

REPORT NUMBER: R&D-CAL-12-003

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

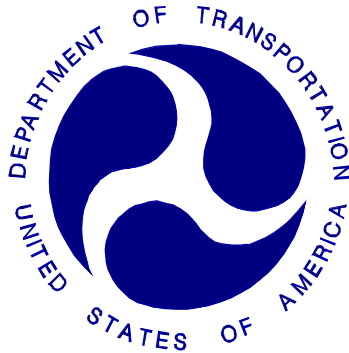
2013 NISSAN VERSA

90.1KPH, 15 DEGREE ANGLE, 35% OVERLAP

TEST DATE: 12/7/2012

NHTSA No: RD5226

**CALSPAN CORPORATION
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FINAL REPORT SUBMITTED:

March 3, 2015

PREPARED FOR:

**U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Vehicle safety Research
1200 New Jersey Ave, SE
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FINAL REPORT ACCEPTANCE BY VEHICLE SAFETY RESEARCH, OFFICE OF
STRUCTURAL AND RESTRAINTS RESEARCH DIVISION
:

Date: _____

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

Date: _____

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16. Abstract A test was conducted in accordance with Task Order 0001 of Contract DTNH22-10-D-00155. The Test consisted of a Research Moving Deformable Barrier (RMDB) traveling at a target speed of 90.12 kph into a stationary 2013 Nissan Versa. The struck vehicle was positioned 15 degrees relative to the moving barrier and impacted 35% of the left side of the vehicle. The test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at the Calspan Corporation's Transportation Test Operation's facility in Buffalo, New York on December 7, 2012. The RMDB impact velocity was 89.85 kph and the ambient temperature at the test vehicle at the time of impact was 20°C. The target vehicle post-test maximum crush was 691 mm. The test vehicle's performance was as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Pass. ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>136.91</td> <td>700</td> <td>543.24</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-36.24</td> <td>63</td> <td>-41.40</td> </tr> <tr> <td>Neck Injury Criteria (Nij)</td> <td>N/A</td> <td>1</td> <td>0.29</td> <td>1</td> <td>0.63</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>1840.54</td> <td>4,170</td> <td>2531.20</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-80.45</td> <td>4,000</td> <td>-145.63</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-6184.83</td> <td>10,008</td> <td>-3269.77</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-5897.52</td> <td>10,008</td> <td>-4125.51</td> </tr> </tbody> </table>					Measurement Description	Units	Driver ATD		Pass. ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	136.91	700	543.24	Maximum Chest Compression	mm	63	-36.24	63	-41.40	Neck Injury Criteria (Nij)	N/A	1	0.29	1	0.63	Neck Tension	N	4,170	1840.54	4,170	2531.20	Neck Compression	N	4,000	-80.45	4,000	-145.63	Left Femur Force	N	10,008	-6184.83	10,008	-3269.77	Right Femur Force	N	10,008	-5897.52	10,008	-4125.51
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SECTION 1
PURPOSE OF TEST

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012

This 90.12 kph (56 mph) Research Moving Deformable Barrier (RMDB) into a vehicle test is part of the Frontal Offset Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-10-D-00155. The purpose of this test is to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

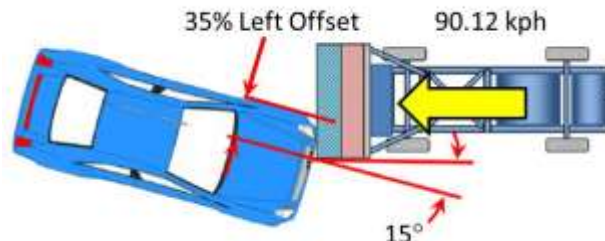
This test was conducted in accordance with the instructions set forth by NHTSA in which the vehicle was placed at a 15° angle, 35% offset relative to the RMDB as outlined in Task Order (TO-1) DTNH22-10-D00155. Data was obtained indicant of Federal Motor Vehicle Safety Standard FMVSS 208-Occupant Crash Protection, FMVSS 212 – Windshield Mounting, FMVSS 219 (partial) – Windshield Zone Intrusion, and FMVSS 301 – Fuel System Integrity, in addition to the requirements of TO-1 of DTNH22-10-D-00155.

SECTION 2 SUMMARY OF TEST

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012

A 2013 Nissan Versa Four Door Sedan was impacted on the left front corner by a Research Moving Deformable Barrier (RMDB). This test vehicle was stationary and positioned at a target angle of 15° and at a target offset of 35% to the forward line of motion of the RMDB. The RMDB was towed down the test track in a full forward direction, without any crabbing, and at the targeted impact velocity of 90.12 kph (56.0 mph) into the test vehicle. The test vehicle's mass was 1,451.0 kg (3,198.9 lbs), and the RMDB's mass was 2490.7 kg (5491 lbs). The test was conducted by Calspan Corporation on December 7, 2012.



The test was documented by one (1) real time and fourteen (14) high-speed video cameras. Camera locations and other pertinent data are located in Data Sheet No. 6 of this report. Pre and post – test photographs of the test vehicle, RMDB, and test setup were taken using a digital still camera. Photographic documentation of the test is presented in Appendix A of this report.

One 50% adult male THOR-NT with MOD KIT (TK) Anthropomorphic Test Device (ATD) (Serial No. 007) was seated in the left, front (P1 -Driver's) seating position and one 50% adult male THOR-NT with MOD KIT (TK) ATD (Serial No. 016) was seated in the right front passenger seating position (P2). The THOR TK 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 airbag, and a curtain airbag. The passenger was restrained with a 3 – point seat belt, and a frontal airbag. The passenger's curtain and torso airbags were disabled.

CRASH VEHICLE SUMMARY

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012

Two hundred and thirty (230) 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 90.5% total windshield retention, with 81% 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 691 mm at C1 to the left of the vehicle's centerline. The maximum crush of the structural bumper beam was 688 mm at B1, to the left of the vehicle's centerline. Additional information pertaining to static crush measurements can be found on Data Sheet No.12 of this report.

All four vehicle doors remained closed and latched during the test. The left front door was deformed as a result of the impact causing it to be non-operational. The remaining doors all remained operational after the test.

Structure observations include the following:

- Driver's side A-Pillar buckled rearward. Resulting in separation between the top of the door and roof sill. (See Photo No.061 in Appendix A)
- Windshield cracked throughout, however there was no penetration observed in the protected zone.
- The hood of the vehicle remained latched during the event, however bent upwards exposing the engine compartment.

The Driver ATD's visible contact points were:

- Head Contact: Frontal Airbag, Curtain Airbag, and Head Liner.
- Torso Contact: Frontal Airbag, Curtain Airbag, Torso/Pelvis Airbag, and Driver's Side Door
- Knee Contact: Knee Bolster

The Passenger ATD's visible contact points were:

- Head Contact: Frontal Airbag, Center Dash Panel, and Head Liner
- Torso Contact: Frontal Airbag and Center Dash Panel
- Knee Contact: Glove Box

CRASH VEHICLE SUMMARY

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
RMDB Velocity at Impact	kph	89.85
RMDB Test Weight	kg	2490.7
RMDB Maximum Static Crush	mm	243.1
Vehicle Test Weight	kg	1451
Actual Vehicle Angle	degrees	15
Vehicle Maximum Static Crush	mm	691
Vertical Offset from Target Point (+ down / - up)*	mm	0
Lateral Offset from Target Point (+ left / - right)*	mm	-22
Number of Data Channels		230
Number of Real-Time Cameras		1
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	50% Male, Thor 007		50% Male, Thor 016	
Head Contact	Frontal Airbag, Curtain Airbag & Head Liner	A49-A51	Frontal Airbag, Center Dash Panel & Head Liner	A70-A72
Upper Torso Contact	Frontal Airbag, Curtain Airbag, Torso/Pelvis Airbag & Driver's Side Door	NA	Frontal Airbag & Center Dash Panel	NA
Lower Torso Contact	None	NA	None	NA
Left Knee Contact	Knee Bolster	A28	Glove Box	A52
Right Knee Contact	Knee Bolster	A28	Glove Box	A52

Data Anomalies:

- V2P1 NKCF FZ had spikes on data
- V2P1 PILL FX had questionable data
- V2P1 FOTL AZ had questionable data spikes

- V2P2 NKCR FZ had questionable data spikes
- V2P2 FOTL AZ had questionable data spikes
- V2P2 ANKL RX was questionable
- V2P2 ANKL RY was questionable
- V2P2 ANKR RX was questionable
- V2P2 ANKR RY was questionable
- V2P2 FOTR had questionable data spikes

PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2013 Nissan Versa - Four Door Sedan NHTSA No.: RD5226
 Test Program: Research and Development Left Oblique Offset Test Date: 12/7/2012

Driver: Thor Serial No. 007 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	1.94	-35.32
	Head CG Y	g	1000	51.80	-8.96
	Head CG Z	g	1000	30.06	-0.70
	Head Resultant	g	Compute	53.23	
	36 ms HIC		Compute	238.66	
	15 ms HIC		Compute	136.91	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	38.12	
	Head Rotational Velocity X	deg/s	60	559.91	-1530.60
	Head Rotational Velocity Y	deg/s	60	202.33	-1645.94
	Head Rotational Velocity Z	deg/s	60	1376.96	-412.18
	Head Rotational Velocity Resultant	deg/s	Compute	2199.46	
	Brain Injury Criteria		Compute	0.86	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	69.68	-445.68
	UNLC Neck System Tension, FZ	N	1000	1840.54	
	UNLC Neck System Compression, FZ	N	1000		
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	1.59 ⁽¹⁾	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-16.53 ⁽¹⁾
	NIJ		Compute	0.30	
	On head acting through total neck section, FX	N	Thortest	127.67	-432.70
	On head acting through total neck section, FY	N	Thortest	434.03	-79.45
	On head acting through total neck section, FZ	N	Thortest	1906.02	-32.68
	On head acting through total neck section, MX	N-m	Thortest	52.12	-42.59
	On head acting through total neck section, MY	N-m	Thortest	24.64	-18.56
	On head acting through total neck section, MZ	N-m	Thortest	9.03	-7.66
	On head acting through O.C. joint only, FX	N	Thortest	34.37 ⁽¹⁾	-531.52 ⁽¹⁾
	On head acting through O.C. joint only, FZ	N	Thortest	1828.80 ⁽¹⁾	-110.28 ⁽¹⁾
	On head acting through O.C. joint only, MY	N-m	Thortest	1.59 ⁽¹⁾	-16.53 ⁽¹⁾
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	2.55	-10.83
	Upper Left IR-TRACC Y - deflection	mm	Thortest	6.89	-8.67
	Upper Left IR-TRACC Z - deflection	mm	Thortest	10.23	-7.70
	Upper Left IR-TRACC D - deflection	mm	Thortest	3.09	-10.46
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.13	-40.88
	Upper Right IR-TRACC Y - deflection	mm	Thortest	5.58	-6.63
	Upper Right IR-TRACC Z - deflection	mm	Thortest	17.31	-6.25
	Upper Right IR-TRACC D - deflection	mm	Thortest	0.13	-36.24
	Lower Left IR-TRACC X - deflection	mm	Thortest	9.66	-9.95
	Lower Left IR-TRACC Y - deflection	mm	Thortest	6.13	-20.06

PRELIMINARY INJURY SUMMARY: Driver

Test Vehicle: 2013 Nissan Versa - Four Door Sedan NHTSA No.: RD5226

Test Program: Research and Development Left Oblique Offset Test Date: 12/7/2012

Driver: Thor Serial No. 007 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	20.24	-11.98
	Lower Left IR-TRACC D - deflection	mm	Thortest	7.58	-10.36
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.41	-35.26
	Lower Right IR-TRACC Y - deflection	mm	Thortest	4.57	-22.52
	Lower Right IR-TRACC Z - deflection	mm	Thortest	1.38	-24.69
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.41	-34.42
	Chest CG Acceleration, 3 ms clip	g	Compute	42.70	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	0.77	-71.56
	Lower Left IR-TRACC Y - deflection	mm	Thortest	0.10	-10.61
	Lower Left IR-TRACC Z - deflection	mm	Thortest	10.96	-7.14
	Lower Left IR-TRACC D - deflection	mm	Thortest	0.77	-71.24
	Left Viscous Criterion Based on X - deflection		Compute	1.54	
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.98	-66.30
	Lower Right IR-TRACC Y - deflection	mm	Thortest	7.51	-7.87
	Lower Right IR-TRACC Z - deflection	mm	Thortest	14.38	-0.77
	Lower Right IR-TRACC D - deflection	mm	Thortest	1.03	-65.52
	Right Viscous Criterion Based on X - deflection		Compute	1.74	
Spine	Upper Spine (T1) AX	g	180	18.20	-79.04
	Upper Spine (T1) AY	g	180	23.70	-51.83
	Upper Spine (T1) AZ	g	180	28.67	-16.02
	Upper Spine (T1) Resultant	g	Compute	91.48	
	Middle Spine (T6) AX	g	180	18.33	-49.78
	Middle Spine (T6) AY	g	180	31.67	-9.94
	Middle Spine (T6) AZ	g	180	7.80	-13.91
	Middle Spine (T6) Resultant	g	Compute	49.87	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	52.89	
Acetabulum	Left FX force	N	600	449.38	-2862.60
	Left FY force	N	600	469.95	-2141.31
	Left FZ force	N	600	3542.70	-122.72
	Left Acetabulum Resultant	N	Compute	4756.61	
	Right FX force	N	600	1617.56	-2925.90
	Right FY force	N	600	946.21	-1715.00
	Right FZ force	N	600	1730.46	-954.93
	Right Acetabulum Resultant	N	Compute	3513.97	
Anomalies					
(1) Questionable spikes throughout					

PRELIMINARY INJURY SUMMARY: Driver Legs

Test Vehicle: 2013 Nissan Versa - Four Door Sedan NHTSA No.: RD5226
 Test Program: Research and Development Left Oblique Offset Test Date: 12/7/2012

Driver: Thor Serial No. 007 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	1.79	-18.23
	Right Knee Displacement, DX	mm	180	1.71	-19.17
Femur	Left Femur Force, FZ	N	600	44.38	-6184.83
	Left Femur Moment, MX	N-m	600	19.46	-258.01
	Left Femur Moment, MY	N-m	600	41.56	-103.49
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	267.57	
	Right Femur Force, FZ	N	600	2156.15	-5897.51
	Right Femur Moment, MX	N-m	600	52.57	-171.63
	Right Femur Moment, MY	N-m	600	72.85	-112.48
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	173.83	
Tibia	Left Upper Tibia, FZ	N	600	678.89	-694.16
	Left Upper Tibia, MY	N-m	600	185.14	-180.20
	Left Upper Tibia, Index		Compute	0.77	
	Right Upper Tibia, FZ	N	600	879.74	-1747.62
	Right Upper Tibia, MY	N-m	600	362.15	-78.77
	Right Upper Tibia, Index		Compute	1.52	
	Left Lower Tibia, FZ	N	600	206.16	-1348.57
	Left Lower Tibia, MY	N-m	600	64.80	-170.38
	Left Lower Tibia, Index		Compute	0.77	
	Right Lower Tibia, FZ	N	600	454.40	-2397.72
	Right Lower Tibia, MY	N-m	600	119.30	-109.60
	Right Lower Tibia, Index		Compute	0.68	
Ankle	Left Ankle Rotation, RX	Deg	180	22.22	-22.19
	Left Ankle Rotation, RY	Deg	180	23.40	-26.23
	Right Ankle Rotation, RX	Deg	180	12.37	-22.85
	Right Ankle Rotation, RY	Deg	180	25.62	-33.47
Anomalies					
None					

PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: 2013 Nissan Versa - Four Door Sedan NHTSA No.: RD5226
 Test Program: Research and Development Left Oblique Offset Test Date: 12/7/2012

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Head	Head CG X	g	1000	87.32	-31.50
	Head CG Y	g	1000	74.55	-5.45
	Head CG Z	g	1000	58.53	-1.09
	Head Resultant	g	Compute	113.12	
	36 ms HIC		Compute	596.80	
	15 ms HIC		Compute	543.24	
	Head Resultant CG Acceleration, 3 ms Clip	g	Compute	81.01	
	Head Rotational Velocity X	deg/s	60	348.04	-2972.22
	Head Rotational Velocity Y	deg/s	60	1280.69	-1041.13
	Head Rotational Velocity Z	deg/s	60	4136.92	-1928.10
	Head Rotational Velocity Resultant	deg/s	Compute	4961.69	
	Brain Injury Criteria		Compute	1.90	
Neck	UNLC Transferred to OC, Neck System, FX	N	1000	1128.91	-123.69
	UNLC Neck System Tension, FZ	N	1000	2531.20	
	UNLC Neck System Compression, FZ	N	1000		-145.63
	UNLC Transferred to OC, Neck System Flexion, MY	N-m	Thortest	7.36 ⁽²⁾	
	UNLC Transferred to OC, Neck System Extension, MY	N-m	Thortest		-9.30 ⁽²⁾
	NIJ		Compute	0.68	
	On head acting through total neck section, FX	N	Thortest	1148.09	-317.96
	On head acting through total neck section, FY	N	Thortest	690.00	-199.22
	On head acting through total neck section, FZ	N	Thortest	2919.60	-33.86
	On head acting through total neck section, MX	N-m	Thortest	82.20	-58.34
	On head acting through total neck section, MY	N-m	Thortest	11.60	-21.77
	On head acting through total neck section, MZ	N-m	Thortest	17.05	-70.94
	On head acting through O.C. joint only, FX	N	Thortest	1107.63 ⁽²⁾	-294.95 ⁽²⁾
	On head acting through O.C. joint only, FZ	N	Thortest	2552.78 ⁽²⁾	-139.84 ⁽²⁾
	On head acting through O.C. joint only, MY	N-m	Thortest	7.36 ⁽²⁾	-9.30 ⁽²⁾
Chest	Upper Left IR-TRACC X - deflection	mm	Thortest	0.54	-39.62
	Upper Left IR-TRACC Y - deflection	mm	Thortest	3.76	-17.27
	Upper Left IR-TRACC Z - deflection	mm	Thortest	24.27	-1.57
	Upper Left IR-TRACC D - deflection	mm	Thortest	0.09	-38.48
	Upper Right IR-TRACC X - deflection	mm	Thortest	0.94	-17.82
	Upper Right IR-TRACC Y - deflection	mm	Thortest	5.75	-15.64
	Upper Right IR-TRACC Z - deflection	mm	Thortest	10.04	-11.92
	Upper Right IR-TRACC D - deflection	mm	Thortest	1.30	-16.80
	Lower Left IR-TRACC X - deflection	mm	Thortest	0.22	-46.74
	Lower Left IR-TRACC Y - deflection	mm	Thortest	15.22	-4.05

PRELIMINARY INJURY SUMMARY: Right Front Passenger

Test Vehicle: 2013 Nissan Versa - Four Door Sedan NHTSA No.: RD5226
 Test Program: Research and Development Left Oblique Offset Test Date: 12/7/2012

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Chest (Con't)	Lower Left IR-TRACC Z - deflection	mm	Thortest	6.96	-12.34
	Lower Left IR-TRACC D - deflection	mm	Thortest	0.52	-41.40
	Lower Right IR-TRACC X - deflection	mm	Thortest	26.60	-5.10
	Lower Right IR-TRACC Y - deflection	mm	Thortest	9.41	-21.19
	Lower Right IR-TRACC Z - deflection	mm	Thortest	4.65	-10.51
	Lower Right IR-TRACC D - deflection	mm	Thortest	29.99	-3.09
	Chest CG Acceleration, 3 ms clip	g	Compute	46.37	
Abdomen	Lower Left IR-TRACC X - deflection	mm	Thortest	0.44	-53.69
	Lower Left IR-TRACC Y - deflection	mm	Thortest	7.97	-6.60
	Lower Left IR-TRACC Z - deflection	mm	Thortest	19.49	-11.17
	Lower Left IR-TRACC D - deflection	mm	Thortest	0.44	-53.72
	Left Viscous Criterion Based on X - deflection		Compute	0.76	
	Lower Right IR-TRACC X - deflection	mm	Thortest	0.65	-47.91
	Lower Right IR-TRACC Y - deflection	mm	Thortest	14.01	-1.29
	Lower Right IR-TRACC Z - deflection	mm	Thortest	13.84	-8.12
	Lower Right IR-TRACC D - deflection	mm	Thortest	0.65	-48.20
	Right Viscous Criterion Based on X - deflection		Compute	0.54	
Spine	Upper Spine (T1) AX	g	180	7.81	-51.69
	Upper Spine (T1) AY	g	180	87.68	-8.59
	Upper Spine (T1) AZ	g	180	25.93	-15.27
	Upper Spine (T1) Resultant	g	Compute	89.93	
	Middle Spine (T6) AX	g	180	8.01	-30.09
	Middle Spine (T6) AY	g	180	49.36	-2.81
	Middle Spine (T6) AZ	g	180	8.98	-15.93
	Middle Spine (T6) Resultant	g	Compute	55.42	
Pelvis	Pelvis CG Resultant Acceleration	g	Compute	52.86	
Acetabulum	Left FX force	N	600	1236.77	-1844.89
	Left FY force	N	600	1457.36	-317.61
	Left FZ force	N	600	55.04	-1697.74
	Left Acetabulum Resultant	N	Compute	2052.45	
	Right FX force	N	600	1662.69	-807.05
	Right FY force	N	600	912.91	-274.95
	Right FZ force	N	600	560.25	-2069.29
	Right Acetabulum Resultant	N	Compute	2173.70	
Anomalies					
(2) Questionable spikes throughout					

PRELIMINARY INJURY SUMMARY: Right Front Passenger Legs

Test Vehicle: 2013 Nissan Versa - Four Door Sedan NHTSA No.: RD5226
 Test Program: Research and Development Left Oblique Offset Test Date: 12/7/2012

Right Front Passenger: Thor Serial No. 016 Injury Summary

	Nomenclature	Units	Source	Max	Min
Knee	Left Knee Displacement, DX	mm	180	0.98	-6.59
	Right Knee Displacement, DX	mm	180	1.65	-5.60
Femur	Left Femur Force, FZ	N	600	126.69	-3269.77
	Left Femur Moment, MX	N-m	600	19.74	-158.76
	Left Femur Moment, MY	N-m	600	111.17	-23.84
	Left Femur Res (MX / MY only, not MZ)	N-m	Compute	158.85	
	Right Femur Force, FZ	N	600	623.62	-4125.51
	Right Femur Moment, MX	N-m	600	28.80	-225.75
	Right Femur Moment, MY	N-m	600	138.85	-16.44
	Right Femur Res (MX / MY only, not MZ)	N-m	Compute	225.90	
Tibia	Left Upper Tibia, FZ	N	600	441.41	-1621.83
	Left Upper Tibia, MY	N-m	600	30.93	-153.94
	Left Upper Tibia, Index		Compute	0.85	
	Right Upper Tibia, FZ	N	600	98.55	-2334.20
	Right Upper Tibia, MY	N-m	600	64.23	-28.56
	Right Upper Tibia, Index		Compute	0.51	
	Left Lower Tibia, FZ	N	600	40.86	-1840.41
	Left Lower Tibia, MY	N-m	600	15.38	-125.26
	Left Lower Tibia, Index		Compute	0.74	
	Right Lower Tibia, FZ	N	600	107.69	-3374.20
	Right Lower Tibia, MY	N-m	600	51.46	-48.18
	Right Lower Tibia, Index		Compute	0.45	
Ankle	Left Ankle Rotation, RX	Deg	180	44.00 ⁽³⁾	-39.26 ⁽³⁾
	Left Ankle Rotation, RY	Deg	180	29.34 ⁽⁴⁾	-40.83 ⁽⁴⁾
	Right Ankle Rotation, RX	Deg	180	17.97	-18.02
	Right Ankle Rotation, RY	Deg	180	10.60	-13.86

Anomalies

(3) Channel Failed – Incorrect bridge configuration

(4) Channel Failed – Incorrect bridge configuration

SECTION 3 DATA SHEETS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

Data Sheet No.		Page No.
1	General Test and Vehicle Parameter Data	3-2
2	Seat Adjustment, Fuel System, and Steering Wheel	3-6
3	Dummy Longitudinal Clearance Dimensions	3-8
4	Dummy Lateral Clearance Dimensions	3-10
5	Seat Belt Positioning Data	3-11
6	High-Speed Camera Locations and Data	3-12
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15	Summary of FMVSS 212, 219 (Partial), and 301 Data	
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DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

VEHICLE INFORMATION

NHTSA No.	RD5226
Model Year	2013
Make	Nissan
Model	Versa
Body Style	Four Door Sedan
VIN	3N1CN7AP9DL821712
Body Color	Light gray/silver
Odometer Reading (km/mi)	72 / 45
Engine Displacement. (L)	1.6
Type/No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	Continuously VT
Overdrive	No
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
All-Wheel Drive (AWD)	No
Traction Control System (TCS)	Yes

VEHICLE OPTIONS

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

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

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Nissan Motor Co., LTD
Date of Manufacture	09/12

GVWR (kg)	1537
GAWR Front (kg)	794
GAWR Rear (kg)	758

VEHICLE SEATING AND WEIGHT CAPACITY

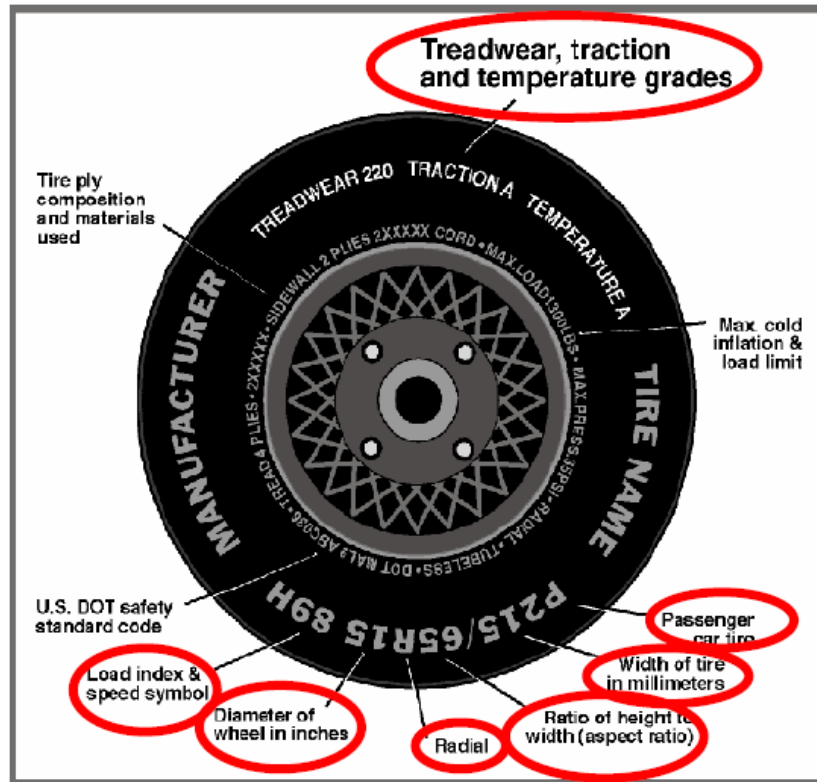
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	--	
Number of Occupants	2	3	--	5
Capacity Wt. (VCW) (kg)				385.00
Cargo Wt. (RCLW) (kg)				44.80

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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

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



Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	250	250
Recommended Tire Size	P185/65R15	P185/65R15
Tire Size on Vehicle	P185/65R15	P185/65R15
Tire Manufacturer	Continental	Continental
Tire Model	ContiProContact	ContiProContact
Treadwear	500	500
Traction	AA	AA
Temperature Grades	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Polyamide	1 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	86H	86H
Tire Material	RUBBER	RUBBER
DOT Safety Code Right	P5FP3YP3312	P5FP3YP3212
DOT Safety Code Left	P5FP3YP3312	P5FP3YP3212

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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	351	230.5		390	359	
Right	kg	310.5	235.5		354	348	
Ratio	%	58.7%	41.3%		51.3%	48.7%	
Totals	kg	661.5	466.0	1,127.5	744.0	707.0	1451

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1,127.50
Weight of 2 P572E ATDs	kg	190.51
Rated Cargo/Luggage Weight (RCLW)	kg	44.80
Calculated Vehicle Target Weight (TVTW)	kg	1,353.81

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	688	697	677	680	1075
As Tested	mm	671	675	622	626	1267
Post Test	mm	753	639	579	634	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2600
Total Vehicle Length at Left Side	mm	4358
Total Vehicle Length at Centerline	mm	4469
Total Vehicle Length at Right Side	mm	4358
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	0
Amount of Stoddard Solvent in Fuel Tank	L	38.0

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

No components were removed in order to meet the required test weight.

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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements		Pre-Test
1	Total Length	mm	4469
2	Total Width	mm	1697
3	Bumper Top Height	mm	620
4	Bumper Bottom Height	mm	485
5	Longitudinal Member Top Height	mm	598
6	Distance Between Longitudinal Members	mm	984
7	Longitudinal Member Width	mm	57
8	Engine Top Height	mm	908
9	Engine Bottom Height	mm	228
10	Engine and Gearbox Width	mm	574
11	Front Bumper-Engine Distance	mm	485
12	Front Shock Absorber Fixing Height	mm	894
13	Bonnet Leading Edge Height	mm	878
14	Front Shock Absorber Fixing Width	mm	1126
15	Front Bumper – Front Axle Distance	mm	834
16	Front Axle – A Pillar Distance	mm	437
17	A-Pillar – B-Pillar Distance	mm	1125
18	B-Pillar – Rear Axle Distance	mm	1038
19	B-Pillar – C-Pillar Distance	mm	1038
20	Roof Sill Bottom Height	mm	1396
21	Roof Sill Top Height	mm	1490
22	Floor Sill Bottom Height	mm	300
23	Floor Sill Top Height	mm	385

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

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

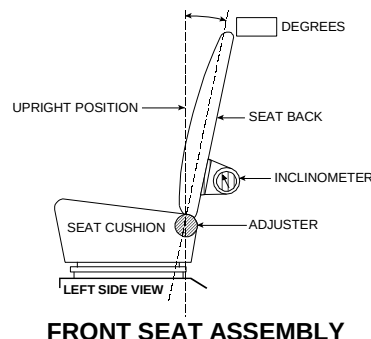
NHTSA No.: RD5226
 Test Date: 12/7/2012

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 to allow for a zero head angle of the passenger dummy



	Deg.
Driver Seat Back Angle	-1.6
Passenger Seat Back Angle	-0.3

SEAT FORE/AFT POSITIONS

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

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

The passenger's seat was positioned at the most forward position of fore/aft travel.

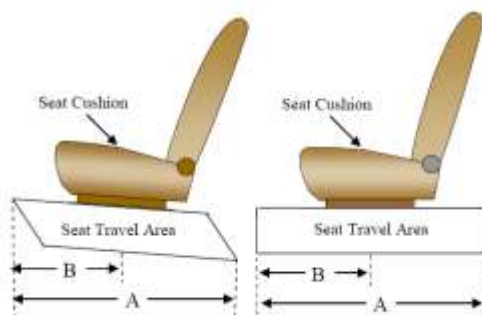
	Total Fore/Aft Travel	Placed in Position #
Driver Seat	240	11
Passenger Seat	240	12

SEAT BELT UPPER ANCHORAGES

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

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

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



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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

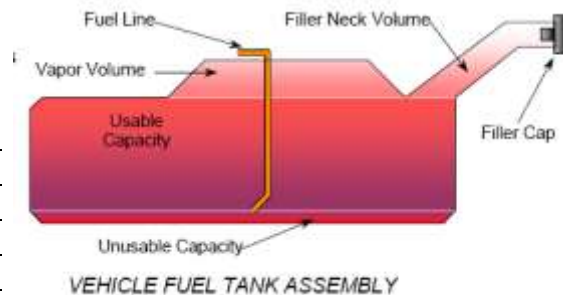
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	40.9
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	38.0
Actual Amount of Solvent Used	38.0
1/3 of Usable Capacity	13.5

FUEL PUMP

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

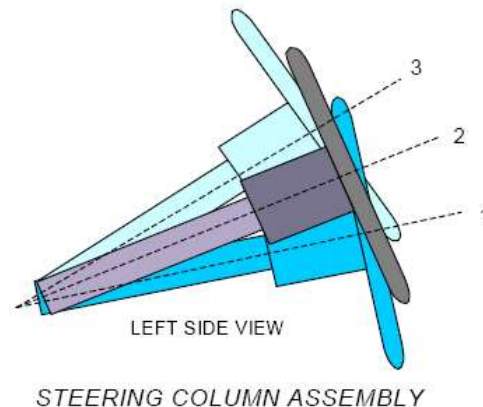
Fuel evacuated according to the specifications provided by the manufacturer in Form 1. Electric fuel pump operates when the ignition is in the 'on' position and the engine is running. The fuel filler neck is located above the left rear wheel.



STEERING COLUMN ADJUSTMENT

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

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



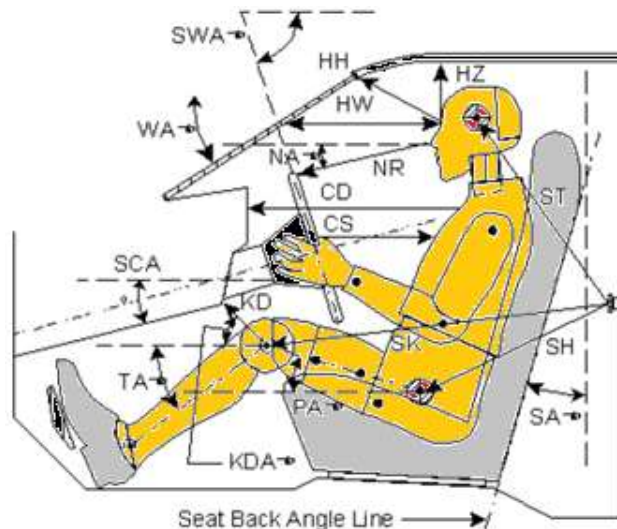
STEERING COLUMN POSITIONS

	Tilt (degrees)	Fore/Aft Position (mm)
Lowermost position No. 1	24.7	
Geometric center position No. 2	27.0	
Uppermost position No. 3	29.4	
Telescoping Steering Wheel Travel		N/A
Test Position	27.0	N/A

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



Code	Measurement Description	Driver (Serial # Thor 007)		Passenger (Serial # Thor 016)	
		Length (mm)	Angle(°)	Length (mm)	Angle (°)
WA°	Windshield Angle		27.0		
SWA°	Steering Wheel Angle		27.0		
SCA°	Steering Column Angle		63.0		
SA°	Seat Back Angle (on headrest post)		-1.6		-0.3
HZ	Head to Roof (Z)	168	90.0	158	90.0
HH	Head to Header	435	12.2	434	9.8
HW	Head to Windshield	672	0.0	644	0.0
NR	Nose to Rim	506	-15.2	675	-27.6
CD	Chest to Dash	571		538	
CS	Chest to Steering Hub	368	-9.2		
RA	Rim to Abdomen	171	1.4		
KDL	Left Knee to Dash	117	20.2	93	28.8
KDR	Right Knee to Dash	78	39.9	112	25.2
PA°	Pelvic Angle		-23.0		-21.4
TA°	Tibia Angle		-49.5		-46.2
SK	Striker to Knee	654	4.7	665	3.4
ST	Striker to Head	67	83.6	52	85.1
SH	Striker to H-Point	257	-18.7	256	19.8
HAX°	Head Angle (X)		-0.4		0.0
HAY°	Head Angle (Y)		-0.1		-0.4
NAX°	Neck Angle (X)		5.4		NA
NAY°	Neck Angle (Y)		-1.0		NA
TAX°	T6 Angle (X)		0.2		5.2
TAY°	T6 Angle (Y)		26.6		-0.5
LAX°	Lumbar Angle (X)		21.8		-0.5
LAY°	Lumbar Angle (Y)		-0.6		20.6

DATA SHEET NO.3 (CONTINUED)
DUMMY CMM MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012

Description	Units	Driver			Passenger		
		X	Y	Z	X	Y	Z
Striker	mm	1028	-738	721	1028	743	720
Head CG	mm	1125	-408	133	1108	410	125
Bridge of Nose	mm	1219	-328	138	1204	334	123
Tip of Nose	mm	1218	-327	176	1204	333	164
Shoulder Bolt	mm	1180	-516	377	1171	530	388
Tip of Chin	mm	1216	-328	256	1208	336	249
H-Point	mm	1315	-529	818	1312	525	819
Left Knee	mm	1712	-525	677	1721	263	688
Right Knee	mm	1721	-240	677	1718	489	685
Left Ankle	mm	1992	-548	990	2007	269	993
Right Ankle	mm	2002	-215	992	2004	508	985
Left Heel	mm	2004	-529	1128	2016	240	1127
Right Heel	mm	2005	-194	1128	2008	471	1122
Outboard Seat Anchor Bolt	mm	1571	-525	1084	1568	528	1081
Outboard Head Restraint Post	mm	967	-389	330	950	395	331
Top of Head Restraint	mm	1018	-330	45	991	331	43
Center of Steering Wheel	mm	1614	-314	446			

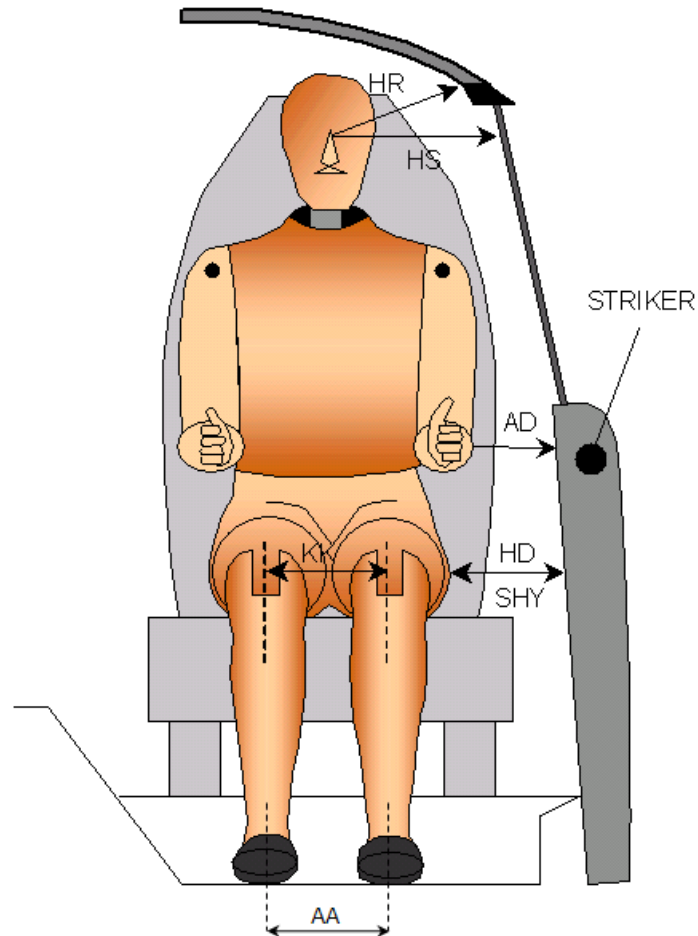
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

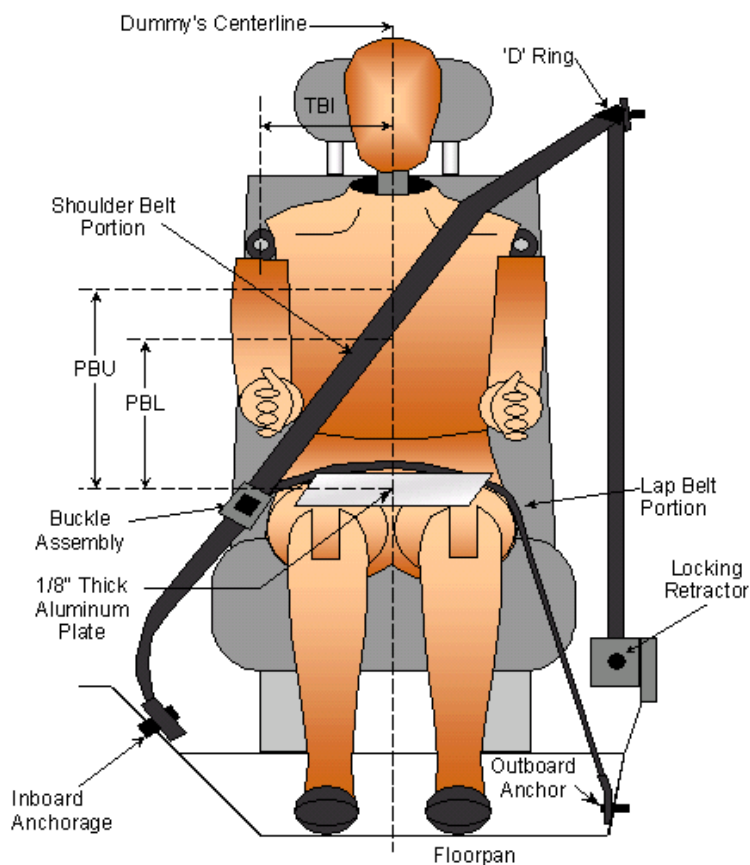


Code	Description	Units	Driver	Passenger
AD	Arm to Door	mm	85	97
HD	H-Point to Door	mm	86	89
HR	Head to Side Header	mm	173	155
HS	Head to Side Window	mm	315	308
KK	Knee to Knee	mm	345	270
SHY	Striker to H-Point (Y Direction)	mm	220	220
AA	Ankle to Ankle	mm	320	235

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	420	385
PBL — Top surface of reference to belt lower edge	mm	340	300

BELT LENGTH DATA

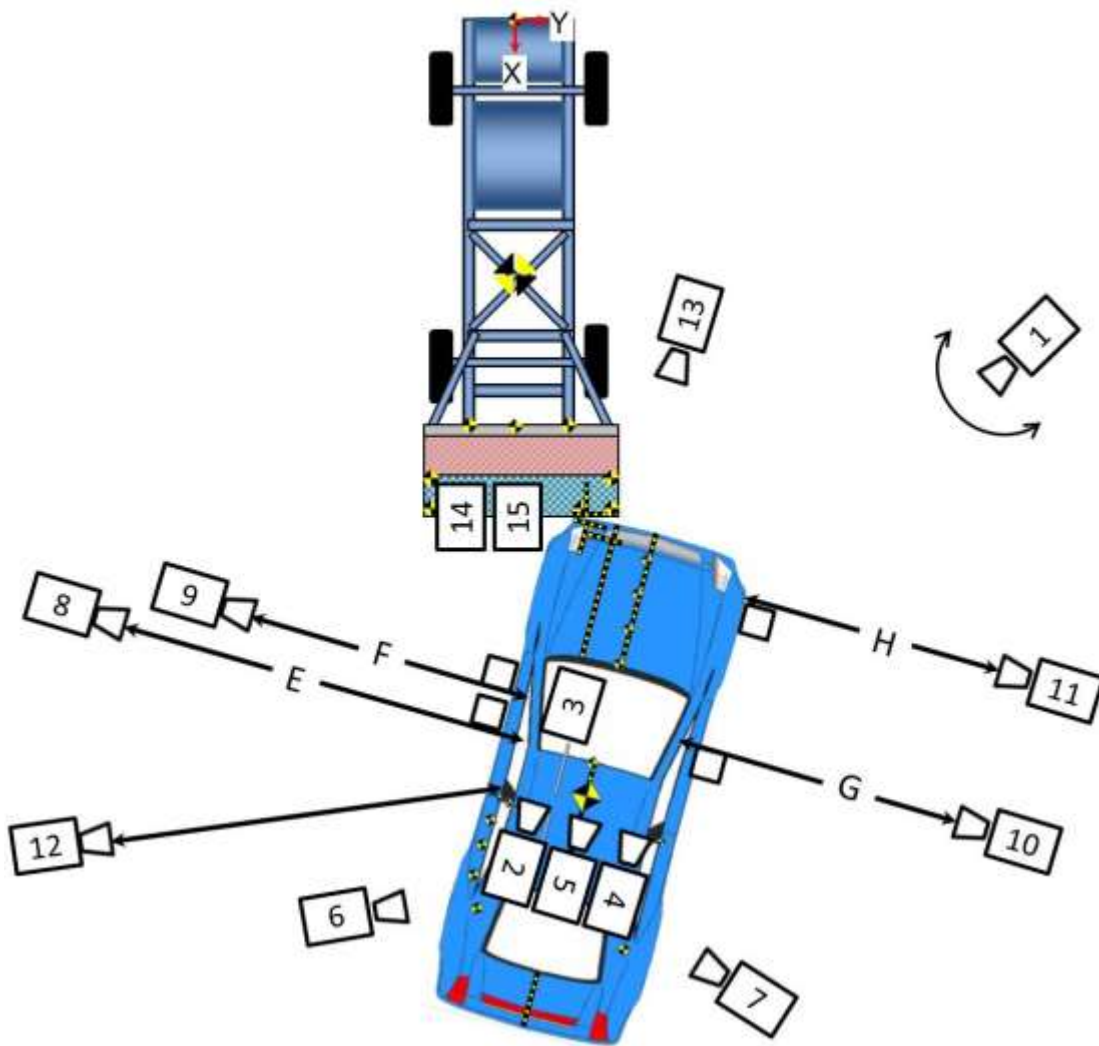
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	925	900
Lap Belt Length as measured on ATD	mm	985	970
Remainder of belt on reel	mm	890	930
Total belt length for continuous webbing systems	mm	2,800	2,800

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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

HORIZONTAL LOCATION



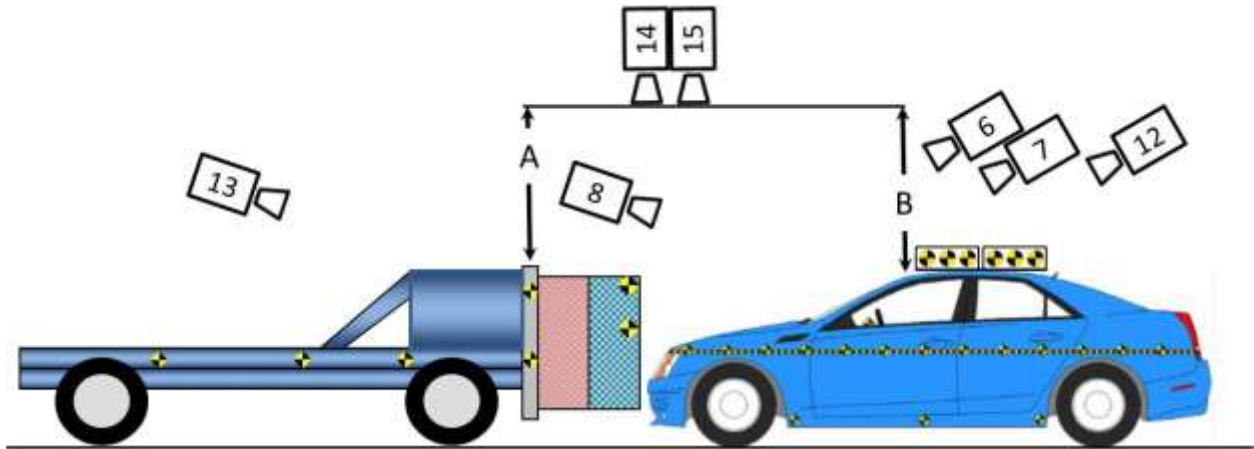
E	mm	9641
F	mm	6550
G	mm	9057
H	mm	8798

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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012

VERTICAL LOCATION



A	mm	3508
B	mm	3827

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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

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	7788	-812	1238	12.5	500
3	Onboard Driver Lower Leg	6110	-698	241	6.5	500
4	Onboard Driver Movement	7625	-217	1238	12.5	500
5	Onboard Centerline	7711	-511	1238	12.5	500
6	Driver Interaction	7694	3967	3380	24	1000
7	Passenger Interaction	12253	-10770	2269	50	1000
8	Target Vehicle Left Side Perpendicular (High)	4859	9654	3409	24-70	1000
9	Target Vehicle Driver Motion	5813	6524	954	24	1000
10	Target Vehicle Passenger Motion	9516	-10183	1759	50	1000
11	Target Vehicle Right Side	8555	-10140	1959	24	1000
12	Target Vehicle Left Side (High)	10246	8506	3124	28-70	1000
13	RMDB/Target Vehicle Interaction	3792	1611	2012	13	1000
14	Close-up Impact Point	4840	-1080	4719	28	1000
15	Overall Impact	6269	-585	5317	14	1000

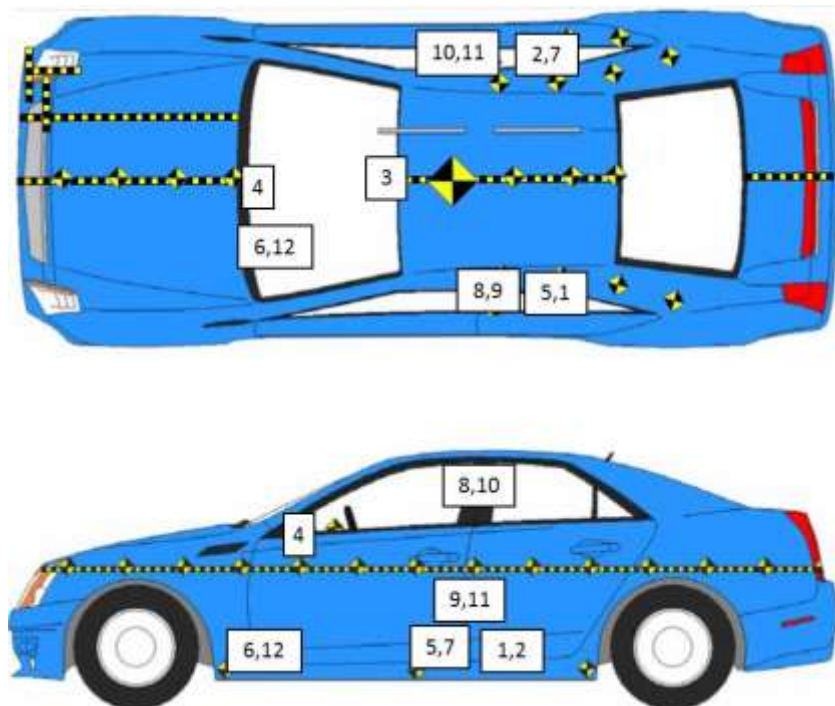
Reference Point: Center most rearward point of the RMDB when in contact with the target vehicle:

- +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: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Axes	Units	Measurements (mm)		
				X	Y	Z
1	Left Rear Sill	X,Y	mm	769	-621	1127
2	Right Rear Sill	X,Y	mm	763	624	1125
3	Vehicle CG	X,Y,Z	mm	1765	57	949
4	Instrument Panel	X	mm	1724	26	639
5	Driver Seat Track	X,Y,Z	mm	1145	-457	1154
6	Behind Brake Pedal	X,Y,Z	mm	2288	-370	903
7	Passenger Seat Track	X,Y,Z	mm	1123	470	1151

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

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

DATA SHEET NO. 7 (CONTINUED)
VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012

VEHICLE INSTRUMENTATION DATA

Loc.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Max	Time (ms)
1	Left Rear Sill	X	g	2.24	246.85	-47.39	34.05
		Y	g	26.33	60.85	-2.89	12.20
2	Right Rear Sill	X	g	2.61	255.70	-39.69	52.40
		Y	g	24.13	49.25	-4.26	10.15
3	Vehicle CG	X	g	3.05	300.00	-60.03	50.05
		Y	g	78.59	55.85	-27.88	32.50
		Z	g	92.15	49.00	-99.52	53.40
4	Instrument Panel	X	g	143.99	61.35	-84.10	50.40
5	Driver Seat Track	X	g	1.81	242.05	-40.87	54.60
		Y	g	26.12	45.00	-5.36	12.65
		Z	g	25.85	63.10	-26.92	49.55
6	Behind Brake Pedal	X	g	77.82	33.75	-117.21	80.15
		Y	g	199.04	81.20	-115.23	32.50
		Z	g	59.97	90.00	-63.81	35.00
7	Passenger Seat Track	X	g	2.64	300.00	-41.12	52.15
		Y	g	32.01	49.05	-4.32	255.90
		Z	g	13.49	46.05	-23.12	55.85
8	Driver Shoulder Belt		N	27,284.50	79.00	-9,738.04	46.65
9	Driver Lap Belt		N	1,612.25	46.95	-0.99	-26.60
10	Passenger Shoulder Belt		N	4,923.13	49.25	-31.96	171.10
11	Passenger Lap Belt		N	6,212.76	64.55	-10.64	300.00
12	Driver Floor Pan String Pot		mm	0.04	-25.35	-108.86	67.80

TIME TO FIRE RESTRAINT TIMING

Loc.	Description	Axes	Units	Time to Fire (ms)
1	Driver Air Bag Squib 1	*	V	15
2	Driver Air Bag Squib 2	*	V	19
3	Driver Curtain Airbag	*	V	41
4	Driver Torso Airbag	*	V	41
5	Driver Knee Airbag	*	V	Not Monitored
6	Driver Pretensioner	*	V	15
7	Passenger Air Bag Squib 1	*	V	15
8	Passenger Air Bag Squib 2	*	V	19
9	Passenger Curtain Airbag	*	V	Disabled
10	Passenger Torso Airbag	*	V	Disabled
11	Passenger Knee Airbag	*	V	Not Monitored
12	Passenger Pretensioner	*	V	14.9

* The measurement indicates the time the voltage changed

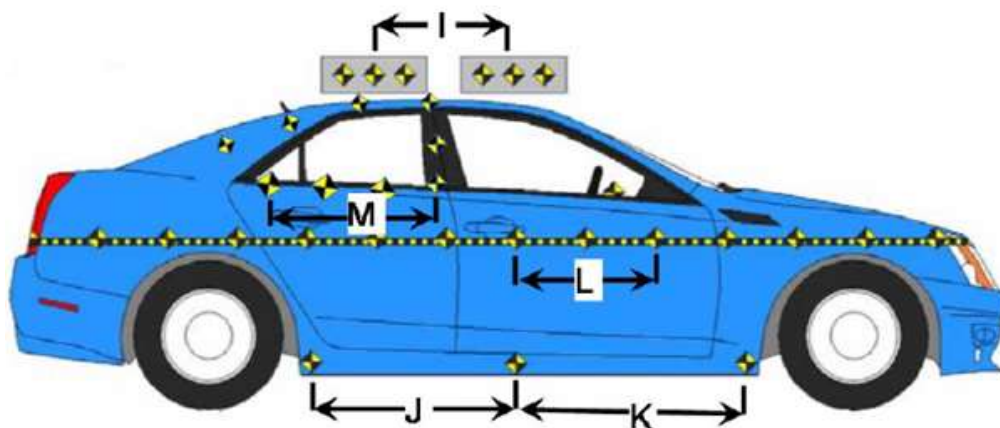
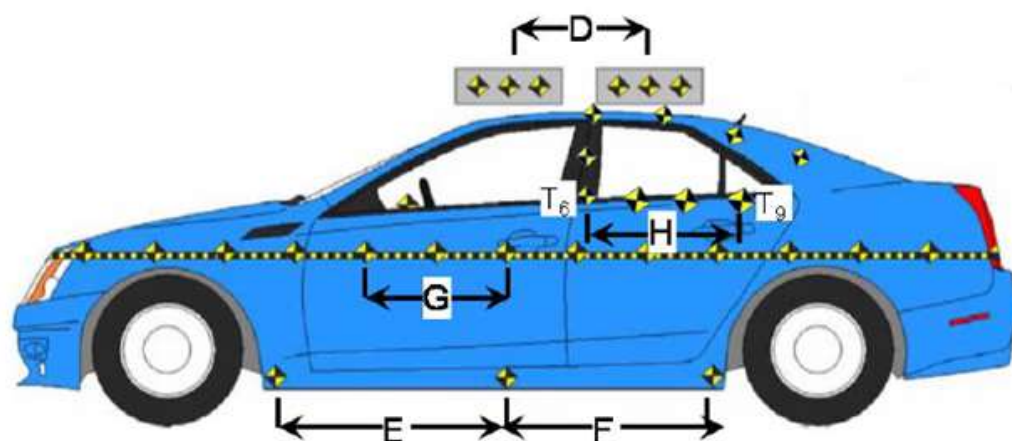
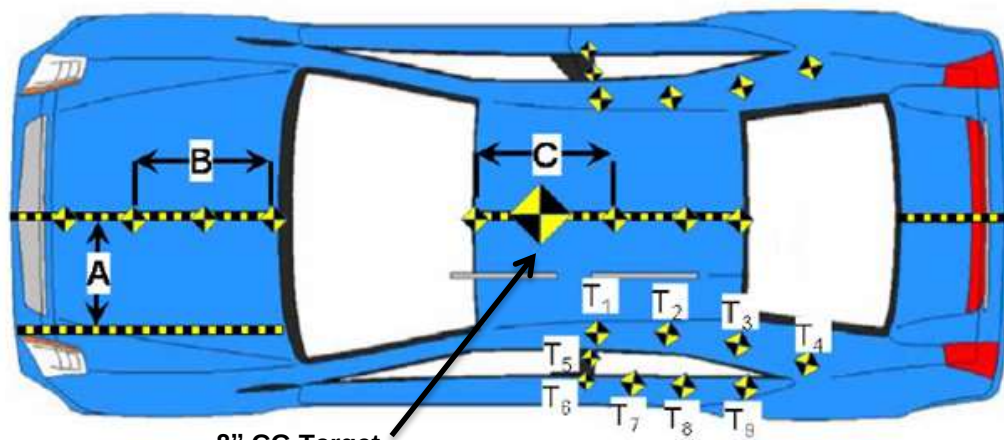
DATA SHEET NO. 8 **PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

Item	Units	Value
A	mm	255
B	mm	1220
C	mm	1220
D	mm	612
E	mm	866
F	mm	864
G	mm	1220
H	mm	1030
I	mm	612
J	mm	870
K	mm	865
L	mm	1220
M	mm	1030

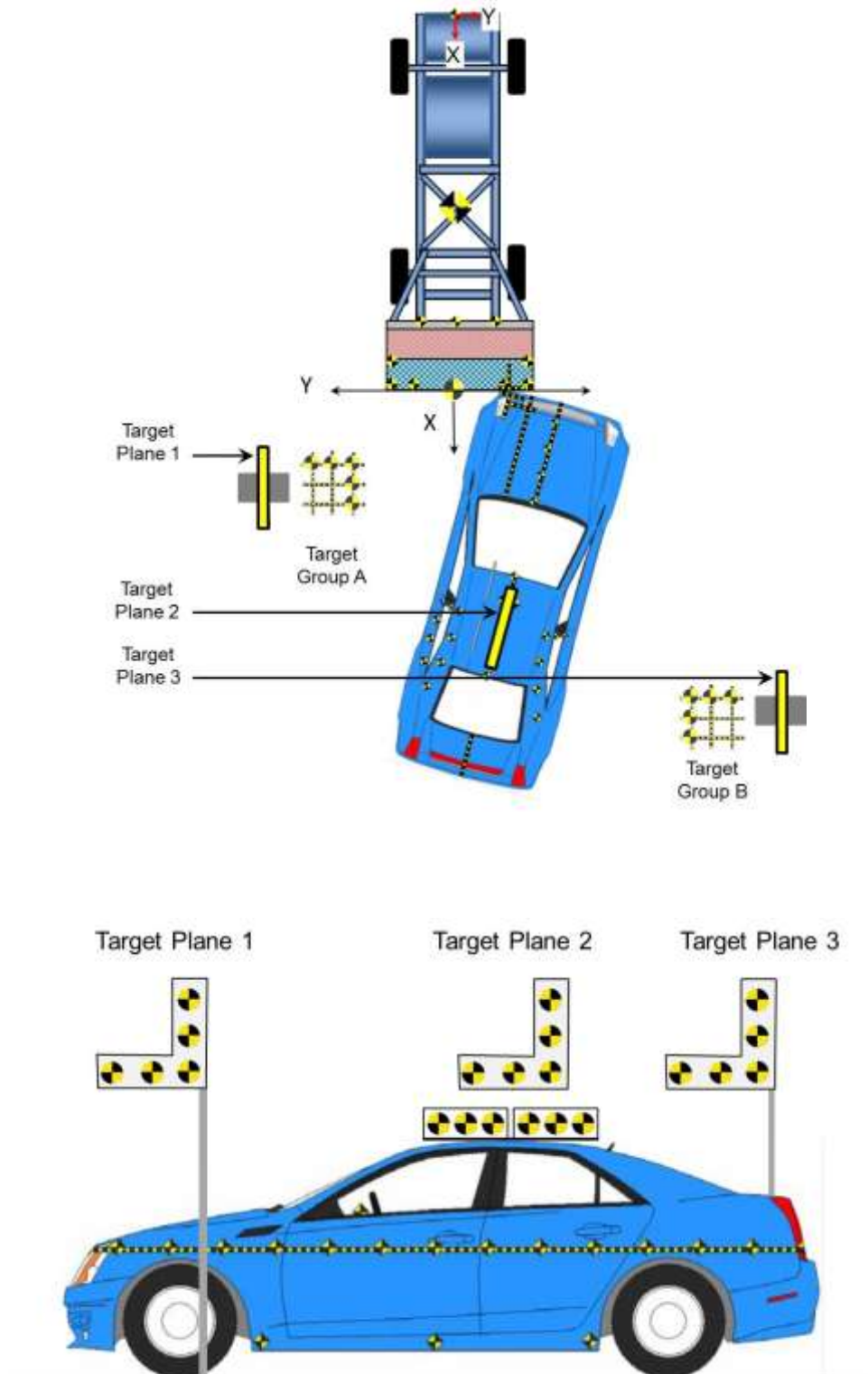
Note: All 6" targets on the centerline of the hood and roof are 610mm apart



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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

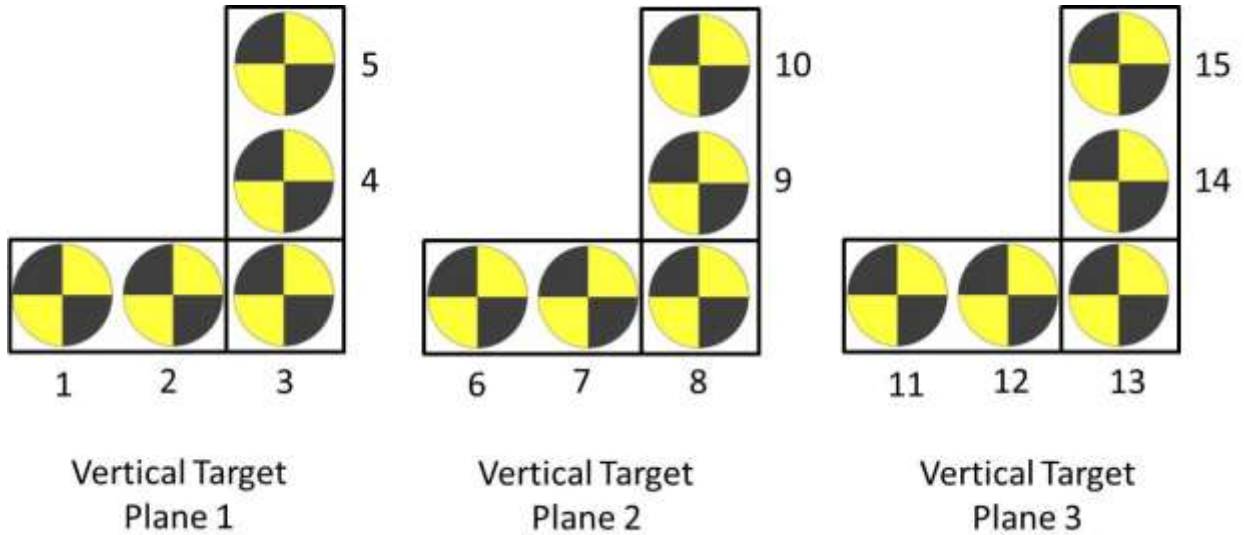
NHTSA No.: RD5226
Test Date: 12/7/2012



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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



Target	Units	X	Y	Z
1	mm	5035	3020	1650
2	mm	5340	3020	1650
3	mm	5645	3020	1650
4	mm	5645	3020	1955
5	mm	5645	3020	2260
6*	mm	1217	-336	-323
7*	mm	913	-333	-329
8*	mm	609	-327	-338
9*	mm	612	-325	-643
10*	mm	621	-330	-948
11	mm	8135	2745	1600
12	mm	8445	2745	1600
13	mm	8750	2745	1600
14	mm	8750	2745	1905
15	mm	8750	2745	2210

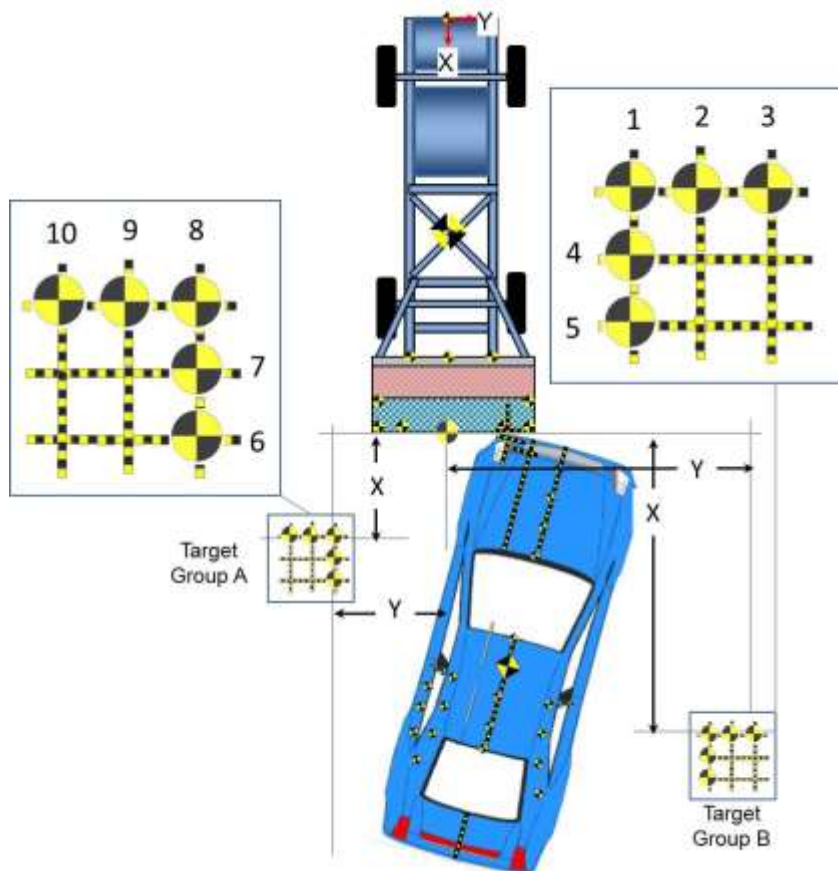
***NOTE:**

- Targets 6-10 are in reference to the vehicle coordinate system
- Targets 1-5 and Targets 11-15 are in reference to the global coordinate system, which references the back of the RMBD.

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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



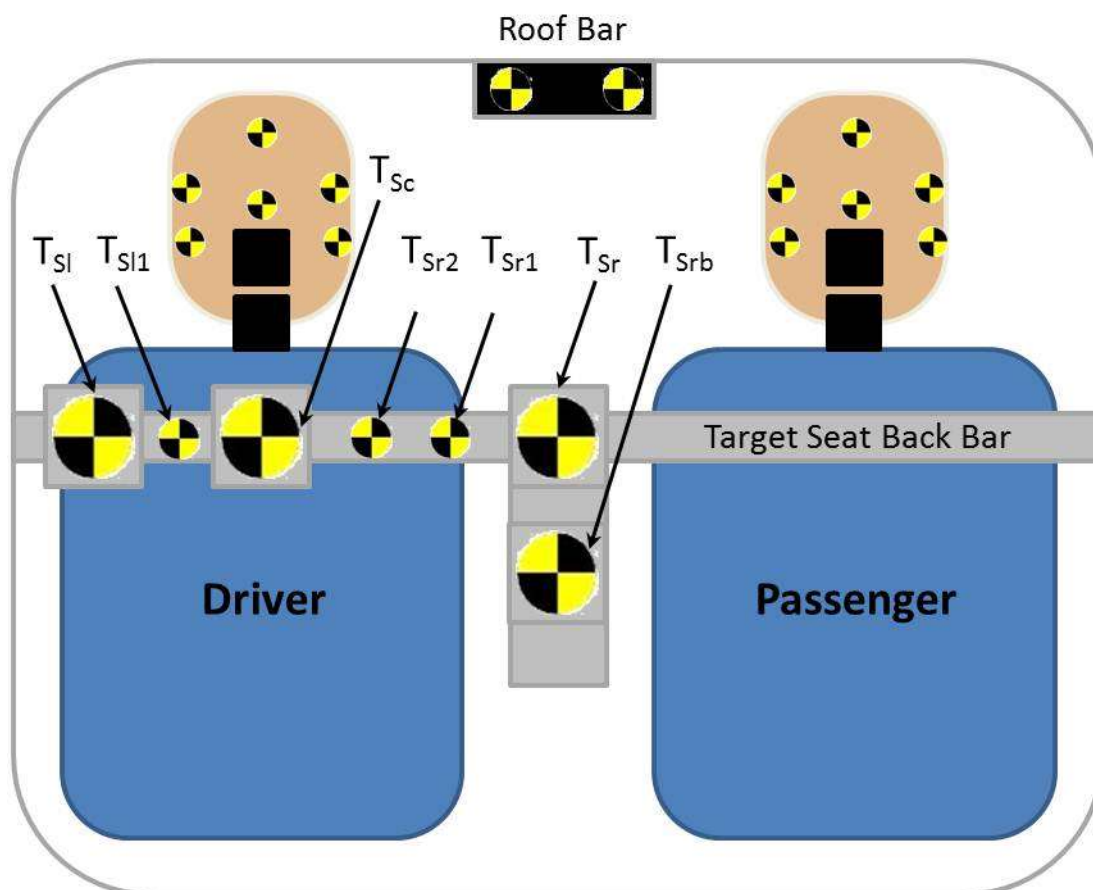
Target	Units	X	Y
1	mm	3198	1820
2	mm	3198	2122
3	mm	3198	2425
4	mm	3500	1820
5	mm	3803	1820
6	mm	1678	615
7	mm	1382	615
8	mm	1068	615
9	mm	1068	923
10	mm	1068	1916

Note: Target Locations are in reference to the front center of RMDB

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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



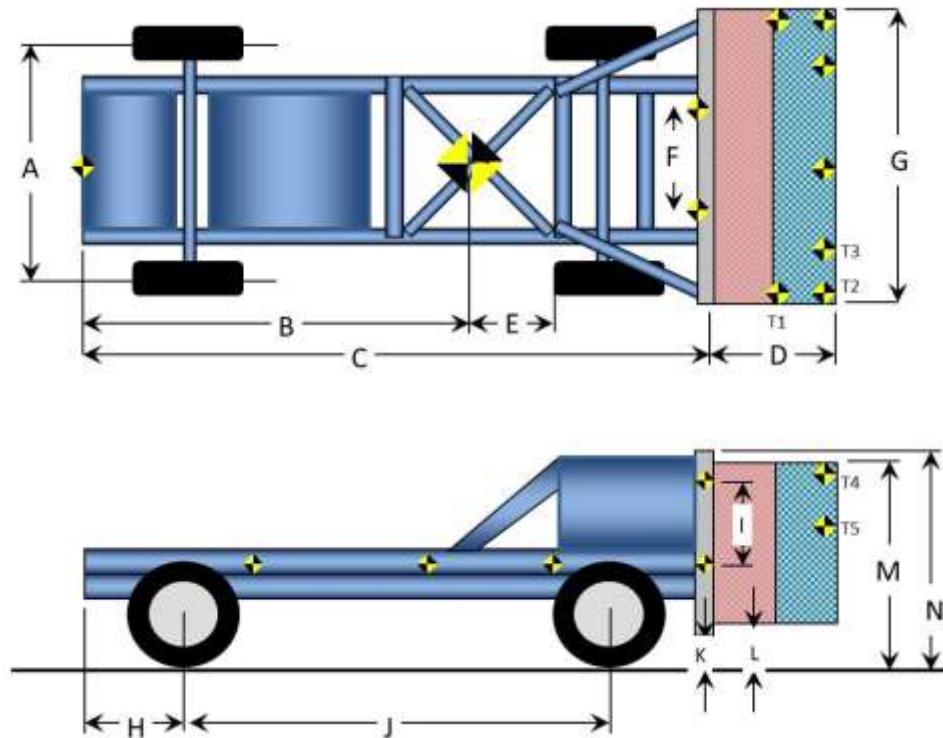
Point	Pre-Test		
	X	Y	Z
TSrb	768	-1	573
TSr	762	-1	422
TSr1	774	-86	454
TSr2	774	-206	452
TSc	765	-331	425
TSI1	774	-448	455
TSI	765	-574	426
TRoof Driver	1601	-61	82
TRoof Passenger	1596	62	79

Note: Target locations are in reference to the vehicle 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)
RMDB PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



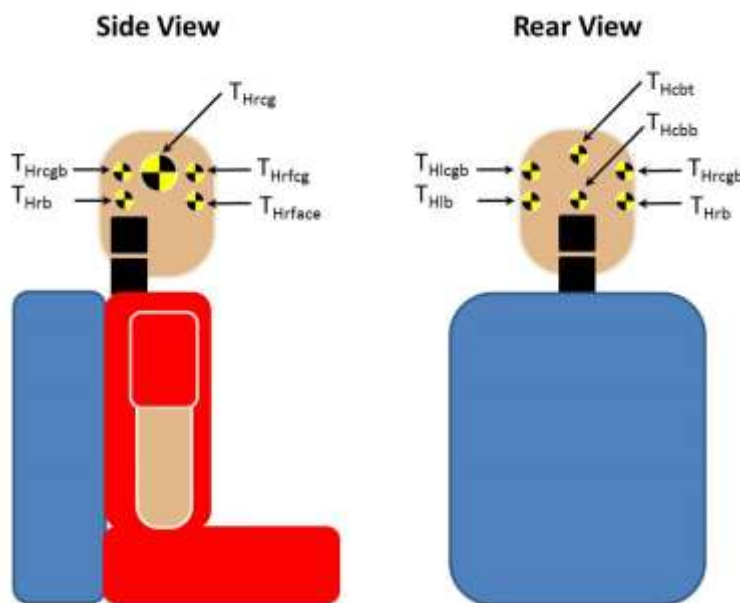
Item	Units	Value	Item	Units	Value
A	mm	1930	H	mm	800
B	mm	2451	I	mm	500
C	mm	3995	J	mm	2555
D	mm	605	K	mm	77
E	mm	904	L	mm	71
F	mm	1123	M	mm	1024
G	mm	2205	N	mm	1177

	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

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

Test Vehicle:	2013 Nissan Versa Four Door Sedan
Test Program:	R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012



Driver Dummy Head Targets (THOR007)

Measurement	Units	Value
Distance between T_{Hrcq} & T_{Hrfcq}	mm	50
Distance between T_{Hrcq} & T_{Hrcgb}	mm	40
Distance between T_{Hrcgb} & T_{Hrb}	mm	70
Distance between T_{Hrfcq} & T_{Hrface}	mm	70
Distance between T_{Hlcl} & T_{Hlfcg}	mm	50
Distance between T_{Hlcl} & T_{Hlclgb}	mm	40
Distance between T_{Hlclgb} & T_{Hlclb}	mm	70
Distance between T_{Hlfcg} & T_{Hlface}	mm	70
Distance between T_{Hcbl} & T_{Hcblb}	mm	67

Passenger Dummy Head Targets (THOR016)

Measurement	Units	Value
Distance between T_{Hrcg} & T_{Hrfcg}	mm	50
Distance between T_{Hrcg} & T_{Hrcgb}	mm	40
Distance between T_{Hrcgb} & T_{Hrb}	mm	70
Distance between T_{Hrfcg} & T_{Hrface}	mm	70
Distance between T_{Hlcg} & T_{Hlfcg}	mm	50
Distance between T_{Hlcg} & T_{Hlrgb}	mm	40
Distance between T_{Hlrgb} & T_{Hlb}	mm	70
Distance between T_{Hlfcg} & T_{Hlface}	mm	70
Distance between T_{Hcbl} & T_{Hcbb}	mm	67

DATA SHEET NO. 9
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	93
Passenger Dummy Accelerometers	93
Vehicle Structure Accelerometers	38
RMDB Cart Accelerometers	6
Total	230

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	4
High-Speed Off-board	10
Real-Time Panning	1
Total	15

DATA SHEET NO. 10 - POST TEST OBSERVATIONS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Right Front Passenger
Dummy Type/Serial No.	THOR 007	THOR 016
Lower Leg Type	THOR LOWER LEG LX	THOR LOWER LEG LX
Lower Leg Serial No.	LX018 / LX019	LX036 / LX037
Head Contact	Frontal Airbag, Curtain Airbag & Head Liner	Frontal Airbag, Center Dash Panel, & Head Liner
Upper Torso Contact	Frontal Airbag, Curtain Airbag, Torso/Pelvis Airbag, Driver's Side Door	Frontal Airbag & Center Dash Panel
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Right Front Passenger
Locked/Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed & Jammed Shut	Closed & Operational
Rear Door Opening	Closed & Operational	Closed & Operational
Seat Track Shift (mm)	10	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	Driver's A-Pillar buckled causing separation between door and vehicle	Y
Windshield Damage	Cracks throughout	Y
Window Damage	None	Y
Other Notable Effects	None	--

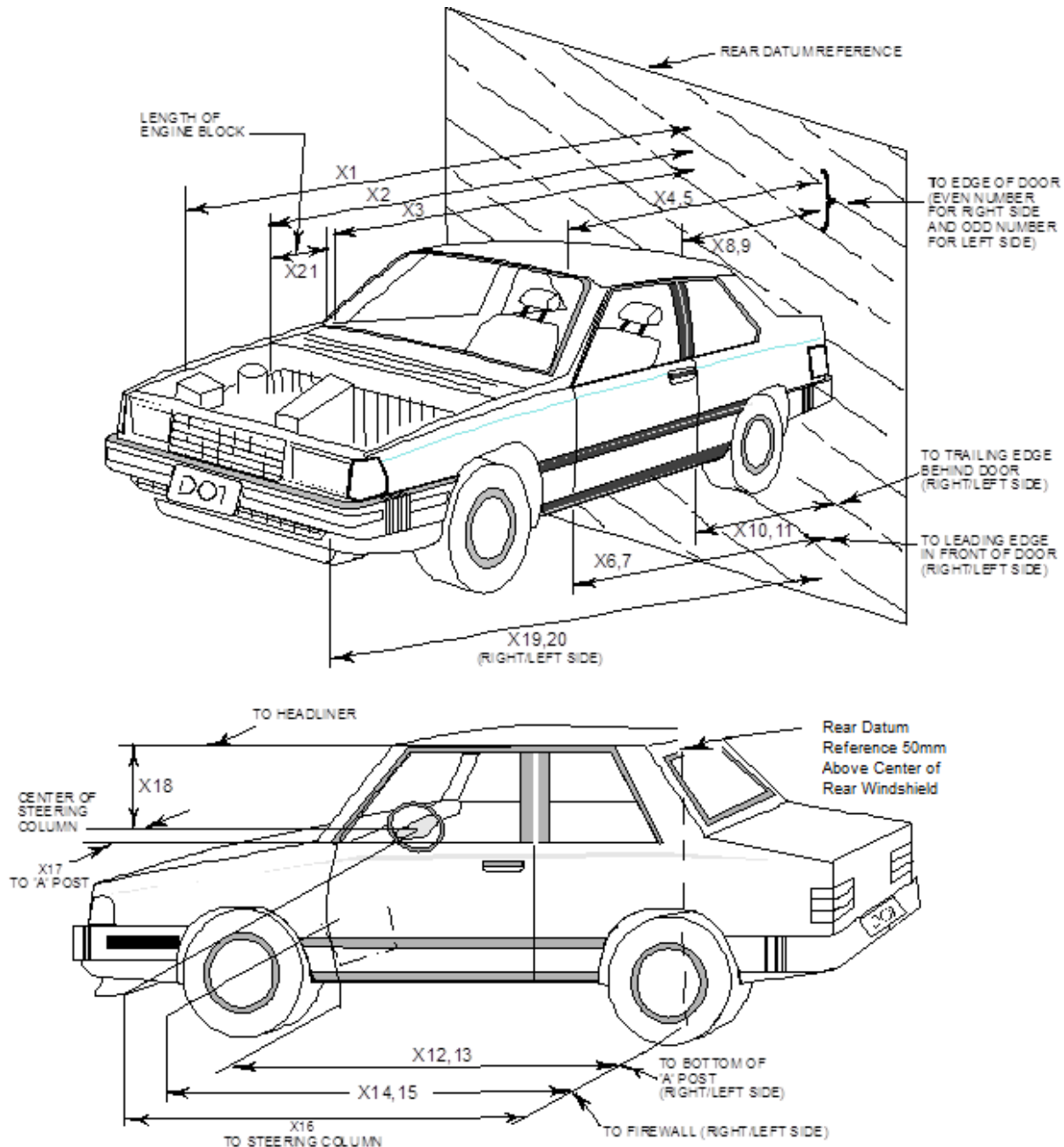
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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	No	NA	No	NA
Seat Belt Pretensioner	Yes	Yes	Yes	NA
Seat Belt Load Limiter	Yes	Yes	Yes	NA
Other				

DATA SHEET NO. 11 **VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



DATA SHEET NO. 11 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	3339	2952	387
2	Rear Surface of Vehicle (RSOV) to Front of Engine	mm	2854	2590	264
3	RSOV to Firewall	mm	2504	UR*	UR*
4	RSOV to Upper Leading Edge of Right Door	mm	2075	2073	2
5	RSOV to Upper Leading Edge of Left Door	mm	2074	2022	52
6	RSOV to Lower Leading Edge of Right Door	mm	2077	2081	-4
7	RSOV to Lower Leading Edge of Left Door	mm	2076	2030	46
8	RSOV to Upper Trailing Edge of Right Door	mm	952	950	2
9	RSOV to Upper Trailing Edge of Left Door	mm	952	927	25
10	RSOV to Lower Trailing Edge of Right Door	mm	956	962	-6
11	RSOV to Lower Trailing Edge of Left Door	mm	955	931	24
12	RSOV to Bottom of "A" Post of Right Side	mm	2094	2092	2
13	RSOV to Bottom of "A" Post of Left Side	mm	2097	2037	60
14	RSOV to Firewall, Right Side	mm	2401	2370	31
15	RSOV to Firewall, Left Side	mm	2404	UR*	UR*
16	RSOV to Steering Column	mm	1614	1508	106
17	Center of Steering Column to "A" Post	mm	272	261	11
18	Center of Steering Column to Headliner	mm	398	394	4
19	RSOV to Right Side of Front Bumper	mm	3276	3271	5
20	RSOV to Left Side of Front Bumper	mm	3274	2682	592
21	Length of Engine Block	mm	388	UR*	UR*
RD	RSOV to Right Side of Dash Panel	mm	1813	1790	23
CD	RSOV to Center of Dash Panel	mm	1809	1702	107
LD	RSOV to Left Side of Dash Panel	mm	1793	1686	107

*UR: Unrecoverable

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. 12
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012

VEHICLE INFORMATION

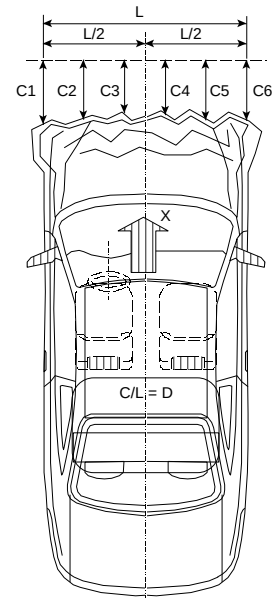
VIN: 3N1CN7AP9DL821712 Wheelbase (mm): 2600
Vehicle Size Category: Four Door Sedan Test Weight (kg): 1451.0

ACCELEROMETER DATA

Accelerometer Locations: As Described in Data Sheet No. 7
Cal. Procedure/Interval: Calspan Procedure / 6 month
Integration Algorithm: Trapezoidal
Linearity: > 99%
Impact Velocity (kph): 89.85
Velocity Change (kph): 89.85

CRUSH PROFILE

Collision Deformation Classification: 11FYEW5
Midpoint of Damage: C2
Damage Region Length (mm): 1162
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	3207	2516	691
C2	Crush zone 2 at left side	mm	3296	2701	595
C3	Crush zone 3 at left side	mm	3329	2856	473
C4	Crush zone 4 at right side	mm	3330	2999	331
C5	Crush zone 5 at right side	mm	3298	3119	179
C6	Crush zone 6 at right side	mm	3207	3194	13
L	C1 to C6	mm	1162	961	201

Crush Measurements: Bumper Cover Removed

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
B1	Bumper Beam 1 at left side	mm	3179	2491	-688
B2	Bumper Beam 2 at left side	mm	3195	2578	-617
B3	Bumper Beam 3 at left side	mm	3207	2664	-543
B4	Bumper Beam 4 at left side	mm	3214	2752	-462
B5	Bumper Beam 5 at right side	mm	3216	2836	-380
B6	Bumper Beam 6 at right side	mm	3213	2917	-296
B7	Bumper Beam 7 at right side	mm	3206	2995	-211
B8	Bumper Beam 8 at right side	mm	3195	3069	-126
B9	Bumper Beam 9 at right side	mm	3176	3138	-37
L	B1 to B9	mm	944	688	256

DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

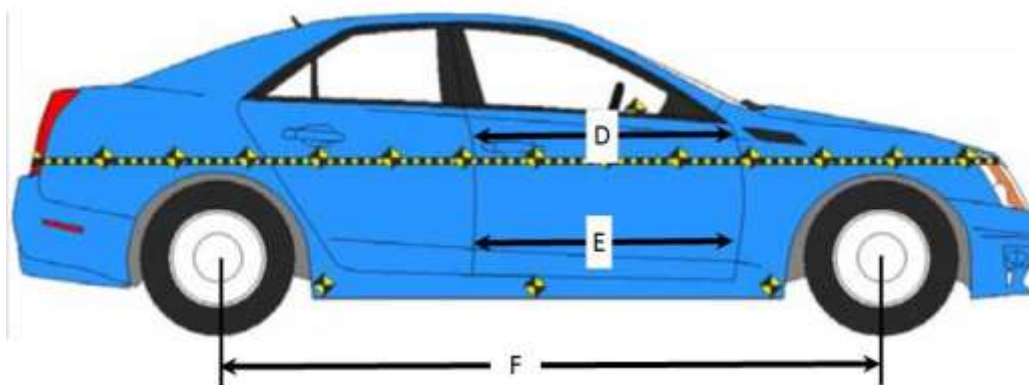
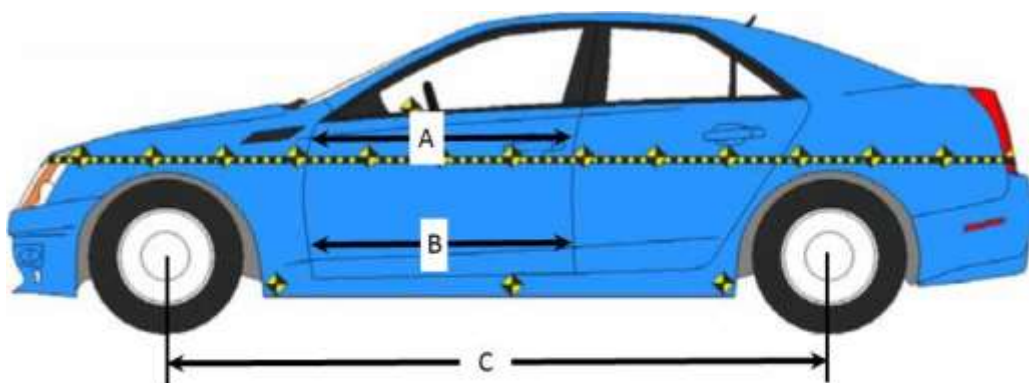
NHTSA No.: RD5226
 Test Date: 12/7/2012

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1027	940	-87
B	Left Side Lower	mm	911	818	-93
D	Right Side Upper	mm	1026	1023	-3
E	Right Side Lower	mm	932	931	-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2600	2361	-239
F	Right Side Wheelbase	mm	2600	2559	-41



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

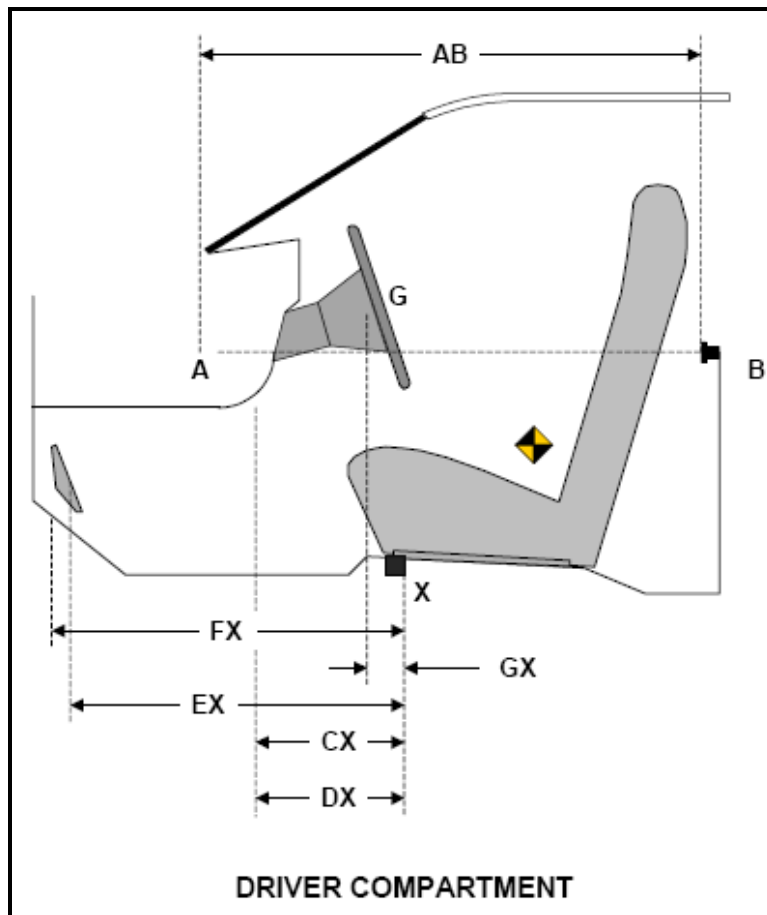
Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	847	813	-34
CX	Left Knee Bolster to X	mm	235	177	-58
DX	Right Knee Bolster to X	mm	227	154	-73
EX	Brake Pedal to X	mm	521	286	-235
FX	Foot Rest to X	mm	538	405	-133
GX	Center of Steering Column Wheel Hub to X	mm	43	-57	-100

X = Front of Seat Track (Stationary)



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

DRIVER SIDE DOOR SILL INTRUSIONS



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

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
1	2042	-698	955	1950	-692	943	-92	6	-12
2	2045	-691	873	1930	-690	862	-115	1	-11
3	2041	-686	798	1920	-693	786	-121	-7	-12
4	2044	-681	500	1946	-669	494	-98	12	-6
5	2033	-679	424	1944	-660	417	-89	19	-7
6	2002	-667	349	1923	-649	341	-79	18	-8
7	1891	-699	1074	1876	-682	1100	-15	17	26
8	1743	-705	1075	1732	-701	1078	-11	4	3
9	1592	-705	1075	1582	-707	1079	-10	-2	4
10	1962	-704	1063	1943	-679	1075	-19	25	12
11	2016	-703	1019	1963	-692	1011	-53	11	-8
12	2041	-684	698	1921	-691	687	-120	-7	-11
13	2043	-683	597	1934	-680	589	-109	3	-8
14	1937	-665	270	1884	-648	247	-53	17	-23
15	1861	-649	222	1825	-640	179	-36	9	-43
16	1785	-634	177	1763	-631	114	-22	3	-63

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	1707	-618	135	1702	-618	50	-5	0	-85
18	1625	-603	96	1634	-605	-4	9	-2	-100
19	1543	-588	63	1548	-590	-21	5	-2	-84
20	1457	-575	36	1460	-575	-34	3	0	-70
21	1371	-564	16	1371	-563	-41	0	1	-57
22	1283	-556	1	1282	-554	-42	-1	2	-43
23	1192	-551	-8	1191	-547	-37	-1	4	-29
24	1101	-547	-13	1100	-543	-28	-1	4	-15
25	1010	-544	-16	1009	-543	-14	-1	1	2
26	921	-543	-16	918	-542	-14	-3	1	2
27	1533	-705	1075	1523	-710	1078	-10	-5	3
28	1473	-704	1076	1464	-712	1078	-9	-8	2
29	1413	-705	1076	1403	-715	1077	-10	-10	1
30	1351	-704	1075	1341	-717	1075	-10	-13	0
31	1290	-705	1073	1279	-719	1074	-11	-14	1
32	1242	-702	1058	1232	-718	1059	-10	-16	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: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

PASSENGER SIDE DOOR SILL INTRUSIONS



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

Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
1	2037	697	957	2038	723	948	1	26	-9
2	2043	691	881	2043	716	872	0	25	-9
3	2040	687	806	2039	711	798	-1	24	-8
4	2041	681	504	2037	699	496	-4	18	-8
5	2034	680	432	2030	696	423	-4	16	-9
6	2006	669	356	2002	683	348	-4	14	-8
7	1892	702	1070	1894	724	1063	2	22	-7
8	1745	708	1071	1746	726	1065	1	18	-6
9	1593	710	1071	1594	724	1065	1	14	-6
10	1959	703	1058	1960	726	1050	1	23	-8
11	2009	702	1019	2010	728	1011	1	26	-8
12	2039	685	706	2038	708	698	-1	23	-8
13	2041	683	607	2038	704	598	-3	21	-9
14	1952	669	280	1948	680	271	-4	11	-9
15	1875	653	229	1872	660	221	-3	7	-8
16	1795	637	181	1793	640	173	-2	3	-8

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

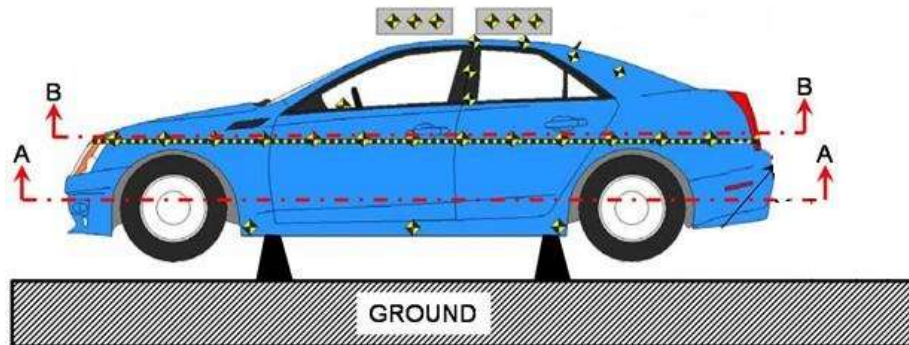
Point	Pre-Test			Post-Test			Difference		
	X	Y	Z	X	Y	Z	X	Y	Z
17	1716	621	137	1715	622	130	-1	1	-7
18	1636	606	98	1635	603	90	-1	-3	-8
19	1551	590	64	1550	587	55	-1	-3	-9
20	1465	577	35	1465	574	28	0	-3	-7
21	1376	566	14	1376	563	7	0	-3	-7
22	1287	558	-1	1287	556	-9	0	-2	-8
23	1195	552	-11	1195	551	-18	0	-1	-7
24	1104	548	-17	1104	547	-22	0	-1	-5
25	1012	546	-20	1012	545	-24	0	-1	-4
26	921	546	-20	922	546	-24	1	0	-4
27	1531	710	1072	1532	723	1066	1	13	-6
28	1471	710	1072	1473	721	1066	2	11	-6
29	1411	710	1072	1413	720	1067	2	10	-5
30	1351	710	1072	1353	718	1066	2	8	-6
31	1291	709	1069	1293	715	1064	2	6	-5
32	1241	709	1054	1242	715	1049	1	6	-5

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

DATA SHEET NO.13 (CONTINUED) VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012



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

VEHICLE EXTERIOR CRUSH PROFILE SECTION A-A

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
1	2173	842	910	1	2161	880	907
2	2025	837	907	2	2034	859	907
3	1748	839	908	3	1808	855	907
4	1496	841	909	4	1591	853	905
5	1270	842	908	5	1406	850	906
6	979	842	908	6	1174	845	907
7	778	840	907	7	987	841	907
8	557	836	907	8	866	838	906
9	383	837	907	9	662	834	906
10	233	847	906	10	417	832	907
11	-413	847	906	11	280	839	906
12	-580	826	907	12	-453	807	907
13	-711	811	908	13	-453	807	907
14	-827	796	909	14	-749	809	907
15	-906	783	907	15	-880	774	908
16	-946	760	906	16	-953	707	907
17	-1017	671	906	17	-1000	637	907
18	-1063	563	907	18	-1050	526	907
19	-1095	442	905	19	-1087	333	907
20	-1115	288	907	20	-1104	143	908
21	-1124	143	909	21	-1110	28	907
22	-1127	1	909	22	-1113	-79	907
23	-1120	-221	901	23	-1108	-248	907
24	-1104	-375	905	24	-1087	-426	907
25	-1068	-533	908	25	-1071	-502	907

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

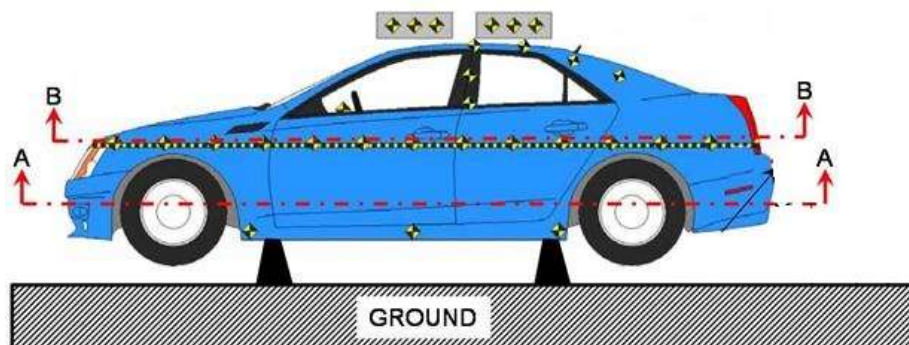
VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	-1016	-661	906	26	-1037	-606	907
27	-956	-741	906	27	-986	-703	907
28	-832	-785	907	28	-928	-765	908
29	-697	-802	909	29	-831	-789	907
30	-556	-818	908	30	-669	-812	907
31	-405	-835	911	31	-536	-829	907
32	218	-842	907	32	-408	-845	906
33	393	-833	903	33	214	-845	906
34	584	-833	906	34	340	-849	906
35	831	-835	905	35	648	-847	906
36	990	-836	906	36	904	-847	906
37	1168	-837	907	37	987	-858	907
38	1430	-837	907	38	1147	-870	907
39	1669	-835	905	39	1272	-873	906
40	1965	-831	907	40	1367	-876	906
41	2162	-838	908	41	1511	-880	907
42	2851	-830	907	42	1726	-887	906
43	2945	-813	907	43	1852	-890	907
44	3030	-794	909	44	1943	-869	906
45	3099	-747	906	45	2020	-839	906
46	3171	-654	909	46	2048	-820	907
47	3224	-555	906	47	2086	-729	906
48	3275	-436	908	48	2207	-720	907
49	3314	-279	908	49	2302	-710	905
50	3330	-150	908	50	2414	-697	907
51	3337	-25	907	51	2567	-676	906
52	3336	64	906	52	2441	-364	906
53	3329	168	907	53	2464	-360	906
54	3313	292	910	54	2577	-282	906
55	3267	462	906	55	2620	-154	906
56	3198	607	905	56	2696	-77	906
57	3144	699	909	57	2772	-38	906
58	3067	777	909	58	2870	43	906
59	2994	808	911	59	2971	161	906
60	2912	825	908	60	2950	440	907
61	2835	838	904	61	2792	965	907
62	2173	842	910	62	2727	1046	906
				63	2603	998	906
				64	2345	827	906
				65	2204	870	907

DATA SHEET NO.13 (CONTINUED) VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012



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

VEHICLE EXTERIOR CRUSH PROFILE SECTION B-B

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
1	2755	791	607	1	2199	874	612
2	2522	820	608	2	2056	853	612
3	2309	824	610	3	1980	852	612
4	2117	825	610	4	1709	851	612
5	1931	827	610	5	1467	850	612
6	1694	831	610	6	1188	846	611
7	1465	836	610	7	1001	841	611
8	1258	839	611	8	836	839	612
9	1066	841	612	9	635	837	612
10	858	839	611	10	270	832	612
11	666	838	612	11	56	830	612
12	449	837	612	12	-38	838	611
13	228	836	613	13	-38	838	611
14	4	835	613	14	-174	798	611
15	-46	838	609	15	-341	782	611
16	-250	834	611	16	-554	753	612
17	-384	829	611	17	-826	762	612
18	-502	824	611	18	-898	686	612
19	-657	813	613	19	-946	585	613
20	-769	802	611	20	-992	492	613
21	-845	784	612	21	-988	313	612
22	-911	748	611	22	-995	130	612
23	-955	675	608	23	-1000	-8	612
24	-997	546	610	24	-1002	-131	612
25	-1018	443	611	25	-1007	-304	612

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

Point	Pre-Test			Point	Post-Test		
	X	Y	Z		X	Y	Z
26	-1024	326	611	26	-1009	-437	612
27	-1022	191	612	27	-980	-594	612
28	-1021	35	612	28	-907	-742	612
29	-1021	-188	612	29	-815	-787	612
30	-1023	-322	611	30	-594	-810	612
31	-1015	-448	611	31	-436	-819	612
32	-996	-537	611	32	-387	-821	611
33	-975	-615	613	33	-348	-823	612
34	-951	-674	612	34	-202	-828	612
35	-911	-736	610	35	-48	-830	612
36	-801	-789	612	36	68	-844	612
37	-661	-804	612	37	234	-844	612
38	-500	-814	612	38	416	-844	612
39	-375	-819	611	39	623	-843	612
40	-190	-828	608	40	812	-843	612
41	-52	-829	611	41	937	-843	611
42	126	-831	611	42	1030	-859	612
43	357	-832	612	43	1178	-873	612
44	602	-833	613	44	1297	-883	611
45	827	-834	612	45	1444	-885	611
46	958	-835	611	46	1603	-884	612
47	1123	-835	611	47	1733	-873	612
48	1332	-833	610	48	1946	-833	612
49	1514	-830	611	49	2032	-792	612
50	1732	-826	613	50	2096	-704	611
51	1929	-823	613	51	2130	-639	611
52	2124	-821	612	52	2156	-539	612
53	2365	-819	612	53	2283	-400	610
54	2549	-813	612	54	2370	-330	613
55	2723	-792	613	55	2424	-236	611
56	2848	-772	609	56	2496	-199	613
57	2924	-753	610	57	2503	-125	611
58	2979	-729	613	58	2614	-47	612
59	3029	-685	612	59	2730	25	612
60	3073	-614	611	60	2837	124	612
61	3124	-507	612	61	2956	251	612
62	3171	-363	608	62	2909	463	611
63	3196	-238	613	63	2802	782	612
64	3211	-98	611	64	2616	825	612
65	3211	82	611	65	2406	851	611
66	3197	232	610				
67	3172	365	609				

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

VEHICLE EXTERIOR CRUSH PROFILE
SECTION B-B (Continued)

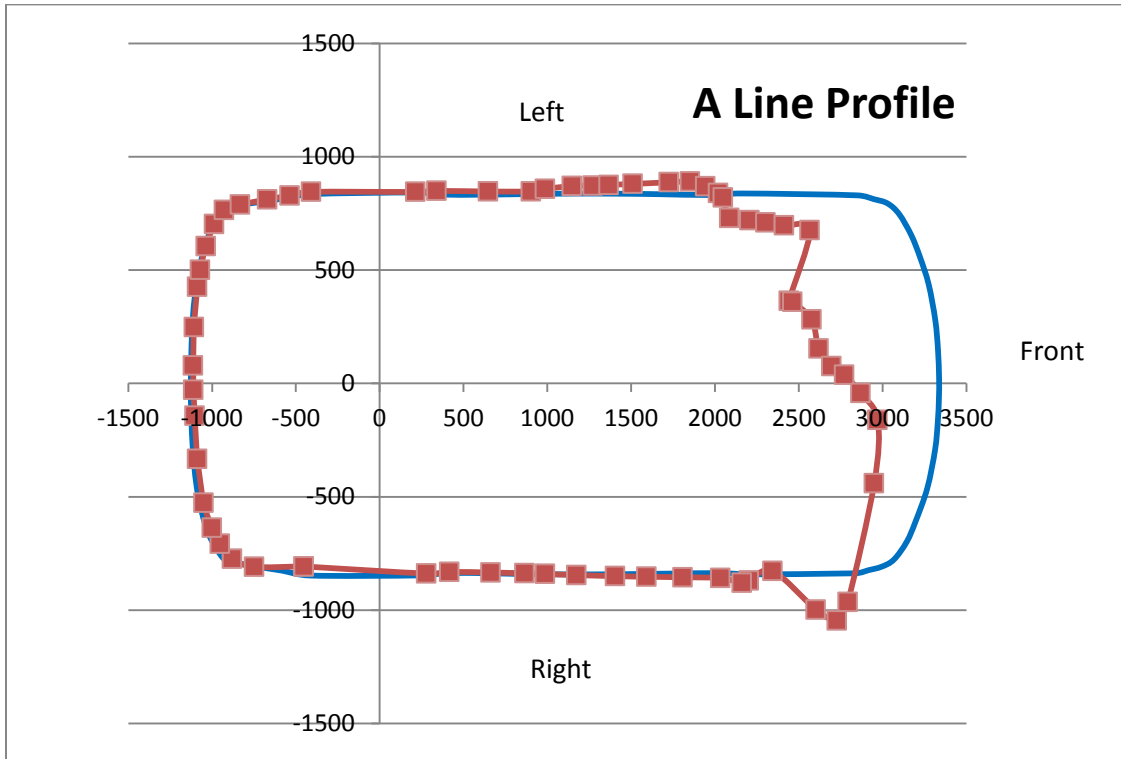
Point	Pre-Test		
	X	Y	Z
68	3130	503	613
69	3093	569	614
70	3044	665	609
71	2991	725	611
72	2931	756	609
73	2838	778	603
74	2755	791	607

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

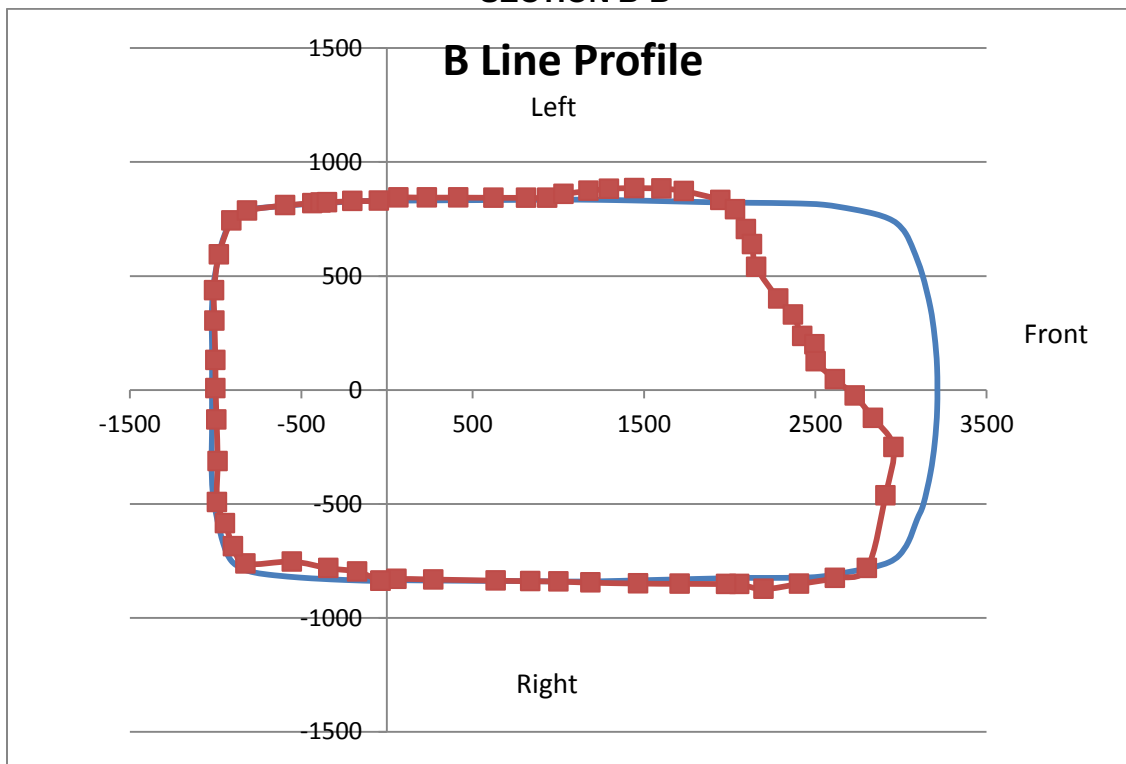
Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012

VEHICLE EXTERIOR CRUSH PROFILE
SECTION A-A



SECTION B-B



DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



STRUCTURAL BUMPER BEAM POINTS

	Point	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
		X	Y	Z	X	Y	Z	X	Y	Z
Redundant Structural Bumper Beam	B10	3179	-467	873	2486	-291	689	-693	176	-184
	B11	3195	-349	873	2573	-211	687	-622	138	-186
	B12	3207	-231	872	2660	-131	683	-547	100	-189
	B13	3214	-113	872	2746	-50	681	-468	63	-191
	B14	3216	7	871	2831	35	680	-385	28	-191
	B15	3213	125	871	2911	121	681	-302	-4	-190
	B16	3206	243	870	2989	211	683	-217	-32	-187
	B17	3196	359	861	3065	306	679	-131	-53	-182
	B18	3175	477	870	3132	398	693	-43	-79	-177
Center Structural Bumper Beam	B1	3179	-467	899	2491	-296	715	-688	171	-184
	B2	3195	-349	898	2578	-215	712	-617	134	-186
	B3	3207	-231	897	2664	-134	708	-543	97	-189
	B4	3214	-113	897	2752	-55	705	-462	58	-192
	B5	3216	7	894	2836	29	701	-380	22	-193
	B6	3213	125	896	2917	116	704	-296	-9	-192
	B7	3206	243	896	2995	205	706	-211	-38	-190
	B8	3195	363	896	3069	294	711	-126	-69	-185
	B9	3176	477	896	3138	392	717	-38	-85	-179
Upper Radiator Support	1	2968	-456	639	2374	-232	509	-594	224	-130
	2	2981	-349	630	2393	-141	472	-588	208	-158
	3	2993	-236	612	2475	-67	448	-518	169	-164
	4	3000	-118	608	2563	1	419	-437	119	-189
	5	3000	-1	609	2644	81	393	-356	82	-216
	6	3002	116	613	2721	169	404	-281	53	-209
	7	2996	232	608	2786	266	419	-210	34	-189
	8	2983	346	629	2843	358	464	-140	12	-165
	9	2965	461	636	2897	454	500	-68	-7	-136

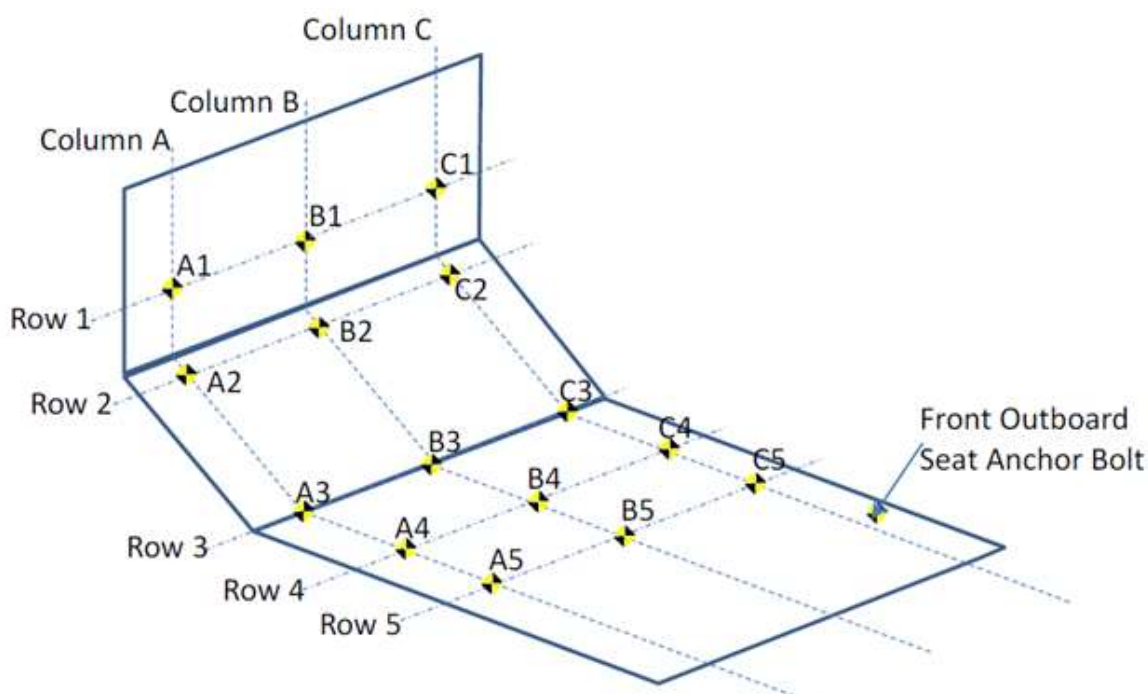
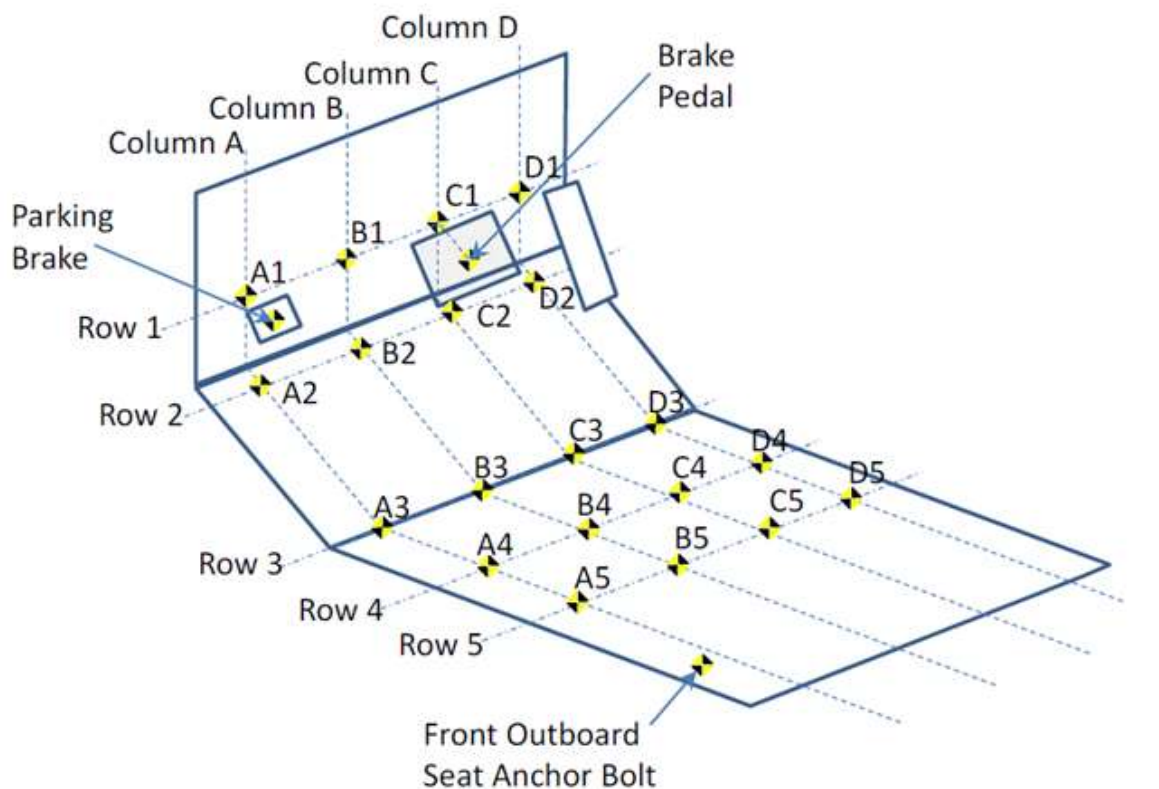
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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.13 (CONTINUED) **VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



Note: See Appendix D for toe pan measuring procedure

DATA SHEET NO.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012

DRIVER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2210	-553	954	2019	-485	922	-192	68	-33
B1	2295	-452	957	2043	-358	902	-252	94	-54
C1	2347	-303	958	2037	-268	925	-309	35	-32
D1	2307	-149	950	2077	-73	946	-230	76	-4
A2	2189	-553	1026	2052	-493	991	-138	60	-35
B2	2241	-451	1026	2066	-384	984	-175	68	-42
C2	2248	-304	1026	2030	-239	1006	-218	66	-20
D2	2241	-150	1026	2087	-110	1011	-154	40	-15
A3	2098	-552	1154	2057	-515	1125	-41	37	-29
B3	2097	-452	1155	2055	-419	1150	-42	34	-5
C3	2099	-302	1141	2020	-283	1150	-79	19	9
D3	2099	-152	1157	2059	-145	1198	-40	7	40
A4	2048	-549	1165	2015	-518	1152	-34	31	-13
B4	2047	-446	1176	2016	-422	1186	-31	24	10
C4	2046	-300	1172	2000	-285	1208	-46	15	36
D4	2046	-146	1178	2018	-145	1222	-28	1	44
A5	1996	-545	1178	1971	-523	1181	-25	22	3
B5	1996	-446	1185	1968	-428	1206	-28	18	21
C5	1995	-296	1187	1963	-286	1246	-32	10	59
D5	1995	-146	1188	1969	-149	1237	-26	-3	49
Brake Pedal	2092	-295	955	1850	-264	899	-242	31	-56
Driver IP Left	1806	-468	646	1741	-449	581	-65	19	-66
Driver IP Right	1798	-167	646	1718	-146	593	-80	21	-53
DOLP	1707	-614	673	1722	-540	604	15	74	-69
Steering Column	1614	-314	446	1508	-314	370	-106	0	-76
Front Outboard Bolt	1571	-525	1084	1565	-531	1097	-7	-6	13

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.13 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

PASSENGER FLOOR PAN MEASUREMENTS

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	2300	181	953	2202	228	916	-98	47	-37
B1	2296	333	958	2276	357	944	-20	24	-13
C1	2249	481	959	2238	507	942	-11	26	-17
A2	2232	181	1024	2146	233	989	-86	53	-35
B2	2234	331	1025	2226	360	1018	-8	29	-7
C2	2233	480	1026	2225	507	1013	-9	26	-13
A3	2095	181	1150	2103	213	1156	8	32	6
B3	2095	332	1149	2098	361	1153	4	30	4
C3	2095	479	1151	2099	514	1142	4	35	-9
A4	2043	182	1162	2050	212	1174	7	30	12
B4	2046	332	1172	2052	363	1176	6	31	4
C4	2046	479	1172	2051	513	1163	5	33	-9
A5	1996	180	1172	2004	210	1185	8	30	14
B5	1997	331	1182	2003	361	1187	6	30	5
C5	1995	479	1182	2002	510	1172	7	31	-10
Pass IP Left	1806	182	666	1807	196	606	1	14	-60
Pass IP Right	1839	480	668	1825	496	641	-14	16	-27
PORP	1708	622	671	1826	599	649	117	-23	-23
Front Outboard Bolt	1568	528	1081	1574	538	1081	6	11	0

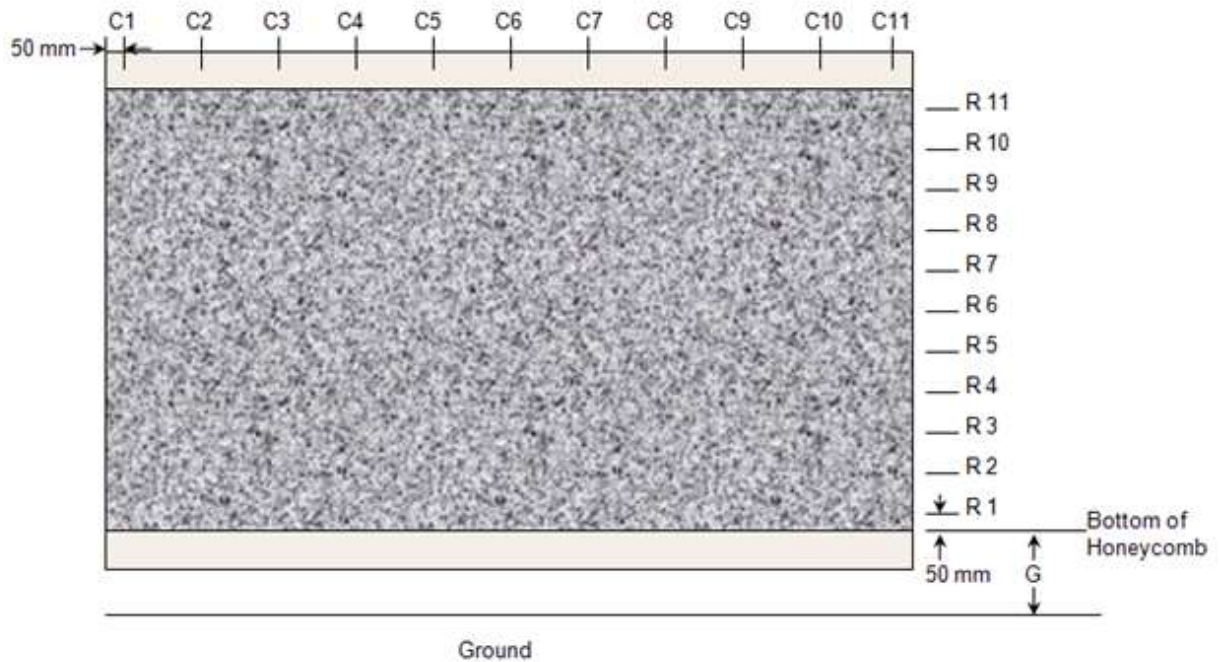
Reference point: 50mm above the center of the rear windshield (See appendix D for procedure to create coordinate system).

- +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.14 **RMDB CRUSH MEASUREMENTS**

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012



		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
		50 mm	260 mm	470 mm	680 mm	890 mm	1100 mm	1310 mm	1520 mm	1730 mm	1940 mm	2150 mm
R11	910mm	-1.9	0.9	1.5	1.1	2.2	2.7	3.1	3.5	3.1	2.7	13.2
R10	824mm	-2.8	-1.4	-1.9	-1.5	-1.0	-0.4	0.4	1.4	2.0	6.1	37.2
R9	738mm	-3.5	-3.2	-2.8	-2.4	-1.9	-1.3	-0.5	0.2	3.2	12.0	68.0
R8	652mm	-4.1	-4.1	-3.6	-3.2	-2.5	-1.9	-1.2	2.9	13.1	46.9	96.9
R7	566mm	-4.8	-4.8	-4.4	-3.8	-3.1	-2.5	-1.7	0.3	46.8	89.7	132.1
R6	480mm	-5.6	-5.7	-5.1	-4.5	-3.7	-3.1	-1.8	13.1	33.1	138.5	180.9
R5	384mm	-6.3	-6.4	-5.5	-5.0	-4.3	-3.6	-2.8	76.3	29.6	159.1	225.5
R4	308mm	-7.3	-7.1	-6.4	-5.4	-4.8	-4.1	-3.2	117.3	20.7	157.2	243.1
R3	222mm	-8.2	-7.8	-6.9	-5.9	-5.3	-4.6	-3.5	158.6	13.3	161.5	229.3
R2	136mm	-9.1	-8.3	-7.2	-6.3	-5.6	-4.9	-3.9	181.8	31.1	179.2	204.9
R1	50mm	-9.5	-8.6	-7.0	-6.0	*	*	-2.4	184.3	43.0	152.9	191.0

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

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

Test Vehicle: 2013 Nissan Versa Four Door Sedan
 Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
 Test Date: 12/7/2012

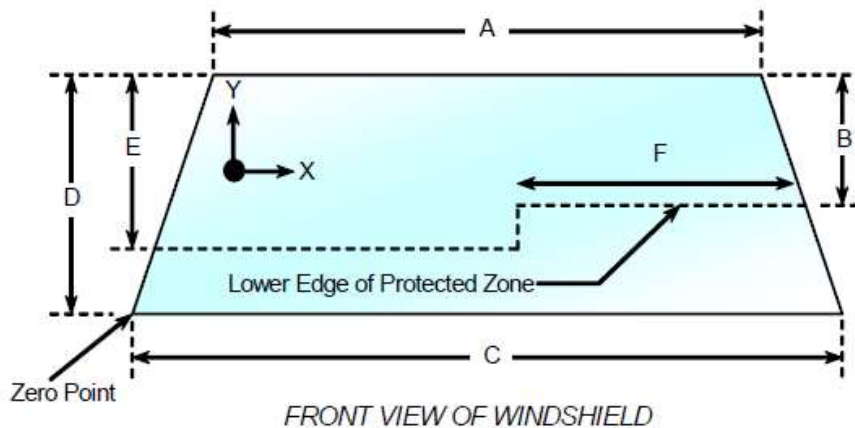
Please provide windshield mounting details. A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	1892	1532	81%
Right Side	1892	1892	100%
Total	3783	3424	90.5%



Item	Units	Value
A	mm	1055
B	mm	418
C	mm	1298
D	mm	715
E	mm	490
F	mm	272

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: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

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

Test Time: 1:42 PM

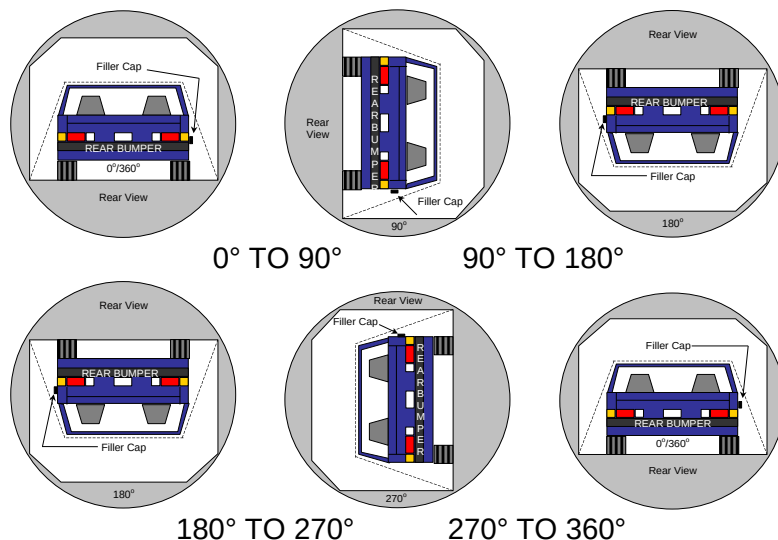
Stoddard Solvent Spillage Measurements

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

DATA SHEET NO. 16 FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012



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°	72	300	372
90° to 180°	63	300	363
180° to 270°	61	300	361
270° to 360°	67	300	367

FMVSS 301 SPILLAGE TABLE

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

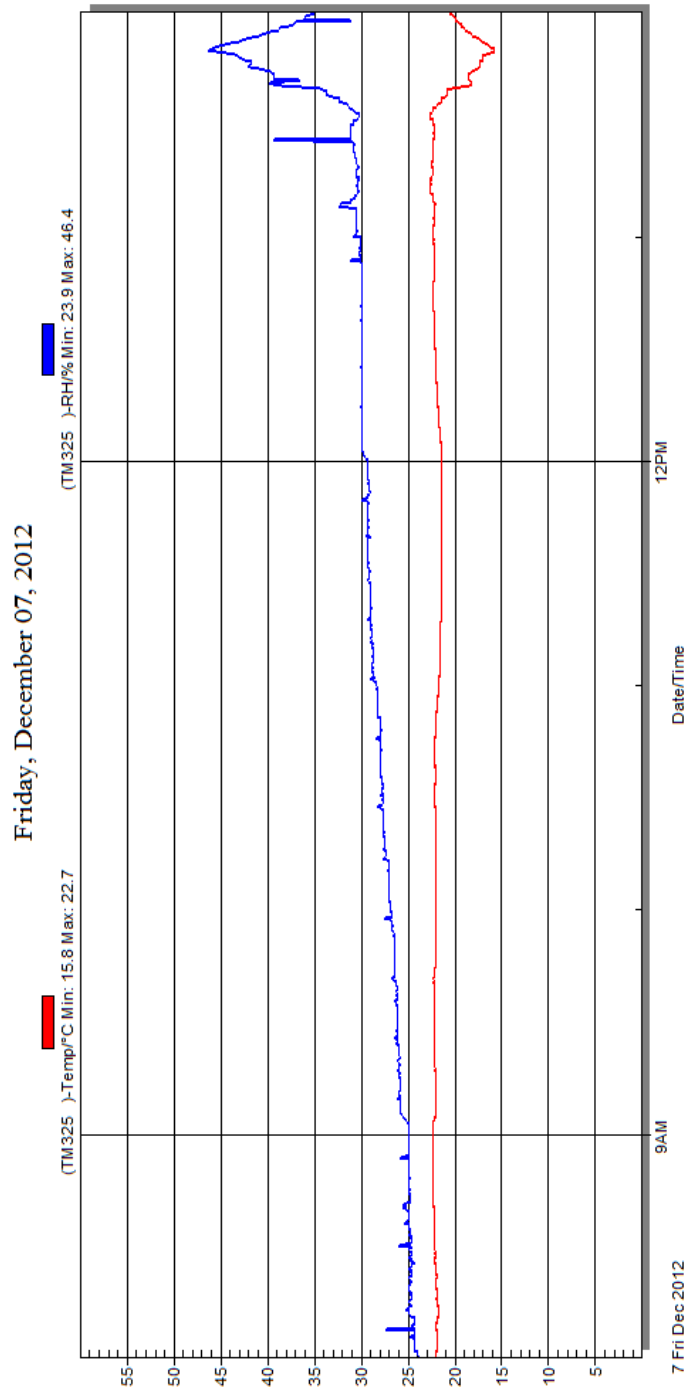
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2013 Nissan Versa Four Door Sedan
Test Program: R&D 90.1kph, 15° angle, 35% offset

NHTSA No.: RD5226
Test Date: 12/7/2012



Temperature Stabilization Chart/Data

APPENDIX A
PHOTOGRAPHS

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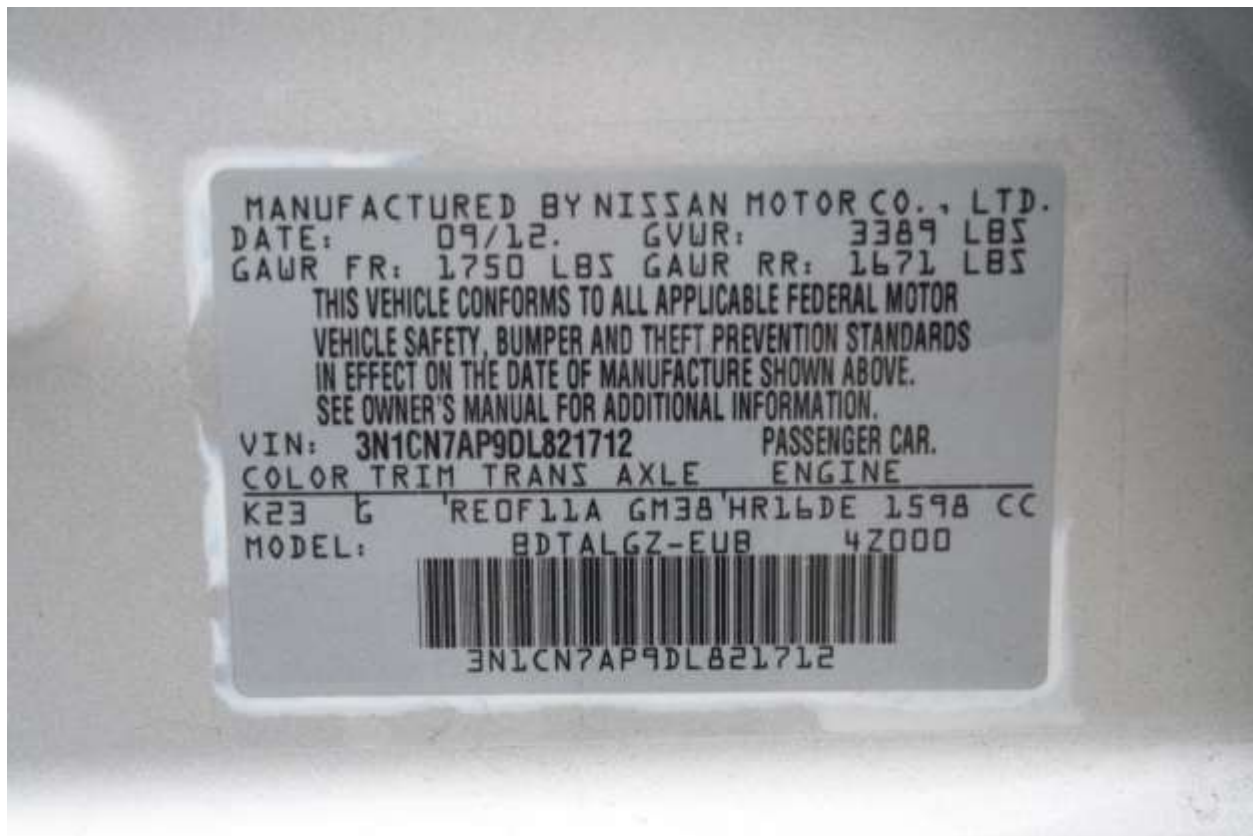
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No. 001 As Delivered Right Front 3-4 View of Test Vehicle



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



No. 003 Test Vehicle Certification Label



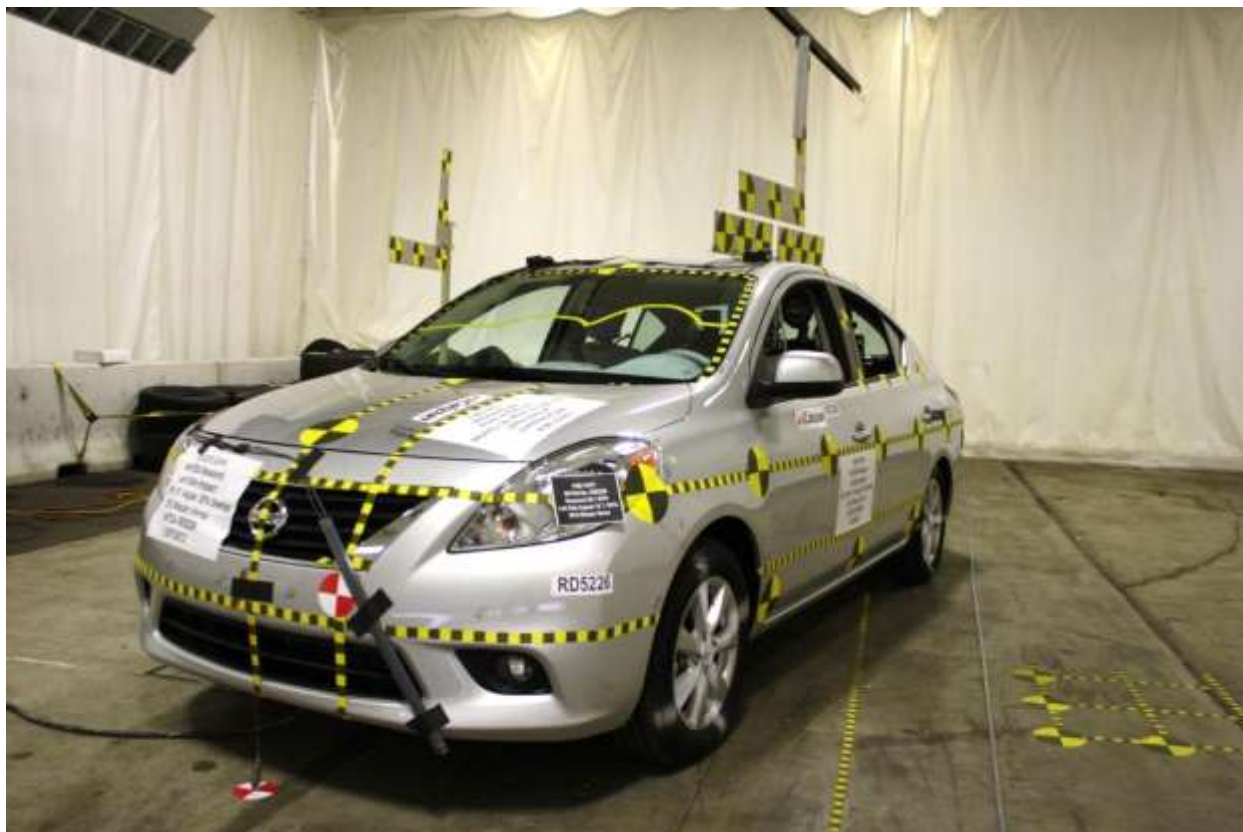
No. 004 Test Vehicle Tire Placard



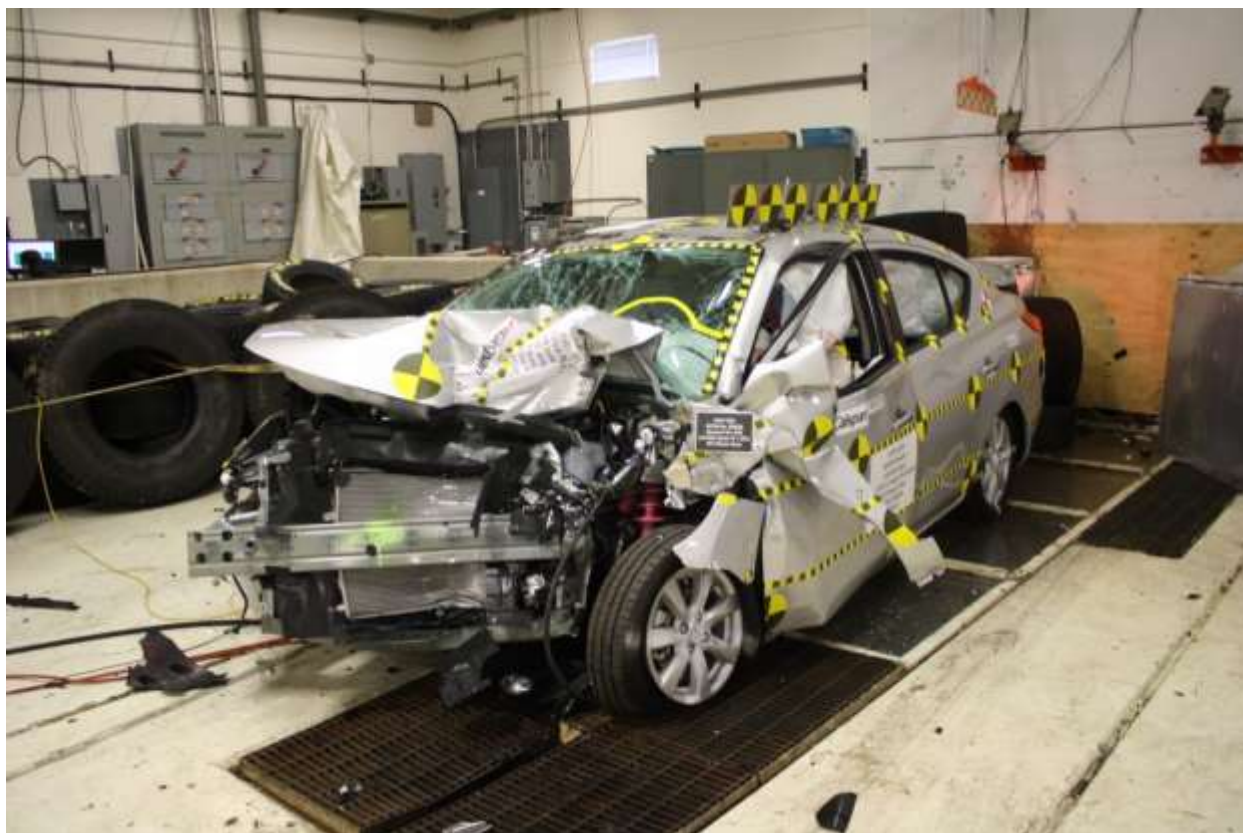
No. 005 Pre-Test Front View of Test Vehicle



No. 006 Post-Test Front View of Test Vehicle



No. 007 Pre-Test Left Front 3-4 View of Test Vehicle



No. 008 Post-Test Left Front 3-4 View of Test Vehicle



No. 009 Pre-Test Left Side View of Test Vehicle



No. 010 Post-Test Left Side View of Test Vehicle



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



No. 012 Post-Test Left Rear 3-4 View of Test Vehicle



No. 013 Pre-Test Rear View of Test Vehicle



No. 014 Post-Test Rear View of Test Vehicle



No. 015 Pre-Test Right Rear 3-4 View of Test Vehicle



No. 016 Post-Test Right Rear 3-4 View of Test Vehicle



No. 017 Pre-Test Right Side View of Test Vehicle



No. 018 Post-Test Right Side View of Test Vehicle



No. 019 Pre-Test Right Front 3-4 View of Test Vehicle



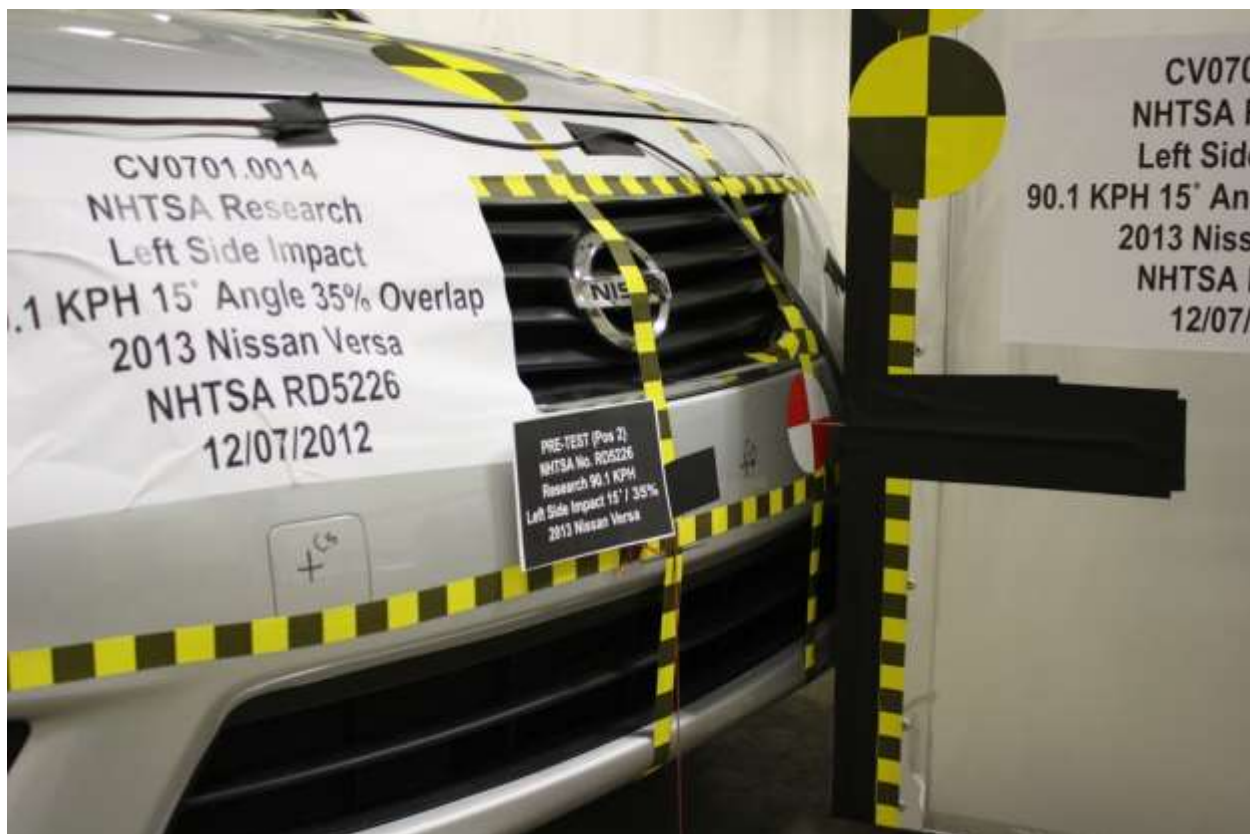
No. 020 Post-Test Right Front 3-4 View of Test Vehicle



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



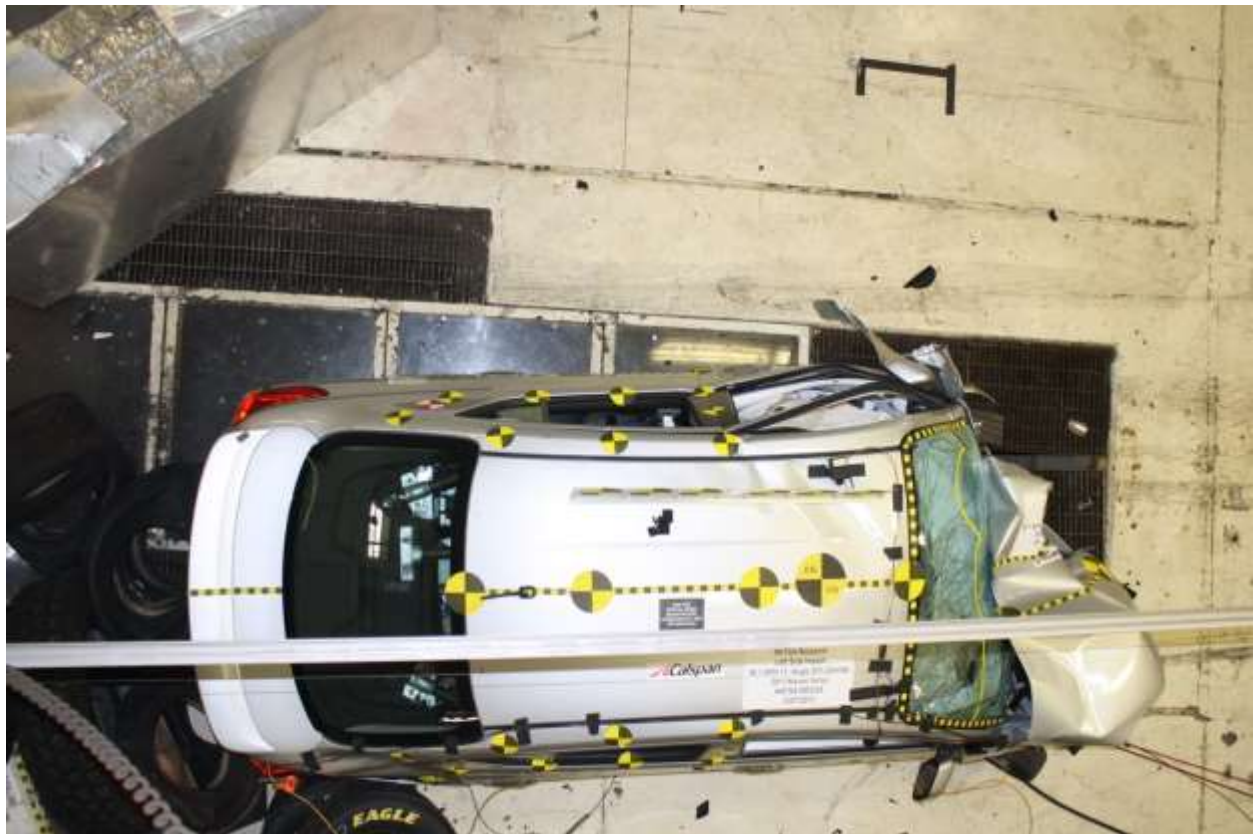
No. 024 Pre-Test Right Side View of RMDB against target vehicle at ideal Impact Point



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



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



No. 027 Post-Test Vehicle Overhead View



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



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



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



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



No. 032 Pre-Test Windshield View



No. 033 Post-Test Windshield View



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



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



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



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



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



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



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



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



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



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



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

Photo Not Available

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



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



No. 060 Pre-Test View of Driver Door Clearance



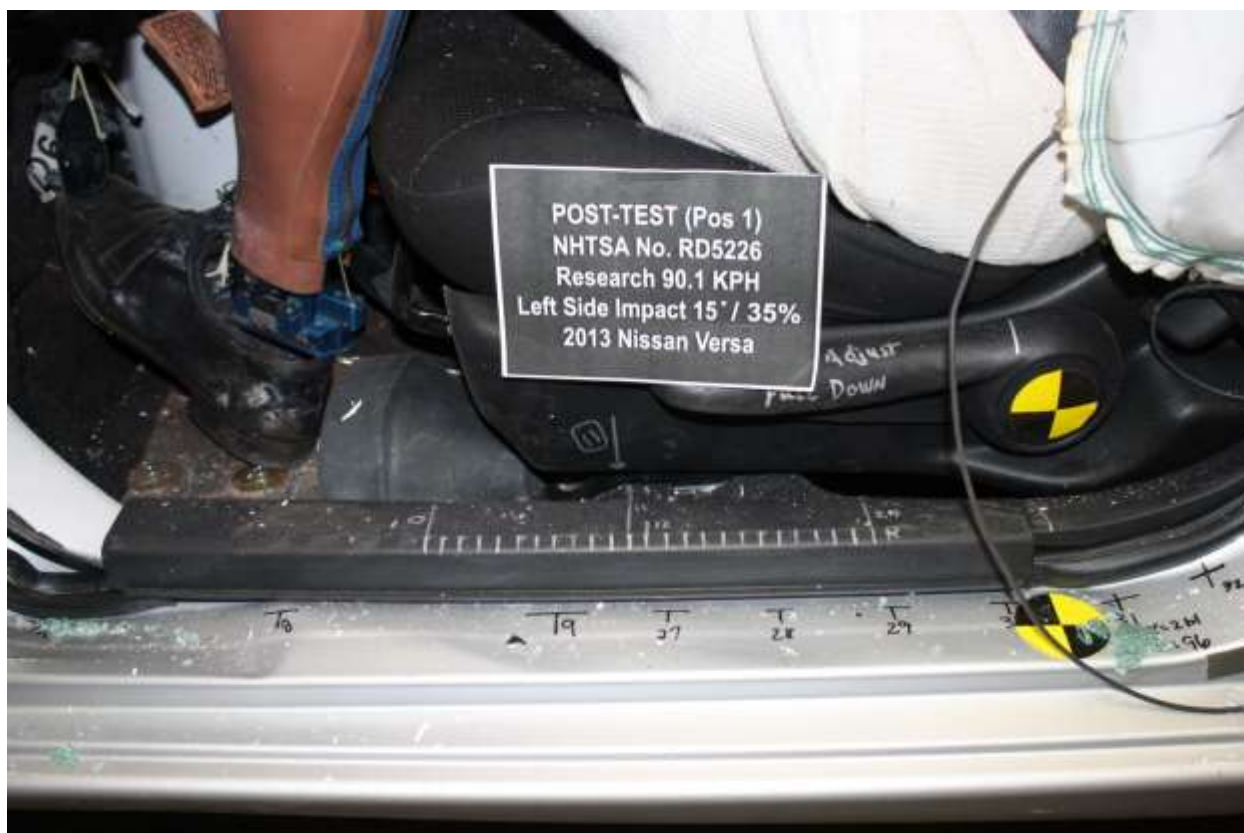
No. 061 Post-Test View of Driver Door Clearance



No. 062 Pre-Test View of Parking Brake



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



No. 067 Pre-Test Driver Adjustable D-Ring



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No. 069 Pre-Test Driver Feet



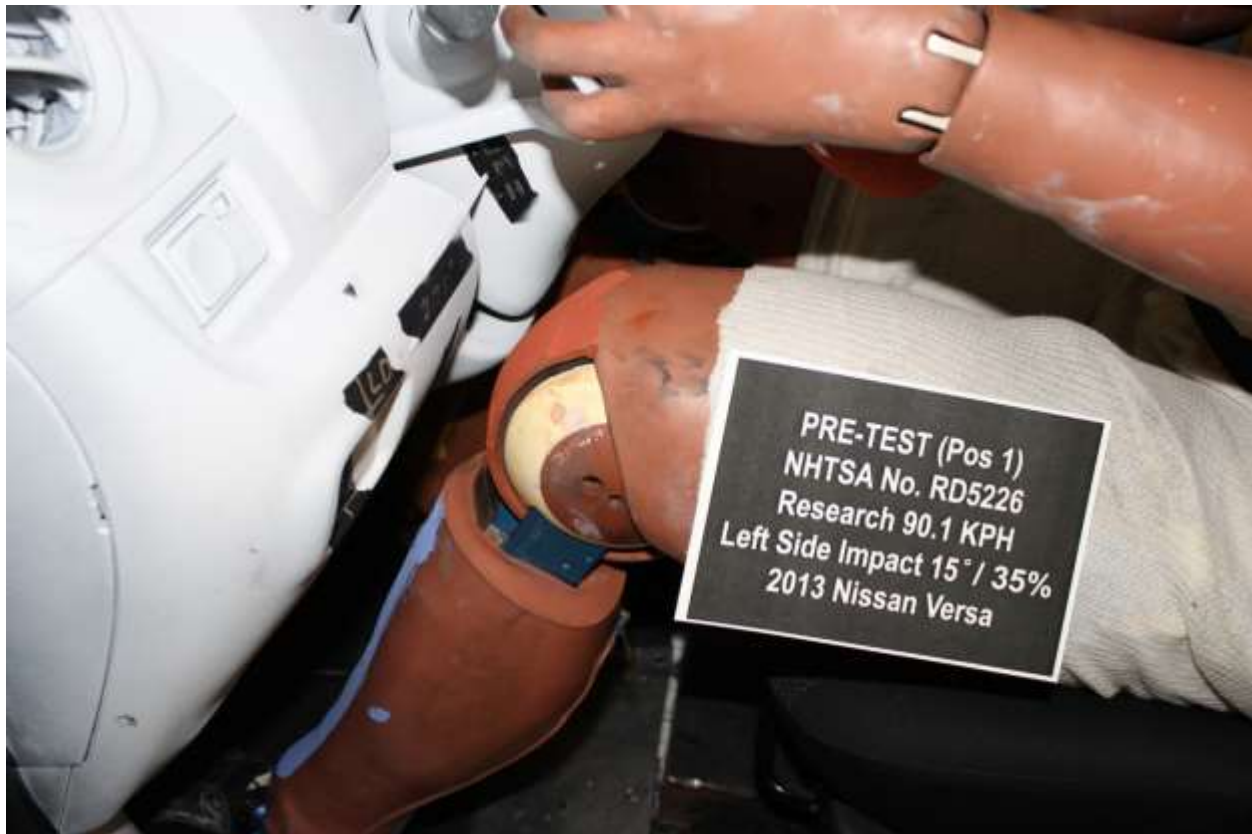
No. 070 Post-Test Driver Feet



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



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



No. 075 Pre-Test View of Driver Abdomen



No. 076 Post-Test View of Driver Abdomen



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



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



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



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



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

Photo Not Applicable

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

Photo Not Applicable

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



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No. 118 Pre-Test View of Passenger Abdomen



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Photo Not Applicable

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



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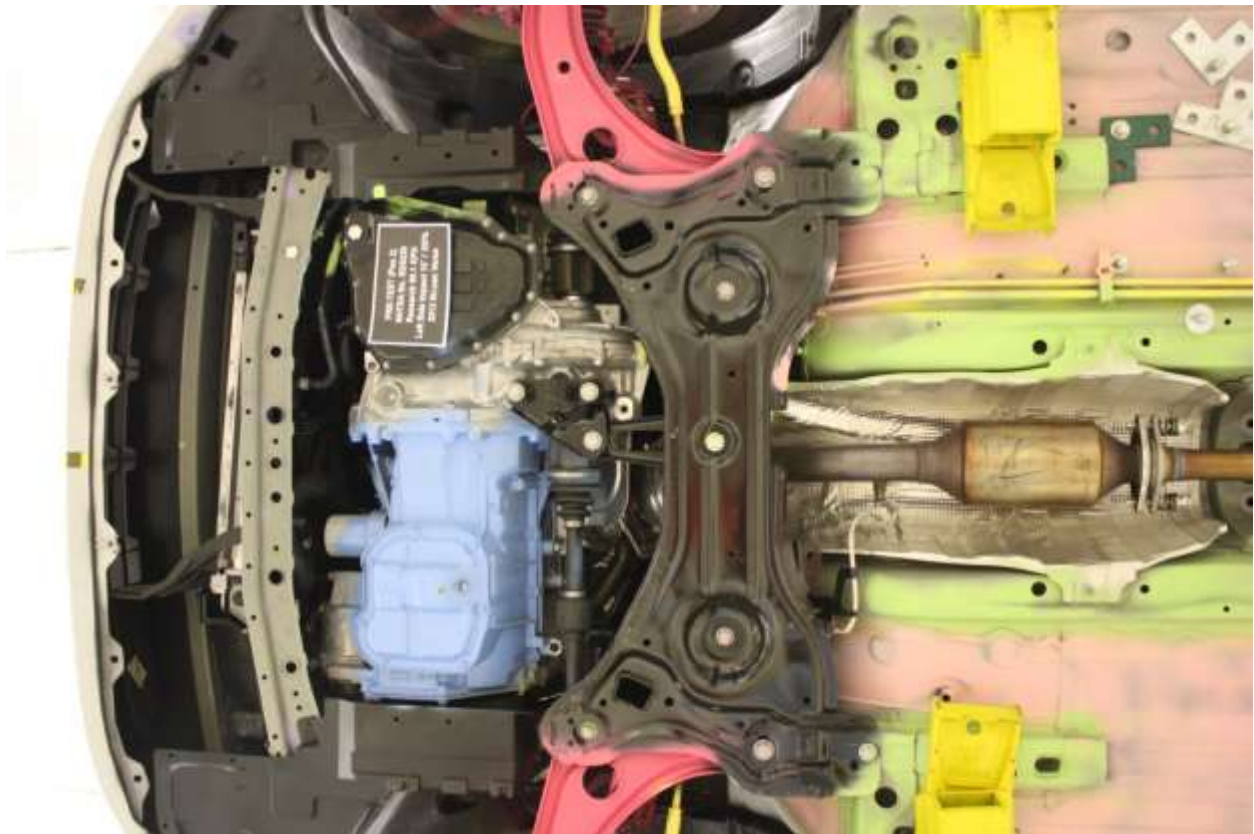
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No. 128 Post-Test Engine Compartment View



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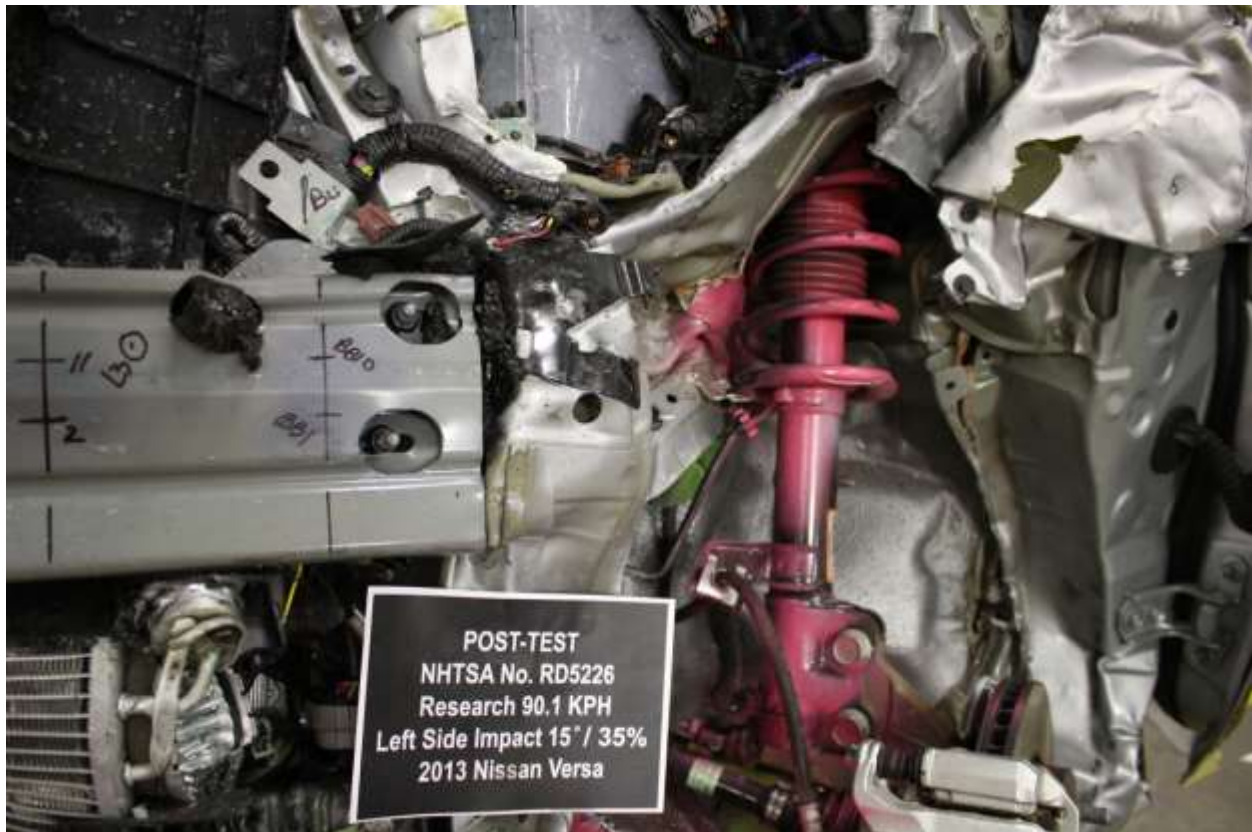
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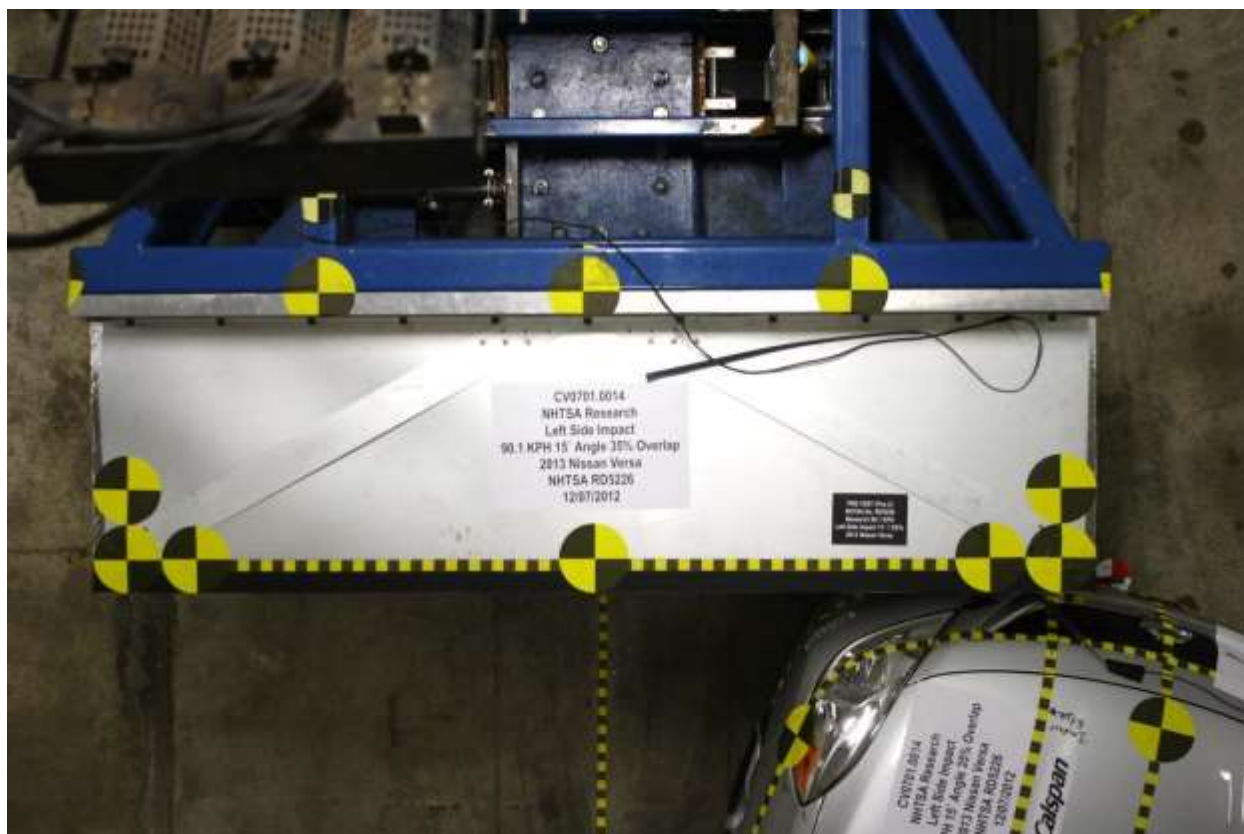
No. 163 Post-Test Left Side View of RMDB



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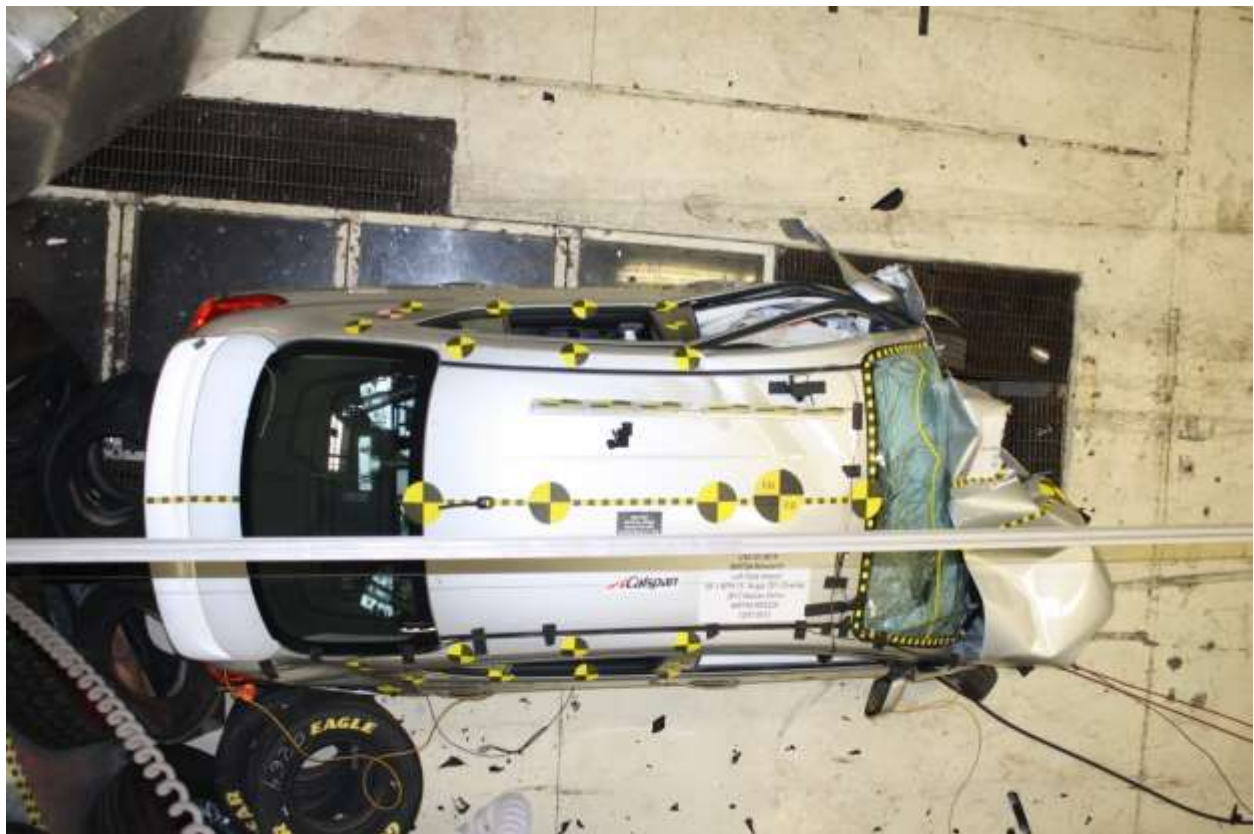
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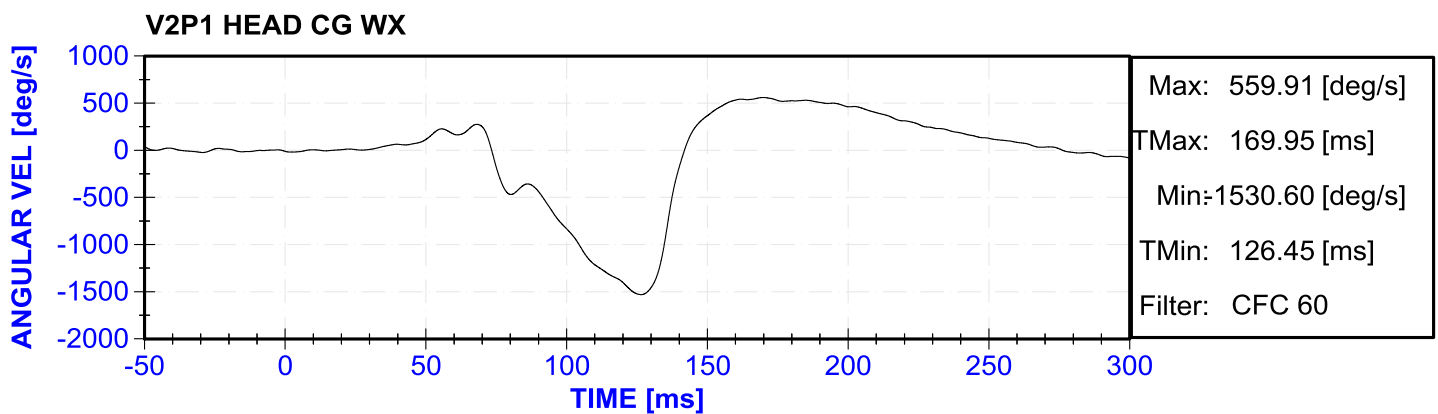
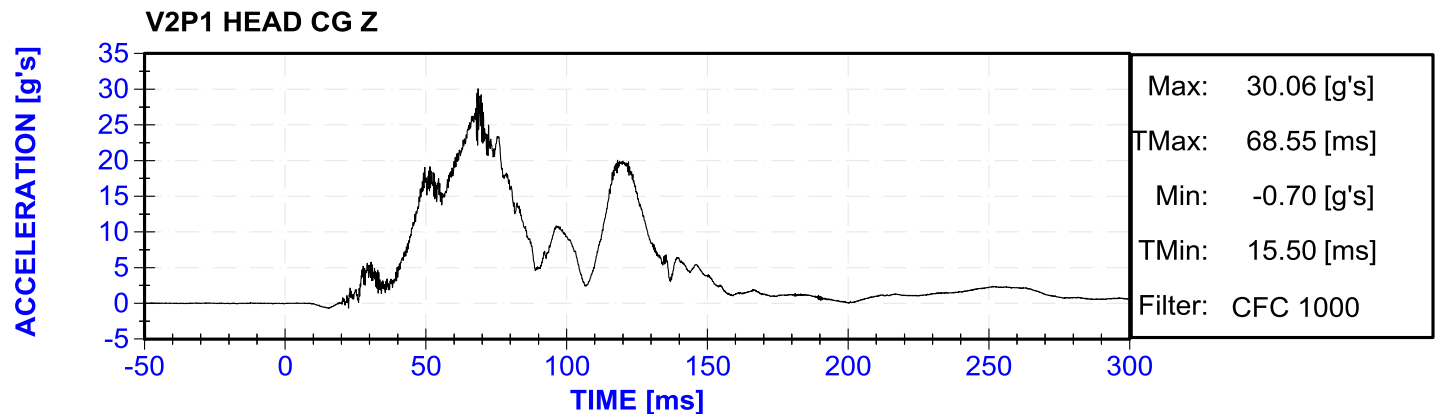
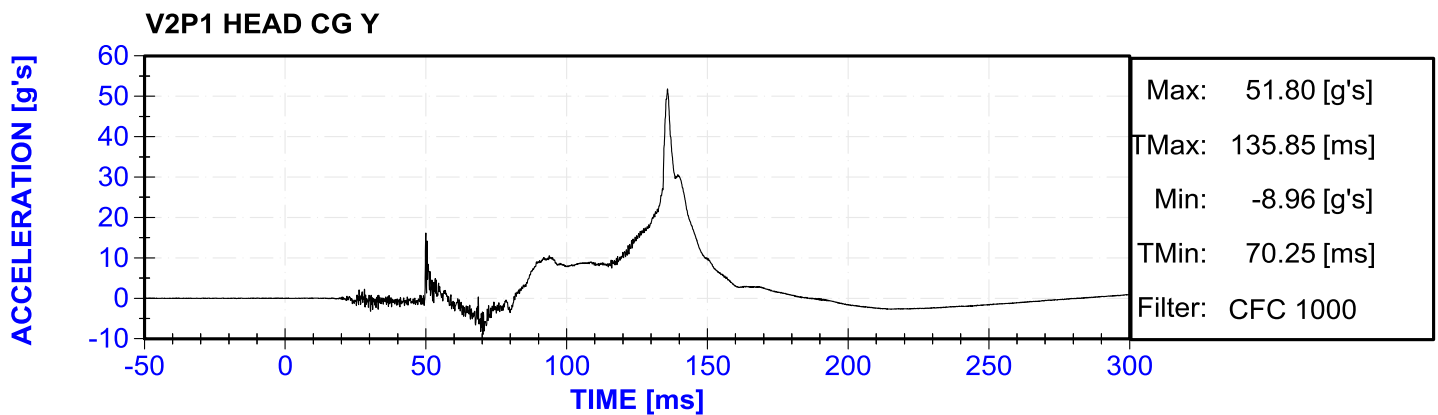
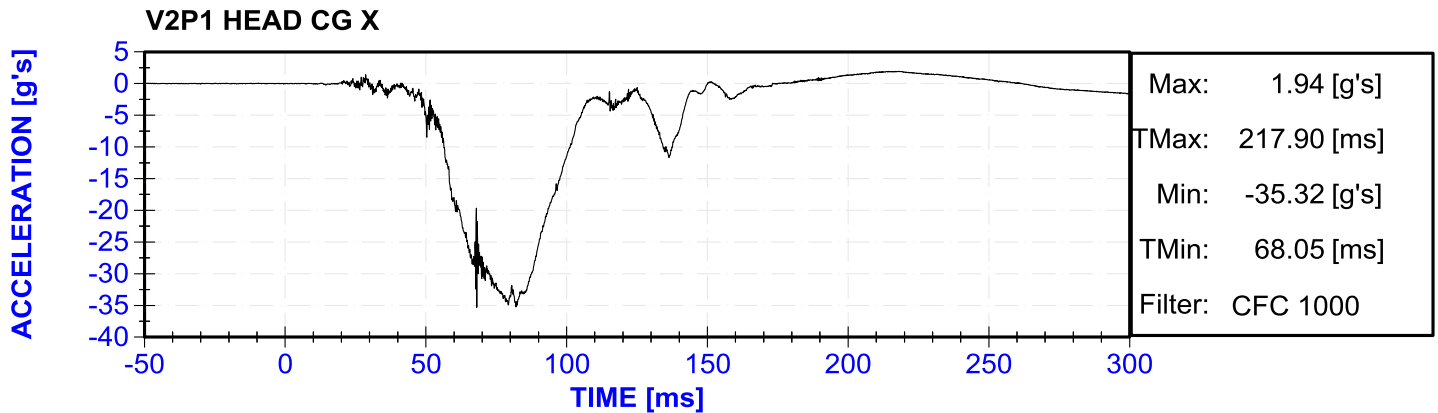
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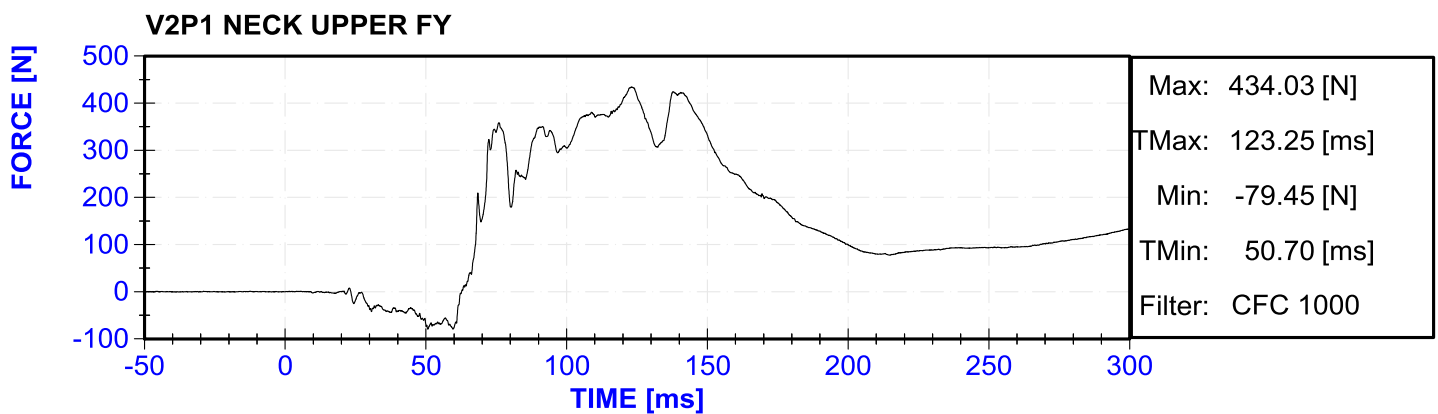
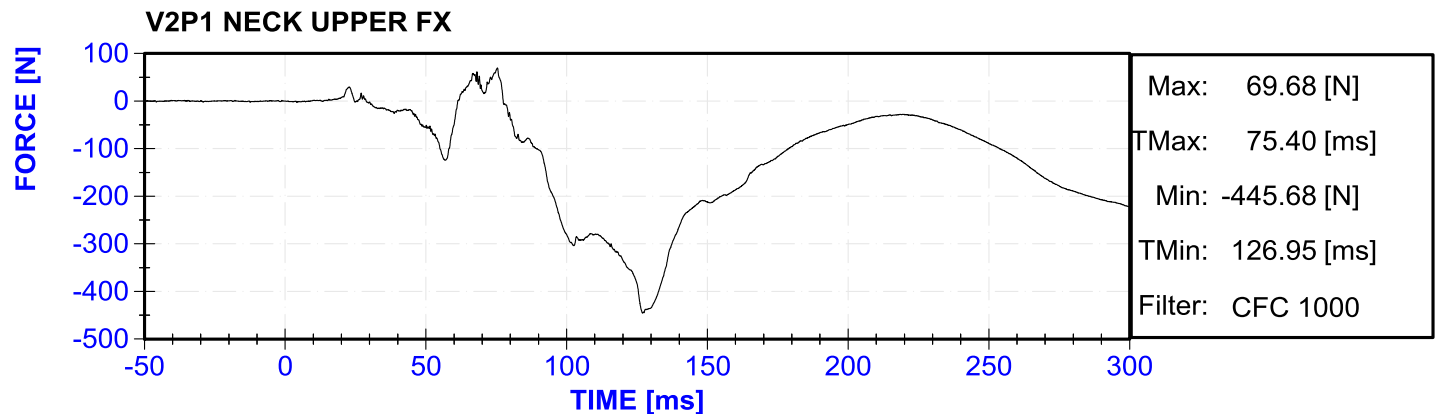
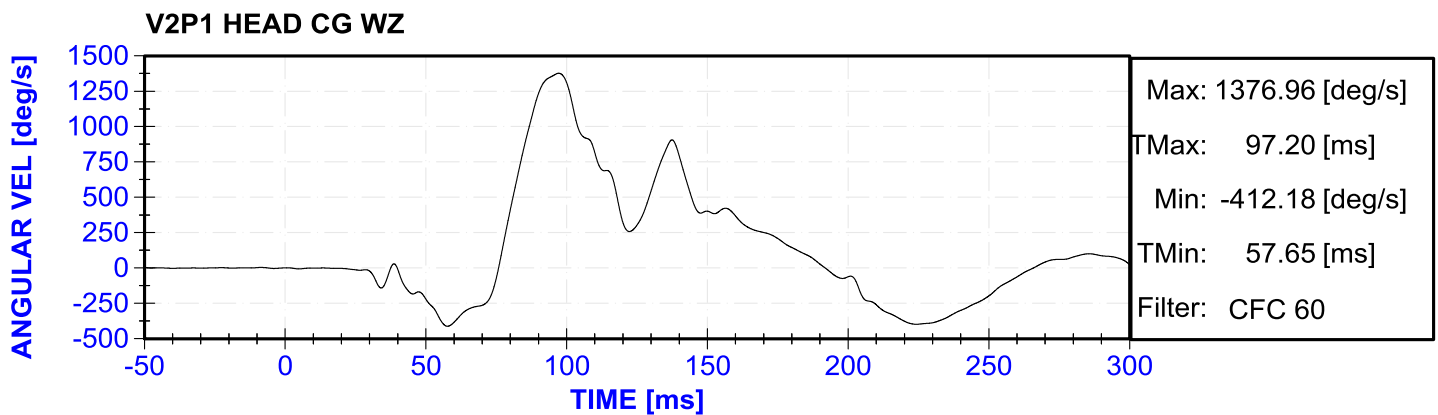
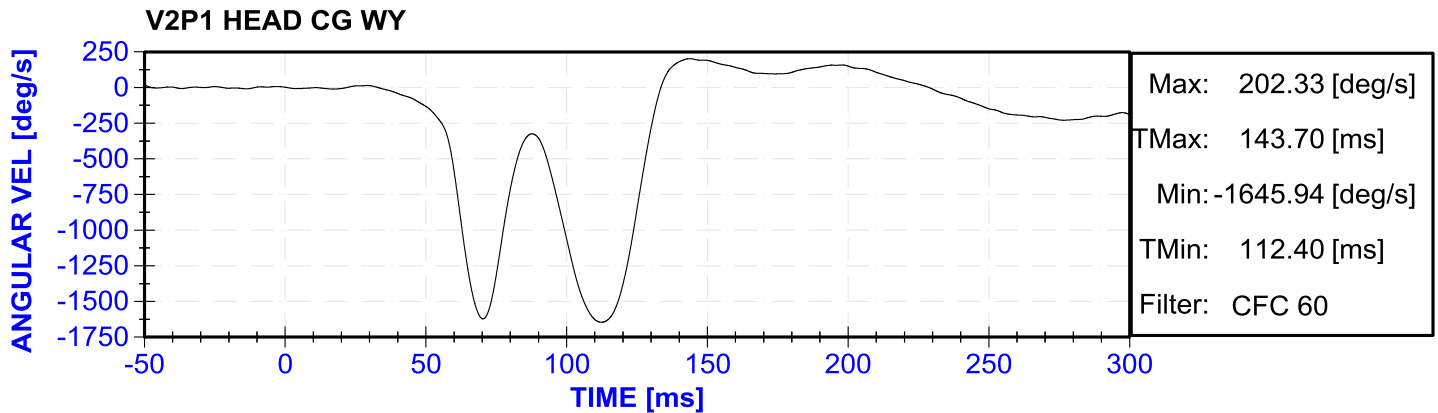
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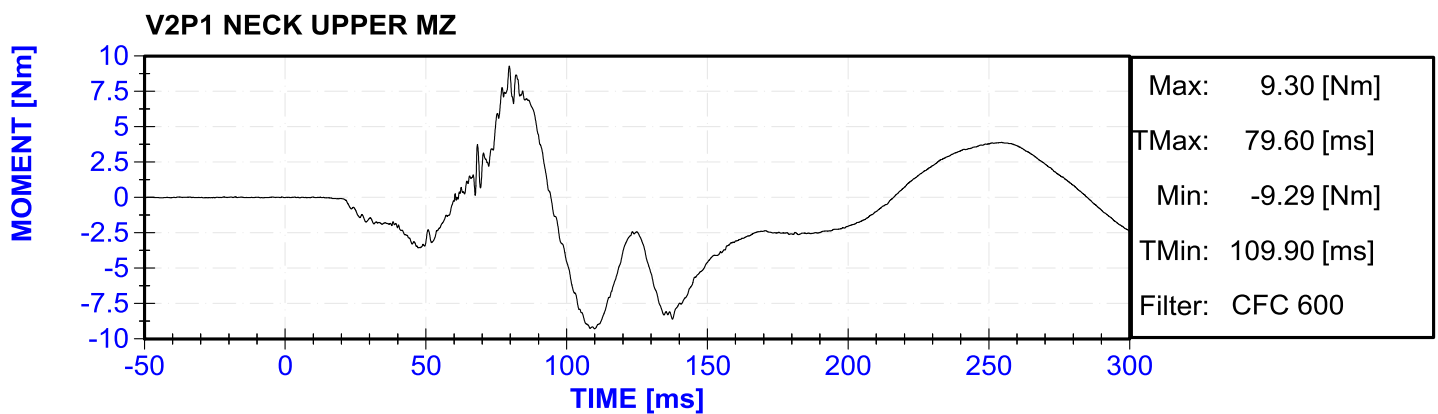
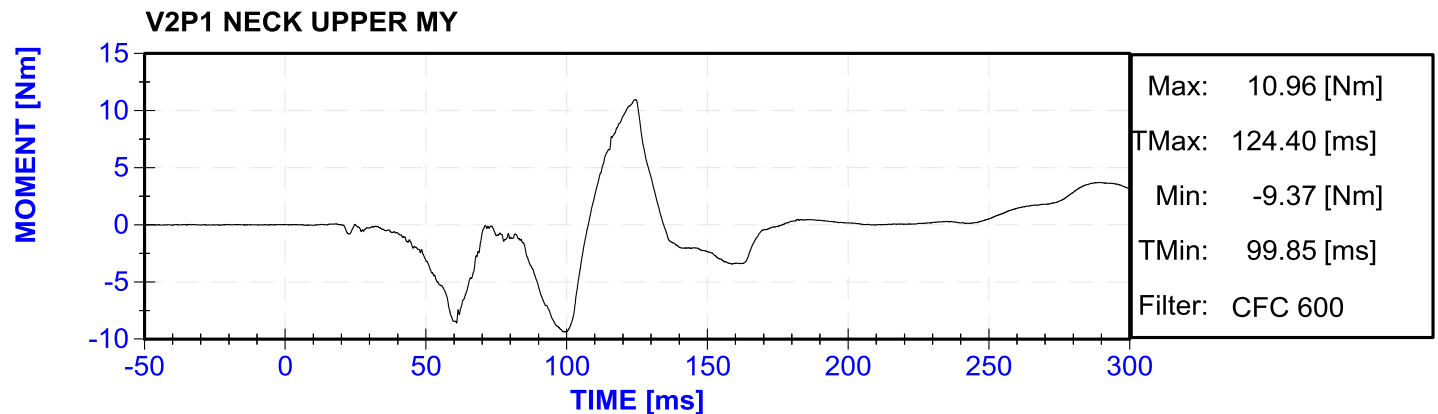
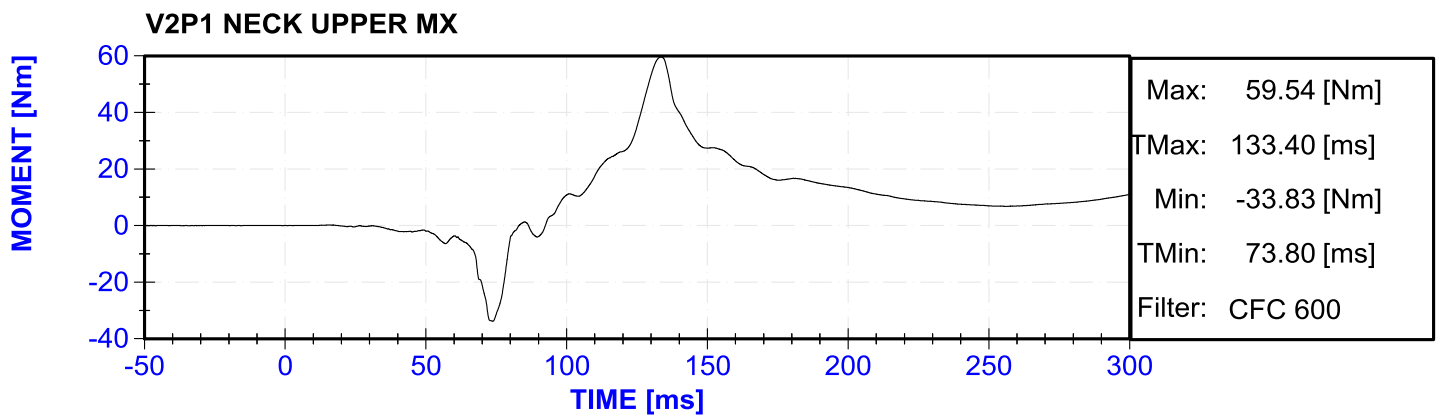
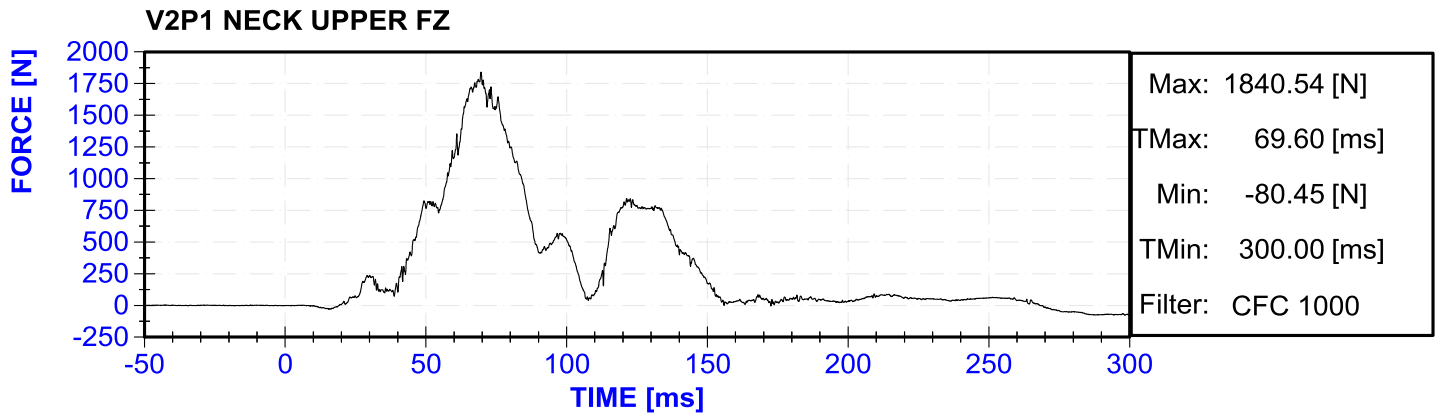
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Plot 209	V2 PASSENGER SEAT TRACK Z	B-60
Plot 210	V2 DRIVER FLOOR PAN X	B-60
Plot 211	V2 DRIVER FLOOR PAN Y	B-60
Plot 212	V2 DRIVER FLOOR PAN Z	B-60
Plot 213	V2 DRIVER FLOOR PAN STRING POT	B-61
Plot 214	V2 DRIVER SW AIRBAG STAGE 1	B-61
Plot 215	V2 DRIVER SW AIRBAG STAGE 2	B-61
Plot 216	V2 DRIVER HEAD CURTAIN	B-61
Plot 217	V2 DRIVER SEAT HEAD/TORSO/PELVIS	B-62
Plot 218	V2 DRIVER TORSO BELT PRETENSIONER	B-62
Plot 219	V2 PASSENGER FRT AIRBAG STAGE 1	B-62
Plot 220	V2 PASSENGER FRT AIRBAG STAGE 2	B-62
Plot 221	V2 PASSENGER HEAD CURTAIN	B-63
Plot 222	V2 PASSENGER HEAD/TORSO/PELVIS	B-63
Plot 223	V2 PASSENGER KNEE	B-63
Plot 224	V2 PASSENGER TORSO BELT PRETENSIONER	B-63
Plot 225	V1 CG AX	B-64
Plot 226	V1 CG AY	B-64
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Plot 228	V1 REAR C/L AX	B-64
Plot 229	V1 REAR C/L AY	B-65
Plot 230	V1 REAR C/L AZ	B-65

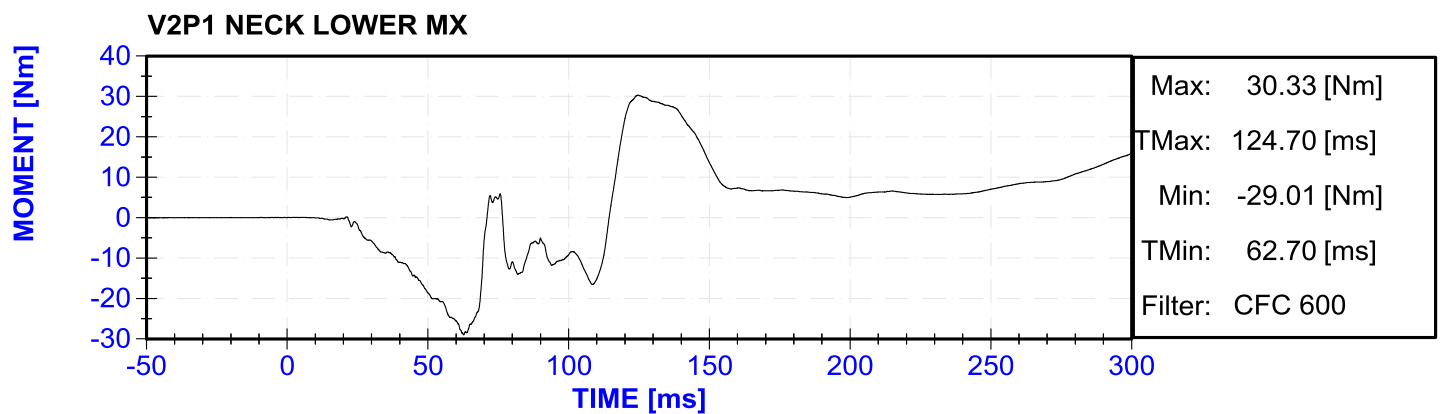
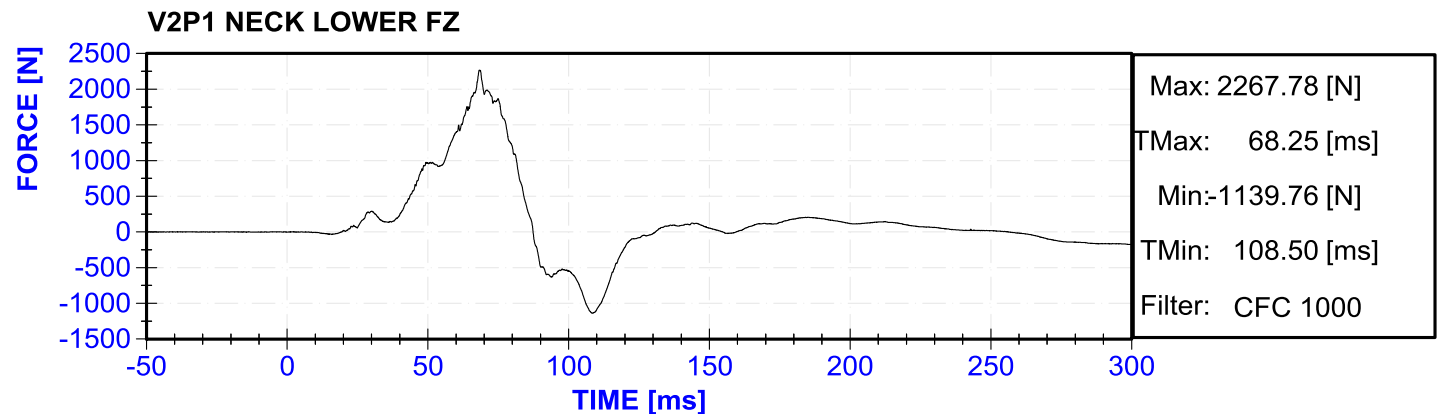
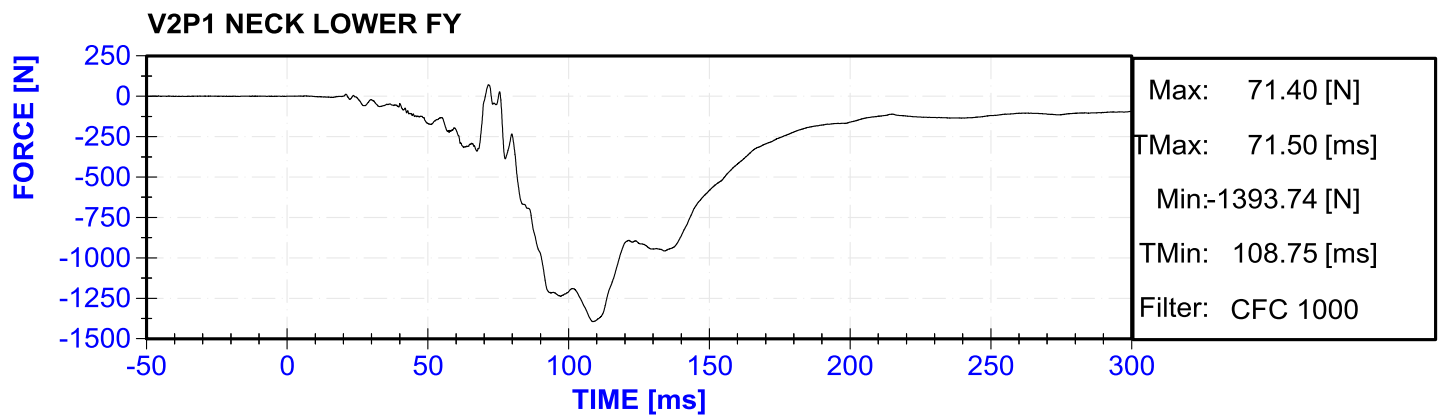
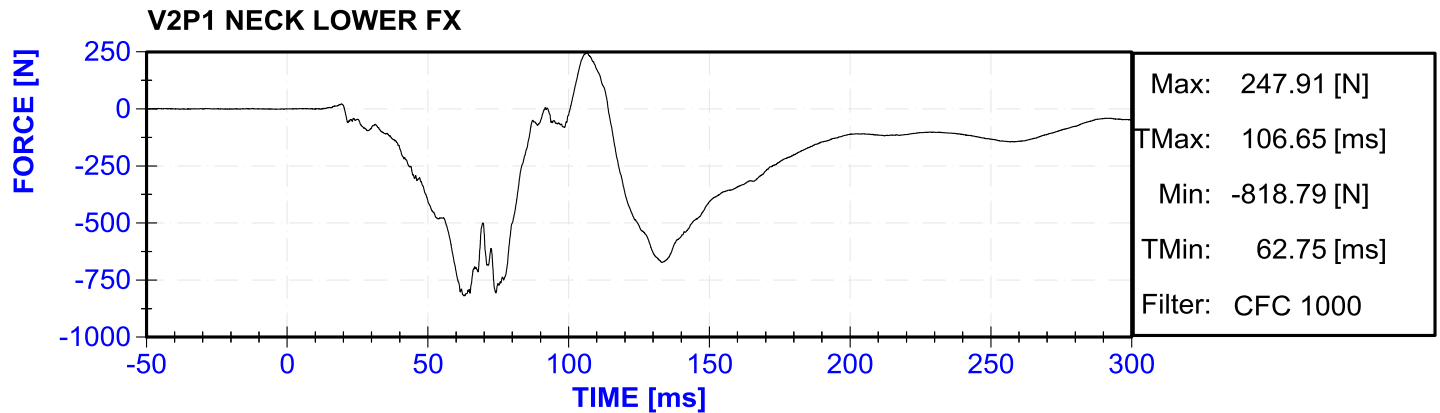
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Plot 232	V2P1 NECK OCCIPITAL CONDYLE FORCE Z [THORTEST]	B-65
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Plot 234	V2P1 NECK UPPER FORCE X [THORTEST]	B-66
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Plot 238	V2P1 NECK UPPER MOMENT Y [THORTEST]	B-67
Plot 239	V2P1 NECK UPPER MOMENT Z [THORTEST]	B-67
Plot 240	V2P1 CHEST UPPER LEFT X [CFC_180]	B-67
Plot 241	V2P1 CHEST UPPER LEFT Y [CFC_180]	B-68
Plot 242	V2P1 CHEST UPPER LEFT Z [CFC_180]	B-68
Plot 243	V2P1 CHEST UPPER LEFT D [CFC_180]	B-68
Plot 244	V2P1 CHEST UPPER RIGHT X [CFC_180]	B-68
Plot 245	V2P1 CHEST UPPER RIGHT Y [CFC_180]	B-69
Plot 246	V2P1 CHEST UPPER RIGHT Z [CFC_180]	B-69
Plot 247	V2P1 CHEST UPPER RIGHT D [CFC_180]	B-69
Plot 248	V2P1 CHEST LOWER LEFT X [CFC_180]	B-69
Plot 249	V2P1 CHEST LOWER LEFT Y [CFC_180]	B-70
Plot 250	V2P1 CHEST LOWER LEFT Z [CFC_180]	B-70
Plot 251	V2P1 CHEST LOWER LEFT D [CFC_180]	B-70
Plot 252	V2P1 CHEST LOWER RIGHT X [CFC_180]	B-70
Plot 253	V2P1 CHEST LOWER RIGHT Y [CFC_180]	B-71
Plot 254	V2P1 CHEST LOWER RIGHT Z [CFC_180]	B-71
Plot 255	V2P1 CHEST LOWER RIGHT D [CFC_180]	B-71
Plot 256	V2P1 ABDOMEN LEFT LOWER X [CFC_180]	B-71
Plot 257	V2P1 ABDOMEN LEFT LOWER Y [CFC_180]	B-72
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Plot 260	V2P1 ABDOMEN RIGHT LOWER X [CFC_180]	B-72
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Plot 262	V2P1 ABDOMEN RIGHT LOWER Z [CFC_180]	B-73
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Plot 264	V2P2 NECK OCCIPITAL CONDYLE FORCE X [THORTEST]	B-73
Plot 265	V2P2 NECK OCCIPITAL CONDYLE FORCE Z [THORTEST]	B-74
Plot 266	V2P2 NECK OCCIPITAL CONDYLE MY [THORTEST]	B-74
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Plot 268	V2P2 NECK UPPER FORCE Y [THORTEST]	B-74
Plot 269	V2P2 NECK UPPER FORCE Z [THORTEST]	B-75
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Plot 275	V2P2 CHEST UPPER LEFT Z [CFC_180]	B-76
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Plot 277	V2P2 CHEST UPPER RIGHT X [CFC_180]	B-77
Plot 278	V2P2 CHEST UPPER RIGHT Y [CFC_180]	B-77
Plot 279	V2P2 CHEST UPPER RIGHT Z [CFC_180]	B-77
Plot 280	V2P2 CHEST UPPER RIGHT D [CFC_180]	B-77
Plot 281	V2P2 CHEST LOWER LEFT X [CFC_180]	B-78
Plot 282	V2P2 CHEST LOWER LEFT Y [CFC_180]	B-78
Plot 283	V2P2 CHEST LOWER LEFT Z [CFC_180]	B-78
Plot 284	V2P2 CHEST LOWER LEFT D [CFC_180]	B-78
Plot 285	V2P2 CHEST LOWER RIGHT X [CFC_180]	B-79
Plot 286	V2P2 CHEST LOWER RIGHT Y [CFC_180]	B-79
Plot 287	V2P2 CHEST LOWER RIGHT Z [CFC_180]	B-79
Plot 288	V2P2 CHEST LOWER RIGHT D [CFC_180]	B-79

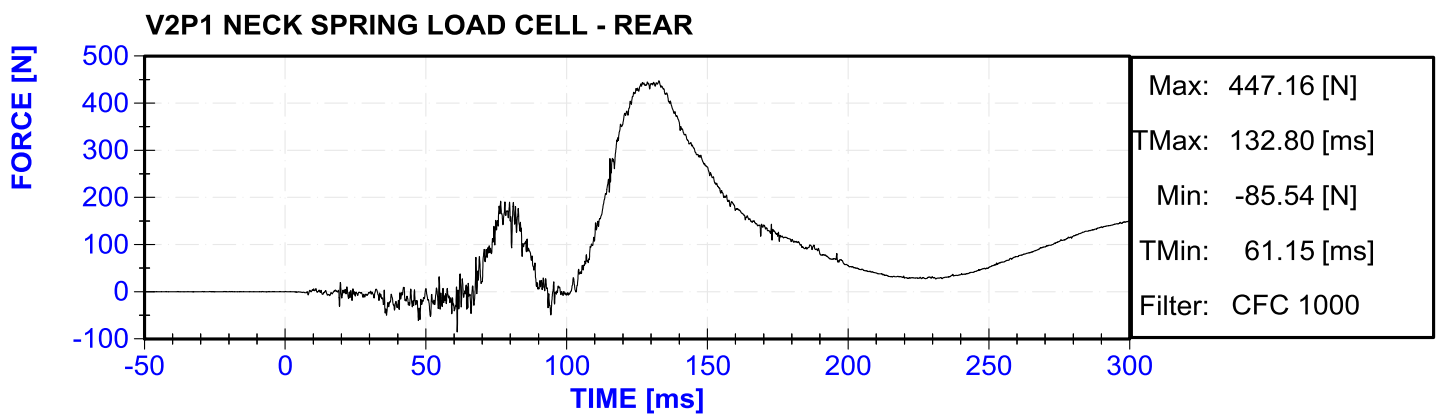
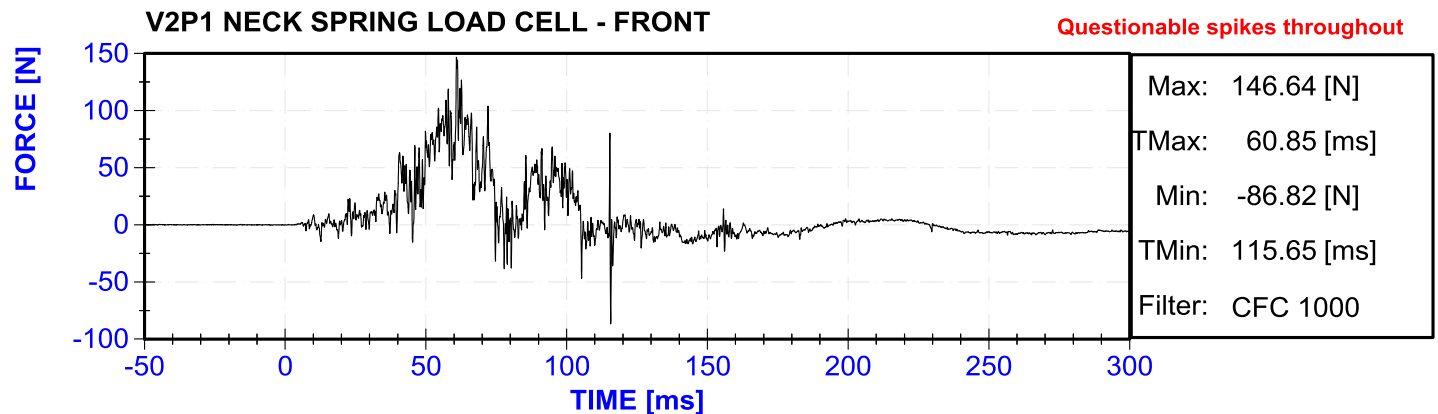
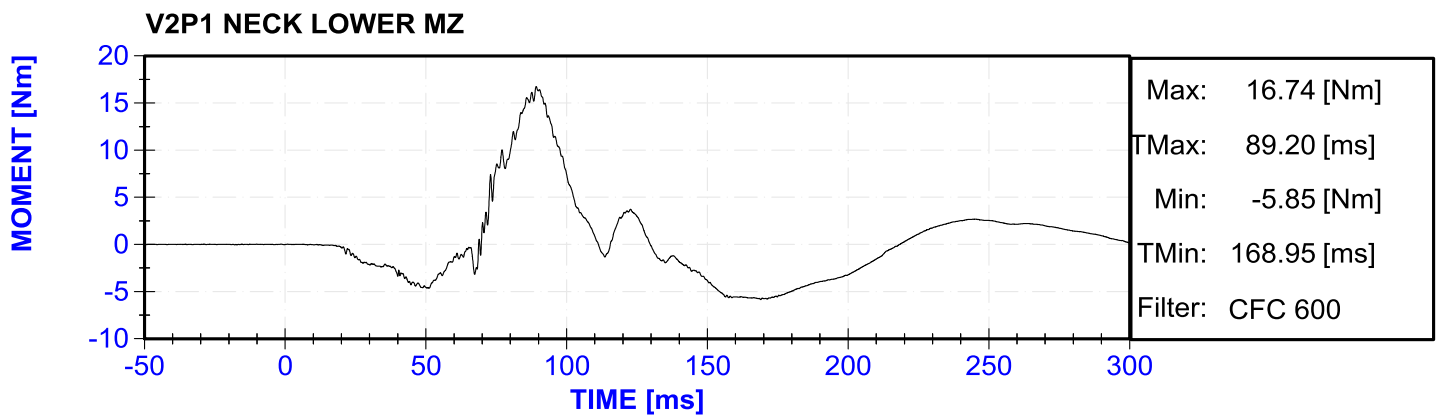
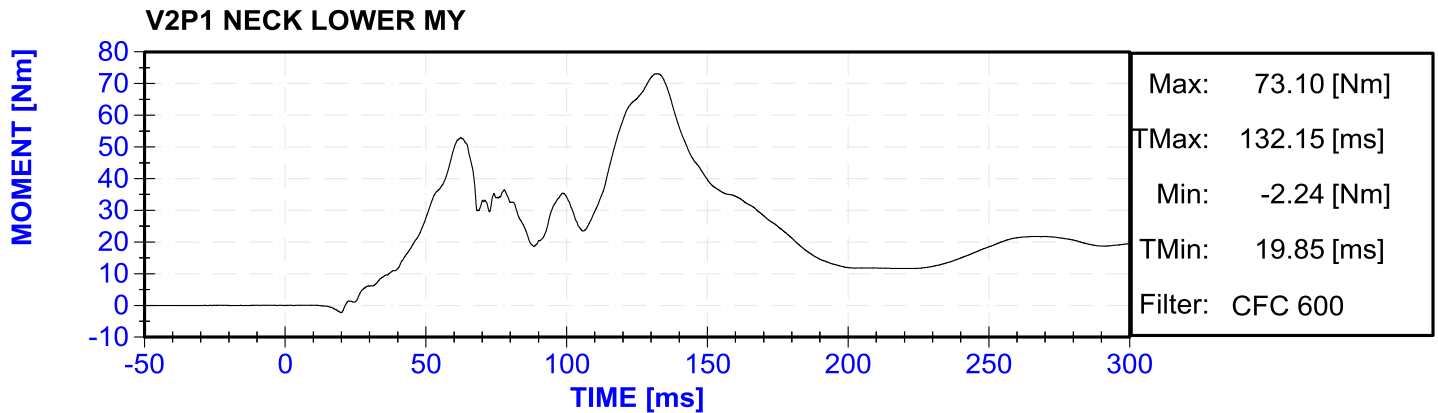
Plot 289	V2P2 ABDOMEN LEFT LOWER X [CFC_180]	B-80
Plot 290	V2P2 ABDOMEN LEFT LOWER Y [CFC_180]	B-80
Plot 291	V2P2 ABDOMEN LEFT LOWER Z [CFC_180]	B-80
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Plot 293	V2P2 ABDOMEN RIGHT LOWER X [CFC_180]	B-81
Plot 294	V2P2 ABDOMEN RIGHT LOWER Y [CFC_180]	B-81
Plot 295	V2P2 ABDOMEN RIGHT LOWER Z [CFC_180]	B-81
Plot 296	V2P2 ABDOMEN RIGHT LOWER D [CFC_180]	B-81

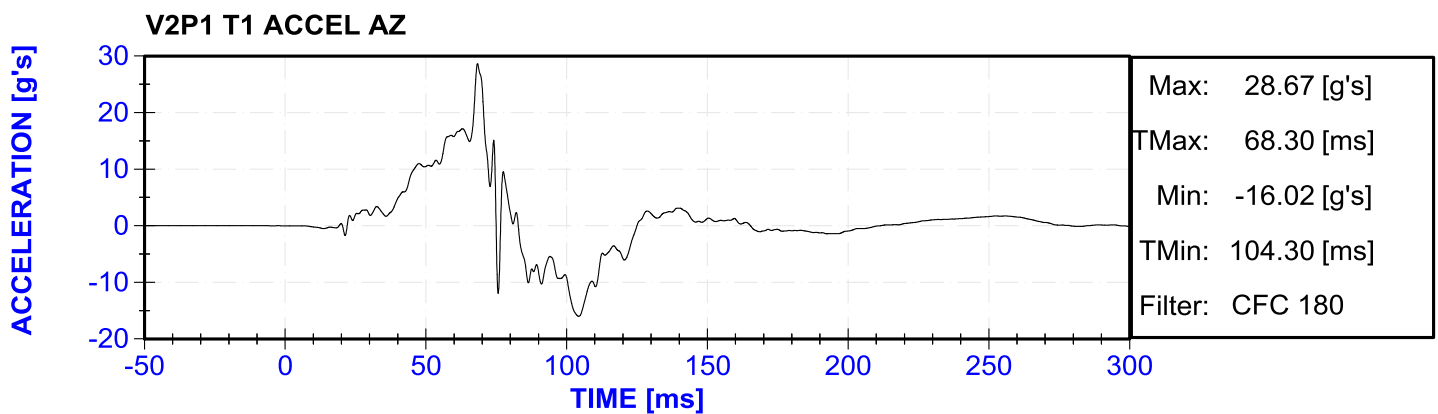
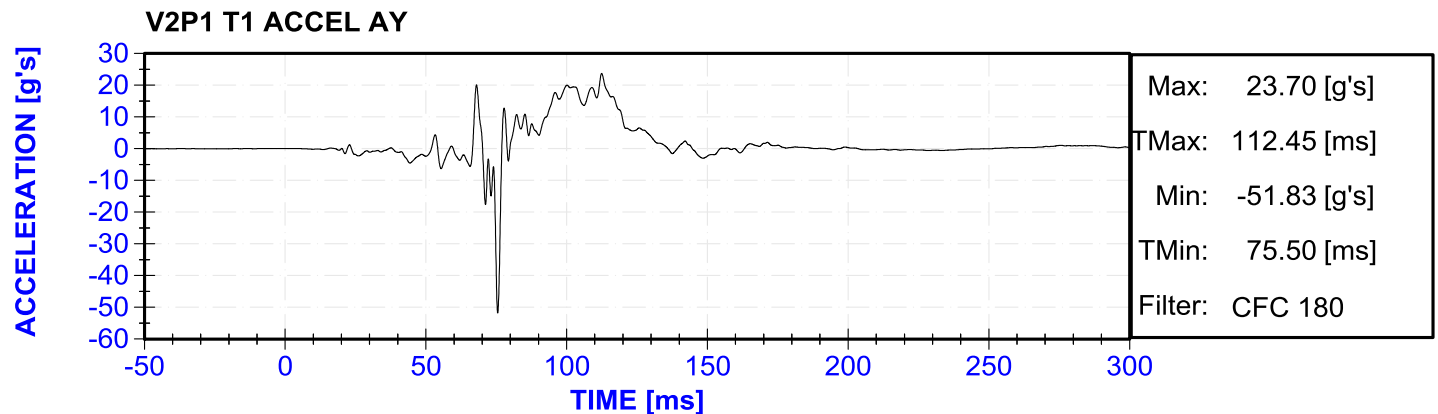
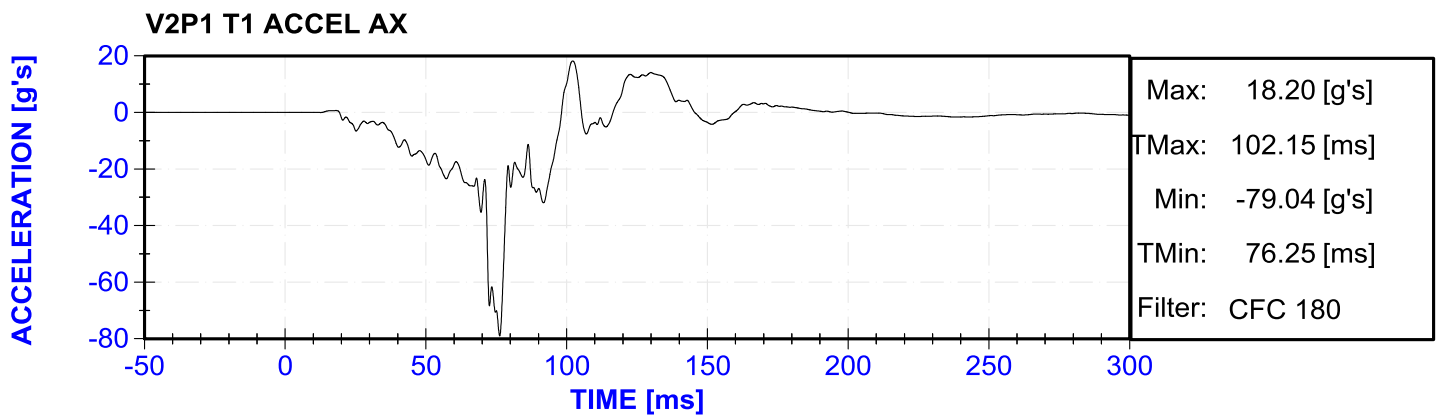
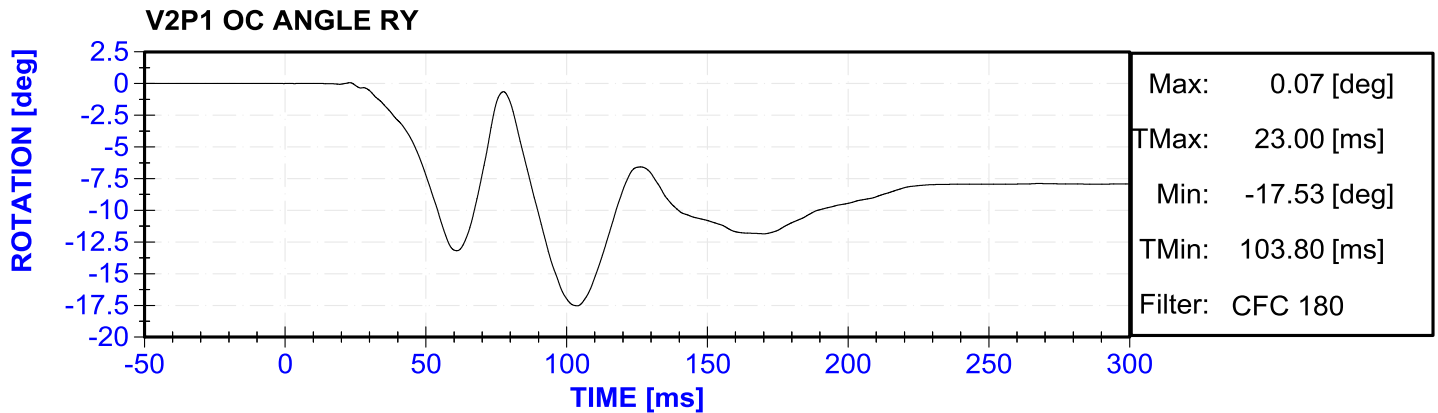


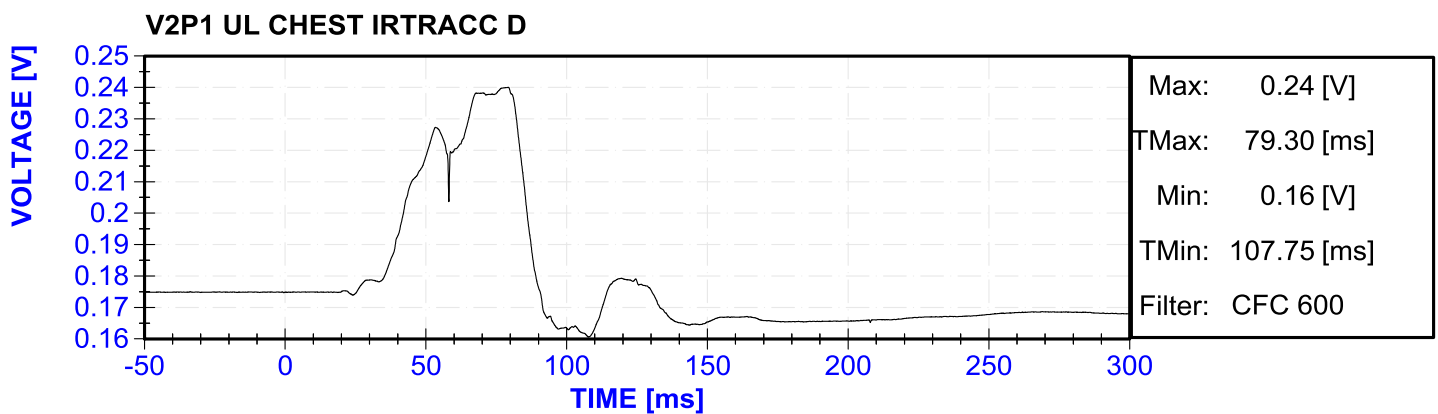
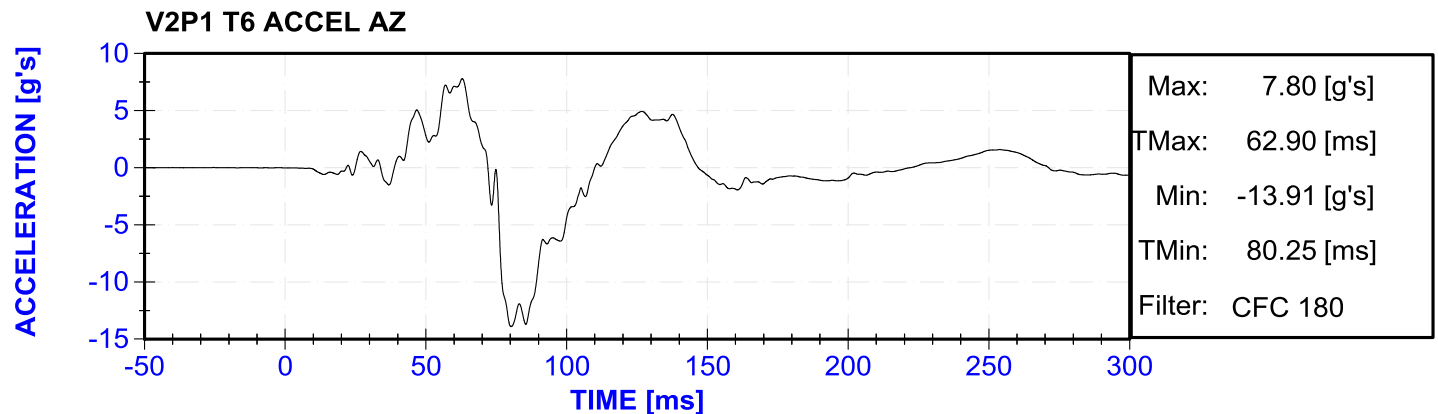
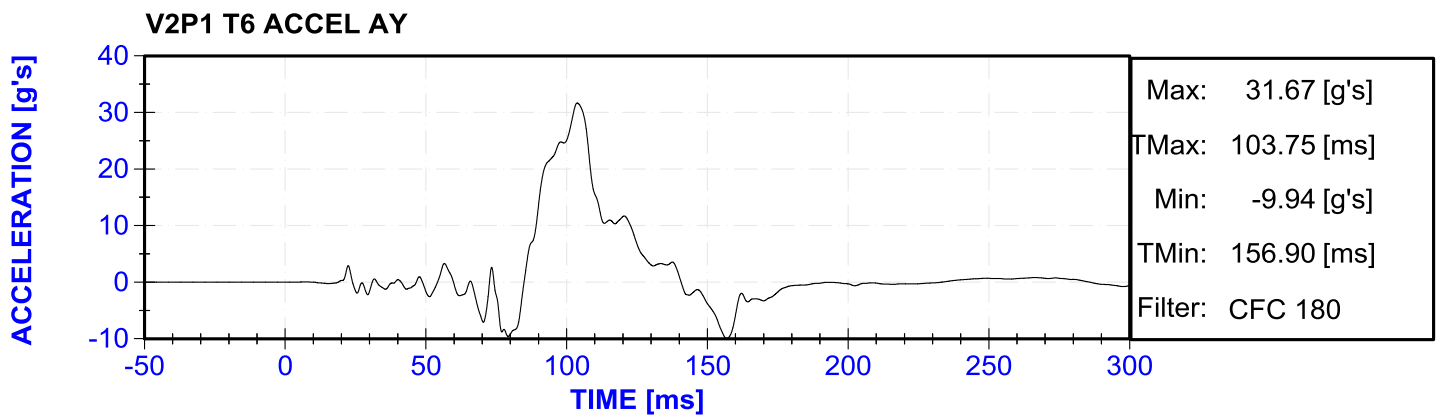
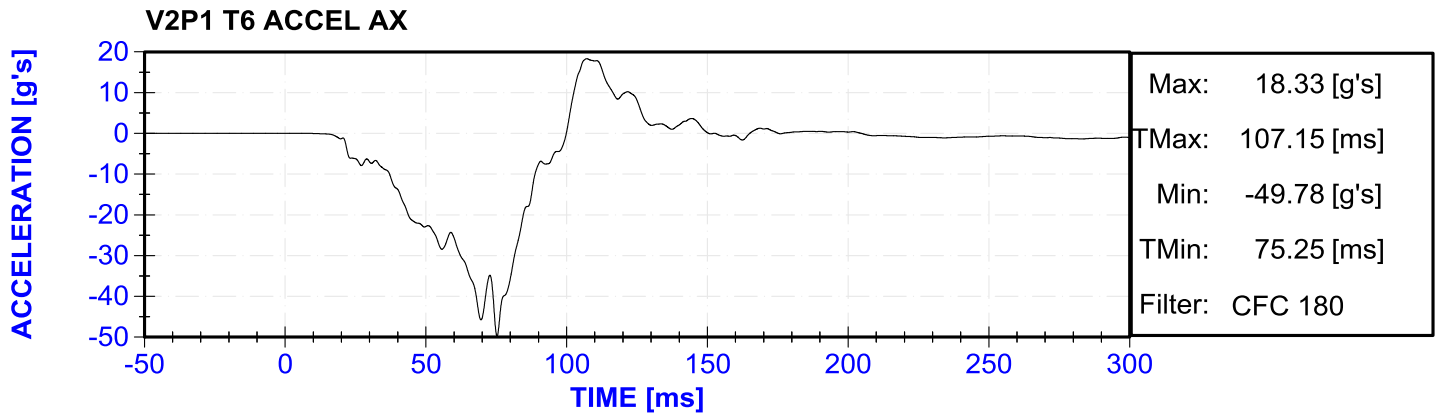


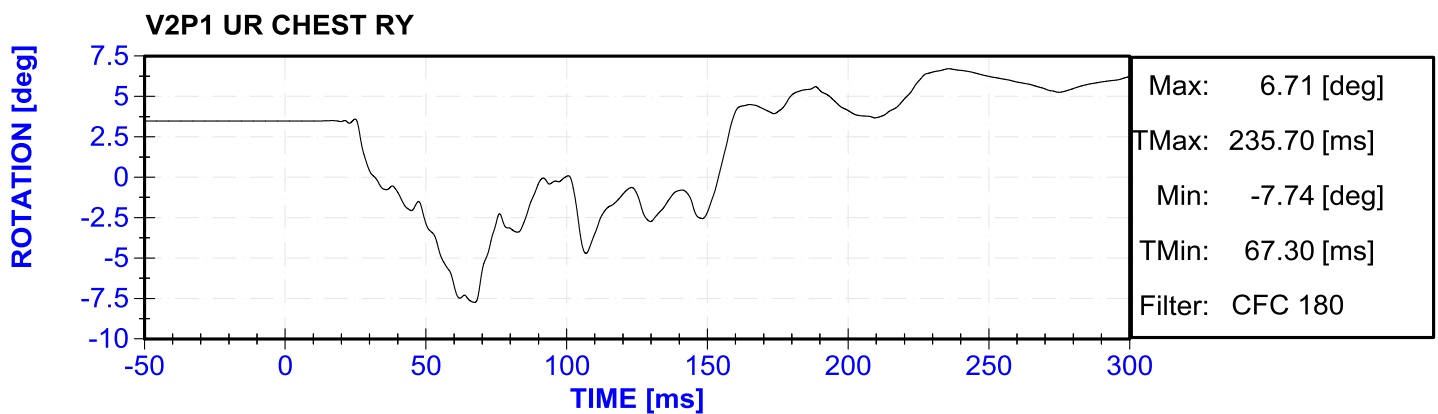
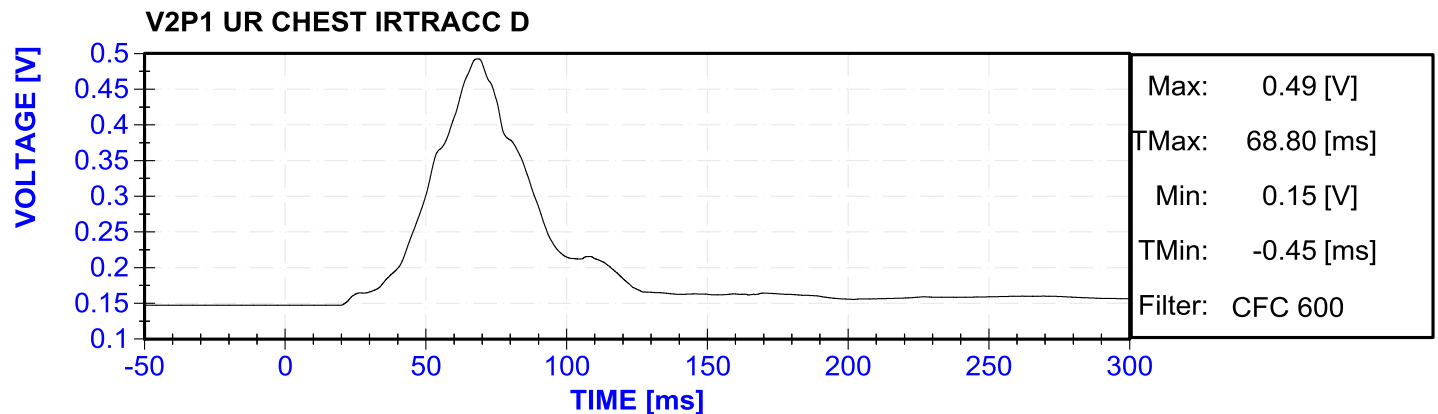
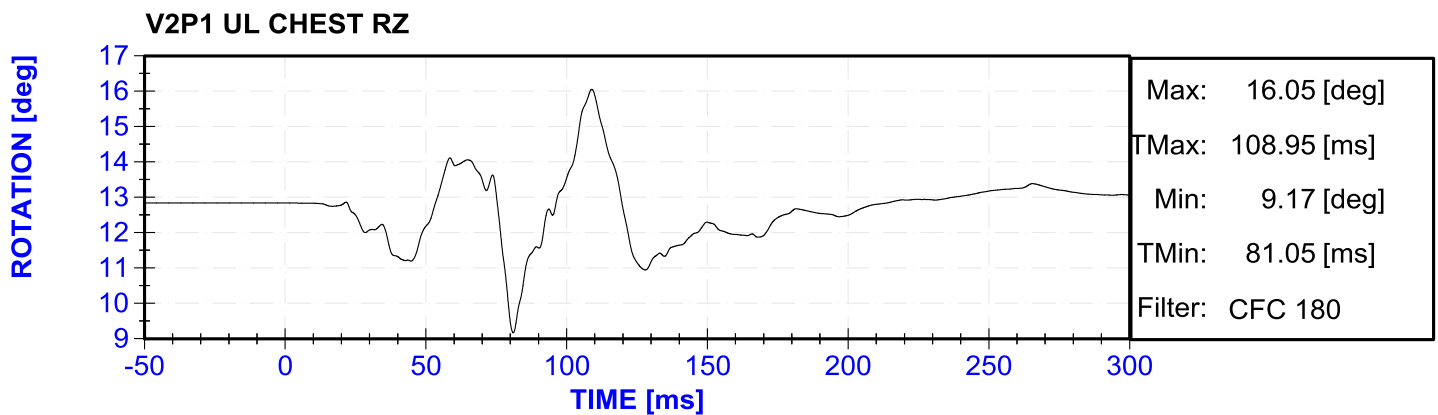
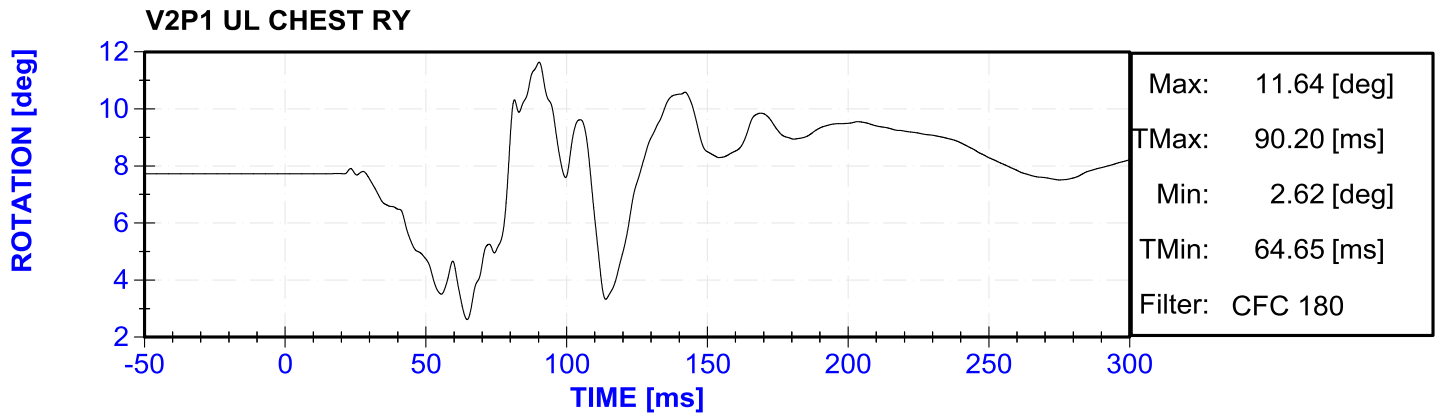


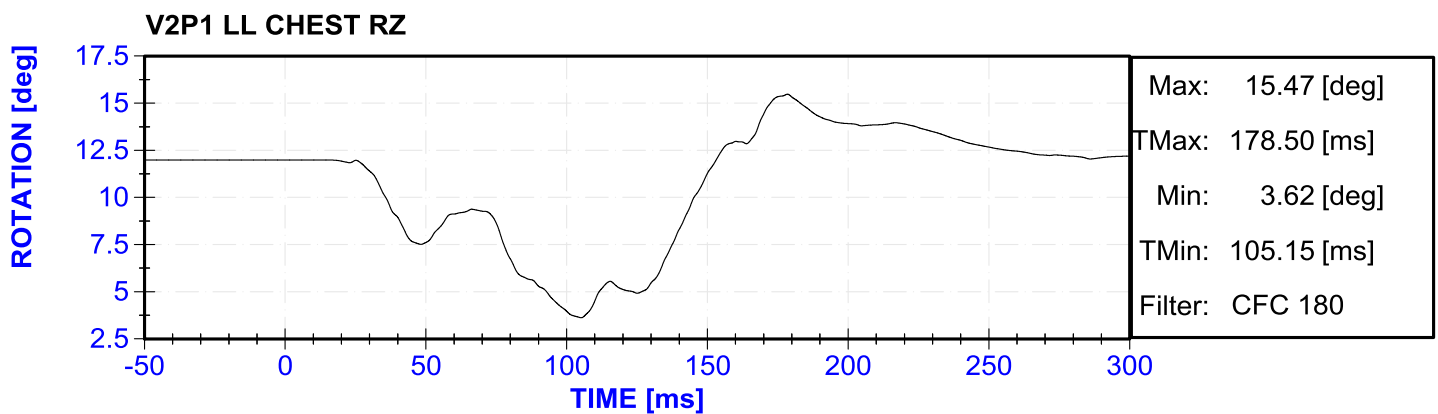
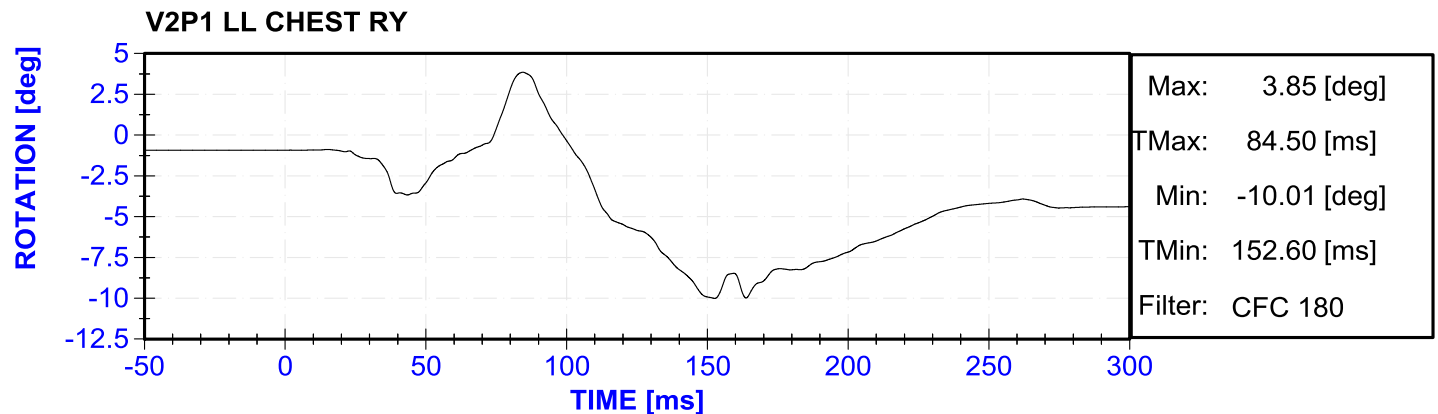
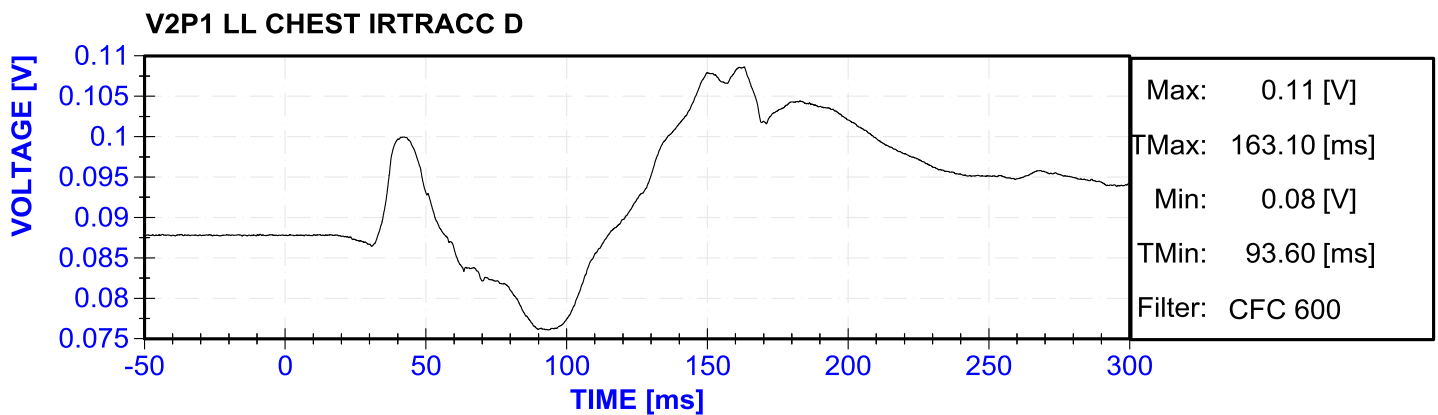
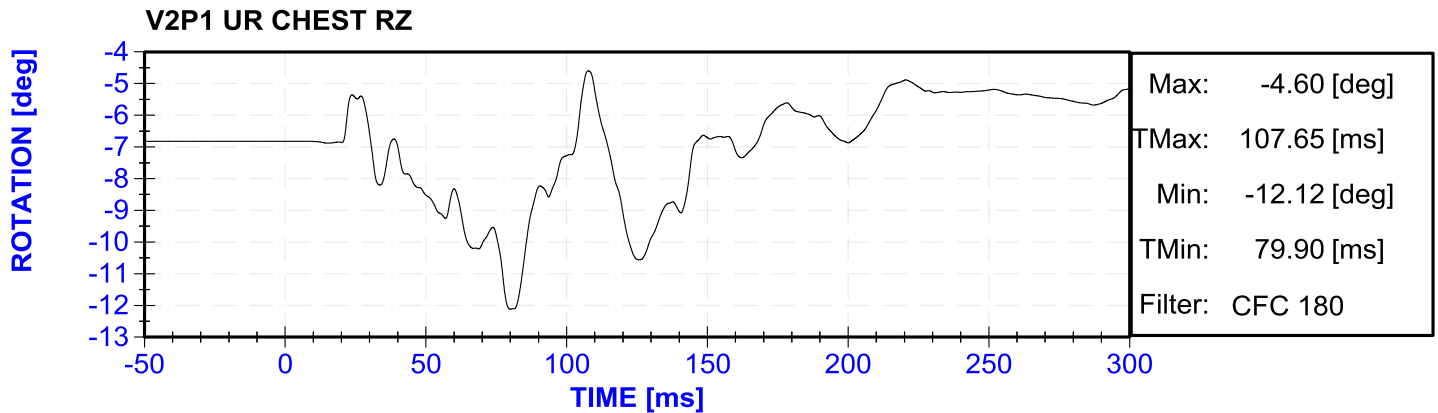




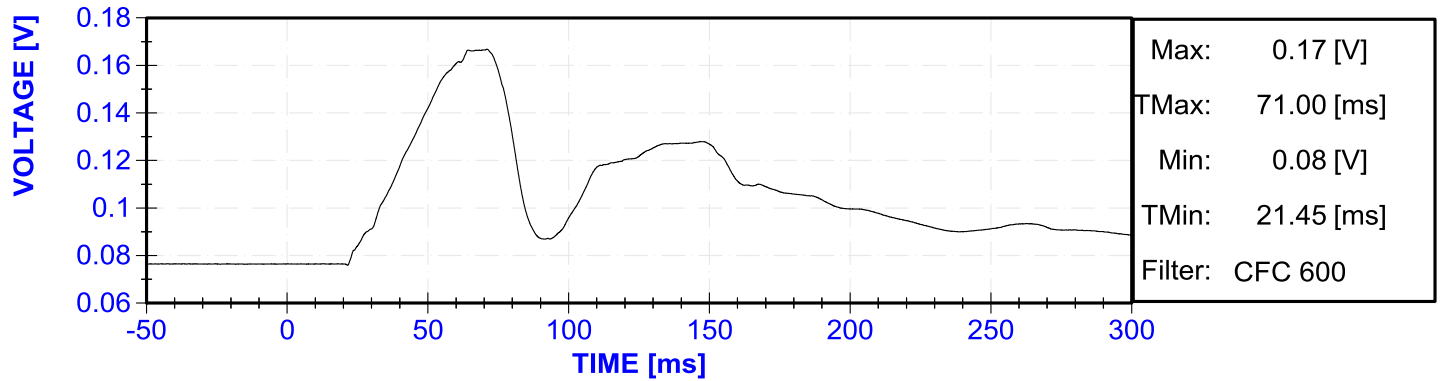




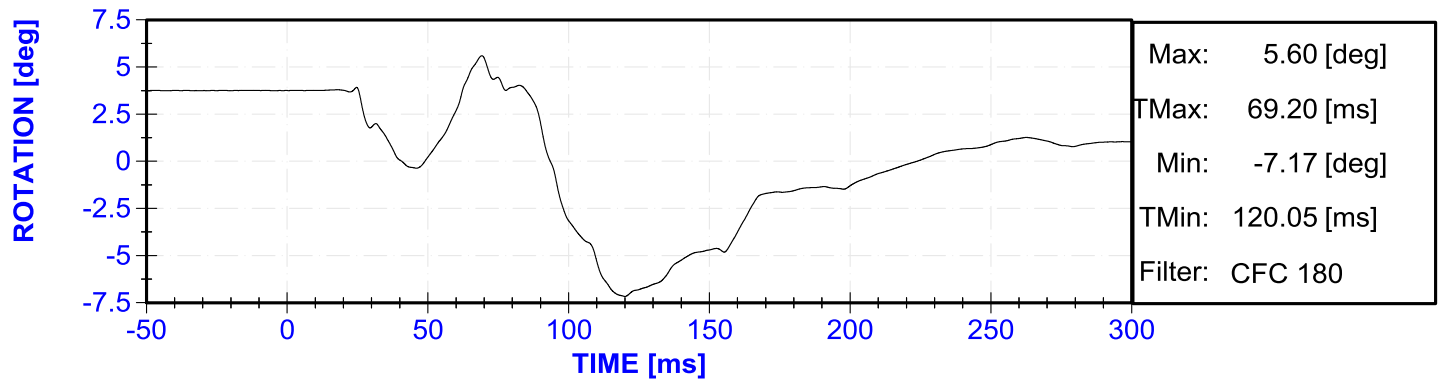




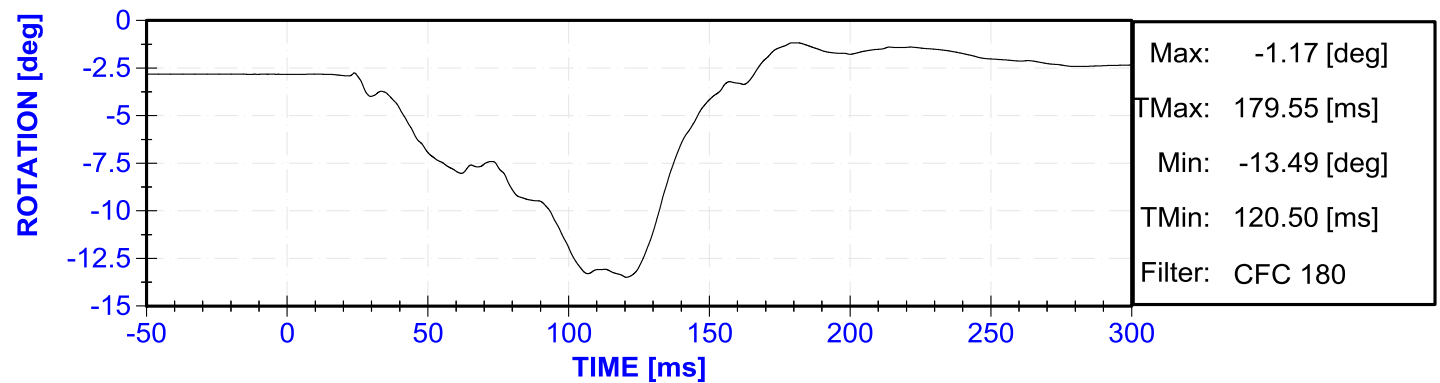
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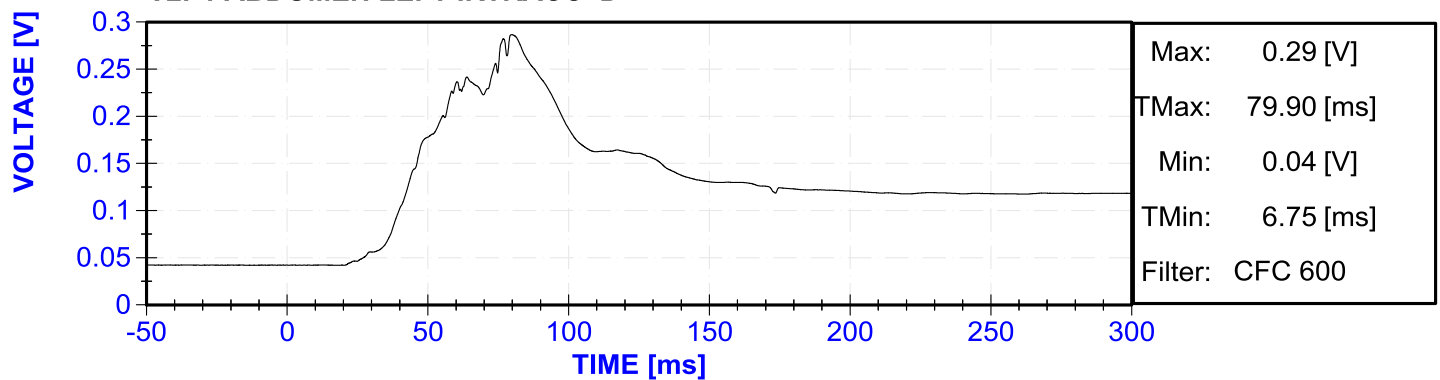
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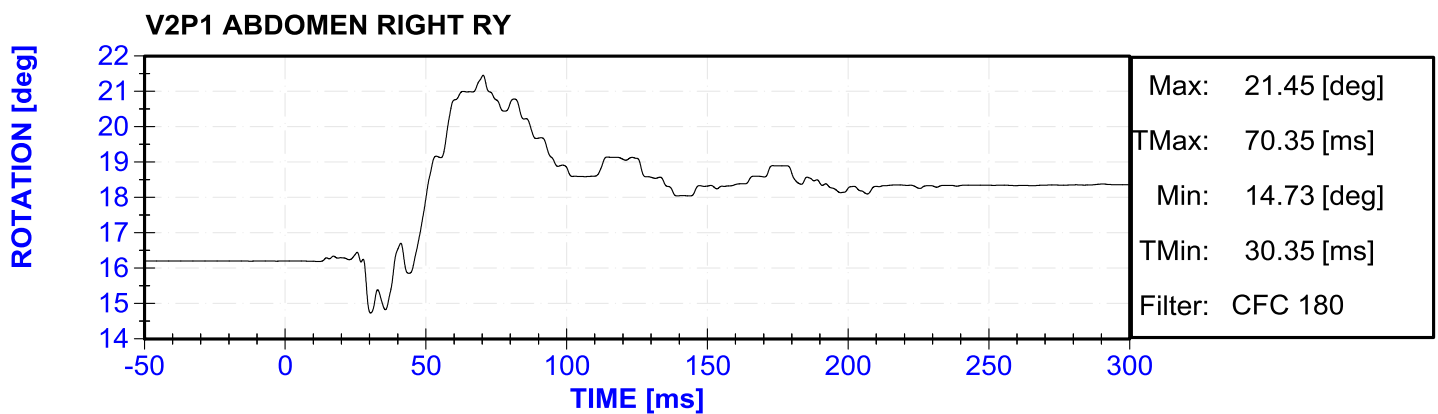
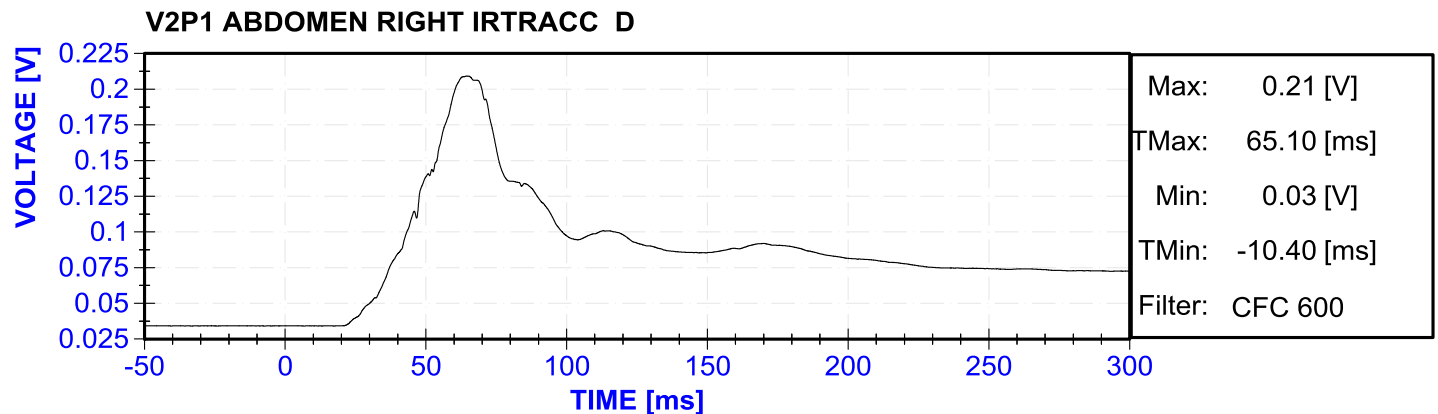
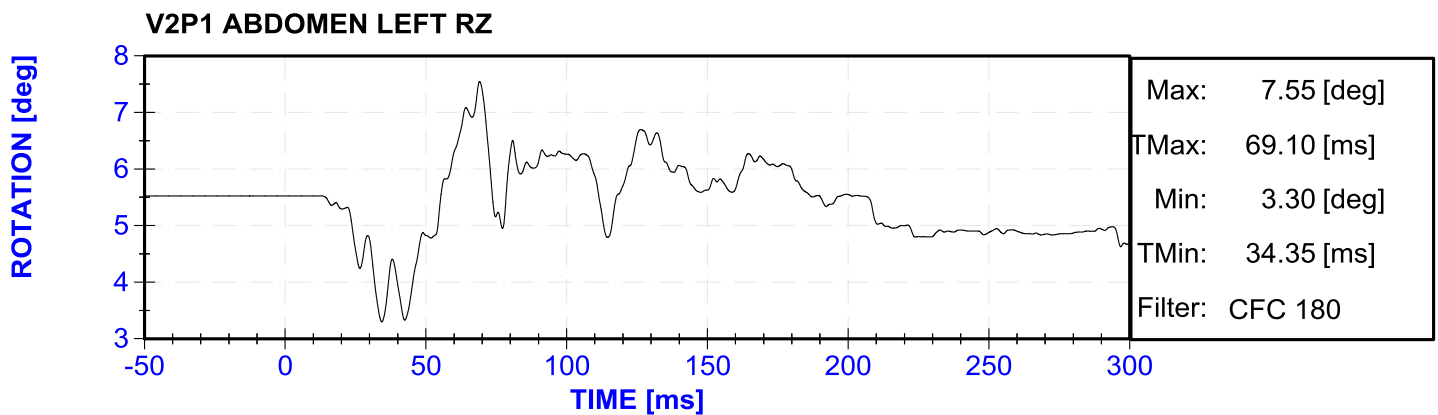
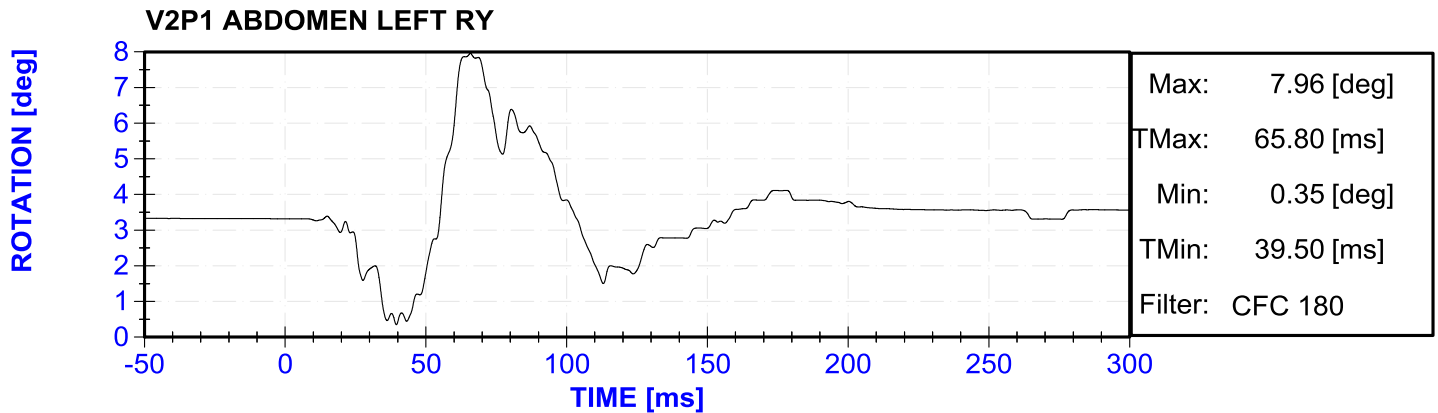


V2P1 LR CHEST RZ

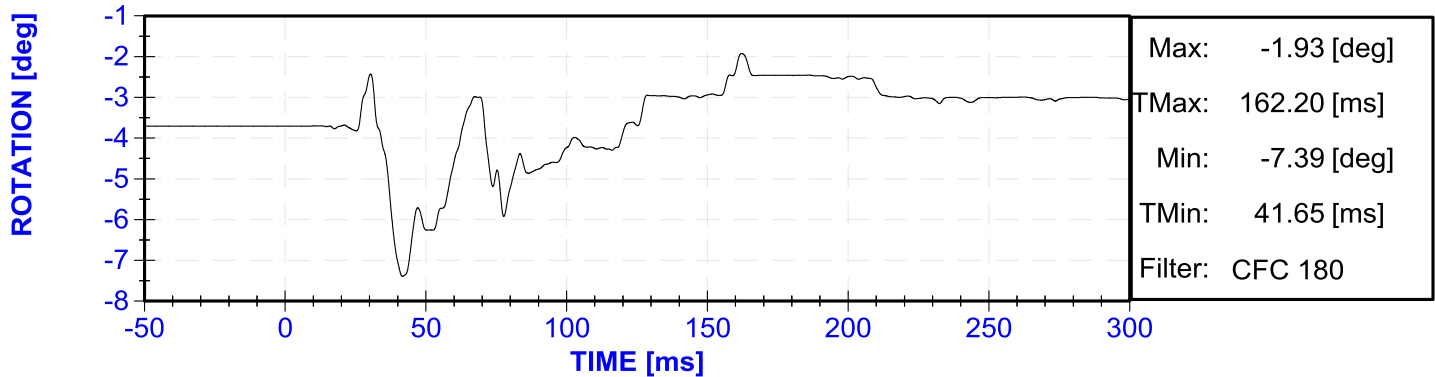


V2P1 ABDOMEN LEFT IRTRACC D

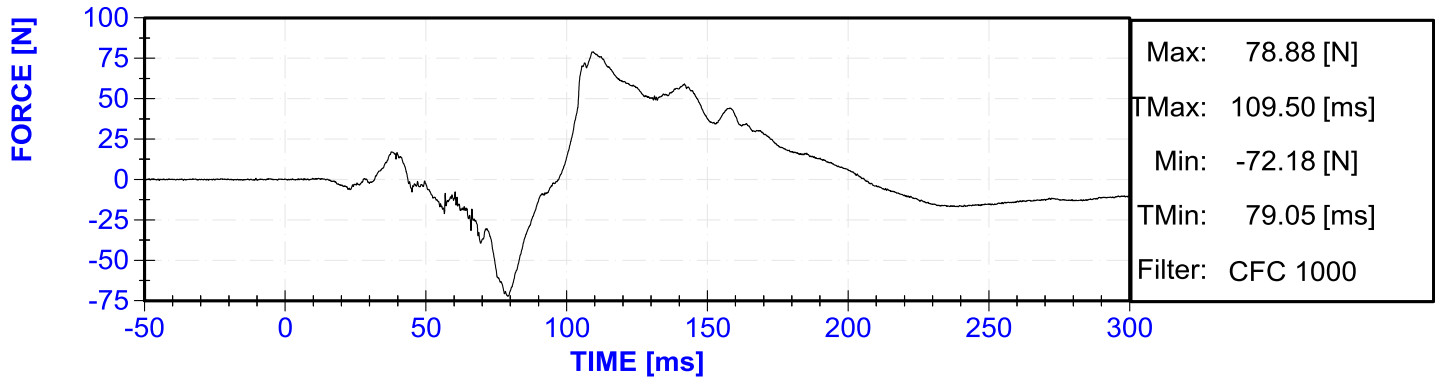




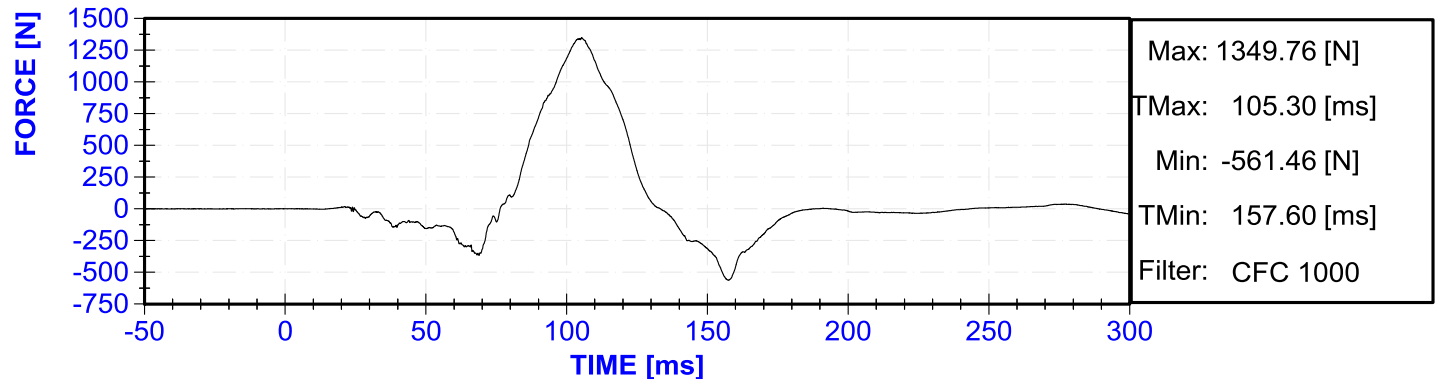
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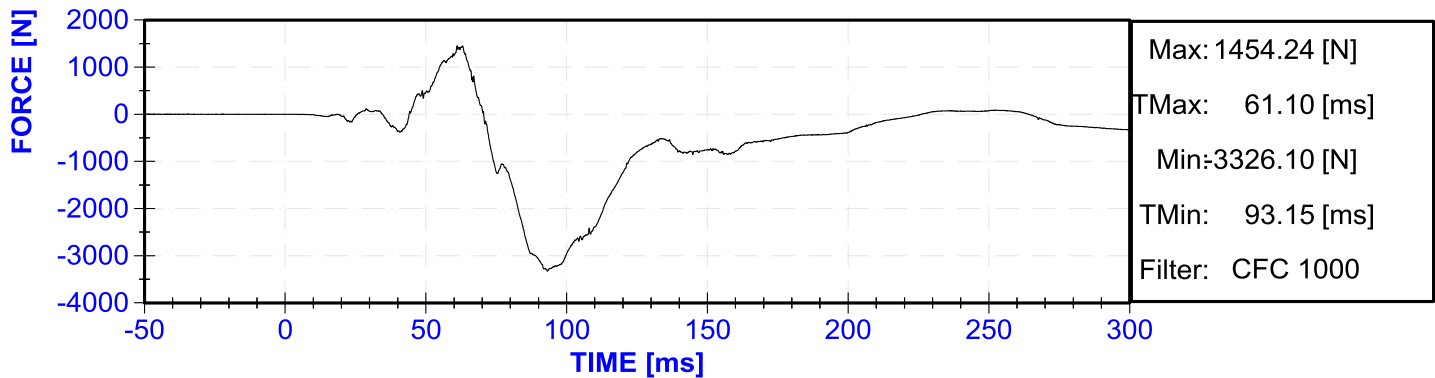
V2P1 SPINE LOWER FX

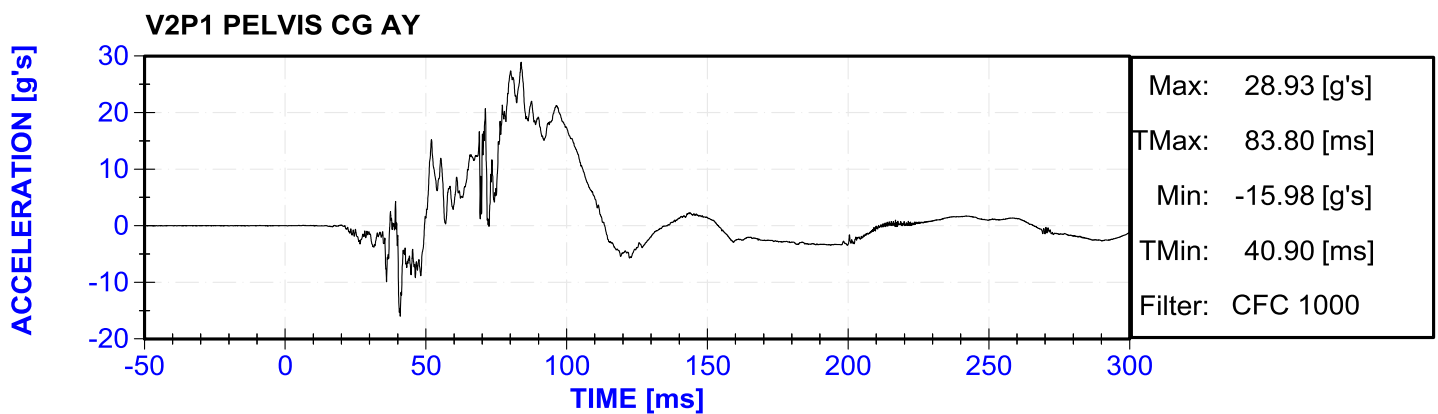
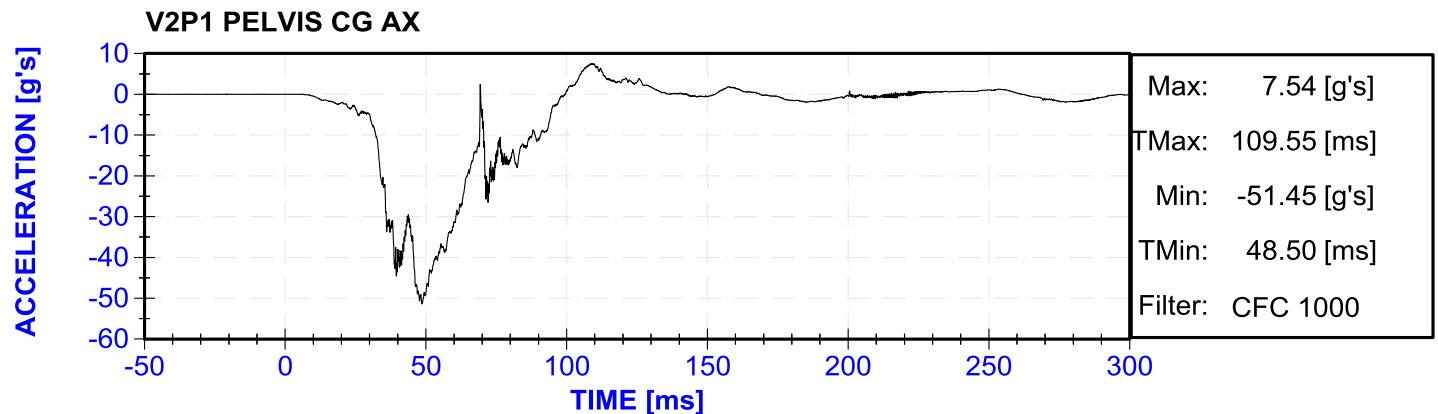
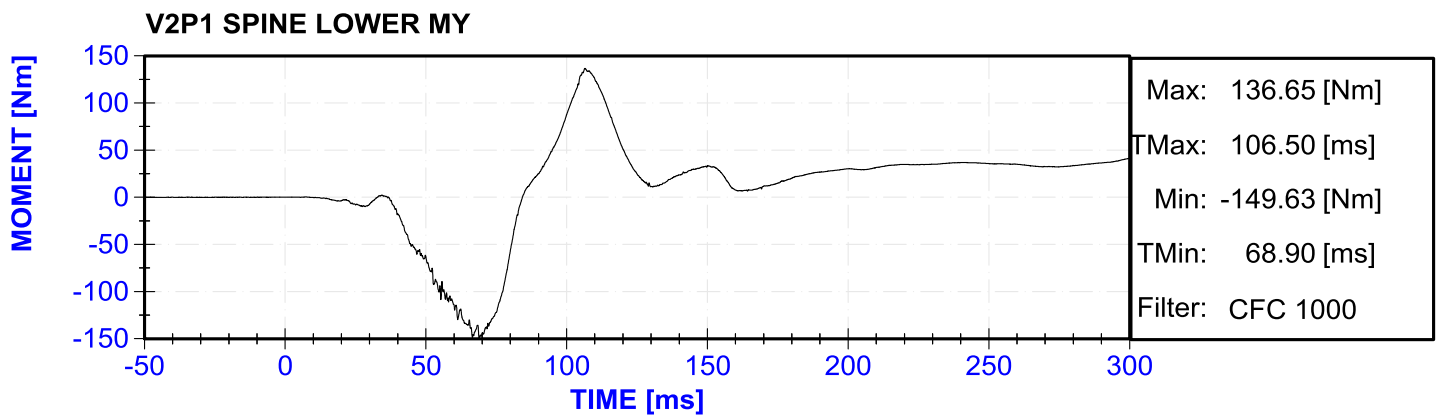
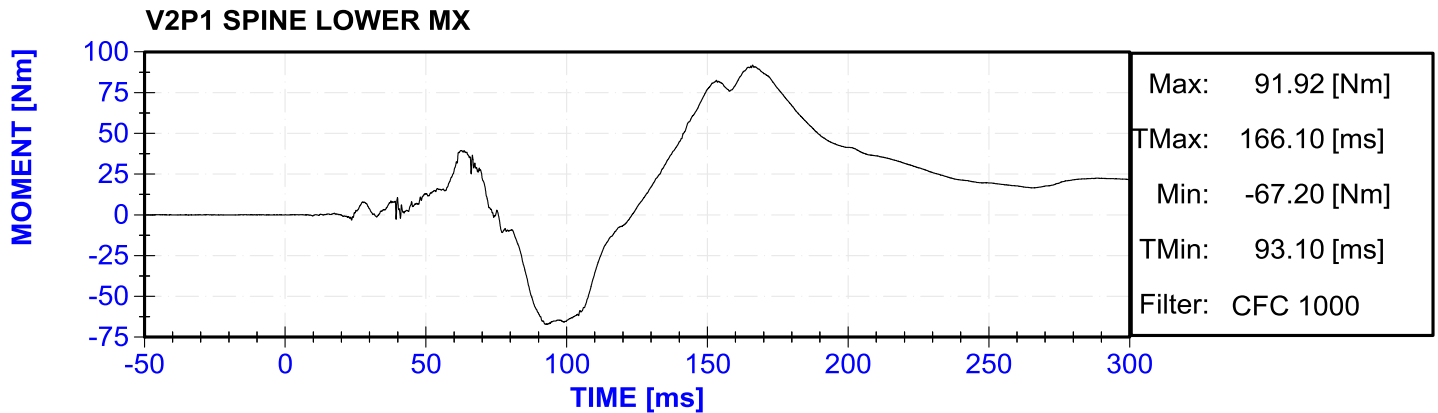


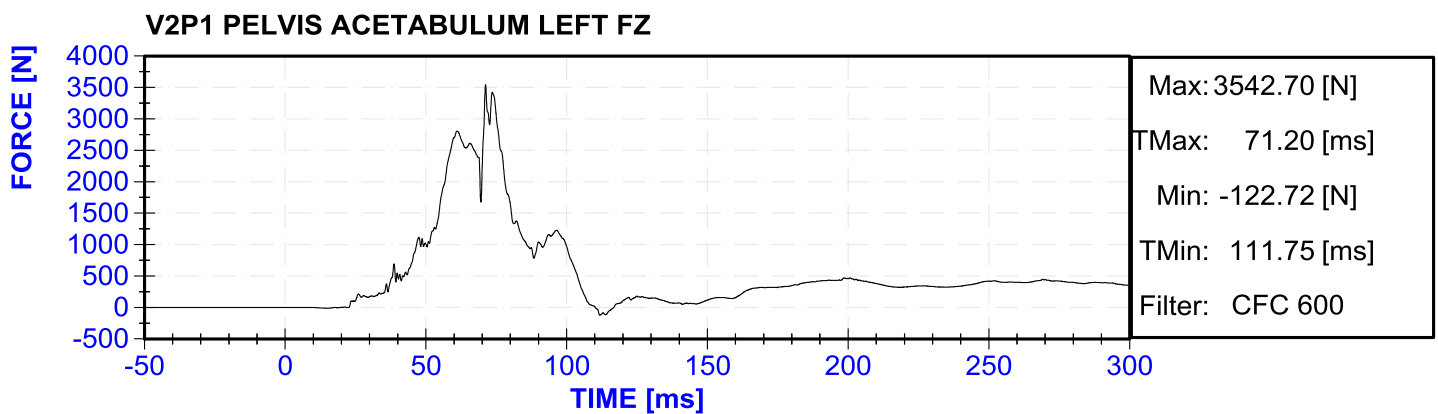
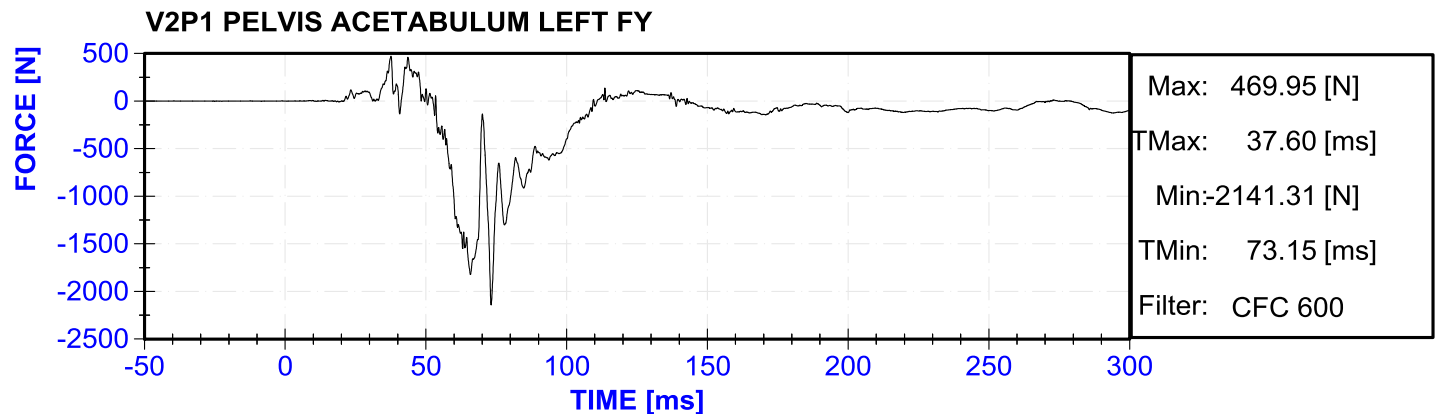
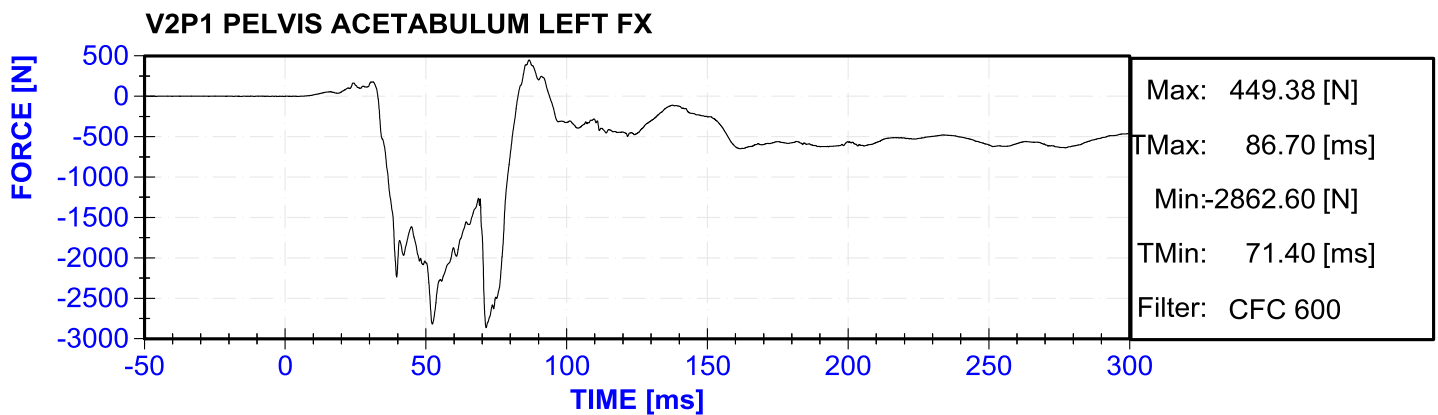
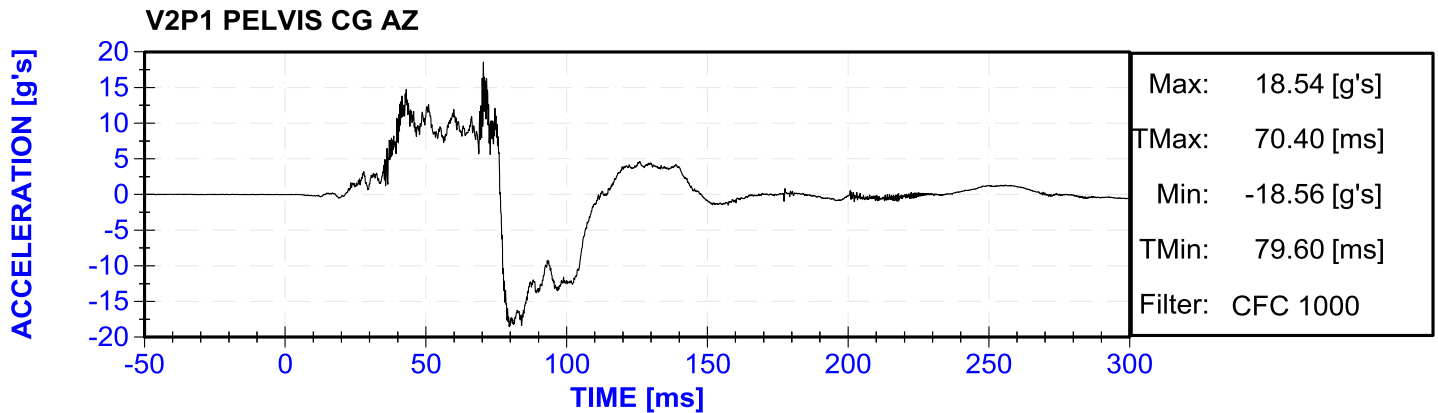
V2P1 SPINE LOWER FY



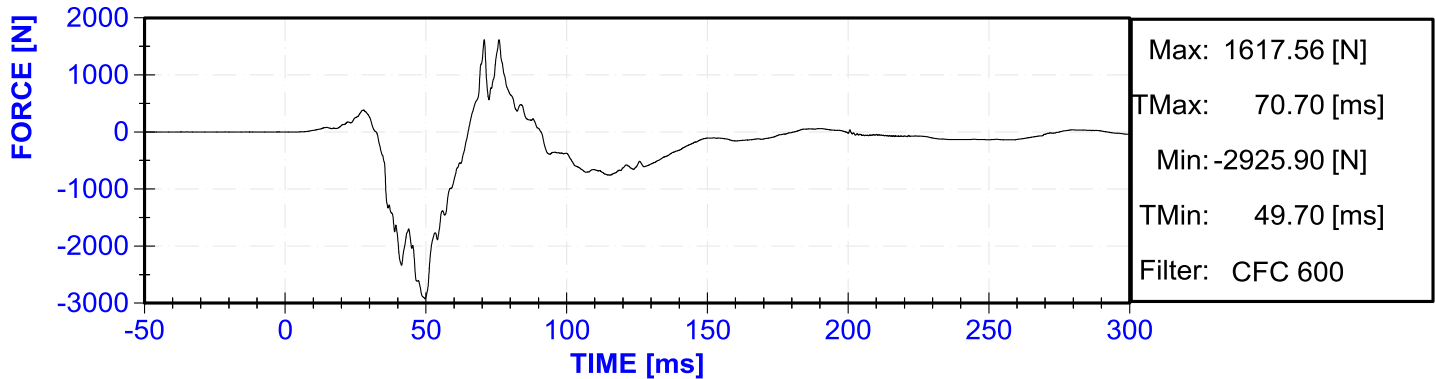
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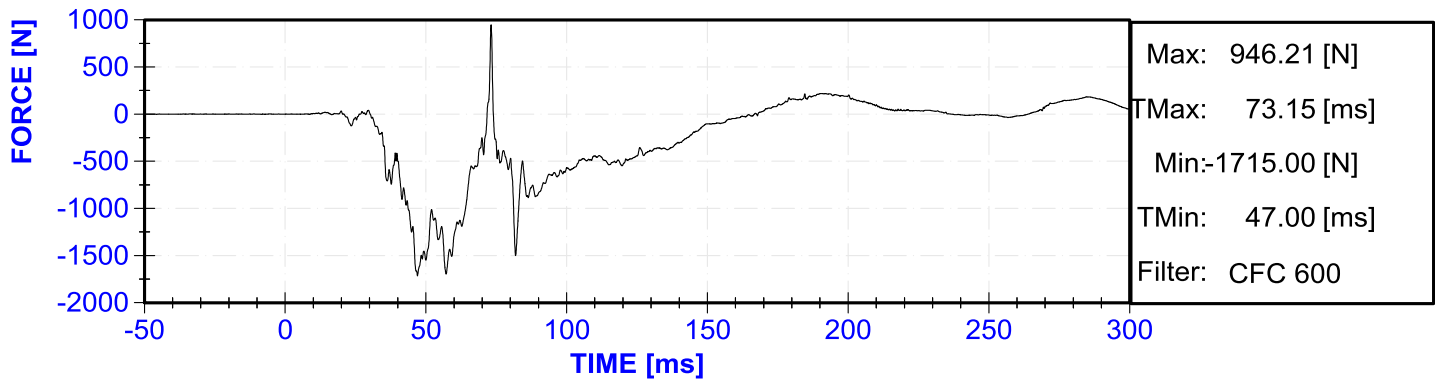




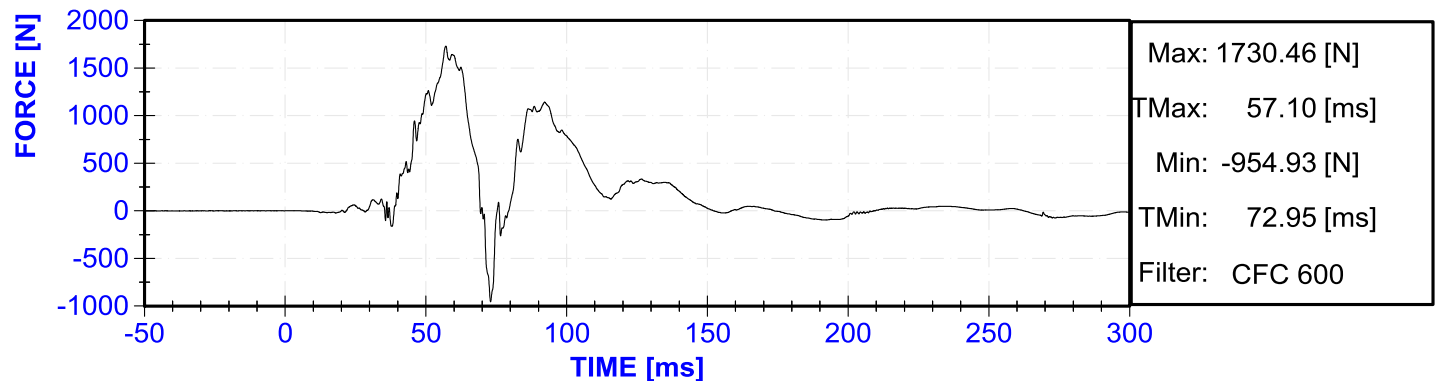
V2P1 PELVIS ACETABULUM RIGHT FX



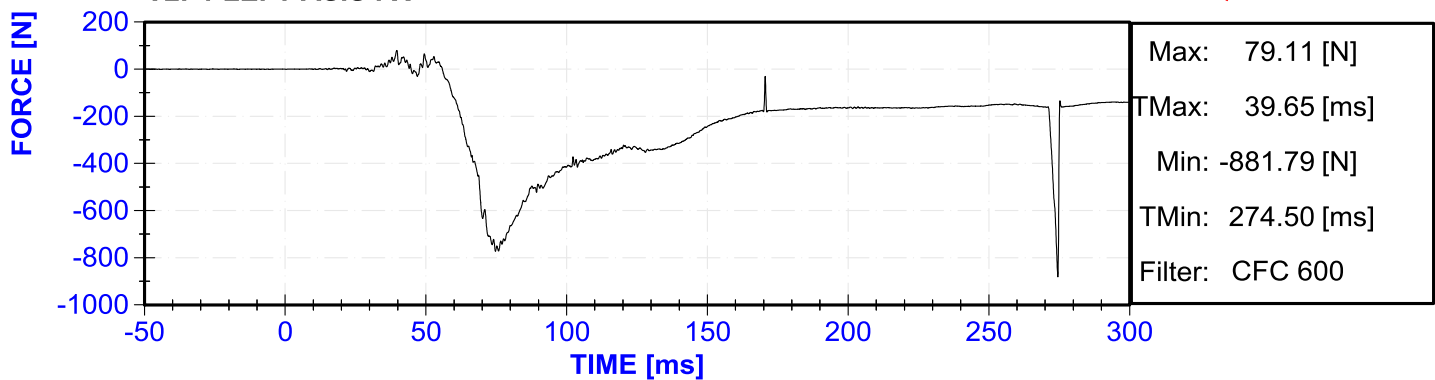
V2P1 PELVIS ACETABULUM RIGHT FY



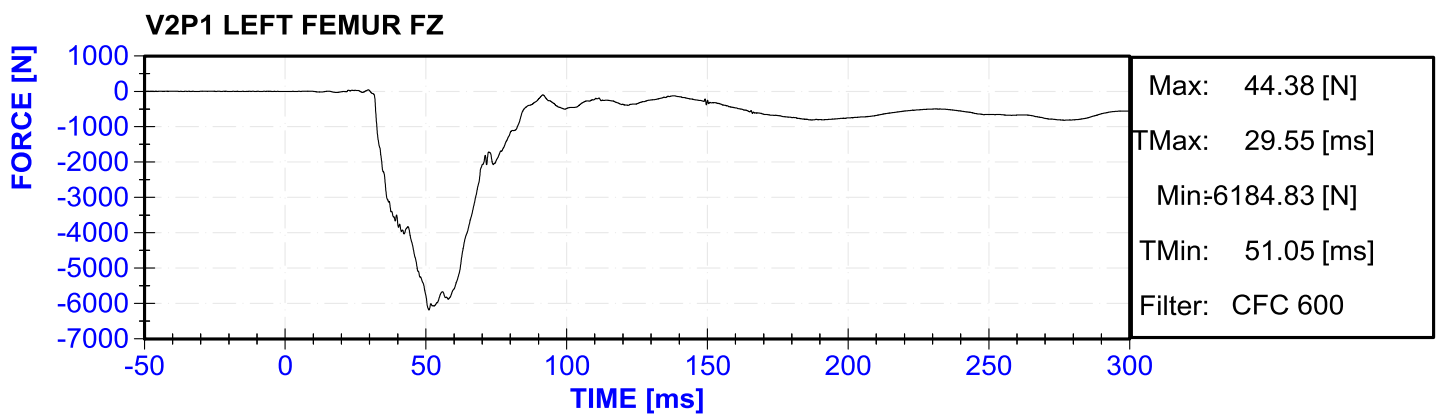
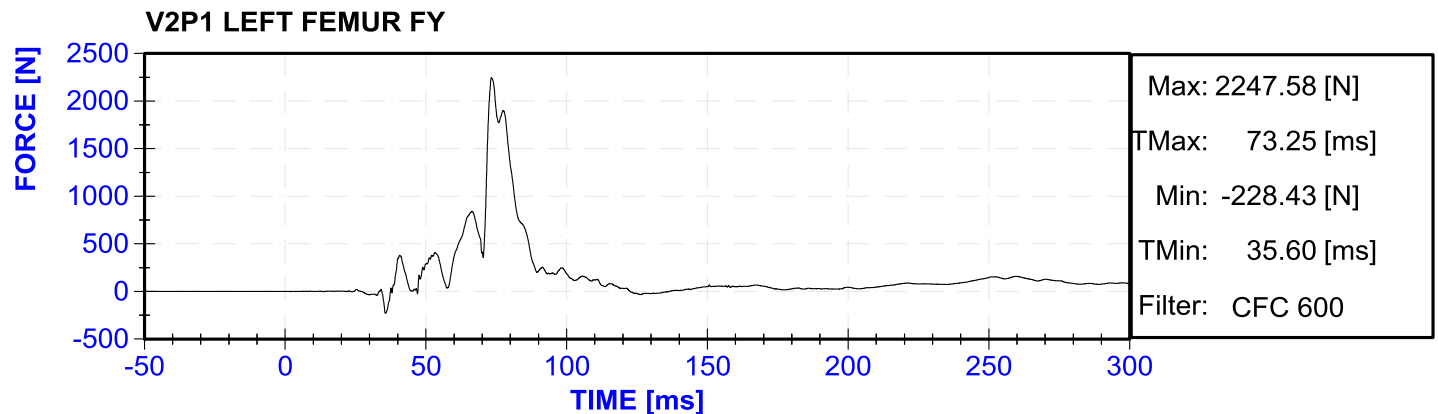
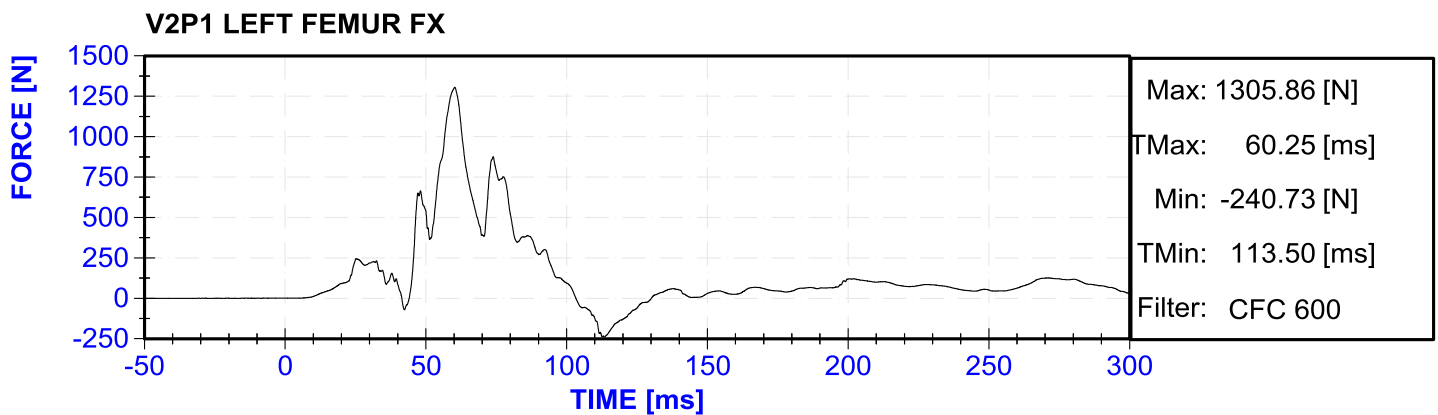
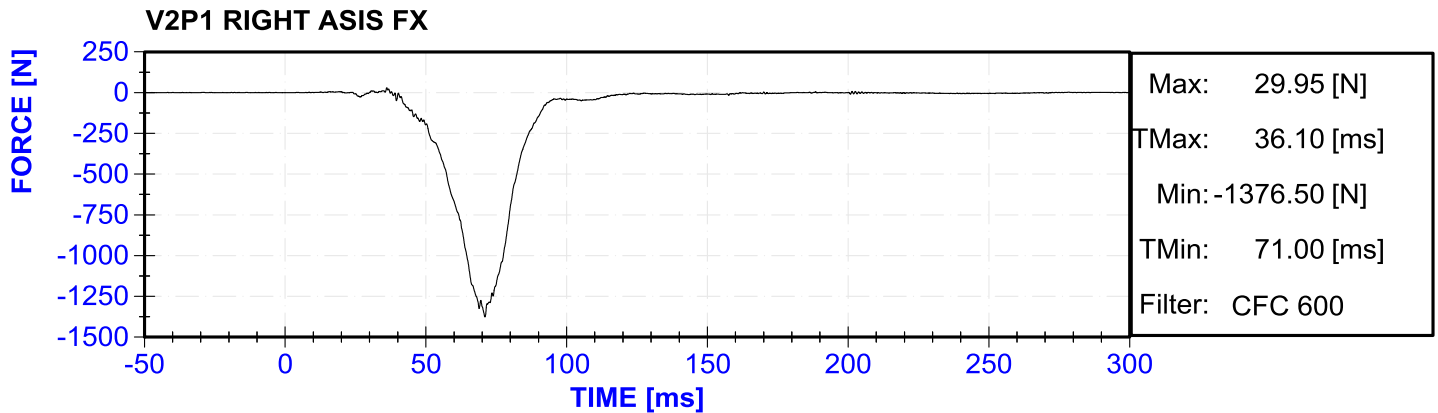
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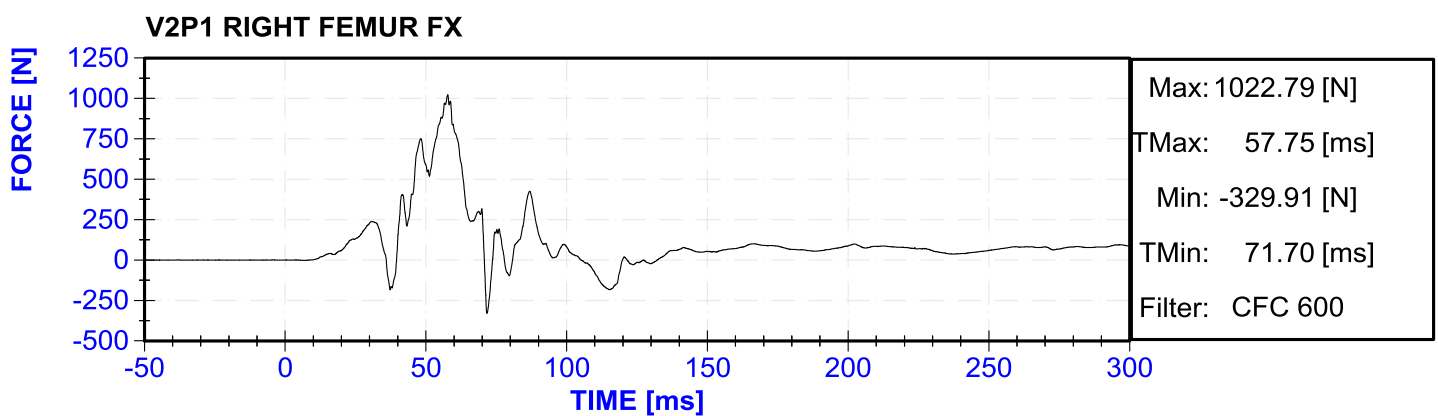
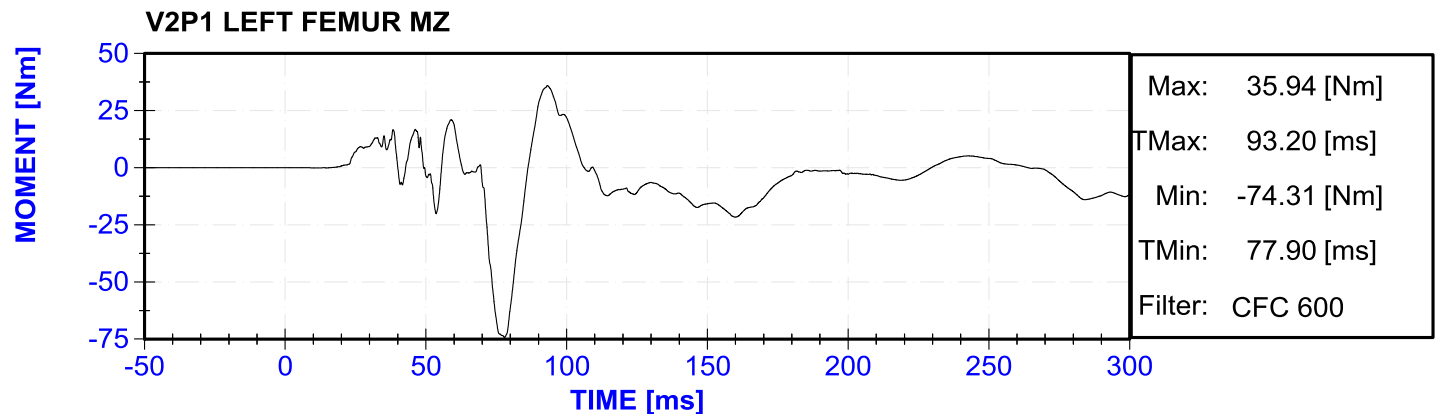
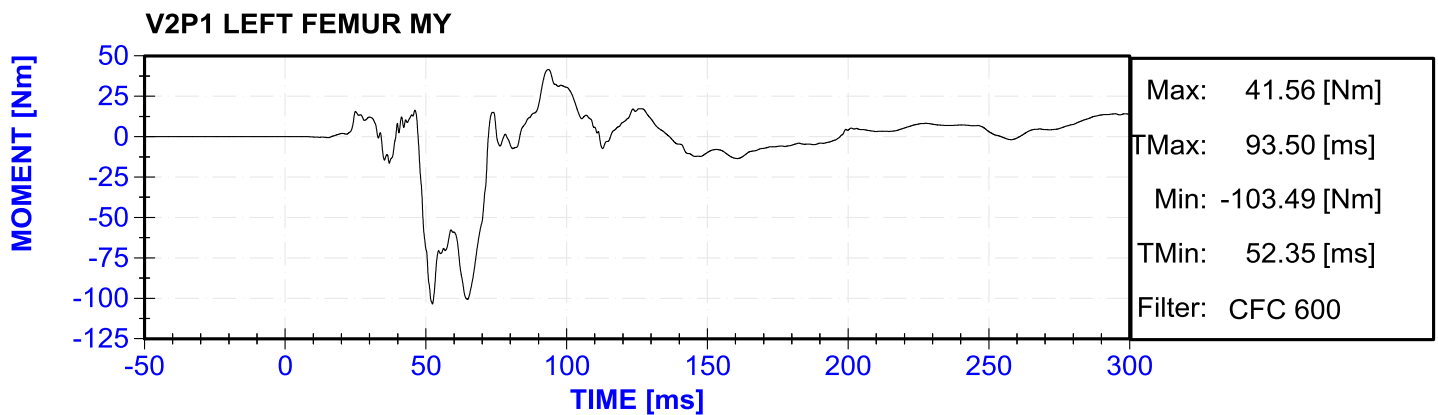
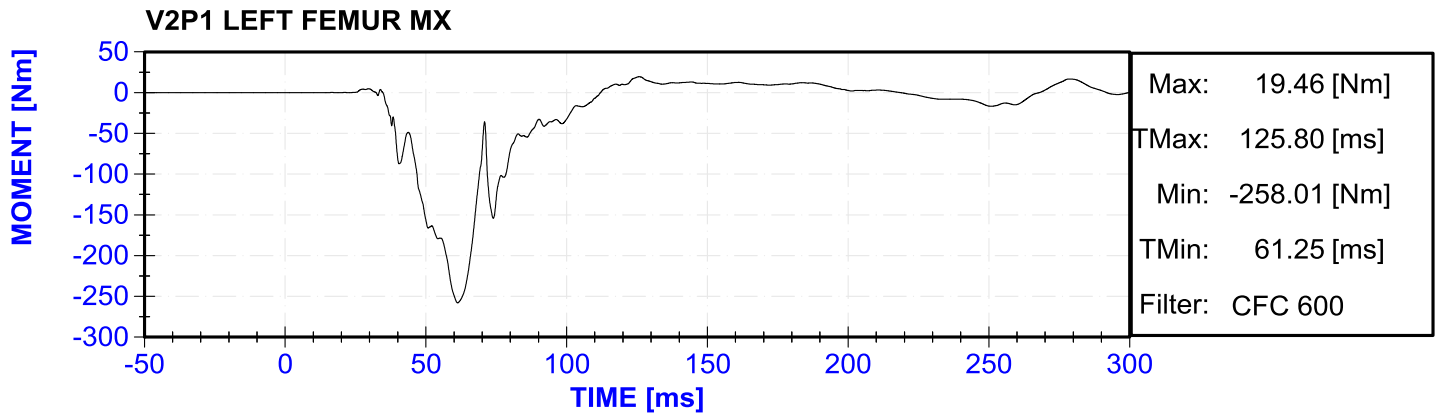


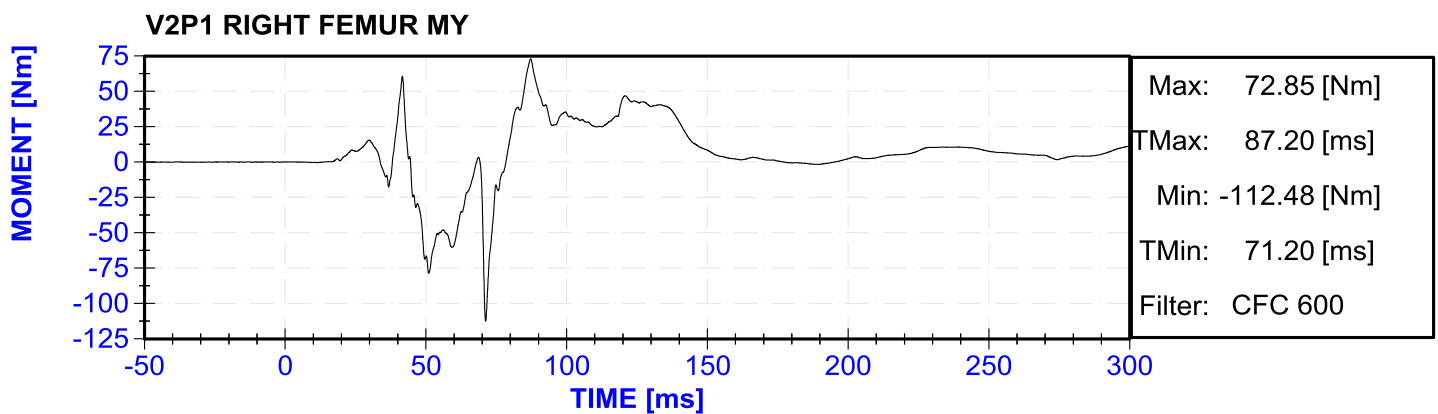
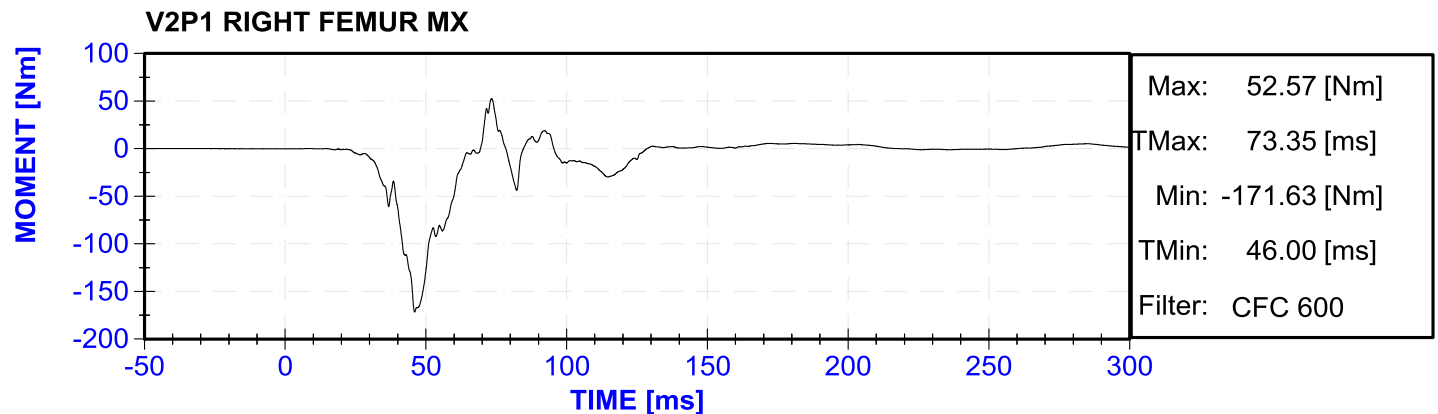
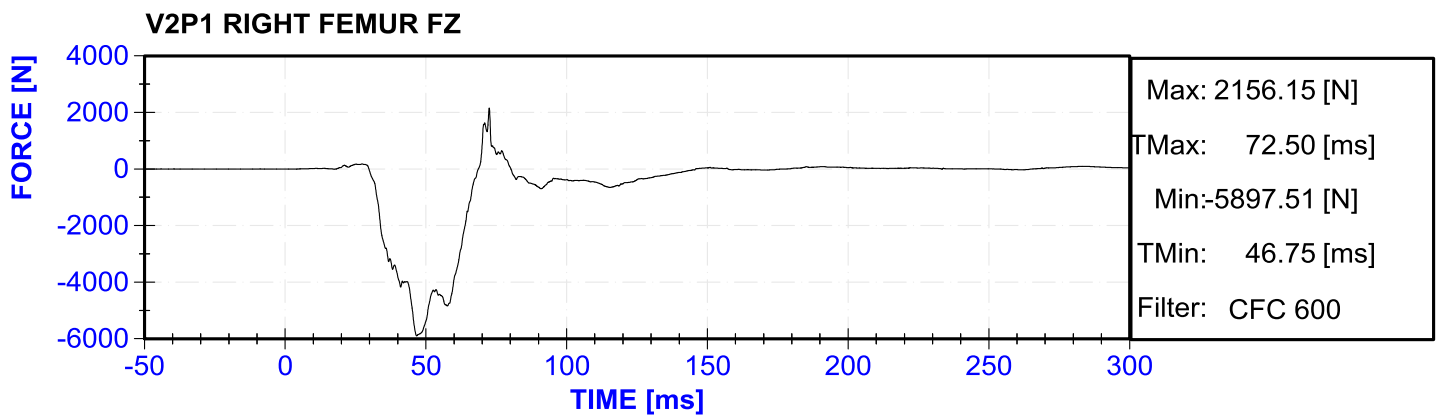
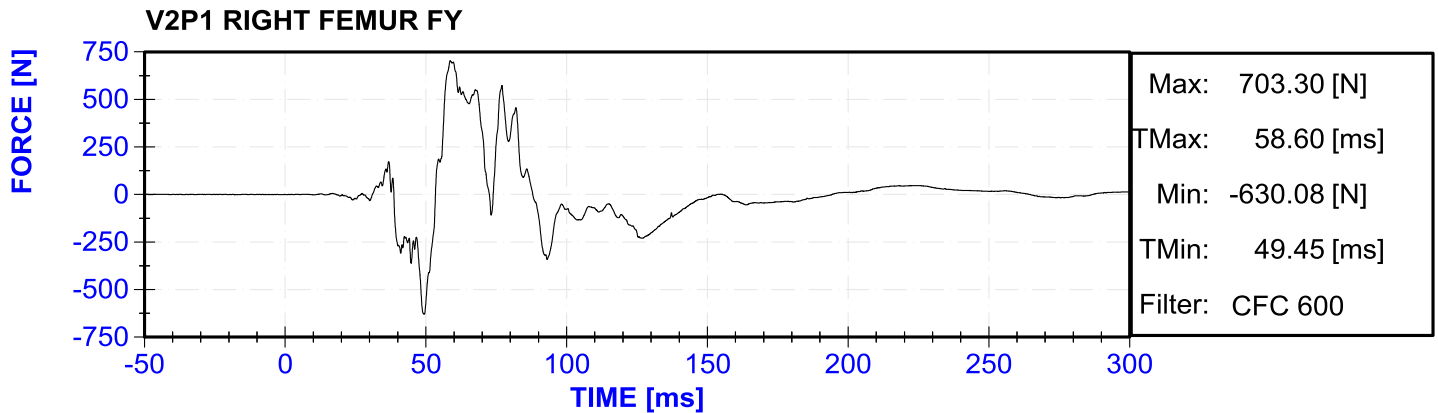
V2P1 LEFT ASIS FX

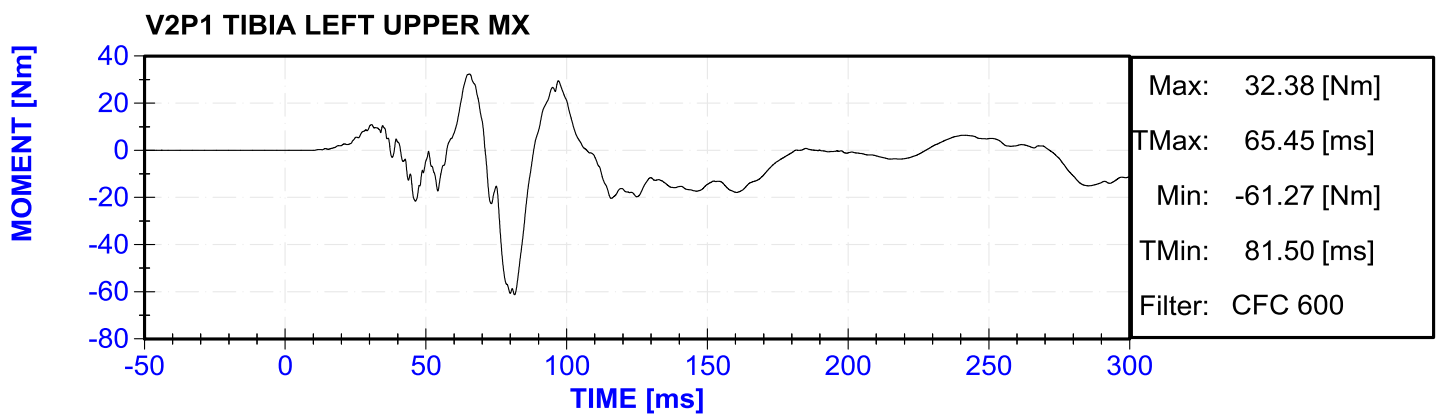
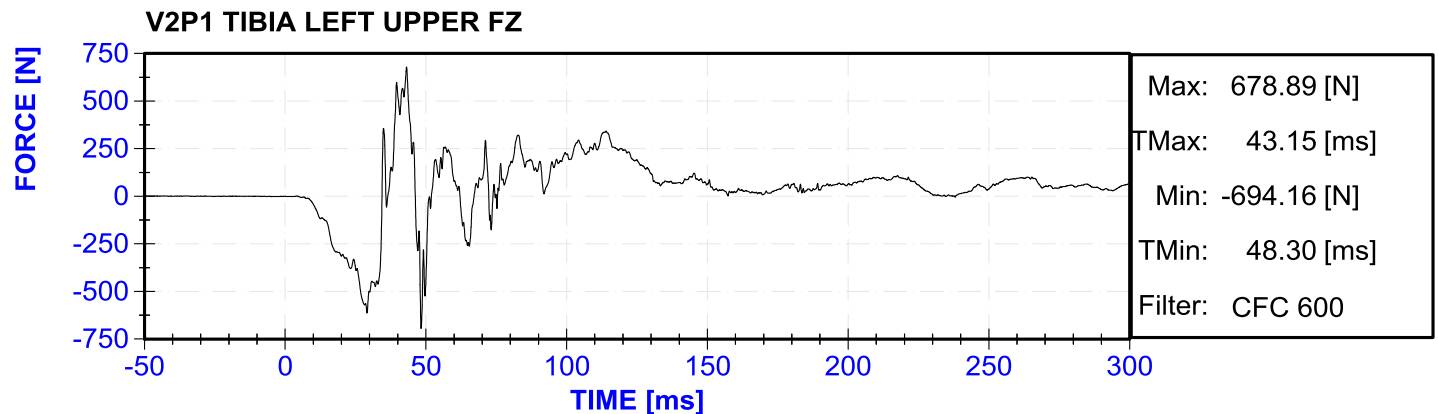
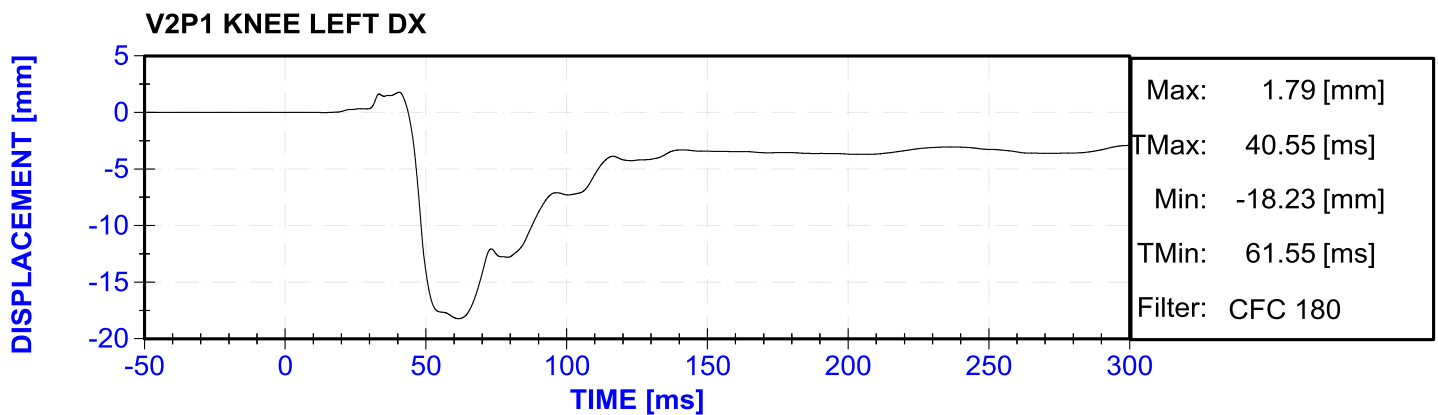
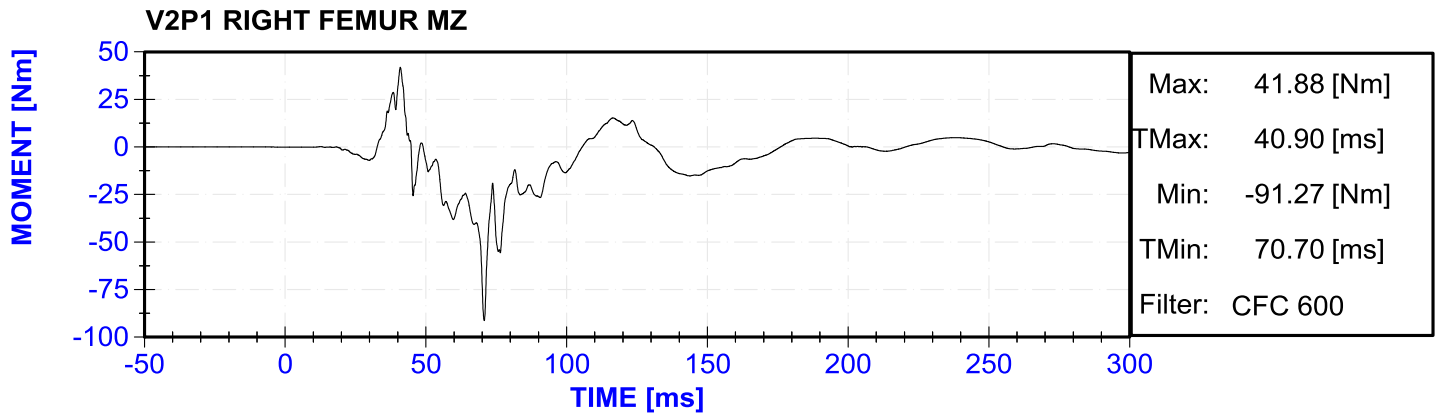


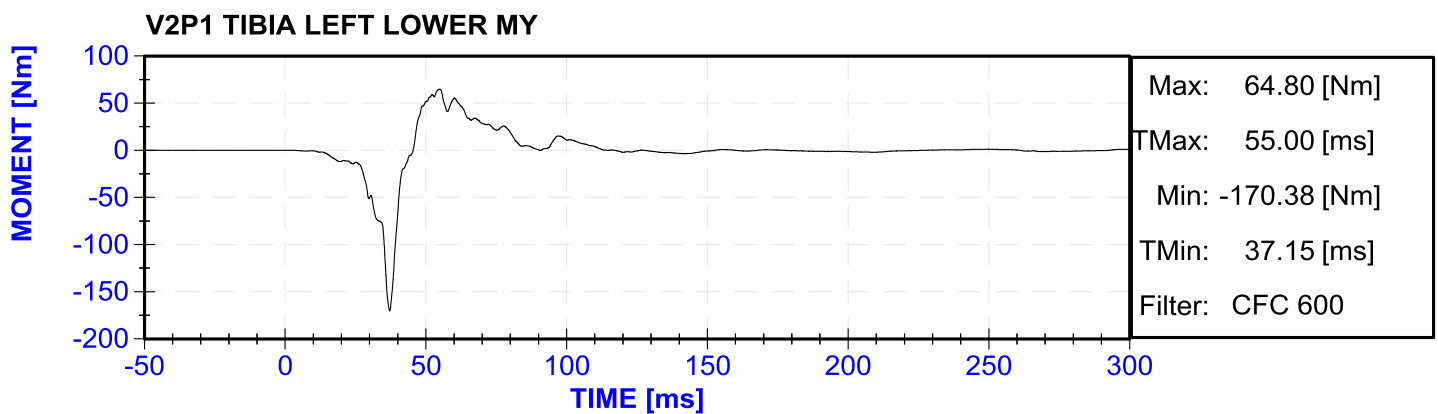
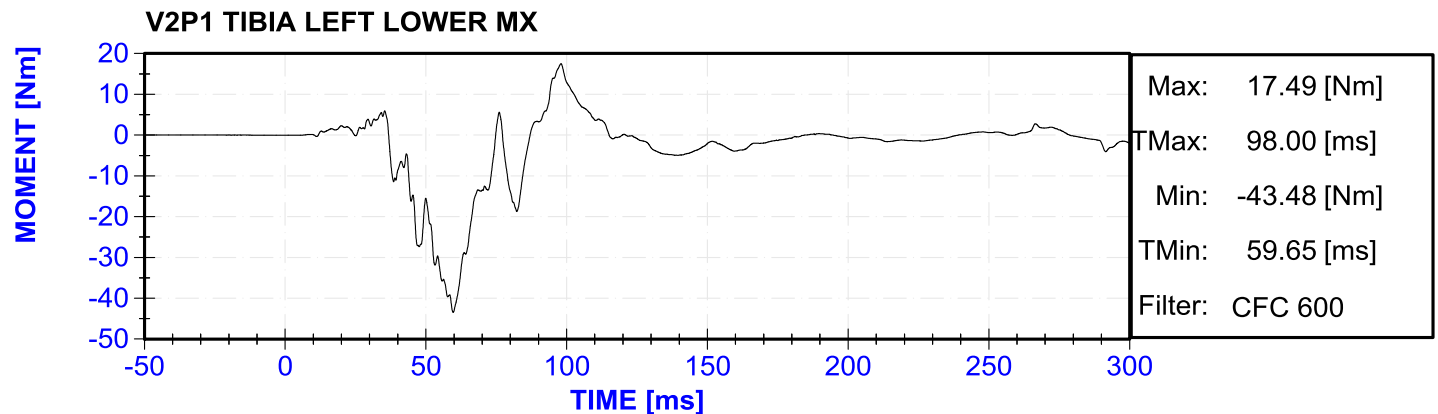
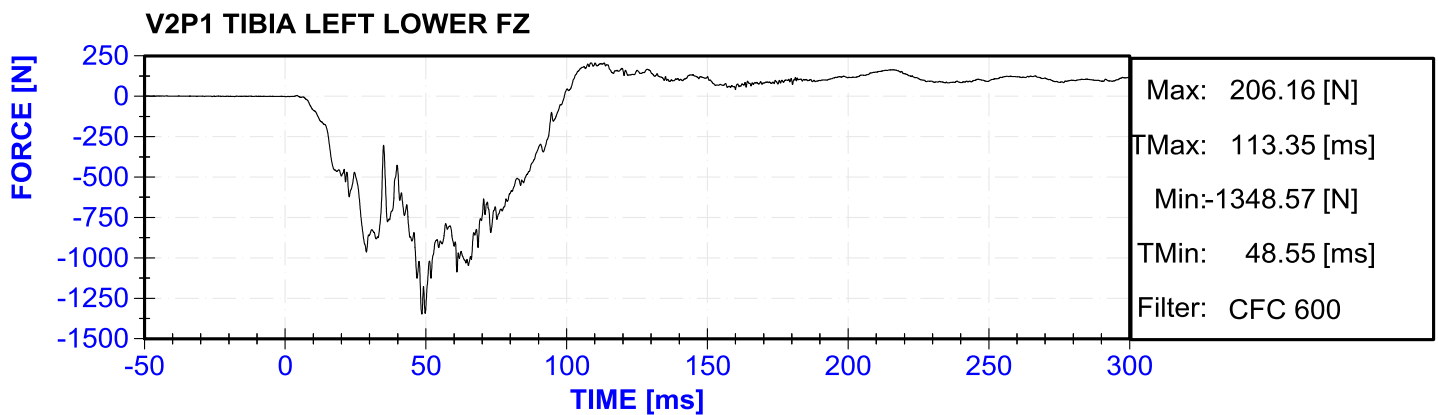
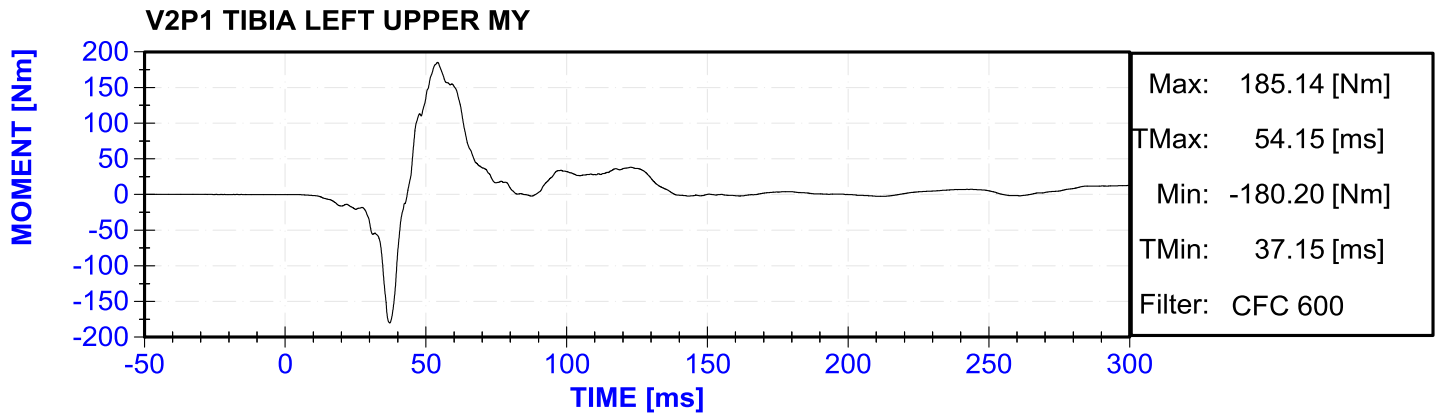
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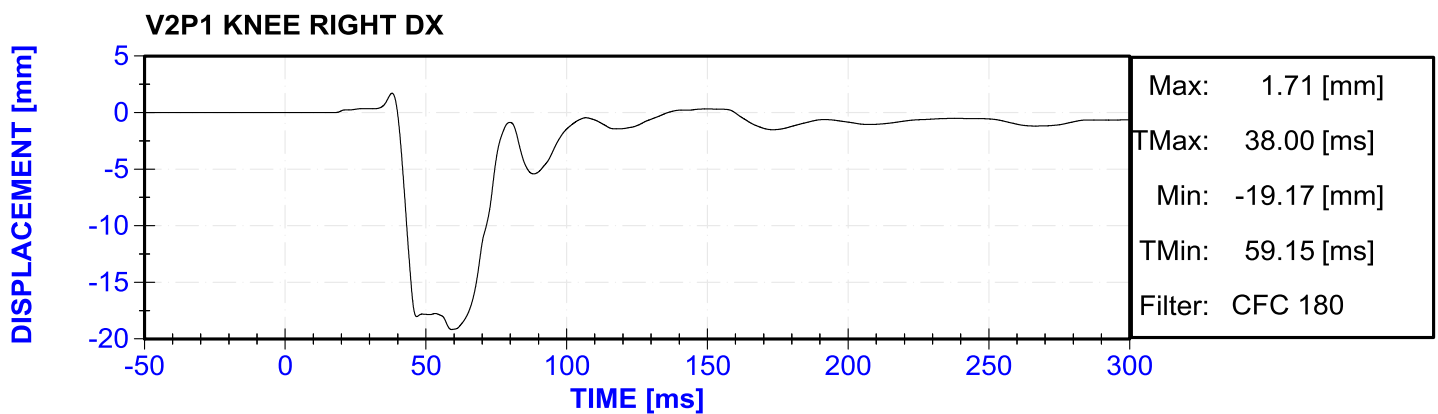
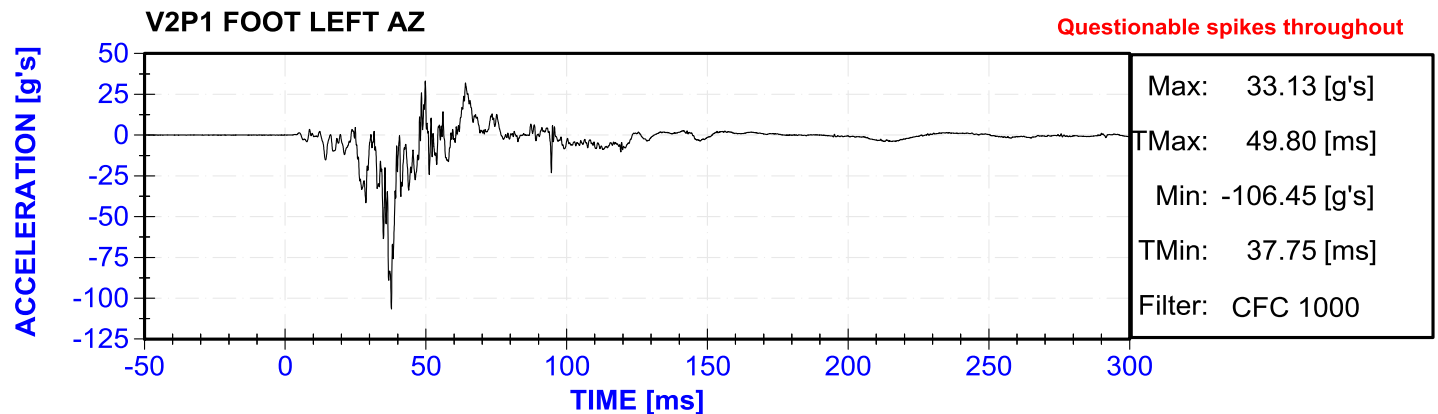
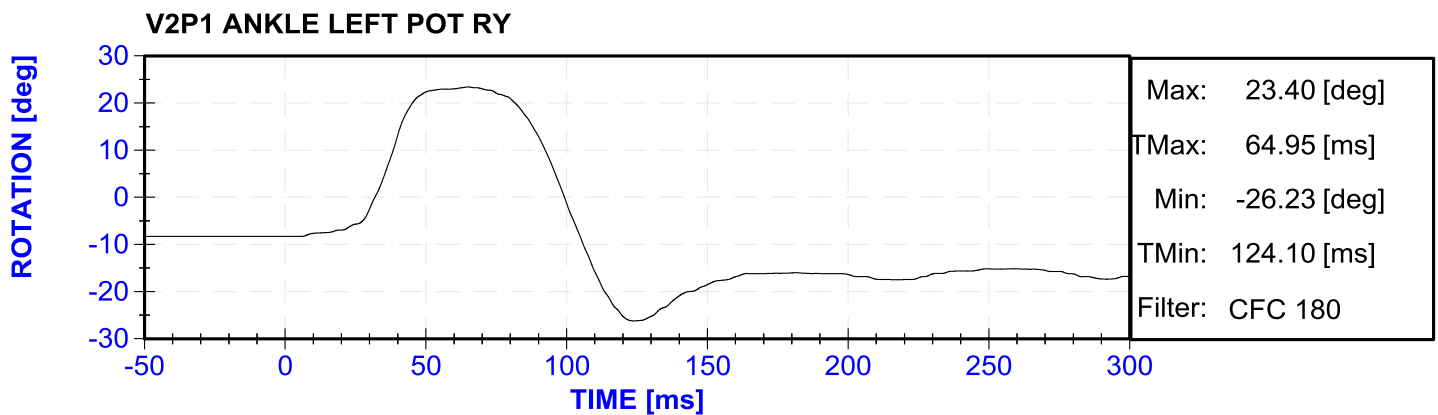
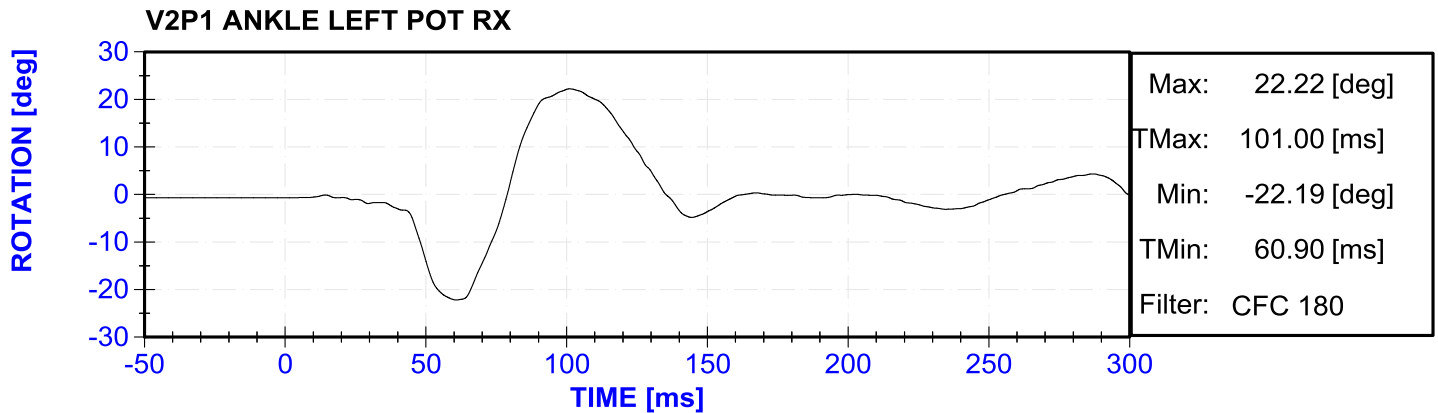




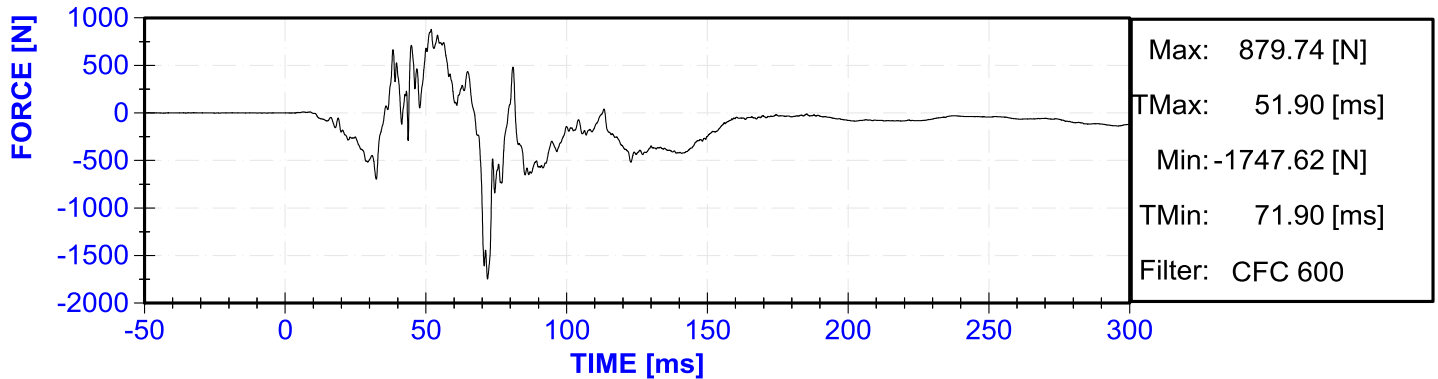




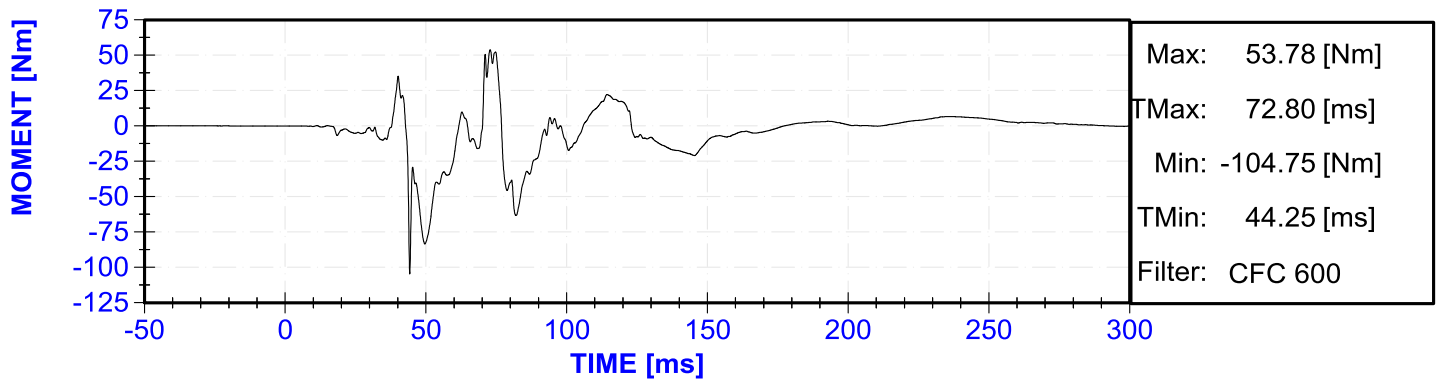




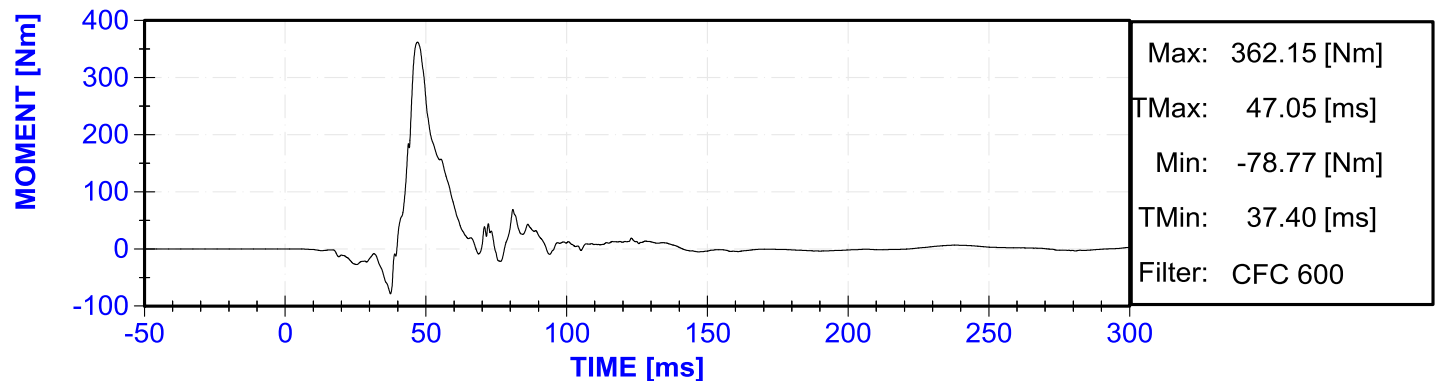
V2P1 TIBIA RIGHT UPPER FZ



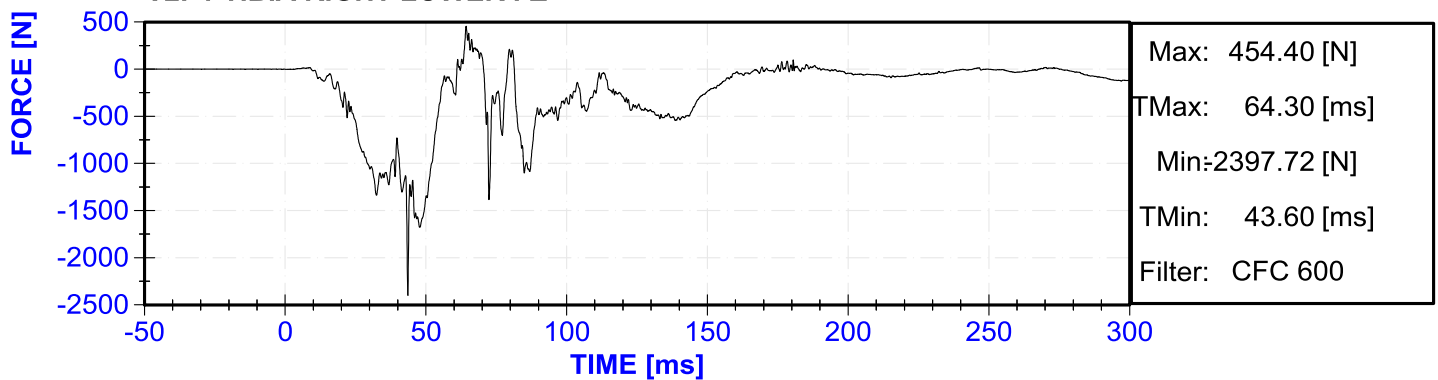
V2P1 TIBIA RIGHT UPPER MX

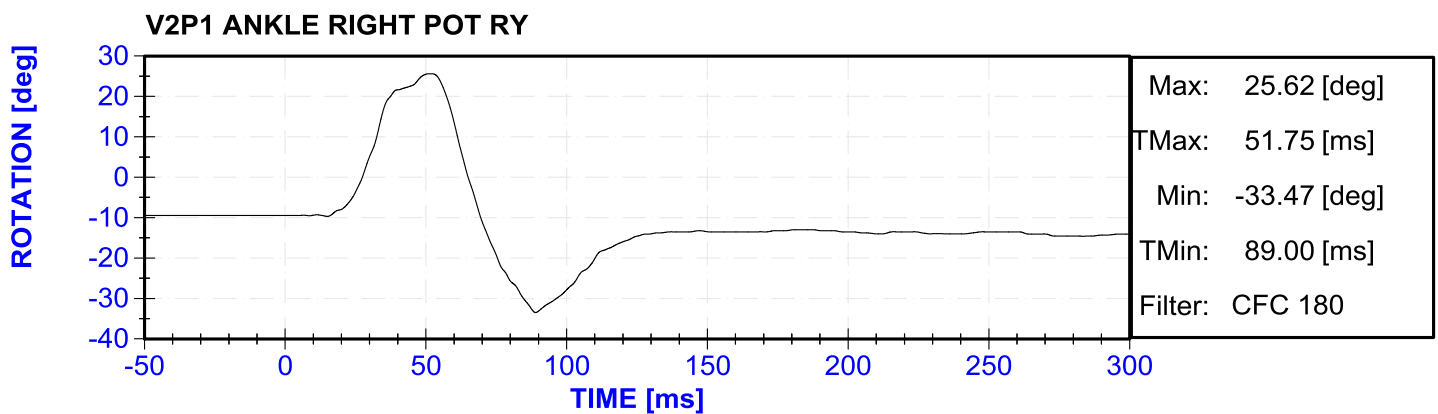
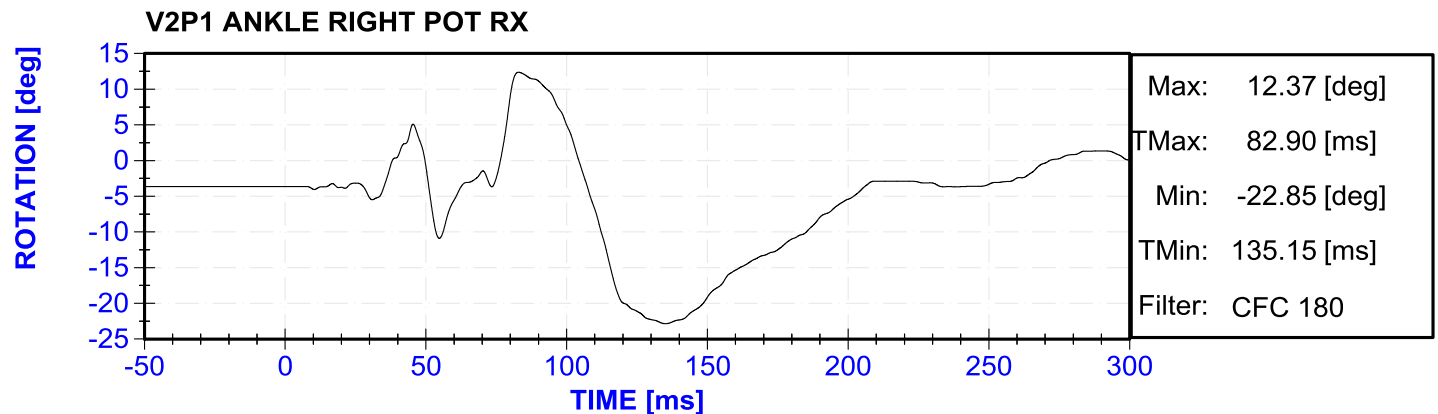
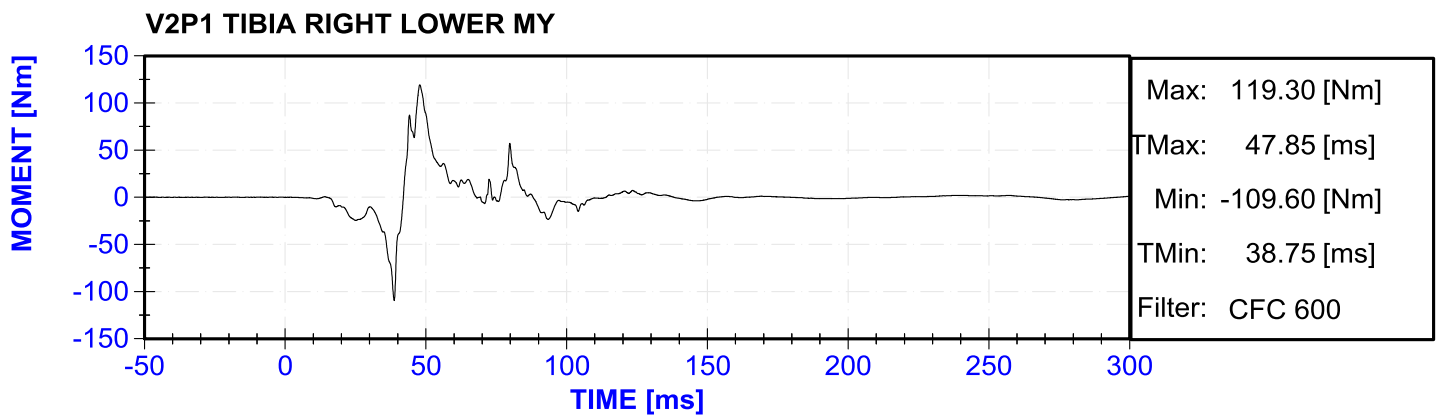
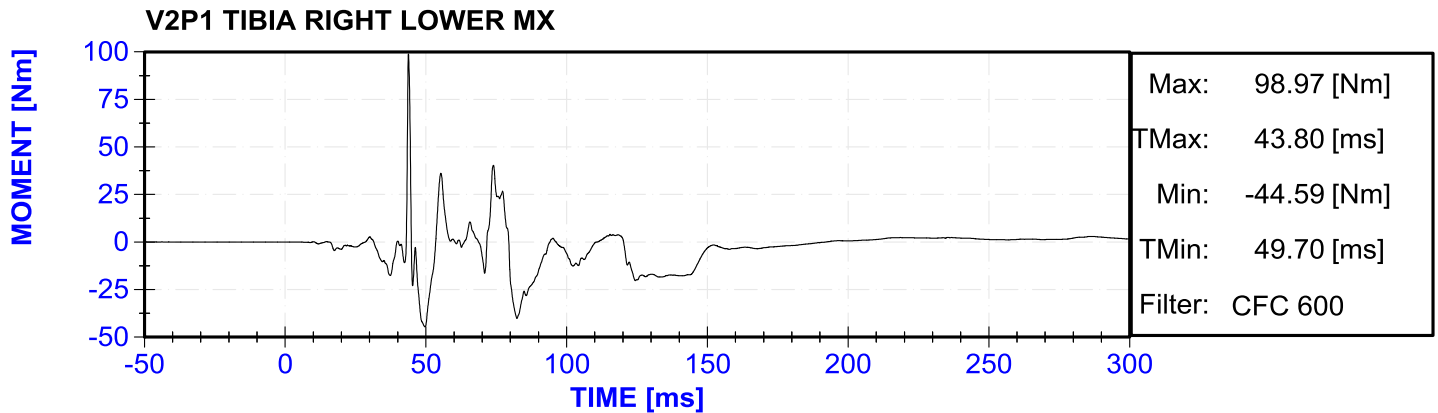


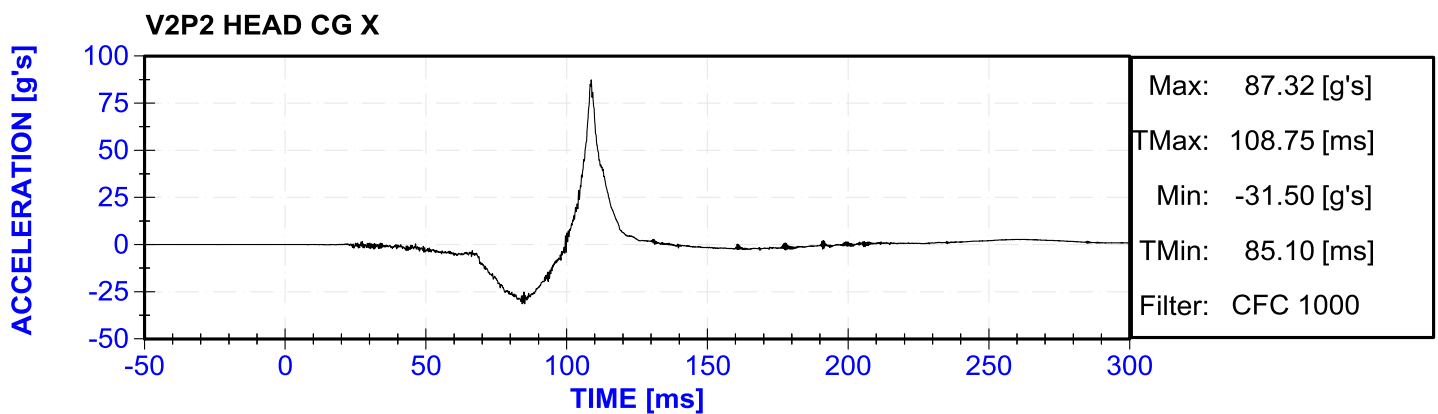
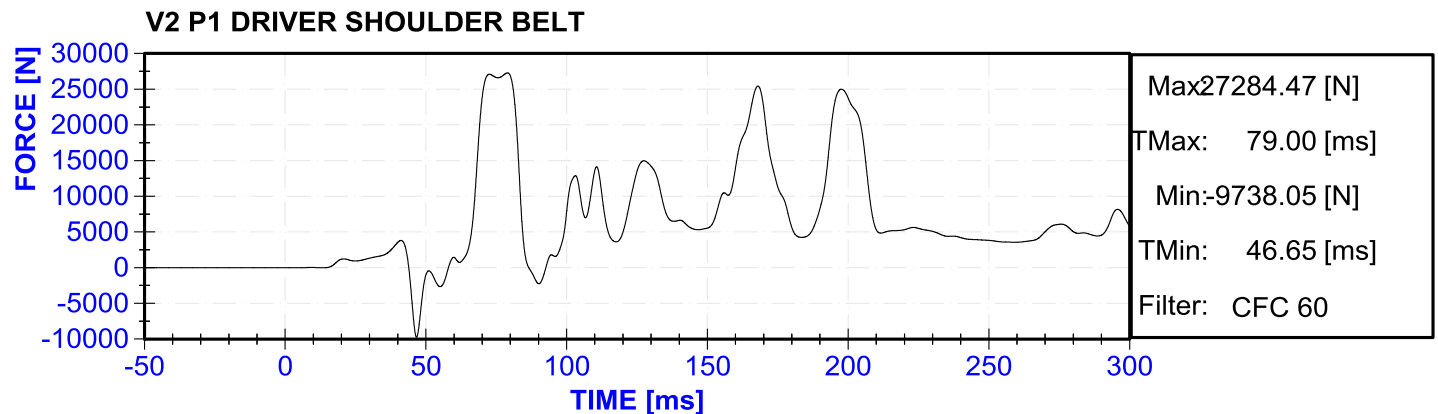
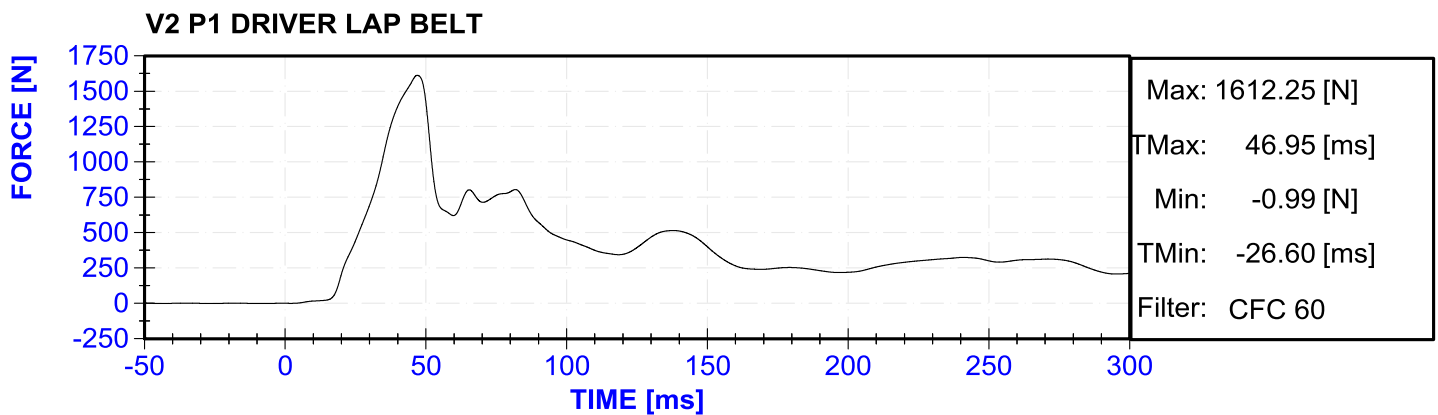
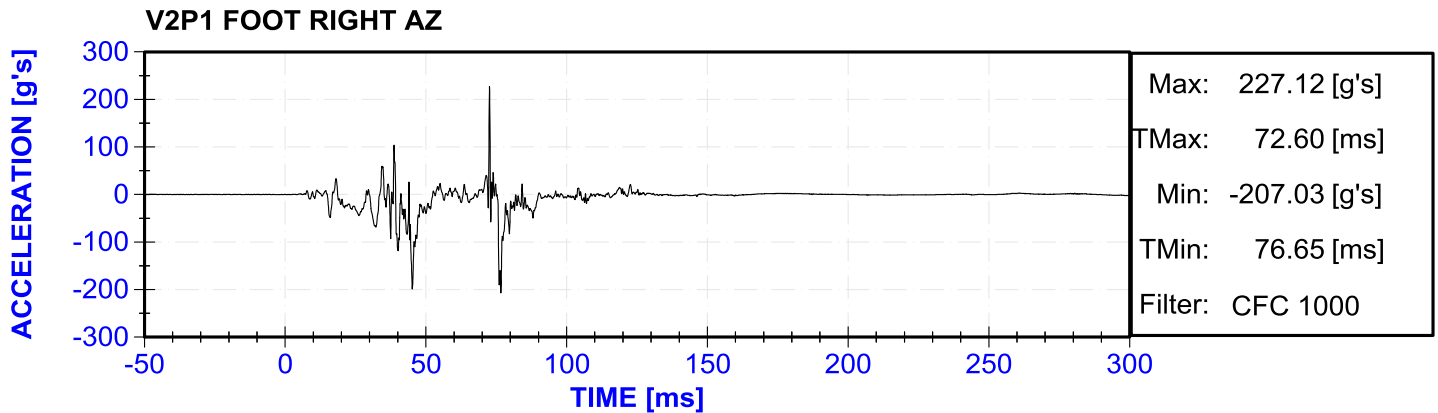
V2P1 TIBIA RIGHT UPPER MY

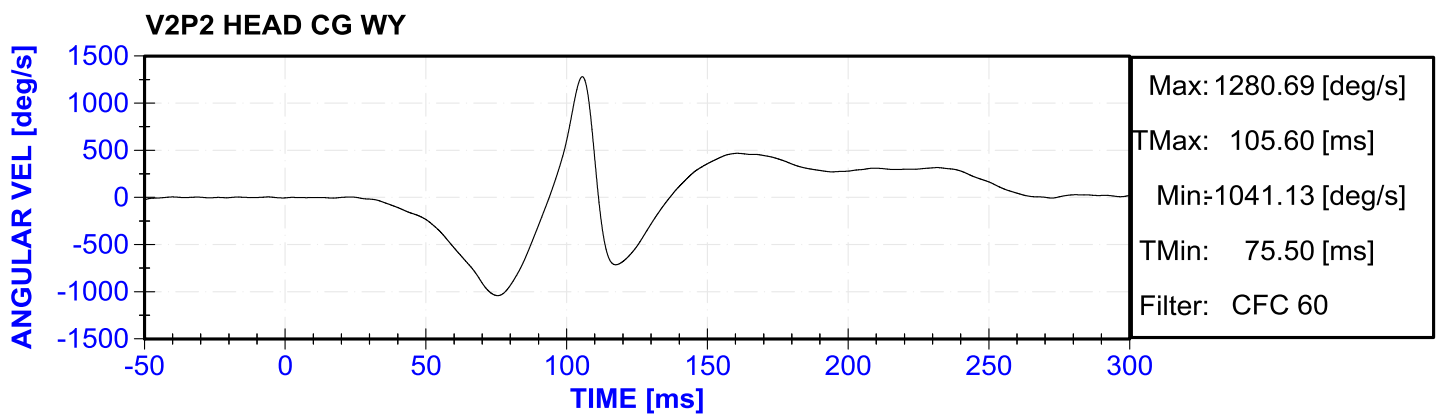
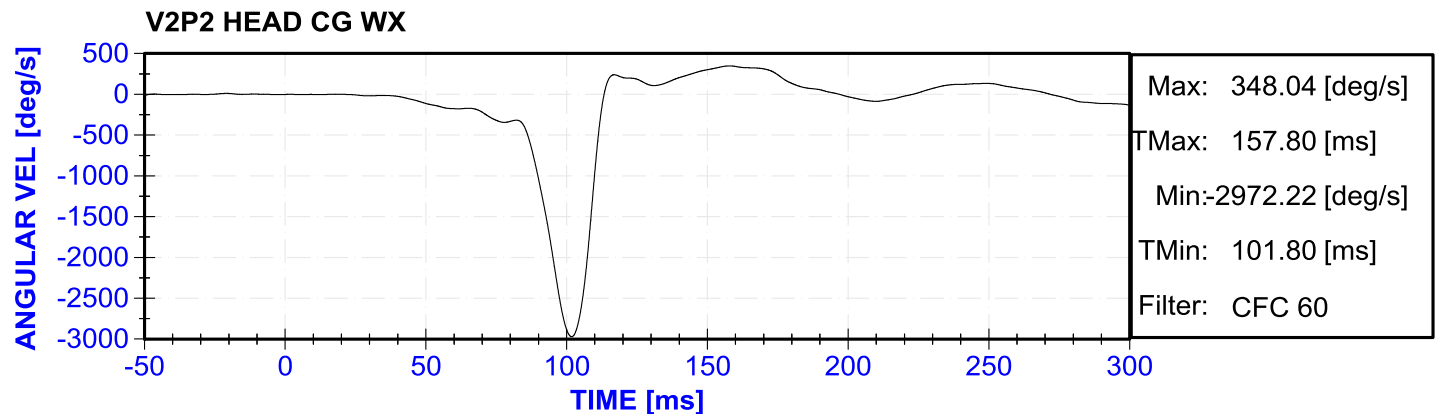
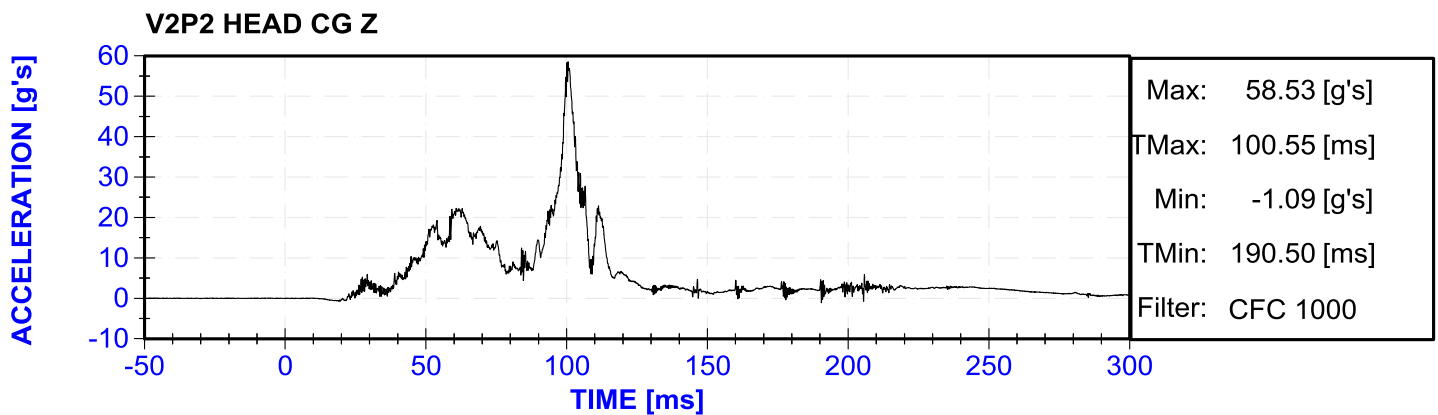
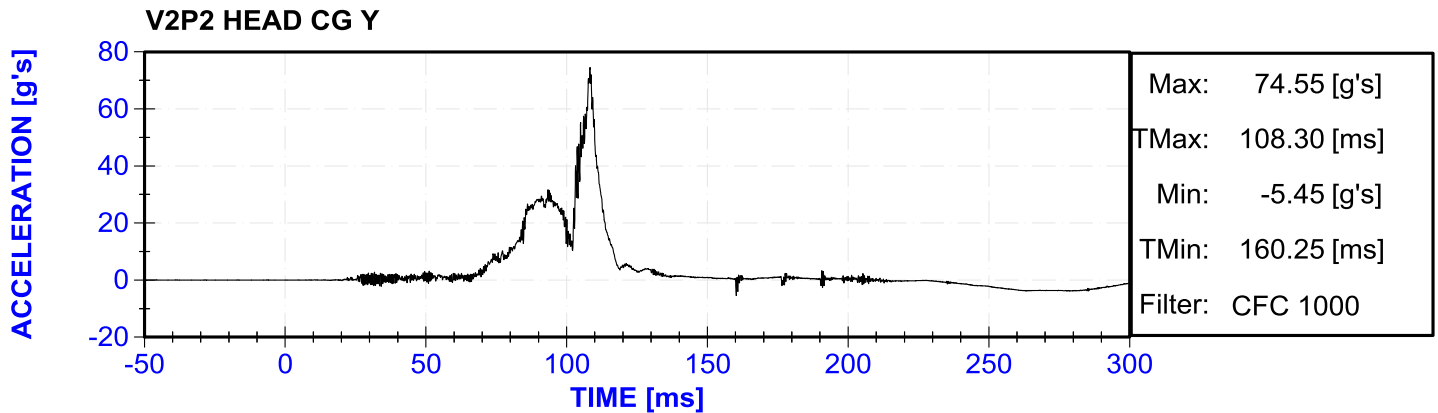


V2P1 TIBIA RIGHT LOWER FZ

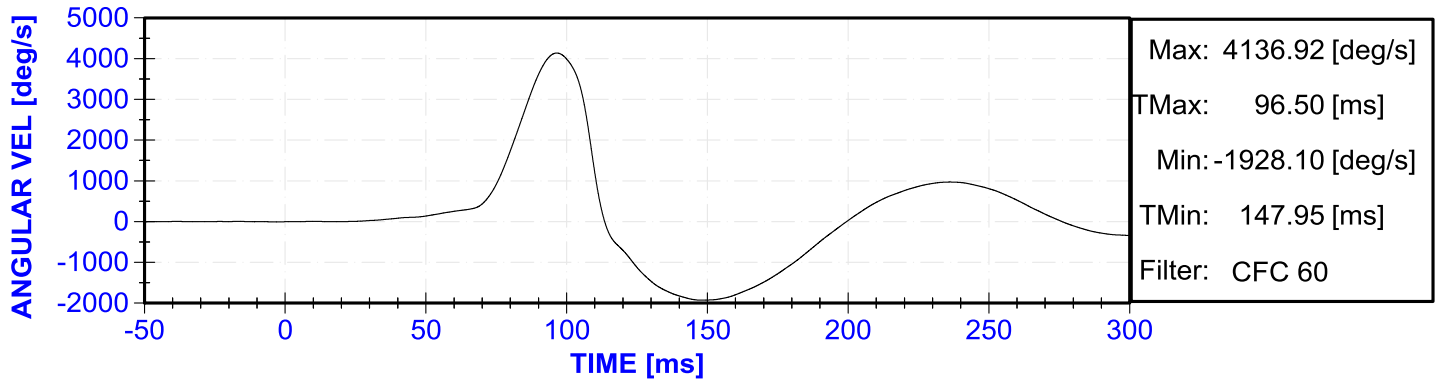




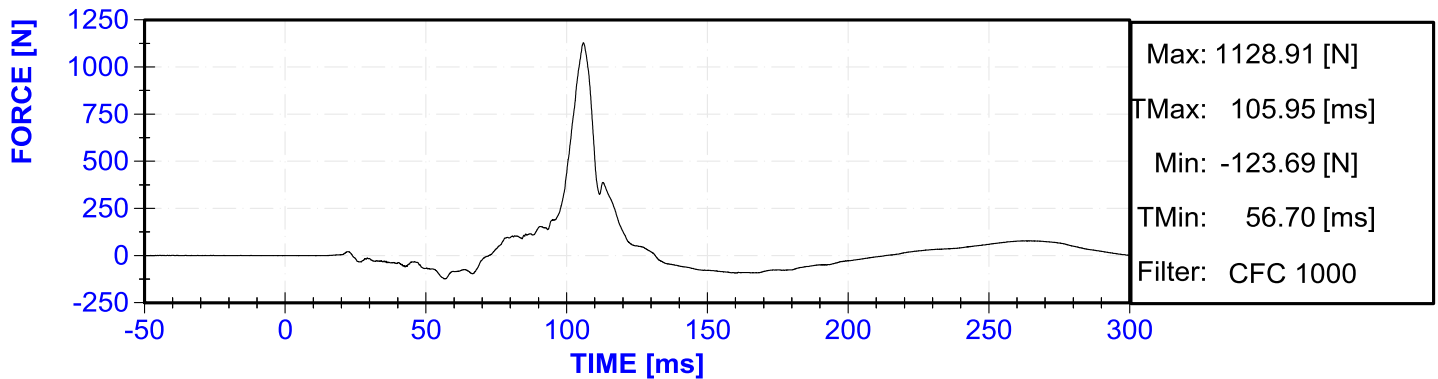




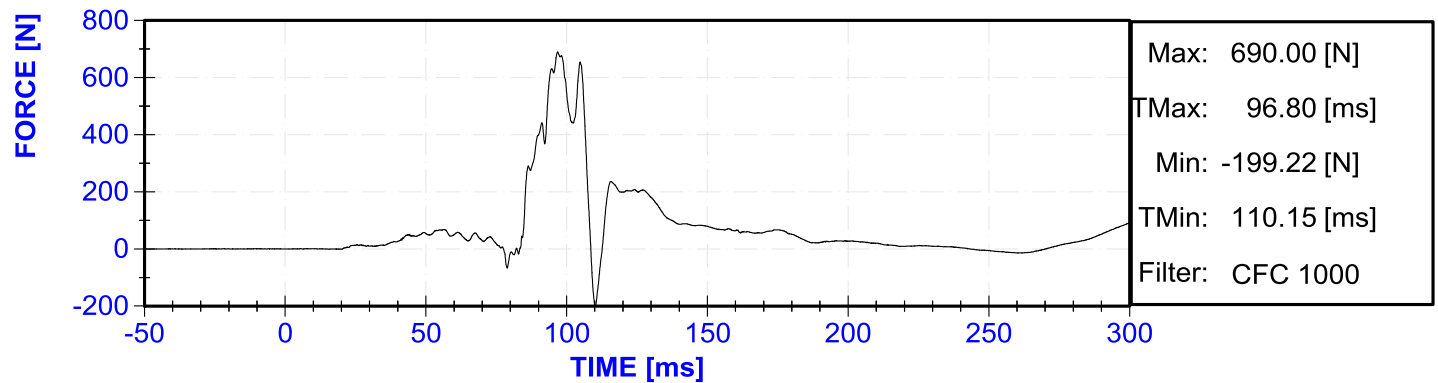
V2P2 HEAD CG WZ



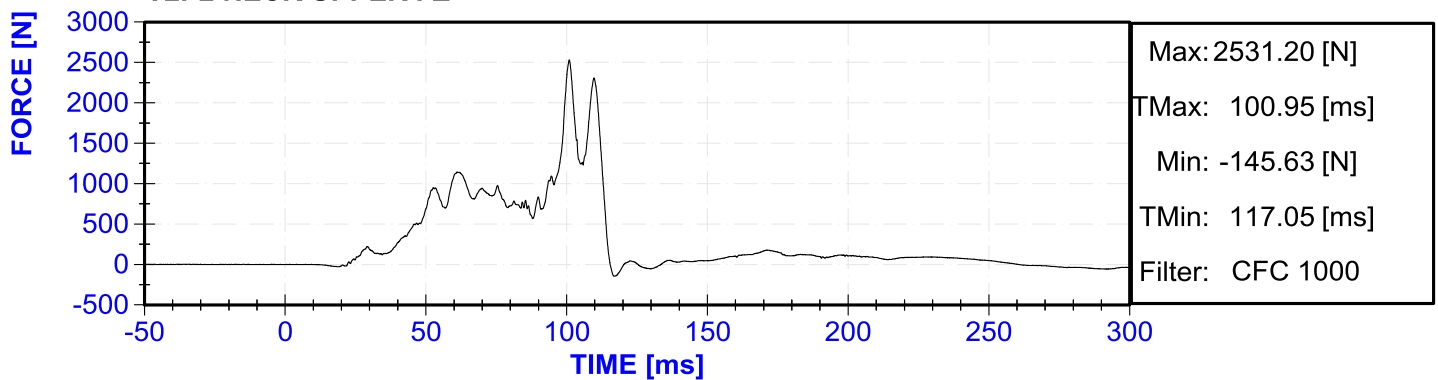
V2P2 NECK UPPER FX

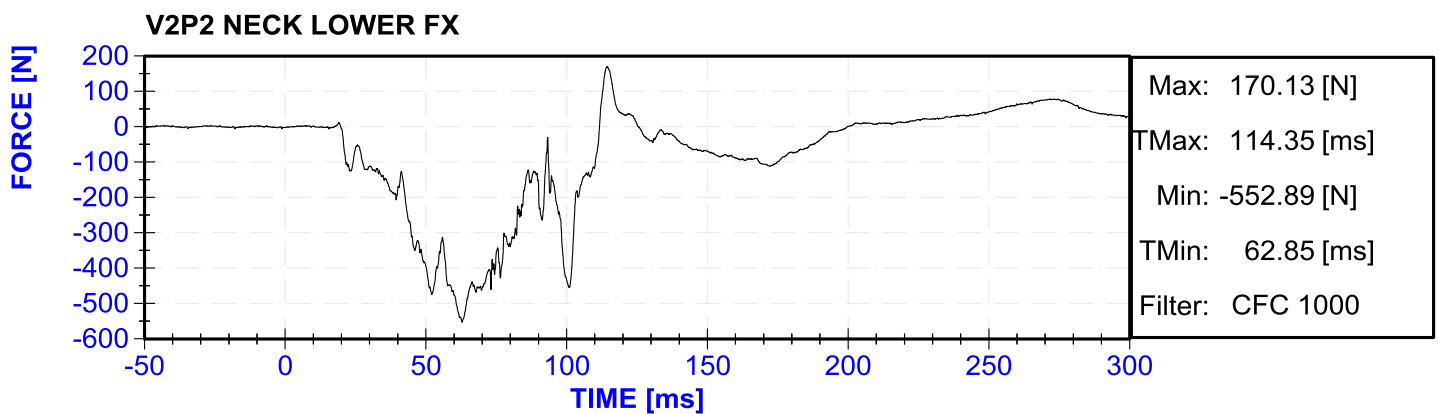
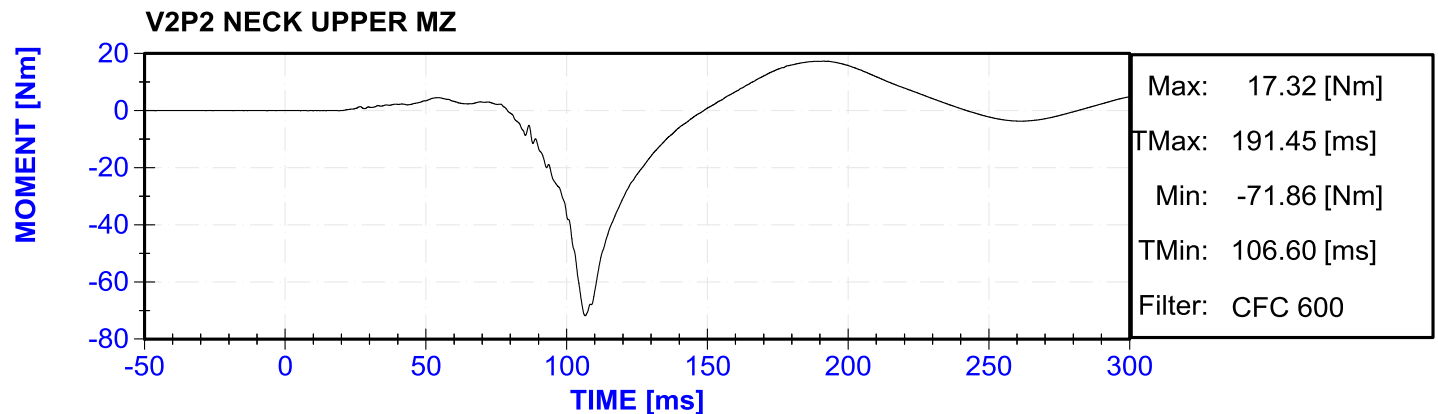
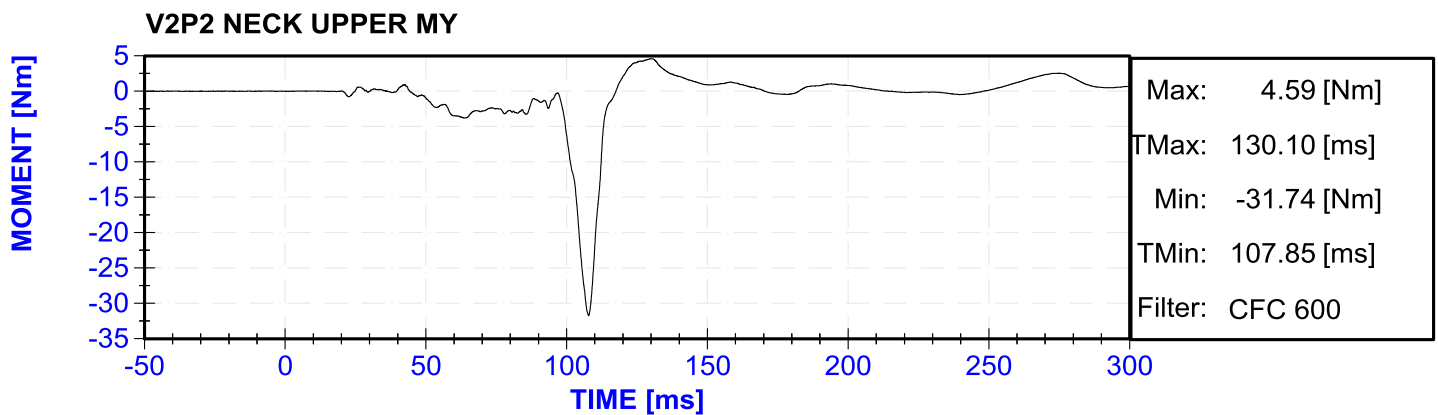
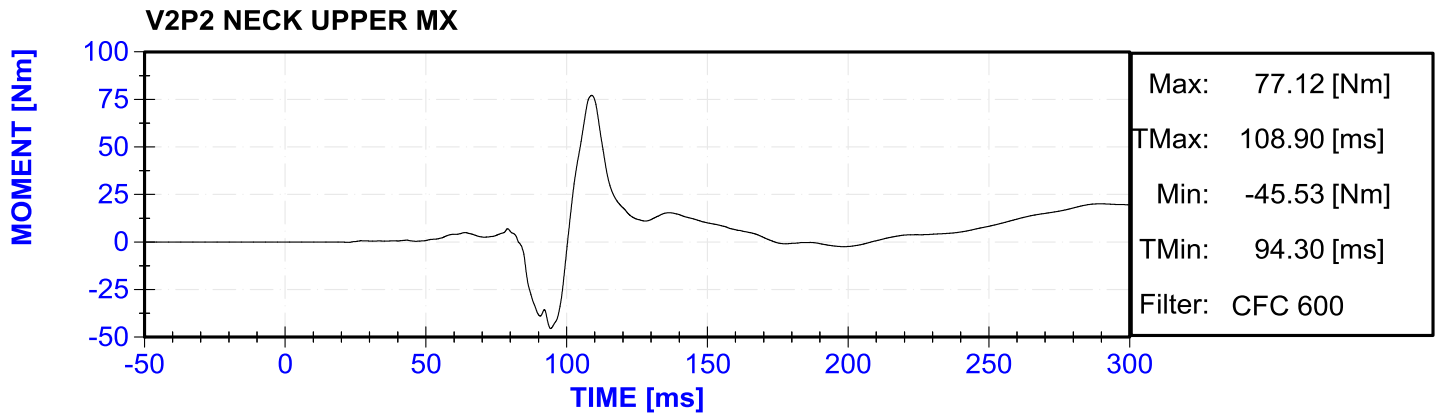


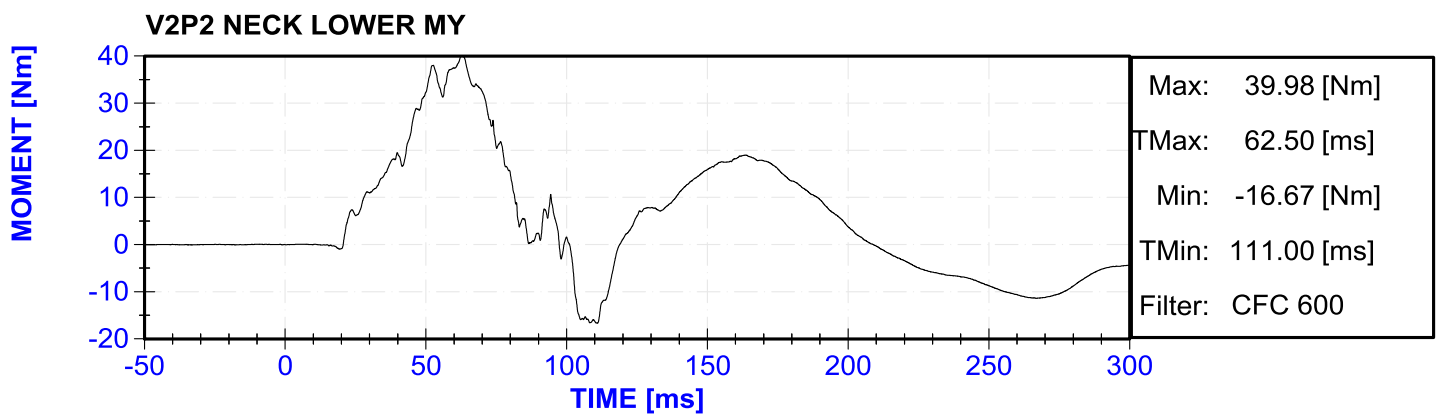
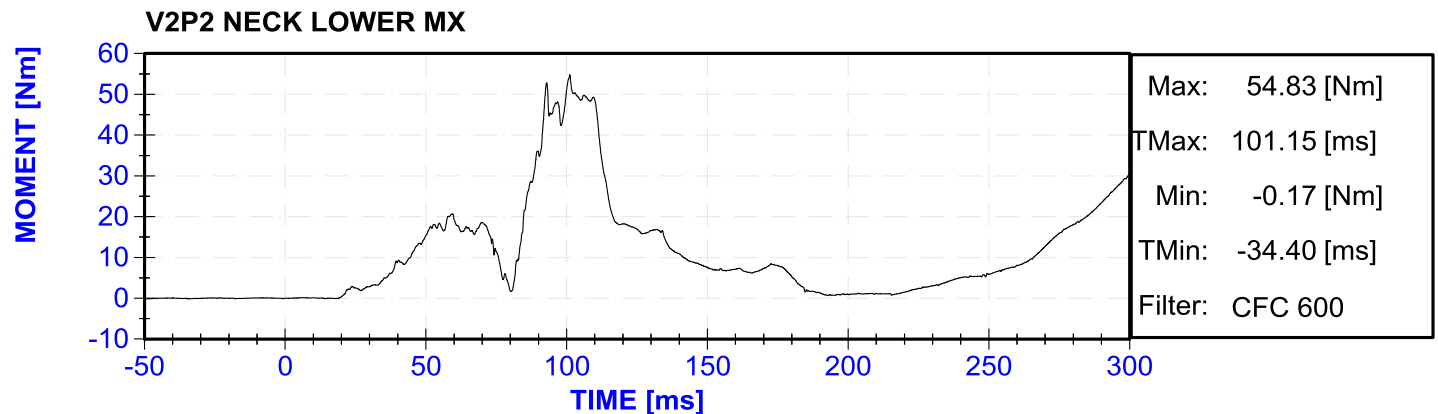
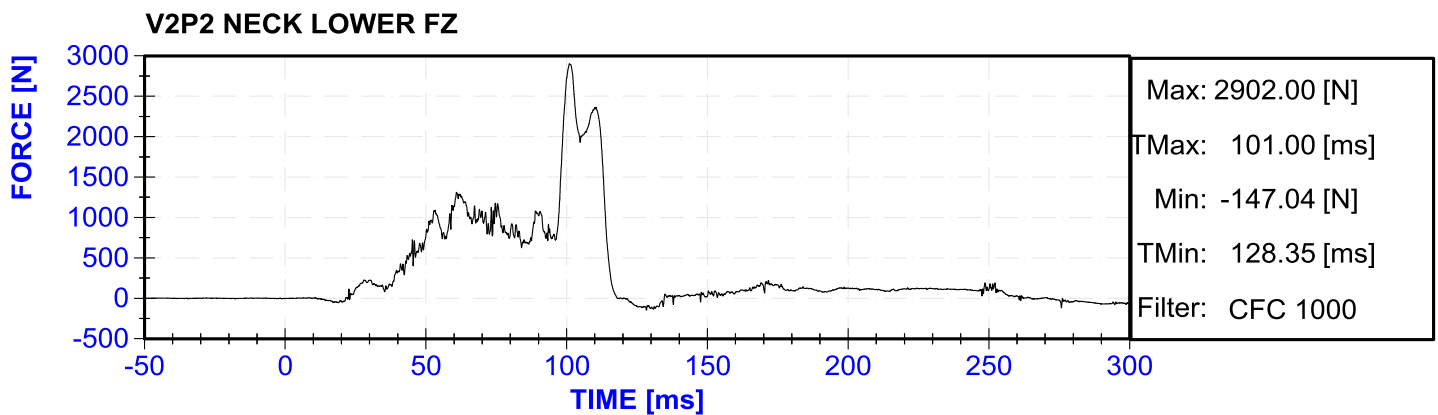
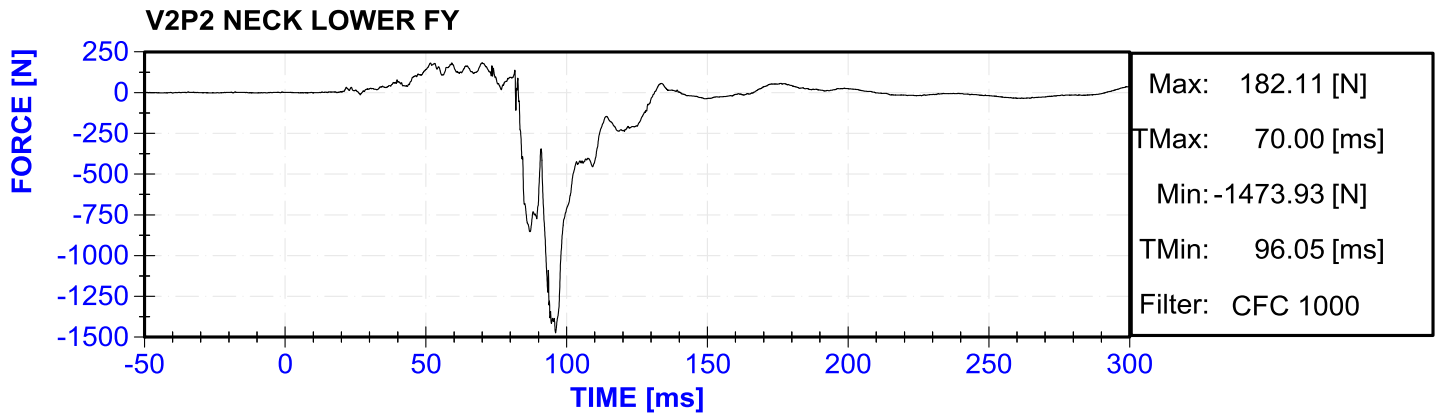
V2P2 NECK UPPER FY

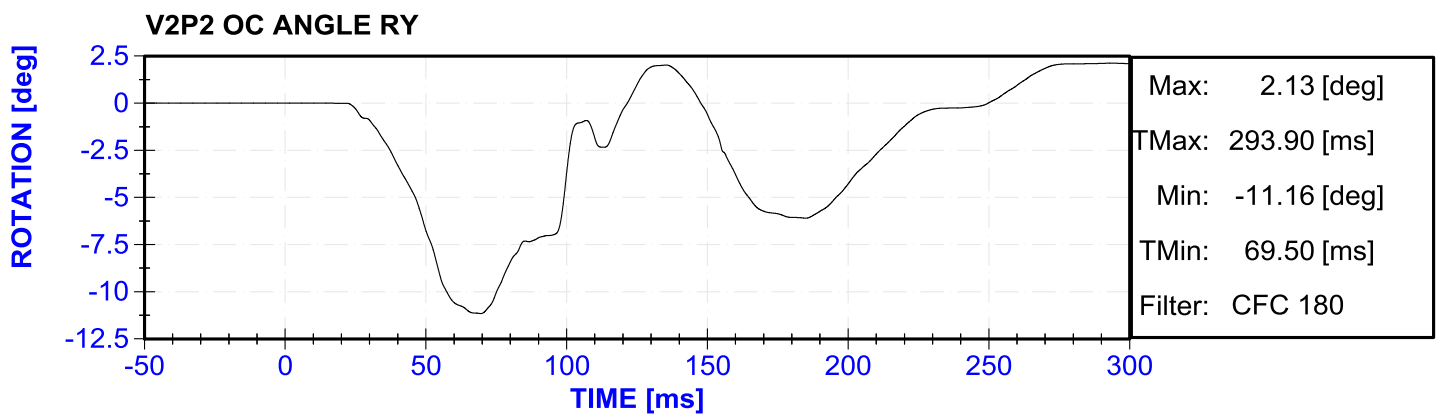
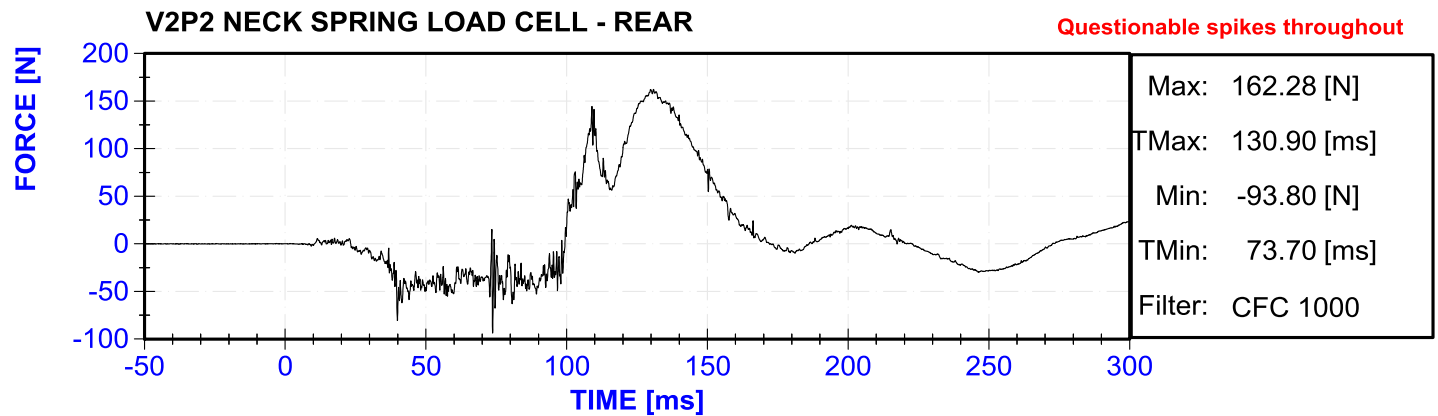
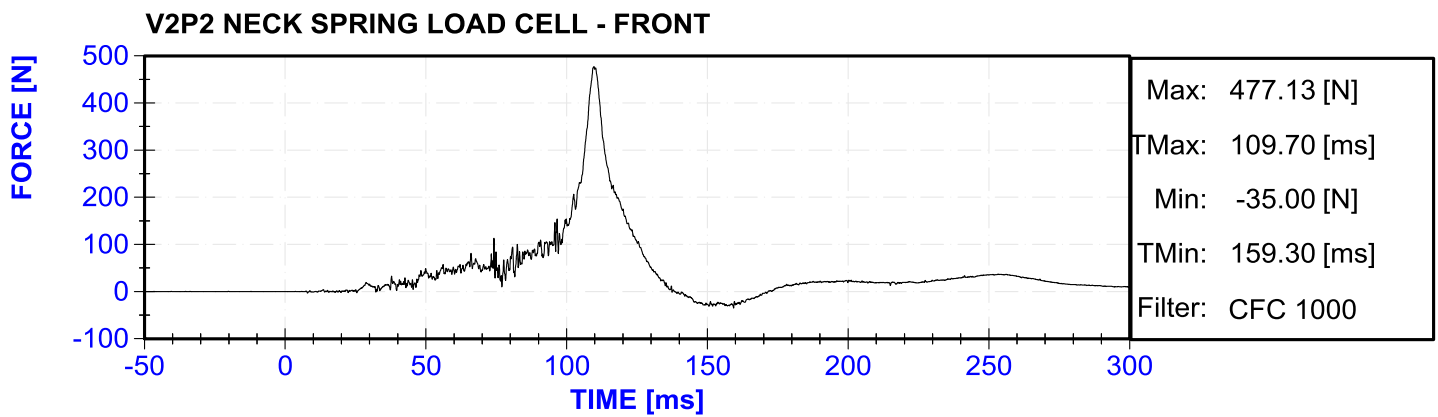
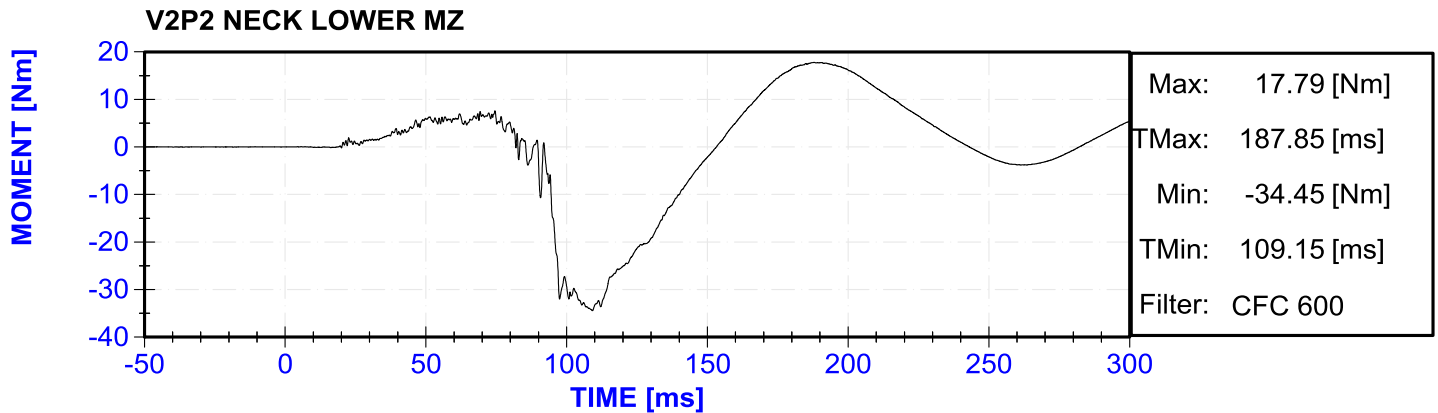


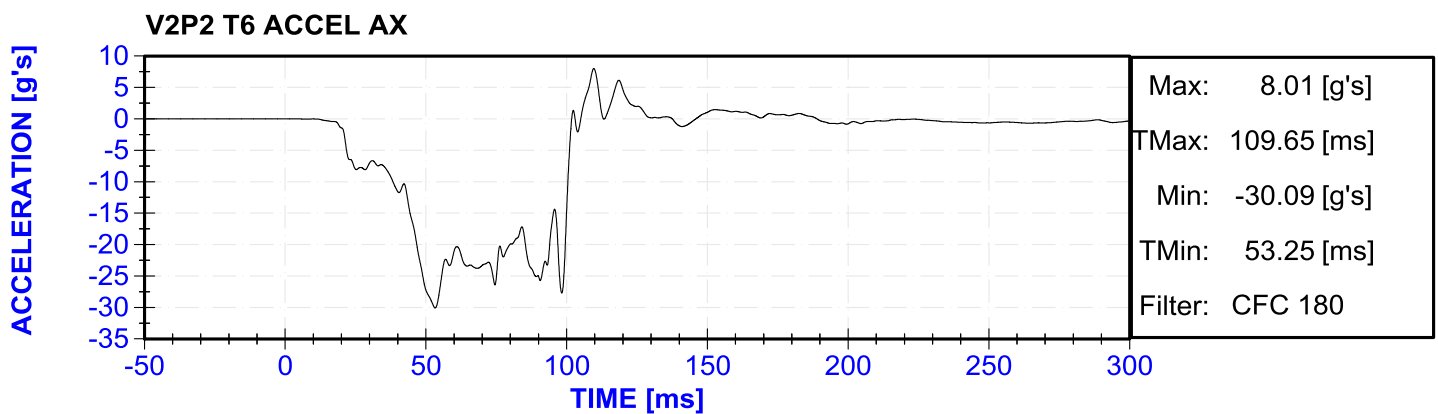
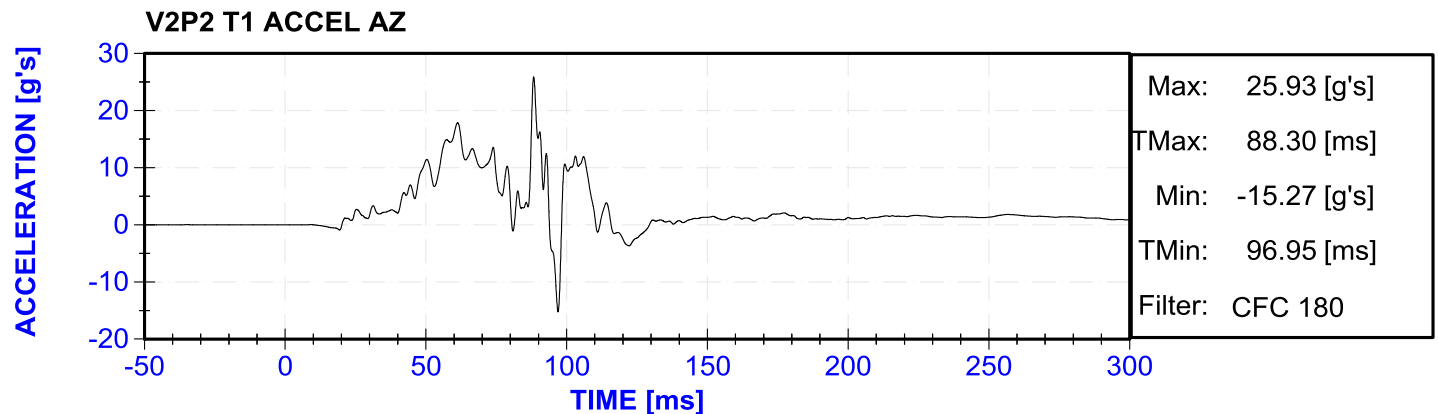
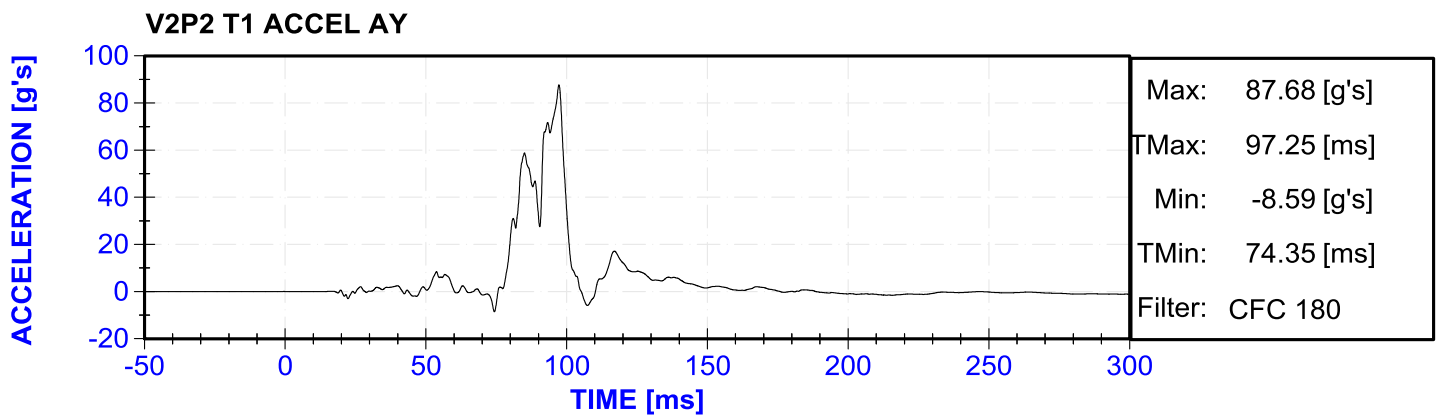
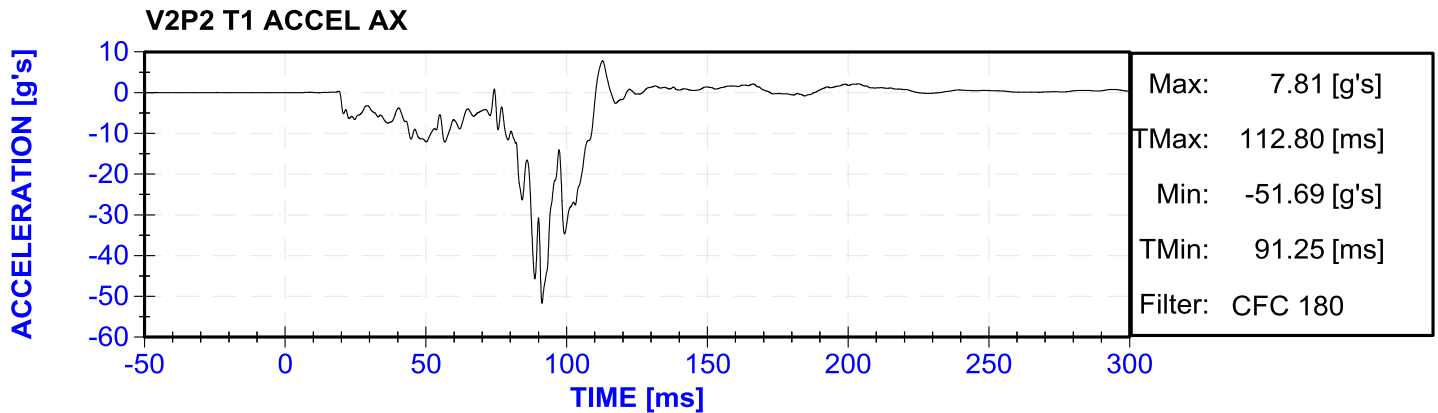
V2P2 NECK UPPER FZ

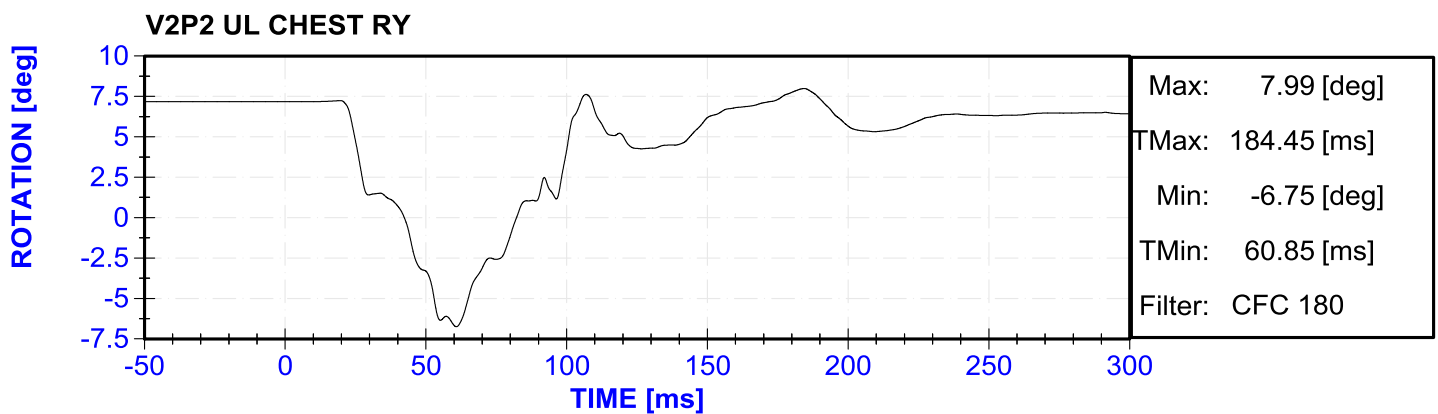
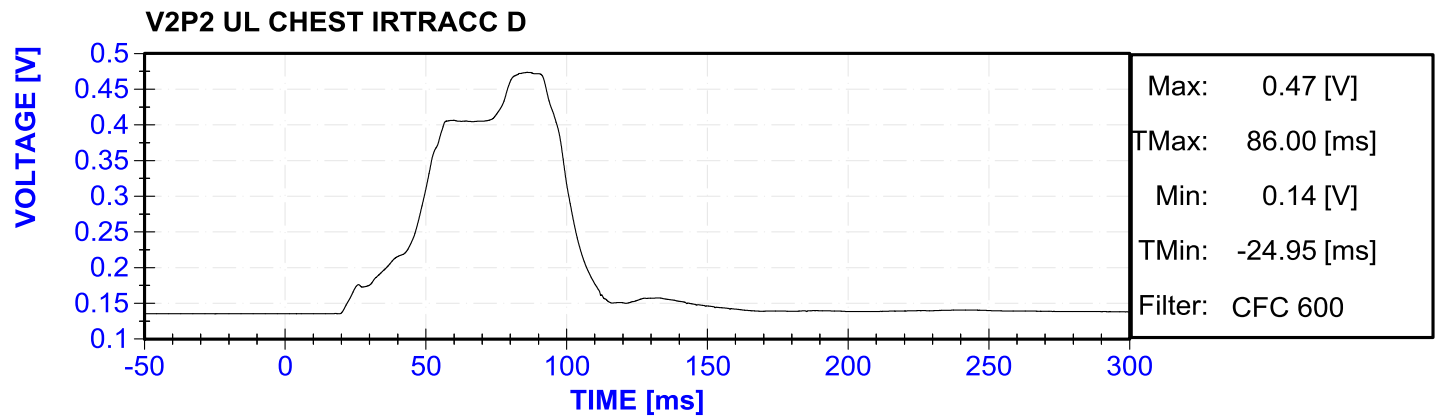
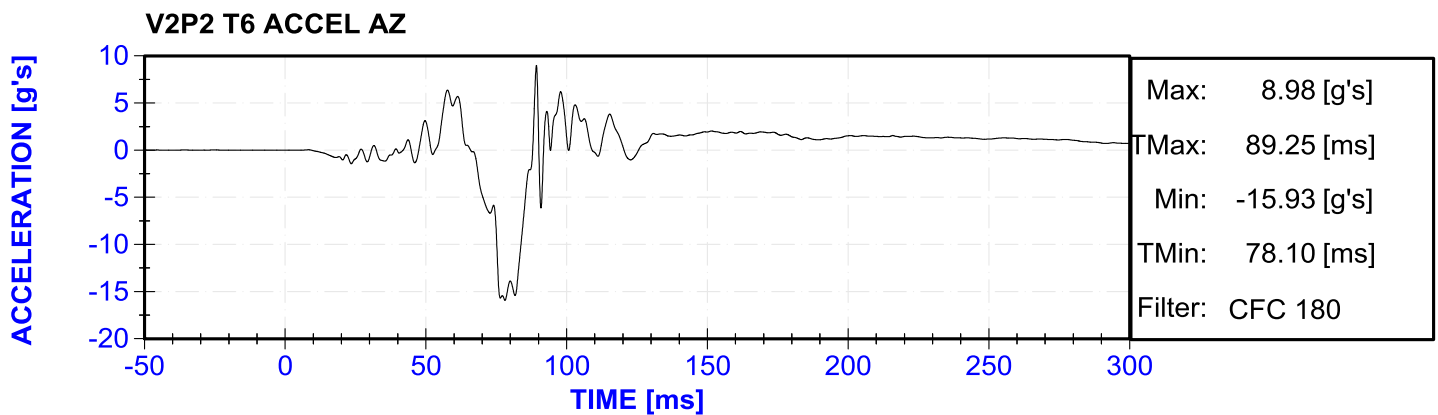
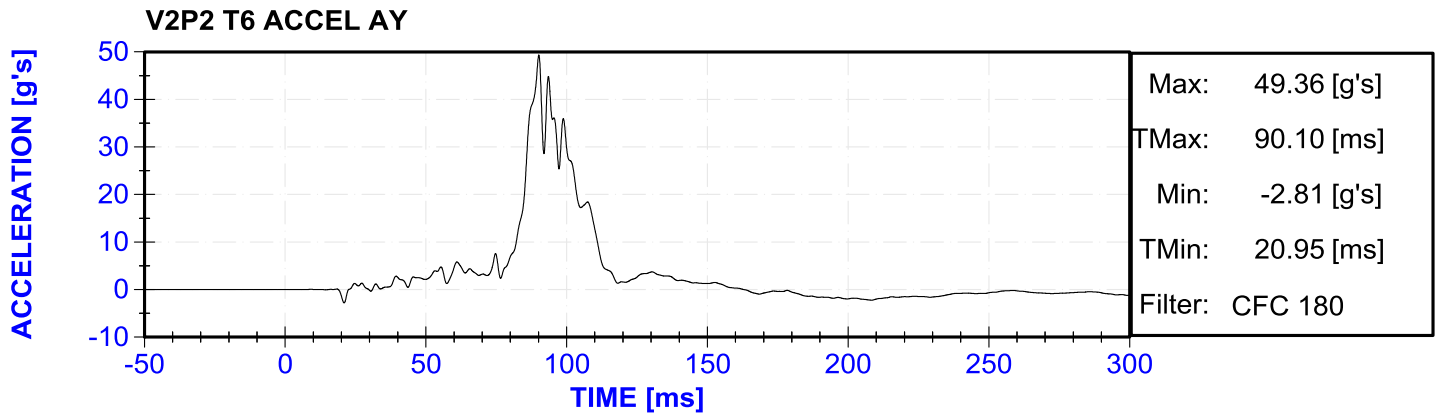


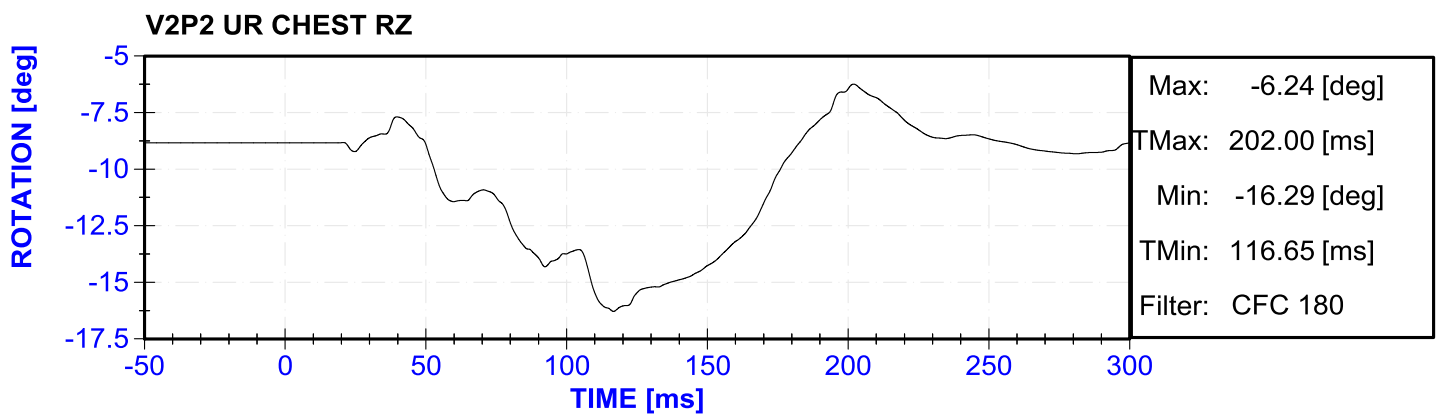
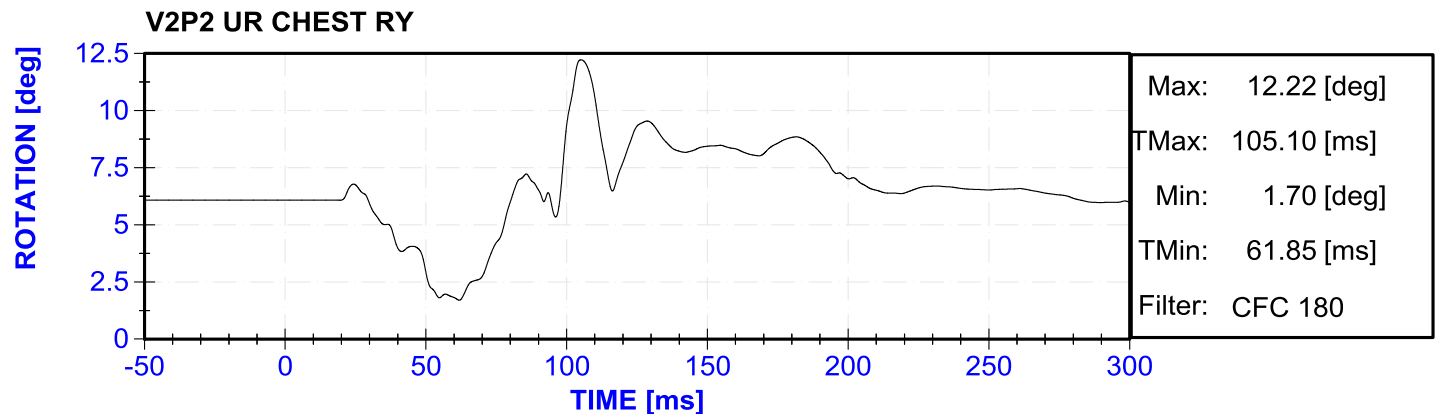
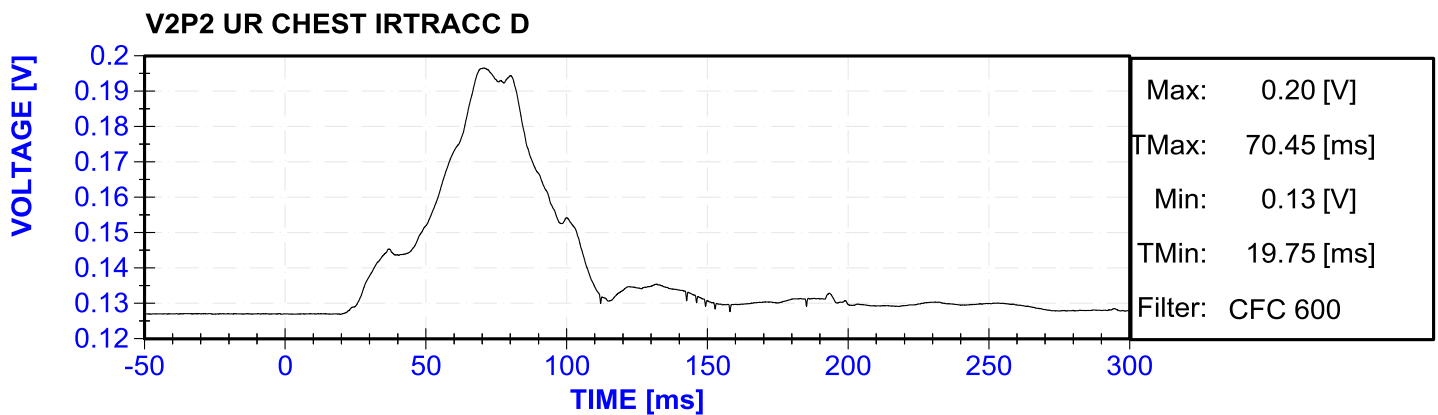
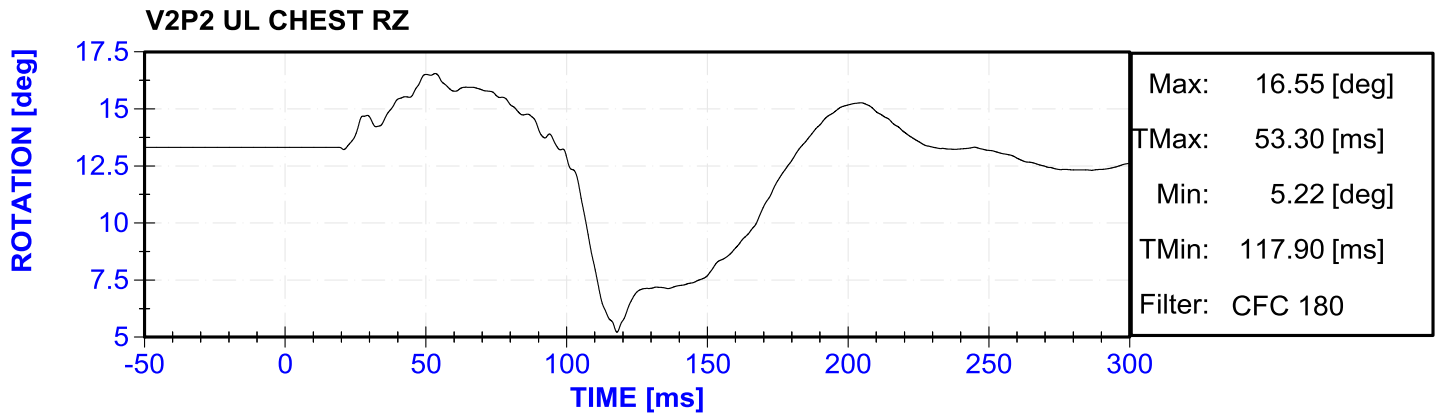




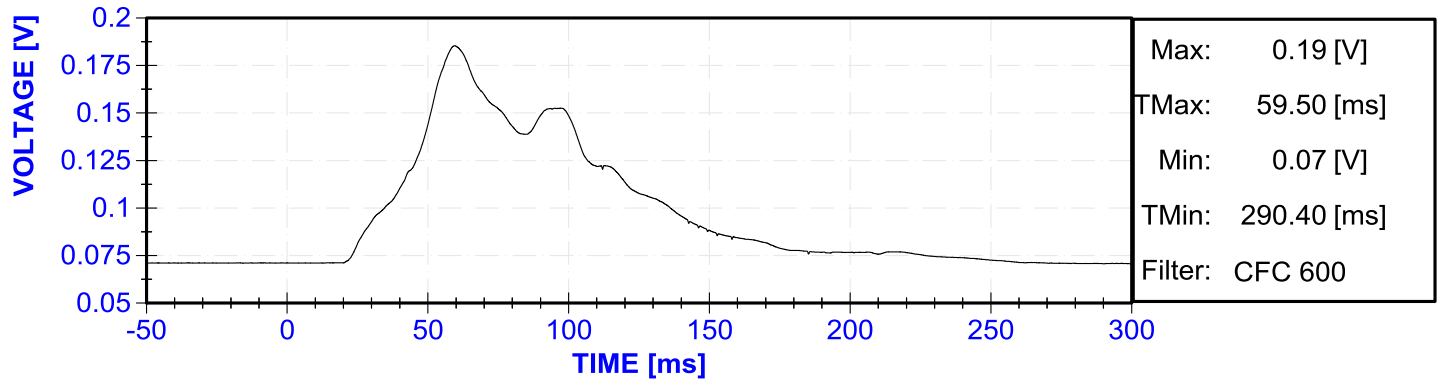




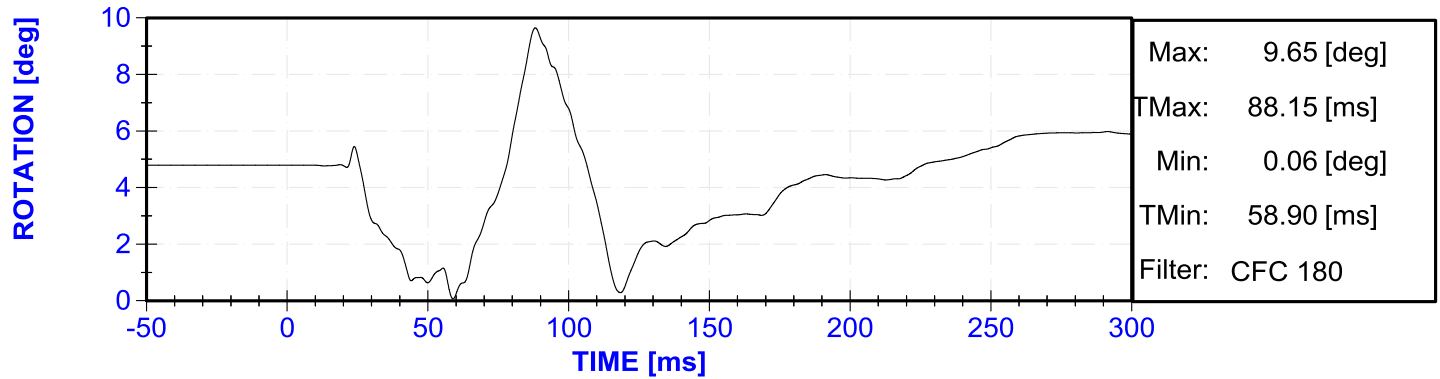




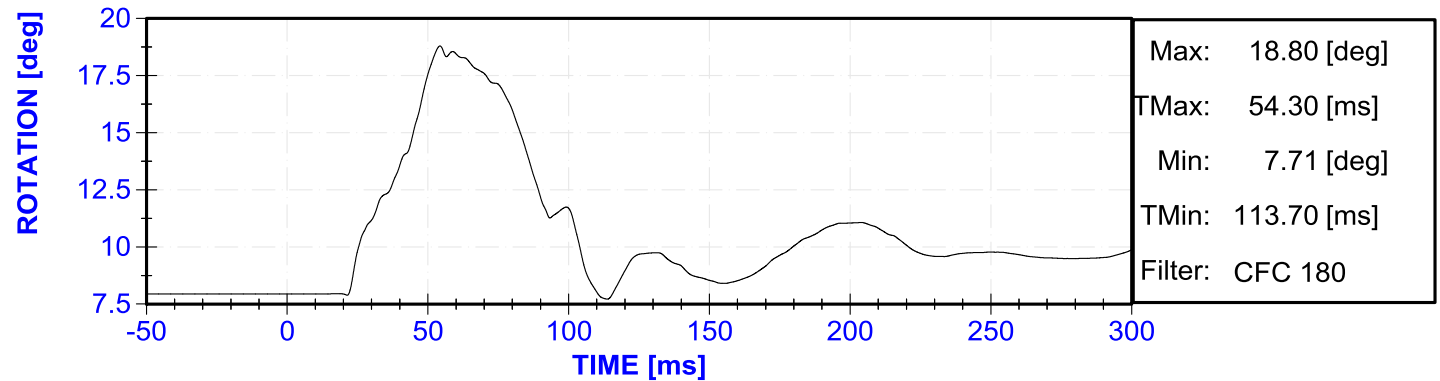
V2P2 LL CHEST IRTACC D



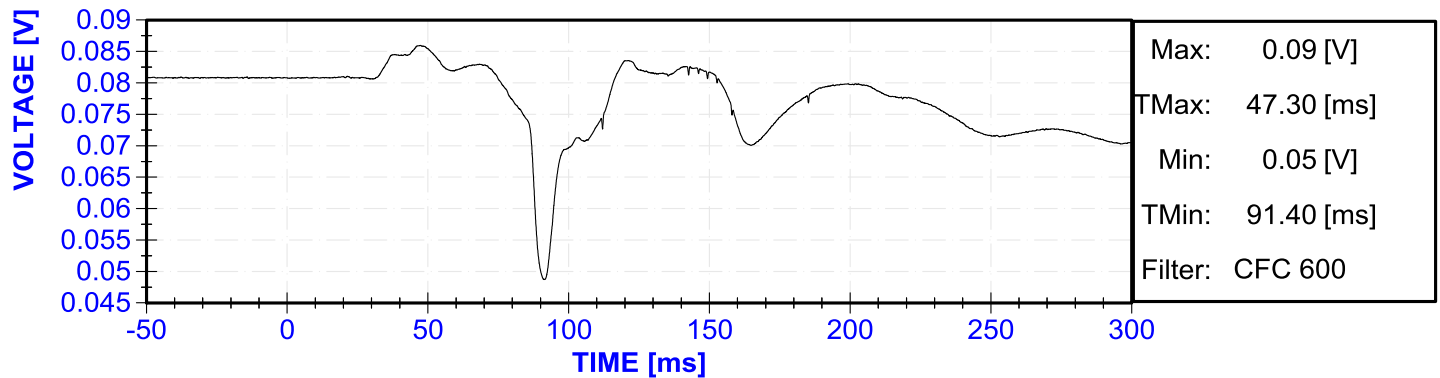
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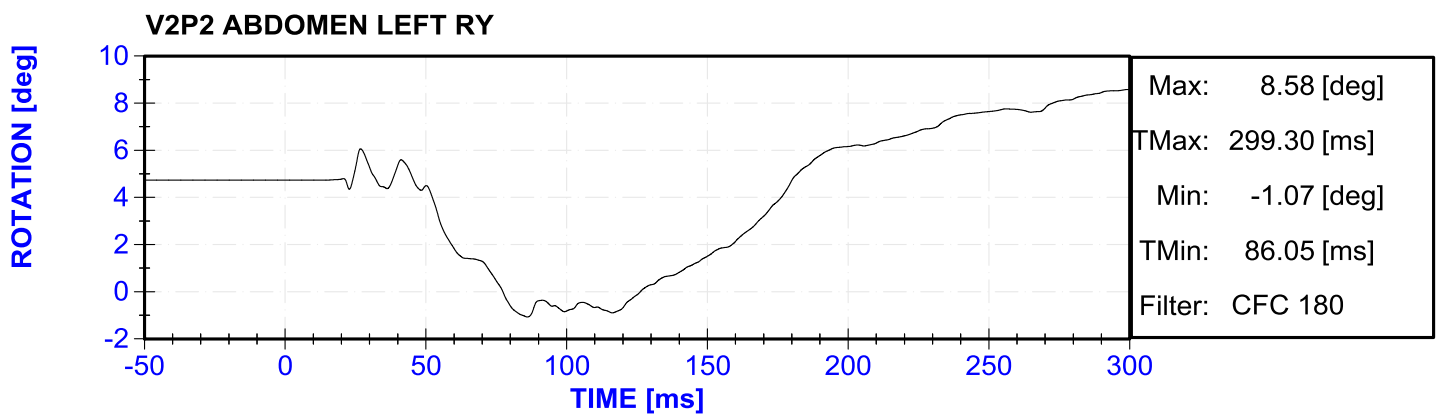
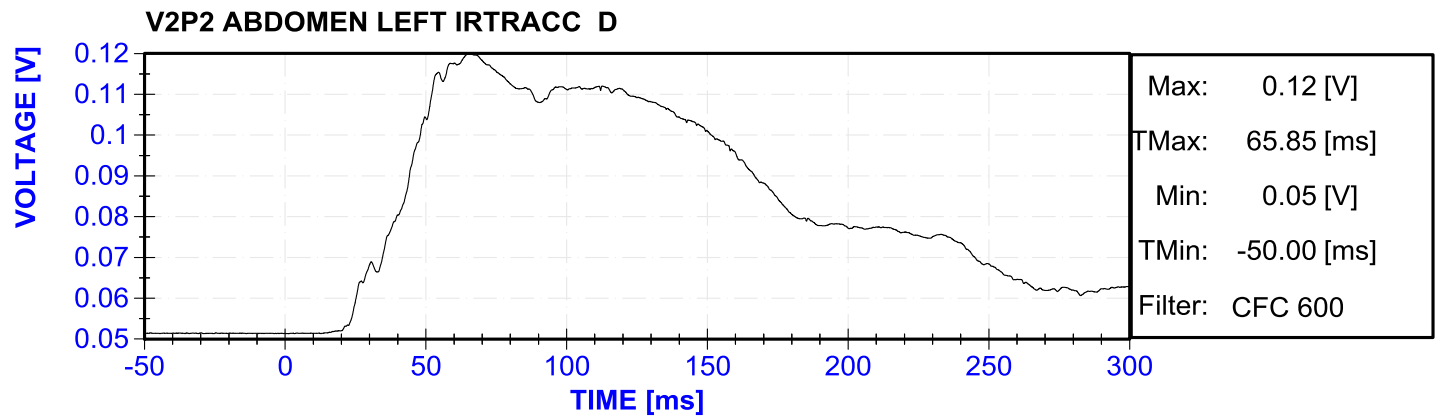
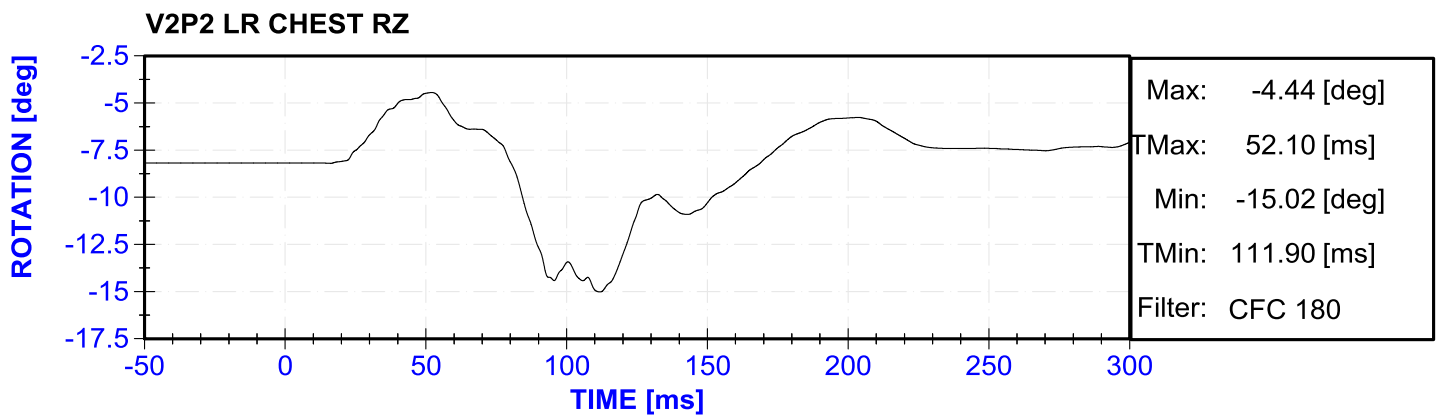
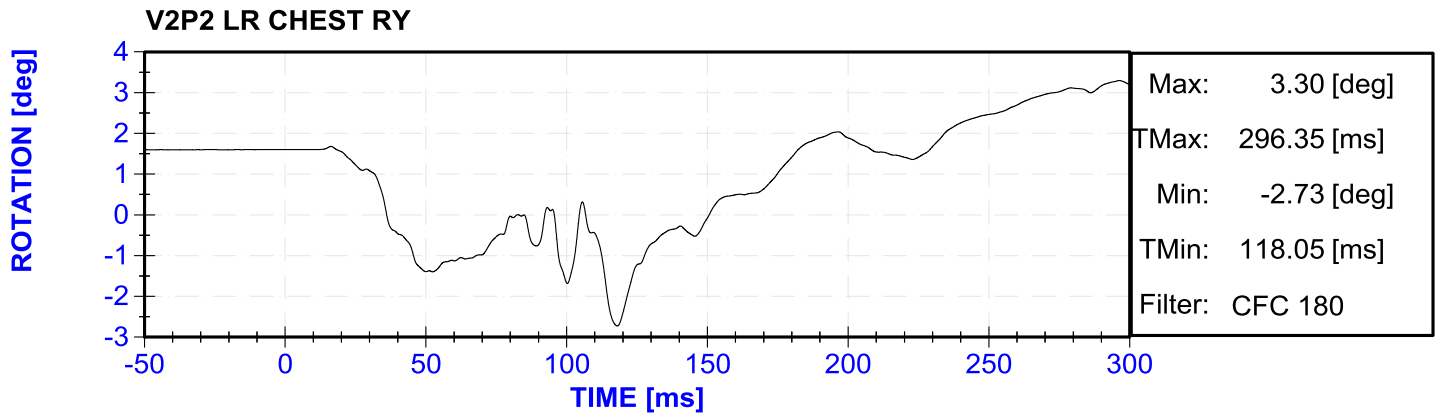


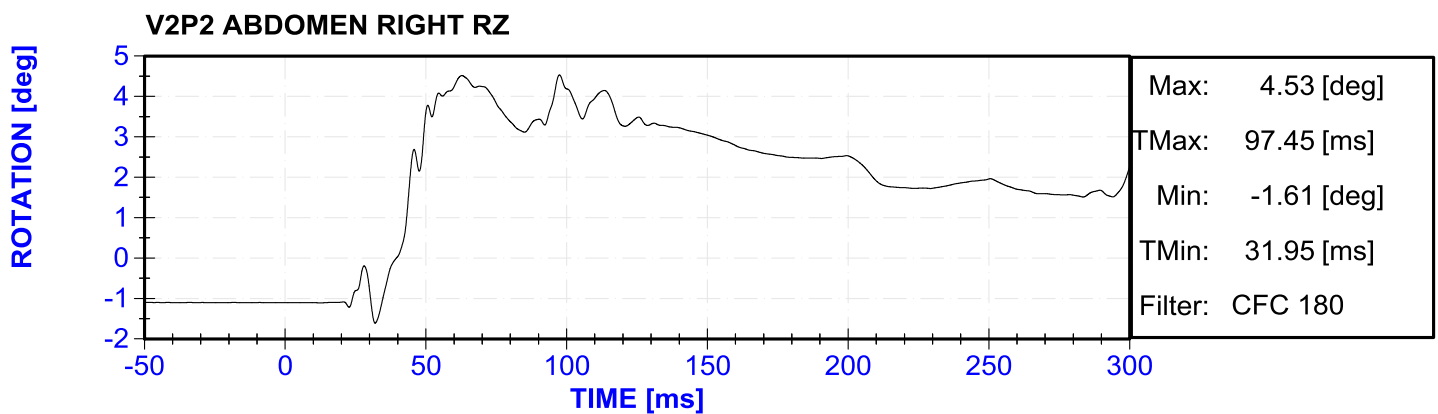
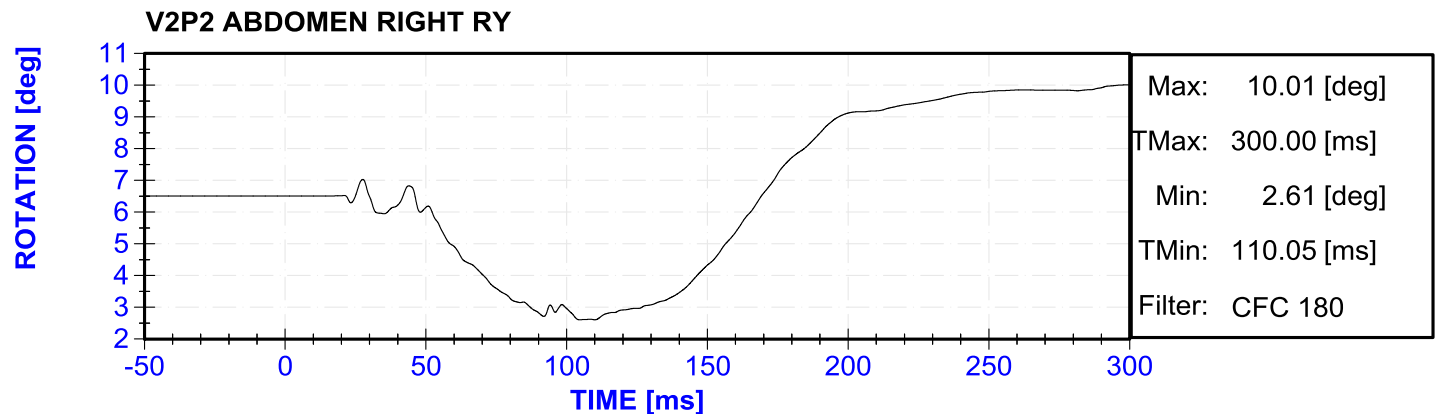
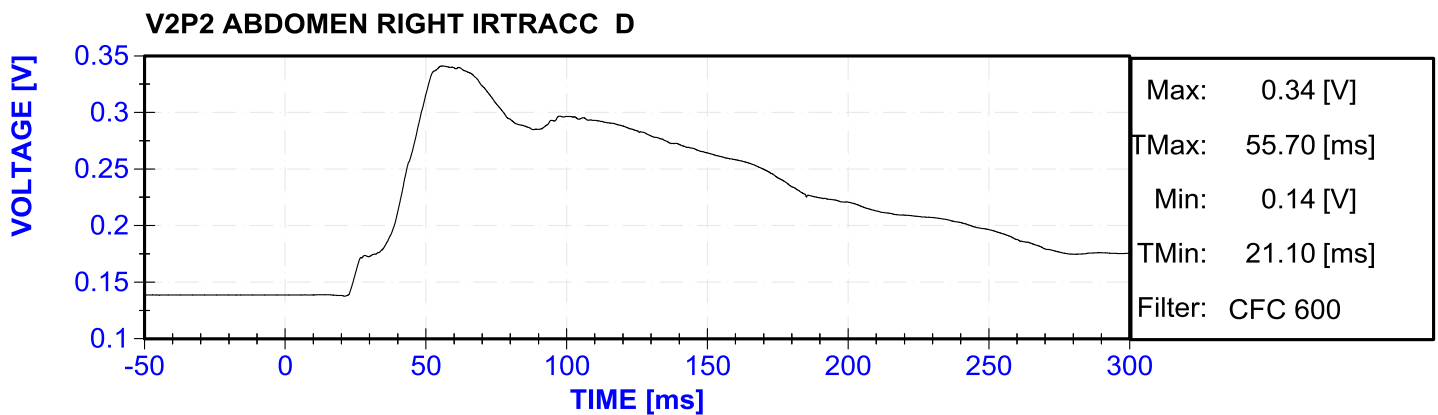
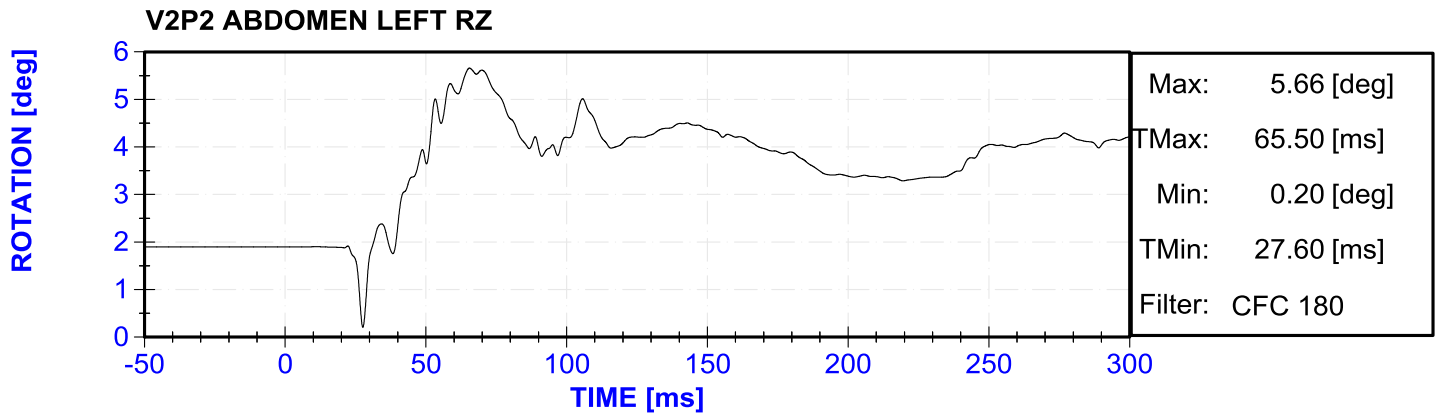
V2P2 LL CHEST RZ

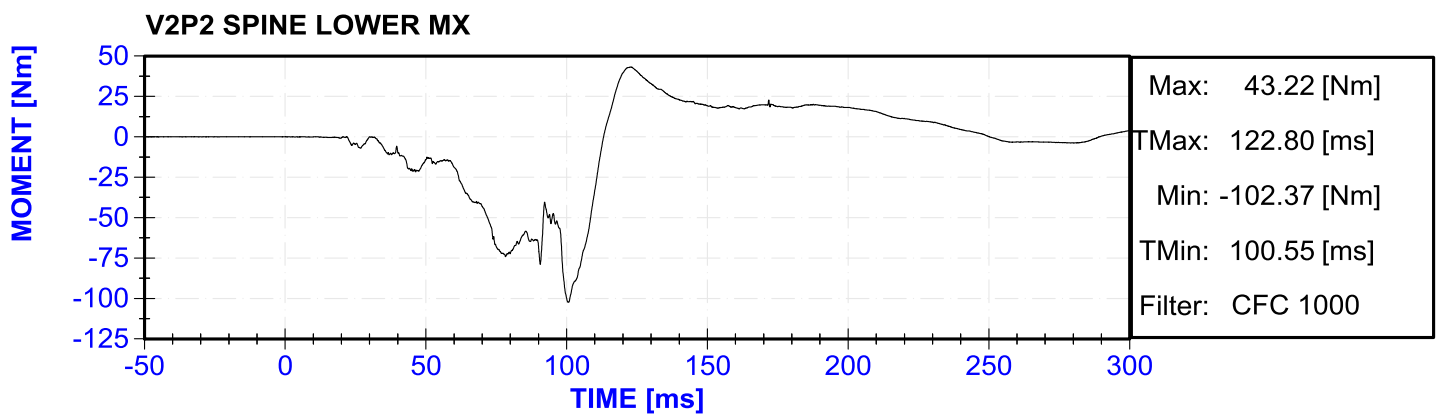
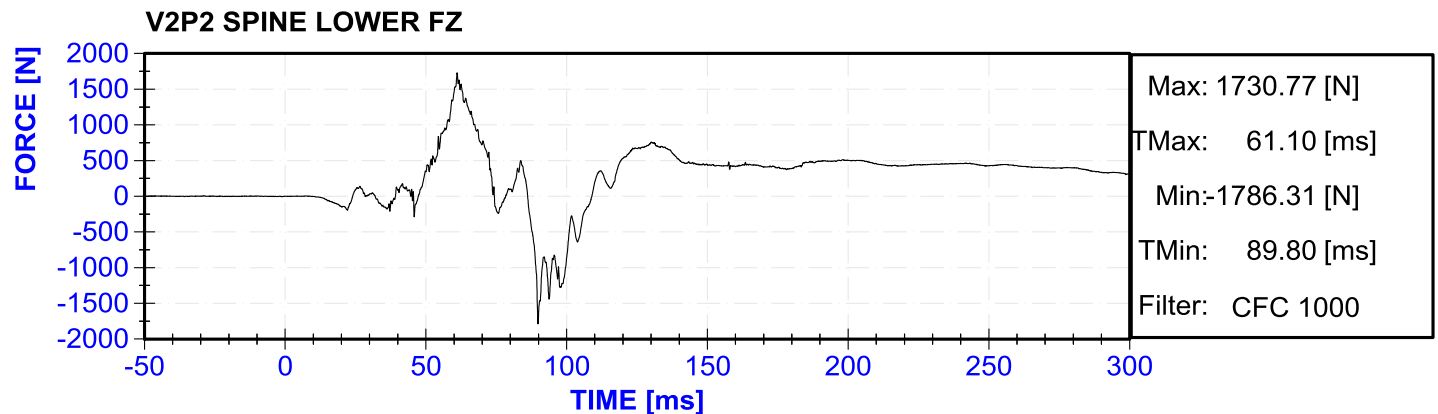
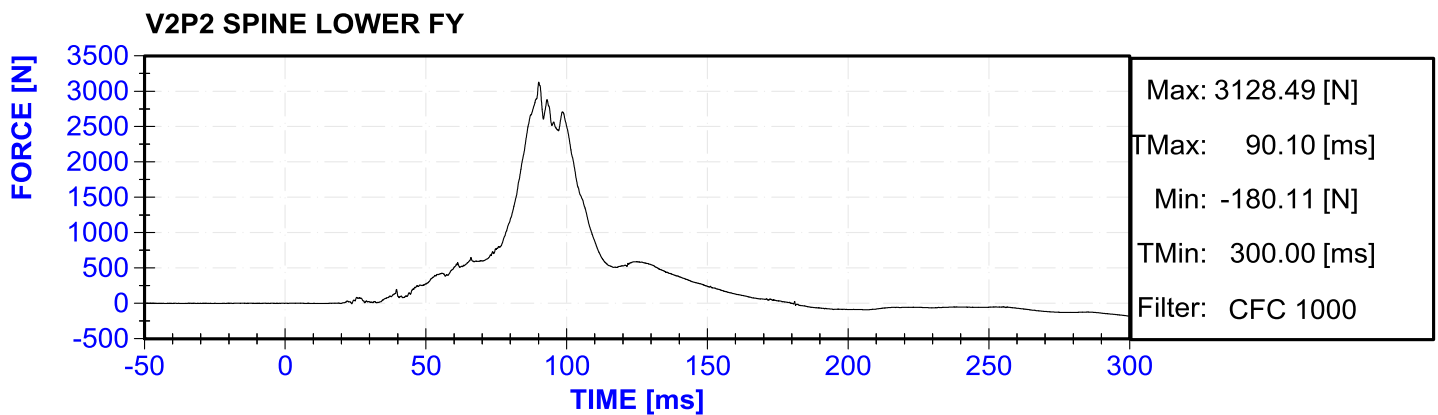
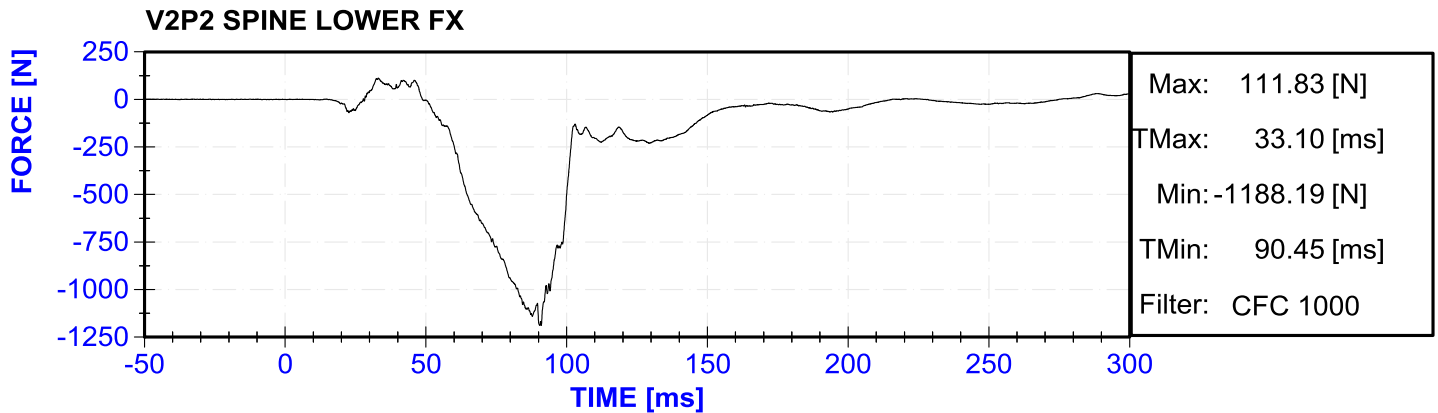


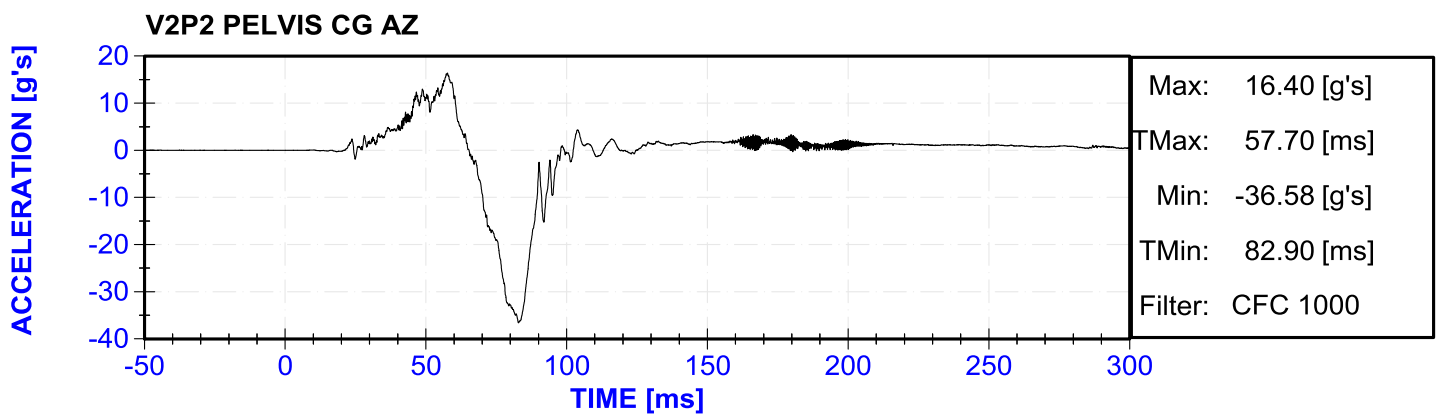
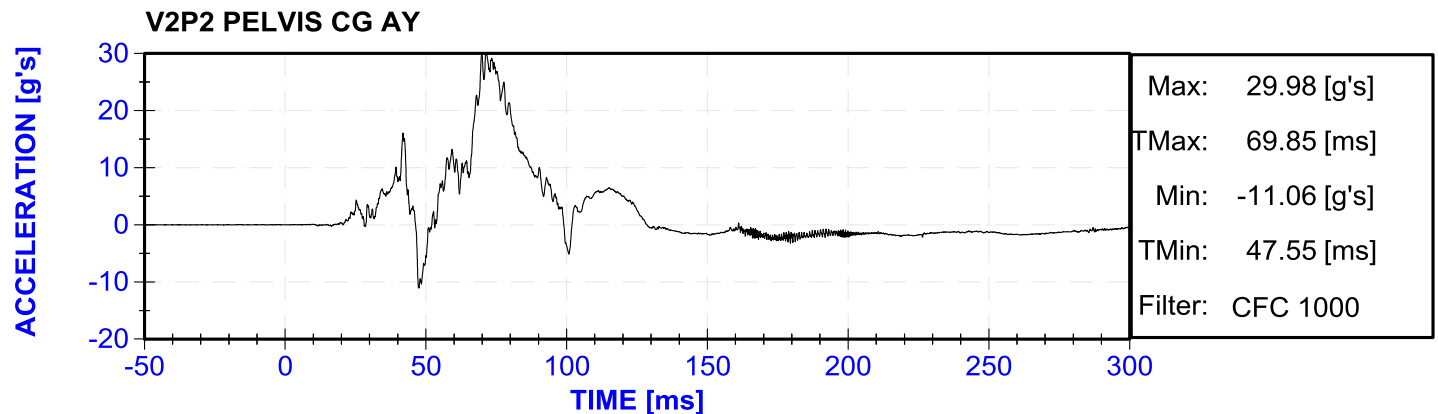
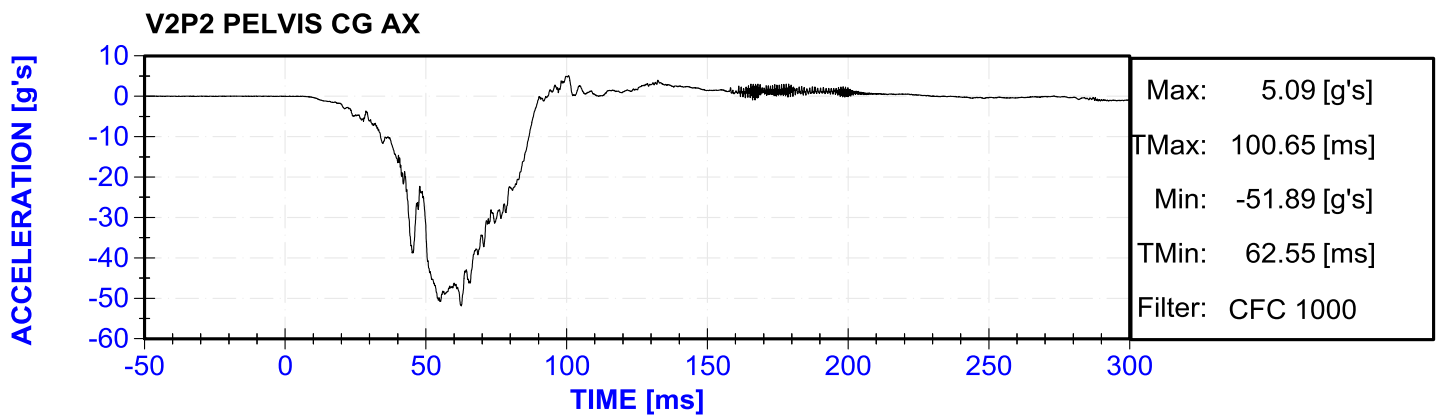
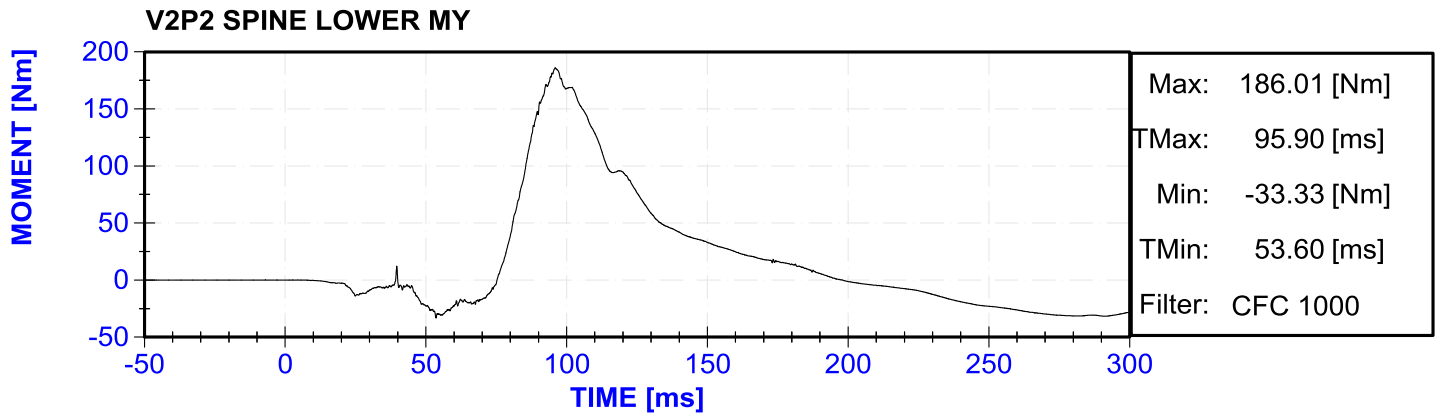
V2P2 LR CHEST IRTACC D



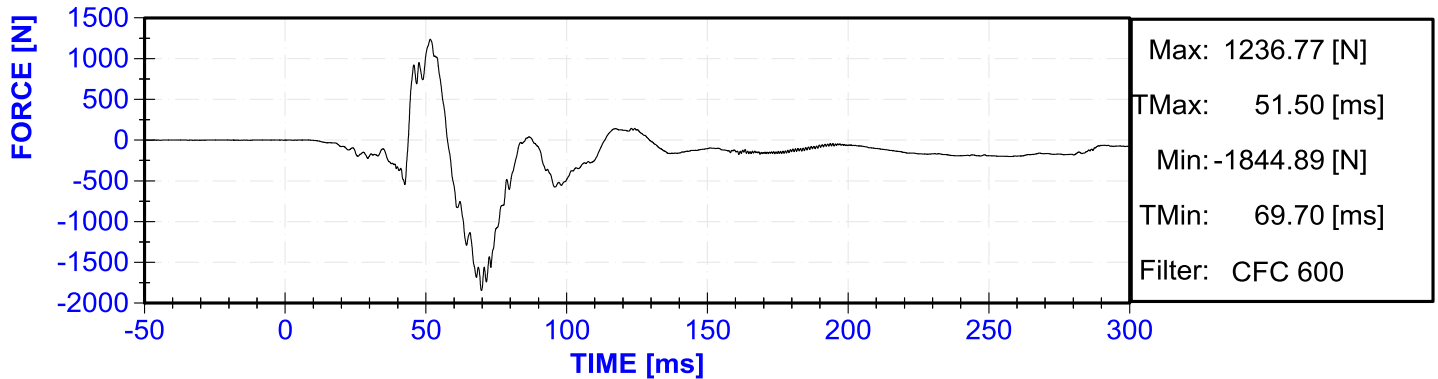




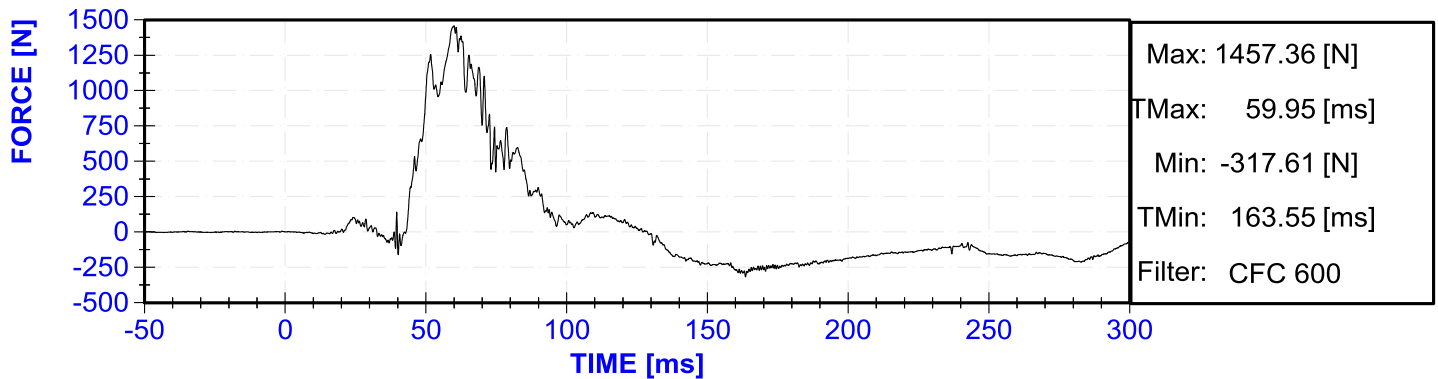




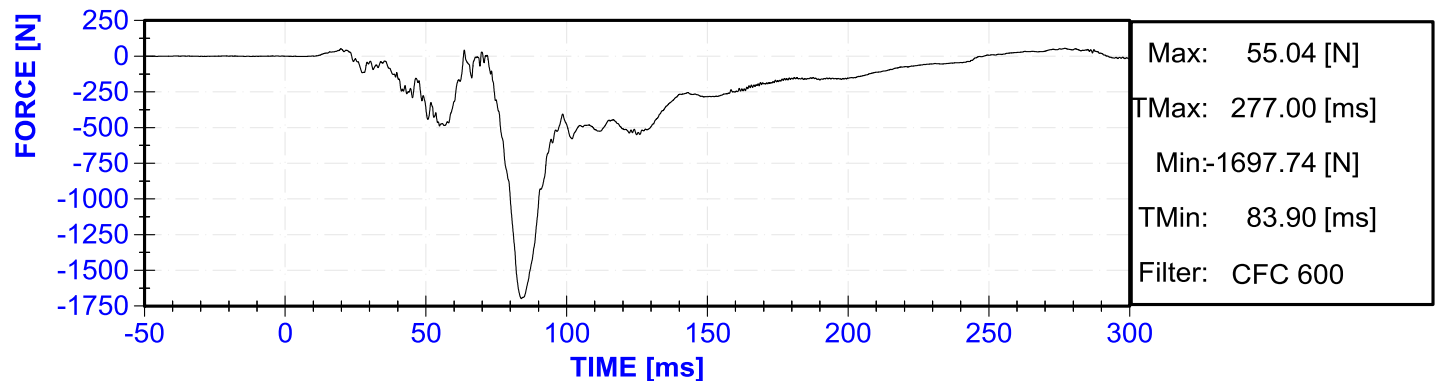
V2P2 PELVIS ACETABULUM LEFT FX



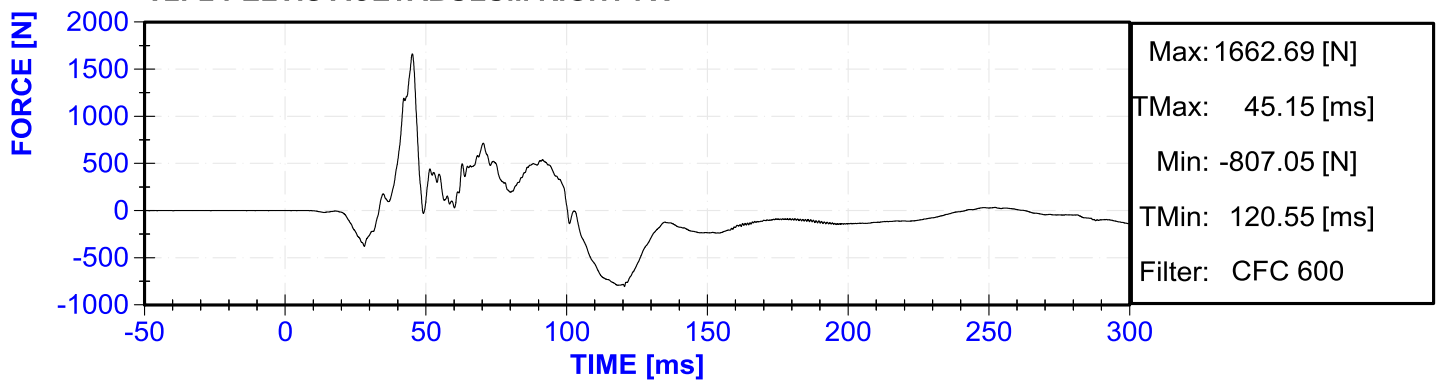
V2P2 PELVIS ACETABULUM LEFT FY



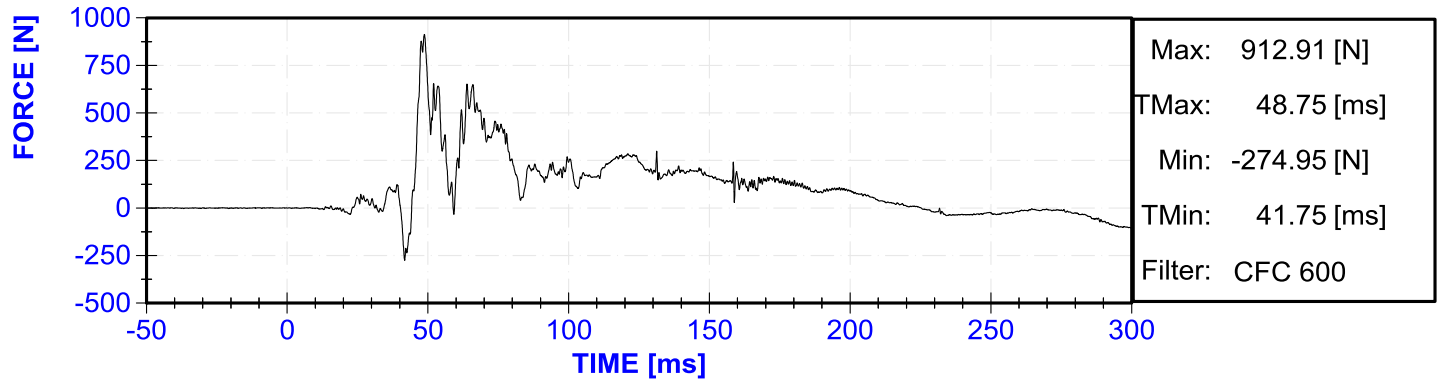
V2P2 PELVIS ACETABULUM LEFT FZ



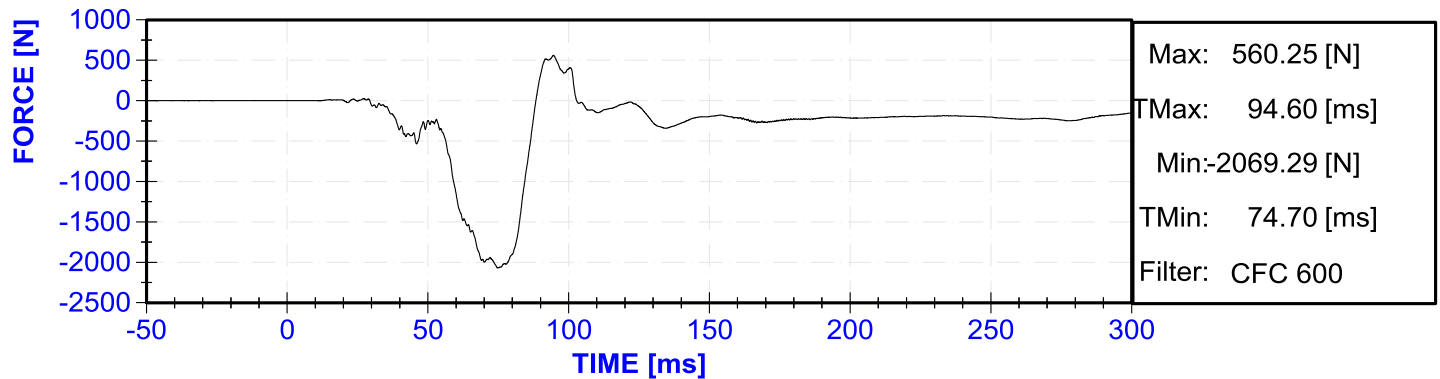
V2P2 PELVIS ACETABULUM RIGHT FX



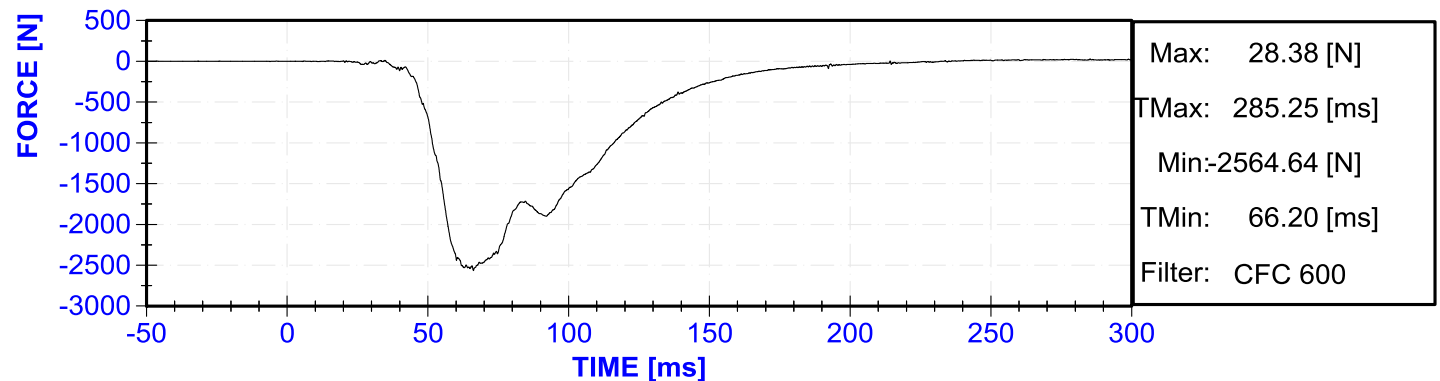
V2P2 PELVIS ACETABULUM RIGHT FY



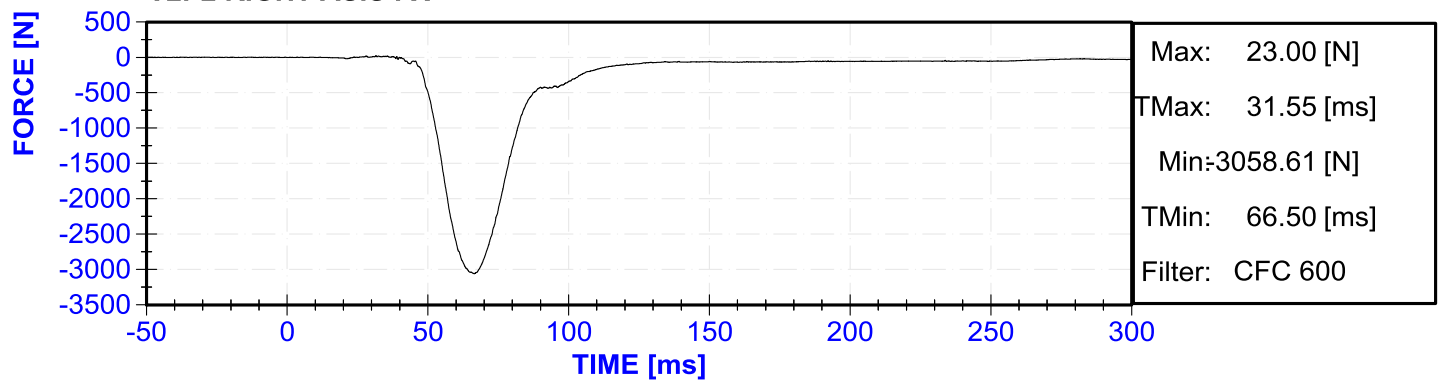
V2P2 PELVIS ACETABULUM RIGHT FZ

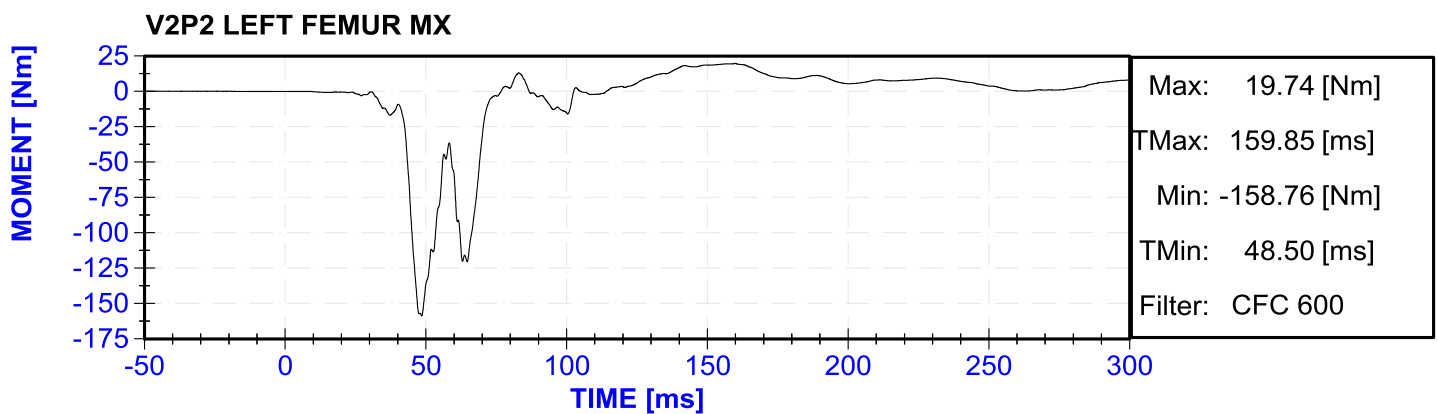
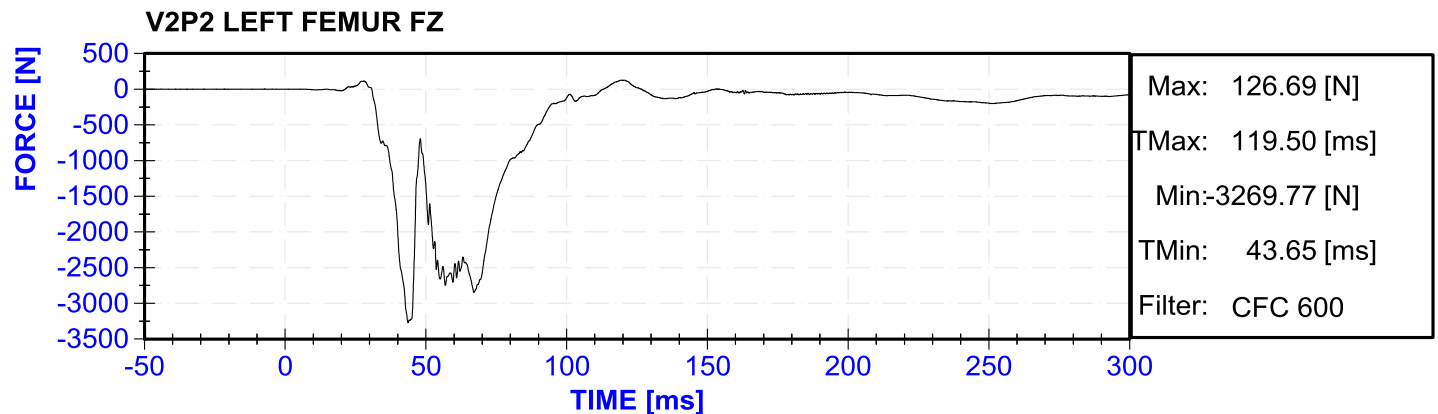
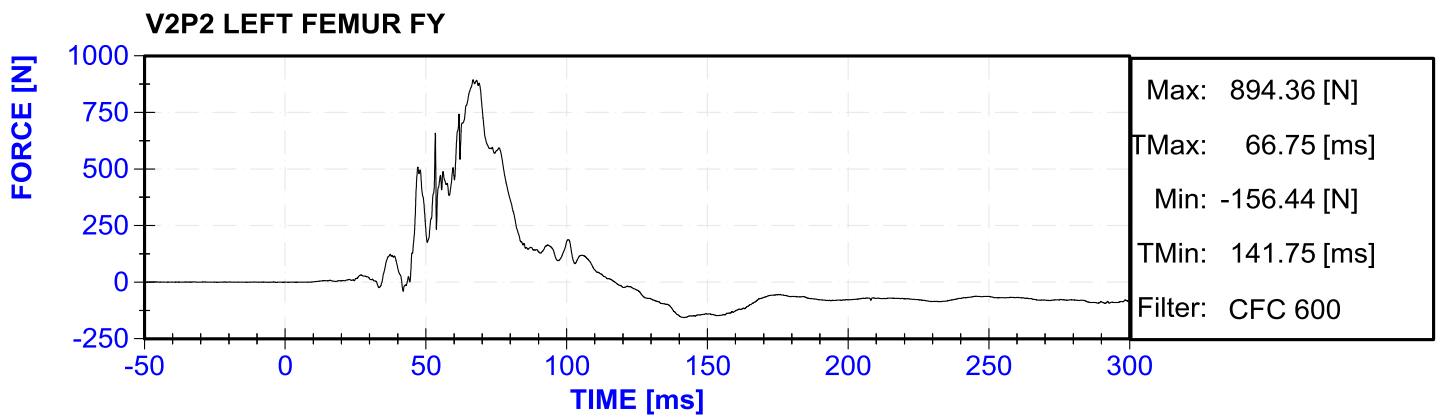
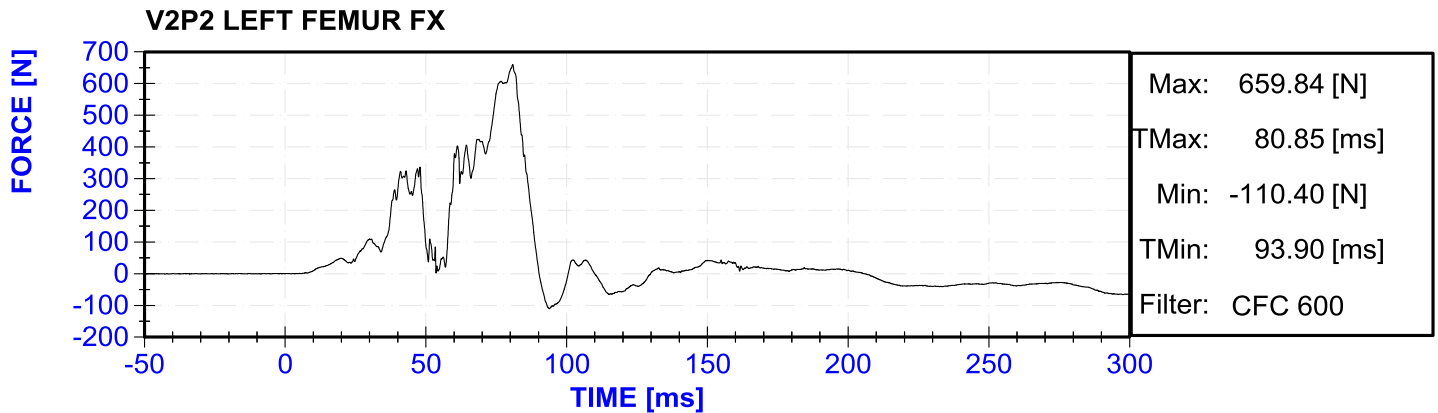


V2P2 LEFT ASIS FX

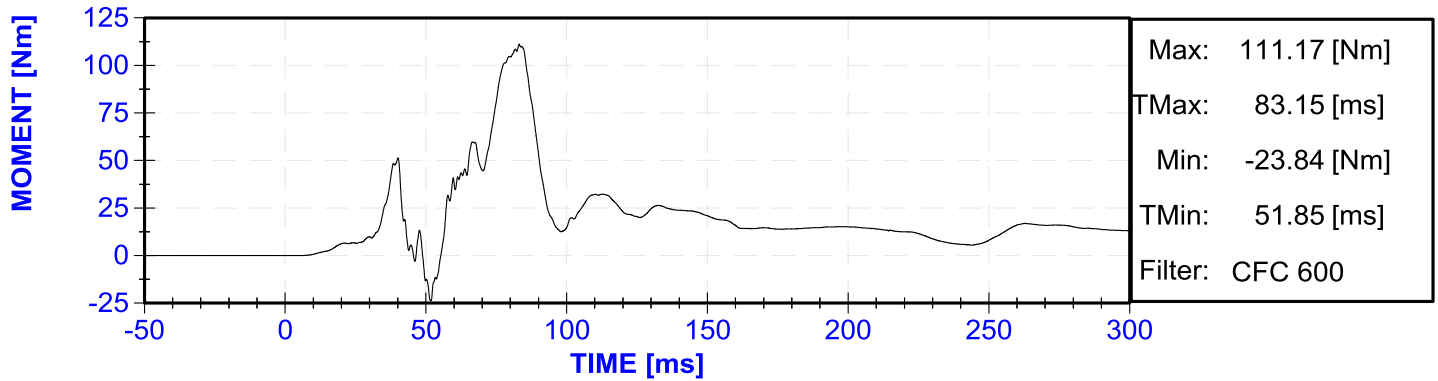


V2P2 RIGHT ASIS FX

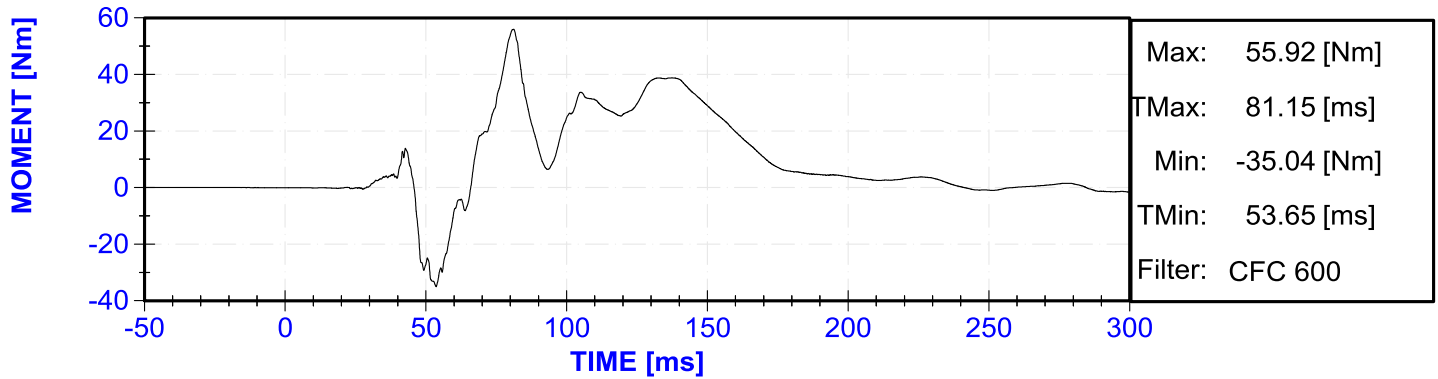




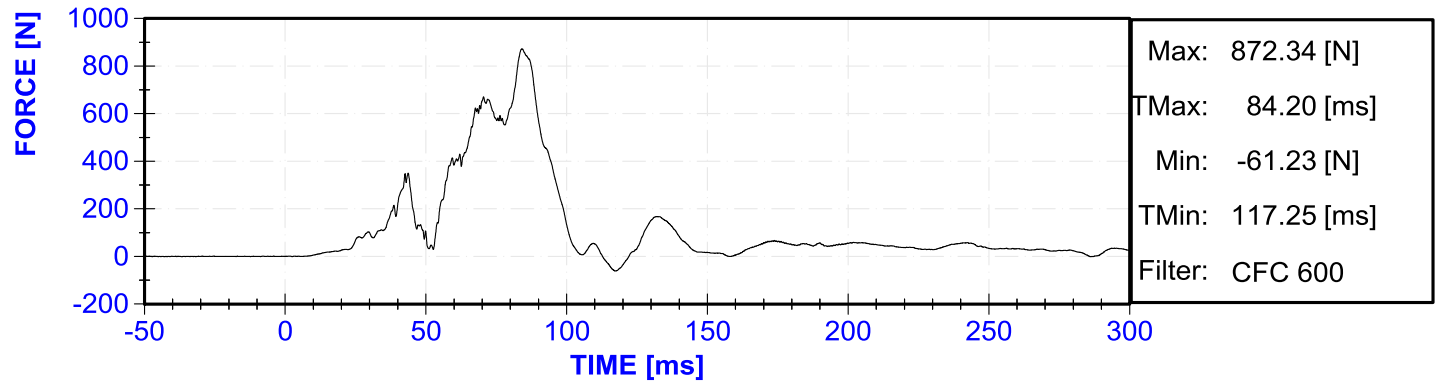
V2P2 LEFT FEMUR MY



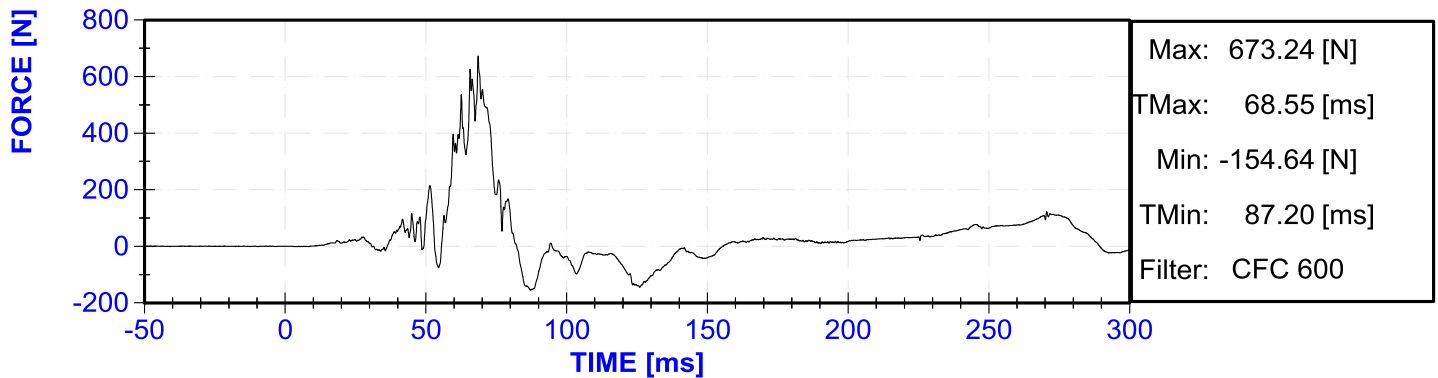
V2P2 LEFT FEMUR MZ

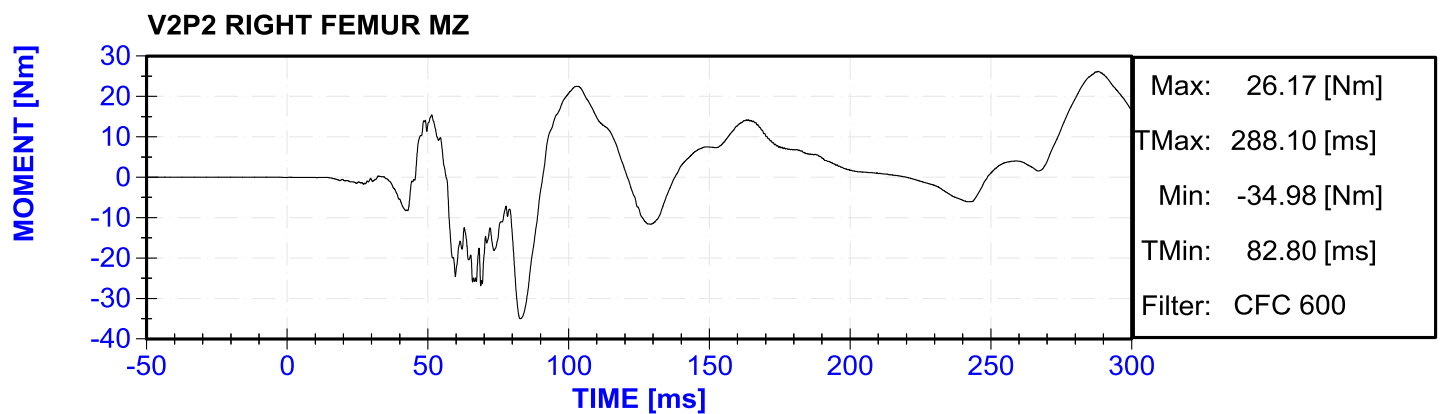
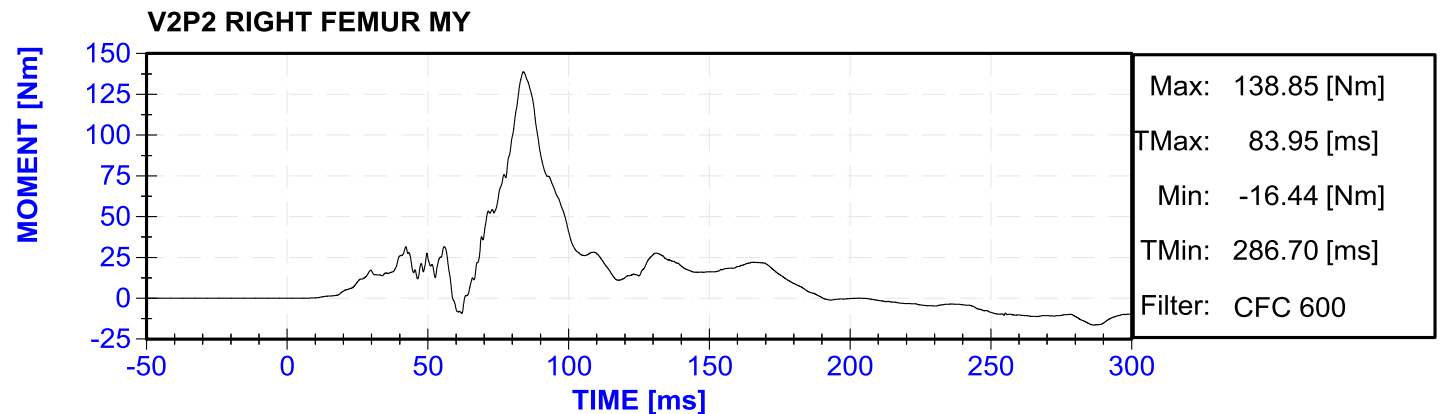
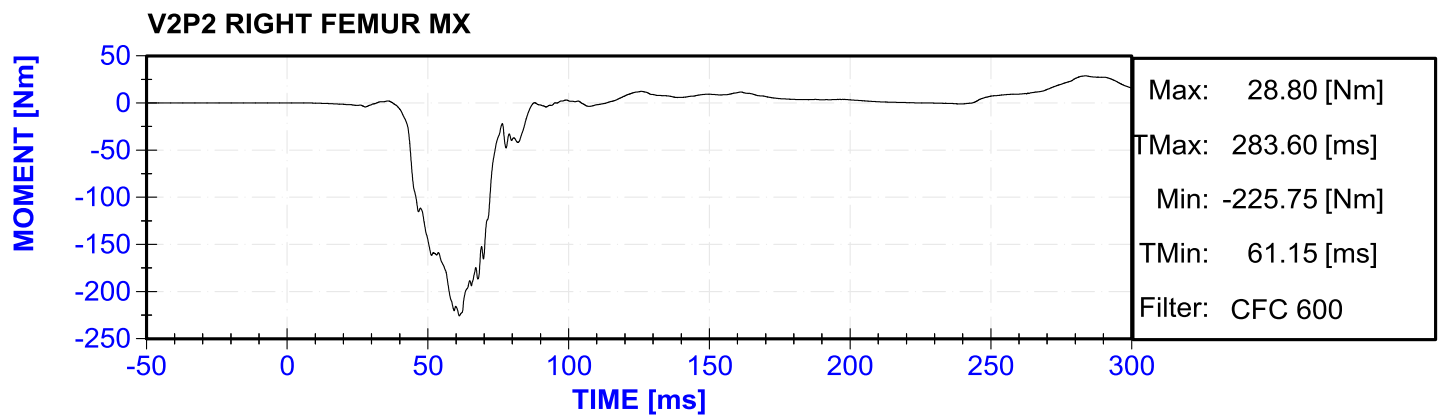
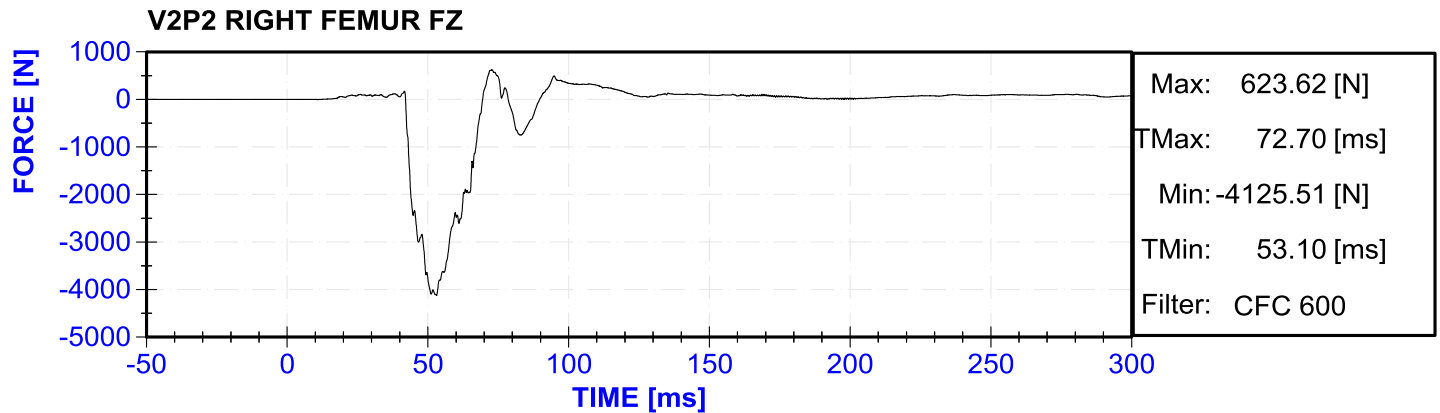


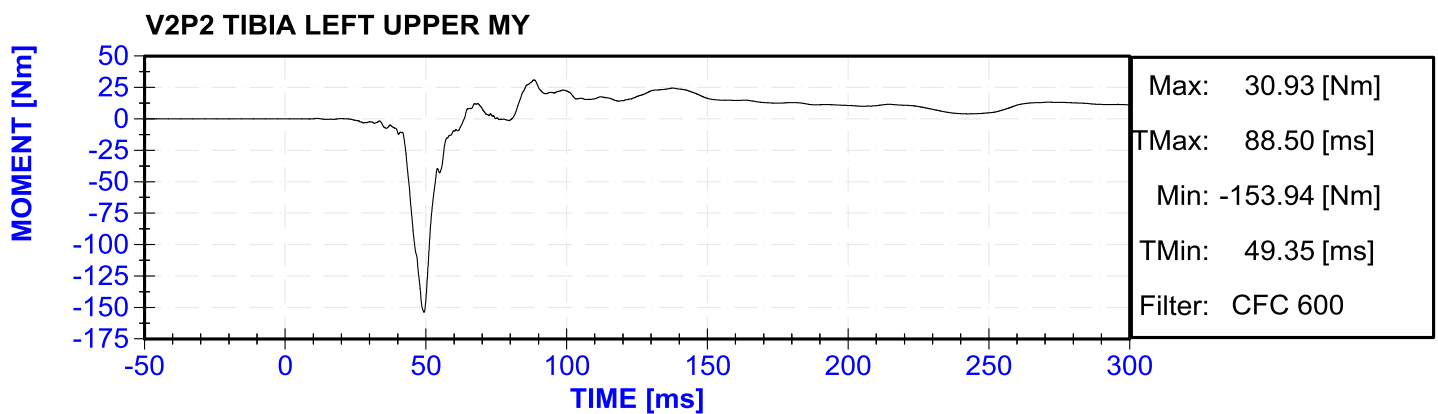
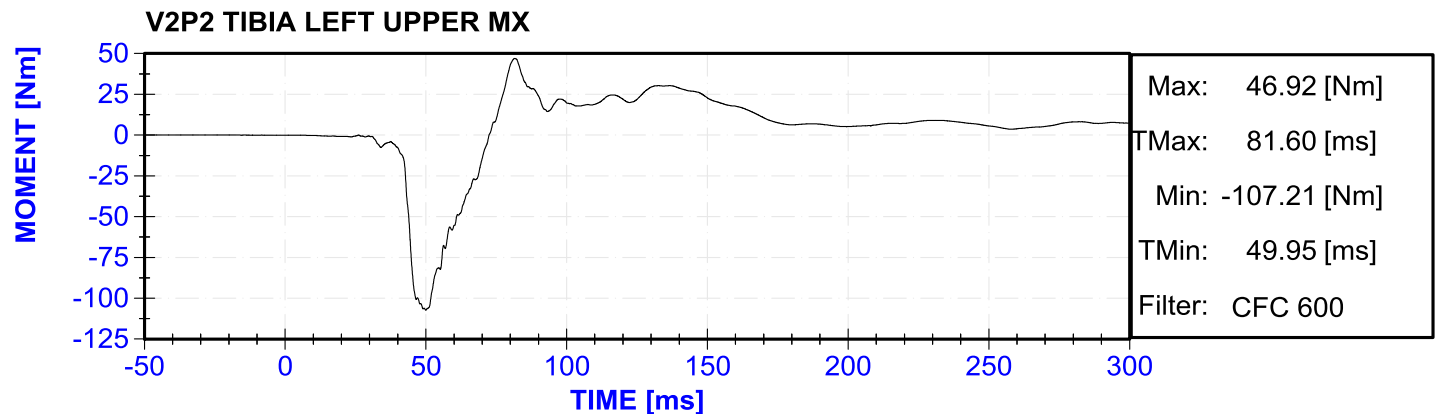
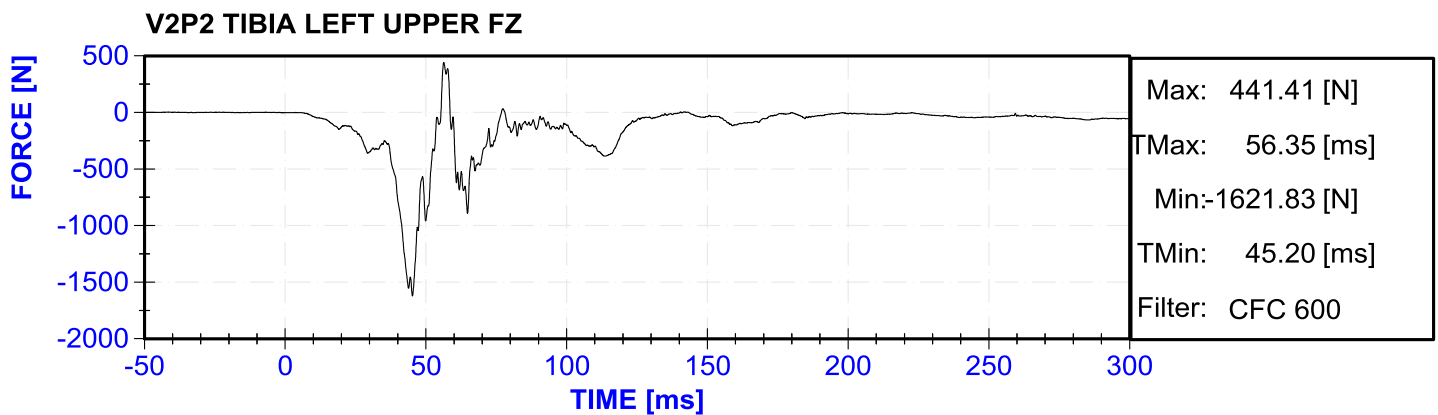
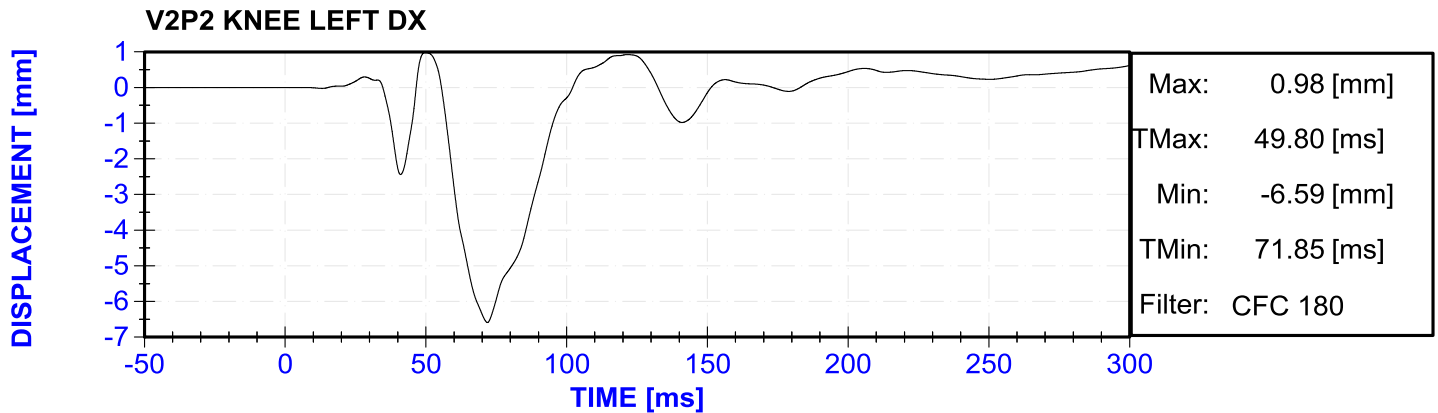
V2P2 RIGHT FEMUR FX

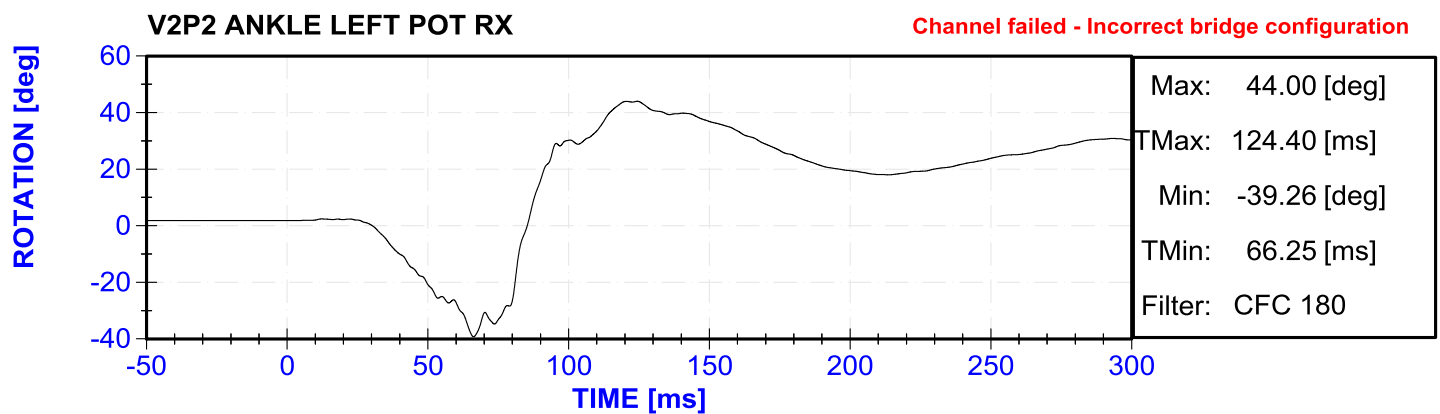
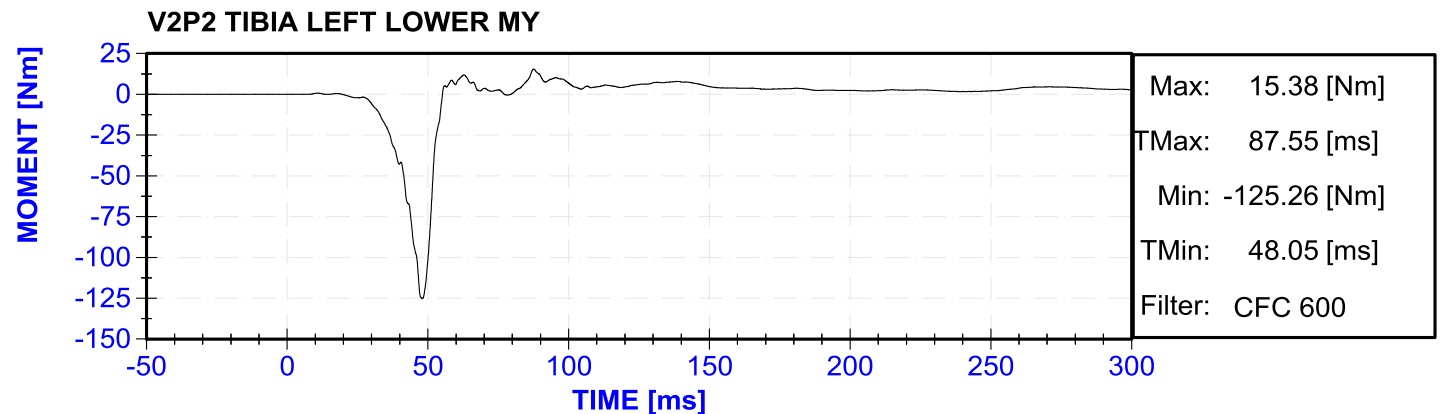
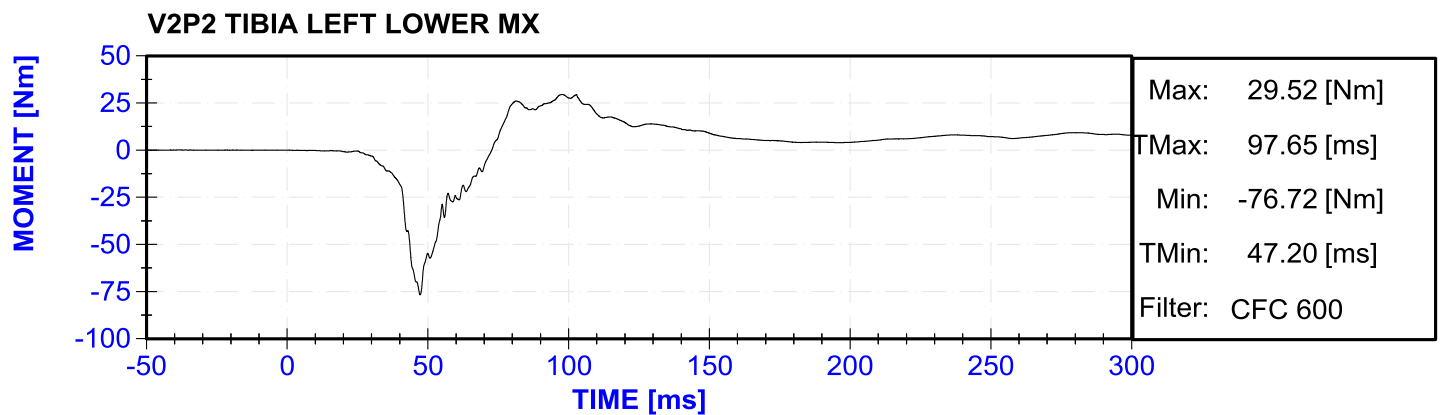
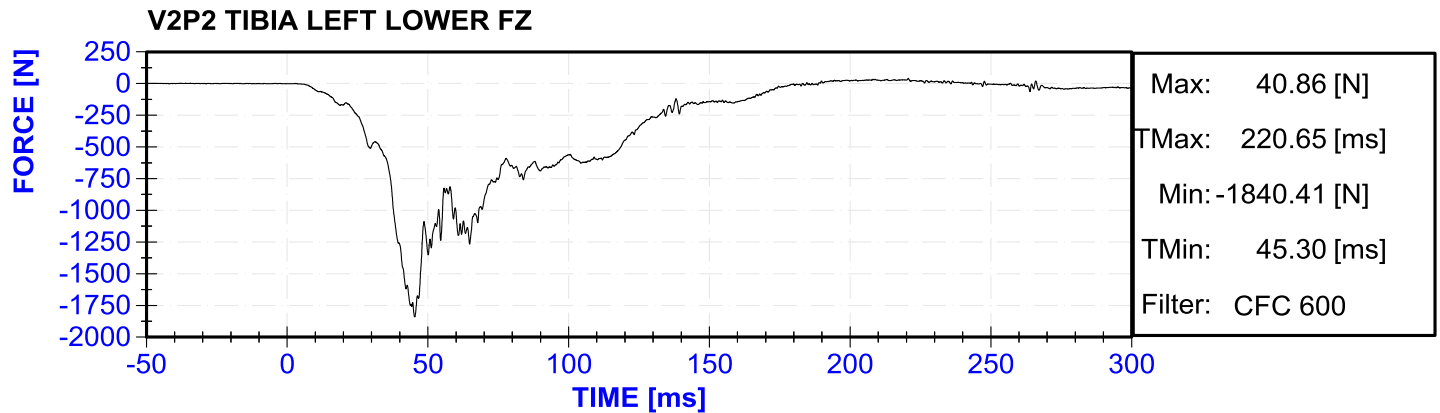


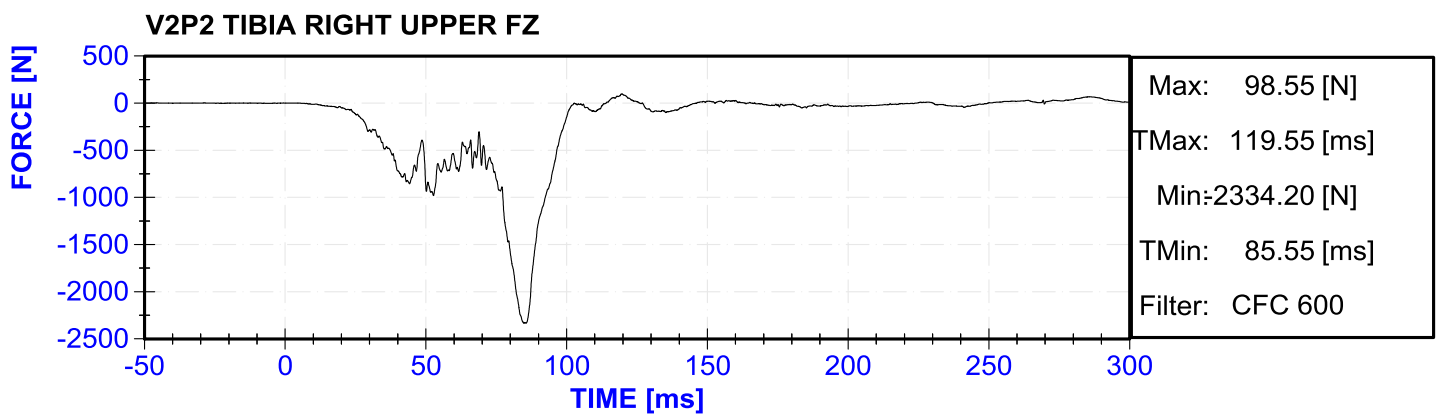
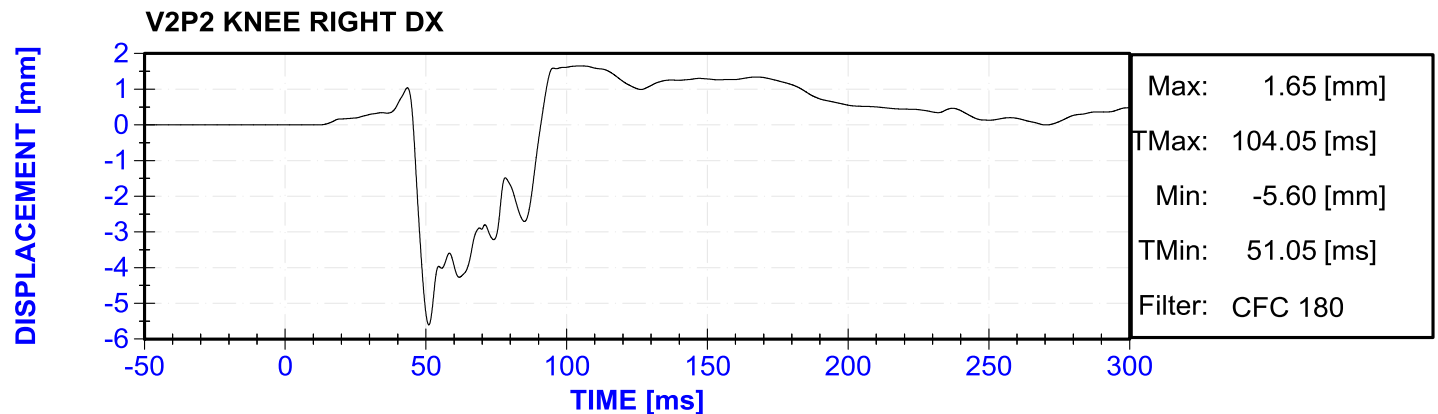
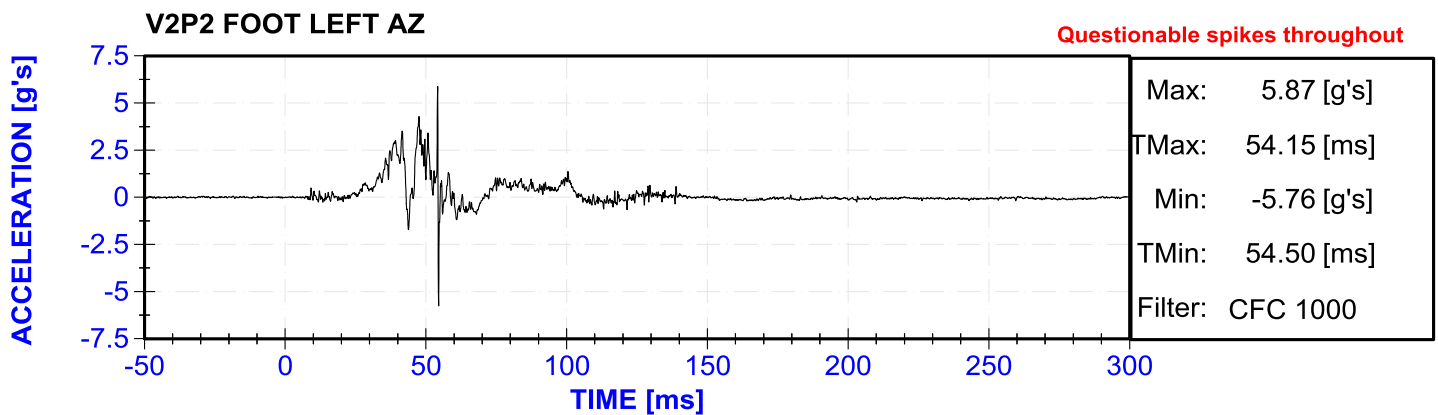
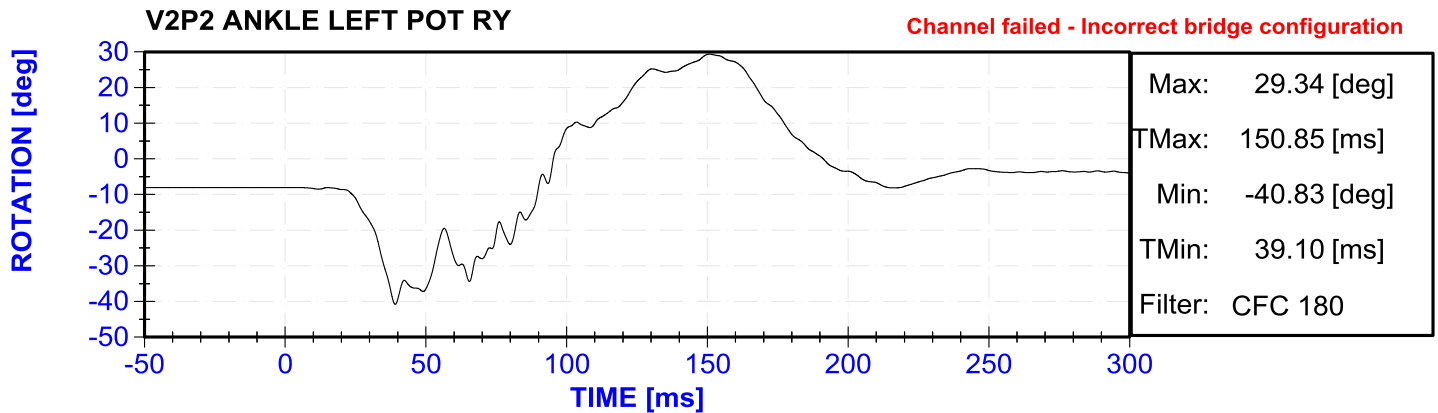
V2P2 RIGHT FEMUR FY

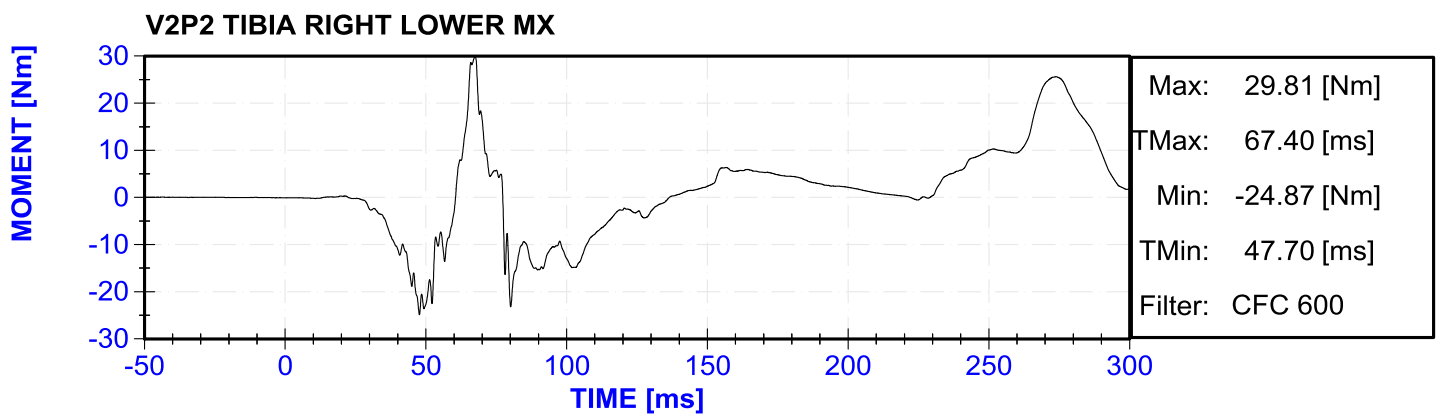
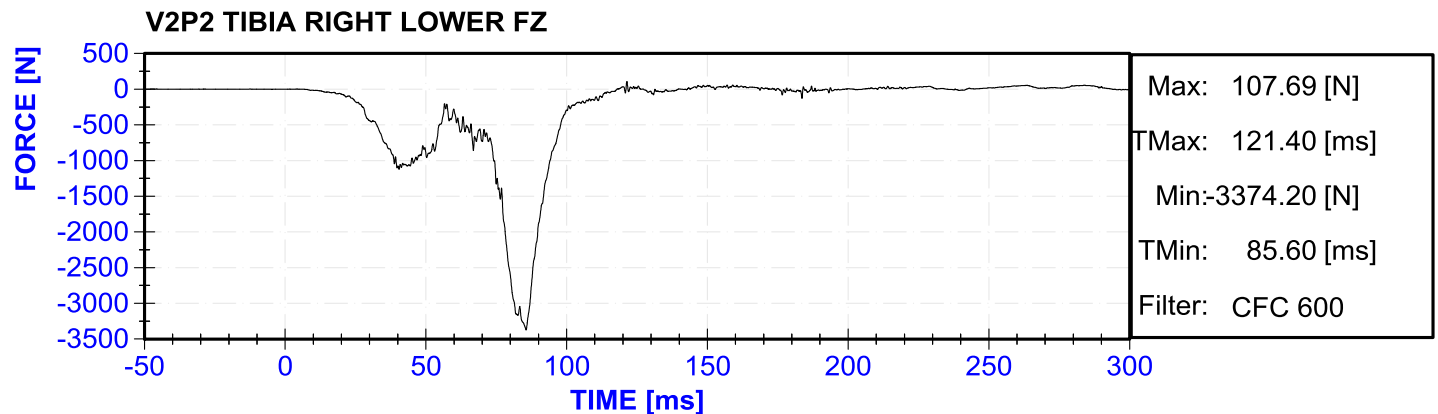
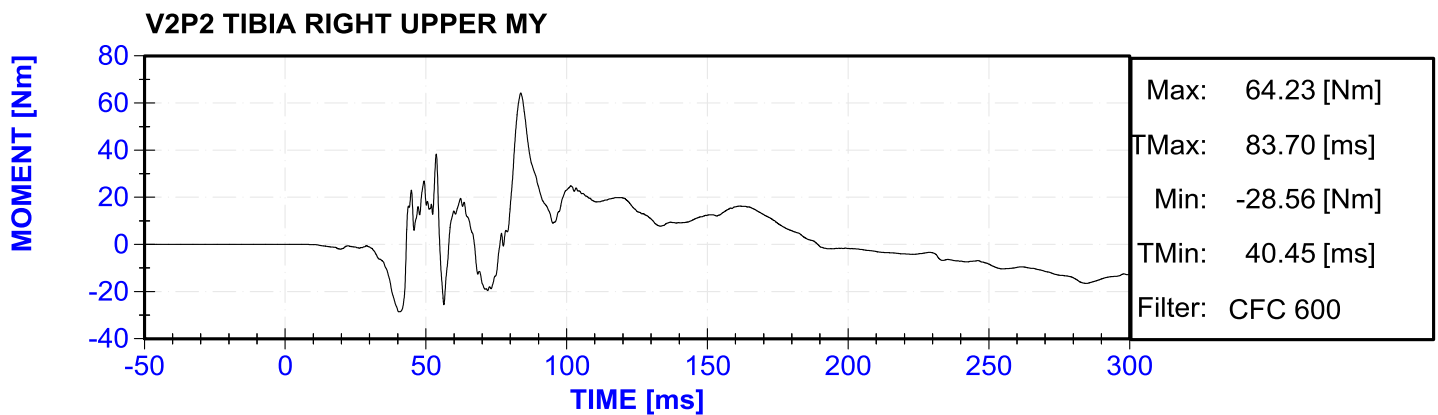
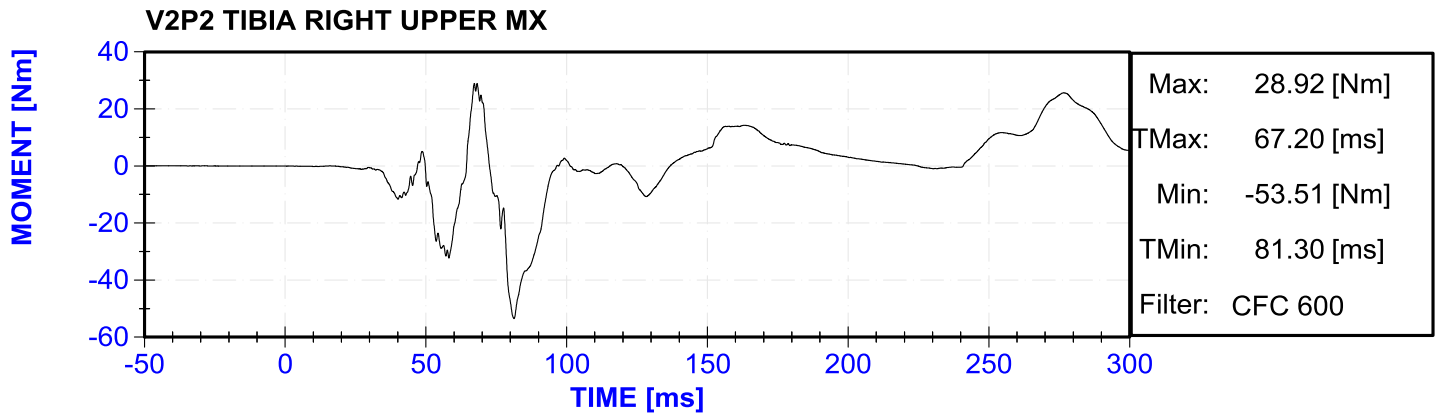


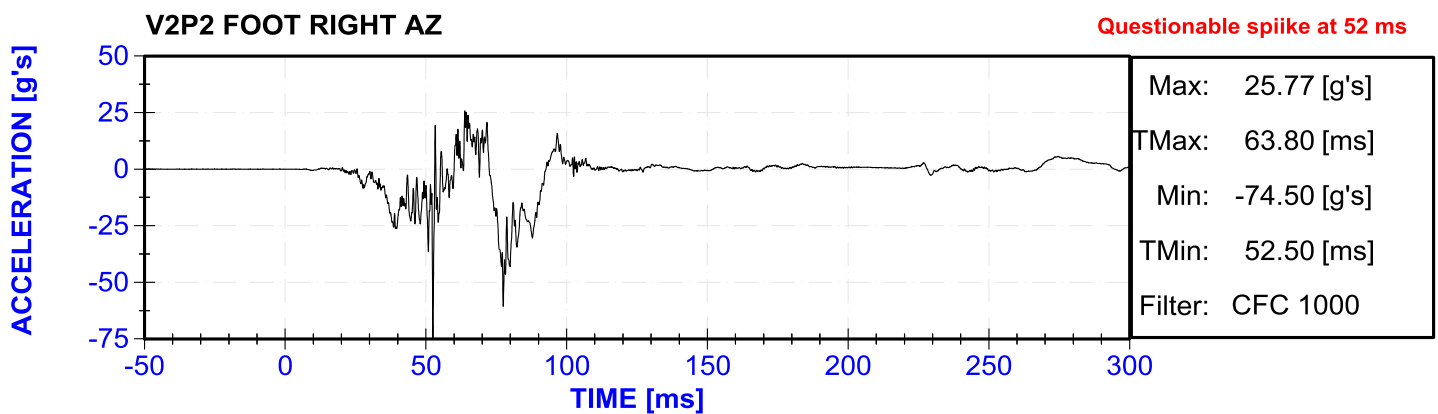
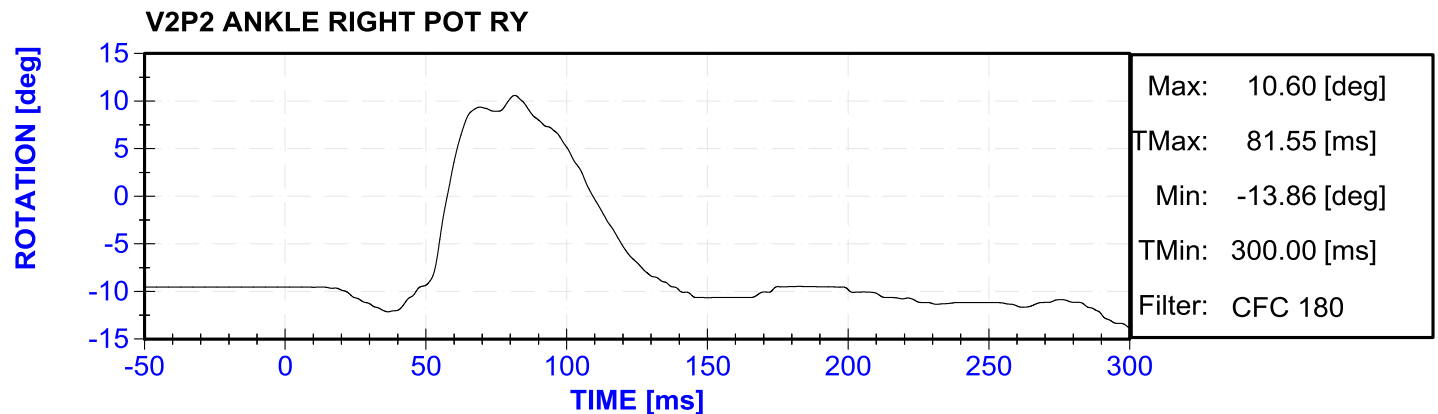
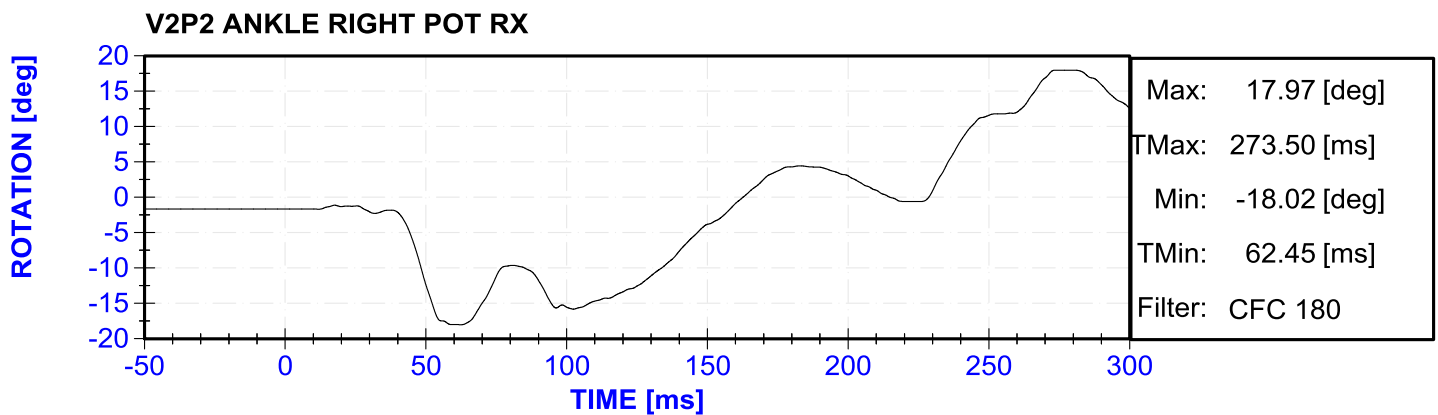
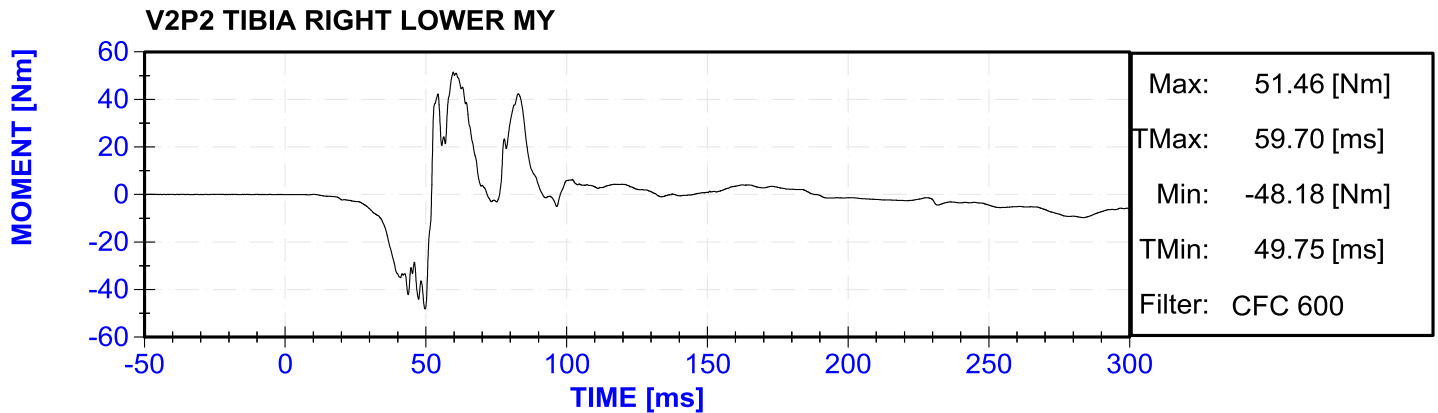




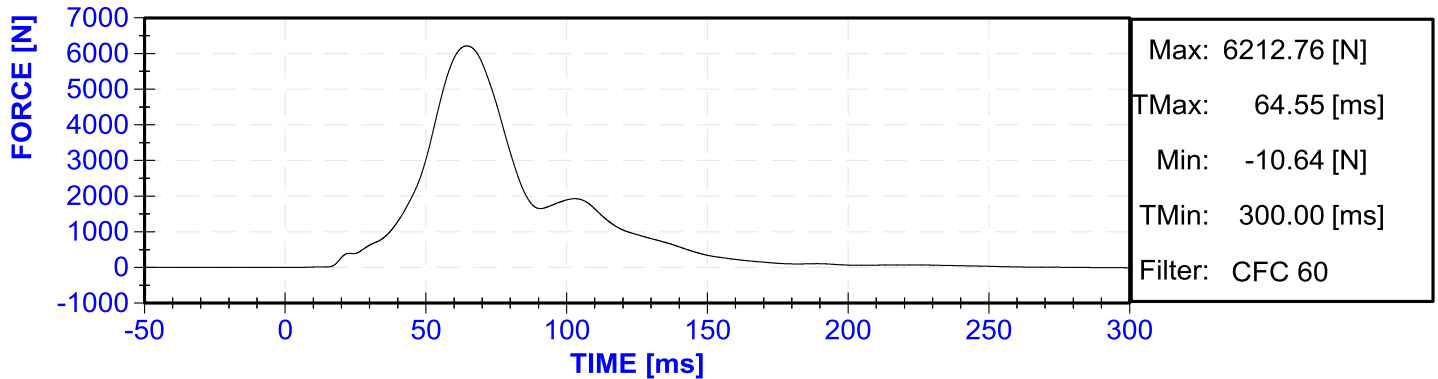




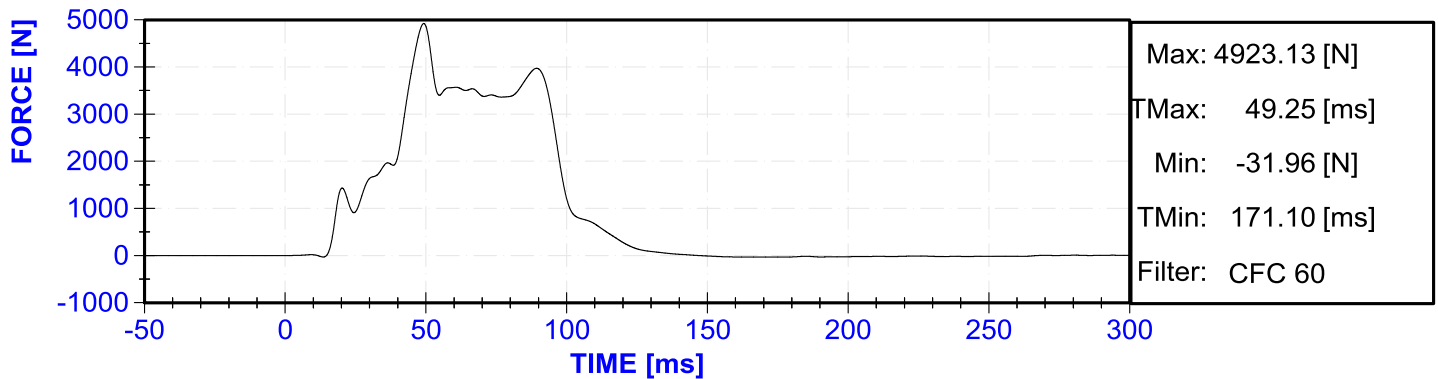




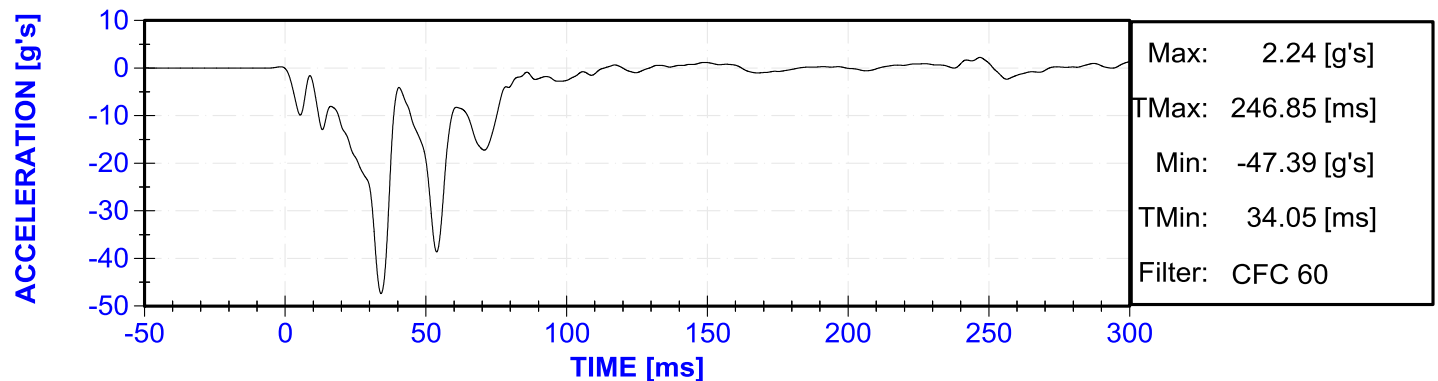
V2 P2 PASSENGER LAP BELT



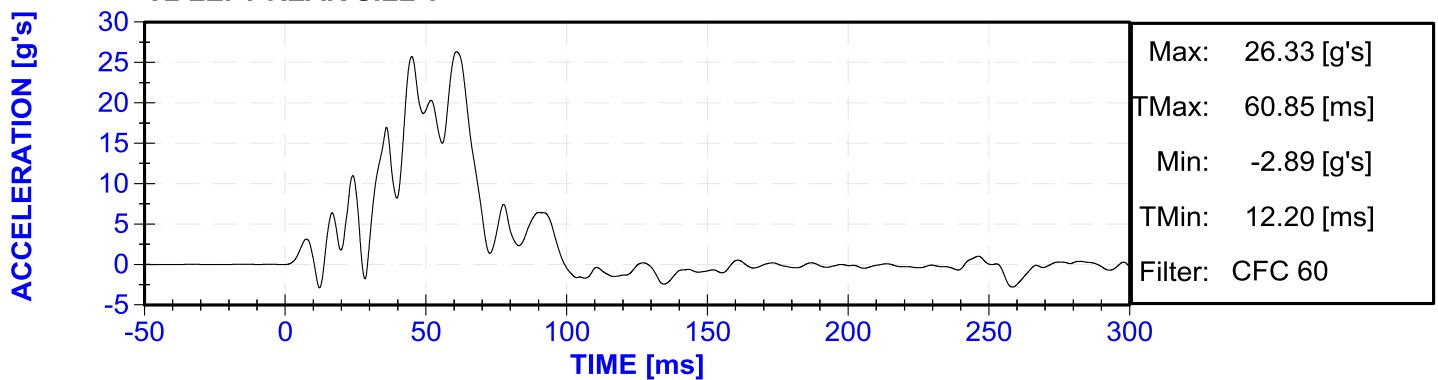
V2 P2 PASSENGER SHOULDER BELT

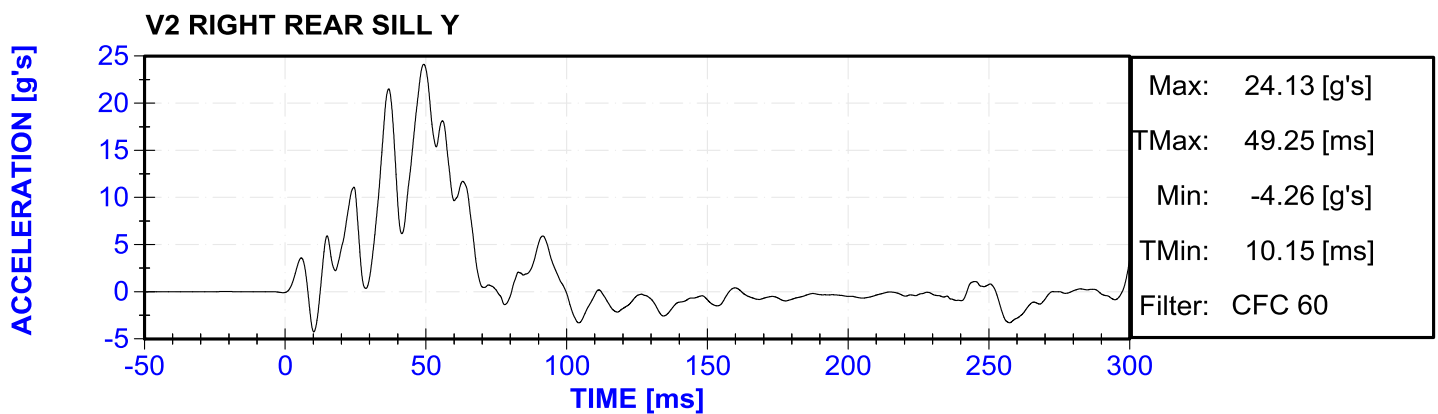
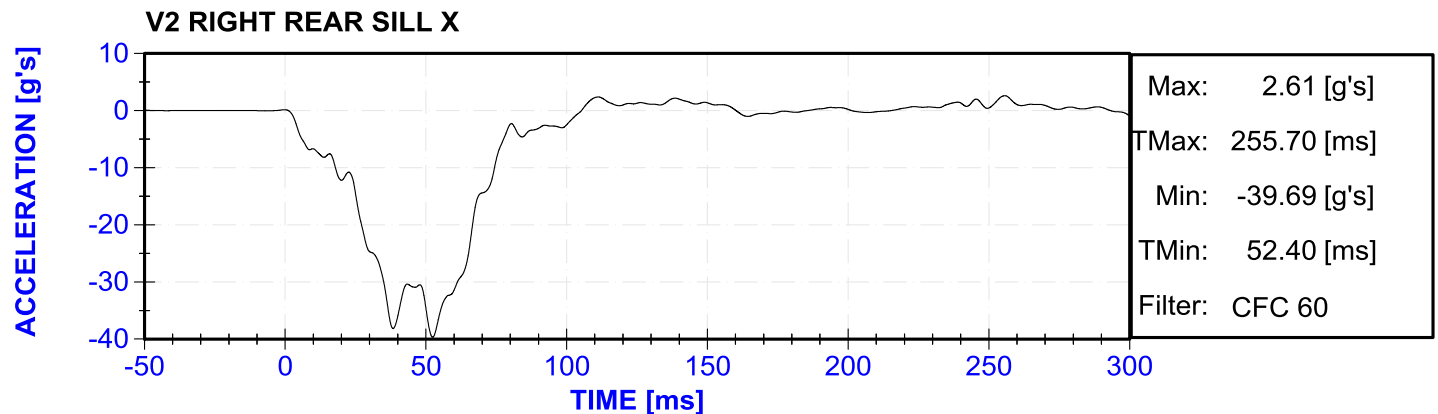
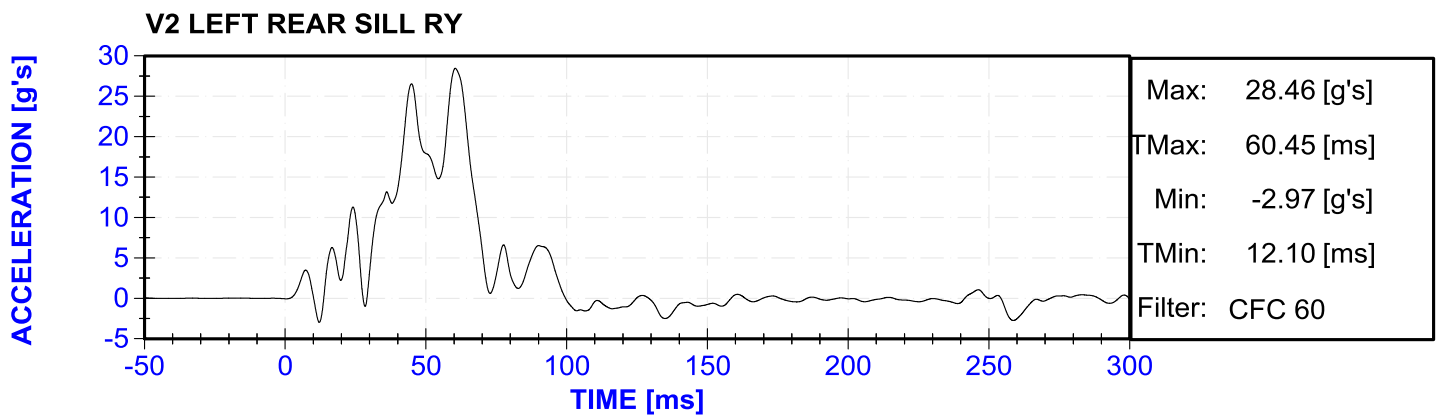
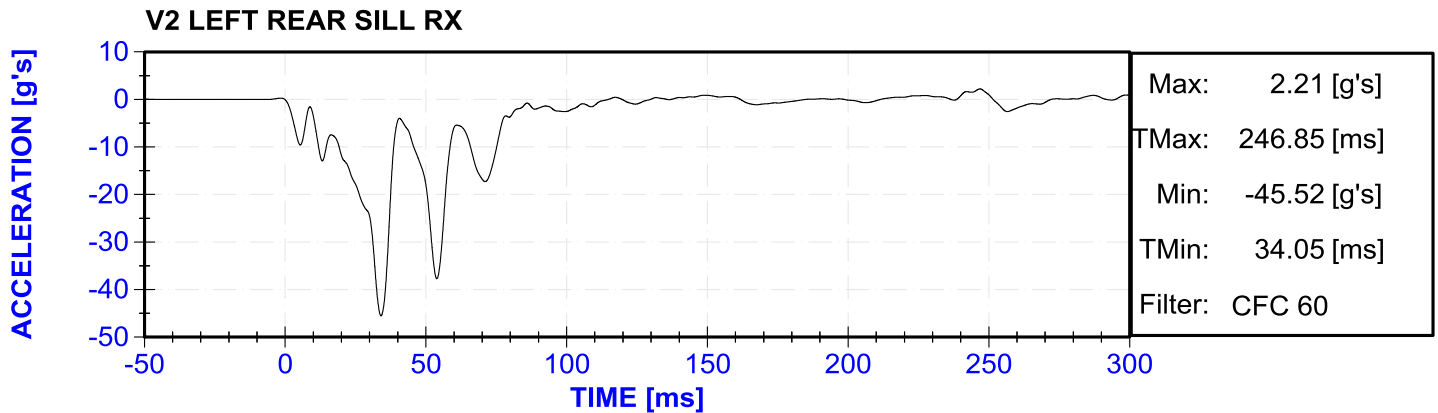


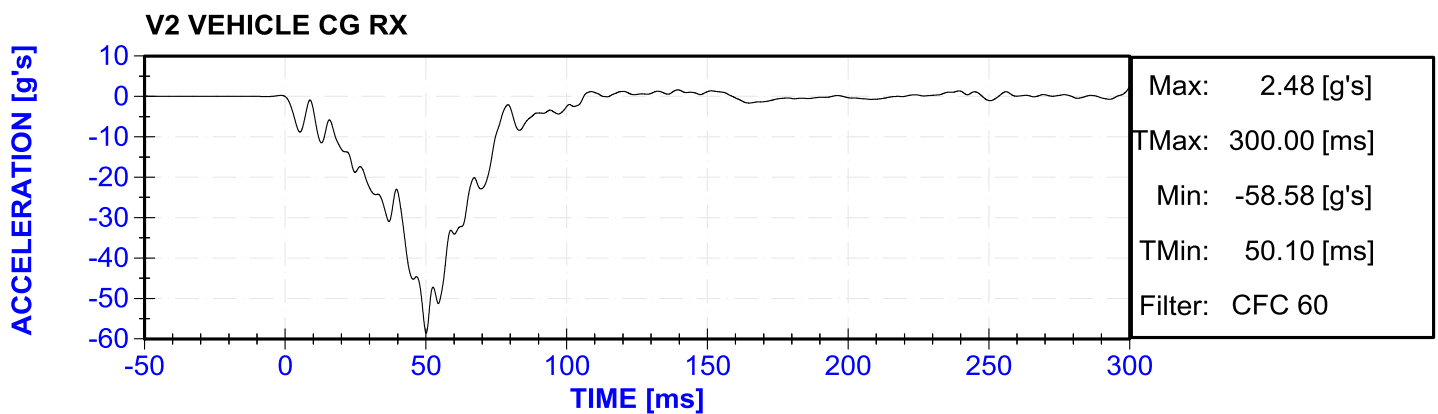
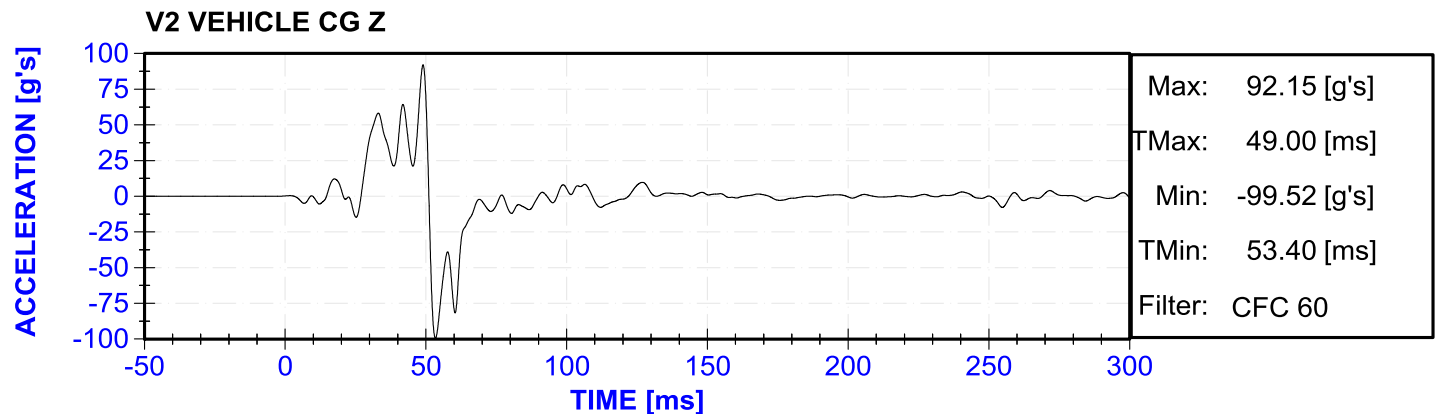
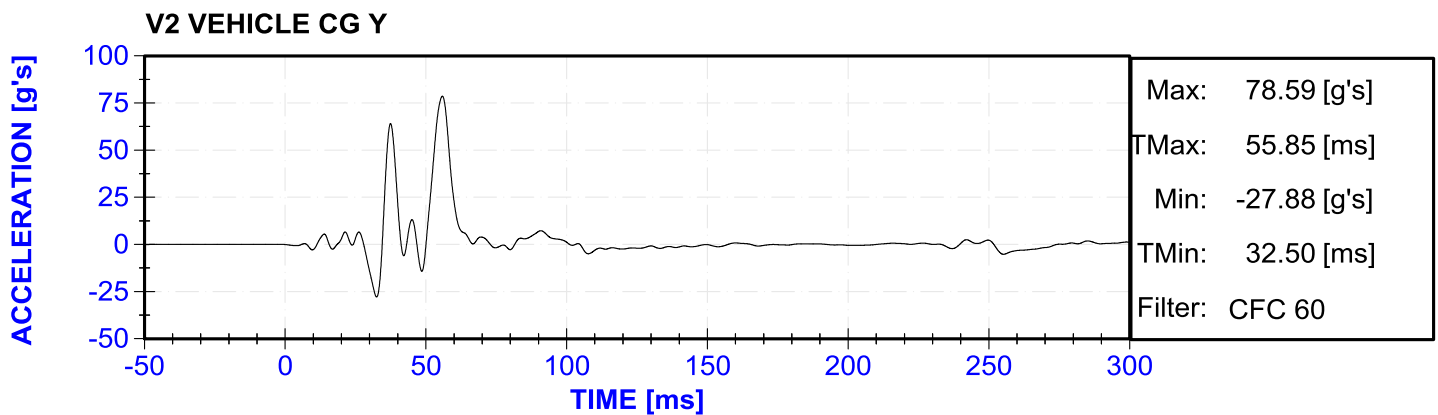
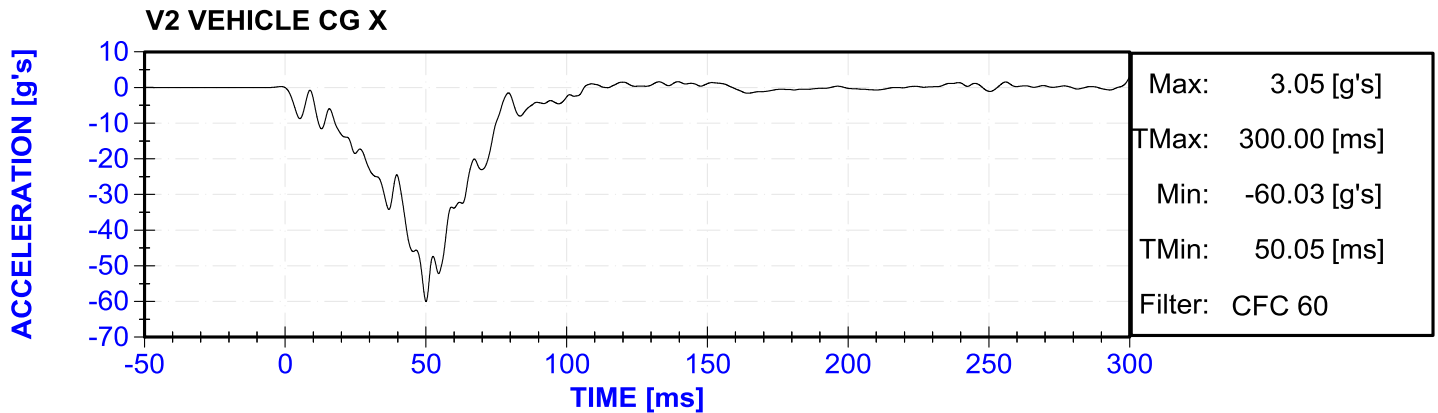
V2 LEFT REAR SILL X

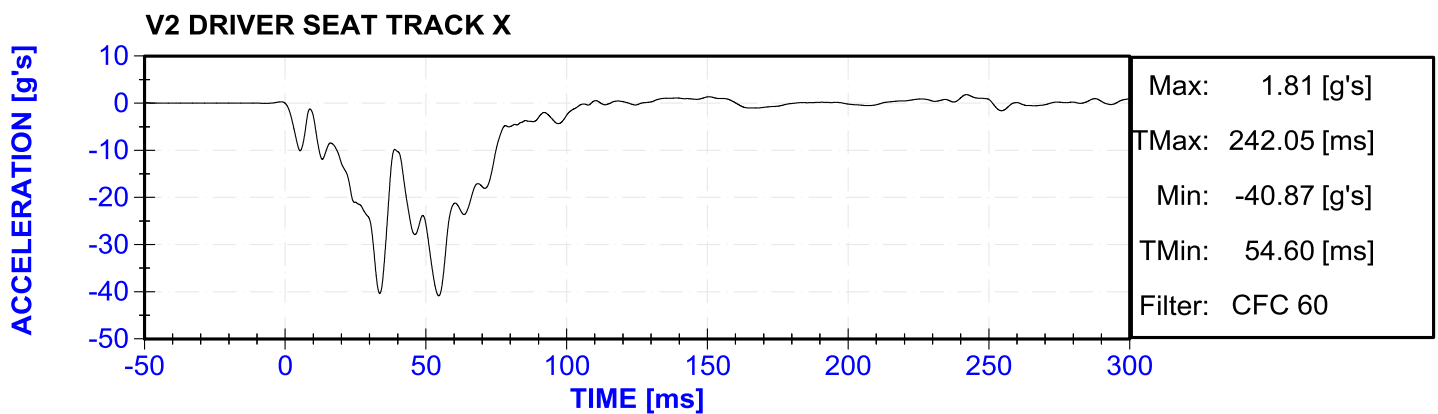
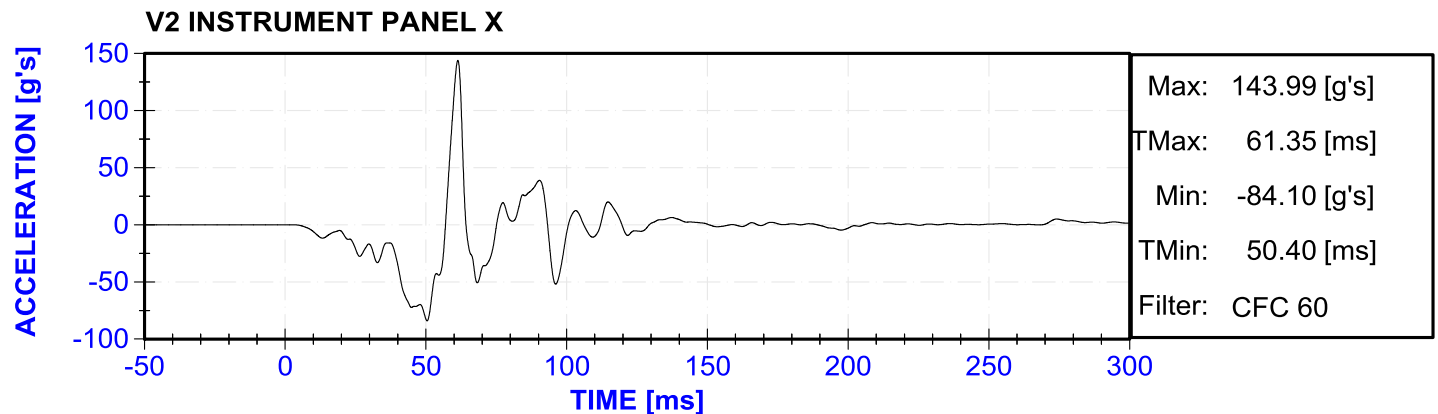
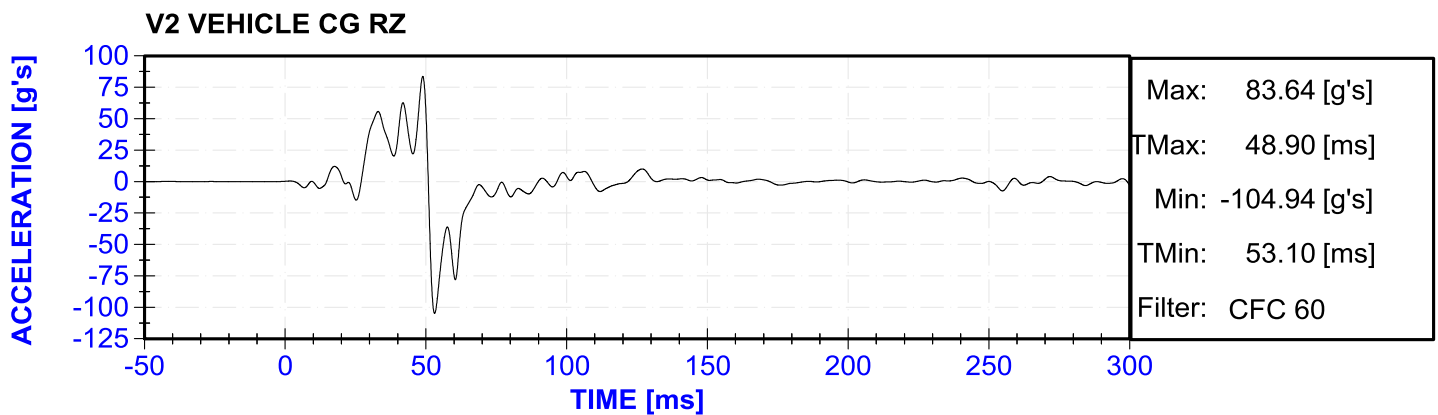
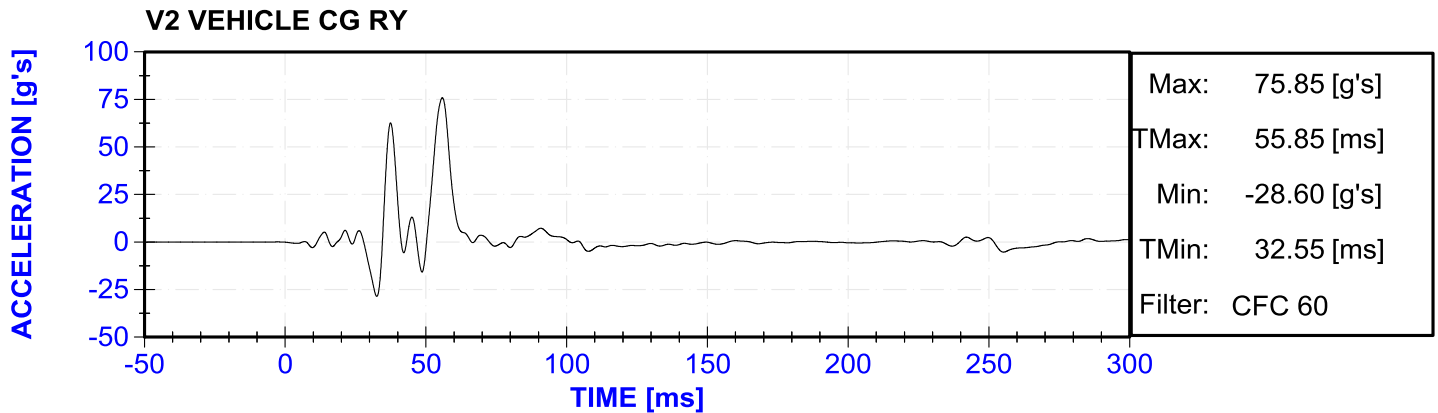


V2 LEFT REAR SILL Y

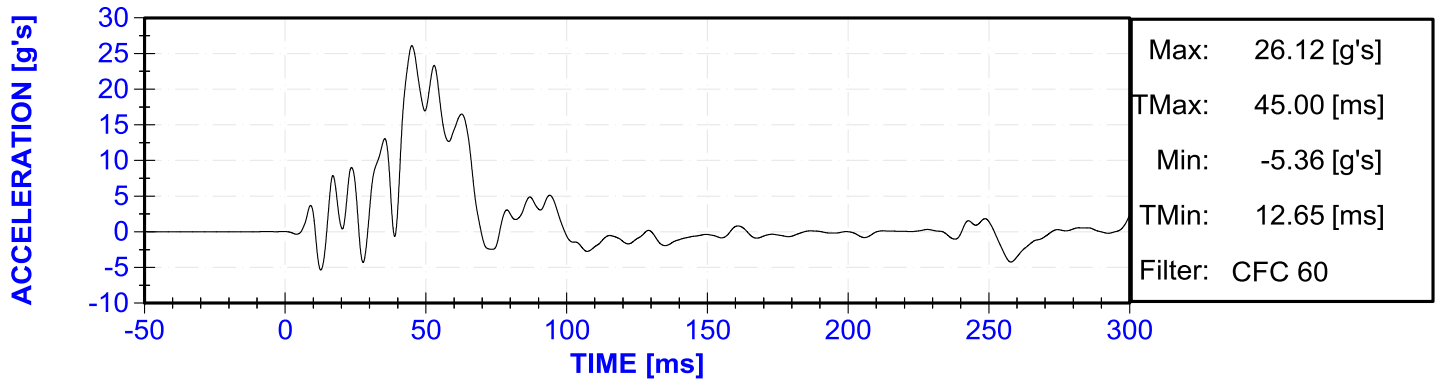




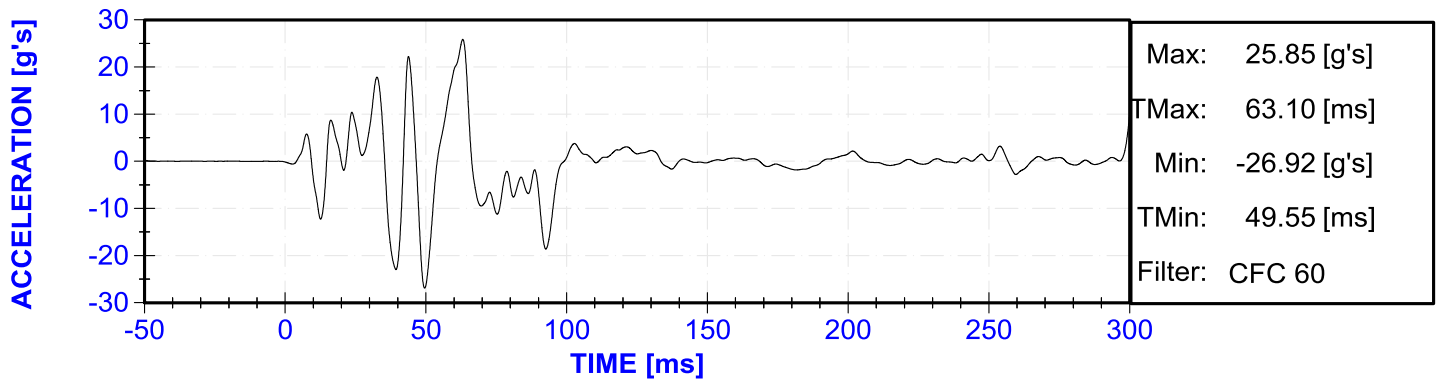




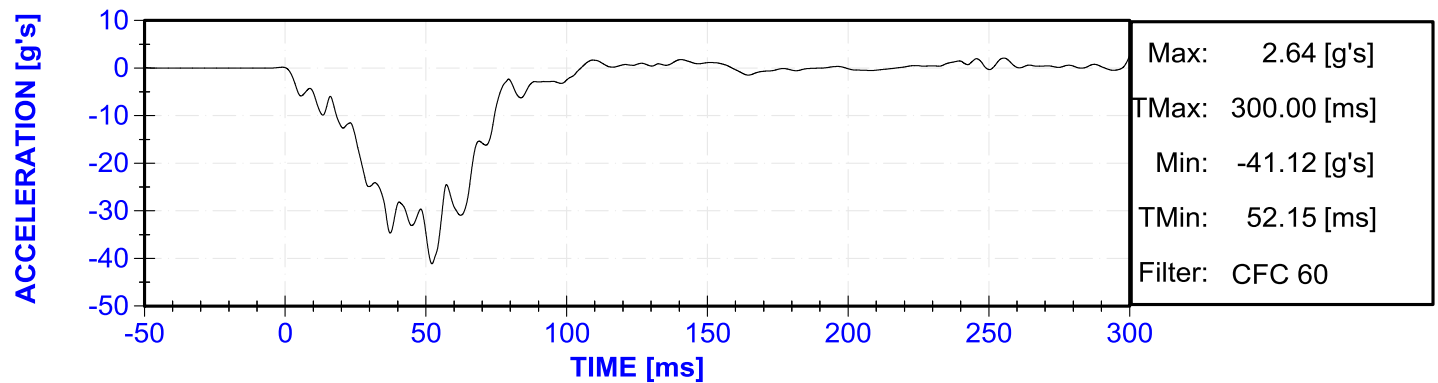
V2 DRIVER SEAT TRACK Y



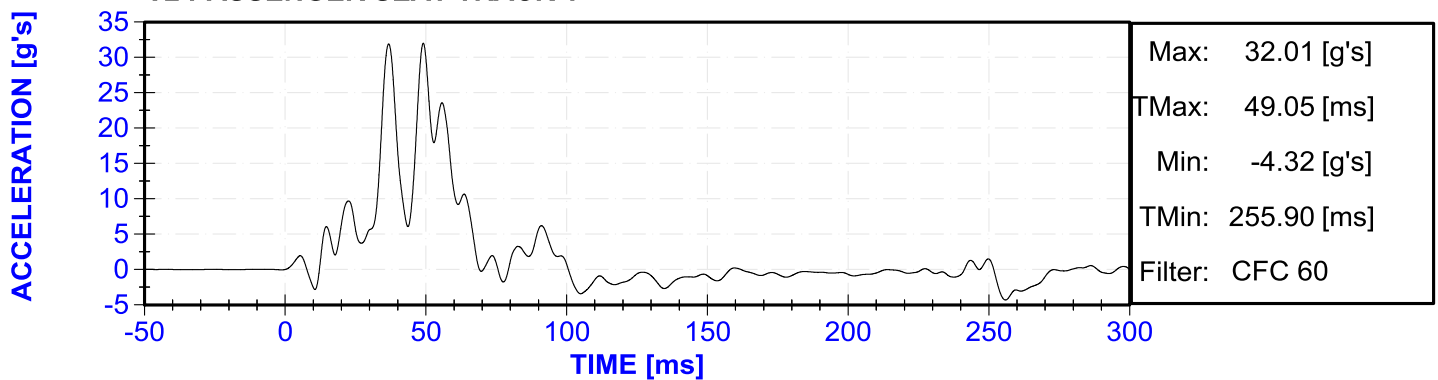
V2 DRIVER SEAT TRACK Z



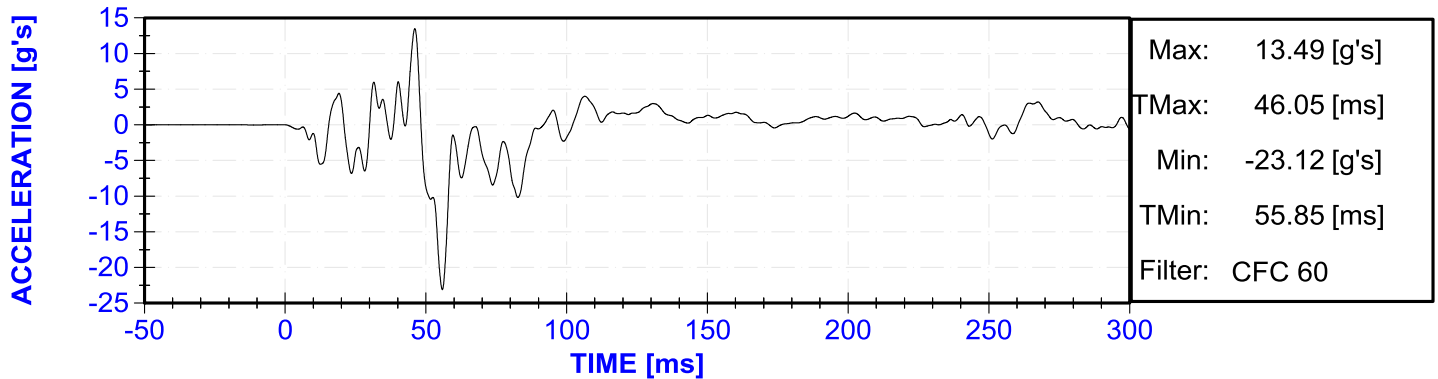
V2 PASSENGER SEAT TRACK X



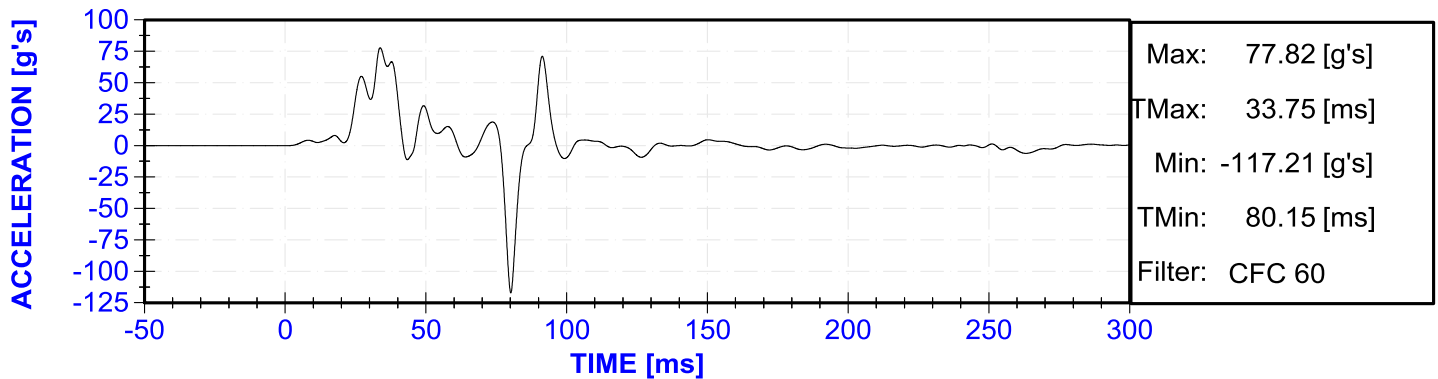
V2 PASSENGER SEAT TRACK Y



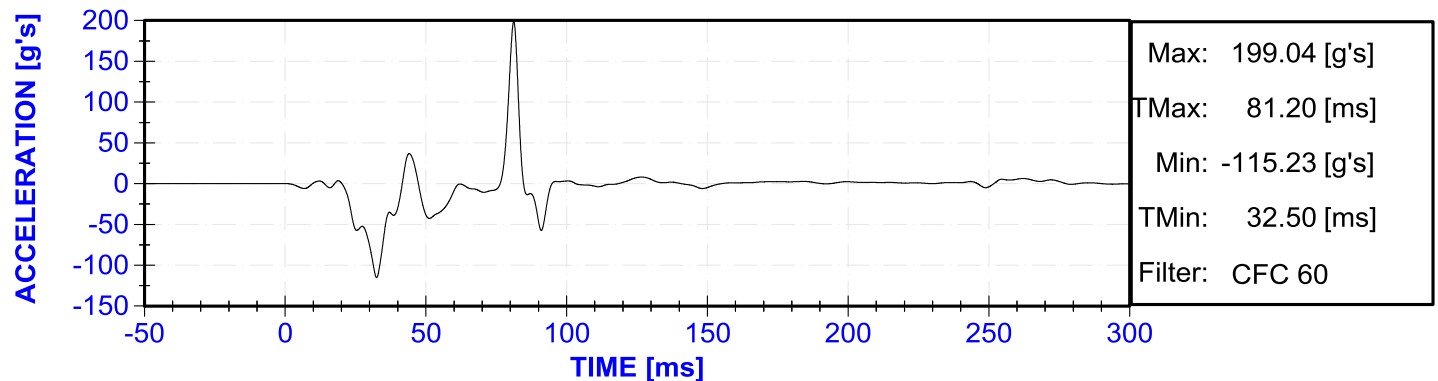
V2 PASSENGER SEAT TRACK Z



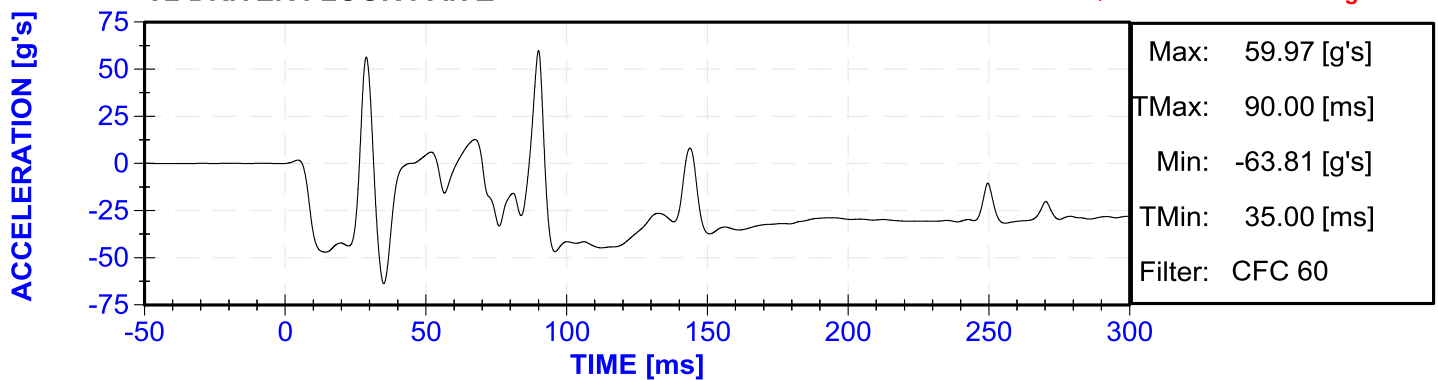
V2 DRIVER FLOOR PAN X



V2 DRIVER FLOOR PAN Y

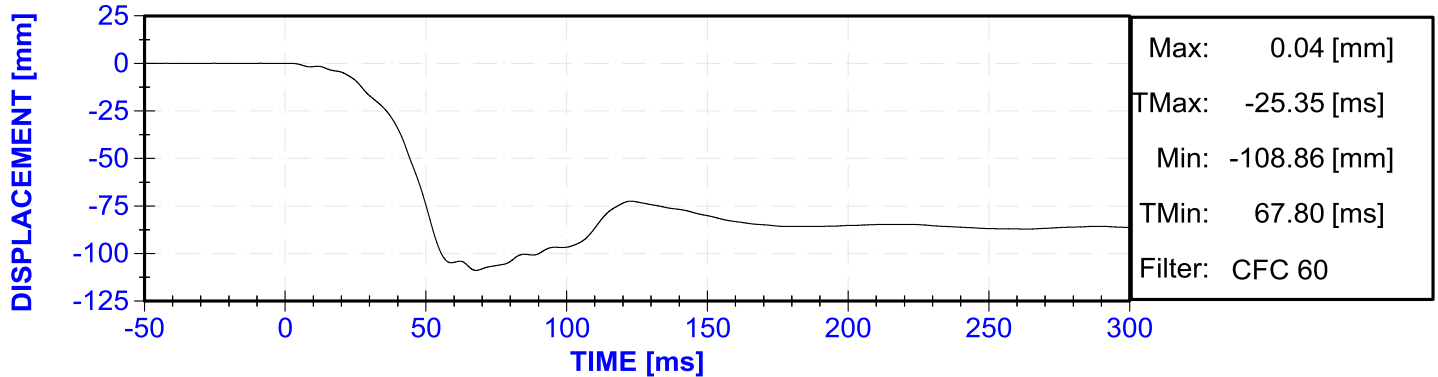


V2 DRIVER FLOOR PAN Z

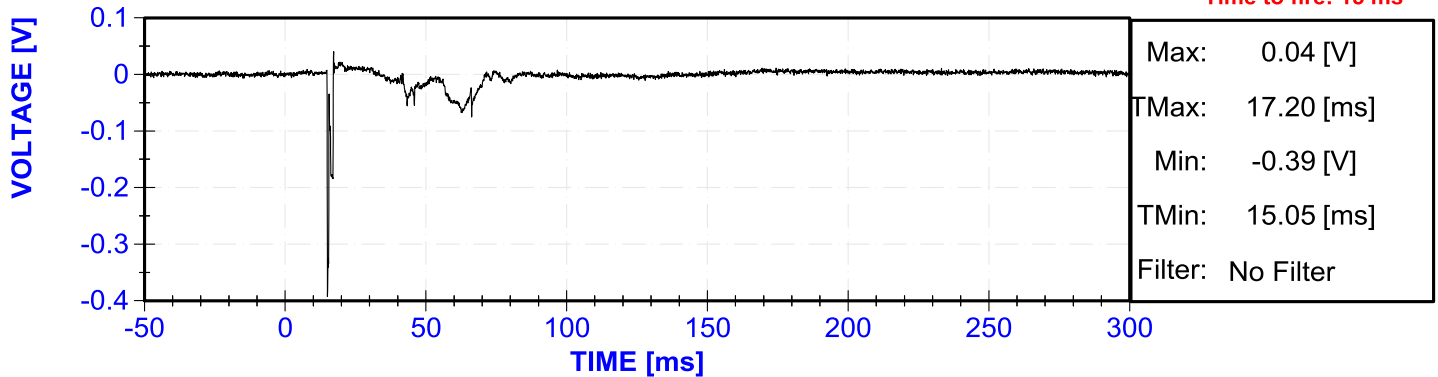


Questionable data throughout

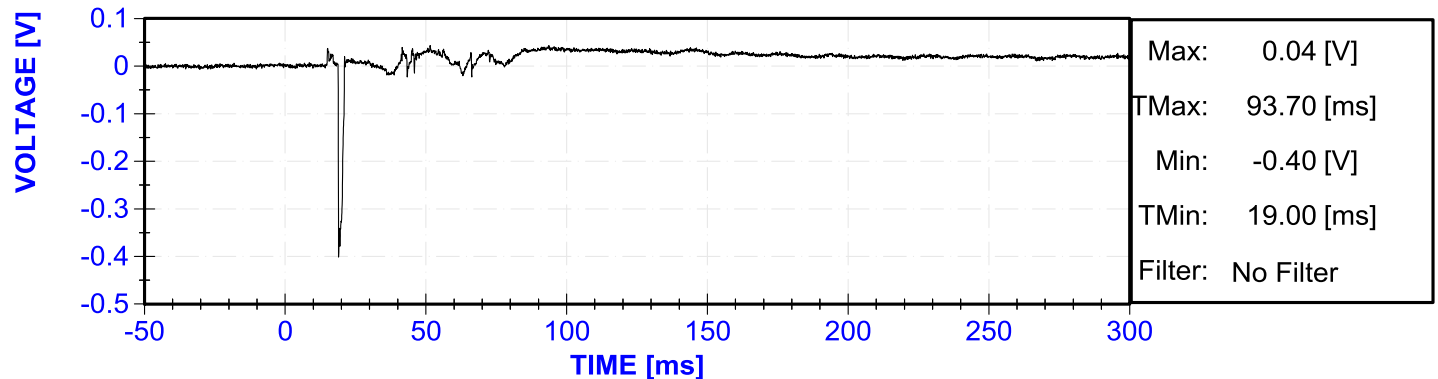
V2 DRIVER FLOOR PAN STRING POT



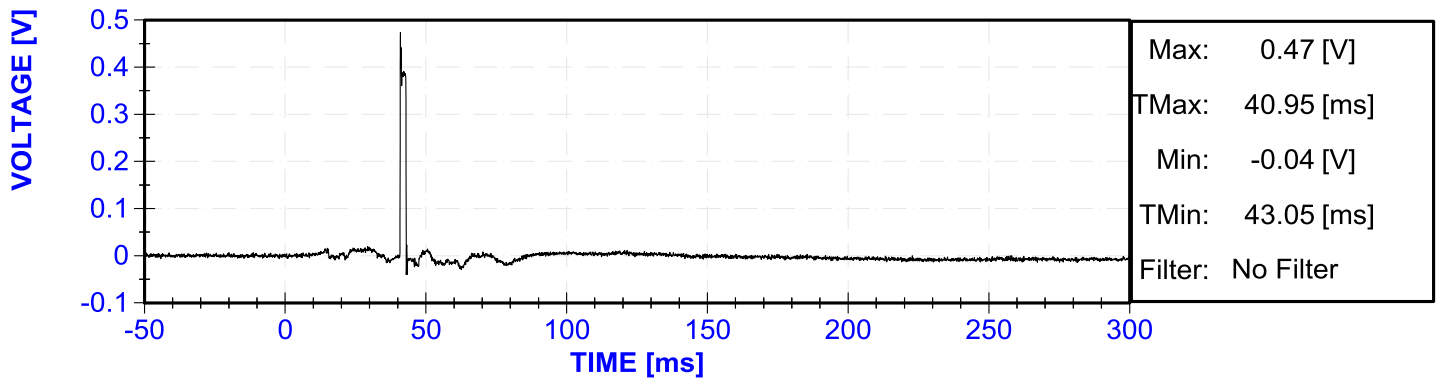
V2 DRIVER SW AIRBAG STAGE 1



V2 DRIVER SW AIRBAG STAGE 2

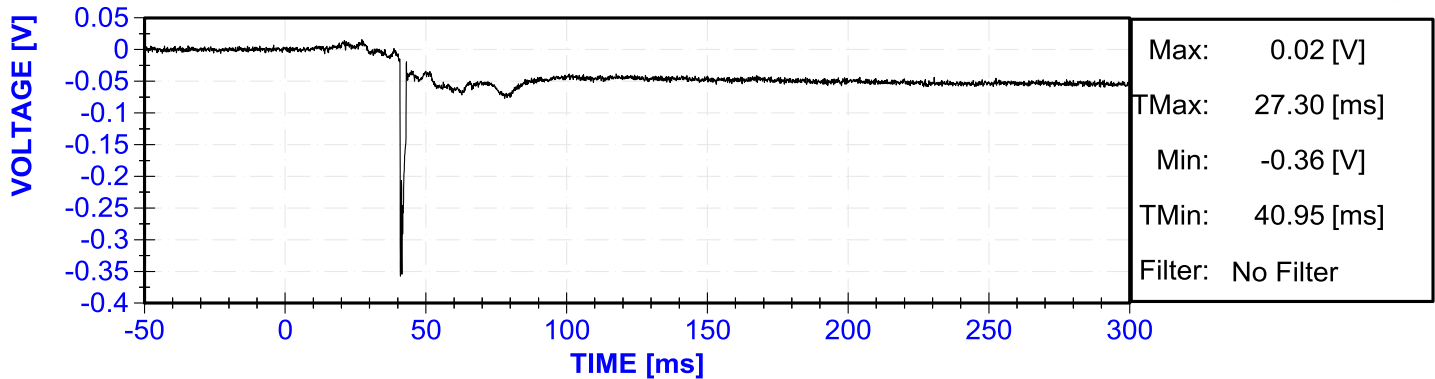


V2 DRIVER HEAD CURTAIN



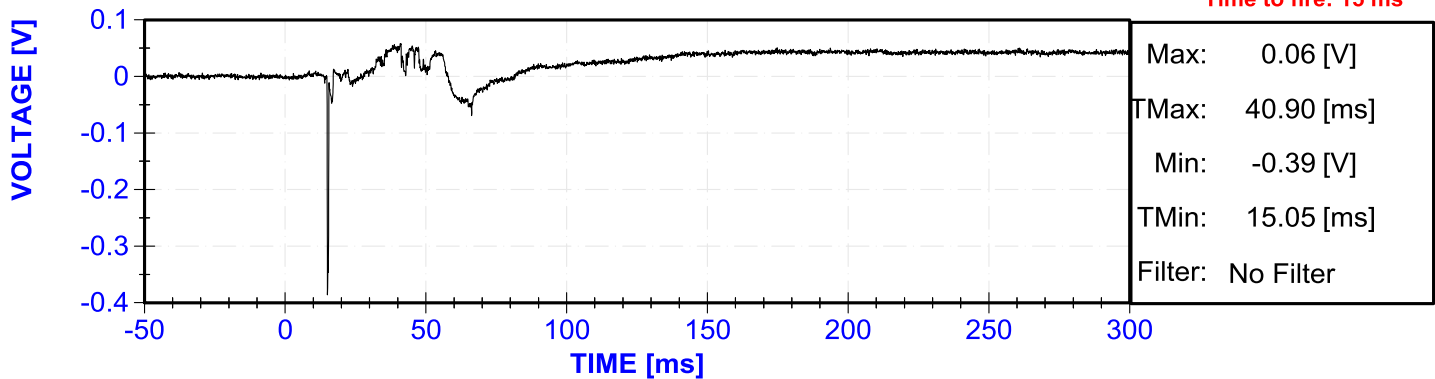
V2 DRIVER SEAT HEAD/TORSO/PELVIS

Time to fire: 41 ms



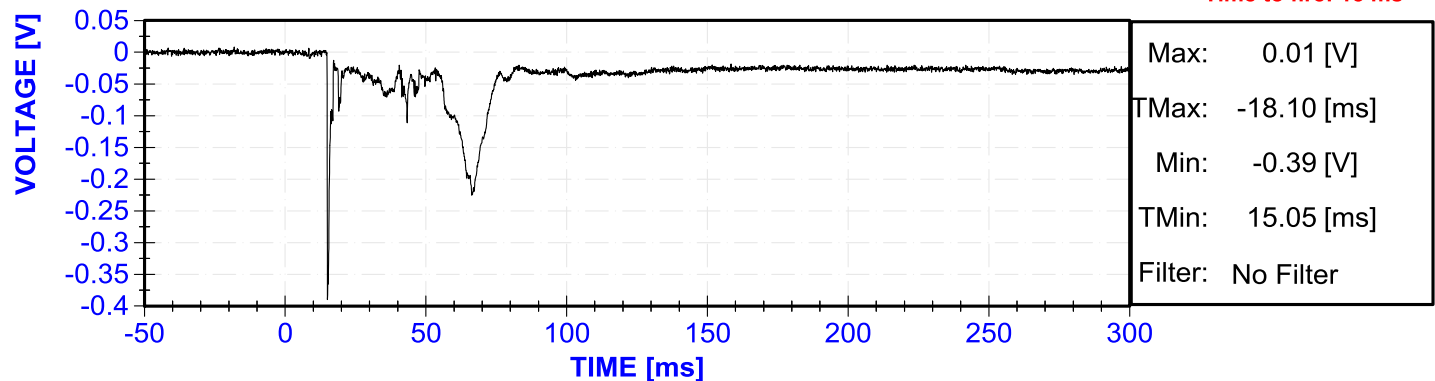
V2 DRIVER TORSO BELT PRETENSIONER

Time to fire: 15 ms



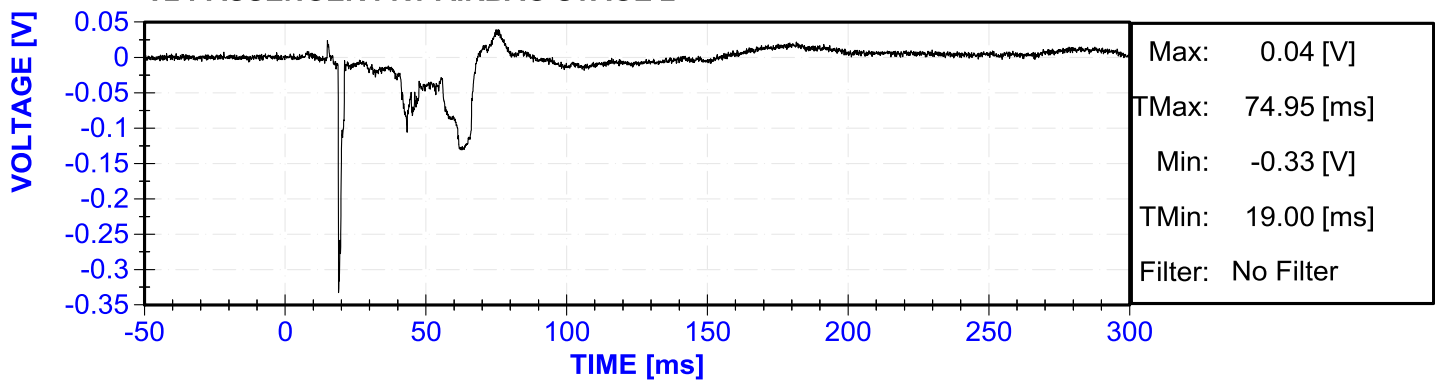
V2 PASSENGER FRT AIRBAG STAGE 1

Time to fire: 15 ms



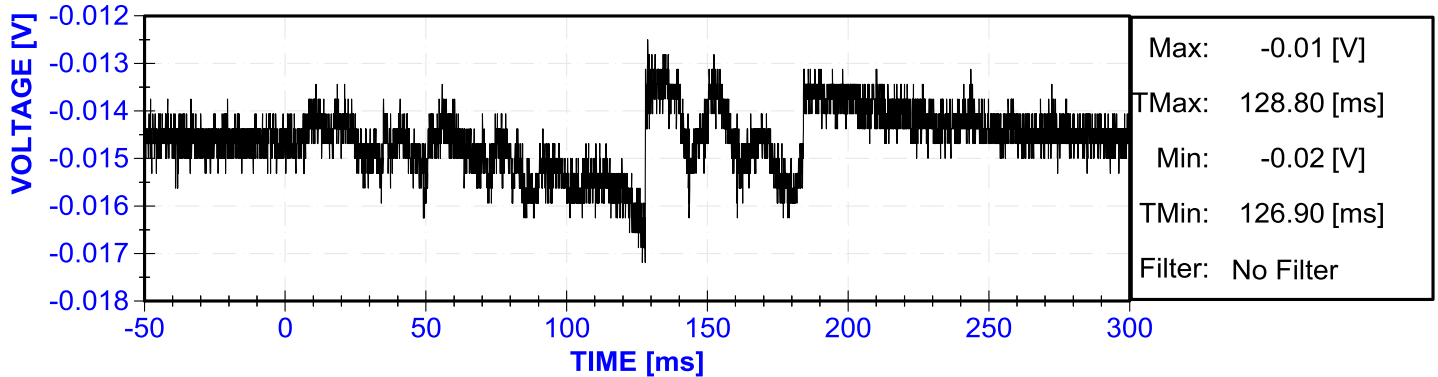
V2 PASSENGER FRT AIRBAG STAGE 2

Time to fire: 19 ms



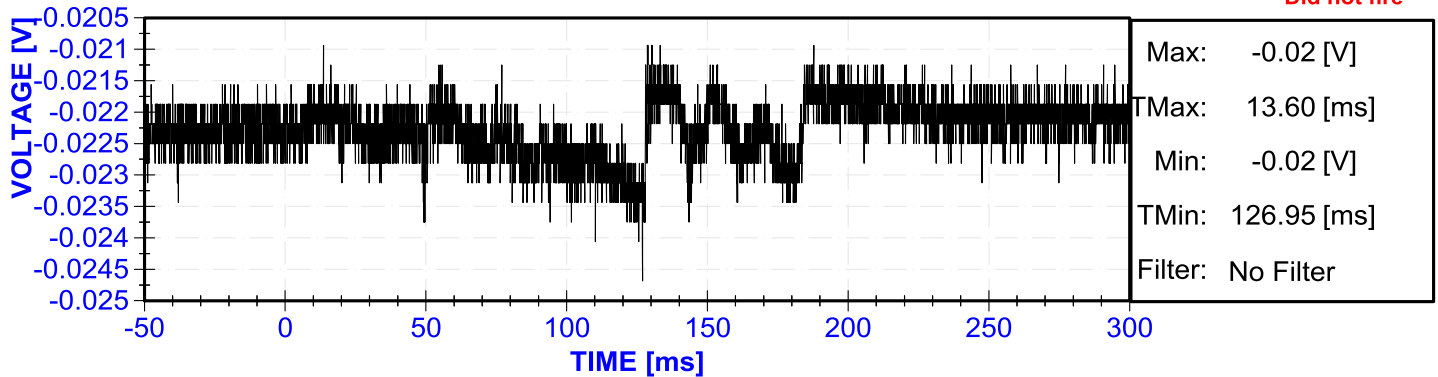
V2 PASSENGER HEAD CURTAIN

Did not fire



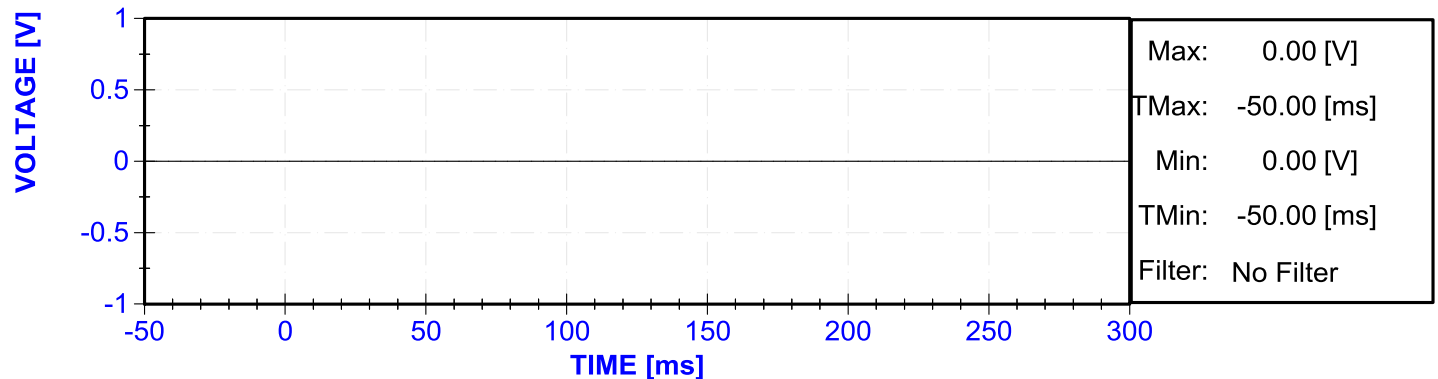
V2 PASSENGER HEAD/TORSO/PELVIS

Did not fire



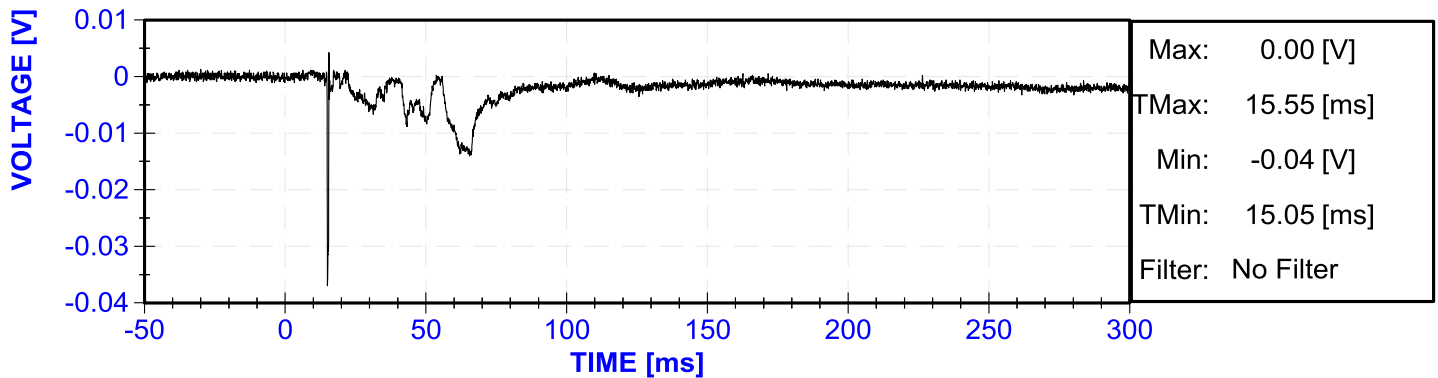
V2 PASSENGER KNEE

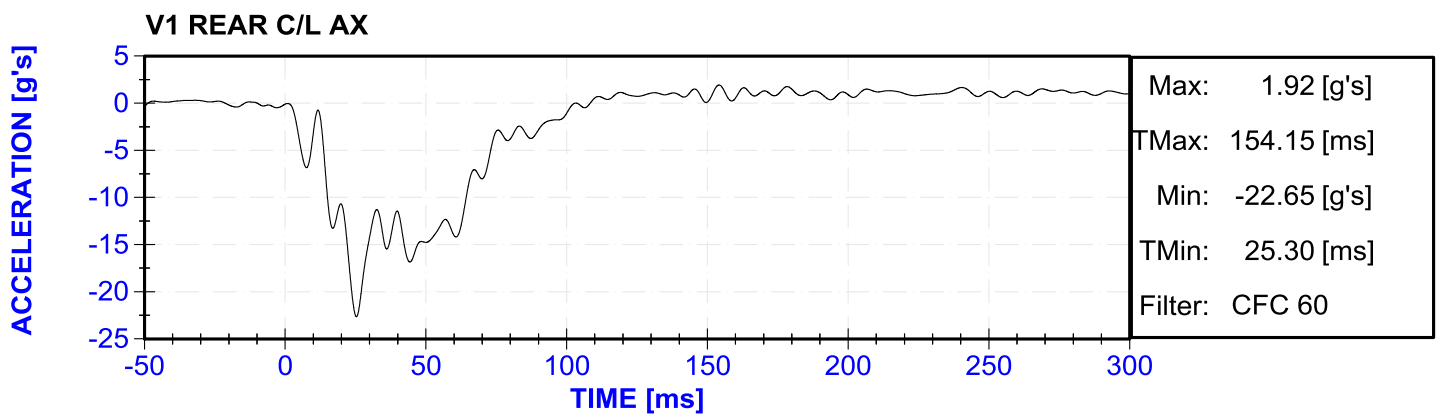
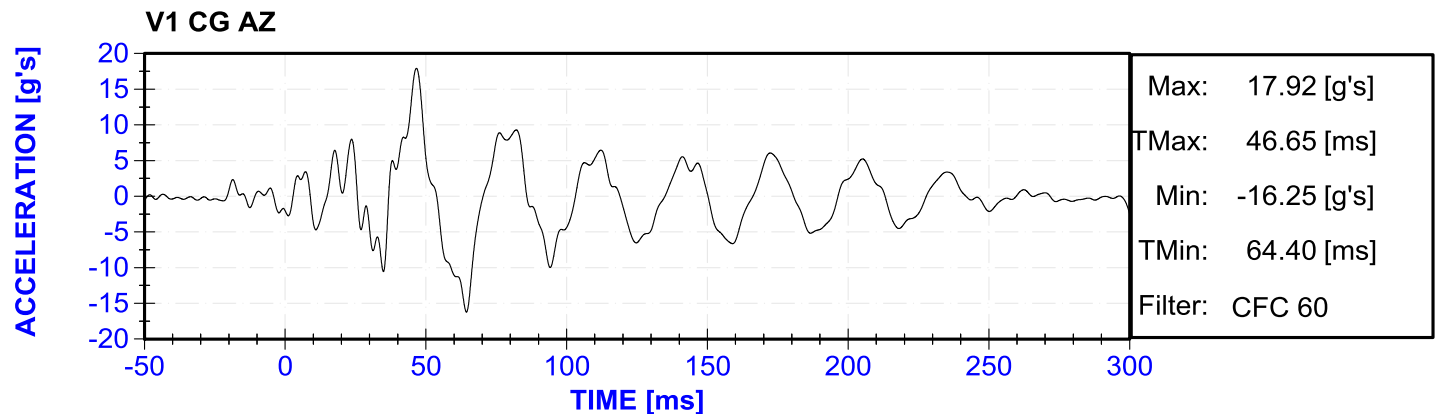
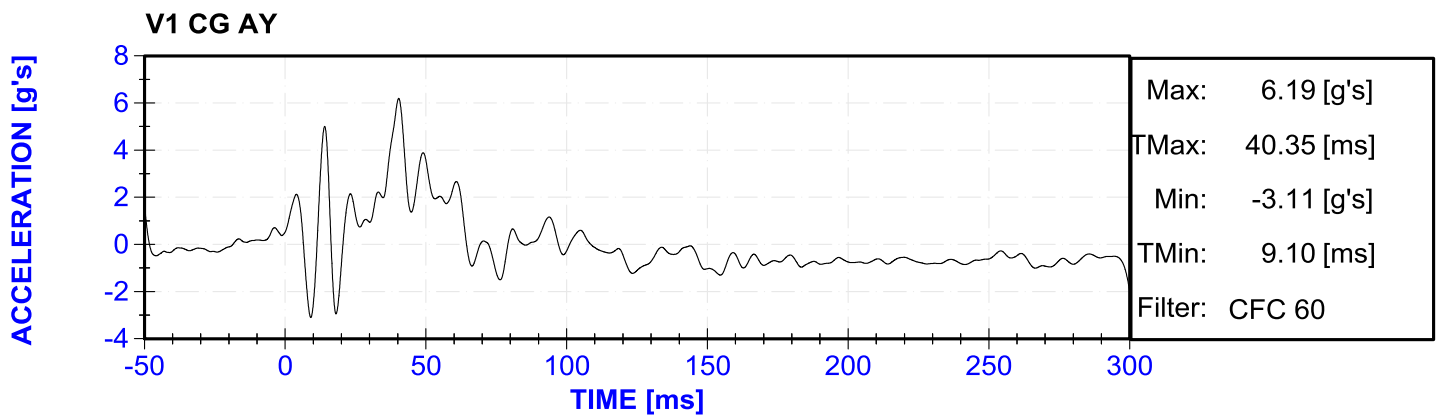
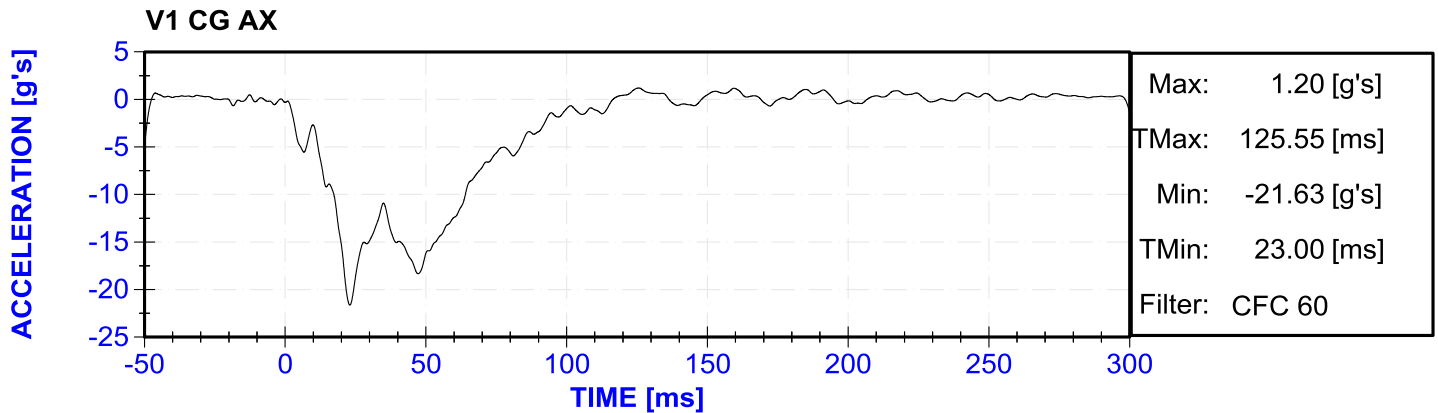
Not monitored

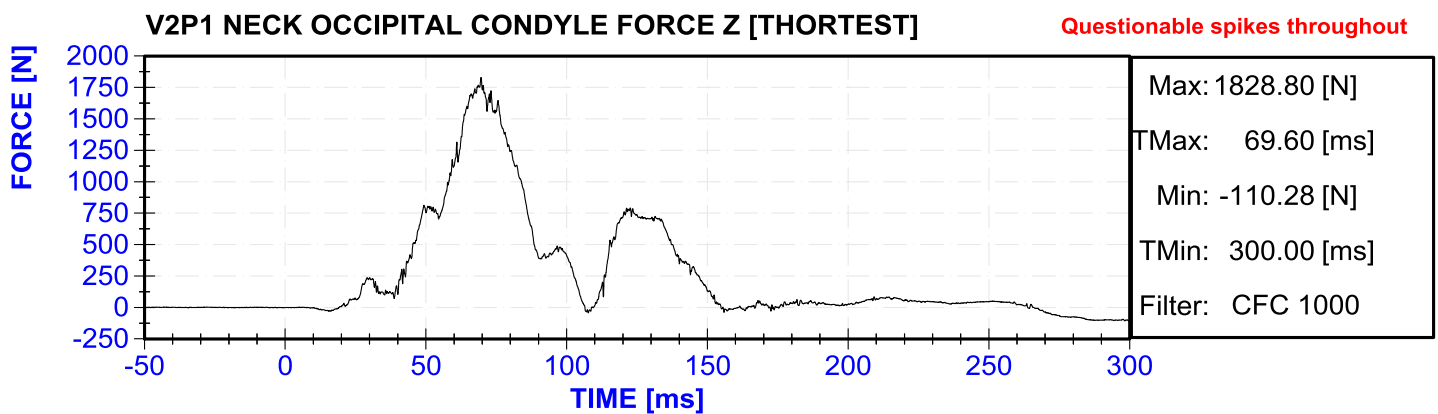
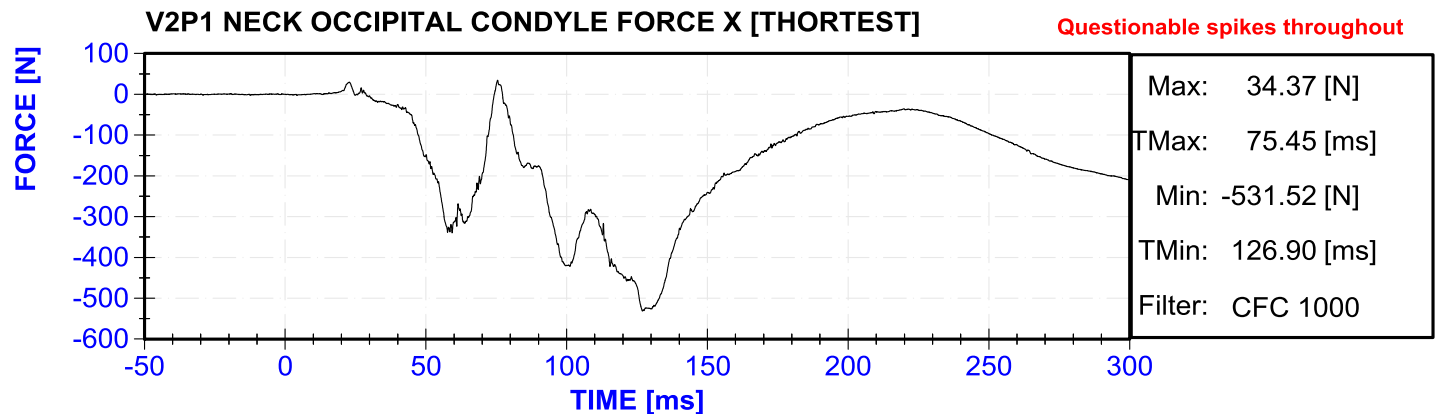
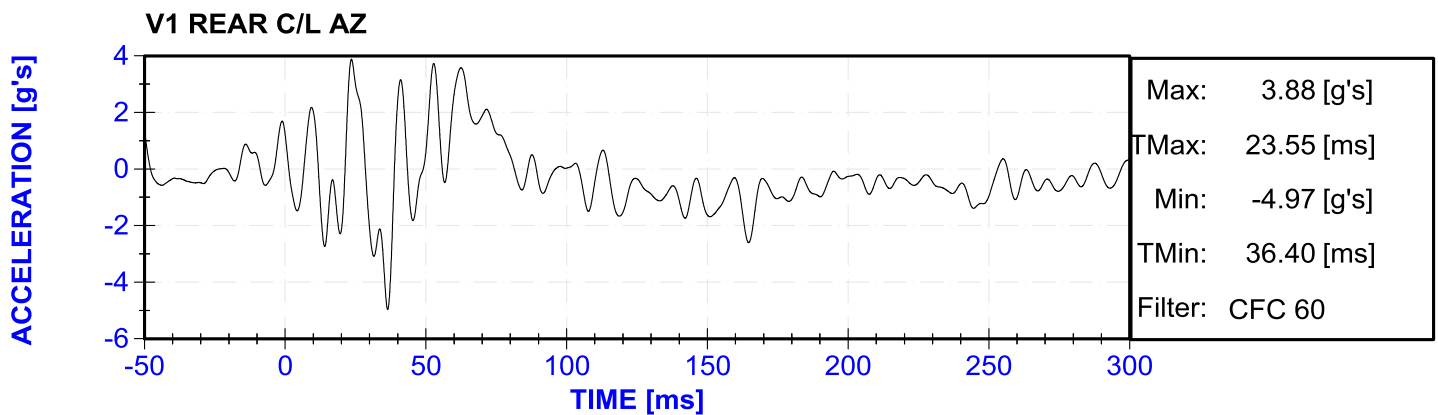
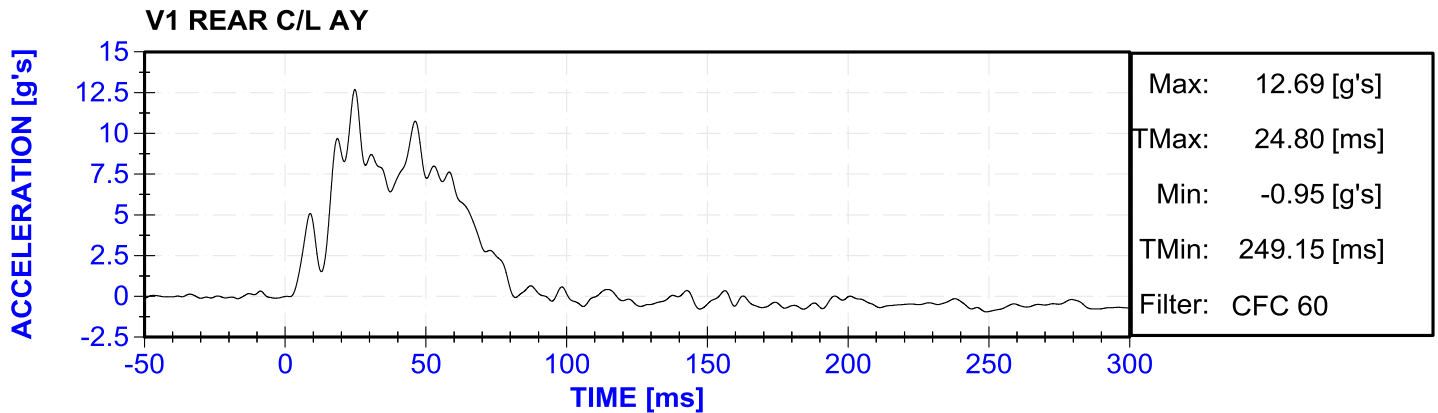


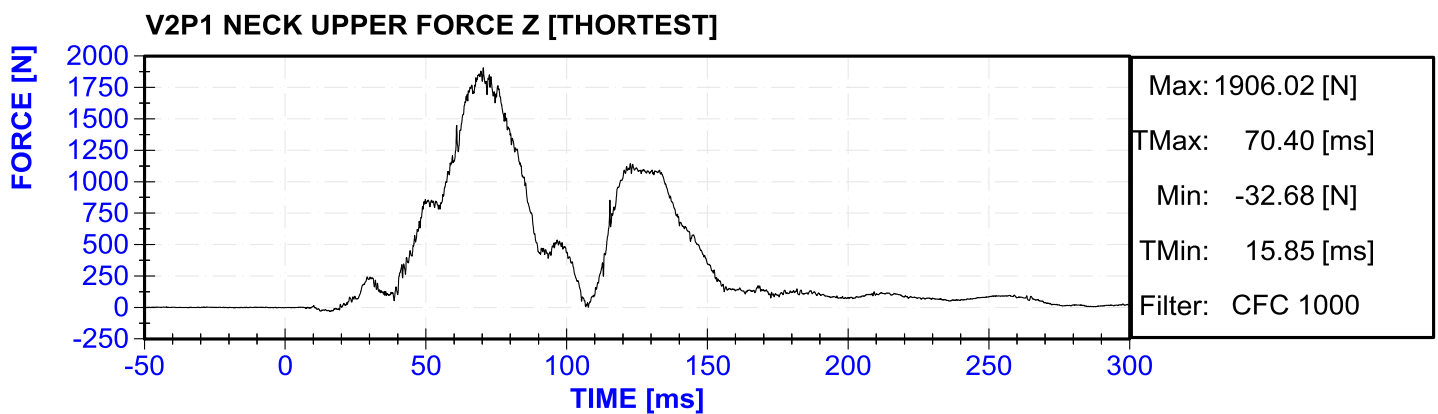
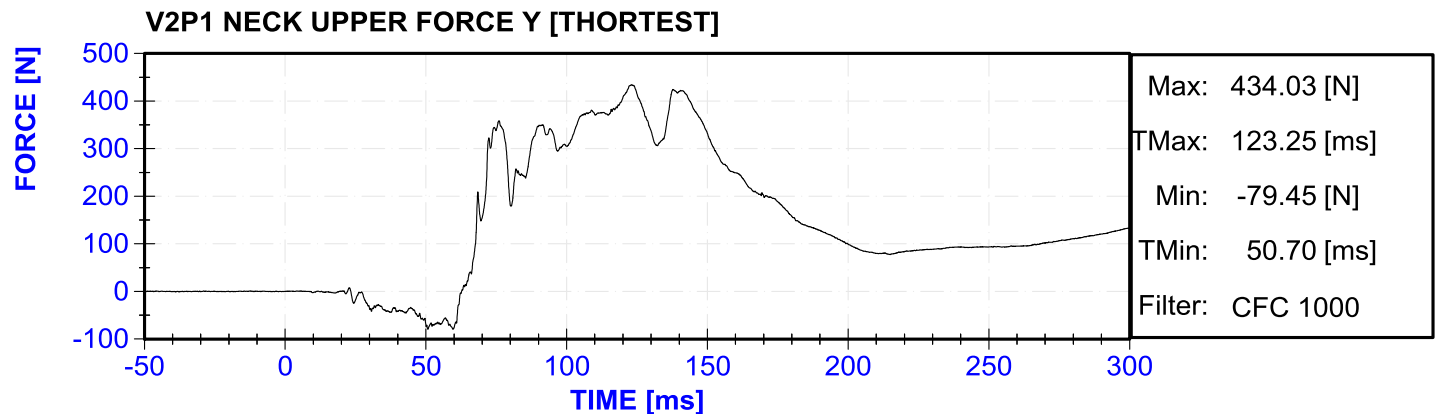
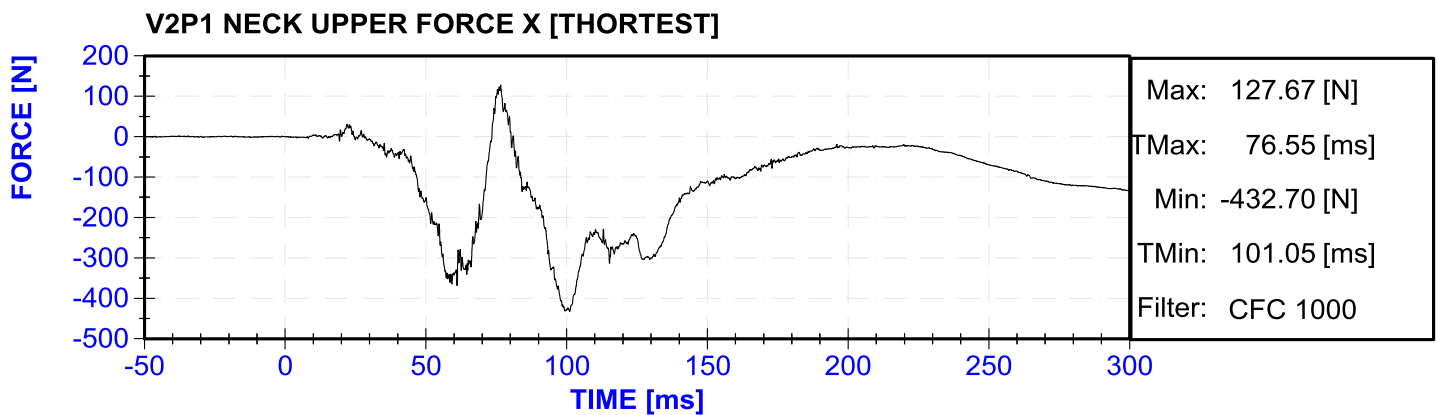
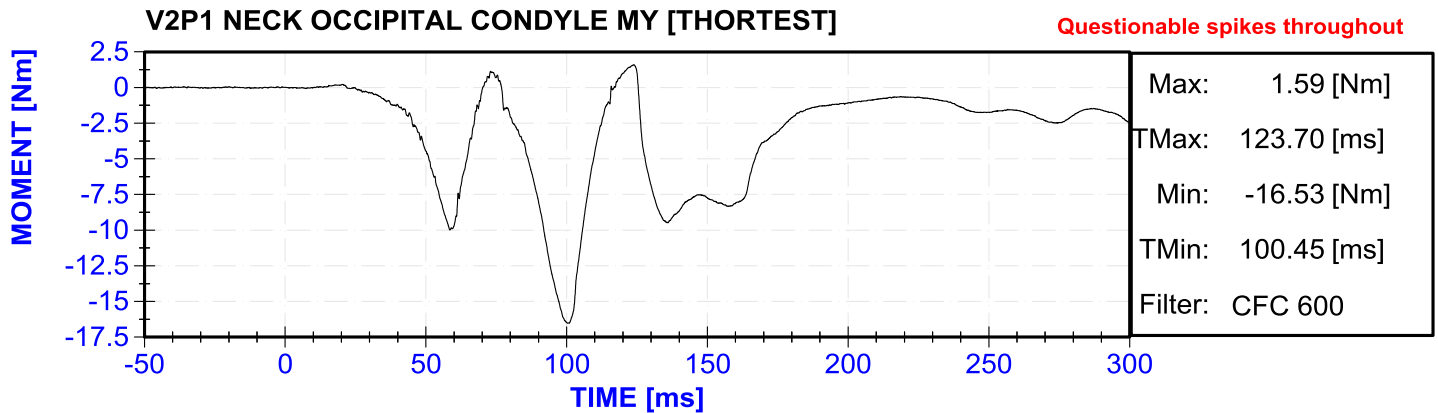
V2 PASSENGER TORSO BELT PRETENSIONER

Time to fire: 14.9 ms

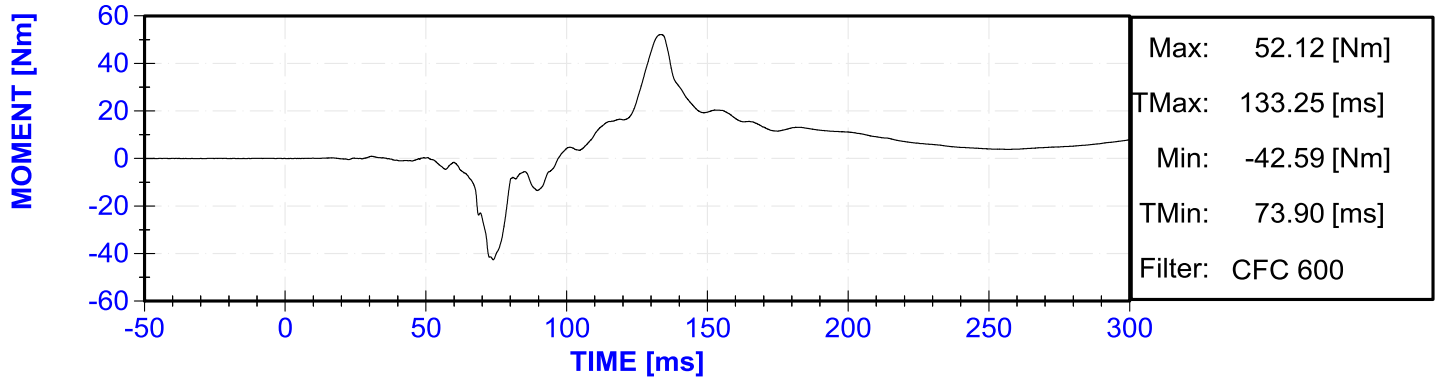




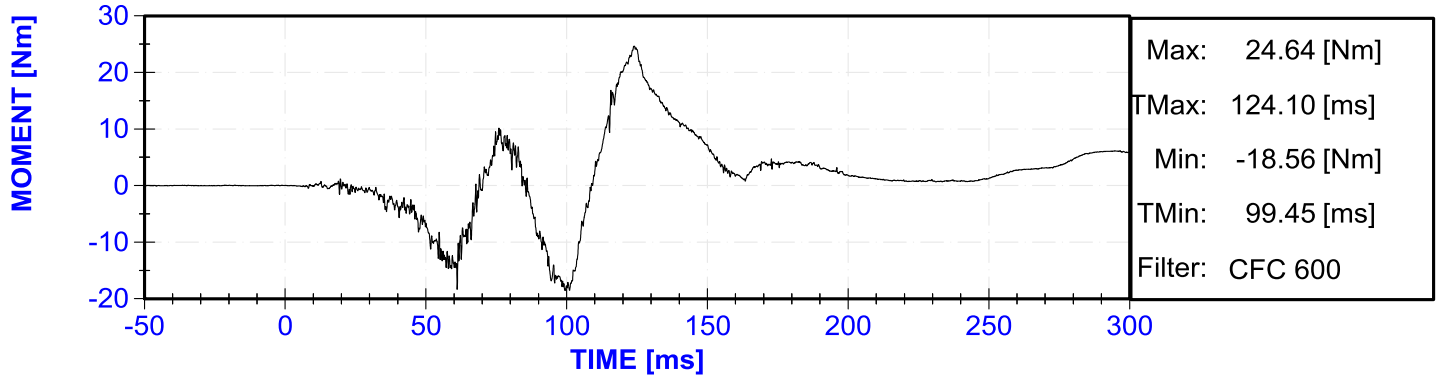




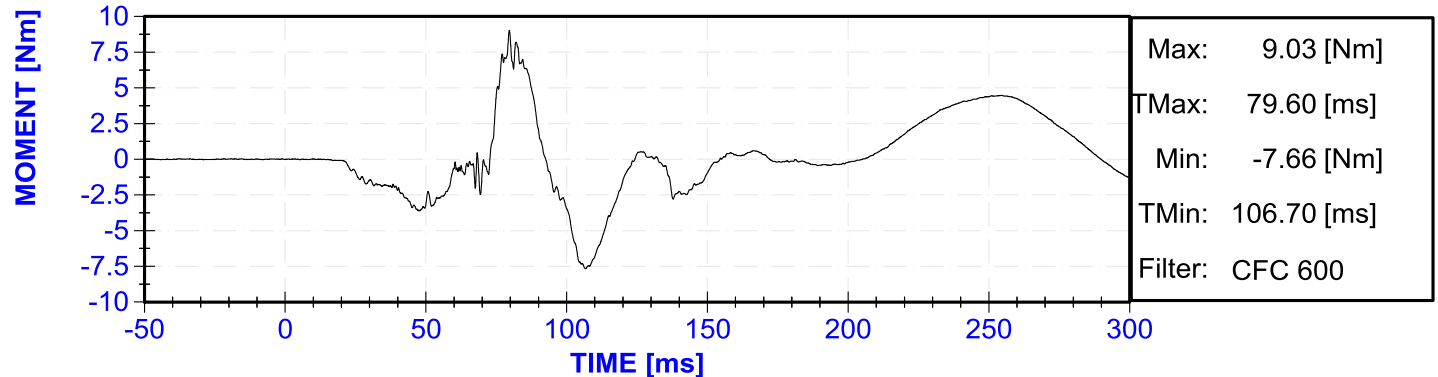
V2P1 NECK UPPER MOMENT X [THORTEST]



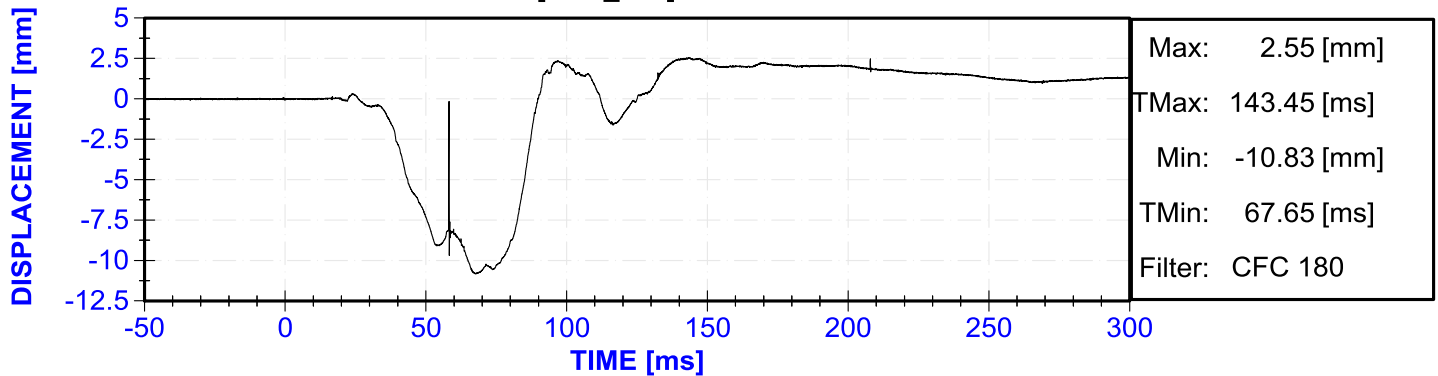
V2P1 NECK UPPER MOMENT Y [THORTEST]

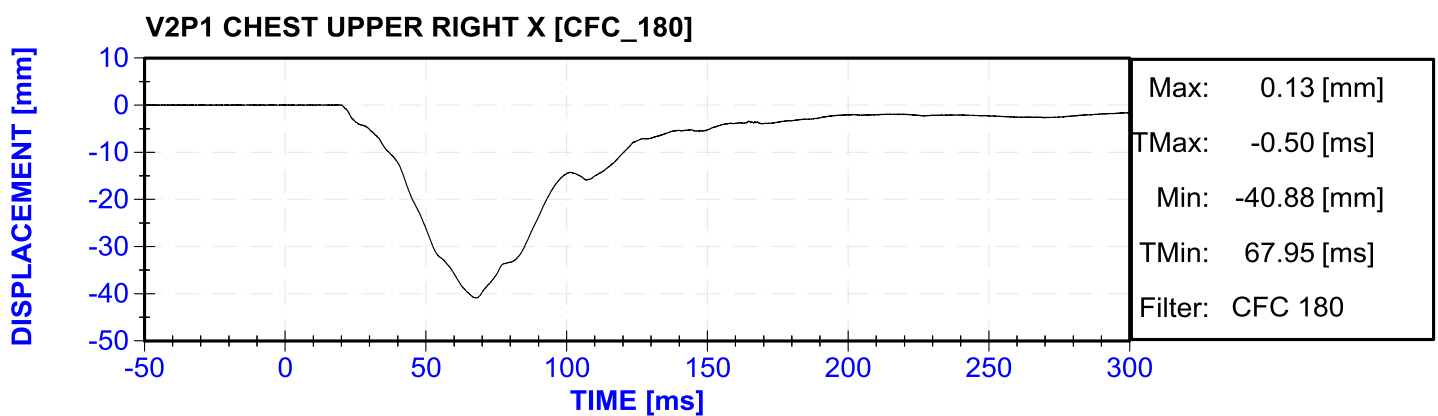
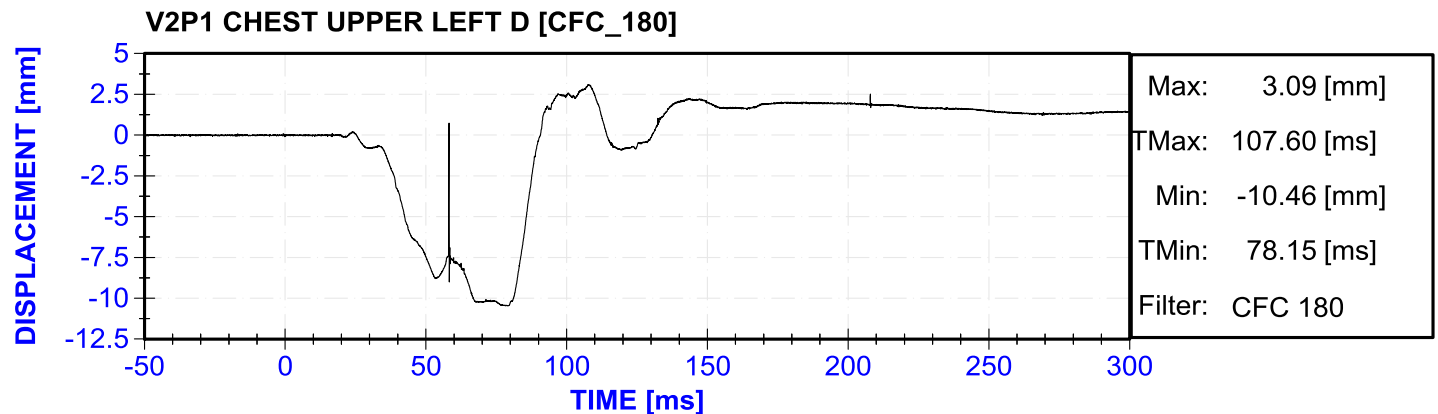
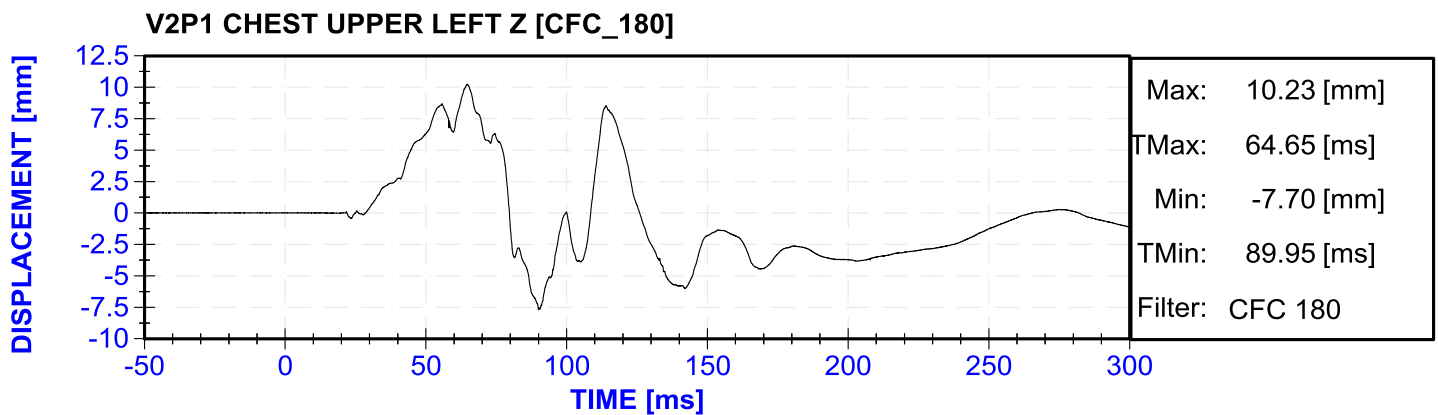
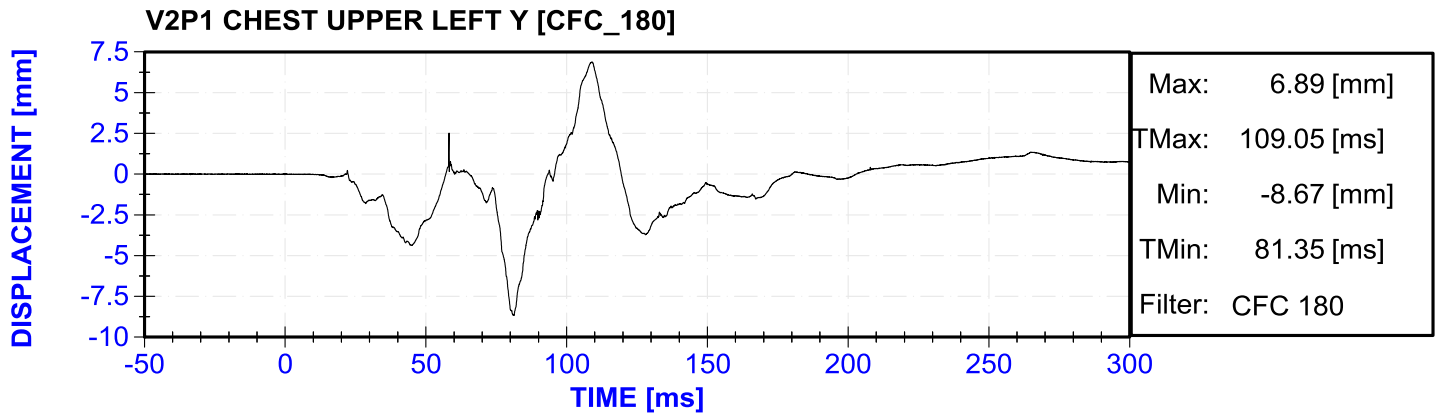


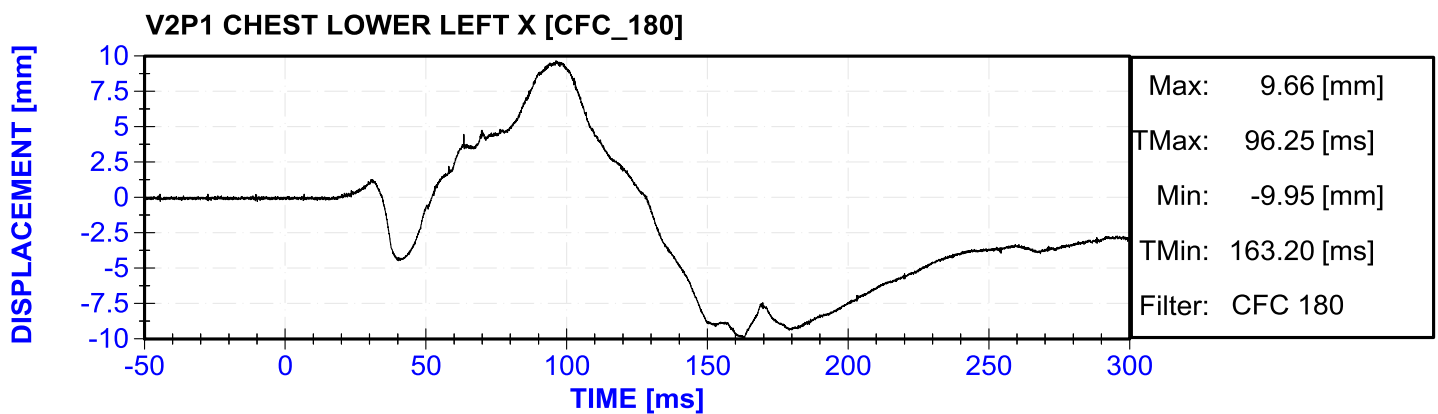
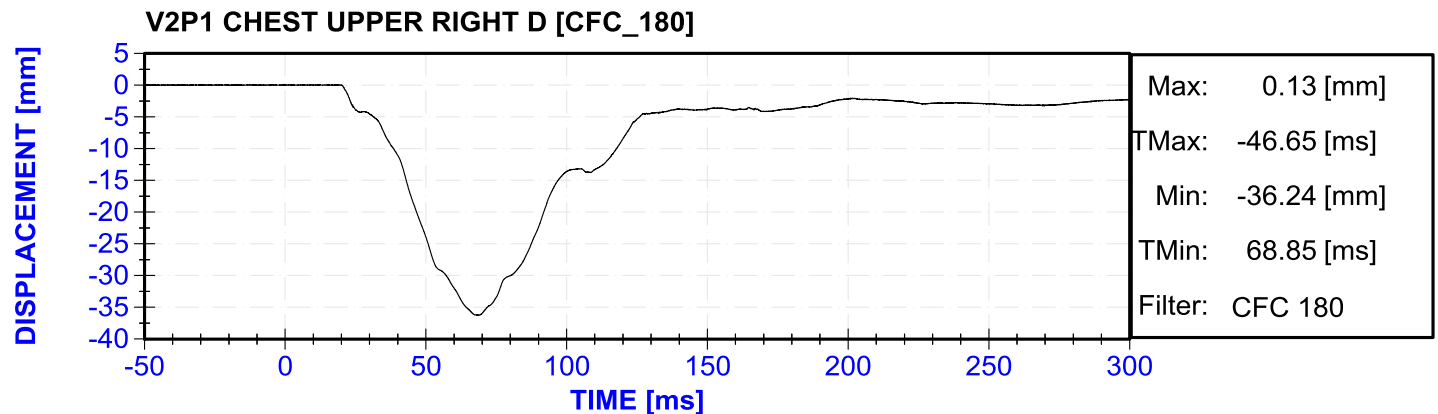
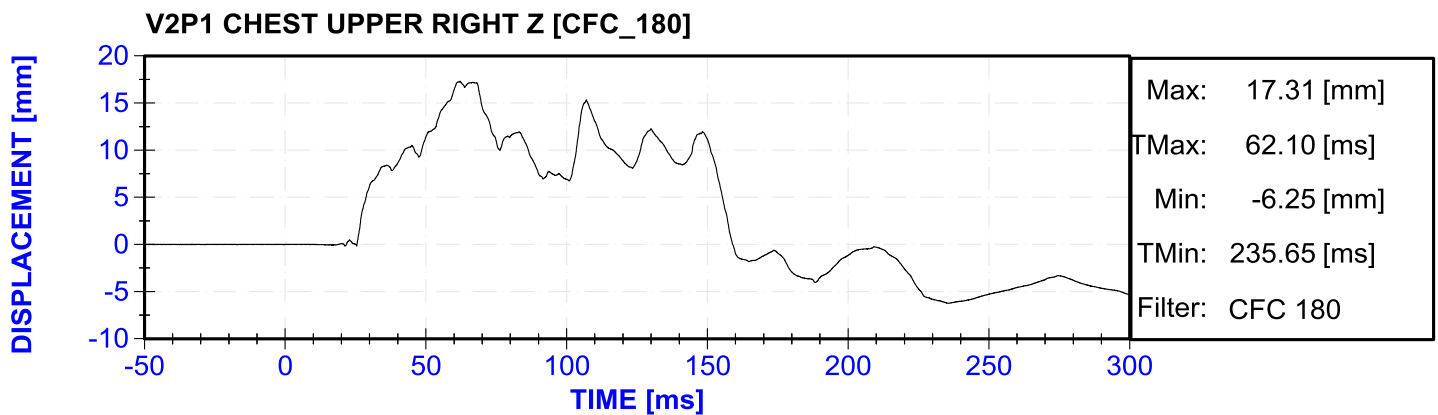
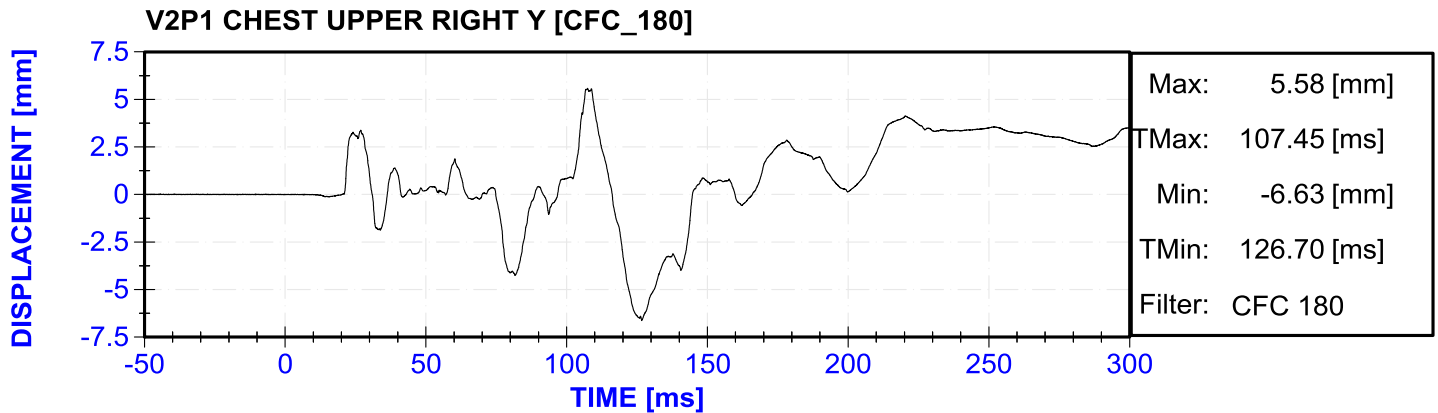
V2P1 NECK UPPER MOMENT Z [THORTEST]

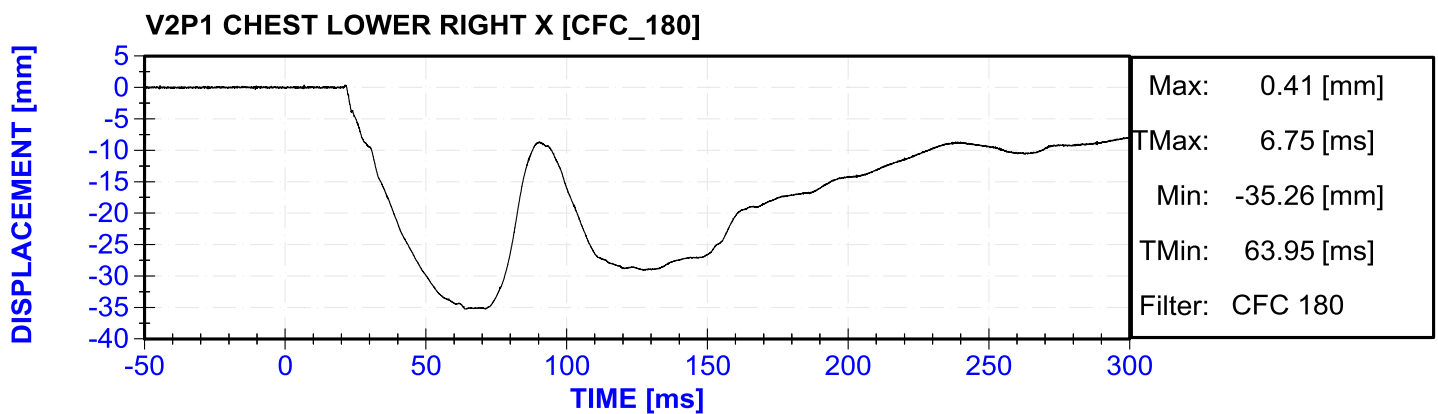
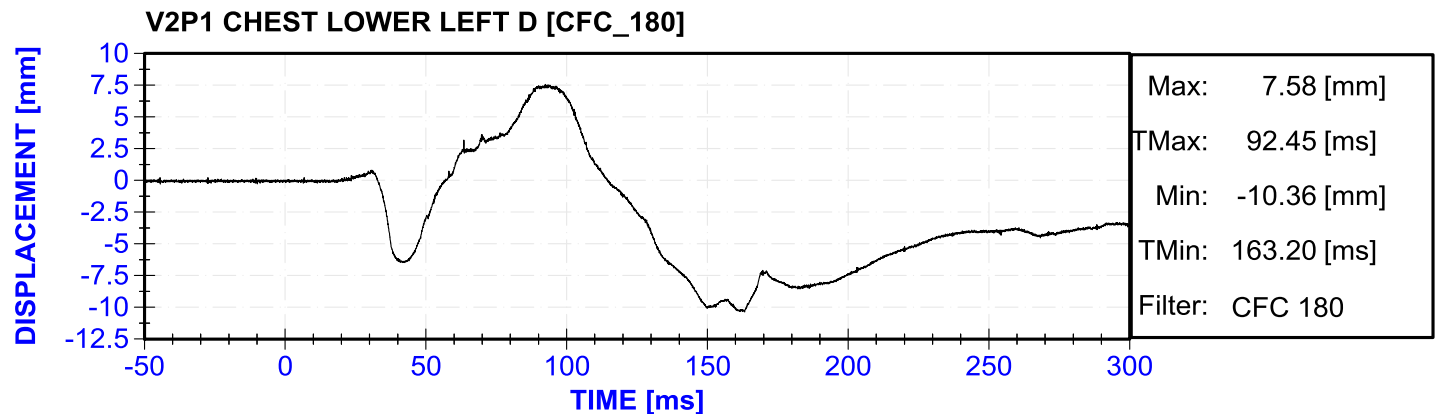
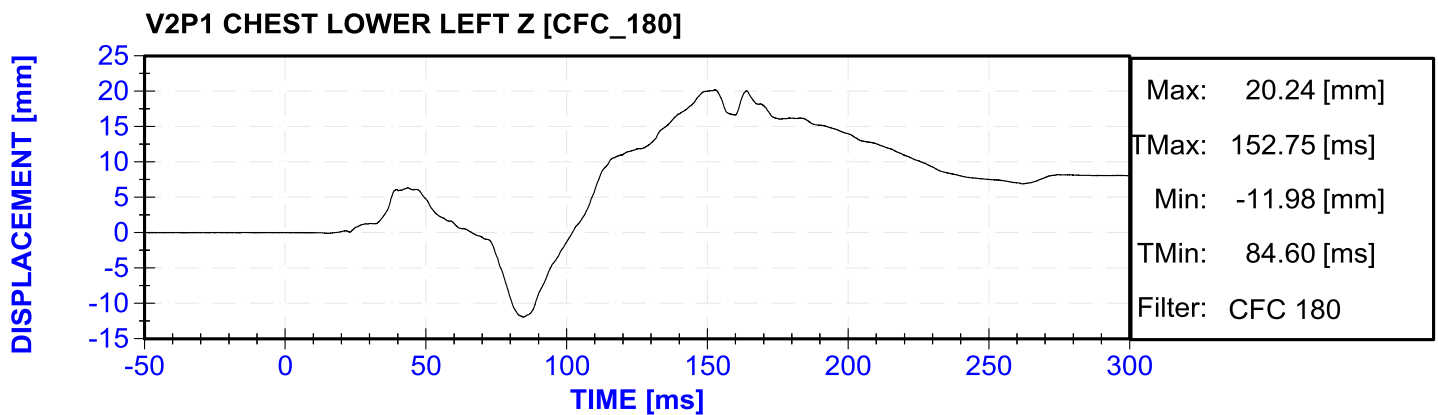
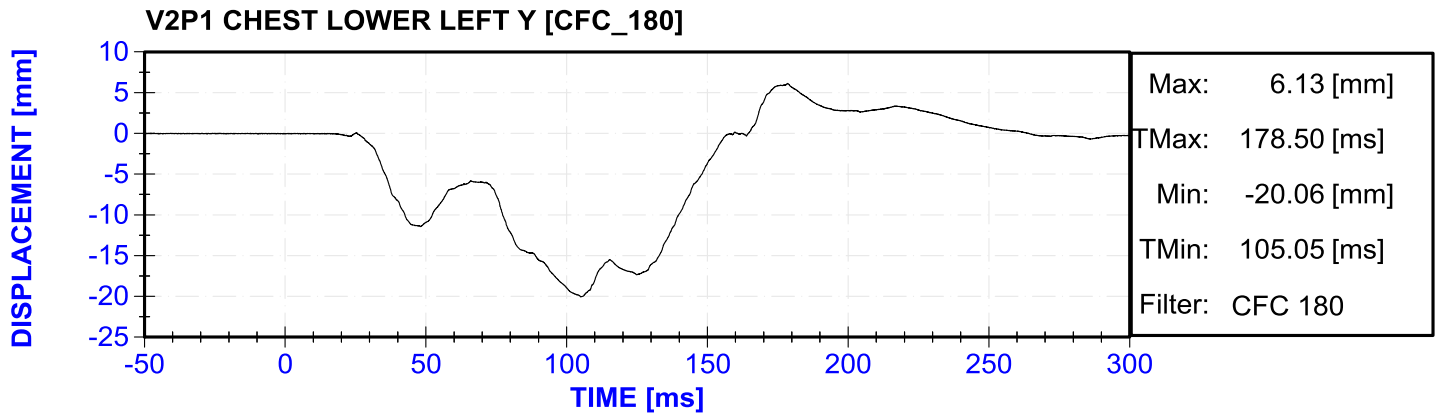


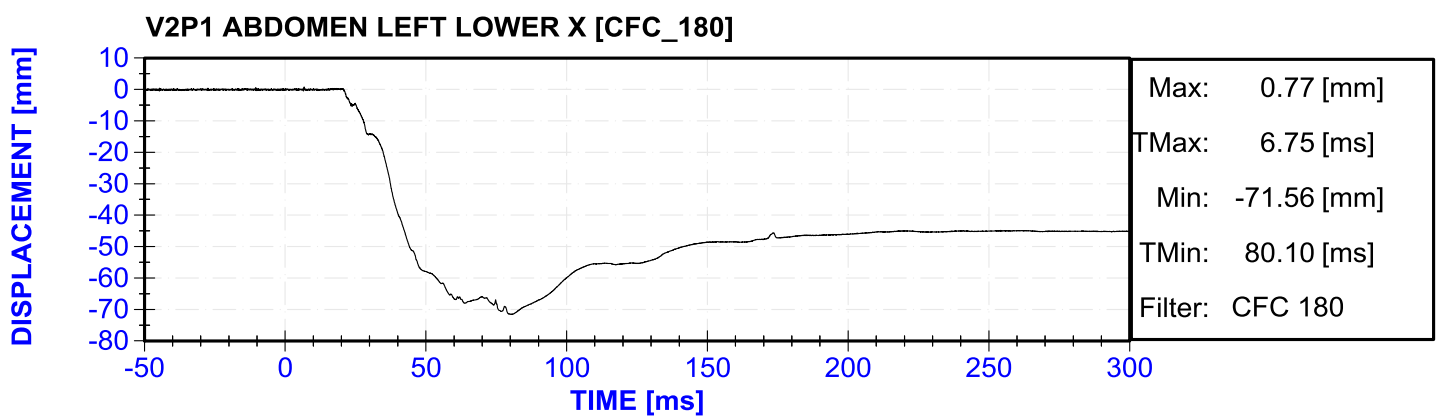
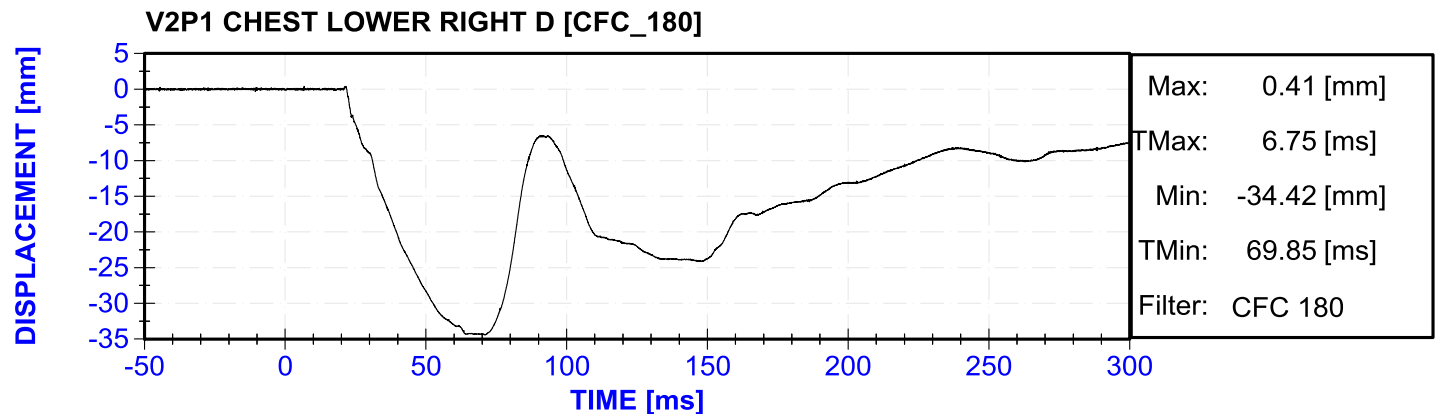
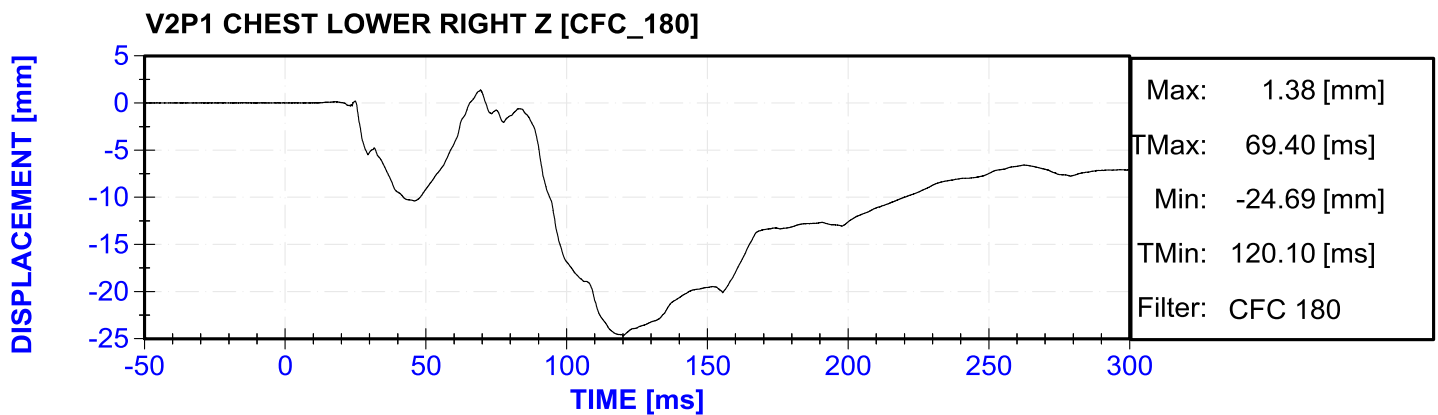
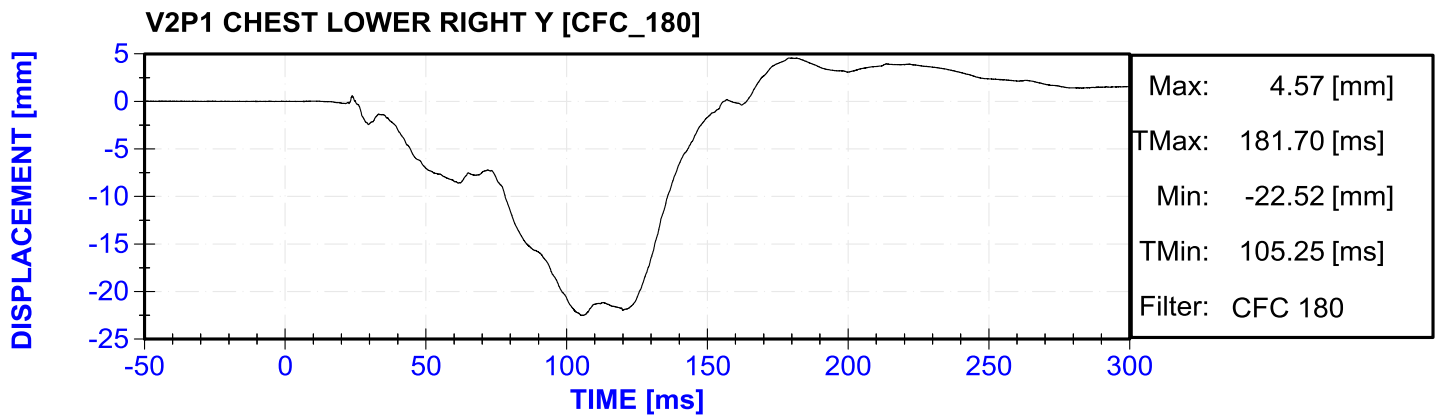
V2P1 CHEST UPPER LEFT X [CFC_180]

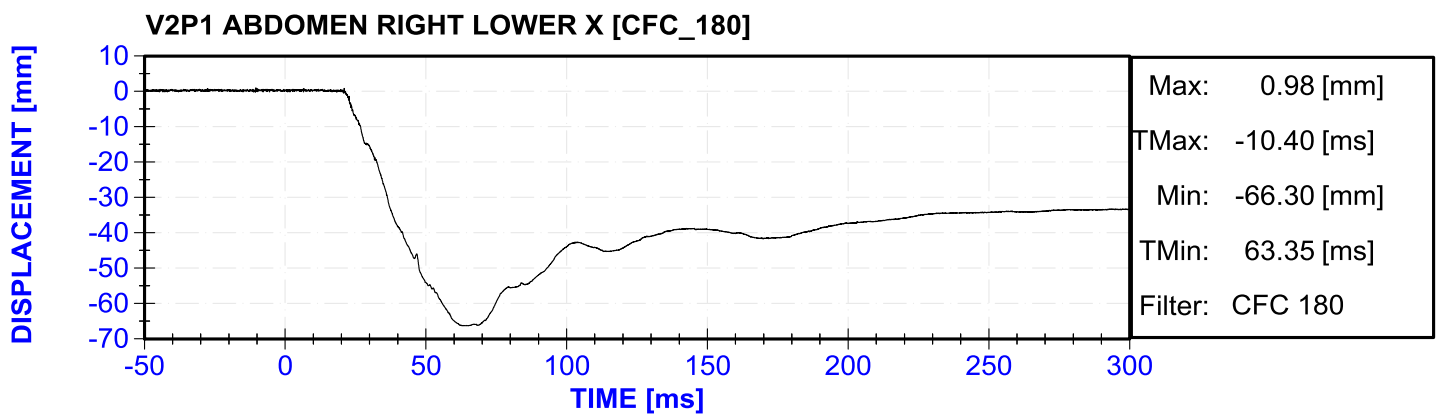
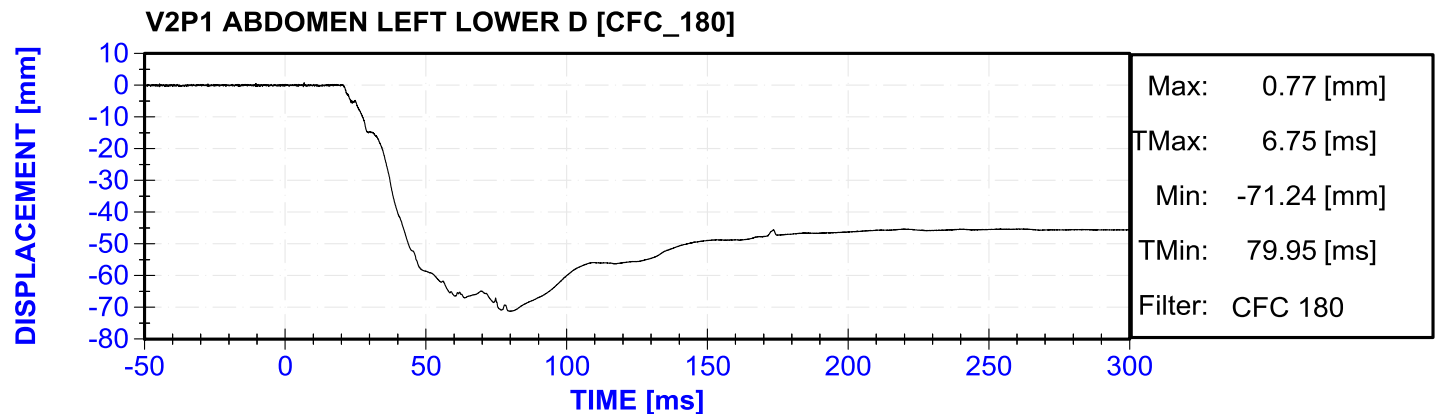
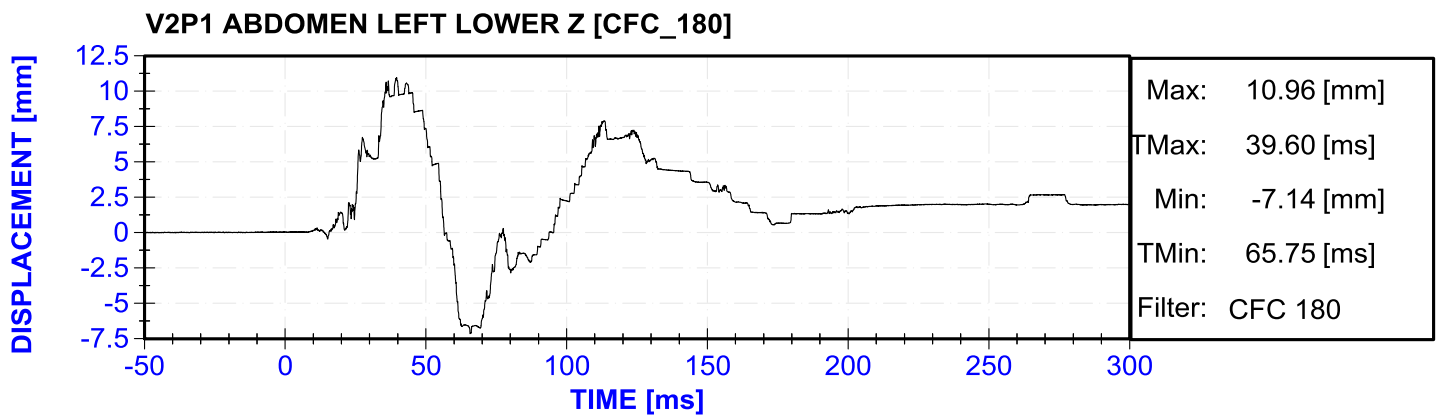
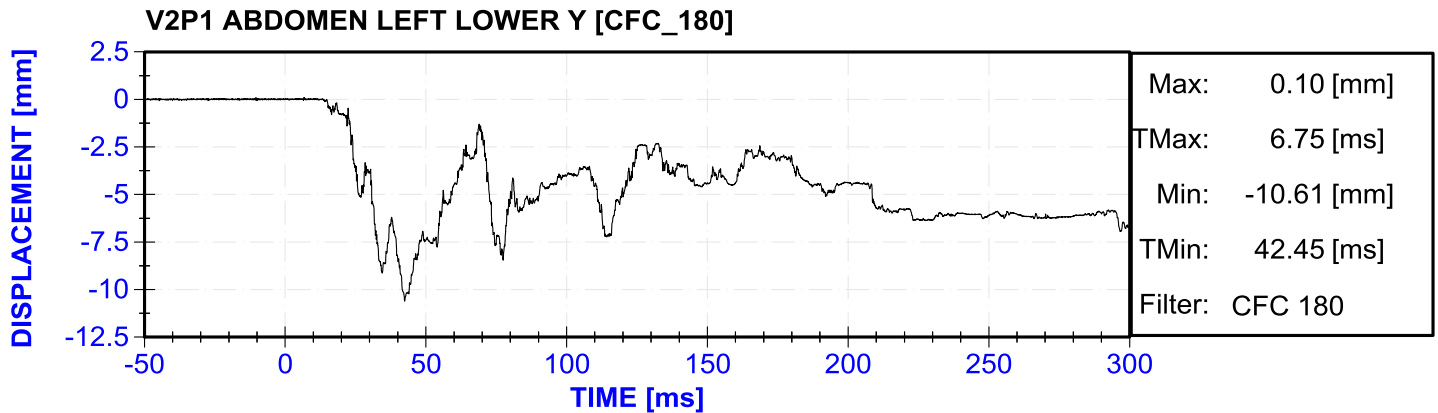


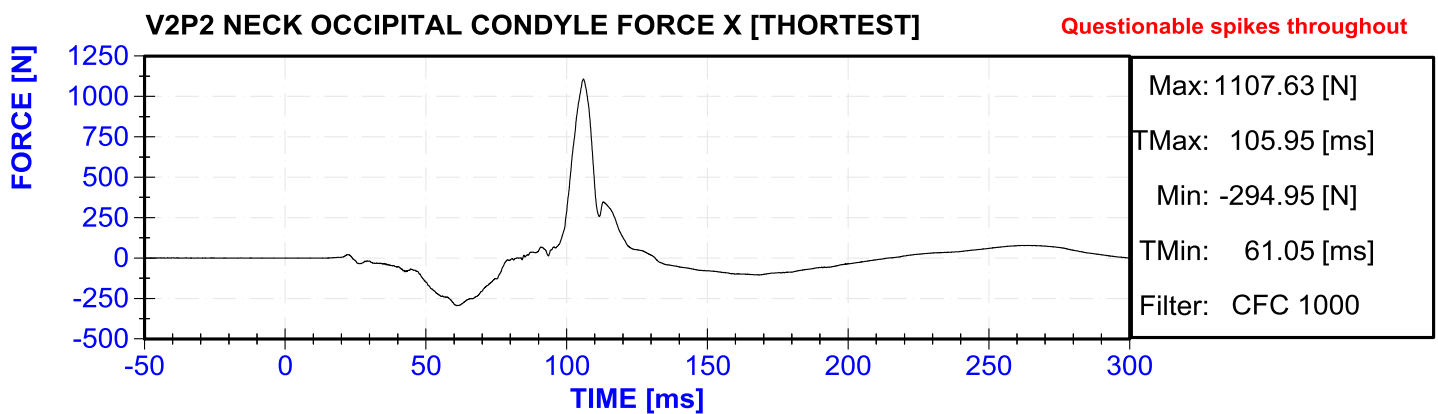
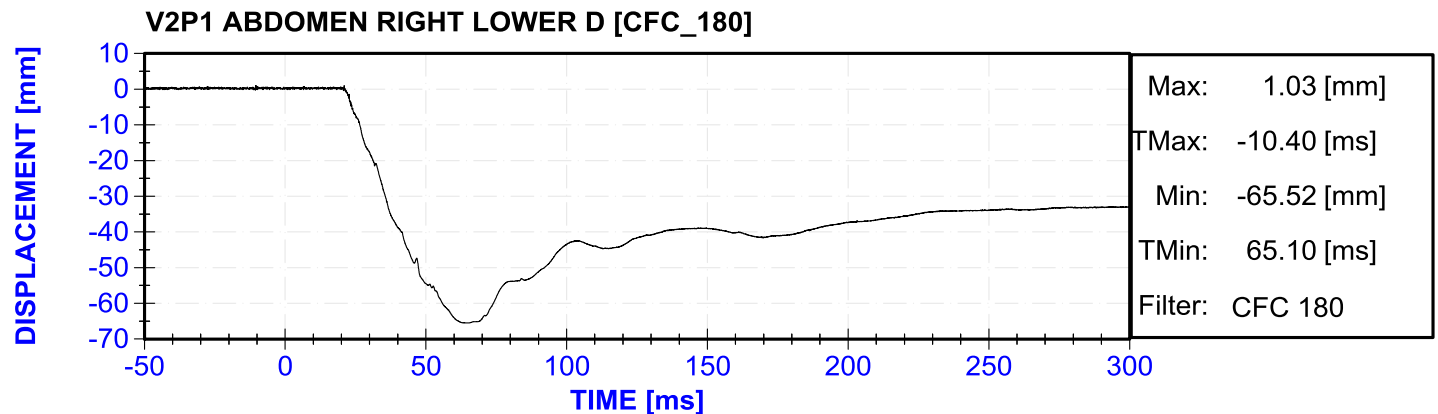
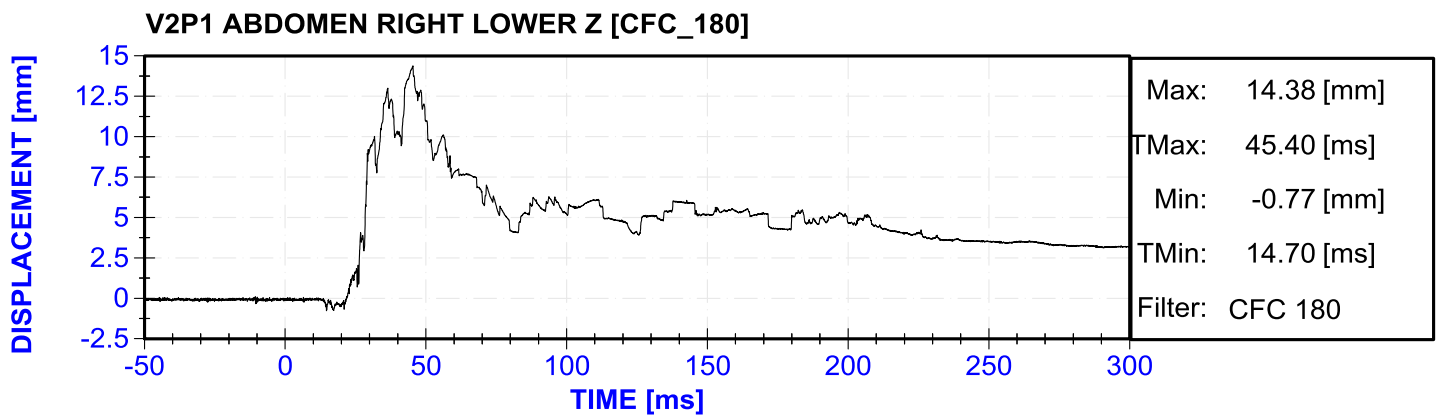
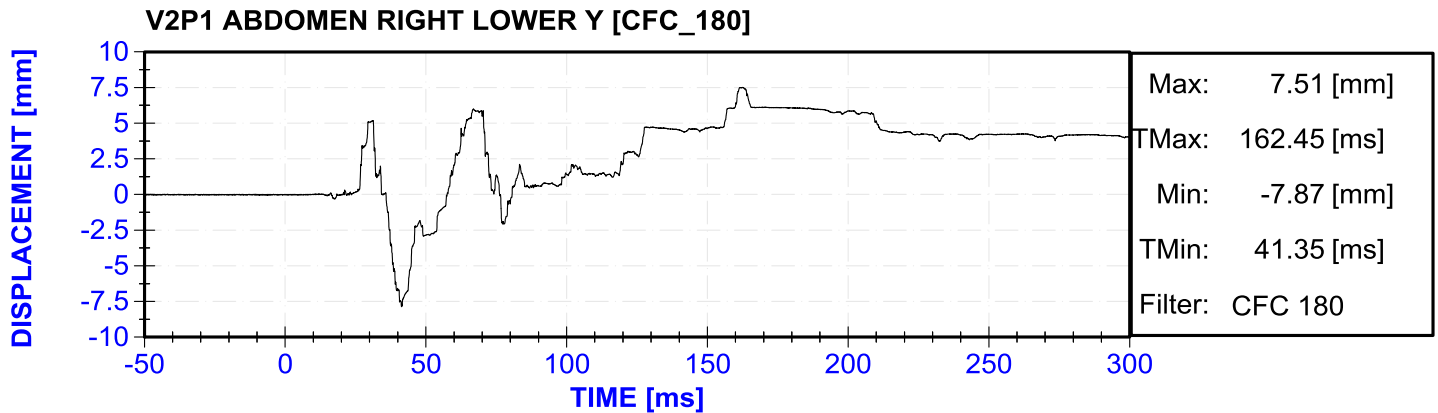






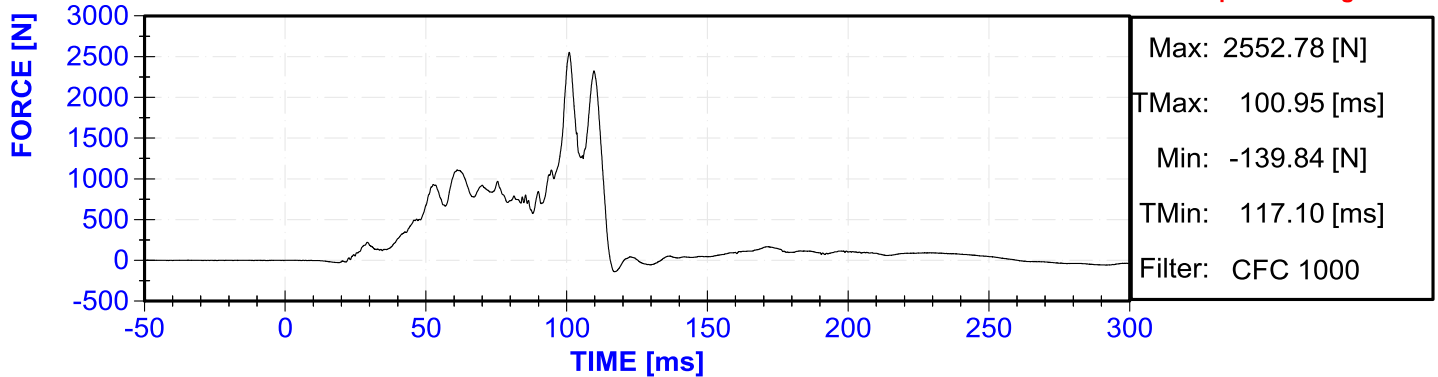






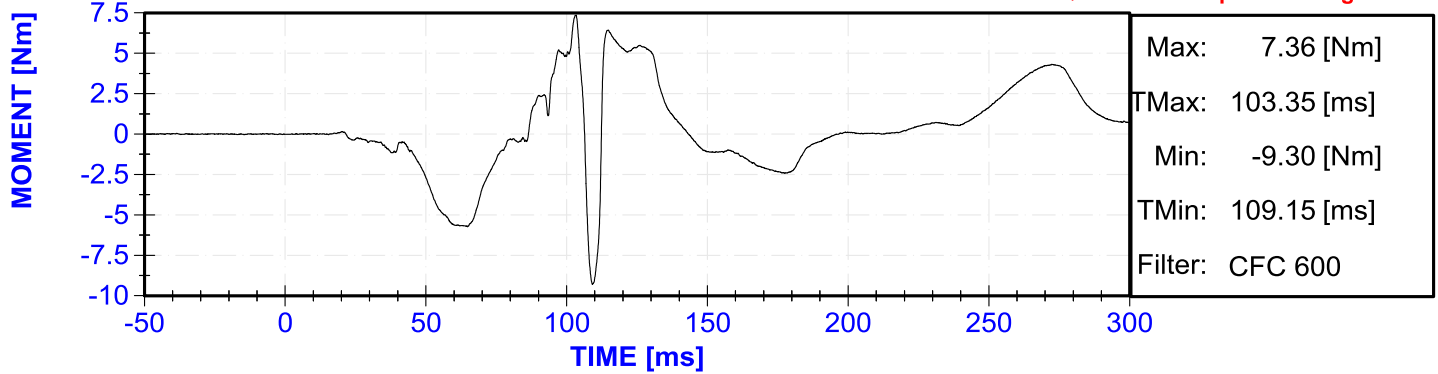
V2P2 NECK OCCIPITAL CONDYLE FORCE Z [THORTEST]

Questionable spikes throughout

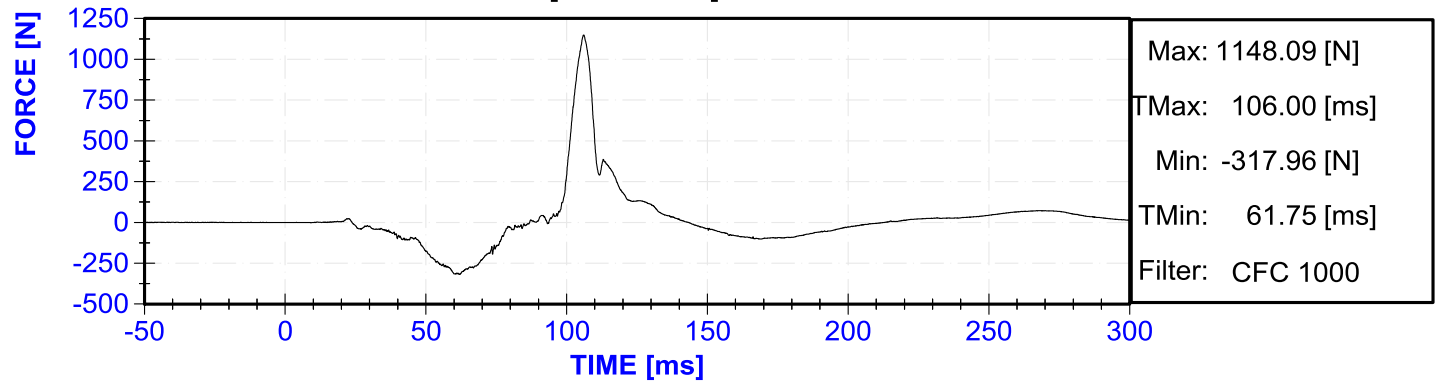


V2P2 NECK OCCIPITAL CONDYLE MY [THORTEST]

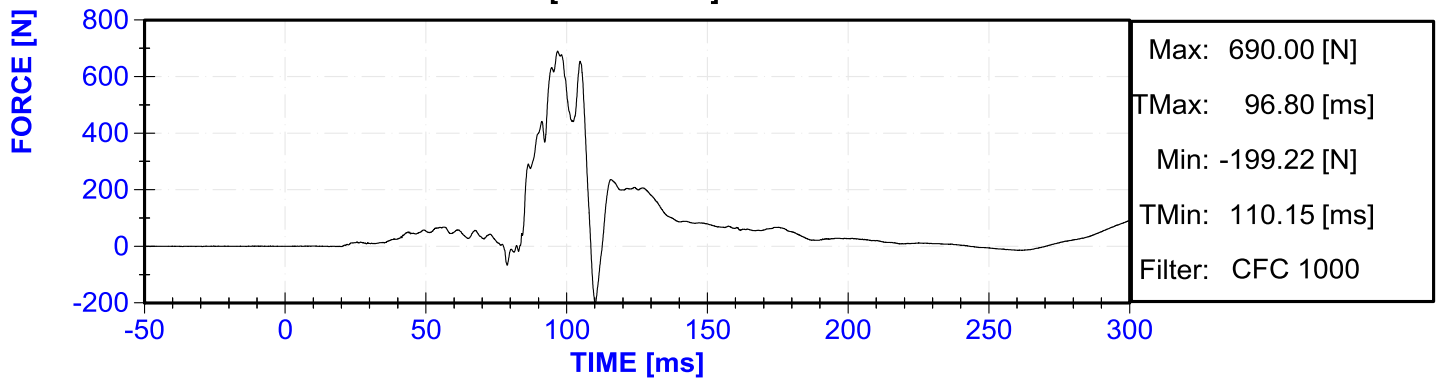
Questionable spikes throughout



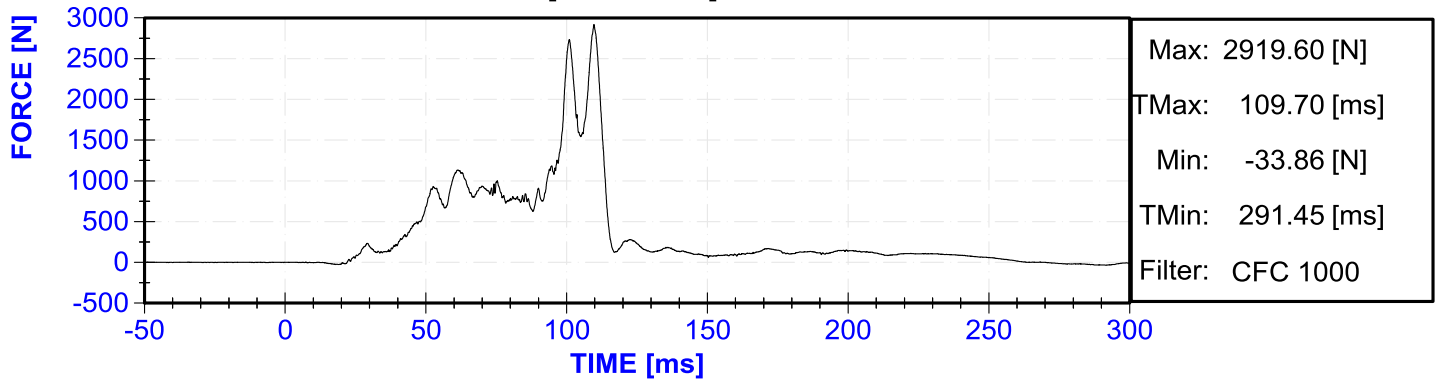
V2P2 NECK UPPER FORCE X [THORTEST]



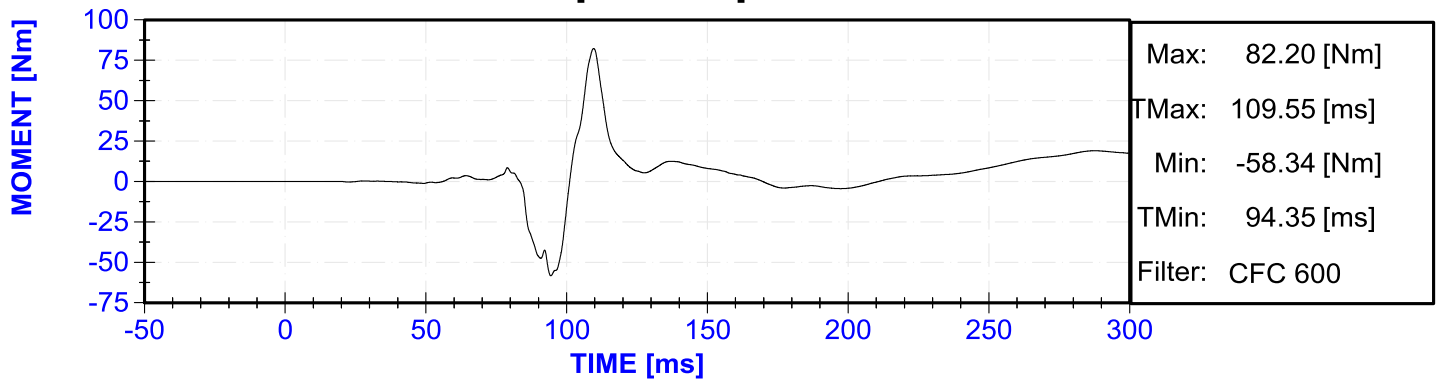
V2P2 NECK UPPER FORCE Y [THORTEST]



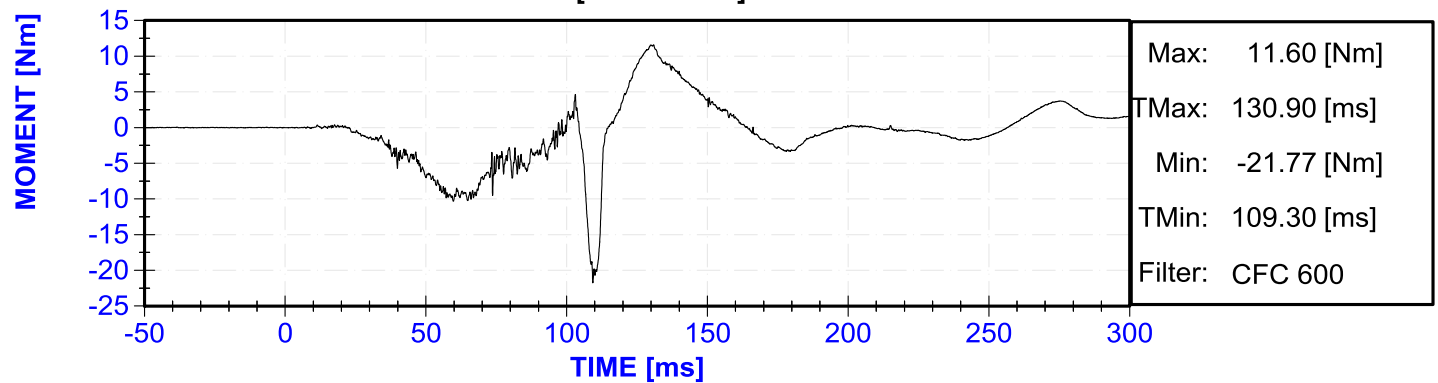
V2P2 NECK UPPER FORCE Z [THORTEST]



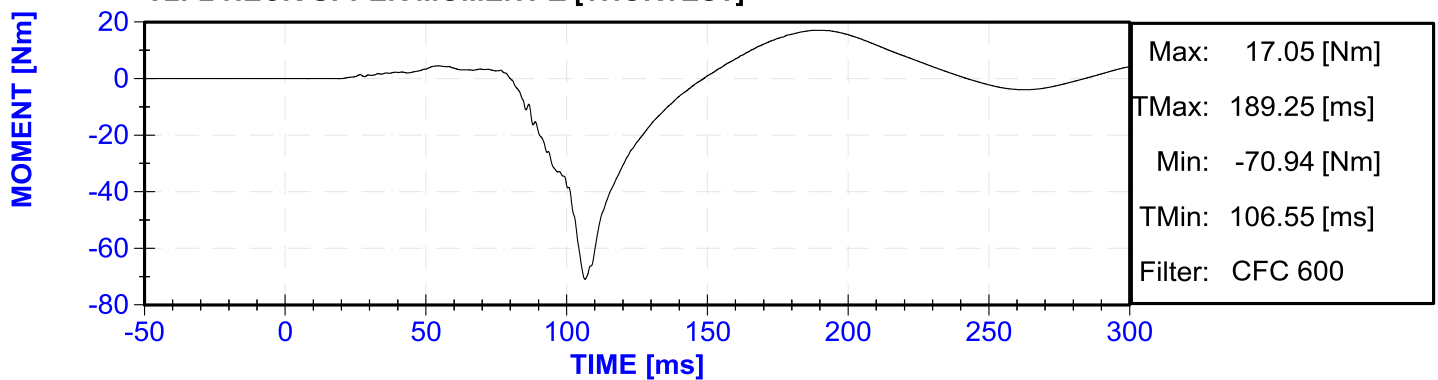
V2P2 NECK UPPER MOMENT X [THORTEST]

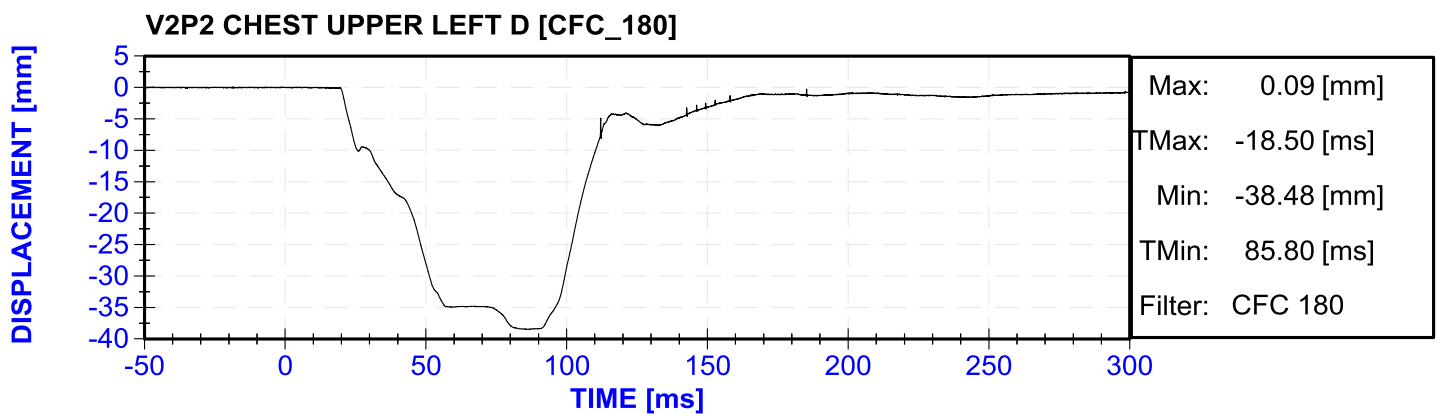
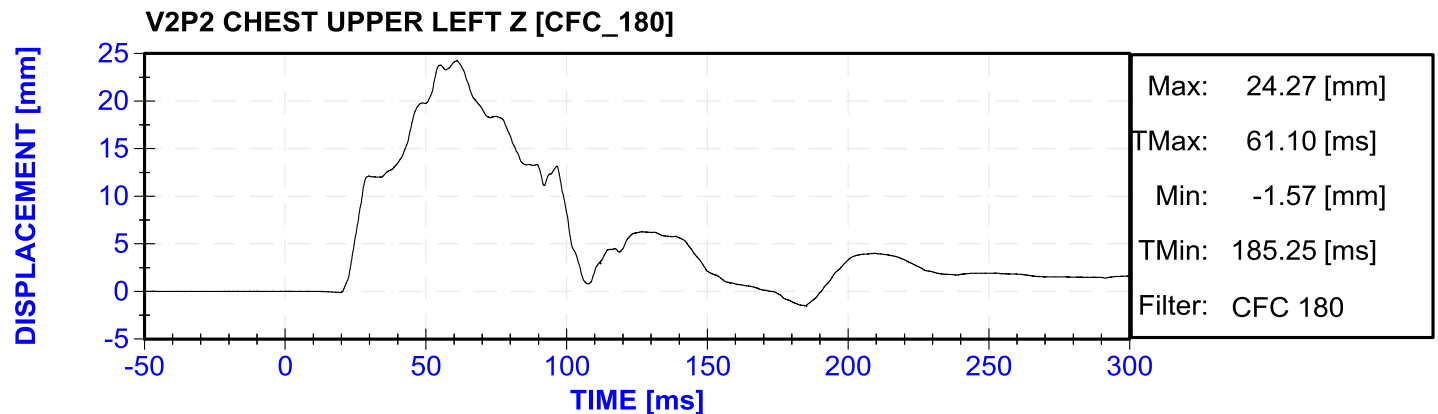
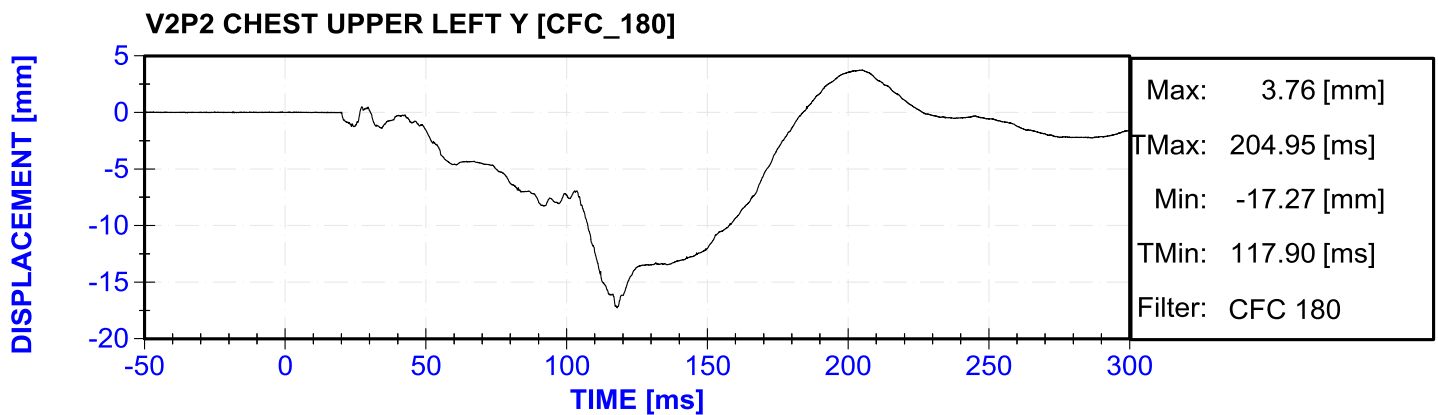
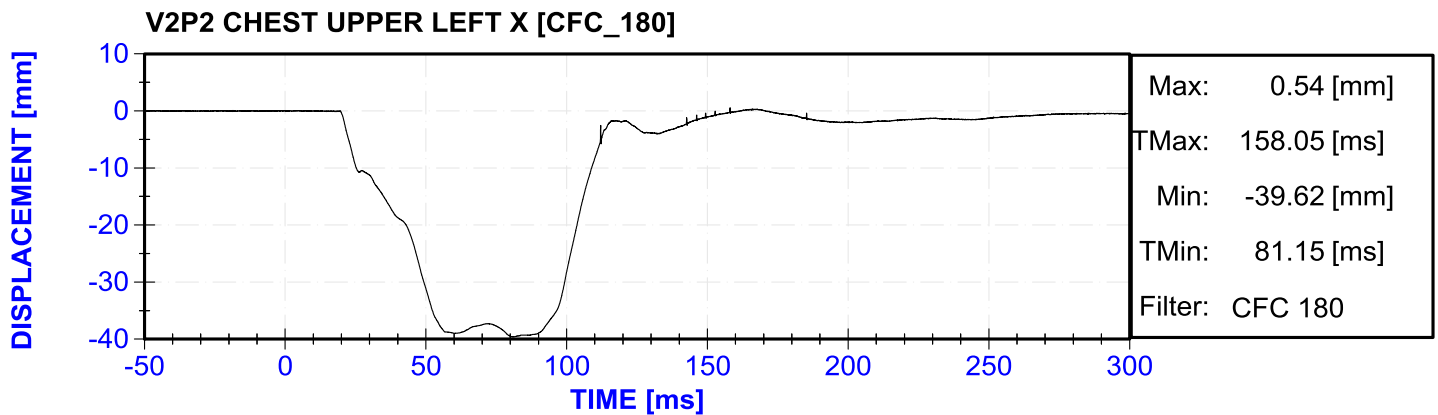


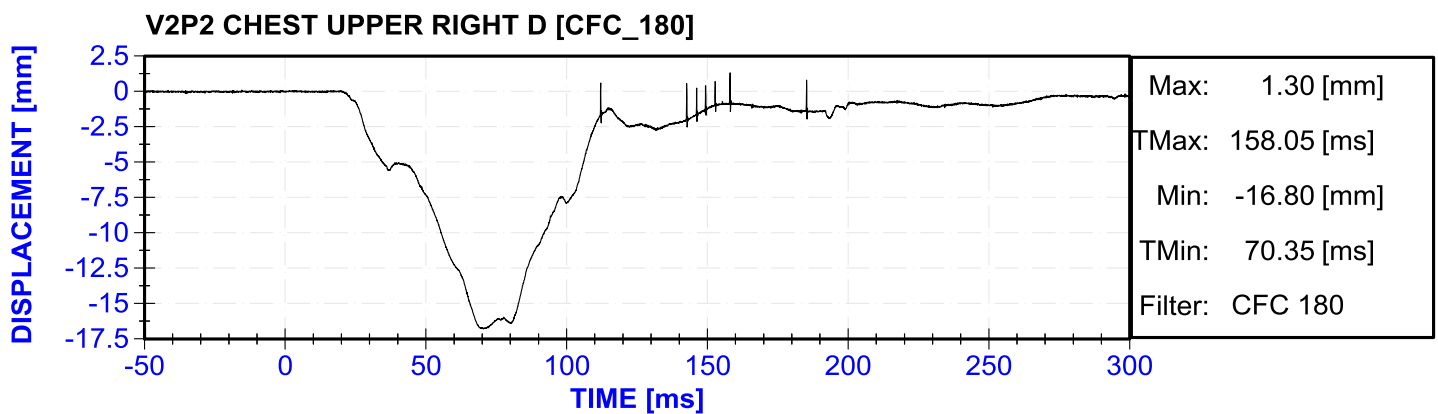
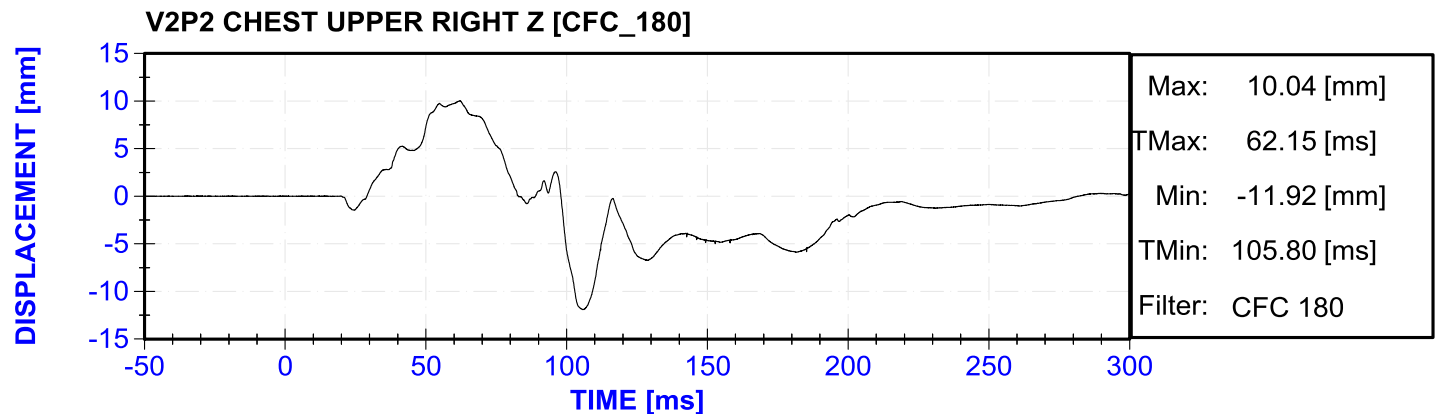
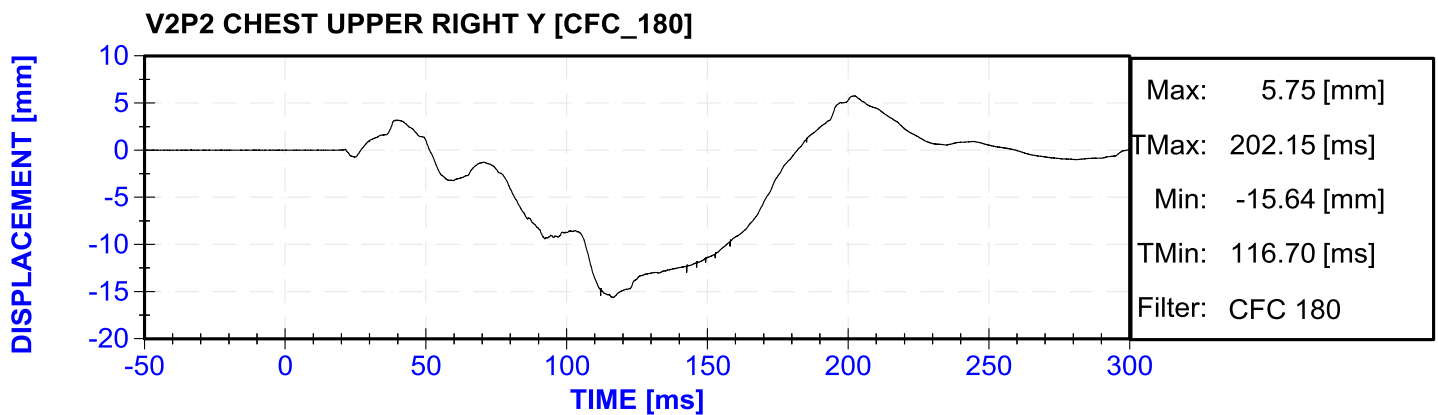
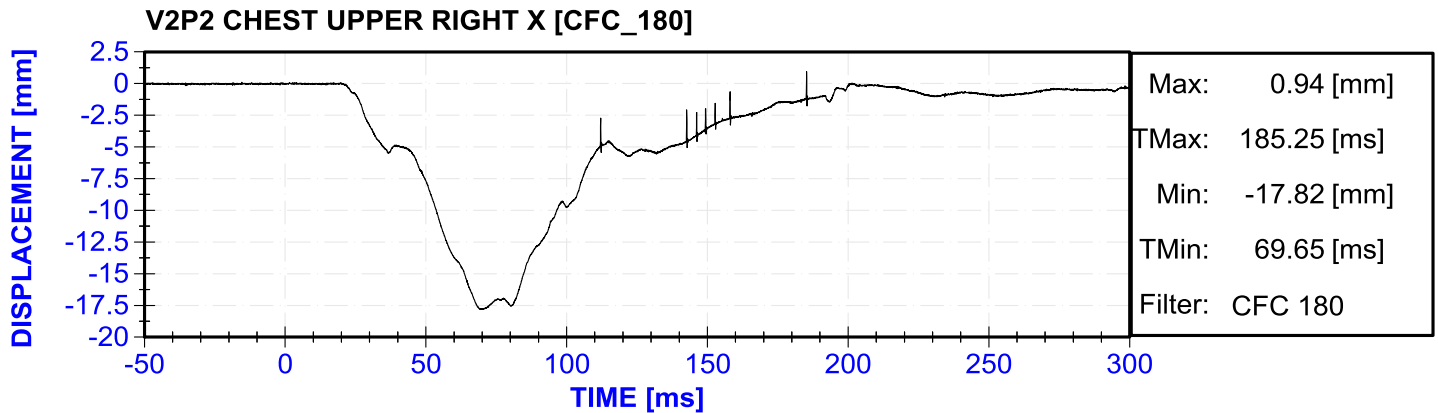
V2P2 NECK UPPER MOMENT Y [THORTEST]

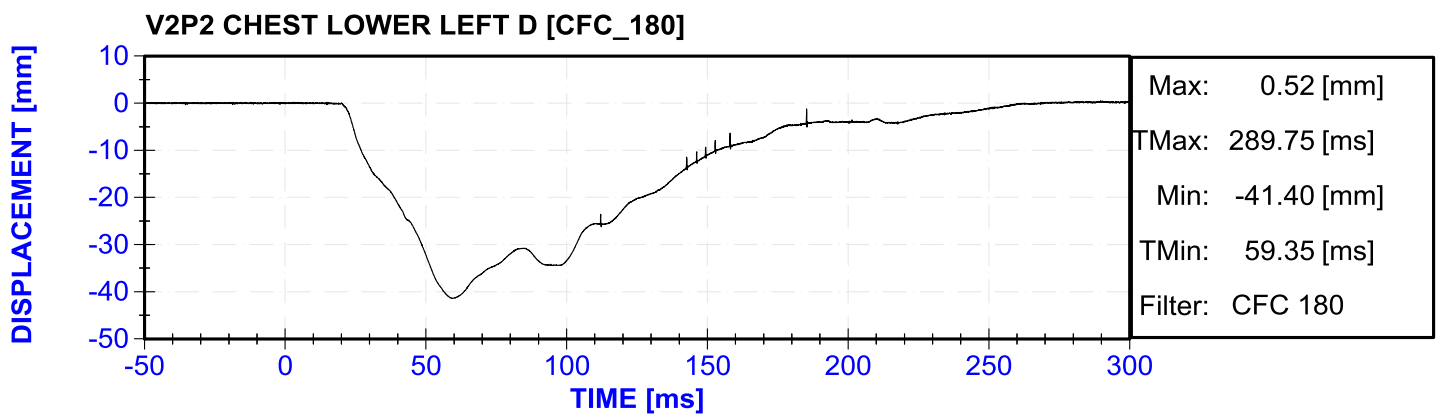
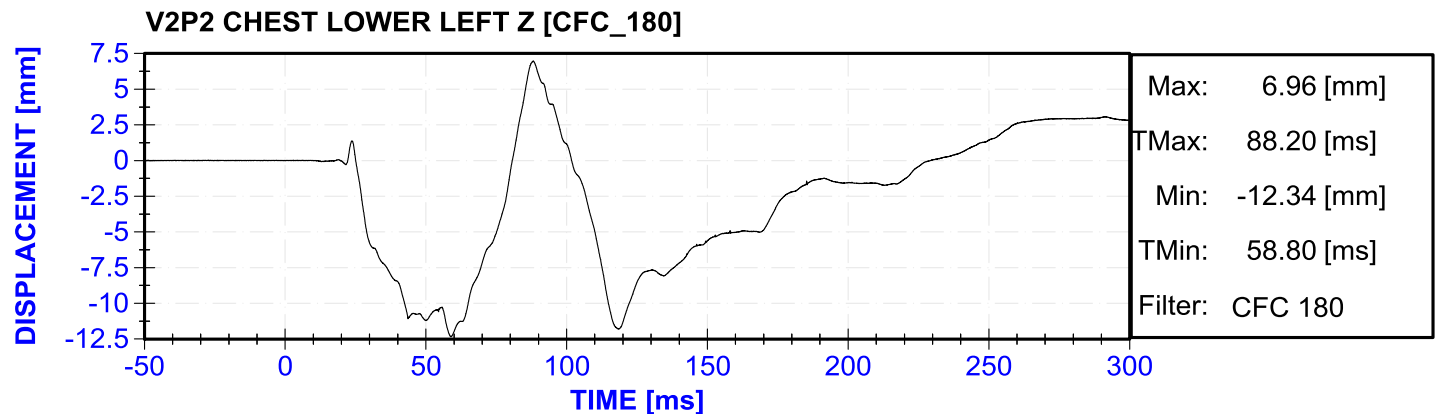
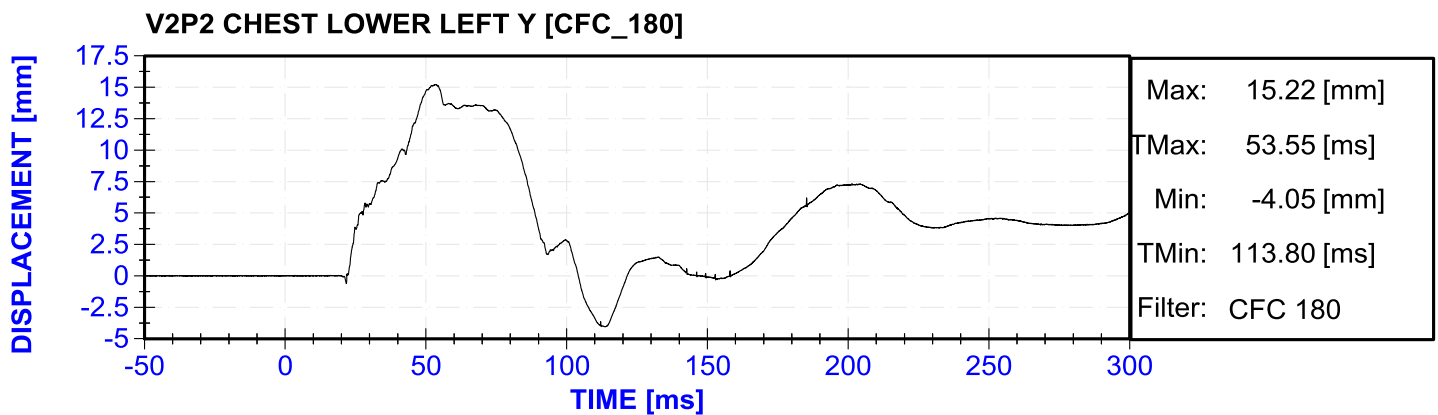
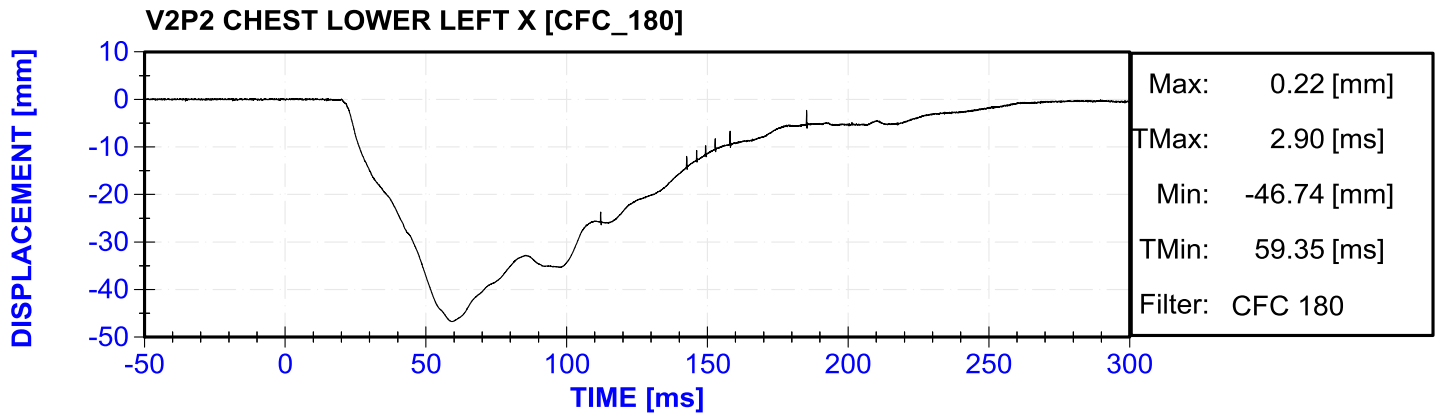


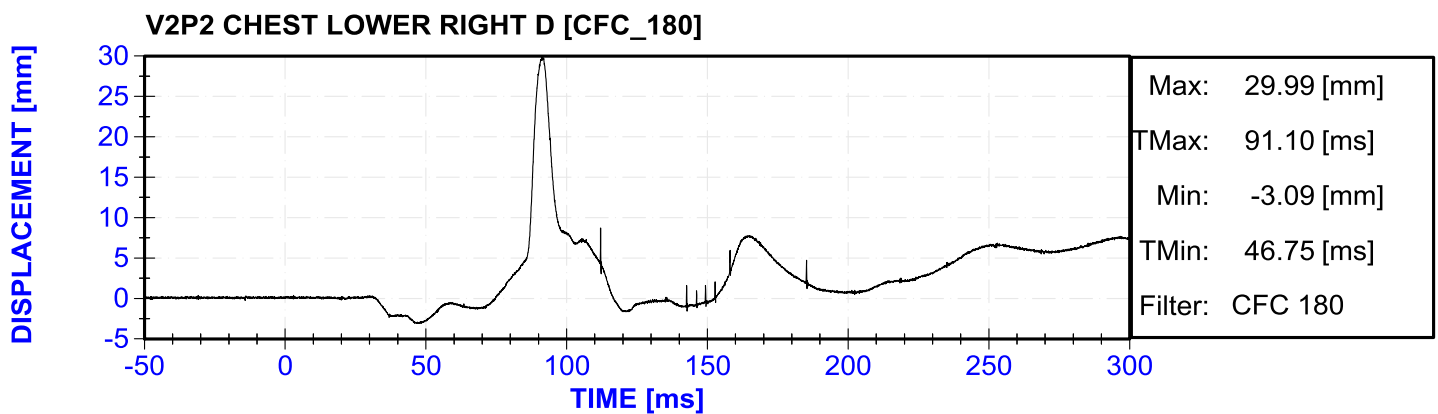
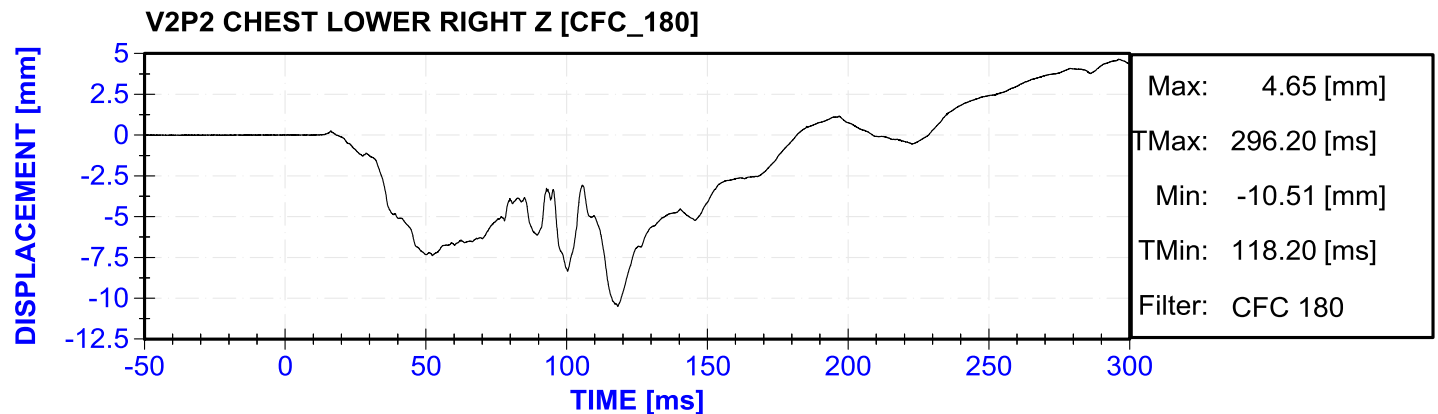
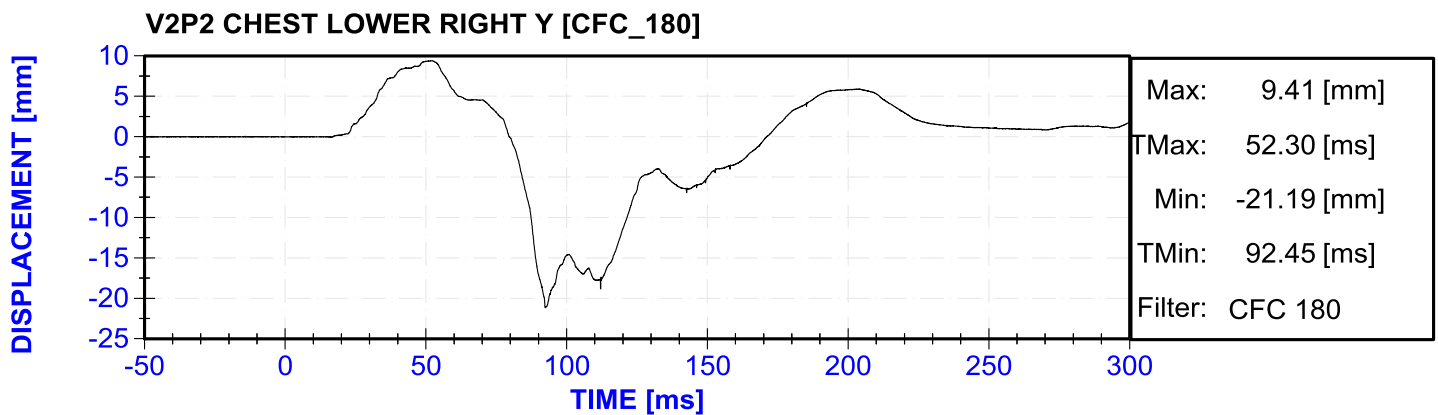
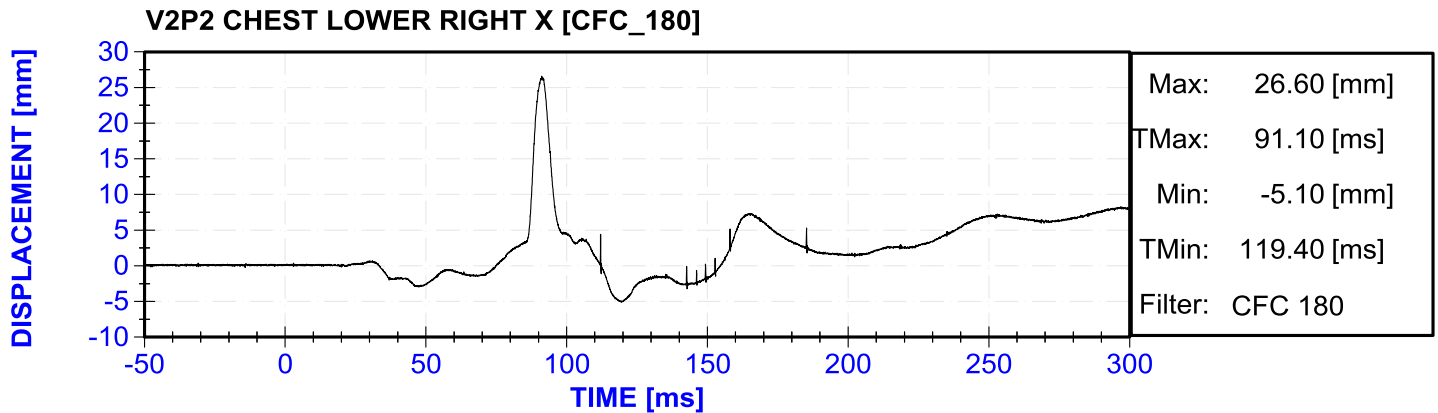
V2P2 NECK UPPER MOMENT Z [THORTEST]

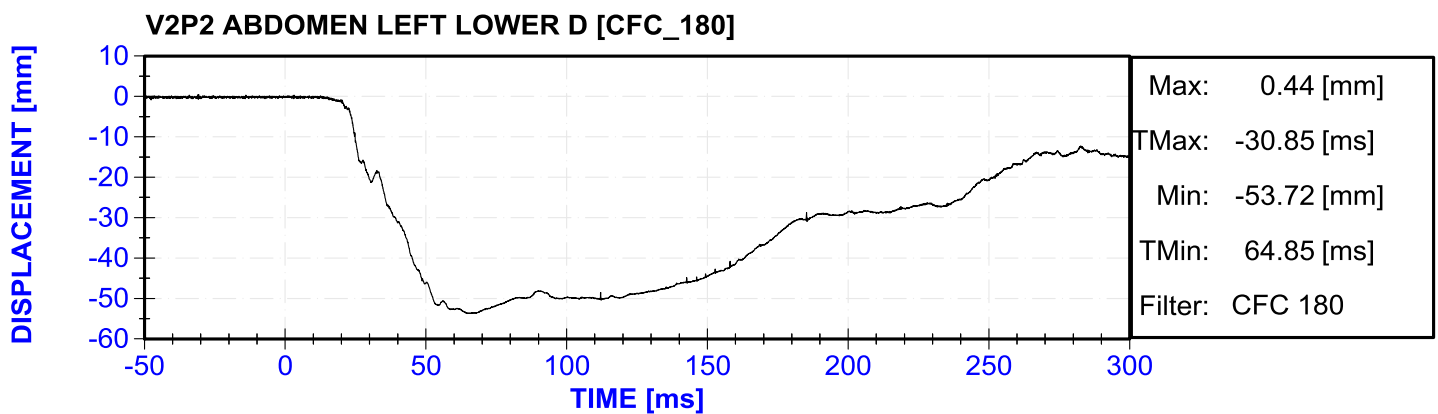
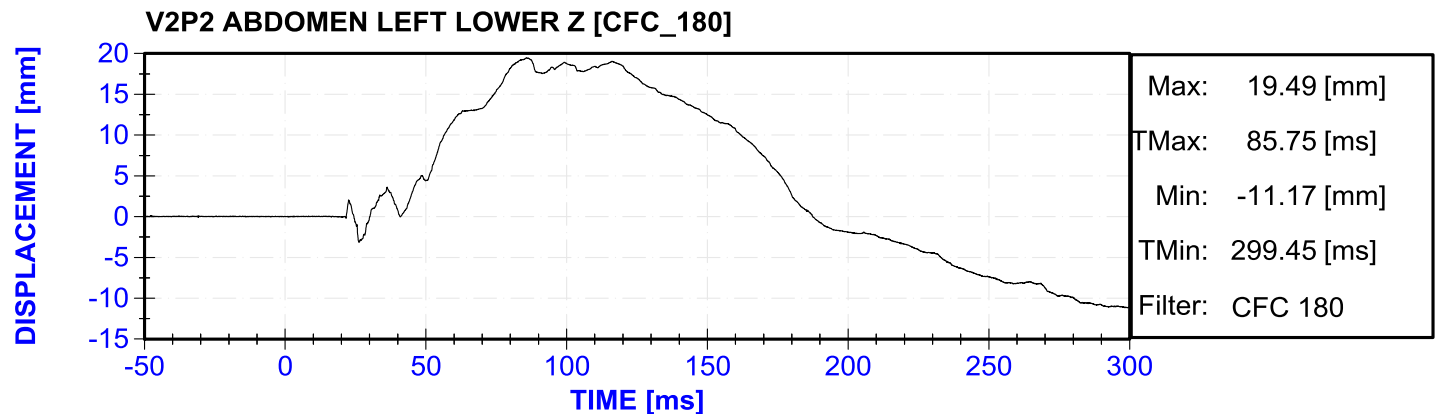
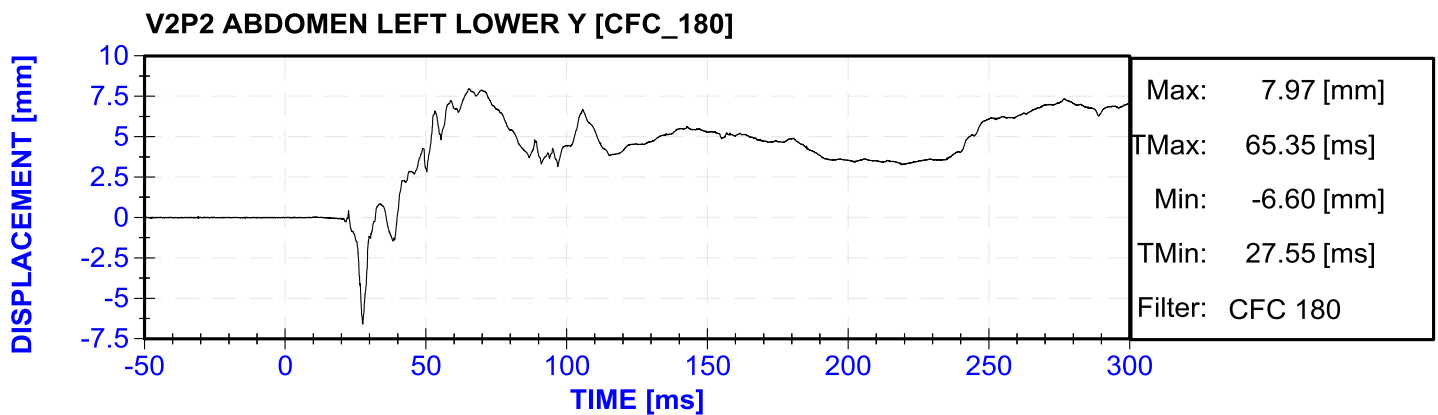
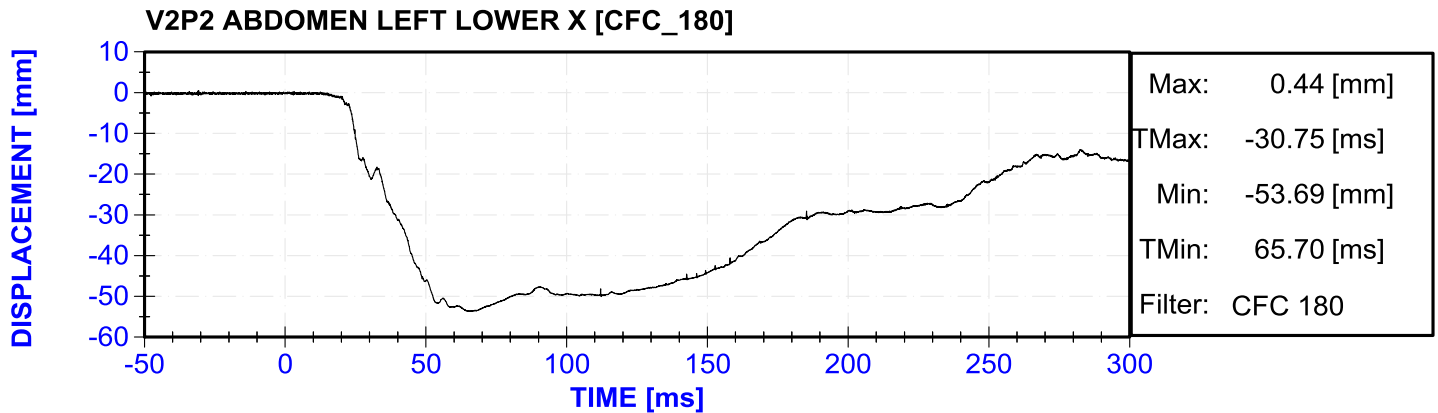


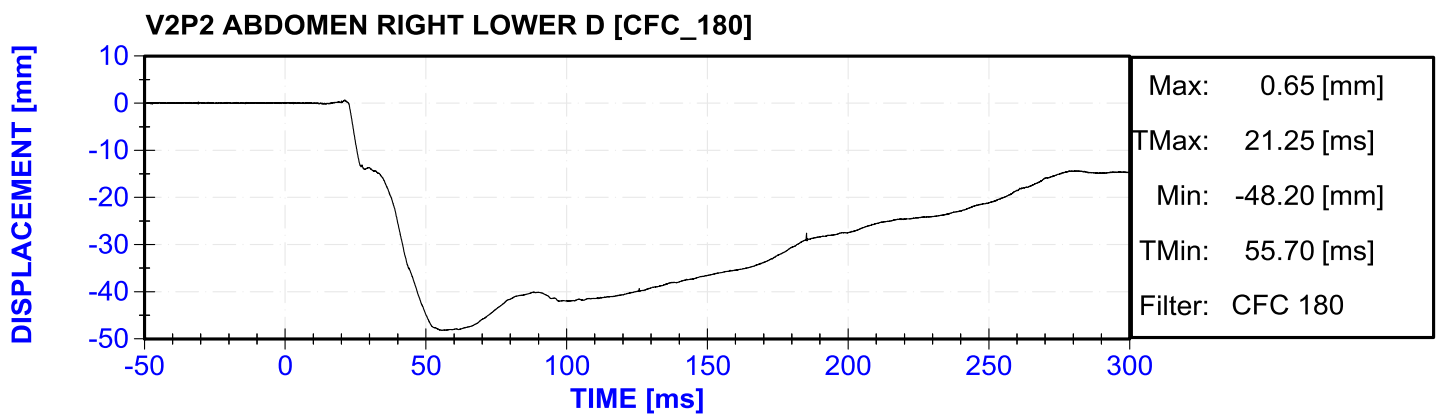
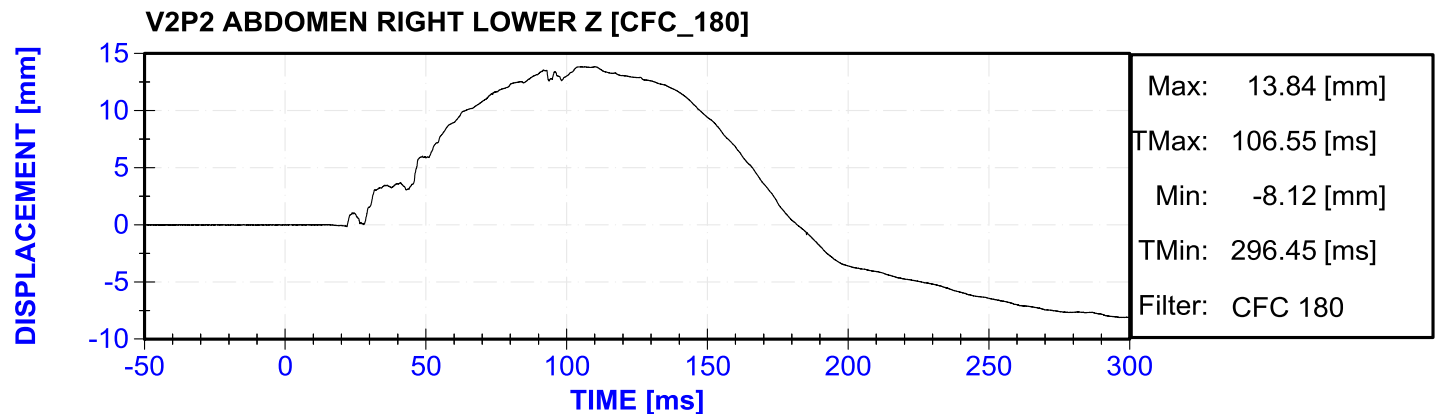
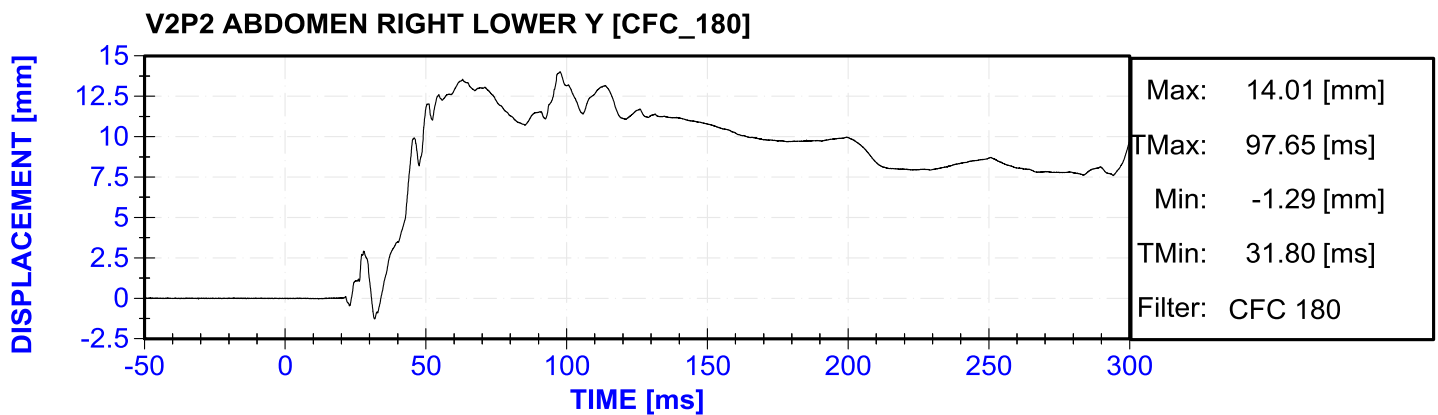
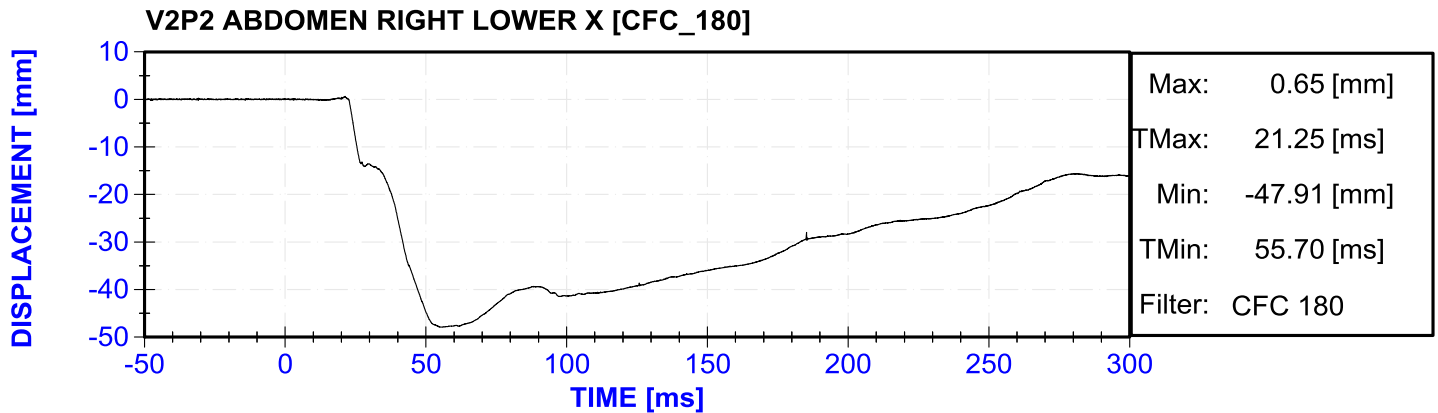












APPENDIX C

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

Table C-1: Dummy Information

TYPE	DESCRIPTION	SERIAL NUMBER
THOR TK	50 TH Male	007
THOR TK	50 TH Male	016

Table C-2: Ankle Offset Files

THOR – TK S/N: 007					
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
-0.83479	-16.049		0.0405	-11.961	
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
-0.9575	-14.97		-6.842	13.223	

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

THOR – TK S/N: 0007								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
HEAD CG X	MFG: ENDEVCO S/N: P74967	2000	g	g	-1000	1000	0.0185	0
HEAD CG Y	MFG: ENDEVCO S/N: P71875	2000	g	g	-1000	1000	0.0176	0
HEAD CG Z	MFG: ENDEVCO S/N: P74784	2000	g	g	-1000	1000	0.01999	0
HDCG Wx	MFG: DTS S/N: ARS4643	36000	deg/s	deg/s	-18000	1000	0.0921	0
HDCG Wy	MFG: DTS S/N: ARS4651	36000	deg/s	deg/s	-18000	1000	0.09301	0
HDCG Wz	MFG: DTS S/N: ARS4650	36000	deg/s	deg/s	-18000	1000	0.09444	0
NEKU Fx	MFG: Denton S/N: 94	18000	lbf	N	-9000	1000	-0.00022811	0
NEKU Fy	MFG: Denton S/N: 94	18000	lbf	N	-9000	1000	0.00022894	0
NEKU Fz	MFG: Denton S/N: 94	26000	lbf	N	-13000	1000	-0.00008764	0
NEKU Mx	MFG: Denton S/N: 94	1200	in-lbf	N-m	-600	600	-0.00591849	0
NEKU My	MFG: Denton S/N: 94	1200	in-lbf	N-m	-600	600	0.00598399	0
NEKU Mz	MFG: Denton S/N: 94	1200	in-lbf	N-m	-600	600	0.00965262	0
NEKL Fx	MFG: DENTON S/N: 88	26000	lbf	N	-13000	1000	0.00017038	0
NEKL Fy	MFG: DENTON S/N: 88	26000	lbf	N	-13000	1000	0.0001704	0
NEKL Fz	MFG: DENTON S/N: 88	26000	lbf	N	-13000	1000	-0.00007065	0
NEKL Mx	MFG: DENTON S/N: 88	1200	in-lbf	N-m	-600	600	-0.0040085	0
NEKL My	MFG: DENTON S/N: 88	1200	in-lbf	N-m	-600	600	0.00400231	0
NEKL Mz	MFG: DENTON S/N: 88	1200	in-lbf	N-m	-600	600	0.0067779	0
NKCF Fz	MFG: DENTON S/N: 93	90000	lbf	N	-45000	1000	0.00086877	0

THOR – TK (Continued) S/N: 0007								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
NKCR Fz	MFG: DENTON S/N: 132	90000	lbf	N	-45000	1000	0.00071044	0
HDOT RDy	MFG: Sfernice S/N: 0942	340	deg	deg	-170	180	3.038	0
SPNU Ax	MFG: ENDEVCO S/N: P74970	1000	g	g	-500	180	0.02212	0
SPNU Ay	MFG: ENDEVCO S/N: P74979	1000	g	g	-500	180	0.01907	0
SPNU Az	MFG: ENDEVCO S/N: P75158	1000	g	g	-500	180	0.01723	0
SPNM Ax	MFG: ENDEVCO S/N: P75155	1000	g	g	-500	180	0.01993	0
SPNM Ay	MFG: ENDEVCO S/N: P75150	1000	g	g	-500	180	0.01954	0
SPNM Az	MFG: ENDEVCO S/N: P75153	1000	g	g	-500	180	0.02378	0
CHLU Dx	MFG: FTSS S/N: AC3556	3.3	V	mm	3.3	600	1000	
CHLU Ry	MFG: Sfernice S/N: AC6043	150	deg	deg	-75	180	3.0419	8.364
CHLU Rz	MFG: Sfernice S/N: AC6041	150	deg	deg	-75	180	3.0642	12.383
CHRU Dx	MFG: FTSS S/N: AC2288	3.3	V	mm	3.3	600	1000	
CHRU Ry	MFG: Sfernice S/N: AC6045	150	deg	deg	-75	180	3.0685	4.271
CHRU Rz	MFG: Sfernice S/N: AC6044	150	deg	deg	-75	180	3.0637	-7.104
CHLL Dx	MFG: FTSS S/N: AC3555	3.3	V	mm	3.3	600	1000	
CHLL Ry	MFG: Sfernice S/N: AC6158	150	deg	deg	-75	180	3.0696	-2.058
CHLL Rz	MFG: Sfernice S/N: AC6159	150	deg	deg	-75	180	3.0682	12.064
CHRL Dx	MFG: FTSS S/N: AC2287	3.3	V	mm	3.3	600	1000	
CHRL Ry	MFG: Sfernice S/N: AC6042	150	deg	deg	-75	180	2.6324	4.158
CHRL Rz	MFG: Sfernice S/N: AC6040	150	deg	deg	-75	180	3.0327	-3.550
ABDL Dx	MFG: Denton S/N: 173	3.3	V	mm	3.3	600	12.97679	
ABDL Ry	MFG: Contelec S/N: DS-558	150	deg	deg	-75	180	3.0172	1.067
ABDL Rz	MFG: Contelec S/N: DS-556	150	deg	deg	-75	180	3.0149	4.797
ABDR Dx	MFG: Denton S/N: 172	3.3	V	mm	3.3	600	13.03657	
ABDR Ry	MFG: Contelec S/N: DS-523	150	deg	deg	-75	180	3.0277	16.200
ABDR Rz	MFG: Contelec S/N: DS-557	150	deg	deg	-75	180	3.0114	-4.094
SPNL Fx	MFG: Denton S/N: 122	26000	lbf	N	-13000	1000	-0.0001395	0
SPNL Fy	MFG: Denton S/N: 122	26000	lbf	N	-13000	1000	0.00014053	0
SPNL Fz	MFG: Denton S/N: 122	36000	lbf	N	-18000	1000	-0.0000533	0
SPNL Mx	MFG: Denton S/N: 122	1400	in-lbf	N-m	-700	1000	-0.00209586	0
SPNL My	MFG: Denton S/N: 122	1400	in-lbf	N-m	-700	1000	0.00184981	0
PVCG Ax	MFG: ENDEVCO S/N: P74965	1000	g	g	-500	1000	0.0202	0
PVCG Ay	MFG: ENDEVCO S/N: P74976	1000	g	g	-500	1000	0.01703	0
PVCG Az	MFG: ENDEVCO S/N: P49439	1000	g	g	-500	1000	0.01961	0
PVAL Fx	MFG: DENTON S/N: 75	44000	lbf	N	-22000	600	0.00012174	0
PVAL Fy	MFG: DENTON S/N: 75	27000	lbf	N	-13500	600	-0.00005981	0
PVAL Fz	MFG: DENTON S/N: 75	27000	lbf	N	-13500	600	0.00016528	0
PVAR Fx	MFG: DENTON S/N: 75	44000	lbf	N	-22000	600	0.00012302	0
PVAR Fy	MFG: DENTON S/N: 75	26000	lbf	N	-13000	600	-0.00006078	0
PVAR Fz	MFG: DENTON S/N: 75	26000	lbf	N	-13000	600	-0.0001662	0
PILL Fx	MFG: Denton S/N: 75	26000	lbf	N	-13000	600	-0.00006743	0
PILR Fx	MFG: Denton S/N: 76	26000	lbf	N	-13000	600	-0.00006867	0
FMRL Fx	MFG: Humanetics S/N: DJ1040Fx	30000	N	N	-15000	600	0.0001436	0
FMRL Fy	MFG: Humanetics S/N: DJ1040Fy	30000	N	N	-15000	600	0.0001441	0
FMRL Fz	MFG: Humanetics S/N: DJ1040Fz	40000	N	N	-20000	600	-0.0000728	0
FMRL Mx	MFG: Humanetics S/N: DJ1040Mx	700	N-m	N-m	-350	600	0.0064454	0

THOR – TK (Continued) S/N: 0007								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
FMRL My	MFG: Humanetics S/N: DJ1040My	700	N-m	N-m	-350	600	0.0064621	0
FMRL Mz	MFG: Humanetics S/N: DJ1040Mz	600	N-m	N-m	-300	600	0.009063	0
KNEL Dx	MFG: Space Age Controls S/N: 025670	80	mm	mm	-40	180	23.8618	0
TBLU Fz	MFG: DENTON S/N: 110Fz	50000	N	N	-25000	600	-0.0000908	0
TBLU Mx	MFG: DENTON S/N: 110Mx	800	N-m	N-m	-400	600	0.0072731	0
TBLU My	MFG: DENTON S/N: 110My	800	N-m	N-m	-400	600	0.0072771	0
TBLL Fz	MFG: Denton S/N: 120Fz	50000	N	N	-25000	600	-0.00009686	0
TBLL Mx	MFG: Denton S/N: 120Mx	800	N-m	N-m	-400	600	0.00750986	0
TBLL My	MFG: Denton S/N: 120My	800	N-m	N-m	-400	600	0.0075842	0
ANKL Rx	MFG: Contelec S/N: ANKLX-0371	200	deg	deg	-100	180	2.995	-0.83479
ANKL Ry	MFG: Contelec S/N: ANKLY-0367	200	deg	deg	-100	180	3.014	-16.049
FOTL Az	MFG: ENDEVCO S/N: P51711	3000	g	g	-1500	1000	0.01972	0
FMRR Fx	MFG: Humanetics S/N: DJ1045Fx	30000	N	N	-15000	600	0.0001461	0
FMRR Fy	MFG: Humanetics S/N: DJ1045Fy	30000	N	N	-15000	600	0.0001465	0
FMRR Fz	MFG: Humanetics S/N: DJ1045Fz	40000	N	N	-20000	600	-0.0000756	0
FMRR Mx	MFG: Humanetics S/N: DJ1045Mx	700	N-m	N-m	-350	600	0.0065482	0
FMRR My	MFG: Humanetics S/N: DJ1045My	700	N-m	N-m	-350	600	0.006518	0
FMRR Mz	MFG: Humanetics S/N: DJ1045Mz	600	N-m	N-m	-300	600	0.0097325	0
KNER Dx	MFG: Space Age Controls S/N: 019588	80	mm	mm	-40	180	23.9349	0
TBRU Fz	MFG: DENTON S/N: 107Fz	50000	N	N	-25000	600	-0.0000955	0
TBRU Mx	MFG: DENTON S/N: 107Mx	800	N-m	N-m	-400	600	0.0074272	0
TBRU My	MFG: DENTON S/N: 107My	800	N-m	N-m	-400	600	0.007333	0
TBRL Fz	MFG: Denton S/N: 75Fz	50000	N	N	-25000	600	-0.00009964	0
TBRL Mx	MFG: Denton S/N: 75Mx	800	N-m	N-m	-400	600	0.00736028	0
TBRL My	MFG: Denton S/N: 75My	800	N-m	N-m	-400	600	0.00736294	0
ANKR Rx	MFG: Contelec S/N: ANKRX-0368	200	deg	deg	-100	180	3.017	0.0405
ANKR Ry	MFG: Contelec S/N: ANKRY-0369	200	deg	deg	-100	180	3.009	-11.961
FOTR Az	MFG: ENDEVCO S/N: P64128	3000	g	g	-1500	1000	0.02344	0

THOR – TK S/N: 016								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
HEAD CG X	MFG: ENDEVCO S/N: P49194	2000	g	g	-1000	1000	0.0177	0
HEAD CG Y	MFG: ENDEVCO S/N: P52086	2000	g	g	-1000	1000	0.02065	0
HEAD CG Z	MFG: ENDEVCO S/N: P52043	2000	g	g	-1000	1000	0.01721	0
HDCG Wx	MFG: DTS S/N: ARS4727	36000	deg/s	deg/s	-18000	1000	0.09262	0
HDCG Wy	MFG: DTS S/N: ARS4712	36000	deg/s	deg/s	-18000	1000	0.09378	0
HDCG Wz	MFG: DTS S/N: ARS4714	36000	deg/s	deg/s	-18000	1000	0.09563	0
NEKU Fx	MFG: DENTON S/N: 77	18000	lbf	N	-9000	1000	0.0002406	0
NEKU Fy	MFG: DENTON S/N: 77	18000	lbf	N	-9000	1000	0.00024081	0
NEKU Fz	MFG: DENTON S/N: 77	26000	lbf	N	-13000	1000	-0.00008546	0
NEKU Mx	MFG: DENTON S/N: 77	1200	in-lbf	N-m	-600	600	0.00584857	0
NEKU My	MFG: DENTON S/N: 77	1200	in-lbf	N-m	-600	600	0.00609285	0

THOR – TK (Continued) S/N: 016								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
NEKU Mz	MFG: DENTON S/N: 80	1200	in-lbf	N-m	-600	600	0.00980132	0
NEKL Fx	MFG: DENTON S/N: 80	26000	lbf	N	-13000	1000	-0.00017312	0
NEKL Fy	MFG: DENTON S/N: 80	26000	lbf	N	-13000	1000	0.00017328	0
NEKL Fz	MFG: DENTON S/N: 80	26000	lbf	N	-13000	1000	-0.00006903	0
NEKL Mx	MFG: DENTON S/N: 80	1200	in-lbf	N-m	-600	600	-0.00417667	0
NEKL My	MFG: DENTON S/N: 80	1200	in-lbf	N-m	-600	600	0.00421295	0
NEKL Mz	MFG: DENTON S/N: 75	1200	in-lbf	N-m	-600	600	0.00690093	0
NKCF Fz	MFG: Sfernice S/N: DI7189	90000	lbf	N	-45000	1000	0.00052317	0
NKCR Fz	MFG: ENDEVCO S/N: P64099	90000	lbf	N	-45000	1000	0.0004801	0
HDOT RDy	MFG: ENDEVCO S/N: P58838	340	deg	deg	-170	180	3.038	0
SPNU Ax	MFG: ENDEVCO S/N: P58834	1000	g	g	-500	180	0.01844	0
SPNU Ay	MFG: ENDEVCO S/N: P64002	1000	g	g	-500	180	0.01739	0
SPNU Az	MFG: ENDEVCO S/N: P58735	1000	g	g	-500	180	0.0188	0
SPNM Ax	MFG: ENDEVCO S/N: P64111	1000	g	g	-500	180	0.01799	0
SPNM Ay	MFG: FTSS S/N: DI4715	1000	g	g	-500	180	0.01841	0
SPNM Az	MFG: Denton S/N: DI2382	1000	g	g	-500	180	0.01674	0
CHLU Dx	MFG: Denton S/N: DI2383	3.3	V	mm	3.3	600	1000	
CHLU Ry	MFG: FTSS S/N: DI4716	150	deg	deg	-75	180	3.0087	8.434
CHLU Rz	MFG: Denton S/N: DI2381	150	deg	deg	-75	180	3.0074	11.913
CHRU Dx	MFG: Denton S/N: DI2380	3.3	V	mm	3.3	600	1000	
CHRU Ry	MFG: FTSS S/N: DI4718	150	deg	deg	-75	180	3.0077	7.451
CHRU Rz	MFG: Denton S/N: DI2386	150	deg	deg	-75	180	3.0199	-9.781
CHLL Dx	MFG: Denton S/N: DI6129	3.3	V	mm	3.3	600	1000	
CHLL Ry	MFG: FTSS S/N: DI4717	150	deg	deg	-75	180	3.0211	3.758
CHLL Rz	MFG: Denton S/N: DI2385	150	deg	deg	-75	180	3.01218	7.021
CHRL Dx	MFG: Denton S/N: DI2384	3.3	V	mm	3.3	600	1000	
CHRL Ry	MFG: Denton S/N: 183	150	deg	deg	-75	180	3.016	.5991
CHRL Rz	MFG: Denton S/N: 219	150	deg	deg	-75	180	3.0217	-8.613
ABDL Dx	MFG: Denton S/N: 218	3.3	V	mm	3.3	600	1000	
ABDL Ry	MFG: Denton S/N: 184	150	deg	deg	-75	180	3.218	4.171
ABDL Rz	MFG: Denton S/N: 220	150	deg	deg	-75	180	3.165	1.789
ABDR Dx	MFG: Denton S/N: 221	3.3	V	mm	3.3	600	1000	
ABDR Ry	MFG: Denton S/N: 123	150	deg	deg	-75	180	3.182	5.652
ABDR Rz	MFG: Denton S/N: 123	150	deg	deg	-75	180	3.168	-1.162
SPNL Fx	MFG: Denton S/N: 123	26000	lbf	N	-13000	1000	0.00139138	0
SPNL Fy	MFG: Denton S/N: 123	26000	lbf	N	-13000	1000	0.00013943	0
SPNL Fz	MFG: Denton S/N: 123	36000	lbf	N	-18000	1000	-0.00005291	0
SPNL Mx	MFG: ENDEVCO S/N: P64087	1400	in-lbf	N-m	-700	1000	-0.00209586	0
SPNL My	MFG: ENDEVCO S/N: P50065	1400	in-lbf	N-m	-700	1000	0.00182945	0
PVCG Ax	MFG: ENDEVCO S/N: P64123	1000	g	g	-500	1000	0.01834	0
PVCG Ay	MFG: DENTON S/N: 77	1000	g	g	-500	1000	0.01785	0
PVCG Az	MFG: DENTON S/N: 77	1000	g	g	-500	1000	0.01914	0
PVAL Fx	MFG: DENTON S/N: 77	44000	lbf	N	-22000	600	-0.00011976	0
PVAL Fy	MFG: DENTON S/N: 84	27000	lbf	N	-13500	600	-0.00005959	0
PVAL Fz	MFG: DENTON S/N: 84	27000	lbf	N	-13500	600	-0.00016344	0

THOR – TK (Continued) S/N: 016								
Sensor	Manufacturer/ Serial #	Capacity	Units (E)	Units (M)	Range	CFC	Sensitivity (mv/V/EU)	Initial Offset (EU)
PVAR Fx	MFG: DENTON S/N: 84	44000	lbf	N	-22000	600	0.00012055	0
PVAR Fy	MFG: Denton S/N: DI4774	26000	lbf	N	-13000	600	-0.00006006	0
PVAR Fz	MFG: Denton S/N: DI4775	26000	lbf	N	-13000	600	0.00016272	0
PILL Fx	MFG: Denton S/N: DH9717	26000	lbf	N	-13000	1000	-0.00012118	0
PILR Fx	MFG: Denton S/N: DH9717	26000	lbf	N	-13000	1000	-0.00012068	0
FMRL Fx	MFG: Denton S/N: DH9717	30000	N	N	-15000	600	0.0001446	0
FMRL Fy	MFG: Denton S/N: DH9717	30000	N	N	-15000	600	0.0001458	0
FMRL Fz	MFG: Denton S/N: DH9717	40000	N	N	-20000	600	-0.0000724	0
FMRL Mx	MFG: Denton S/N: DH9717	700	N-m	N-m	-350	600	0.0065482	0
FMRL My	MFG: Space Age Controls S/N: D2103665B	700	N-m	N-m	-350	600	0.0065257	0
FMRL Mz	MFG: Denton S/N: 89	600	N-m	N-m	-300	600	0.0091723	0
KNEL Dx	MFG: Denton S/N: 89	80	mm	mm	-40	180	22.147	0
TBLU Fz	MFG: Denton S/N: 89	50000	N	N	-25000	600	-0.0000921	0
TBLU Mx	MFG: Denton S/N: 142	800	N-m	N-m	-400	600	0.0073598	0
TBLU My	MFG: Denton S/N: 142	800	N-m	N-m	-400	600	0.0073288	0
TBLL Fz	MFG: Denton S/N: 142	50000	N	N	-25000	600	-0.0000948	0
TBLL Mx	MFG: Contelec S/N: LX0019	800	N-m	N-m	-400	600	0.0073026	0
TBLL My	MFG: Contelec S/N: LX0019	800	N-m	N-m	-400	600	0.0073735	0
ANKL Rx	MFG: ENDEVCO S/N: P52001	200	deg	deg	-100	180	3.04982	-0.9575
ANKL Ry	MFG: Denton S/N: DH9722	200	deg	deg	-100	180	2.96419	-14.97
FOTL Az	MFG: Denton S/N: DH9722	3000	g	g	-1500	1000	0.0191	0
FMRR Fx	MFG: Denton S/N: DH9722	30000	N	N	-15000	600	0.0001474	0
FMRR Fy	MFG: Denton S/N: DH9722	30000	N	N	-15000	600	0.0001474	0
FMRR Fz	MFG: Denton S/N: DH9722	40000	N	N	-20000	600	-0.0000737	0
FMRR Mx	MFG: Denton S/N: DH9722	700	N-m	N-m	-350	600	0.0065614	0
FMRR My	MFG: Space Age Controls S/N: D2103657B	700	N-m	N-m	-350	600	0.0065759	0
FMRR Mz	MFG: Denton S/N: 95	600	N-m	N-m	-300	600	0.0089348	0
KNER Dx	MFG: Denton S/N: 95	80	mm	mm	-40	180	23.135	0
TBRU Fz	MFG: Denton S/N: 95	50000	N	N	-25000	600	-0.0000918	0
TBRU Mx	MFG: Denton S/N: 164	800	N-m	N-m	-400	600	0.0073681	0
TBRU My	MFG: Denton S/N: 164	800	N-m	N-m	-400	600	0.0072947	0
TBRL Fz	MFG: Denton S/N: 164	50000	N	N	-25000	600	-0.0000956	0
TBRL Mx	MFG: Contelec S/N: LX0018	800	N-m	N-m	-400	600	0.0075105	0
TBRL My	MFG: Contelec S/N: LX0018	800	N-m	N-m	-400	600	0.0073588	0
ANKR Rx	MFG: ENDEVCO S/N: P64102	200	deg	deg	-100	180	3.13066	-6.842
ANKR Ry	MFG: First Technology S/N: 294	200	deg	deg	-100	180	2.95682	13.223
FOTR Az	MFG: First Technology S/N: 316	3000	g	g	-1500	1000	0.01986	0

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

THOR – TK S/N: 007			
Sensor	IR-TRACC Exponent	IR-TRACC Slope	IR-TRACC Intercept
CHLU Dx	-0.4675	-34.009493	120.7103
CHRU Dx	-0.4675	-34.871682	125.2528
CHLL Dx	-0.4675	-34.916600	123.9557
CHRL Dx	-0.4675	-34.121632	121.9603
ABDL Dx	-0.43568	31.6159	3.688
ABDR Dx	-0.40940	31.7099	3.774
THOR – TK S/N: 016			
Sensor	IR-TRACC Exponent	IR-TRACC Slope	IR-TRACC Intercept
CHLU Dx	-0.48024	33.0284	3.680
CHRU Dx	-0.4675	-34.919035	121.2325
CHLL Dx	-0.4672	33.6317	3.612
CHRL Dx	-0.48206	32.0908	3.791
ABDL Dx	-0.47743	38.9774	3.894
ABDR Dx	-0.48020	53.1720	2.874

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 007

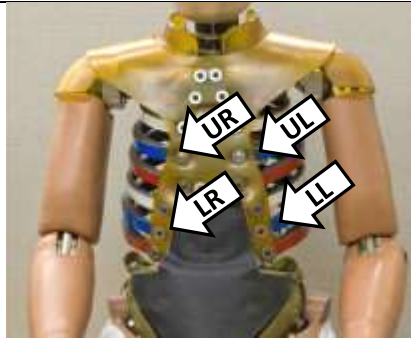
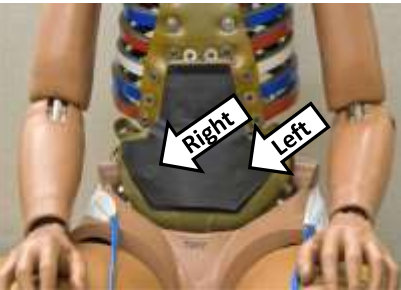


Figure 1. Manipulation to determine thoracic IR-TRACC polarity.

UR				UL			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.1501	.1760	Increase	DX (V)	.1759	.2025	Increase
			Increase				Increase
RY (Deg)	4.271	-.331	Increase	RY (Deg)	8.364	5.141	Decrease
			Decrease				Decrease
RZ (Deg)	-7.104	-5.851	Decrease	RZ (Deg)	12.383	13.858	Decrease
			Increase				Increase
LR				LL			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.0781	.1042	Increase	DX (V)	.0921	.1323	Increase
			Increase				Increase
RY (Deg)	4.158	.9250	Increase	RY (Deg)	-2.058	-4.612	Decrease
			Decrease				Decrease
RZ (Deg)	-3.550	-1.357	Decrease	RZ (Deg)	12.064	17.925	Increase
			Increase				Increase
							
Abdomen Left				Abdomen Right			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.0431	.1373	Increase	DX (V)	.0329	.9302	Increase
			Increase				Increase
RY (Deg)	1.067	-3.028	Decrease	RY (Deg)	16.200	8.392	Increase
			Decrease				Decrease
RZ (Deg)	4.797	10.073	Increase	RZ (Deg)	-4.094	.4204	Decrease
			Increase				Increase

THOR 0016

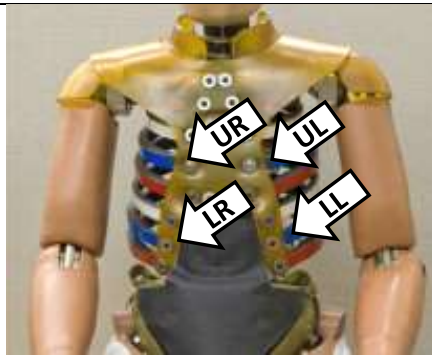
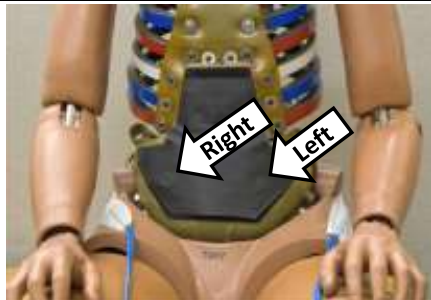


Figure 2. Manipulation to determine thoracic IR-TRACC polarity.

UR				UL			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.1312	.2071	Increase	DX (V)	.1357	.2316	Increase
			Increase				Increase
RY (Deg)	7.451	2.791	Increase	RY (Deg)	8.434	1.591	Decrease
			Decrease				Decrease
RZ (Deg)	-9.781	-6.440	Decrease	RZ (Deg)	11.913	16.909	Decrease
			Increase				Increase
LR				LL			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.0856	.1421	Increase	DX (V)	.0753	.1350	Increase
			Increase				Increase
RY (Deg)	.5991	-3.319	Increase	RY (Deg)	3.758	-1.598	Decrease
			Decrease				Decrease
RZ (Deg)	-8.613	-1.556	Decrease	RZ (Deg)	7.021	15.472	Increase
			Increase				Increase
							
Abdomen Left				Abdomen Right			
Channel	Initial	Final	Measured	Channel	Initial	Final	Measured
			Expected				Expected
DX (V)	.0512	.1152	Increase	DX (V)	.1361	.2685	Increase
			Increase				Increase
RY (Deg)	4.171	-2.343	Decrease	RY (Deg)	5.652	-.500	Increase
			Decrease				Decrease
RZ (Deg)	1.789	10.213	Increase	RZ (Deg)	-1.162	2.668	Decrease
			Increase				Increase

THOR Inspection Checklist

Date: 12/6/2012
NHTSA Representative: James Saunders
Witness(es):
Inspection type (check one): ☒ PRE ☐ POST
Dummy S/N: 007
Dummy Description: Thor NT 50th Male
Date of last Certification or Inspection: 12/1/2012
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RC5142 Right side Camry <u>Since last certification:</u> RD5227 Right side Versa RC5142 Right side Camry
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> V2P2 HDCG WZ V2P2 ABDR RZ
<u>Physical evidence of damage:</u>
<u>Anecdotal evidence of damage:</u>
<u>Equipment delivered to Borrower:</u>

HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull -slightly small, does not fit 100% in rear
Y / N	Head skin shows no sign of tears or damage -nicks/cuts 
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell): -debonding above pucks 4, 5 
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 -tears in left/right sides? 
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 -left stop slightly debonded 
OTHER	

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material -top interior left ribs 2, 5 -top interior right rib 4
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	

ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper -holes in left, right sides near 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	
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	-holes in pelvis flesh near ASIS anterior surfaces 

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 -cuts/tears/hole in both knee flesh covers 
OTHER	

LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
OTHER	

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
OTHER	

THOR Inspection Checklist

Date: 12/8/2012							
NHTSA Representative: James Saunders							
Witness(es):							
Inspection type (check one):	☐ PRE ☒ POST						
Dummy S/N: 007							
Dummy Description: Thor NT 50th Male							
Date of last Certification or Inspection: 12/6/2012							
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RD5226 Left side Versa <u>Since last certification:</u> RD5227 Right side Versa RC5142 Right side Camry RD5226 Left side Versa							
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> <table> <tr> <td>V2P1 NKCF FZ</td> <td>Spikes on Data – consistent with previous data</td> </tr> <tr> <td>V2P1 PILL FX</td> <td>Questionable Data – data spikes around 270ms, 170 ms – checked ok</td> </tr> <tr> <td>V2P1 FOTL AZ</td> <td>Questionable Data Spikes – 106g magnitude is possible – sensor appears fine</td> </tr> </table>		V2P1 NKCF FZ	Spikes on Data – consistent with previous data	V2P1 PILL FX	Questionable Data – data spikes around 270ms, 170 ms – checked ok	V2P1 FOTL AZ	Questionable Data Spikes – 106g magnitude is possible – sensor appears fine
V2P1 NKCF FZ	Spikes on Data – consistent with previous data						
V2P1 PILL FX	Questionable Data – data spikes around 270ms, 170 ms – checked ok						
V2P1 FOTL AZ	Questionable Data Spikes – 106g magnitude is possible – sensor appears fine						
<u>Physical evidence of damage:</u>							
<u>Anecdotal evidence of damage:</u>							
<u>Equipment delivered to Borrower:</u>							

HEAD	
Y / N	Rear head cap mounts securely to head
Y / N	Head skin fits securely over skull -slightly small, does not fit 100% in rear
Y / N	Head skin shows no sign of tears or damage -nicks/cuts 
Y / N	Interior components of skull cavity (ballast, accelerometer mount, accelerometers) securely attached
Y / N	Head securely mounted to OC joint
OTHER	

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell): -debonding above pucks 4, 5 
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 -tears in left/right sides? 
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 -left stop slightly debonded 
OTHER	

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material -top interior left ribs 2, 5 -top interior right rib 4
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	
ABDOMEN	
Y / N	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper -holes in left, right sides near 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	
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	-holes in pelvis flesh near ASIS anterior surfaces
	 

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 -cuts/tears/hole in both knee flesh covers 
OTHER	

LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops
OTHER	-Both feet starting to tear at rear 

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
OTHER	

THOR Inspection Checklist

Date: 12/6/2012
NHTSA Representative: James Saunders
Witness(es):
Inspection type (check one): ☒ PRE ☐ POST
Dummy S/N: 0016
Dummy Description: Thor NT 50th Male
Date of last Certification or Inspection: 12/1/2012
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RC5142 Right side Camry <u>Since last certification:</u> RD5227 Right side Versa RC5142 Right side Camry
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> V2P1 NKCF FZ V2P1 FMRL FX V2P1 FMRL FY V2P1 FMRL FZ V2P1 FOTR AZ
<u>Physical evidence of damage:</u>
<u>Anecdotal evidence of damage:</u>
<u>Equipment delivered to Borrower:</u> Thor 16 ATD

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

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell): -cracks in neck rubber, 2-3, 3-4 
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
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 -small white mark on left shoulder 
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops
OTHER	

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material -slight contact top right of rib #2 under arm 
Y / N	No evidence of debonding between rib damping material and ribs -right front of rib #5 
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	- Left lower IR-Tracc sticks during compression
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 -torn stitches on left/right side at leg zipper 
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
OTHER	

PELVIS	
Y / N	Pelvis flesh fits securely over pelvis bones
Y / N	H-point tool fits securely into hole on both sides of pelvis
OTHER	

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
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops -ankle roll stops cracked 
OTHER	
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
OTHER	

THOR Inspection Checklist

Date: 12/8/2012
NHTSA Representative: James Saunders
Witness(es):
Inspection type (check one): ☐ PRE ☒ POST
Dummy S/N: 0016
Dummy Description: Thor NT 50th Male
Date of last Certification or Inspection: 12/6/2012
<u>Tests conducted since last full certification or inspection:</u> <u>Since last inspection:</u> RD5226 Left side Versa <u>Since last certification:</u> RD5227 Right side Versa RC5142 Right side Camry RD5226 Left side Versa
<u>Known errors in data channels (no data, clipping, unexpected drops):</u> V2P2 NKCR FZ - Questionable Data Spikes – some noise around 73 ms, but looks okay during ringout V2P2 FOTL AZ - Questionable Data Spikes – Known dead channel V2P2 ANKR RX - Questionable Max & Min – hitting physical stops – this is okay V2P2 FOTR AZ - Questionable Data Spikes – noise at 53 ms – appears fine for ringout
<u>Physical evidence of damage:</u>
<u>Anecdotal evidence of damage:</u>
<u>Equipment delivered to Borrower:</u> Thor 16 ATD

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

NECK	
Y / N	Neck cables slide freely through holes in neck plates
Y / N	Neck cables show no sign of fraying, broken strands, or kinking
Y / N	No evidence of debonding between neck pucks and plates If N – indicate which interface (where plate/puck 1 attach to upper neck load cell): -cracks in neck rubber, 2-3, 3-4 
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
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 -small white mark on left shoulder 
Y / N	Clavicles securely attached to sternum and shoulder
Y / N	No evidence of debonding, tearing, or permanent compression of posterior soft stops
OTHER	

THORAX	
Y / N	No evidence of contact at top, bottom, or interior faces of rib damping material -slight contact top right of rib #2 under arm 
Y / N	No evidence of debonding between rib damping material and ribs -right front of rib #5 
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	- Left lower IR-Tracc sticks during compression
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 -torn stitches on left/right side at leg zipper
	
Y / N	Lower abdomen insert securely attached to spine
Y / N	Lower abdomen insert shows no evidence of permanent set
OTHER	

PELVIS	
Y / N	Pelvis flesh fits securely over pelvis bones
Y / N	H-point tool fits securely into hole on both sides of pelvis
OTHER	

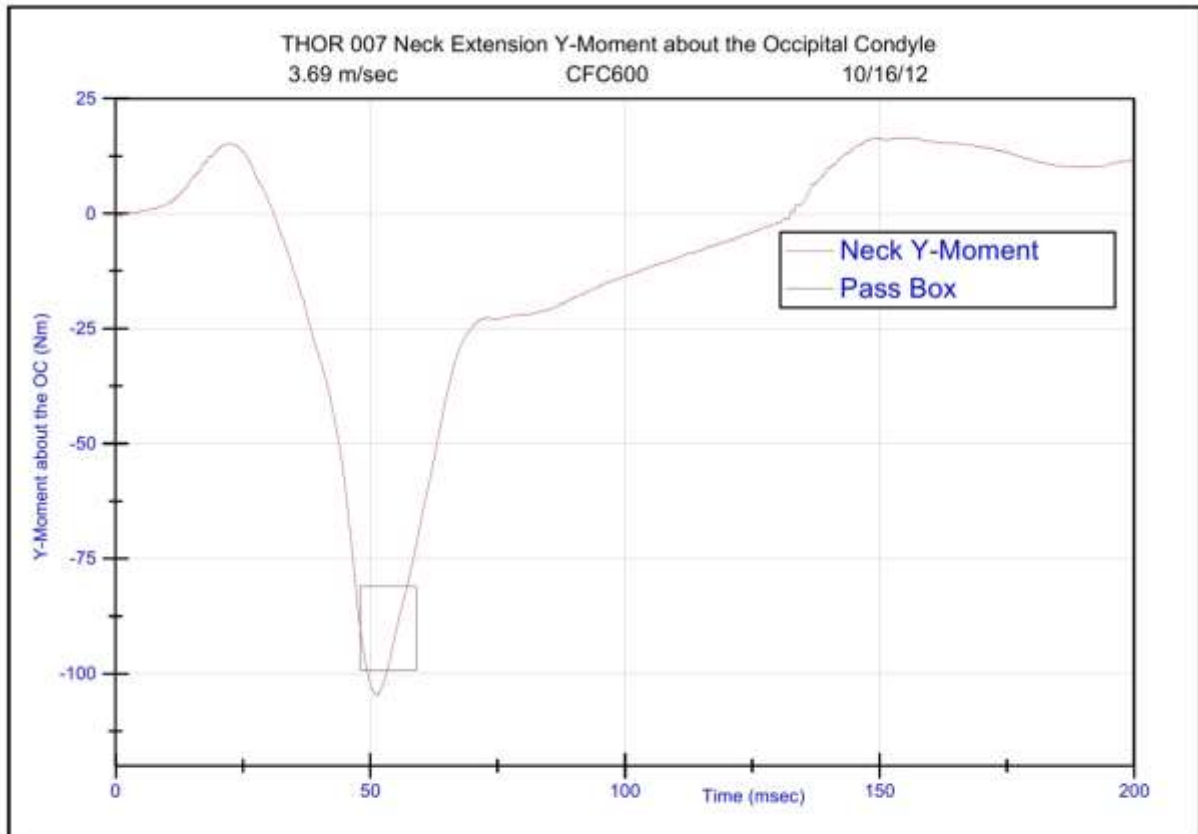
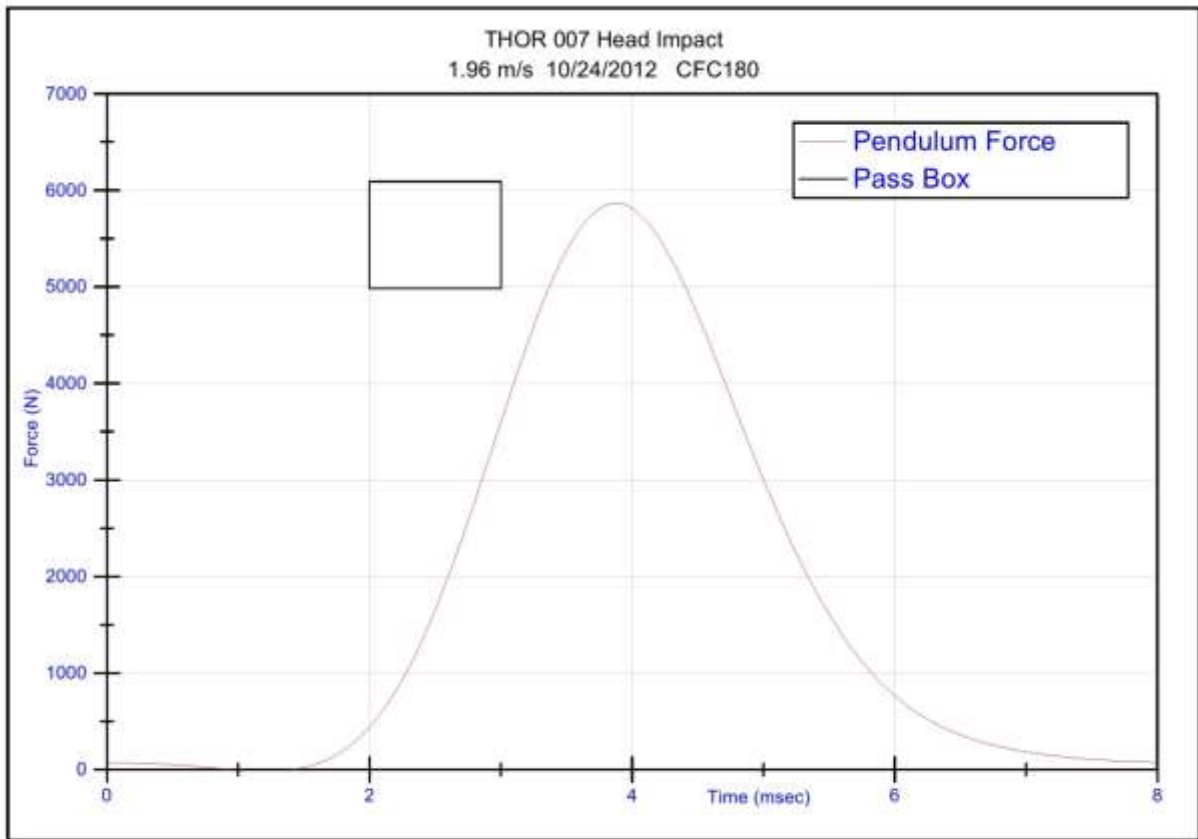
FEMUR	
Y / N	Acetabular load cells firmly attached
Y / N	Femur load cells firmly attached
Y / N	No evidence of deformation of knee slider bump stop
Y / N	No cuts, tears, or scuffing of knee flesh
OTHER	
LOWER EXTREMITY (LX)	
Y / N	Rotational potentiometers in ankle securely attached
Y / N	Achilles tendon provides resistance to dorsiflexion
Y / N	No evidence of debonding, tearing, or permanent compression of ankle soft stops -ankle roll stops cracked
	
OTHER	-Right leg skin is tearing
	

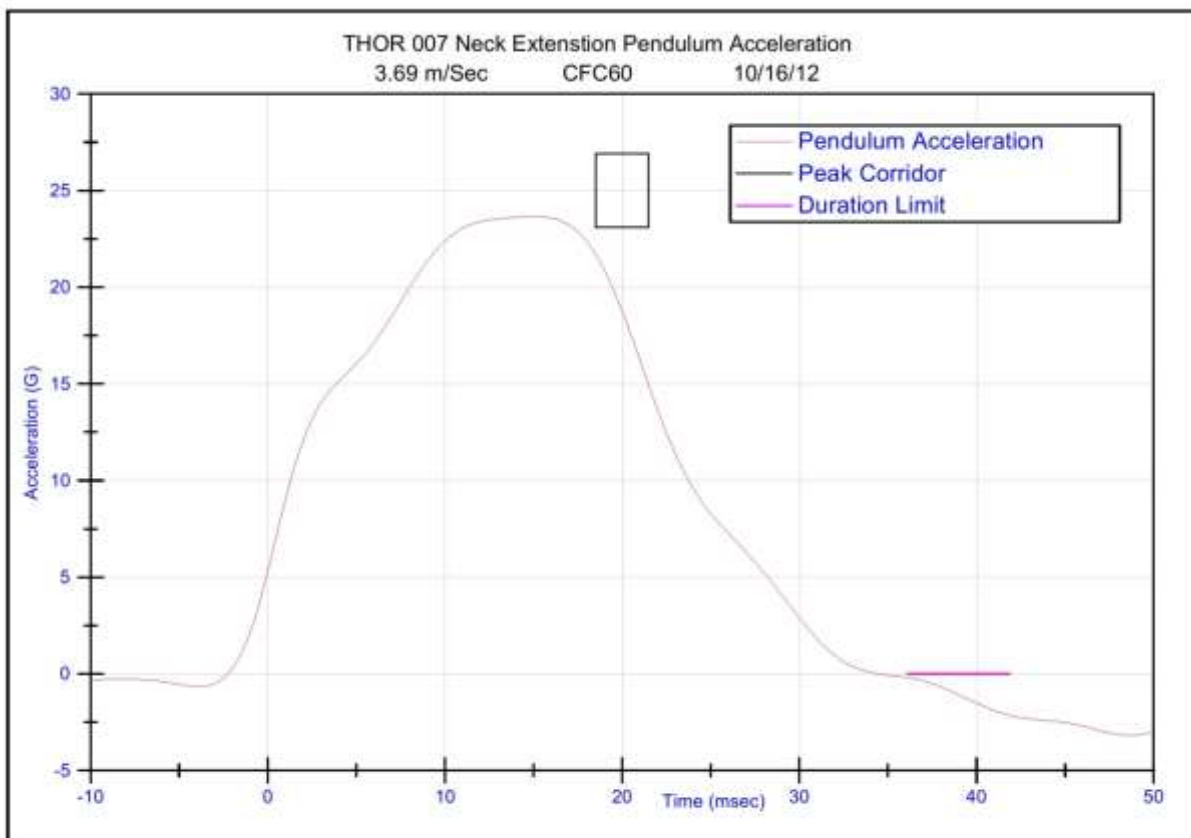
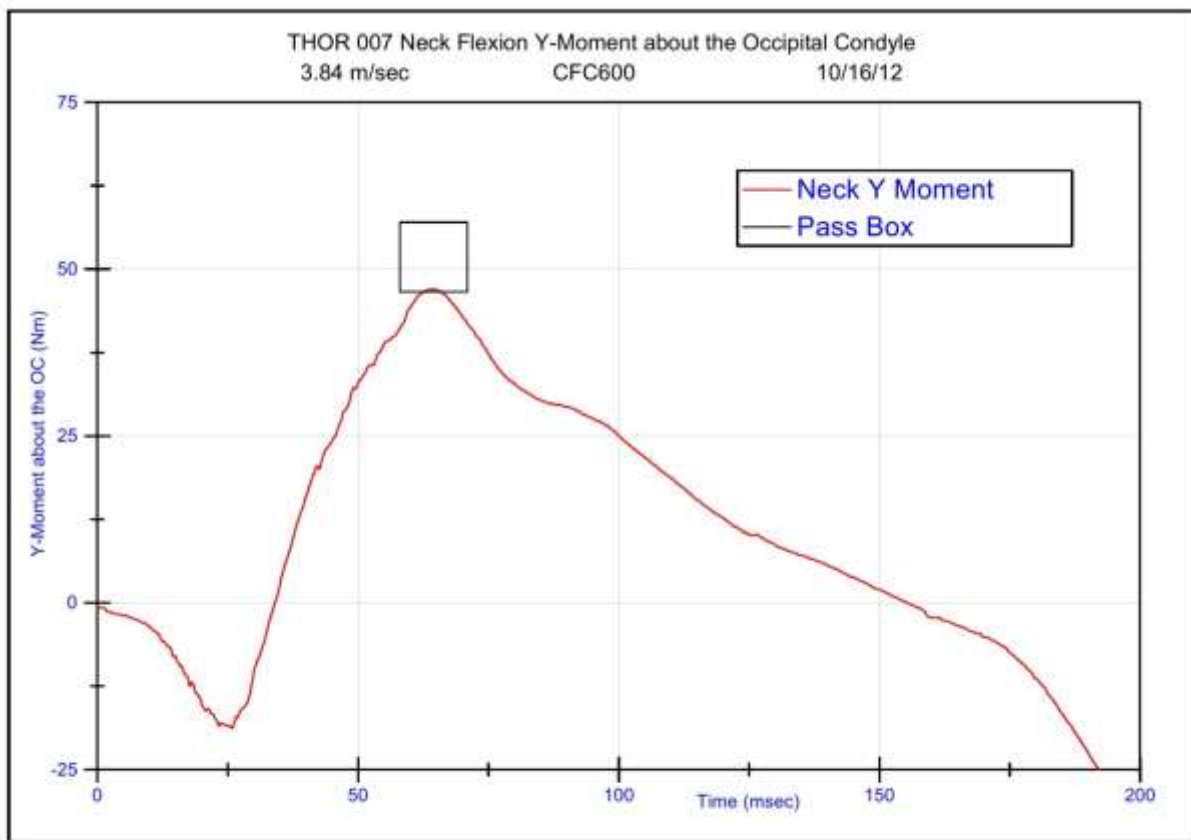
JACKET	
Y / N	Rib stiffeners show no sign of permanent deformation
Y / N	No evidence of tears or holes in jacket fabric, Velcro, or zippers
OTHER	

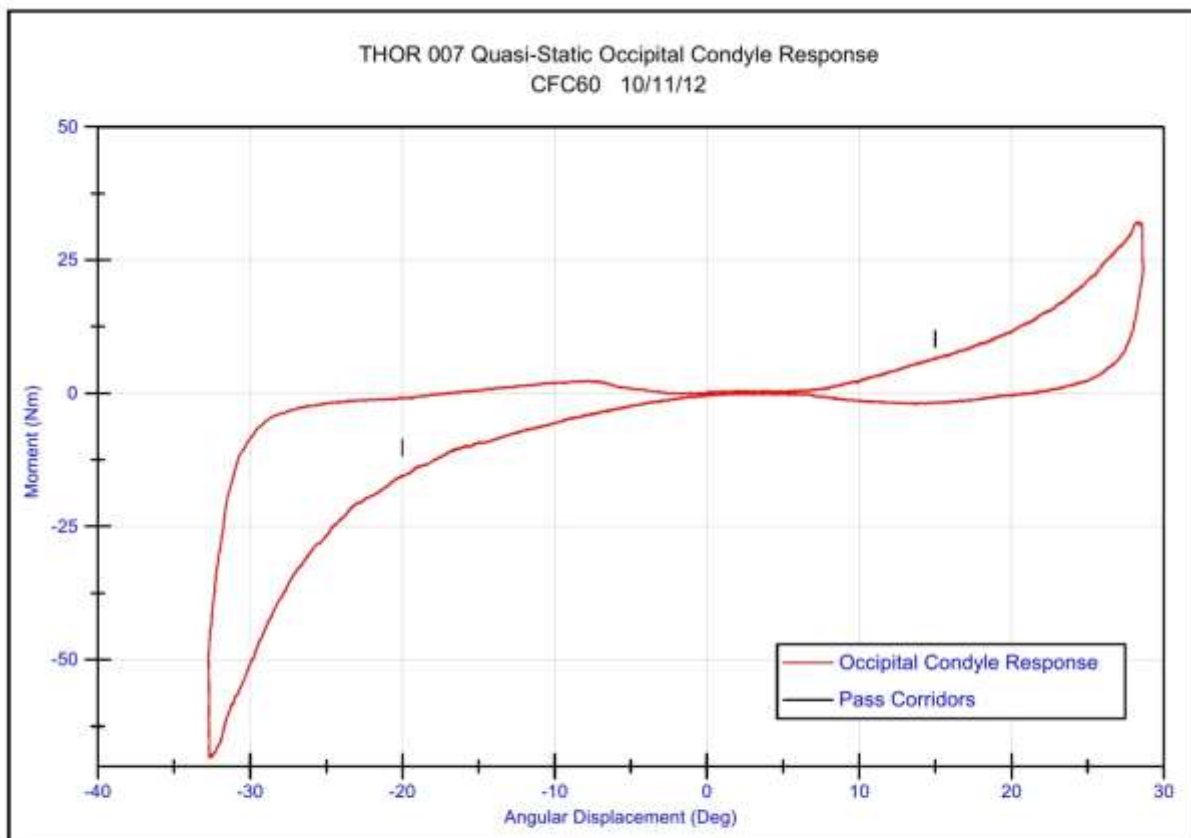
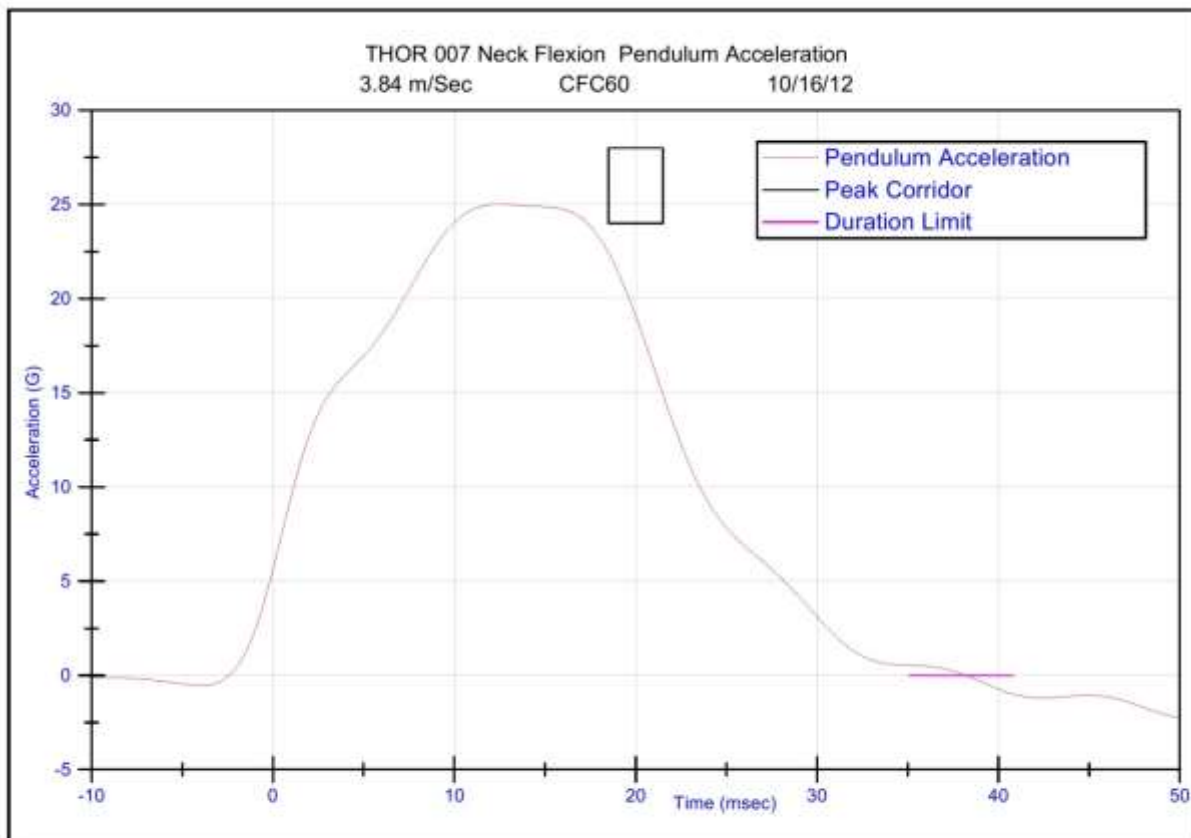
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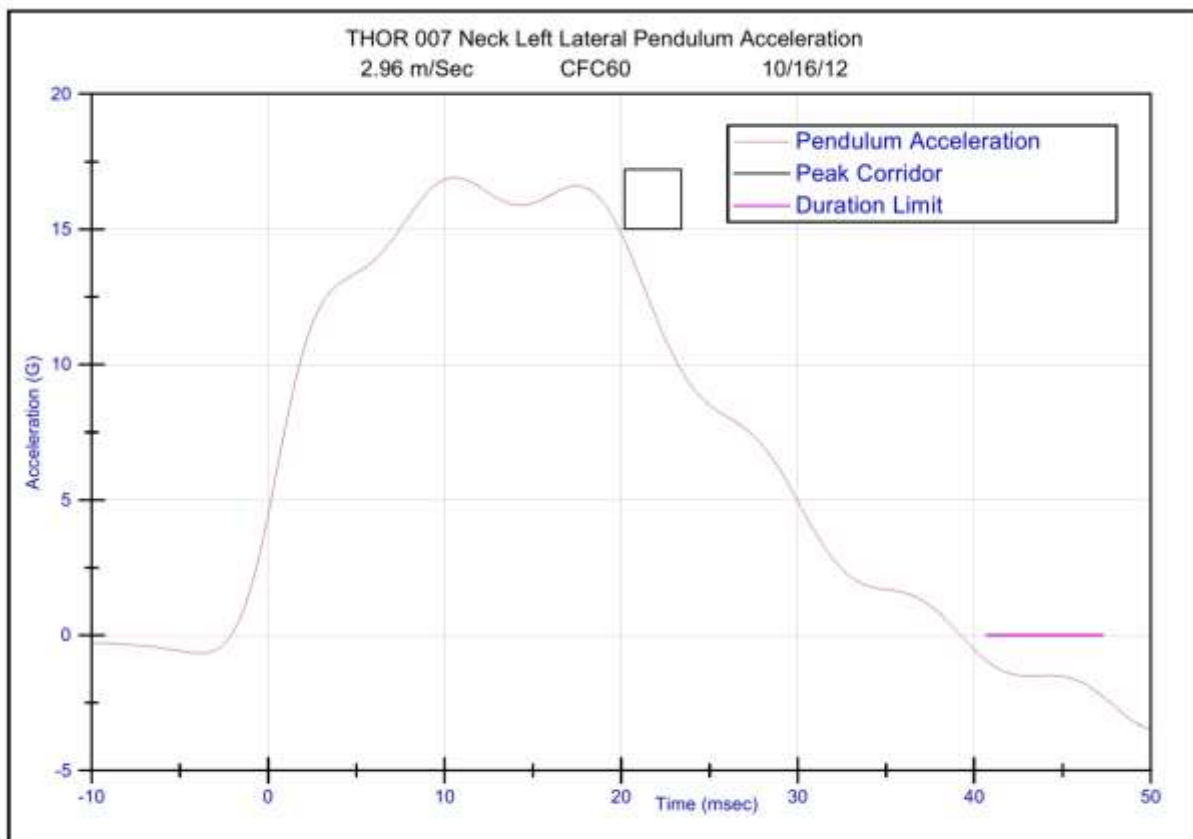
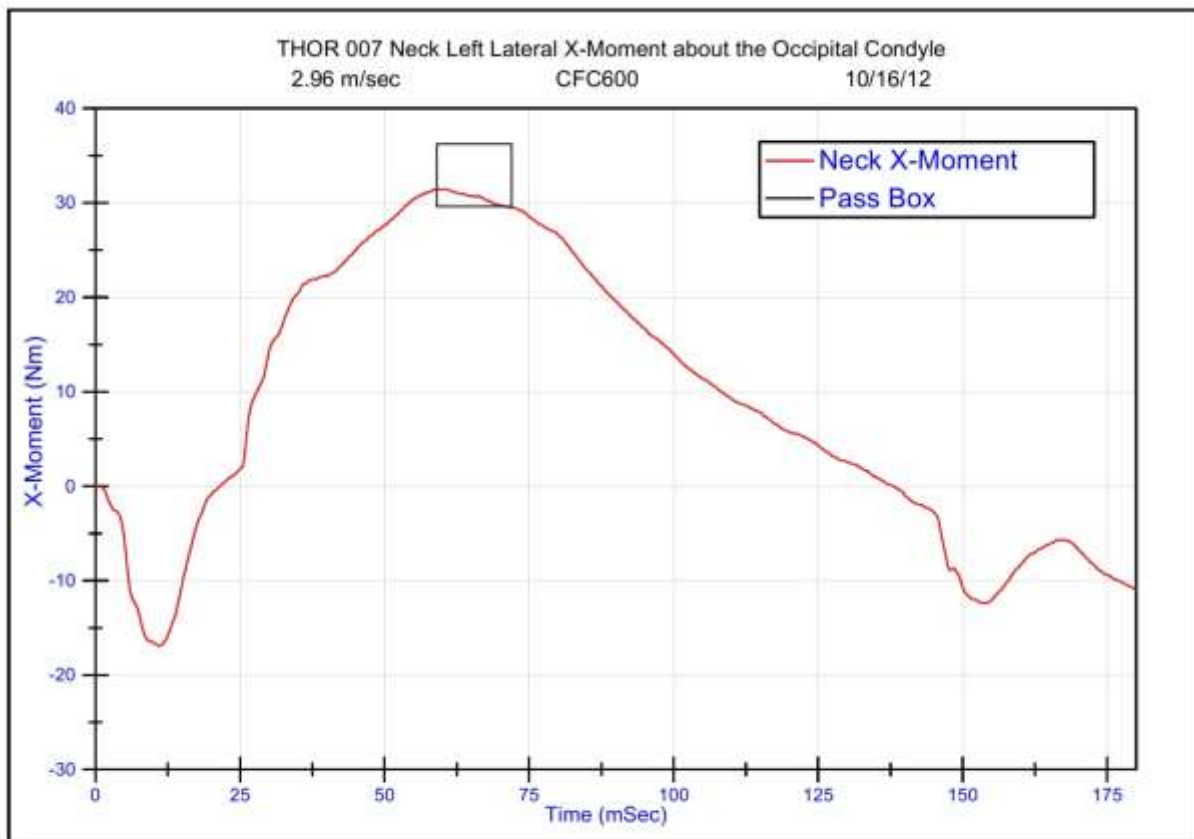
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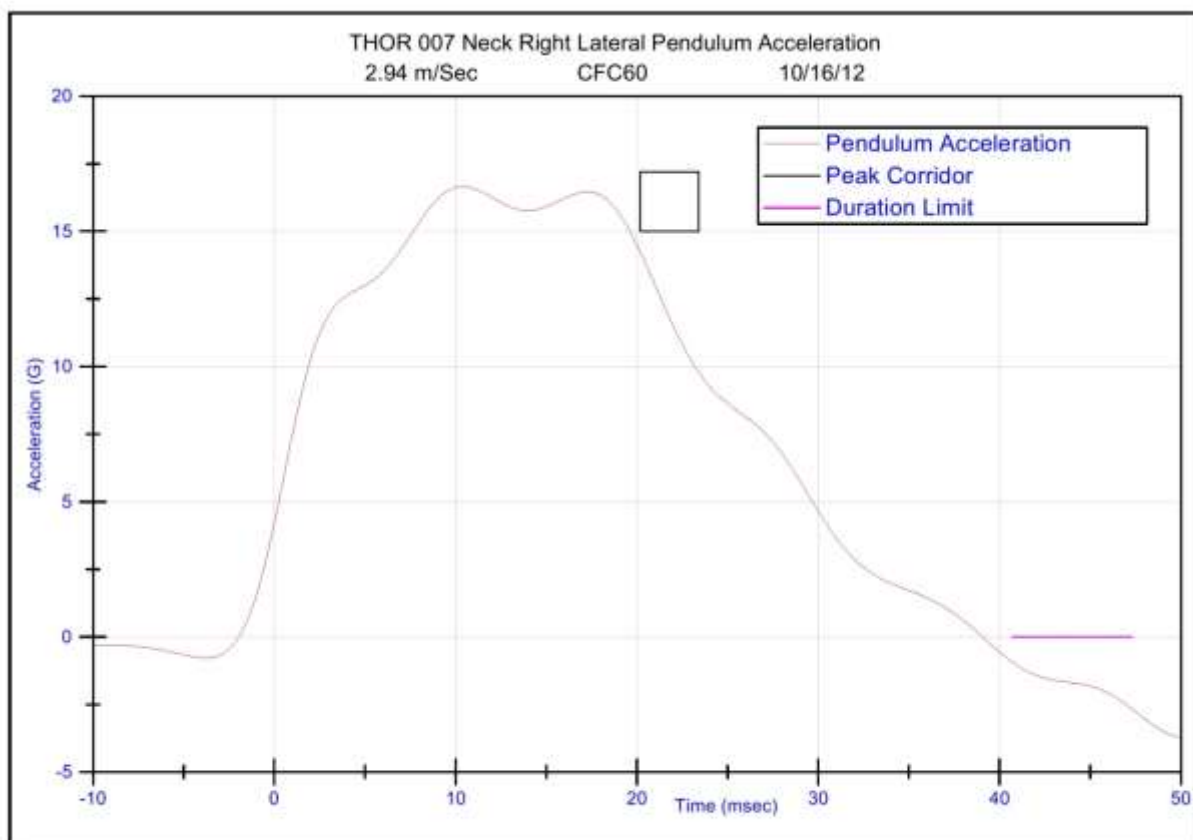
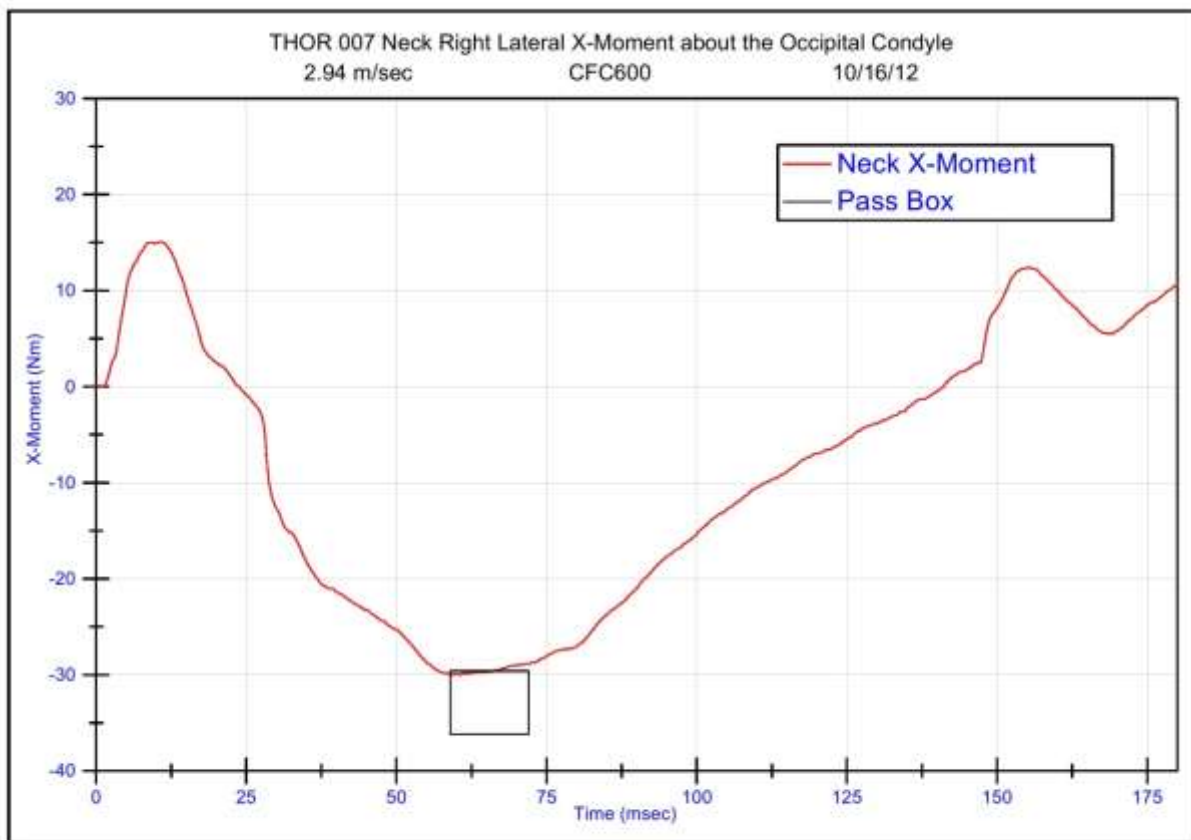
50% ADULT MALE THOR007 DUMMY CALIBRATIONS

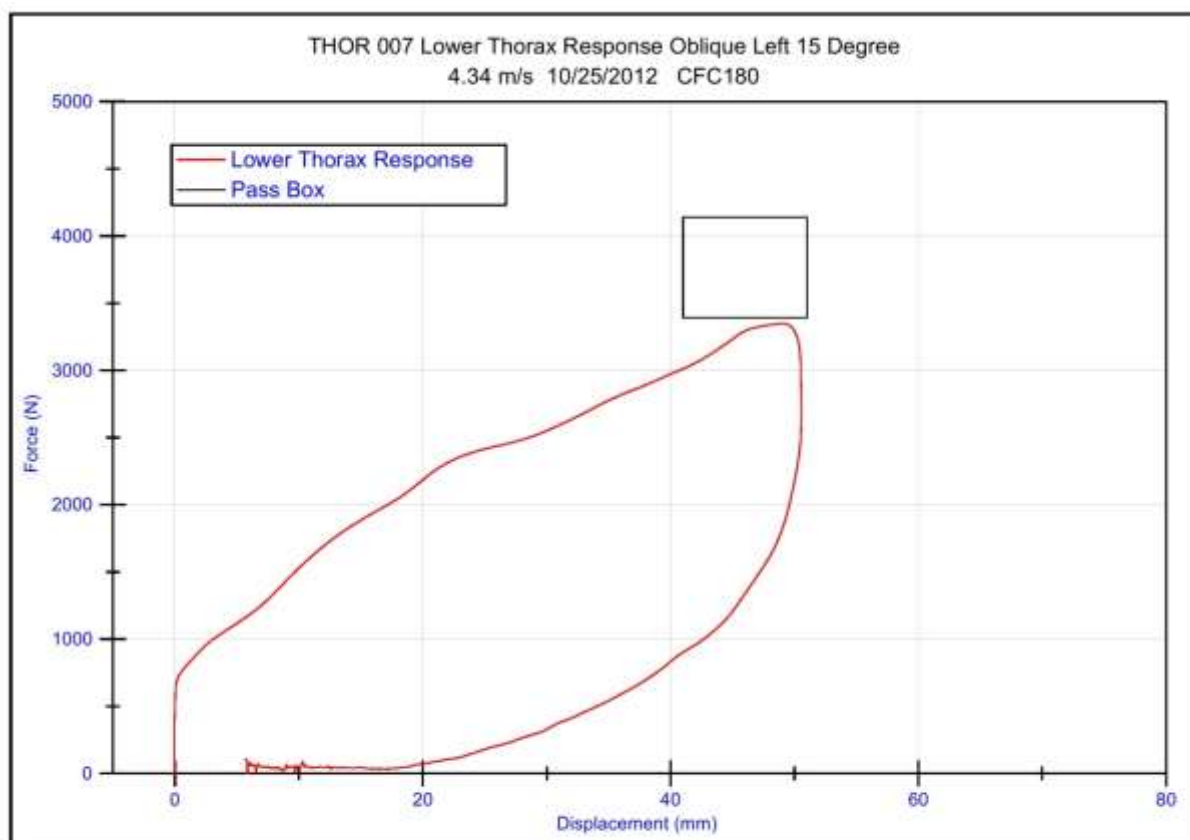
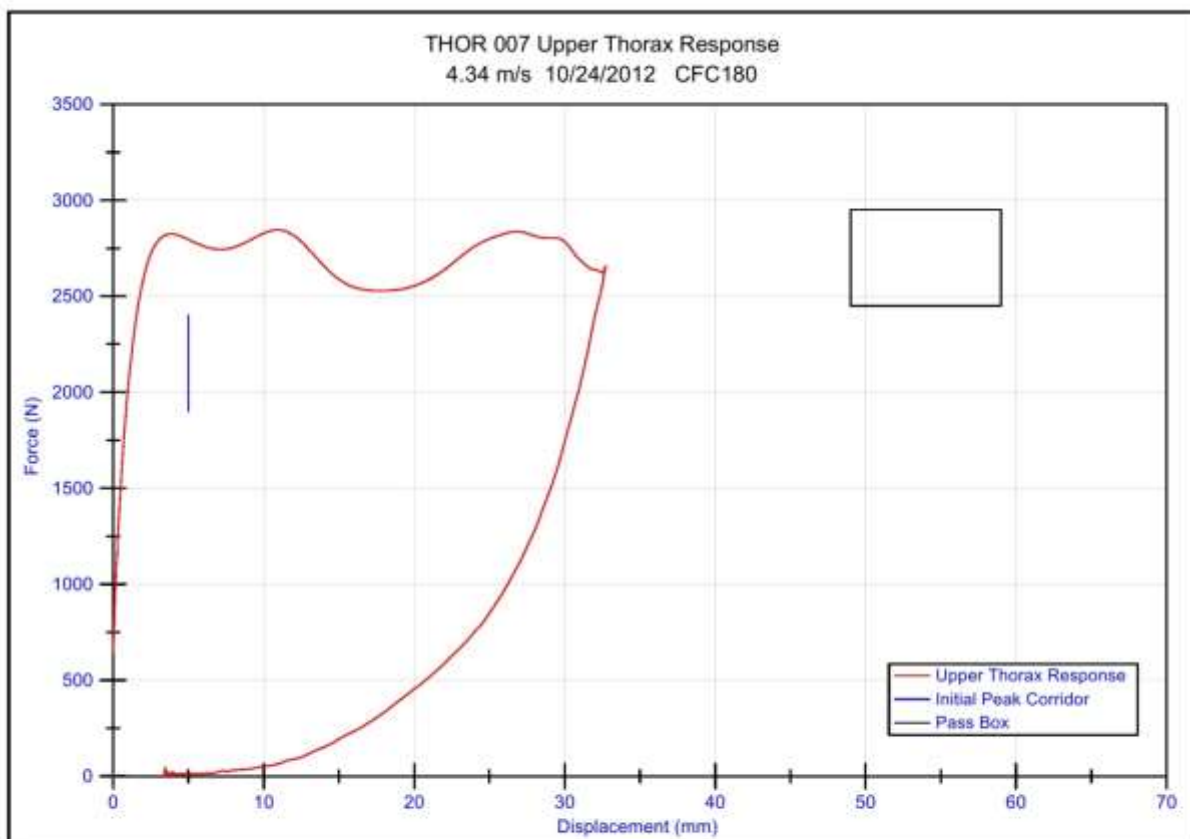


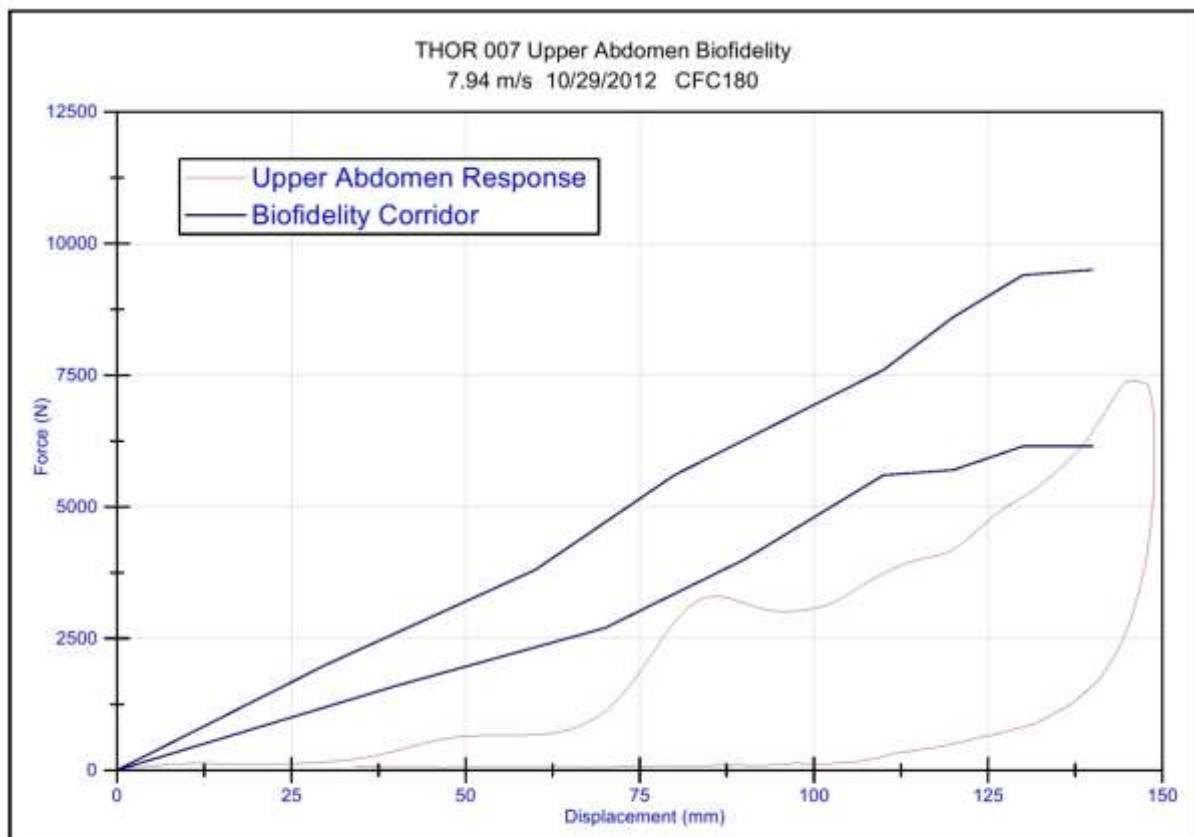
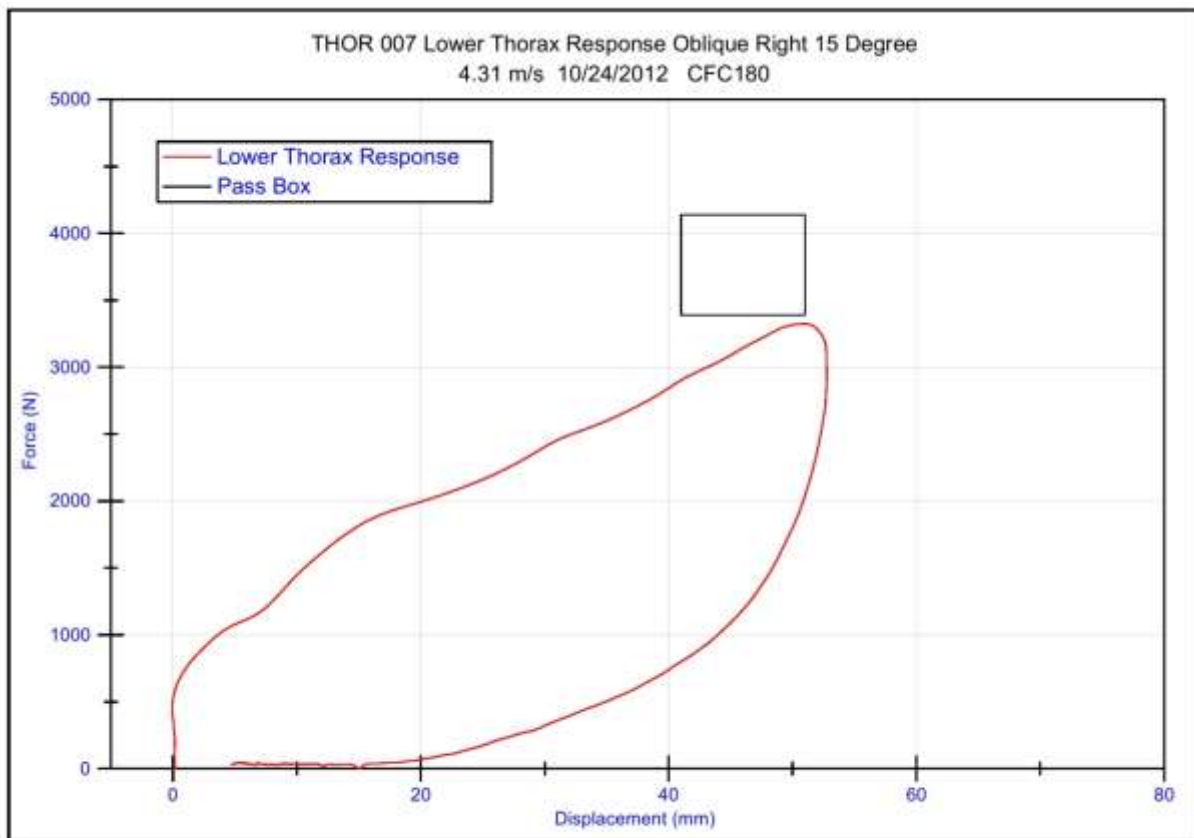


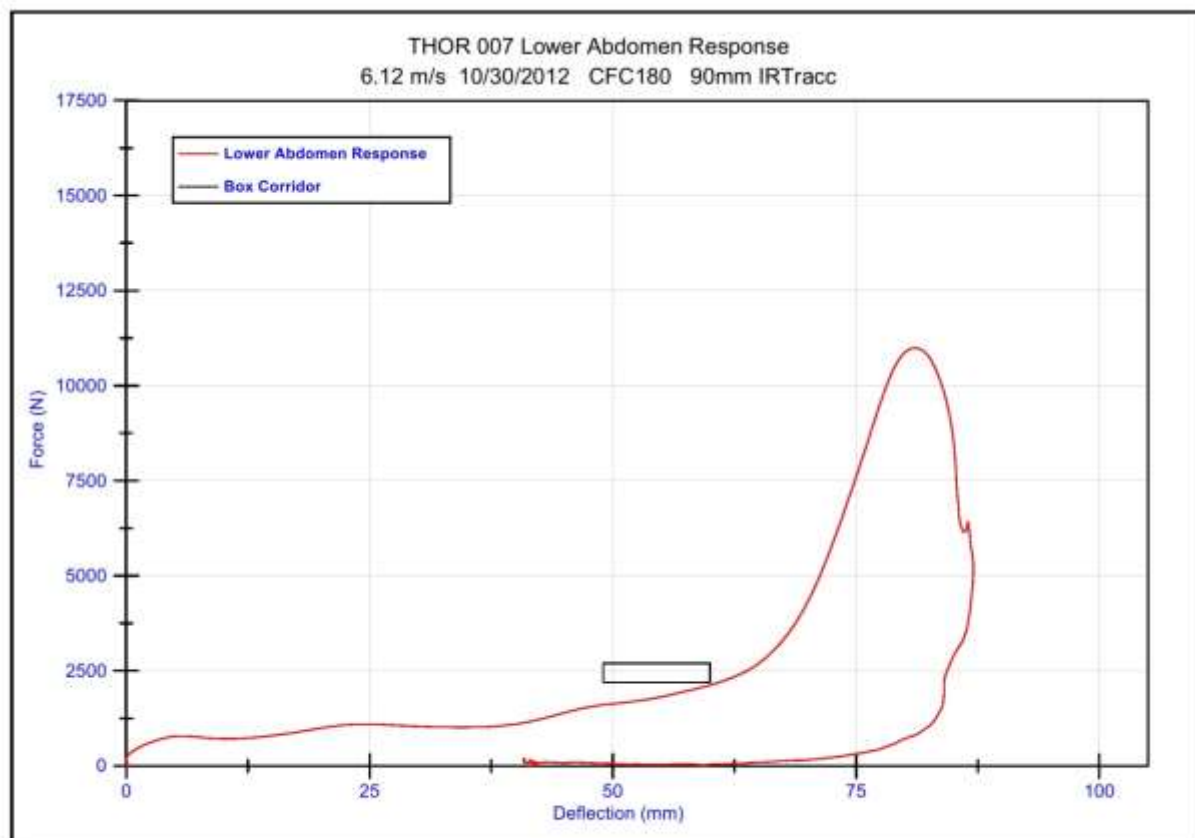






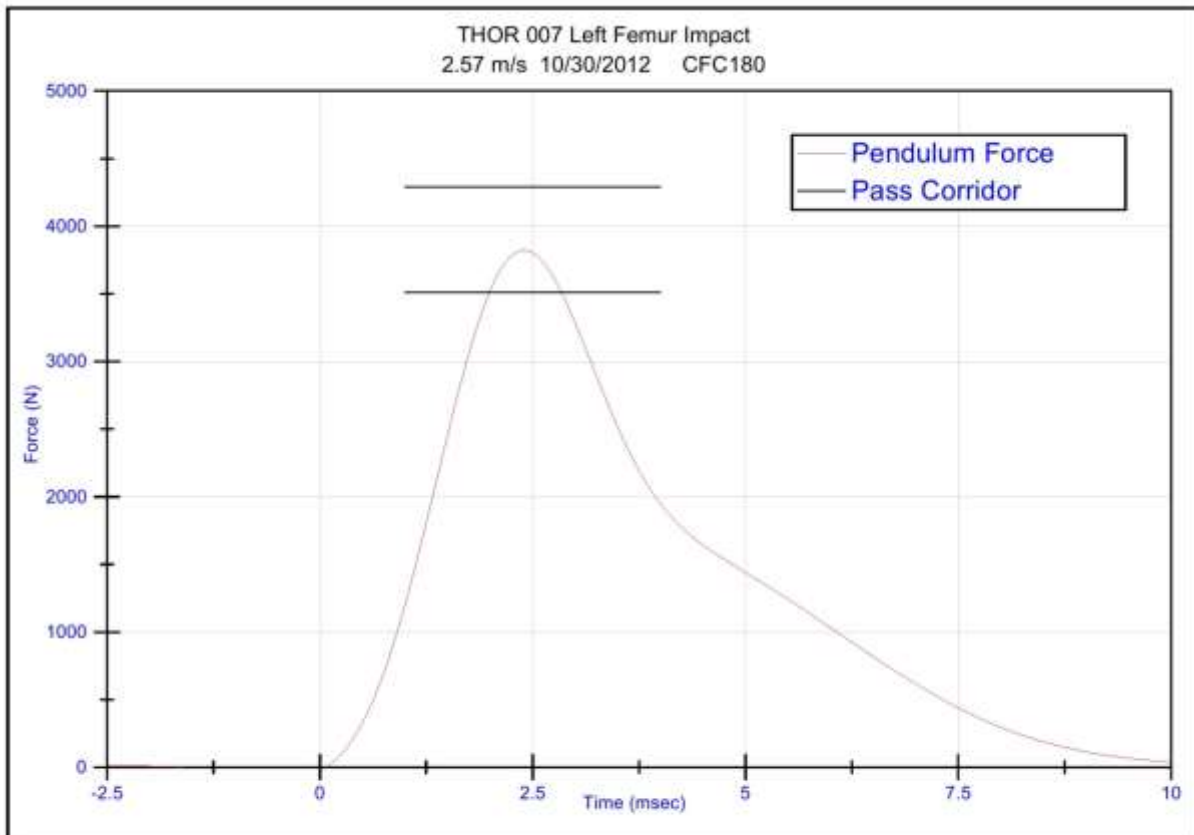
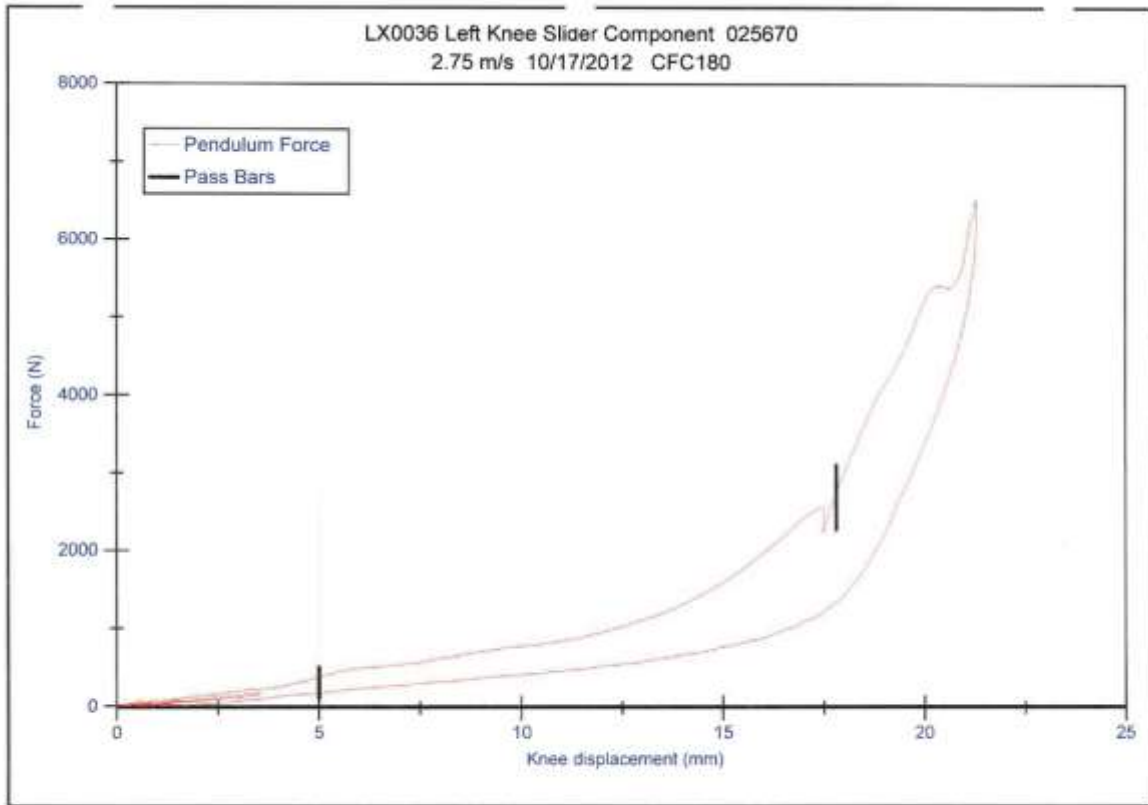


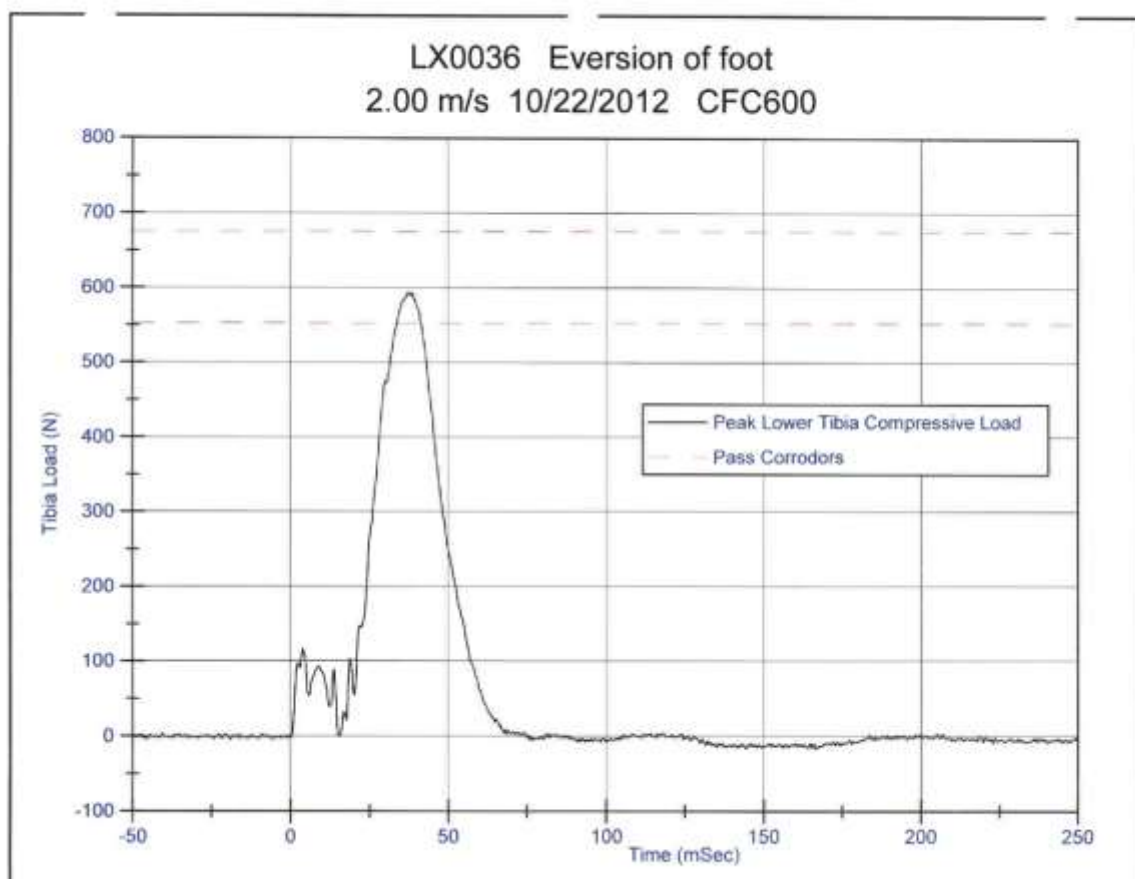
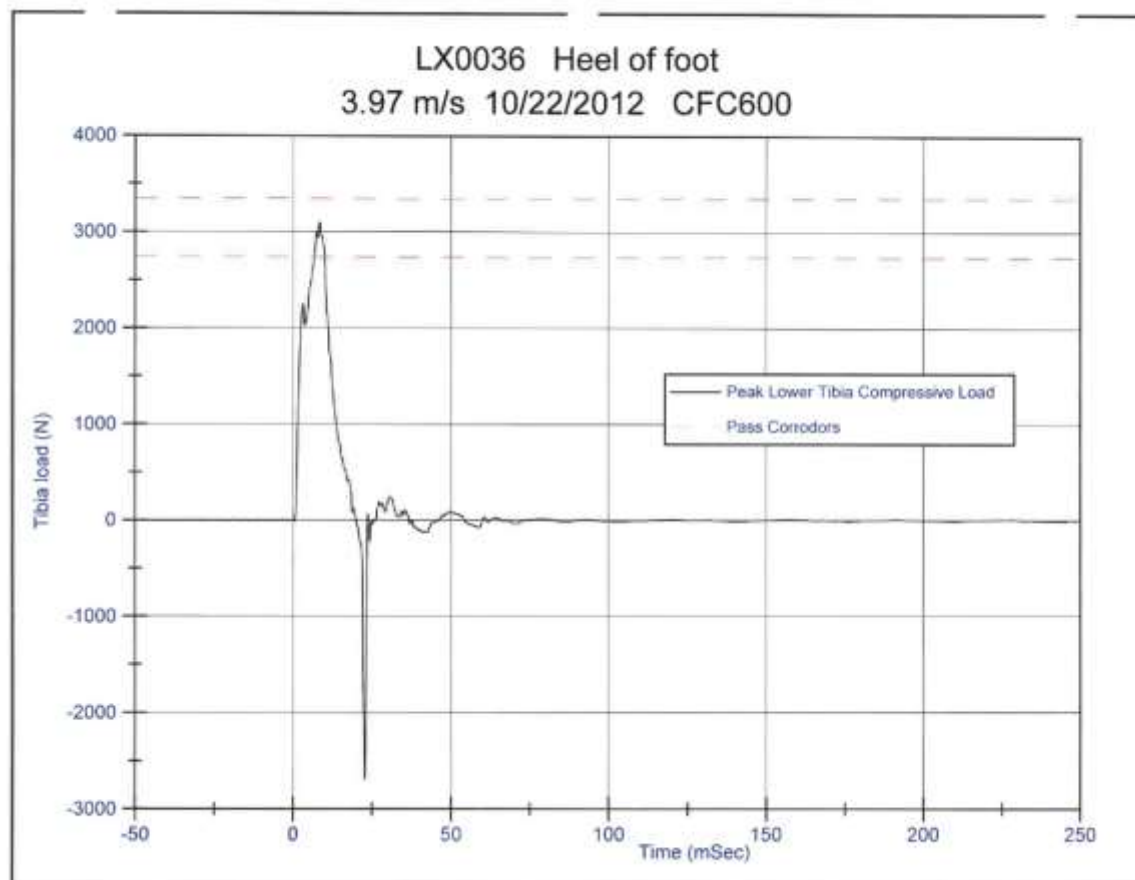


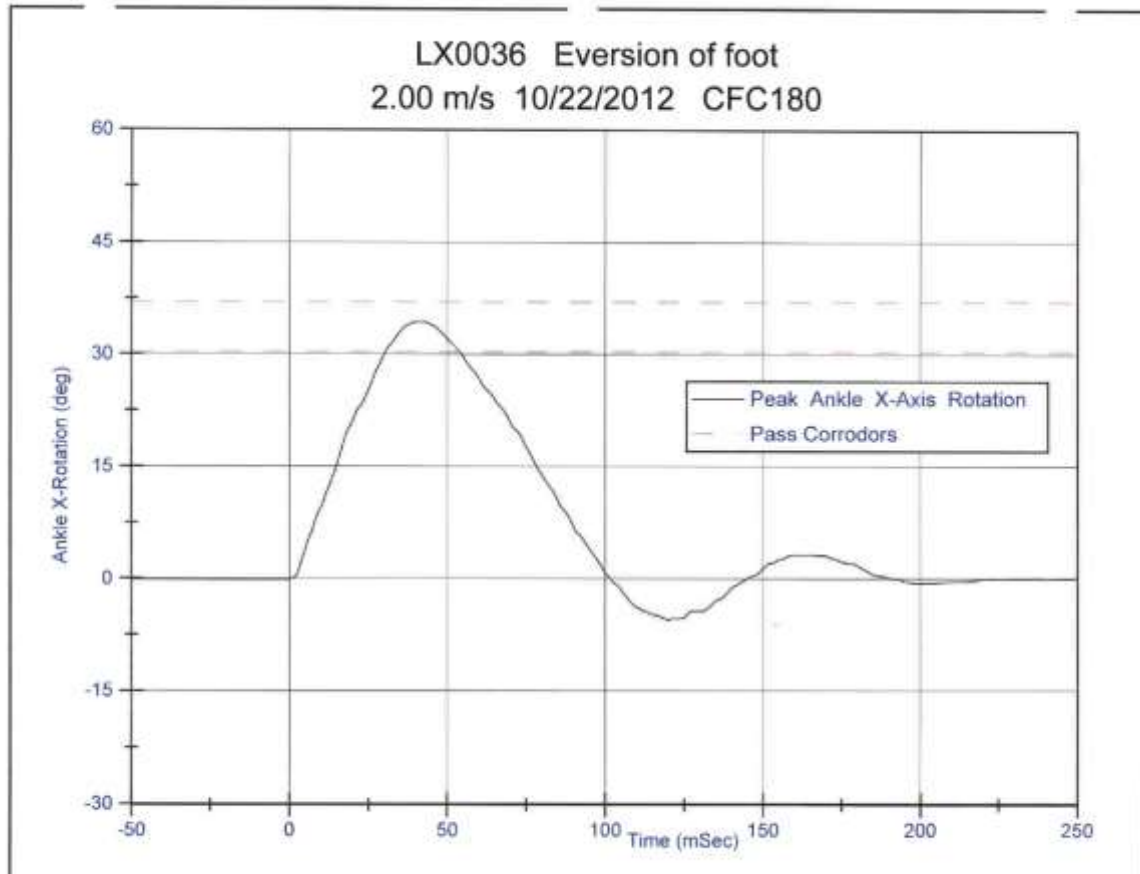
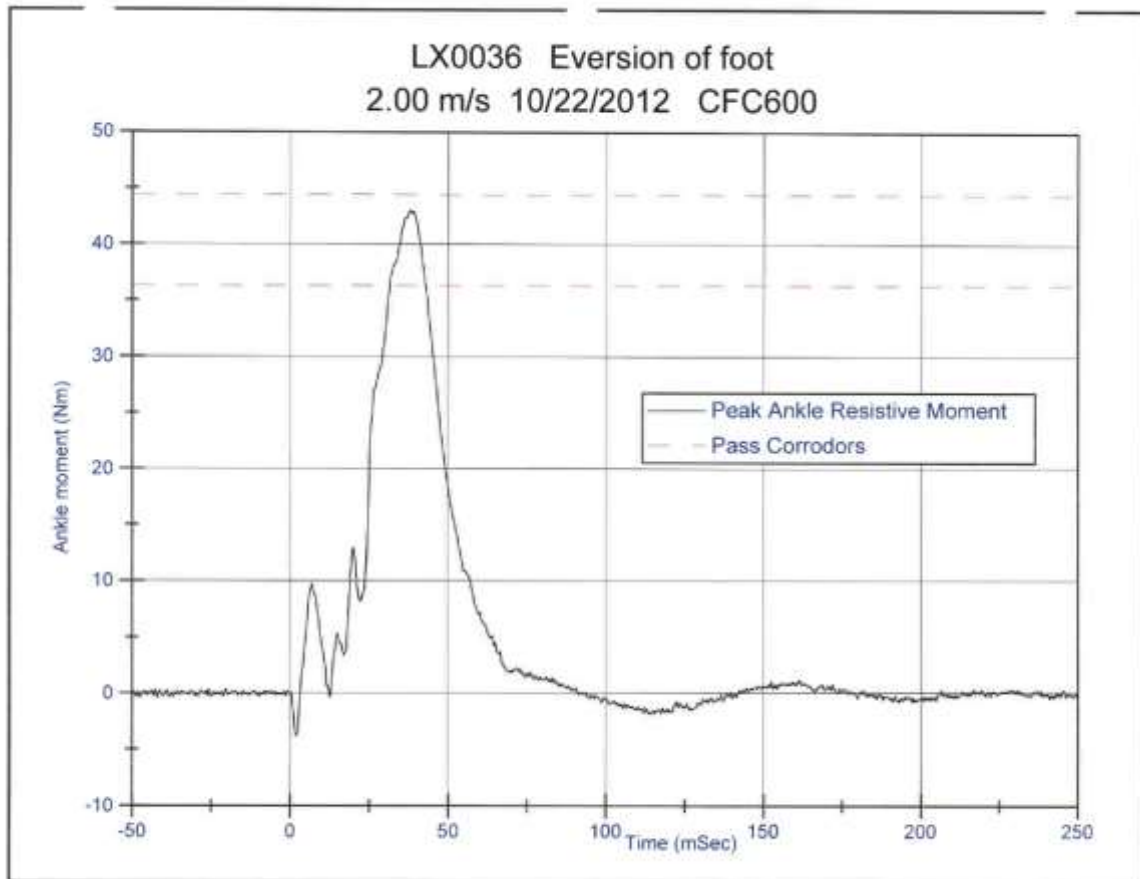


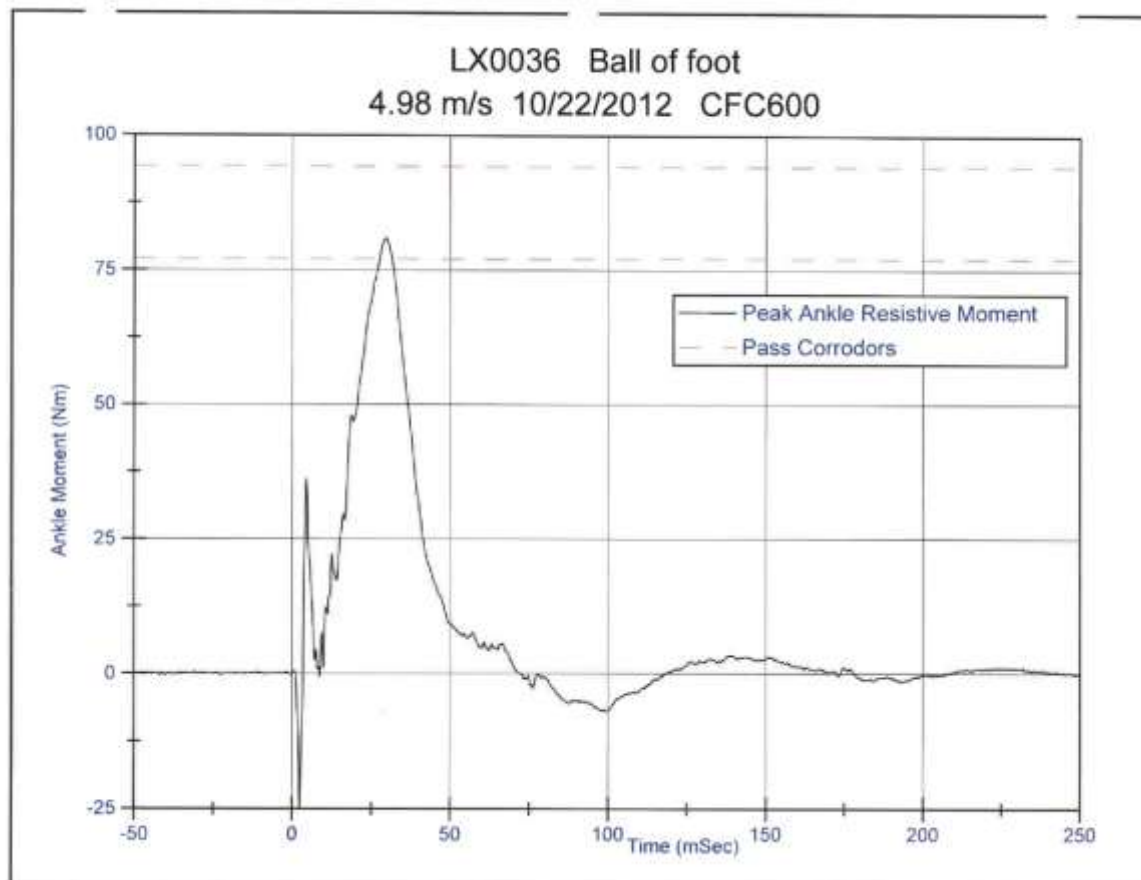
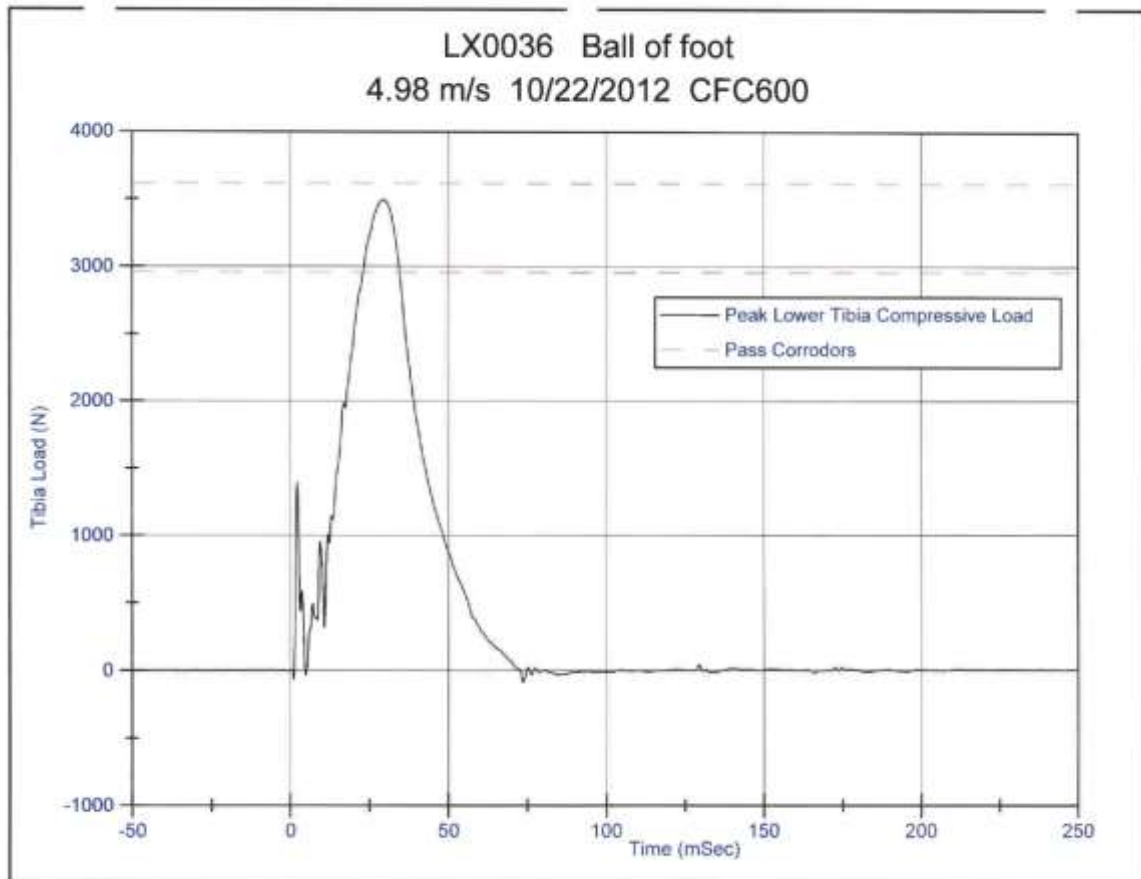
THOR 007 LEG CALIBRATIONS
LX0036 / LX0037

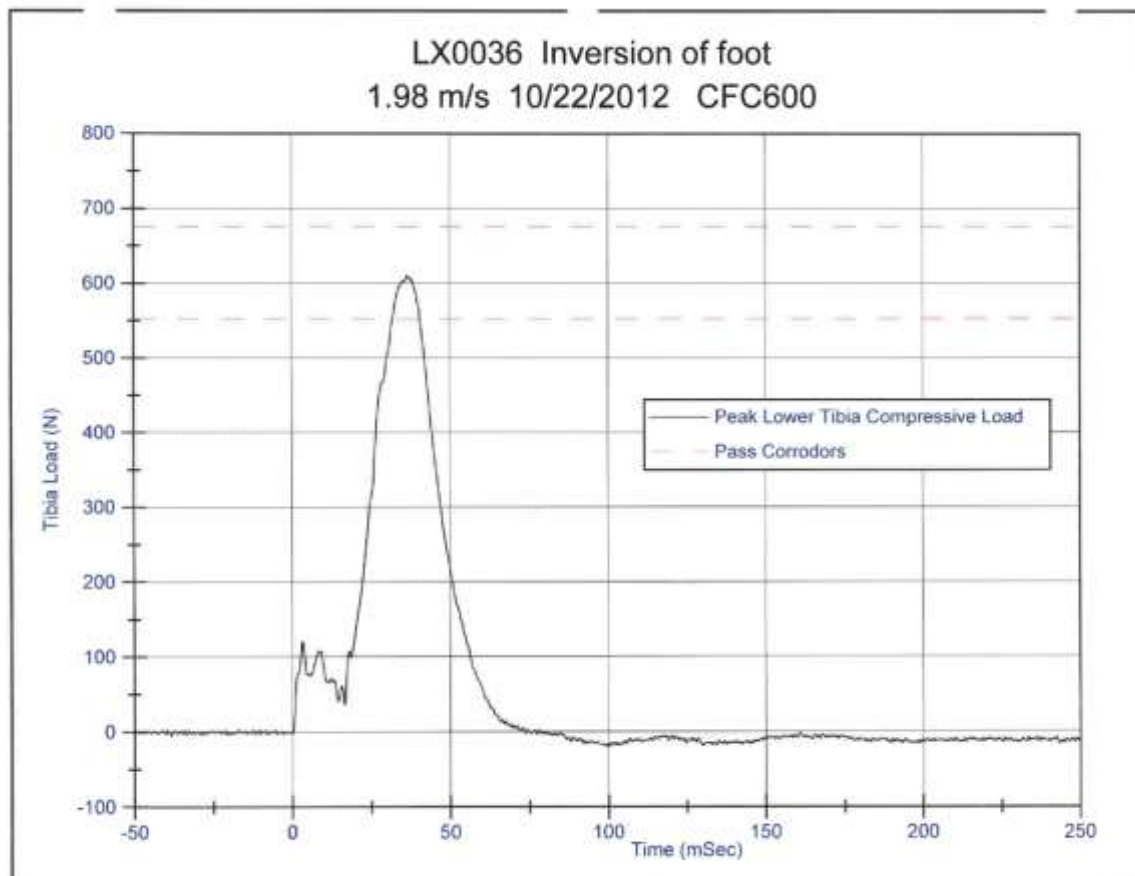
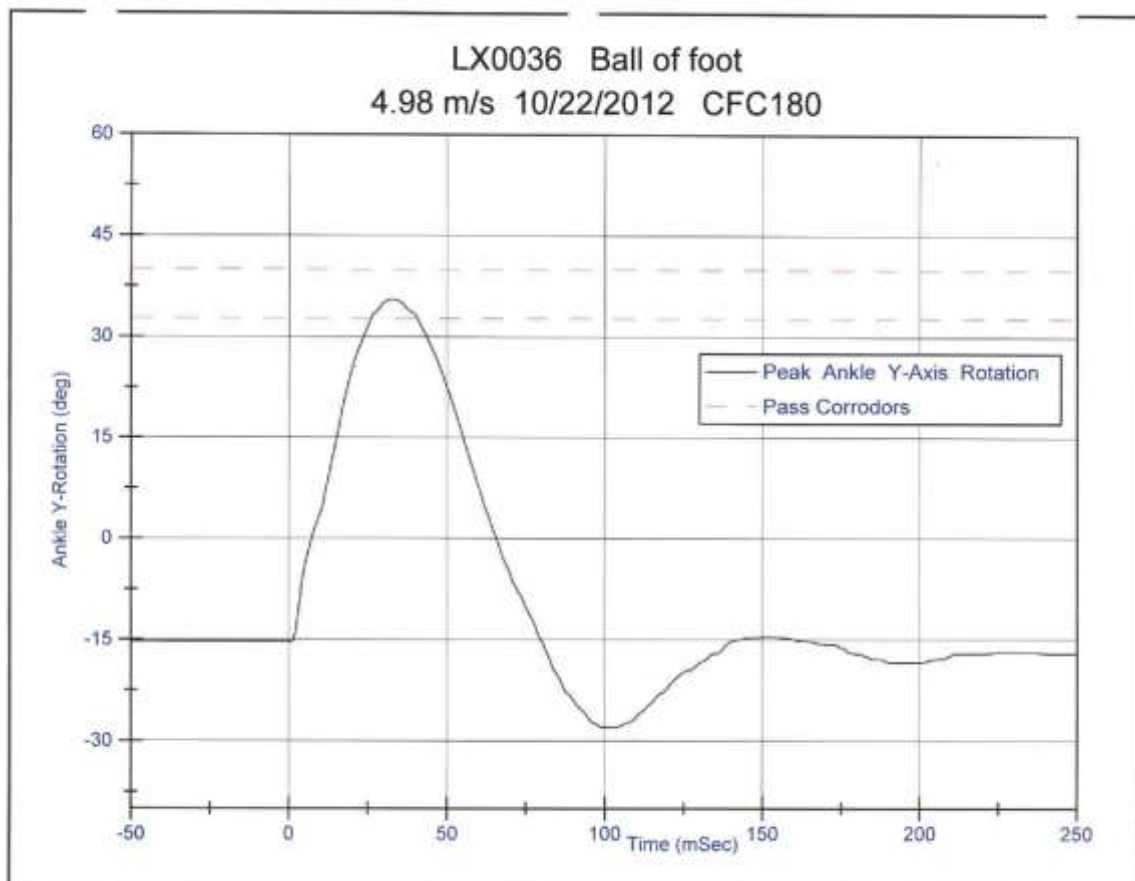
LX0036

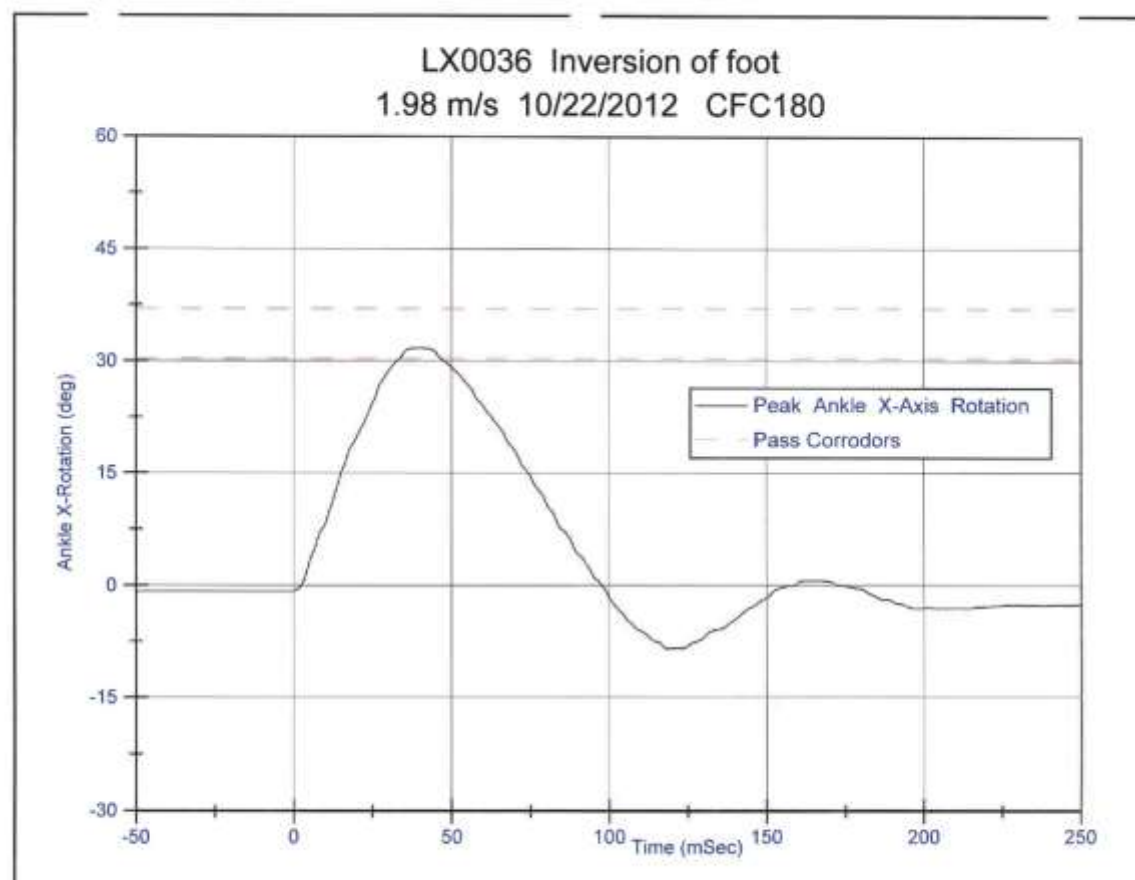
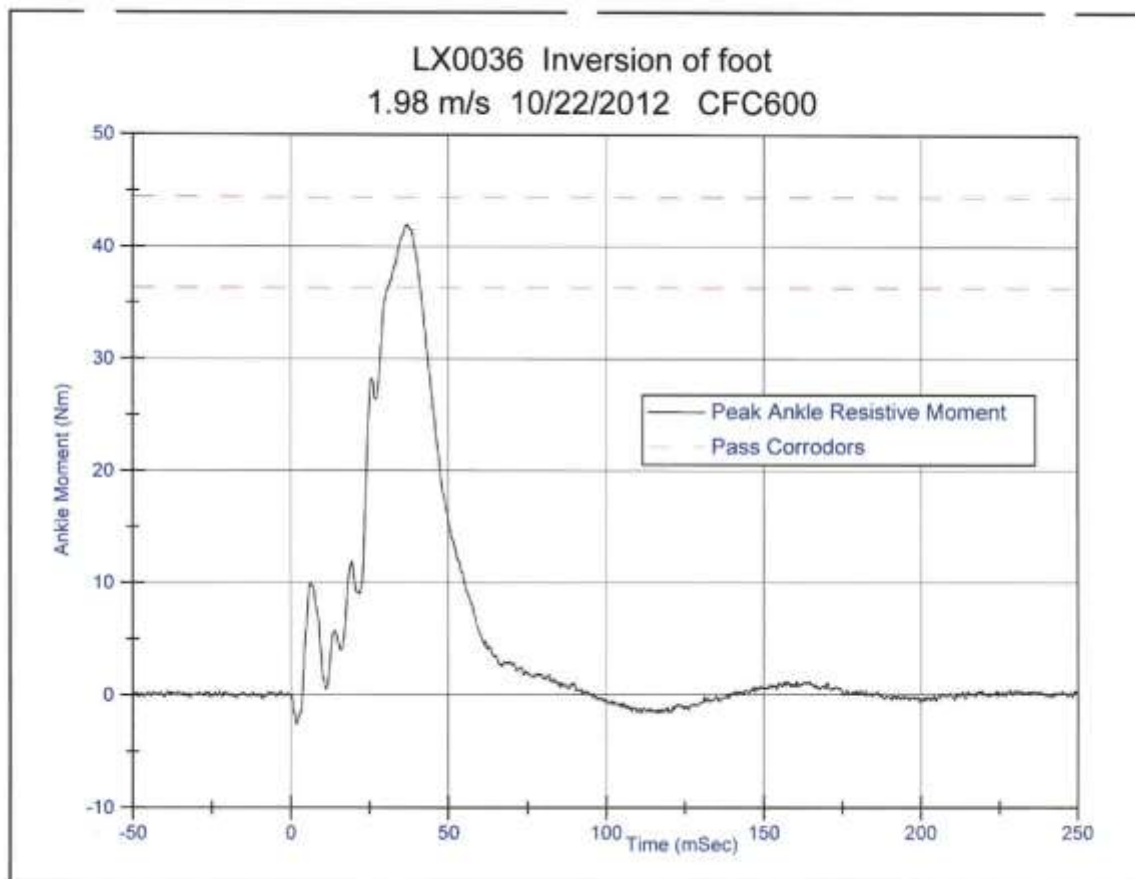




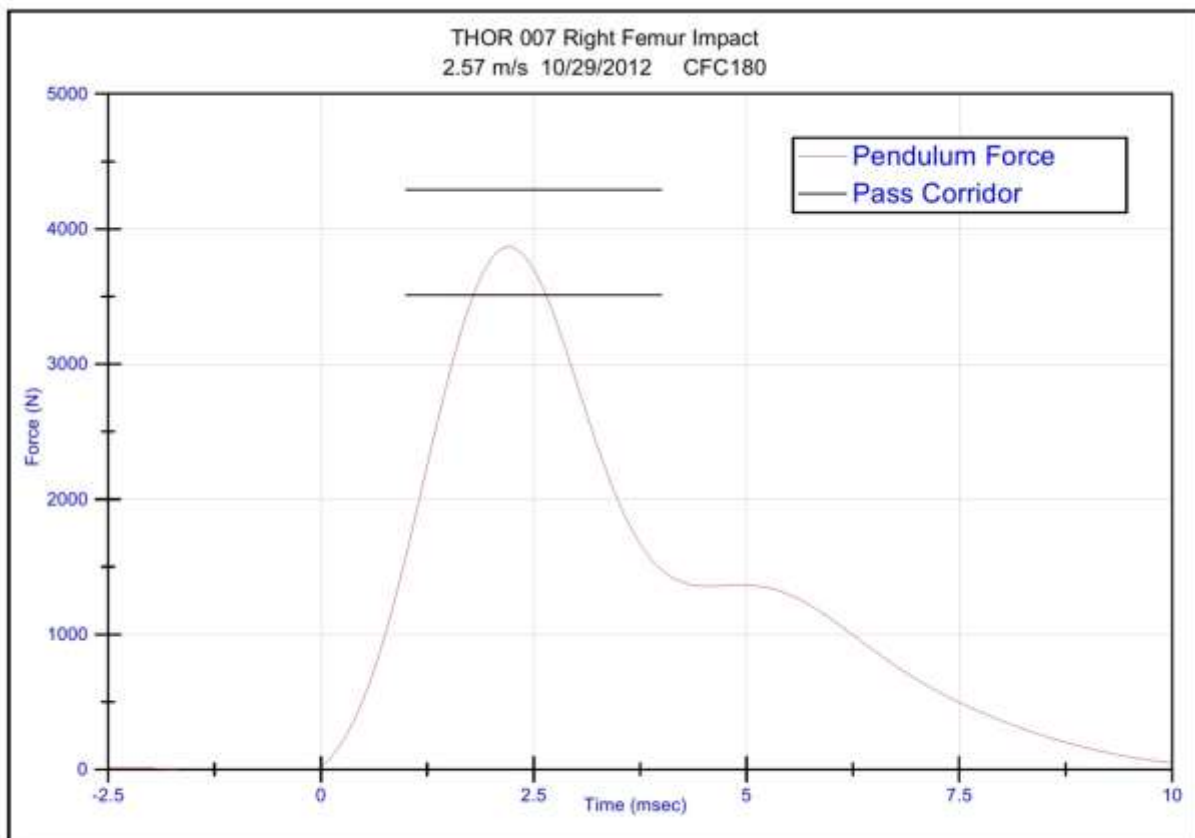
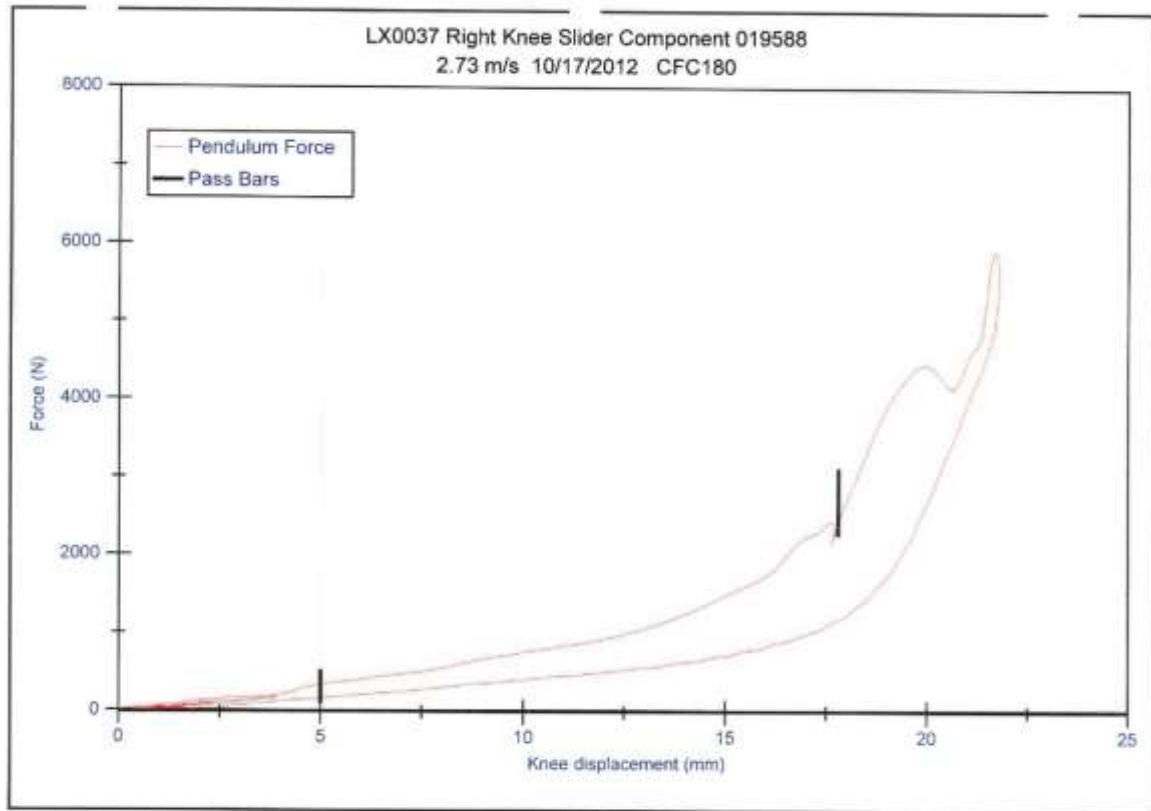


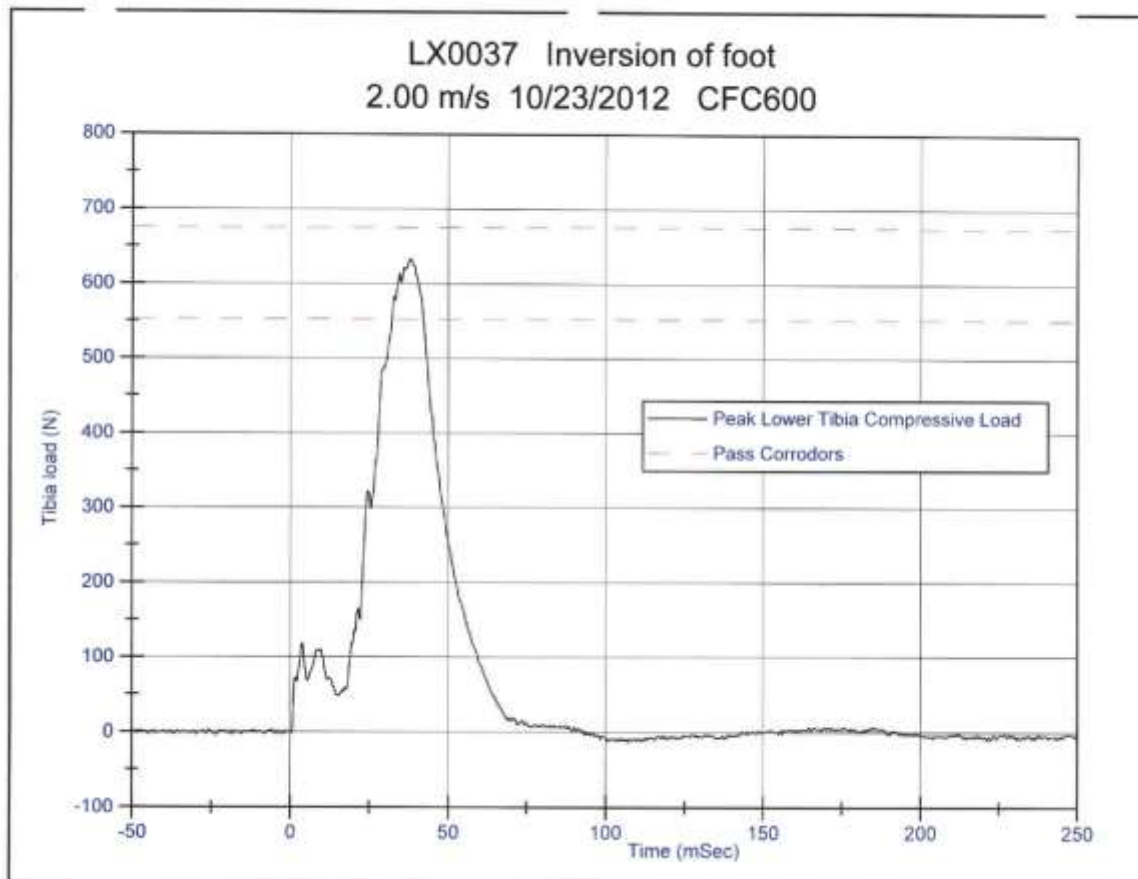
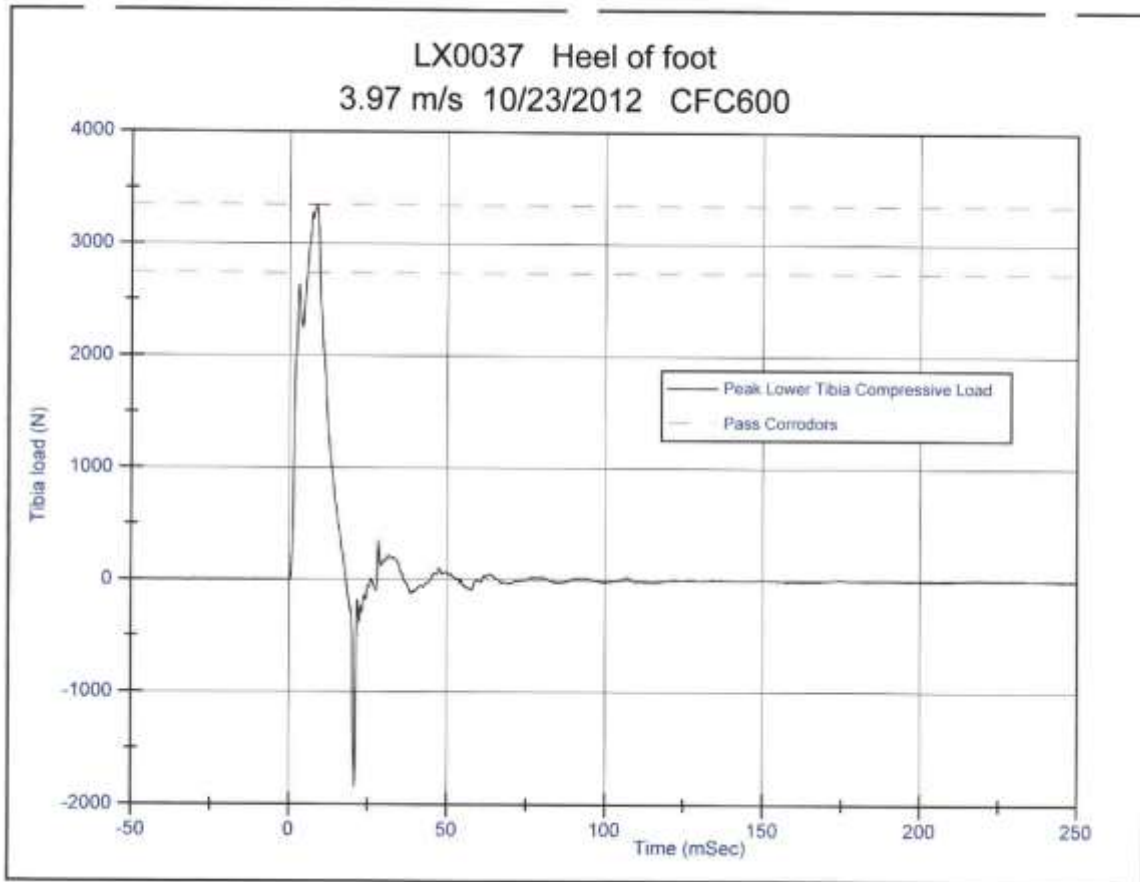


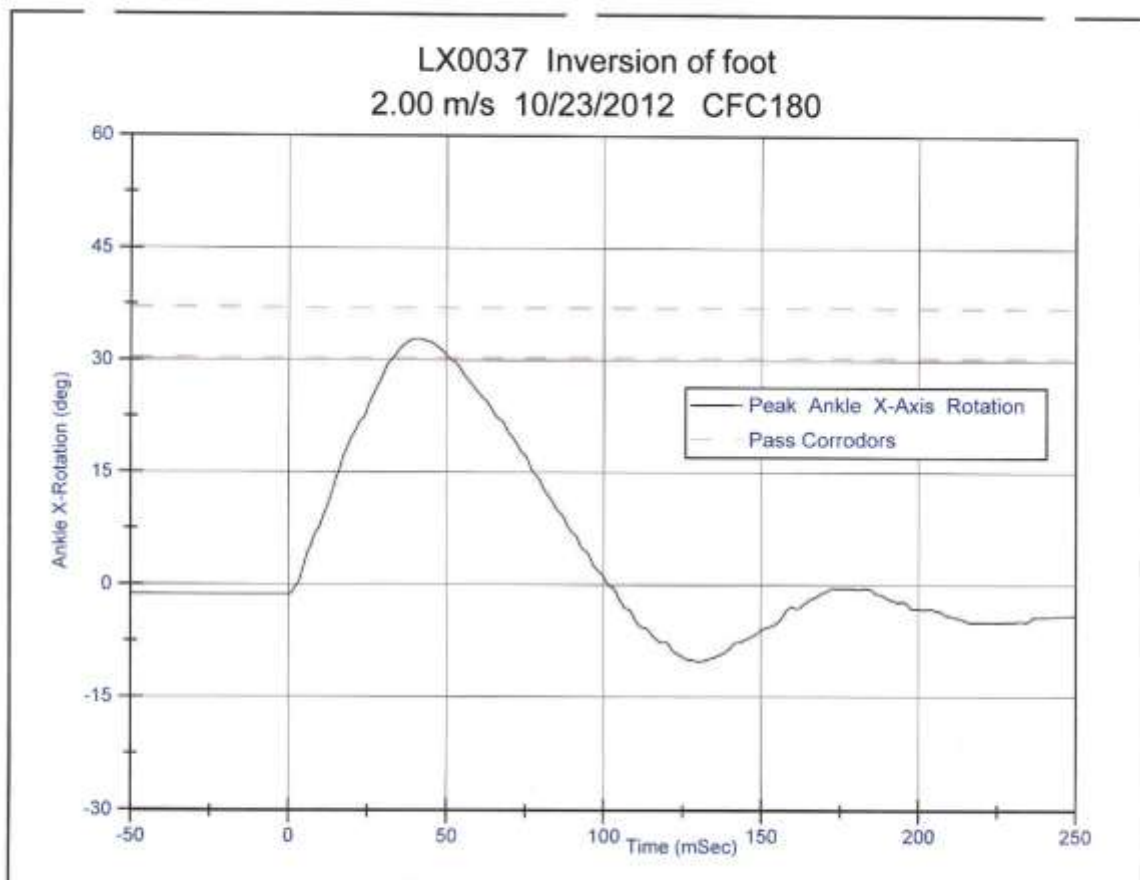
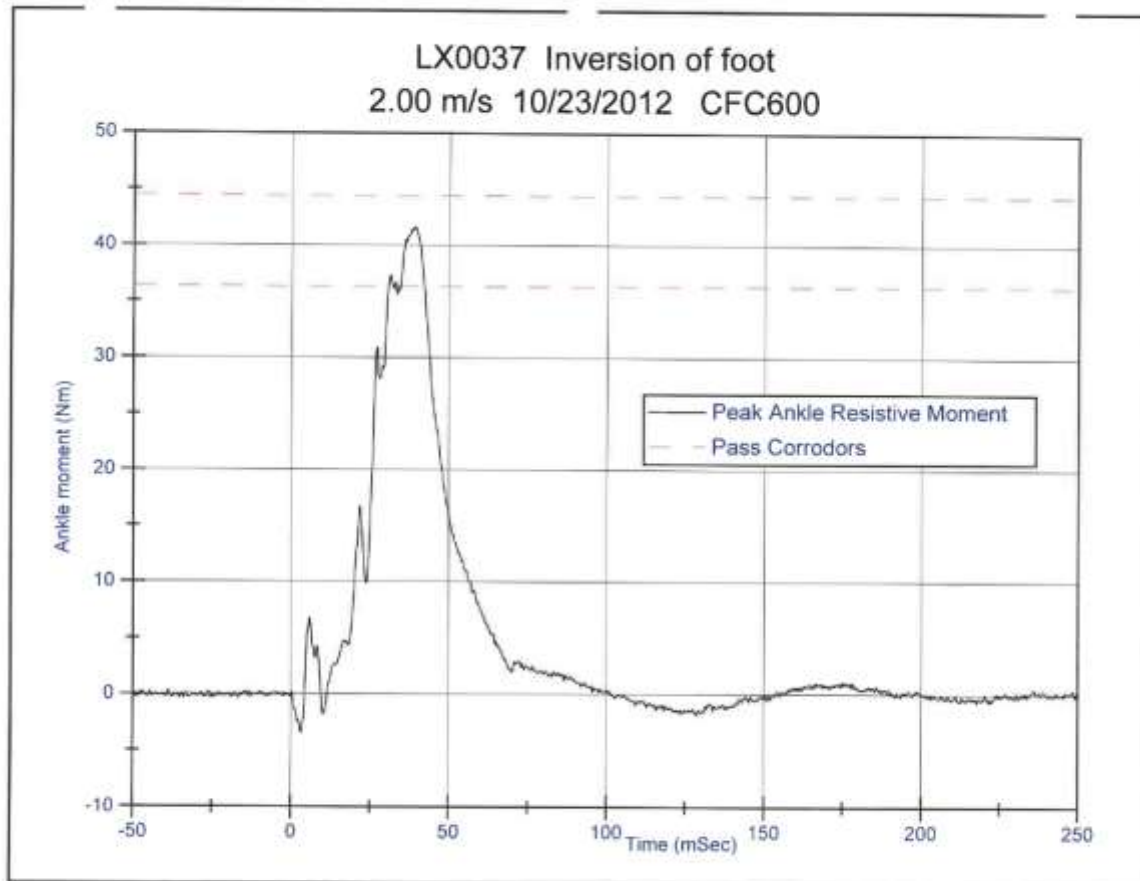


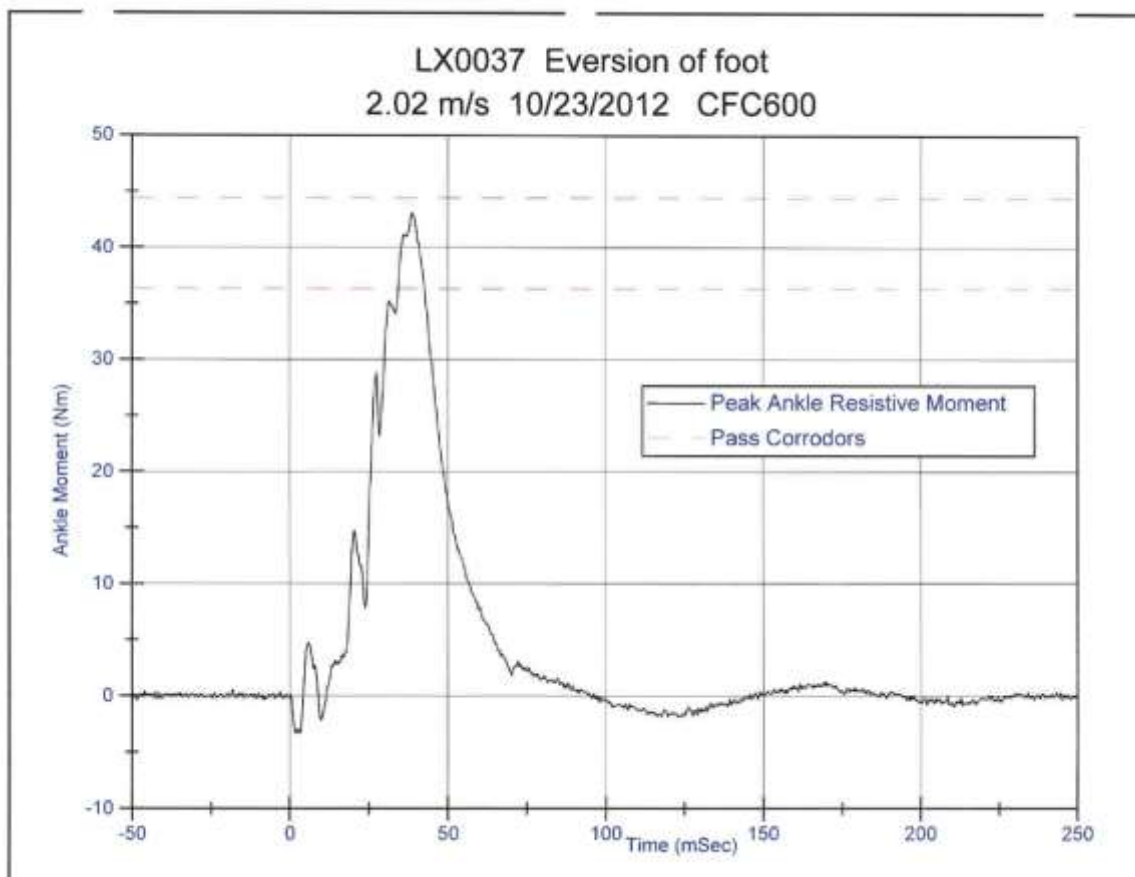
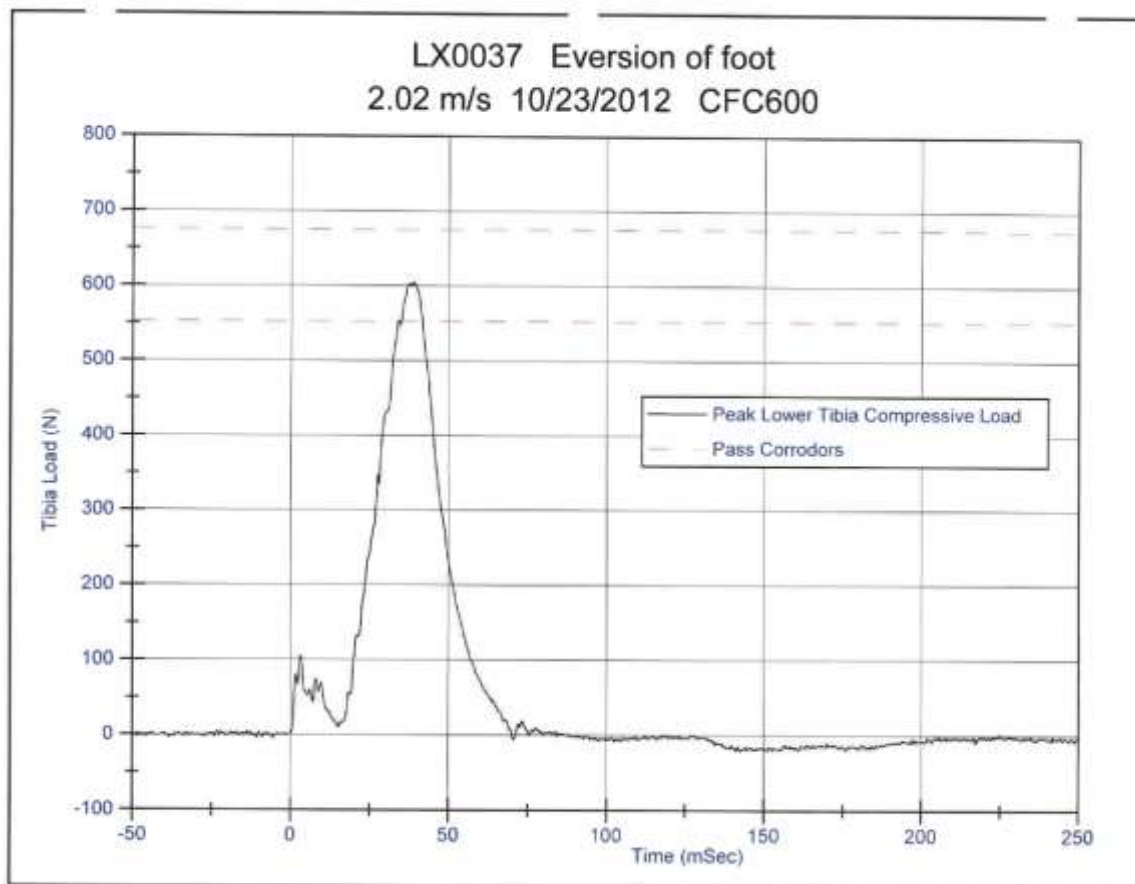


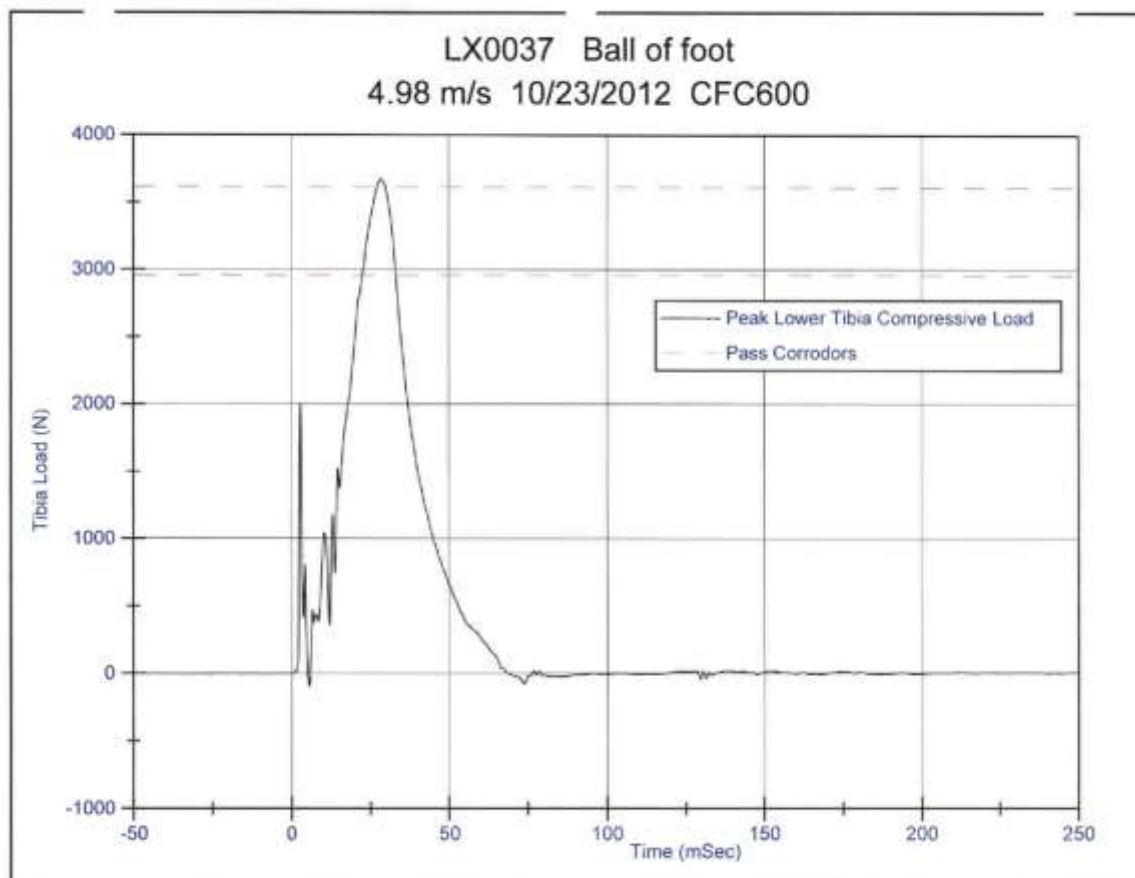
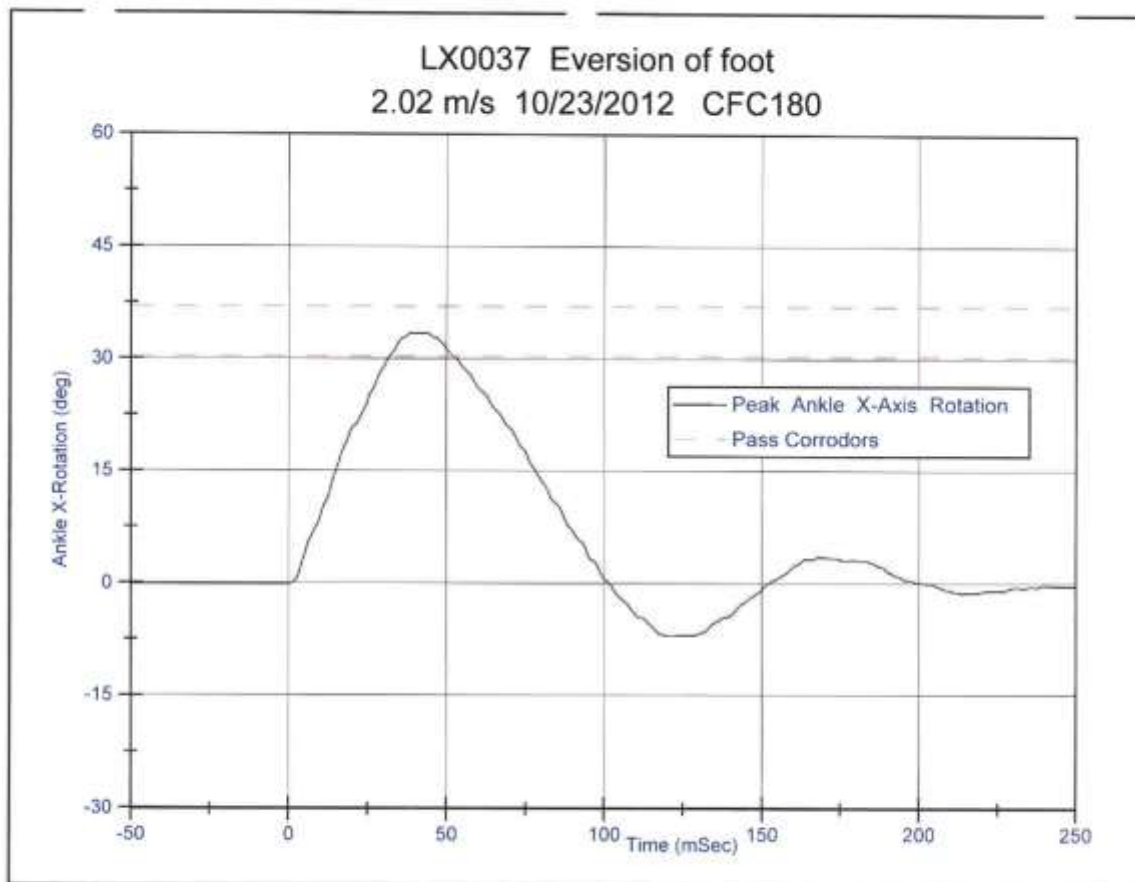
LX0037

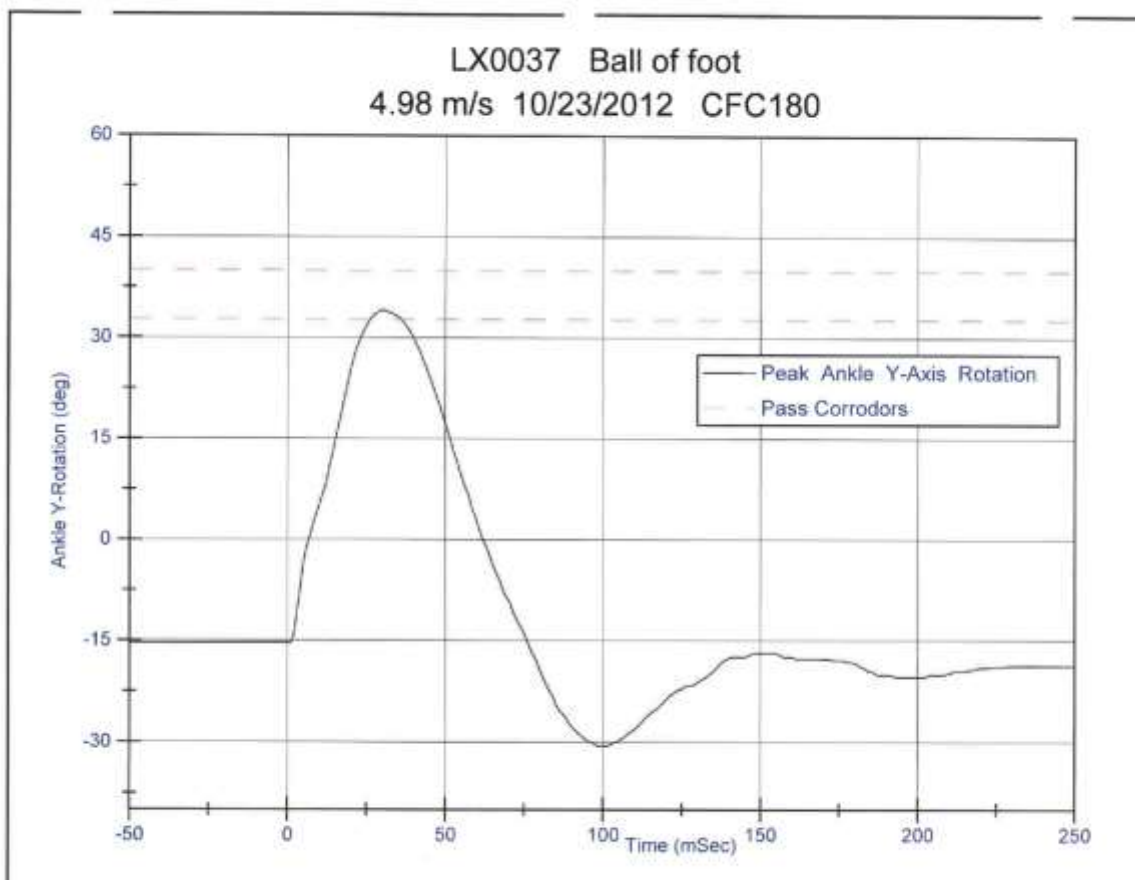
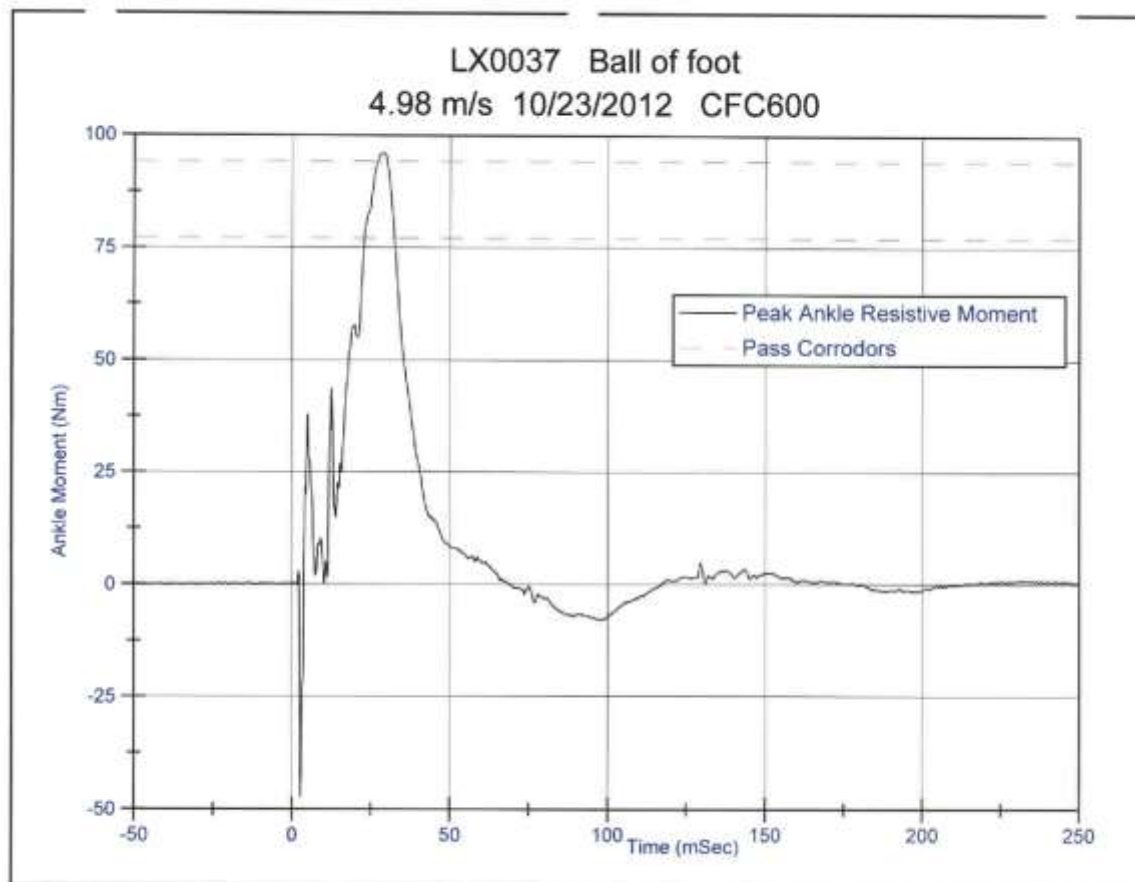




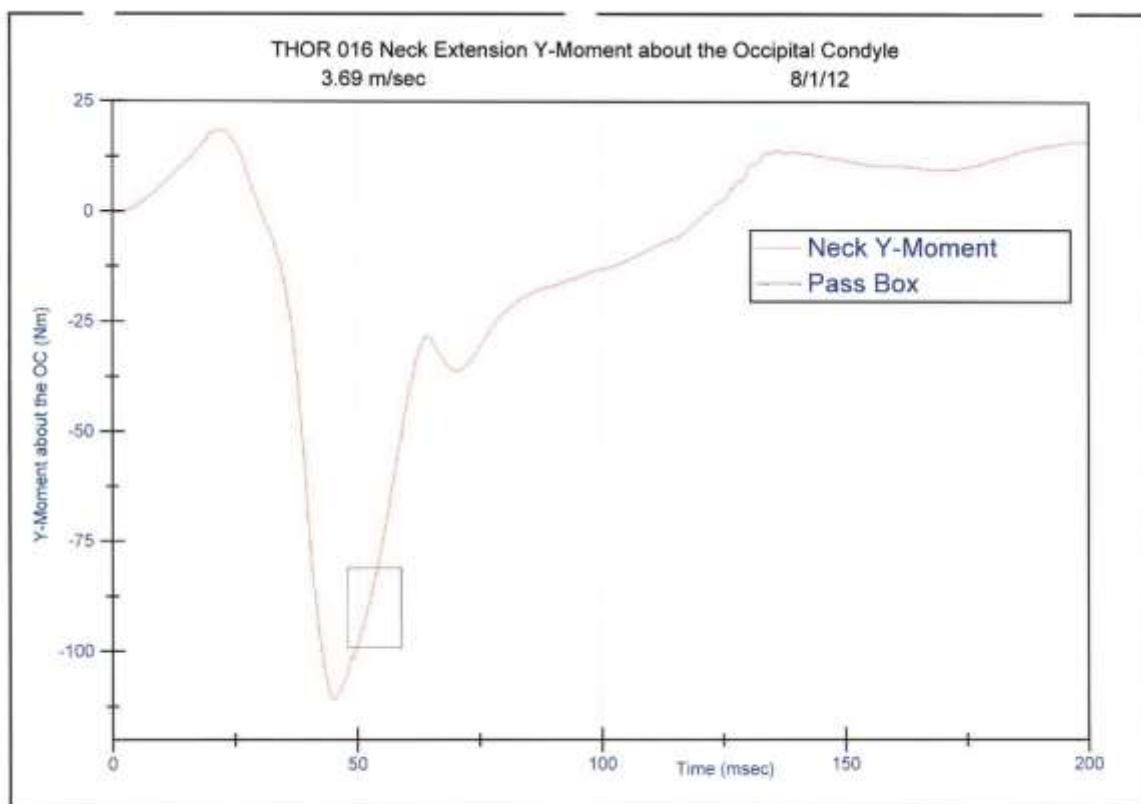
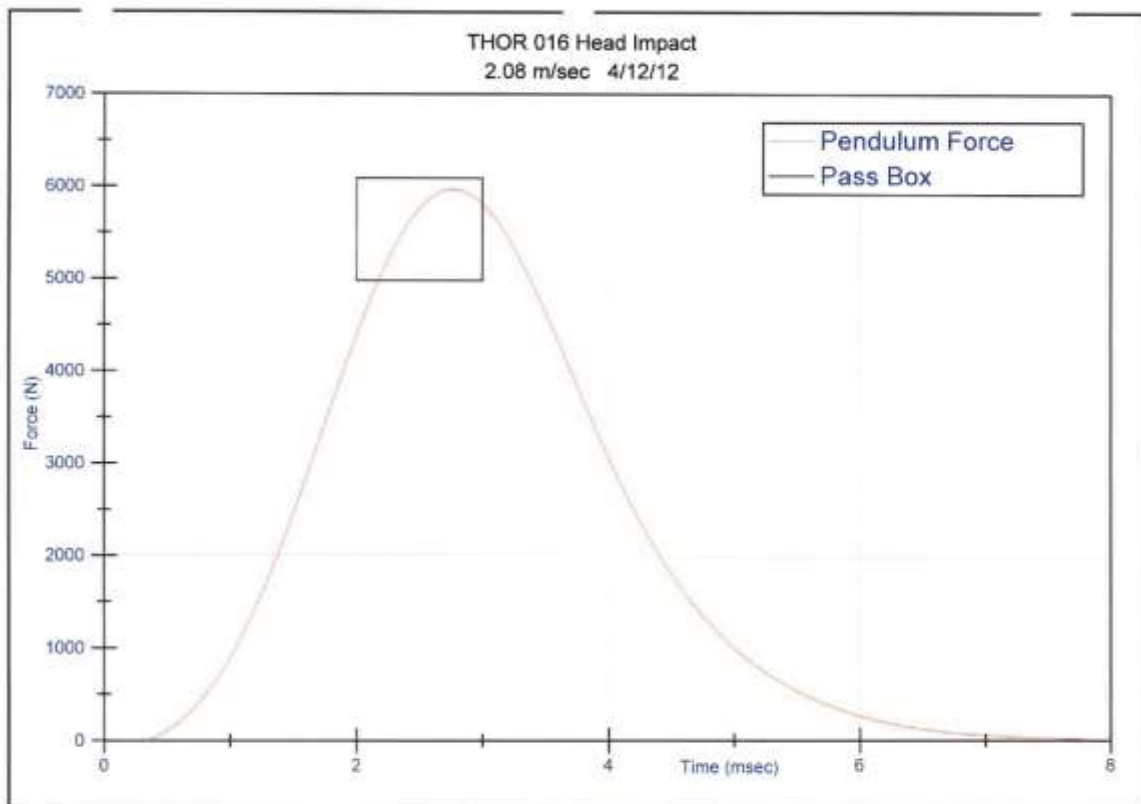


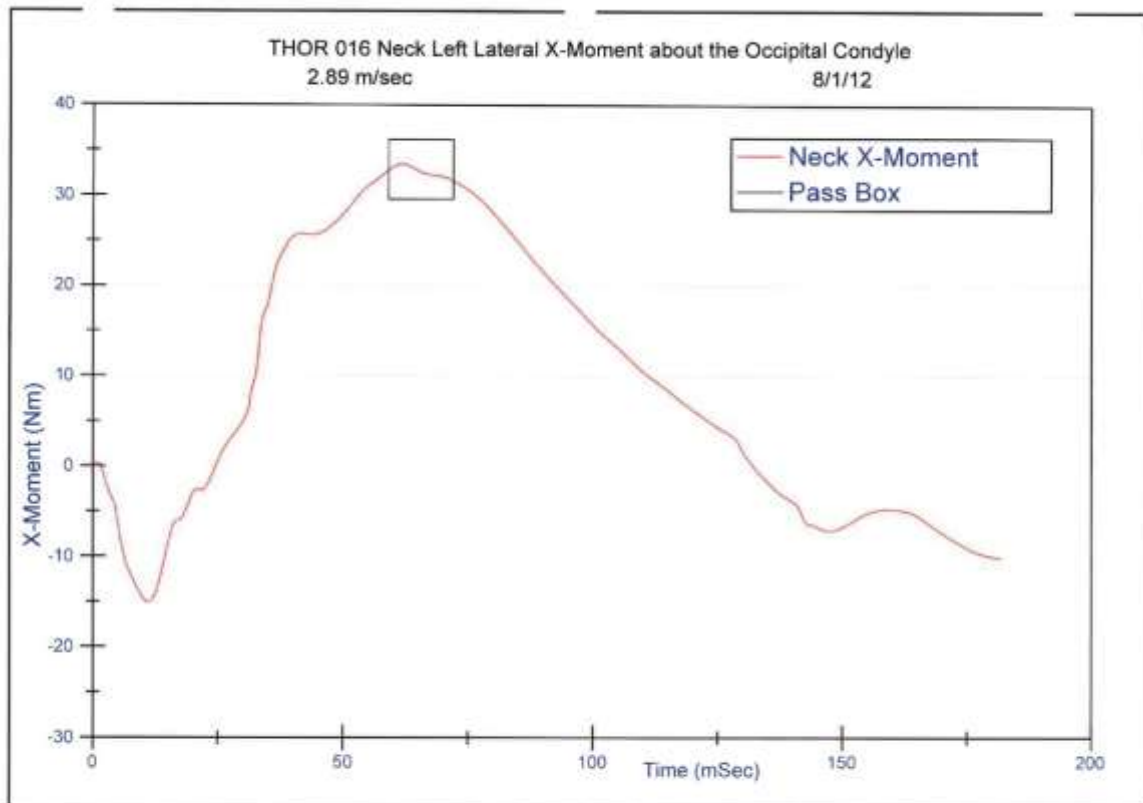
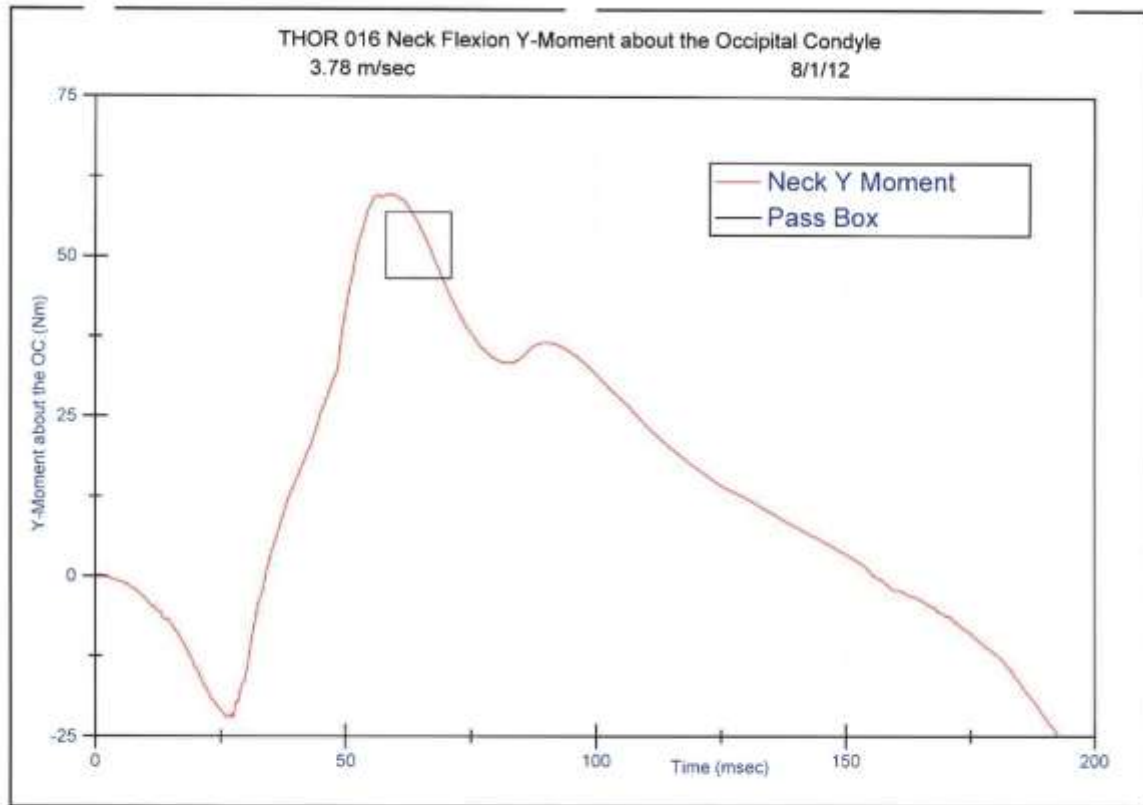


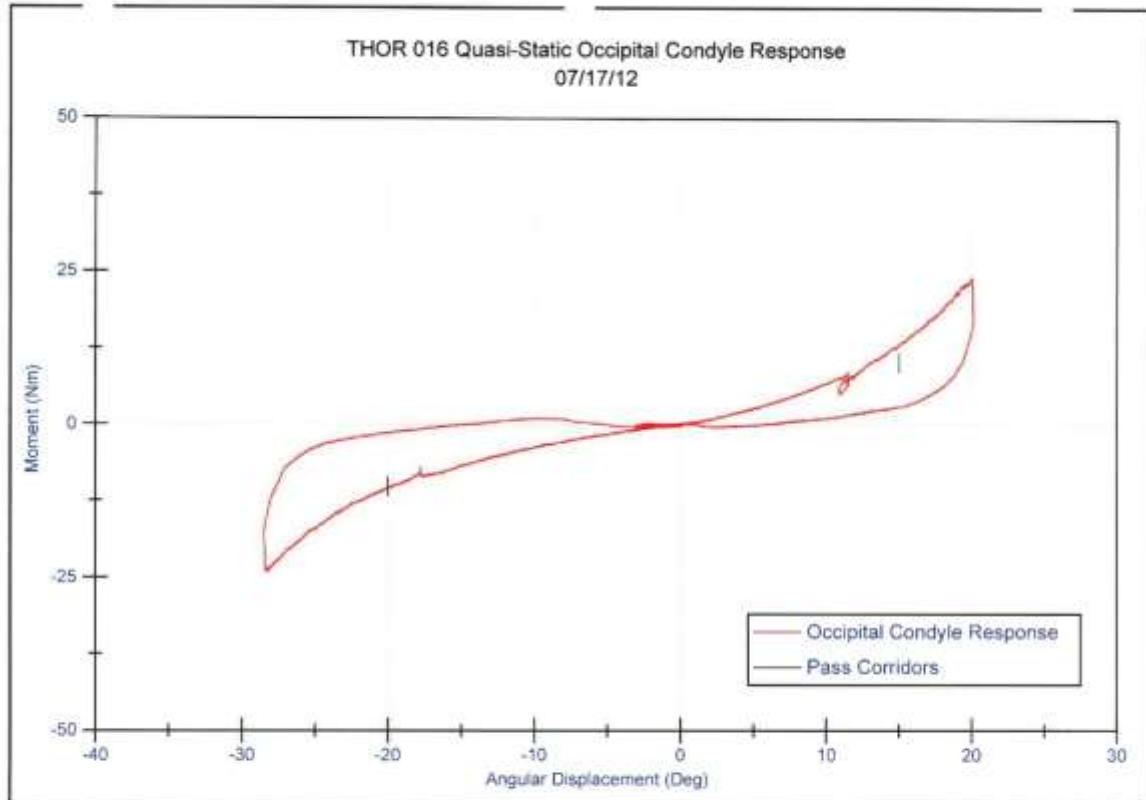
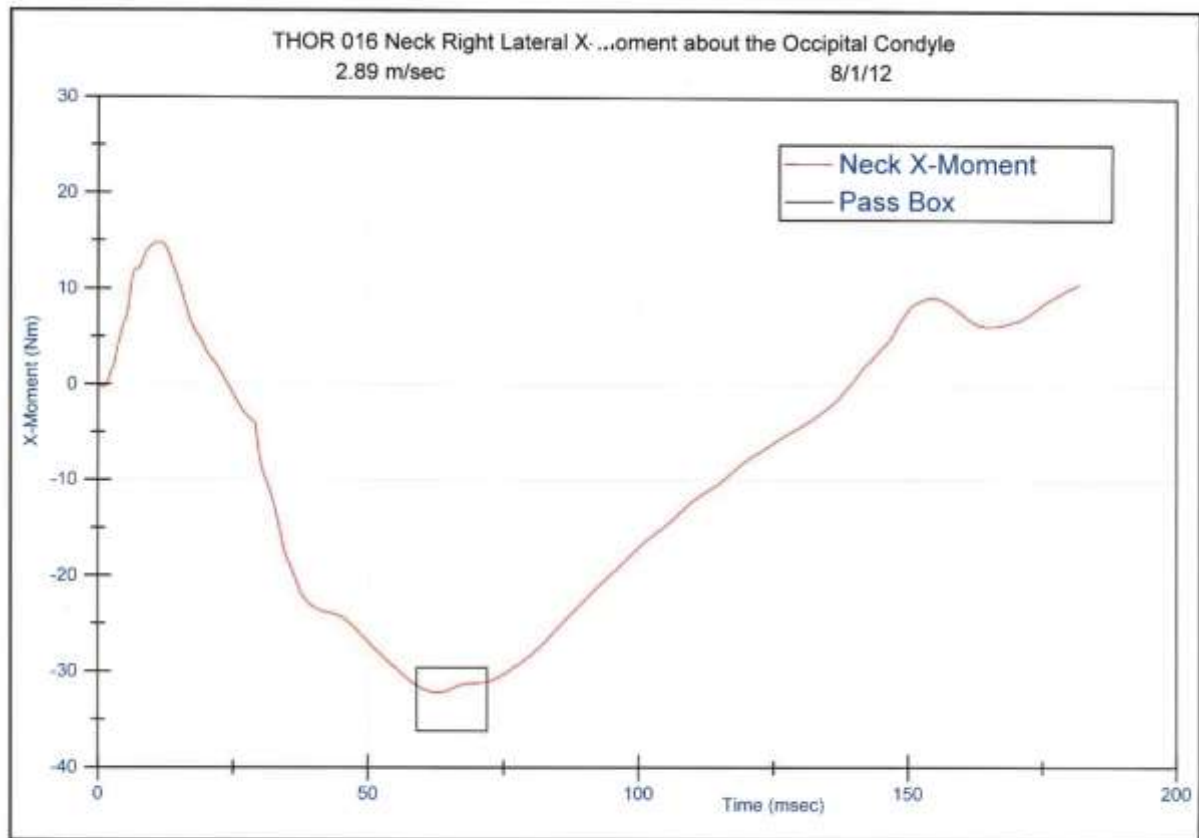


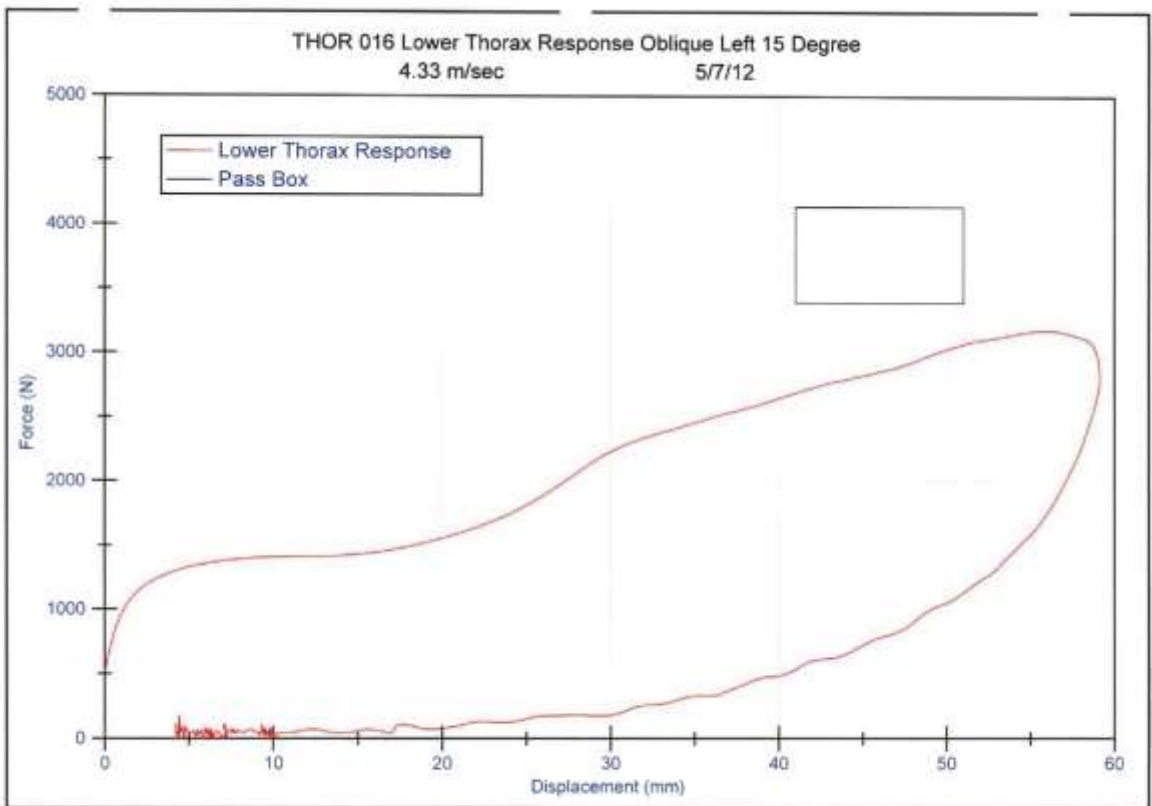
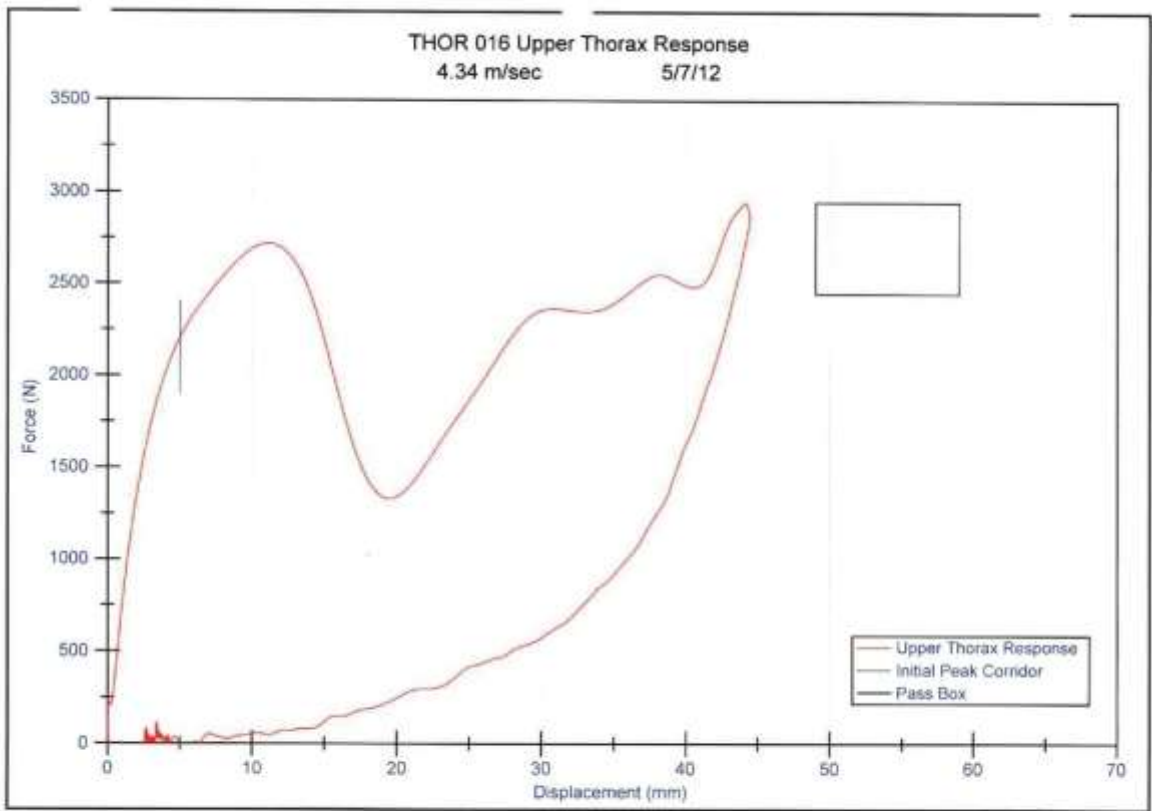


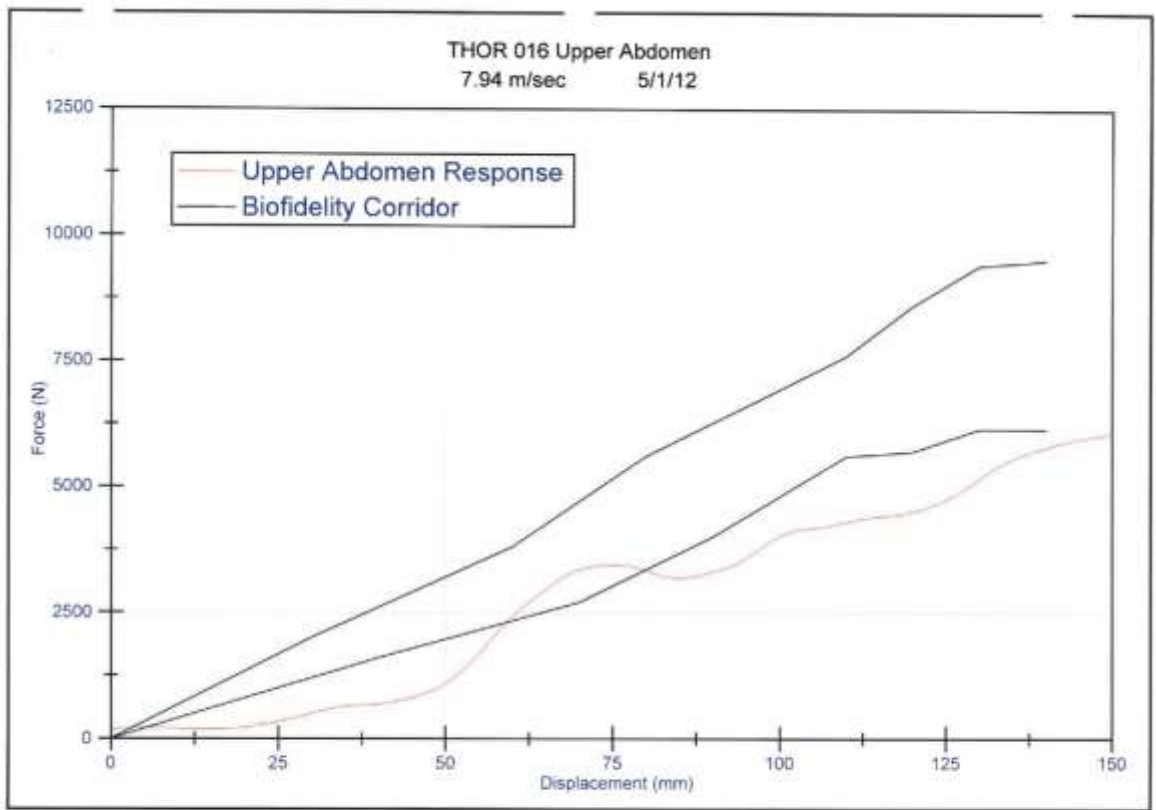
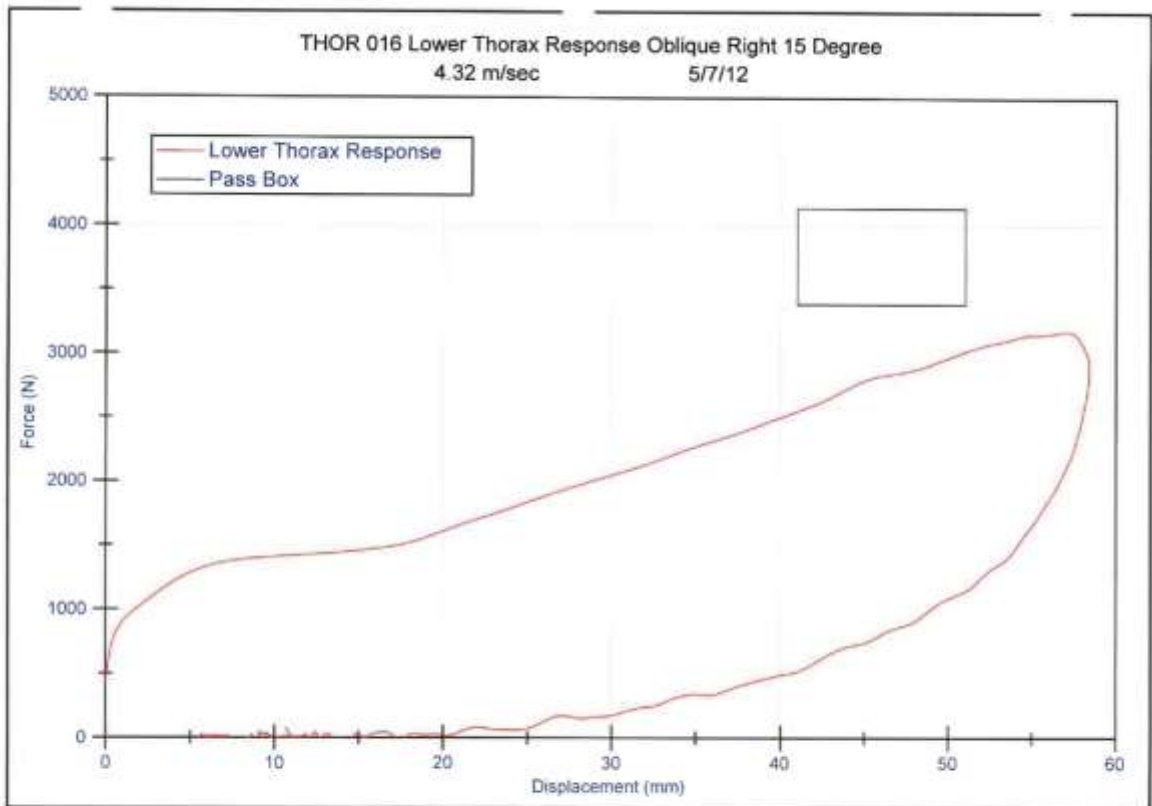
50% ADULT MALE THOR016 DUMMY CALIBRATIONS

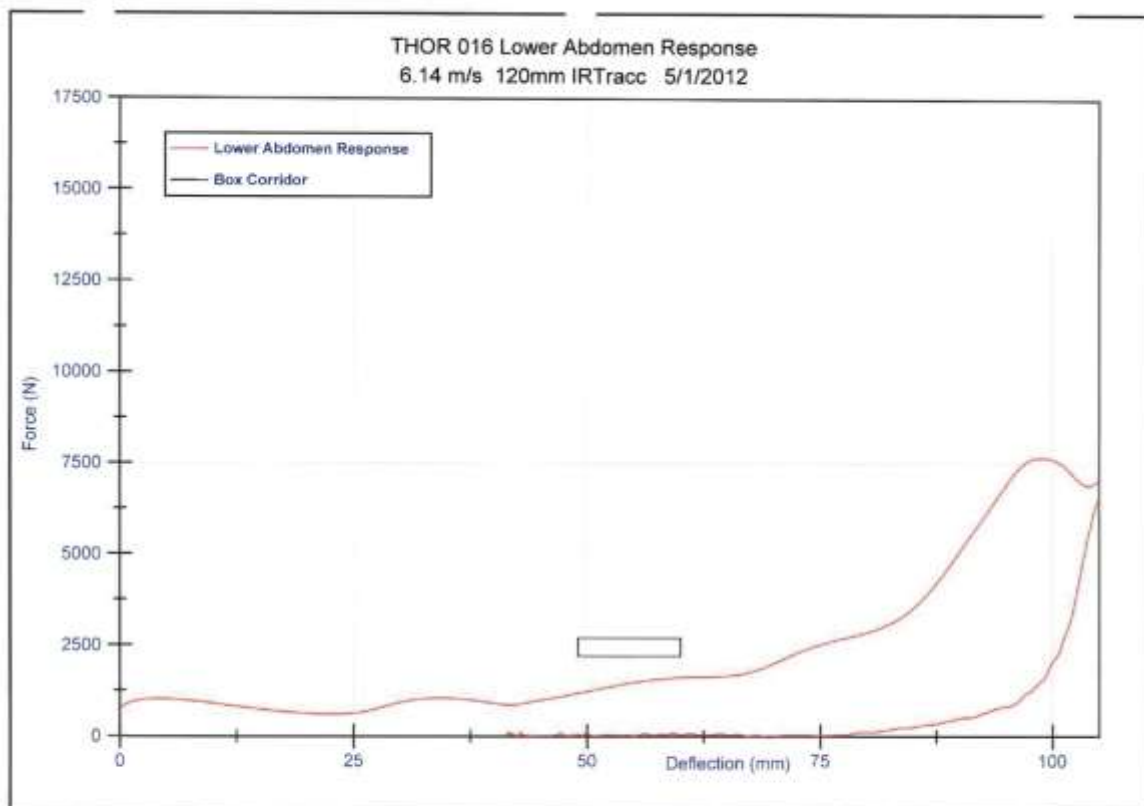




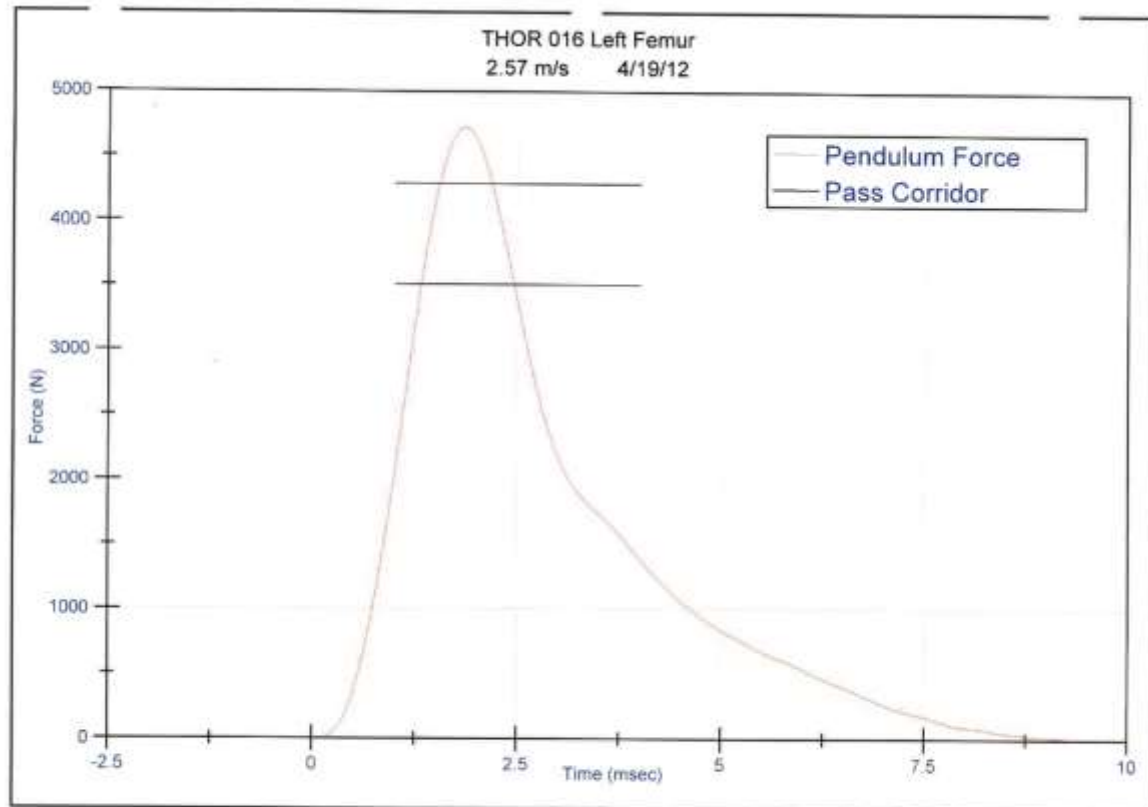
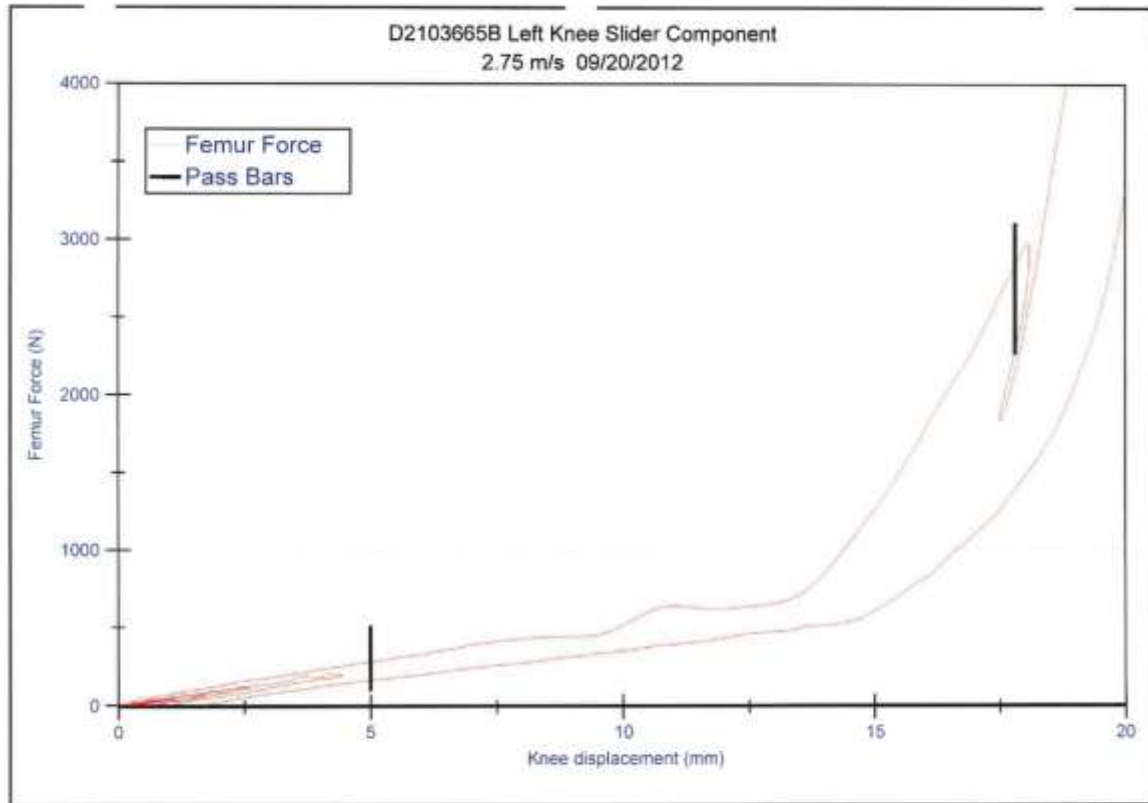


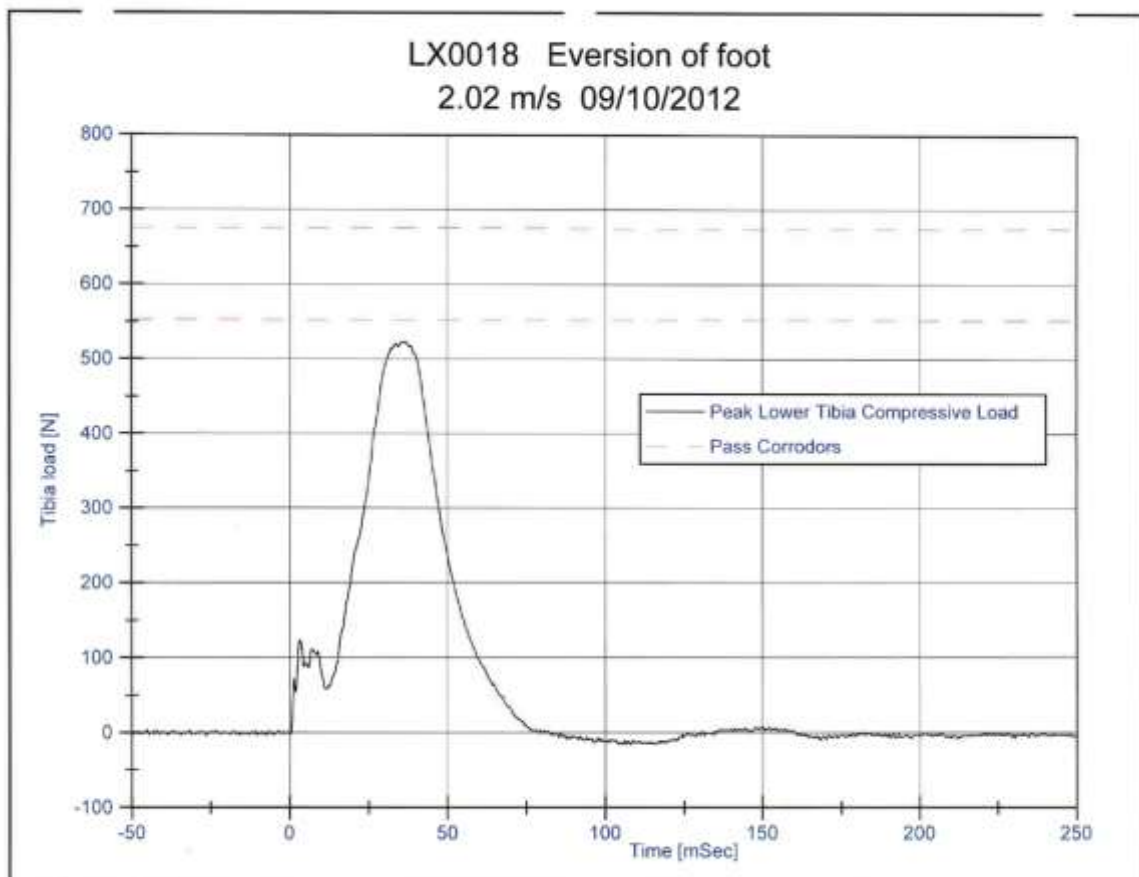
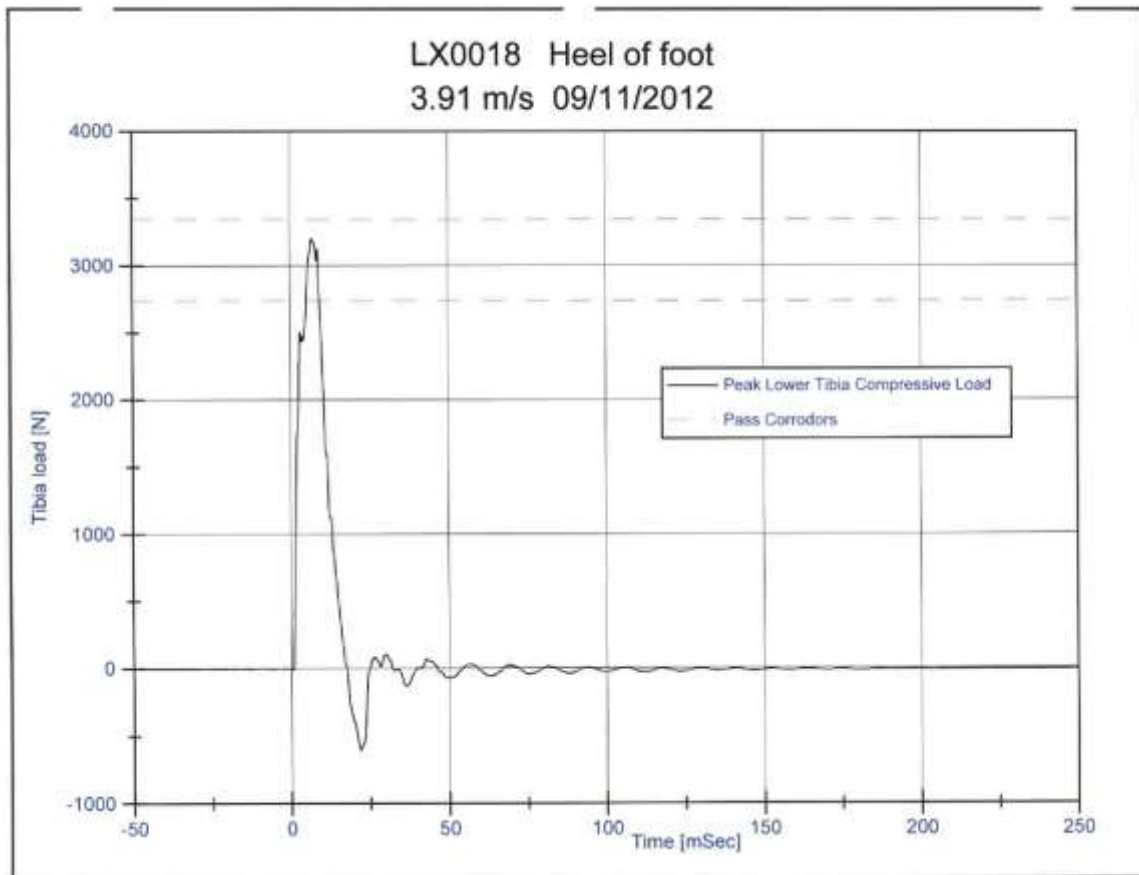


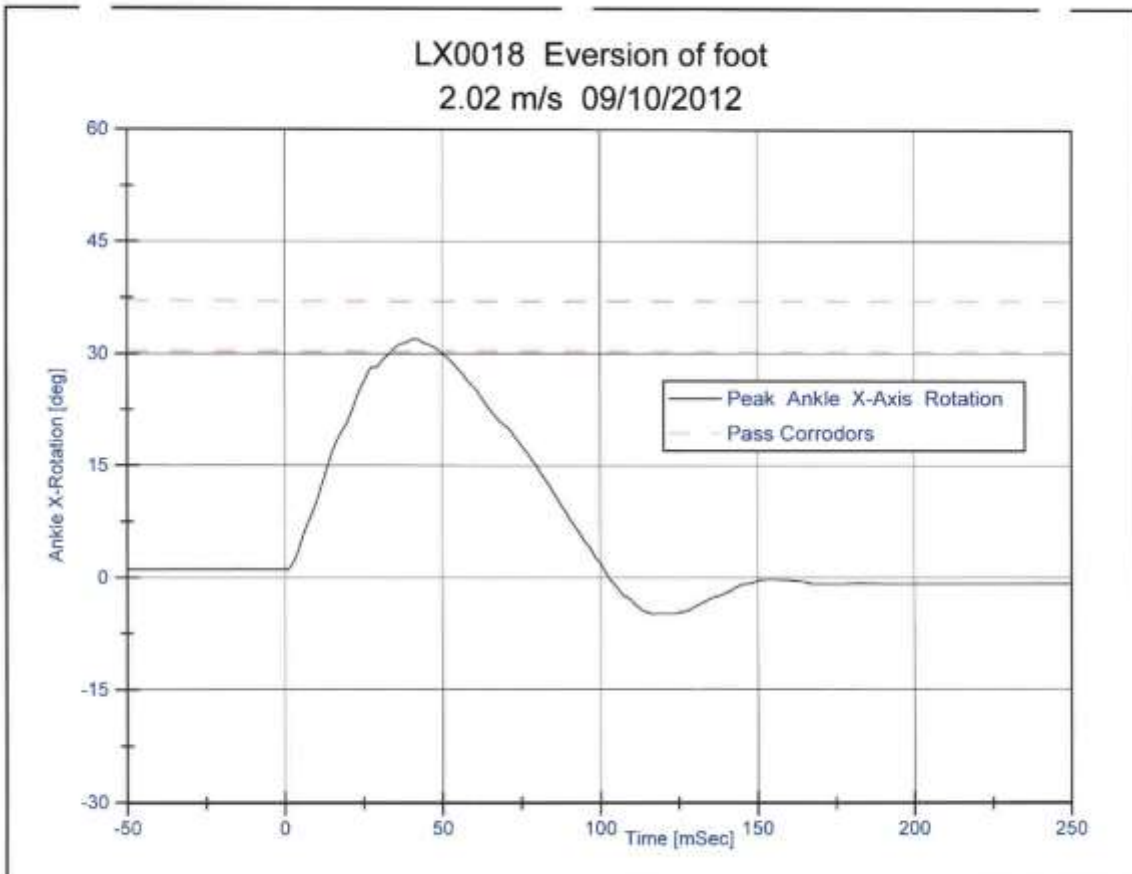
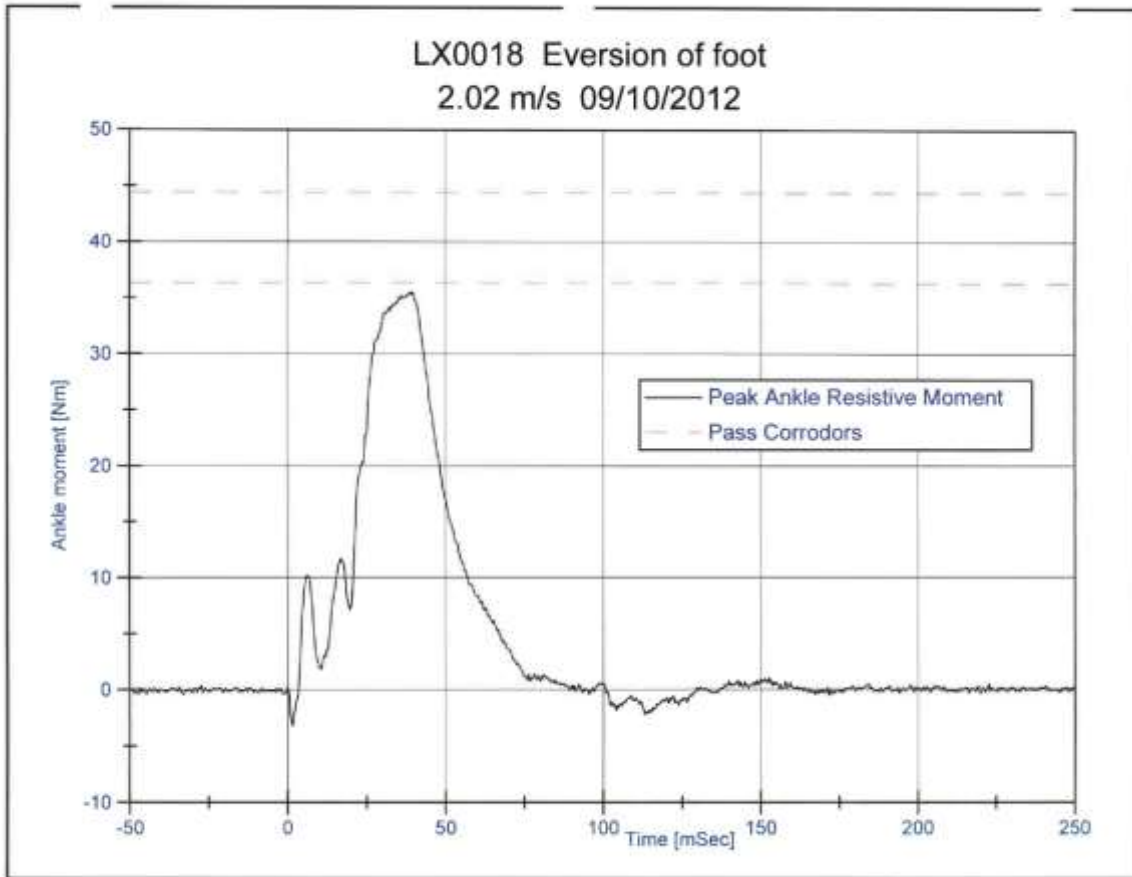


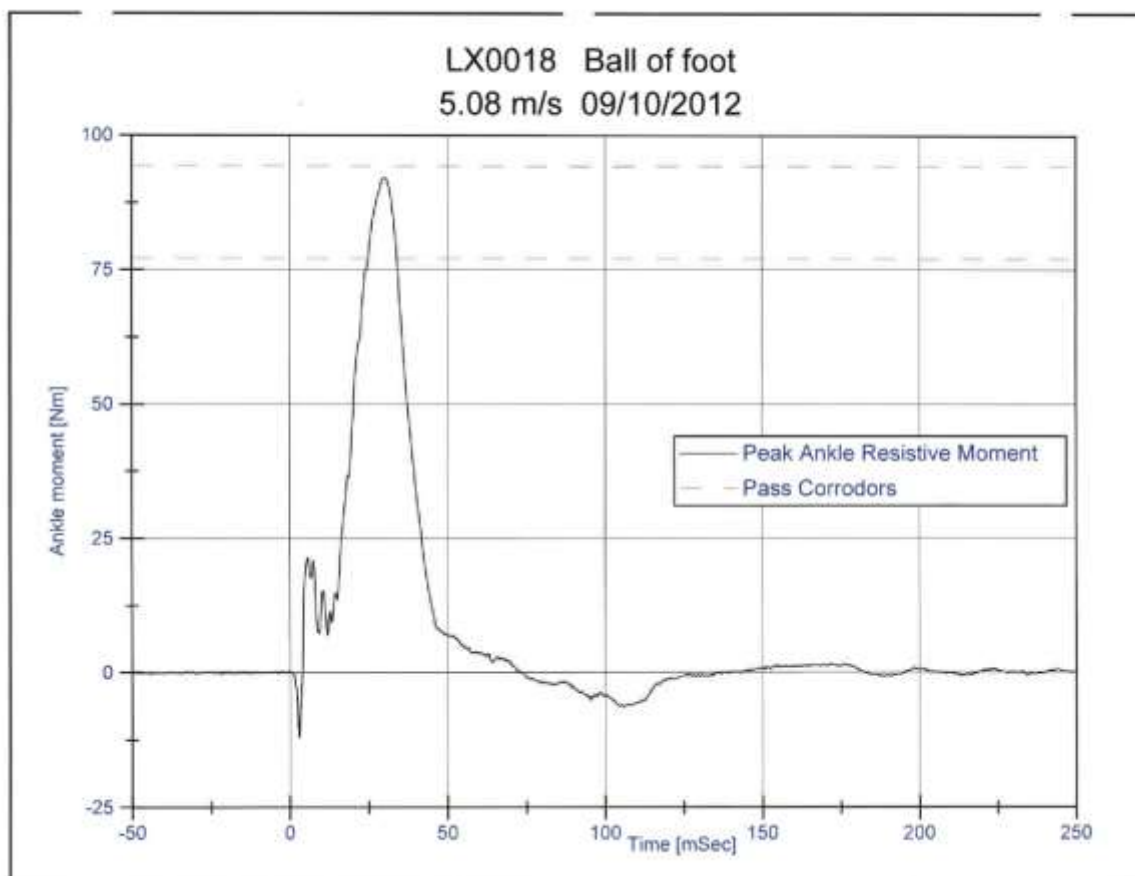
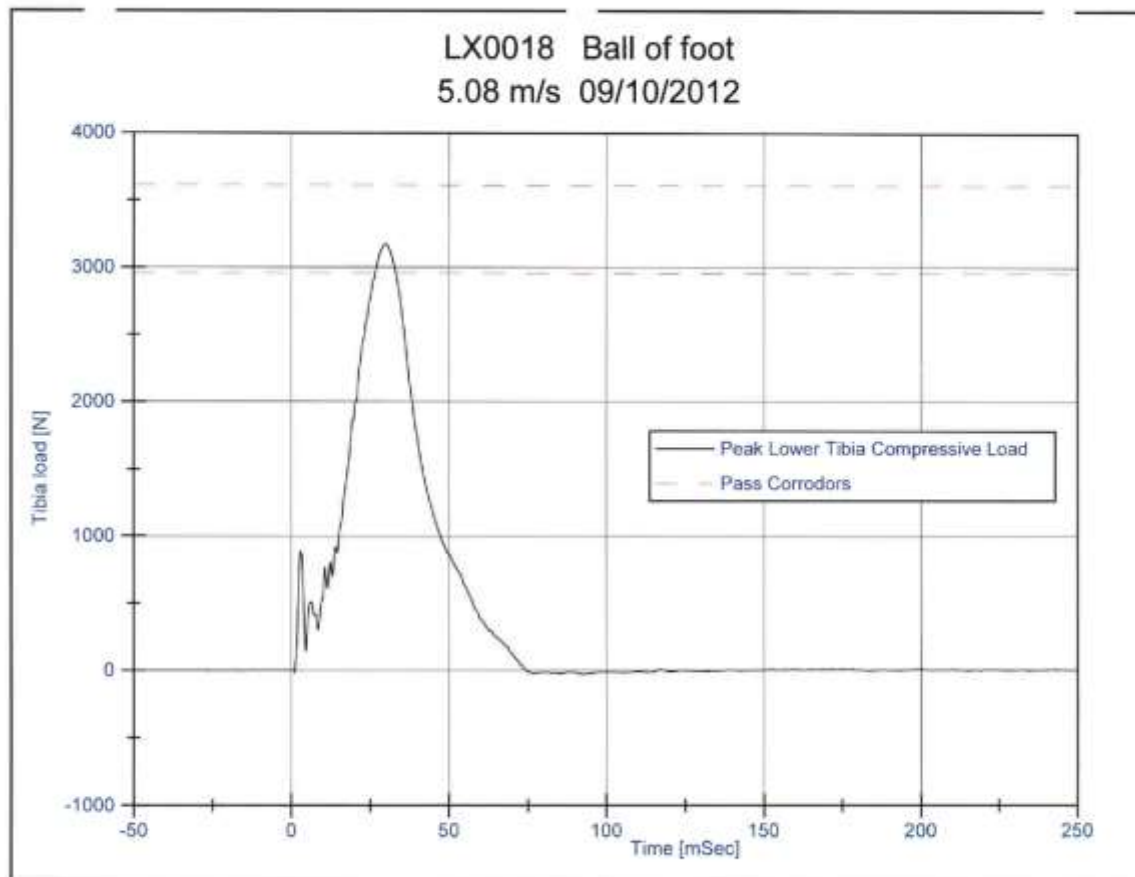


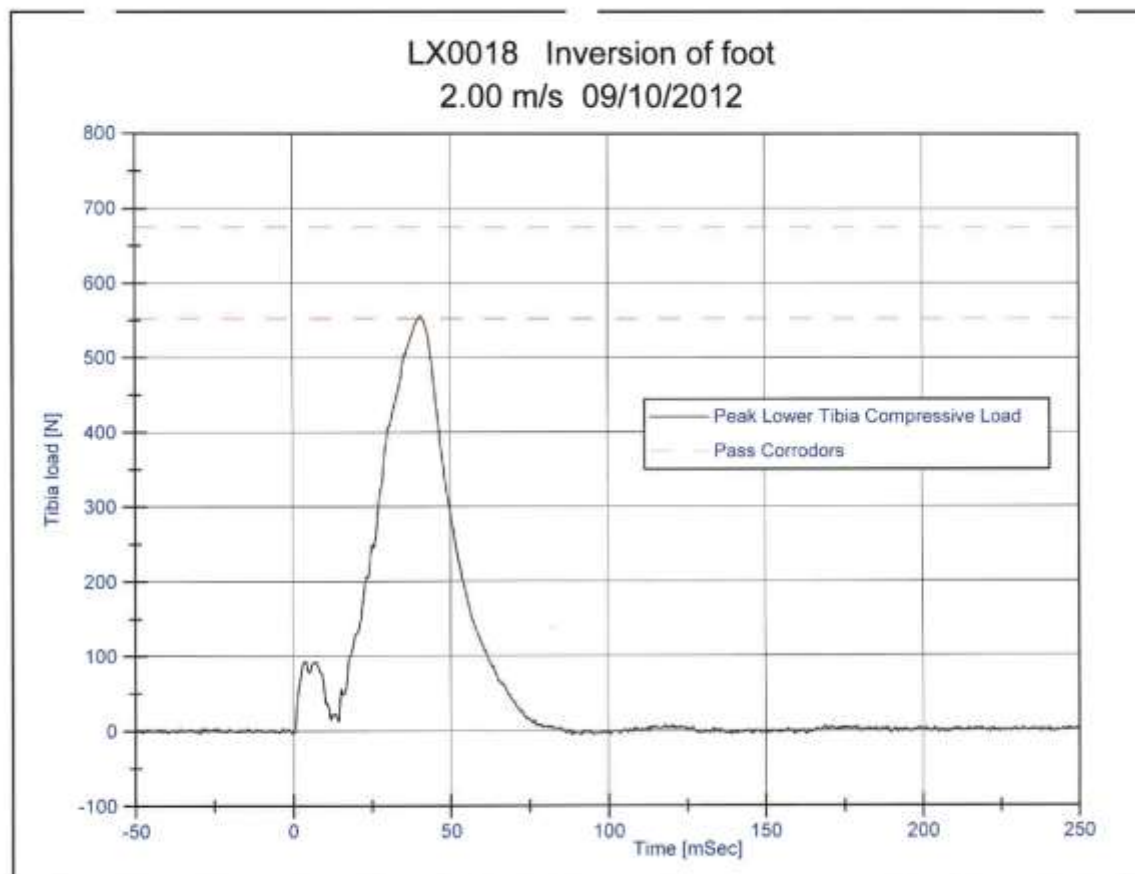
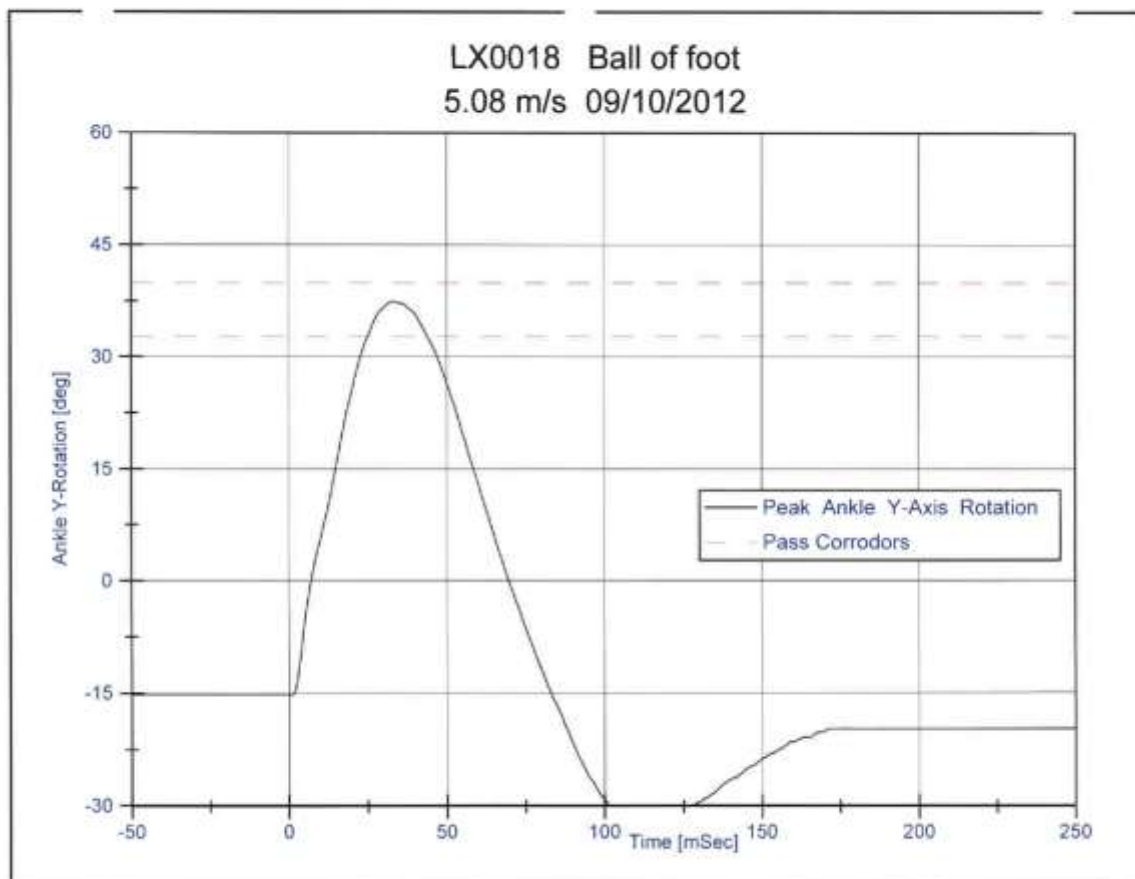
THOR 016 LEG CALIBRATIONS
LX0018 / LX0019

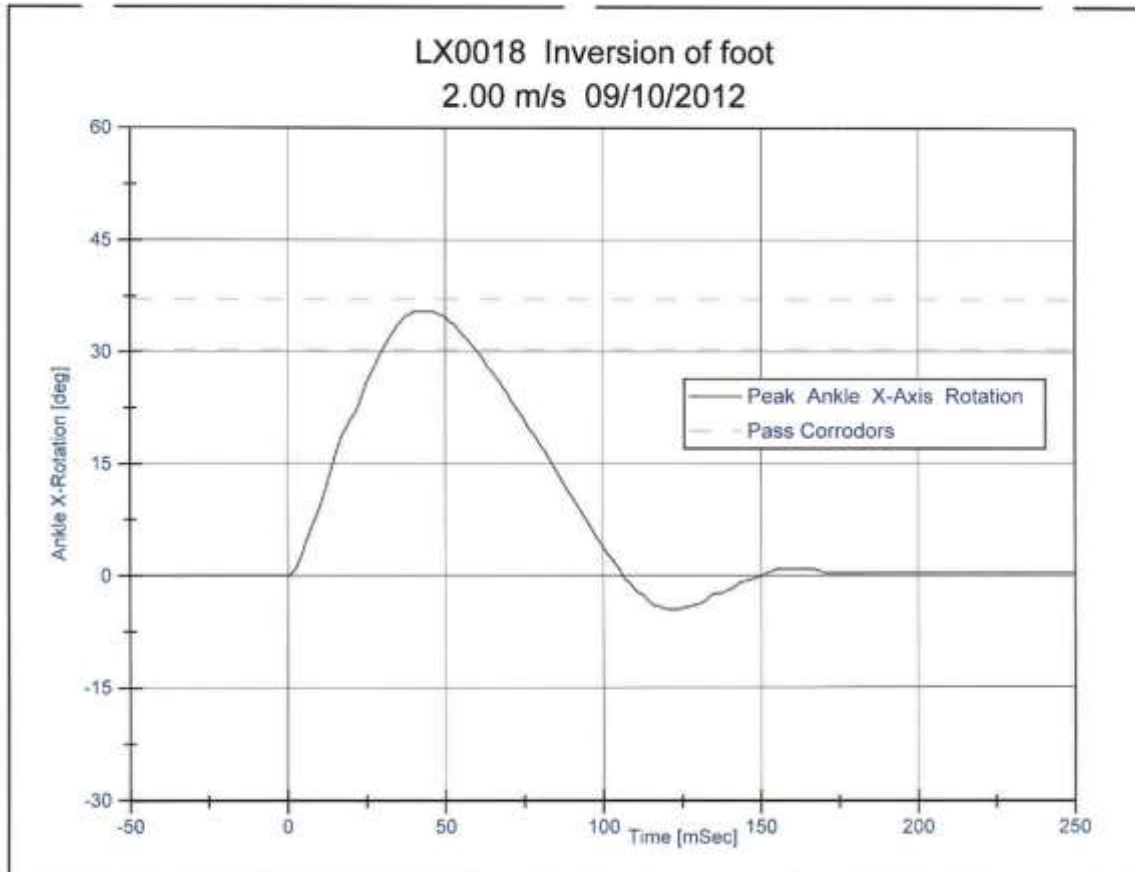
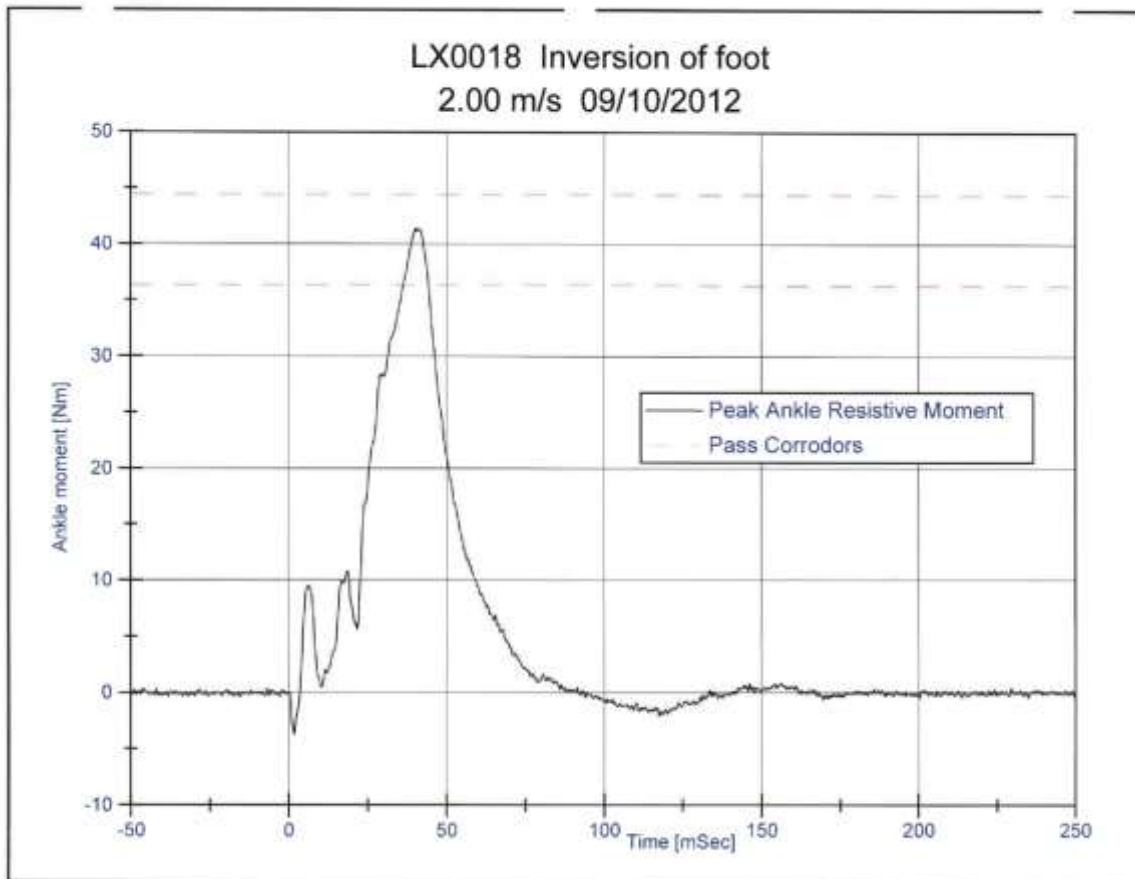




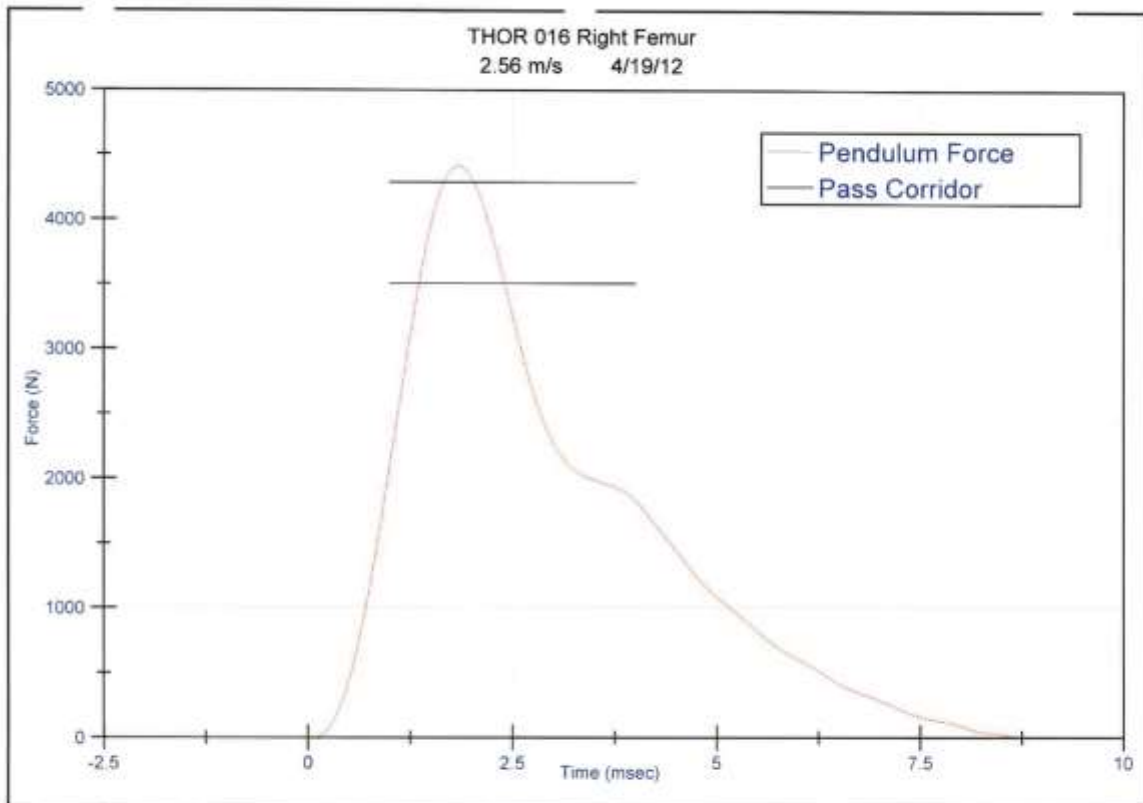
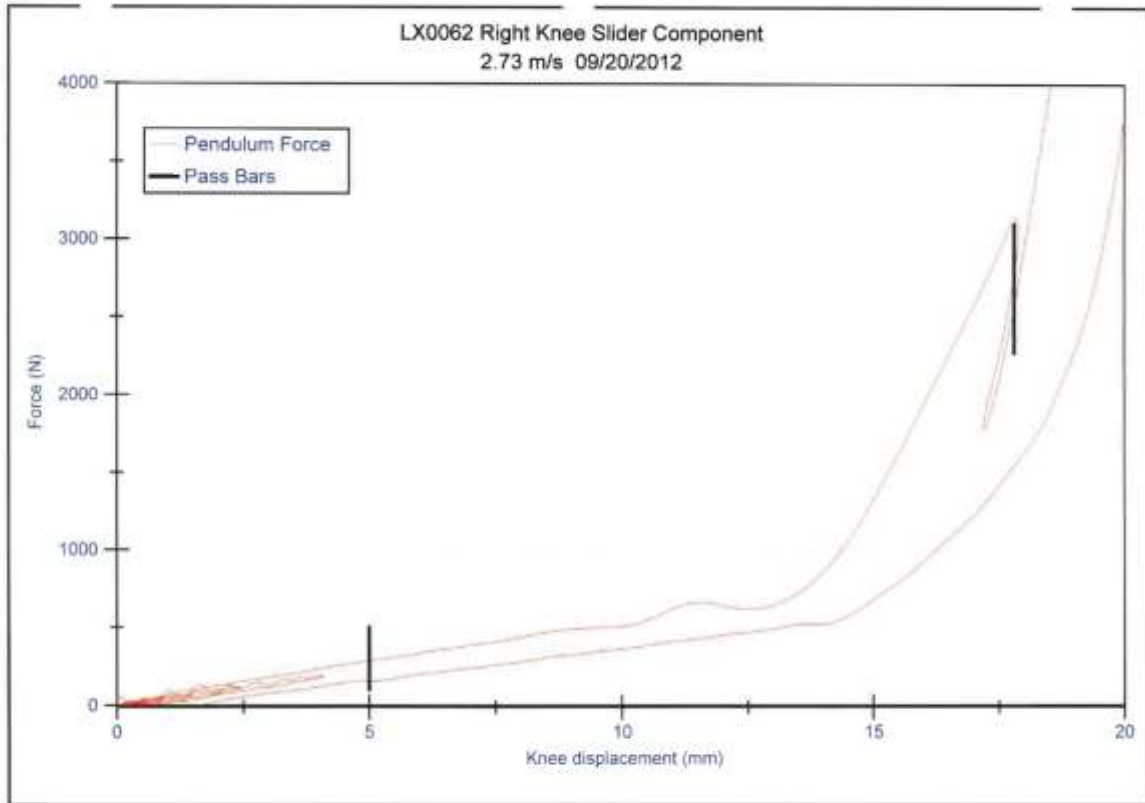


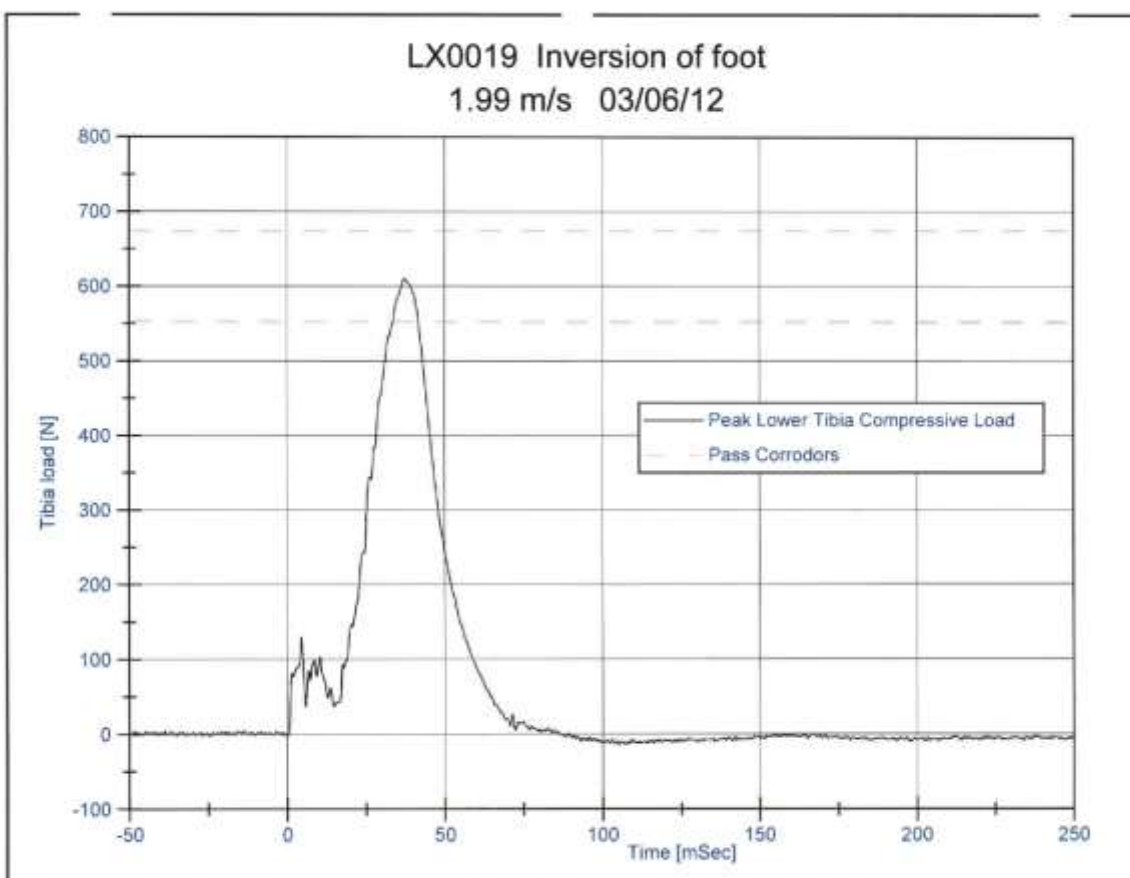
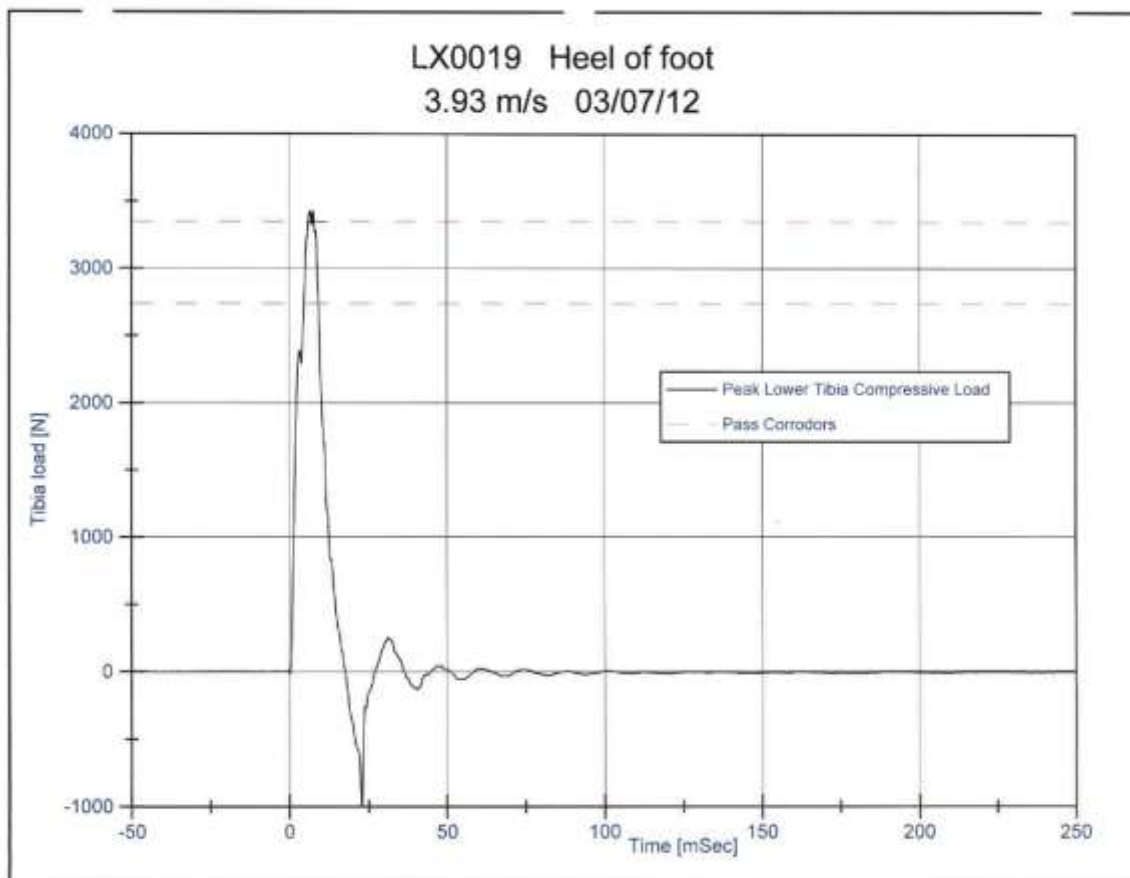


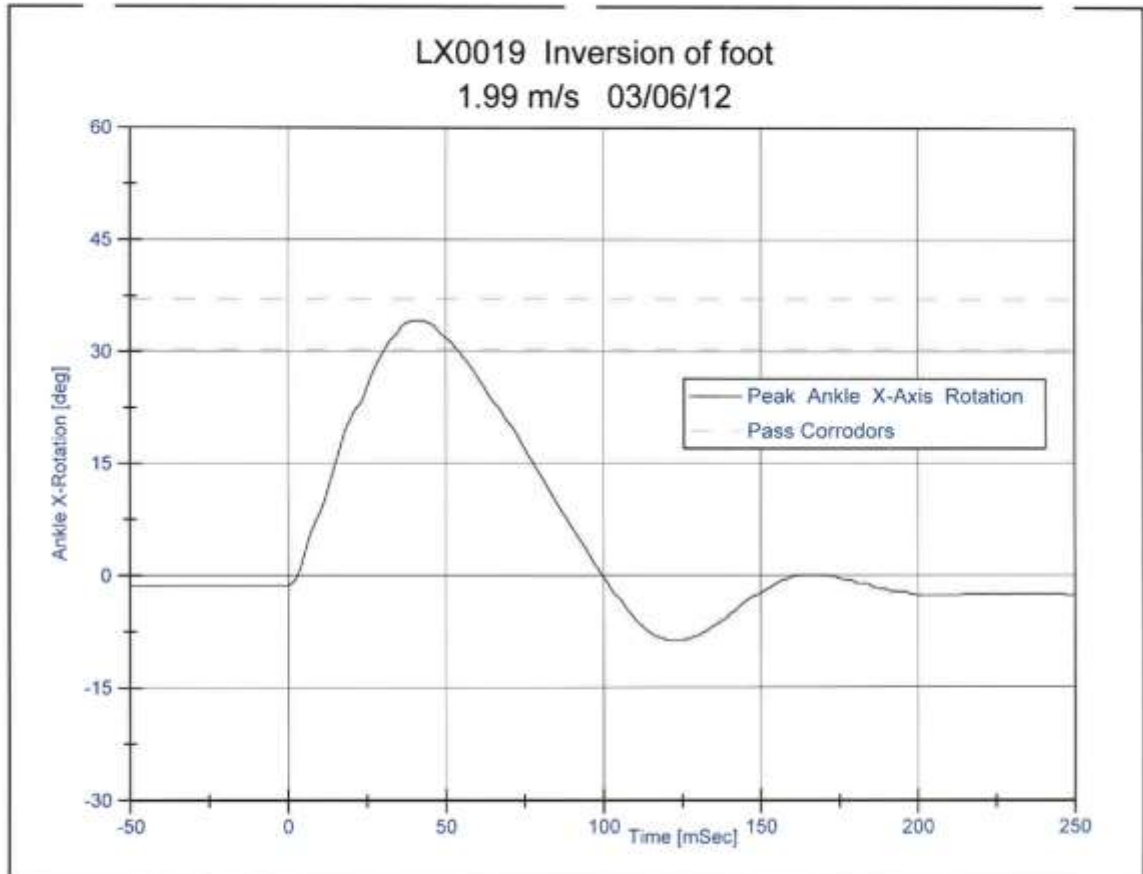
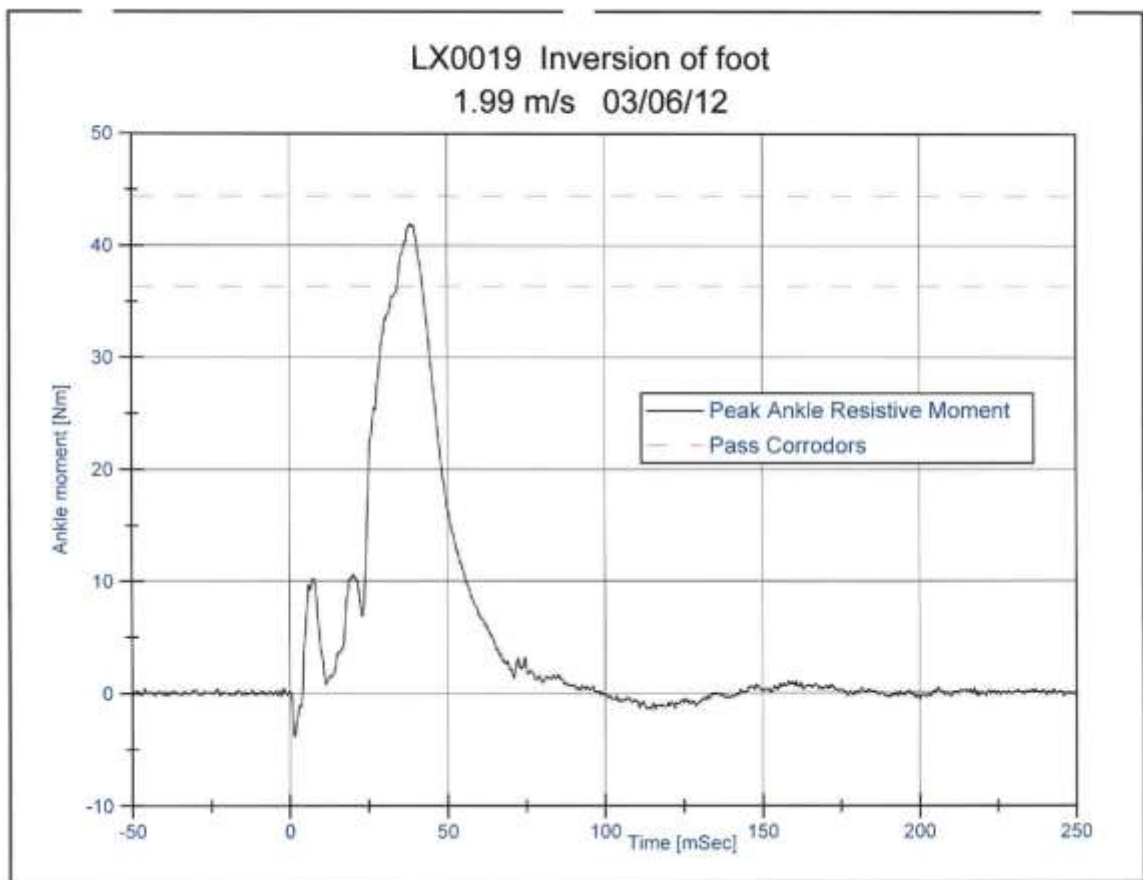


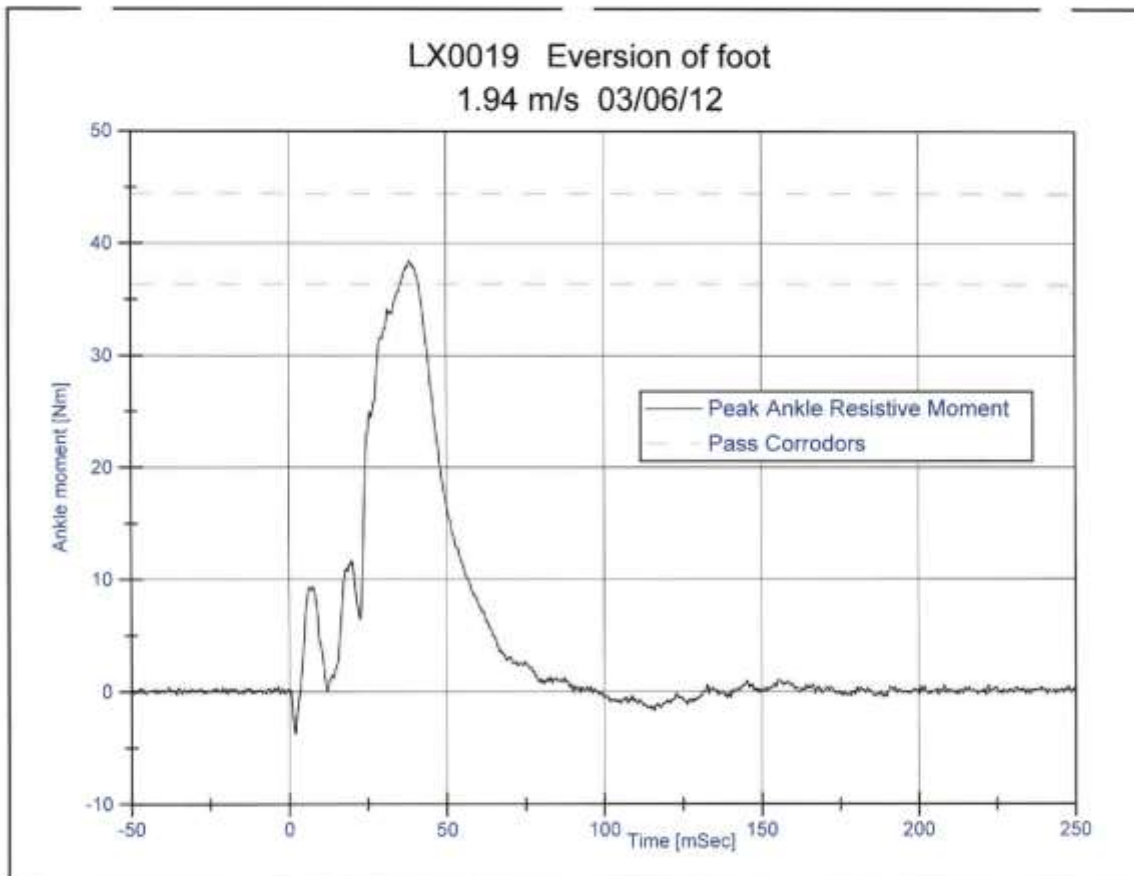
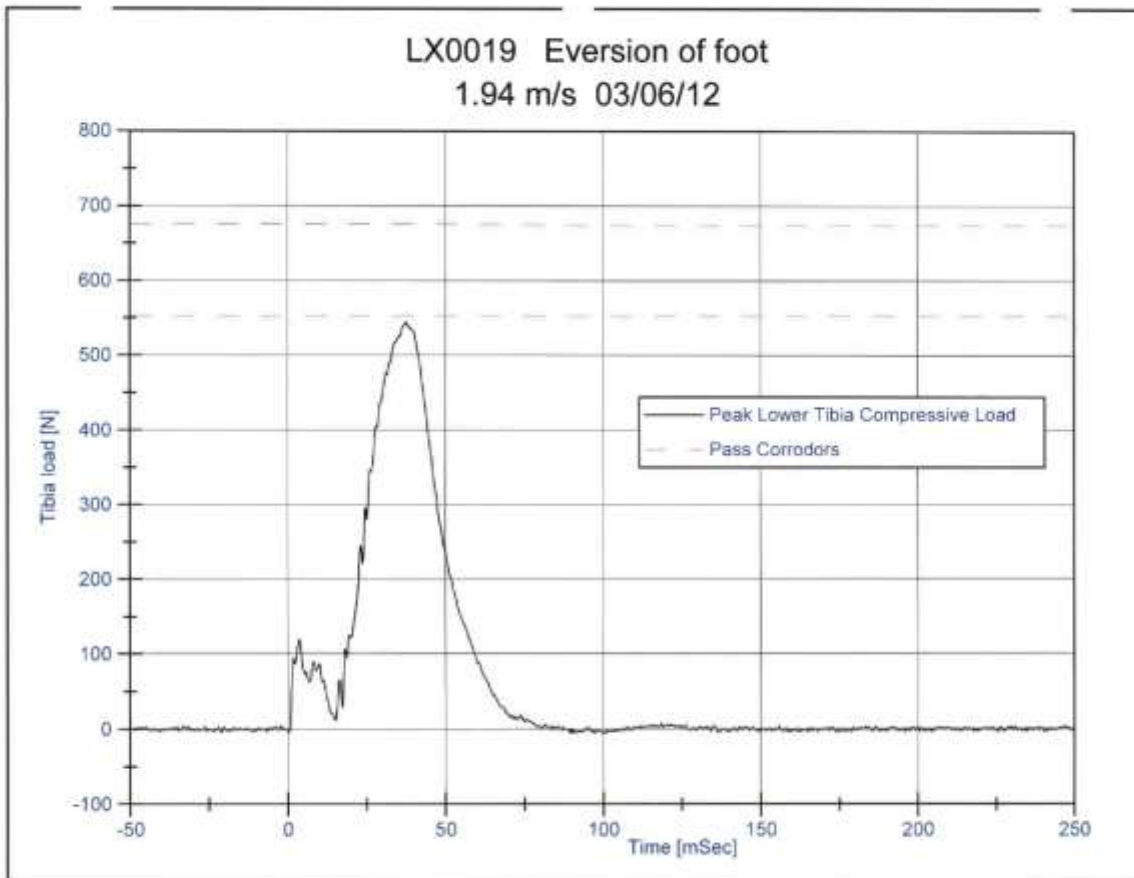


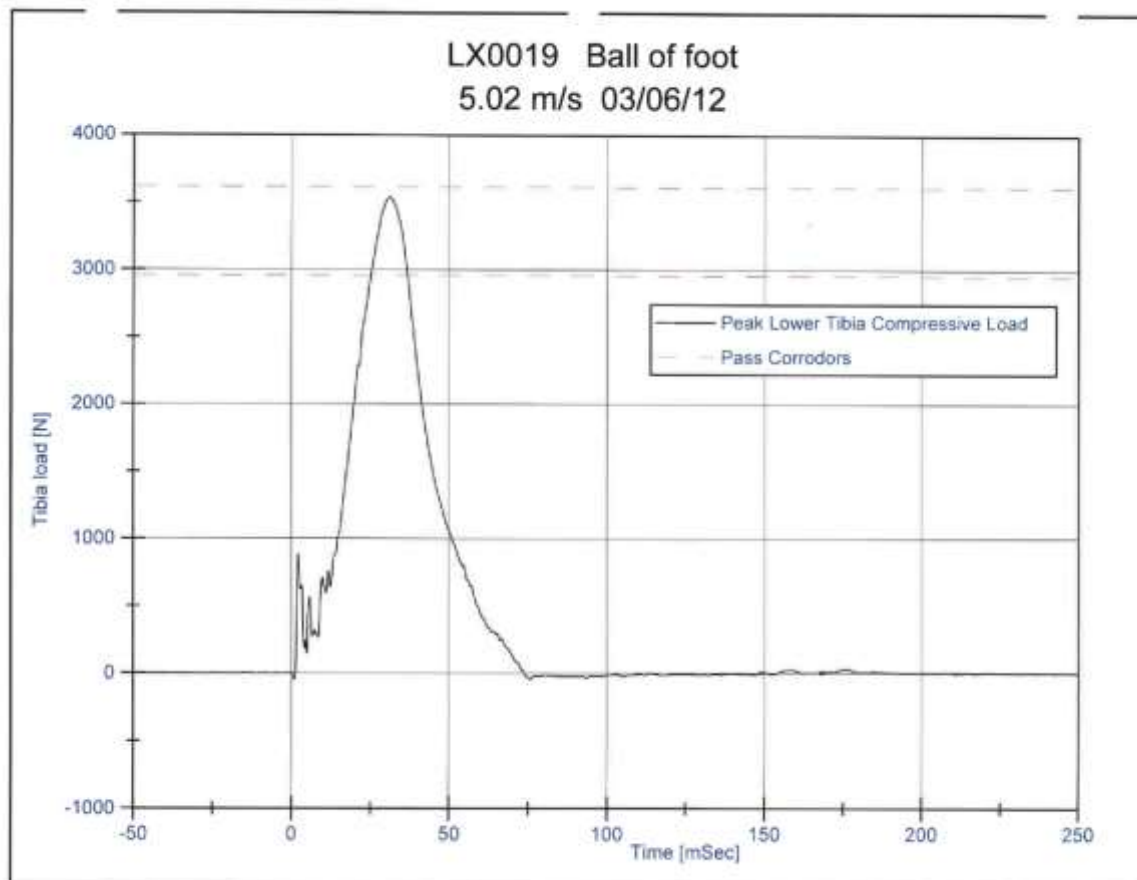
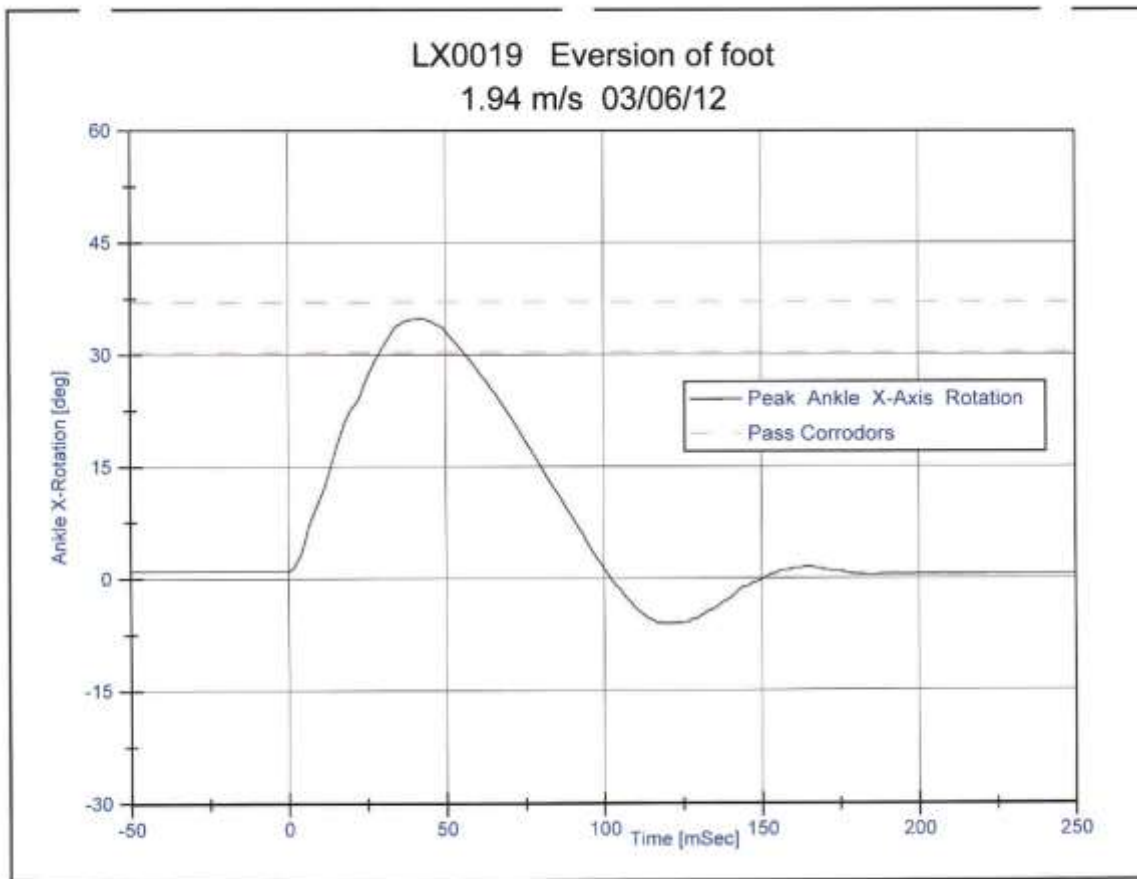
LX0019



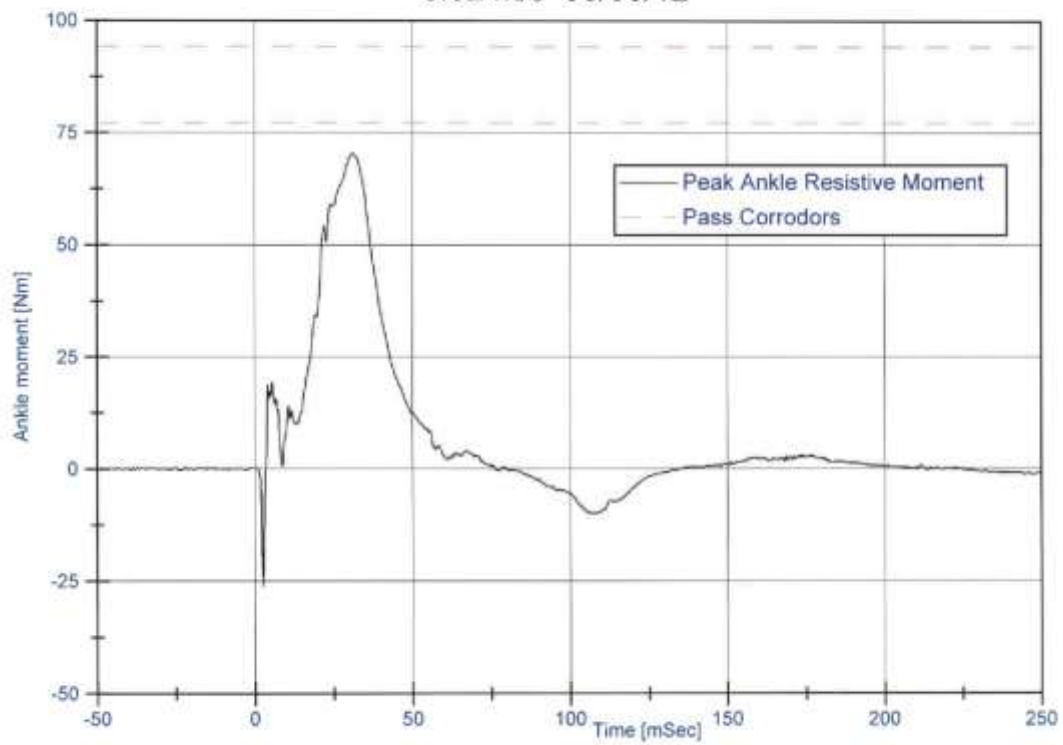




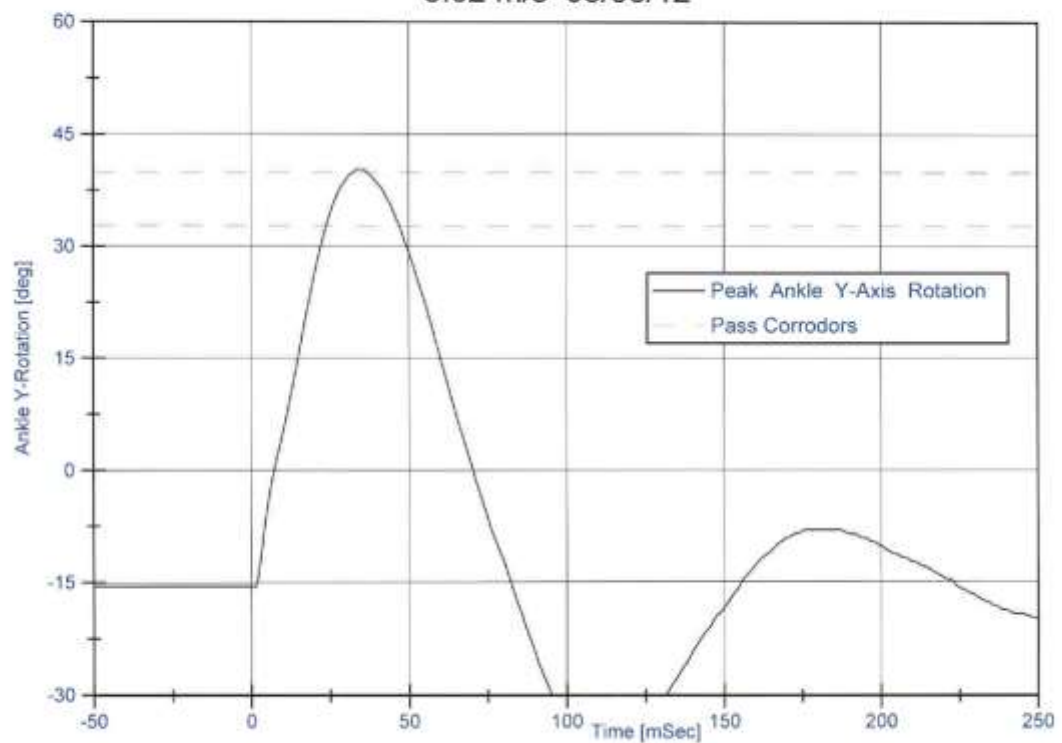




LX0019 Ball of foot
5.02 m/s 03/06/12



LX0019 Ball of foot
5.02 m/s 03/06/12



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

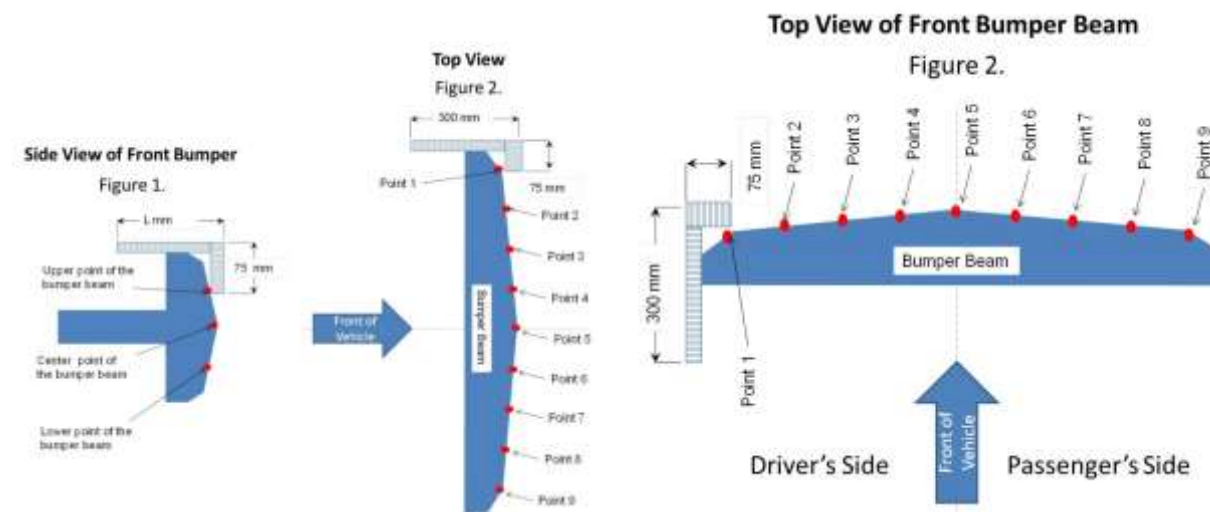
The Brake Pedal Reference Point is the x, y, and z location of the geometric center of the brake pedal pad (top surface) in the VCS.

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 plan 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 22 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 5 cm from the A3 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 5 cm from the B3 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 5 cm from the C3 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 5 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 5 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 5 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 5 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 5 cm

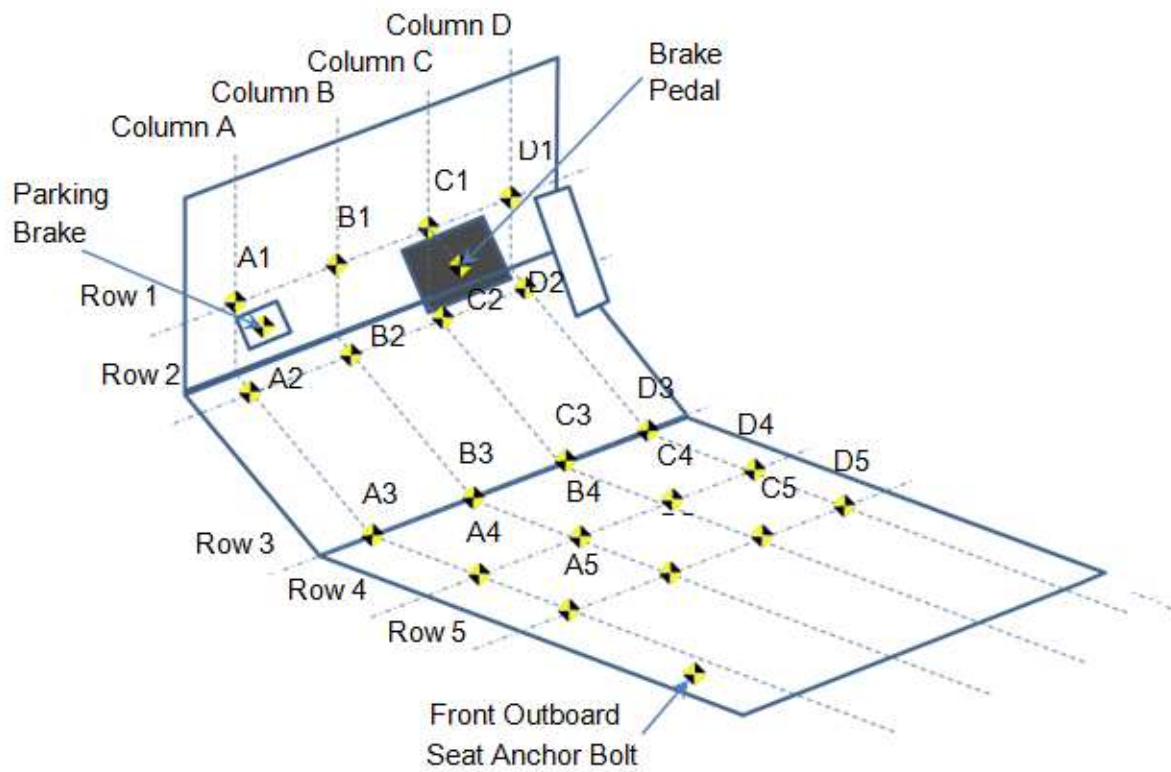
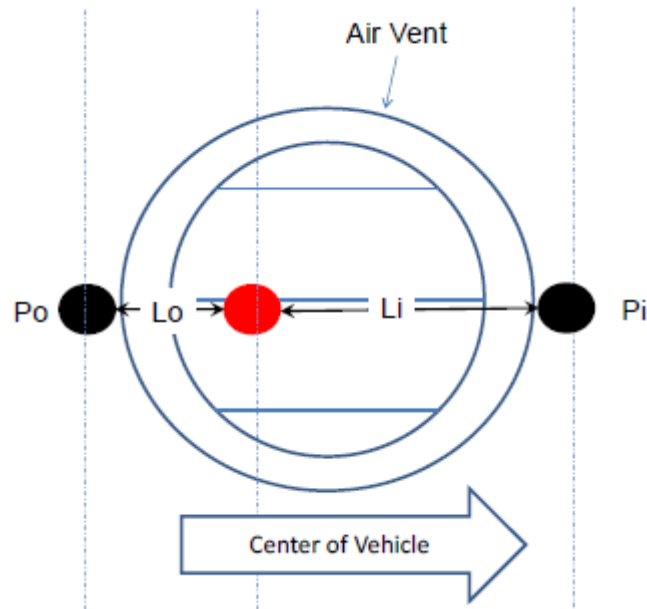


Figure 22: Lower interior intrusion measurements

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 25 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 15 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 subtracting 0 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 25 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 15 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 subtracting 0 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 floor reference. The lateral coordinate of the A3 is obtained by subtracting 25 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 floor reference. The lateral coordinate of the B3 is obtained by subtracting 15 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 floor reference. The lateral coordinate of the C3 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT A4

The longitudinal coordinate of the A4 measurement location is obtained by subtracting 5 cm from the A3 reference. The lateral coordinate of the A4 is obtained by subtracting 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B4

The longitudinal coordinate of the B4 measurement location is obtained by subtracting 5 cm from the B3 reference. The lateral coordinate of the B4 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C4

The longitudinal coordinate of the C4 measurement location is obtained by subtracting 5 cm from the C3 reference. The lateral coordinate of the C4 is obtained by subtracting 0 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT A5

The longitudinal coordinate of the A5 measurement location is obtained by subtracting 5 cm from the A4 reference. The lateral coordinate of the A5 is obtained by subtracting 25 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT B5

The longitudinal coordinate of the B5 measurement location is obtained by subtracting 5 cm from the B4 reference. The lateral coordinate of the B5 is obtained by subtracting 15 cm from the center passenger seat reference lateral coordinate.

PASSENGER POINT C5

The longitudinal coordinate of the C5 measurement location is obtained by subtracting 5 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.

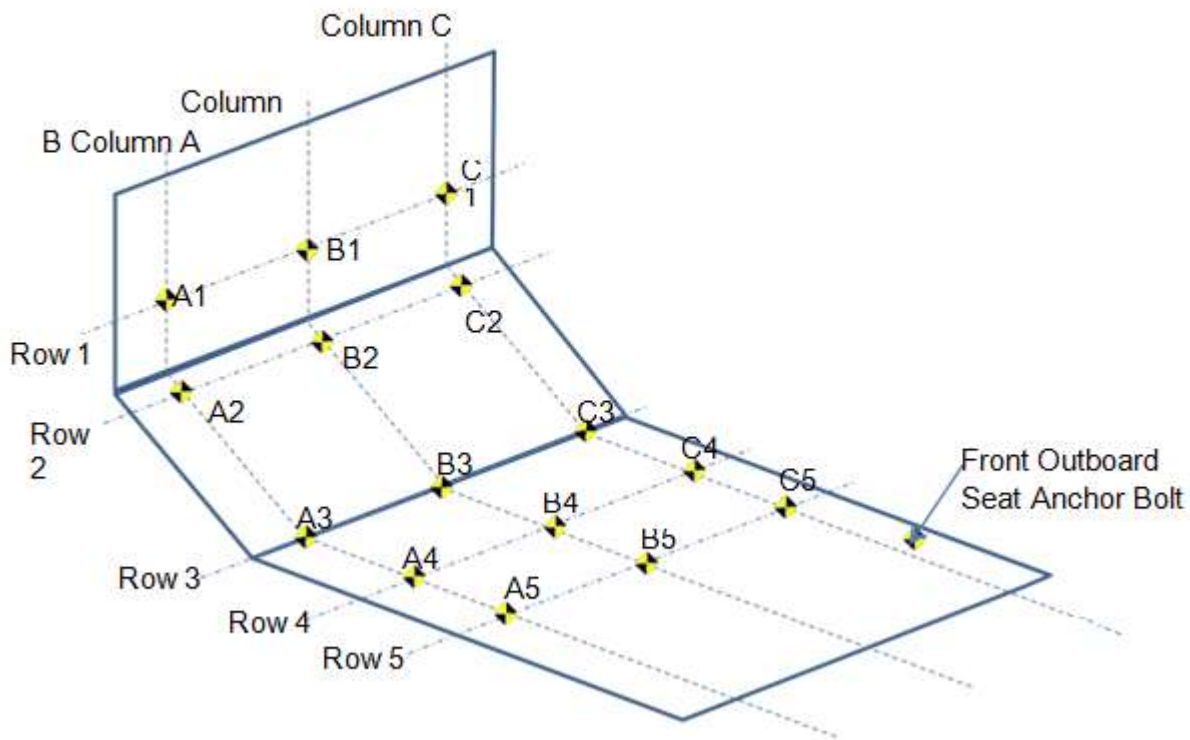


Figure 24: Passenger side lower interior measurements

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



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.

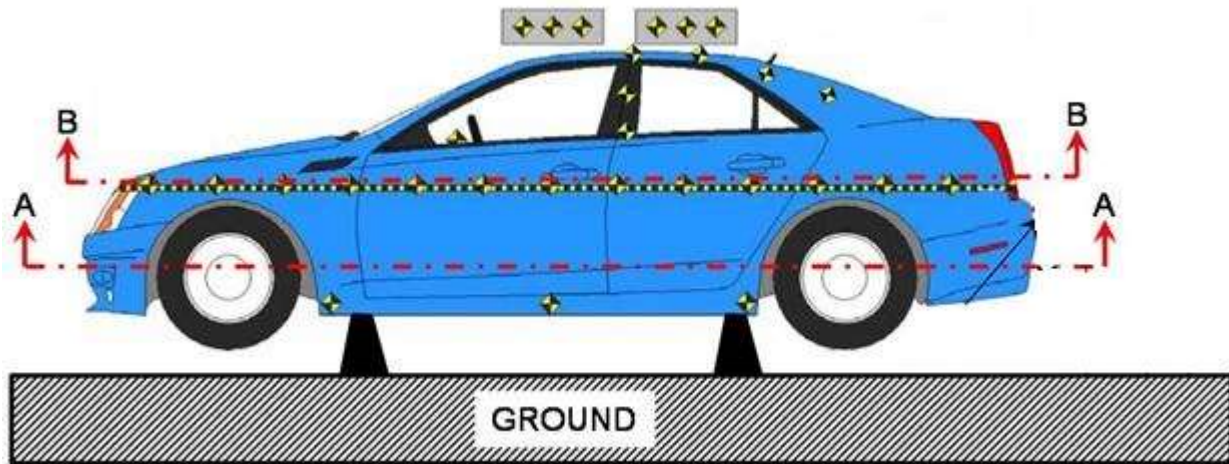


Figure 26: Pre-Test Vehicle Profile

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.

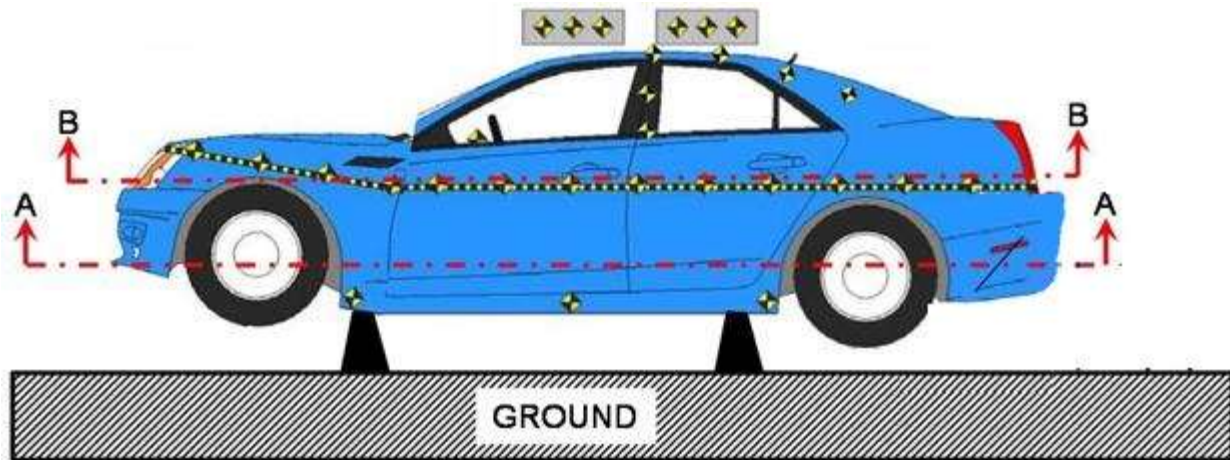


Figure 27: Post-Test Vehicle Profile

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.