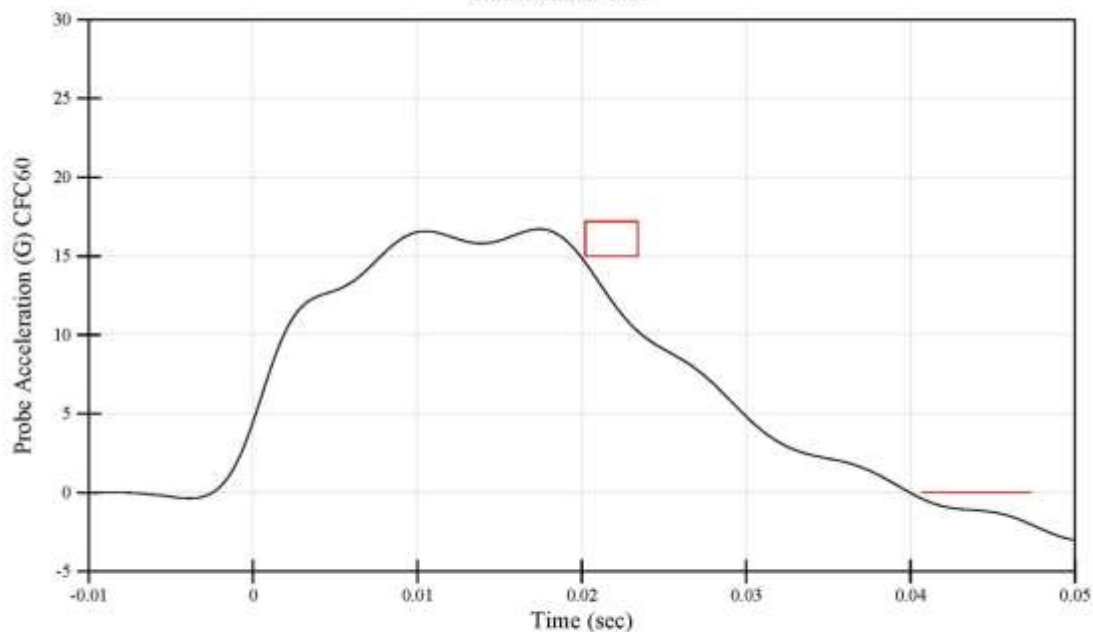
Software Version: 2.4

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

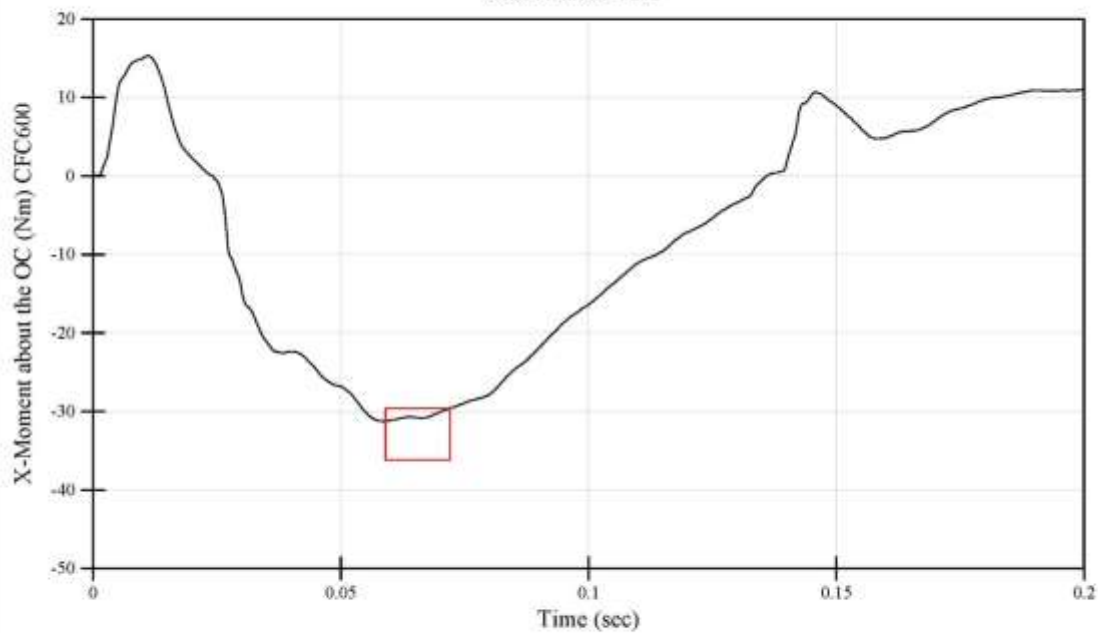


Software Version: 2.4

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

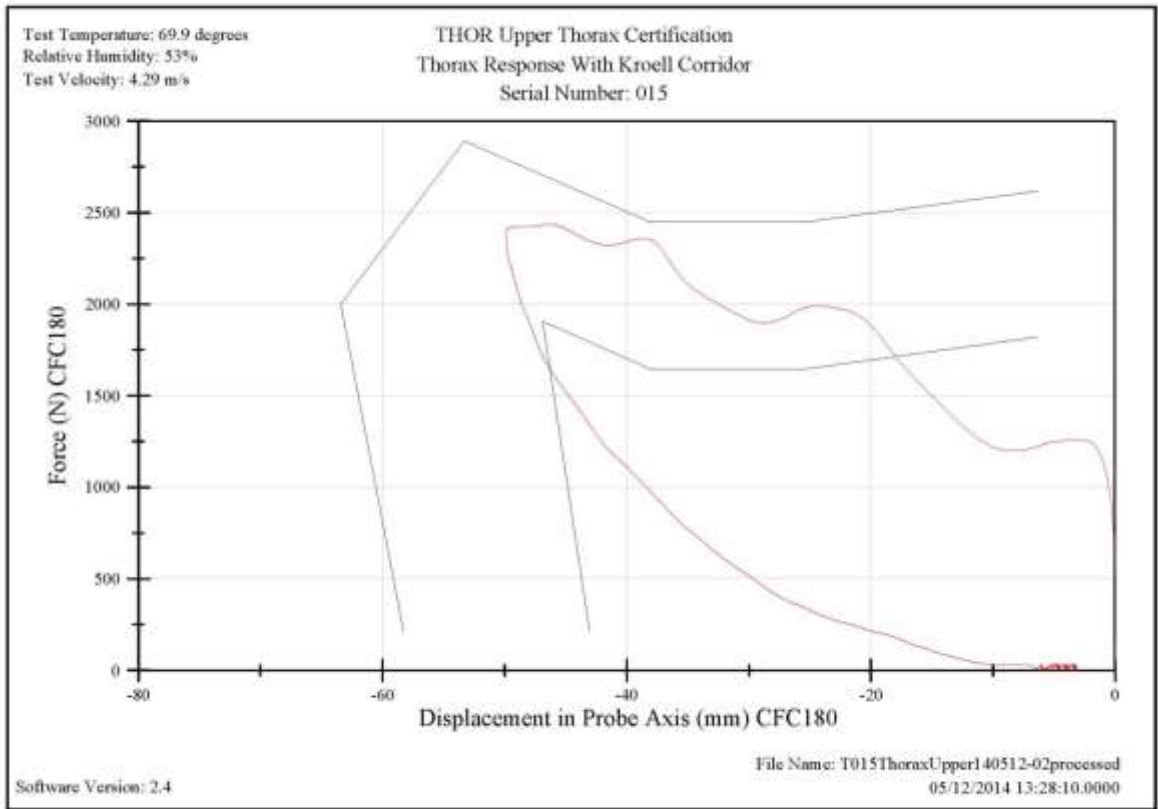
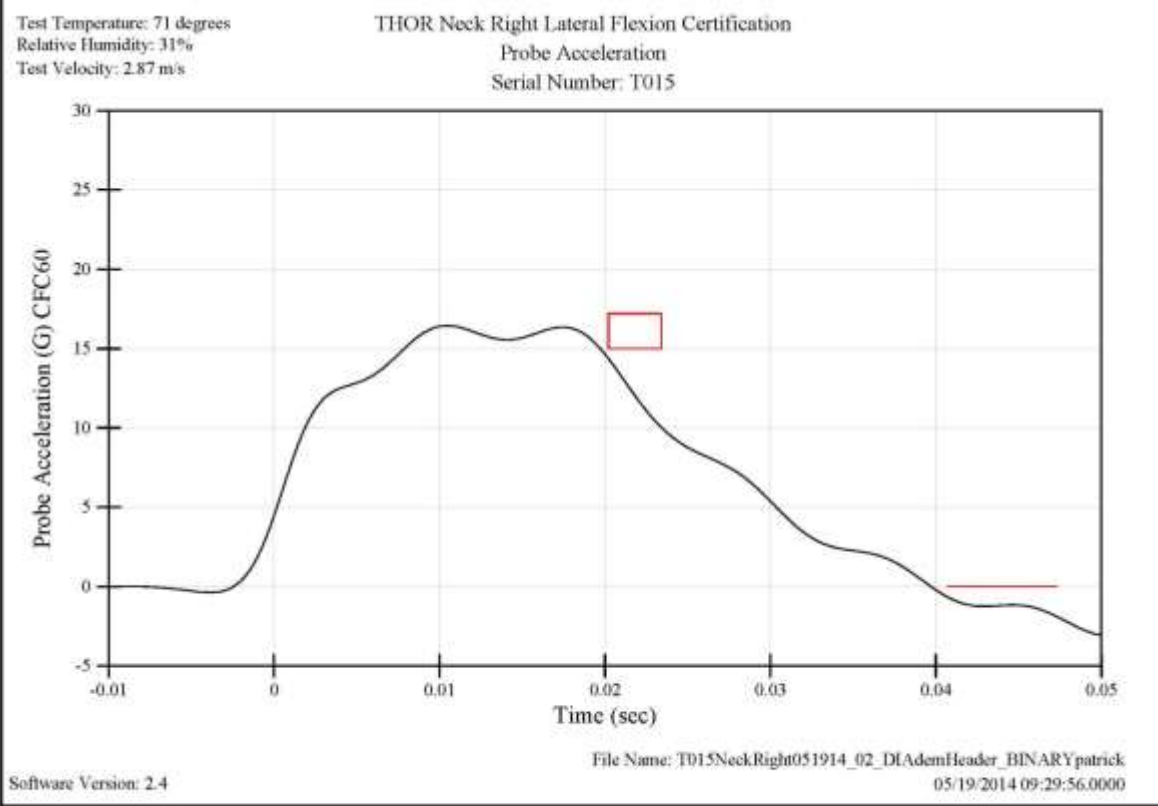
Test Temperature: 71 degrees
Relative Humidity: 31%
Test Velocity: 2.87 m/s

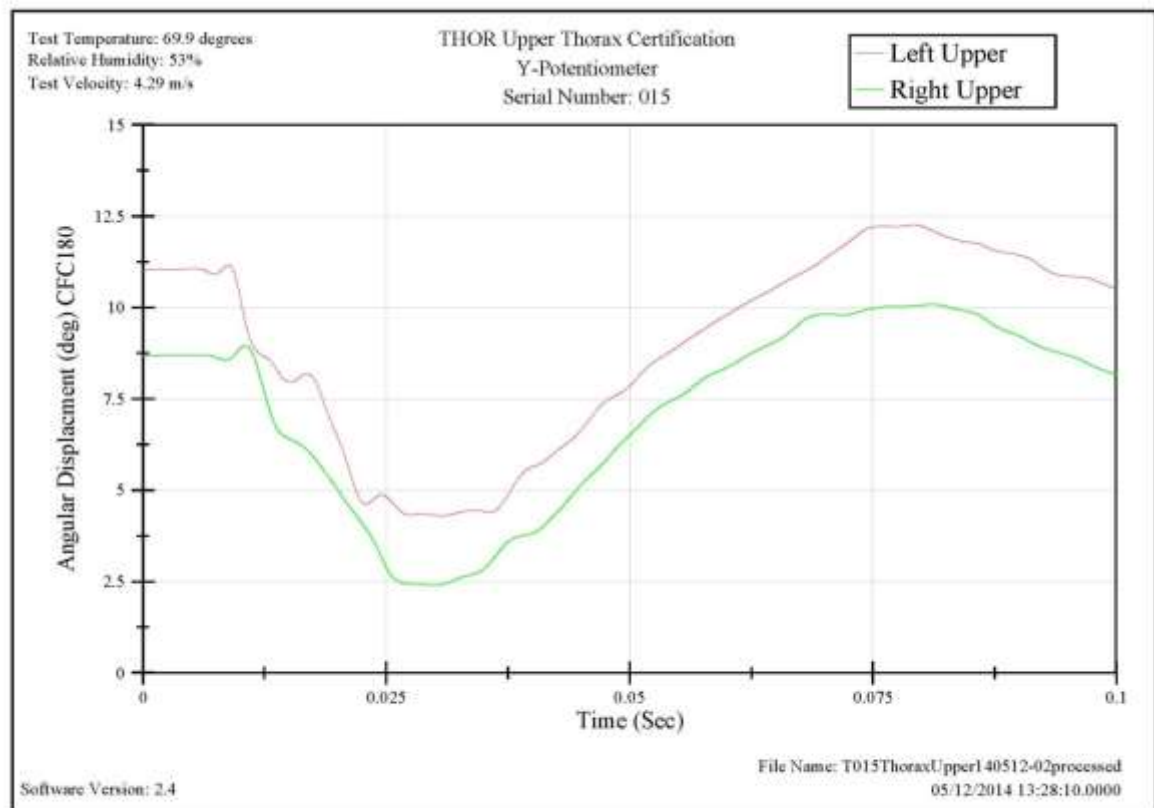
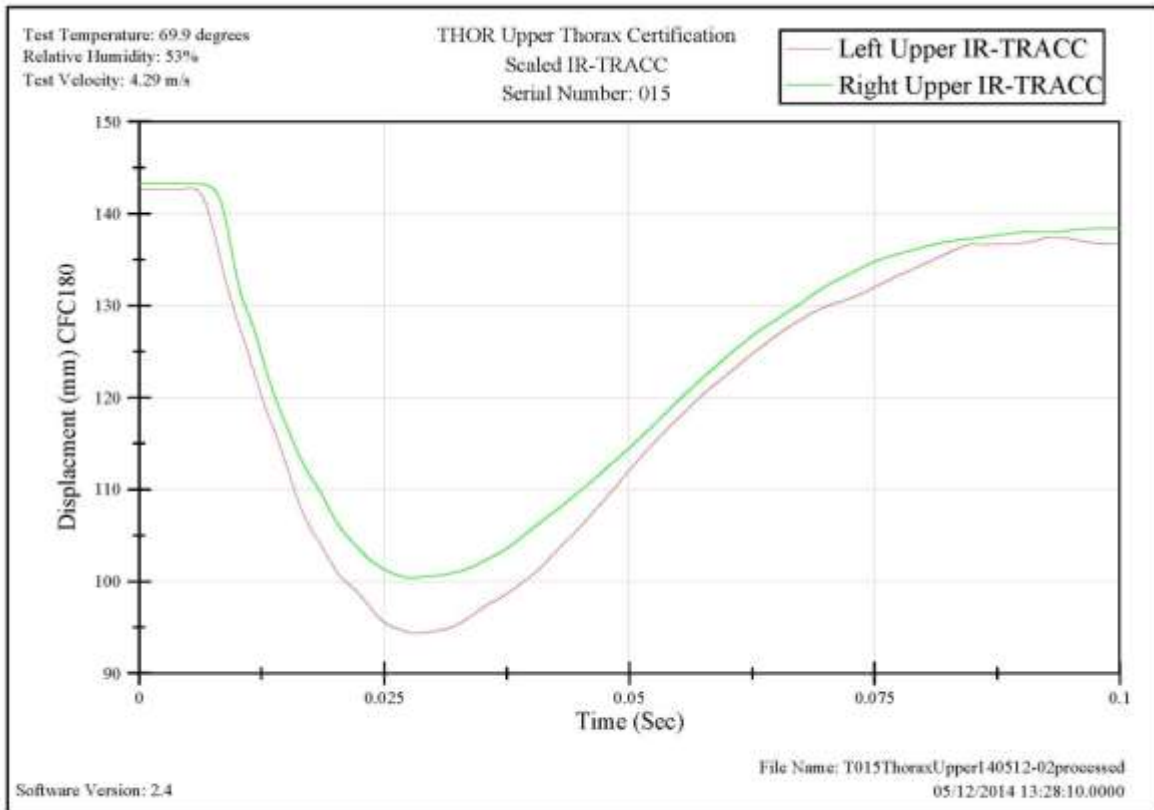
THOR Neck Right Lateral Flexion Certification
X-Moment
Serial Number: T015

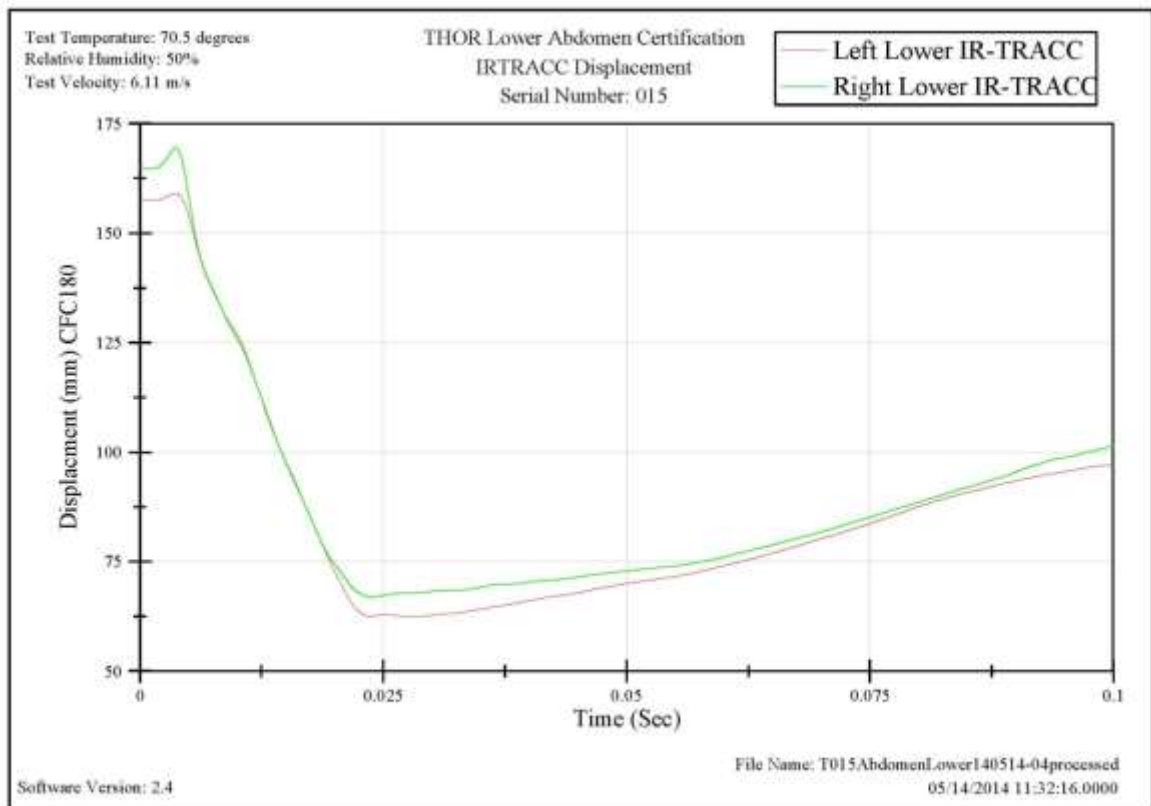
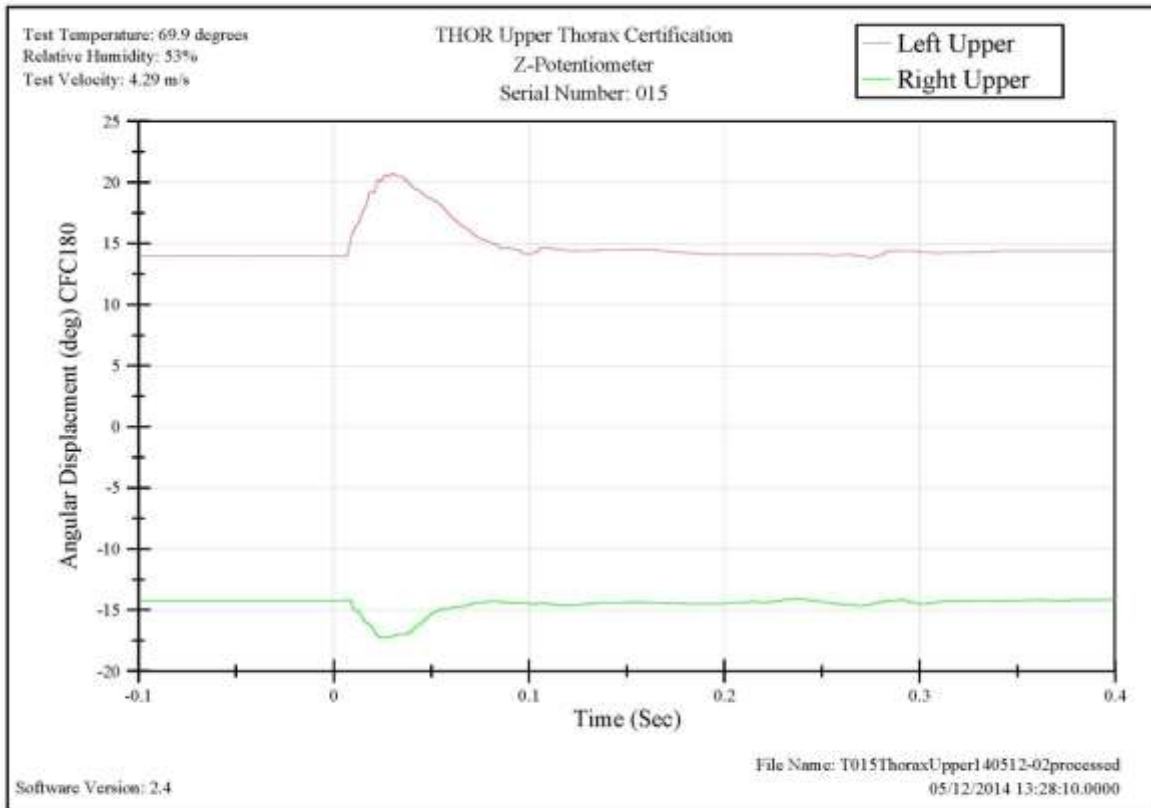


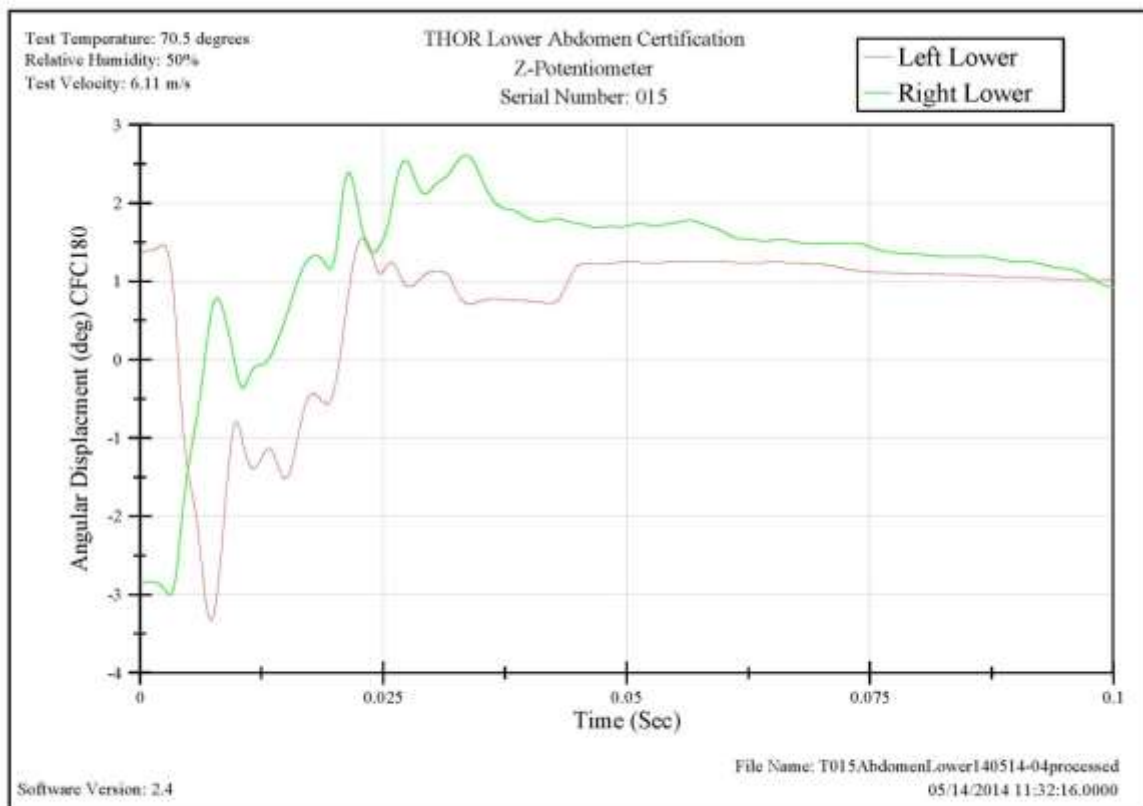
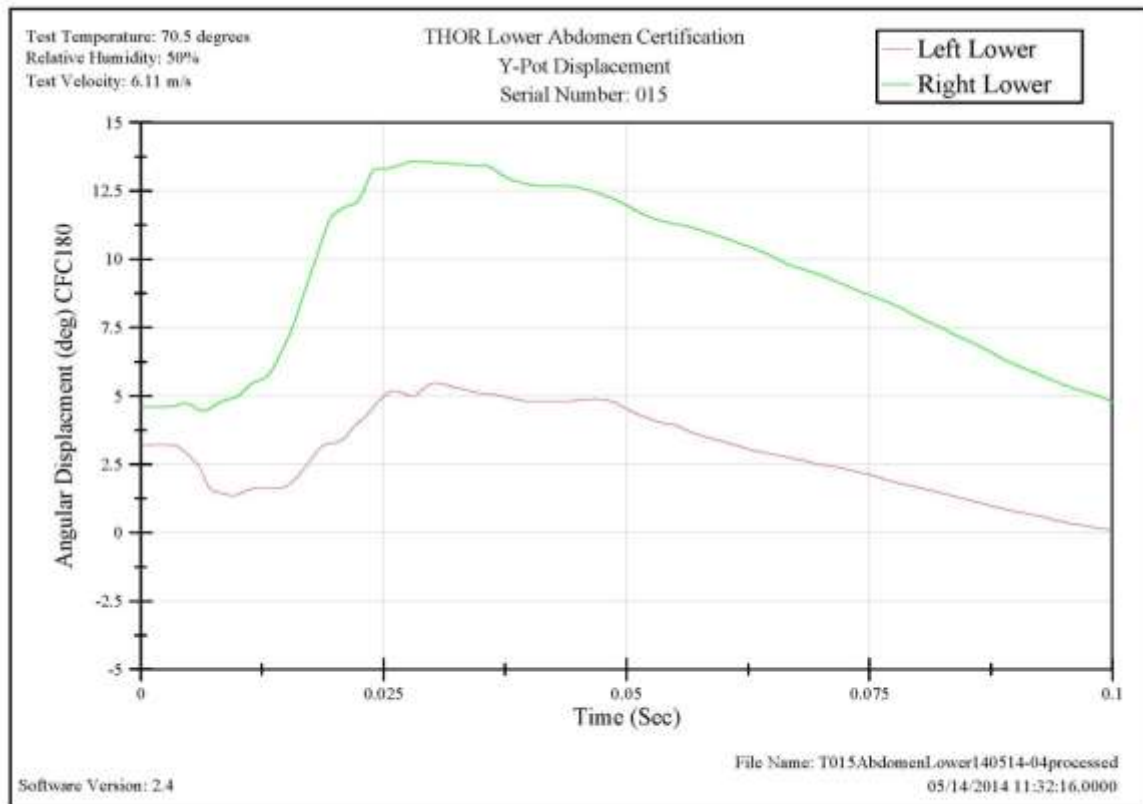
Software Version: 2.4

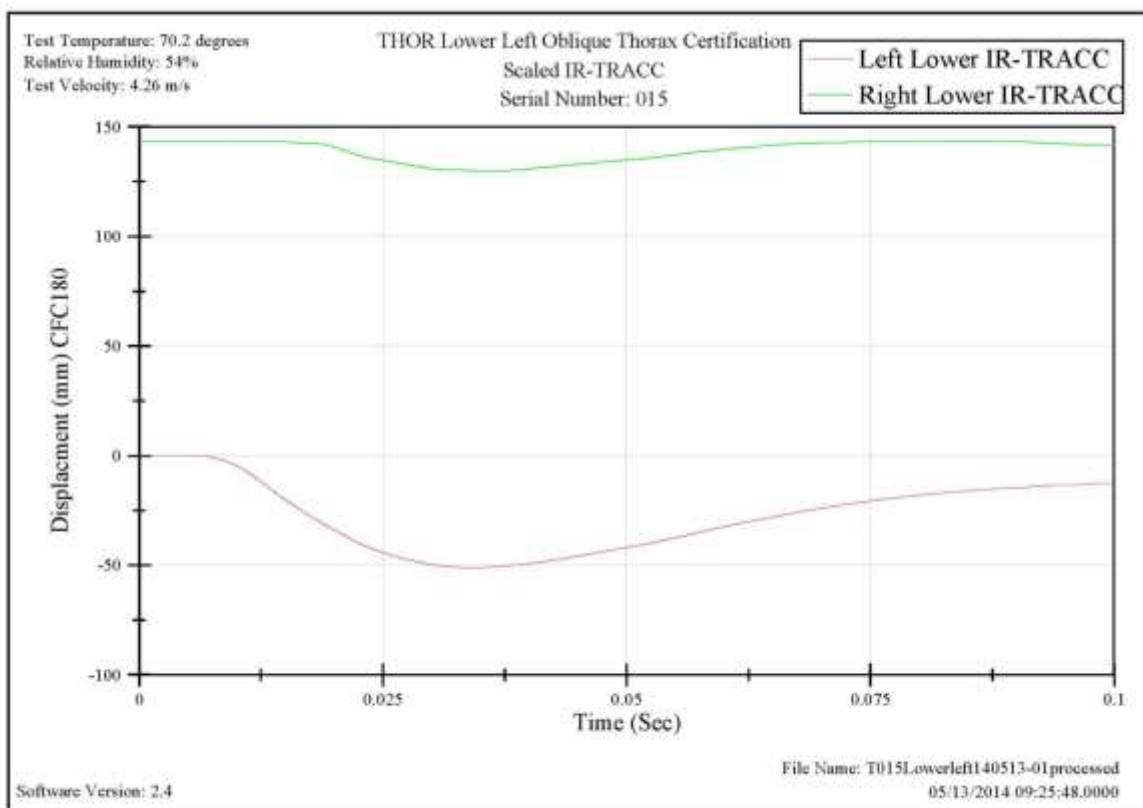
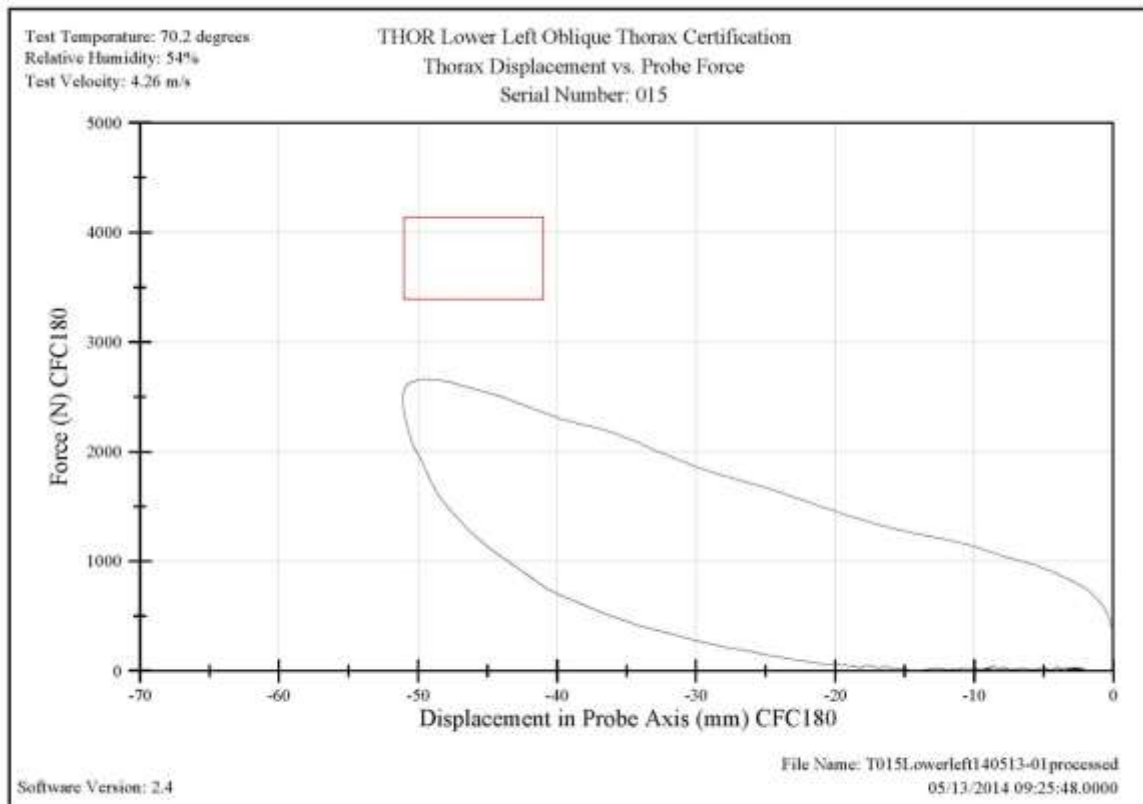
File Name: T015NeckRight051914_02_DLAdemHeader_BINARYpatrick
05/19/2014 09:29:56.0000

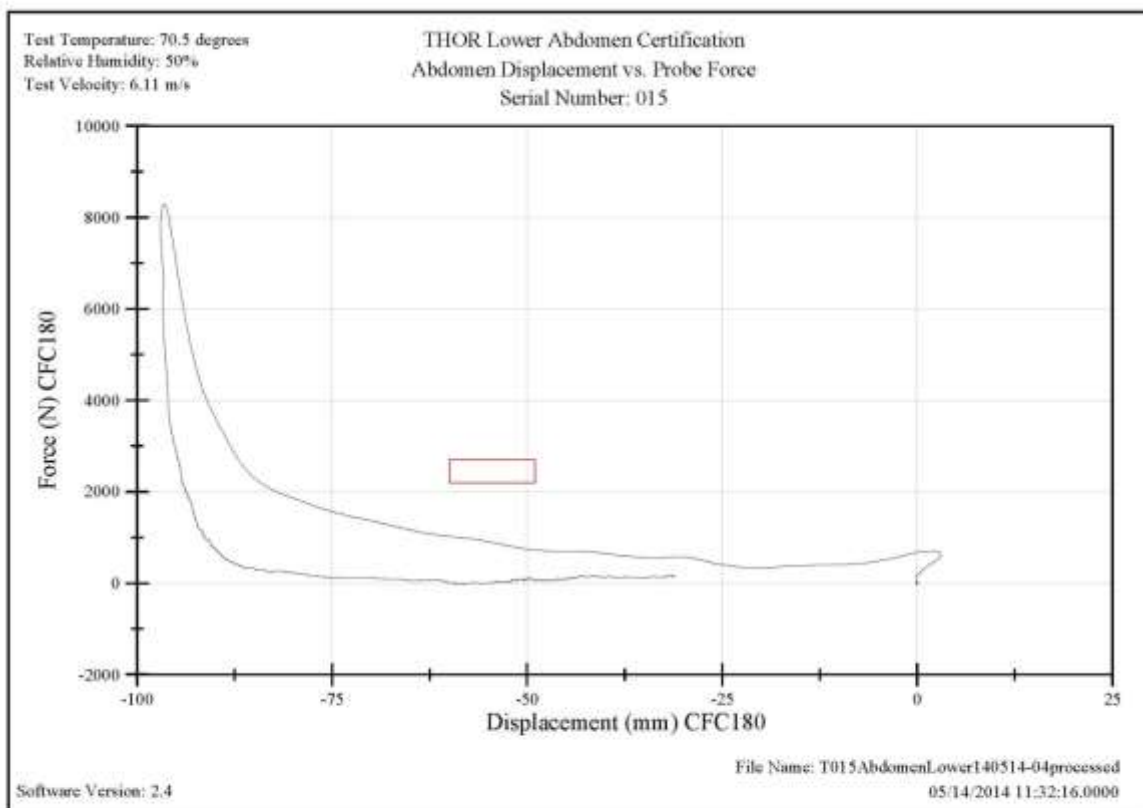
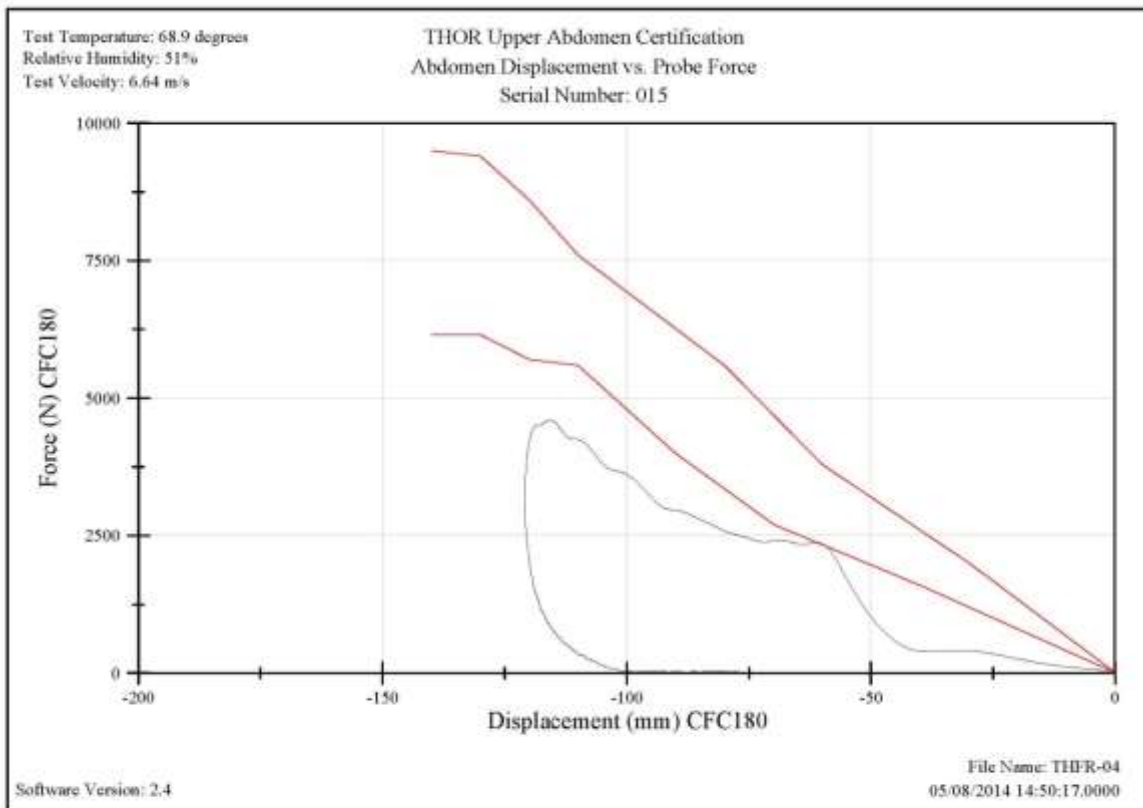


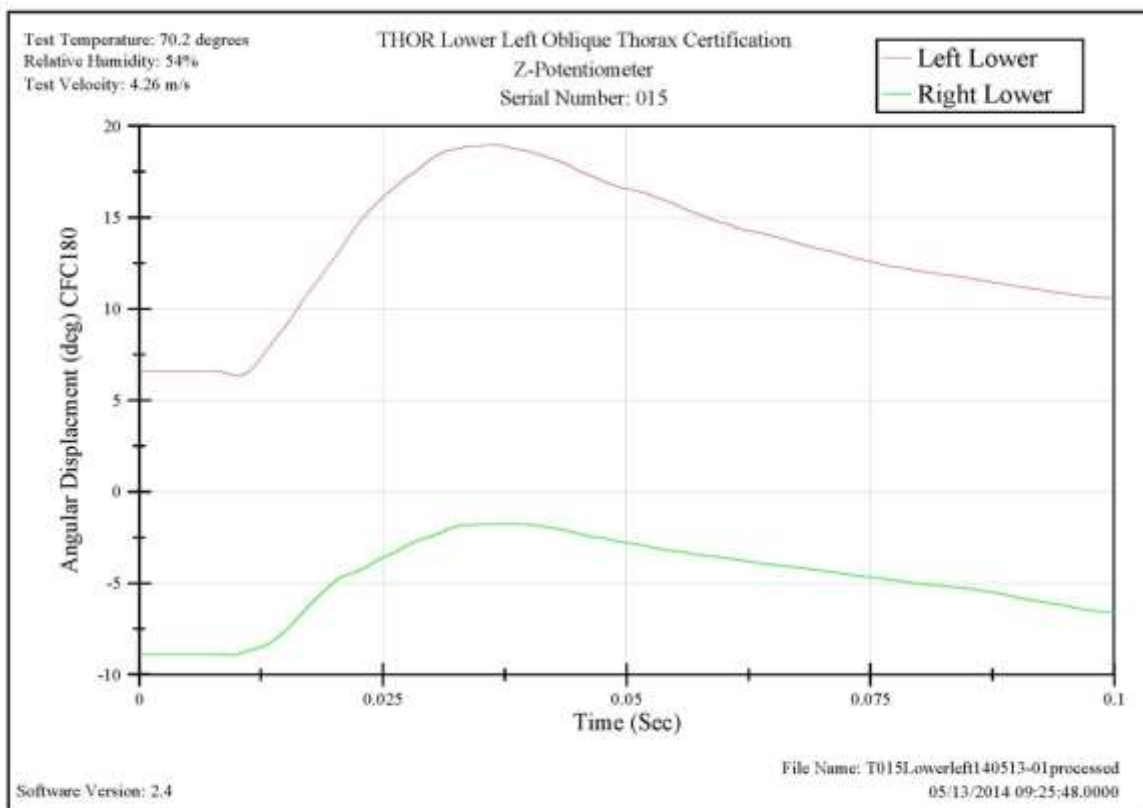
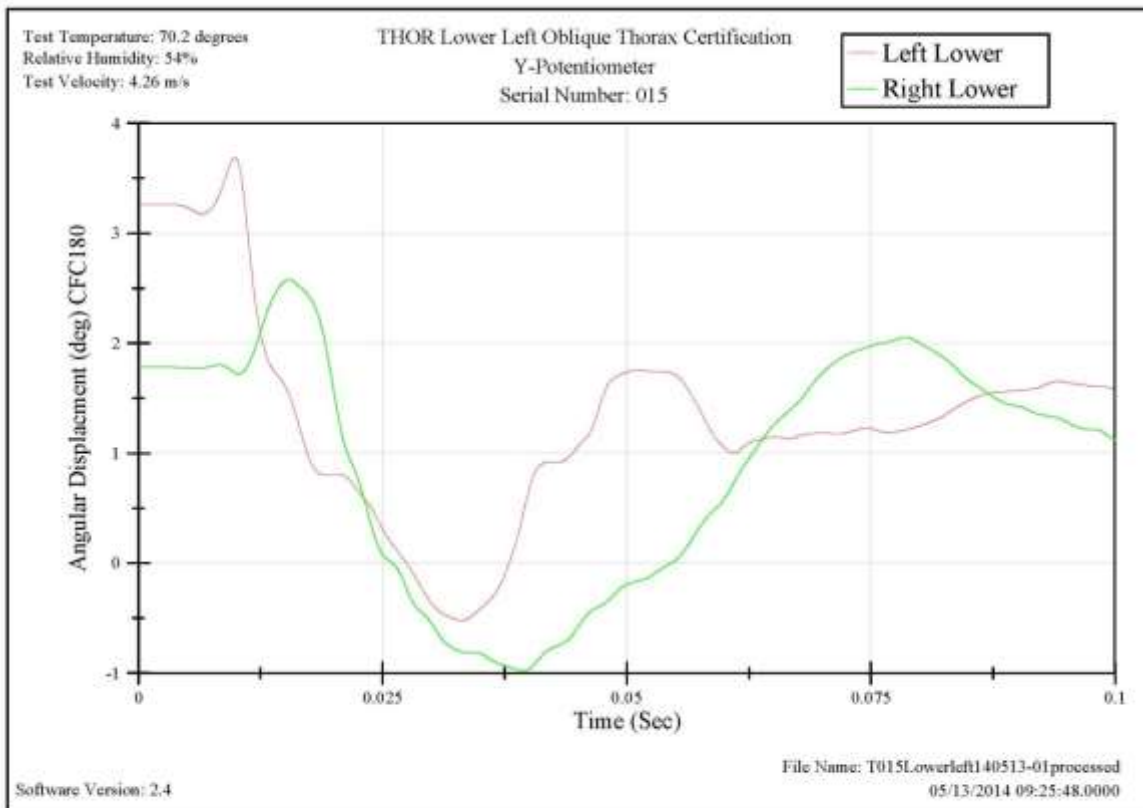


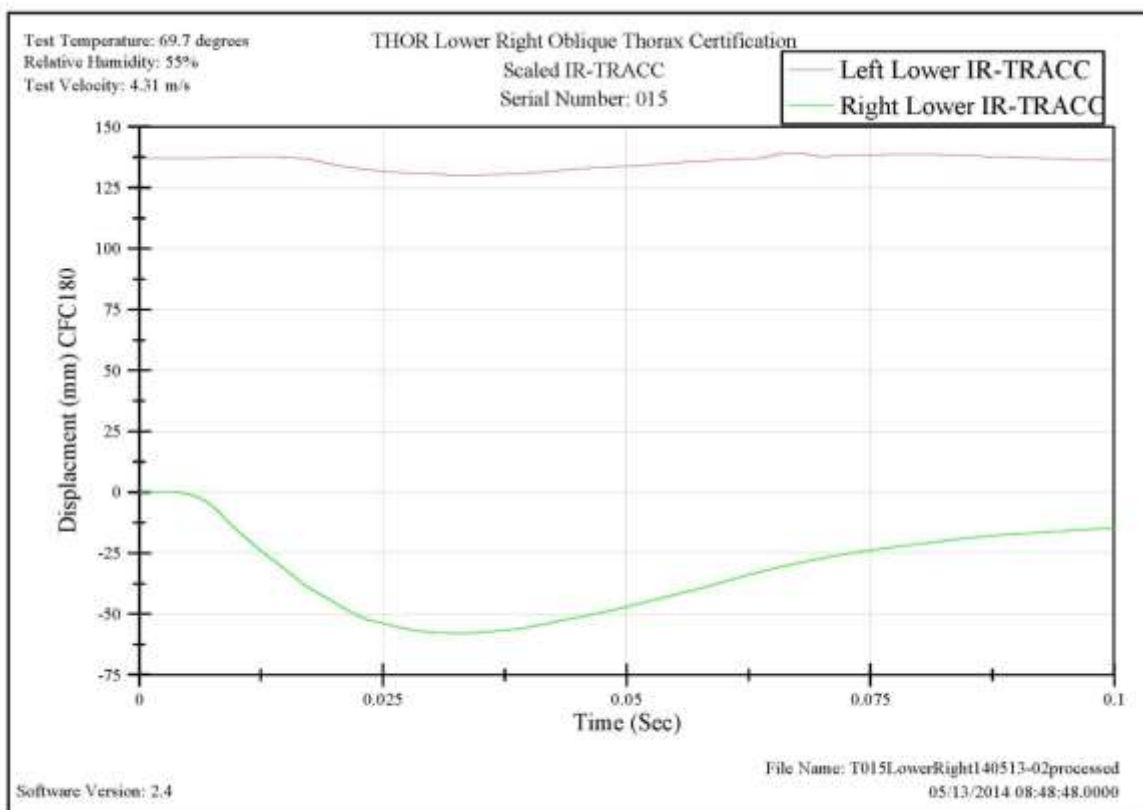
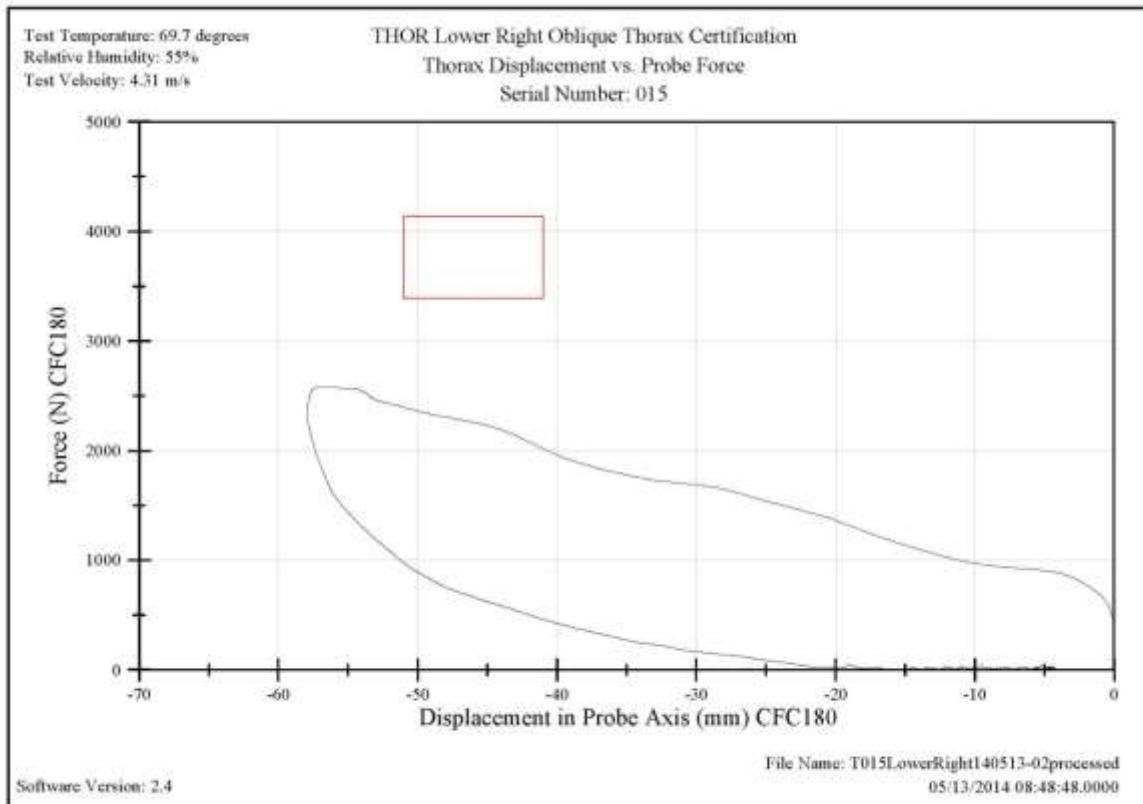


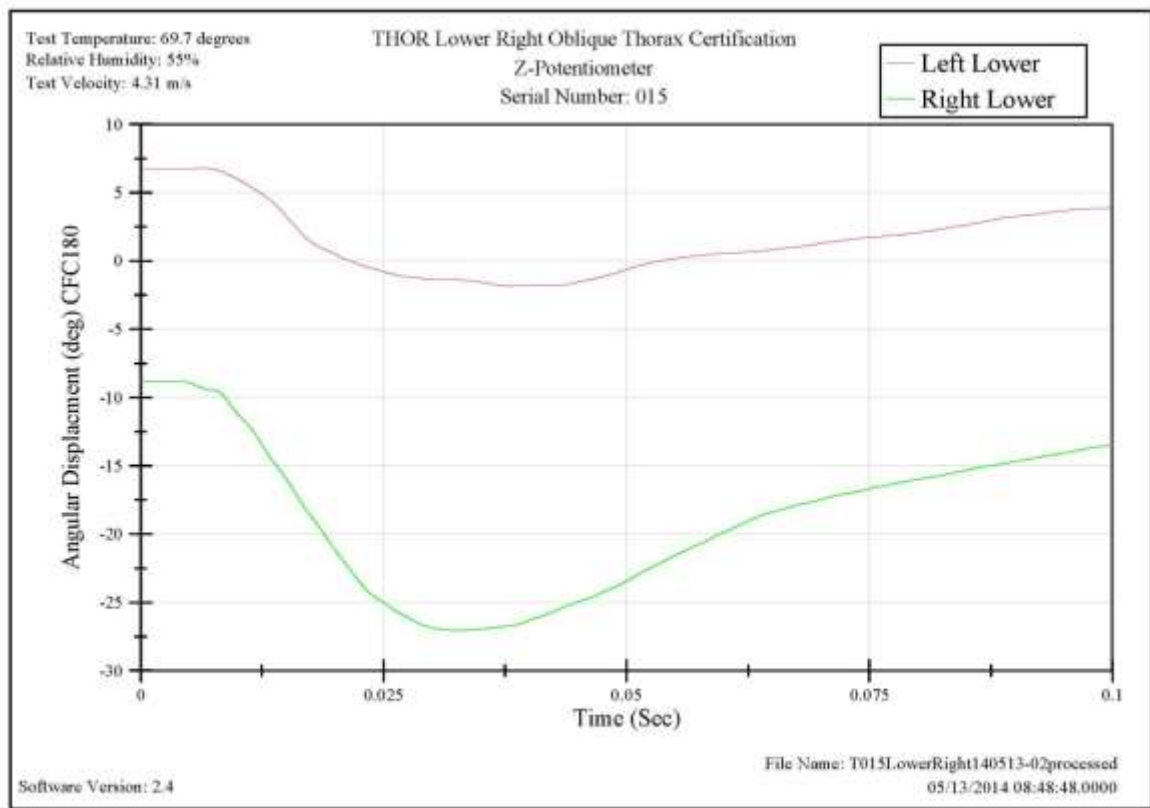
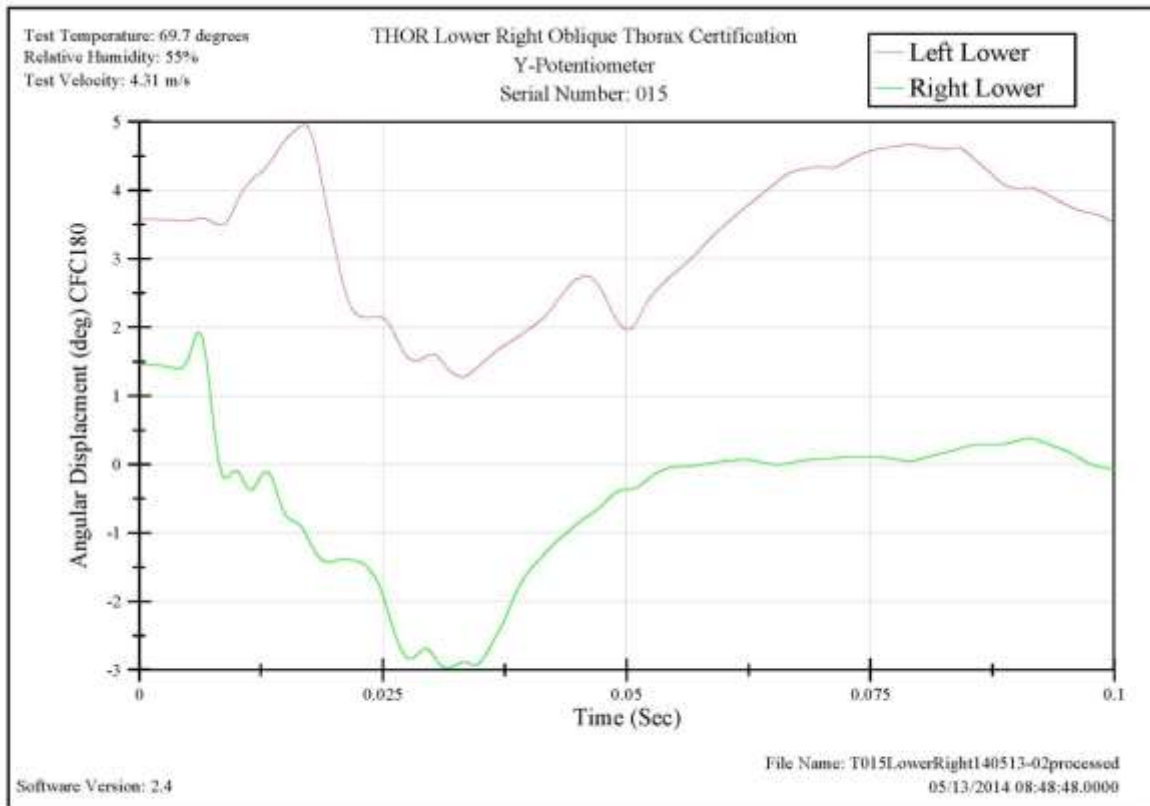


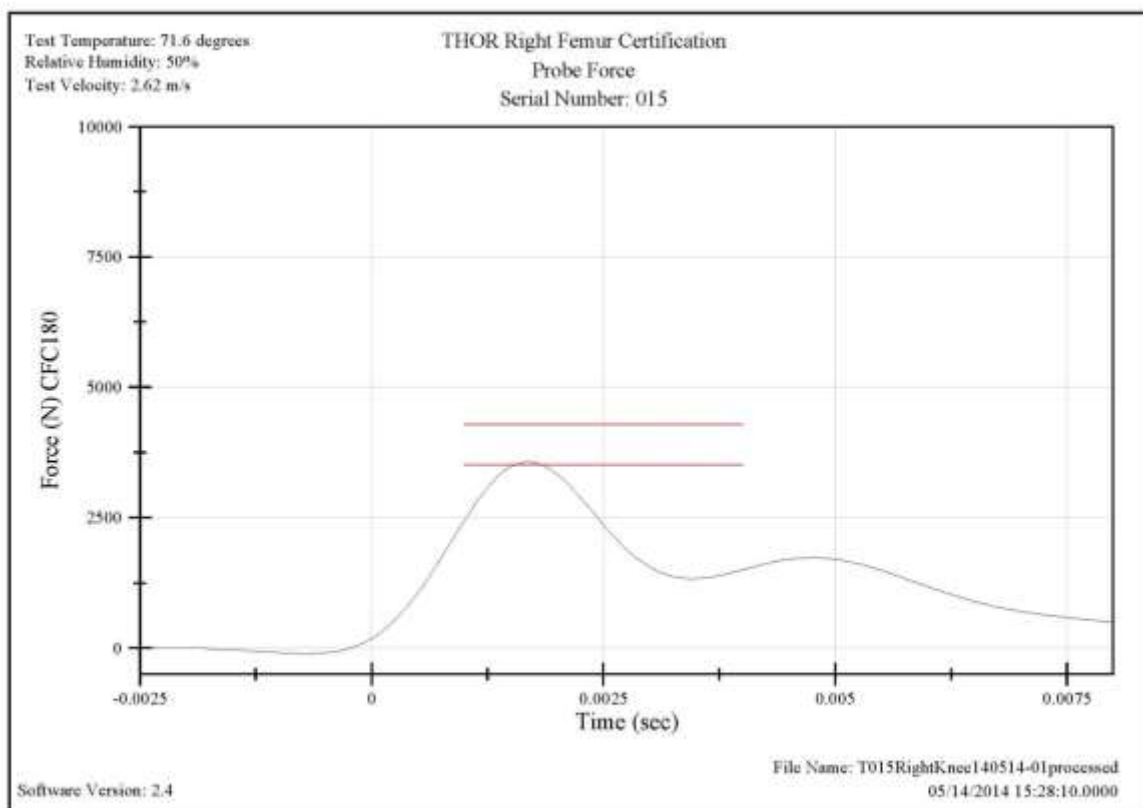
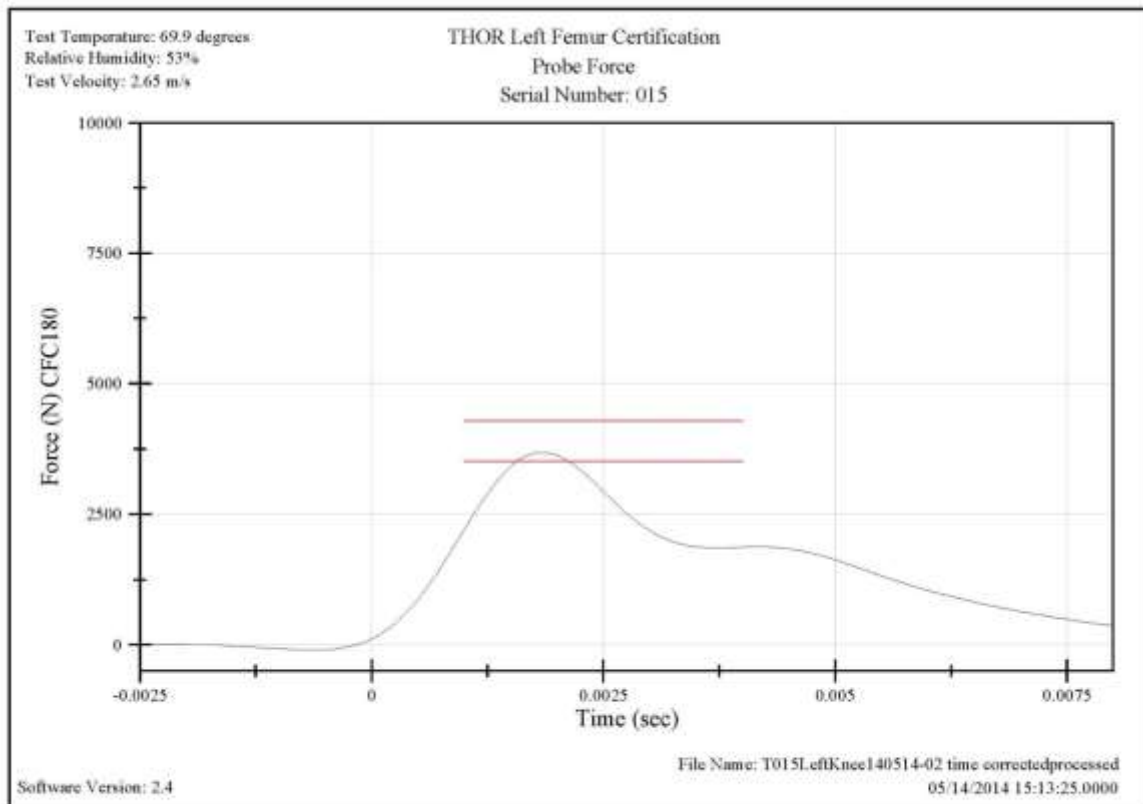






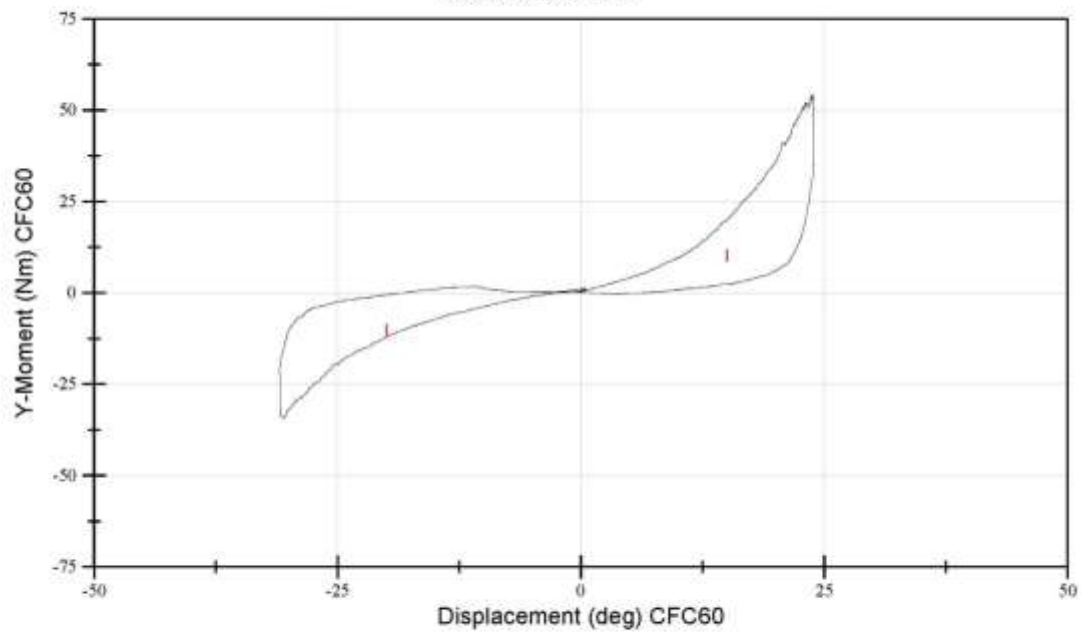






Test Temperature: 71 degrees
Relative Humidity: 35%
Test Velocity: 0 m/s

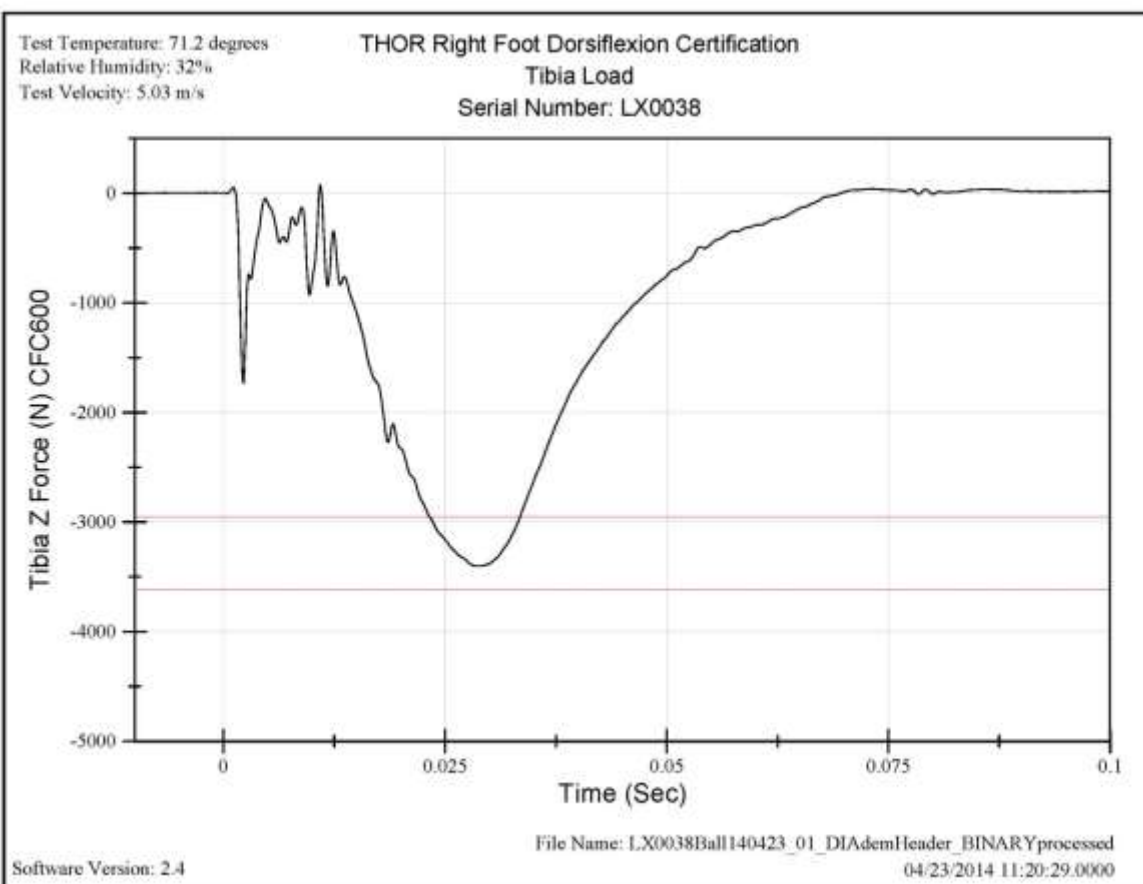
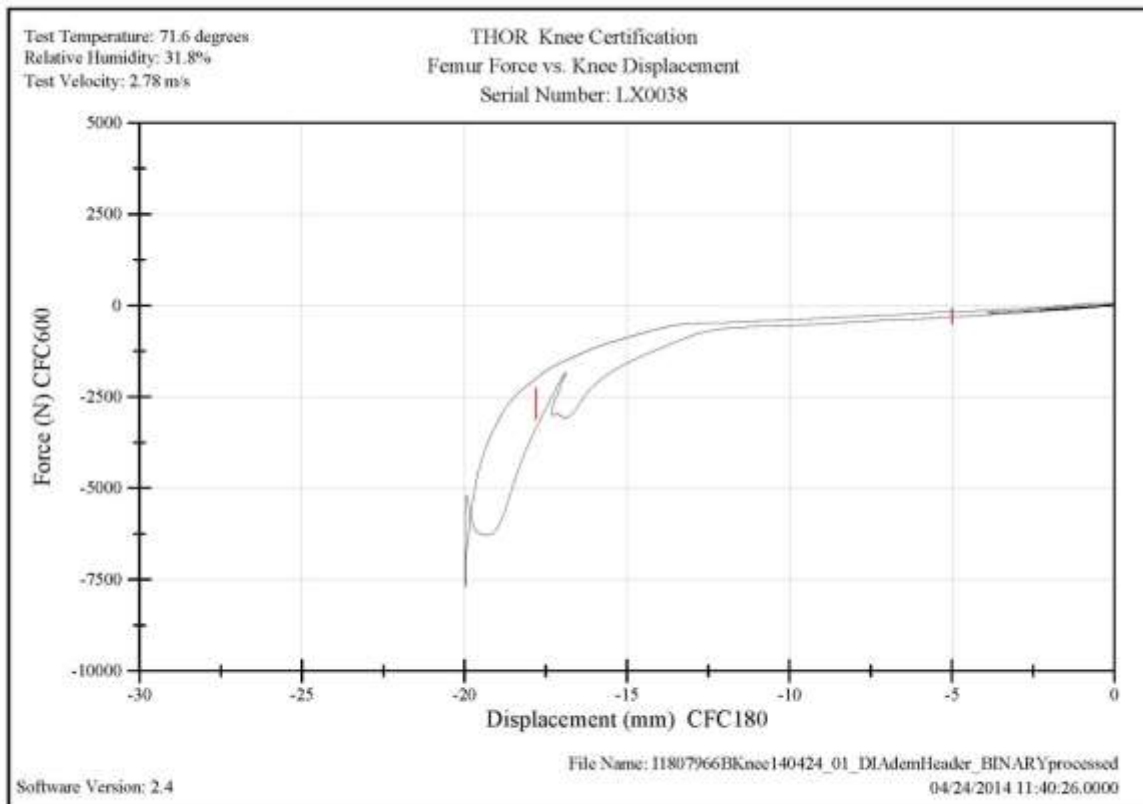
THOR Occipital Condyle Quasi-Static Certification
Displacement vs. Torque
Serial Number: T015



Software Version: 2.4

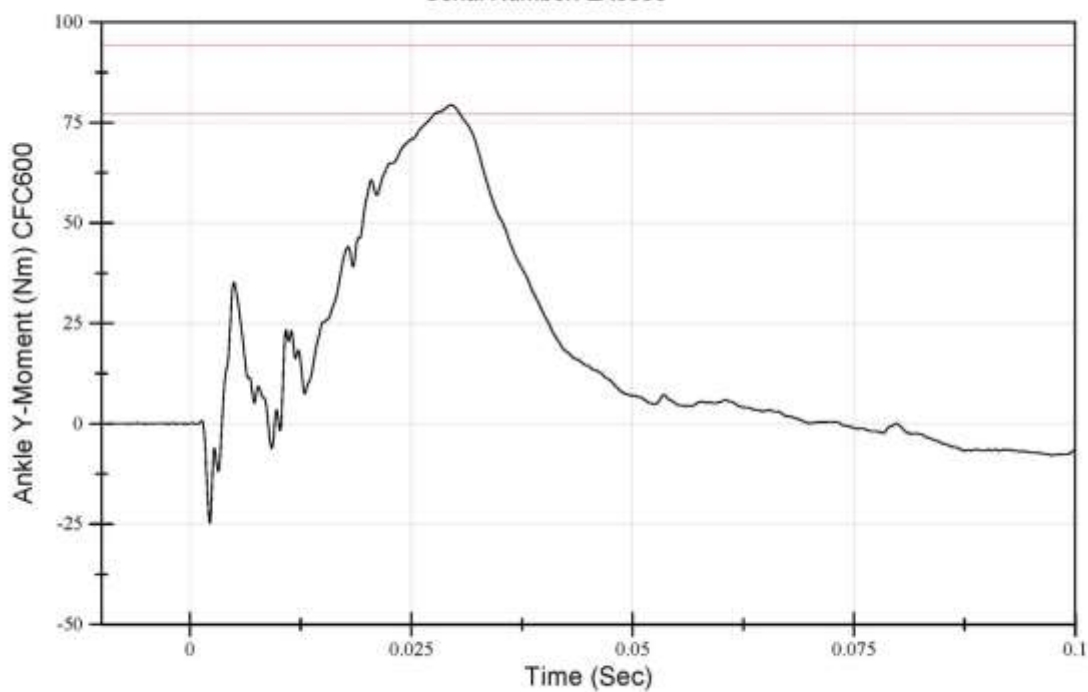
File Name: T015OC050814_01_DIAdemHeader_BINARYpatrick
05/08/2014 08:51:05.0000

THOR 015 LEG CALIBRATIONS
LX0039 / LX0038



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

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

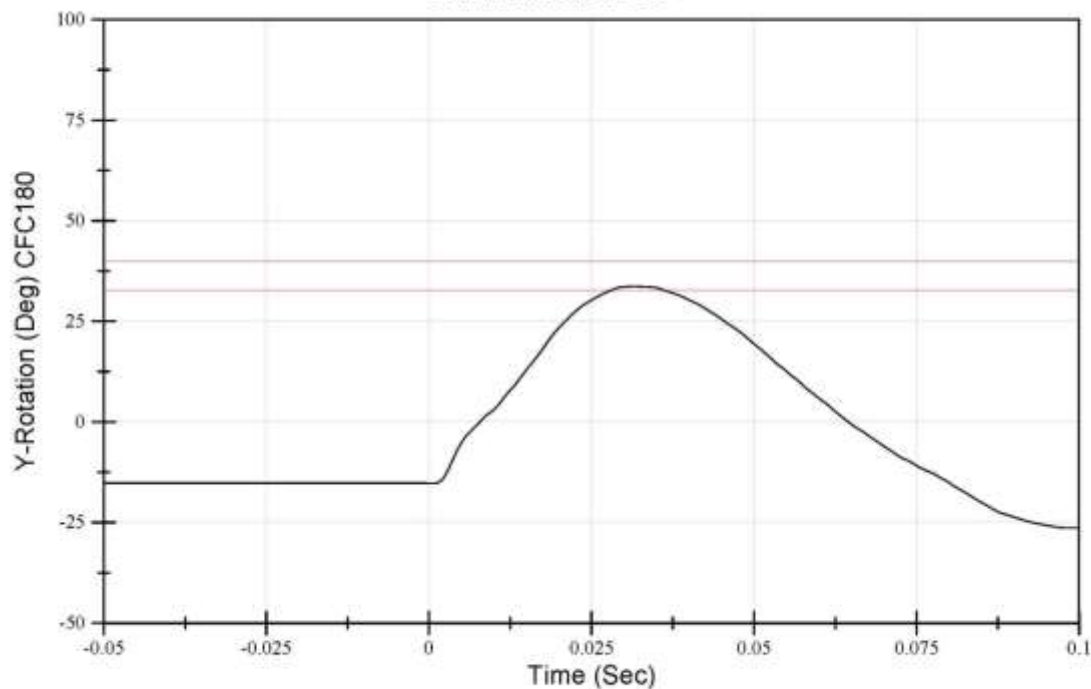


Software Version: 2.4

File Name: LX0038Ball140423_01_DIADEMHeader_BINARYprocessed
04/23/2014 11:20:29.0000

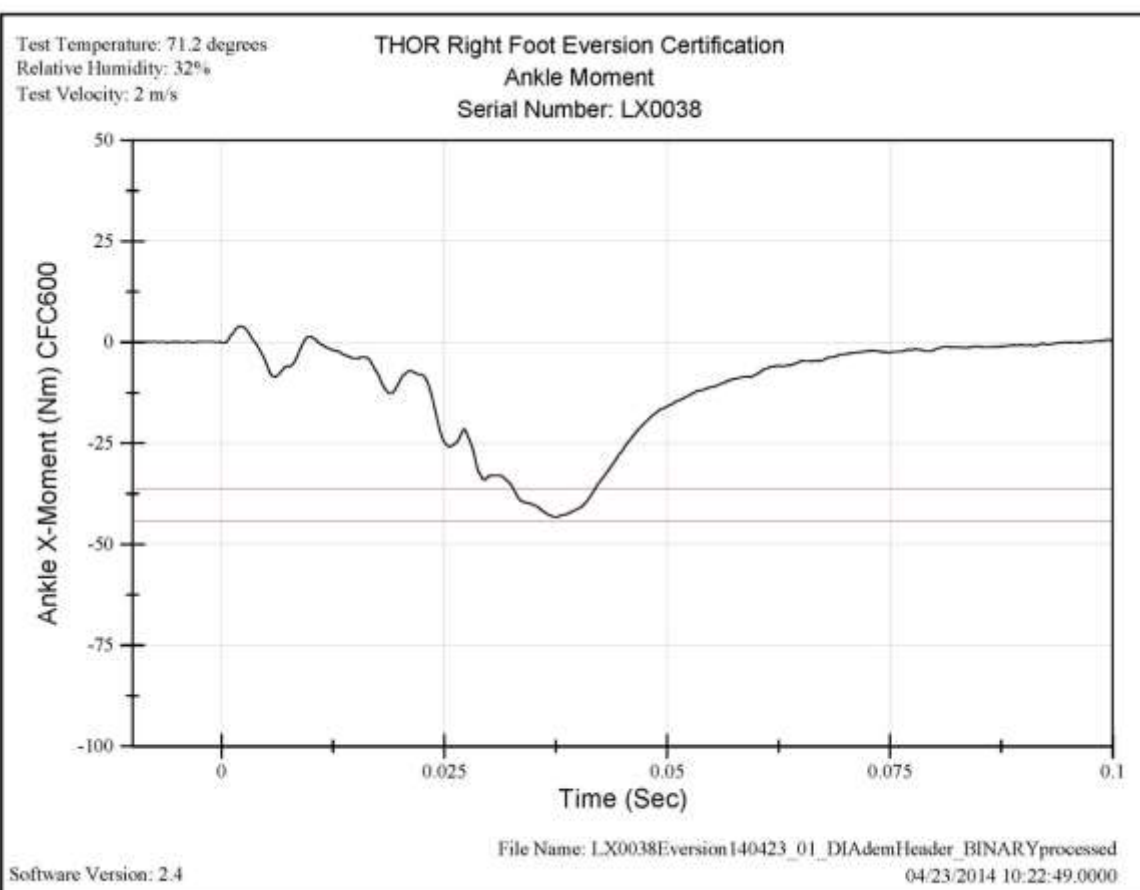
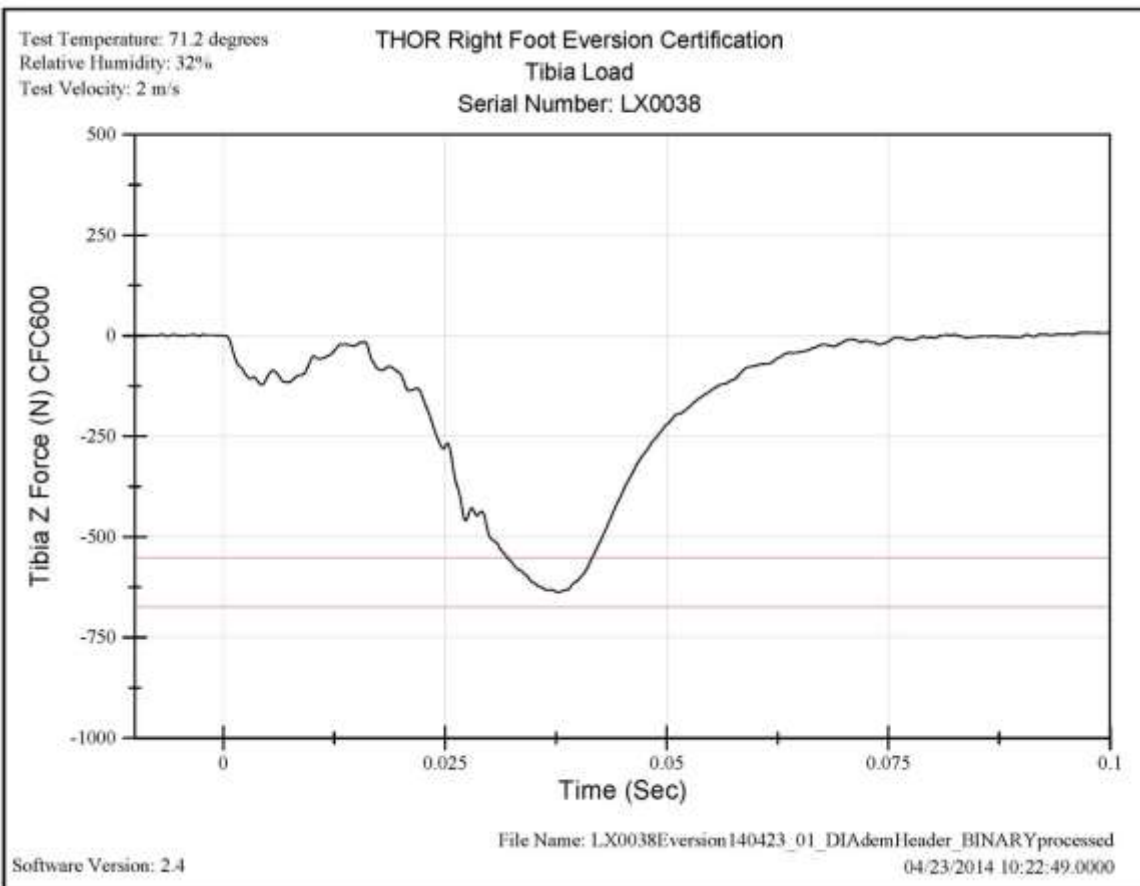
Test Temperature: 71.2 degrees
Relative Humidity: 32%
Test Velocity: 5.03 m/s

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



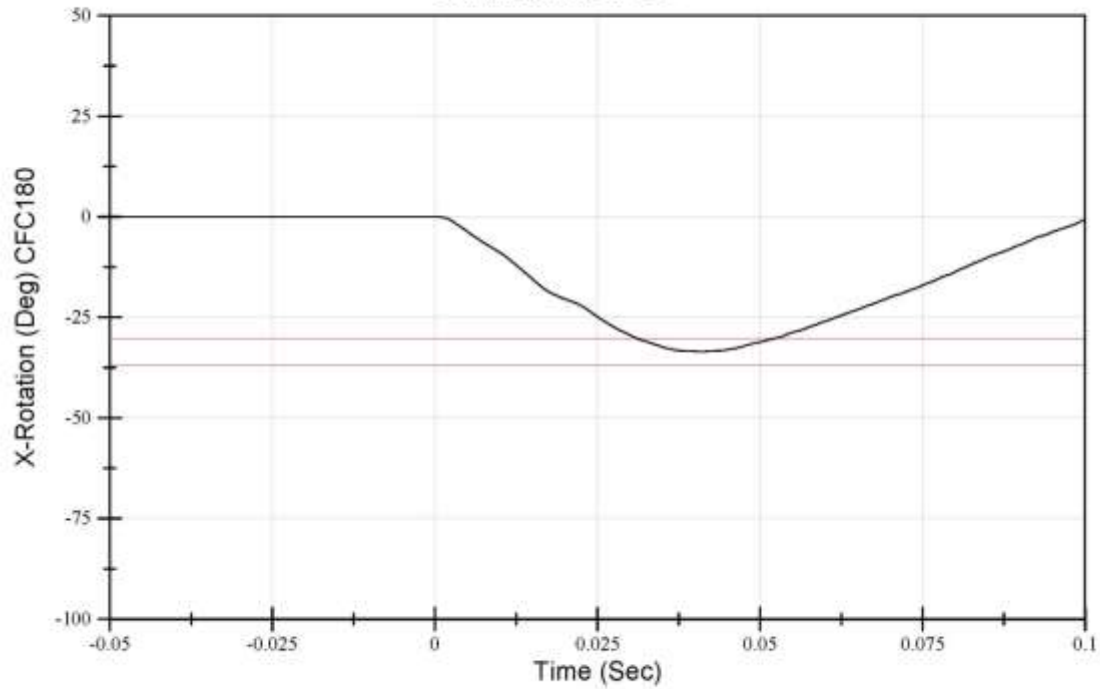
Software Version: 2.4

File Name: LX0038Ball140423_01_DIADEMHeader_BINARYprocessed
04/23/2014 11:20:29.0000



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

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

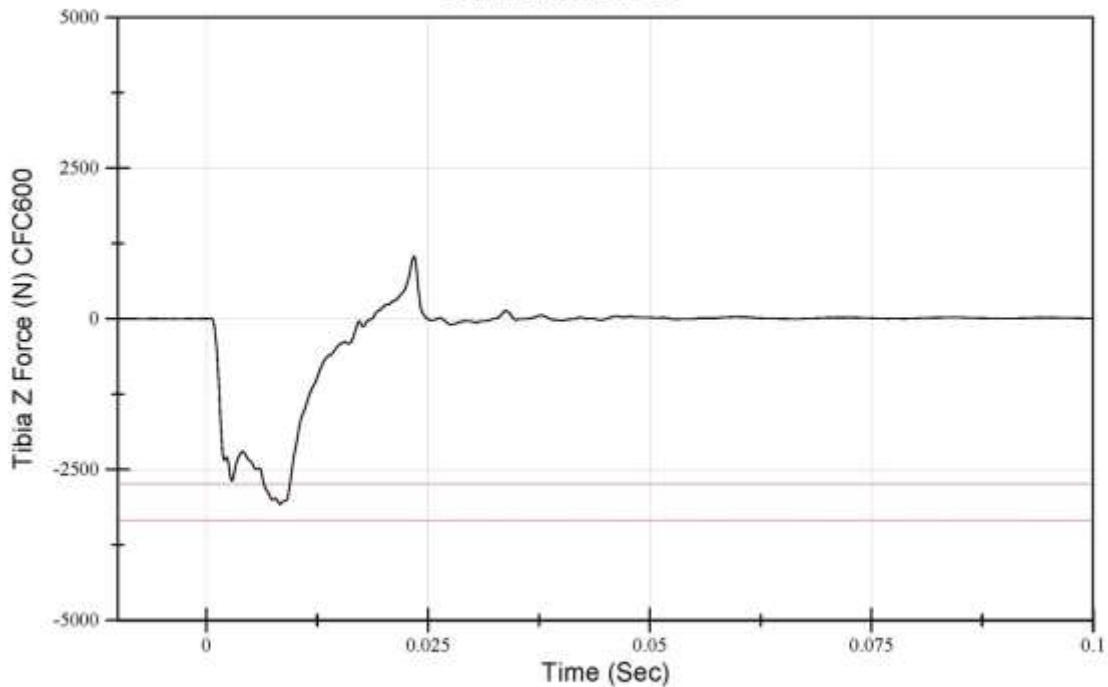


Software Version: 2.4

File Name: LX0038Eversion140423_01_DIADEMHeader_BINARYprocessed
04/23/2014 10:22:49.0000

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

THOR Right Foot Heel Certification
Tibia Load
Serial Number: LX0038

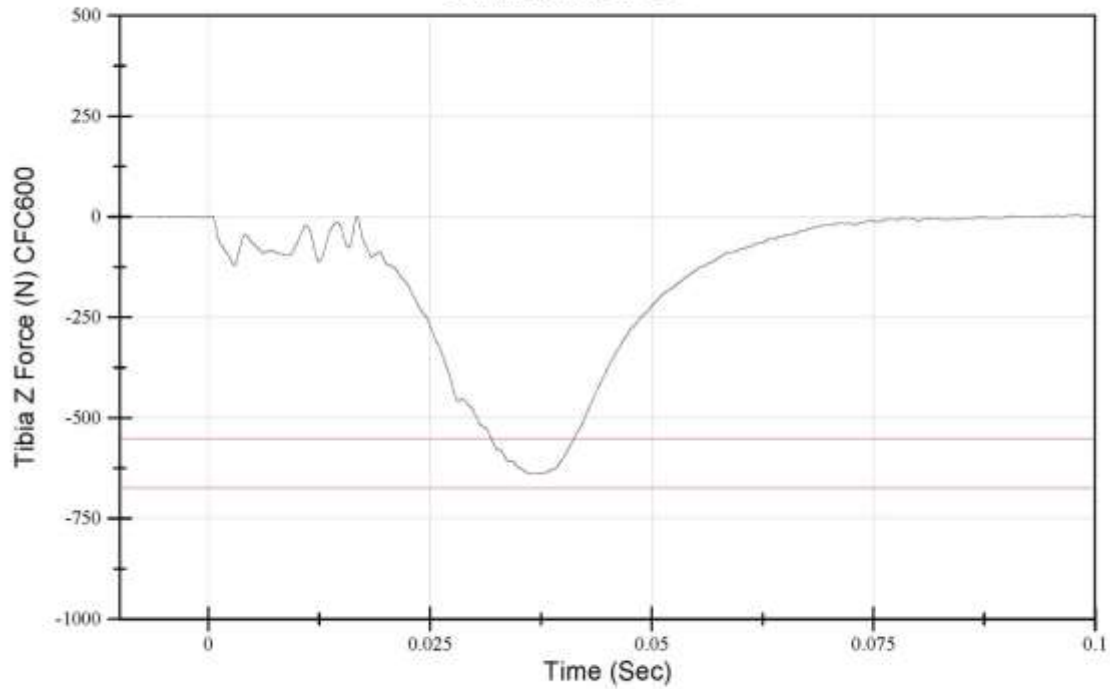


Software Version: 2.4

File Name: LX0038Heel140423_01_DIADEMHeader_BINARYprocessed
04/23/2014 13:15:18.0000

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

THOR Right Foot Inversion Certification
Tibia Load
Serial Number: LX0038

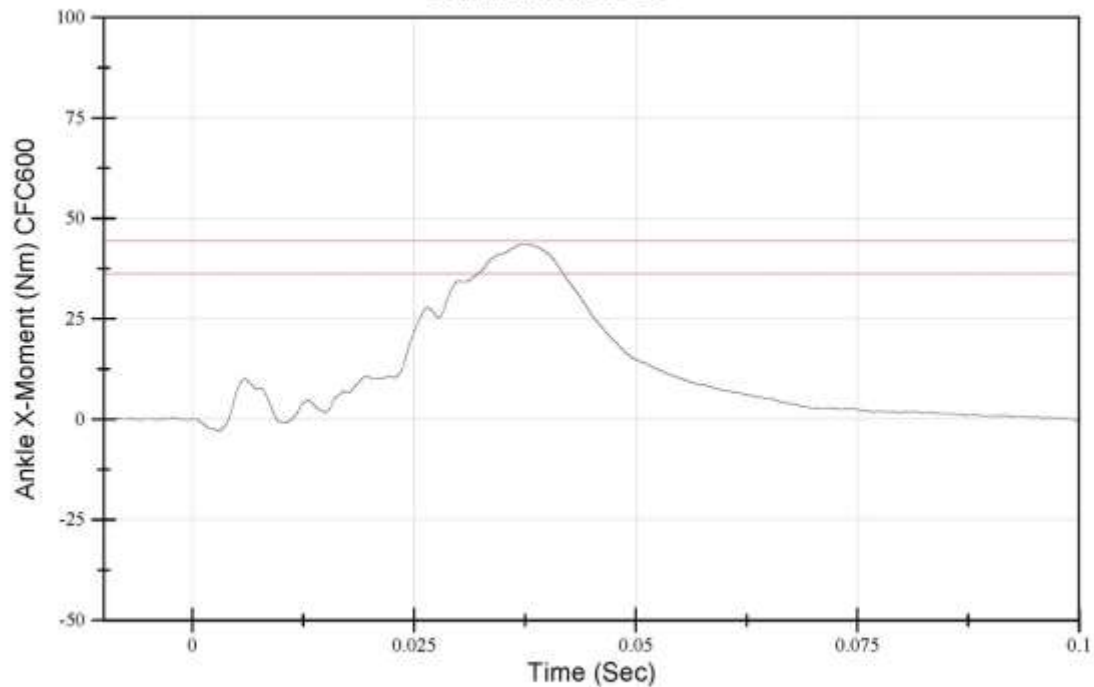


Software Version: 2.4

File Name: LX0038Inversion140423_01_DIADEMHeader_BINARYprocessed
04/23/2014 09:52:27.0000

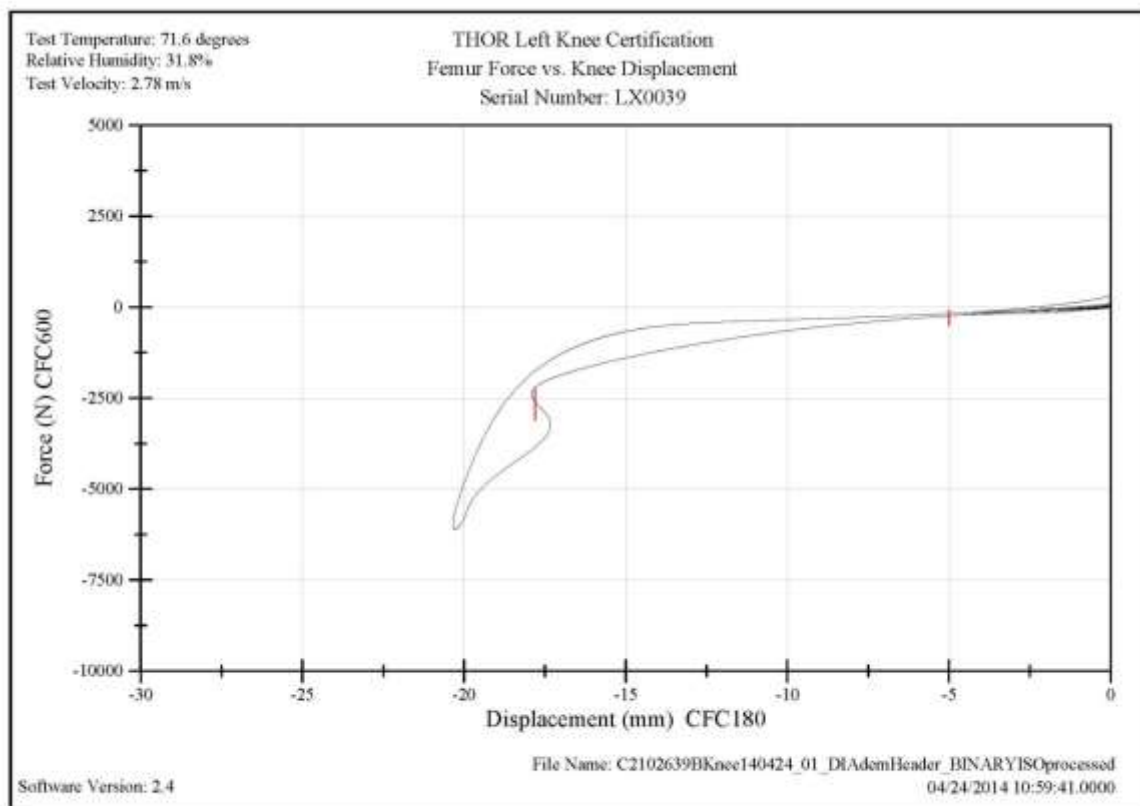
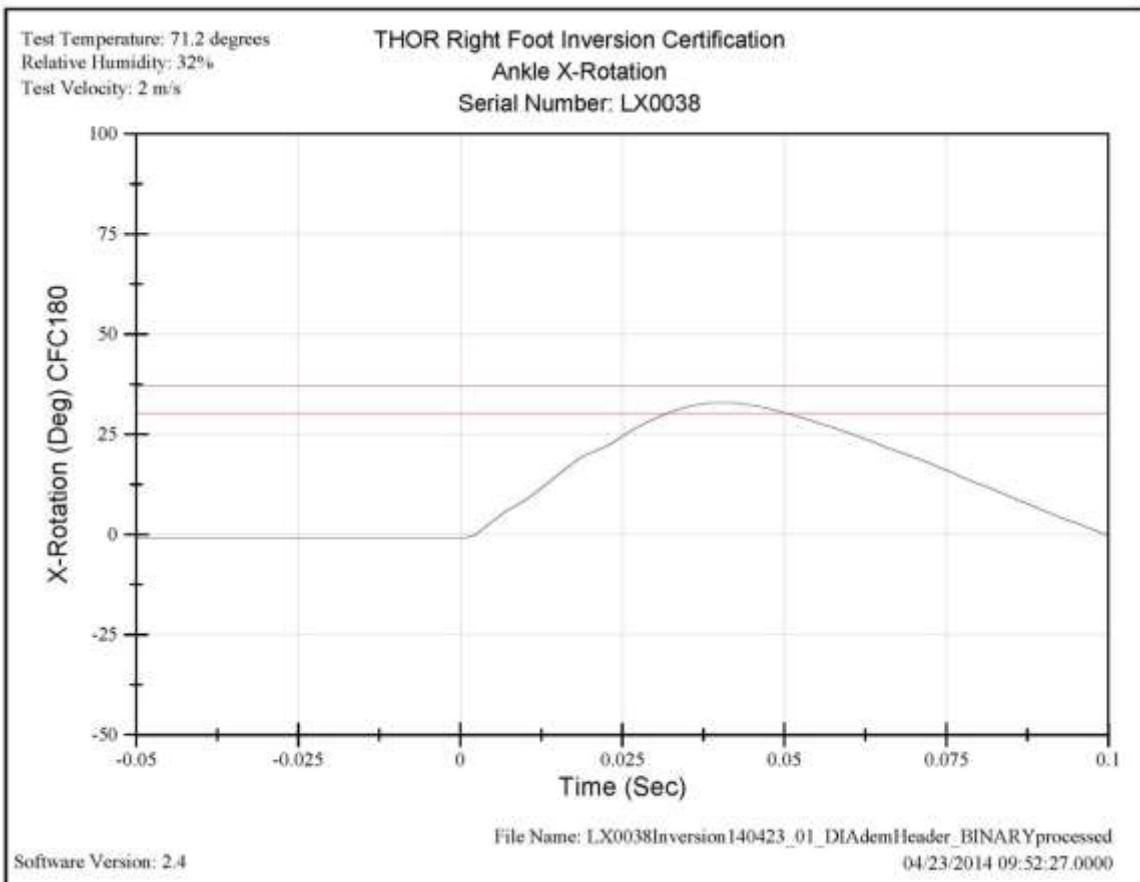
Test Temperature: 71.2 degrees
Relative Humidity: 32%
Test Velocity: 2 m/s

THOR Right Foot Inversion Certification
Ankle Moment
Serial Number: LX0038



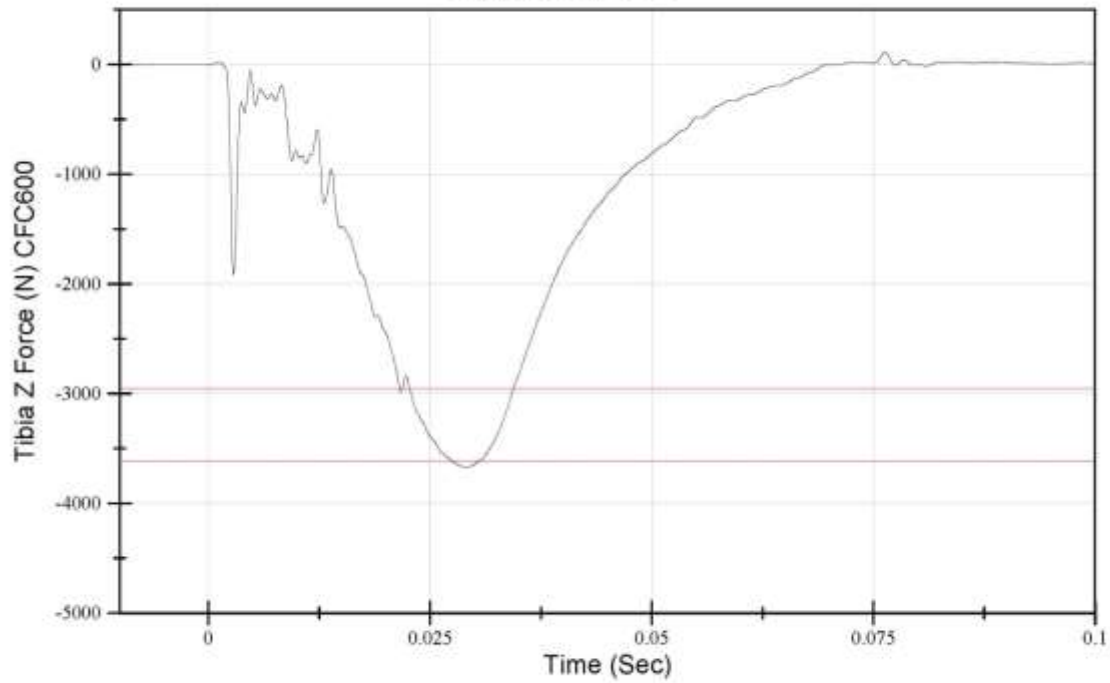
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Relative Humidity: 30.1%
Test Velocity: 5.03 m/s

THOR Left Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0039

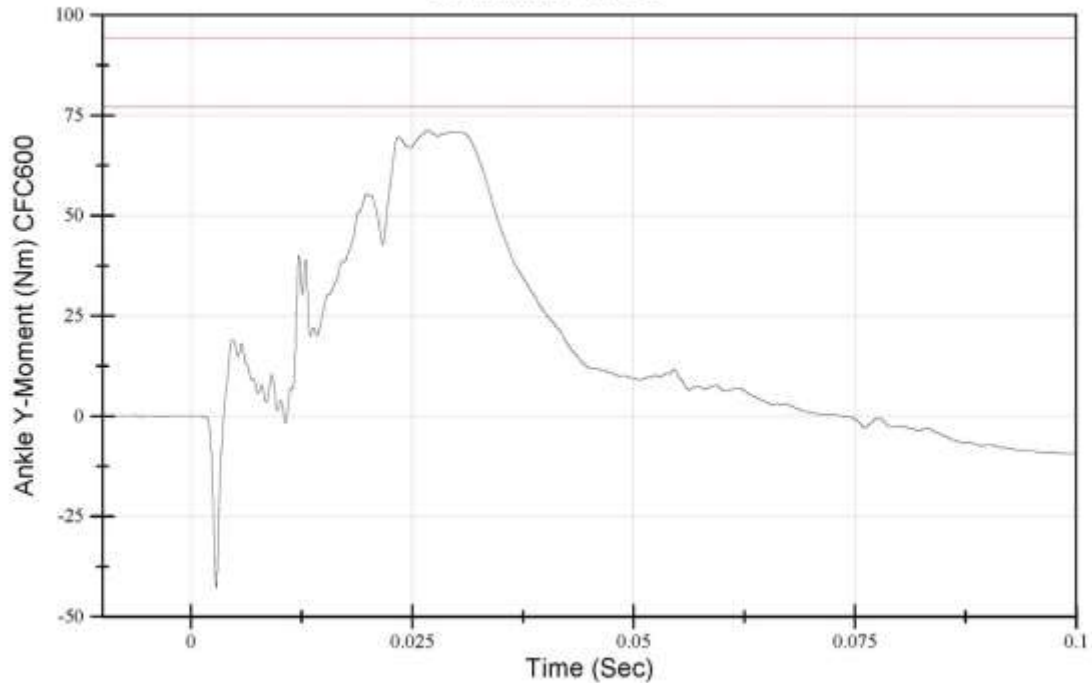


Software Version: 2.4

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

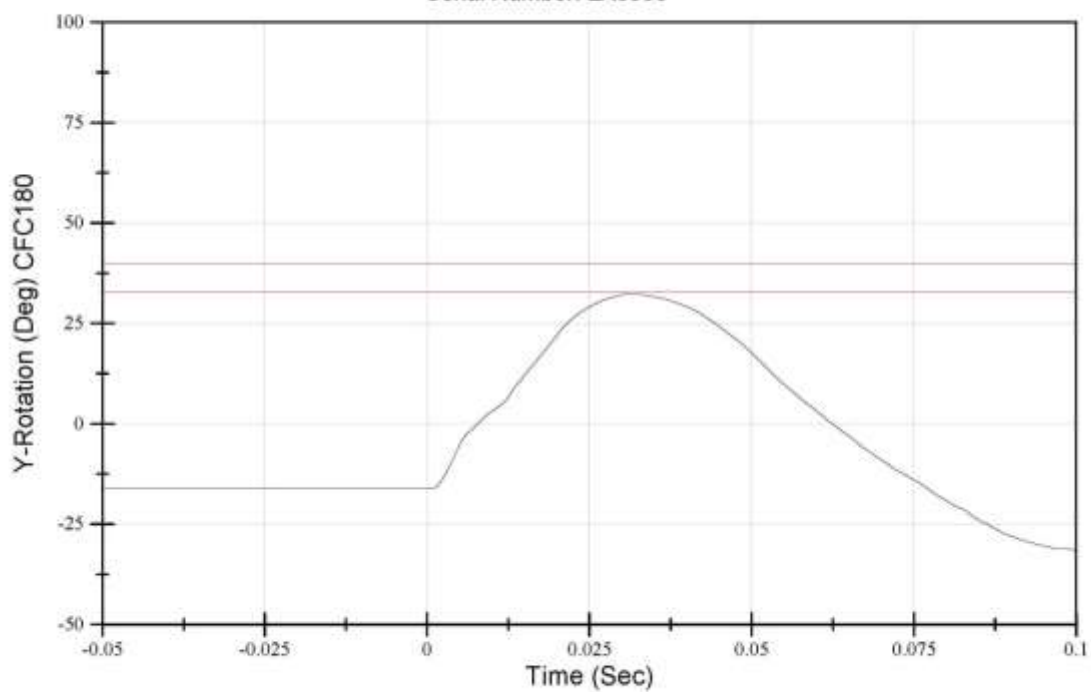


Software Version: 2.4

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THOR Left Foot Dorsiflexion Certification
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Serial Number: LX0039

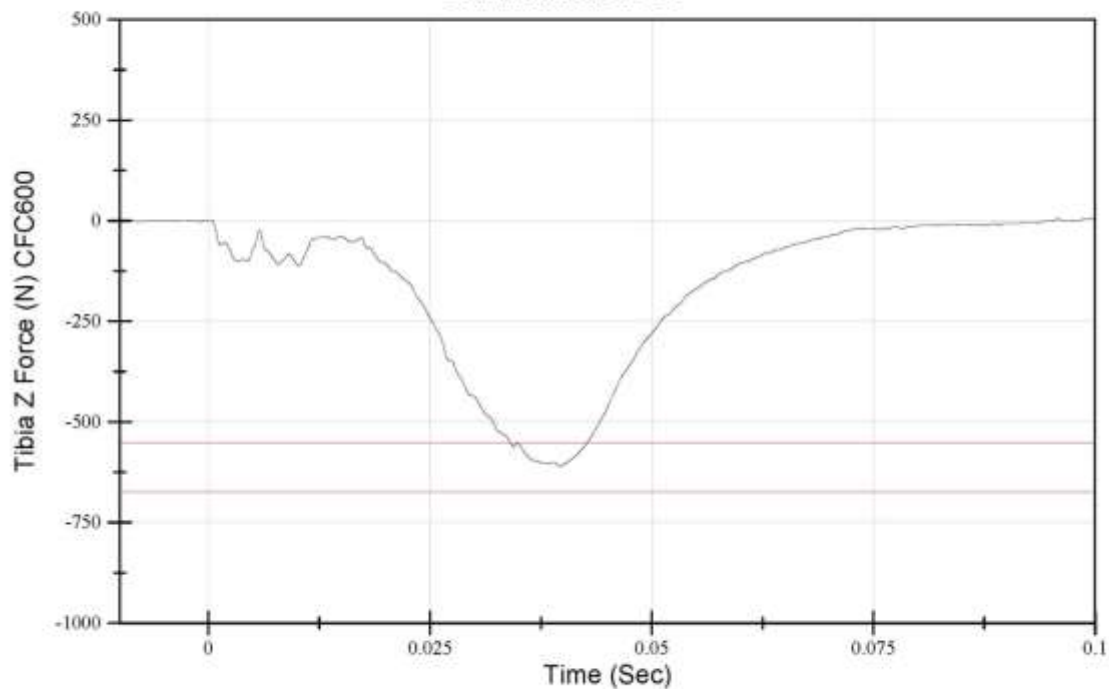


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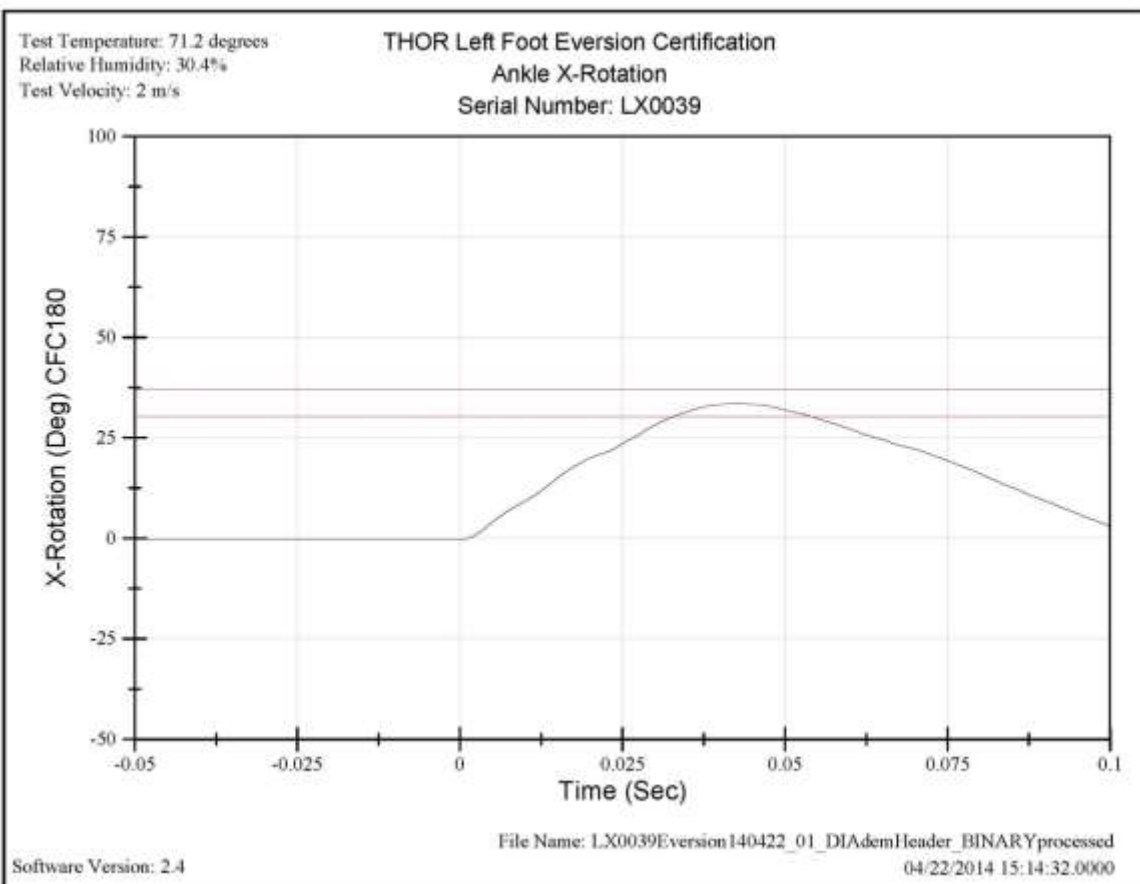
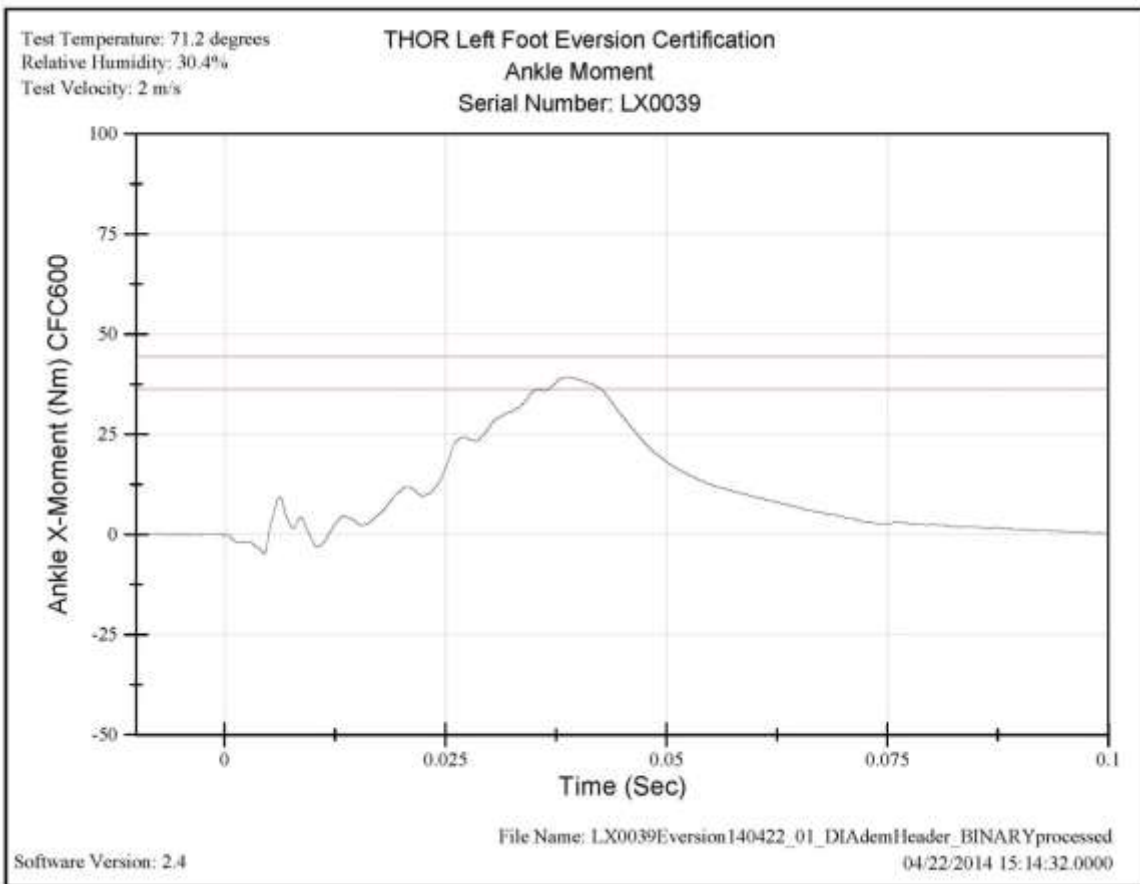
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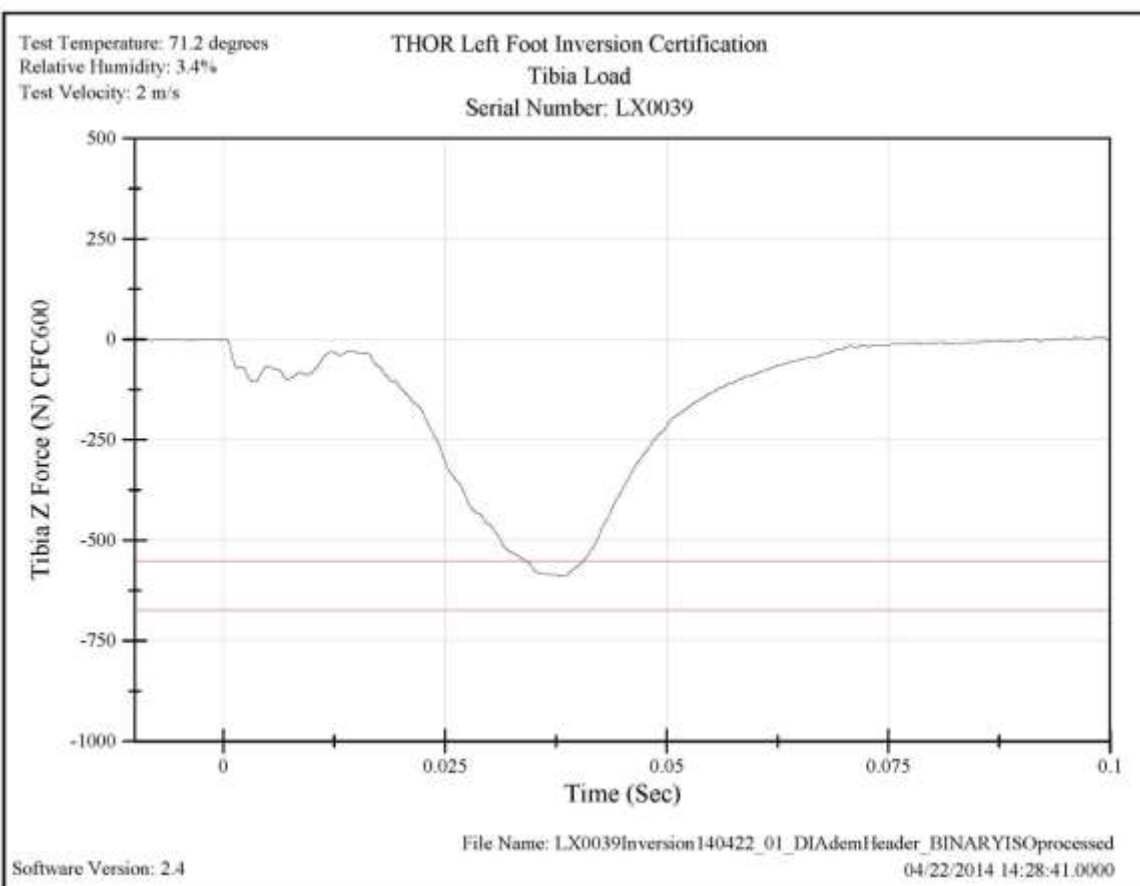
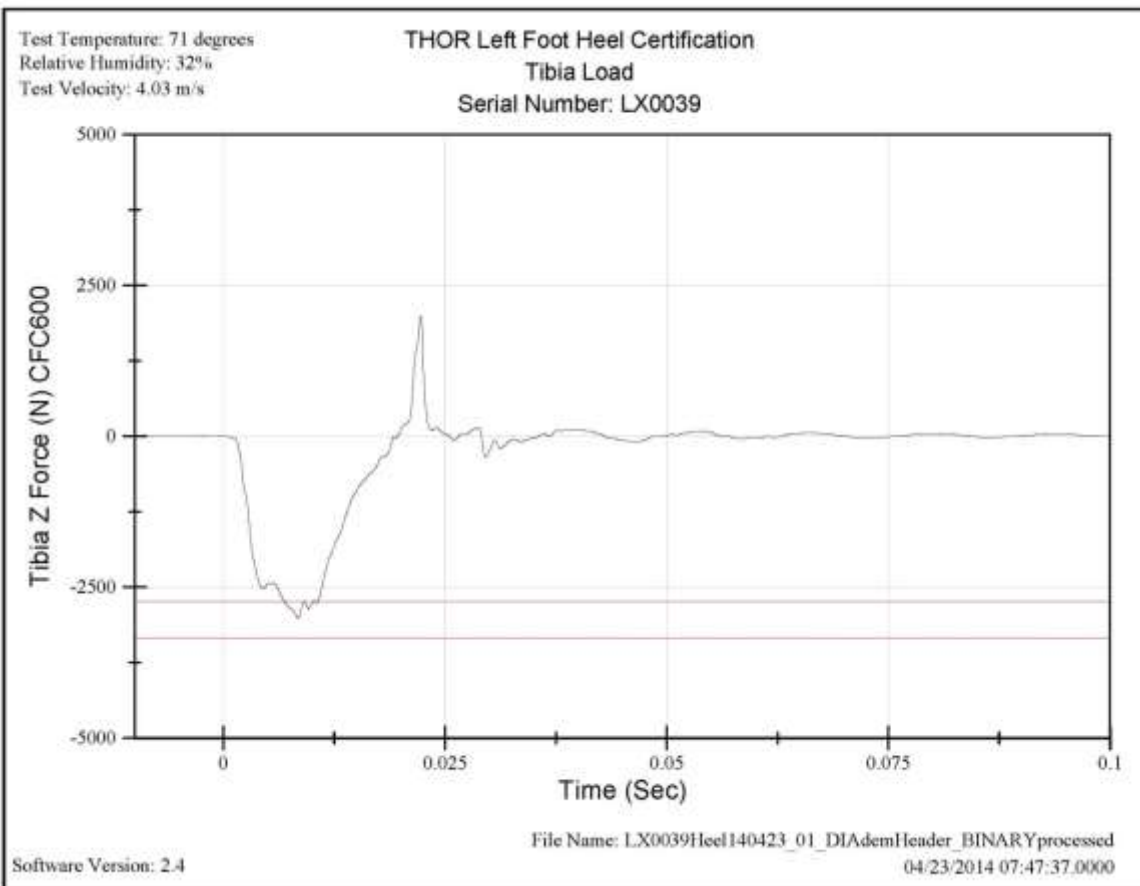
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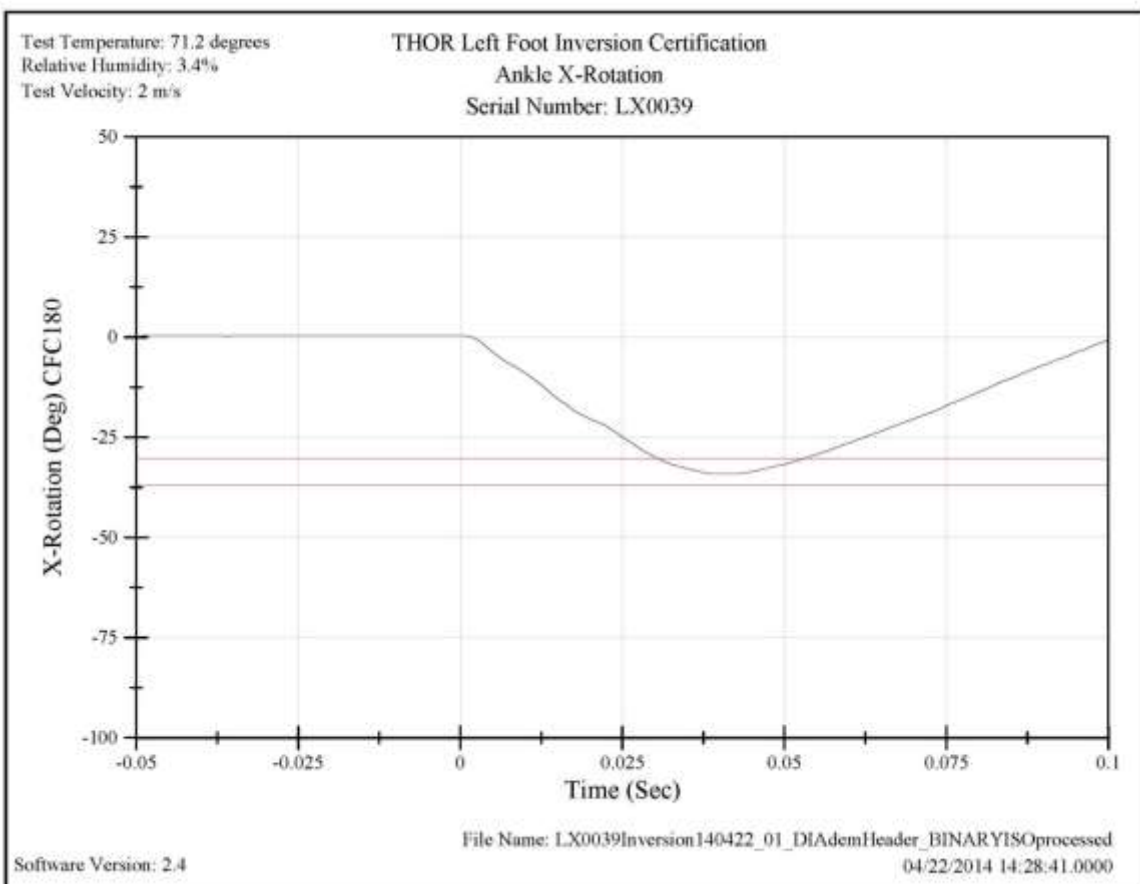
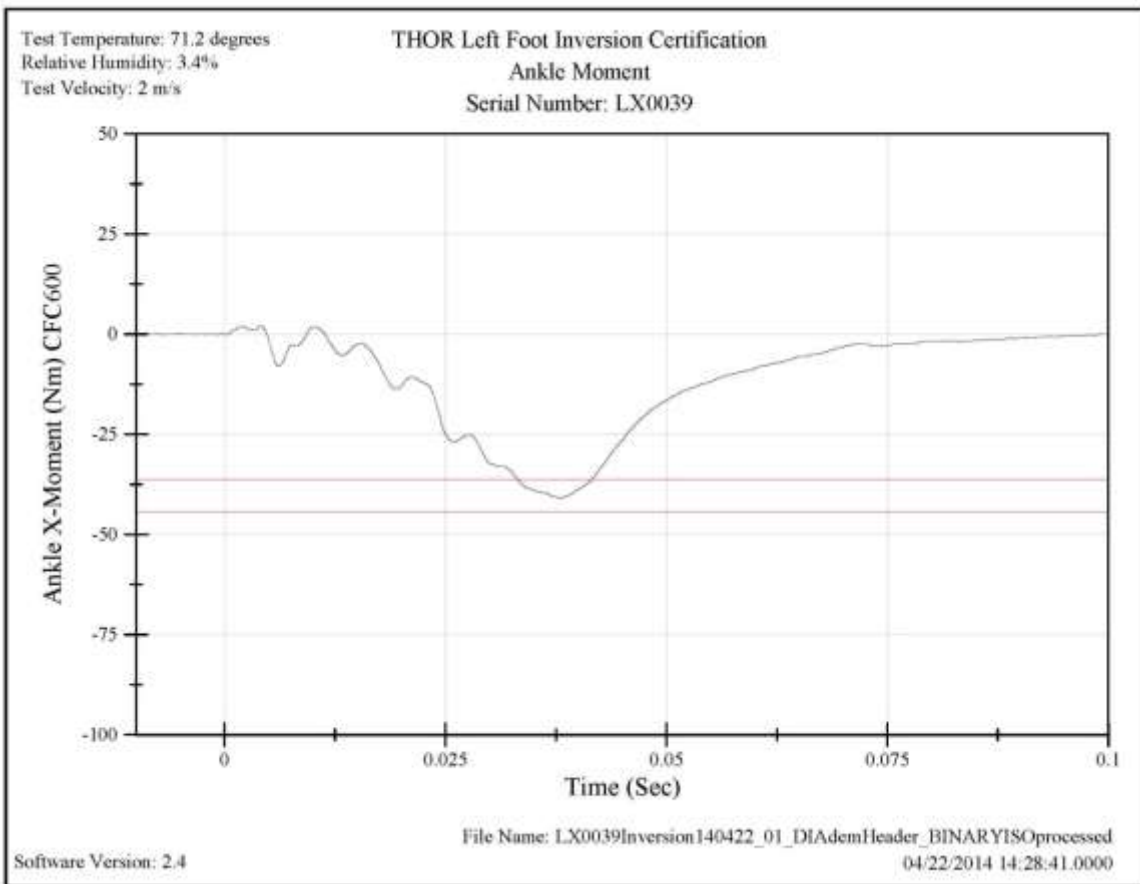


Software Version: 2.4

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04/22/2014 15:14:32.0000







APPENDIX D:
CMM MEASUREMENT PROCEDURES

Vehicle Coordinate System

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

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

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

Steering Column Reference Point

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

Brake Pedal Reference Point

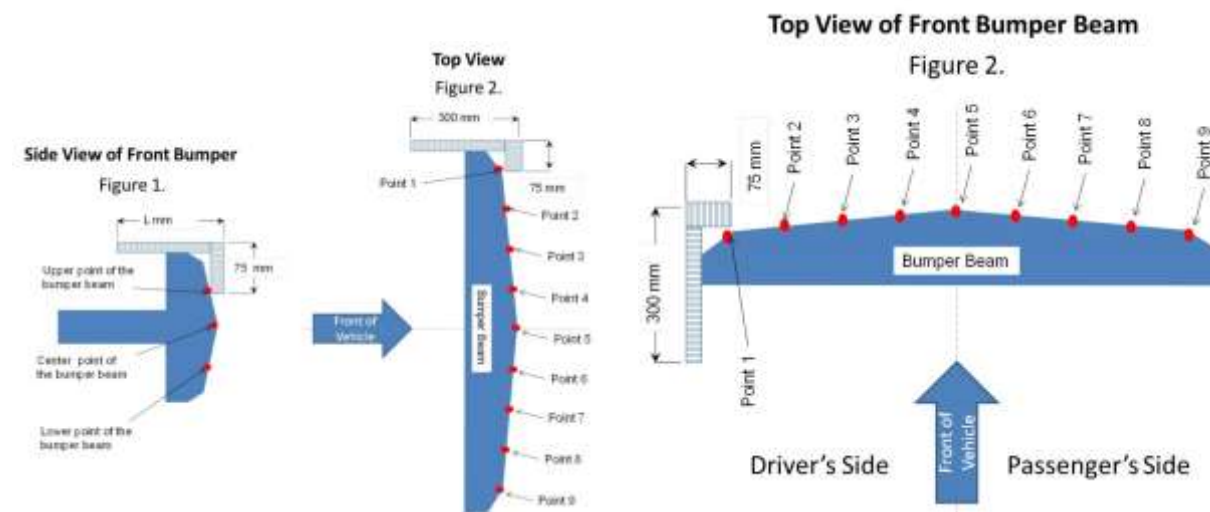
The Brake Pedal Reference Point is the x, y, and z location of the geometric center of the brake pedal pad (top surface) in the VCS.

Floor Reference Point

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

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

Pre and Post Bumper Beam and Radiator Support Measurement



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

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

Pre and Post Driver Left Lower Instrument Panel

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

Pre and Post Driver Right Lower Instrument Panel

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

Pre and Post Brake Pedal (Figure 22)

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

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

DRIVER POINT A1

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

DRIVER POINT B1

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

DRIVER POINT C1

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

DRIVER POINT D1

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

DRIVER POINT A2

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

DRIVER POINT B2

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

DRIVER POINT C2

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

DRIVER POINT D2

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

DRIVER POINT A3

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

DRIVER POINT B3

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

DRIVER POINT C3

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

DRIVER POINT D3

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

DRIVER POINT A4

The longitudinal coordinate of the A4 measurement location is obtained by subtracting 10 cm from the D3 reference. The lateral coordinate of the A4 is obtained by subtracting 25 cm from the brake pedal reference lateral coordinate.

DRIVER POINT B4

The longitudinal coordinate of the B4 measurement location is obtained by subtracting 10 cm from the D3 reference. The lateral coordinate of the B4 is obtained by subtracting 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT C4

The longitudinal coordinate of the C4 measurement location is obtained by subtracting 10 cm from the D3 reference. The lateral coordinate of the C4 is obtained by subtracting 0 cm from the brake pedal reference lateral coordinate.

DRIVER POINT D4

The longitudinal coordinate of the D4 measurement location is obtained by subtracting 10 cm from the D3 reference. The lateral coordinate of the D4 is obtained by adding 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT A5

The longitudinal coordinate of the A5 measurement location is obtained by subtracting 10 cm from the A4 reference. The lateral coordinate of the A5 is obtained by subtracting 25 cm from the brake pedal reference lateral coordinate.

DRIVER POINT B5

The longitudinal coordinate of the B5 measurement location is obtained by subtracting 10 cm from the B4 reference. The lateral coordinate of the B5 is obtained by subtracting 15 cm from the brake pedal reference lateral coordinate.

DRIVER POINT C5

The longitudinal coordinate of the C5 measurement location is obtained by subtracting 10 cm from the C4 reference. The lateral coordinate of the C5 is obtained by subtracting 0 cm from the brake pedal reference lateral coordinate.

DRIVER POINT D5

The longitudinal coordinate of the D5 measurement location is obtained by subtracting 10 cm from the D4 reference. The lateral coordinate of the D5 is obtained by adding 15 cm from the brake pedal reference lateral coordinate.

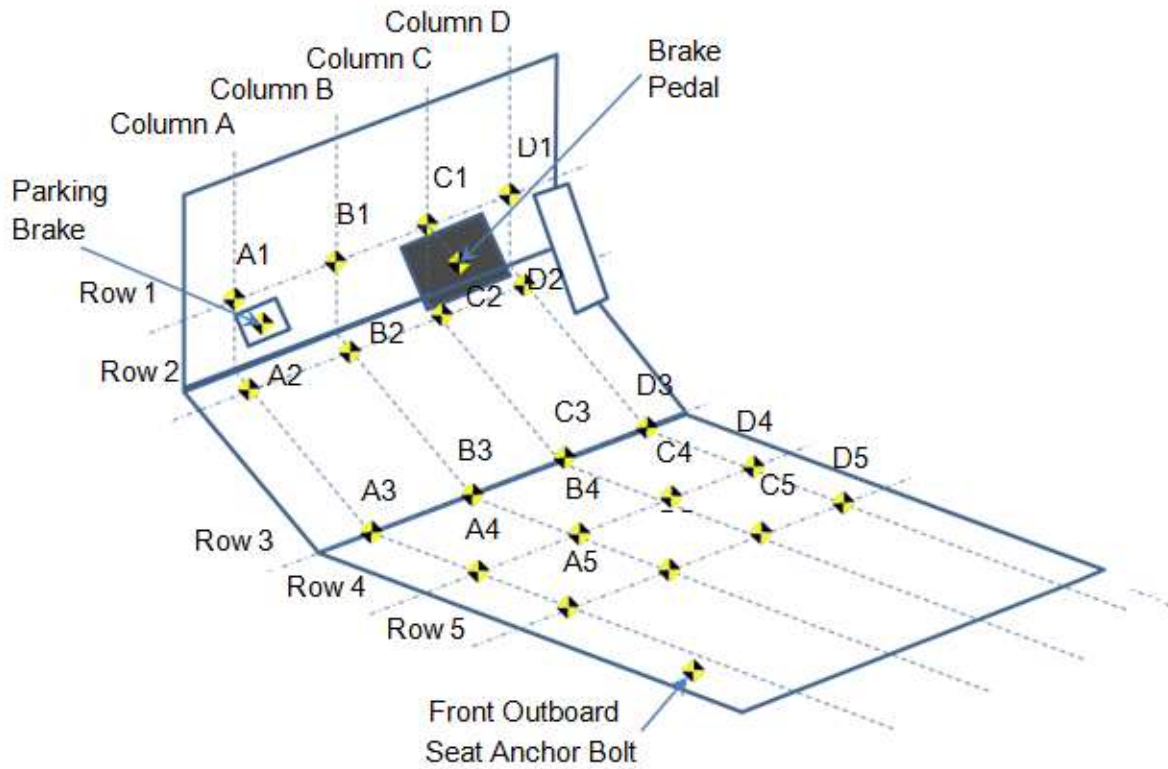
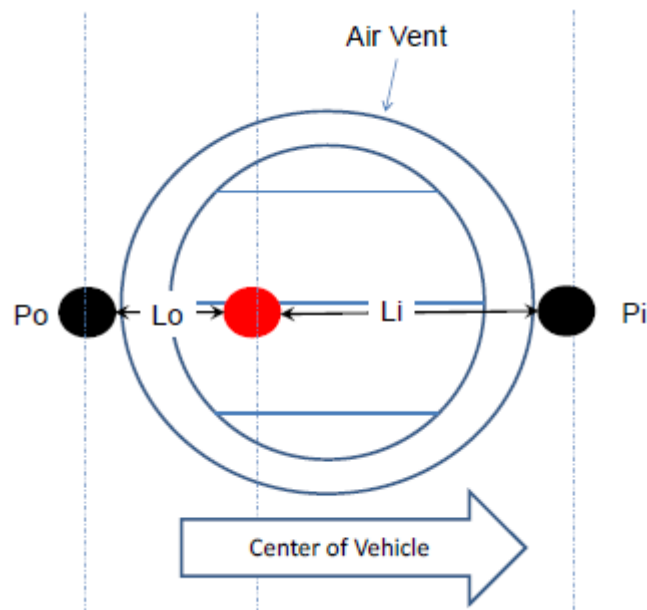


Figure 22: Lower interior intrusion measurements

Driver Upper Dash

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

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



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

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

Passenger Left Lower Instrument Panel

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

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

Passenger Right Lower Instrument Panel

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

Passenger Toe pan and Floor Board (Figure 24)

PASSENGER POINT A1

The vertical coordinate for the A1 measurement location is the vertical coordinate of the brake pedal reference. The lateral coordinate of the A1 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B1

The vertical coordinate for the B1 location is the vertical coordinate of the brake pedal reference. The lateral coordinate of the B1 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C1

The vertical coordinate for the C1 location is the vertical coordinate of the brake pedal reference. The lateral coordinate of the C1 is obtained by adding 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT D1

The vertical coordinate for the D1 location is the vertical coordinate of the brake pedal reference. The lateral coordinate of the D1 is obtained by adding 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT A2

The vertical coordinate of the A2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference and the vertical coordinate of the floor reference. The lateral coordinate of the A2 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B2

The vertical coordinate of the B2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference the vertical coordinate of the floor reference. The lateral coordinate of the B2 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C2

The vertical coordinate of the C2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference and the vertical coordinate of the floor reference. The lateral coordinate of the C2 is obtained by adding 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT D2

The vertical coordinate of the C2 measurement location is obtained by adding half the distance between the vertical coordinate of the brake pedal reference and the vertical coordinate of the floor reference. The lateral coordinate of the D2 is obtained by adding 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT A3

The vertical coordinate of the A3 measurement location is obtained by subtracting 1 cm from the driver's floor reference. The lateral coordinate of the A3 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B3

The vertical coordinate of the B3 measurement location is obtained by subtracting 1 cm from the driver's floor reference. The lateral coordinate of the B3 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C3

The vertical coordinate of the C3 measurement location is obtained by subtracting 1 cm from the driver's floor reference. The lateral coordinate of the C3 is obtained by adding 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT D3

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

PASSENGER POINT A4

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

PASSENGER POINT B4

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

PASSENGER POINT C4

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

PASSENGER POINT D4

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

PASSENGER POINT A5

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

PASSENGER POINT B5

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

PASSENGER POINT C5

The longitudinal coordinate of the C5 measurement location is obtained by subtracting 10 cm from the C4 reference. The lateral coordinate of the C5 is obtained by adding 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT D5

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

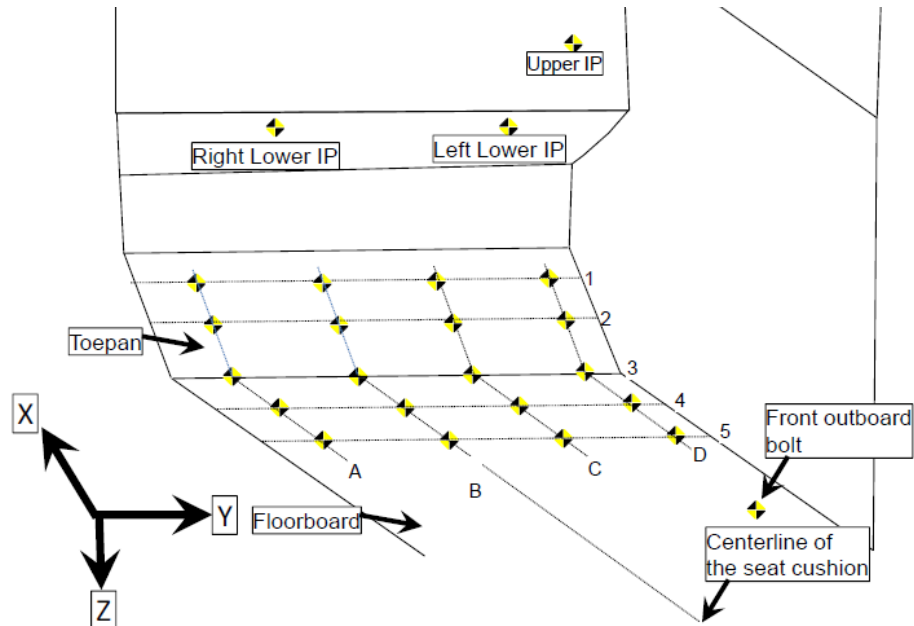


Figure 24: Passenger side lower interior measurements

Passenger Upper Dash

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

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

Driver Door Measurements (Figure 25)

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

- 1) **Point 1:** The vertical coordinates of this point is obtained by subtracting 0 cm from the brake pedal reference point.
- 2) **Point 2:** The vertical coordinates of this point is obtained by subtracting 7.5 cm from the brake pedal reference point.
- 3) **Point 3:** The vertical coordinates of this point is obtained by subtracting 15 cm from the brake pedal reference point
- 4) **Point 4:** The vertical coordinates of this point is obtained by subtracting 45 cm from the brake pedal reference point.
- 5) **Point 5:** The vertical coordinates of this point is obtained by subtracting 52.5 cm from the brake pedal reference point).
- 6) **Point 6:** The vertical coordinates of this point is obtained by subtracting 60 cm from the brake pedal reference point
- 7) **Point 7:** The longitudinal coordinates of this point is obtained by subtracting 20 cm from the brake pedal reference point. If the 20 cm point is forward of the actual door frame, this point is located 5 cm rearward of lower hinge pillar point.
- 8) **Point 8:** The longitudinal coordinates of this point is obtained by subtracting 35 cm from the brake pedal reference point.
- 9) **Point 9:** The longitudinal coordinates of this point is obtained by subtracting 50 cm from the brake pedal reference point.
- 10) **Point 10 and 11:** Mark 2 evenly spaced points between points 1 and 7
- 11) **Point 12 and 13:** Mark 2 evenly spaced points between points 3 and 4
- 12) **Point 26:** Mark a point at the intersection of the roof rail and the start of the B-pillar
- 13) **Points 14-25:** Mark 12 evenly spaced points between points 6 and 26
- 14) **Point 32:** Mark a point at the intersection of the lower sill and the start of the B-pillar
- 15) **Points 27-31:** Mark 5 evenly spaced points between points 9 and 32
- 16) **Point 33:** Subtract 150mm from the vertical coordinate of the brake pedal reference point
- 17) **Point 34:** Subtract 0mm from the vertical coordinate of the brake pedal reference point

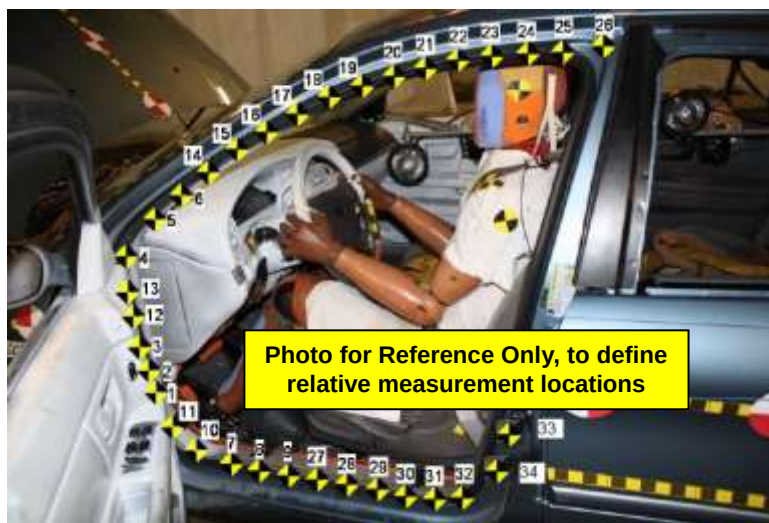


Figure 25: Driver Door Measurements

Passenger Door Measurements

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

Pre-Test Exterior Profile

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

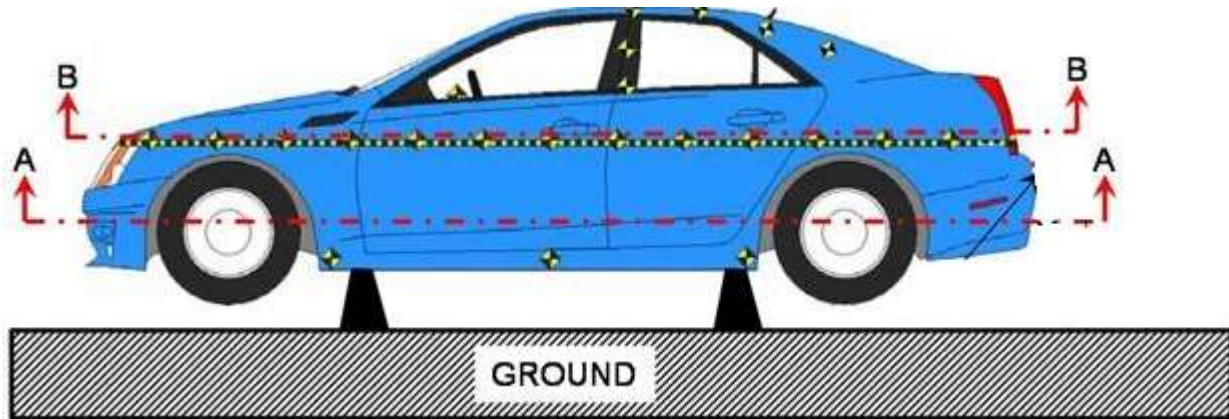


Figure 26: Pre-Test Vehicle Profile

Post-Test Exterior Profile

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

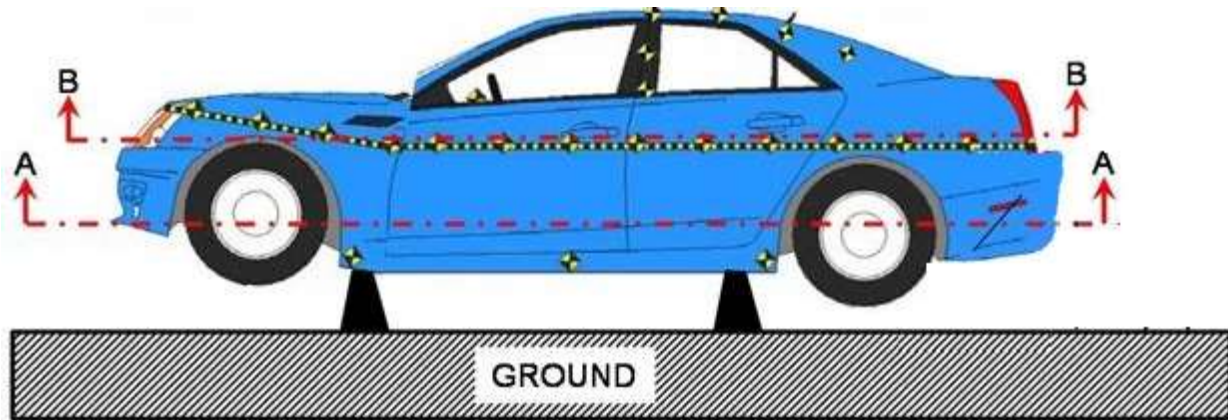
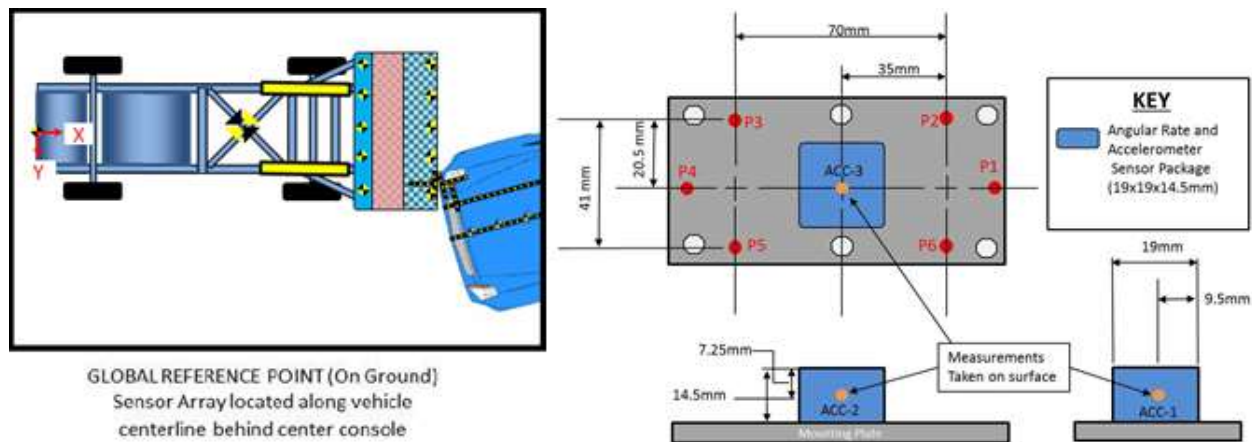


Figure 27: Post-Test Vehicle Profile

Pre and Post Honeycomb Requirements

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

Angular Rate Sensor Mounting & Dimensions:



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

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

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