

***Frontal Oblique Offset Test
90.1 kph, 15 degree angle, 35% overlap
Research Vehicle 4969***

NHTSA Code: M3V3T1M
Report Number: R&D-CAL-13-15
Report Date: February 11, 2014

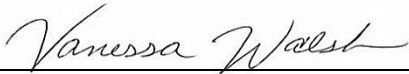
Contract Number: G13104BG/01
Test Number: CAL2672
Test Date: January 12, 2014

Test Conducted By:
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Date: March 6, 2015

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Date: March 6, 2015

TECHNICAL REPORT DOCUMENTATION PAGE

Report No.: R&D-CAL-13-15	Report Date: 3/6/2015	Customer PO or Contract No.: G13104BG/01
Test Type and Vehicle: Report for Frontal Oblique Offset Program Testing of a Research Vehicle 4969 Test No.: CAL2672		Author(s): Vanessa Walsh, Project Engineer Edward Dutton, Senior Test Engineer
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16. Abstract

A test was conducted in accordance with Contract No. G13104BG/01. The test consisted of a research moving deformable barrier (RMDb) traveling at a target speed of 90.12 kph into a stationary four door sedan. The struck vehicle was positioned 15 degrees relative to the moving deformable barrier and impacted 35% of the left side of the vehicle. The test was conducted to obtain data indicant of the NHTSA R&D Oblique test procedure, FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at Calspan Corporation's Transportation Test Operation's facility in Buffalo, New York on January 11, 2013.

The impact velocity of the vehicle was 90.15 kph and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle post-test maximum crush was 566 mm. The test vehicle's performance was as follows:

Measurement Description	Units	Driver ATD		Pass. ATD	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC ₁₅)	N/A	700	462.80	700	200.39
Maximum Chest Compression	mm	63	-42.55	63	-50.76
Neck Injury Criteria (Nij)	N/A	1	0.39	1	0.31
Neck Tension	N	4,170	2014.01	4,170	1780.09
Neck Compression	N	4,000	-348.00	4,000	-1273.33
Left Femur Force	N	10,008	-4420.50	10,008	-5546.13
Right Femur Force	N	10,008	-4266.91	10,008	-6596.72

Number of Pages: 238

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SECTION 1
PURPOSE OF TEST

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

This 90.12 kph (56 mph) Moving Barrier into a test vehicle is part of the Frontal Offset Test outlined in Contract No. G13104BG/01. The purpose of this test is to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

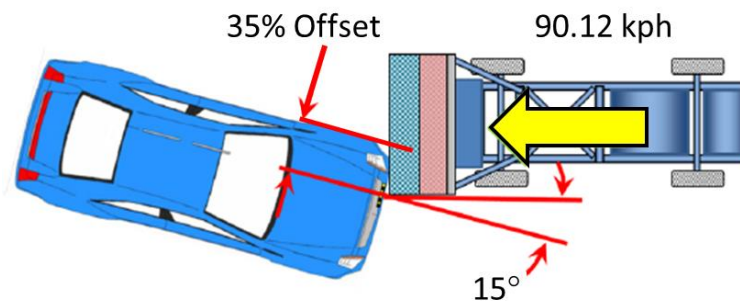
This test was conducted in accordance with the instructions set forth for a 15° angle, 35% offset moving barrier to vehicle impact, outlined in Contract No. G13104BG/01. Data was obtained indicant of Federal Motor Vehicle Safety Standard FMVSS 208-Occupant Crash Protection, FMVSS 212 – Windshield Mounting, FMVSS 219 (partial) – Windshield Zone Intrusion, and FMVSS 301 – Fuel System Integrity, in addition to the requirements of Contract No. G13104BG/01.

SECTION 2 SUMMARY OF TEST

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

A Research Vehicle 4969 was impacted on the left front corner by a research moving deformable barrier (RMDB). This test vehicle was stationary and positioned at a target angle of 15° and at a target offset of 35% to the forward line of motion of the RMDB. The RMDB was towed down the test track in a full forward direction, without any crabbing, and at the targeted impact velocity of 90.12 kph (56.0 mph) into the test vehicle. The test vehicle's mass was 1,554 kg (3,425 lbs), and the RMDB's mass was 2490.7 kg (5491 lbs). The test was conducted by Calspan Corporation on January 11, 2013.



The test was documented by two (2) real time and fourteen (14) high-speed video cameras. Camera locations and other pertinent data are located in Data Sheet No. 6 of this report. Pre and post – test photographs of the test vehicle, RMDB, and test setup were taken using a digital still camera. Photographic documentation of the test is presented in Appendix A of this report.

One 50% adult male THOR-NT anthropomorphic test device (ATD) (Serial No. 016) was seated in the left, front (P1 -Driver's) seating position and one 50% adult male THOR-NT adult male ATD (Serial No. 015) was seated in the right front passenger seating position (P2). The driver and passenger were positioned according to instructions specified in laboratory test procedures FMVSS 208-14, "Occupant Crash Protection", TP208-14, July 27, 2006.

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

SECTION 2 (CONTINUED)

SUMMARY OF TEST

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

Two hundred and thirty three (233) 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 82.8% total windshield retention, with 65.5% and 100% retention on the left and right sides, respectively. There appeared to be no intrusion into the protected zone of the windshield during any portion of the impact event. The maximum static crush of the vehicle was 539 mm at C1 to the left of the vehicle's centerline. The maximum crush of the structural bumper beam was 566 mm at B1, to the left of the vehicle's centerline. Full vehicle measurements are presented in Section 3 of this report.

All four vehicle doors remained closed and latched during the test. The driver's door was jammed after the impact event. All other doors remained operational after the impact event.

Structure observations include the following:

- The A-Pillar, B-Pillar, and C-Pillar buckled
- Windshield had cracks throughout with some separation
- Hood bent inwards and exposed part of the engine compartment

The driver ATD's visible contact points were:

- Head contacted the frontal and curtain airbag
- Torso contacted the frontal and torso airbag
- Knees contacted the knee bolster

The passenger ATD's visible contact points were:

- Head contacted the frontal airbag, visor, center instrument panel, steering wheel rim and driver's front airbag
- Torso contacted the frontal airbag, and left shoulder contacted the center instrument panel
- Knees contacted the glove box

SECTION 2 (CONTINUED)
CRASH VEHICLE SUMMARY

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

Primary Impact Data

Measured Parameter	Units	Value
RMDB Velocity at Impact	kph	90.15
RMDB Test Weight	kg	2490.7
RMDB Maximum Static Crush	mm	201.5
Vehicle Test Weight	kg	1554
Actual Vehicle Angle	degrees	15
Vehicle Maximum Static Crush	mm	566
Vertical Offset from Target Point (+ down / - up)*	mm	+7
Lateral Offset from Target Point (+ left / - right)*	mm	+6
Number of Data Channels		233
Number of Real-Time Cameras		2
Number of High-Speed Cameras		14

*Offsets are in relation to the vehicle coordinate system.

Dummy Contacts

	Driver	Picture Ref.	Passenger	Picture Ref.
Dummy Type	THOR, S/N: 016		THOR, S/N: 015	
Head Contact	Front & Curtain Airbags	A49-A51	Front Airbag, Visor, Center Instrument Panel, Steering Wheel Rim, Driver's Frontal Airbag	A70-A72
Left Side Contact	Torso Airbag		Shoulder Contact the Center Instrument Panel	
Upper Torso Contact	Front Airbag	NA	Frontal Airbag	NA
Lower Torso Contact	None	NA	None	NA
Left Knee Contact	Knee Bolster	A28	Glove Box	A52
Right Knee Contact	Knee Bolster	A28	Glove Box	A52

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: Left Oblique Research Vehicle 4969 NHTSA No.: CAL2672
Test Program: Research and Development Left Oblique Offset Test Date: 1/11/2014

Driver: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	15.01	-74.99
	Head CG Y	g	1000	23.82	-9.14
	Head CG Z	g	1000	38.84	-3.44
	Head Resultant	g	Compute	81.48	
	36 ms HIC		Compute	600.48	
	15 ms HIC		Compute	462.80	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	62.18	
	Head Rotational Velocity X	deg/s	60	530.57	-879.07
	Head Rotational Velocity Y	deg/s	60	1159.65	-1868.11
	Head Rotational Velocity Z	deg/s	60	2014.31	-1053.50
	Head Rotational Velocity Resultant	deg/s	Compute	2077.28	
	Brain Injury Criteria		Compute	1.03	
	Neck	UNLC Transferred to OC, Neck System, FX	N	1000	334.98
UNLC Neck System Tension, FZ		N	1000	2014.01	
UNLC Neck System Compression, FZ		N	1000		-348.00
UNLC Transferred to OC, Neck System Flexion, MY		N-m	Thortest	11.30 ⁽¹⁾	
UNLC Transferred to OC, Neck System Extension, MY		N-m	Thortest		-9.85 ⁽¹⁾
NIJ			Compute	0.39	
On head acting through total neck section, FX		N	Thortest	1098.21	-2043.67
On head acting through total neck section, FY		N	Thortest	763.75	-64.45
On head acting through total neck section, FZ		N	Thortest	333.95	-647.32
On head acting through total neck section, MX		N-m	Thortest	41.37	-1.24
On head acting through total neck section, MY		N-m	Thortest	8.43	-20.78
On head acting through total neck section, MZ		N-m	Thortest	10.75	-80.62
On head acting through O.C. joint only, FX		N	Thortest	621.63	-2028.58
On head acting through O.C. joint only, FZ		N	Thortest	309.87	-655.59
On head acting through O.C. joint only, MY		N-m	Thortest	11.30 ⁽¹⁾	-9.85 ⁽¹⁾
Chest		Upper Left IR-TRACC X - deflection	mm	Thortest	2.64
	Upper Left IR-TRACC Y - deflection	mm	Thortest	5.41	-7.68
	Upper Left IR-TRACC Z - deflection	mm	Thortest	8.26	-21.86
	Upper Left IR-TRACC D - deflection	mm	Thortest	3.36	-11.39
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.35	-45.19
	Upper Right IR-TRACC Y - deflection	mm	Thortest	5.32	-7.21
	Upper Right IR-TRACC Z - deflection	mm	Thortest	23.81	-13.87
	Upper Right IR-TRACC D - deflection	mm	Thortest	0.31	-42.55
	Lower Left IR-TRACC X - deflection	mm	Thortest	9.46	-5.83
	Lower Left IR-TRACC Y - deflection	mm	Thortest	8.17	-15.18

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: Left Oblique Research Vehicle 4969 NHTSA No.: CAL2672
Test Program: Research and Development Left Oblique Offset Test Date: 1/11/2014

Driver: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	7.11	-16.20
	Lower Left IR-TRACC D - deflection	mm	Thortest	9.15	-3.98
	Lower Right IR-TRACC X - deflection	mm	Thortest	1.78	-45.80
	Lower Right IR-TRACC Y - deflection	mm	Thortest	5.74	-19.60
	Lower Right IR-TRACC Z - deflection	mm	Thortest	3.00	-16.52
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.90	-42.52
	Chest CG Acceleration, 3 ms clip	g	Compute	50.65	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC Y - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC Z - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC D - deflection	mm	Thortest	N/A	N/A
	Left Viscous Criterion Based on X - deflection		Compute	N/A	
	Lower Right IR-TRACC X - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC Y - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC Z - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC D - deflection	mm	Thortest	N/A	N/A
	Right Viscous Criterion Based on X - deflection		Compute	N/A	
Spine	Upper Spine (T1) AX	g	180	8.08	-56.08
	Upper Spine (T1) AY	g	180	32.79	-27.81
	Upper Spine (T1) AZ	g	180	37.70	-6.11
	Upper Spine (T1) Resultant	g	Compute	64.12	
	Middle Spine (T6) AX	g	180	7.64	-52.26
	Middle Spine (T6) AY	g	180	17.65	-7.27
	Middle Spine (T6) AZ	g	180	4.04	-10.95
	Middle Spine (T6) Resultant	g	Compute	53.13	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	58.52	
Acetabulum	Left FX force	N	600	990.67	-1471.37
	Left FY force	N	600	411.61	-401.46
	Left FZ force	N	600	1012.68	-2359.50
	Left Acetabulum Resultant	N	Compute	2466.80	
	Right FX force	N	600	1719.47	-1896.03
	Right FY force	N	600	239.00	-1086.09
	Right FZ force	N	600	1198.08	-186.20
	Right Acetabulum Resultant	N	Compute	2082.27	
Anomalies					
(1) O. C. potentiometer has questionable data after 8 ms					

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver Legs

Test Vehicle: Left Oblique Research Vehicle 4969 NHTSA No.: CAL2672
 Test Program: Research and Development Left Oblique Offset Test Date: 1/11/2014

Driver: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	1.82	-11.94
	Right Knee Displacement, DX	mm	180	1.36	-6.94
Femur	Left Femur Force, FZ	N	600	112.44	-4420.50
	Left Femur Moment, MX	N-m	600	20.40	-132.61
	Left Femur Moment, MY	N-m	600	60.11	-69.72
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	133.84	
	Right Femur Force, FZ	N	600	330.05	-4266.91
	Right Femur Moment, MX	N-m	600	26.57	-116.61
	Right Femur Moment, MY	N-m	600	74.85	-34.45
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	123.76	
	Left Upper Tibia, FZ	N	600	4608.36 ⁽²⁾	-11148.17 ⁽²⁾
	Left Upper Tibia, MY	N-m	600	63.20	-127.52
Tibia	Left Upper Tibia, Index		Compute	1.34 ⁽²⁾	
	Right Upper Tibia, FZ	N	600	98.37	-2926.16
	Right Upper Tibia, MY	N-m	600	52.13	-148.13
	Right Upper Tibia, Index		Compute	0.86	
	Left Lower Tibia, FZ	N	600	77.41	-2164.00
	Left Lower Tibia, MY	N-m	600	29.40	-78.60
	Left Lower Tibia, Index		Compute	0.56	
	Right Lower Tibia, FZ	N	600	302.73	-3839.76
	Right Lower Tibia, MY	N-m	600	14.54	-102.17
	Right Lower Tibia, Index		Compute	0.79	
Ankle	Left Ankle Rotation, RX	Deg	180	6.87	-33.36
	Left Ankle Rotation, RY	Deg	180	29.01	-7.95
	Right Ankle Rotation, RX	Deg	180	10.67	-40.44
	Right Ankle Rotation, RY	Deg	180	27.80	-7.41
Anomalies					
(2) Questionable data from 75 to 120 ms					

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

Test Vehicle: Left Oblique Research Vehicle 4969 NHTSA No.: CAL2672
Test Program: Research and Development Left Oblique Offset Test Date: 1/11/2014

Right Front Passenger: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	45.95	-35.65
	Head CG Y	g	1000	34.18	-18.76
	Head CG Z	g	1000	39.47	-4.52
	Head Resultant	g	Compute	52.96	
	36 ms HIC		Compute	296.20	
	15 ms HIC		Compute	200.39	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	44.63	
	Head Rotational Velocity X	deg/s	60	731.44	-1136.17
	Head Rotational Velocity Y	deg/s	60	1841.64	-2034.85
	Head Rotational Velocity Z	deg/s	60	6662.35	-2654.89
	Head Rotational Velocity Resultant	deg/s	Compute	6720.21	
	Brain Injury Criteria		Compute	2.80	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	246.93	-137.48
	UNLC Neck System Tension, FZ	N	1000	1780.09	
	UNLC Neck System Compression, FZ	N	1000		-1273.33
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	15.44	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-8.44
	NIJ		Compute	0.31	
	On head acting through total neck section, FX	N	Thortest	534.73	-263.19
	On head acting through total neck section, FY	N	Thortest	206.62	-541.66
	On head acting through total neck section, FZ	N	Thortest	1846.62	-177.11
	On head acting through total neck section, MX	N-m	Thortest	15.35	-18.17
	On head acting through total neck section, MY	N-m	Thortest	23.41	-43.60
	On head acting through total neck section, MZ	N-m	Thortest	19.85	-97.41
	On head acting through O.C. joint only, FX	N	Thortest	452.05	-255.08
	On head acting through O.C. joint only, FZ	N	Thortest	1780.99	-1248.99
	On head acting through O.C. joint only, MY	N-m	Thortest	15.44	-8.44
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	0.00	-41.82
	Upper Left IR-TRACC Y - deflection	mm	Thortest	18.09	-4.06
	Upper Left IR-TRACC Z - deflection	mm	Thortest	21.03	-13.42
	Upper Left IR-TRACC D - deflection	mm	Thortest	0.00	-37.32
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.33	-24.13
	Upper Right IR-TRACC Y - deflection	mm	Thortest	19.14	-2.05
	Upper Right IR-TRACC Z - deflection	mm	Thortest	8.99	-19.85
	Upper Right IR-TRACC D - deflection	mm	Thortest	0.38	-26.12
	Lower Left IR-TRACC X - deflection	mm	Thortest	5.51	-52.29
	Lower Left IR-TRACC Y - deflection	mm	Thortest	17.37	-0.91

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

Test Vehicle: Left Oblique Research Vehicle 4969 NHTSA No.: CAL2672
Test Program: Research and Development Left Oblique Offset Test Date: 1/11/2014

Right Front Passenger: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	12.35	-6.52
	Lower Left IR-TRACC D - deflection	mm	Thortest	7.56	-50.76
	Lower Right IR-TRACC X - deflection	mm	Thortest	7.59	-17.75
	Lower Right IR-TRACC Y - deflection	mm	Thortest	13.98	-12.61
	Lower Right IR-TRACC Z - deflection	mm	Thortest	7.85	-17.88
	Lower Right IR-TRACC D - deflection	mm	Thortest	5.56	-15.51
	Chest CG Acceleration, 3 ms clip	g	Compute	36.67	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC Y - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC Z - deflection	mm	Thortest	N/A	N/A
	Lower Left IR-TRACC D - deflection	mm	Thortest	N/A	N/A
	Left Viscous Criterion Based on X - deflection		Compute	N/A	
	Lower Right IR-TRACC X - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC Y - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC Z - deflection	mm	Thortest	N/A	N/A
	Lower Right IR-TRACC D - deflection	mm	Thortest	N/A	N/A
	Right Viscous Criterion Based on X - deflection		Compute	N/A	
Spine	Upper Spine (T1) AX	g	180	13.27	-23.79
	Upper Spine (T1) AY	g	180	38.99	-4.31
	Upper Spine (T1) AZ	g	180	30.53	-0.94
	Upper Spine (T1) Resultant	g	Compute	45.71	
	Middle Spine (T6) AX	g	180	7.89	-36.84
	Middle Spine (T6) AY	g	180	27.25	-2.68
	Middle Spine (T6) AZ	g	180	10.72	-4.12
	Middle Spine (T6) Resultant	g	Compute	38.40	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	70.23	
Acetabulum	Left FX force	N	600	2274.33	-2590.45
	Left FY force	N	600	460.22	-958.67
	Left FZ force	N	600	689.33	-2260.71
	Left Acetabulum Resultant	N	Compute	2828.33	
	Right FX force	N	600	1107.98	-2100.84
	Right FY force	N	600	437.24	-2247.18
	Right FZ force	N	600	1434.54	-64.48
	Right Acetabulum Resultant	N	Compute	2968.75	
Anomalies					
None					

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

Test Vehicle: Left Oblique Research Vehicle 4969 NHTSA No.: CAL2672
Test Program: Research and Development Left Oblique Offset Test Date: 1/11/2014

Right Front Passenger: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	1.08	-8.29
	Right Knee Displacement, DX	mm	180	1.68	-0.94
Femur	Left Femur Force, FZ	N	600	493.81	-5546.13
	Left Femur Moment, MX	N-m	600	67.68	-84.69
	Left Femur Moment, MY	N-m	600	69.57	-52.07
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	92.25	
	Right Femur Force, FZ	N	600	636.31	-6596.72
	Right Femur Moment, MX	N-m	600	92.52	-205.34
	Right Femur Moment, MY	N-m	600	147.72	-107.99
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	225.90	
Tibia	Left Upper Tibia, FZ	N	600	133.39	-2599.52
	Left Upper Tibia, MY	N-m	600	67.60	-48.91
	Left Upper Tibia, Index		Compute	0.55	
	Right Upper Tibia, FZ	N	600	479.71	-1515.65
	Right Upper Tibia, MY	N-m	600	27.10	-62.34
	Right Upper Tibia, Index		Compute	0.55	
	Left Lower Tibia, FZ	N	600	156.23	-3094.38
	Left Lower Tibia, MY	N-m	600	35.58	-29.96
	Left Lower Tibia, Index		Compute	0.37	
	Right Lower Tibia, FZ	N	600	543.53	-2143.75
	Right Lower Tibia, MY	N-m	600	19.52	-33.59
	Right Lower Tibia, Index		Compute	0.56	
Ankle	Left Ankle Rotation, RX	Deg	180	28.17	-18.67
	Left Ankle Rotation, RY	Deg	180	6.66	-21.70
	Right Ankle Rotation, RX	Deg	180	23.96	-33.62
	Right Ankle Rotation, RY	Deg	180	-3.30	-26.10
Anomalies					
None					

SECTION 3 DATA SHEETS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

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DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

VEHICLE INFORMATION

Test No.	CAL2672
Model Year	
Make	
Model	
Body Style	Four Door Sedan
VIN	
Body Color	Silver
Odometer Reading (km/mi)	N/A
Engine Displacement. (L)	1.8
Type/No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	5-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	
Date of Manufacture	02/13

GVWR (kg)	1700
GAWR Front (kg)	915
GAWR Rear (kg)	795

VEHICLE SEATING AND WEIGHT CAPACITY

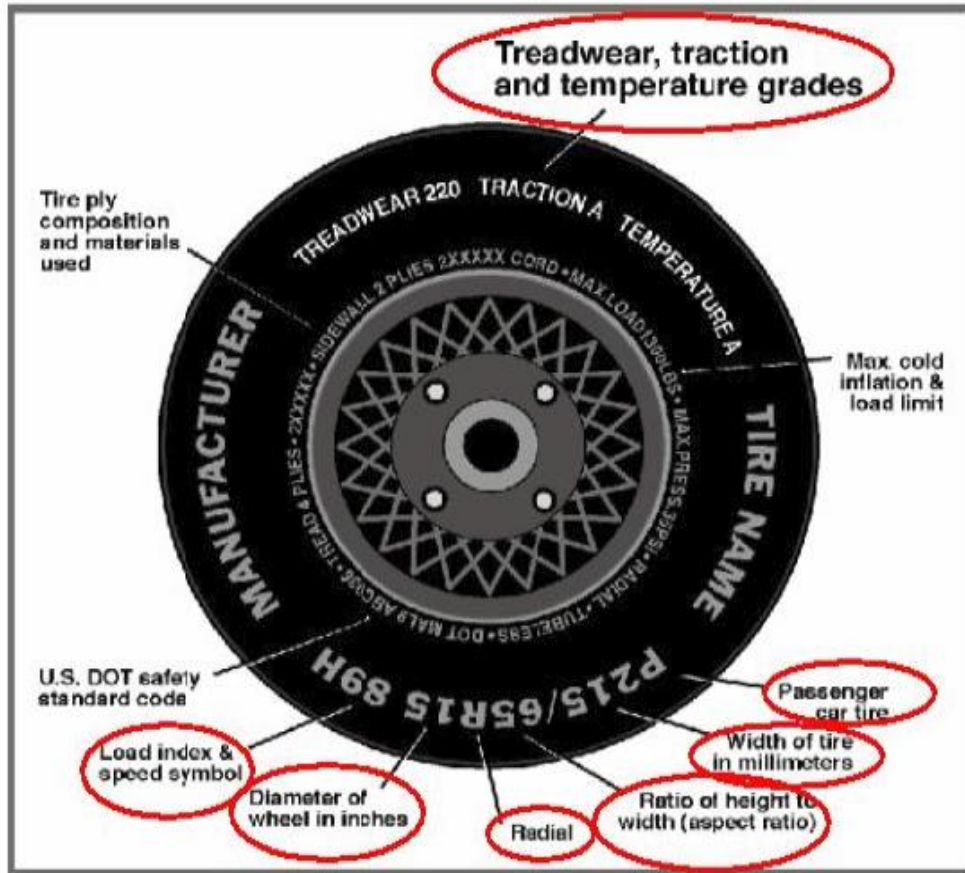
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	-	
Number of Occupants	2	3	-	5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				44.8

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

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



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	210	210
Recommended Tire Size	P195/65R15	P195/65R15
Tire Size on Vehicle	P195/65R15	P195/65R15
Tire Manufacturer	Firestone	Firestone
Tire Model	Affinity	Affinity
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Nylon	1 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	89H	89H
Tire Material	Rubber	Rubber
DOT Safety Code Right	8XC6A120213	8XC6A120213
DOT Safety Code Left	8XC6A120213	8XC6A120213

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	399	239		454	336	
Right	kg	377	236		412	352	
Ratio	%	62%	38%		56%	44%	
Totals	kg	776	475	1251	866	688	1554

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1251
Weight of 2 P572E ATDs	kg	197.8
Rated Cargo/Luggage Weight (RCLW)	kg	44.8
Calculated Vehicle Target Weight (TVTW)	kg	1493.6

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	693	693	697	703	1012
As Tested	mm	676	679	655	653	1180
Post Test	mm	722	712	603	687	

*UR = Unrecoverable data point

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2666
Total Vehicle Length at Left Side	mm	4423
Total Vehicle Length at Centerline	mm	4558
Total Vehicle Length at Right Side	mm	4421
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	2
Amount of Stoddard Solvent in Fuel Tank	L	46.5

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Rear tail lights along with various components the OEM removed during internal prep.

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements		Pre-Test
1	Total Length	mm	4558
2	Total Width	mm	1746
3*	Bumper Top Height	mm	601
4*	Bumper Bottom Height	mm	458
5*	Longitudinal Member Top Height	mm	573
6	Distance Between Longitudinal Members	mm	1127
7	Longitudinal Member Width	mm	104
8*	Engine Top Height	mm	882
9*	Engine Bottom Height	mm	235
10	Engine and Gearbox Width	mm	527
11	Front Bumper-Engine Distance	mm	593
12*	Front Shock Absorber Fixing Height	mm	917
13*	Bonnet Leading Edge Height	mm	751
14	Front Shock Absorber Fixing Width	mm	1144
15	Front Bumper – Front Axle Distance	mm	929
16	Front Axle – A Pillar Distance	mm	486
17	A-Pillar – B-Pillar Distance	mm	1143
18	B-Pillar – Rear Axle Distance	mm	1038
19	B-Pillar – C-Pillar Distance	mm	974
20*	Roof Sill Bottom Height	mm	1335
21*	Roof Sill Top Height	mm	1440
22*	Floor Sill Bottom Height	mm	276
23*	Floor Sill Top Height	mm	429

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

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

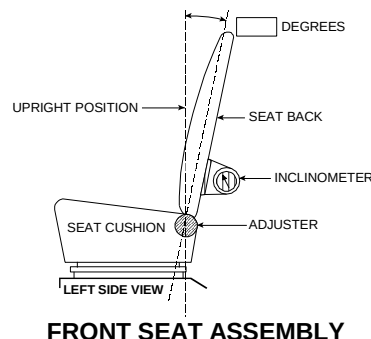
Test No.: CAL2672
 Test Date: 1/11/2014

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	8
Passenger Seat Back Angle	9

SEAT FORE/AFT POSITIONS

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

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

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

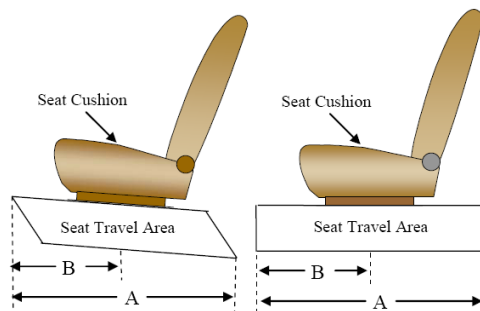
	Total Fore/Aft Travel	Placed in Position #
Driver Seat	25	10
Passenger Seat	25	12

SEAT BELT UPPER ANCHORAGES

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

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

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



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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

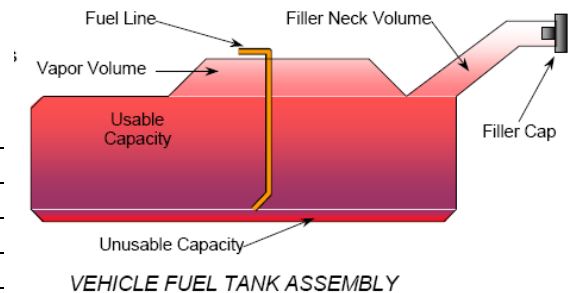
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	50
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	46.5
Actual Amount of Solvent Used	46.5
1/3 of Usable Capacity	16.7

FUEL PUMP

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

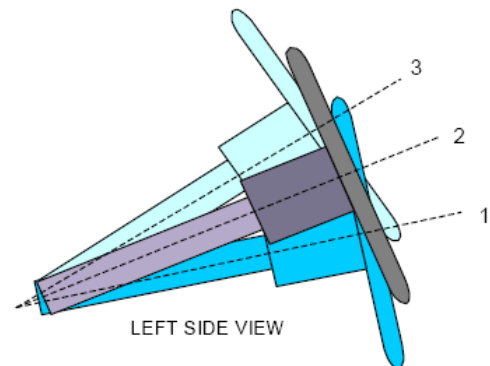
Fuel evacuated according to the specifications provided by the manufacturer in Form 1. Electric fuel pump operates when the ignition is in the 'on' position and the engine is running. The fuel filler neck is located above the right rear wheel.



STEERING COLUMN ADJUSTMENT

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

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



STEERING COLUMN ASSEMBLY

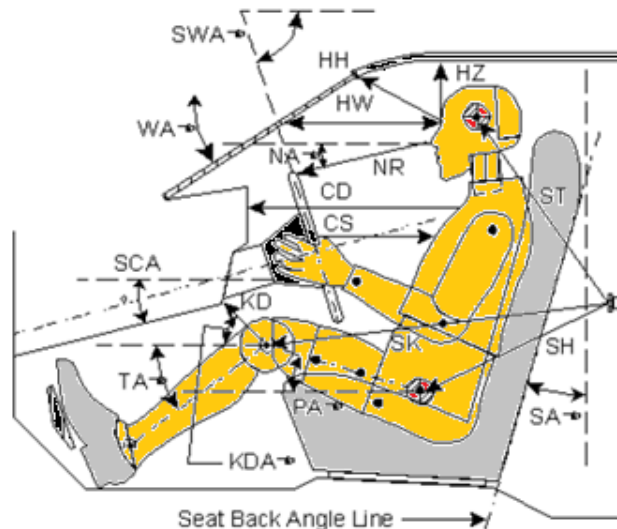
STEERING COLUMN POSITIONS

	Tilt (degrees)	Fore/Aft Position (mm)
Lowermost position No. 1	20.2	
Geometric center position No. 2	22.8	
Uppermost position No. 3	25.2	
Telescoping Steering Wheel Travel		40
Test Position	22.8	20

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014



Code	Measurement Description	Driver (Serial # THOR 016)		Passenger (Serial # THOR 015)	
		Length (mm)	Angle(°)	Length (mm)	Angle (°)
WA°	Windshield Angle		-23.6		
SWA°	Steering Wheel Angle		23.0		
SCA°	Steering Column Angle		67.0		
SA°	Seat Back Angle (on headrest post)		9.0		8.4
HZ	Head to Roof (Z)	165	90	130	90
HH	Head to Header	390	17.4	363	11.1
HW	Head to Windshield	685	0	554	0
NR	Nose to Rim	482	-20.9	657	-35.7
CD	Chest to Dash	568		521	
CS	Chest to Steering Hub	340	-2.6		
RA	Rim to Abdomen	190	0		
KDL	Left Knee to Dash	106	35.0	113	28.1
KDR	Right Knee to Dash	98	37.7	115	32.1
PA°	Pelvic Angle		23.9		21.5
TA°	Tibia Angle		-43.8		-40.8
SK	Striker to Knee	624	-5.5	634	-6.8
ST	Striker to Head	477	-84.1	510	-82.2
SH	Striker to H-Point	328	-39.6	303	-39.5
HAX°	Head Angle (X)		-0.2		-0.2
HAY°	Head Angle (Y)		0.2		0.1
TAX°	T6 Angle (X)		-0.8		-0.2
TAY°	T6 Angle (Y)		18.0		14.2
LAX°	T1 Angle (X)		-0.1		-1.0
LAY°	T1 Angle (Y)		-0.4		-3.5

DATA SHEET NO.3 (CONTINUED)
DUMMY CMM MEASUREMENTS

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

Description	Units	Driver			Passenger		
		X	Y	Z	X	Y	Z
Striker	mm	932	-775	633	934	778	635
Head CG	mm	1016	-422	172	1036	424	144
Bridge of Nose	mm	1114	-348	164	1134	353	136
Tip of Nose	mm	1114	-351	210	1135	352	172
Shoulder Bolt	mm	1074	-544	428	1082	539	419
Tip of Chin	mm	1110	-349	305	1129	346	277
H-Point	mm	1220	-596	856	1201	597	842
Left Knee	mm	1589	-591	707	1596	294	716
Right Knee	mm	1609	-280	714	1597	519	724
Left Ankle	mm	1891	-600	995	1919	280	985
Right Ankle	mm	1928	-244	996	1922	495	988
Left Heel	mm	1909	-575	1129	1900	240	1124
Right Heel	mm	1938	-198	1125	1912	460	1124
Head Bolt 1 – Top Left	mm	959	-369	214	977	304	104
Head Bolt 2 – Lower Left	mm	977	-368	277	982	319	187
Head Bolt 3 – Top Right	mm	961	-317	216	972	377	101
Head Bolt 4 – Lower Right	mm	979	-323	279	980	369	187
Driver's Outboard Seat Anchor Bolt	mm	1433	-567	1070	934	778	635
Outboard Head Restraint Post	mm	835	-431	382	824	436	363
Top of Head Restraint	mm	901	-350	111	903	347	92
Center of Steering Wheel	mm	1505	-354	478			

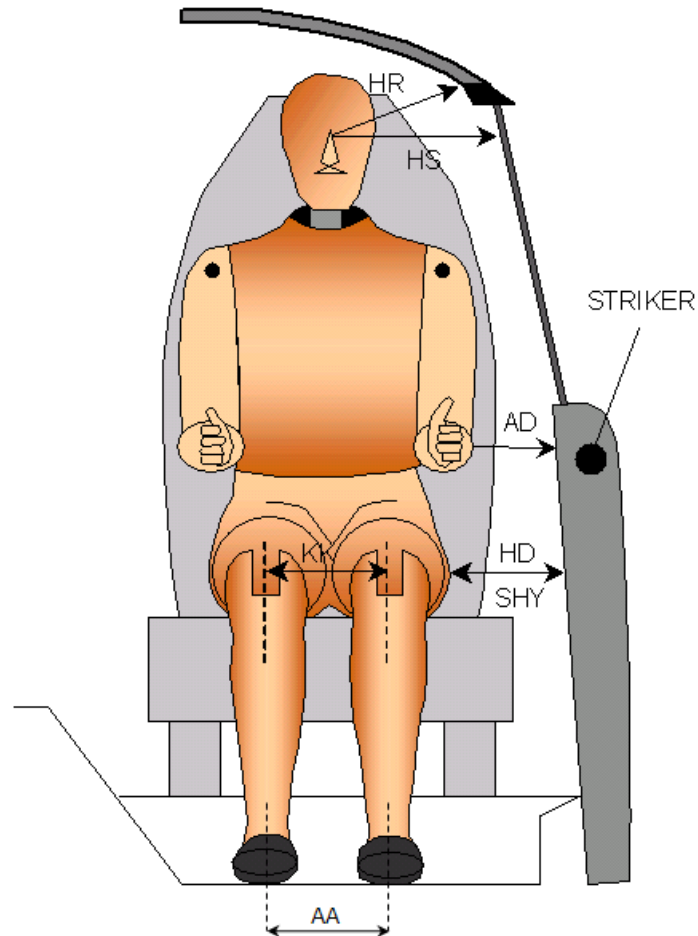
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

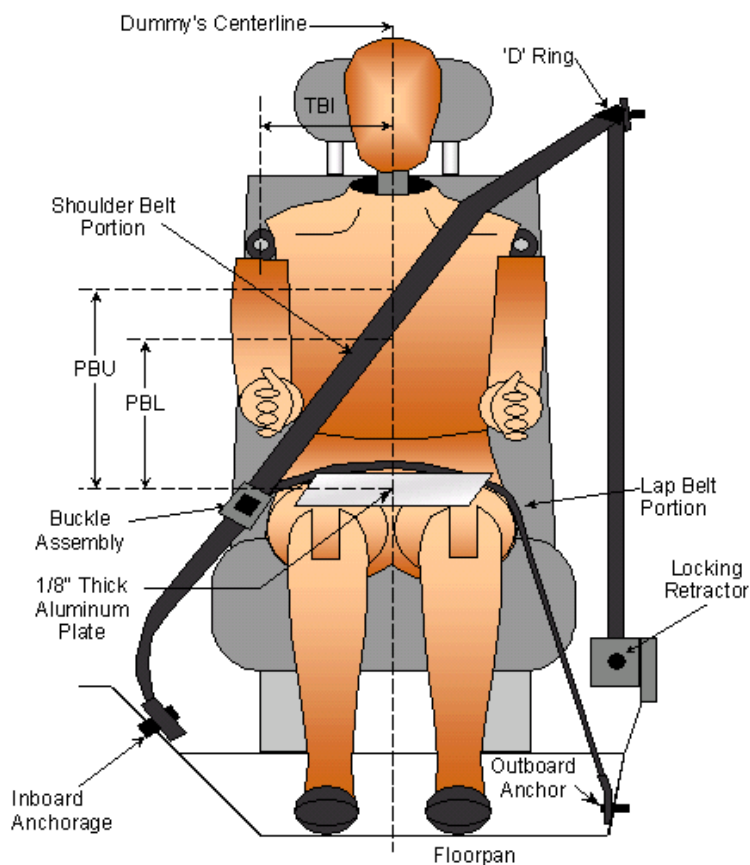


Code	Description	Units	Driver	Passenger
AD	Arm to Door	mm	112	45
HD	H-Point to Door	mm	124	138
HR	Head to Side Header	mm	209	198
HS	Head to Side Window	mm	335	325
KK	Knee to Knee	mm	360	270
SHY	Striker to H-Point (Y Direction)	mm	230	230
AA	Ankle to Ankle	mm	360	212

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	375	365
PBL — Top surface of reference to belt lower edge	mm	295	285

BELT LENGTH DATA

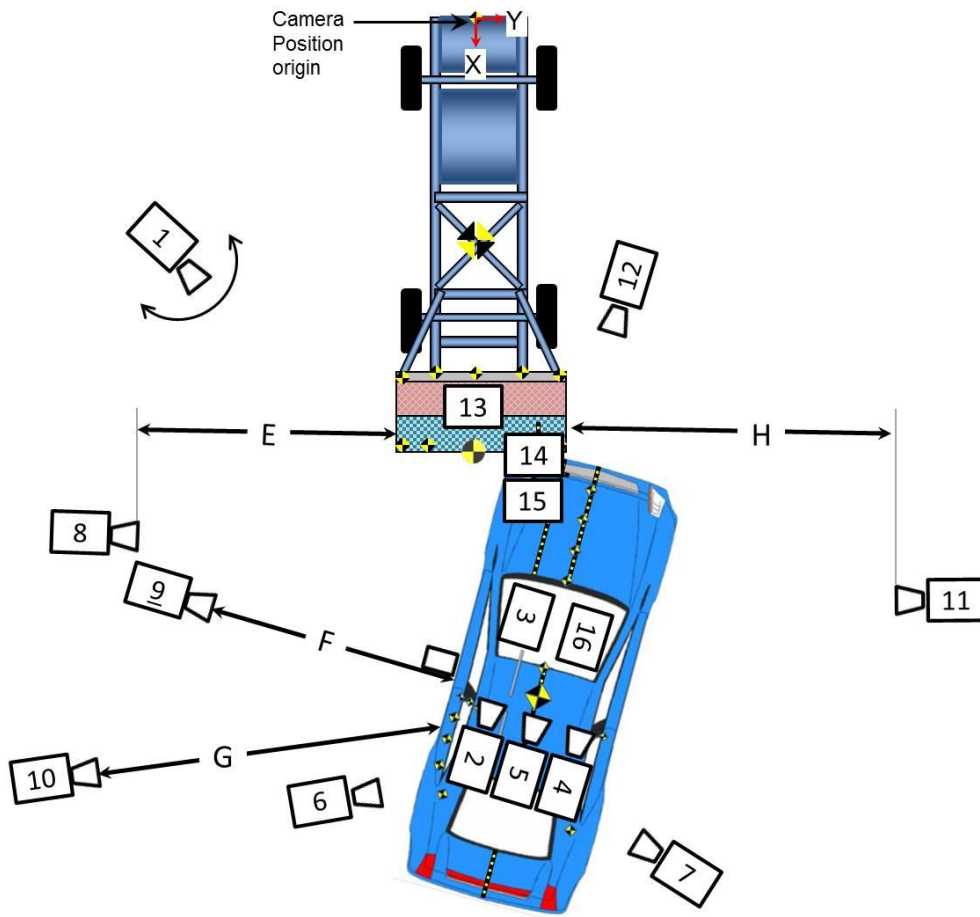
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	900	950
Lap Belt Length as measured on ATD	mm	640	580
Remainder of belt on reel	mm	860	970
Total belt length for continuous webbing systems	mm	2400	2500

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

HORIZONTAL LOCATION



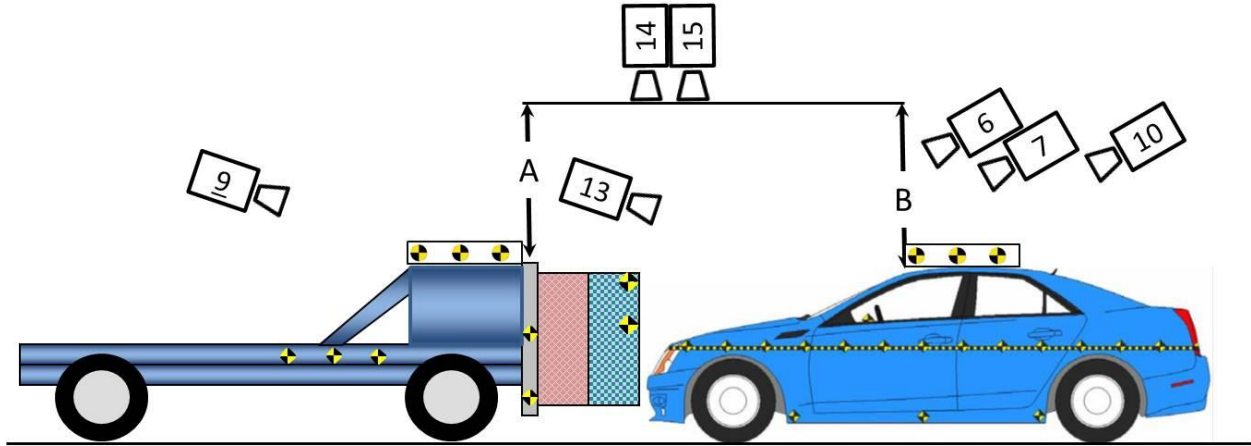
E	mm	6556
F	mm	7469
G	mm	9220
H	mm	6701

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

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

VERTICAL LOCATION



A	mm	4164
B	mm	3901

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

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	7708	-167	1172	12.5	1000
3	Onboard Driver Lower Leg	6350	-566	224	6.5	1000
4	Onboard Driver Movement	8118	-917	1192	12.5	1000
5	Onboard Centerline	8205	-385	1189	12.5	1000
6	Driver Interaction	7553	2216	3663	24-70	1000
7	Passenger Interaction	11233	-8570	2526	28	1000
8	Target Vehicle Left Side Perpendicular (High)	4370	7710	1100	24	1000
9	Target Vehicle Driver Motion	6345	7544	1109	28	1000
10	Target Vehicle Passenger Motion	10439	8671	3406	24-70	1000
11	Target Vehicle Right Side	4825	7844	1153	24	1000
12	Target Vehicle Left Side (High)	1096	-2250	1125	28	1000
13	RMDB/Target Vehicle Interaction	4844	1018	4630	28	1000
14	Close-up Impact Point	6767	662	5341	15	1000
15	Overall Impact	4842	662	5341	15	1000

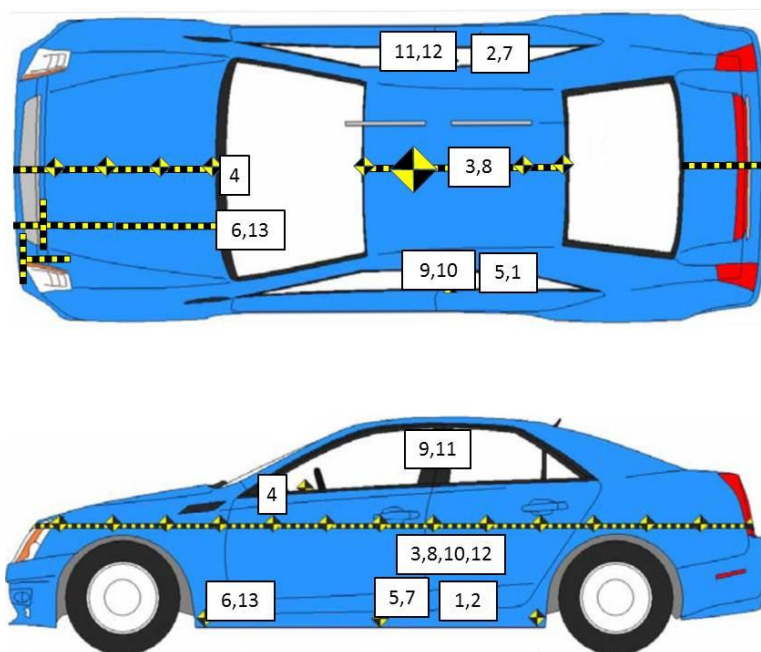
Reference Point: Center most rearward point of the RMDB when in contact with the target vehicle:

- +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: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Axes	Units	Measurements (mm)		
				X	Y	Z
1	Left Rear Sill	X,Y	mm	629	-719	1009
2	Right Rear Sill	X,Y	mm	637	713	1021
3	Vehicle CG	X,Y,Z	mm	847	0	1086
4	Instrument Panel	X	mm	1632	0	630
5	Driver Seat Track	X,Y,Z	mm	925	-570	1143
6	Behind Brake Pedal	X,Y,Z	mm	2218	-404	914
7	Passenger Seat Track	X,Y,Z	mm	924	565	1144
8	Angular Rate Sensor	X	mm	818	0	1110
	Angular Rate Sensor	Y	mm	863	-6	1109
	Angular Rate Sensor	Z,	mm	847	0	1086

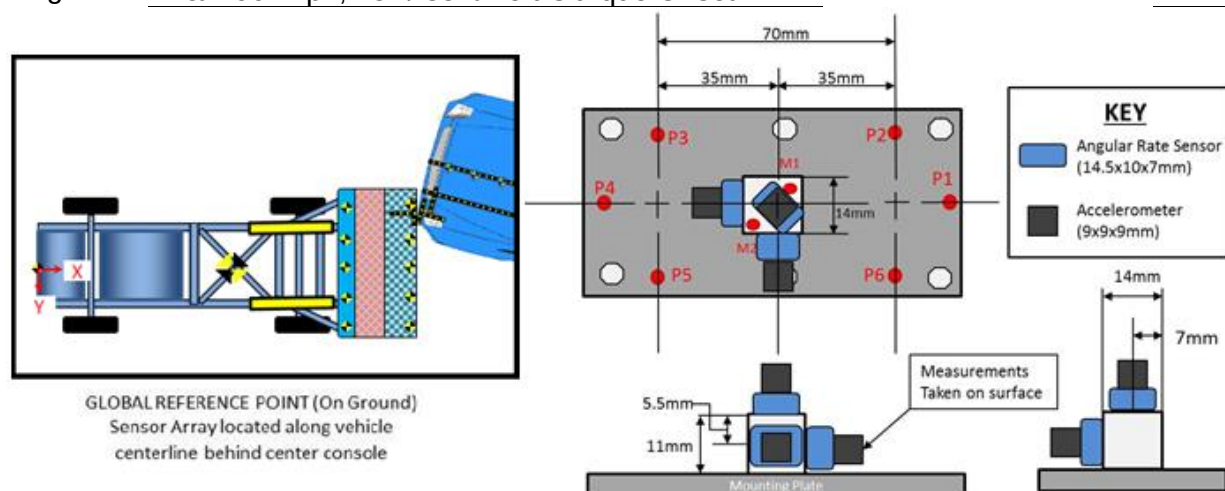
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

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

DATA SHEET NO. 7 (CONTINUED) **VEHICLE INSTRUMENTATION DATA**

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014



VEHICLE COORDINATE SYSTEM					
No.	Accelerometer Location	Units	Measurements (mm)		
			X	Y	Z
ACC-1	Accelerometer CG – X Direction	mm	818	0	1110
ACC-2	Accelerometer CG – Y Direction	mm	863	-6	1109
ACC-3	Accelerometer CG – Z Direction	mm	847	0	1086
M1	Mounting Bolt 1	mm	850	-10	1103
M2	Mounting Bolt 2	mm	840	1	1103
P1	Plate Point 1	mm	895	-1	1115
P2	Plate Point 2	mm	884	-21	1116
P3	Plate Point 3	mm	814	-20	1117
P4	Plate Point 4	mm	803	0	1117
P5	Plate Point 5	mm	815	21	1116
P6	Plate Point 6	mm	884	20	1115

GLOBAL COORDINATE SYSTEM					
No.	Accelerometer Location	Units	Measurements (mm)		
			X	Y	Z
ACC-1	Accelerometer CG – X Direction	mm	7148	-717	-226
ACC-2	Accelerometer CG – Y Direction	mm	7103	-722	-227
ACC-3	Accelerometer CG – Z Direction	mm	7120	-724	-250
M1	Mounting Bolt 1	mm	7115	-715	-234
M2	Mounting Bolt 2	mm	7128	-723	-234
P1	Plate Point 1	mm	7074	-736	-222
P2	Plate Point 2	mm	7079	-713	-221
P3	Plate Point 3	mm	7147	-696	-219
P4	Plate Point 4	mm	7163	-713	-220
P5	Plate Point 5	mm	7157	-736	-221
P6	Plate Point 6	mm	7090	-753	-222

DATA SHEET NO. 7 (CONTINUED)
VEHICLE INSTRUMENTATION DATA

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

VEHICLE INSTRUMENTATION DATA

Loc.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Max	Time (ms)
1	Left Rear Sill	X	g	1.45	152.90	-65.39	40.30
		Y	g	17.12	33.00	-6.12	46.50
2	Right Rear Sill	X	g	2.11	112.65	-43.87	39.70
		Y	g	19.44	42.35	-1.22	91.30
3	Vehicle CG	X	g	1.90	128.85	-62.33	39.20
		Y	g	19.59	41.55	-2.02	88.30
		Z	g	27.66	45.20	-49.28	49.40
4	Instrument Panel	X	g	61.49	79.90	-54.67	51.90
5	Driver Seat Track	X	g	1.10	144.25	-68.53	40.25
		Y	g	25.43	40.60	-1.16	128.30
		Z	g	33.02	40.75	-39.31	45.55
6	Behind Brake Pedal	X	g	34.33	24.35	-127.61	39.45
		Y	g	34.50	43.00	-18.44	36.50
		Z	g	40.82	45.20	-27.72	31.15
7	Passenger Seat Track	X	g	1.60	131.45	-46.66	40.00
		Y	g	21.21	32.20	-2.11	90.30
		Z	g	6.74	77.00	-16.41	72.50
8	Angular Rate Sensors	X	deg/s	1044.47	41.00	-293.94	81.90
		Y	deg/s	610.16	42.00	-95.21	74.00
		Z	deg/s	201.80	39.60	-156.39	22.25
9	Driver Shoulder Belt		N	5999.09	59.30	-10.14	10.75
10	Driver Lap Belt		N	328.94	56.00	-6.32	11.90
11	Passenger Shoulder Belt		N	7289.80	63.20	-1.01	-50.00
12	Passenger Lap Belt		N	4920.00	61.30	-0.84	-50.00
13	Driver Floor Pan String Pot		mm	0.18	2.00	-105.50	67.05

Note: See Appendix B for all additional vehicle channel data

TIME TO FIRE RESTRAINT TIMING

Loc.	Description	Axes	Units	Time to Fire (ms)
1	Driver Air Bag Squib 1	*	V	17.90
2	Driver Air Bag Squib 2	*	V	57.90
3	Driver Curtain Airbag	*	V	38.65
4	Driver Torso Airbag	*	V	38.65
5	Driver Knee Airbag	*	V	N/A
6	Driver Pretensioner	*	V	10.90
7	Passenger Air Bag Squib 1	*	V	15.90
8	Passenger Air Bag Squib 2	*	V	55.90
9	Passenger Curtain Airbag	*	V	Did Not Fire
10	Passenger Torso Airbag	*	V	Did Not Fire
11	Passenger Knee Airbag	*	V	N/A
12	Passenger Pretensioner	*	V	10.90

* The measurement indicates the time the voltage changed

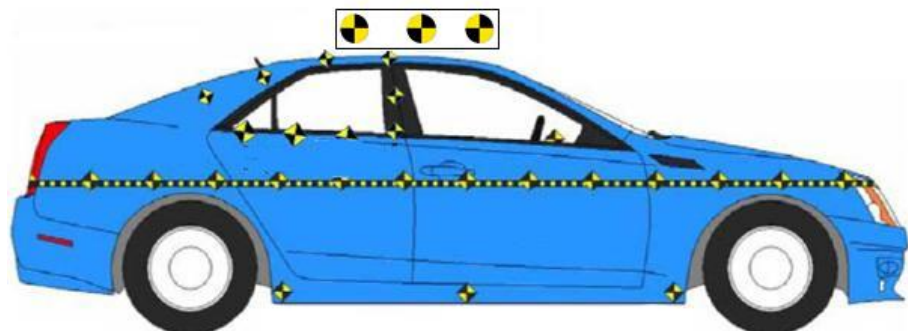
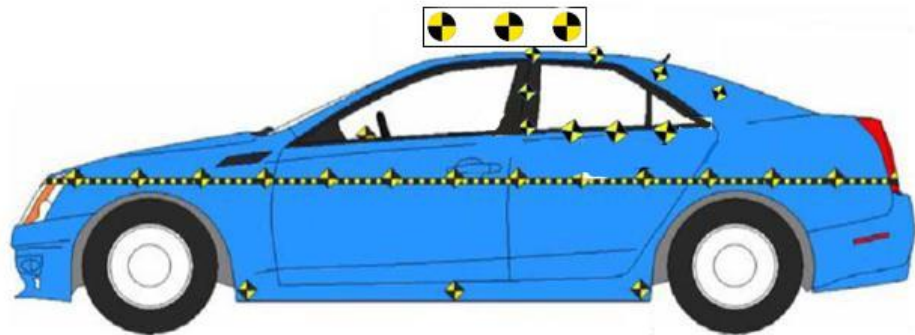
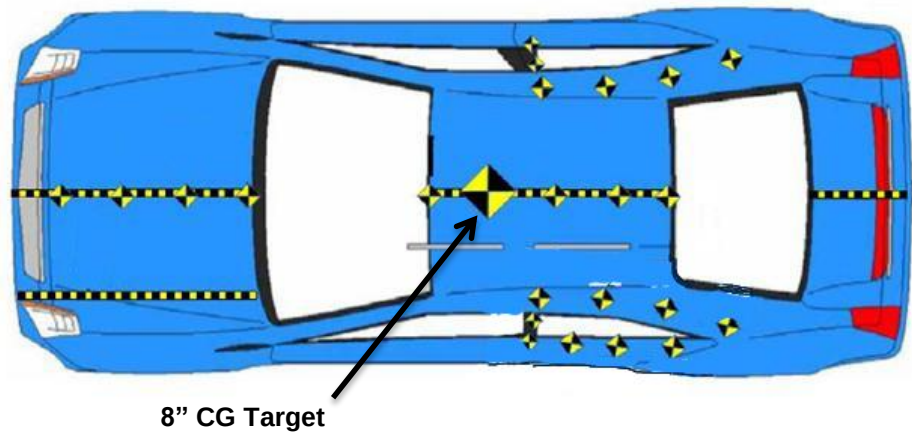
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

Item	Units	Value
A	mm	263

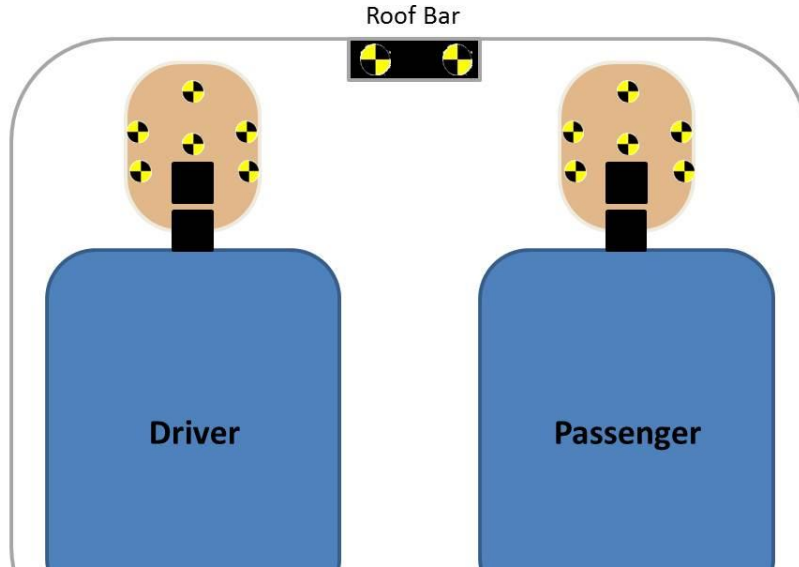
Note: All 6" targets on vehicle are 450 mm apart.



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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014



Point	Pre-Test		
	X	Y	Z
Roof Bar Driver	1476	-64	95
Roof Bar Passenger	1475	61	95

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

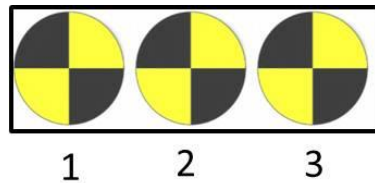
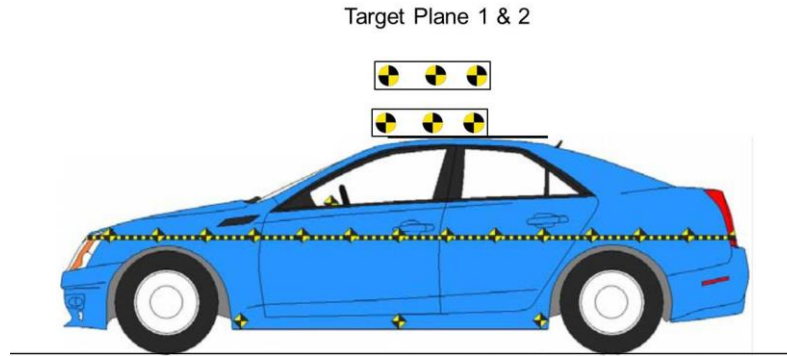
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

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

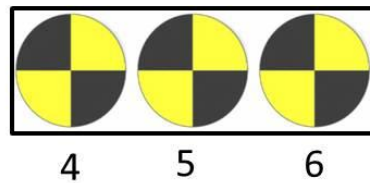
Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

OVERHEAD TARGET BARS



Vertical Target
Plane 1
(Driver's Side)



Vertical Target
Plane 2
(Passenger Side)

Target	Units	X	Y	Z
1	mm	1403	-380	-423
2	mm	950	-362	-425
3	mm	498	-347	-424
4	mm	1437	349	-420
5	mm	985	354	-422
6	mm	537	352	-421

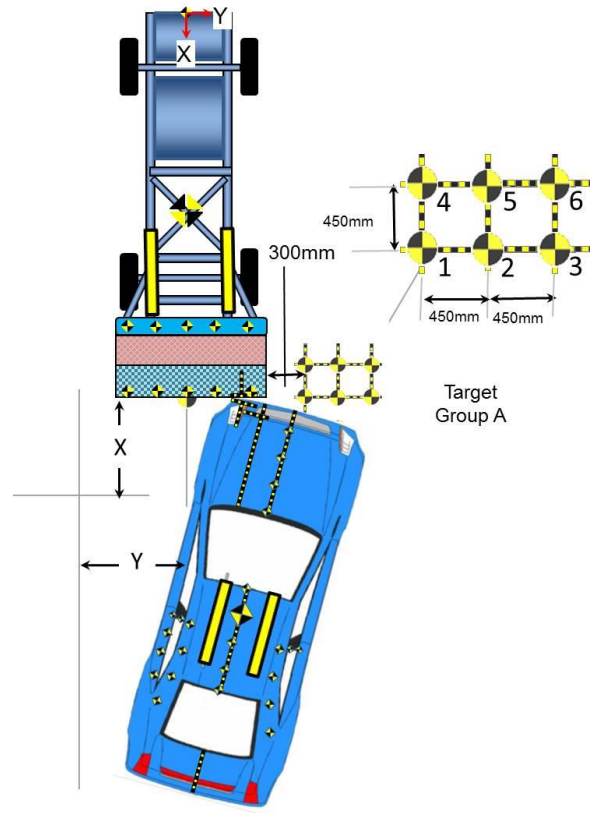
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

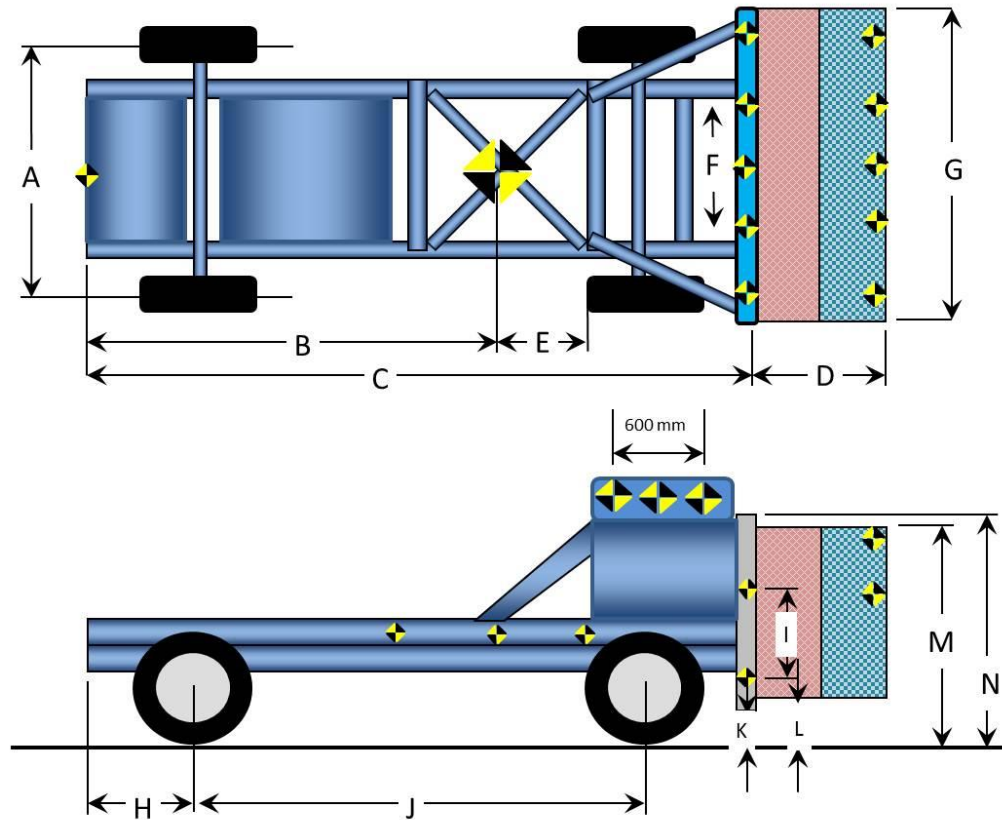


Target	Units	X	Y
1	mm	0	1411
2	mm	0	1861
3	mm	0	2311
4	mm	-450	1411
5	mm	-450	1861
6	mm	-450	2311

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014



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

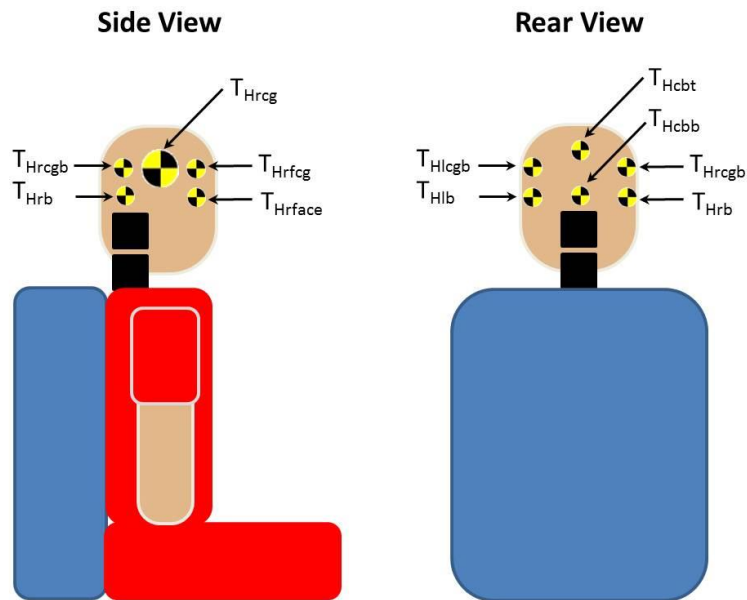
	Units	Front Axle	Rear Axle	Total
Left	kg	802.0	453.6	1255.6
Right	kg	807.4	427.7	1235.1
Ratio	%	65	35	100
Total	kg	1609.4	881.3	2490.7
CG Aft of Front Axle	mm			904

Note: All targets on the RMDB honeycomb are 450mm apart

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014



Driver Dummy Head Targets (S/N 016)

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

Passenger Dummy Head Targets (S/N 015)

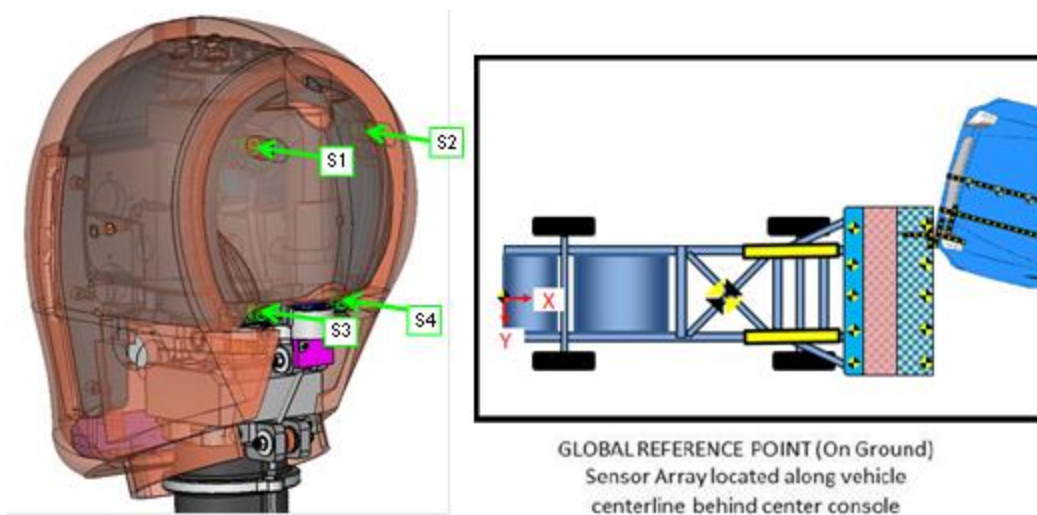
Measurement	Units	Value
Distance between T _{Hrcg} & T _{Hrfcg}	mm	38
Distance between T _{Hrcg} & T _{Hrcgb}	mm	38
Distance between T _{Hrcgb} & T _{Hrb}	mm	70
Distance between T _{Hrfcg} & T _{Hrface}	mm	70
Distance between T _{Hlcbg} & T _{Hlfcg}	mm	38
Distance between T _{Hlcbg} & T _{Hlface}	mm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

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

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 HEAD BOLT POINTS

Target	X	Y	Z
S1	6917	-396	-1122
S3	6899	-402	-1060
S2	6929	-446	-1121
S4	6909	-445	-1058

FRONT PASSENGER HEAD BOLT POINTS

Target	X	Y	Z
S1	7074	-1050	-1233
S3	7073	-1067	-1149
S2	7097	-1120	-1235
S4	7088	-1114	-1149

*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: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	87
Passenger Dummy Accelerometers	81
Vehicle Structure Accelerometers	59
RMDB Cart Accelerometers	6
Total	233

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: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Right Front Passenger
Dummy Type/Serial No.	THOR016	THOR015
Lower Leg Type	LX	LX
Lower Leg Serial No.	LX0018/ LX0019	LX0038/LX0039
Head Contact	Front & Curtain Airbag	Front Airbag, Visor, Center Instrument Panel, Steering Wheel Rim, Driver's Front Airbag
Side Body Contact	Torso Airbag	Shoulder contacts Center Instrument Panel
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Right Front Passenger
Locked/Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Jammed	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	A-Pillar, B-Pillar & C-Pillar buckled	Y
Windshield Damage	Cracks throughout with minor separation	Y
Window Damage	None	Y
Other Notable Effects	None	--

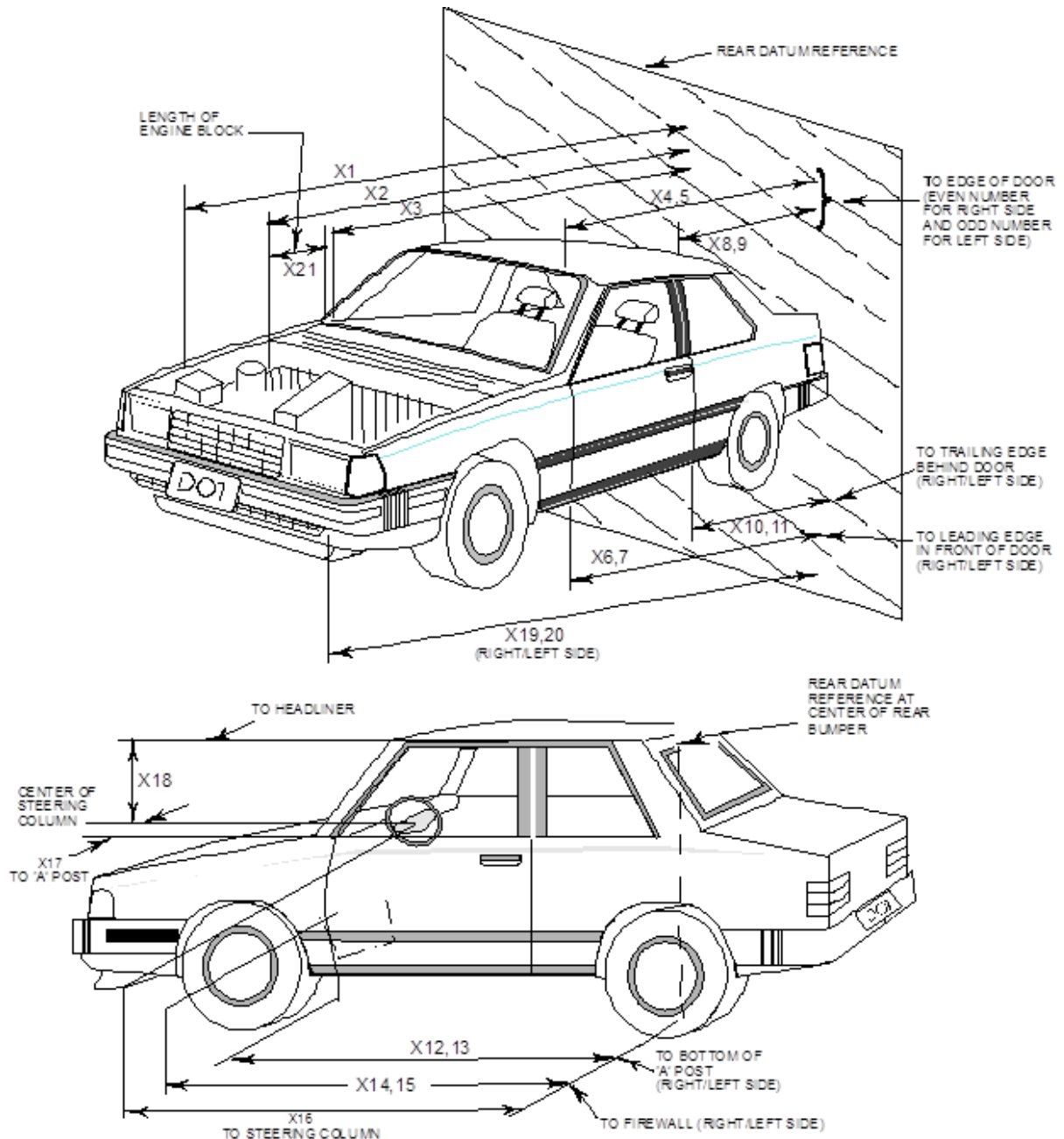
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver (Occupant 1)		Right Front Passenger (Occupant 2)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Curtain Airbag	Yes	Yes	Yes	Disabled
Torso/Pelvis Airbag	Yes	Yes	Yes	Disabled
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: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014



DATA SHEET NO. 11 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm			321
2	Rear Surface of Vehicle (RSOV) to Front of Engine	mm			143
3	RSOV to Firewall	mm			99
4	RSOV to Upper Leading Edge of Right Door	mm			2
5	RSOV to Upper Leading Edge of Left Door	mm			6
6	RSOV to Lower Leading Edge of Right Door	mm			1
7	RSOV to Lower Leading Edge of Left Door	mm			1
8	RSOV to Upper Trailing Edge of Right Door	mm			3
9	RSOV to Upper Trailing Edge of Left Door	mm			5
10	RSOV to Lower Trailing Edge of Right Door	mm			2
11	RSOV to Lower Trailing Edge of Left Door	mm			-1
12	RSOV to Bottom of "A" Post of Right Side	mm			3
13	RSOV to Bottom of "A" Post of Left Side	mm			7
14	RSOV to Firewall, Right Side	mm			-2
15	RSOV to Firewall, Left Side	mm			191
16	RSOV to Steering Column	mm			-10
17	Center of Steering Column to "A" Post	mm			25
18	Center of Steering Column to Headliner	mm			54
19	RSOV to Right Side of Front Bumper	mm			81
20	RSOV to Left Side of Front Bumper	mm			546
21	Length of Engine Block	mm			13
RD	RSOV to Right Side of Dash Panel	mm			-8
CD	RSOV to Center of Dash Panel	mm			4
LD	RSOV to Left Side of Dash Panel	mm			-324

UR* = Unrecoverable Data Point

DATA SHEET NO. 12
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

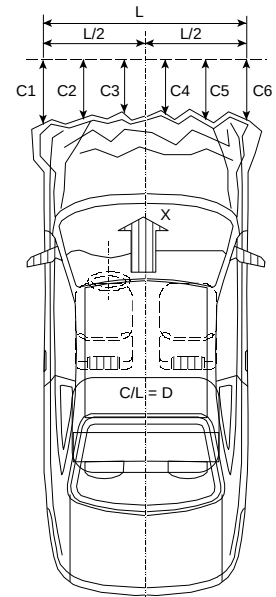
Test No.: CAL2672
Test Date: 1/11/2014

VEHICLE INFORMATION

VIN: N/A Wheelbase (mm): 2666
Vehicle Size Category: Passenger Test Weight (kg): 1554

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): 90.15
Velocity Change (kph): 90.15



CRUSH PROFILE

Midpoint of Damage: C2
Damage Region Length (mm): 1135
Impact Mode: Frontal 15° Angle, 35% Left Offset

Crush Measurements: Bumper Cover

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm			539
C2	Crush zone 2 at left side	mm			485
C3	Crush zone 3 at left side	mm			392
C4	Crush zone 4 at right side	mm			261
C5	Crush zone 5 at right side	mm			126
C6	Crush zone 6 at right side	mm			-13
L	C1 to C6	mm			121

UR* = Unrecoverable Data Point

Crush Measurements: Bumper Cover Removed

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
B1	Bumper Beam 1 at left side	mm			-566
B2	Bumper Beam 2 at left side	mm			-565
B3	Bumper Beam 3 at left side	mm			-539
B4	Bumper Beam 4 at left side	mm			-481
B5	Bumper Beam 5 at right side	mm			-381
B6	Bumper Beam 6 at right side	mm			-282
B7	Bumper Beam 7 at right side	mm			-179
B8	Bumper Beam 8 at right side	mm			-68
B9	Bumper Beam 9 at right side	mm			38
L	B1 to B9	mm			-170

DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

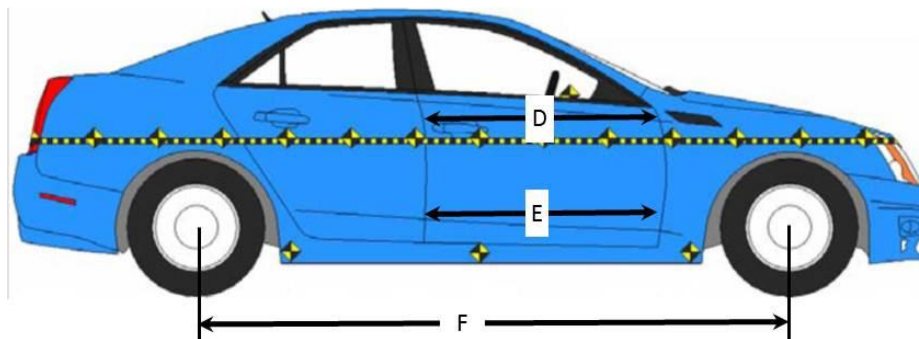
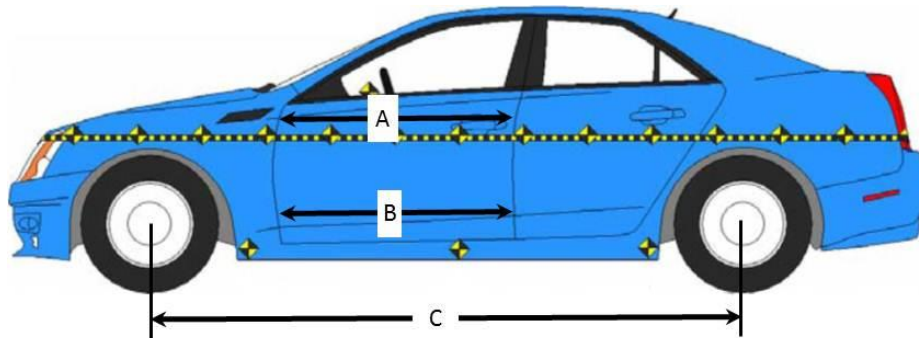
Test No.: CAL2672
 Test Date: 1/11/2014

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm			-15
B	Left Side Lower	mm			-7
D	Right Side Upper	mm			-3
E	Right Side Lower	mm			0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm			-139
F	Right Side Wheelbase	mm			-43



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

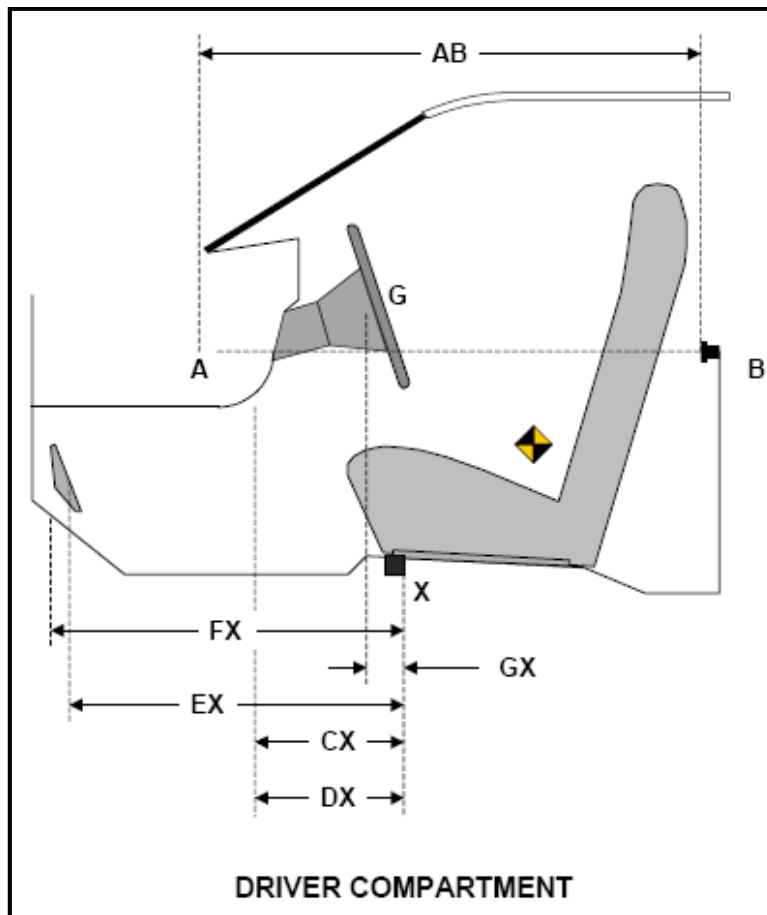
Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm			3
CX	Left Knee Bolster to X	mm			-27
DX	Right Knee Bolster to X	mm			-17
EX	Brake Pedal to X	mm			-37
FX	Foot Rest to X	mm			-83
GX	Center of Steering Column Wheel Hub to X	mm			3

X = Front of Seat Track (Stationary)



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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

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							2	-2	-17
2							-2	-4	-18
3							-5	-11	-19
4							-11	-28	-21
5							-8	-30	-19
6							-4	-30	-21
7							7	5	-14
8							7	4	-13
9							7	4	-12
10							5	3	-14
11							3	-1	-15
12							-9	-21	-19
13							-10	-26	-20
14							-3	-28	-21
15							-3	-25	-21
16							-3	-22	-21

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17							-2	-19	-20
18							-2	-17	-19
19							0	-12	-19
20							-1	-11	-18
21							-1	-10	-17
22							-1	-10	-17
23							0	-8	-16
24							0	-6	-13
25							-1	-6	-12
26							0	-4	-9
27							7	4	-12
28							7	4	-12
29							6	3	-11
30							6	3	-12
31							7	3	-10
32							7	3	-11
33							5	2	-9
34							6	2	-10

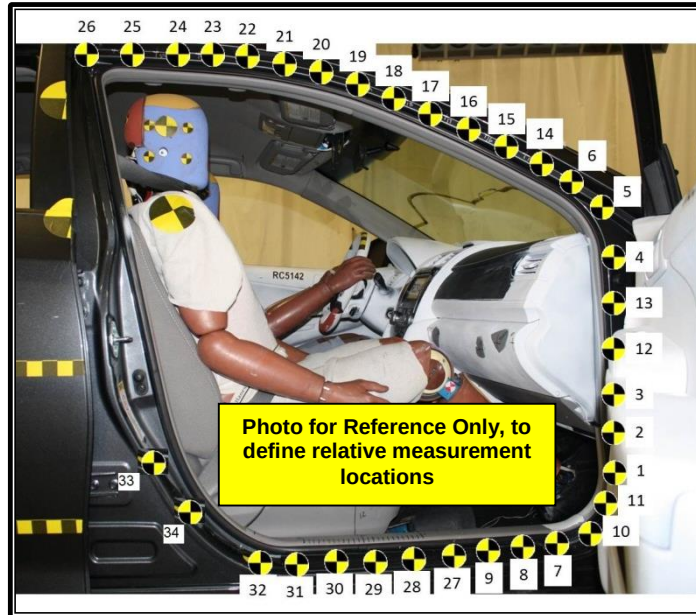
Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

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							0	19	-2
2							0	19	-3
3							-1	17	-1
4							-2	15	-2
5							-3	14	-3
6							-2	12	-1
7							1	20	-2
8							2	17	-2
9							1	15	-3
10							0	20	-2
11							1	20	-2
12							-1	16	-2
13							-2	14	-1
14							-2	10	-2
15							-2	7	0
16							-1	6	-1

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17							-1	4	-1
18							-1	3	-1
19							0	1	0
20							1	-1	1
21							0	-1	0
22							0	-2	1
23							1	-1	0
24							1	-1	-1
25							0	0	0
26							-1	-1	0
27							2	15	-3
28							1	14	-3
29							1	14	-2
30							2	13	-2
31							-1	12	-2
32							1	12	-3
33							1	8	-1
34							1	11	-2

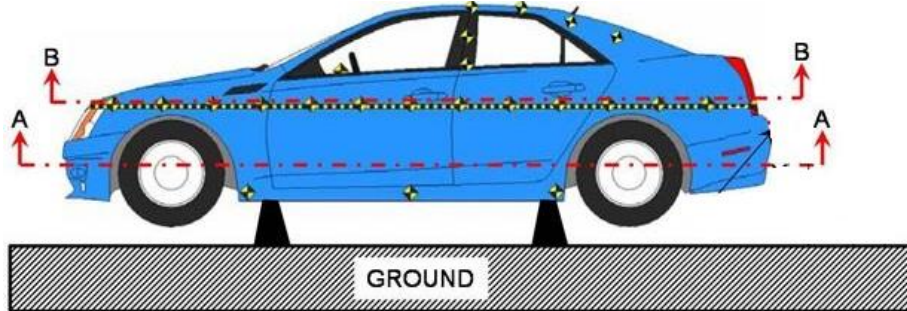
Note: See Appendix D for detailed procedure on how to measure the required door sill intrusions.

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

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	2811	-858		1	2487	-555	
2	2871	-852		2	2557	-465	
3	2988	-833		3	2598	-309	
4	3079	-801		4	2659	-271	
5	3162	-721		5	2700	-188	
6	3227	-614		6	2741	-78	
7	3285	-500		7	2803	0	
8	3337	-378		8	2876	87	
9	3375	-260		9	2968	197	
10	3394	-136		10	3060	276	
11	3400	-4		11	3172	397	
12	3397	73		12	3216	506	
13	3387	191		13	3234	575	
14	3359	309		14	3244	645	
15	3308	445		15	3123	671	
16	3240	586		16	3028	675	
17	3161	718		17	2973	730	
18	3104	780		18	2959	780	
19	2958	836		19	2851	751	
20	2814	856		20	2765	814	
21	2125	878		21	2705	943	
22	2027	874		22	2580	1057	
23	1856	867		23	2105	892	
24	1669	866		24	2015	883	
25	1444	866		25	1908	883	

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	1253	867		26	1808	879	
27	1051	867		27	1593	875	
28	908	867		28	1374	873	
29	797	865		29	1216	872	
30	615	863		30	959	869	
31	452	861		31	862	866	
32	291	864		32	592	863	
33	144	873		33	342	862	
34	-535	871		34	209	870	
35	-621	859		35	139	868	
36	-709	846		36	-539	869	
37	-792	832		37	-639	854	
38	-897	812		38	-822	824	
39	-964	790		39	-953	792	
40	-1018	728		40	-1029	703	
41	-1067	628		41	-1089	558	
42	-1106	515		42	-1125	419	
43	-1142	316		43	-1143	265	
44	-1153	132		44	-1151	111	
45	-1156	-1		45	-1153	-4	
46	-1152	-166		46	-1151	-102	
47	-1142	-311		47	-1144	-236	
48	-1123	-440		48	-1125	-407	
49	-1086	-576		49	-1087	-561	
50	-1028	-709		50	-1026	-705	
51	-981	-776		51	-962	-789	
52	-852	-818		52	-807	-828	
53	-698	-845		53	-609	-859	
54	-561	-866		54	-533	-869	
55	147	-870		55	256	-865	
56	225	-866		56	438	-860	
57	296	-861		57	656	-862	
58	363	-859		58	891	-866	
59	551	-859		59	1054	-869	
60	764	-862		60	1255	-870	
61	904	-864		61	1396	-872	
62	1113	-865		62	1561	-873	
63	1228	-865		63	1789	-877	
64	1387	-865		64	2005	-886	
65	1572	-865		65	2134	-888	
66	1763	-865		66	2253	-815	

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

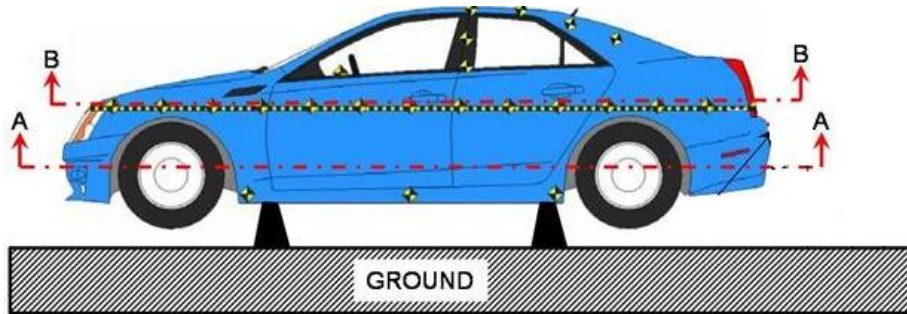
Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
67	1936	-868		67	2424	-733	
68	2019	-872		68	2538	-686	
69	2111	-877					
70	2811	-858					

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

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	2449	-863		1	2472	-461	
2	2506	-861		2	2489	-357	
3	2607	-852		3	2520	-286	
4	2729	-835		4	2546	-224	
5	2809	-824		5	2636	-124	
6	2887	-801		6	2784	-9	
7	2935	-740		7	2875	113	
8	3002	-666		8	2975	269	
9	3084	-532		9	3018	364	
10	3140	-426		10	3081	481	
11	3175	-243		11	3052	597	
12	3186	-92		12	2958	715	
13	3189	0		13	2814	835	
14	3184	132		14	2695	841	
15	3168	279		15	2534	835	
16	3148	402		16	2320	869	
17	3076	539		17	2105	870	
18	3017	635		18	2020	864	
19	2980	688		19	1887	872	
20	2925	745		20	1829	872	
21	2890	787		21	1618	871	
22	2806	823		22	1408	870	
23	2669	844		23	1276	869	
24	2463	863		24	1003	867	
25	2301	862		25	893	867	

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	2192	859		26	734	864	
27	2052	859		27	494	862	
28	1910	860		28	224	859	
29	1746	862		29	1	860	
30	1525	865		30	-76	868	
31	1307	867		31	-244	868	
32	1104	868		32	-440	847	
33	960	869		33	-668	816	
34	781	867		34	-860	778	
35	614	866		35	-949	665	
36	433	864		36	-1000	473	
37	235	863		37	-1012	289	
38	48	864		38	-1015	118	
39	-156	869		39	-1017	-4	
40	-386	854		40	-1014	-118	
41	-581	830		41	-1011	-228	
42	-702	812		42	-1012	-317	
43	-764	801		43	-997	-478	
44	-851	784		44	-884	-771	
45	-908	747		45	-695	-813	
46	-979	584		46	-406	-851	
47	-1011	486		47	-143	-867	
48	-1040	339		48	-12	-861	
49	-1012	283		49	31	-863	
50	-1016	173		50	284	-863	
51	-1019	39		51	568	-867	
52	-1020	0		52	777	-870	
53	-1017	-119		53	884	-871	
54	-1013	-283		54	1011	-880	
55	-1041	-321		55	1258	-886	
56	-1022	-434		56	1576	-893	
57	-1000	-514		57	1772	-897	
58	-955	-658		58	1945	-901	
59	-916	-736		59	2012	-903	
60	-884	-773		60	2061	-837	
61	-702	-810		61	2180	-777	
62	-459	-843		62	2252	-702	
63	-211	-866		63	2343	-605	
64	-15	-862		64	2415	-574	
65	247	-860		65	2421	-511	
66	372	-861					
67	446	-862					

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

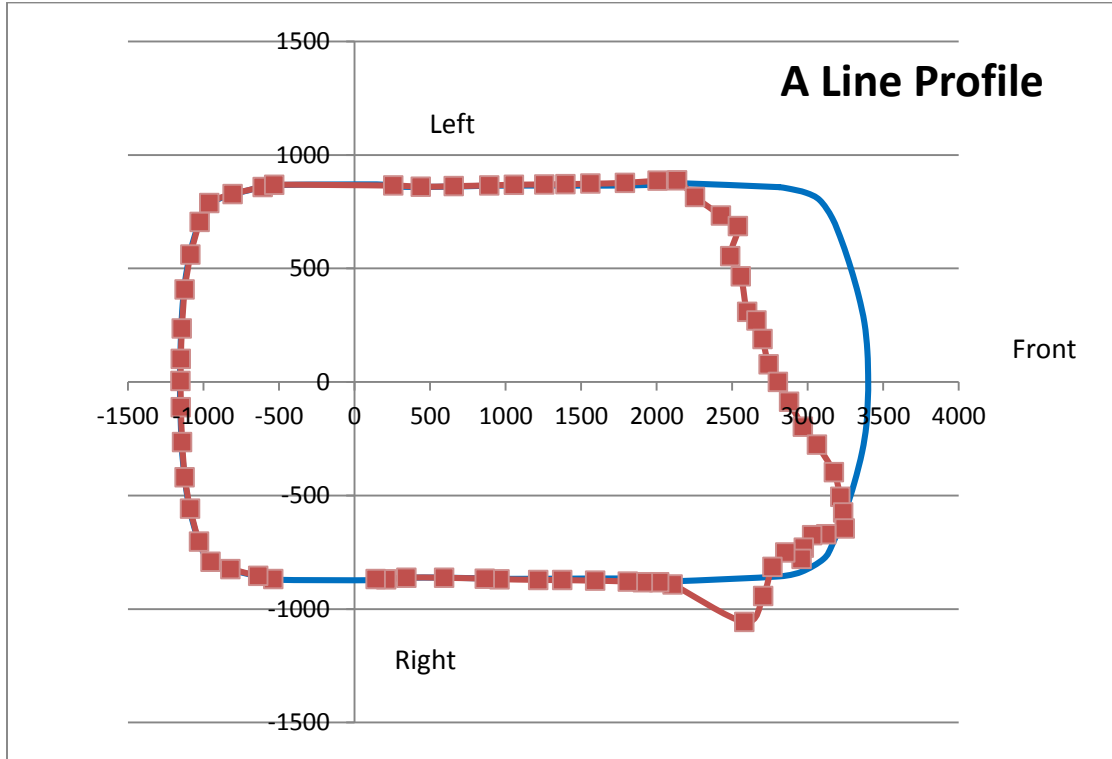
Point	Pre-Test		
	X	Y	Z
68	629	-864	
69	849	-865	
70	1026	-866	
71	1165	-866	
72	1347	-865	
73	1544	-863	
74	1766	-861	
75	2000	-857	
76	2220	-858	
77	2357	-862	
78	2410	-863	
79	2449	-863	

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

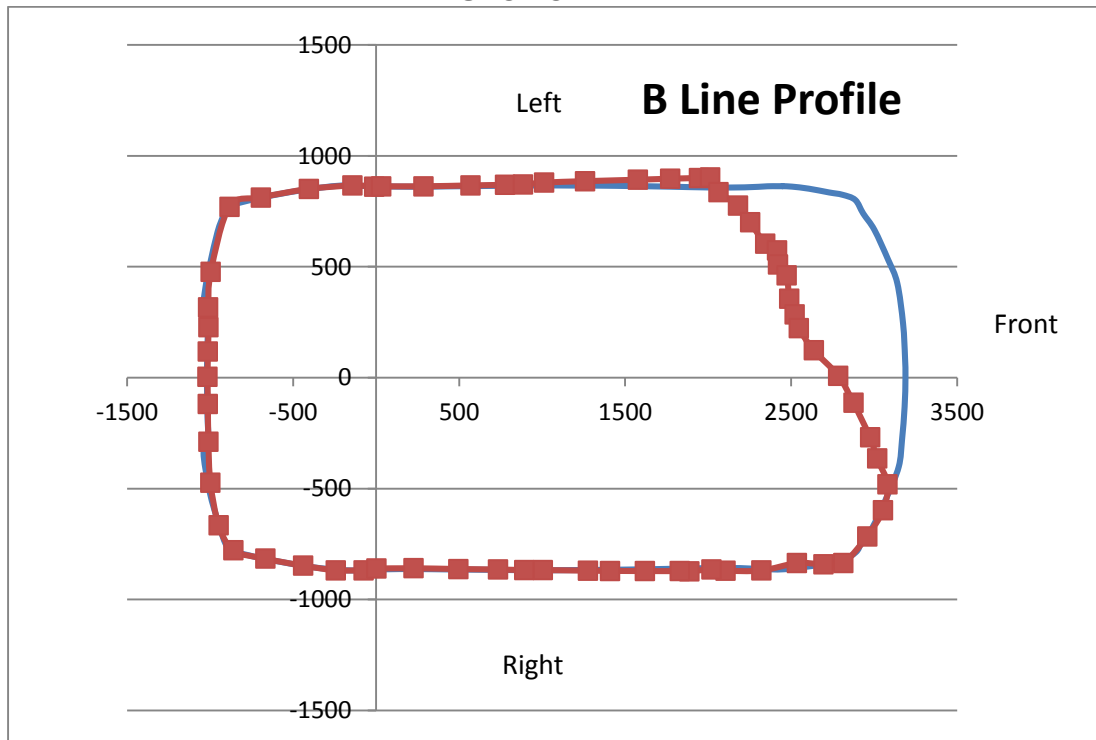
Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A



SECTION B-B



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

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							-573	120	-91
	B2							-568	117	-87
	B3							-545	107	-79
	B4							-485	58	-78
	B5							-385	23	-76
	B6							-285	-14	-75
	B7							-183	-40	-72
	B8							-72	-49	-62
	B9							33	-48	-50
Center Structural Bumper Beam	B1							-566	118	-94
	B2							-565	114	-87
	B3							-539	104	-80
	B4							-481	56	-77
	B5							-381	20	-76
	B6							-282	-16	-76
	B7							-179	-43	-72
	B8							-68	-51	-63
	B9							38	-52	-51
Upper Radiator Support	1							-511	167	-57
	2							-475	159	-73
	3							-427	143	-100
	4							-370	125	-119
	5							-313	114	-104
	6							-253	87	-93
	7							-199	55	-73
	8							-145	32	-51
	9							-90	11	-28

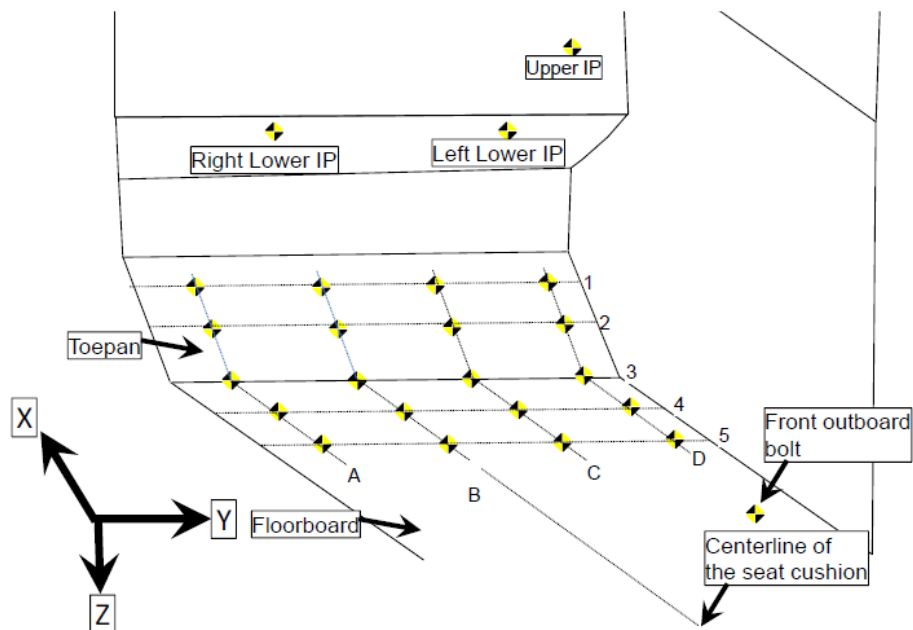
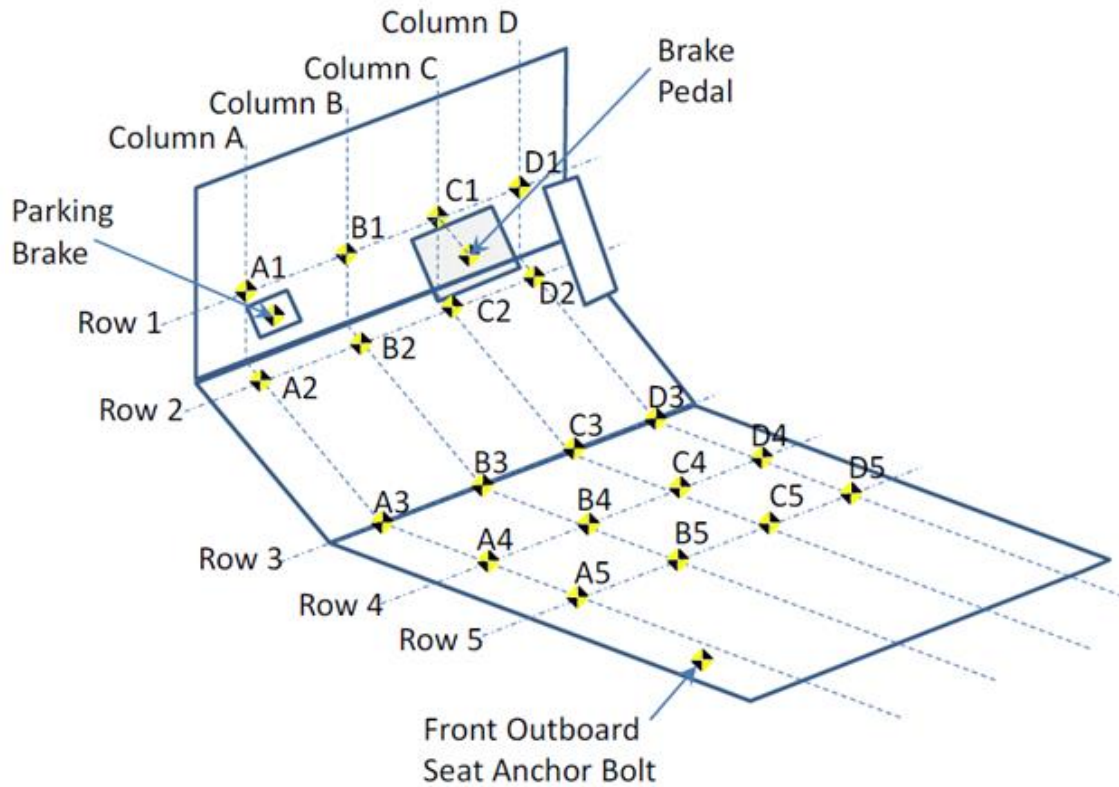
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014



Note: See Appendix D for toe pan measuring procedure

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

DRIVER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1							-76	26	-40
B1							-105	39	-51
C1							-99	28	-49
D1							-84	25	-32
A2							-63	23	-35
B2							-80	30	-43
C2							-72	22	-33
D2							-59	20	-10
A3							-34	19	-28
B3							-46	20	-20
C3							-33	15	-2
D3							-32	17	8
A4							7	11	-5
B4							8	11	3
C4							4	11	11
D4							3	10	11
A5							6	12	-10
B5							6	9	0
C5							3	10	10
D5							4	9	16
Brake Pedal							-30	-58	1
Driver IP Left							-19	-28	-22
Driver IP Right							-10	0	6
DOLP							-11	-42	-28
Steering Column							10	-33	-61
Front Outboard Bolt							7	8	-12
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: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

PASSENGER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1							-21	33	-25
B1							-7	26	-16
C1							-6	23	-10
D1							-2	26	-6
A2							-14	35	-18
B2							8	24	-8
C2							-5	21	-8
D2							0	23	-5
A3							5	23	-15
B3							5	22	-13
C3							9	23	-1
D3							1	24	-5
A4							7	21	-14
B4							5	21	-12
C4							2	21	-9
D4							2	22	-5
A5							6	19	-12
B5							4	20	-12
C5							3	19	-8
D5							1	18	-5
Pass IP Left							16	1	-9
Pass IP Right							15	-1	-9
PORP							11	-1	-6
Front Outboard Bolt							2	12	-6

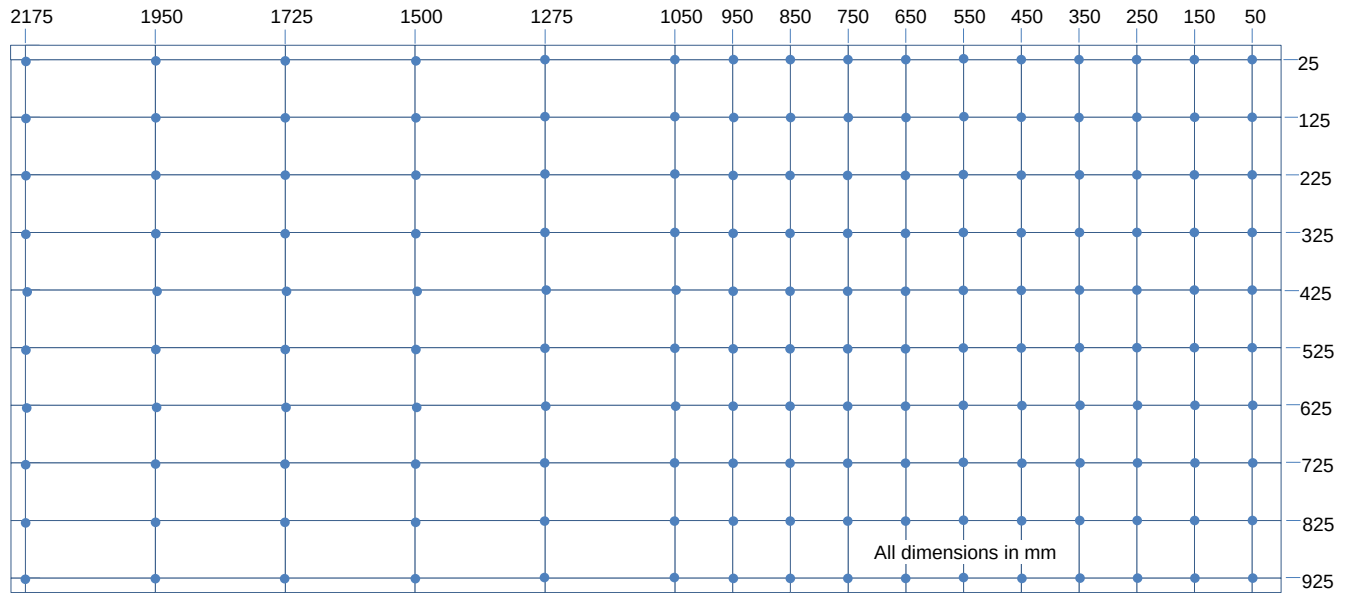
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

- +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: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014



	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
R10	-0.5	-0.1	0.1	0.1	0.4	0.3	0.4	0.4	0.3	0.2	0.2	0.3	0.1	0.2	0.0	-0.5
R9	-0.5	-0.4	-0.1	0.0	0.2	0.2	0.4	1.6	0.4	2.0	3.6	1.7	0.2	0.1	0.2	2.8
R8	-0.6	-0.3	-0.3	-0.1	0.0	0.1	1.8	12.0	10.6	78.2	44.9	13.3	0.2	1.4	2.0	15.9
R7	-0.5	-0.4	-0.3	0.0	-0.1	0.0	0.2	5.0	16.8	75.5	75.3	26.9	3.9	11.0	24.1	43.4
R6	-0.5	-0.2	-0.4	-0.3	-0.1	-0.2	0.0	0.1	6.0	18.2	40.8	19.9	28.5	44.5	68.7	102.4
R5	-0.6	-0.5	-0.2	-0.2	-0.1	0.0	0.1	0.2	24.6	36.0	64.3	116.3	142.2	155.3	175.2	195.5
R4	-0.5	-0.2	-0.2	-0.1	-0.1	0.1	0.1	2.4	56.3	88.5	64.1	119.6	142.6	153.7	181.8	201.5
R3	-0.6	-0.4	-0.2	-0.3	-0.1	0.1	-0.1	9.0	65.7	118.9	45.0	71.5	115.2	139.2	173.6	184.1
R2	-0.4	-0.2	-0.2	-0.2	-0.2	0.0	0.0	13.2	73.3	141.3	67.8	42.3	108.2	137.4	161.9	172.7
R1	-0.6	-0.1	-0.3	-0.2						149.7	86.3	21.1	58.5	74.7	95.3	122.4

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

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014

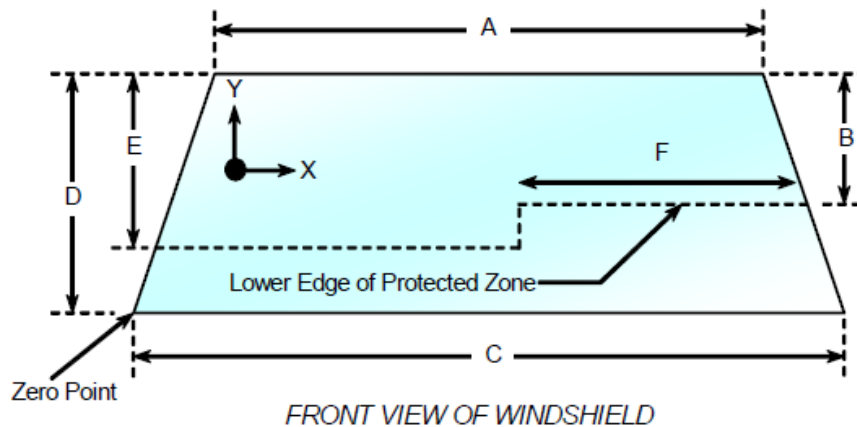
Please provide windshield mounting details. A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2273	1488	65.5%
Right Side	2273	2273	100%
Total	4546	3761	82.8%



Item	Units	Value
A	mm	1220
B	mm	520
C	mm	1515
D	mm	905
E	mm	630
F	mm	315

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: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

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

Test Time: 12:55 PM

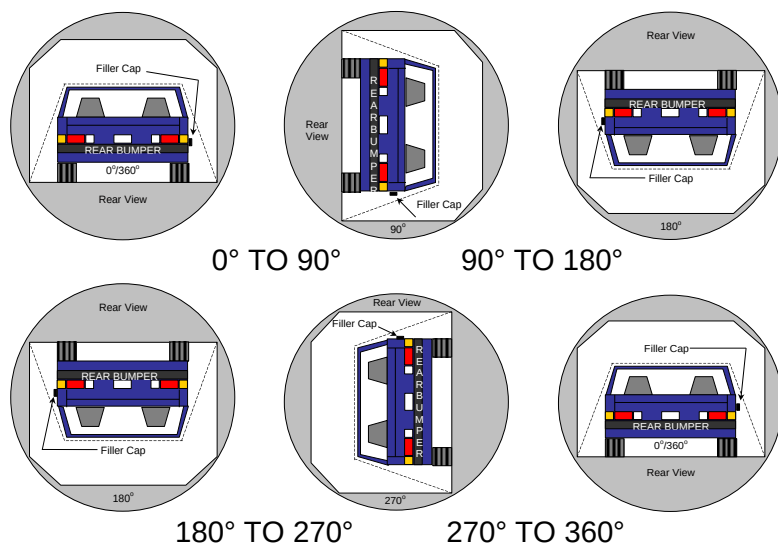
Stoddard Solvent Spillage Measurements

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

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

Test Vehicle: Research Vehicle 4969
 Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
 Test Date: 1/11/2014



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°	73	300	373
90° to 180°	66	300	366
180° to 270°	60	300	360
270° to 360°	69	300	369

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	

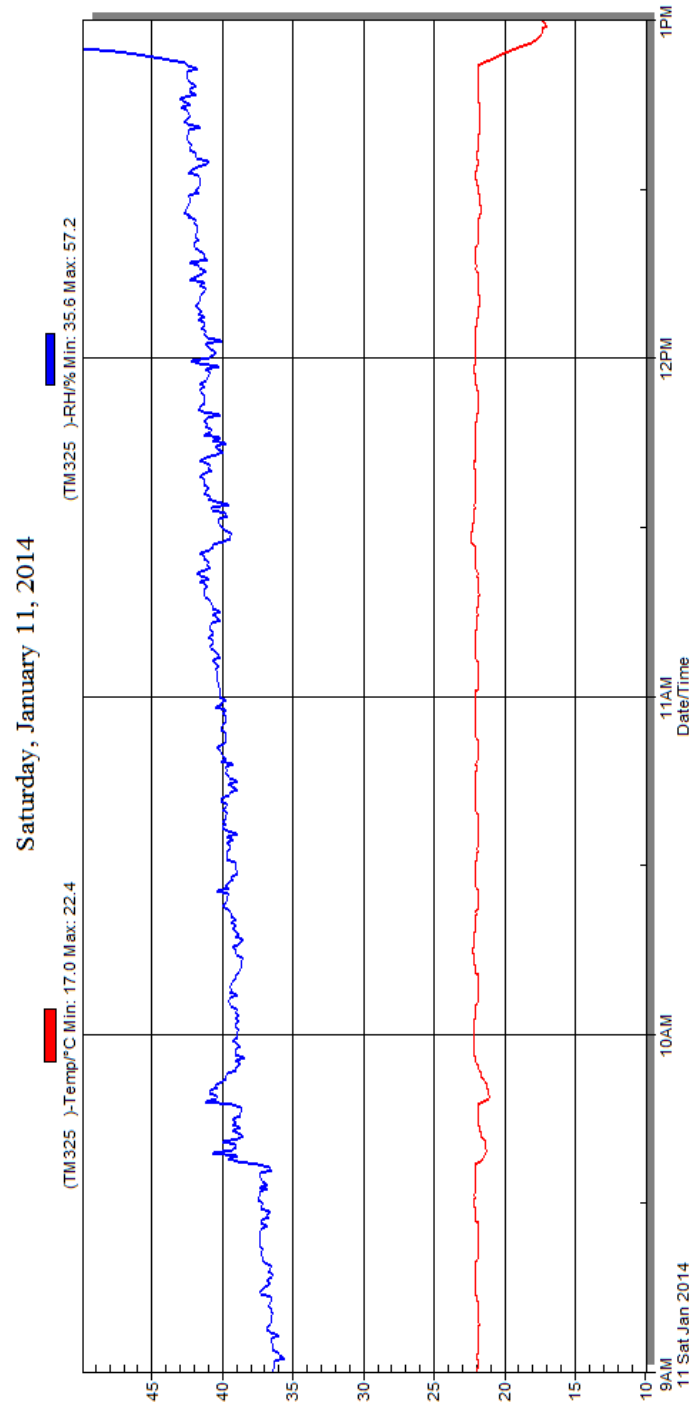
SOLVENT SPILLAGE LOCATION TABLE

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: Research Vehicle 4969
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset

Test No.: CAL2672
Test Date: 1/11/2014



Temperature Stabilization Chart/Data

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PHOTOGRAPHS

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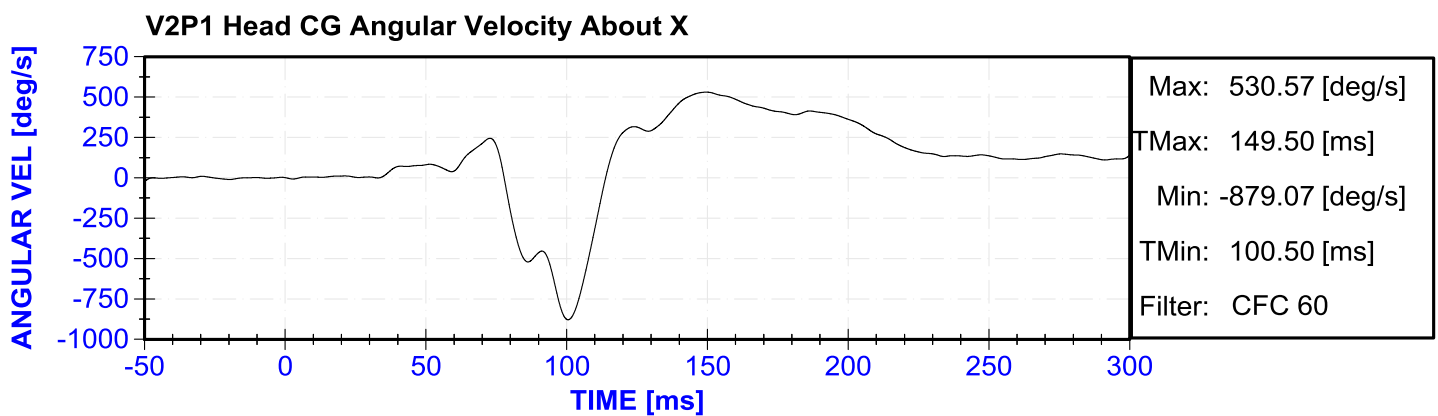
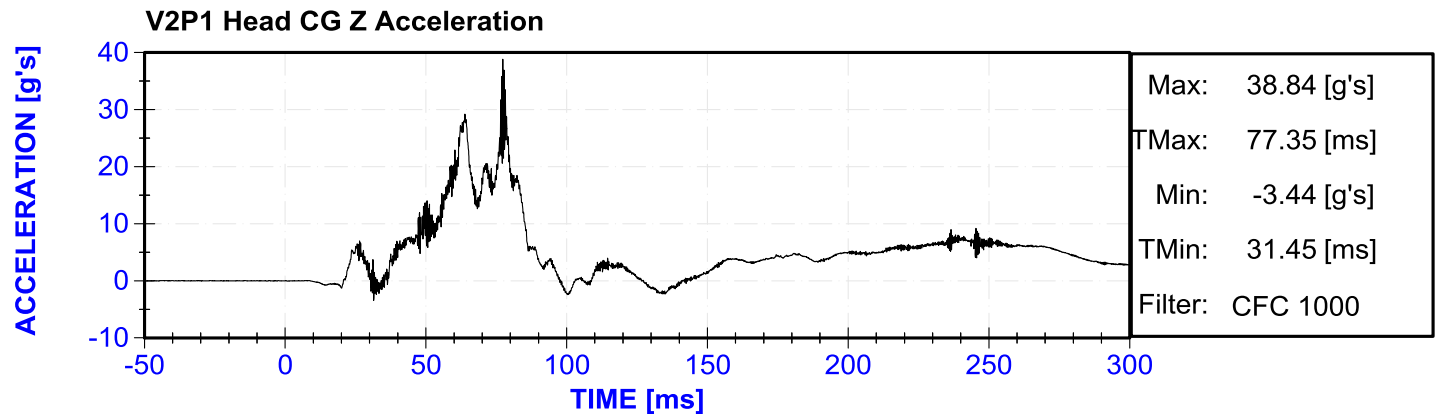
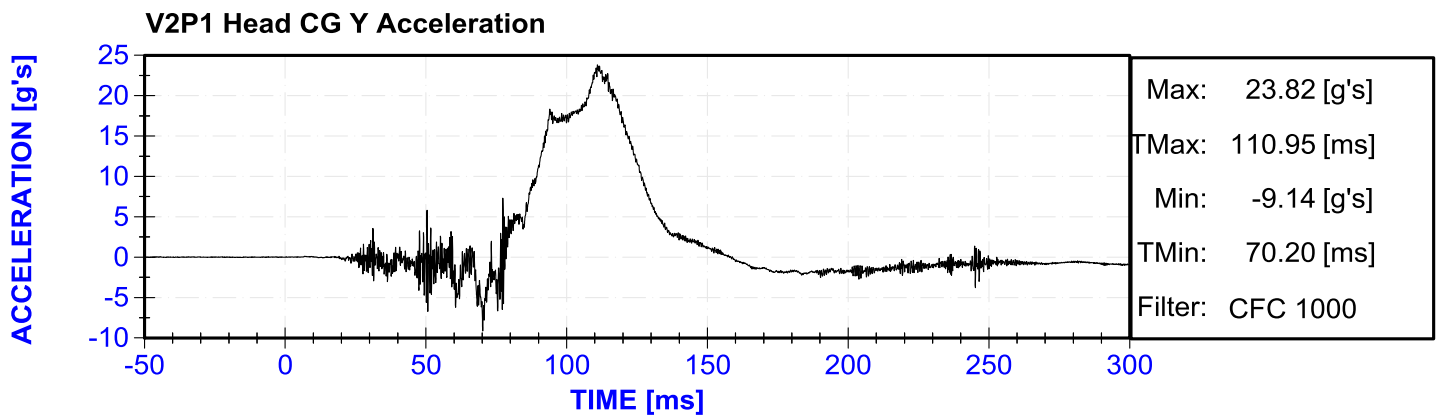
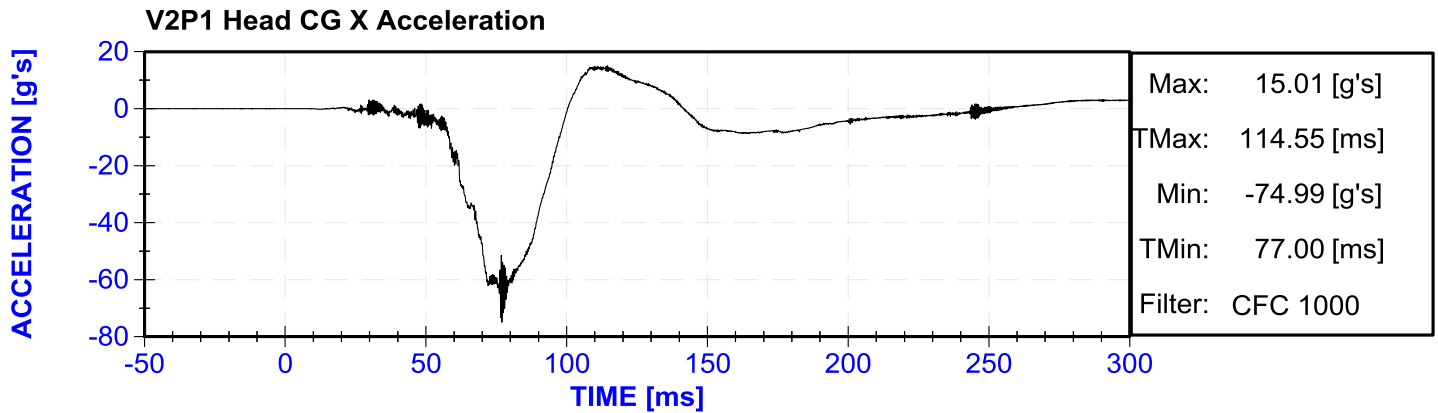
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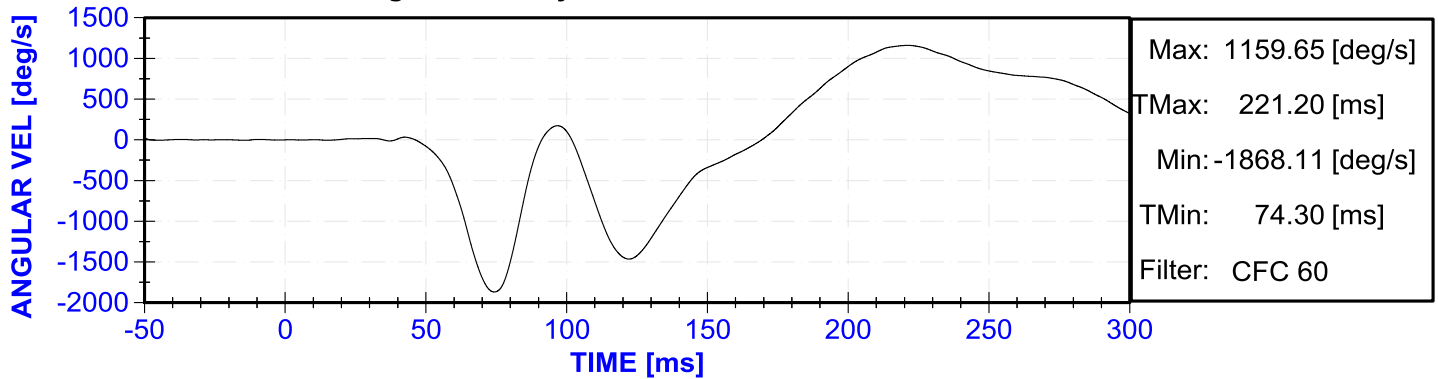
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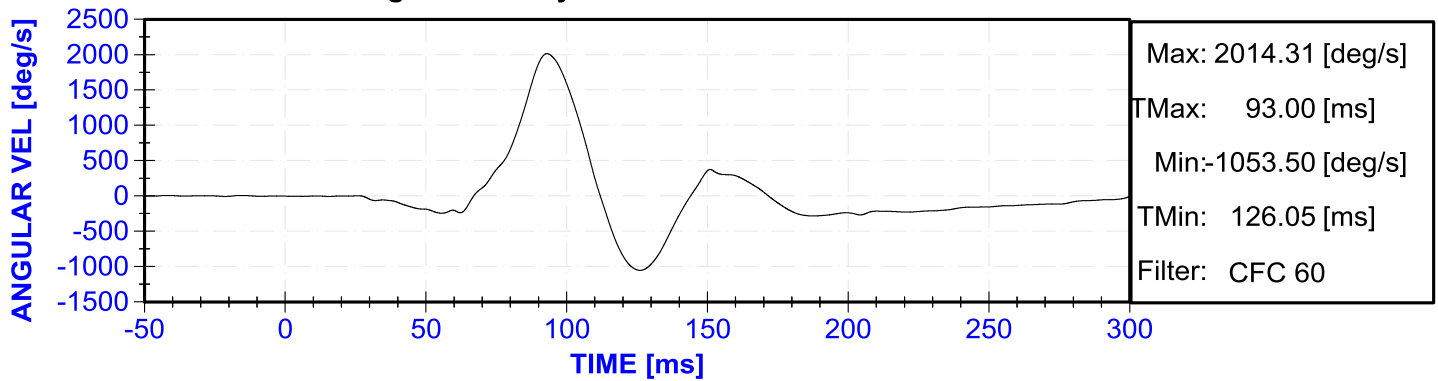
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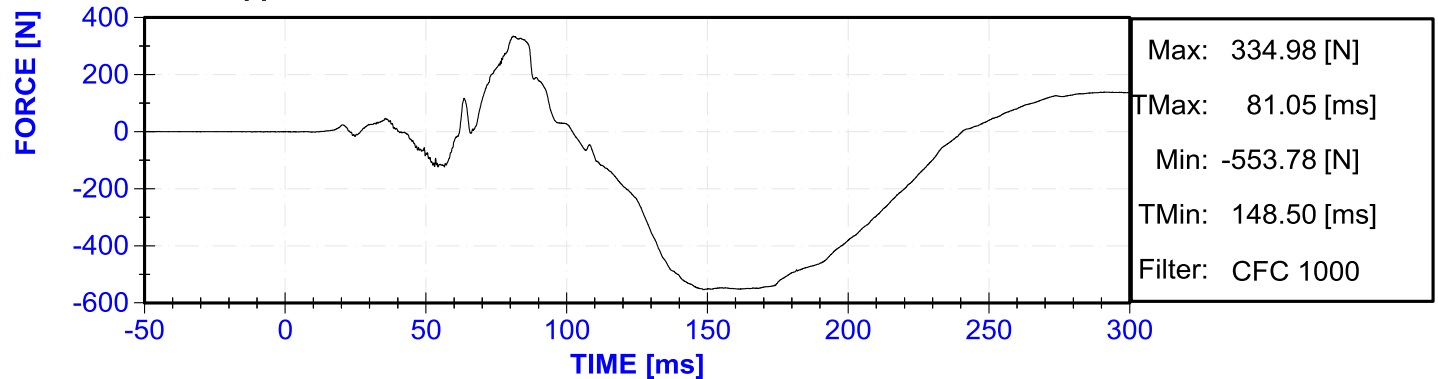
V2P1 Head CG Angular Velocity About Y



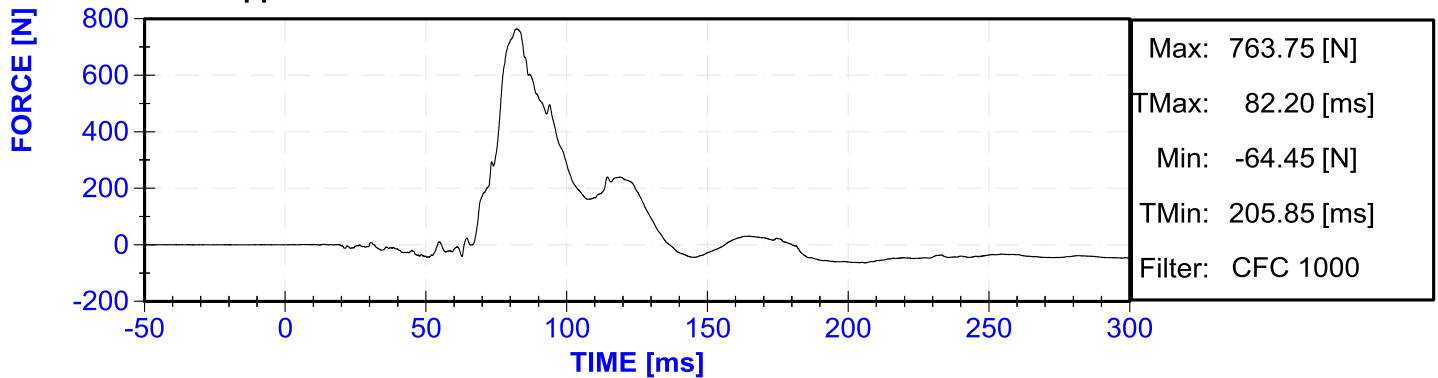
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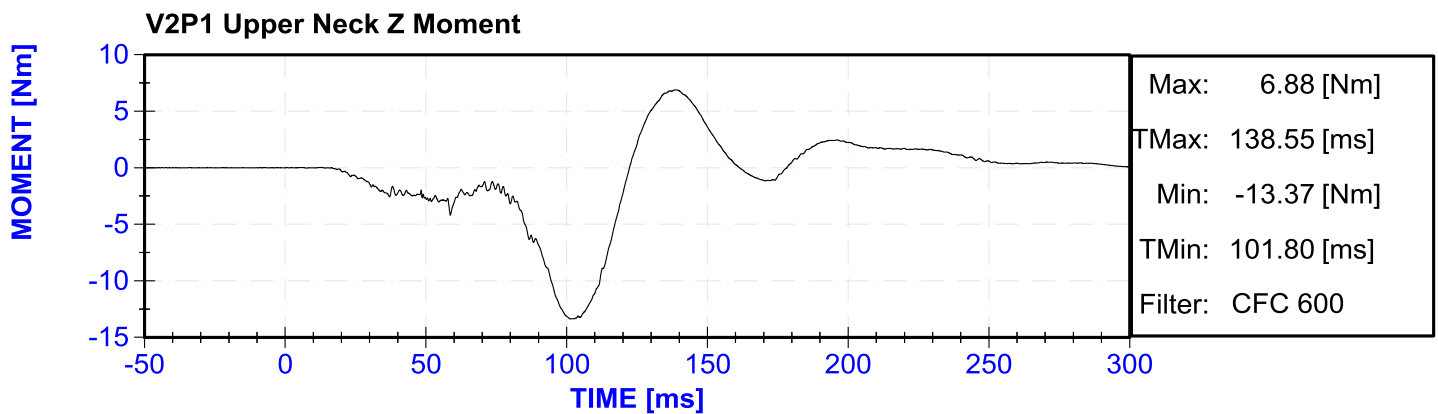
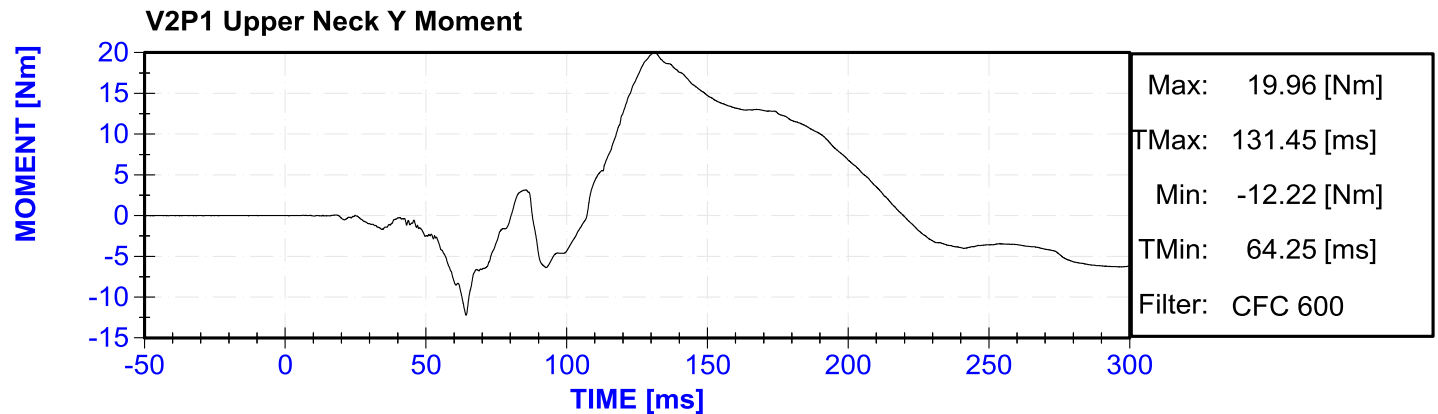
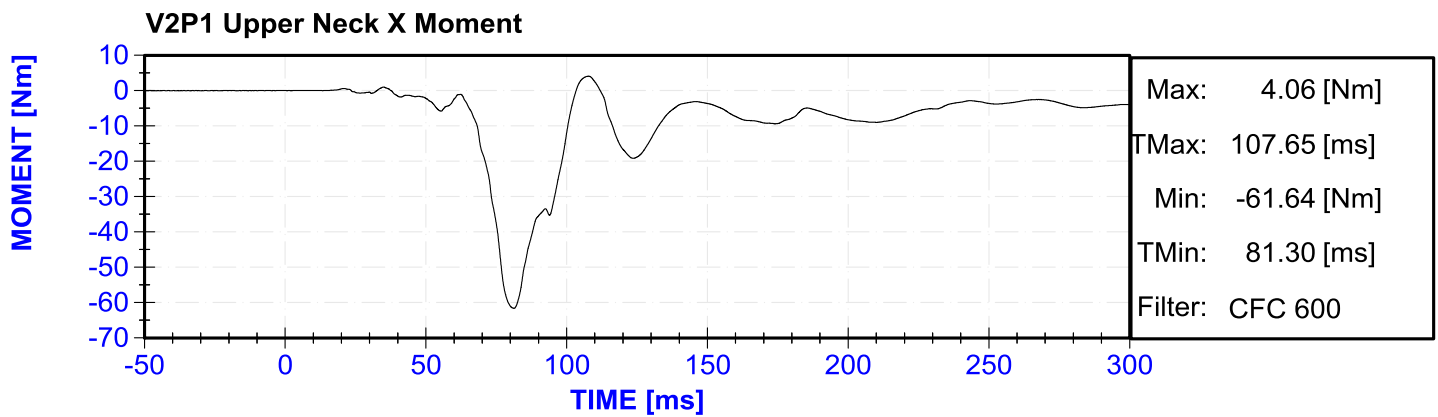
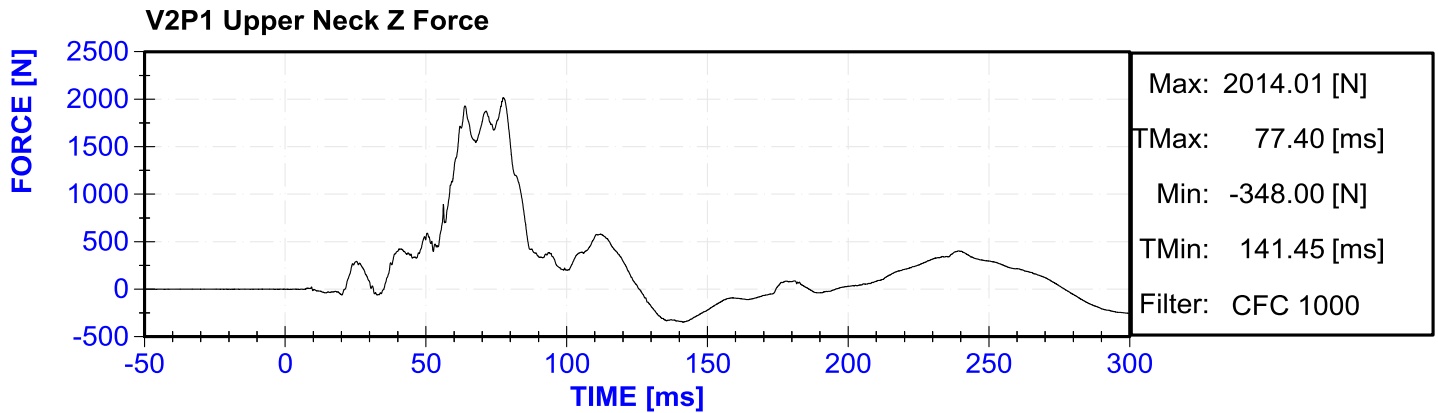


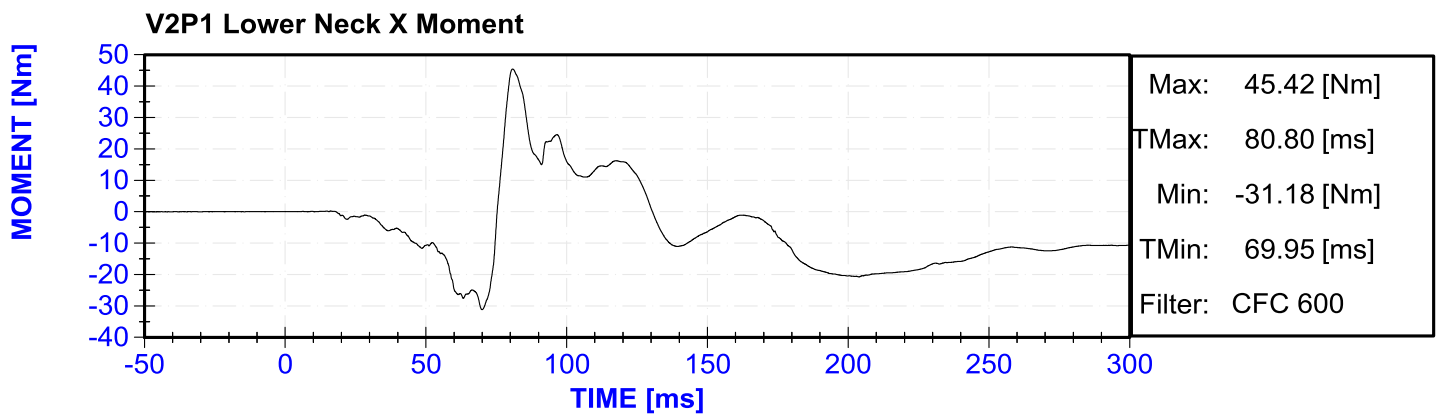
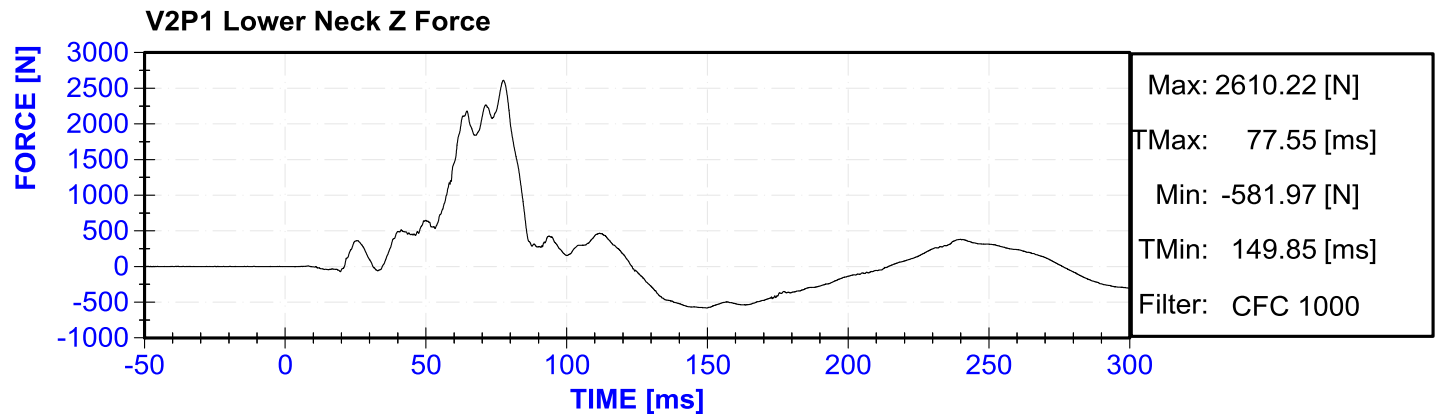
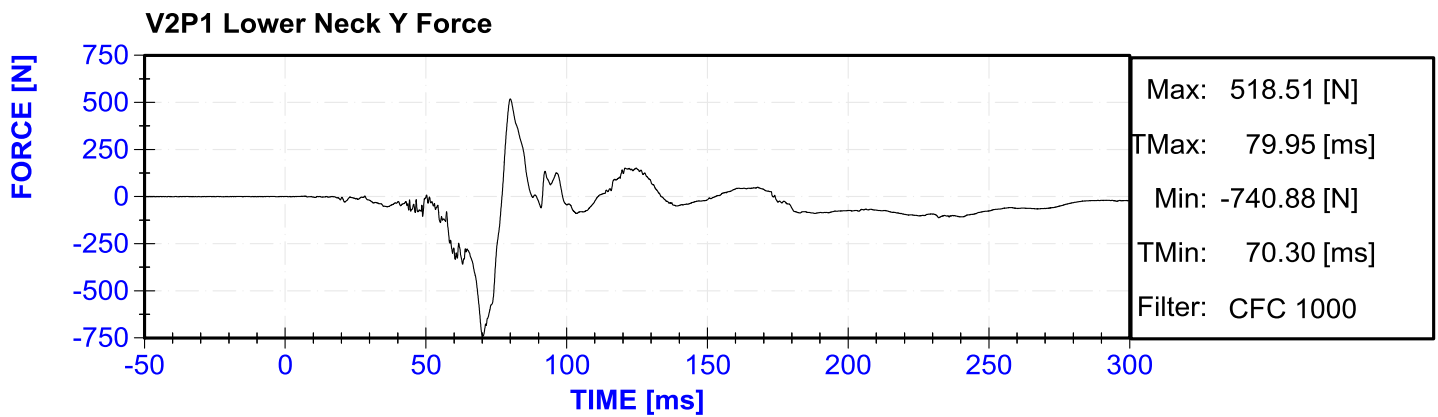
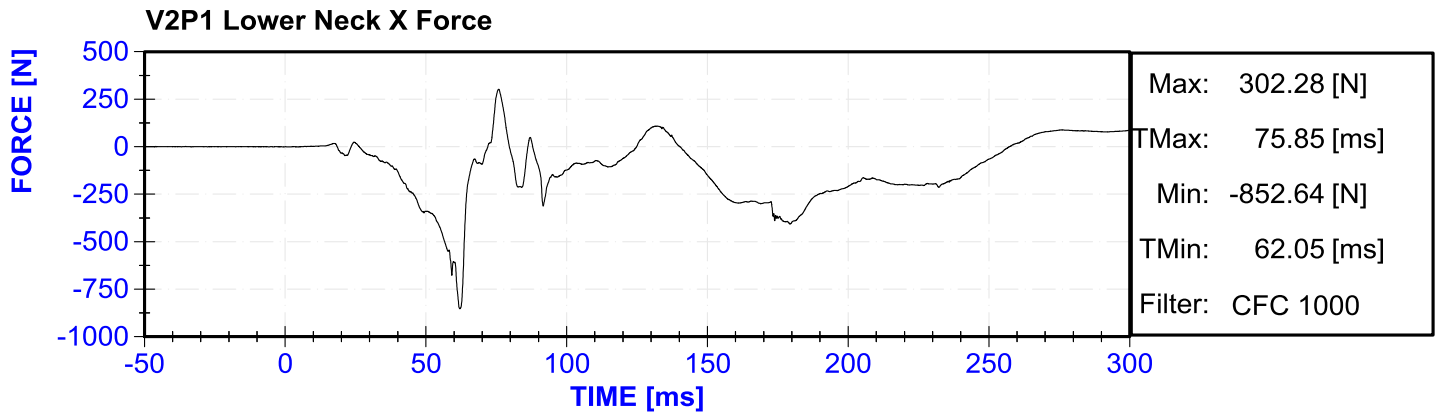
V2P1 Upper Neck X Force

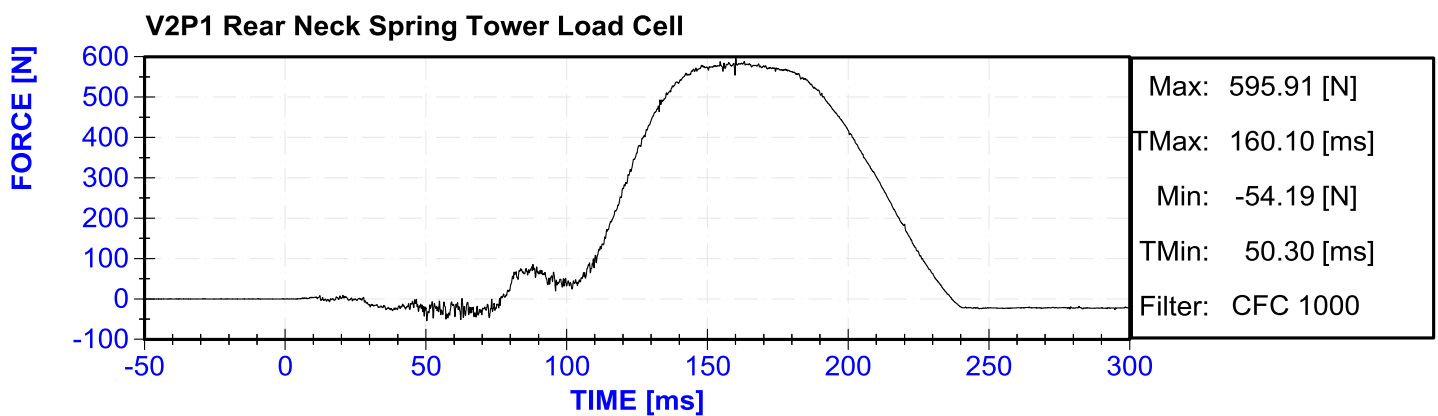
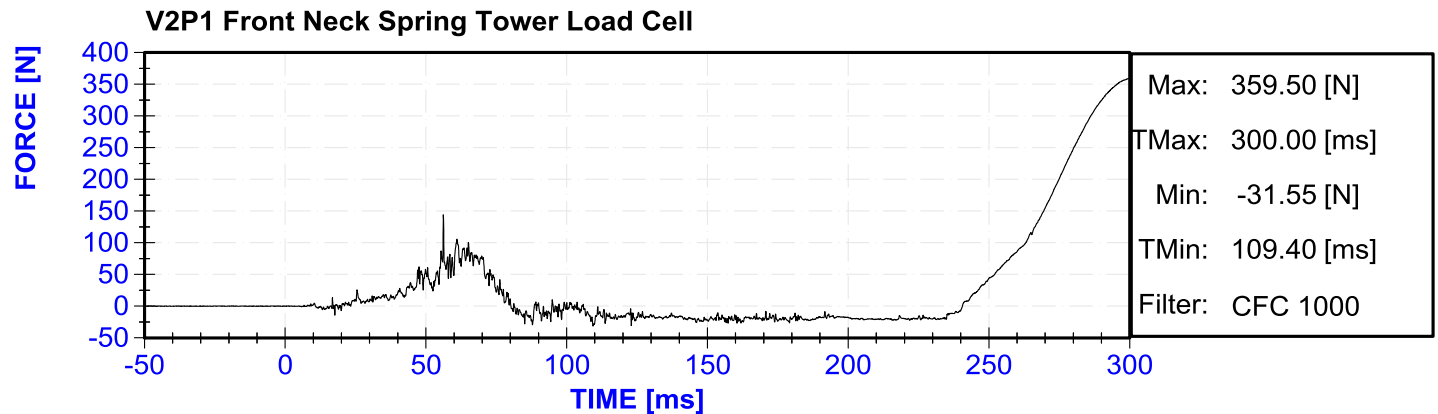
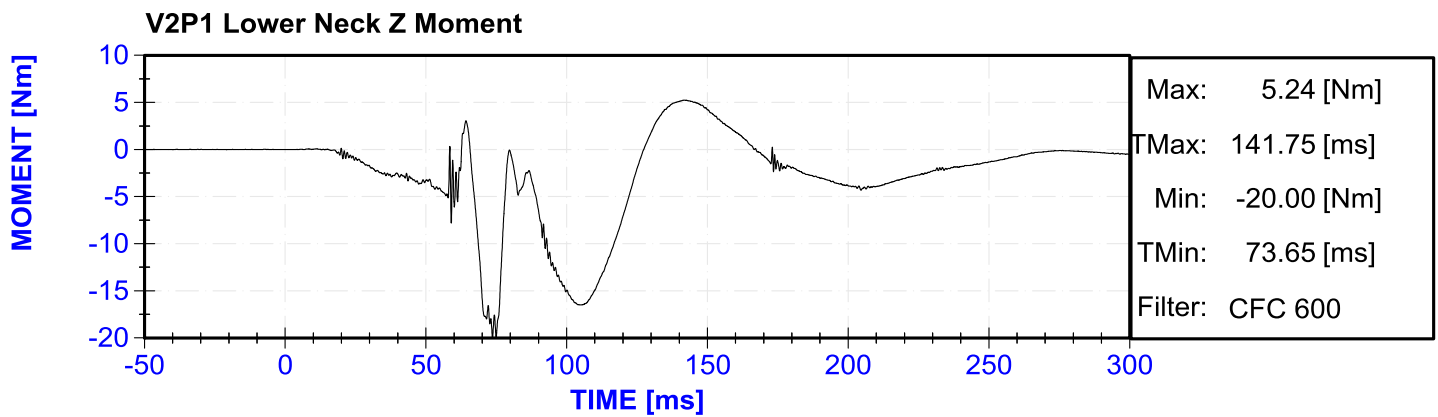
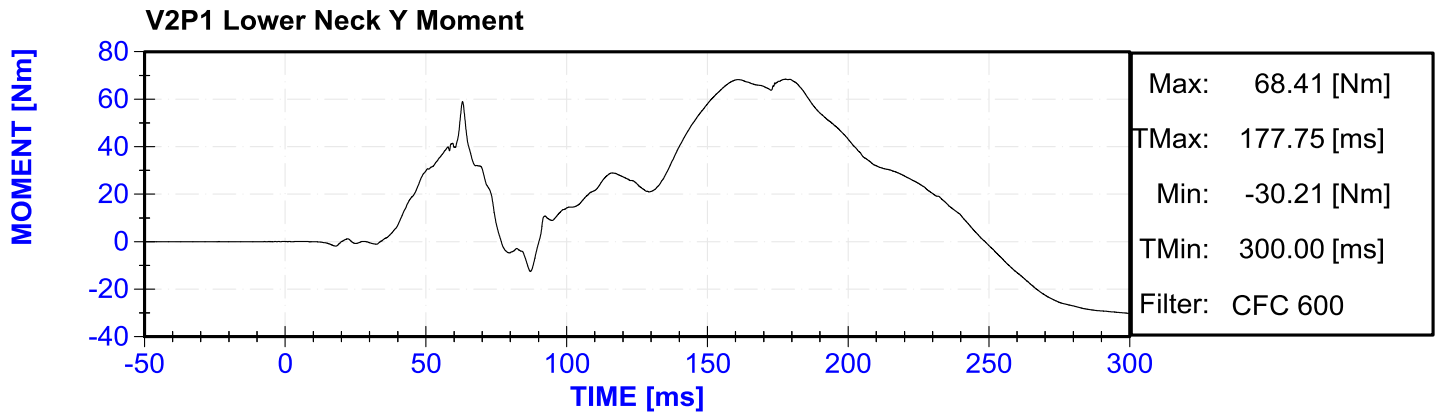


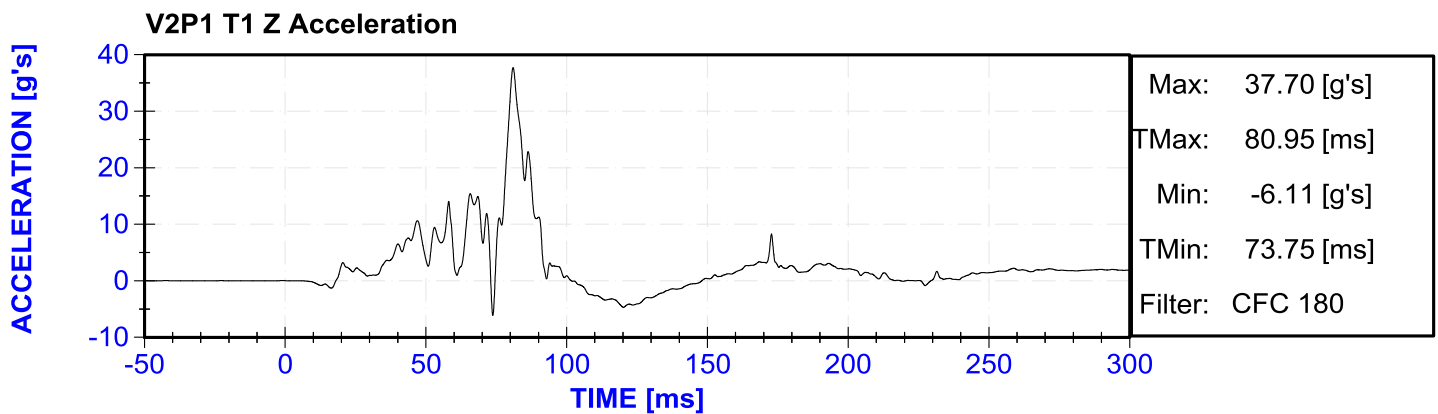
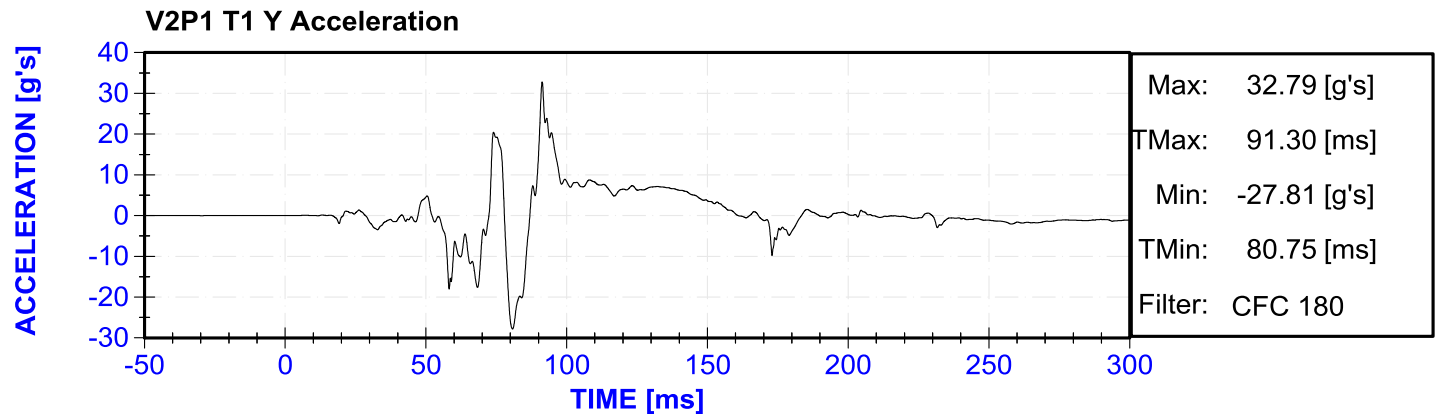
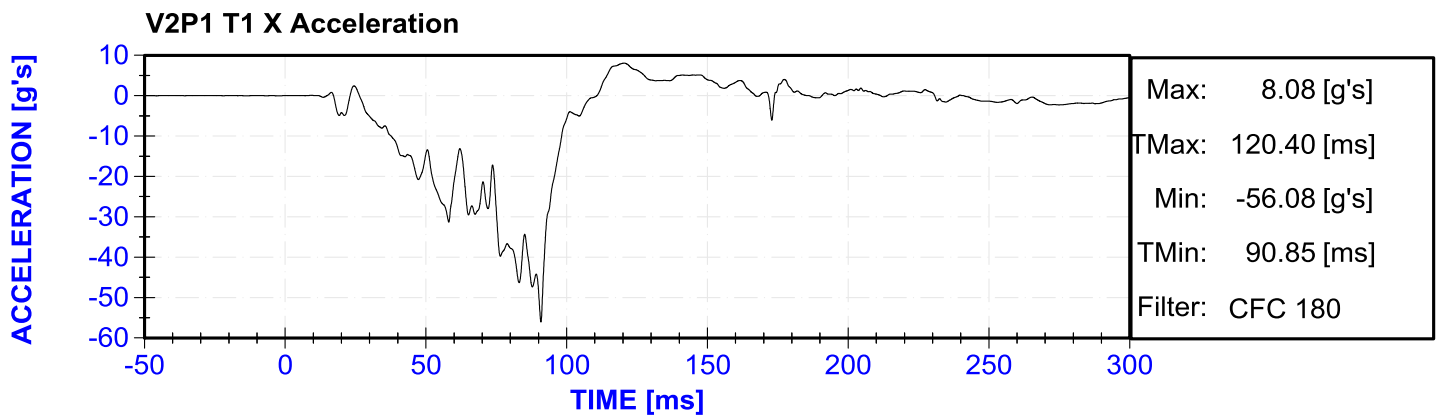
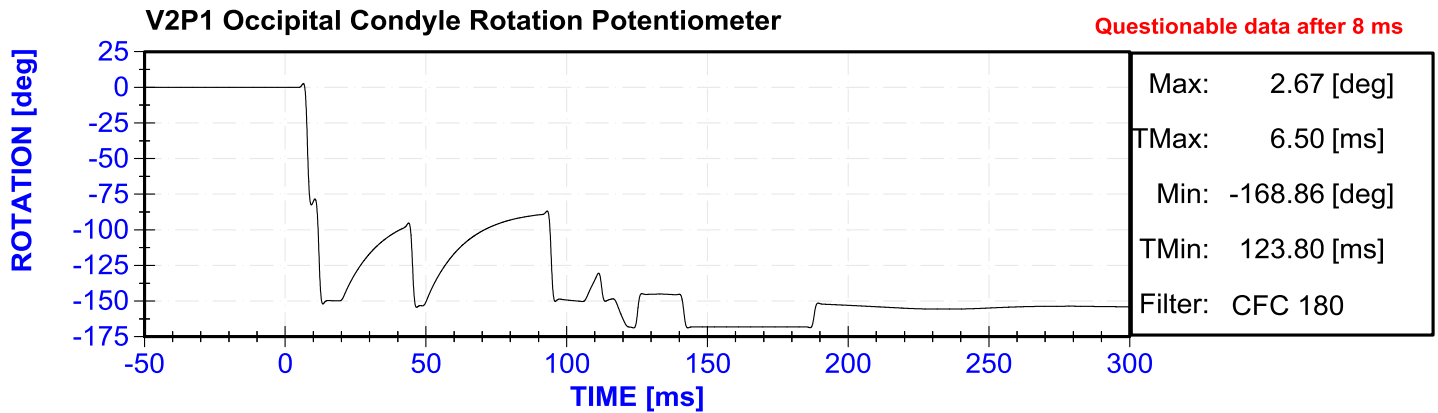
V2P1 Upper Neck Y Force

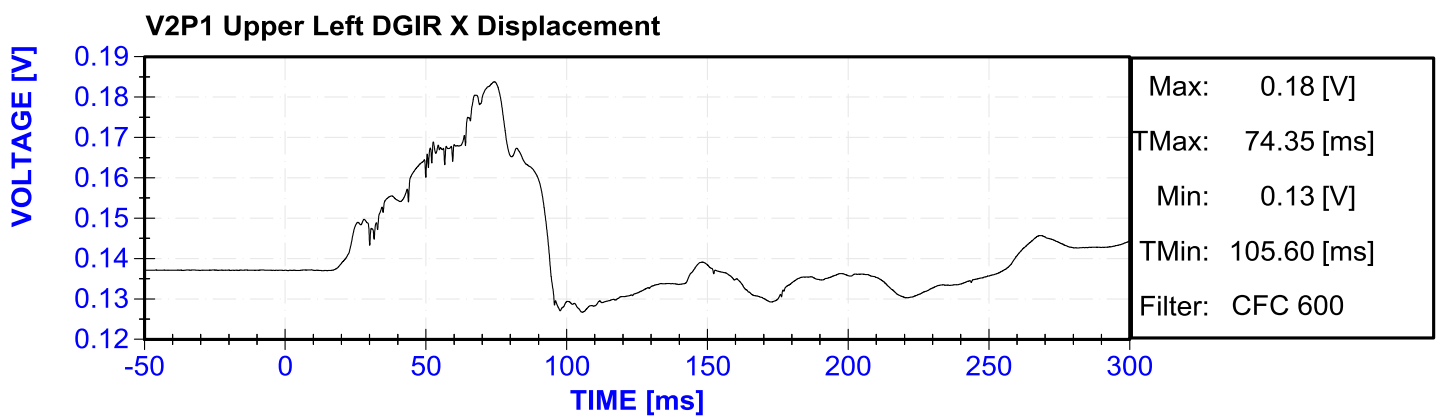
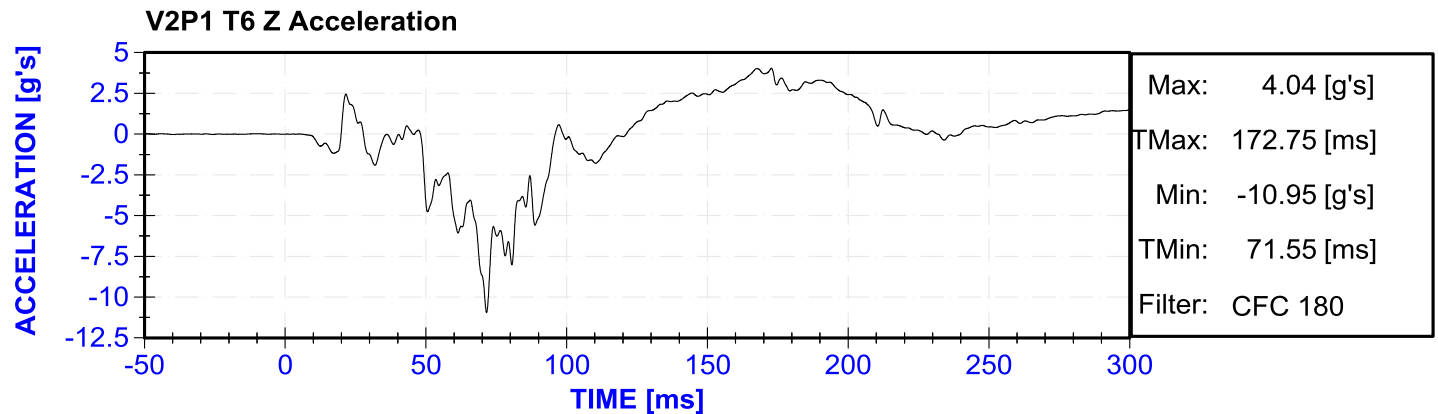
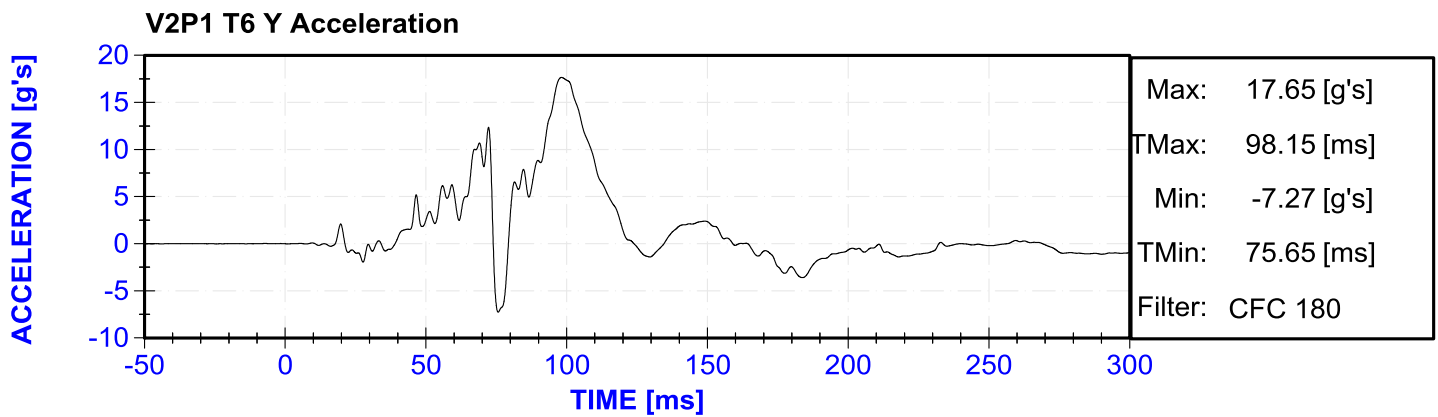
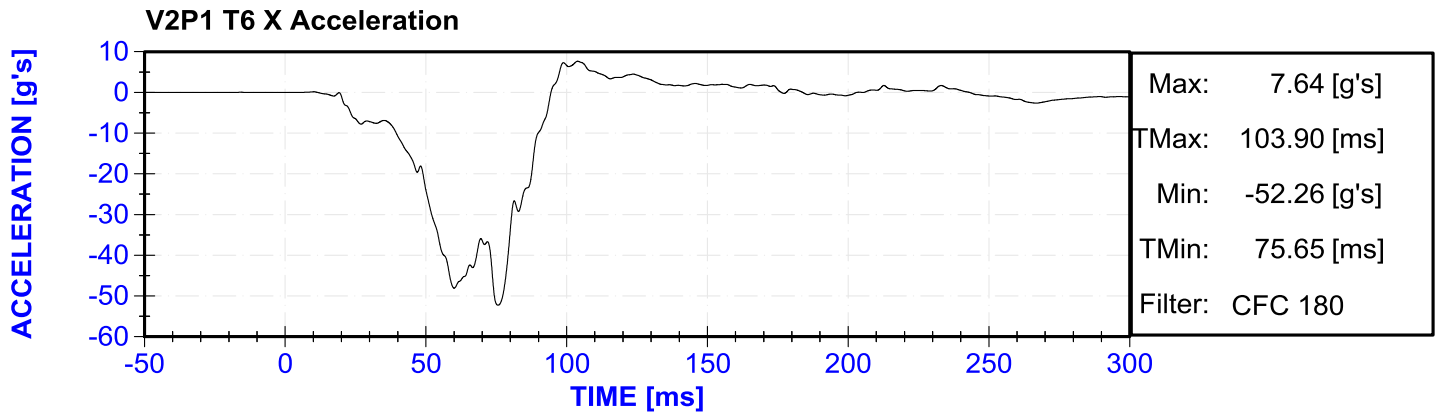


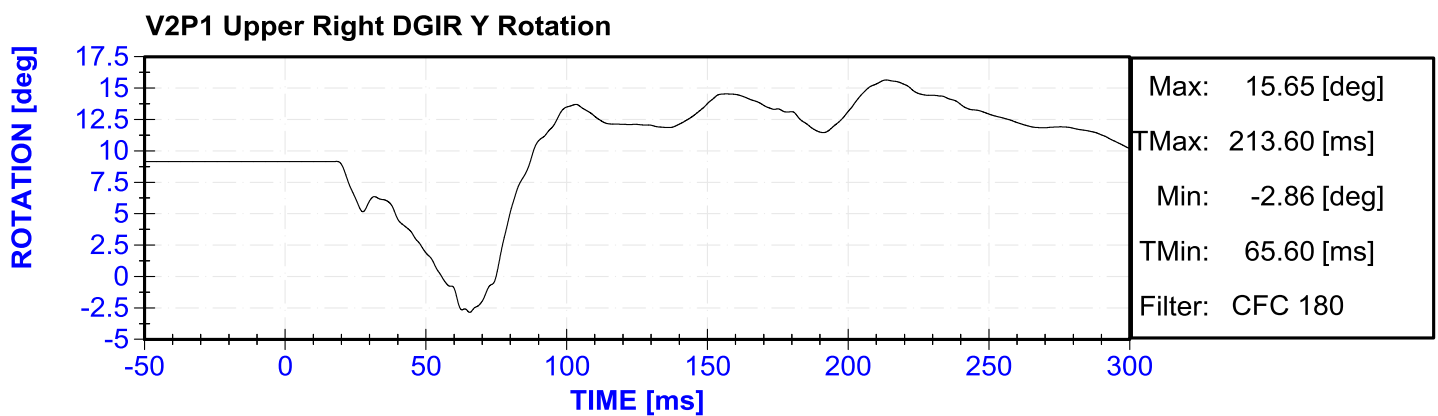
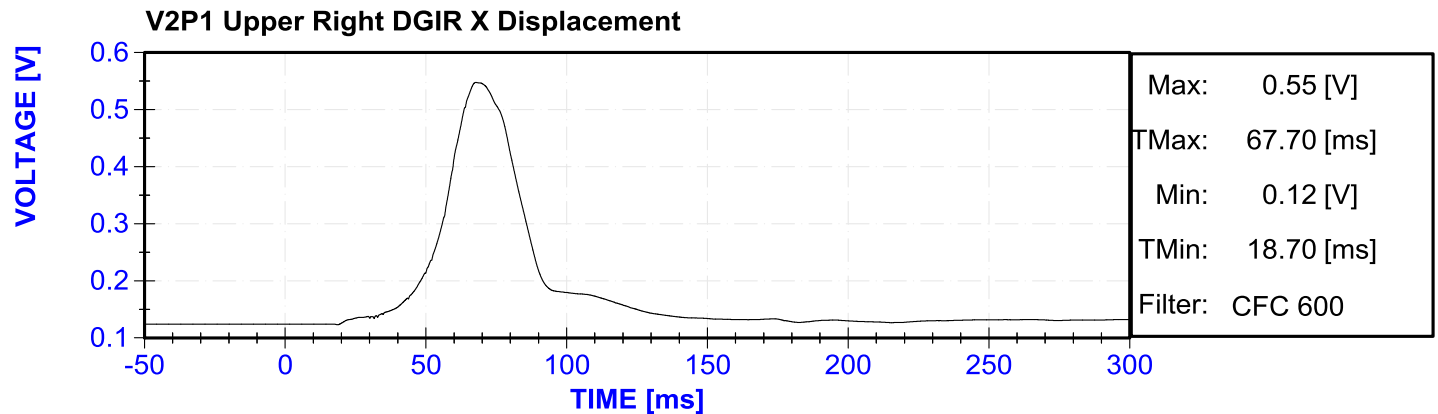
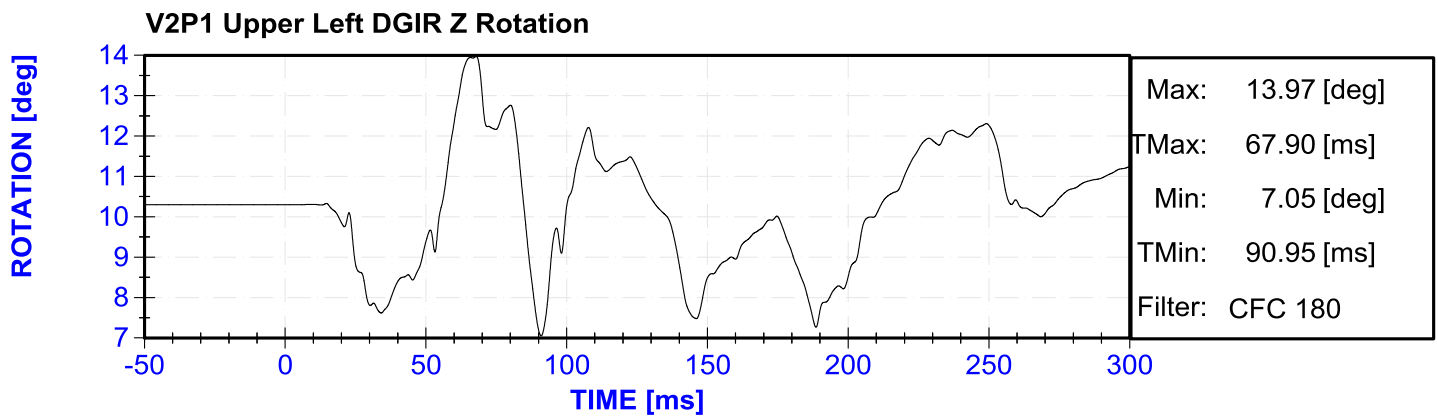
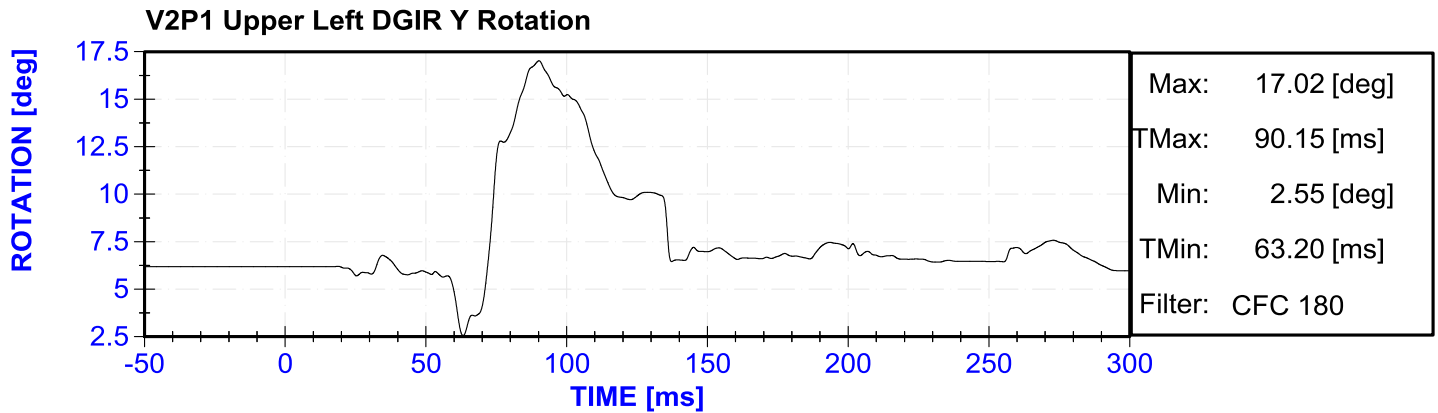




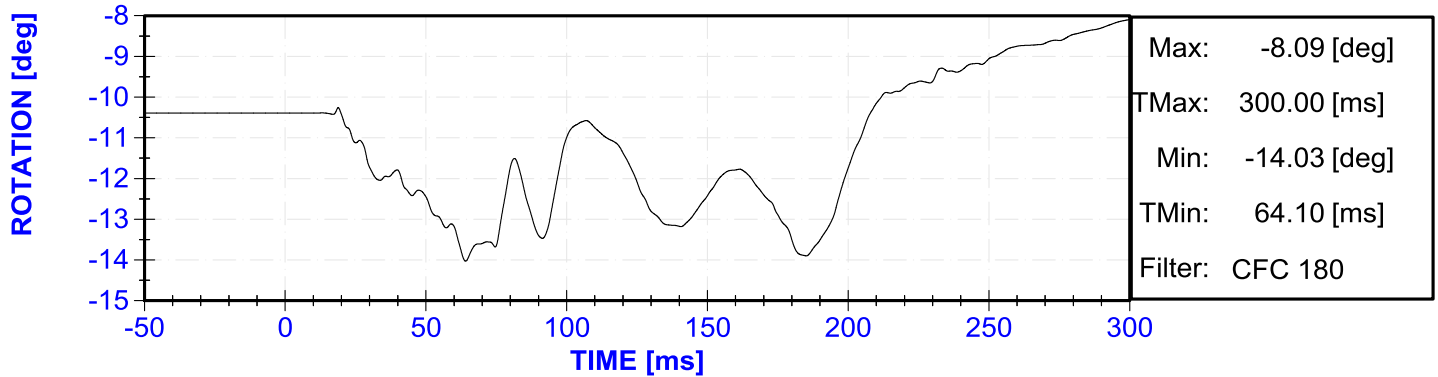




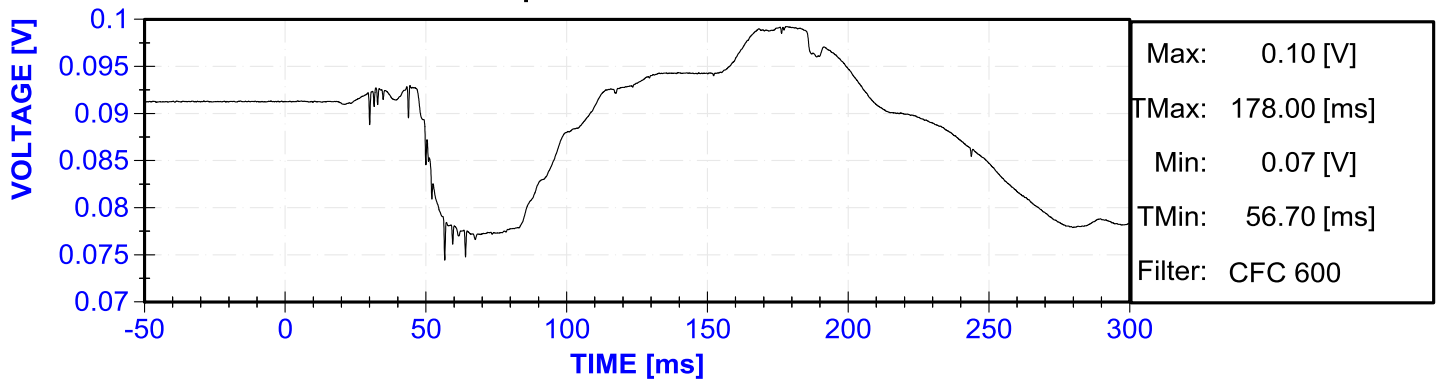




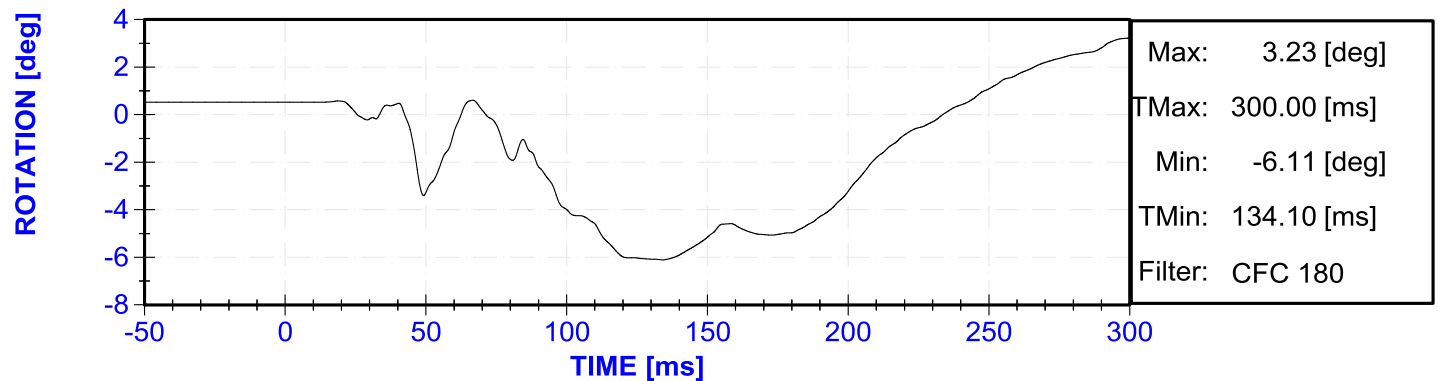
V2P1 Upper Right DGIR Z Rotation



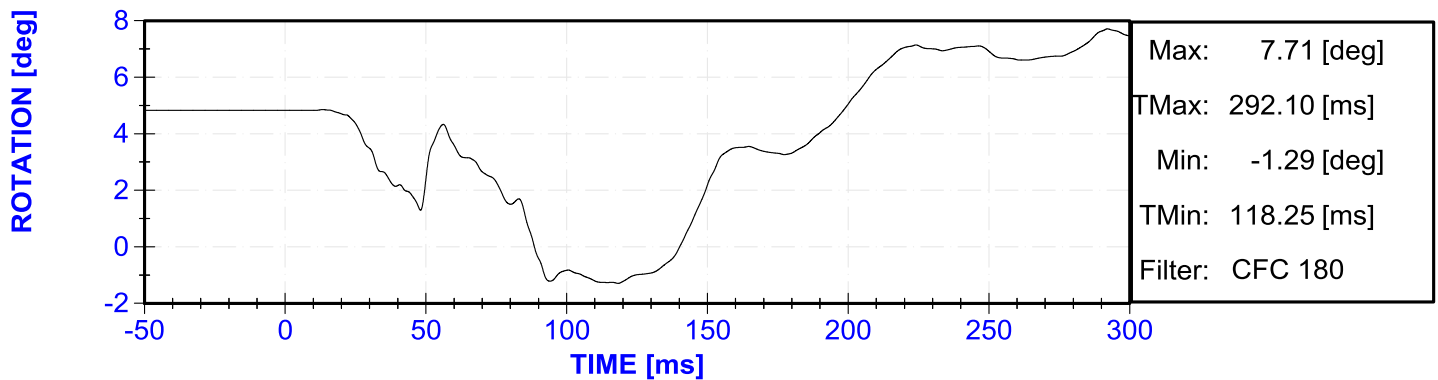
V2P1 Lower Left DGIR X Displacement



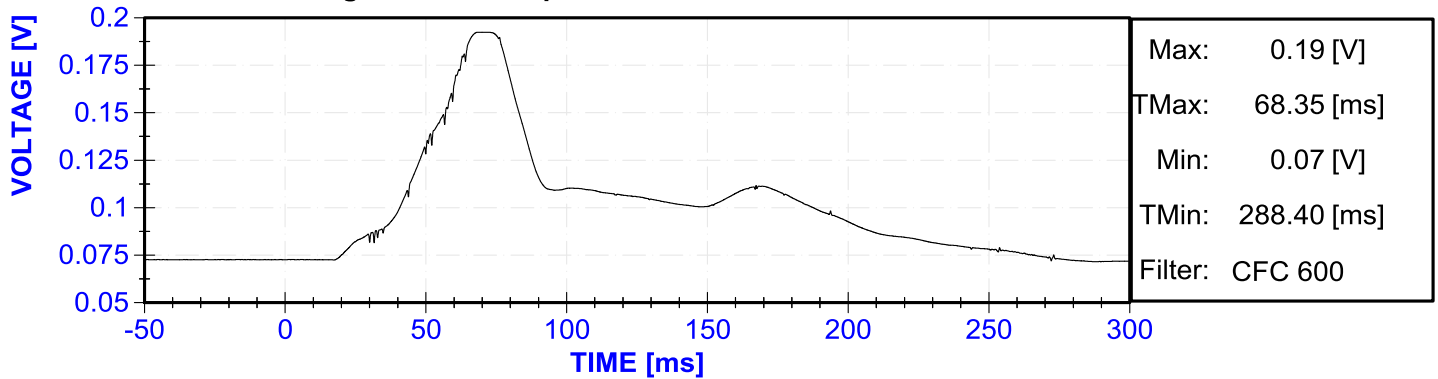
V2P1 Lower Left DGIR Y Rotation



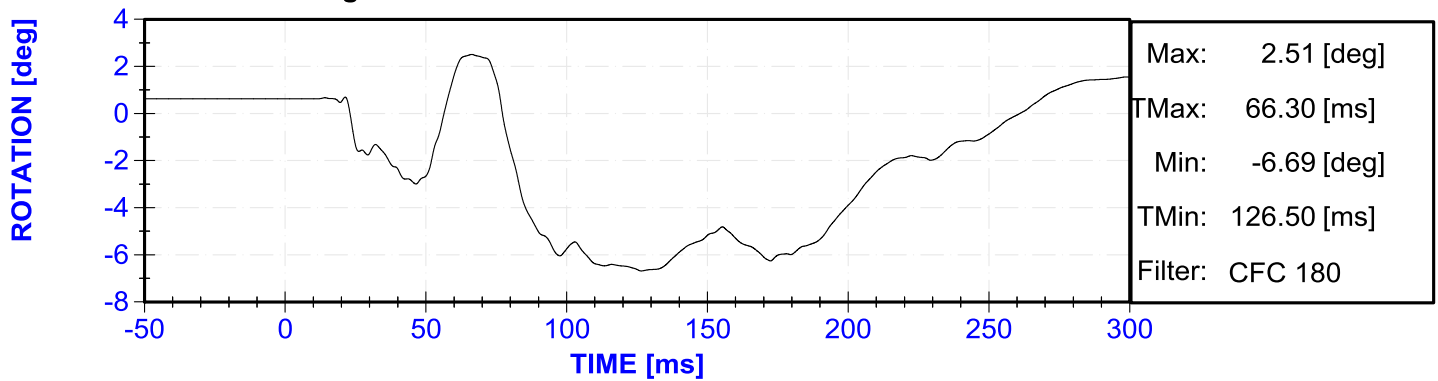
V2P1 Lower Left DGIR Z Rotation



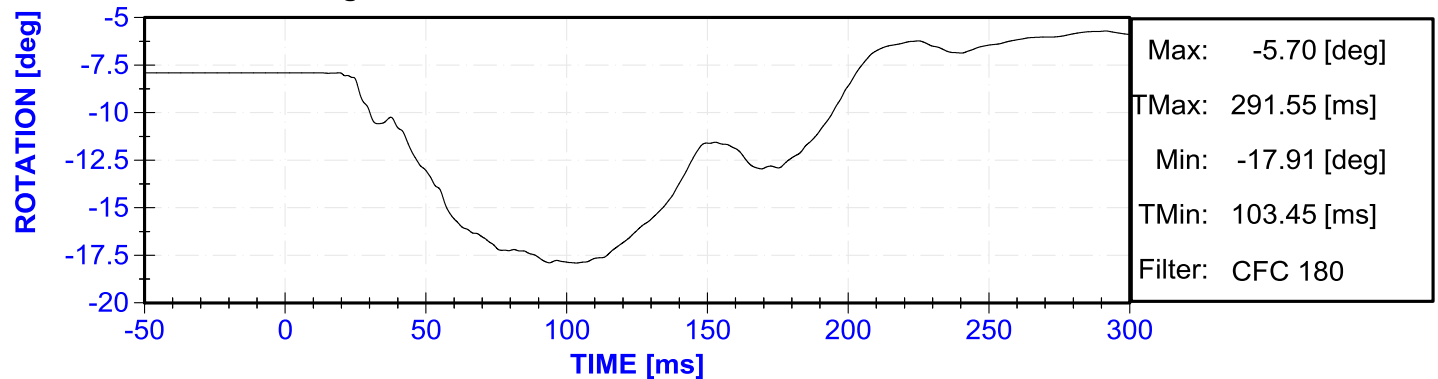
V2P1 Lower Right DGIR X Displacement



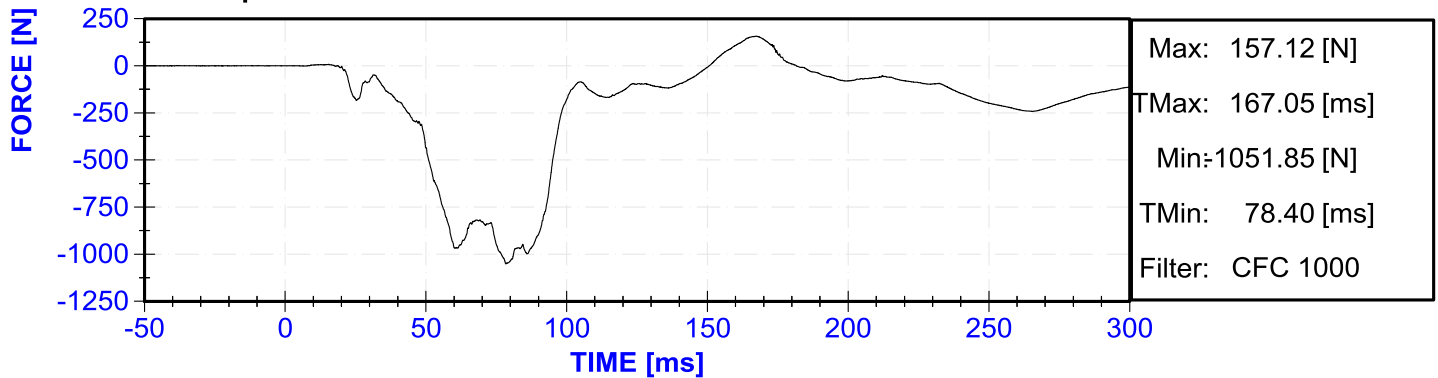
V2P1 Lower Right DGIR Y Rotation

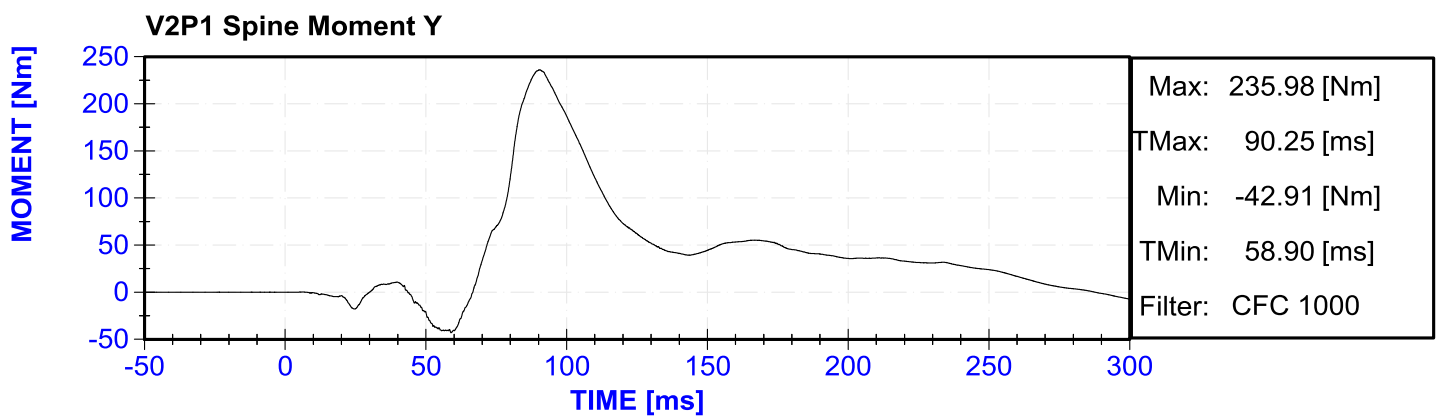
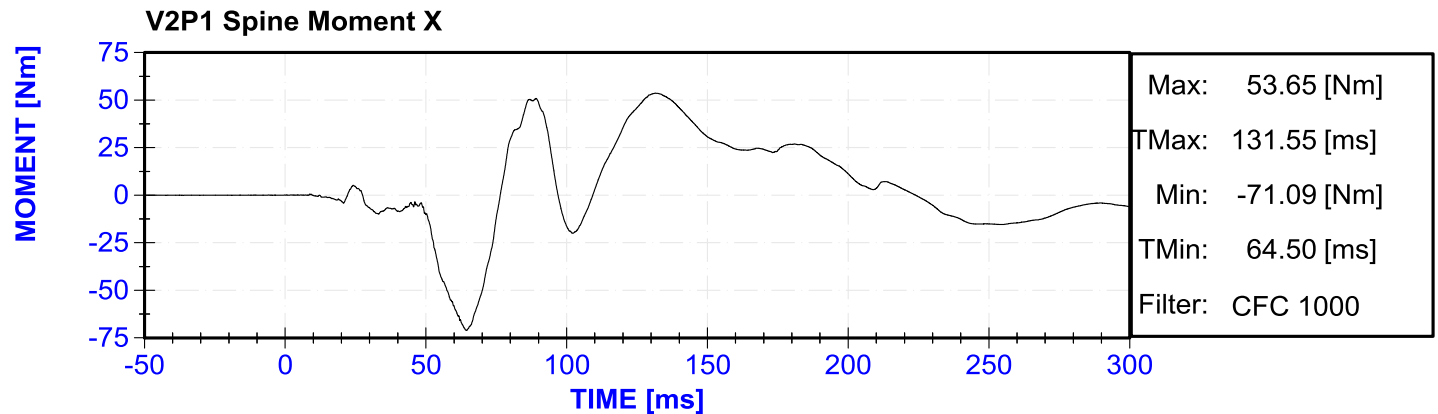
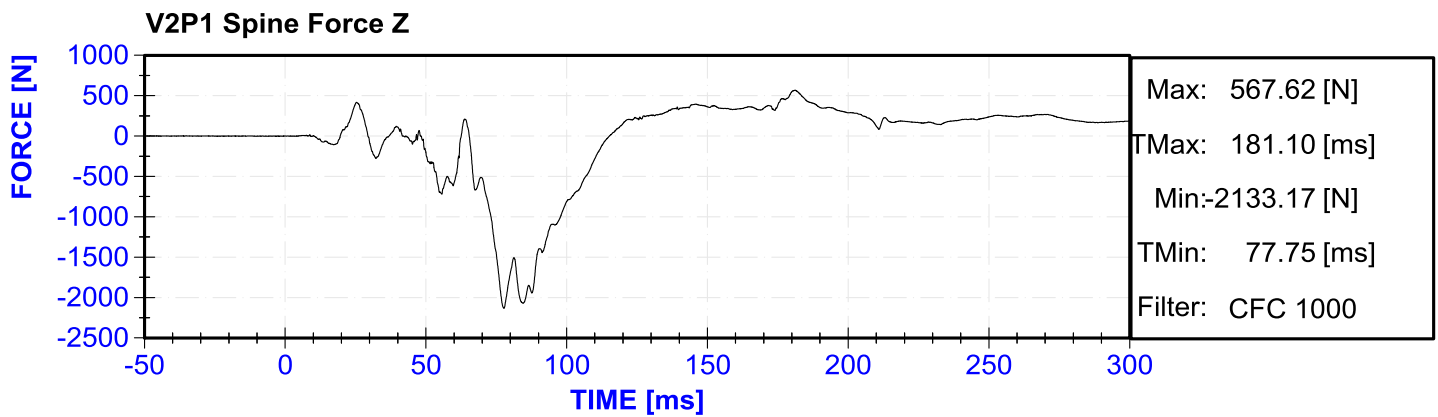
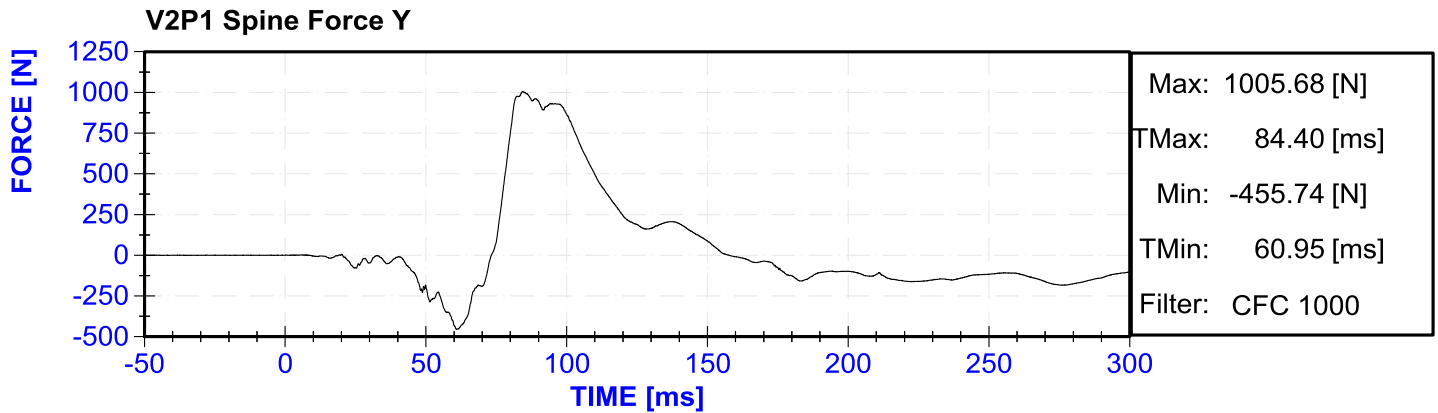


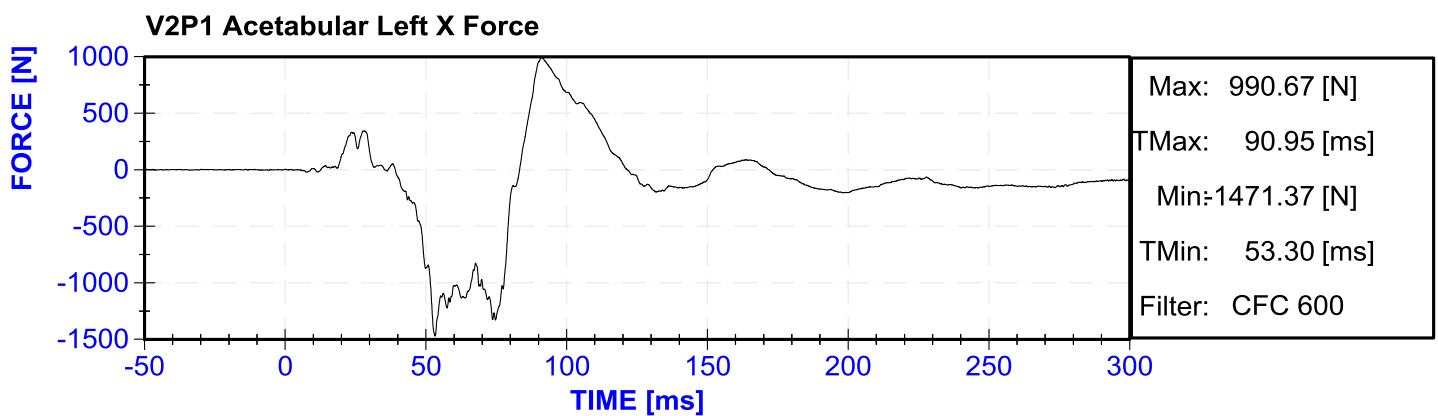
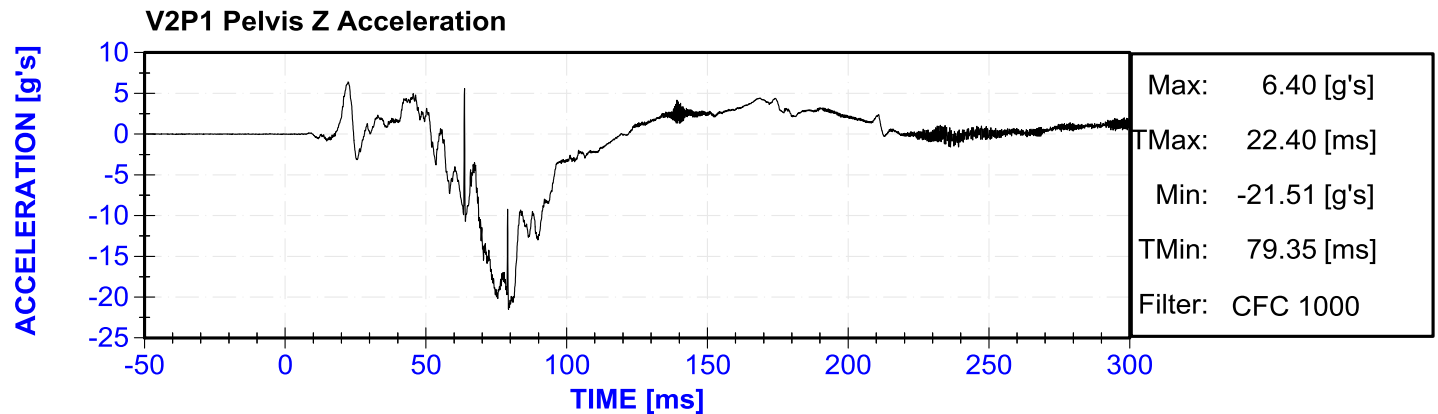
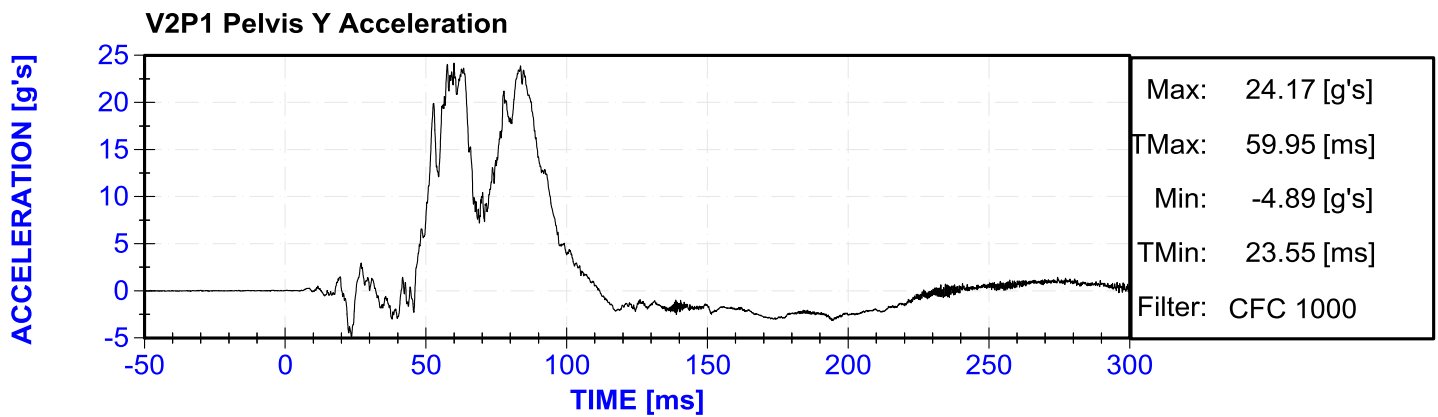
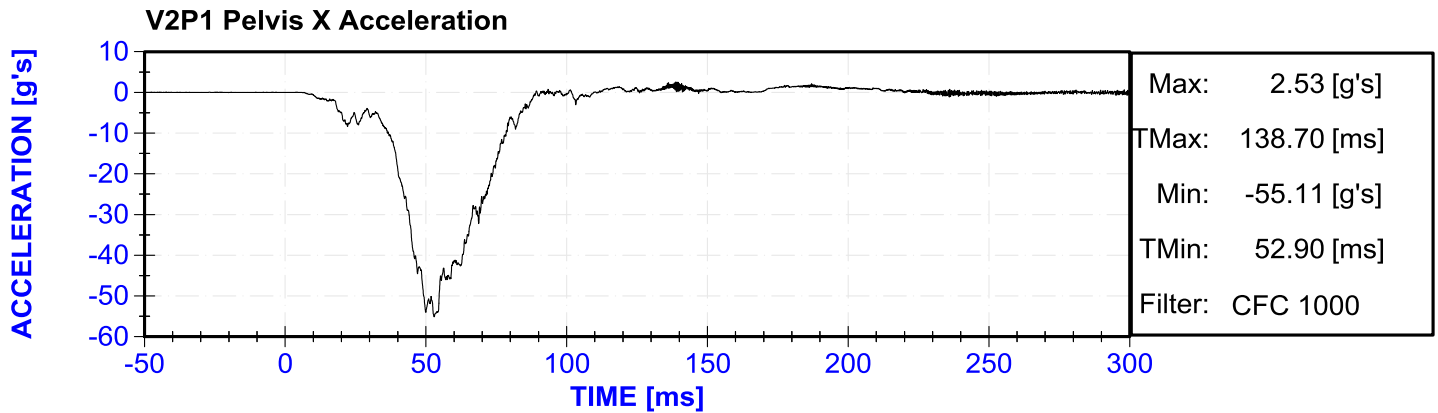
V2P1 Lower Right DGIR Z Rotation

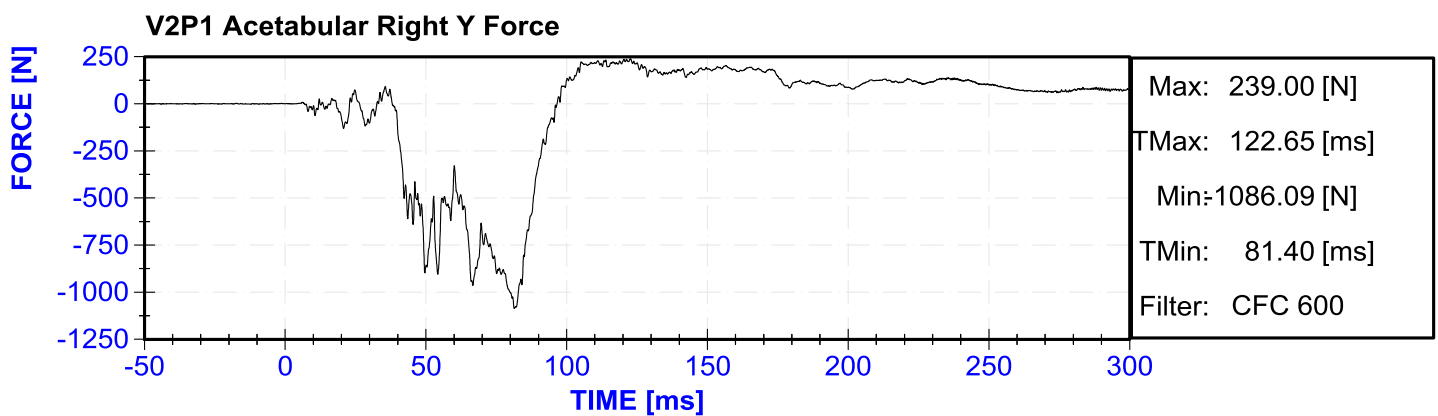
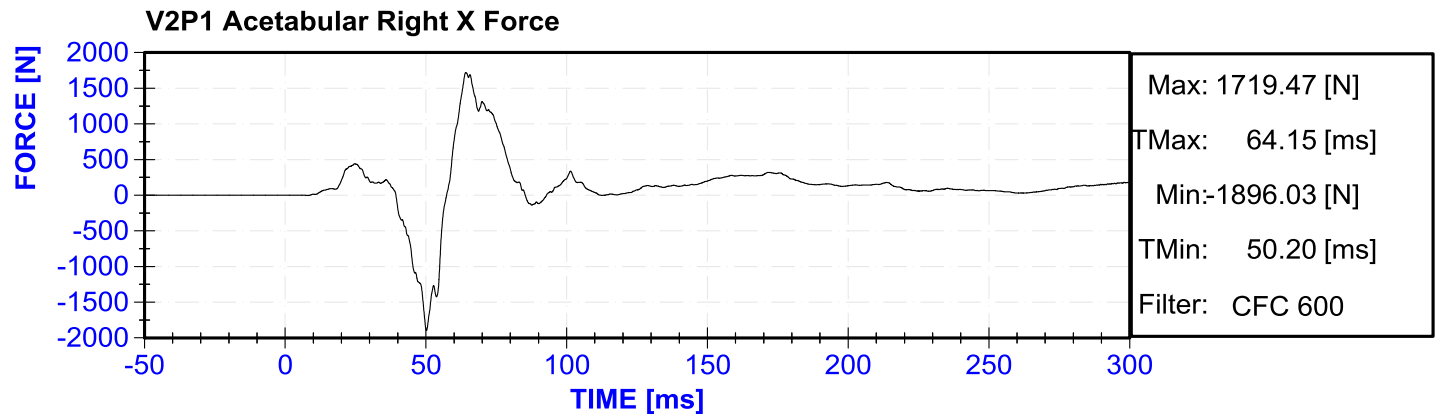
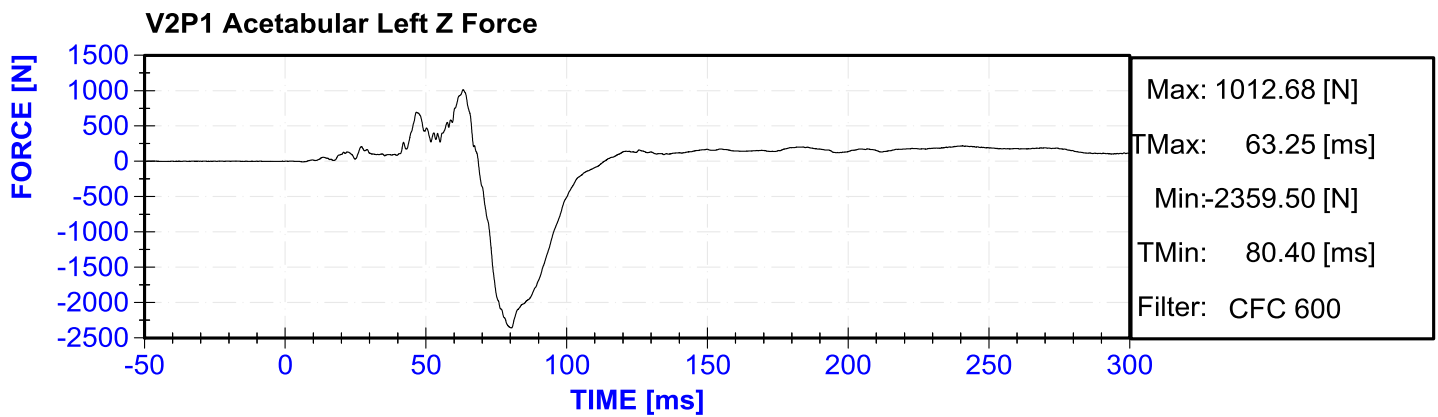
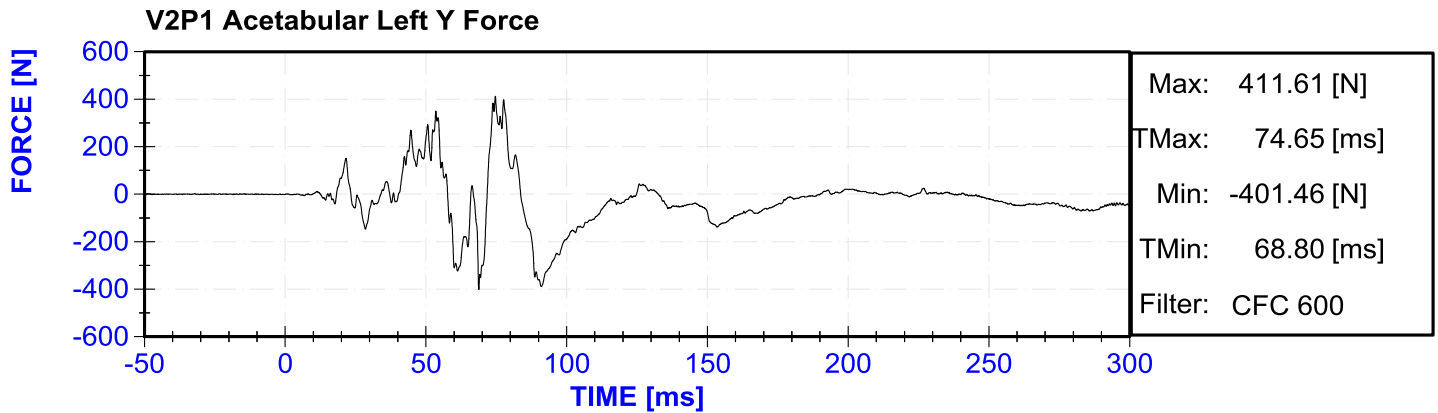


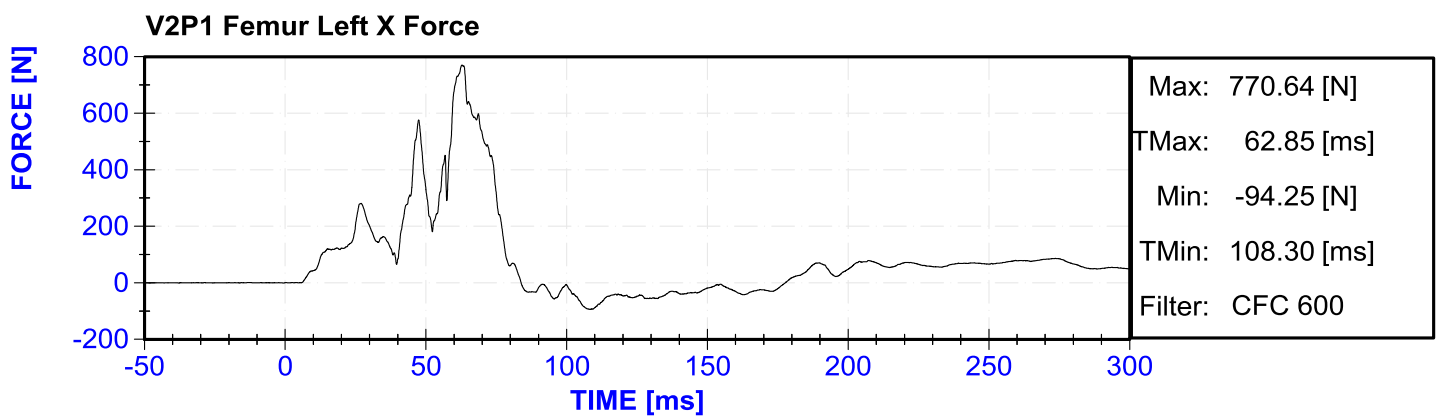
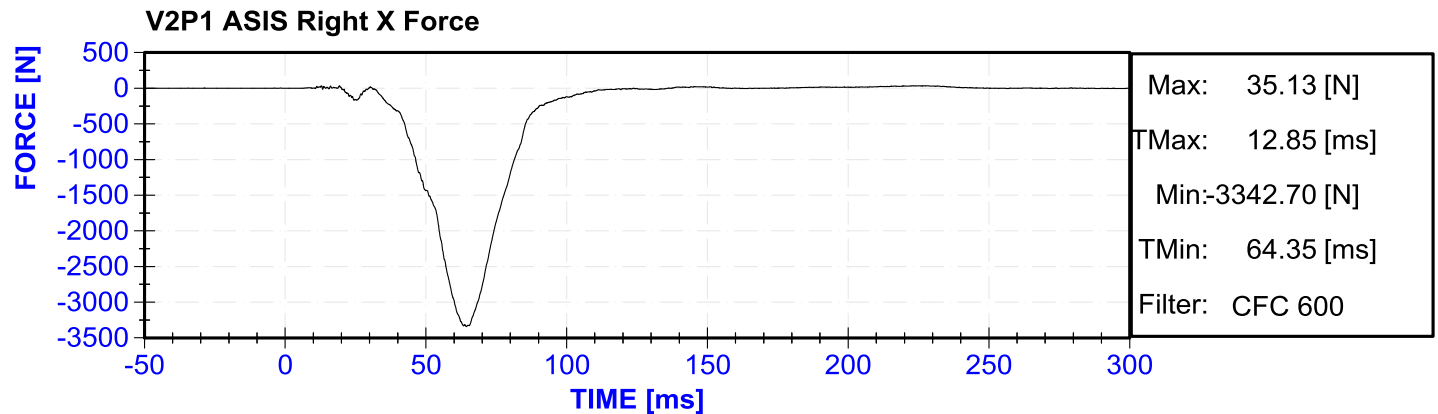
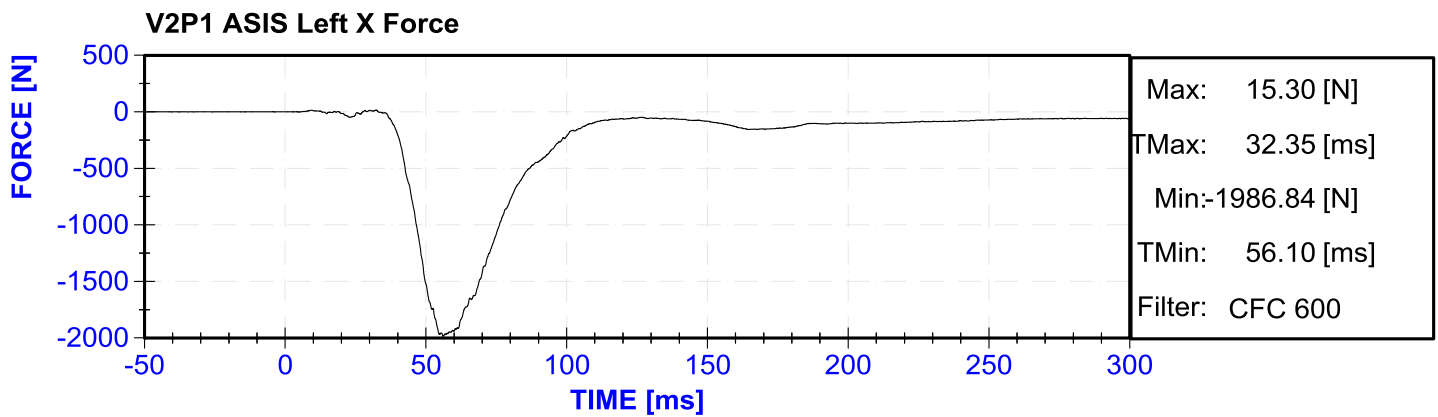
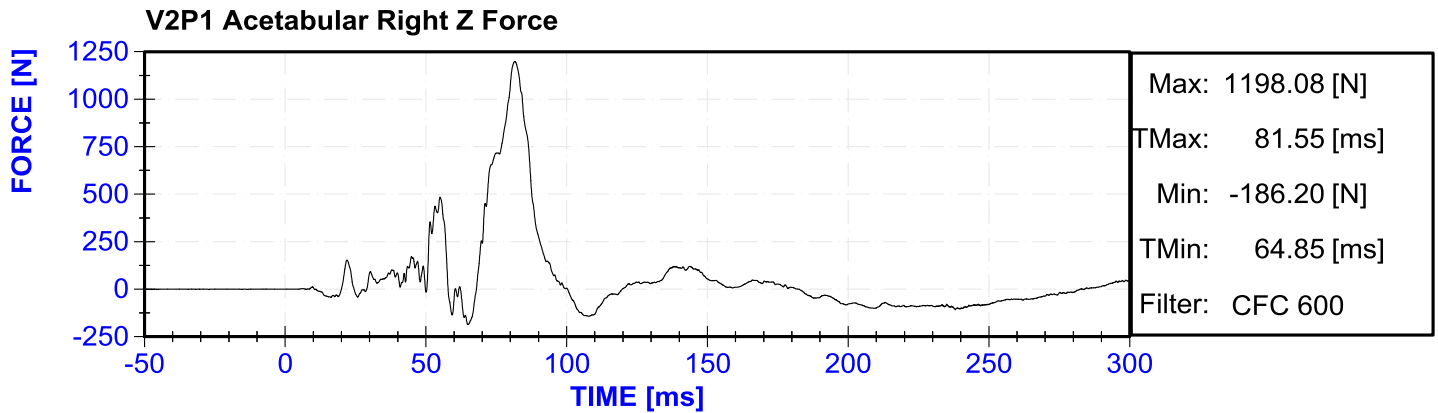
V2P1 Spine Force X

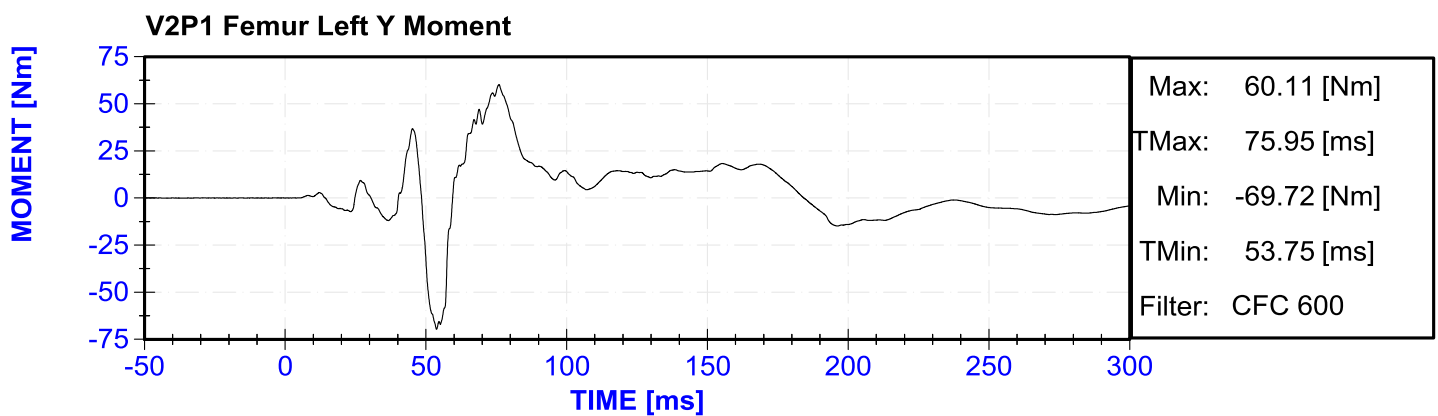
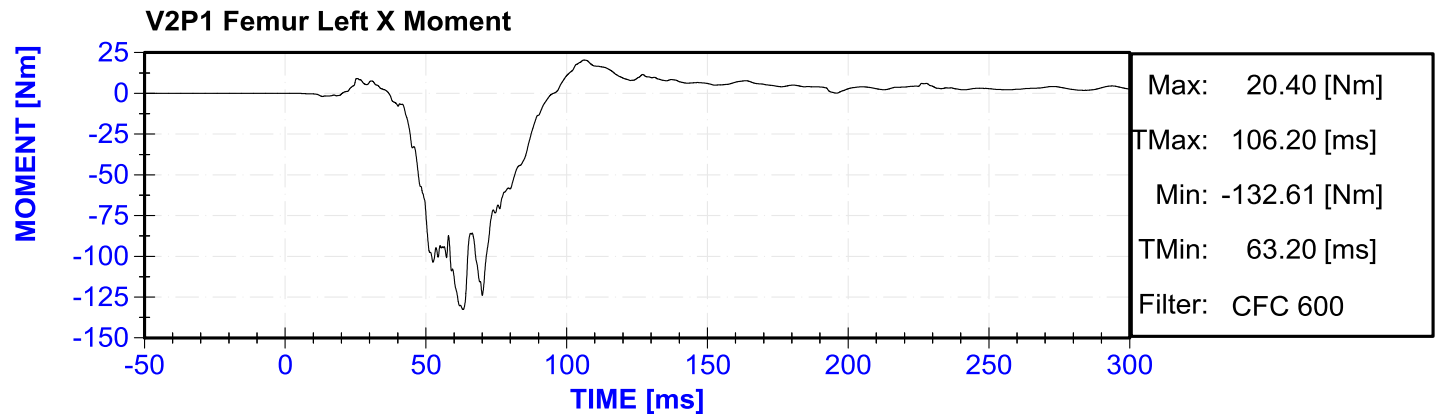
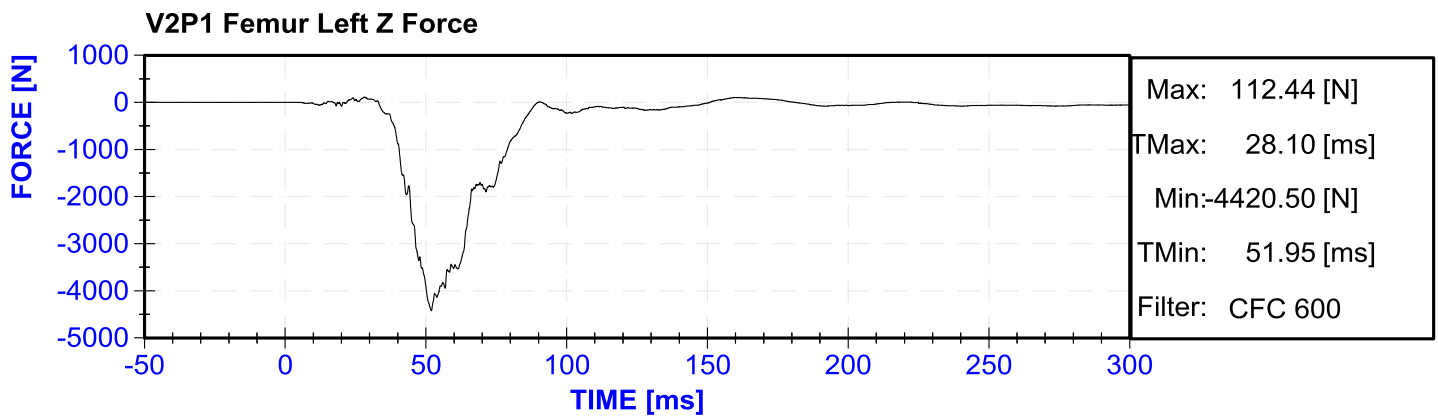
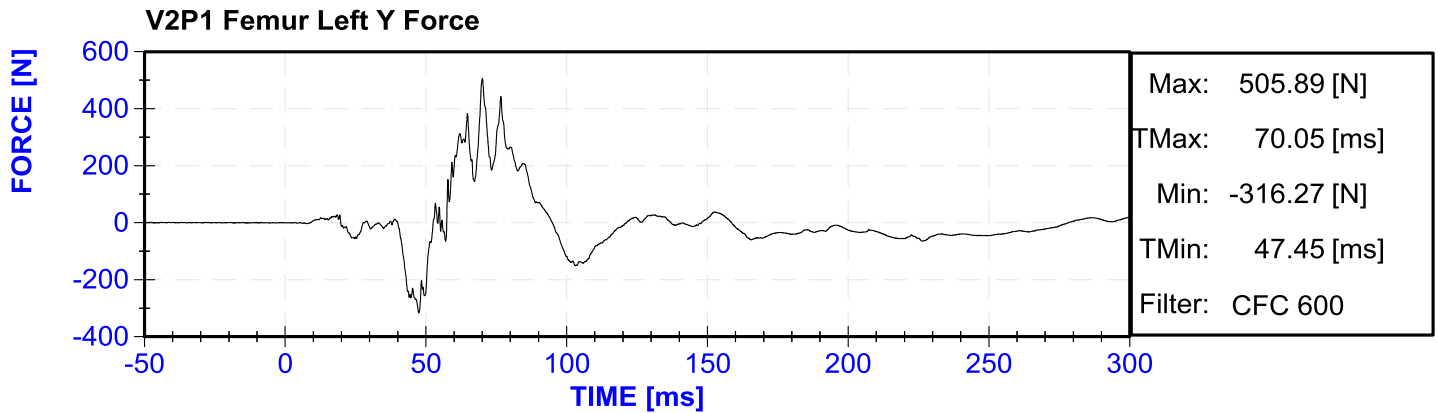


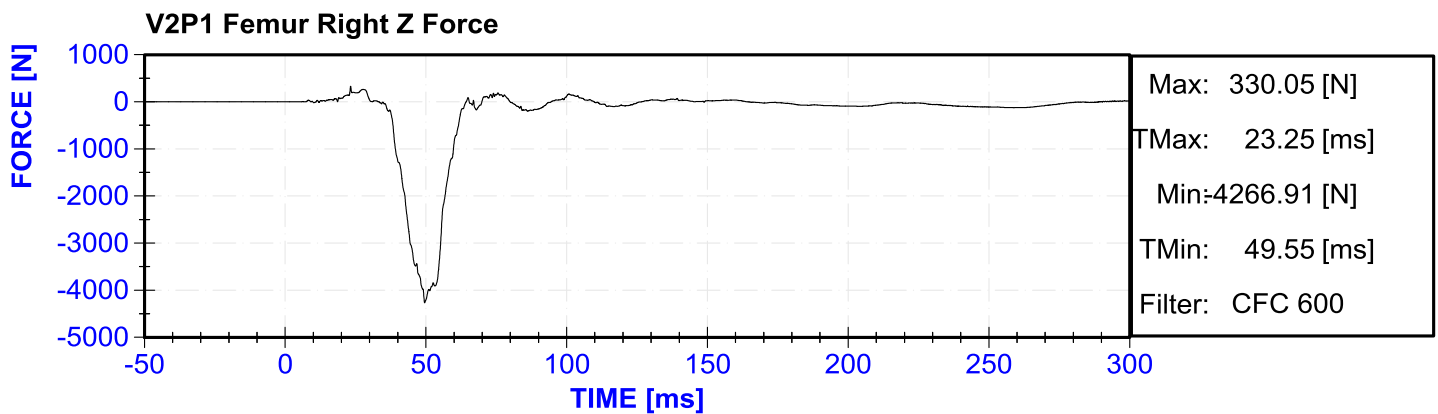
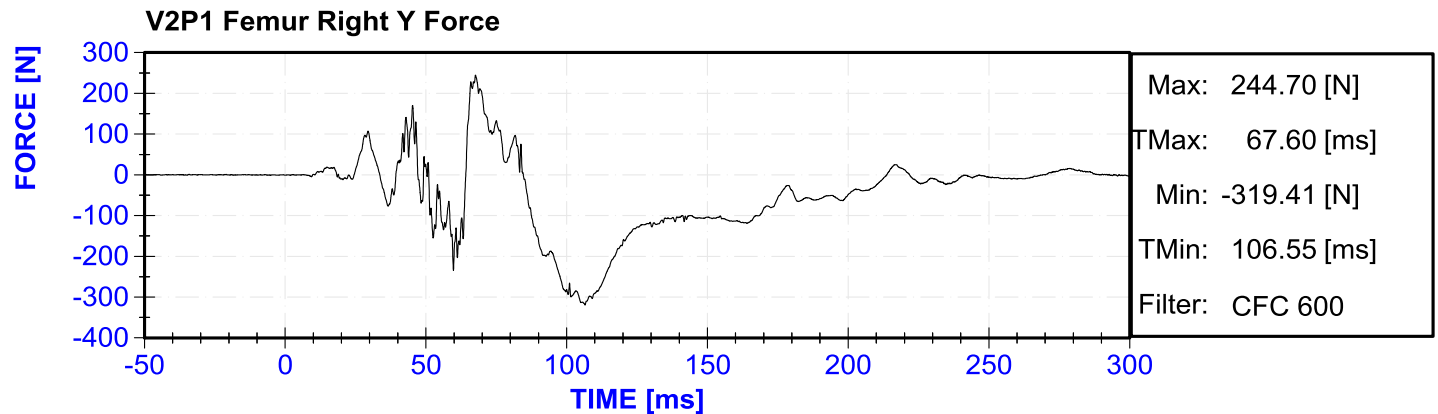
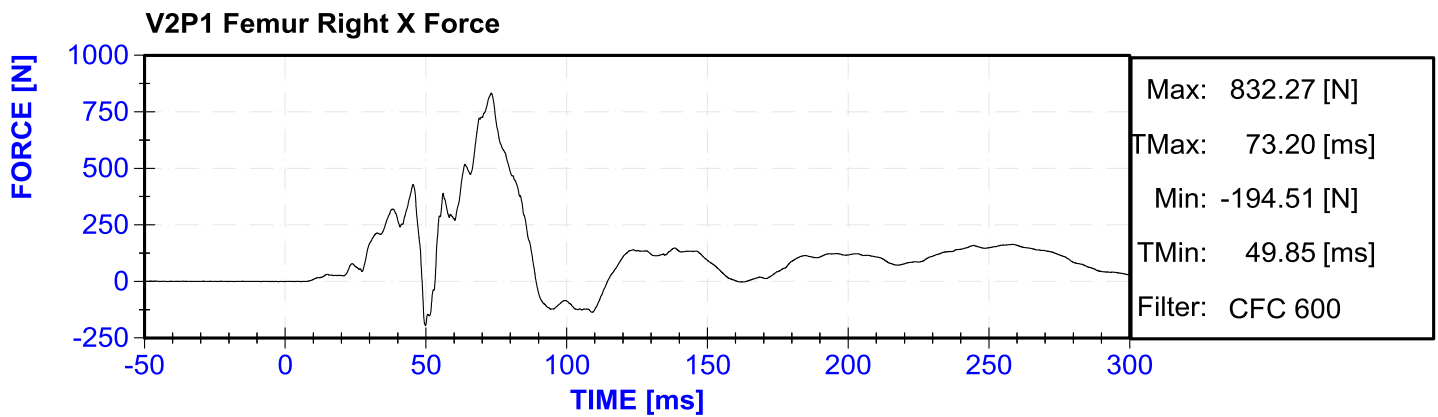
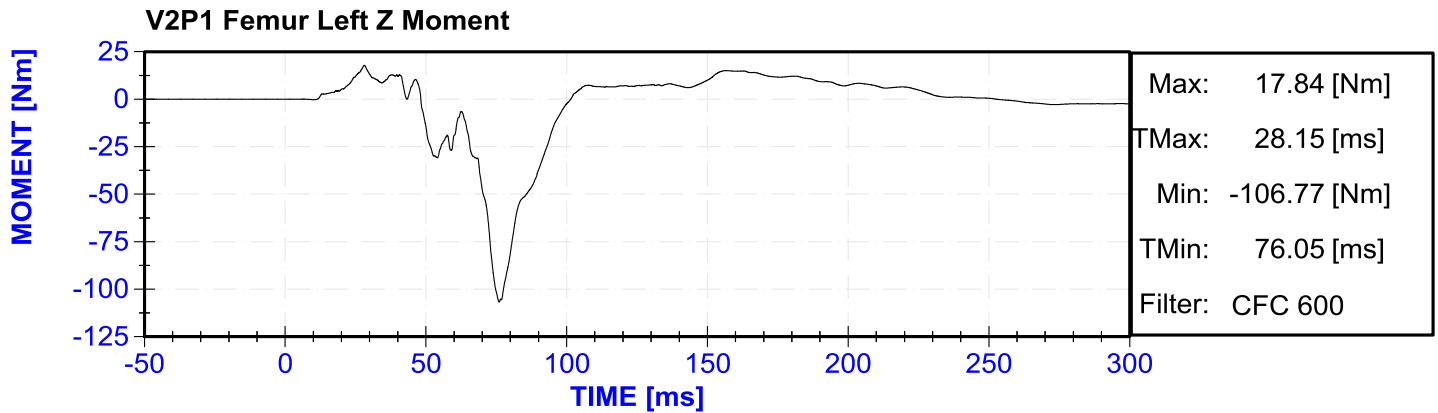


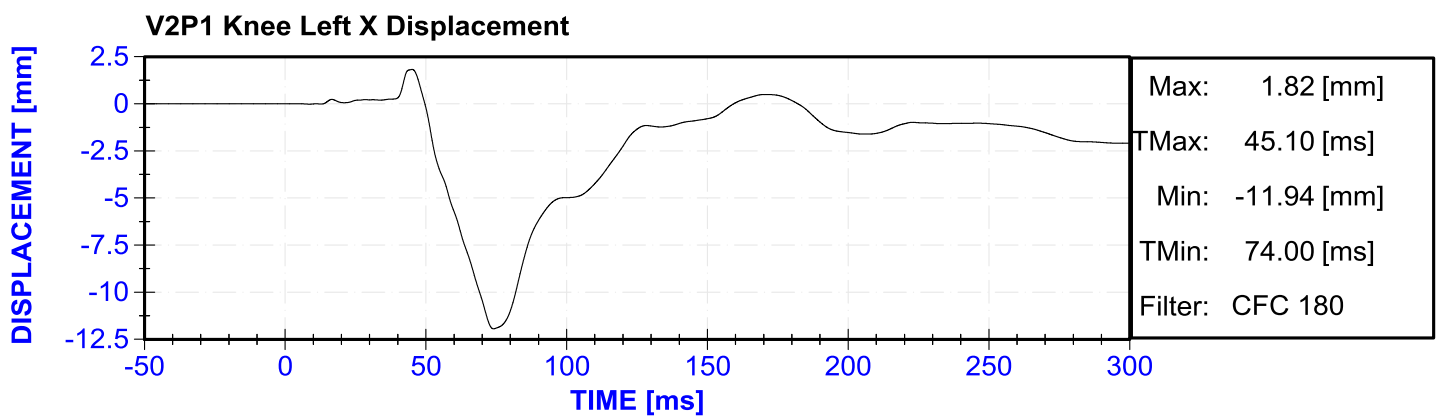
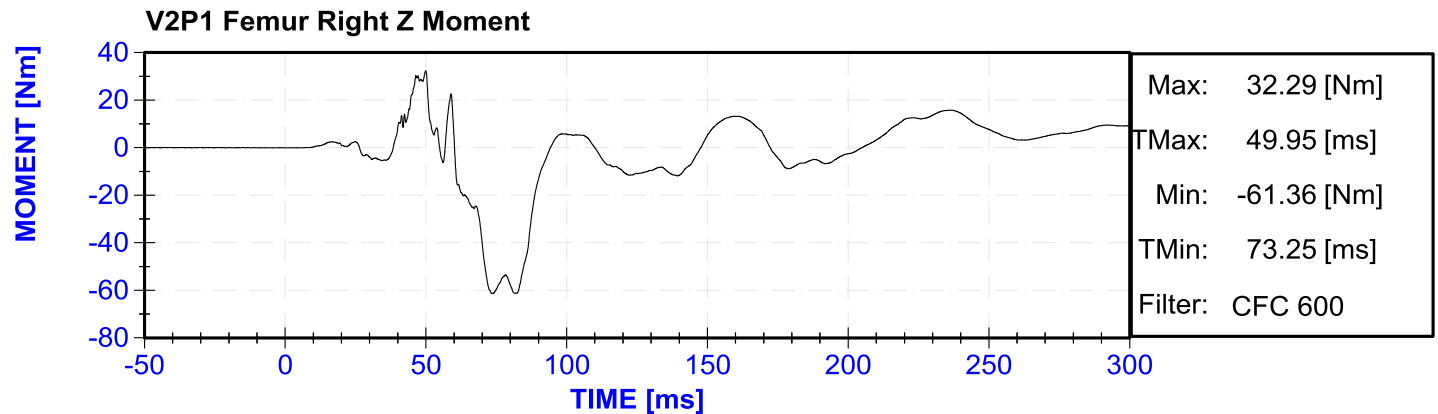
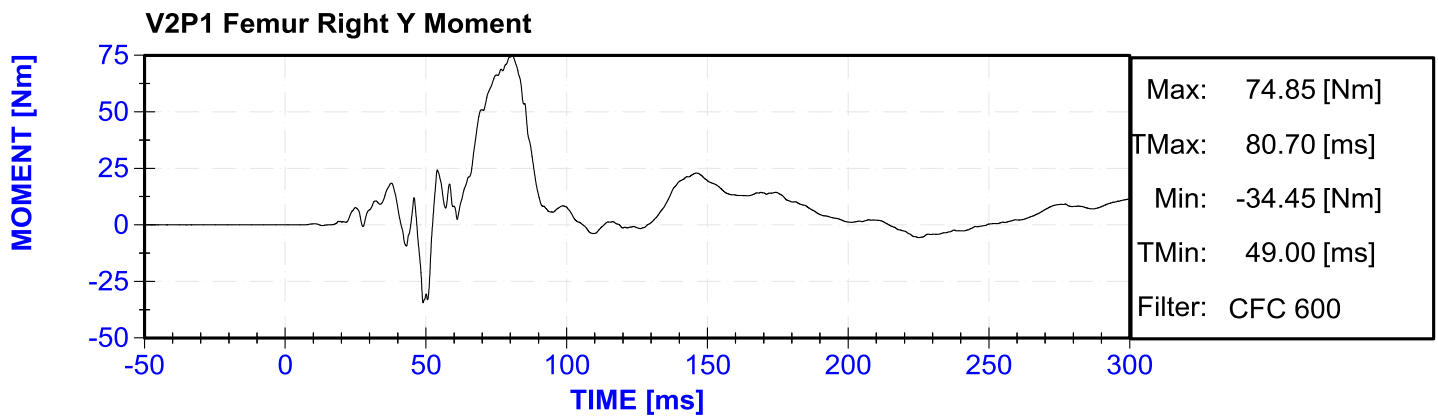
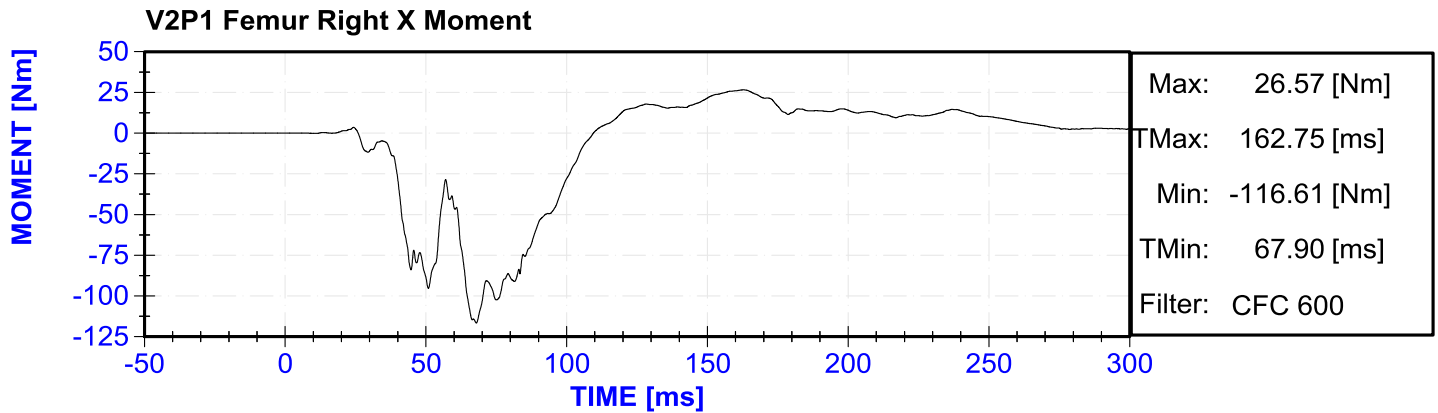


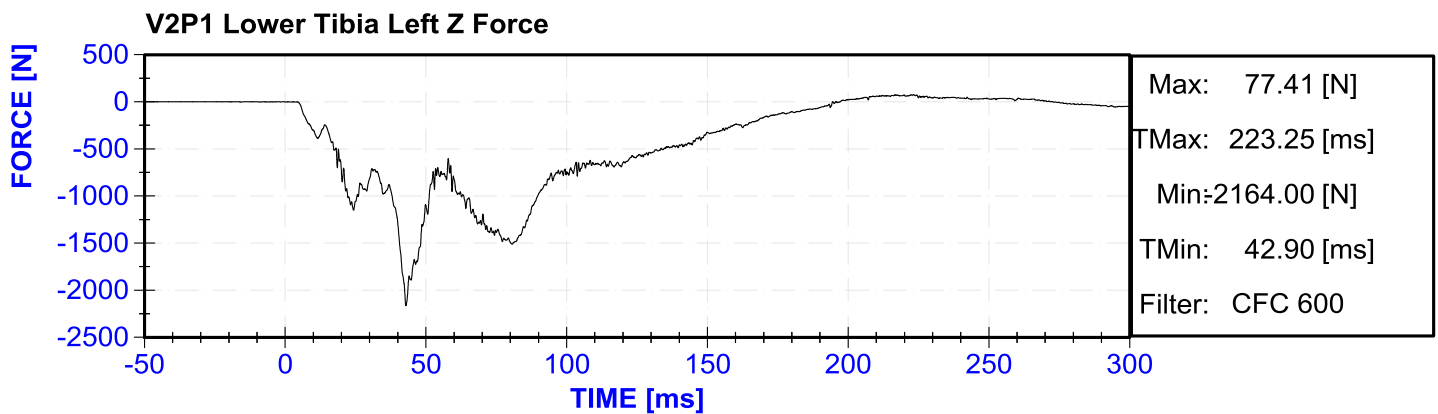
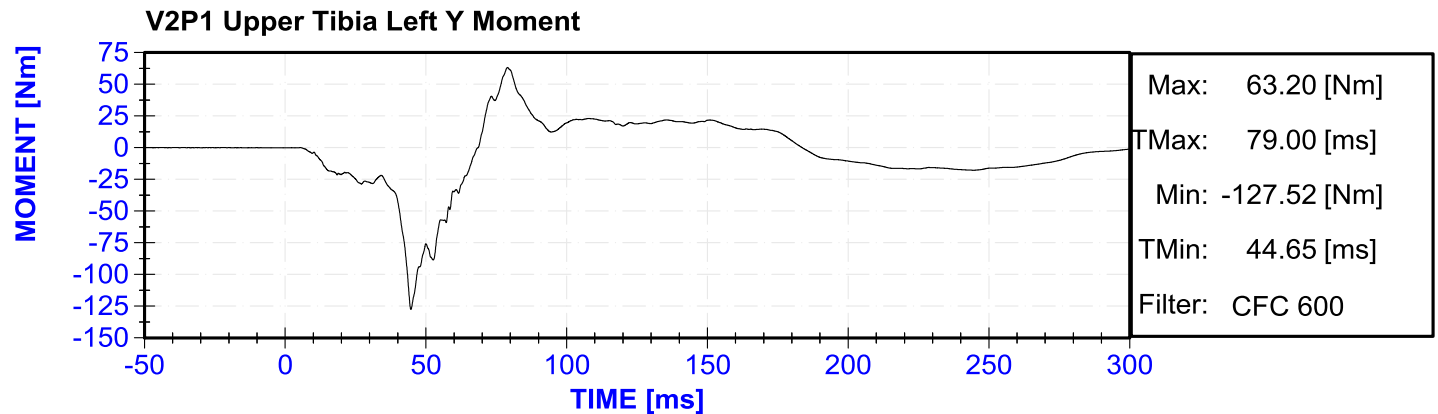
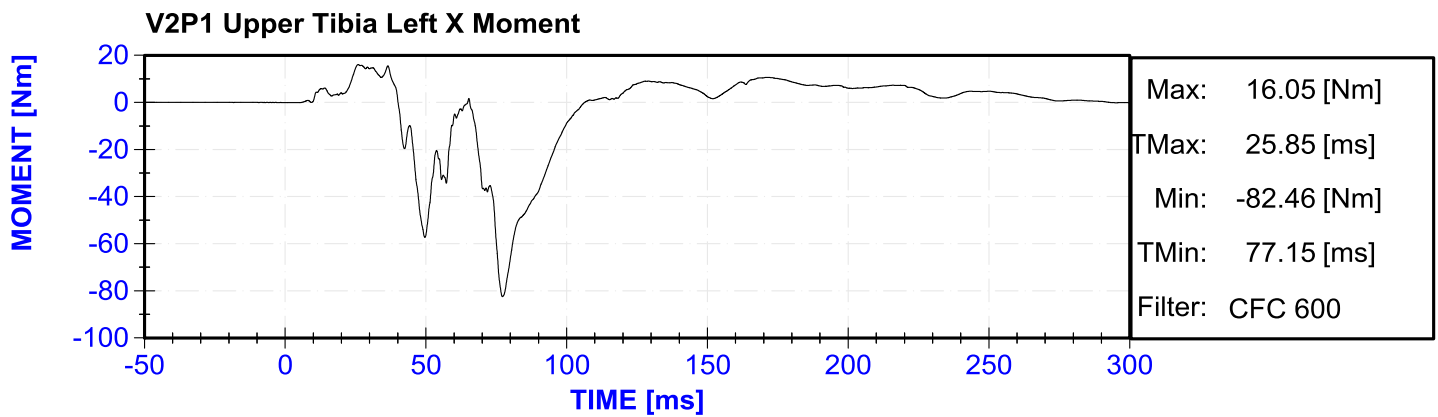
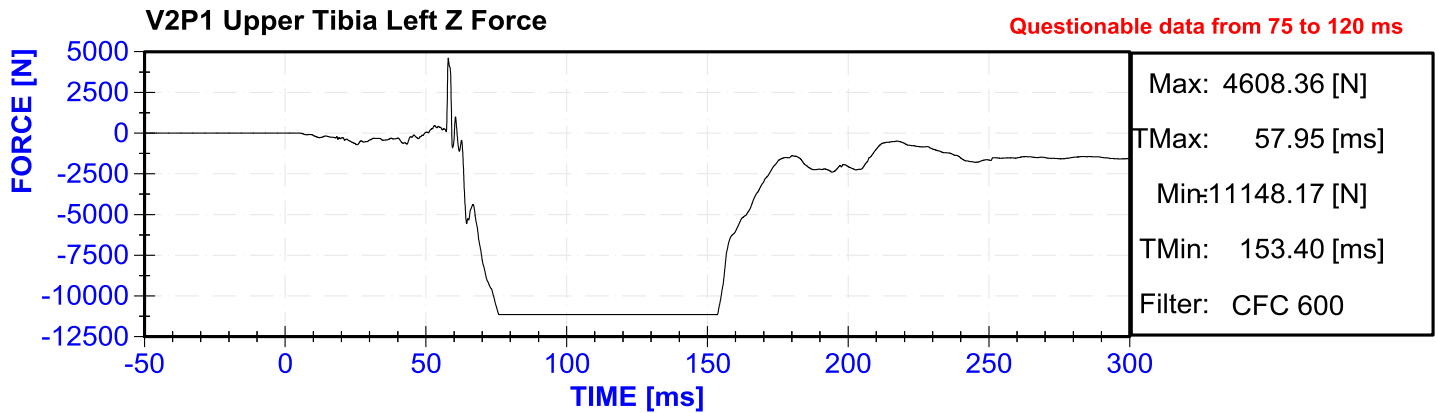


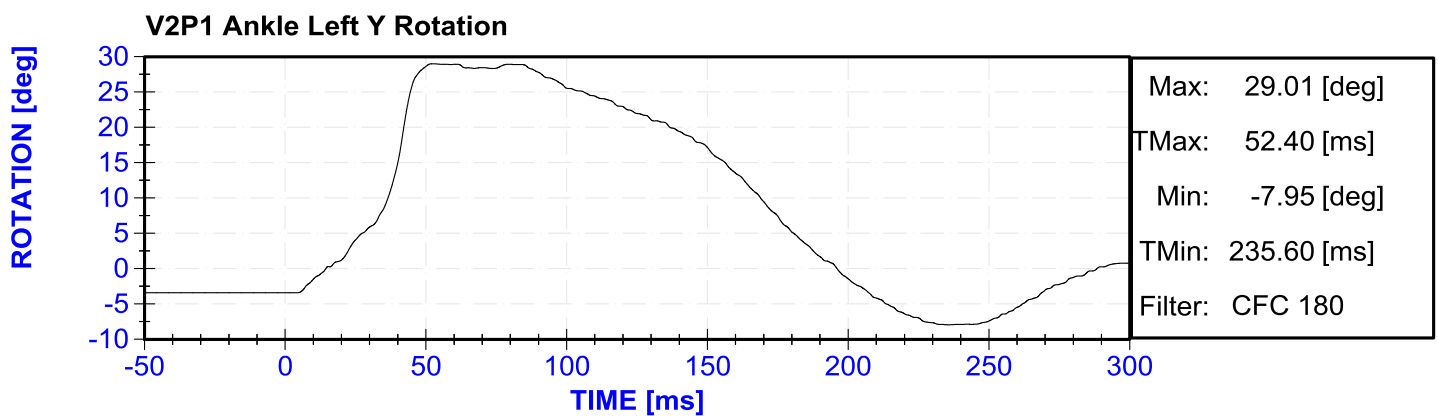
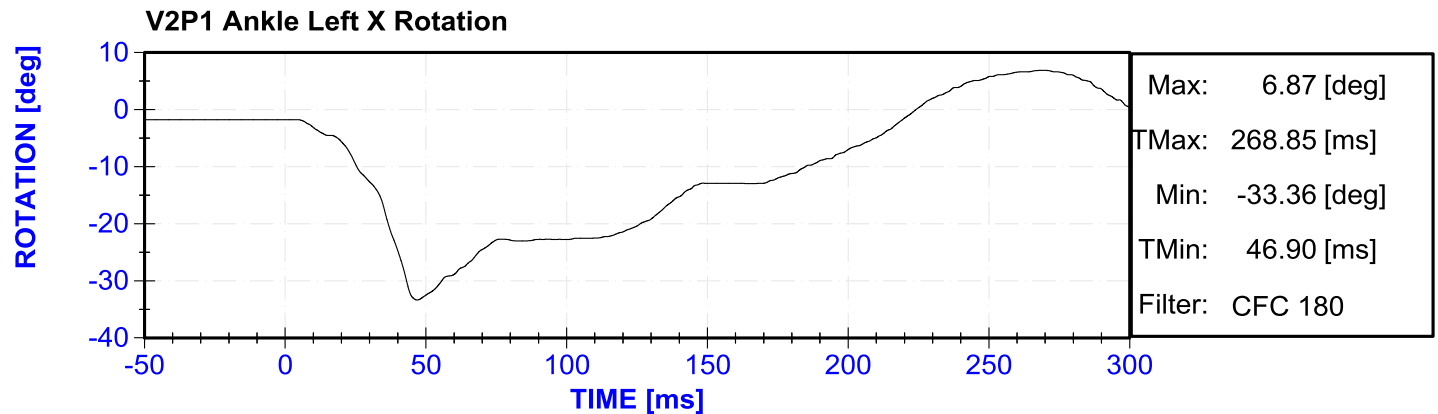
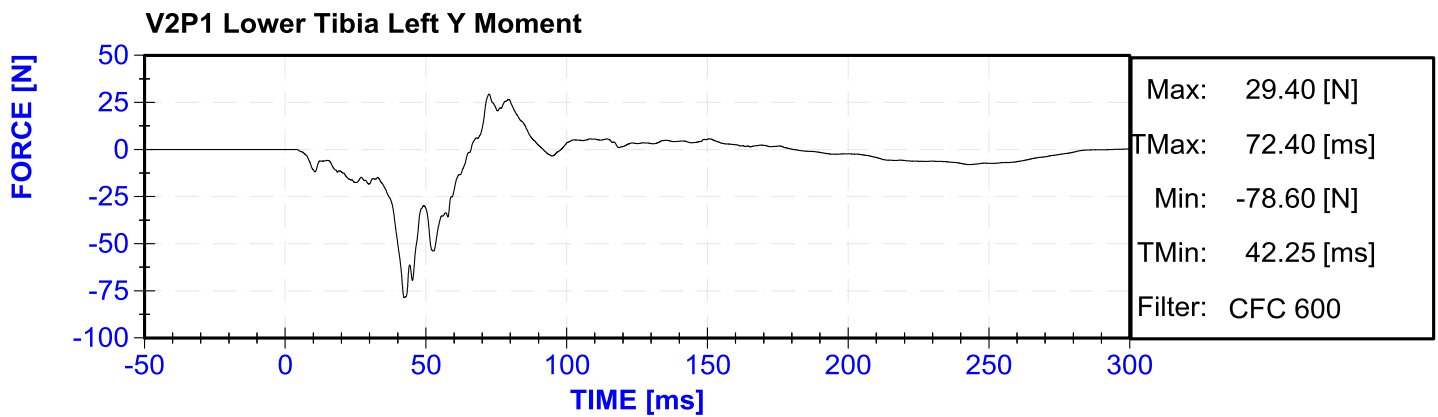
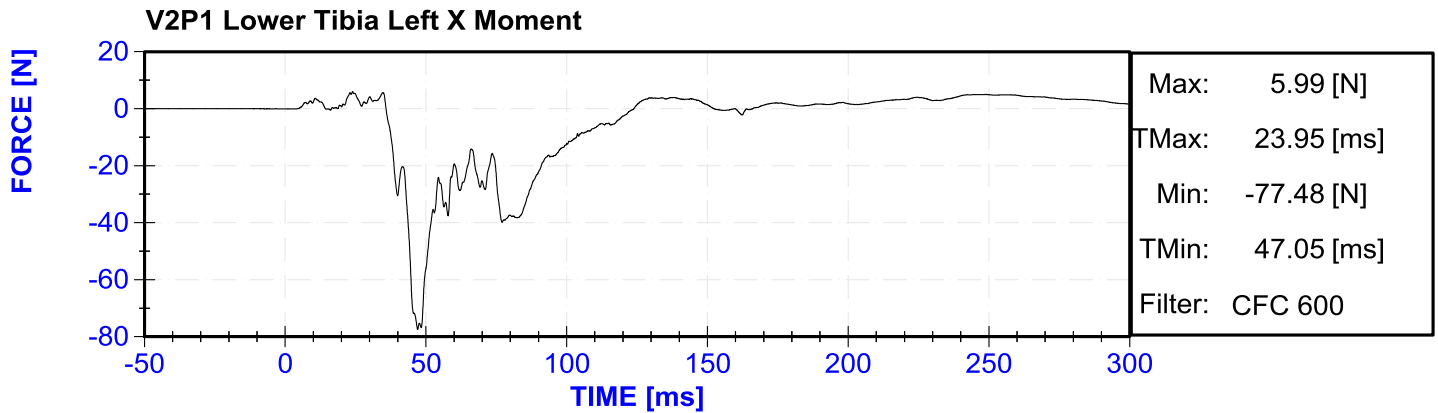


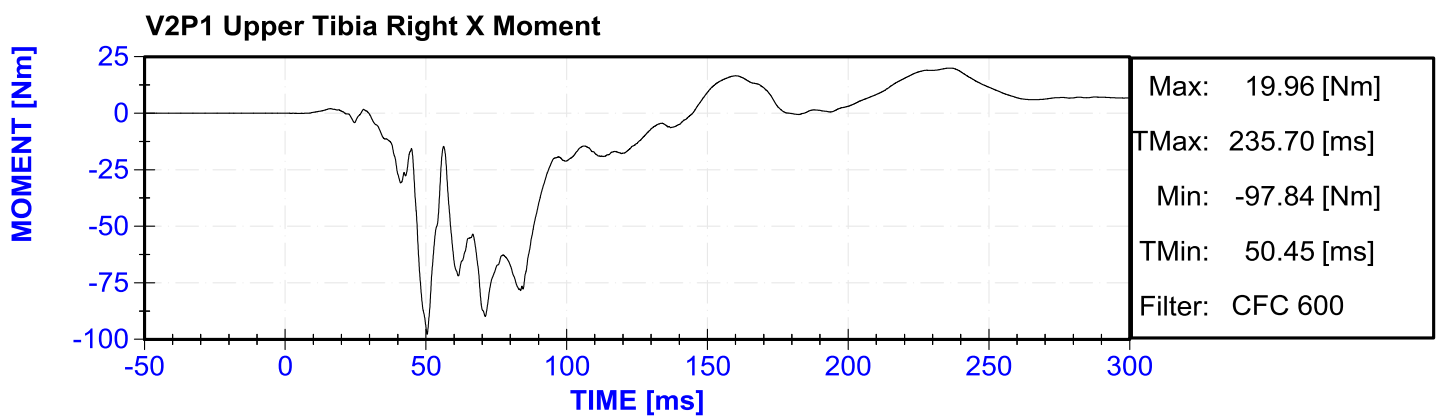
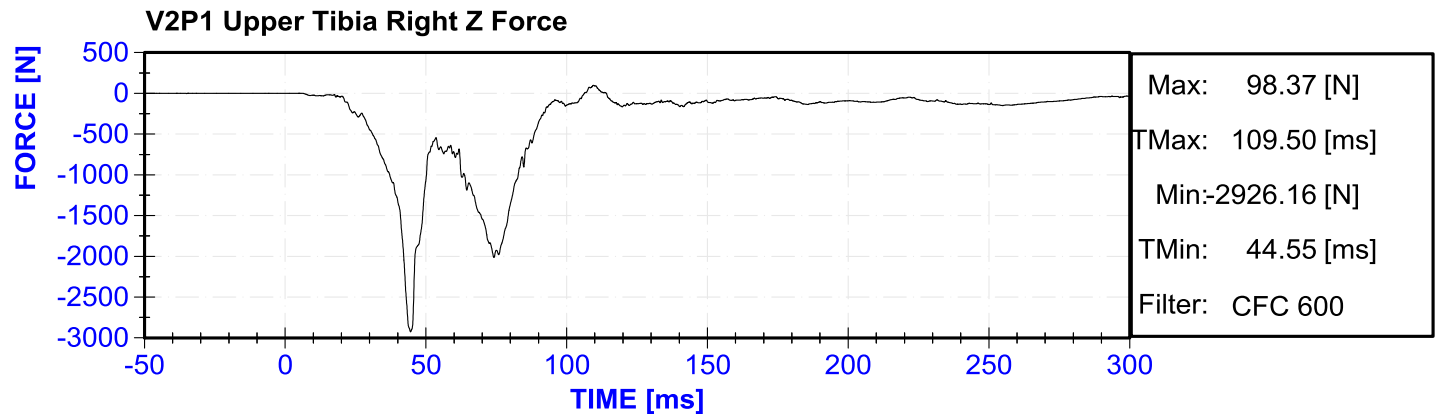
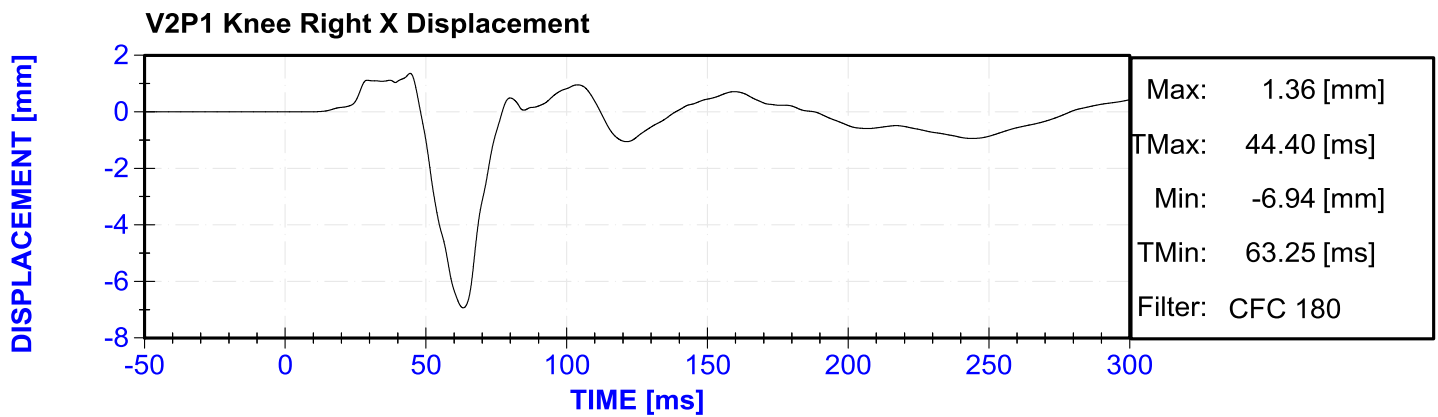
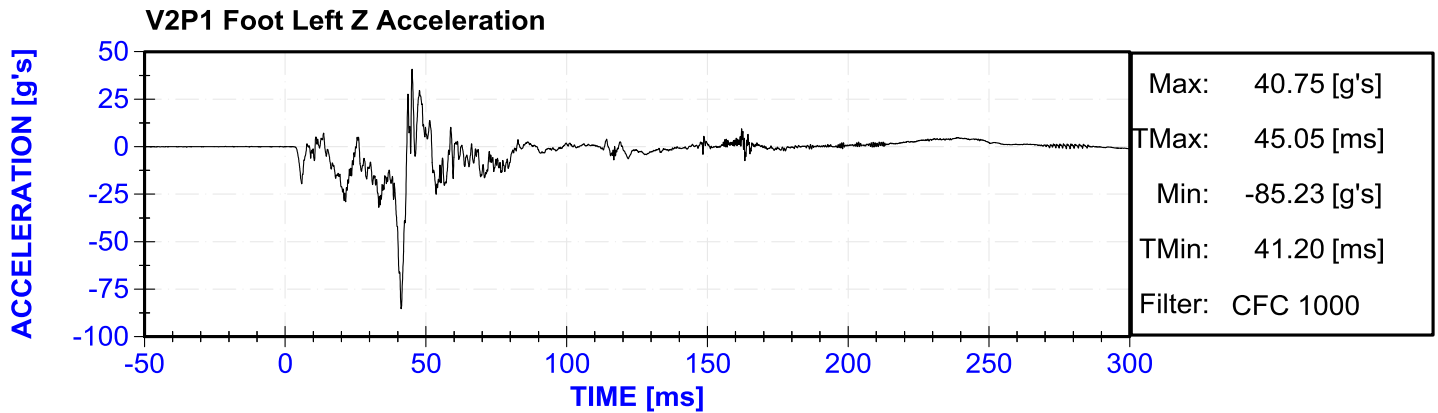


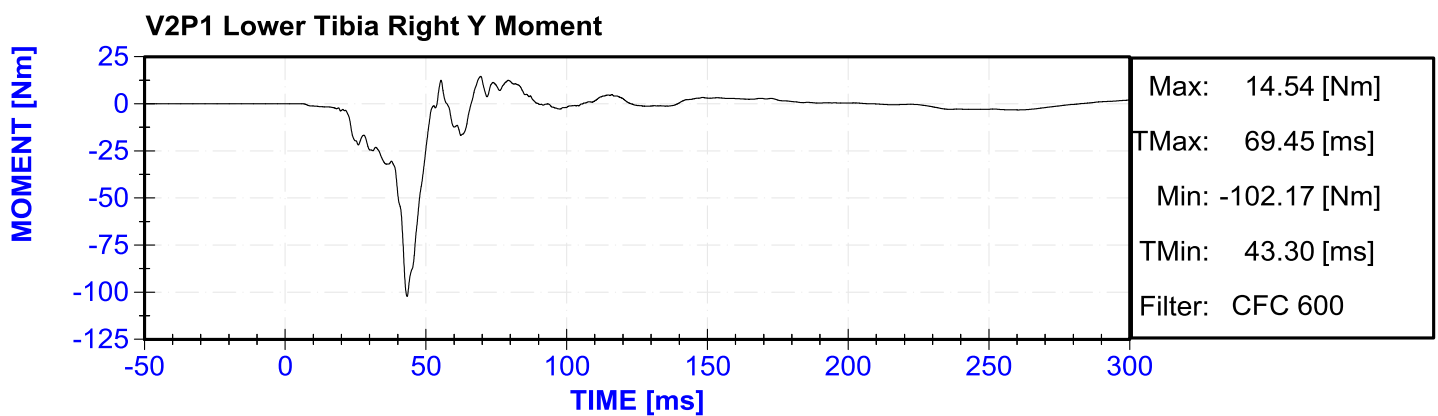
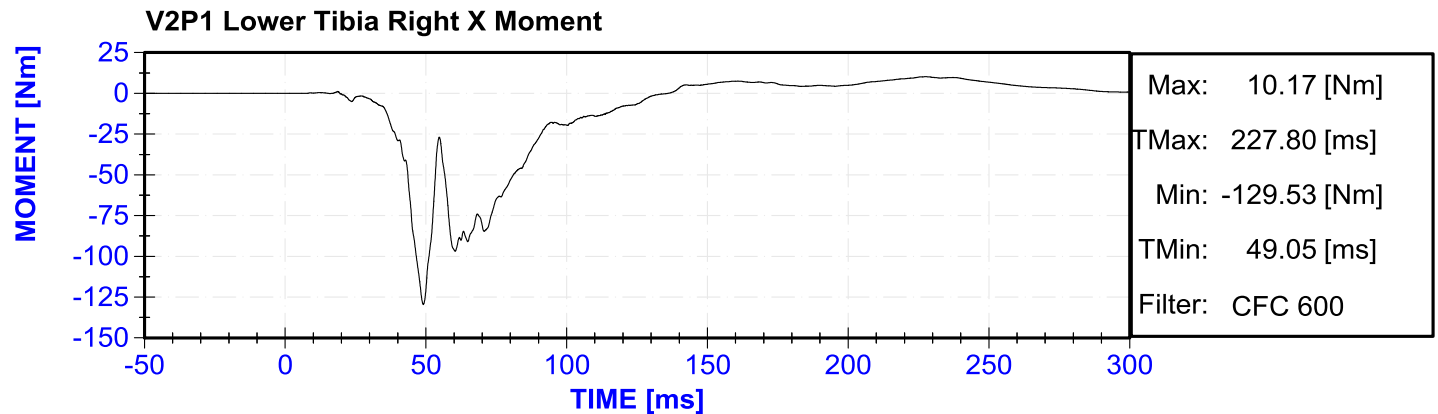
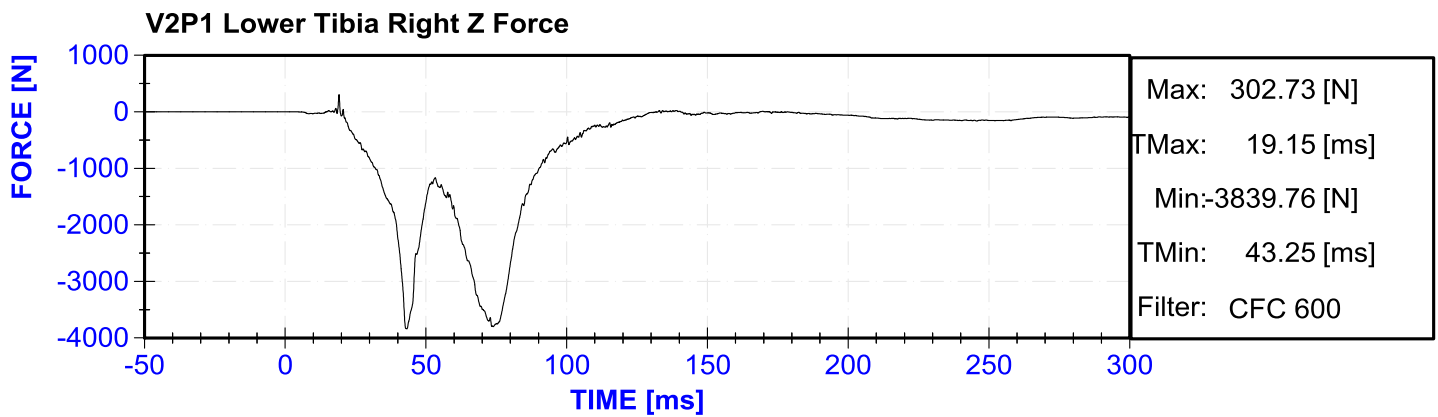
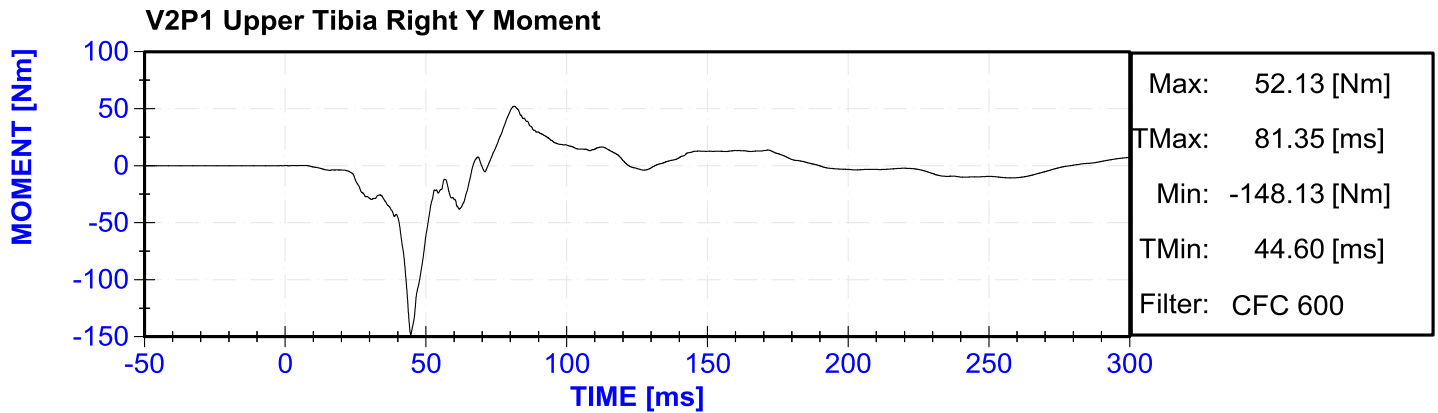


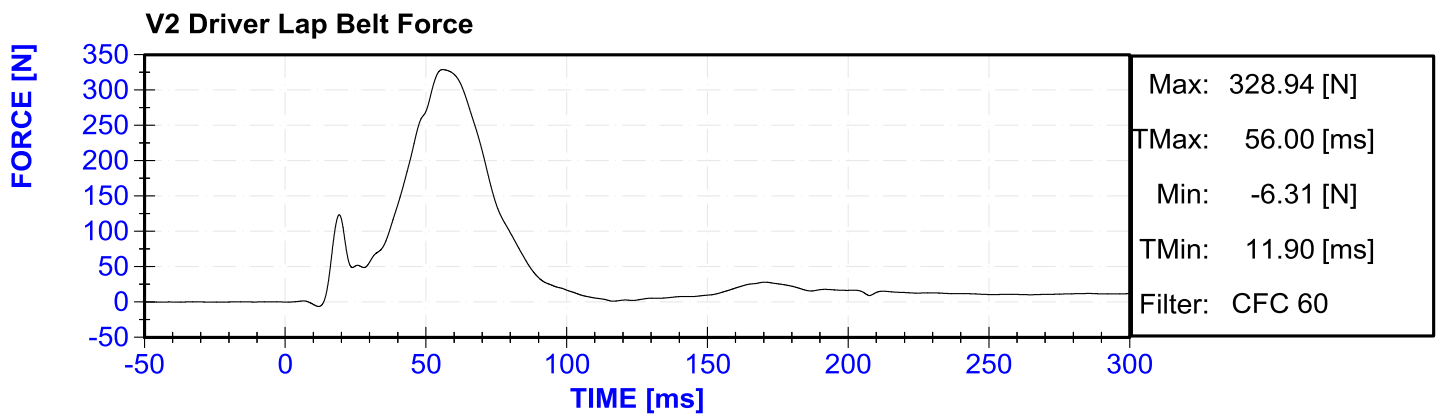
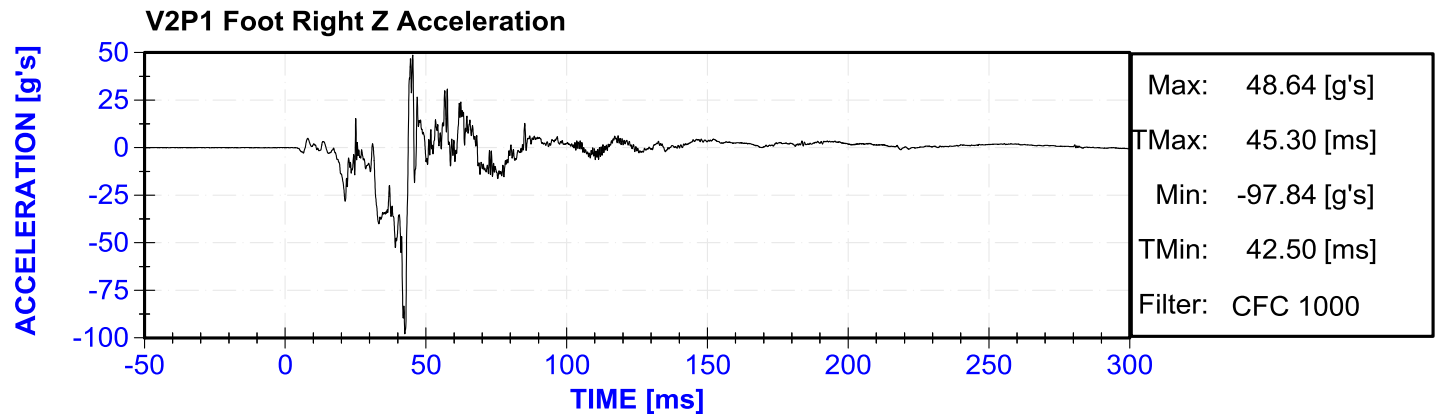
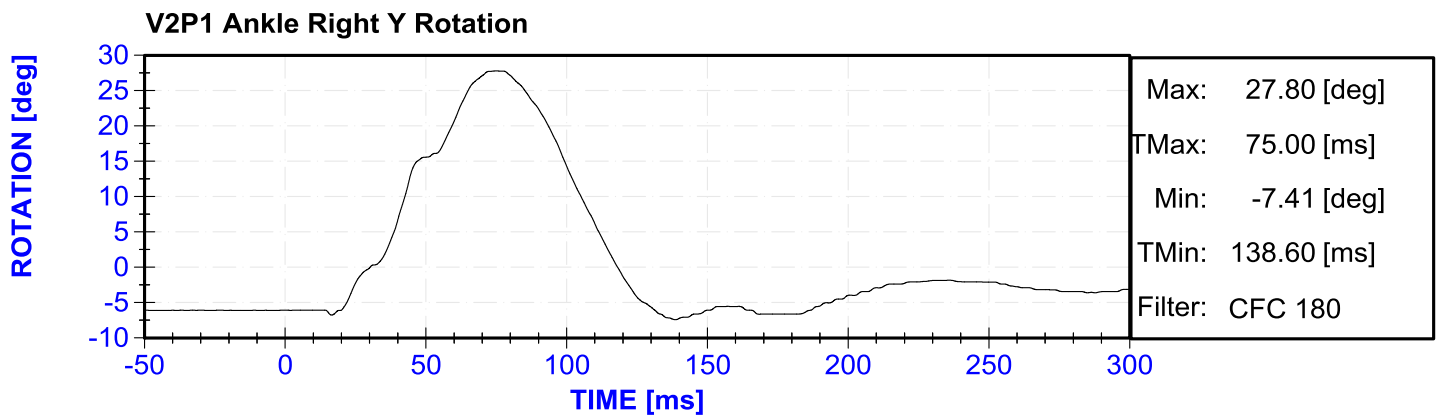
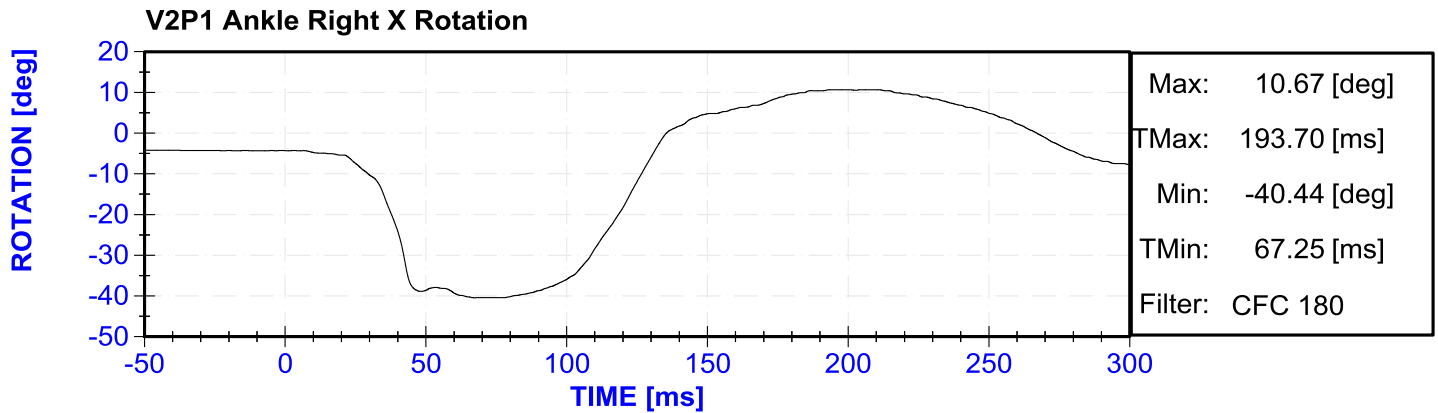




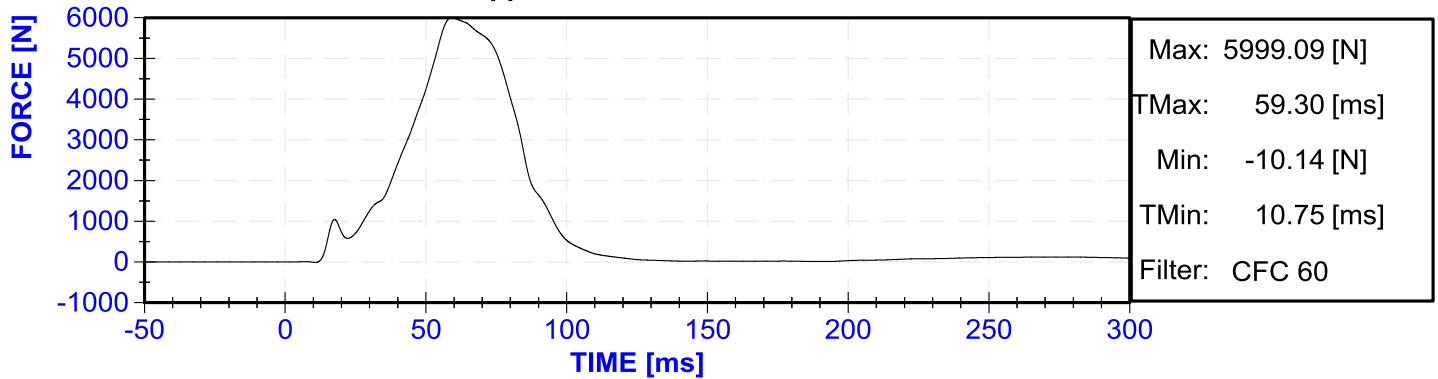




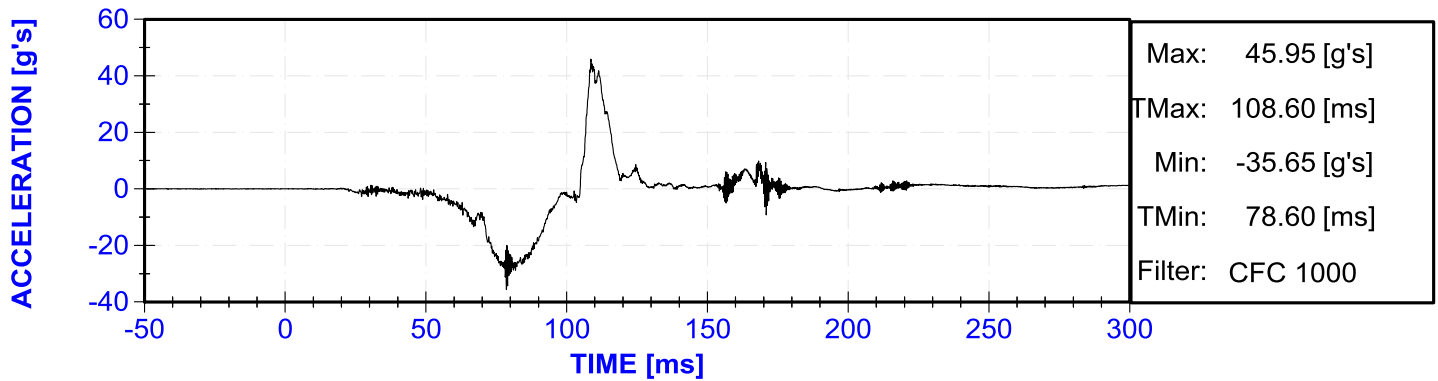




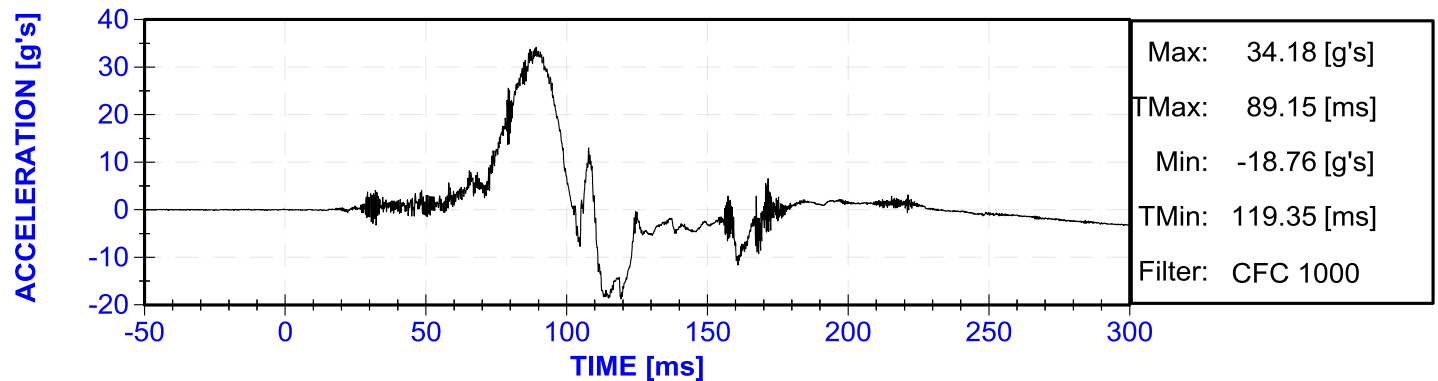
V2 Driver Shoulder Belt Upper Force



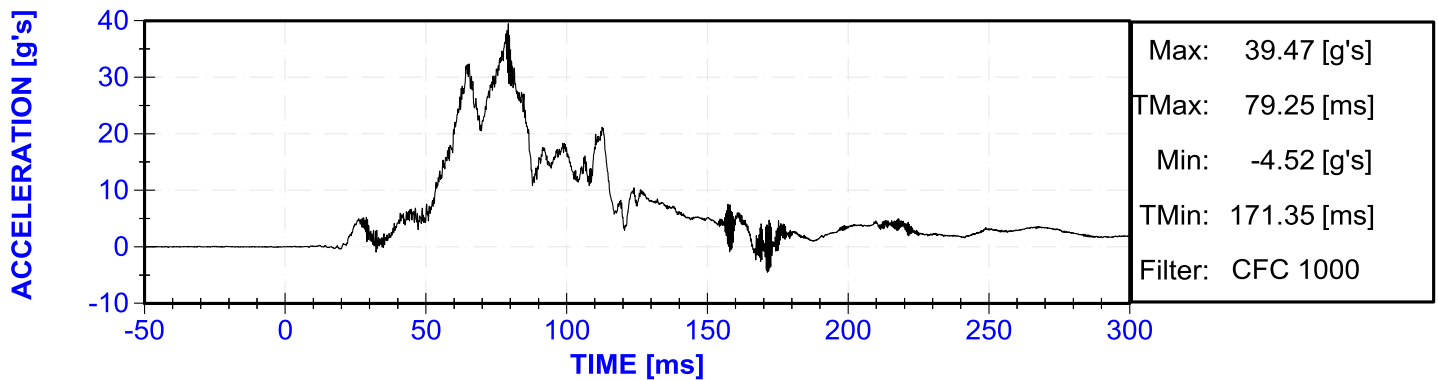
V2P2 Head CG X Acceleration

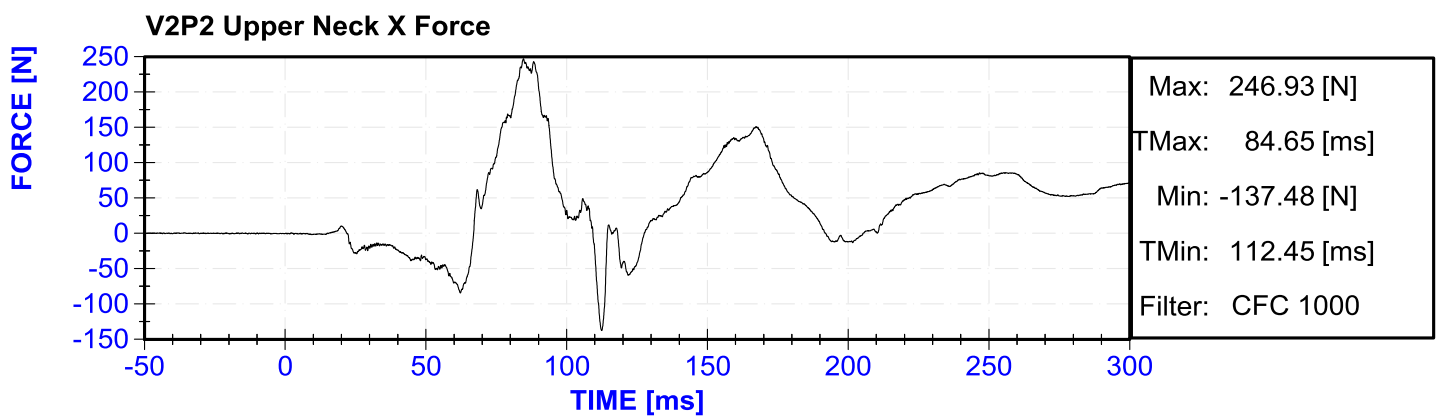
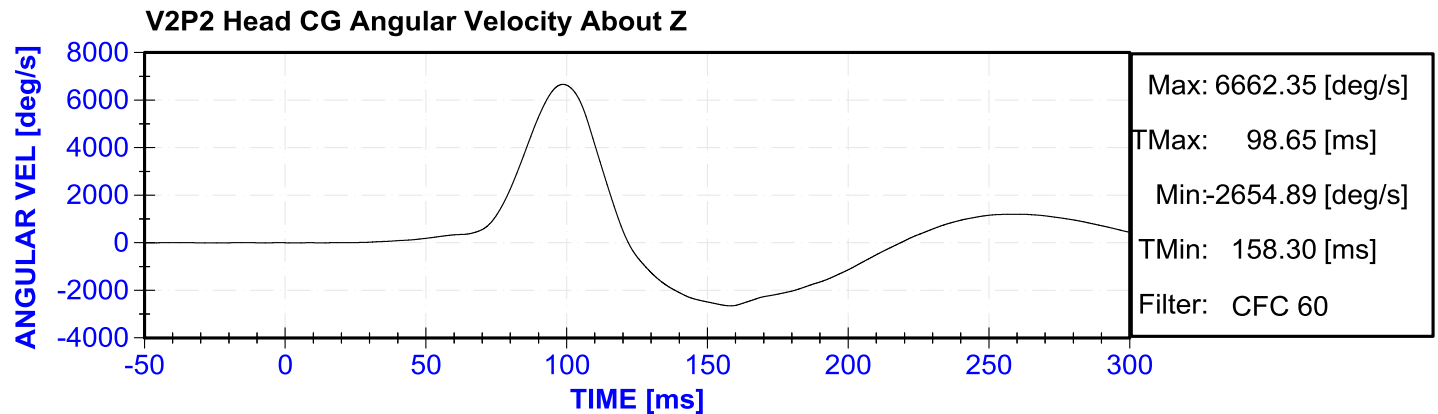
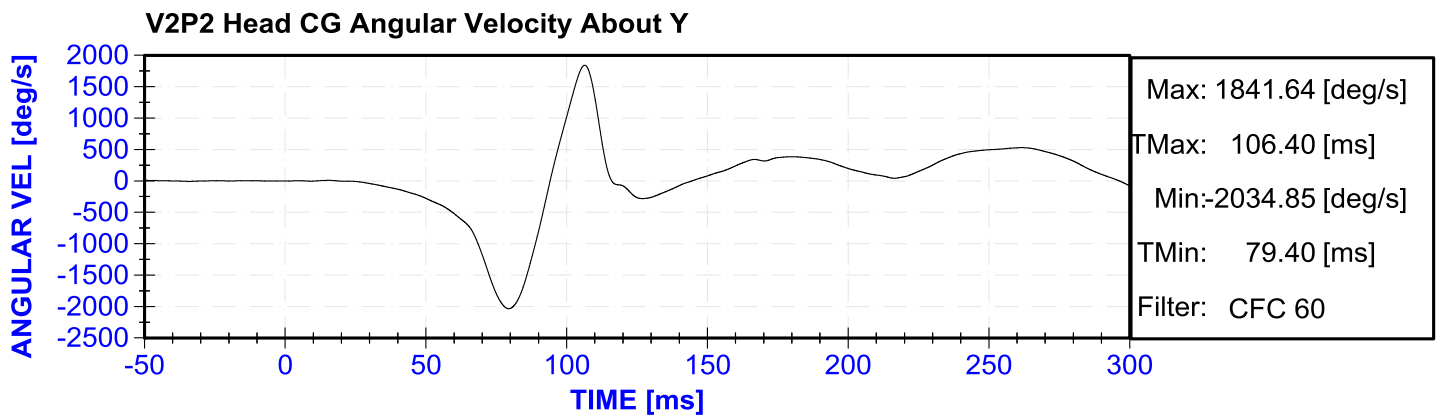
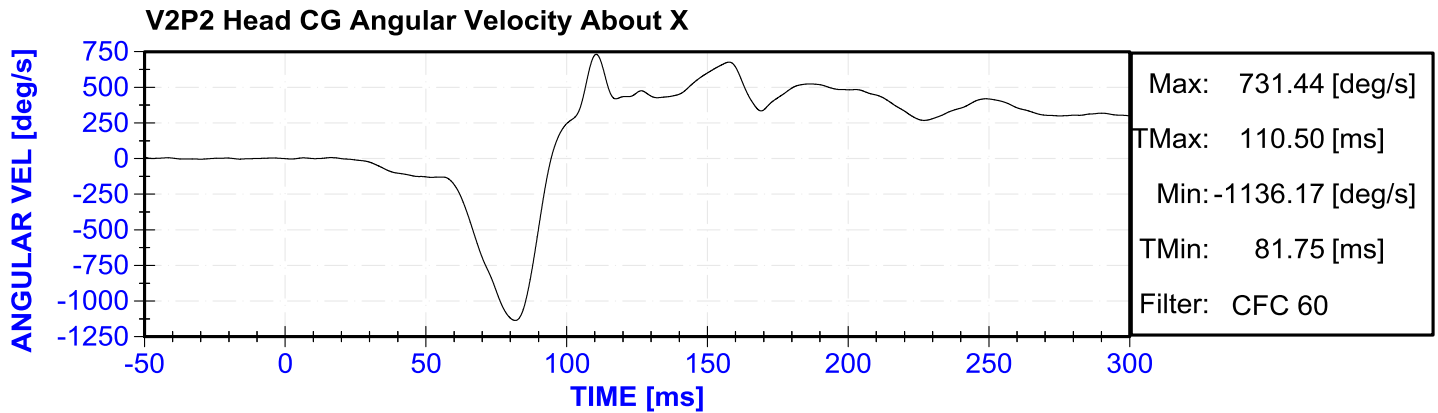


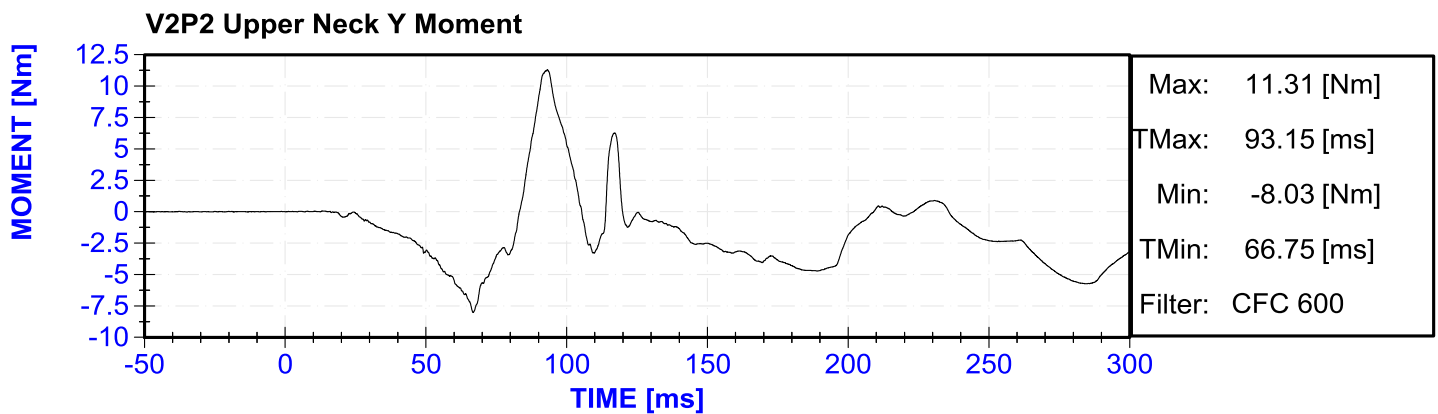
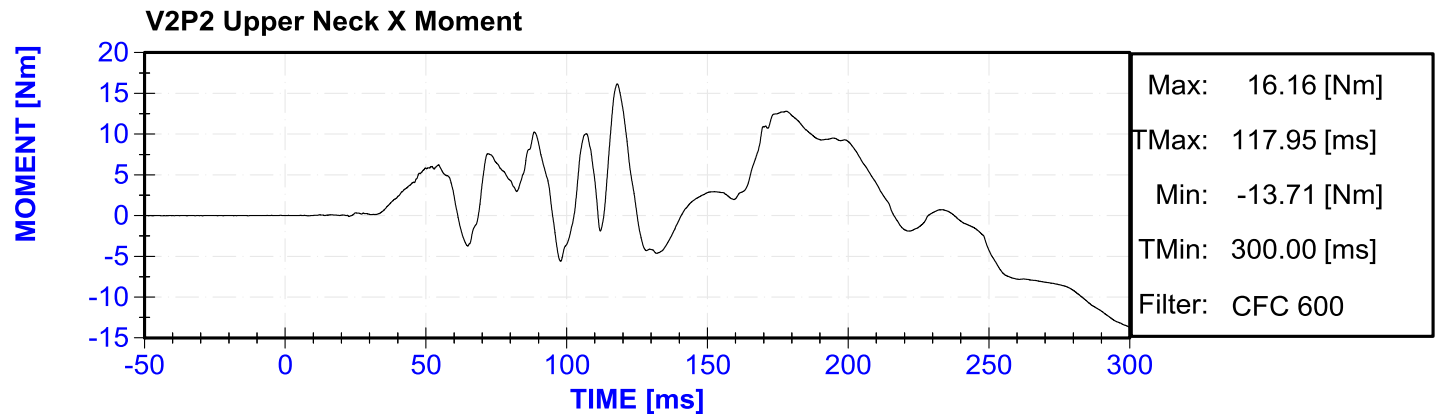
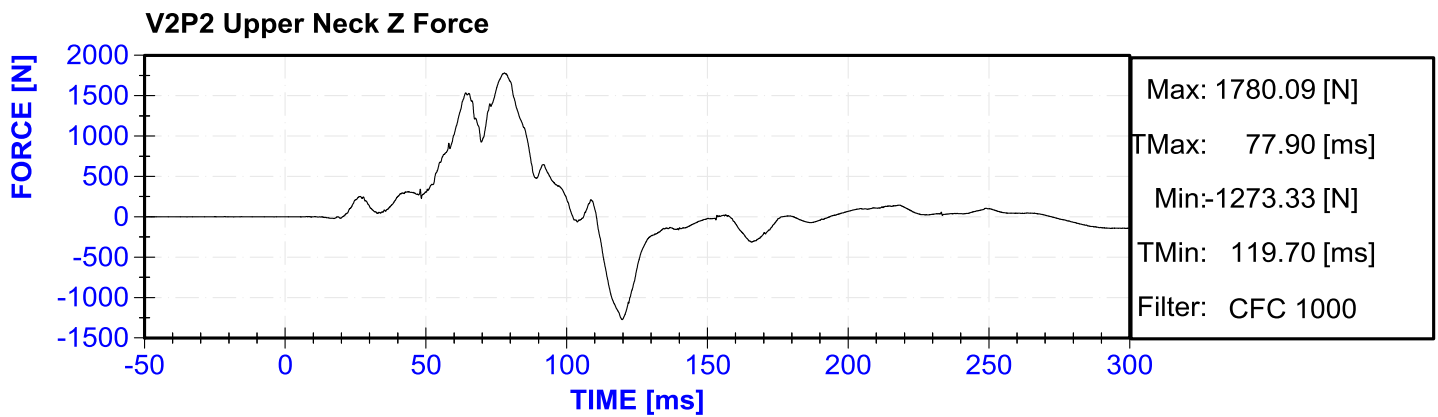
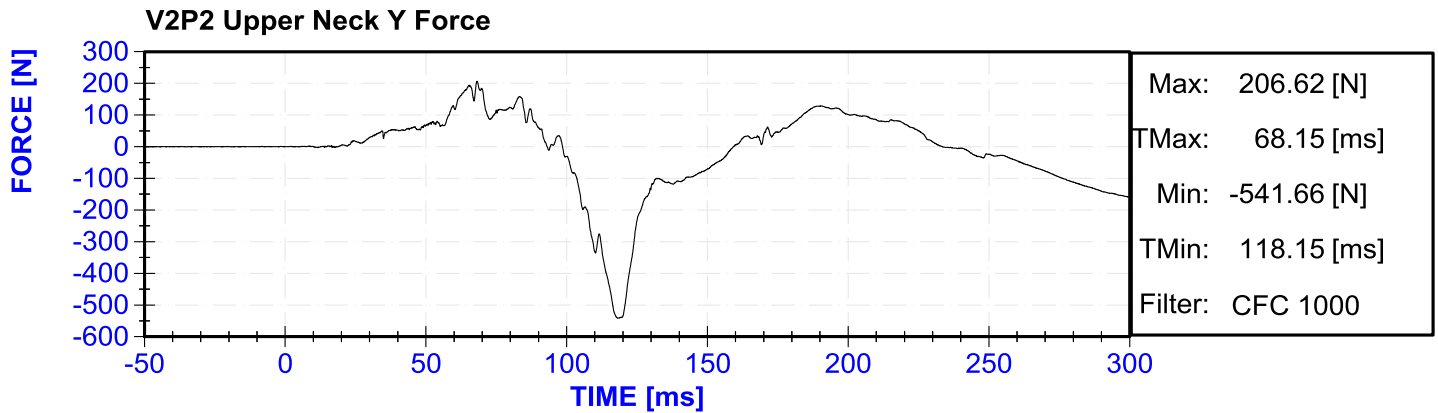
V2P2 Head CG Y Acceleration

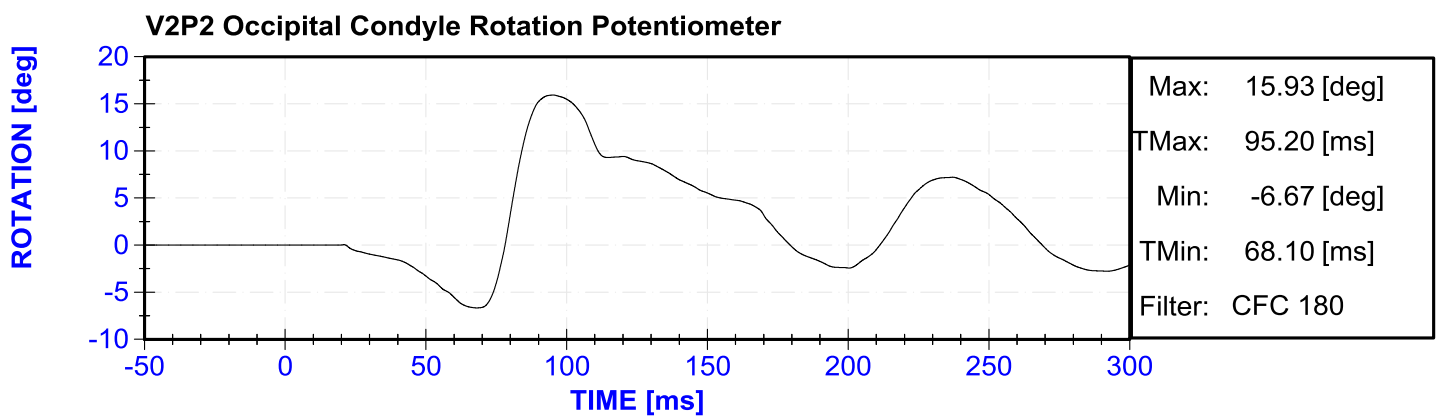
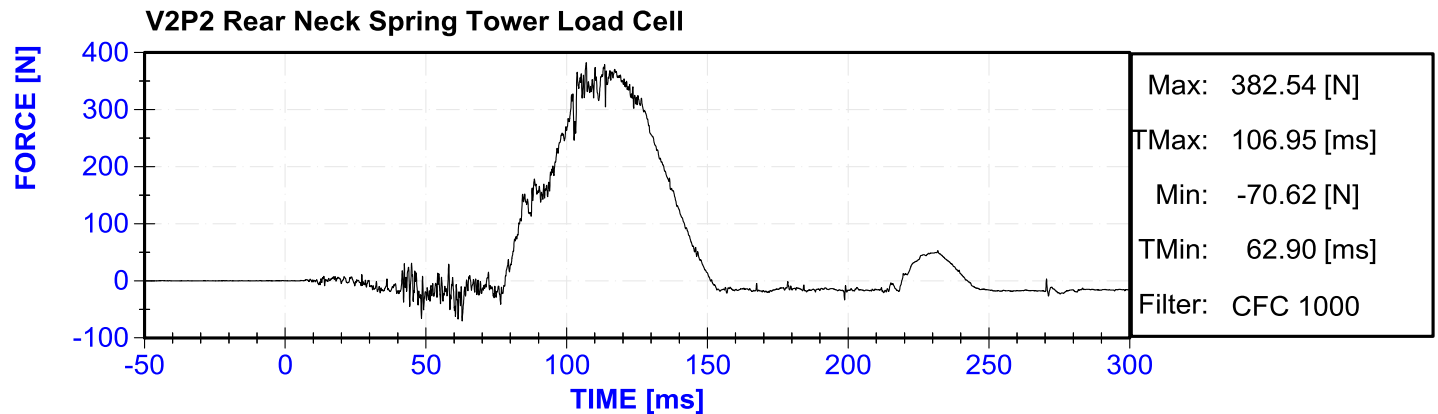
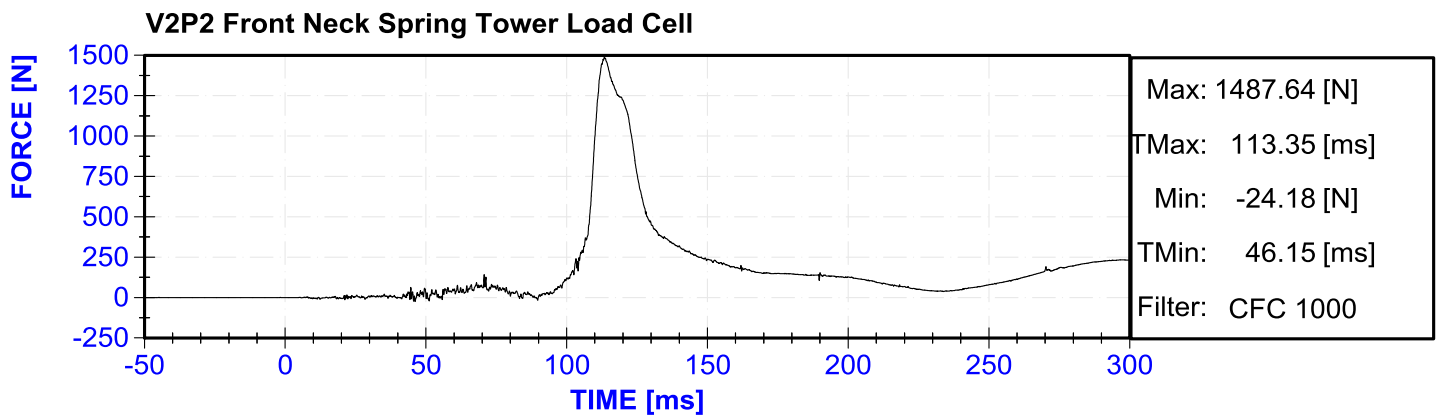
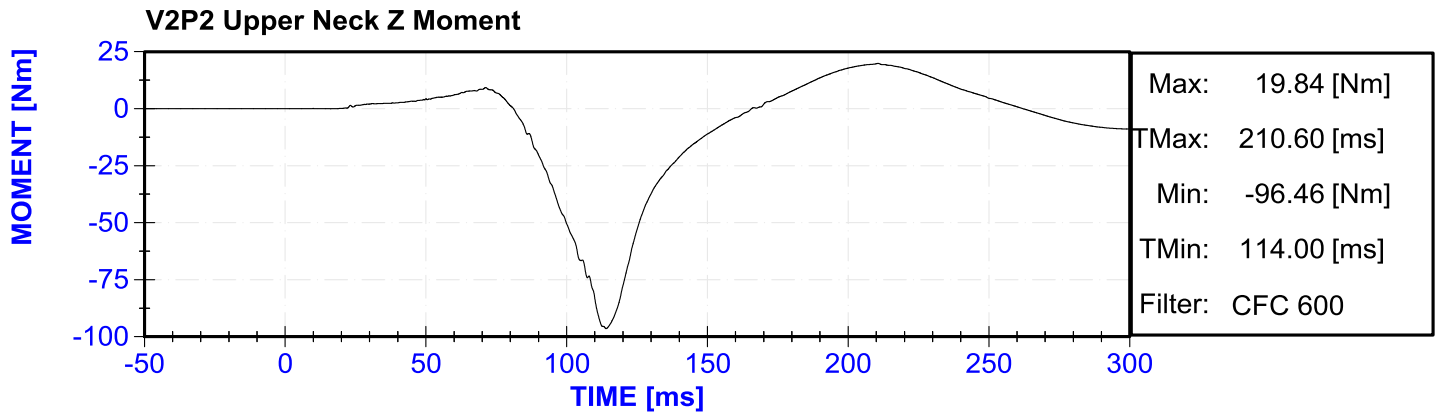


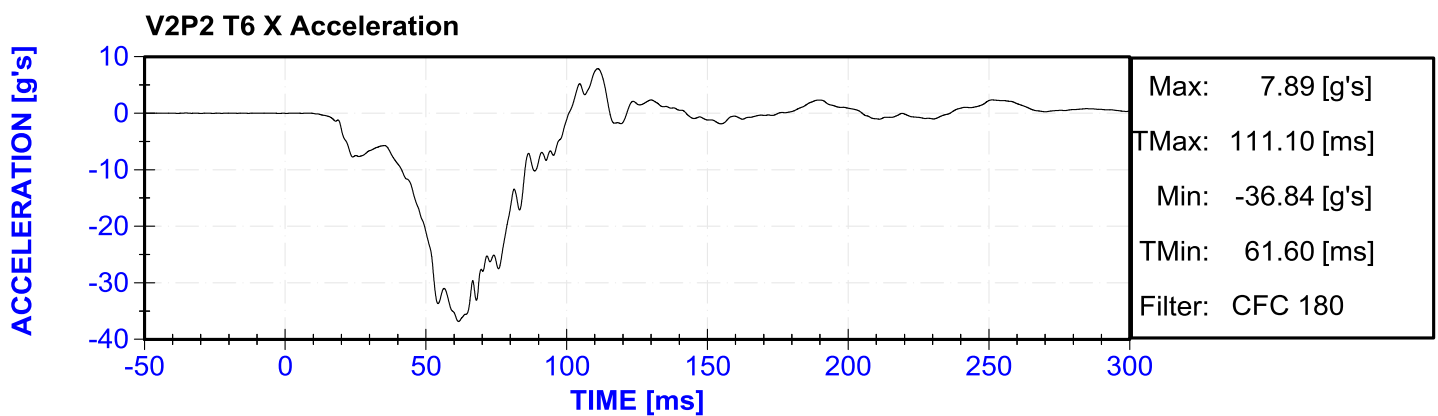
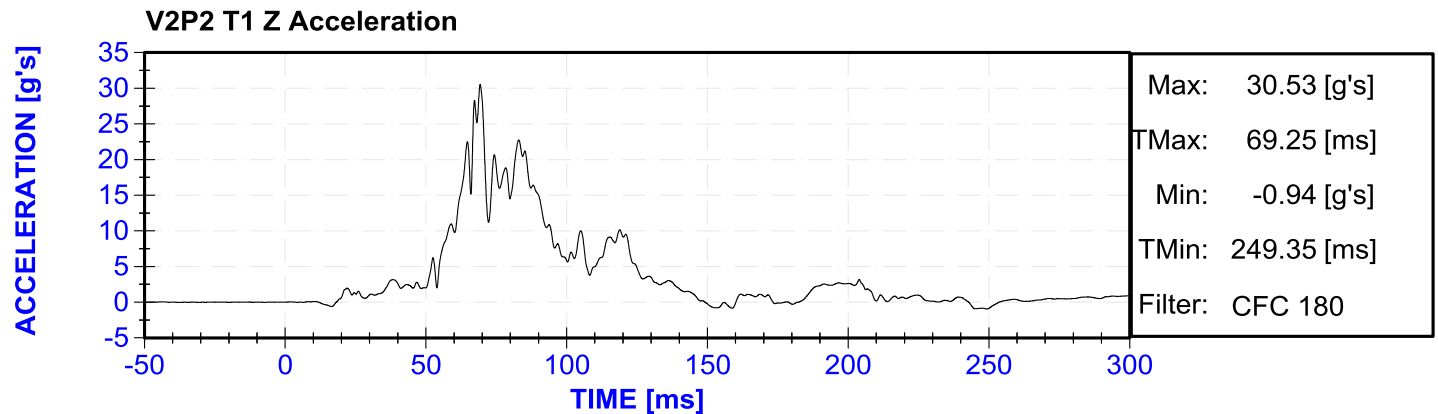
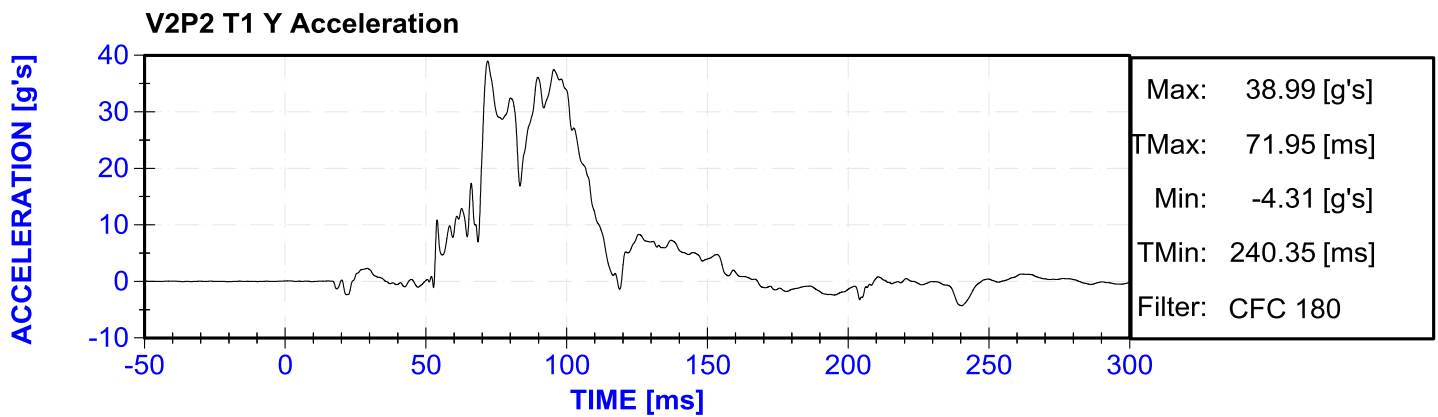
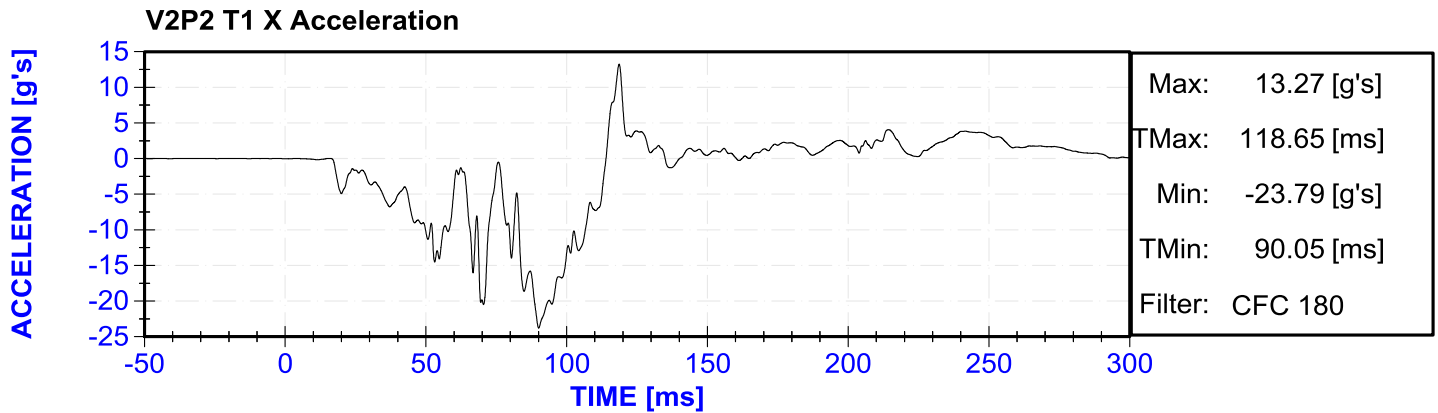
V2P2 Head CG Z Acceleration

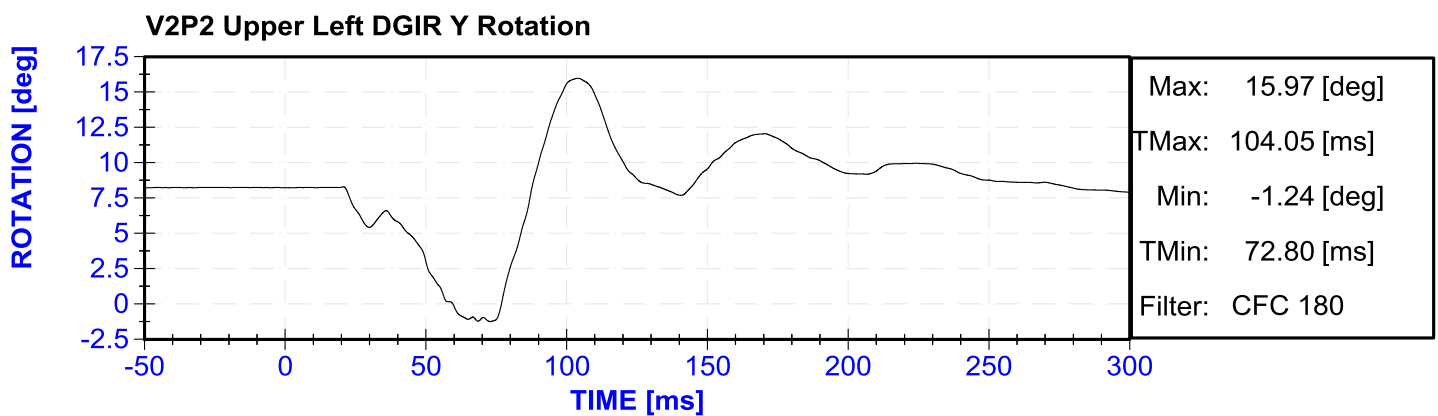
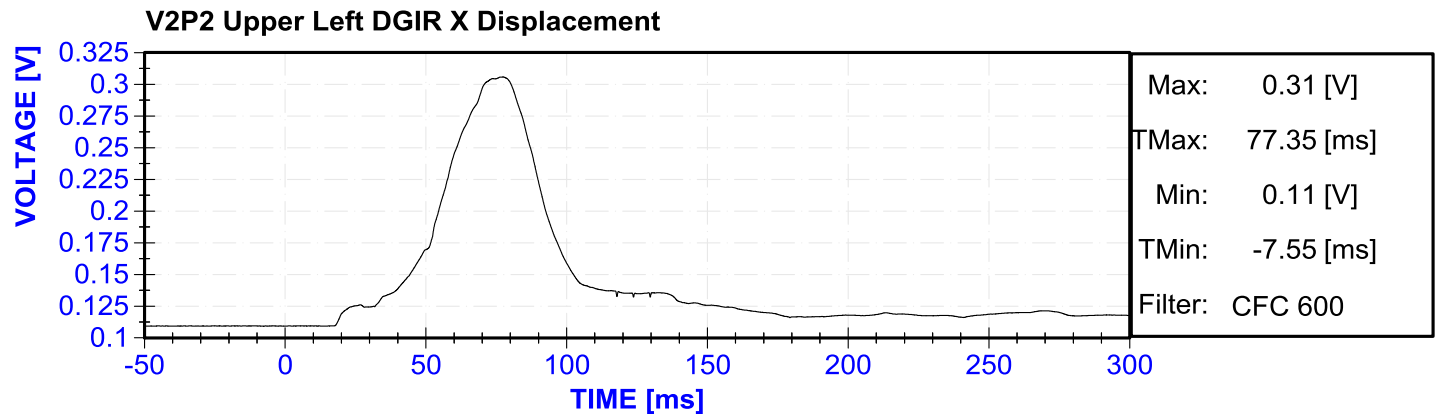
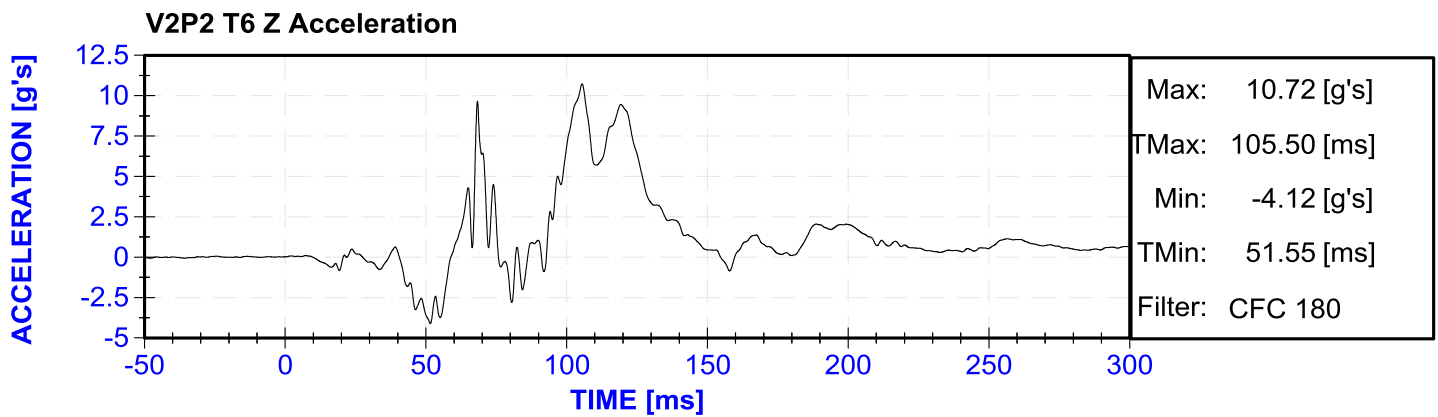
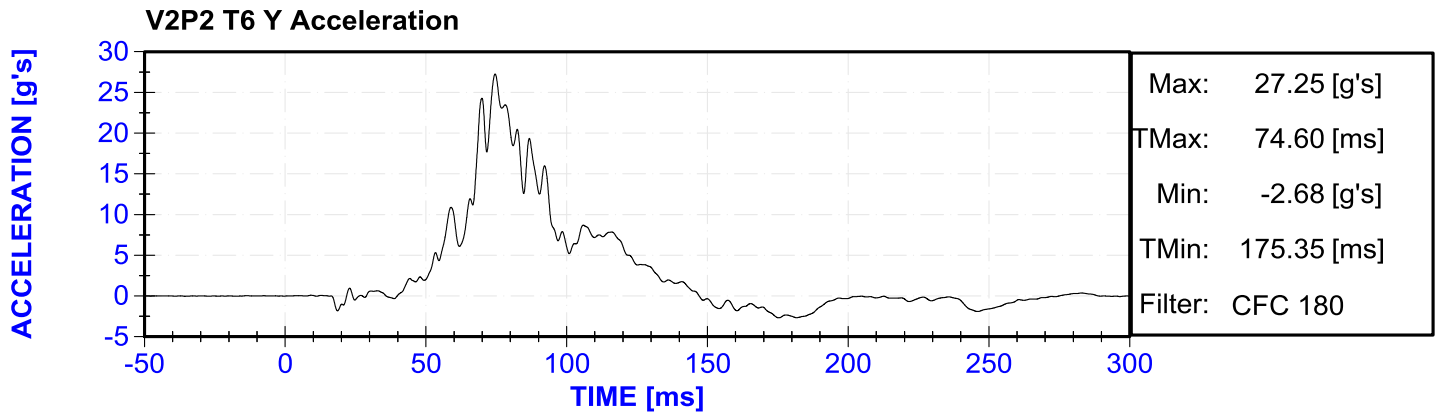


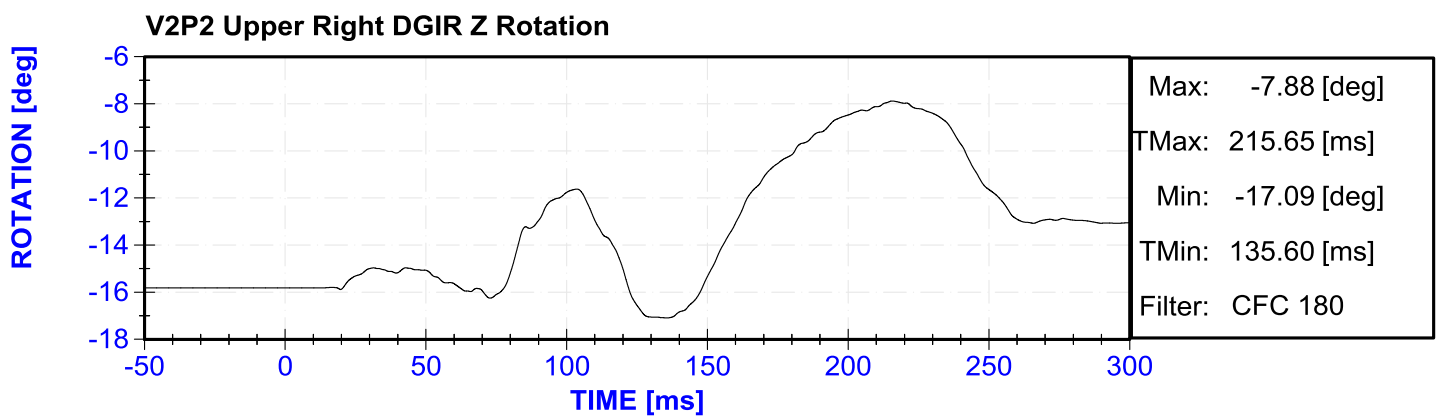
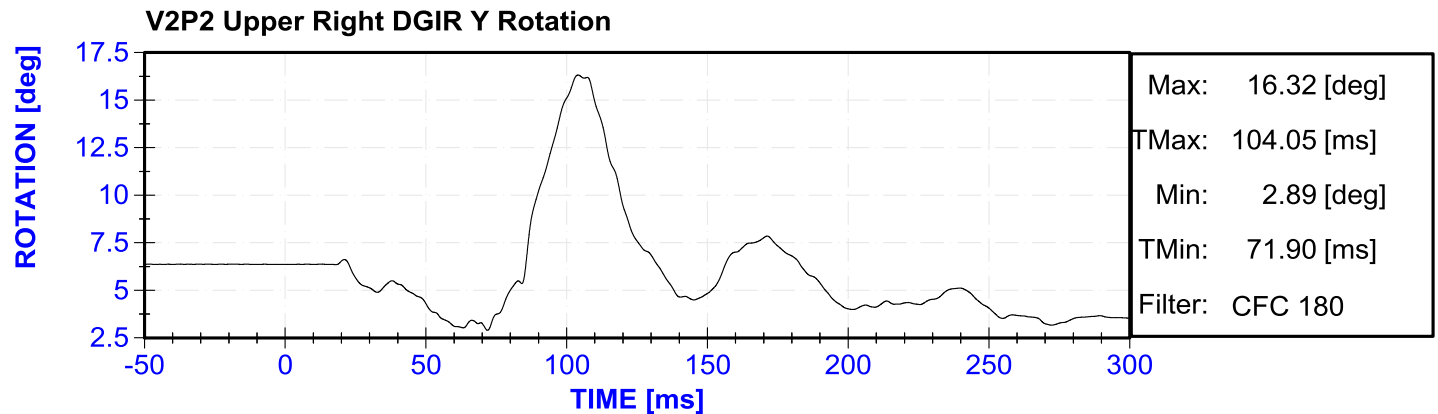
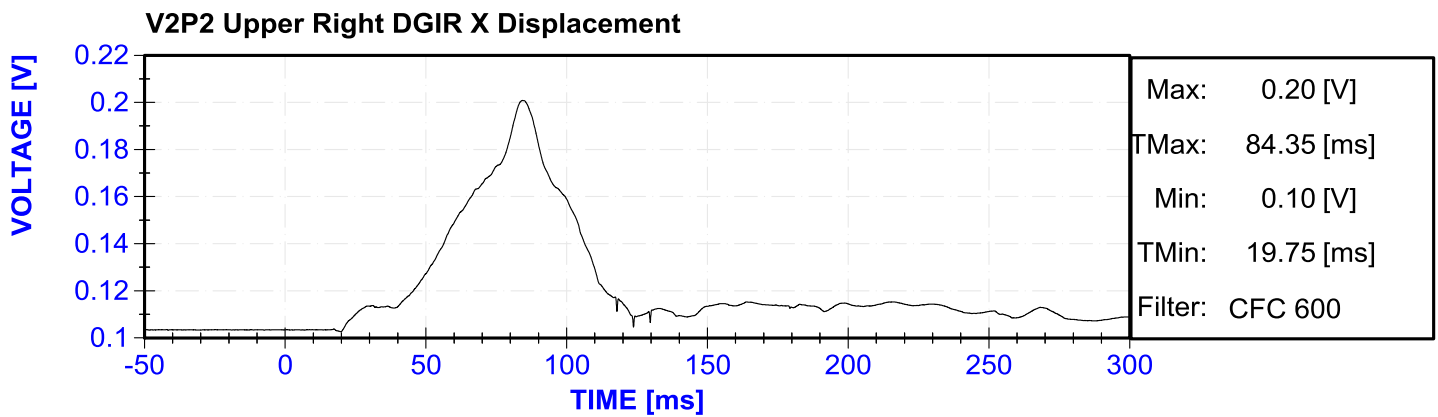
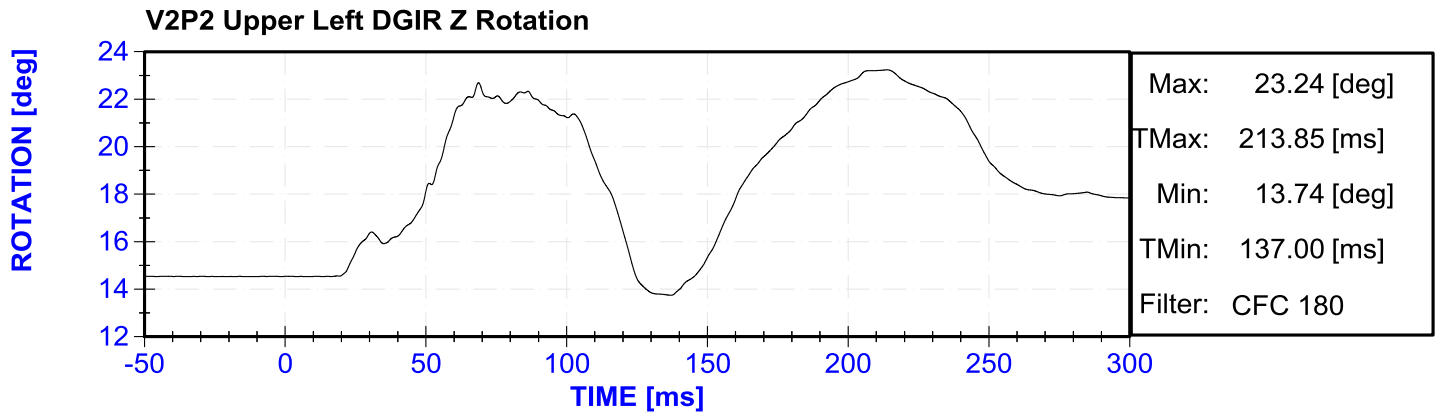




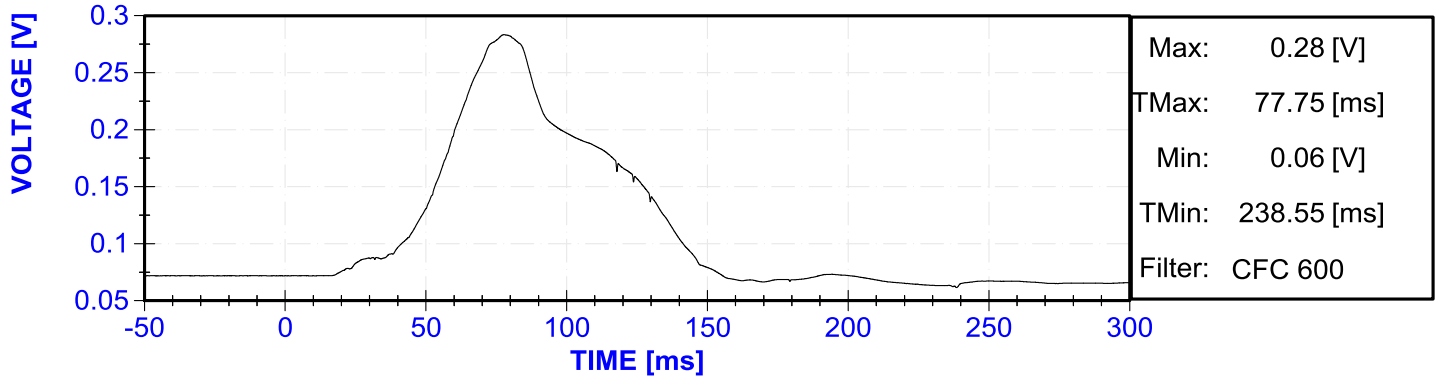




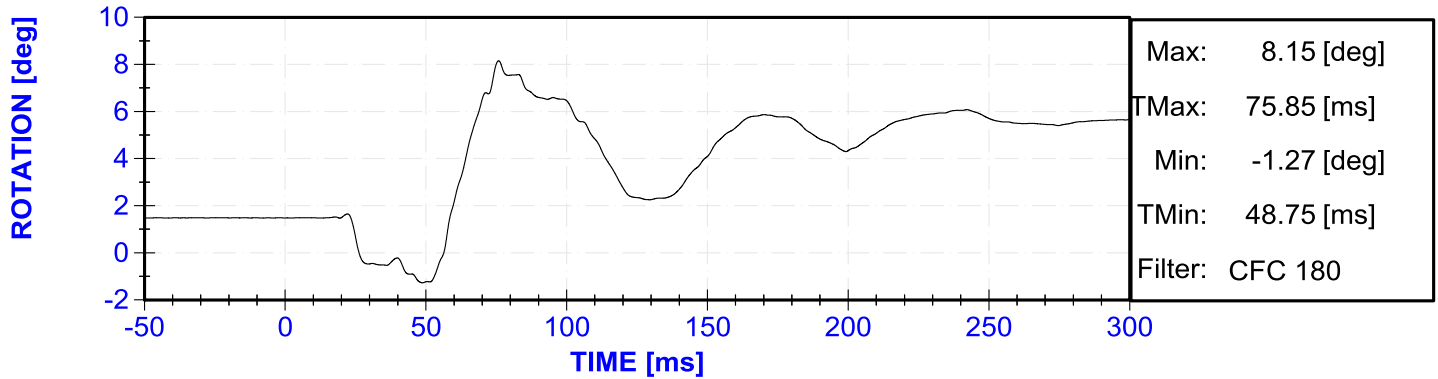




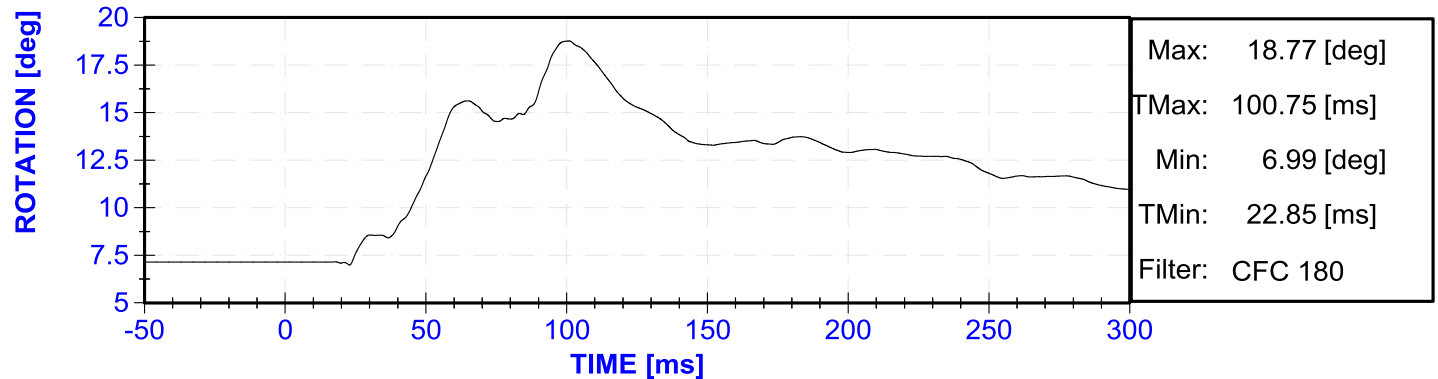
V2P2 Lower Left DGIR X Displacement



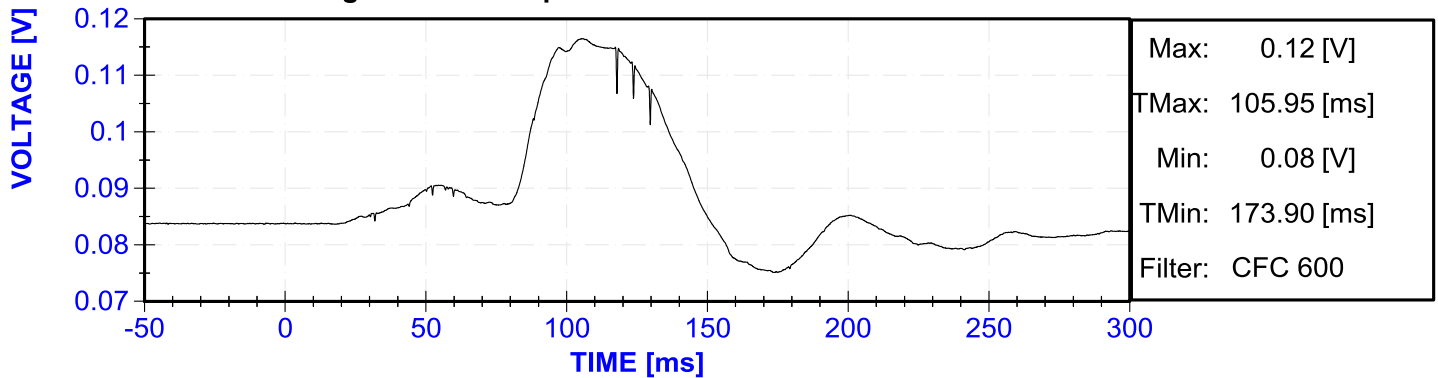
V2P2 Lower Left DGIR Y Rotation

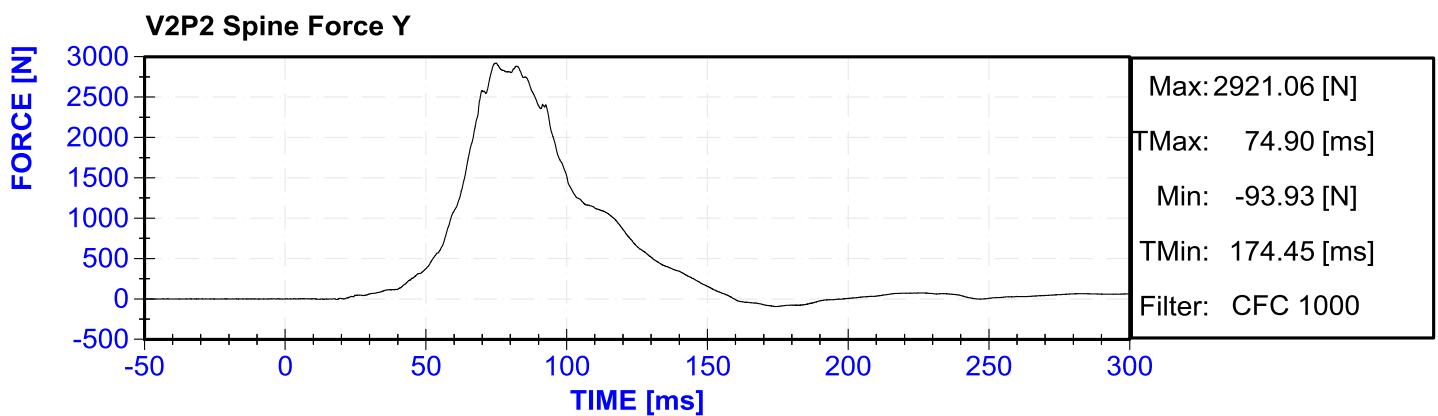
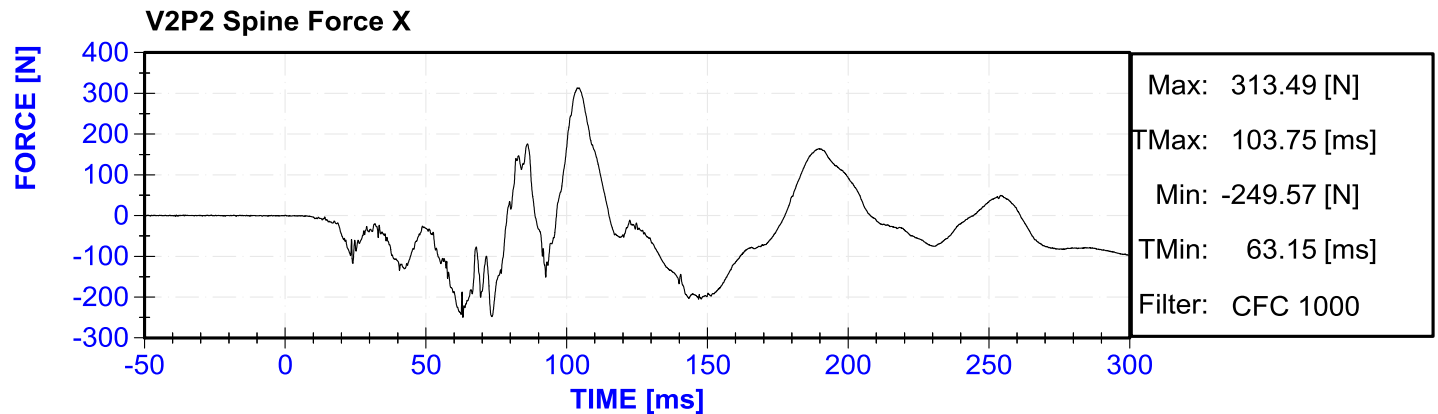
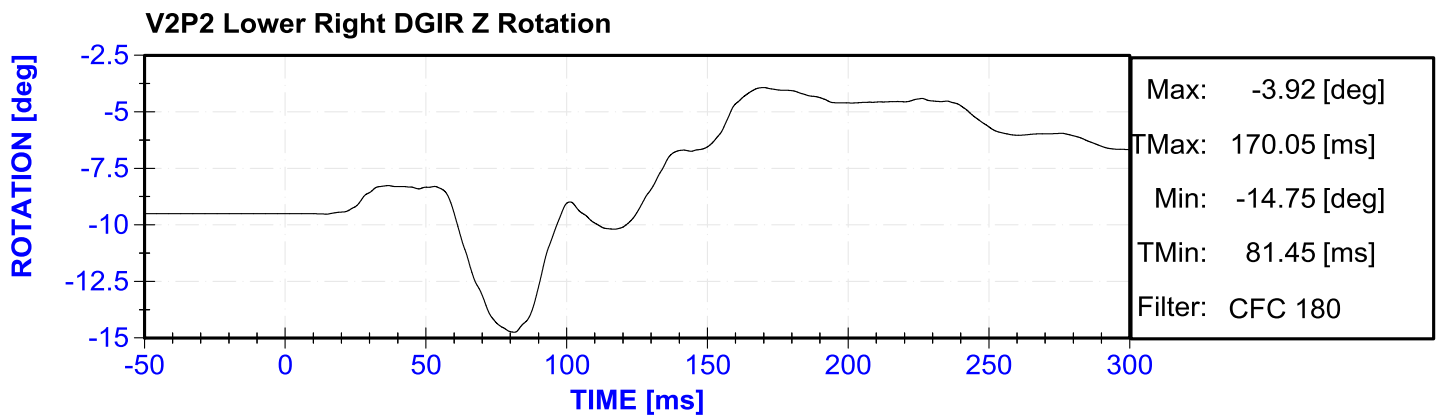
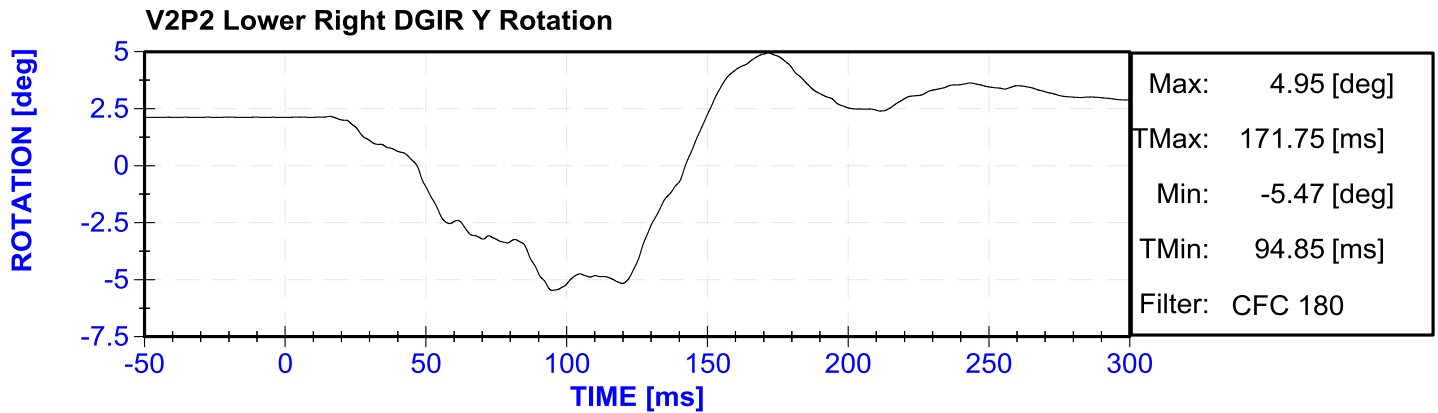


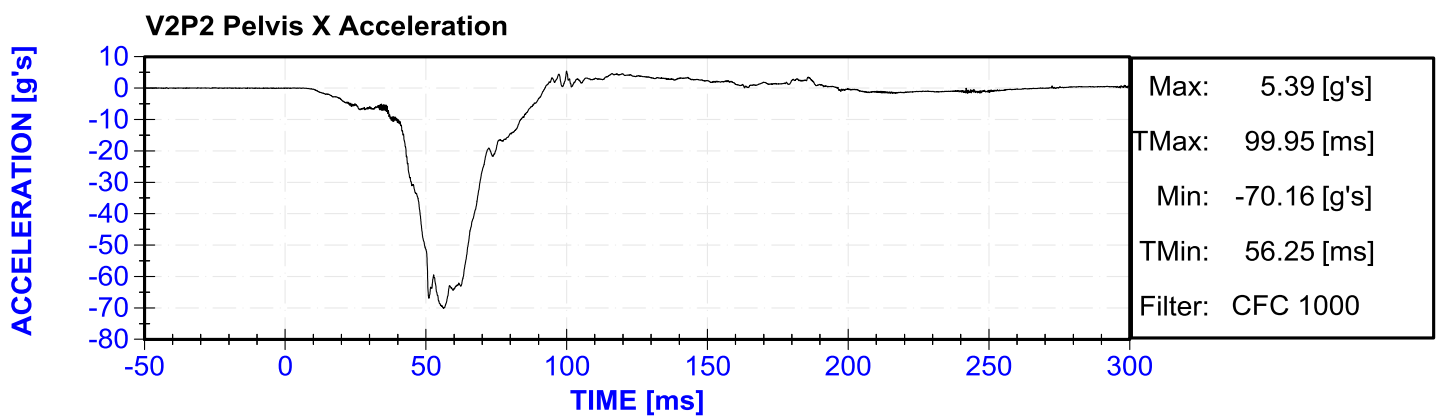
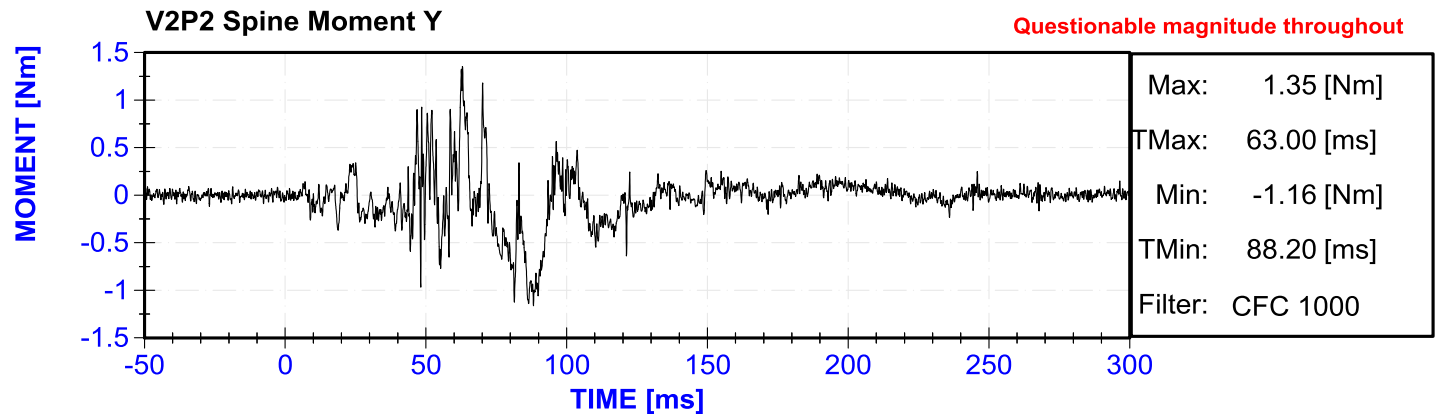
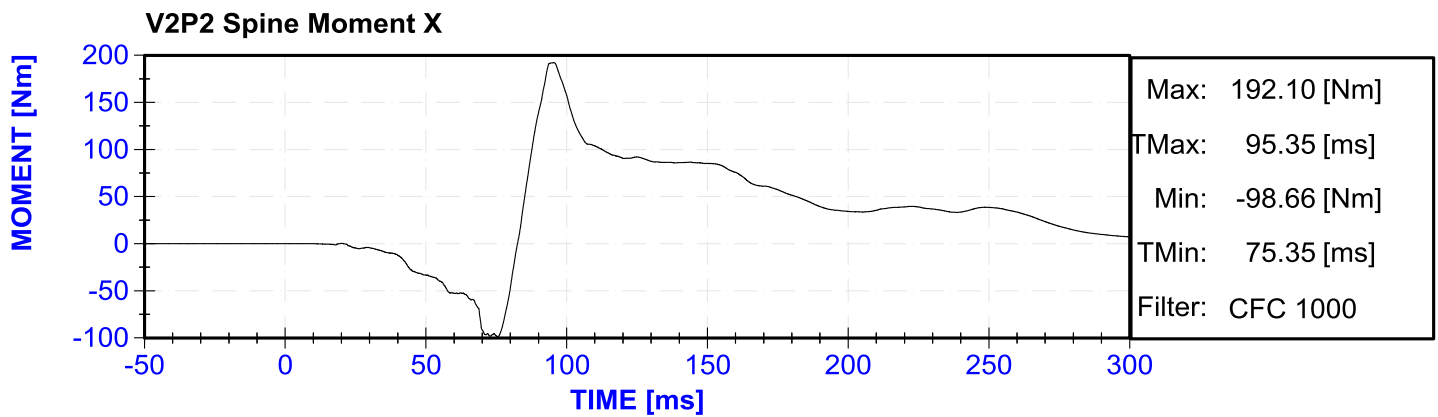
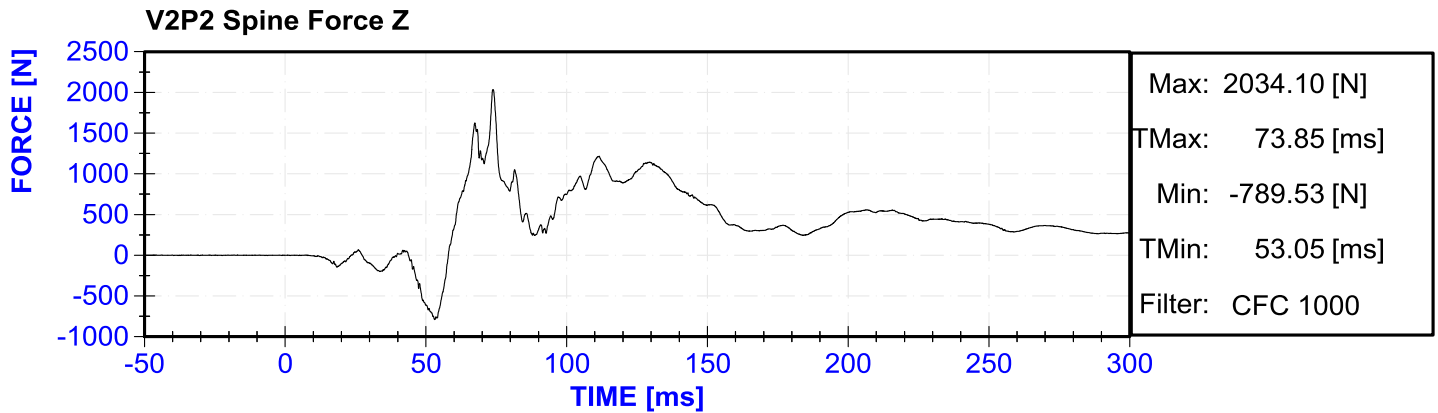
V2P2 Lower Left DGIR Z Rotation

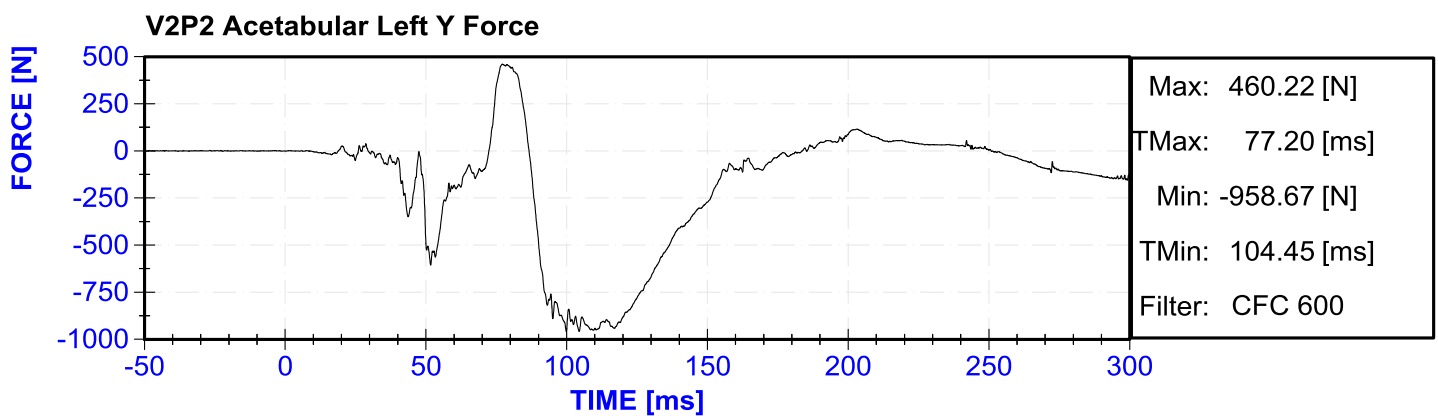
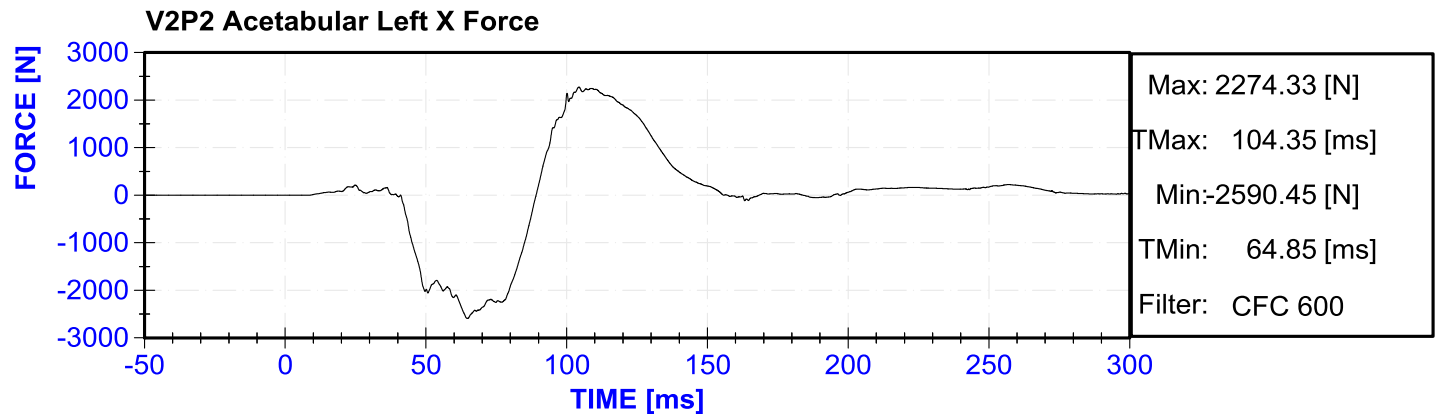
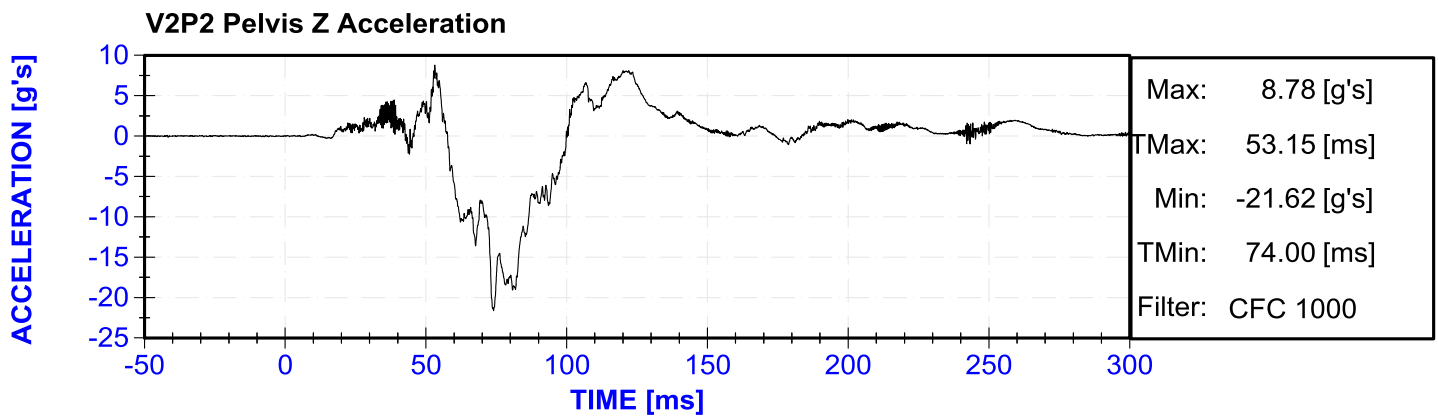
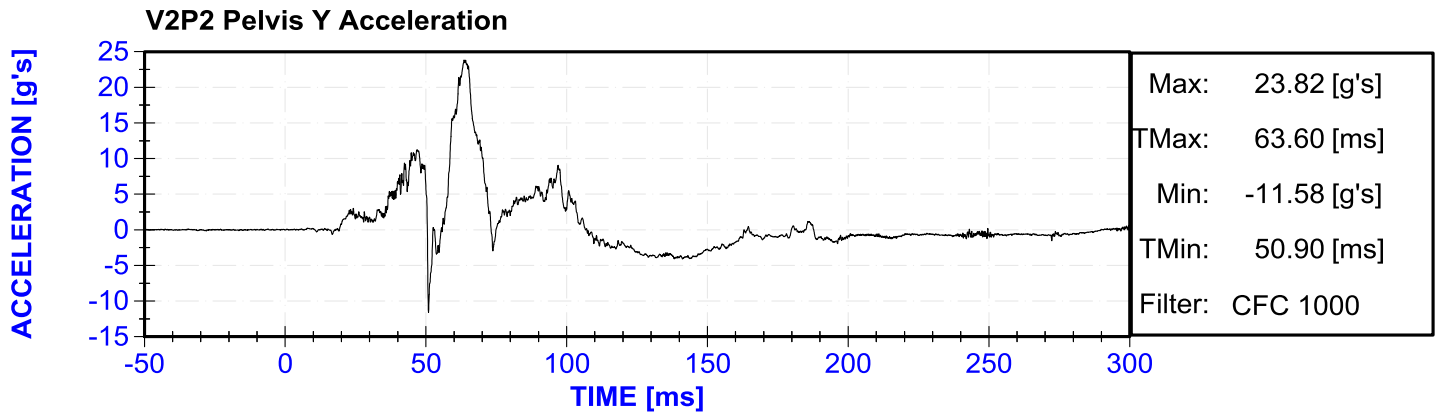


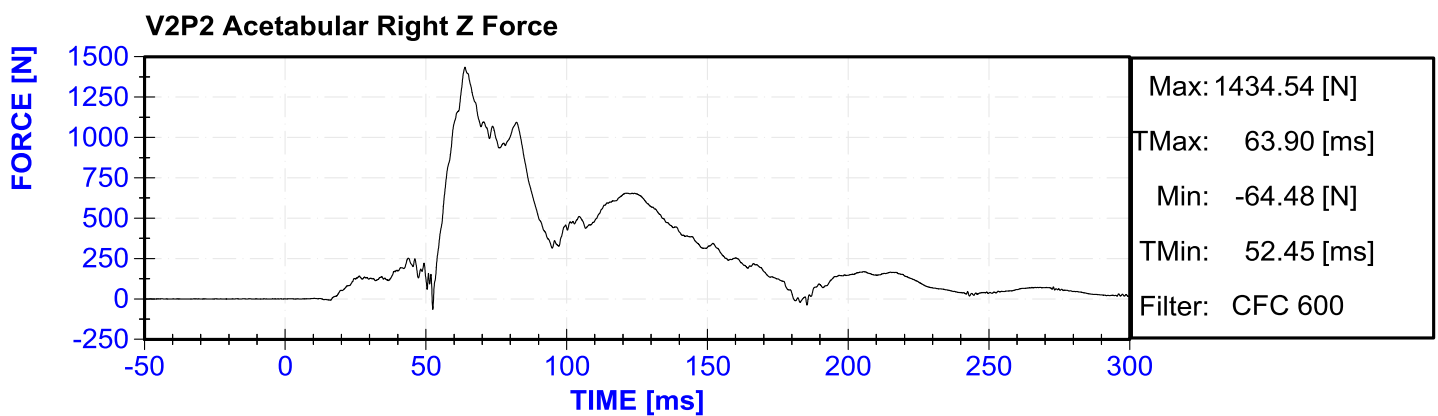
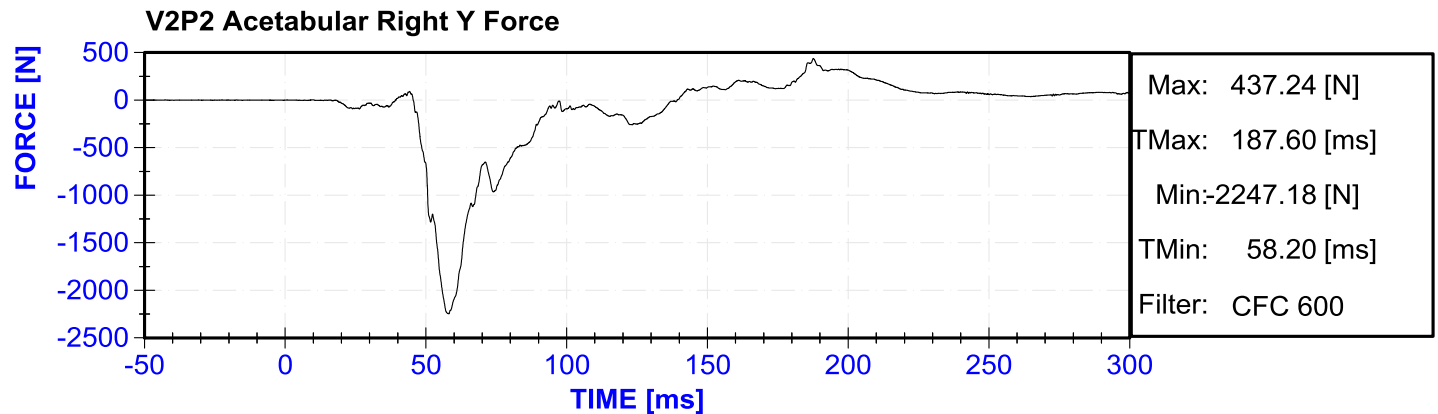
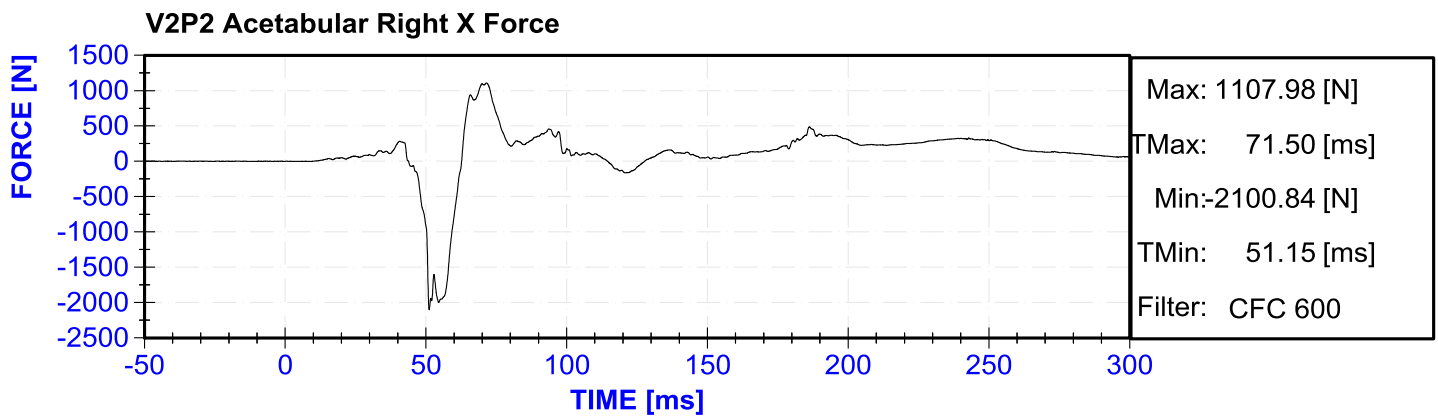
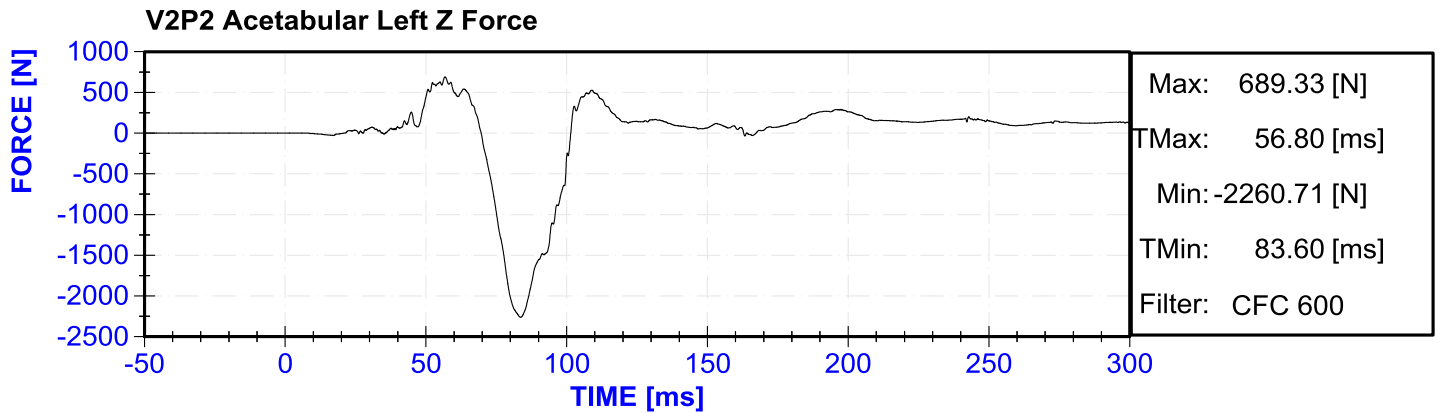
V2P2 Lower Right DGIR X Displacement

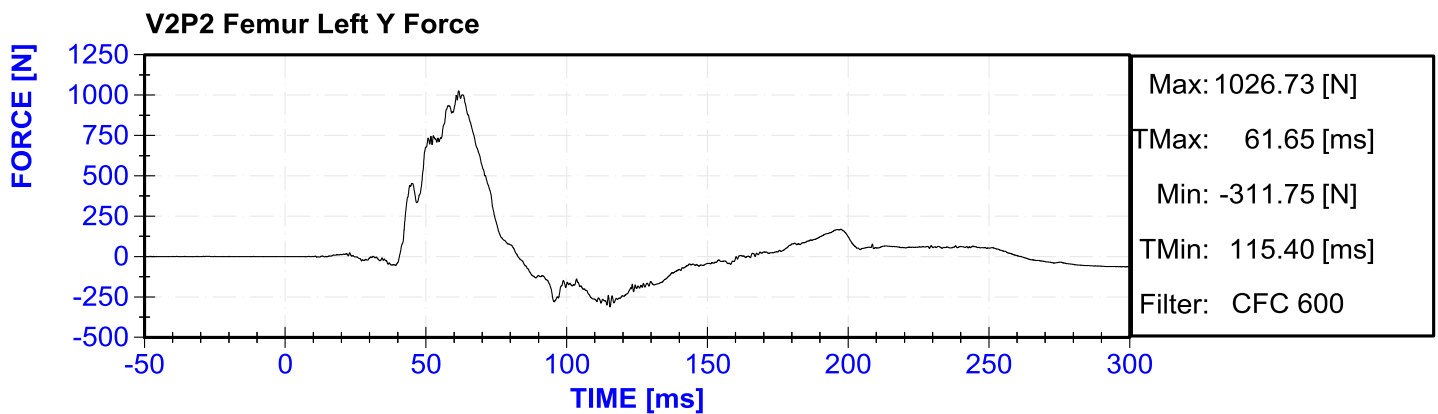
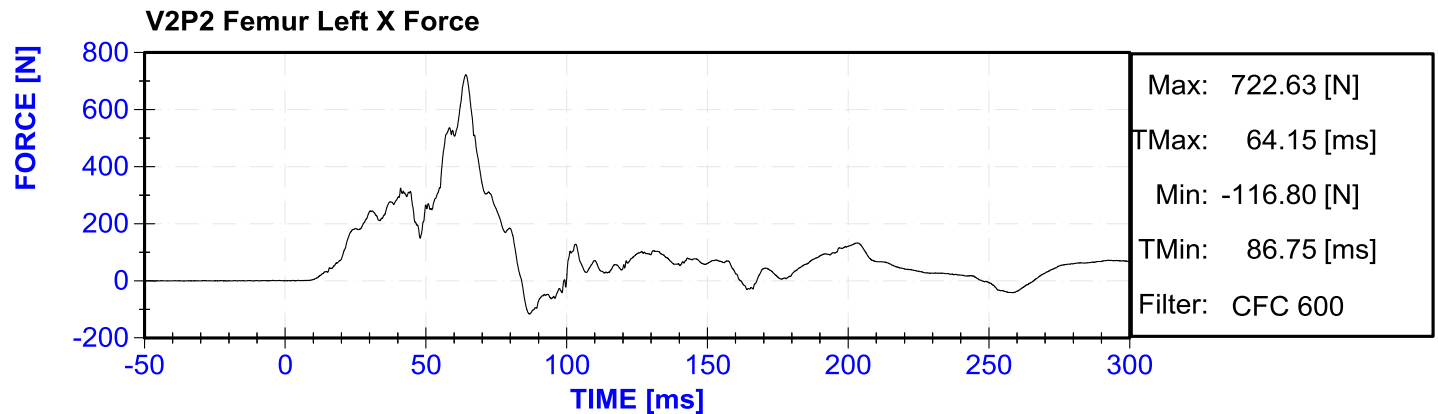
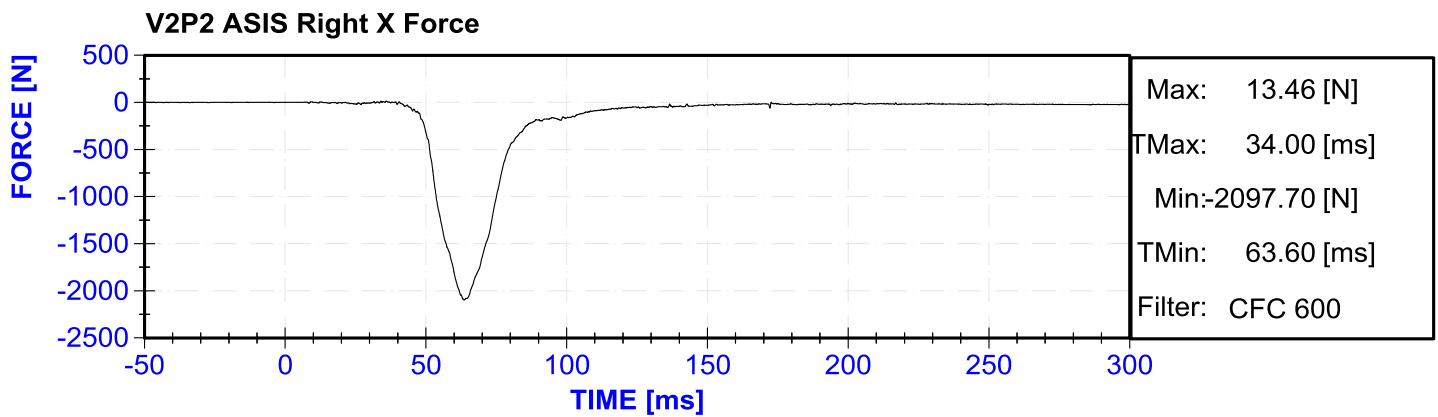
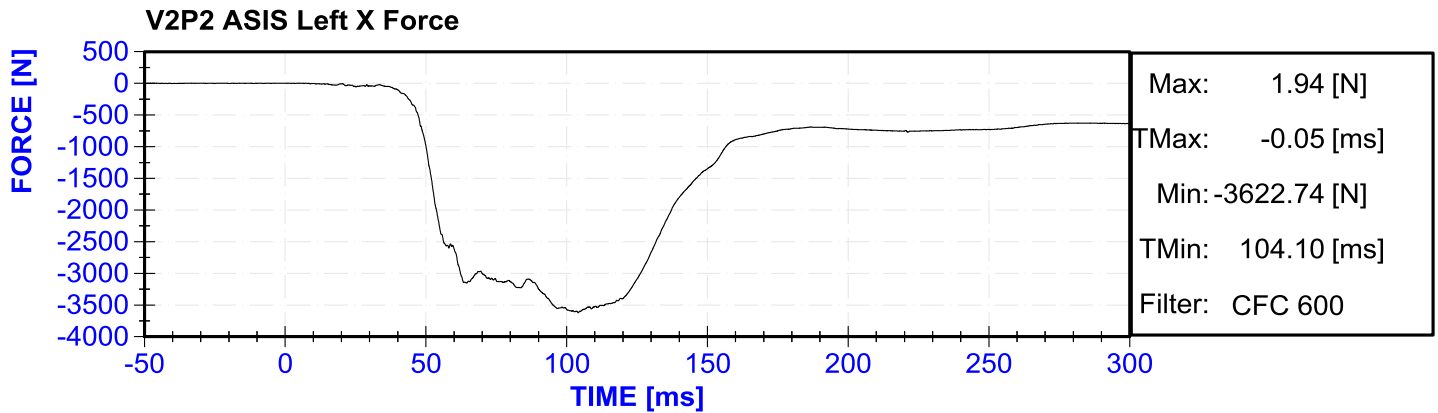


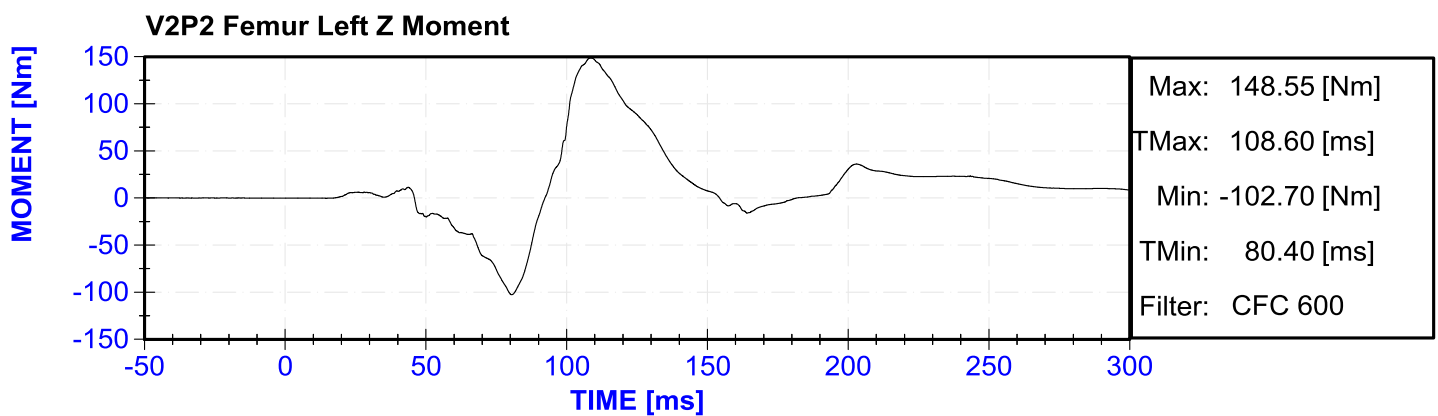
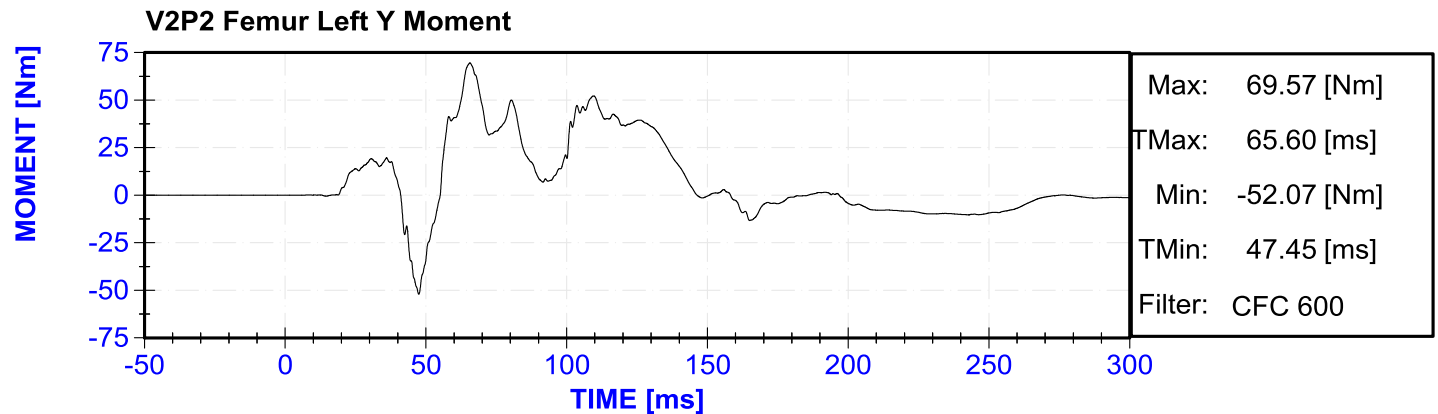
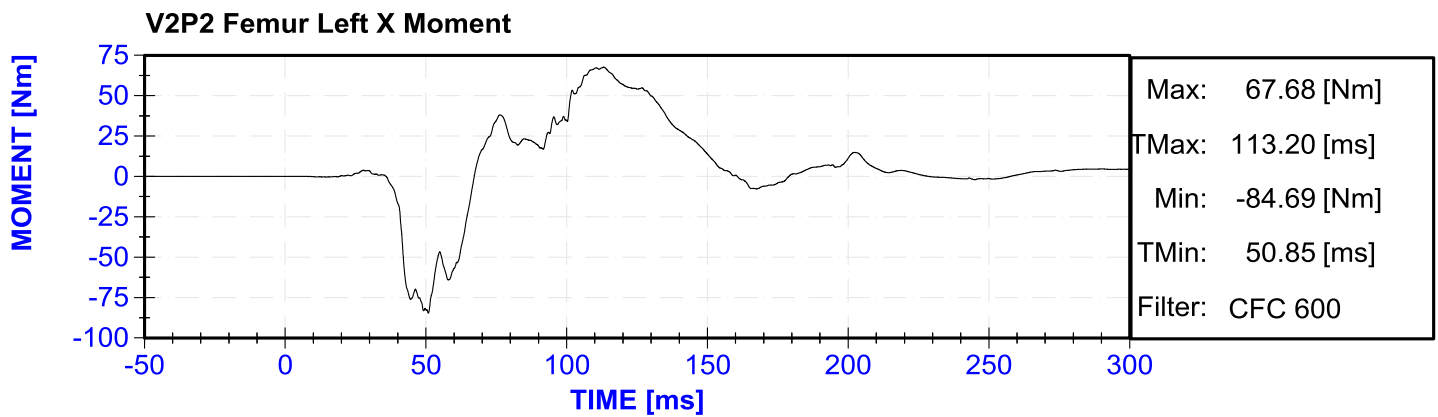
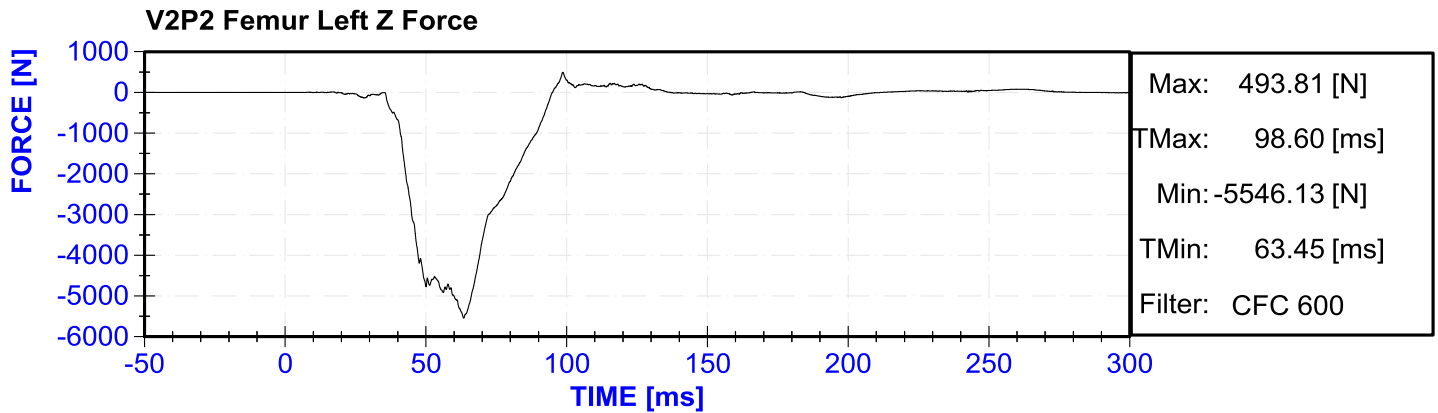


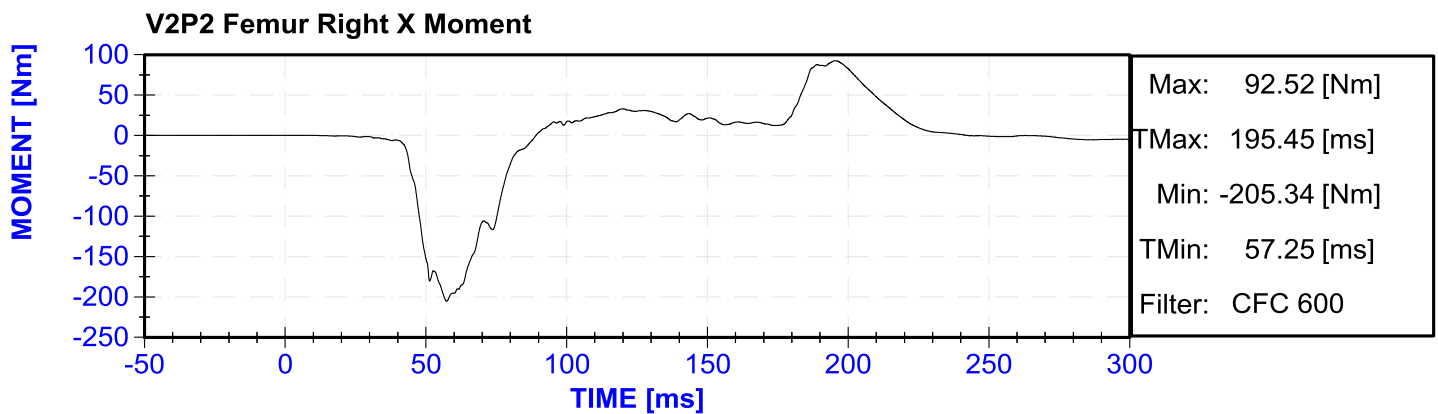
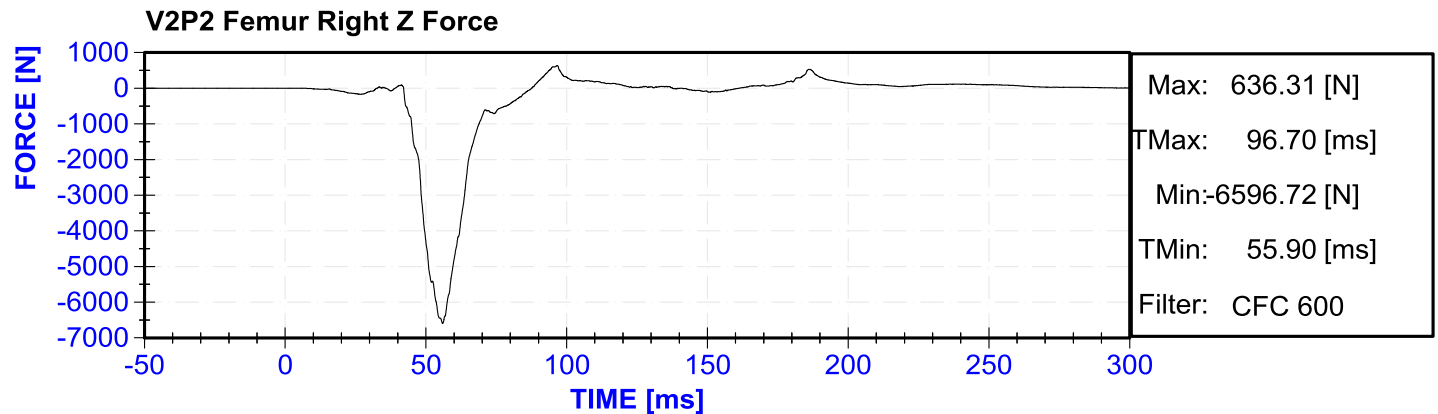
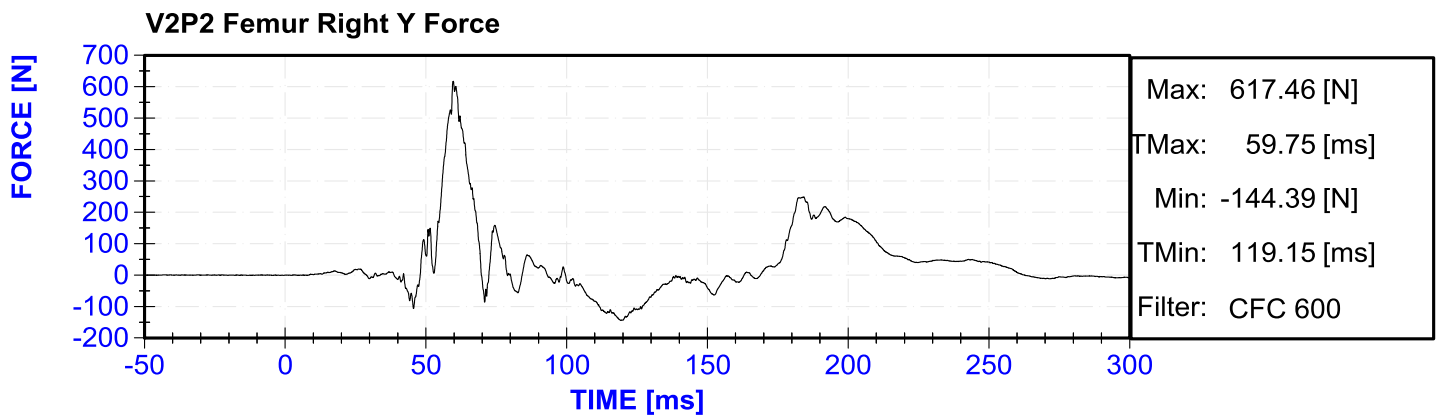
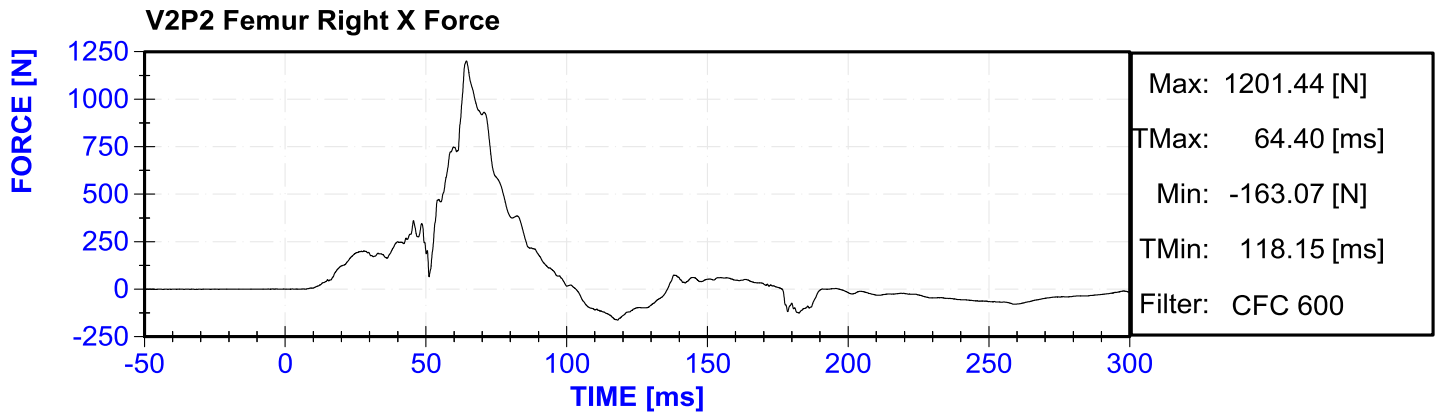


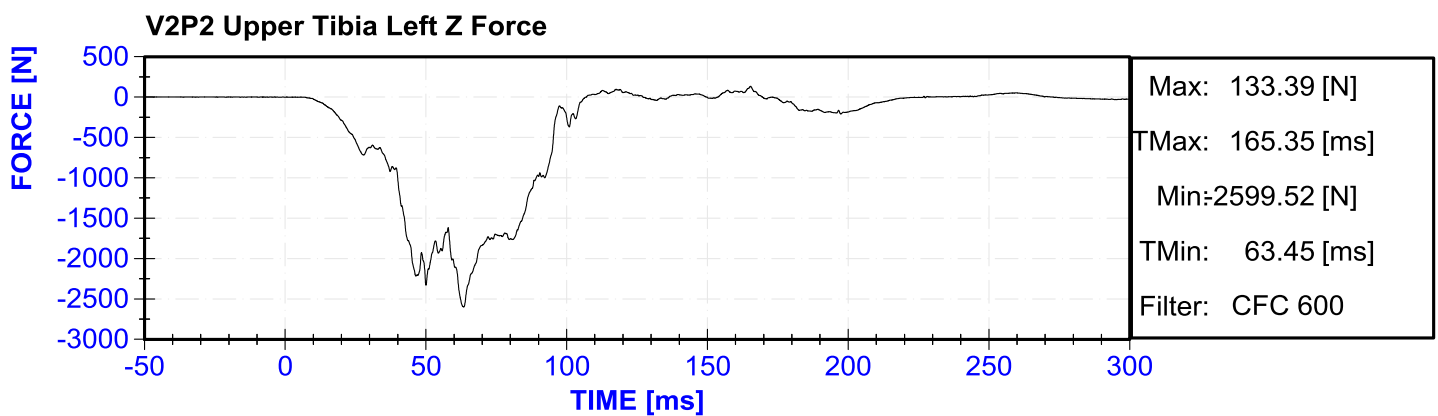
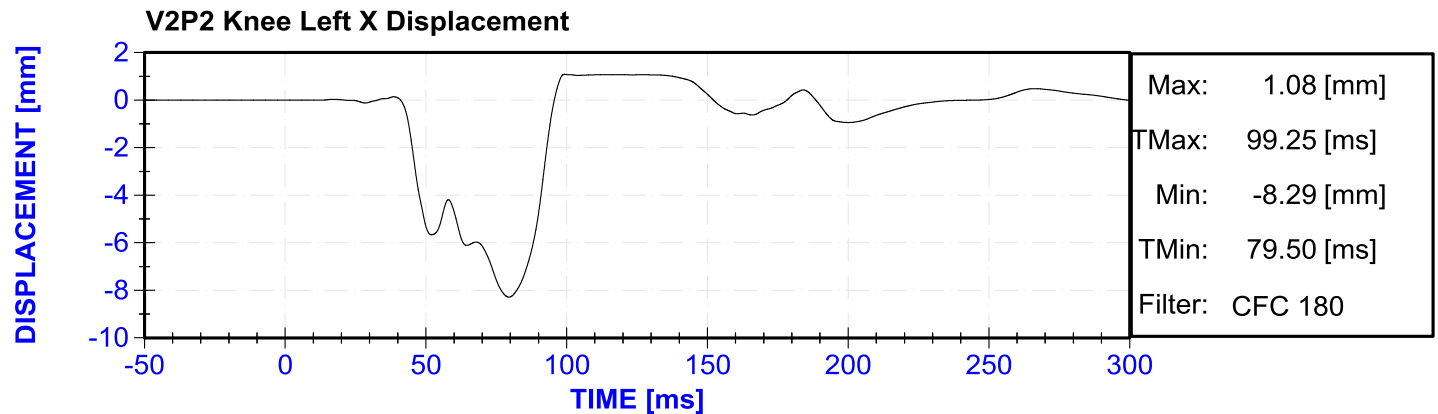
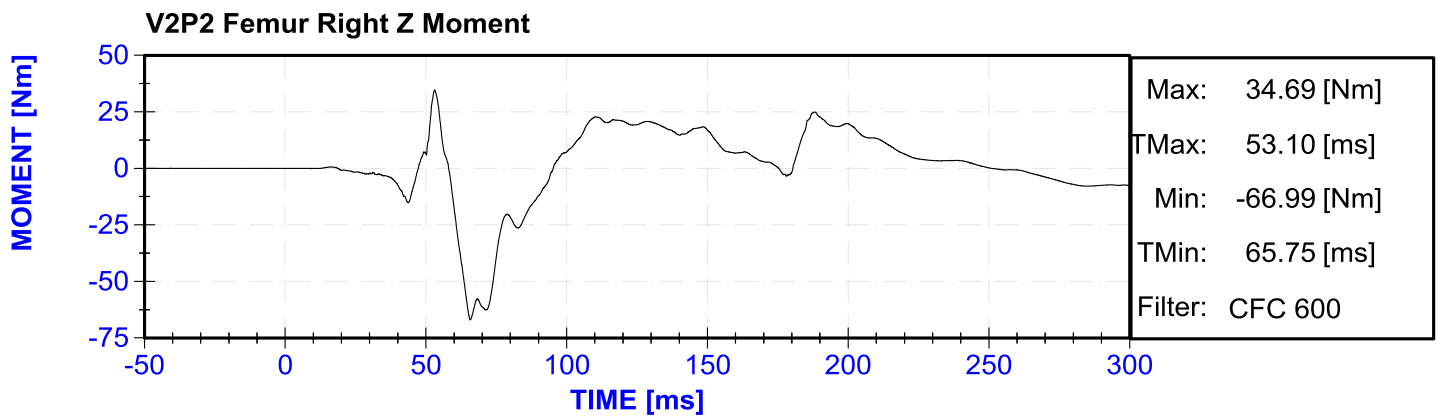
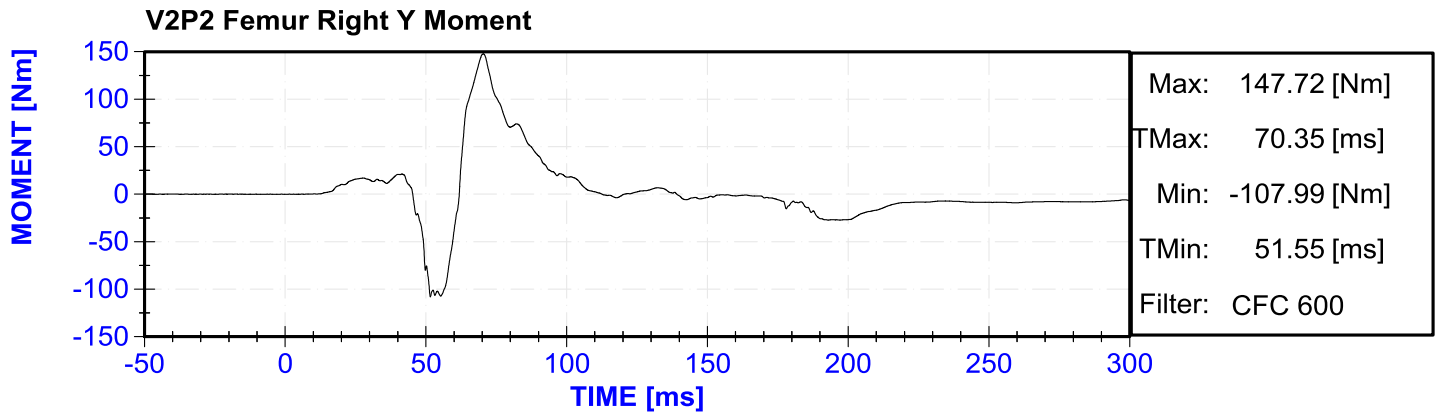




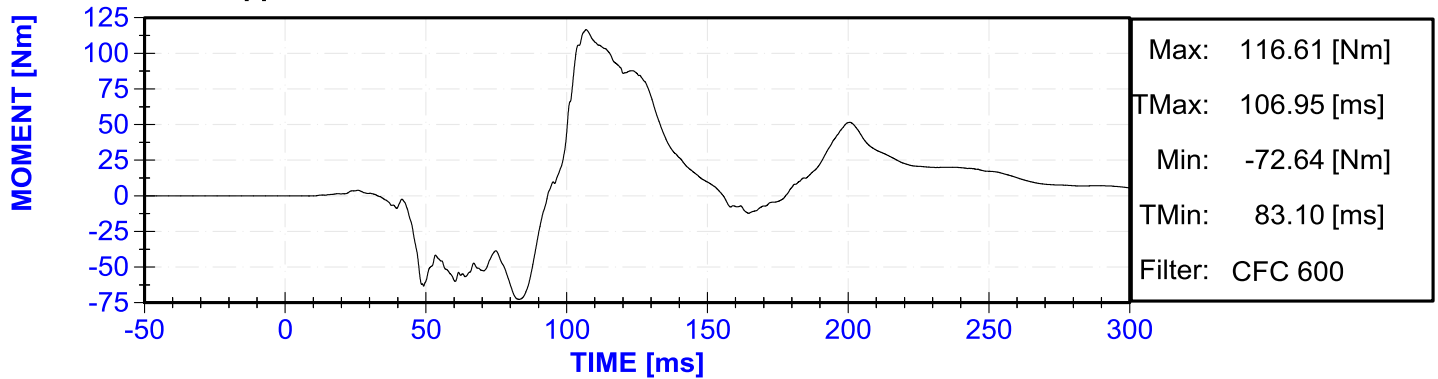




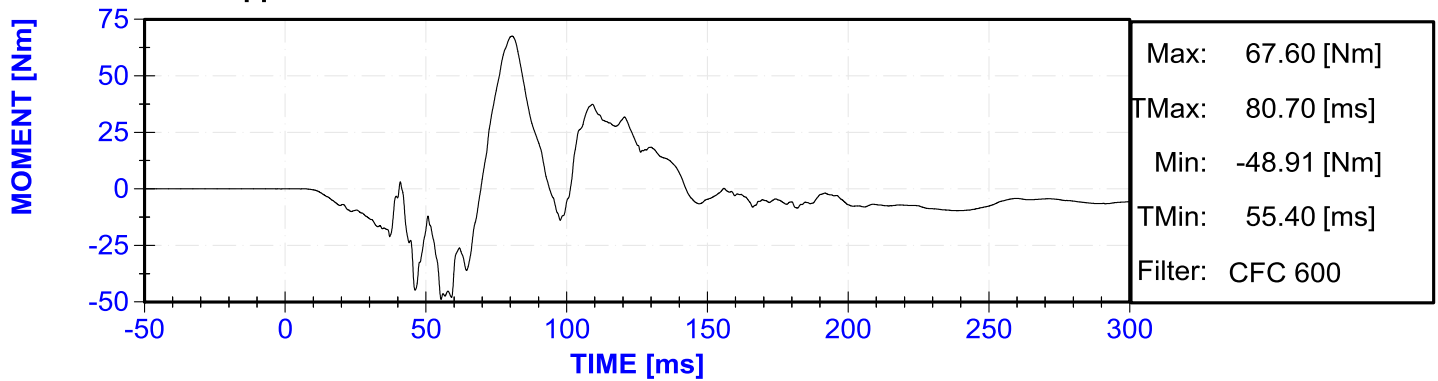




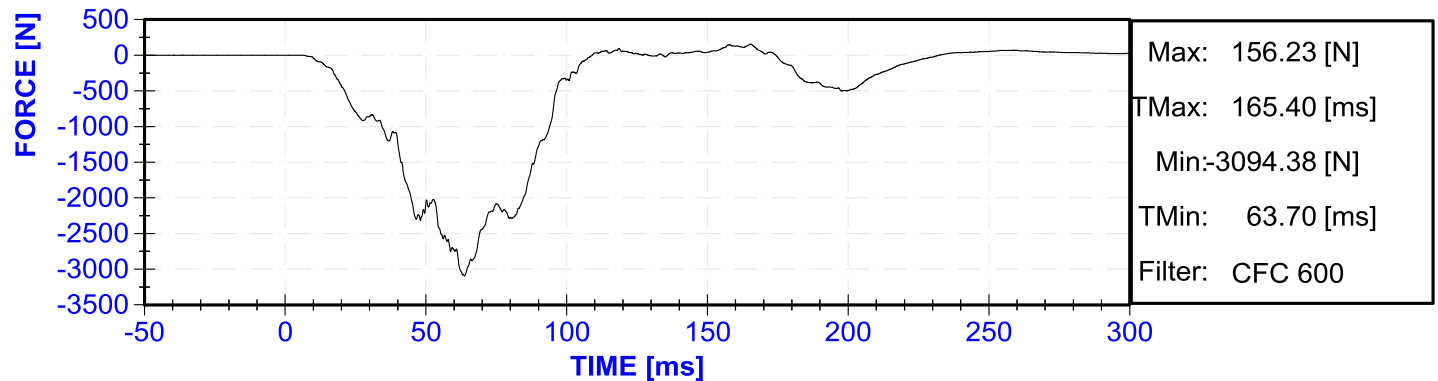
V2P2 Upper Tibia Left X Moment



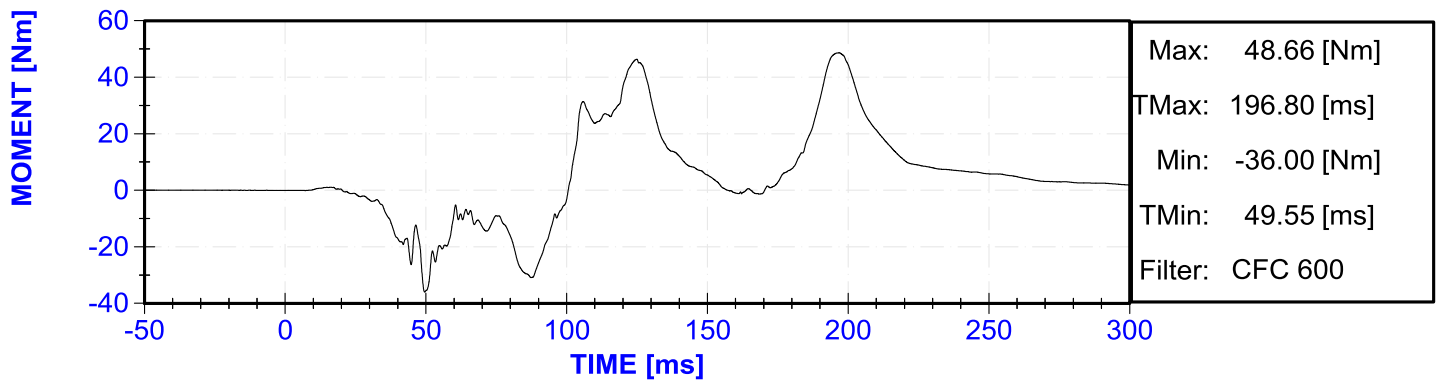
V2P2 Upper Tibia Left Y Moment

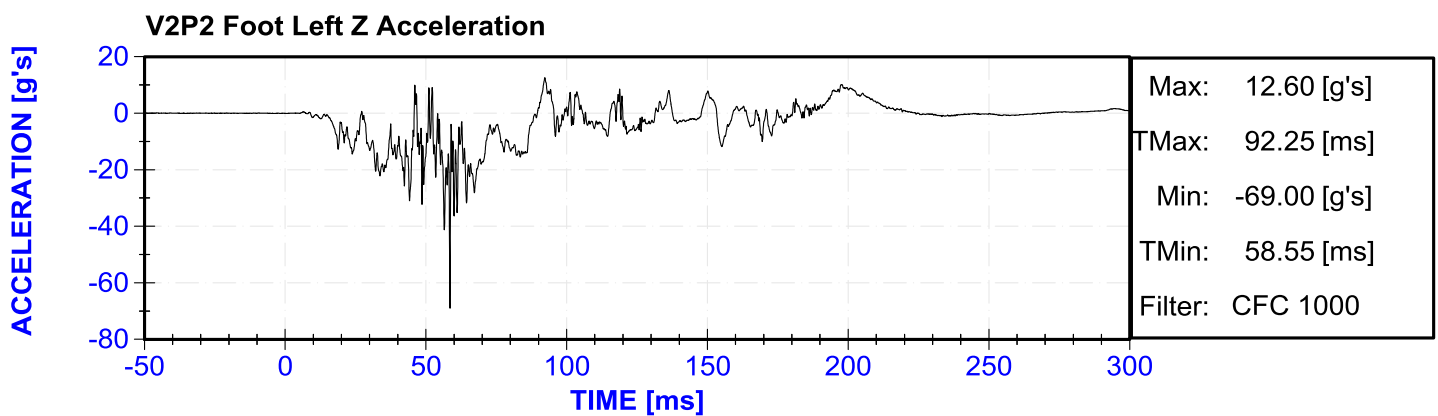
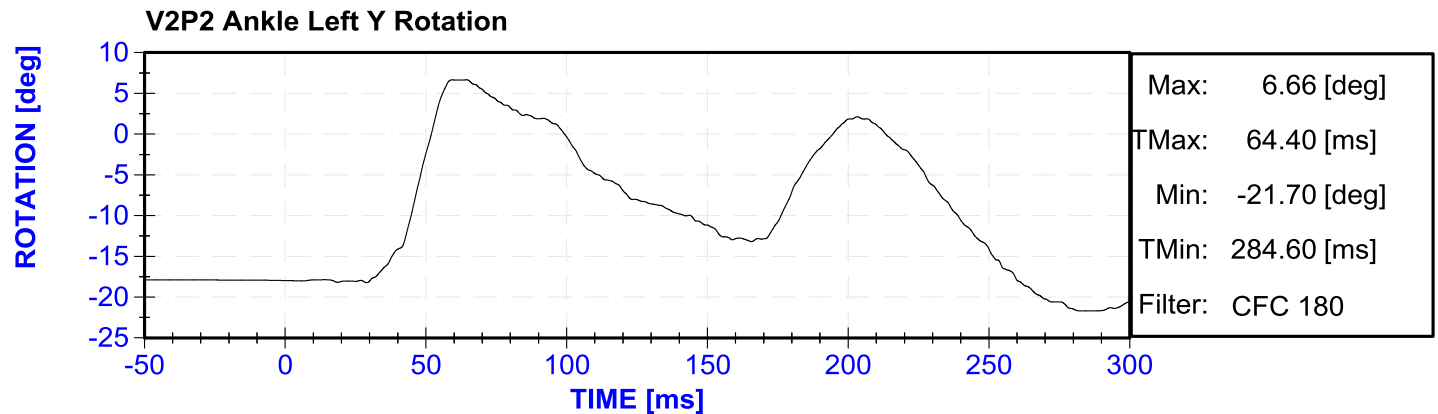
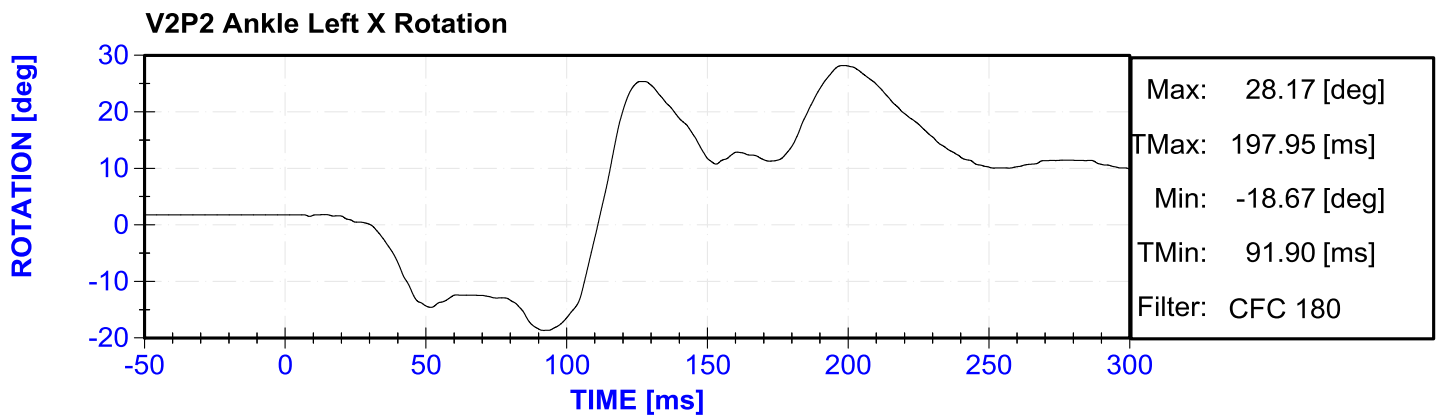
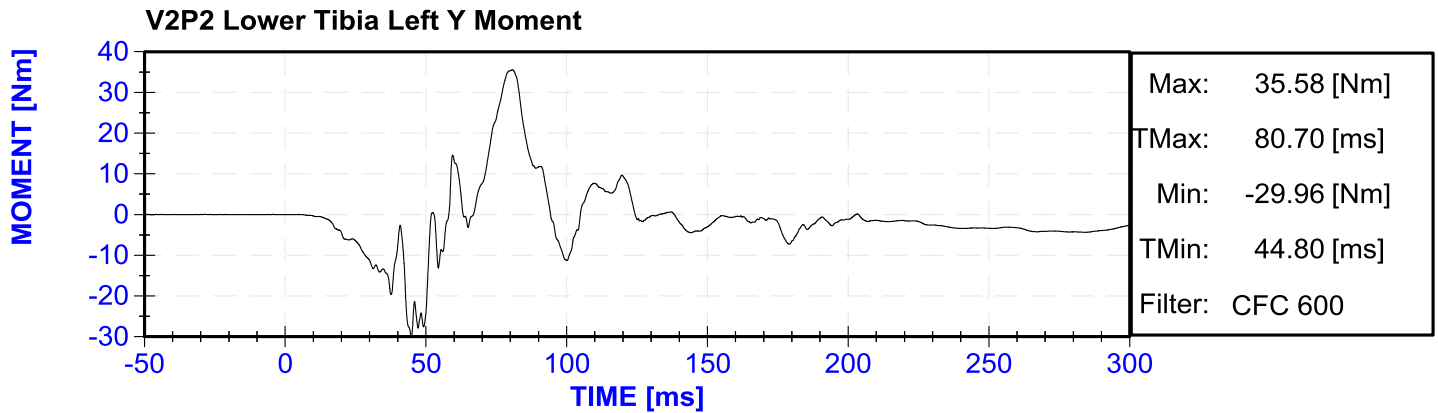


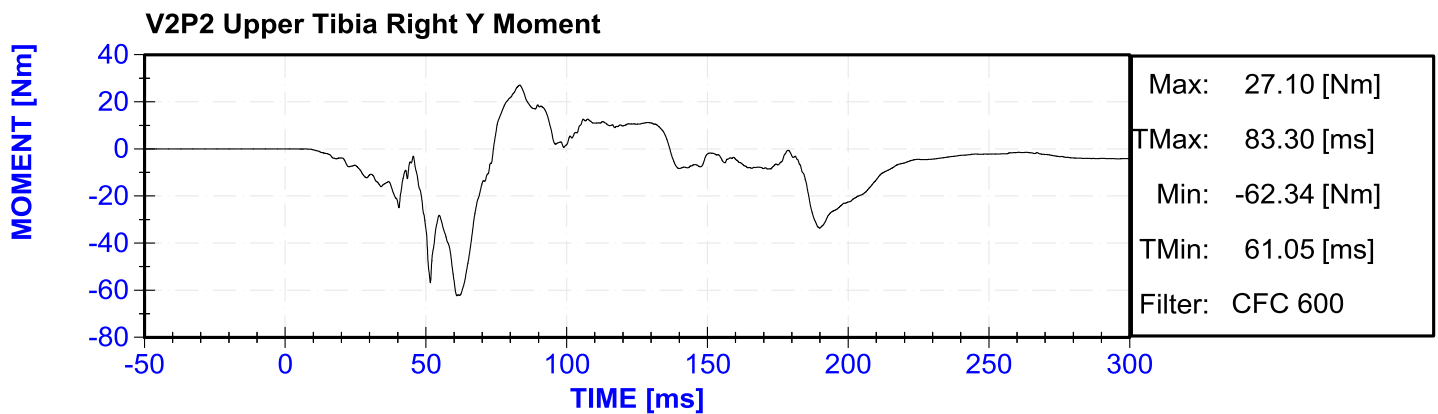
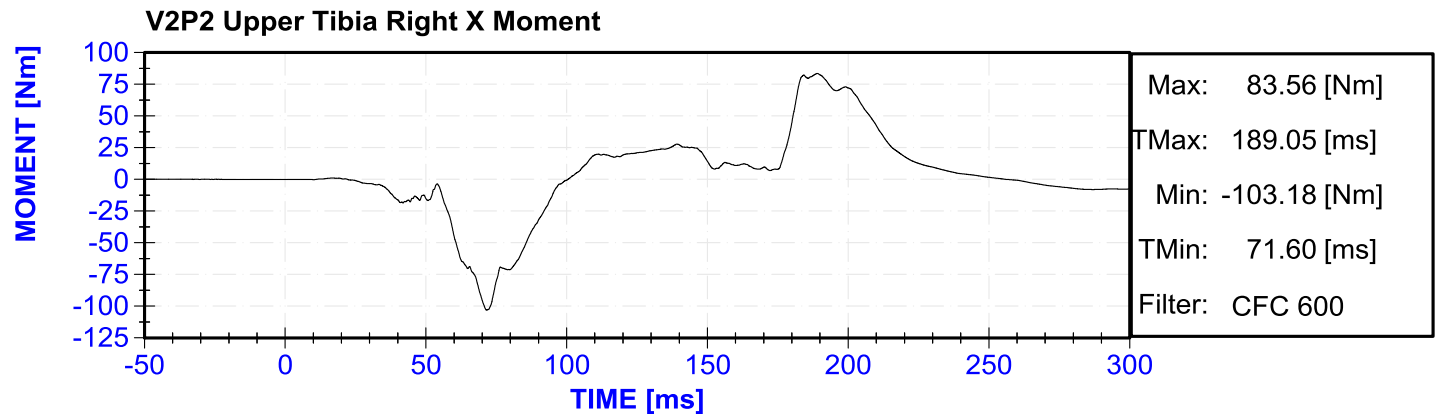
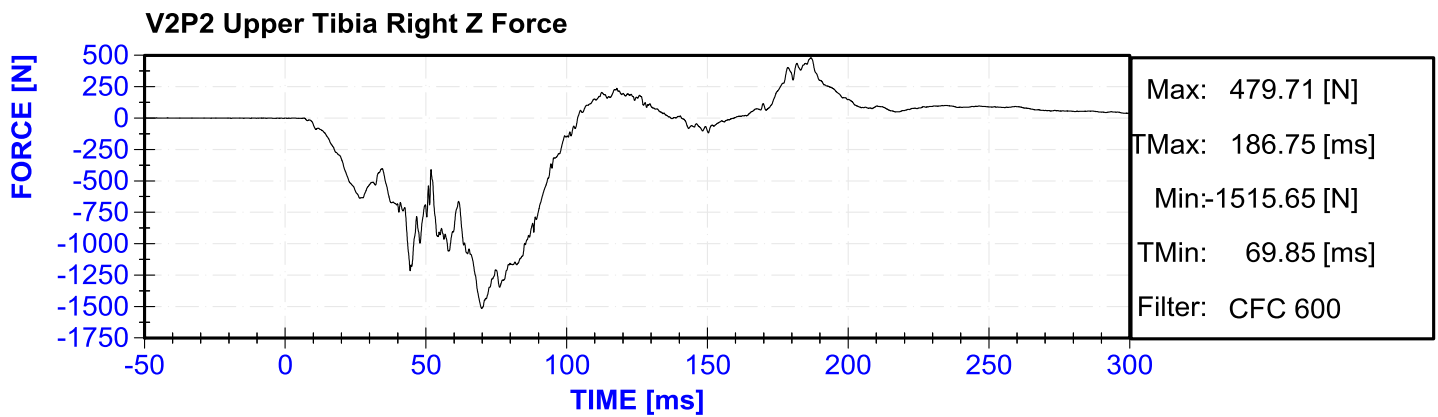
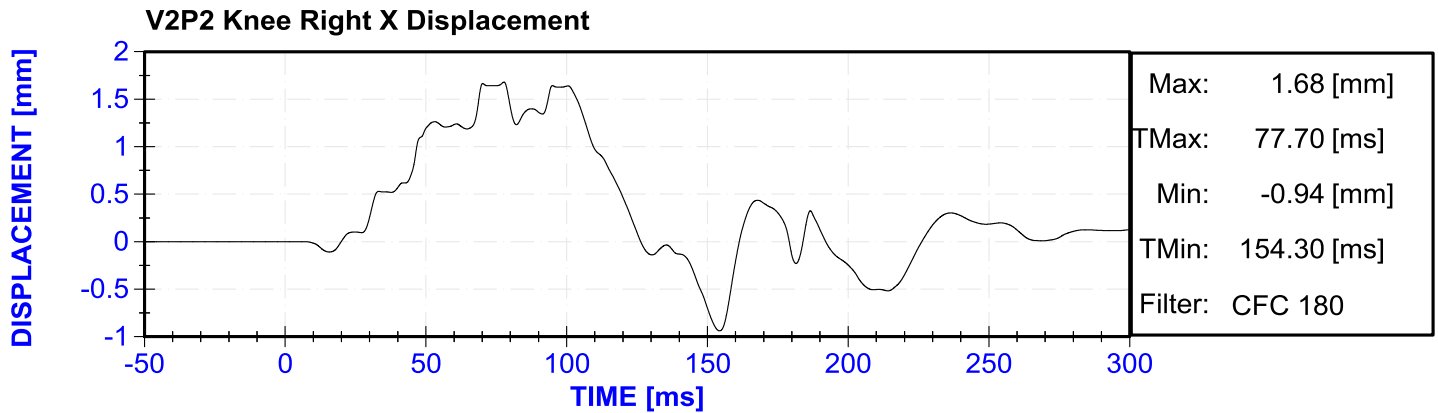
V2P2 Lower Tibia Left Z Force

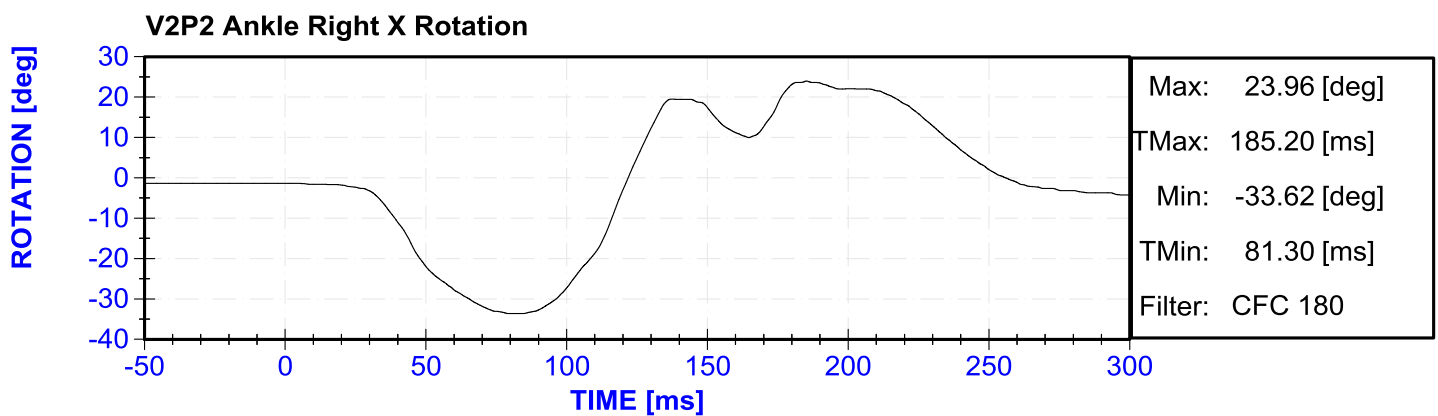
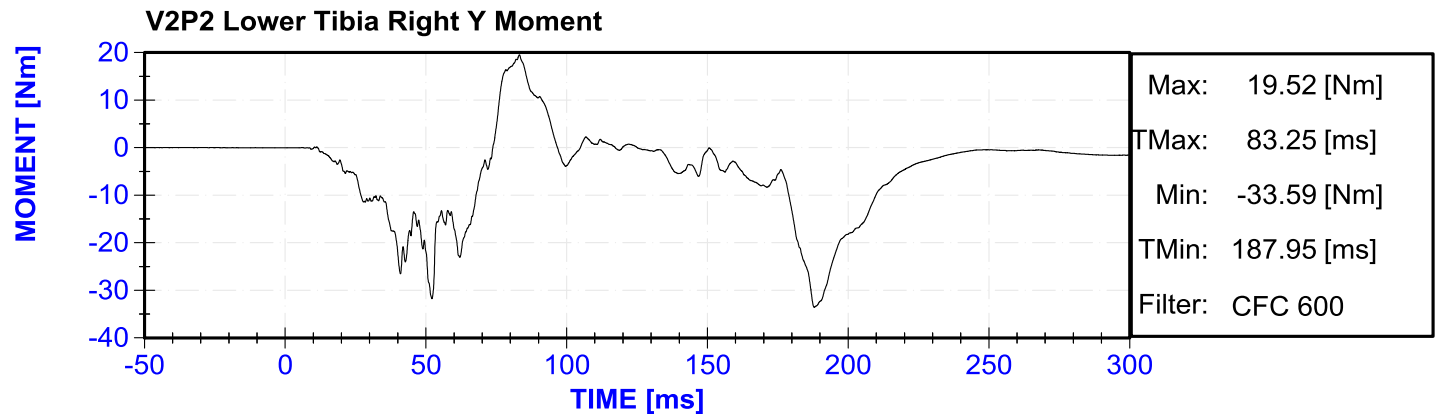
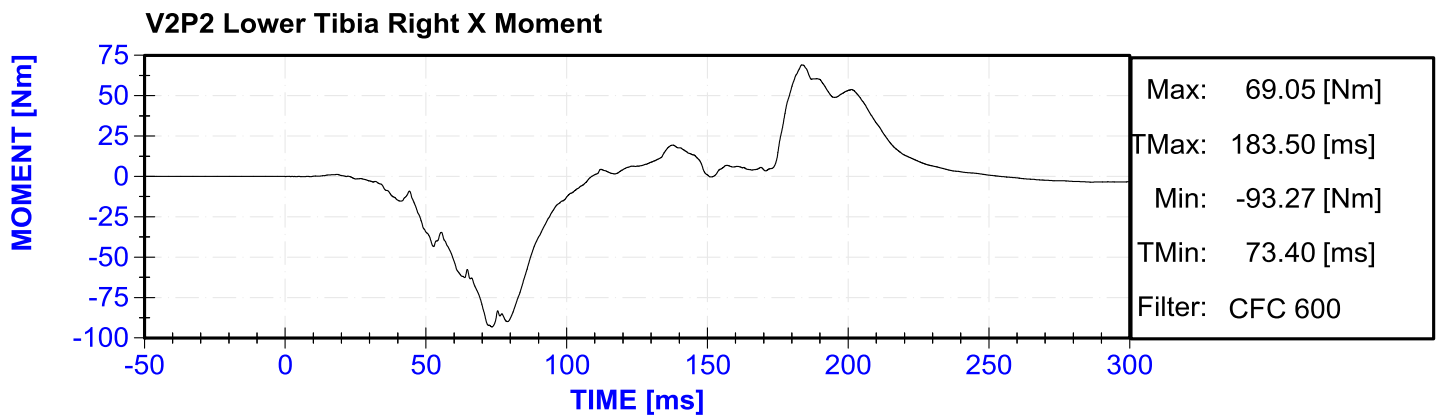
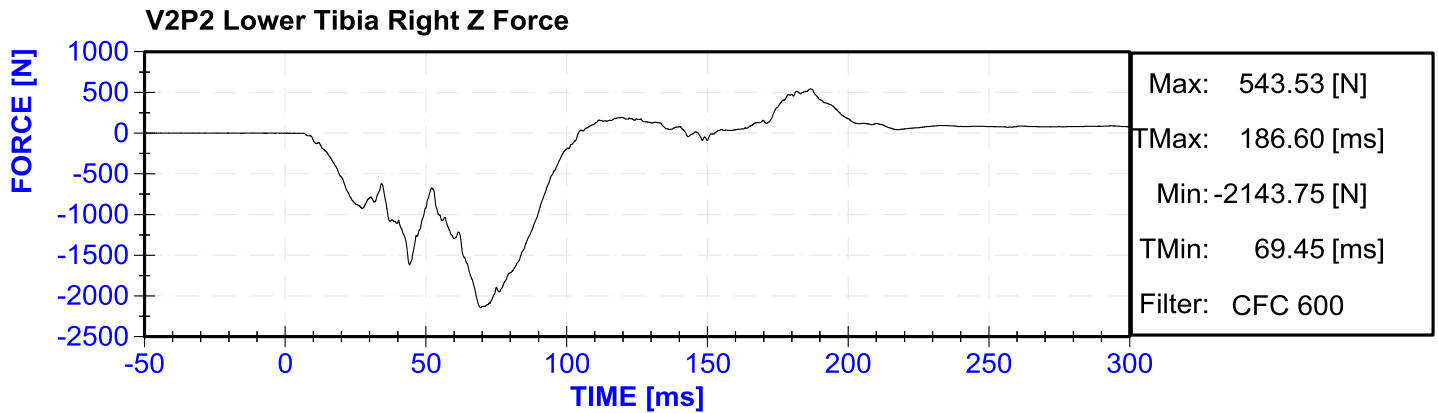


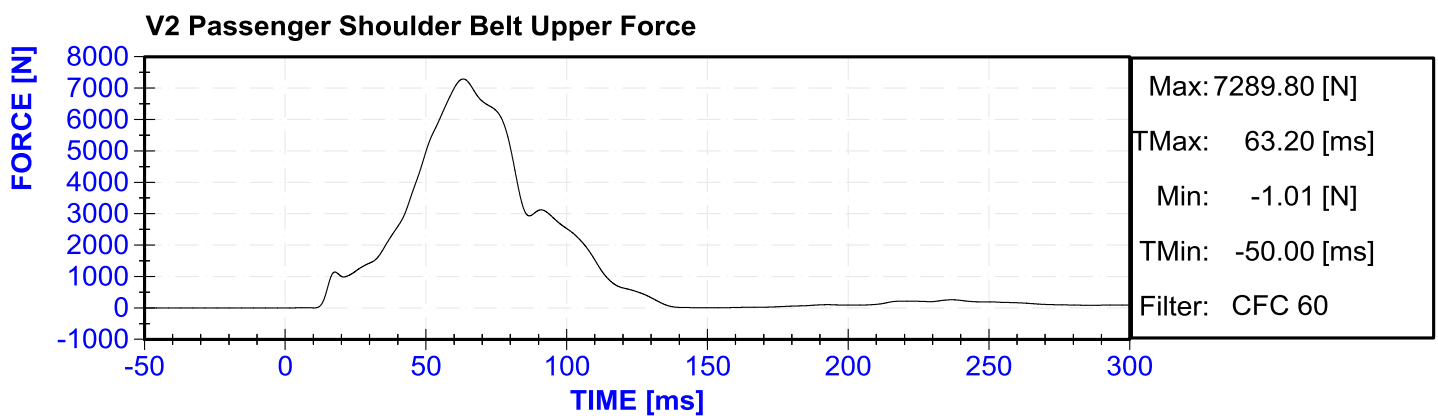
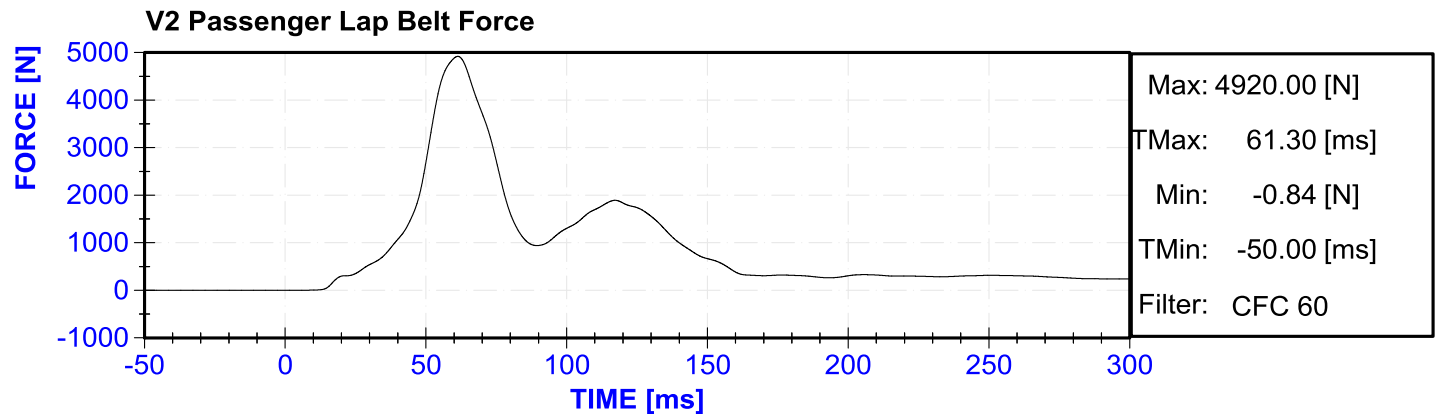
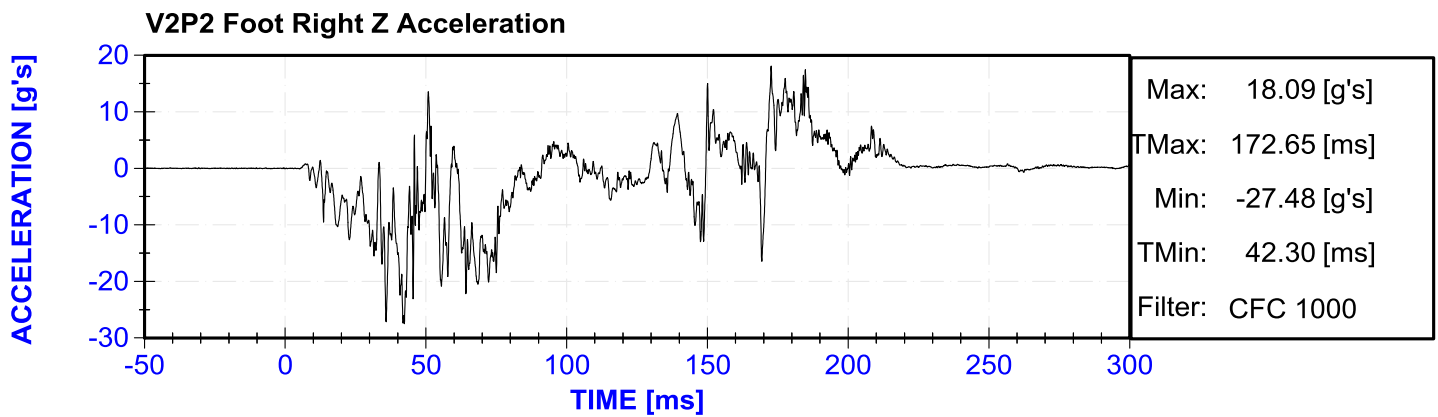
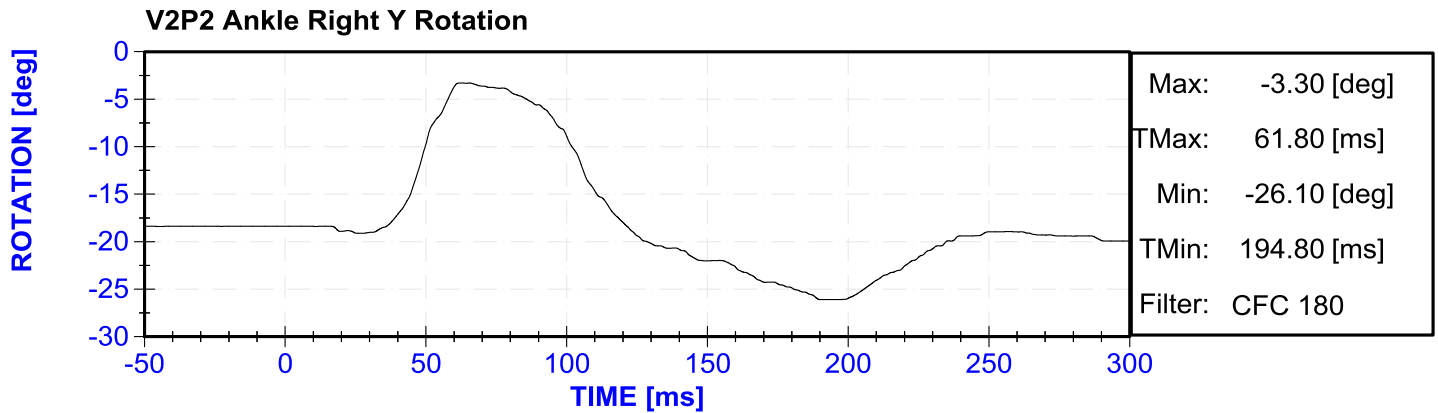
V2P2 Lower Tibia Left X Moment

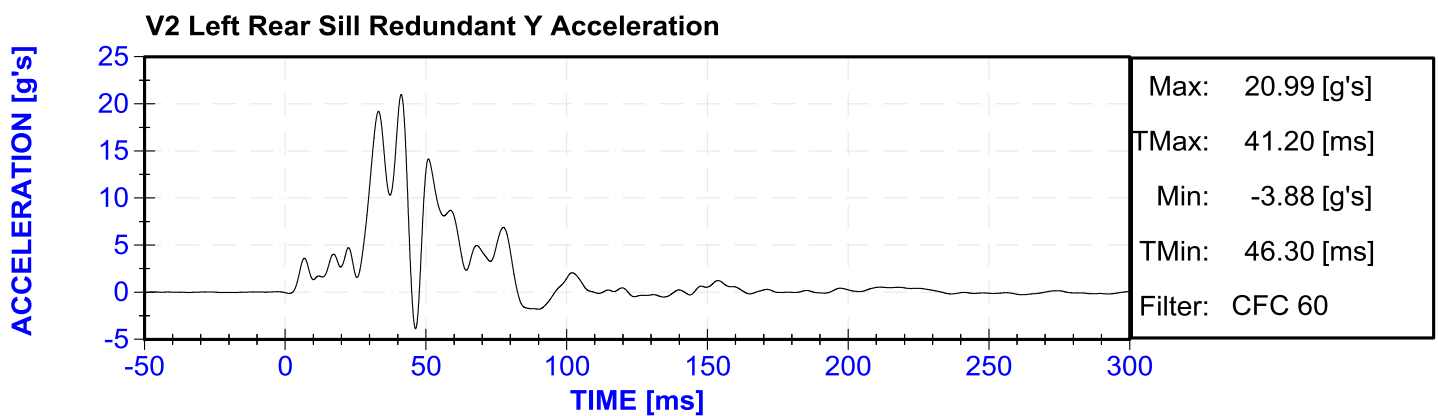
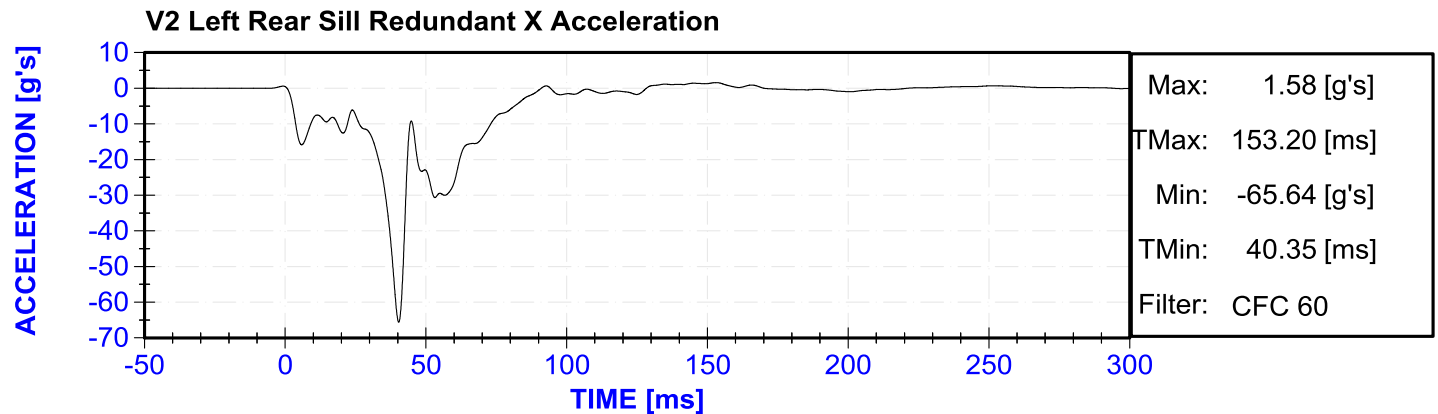
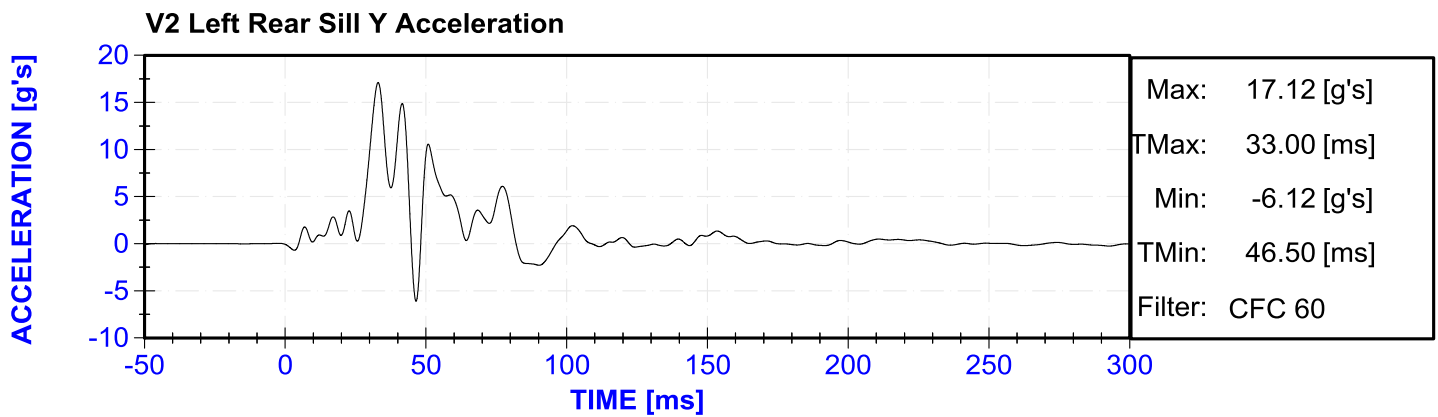
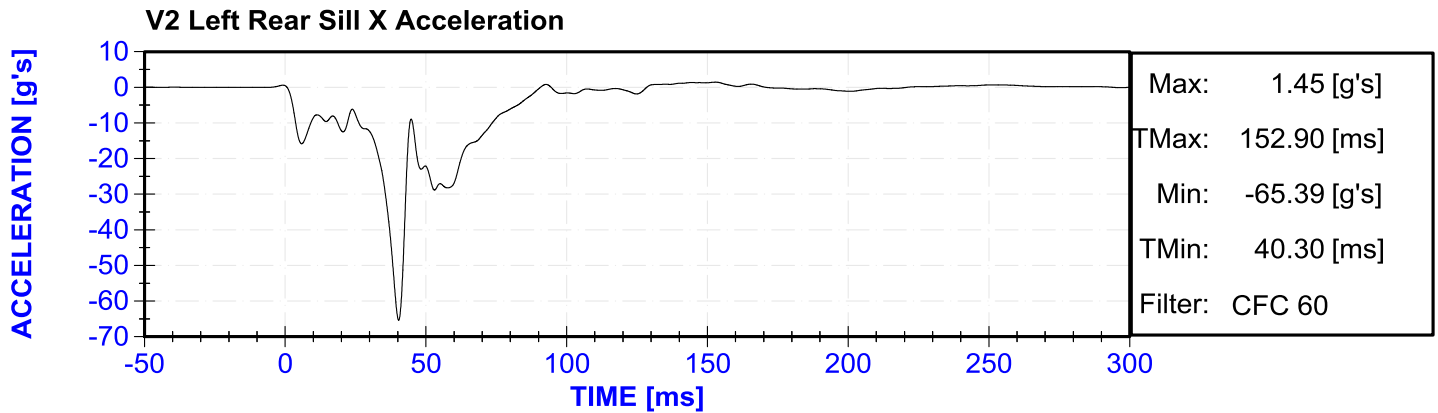


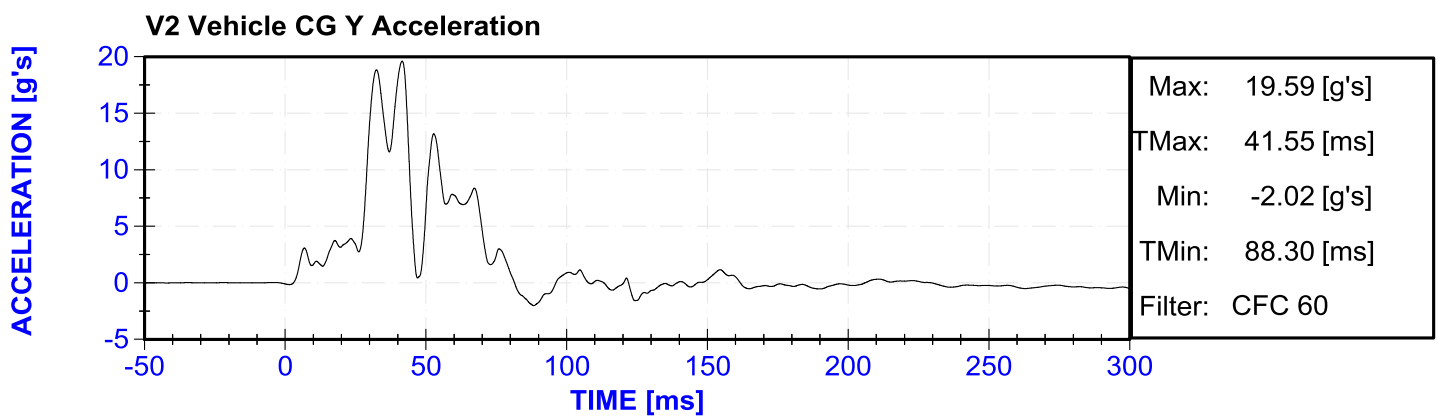
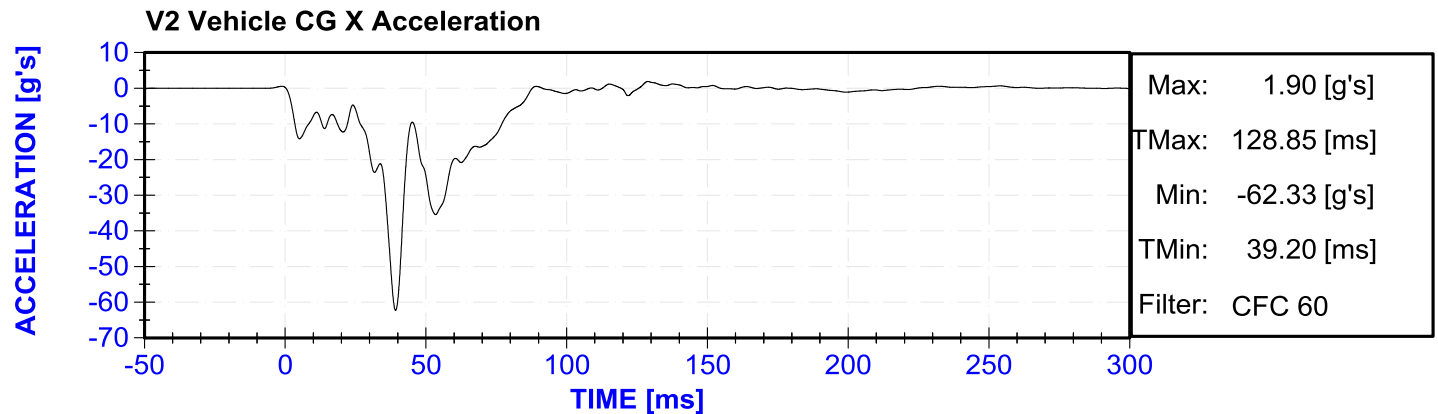
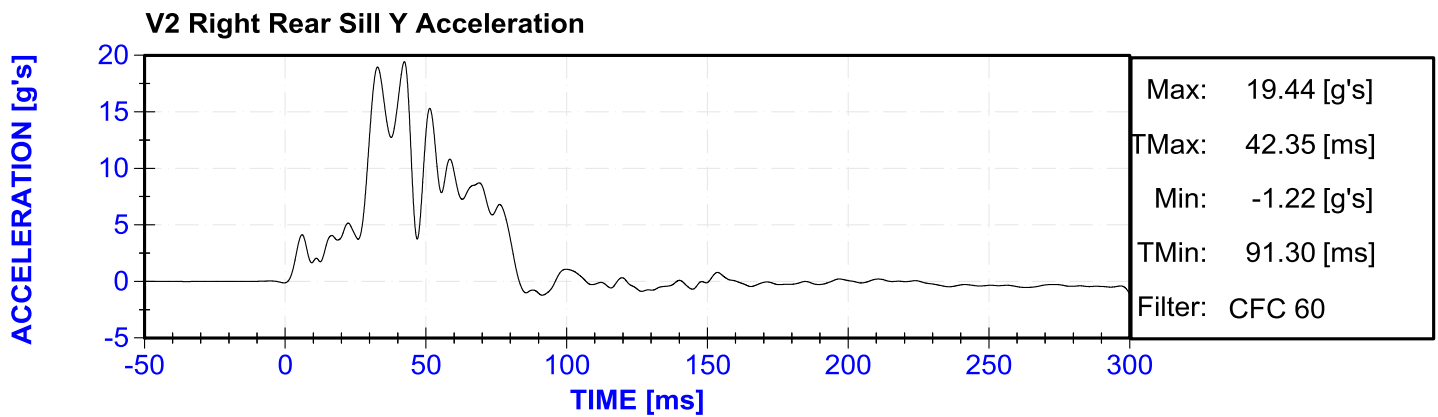
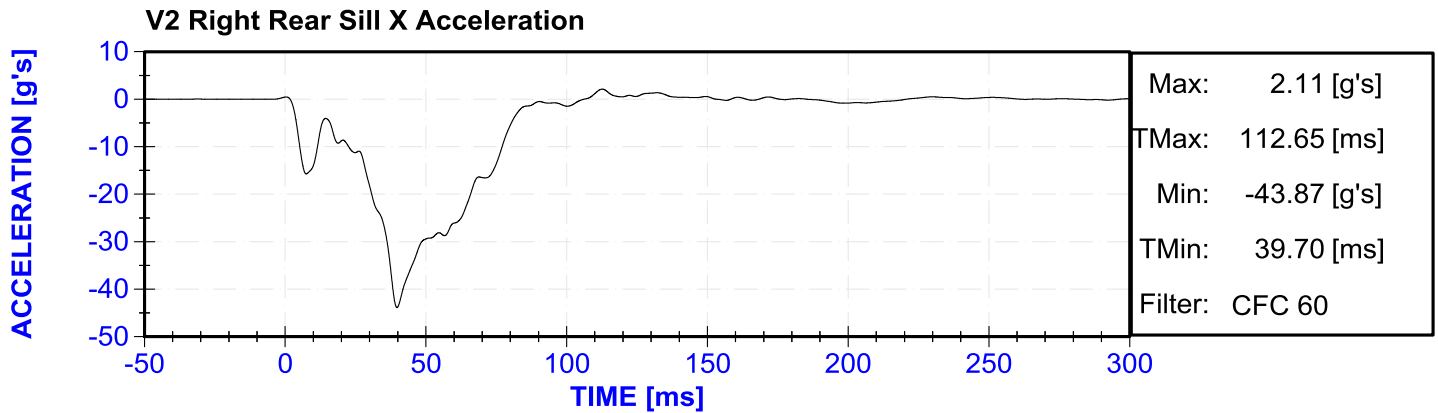


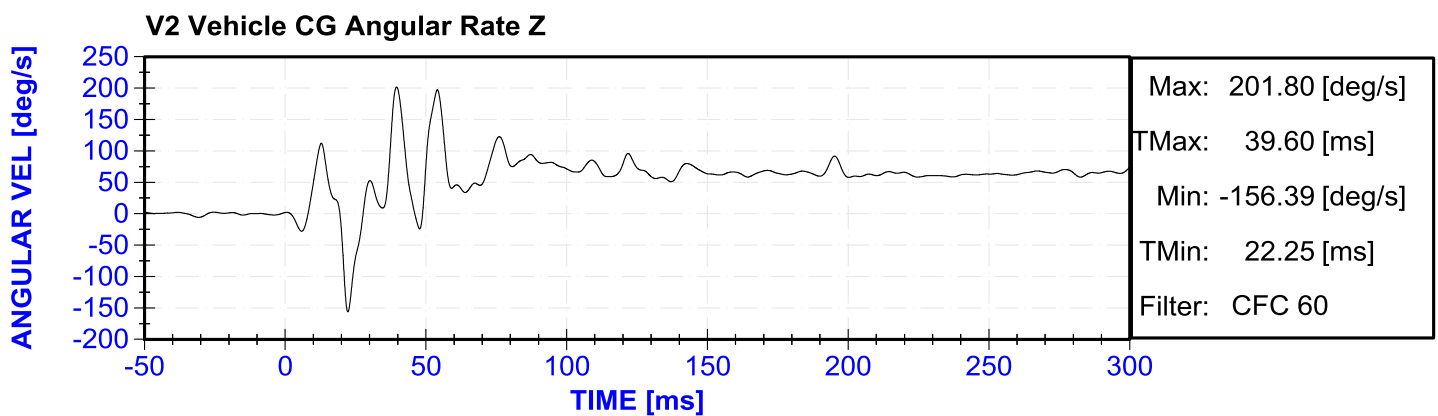
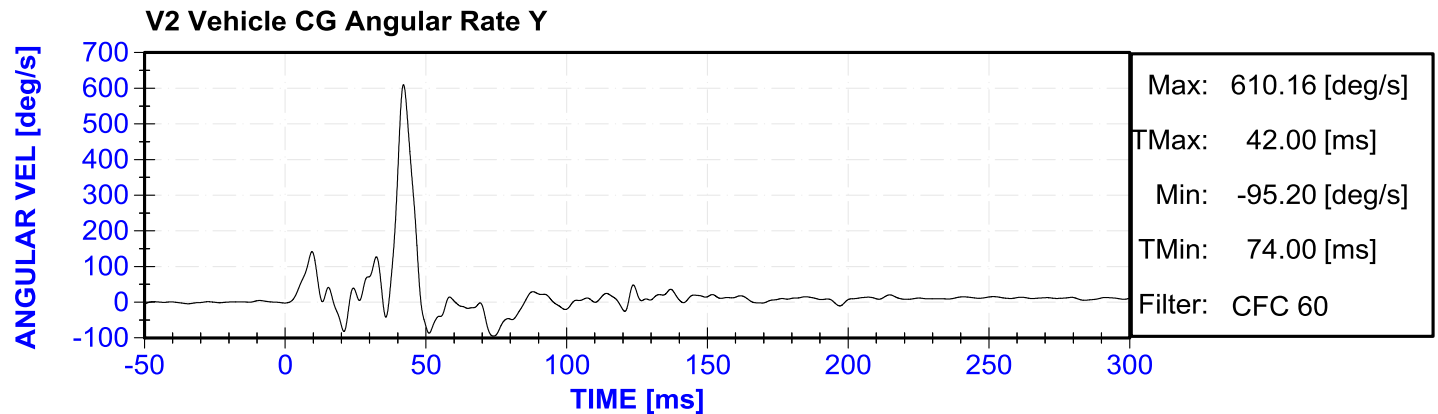
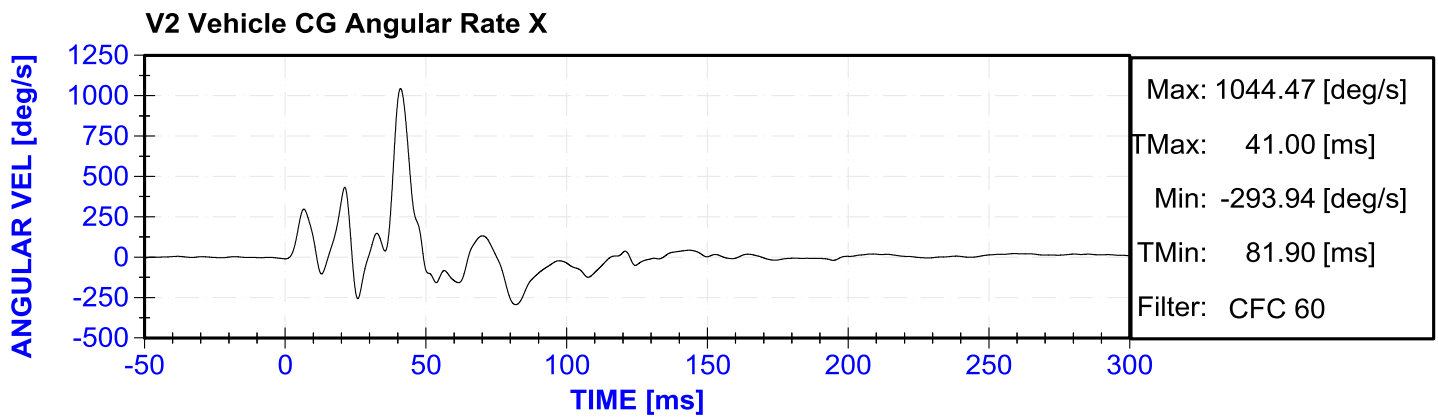
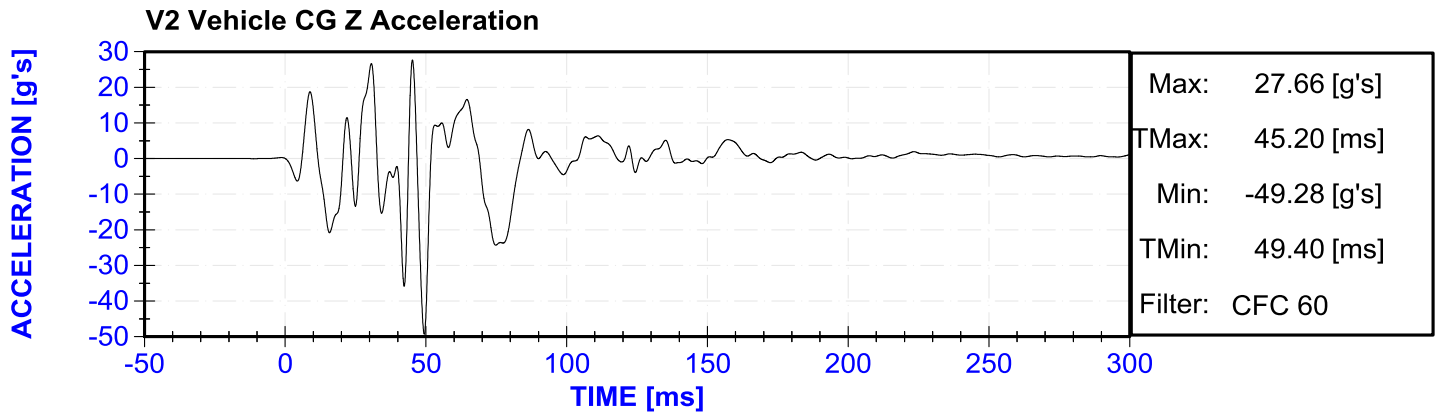




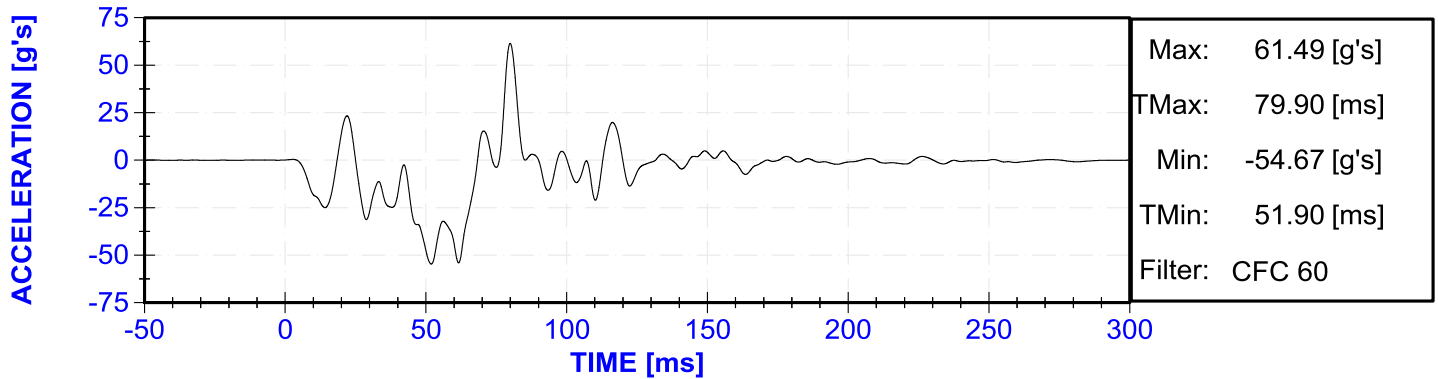




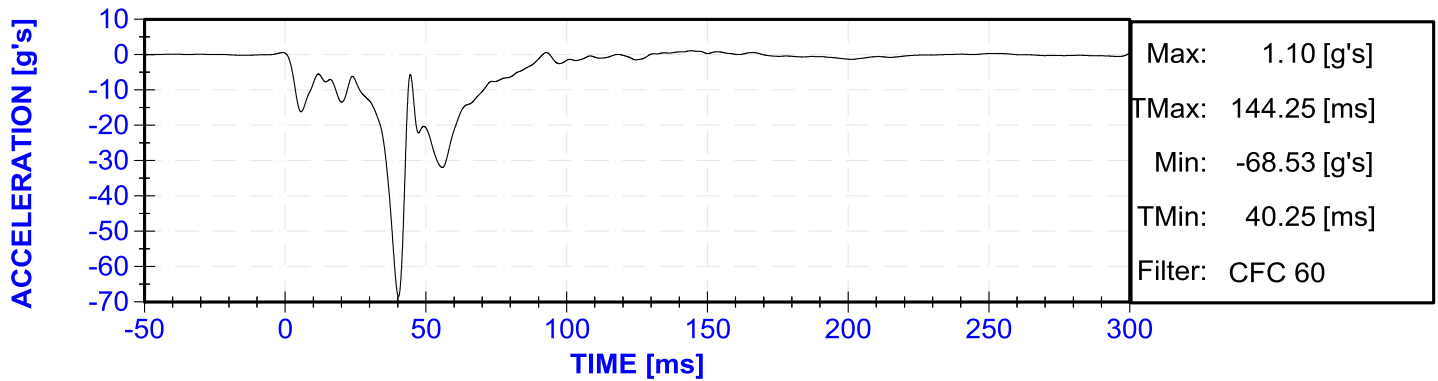




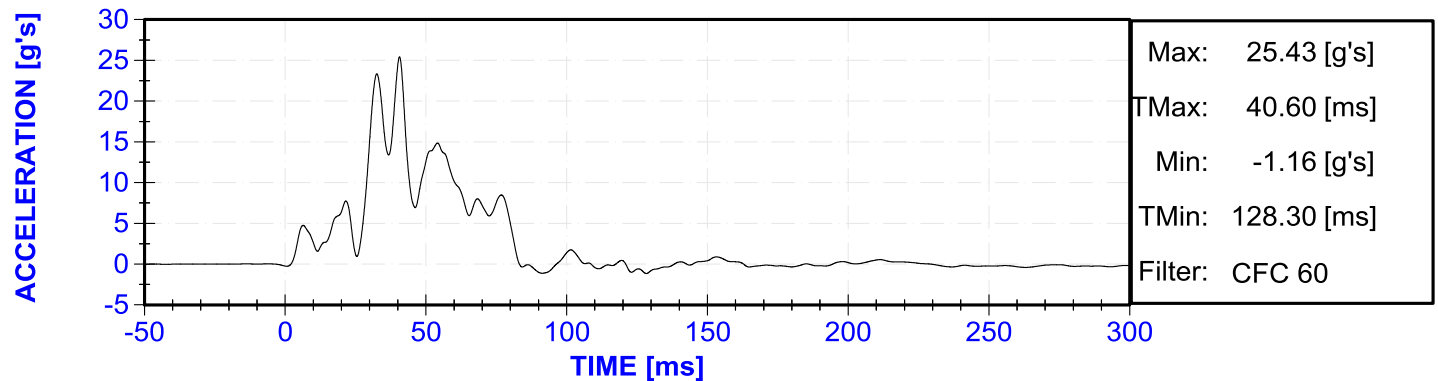
V2 Instrument Panel X Acceleration



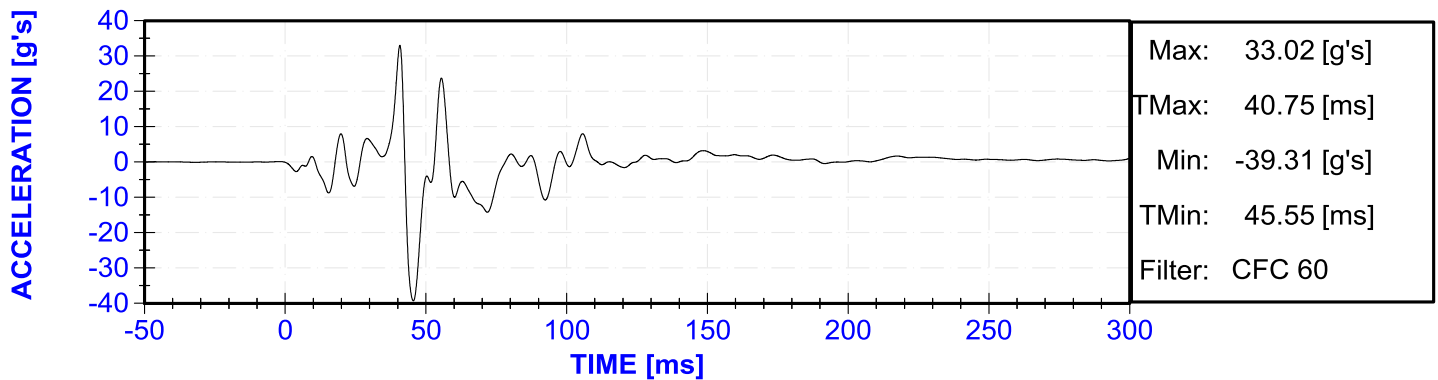
V2 Driver Seat Track X Acceleration

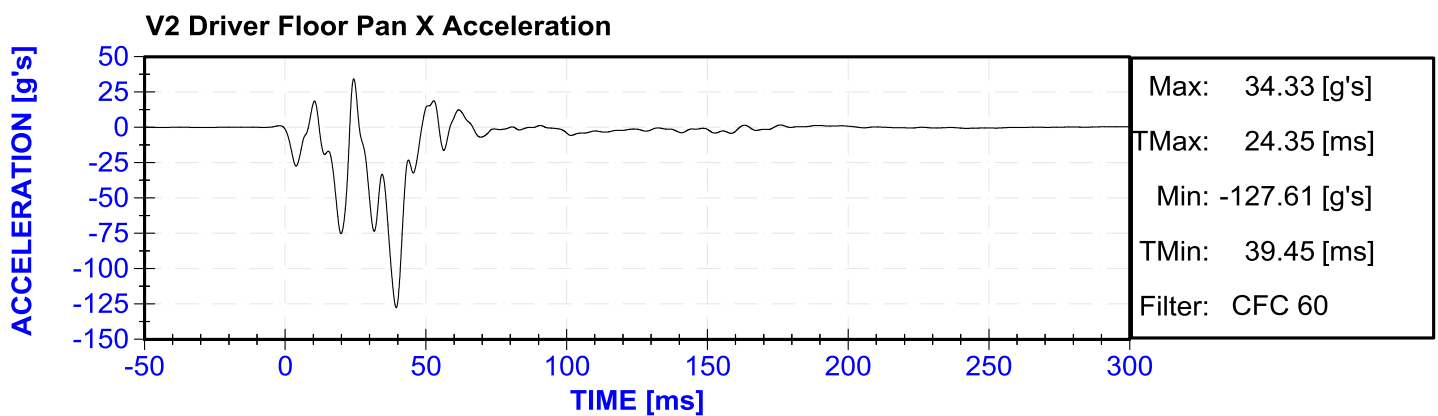
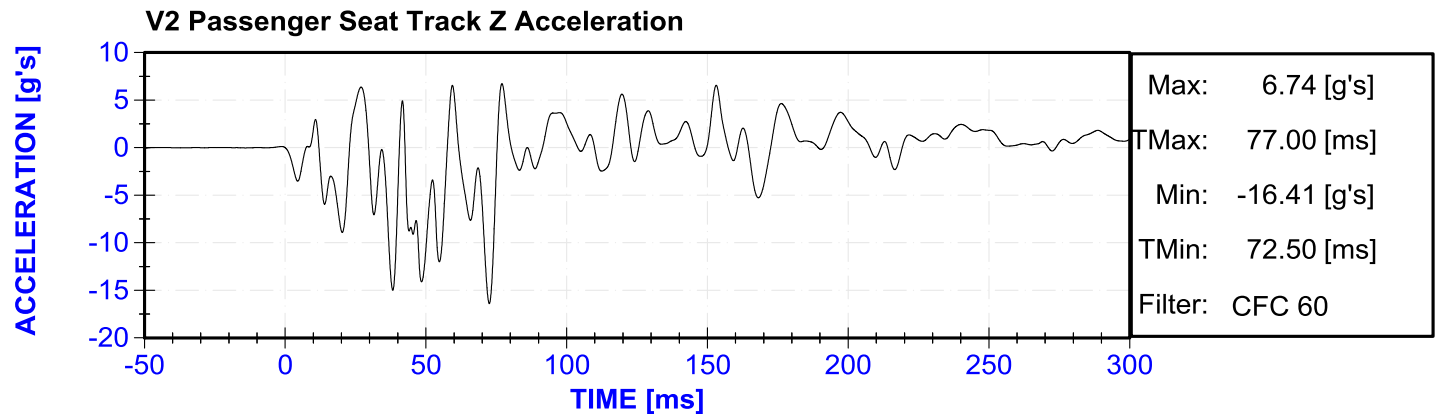
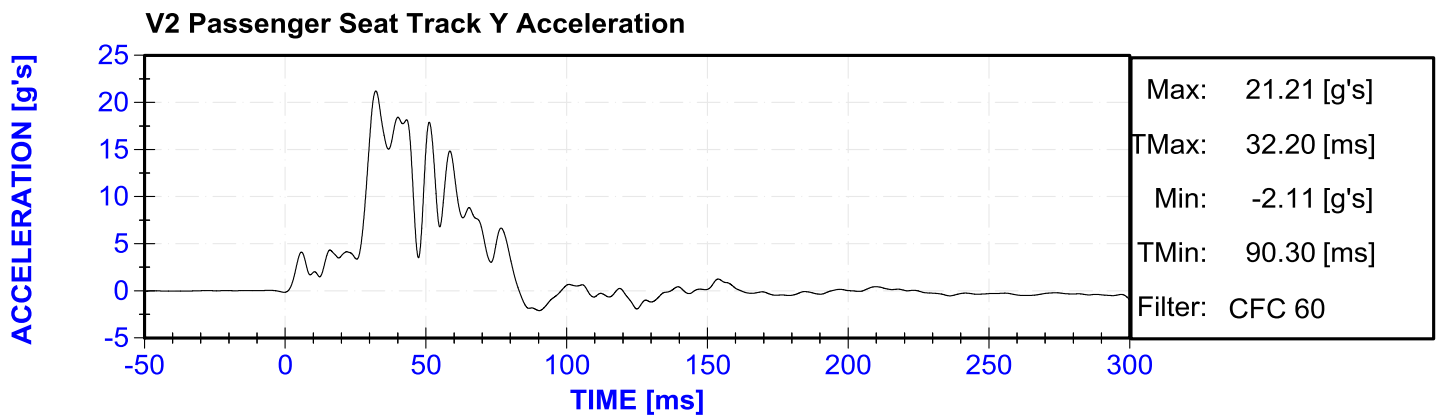
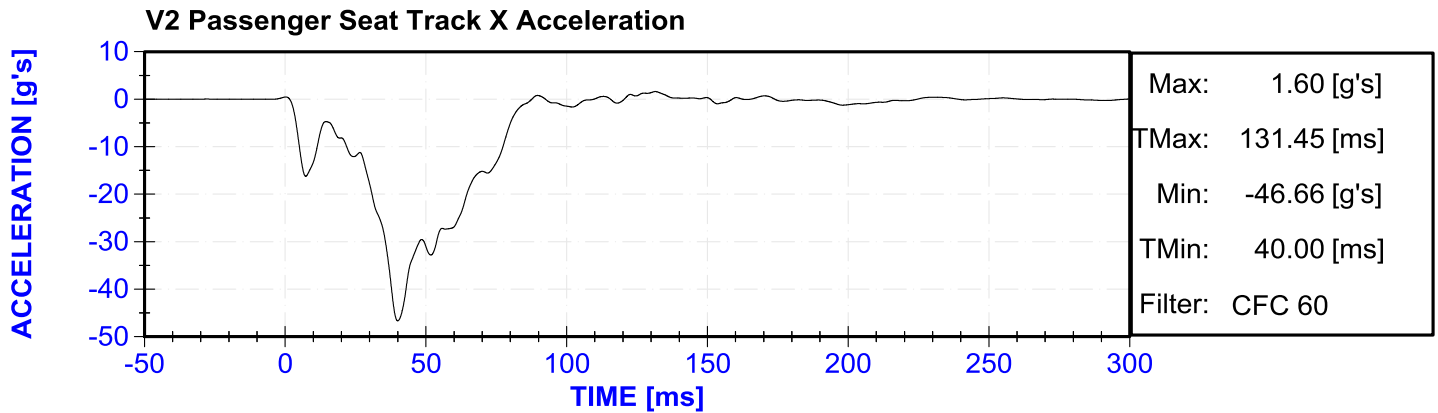


V2 Driver Seat Track Y Acceleration

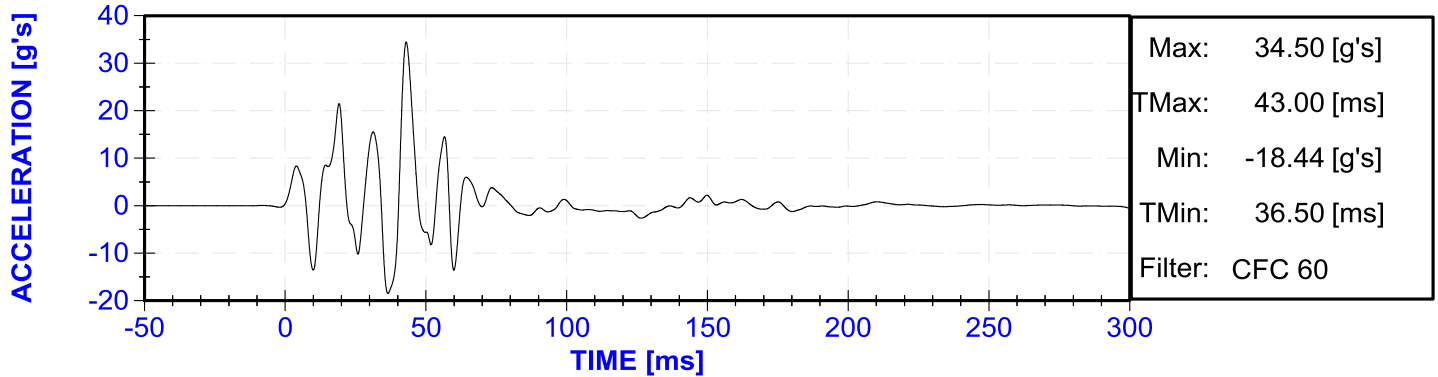


V2 Driver Seat Track Z Acceleration

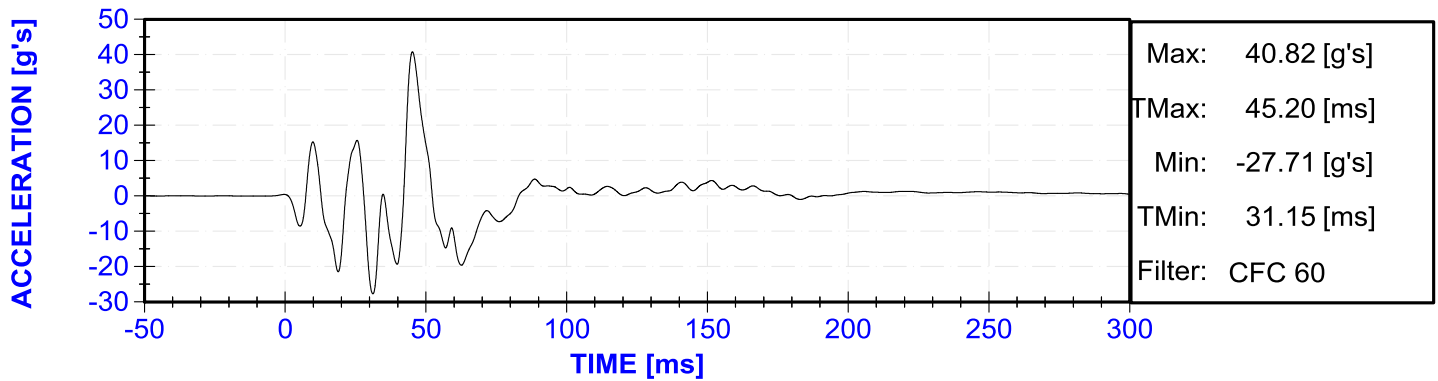




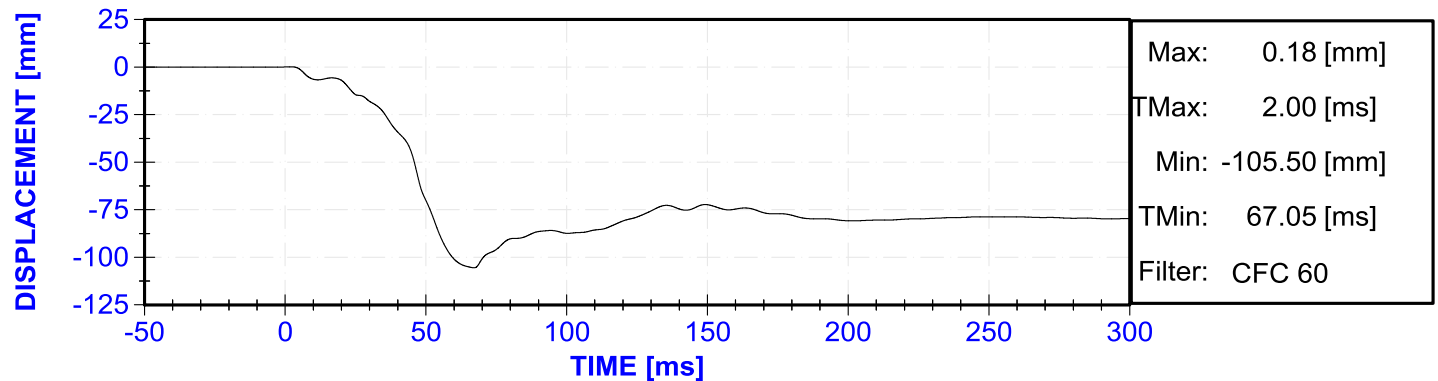
V2 Driver Floor Pan Y Acceleration



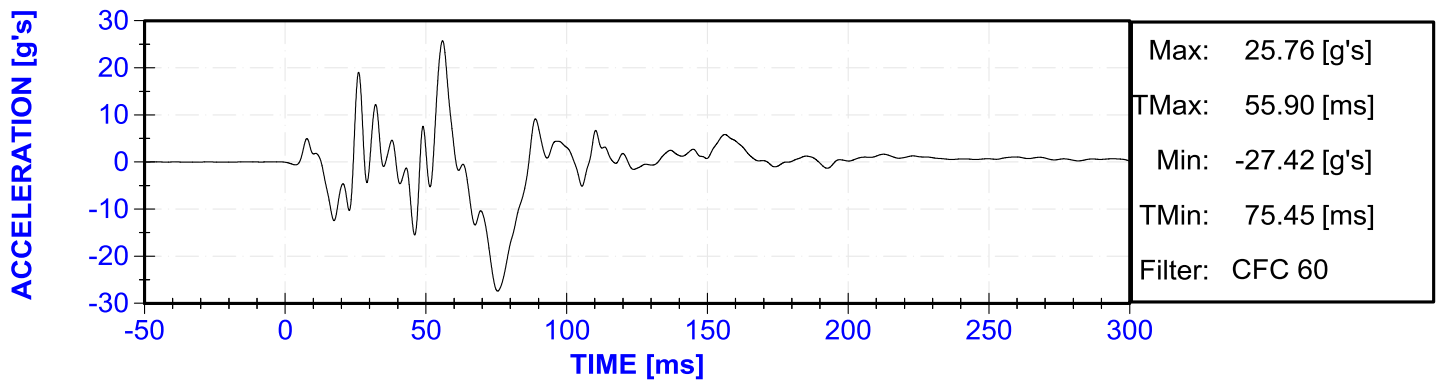
V2 Driver Floor Pan Z Acceleration

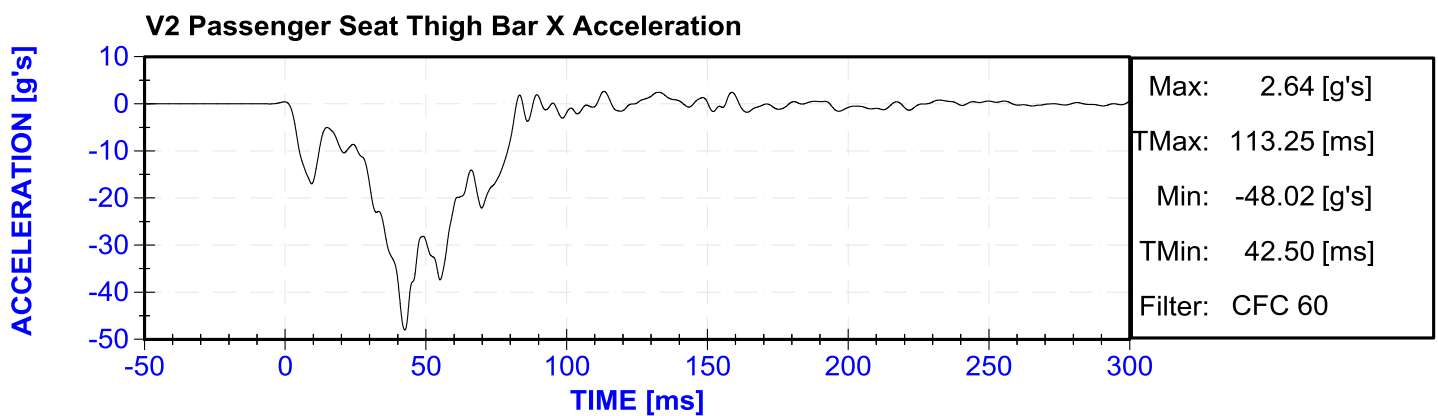
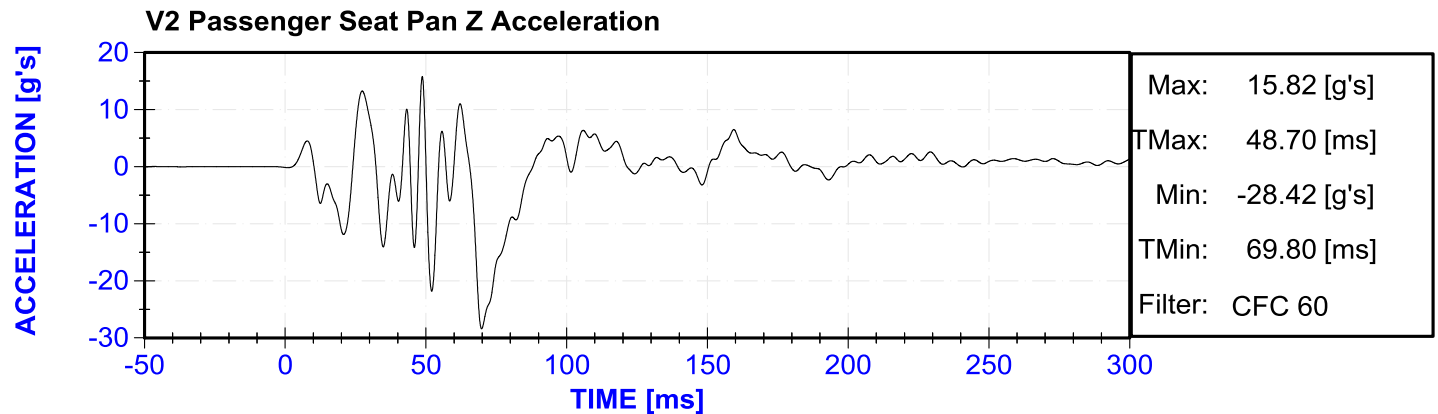
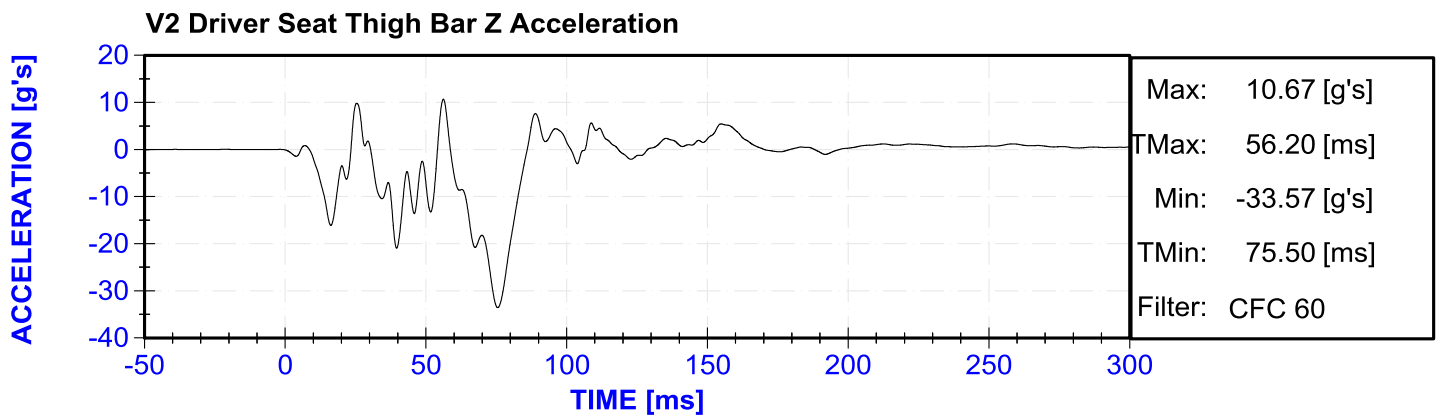
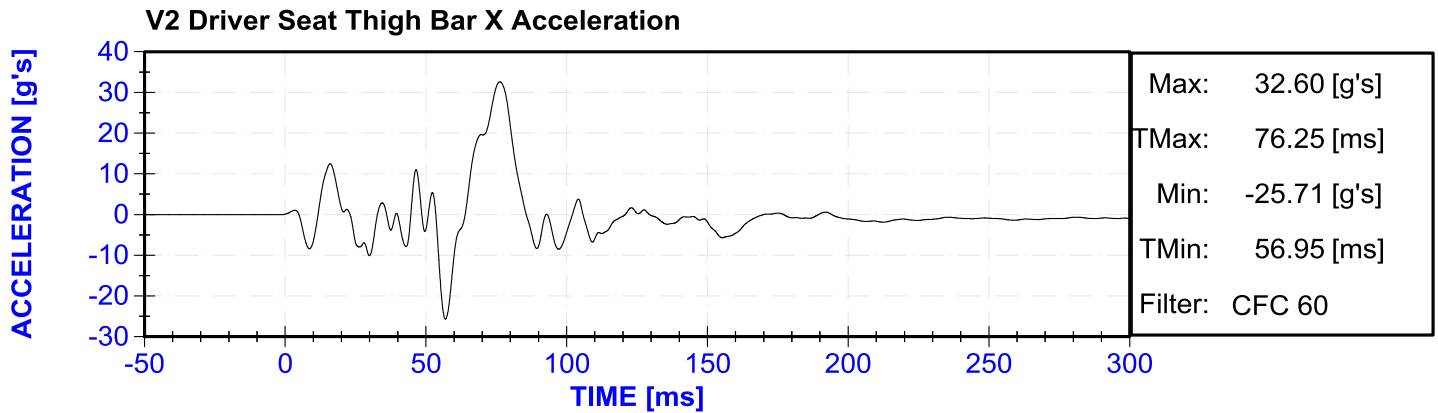


V2 Driver Floor Pan X Deflection

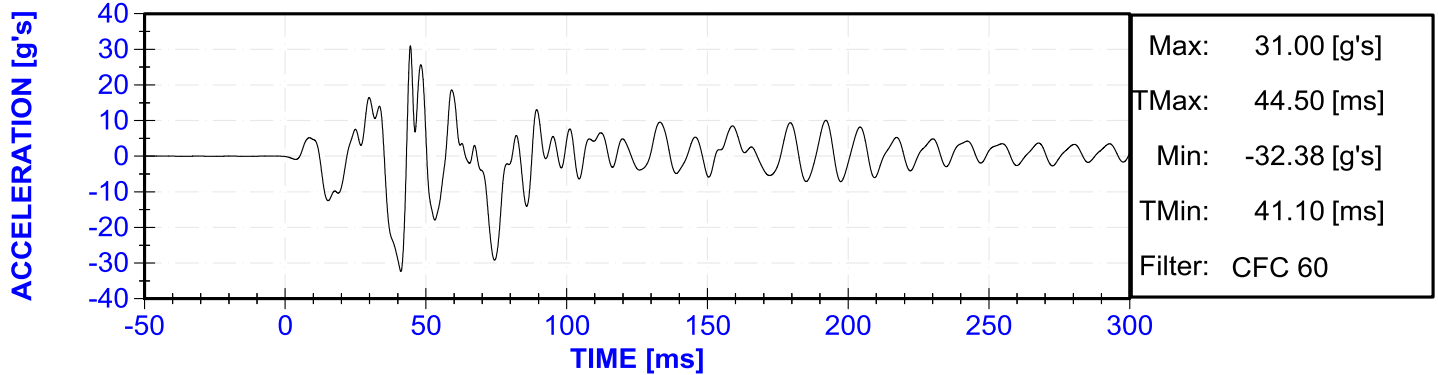


V2 Driver Seat Pan Z Acceleration

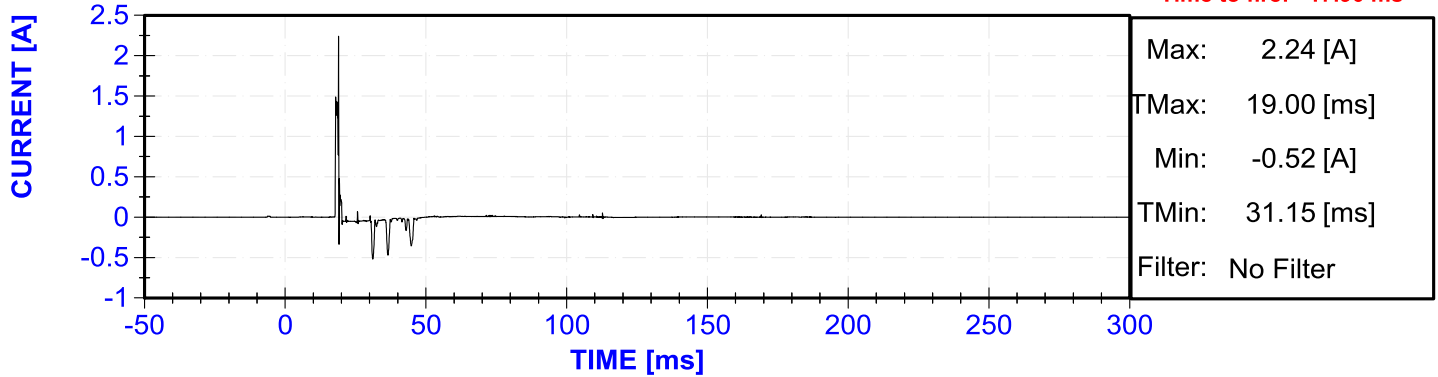




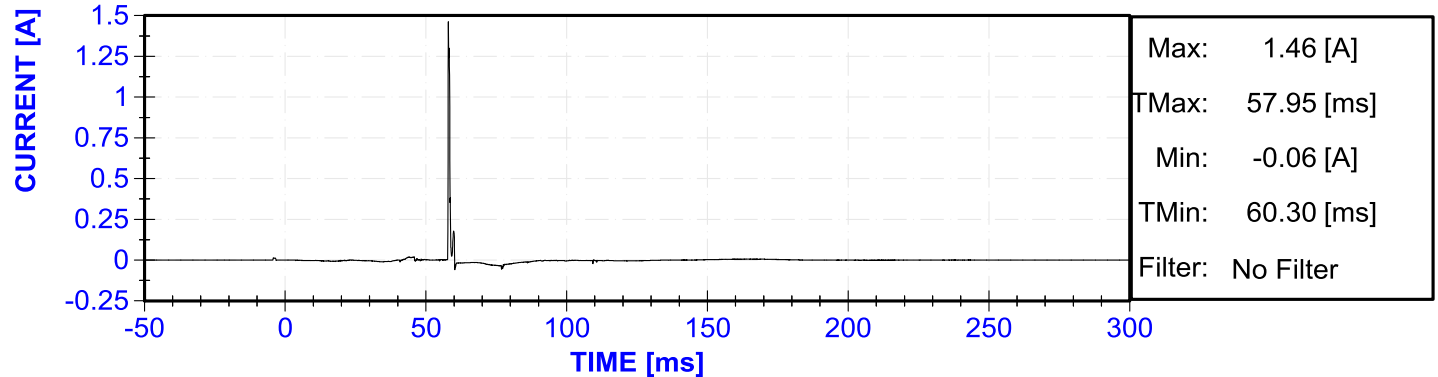
V2 Passenger Seat Thigh Bar Z Acceleration



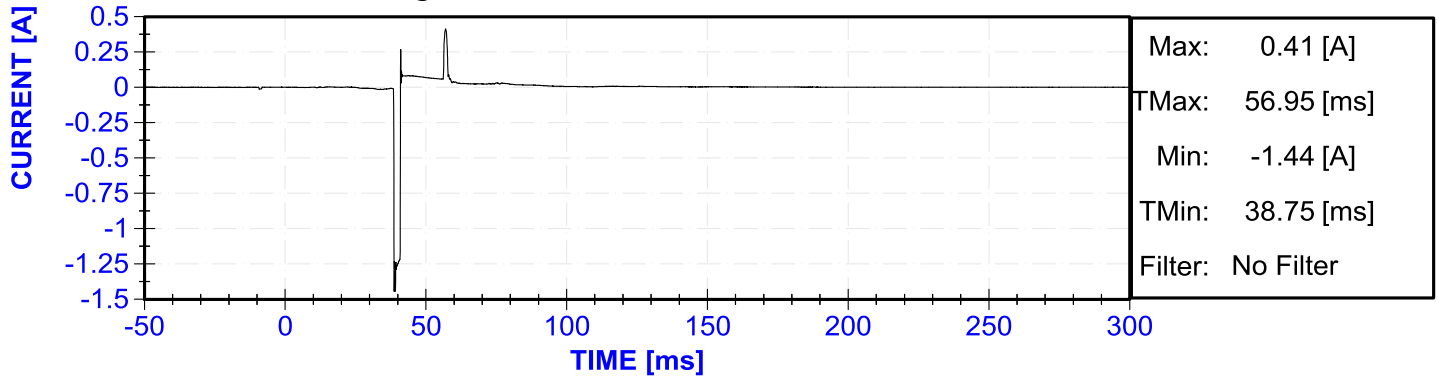
Driver Front Airbag Stage 1 Monitor

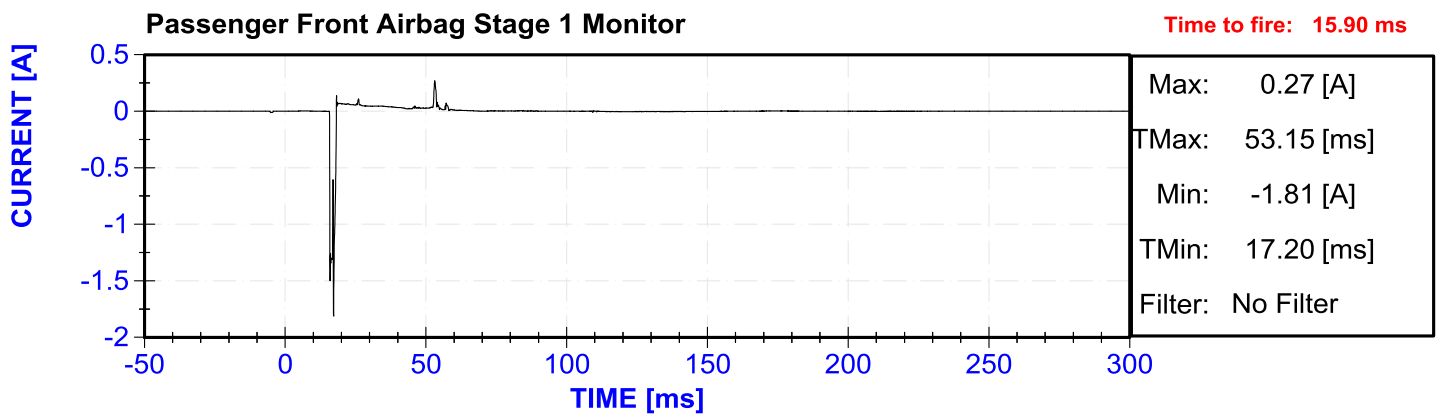
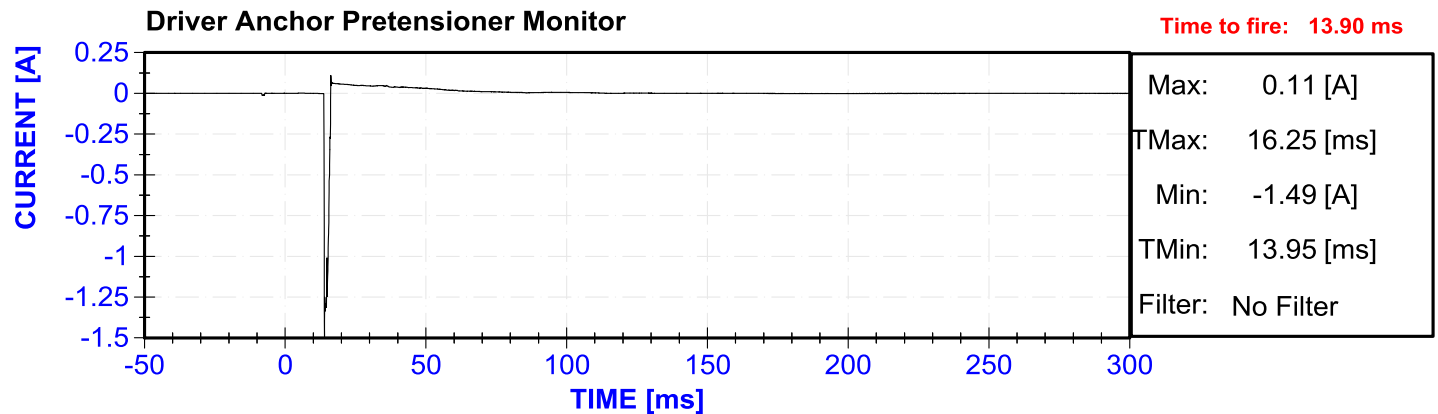
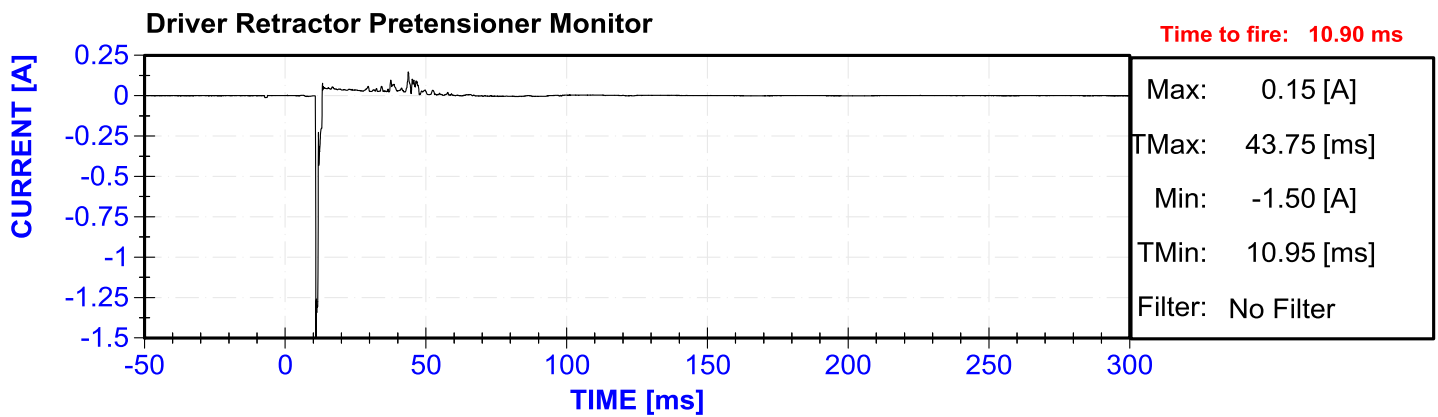
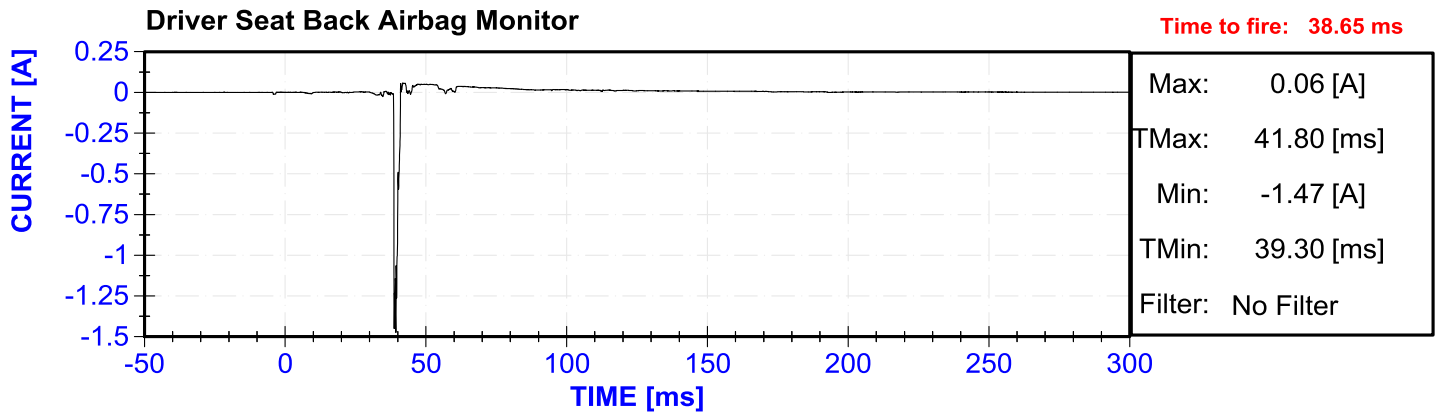


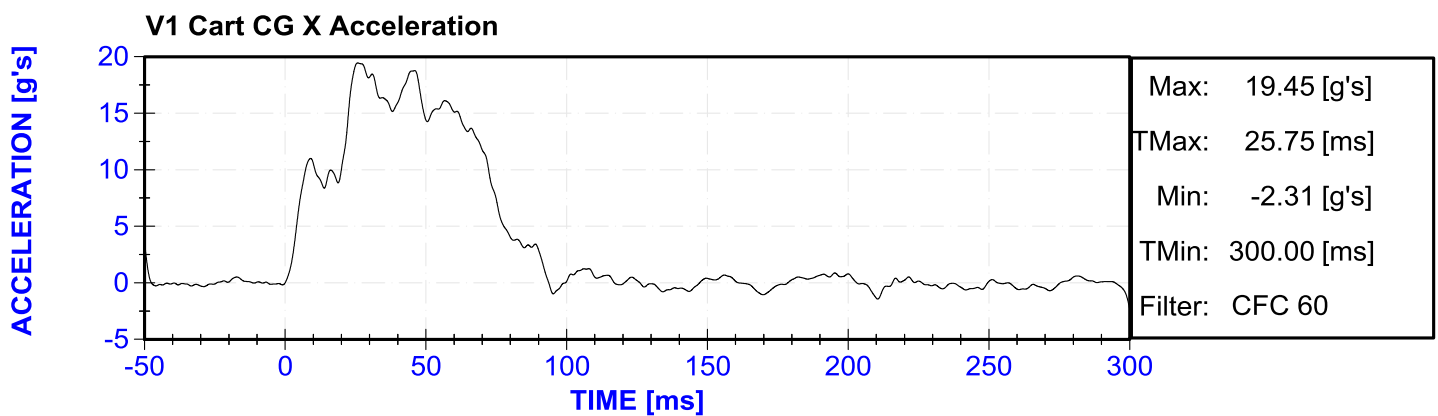
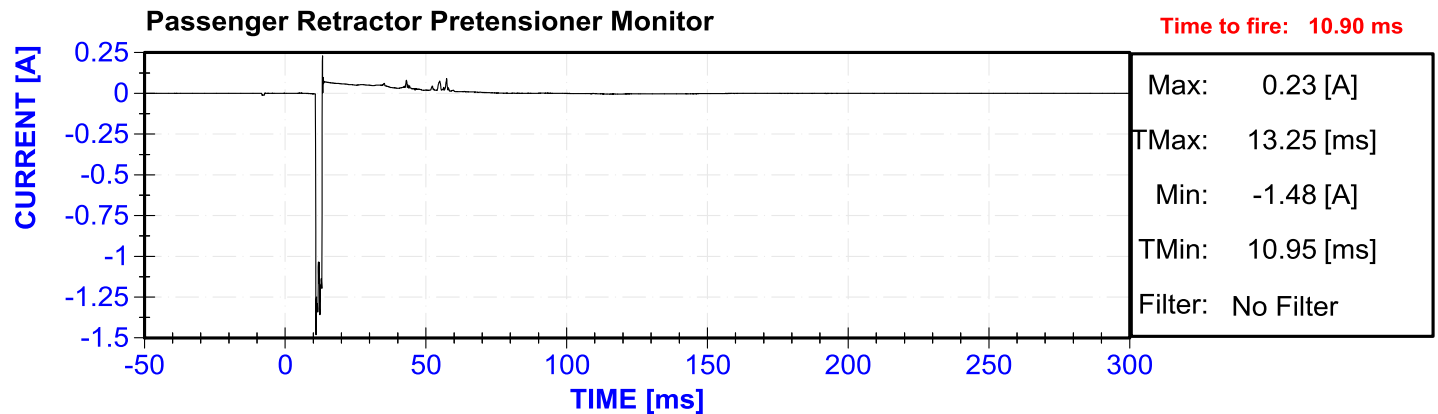
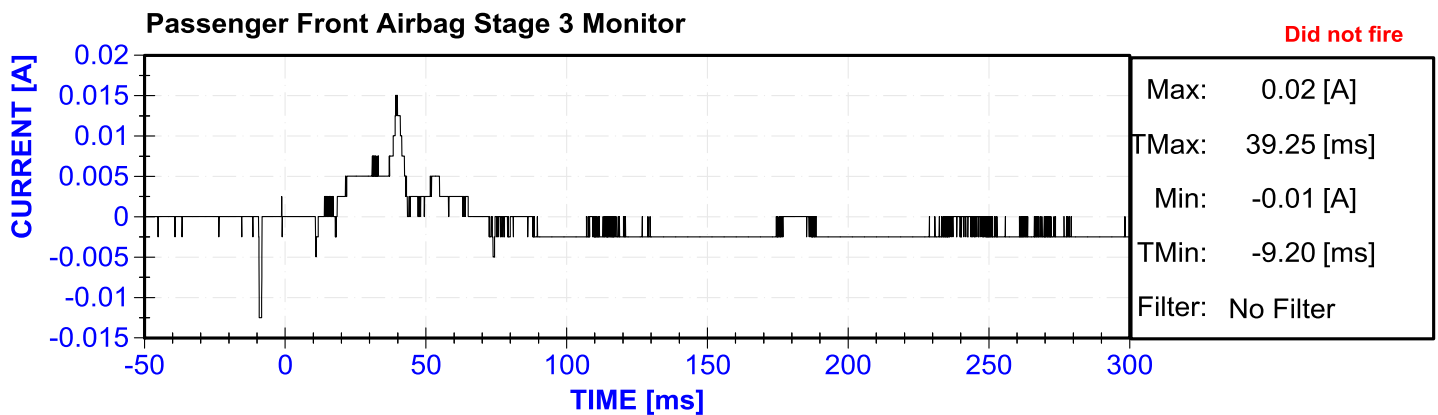
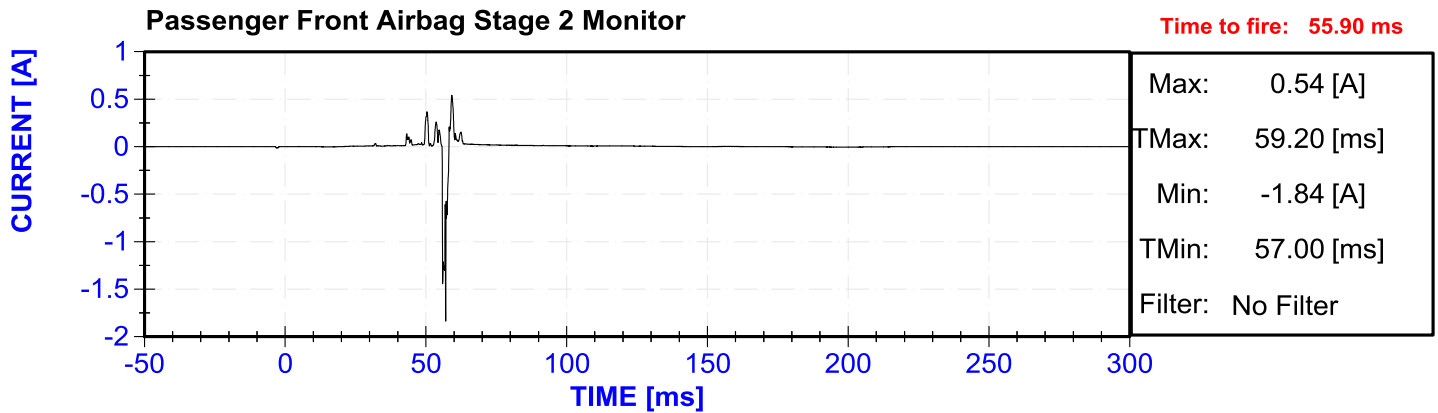
Driver Front Airbag Stage 2 Monitor

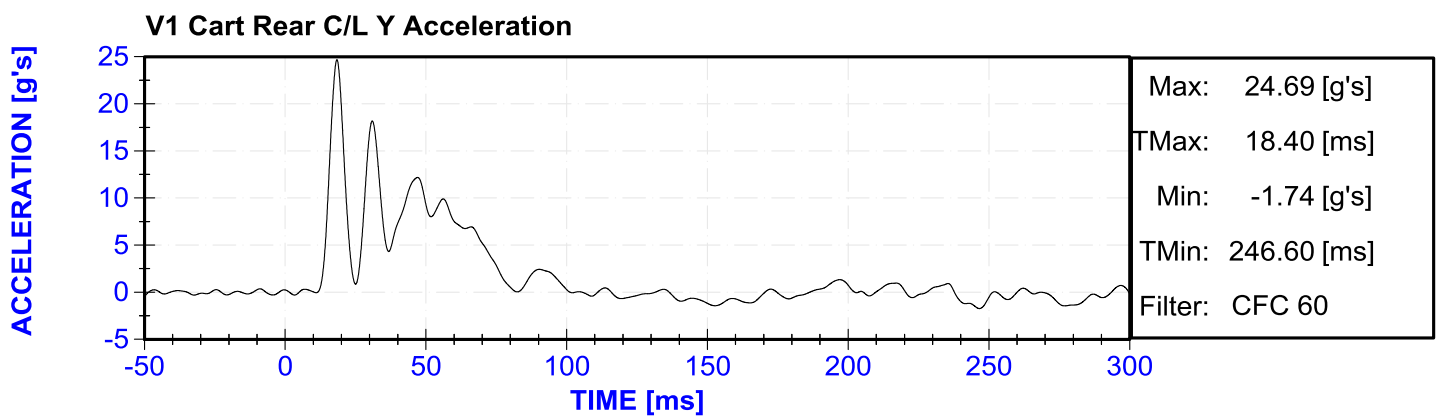
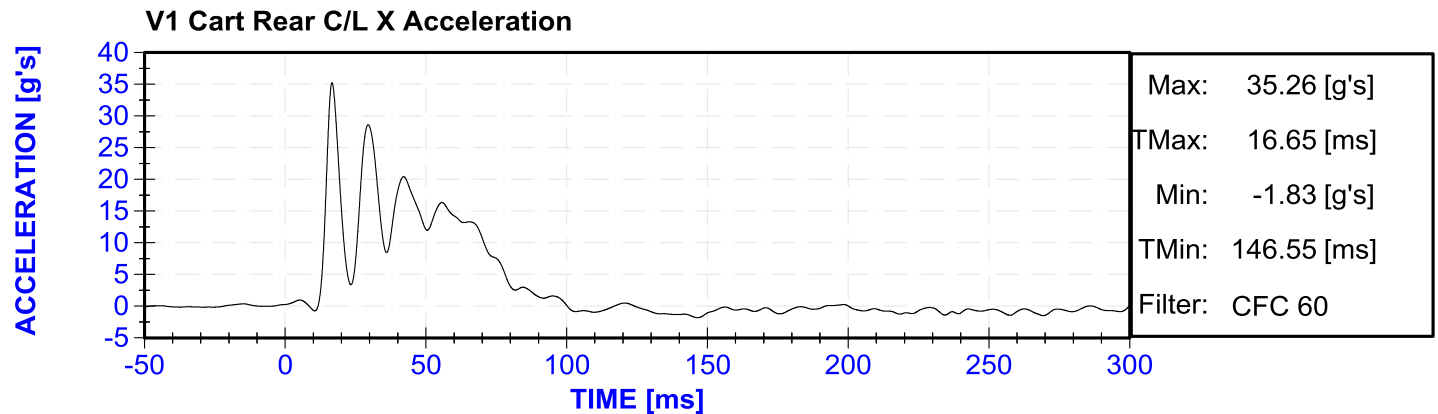
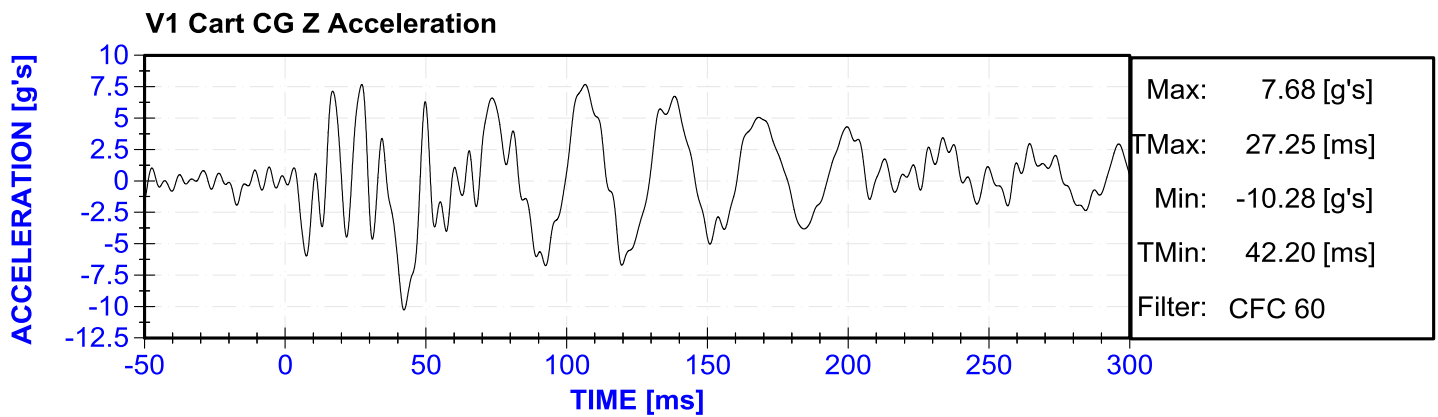
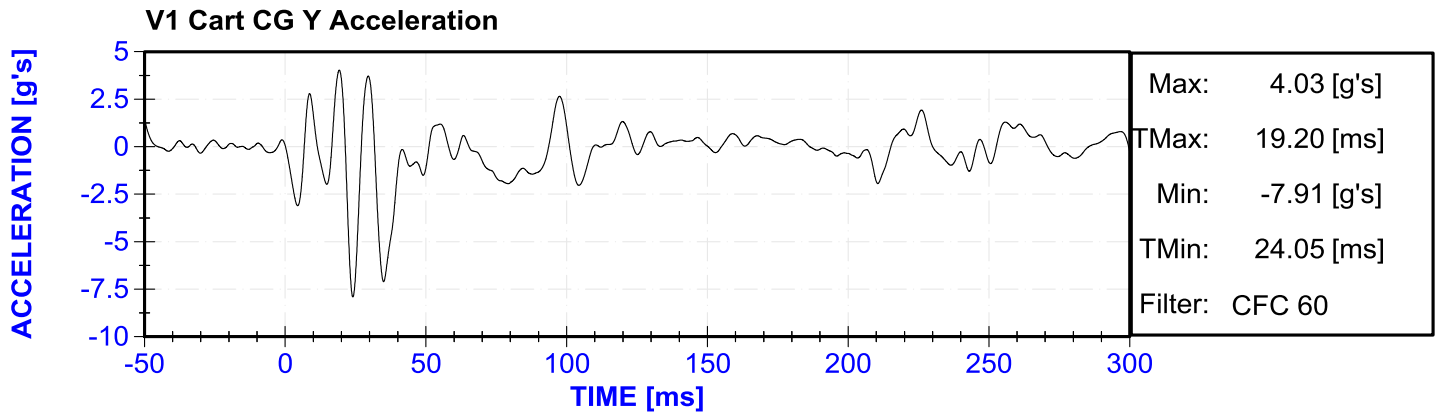


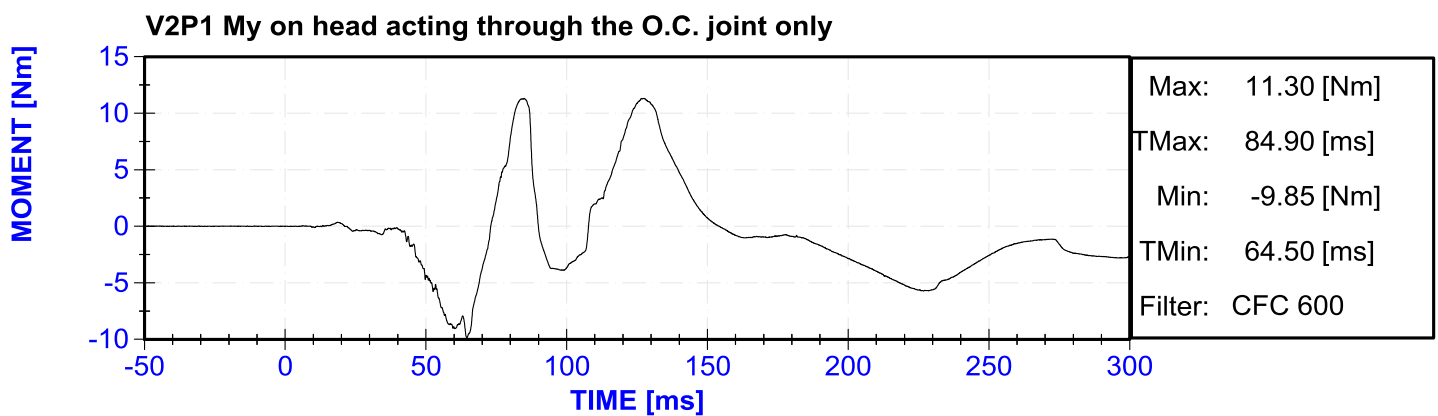
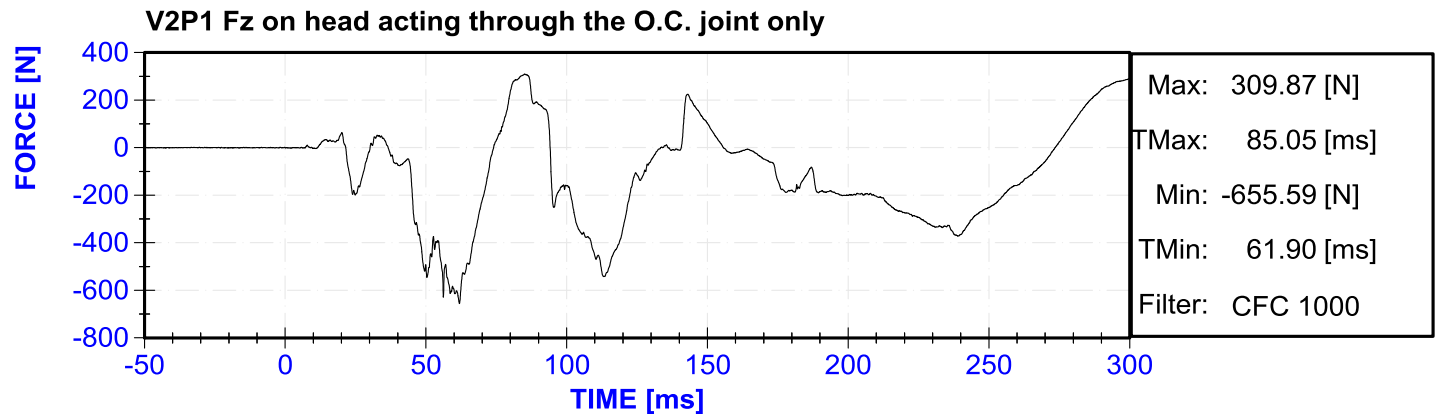
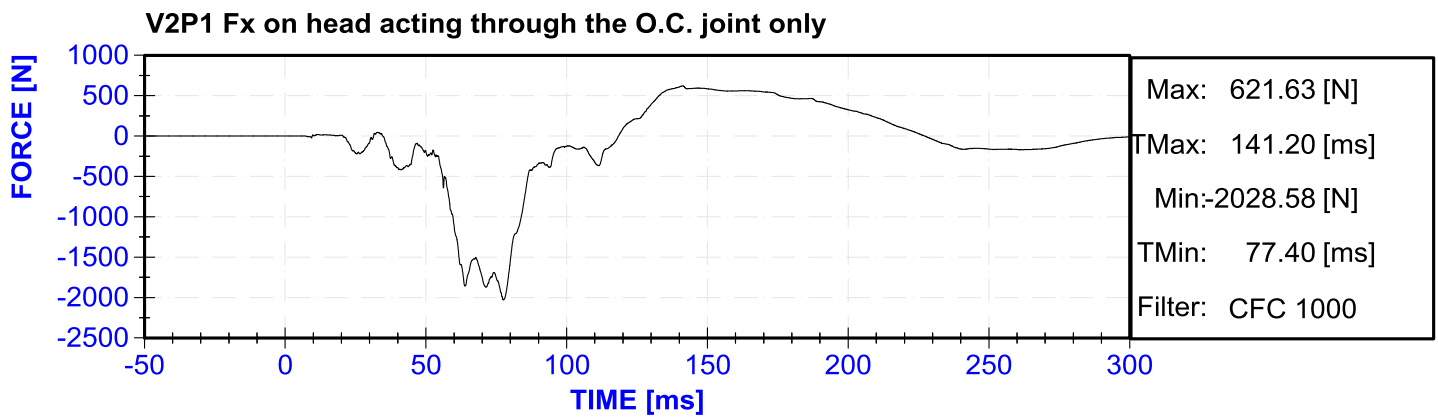
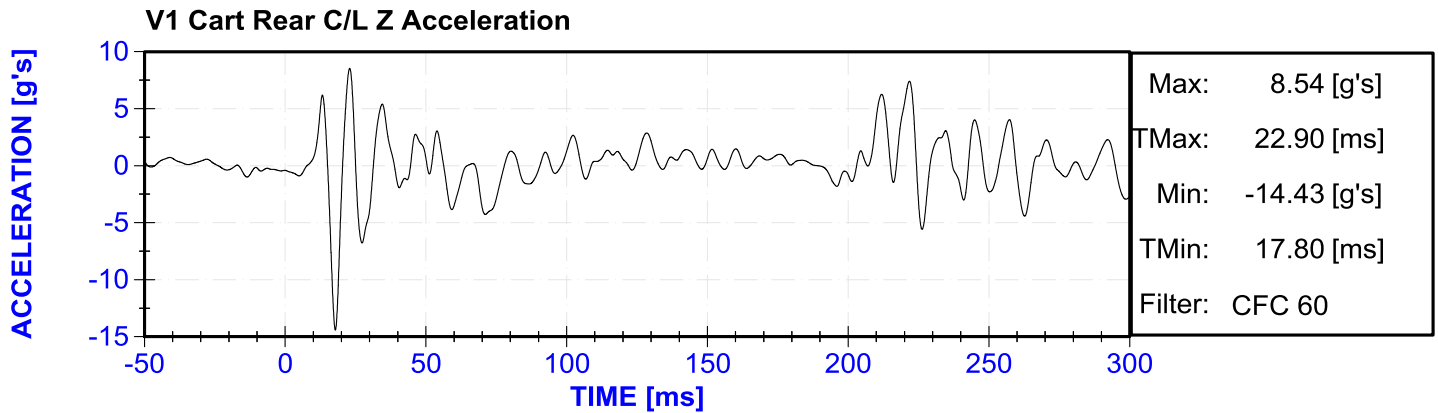
Driver Curtain Airbag Monitor



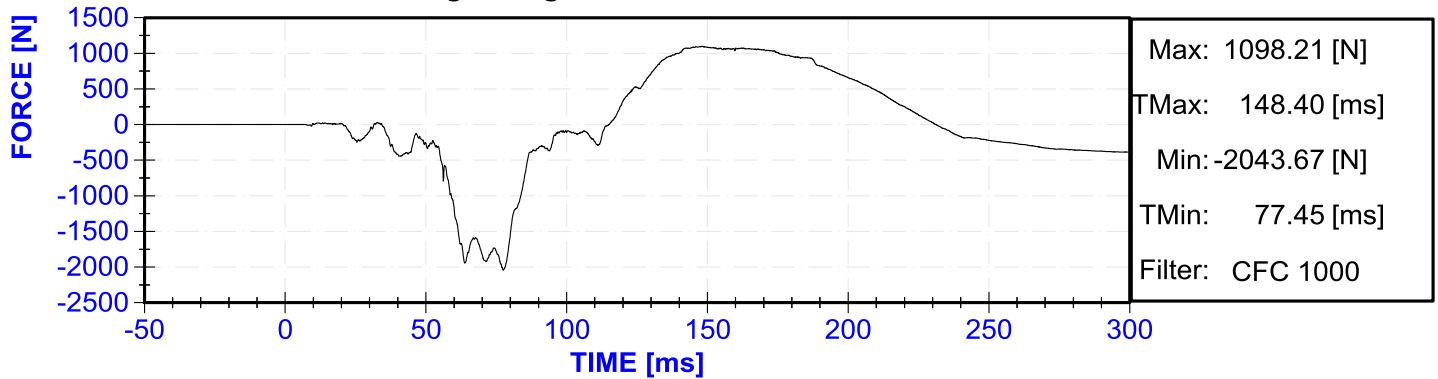




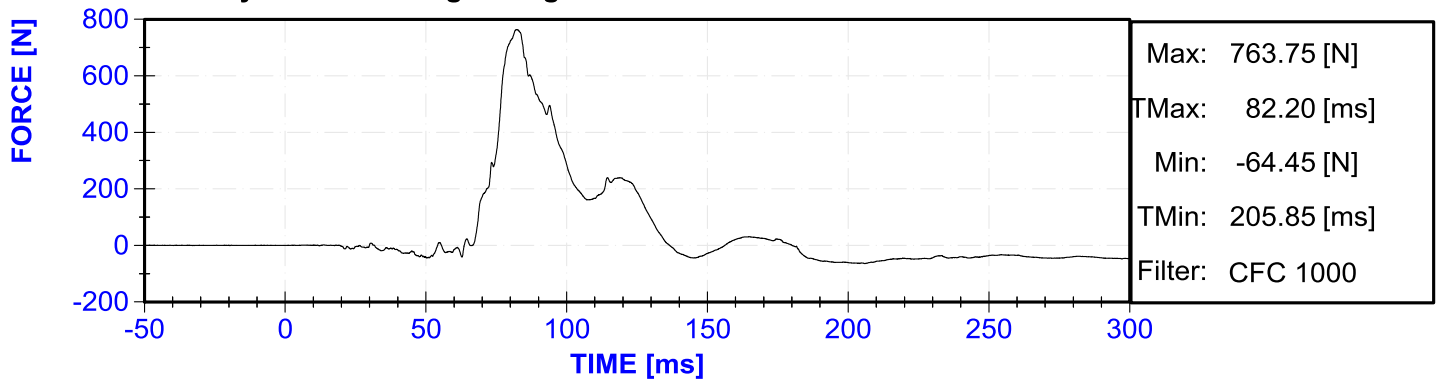




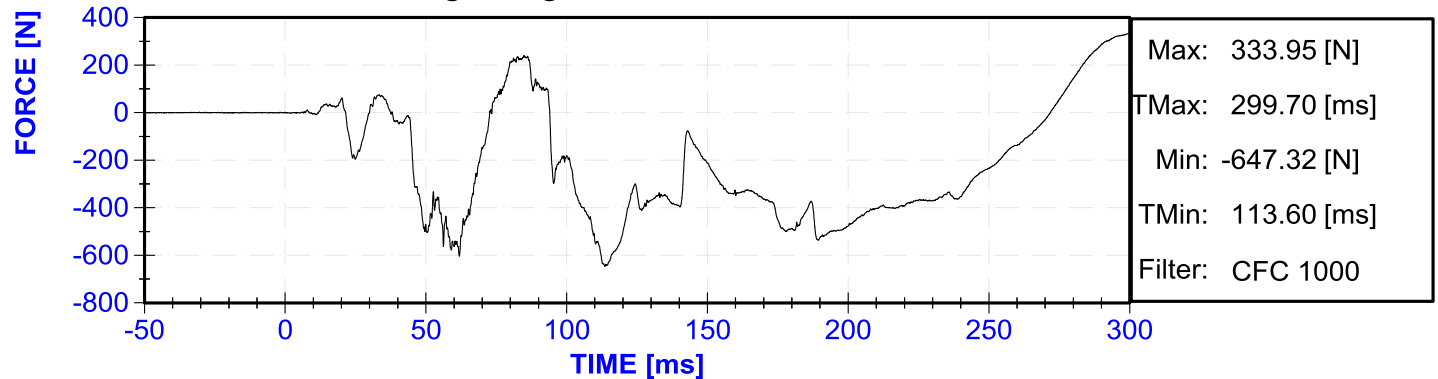
V2P1 Fx on head acting through the total neck section



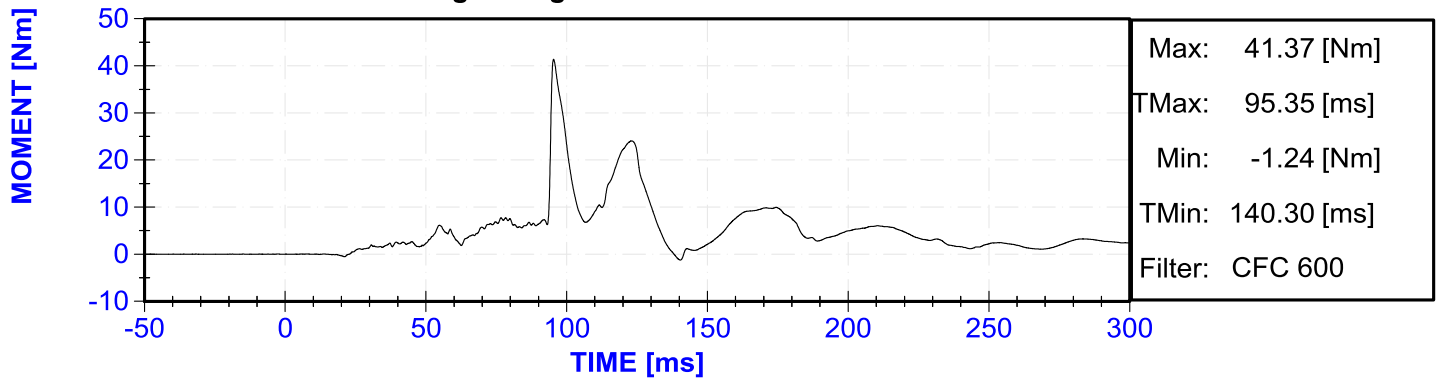
V2P1 Fy on head acting through the total neck section



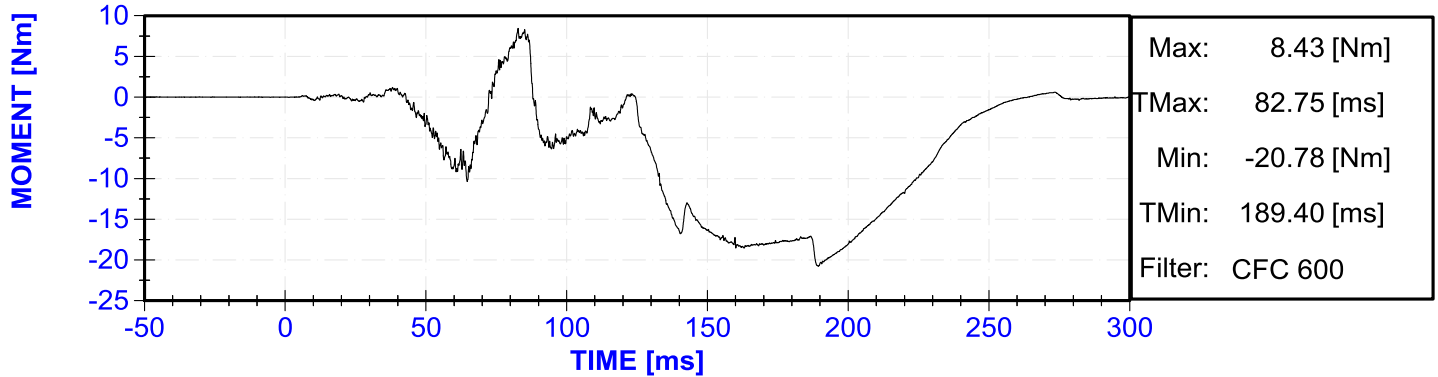
V2P1 Fz on head acting through the total neck section



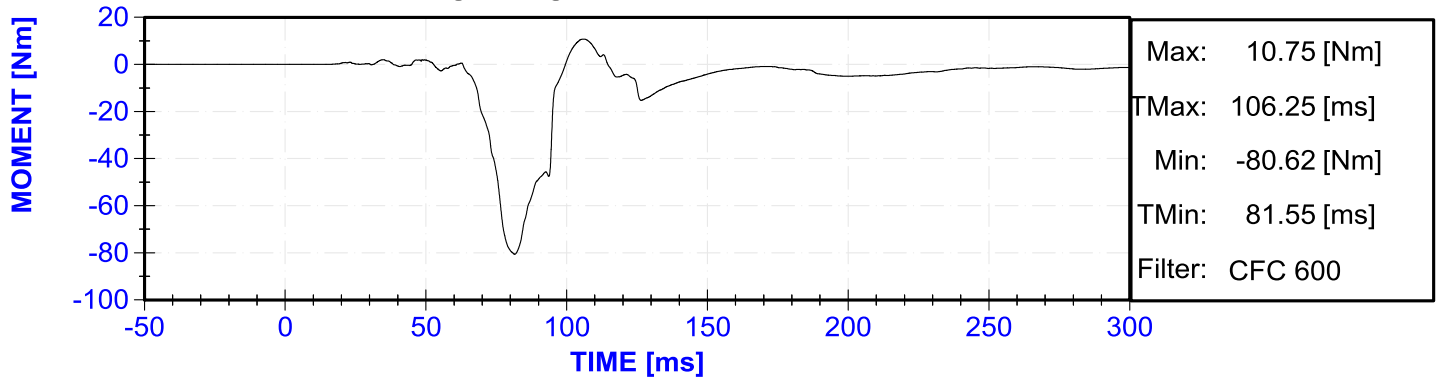
V2P1 Mx on head acting through the total neck section



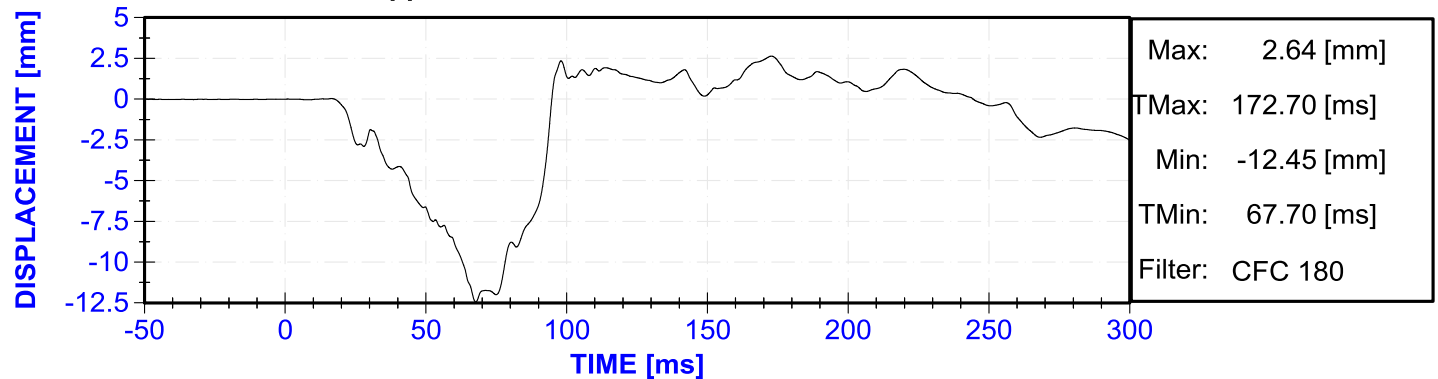
V2P1 My on head acting through the total neck section



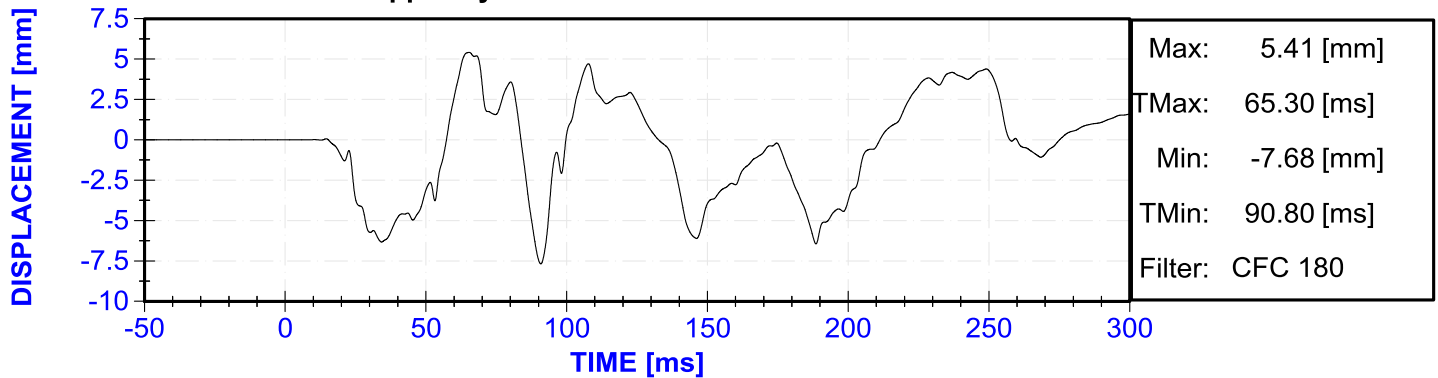
V2P1 Mz on head acting through the total neck section

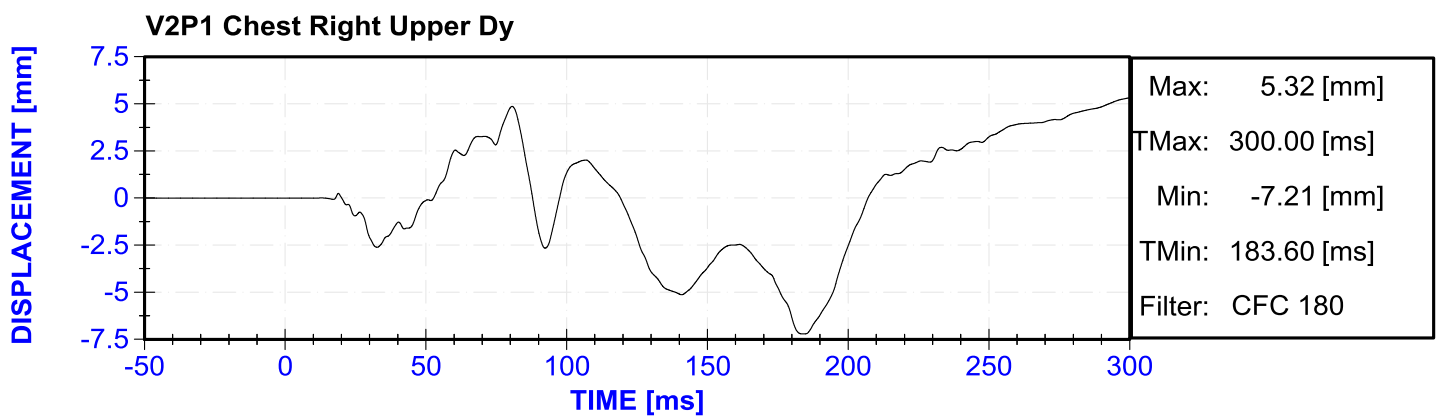
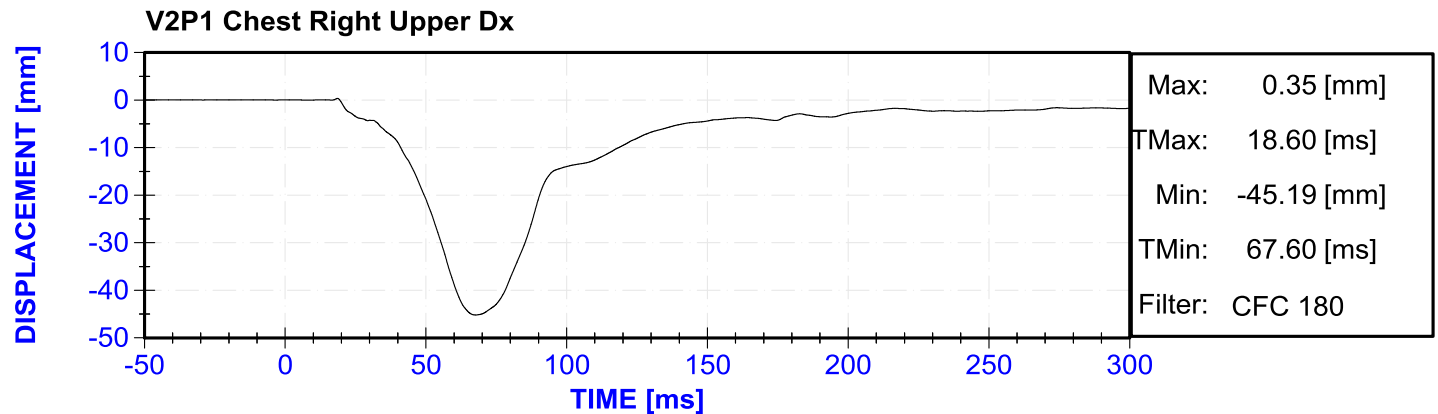
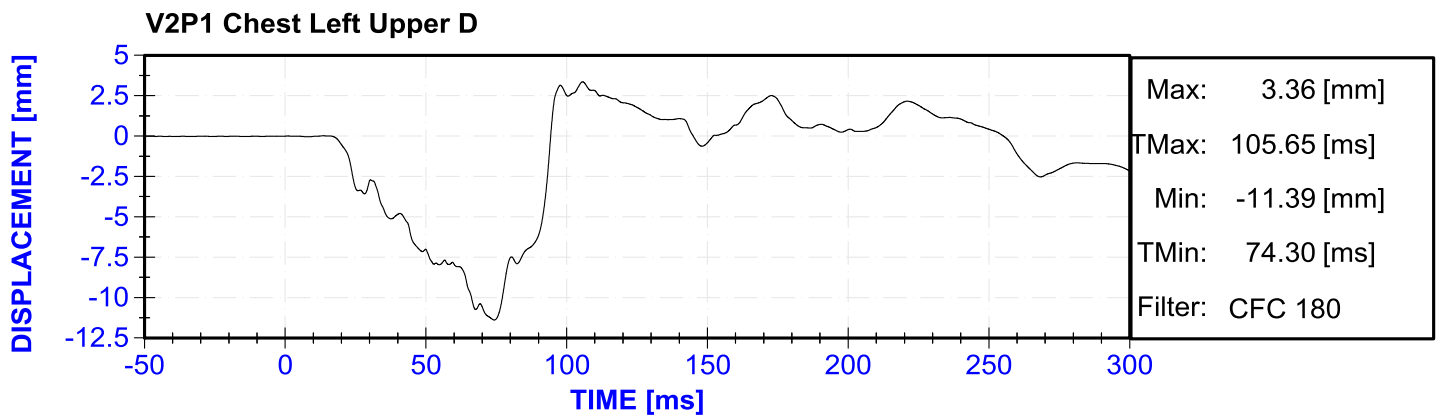
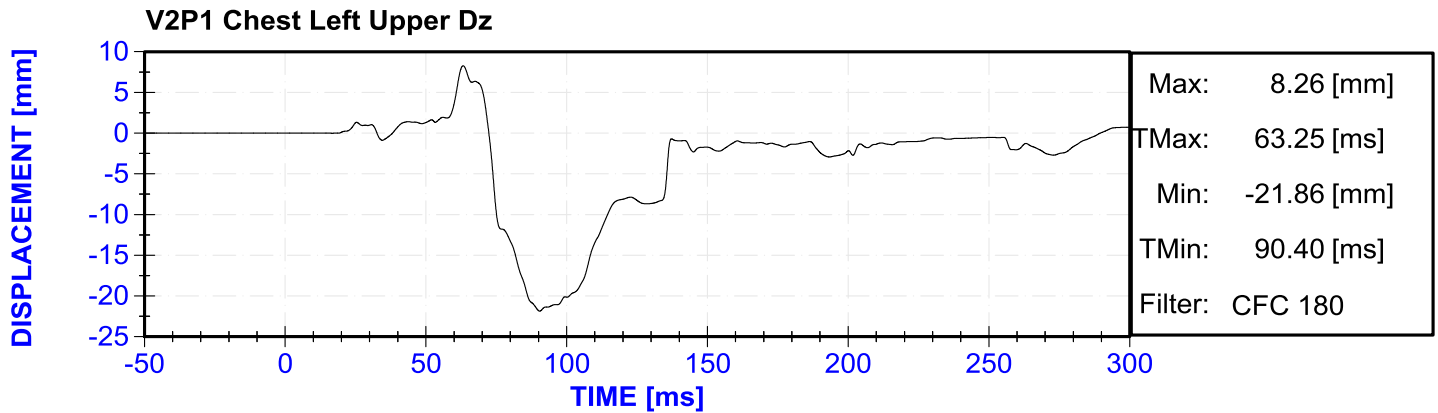


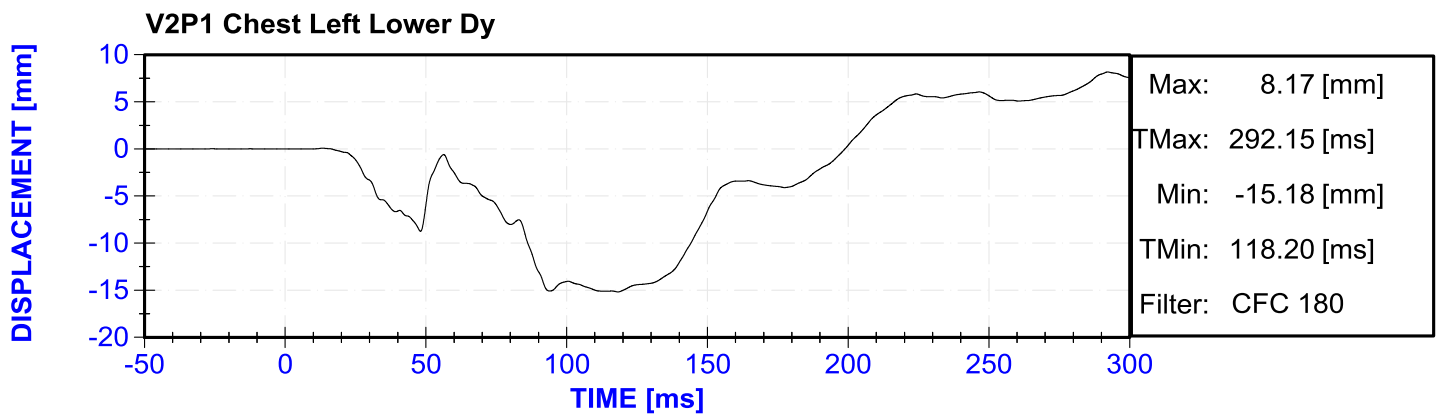
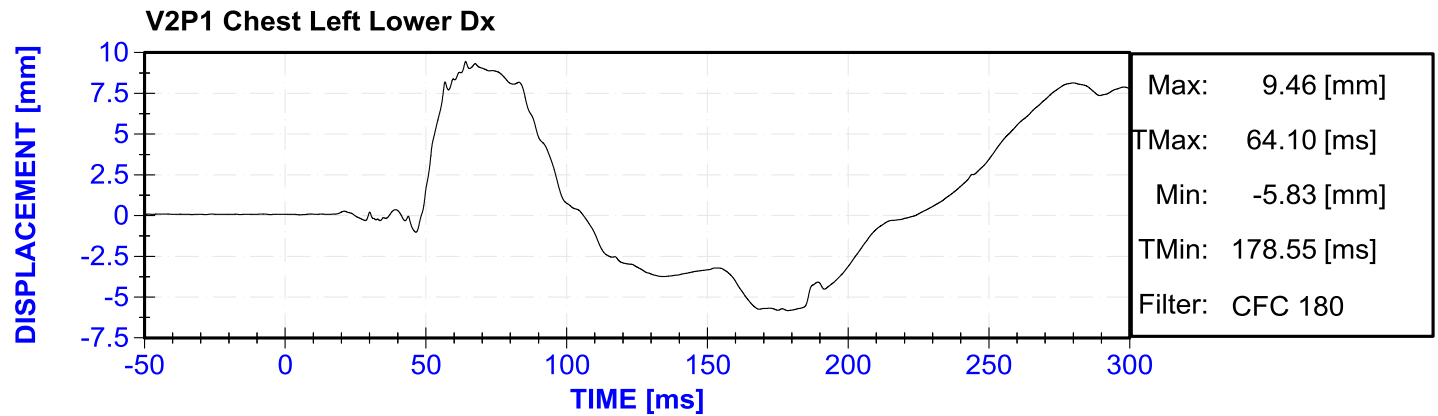
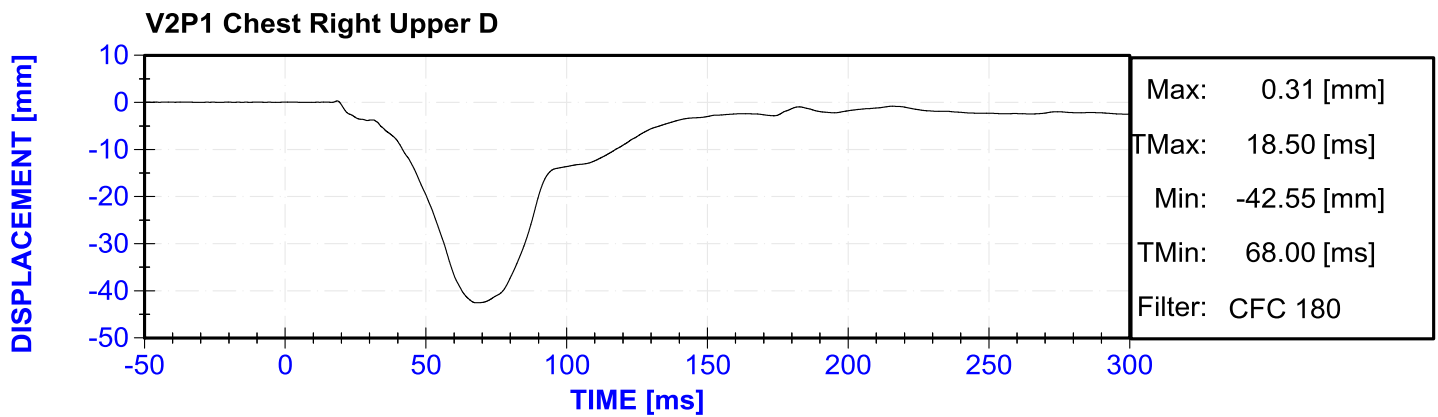
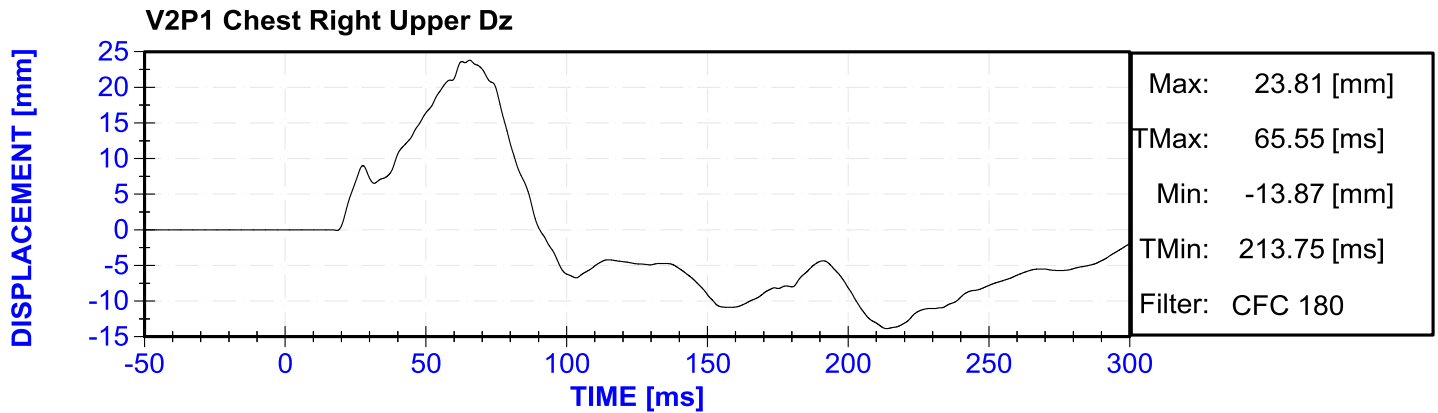
V2P1 Chest Left Upper Dx

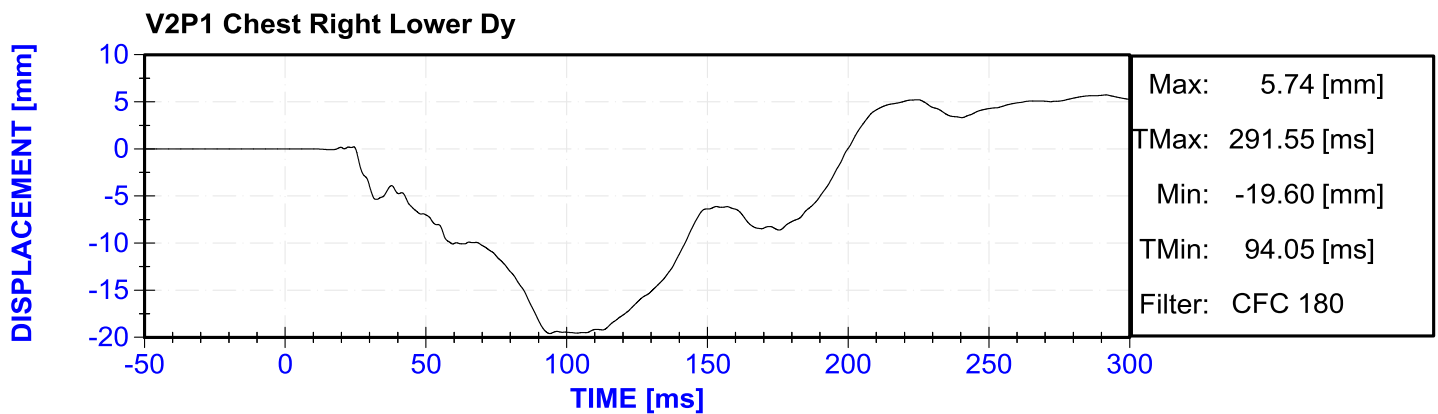
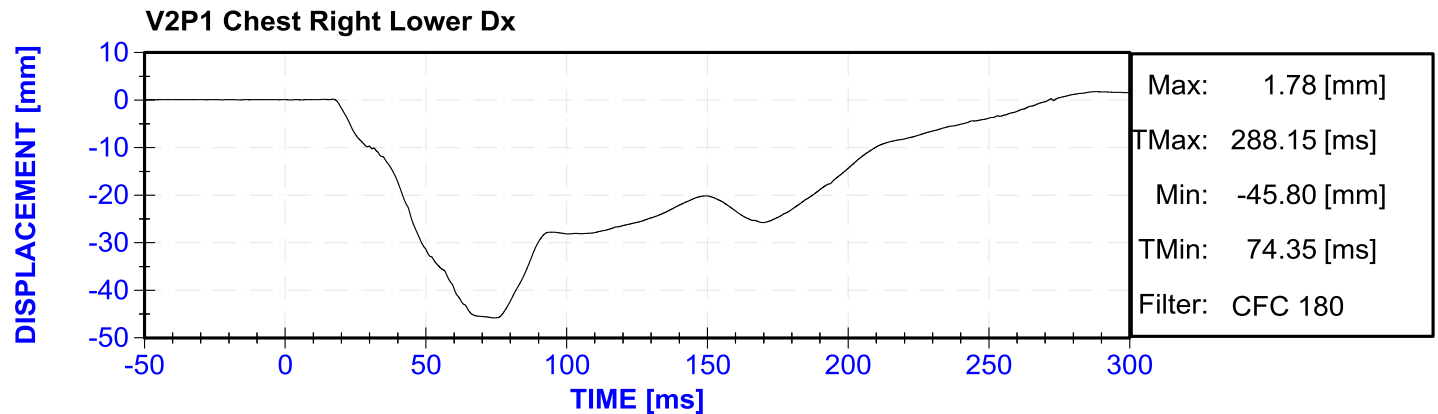
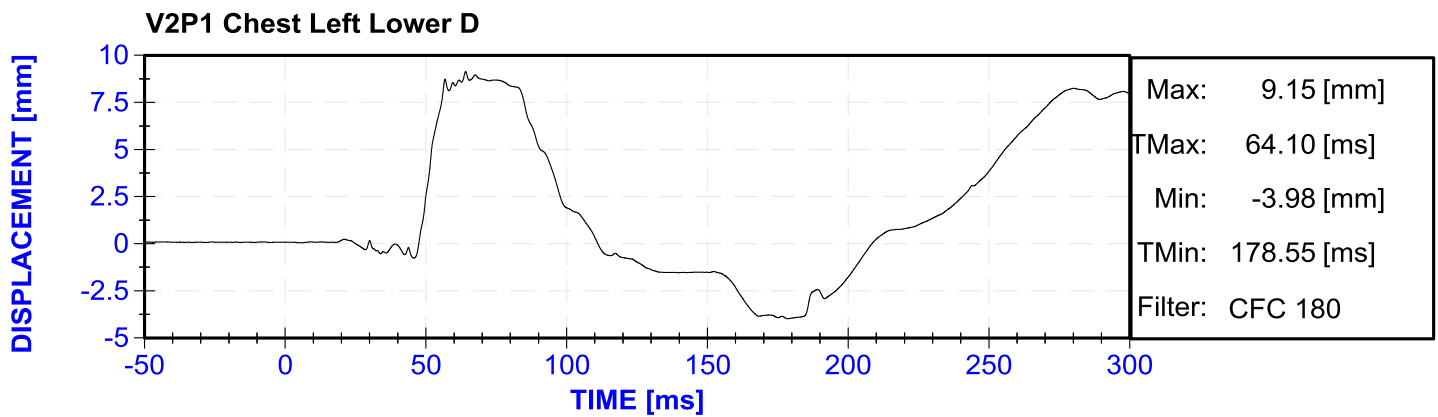
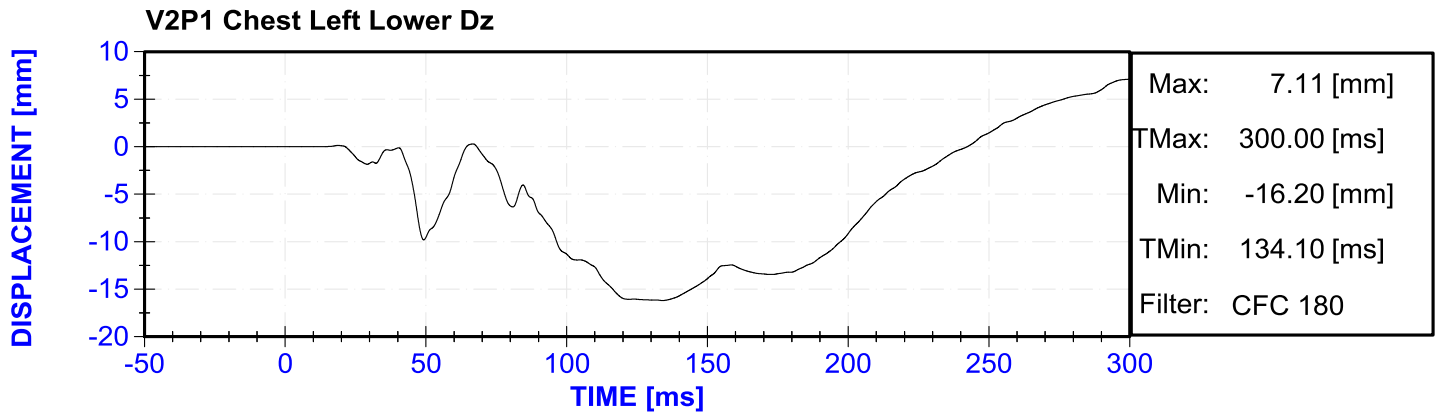


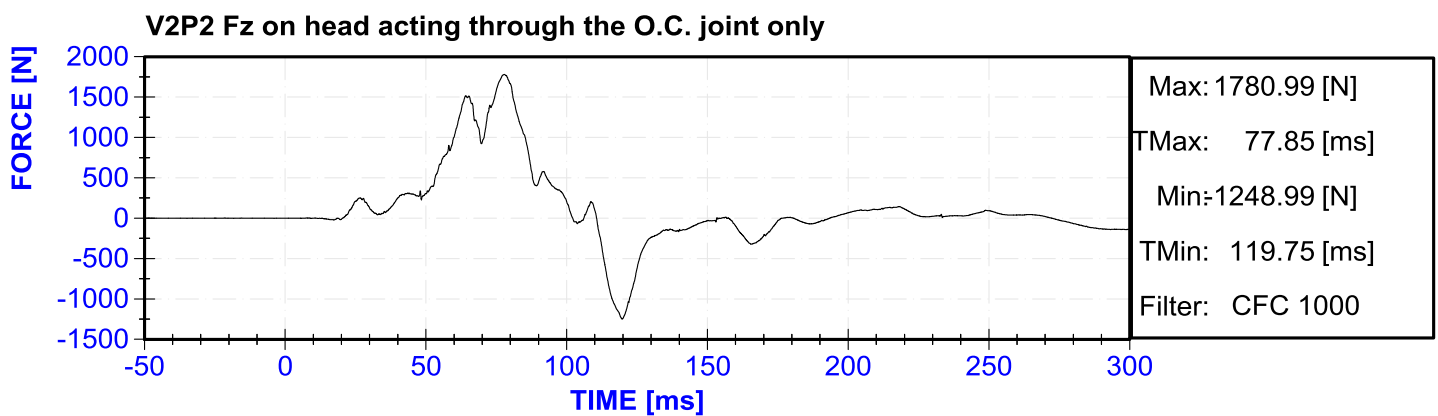
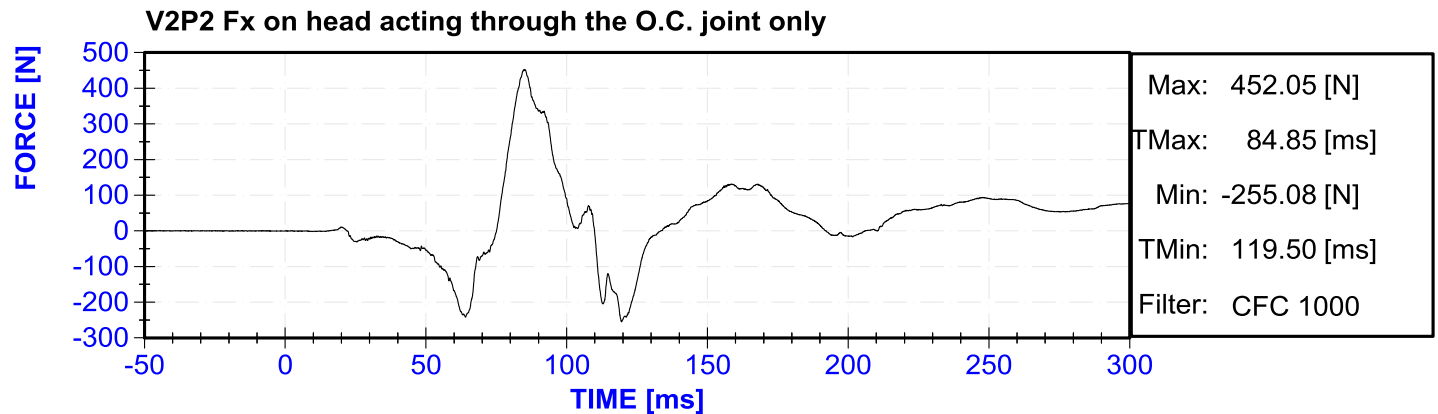
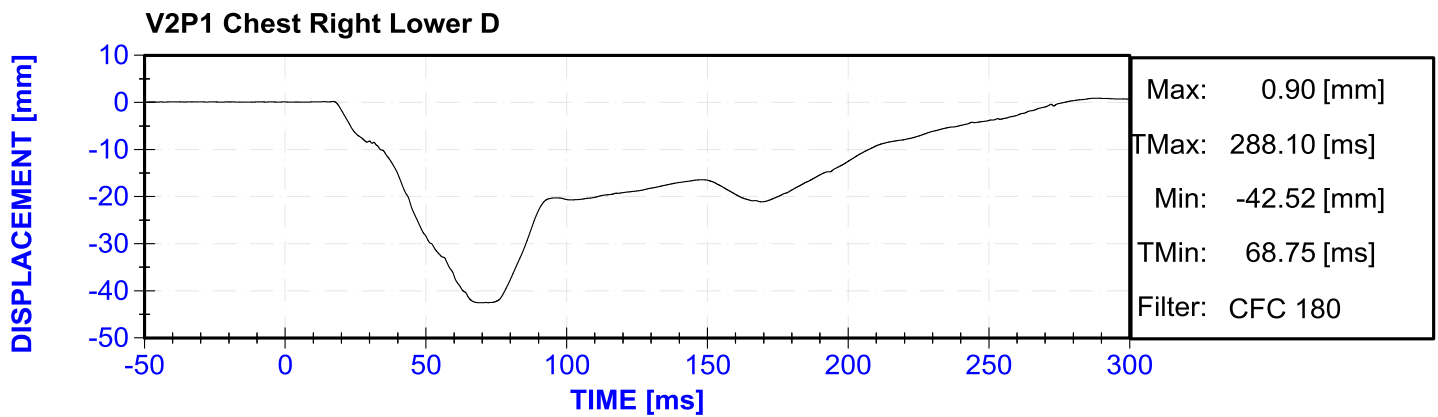
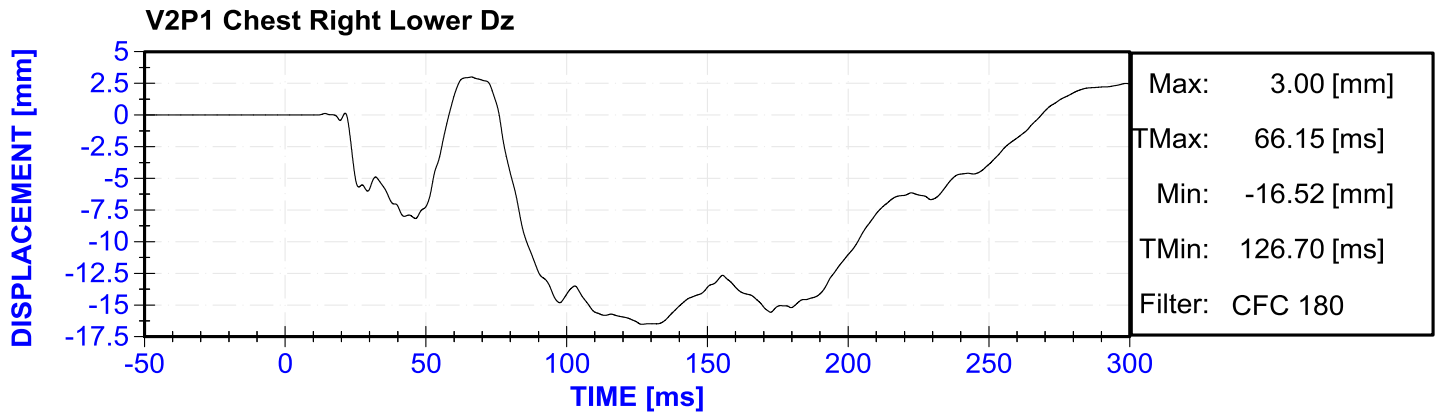
V2P1 Chest Left Upper Dy



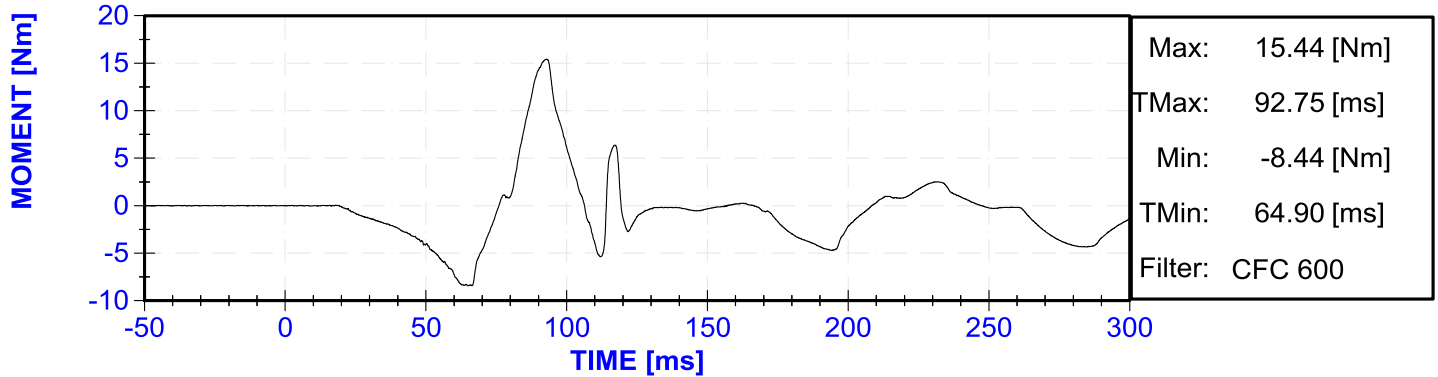




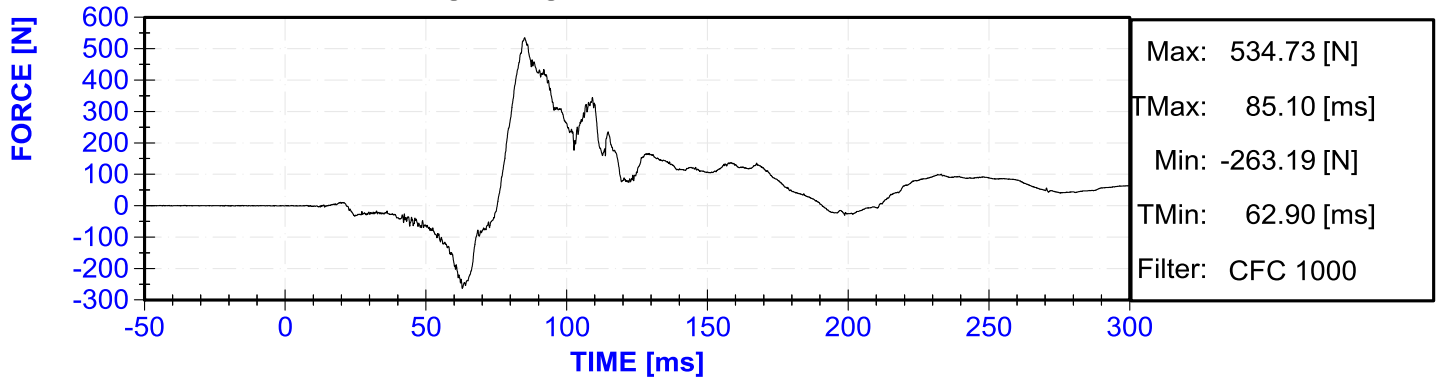




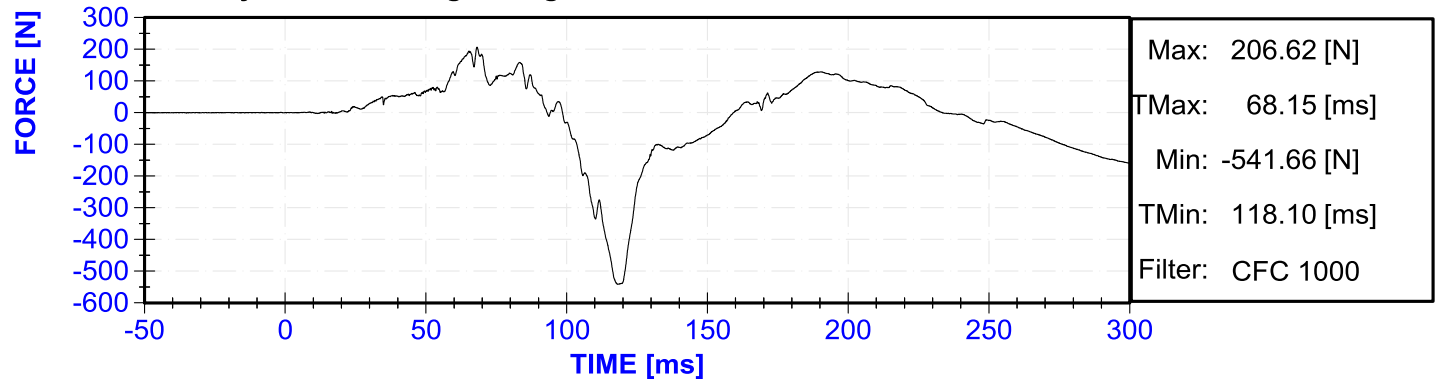
V2P2 My on head acting through the O.C. joint only



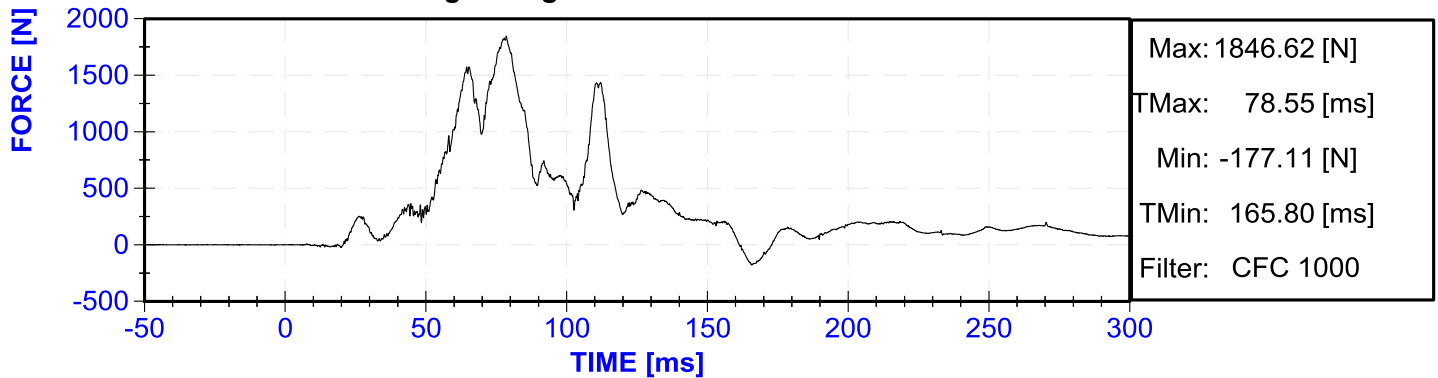
V2P2 Fx on head acting through the total neck section



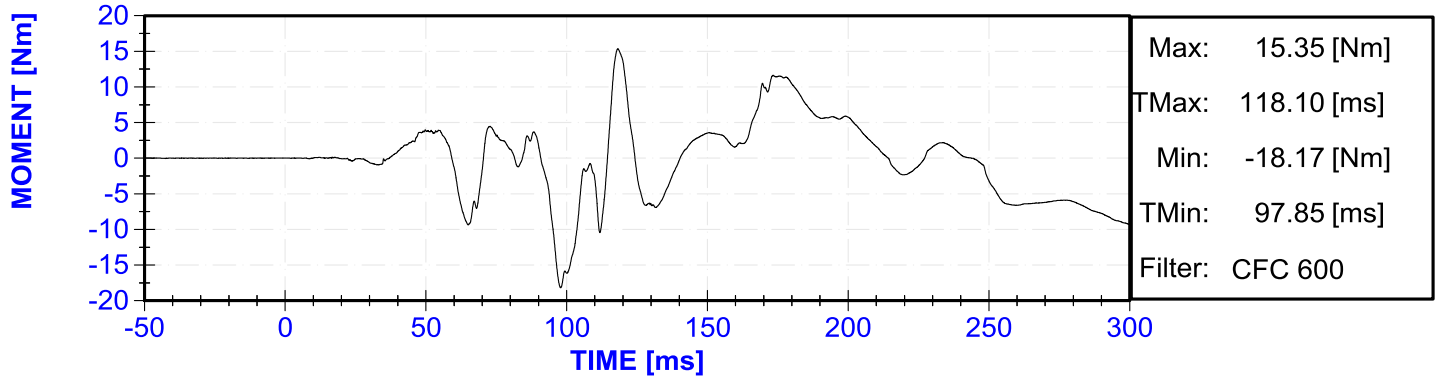
V2P2 Fy on head acting through the total neck section



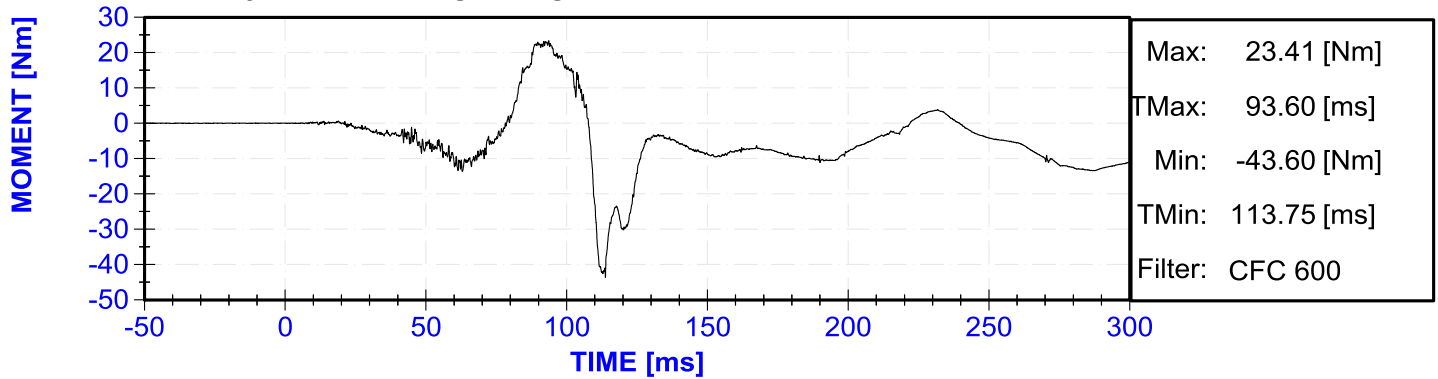
V2P2 Fz on head acting through the total neck section



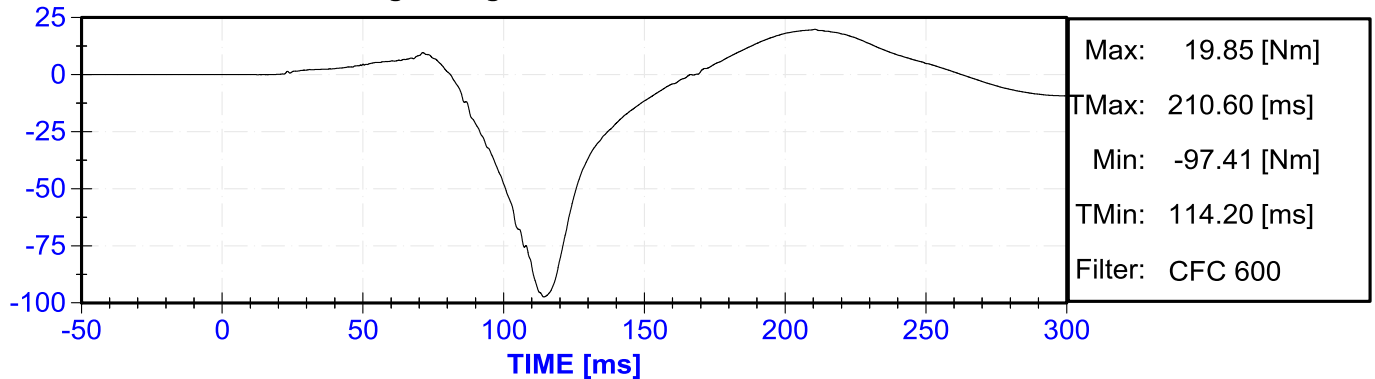
V2P2 Mx on head acting through the total neck section



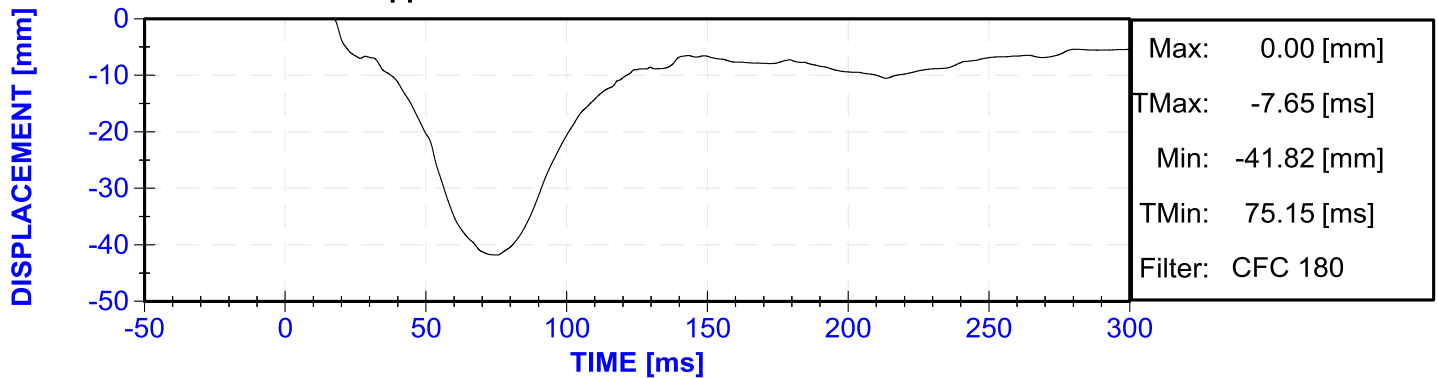
V2P2 My on head acting through the total neck section

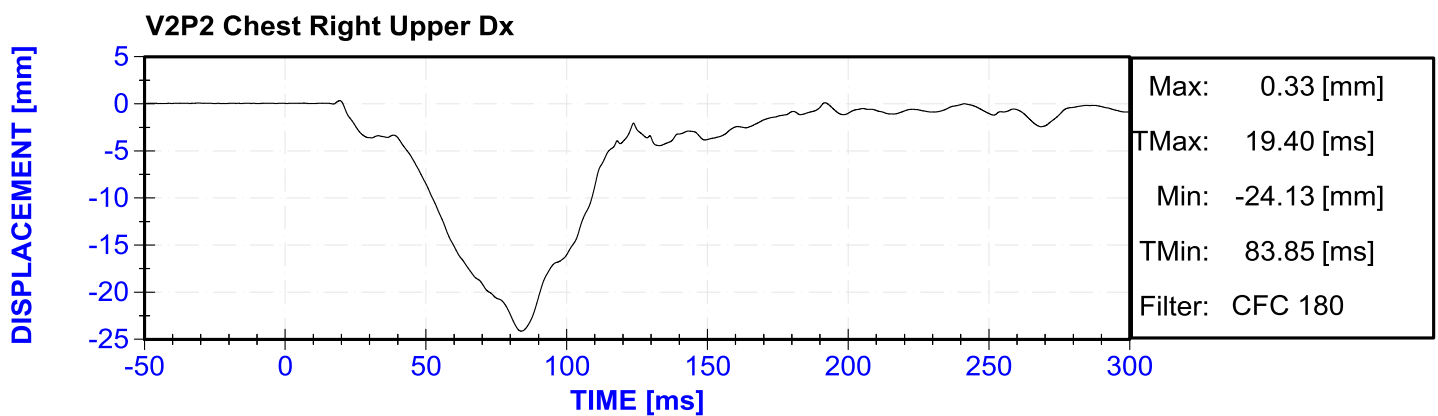
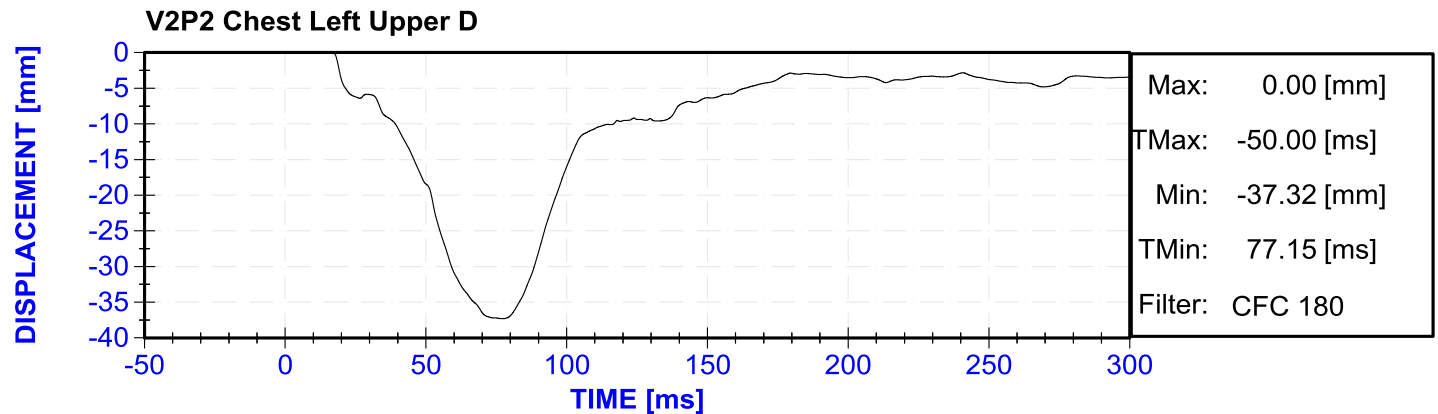
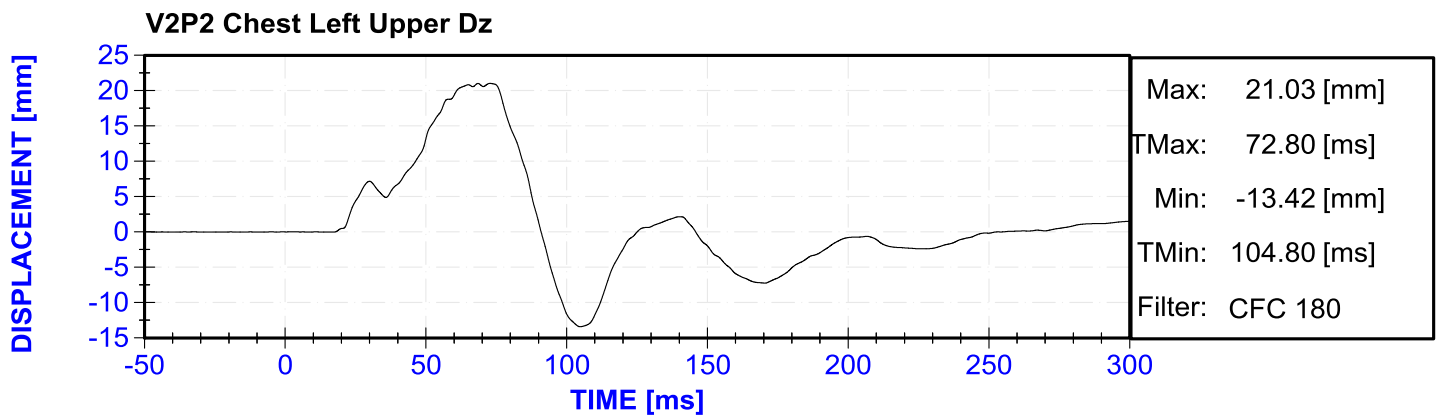
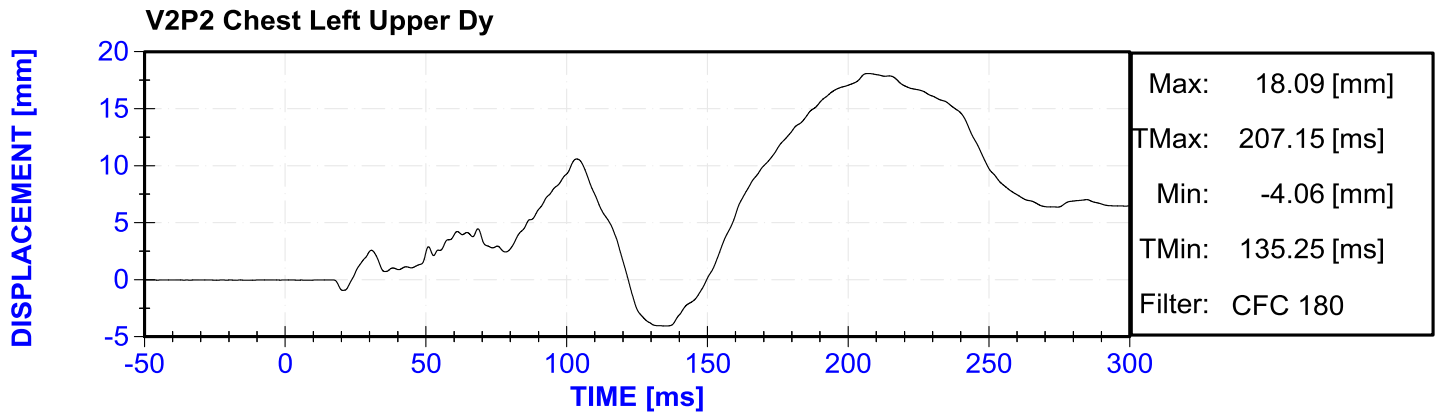


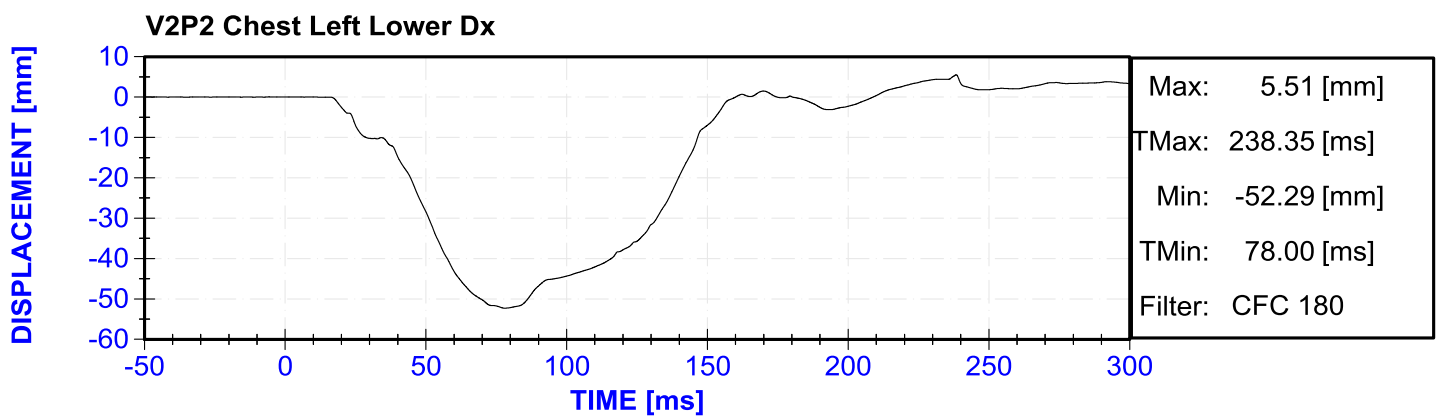
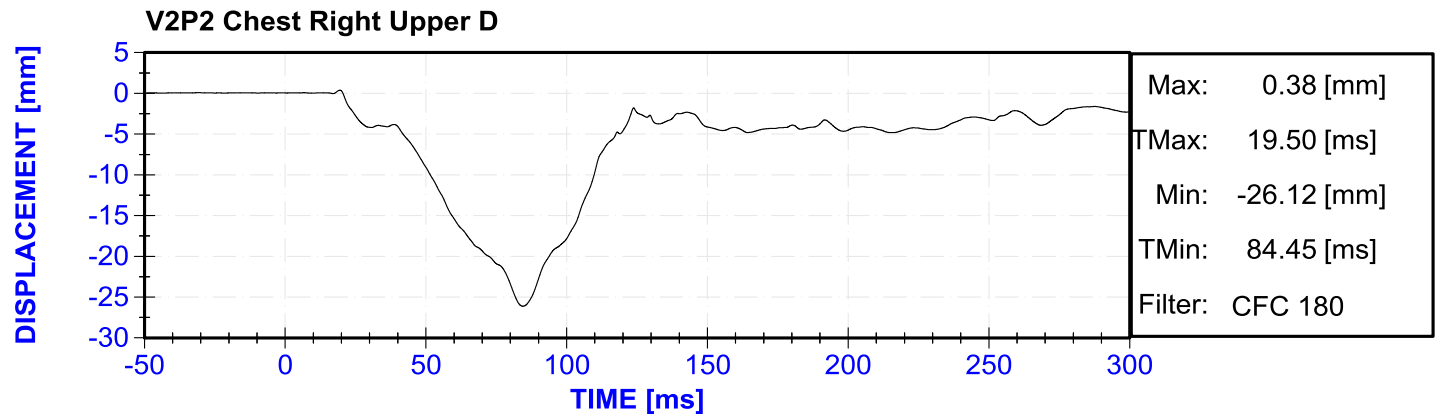
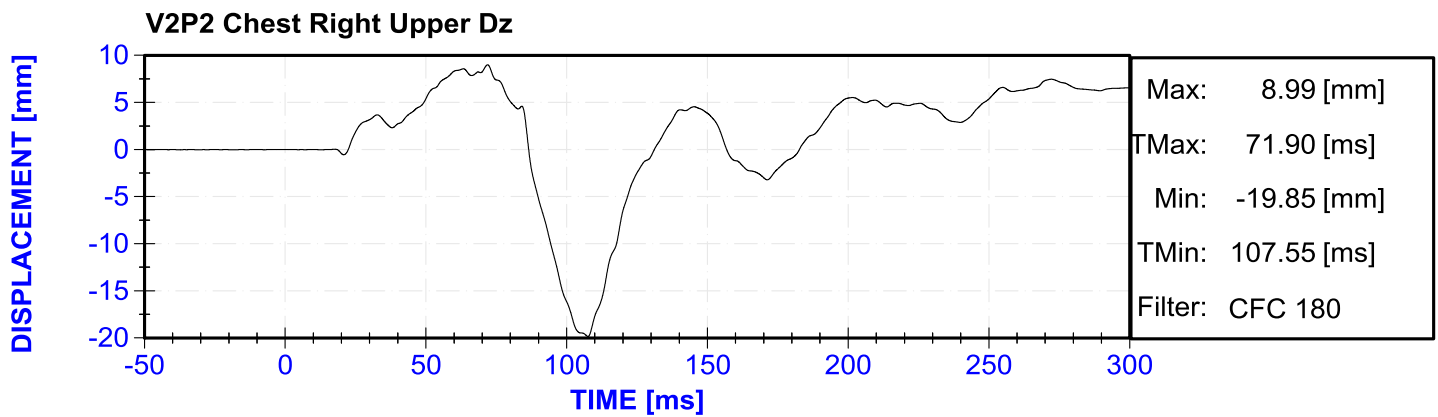
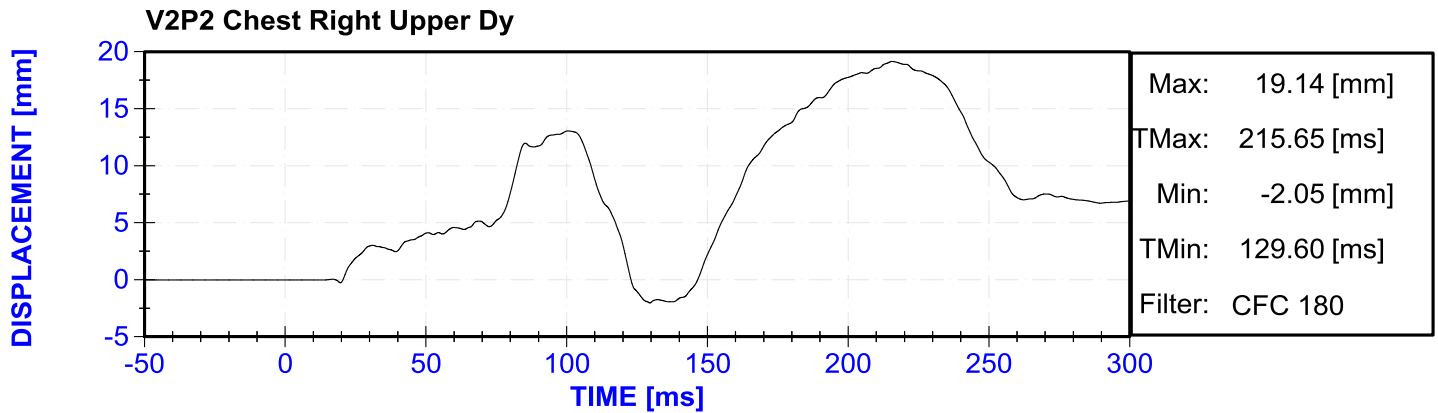
V2P2 Mz on head acting through the total neck section

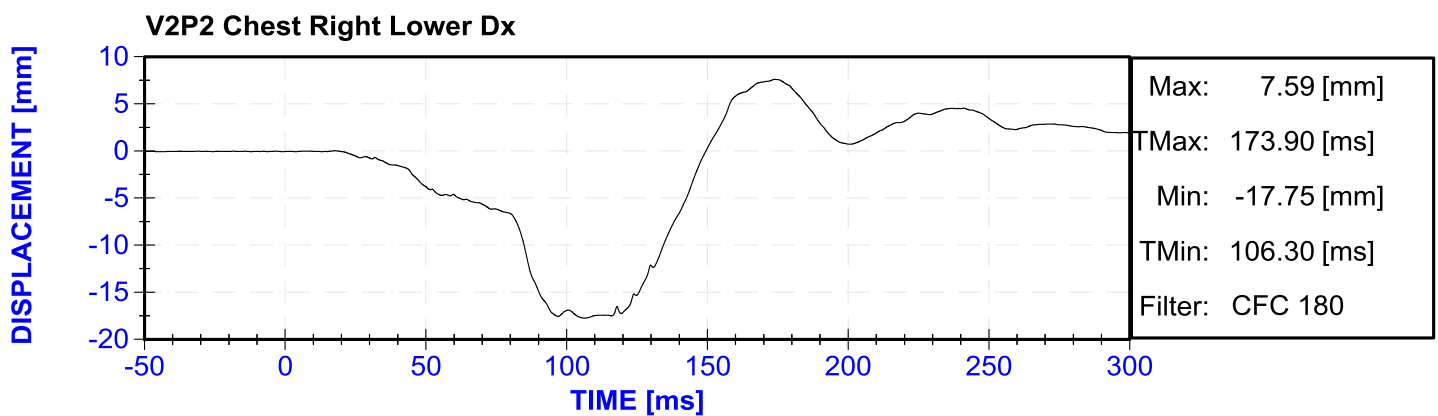
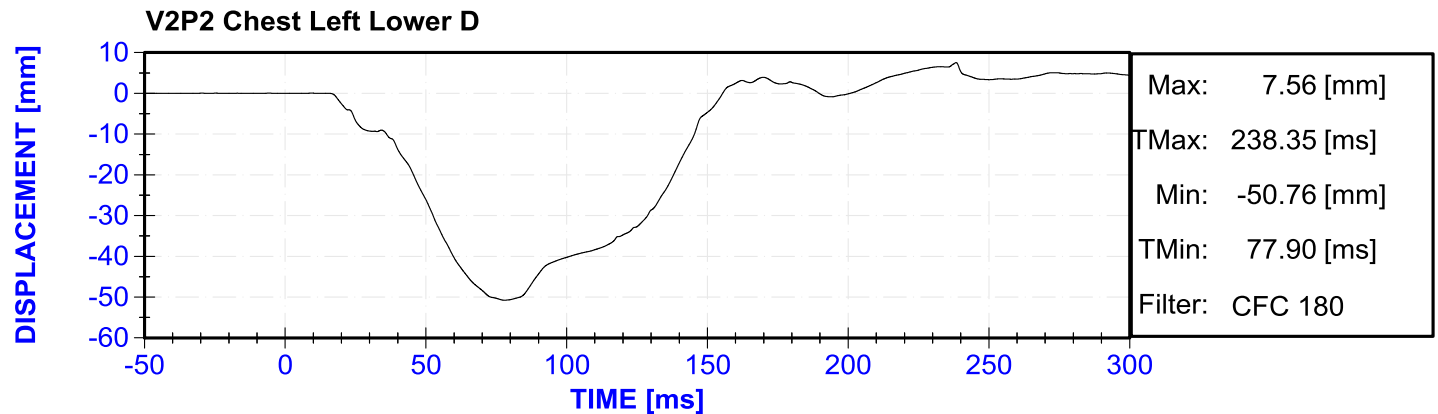
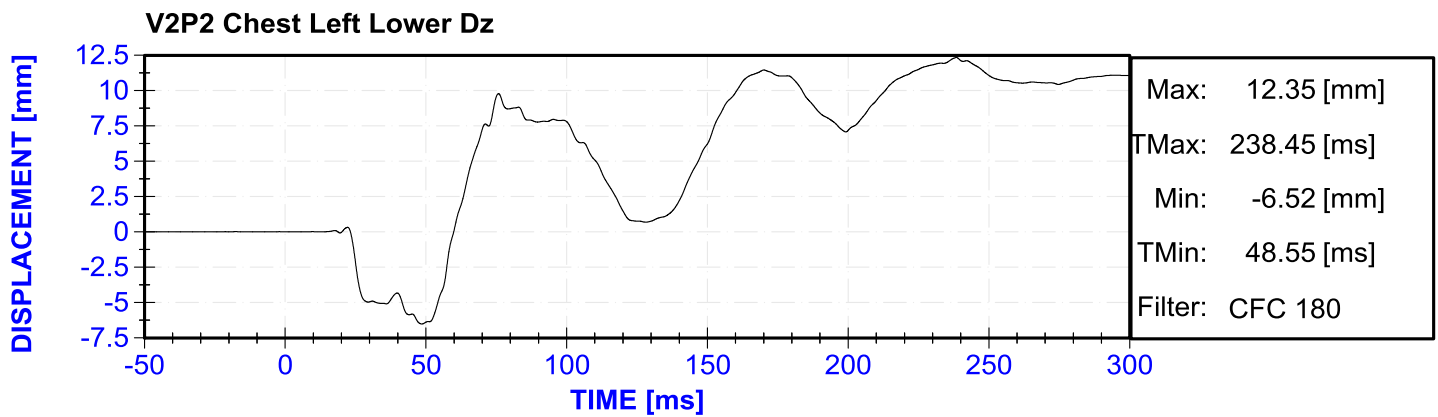
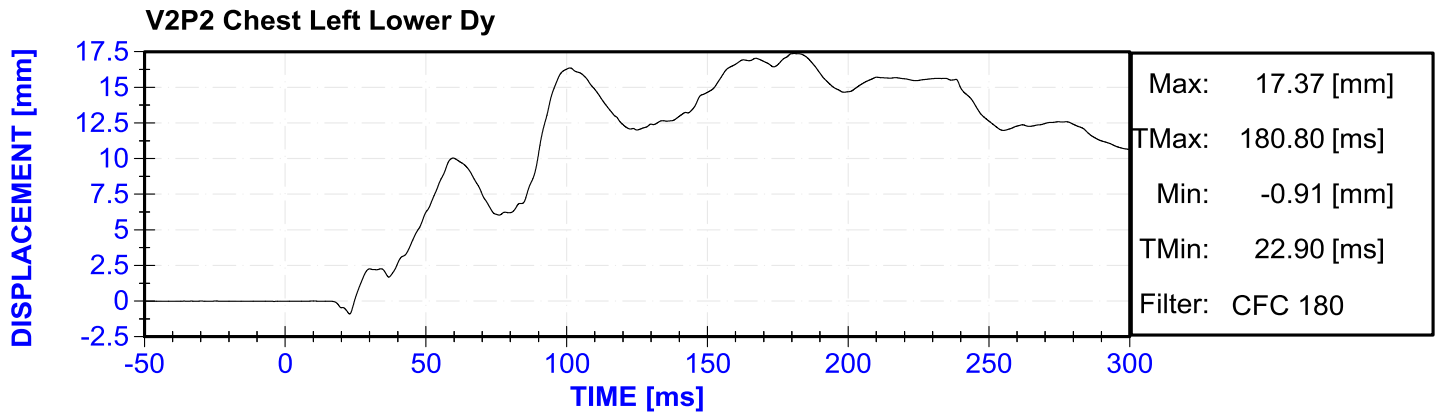


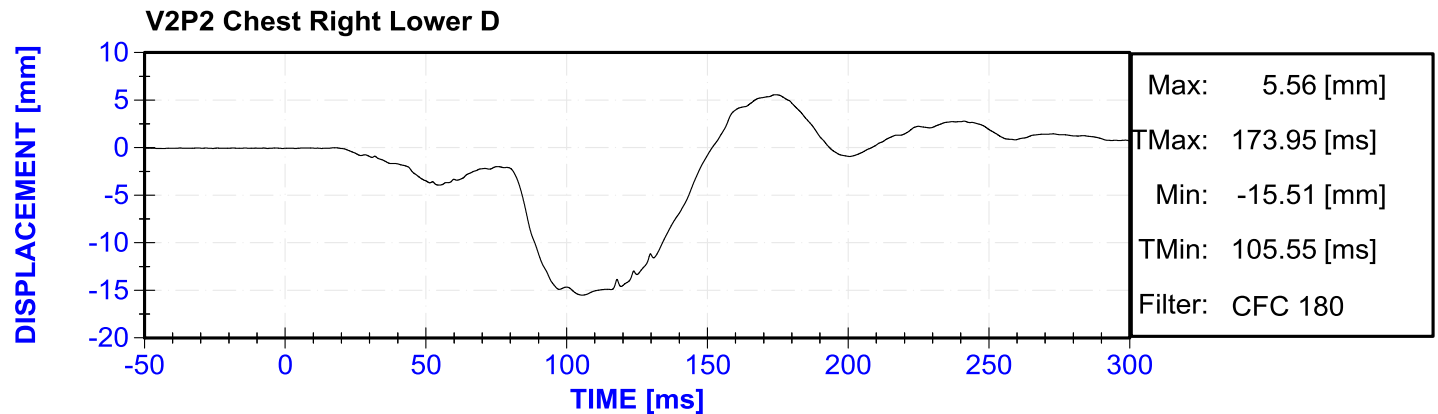
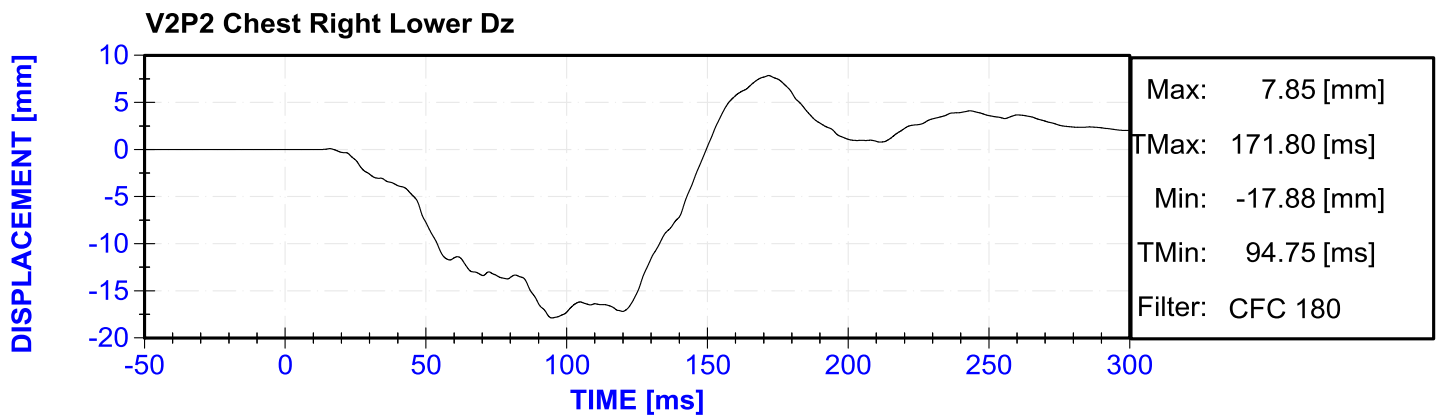
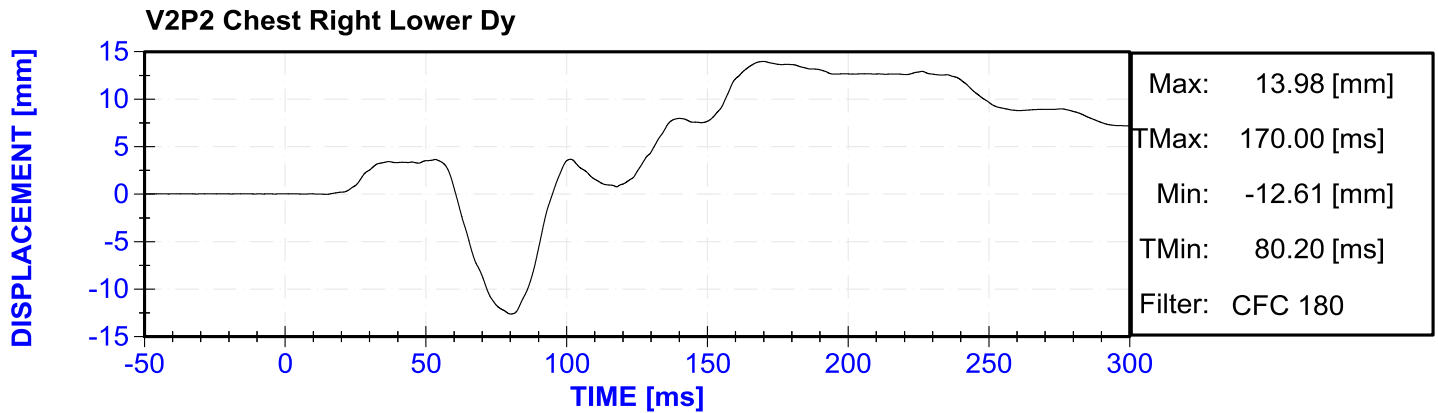
V2P2 Chest Left Upper Dx











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

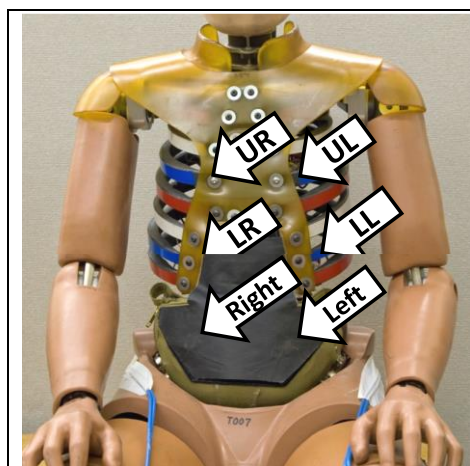


Figure 1. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

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

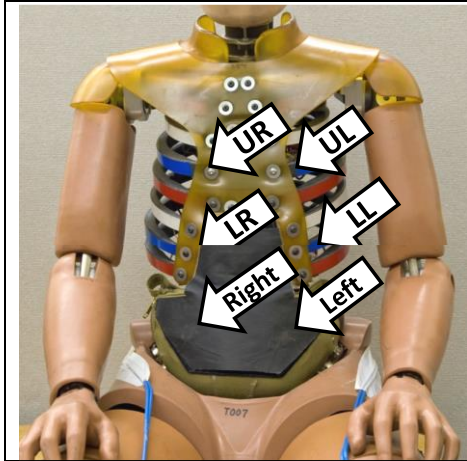


Figure 2. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

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

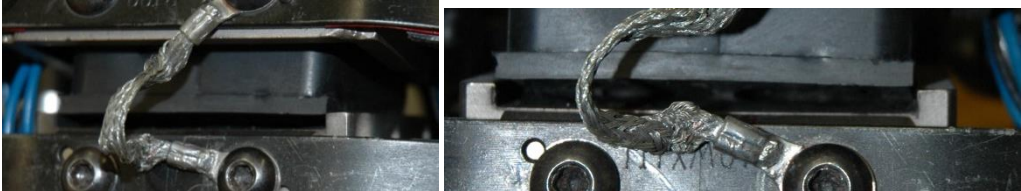
THOR Inspection Checklist

Date: 1/10/2014	
NHTSA Representative: James Saunders	
Inspection Reporter: Matthew Goehle	
Witness(es):	
Inspection type (check one): ☒ PRE ☐ POST	
Dummy S/N: 0016	Legs S/N: LX019/LX018
Dummy Description: Thor NT 50th Male	
Date of last Certification or Inspection: 1/7/2014	
<u>Tests conducted since...</u> <u>Since last inspection:</u> CAL2671 – Test Vehicle 0028 <u>Since last certification:</u> RD0332 Dodge Dart RD5371 Honda Civic RE5507 Subaru Forester RD5910 Volvo XC60 CAL2658- Test Vehicle 8572 CAL2659 – Test Vehicle 3A CAL2660 – Test Vehicle 3B CAL2660 – Test Vehicle 03EX	<i>Continued</i> CAL2665 – Test Vehicle 25002 CAL2667 – Test Vehicle 9293 CAL2668 – Test Vehicle 3100 RC5911 Volvo S60 CAL2671 – Test Vehicle 0028
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> - Ankle Right Rx - Questionable data after 80 ms – Wire stretched thin near potentiometer – We repaired	
<u>Physical evidence of damage:</u> - Scuffing on front of neck nylon bracket - Right leg zipper is broken	
<u>Anecdotal evidence of damage:</u> N/A	
<u>Equipment delivered to Borrower:</u> Thor 16 ATD 26 Accelerometers 3 Angular Rate Sensors 2 Skull Spring LC 1 Condyle Pot 1 Upper Neck LC 1 Lower Neck LC 4 IRTraccs 8 Rotational Pots 1 Spine LC 2 Acetabulum LC 2 ASIS LC 2 Femur LC	<i>Continued</i> 2 LX Leg Assemblies 2 Upper Tibia LC 2 Lower Tibia LC 6 Ankle 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 1 cap tab broke. The other tab has a stress crack. 
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	Small tear in the insulation 

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell):
Y / N	No evidence of debonding or permanent compression in neck soft stop assemblies
Y / N	Neck securely attached to upper neck load cell
Y / N	Neck securely attached to lower neck load cell
Y / N	Neck pitch change joint mechanism mating teeth are engaged
OTHER	Scuffing on front of neck nylon bracket

		
SPINE		
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates Debonding has occurred at bottom of thoracic spine rubber. Second photo after CAL2665	
		
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates Debonding has occurred at bottom of lumbar spine rubber.	
		
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged	
OTHER		

SHOULDER		
Y / N	Urethane shoulder pads show no evidence of contact	
Y / N	Clavicles securely attached to sternum and shoulder	
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops	
OTHER	Left shoulder nylon lock-nut continually loosens. Nylon strips off on keyed shaft.  Tear to the left wrist area and inside left hand has cuts. 	

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
Y / N	No evidence of debonding between rib damping material and ribs
Y / N	IRTRACCs arms securely attached to anterior ribs IRTRACC housing bolts were loose on both right IRTRACCs. We confirmed and tested electrical function.
Y / N	Urethane bib is securely attached to ribs with no sign of tearing or washer penetration  Bib has torn in the center of sternum
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)
OTHER	 Lower Neck LC Cable has been repaired where it passes through the upper rear spine box.  T6 X Accelerometer missing insulation at transducer. Electrical tape covers this.
ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper  Upper abdomen came held together with black tape
Y / N	Upper abdomen insert securely attached to spine
Y / N	Upper abdomen insert shows no evidence of permanent set
Y / N	No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper



Abdomen bag has many broken stitches forming, but no tears occurring.



Both sides of the Abdomen Bag have torn where the stitches had broke

Y / N

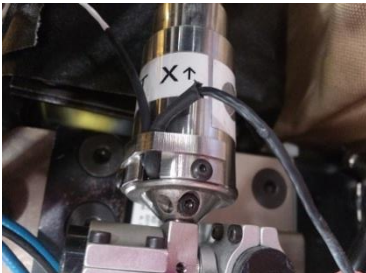
Lower abdomen insert securely attached to spine

Y / N

Lower abdomen insert shows no evidence of permanent set

Other

Both lower abdomen IRTracc screws are inserted, but the IRTraccs are not installed.



Wire seems to have been pinched

PELVIS

Y / N

Pelvis flesh fits securely over pelvis bones

Y / N

H-point tool fits securely into hole on both sides of pelvis

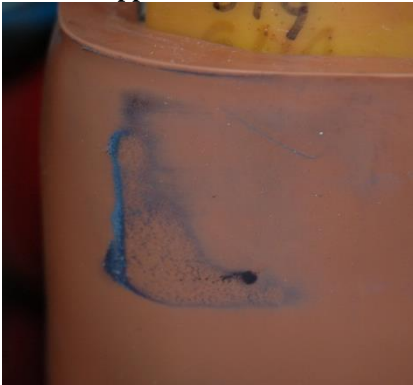
OTHER

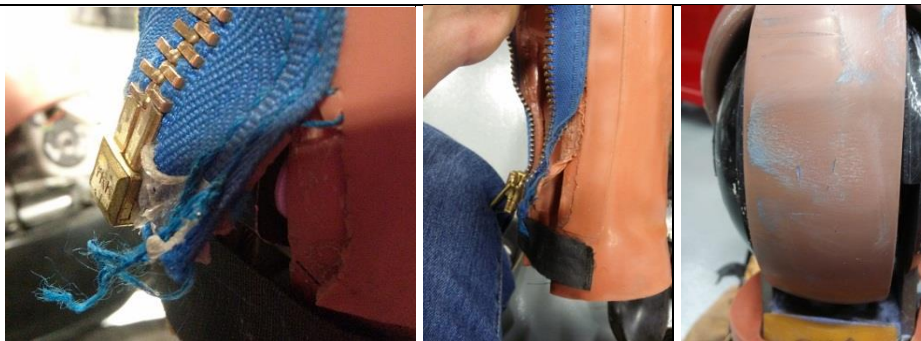
Rear of pelvis has torn flesh



Tears have formed to the front of the pelvis - got worse after RD5910



FEMUR	
Y / N	Acetabular load cells firmly attached
Y / N	Femur load cells firmly attached
Y / N	No evidence of deformation of knee slider bump stop
Y / N	No cuts, tears, or scuffing of knee flesh
Other	
LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached -Left ankle Y pot has intermittent failure in cable close to amp connector. –Repaired by cutting back cable and reinstalling on connector.
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
Y / N	No cuts, tears, or scuffing of leg flesh Flesh around both lower zippers are starting to tear:  Numerous minor cuts. Additional abrasion on right leg seen after CAL2660. Right outer knee cap rubber started to pull away from composite material.  Scuff on upper left shin after CAL2665  Zipper on right ankle is pulling away from the flesh – This became much worse during the RE5507 test. (See second photo) (Replaced flesh) Right knee has some nicks in the flesh



Right leg zipper is broken after CAL2671



Other



Damage to the metal of the right ankle

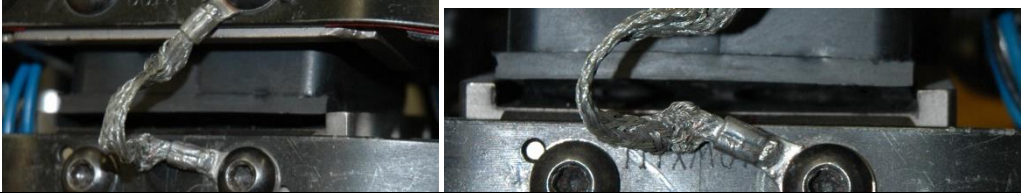
JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers Jacket has tears around neck and at most seam ends as seen here on the front left shoulder.  Airbag burn on left rear Jacket 
OTHER	Lifting strap torn 

THOR Inspection Checklist

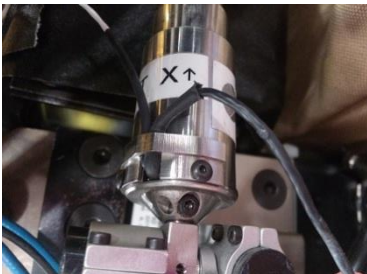
Date: 1/13/2014	
NHTSA Representative: James Saunders	
Inspection Reporter: Matthew Goehle	
Witness(es):	
Inspection type (check one): ☐ PRE ☒ POST	
Dummy S/N: 0016	Legs S/N: LX019/LX018
Dummy Description: Thor NT 50th Male	
Date of last Certification or Inspection: 1/7/2014	
<u>Tests conducted since...</u> <u>Since last inspection:</u> CAL2672 – Test Vehicle 4969 <u>Since last certification:</u> RD0332 Dodge Dart RD5371 Honda Civic RE5507 Subaru Forester RD5910 Volvo XC60 CAL2658- Test Vehicle 8572 CAL2659 – Test Vehicle 3A CAL2660 – Test Vehicle 3B CAL2660 – Test Vehicle 03EX	<i>Continued</i> CAL2665 – Test Vehicle 25002 CAL2667 – Test Vehicle 9293 CAL2668 – Test Vehicle 3100 RC5911 Volvo S60 CAL2672 – Test Vehicle 4969
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> - Ankle Right Rx - Questionable data after 80 ms – Wire stretched thin near potentiometer – We repaired	
<u>Physical evidence of damage:</u> - Scuffing on front of neck nylon bracket - Right leg zipper is broken	
<u>Anecdotal evidence of damage:</u> N/A	
<u>Equipment delivered to Borrower:</u> Thor 16 ATD 26 Accelerometers 3 Angular Rate Sensors 2 Skull Spring LC 1 Condyle Pot 1 Upper Neck LC 1 Lower Neck LC 4 IRTraccs 8 Rotational Pots 1 Spine LC 2 Acetabulum LC 2 ASIS LC 2 Femur LC	<i>Continued</i> 2 LX Leg Assemblies 2 Upper Tibia LC 2 Lower Tibia LC 6 Ank1e Potentiometers 2 Knee Sliders 1 Neck Skin 1 Neck Foam 1 Tiltview Interface Cable 4 Tilt Sensors 1 H-Point Tool 1 Tool Box 1 Laptop

Note: New Damage is Noted in Red

HEAD	
Y / N	Rear head cap mounts securely to head 1 cap tab broke. The other tab has a stress crack. A photograph of a metallic, semi-circular rear head cap assembly. It has two mounting tabs at the bottom. The left tab is broken and bent. The right tab has a visible stress crack. The assembly is resting on a red fabric surface. A close-up photograph of a mounting tab from the rear head cap. A black arrow points to a stress crack on the surface of the tab. The tab is resting on a red fabric surface.
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	Small tear in the insulation A photograph showing a bundle of cables and wires. A red box highlights a small tear in the white insulation on one of the cables.

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell):
Y / N	No evidence of debonding or permanent compression in neck soft stop assemblies
Y / N	Neck securely attached to upper neck load cell
Y / N	Neck securely attached to lower neck load cell
Y / N	Neck pitch change joint mechanism mating teeth are engaged
OTHER	Scuffing on front of neck nylon bracket 
SPINE	
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates Debonding has occurred at bottom of thoracic spine rubber. Second photo after CAL2665 
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates  Debonding has occurred at bottom of lumbar spine rubber.
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged
OTHER	

SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops
OTHER	Left shoulder nylon lock-nut continually loosens. Nylon strips off on keyed shaft.  Tear to the left wrist area and inside left had has cuts. 
THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
Y / N	No evidence of debonding between rib damping material and ribs
Y / N	IRTRACCs arms securely attached to anterior ribs IRTRACC housing bolts were loose on both right IRTRACCs. We confirmed and tested electrical function.
Y / N	Urethane bib is securely attached to ribs with no sign of tearing or washer penetration  Bib has torn in the center of sternum
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)
OTHER	 Lower Neck LC Cable has been repaired where it passes through the upper rear spine box.  T6 X Accelerometer missing insulation at transducer. Electrical tape covers this.

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

PELVIS	
Y / N	Pelvis flesh fits securely over pelvis bones
Y / N	H-point tool fits securely into hole on both sides of pelvis
OTHER	Rear of pelvis has torn flesh  Tears have formed to the front of the pelvis - got worse after RD5910 

FEMUR	
Y / N	Acetabular load cells firmly attached
Y / N	Femur load cells firmly attached
Y / N	No evidence of deformation of knee slider bump stop
Y / N	No cuts, tears, or scuffing of knee flesh
Other	
LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached -Left ankle Y pot has intermittent failure in cable close to amp connector. –Repaired by cutting back cable and reinstalling on connector.
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
Y / N	No cuts, tears, or scuffing of leg flesh Flesh around both lower zippers are starting to tear:  Numerous minor cuts. Additional abrasion on right leg seen after CAL2660. Right outer knee cap rubber started to pull away from composite material. 

Scuff on upper left shin after CAL2665



Zipper on right ankle is pulling away from the flesh – This became much worse during the RE5507 test. (See second photo) (Replaced flesh) Right knee has some nicks in the flesh



Right leg zipper is broken after CAL2672



Other



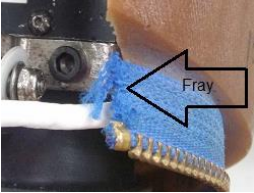
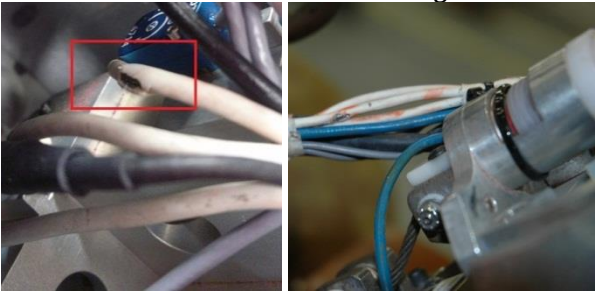
Damage to the metal of the right ankle

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

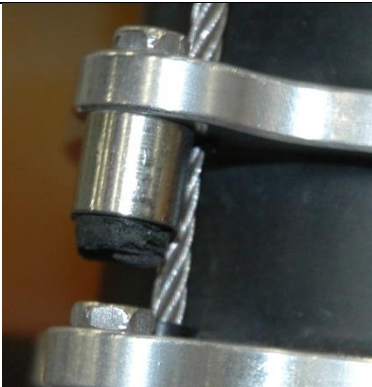
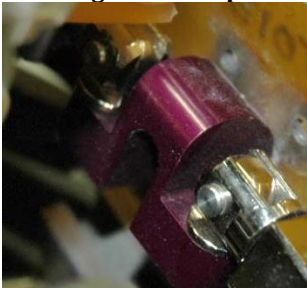
THOR Inspection Checklist

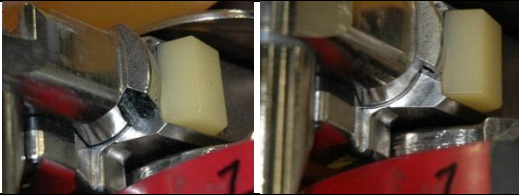
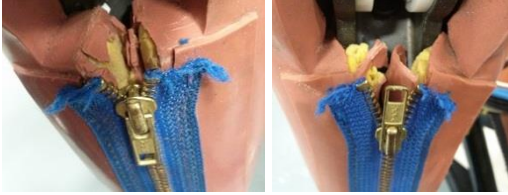
Date: 1/10/2014	
NHTSA Representative: James Saunders	
Inspection Reporter: Matthew Goehle	
Witness(es):	
Inspection type (check one): ☒ PRE ☐ POST	
Dummy S/N: 0015	Legs S/N: LX0038/LX0039
Dummy Description: Thor NT 50th Male	
Date of last Certification or Inspection: 1/7/2014	
<u>Tests conducted since...</u> <u>Since last inspection:</u> CAL2671 – Test Vehicle 0028 <u>Since last certification:</u> RD0332 Dodge Dart RD5371 Honda Civic RE5507 Subaru Forester RD5910 Volvo XC60 CAL2658- Test Vehicle 8572 CAL2659 – Test Vehicle 3A CAL2660 – Test Vehicle 3B CAL2660 – Test Vehicle 03EX	<i>Continued</i> CAL2665 – Test Vehicle 25002 CAL2667 – Test Vehicle 9293 CAL2668 – Test Vehicle 3100 RC5911 Volvo S60 CAL2671 – Test Vehicle 0028
<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> N/A	
<u>Equipment delivered to Borrower:</u> Thor 0015 ATD 26 Accelerometers 3 Angular Rate Sensors 2 Skull Spring LC 1 Condyle Pot 1 Upper Neck LC 4 IRTraccs 8 Rotational Pots 1 Spine LC 2 Acetabulum LC 2 ASIS LC 2 Femur LC	<i>Continued</i> 2 LX Leg Assemblies 2 Upper Tibia LC 2 Lower Tibia LC 6 Ank1e Potentiometers 2 Knee Sliders 1 Neck Skin 1 Neck Foam 1 Tiltview Interface Cable 4 Tilt Sensors 1 H-Point Tool 1 Tool Box 1 Laptop 1 LX Zeroing Bracket

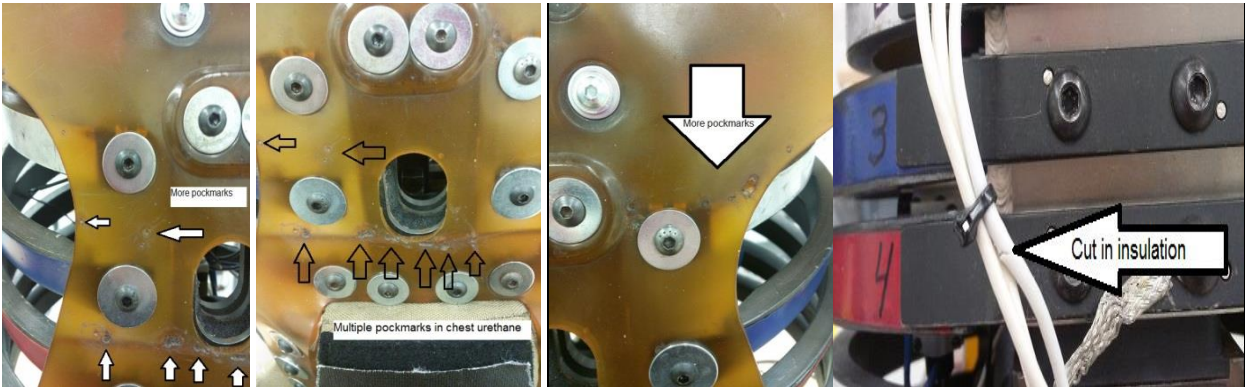
Note: New Damage is Noted in Red

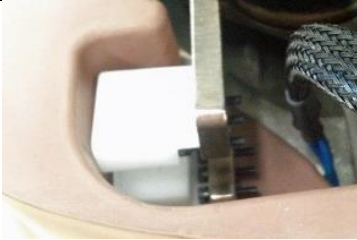
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage  Thor has holes/pockmarks in his head skin, along with a tear
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	Fraying of material for zipper at the back of the head  Head CG Y Accelerometer wire damaged. Another wire insulation damaged during CAL2659 

NECK	
Y / N	Neck cables slide freely through holes in neck plates Plastic slides pulled out of cable. We reinstalled. 
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell):
Y / N	No evidence of debonding or permanent compression in neck soft stop assemblies Slight damage to upper neck stop.

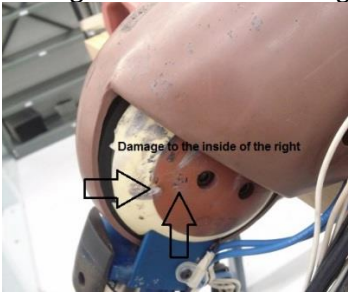
		
Y / N	Neck securely attached to upper neck load cell	
Y / N	Neck securely attached to lower neck load cell THOR 0015 does not have a lower neck load cell	
Y / N	Neck pitch change joint mechanism mating teeth are engaged	
OTHER	Lifting strap has begun to stretch. (We installed a 250lb cable tie around strap for safety) 	
SPINE		
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates	
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates	
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged	
OTHER		
SHOULDER		
Y / N	Urethane shoulder pads show no evidence of contact	
Y / N	Clavicles securely attached to sternum and shoulder Inner right clavicle pin missing C-clip. (Replaced) 	
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops Left rubber shoulder stop compressed. Stop fell out during CAL2665	

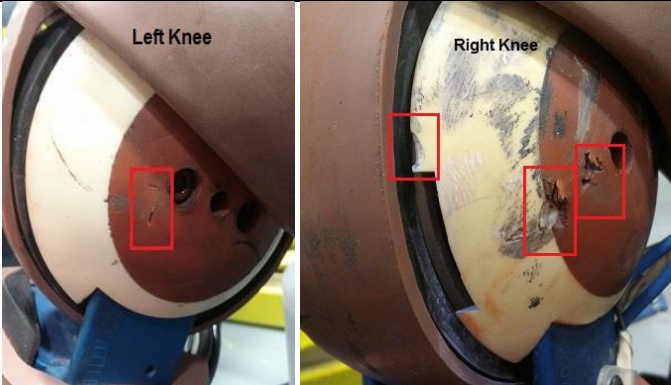
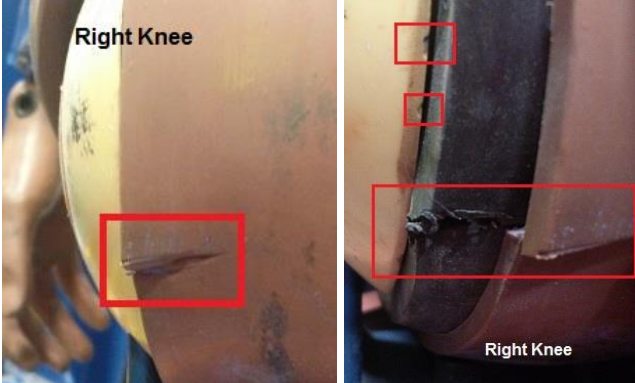
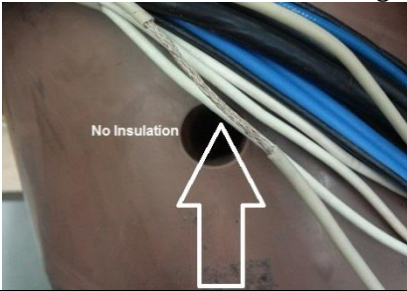
		
OTHER	Both left and right arms show signs of internal tearing  Left arm shows worse tearing after RC5911. 	

THORAX		
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material	
Y / N	No evidence of debonding between rib damping material and ribs	
Y / N	CRUX anterior arms securely attached to anterior ribs	
Y / N	CRUX posterior arms securely attached to double gimbals, spine	
Y / N	Urethane bib is securely attached to ribs with no sign of tearing or washer penetration See "OTHER" below.	
Y / N	Ribs securely attached to posterior spine	
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)	
OTHER	There are multiple pockmarks in the chest urethane, and at the back there is a cut in the insulation to one of the accelerometer wires 	

ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper
Y / N	Upper abdomen insert securely attached to spine
Y / N	Upper abdomen insert shows no evidence of permanent set
Y / N	No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
Other	 Both lower abdomen IRTracc screws are inserted, but the IRTraccs are not installed.

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

FEMUR	
Y / N	Acetabular load cells firmly attached
Y / N	Femur load cells firmly attached
Y / N	No evidence of deformation of knee slider bump stop Damage to the inside of the right knee  Some damage done to the outer left knee, inside right knee sustained more damage

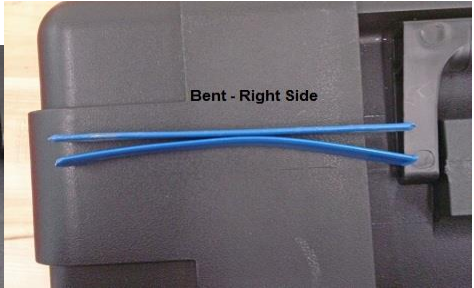
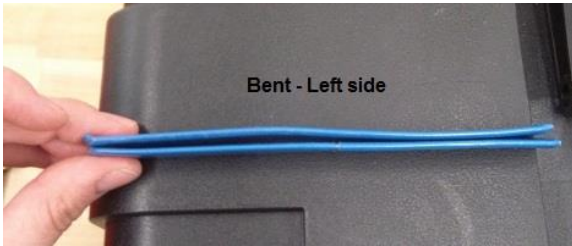
		
Y / N	No cuts, tears, or scuffing of knee flesh Right knee flesh, and rubber insert were cut, chips is white area 	
Other	One accelerometer wire is missing a large portion of insulation 	

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

JACKET

Y / **N**

Rib stiffeners show no sign of permanent deformation
One of the left rib stiffeners has damage to the outer coating that goes all the way around, also, the rib stiffeners were severely bent when we received 0015.



Y / **N**

No evidence of tears or holes in jacket fabric, Velcro, or zippers
Many of the seams of the jacket are coming undone, and there is a hole on the bottom left side along with stains all over the jacket.

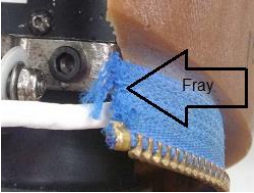
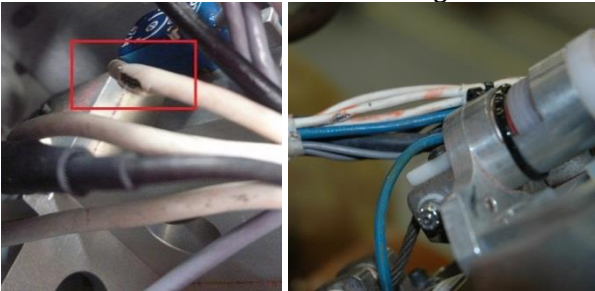


OTHER

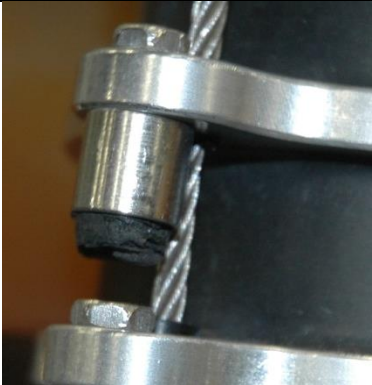
THOR Inspection Checklist

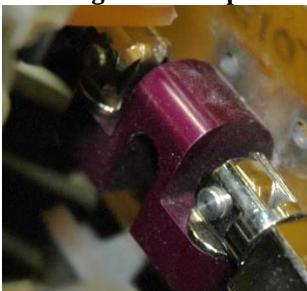
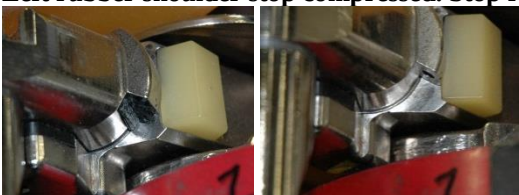
Date: 1/13/2014	
NHTSA Representative: James Saunders	
Inspection Reporter: Matthew Goehle	
Witness(es):	
Inspection type (check one): ☐ PRE ☒ POST	
Dummy S/N: 0015	Legs S/N: LX0038/LX0039
Dummy Description: Thor NT 50th Male	
Date of last Certification or Inspection: 1/7/2014	
<u>Tests conducted since...</u> <u>Since last inspection:</u> CAL2672 – Test Vehicle 4969 <u>Since last certification:</u> RD0332 Dodge Dart RD5371 Honda Civic RE5507 Subaru Forester RD5910 Volvo XC60 CAL2658- Test Vehicle 8572 CAL2659 – Test Vehicle 3A CAL2660 – Test Vehicle 3B CAL2660 – Test Vehicle 03EX	<i>Continued</i> CAL2665 – Test Vehicle 25002 CAL2667 – Test Vehicle 9293 CAL2668 – Test Vehicle 3100 RC5911 Volvo S60 CAL2672 – Test Vehicle 4969
<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>	
N/A	
<u>Equipment delivered to Borrower:</u> Thor 0015 ATD 26 Accelerometers 3 Angular Rate Sensors 2 Skull Spring LC 1 Condyle Pot 1 Upper Neck LC 4 IRTraccs 8 Rotational Pots 1 Spine LC 2 Acetabulum LC 2 ASIS LC 2 Femur LC	<i>Continued</i> 2 LX Leg Assemblies 2 Upper Tibia LC 2 Lower Tibia LC 6 Ank1e Potentiometers 2 Knee Sliders 1 Neck Skin 1 Neck Foam 1 Tiltview Interface Cable 4 Tilt Sensors 1 H-Point Tool 1 Tool Box 1 Laptop 1 LX Zeroing Bracket

Note: New Damage is Noted in Red

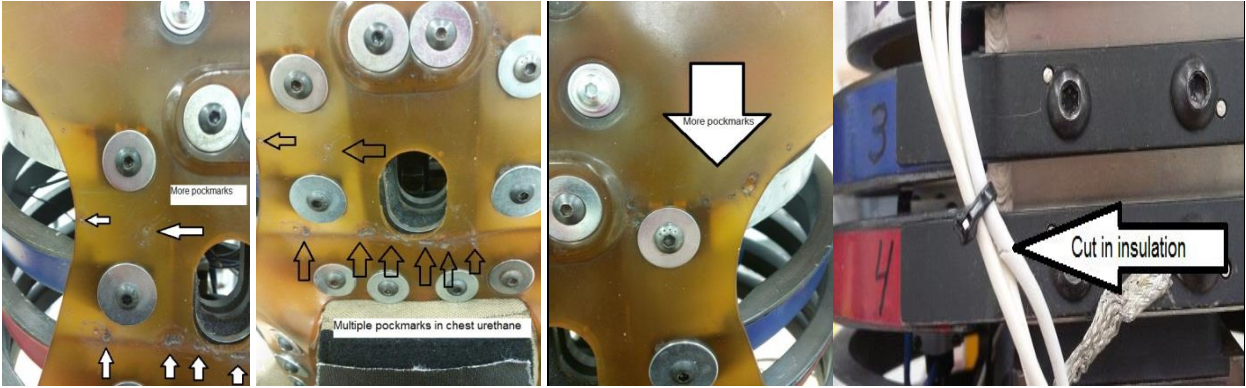
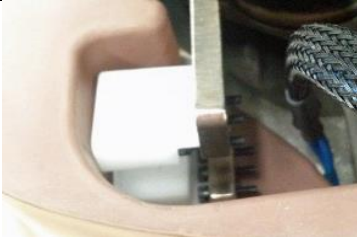
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage  Thor has holes/pockmarks in his head skin, along with a tear
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	Fraying of material for zipper at the back of the head  Head CG Y Accelerometer wire damaged. Another wire insulation damaged during CAL2659 

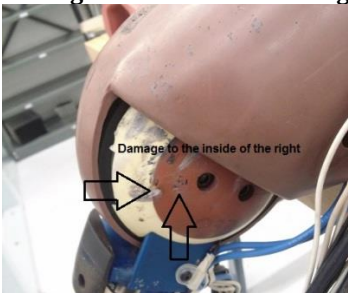
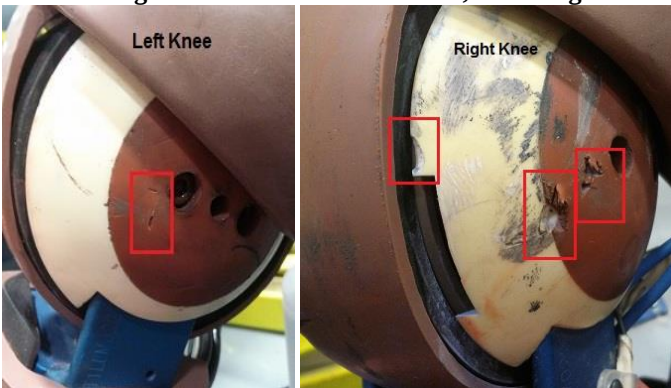
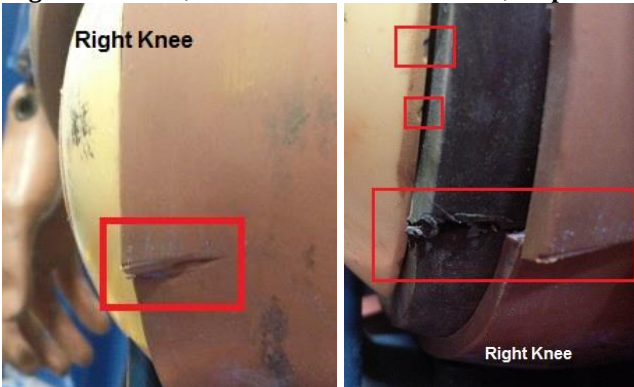
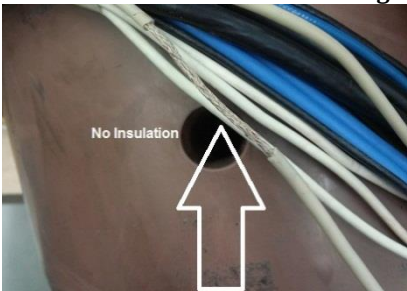
NECK	
Y / N	Neck cables slide freely through holes in neck plates Plastic slides pulled out of cable. We reinstalled. 
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell):
Y / N	No evidence of debonding or permanent compression in neck soft stop assemblies Slight damage to upper neck stop.

		
Y / N	Neck securely attached to upper neck load cell	
Y / N	Neck securely attached to lower neck load cell THOR 0015 does not have a lower neck load cell	
Y / N	Neck pitch change joint mechanism mating teeth are engaged	
OTHER	Lifting strap has begun to stretch. (We installed a 250lb cable tie around strap for safety) 	
SPINE		
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates	
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates	
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged	
OTHER		

SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact
Y / N	Clavicles securely attached to sternum and shoulder Inner right clavicle pin missing C-clip. (Replaced) 
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops Left rubber shoulder stop compressed. Stop fell out during CAL2665 
OTHER	Both left and right arms show signs of internal tearing  Left arm shows worse tearing after RC5911. 

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
Y / N	No evidence of debonding between rib damping material and ribs
Y / N	CRUX anterior arms securely attached to anterior ribs
Y / N	CRUX posterior arms securely attached to double gimbals, spine
Y / N	Urethane bib is securely attached to ribs with no sign of tearing or washer penetration See "OTHER" below.
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)

OTHER	There are multiple pockmarks in the chest urethane, and at the back there is a cut in the insulation to one of the accelerometer wires 
ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper
Y / N	Upper abdomen insert securely attached to spine
Y / N	Upper abdomen insert shows no evidence of permanent set
Y / N	No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
Other	 Both lower abdomen IRTracc screws are inserted, but the IRTraccs are not installed.
PELVIS	
Y / N	Pelvis flesh fits securely over pelvis bones
Y / N	H-point tool fits securely into hole on both sides of pelvis
OTHER	Small tear in pelvis flesh on the left side 

FEMUR	
Y / N	Acetabular load cells firmly attached
Y / N	Femur load cells firmly attached
Y / N	No evidence of deformation of knee slider bump stop Damage to the inside of the right knee  Some damage done to the outer left knee, inside right knee sustained more damage 
Y / N	No cuts, tears, or scuffing of knee flesh Right knee flesh, and rubber insert were cut, chips is white area 
Other	One accelerometer wire is missing a large portion of insulation 

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

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

DUMMY CALIBRATIONS

50% ADULT MALE THOR016 DUMMY CALIBRATIONS

Summary of Thor 16 Certification Test Results

Reported by: Calspan

Technician: M. Goehle

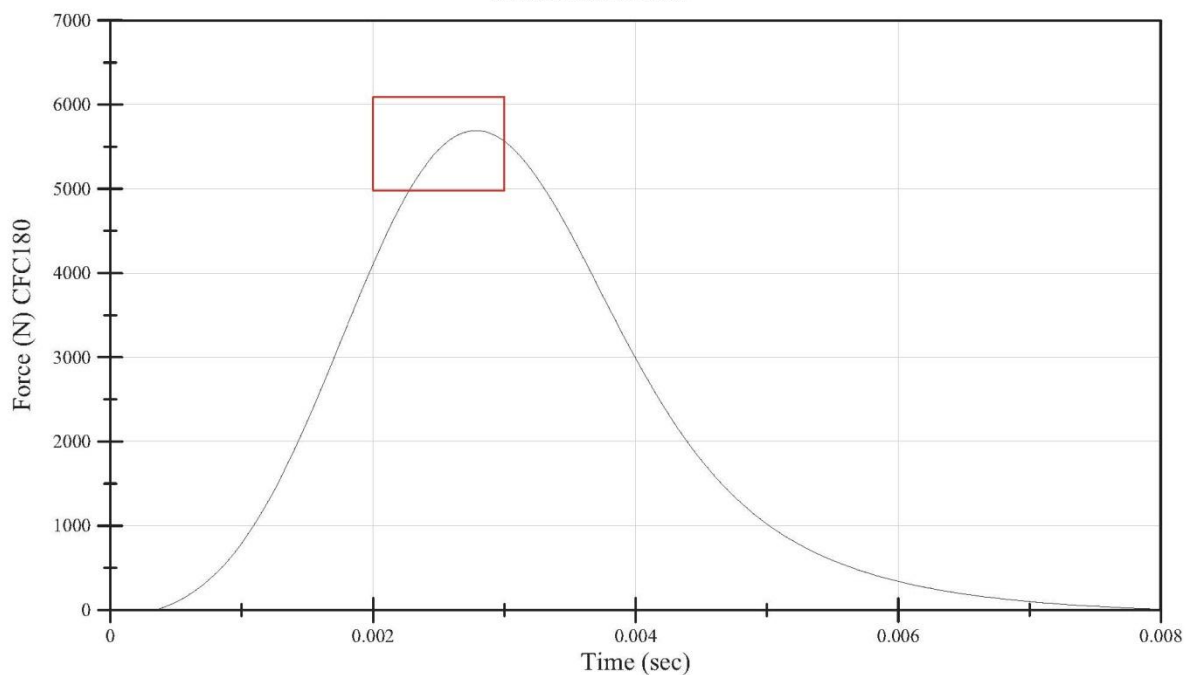
Date: 10/21/2013

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

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

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

THOR Head Impact Certification
Probe Force
Serial Number: T016

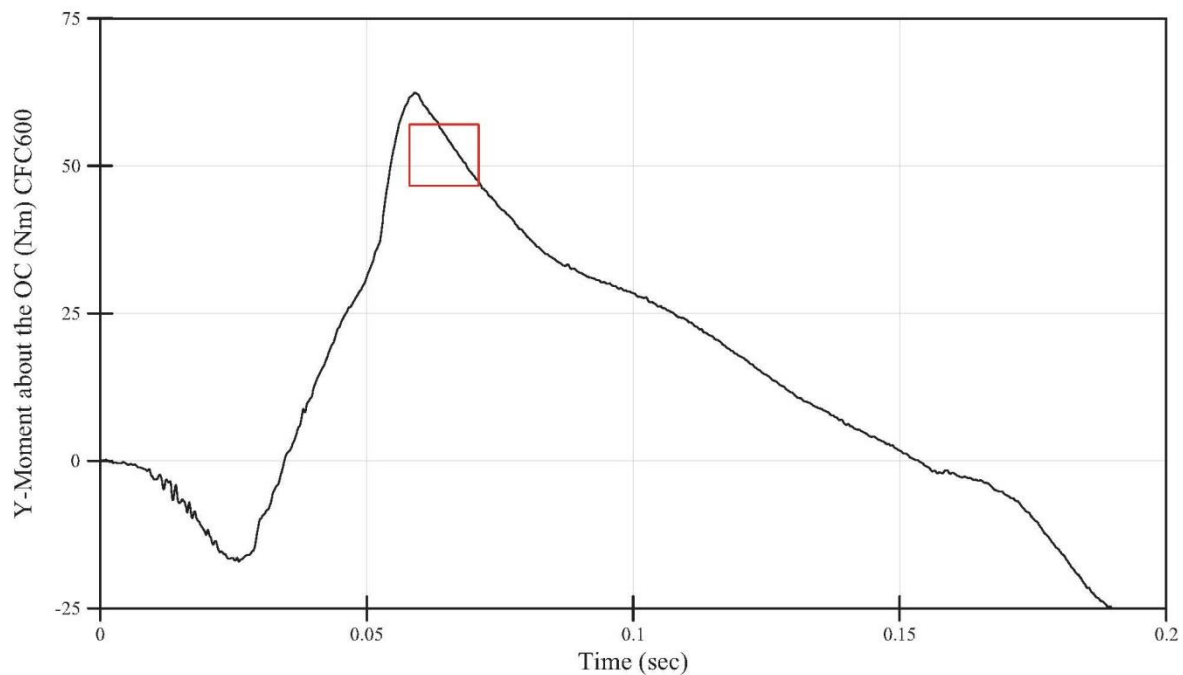


Software Version: 2.2

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

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

THOR Neck Flexion Certification
Y-Moment
Serial Number: T016



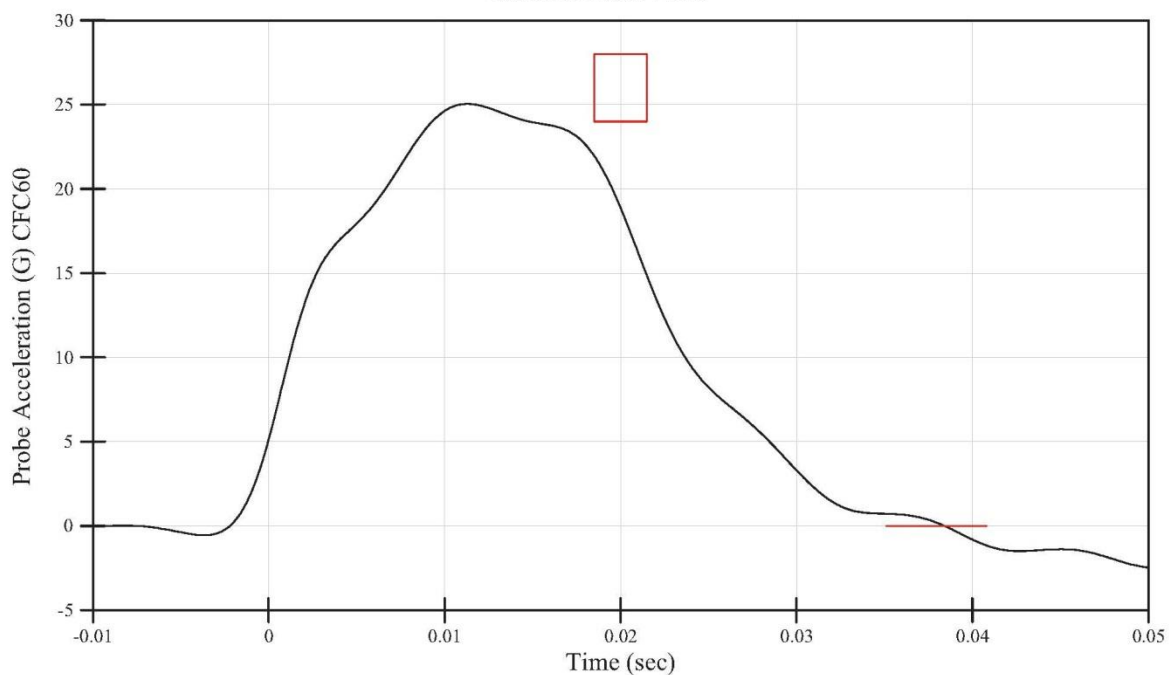
Software Version: 2.2

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

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

THOR Neck Flexion Certification

Probe Acceleration
Serial Number: T016



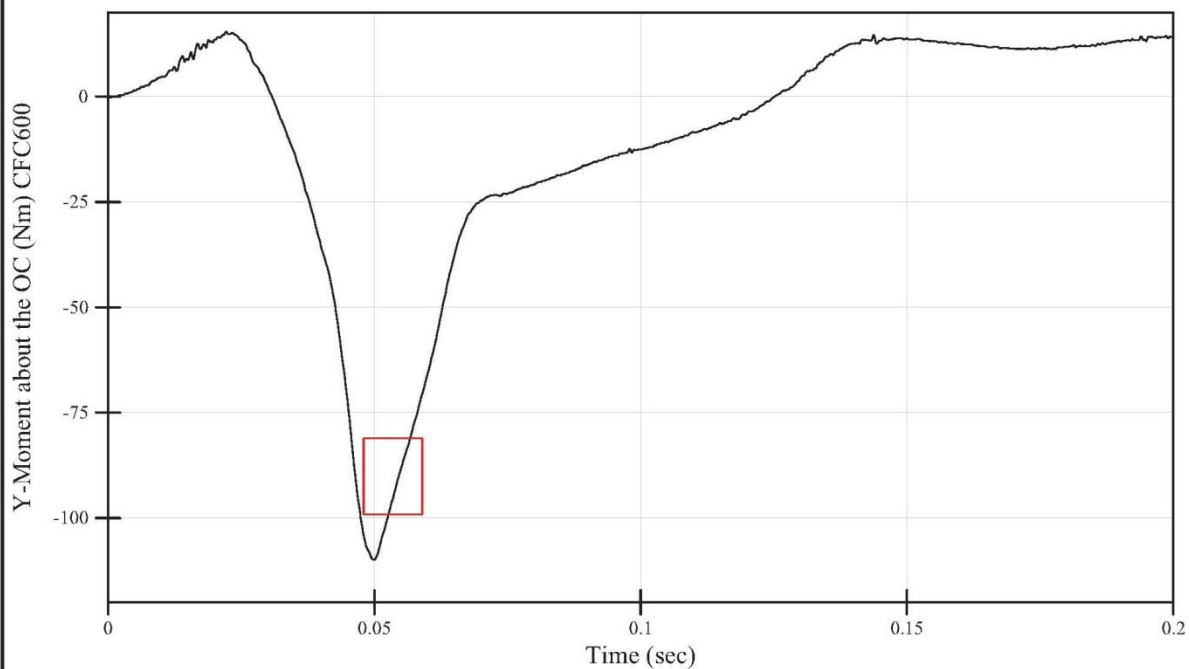
Software Version: 2.2

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

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

THOR Neck Extension Certification

Y-Moment
Serial Number: T016

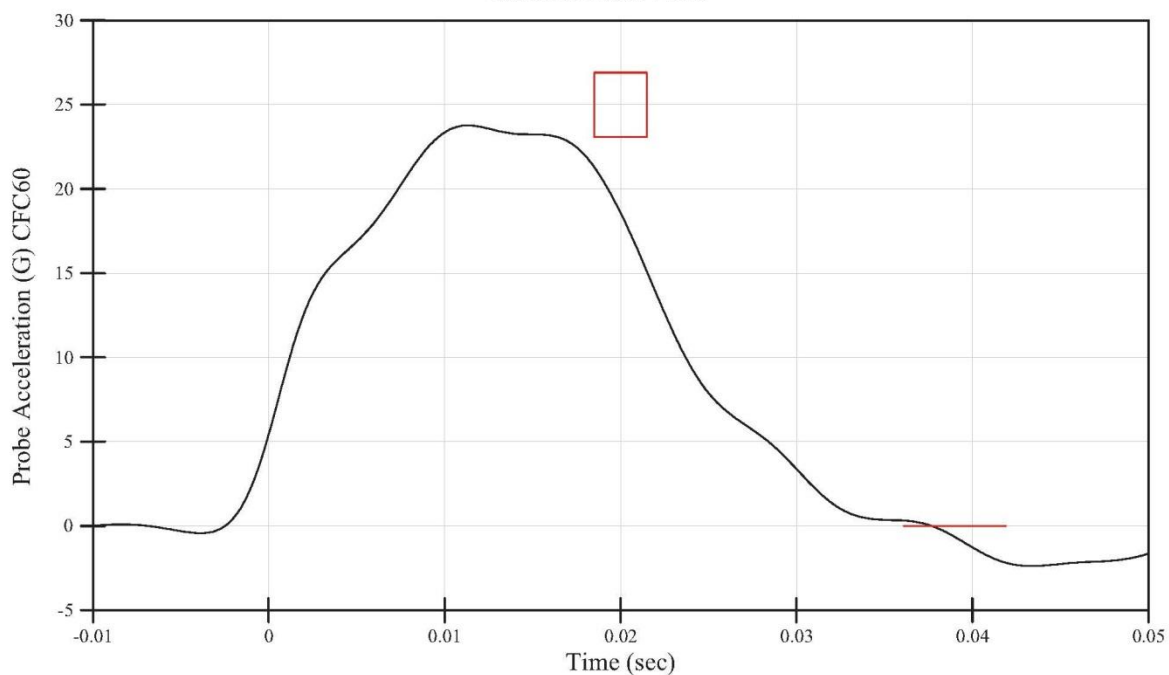


Software Version: 2.2

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

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

THOR Neck Extension Certification
Probe Acceleration
Serial Number: T016

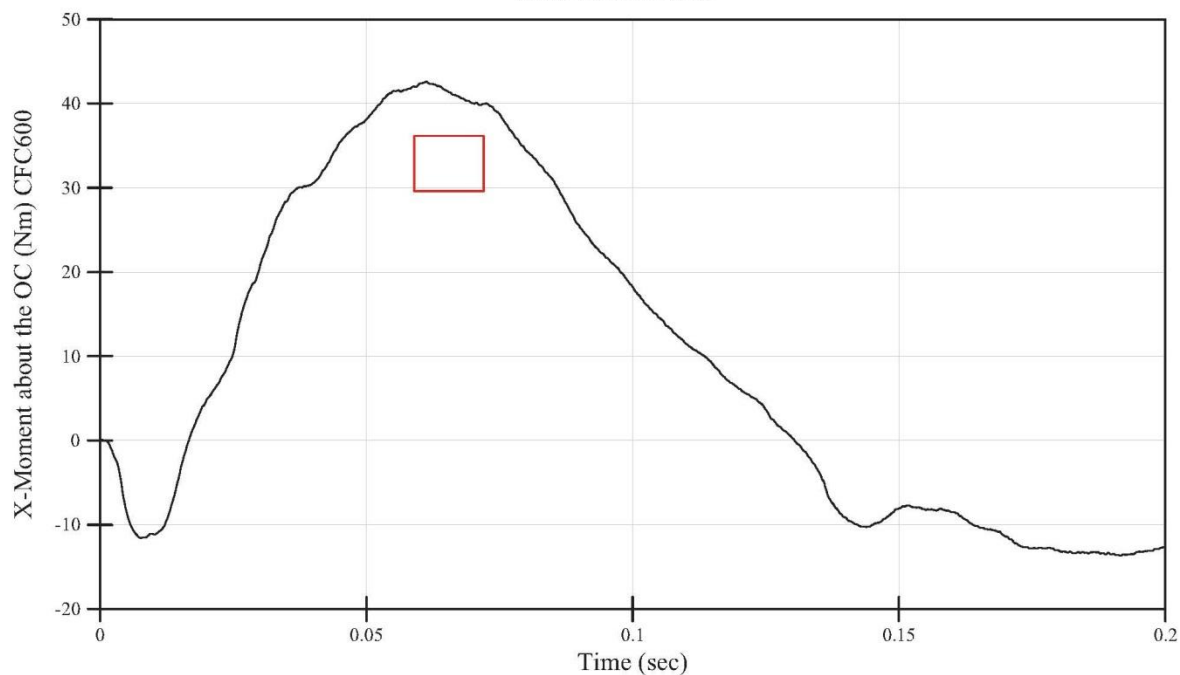


Software Version: 2.2

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

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

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



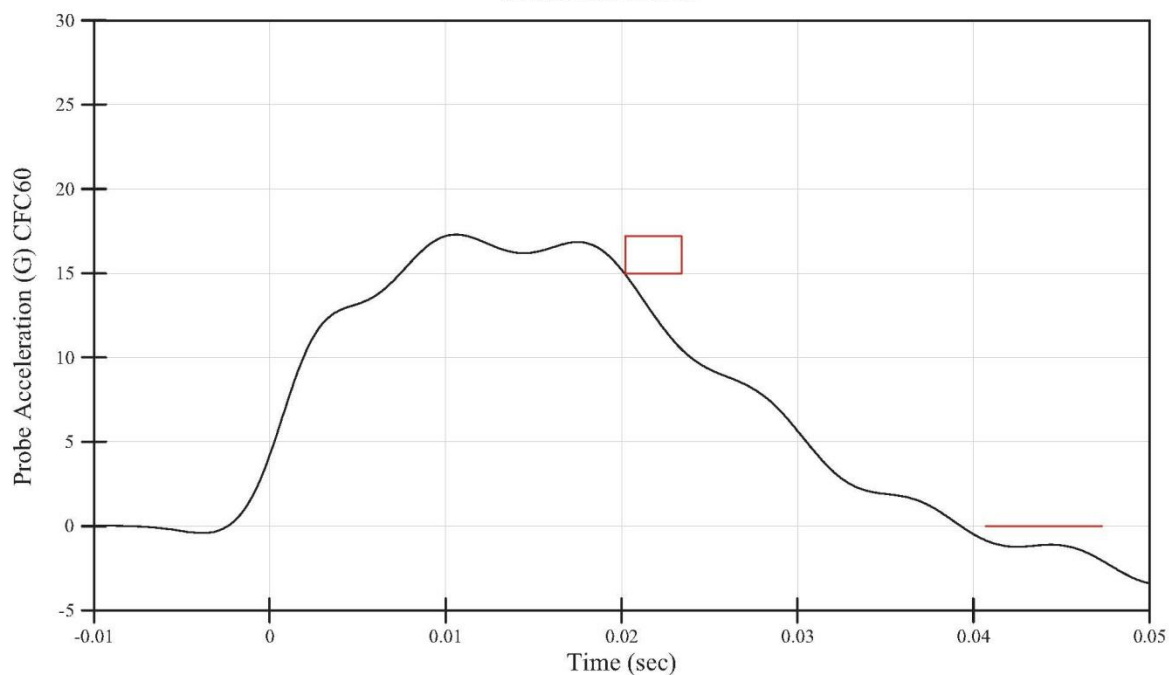
Software Version: 2.2

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

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

THOR Neck Left Lateral Flexion Certification

Probe Acceleration
Serial Number: T016



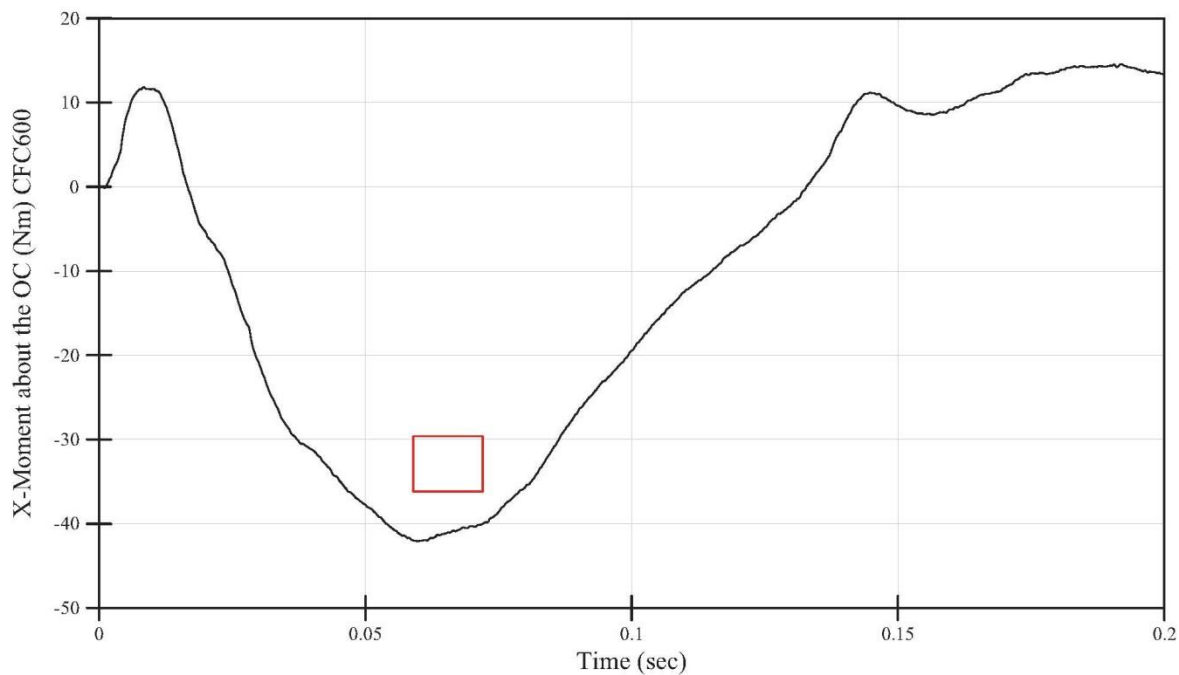
Software Version: 2.2

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

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

THOR Neck Right Lateral Flexion Certification

X-Moment
Serial Number: T016



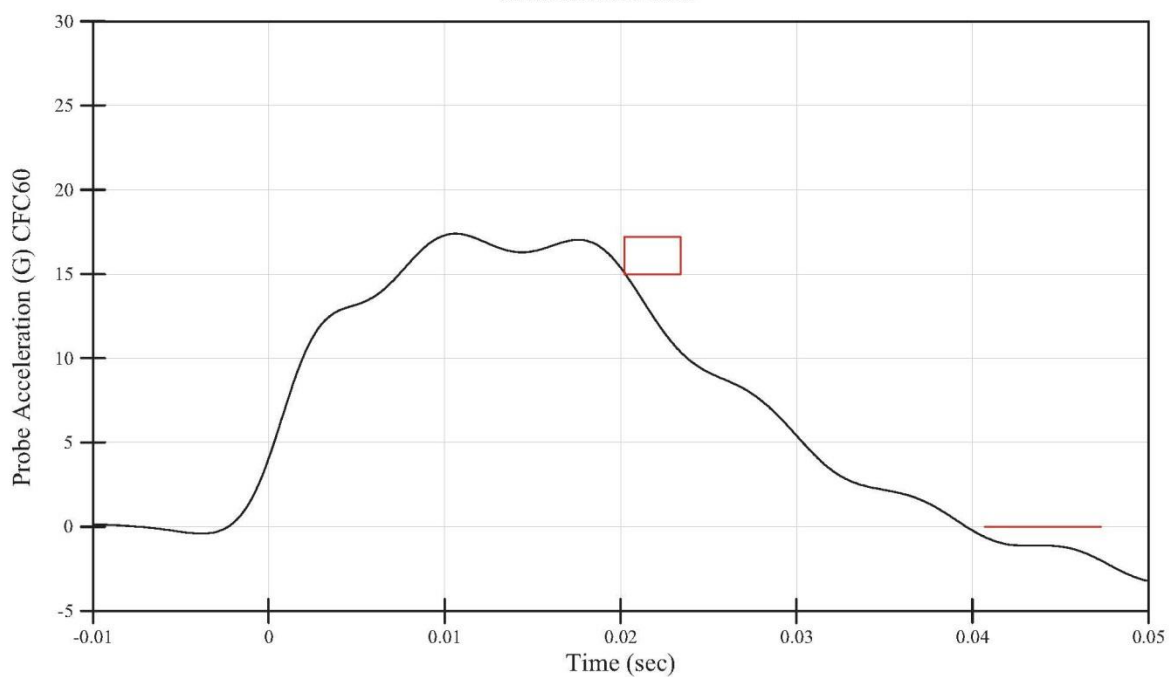
Software Version: 2.2

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

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

THOR Neck Right Lateral Flexion Certification

Probe Acceleration
Serial Number: T016



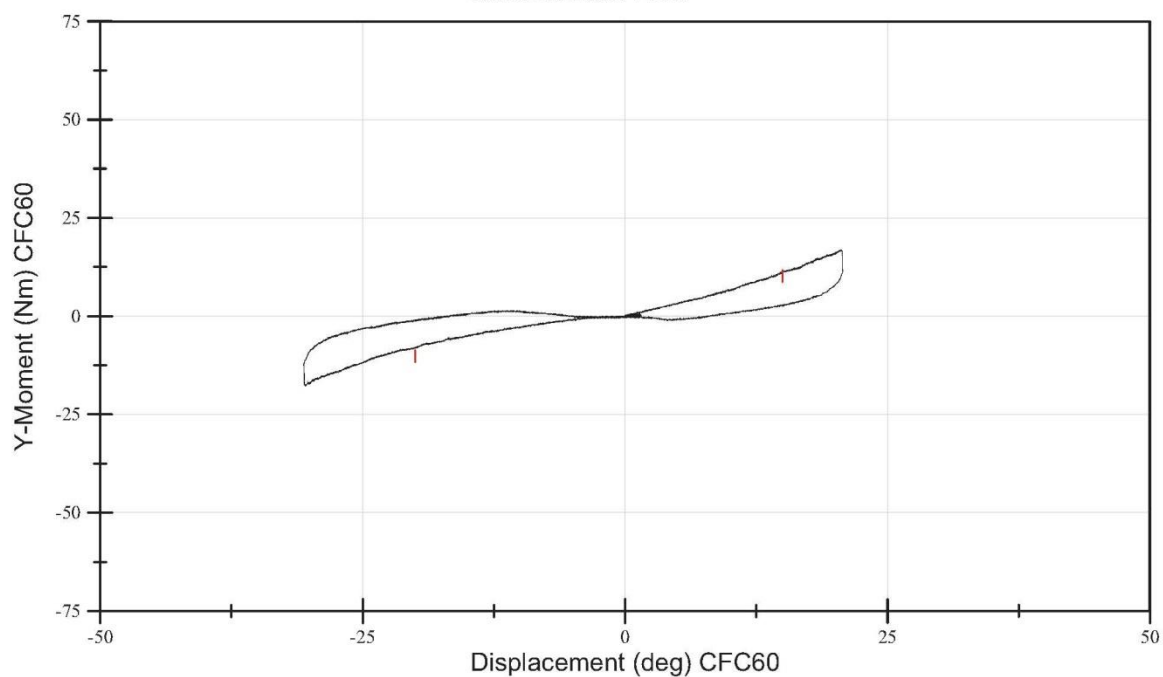
Software Version: 2.2

File Name: T016NECKRIGHT092413_01_DIADEMHeader_BINARYpp
09/24/2013 08:23:43.0000

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

THOR Occipital Condyle Quasi-Static Certification

Displacement vs. Torque
Serial Number: T016

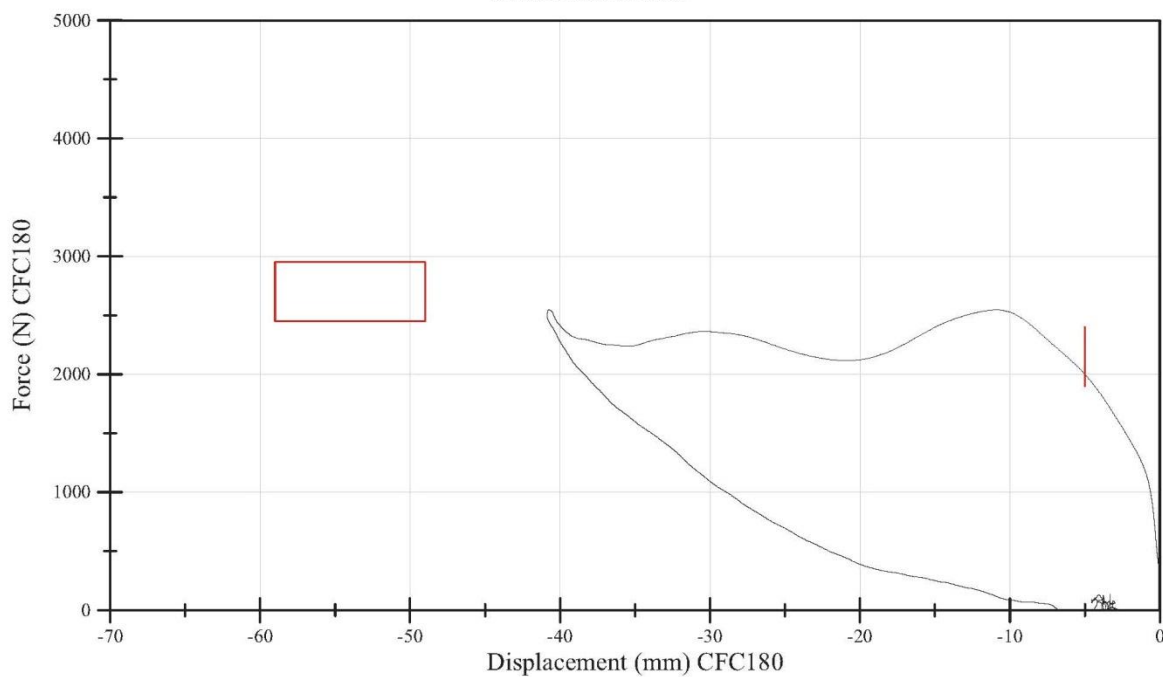


Software Version: 2.2

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

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

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

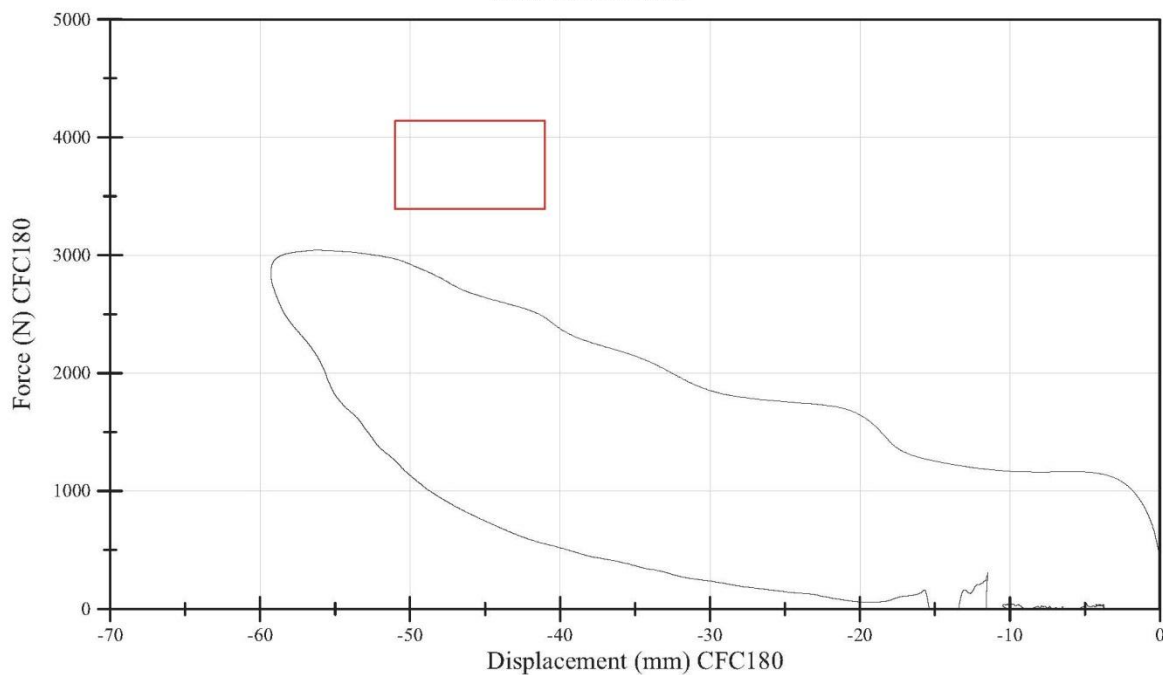


Software Version: 2.2

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

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

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

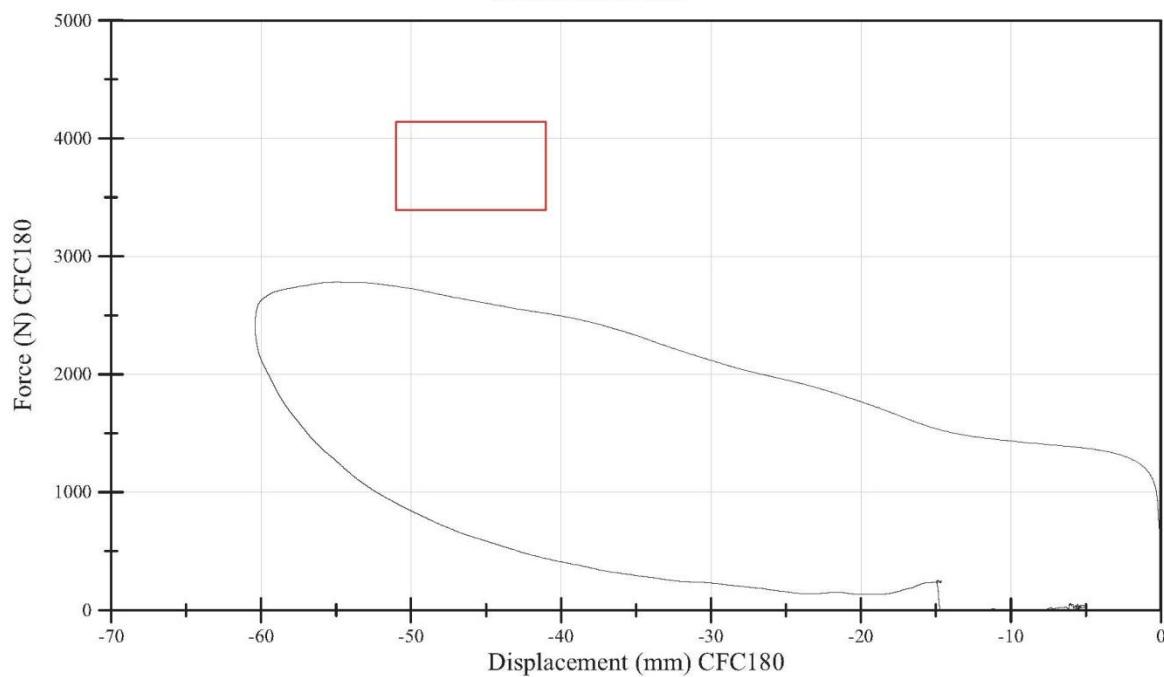


Software Version: 2.2

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

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

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

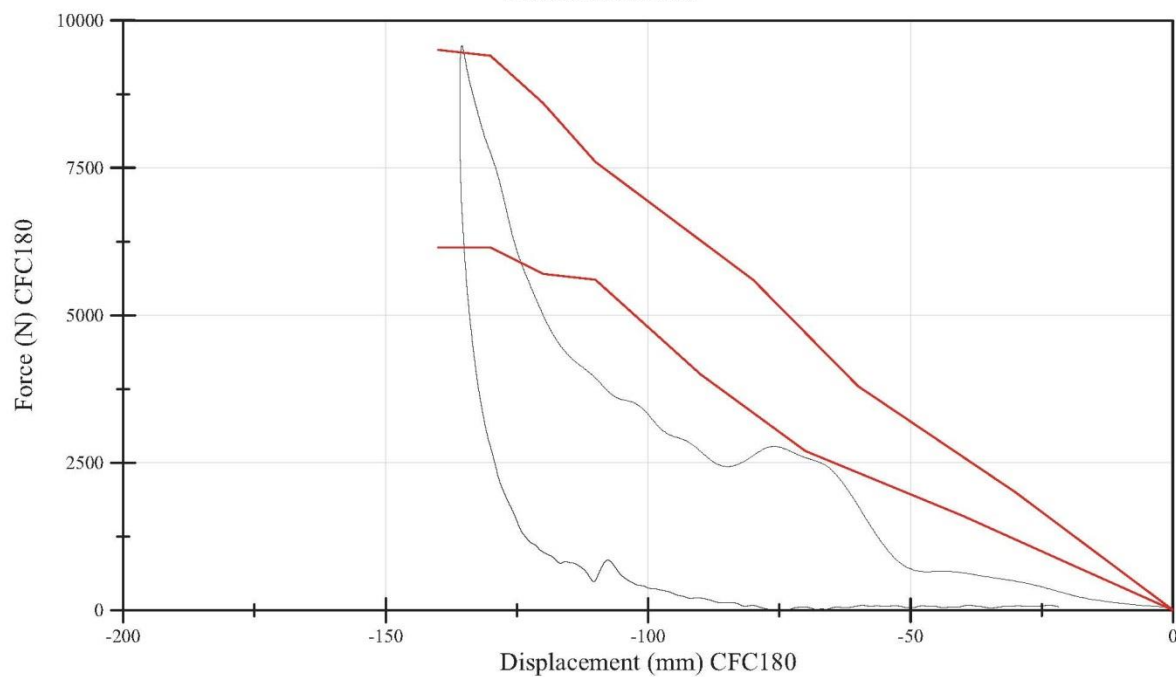


Software Version: 2.2

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

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

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

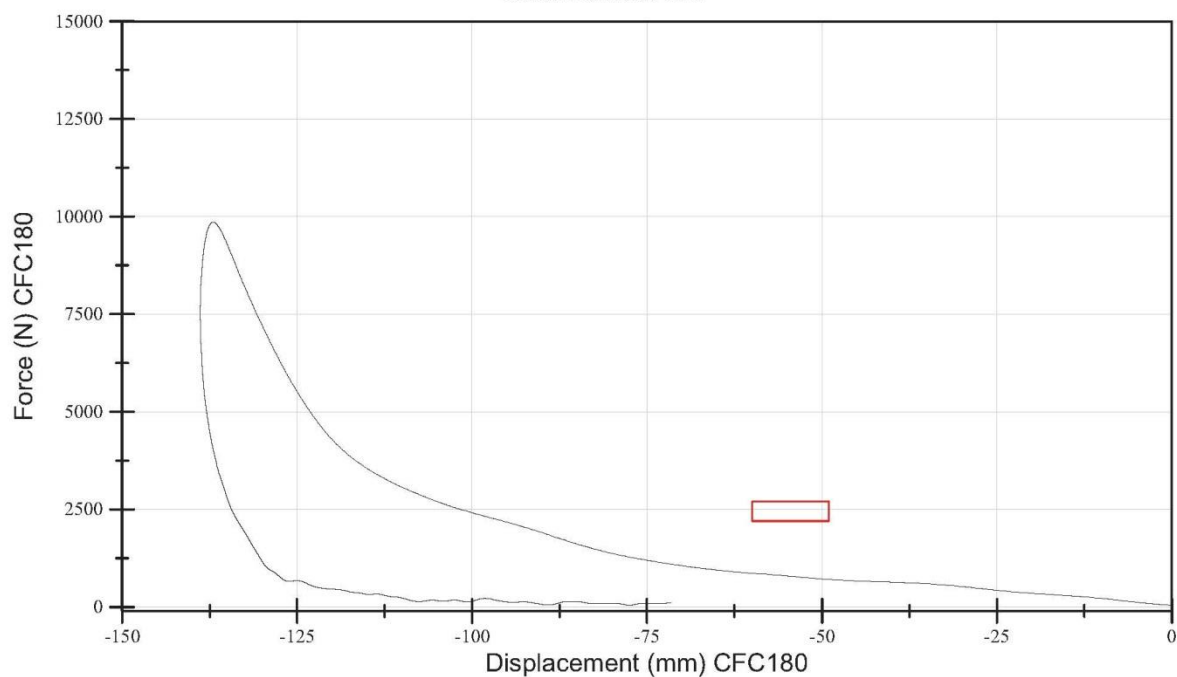


Software Version: 2.2

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

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

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



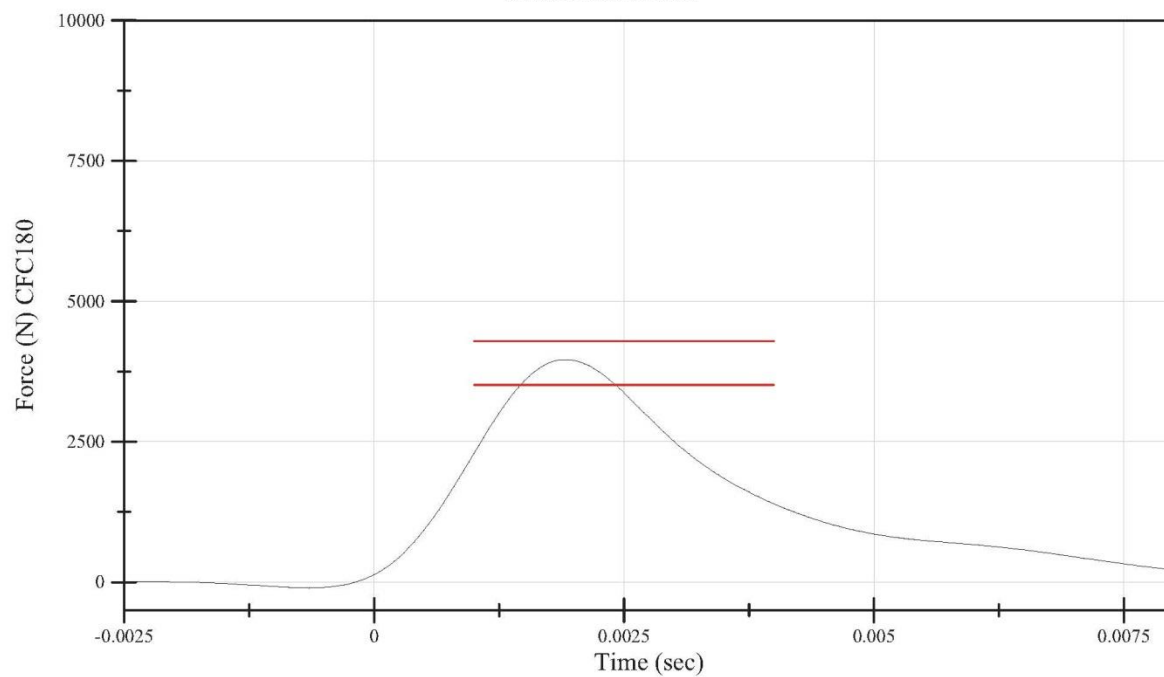
Software Version:

File Name: T016ABDOMENLOWER092413_01_DIADEMHeader_BINARYp

09/24/2013 13:10:11.0000

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

THOR Left Femur Certification
Probe Force
Serial Number: T015



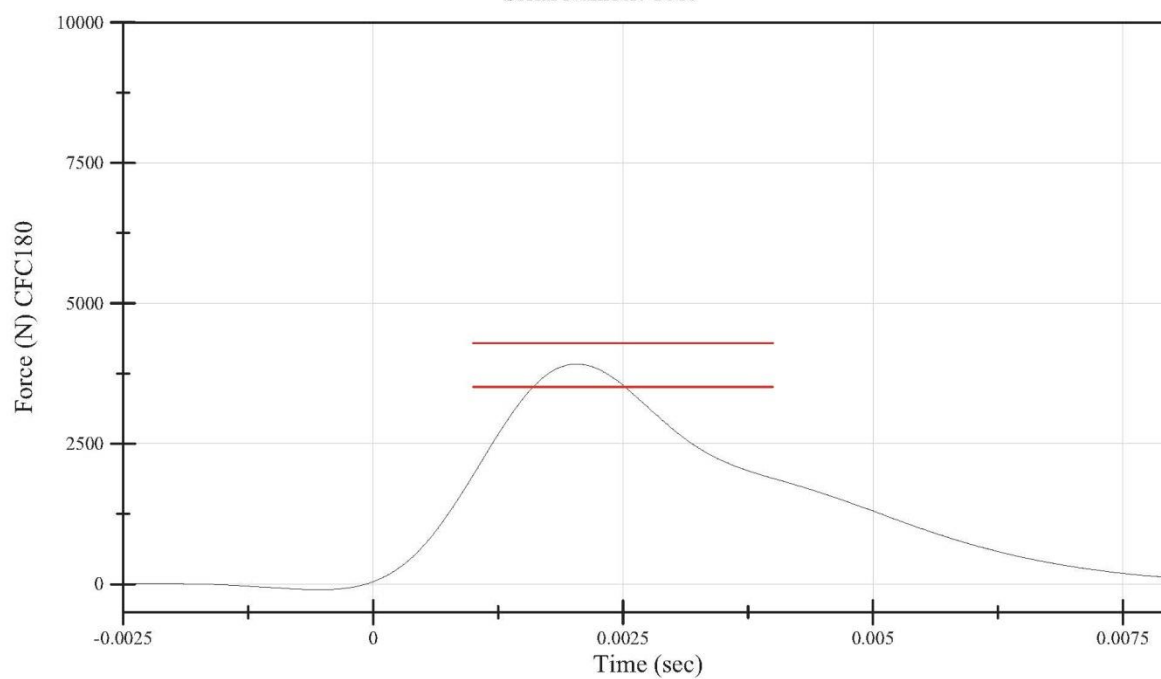
Software Version: 2.2

File Name: T016FEMURLEFT092613_01_DIADEMHeader_BINARYpp

09/26/2013 13:23:16.0000

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

THOR Right Femur Certification
Probe Force
Serial Number: T015



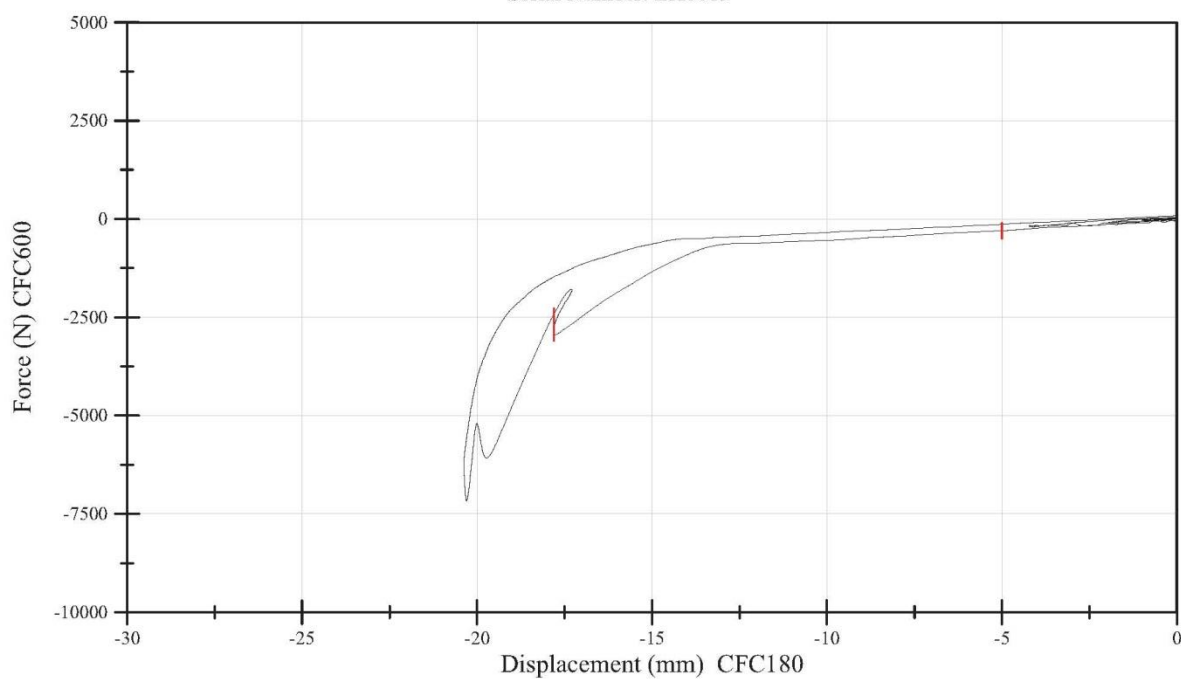
Software Version: 2.2

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

THOR 016 LEG CALIBRATIONS
LX0018/ LX0019

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

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

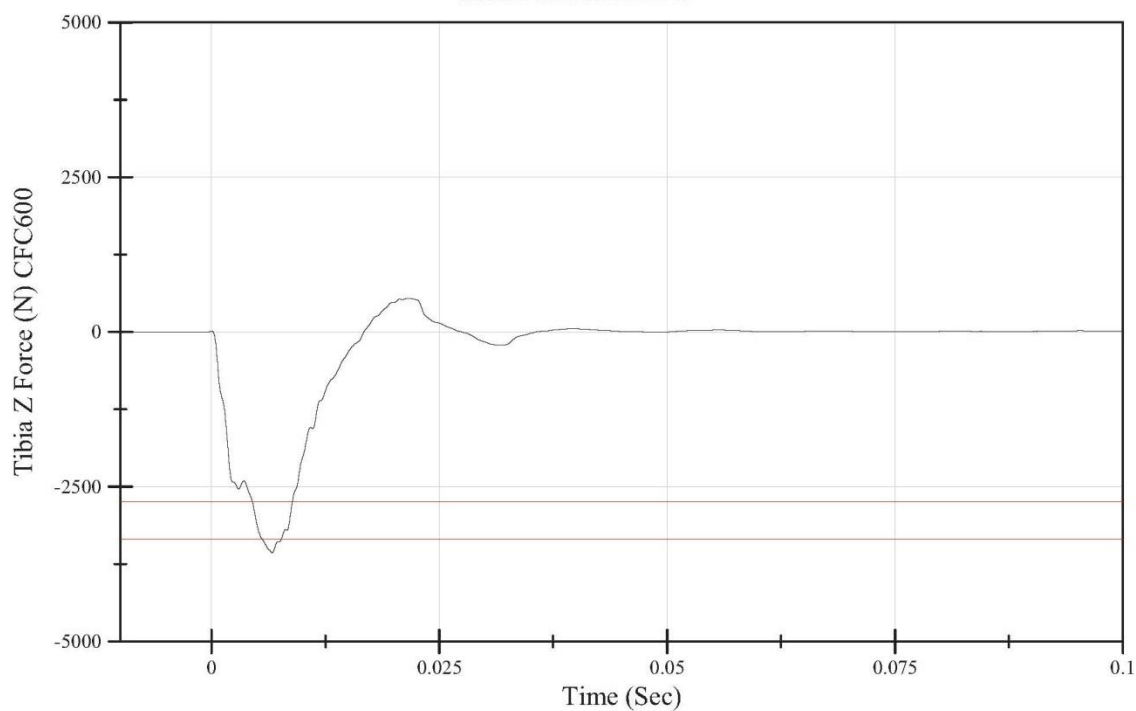


Software Version: 2.2

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

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

THOR Left Foot Heel Certification Tibia Load Serial Number: LX0019

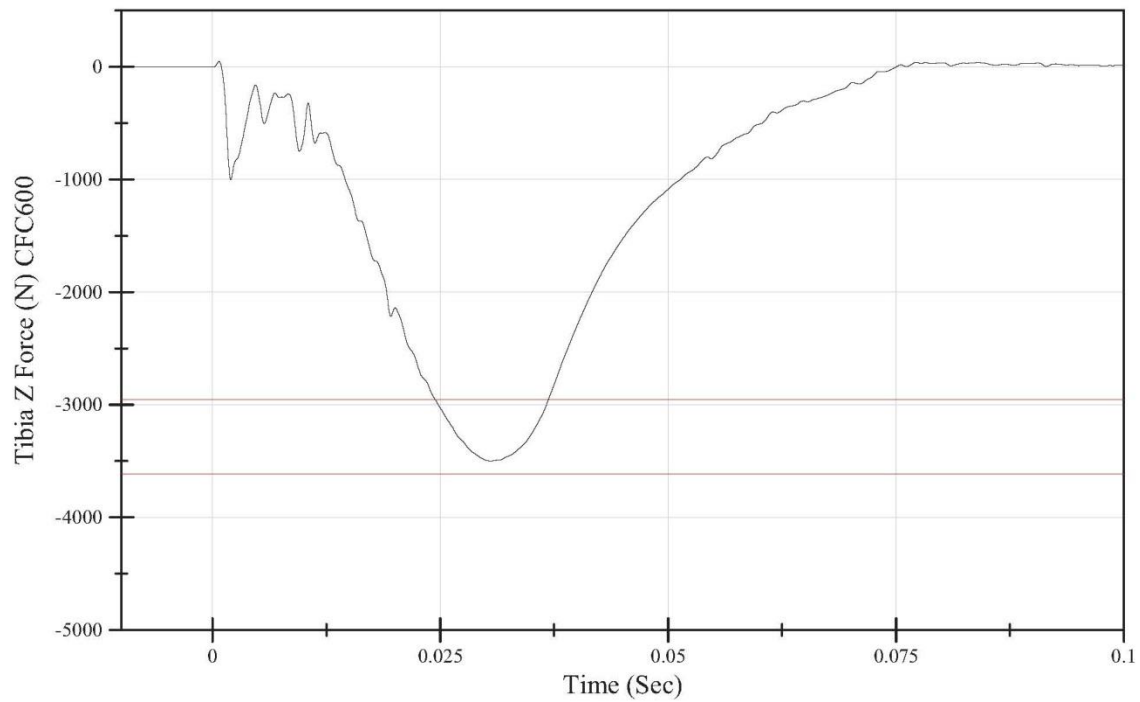


Software Version: 2.2

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

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

THOR Left Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0019

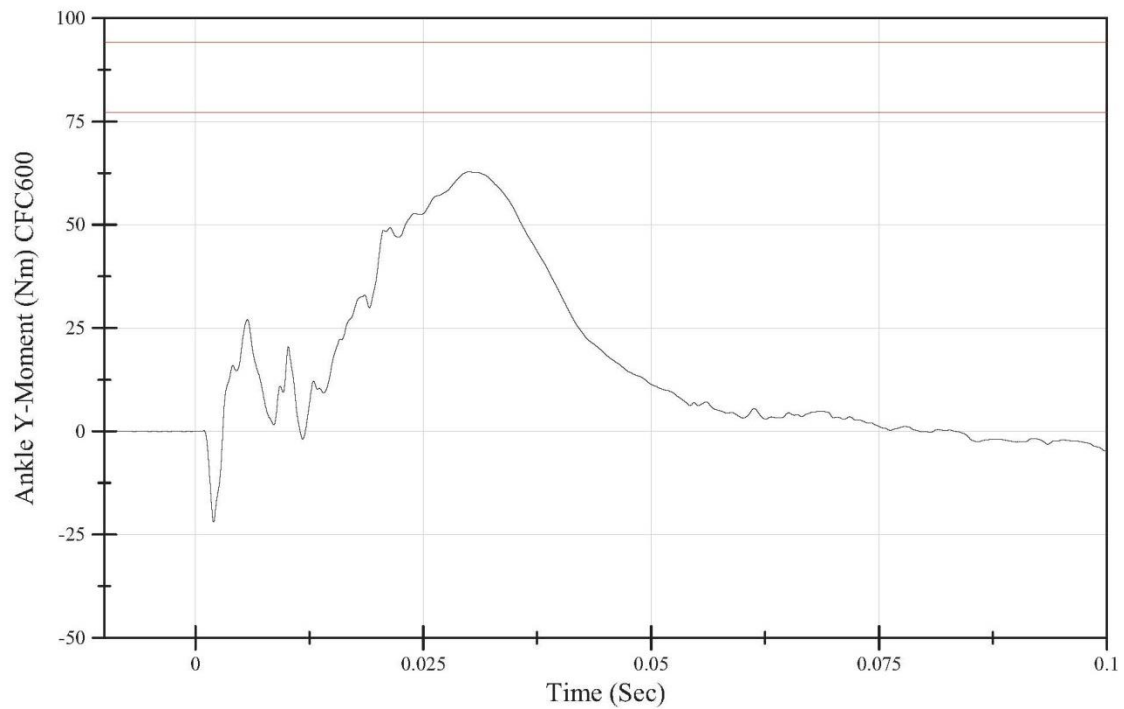


Software Version: 2.2

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

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

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

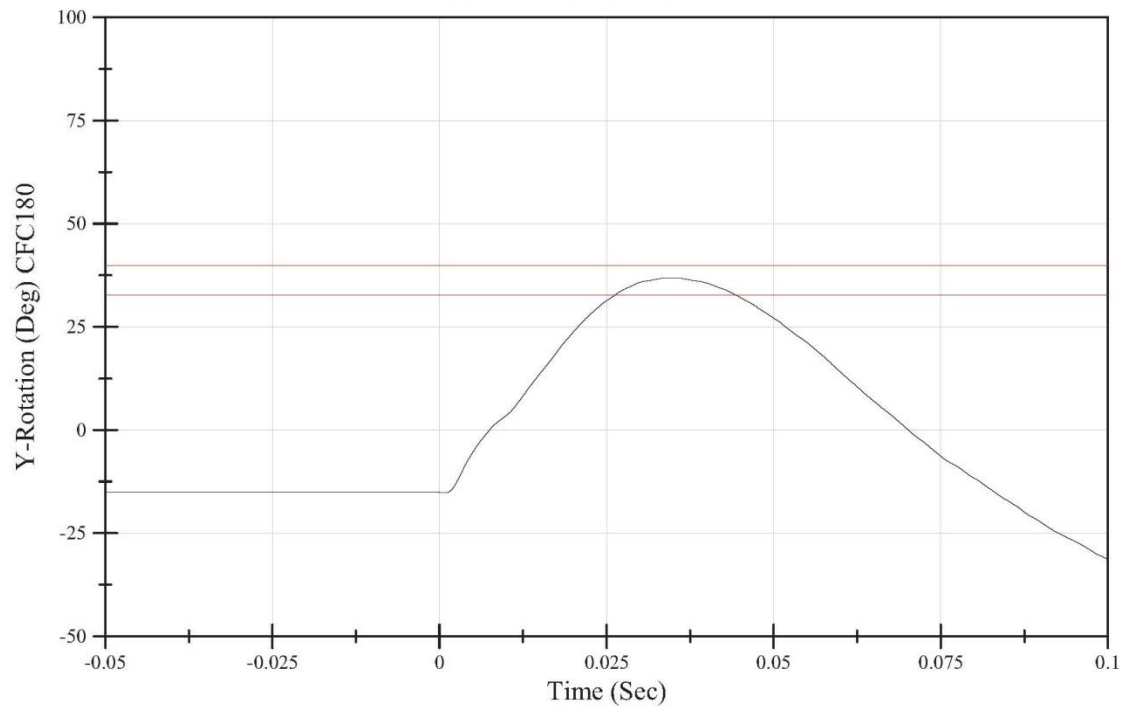


Software Version: 2.2

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

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

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

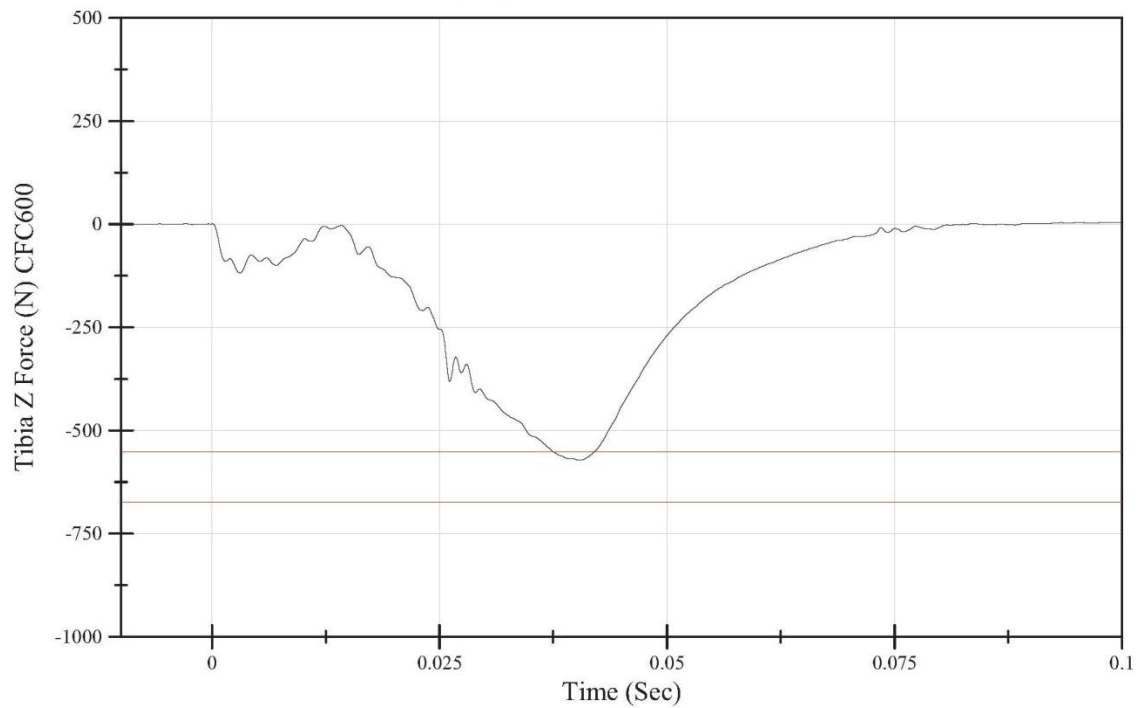


Software Version: 2.2

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

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

THOR Left Foot Eversion Certification
Tibia Load
Serial Number: LX0019

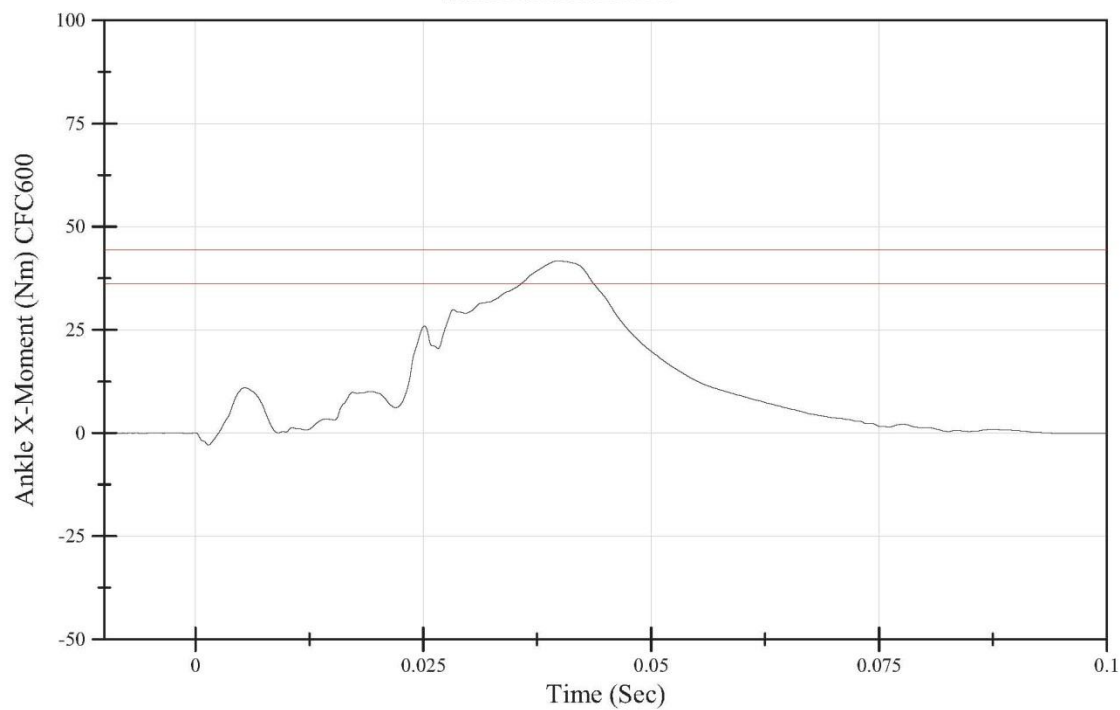


Software Version: 2.2

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

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

THOR Left Foot Eversion Certification
Ankle Moment
Serial Number: LX0019

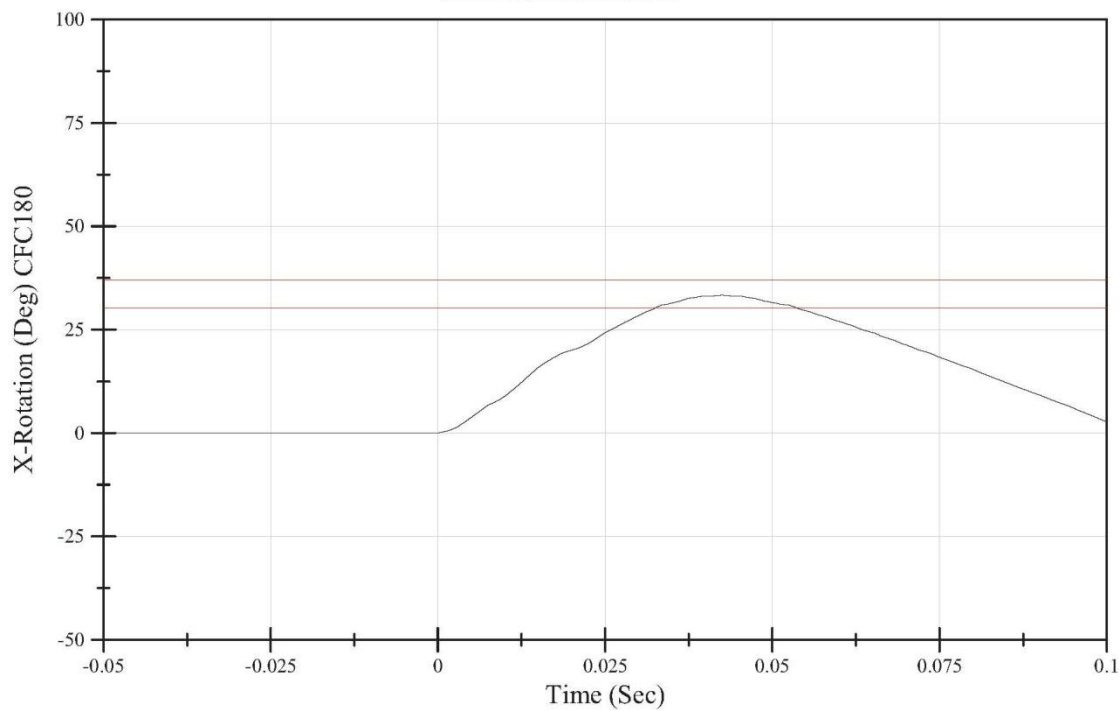


Software Version: 2.2

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

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

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

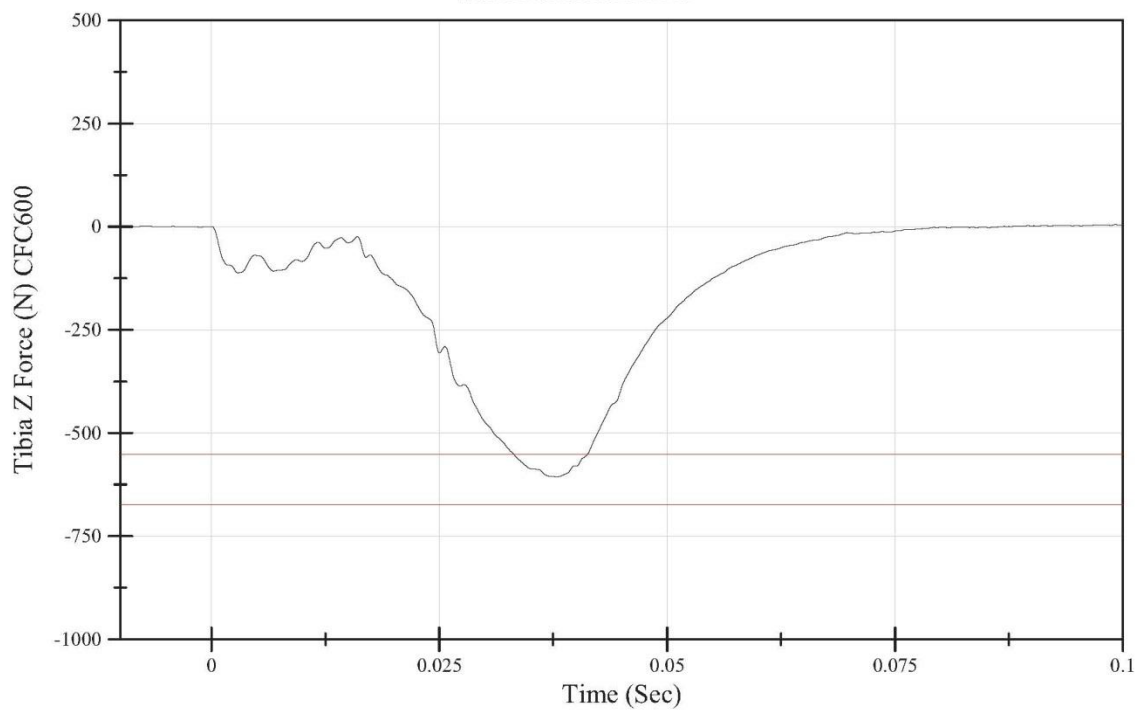


Software Version: 2.2

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

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

THOR Left Foot Inversion Certification
Tibia Load
Serial Number: LX0019

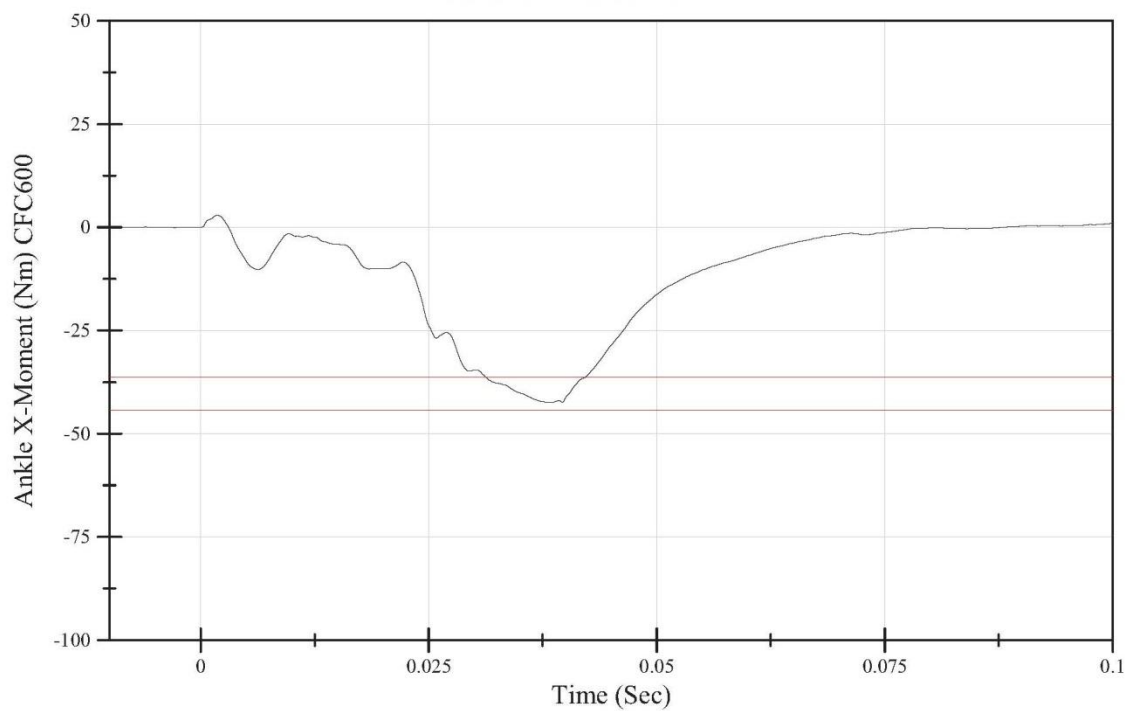


Software Version: 2.2

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

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

THOR Left Foot Inversion Certification
Ankle Moment
Serial Number: LX0019

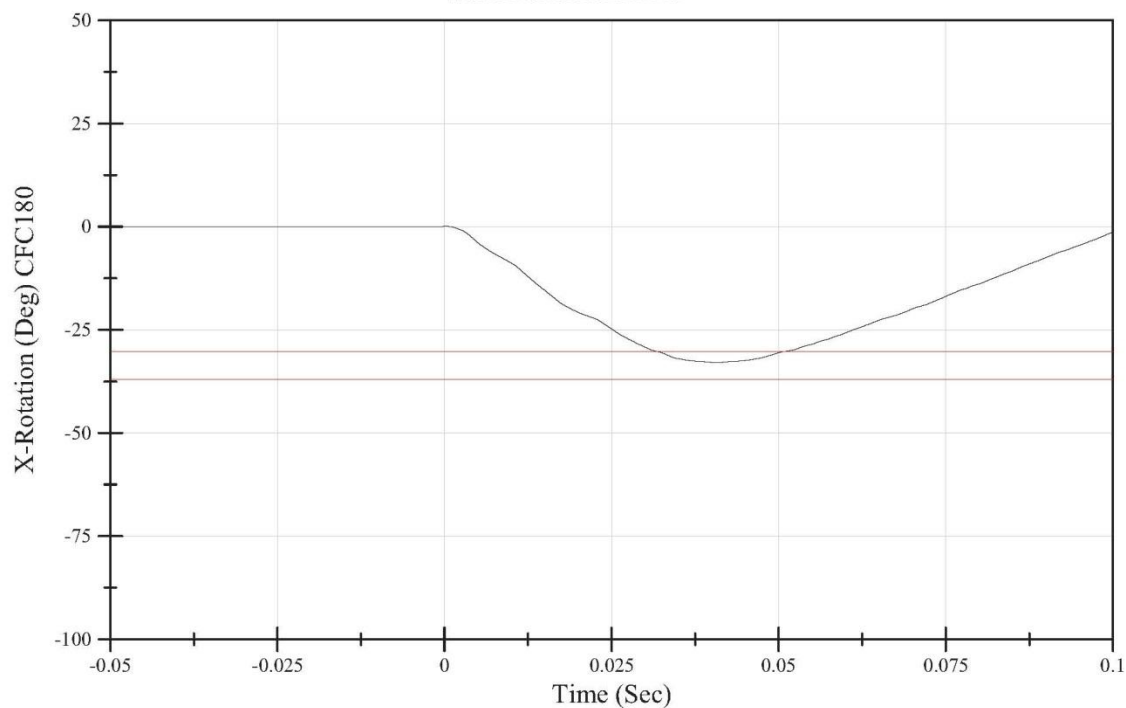


Software Version: 2.2

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

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

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

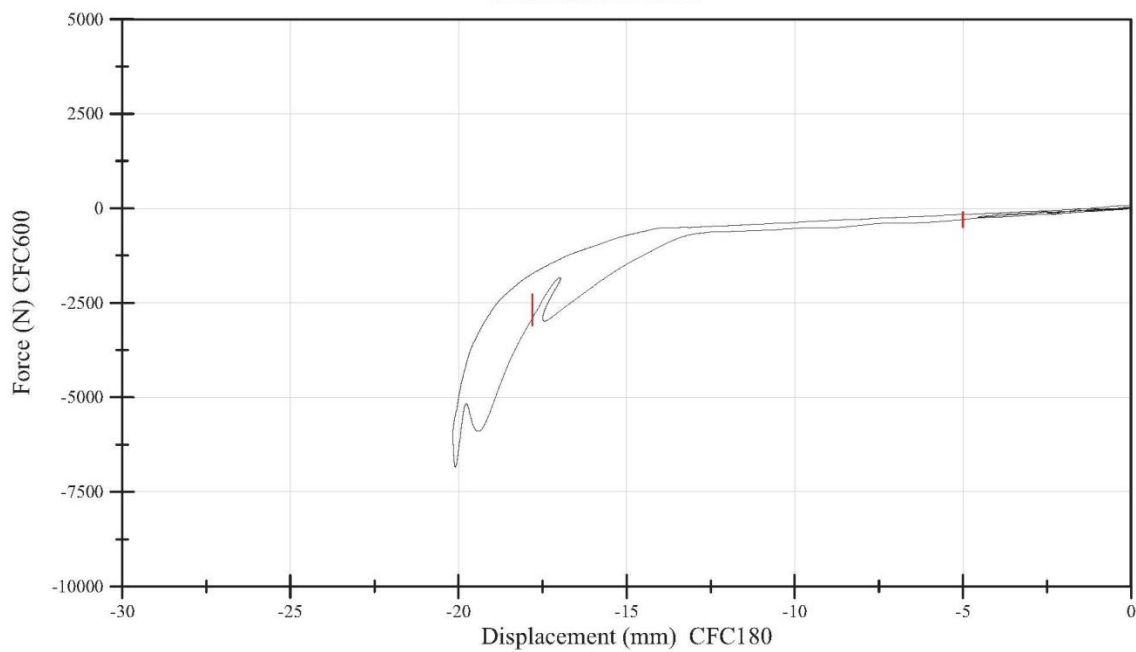


Software Version: 2.2

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

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

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

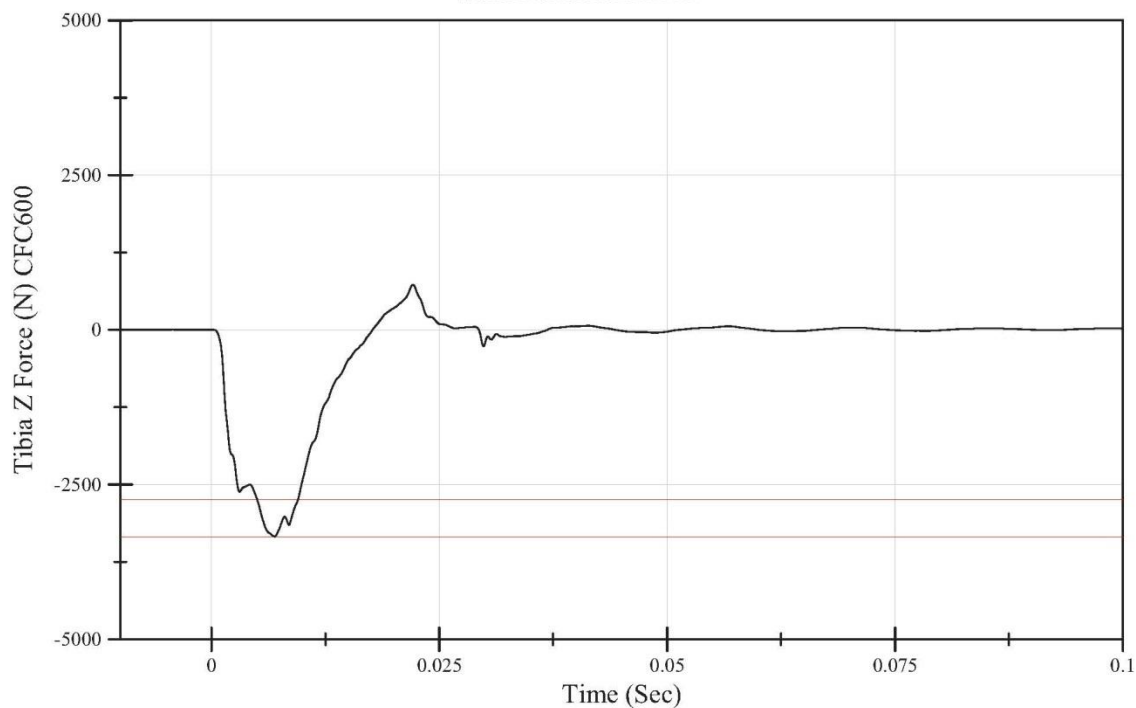


Software Version: 2.2

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

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

THOR Right Foot Heel Certification
Tibia Load
Serial Number: LX0018

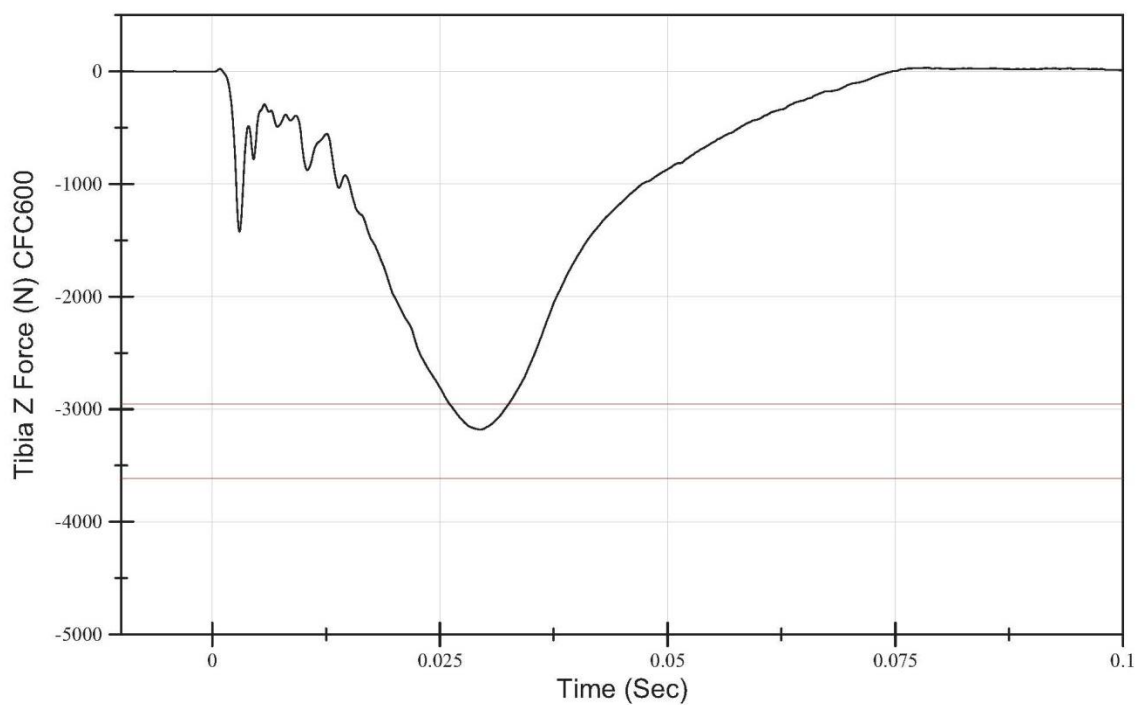


Software Version: 2.2

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

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

THOR Right Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0018

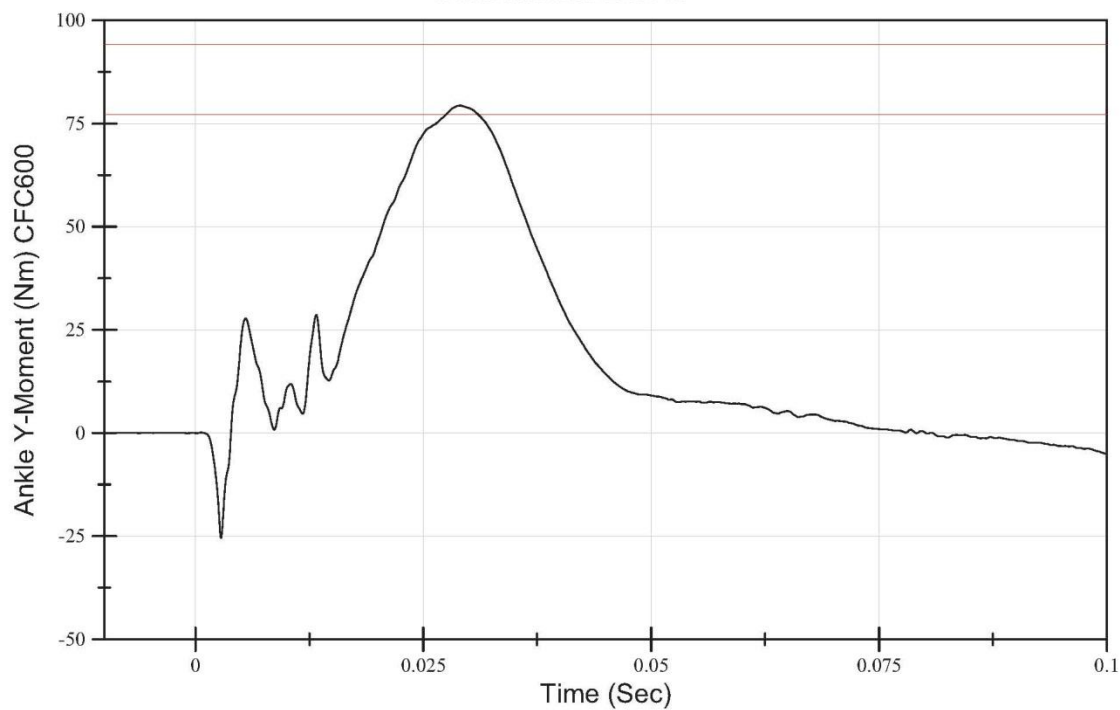


Software Version: 2.2

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

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

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

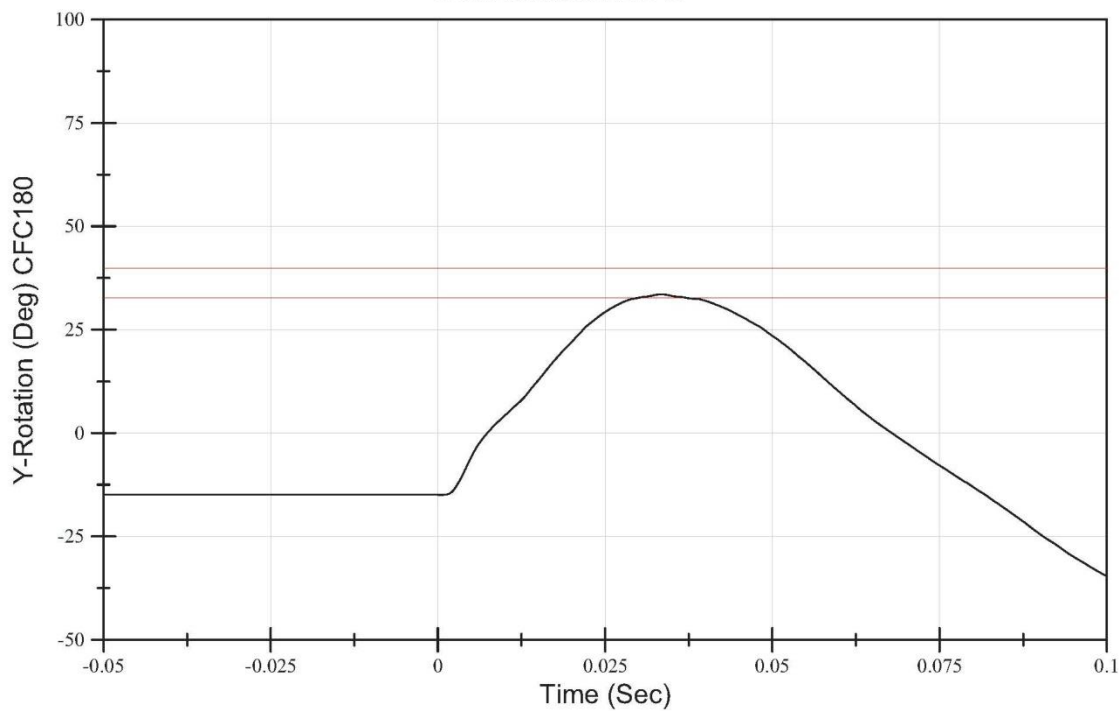


Software Version: 2.2

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

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

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

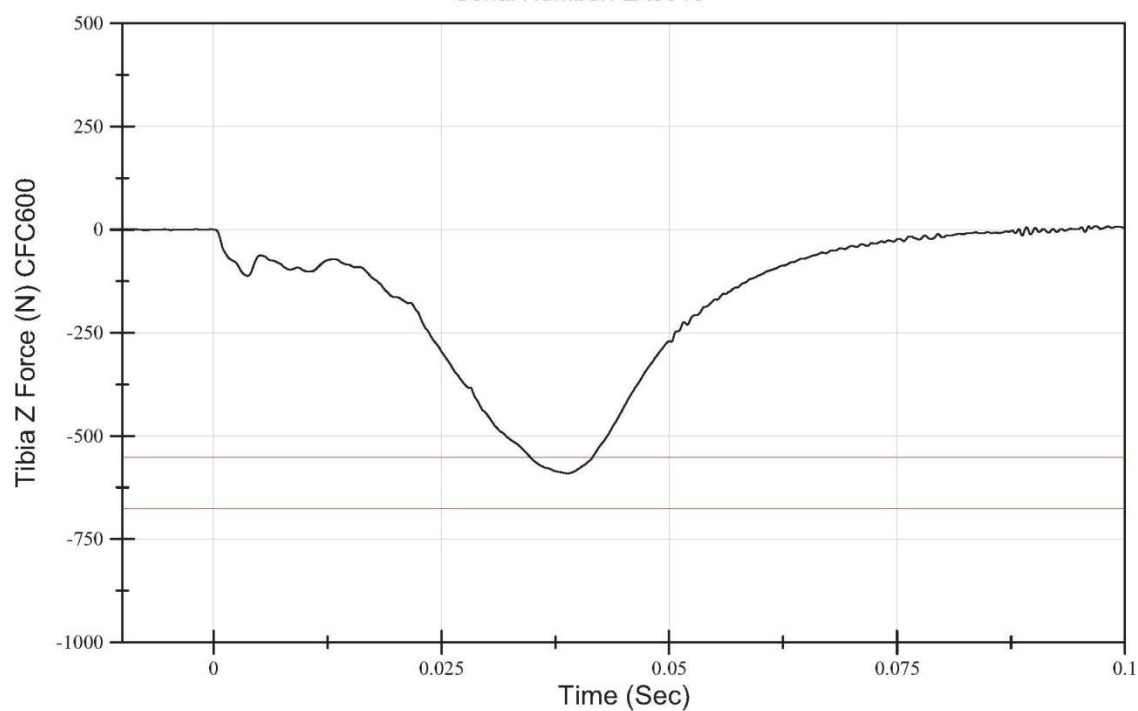


Software Version: 2.2

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

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

THOR Right Foot Eversion Certification
Tibia Load
Serial Number: LX0018

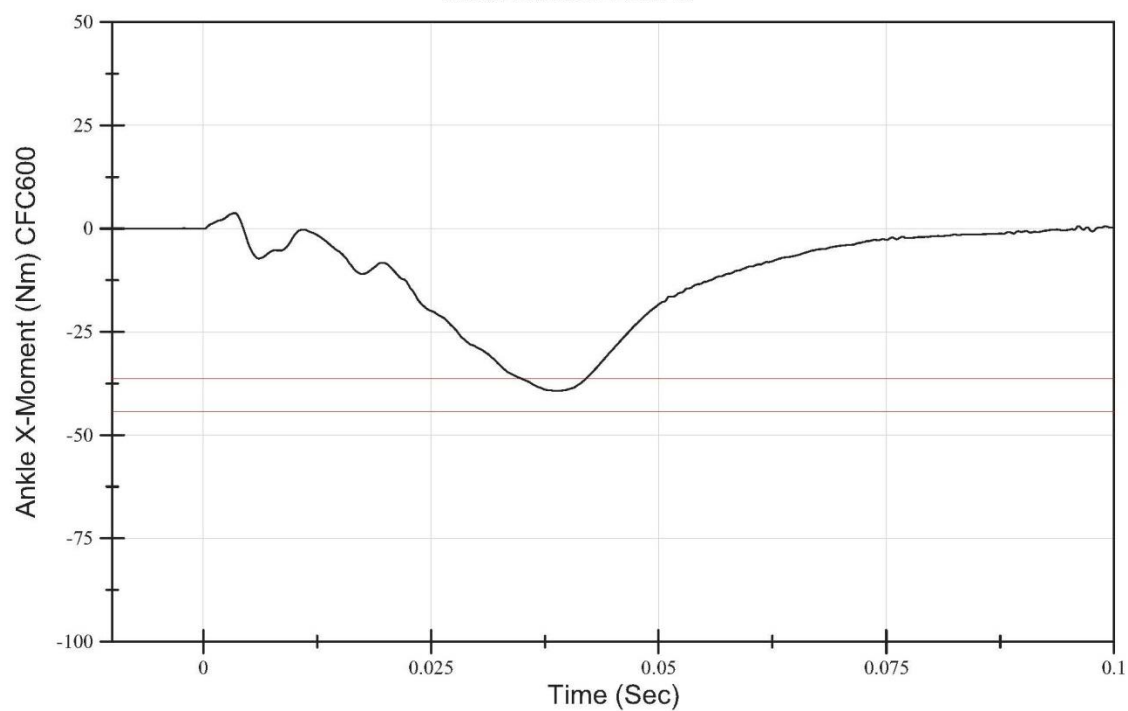


Software Version: 2.2

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

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

THOR Right Foot Eversion Certification
Ankle Moment
Serial Number: LX0018

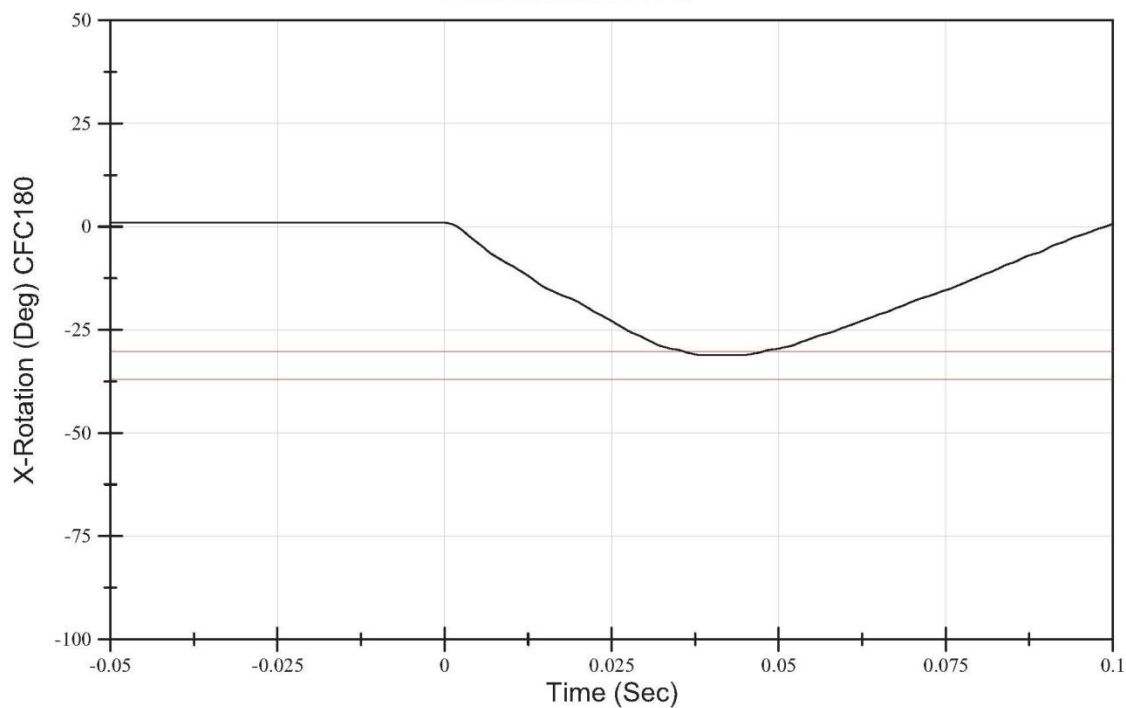


Software Version: 2.2

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

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

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

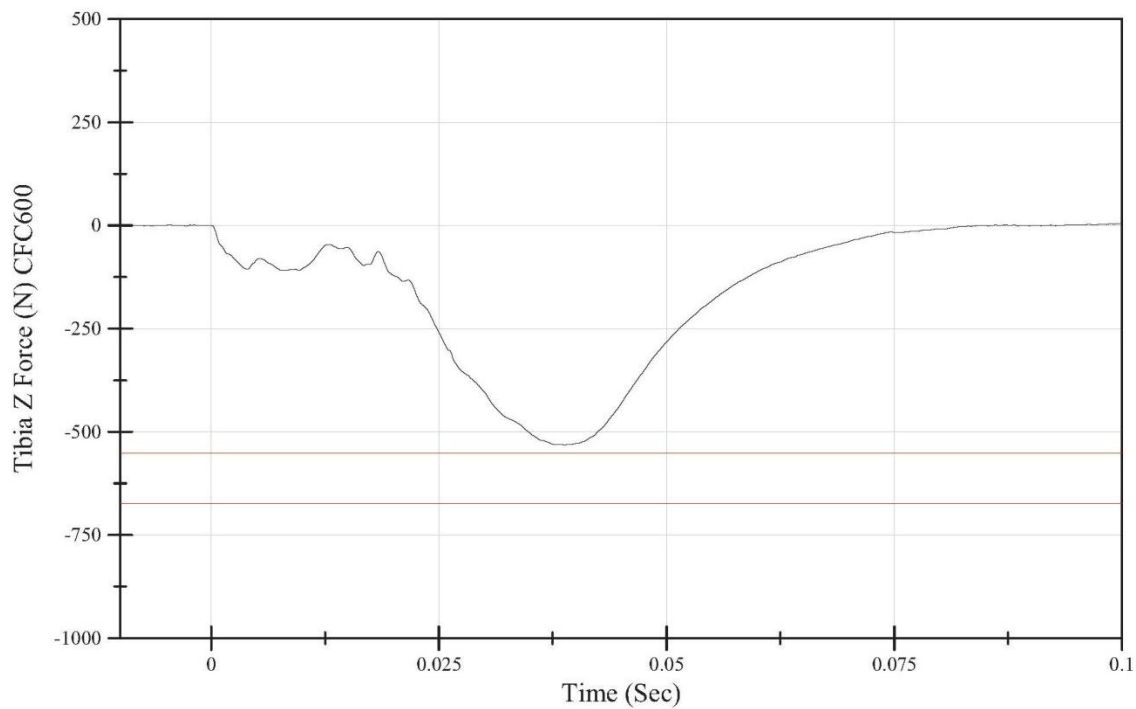


Software Version: 2.2

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

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

THOR Right Foot Inversion Certification
Tibia Load
Serial Number: LX0018



Software Version: 2.2

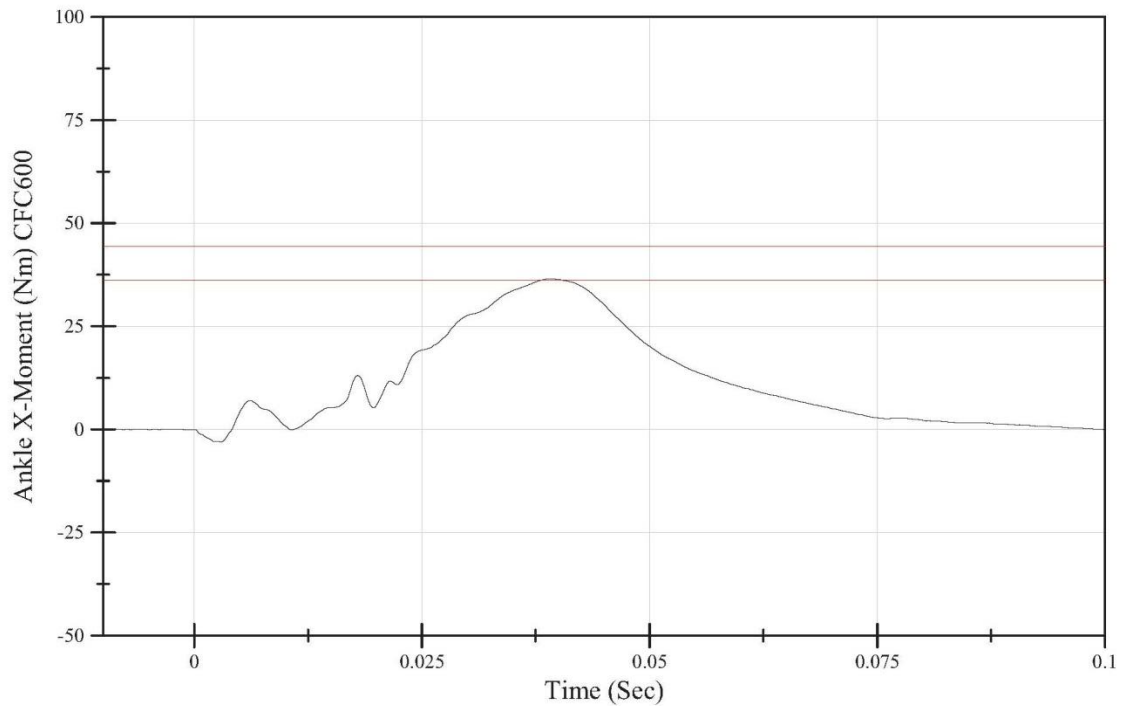
File Name: Inver_LX0018_2013_09_25 01 processed
09/25/2013 14:22:55.0000

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

THOR Right Foot Inversion Certification

Ankle Moment

Serial Number: LX0018



Software Version: 2.2

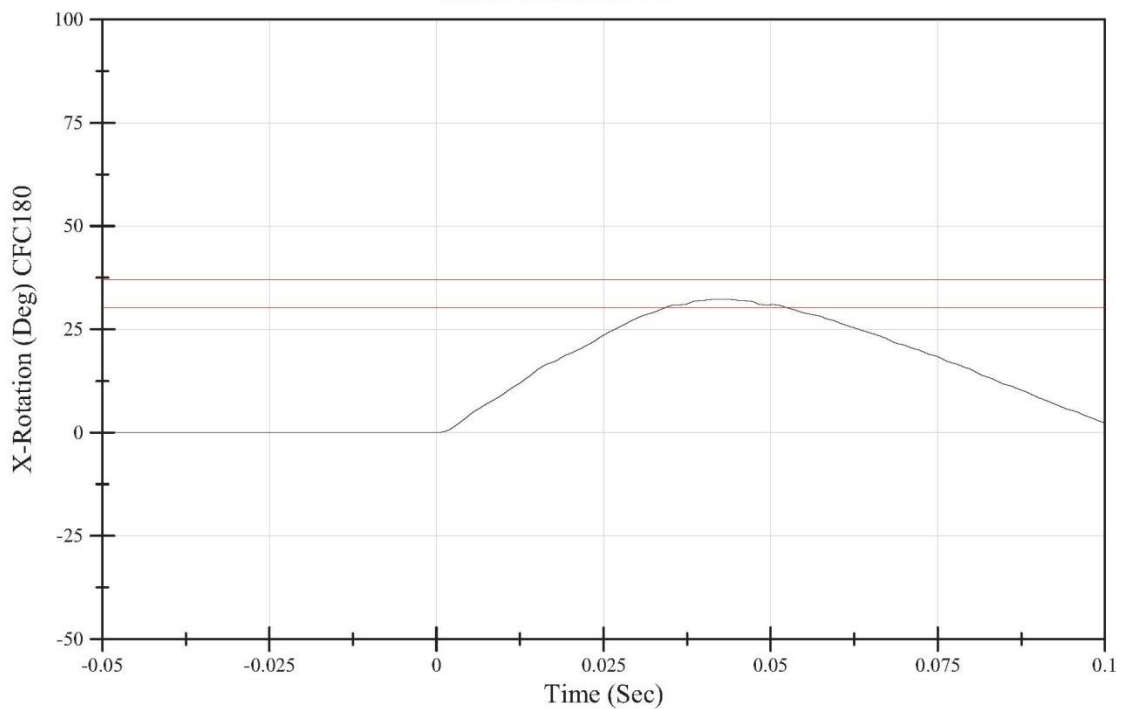
File Name: Inver_LX0018_2013_09_25 01 processed
09/25/2013 14:22:55.0000

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

THOR Right Foot Inversion Certification

Ankle X-Rotation

Serial Number: LX0018



Software Version: 2.2

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

50% ADULT MALE THOR015 DUMMY CALIBRATIONS

Summary of Thor 15 Certification Test Results

Reported by: Calspan

Technician: M. Goehle

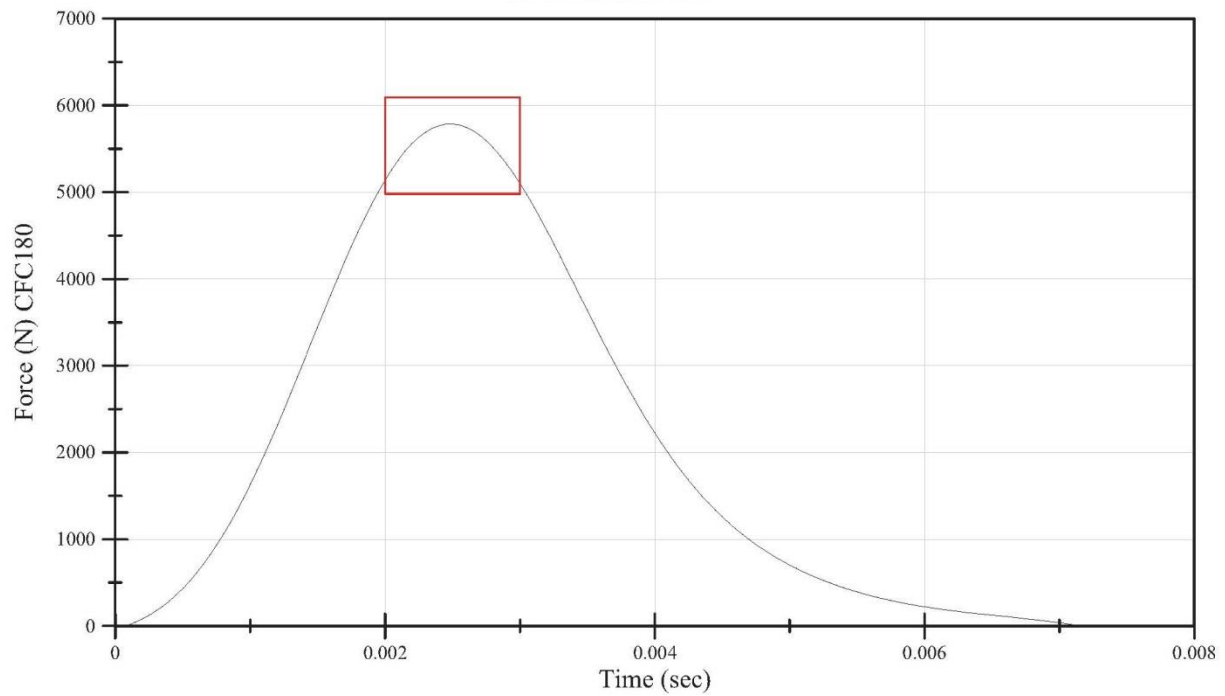
Date: 10/28/2013

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

Certifications performed by VRTC

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

THOR Head Impact Certification
Probe Force
Serial Number: T015

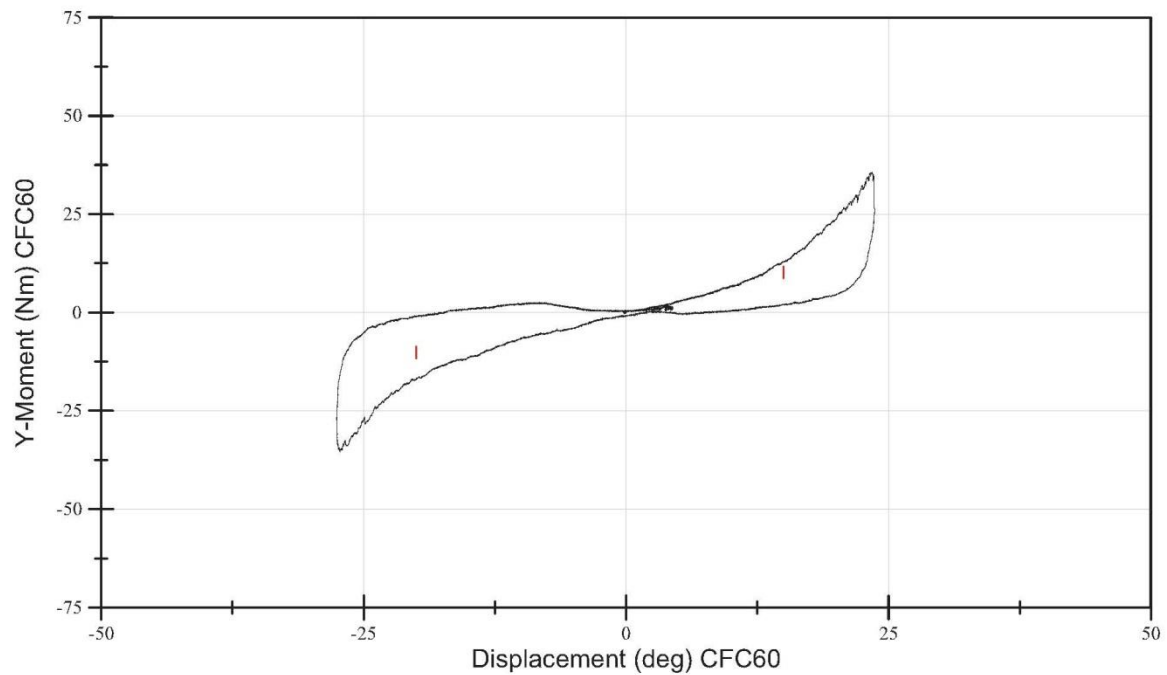


Software Version: 2.2

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

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

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

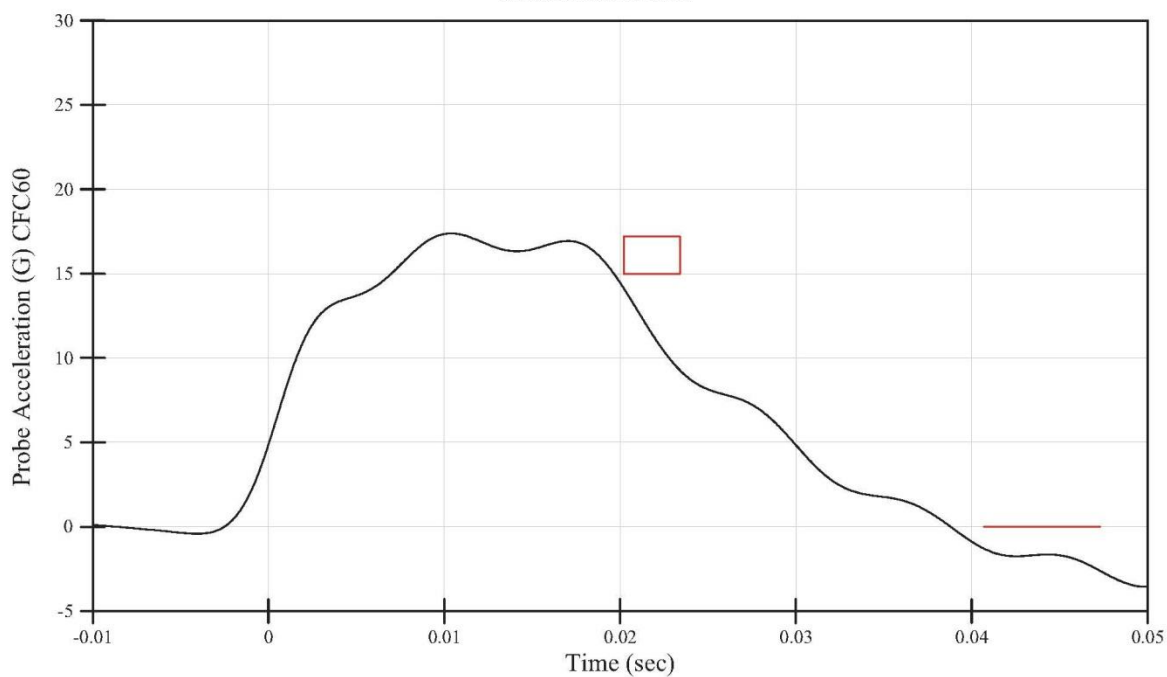


Software Version: 2.2

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

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

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

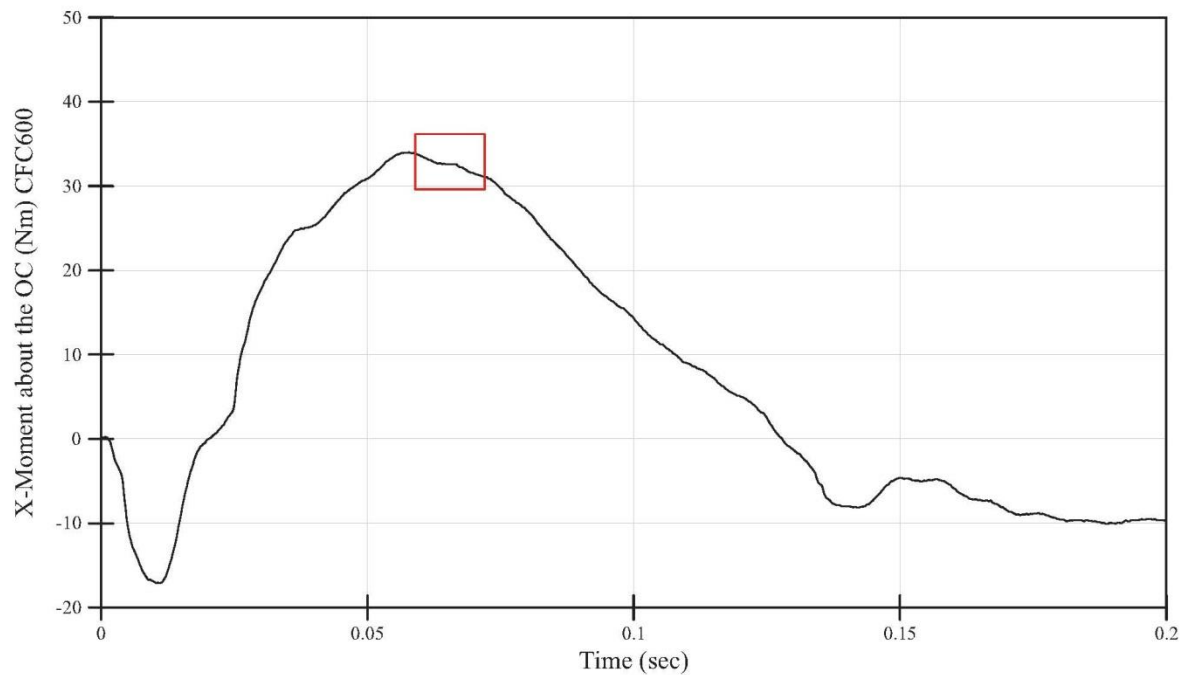


Software Version: 2.2

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

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

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



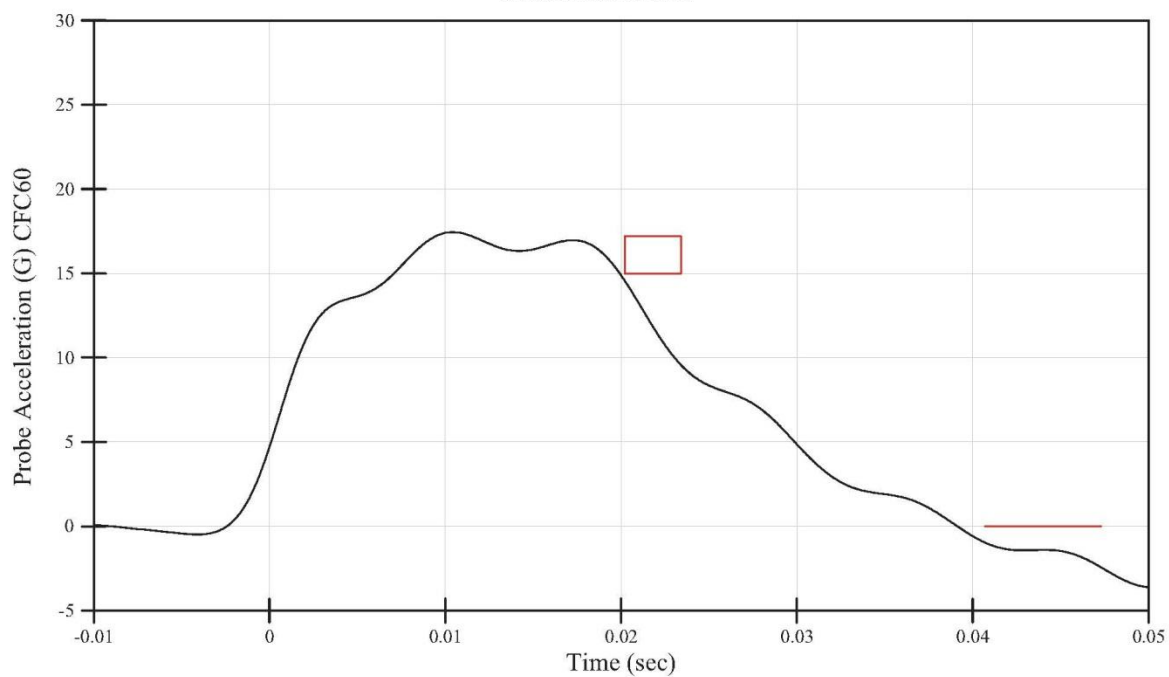
Software Version: 2.2

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

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

THOR Neck Right Lateral Flexion Certification

Probe Acceleration
Serial Number: T015



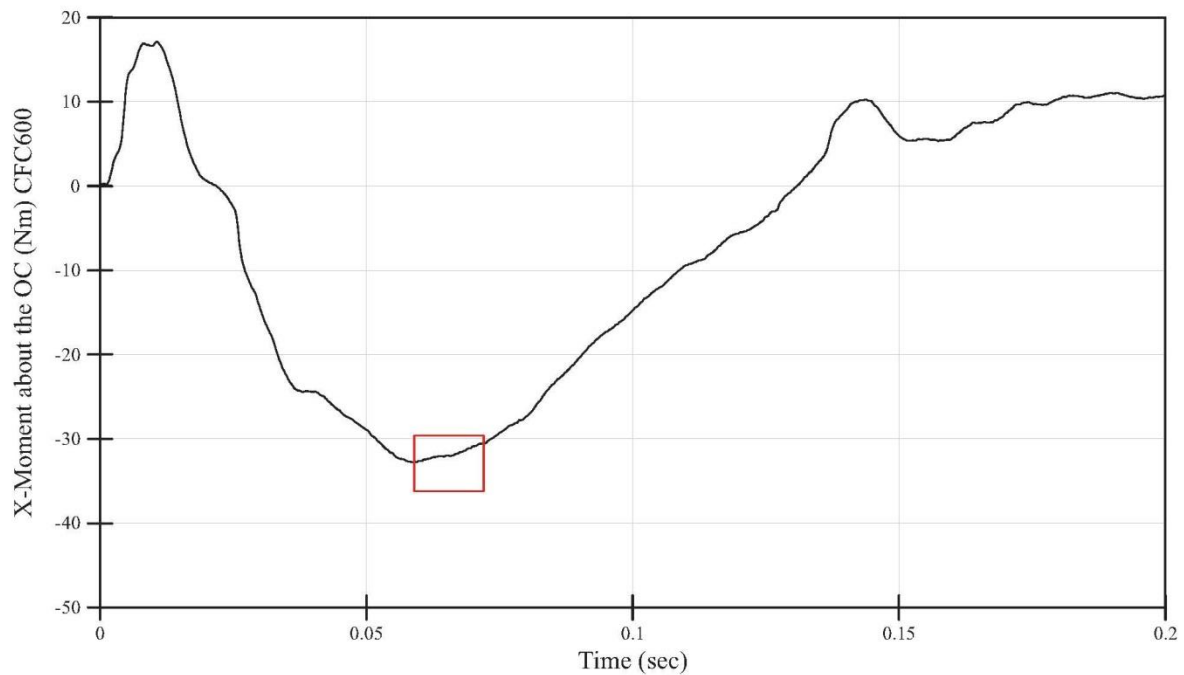
Software Version: 2.2

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

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

THOR Neck Right Lateral Flexion Certification

X-Moment
Serial Number: T015

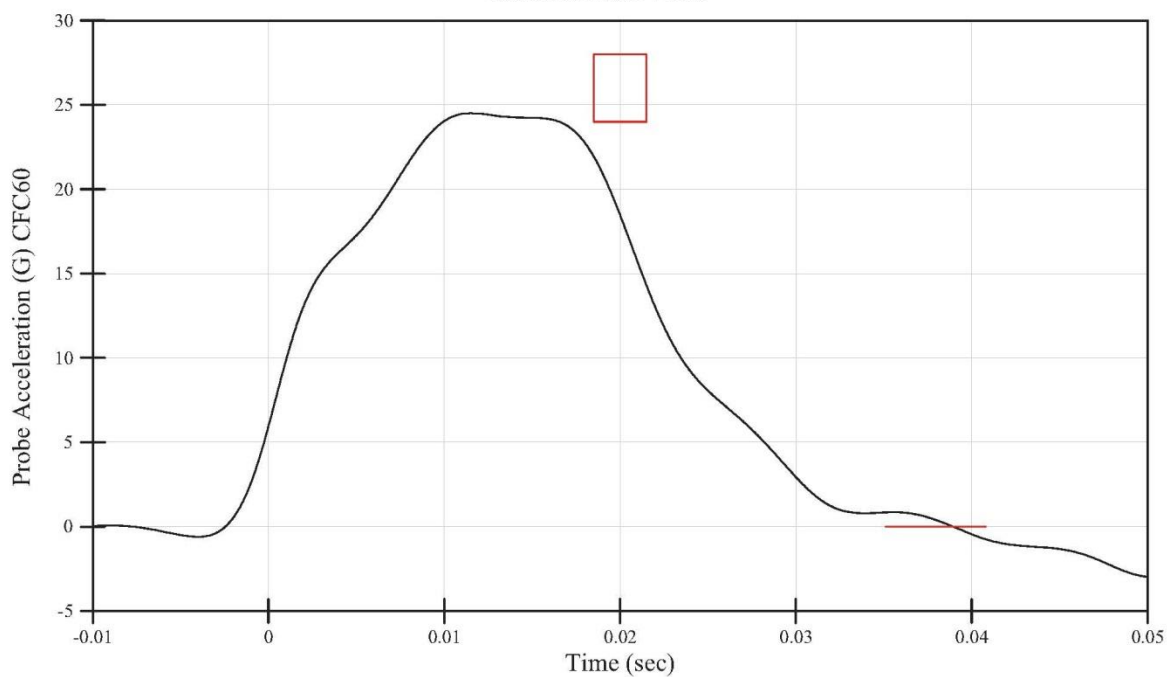


Software Version: 2.2

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

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

THOR Neck Flexion Certification
Probe Acceleration
Serial Number: T015

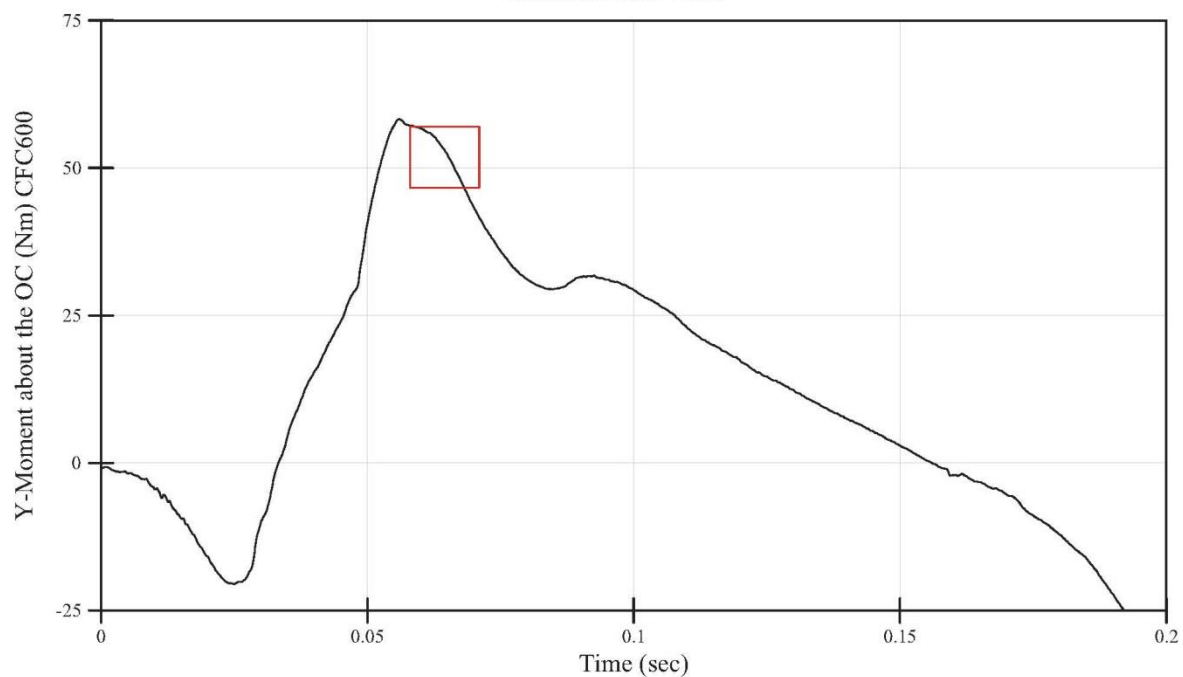


Software Version: 2.2

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

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

THOR Neck Flexion Certification
Y-Moment
Serial Number: T015

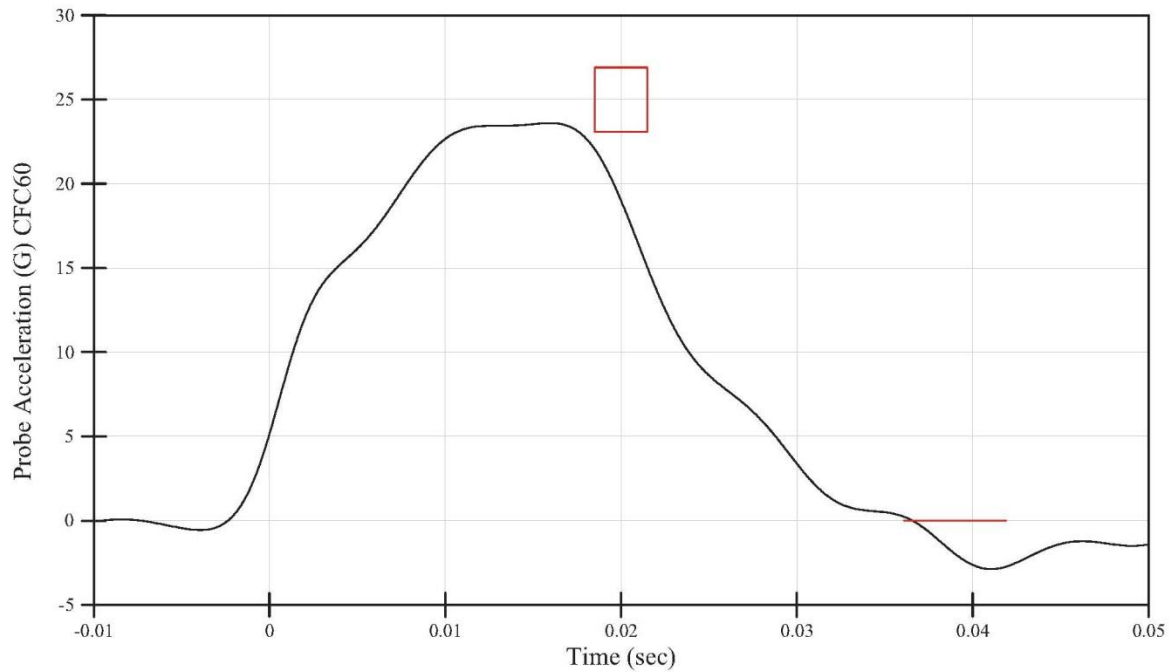


Software Version: 2.2

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

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

THOR Neck Extension Certification
Probe Acceleration
Serial Number: T015

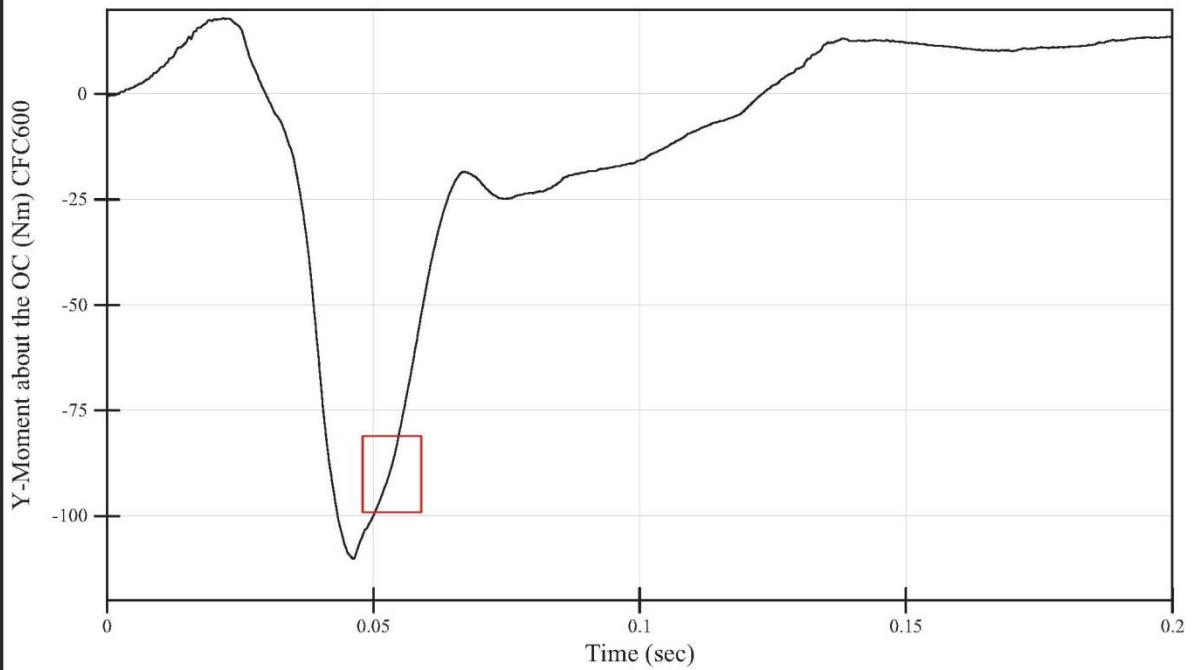


Software Version: 2.2

File Name: T015NECKEXT093013_01_DIAdemHeader_BINARYpp
09/30/2013 09:28:21.0000

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

THOR Neck Extension Certification
Y-Moment
Serial Number: T015

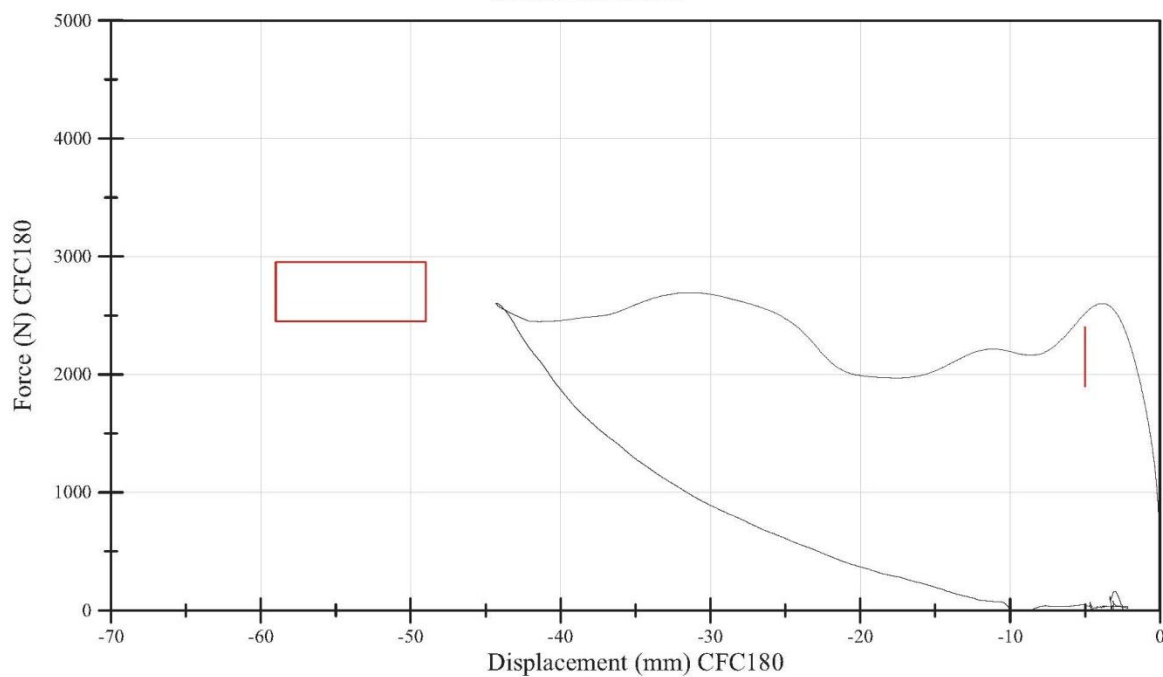


Software Version: 2.2

File Name: T015NECKEXT093013_01_DIAdemHeader_BINARYpp
09/30/2013 09:28:21.0000

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

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

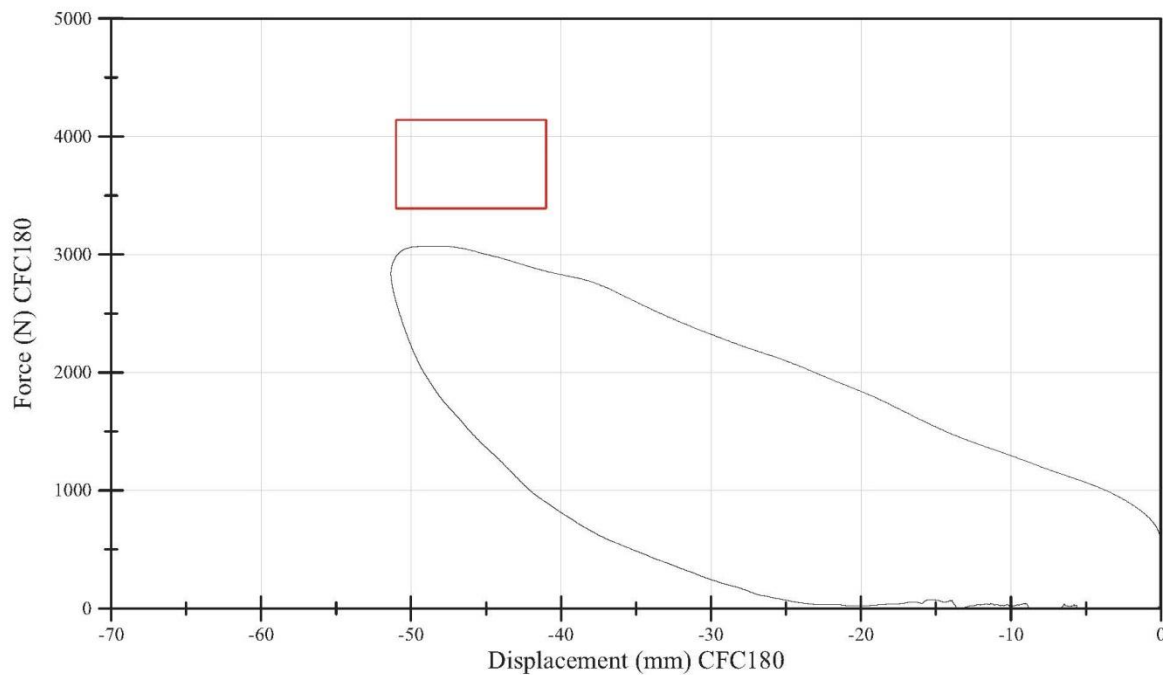


Software Version: 2.2

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

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

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

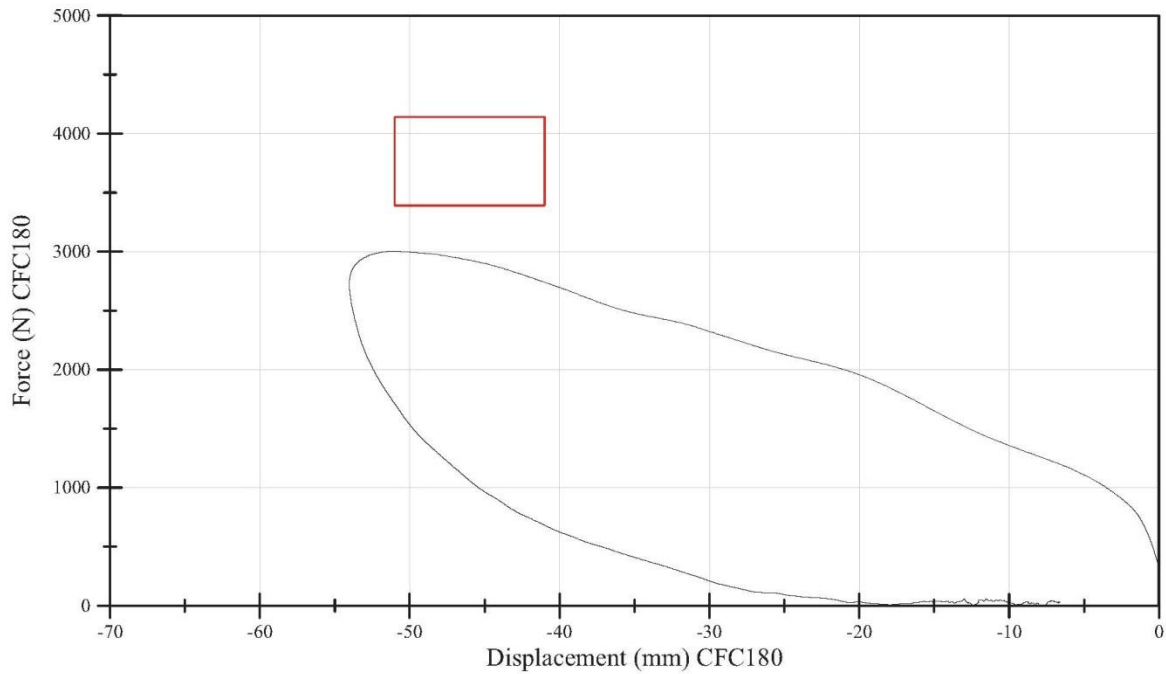


Software Version: 2.2

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

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

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

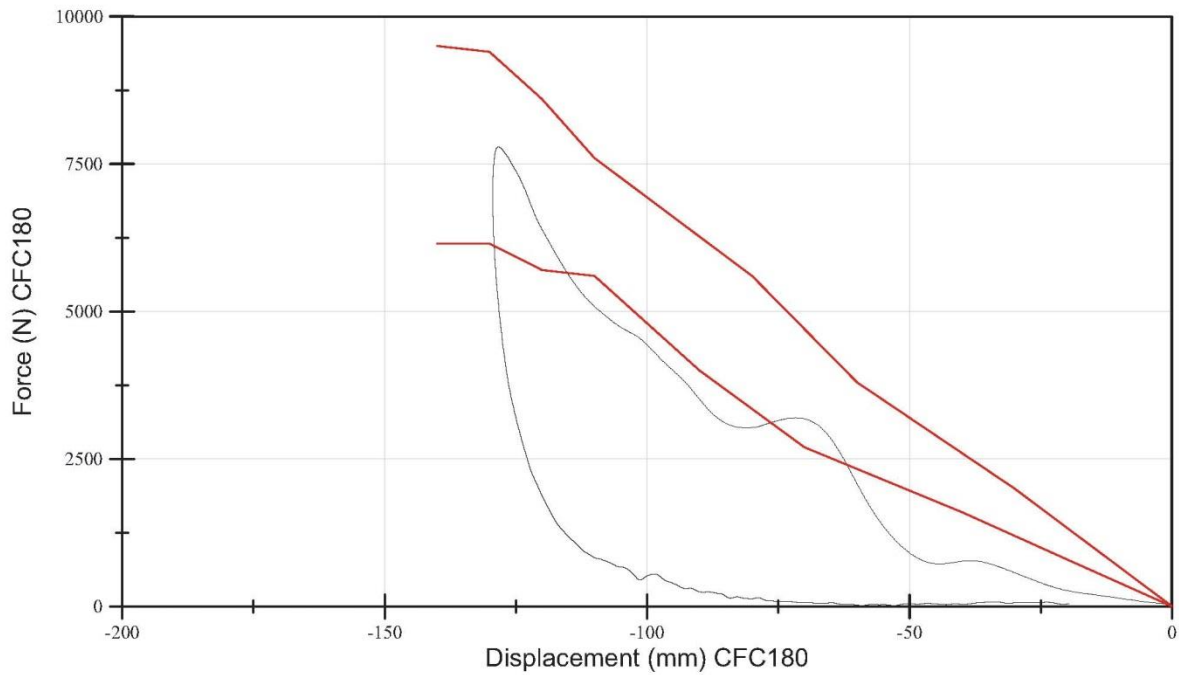


Software Version: 2.2

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

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

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

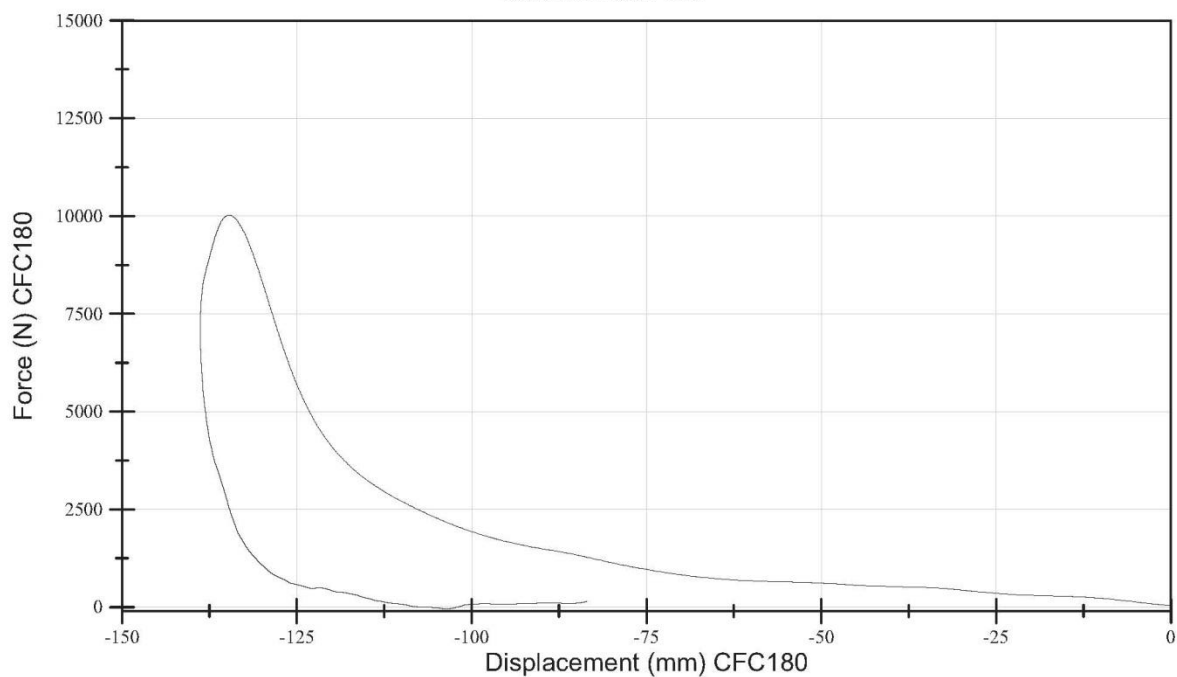


Software Version: 2.2

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

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

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



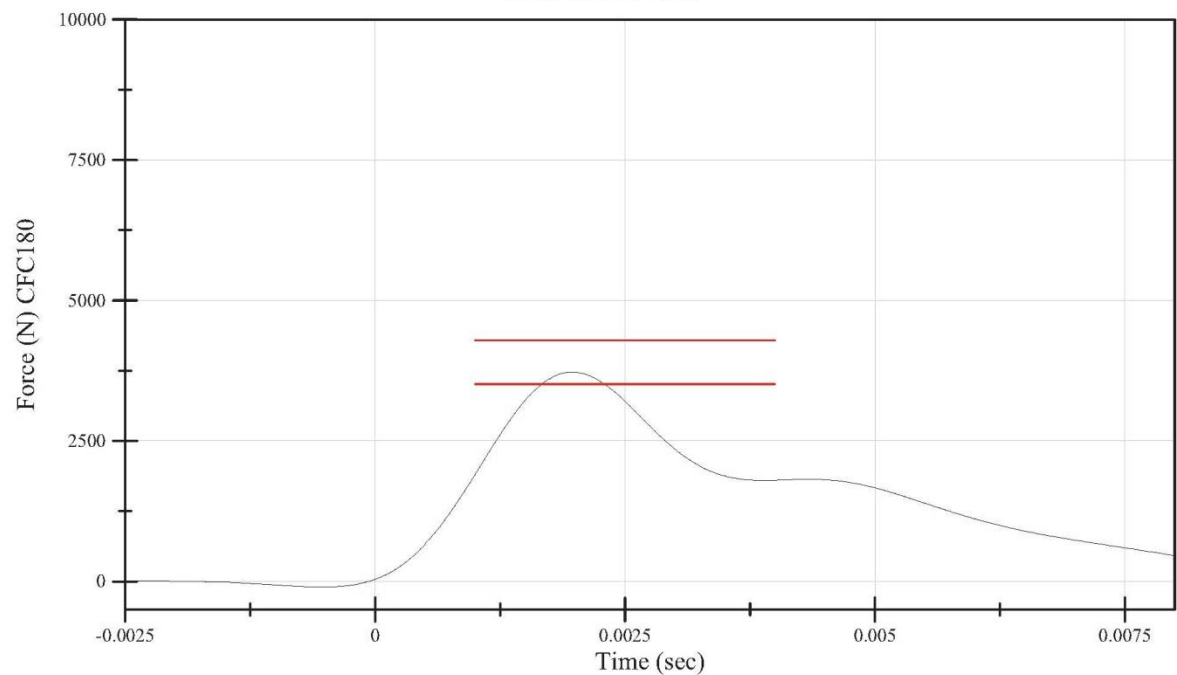
Software Version:

File Name: T015ABDOMENLOWER102113_01_DIADEMHeader_BINARY

01/01/0000 00:00:00.0000

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

THOR Left Femur Certification
Probe Force
Serial Number: T015



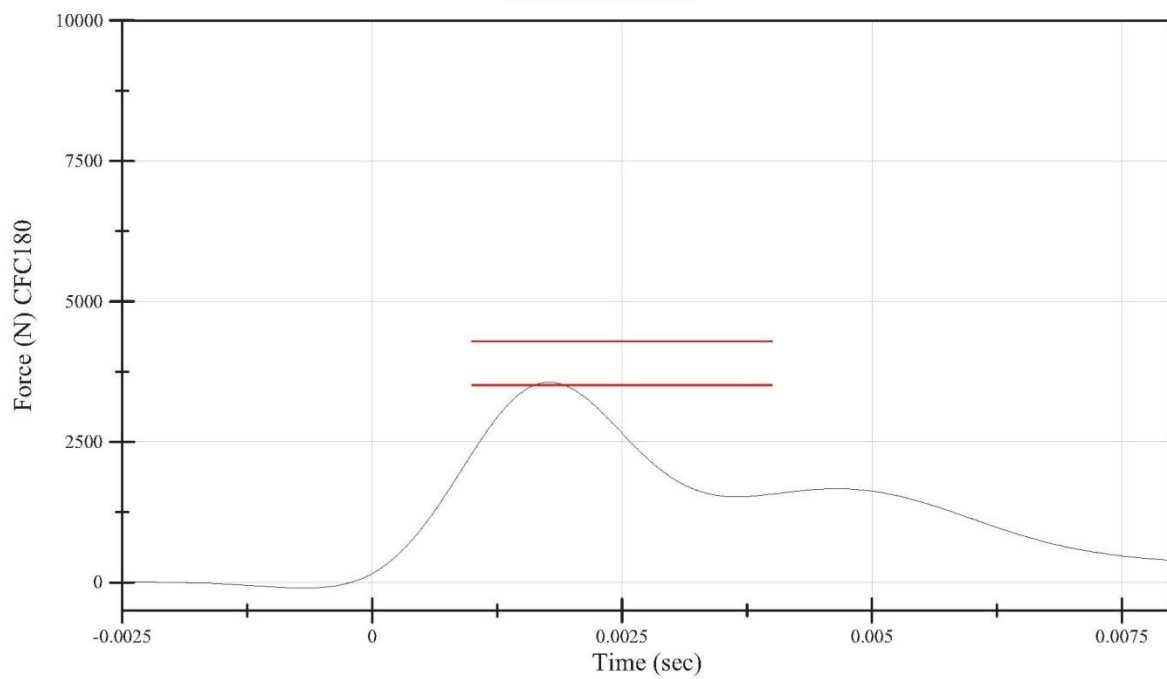
Software Version: 2.2

File Name: T015FEMURLEFT102213_01_DIADEMHeader_BINARYpp

10/22/2013 14:06:02.0000

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

THOR Right Femur Certification
Probe Force
Serial Number: T015



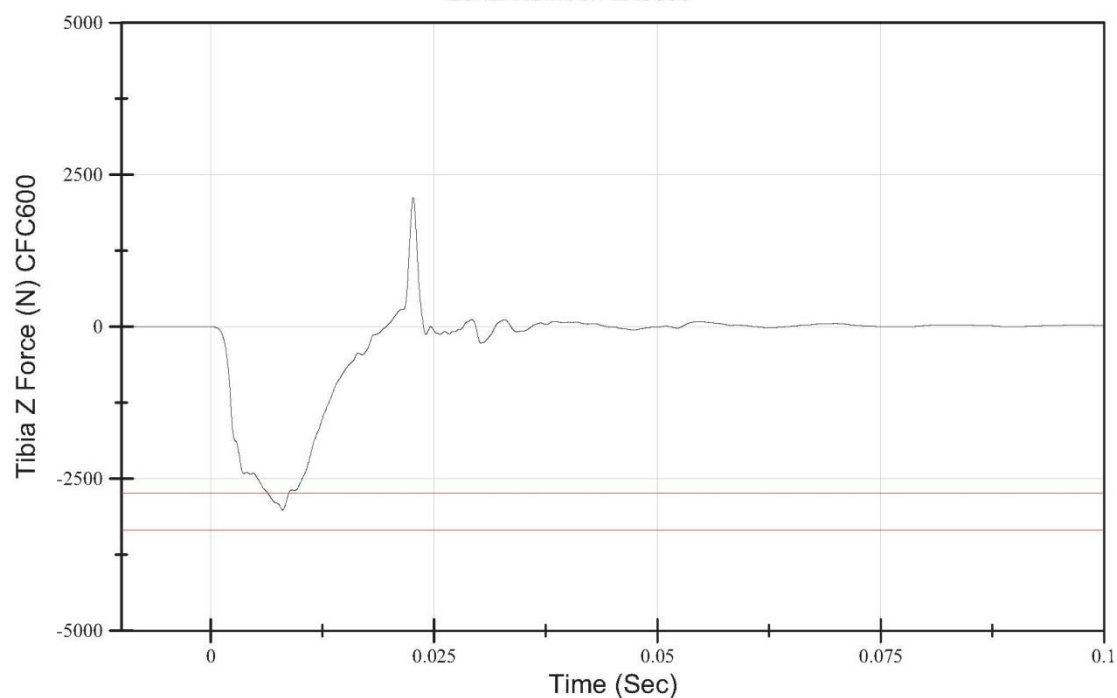
Software Version: 2.2

File Name: T015FEMURRIGHT102213_01_DIADEMHeader_BINARYpp
10/22/2013 14:07:36.0000

THOR 015 LEG CALIBRATIONS
LX0039 / LX0038

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

THOR Left Foot Heel Certification
Tibia Load
Serial Number: LX0039

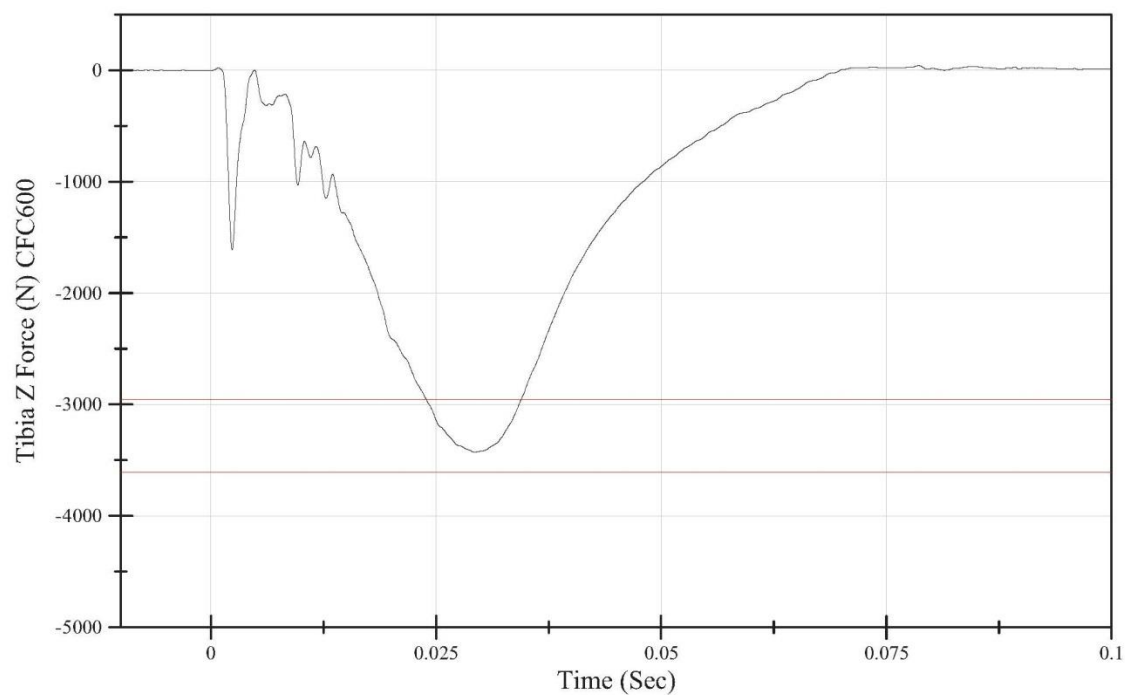


Software Version: 2.2

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

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

THOR Left Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0039

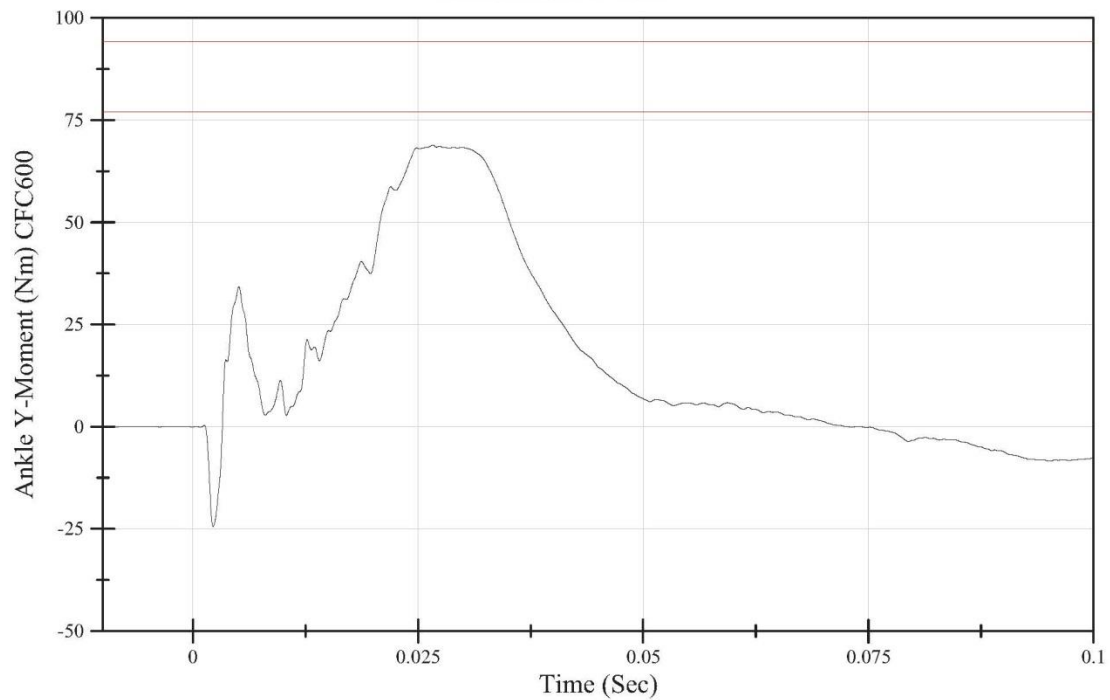


Software Version: 2.2

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

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

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

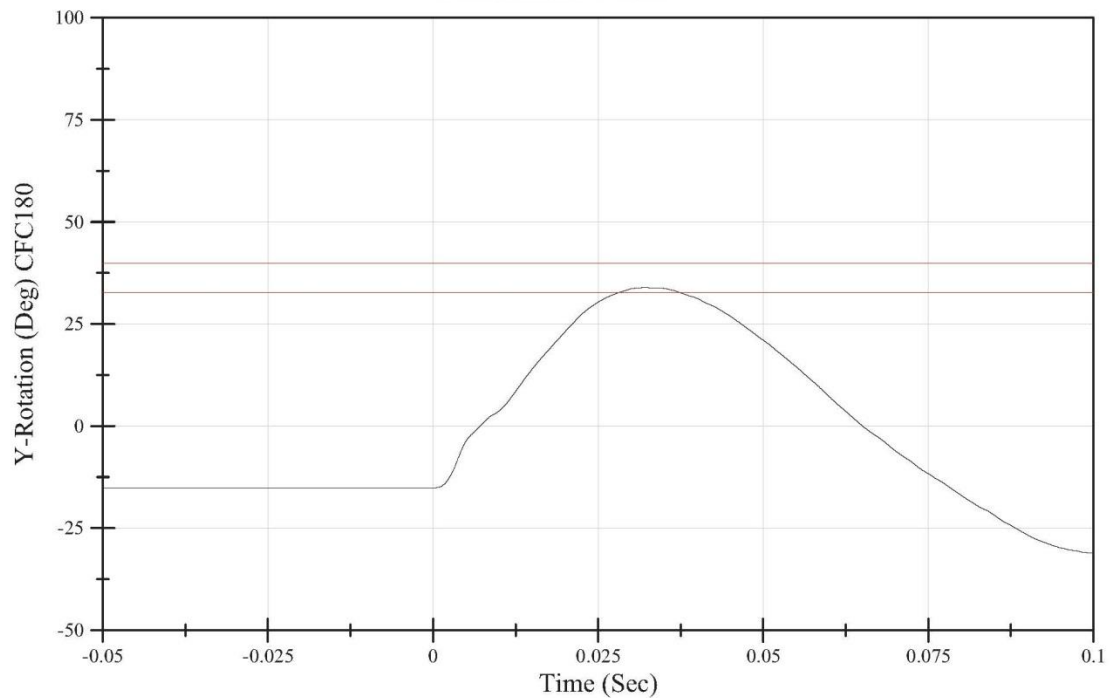


Software Version: 2.2

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

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

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

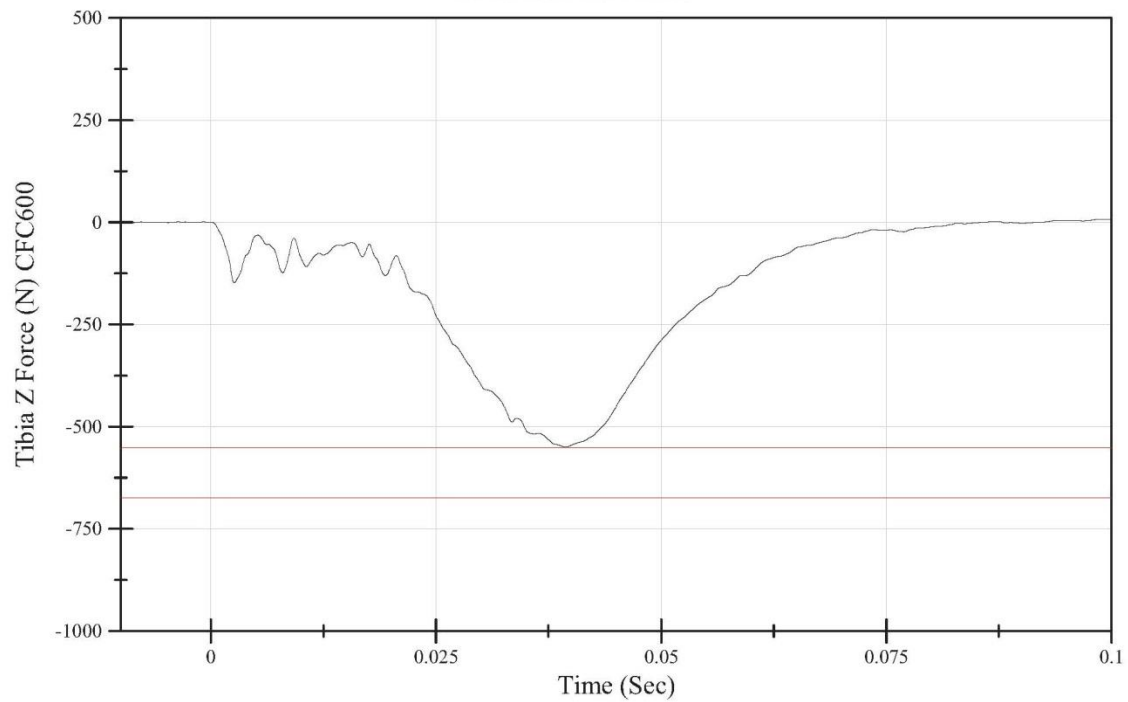


Software Version: 2.2

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

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

THOR Left Foot Eversion Certification
Tibia Load
Serial Number: LX0039

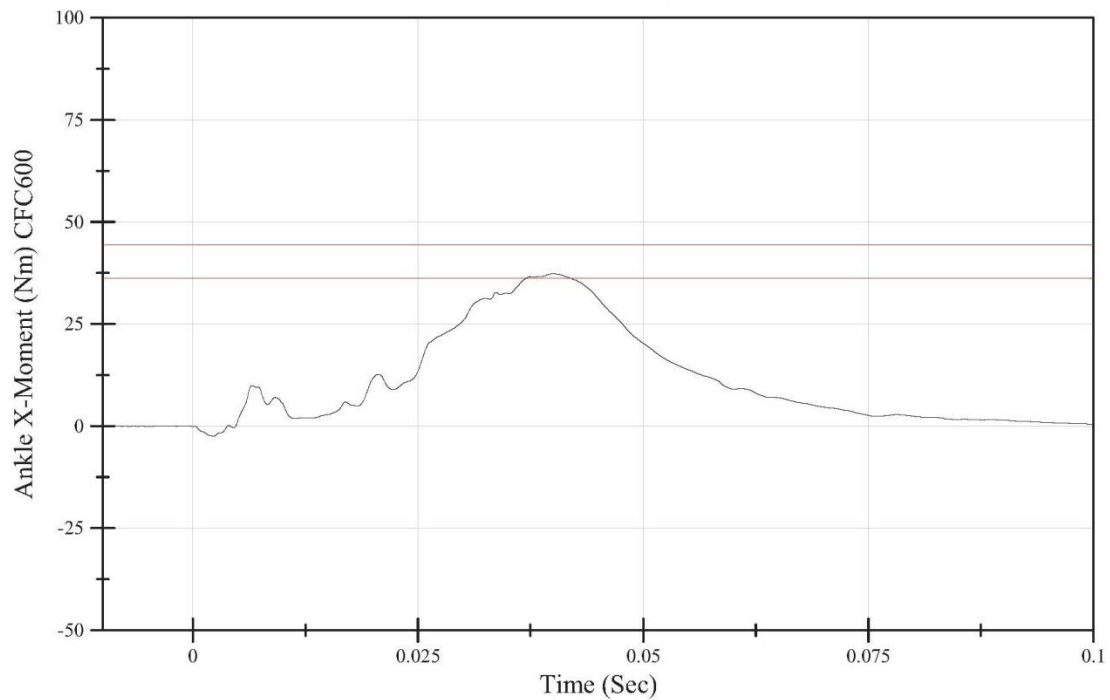


Software Version: 2.2

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

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

THOR Left Foot Eversion Certification
Ankle Moment
Serial Number: LX0039

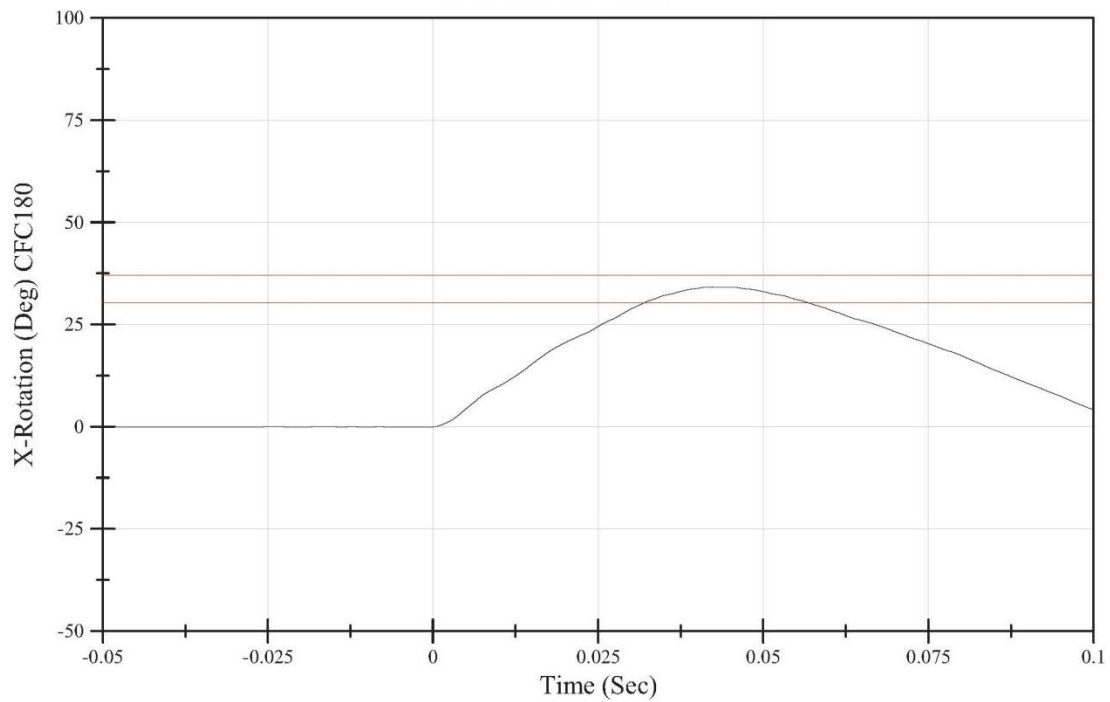


Software Version: 2.2

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

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

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

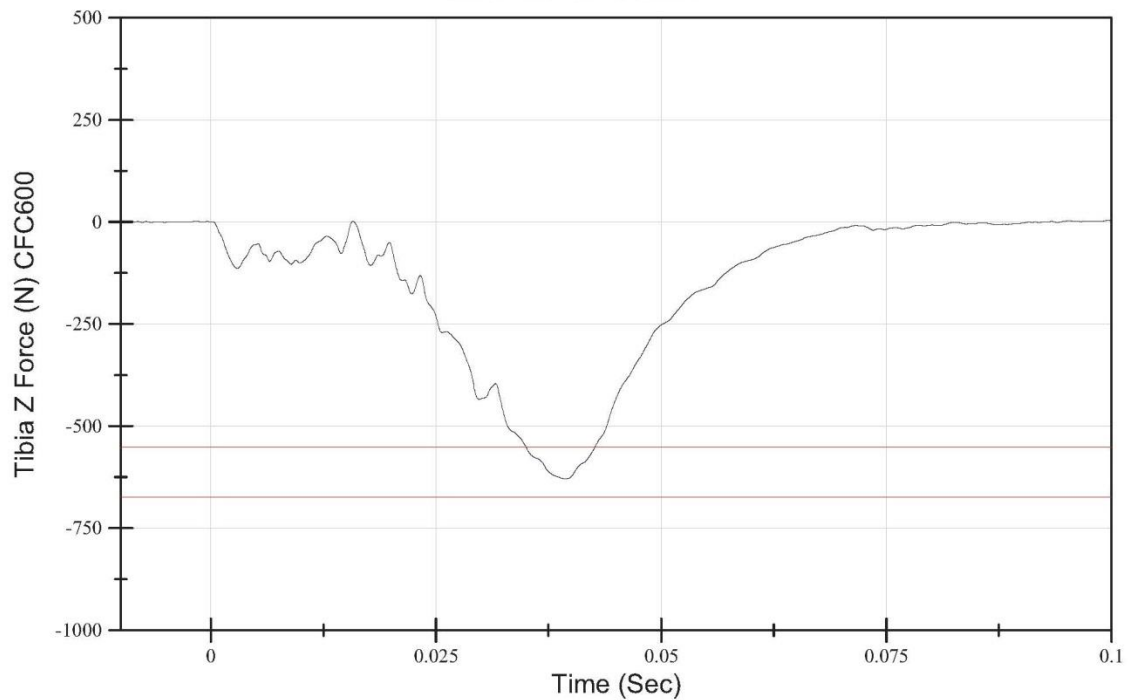


Software Version: 2.2

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

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

THOR Left Foot Inversion Certification
Tibia Load
Serial Number: LX0039

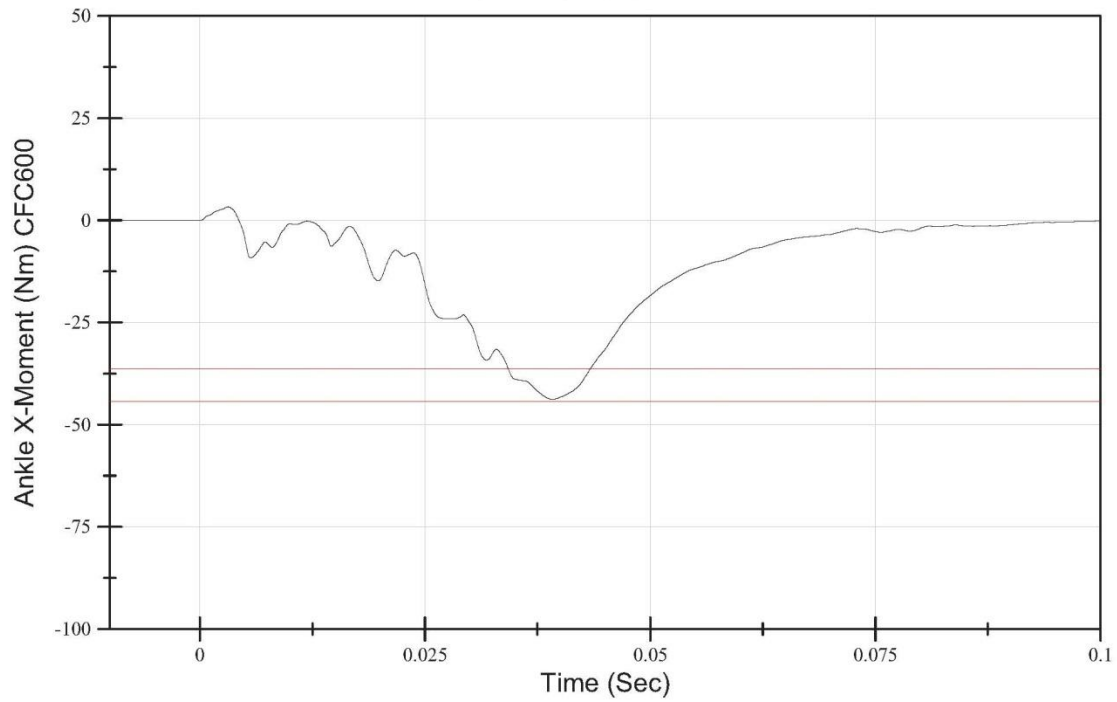


Software Version: 2.2

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

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

THOR Left Foot Inversion Certification
Ankle Moment
Serial Number: LX0039

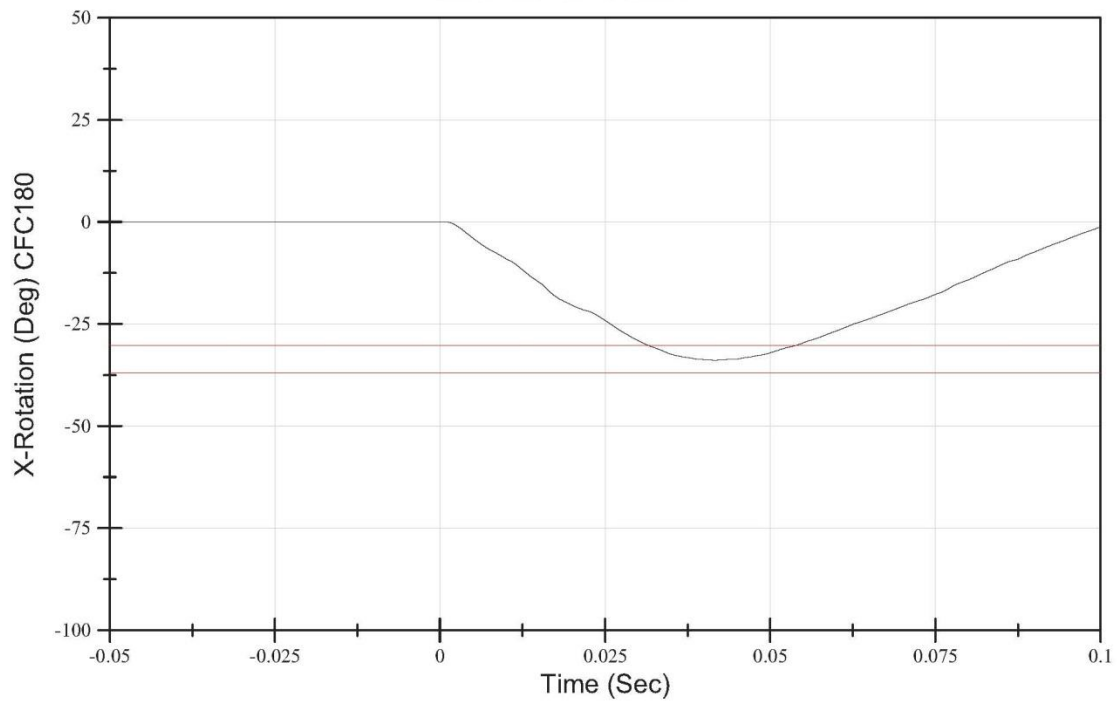


Software Version: 2.2

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

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

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

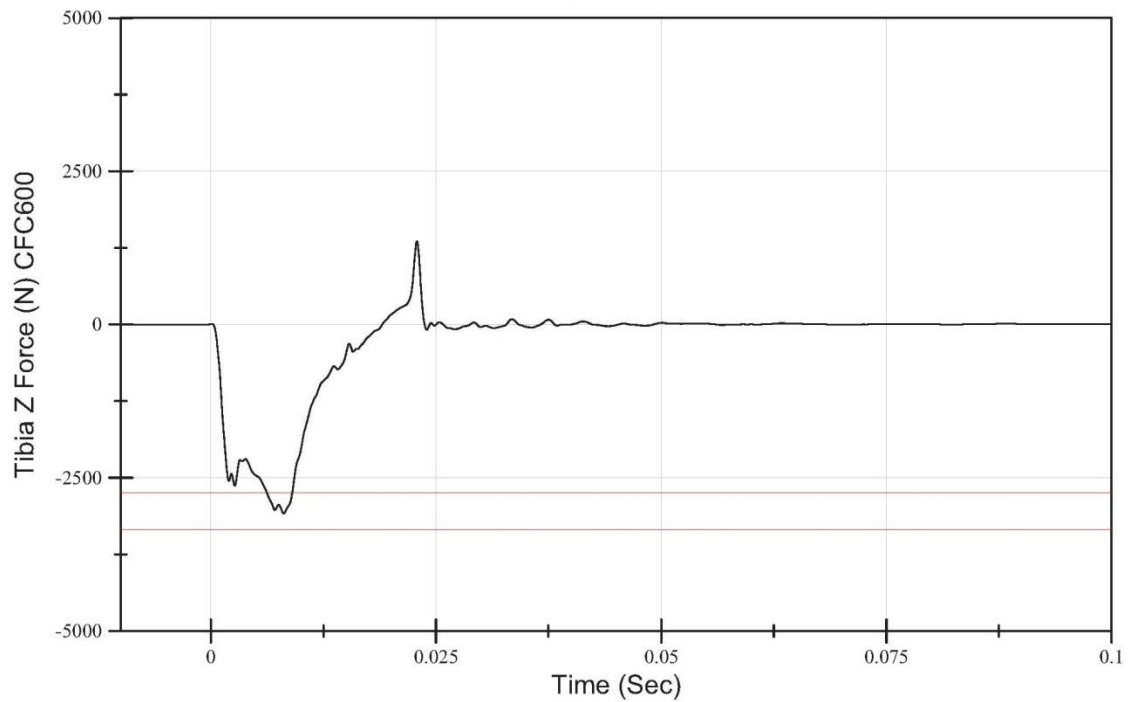


Software Version: 2.2

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

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

THOR Right Foot Heel Certification
Tibia Load
Serial Number: LX0038

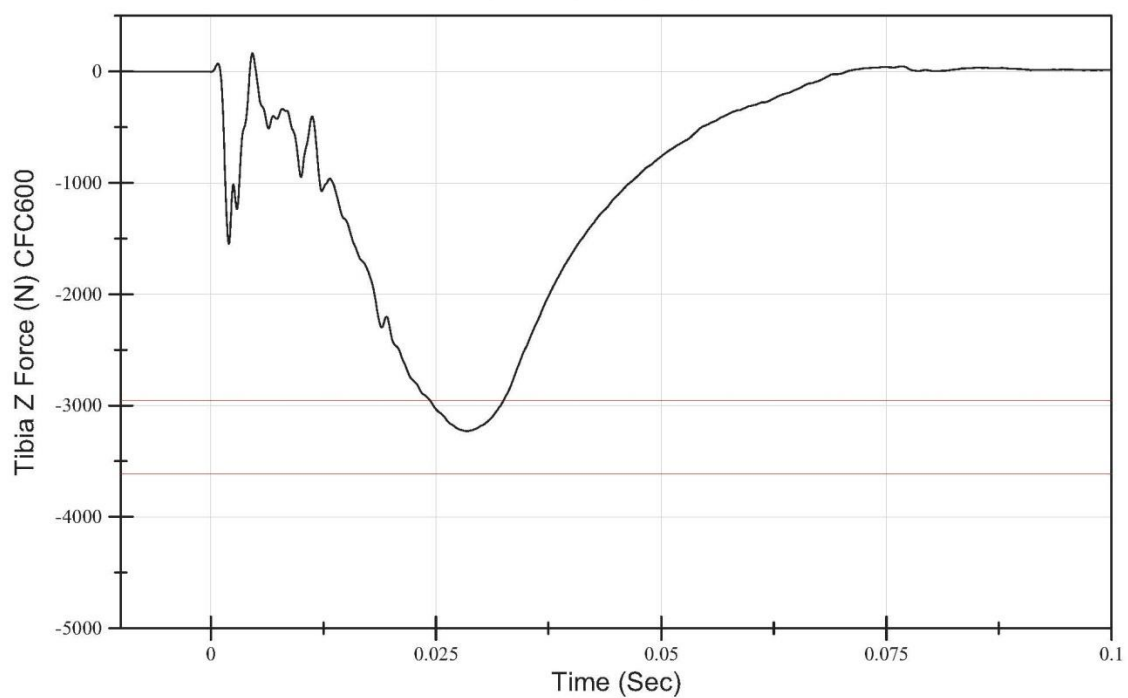


Software Version: 2.2

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

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

THOR Right Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0038

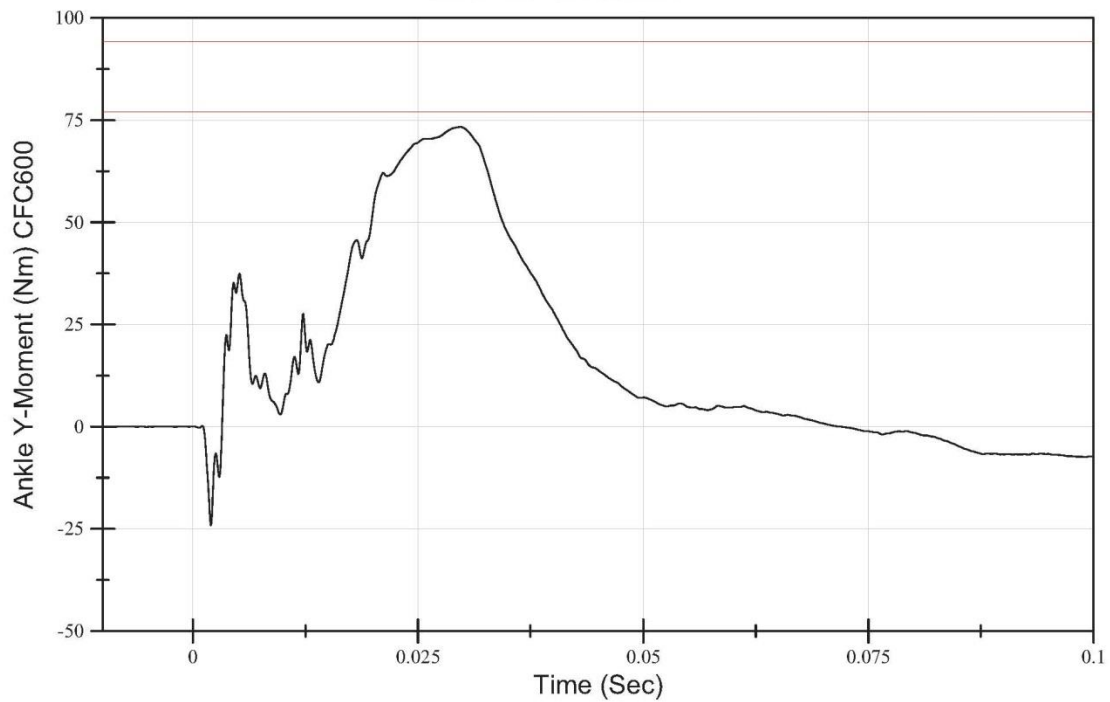


Software Version: 2.2

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

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

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

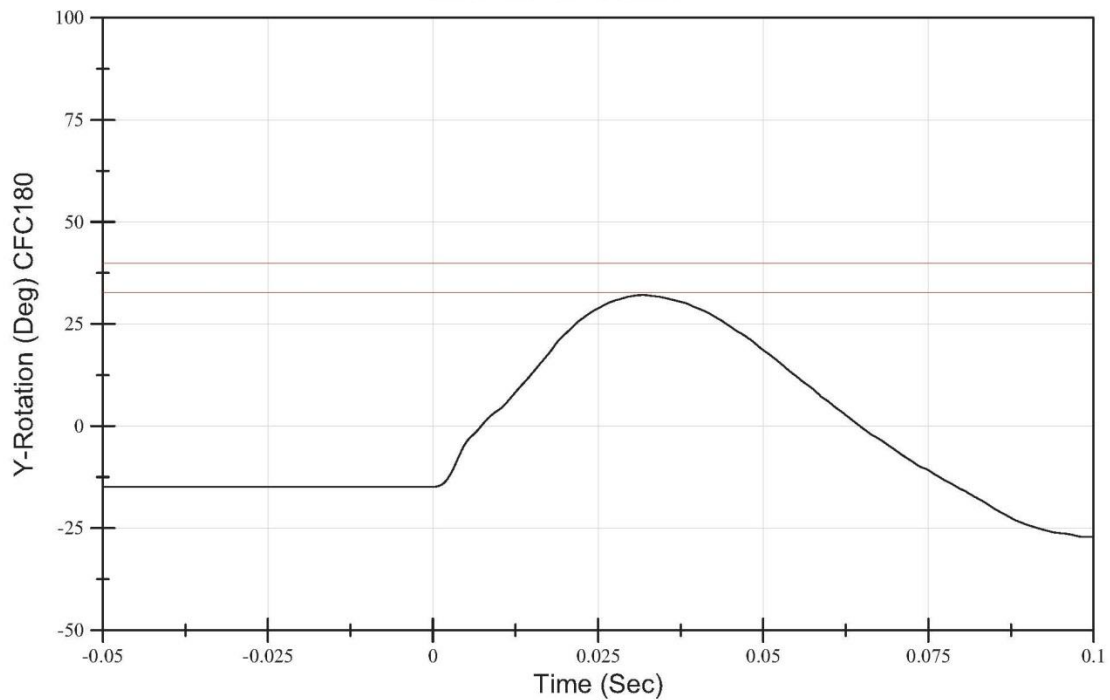


Software Version: 2.2

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

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

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

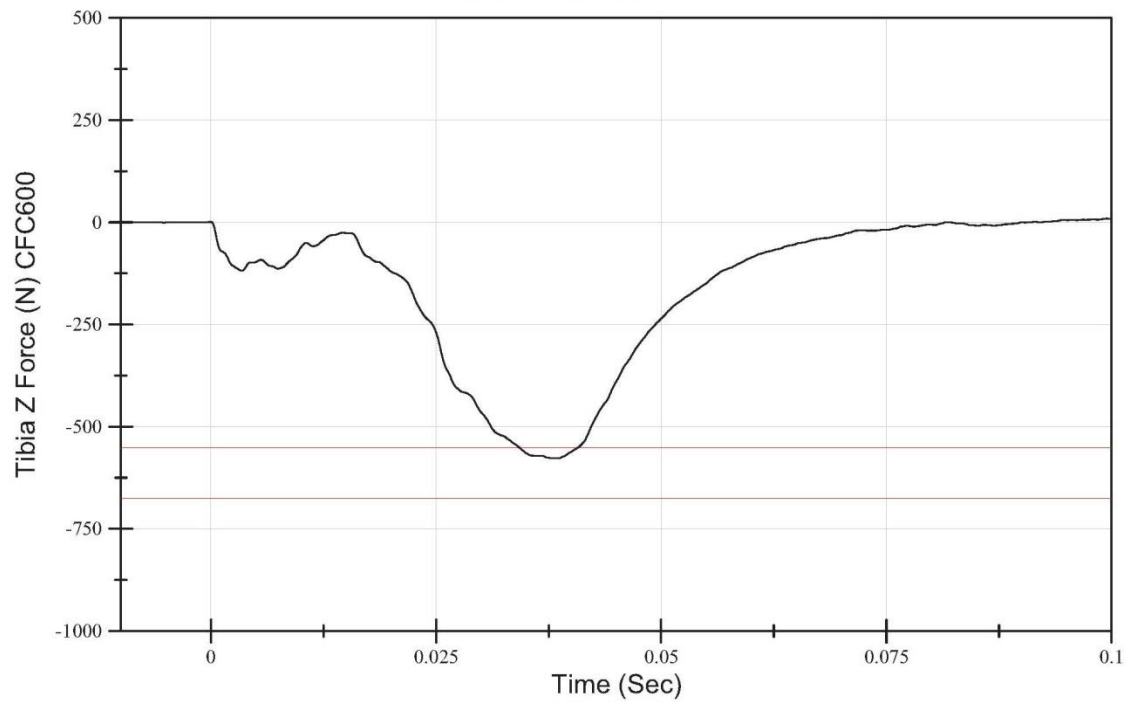


Software Version: 2.2

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

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

THOR Right Foot Eversion Certification
Tibia Load
Serial Number: LX0038

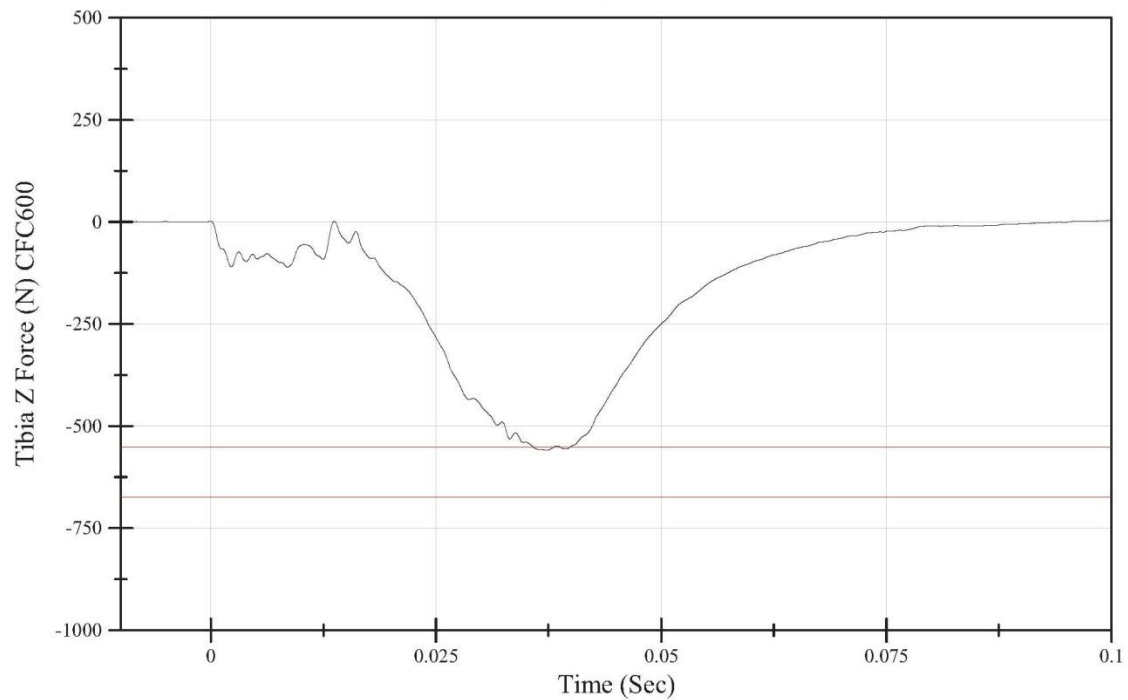


Software Version: 2.2

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

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

THOR Right Foot Inversion Certification
Tibia Load
Serial Number: LX0038

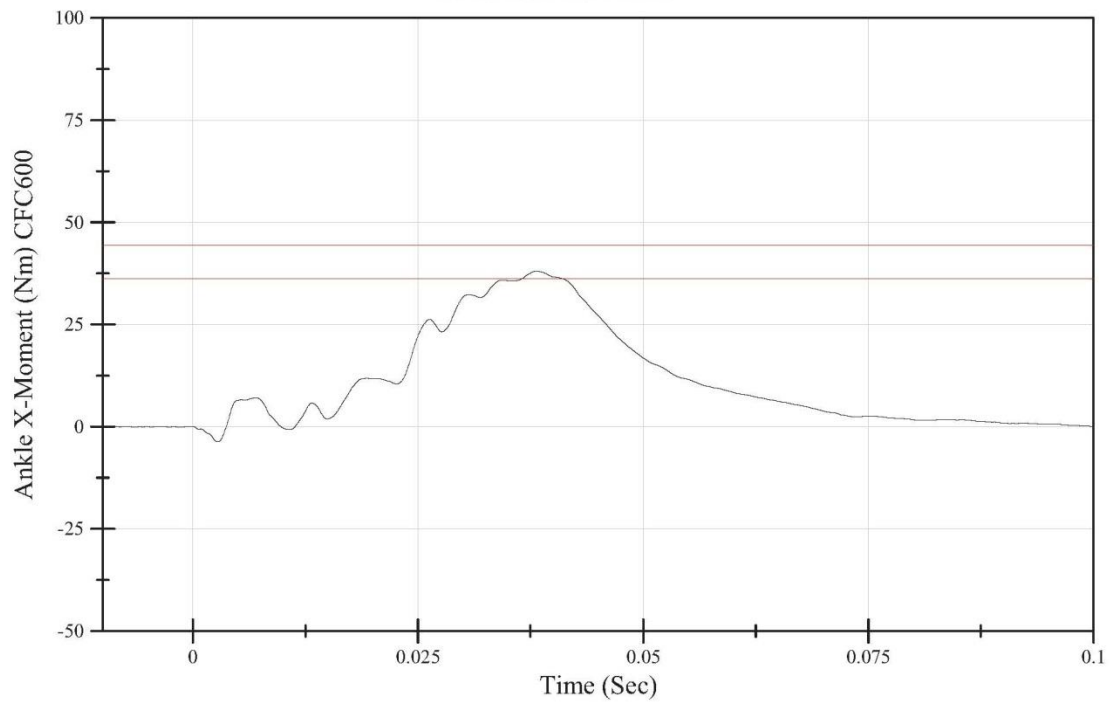


Software Version: 2.2

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

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

THOR Right Foot Inversion Certification
Ankle Moment
Serial Number: LX0038

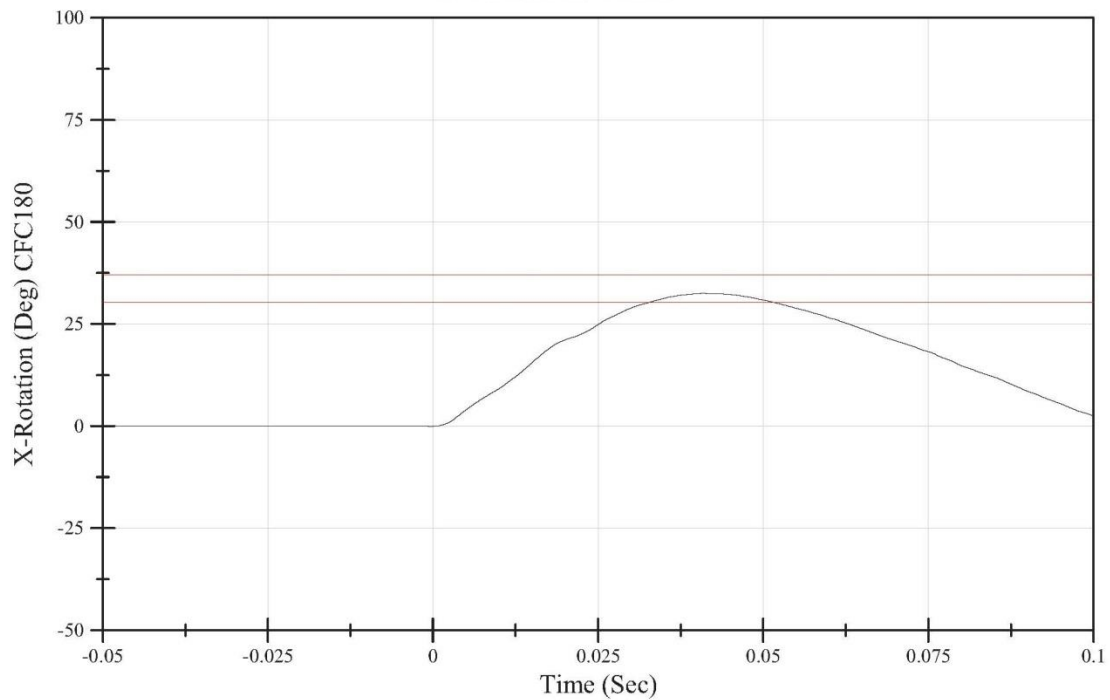


Software Version: 2.2

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

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

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

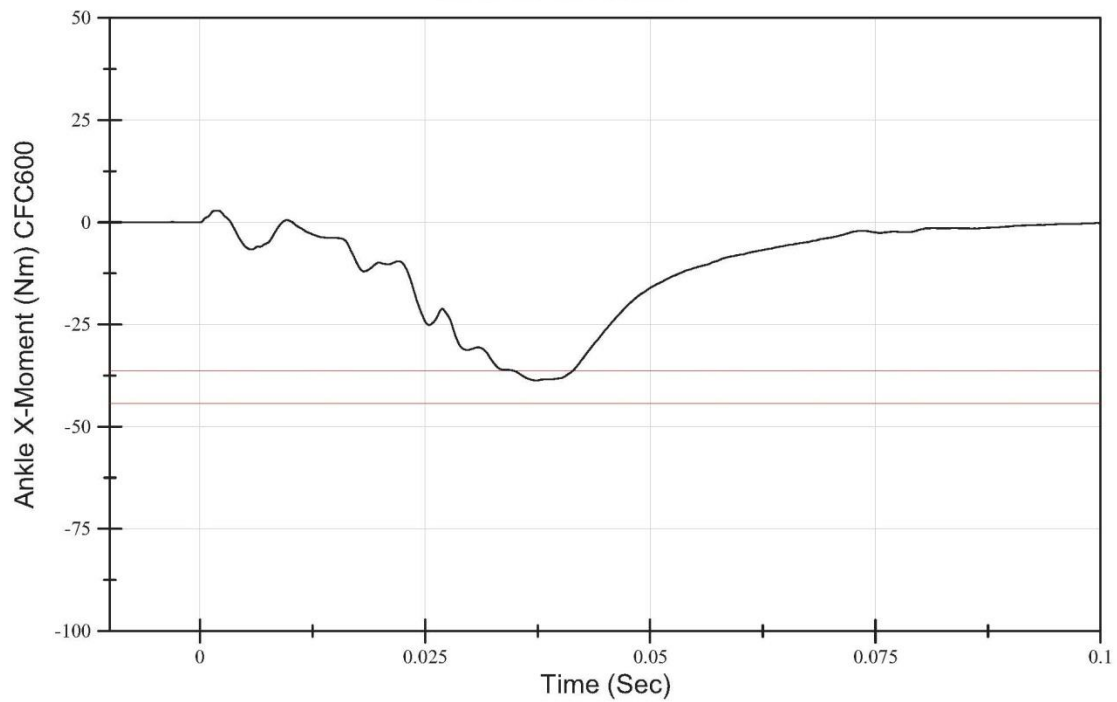


Software Version: 2.2

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

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

THOR Right Foot Eversion Certification
Ankle Moment
Serial Number: LX0038

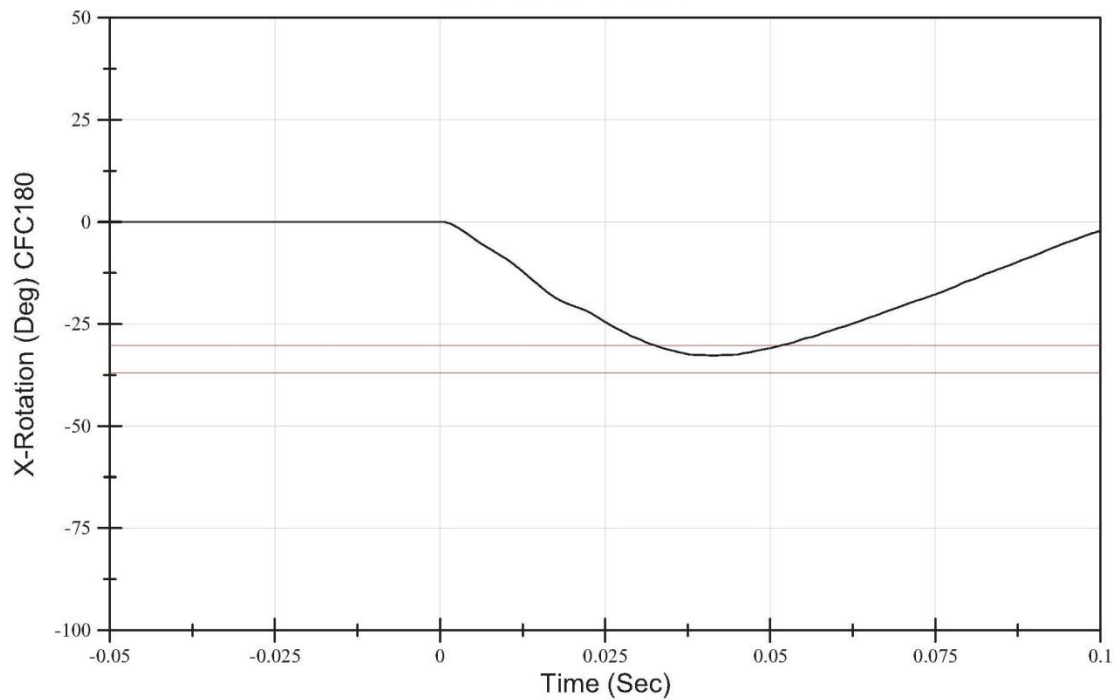


Software Version: 2.2

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

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

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



Software Version: 2.2

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

APPENDIX D:
CMM MEASUREMENT PROCEDURES

Vehicle Coordinate System

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

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

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

Steering Column Reference Point

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

Brake Pedal Reference Point

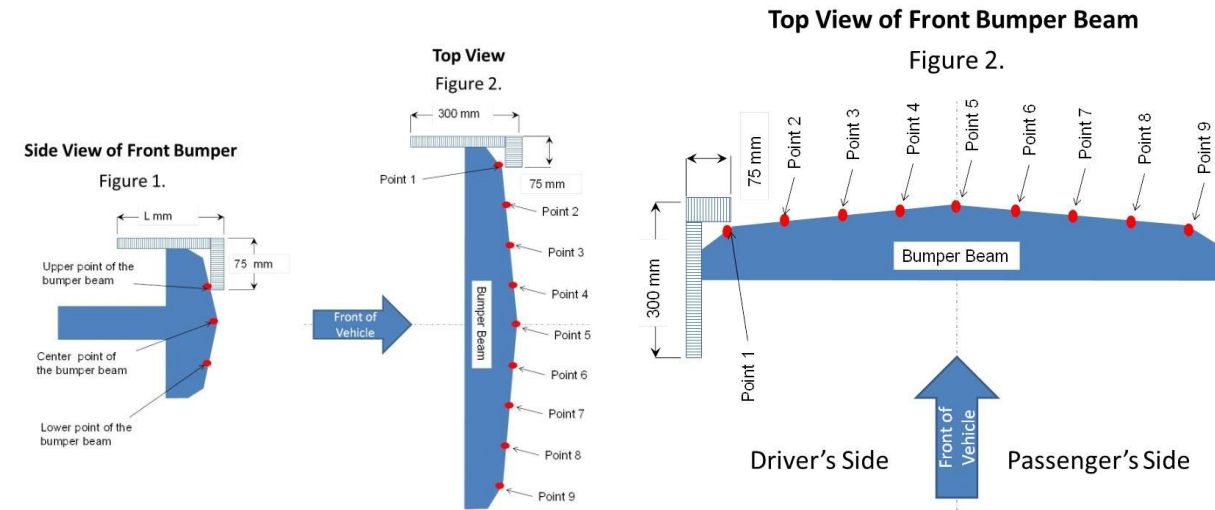
The Brake Pedal Reference Point is the x, y, and z location of the geometric center of the brake pedal pad (top surface) in the VCS.

Floor Reference Point

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

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

Pre and Post Bumper Beam and Radiator Support Measurement



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

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

Pre and Post Driver Left Lower Instrument Panel

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

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

Pre and Post Driver Right Lower Instrument Panel

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

Pre and Post Brake Pedal (Figure 22)

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

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

DRIVER POINT A1

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

DRIVER POINT B1

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

DRIVER POINT C1

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

DRIVER POINT D1

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

DRIVER POINT A2

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

DRIVER POINT B2

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

DRIVER POINT C2

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

DRIVER POINT D2

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

DRIVER POINT A3

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

DRIVER POINT B3

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

DRIVER POINT C3

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

DRIVER POINT D3

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

DRIVER POINT A4

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

DRIVER POINT B4

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

DRIVER POINT C4

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

DRIVER POINT D4

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

DRIVER POINT A5

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

DRIVER POINT B5

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

DRIVER POINT C5

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

DRIVER POINT D5

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

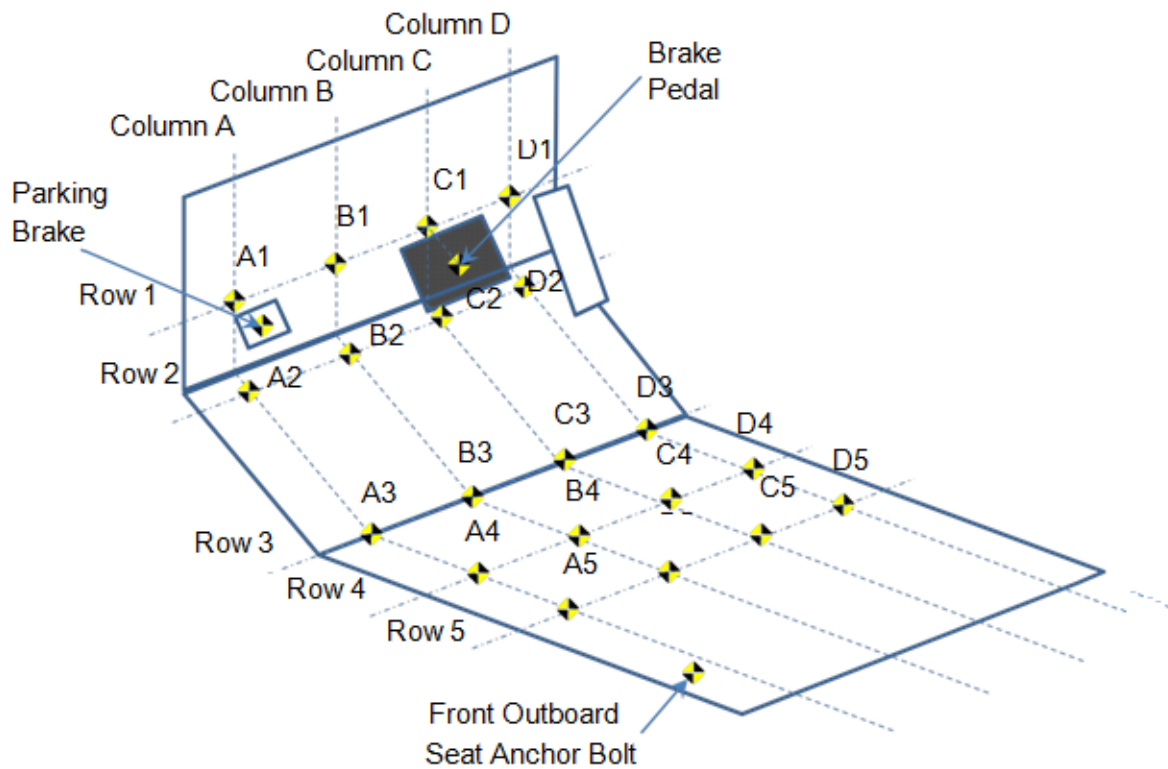
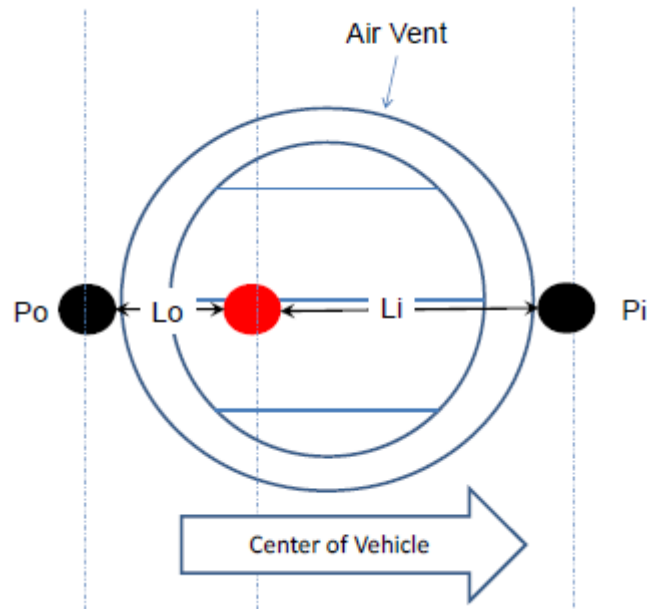


Figure 22: Lower interior intrusion measurements

Driver Upper Dash

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

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



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

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

Passenger Left Lower Instrument Panel

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

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

Passenger Right Lower Instrument Panel

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

Passenger Toe pan and Floor Board (Figure 24)

PASSENGER POINT A1

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

PASSENGER POINT B1

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

PASSENGER POINT C1

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

PASSENGER POINT D1

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

PASSENGER POINT A2

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

PASSENGER POINT B2

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

PASSENGER POINT C2

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

PASSENGER POINT D2

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

PASSENGER POINT A3

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

PASSENGER POINT B3

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

PASSENGER POINT C3

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

PASSENGER POINT D3

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

PASSENGER POINT A4

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

PASSENGER POINT B4

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

PASSENGER POINT C4

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

PASSENGER POINT D4

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

PASSENGER POINT A5

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

PASSENGER POINT B5

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

PASSENGER POINT C5

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

PASSENGER POINT D5

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

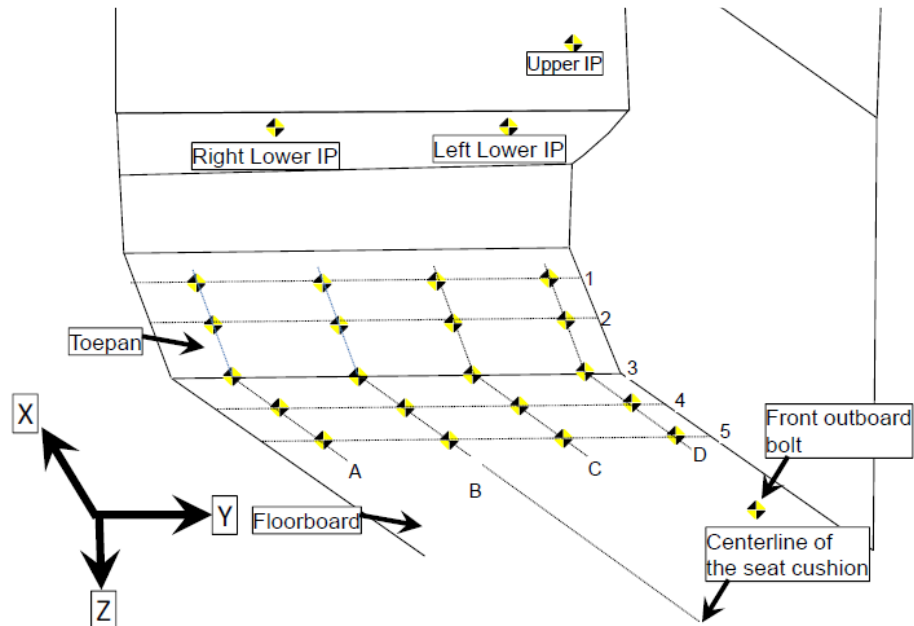


Figure 24: Passenger side lower interior measurements

Passenger Upper Dash

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

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

Driver Door Measurements (Figure 25)

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

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

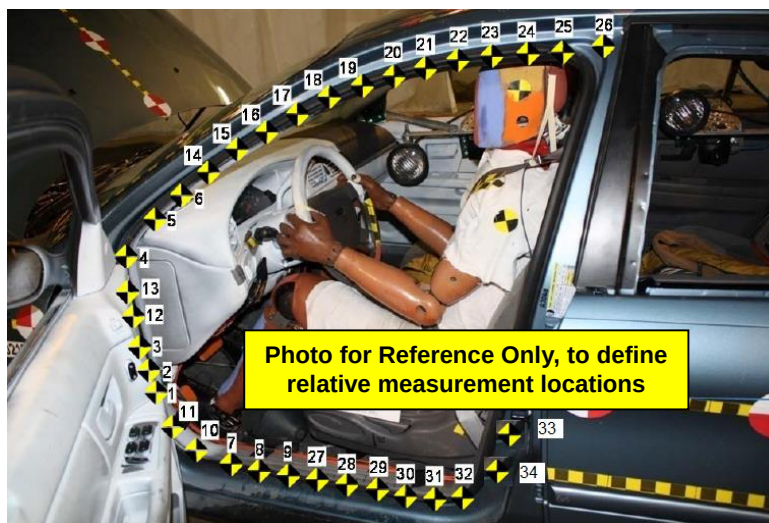


Figure 25: Driver Door Measurements

Passenger Door Measurements

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

Pre-Test Exterior Profile

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

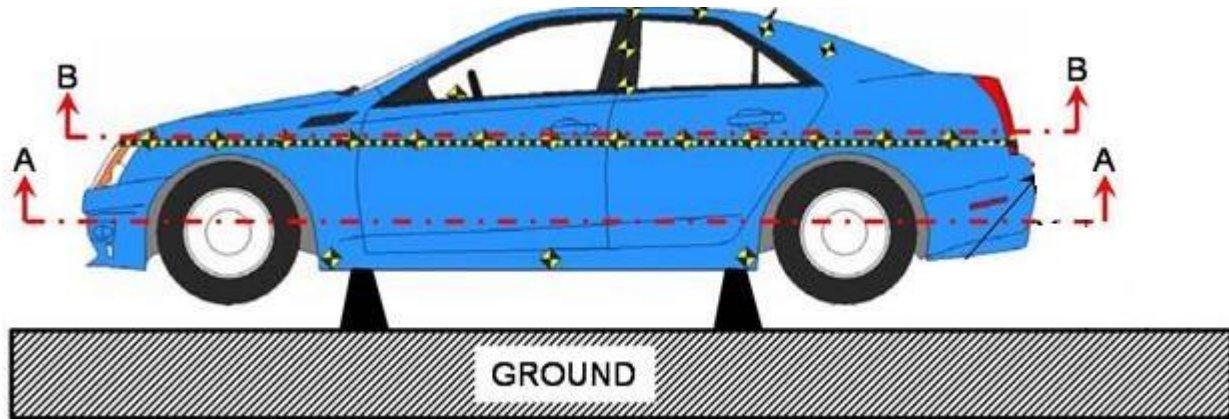


Figure 26: Pre-Test Vehicle Profile

Post-Test Exterior Profile

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

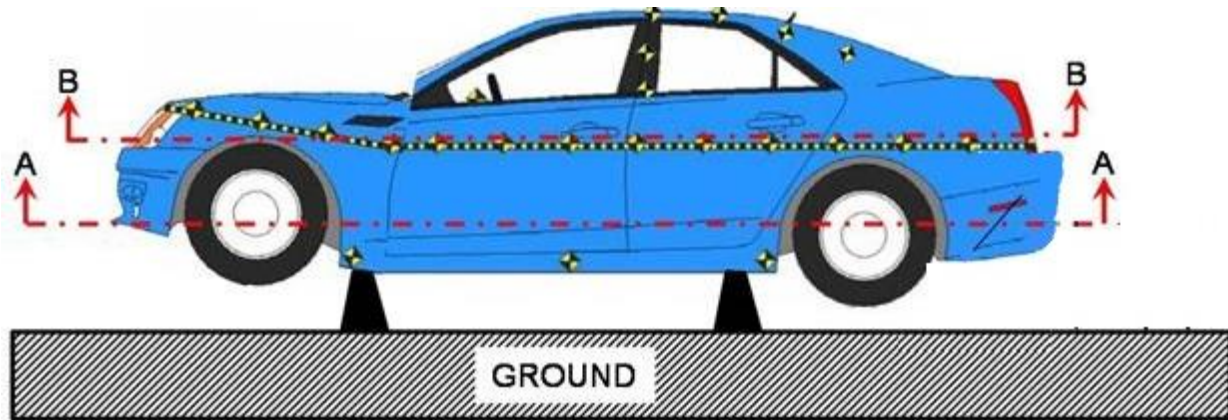


Figure 27: Post-Test Vehicle Profile

Pre and Post Honeycomb Requirements

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

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

KEY

- Angular Rate Sensor (14.5x10x7mm)
- Accelerometer (9x9x9mm)

Measurements Taken on surface

Mounting Plate

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

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