Frontal Oblique Offset Test
90.1 kph, 15 degree angle, 35% overlap
Research Vehicle 8572

NHTSA Code: M7V1T1P
Report Number: R&D-CAL-13-05
Report Date: November 13, 2013

Contract Number: 4500414343
Test Number: CAL2658
Test Date: November 13, 2013

Test Conducted By:
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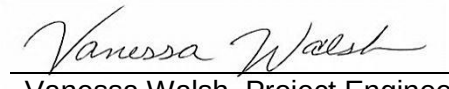
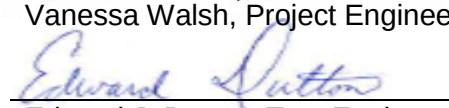
Prepared by:  Date: March 9, 2015

Vanessa Walsh, Project Engineer

Approved by:  Date: March 9, 2015

Edward J. Dutton, Test Engineer Director
Transportation Test Operations

TECHNICAL REPORT DOCUMENTATION PAGE

Report No.:	***Report Date:***	***Customer PO or Contract No.:***
R&D-CAL-13-05	3/9/2015	4500414343

Test Type and Vehicle:	***Author(s):***
Report for Frontal Oblique Offset Program Testing of a Research Vehicle 8572 Test No.: CAL2658	Vanessa Walsh, Project Engineer Edward Dutton, Senior Test Engineer
Performed By: Calspan Corporation 4455 Genesee Street Buffalo, New York 14225	***Calspan Internal Charge No.:*** CV0167.0000

16. Abstract

A test was conducted in accordance with Contract No. 4500414343. 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 November 13, 2013.

The impact velocity of the vehicle was 90.11 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 315 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	185.39	700	112.96
Maximum Chest Compression	mm	63	-47.04	63	-30.04
Neck Injury Criteria (Nij)	N/A	1	0.36	1	0.27
Neck Tension	N	4,170	2070.11	4,170	1469.76
Neck Compression	N	4,000	-373.05	4,000	-1075.50
Left Femur Force	N	10,008	-5453.45	10,008	-2667.49
Right Femur Force	N	10,008	-4229.73	10,008	-2127.68

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SECTION 1
PURPOSE OF TEST

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

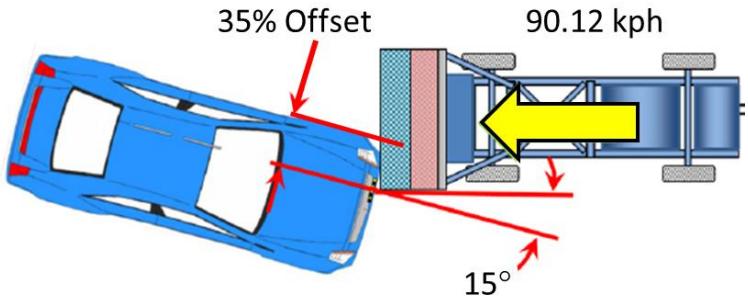
This 90.12 kph (56 mph) Moving Barrier into a test vehicle is part of the Frontal Offset Test outlined in Contract No. 4500414343. The purpose of this test is to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

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. 4500414343. 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. 4500414343.

SECTION 2
SUMMARY OF TEST

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

A Research Vehicle 8572 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 2,109 kg (4,648.2 lbs), and the RMDB's mass was 2490.7 kg (5491 lbs). The test was conducted by Calspan Corporation on November 13, 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.

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

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

SECTION 2 (CONTINUED)

SUMMARY OF TEST

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

Two hundred and forty five (245) 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 100 total windshield retention, with 100% 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 315 mm at C2 to the left of the vehicle's centerline. The maximum crush of the structural bumper beam was 305 mm at B2, to the left of the vehicle's centerline. Full vehicle measurements are presented in Section 3 of this report.

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

Structure observations include the following:

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

The driver ATD's visible contact points were:

- Head contacted the frontal and curtain airbag, and side head liner
- Torso contacted the frontal airbag, and driver's arm and side torso contacted the door
- Knee contacted the knee airbag

The passenger ATD's visible contact points were:

- Head contacted the frontal airbag, side head liner and visor
- Torso contacted the frontal airbag
- Knee contacted the knee airbag

SECTION 2 (CONTINUED)
CRASH VEHICLE SUMMARY

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

Primary Impact Data

Measured Parameter	Units	Value
RMDB Velocity at Impact	kph	90.11
RMDB Test Weight	kg	2490.7
RMDB Maximum Static Crush	mm	227.4
Vehicle Test Weight	kg	2109
Actual Vehicle Angle	degrees	15
Vehicle Maximum Static Crush	mm	305
Vertical Offset from Target Point (+ down / - up)*	mm	-8
Lateral Offset from Target Point (+ left / - right)*	mm	+10
Number of Data Channels		245
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 airbag, and side head liner	A49-A51	Front airbag, side head liner & visor	A70-A72
Left Side Contact	Shoulder, lower arm, and side torso contact driver's side door		N/A	
Upper Torso Contact	Front airbag	NA	Front Airbag	NA
Lower Torso Contact	None	NA	None	NA
Left Knee Contact	Knee Airbag	A28	Knee Airbag	A52
Left Outside Leg Contact	None		N/A	
Right Knee Contact	Knee Airbag	A28	Knee Airbag	A52

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2013 Research Vehicle 8572 NHTSA No.: CAL2658
Test Program: Research and Development Left Oblique Offset Test Date: 11/13/2013

Driver: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	2.88	-48.82
	Head CG Y	g	1000	19.19	-11.10
	Head CG Z	g	1000	25.74	-4.22
	Head Resultant	g	Compute	54.07	
	36 ms HIC		Compute	225.04	
	15 ms HIC		Compute	185.39	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	44.64	
	Head Rotational Velocity X	deg/s	60	578.53	-1087.84
	Head Rotational Velocity Y	deg/s	60	560.43	-1547.05
	Head Rotational Velocity Z	deg/s	60	600.45	-423.56
	Head Rotational Velocity Resultant	deg/s	Compute	1566.73	
	Brain Injury Criteria		Compute	0.61	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	189.97	-480.67
	UNLC Neck System Tension, FZ	N	1000	2070.11	
	UNLC Neck System Compression, FZ	N	1000		-373.05
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	10.27	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-12.64
	NIJ		Compute	0.36	
	On head acting through total neck section, FX	N	Thortest	314.19	-325.30
	On head acting through total neck section, FY	N	Thortest	489.58	-289.74
	On head acting through total neck section, FZ	N	Thortest	2116.98	-423.48
	On head acting through total neck section, MX	N-m	Thortest	32.13	-51.53
	On head acting through total neck section, MY	N-m	Thortest	23.99	-17.14
	On head acting through total neck section, MZ	N-m	Thortest	9.02	-8.02
	On head acting through O.C. joint only, FX	N	Thortest	266.21	-476.66
	On head acting through O.C. joint only, FZ	N	Thortest	2068.09	-373.24
	On head acting through O.C. joint only, MY	N-m	Thortest	10.27	-12.64
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	3.39	-27.07
	Upper Left IR-TRACC Y - deflection	mm	Thortest	7.39	-2.60
	Upper Left IR-TRACC Z - deflection	mm	Thortest	7.80	-19.89
	Upper Left IR-TRACC D - deflection	mm	Thortest	3.60	-25.51
	Upper Right IR-TRACC X - deflection	mm	Thortest	1.04	-36.94
	Upper Right IR-TRACC Y - deflection	mm	Thortest	9.81	-4.30
	Upper Right IR-TRACC Z - deflection	mm	Thortest	18.20	-7.78
	Upper Right IR-TRACC D - deflection	mm	Thortest	1.07	-36.06
	Lower Left IR-TRACC X - deflection	mm	Thortest	13.74	-12.17
	Lower Left IR-TRACC Y - deflection	mm	Thortest	3.01	-22.58

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2013 Research Vehicle 8572 NHTSA No.: CAL2658
Test Program: Research and Development Left Oblique Offset Test Date: 11/13/2013

Driver: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	6.11	-14.65
	Lower Left IR-TRACC D - deflection	mm	Thortest	12.65	-12.40
	Lower Right IR-TRACC X - deflection	mm	Thortest	2.34	-50.26
	Lower Right IR-TRACC Y - deflection	mm	Thortest	5.29	-33.62
	Lower Right IR-TRACC Z - deflection	mm	Thortest	1.80	-14.16
	Lower Right IR-TRACC D - deflection	mm	Thortest	2.33	-47.04
	Chest CG Acceleration, 3 ms clip	g	Compute	36.02	
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	6.45	-36.46
	Upper Spine (T1) AY	g	180	32.07	-8.07
	Upper Spine (T1) AZ	g	180	20.59	-4.96
	Upper Spine (T1) Resultant	g	Compute	45.02	
	Middle Spine (T6) AX	g	180	14.07	-34.44
	Middle Spine (T6) AY	g	180	32.04	-3.02
	Middle Spine (T6) AZ	g	180	3.23	-6.73
	Middle Spine (T6) Resultant	g	Compute	38.76	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	57.23	
Acetabulum	Left FX force	N	600	1014.79	-2490.13
	Left FY force	N	600	1274.89	-154.26
	Left FZ force	N	600	1115.88	-2038.44
	Left Acetabulum Resultant	N	Compute	2717.58	
	Right FX force	N	600	522.35	-1771.07
	Right FY force	N	600	595.12	-1051.42
	Right FZ force	N	600	1447.65	-305.33
	Right Acetabulum Resultant	N	Compute	2101.12	

Anomalies
None

SECTION 2 (CONTINUED)
PRELIMINARY INJURY SUMMARY: Driver Legs

Test Vehicle: 2013 Research Vehicle 8572 NHTSA No.: CAL2658
Test Program: Research and Development Left Oblique Offset Test Date: 11/13/2013

Driver: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	0.41	-12.29
	Right Knee Displacement, DX	mm	180	0.59	-9.75
Femur	Left Femur Force, FZ	N	600	356.19	-5453.45
	Left Femur Moment, MX	N-m	600	48.55	-123.20
	Left Femur Moment, MY	N-m	600	51.81	-26.12
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	124.12	
	Right Femur Force, FZ	N	600	378.26	-4229.73
	Right Femur Moment, MX	N-m	600	57.73	-128.28
	Right Femur Moment, MY	N-m	600	135.90	-36.28
	Right Femur Res (MX / MX only, not MZ)	N-m	Compute	180.21	
Tibia	Left Upper Tibia, FZ	N	600	49.88	-2430.94
	Left Upper Tibia, MY	N-m	600	74.14	-9.96
	Left Upper Tibia, Index		Compute	0.61	
	Right Upper Tibia, FZ	N	600	380.56	-2864.05
	Right Upper Tibia, MY	N-m	600	106.43	-27.30
	Right Upper Tibia, Index		Compute	0.88	
	Left Lower Tibia, FZ	N	600	29.25	-3310.03
	Left Lower Tibia, MY	N-m	600	34.47	-17.58
	Left Lower Tibia, Index		Compute	0.61	
	Right Lower Tibia, FZ	N	600	455.62	-3540.81
	Right Lower Tibia, MY	N-m	600	55.42	-18.21
	Right Lower Tibia, Index		Compute	0.99	
Ankle	Left Ankle Rotation, RX	Deg	180	17.71	-26.79
	Left Ankle Rotation, RY	Deg	180	20.79	-11.65
	Right Ankle Rotation, RX	Deg	180	20.89	-38.60
	Right Ankle Rotation, RY	Deg	180	-7.72	-30.29

Anomalies
None

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

Test Vehicle: 2013 Research Vehicle 8572 NHTSA No.: CAL2658
Test Program: Research and Development Left Oblique Offset Test Date: 11/13/2013

Right Front Passenger: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	30.84	-25.32
	Head CG Y	g	1000	22.52	-32.57
	Head CG Z	g	1000	38.57	-2.37
	Head Resultant	g	Compute	43.35	
	36 ms HIC		Compute	212.63	
	15 ms HIC		Compute	112.96	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	39.85	
	Head Rotational Velocity X	deg/s	60	906.11	-2027.25
	Head Rotational Velocity Y	deg/s	60	1183.23	-1514.66
	Head Rotational Velocity Z	deg/s	60	2734.43	-1555.03
	Head Rotational Velocity Resultant	deg/s	Compute	3361.51	
	Brain Injury Criteria		Compute	741.99	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	455.11	-181.76
	UNLC Neck System Tension, FZ	N	1000	1469.76	
	UNLC Neck System Compression, FZ	N	1000		-1075.50
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	22.61	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-9.27
	NIJ		Compute	0.27	
	On head acting through total neck section, FX	N	Thortest	577.97	-275.96
	On head acting through total neck section, FY	N	Thortest	494.09	-315.91
	On head acting through total neck section, FZ	N	Thortest	1569.28	-1070.83
	On head acting through total neck section, MX	N-m	Thortest	47.51	-45.61
	On head acting through total neck section, MY	N-m	Thortest	25.16	-33.32
	On head acting through total neck section, MZ	N-m	Thortest	6.44	-49.51
	On head acting through O.C. joint only, FX	N	Thortest	530.36	-260.26
	On head acting through O.C. joint only, FZ	N	Thortest	1402.10	-1081.40
	On head acting through O.C. joint only, MY	N-m	Thortest	22.61	-9.27
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	0.07	-30.25
	Upper Left IR-TRACC Y - deflection	mm	Thortest	6.46	-14.99
	Upper Left IR-TRACC Z - deflection	mm	Thortest	19.31	-5.64
	Upper Left IR-TRACC D - deflection	mm	Thortest	0.07	-30.04
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.67	-14.63
	Upper Right IR-TRACC Y - deflection	mm	Thortest	6.90	-13.16
	Upper Right IR-TRACC Z - deflection	mm	Thortest	9.30	-5.92
	Upper Right IR-TRACC D - deflection	mm	Thortest	1.12	-11.98
	Lower Left IR-TRACC X - deflection	mm	Thortest	0.65	-29.56
	Lower Left IR-TRACC Y - deflection	mm	Thortest	6.86	-7.37

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

Test Vehicle: 2013 Research Vehicle 8572 NHTSA No.: CAL2658
Test Program: Research and Development Left Oblique Offset Test Date: 11/13/2013

Right Front Passenger: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	10.24	-13.20
	Lower Left IR-TRACC D - deflection	mm	Thortest	0.19	-28.87
	Lower Right IR-TRACC X - deflection	mm	Thortest	1.77	-9.71
	Lower Right IR-TRACC Y - deflection	mm	Thortest	4.25	-18.22
	Lower Right IR-TRACC Z - deflection	mm	Thortest	2.19	-7.85
	Lower Right IR-TRACC D - deflection	mm	Thortest	5.54	-7.18
	Chest CG Acceleration, 3 ms clip	g	Compute	28.20	
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	5.55	-49.87
	Upper Spine (T1) AY	g	180	52.01	-3.52
	Upper Spine (T1) AZ	g	180	13.70	-2.75
	Upper Spine (T1) Resultant	g	Compute	71.55	
	Middle Spine (T6) AX	g	180	4.12	-28.65
	Middle Spine (T6) AY	g	180	17.33	-4.88
	Middle Spine (T6) AZ	g	180	10.89	-5.19
	Middle Spine (T6) Resultant	g	Compute	29.85	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	51.84	
Acetabulum	Left FX force	N	600	1949.99	-1581.83
	Left FY force	N	600	462.61	-588.68
	Left FZ force	N	600	625.18	-260.00
	Left Acetabulum Resultant	N	Compute	2001.86	
	Right FX force	N	600	1351.90	-832.11
	Right FY force	N	600	93.89	-1504.21
	Right FZ force	N	600	1587.15	-39.13
	Right Acetabulum Resultant	N	Compute	2093.93	

Anomalies
None

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

Test Vehicle: 2013 Research Vehicle 8572 NHTSA No.: CAL2658
Test Program: Research and Development Left Oblique Offset Test Date: 11/13/2013

Right Front Passenger: Thor Serial No. 015 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	0.37	-7.28
	Right Knee Displacement, DX	mm	180	0.84	-5.62
Femur	Left Femur Force, FZ	N	600	244.66	-2667.49
	Left Femur Moment, MX	N-m	600	98.85	-80.03
	Left Femur Moment, MY	N-m	600	49.38	-4.68
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	109.31	
	Right Femur Force, FZ	N	600	377.89	-2127.68
	Right Femur Moment, MX	N-m	600	57.80	-235.43
	Right Femur Moment, MY	N-m	600	127.96	-27.80
	Right Femur Res (MX / MX only, not MZ)	N-m	Compute	241.27	
Tibia	Left Upper Tibia, FZ	N	600	52.52	-2632.68
	Left Upper Tibia, MY	N-m	600	47.62	-13.93
	Left Upper Tibia, Index		Compute	0.50	
	Right Upper Tibia, FZ	N	600	231.98	-2628.87
	Right Upper Tibia, MY	N-m	600	66.92	-12.07
	Right Upper Tibia, Index		Compute	0.76	
	Left Lower Tibia, FZ	N	600	40.32	-3078.11
	Left Lower Tibia, MY	N-m	600	23.49	-17.85
	Left Lower Tibia, Index		Compute	0.54	
	Right Lower Tibia, FZ	N	600	137.30	-3191.62
	Right Lower Tibia, MY	N-m	600	28.34	-16.02
	Right Lower Tibia, Index		Compute	0.58	
Ankle	Left Ankle Rotation, RX	Deg	180	28.13	-19.16
	Left Ankle Rotation, RY	Deg	180	-4.83	-22.58
	Right Ankle Rotation, RX	Deg	180	23.98	-32.47
	Right Ankle Rotation, RY	Deg	180	-5.87	-26.61

Anomalies
None

SECTION 3
DATA SHEETS

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

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

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

VEHICLE INFORMATION

Test No.	CAL2658
Model Year	
Make	
Model	
Body Style	4 Door Sedan
VIN	
Body Color	Black
Odometer Reading (km/mi)	30.58 km / 19 mi
Engine Displacement. (L)	2.0
Type/No. Cylinders	I4
Engine Placement	Inline
Transmission Type	Automatic
Transmission Speeds	CVT
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof/T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes
All-Wheel Drive (AWD)	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	Yes
Pass. Front Airbag	Yes
Pass. Curtain Airbag	Yes
Pass. Head/Torso Airbag	No
Pass. Torso Airbag	Yes
Pass. Torso/Pelvis Airbag	No
Pass. Pelvis Airbag	No
Pass. Knee Airbag	Yes
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	05/13

GVWR (kg)	2315
GAWR Front (kg)	1160
GAWR Rear (kg)	1230

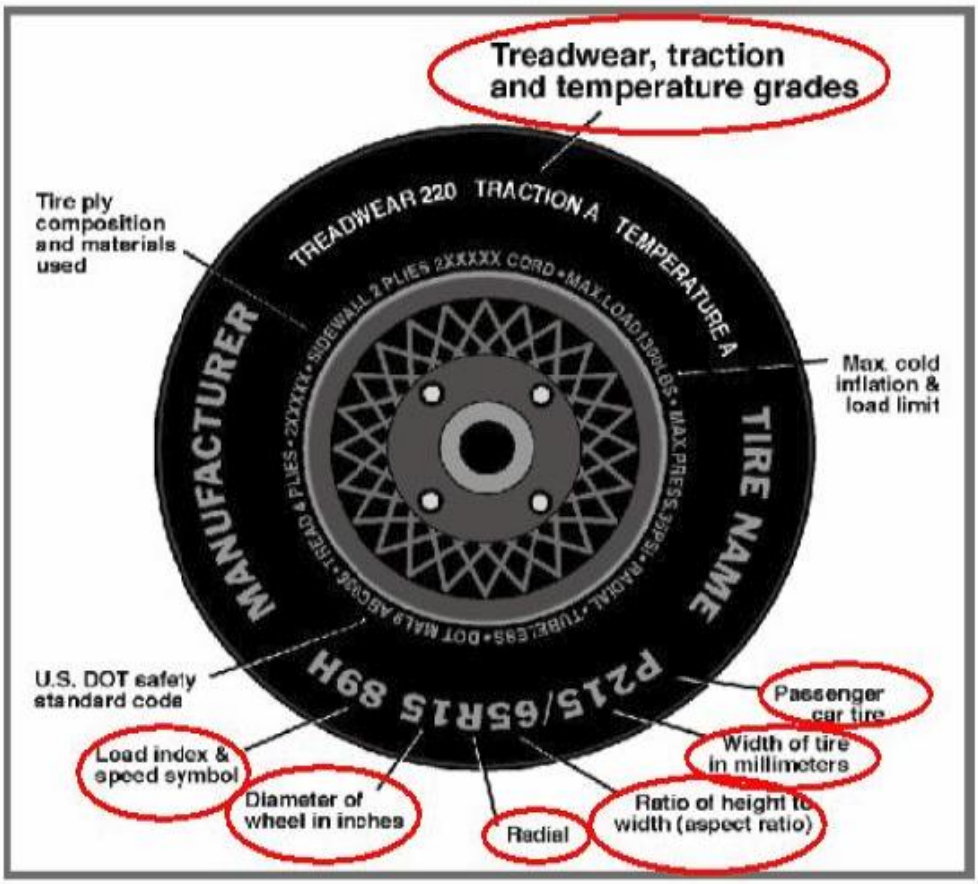
VEHICLE SEATING AND WEIGHT CAPACITY

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	--	
Number of Occupants	2	3	--	5
Capacity Wt. (VCW) (kg)				500
Cargo Wt. (RCLW) (kg)				136

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

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

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



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	340	340
Cold Pressure (kPa)	240	260
Recommended Tire Size	P245/45R18	P245/45R18
Tire Size on Vehicle	P245/45R18	P245/45R18
Tire Manufacturer	Firelli	Firelli
Tire Model	Cintuato	Cintuato
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Rayon	2 Rayon
Tire Plies Body	2 Rayon, 2 Steel, 2 Polyamide	2 Rayon, 2 Steel, 2 Polyamide
Load Index/Speed Symbol	100H	100H
Tire Material	Rubber	Rubber
DOT Safety Code Right	XT4JN3101713	XT4JN3101713
DOT Safety Code Left	XT4JN3101713	XT4JN3101713

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

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	501	387		542	517	
Right	kg	455	441		500	550	
Ratio	%	53.6%	46.4%		49.4%	50.6%	
Totals	kg	956	828	1784	1042	1067	2109

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1784.0
Weight of 2 P572E ATDs	kg	197.8
Rated Cargo/Luggage Weight (RCLW)	kg	136.0
Calculated Vehicle Target Weight (TVTW)	kg	2117.8

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	743	743	752	751	1348
As Tested	mm	728	729	713	709	1469
Post Test	mm	791	698	658	770	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2904
Total Vehicle Length at Left Side	mm	4814
Total Vehicle Length at Centerline	mm	4922
Total Vehicle Length at Right Side	mm	4819
Weight of Ballast in Cargo Area	kg	58
Weight of Vehicle Components Removed	kg	20
Amount of Stoddard Solvent in Fuel Tank	L	69.7

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting, spare tire, jack, and tail light

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

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements		Pre-Test
1	Total Length	mm	4922
2	Total Width	mm	1867
3*	Bumper Top Height	mm	518
4*	Bumper Bottom Height	mm	433
5*	Longitudinal Member Top Height	mm	527
6	Distance Between Longitudinal Members	mm	1011
7	Longitudinal Member Width	mm	80
8*	Engine Top Height	mm	864
9*	Engine Bottom Height	mm	167
10	Engine and Gearbox Width	mm	524
11	Front Bumper-Engine Distance	mm	445
12*	Front Shock Absorber Fixing Height	mm	867
13*	Bonnet Leading Edge Height	mm	726
14	Front Shock Absorber Fixing Width	mm	906
15	Front Bumper – Front Axle Distance	mm	922
16	Front Axle – A Pillar Distance	mm	617
17	A-Pillar – B-Pillar Distance	mm	1120
18	B-Pillar – Rear Axle Distance	mm	1165
19	B-Pillar – C-Pillar Distance	mm	937
20*	Roof Sill Bottom Height	mm	1323
21*	Roof Sill Top Height	mm	1421
22*	Floor Sill Bottom Height	mm	294
23*	Floor Sill Top Height	mm	386

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

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

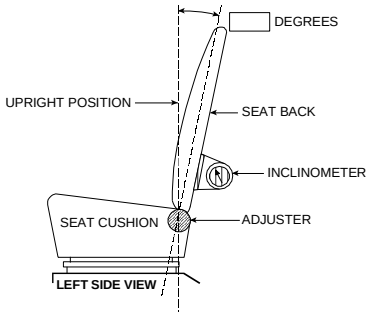
Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

NORMAL DESIGN RIDING POSITION

For adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.

Driver seat: The driver seat back was positioned according to the Nominal Design Riding position listed in FORM 1

Passenger Seat: The passenger seat back was positioned according to the Nominal Design Riding position listed in FORM 1



FRONT SEAT ASSEMBLY

	Deg.
Driver Seat Back Angle	19.6
Passenger Seat Back Angle	19.3

SEAT FORE/AFT POSITIONS

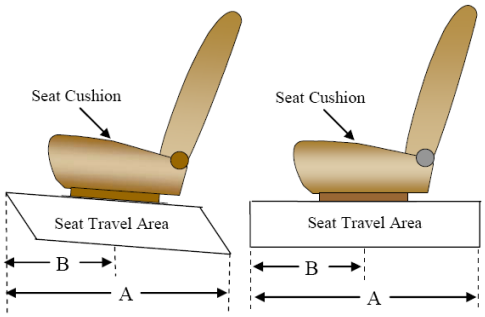
Describe the method used of determining seat fore/aft positions. The driver's seat was positioned at its lowest postion and at the mid-point of fore/aft travel. The passenger's seat was positioned at the mid-point of fore/aft travel.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	307	154
Passenger Seat	314	157

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 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

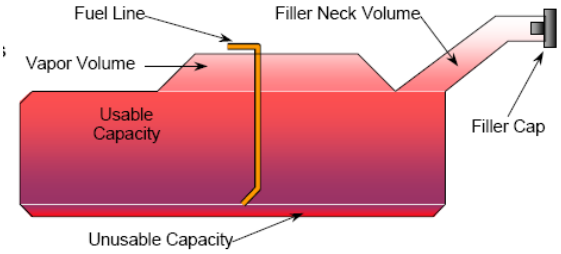
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	75.0
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	69.7
Actual Amount of Solvent Used	69.7
1/3 of Usable Capacity	25.0

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.

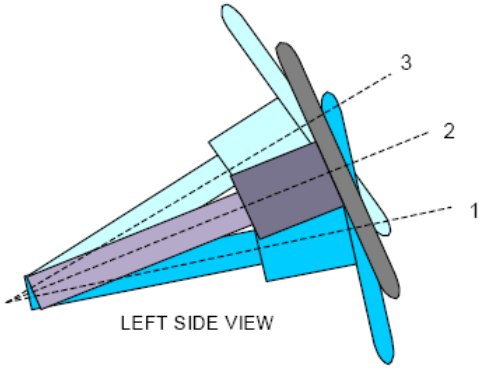


VEHICLE FUEL TANK ASSEMBLY

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)



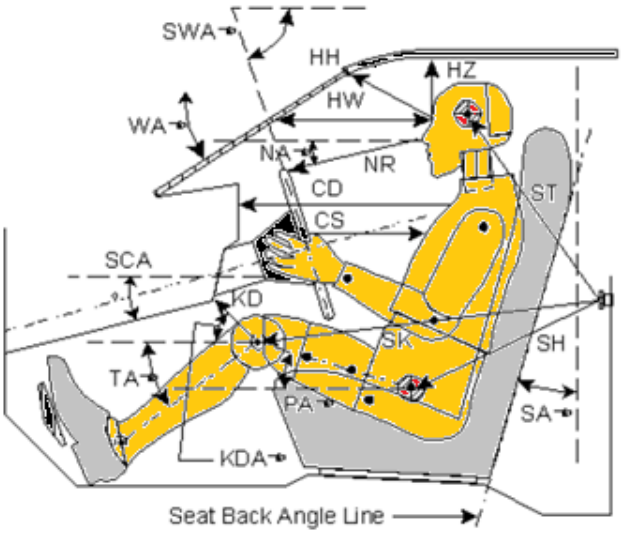
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

	Tilt (degrees)	Fore/Aft Position (mm)
Lowermost position No. 1	18.8	
Geometric center position No. 2	21.4	
Uppermost position No. 3	23.9	
Telescoping Steering Wheel Travel		60
Test Position	21.4	30

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013



Code	Measurement Description	Driver (Serial # THOR 016)		Passenger (Serial # THOR 015)	
		Length (mm)	Angle(°)	Length (mm)	Angle (°)
WAº	Windshield Angle		-27.0		
SWAº	Steering Wheel Angle		21.9		
SCAº	Steering Column Angle		68.1		
SAº	Seat Back Angle (on headrest post)		19.6		19.3
HZ	Head to Roof (Z)	157	90	154	90
HH	Head to Header	420	16.4	447	14.4
HW	Head to Windshield	655	0	640	0
NR	Nose to Rim	506	16.1	690	-30.2
CD	Chest to Dash	578		549	
CS	Chest to Steering Hub	362	0		
RA	Rim to Abdomen	210	0		
KDL	Left Knee to Dash	177	37.8	177	36.8
KDR	Right Knee to Dash	182	39.6	182	39.6
PAº	Pelvic Angle		23.1		22.9
TAº	Tibia Angle		-34.5		33.9
SK	Striker to Knee	574	-11.3	583	-13.9
ST	Striker to Head	468	86.2	460	82.5
SH	Striker to H-Point	278	-53.6	265	-56.1
HAX˚	Head Angle (X)		0.1		0.4
HAY˚	Head Angle (Y)		-0.1		-0.4
TAX˚	T1 Angle (X)		0.4		0.3
TAY˚	T1 Angle (Y)		-0.1		1.9
LAX˚	T6 Lumbar Angle (X)		-0.5		-1.2
LAY˚	T6 Lumbar Angle (Y)		20.8		19.9

DATA SHEET NO.3 (CONTINUED)
DUMMY CMM MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

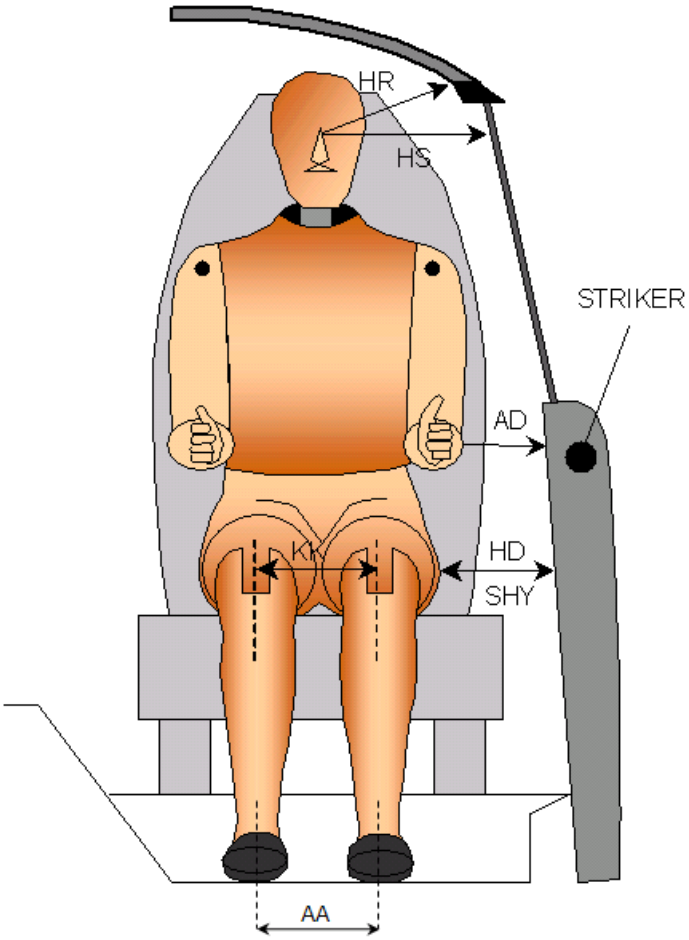
Description	Units	Driver			Passenger		
		X	Y	Z	X	Y	Z
Striker	mm	1423	-795	411	1423	795	409
Head CG	mm	1418	-452	861	1445	452	859
Bridge of Nose	mm	1325	-372	867	1351	377	869
Tip of Nose	mm	1327	-373	824	1349	377	827
Shoulder Bolt	mm	1387	-557	610	1412	610	601
Tip of Chin	mm	1328	-375	732	1351	378	733
H-Point	mm	1222	-573	174	1238	577	181
Left Knee	mm	824	-599	285	822	333	267
Right Knee	mm	809	-303	291	820	552	261
Left Ankle	mm	487	-623	48	450	335	70
Right Ankle	mm	466	-278	55	448	544	63
Left Heel	mm	458	-599	-85	439	310	-68
Right Heel	mm	444	-240	-73	439	506	-72
Head Bolt 1 – Top Left	mm	1489	-408	907	1513	331	906
Head Bolt 2 – Lower Left	mm	1480	-398	821	1502	346	820
Head Bolt 3 – Top Right	mm	1488	-339	907	1515	407	904
Head Bolt 4 – Lower Right	mm	1479	-347	820	1506	396	819
Driver's Outboard Seat Anchor Bolt	mm	957	-648	-11	1423	795	409
Outboard Head Restraint Post	mm	1574	-463	692	1590	465	691
Top of Head Restraint	mm	1515	-376	931	1507	380	927
Center of Steering Wheel	mm	906	-381	570			

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

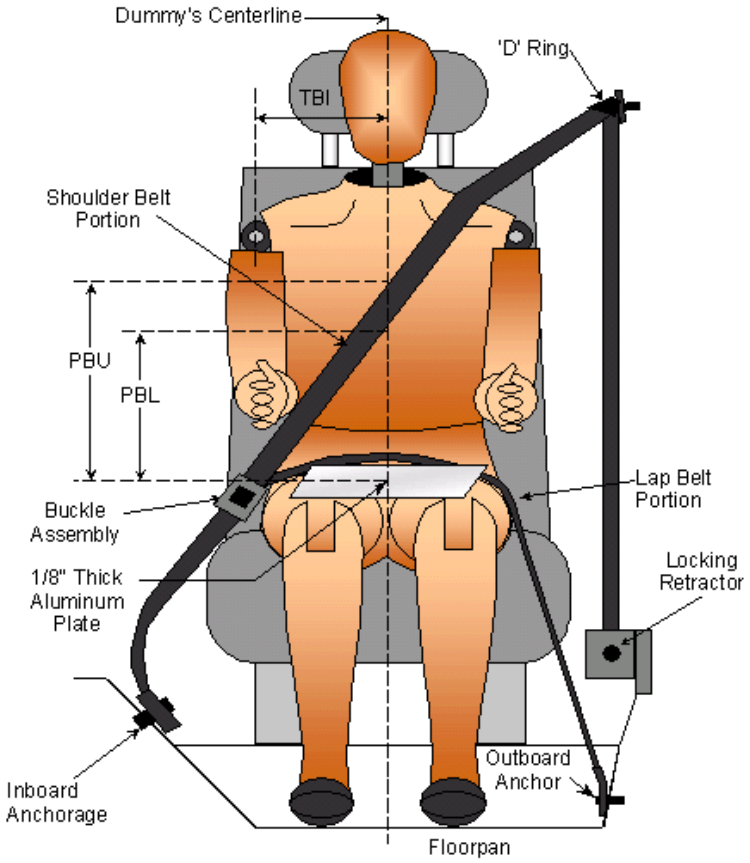
Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013



Code	Description	Units	Driver	Passenger
AD	Arm to Door	mm	162	58
HD	H-Point to Door	mm	134	143
HR	Head to Side Header	mm	193	193
HS	Head to Side Window	mm	338	338
KK	Knee to Knee	mm	350	270
SHY	Striker to H-Point (Y Direction)	mm	235	240
AA	Ankle to Ankle	mm	340	203

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	385	395
PBL — Top surface of reference to belt lower edge	mm	295	305

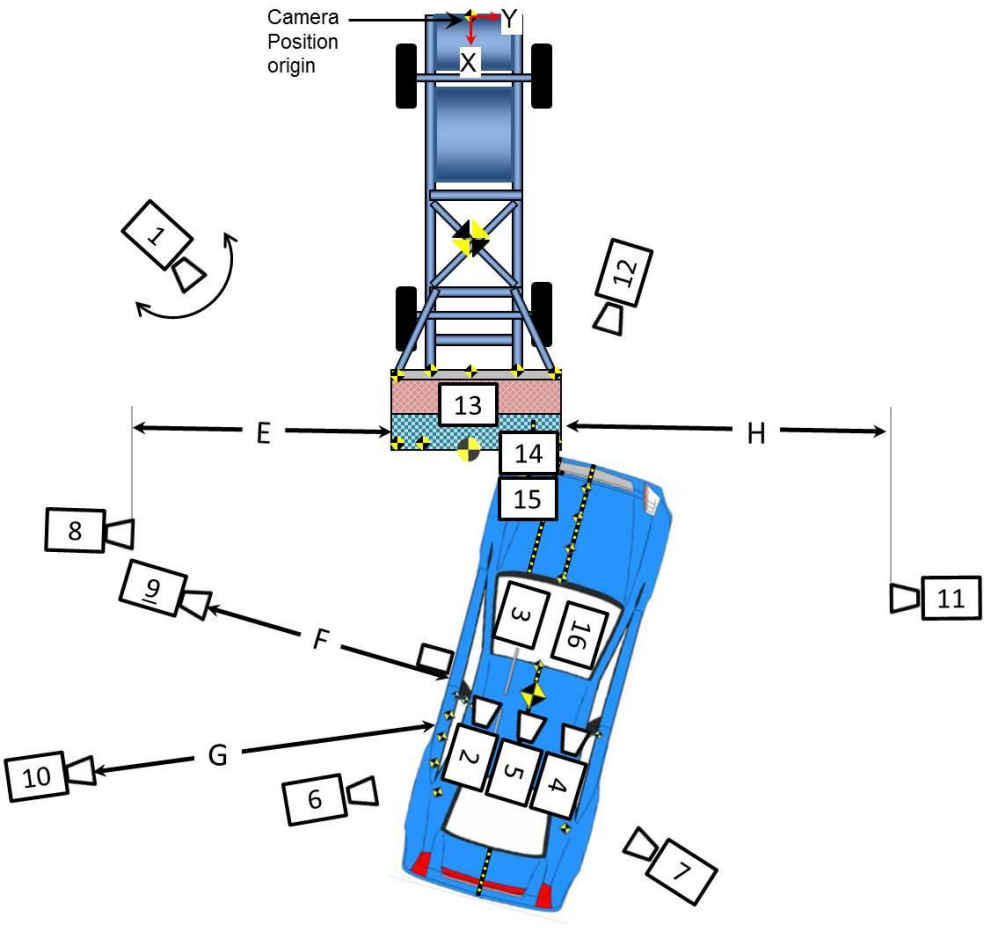
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	845	840
Lap Belt Length as measured on ATD	mm	575	575
Remainder of belt on reel	mm	830	835
Total belt length for continuous webbing systems	mm	2250	2250

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

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

HORIZONTAL LOCATION

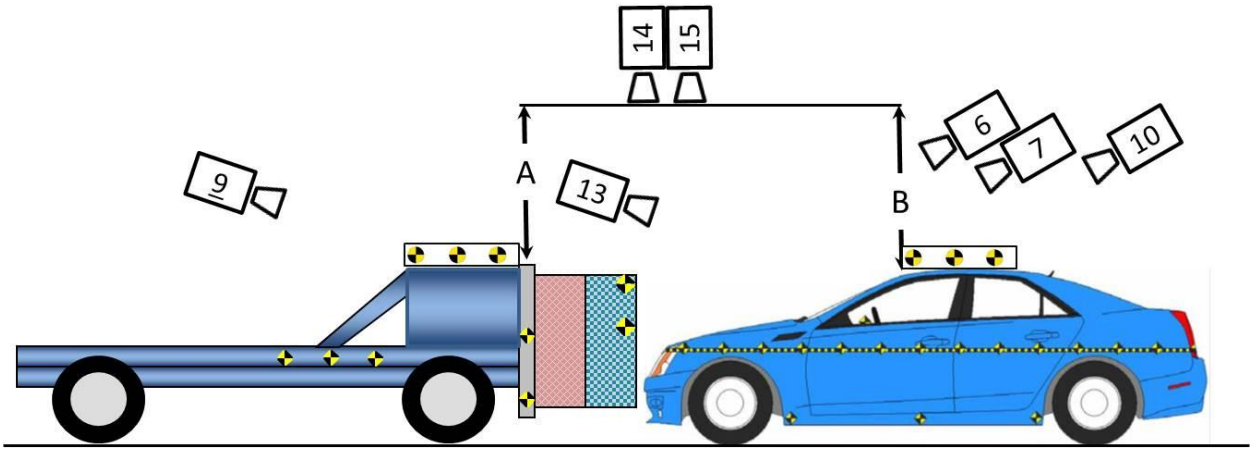


E	mm	6716
F	mm	7513
G	mm	9381
H	mm	6763

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

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

VERTICAL LOCATION



A	mm	4164
B	mm	3920

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

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

CAMERA LOCATIONS

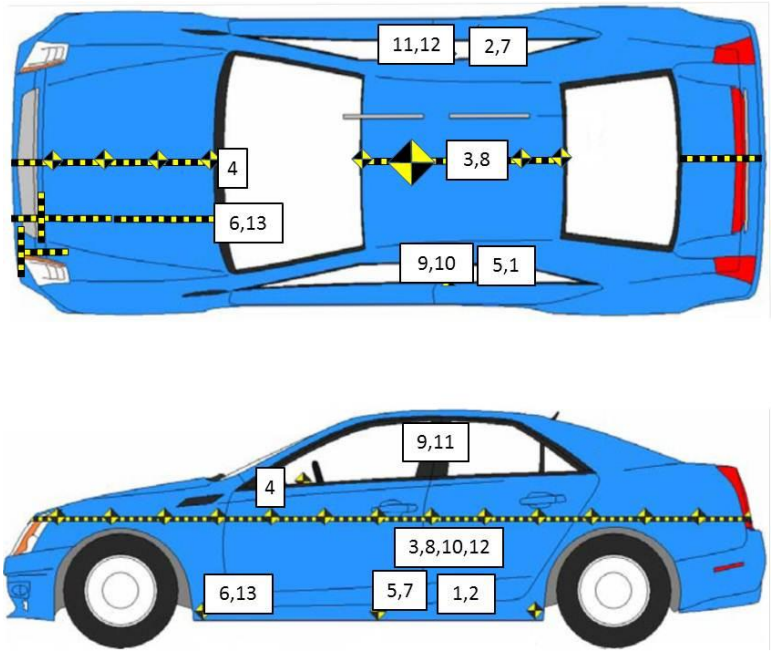
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side	--	--	--	Zoom	30
2	Onboard Passenger Movement	7786	190	1235	12.5	1000
3	Onboard Driver Lower Leg	6584	-436	363	6.5	1000
4	Onboard Driver Movement	7621	-1030	1239	12.5	1000
5	Onboard Centerline	8161	-302	1247	12.5	1000
6	Driver Interaction	7553	2216	3663	24	1000
7	Passenger Interaction	11233	-8570	2526	24-70	1000
8	Target Vehicle Left Side Perpendicular (High)	4847	7781	971	24	1000
9	Target Vehicle Driver Motion	6182	7444	1028	28	1000
10	Target Vehicle Passenger Motion	10271	8893	3416	28-70	1000
11	Target Vehicle Right Side	4840	-7864	987	24	1000
12	Target Vehicle Left Side (High)	1115	-2101	1223	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 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

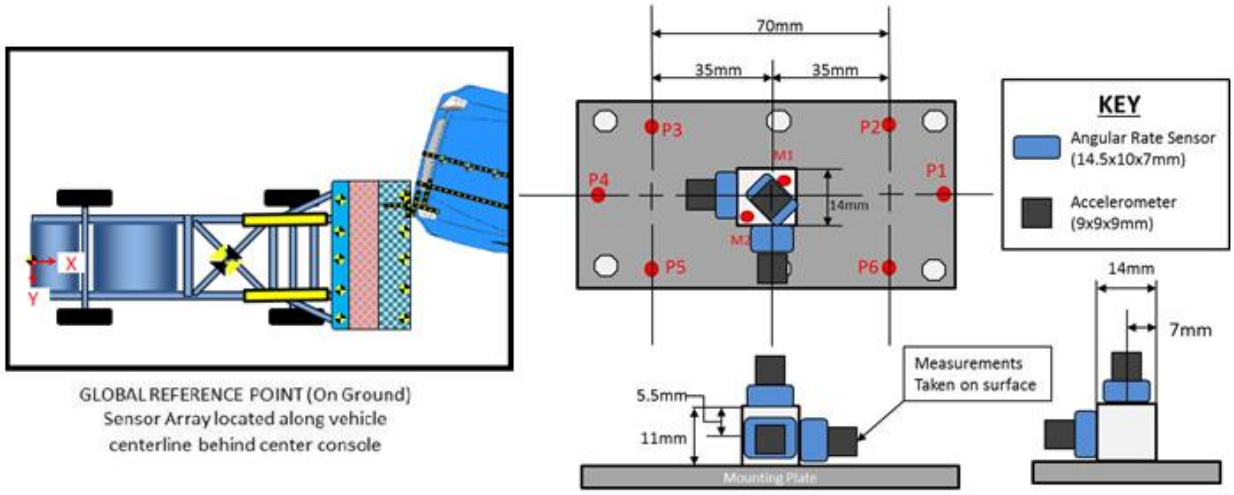
No.	Accelerometer Location	Axes	Units	Measurements (mm)		
				X	Y	Z
1	Left Rear Sill	X,Y	mm	1521	-678	-76
2	Right Rear Sill	X,Y	mm	1537	686	-61
3	Vehicle CG	X,Y,Z	mm	2135	1	136
4	Instrument Panel	X	mm	735	-3	505
5	Driver Seat Track	X,Y,Z	mm	1438	-645	-58
6	Behind Brake Pedal	X,Y,Z	mm	N/A	N/A	N/A
7	Passenger Seat Track	X,Y,Z	mm	1437	650	-56
8	Angular Rate Sensors	X	mm	2166	-1	114
8	Angular Rate Sensors	Y	mm	2137	-22	112
8	Angular Rate Sensors	Z,	mm	2135	1	136

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

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

DATA SHEET NO. 7
VEHICLE INSTRUMENTATION DATA

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013



VEHICLE COORDINATE SYSTEM					
No.	**Accelerometer Location**	**Units**	**Measurements (mm)**		
			X	**Y**	**Z**
ACC-1	Accelerometer CG – X Direction	mm	330	0	937
ACC-2	Accelerometer CG – Y Direction	mm	360	-21	938
ACC-3	Accelerometer CG – Z Direction	mm	361	2	914
M1	Mounting Bolt 1	mm	362	-8	930
M2	Mounting Bolt 2	mm	352	3	930
P1	Plate Point 1	mm	407	2	944
P2	Plate Point 2	mm	396	-19	944
P3	Plate Point 3	mm	326	-19	943
P4	Plate Point 4	mm	315	2	943
P5	Plate Point 5	mm	326	23	943
P6	Plate Point 6	mm	396	22	944

GLOBAL COORDINATE SYSTEM					
No.	**Accelerometer Location**	**Units**	**Measurements (mm)**		
			X	**Y**	**Z**
ACC-1	Accelerometer CG – X Direction	mm	7857	-544	-456
ACC-2	Accelerometer CG – Y Direction	mm	7823	-532	-454
ACC-3	Accelerometer CG – Z Direction	mm	7827	-554	-478
M1	Mounting Bolt 1	mm	7824	-545	-462
M2	Mounting Bolt 2	mm	7837	-553	-462
P1	Plate Point 1	mm	7783	-566	-449
P2	Plate Point 2	mm	7789	-543	-449
P3	Plate Point 3	mm	7856	-525	-450
P4	Plate Point 4	mm	7872	-542	-450
P5	Plate Point 5	mm	7867	-565	-450
P6	Plate Point 6	mm	7799	-583	-449

DATA SHEET NO. 7 (CONTINUED)
VEHICLE INSTRUMENTATION DATA

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

VEHICLE INSTRUMENTATION DATA

Loc.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Max	Time (ms)
1	Left Rear Sill	X	g	1.79	123.65	-30.62	37.35
		Y	g	34.64	44.25	-12.71	12.05
2	Right Rear Sill	X	g	2.77	117.90	-37.54	49.75
		Y	g	27.14	51.65	-7.39	8.95
3	Vehicle CG	X	g	2.09	118.00	-31.72	47.55
		Y	g	14.98	54.00	-1.76	107.80
		Z	g	9.94	48.00	-17.01	8.55
4	Instrument Panel	X	g	35.59	18.40	-50.78	54.30
5	Driver Seat Track	X	g	3.64	8.70	-31.18	61.75
		Y	g	21.69	52.60	-3.65	38.75
		Z	g	15.28	40.60	-20.32	69.10
6	Behind Brake Pedal	X	g	27.27	6.90	-59.73	48.20
		Y	g	33.58	49.95	-9.52	70.35
		Z	g	36.43	32.35	-14.28	60.05
7	Passenger Seat Track	X	g	2.34	118.65	-35.74	60.10
		Y	g	21.62	50.80	-3.74	9.70
		Z	g	6.12	17.15	-13.91	69.30
8	Angular Rate Sensors	X	deg/s	109.40	41.65	-327.42	32.85
		Y	deg/s	165.57	33.30	-246.33	67.95
		Z	deg/s	297.31	65.30	-172.24	47.55
9	Driver Shoulder Belt		N	3877.37	64.50	-82.59	151.40
10	Driver Lap Belt		N	1745.03	58.60	-0.79	-26.75
11	Passenger Shoulder Belt		N	6268.25	55.60	-66.35	199.85
12	Passenger Lap Belt		N	6252.00	67.60	-51.44	218.40
13	Driver Floor Pan String Pot		mm	0.06	0.50	-18.88	70.05

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	8.30
2	Driver Air Bag Squib 2	*	V	208.30
3	Driver Curtain Airbag	*	V	10.35
4	Driver Torso Airbag	*	V	Did Not Fire
5	Driver Knee Airbag	*	V	8.30
6	Driver Pretensioner	*	V	7.35
7	Passenger Air Bag Squib 1	*	V	8.30
8	Passenger Air Bag Squib 2	*	V	13.30
9	Passenger Curtain Airbag	*	V	Disabled
10	Passenger Torso Airbag	*	V	Disabled
11	Passenger Knee Airbag	*	V	8.30
12	Passenger Pretensioner	*	V	7.35

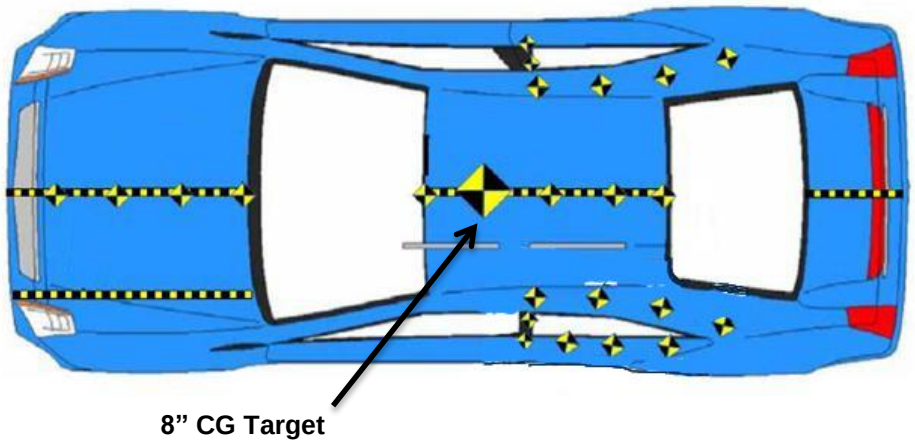
* The measurement indicates the time the voltage changed

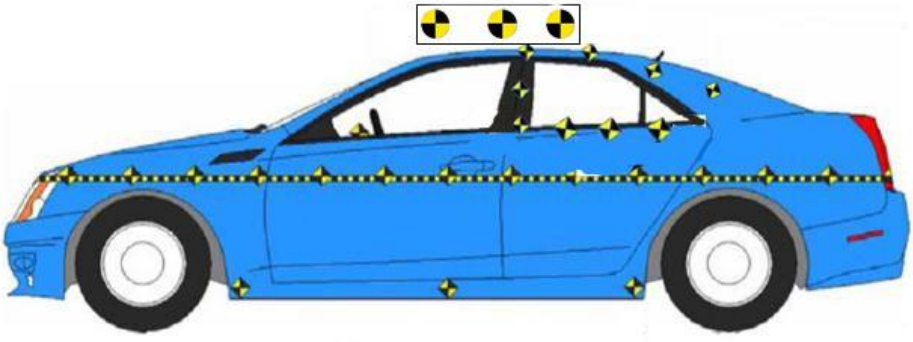
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

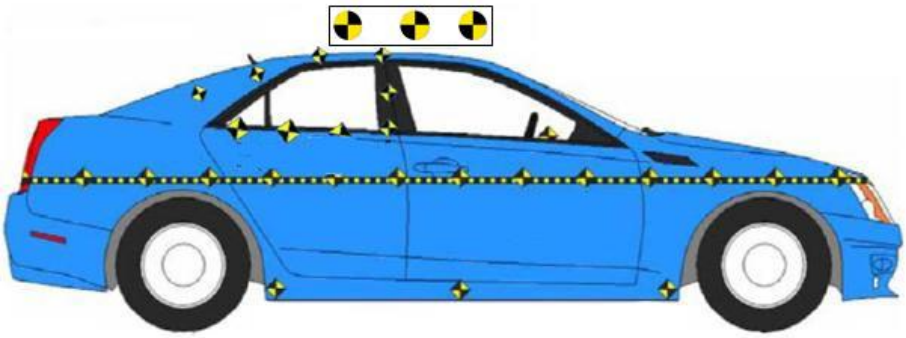
Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

Item	Units	Value
A	mm	282

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

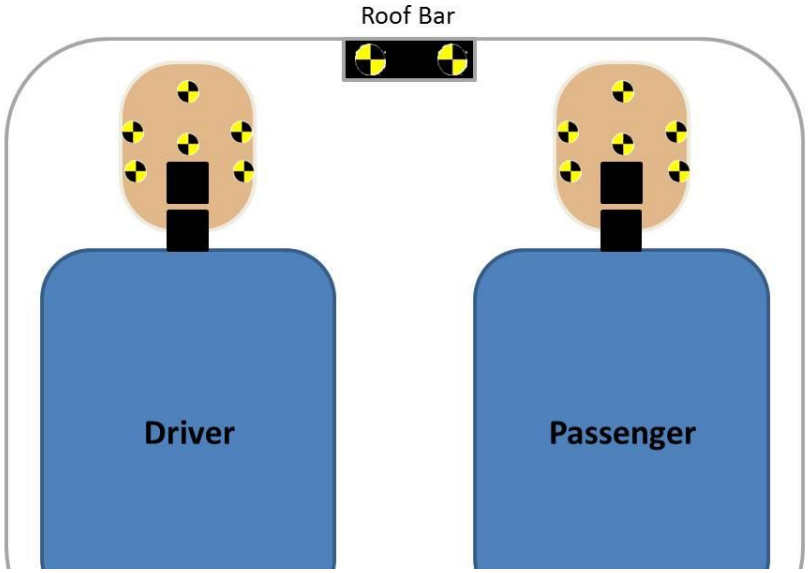






DATA SHEET NO. 8 (CONTINUED)
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013



Point	Pre-Test		
	X	Y	Z
Roof Bar Driver	947	-66	903
Roof Bar Passenger	949	56	903

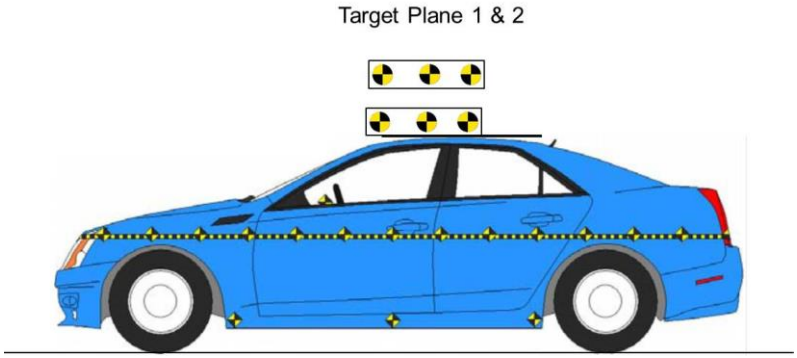
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

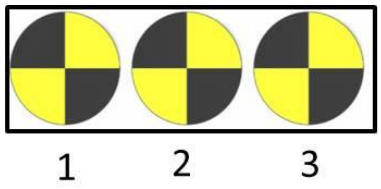
+X – From the rear of the vehicle to the front of the vehicle
+Y – From the left side of the vehicle to the right side of the vehicle
+Z – From the top of the vehicle to the bottom of the vehicle

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

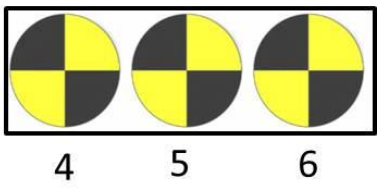
Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

OVERHEAD TARGET BARS





Vertical Target Plane 1 (Driver's Side)



Vertical Target Plane 2 (Passenger Side)

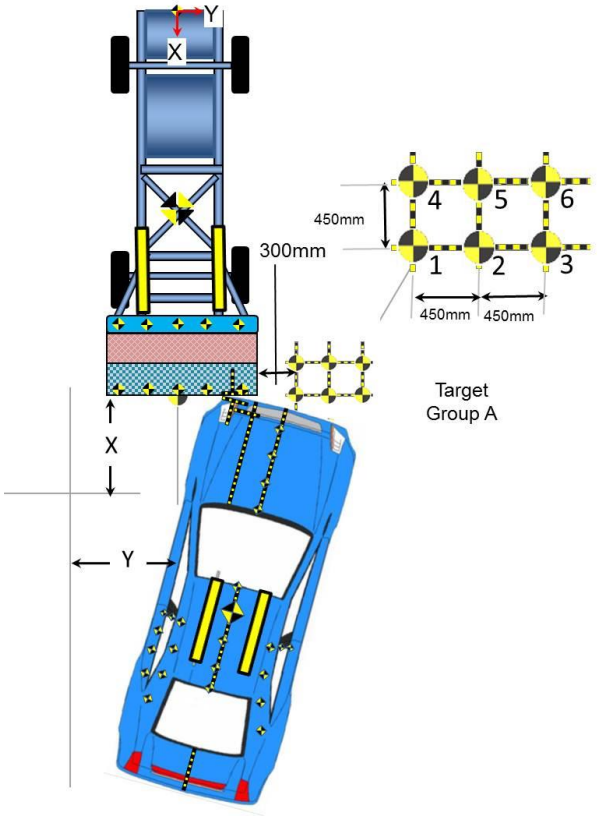
Target	Units	X	Y	Z
1	mm	891	-373	1436
2	mm	1339	-374	1442
3	mm	1793	-374	1447
4	mm	879	422	1442
5	mm	1331	408	1448
6	mm	1784	399	1447

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

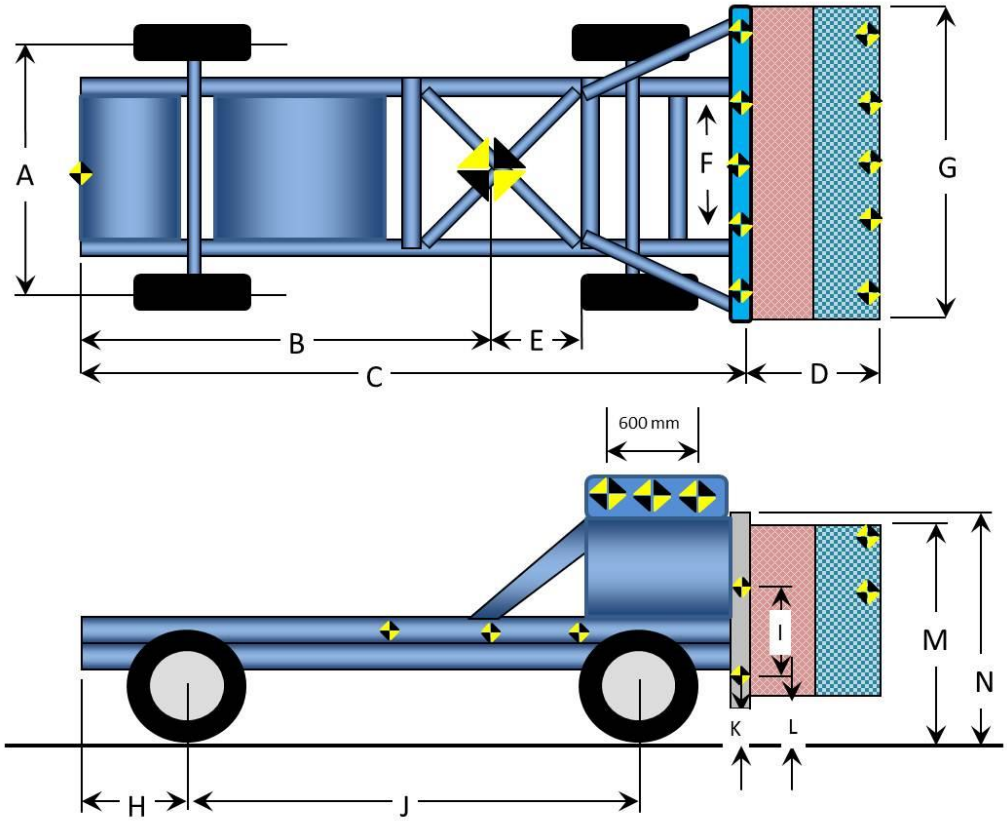
Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013



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

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

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013



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

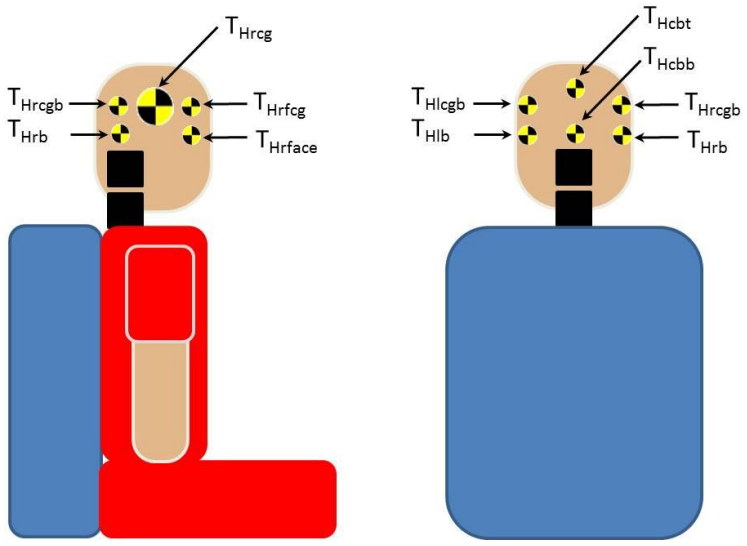
	Units	Front Axle	Rear Axle	Total
Left	kg	802.0	453.6	1255.6
Right	kg	807.4	427.7	1235.1
Ratio	%	65	35	100
Total	kg	1609.4	881.3	2490.7
CG Aft of Front Axle	mm			904

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

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

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

Side View **Rear View**



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_{Hlcg} & T_{Hlfcg}	mm	38
Distance between T_{Hlcg} & T_{Hlcgb}	mm	38
Distance between T_{Hlcgb} & T_{Hlb}	mm	70
Distance between T_{Hlfcg} & T_{Hlface}	mm	70
Distance between T_{Hcbt} & T_{Hcbb}	mm	72

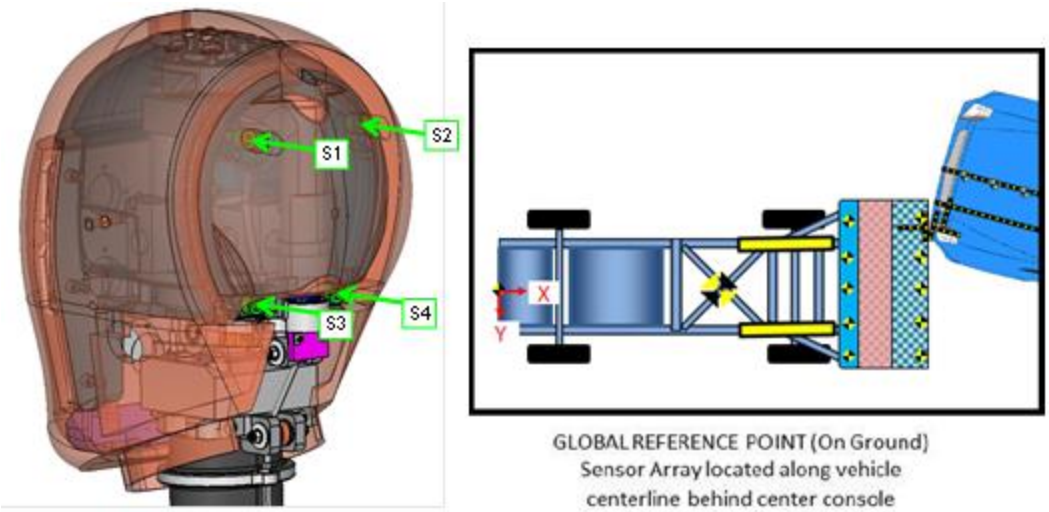
Passenger Dummy Head Targets (S/N 015)

Measurement	Units	Value
Distance between T_{Hrcg} & T_{Hrfcg}	mm	38
Distance between T_{Hrcg} & T_{Hrcgb}	mm	38
Distance between T_{Hrcgb} & T_{Hrb}	mm	70
Distance between T_{Hrfcg} & T_{Hrface}	mm	70
Distance between T_{Hlcg} & T_{Hlfcg}	mm	38
Distance between T_{Hlcg} & T_{Hlcgb}	mm	38
Distance between T_{Hlcgb} & T_{Hlb}	mm	70
Distance between T_{Hlfcg} & T_{Hlface}	mm	70
Distance between T_{Hcbt} & T_{Hcbb}	mm	72

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

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

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	7098	-327	-1249
S3	7091	-339	-1163
S2	7114	-394	-1249
S4	7104	-388	-1162

FRONT PASSENGER HEAD BOLT POINTS

Target	X	Y	Z
S1	7312	-1033	-1248
S3	7306	-1051	-1162
S2	7334	-1106	-1246
S4	7322	-1099	-1161

**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 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	87
Passenger Dummy Accelerometers	81
Vehicle Structure Accelerometers	71
RMDB Cart Accelerometers	6
Total	245

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 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Right Front Passenger
Dummy Type/Serial No.	THOR016	THOR015
Lower Leg Type	LX	LX
Lower Leg Serial No.	LX0018/ LX0019	LX0038/LX0039
Head Contact	Front & Curtain airbag and side head liner	Front airbag, side head liner and visor
Side Body Contact	Shoulder, Arm and Side torso contacted the driver's door	N/A
Upper Torso Contact	Front airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee airbag	Knee airbag
Right Knee Contact	Knee airbag	Knee airbag

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Right Front Passenger
Locked/Unlocked Doors	Locked	Locked
Front Door Opening	Closed & Operational	Closed & Operational
Rear Door Opening	Closed & Operational	Closed & Operational
Seat Track Shift (mm)	0	0
Seat Back Failure	No	No
Glazing Damage	None	None

POST TEST STRUCTURAL OBSERVATIONS

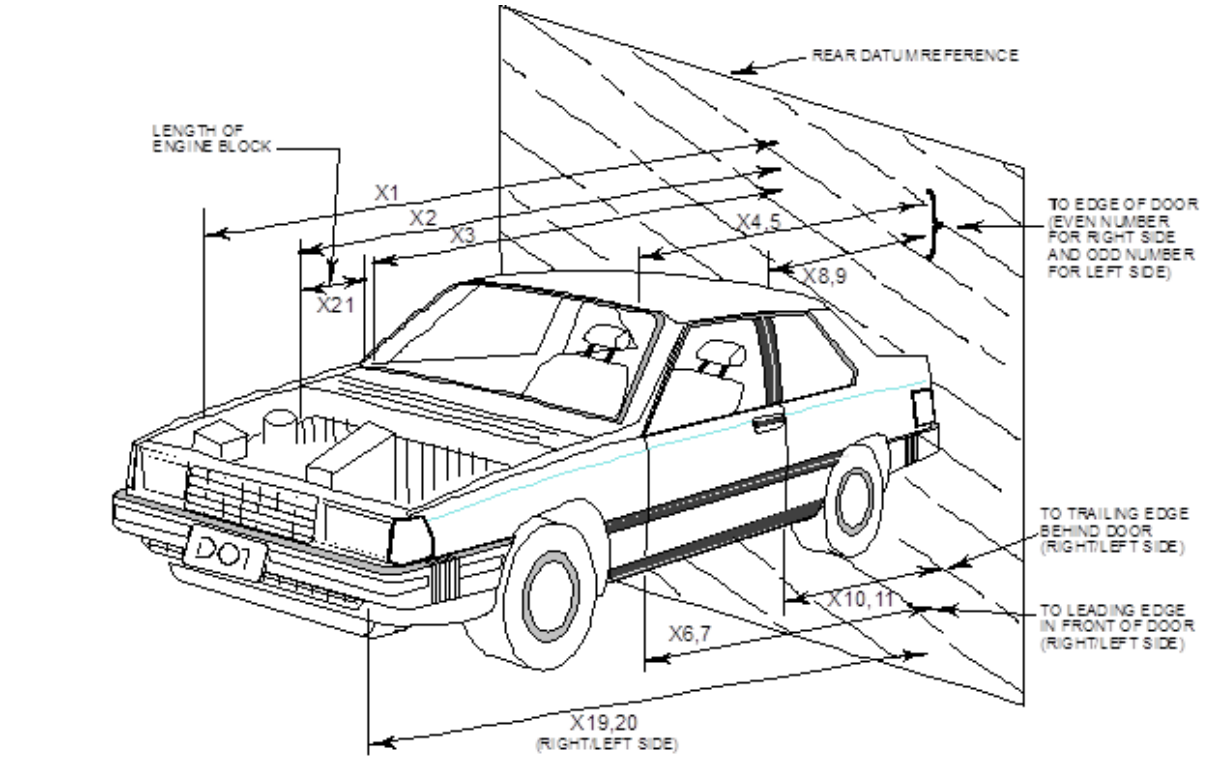
Critical Areas of Performance	Observations and Conclusions	Photo Taken (Y/N)
Pillar Performance	Remained in good condition	Y
Windshield Damage	Cracks throughout	Y
Window Damage	None	Y
Other Notable Effects	None	--

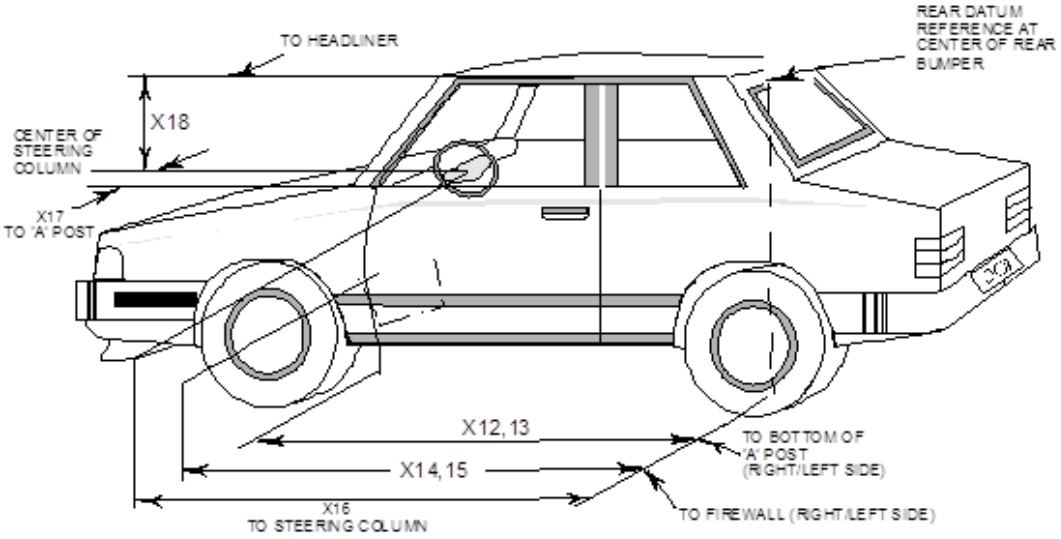
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver (Occupant 1)		Right Front Passenger (Occupant 2)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Curtain Airbag	Yes	Yes	Yes	Disabled
Torso Airbag	Yes	No	Yes	Disabled
Knee Airbag	Yes	Yes	Yes	Yes
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 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013





DATA SHEET NO. 11 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm			UR*
2	Rear Surface of Vehicle (RSOV) to Front of Engine	mm			-71
3	RSOV to Firewall	mm			-61
4	RSOV to Upper Leading Edge of Right Door	mm			-3
5	RSOV to Upper Leading Edge of Left Door	mm			-7
6	RSOV to Lower Leading Edge of Right Door	mm			-5
7	RSOV to Lower Leading Edge of Left Door	mm			-8
8	RSOV to Upper Trailing Edge of Right Door	mm			-4
9	RSOV to Upper Trailing Edge of Left Door	mm			-9
10	RSOV to Lower Trailing Edge of Right Door	mm			-5
11	RSOV to Lower Trailing Edge of Left Door	mm			-3
12	RSOV to Bottom of “A” Post of Right Side	mm			-5
13	RSOV to Bottom of “A” Post of Left Side	mm			-5
14	RSOV to Firewall, Right Side	mm			-11
15	RSOV to Firewall, Left Side	mm			-290
16	RSOV to Steering Column	mm			-15
17	Center of Steering Column to “A” Post	mm			27
18	Center of Steering Column to Headliner	mm			15
19	RSOV to Right Side of Front Bumper	mm			UR*
20	RSOV to Left Side of Front Bumper	mm			UR*
21	Length of Engine Block	mm			16
RD	RSOV to Right Side of Dash Panel	mm			6
CD	RSOV to Center of Dash Panel	mm			-27
LD	RSOV to Left Side of Dash Panel	mm			-33

UR* = Unrecoverable Data Point

DATA SHEET NO. 12
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

VEHICLE INFORMATION

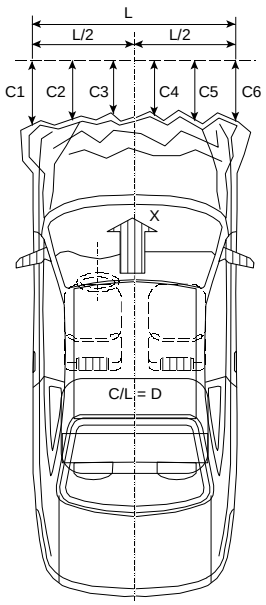
VIN:	N/A	Wheelbase (mm):	2904
Vehicle Size Category:	Passenger	Test Weight (kg):	2,109

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):	90.11
Velocity Change (kph):	90.11

CRUSH PROFILE

Collision Deformation Classification:	11FYEW4
Midpoint of Damage:	C2
Damage Region Length (mm):	1009
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			UR*
C2	Crush zone 2 at left side	mm			-315
C3	Crush zone 3 at left side	mm			-251
C4	Crush zone 4 at right side	mm			-164
C5	Crush zone 5 at right side	mm			-76
C6	Crush zone 6 at right side	mm			33
L	C1 to C6	mm			759

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			221
B2	Bumper Beam 2 at left side	mm			305
B3	Bumper Beam 3 at left side	mm			289
B4	Bumper Beam 4 at left side	mm			239
B5	Bumper Beam 5 at right side	mm			190
B6	Bumper Beam 6 at right side	mm			140
B7	Bumper Beam 7 at right side	mm			89
B8	Bumper Beam 8 at right side	mm			38
B9	Bumper Beam 9 at right side	mm			-17
L	B1 to B9	mm			-124

DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

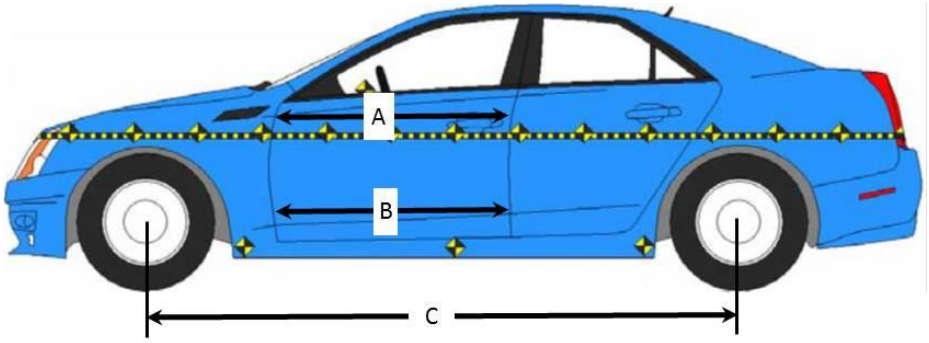
Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

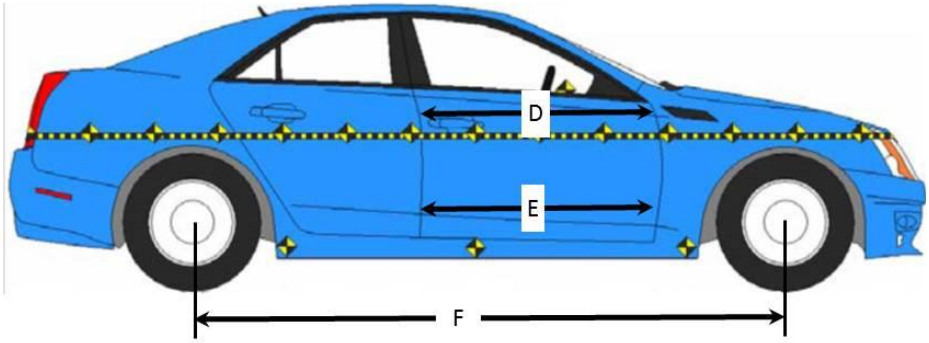
DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm			17
B	Left Side Lower	mm			3
D	Right Side Upper	mm			1
E	Right Side Lower	mm			-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm			-139
F	Right Side Wheelbase	mm			17





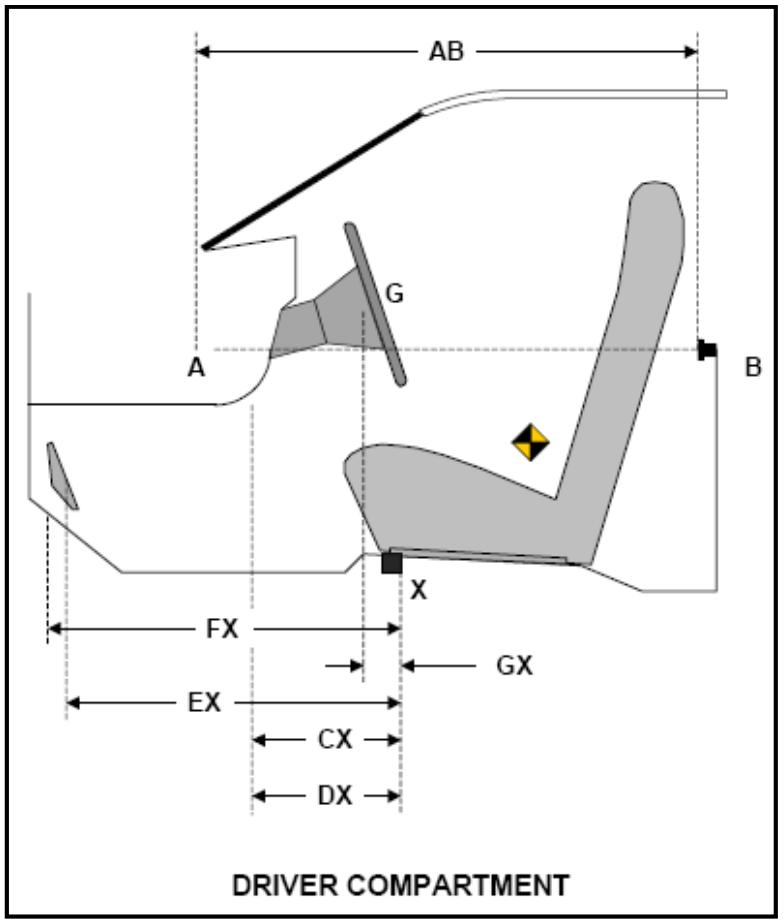
DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm			1
CX	Left Knee Bolster to X	mm			44
DX	Right Knee Bolster to X	mm			51
EX	Brake Pedal to X	mm			60
FX	Foot Rest to X	mm			43
GX	Center of Steering Column Wheel Hub to X	mm			13

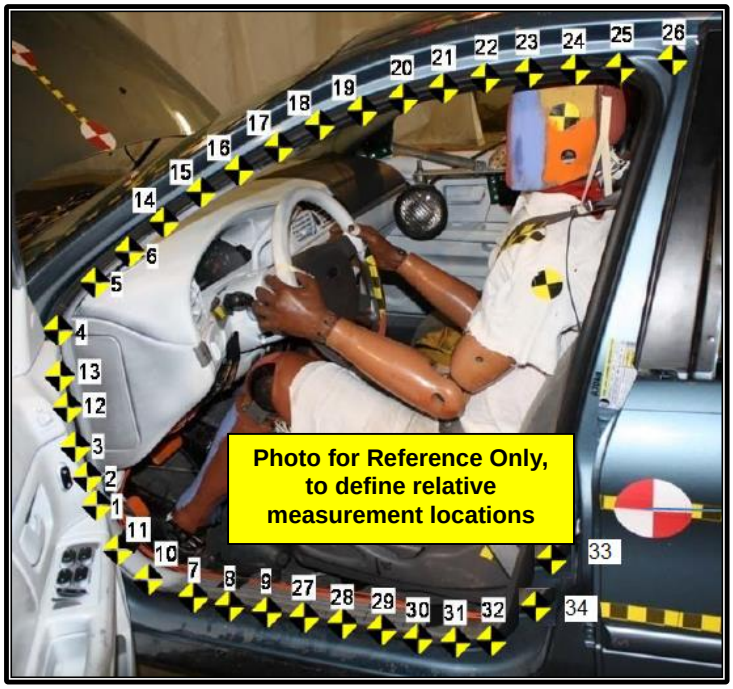
X = Front of Seat Track (Stationary)



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

DRIVER SIDE DOOR SILL INTRUSIONS



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

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

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
1							4	3	4
2							8	-4	3
3							11	-11	2
4							11	-14	4
5							6	-13	6
6							1	-7	7
7							2	9	4
8							2	8	3
9							2	6	2
10							2	7	4
11							2	5	4
12							15	-15	3
13							13	-14	5
14							0	-7	6
15							0	-6	6
16							0	-4	5

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

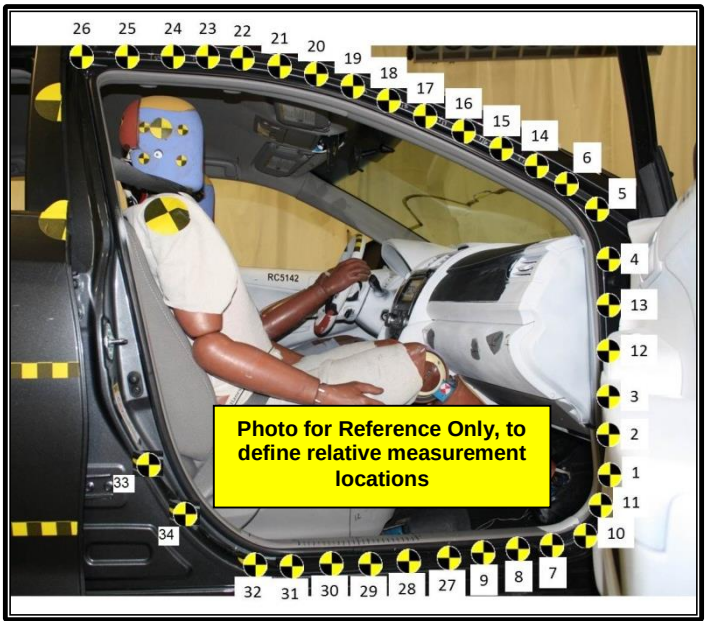
Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17							-1	-2	4
18							-1	-1	4
19							-1	0	3
20							-1	1	3
21							0	1	2
22							-1	0	3
23							-1	0	1
24							0	0	1
25							-1	0	1
26							1	0	1
27							1	8	2
28							2	6	2
29							2	5	1
30							2	4	0
31							1	5	1
32			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

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

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

PASSENGER SIDE DOOR SILL INTRUSIONS



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

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

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
1							2	15	2
2							3	17	2
3							3	15	3
4							3	16	2
5							3	17	2
6							3	14	1
7							1	12	1
8							2	13	1
9							2	10	1
10							3	14	2
11							2	14	2
12							3	17	3
13							2	17	2
14							3	12	2
15							3	10	1
16							1	7	0

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

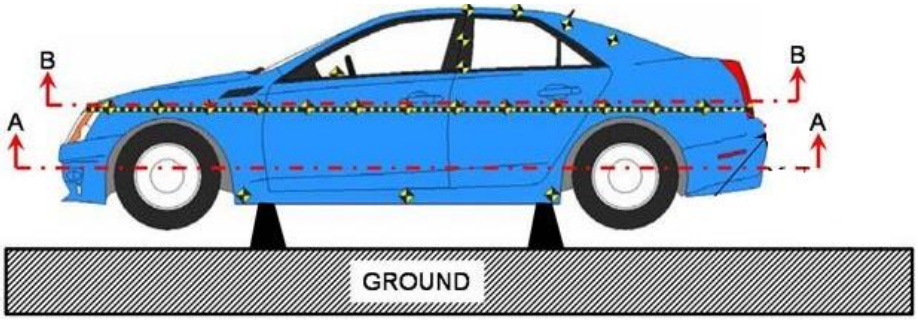
Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17							1	6	-1
18							0	5	-1
19							1	5	0
20							1	3	-2
21							1	2	-2
22							1	2	-3
23							1	1	-2
24							2	1	-2
25							1	1	-3
26							0	2	-1
27							2	11	1
28							3	9	0
29							2	8	0
30							2	8	1
31							2	9	0
32		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

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

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

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	-582	-912		1	-276	-818	
2	-613	-905		2	-375	-775	
3	-695	-865		3	-387	-465	
4	-770	-832		4	-398	-395	
5	-857	-772		5	-566	-257	
6	-911	-719		6	-613	-264	
7	-972	-642		7	-676	-192	
8	-1024	-553		8	-707	-113	
9	-1060	-467		9	-768	5	
10	-1080	-394		10	-797	75	
11	-1078	-332		11	-826	160	
12	-1100	-241		12	-850	240	
13	-1105	-180		13	-866	296	
14	-1116	-167		14	-887	330	
15	-1119	-79		15	-1003	419	
16	-1120	-1		16	-1024	494	
17	-1119	101		17	-1032	574	
18	-1117	165		18	-1028	600	
19	-1106	176		19	-531	922	
20	-1099	270		20	-304	938	
21	-1070	354		21	178	945	
22	-1083	378		22	267	939	
23	-1047	504		23	341	935	
24	-990	618		24	491	930	
25	-921	711		25	672	932	

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	-871	760		26	861	934	
27	-767	831		27	993	935	
28	-667	876		28	1123	935	
29	-581	909		29	1286	934	
30	168	930		30	1433	933	
31	250	922		31	1565	933	
32	344	911		32	1730	931	
33	500	910		33	1886	929	
34	759	915		34	2067	925	
35	951	917		35	2221	931	
36	1160	918		36	2285	937	
37	1295	918		37	3086	915	
38	1456	918		38	3121	913	
39	1587	918		39	3168	901	
40	1751	916		40	3258	881	
41	1943	913		41	3344	862	
42	2189	914		42	3454	832	
43	2324	922		43	3561	788	
44	3087	915		44	3636	733	
45	3166	901		45	3713	589	
46	3263	880		46	3736	501	
47	3377	853		47	3755	399	
48	3491	819		48	3770	285	
49	3577	780		49	3781	159	
50	3642	728		50	3785	52	
51	3682	670		51	3785	-21	
52	3733	524		52	3784	-100	
53	3758	392		53	3778	-207	
54	3773	270		54	3764	-340	
55	3781	166		55	3747	-452	
56	3786	64		56	3721	-563	
57	3787	4		57	3686	-655	
58	3784	-123		58	3653	-708	
59	3776	-242		59	3573	-774	
60	3760	-375		60	3455	-823	
61	3738	-497		61	3330	-856	
62	3706	-609		62	3214	-881	
63	3639	-723		63	3127	-902	
64	3538	-791		64	3085	-906	
65	3422	-832		65	2327	-918	
66	3308	-860		66	2259	-917	

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

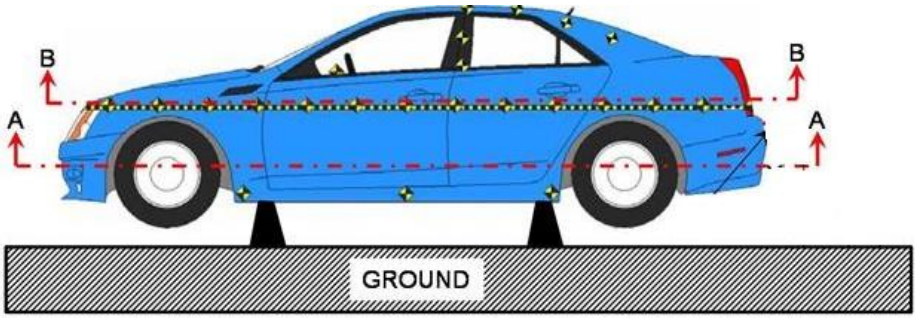
Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
67	3165	-891		67	2145	-908	
68	3084	-905		68	1954	-909	
69	2326	-918		69	1771	-912	
70	2264	-918		70	1560	-912	
71	2169	-908		71	1472	-911	
72	2026	-907		72	1338	-913	
73	1833	-911		73	1159	-915	
74	1639	-914		74	968	-916	
75	1487	-916		75	821	-915	
76	1357	-917		76	619	-913	
77	1198	-918		77	466	-912	
78	1021	-917		78	365	-915	
79	768	-914		79	329	-941	
80	577	-911		80	282	-973	
81	369	-909		81	157	-969	
82	261	-920		82	51	-935	
83	169	-929		83	-29	-873	
84	-582	-912		84	-128	-854	
				85	-163	-860	

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

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

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	279	-895		1	-105	-651	
2	192	-893		2	-106	-363	
3	66	-890		3	-255	-224	
4	-86	-893		4	-400	-192	
5	-219	-891		5	-526	-152	
6	-381	-857		6	-738	-41	
7	-503	-822		7	-813	101	
8	-609	-790		8	-837	180	
9	-688	-739		9	-868	254	
10	-737	-687		10	-869	333	
11	-808	-588		11	-867	444	
12	-861	-497		12	-787	754	
13	-892	-371		13	-654	827	
14	-918	-234		14	-517	865	
15	-931	-98		15	-362	907	
16	-934	-3		16	-235	928	
17	-929	134		17	-146	928	
18	-916	269		18	-41	920	
19	-885	402		19	163	917	
20	-864	496		20	317	925	
21	-775	648		21	400	925	
22	-676	753		22	569	932	
23	-509	822		23	742	935	
24	-338	869		24	914	938	
25	-247	890		25	1052	939	

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	-165	895		26	1179	940	
27	-11	892		27	1382	941	
28	134	891		28	1461	941	
29	303	897		29	1582	938	
30	504	905		30	1740	938	
31	734	913		31	1896	936	
32	914	917		32	2085	932	
33	1126	920		33	2268	927	
34	1257	922		34	2419	924	
35	1422	924		35	2559	931	
36	1577	925		36	2725	934	
37	1739	924		37	2844	924	
38	1967	921		38	2912	903	
39	2194	917		39	3002	888	
40	2391	912		40	3095	875	
41	2601	917		41	3186	864	
42	2801	912		42	3287	848	
43	2924	896		43	3402	822	
44	2972	894		44	3466	802	
45	3067	880		45	3574	718	
46	3166	868		46	3606	654	
47	3282	850		47	3623	586	
48	3411	821		48	3644	463	
49	3468	802		49	3665	290	
50	3541	764		50	3674	181	
51	3600	675		51	3674	164	
52	3624	582		52	3674	-160	
53	3636	500		53	3670	-226	
54	3658	340		54	3660	-333	
55	3671	184		55	3645	-449	
56	3672	-160		56	3627	-552	
57	3663	-281		57	3612	-625	
58	3650	-399		58	3587	-697	
59	3634	-507		59	3461	-796	
60	3624	-579		60	3297	-839	
61	3607	-644		61	3146	-863	
62	3582	-719		62	2946	-891	
63	3515	-773		63	2777	-912	
64	3457	-797		64	2595	-914	
65	3314	-835		65	2495	-910	
66	3184	-857		66	2401	-911	
67	3060	-873		67	2266	-913	

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

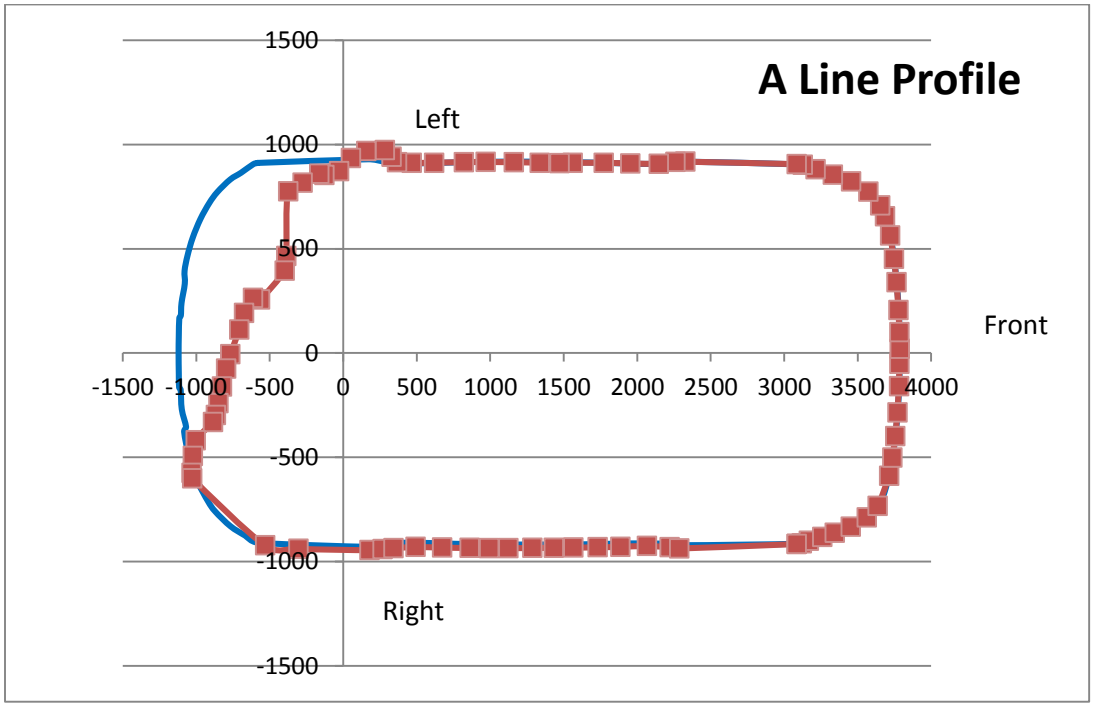
Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
68	2913	-894		68	2108	-917	
69	2770	-911		69	1934	-919	
70	2637	-914		70	1788	-921	
71	2506	-909		71	1609	-921	
72	2391	-908		72	1483	-920	
73	2274	-911		73	1266	-928	
74	2127	-914		74	1103	-928	
75	1985	-918		75	912	-928	
76	1863	-920		76	739	-926	
77	1701	-922		77	577	-924	
78	1540	-923		78	451	-921	
79	1343	-922		79	403	-920	
80	1212	-920		80	384	-993	
81	1057	-918		81	334	-993	
82	854	-914		82	234	-936	
83	629	-908		83	199	-881	
84	459	-902		84	185	-949	
85	323	-897		85	151	-847	
86	279	-895		86	83	-815	
				87	-58	-809	
				88	-86	-743	

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

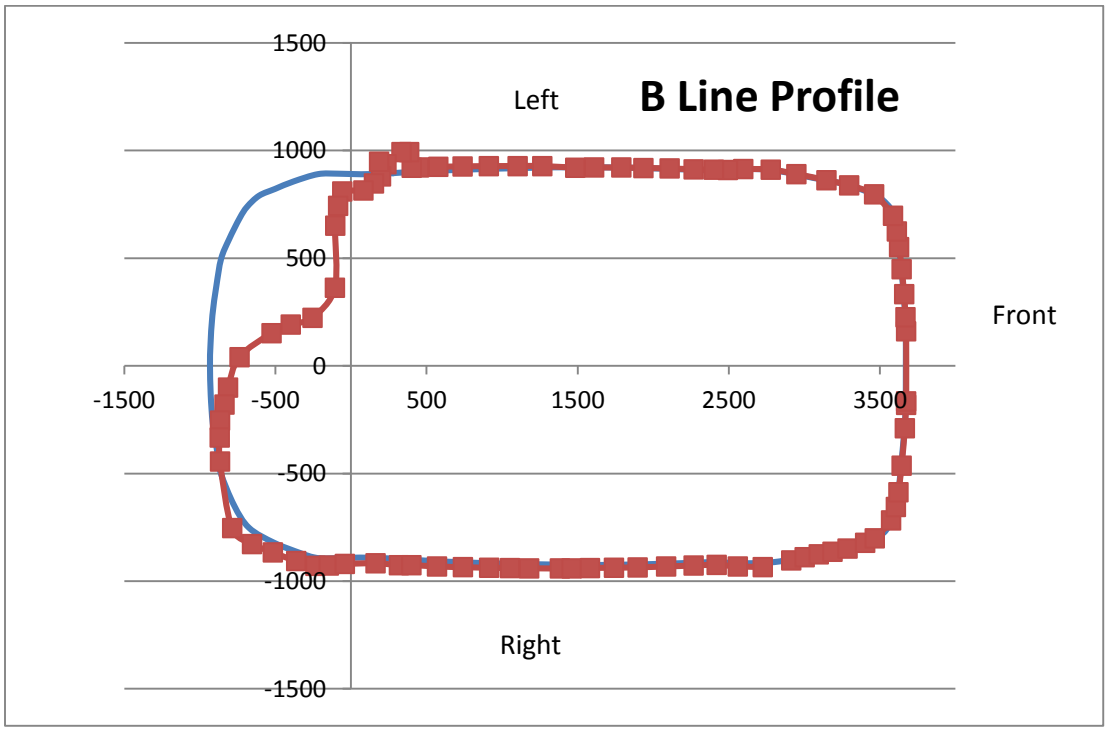
DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A



SECTION B-B



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

STRUCTURAL BUMPER BEAM POINTS

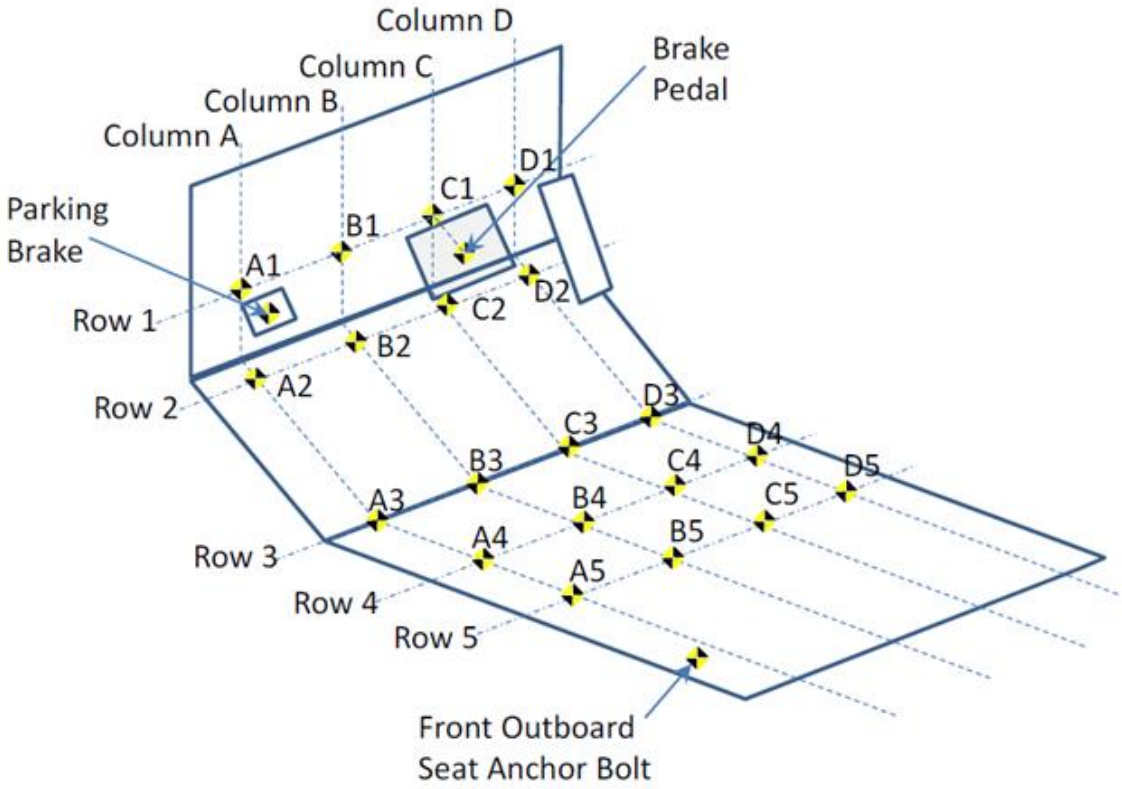
	Point	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
		X	Y	Z	X	Y	Z	X	Y	Z
Redundant Structural Bumper Beam	B1							215	143	109
	B2							296	116	124
	B3							289	79	124
	B4							240	62	110
	B5							190	49	95
	B6							139	40	79
	B7							89	33	64
	B8							37	30	49
	B9							-17	26	32
Center Structural Bumper Beam	B1							221	145	109
	B2							305	116	126
	B3							289	72	125
	B4							239	58	110
	B5							190	46	96
	B6							140	36	80
	B7							89	29	64
	B8							38	26	49
	B9							-17	21	33
Upper Radiator Support	1							601	218	142
	2							419	196	72
	3							355	137	81
	4							261	81	123
	5							140	47	145
	6							80	27	121
	7							37	18	80
	8							13	11	48
	9							4	19	41

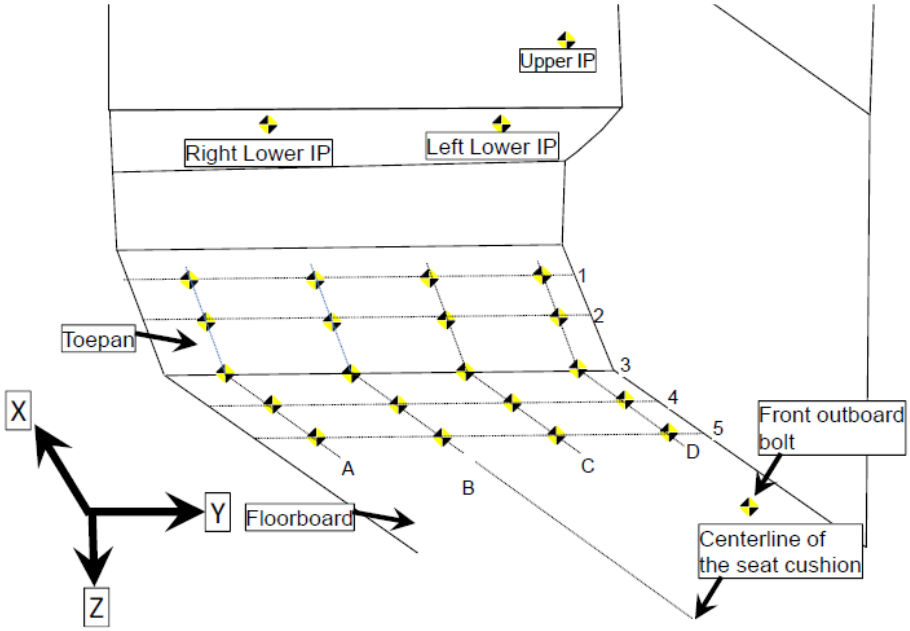
Reference point: Rear most center of the top of rear window (See appendix D for procedure to create coordinate system).

+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 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013





Note: See Appendix D for toe pan measuring procedure

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

DRIVER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1							30	21	18
B1							28	20	20
C1							23	17	11
D1							9	17	-4
A2							15	18	16
B2							17	17	14
C2							20	16	10
D2							6	17	-5
A3							4	14	3
B3							5	14	3
C3							6	14	-3
D3							5	13	-12
A4							2	12	2
B4							3	12	-2
C4							4	12	-6
D4							6	13	-11
A5							4	12	9
B5							2	11	-1
C5							4	11	-2
D5							4	11	-10
Brake Pedal							61	-5	-35
Driver IP Left							45	-11	4
Driver IP Right							52	-4	-1
DOLP							38	-14	7
Steering Column							15	-24	14
Front Outboard Bolt							2	6	-1
Emergency Brake							30	21	18

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

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

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013

PASSENGER FLOOR PAN MEASUREMENTS

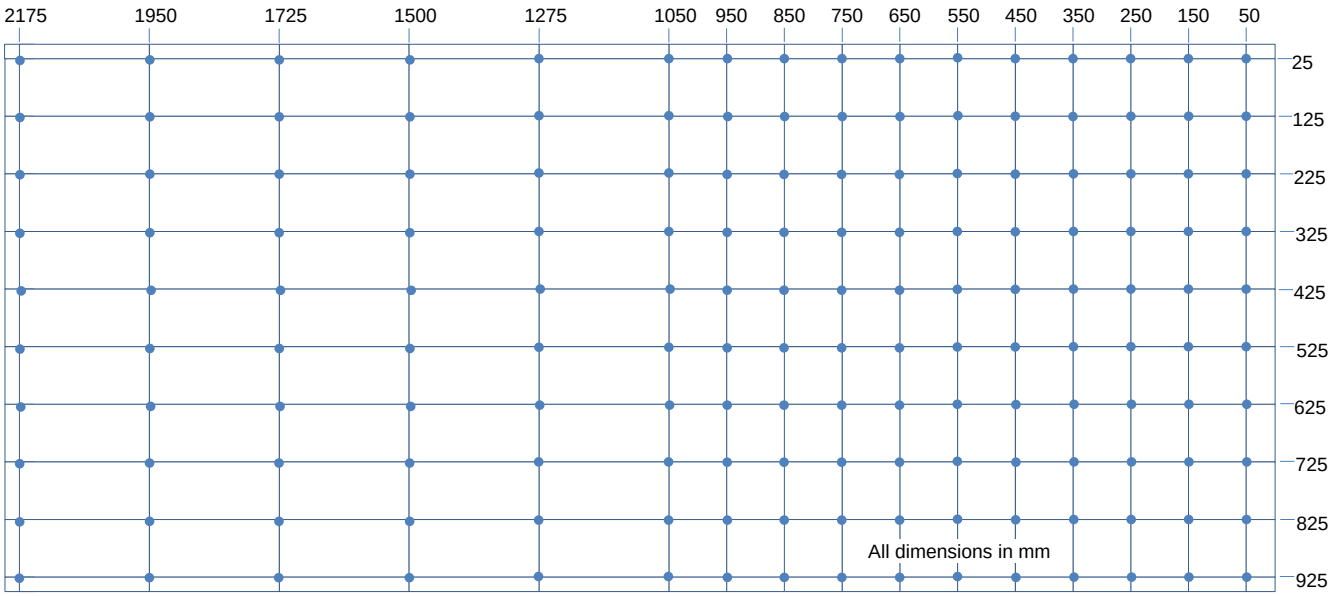
Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1							2	17	9
B1							2	17	12
C1							3	18	7
A2							0	15	6
B2							1	15	7
C2							3	16	6
A3							1	14	6
B3							-2	15	5
C3							1	15	4
A4							0	13	2
B4							0	13	3
C4							-2	17	4
A5							-1	14	1
B5							0	12	1
C5							-1	14	1
Pass IP Left							2	5	-2
Pass IP Right							-6	5	-2
PORP							-7	5	-3
Front Outboard Bolt							1	10	1

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 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013



	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
R10	-0.7	-0.8	-1.0	-1.1	-1.2	-1.3	-1.3	-1.5	-1.4	0.2	-0.9	-2.1	-2.2	-2.4	-2.4	-1.3
R9	-0.5	-0.8	-0.7	-1.0	-1.1	-1.1	0.1	-1.2	2.7	8.2	1.3	-1.8	-1.9	-2.3	-2.2	13.8
R8	-0.3	-0.5	-0.7	-0.8	-0.9	-0.9	0.8	-0.9	8.2	29.8	18.1	-0.5	2.9	1.4	5.5	45.0
R7	-0.1	-0.4	-0.6	-0.6	-0.8	-0.7	-0.7	5.1	1.9	6.4	6.8	3.6	2.8	5.7	41.1	94.4
R6	0.0	-0.3	-0.7	-0.7	-0.5	-0.6	-0.3	5.5	6.4	3.2	5.2	14.9	33.5	38.1	103.3	163.6
R5	-0.1	-0.4	-0.2	-0.3	-0.5	-0.3	12.0	71.1	68.9	13.8	3.7	35.6	134.2	227.4	220.2	224.6
R4	0.2	0.1	0.0	-0.1	-0.2	-0.2	41.5	94.6	115.4	43.0	0.9	24.6	108.1	205.2	146.0	202.8
R3	0.1	0.0	0.1	0.1	0.2	8.7	64.3	120.8	155.1	82.2	29.5	36.0	134.4	108.0	110.0	190.1
R2	0.3	0.3	0.2	0.1	0.2	44.1	102.4	156.5	186.9	109.9	35.8	41.9	78.2	154.1	131.5	183.2
R1	-0.1	0.6	0.4	0.5	*	*	*	*	*	131.0	45.5	20.3	26.4	87.8	118.5	184.6

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

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

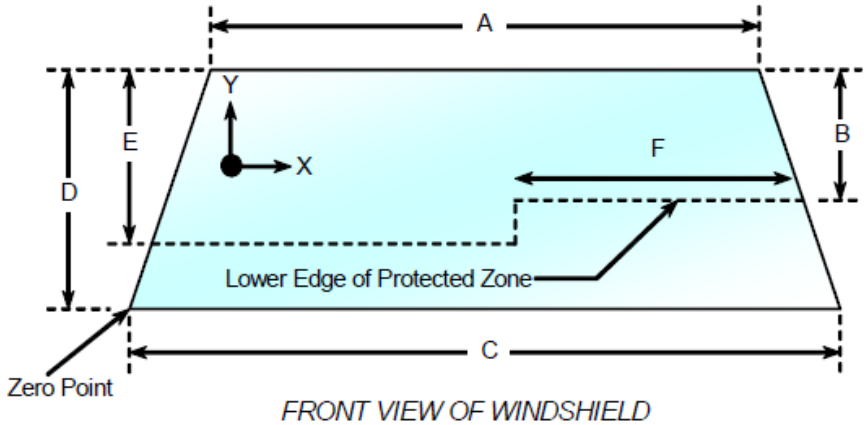
Test Vehicle:	Research Vehicle 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

Please provide windshield mounting details. A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.
The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21ºC

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2145	2145	100%
Right Side	2145	2145	100%
Total	4290	4290	100%



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1208
B	mm	401
C	mm	1557
D	mm	762
E	mm	423
F	mm	533

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 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

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

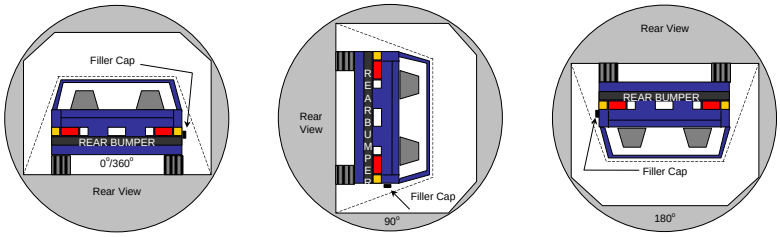
Test Time: 2:40 PM

Stoddard Solvent Spillage Measurements

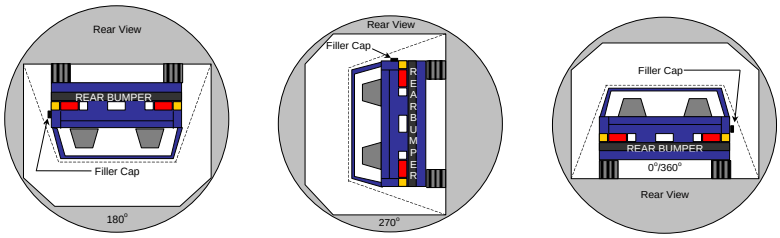
A.	From impact until vehicle motion ceases: (Maximum allowable = 1 oz.)	0	oz
B.	For the 5-minute period after motion ceases: (Maximum allowable = 5 oz.	0	oz
C.	For the following 25 minutes: (Maximum allowable = 1 oz./minute	0	oz
D.	Spillage	0	oz

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: Research Vehicle 8572 Test No.: CAL2658
Test Program: R&D 90.1kph, 15° / 35% Left Oblique Offset Test Date: 11/13/2013



0° TO 90° 90° TO 180°



180° TO 270° 270° TO 360°

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°	75	300	375
90° to 180°	68	300	368
180° to 270°	61	300	361
270° to 360°	69	300	369

FMVSS 301 SPILLAGE TABLE

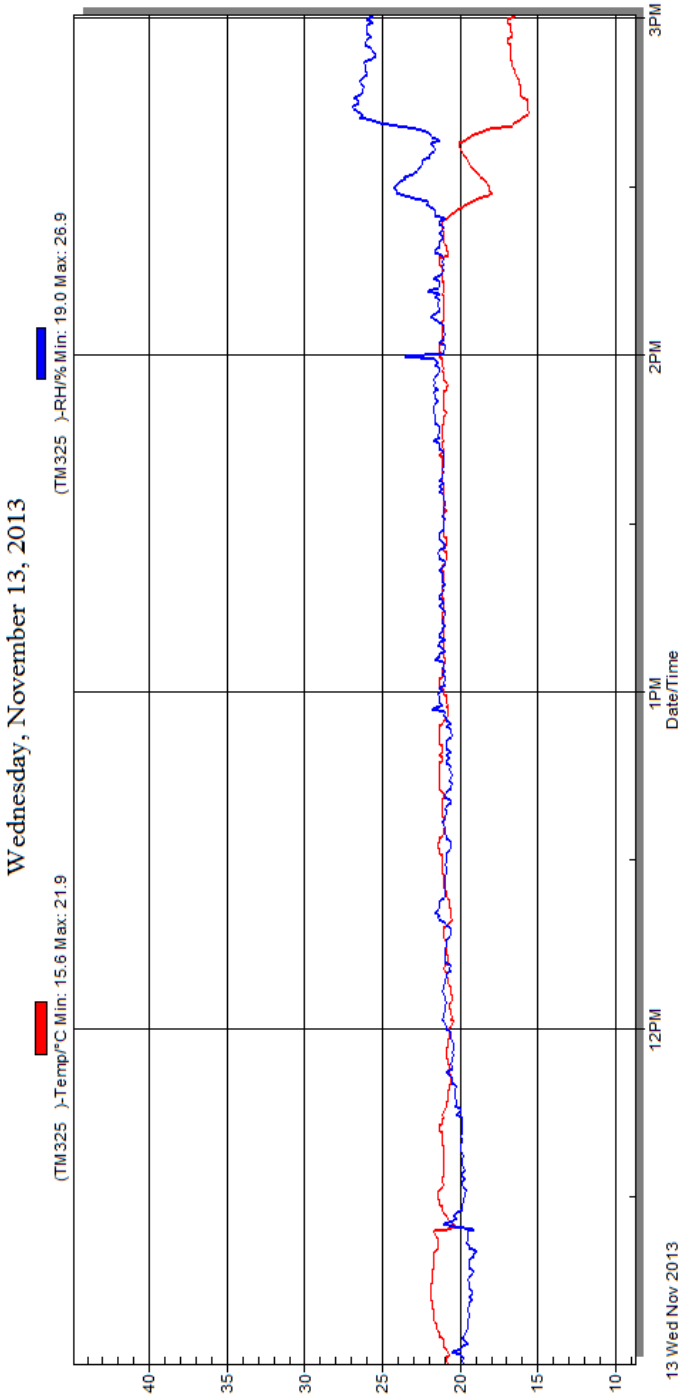
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

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 8572	Test No.:	CAL2658
Test Program:	R&D 90.1kph, 15° / 35% Left Oblique Offset	Test Date:	11/13/2013



Temperature Stabilization Chart/Data

APPENDIX A
PHOTOGRAPHS

*Photos not provide per NHTSA Loan Agreement

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

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Plot 245	V2P2 Fz on head acting through the O.C. joint only	B-69
Plot 246	V2P2 My on head acting through the O.C. joint only	B-69
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Plot 248	V2P2 Fy on head acting through the total neck section	B-69

Plot 249	V2P2 Fz on head acting through the total neck section	B-70
Plot 250	V2P2 Mx on head acting through the total neck section	B-70
Plot 251	V2P2 My on head acting through the total neck section	B-70
Plot 252	V2P2 Mz on head acting through the total neck section	B-70
Plot 253	V2P2 Chest Left Upper Dx	B-71
Plot 254	V2P2 Chest Left Upper Dy	B-71
Plot 255	V2P2 Chest Left Upper Dz	B-71
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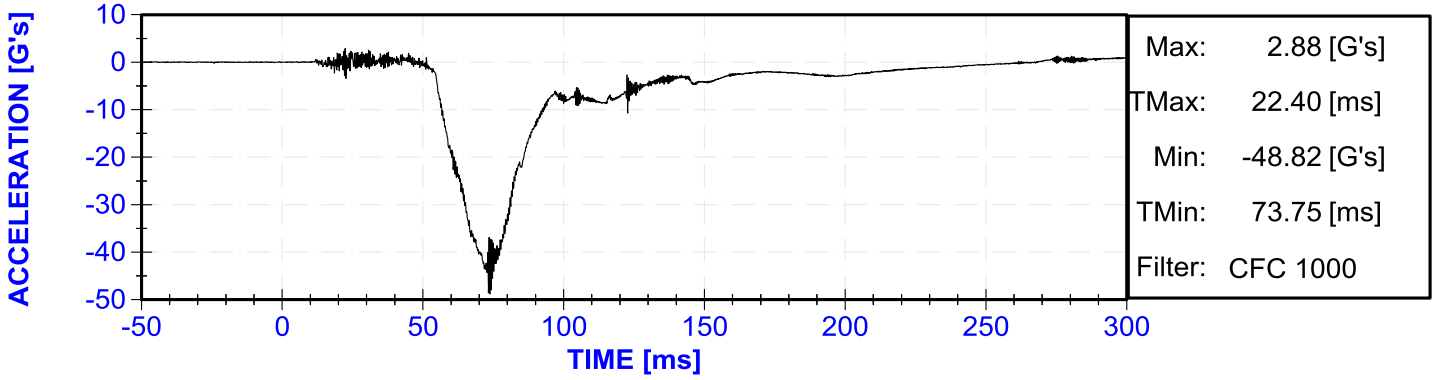
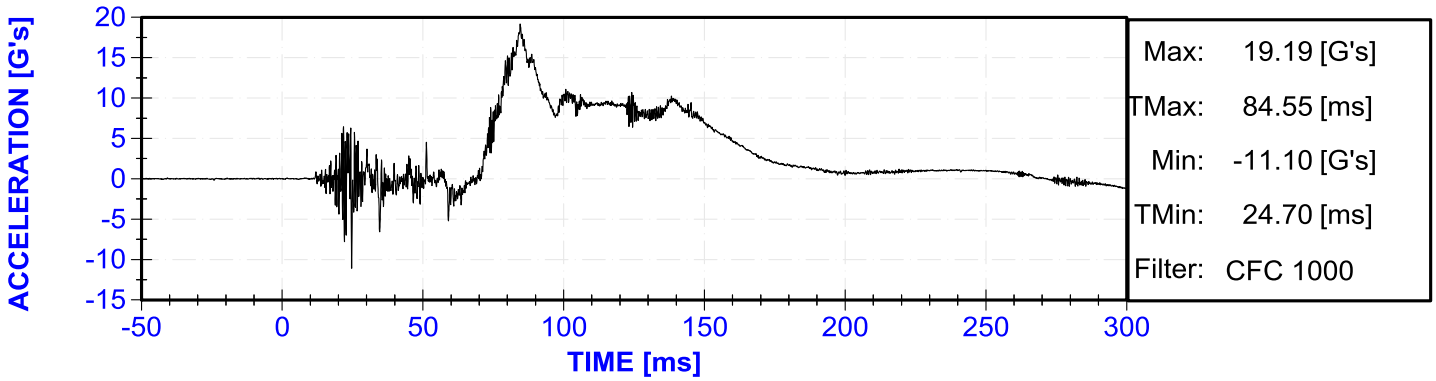
Plot 257	V2P2 Chest Right Upper Dx	B-72
Plot 258	V2P2 Chest Right Upper Dy	B-72
Plot 259	V2P2 Chest Right Upper Dz	B-72
Plot 260	V2P2 Chest Right Upper D	B-72
Plot 261	V2P2 Chest Left Lower Dx	B-73
Plot 262	V2P2 Chest Left Lower Dy	B-73
Plot 263	V2P2 Chest Left Lower Dz	B-73
Plot 264	V2P2 Chest Left Lower D	B-73
Plot 265	V2P2 Chest Right Lower Dx	B-74
Plot 266	V2P2 Chest Right Lower Dy	B-74
Plot 267	V2P2 Chest Right Lower Dz	B-74
Plot 268	V2P2 Chest Right Lower D	B-74

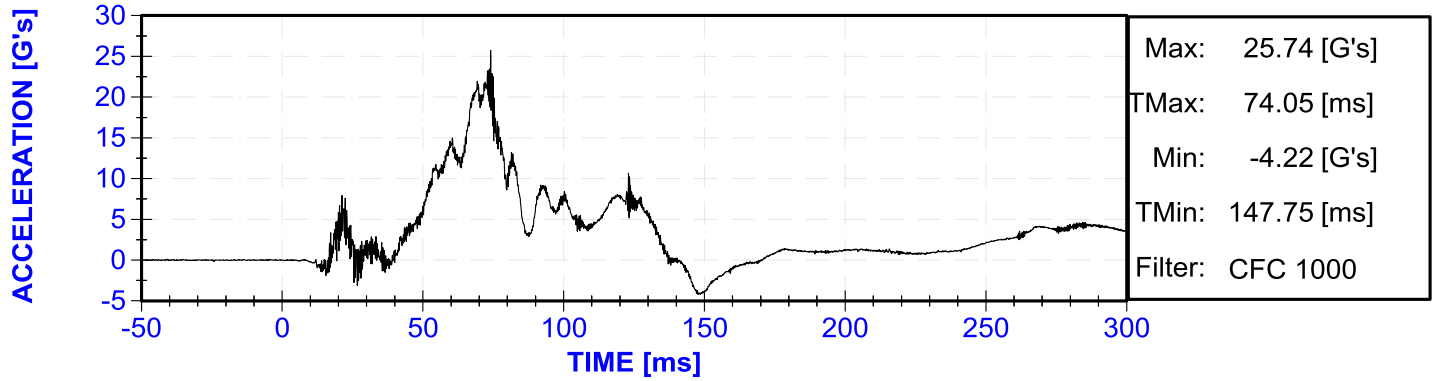
V2P1 Head CG X Acceleration



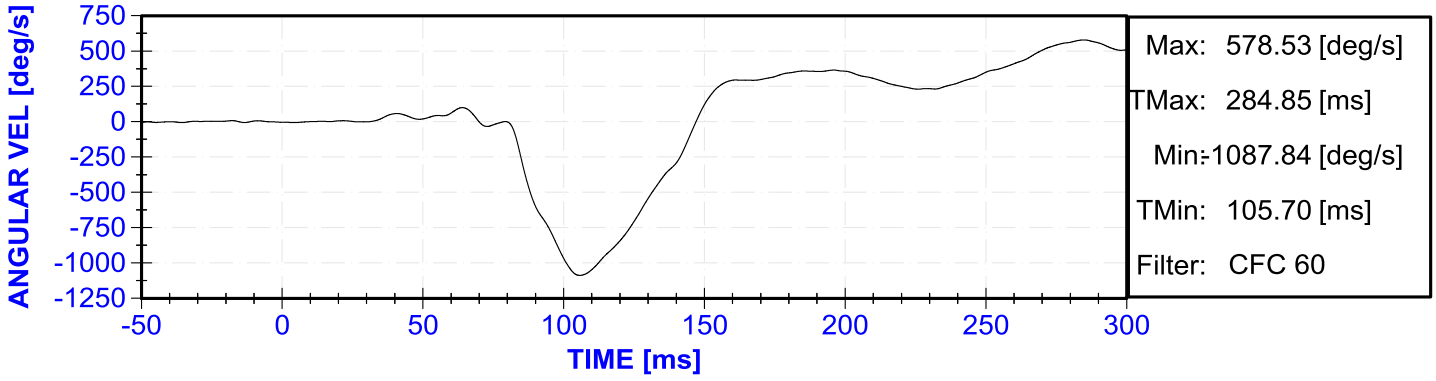
V2P1 Head CG Y Acceleration



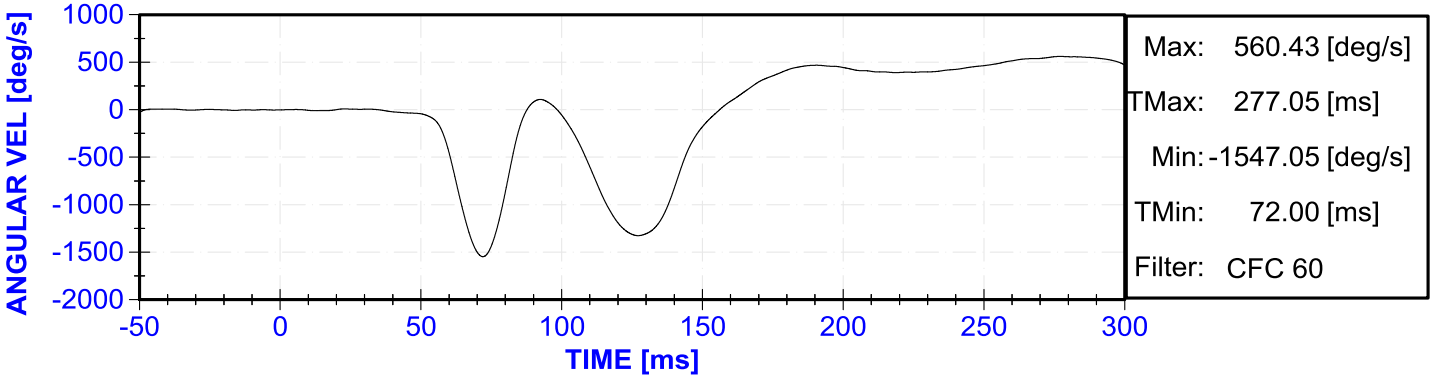
V2P1 Head CG Z Acceleration



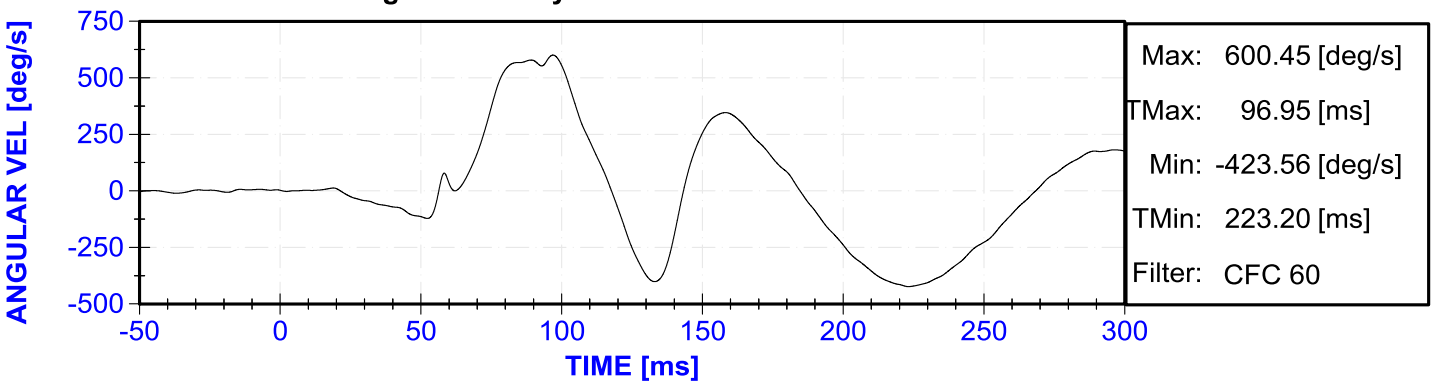
V2P1 Head CG Angular Velocity About X



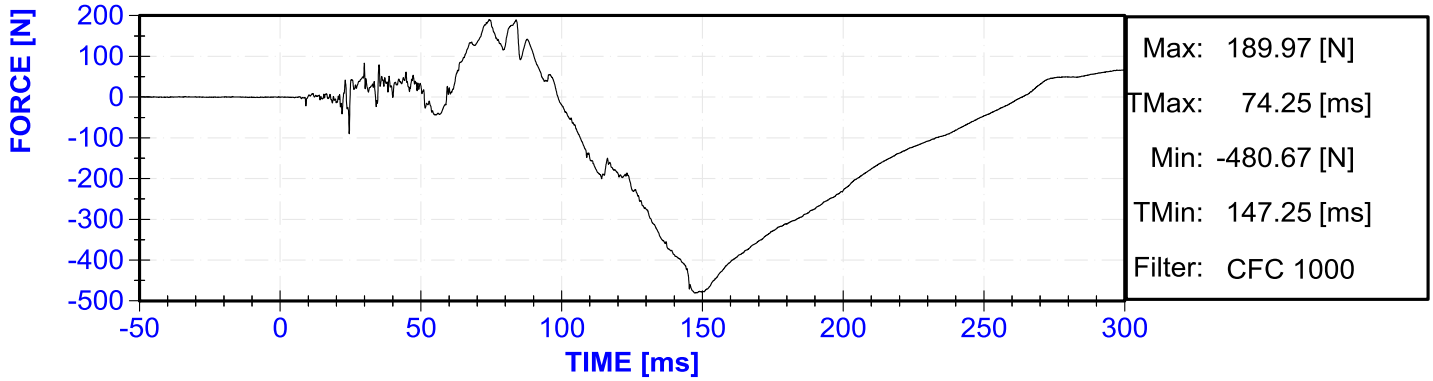
V2P1 Head CG Angular Velocity About Y



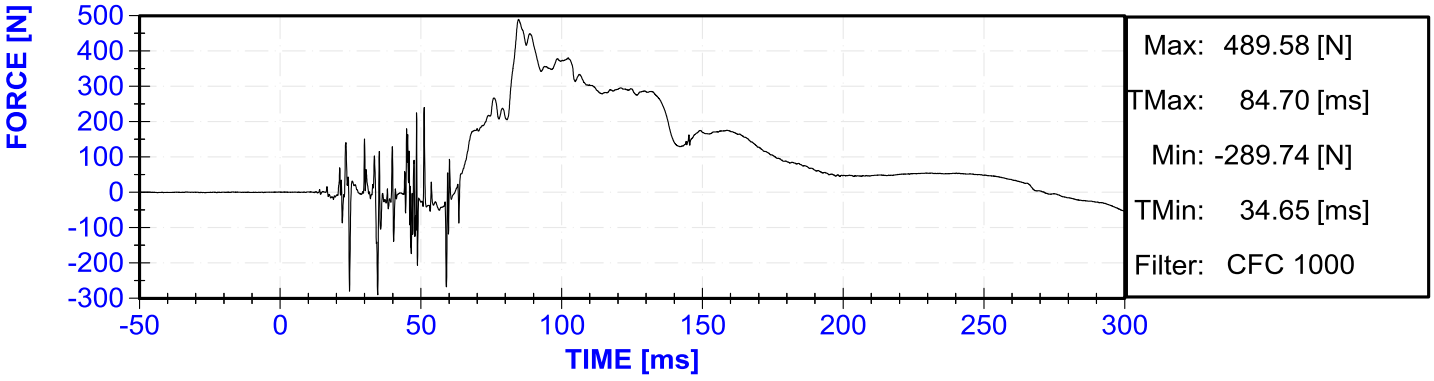
V2P1 Head CG Angular Velocity About Z



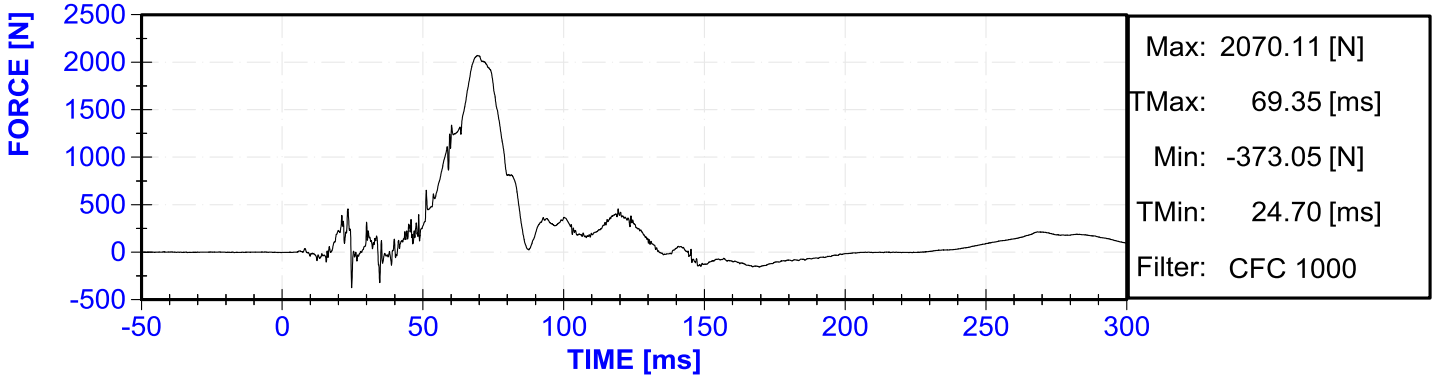
V2P1 Upper Neck X Force



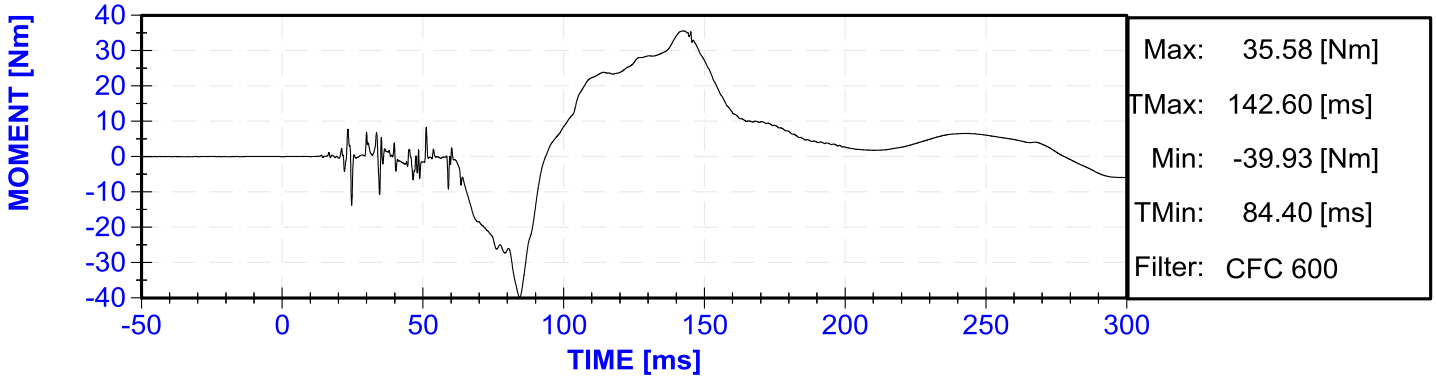
V2P1 Upper Neck Y Force



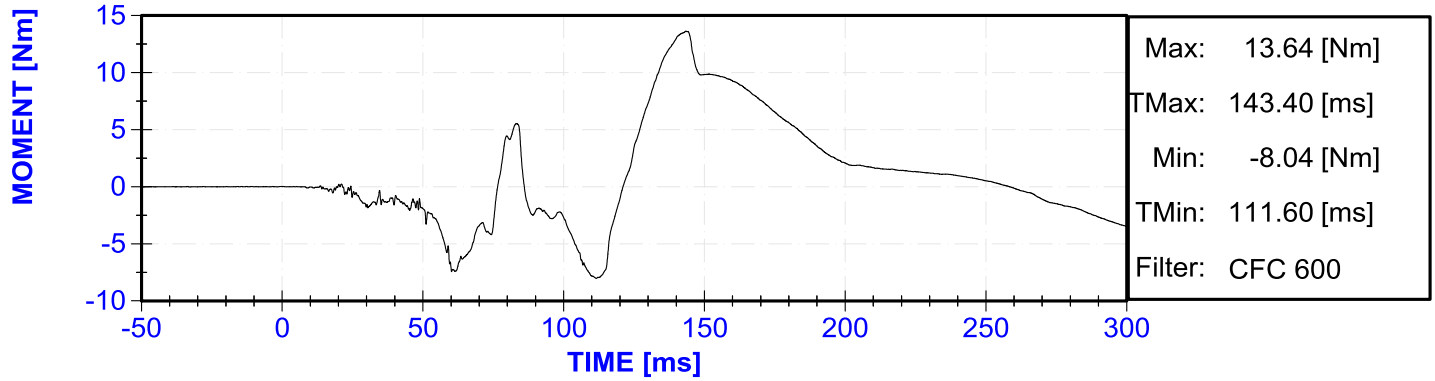
V2P1 Upper Neck Z Force



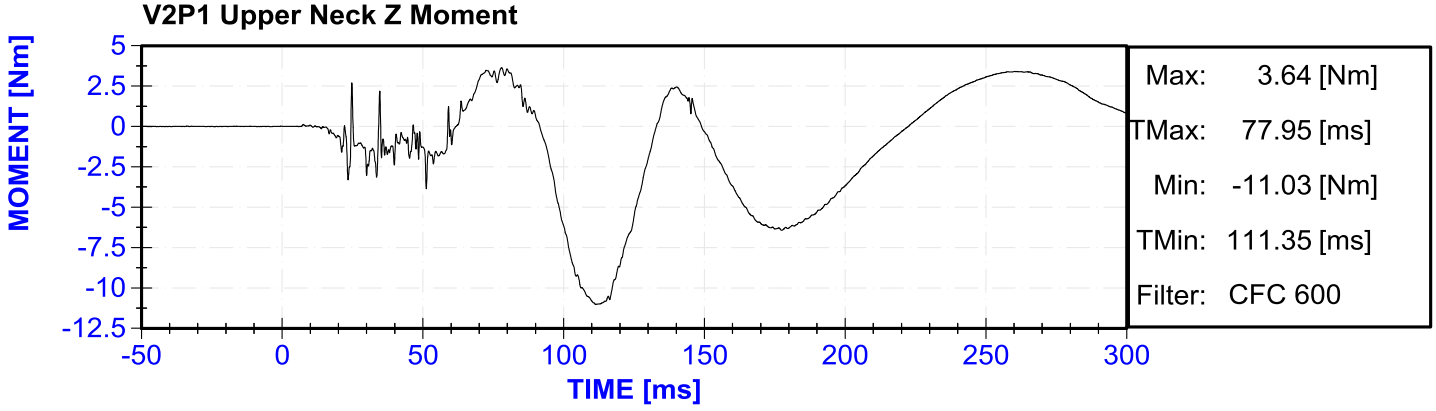
V2P1 Upper Neck X Moment



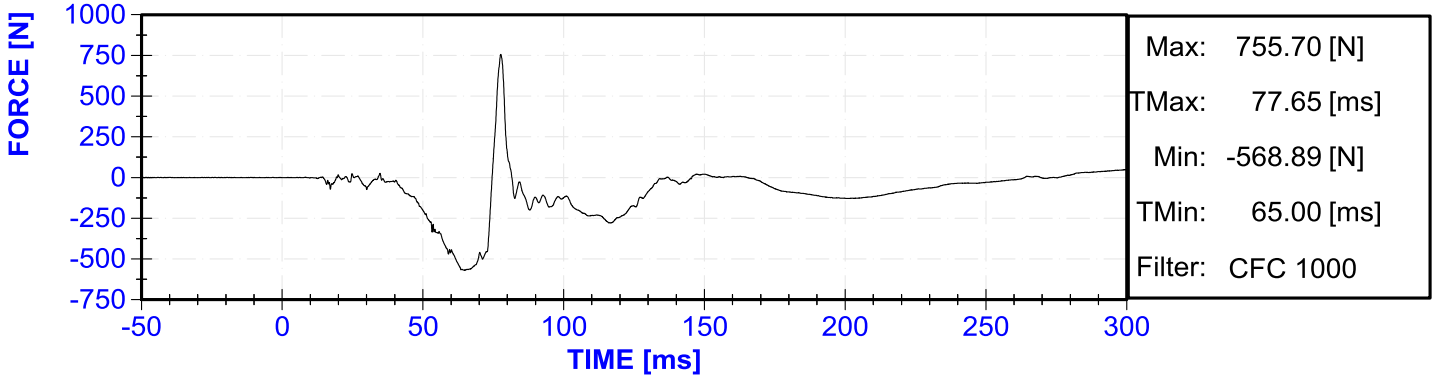
V2P1 Upper Neck Y Moment



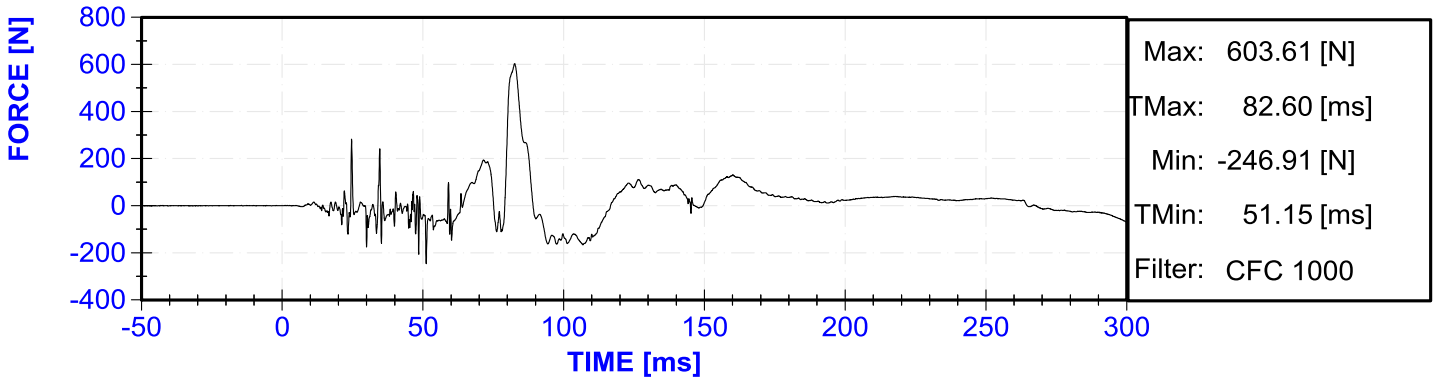
V2P1 Upper Neck Z Moment



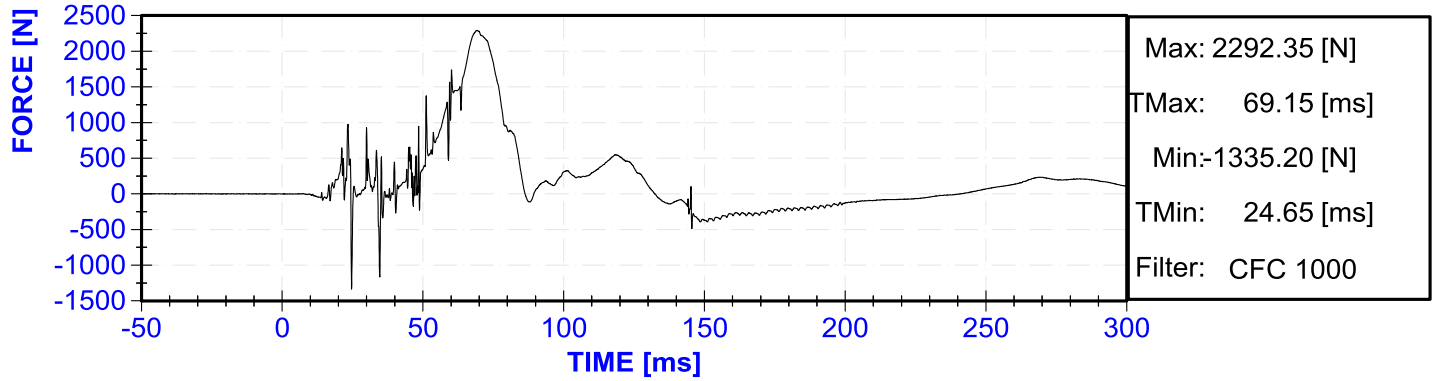
V2P1 Lower Neck X Force



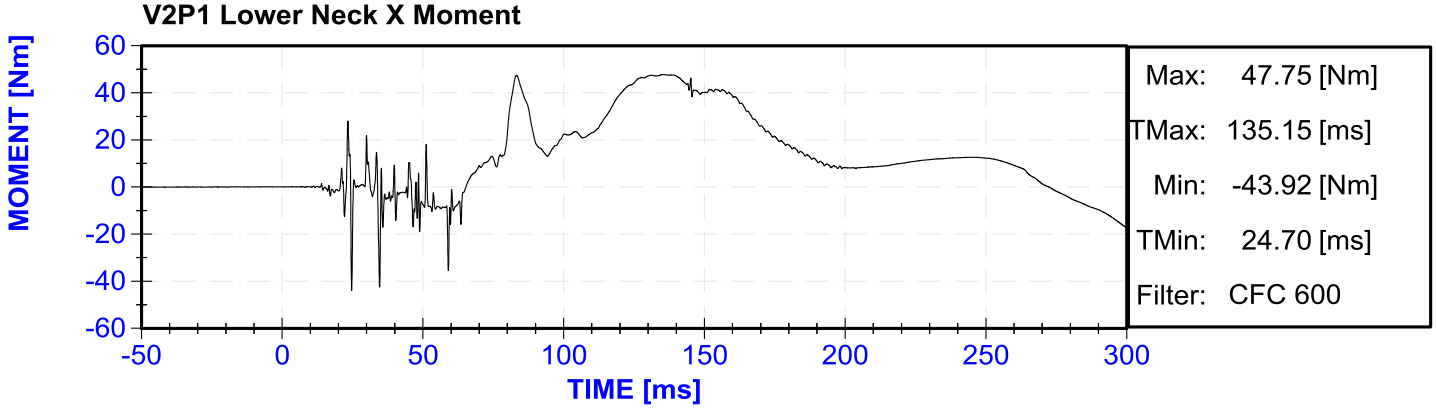
V2P1 Lower Neck Y Force



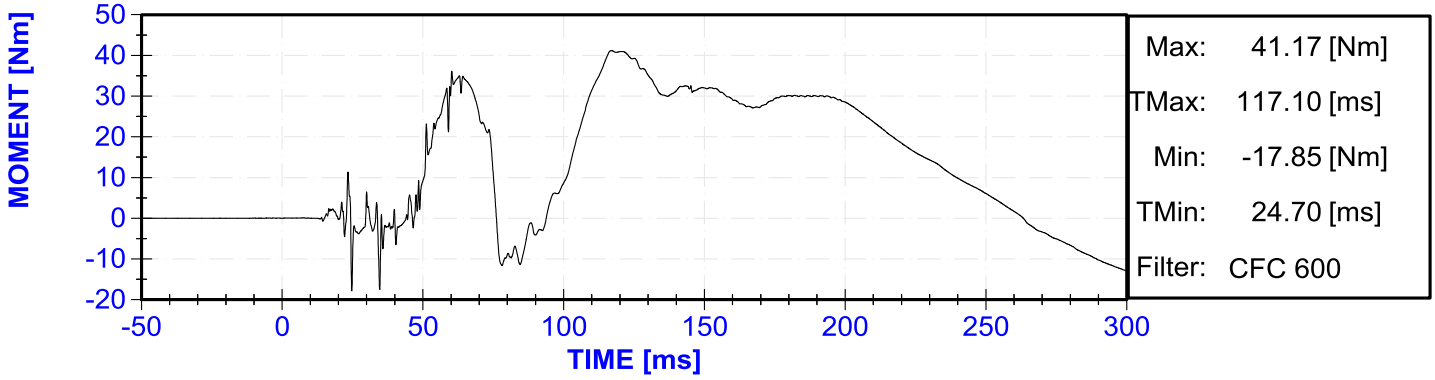
V2P1 Lower Neck Z Force



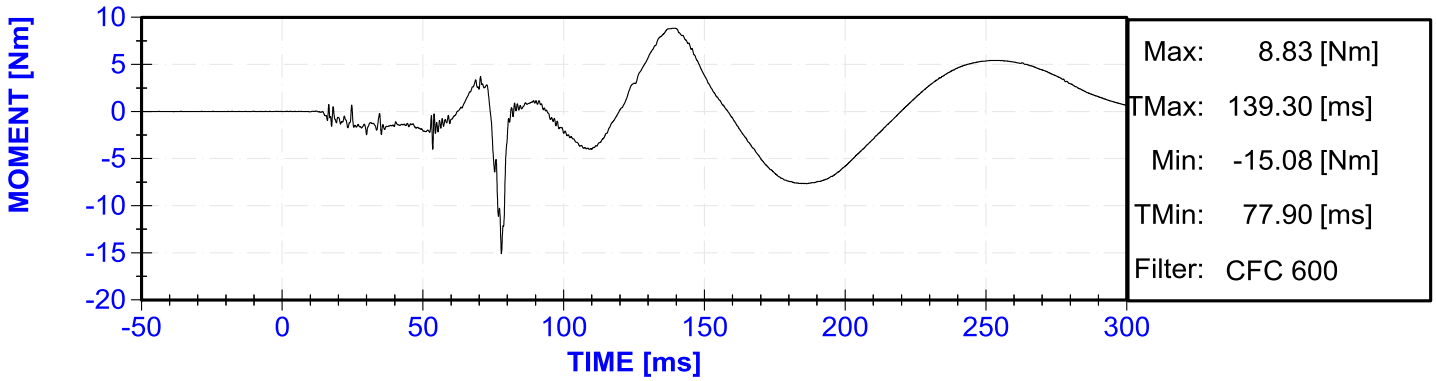
V2P1 Lower Neck X Moment



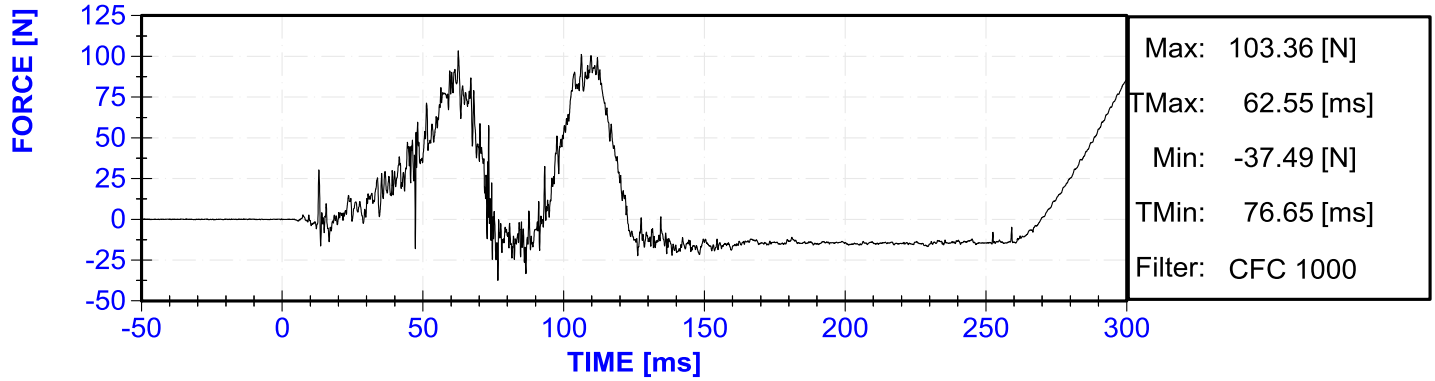
V2P1 Lower Neck Y Moment



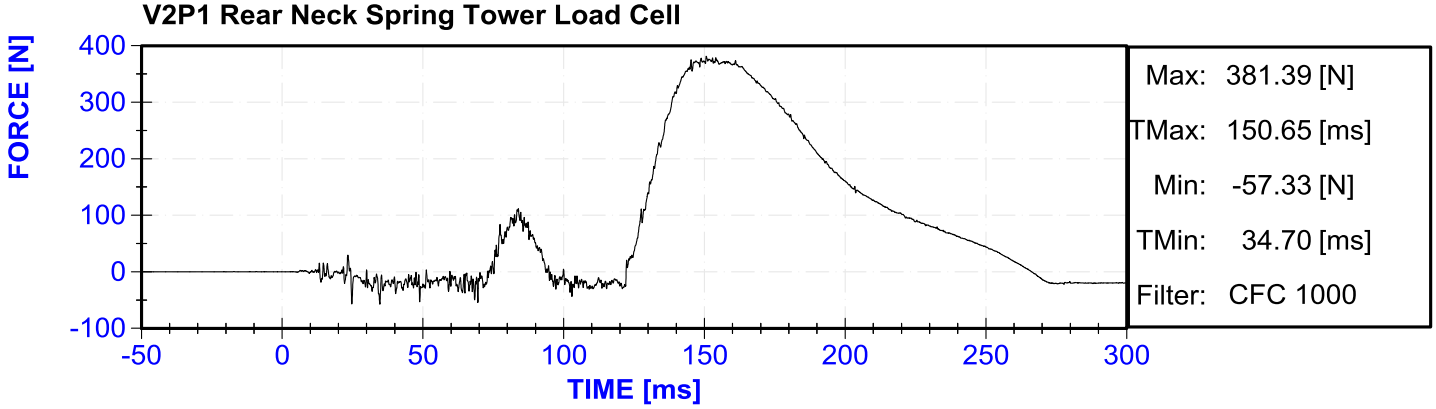
V2P1 Lower Neck Z Moment



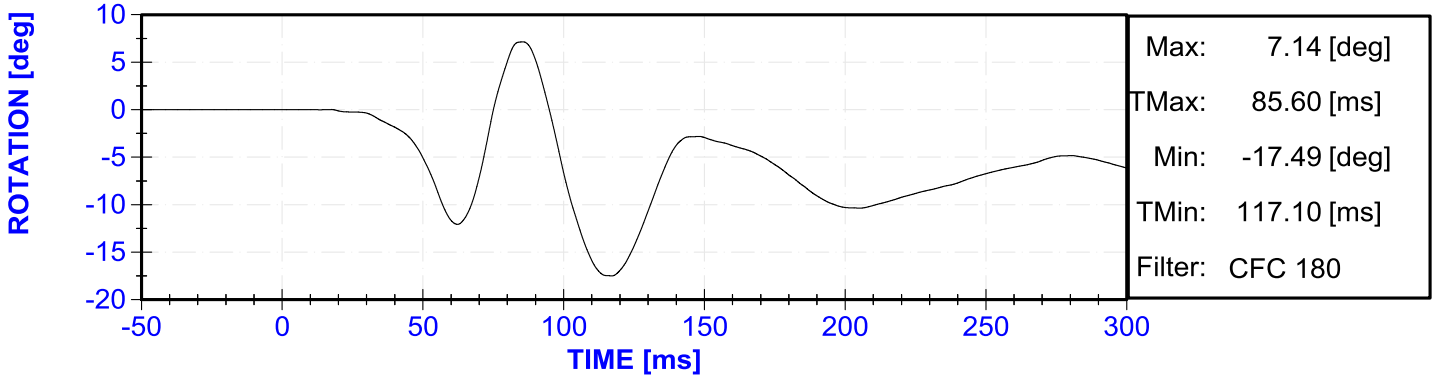
V2P1 Front Neck Spring Tower Load Cell



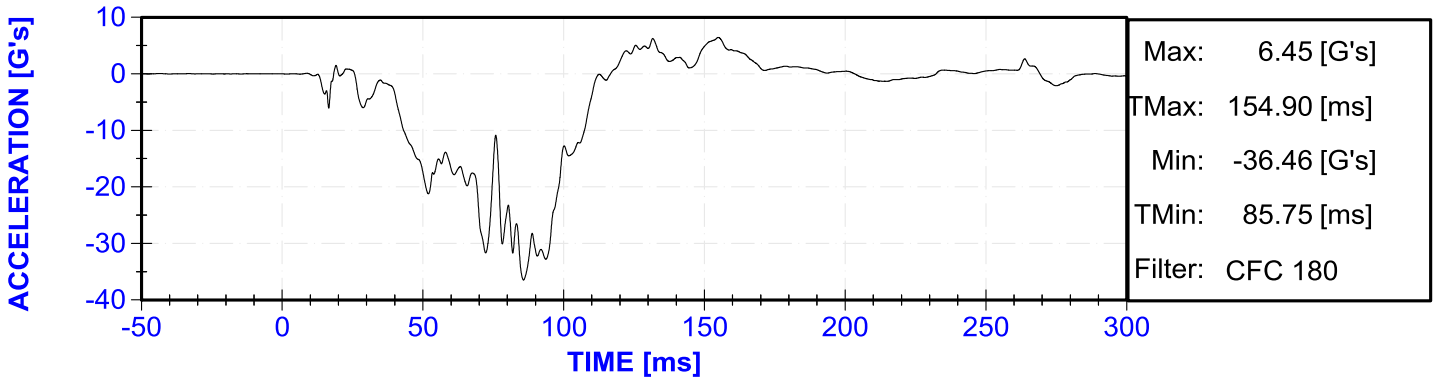
V2P1 Rear Neck Spring Tower Load Cell



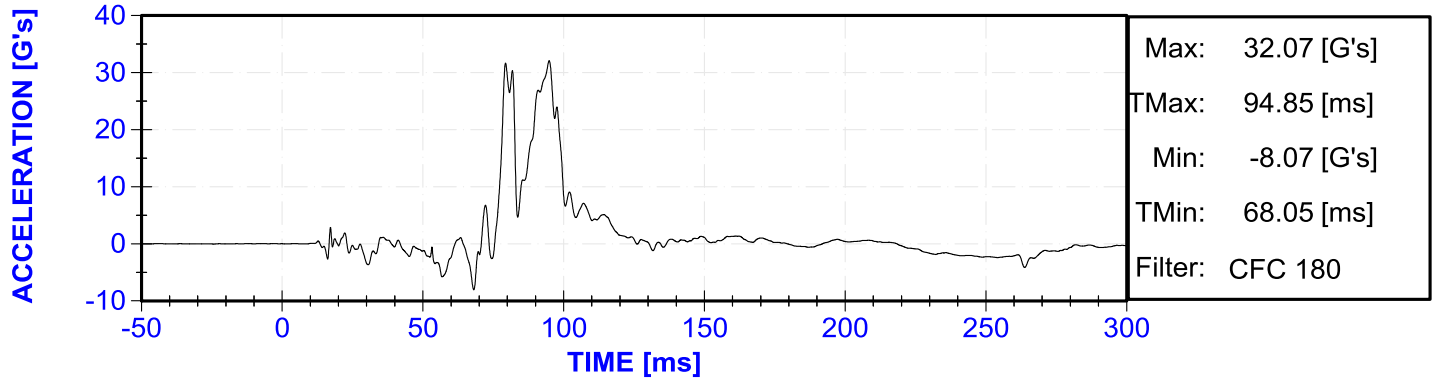
V2P1 Occipital Condyle Rotation Potentiometer



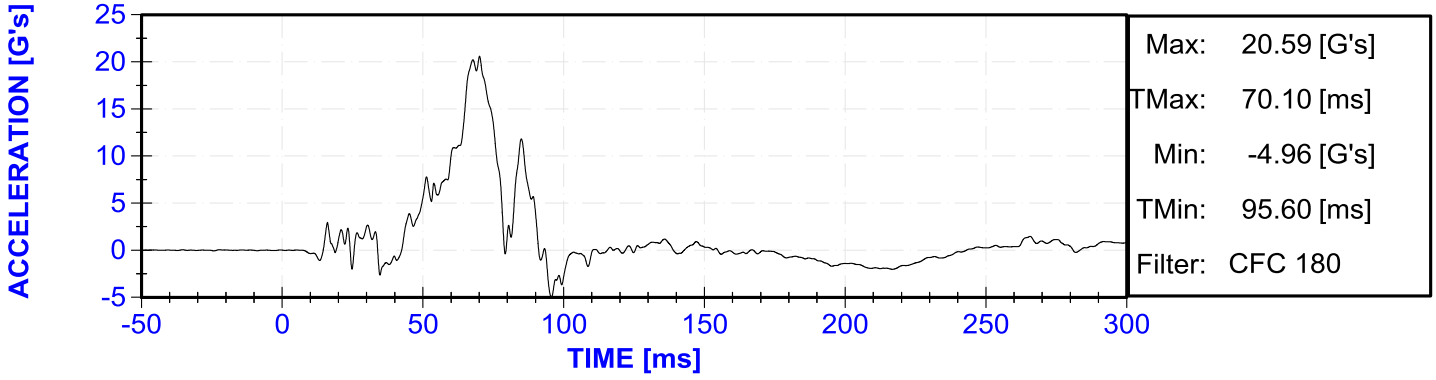
V2P1 T1 X Acceleration

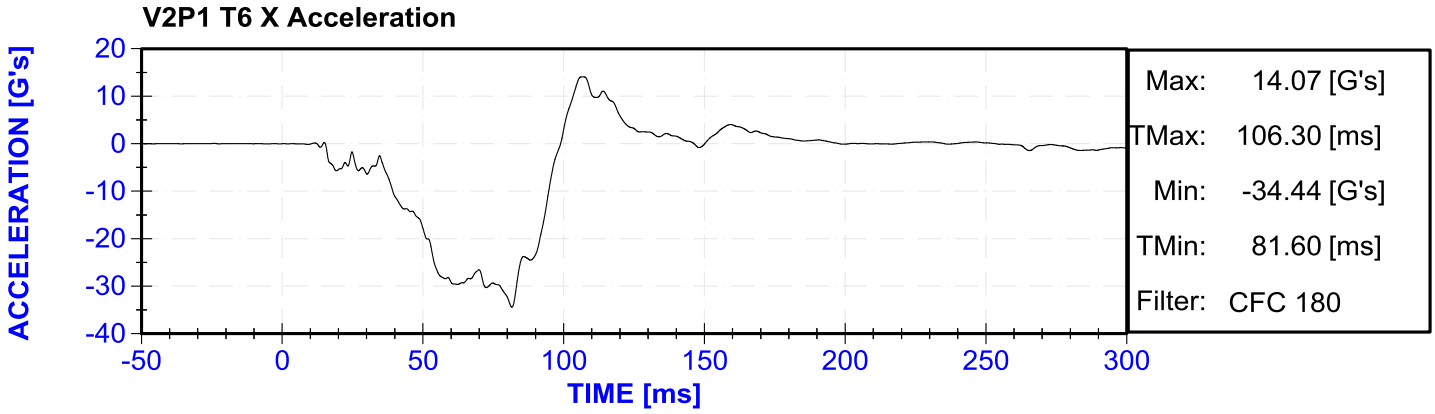


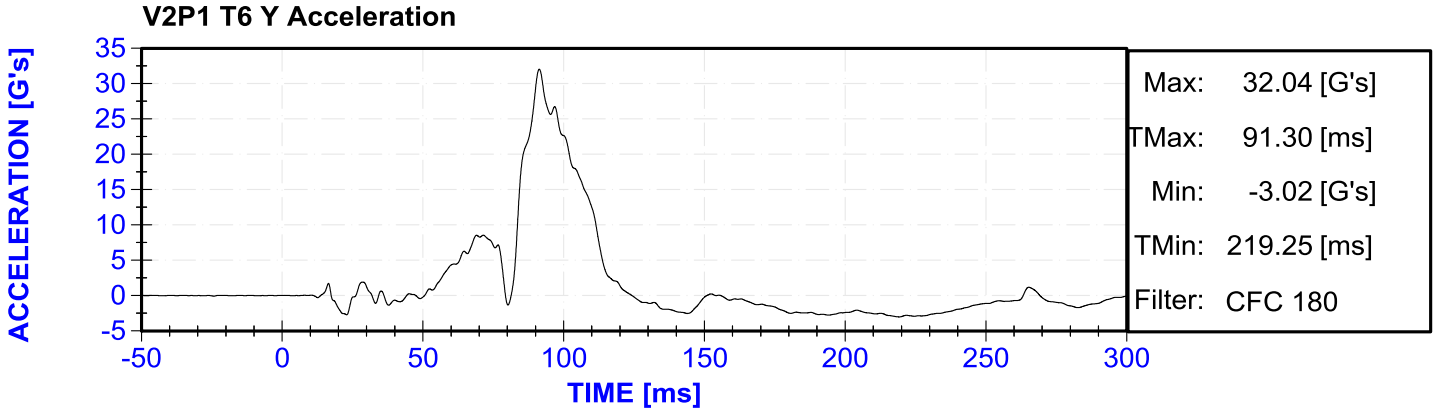
V2P1 T1 Y Acceleration

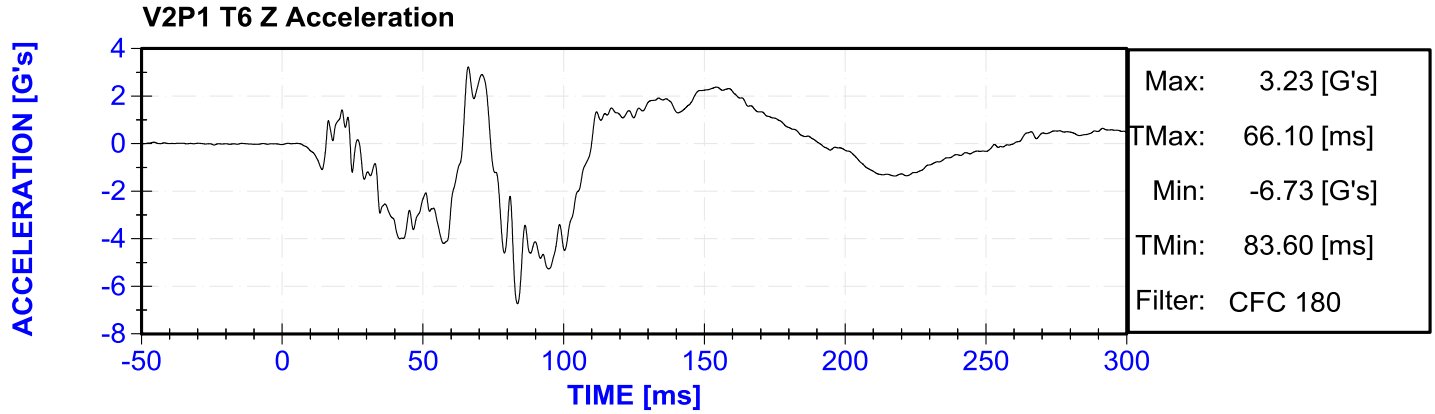


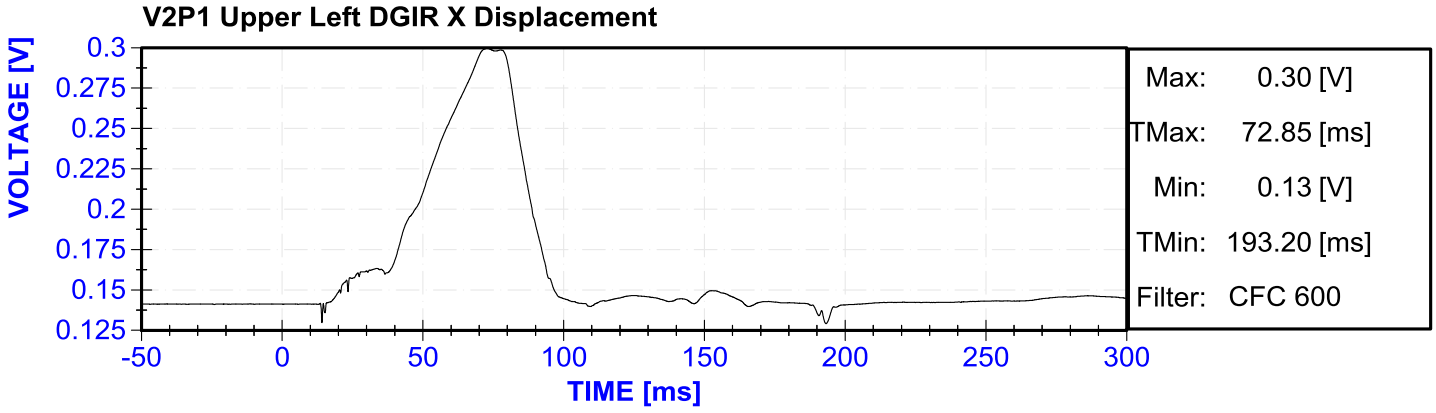
V2P1 T1 Z Acceleration



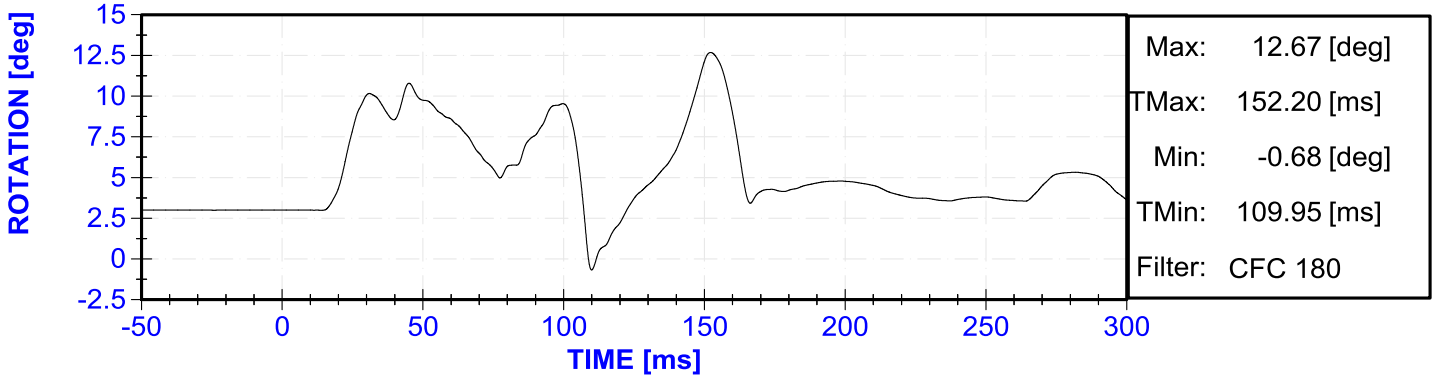

V2P1 T6 X Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 14.07 [G's]
TMax: 106.30 [ms]
Min: -34.44 [G's]
TMin: 81.60 [ms]
Filter: CFC 180


V2P1 T6 Y Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 32.04 [G's]
TMax: 91.30 [ms]
Min: -3.02 [G's]
TMin: 219.25 [ms]
Filter: CFC 180

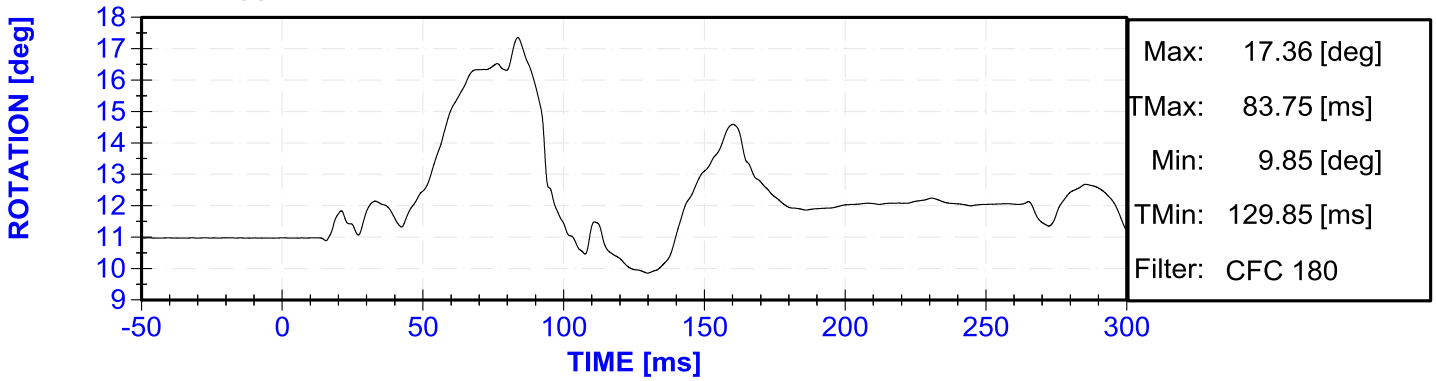

V2P1 T6 Z Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 3.23 [G's]
TMax: 66.10 [ms]
Min: -6.73 [G's]
TMin: 83.60 [ms]
Filter: CFC 180


V2P1 Upper Left DGIR X Displacement
VOLTAGE [V]
TIME [ms]
Max: 0.30 [V]
TMax: 72.85 [ms]
Min: 0.13 [V]
TMin: 193.20 [ms]
Filter: CFC 600

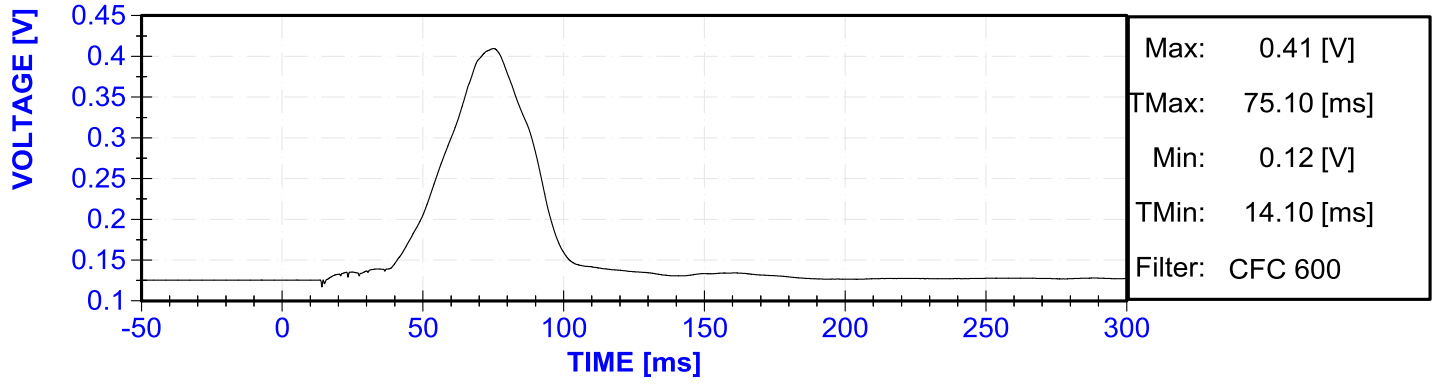
V2P1 Upper Left DGIR Y Rotation



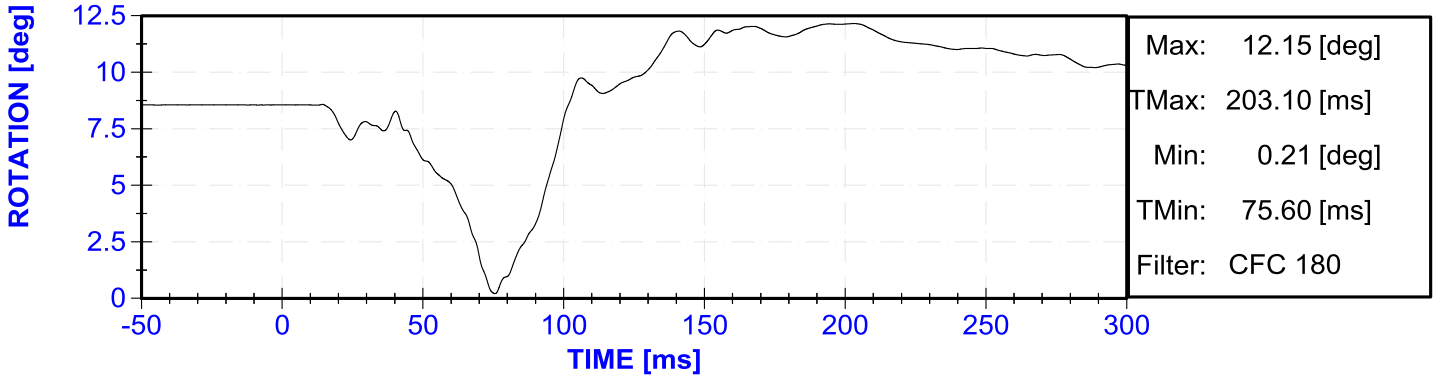
V2P1 Upper Left DGIR Z Rotation



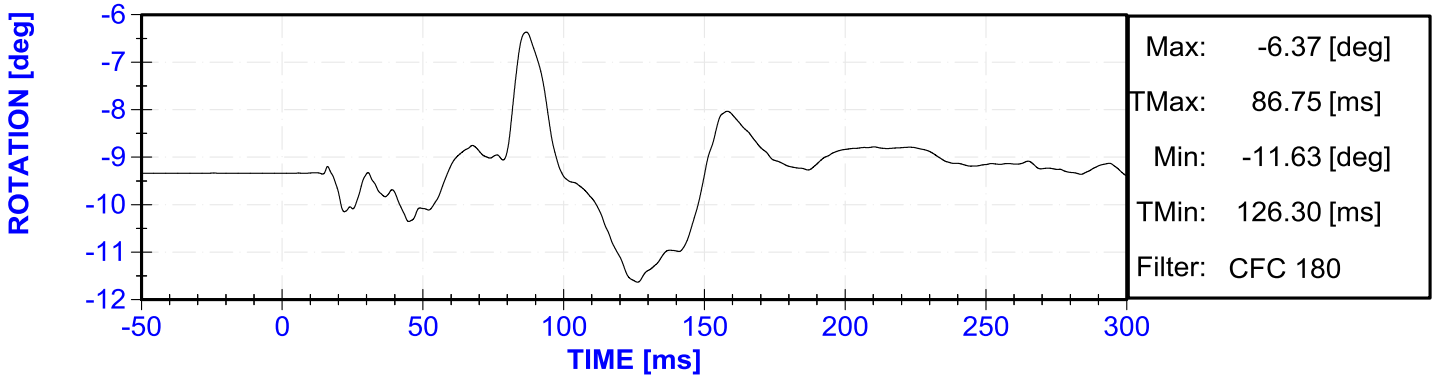
V2P1 Upper Right DGIR X Displacement



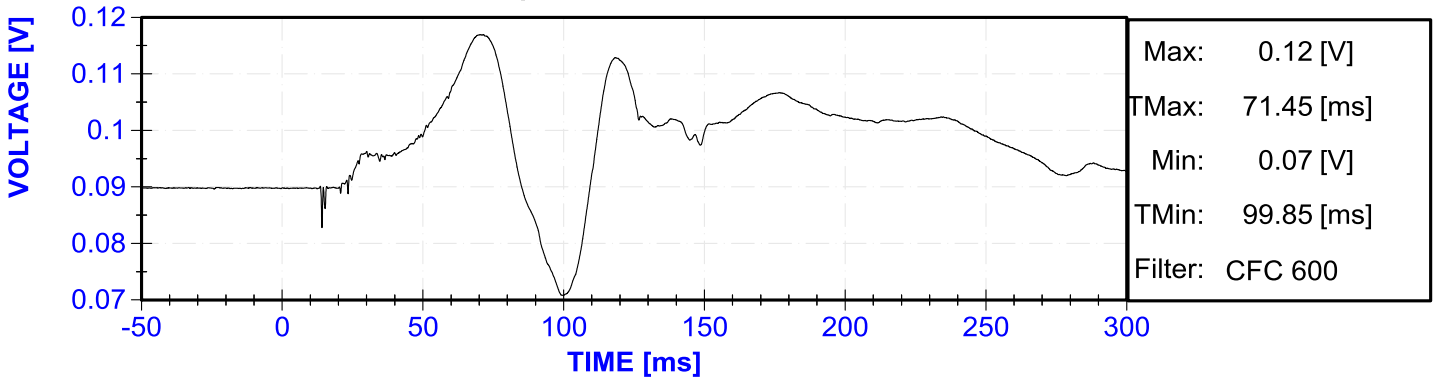
V2P1 Upper Right DGIR Y Rotation



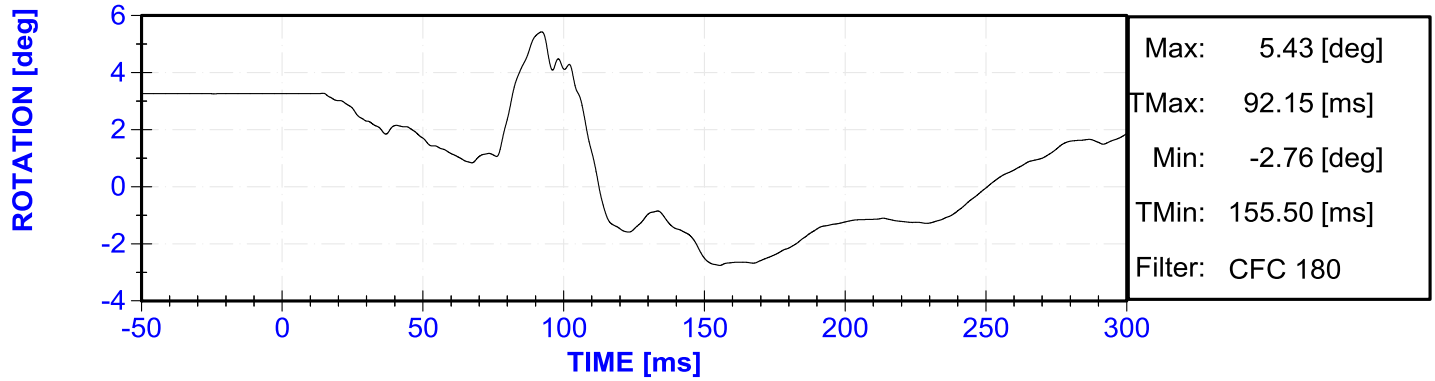
V2P1 Upper Right DGIR Z Rotation



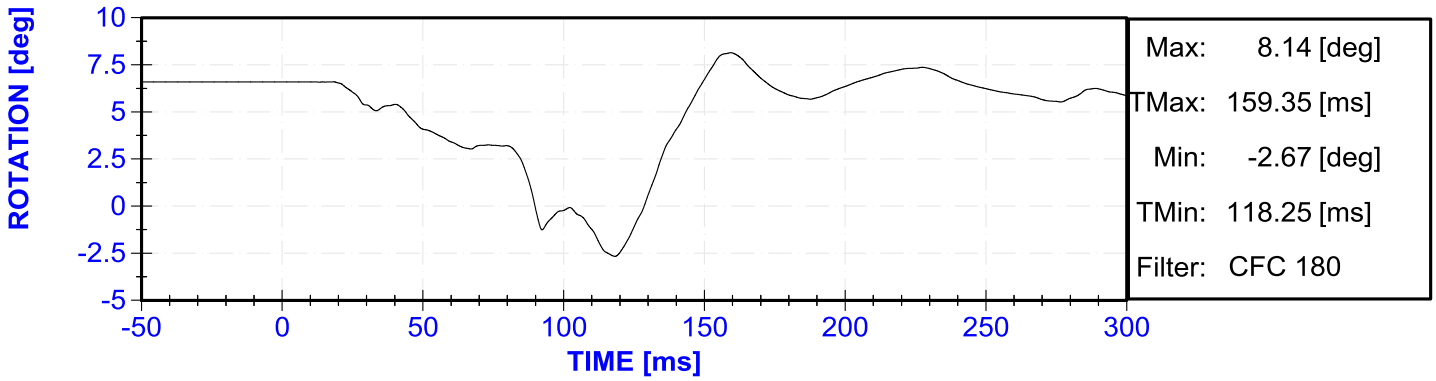
V2P1 Lower Left DGIR X Displacement



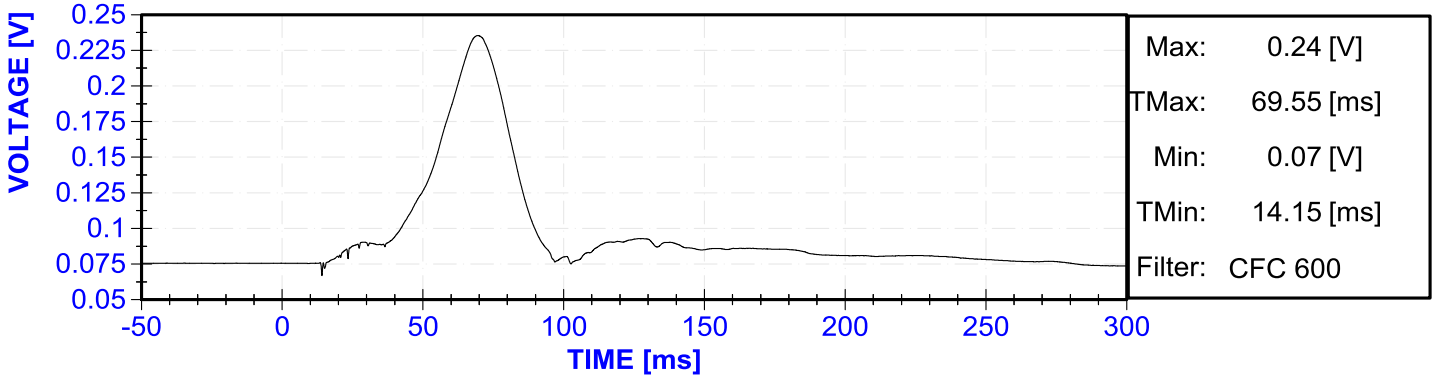
V2P1 Lower Left DGIR Y Rotation



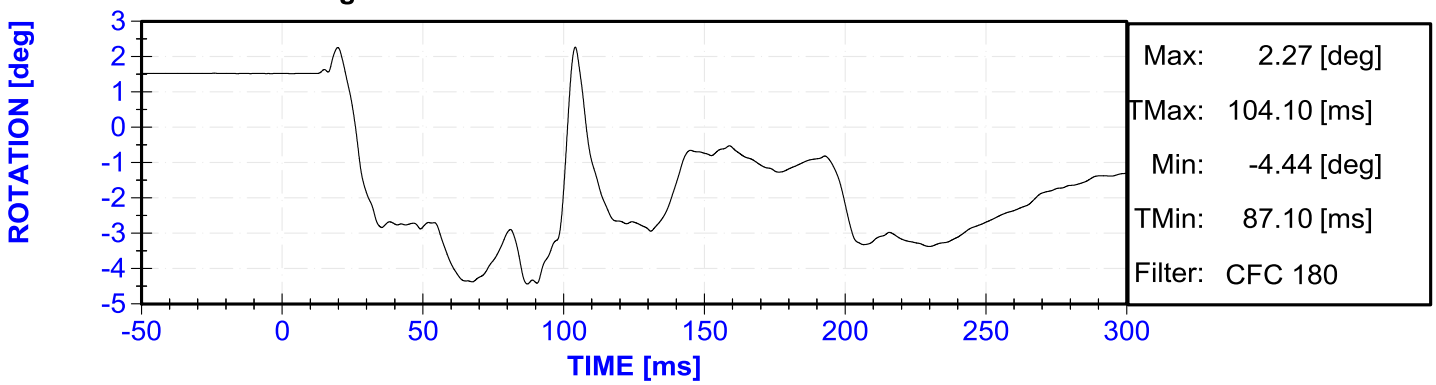
V2P1 Lower Left DGIR Z Rotation



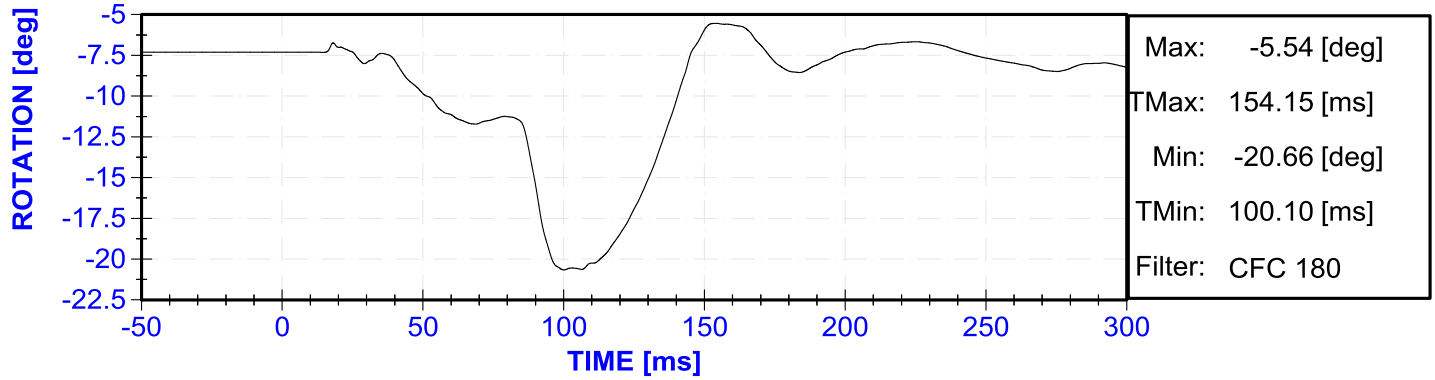
V2P1 Lower Right DGIR X Displacement



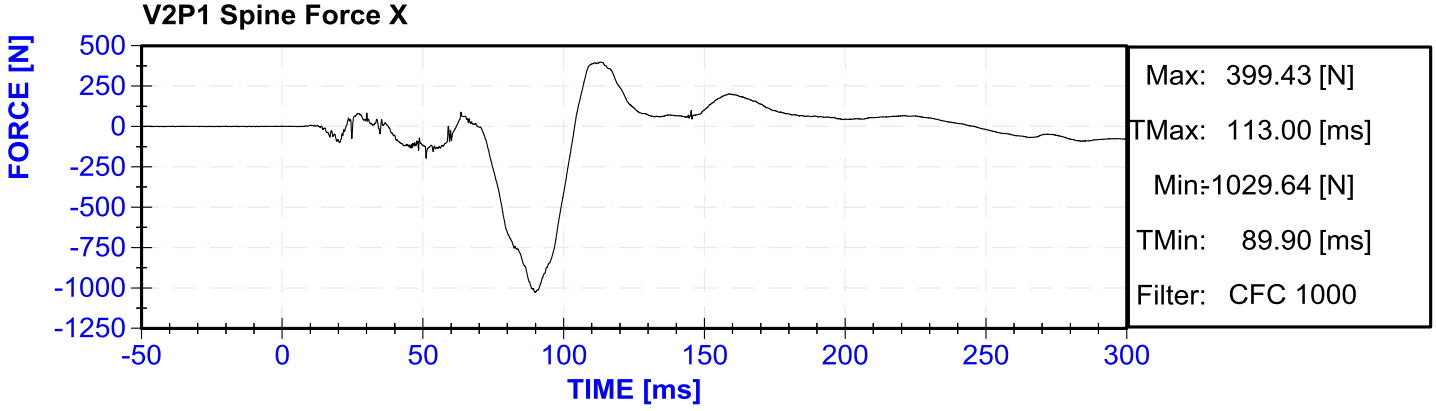
V2P1 Lower Right DGIR Y Rotation



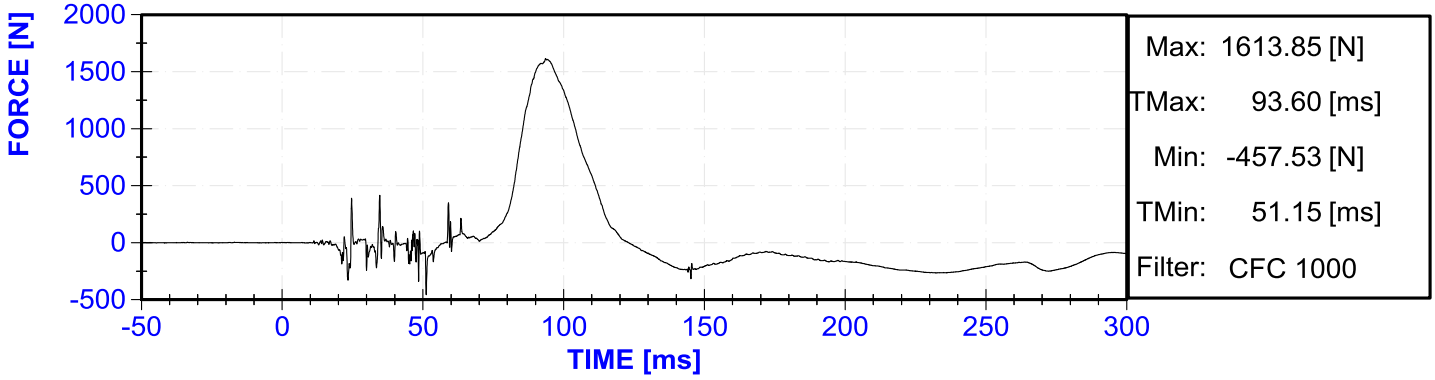
V2P1 Lower Right DGIR Z Rotation



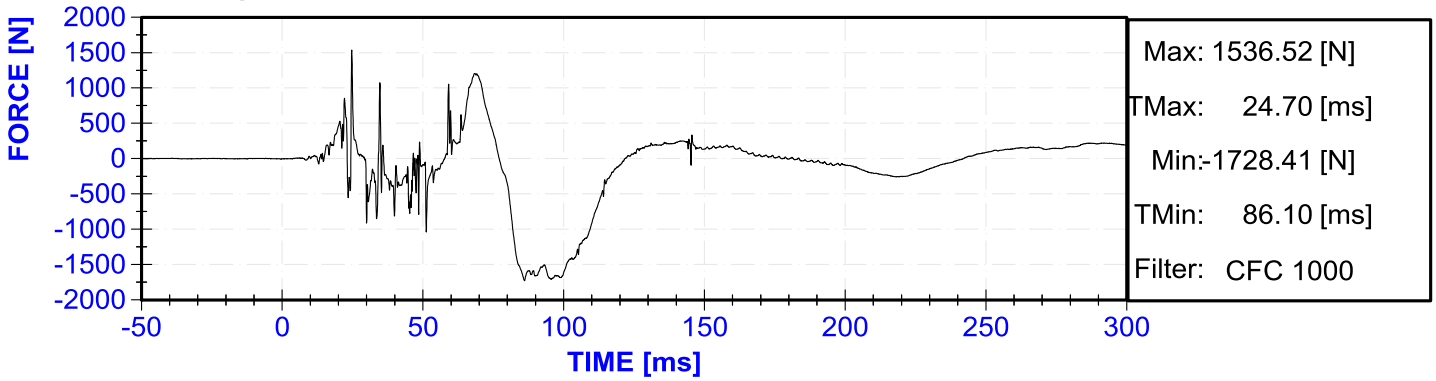
V2P1 Spine Force X



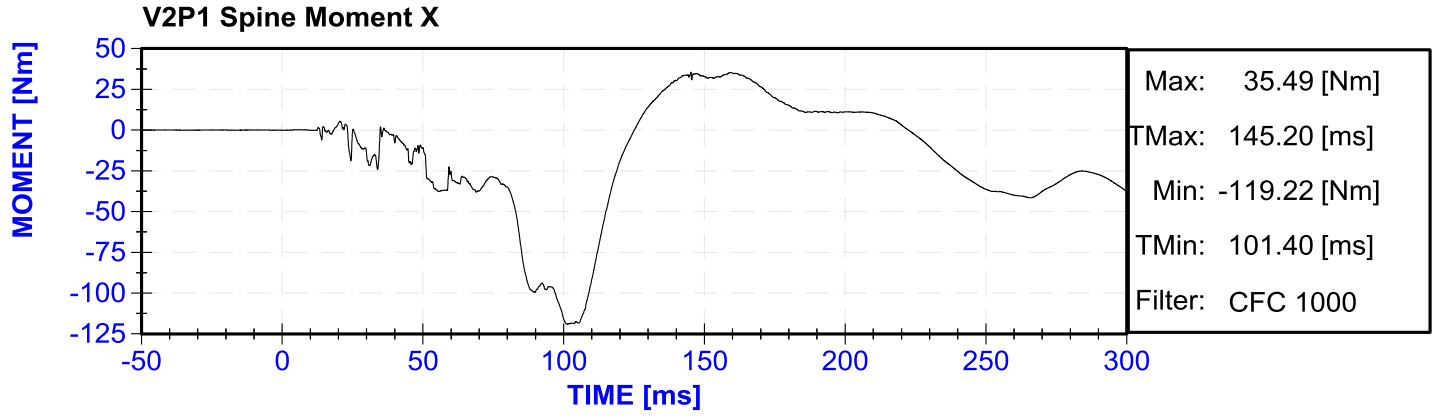
V2P1 Spine Force Y



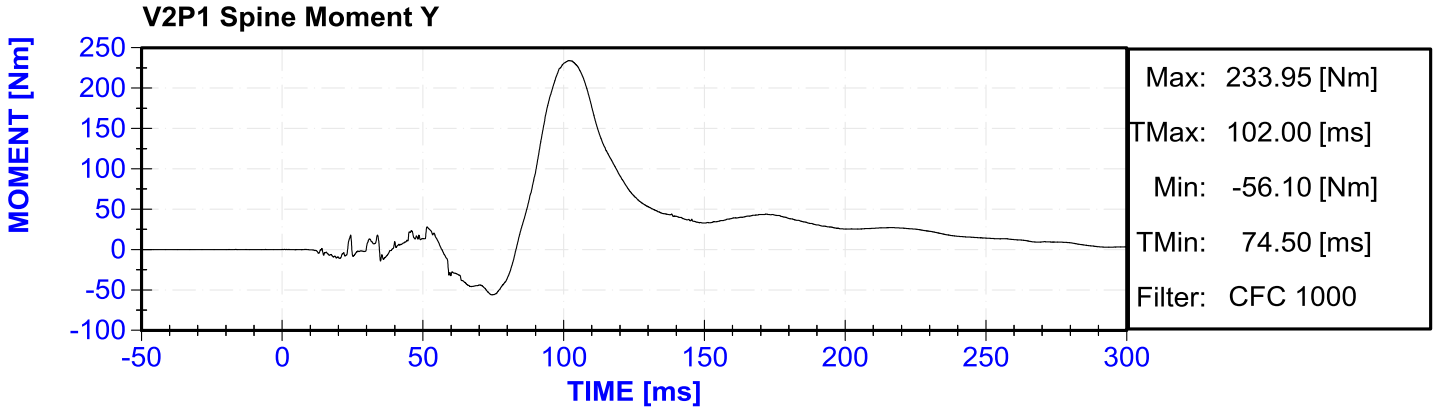
V2P1 Spine Force Z

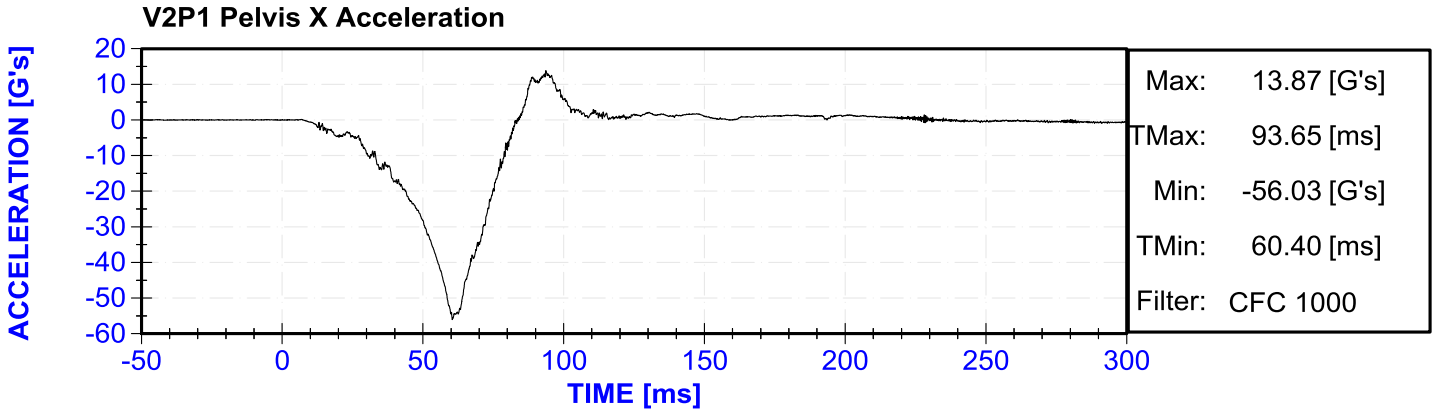


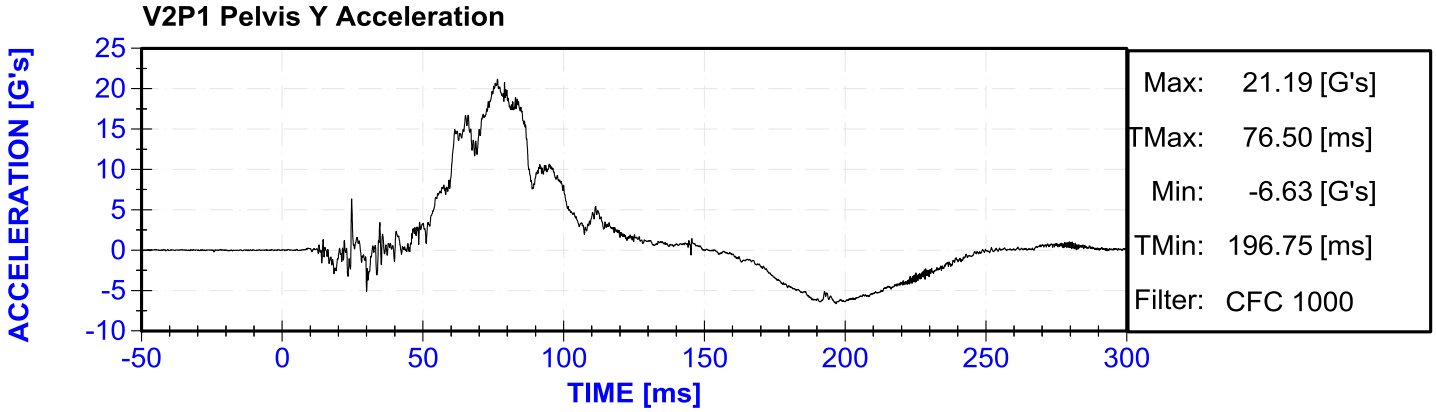
V2P1 Spine Moment X

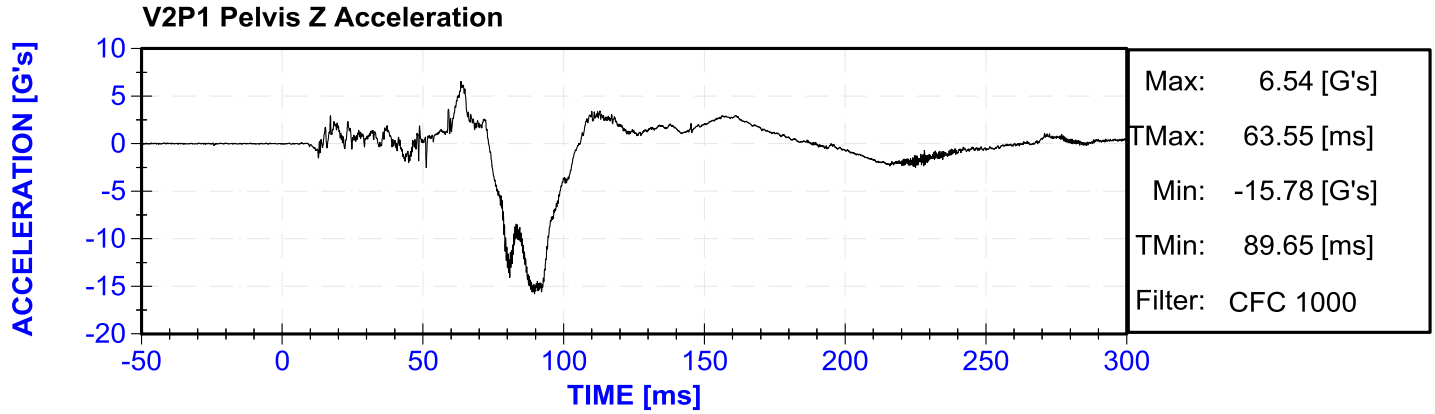


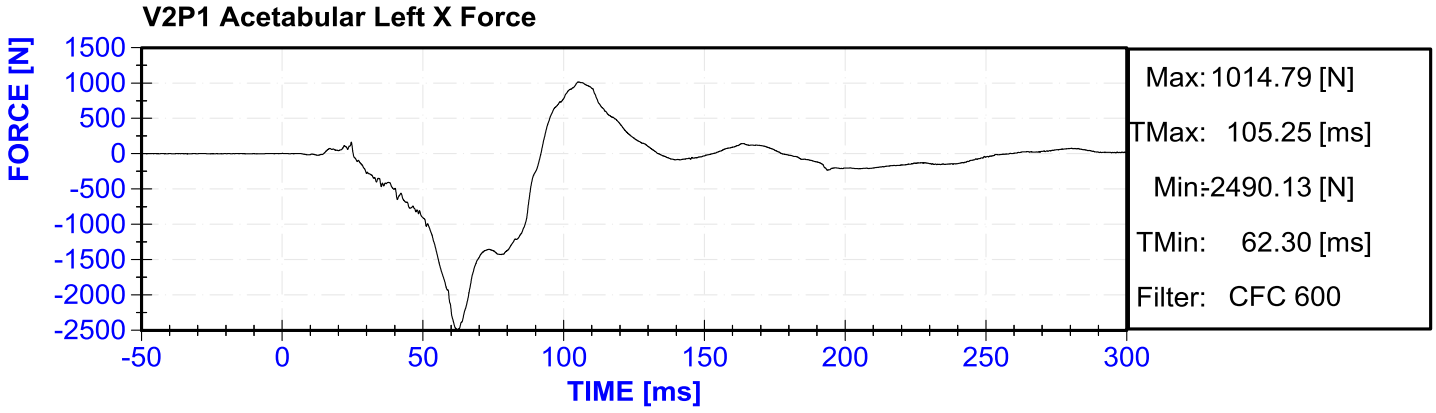
V2P1 Spine Moment Y



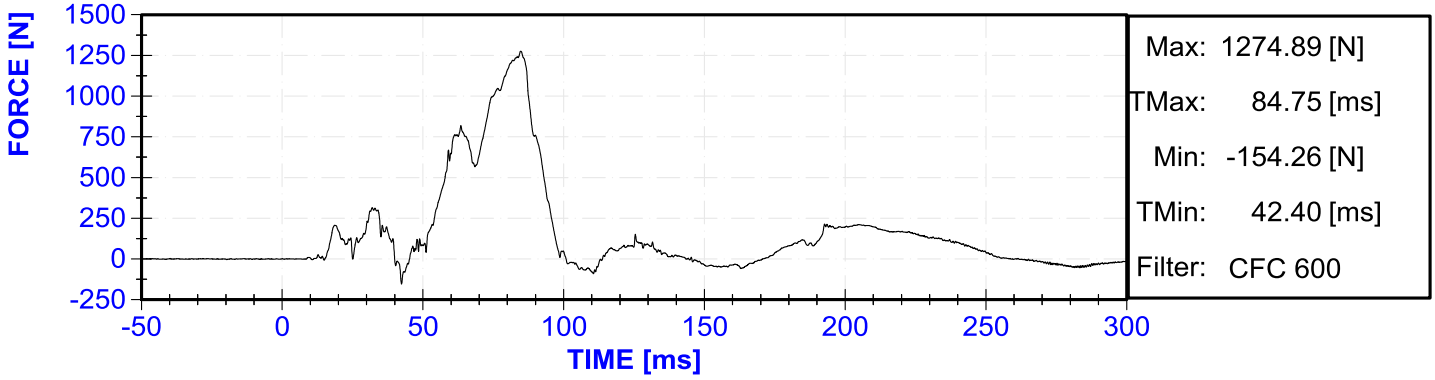

V2P1 Pelvis X Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 13.87 [G's]
TMax: 93.65 [ms]
Min: -56.03 [G's]
TMin: 60.40 [ms]
Filter: CFC 1000


V2P1 Pelvis Y Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 21.19 [G's]
TMax: 76.50 [ms]
Min: -6.63 [G's]
TMin: 196.75 [ms]
Filter: CFC 1000

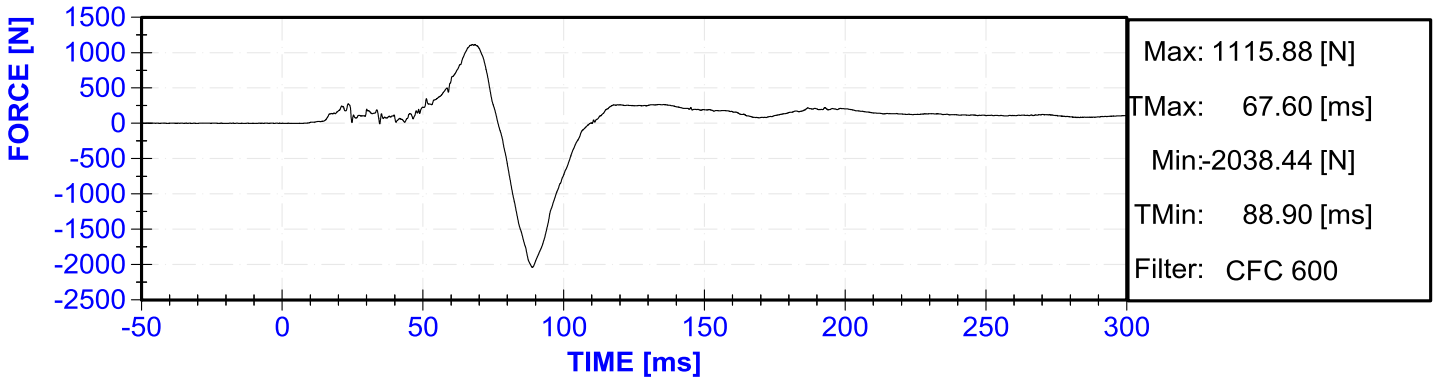

V2P1 Pelvis Z Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 6.54 [G's]
TMax: 63.55 [ms]
Min: -15.78 [G's]
TMin: 89.65 [ms]
Filter: CFC 1000


V2P1 Acetabular Left X Force
FORCE [N]
TIME [ms]
Max: 1014.79 [N]
TMax: 105.25 [ms]
Min: -2490.13 [N]
TMin: 62.30 [ms]
Filter: CFC 600

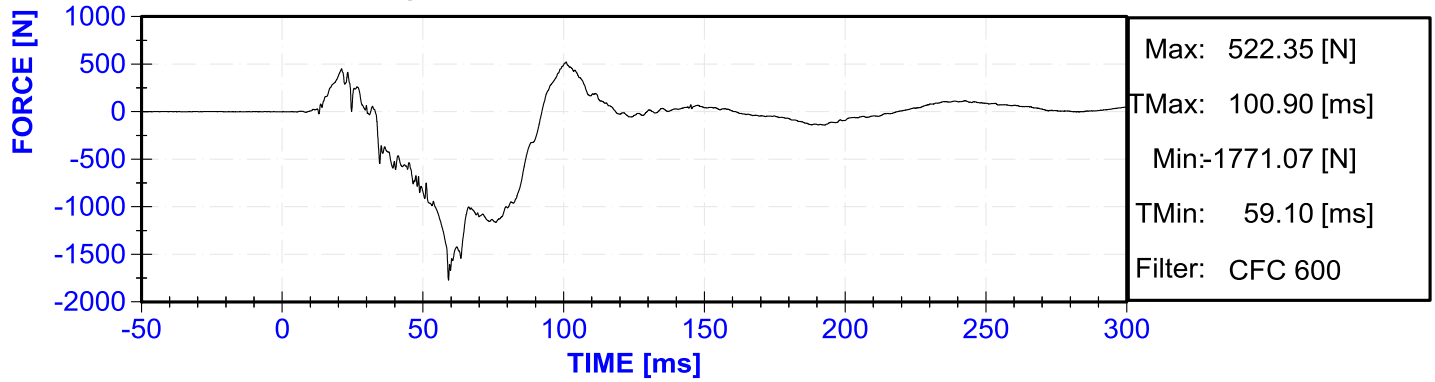
V2P1 Acetabular Left Y Force



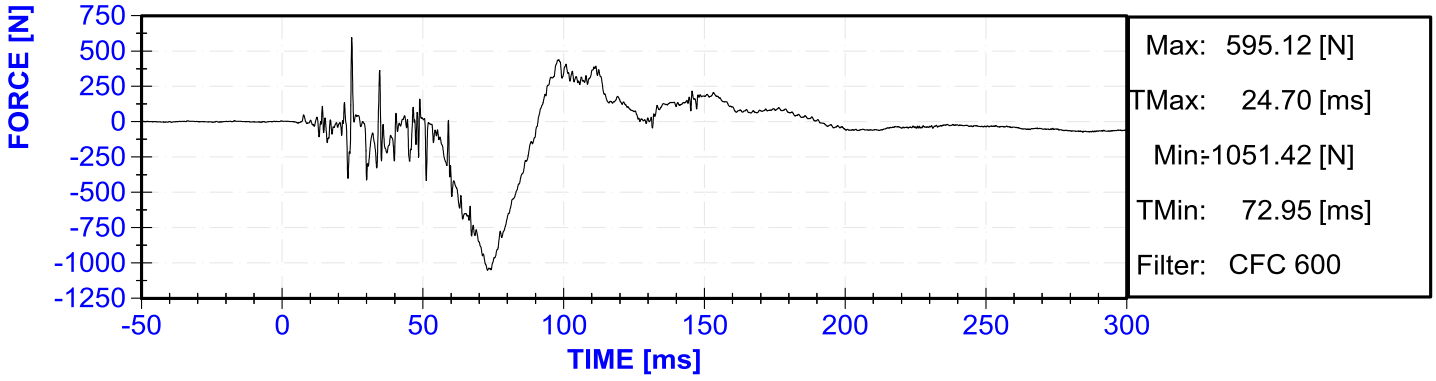
V2P1 Acetabular Left Z Force



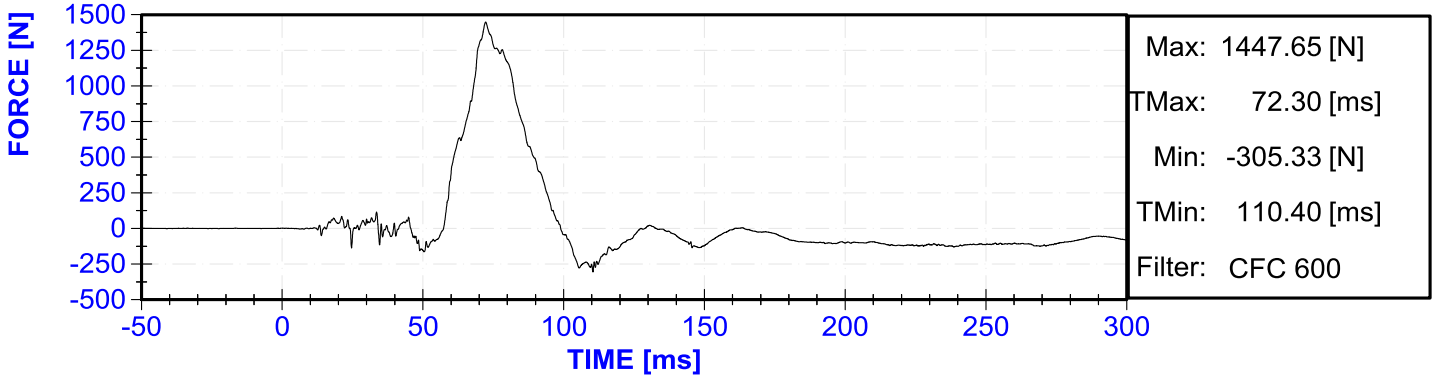
V2P1 Acetabular Right X Force



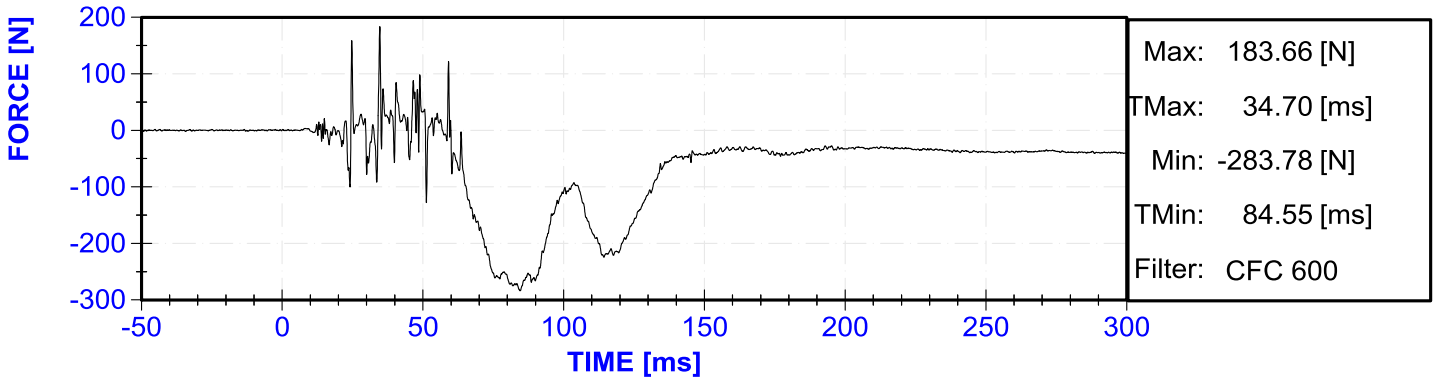
V2P1 Acetabular Right Y Force



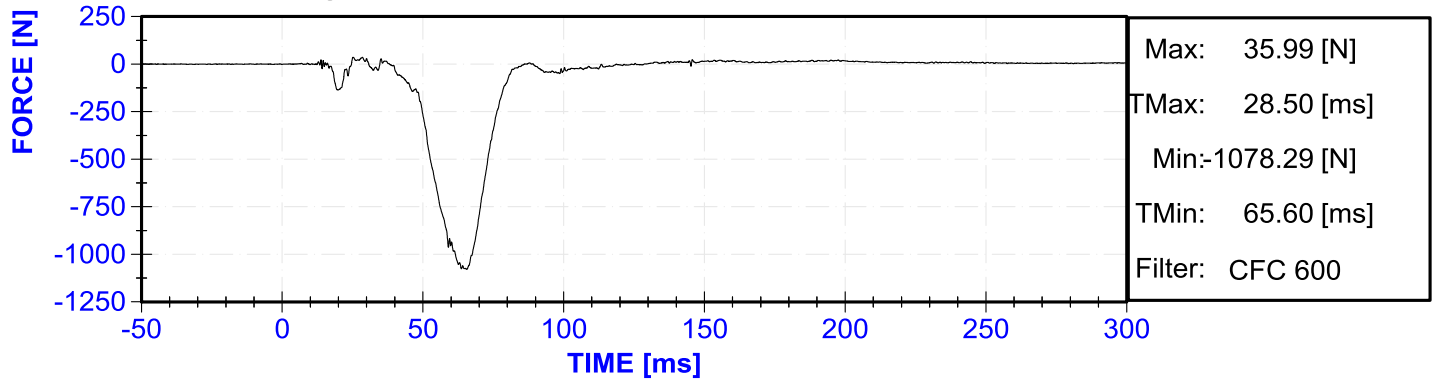
V2P1 Acetabular Right Z Force



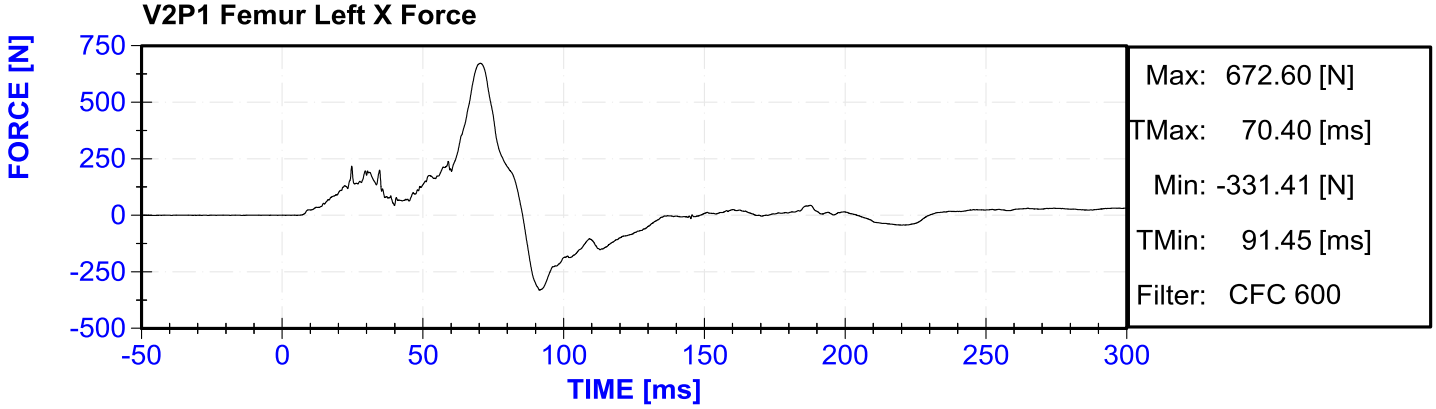
V2P1 ASIS Left X Force

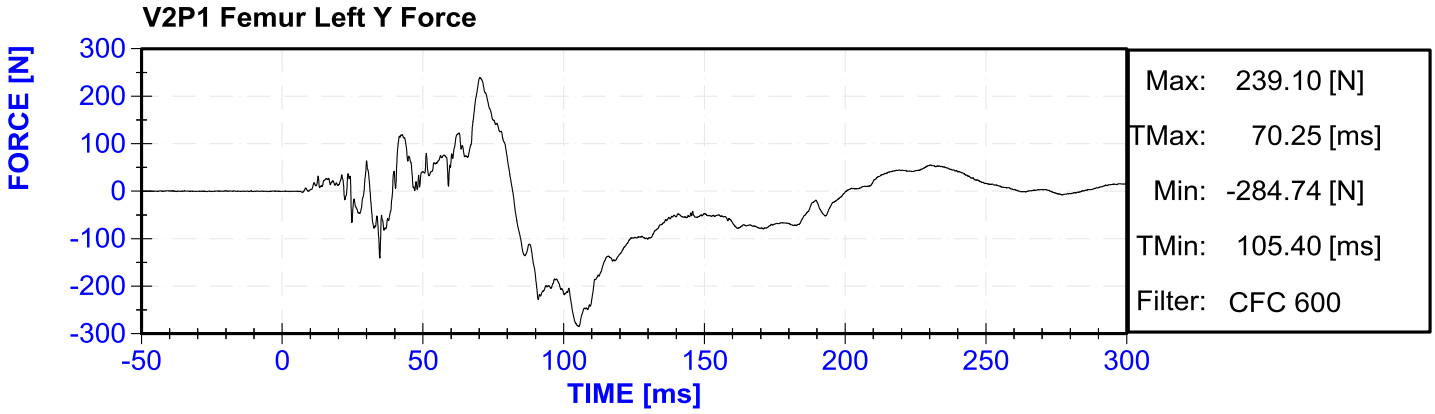


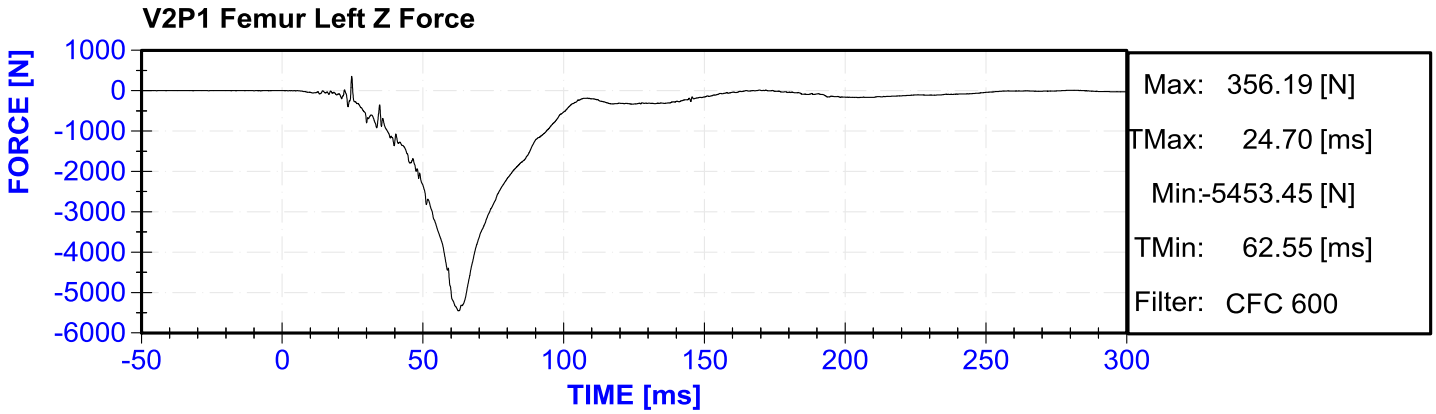
V2P1 ASIS Right X Force

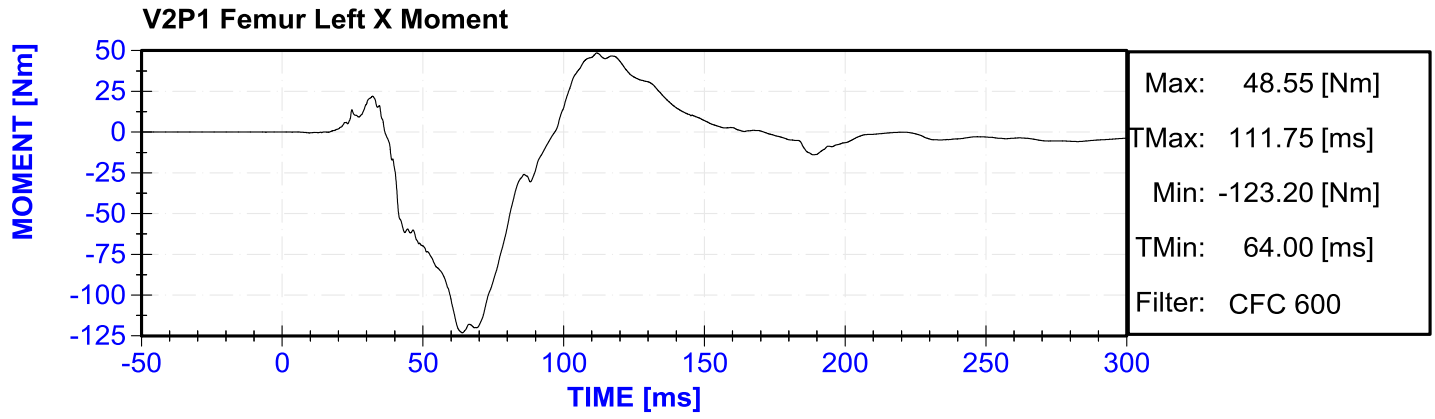


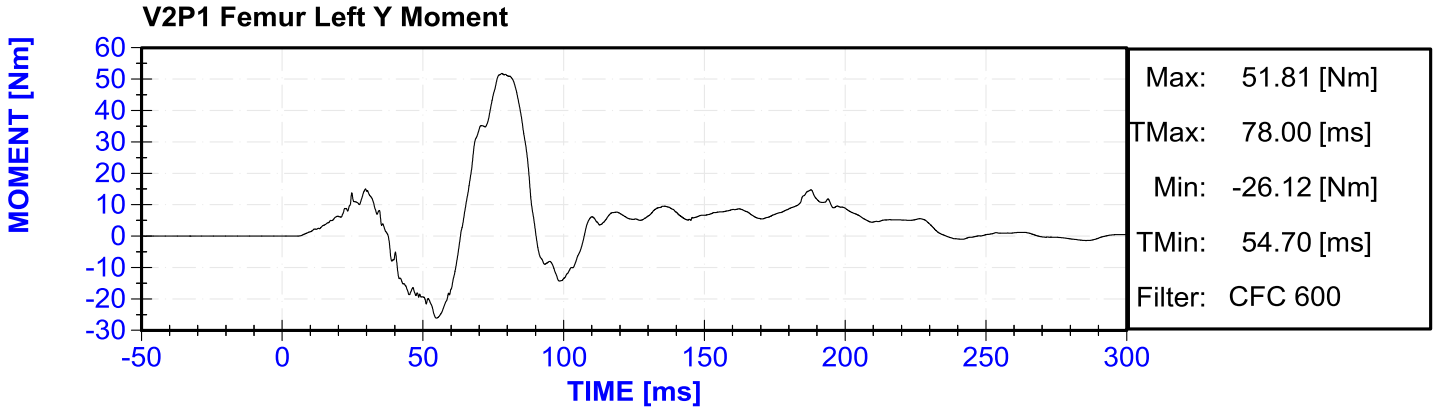
V2P1 Femur Left X Force



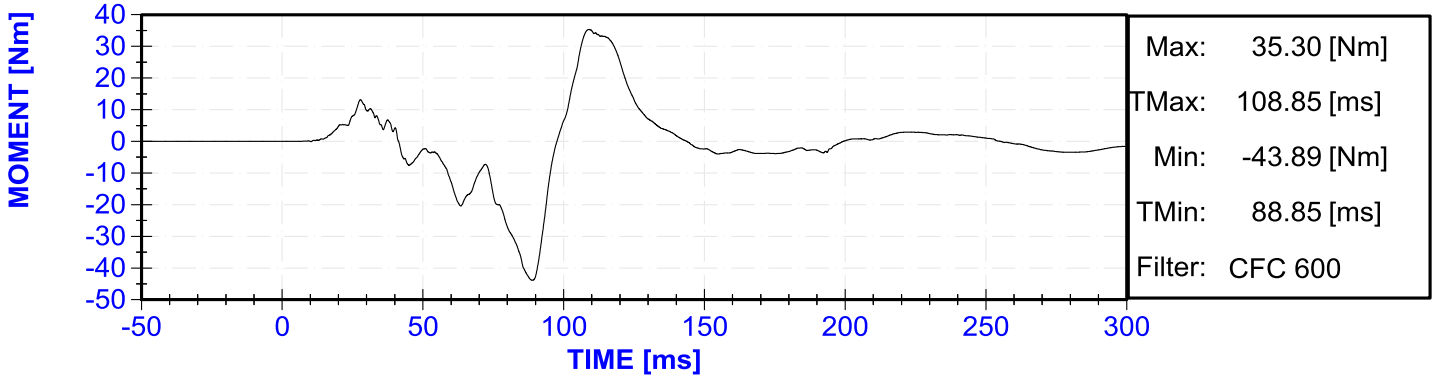

V2P1 Femur Left Y Force
FORCE [N]
300
200
100
0
-100
-200
-300
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 239.10 [N]
TMax: 70.25 [ms]
Min: -284.74 [N]
TMin: 105.40 [ms]
Filter: CFC 600


V2P1 Femur Left Z Force
FORCE [N]
1000
0
-1000
-2000
-3000
-4000
-5000
-6000
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 356.19 [N]
TMax: 24.70 [ms]
Min:-5453.45 [N]
TMin: 62.55 [ms]
Filter: CFC 600

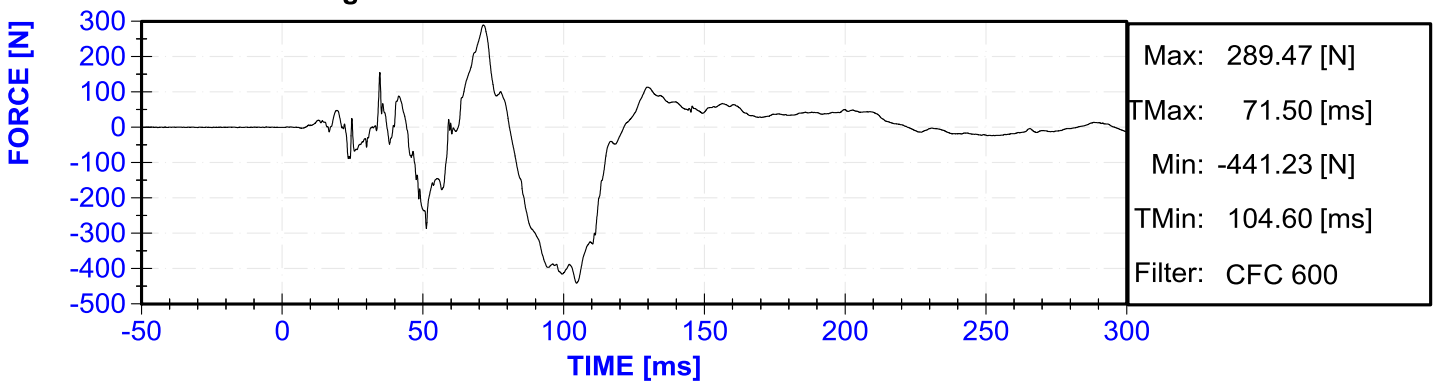

V2P1 Femur Left X Moment
MOMENT [Nm]
50
25
0
-25
-50
-75
-100
-125
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 48.55 [Nm]
TMax: 111.75 [ms]
Min: -123.20 [Nm]
TMin: 64.00 [ms]
Filter: CFC 600


V2P1 Femur Left Y Moment
MOMENT [Nm]
60
50
40
30
20
10
0
-10
-20
-30
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 51.81 [Nm]
TMax: 78.00 [ms]
Min: -26.12 [Nm]
TMin: 54.70 [ms]
Filter: CFC 600

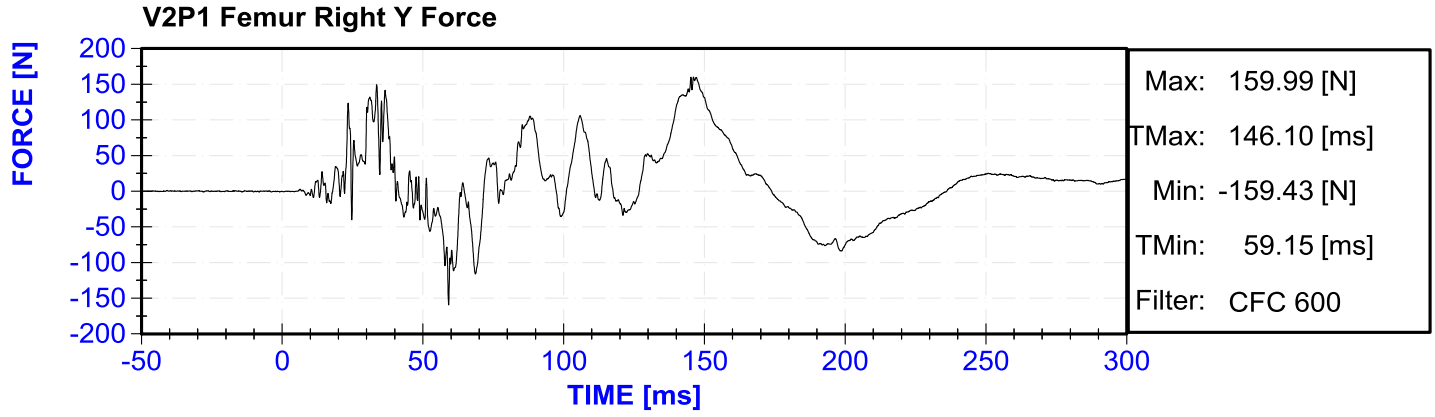
V2P1 Femur Left Z Moment



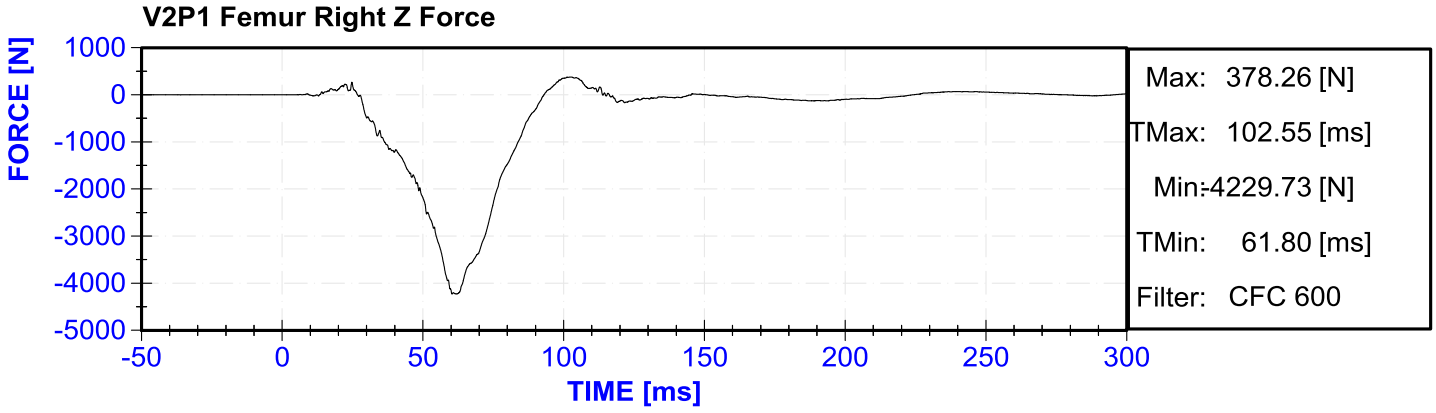
V2P1 Femur Right X Force



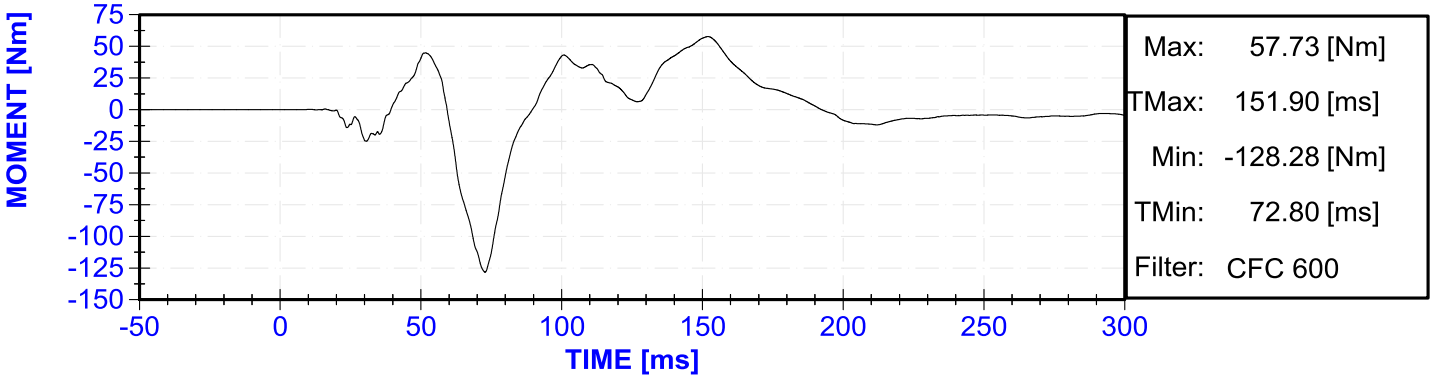
V2P1 Femur Right Y Force



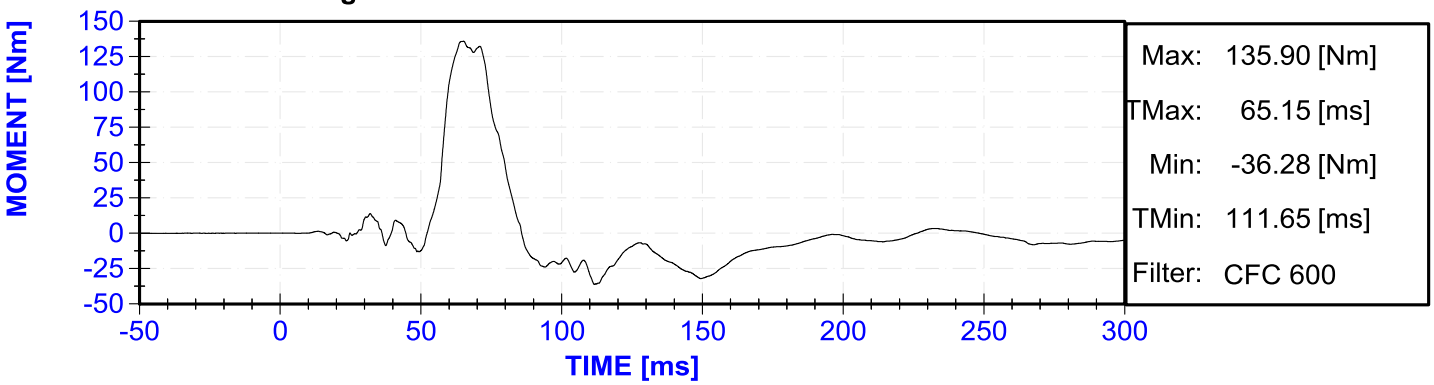
V2P1 Femur Right Z Force



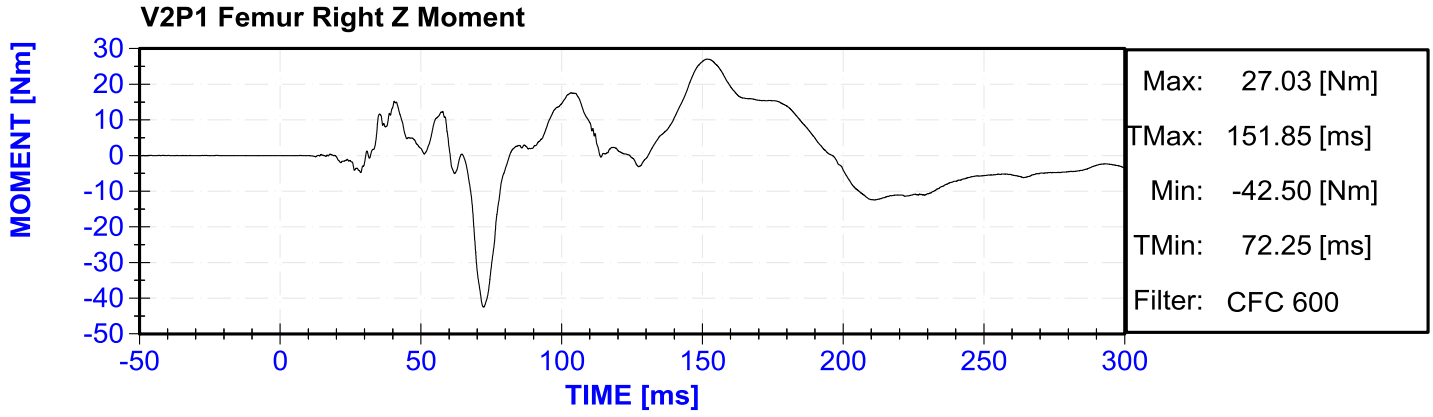
V2P1 Femur Right X Moment



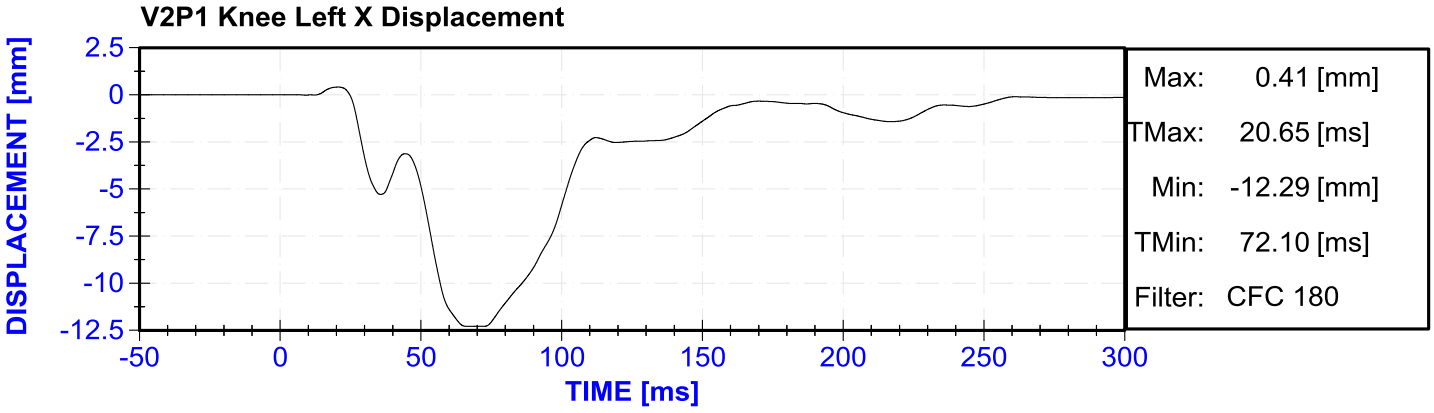
V2P1 Femur Right Y Moment



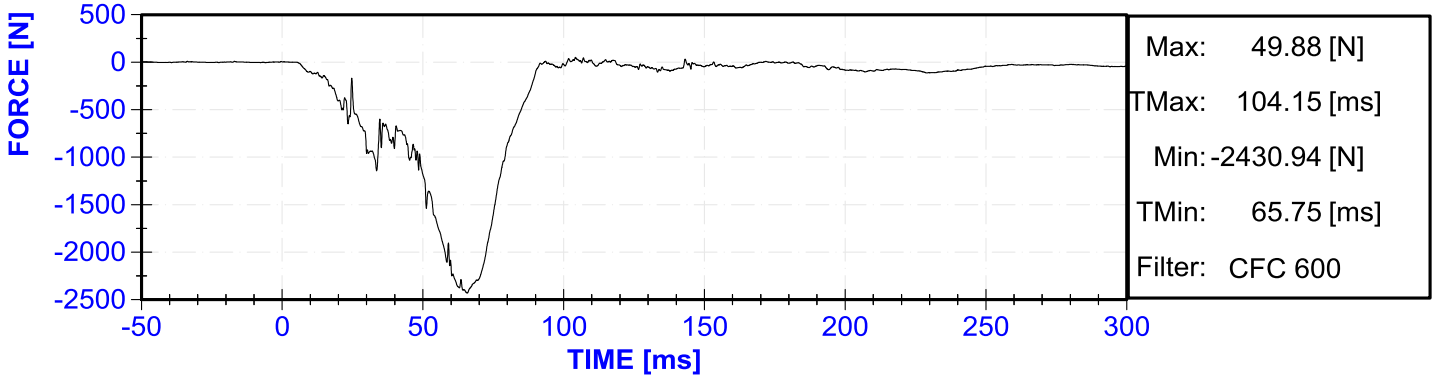
V2P1 Femur Right Z Moment



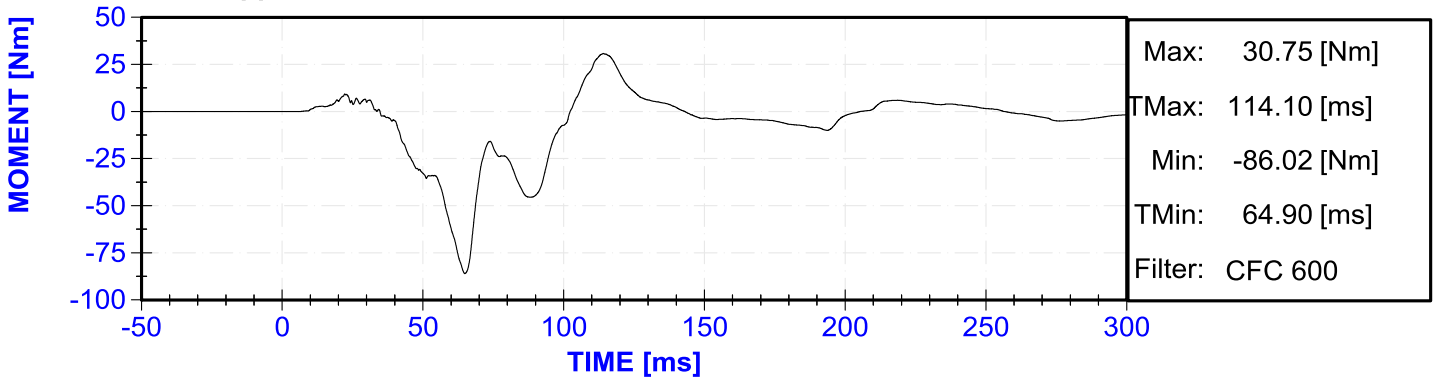
V2P1 Knee Left X Displacement



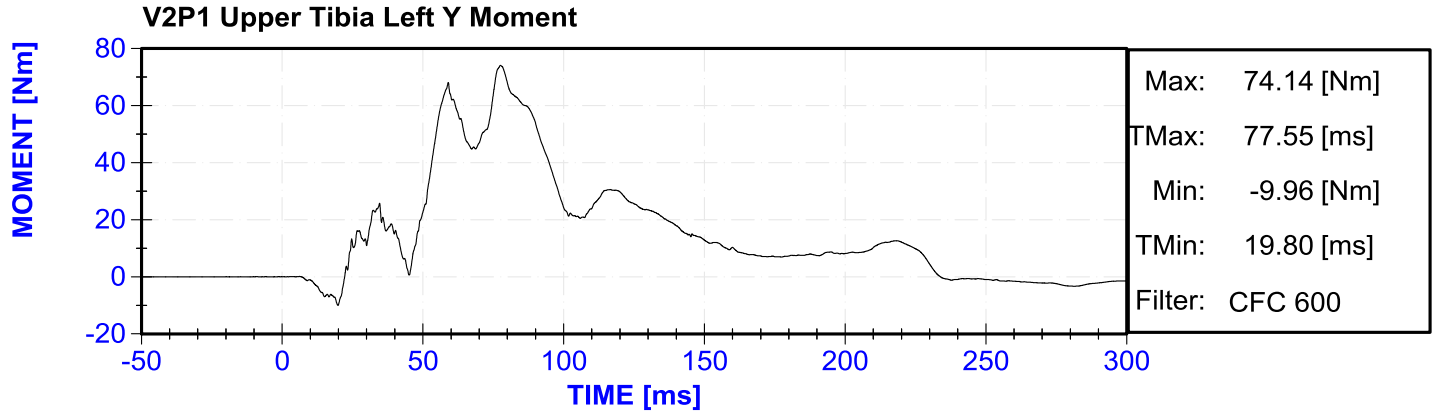
V2P1 Upper Tibia Left Z Force



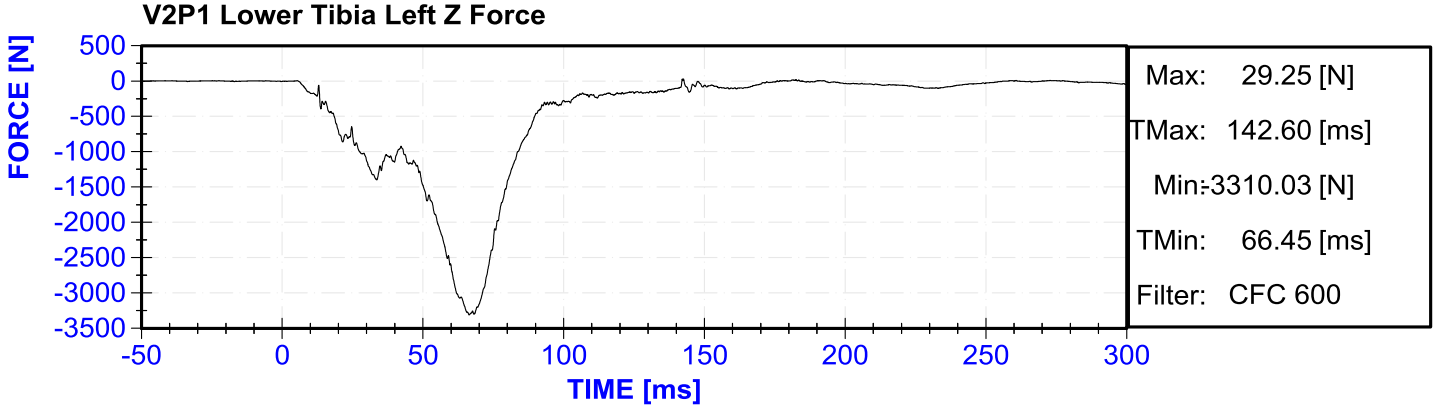
V2P1 Upper Tibia Left X Moment



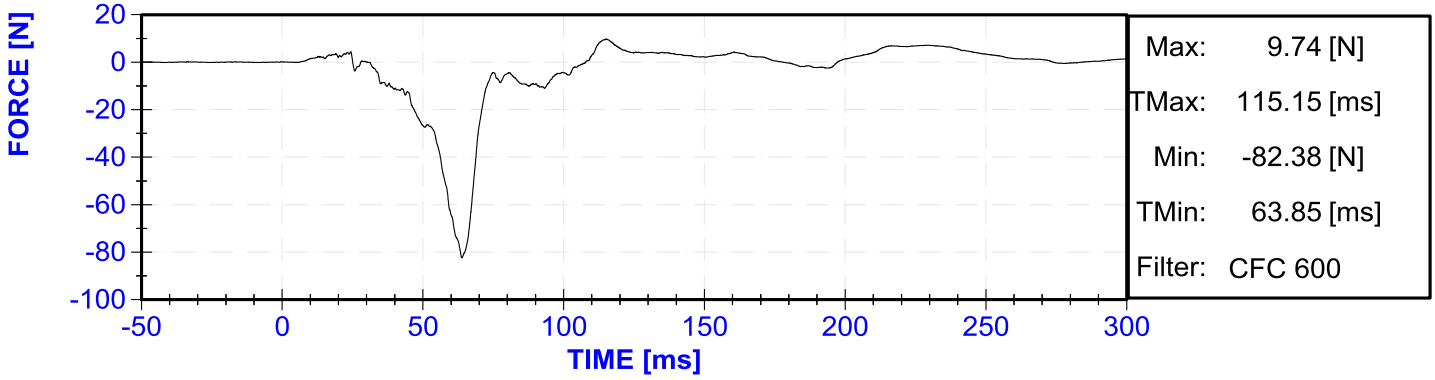
V2P1 Upper Tibia Left Y Moment



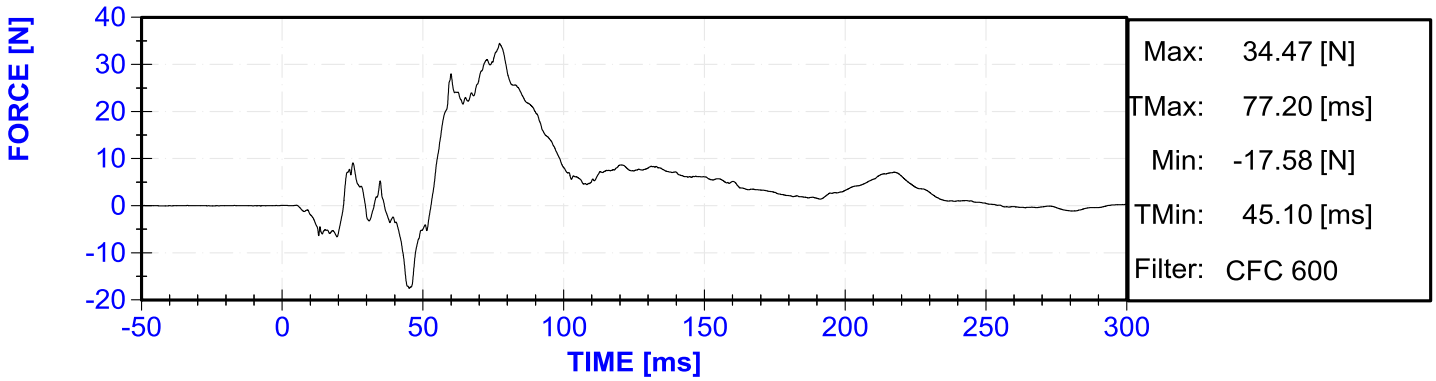
V2P1 Lower Tibia Left Z Force



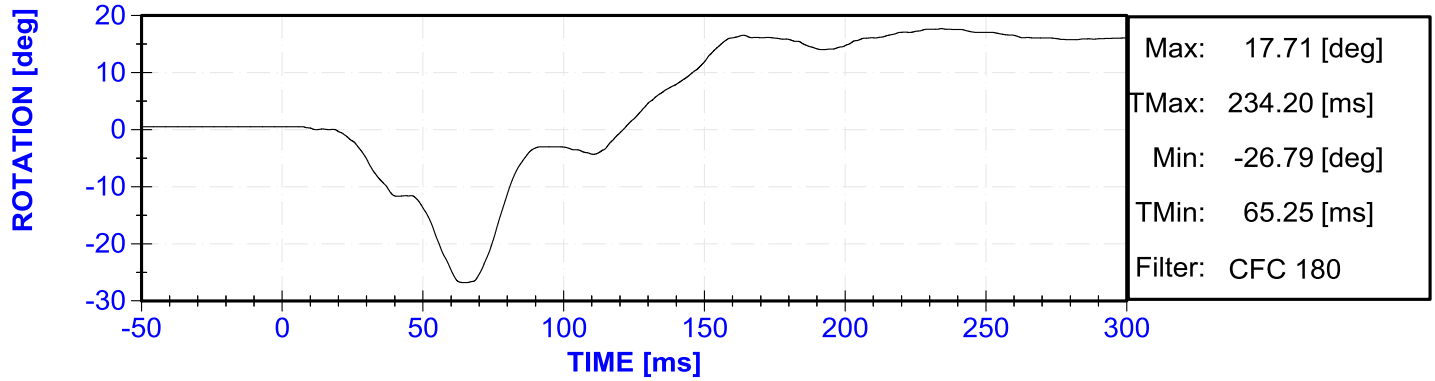
V2P1 Lower Tibia Left X Moment



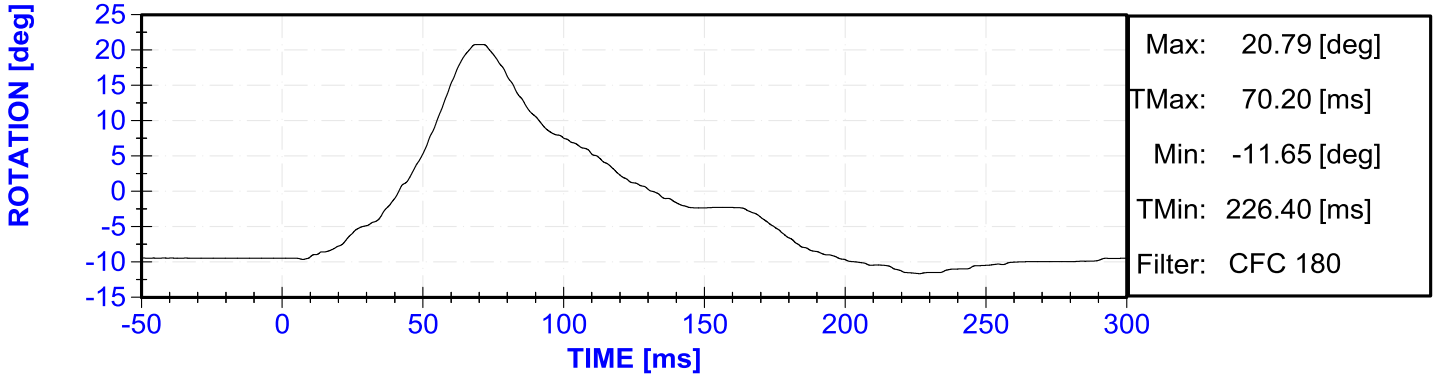
V2P1 Lower Tibia Left Y Moment

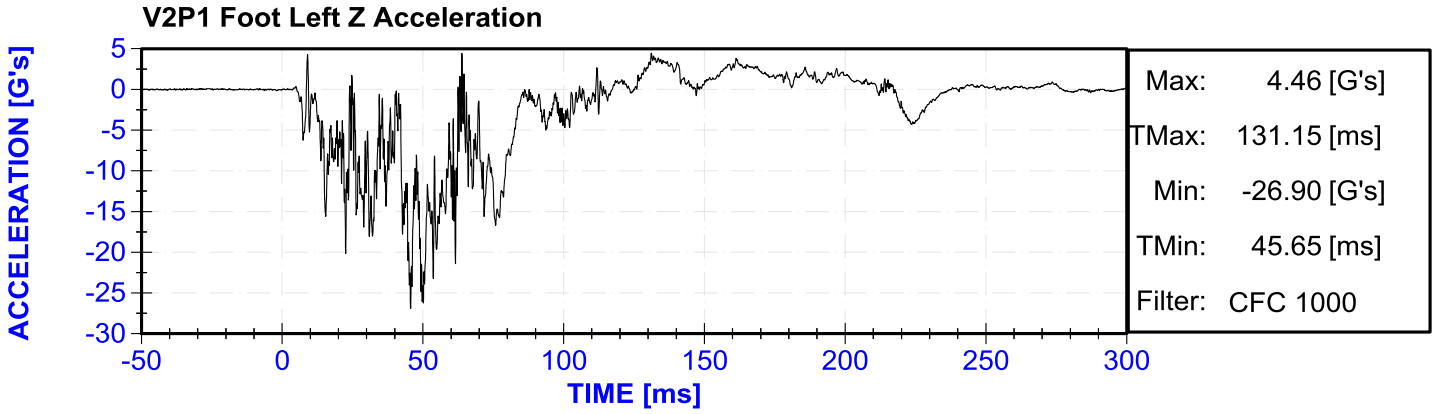


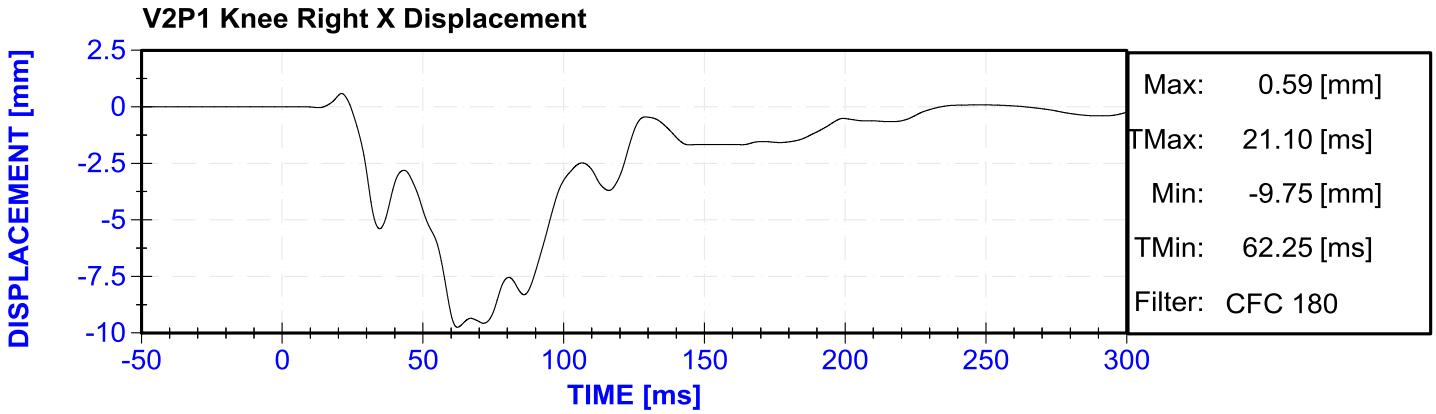
V2P1 Ankle Left X Rotation

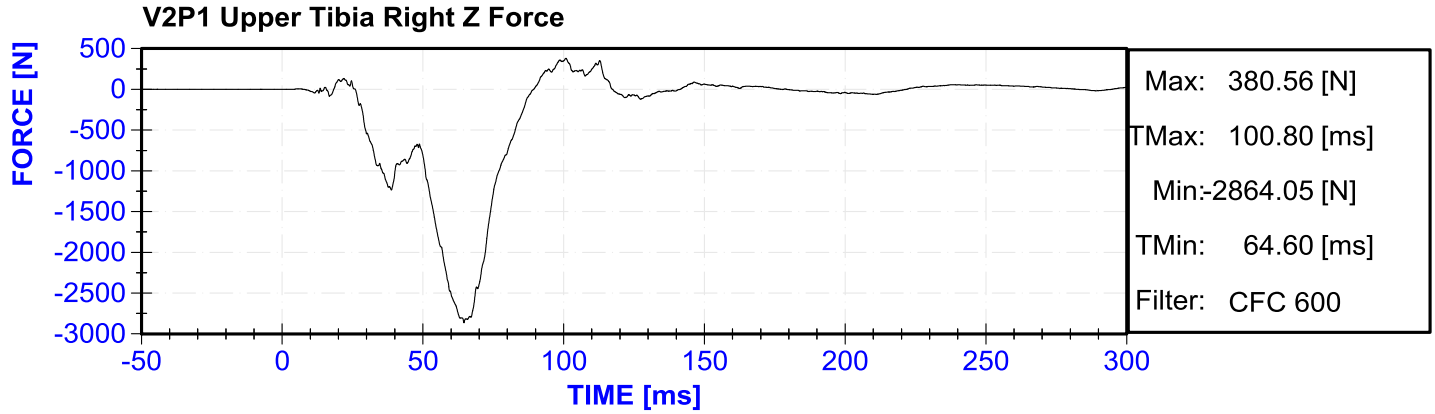


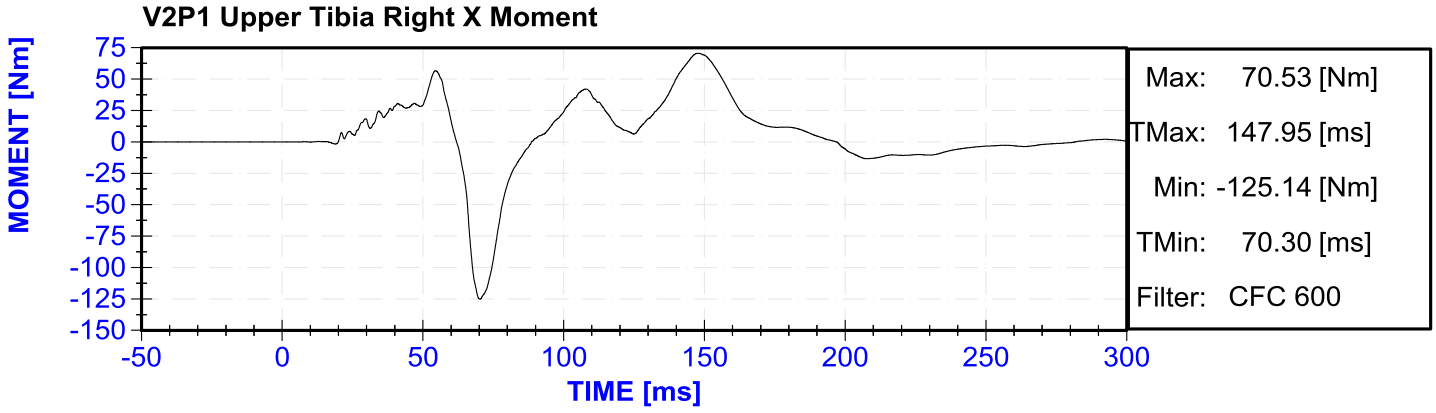
V2P1 Ankle Left Y Rotation



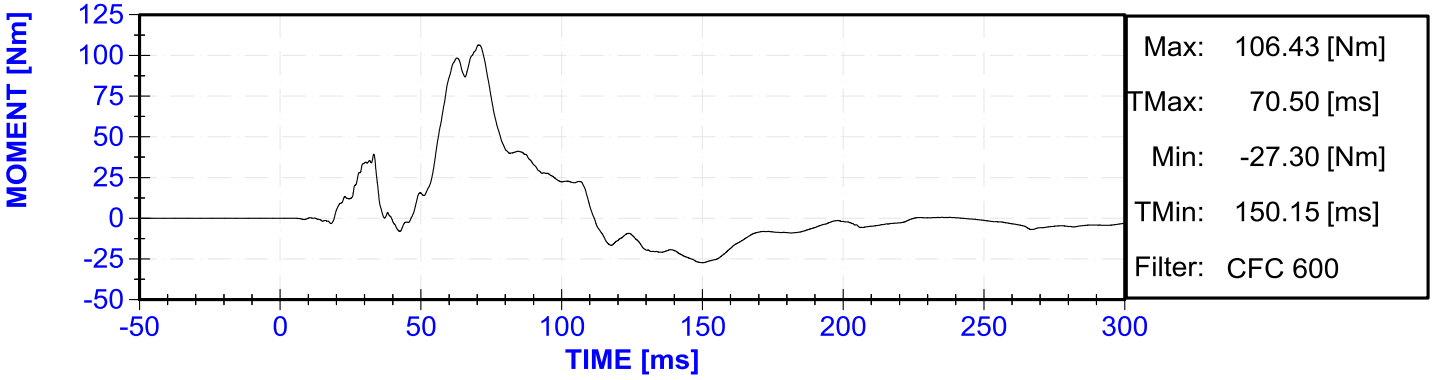

V2P1 Foot Left Z Acceleration
ACCELERATION [G's]
5
0
-5
-10
-15
-20
-25
-30
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 4.46 [G's]
TMax: 131.15 [ms]
Min: -26.90 [G's]
TMin: 45.65 [ms]
Filter: CFC 1000


V2P1 Knee Right X Displacement
DISPLACEMENT [mm]
2.5
0
-2.5
-5
-7.5
-10
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 0.59 [mm]
TMax: 21.10 [ms]
Min: -9.75 [mm]
TMin: 62.25 [ms]
Filter: CFC 180

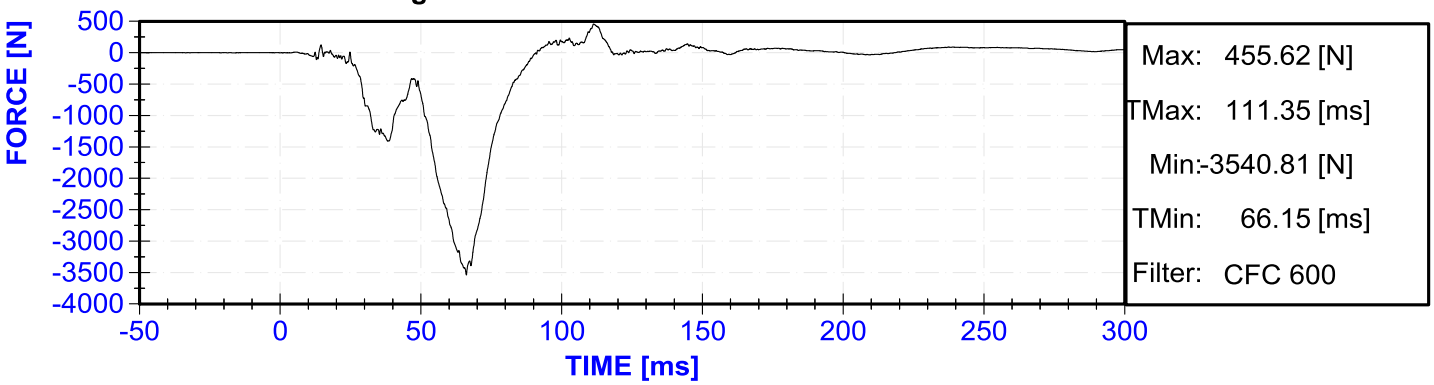

V2P1 Upper Tibia Right Z Force
FORCE [N]
500
0
-500
-1000
-1500
-2000
-2500
-3000
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 380.56 [N]
TMax: 100.80 [ms]
Min:-2864.05 [N]
TMin: 64.60 [ms]
Filter: CFC 600


V2P1 Upper Tibia Right X Moment
MOMENT [Nm]
75
50
25
0
-25
-50
-75
-100
-125
-150
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 70.53 [Nm]
TMax: 147.95 [ms]
Min: -125.14 [Nm]
TMin: 70.30 [ms]
Filter: CFC 600

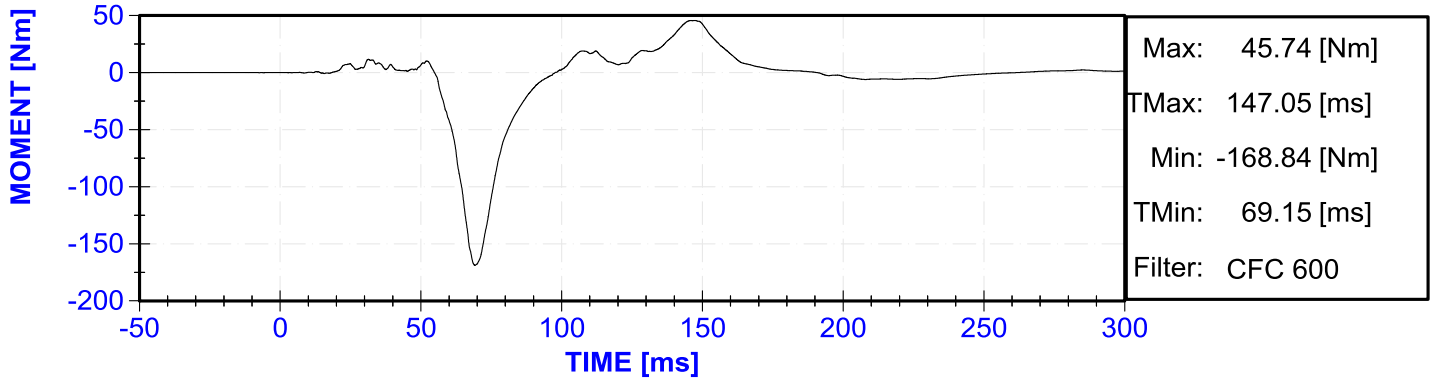
V2P1 Upper Tibia Right Y Moment



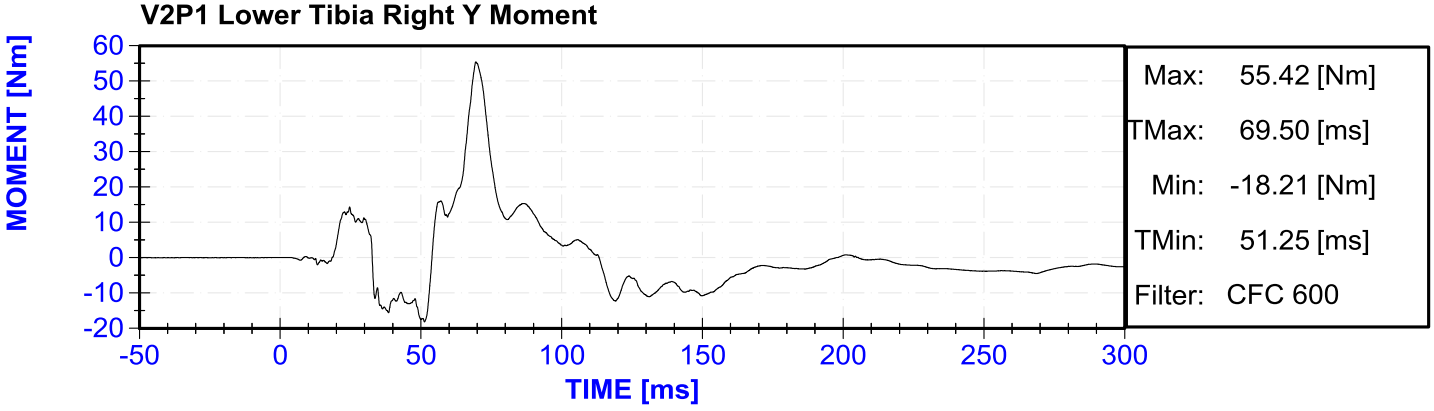
V2P1 Lower Tibia Right Z Force

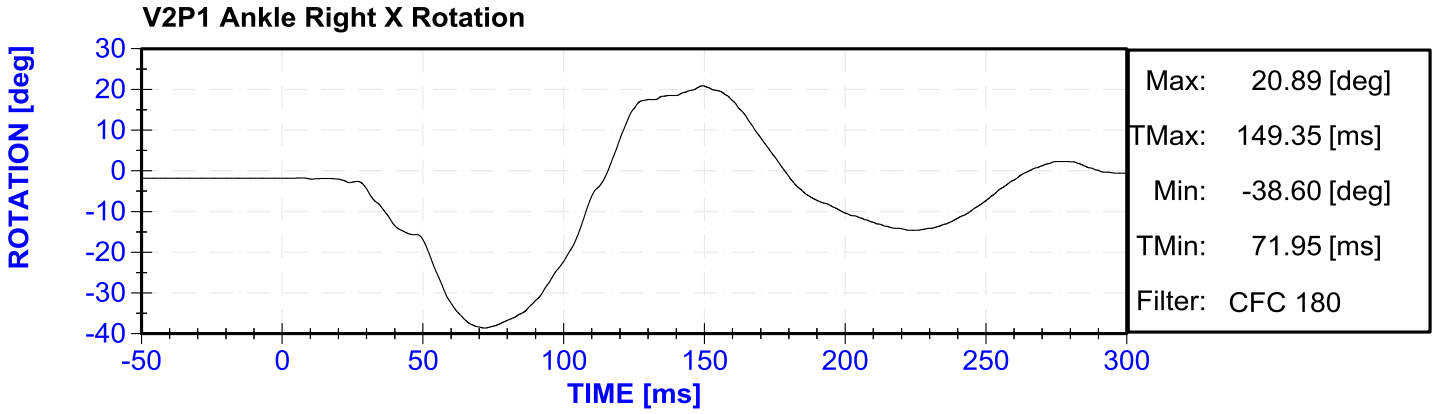


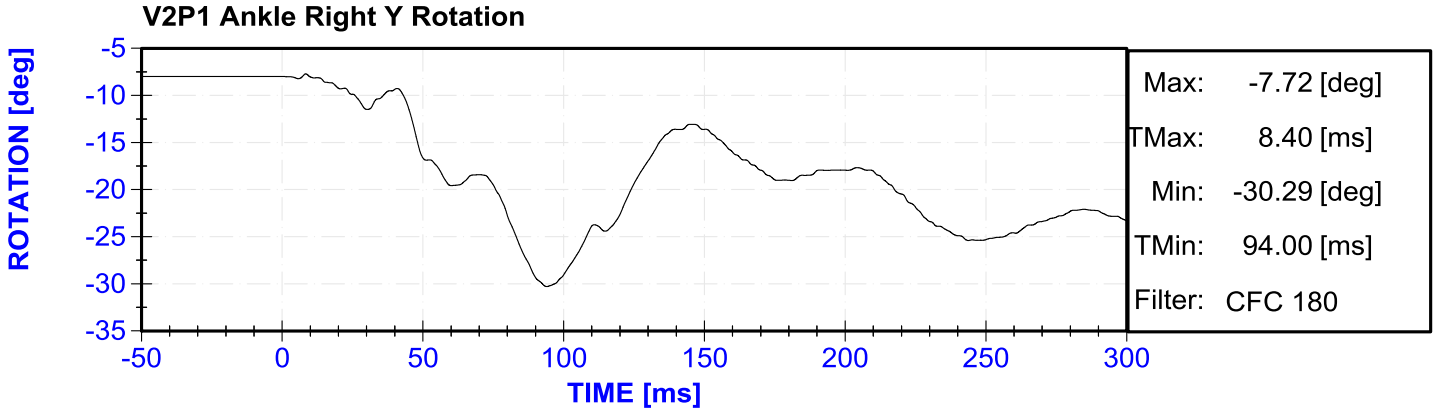
V2P1 Lower Tibia Right X Moment

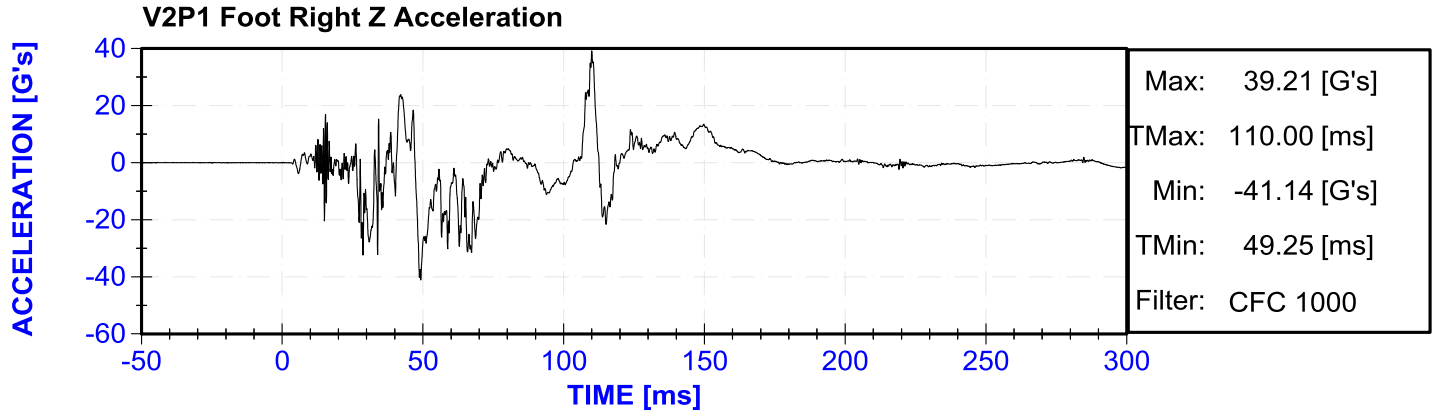


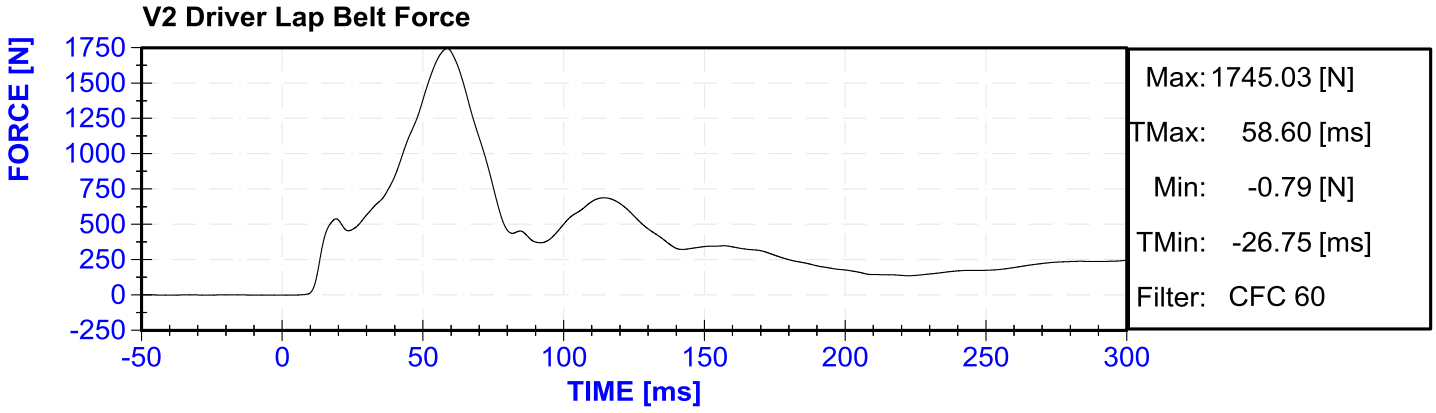
V2P1 Lower Tibia Right Y Moment



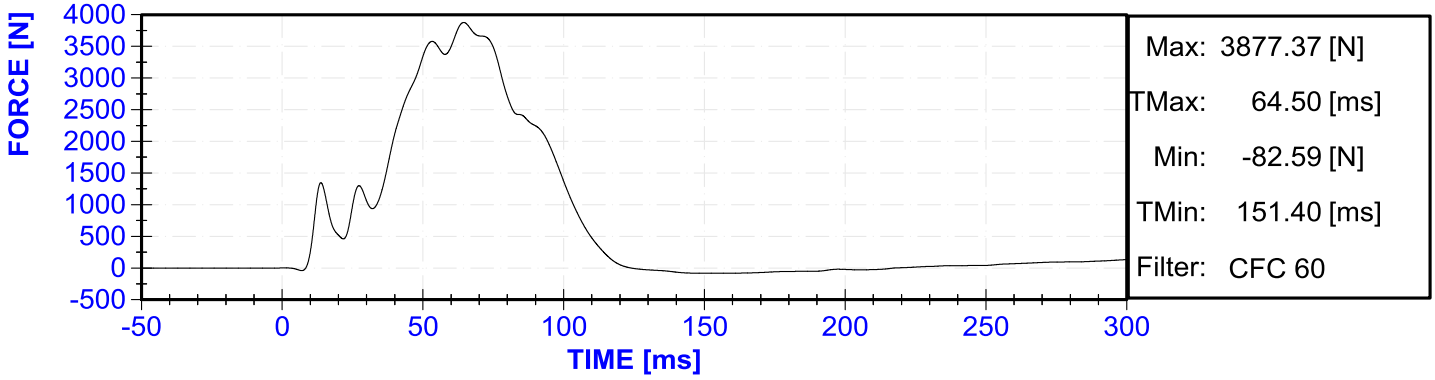

V2P1 Ankle Right X Rotation
ROTATION [deg]
30
20
10
0
-10
-20
-30
-40
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 20.89 [deg]
TMax: 149.35 [ms]
Min: -38.60 [deg]
TMin: 71.95 [ms]
Filter: CFC 180


V2P1 Ankle Right Y Rotation
ROTATION [deg]
-5
-10
-15
-20
-25
-30
-35
-50
0
50
100
150
200
250
300
TIME [ms]
Max: -7.72 [deg]
TMax: 8.40 [ms]
Min: -30.29 [deg]
TMin: 94.00 [ms]
Filter: CFC 180

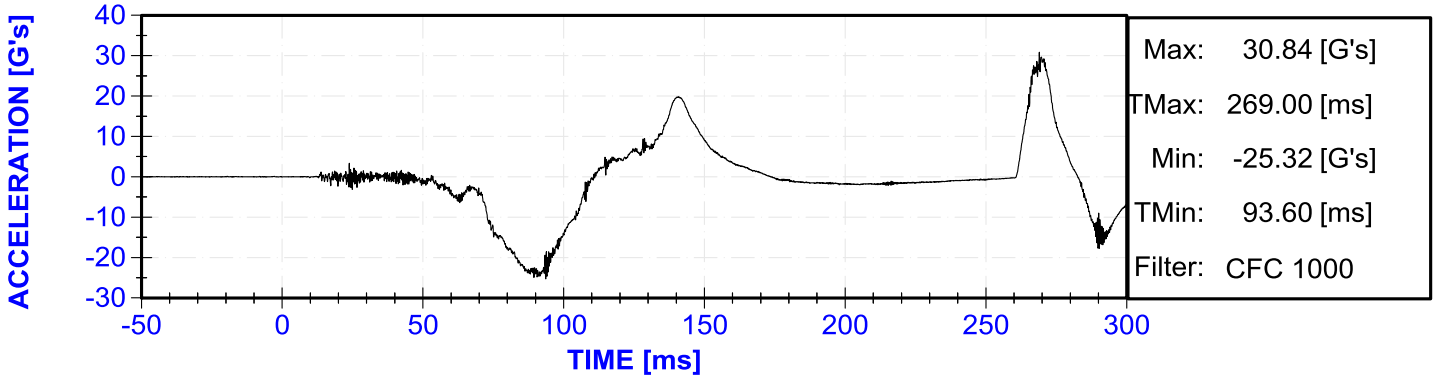

V2P1 Foot Right Z Acceleration
ACCELERATION [G's]
40
20
0
-20
-40
-60
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 39.21 [G's]
TMax: 110.00 [ms]
Min: -41.14 [G's]
TMin: 49.25 [ms]
Filter: CFC 1000


V2 Driver Lap Belt Force
FORCE [N]
1750
1500
1250
1000
750
500
250
0
-250
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 1745.03 [N]
TMax: 58.60 [ms]
Min: -0.79 [N]
TMin: -26.75 [ms]
Filter: CFC 60

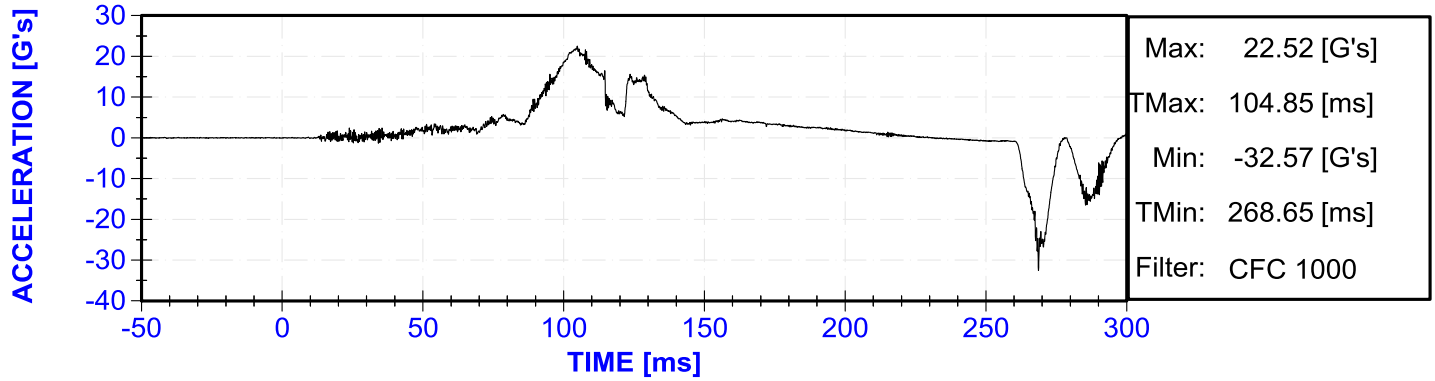
V2 Driver Shoulder Belt Upper Force



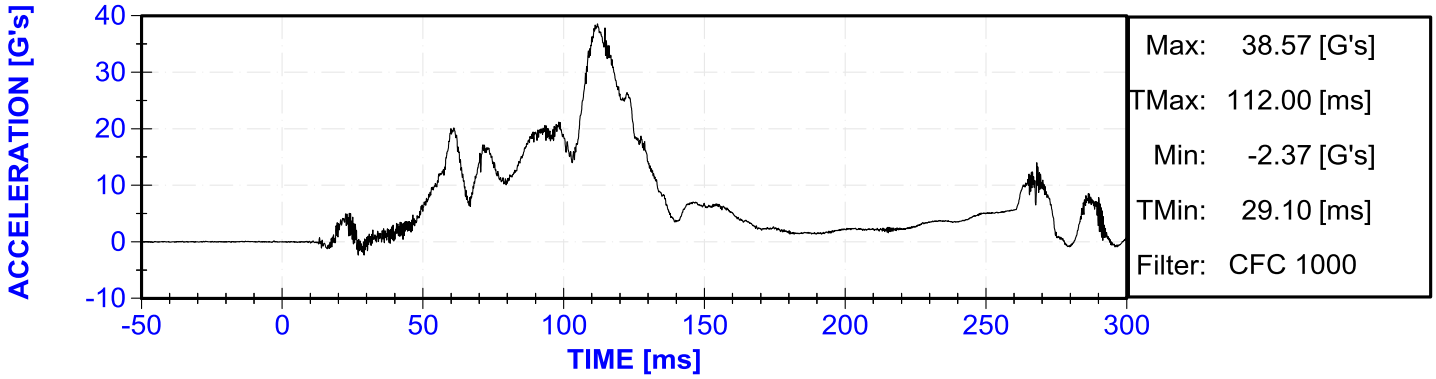
V2P2 Head CG X Acceleration



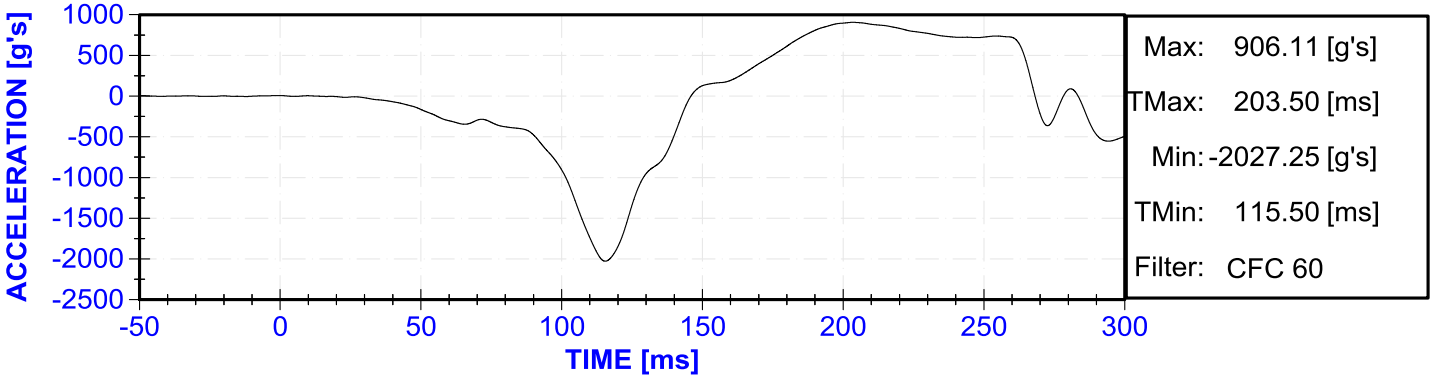
V2P2 Head CG Y Acceleration



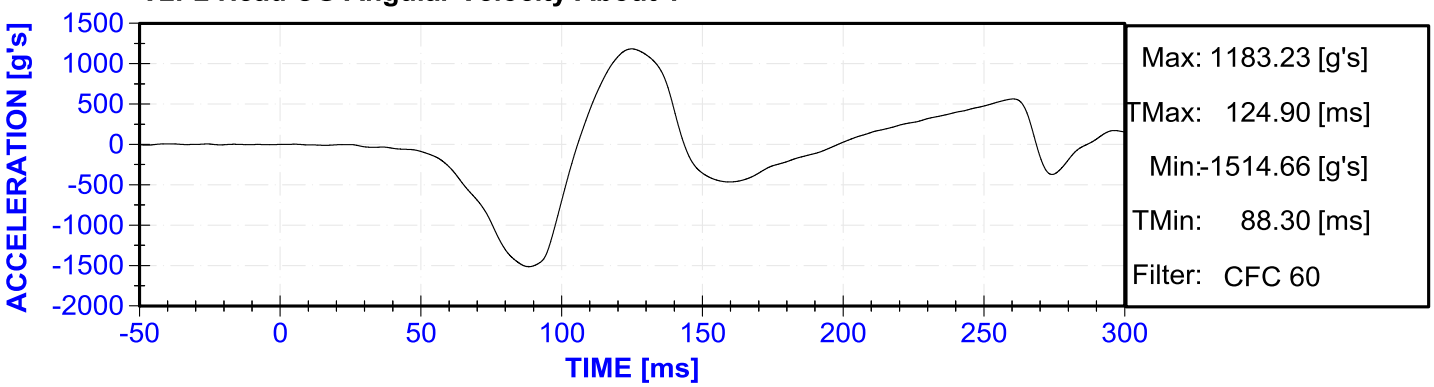
V2P2 Head CG Z Acceleration



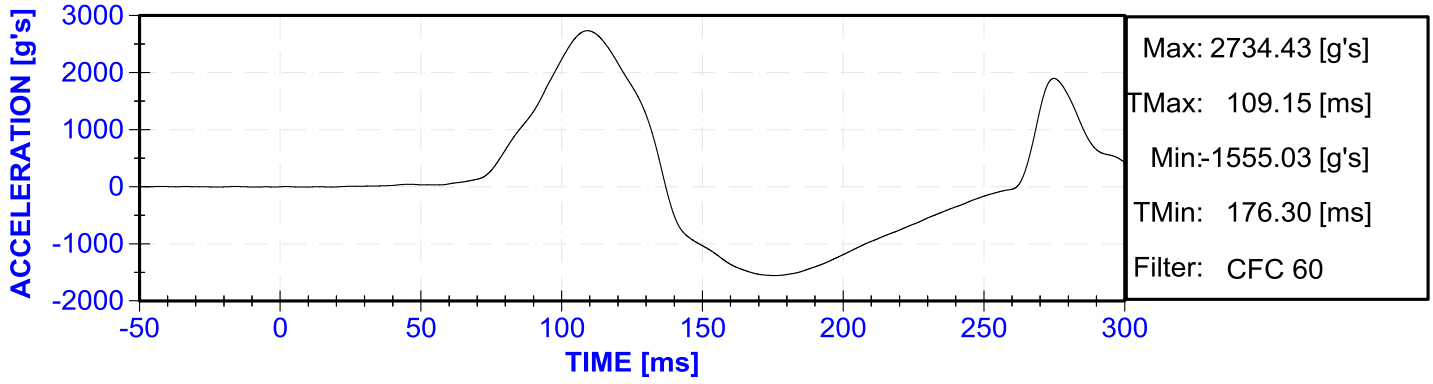
V2P2 Head CG Angular Velocity About X



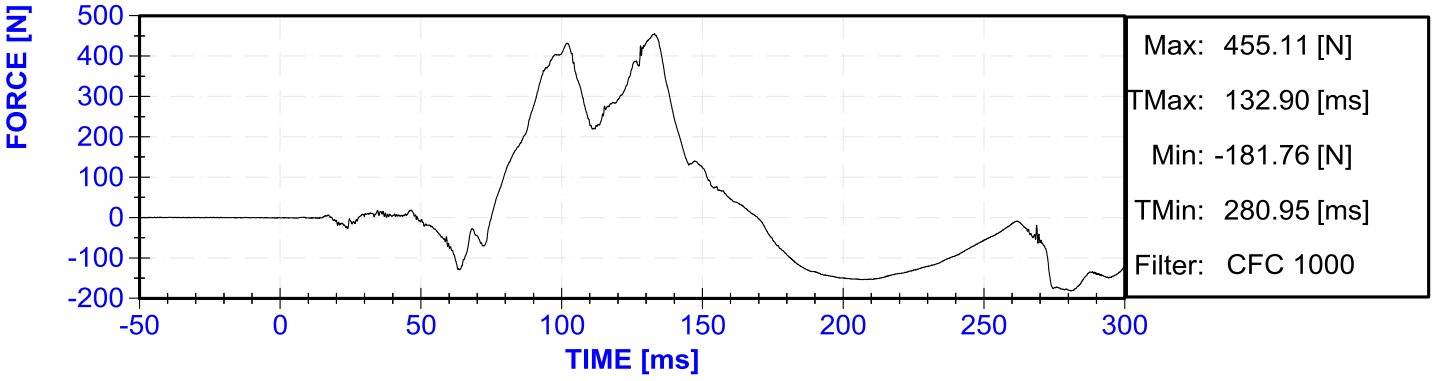
V2P2 Head CG Angular Velocity About Y



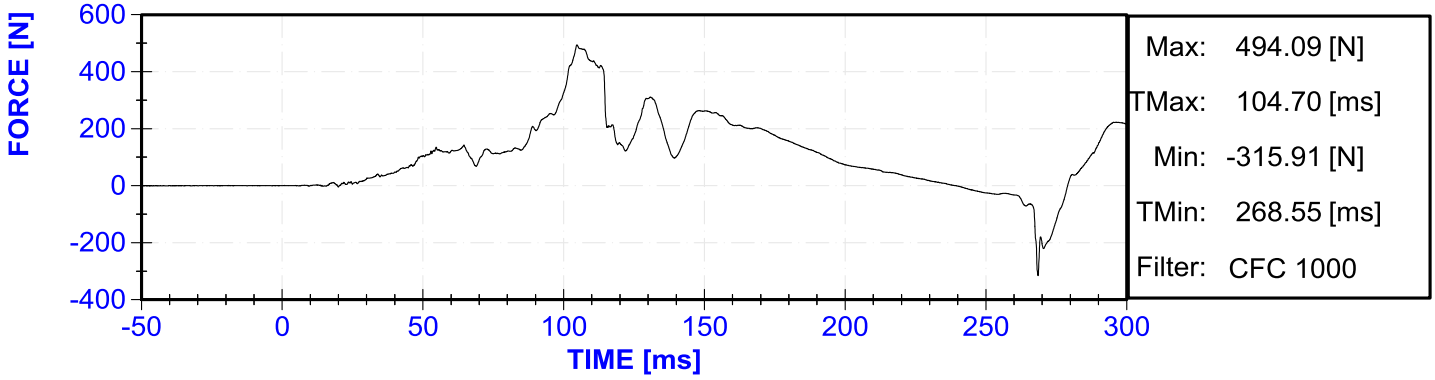
V2P2 Head CG Angular Velocity About Z



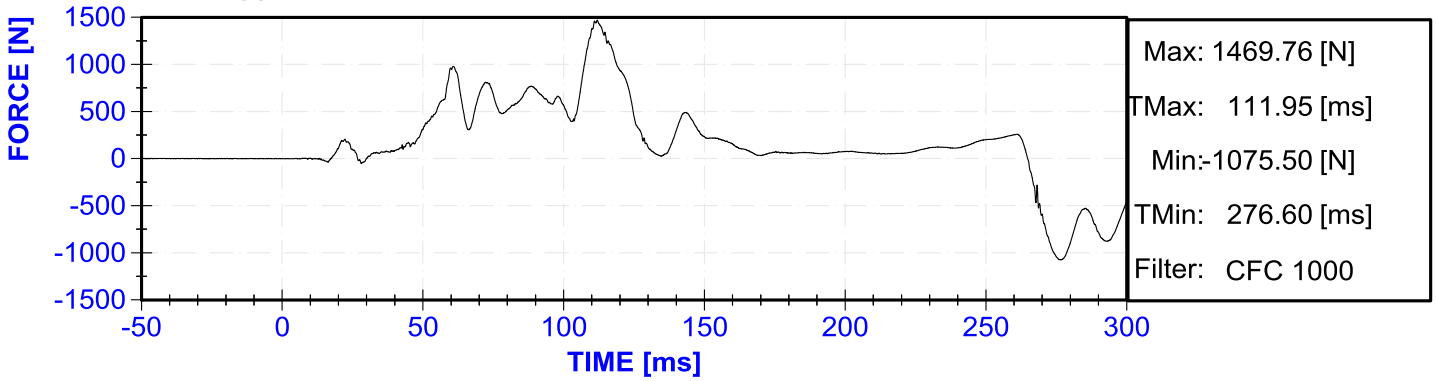
V2P2 Upper Neck X Force



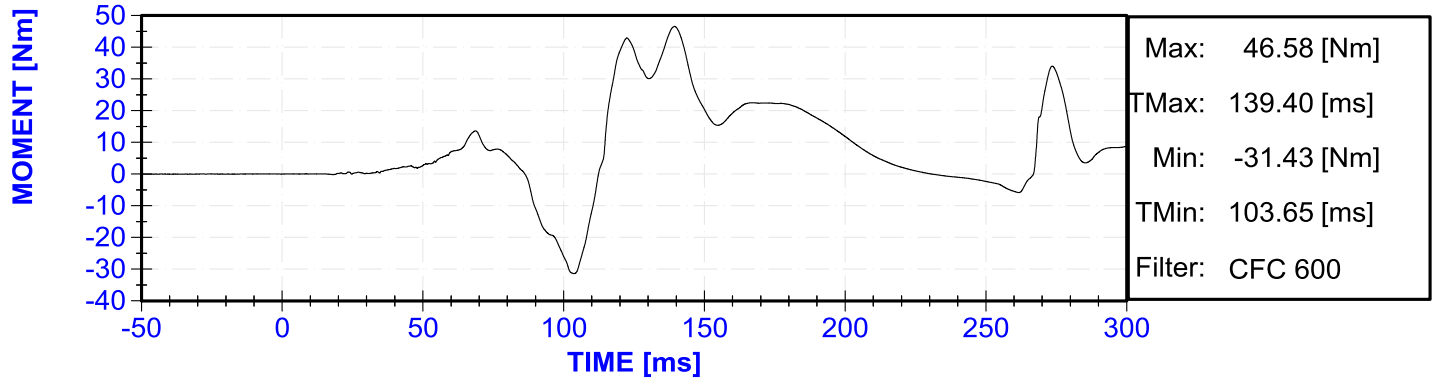
V2P2 Upper Neck Y Force



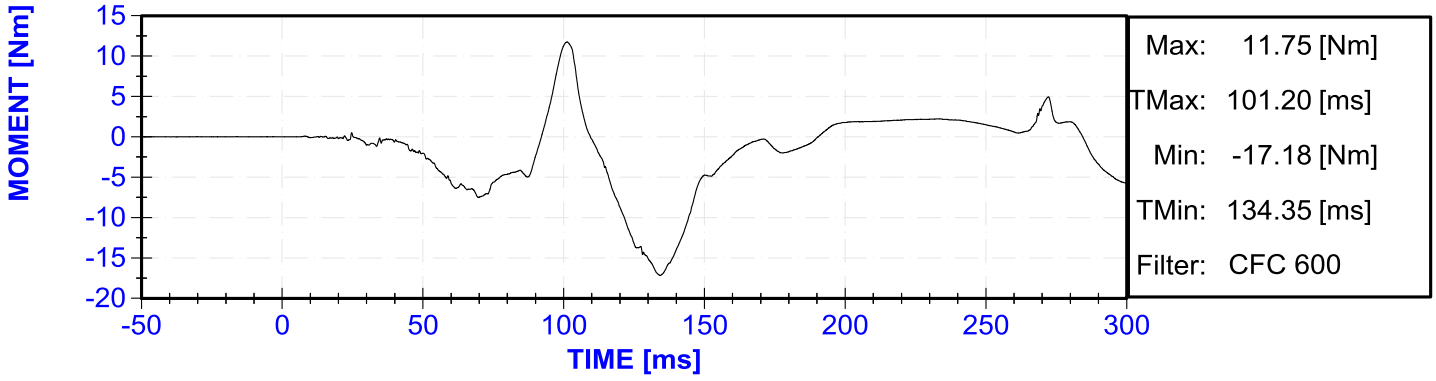
V2P2 Upper Neck Z Force



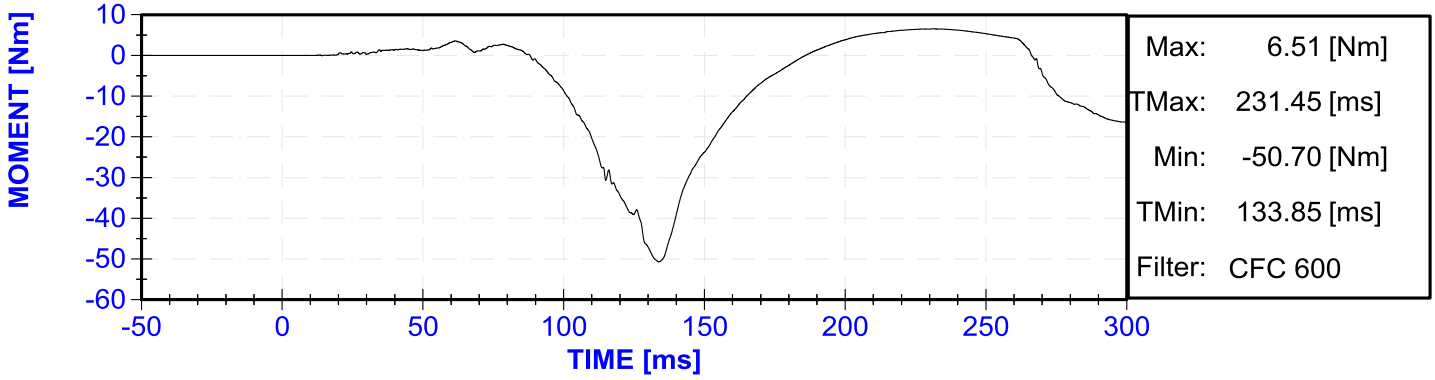
V2P2 Upper Neck X Moment



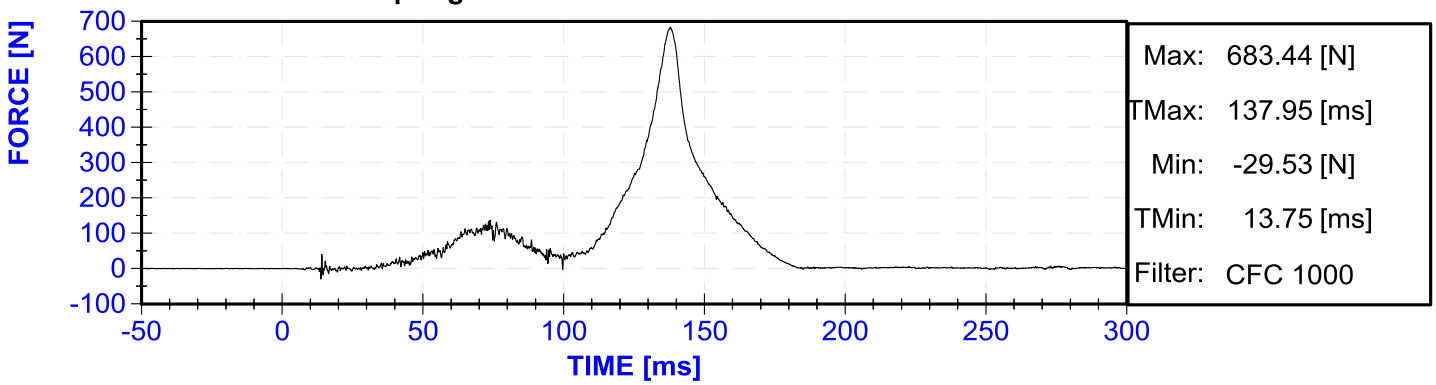
V2P2 Upper Neck Y Moment



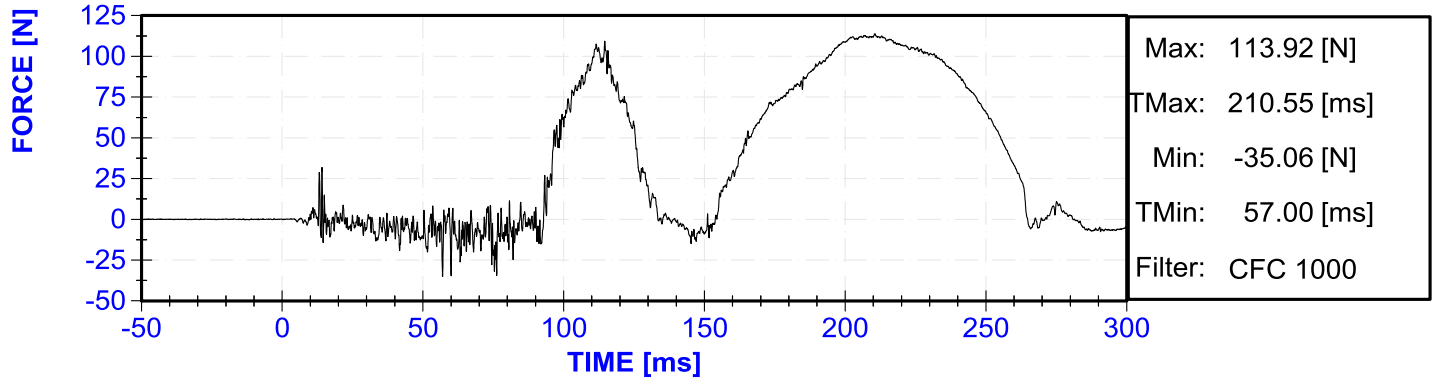
V2P2 Upper Neck Z Moment



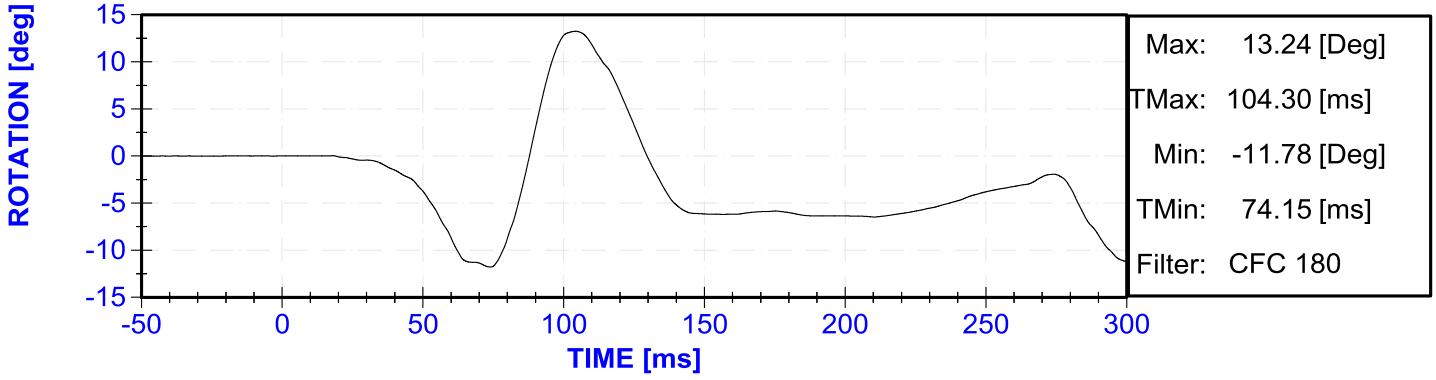
V2P2 Front Neck Spring Tower Load Cell

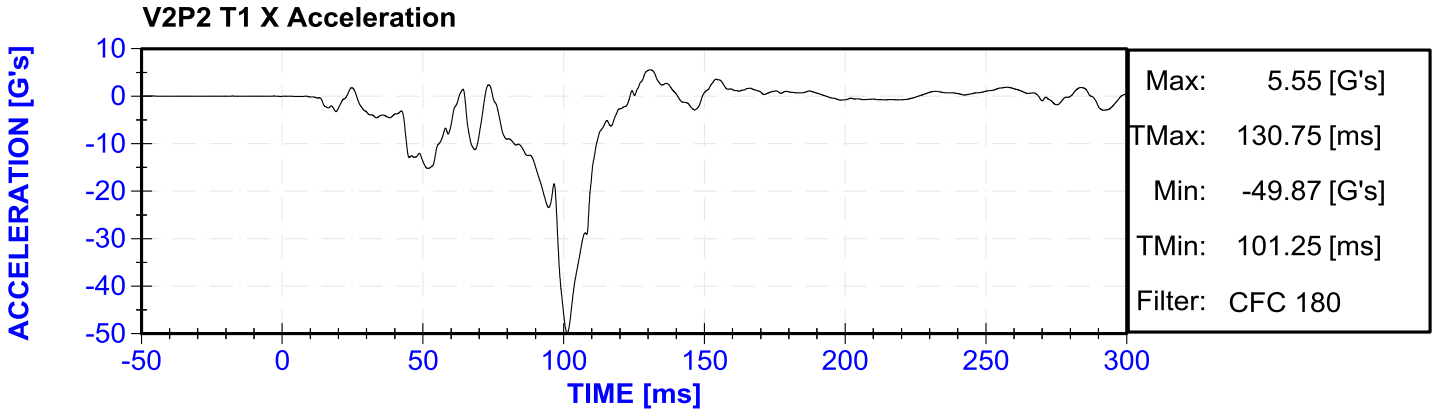


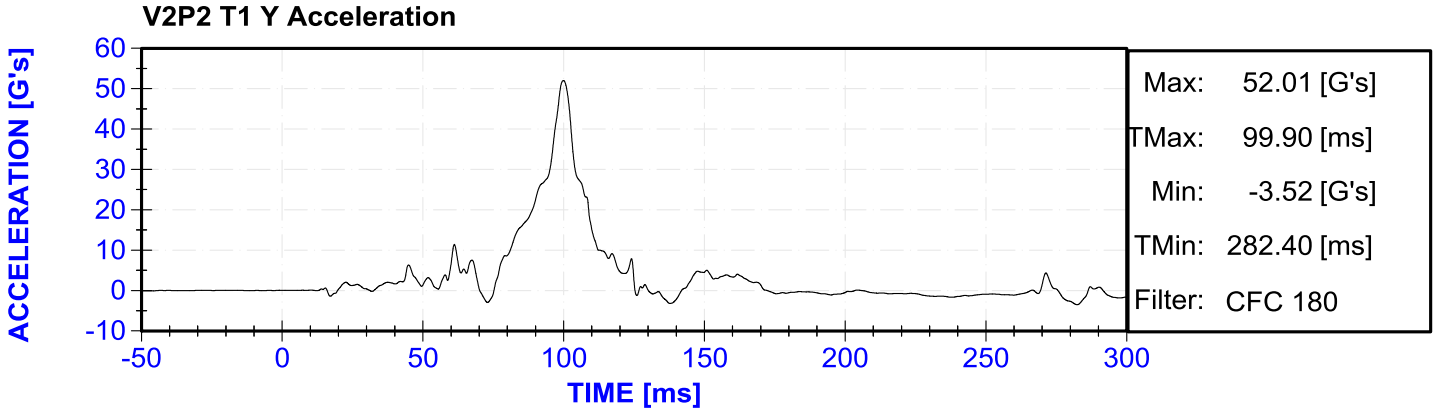
V2P2 Rear Neck Spring Tower Load Cell

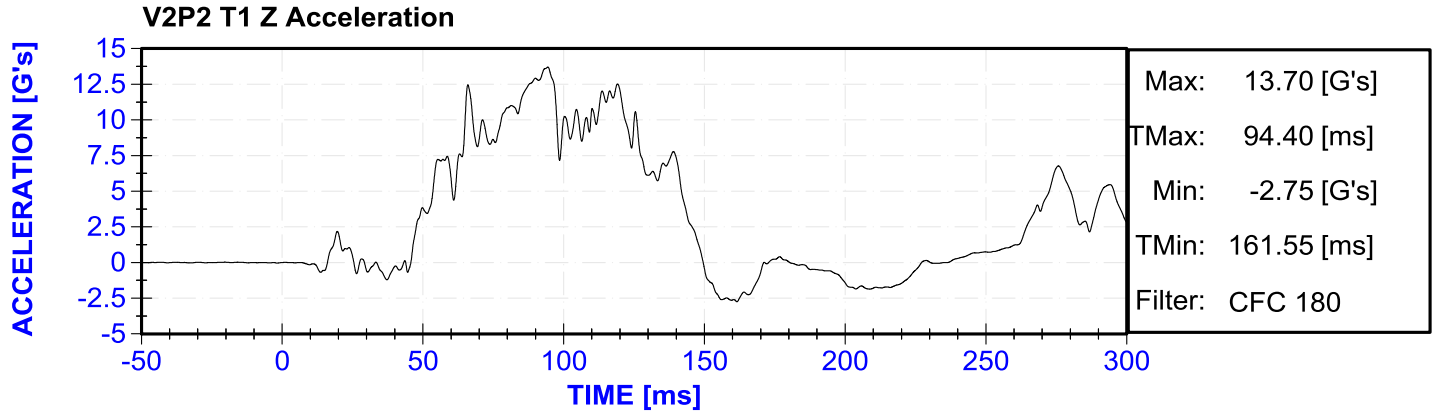


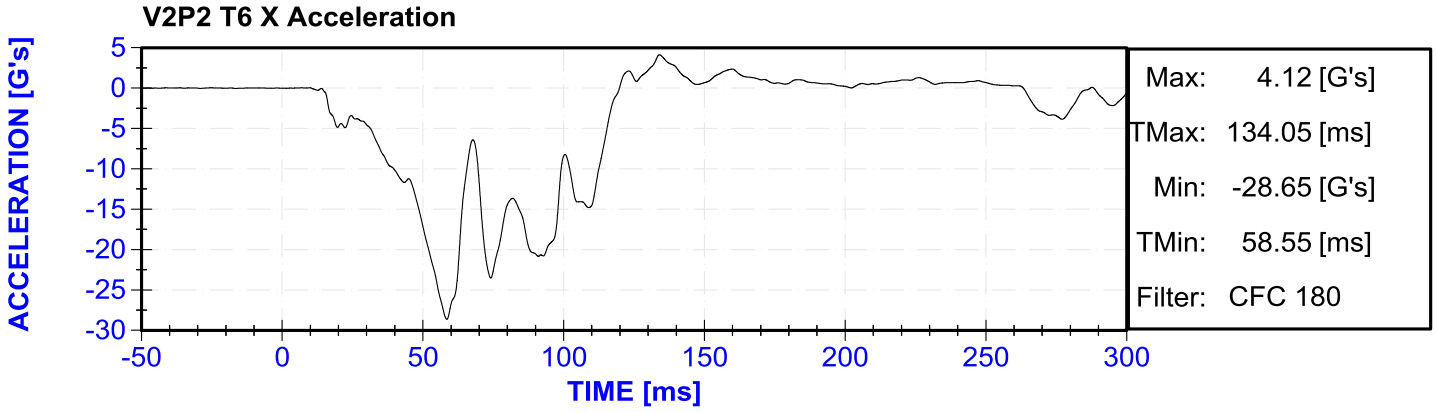
V2P2 Occipital Condyle Rotation Potentiometer

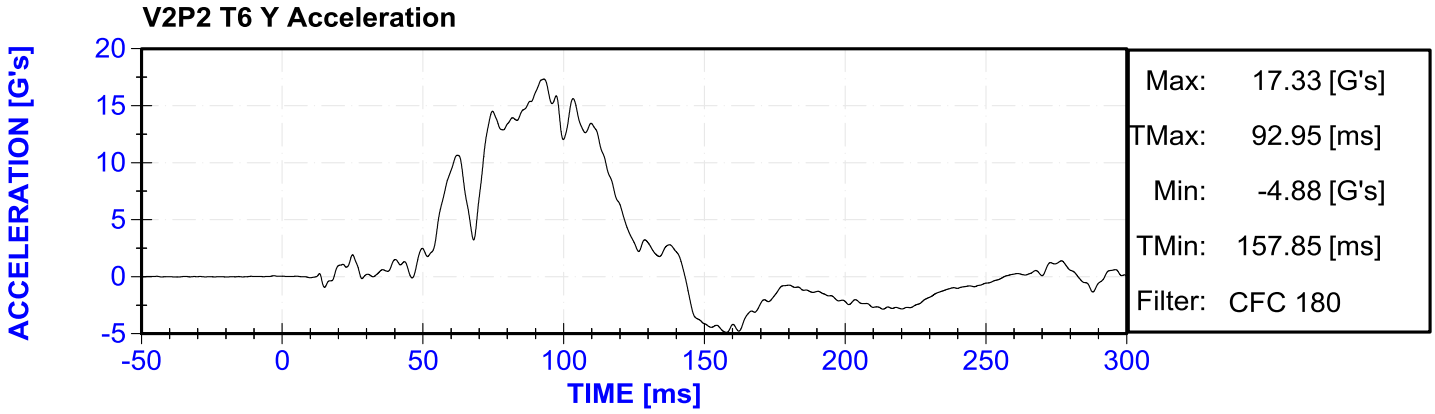


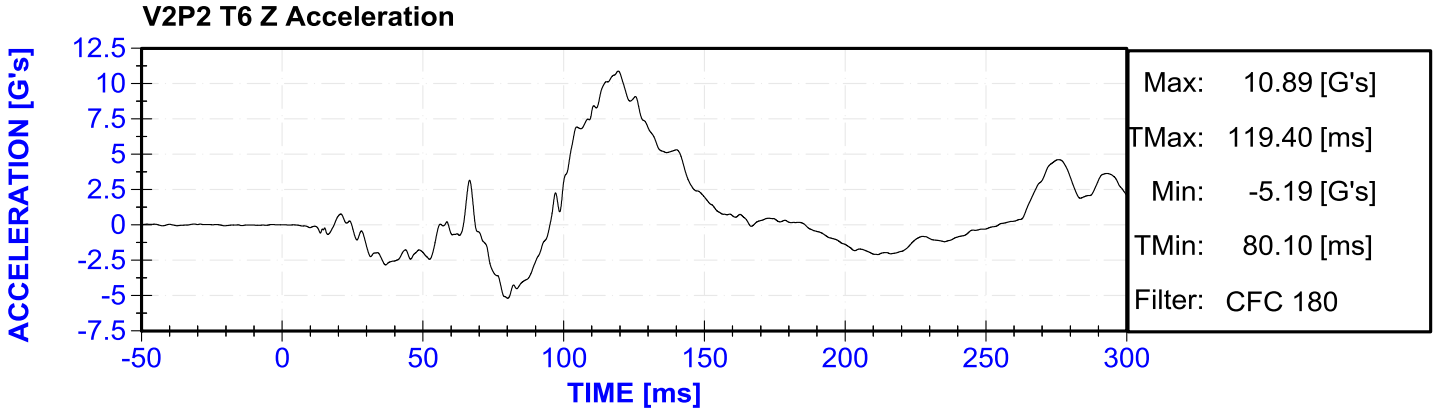

V2P2 T1 X Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 5.55 [G's]
TMax: 130.75 [ms]
Min: -49.87 [G's]
TMin: 101.25 [ms]
Filter: CFC 180

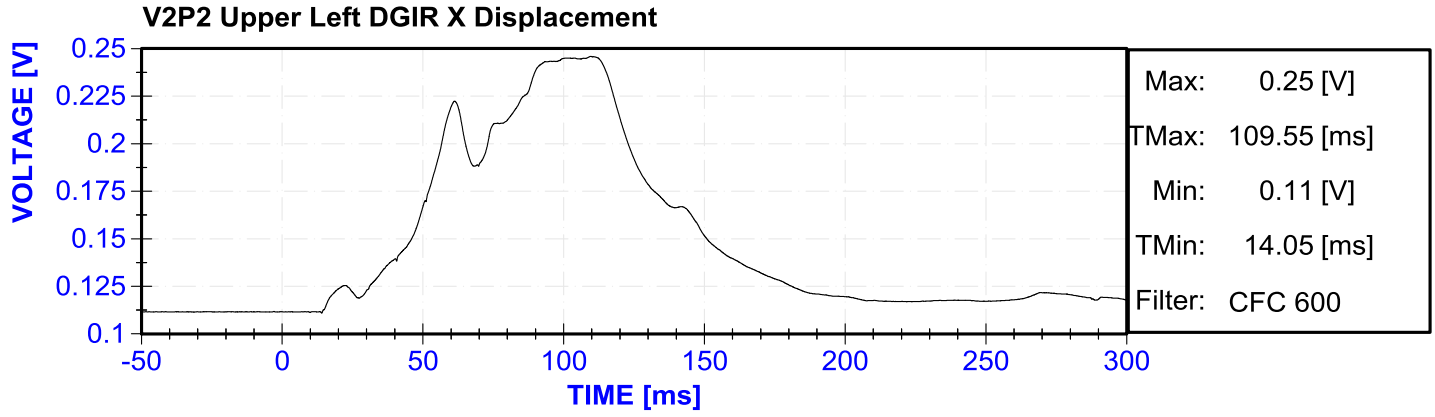

V2P2 T1 Y Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 52.01 [G's]
TMax: 99.90 [ms]
Min: -3.52 [G's]
TMin: 282.40 [ms]
Filter: CFC 180

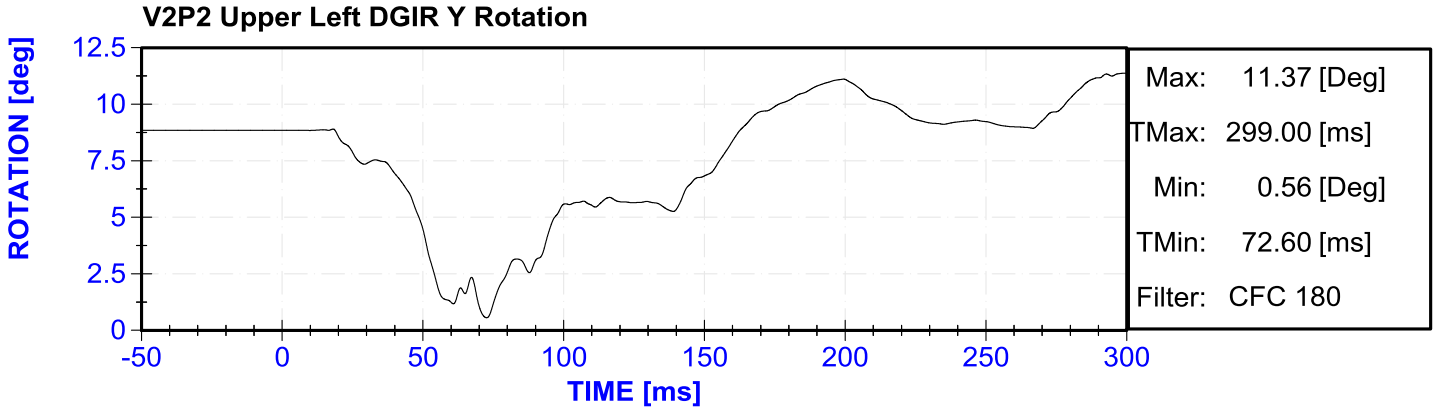

V2P2 T1 Z Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 13.70 [G's]
TMax: 94.40 [ms]
Min: -2.75 [G's]
TMin: 161.55 [ms]
Filter: CFC 180


V2P2 T6 X Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 4.12 [G's]
TMax: 134.05 [ms]
Min: -28.65 [G's]
TMin: 58.55 [ms]
Filter: CFC 180

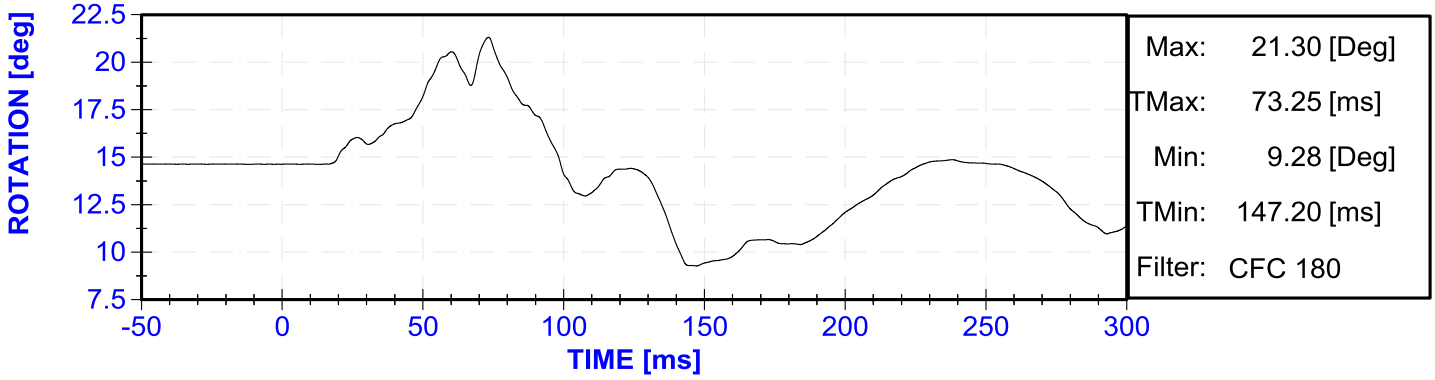

V2P2 T6 Y Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 17.33 [G's]
TMax: 92.95 [ms]
Min: -4.88 [G's]
TMin: 157.85 [ms]
Filter: CFC 180


V2P2 T6 Z Acceleration
ACCELERATION [G's]
TIME [ms]
Max: 10.89 [G's]
TMax: 119.40 [ms]
Min: -5.19 [G's]
TMin: 80.10 [ms]
Filter: CFC 180

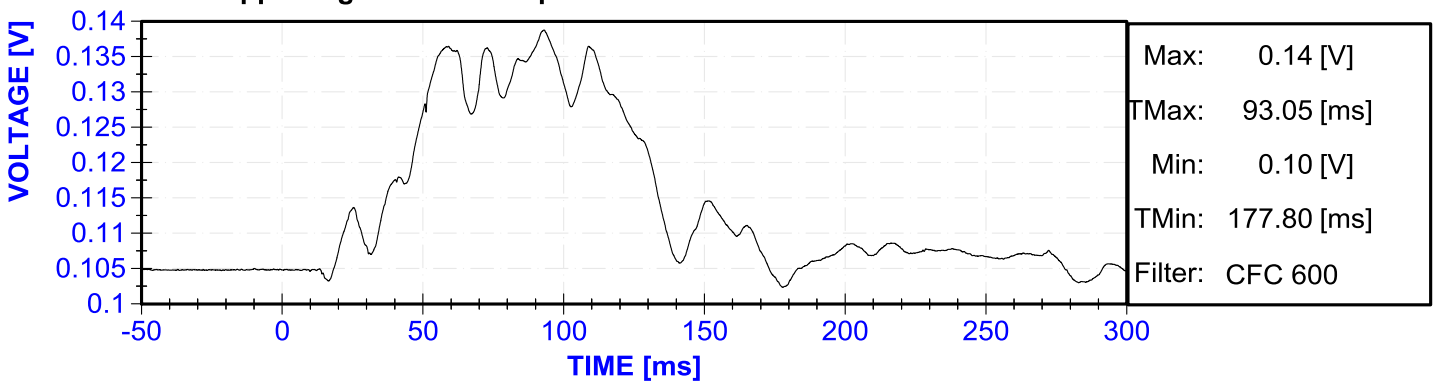

V2P2 Upper Left DGIR X Displacement
VOLTAGE [V]
TIME [ms]
Max: 0.25 [V]
TMax: 109.55 [ms]
Min: 0.11 [V]
TMin: 14.05 [ms]
Filter: CFC 600


V2P2 Upper Left DGIR Y Rotation
ROTATION [deg]
TIME [ms]
Max: 11.37 [Deg]
TMax: 299.00 [ms]
Min: 0.56 [Deg]
TMin: 72.60 [ms]
Filter: CFC 180

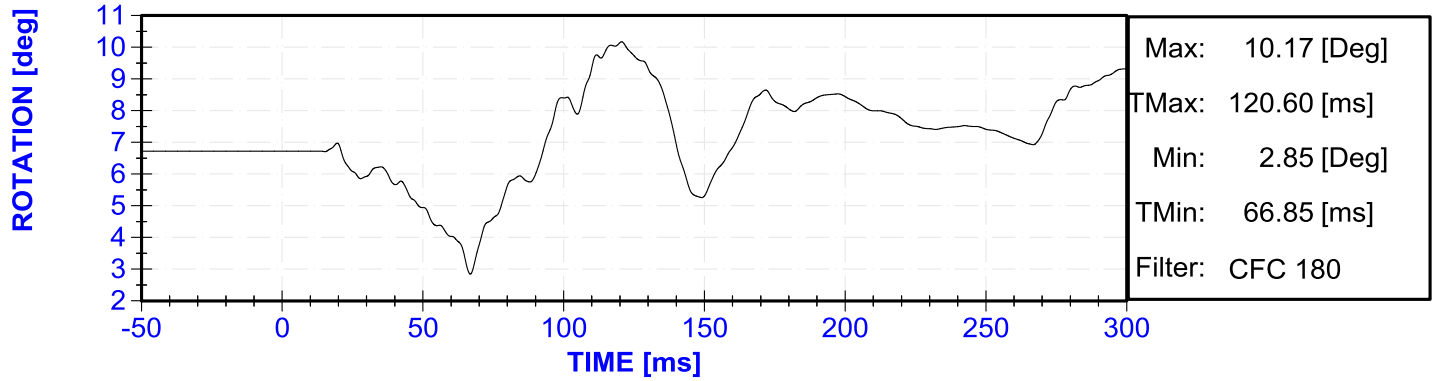
V2P2 Upper Left DGIR Z Rotation



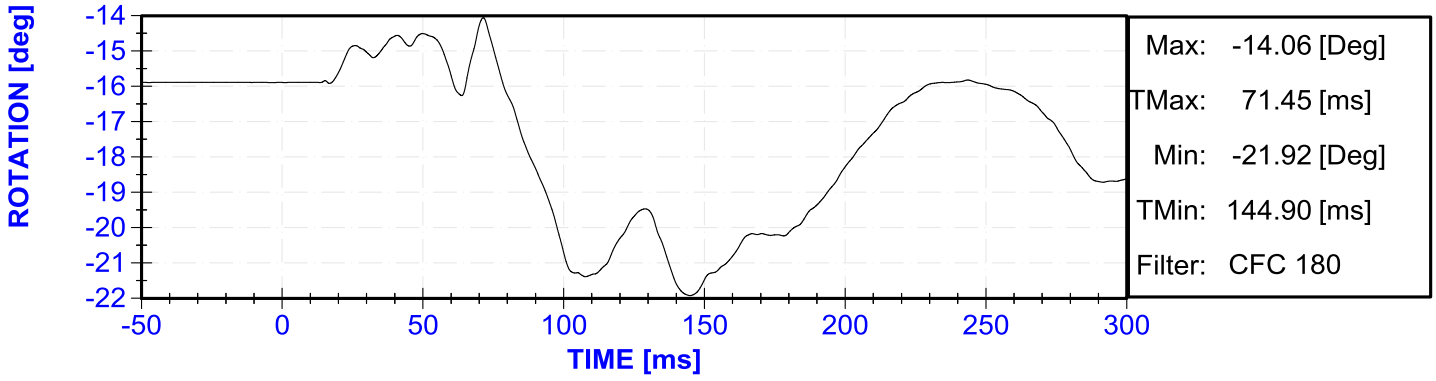
V2P2 Upper Right DGIR X Displacement

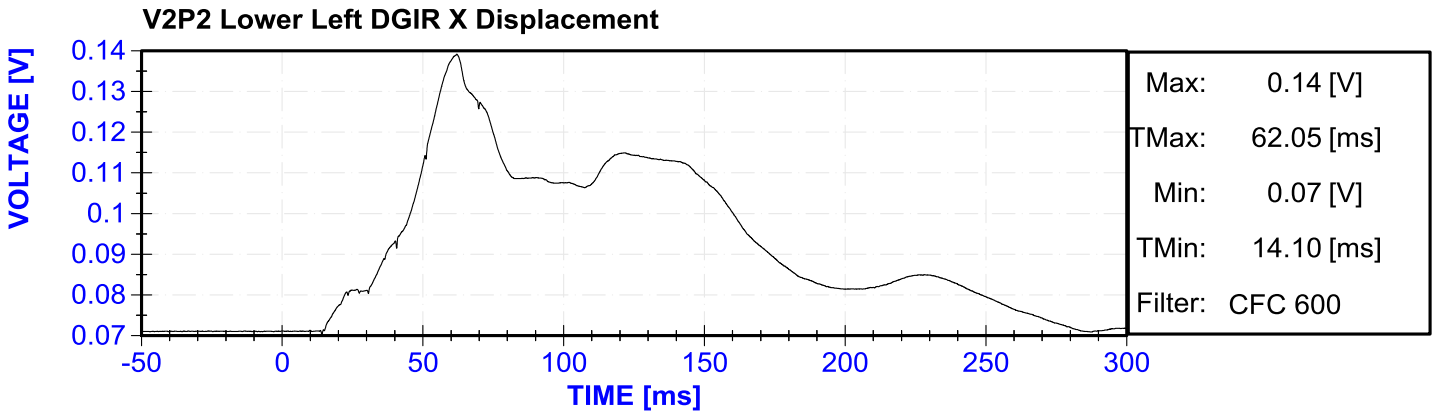


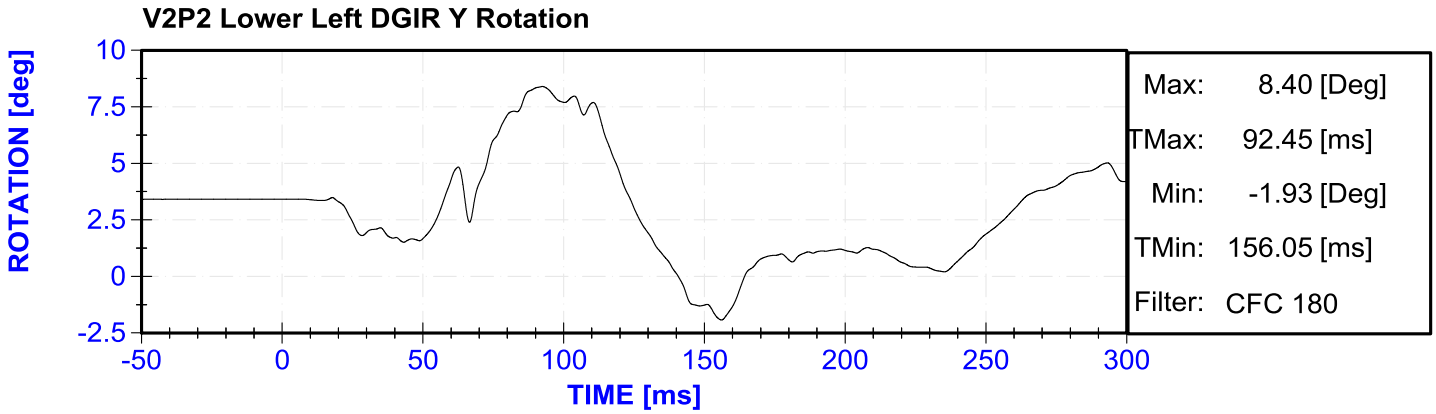
V2P2 Upper Right DGIR Y Rotation

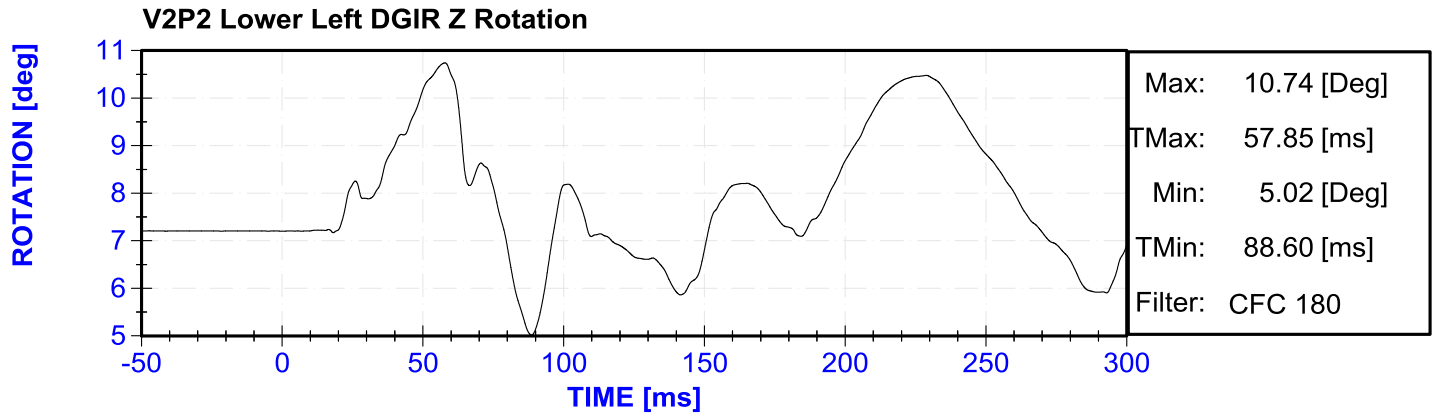


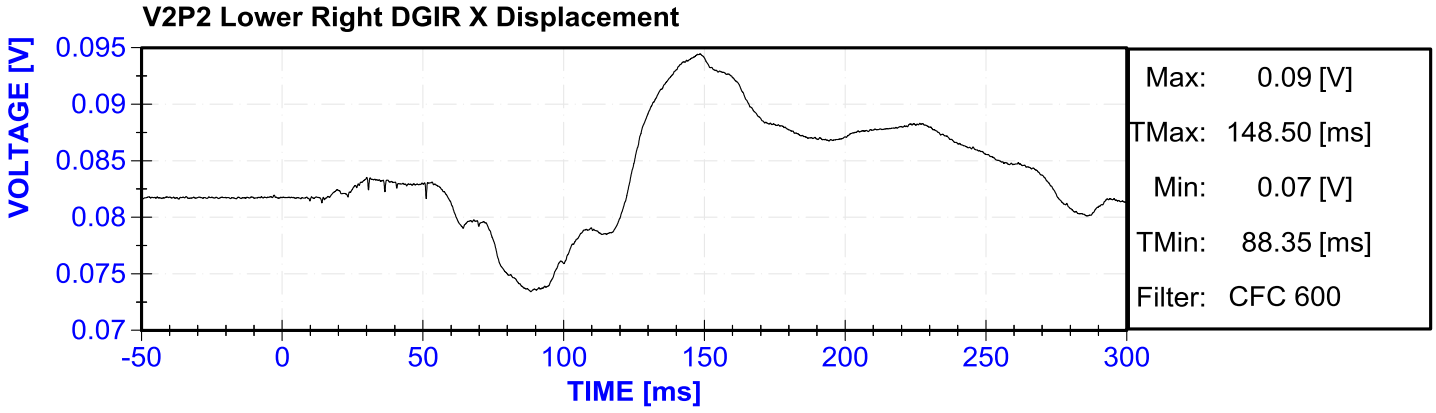
V2P2 Upper Right DGIR Z Rotation

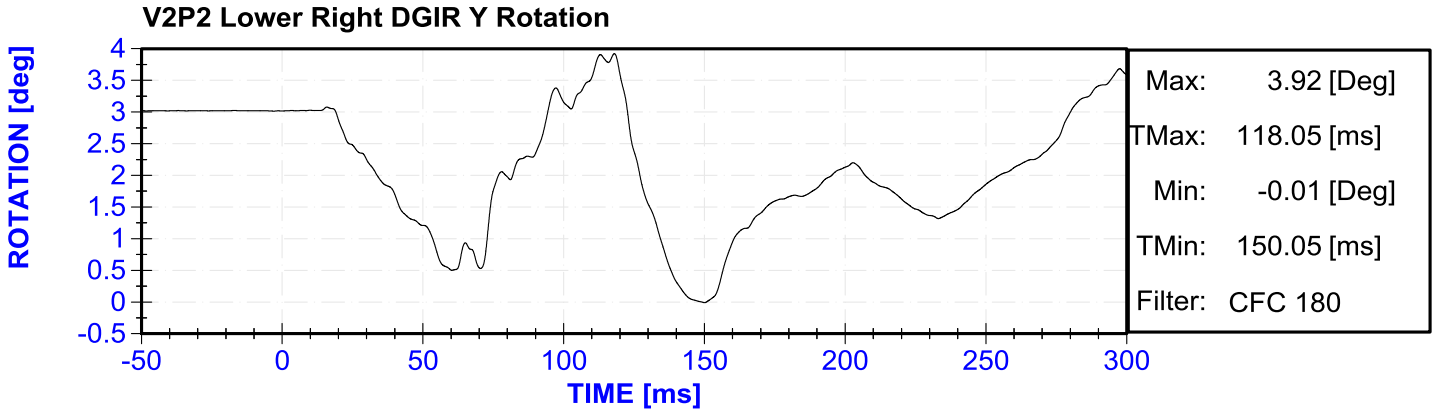


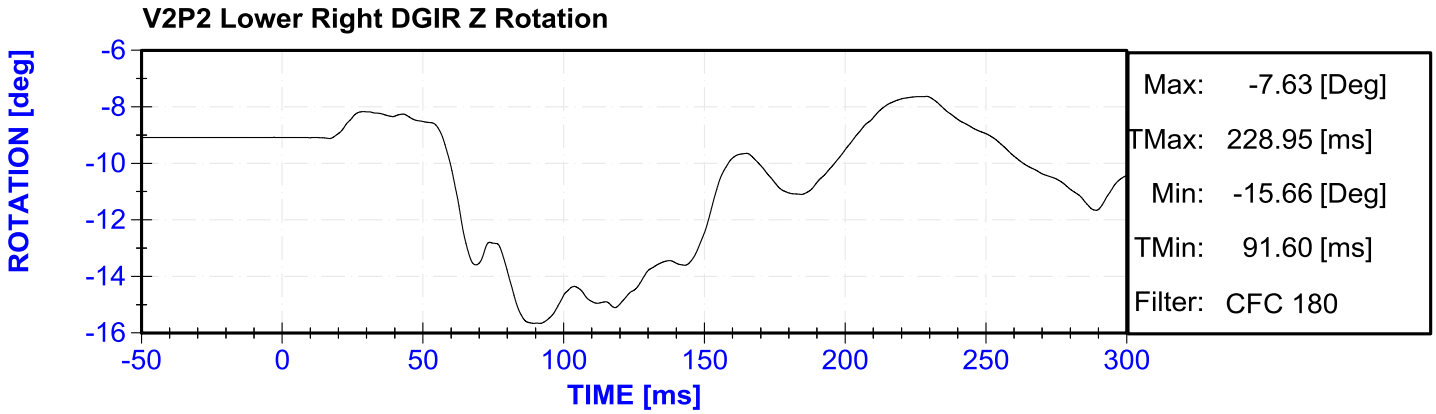

V2P2 Lower Left DGIR X Displacement
VOLTAGE [V]
0.14
0.13
0.12
0.11
0.1
0.09
0.08
0.07
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 0.14 [V]
TMax: 62.05 [ms]
Min: 0.07 [V]
TMin: 14.10 [ms]
Filter: CFC 600

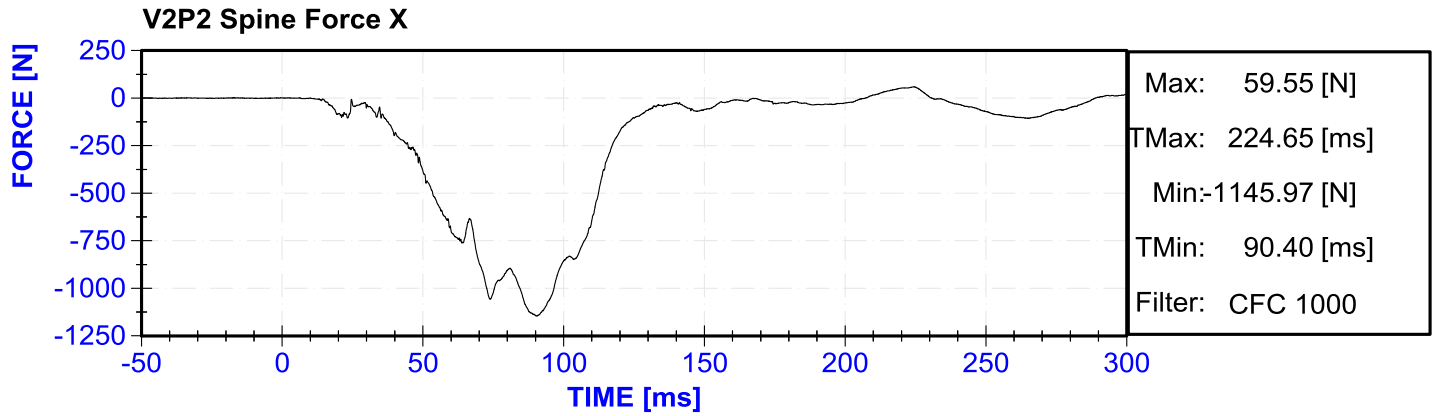

V2P2 Lower Left DGIR Y Rotation
ROTATION [deg]
10
7.5
5
2.5
0
-2.5
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 8.40 [Deg]
TMax: 92.45 [ms]
Min: -1.93 [Deg]
TMin: 156.05 [ms]
Filter: CFC 180

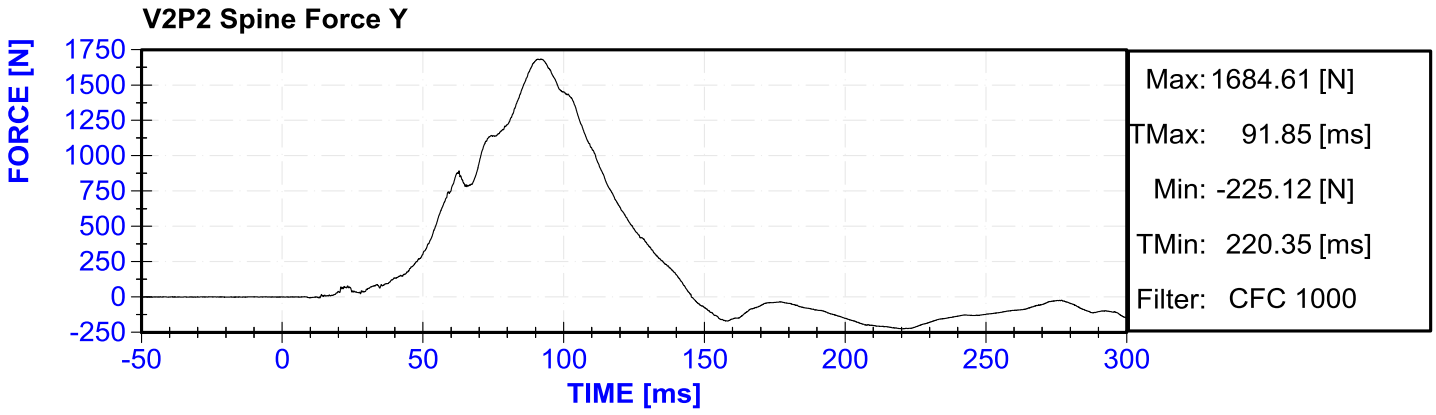

V2P2 Lower Left DGIR Z Rotation
ROTATION [deg]
11
10
9
8
7
6
5
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 10.74 [Deg]
TMax: 57.85 [ms]
Min: 5.02 [Deg]
TMin: 88.60 [ms]
Filter: CFC 180


V2P2 Lower Right DGIR X Displacement
VOLTAGE [V]
0.095
0.09
0.085
0.08
0.075
0.07
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 0.09 [V]
TMax: 148.50 [ms]
Min: 0.07 [V]
TMin: 88.35 [ms]
Filter: CFC 600

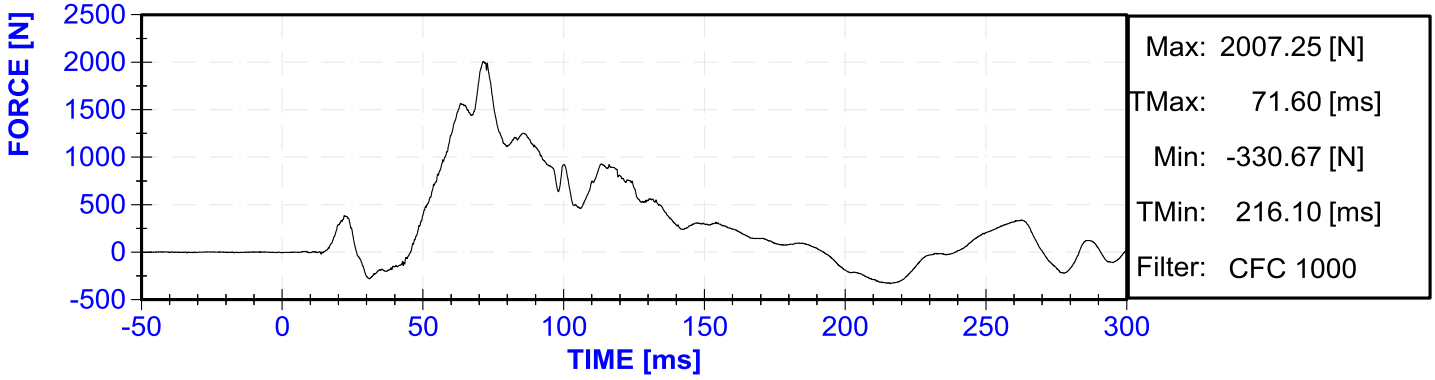

V2P2 Lower Right DGIR Y Rotation
ROTATION [deg]
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 3.92 [Deg]
TMax: 118.05 [ms]
Min: -0.01 [Deg]
TMin: 150.05 [ms]
Filter: CFC 180


V2P2 Lower Right DGIR Z Rotation
ROTATION [deg]
-6
-8
-10
-12
-14
-16
-50
0
50
100
150
200
250
300
TIME [ms]
Max: -7.63 [Deg]
TMax: 228.95 [ms]
Min: -15.66 [Deg]
TMin: 91.60 [ms]
Filter: CFC 180

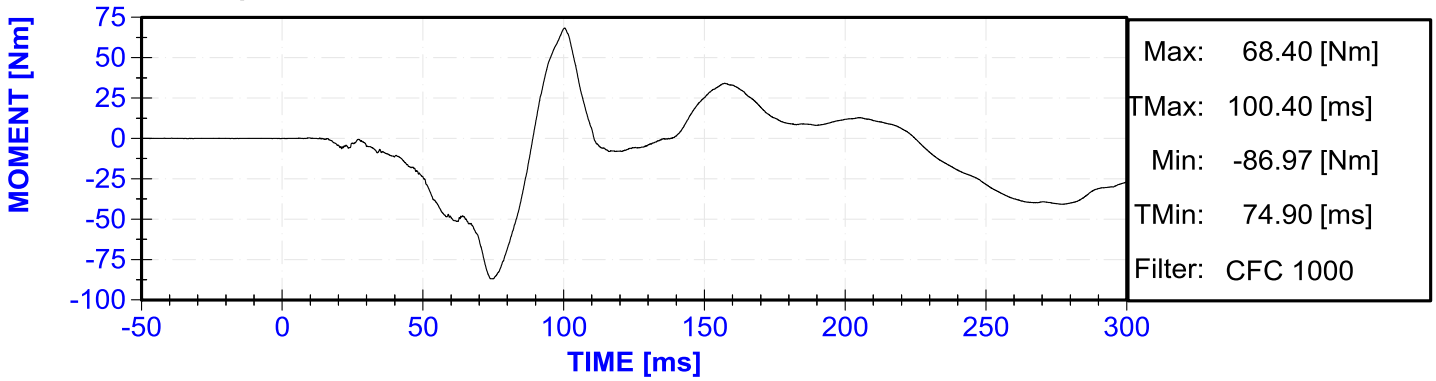

V2P2 Spine Force X
FORCE [N]
250
0
-250
-500
-750
-1000
-1250
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 59.55 [N]
TMax: 224.65 [ms]
Min:-1145.97 [N]
TMin: 90.40 [ms]
Filter: CFC 1000


V2P2 Spine Force Y
FORCE [N]
1750
1500
1250
1000
750
500
250
0
-250
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 1684.61 [N]
TMax: 91.85 [ms]
Min: -225.12 [N]
TMin: 220.35 [ms]
Filter: CFC 1000

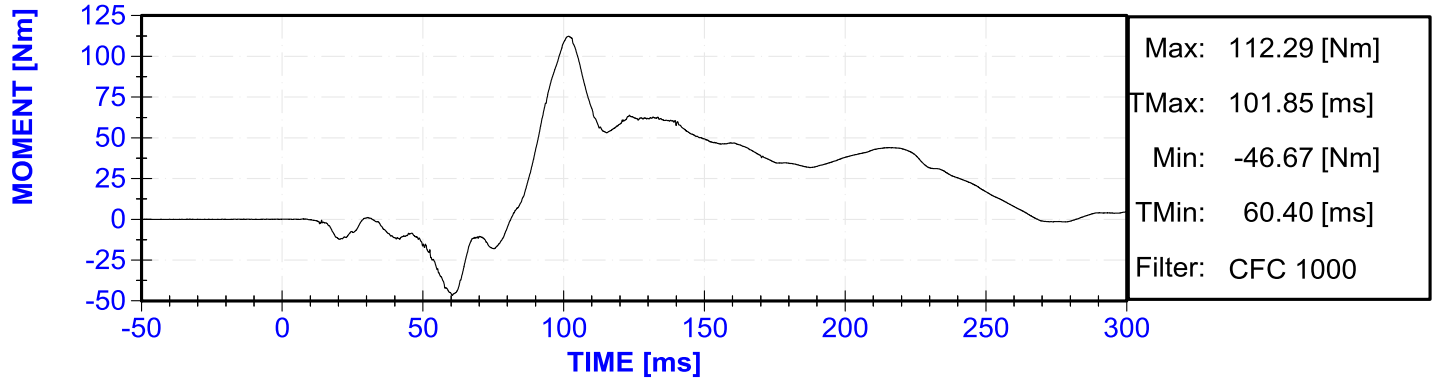
V2P2 Spine Force Z



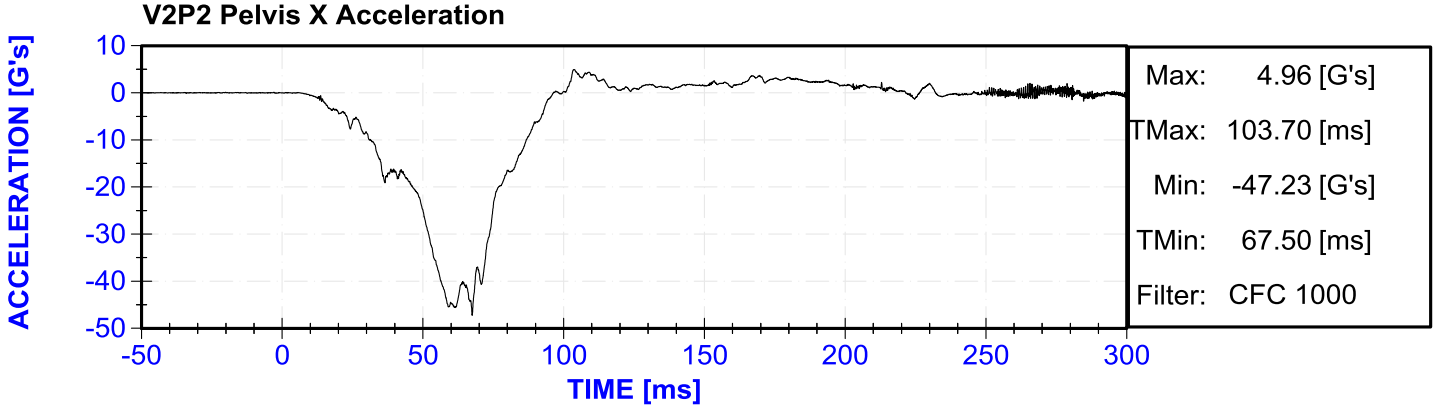
V2P2 Spine Moment X



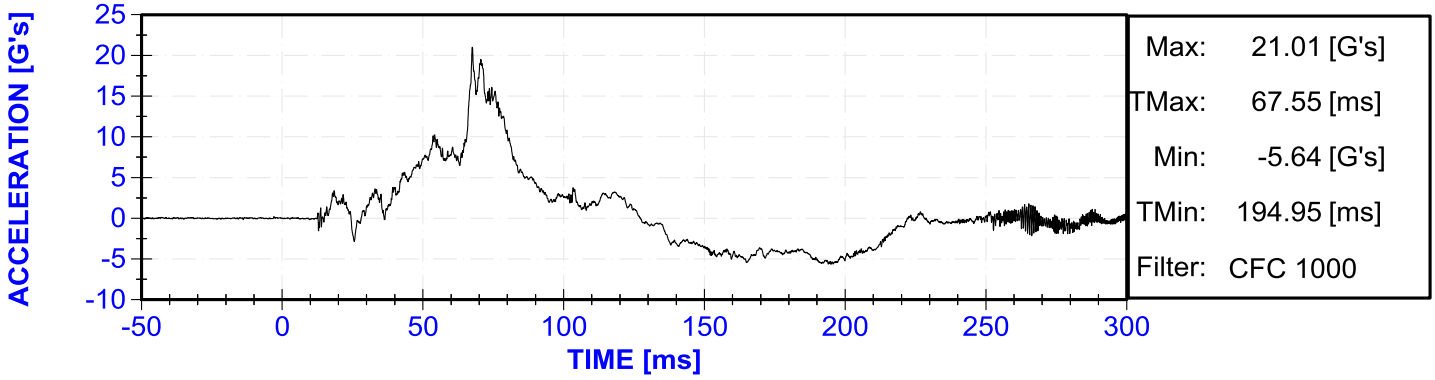
V2P2 Spine Moment Y



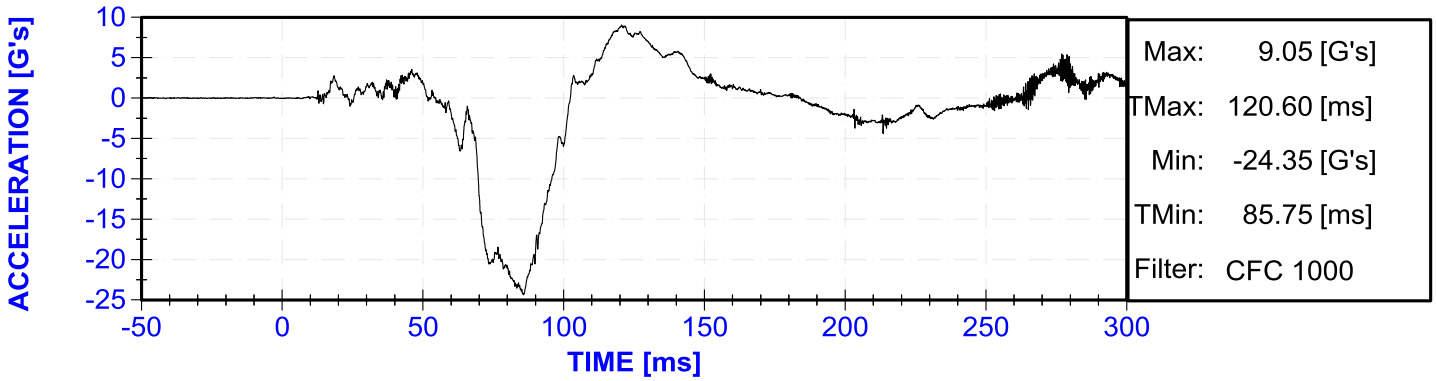
V2P2 Pelvis X Acceleration



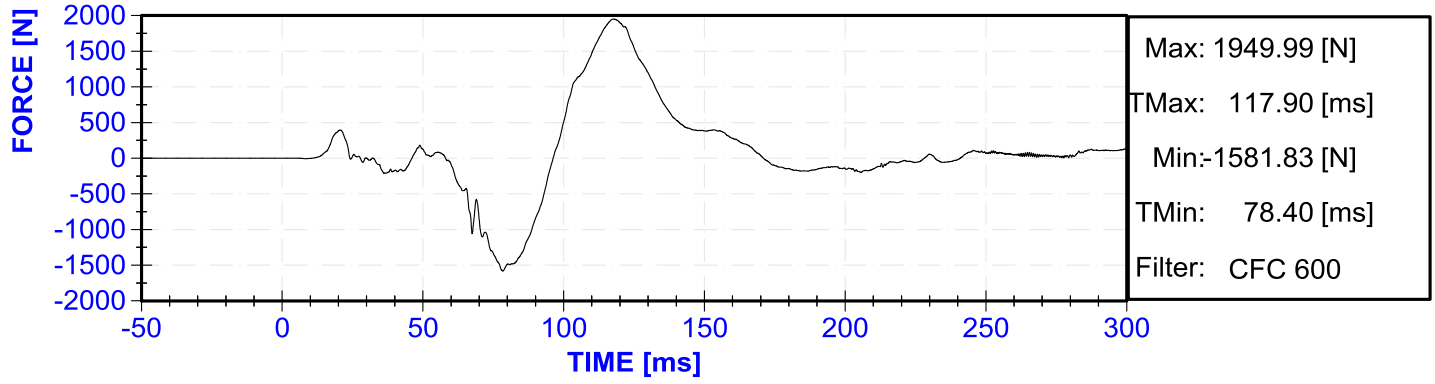
V2P2 Pelvis Y Acceleration



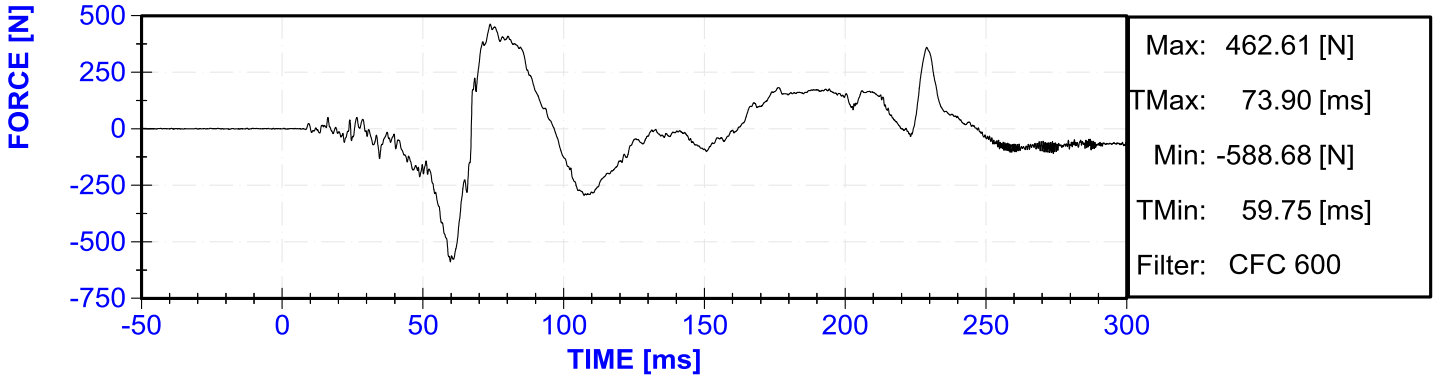
V2P2 Pelvis Z Acceleration



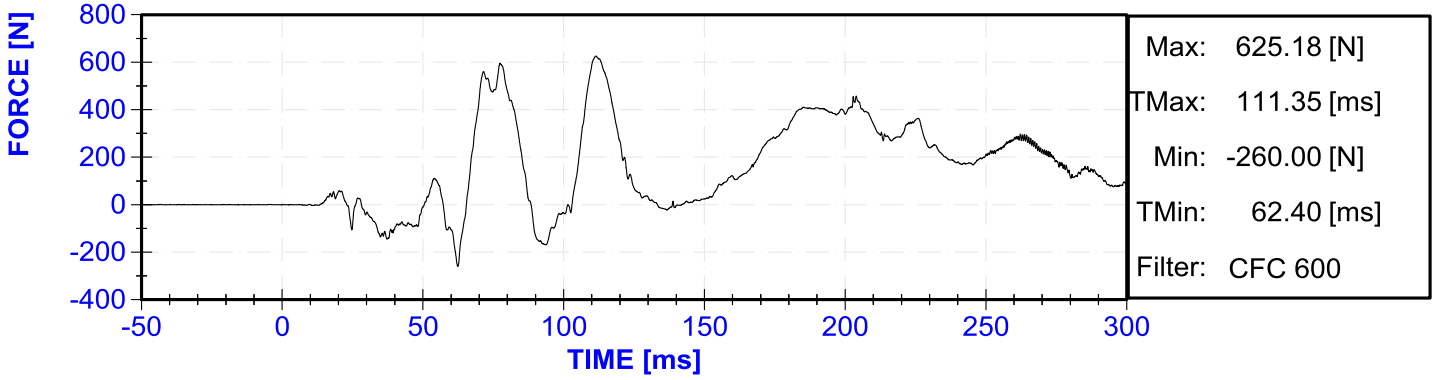
V2P2 Acetabular Left X Force



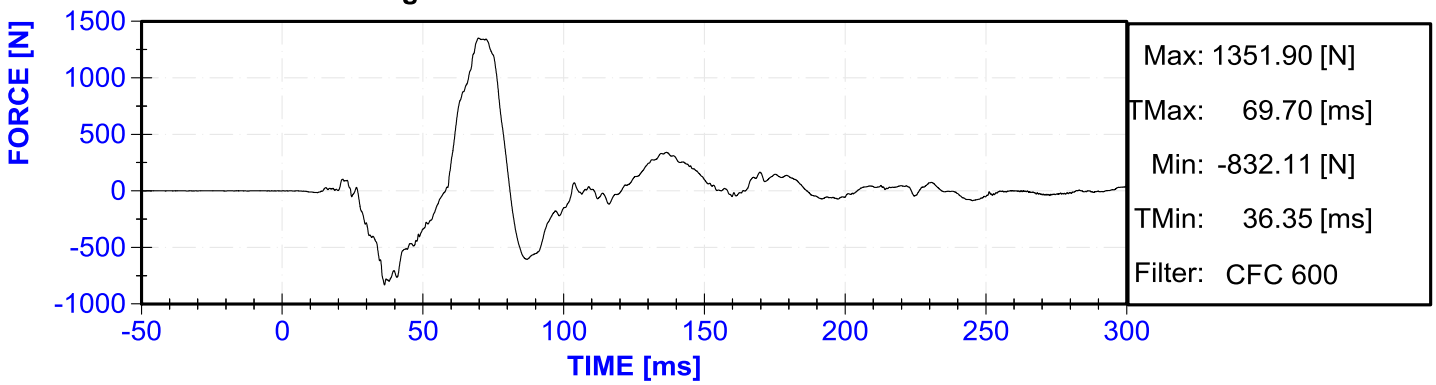
V2P2 Acetabular Left Y Force



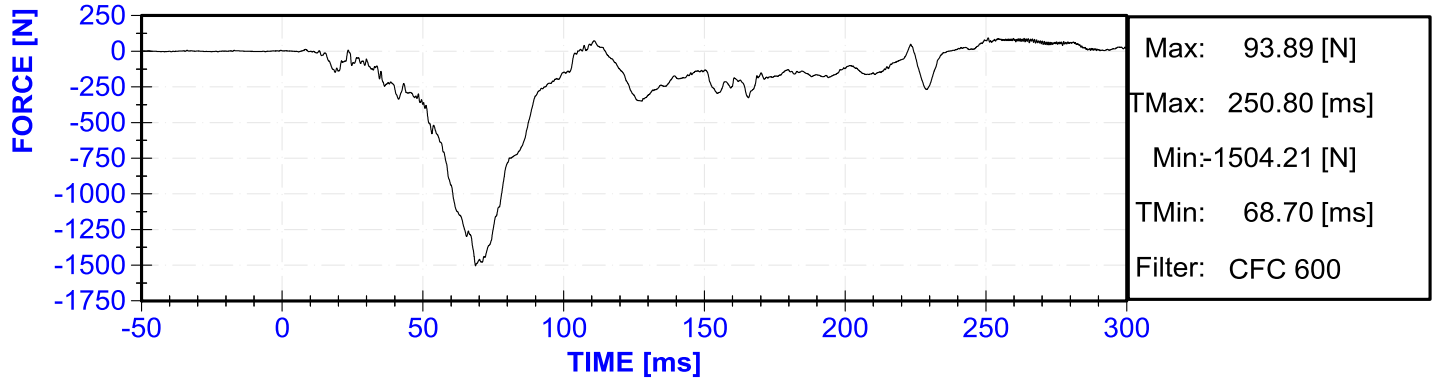
V2P2 Acetabular Left Z Force



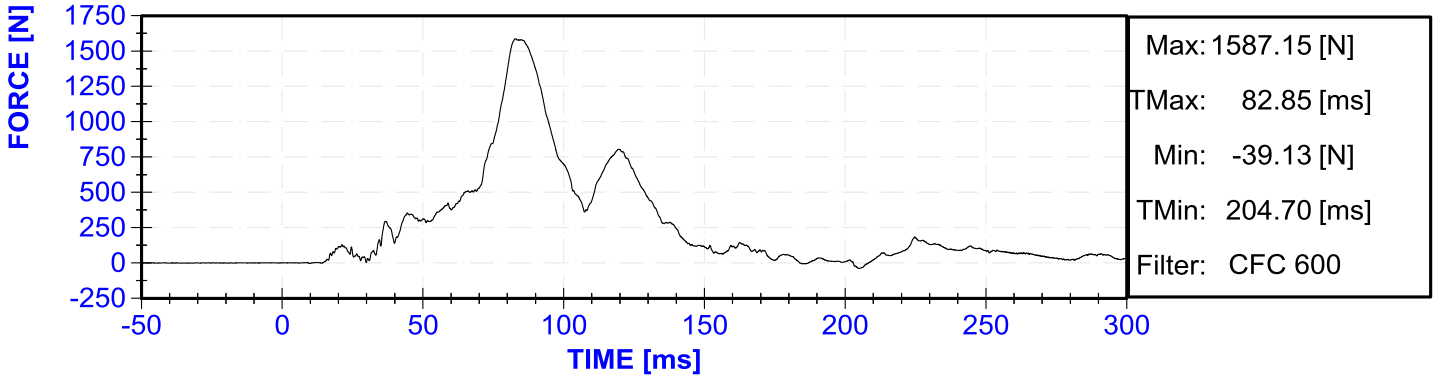
V2P2 Acetabular Right X Force



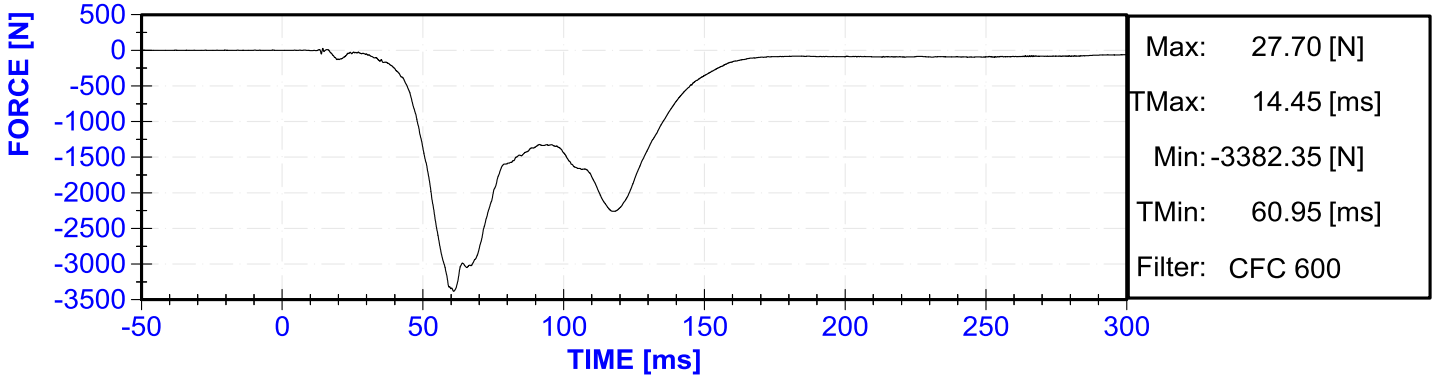
V2P2 Acetabular Right Y Force



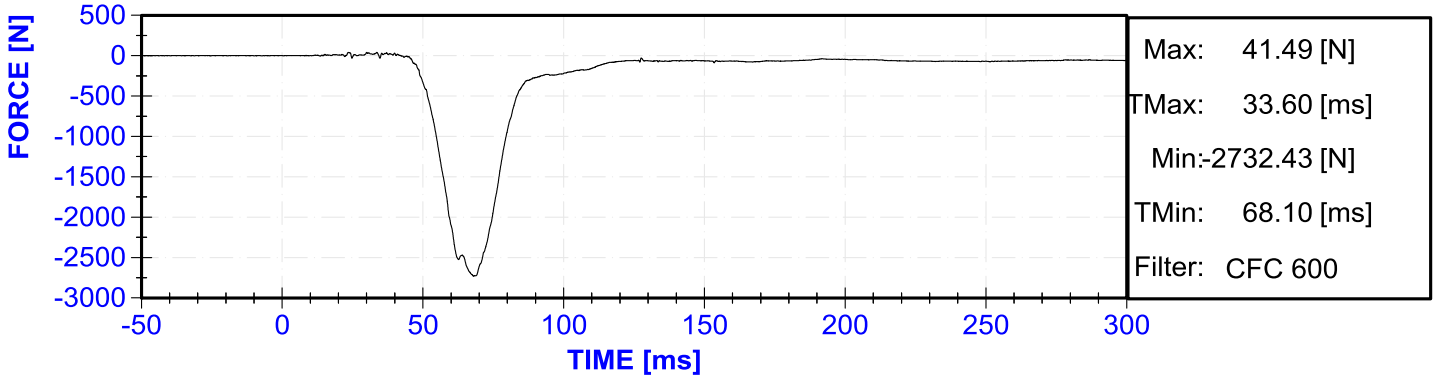
V2P2 Acetabular Right Z Force



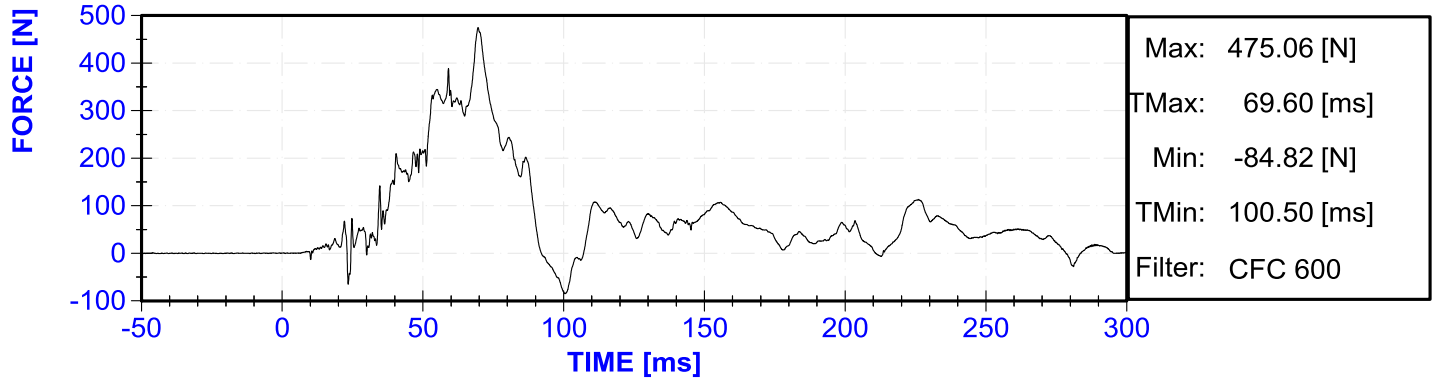
V2P2 ASIS Left X Force



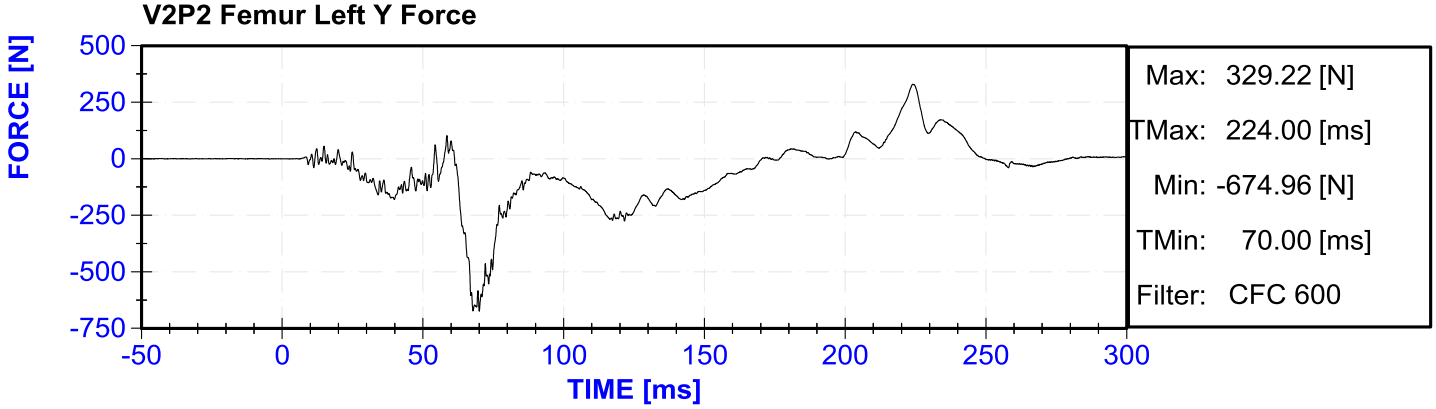
V2P2 ASIS Right X Force



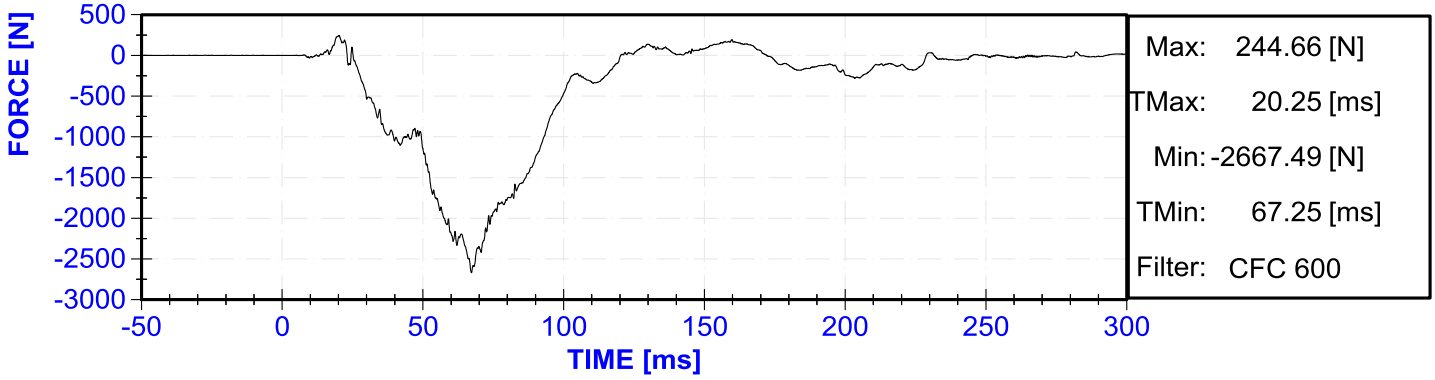
V2P2 Femur Left X Force



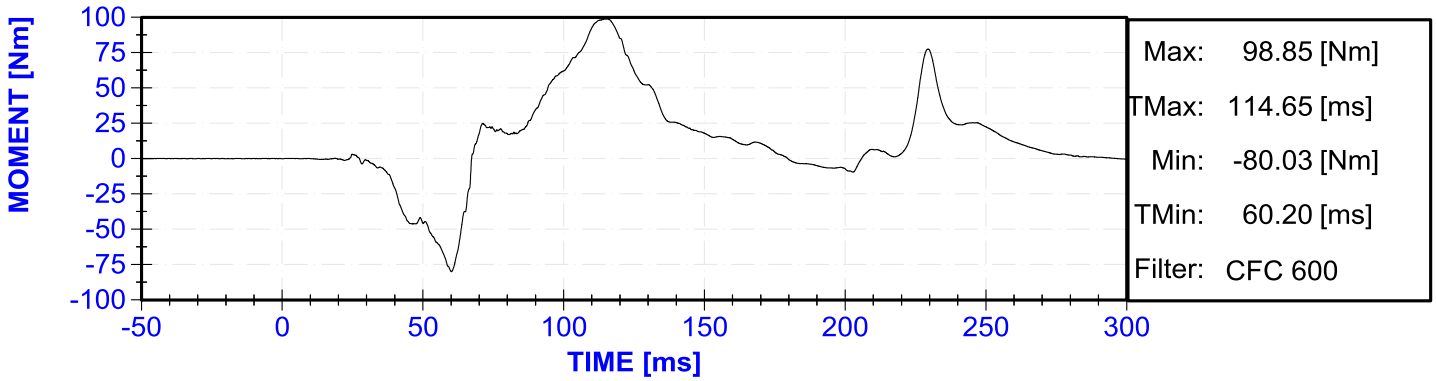
V2P2 Femur Left Y Force



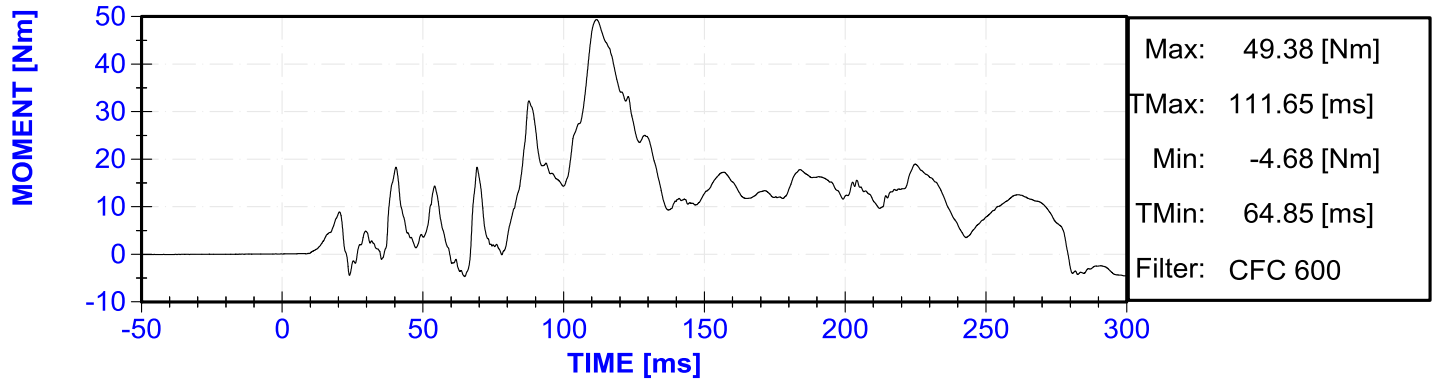
V2P2 Femur Left Z Force



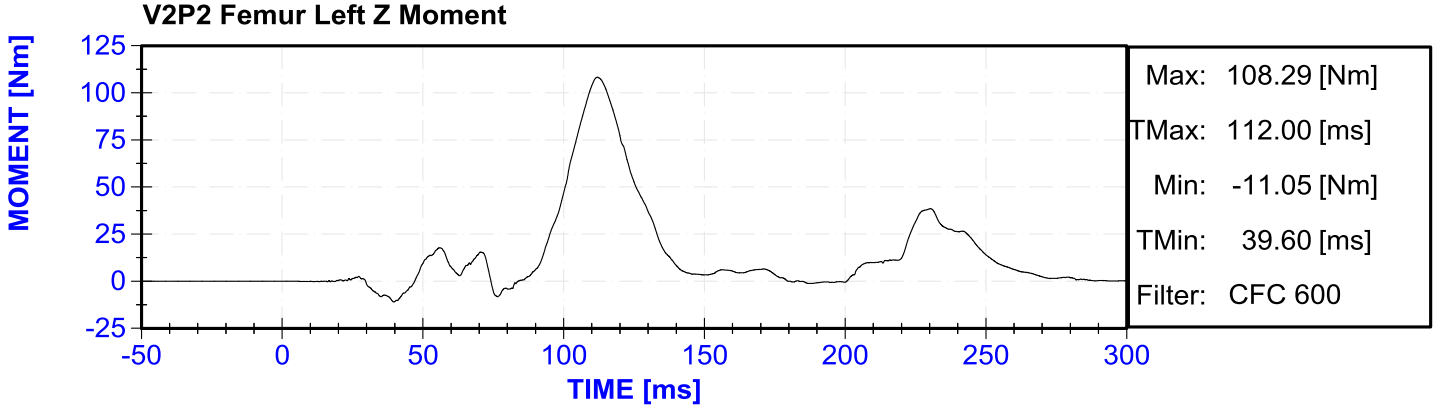
V2P2 Femur Left X Moment



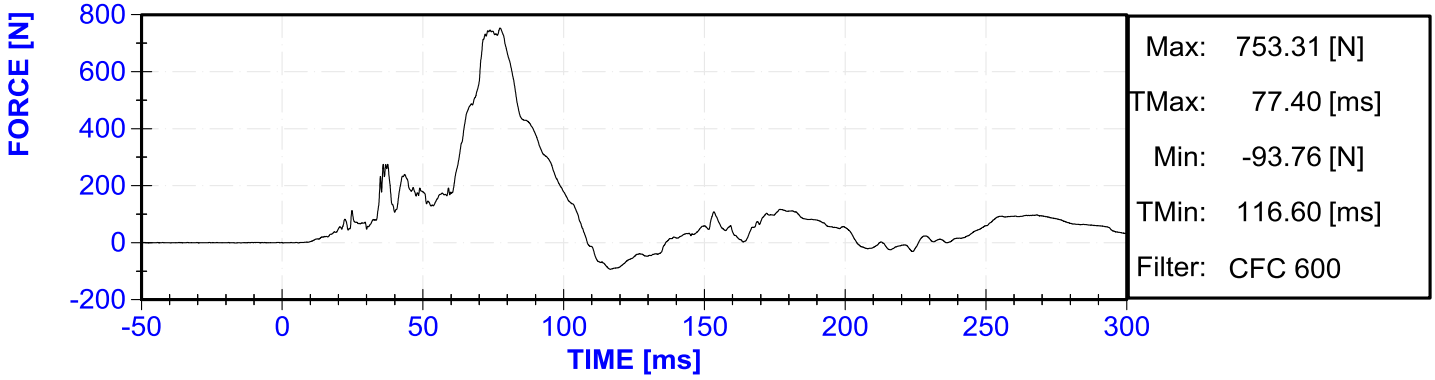
V2P2 Femur Left Y Moment



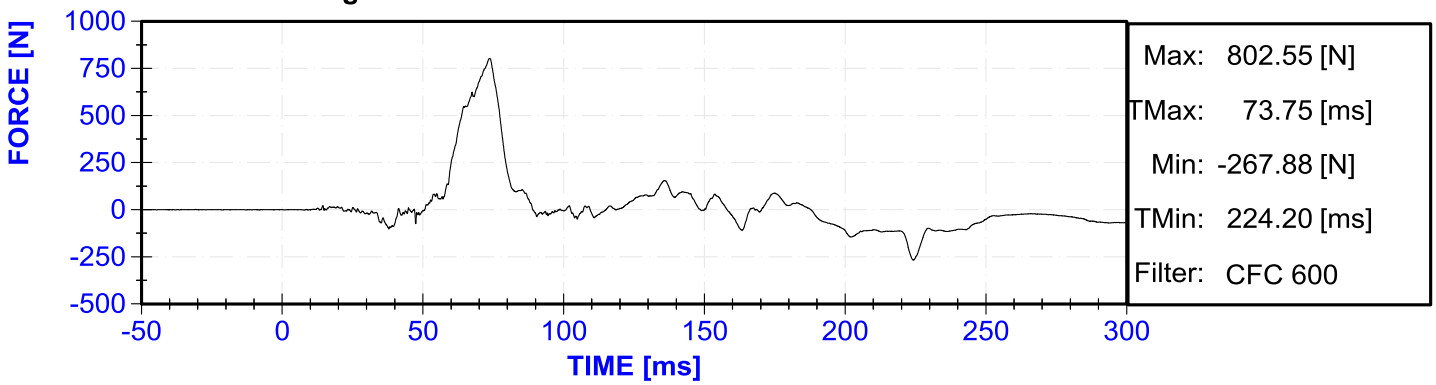
V2P2 Femur Left Z Moment



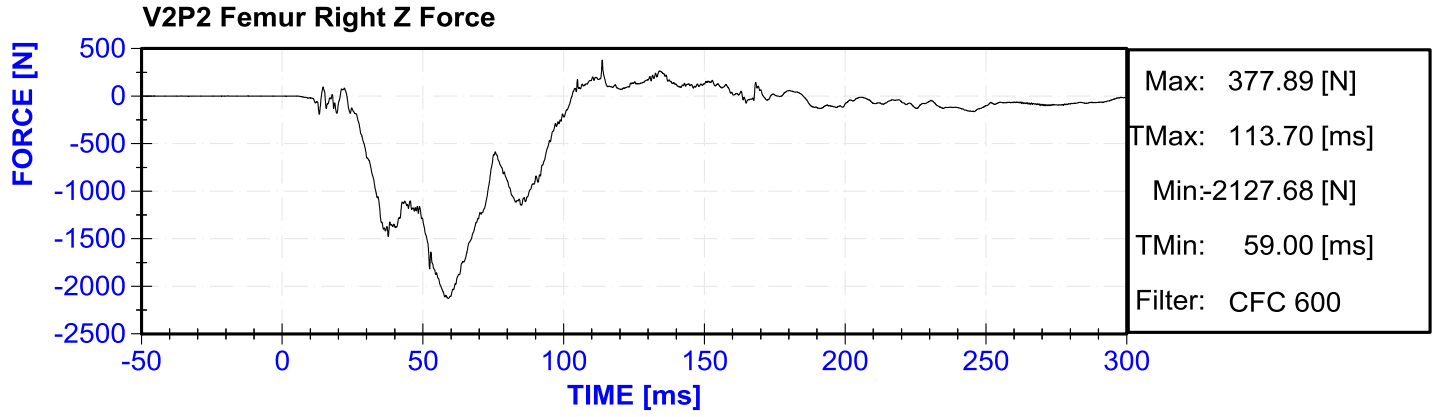
V2P2 Femur Right X Force



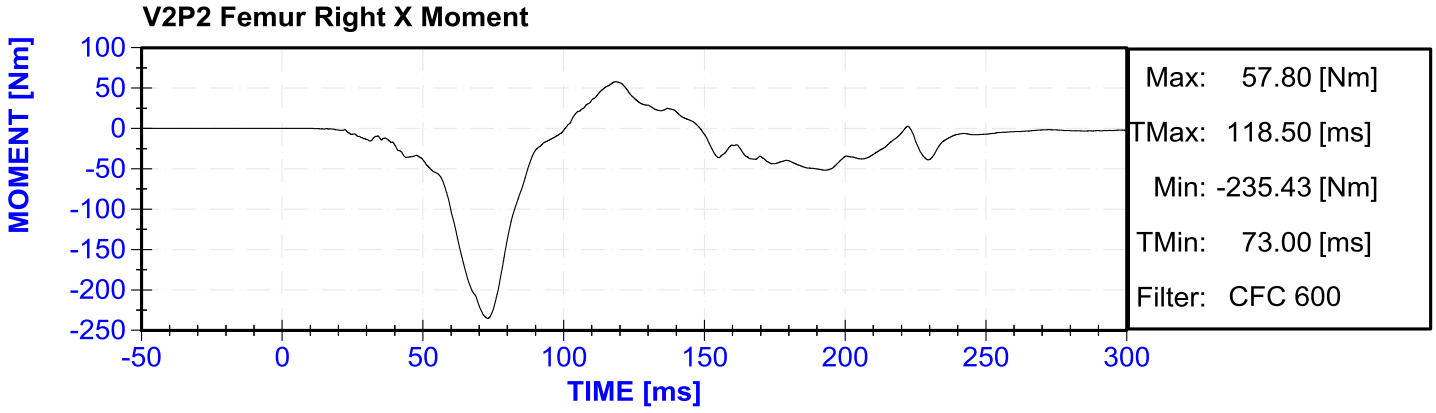
V2P2 Femur Right Y Force



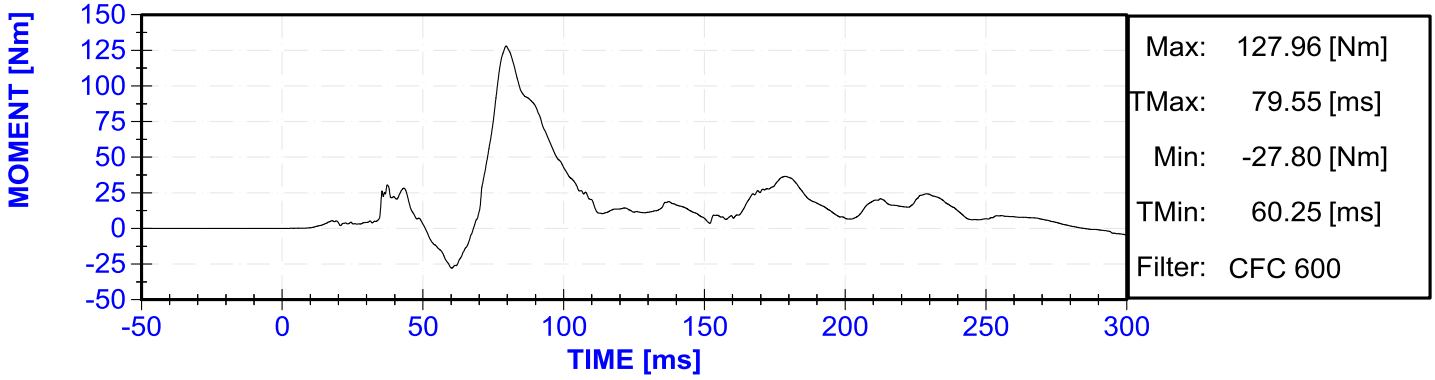
V2P2 Femur Right Z Force



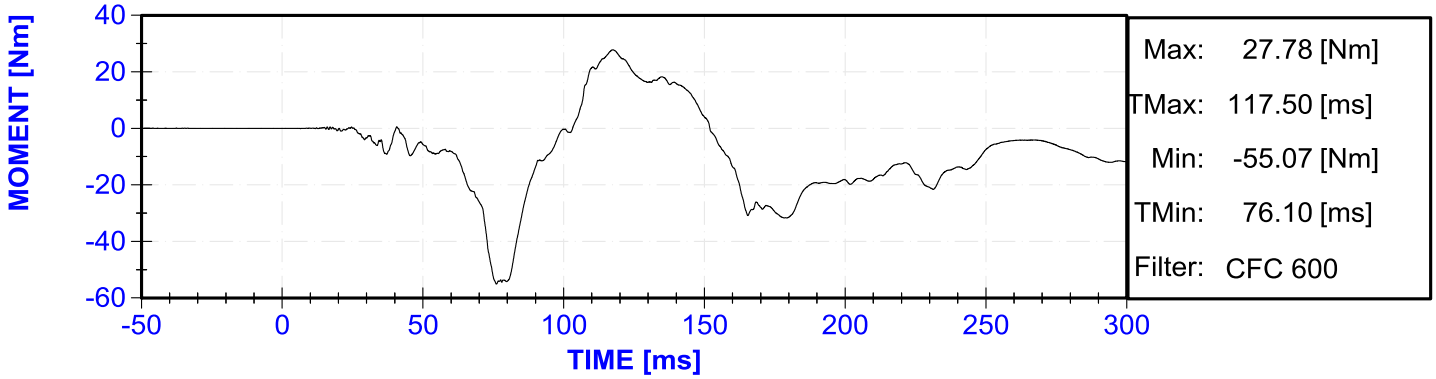
V2P2 Femur Right X Moment



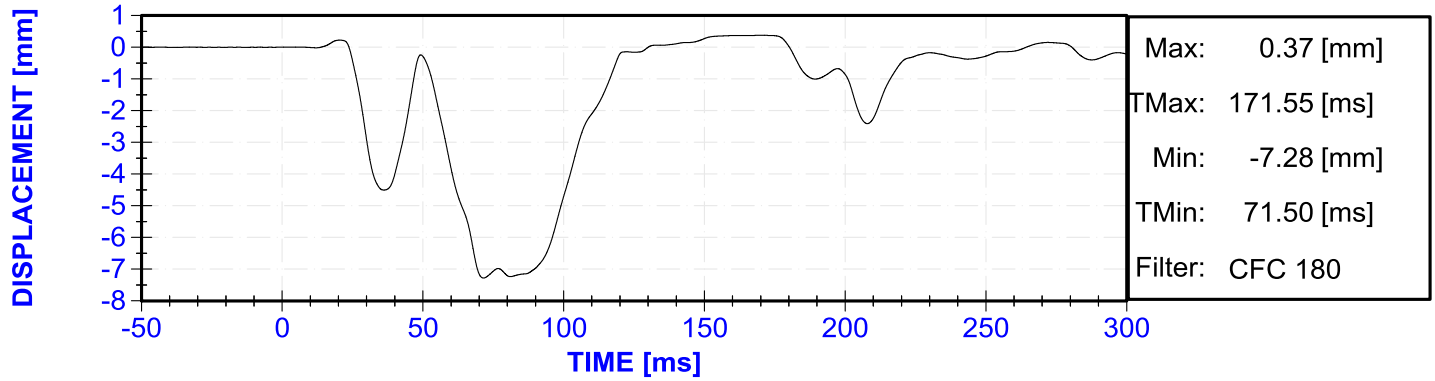
V2P2 Femur Right Y Moment



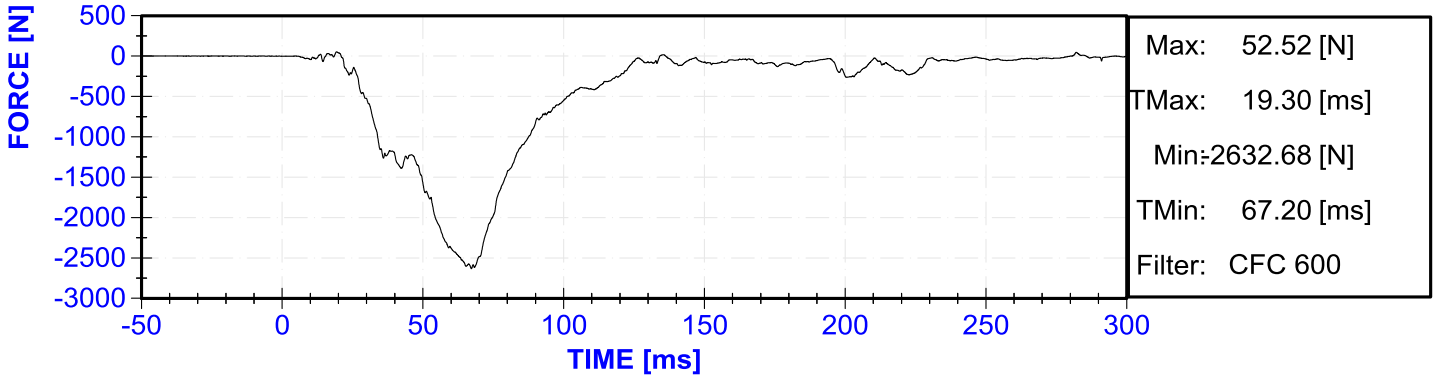
V2P2 Femur Right Z Moment



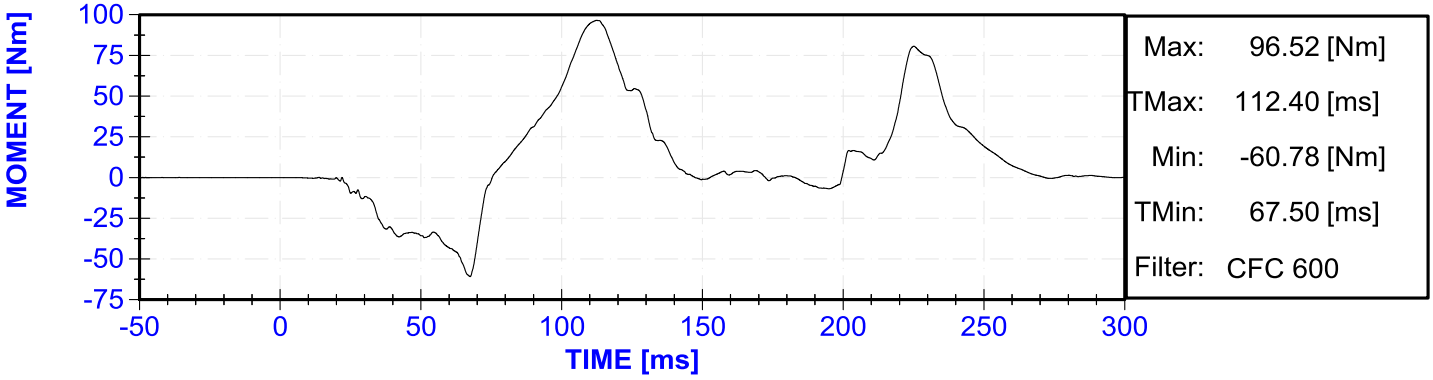
V2P2 Knee Left X Displacement



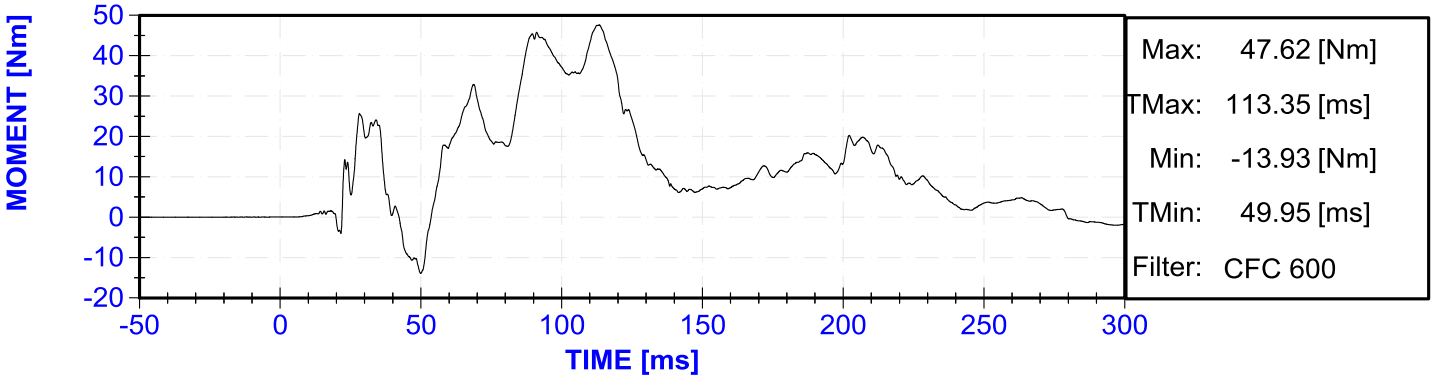
V2P2 Upper Tibia Left Z Force



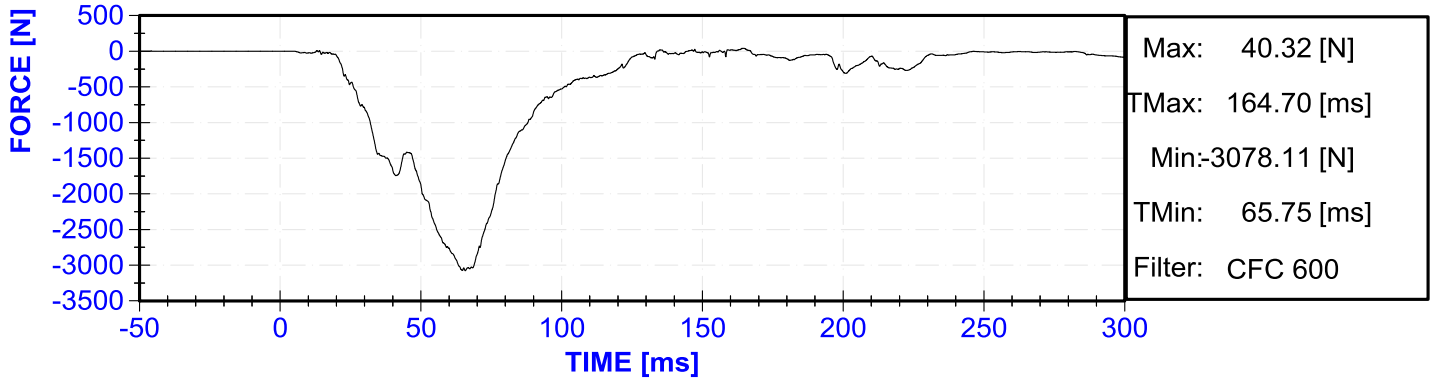
V2P2 Upper Tibia Left X Moment



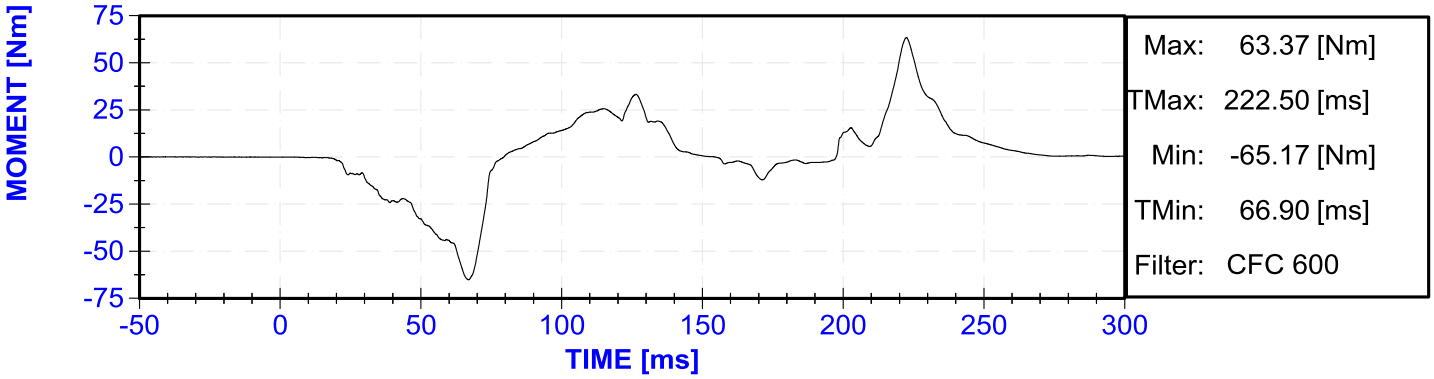
V2P2 Upper Tibia Left Y Moment



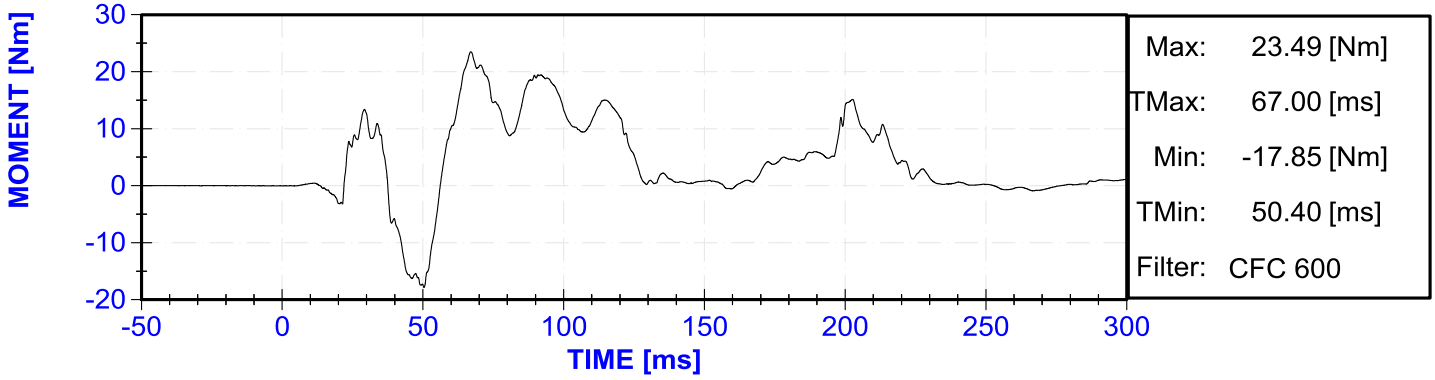
V2P2 Lower Tibia Left Z Force



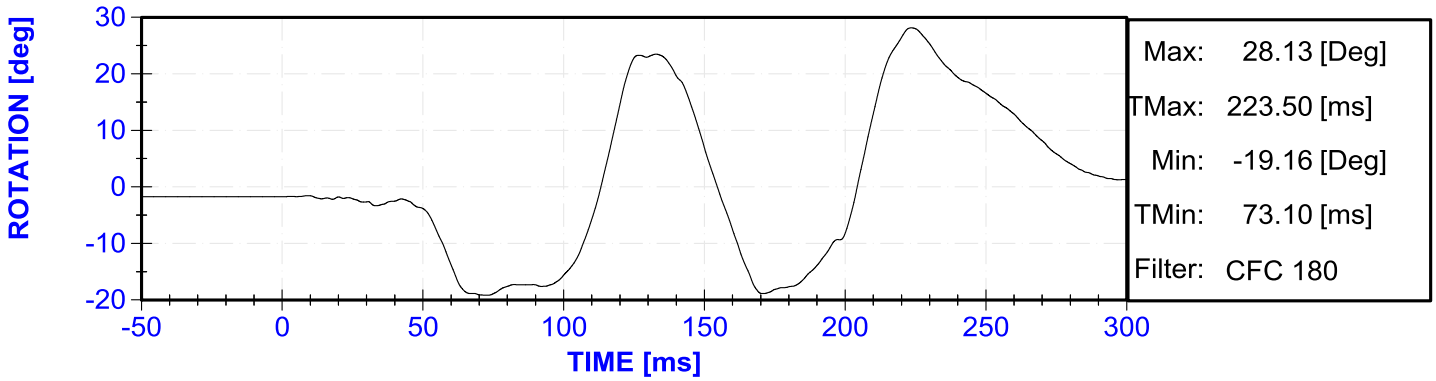
V2P2 Lower Tibia Left X Moment



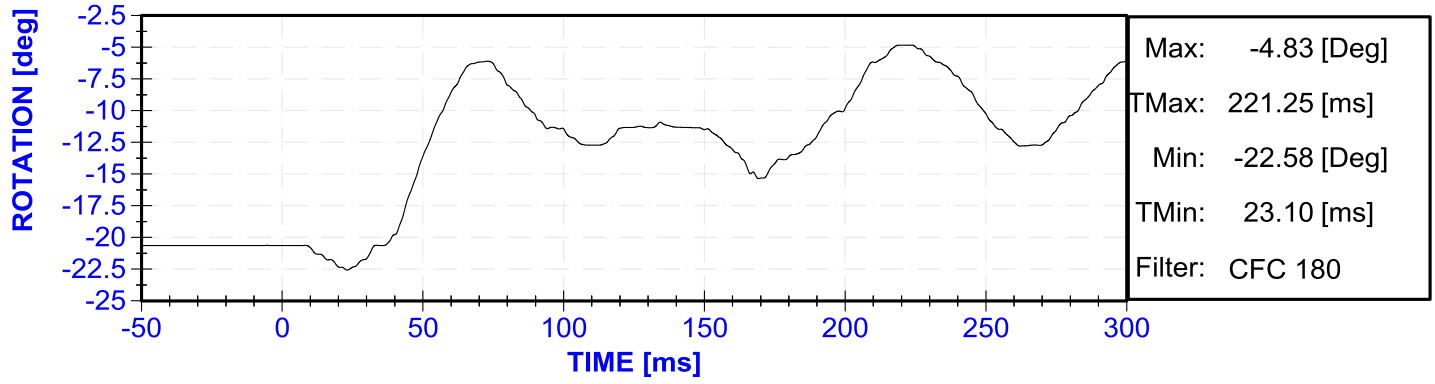
V2P2 Lower Tibia Left Y Moment



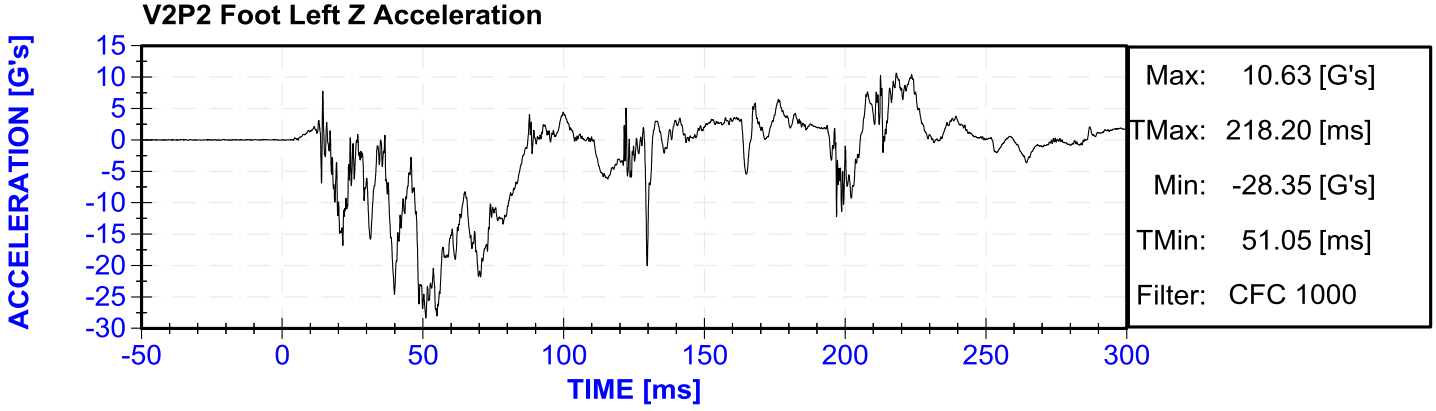
V2P2 Ankle Left X Rotation



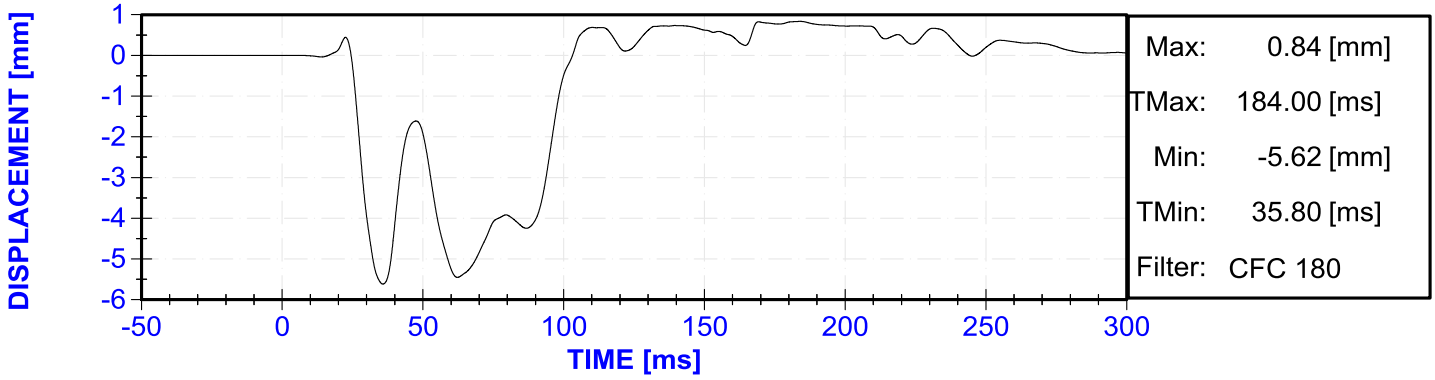
V2P2 Ankle Left Y Rotation



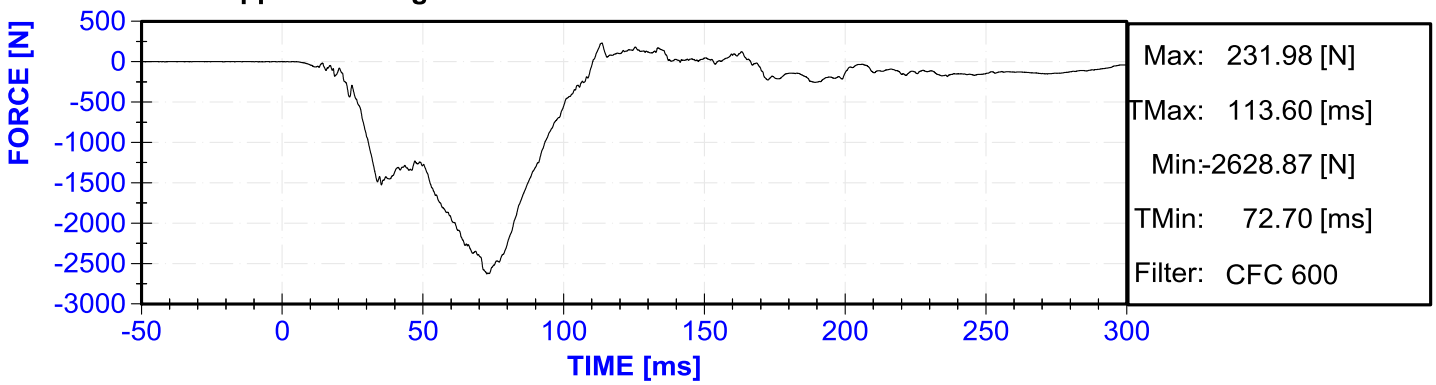
V2P2 Foot Left Z Acceleration



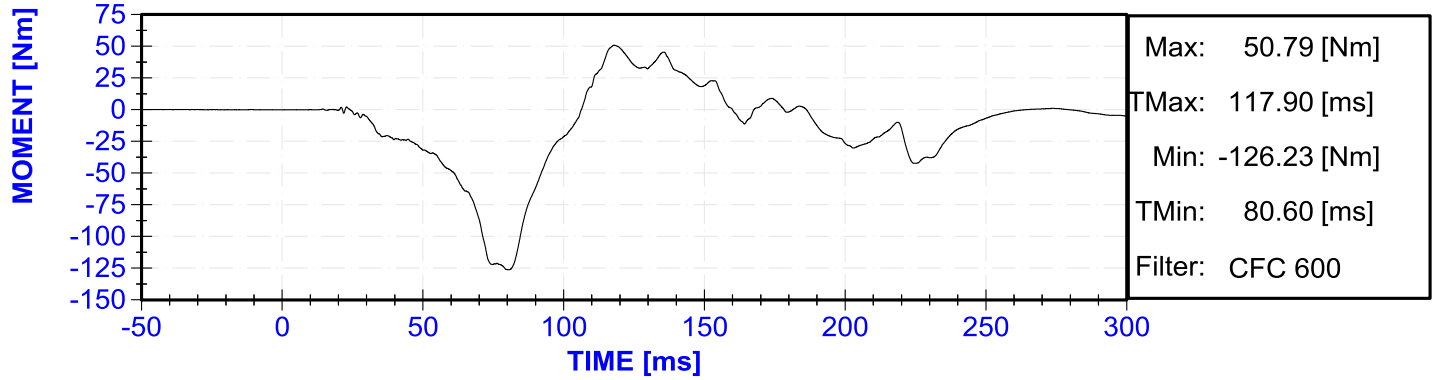
V2P2 Knee Right X Displacement



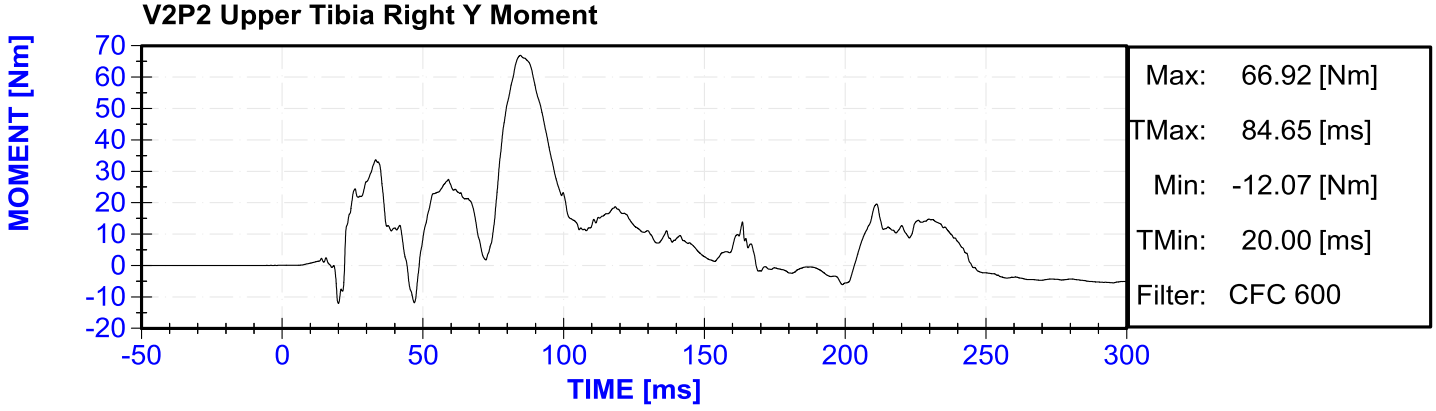
V2P2 Upper Tibia Right Z Force



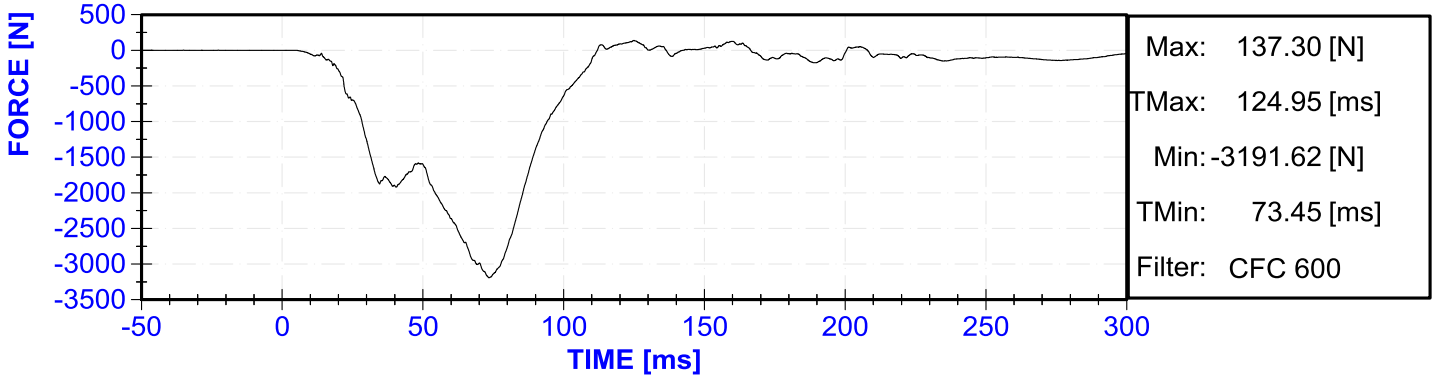
V2P2 Upper Tibia Right X Moment



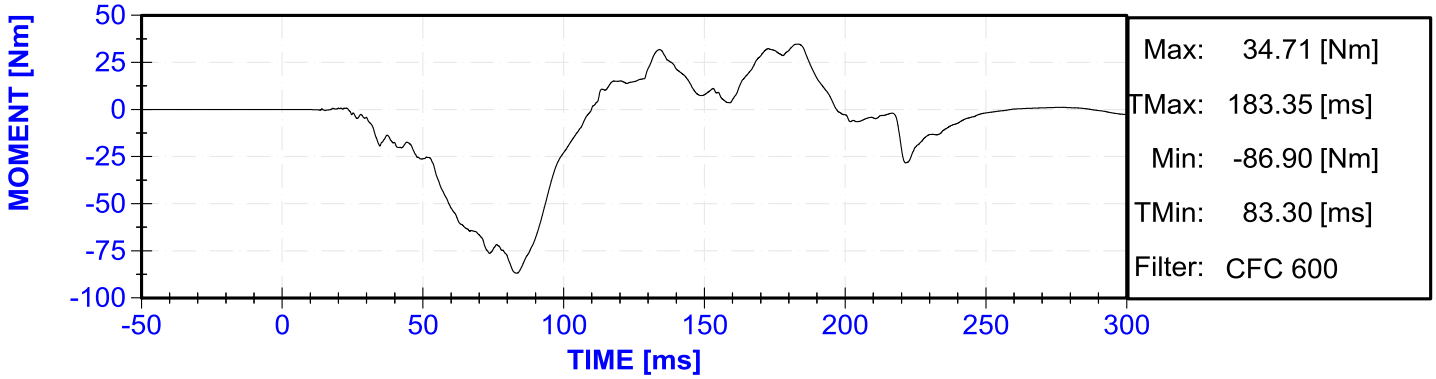
V2P2 Upper Tibia Right Y Moment



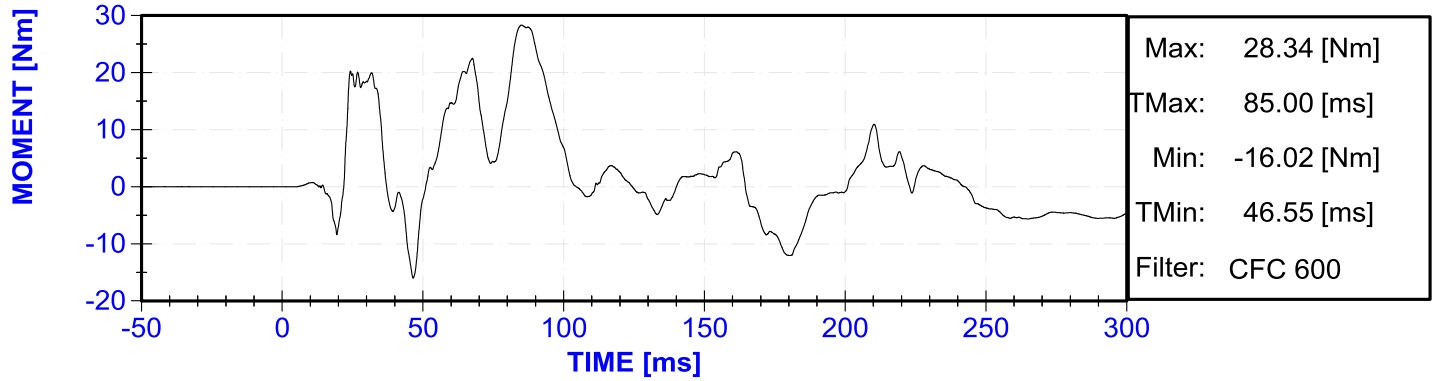
V2P2 Lower Tibia Right Z Force



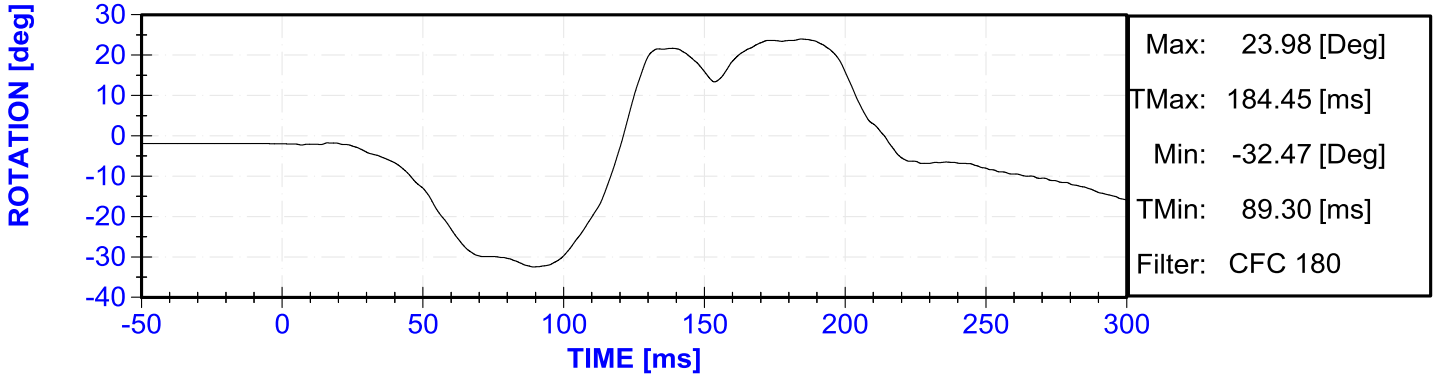
V2P2 Lower Tibia Right X Moment

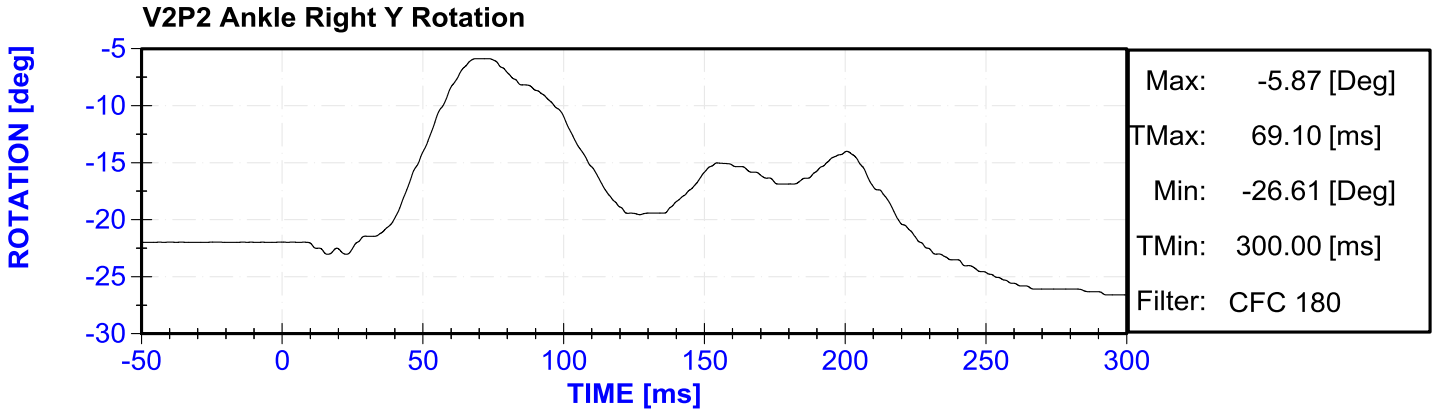


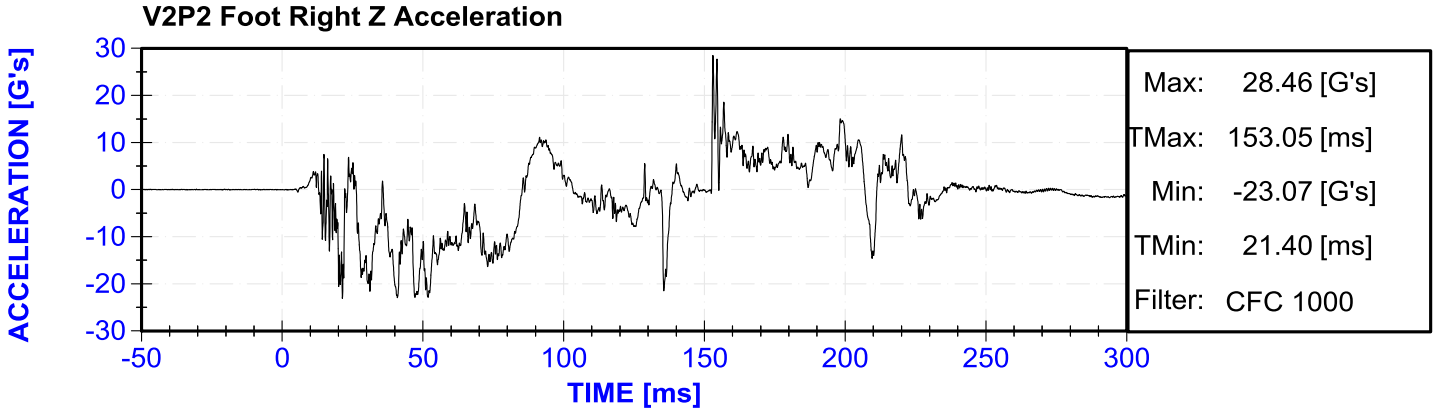
V2P2 Lower Tibia Right Y Moment

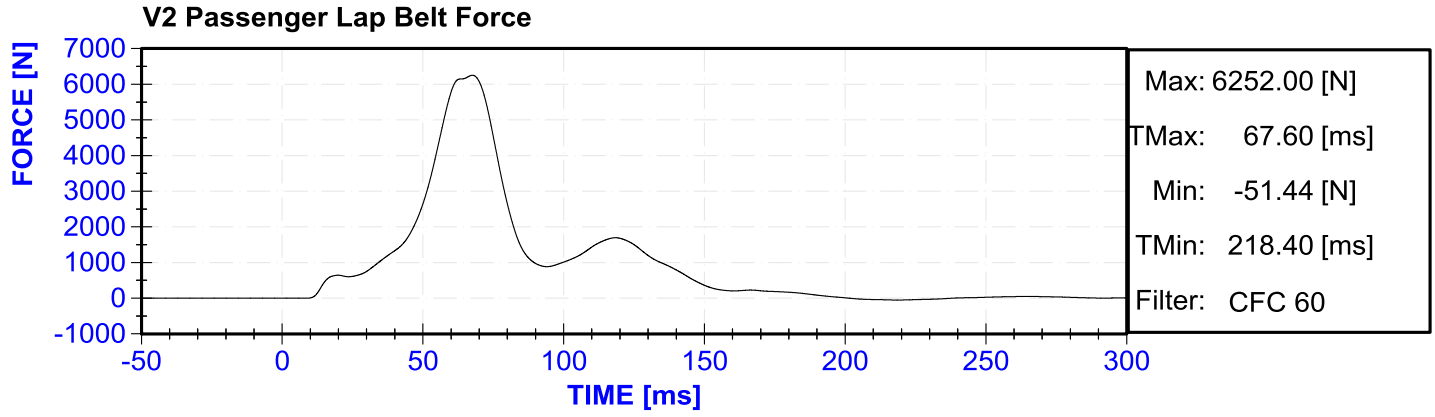


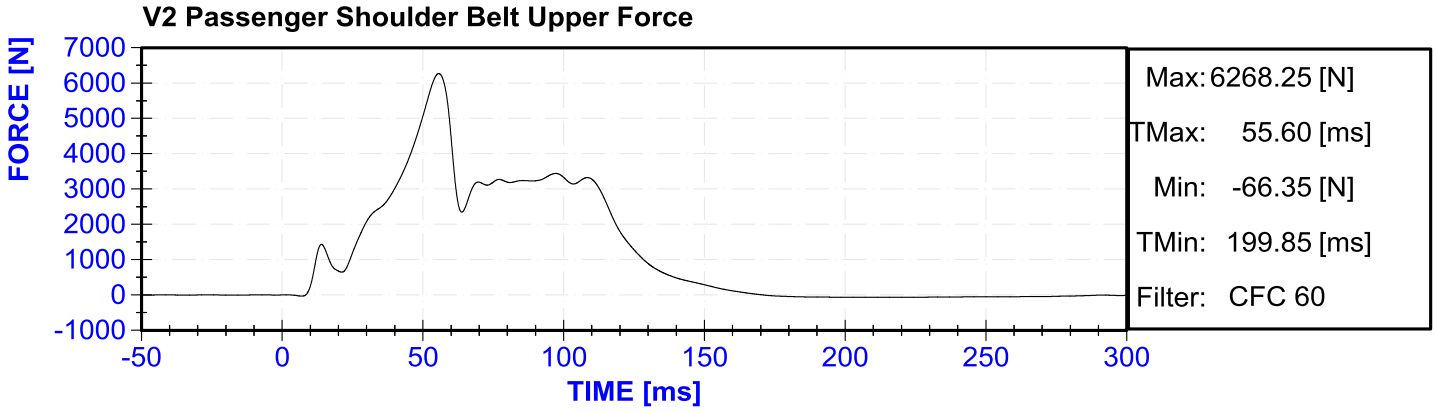
V2P2 Ankle Right X Rotation



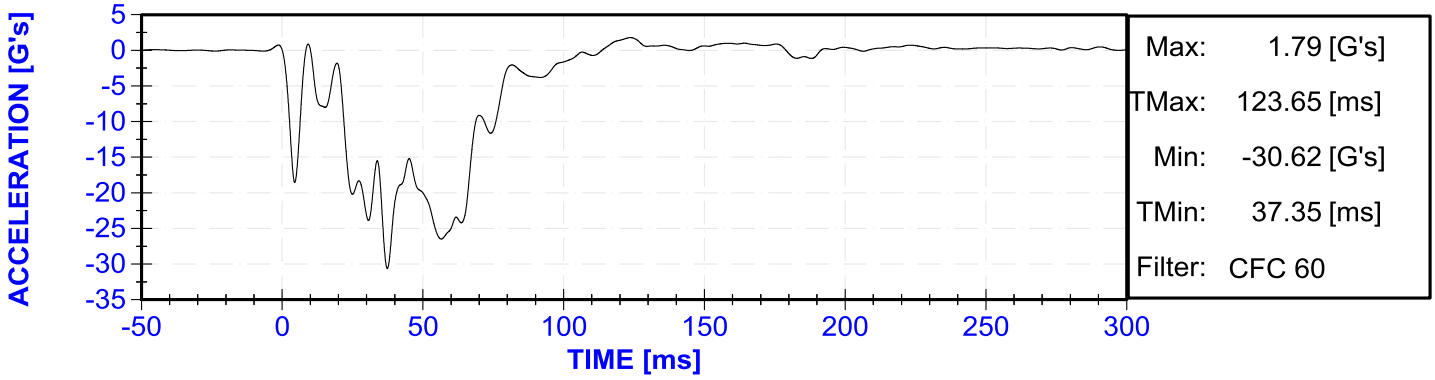

V2P2 Ankle Right Y Rotation
ROTATION [deg]
-5
-10
-15
-20
-25
-30
-50
0
50
100
150
200
250
300
TIME [ms]
Max: -5.87 [Deg]
TMax: 69.10 [ms]
Min: -26.61 [Deg]
TMin: 300.00 [ms]
Filter: CFC 180


V2P2 Foot Right Z Acceleration
ACCELERATION [G's]
30
20
10
0
-10
-20
-30
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 28.46 [G's]
TMax: 153.05 [ms]
Min: -23.07 [G's]
TMin: 21.40 [ms]
Filter: CFC 1000

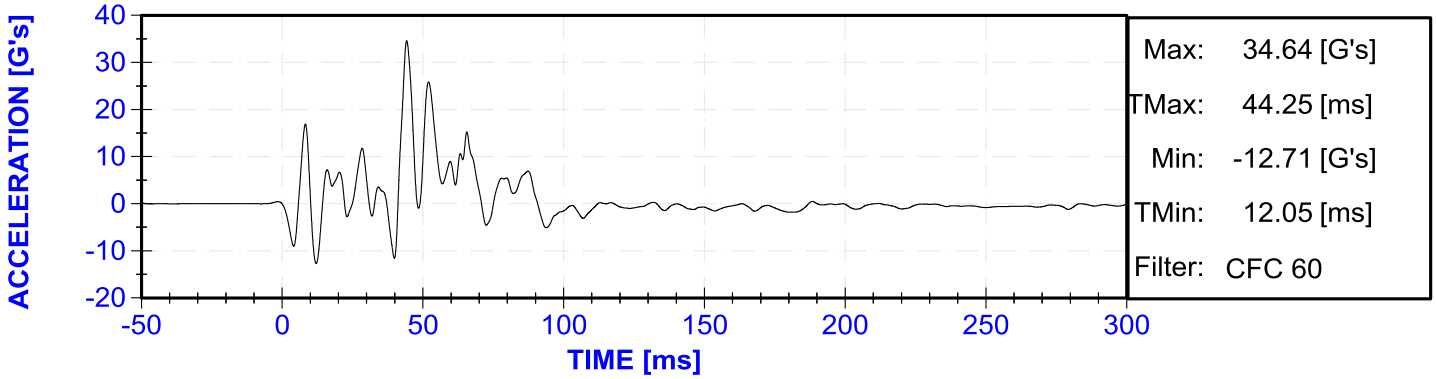

V2 Passenger Lap Belt Force
FORCE [N]
7000
6000
5000
4000
3000
2000
1000
0
-1000
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 6252.00 [N]
TMax: 67.60 [ms]
Min: -51.44 [N]
TMin: 218.40 [ms]
Filter: CFC 60


V2 Passenger Shoulder Belt Upper Force
FORCE [N]
7000
6000
5000
4000
3000
2000
1000
0
-1000
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 6268.25 [N]
TMax: 55.60 [ms]
Min: -66.35 [N]
TMin: 199.85 [ms]
Filter: CFC 60

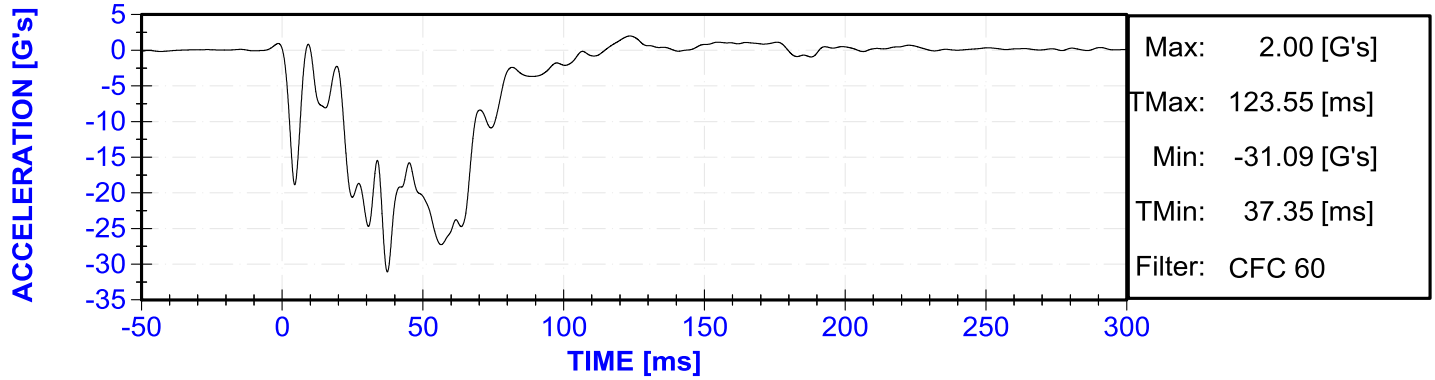
V2 Left Rear Sill X Acceleration



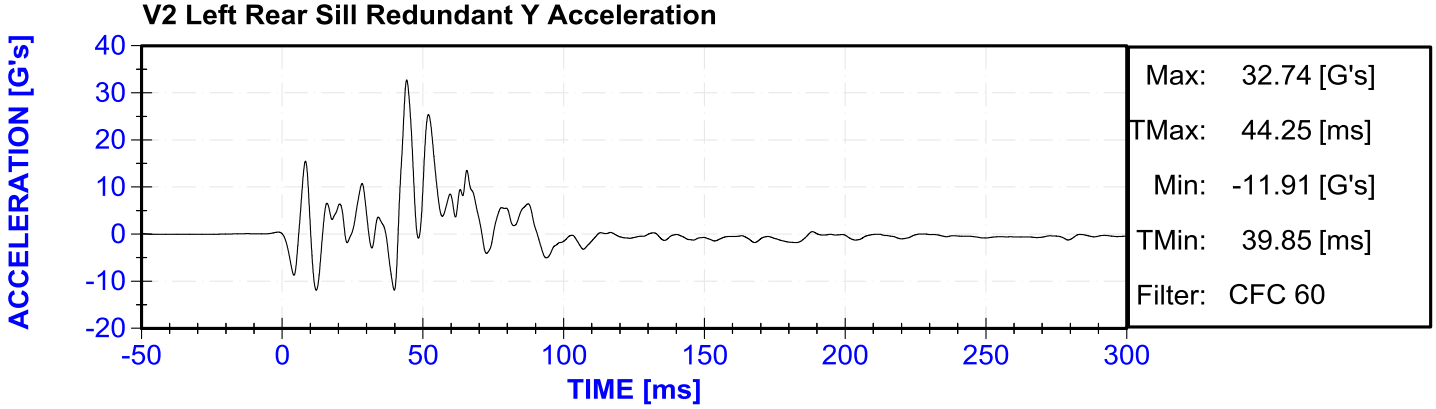
V2 Left Rear Sill Y Acceleration



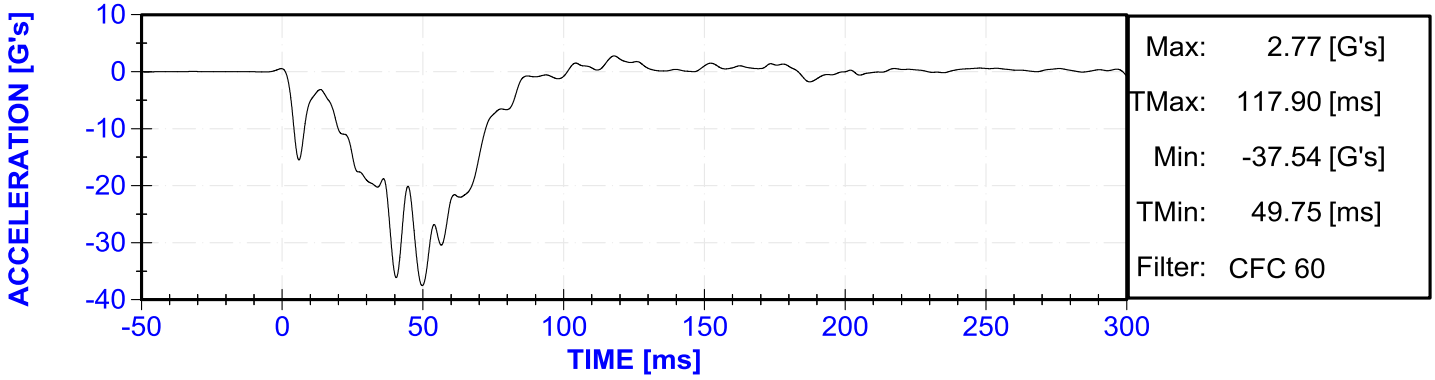
V2 Left Rear Sill Redundant X Acceleration



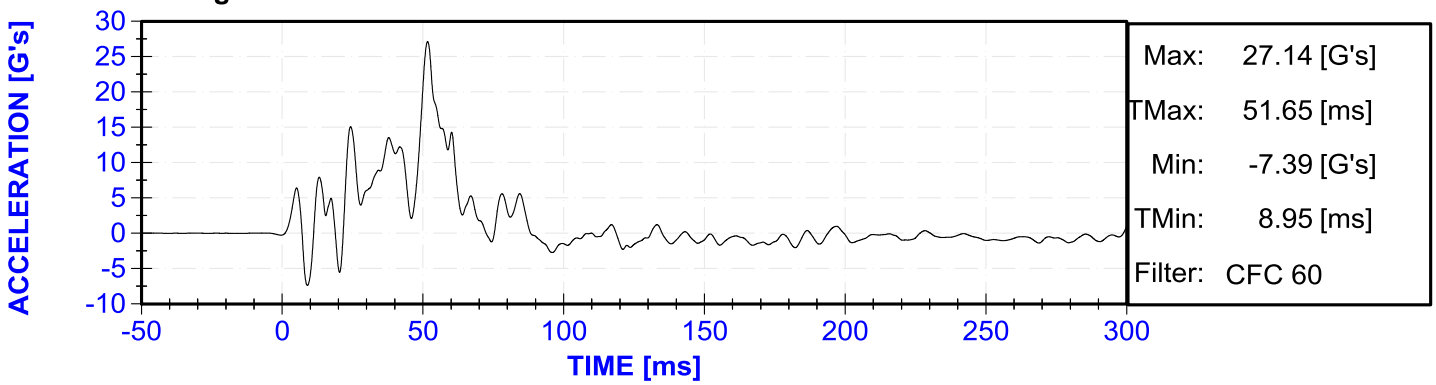
V2 Left Rear Sill Redundant Y Acceleration



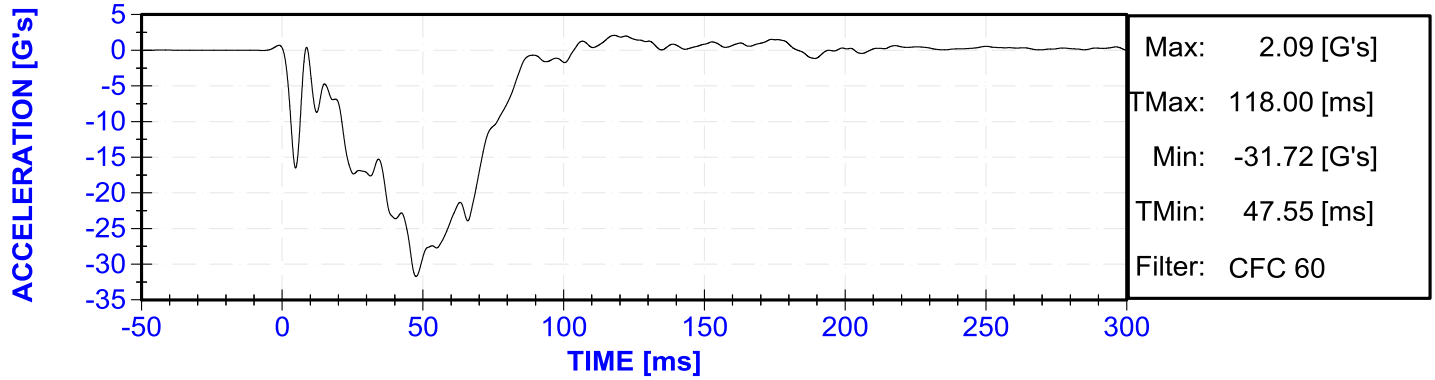
V2 Right Rear Sill X Acceleration



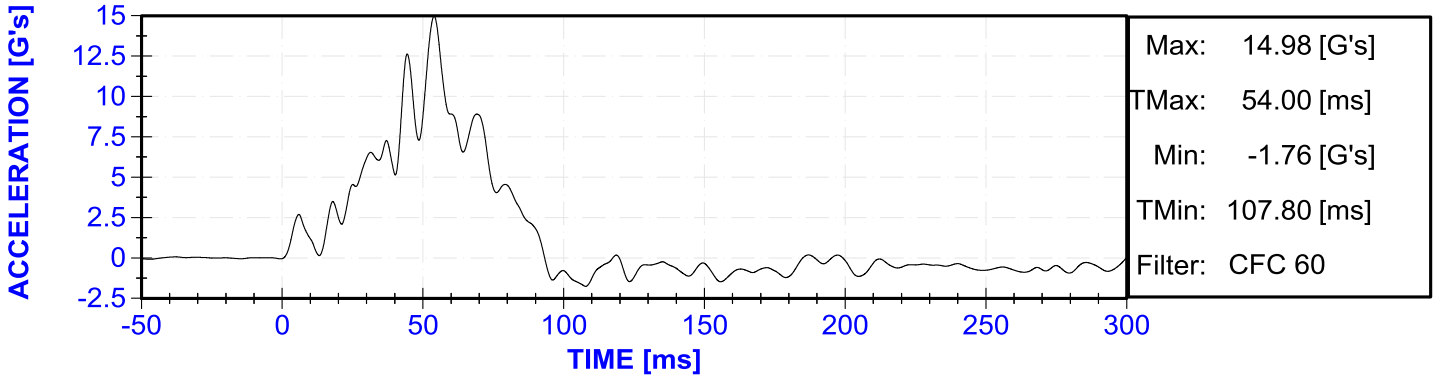
V2 Right Rear Sill Y Acceleration

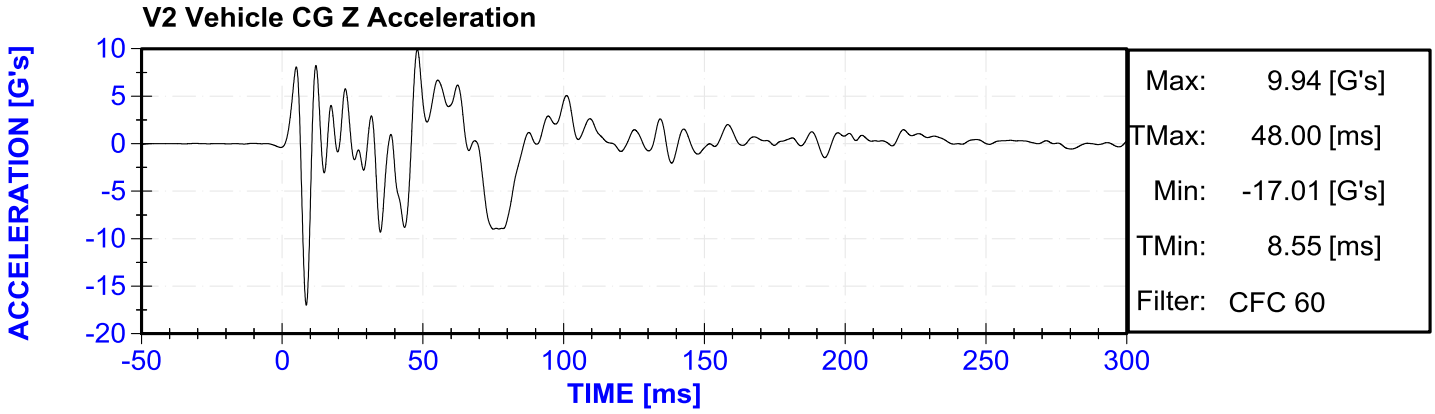


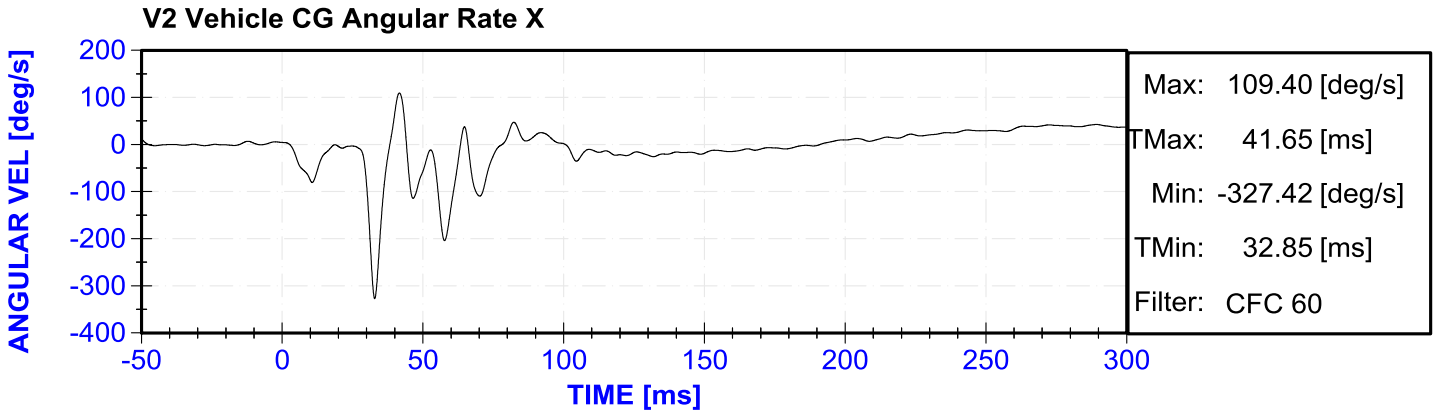
V2 Vehicle CG X Acceleration

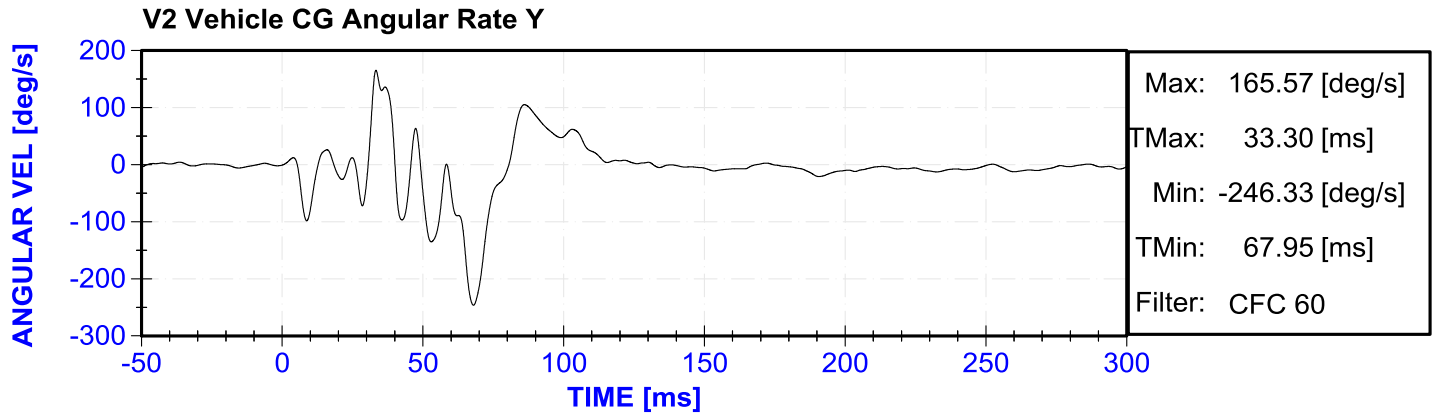


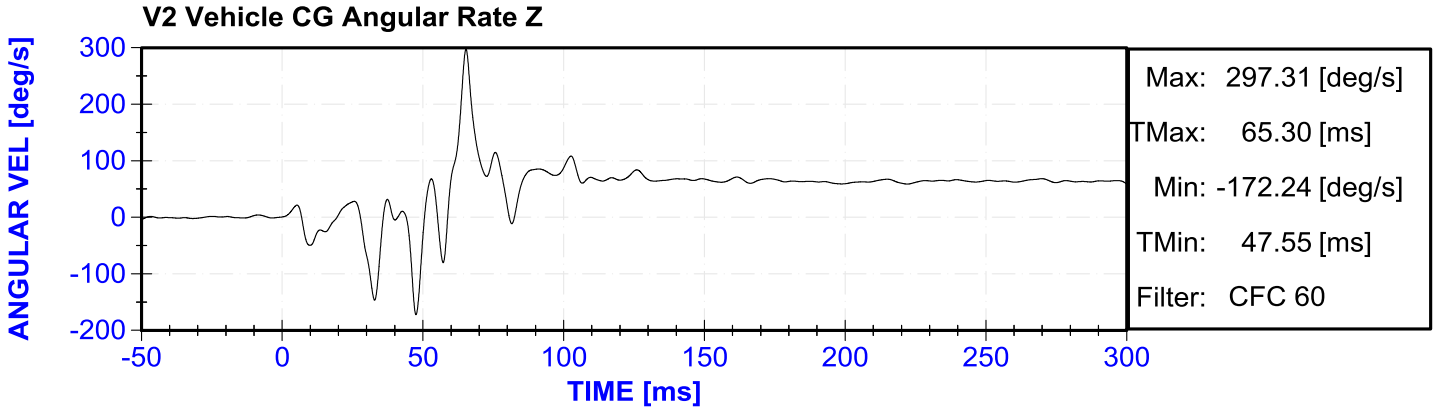
V2 Vehicle CG Y Acceleration



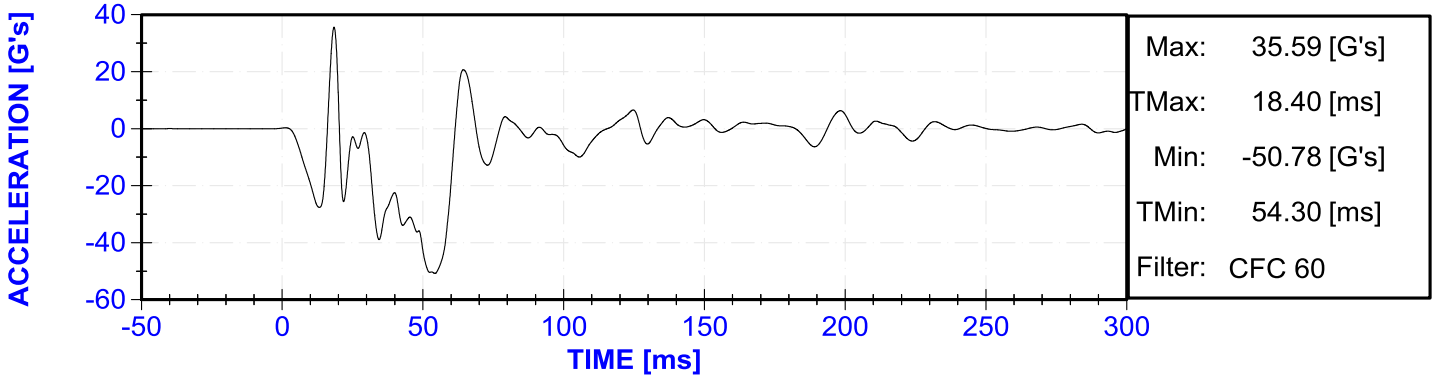

V2 Vehicle CG Z Acceleration
ACCELERATION [G's]
10
5
0
-5
-10
-15
-20
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 9.94 [G's]
TMax: 48.00 [ms]
Min: -17.01 [G's]
TMin: 8.55 [ms]
Filter: CFC 60


V2 Vehicle CG Angular Rate X
ANGULAR VEL [deg/s]
200
100
0
-100
-200
-300
-400
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 109.40 [deg/s]
TMax: 41.65 [ms]
Min: -327.42 [deg/s]
TMin: 32.85 [ms]
Filter: CFC 60

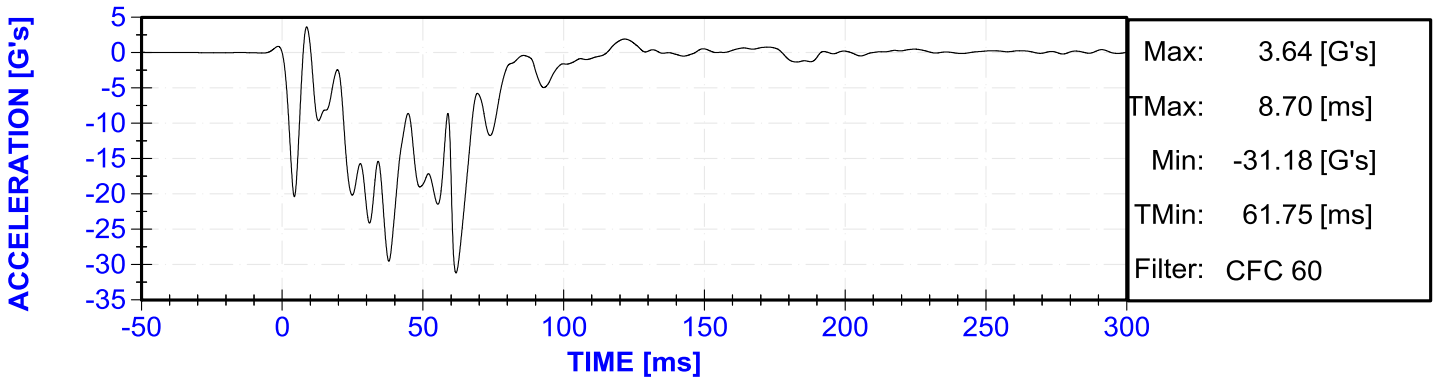

V2 Vehicle CG Angular Rate Y
ANGULAR VEL [deg/s]
200
100
0
-100
-200
-300
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 165.57 [deg/s]
TMax: 33.30 [ms]
Min: -246.33 [deg/s]
TMin: 67.95 [ms]
Filter: CFC 60


V2 Vehicle CG Angular Rate Z
ANGULAR VEL [deg/s]
300
200
100
0
-100
-200
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 297.31 [deg/s]
TMax: 65.30 [ms]
Min: -172.24 [deg/s]
TMin: 47.55 [ms]
Filter: CFC 60

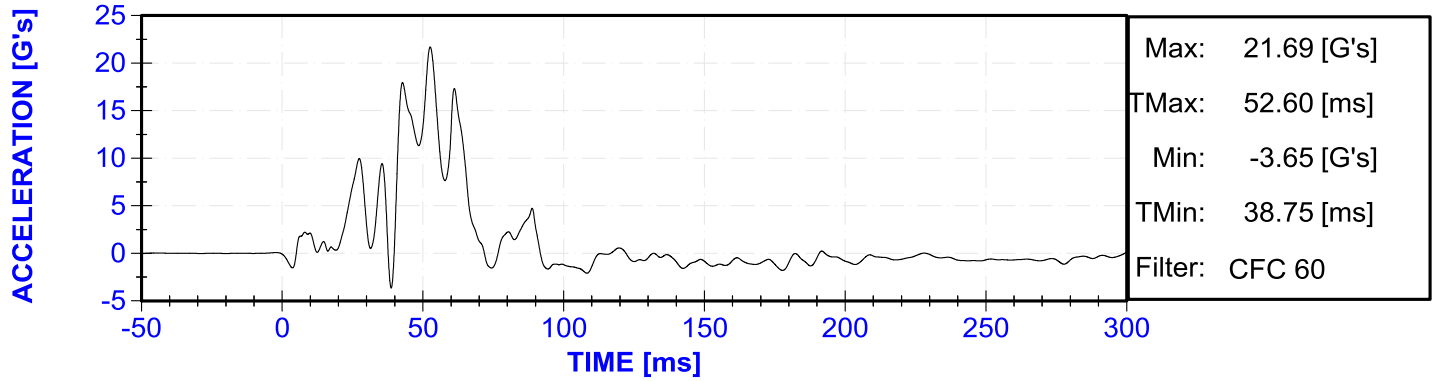
V2 Instrument Panel X Acceleration



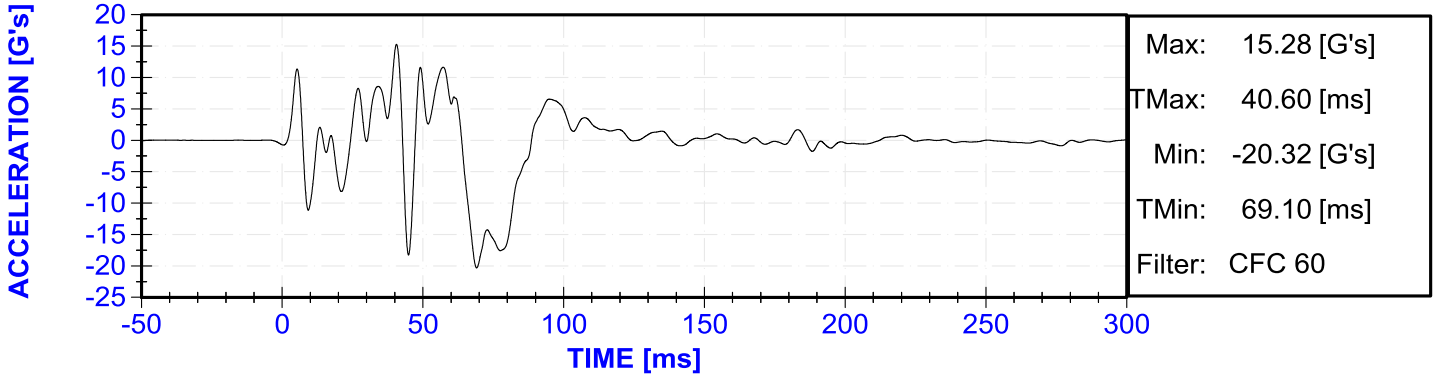
V2 Driver Seat Track X Acceleration



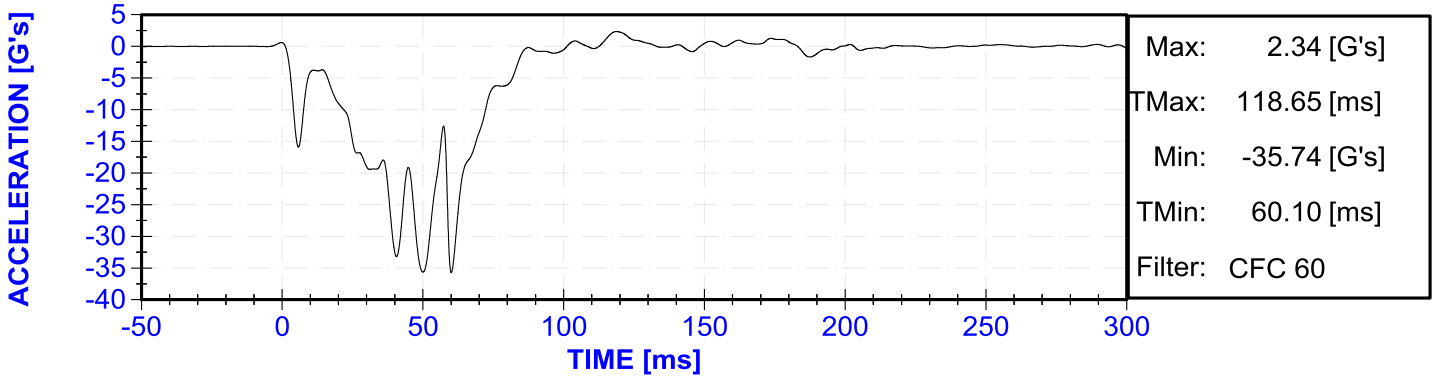
V2 Driver Seat Track Y Acceleration



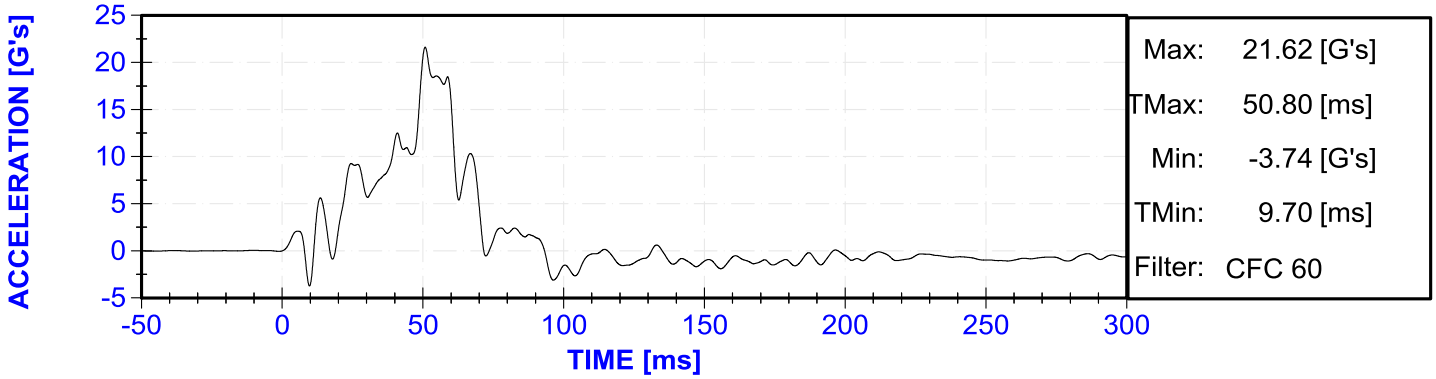
V2 Driver Seat Track Z Acceleration



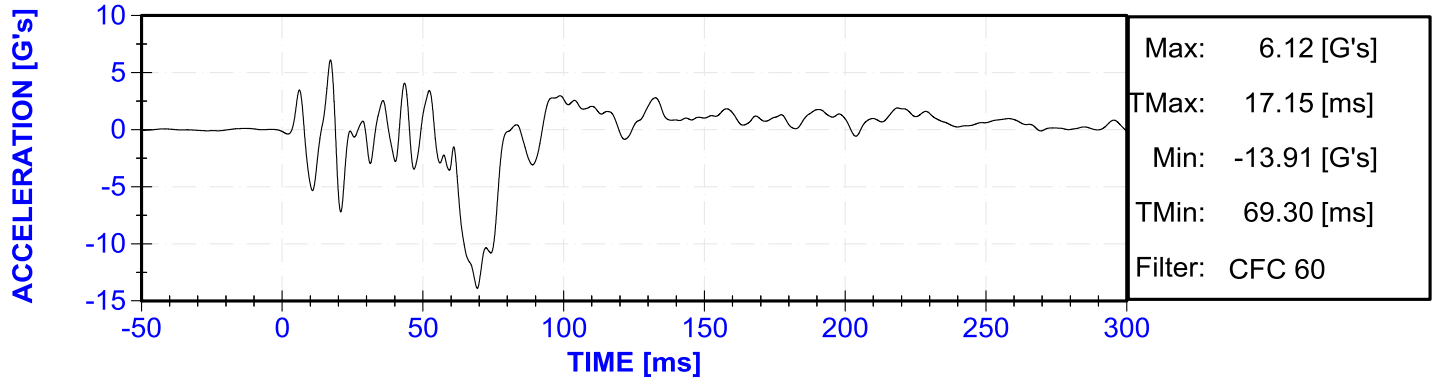
V2 Passenger Seat Track X Acceleration



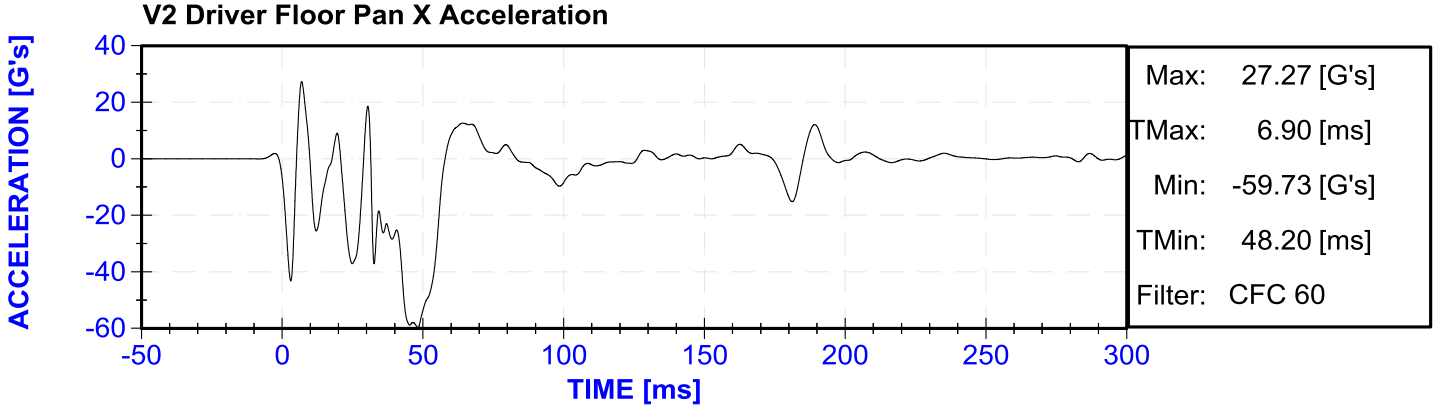
V2 Passenger Seat Track Y Acceleration



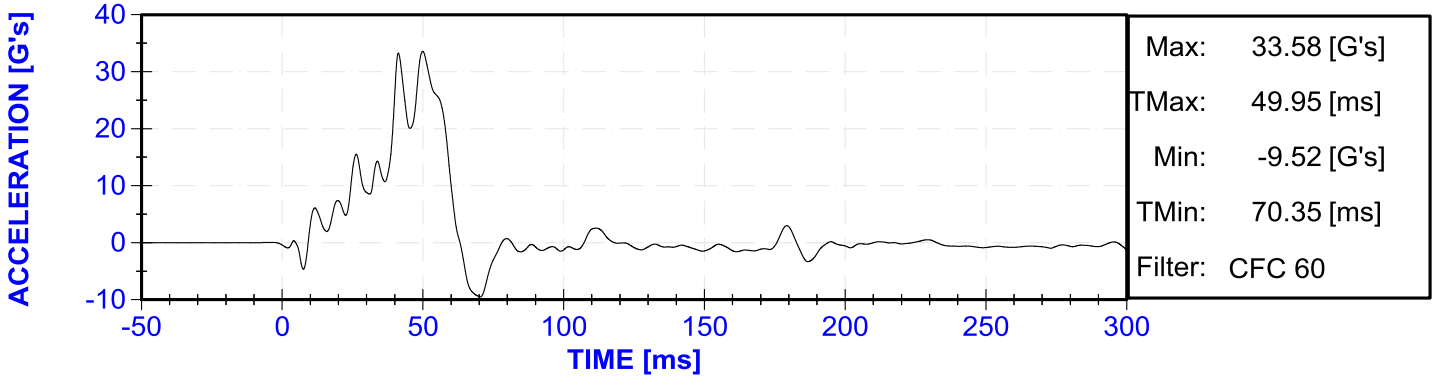
V2 Passenger Seat Track Z Acceleration



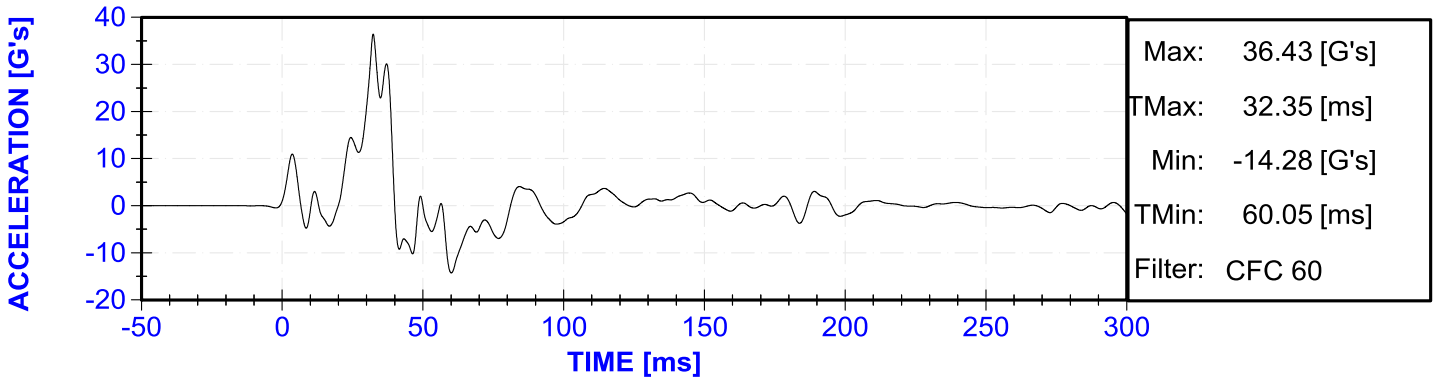
V2 Driver Floor Pan X Acceleration



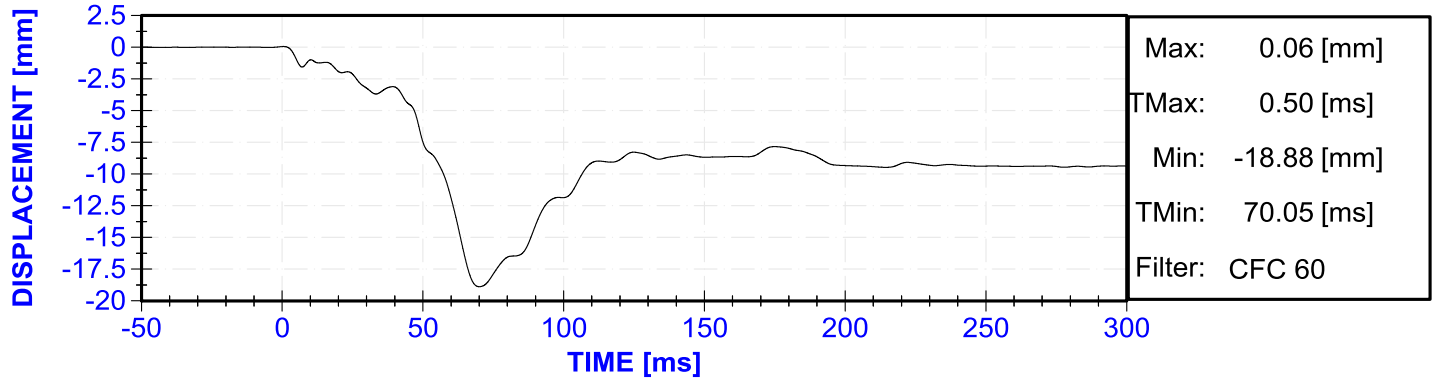
V2 Driver Floor Pan Y Acceleration



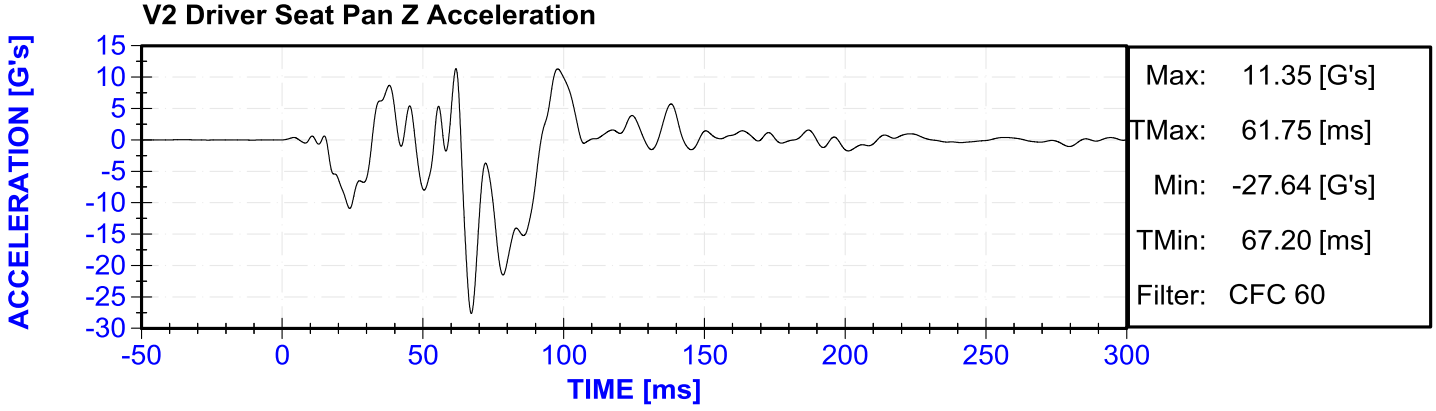
V2 Driver Floor Pan Z Acceleration



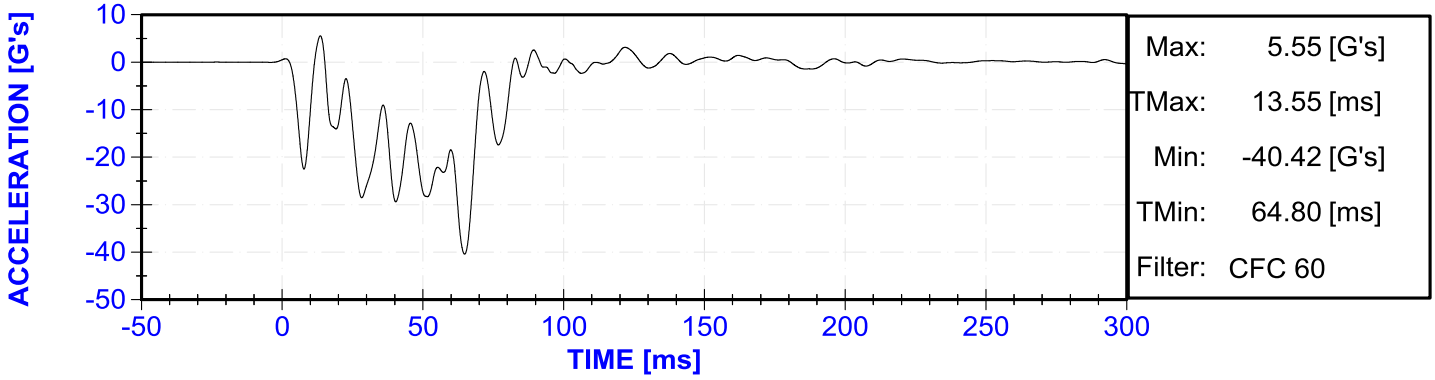
V2 Driver Floor Pan X Deflection



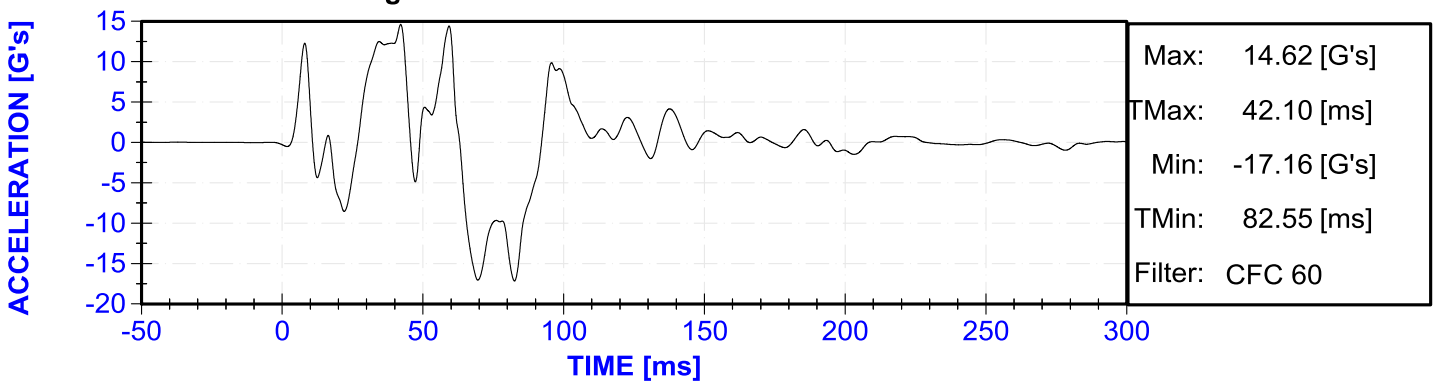
V2 Driver Seat Pan Z Acceleration



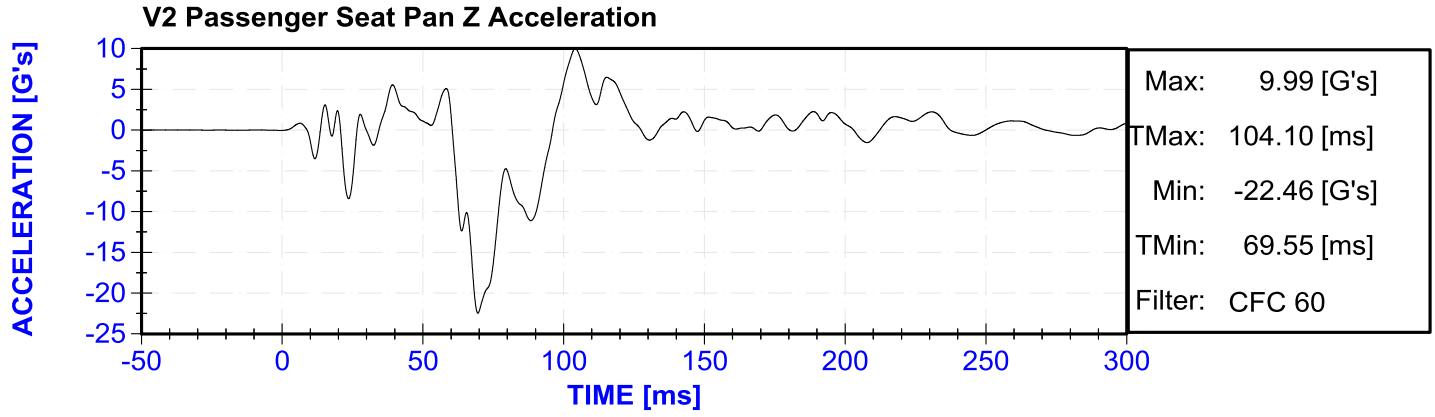
V2 Driver Seat Thigh Bar X Acceleration



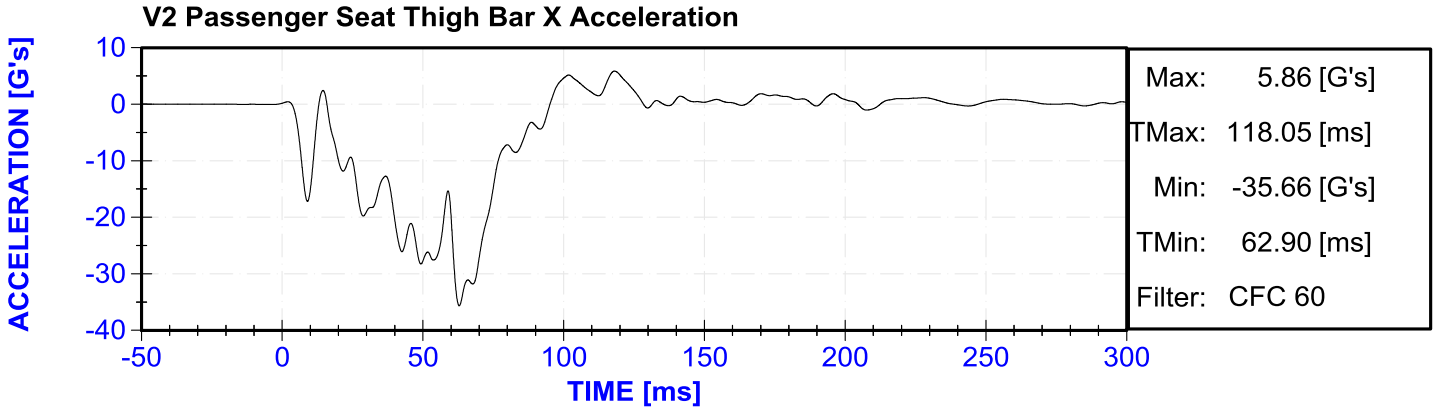
V2 Driver Seat Thigh Bar Z Acceleration



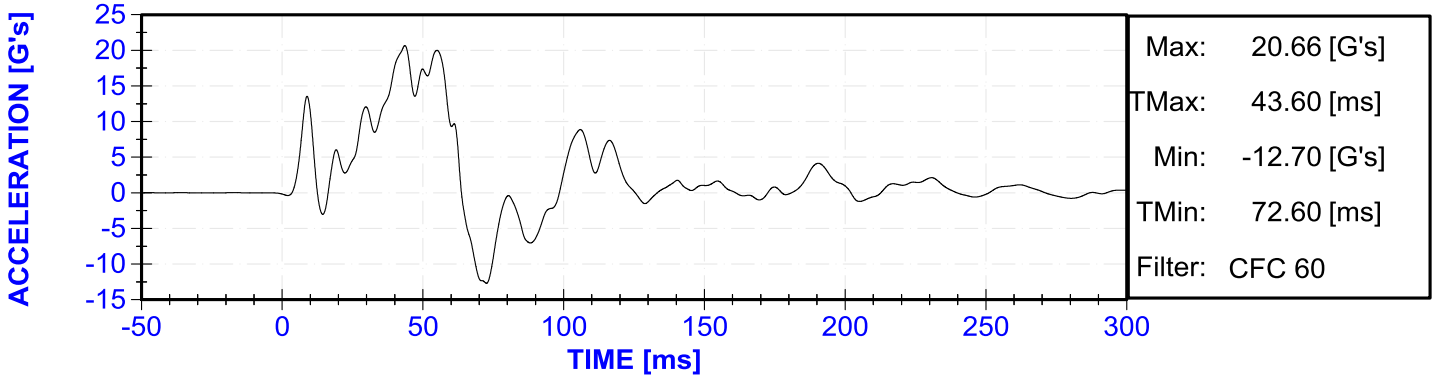
V2 Passenger Seat Pan Z Acceleration



V2 Passenger Seat Thigh Bar X Acceleration

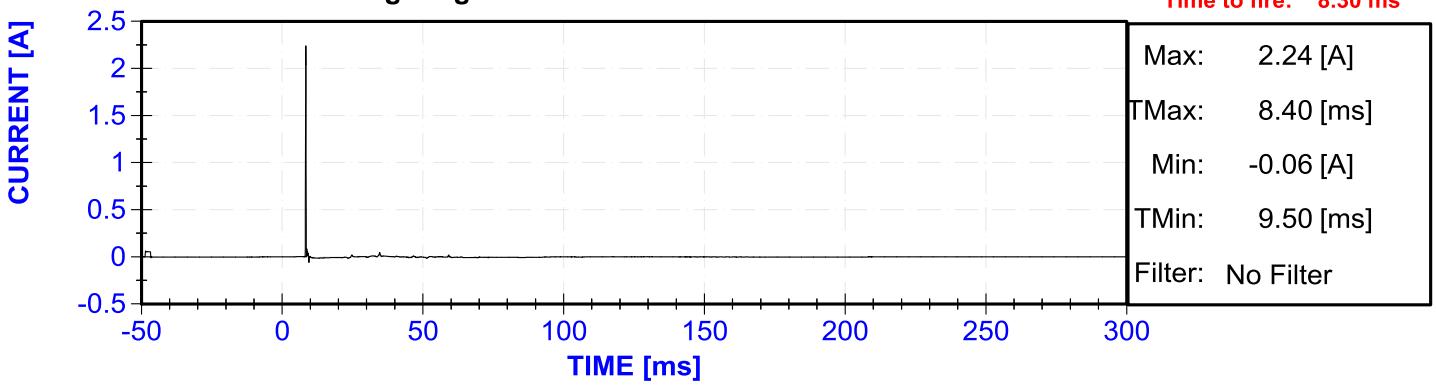


V2 Passenger Seat Thigh Bar Z Acceleration



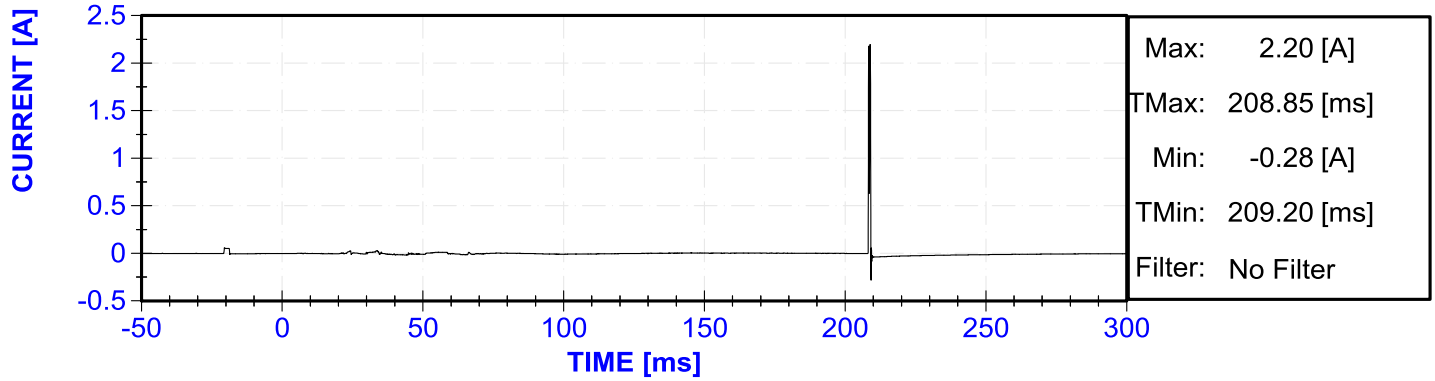
Driver Front Airbag Stage 1 Monitor

Time to fire: 8.30 ms



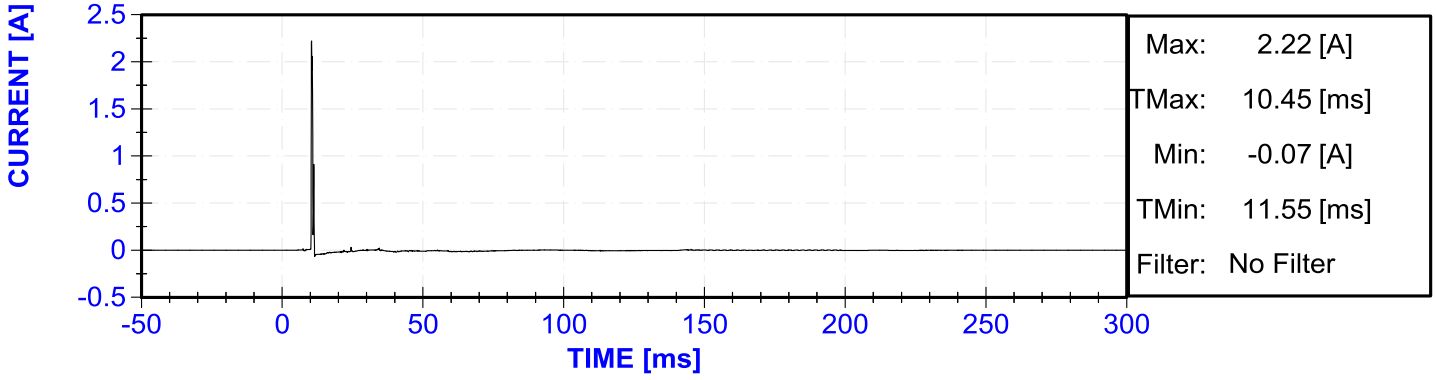
Driver Front Airbag Stage 2 Monitor

Time to fire: 208.30 ms



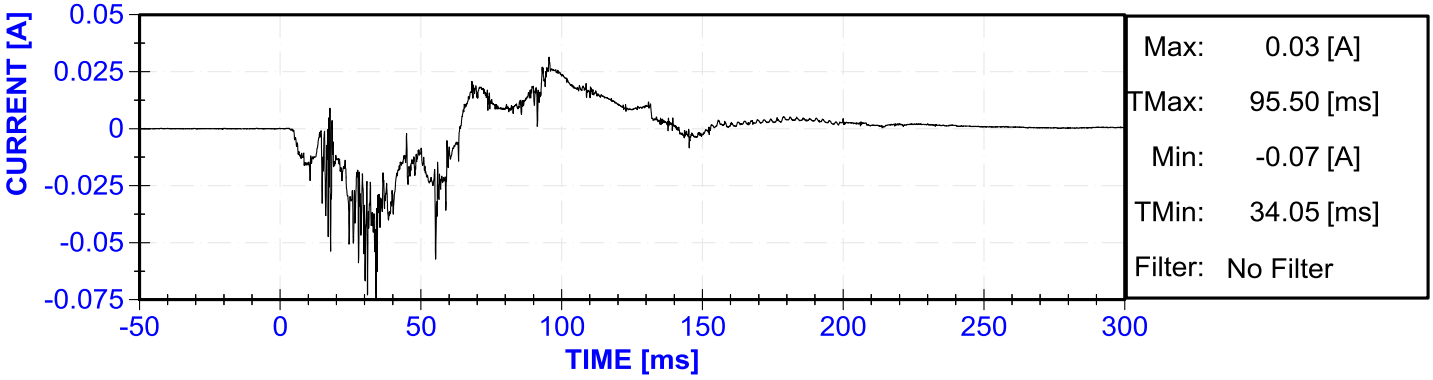
Driver Curtain Airbag Monitor

Time to fire: 10.35 ms



Driver Seat Back Airbag Monitor

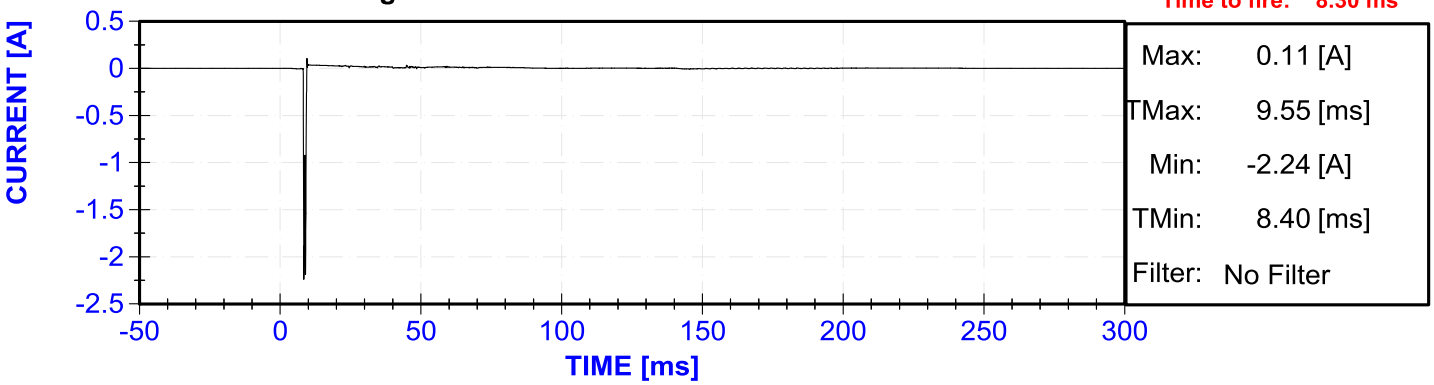
Did not fire



Max:	0.03 [A]
TMax:	95.50 [ms]
Min:	-0.07 [A]
TMin:	34.05 [ms]
Filter:	No Filter

Driver Knee Airbag Monitor

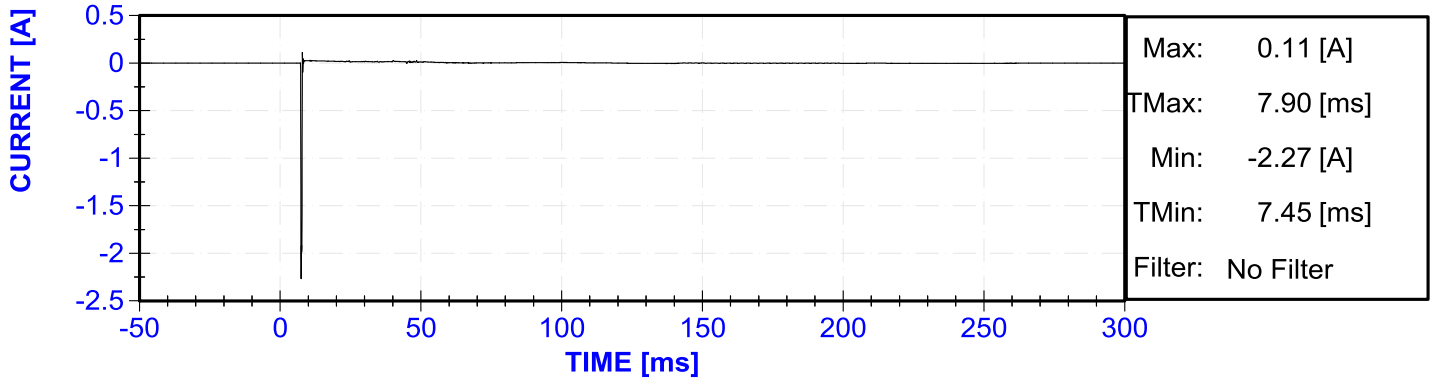
Time to fire: 8.30 ms



Max:	0.11 [A]
TMax:	9.55 [ms]
Min:	-2.24 [A]
TMin:	8.40 [ms]
Filter:	No Filter

Driver Retractor Pretensioner Monitor

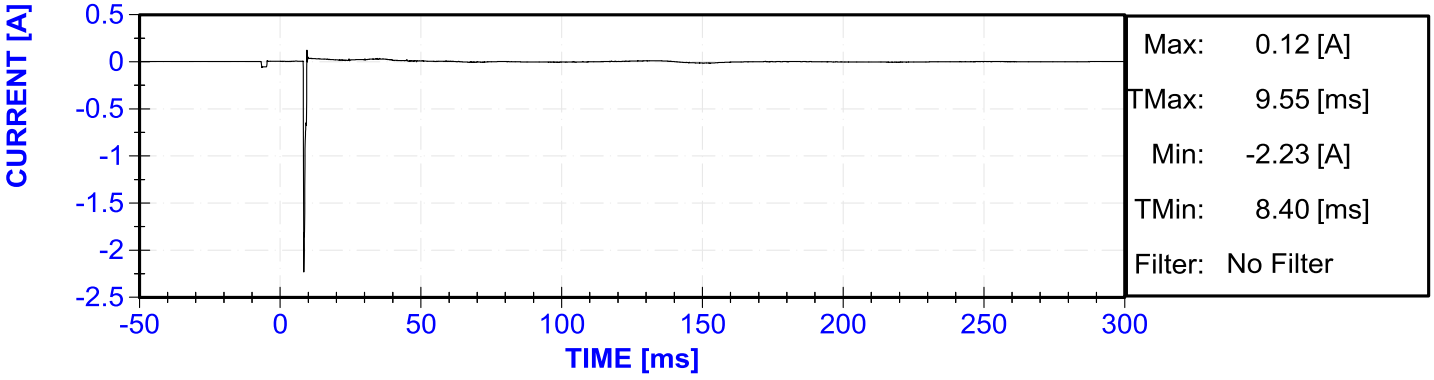
Time to fire: 7.35 ms



Max:	0.11 [A]
TMax:	7.90 [ms]
Min:	-2.27 [A]
TMin:	7.45 [ms]
Filter:	No Filter

Passenger Front Airbag Stage 1 Monitor

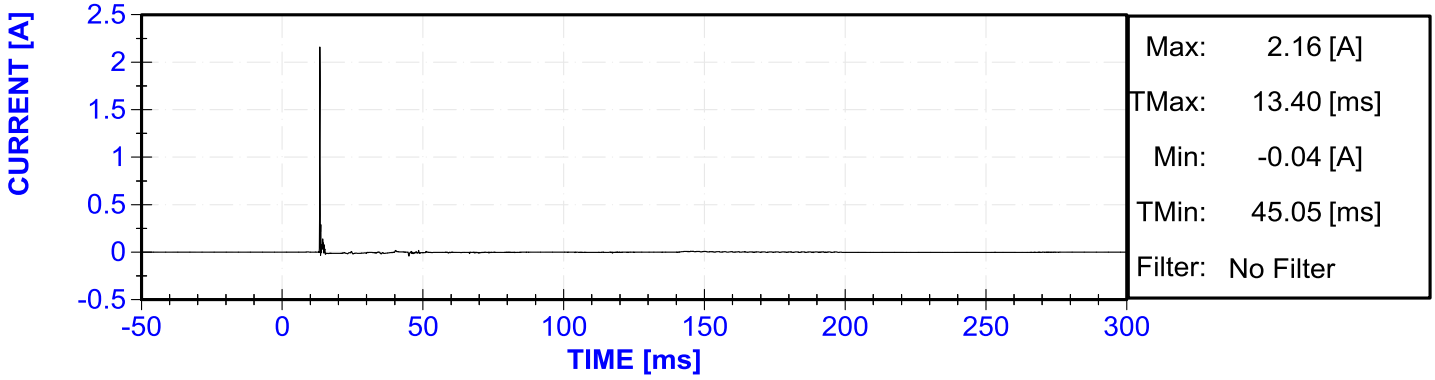
Time to fire: 8.30 ms



Max:	0.12 [A]
TMax:	9.55 [ms]
Min:	-2.23 [A]
TMin:	8.40 [ms]
Filter:	No Filter

Passenger Front Airbag Stage 2 Monitor

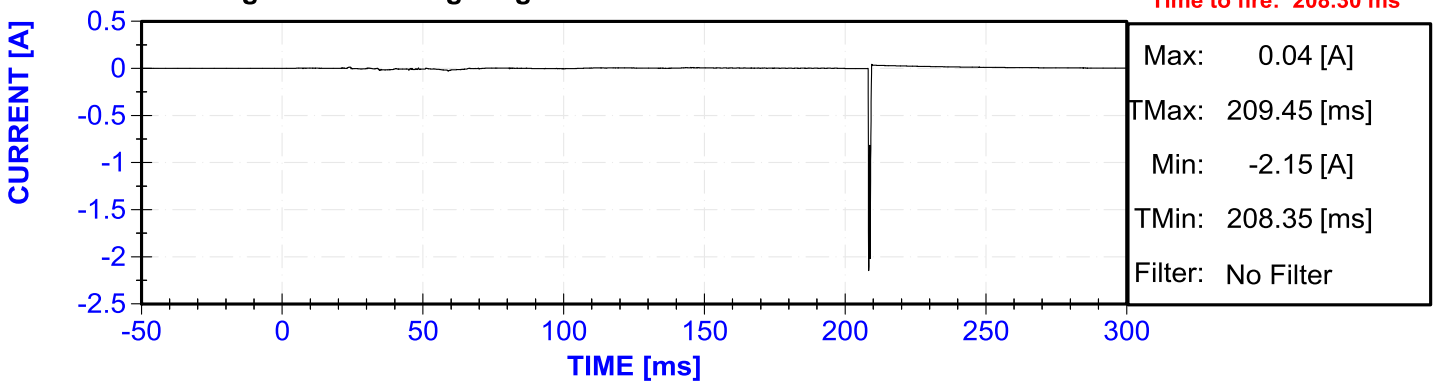
Time to fire: 13.30 ms



Max:	2.16 [A]
TMax:	13.40 [ms]
Min:	-0.04 [A]
TMin:	45.05 [ms]
Filter:	No Filter

Passenger Front Airbag Stage 3 Monitor

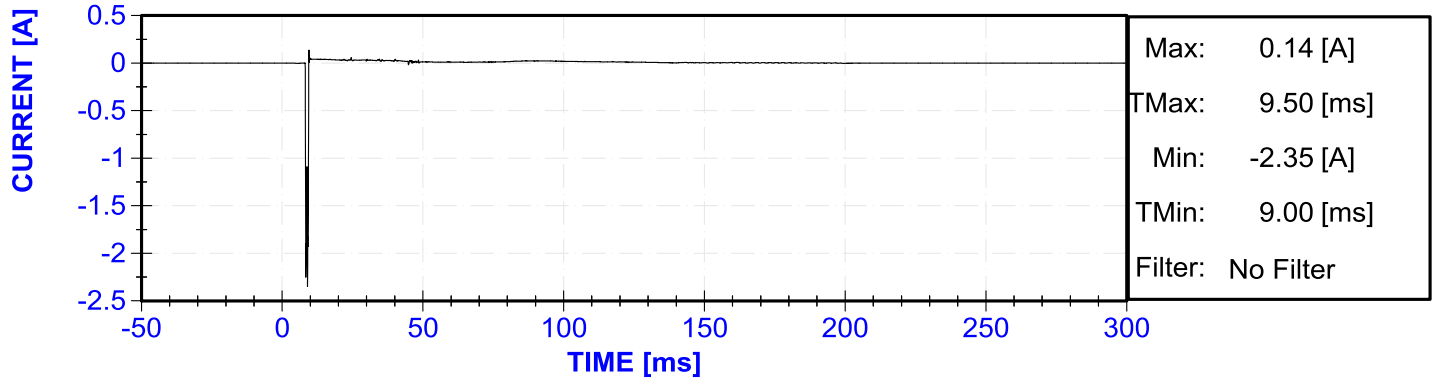
Time to fire: 208.30 ms



Max:	0.04 [A]
TMax:	209.45 [ms]
Min:	-2.15 [A]
TMin:	208.35 [ms]
Filter:	No Filter

Passenger Knee Airbag Monitor

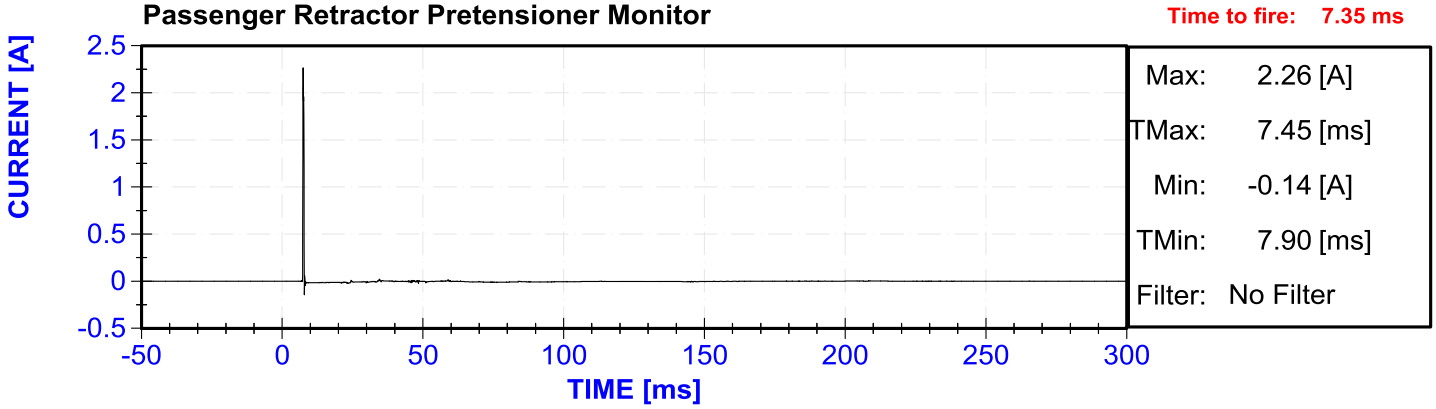
Time to fire: 8.30 ms



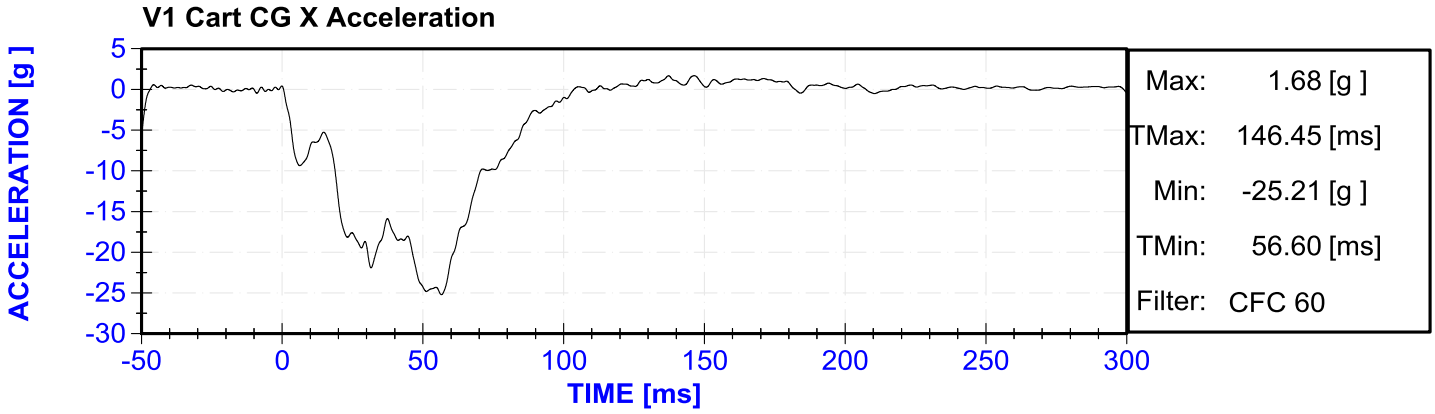
Max:	0.14 [A]
TMax:	9.50 [ms]
Min:	-2.35 [A]
TMin:	9.00 [ms]
Filter:	No Filter

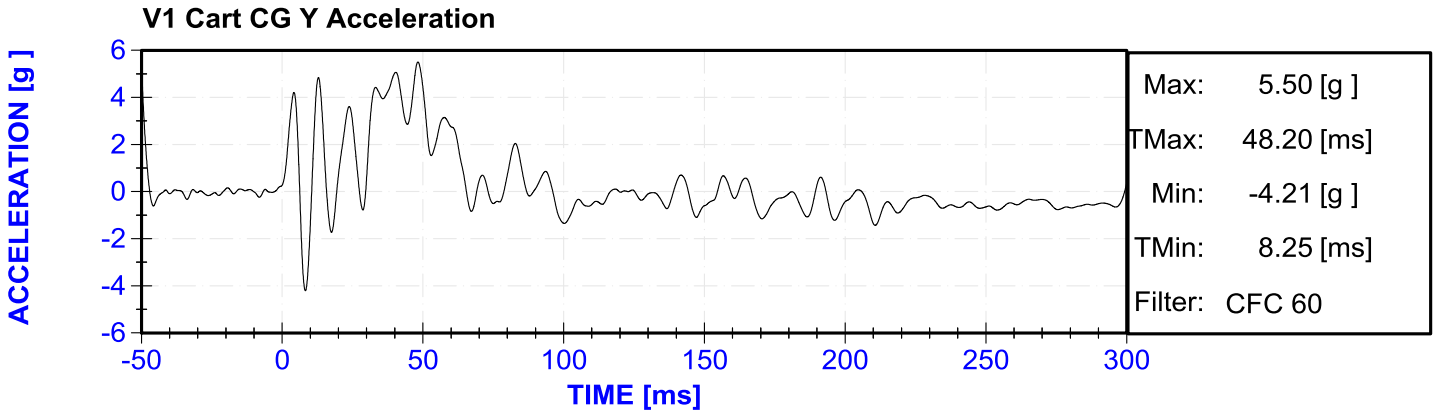
Passenger Retractor Pretensioner Monitor

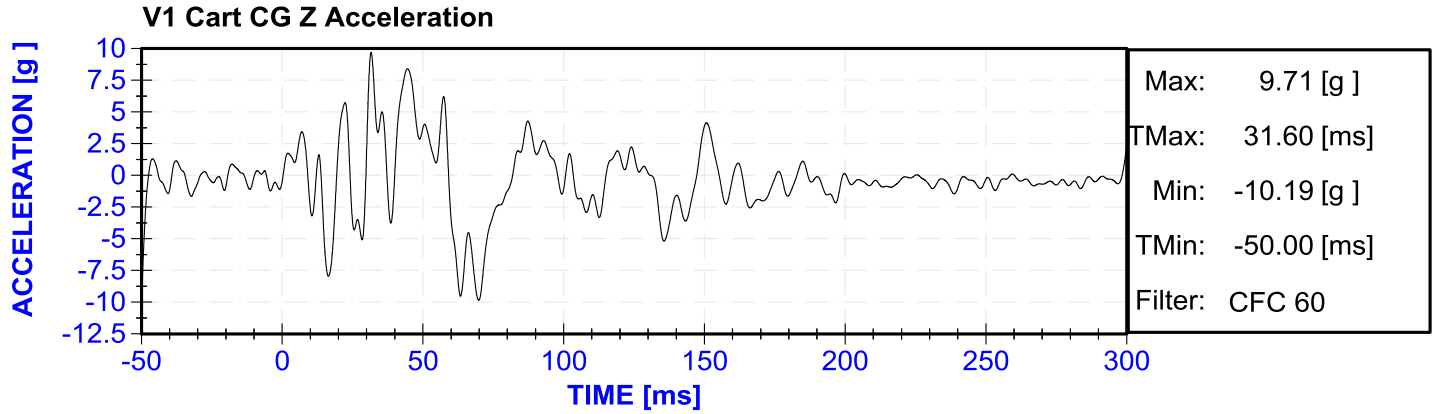
Time to fire: 7.35 ms

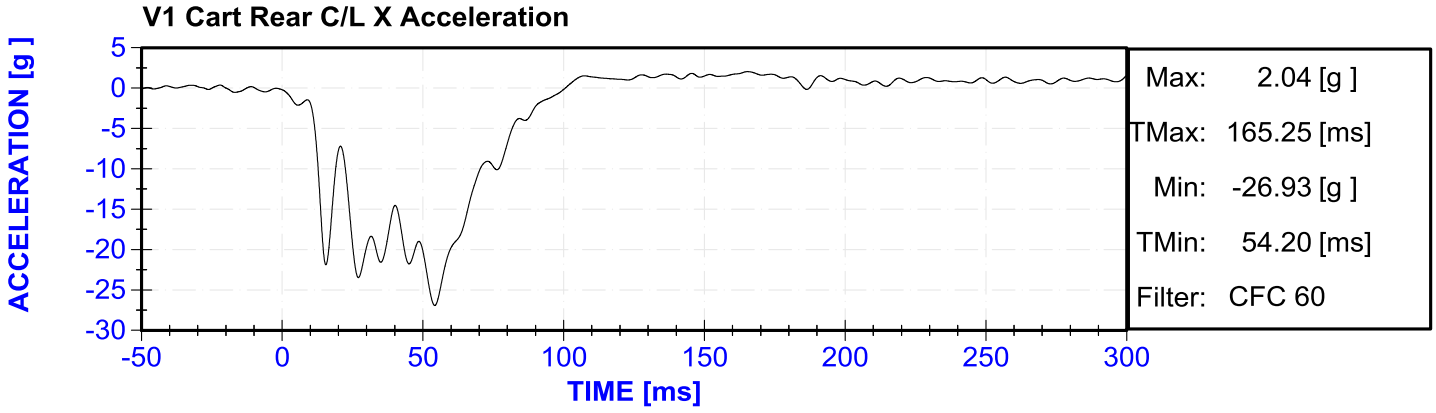


Max:	2.26 [A]
TMax:	7.45 [ms]
Min:	-0.14 [A]
TMin:	7.90 [ms]
Filter:	No Filter

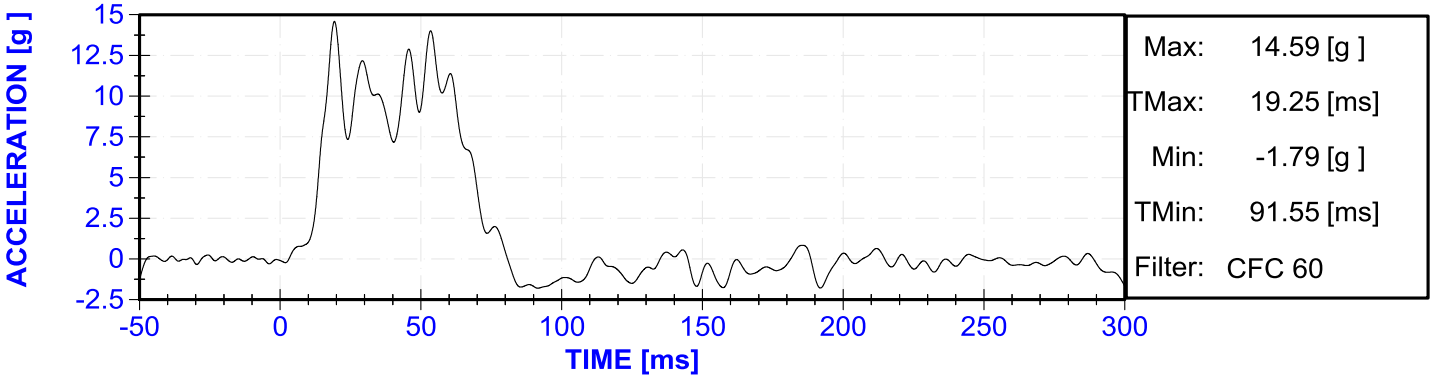

V1 Cart CG X Acceleration
ACCELERATION [g]
TIME [ms]
Max: 1.68 [g]
TMax: 146.45 [ms]
Min: -25.21 [g]
TMin: 56.60 [ms]
Filter: CFC 60


V1 Cart CG Y Acceleration
ACCELERATION [g]
TIME [ms]
Max: 5.50 [g]
TMax: 48.20 [ms]
Min: -4.21 [g]
TMin: 8.25 [ms]
Filter: CFC 60

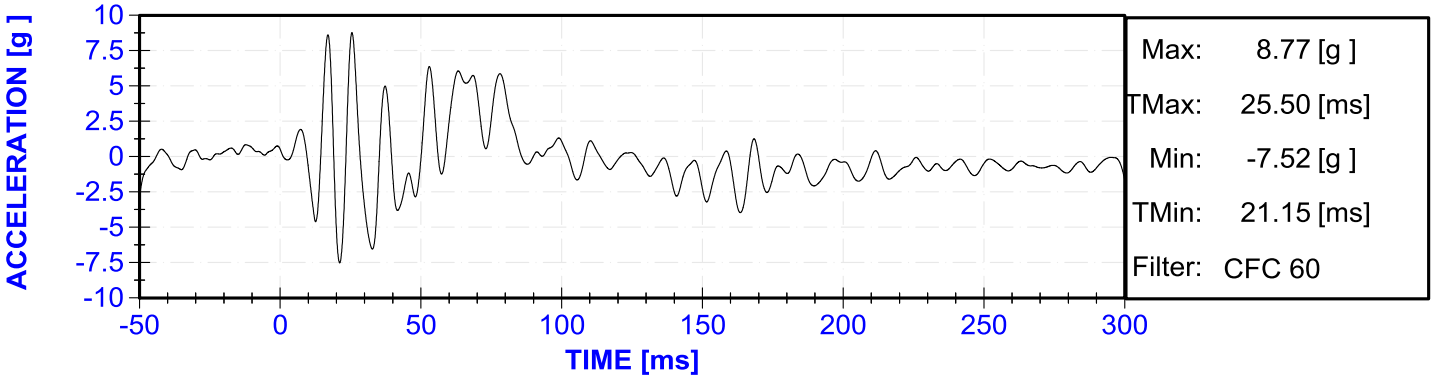

V1 Cart CG Z Acceleration
ACCELERATION [g]
TIME [ms]
Max: 9.71 [g]
TMax: 31.60 [ms]
Min: -10.19 [g]
TMin: -50.00 [ms]
Filter: CFC 60


V1 Cart Rear C/L X Acceleration
ACCELERATION [g]
TIME [ms]
Max: 2.04 [g]
TMax: 165.25 [ms]
Min: -26.93 [g]
TMin: 54.20 [ms]
Filter: CFC 60

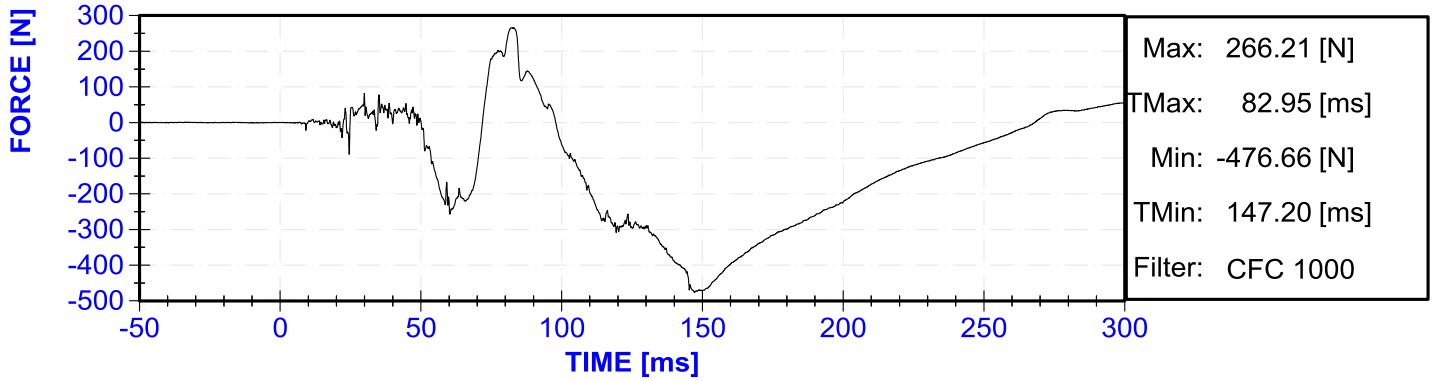
V1 Cart Rear C/L Y Acceleration



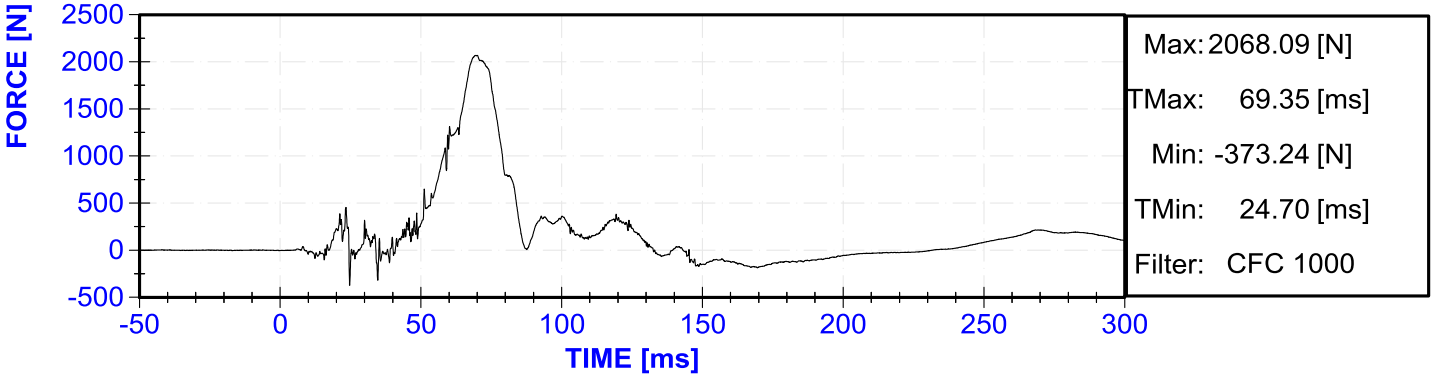
V1 Cart Rear C/L Z Acceleration



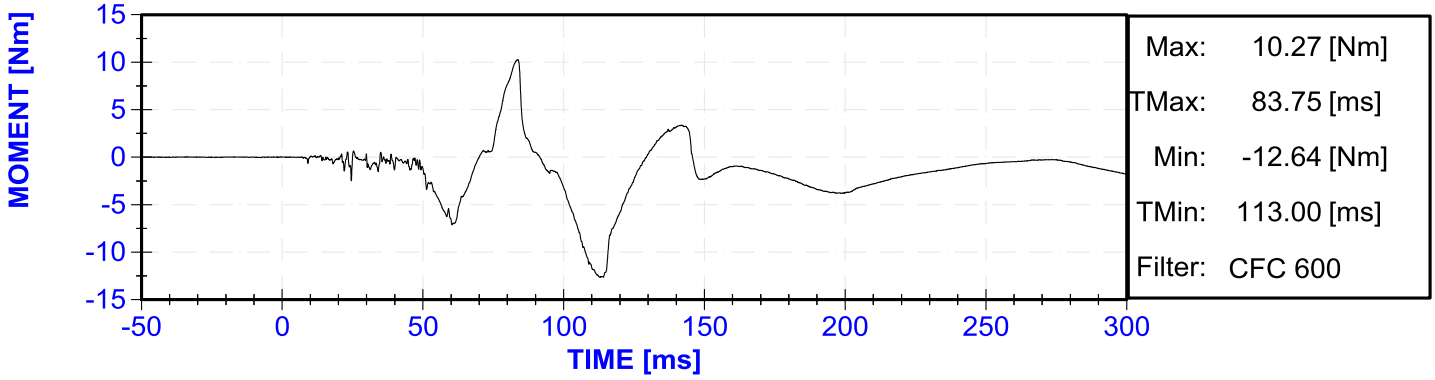
V2P1 Fx on head acting through the O.C. joint only



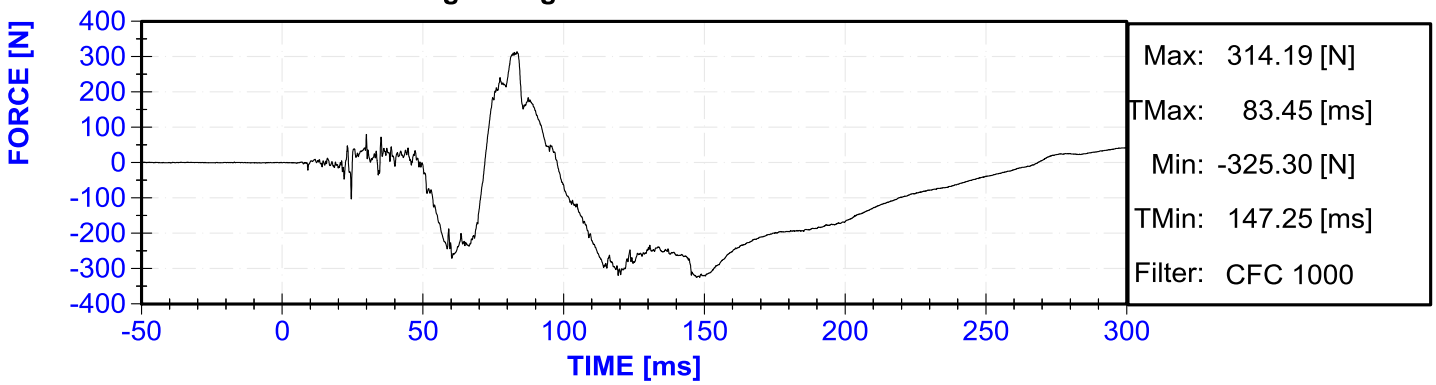
V2P1 Fz on head acting through the O.C. joint only



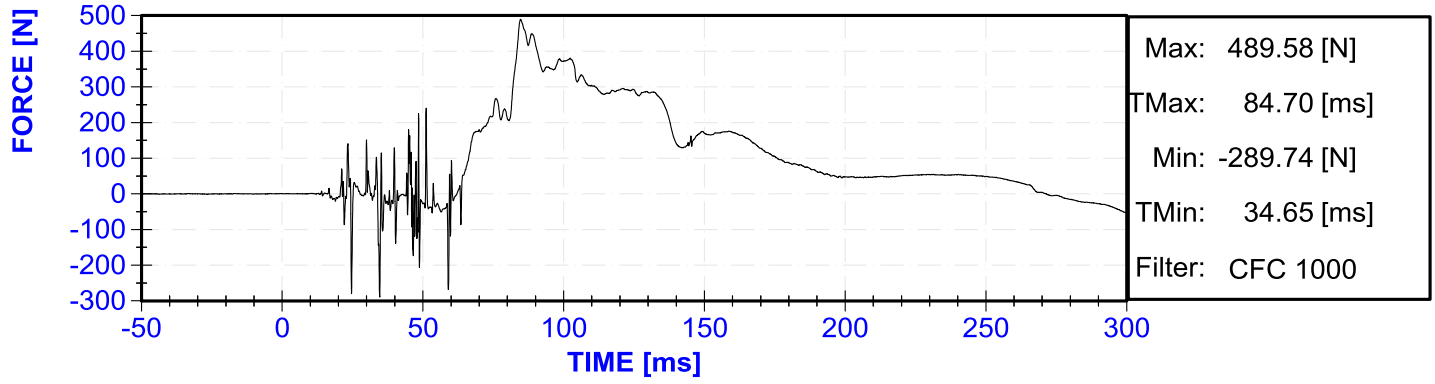
V2P1 My on head acting through the O.C. joint only



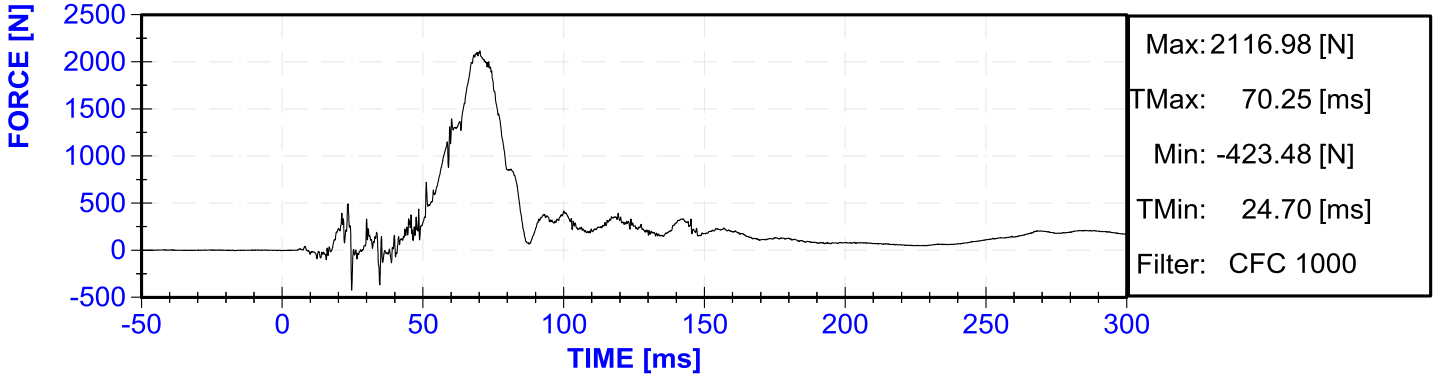
V2P1 Fx on head acting through the total neck section



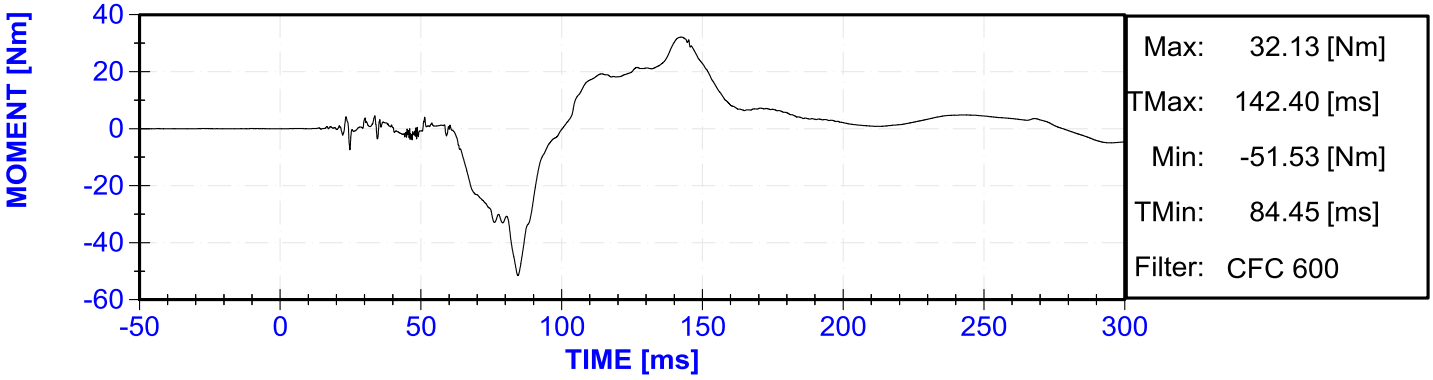
V2P1 Fy on head acting through the total neck section



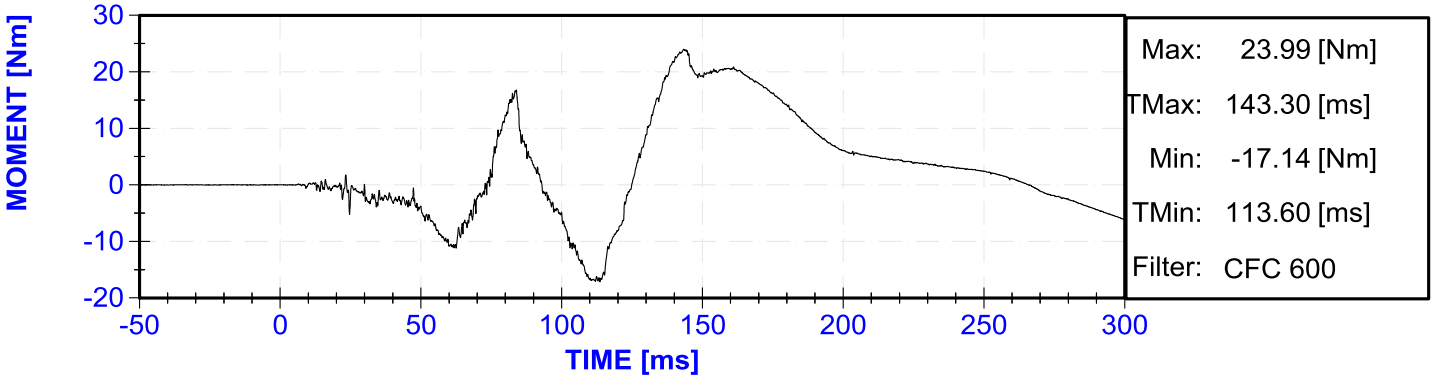
V2P1 Fz on head acting through the total neck section



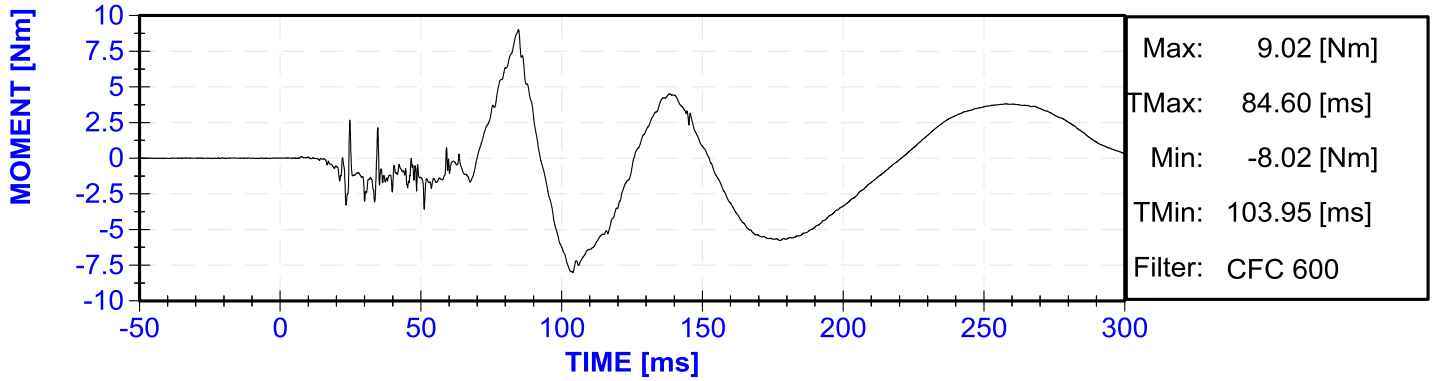
V2P1 Mx on head acting through the total neck section



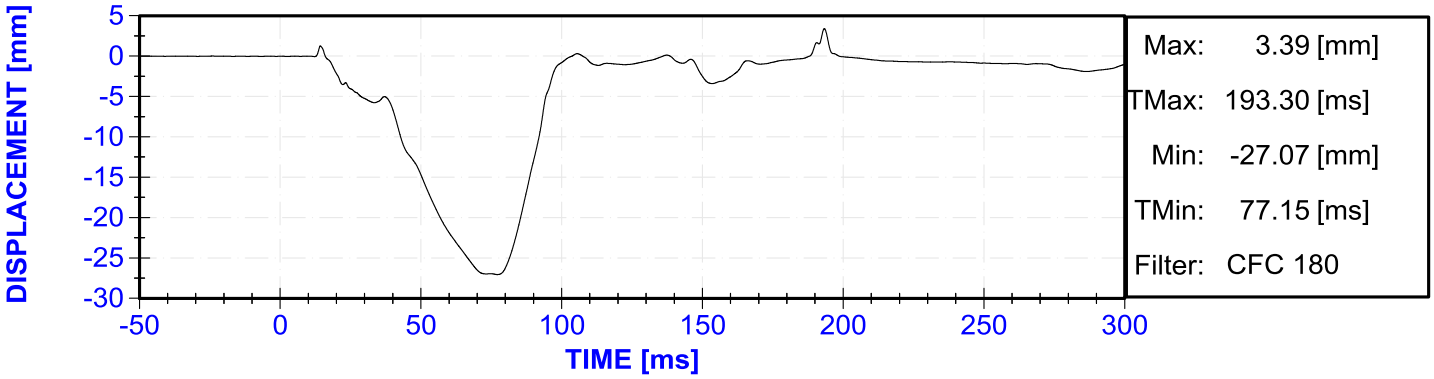
V2P1 My on head acting through the total neck section



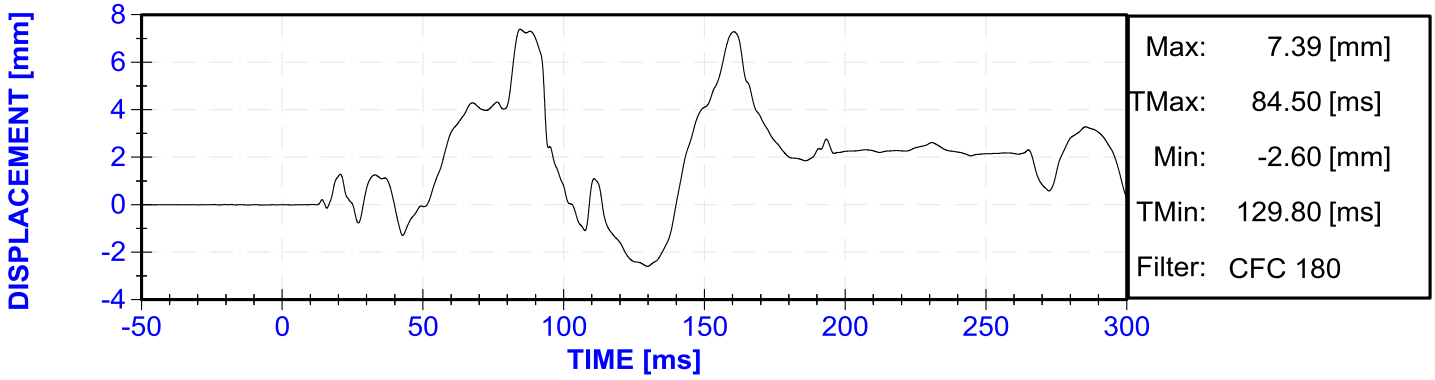
V2P1 Mz on head acting through the total neck section



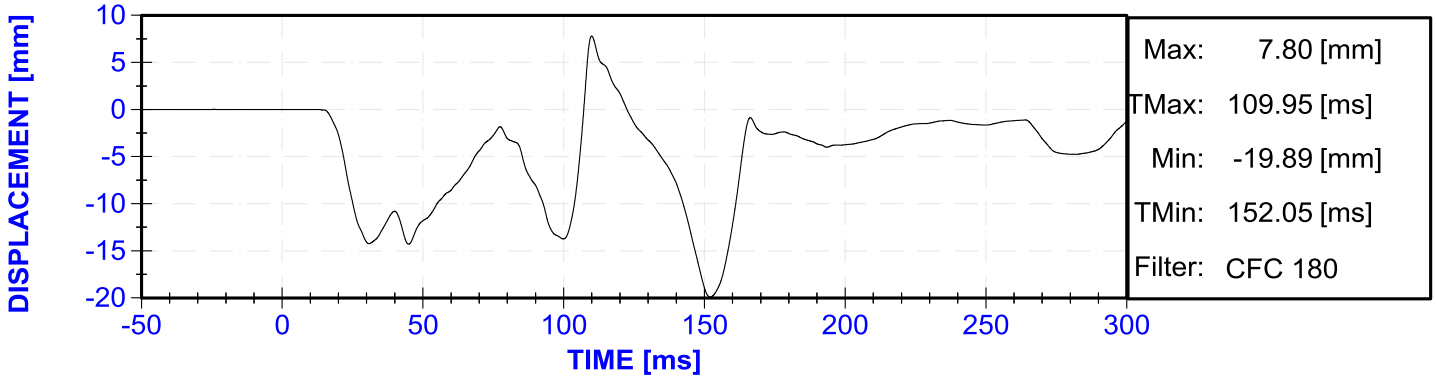
V2P1 Chest Left Upper Dx



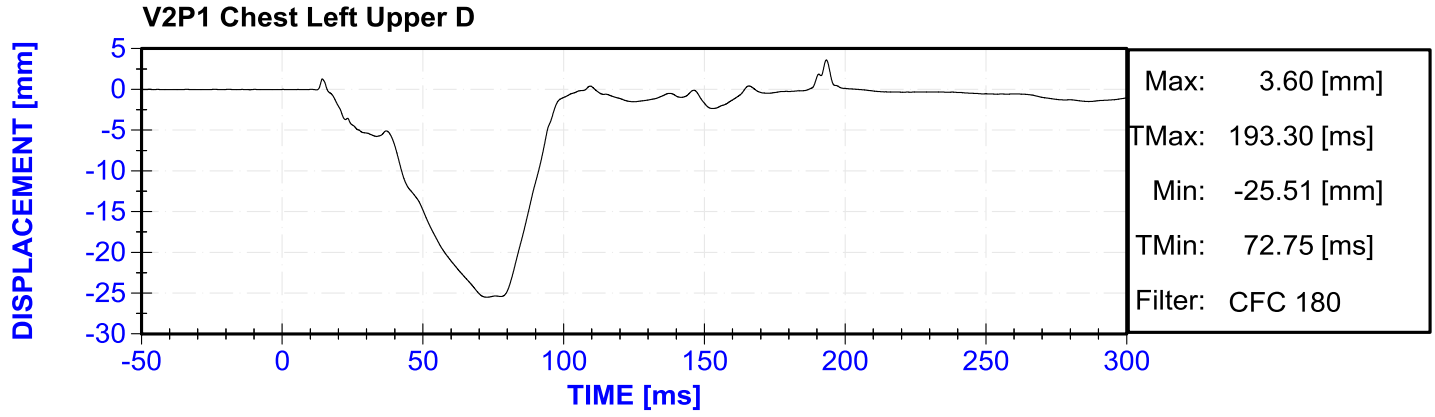
V2P1 Chest Left Upper Dy



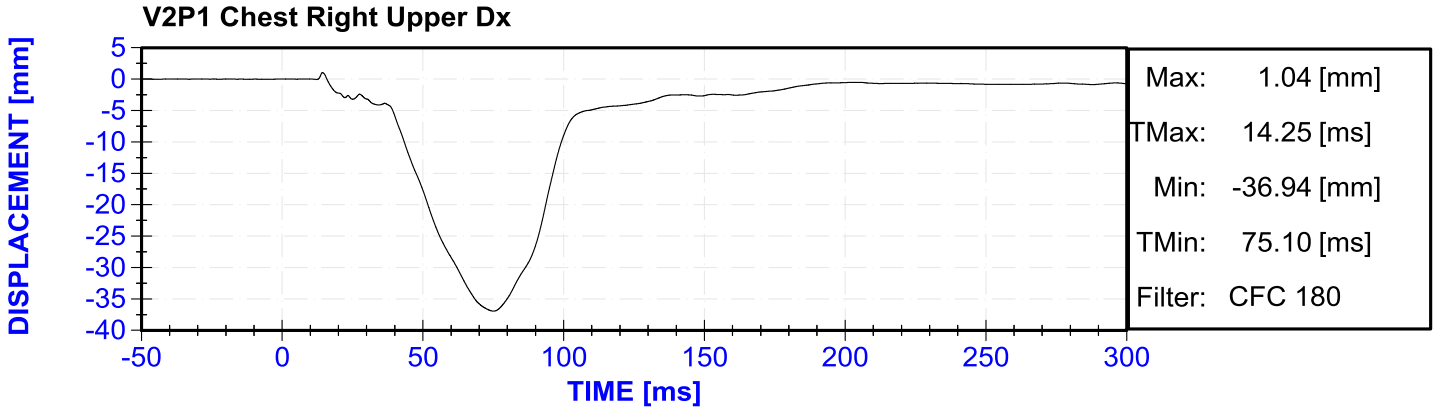
V2P1 Chest Left Upper Dz



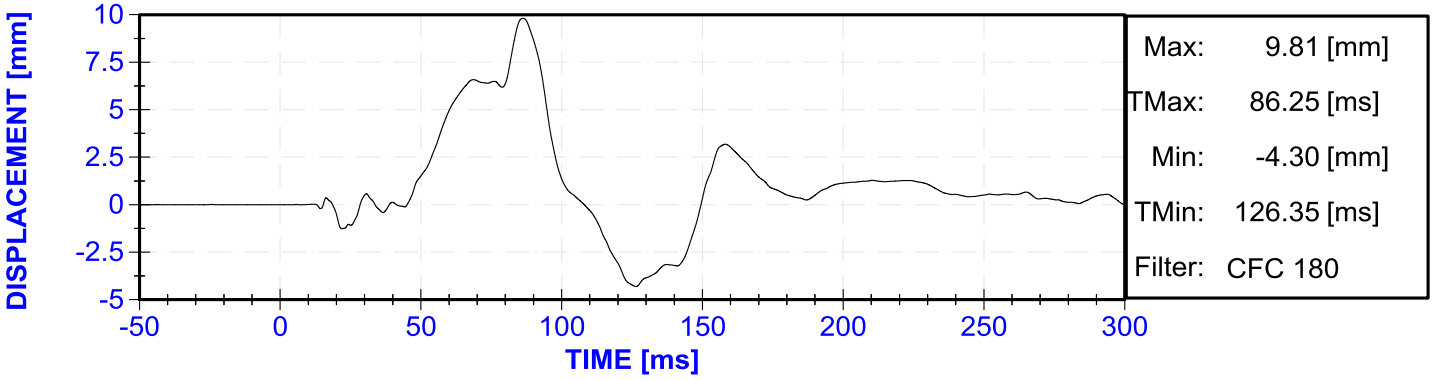
V2P1 Chest Left Upper D



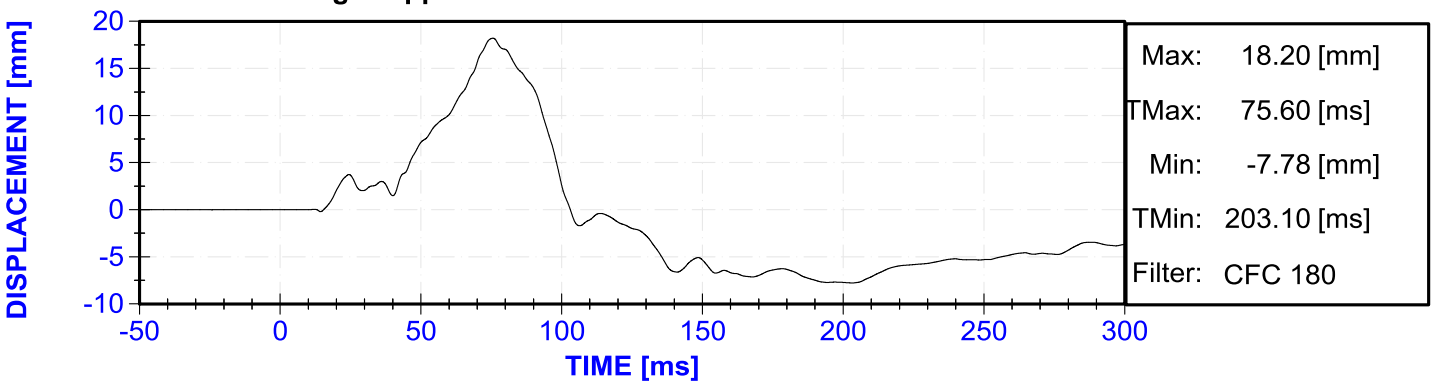
V2P1 Chest Right Upper Dx



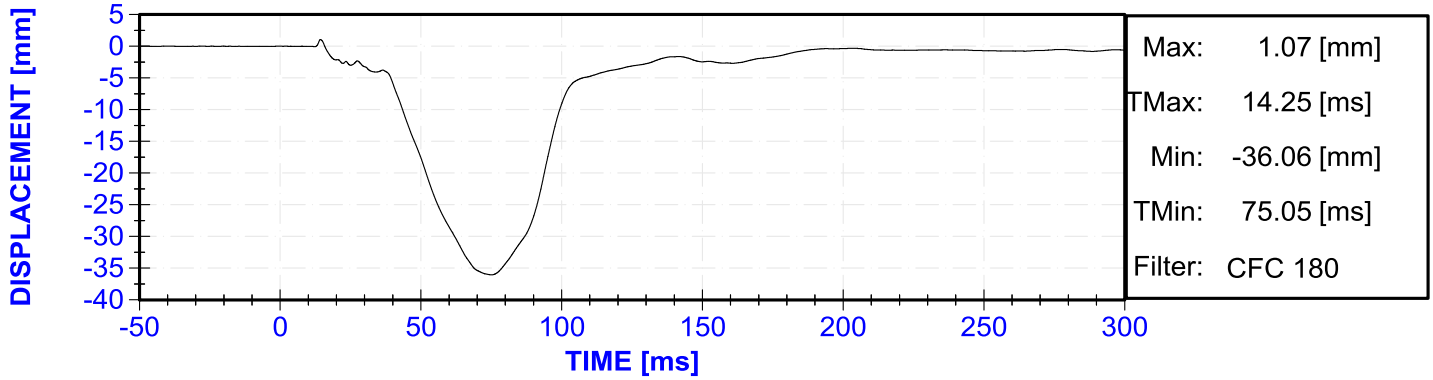
V2P1 Chest Right Upper Dy



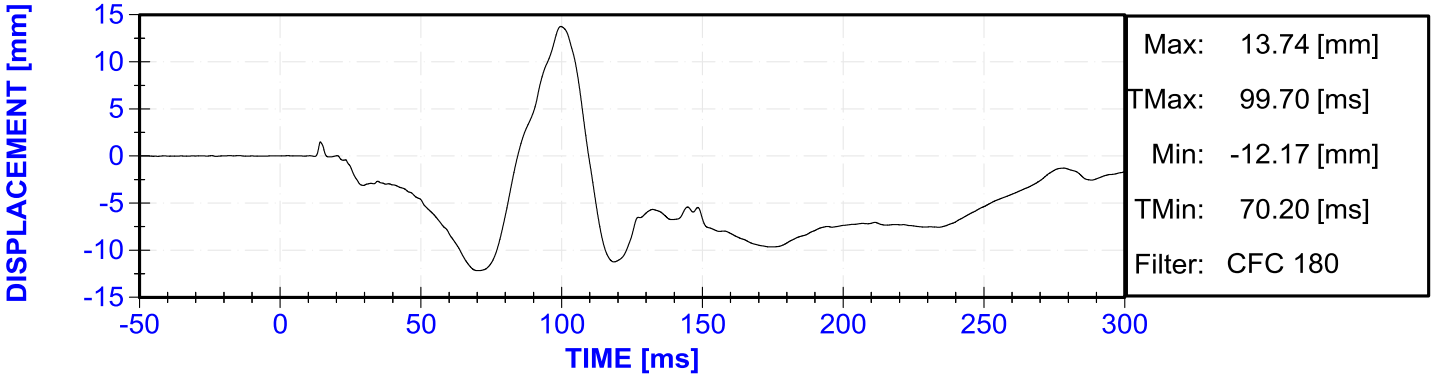
V2P1 Chest Right Upper Dz

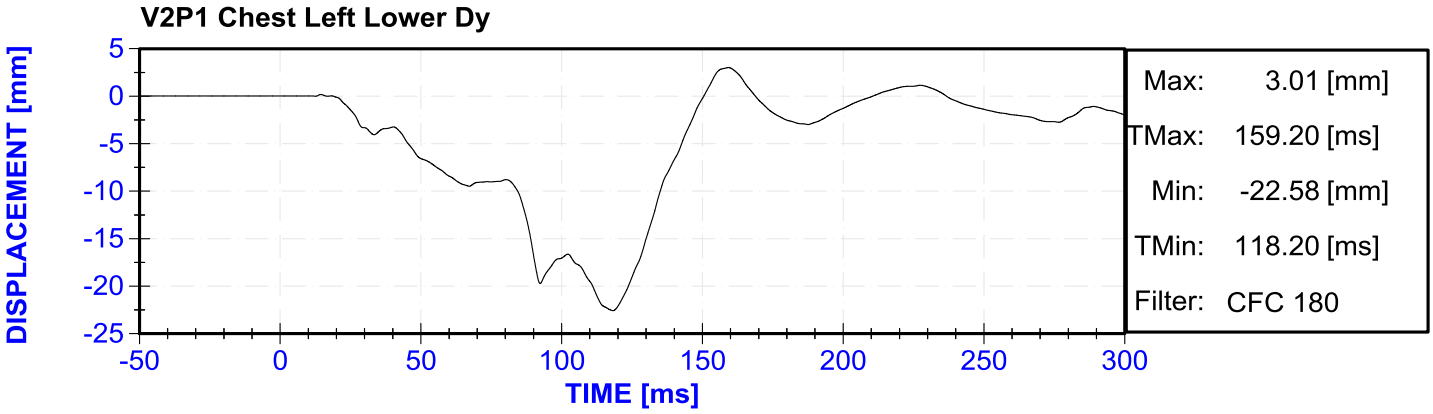


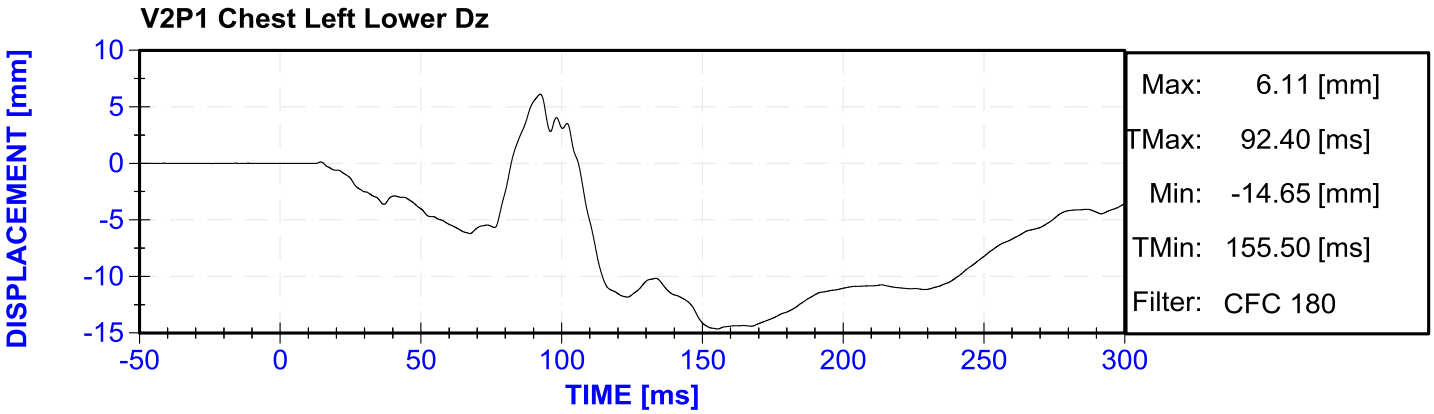
V2P1 Chest Right Upper D

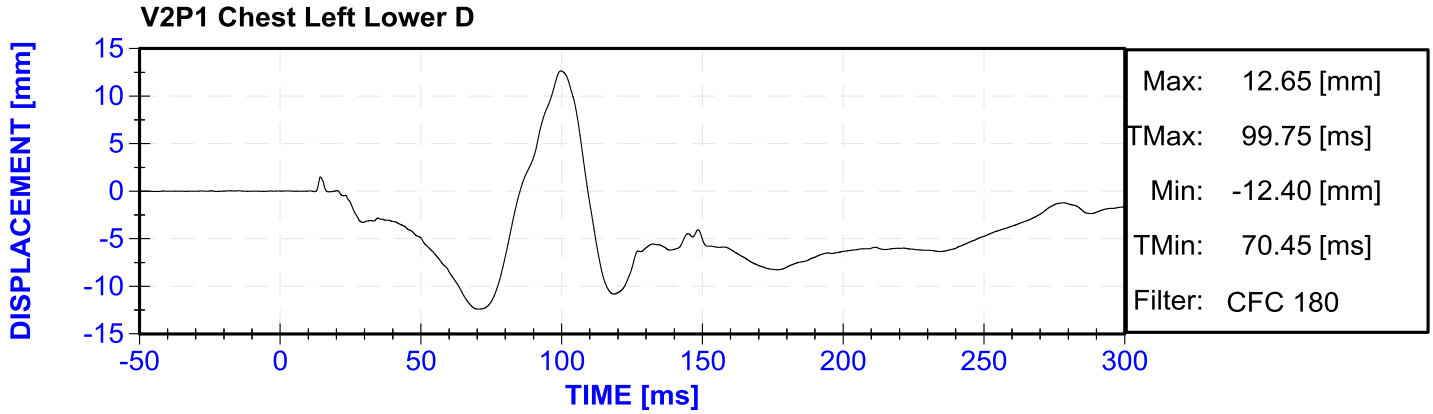


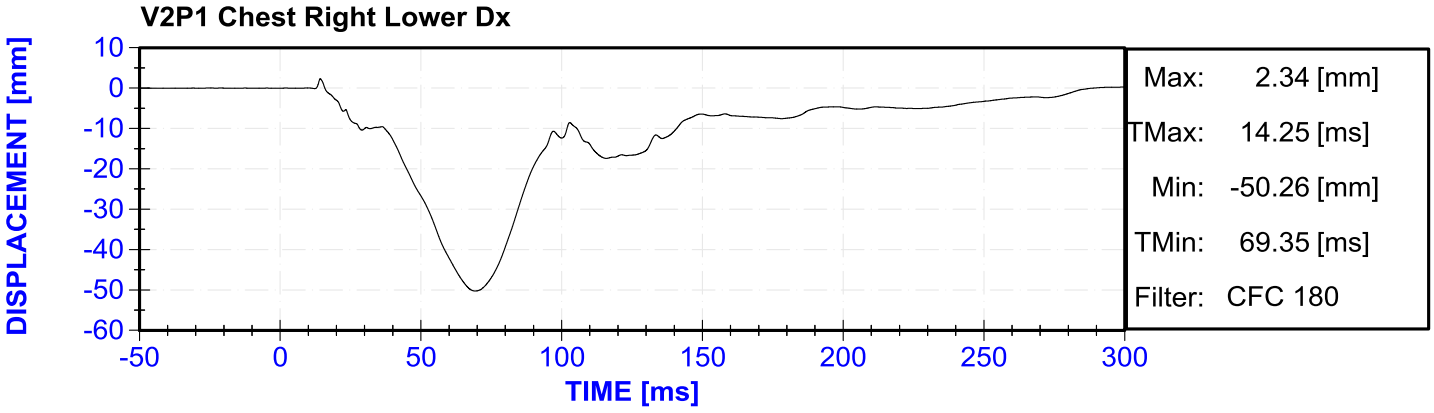
V2P1 Chest Left Lower Dx



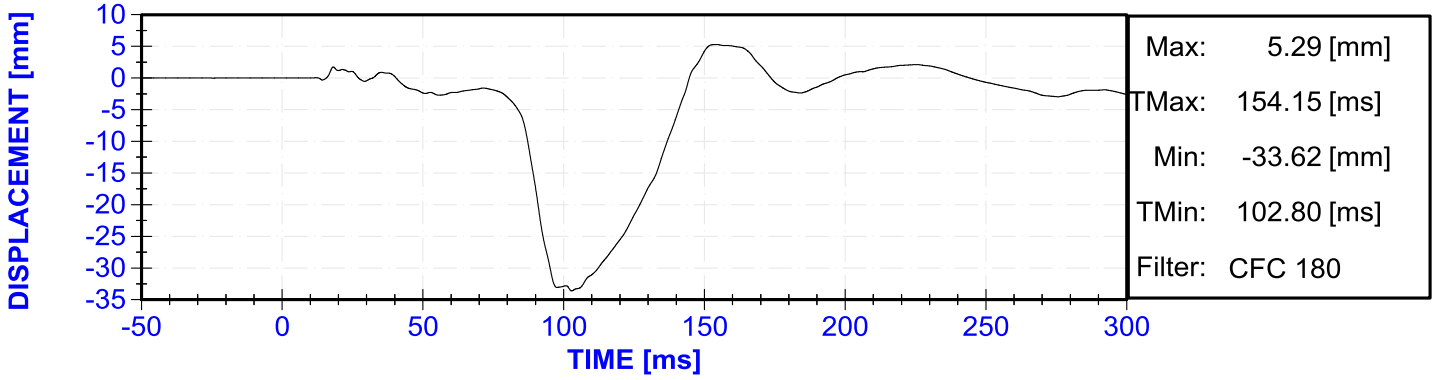

V2P1 Chest Left Lower Dy
DISPLACEMENT [mm]
TIME [ms]
Max: 3.01 [mm]
TMax: 159.20 [ms]
Min: -22.58 [mm]
TMin: 118.20 [ms]
Filter: CFC 180


V2P1 Chest Left Lower Dz
DISPLACEMENT [mm]
TIME [ms]
Max: 6.11 [mm]
TMax: 92.40 [ms]
Min: -14.65 [mm]
TMin: 155.50 [ms]
Filter: CFC 180

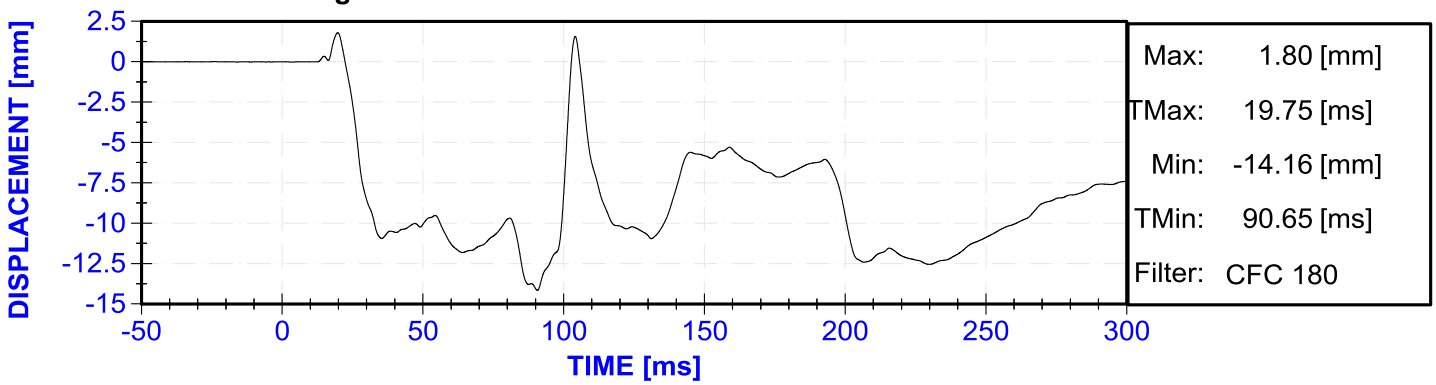

V2P1 Chest Left Lower D
DISPLACEMENT [mm]
TIME [ms]
Max: 12.65 [mm]
TMax: 99.75 [ms]
Min: -12.40 [mm]
TMin: 70.45 [ms]
Filter: CFC 180


V2P1 Chest Right Lower Dx
DISPLACEMENT [mm]
TIME [ms]
Max: 2.34 [mm]
TMax: 14.25 [ms]
Min: -50.26 [mm]
TMin: 69.35 [ms]
Filter: CFC 180

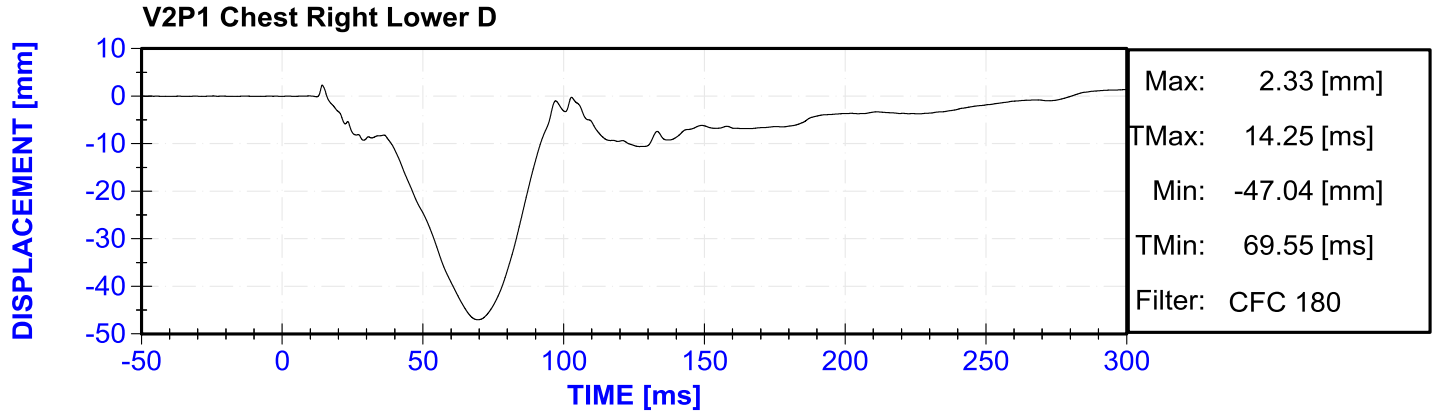
V2P1 Chest Right Lower Dy



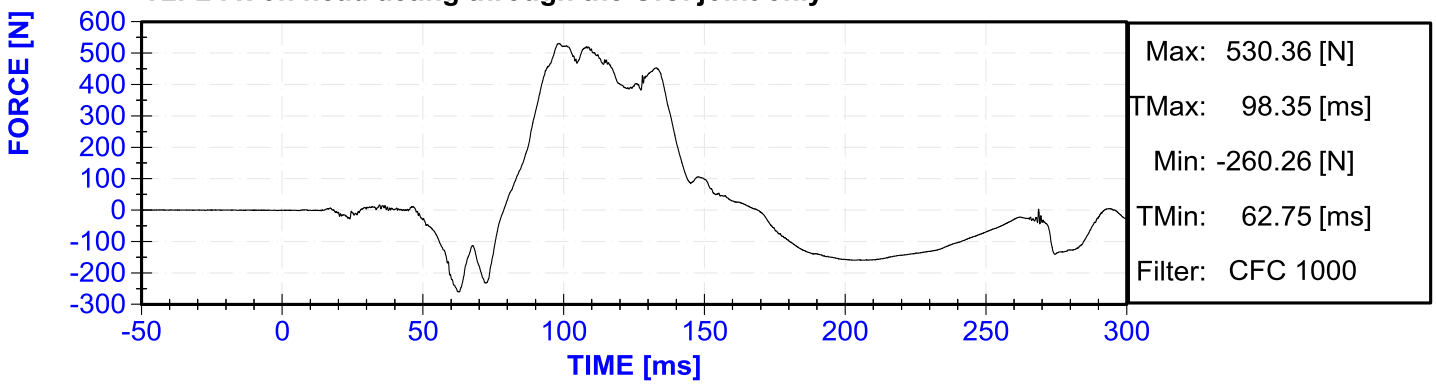
V2P1 Chest Right Lower Dz



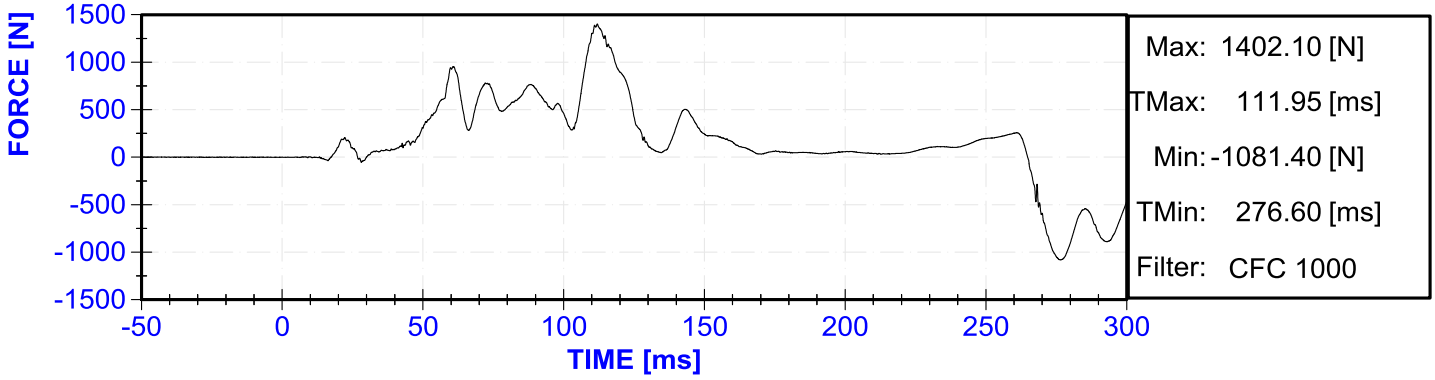
V2P1 Chest Right Lower D



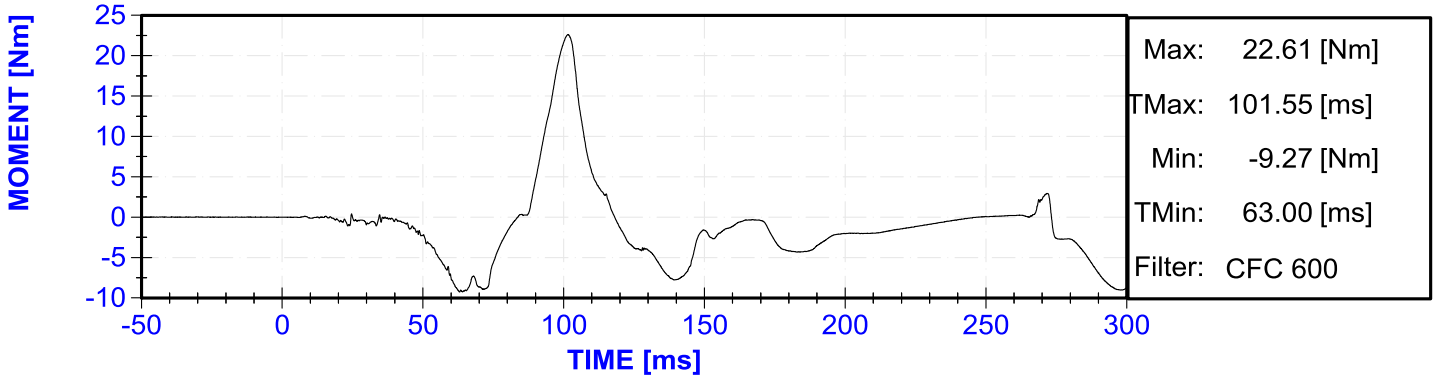
V2P2 Fx on head acting through the O.C. joint only



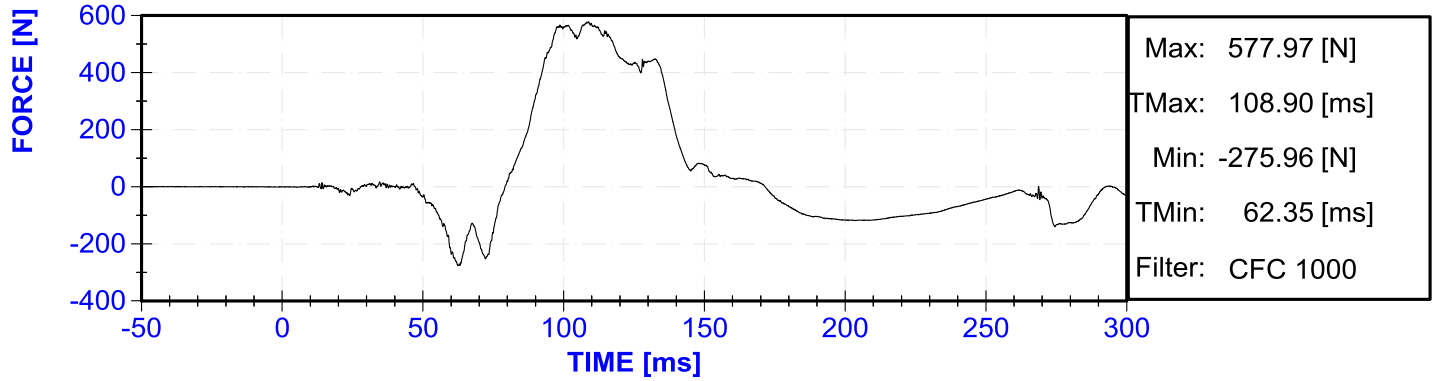
V2P2 Fz on head acting through the O.C. joint only



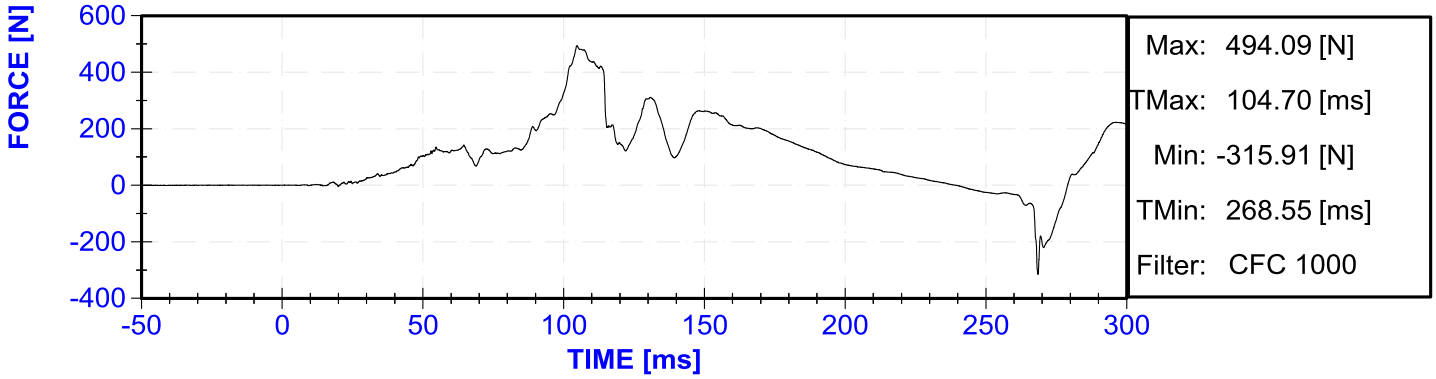
V2P2 My on head acting through the O.C. joint only



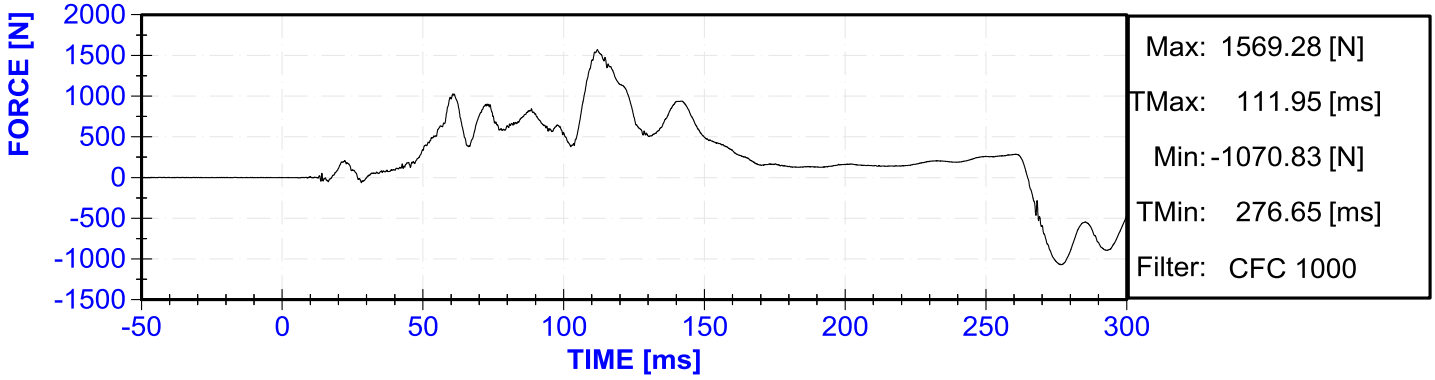
V2P2 Fx on head acting through the total neck section



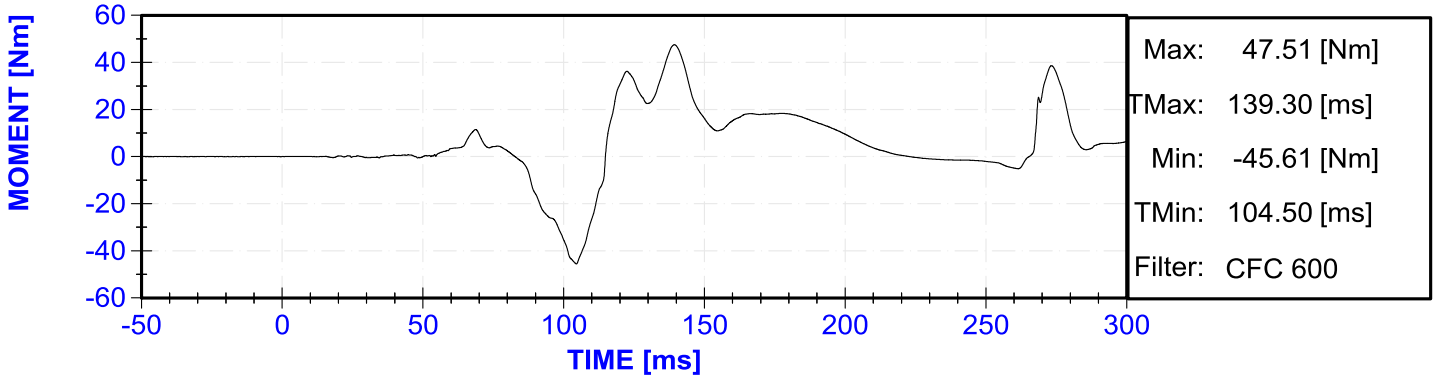
V2P2 Fy on head acting through the total neck section



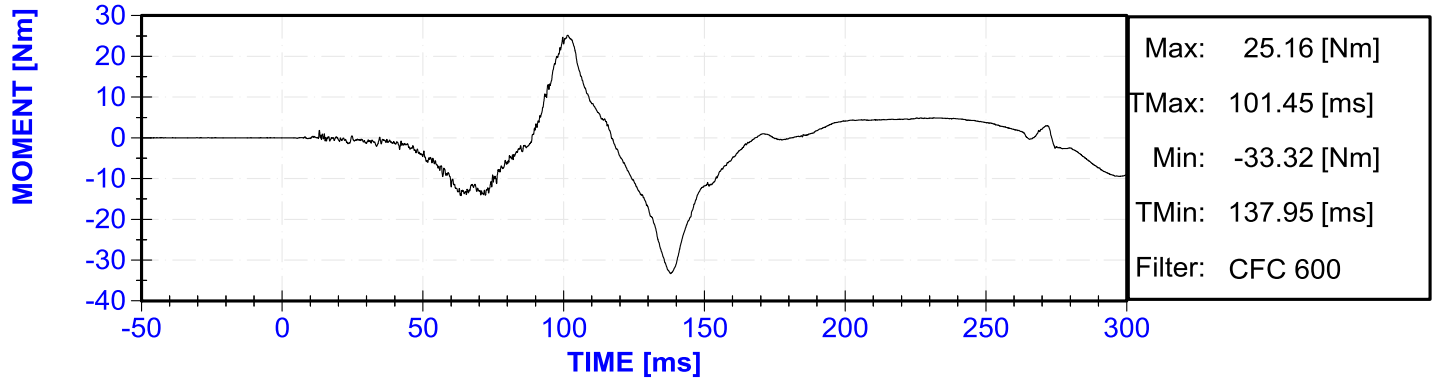
V2P2 Fz on head acting through the total neck section



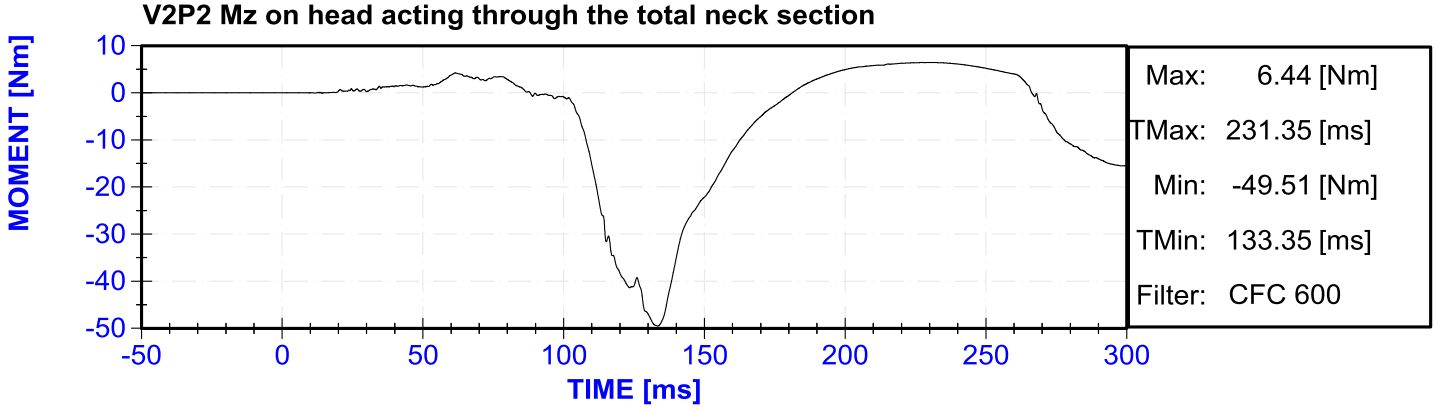
V2P2 Mx on head acting through the total neck section

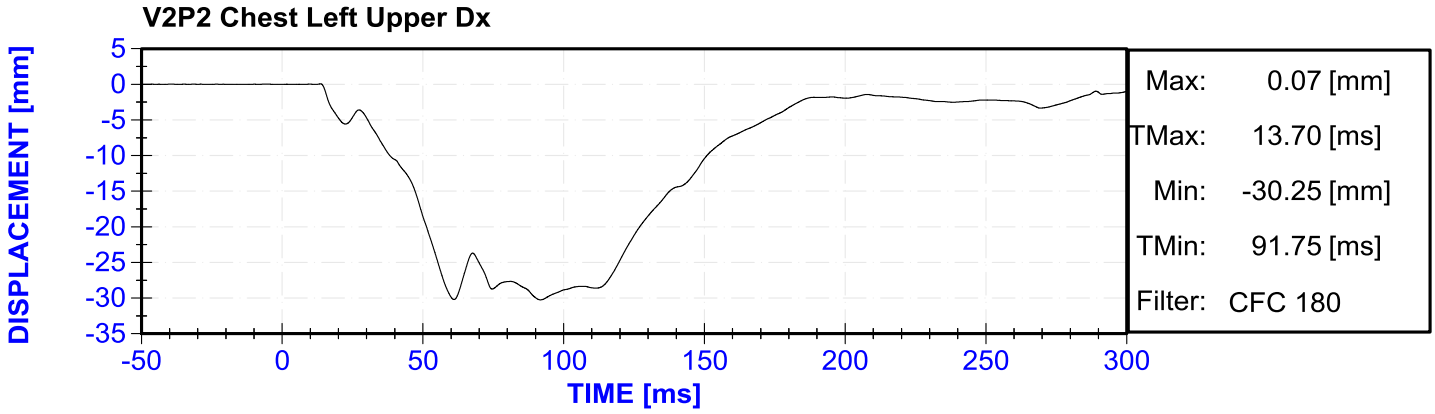


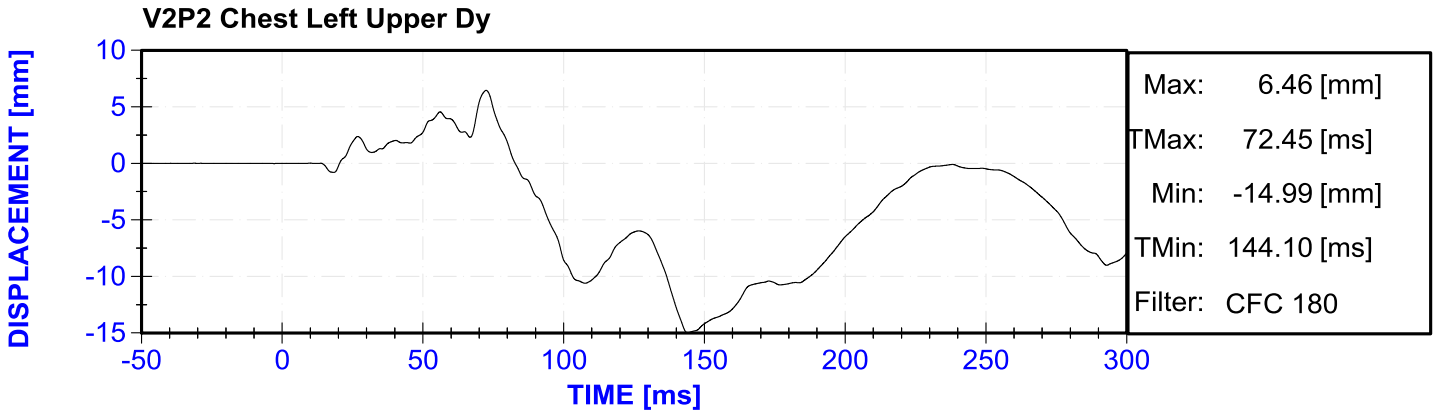
V2P2 My on head acting through the total neck section

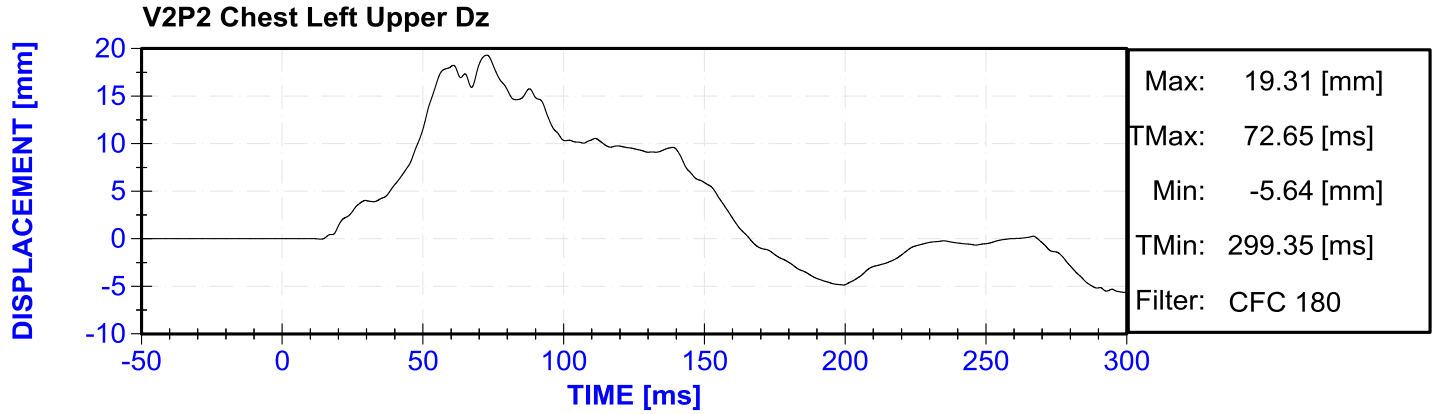


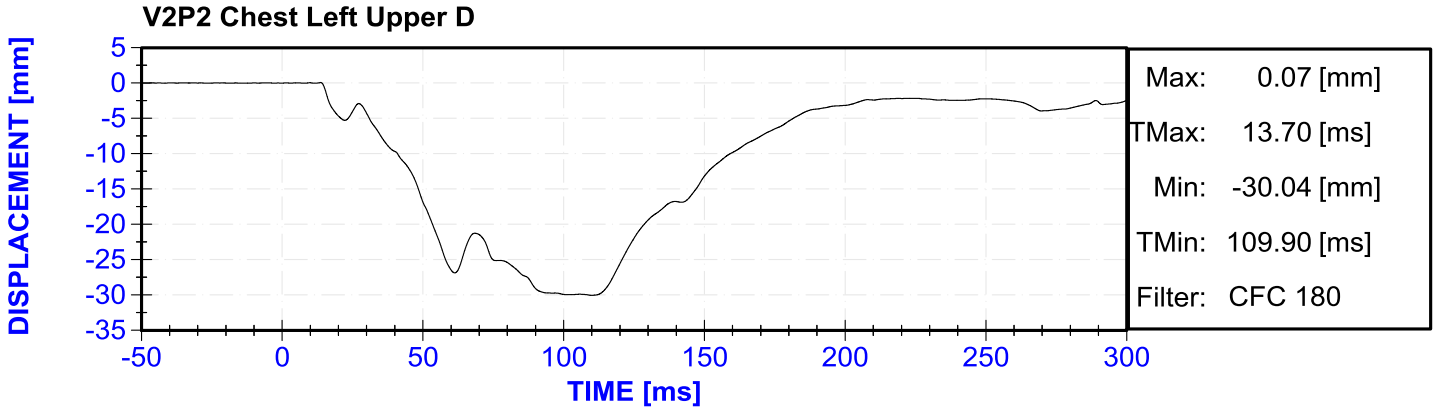
V2P2 Mz on head acting through the total neck section

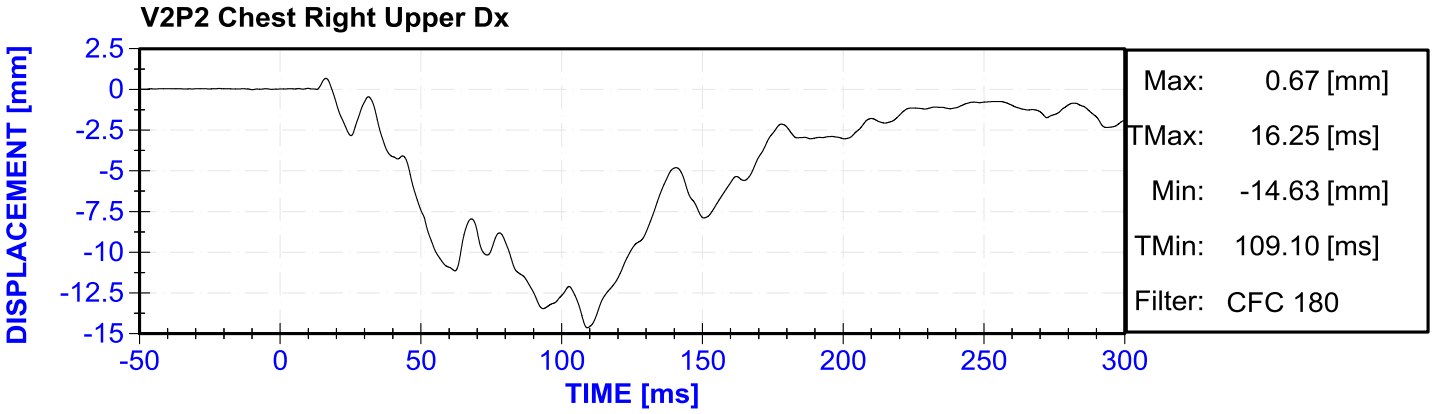


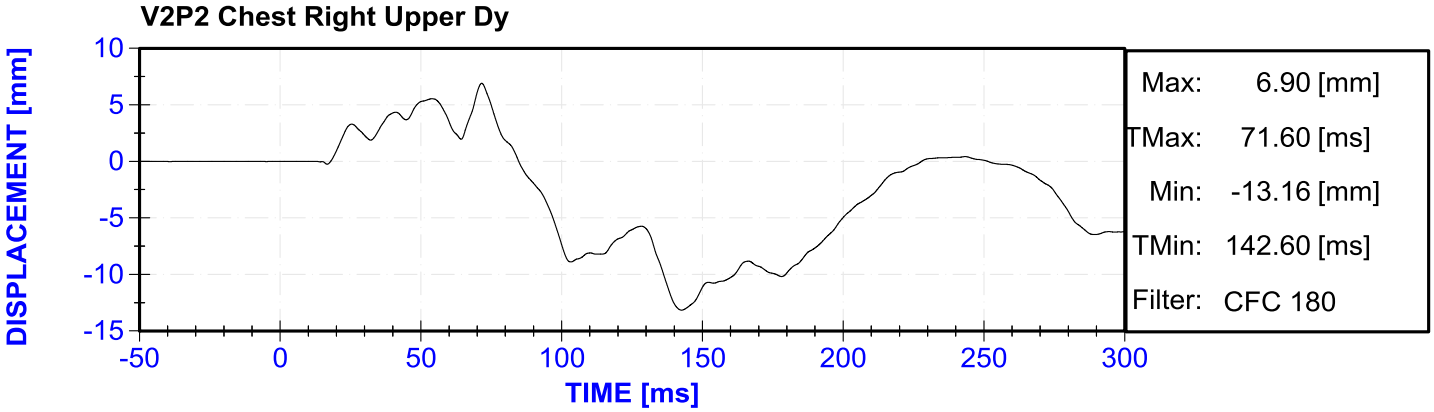

V2P2 Chest Left Upper Dx
DISPLACEMENT [mm]
TIME [ms]
Max: 0.07 [mm]
TMax: 13.70 [ms]
Min: -30.25 [mm]
TMin: 91.75 [ms]
Filter: CFC 180

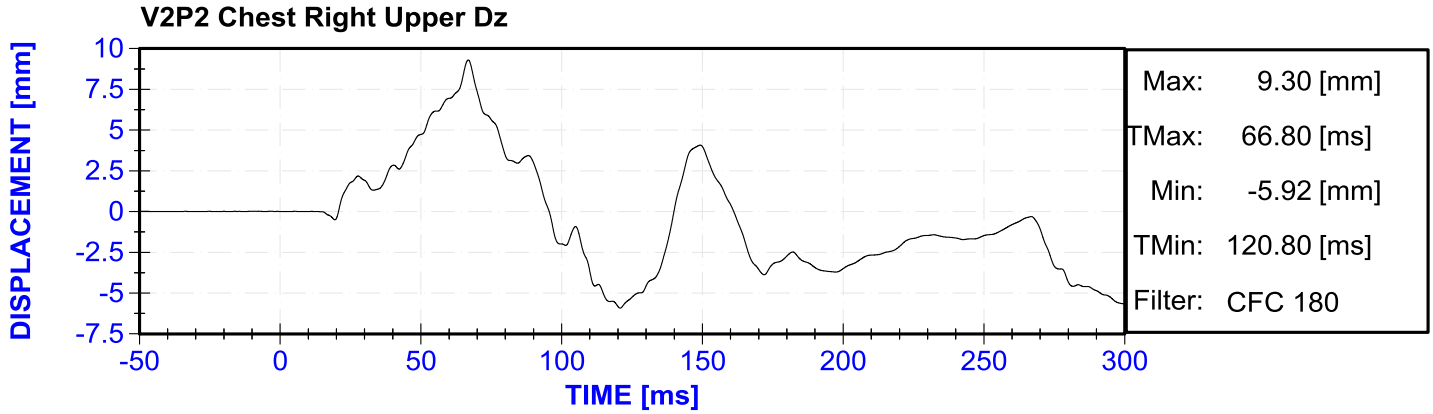

V2P2 Chest Left Upper Dy
DISPLACEMENT [mm]
TIME [ms]
Max: 6.46 [mm]
TMax: 72.45 [ms]
Min: -14.99 [mm]
TMin: 144.10 [ms]
Filter: CFC 180

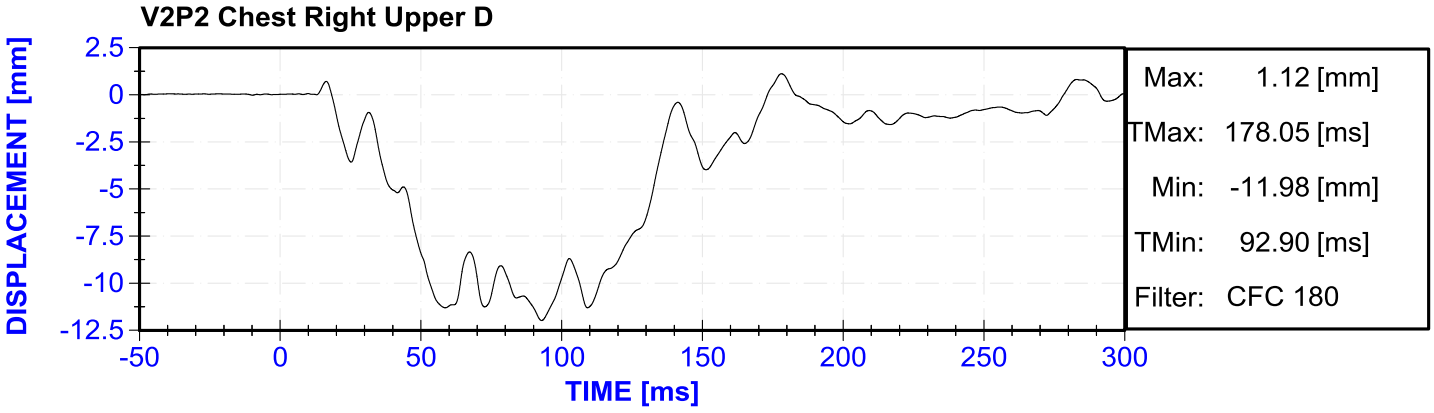

V2P2 Chest Left Upper Dz
DISPLACEMENT [mm]
TIME [ms]
Max: 19.31 [mm]
TMax: 72.65 [ms]
Min: -5.64 [mm]
TMin: 299.35 [ms]
Filter: CFC 180

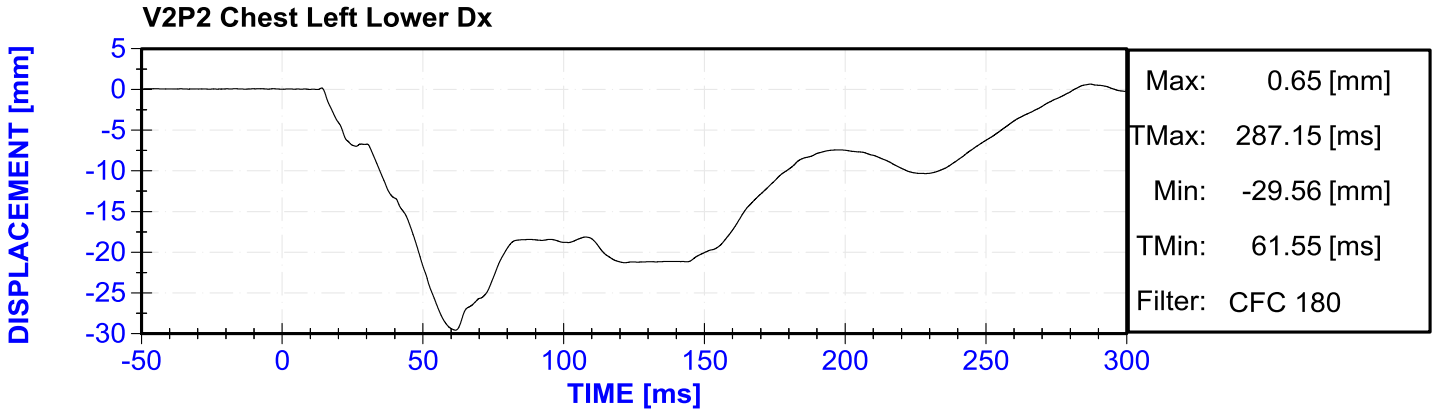

V2P2 Chest Left Upper D
DISPLACEMENT [mm]
TIME [ms]
Max: 0.07 [mm]
TMax: 13.70 [ms]
Min: -30.04 [mm]
TMin: 109.90 [ms]
Filter: CFC 180

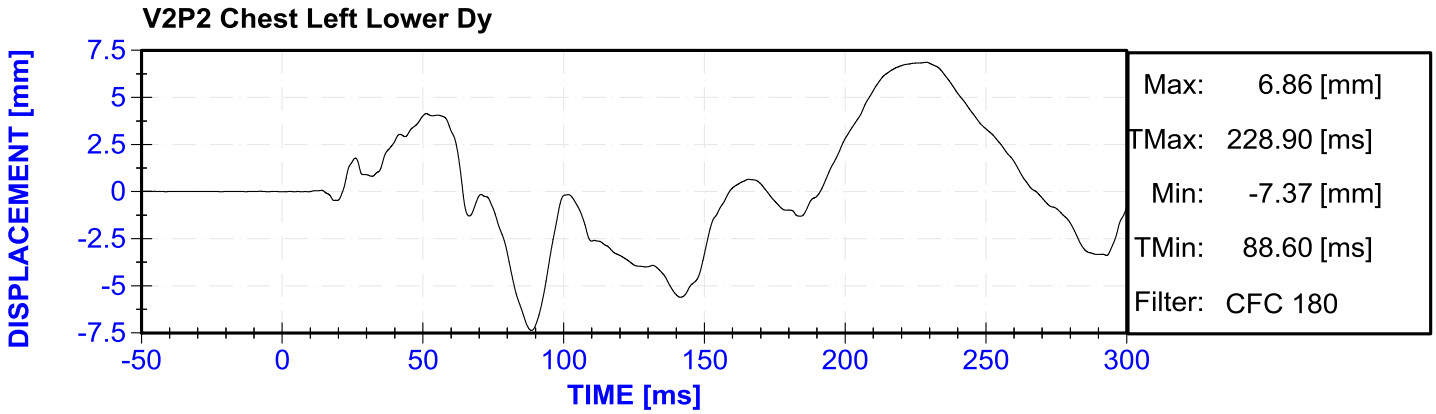

V2P2 Chest Right Upper Dx
DISPLACEMENT [mm]
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 0.67 [mm]
TMax: 16.25 [ms]
Min: -14.63 [mm]
TMin: 109.10 [ms]
Filter: CFC 180

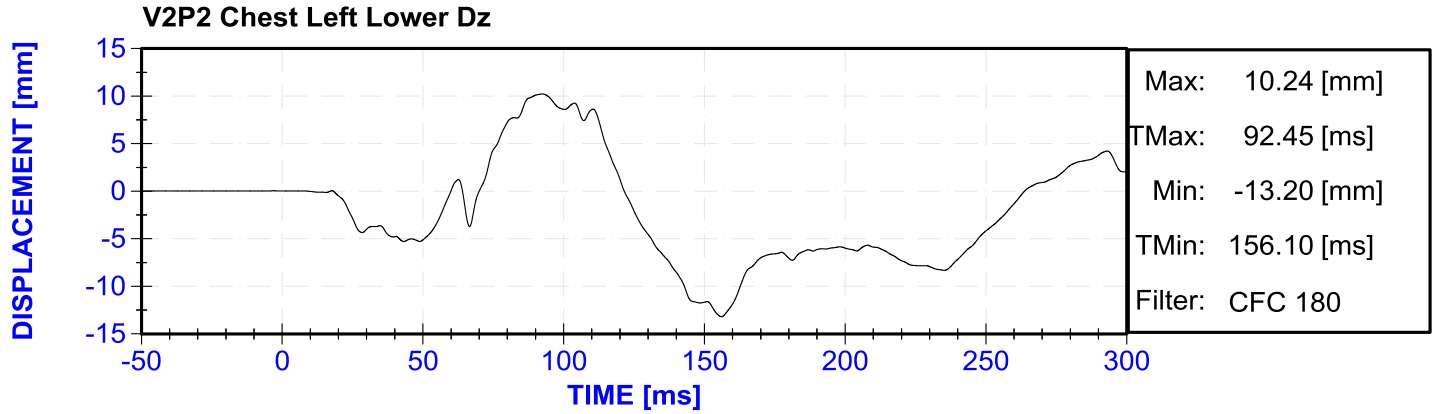

V2P2 Chest Right Upper Dy
DISPLACEMENT [mm]
10
5
0
-5
-10
-15
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 6.90 [mm]
TMax: 71.60 [ms]
Min: -13.16 [mm]
TMin: 142.60 [ms]
Filter: CFC 180

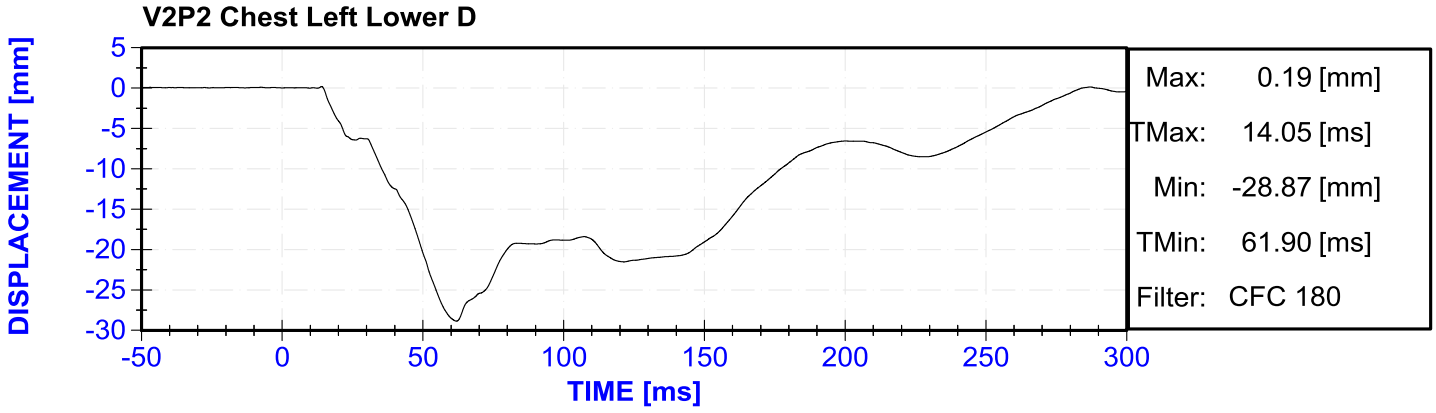

V2P2 Chest Right Upper Dz
DISPLACEMENT [mm]
10
7.5
5
2.5
0
-2.5
-5
-7.5
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 9.30 [mm]
TMax: 66.80 [ms]
Min: -5.92 [mm]
TMin: 120.80 [ms]
Filter: CFC 180

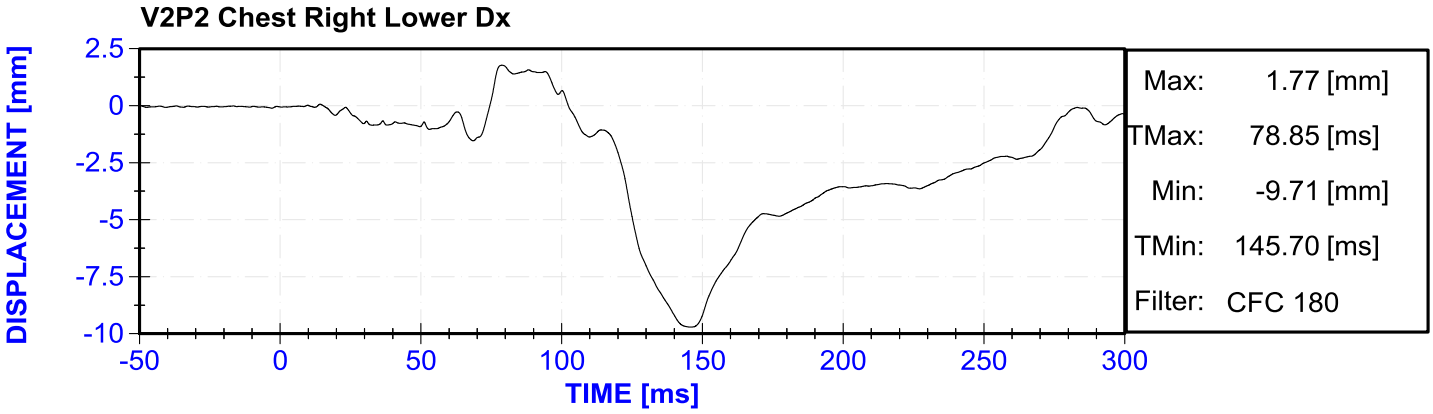

V2P2 Chest Right Upper D
DISPLACEMENT [mm]
2.5
0
-2.5
-5
-7.5
-10
-12.5
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 1.12 [mm]
TMax: 178.05 [ms]
Min: -11.98 [mm]
TMin: 92.90 [ms]
Filter: CFC 180

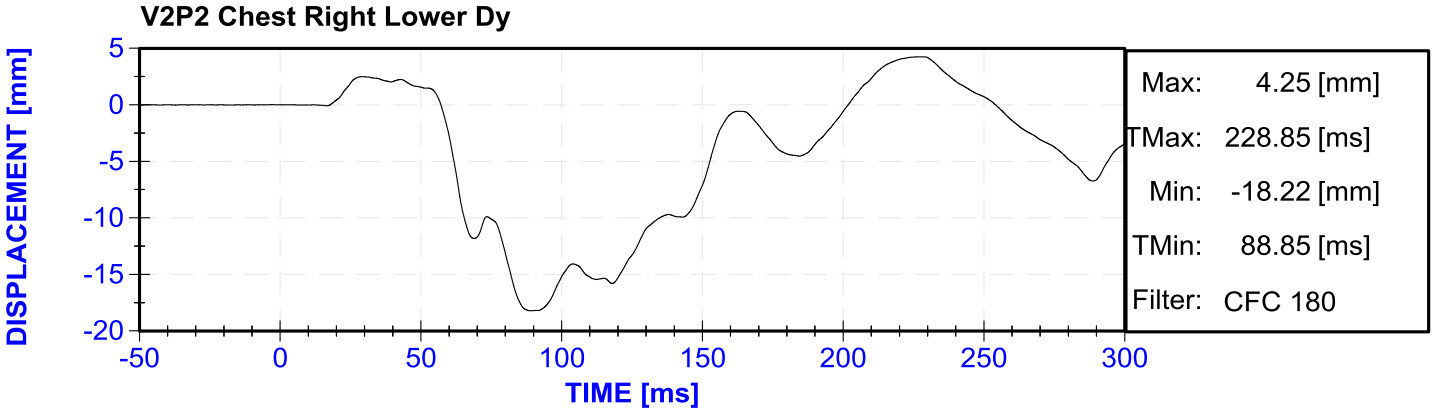

V2P2 Chest Left Lower Dx
DISPLACEMENT [mm]
TIME [ms]
Max: 0.65 [mm]
TMax: 287.15 [ms]
Min: -29.56 [mm]
TMin: 61.55 [ms]
Filter: CFC 180

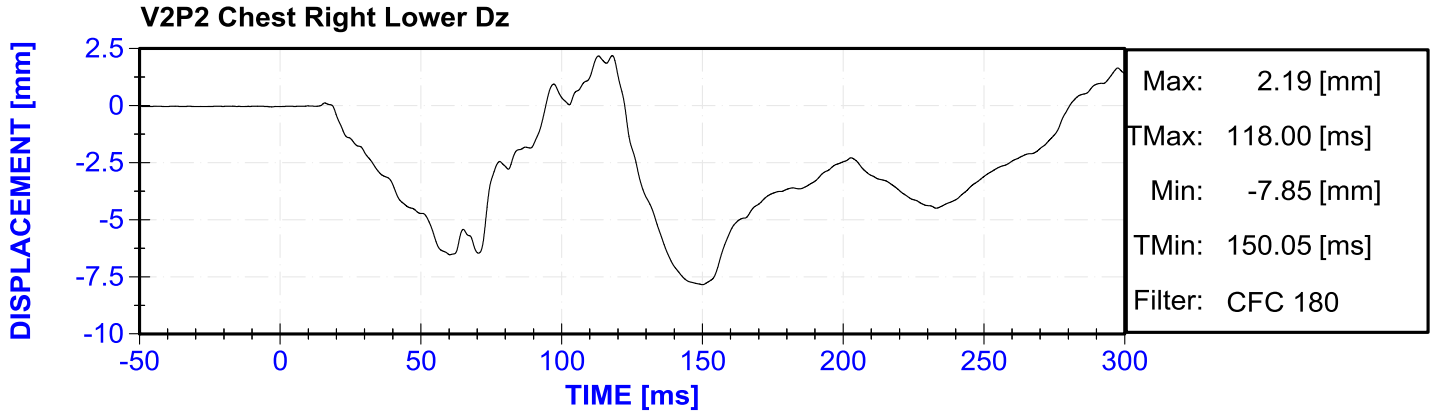

V2P2 Chest Left Lower Dy
DISPLACEMENT [mm]
TIME [ms]
Max: 6.86 [mm]
TMax: 228.90 [ms]
Min: -7.37 [mm]
TMin: 88.60 [ms]
Filter: CFC 180

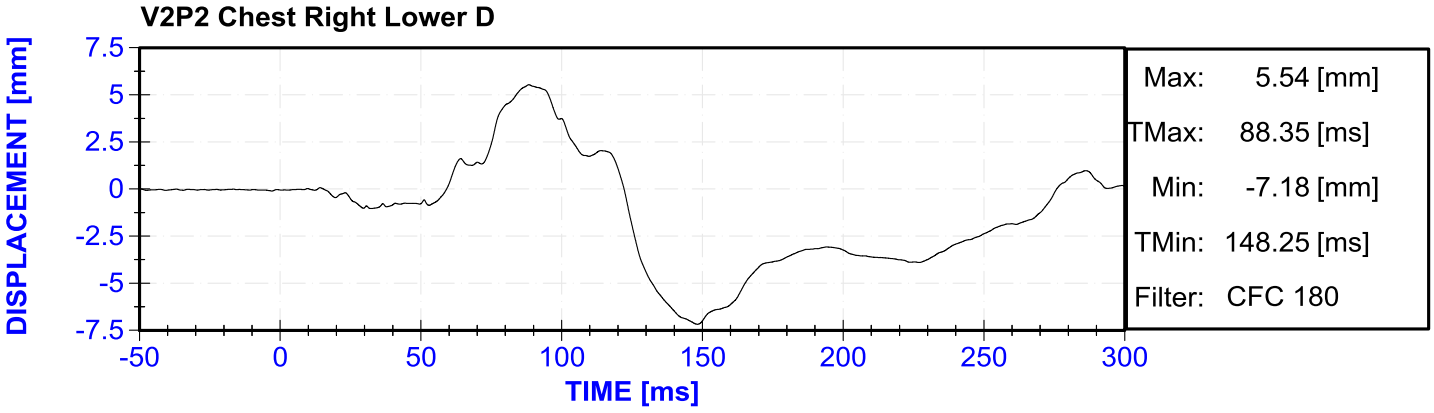

V2P2 Chest Left Lower Dz
DISPLACEMENT [mm]
TIME [ms]
Max: 10.24 [mm]
TMax: 92.45 [ms]
Min: -13.20 [mm]
TMin: 156.10 [ms]
Filter: CFC 180


V2P2 Chest Left Lower D
DISPLACEMENT [mm]
TIME [ms]
Max: 0.19 [mm]
TMax: 14.05 [ms]
Min: -28.87 [mm]
TMin: 61.90 [ms]
Filter: CFC 180


V2P2 Chest Right Lower Dx
DISPLACEMENT [mm]
2.5
0
-2.5
-5
-7.5
-10
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 1.77 [mm]
TMax: 78.85 [ms]
Min: -9.71 [mm]
TMin: 145.70 [ms]
Filter: CFC 180


V2P2 Chest Right Lower Dy
DISPLACEMENT [mm]
5
0
-5
-10
-15
-20
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 4.25 [mm]
TMax: 228.85 [ms]
Min: -18.22 [mm]
TMin: 88.85 [ms]
Filter: CFC 180


V2P2 Chest Right Lower Dz
DISPLACEMENT [mm]
2.5
0
-2.5
-5
-7.5
-10
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 2.19 [mm]
TMax: 118.00 [ms]
Min: -7.85 [mm]
TMin: 150.05 [ms]
Filter: CFC 180


V2P2 Chest Right Lower D
DISPLACEMENT [mm]
7.5
5
2.5
0
-2.5
-5
-7.5
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 5.54 [mm]
TMax: 88.35 [ms]
Min: -7.18 [mm]
TMin: 148.25 [ms]
Filter: CFC 180

APPENDIX C

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

Table C-1: Dummy Information

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

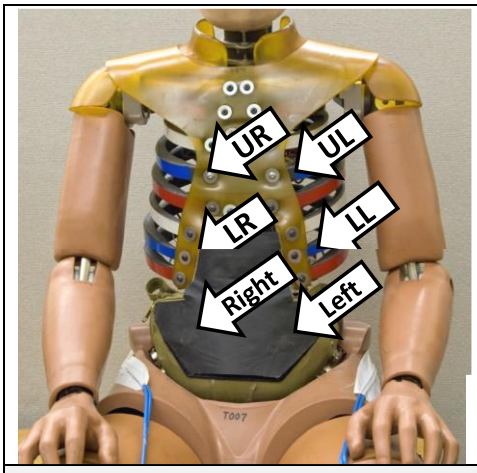


Figure 1. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

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

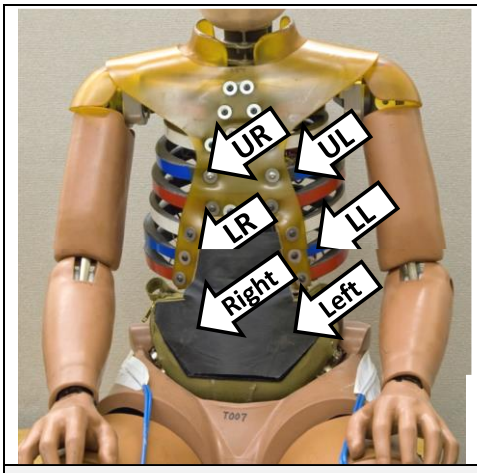


Figure 2. Manipulation to determine thoracic and abdominal IR-TRACC polarity.

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: **11/11/2013**

NHTSA Representative: **James Saunders**

Inspection Reporter: **Mary Geesey**

Witness(es):

Inspection type (check one): ☒ PRE ☐ POST

Dummy S/N: **0016** | Legs S/N: **LX019/LX018**

Dummy Description: **Thor NT 50th Male**

Date of last Certification or Inspection: **10/31/2013**

Tests conducted since last full certification or inspection:
Since last inspection:
RD5910 Volvo XC60
Since last certification:
RD0332 Dodge Dart
RD5371 Honda Civic
RE5507 Subaru Forester
RD5910 Volvo XC60

Known errors in data channels (no data, clipping, unexpected drops):

- **Pelvis X Acceleration – Questionable spike at 110ms. – Inspected physical and electrical aspects with no trouble arising during data live-view.**

Physical evidence of damage:
See Report – Arm Tears, Pelvis Tears, Leg Tears

Anecdotal evidence of damage:
N/A

Equipment delivered to Borrower:

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

Continued
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 Font

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

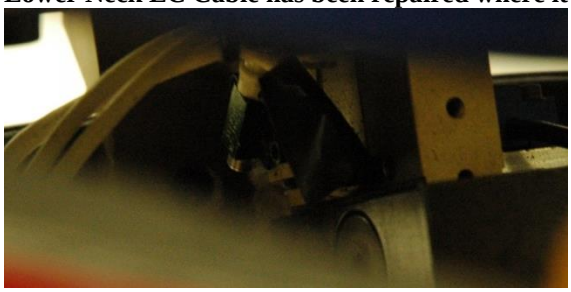
NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell):
Y / N	No evidence of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

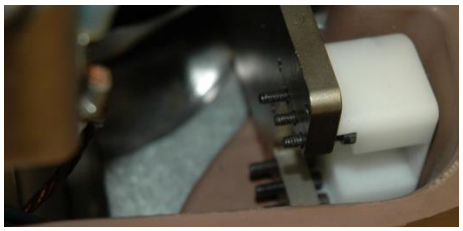
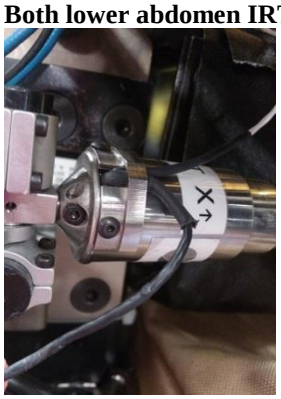
SPINE	
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates **Debonding has occurred at bottom of thoracic spine rubber**
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates **Debonding has occurred at bottom of lumbar spine rubber**
Y / N	Lumbar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

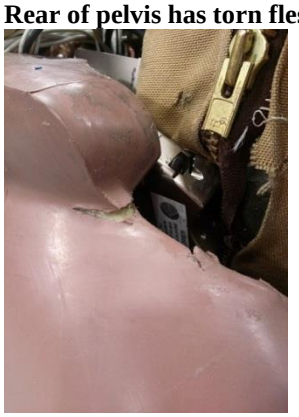
SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops
OTHER	 **Tear to the left wrist area**

	 Inside left had has cuts

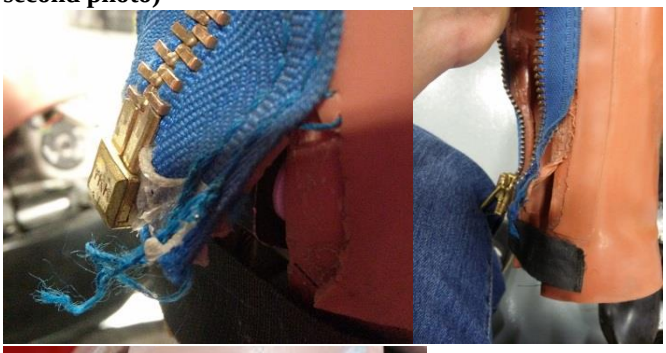
THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
Y / N	No evidence of debonding between rib damping material and ribs
Y / N	CRUX anterior arms securely attached to anterior ribs
Y / N	CRUX posterior arms securely attached to double gimbals, spine
Y / N	Urethane bib is securely attached to ribs with no sign of tearing or washer penetration **Bib has torn in the center of sternum**
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)

OTHER	 **Lower Neck LC Cable has been repaired where it passes through the upper rear spine box.**  **T6 X Accelerometer missing insulation at transducer. Electrical tape covers this.**
ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper **Upper abdomen came held together with black tape**
Y / N	Upper abdomen insert securely attached to spine
Y / N	Upper abdomen insert shows no evidence of permanent set
Y / N	No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper **Abdomen bag has many broken stitches forming, but no tears occurring.**

	Both sides of the Abdomen Bag have torn where the stitches had broke
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
Other	 **Both lower abdomen IRTracc screws are inserted, but the IRTraccs are not installed.**  **Wire seems to have been pinched**

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

FEMUR	
Y / N	Acetabular load cells firmly attached
Y / N	Femur load cells firmly attached
Y / N	No evidence of deformation of knee slider bump stop
Y / N	No cuts, tears, or scuffing of knee flesh
Other	

LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached **-Left ankle Y pot has intermittent failure in cable close to amp connector. –Repaired by cutting back cable and reinstalling on connector.**
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
Y / N	No cuts, tears, or scuffing of leg flesh **Numerous minor cuts** **Zipper on right ankle is pulling away from the flesh – This became much worse during the RE5507 test. (See second photo)**  **Right knee has some nicks in the flesh**

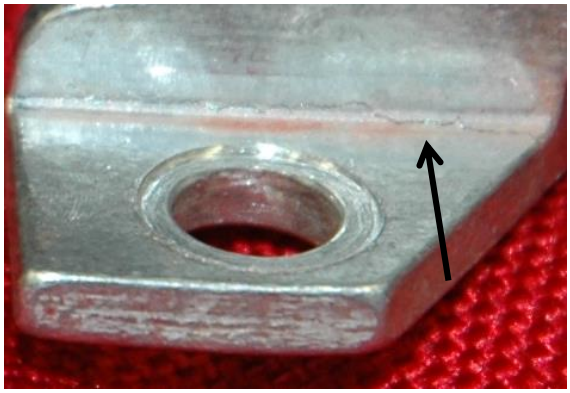
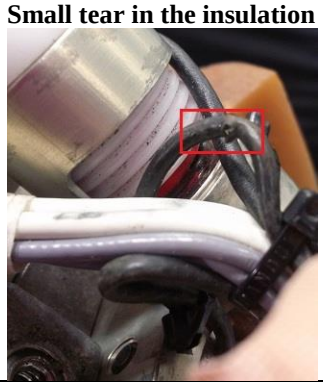
Other	 **Damage to the metal of the right ankle**

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.**
OTHER	 **Lifting strap torn**

THOR Inspection Checklist

Date: **11/14/2013**	
NHTSA Representative: **James Saunders**	
Inspection Reporter: **Matthew Goehle**	
Witness(es):	
Inspection type (check one): ☐ PRE ☒ POST	
Dummy S/N: **0016**	Legs S/N: **LX019/LX018**
Dummy Description: **Thor NT 50th Male**	
Date of last Certification or Inspection: **11/11/2013**	
Tests conducted since last full certification or inspection: Since last inspection: **CAL2658- Test Vehicle 8572** Since last certification: **RD0332 Dodge Dart** **RD5371 Honda Civic** **RE5507 Subaru Forester** **RD5910 Volvo XC60** **CAL2658- Test Vehicle 8572**	
Known errors in data channels (no data, clipping, unexpected drops): **None**	
Physical evidence of damage: **See Report – Head Cap**	
Anecdotal evidence of damage: **N/A**	
Equipment delivered to Borrower: **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**	*Continued* **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**

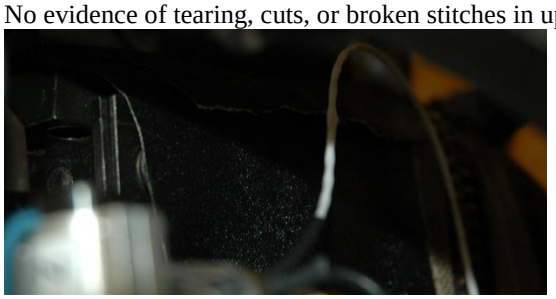
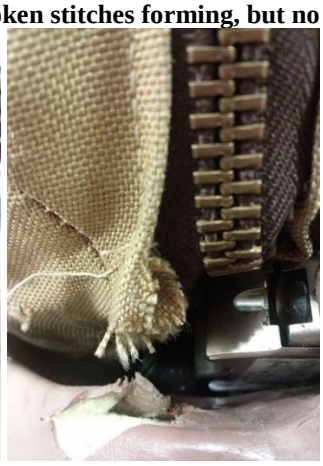
Note: New damage is noted in Red Font

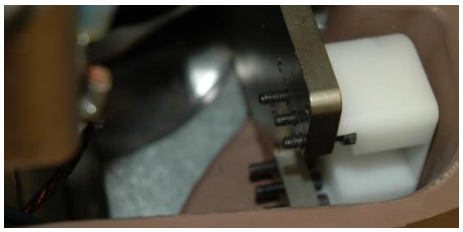
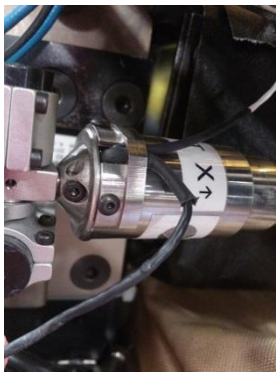
HEAD	
Y / N	Rear head cap mounts securely to head **1 cap tab broke. The other tab has a stress crack.** 
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	**Small tear in the insulation** 

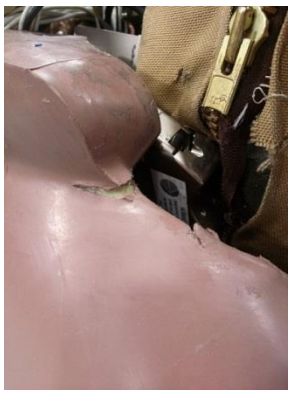
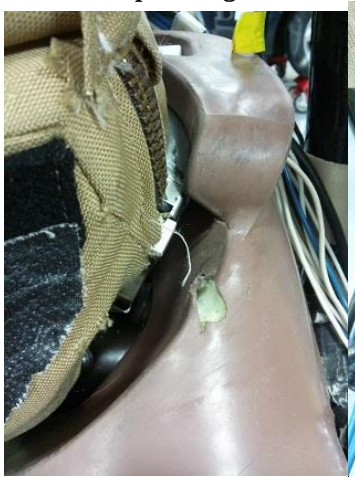
NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell):
Y / N	No evidence of 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	
SPINE	
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates **Debonding has occurred at bottom of thoracic spine rubber**
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates **Debonding has occurred at bottom of lumbar spine rubber**
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged
OTHER	

SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops
OTHER	**Tear to the left wrist area and inside left had has cuts.**

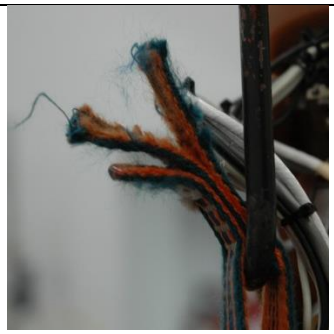
THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
Y / N	No evidence of debonding between rib damping material and ribs
Y / N	CRUX anterior arms securely attached to anterior ribs
Y / N	CRUX posterior arms securely attached to double gimbals, spine
Y / N	Urethane bib is securely attached to ribs with no sign of tearing or washer penetration **Bib has torn in the center of sternum**
Y / N	Ribs securely attached to posterior spine
Y / N	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners)

OTHER	 **Lower Neck LC Cable has been repaired where it passes through the upper rear spine box.** **T6 X Accelerometer missing insulation at transducer. Electrical tape covers this.**
ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper  **Upper abdomen came held together with black tape**
Y / N	Upper abdomen insert securely attached to spine
Y / N	Upper abdomen insert shows no evidence of permanent set
Y / N	No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper **Abdomen bag has many broken stitches forming, but no tears occurring.**  **Both sides of the Abdomen Bag have torn where the stitches had broke**
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set

Other	 **Both lower abdomen IRTracc screws are inserted, but the IRTraccs are not installed.**  **Wire seems to have been pinched**

PELVIS	
Y / N	Pelvis flesh fits securely over pelvis bones
Y / N	H-point tool fits securely into hole on both sides of pelvis
OTHER	**Rear of pelvis has torn flesh** **Tears have formed to the front of the pelvis - 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 **Numerous minor cuts** **Zipper on right ankle is pulling away from the flesh – This became much worse during the RE5507 test. (See second photo) Right knee has some nicks in the flesh**
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.**
OTHER	 **Lifting strap torn**

THOR Inspection Checklist

Date: **11/11/2013**

NHTSA Representative: **James Saunders**

Inspection Reporter: **Mary Geesey**

Witness(es):

Inspection type (check one): ☒ PRE ☐ POST

Dummy S/N: **0015** | Legs S/N: **LX0038/LX0039**

Dummy Description: **Thor NT 50th Male**

Date of last Certification or Inspection: **10/31/2013**

Tests conducted since last full certification or inspection:
Since last inspection:
RD5910 Volvo XC60
Since last certification:
RD0332 Dodge Dart
RD5371 Honda Civic
RE5507 Subaru Forester
RD5910 Volvo XC60

Known errors in data channels (no data, clipping, unexpected drops):

- **Head CG X Acceleration – Questionable Data Throughout - Inspected physical and electrical aspects with no trouble arising during data live-view.**

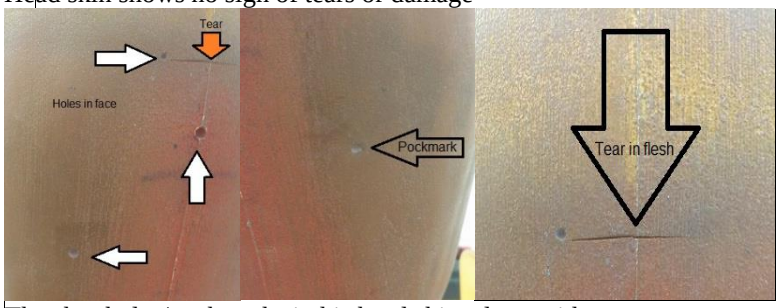
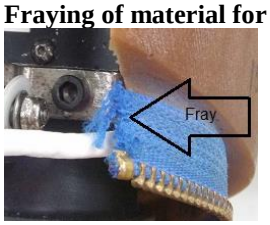
Physical evidence of damage:
See report – Leg damage

Anecdotal evidence of damage:
N/A

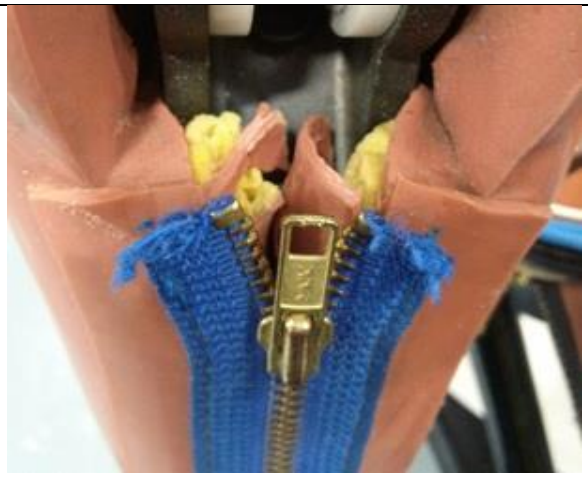
Equipment delivered to Borrower:

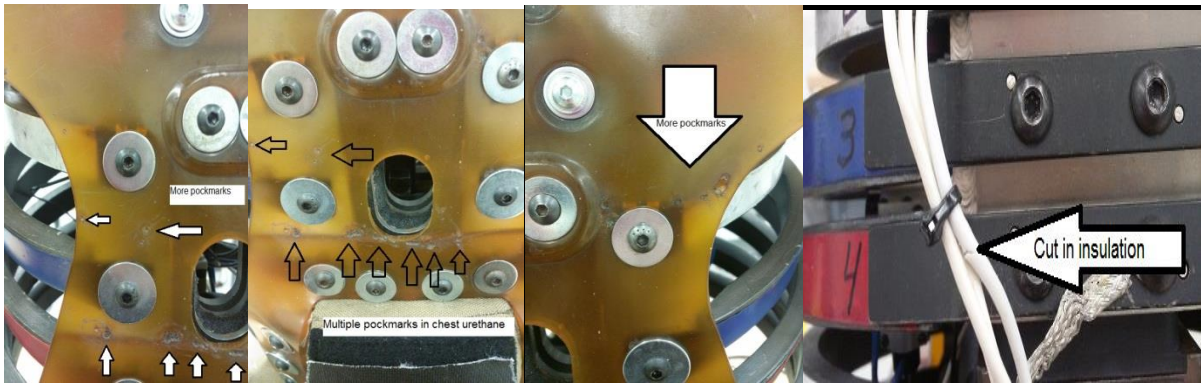
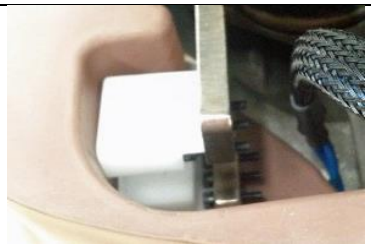
Thor 0015 ATD
26 Accelerometers
3 Angular Rate Sensors
2 Skull Spring LC
1 Condyle Pot
1 Upper Neck LC
4 IRTraccs
8 Rotational Pots
1 Spine LC
2 Acetabulum LC
2 ASIS LC
2 Femur LC

Continued
2 LX Leg Assemblies
2 Upper Tibia LC
2 Lower Tibia LC
6 Ank1e Potentiometers
2 Knee Sliders
1 Neck Skin
1 Neck Foam
1 Tiltview Interface Cable
4 Tilt Sensors
1 H-Point Tool
1 Tool Box
1 Laptop
1 LX Zeroing Bracket

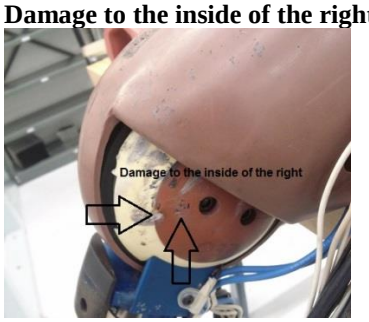
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage  Thor has holes/pockmarks in his head skin, along with a tear
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached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

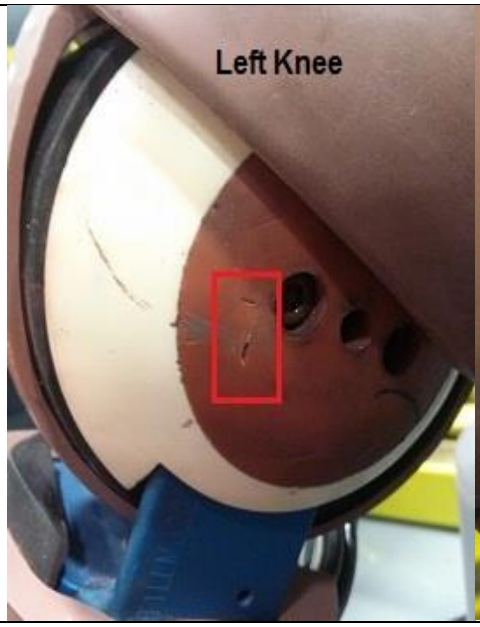
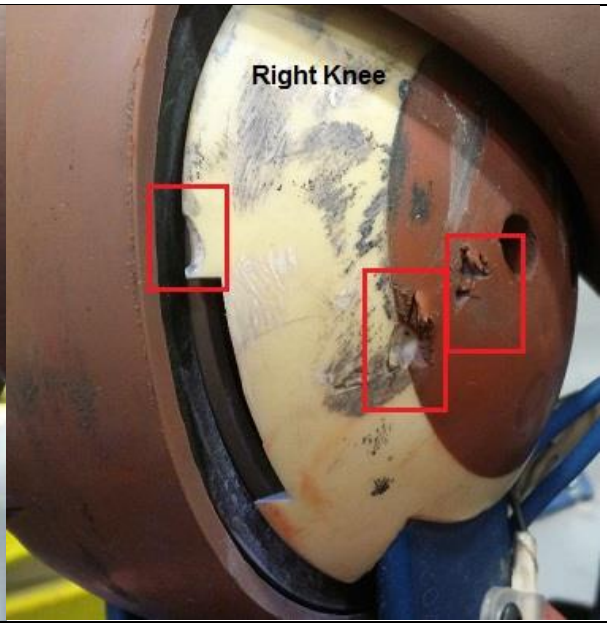
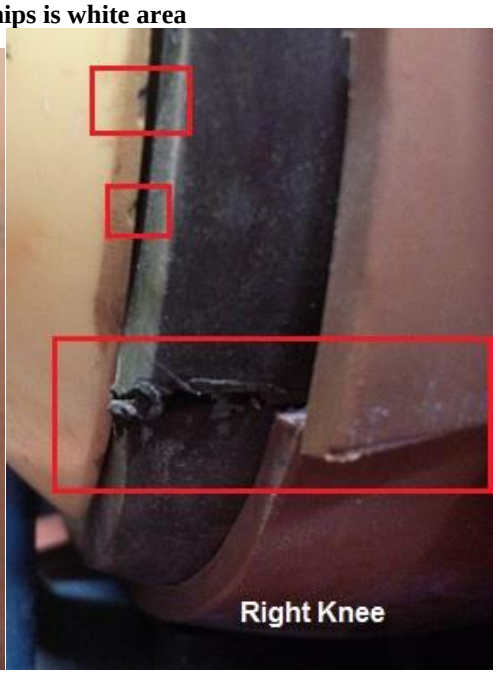
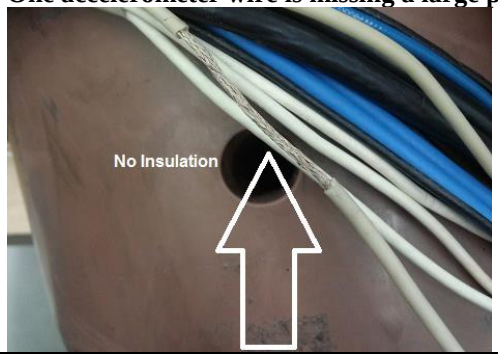
NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell):
Y / N	No evidence of debonding or permanent compression in neck soft stop assemblies
Y / N	Neck securely attached to upper neck load cell
Y / N	Neck securely attached to lower neck load cell **THOR 0015 does not have a lower neck load cell**
Y / N	Neck pitch change joint mechanism mating teeth are engaged
OTHER	
SPINE	
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged
OTHER	

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

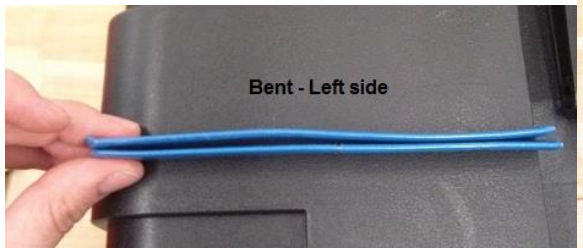
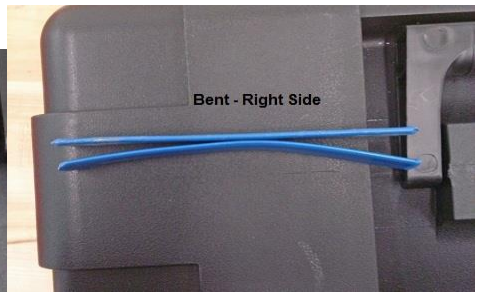
THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
Y / N	No evidence of debonding between rib damping material and ribs
Y / N	CRUX anterior arms securely attached to anterior ribs
Y / N	CRUX posterior arms securely attached to double gimbals, spine
Y / N	Urethane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

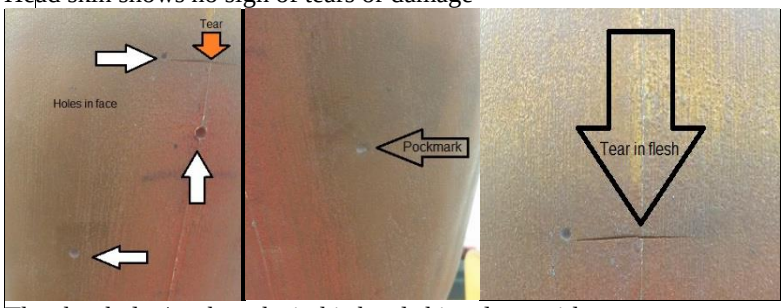
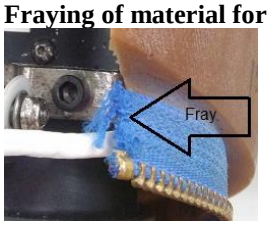
	 
Y / N	No cuts, tears, or scuffing of knee flesh **Right knee flesh, and rubber insert were cut, chips is white area** 
Other	**One accelerometer wire is missing a large portion of insulation** 

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	

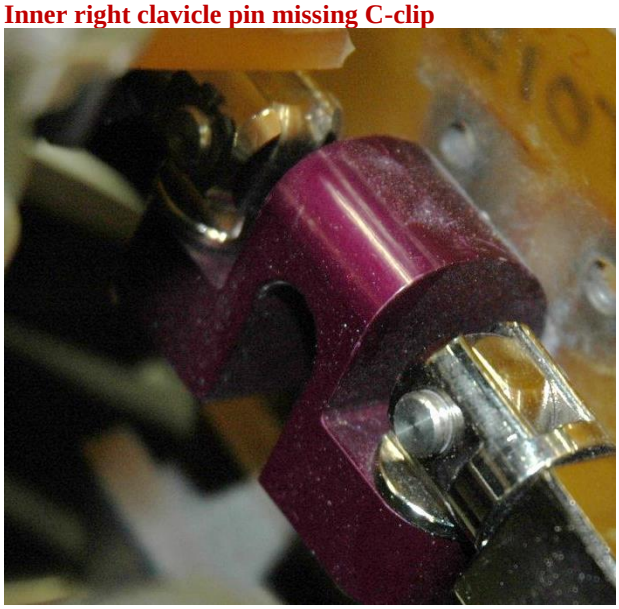
JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation **One of the left rib stiffeners has damage to the outer coating that goes all the way around, also, the rib stiffeners were severely bent when we received 0015.**  
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers **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	

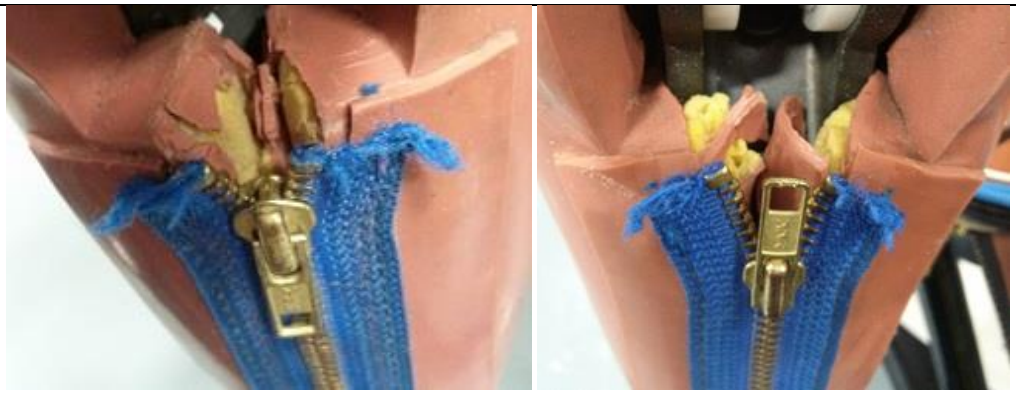
THOR Inspection Checklist

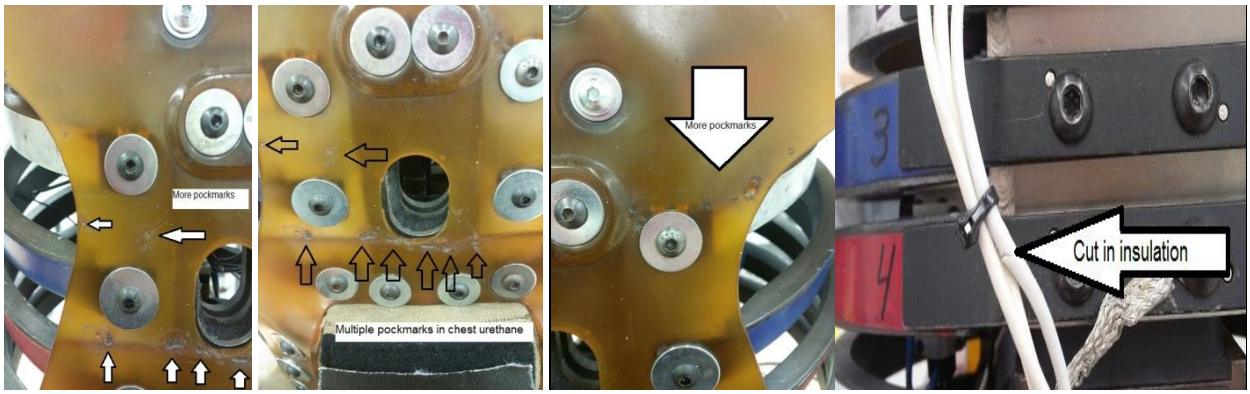
Date: **11/14/2013**	
NHTSA Representative: **James Saunders**	
Inspection Reporter: **Matthew Goehle**	
Witness(es):	
Inspection type (check one): ☐ PRE ☒ POST	
Dummy S/N: **0015**	Legs S/N: **LX0038/LX0039**
Dummy Description: **Thor NT 50th Male**	
Date of last Certification or Inspection: **11/11/2013**	
Tests conducted since last full certification or inspection: Since last inspection: **CAL2658- Test Vehicle 8572** Since last certification: **RD0332 Dodge Dart** **RD5371 Honda Civic** **RE5507 Subaru Forester** **RD5910 Volvo XC60** **CAL2658- Test Vehicle 8572**	
Known errors in data channels (no data, clipping, unexpected drops): - **None**	
Physical evidence of damage: **See report – Clavicle Pin**	
Anecdotal evidence of damage: **N/A**	
Equipment delivered to Borrower: **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**	*Continued* **2 LX Leg Assemblies** **2 Upper Tibia LC** **2 Lower Tibia LC** **6 Ank1e Potentiometers** **2 Knee Sliders** **1 Neck Skin** **1 Neck Foam** **1 Tiltview Interface Cable** **4 Tilt Sensors** **1 H-Point Tool** **1 Tool Box** **1 Laptop** **1 LX Zeroing Bracket**

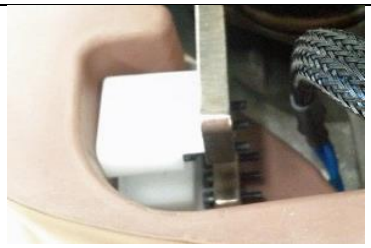
HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull
Y / N	Head skin shows no sign of tears or damage  Thor has holes/pockmarks in his head skin, along with a tear
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached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

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell):
Y / N	No evidence of debonding or permanent compression in neck soft stop assemblies
Y / N	Neck securely attached to upper neck load cell
Y / N	Neck securely attached to lower neck load cell **THOR 0015 does not have a lower neck load cell**
Y / N	Neck pitch change joint mechanism mating teeth are engaged
OTHER	
SPINE	
Y / N	No evidence of debonding between thoracic spine flex joint and metal plates
Y / N	No evidence of debonding between lumbar spine flex joint and metal plates
Y / N	Lumbar spine pitch change joint mechanism mating teeth are engaged
OTHER	

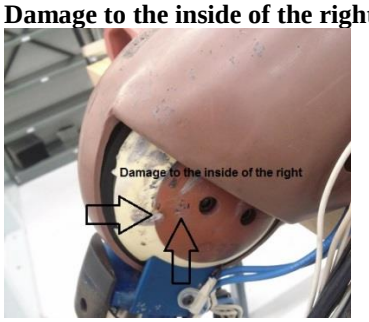
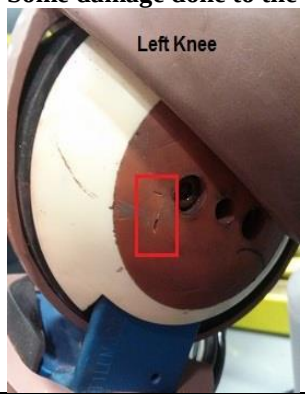
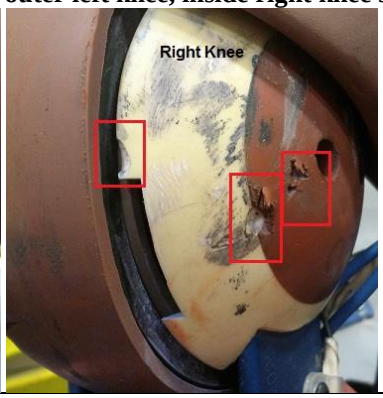
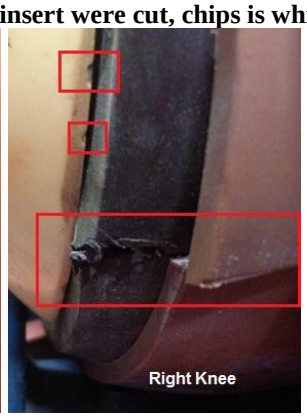
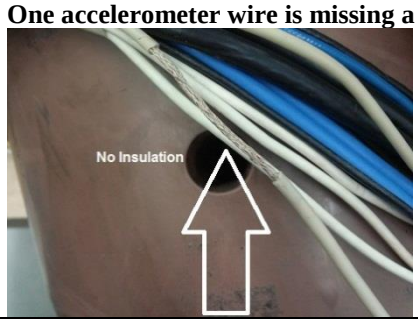
SHOULDER	
Y / N	Urethane shoulder pads show no evidence of contact
Y / N	Clavicles securely attached to sternum and shoulder **Inner right clavicle pin missing C-clip** 
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops

OTHER	 **Both left and right arms show signs of internal tearing**

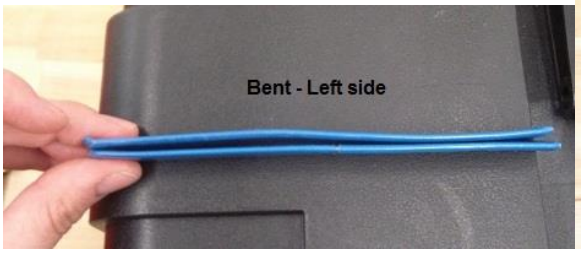
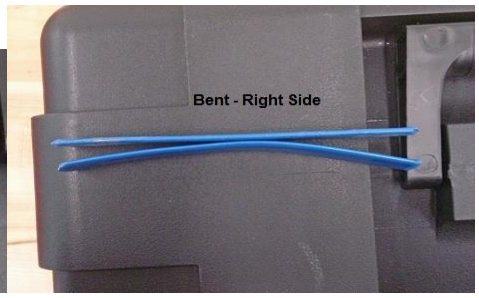
THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material
Y / N	No evidence of debonding between rib damping material and ribs
Y / N	CRUX anterior arms securely attached to anterior ribs
Y / N	CRUX posterior arms securely attached to double gimbals, spine
Y / N	Urethane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

	Stains Hole Tear in material Seam coming undone Seam coming undone Seam coming undone at neck line Holes in chest jacket where seams broke Right Shoulder Hole on the bottom left of the chest jacket Seam torn, material ripped
OTHER	

DUMMY CALIBRATIONS

50% ADULT MALE THOR016 DUMMY CALIBRATIONS

Summary of Thor 16 Certification Test Results

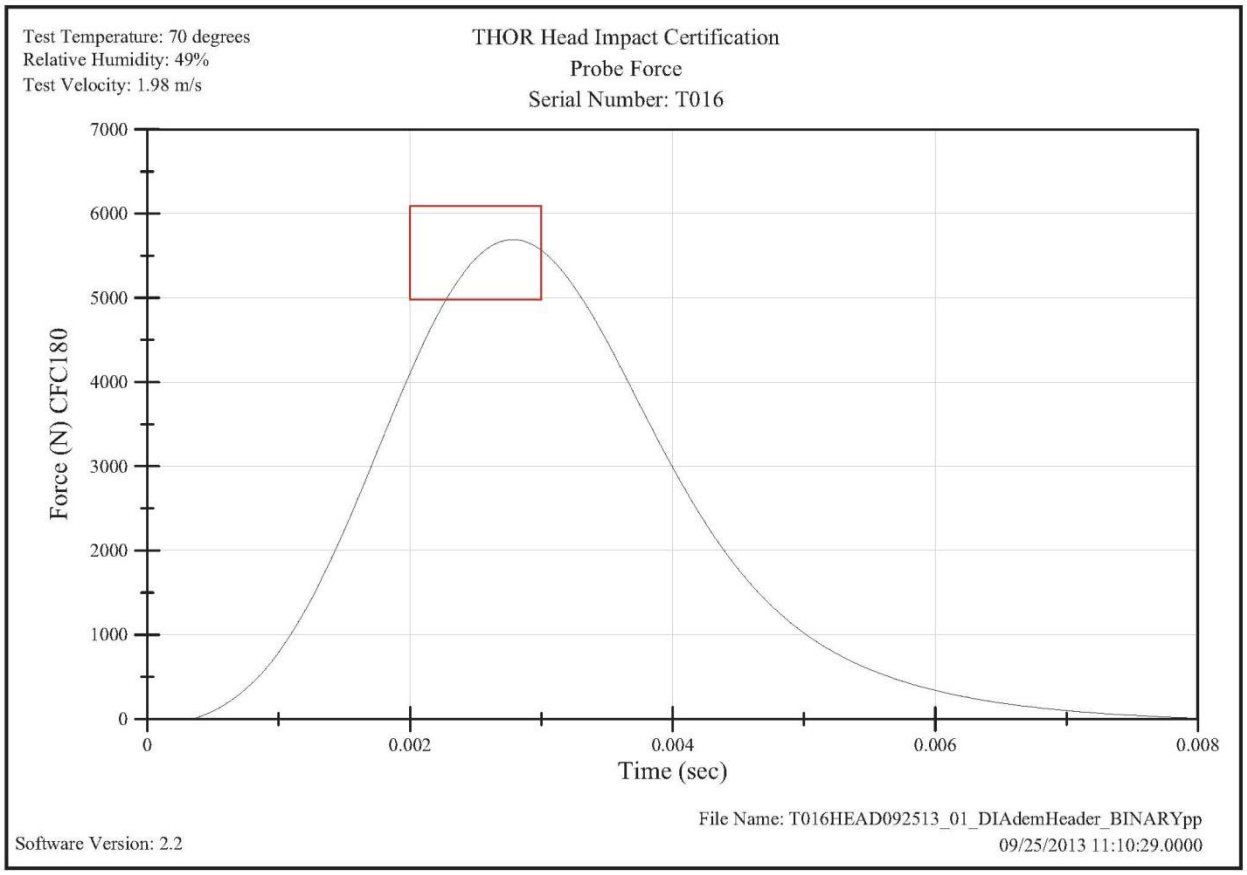
Reported by: Calspan

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
Force (N) CFC180
7000
6000
5000
4000
3000
2000
1000
0
0
0.002
0.004
0.006
0.008
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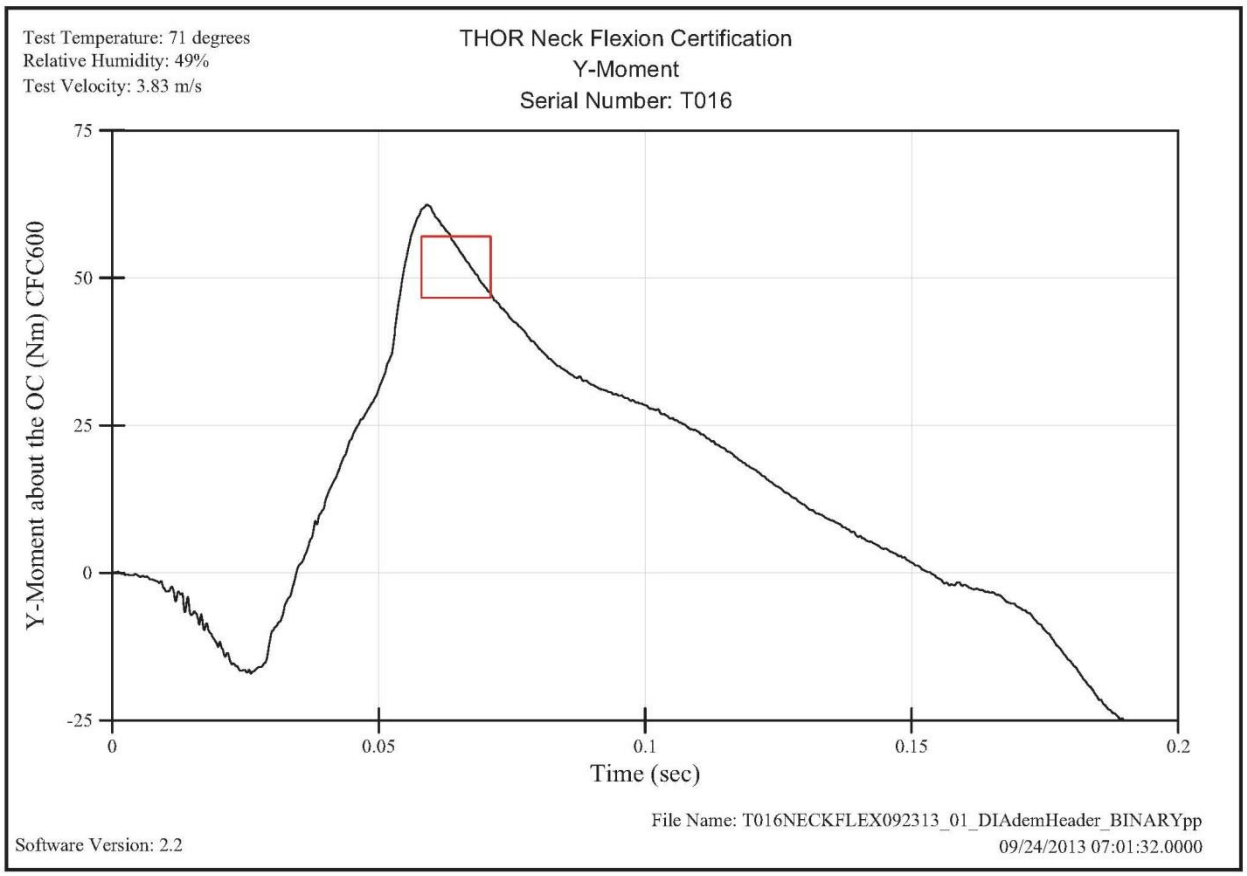
Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 3.83 m/s
THOR Neck Flexion Certification
Y-Moment
Serial Number: T016
Y-Moment about the OC (Nm) CFC600
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25
0
-25
0
0.05
0.1
0.15
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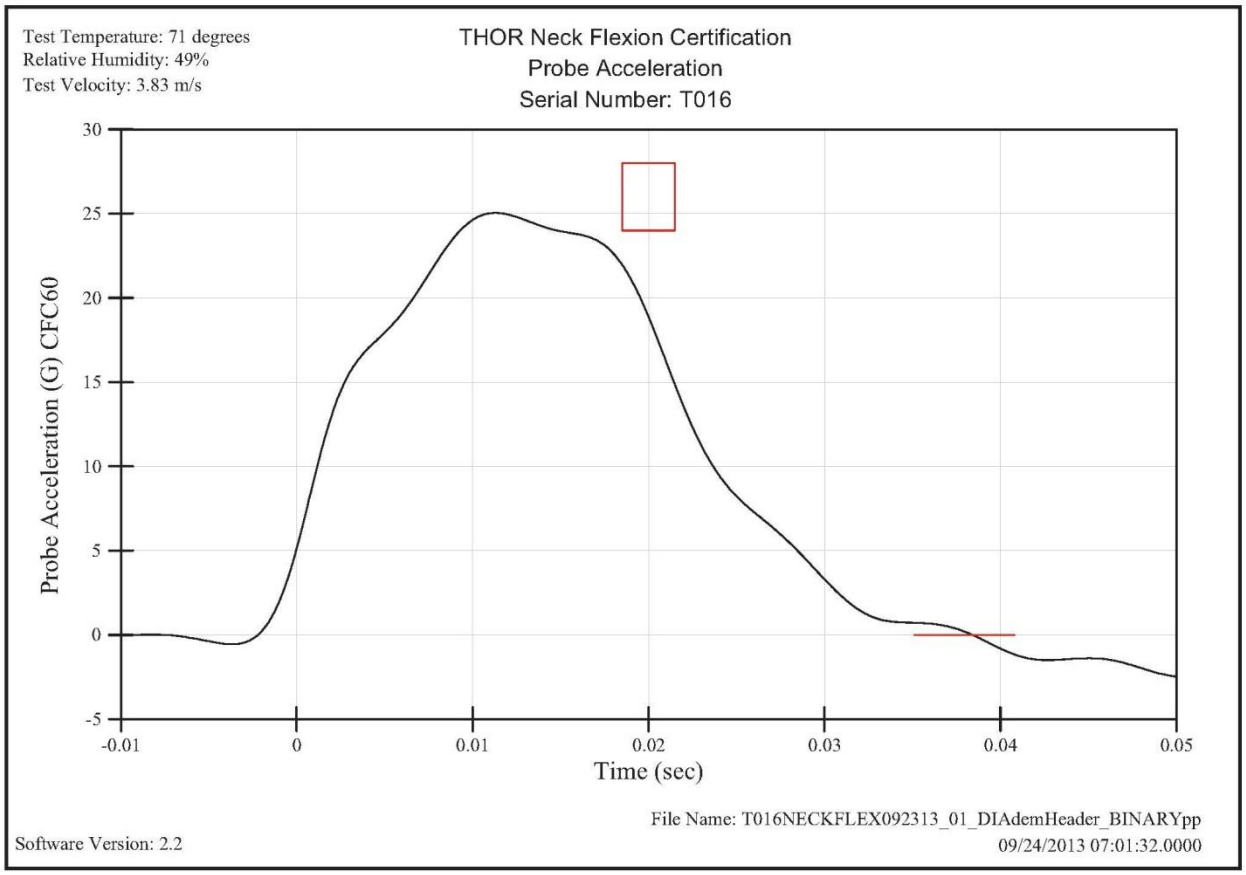
Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 3.83 m/s
THOR Neck Flexion Certification
Probe Acceleration
Serial Number: T016
Probe Acceleration (G) CFC60
30
25
20
15
10
5
0
-5
-0.01
0
0.01
0.02
0.03
0.04
0.05
Time (sec)
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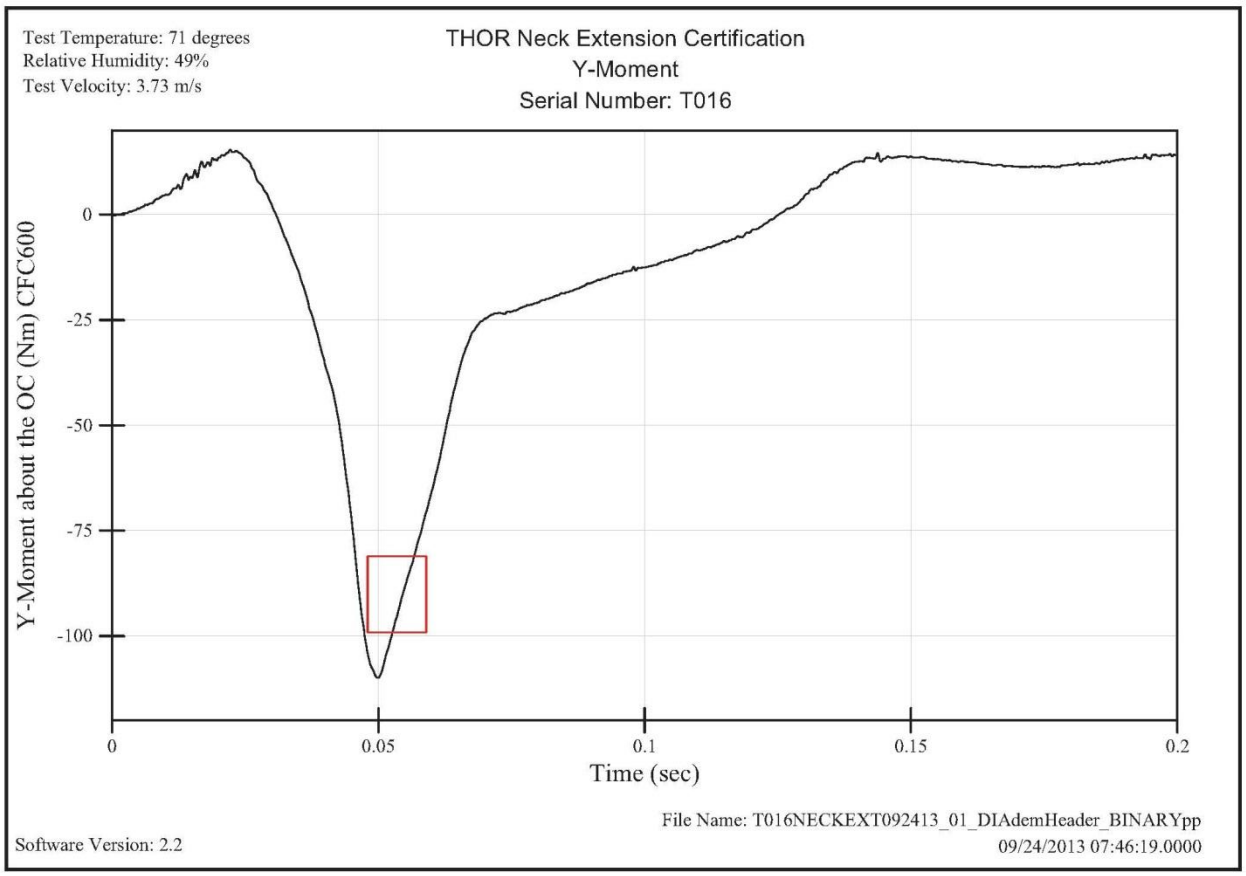
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Relative Humidity: 49%
Test Velocity: 3.73 m/s
THOR Neck Extension Certification
Y-Moment
Serial Number: T016
Y-Moment about the OC (Nm) CFC600
0
-25
-50
-75
-100
0
0.05
0.1
0.15
0.2
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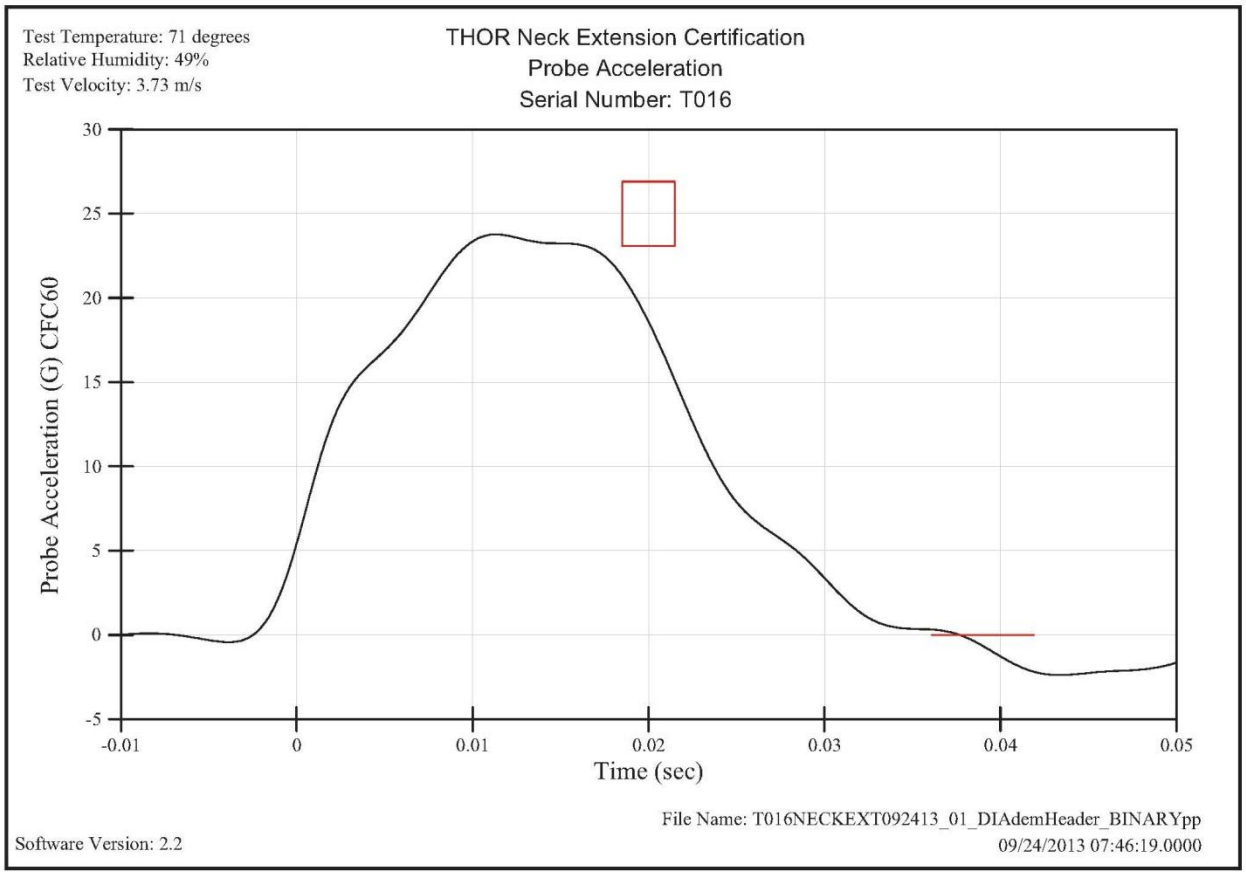
Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 3.73 m/s
THOR Neck Extension Certification
Probe Acceleration
Serial Number: T016
Probe Acceleration (G) CFC60
30
25
20
15
10
5
0
-5
-0.01
0
0.01
0.02
0.03
0.04
0.05
Time (sec)
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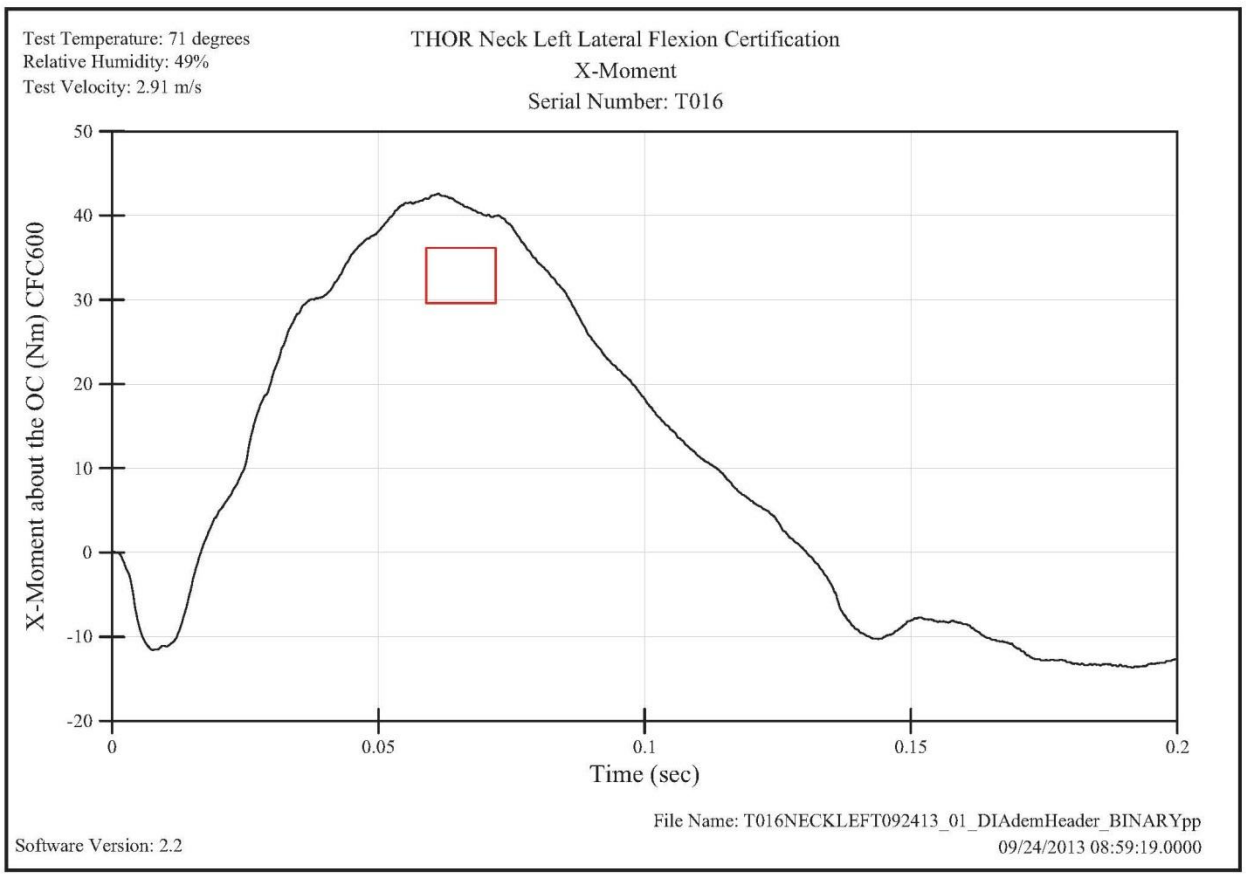
Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 2.91 m/s
THOR Neck Left Lateral Flexion Certification
X-Moment
Serial Number: T016
X-Moment about the OC (Nm) CFC600
50
40
30
20
10
0
-10
-20
0
0.05
0.1
0.15
0.2
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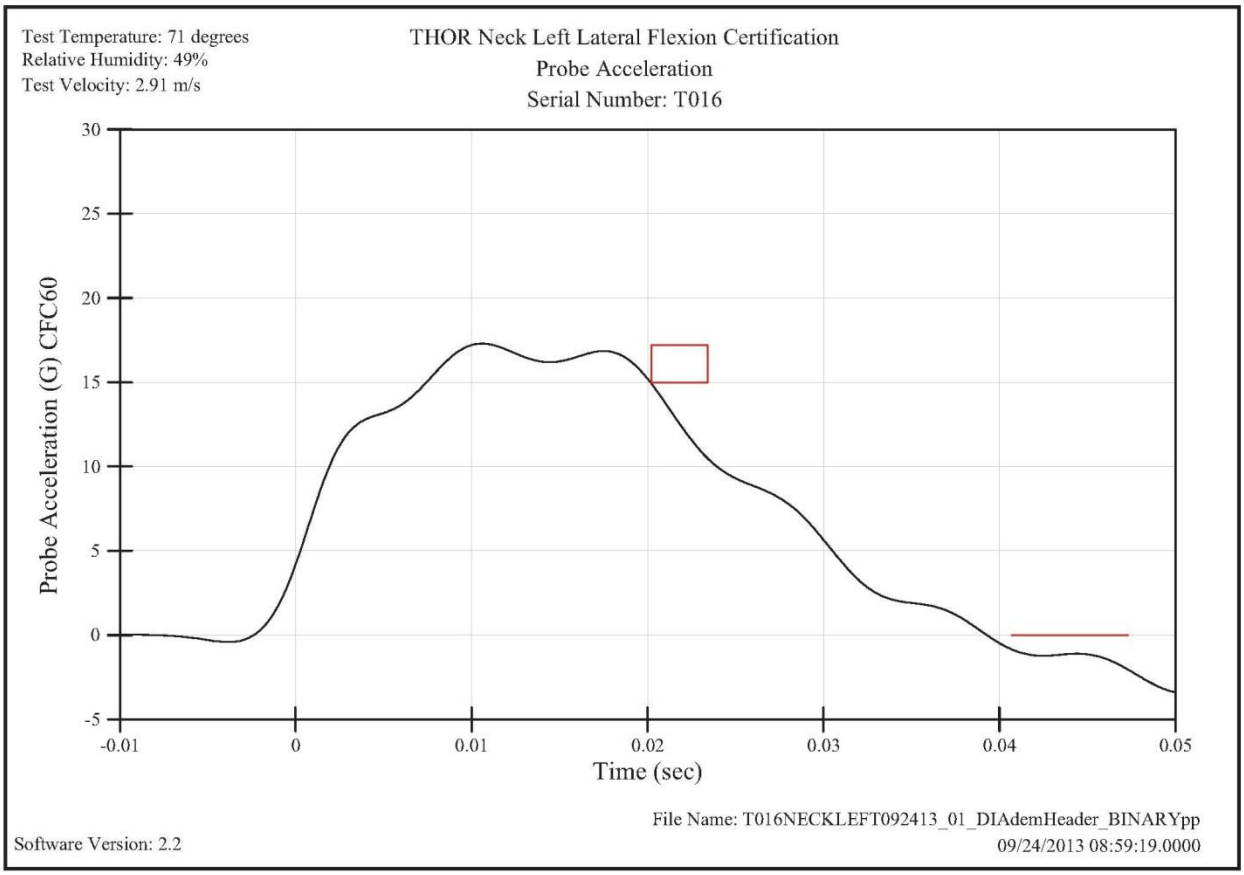
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Relative Humidity: 49%
Test Velocity: 2.91 m/s
THOR Neck Left Lateral Flexion Certification
Probe Acceleration
Serial Number: T016
Probe Acceleration (G) CFC60
30
25
20
15
10
5
0
-5
-0.01
0
0.01
0.02
0.03
0.04
0.05
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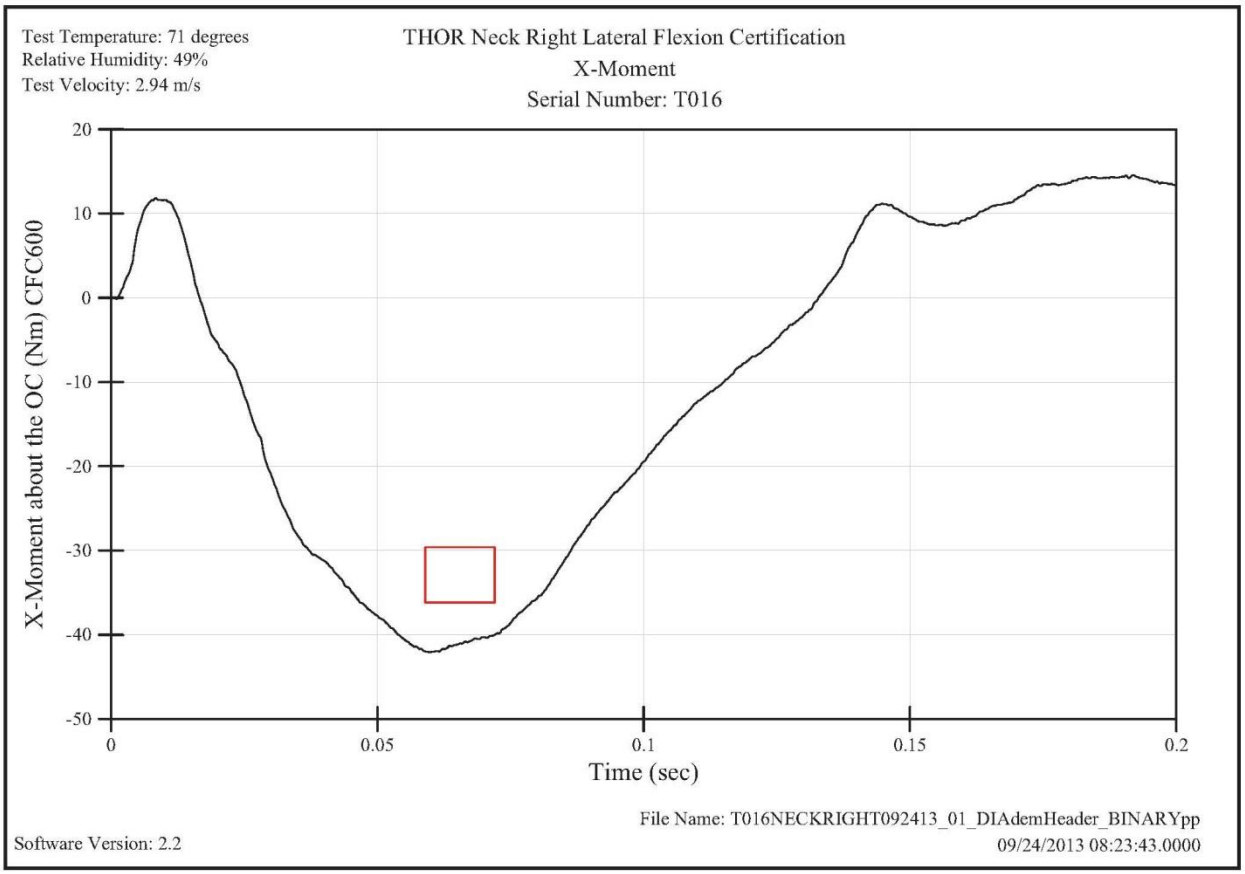
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Relative Humidity: 49%
Test Velocity: 2.94 m/s
THOR Neck Right Lateral Flexion Certification
X-Moment
Serial Number: T016
X-Moment about the OC (Nm) CFC600
20
10
0
-10
-20
-30
-40
-50
0
0.05
0.1
0.15
0.2
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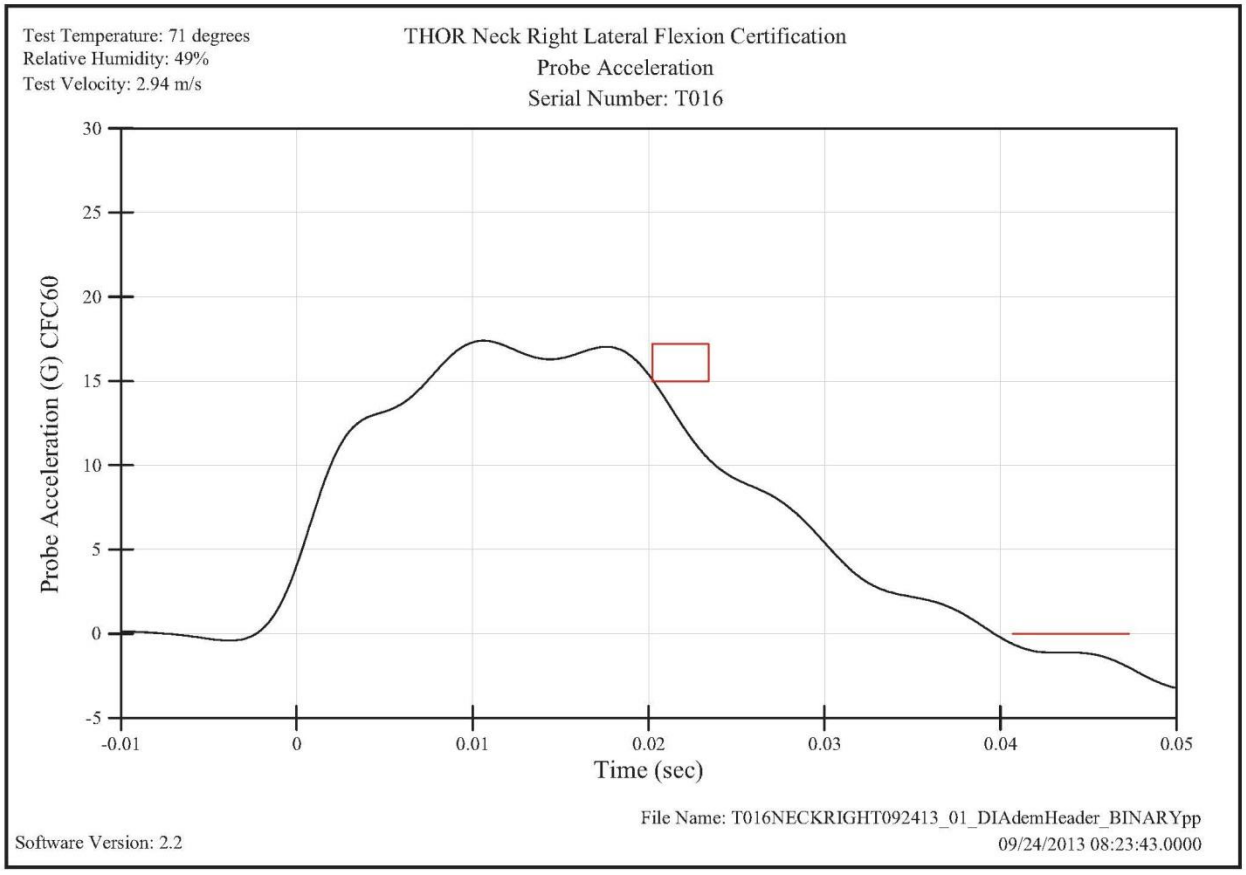
Software Version: 2.2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Relative Humidity: 49%
Test Velocity: 2.94 m/s
THOR Neck Right Lateral Flexion Certification
Probe Acceleration
Serial Number: T016
Probe Acceleration (G) CFC60
Time (sec)
30
25
20
15
10
5
0
-5
-0.01
0
0.01
0.02
0.03
0.04
0.05
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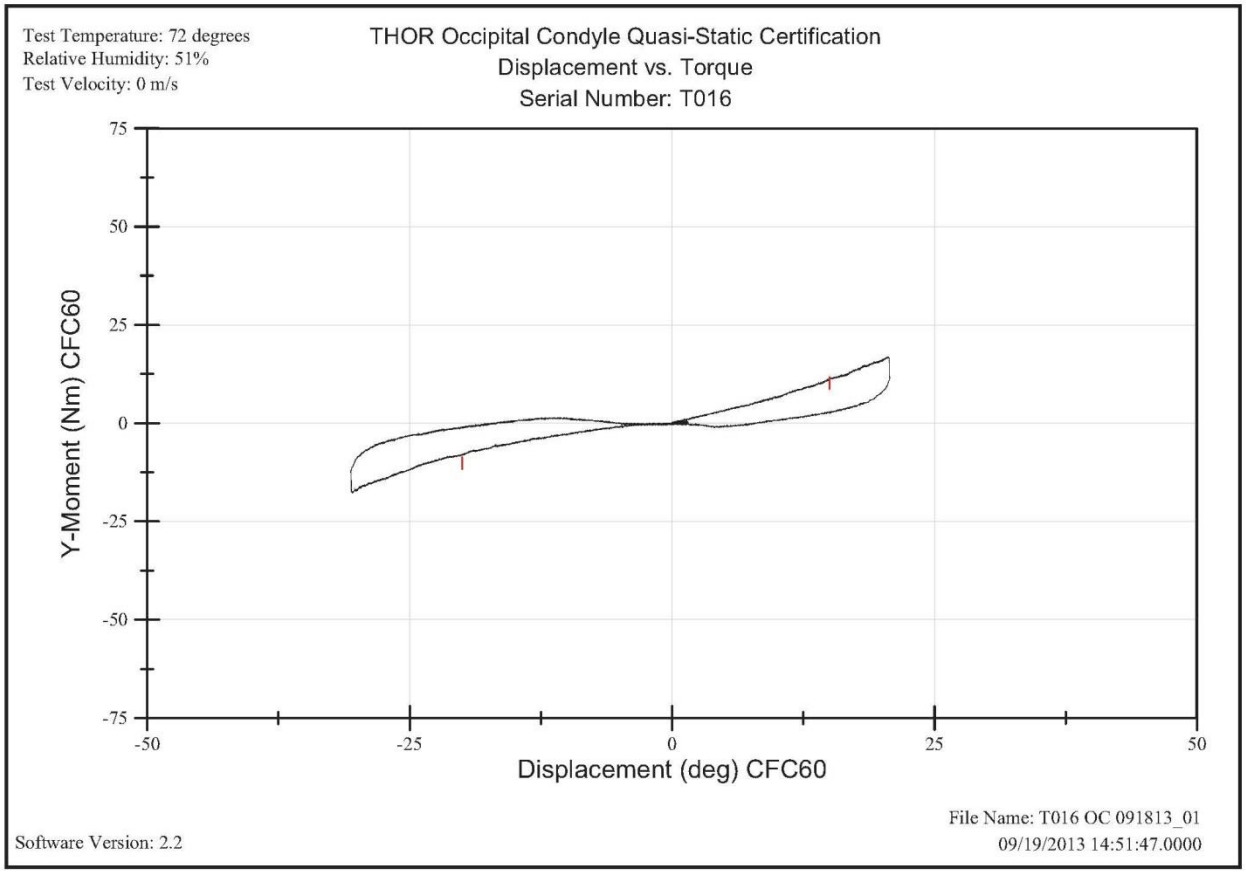
Software Version: 2.2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Relative Humidity: 51%
Test Velocity: 0 m/s
THOR Occipital Condyle Quasi-Static Certification
Displacement vs. Torque
Serial Number: T016
Y-Moment (Nm) CFC60
Displacement (deg) CFC60
75
50
25
0
-25
-50
-75
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-25
0
25
50
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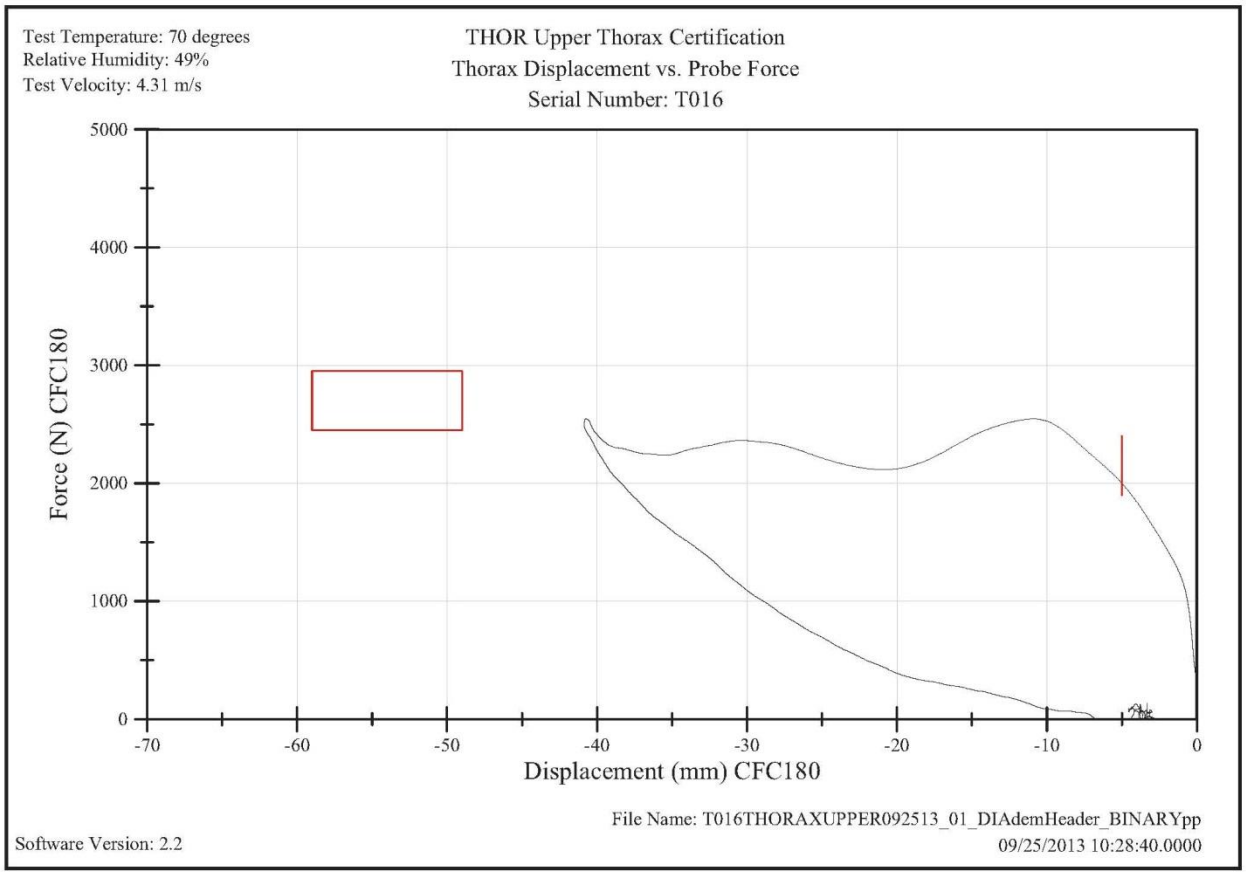
Software Version: 2.2


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
Force (N) CFC180
5000
4000
3000
2000
1000
0
-70
-60
-50
-40
-30
-20
-10
0
Displacement (mm) CFC180
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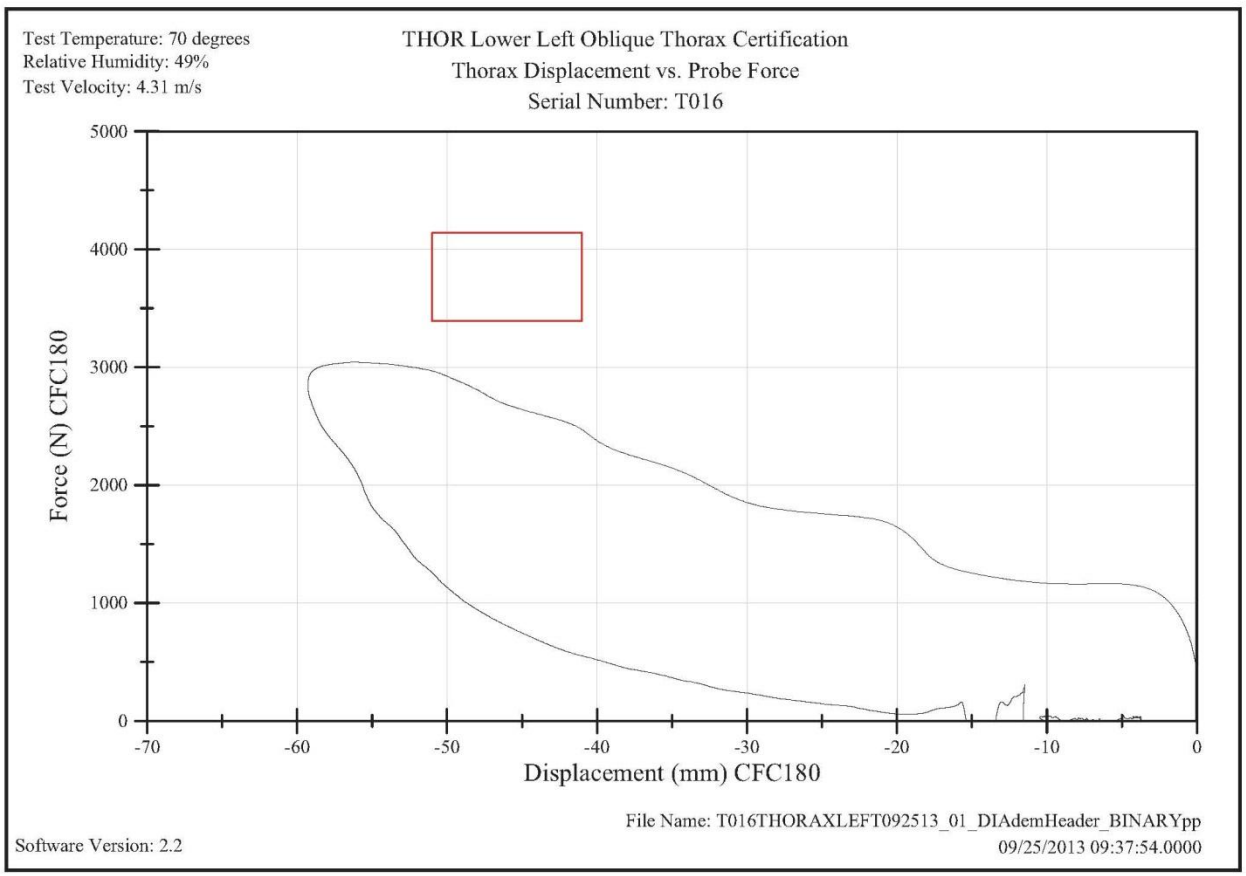
Software Version: 2.2


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
Force (N) CFC180
5000
4000
3000
2000
1000
0
-70
-60
-50
-40
-30
-20
-10
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Displacement (mm) CFC180
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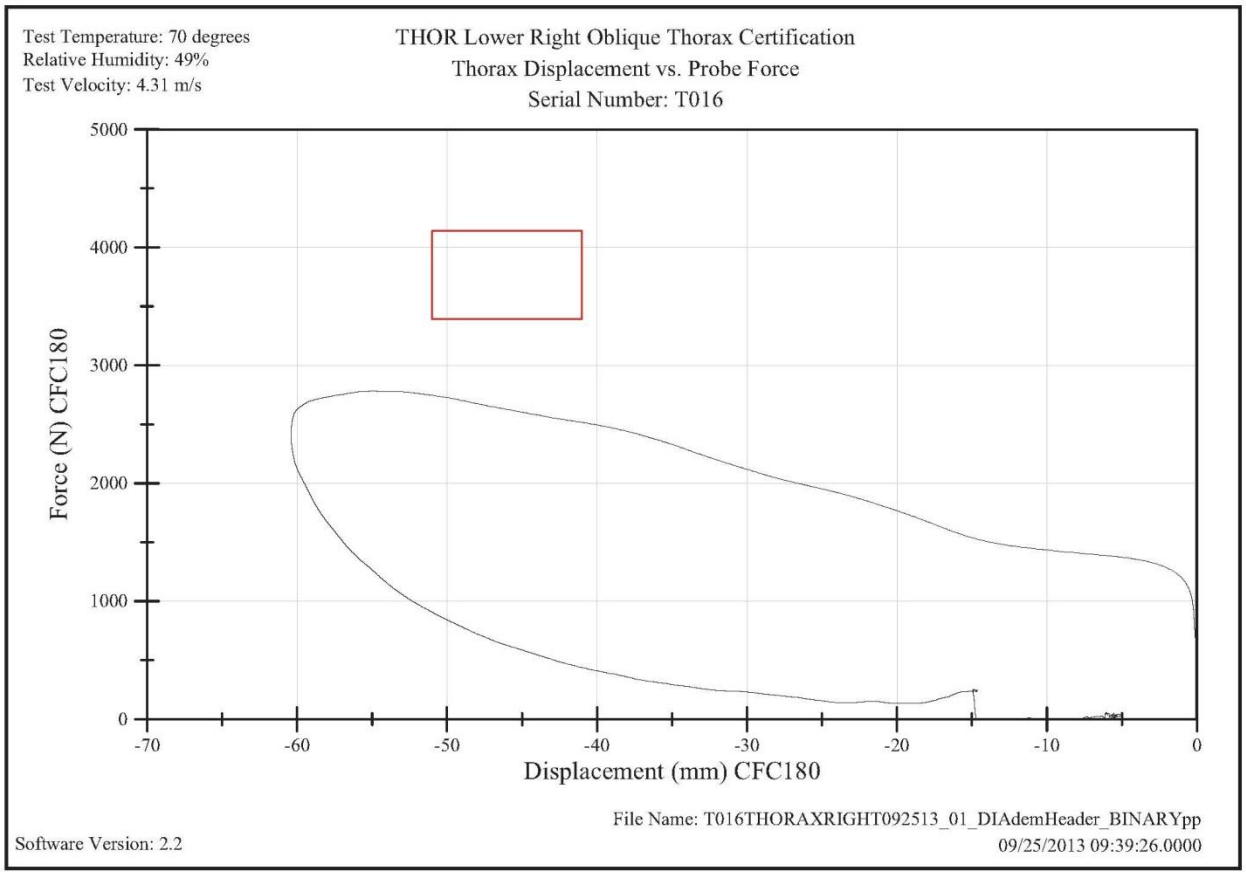
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THOR Lower Right Oblique Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T016
Force (N) CFC180
5000
4000
3000
2000
1000
0
-70
-60
-50
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-30
-20
-10
0
Displacement (mm) CFC180
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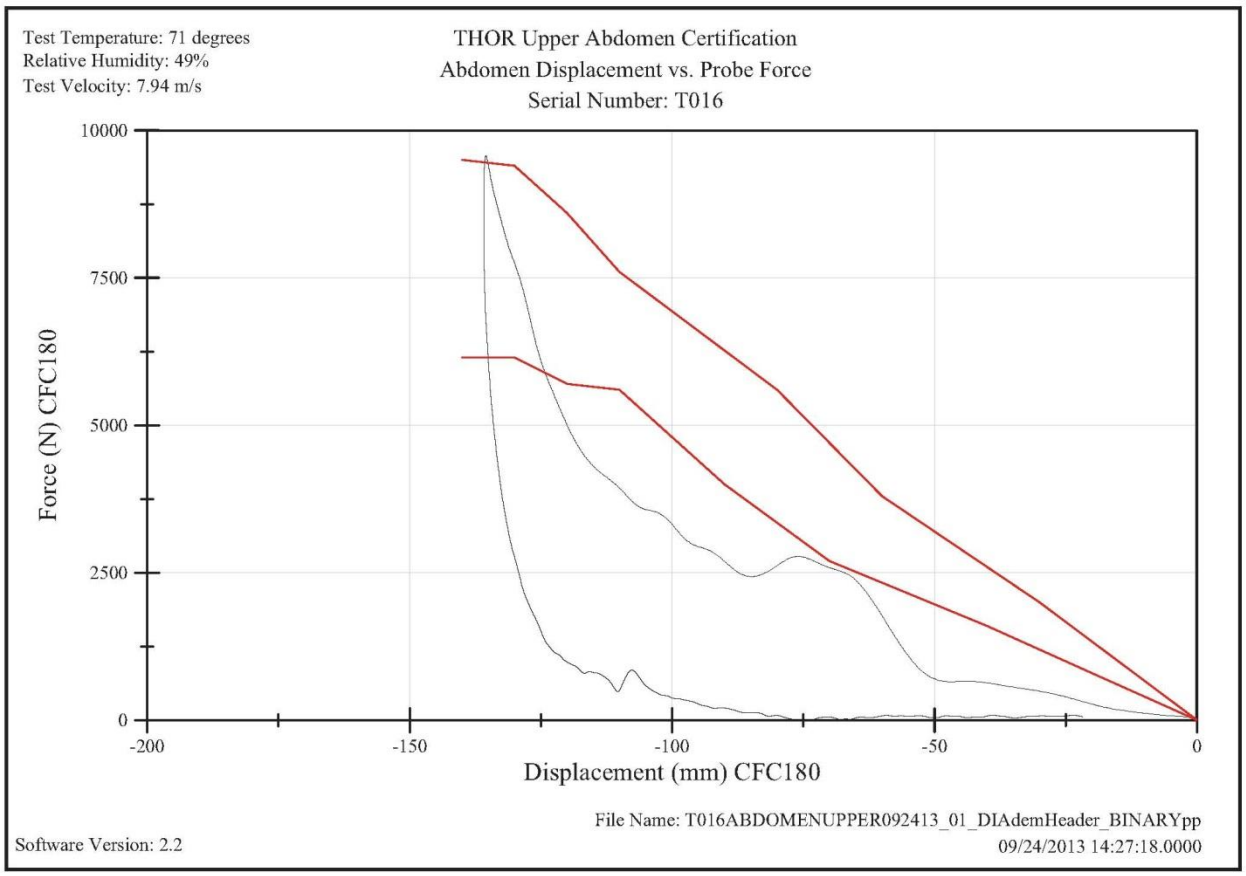
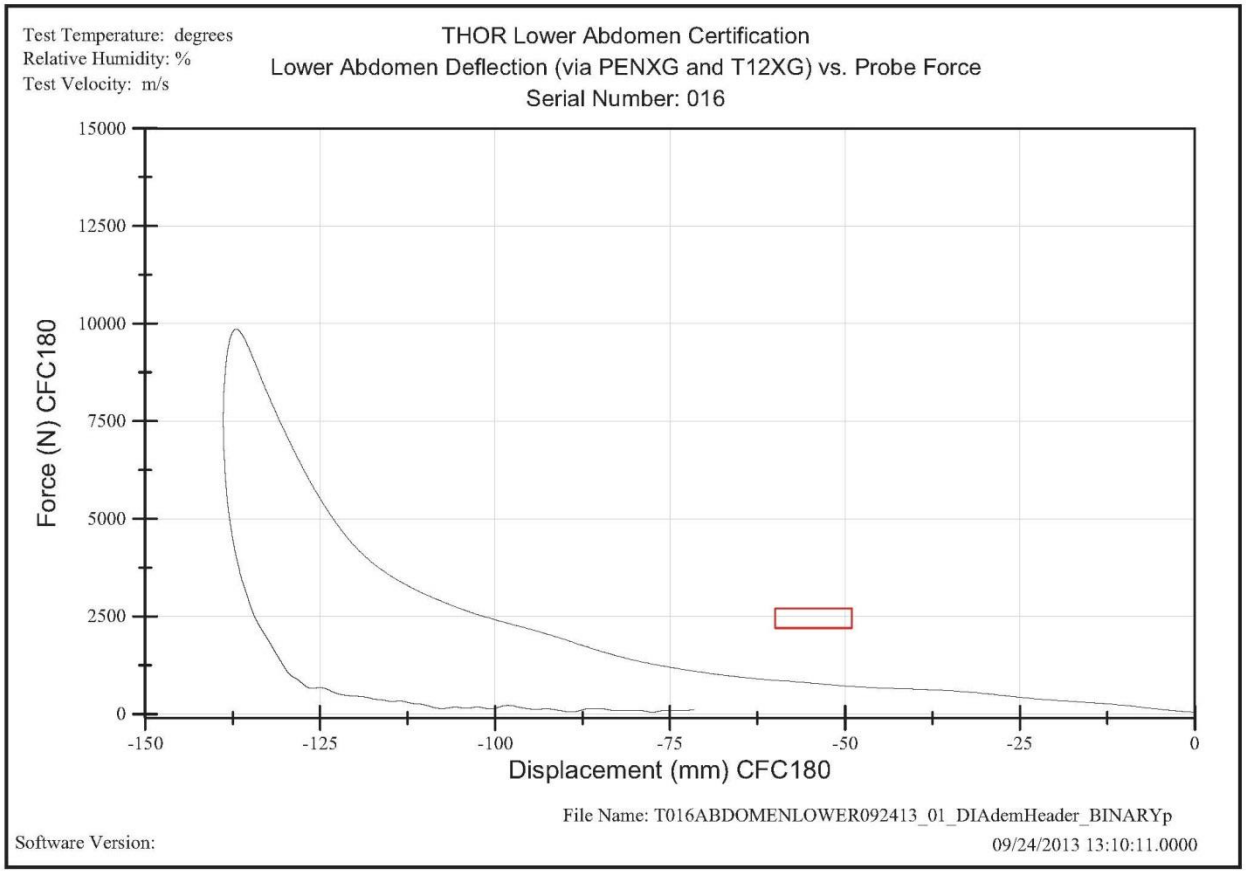
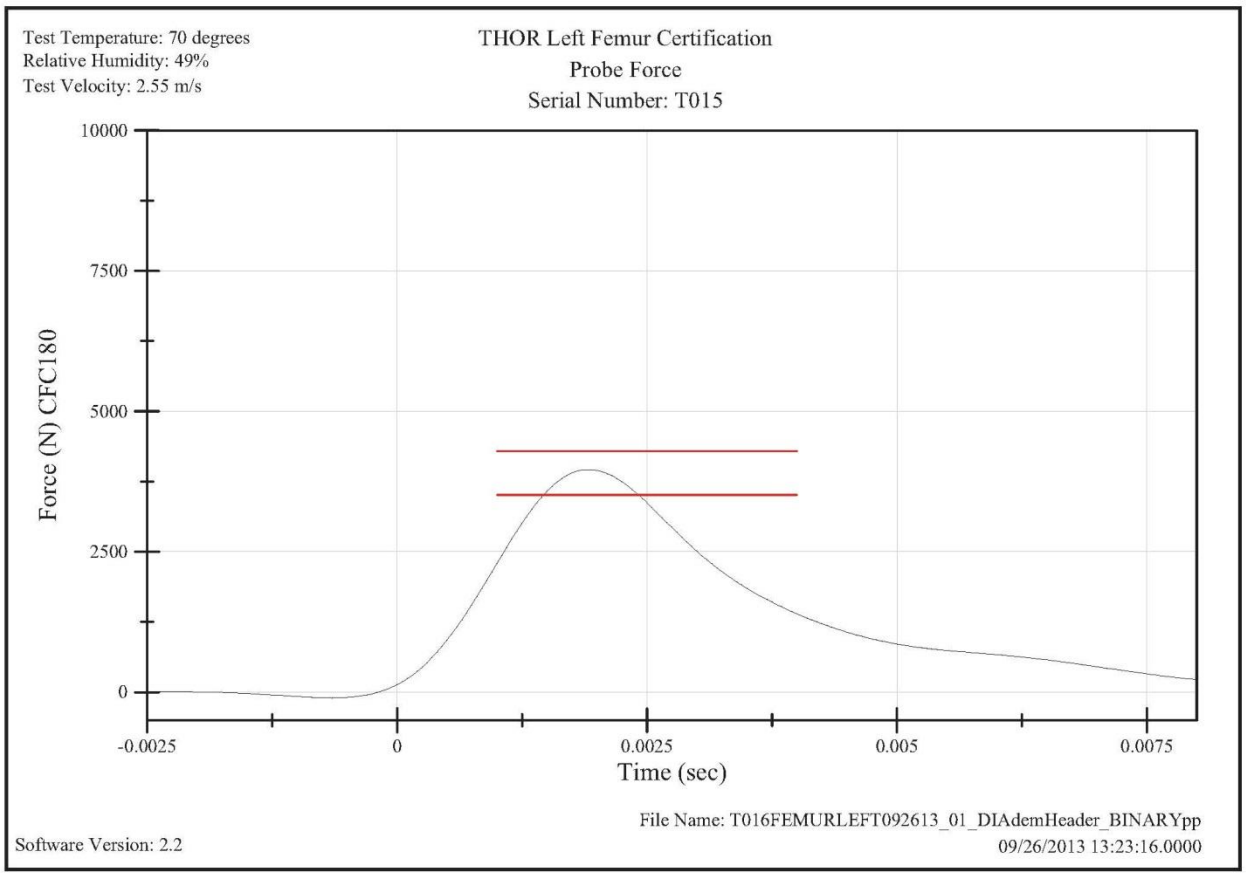
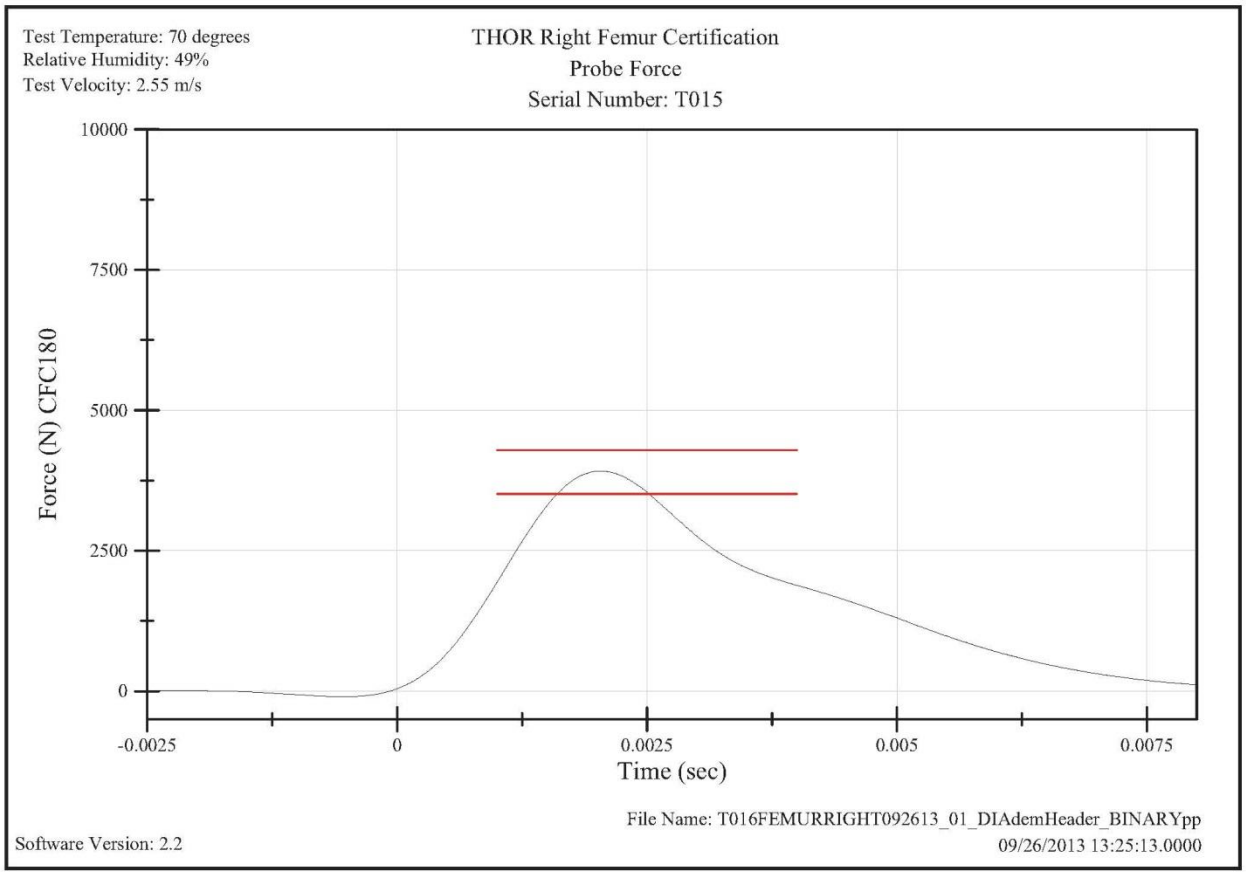
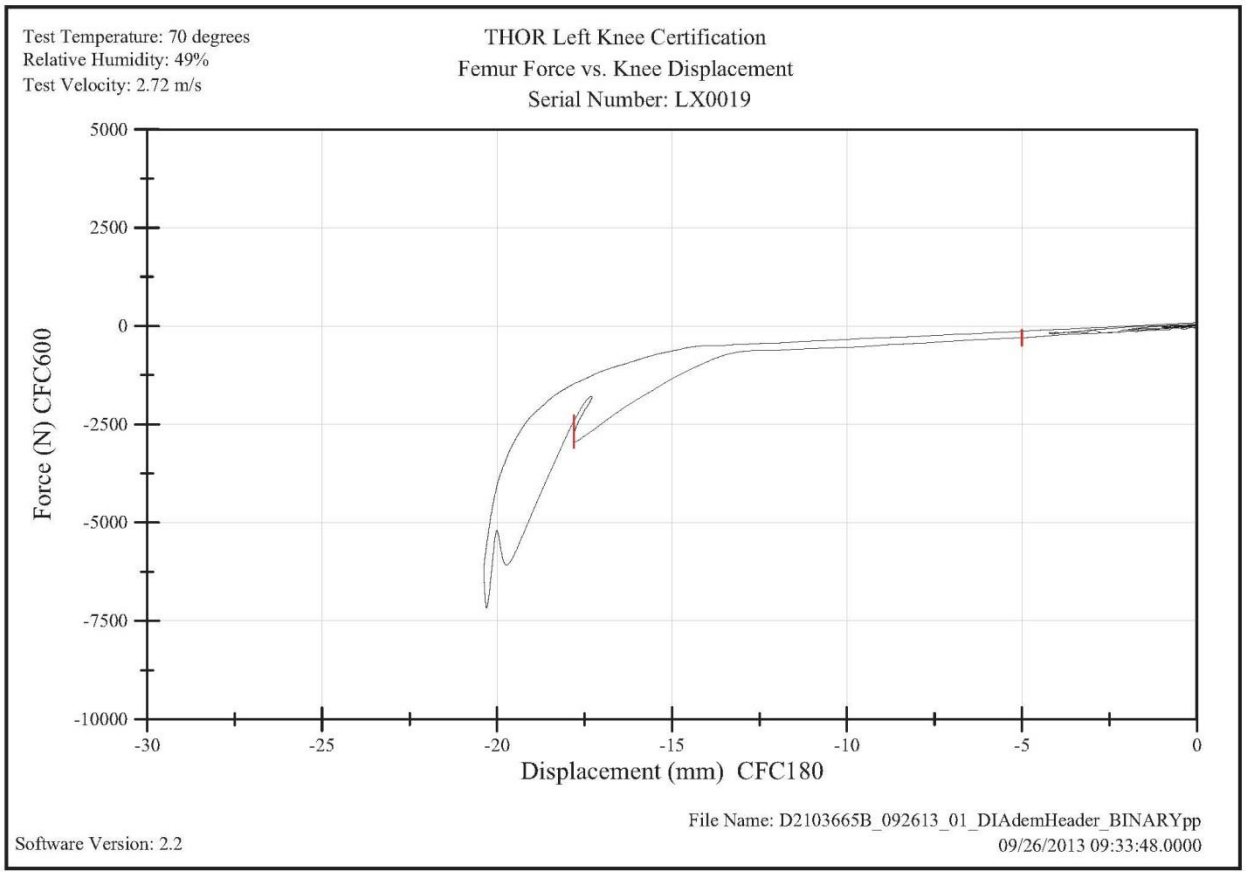
09/25/2013 09:39:26.0000
Software Version: 2.2

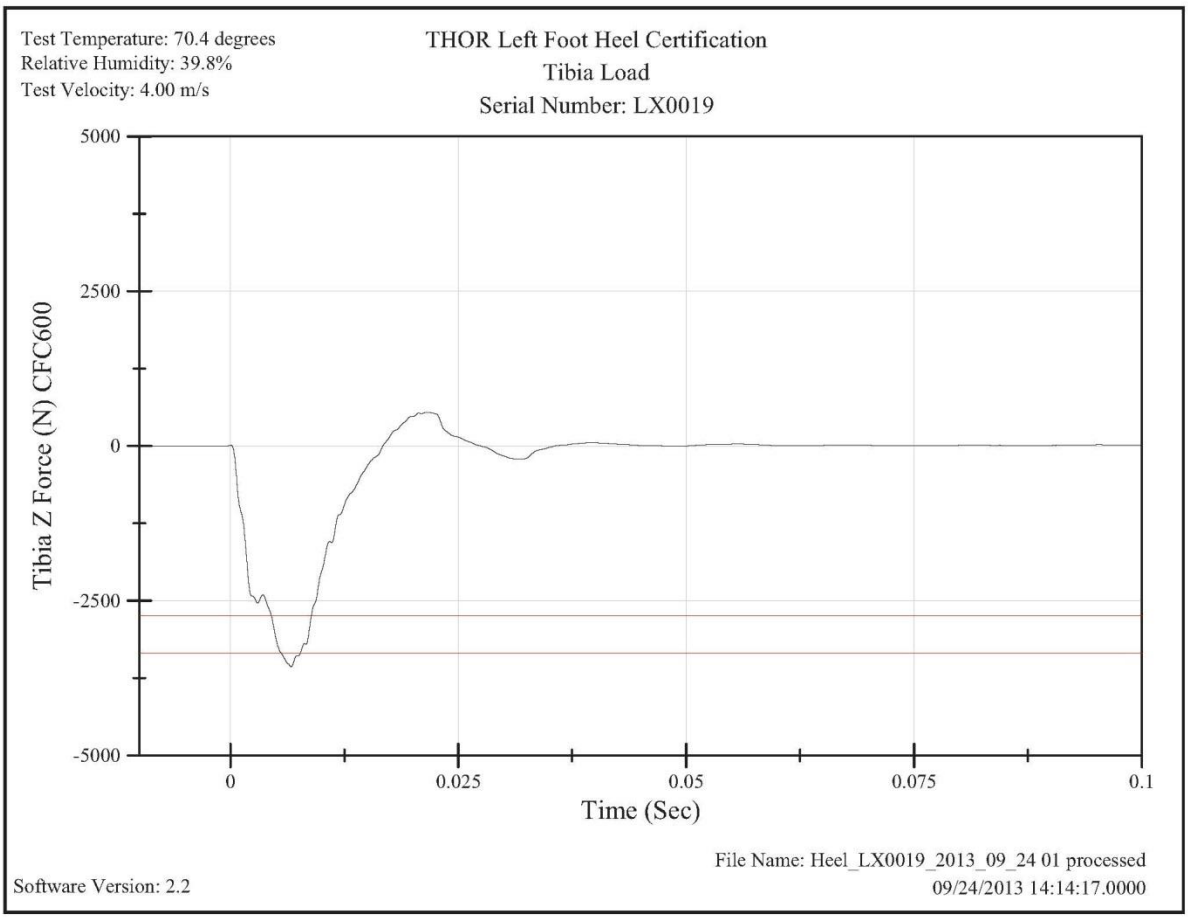

Test Temperature: 71 degrees
Relative Humidity: 49%
Test Velocity: 7.94 m/s
THOR Upper Abdomen Certification
Abdomen Displacement vs. Probe Force
Serial Number: T016
Force (N) CFC180
10000
7500
5000
2500
0
-200
-150
-100
-50
0
Displacement (mm) CFC180
File Name: T016ABDOMENUPPER092413_01_DIAdemHeader_BINARYpp
09/24/2013 14:27:18.0000
Software Version: 2.2

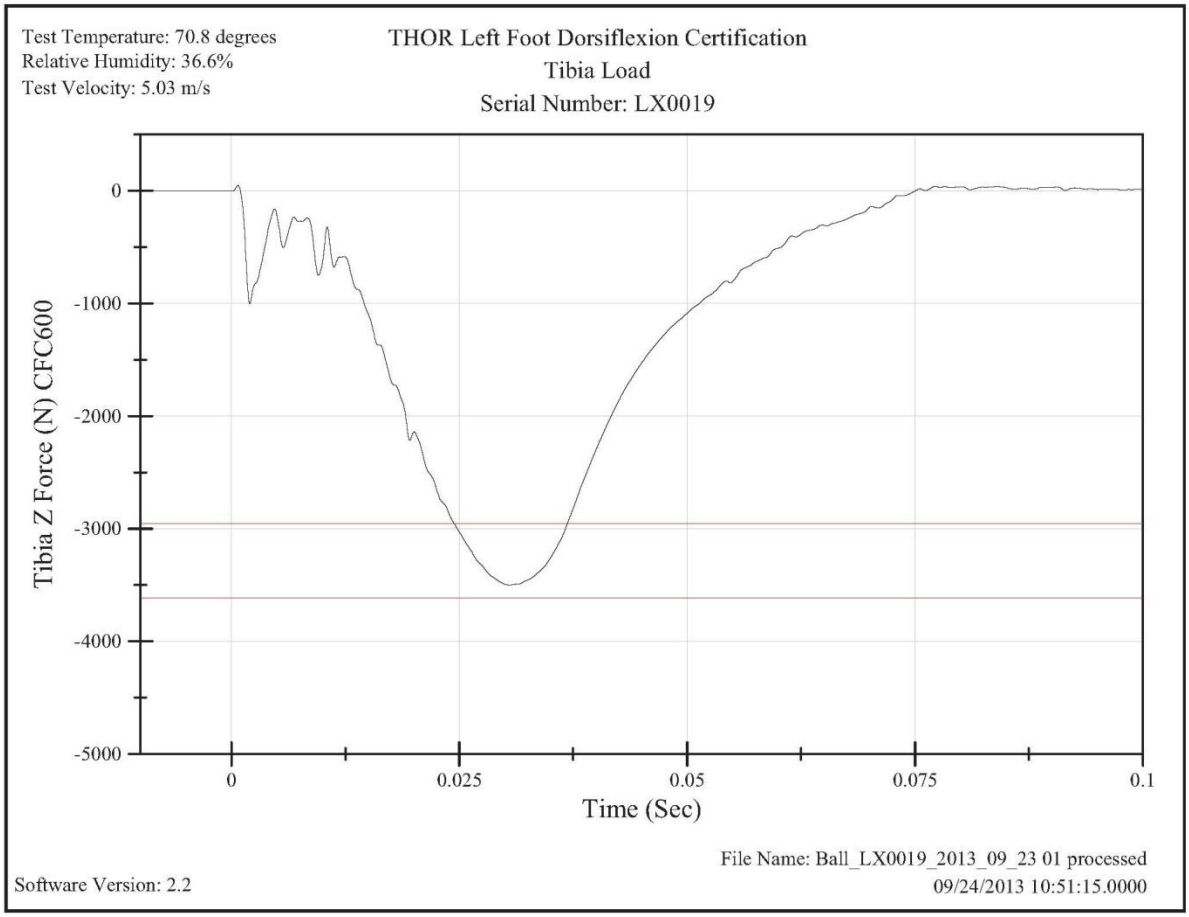

Test Temperature: degrees
Relative Humidity: %
Test Velocity: m/s
THOR Lower Abdomen Certification
Lower Abdomen Deflection (via PENXG and T12XG) vs. Probe Force
Serial Number: 016
Force (N) CFC180
15000
12500
10000
7500
5000
2500
0
-150
-125
-100
-75
-50
-25
0
Displacement (mm) CFC180
File Name: T016ABDOMENLOWER092413_01_DIAdemHeader_BINARYp
Software Version:
09/24/2013 13:10:11.0000

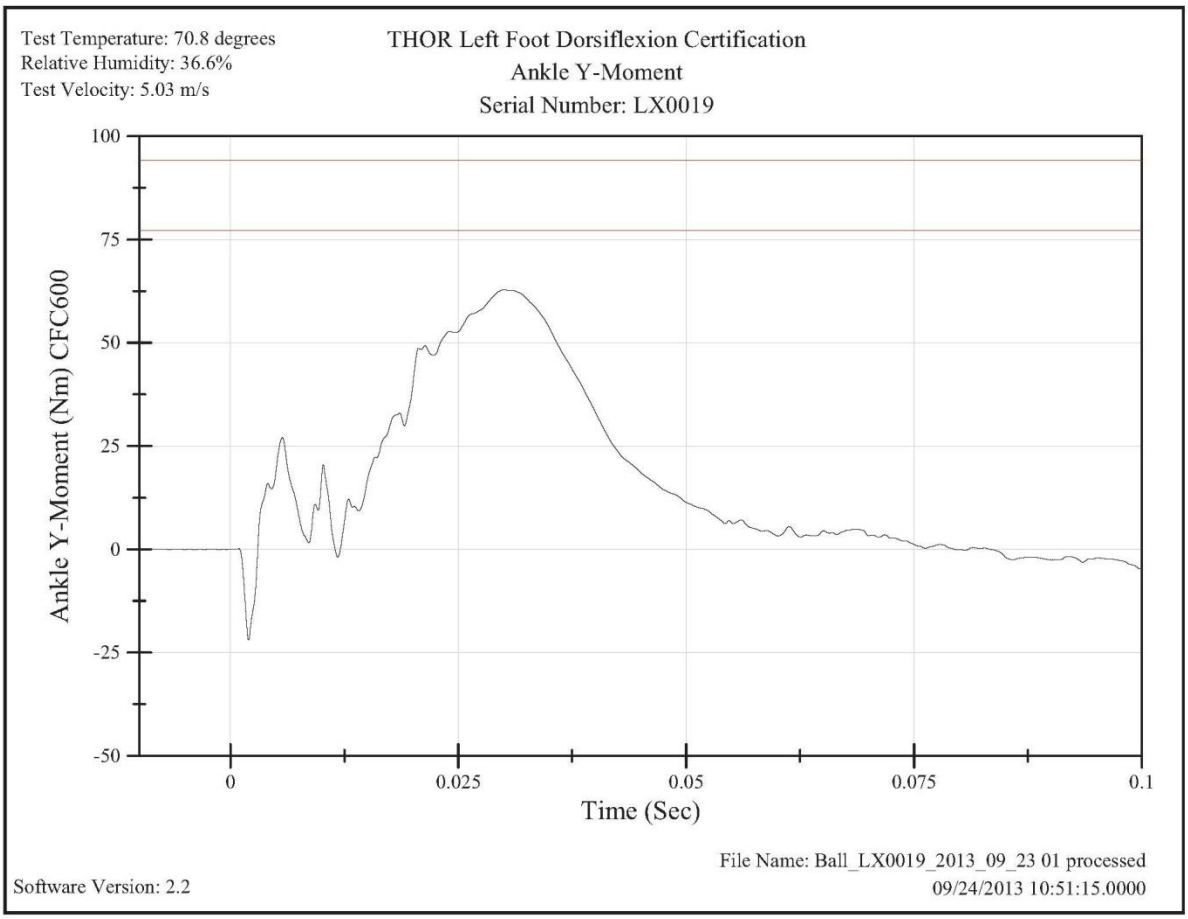

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 2.55 m/s
THOR Left Femur Certification
Probe Force
Serial Number: T015
Force (N) CFC180
10000
7500
5000
2500
0
-0.0025
0
0.0025
0.005
0.0075
Time (sec)
File Name: T016FEMURLEFT092613_01_DIAdemHeader_BINARYpp
Software Version: 2.2
09/26/2013 13:23:16.0000

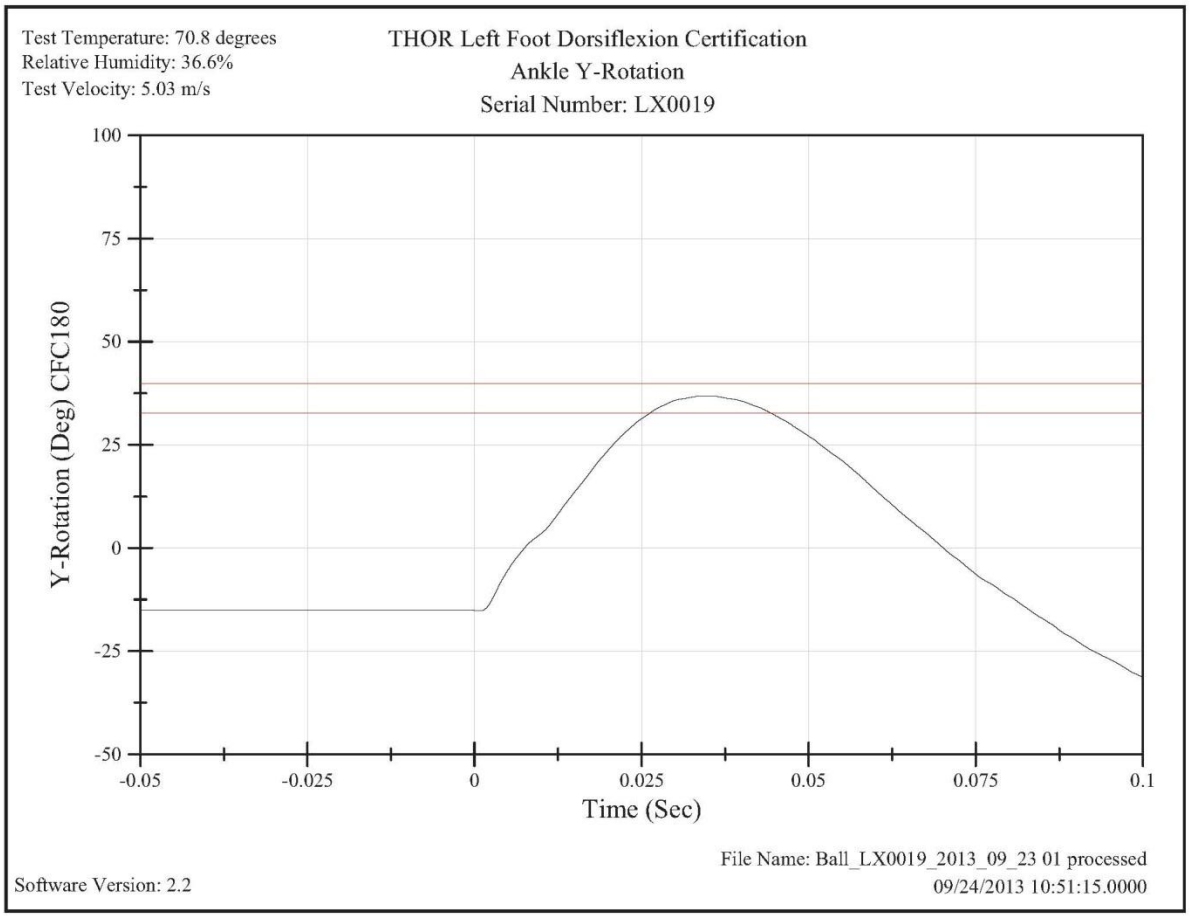

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 2.55 m/s
THOR Right Femur Certification
Probe Force
Serial Number: T015
10000
7500
5000
2500
0
Force (N) CFC180
-0.0025
0
0.0025
0.005
0.0075
Time (sec)
File Name: T016FEMURRIGHT092613_01_DIAdemHeader_BINARYpp
Software Version: 2.2
09/26/2013 13:25:13.0000

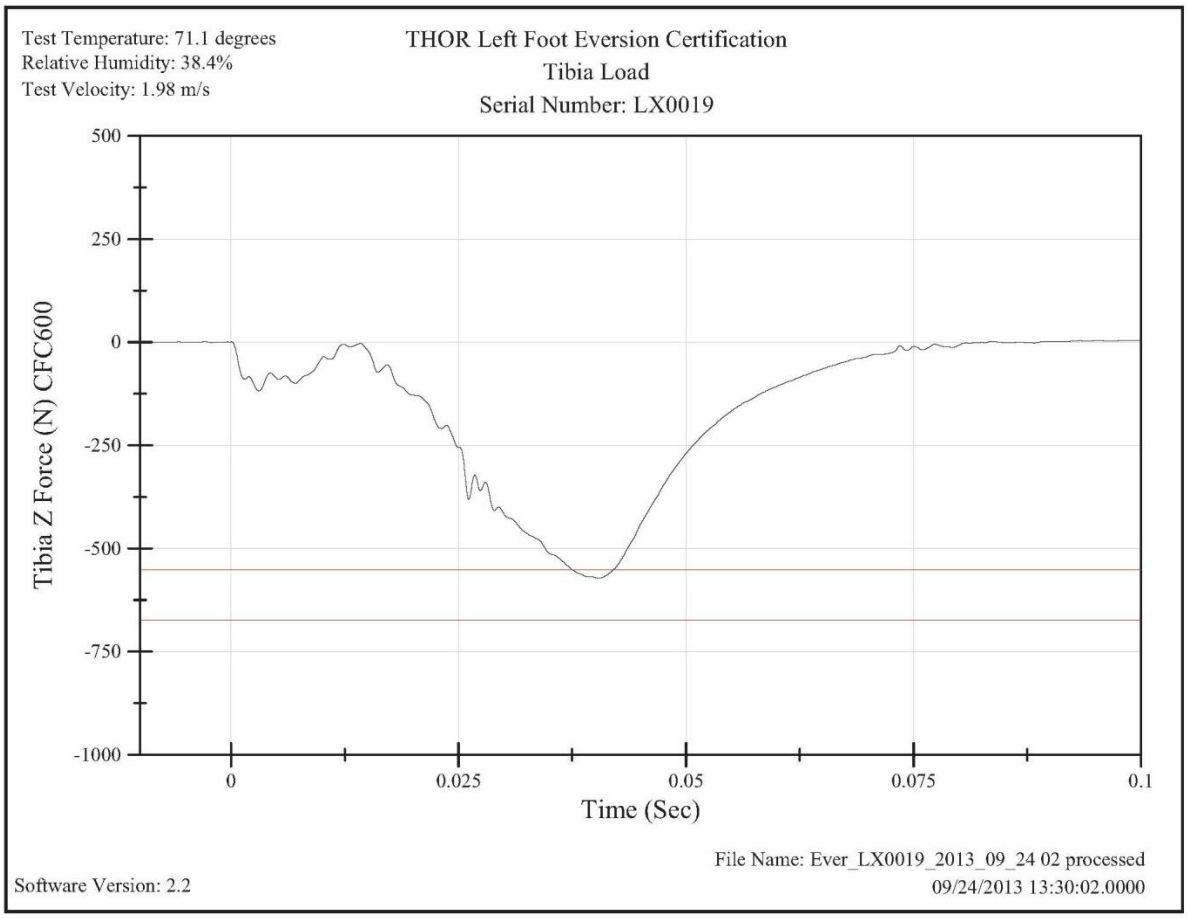

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 2.72 m/s
THOR Left Knee Certification
Femur Force vs. Knee Displacement
Serial Number: LX0019
Force (N) CFC600
5000
2500
0
-2500
-5000
-7500
-10000
-30
-25
-20
-15
-10
-5
0
Displacement (mm) CFC180
File Name: D2103665B_092613_01_DIAdemHeader_BINARYpp
09/26/2013 09:33:48.0000
Software Version: 2.2

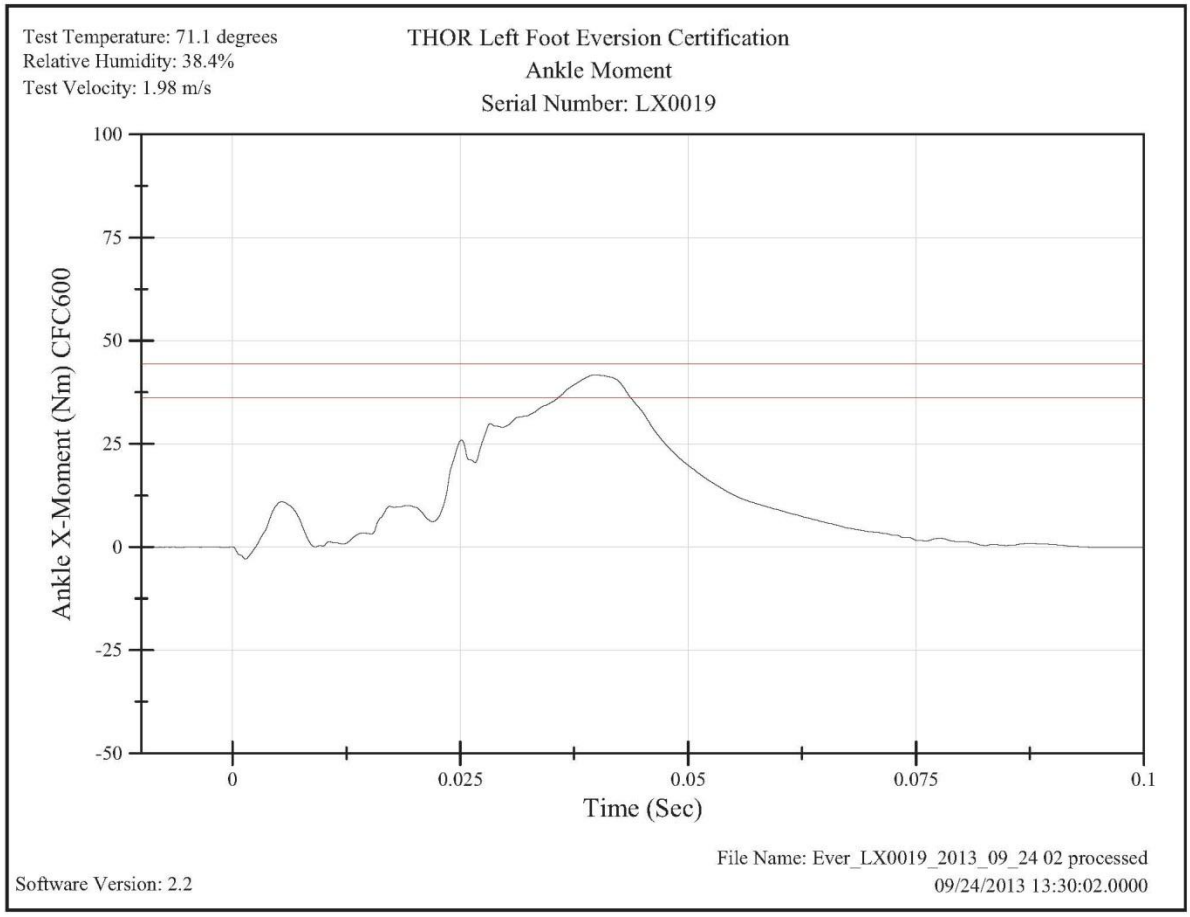

Test Temperature: 70.4 degrees
Relative Humidity: 39.8%
Test Velocity: 4.00 m/s
THOR Left Foot Heel Certification
Tibia Load
Serial Number: LX0019
Tibia Z Force (N) CFC600
5000
2500
0
-2500
-5000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Heel_LX0019_2013_09_24 01 processed
09/24/2013 14:14:17.0000
Software Version: 2.2

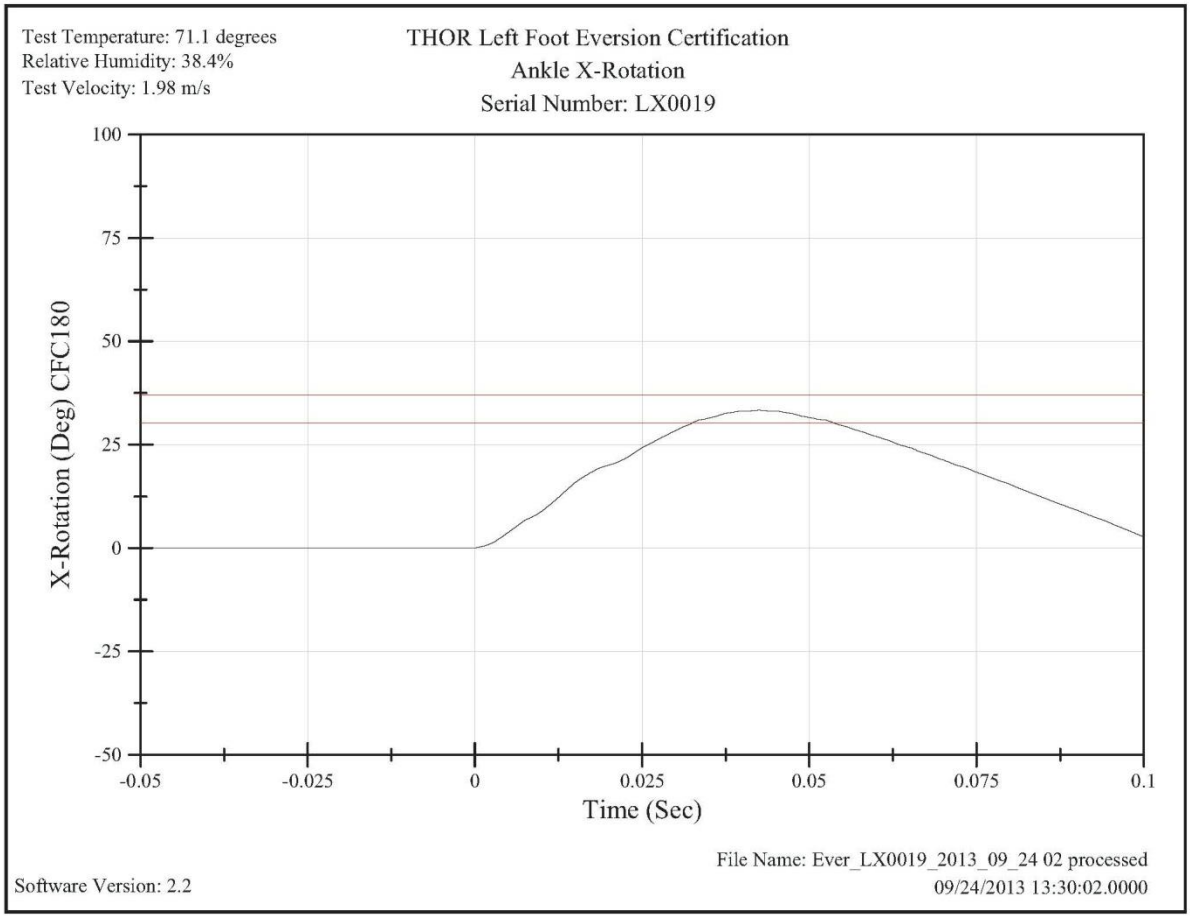

Test Temperature: 70.8 degrees
Relative Humidity: 36.6%
Test Velocity: 5.03 m/s
THOR Left Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0019
Tibia Z Force (N) CFC600
0
-1000
-2000
-3000
-4000
-5000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ball_LX0019_2013_09_23 01 processed
09/24/2013 10:51:15.0000
Software Version: 2.2

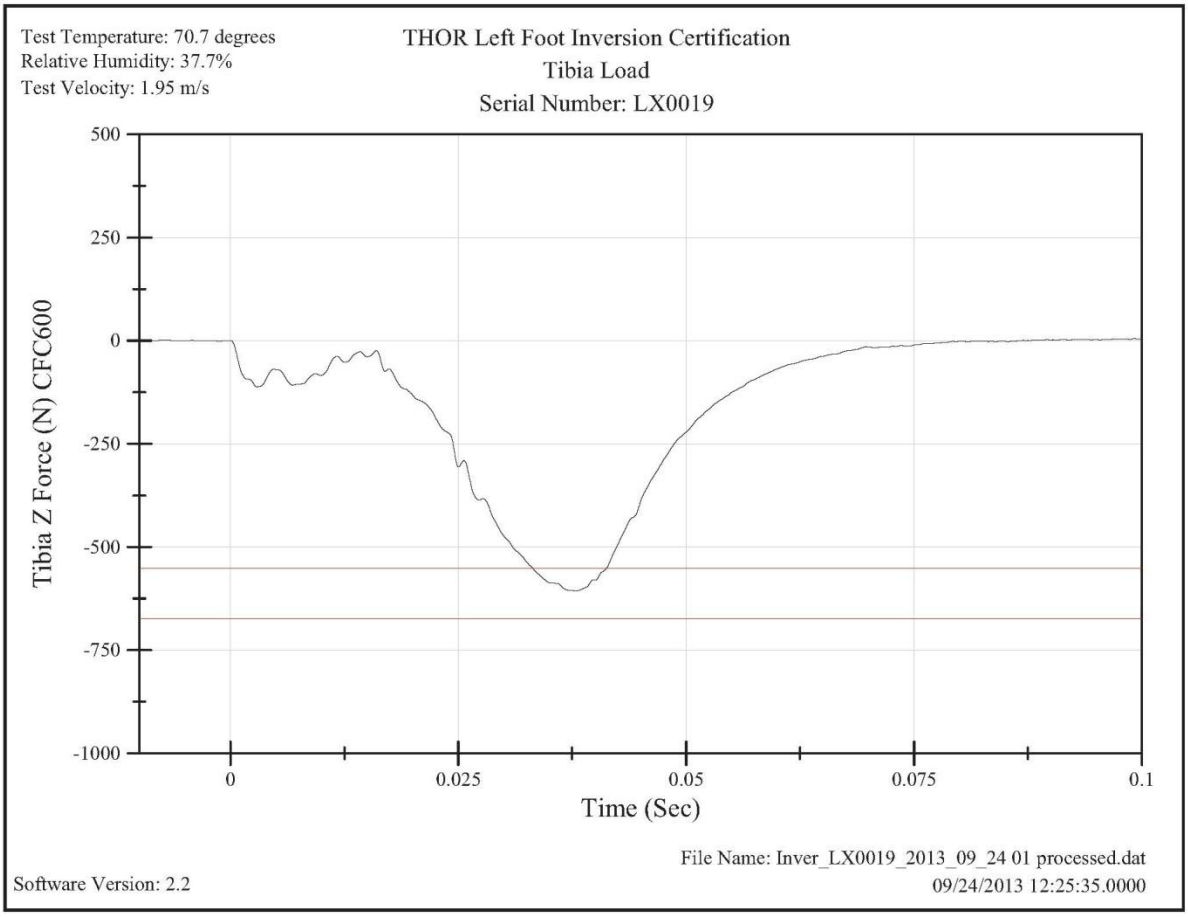

Test Temperature: 70.8 degrees
Relative Humidity: 36.6%
Test Velocity: 5.03 m/s
THOR Left Foot Dorsiflexion Certification
Ankle Y-Moment
Serial Number: LX0019
Ankle Y-Moment (Nm) CFC600
100
75
50
25
0
-25
-50
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ball_LX0019_2013_09_23 01 processed
09/24/2013 10:51:15.0000
Software Version: 2.2

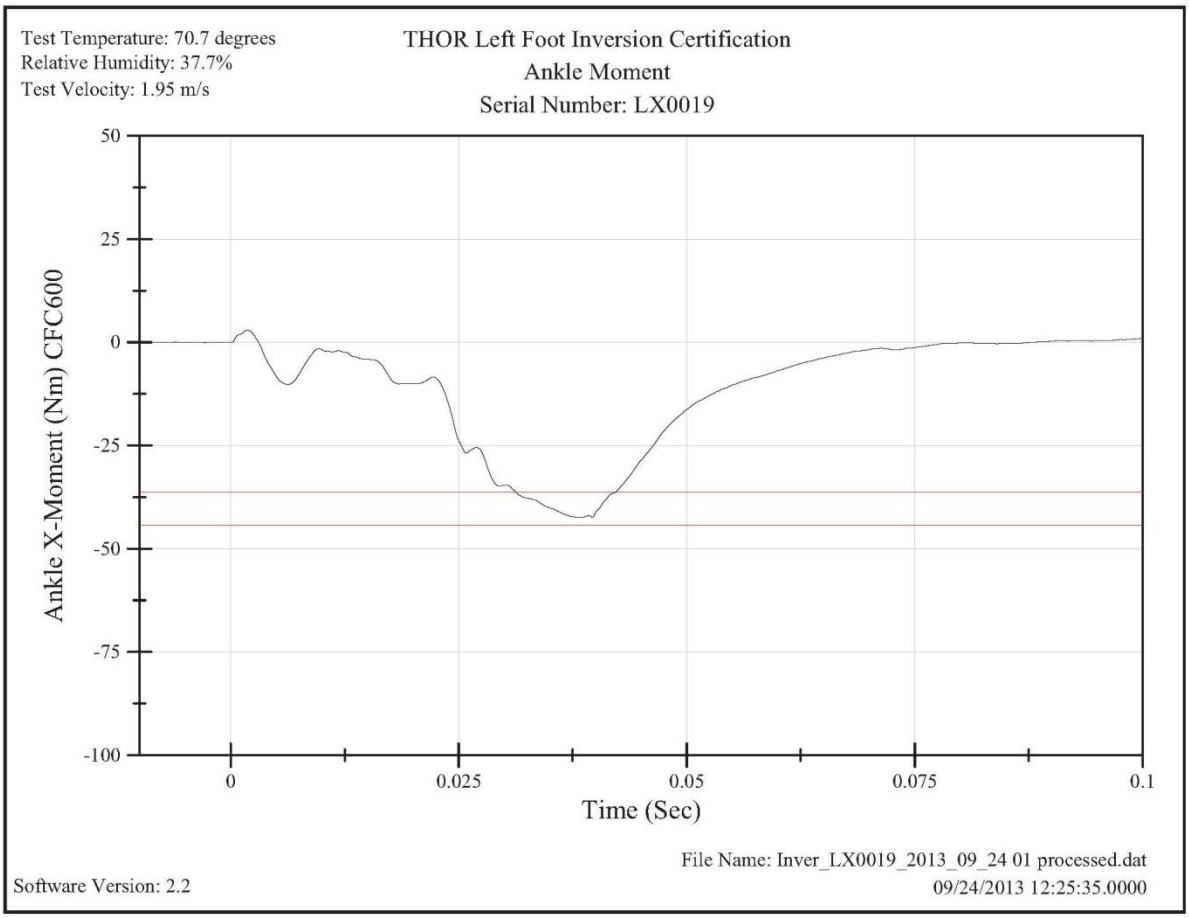

Test Temperature: 70.8 degrees
Relative Humidity: 36.6%
Test Velocity: 5.03 m/s
THOR Left Foot Dorsiflexion Certification
Ankle Y-Rotation
Serial Number: LX0019
Y-Rotation (Deg) CFC180
100
75
50
25
0
-25
-50
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ball_LX0019_2013_09_23 01 processed
09/24/2013 10:51:15.0000
Software Version: 2.2

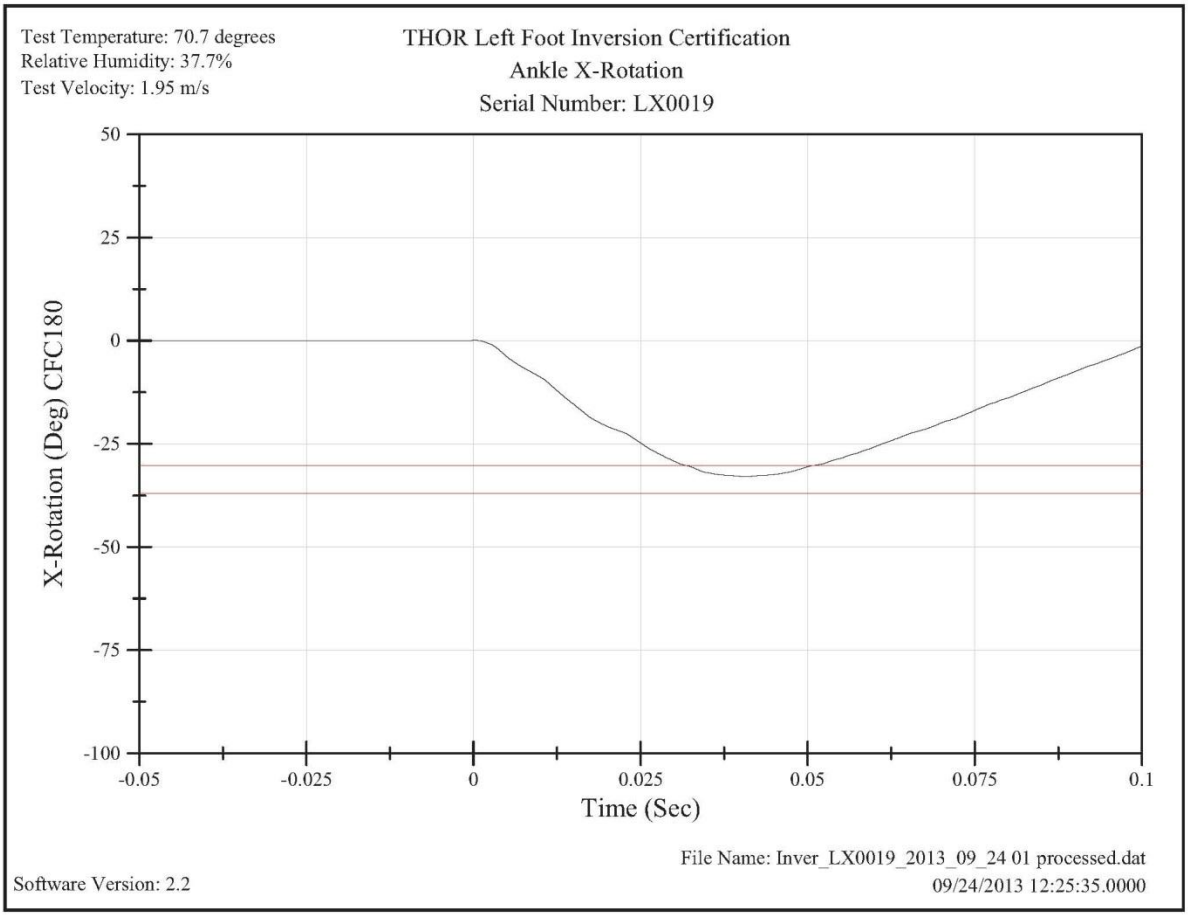

Test Temperature: 71.1 degrees
Relative Humidity: 38.4%
Test Velocity: 1.98 m/s
THOR Left Foot Eversion Certification
Tibia Load
Serial Number: LX0019
Tibia Z Force (N) CFC600
500
250
0
-250
-500
-750
-1000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0019_2013_09_24 02 processed
09/24/2013 13:30:02.0000
Software Version: 2.2

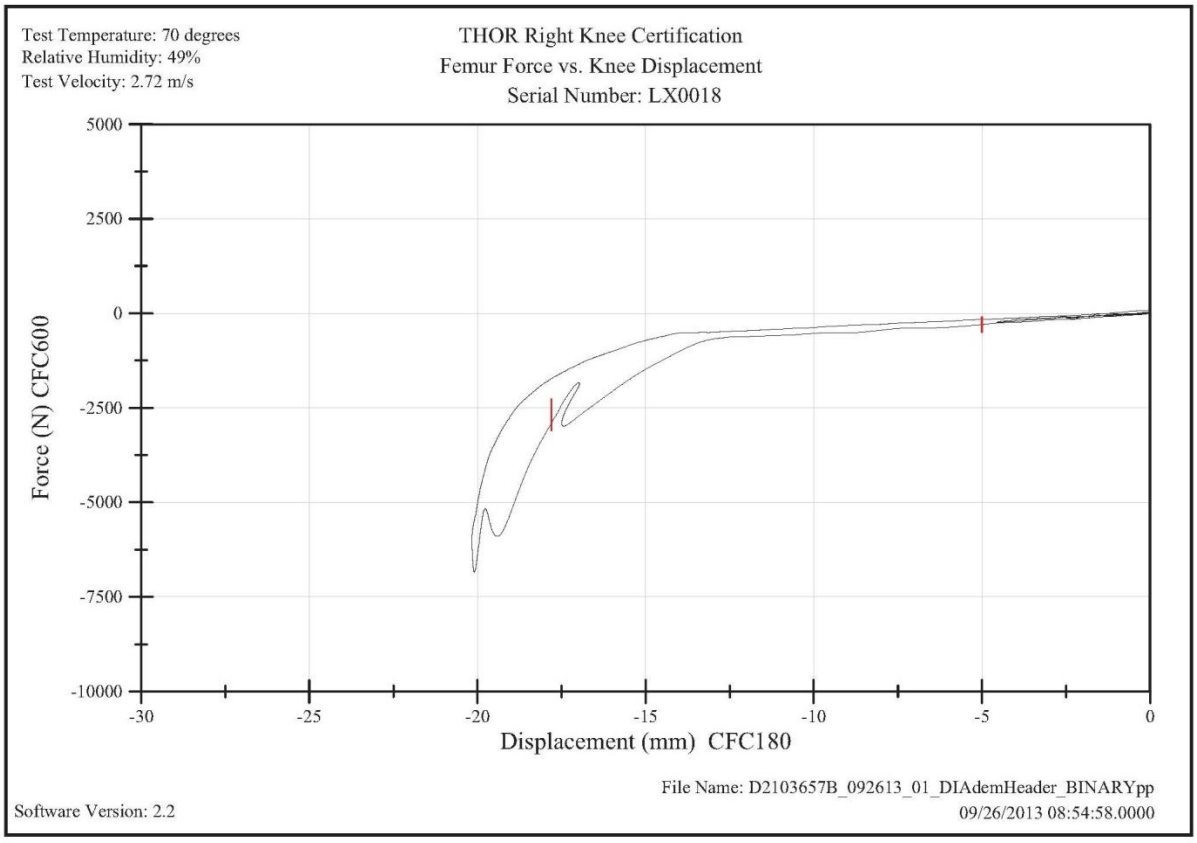

Test Temperature: 71.1 degrees
Relative Humidity: 38.4%
Test Velocity: 1.98 m/s
THOR Left Foot Eversion Certification
Ankle Moment
Serial Number: LX0019
Ankle X-Moment (Nm) CFC600
100
75
50
25
0
-25
-50
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0019_2013_09_24 02 processed
09/24/2013 13:30:02.0000
Software Version: 2.2

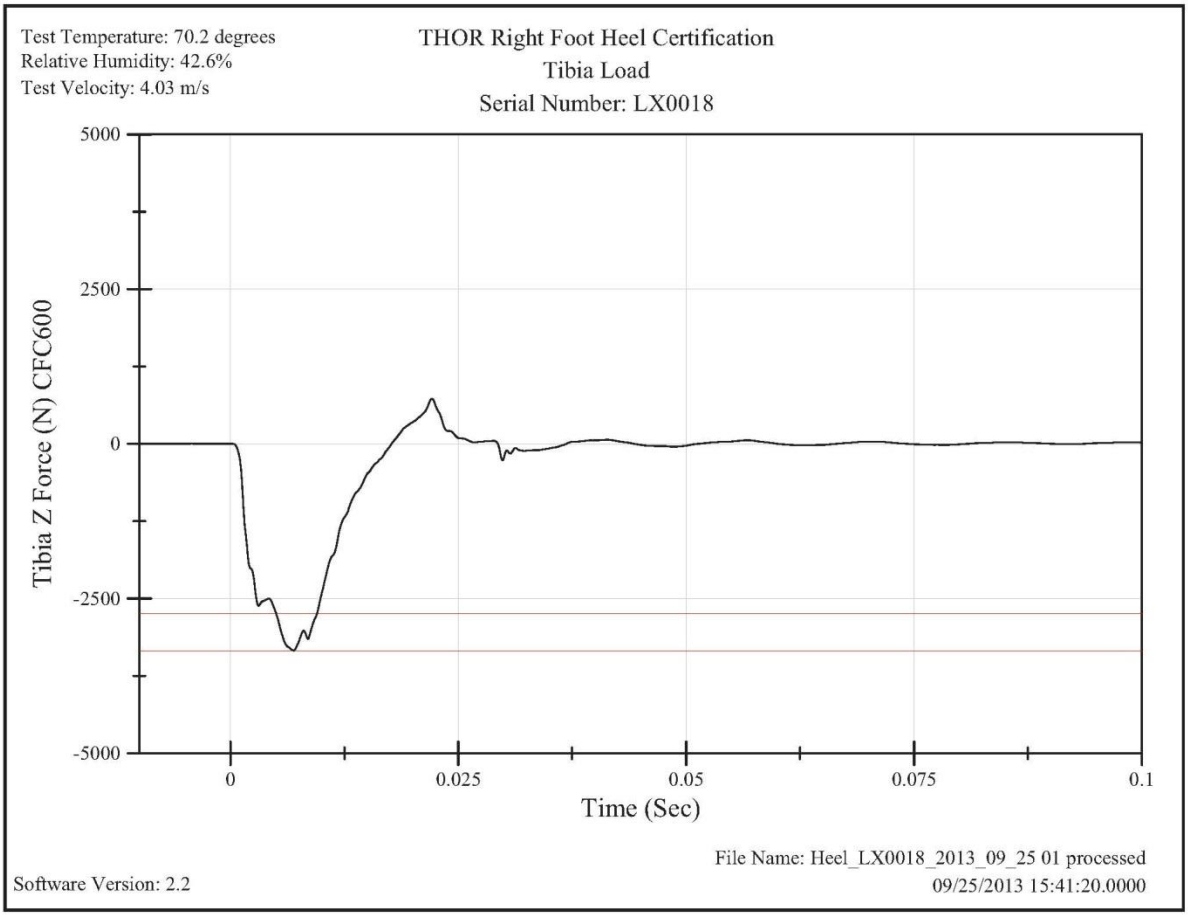

Test Temperature: 71.1 degrees
Relative Humidity: 38.4%
Test Velocity: 1.98 m/s
THOR Left Foot Eversion Certification
Ankle X-Rotation
Serial Number: LX0019
X-Rotation (Deg) CFC180
100
75
50
25
0
-25
-50
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0019_2013_09_24 02 processed
09/24/2013 13:30:02.0000
Software Version: 2.2

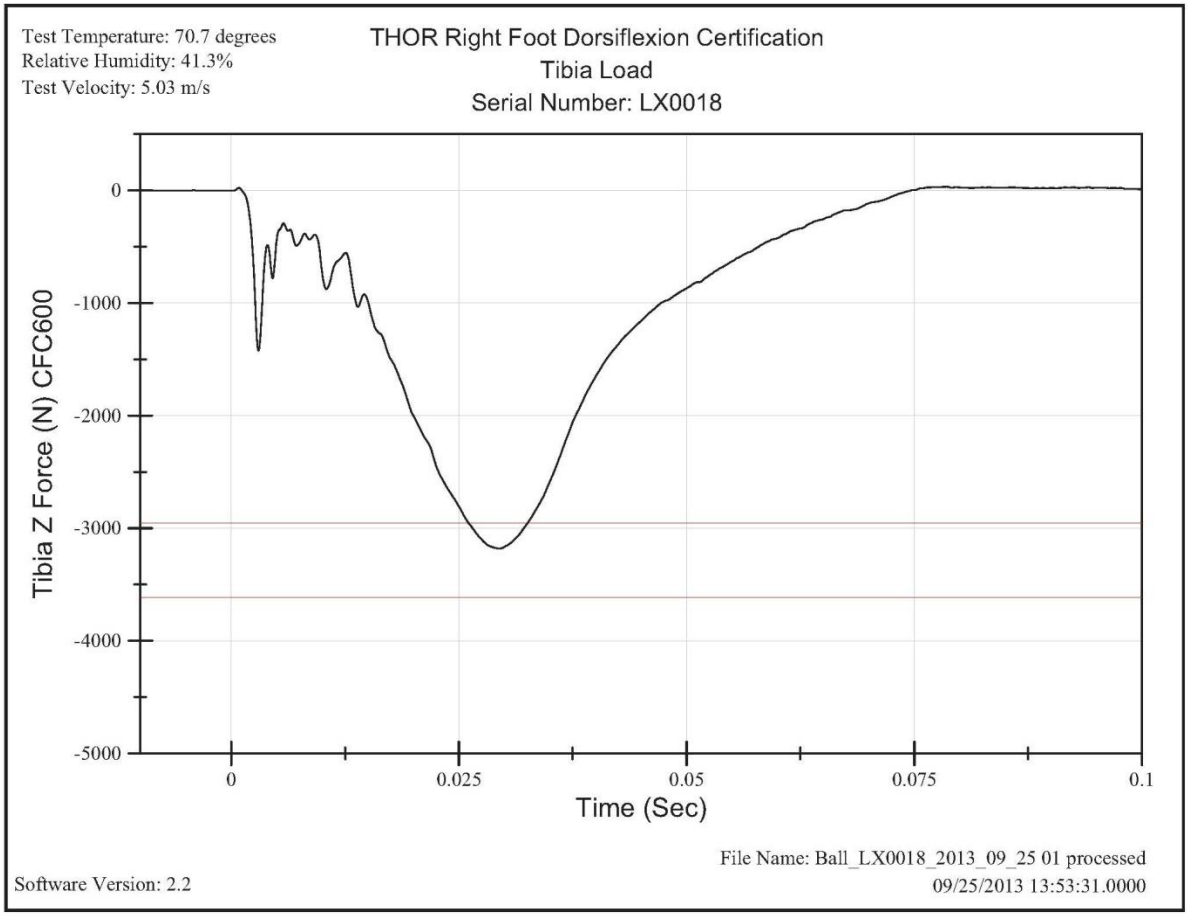

Test Temperature: 70.7 degrees
Relative Humidity: 37.7%
Test Velocity: 1.95 m/s
THOR Left Foot Inversion Certification
Tibia Load
Serial Number: LX0019
Tibia Z Force (N) CFC600
500
250
0
-250
-500
-750
-1000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Inver_LX0019_2013_09_24 01 processed.dat
09/24/2013 12:25:35.0000
Software Version: 2.2

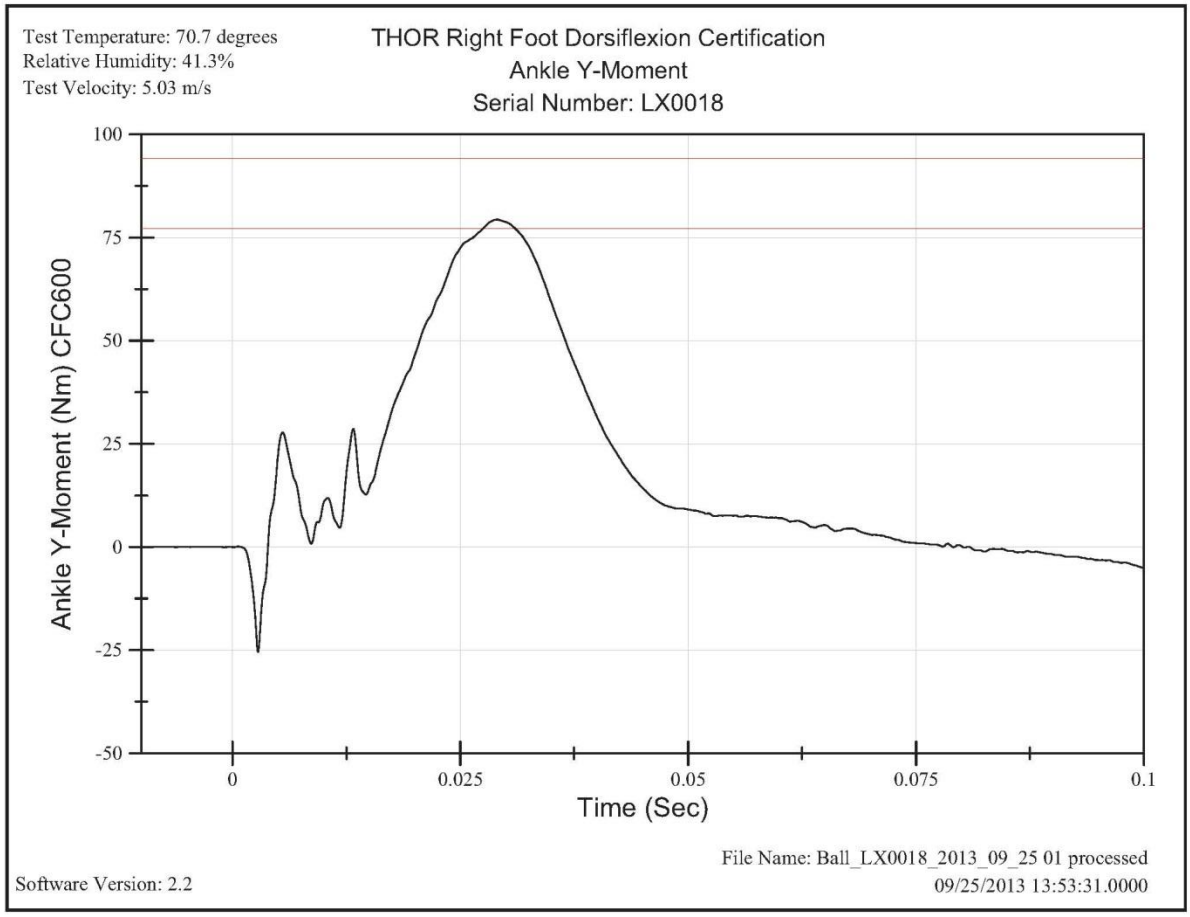

Test Temperature: 70.7 degrees
Relative Humidity: 37.7%
Test Velocity: 1.95 m/s
THOR Left Foot Inversion Certification
Ankle Moment
Serial Number: LX0019
Ankle X-Moment (Nm) CFC600
50
25
0
-25
-50
-75
-100
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Inver_LX0019_2013_09_24 01 processed.dat
09/24/2013 12:25:35.0000
Software Version: 2.2

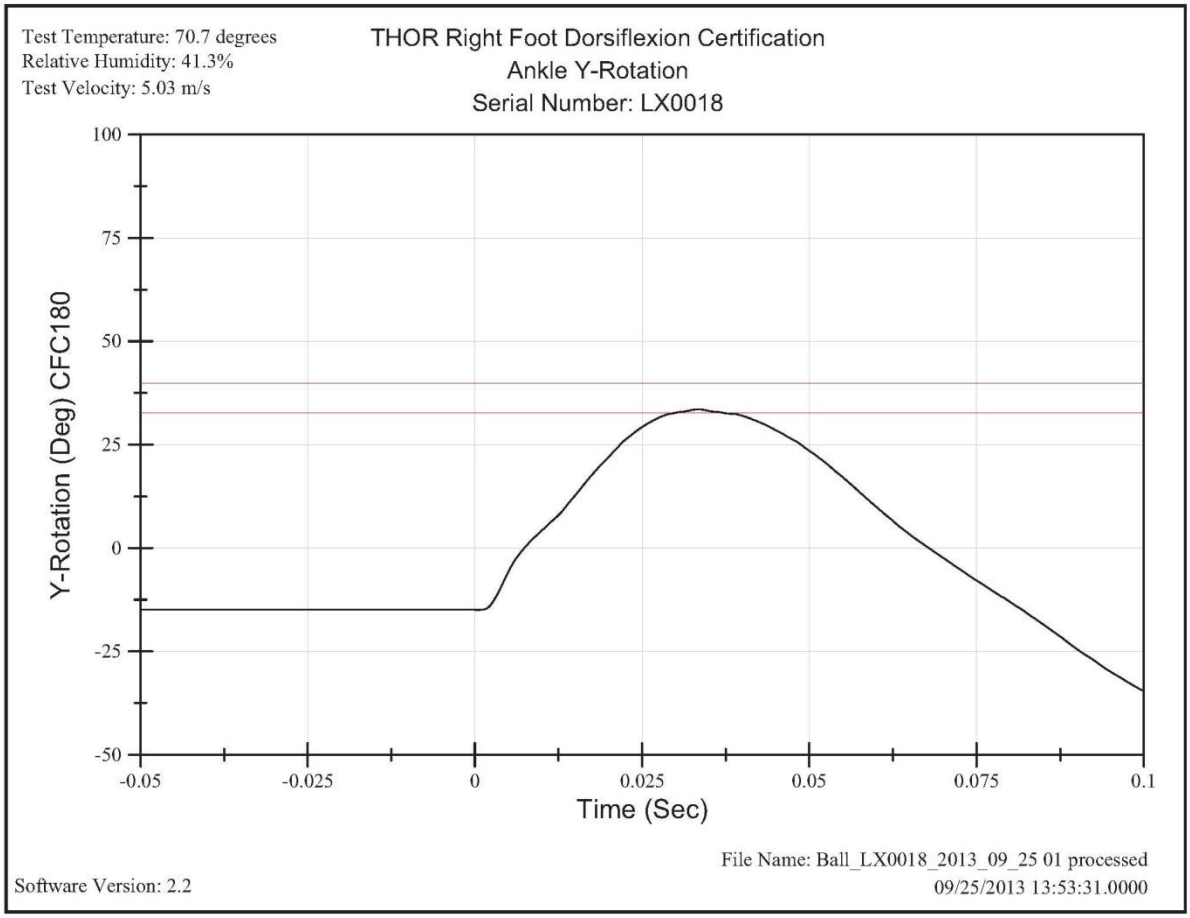

Test Temperature: 70.7 degrees
Relative Humidity: 37.7%
Test Velocity: 1.95 m/s
THOR Left Foot Inversion Certification
Ankle X-Rotation
Serial Number: LX0019
X-Rotation (Deg) CFC180
50
25
0
-25
-50
-75
-100
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Inver_LX0019_2013_09_24 01 processed.dat
09/24/2013 12:25:35.0000
Software Version: 2.2

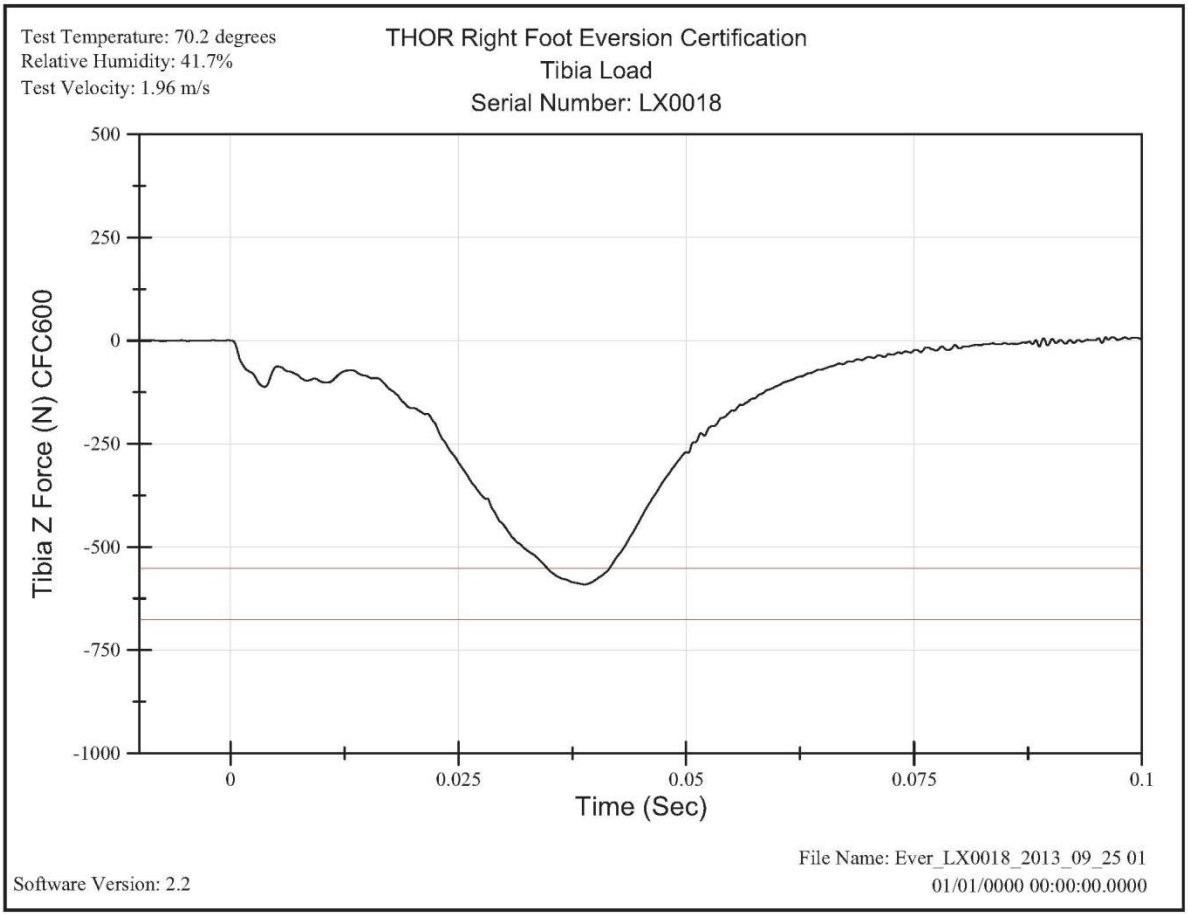

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 2.72 m/s
THOR Right Knee Certification
Femur Force vs. Knee Displacement
Serial Number: LX0018
Force (N) CFC600
5000
2500
0
-2500
-5000
-7500
-10000
-30
-25
-20
-15
-10
-5
0
Displacement (mm) CFC180
File Name: D2103657B_092613_01_DIAdemHeader_BINARYpp
09/26/2013 08:54:58.0000
Software Version: 2.2

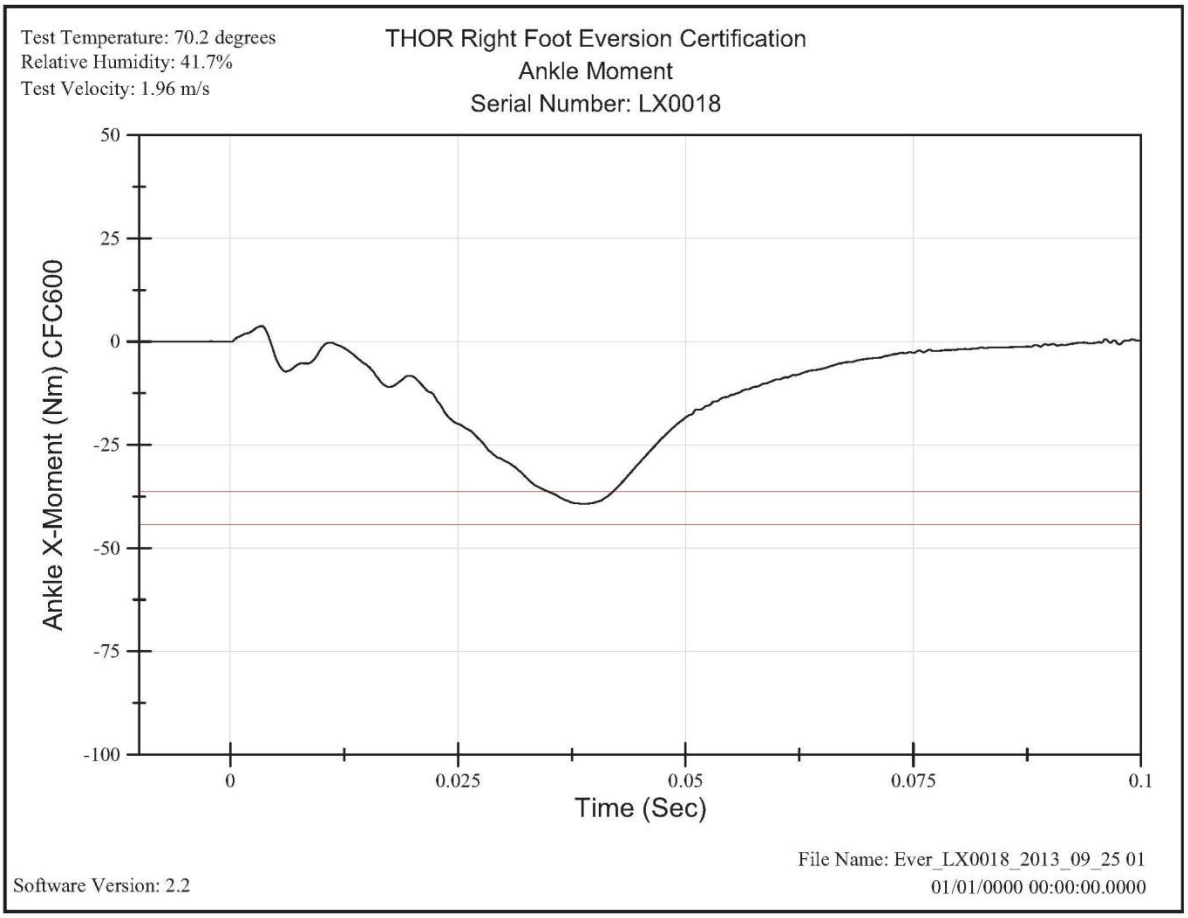

Test Temperature: 70.2 degrees
Relative Humidity: 42.6%
Test Velocity: 4.03 m/s
THOR Right Foot Heel Certification
Tibia Load
Serial Number: LX0018
Tibia Z Force (N) CFC600
5000
2500
0
-2500
-5000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Heel_LX0018_2013_09_25 01 processed
09/25/2013 15:41:20.0000
Software Version: 2.2

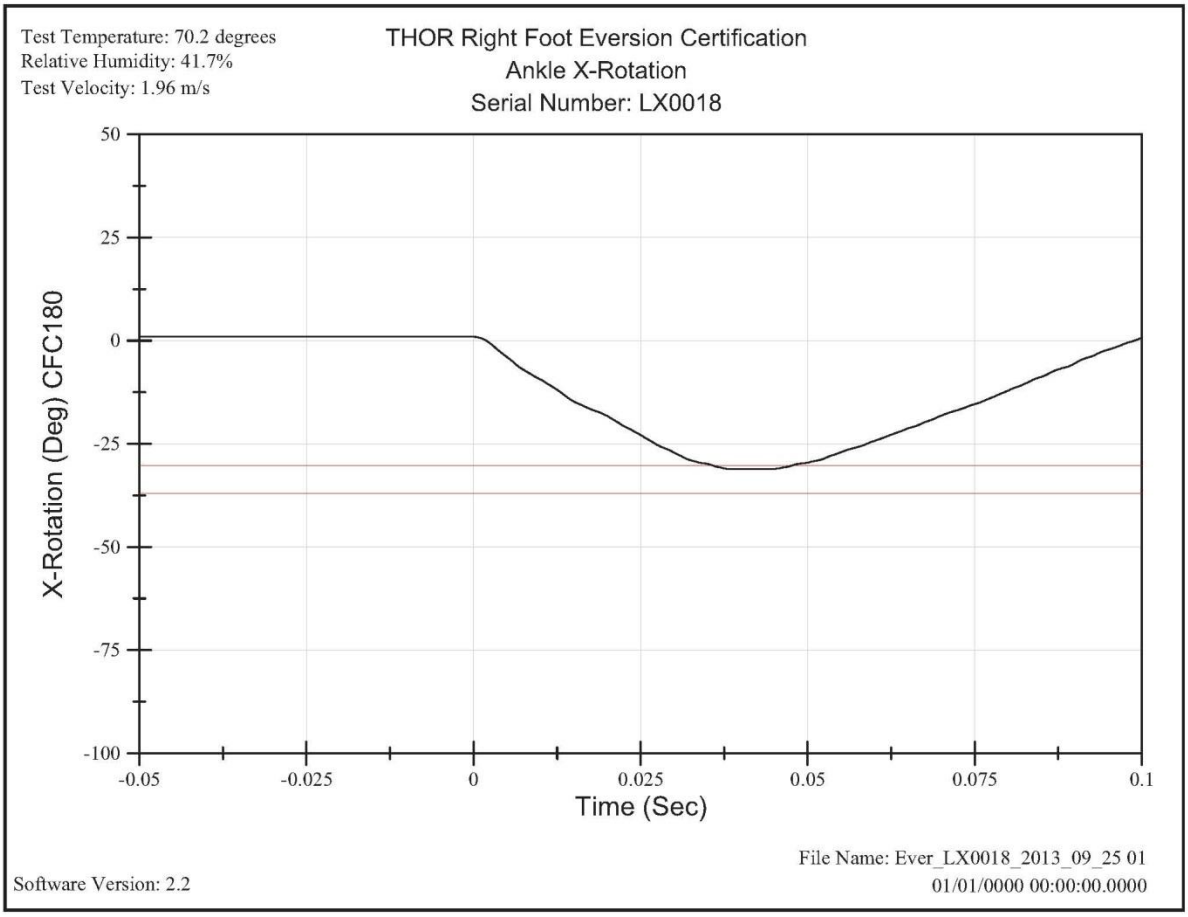

Test Temperature: 70.7 degrees
Relative Humidity: 41.3%
Test Velocity: 5.03 m/s
THOR Right Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0018
Tibia Z Force (N) CFC600
0
-1000
-2000
-3000
-4000
-5000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ball_LX0018_2013_09_25 01 processed
09/25/2013 13:53:31.0000
Software Version: 2.2

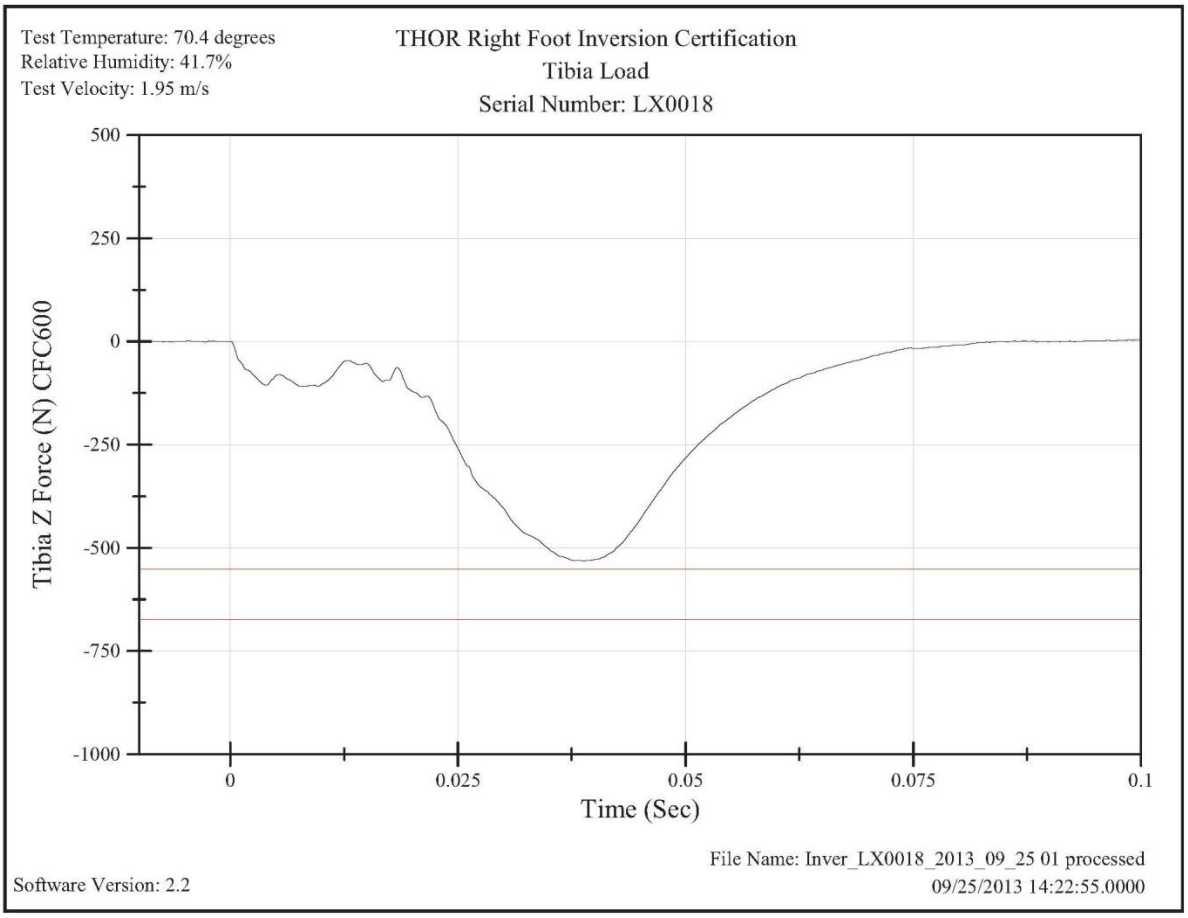

Test Temperature: 70.7 degrees
Relative Humidity: 41.3%
Test Velocity: 5.03 m/s
THOR Right Foot Dorsiflexion Certification
Ankle Y-Moment
Serial Number: LX0018
Ankle Y-Moment (Nm) CFC600
100
75
50
25
0
-25
-50
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ball_LX0018_2013_09_25 01 processed
09/25/2013 13:53:31.0000
Software Version: 2.2

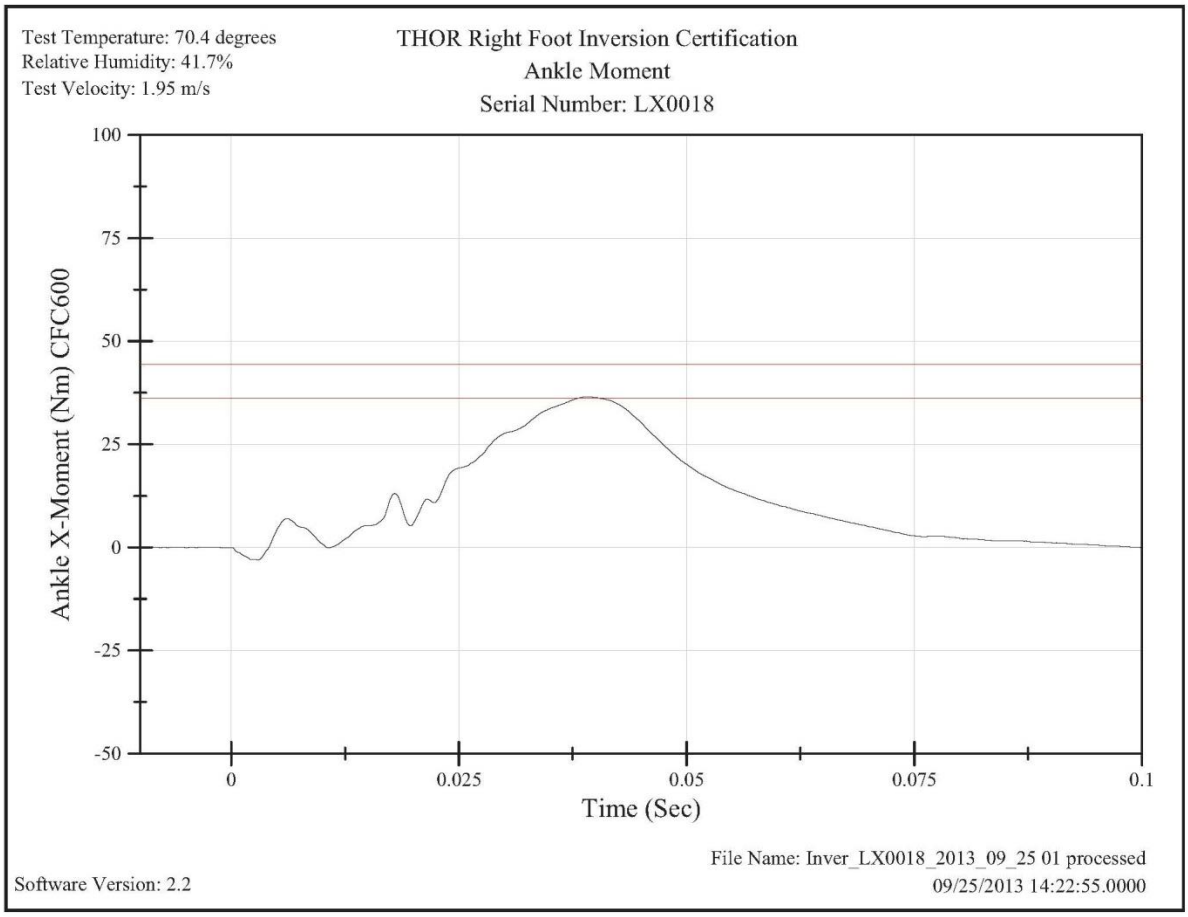

Test Temperature: 70.7 degrees
Relative Humidity: 41.3%
Test Velocity: 5.03 m/s
THOR Right Foot Dorsiflexion Certification
Ankle Y-Rotation
Serial Number: LX0018
Y-Rotation (Deg) CFC180
100
75
50
25
0
-25
-50
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ball_LX0018_2013_09_25 01 processed
09/25/2013 13:53:31.0000
Software Version: 2.2

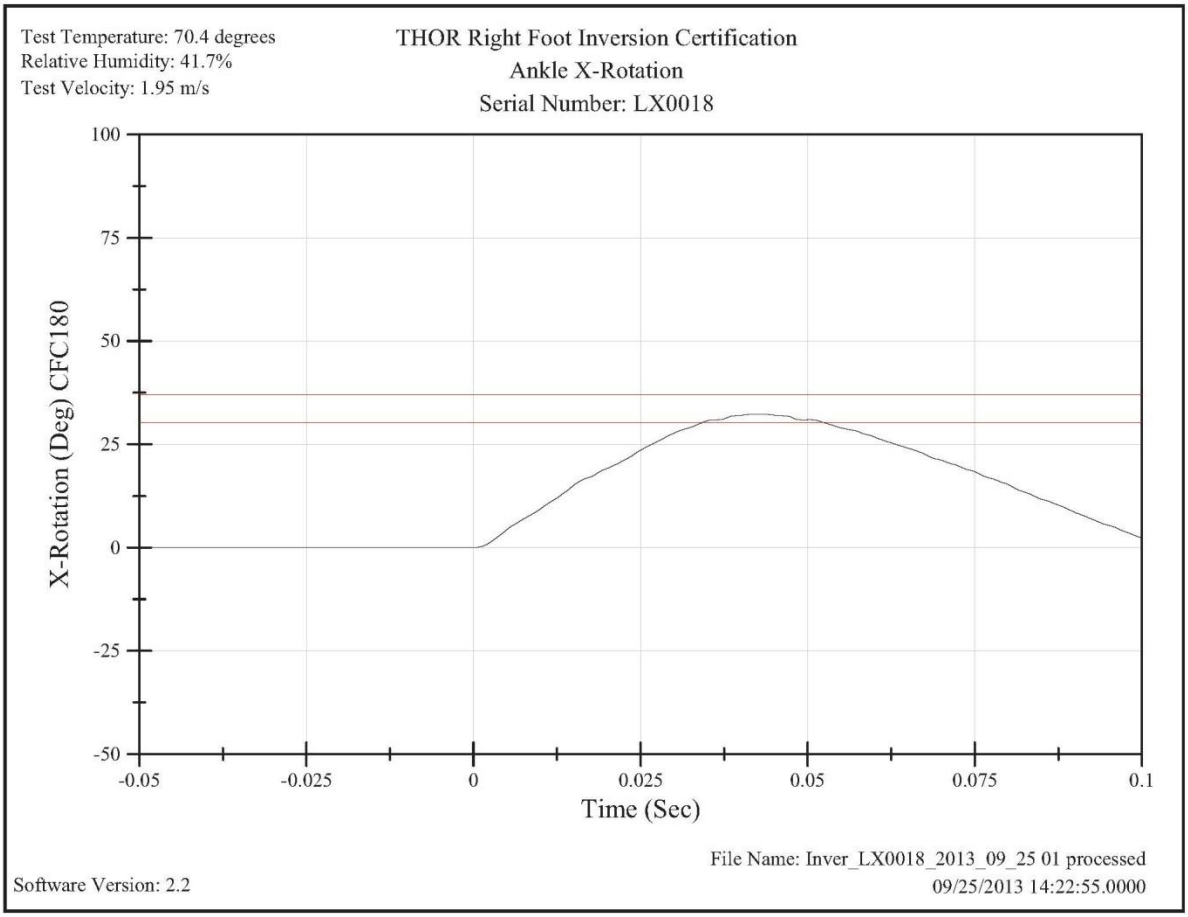

Test Temperature: 70.2 degrees
Relative Humidity: 41.7%
Test Velocity: 1.96 m/s
THOR Right Foot Eversion Certification
Tibia Load
Serial Number: LX0018
Tibia Z Force (N) CFC600
500
250
0
-250
-500
-750
-1000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0018_2013_09_25 01
01/01/0000 00:00:00.0000
Software Version: 2.2


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
Ankle X-Moment (Nm) CFC600
50
25
0
-25
-50
-75
-100
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0018_2013_09_25 01
01/01/0000 00:00:00.0000
Software Version: 2.2


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
X-Rotation (Deg) CFC180
50
25
0
-25
-50
-75
-100
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0018_2013_09_25 01
01/01/0000 00:00:00.0000
Software Version: 2.2


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
Tibia Z Force (N) CFC600
500
250
0
-250
-500
-750
-1000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Inver_LX0018_2013_09_25 01 processed
09/25/2013 14:22:55.0000
Software Version: 2.2


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
Ankle X-Moment (Nm) CFC600
100
75
50
25
0
-25
-50
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Inver_LX0018_2013_09_25 01 processed
09/25/2013 14:22:55.0000
Software Version: 2.2


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
X-Rotation (Deg) CFC180
100
75
50
25
0
-25
-50
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Inver_LX0018_2013_09_25 01 processed
09/25/2013 14:22:55.0000
Software Version: 2.2

50% ADULT MALE THOR015 DUMMY CALIBRATIONS

Summary of Thor 15 Certification Test Results

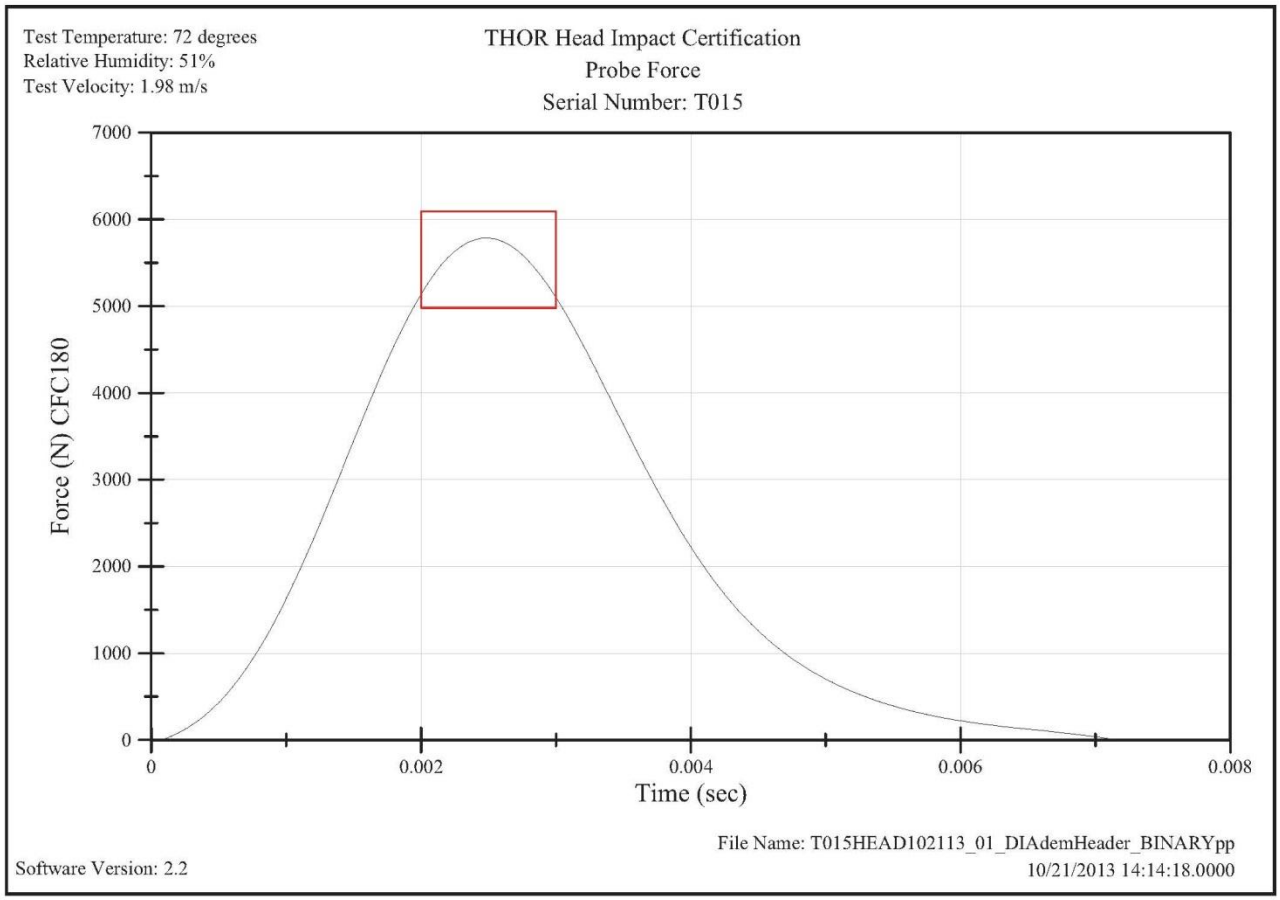
Reported by: Calspan

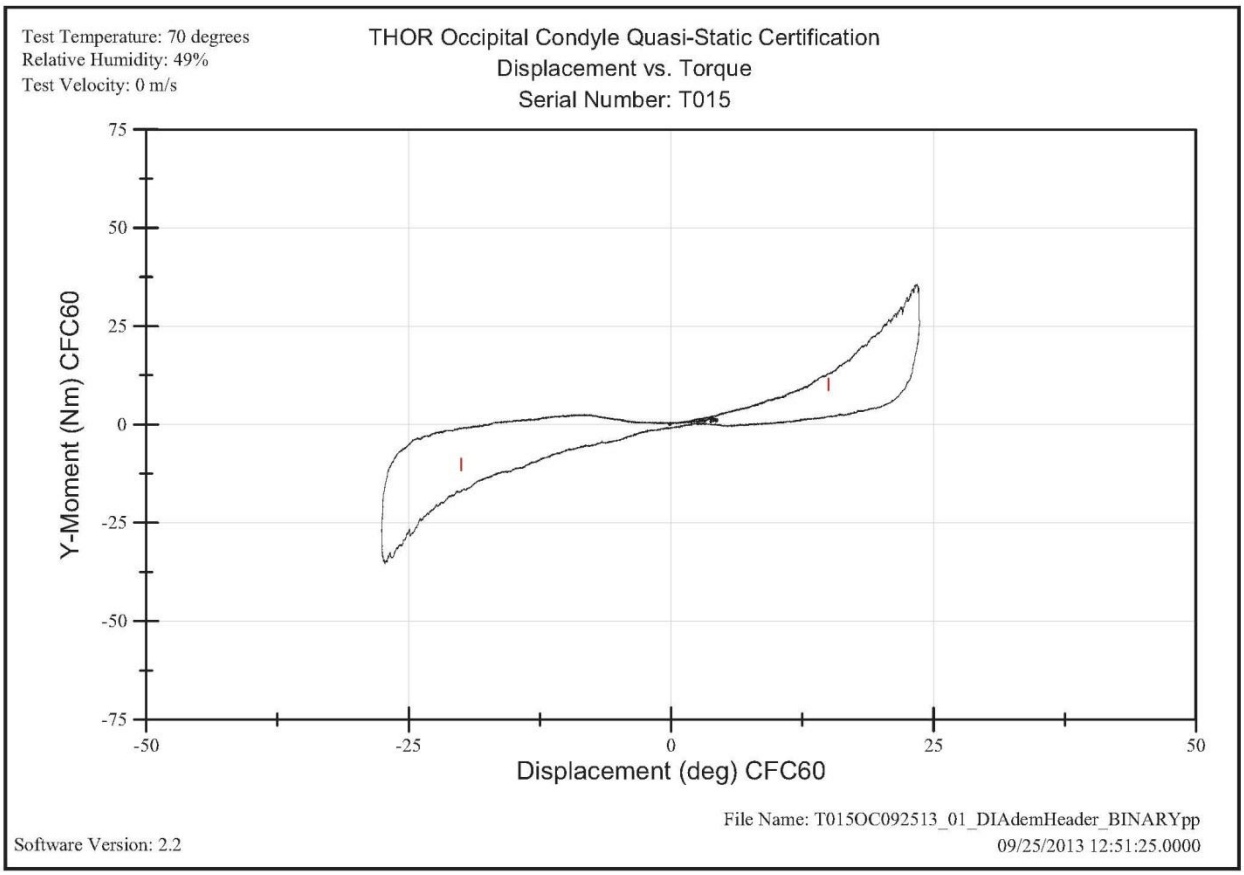
Technician: M. Goehle

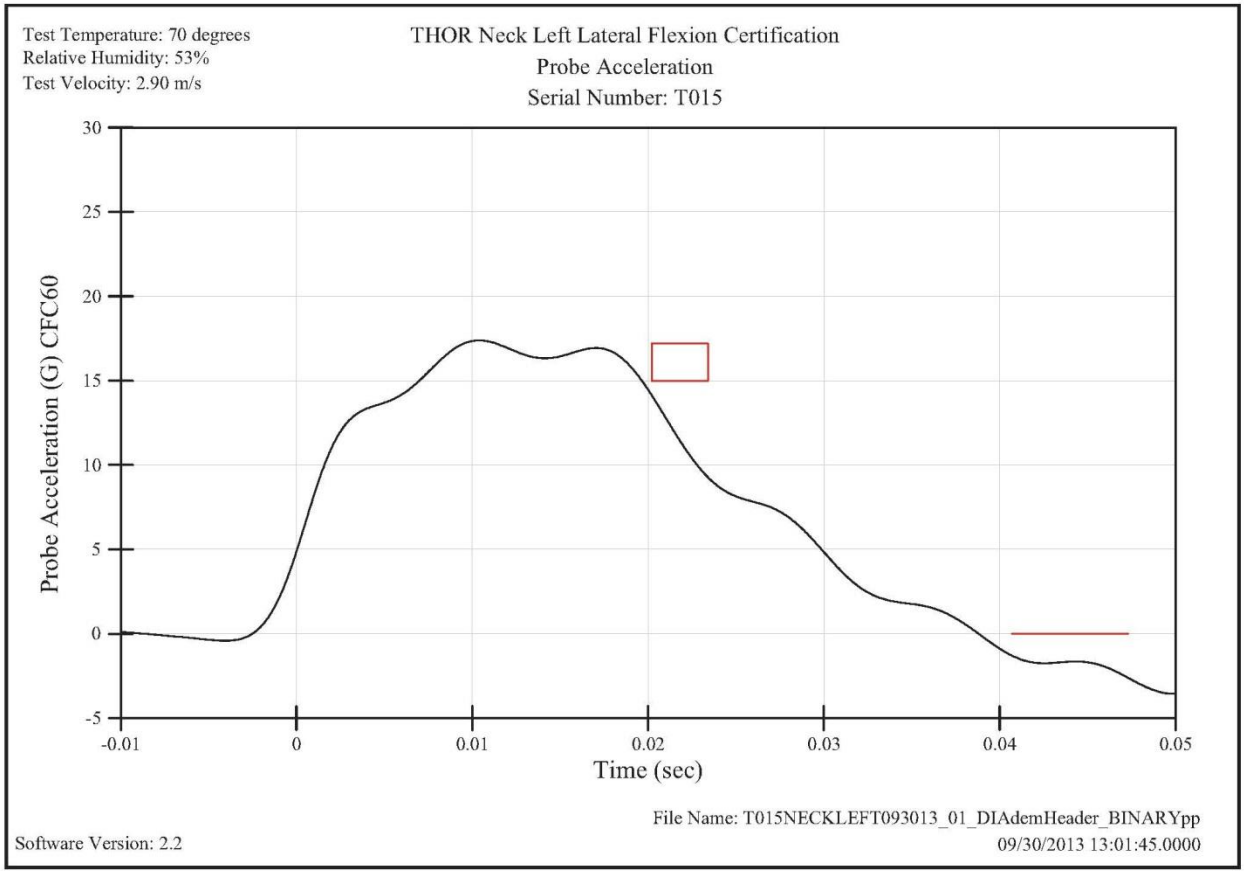
Date: 10/28/2013

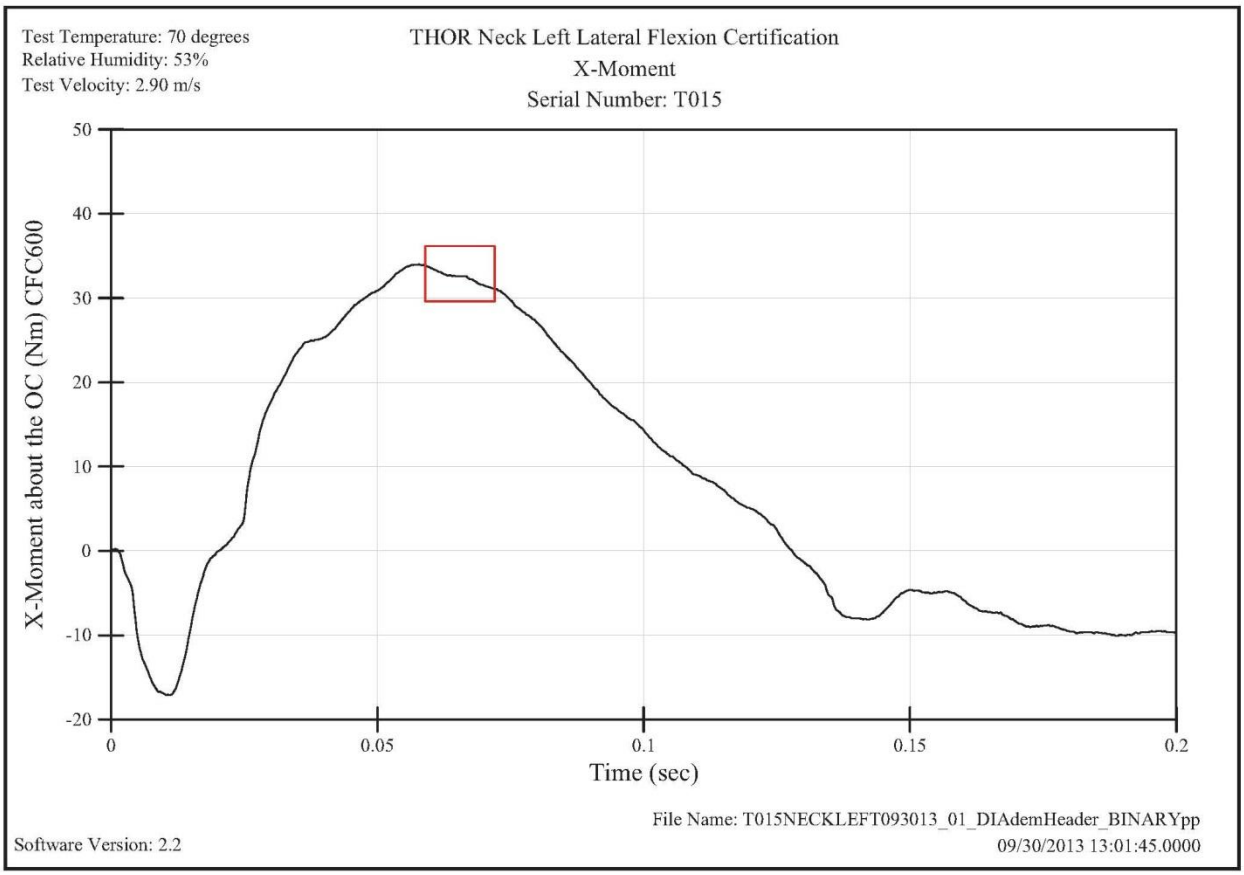
Head Impact	Passed
Occipital Condyle Quasi-Static	Failed
Neck Left Lateral Flexion	Failed
Neck Right Lateral Flexion	Failed
Neck Flexion	Failed
Neck Extension	Failed
Upper Thorax	Failed
Lower Left Oblique Thorax	Failed
Lower Right Oblique Thorax	Failed
Upper Abdomen	Failed
Lower Abdomen	Failed
Left Femur	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

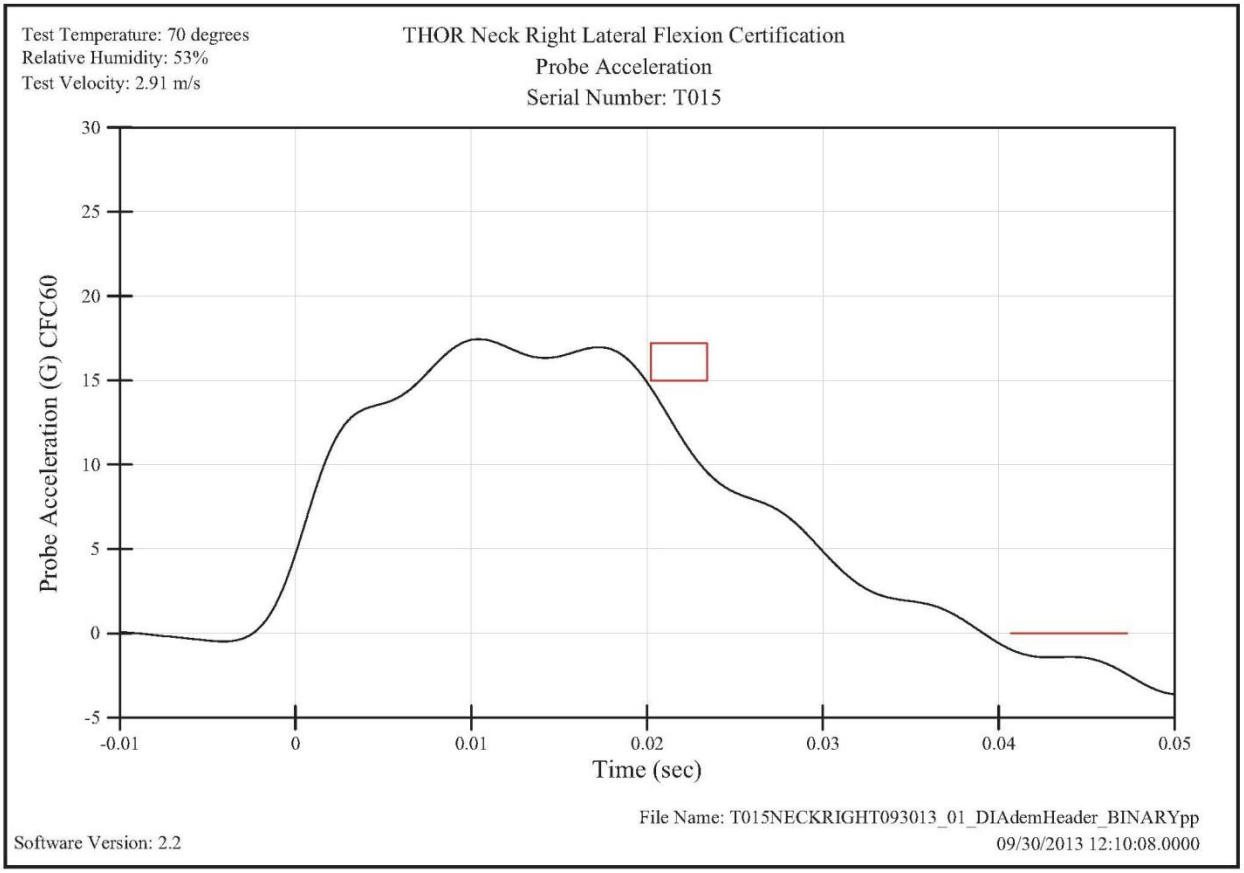
Certifications performed by VRTC

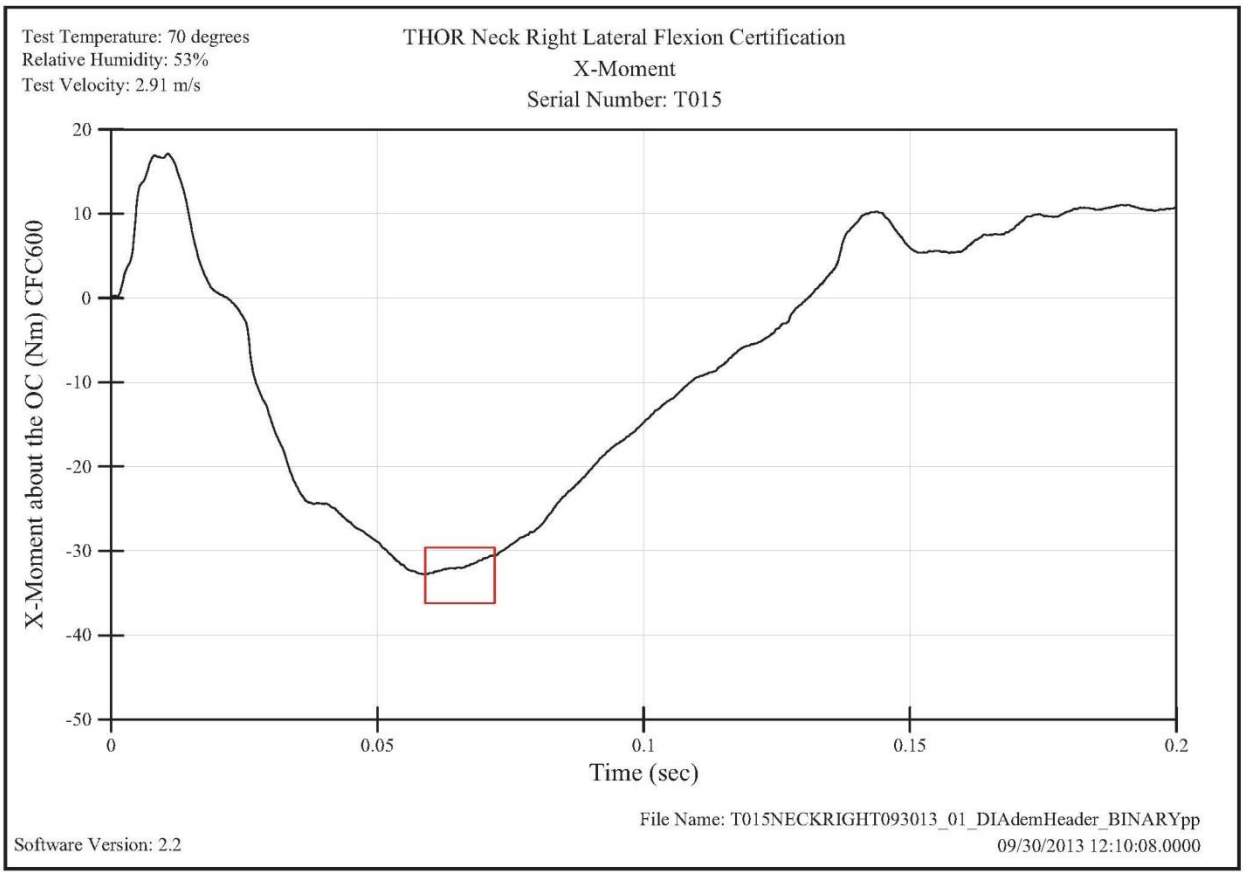

Test Temperature: 72 degrees
Relative Humidity: 51%
Test Velocity: 1.98 m/s
THOR Head Impact Certification
Probe Force
Serial Number: T015
Force (N) CFC180
7000
6000
5000
4000
3000
2000
1000
0
0
0.002
0.004
0.006
0.008
Time (sec)
File Name: T015HEAD102113_01_DIAdemHeader_BINARYpp
10/21/2013 14:14:18.0000
Software Version: 2.2

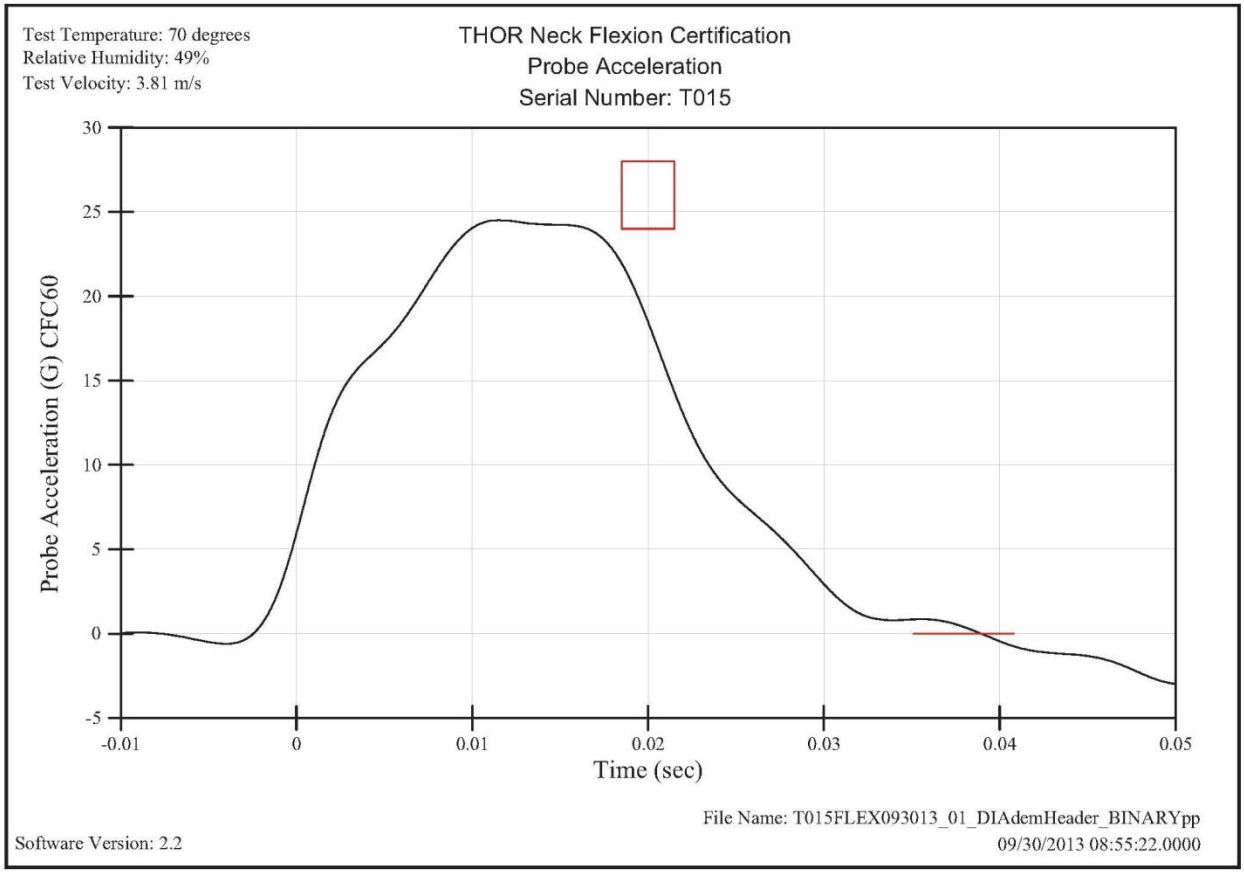

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 0 m/s
THOR Occipital Condyle Quasi-Static Certification
Displacement vs. Torque
Serial Number: T015
Y-Moment (Nm) CFC60
75
50
25
0
-25
-50
-75
-50
-25
0
25
50
Displacement (deg) CFC60
File Name: T015OC092513_01_DIAdemHeader_BINARYpp
09/25/2013 12:51:25.0000
Software Version: 2.2

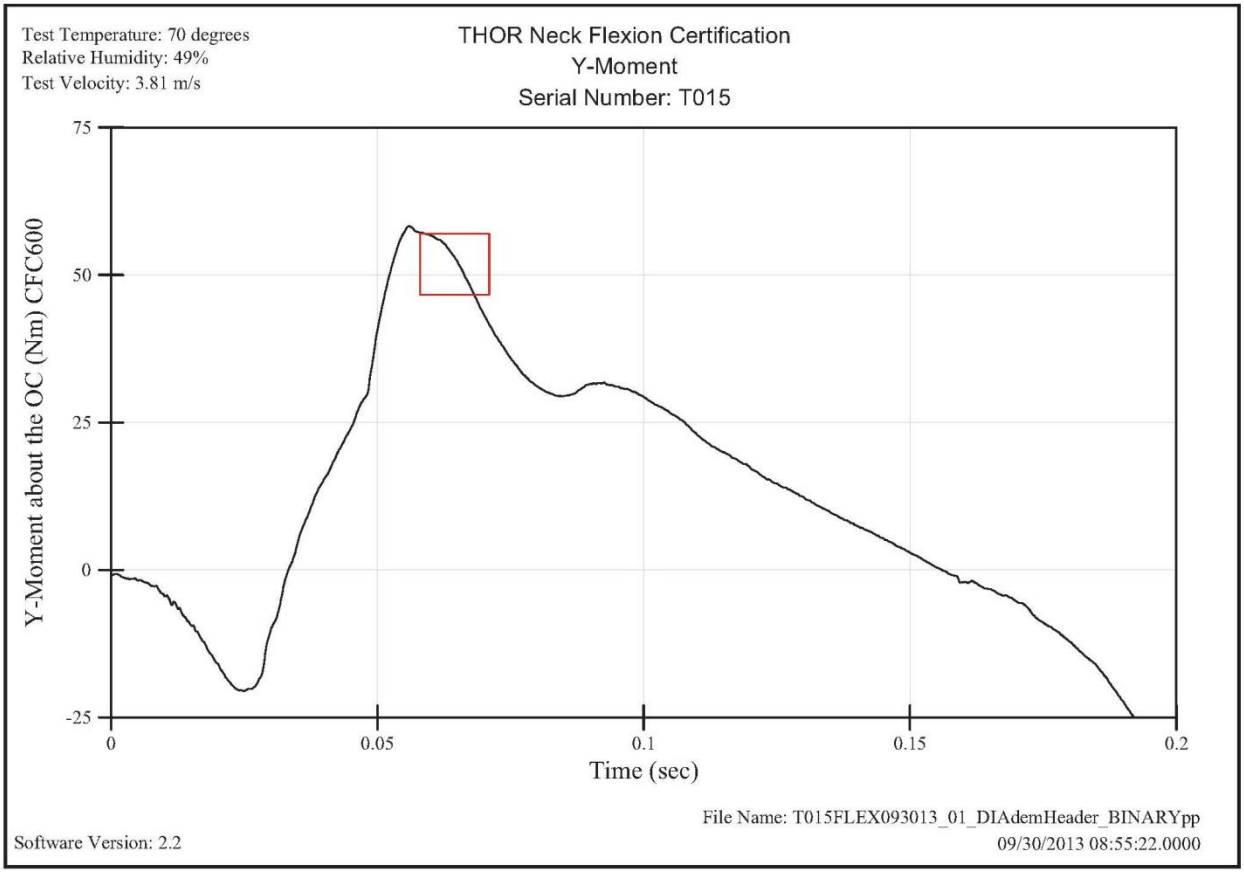

Test Temperature: 70 degrees
Relative Humidity: 53%
Test Velocity: 2.90 m/s
THOR Neck Left Lateral Flexion Certification
Probe Acceleration
Serial Number: T015
Probe Acceleration (G) CFC60
30
25
20
15
10
5
0
-5
-0.01
0
0.01
0.02
0.03
0.04
0.05
Time (sec)
File Name: T015NECKLEFT093013_01_DIAdemHeader_BINARYpp
09/30/2013 13:01:45.0000
Software Version: 2.2

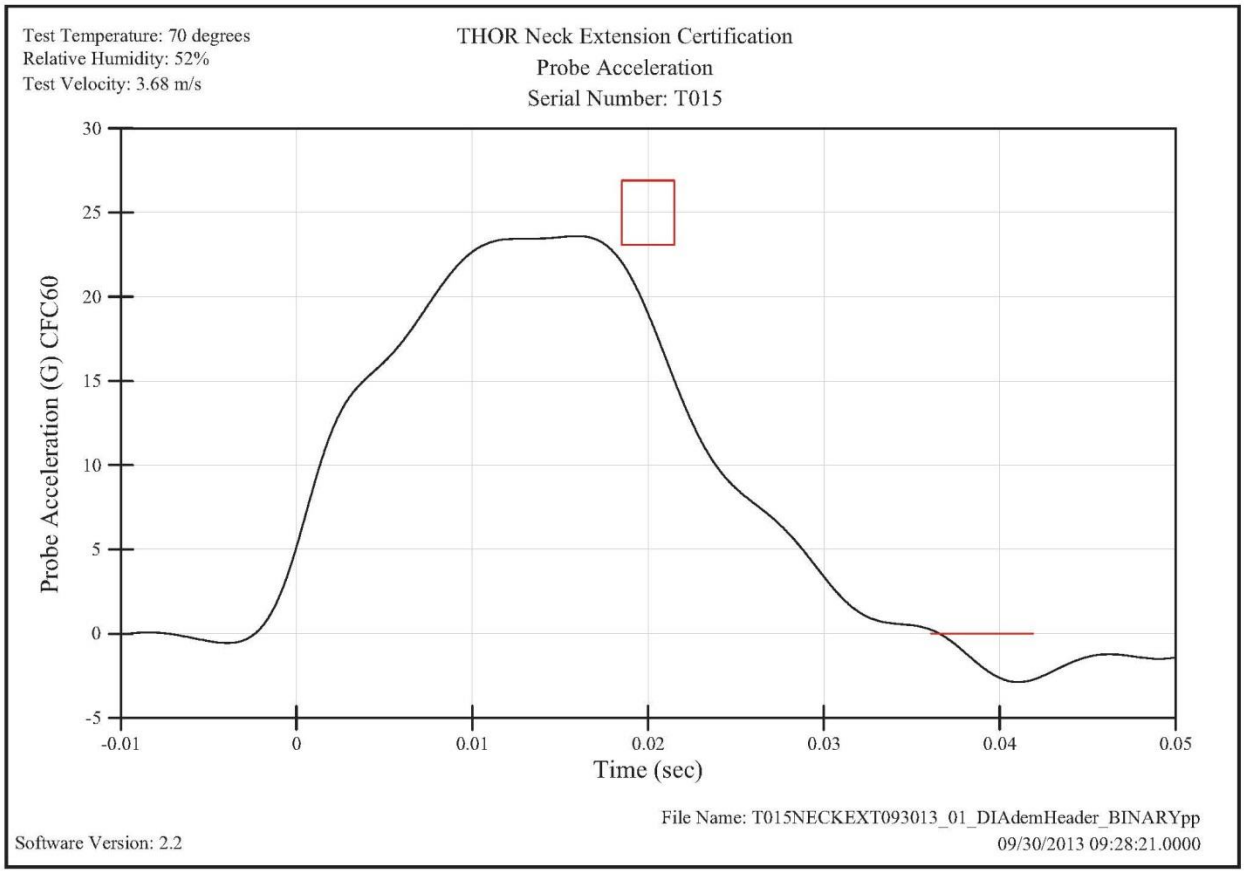

Test Temperature: 70 degrees
Relative Humidity: 53%
Test Velocity: 2.90 m/s
THOR Neck Left Lateral Flexion Certification
X-Moment
Serial Number: T015
X-Moment about the OC (Nm) CFC600
50
40
30
20
10
0
-10
-20
0
0.05
0.1
0.15
0.2
Time (sec)
File Name: T015NECKLEFT093013_01_DIAdemHeader_BINARYpp
09/30/2013 13:01:45.0000
Software Version: 2.2

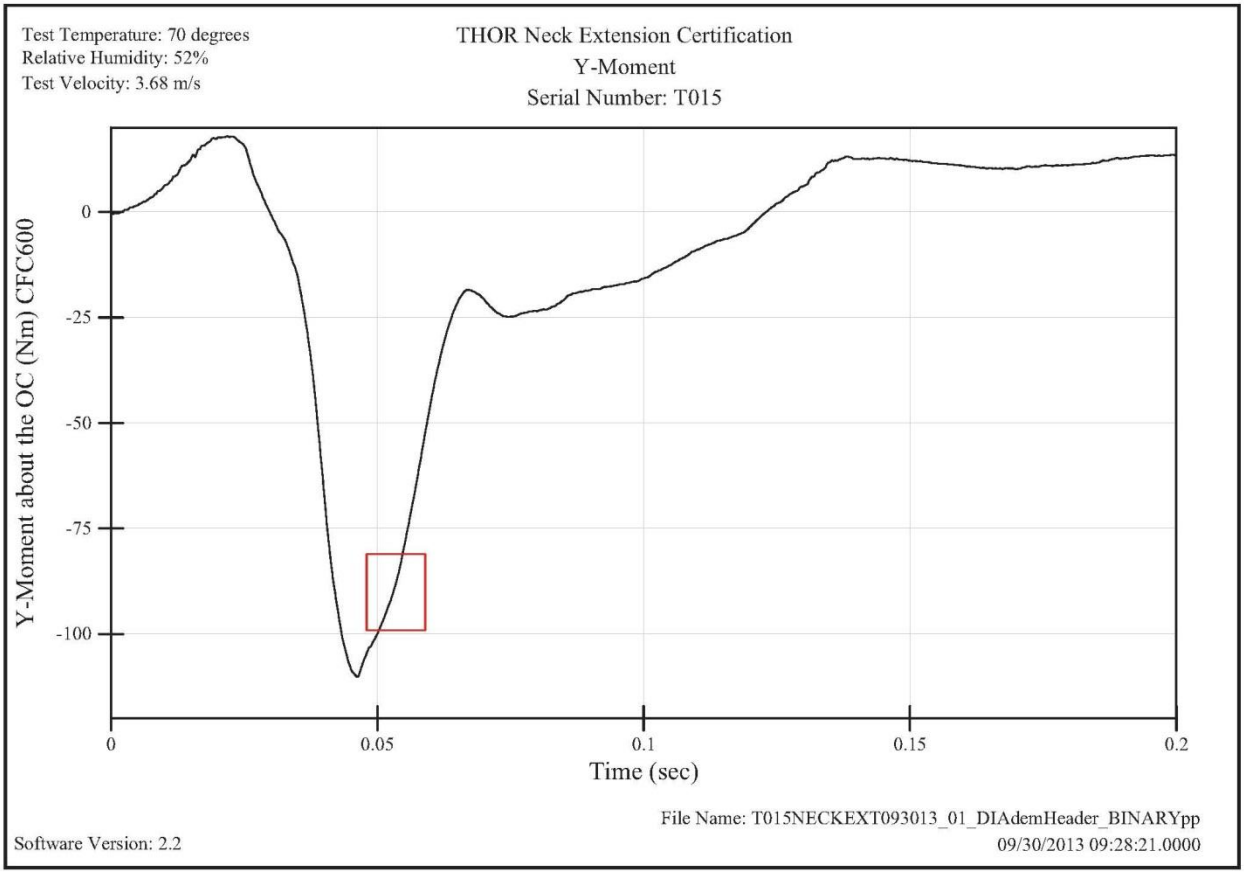

Test Temperature: 70 degrees
Relative Humidity: 53%
Test Velocity: 2.91 m/s
THOR Neck Right Lateral Flexion Certification
Probe Acceleration
Serial Number: T015
Probe Acceleration (G) CFC60
30
25
20
15
10
5
0
-5
-0.01
0
0.01
0.02
0.03
0.04
0.05
Time (sec)
File Name: T015NECKRIGHT093013_01_DIAdemHeader_BINARYpp
09/30/2013 12:10:08.0000
Software Version: 2.2

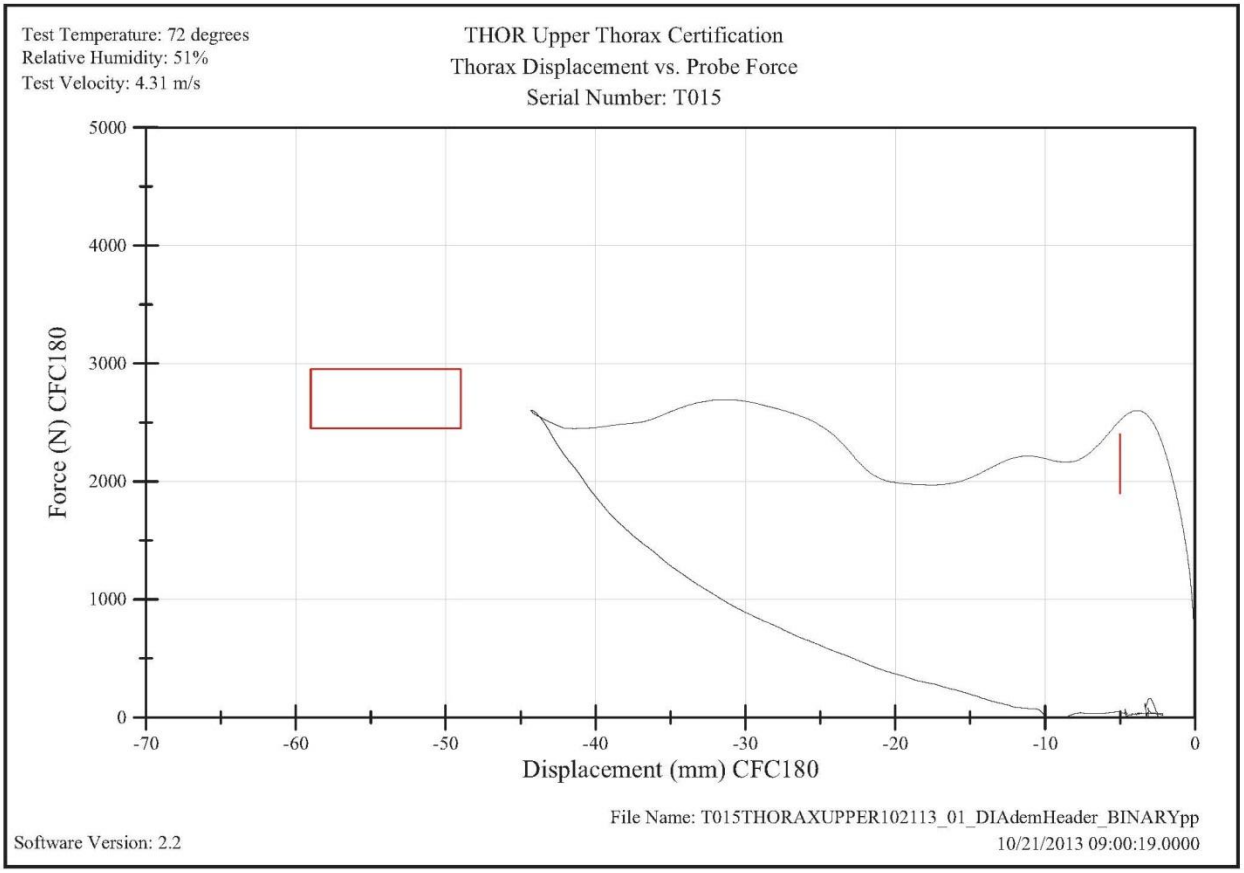

Test Temperature: 70 degrees
Relative Humidity: 53%
Test Velocity: 2.91 m/s
THOR Neck Right Lateral Flexion Certification
X-Moment
Serial Number: T015
X-Moment about the OC (Nm) CFC600
20
10
0
-10
-20
-30
-40
-50
0
0.05
0.1
0.15
0.2
Time (sec)
File Name: T015NECKRIGHT093013_01_DIAdemHeader_BINARYpp
09/30/2013 12:10:08.0000
Software Version: 2.2

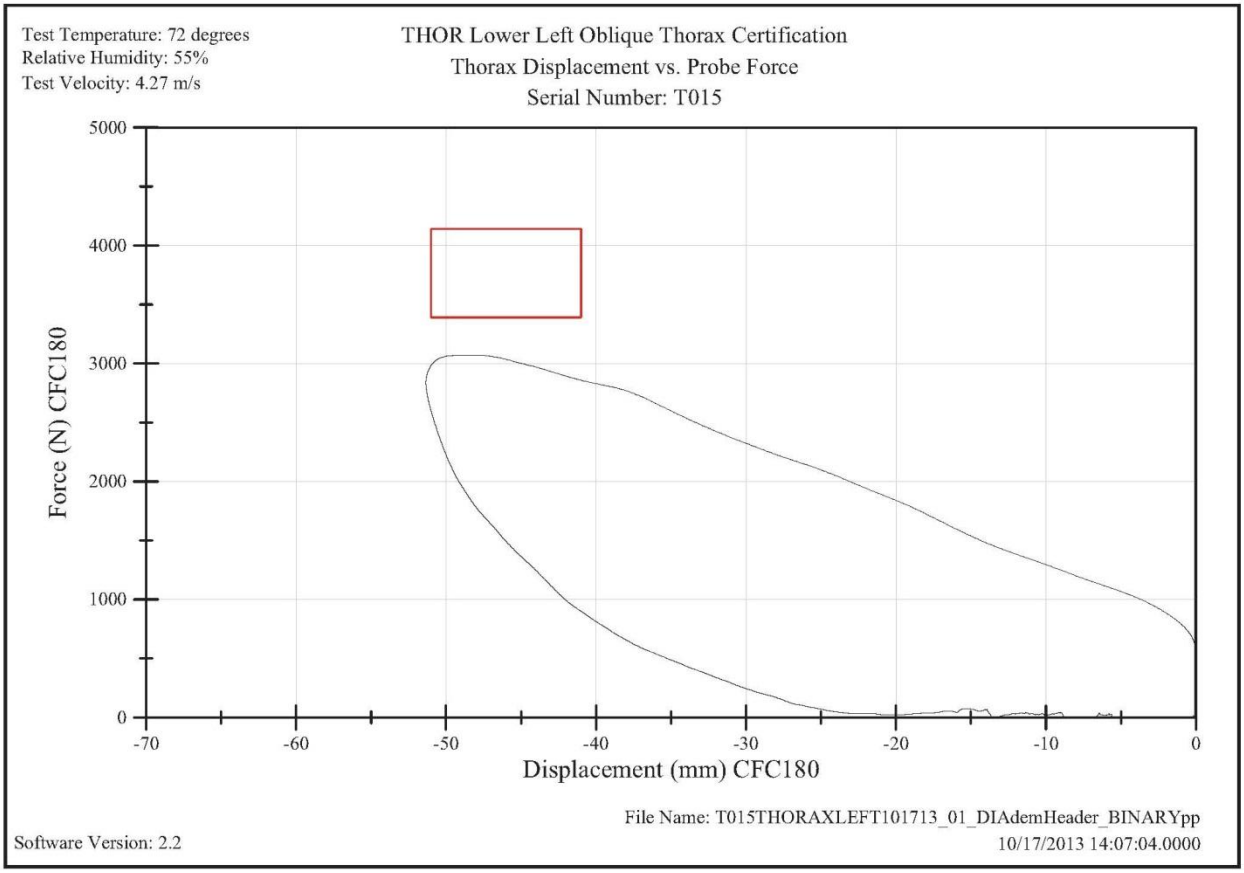

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 3.81 m/s
THOR Neck Flexion Certification
Probe Acceleration
Serial Number: T015
Probe Acceleration (G) CFC60
30
25
20
15
10
5
0
-5
-0.01
0
0.01
0.02
0.03
0.04
0.05
Time (sec)
File Name: T015FLEX093013_01_DIAdemHeader_BINARYpp
09/30/2013 08:55:22.0000
Software Version: 2.2

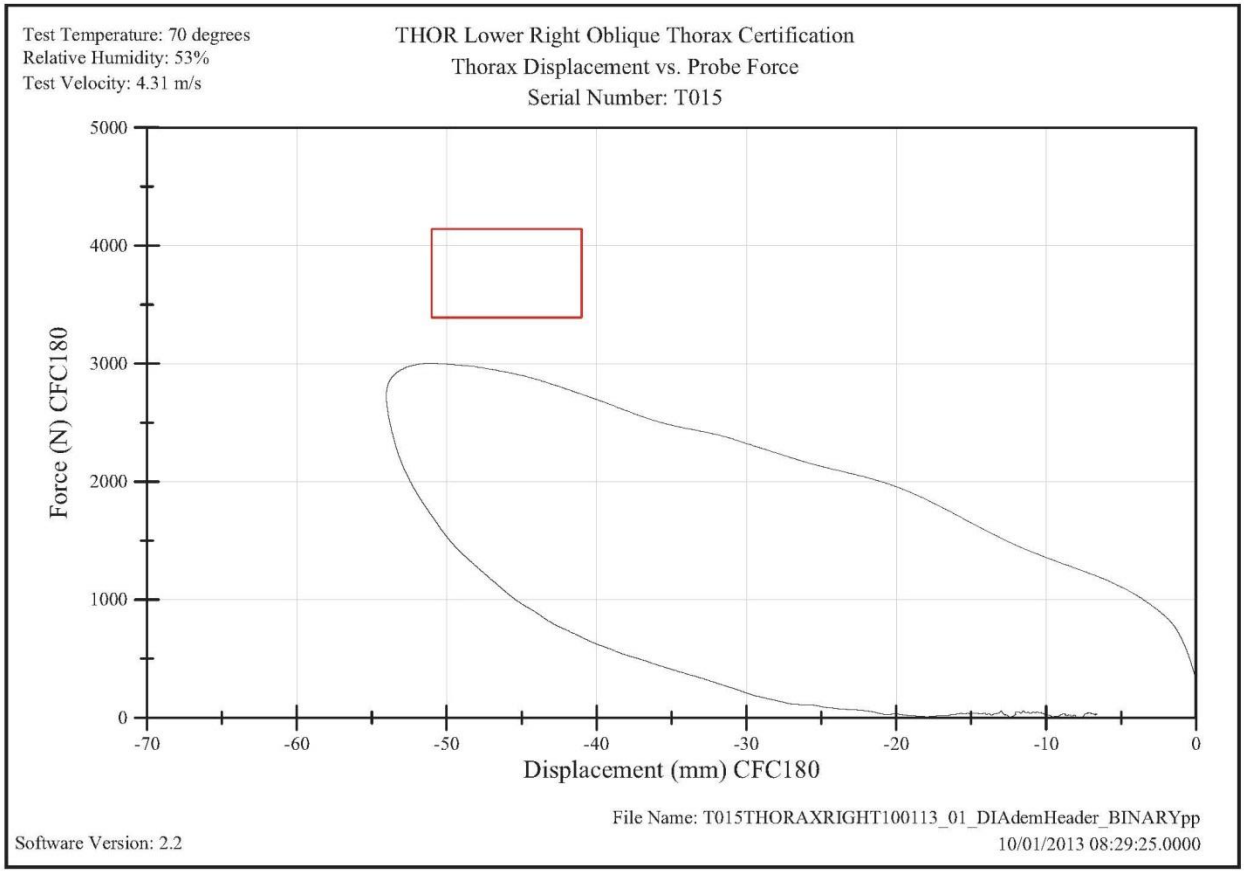

Test Temperature: 70 degrees
Relative Humidity: 49%
Test Velocity: 3.81 m/s
THOR Neck Flexion Certification
Y-Moment
Serial Number: T015
Y-Moment about the OC (Nm) CFC600
75
50
25
0
-25
0
0.05
0.1
0.15
0.2
Time (sec)
File Name: T015FLEX093013_01_DIAdemHeader_BINARYpp
09/30/2013 08:55:22.0000
Software Version: 2.2

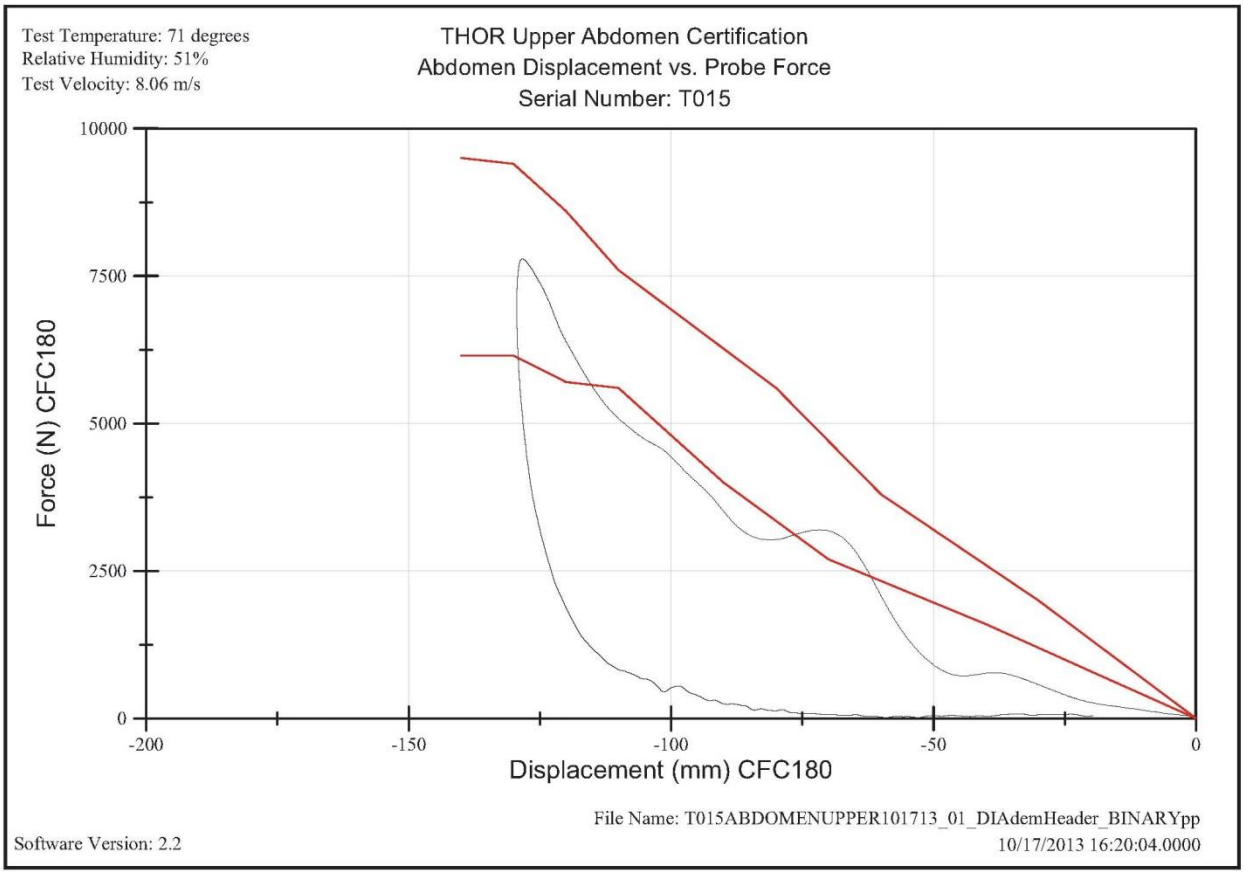

Test Temperature: 70 degrees
Relative Humidity: 52%
Test Velocity: 3.68 m/s
THOR Neck Extension Certification
Probe Acceleration
Serial Number: T015
Probe Acceleration (G) CFC60
30
25
20
15
10
5
0
-5
-0.01
0
0.01
0.02
0.03
0.04
0.05
Time (sec)
File Name: T015NECKEXT093013_01_DIAdemHeader_BINARYpp
Software Version: 2.2
09/30/2013 09:28:21.0000

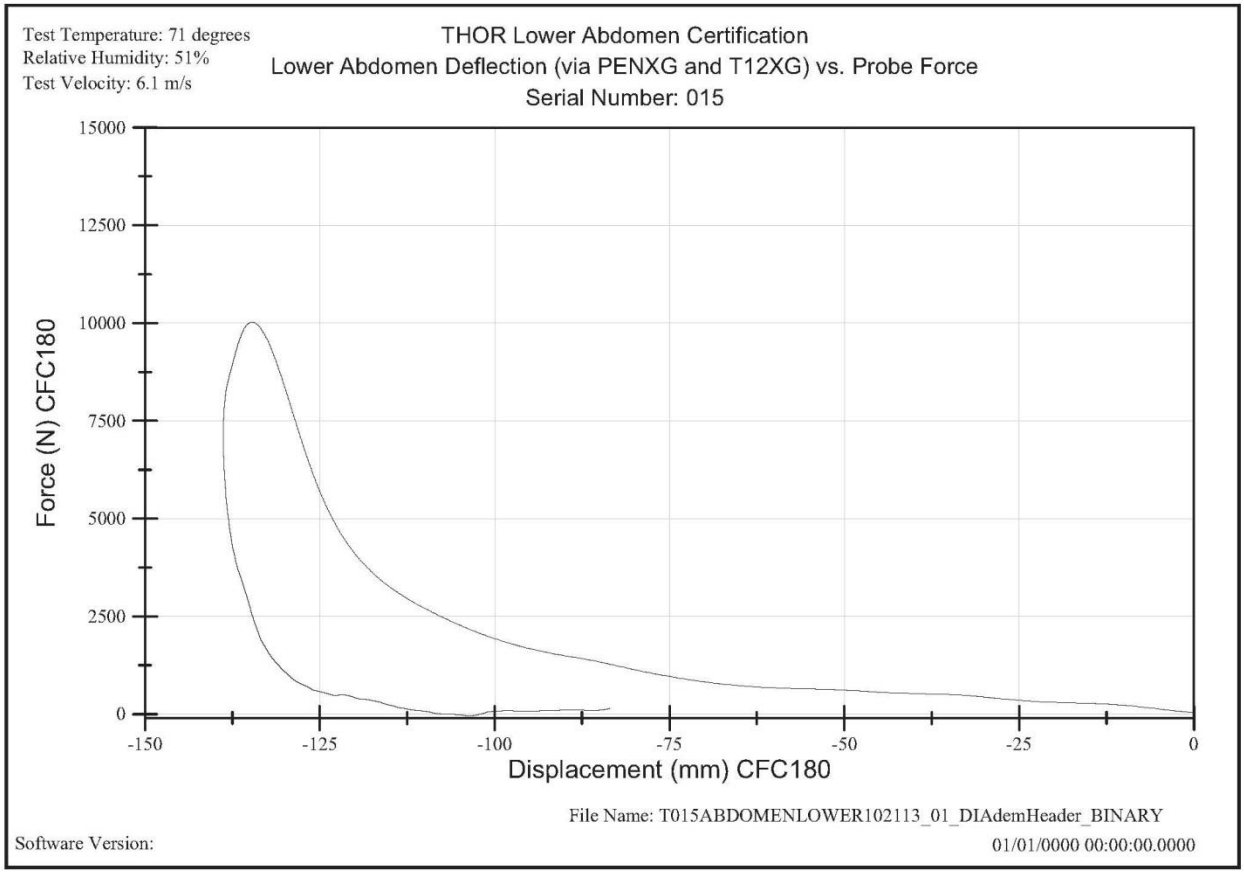

Test Temperature: 70 degrees
Relative Humidity: 52%
Test Velocity: 3.68 m/s
THOR Neck Extension Certification
Y-Moment
Serial Number: T015
Y-Moment about the OC (Nm) CFC600
0
-25
-50
-75
-100
0
0.05
0.1
0.15
0.2
Time (sec)
File Name: T015NECKEXT093013_01_DIAdemHeader_BINARYpp
Software Version: 2.2
09/30/2013 09:28:21.0000

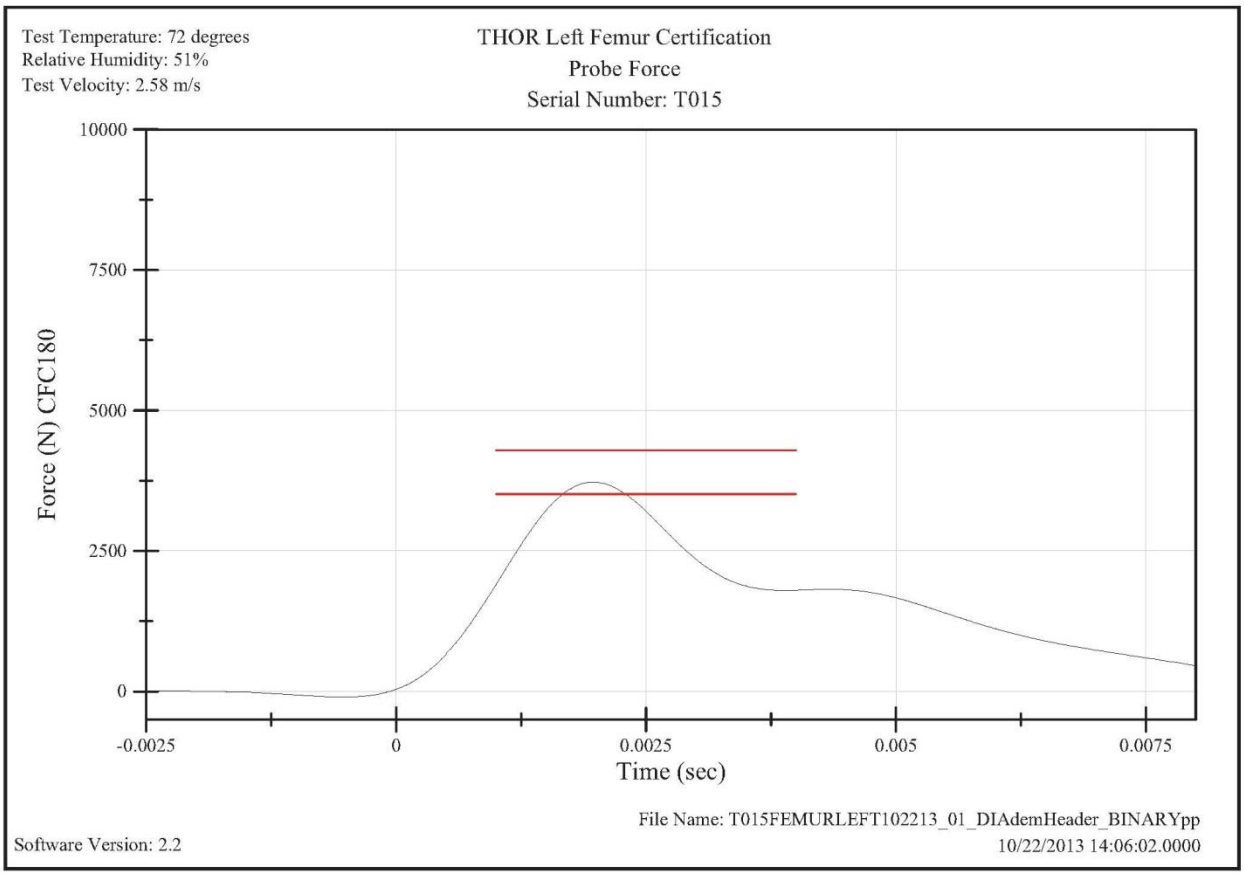

Test Temperature: 72 degrees
Relative Humidity: 51%
Test Velocity: 4.31 m/s
THOR Upper Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T015
Force (N) CFC180
Displacement (mm) CFC180
5000
4000
3000
2000
1000
0
-70
-60
-50
-40
-30
-20
-10
0
File Name: T015THORAXUPPER102113_01_DIAdemHeader_BINARYpp
Software Version: 2.2
10/21/2013 09:00:19.0000

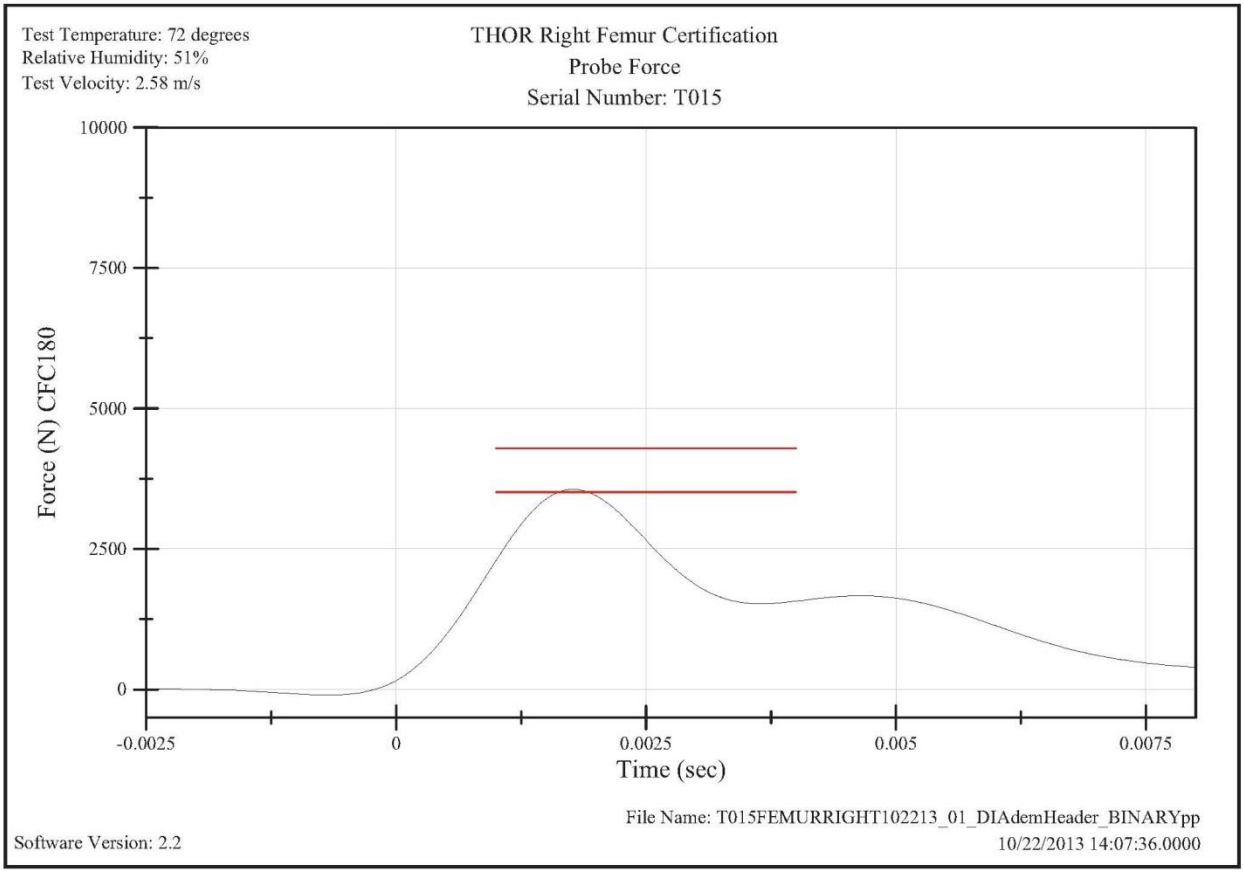

Test Temperature: 72 degrees
Relative Humidity: 55%
Test Velocity: 4.27 m/s
THOR Lower Left Oblique Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T015
Force (N) CFC180
Displacement (mm) CFC180
5000
4000
3000
2000
1000
0
-70
-60
-50
-40
-30
-20
-10
0
File Name: T015THORAXLEFT101713_01_DIAdemHeader_BINARYpp
Software Version: 2.2
10/17/2013 14:07:04.0000

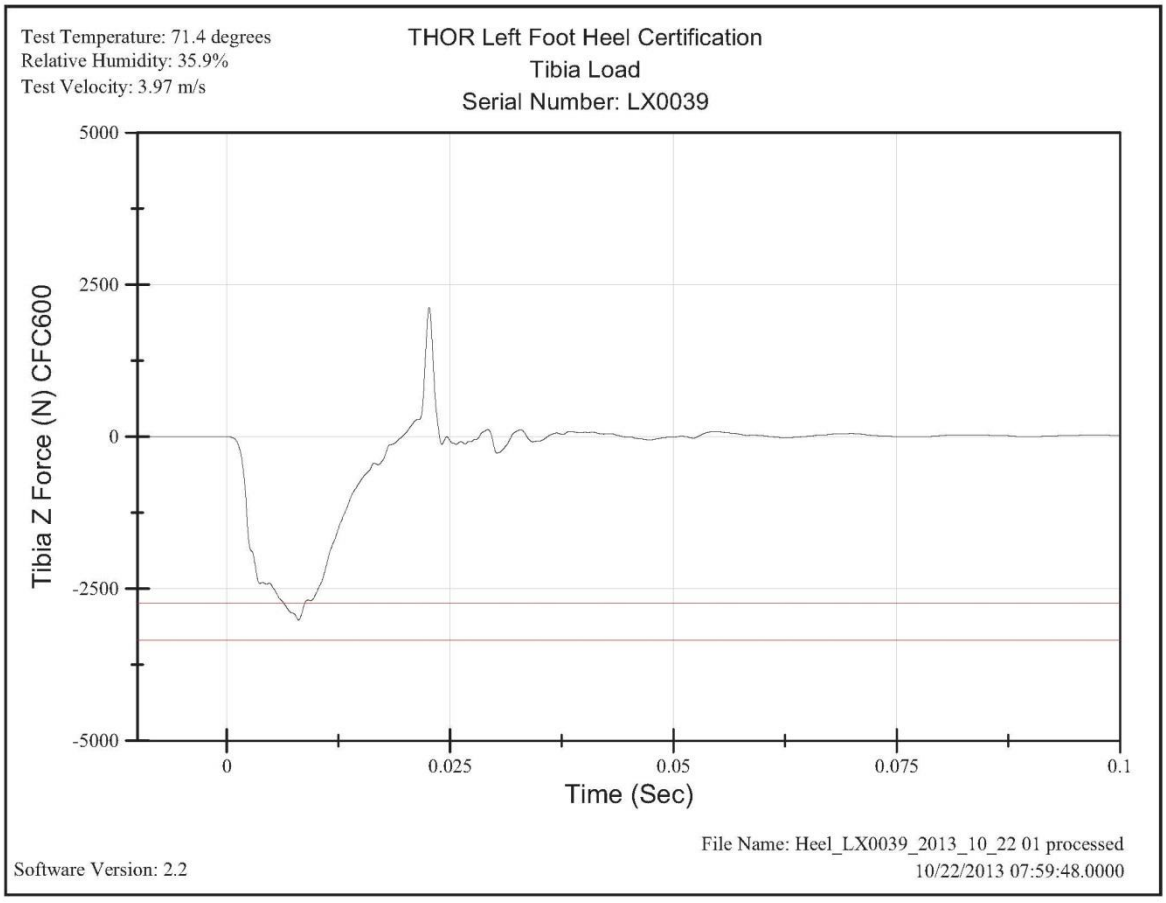

Test Temperature: 70 degrees
Relative Humidity: 53%
Test Velocity: 4.31 m/s
THOR Lower Right Oblique Thorax Certification
Thorax Displacement vs. Probe Force
Serial Number: T015
Force (N) CFC180
5000
4000
3000
2000
1000
0
-70
-60
-50
-40
-30
-20
-10
0
Displacement (mm) CFC180
File Name: T015THORAXRIGHT100113_01_DIAdemHeader_BINARYpp
10/01/2013 08:29:25.0000
Software Version: 2.2

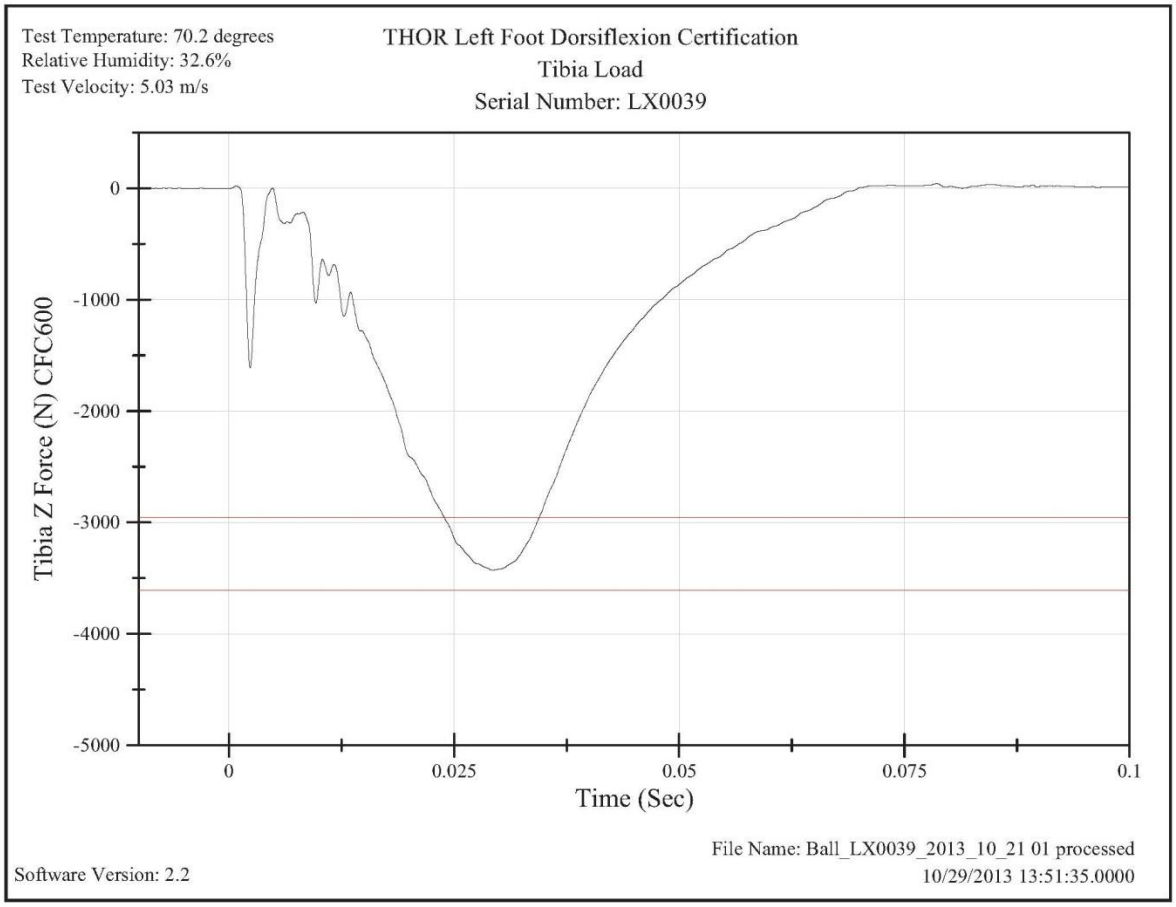

Test Temperature: 71 degrees
Relative Humidity: 51%
Test Velocity: 8.06 m/s
THOR Upper Abdomen Certification
Abdomen Displacement vs. Probe Force
Serial Number: T015
Force (N) CFC180
10000
7500
5000
2500
0
-200
-150
-100
-50
0
Displacement (mm) CFC180
File Name: T015ABDOMENUPPER101713_01_DIAdemHeader_BINARYpp
10/17/2013 16:20:04.0000
Software Version: 2.2

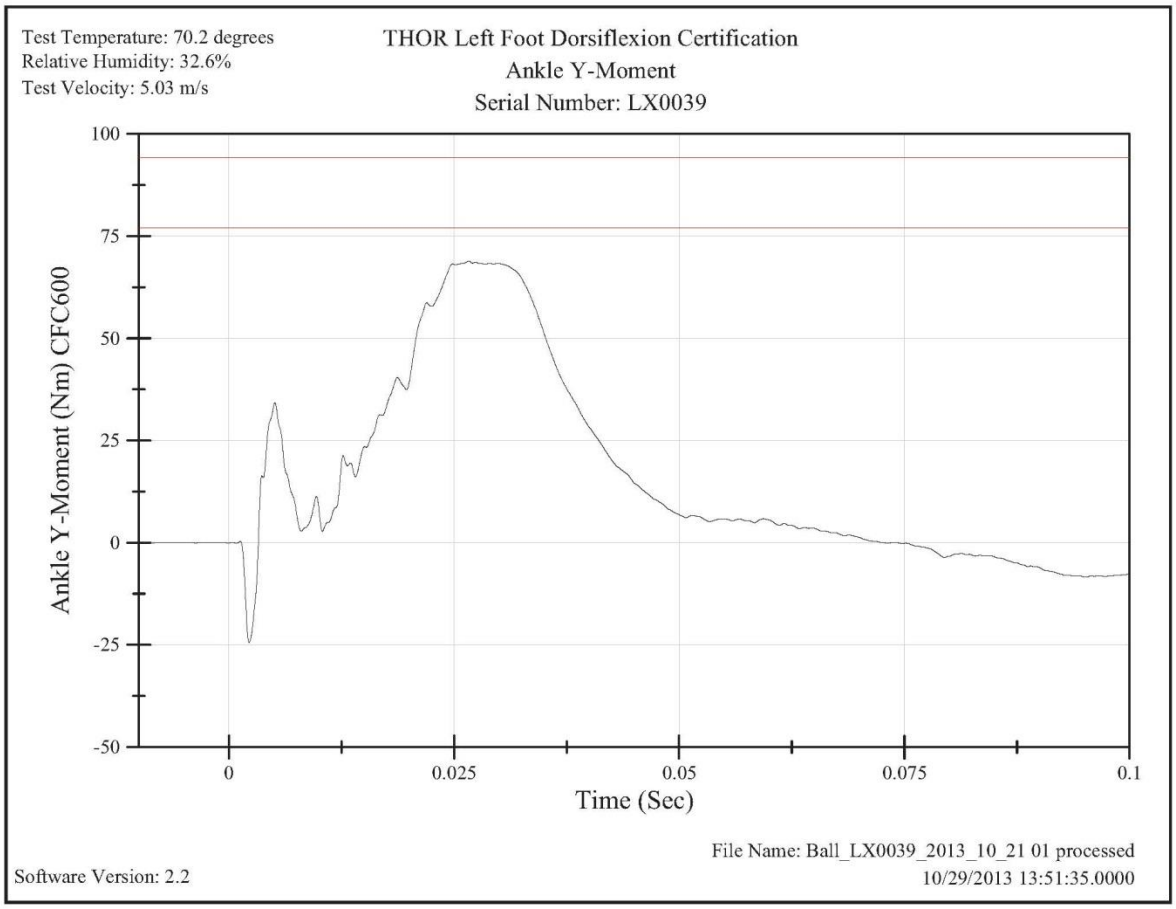

Test Temperature: 71 degrees
Relative Humidity: 51%
Test Velocity: 6.1 m/s
THOR Lower Abdomen Certification
Lower Abdomen Deflection (via PENXG and T12XG) vs. Probe Force
Serial Number: 015
Force (N) CFC180
15000
12500
10000
7500
5000
2500
0
-150
-125
-100
-75
-50
-25
0
Displacement (mm) CFC180
File Name: T015ABDOMENLOWER102113_01_DIAdemHeader_BINARY
Software Version:
01/01/0000 00:00:00.0000

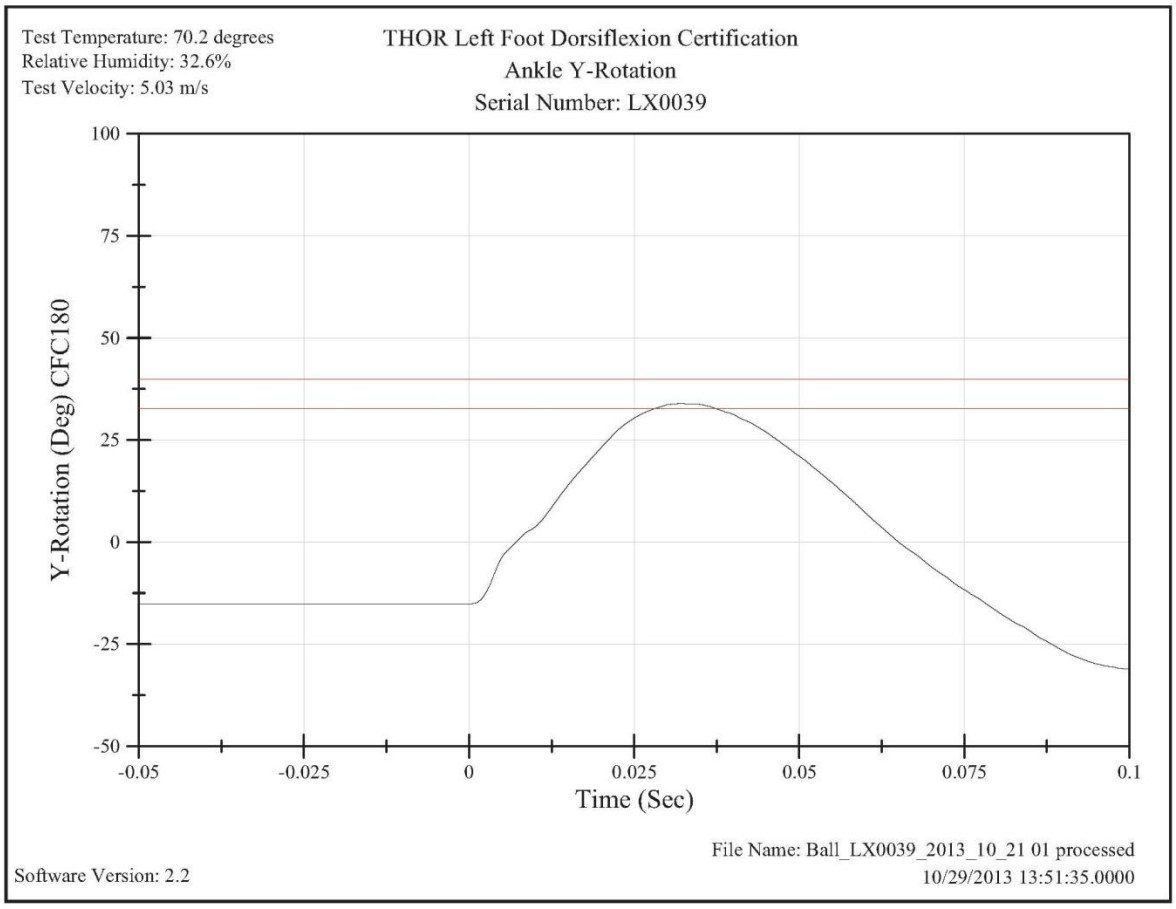

Test Temperature: 72 degrees
Relative Humidity: 51%
Test Velocity: 2.58 m/s
THOR Left Femur Certification
Probe Force
Serial Number: T015
Force (N) CFC180
10000
7500
5000
2500
0
-0.0025
0
0.0025
0.005
0.0075
Time (sec)
File Name: T015FEMURLEFT102213_01_DIAdemHeader_BINARYpp
Software Version: 2.2
10/22/2013 14:06:02.0000

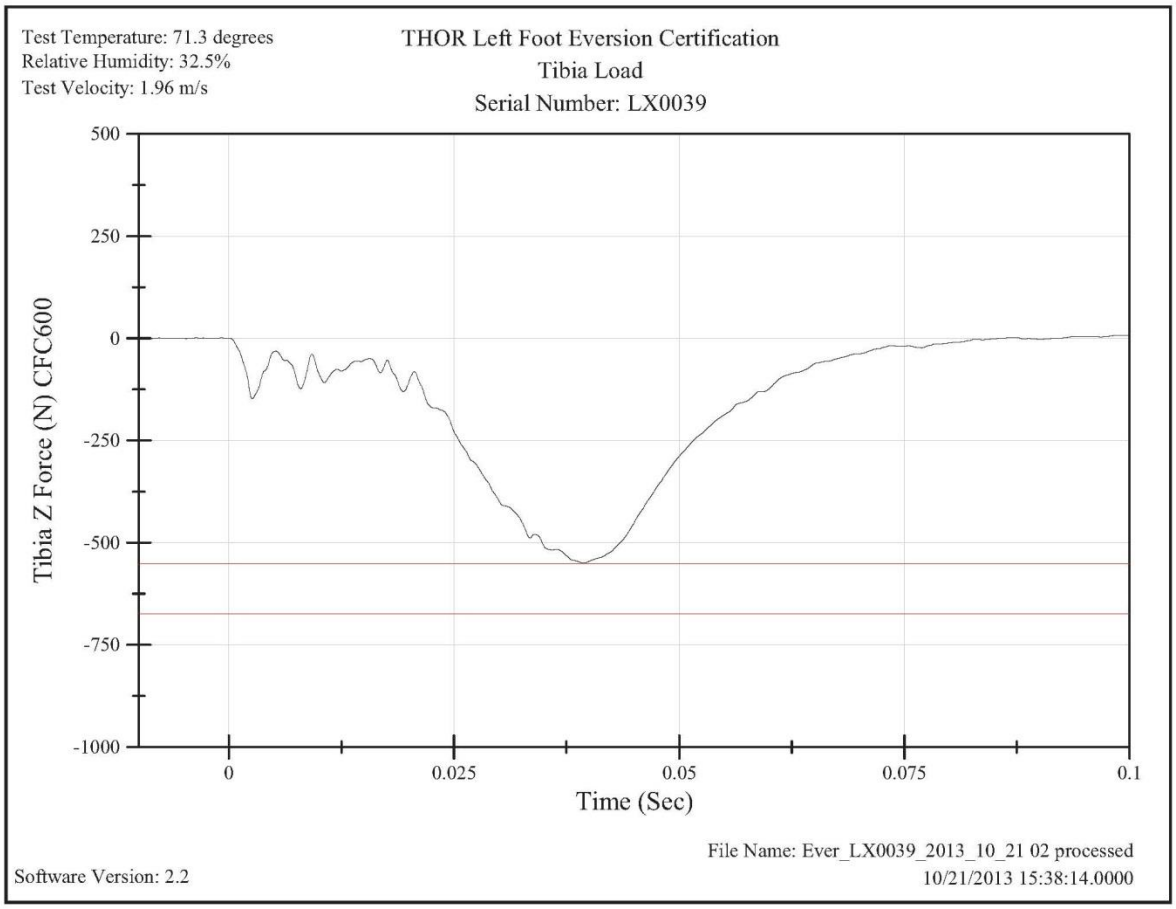

Test Temperature: 72 degrees
Relative Humidity: 51%
Test Velocity: 2.58 m/s
THOR Right Femur Certification
Probe Force
Serial Number: T015
10000
7500
5000
2500
0
Force (N) CFC180
-0.0025
0
0.0025
0.005
0.0075
Time (sec)
File Name: T015FEMURRIGHT102213_01_DIAdemHeader_BINARYpp
Software Version: 2.2
10/22/2013 14:07:36.0000

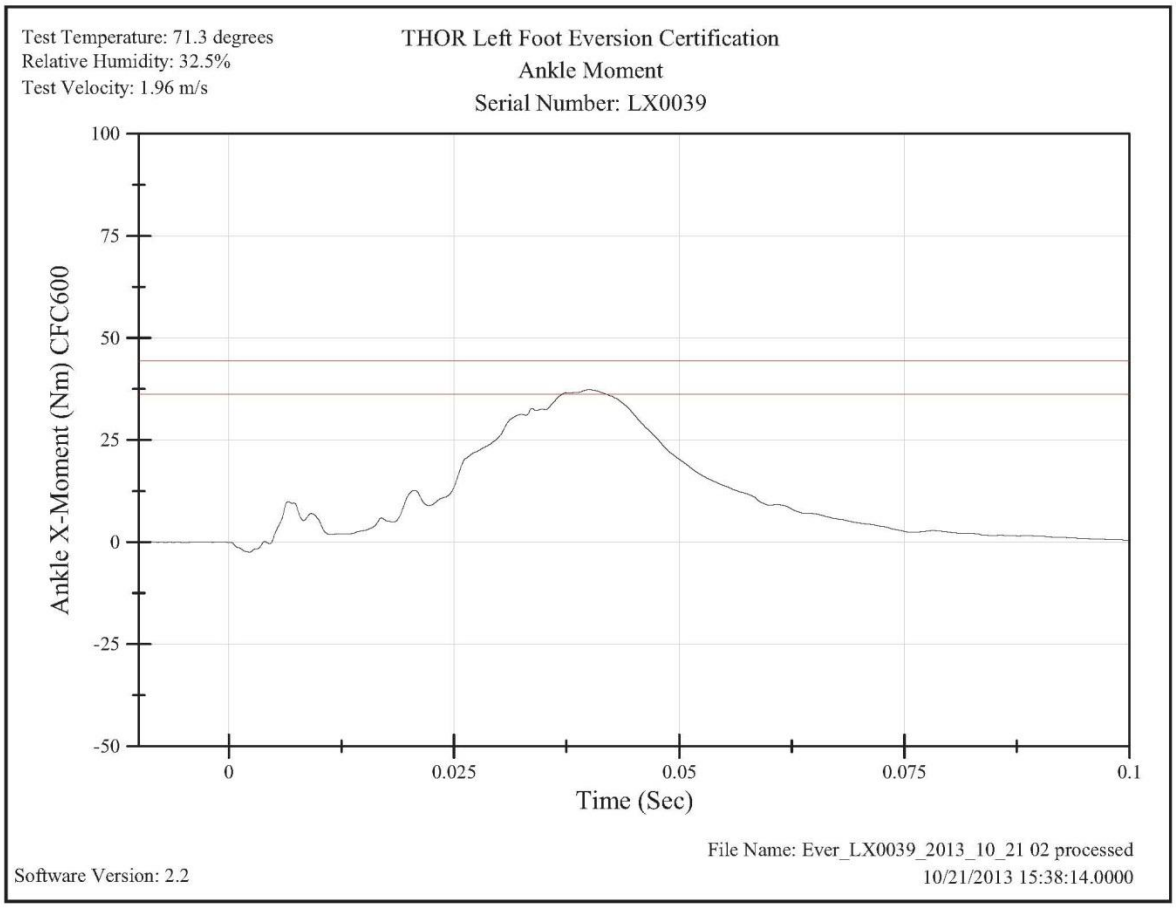

Test Temperature: 71.4 degrees
Relative Humidity: 35.9%
Test Velocity: 3.97 m/s
THOR Left Foot Heel Certification
Tibia Load
Serial Number: LX0039
Tibia Z Force (N) CFC600
5000
2500
0
-2500
-5000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Heel_LX0039_2013_10_22 01 processed
10/22/2013 07:59:48.0000
Software Version: 2.2

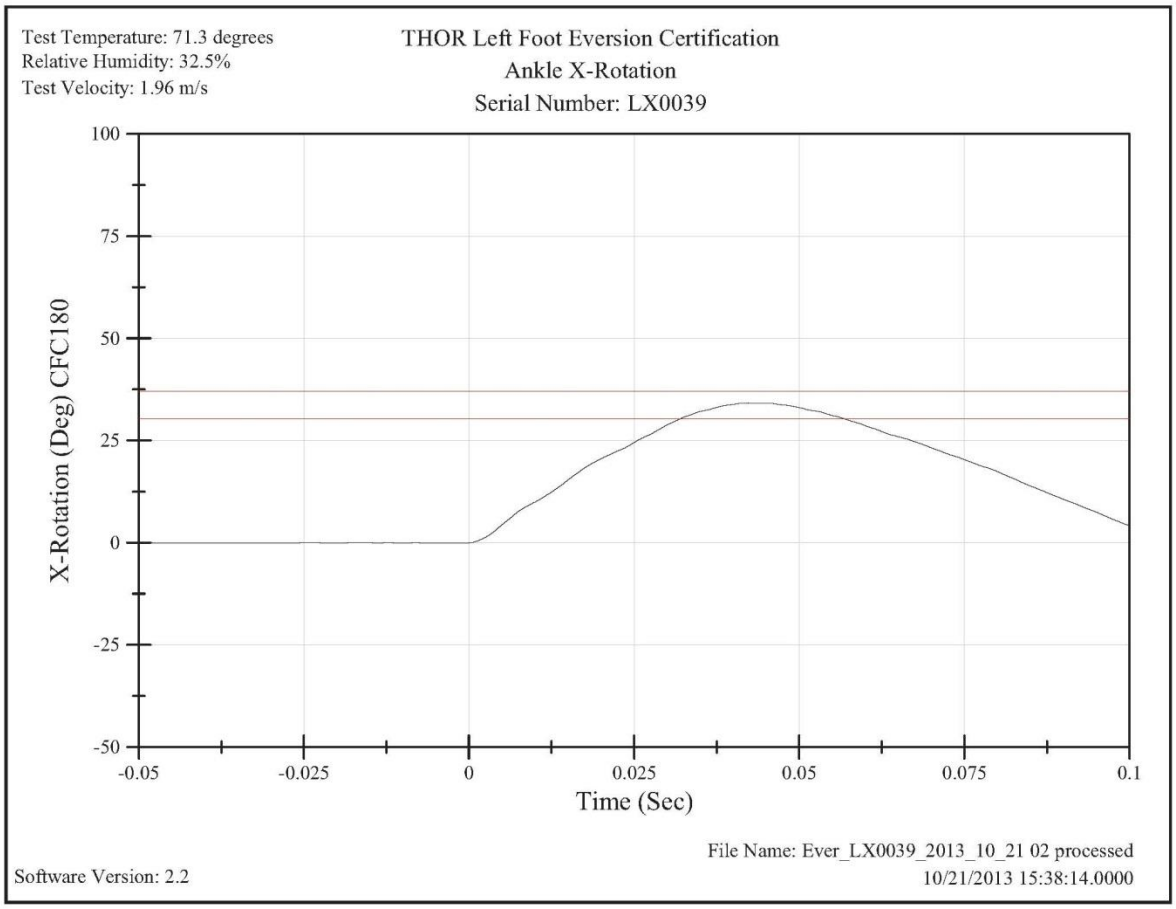

Test Temperature: 70.2 degrees
Relative Humidity: 32.6%
Test Velocity: 5.03 m/s
THOR Left Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0039
Tibia Z Force (N) CFC600
0
-1000
-2000
-3000
-4000
-5000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ball_LX0039_2013_10_21 01 processed
10/29/2013 13:51:35.0000
Software Version: 2.2

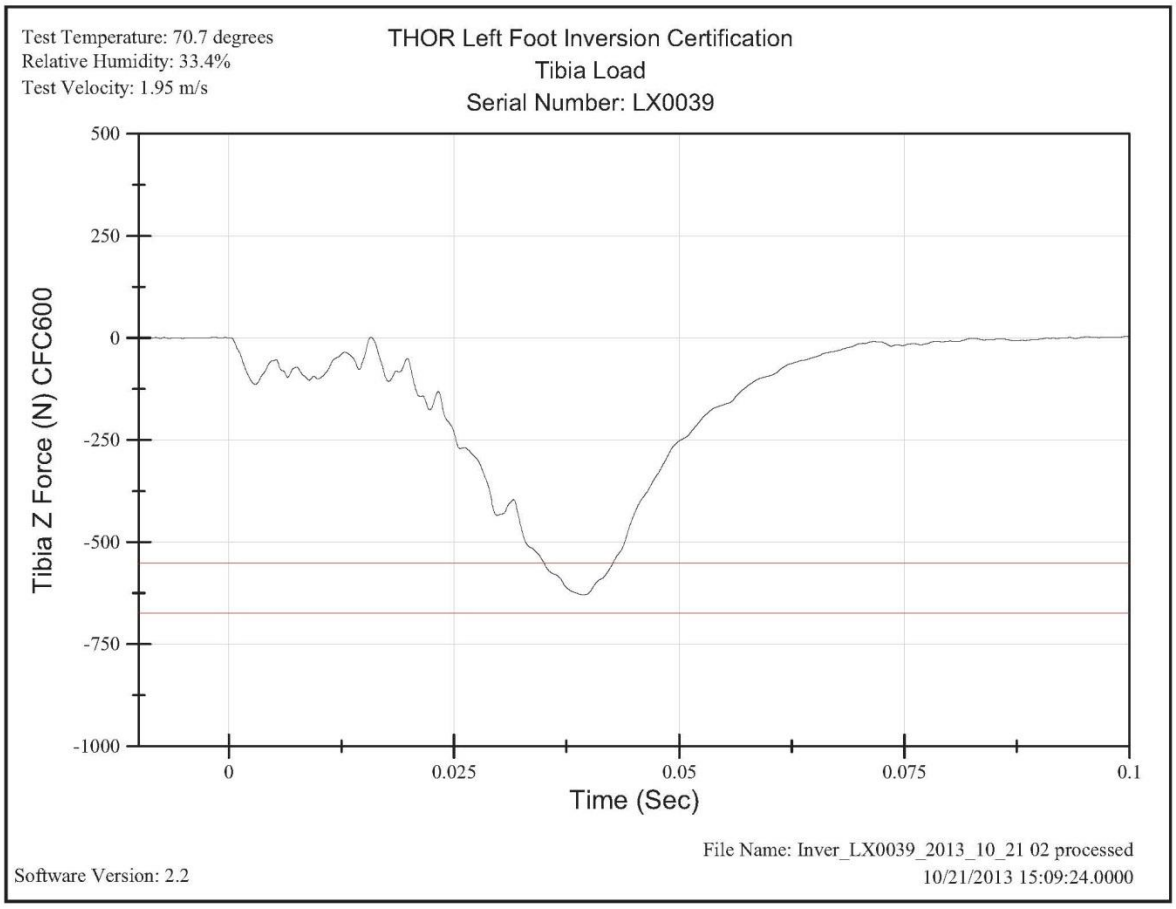

Test Temperature: 70.2 degrees
Relative Humidity: 32.6%
Test Velocity: 5.03 m/s
THOR Left Foot Dorsiflexion Certification
Ankle Y-Moment
Serial Number: LX0039
Ankle Y-Moment (Nm) CFC600
100
75
50
25
0
-25
-50
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ball_LX0039_2013_10_21 01 processed
10/29/2013 13:51:35.0000
Software Version: 2.2

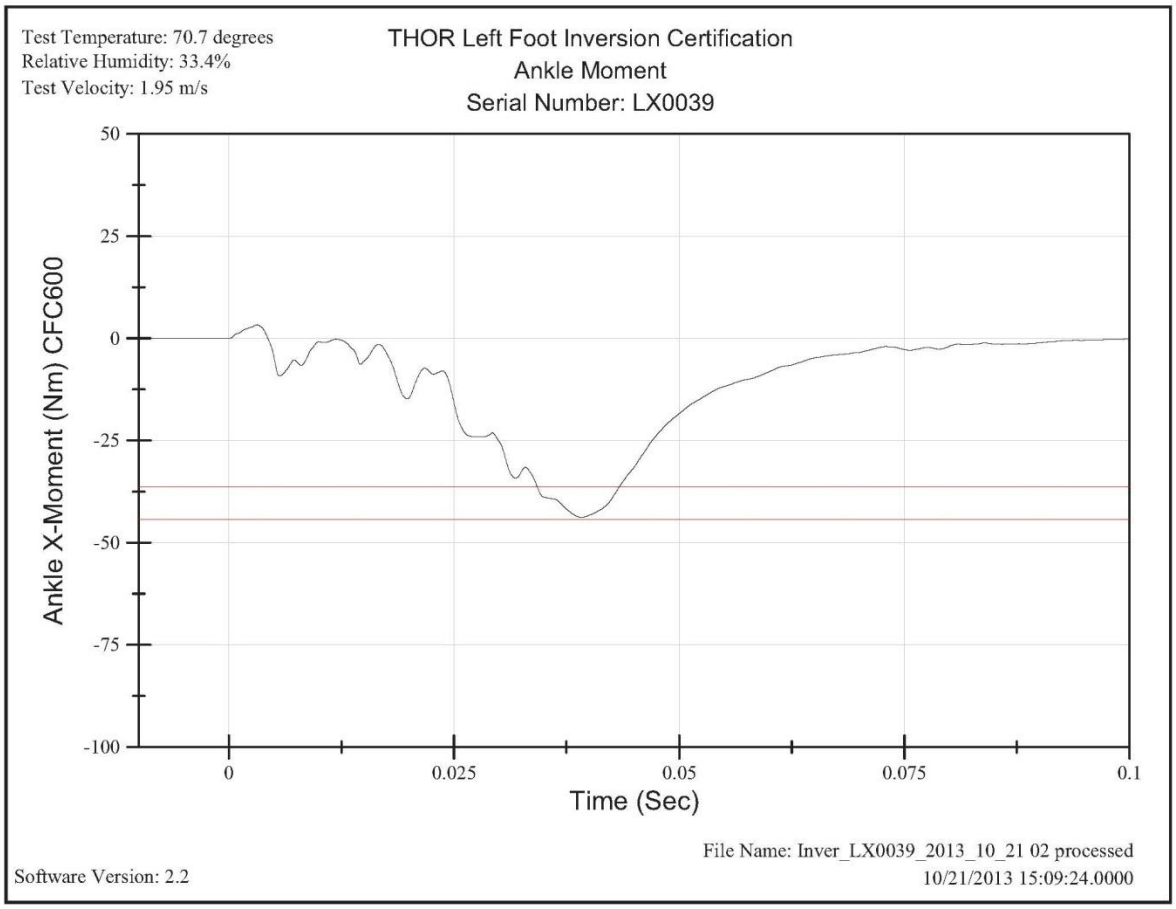

Test Temperature: 70.2 degrees
Relative Humidity: 32.6%
Test Velocity: 5.03 m/s
THOR Left Foot Dorsiflexion Certification
Ankle Y-Rotation
Serial Number: LX0039
Y-Rotation (Deg) CFC180
100
75
50
25
0
-25
-50
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ball_LX0039_2013_10_21 01 processed
10/29/2013 13:51:35.0000
Software Version: 2.2

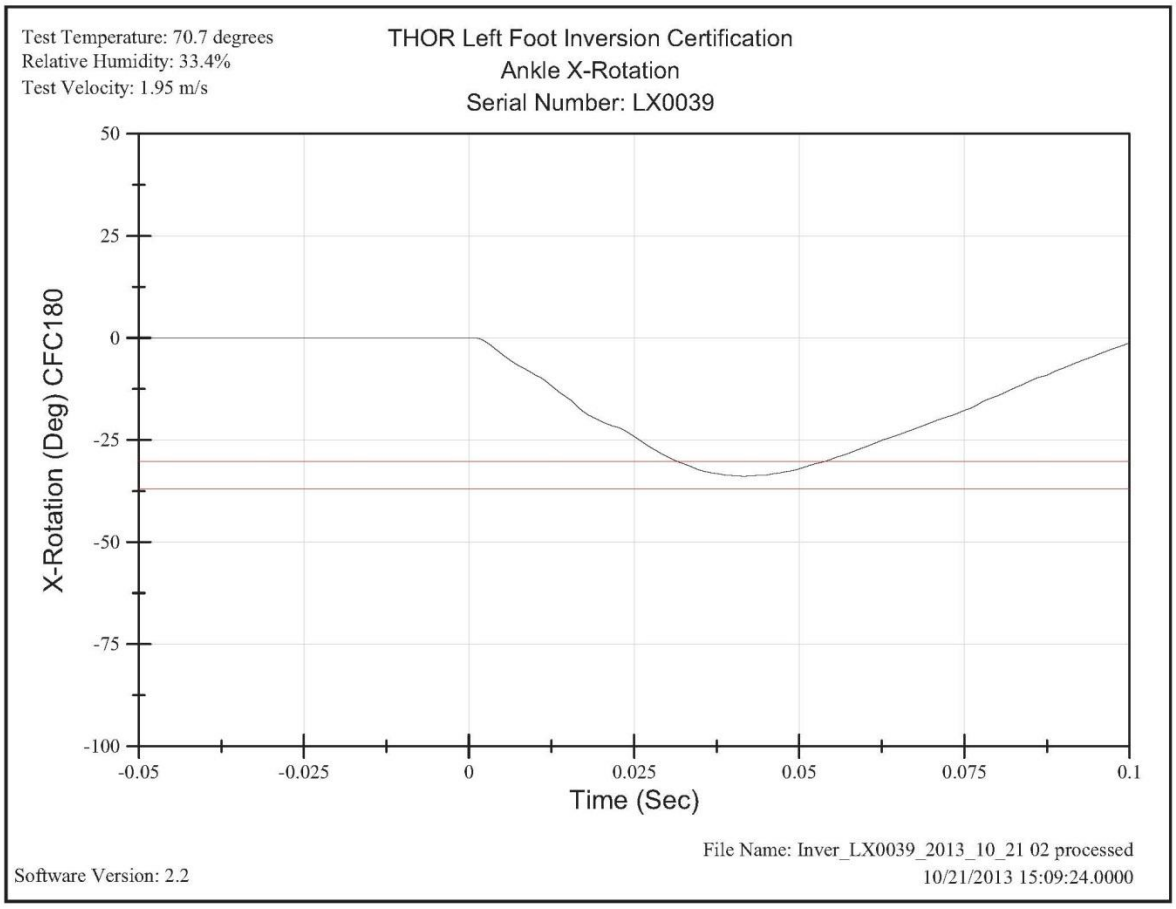

Test Temperature: 71.3 degrees
Relative Humidity: 32.5%
Test Velocity: 1.96 m/s
THOR Left Foot Eversion Certification
Tibia Load
Serial Number: LX0039
Tibia Z Force (N) CFC600
500
250
0
-250
-500
-750
-1000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0039_2013_10_21 02 processed
10/21/2013 15:38:14.0000
Software Version: 2.2


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
Ankle X-Moment (Nm) CFC600
100
75
50
25
0
-25
-50
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0039_2013_10_21 02 processed
10/21/2013 15:38:14.0000
Software Version: 2.2


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
X-Rotation (Deg) CFC180
100
75
50
25
0
-25
-50
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0039_2013_10_21 02 processed
10/21/2013 15:38:14.0000
Software Version: 2.2


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
Tibia Z Force (N) CFC600
500
250
0
-250
-500
-750
-1000
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Inver_LX0039_2013_10_21 02 processed
10/21/2013 15:09:24.0000
Software Version: 2.2


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
Ankle X-Moment (Nm) CFC600
50
25
0
-25
-50
-75
-100
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Inver_LX0039_2013_10_21 02 processed
10/21/2013 15:09:24.0000
Software Version: 2.2


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
X-Rotation (Deg) CFC180
50
25
0
-25
-50
-75
-100
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
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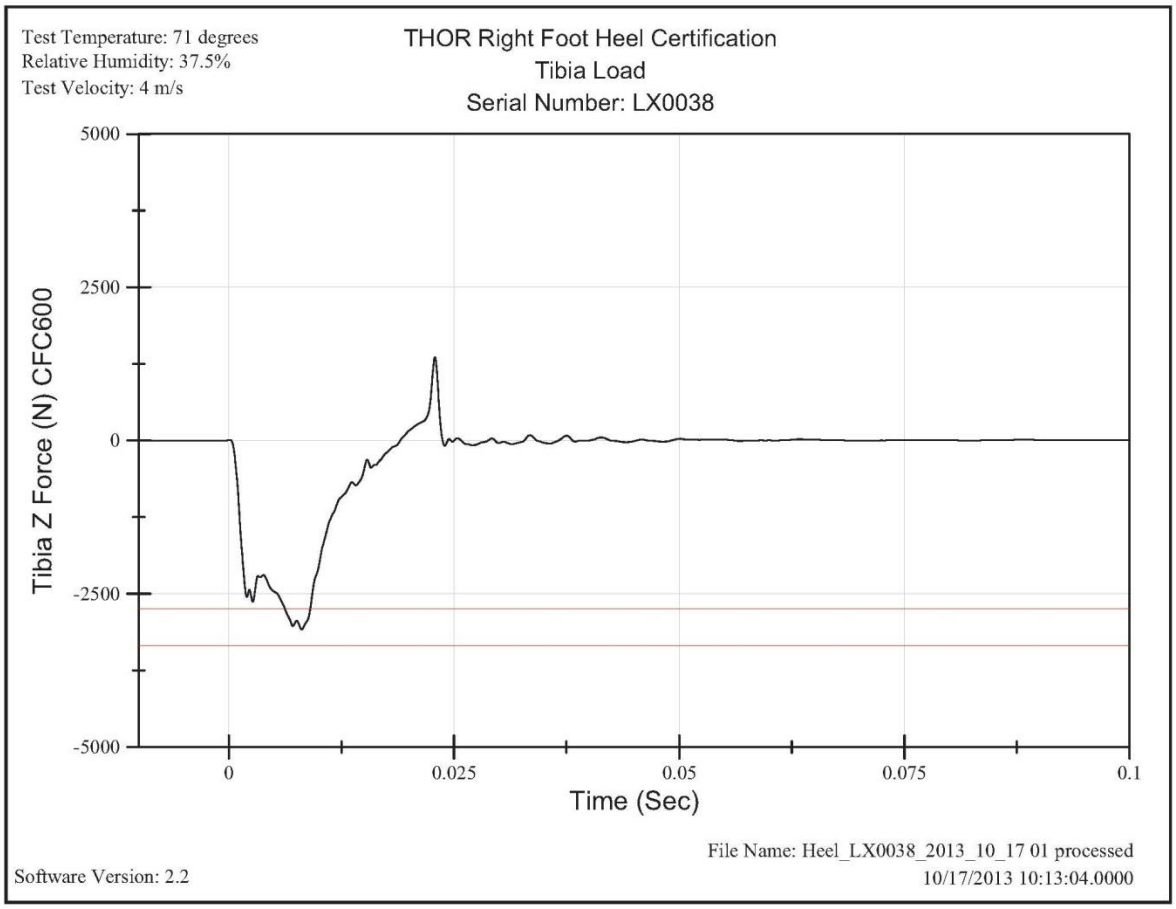
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Relative Humidity: 37.5%
Test Velocity: 4 m/s
THOR Right Foot Heel Certification
Tibia Load
Serial Number: LX0038
Tibia Z Force (N) CFC600
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2500
0
-2500
-5000
0
0.025
0.05
0.075
0.1
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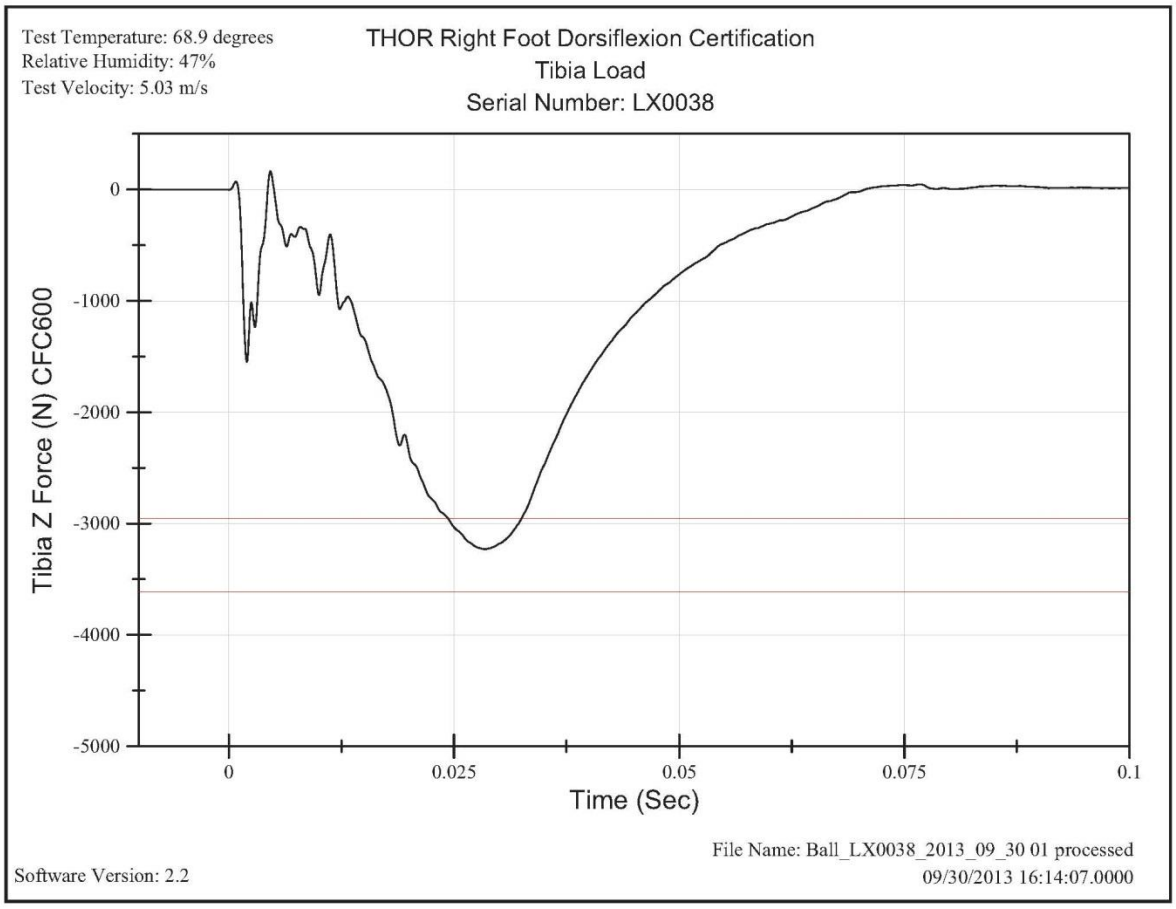
Test Temperature: 68.9 degrees
Relative Humidity: 47%
Test Velocity: 5.03 m/s
THOR Right Foot Dorsiflexion Certification
Tibia Load
Serial Number: LX0038
Tibia Z Force (N) CFC600
0
-1000
-2000
-3000
-4000
-5000
0
0.025
0.05
0.075
0.1
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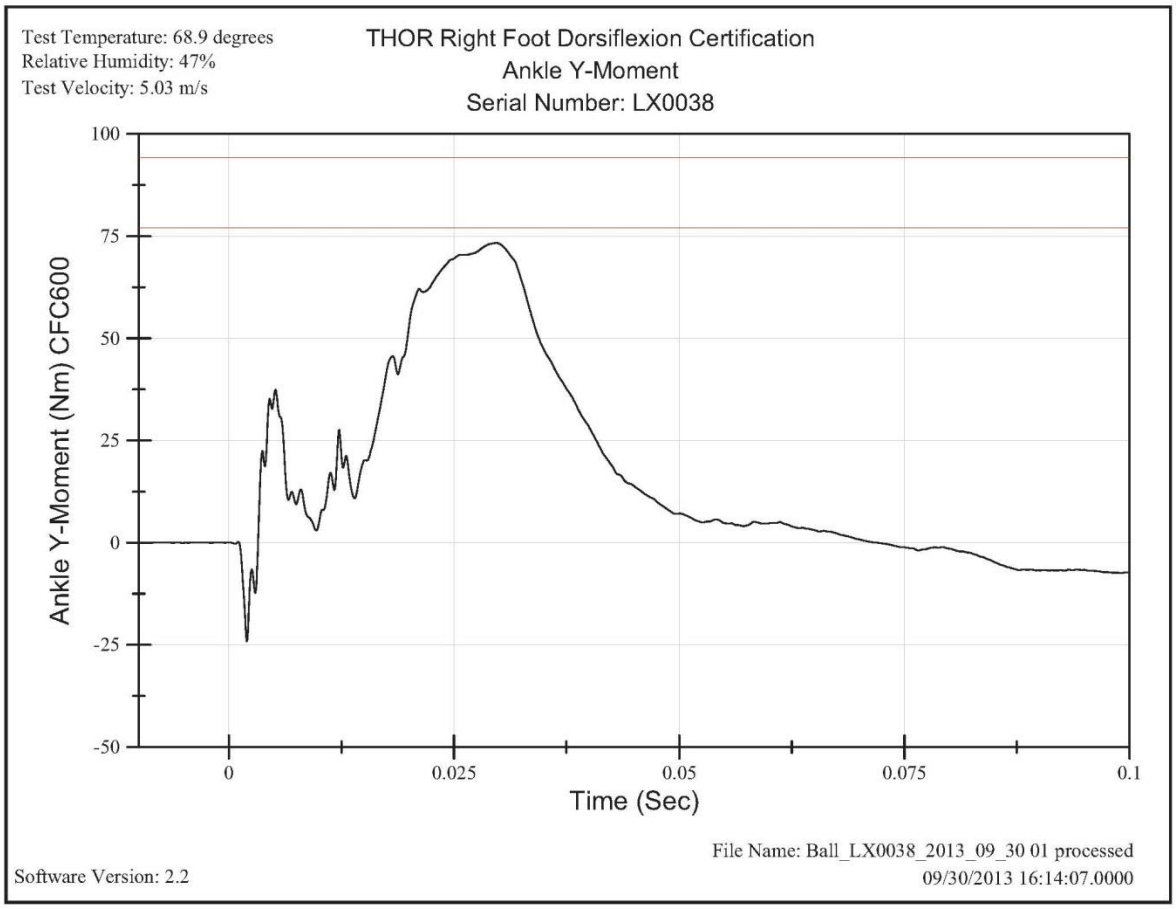
Test Temperature: 68.9 degrees
Relative Humidity: 47%
Test Velocity: 5.03 m/s
THOR Right Foot Dorsiflexion Certification
Ankle Y-Moment
Serial Number: LX0038
Ankle Y-Moment (Nm) CFC600
100
75
50
25
0
-25
-50
0
0.025
0.05
0.075
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Time (Sec)
File Name: Ball_LX0038_2013_09_30 01 processed
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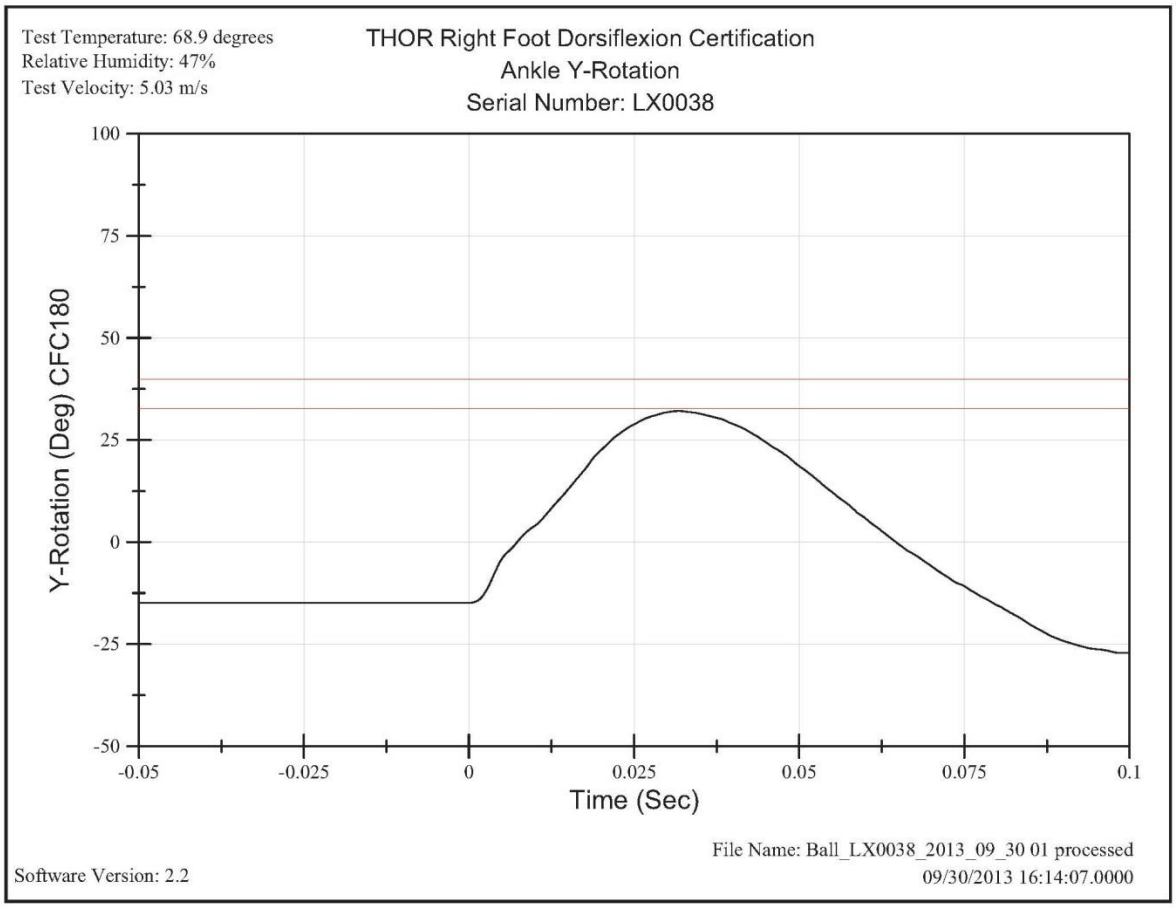
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Relative Humidity: 47%
Test Velocity: 5.03 m/s
THOR Right Foot Dorsiflexion Certification
Ankle Y-Rotation
Serial Number: LX0038
Y-Rotation (Deg) CFC180
100
75
50
25
0
-25
-50
-0.05
-0.025
0
0.025
0.05
0.075
0.1
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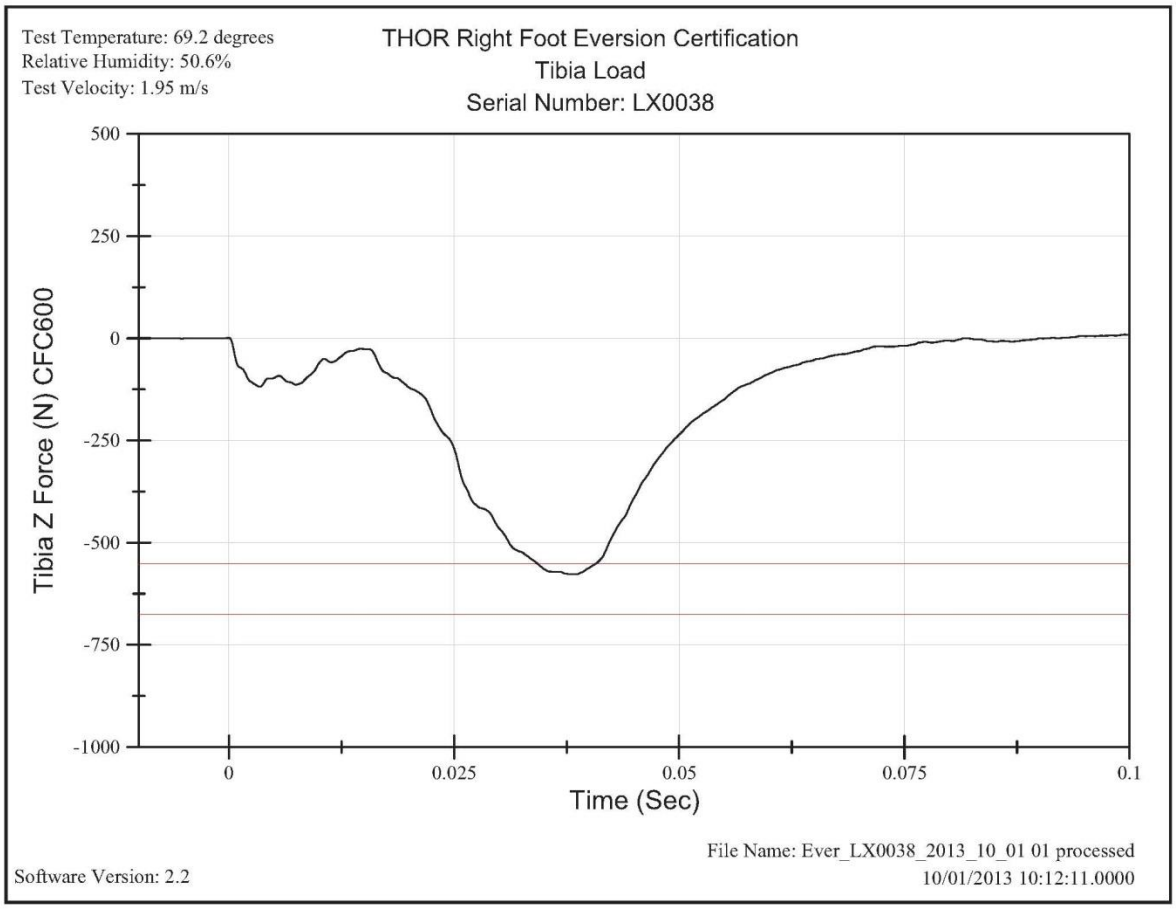
Test Temperature: 69.2 degrees
Relative Humidity: 50.6%
Test Velocity: 1.95 m/s
THOR Right Foot Eversion Certification
Tibia Load
Serial Number: LX0038
Tibia Z Force (N) CFC600
500
250
0
-250
-500
-750
-1000
0
0.025
0.05
0.075
0.1
Time (Sec)
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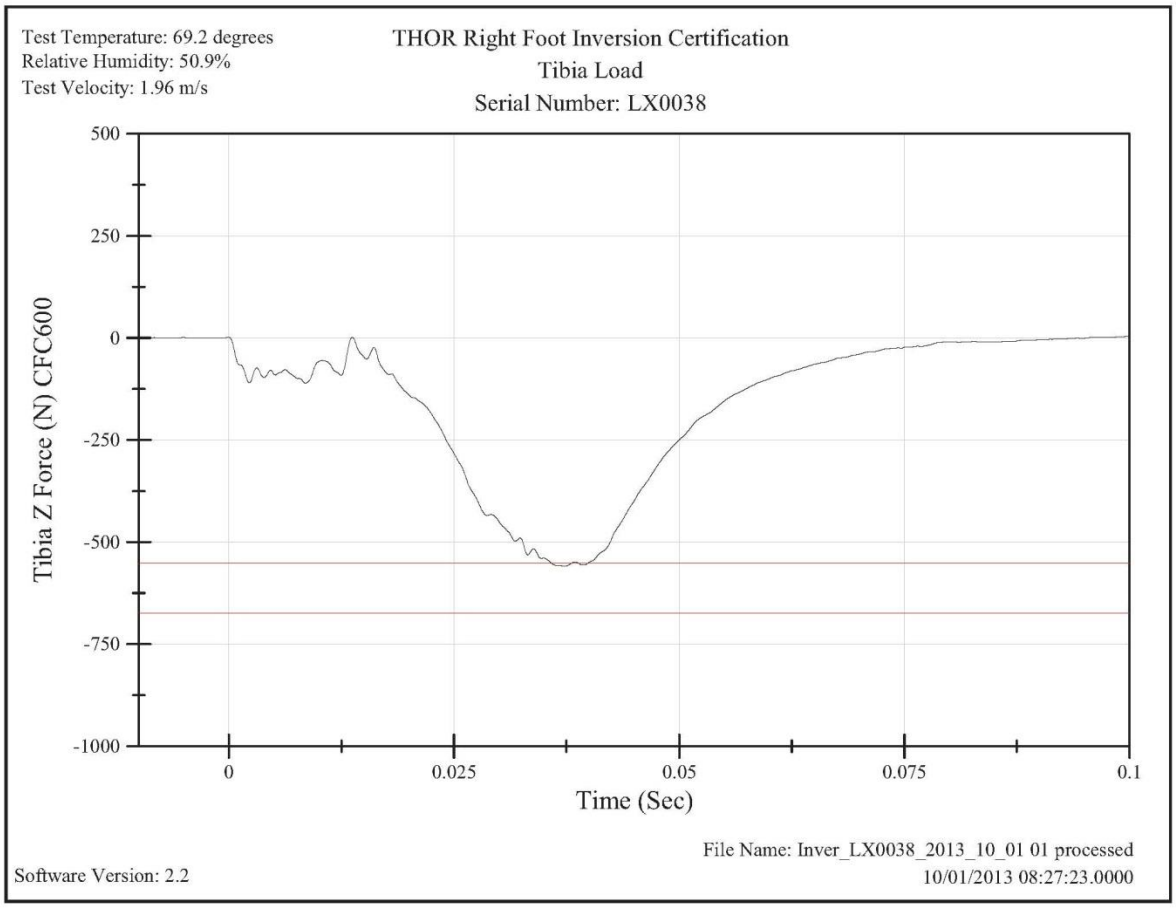
Software Version: 2.2


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
Tibia Z Force (N) CFC600
500
250
0
-250
-500
-750
-1000
0
0.025
0.05
0.075
0.1
Time (Sec)
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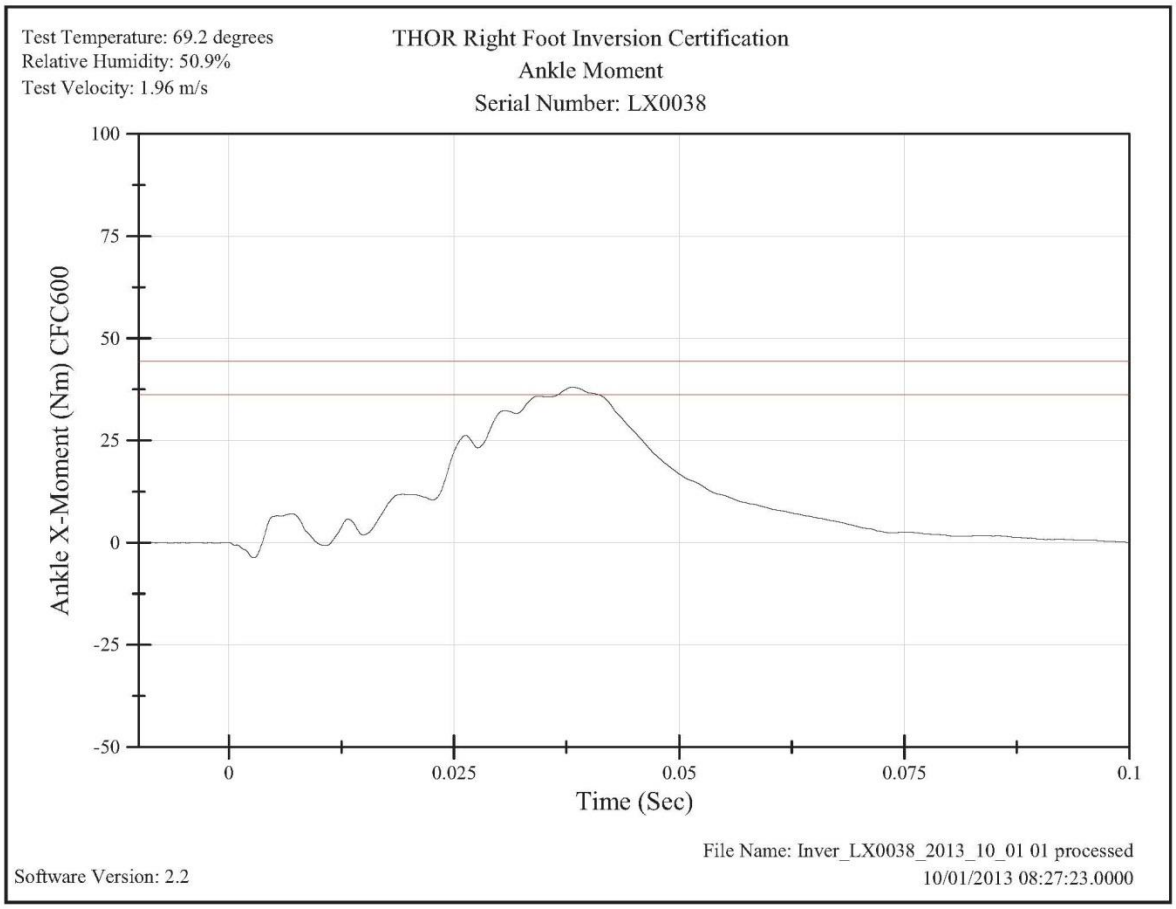
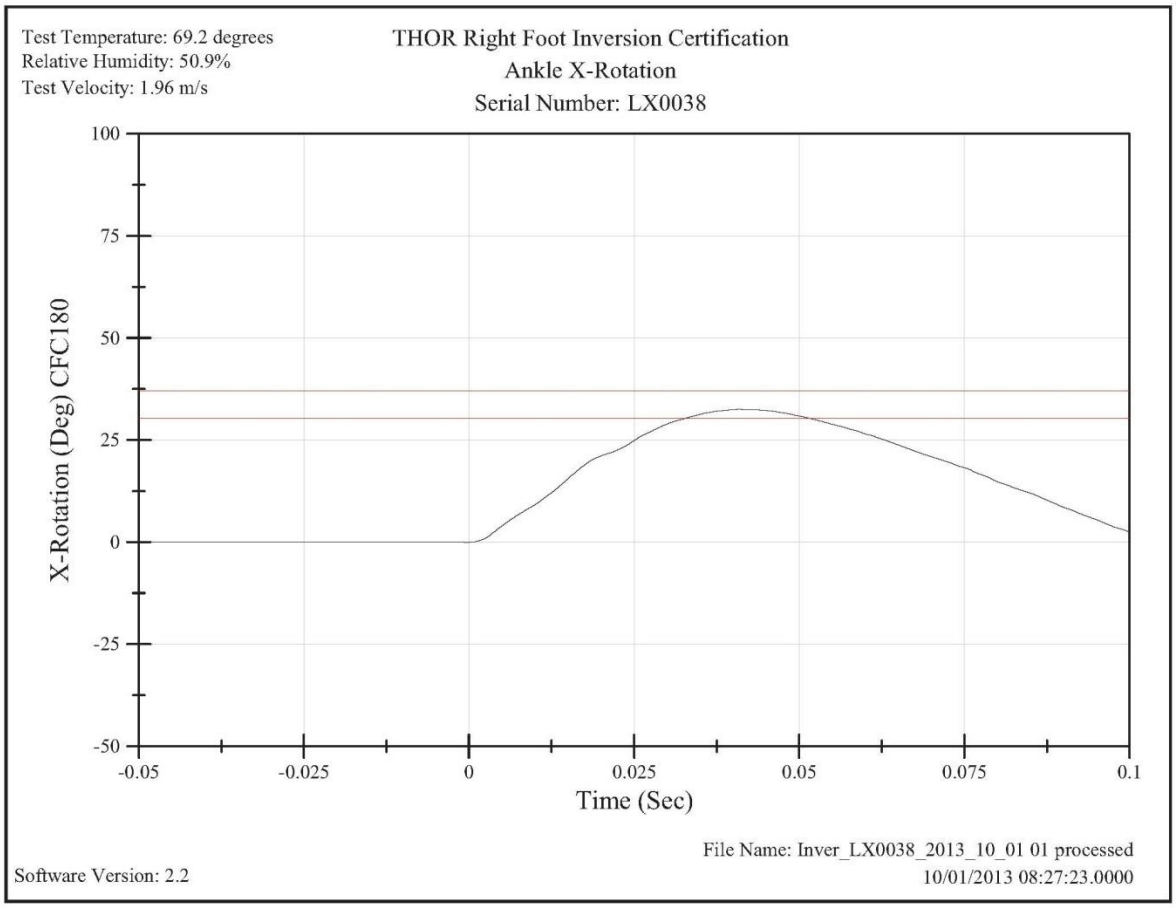
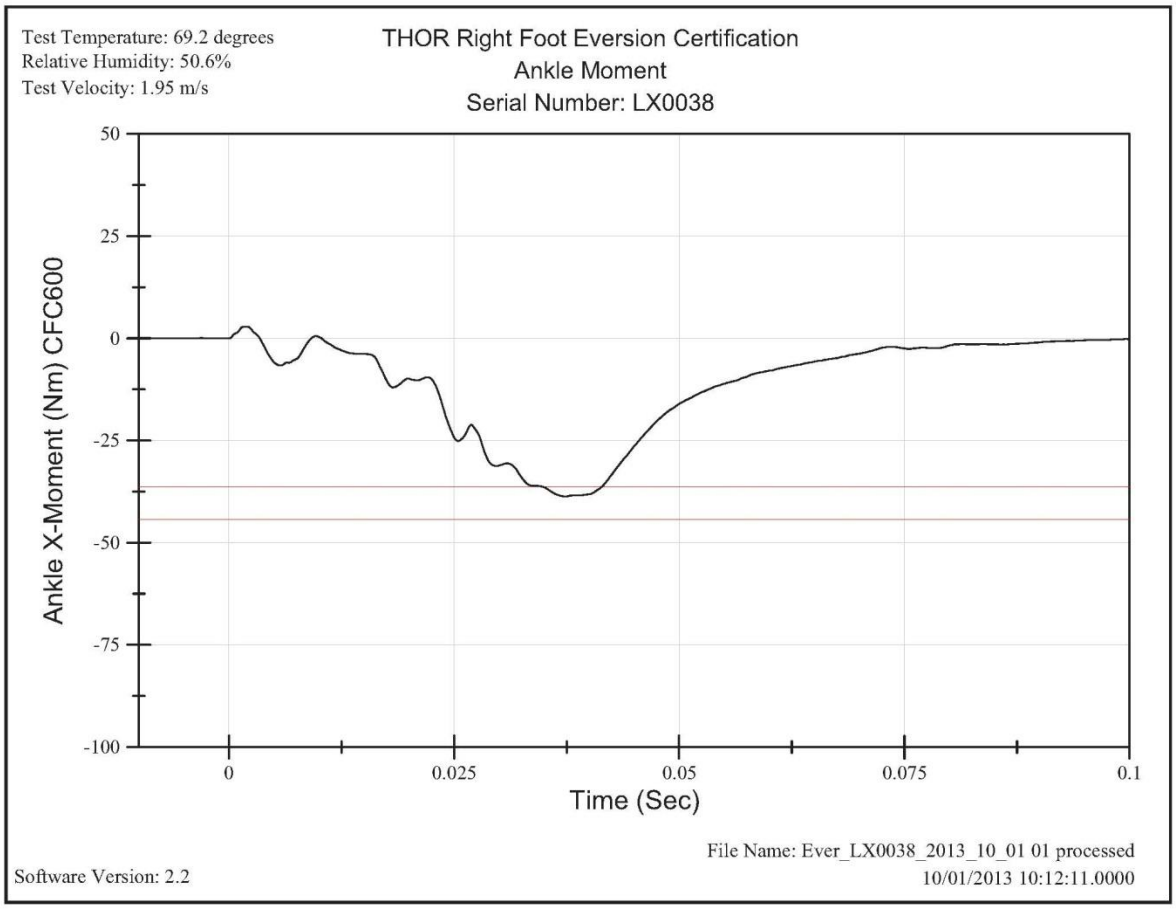
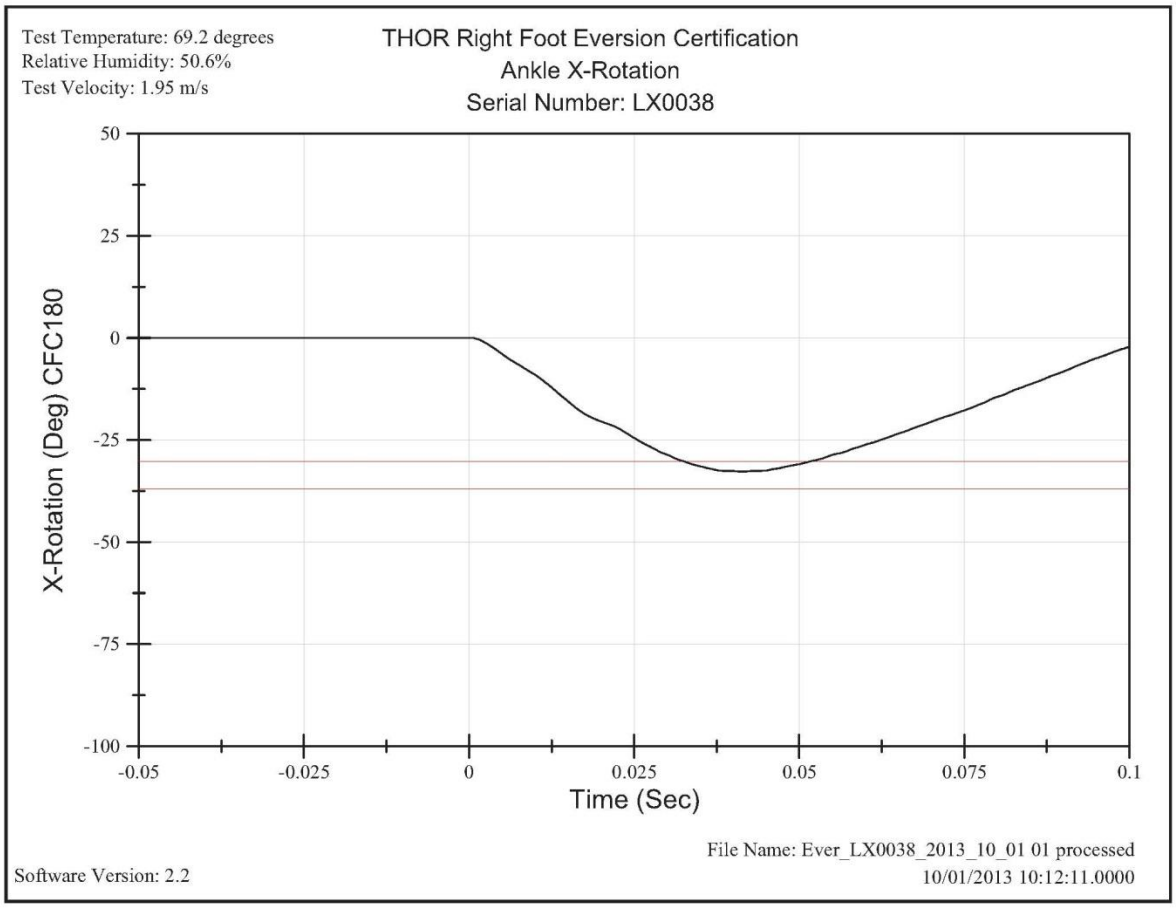

Test Temperature: 69.2 degrees
Relative Humidity: 50.9%
Test Velocity: 1.96 m/s
THOR Right Foot Inversion Certification
Ankle Moment
Serial Number: LX0038
Ankle X-Moment (Nm) CFC600
100
75
50
25
0
-25
-50
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Inver_LX0038_2013_10_01 01 processed
10/01/2013 08:27:23.0000
Software Version: 2.2


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
X-Rotation (Deg) CFC180
100
75
50
25
0
-25
-50
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Inver_LX0038_2013_10_01 01 processed
10/01/2013 08:27:23.0000
Software Version: 2.2


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
Ankle X-Moment (Nm) CFC600
50
25
0
-25
-50
-75
-100
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0038_2013_10_01 01 processed
10/01/2013 10:12:11.0000
Software Version: 2.2


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
X-Rotation (Deg) CFC180
50
25
0
-25
-50
-75
-100
-0.05
-0.025
0
0.025
0.05
0.075
0.1
Time (Sec)
File Name: Ever_LX0038_2013_10_01 01 processed
10/01/2013 10:12:11.0000
Software Version: 2.2

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

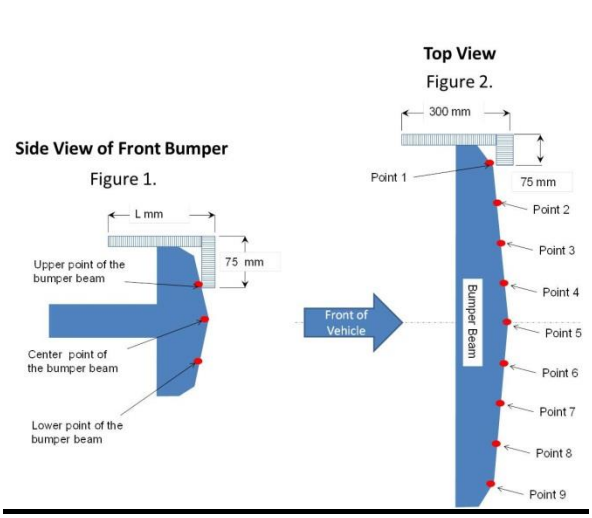
The Brake Pedal Reference Point is the x, y, and z location of the geometric center of the brake pedal pad (top surface) in the VCS.

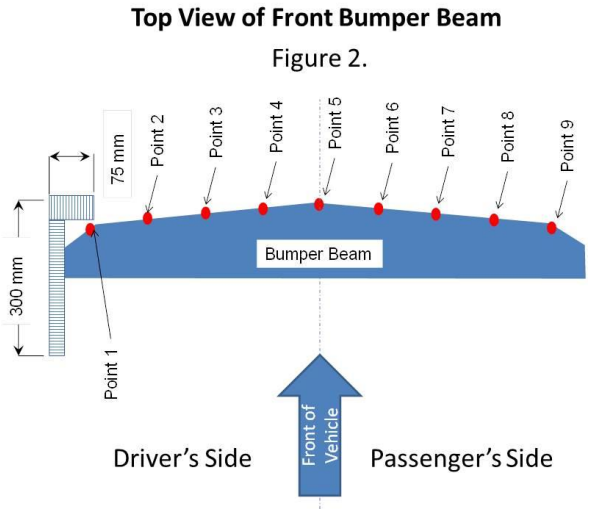
Floor Reference Point

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.

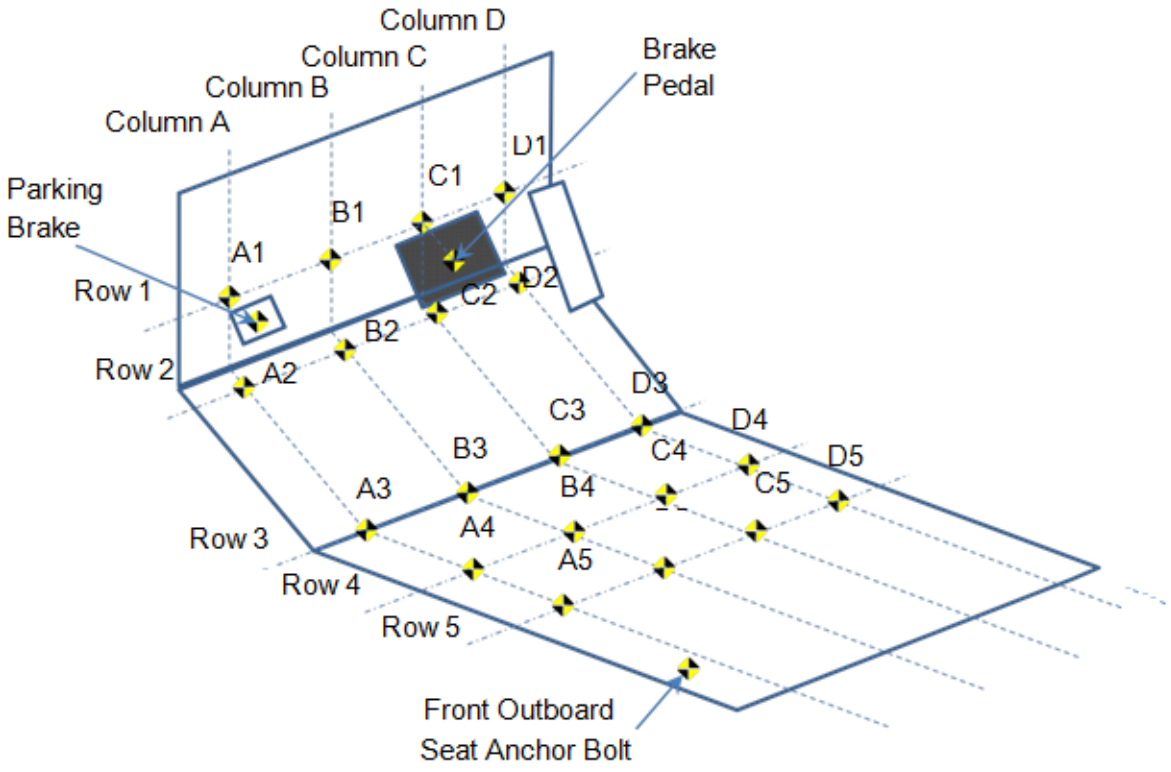
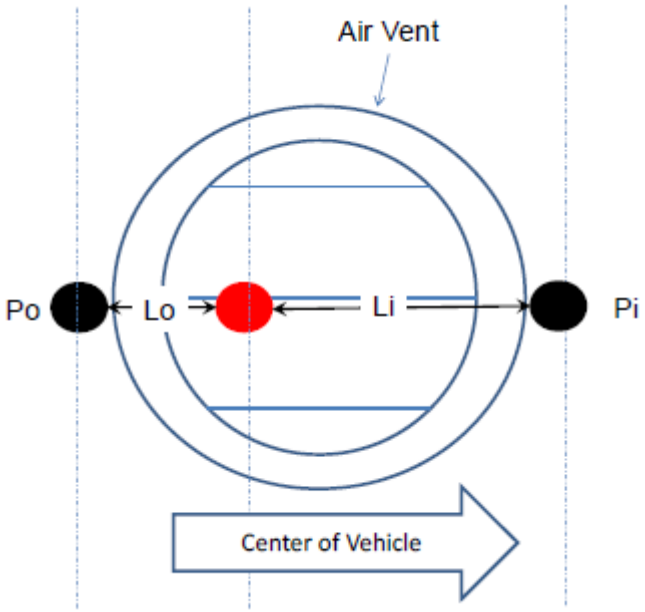


Figure 22: Lower interior intrusion measurements

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.



$$dp = \frac{Li}{Lo + Li}[X_o, Y_o, Z_o] + \frac{Lo}{Lo + Li}[X_o, Y_o, Z_o]$$

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

Passenger Left Lower Instrument Panel

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

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

Passenger Right Lower Instrument Panel

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

Passenger Toe pan and Floor Board (Figure 24)

PASSENGER POINT A1

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

PASSENGER POINT B1

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

PASSENGER POINT C1

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

PASSENGER POINT D1

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

PASSENGER POINT A2

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

PASSENGER POINT B2

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

PASSENGER POINT C2

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

PASSENGER POINT D2

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

PASSENGER POINT A3

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

PASSENGER POINT B3

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

PASSENGER POINT C3

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

PASSENGER POINT D3

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

PASSENGER POINT A4

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

PASSENGER POINT B4

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

PASSENGER POINT C4

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

PASSENGER POINT D4

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

PASSENGER POINT A5

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

PASSENGER POINT B5

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

PASSENGER POINT C5

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

PASSENGER POINT D5

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

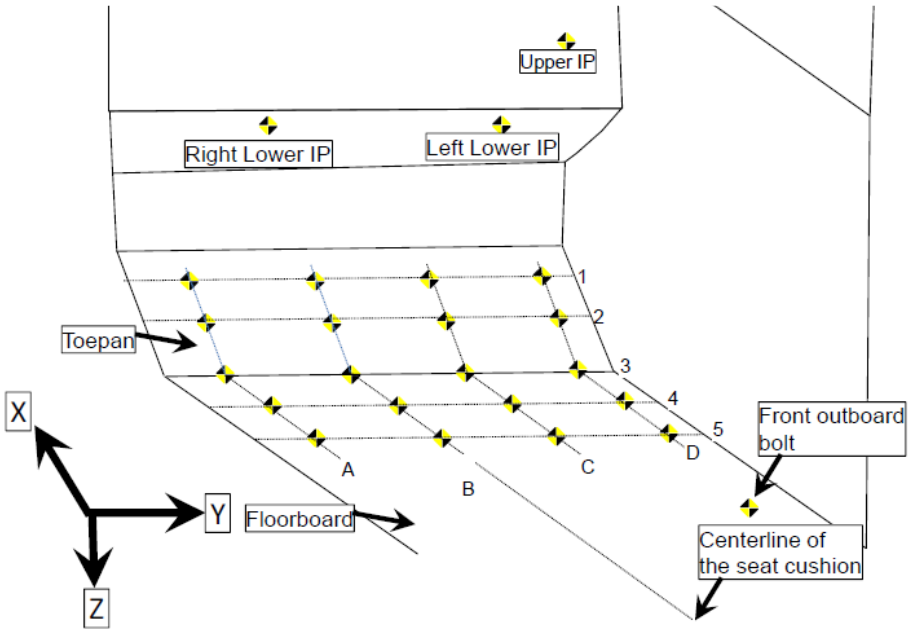


Figure 24: Passenger side lower interior measurements

Passenger Upper Dash

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

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

Driver Door Measurements (Figure 25)

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

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

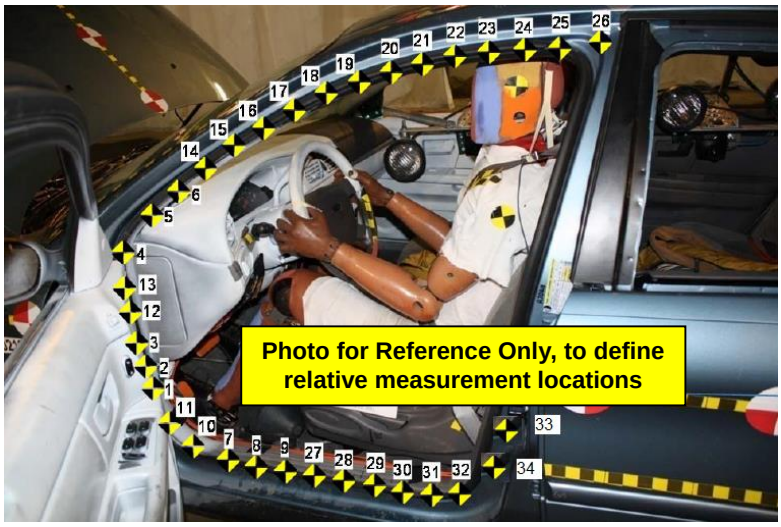


Figure 25: Driver Door Measurements

Passenger Door Measurements

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

Pre-Test Exterior Profile

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

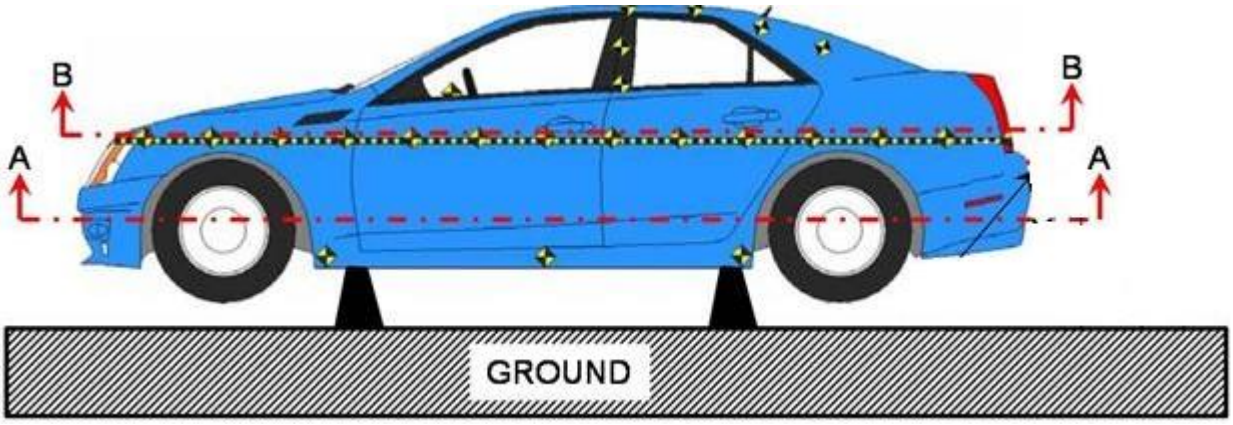


Figure 26: Pre-Test Vehicle Profile

Post-Test Exterior Profile

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

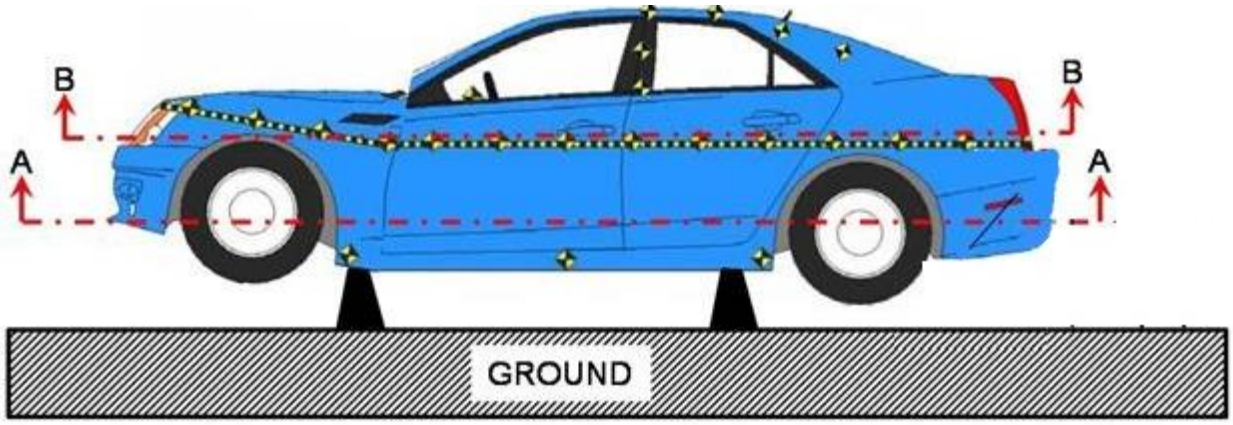
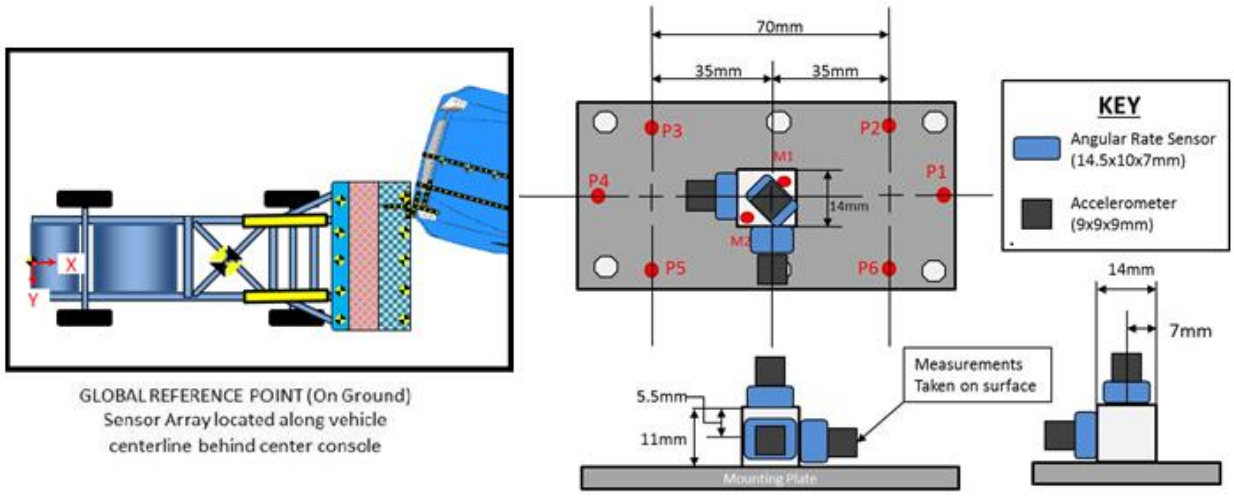


Figure 27: Post-Test Vehicle Profile

Pre and Post Honeycomb Requirements

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

Angular Rate Sensor Mounting & Dimensions:



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

    Note: the block shall not move relative to the vehicle during the test
4) CMM each position alignment point (P1-P6) while the vehicle is level.
5) CMM the middle of the top surface of each direction of the CG accelerometer while the vehicle is level. (ie. Accelerometer CGx will be taken on the surface in the x-direction)
6) Transport the vehicle to test area and align with the RMDB barrier
7) Once vehicle is aligned with the barrier and all dummies are positioned, create a global coordinate system on the ground (GCS). The origin of the GCS is located at the front most point at the centerline of the RMDB.
    - Positive X is from the GCS origin point to the rear of RMDB
    - Positive Y is from the center of RMDB towards the left of RMDB when looking from the back of the RMDB
    - Positive Z is from the GCS origin point downward into the ground
8) Measure and record all points described above