

REPORT NUMBER: 214D-CAL-20-001

RESEARCH MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

**General Motors De Mexico, S. DE R.L. DE C.V.
2020 GMC Terrain
SUV**

NHTSA No: R20200190

**PREPARED BY:
CALSPAN CORPORATION
P.O. BOX 400
BUFFALO, NEW YORK 14225**



March 8, 2024

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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1200 NEW JERSEY AVE SE, ROOM W43-410
WASHINGTON, D.C. 20590**

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Date: March 8, 2024

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Date: March 8, 2024

FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, Structures and Restraints Research
NHTSA, Office of Crashworthiness Standards

Date: _____

COTR, Structures and Restraints Research
NHTSA, Office of Crashworthiness Standards

Date: _____

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16. Abstract A 48/24, (52.90kph / 32.87 mph), 90° Moving Deformable Barrier Research Side Impact Test was conducted on the subject 2020 GMC Terrain SUV in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on October 12, 2020. The impact velocity of the Moving Deformable Barrier (MDB) was 52.95 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21°C. The target vehicle's maximum post-test static crush was 193mm located at level 2. The test vehicle's occupant performance data is as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="2">Driver ATD (ES-2re)</th> </tr> <tr> <th>Units</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>62.61</td> </tr> <tr> <td>Brain Injury Criterion (BrIC)</td> <td>N/A</td> <td>0.49</td> </tr> <tr> <td>Maximum Shoulder Force</td> <td>N</td> <td>674.08</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>18.16</td> </tr> <tr> <td>Combined Abdominal Force</td> <td>N</td> <td>435.24</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>-724.41</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="2">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Units</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>151.67</td> </tr> <tr> <td>Brain Injury Criterion (BrIC)</td> <td>N/A</td> <td>5.19</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>20.94</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>10.44</td> </tr> <tr> <td>Lower Spine Acceleration</td> <td>G</td> <td>57.10</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>2249.78</td> </tr> </tbody> </table>						Measurement Description	Driver ATD (ES-2re)		Units	Result	Head Injury Criteria (HIC ₃₆)	N/A	62.61	Brain Injury Criterion (BrIC)	N/A	0.49	Maximum Shoulder Force	N	674.08	Maximum Thoracic Rib Deflection	mm	18.16	Combined Abdominal Force	N	435.24	Pubic Symphysis Force	N	-724.41	Measurement Description	Passenger ATD (SID-IIs)		Units	Result	Head Injury Criteria (HIC ₃₆)	N/A	151.67	Brain Injury Criterion (BrIC)	N/A	5.19	Maximum Thoracic Rib Deflection	mm	20.94	Maximum Abdominal Rib Deflection	mm	10.44	Lower Spine Acceleration	G	57.10	Total Pelvic Force (sum of acetabular and iliac forces)	N	2249.78
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* Proposed IARV The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.			18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave. SE Washington, D.C. 20590																																																
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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the Federal Motor Vehicle Safety Standard 214 Side Impact Protection Program. It was conducted for the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH-14-00359L by Calspan Corporation. The purpose of this test was to evaluate side impact protection in a 2020 GMC Terrain SUV. The side impact test was conducted in accordance with the latest 214 Test Procedure (TP-214D-09, dated September, 2012)."

SECTION 2

SUMMARY OF TEST RESULTS

A 2020 GMC Terrain SUV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 52.95 km/h. The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by the Calspan Corporation's Transportation Test Operations Center in Buffalo, New York on October 12, 2020. Pre-test and post-test photographs of the test vehicle, the MDB and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated September 2012. The side impact event was documented by 9 high-speed and 2 real-time cameras. Camera locations are included in this report.

The Dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

Head CG tri-axial accelerometer

Head angular rate sensor

Upper and lower neck load cells

Shoulder load cell

Upper (T1), middle (T4), and lower spine (T12) tri-axial accelerometers

Lumbar load cell

Pelvic tri-axial accelerometers

Pubic load cell

PASSENGER ATD (SID-IIs)

Primary and redundant head CG tri-axial accelerometers

Head angular rate sensor

Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers

Abdomen upper rib and lower rib y-axis displacement potentiometers

Upper (T1) and lower spine (T12) tri-axial accelerometers

Acetabulum and iliac wing y-axis load cells

Appendix B contains the vehicle and dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report. Appendix D of this report contains the test equipment and instrumentation calibration data. Appendix E contains the seating procedure worksheets and plots.

DUMMY INJURY VALUES

Measurement Description	Driver ATD (ES-2re)	
	Units	Result
Head Injury Criteria (HIC36)		62.61
Brain Injury Criterion (BrIC)		0.49
Maximum Shoulder Force	N	674.08
Maximum Thoracic Rib Deflection	mm	18.16
Combined Abdominal Force	N	435.24
Pubic Symphysis Force	N	-724.41

Measurement Description	Passenger ATD (SID-IIs)	
	Units	Result
Head Injury Criteria (HIC36)		151.67
Brain Injury Criterion (BrIC)		5.19*
Maximum Thoracic Rib Deflection	mm	20.94
Maximum Abdominal Rib Deflection	mm	10.44
Lower Spine Acceleration	G	57.10
Total Pelvic Force (sum of acetabular and iliac forces)	N	2249.78

*Result is due to an issue with Head X Angular Rate.

SUPPLEMENTAL RESTRAINT INFORMATION

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Air bag	Yes	No		
Knee Air bag	No	N/A		
Side Air bag 1 - Curtain	Yes	Yes	Yes	Yes
Side Air bag 2 – Torso/Pelvis Air bag	Yes	Yes	No	N/A
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt Load Limiter	Yes	Yes	No	N/A
Other				

GENERAL COMMENTS:

1. P1 serial number – F034
2. P4 serial number – 303

Data Anomalies:

The following channel was questionable for

- Rear Left Passenger Head X Angular Velocity, Questionable from -50ms to 67.3ms
- Left B-Pillar Lower Y Acceleration, Exceeded calibration range and saturated at 11.4 ms 15.8 ms
- Left B-Pillar Middle Y Acceleration, Exceeded calibration range and saturated at 10.6 ms

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 - General Test and Vehicle Parameter Data

Data Sheet No. 2 – Seat, Seat Belt, Steering Wheel Adjustment and Fuel System Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Camera and Instrumentation Data

Data Sheet No. 6 – Test Vehicle Accelerometer Locations

Data Sheet No. 7 – MDB Accelerometer Locations

Data Sheet No. 8 – Post-Test Observations

Data Sheet No. 9 – MDB Summary of Results

Data Sheet No. 10 – Test Vehicle Profile Measurements

Data Sheet No. 11 – Test Vehicle Exterior Crush Measurements

Data Sheet No. 12 – MDB Exterior Static Crush Measurements

Data Sheet No. 13 – Vehicle and MDB Damage Profile Distances

Data Sheet No. 14 – FMVSS No. 301 Static Rollover Results

Data Sheet No. 15 – Dummy/Vehicle Temperature and Humidity Stabilization Data

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	R20200190	Traction Control System (TCS)	Yes
Model Year	2020	Auto-Leveling System	No
Make	GMC	Automatic Door Locks (ADL)	Yes
Model	Terrain	Power Window Auto-Reverse	No
Body Style	SUV	Other Optional Feature	N/A
VIN	3GKALMEV6LL299657	Driver Front Air bag	Yes
Body Color	White	Driver Curtain Air bag	Yes
Odometer Reading (km/mi)	11 miles	Driver Head/Torso Air bag	No
Engine Displacement (L)	1.5	Driver Torso Air bag	No
Type/No. Cylinders	I4	Driver Torso/Pelvis Air bag	N/A
Engine Placement	Transverse	Driver Pelvis Air bag	No
Transmission Type	Automatic	Driver Knee Air bag	No
Transmission Speeds	9-Speed	Rear Pass. Curtain Air bag	Yes
Overdrive	Yes	Rear Pass. Head/Torso Air bag	No
Final Drive	Front Wheel Drive	Rear Pass. Torso Air bag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Air bag	No
Sunroof/T-Top	No	Rear Pass. Pelvis Air bag	No
Running Boards	No	Driver Seat Belt Pretensioners	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioners	No
Power Seats	No	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	No
		Other Safety Restraint	-

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

No

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors De Mexico, S. De R.L. DE C.V.	GVWR (kg)	2025
Date of Manufacture	07/20	GAWR Front (kg)	1175
Vehicle Type	M.P.V.	GAWR Rear (kg)	1200

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	-	5	
Capacity Weight (VCW) (kg)				462	(A)
DSC X 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				121.8	(A-B)

VEHICLE SEAT TYPE

Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front Seat	X					X	
Rear or Second Row Seat			X			X	
Third Row seat							

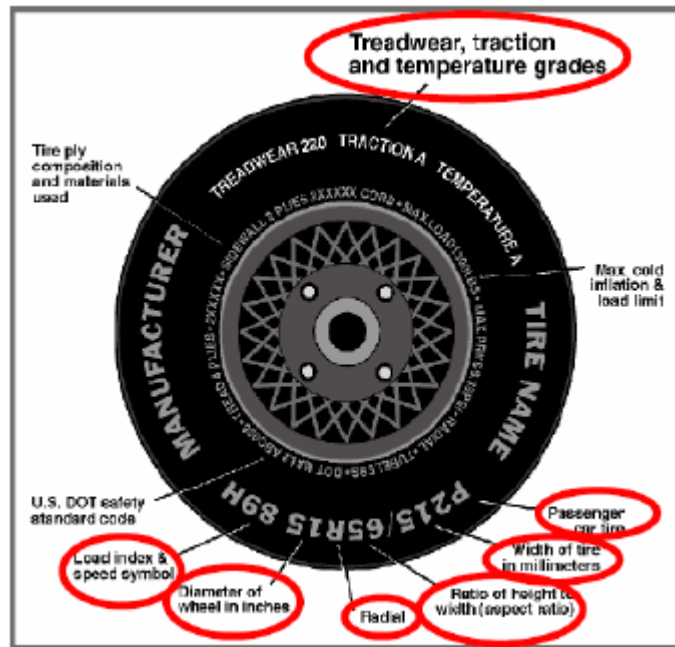
DATA SHEET NO. 1 ... (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020

VEHICLE TIRE INFORMATION

Collected for year, make, model, & VIN, all items circled in red, tire manufacturer and tire name.



TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	225/65R17	225/65R17
Tire Size on Vehicle	225/65R17	225/65R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy	Primacy
Treadwear	540	540
Traction	B	B
Temperature Grade	A	A
Load Index/Speed Symbol	102H	102H
Tire Material	Rubber	Rubber

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

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	218	215	217	210
Tire Placard	kPa	240	240	240	240
Owner's Manual	kPa	240	240	240	240
As Tested	kPa	240	240	240	240

MDB TIRE SPECIFICATIONS

	Units	Requirement	LF	RF	LR	RR
Tire Size		P205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 ± 21	207	207	207	207

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	464	329		497	441		509	444	
Right	kg	442	302		456	387		451	391	
Ratio	%	58.9	41.1		53.5	46.5		53.5	46.5	
Totals	kg	906	613	1537	953	828	1781	960	835	1795

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1537	(A)
Sum of Actual Weight of 1 ES2re and 1 P572 ATD (SID-IIs)	kg	127	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	121.8	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1789.8	(A+B+C)

Does the measured As Test Vehicle Weight lie within the required weight range

(i.e. Calculated Test Vehicle Target Weight – 4.5 kg to – 9 kg)? ☒ Yes ☐ No

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement**
LF	mm	846	845	Yes
RF	mm	860	857	Yes
RR	mm	868	864	Yes
LR	mm	858	855	Yes
Vehicle CG (Aft of Front Axle)	mm	1266	1265	
Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline)	mm	49.5	42.6	

*** The "As Tested" vehicle attitude measurements must be equal to or within ± 10mm of the "Fully Loaded" vehicle attitude measurements at each wheel well. Indicate "Yes" or "No" for "Meets Requirements".

Test height adjustable suspension setting, if applicable: N/A

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

Test Vehicle:	<u>2020 GMC Terrain SUV</u>	NHTSA No.:	<u>R20200190</u>
Test Program:	<u>Research Side MDB Impact Test</u>	Test Date:	<u>10/12/2020</u>

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	14
Spare Tire	13
Jack	4
Ballast / Equipment Added	68

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

Test Vehicle: <u>2020 GMC Terrain SUV</u>	NHTSA No.: <u>R20200190</u>	
Test Program: <u>Research Side MDB Impact Test</u>	Test Date: <u>10/12/2020</u>	

SEAT POSITIONING

The driver's seat, front center seat (if applicable), and right front passenger's seat should be set to the mid-track, lowest, mid-angle position. The struck-side rear passenger's seat, rear center seat, and non-struck side rear passengers' seats should be set to the rear-most, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	17.8	13.3	15.6
Front Passenger Seat	16.7	12.3	14.5
Front Center Seat*			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat*	Fixed	Fixed	Fixed

**if applicable*

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore/Aft	Forward-Most
Driver Seat	15.6	15	Max	-	-	-
			Mid	13	15	17
			Min	-	-	-
Front Passenger Seat	14.5	15	Max	-	-	-
			Mid	12	15	17
			Min	-	-	-
Front Center Seat*	N/A	N/A	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Non-Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Rear Center Seat*	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-

**if applicable*

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

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020

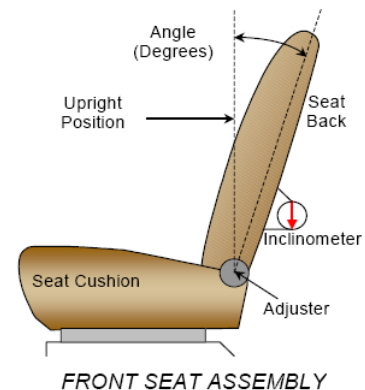
SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	240	25 (0-24)	120	12
Front Passenger Seat	240	25 (0-24)	120	12
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat*	Fixed	Fixed	Fixed	Fixed

**if applicable*

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. The front center and front passenger's seat backs are positioned in a similar manner as the driver's seat back. The struck side rear seat back is positioned such that the dummy's head is level. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck-side rear seat back.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/ Seated Dummy	66.2	N/A	-12.5	8
Front Passenger Seat	40.0	N/A	-7.1	8
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat w/ Seated Dummy	4.6	2 (0-1)	20.7	0
Non-Struck Side Rear Seat	4.6	2 (0-1)	20.7	0
Rear Center Seat*	4.6	2 (0-1)	20.7	0

**if applicable*

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

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. For this test zero is defined as the uppermost position.

	Total # of Positions	Placed in Position #
Driver Seat	Fixed	Fixed
Rear Seat	Fixed	Fixed

HEAD RESTRAINT ADJUSTMENT

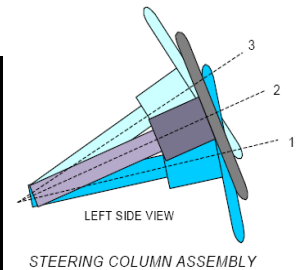
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	-	Uppermost
Rear Seat	-	Lowermost

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.

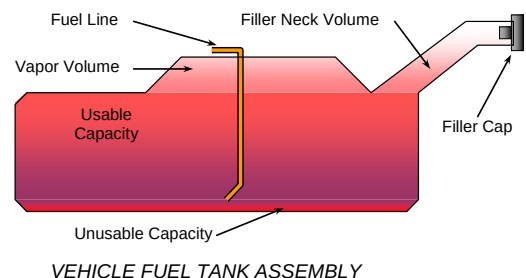
	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	20.2	
Geometric Center – Position 2	22.4	
Uppermost – Position 3	24.6	
Telescoping Steering Wheel Travel		45
Test Position	22.4	22.5



FUEL PUMP

Describe the fuel pump type, details about how it operates, and the location of the fuel filler neck.

The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the left side of the vehicle. The pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. See form 1 for more information.



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

Test Vehicle:	<u>2020 GMC Terrain SUV</u>	NHTSA No.:	<u>R20200190</u>
Test Program:	<u>Research Side MDB Impact Test</u>	Test Date:	<u>10/12/2020</u>

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	56.0
Usable Capacity of "Optional Tank" (see Form No. 1)	N/A
Usable Capacity of Standard Tank (see Owner's Manual)	56.0
Usable Capacity of Optional Tank (see Owner's Manual)	N/A
93% of Usable Capacity	52.08
Actual Amount of Solvent Used in Test	52.08
1/3 of Usable Capacity	18.7

Is the Actual Amount of Solvent Used in the test equal to 93% $\pm$ 1% of the Usable Capacity stated in Form No. 1? ☒ Yes ☐ No

Table 1 ES-2re Instrumentation Data - Serial No. F034

Test Vehicle: 2020 GMC Terrain SLE

NHTSA No.: R20200190

Test Program: NHTSA Research – FMVSS 214 Side MDB

Test Date: 10/12/2020

	Nomenclature	Units	Source	Max	Max Time	Min	Min Time
Head	Head CG X Acceleration	g	CFC1000	3.59	124.25	-14.37	61.65
	Head CG Y Acceleration	g	CFC1000	26.05	53.25	-4.95	89.80
	Head CG Z Acceleration	g	CFC1000	7.98	23.15	-9.36	62.60
	Head Resultant Acceleration	g	Compute	28.08	54.30		
	36 ms HIC		Compute	62.61			
	15 ms HIC		Compute	49.71			
	Head Resultant Acceleration, 3 ms Clip	g	CFC1000	27.20			
	Head CG X Angular Rate	deg/s	CFC60	662.80	52.85	-261.51	108.15
	Head CG Y Angular Rate	deg/s	CFC60	497.59	46.45	-200.04	291.45
	Head CG Z Angular Rate	deg/s	CFC60	776.65	80.85	-1047.79	49.60
	Head CG Resultant Angular Rate	deg/s	CFC60	1266.52			
	Brain Injury Criteria (BrIC)		Compute	0.49			
Neck	Upper Neck Tension	N	CFC1000	317.00	22.75		
	Upper Neck Compression	N	CFC1000			-731.93	62.85
	Upper Neck Resultant Force	N	CFC1000	826.16	62.90		
	Upper Neck Resultant Moment	Nm	CFC600	46.52	54.75		
Shoulder	Shoulder Y Force	N	CFC600	674.08	22.25	-119.89	77.20
	Shoulder Resultant Force	N	CFC600	779.55			
Chest	Thorax Rib Upper Y Deflection	mm	CFC180	16.20	46.80	-1.36	17.15
	Thorax Rib Middle Y Deflection	mm	CFC180	16.54	45.50	-0.01	9.95
	Thorax Rib Lower Y Deflection	mm	CFC180	18.16	44.90	-0.00	10.00
	Thorax Rib Max. Deflection	mm	CFC180	18.16			
	Thorax Rib Avg. Deflection	mm	CFC180	16.97			
Abdomen	Abdomen Front Y Force	N	CFC600	69.51	23.20	-44.65	14.35
	Abdomen Middle Y Force	N	CFC600	183.81	25.55	-5.44	215.75
	Abdomen Rear Y Force	N	CFC600	218.34	39.70	-10.26	216.60
	Combined Abdominal Force	N	Compute	435.24			
Spine	Lower Spine T12 Y Force	N	CFC600	315.24	37.00	-287.66	19.70
	Lower Spine T12 X Moment	Nm	CFC600	71.57	59.05	-67.49	25.45
	Lower Spine T12 Resultant Acceleration	g	CFC180	23.17	25.80		
Pelvis	Lumbar Y Force	N	CFC600	549.22	27.75	-216.84	19.85
	Lumbar Z Force	N	CFC600	1515.31	19.35	-329.69	90.05
	Lumbar X Moment	Nm	CFC600	42.92	56.65	-27.84	21.35
	Pubic Symphysis Y Force	N	CFC600	111.75	200.20	-724.41	52.35
	Pelvis Resultant Acceleration	g	CFC1000	27.95			
	Anomalies None						

Table 2 SID-IIs Instrumentation Data - Serial No. 303

Test Vehicle: 2020 GMC Terrain SLE

NHTSA No.: R20200190

Test Program: NHTSA Research – FMVSS 214 Side MDB

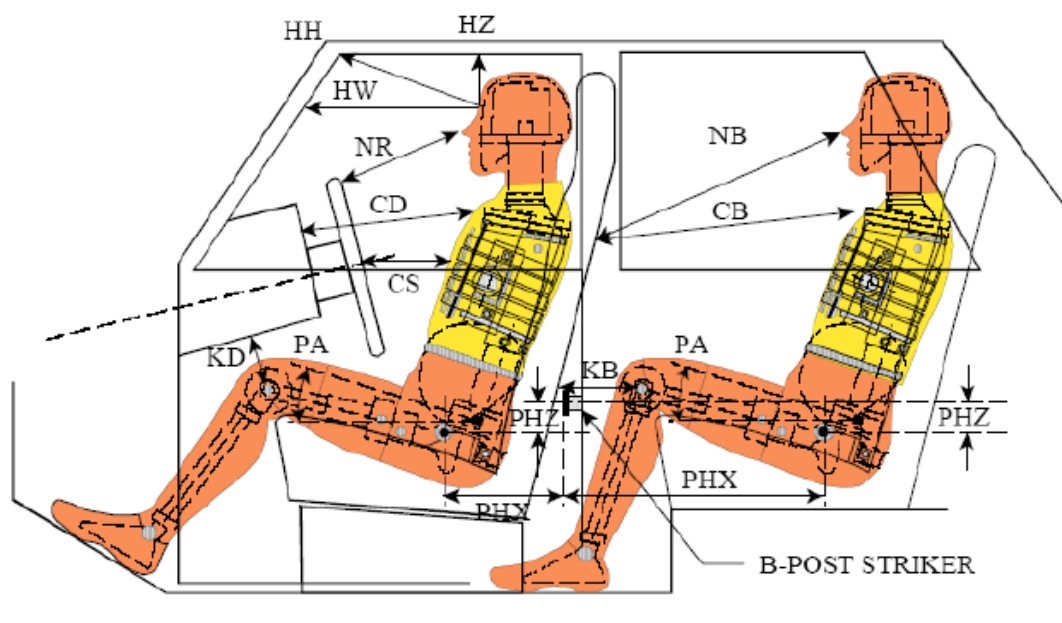
Test Date: 10/12/2020

	Nomenclature	Units	Source	Max	Max Time	Min	Min Time
Head	Head CG X Acceleration	g	CFC1000	2.27	224.45	-12.26	82.65
	Head CG Y Acceleration	g	CFC1000	36.61	71.15	-9.93	214.35
	Head CG Z Acceleration	g	CFC1000	6.65	205.10	-7.66	69.40
	Head Resultant Acceleration	g	Compute	37.77			
	36 ms HIC		Compute	151.67			
	15 ms HIC		Compute	111.48			
	Head Resultant Acceleration, 3ms Clip	g	Compute	36.73			
	Head CG X Angular Rate ¹	deg/s	CFC60	626.21	11.20	-19623.42	19.35
	Head CG Y Angular Rate	deg/s	CFC60	473.50	62.55	-659.43	83.40
	Head CG Z Angular Rate	deg/s	CFC60	971.04	222.05	-1025.82	70.35
	Head CG Resultant Angular Rate ¹	deg/s	CFC60	19623.42	19.35		
	Brain Injury Criteria (BrIC) ¹		Compute	5.19			
Neck	Neck Tension	N	CFC1000	228.42	205.00		
	Neck Compression	N	CFC1000			-353.02	76.25
	Neck Resultant Force	N	CFC1000	385.80	76.10	0.04	4.00
	Neck Resultant Moment	Nm	CFC600	49.04	71.45	0.00	0.80
Shoulder	Shoulder Y Force	N	CFC600	1269.18	63.00	-126.11	105.10
	Shoulder Left Resultant Force	N	CFC600	1307.64	63.15	0.03	-36.80
	Shoulder Deflection	mm	CFC600	30.12	66.80	-0.65	42.20
Chest	Thorax Rib Upper Y Deflection	mm	CFC600	20.94	64.15	-0.99	257.25
	Thorax Rib Middle Y Deflection	mm	CFC600	14.69	61.70	-0.77	271.15
	Thorax Rib Lower Y Deflection	mm	CFC600	12.03	60.70	-0.83	279.55
	Thorax Rib Max. Deflection	mm	CFC600	20.94			
	Thorax Rib Avg. Deflection	mm	CFC600	15.89			
Abdomen	Abdomen Rib Upper Deflection	mm	CFC600	9.30	59.95	-0.16	43.90
	Abdomen Rib Lower Deflection	mm	CFC600	10.44	59.40	-0.23	186.65
	Abdomen Rib Max. Deflection	mm	CFC600	10.44			
	Abdomen Rib Avg. Deflection	mm	CFC600	9.87			
Spine	T12 Resultant Acceleration	g	CFC180	53.10	57.10	0.00	-37.55
	T1 Resultant Acceleration	g	CFC180	41.65	62.25	0.00	-46.40
Iliac	Iliac Left Force	N	CFC600	287.65	57.80	-204.22	47.90
Acetabulum	Acetabulum Left Force	N	CFC600	2269.69	51.60	-2.89	122.15
Pelvis	Pelvis Resultant Acceleration	g	CFC1000	51.46	54.45	0.00	-17.65
	Combined Pelvic Left Force	N	CFC600	2249.78	53.65	-63.23	122.65
	Pubic Symphysis Y Force	N	CFC600	77.77	32.60	-801.30	55.55
Lumbar	Lumbar Resultant Force	N	CFC600	1659.04	56.75	0.05	-19.90
	Lumbar Resultant Moment	Nm	CFC600	80.57	57.85	0.00	-27.85
	Anomalies: (1) - Questionable data from -50ms to 67.3ms						

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 GMC Terrain SUV
Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
Test Date: 10/12/2020



LEFT SIDE VIEW

NOTE: 2-DOOR VEHICLE SHOWN.
REAR DUMMY PHX & PHZ
MEASUREMENTS FOR A 4-DOOR
VEHICLE WOULD USE THE C-POST
STRIKER AS A REFERENCE POINT

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

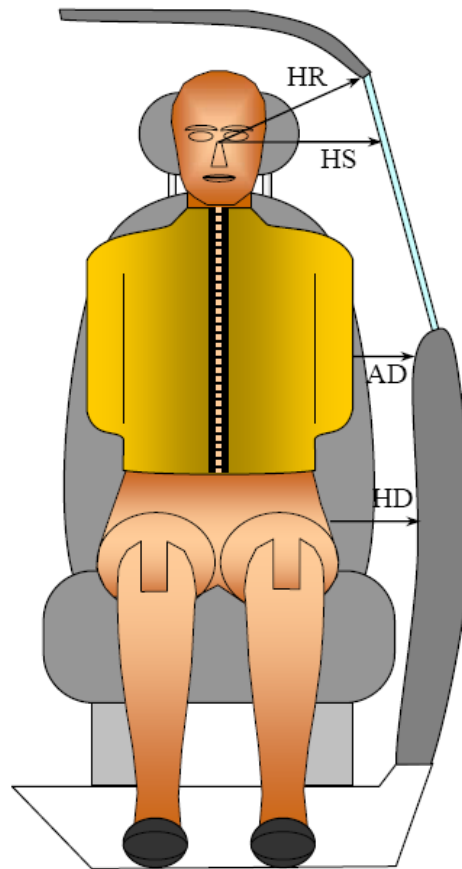
Driver Code	Pass. Code	Description	Driver (Serial No. F034)		Passenger (Serial No.303)	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	456			
HW		Header to Windshield	742			
HZ	HZ	Head to Roof Liner	219		296	
NR	NB	Nose to Rim/Seat Back	471		624	
CD	CB	Chest to Dash/Seat Back	583		631	
CS		Chest to Steering Wheel	382			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	192	21.2	322	0
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	178	24.2	320	0
PAX°	PAX°	Pelvic Tilt Angle X		21.0		19.3
	PAY°	Pelvic Tilt Angle Y				0.3
PHX	PHX	Hip Point to Striker (X-Axis)	133		178	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	114		191	

*See Appendix A for digital tilt sensor angle photographs

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020



FRONT VIEW OF DUMMY

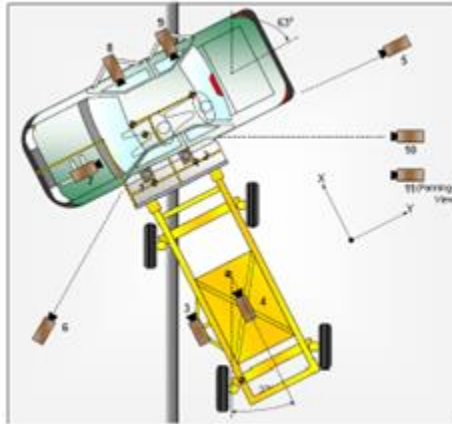
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver (Serial No. F034)	Passenger (Serial No. 303)
HR	Head to Side Header	mm	207	256
HS	Head to Side Window	mm	325	367
AD	Arm to Door	mm	101	128
HD	Hip Point to Door	mm	142	168

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2020 GMC Terrain SUV
Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
Test Date: 10/12/2020



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	316	427	-9370	12.5	1000
2	Overhead Close-up	0	782	-9370	24	1000
3	Impact Point Close-up (MDB)				25	1000
4	Centerline of Impact (MDB)				8	1000
5	Right Side View	0	9472	-1178	28	1000
6	Left Side View	2649	4903	-1288	24	1000
7	Front Seat Occupant – Frontal View (OB)				25	1000
8	Front Seat Occupant – Side View (OB)				12.5	1000
9	Rear Passenger - Side View (OB)				12.5	1000
10	Real Time Coverage				Zoom	60

Notes: *Reference: Impact Point projected to Ground*
+X = To Front of MDB, +Y = To Right of MDB, +Z = Down
**All measurements accurate to ± 6 mm.*

If applicable, explain why camera(s) did not operate as intended: All cameras operated normally

INSTRUMENTATION

Driver Dummy Channels	45
Passenger Dummy Channels	46
Vehicle Structure Accelerometers	37
MDB Accelerometers	7
Total	135

DATA SHEET NO. 6
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2020 GMC Terrain SUV
Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
Test Date: 10/12/2020

TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2,799	641	143
2	Vehicle CG ARS	1,879	636	126
3	Right Sill at Front Seat	2,799	641	143
4	Right Sill at Rear Seat	1,879	636	126
5	Left Side Sill at Front Seat	2,860	-620	161
6	Left Side Sill at Rear Seat	1,899	-637	119
7	Left Front Door - Mid Centerline	2,623	-762	-208
8	Left Front Door - Mid Rear	2,335	-755	-206
9	Left Front Door - Upper Centerline	2,619	-755	-446
10	Left Rear Door - Mid Rear	1,468	-766	-240
11	Left Rear Door - Upper Centerline	1,654	-748	-527
12	Left Lower A-Pillar	3,184	-640	-118
13	Left Middle A-Pillar	3,144	-638	-608
14	Left Lower B-Pillar	2,213	-682	-108
15	Left Middle B-Pillar	2,160	-666	-502
16	Front Seat Track	2,350	-558	64
17	Left Rear Seat Structure	1,761	-416	6
18	Right Rear Occupant Compartment	2,005	400	174
19	Engine Block Top	3,766	24	-396
20	Floorpan Above Rear Axle	1,134	2	-112
21	Rear Deck	237	-5	-95
22	Rear Deck ARS	238	-34	-102

Reference: X – Rear surface of vehicle (+ forward)
Y – Vehicle centerline (+ to right)
Z – Ground plane (+ down)

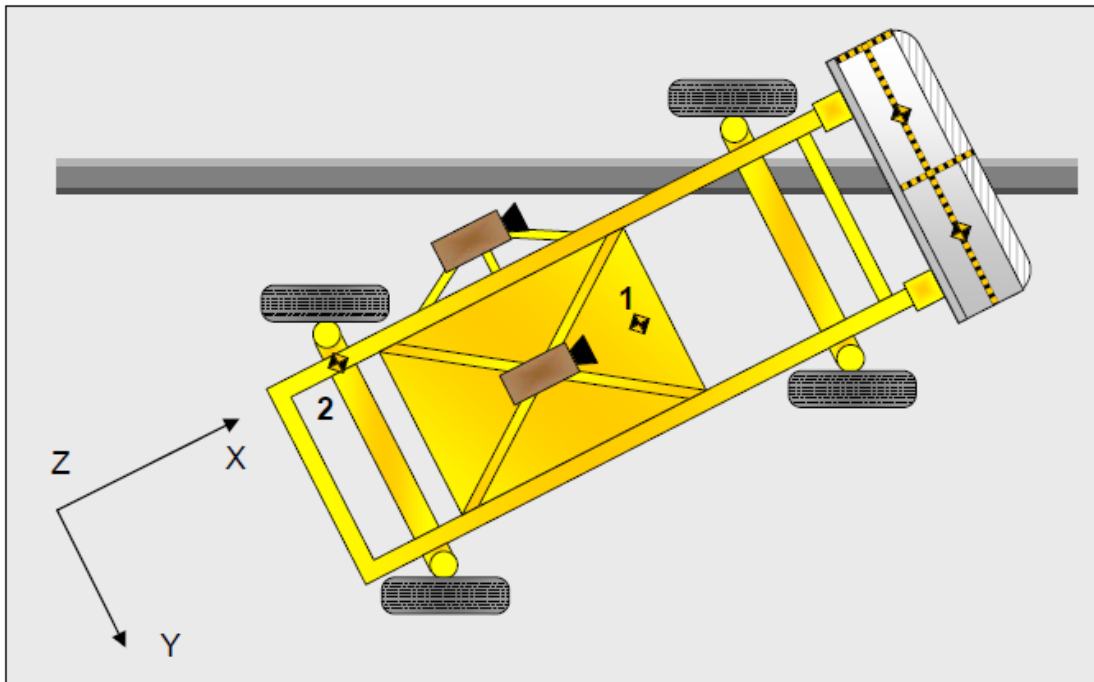
DATA SHEET NO. 6 (CONTINUED)
VEHICLE ACCELEROMETER DATA

Loc. No	Description	Axes	Units	Peak Values			
				Max	Time (ms)	Min	Time (ms)
1	Vehicle CG	X	g	1.53	75.90	-8.35	13.30
	Vehicle CG	Y	g	20.26	12.60	-2.14	101.40
	Vehicle CG	Z	g	6.99	39.45	-8.74	50.75
2	Vehicle CG Angular Rate	X	°/s	259.36	13.95	-651.05	18.80
	Vehicle CG Angular Rate	Y	°/s	61.63	20.70	-37.16	58.90
	Vehicle CG Angular Rate	Z	°/s	6.88	-16.70	-60.53	68.70
3	Right Sill at Front Seat	X	g	3.35	27.00	-8.13	18.20
	Right Sill at Front Seat	Y	g	24.57	14.40	-3.79	101.00
	Right Sill at Front Seat	Z	g	6.79	63.10	-11.43	10.40
4	Right Sill at Rear Seat	X	g	5.24	28.65	-4.39	13.10
	Right Sill at Rear Seat	Y	g	33.72	16.15	-4.55	101.10
	Right Sill at Rear Seat	Z	g	6.10	70.90	-10.37	12.65
5	Left Sill at Front Door	Y	g	52.97	29.75	-44.31	33.70
6	Left Sill at Rear Door	Y	g	69.86	10.10	-53.74	13.25
7	Left Front Door Mid Centerline	Y	g	209.02	10.25	-118.88	14.00
8	Left Front Door Mid Rear	Y	g	113.22	3.00	-70.99	27.00
9	Left Front Door Upper Centerline	Y	g	73.40	35.40	-65.08	29.15
10	Left Rear Door Mid Rear	Y	g	113.61	21.00	-54.03	15.45
11	Left Rear Door Upper Centerline	Y	g	68.44	36.45	-42.80	48.90
12	Left A-Pillar Lower	Y	g	53.07	12.20	-46.61	15.45
13	Left A-Pillar Middle	Y	g	108.04	14.70	-41.11	31.95
14	Left B-Pillar Lower	Y	g	125.33	10.55	-112.20	14.25
15	Left B-Pillar Middle	Y	g	153.14	12.35	-82.01	16.25
16	Front Seat Track	Y	g	34.46	12.10	-6.27	16.20
17	Rear Seat Track or Structure	Y	g	22.35	32.15	-4.42	50.75
18	Right Rear Occ. Compartment	Y	g	29.92	11.80	-3.08	99.60
19	Engine Block	X	g	7.26	86.15	-10.21	47.55
	Engine Block	Y	g	27.27	34.00	-8.40	106.35
20	Rear Floorpan Above Axle	X	g	5.84	300.00	-7.55	26.40
	Rear Floorpan Above Axle	Y	g	29.18	12.00	-7.55	300.00
	Rear Floorpan Above Axle	Z	g	4.80	32.95	-8.27	300.00
21	Rear Deck	X	g	7.16	55.85	-8.08	24.45
	Rear Deck	Y	g	26.55	28.90	-6.24	80.00
	Rear Deck	Z	g	9.68	19.25	-5.88	53.50
22	Rear Deck Angular Velocity	X	°/s	795.96	37.40	-491.40	40.35
	Rear Deck Angular Velocity	Y	°/s	284.33	36.70	-276.48	76.80
	Rear Deck Angular Velocity	Z	°/s	161.32	19.85	-255.69	28.35

DATA SHEET NO. 7
MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020



MDB ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	MDB CG	1859	0	-330
2	MDB Rear	386	-660	-660

Reference: X – Face of MDB (+ forward)
 Y – MDB centerline (+ to right)
 Z – Ground plane (+ down)

Loc. No	Description	Axes	Units	Peak Values (g's)			
				Max	Time (ms)	Min	Time (ms)
1	MDB CG	X	g	0.90	191.90	-19.07	35.10
		Y	g	1.01	61.40	-6.22	34.10
		Z	g	11.57	61.00	-7.58	30.20
2	MDB Rear	X	g	1.88	86.65	-21.96	36.10
		Y	g	2.72	15.50	-3.76	59.20

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2020 GMC Terrain SUV
Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
Test Date: 10/12/2020

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag
Top of Head	Curtain Airbag, Side Header	Curtain Airbag
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Curtain Airbag, Side Header, Headrest	Curtain Airbag, Headrest
Left Shoulder	Curtain Airbag, Torso/Pelvis Airbag	Rear Passenger Door
Upper Torso	Torso/Pelvis Airbag, Seatback	Rear Passenger Door
Lower Torso	Torso/Pelvis Airbag, Seatback	Rear Passenger Door
Left Hip	Torso/Pelvis Airbag, Seatpan	Rear Passenger Door, Seatpan
Left Knee	Driver Door	Driver Door

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch/Other*
	Front	Rear	Front	Rear	
Remained Closed and Operational	No	No	Yes	Yes	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or Hinge Systems Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Width of Opening at Striker (mm)	0	0	0	0	0

POST-TEST SEAT PERFORMANCE

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	No	No	No
Seat Disengagement from Floor Pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	B-Pillar Buckled
Sill Separation	None
Windshield Damage	None
Side Window Damage	None
Other Notable Effects	None

DATA SHEET NO. 8 ... (CONTINUED)
POST-TEST OBSERVATIONS

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Air bag	Yes	No		
Knee Air bag	No	N/A		
Side Air bag 1 - Curtain	Yes	Yes	Yes	Yes
Side Air bag 2 - Torso/Pelvis Air bag	Yes	Yes	No	N/A
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt Load Limiter	Yes	Yes	No	N/A
Other				

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2721
Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point)	mm		420
Actual Impact Point (Aft of Frontal Axle)	mm		418
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	2
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	5

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2020 GMC Terrain SUV
Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
Test Date: 10/12/2020

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1,250
Overall Length Including Honeycomb Frame	4,120
Wheelbase of Framework Carriage	2,600
CG Location of Front Axle	1,123

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	396	291.5	690.0
Right	kg	377.5	301	677.5
Ratio	%	56.6%	43.4%	100.0%
Totals	kg	773.5	592.5	1366

SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	52.10 to 53.70	52.95
Trap No. 2 Velocity (Redundant)	km/h	52.10 to 53.70	52.94
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.0

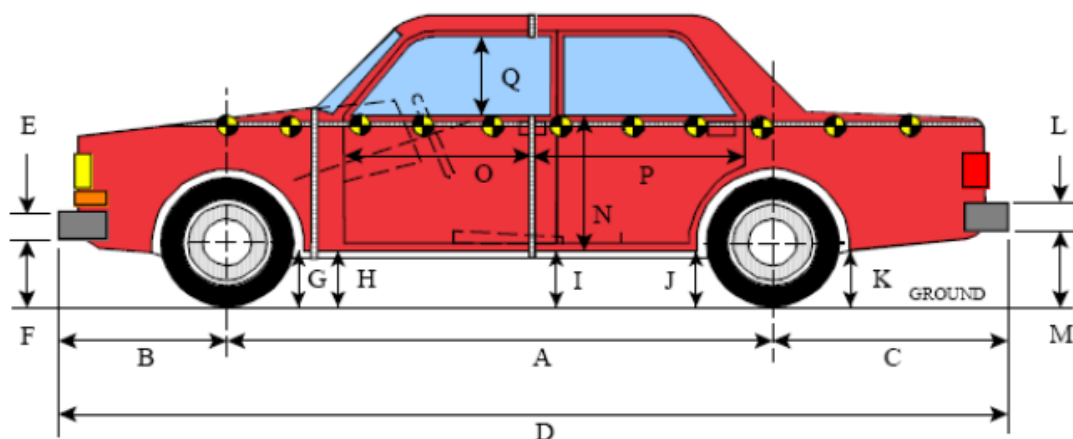
MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Right	172
B	Top of Bumper	533	800	Right	94
C	Mid-Level	686	800	Left	100
D	Top of Stack	813	800	Left	98

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020



LEFT SIDE VIEW

All MEASUREMENTS IN (mm) WITH TOLERANCE OF $\pm 3\text{mm}$

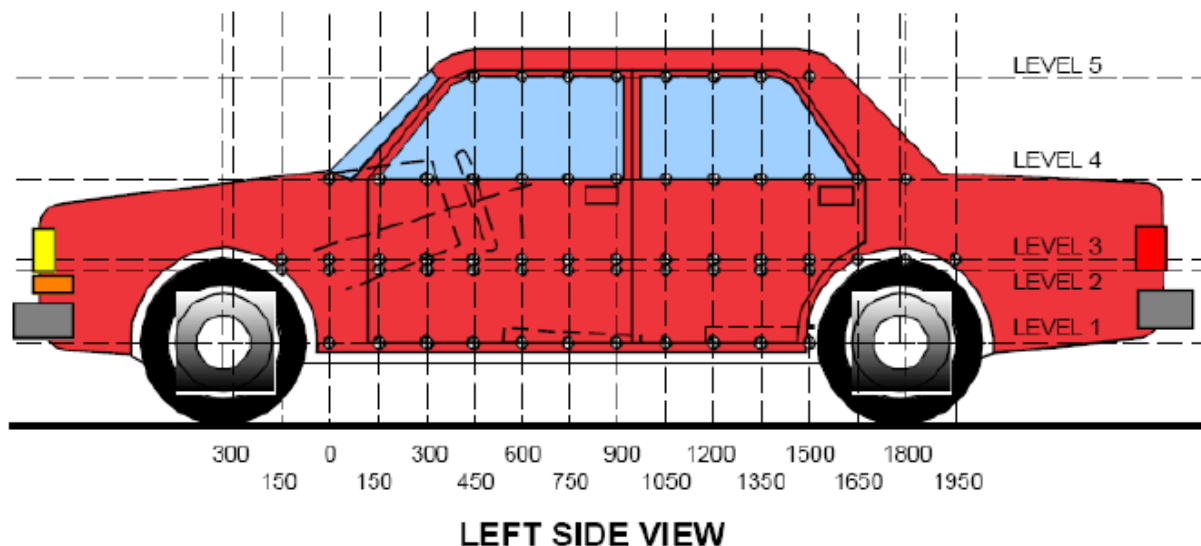
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2721	2726	5
B	Front Axle to FSOV	936	935	-1
C	Rear Axle to RSOV	975	965	-10
D	Total Length at Centerline	4630	4626	-4
E	Front Bumper Thickness	292	292	0
F	Front Bumper Bottom to Ground	215	215	0
G	Sill Height at Front Wheel Well	195	190	-5
H	Sill Height at Front Door Leading Edge	230	234	4
I	Sill Height at B Pillar	235	236	1
J1	Sill Height at Rear Wheel Well	234	232	-2
J2	Pinch Weld Height at Rear Wheel Well	230	225	-5
K	Sill Height Aft of Rear Wheel Well	238	238	0
L	Rear Bumper Thickness	174	174	0
M	Rear Bumper Bottom to Ground	260	258	-2
N	Sill Height to Window Bottom of Front Window Sill	888	861	-27
O	Front Door Leading Edge to Impact CL	784	785	1
P	Rear Door Trailing Edge to Impact CL	1384	1336	-48
Q	Front Window Opening	493	510	17
R	Right Side Length	4508	4506	-2
S	Left Side Length	4510	4506	-4
T	Maximum Vehicle Width	1835	1664	-171

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	320	20	1050
2	Driver Hip Point	mm	688	193	1650
3	Mid-Door	mm	749	189	1650
4	Window Sill	mm	1082	48	1650
5	Window Top	mm	1603	2	1650

*window top level bent outward from original position

NOTE: The above measurements should be taken along the vertical impact reference line.
 Vehicle measurements forward of the vertical impact reference line are negative.

DATA SHEET NO. 11 ... (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

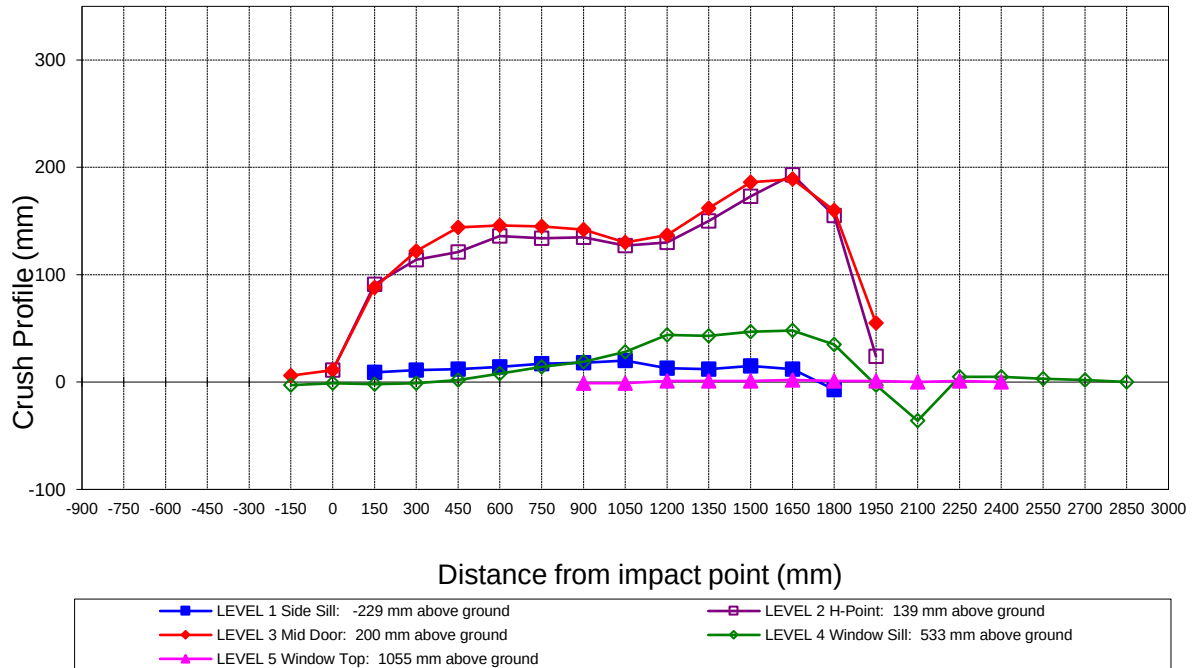
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300															
-150			916	800				910	803				6	-3	
0		913	913	805			902	902	806			11	11	-1	
150	887	902	903	805		878	811	815	807		9	91	88	-2	
300	881	899	901	817		870	785	779	818		11	114	122	-1	
450	877	898	900	829		865	777	756	827		12	121	144	2	
600	876	898	899	844		862	762	753	836		14	136	146	8	
750	875	897	898	855		858	763	753	841		17	134	145	14	
900	874	898	898	862	601	856	763	756	843	602	18	135	142	19	-1
1050	873	897	898	864	605	853	770	768	836	606	20	127	130	28	-1
1200	874	899	899	866	608	861	769	762	822	607	13	130	137	44	1
1350	874	901	901	867	608	862	751	739	824	607	12	150	162	43	1
1500	875	904	902	868	611	860	731	716	821	610	15	173	186	47	1
1650	876	907	905	868	613	864	714	716	820	611	12	193	189	48	2
1800	875	915	913	869	613	882	760	753	834	612	-7	155	160	35	1
1950		918	920	898	612		894	865	901	611		24	55	-3	1
2100				891	608				927	608				-36	0
2250				869	601				864	600				5	1
2400				867	582				862	582				5	
2550				860					857					3	
2700				853					851					2	
2850				839					839						
3000															

NOTE: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition.
 Vehicle measurements forward of the vertical impact reference line are negative.
 The crush profile grid is established prior to test based on an estimated impact point.

DATA SHEET NO. 11 (CONTINUED) **TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020

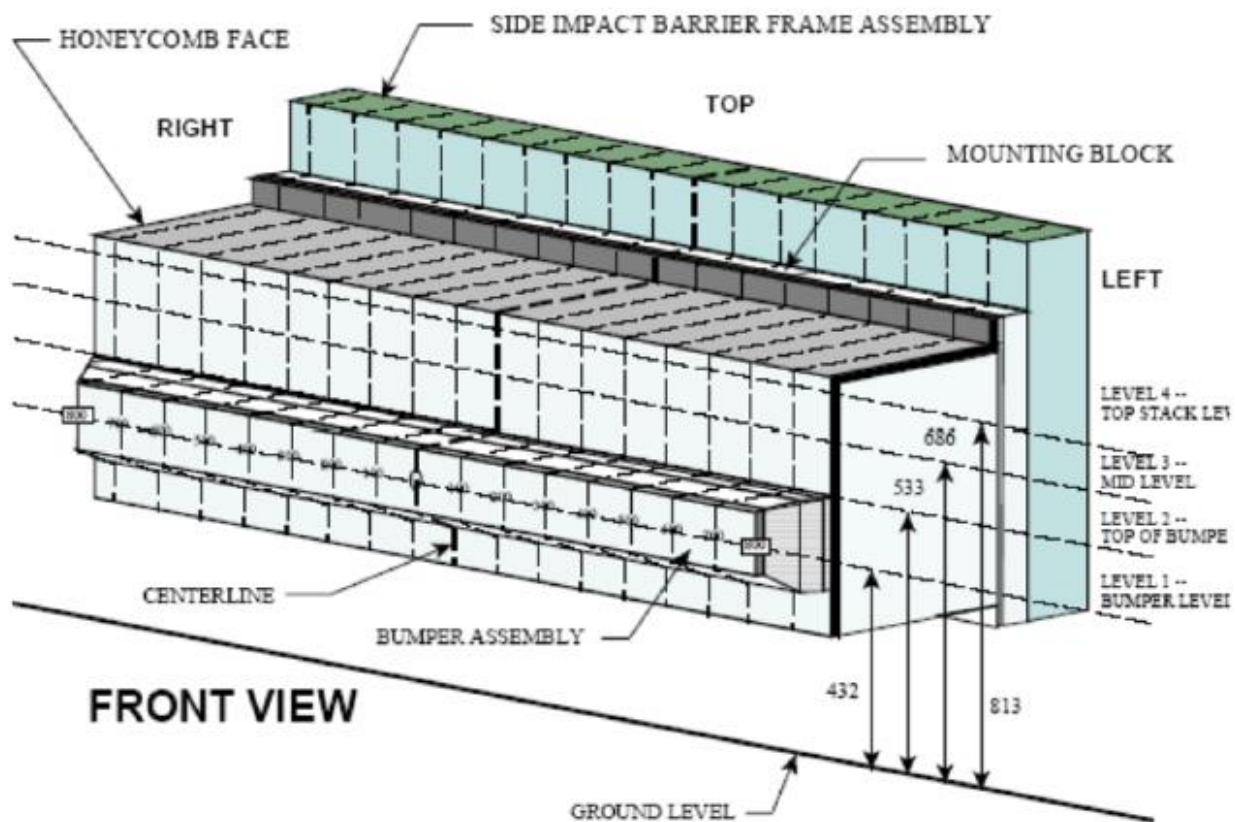


Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020



NOTE: Dimensions are shown in millimeters, mm

DEFORMABLE BARRIER STATIC CRUSH

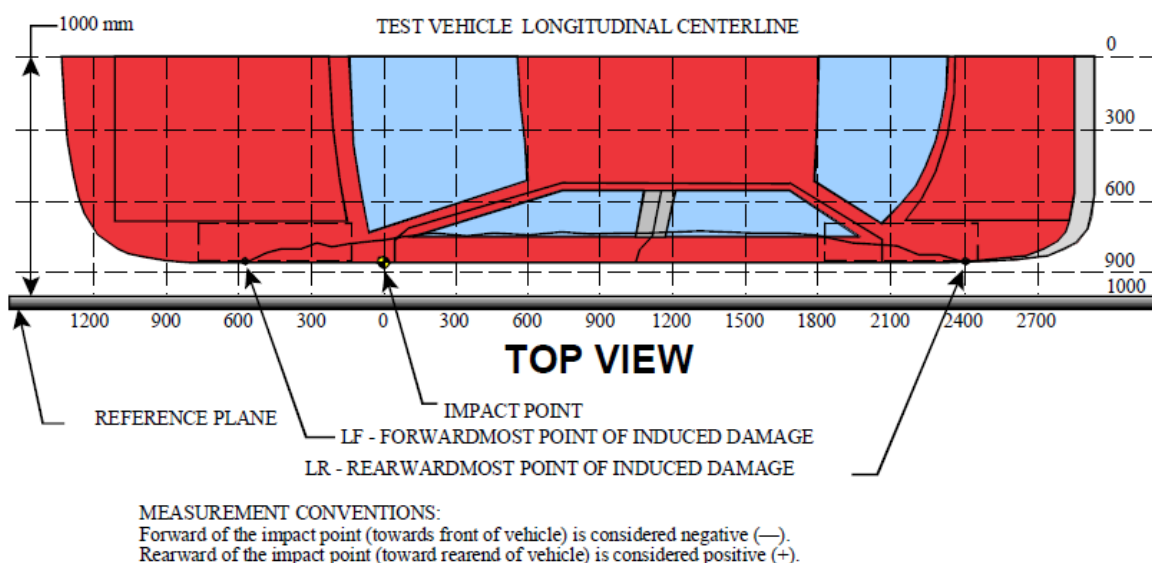
Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		0	100	200	300	400	500	600	700
1	172	165	163	160	159	157	156	154	153	151	149	147	146	145	144	151	160
2	94	92	90	89	85	83	84	80	79	78	78	77	76	75	74	76	90
3	21	10	13	16	26	37	46	35	31	18	15	14	16	22	29	44	100
4	23	12	9	13	20	29	48	54	33	32	32	34	37	40	48	58	98

DATA SHEET NO. 13 **VEHICLE AND MDB DAMAGE PROFILE DISTANCES**

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020

For guidance regarding damage profile distance measurements, please refer to the latest version of the *NHTSA Test Reference Guide, Volume 1: Vehicle Tests*.



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-150	3	90	84	6
2	270	3	214	99	115
3	690	3	247	102	145
4	1110	3	234	102	132
5	1530	3	284	97	187
6	1950	3	135	80	55

MDB DAMAGE PROFILE DISTANCES

DPD	Distance From Center of MDB	Level	Post-Test (mm)*
1	800 mm left of center	1	160
2	480 mm left of center	1	145
3	160 mm left of center	1	150
4	160 mm right of center	1	155
5	480 mm right of center	1	160
6	800 mm right of center	1	172

DATA SHEET NO. 14
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2020 GMC Terrain SUV NHTSA No.: R20200190
Test Program: Research Side MDB Impact Test Test Date: 10/12/2020

Test Time: 1:45 PM Temperature: 21°C

- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable is 1 oz.)
- B. For the 5-minute period after motion ceases: 0 oz.
(Maximum allowable is 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable is 1 oz./minute)
- D. Spillage Details: No Spillage Occurred

FMVSS NO. 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	-	300	N/A
90° to 180°	-	300	N/A
180° to 270°	-	300	N/A
270° to 360°	-	300	N/A

FMVSS NO. 301 ROLLOVER 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	

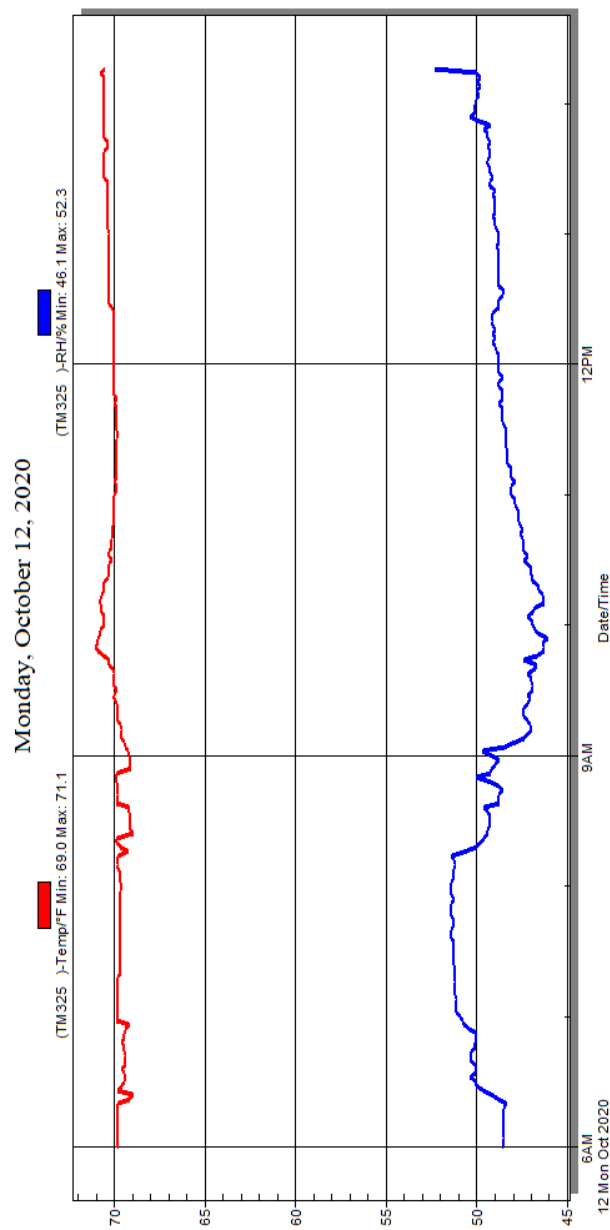
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 15
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle: 2020 GMC Terrain SUV
 Test Program: Research Side MDB Impact Test

NHTSA No.: R20200190
 Test Date: 10/12/2020



Temperature and Humidity Stabilization Chart/Data for Dummies and Test Vehicle

APPENDIX A
PHOTOGRAPHS

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Figure A-1: As-Delivered Right Front 3/4 View of Test Vehicle



Figure A-2: As-Delivered Left Rear 3/4 View of Test Vehicle



Figure A-3: Pre-Test Frontal View of Test Vehicle



Figure A-4: Post-Test Frontal View of Test Vehicle



Figure A-5: Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



Figure A-6: Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



Figure A-7: Pre-Test Left Side View of Test Vehicle



Figure A-8: Post-Test Left Side View of Test Vehicle



Figure A-9: Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



Figure A-10: Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



Figure A-11: Pre-Test Rear View of Test Vehicle



Figure A-12: Post-Test Rear Side View of Test Vehicle



Figure A-13: Pre-Test Right Side View of Test Vehicle



Figure A-14: Post-Test Right Side View of Test Vehicle

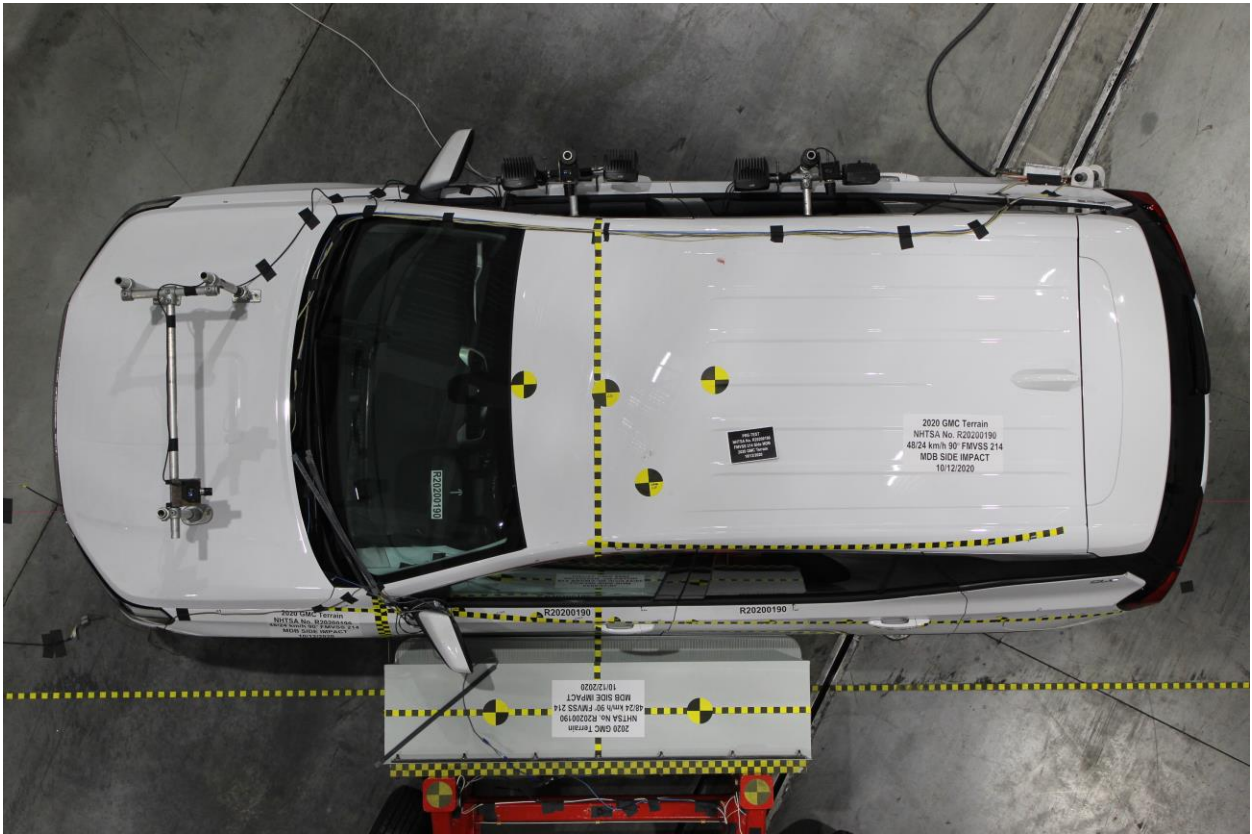


Figure A-15: Pre-Test Overhead View of the Test Area

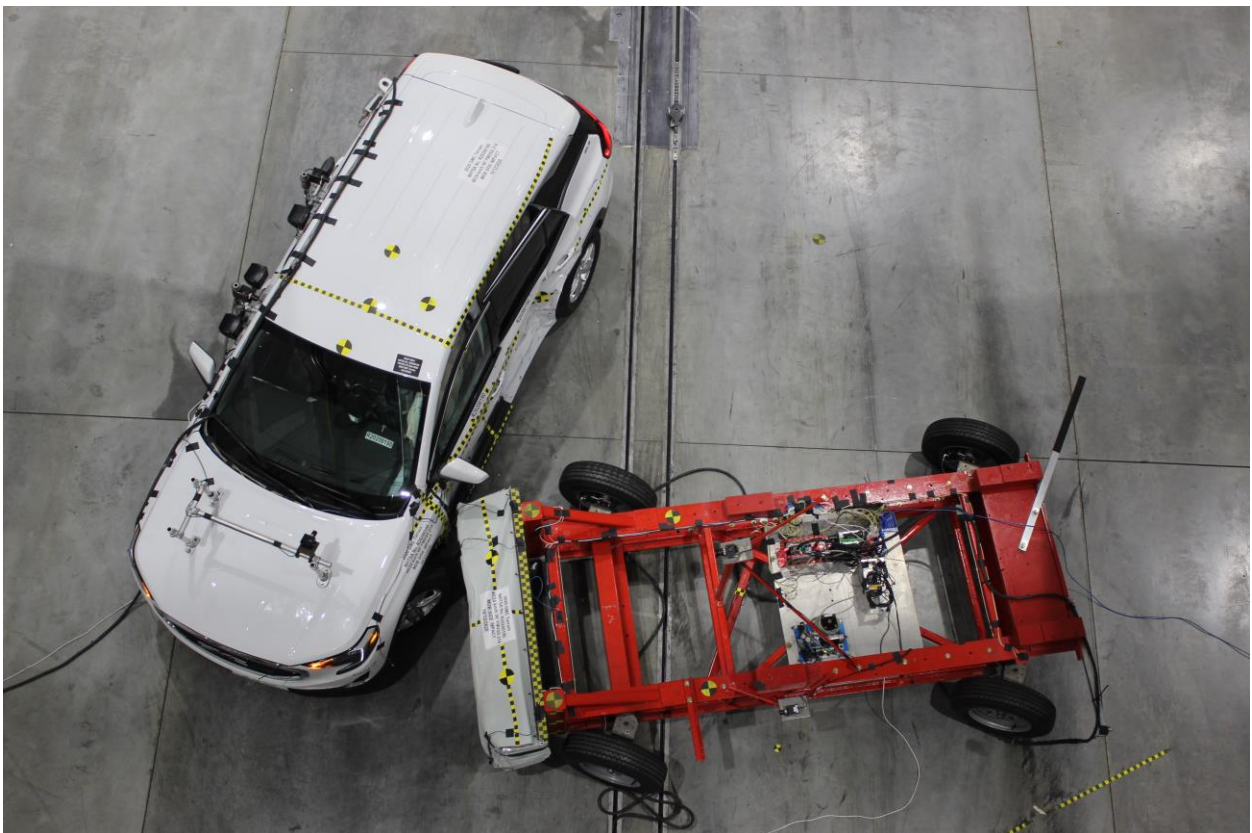


Figure A-16: Post-Test Overhead View of Test Area



Figure A-17: Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



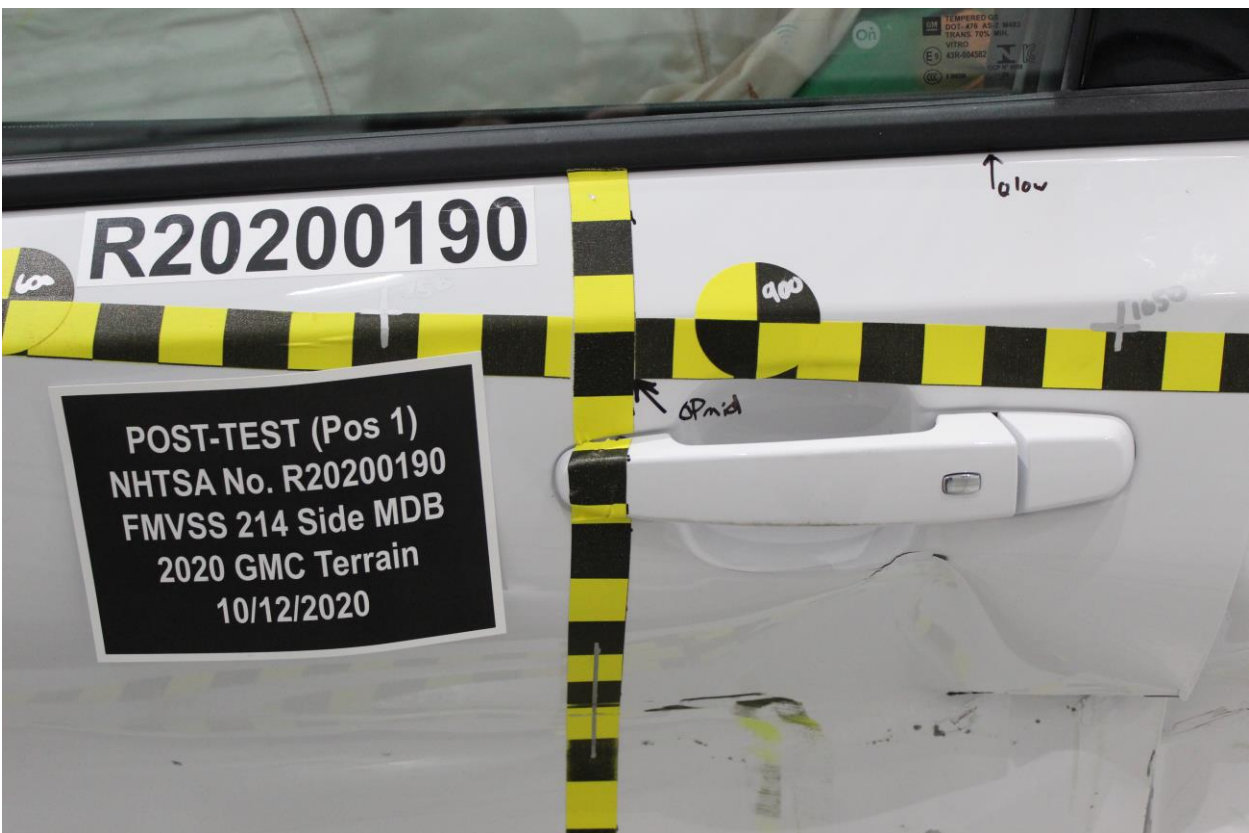
Figure A-18: Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle



Figure A-19: Pre-Test Close-up View of Impact Point Target



Figure A-20: Post-Test Close-up View of Impact Point Target



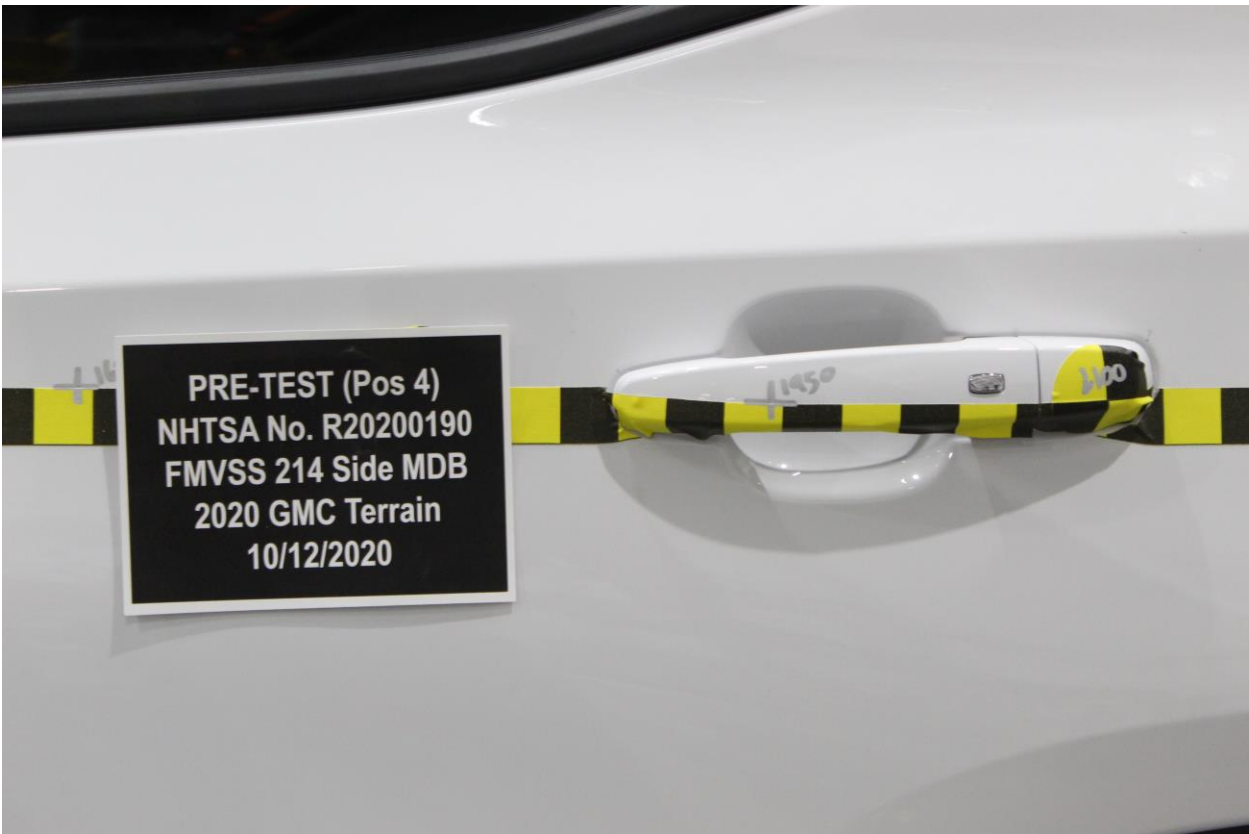


Figure A-23: Pre-Test Left Rear Door Latch Close-Up

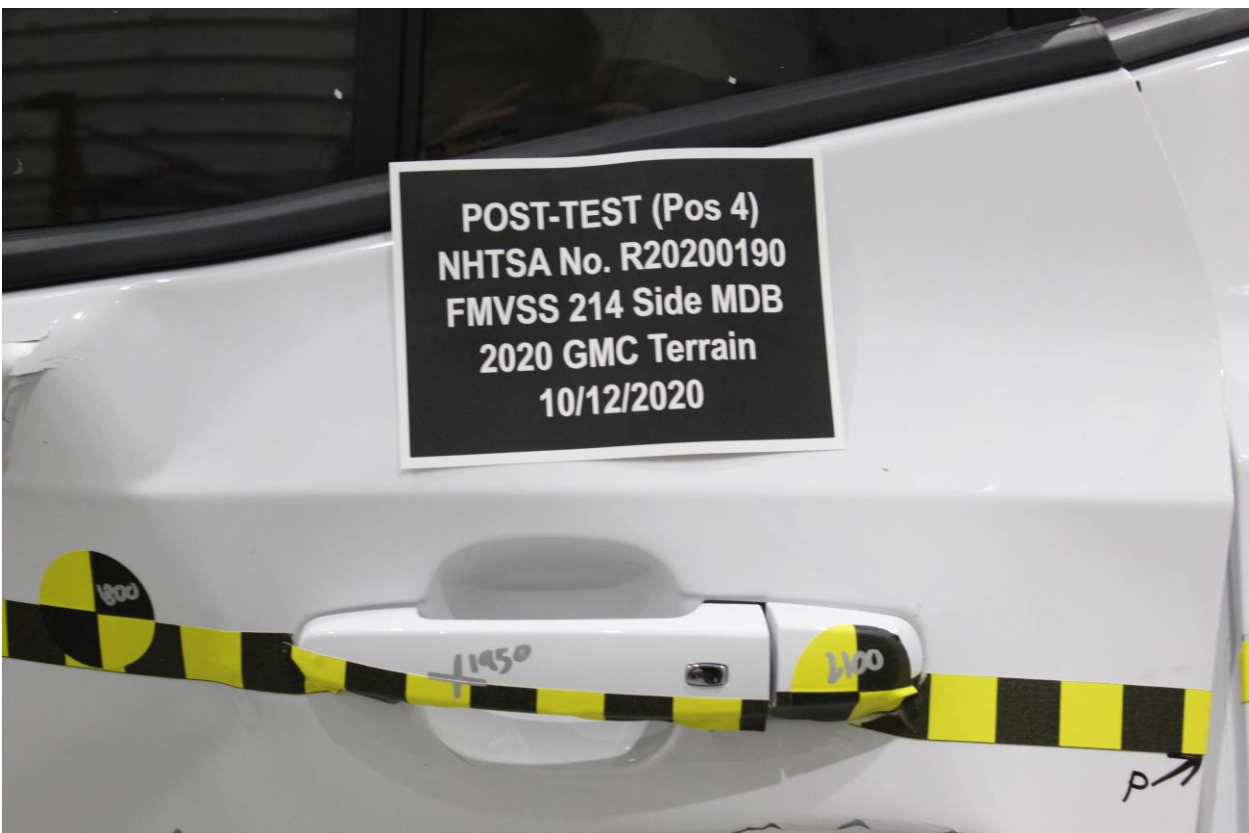


Figure A-24: Post-Test Left Rear Door Latch Close-Up



Figure A-25: Pre-Test Front Close-up View of Driver Dummy



Figure A-26: Post-Test Front Close-up View of Driver Dummy



Figure A-27: Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking



Figure A-28: Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View



Figure A-29: Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



Figure A-30: Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



Figure A-31: Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



Figure A-32: Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



Figure A-33: Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan

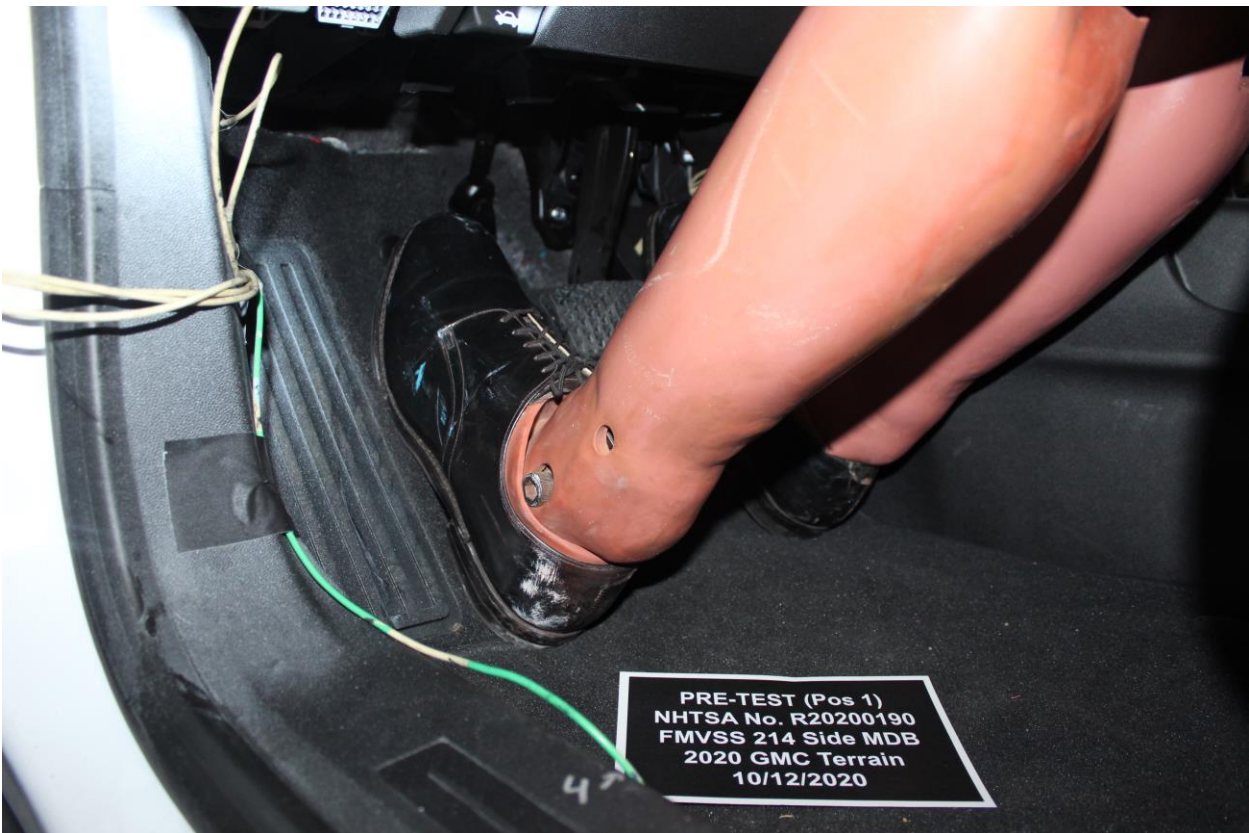


Figure A-34: Pre-Test Placement of Driver Dummy's Feet

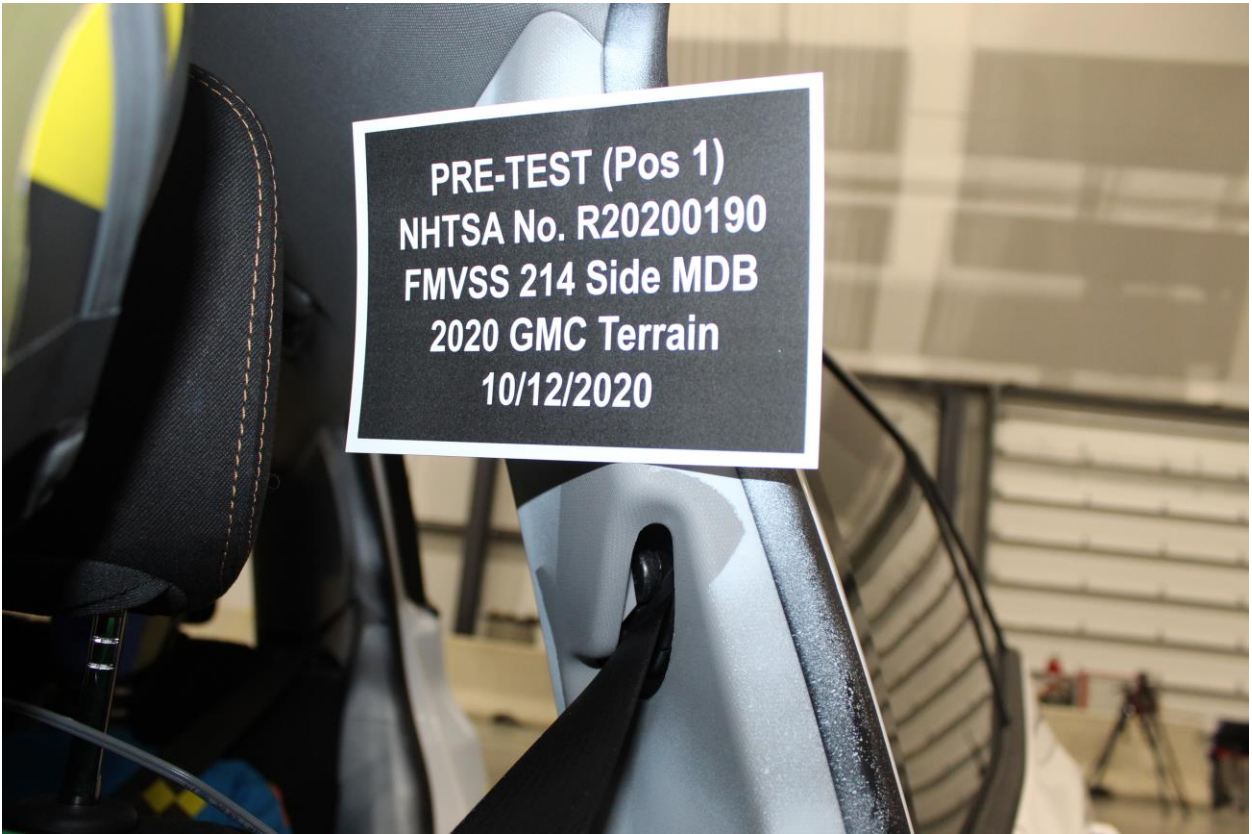


Figure A-35: Pre-Test View of Belt Anchorage for Driver Dummy



Figure A-36: Pre-Test Left Side View of Steering Wheel



Figure A-37: View of Disengaged Parking Brake



Figure A-38: Pre-Test View of Parking Brake

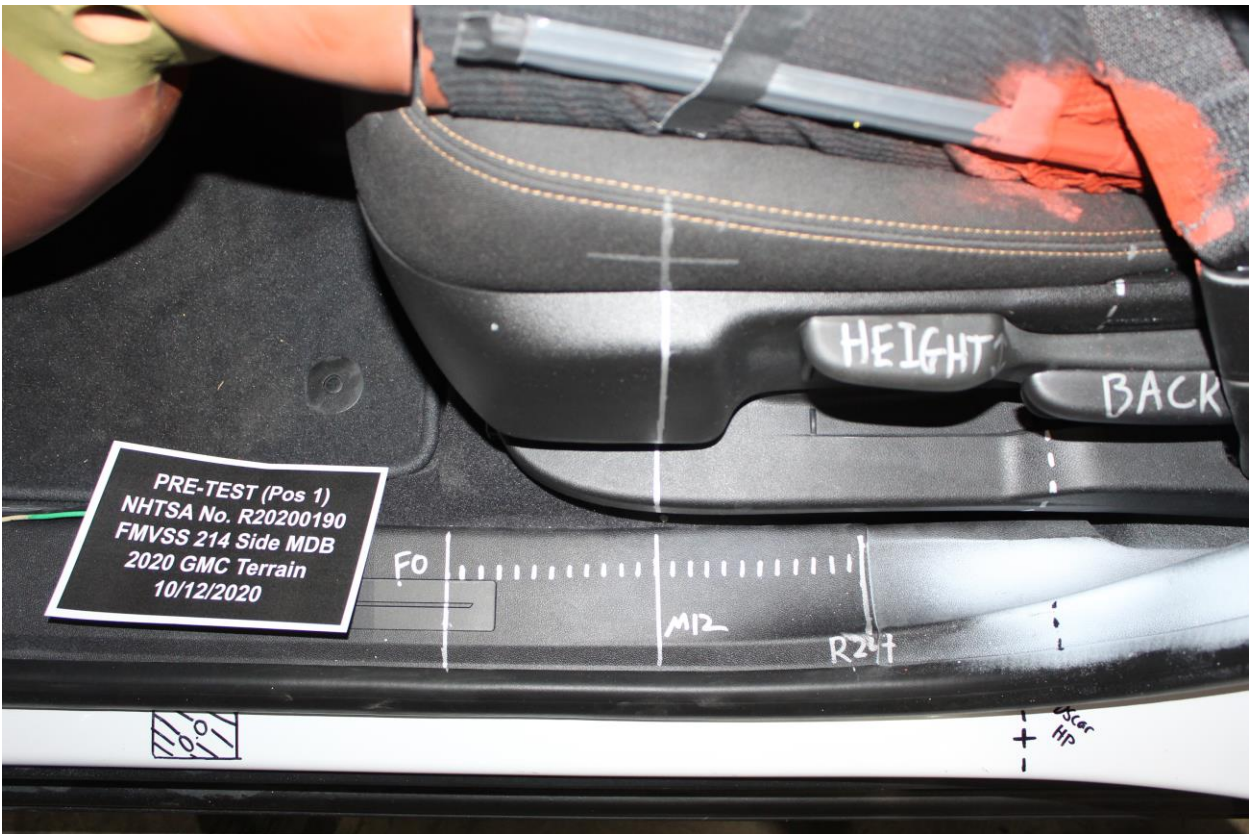


Figure A-39: Pre-test Close-Up Left Side View of Driver Seat Track



Figure A-40: Pre-Test Close-Up Left Side View of Driver Seat Back



Figure A-41: Pre-Test Close-Up View of Driver Seat Back or Head Restraint



Figure A-42: Pre-Test Driver Dummy and Door Clearance View



Figure A-43: Post-Test Driver Dummy and Door Clearance View



Figure A-44: Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Figure A-45: Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Figure A-46: Pre-Test Driver Inner Door Panel View



Figure A-47: Post-Test Driver Inner Door Panel View Showing Driver Dummy Contact Locations



Figure A-48: Post-Test Driver Dummy Close-Up Head Contact with Vehicle View



Figure A-49: Post-Test Driver Dummy Close-Up Head Contact with Side Air bag View



Figure A-50: Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View



Figure A-51: Post-Test Driver Dummy Close-Up Torso Contact with Side Air bag View



Figure A-52: Post-Test Driver Dummy Close-Up Pelvis Contact View



Figure A-53: Post-Test Driver Dummy Close-Up Pelvis Contact with Side Air bag View



Figure A-54: Post-Test Driver Dummy Close-Up Knee Contact View



Figure A-55: Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking



Figure A-56: Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Figure A-57: Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Figure A-58: Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning



Figure A-59: Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



Figure A-60: Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



Figure A-61: Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

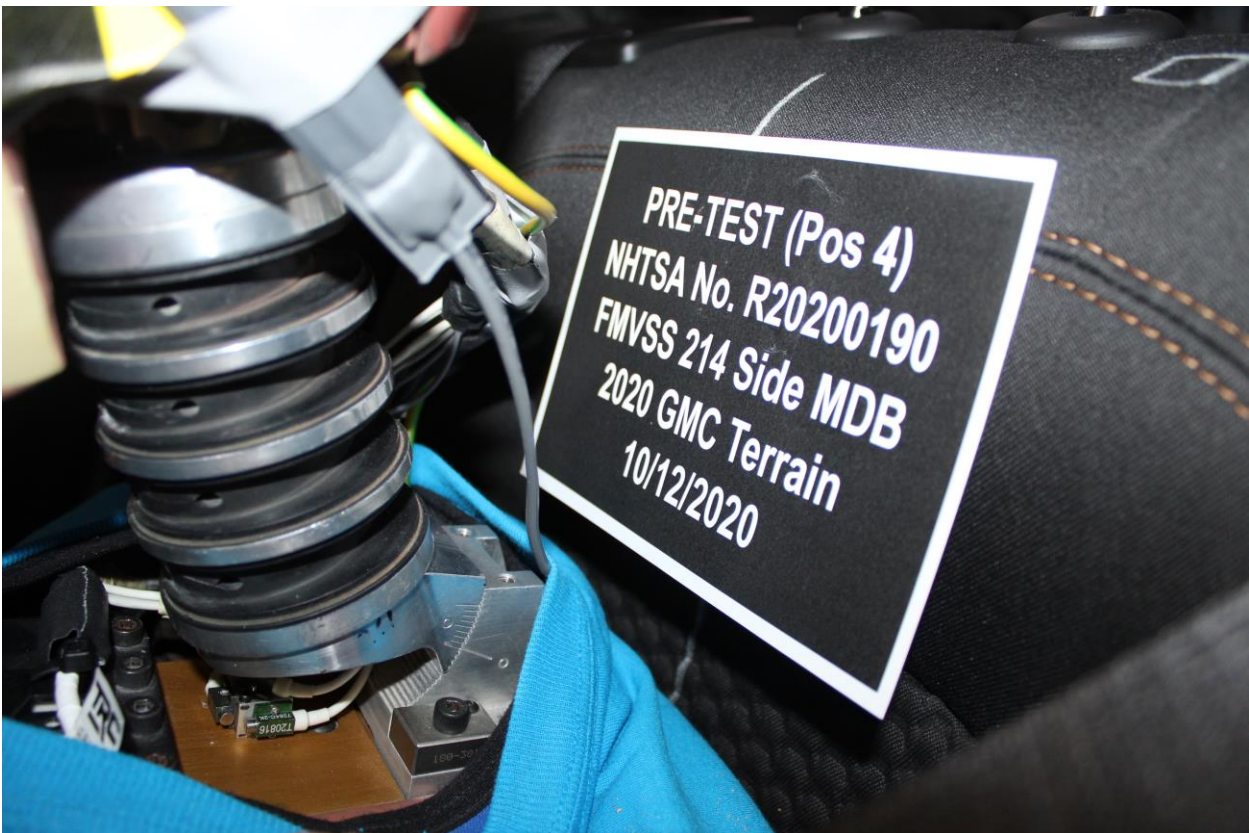


Figure A-62: Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket



Figure A-63: Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level

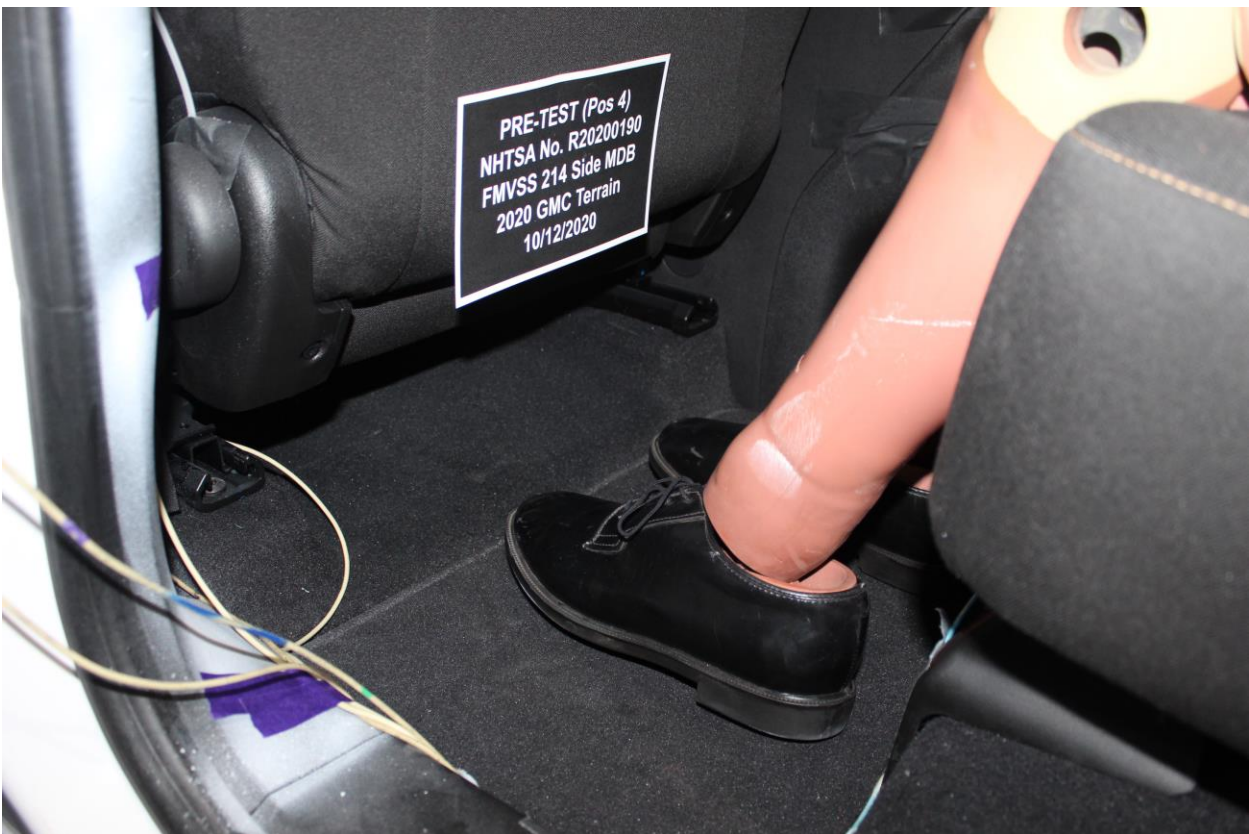


Figure A-64: Pre-Test Placement of Rear Passenger Dummy's Feet



Figure A-65: Pre-Test View of Belt Anchorage for Rear Passenger Dummy



Figure A-66: Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



Figure A-67: Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



Figure A-68: Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint



Figure A-69: Pre-Test Rear Passenger Dummy and Door Clearance View



Figure A-70: Post-Test Rear Passenger Dummy and Door Clearance View



Figure A-71: Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Figure A-72: Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Figure A-73: Pre-Test Rear Passenger Inner Door Panel View



Figure A-74: Post-Test Rear Passenger Inner Door Panel View Showing Rear Passenger Dummy Contact Locations



Figure A-76: Post-Test Rear Passenger Dummy Close-Up Head Contact with Side Air bag View



Figure A-77: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View



Figure A-78: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Air bag View



Figure A-79: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact View



Figure A-80: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Air bag View



Figure A-81: Post-Test Rear Passenger Dummy Close-Up Knee Contact View



Figure A-82: Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



Figure A-83: Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Figure A-84: Pre-Test Front View of MDB Impactor Face



Figure A-85: Post-Test Front View of MDB Impactor Face



Figure A-86: Pre-Test Top View of MDB Impactor Face



Figure A-87: Post-Test Top View of MDB Impactor Face



Figure A-88: Pre-Test Left Side View of MDB Impactor Face



Figure A-89: Post-Test Left Side View of MDB Impactor Face



Figure A-90: Pre-Test Right Side View of MDB Impactor Face



Figure A-91: Post-Test Right Side View of MDB Impactor Face



R20200190

Figure A-92: Close-Up View of Vehicle's Certification Label



Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label

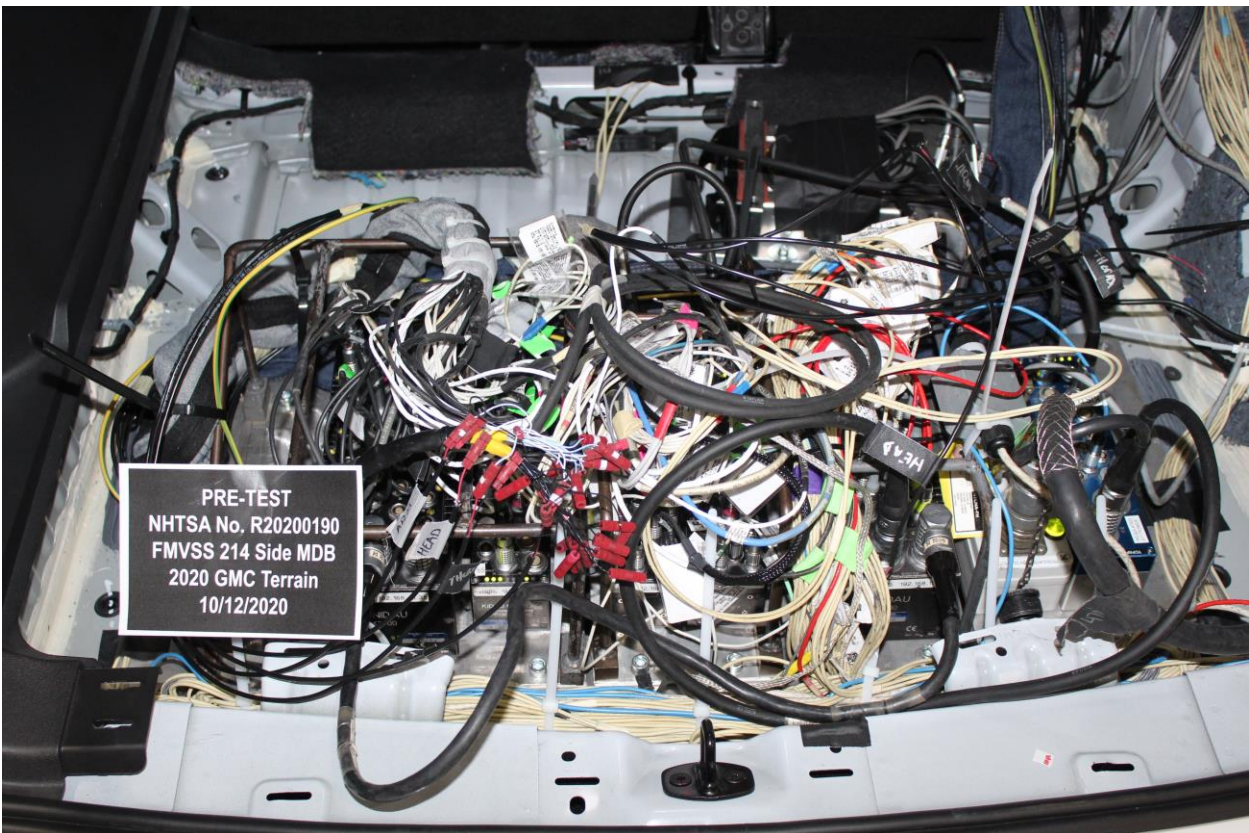


Figure A-94: Pre-Test Ballast View



Figure A-95: Post-Test Primary and Redundant Speed Trap Read-Out

Photo Not Applicable

Figure A-96: FMVSS No. 301 Static Rollover 0 Degrees

Photo Not Applicable

Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees

Photo Not Applicable

Figure A-98: FMVSS No. 301 Static Rollover 180 Degrees

Photo Not Applicable

Figure A-99: FMVSS No. 301 Static Rollover 270 Degrees

Photo Not Applicable

Figure A-100: FMVSS No. 301 Static Rollover 360 Degrees



Figure A-101: Impact Event



2020 TERRAIN FWD SLE

EXTERIOR: METALLIC
INTERIOR: JET BLACK

ENGINE: 1.5L TURBO DOHC 4-CYL
TRANSMISSION, 9-SPD AUTOMATIC

STANDARD EQUIPMENT

ITEMS FEATURED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE (\$26,000)

OWNER BENEFITS

- 3 YEAR/50,000 MILE BUMPER-TO-BUMPER LIMITED WARRANTY
- 5 YEAR/100,000 MILE POWERTRAIN LIMITED WARRANTY, ROADSIDE ASSISTANCE & COURTESY TRANSPORTATION
- FIRST MAINTENANCE VISIT
- *WHICHEVER COMES FIRST SEE GMC.COM OR DEALER FOR TERMS, DETAILS & LIMITS

INTERIOR

- AIR CONDITIONING, SINGLE-ZONE MANUAL
- SEATBACK, PASSENGER SIDE, FLAT FOLDING
- POWER WINDOW W/ EXPRESS DRIVER UP/DOWN

STEERING WHEEL, LEATHER-TRIMMED 4 SPOKE

AUDIO SYSTEM, 6 SPEAKER

DRIVER INFO DISPLAY, 4.2" MULTI-COLOR

EXTERIOR

- HEADLAMPS, HIGH INTENSITY DISCHARGE
- DAYTIME RUNNING LAMPS, LED SIGNATURE
- TAIL LAMPS, LED SIGNATURE

SAFETY & SECURITY

- GMC PRO SAFETY:
 - *NIGHTVISION
 - *FRONT PEDESTRIAN BRAKING
 - *AUTOMATIC EMERGENCY BRAKING
 - *LANE KEEP ASSIST W/ LANE DEPARTURE WARNING
 - *FORWARD COLLISION ALERT
 - *FOLLOWING DISTANCE INDICATOR
 - *REAR VISION CAMERA
 - *TEEN DRIVER

REAR DR LOCKS, CHILD SECURITY

THEFT DETECTION SYSTEM

TIRE PRESSURE MONITOR, W/ TIRE FULL ALERT (EXCL. SPARE TIRE)

PERFORMANCE & MECHANICAL

- ELECTRONIC PRECISION SHIFT
- TRACTION SELECT SYSTEM
- COMPACT SPARE TIRE
- HILL DESCENT CONTROL
- STABILITRAK™ STABILITY CONTROL SYSTEM W/ TRACTION CONTROL

CONNECTIVITY & TECHNOLOGY

- ONSTAR (®) SERVICES & 4G LTE W-I (®) AVAILABLE
- SEE GMC.COM FOR TERMS
- GMC INFOTAINMENT SYSTEM W/ 7" DIAG. COLOR TOUCHSCREEN
- ADDITIONAL FEATURES FOR COMPATIBLE PHONES INCLUDE: BLUETOOTH® AUDIO STREAMING

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- 2 USB PORTS, AUXILIARY INPUT JACK
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MANUFACTURER'S SUGGESTED RETAIL PRICE

STANDARD VEHICLE PRICE	\$26,400.00
------------------------	-------------

OPTIONS & PRICING

OPTIONS RETAILED BY THE MANUFACTURER MAY EXCEED STANDARD EQUIPMENT (EXCISE)

TOTAL OPTIONS	\$0.00
TOTAL PRICE & OPTIONS	\$26,400.00
DESTINATION CHARGE	1,195.00
TOTAL VEHICLE PRICE*	\$29,595.00

EPA DOT Fuel Economy and Environment

Fuel Economy

27 MPG combined city/hwy
26 city
30 highway
3.7 gallons per 100 miles

Small SUVs range from 18 to 120 MPG. The best vehicle rates 138 MPG.

you save \$0 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$1,500

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$7.50 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.70 per gallon. MPG is miles per gallon using equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuel economy.gov

Calculate personalized estimates and compare vehicles

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score ★★★★★

Based on the combined ratings of frontal, side and rollover. Should only be compared to other vehicles of similar size and weight.

Frontal Crash	Driver Passenger	★★★★★
----------------------	-------------------------	--------------

Based on the risk of injury in a frontal impact. Should only be compared to other vehicles of similar size and weight.

Side Crash	Front seat Rear seat	★★★★★
-------------------	-----------------------------	--------------

Based on the risk of injury in a side impact.

Rollover	★★★★★
-----------------	--------------

Based on the risk of rollover in a single-vehicle crash.

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.

Source: National Highway Traffic Safety Administration (NHTSA) www.safercar.gov or 1-888-327-4236

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 47% MAJOR SOURCES OF FOREIGN PARTS CONTENT: MEXICO 29%

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE: FINAL ASSEMBLY POINT: SAN LUIS POTOSI, MEXICO COUNTRY OF ORIGIN: ENGINE: MEXICO TRANSMISSION: UNITED STATES

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WO 1GA185656

Figure A-102: Monroney Label

Head Restraints

The vehicle's front seats have adjustable head restraints in the outboard seating positions.

Warning

With head restraints that are not installed and adjusted properly, there is a greater chance that occupants will suffer a neck/spinal injury in a crash. Do not drive until the head restraints for all occupants are installed and adjusted properly.

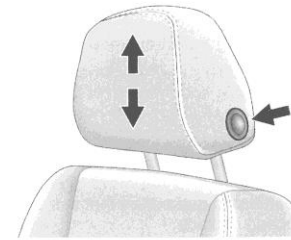
If your vehicle has rear head restraints that fold down, always return them to the full upright position whenever an occupant is seated in the seat.



Adjust the head restraint so that the top of the restraint is at the same height as the top of the occupant's head. This position reduces the chance of a neck injury in a crash.

Front Seats

The vehicle's front seats have adjustable head restraints in the outboard seating positions.



The height of the head restraint can be adjusted.

To raise or lower the head restraint, press the button located on the side of the head restraint and pull up or push the head restraint down, and release the button. Pull and push on the head restraint after the button is released to make sure that it is locked in place.

The front seat outboard head restraints are not removable.

Figure A-103: Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

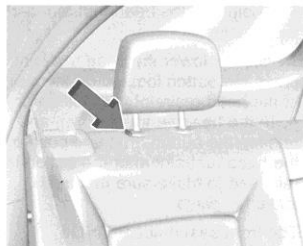
38 Seats and Restraints

Rear Seats

Adjusting the Rear Head Restraint

The vehicle's rear seats have adjustable head restraints in the outboard seating positions.

The height of the head restraint can be adjusted. Pull the head restraint up to raise it. Try to move the head restraint to make sure that it is locked in place.

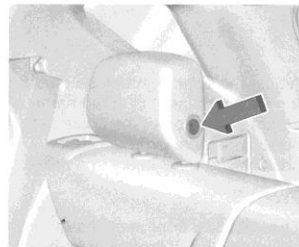


To lower the head restraint, press the button, located on the top of the seatback, and push the head restraint down. Try to move the

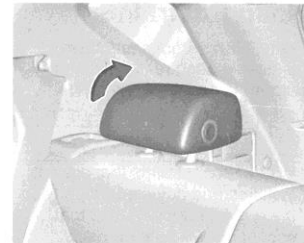
head restraint after the button is released to make sure that it is locked in place.

Folding the Rear Head Restraint

The head restraint can be folded rearward to allow for better visibility when the rear seat is unoccupied.



To fold the head restraint, press the button on the side of the head restraint.



The head restraint will fold rearward automatically.

When an occupant or child restraint is in the seat, always return the head restraint to the full upright position. Pull the head restraint up and forward until it locks into place. Push and pull on the head restraint to make sure that it is locked.

Always adjust the head restraint so that the top of the restraint is at the same height as the top of the occupant's head.

Rear outboard head restraints are not removable.

Figure A-104: Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual-Rear Restraints Not Adjustable

Photo Not Available

Figure A-105: Pre-Test Head Tilt Sensor View for ES-2re

Photo Not Available

Figure A-106: Pre-Test Pelvis Tilt Sensor View for ES-2re

Photo Not Available

Figure A-107: Pre-Test Head Tilt Sensor View for SID-IIs

Photo Not Available

Figure A-108: Pre-Test Pelvis Tilt Sensor View for SID-IIs

Data Traces
VEHICLE & DUMMY RESPONSE DATA TRACES

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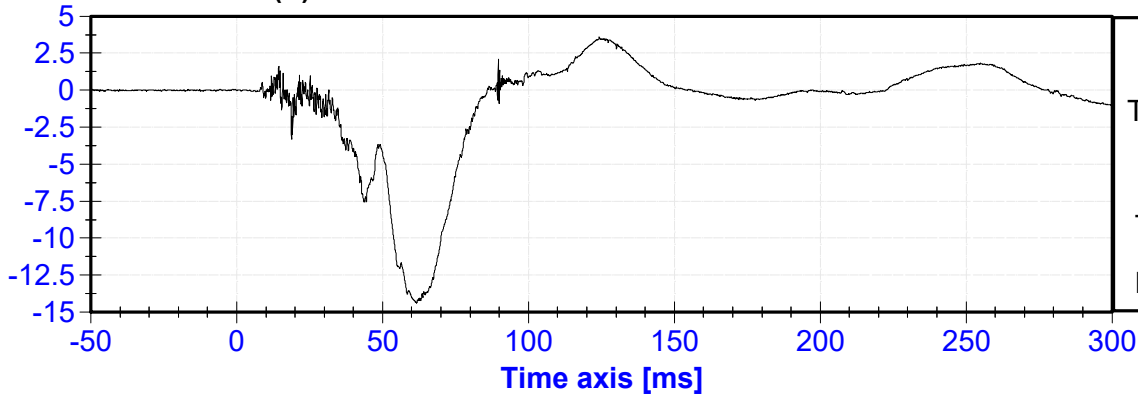
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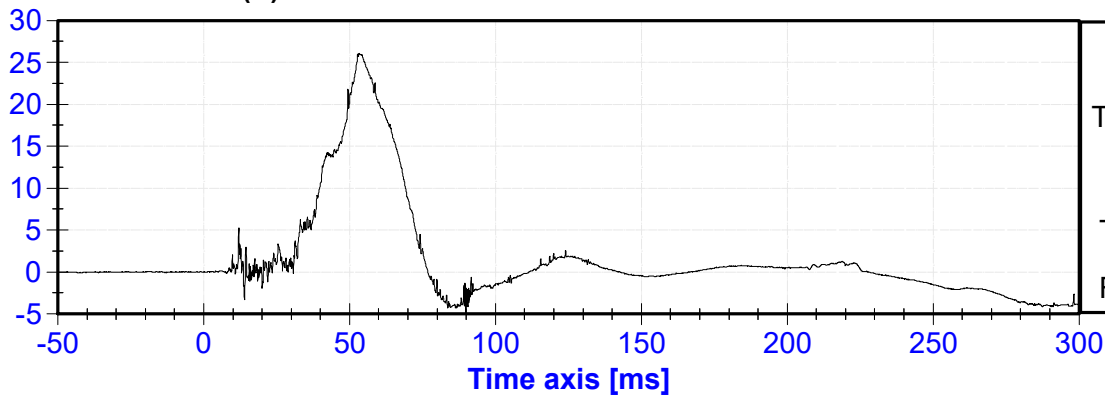
ACCELERATION [G's]

ES-2re Head (X) Acceleration vs. Time



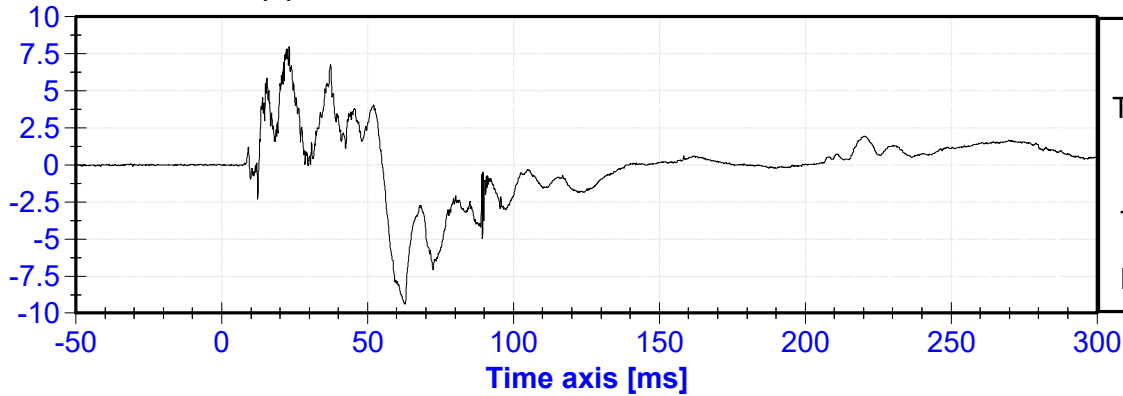
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ES-2re Head (Y) Acceleration vs. Time



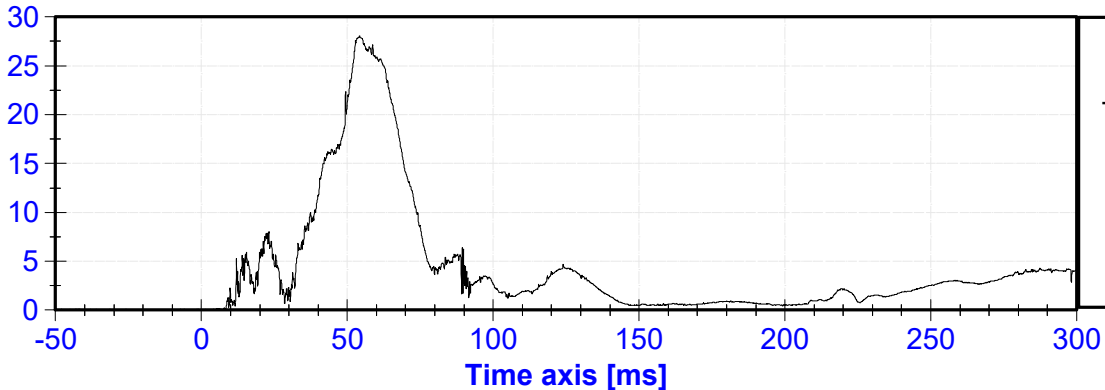
ACCELERATION [G's]

ES-2re Head (Z) Acceleration vs. Time



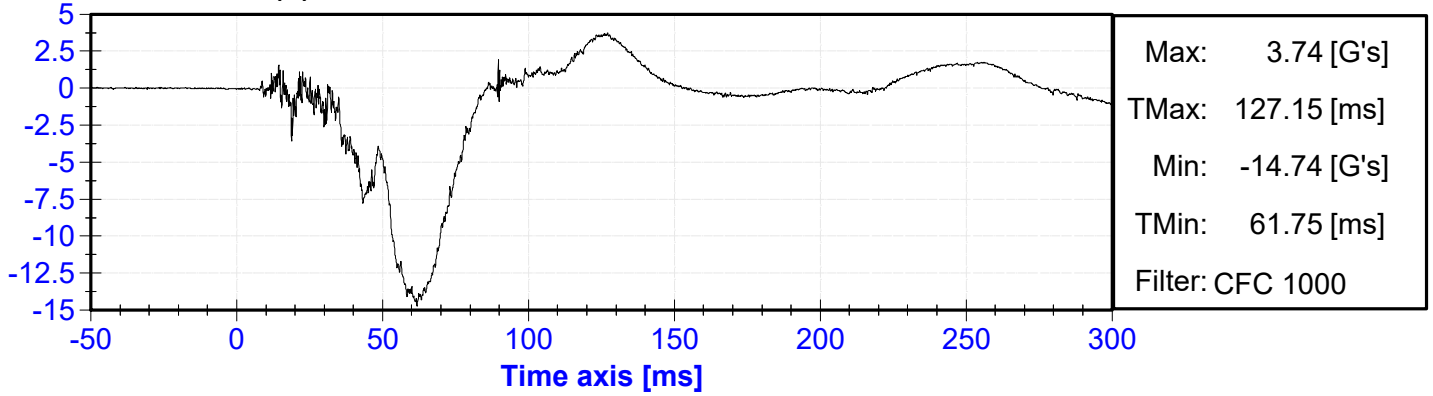
ACCELERATION [g's]

ES-2re Head Resultant Acceleration vs. Time



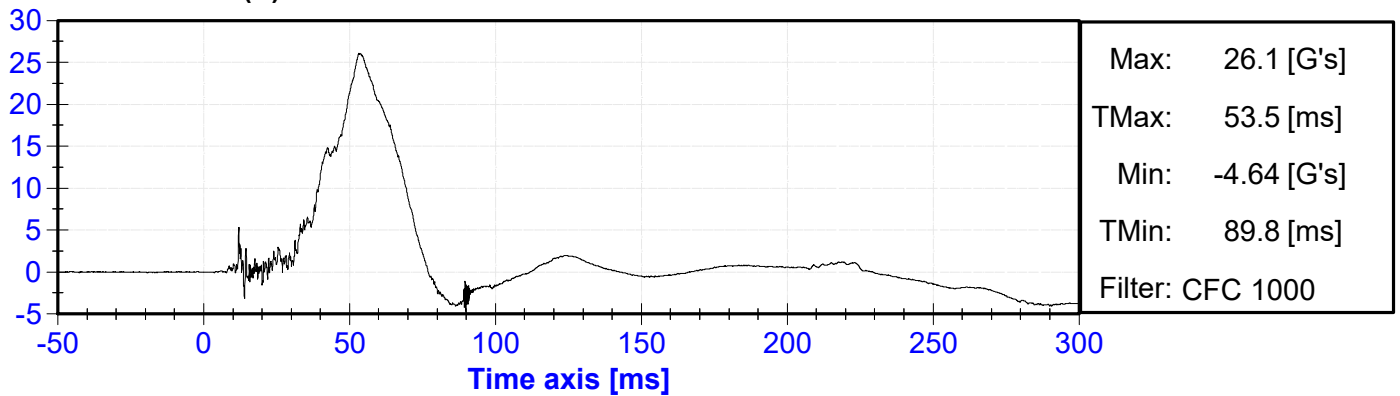
ACCELERATION [G's]

ES-2re Head (X) Redundant Acceleration vs. Time



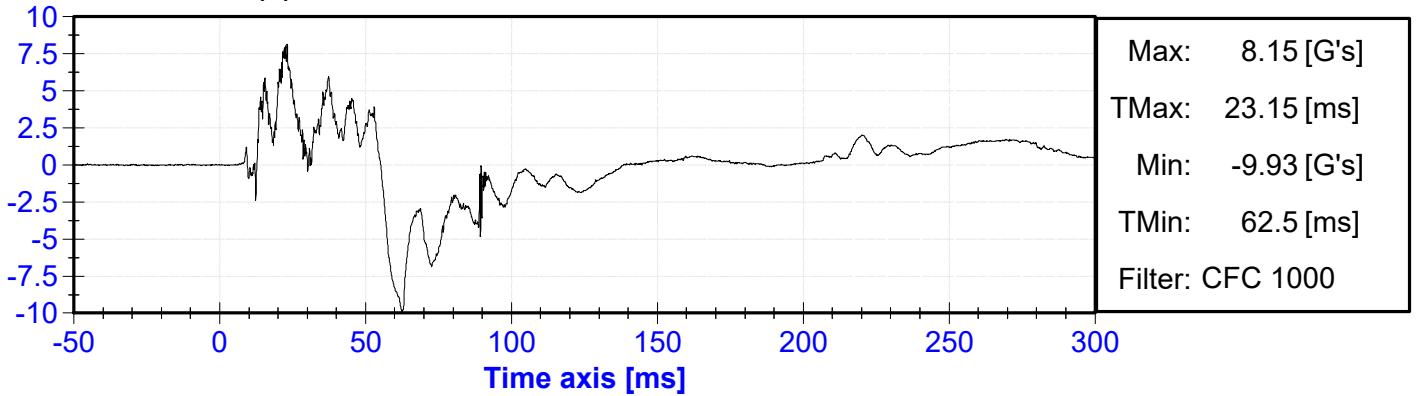
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ES-2re Head (Y) Redundant Acceleration vs. Time



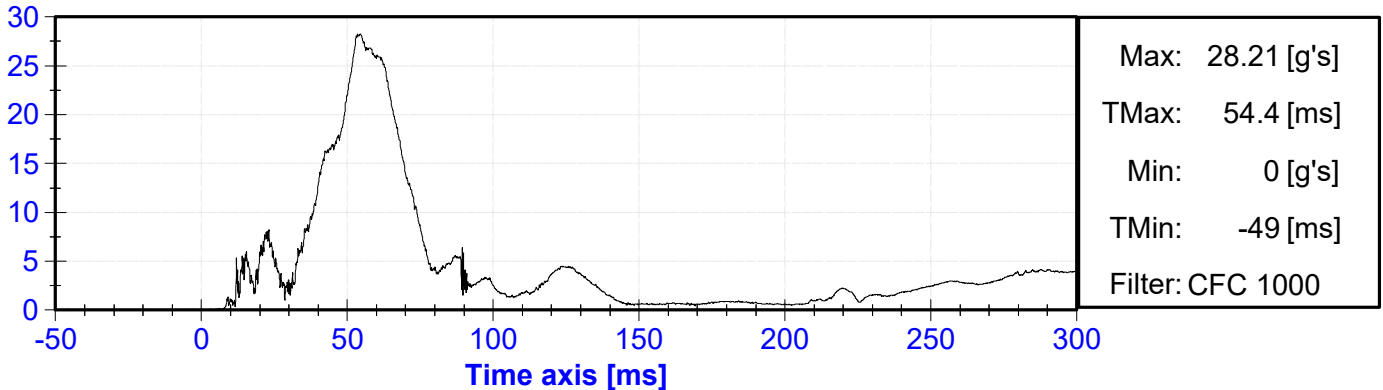
ACCELERATION [G's]

ES-2re Head (Z) Redundant Acceleration vs. Time



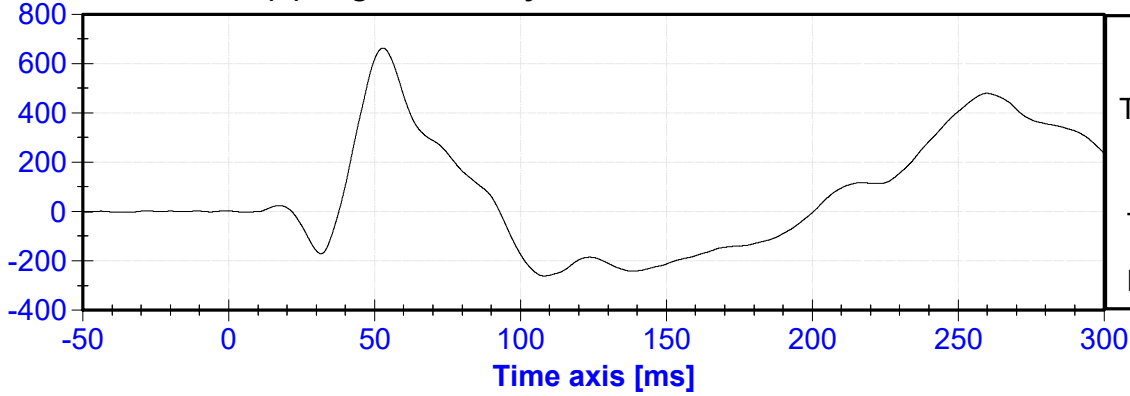
ACCELERATION [g's]

ES-2re Head Resultant Redundant Acceleration vs. Time



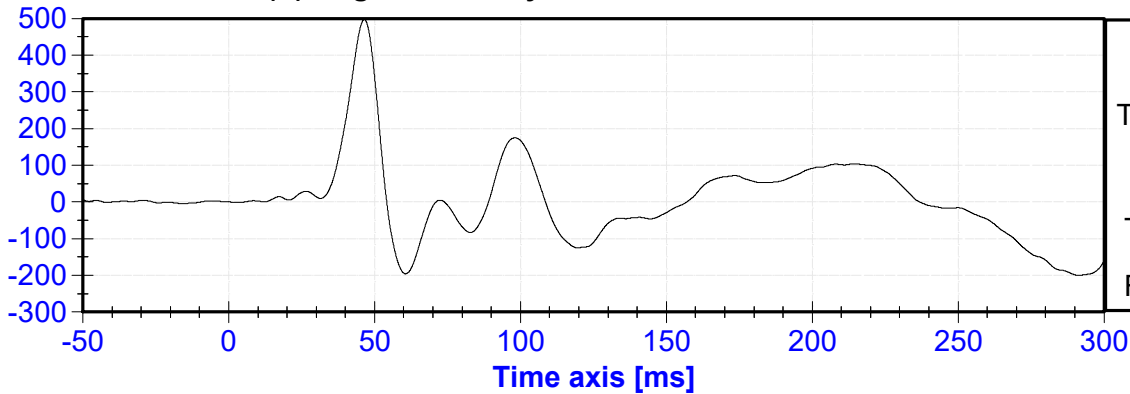
ANGULAR VEL [deg/s]

ES-2re Head (X) Angular Velocity vs. Time



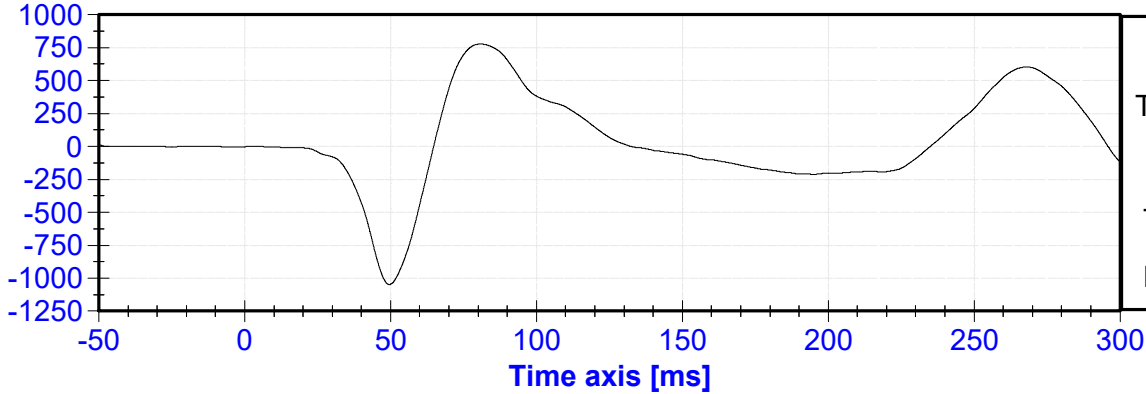
ANGULAR VEL [deg/s]

ES-2re Head (Y) Angular Velocity vs. Time



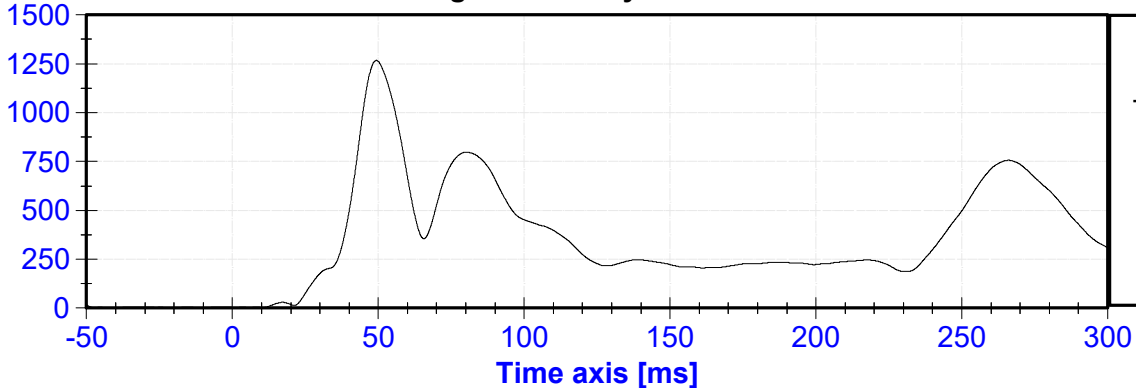
ANGULAR VEL [deg/s]

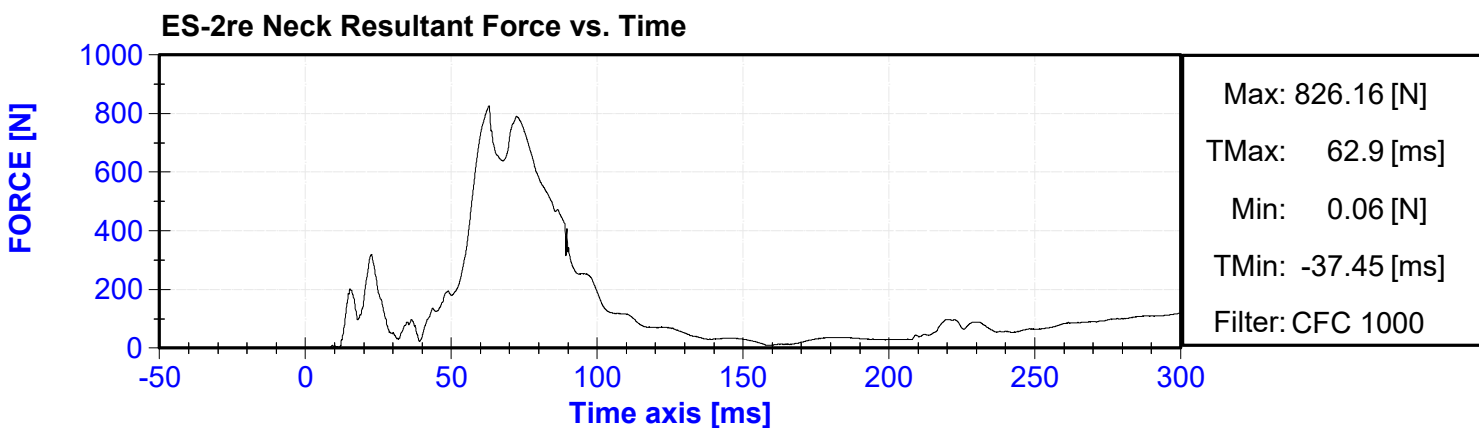
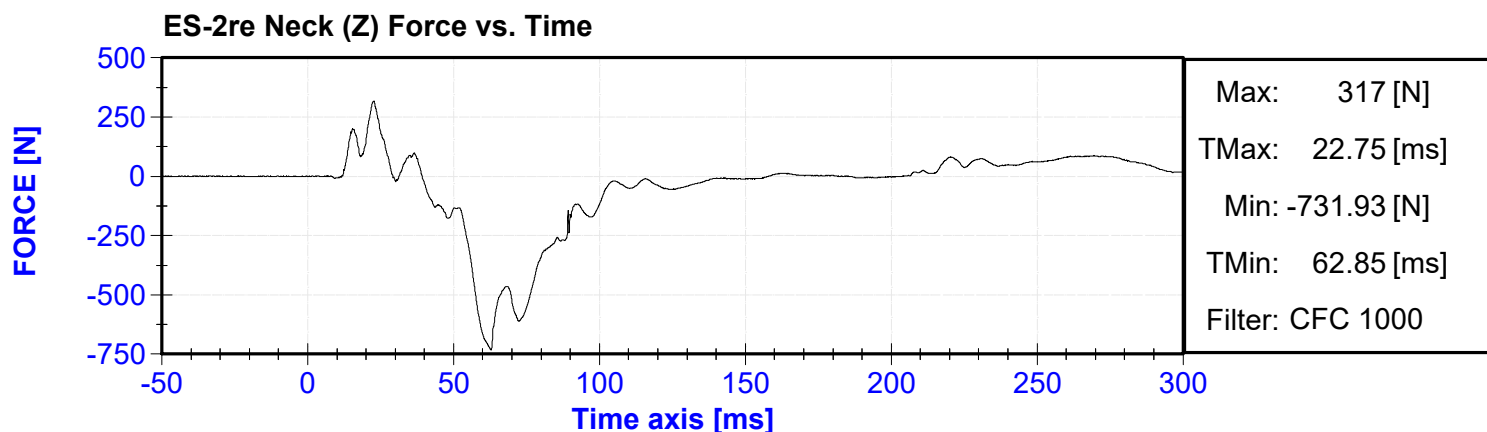
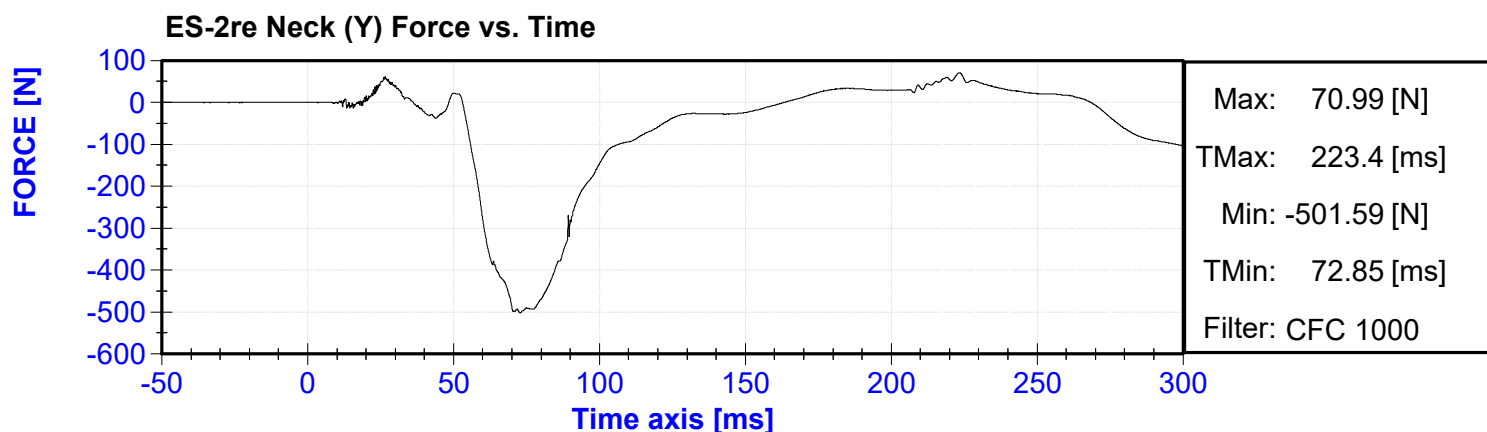
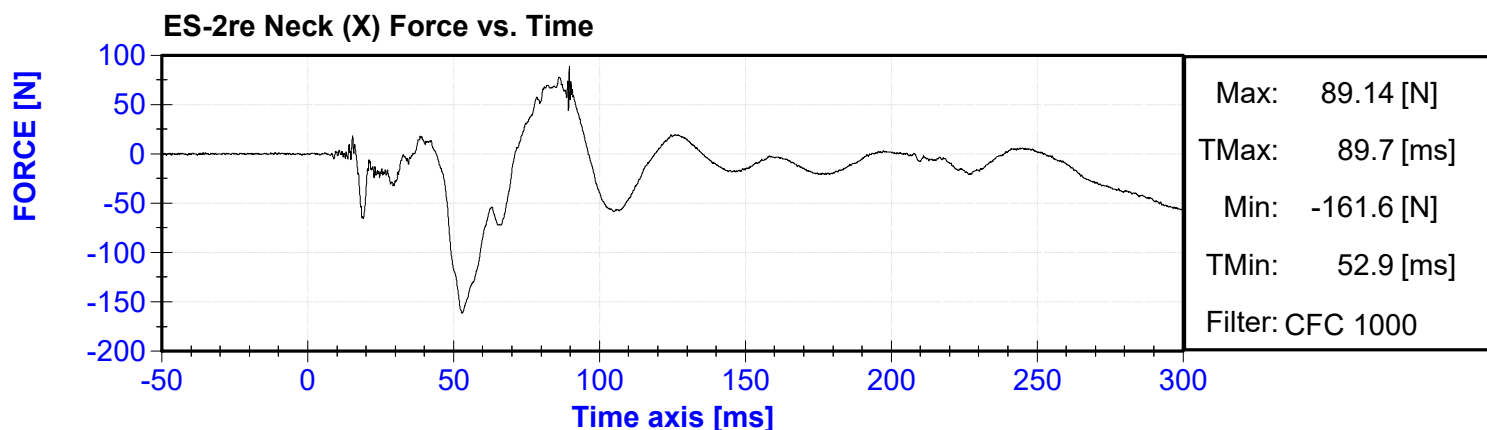
ES-2re Head (Z) Angular Velocity vs. Time

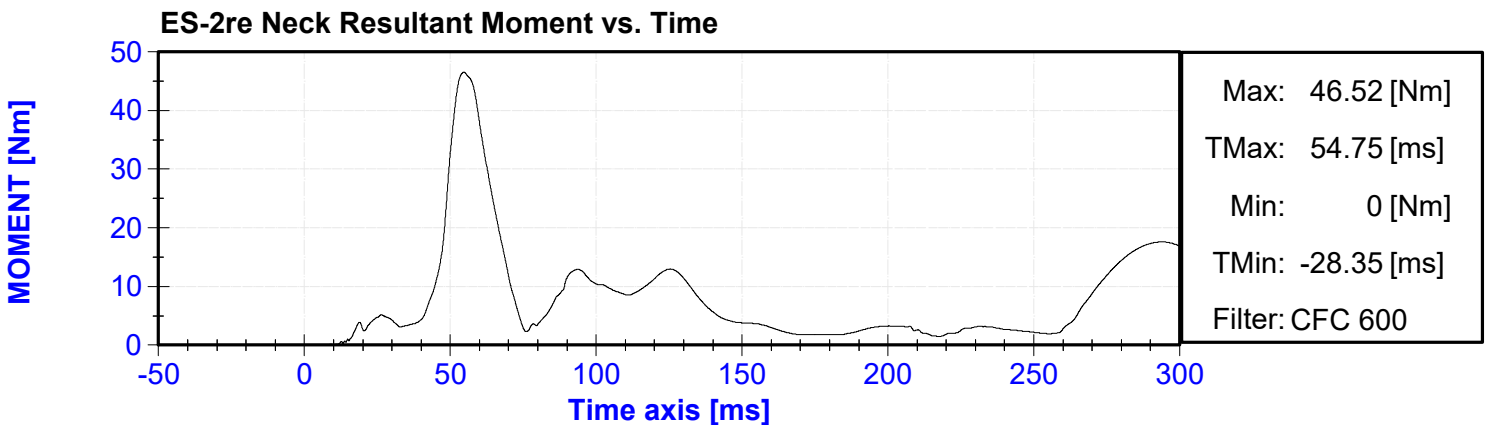
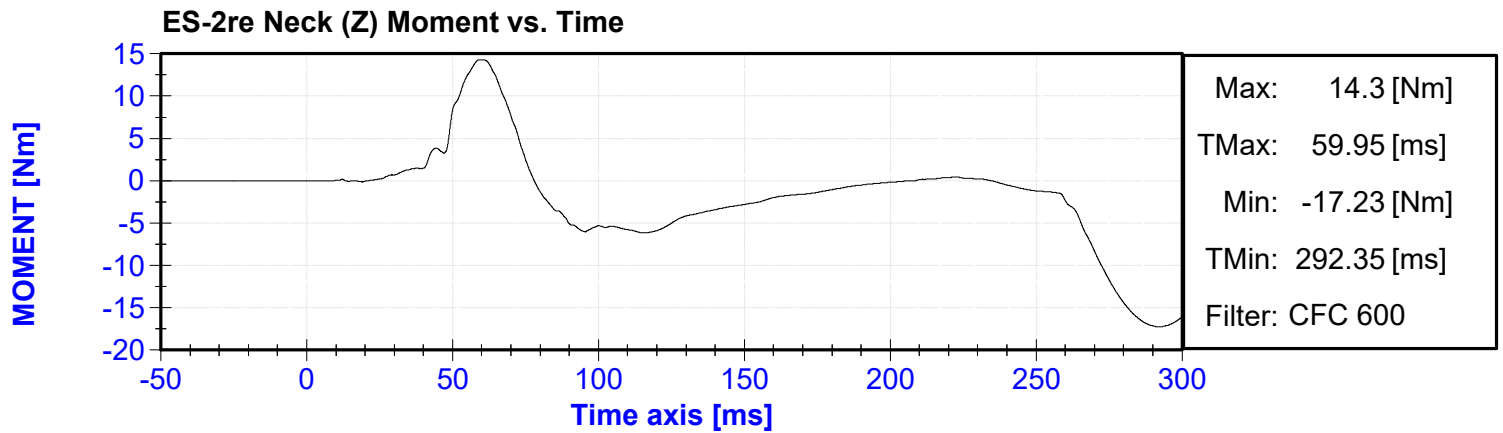
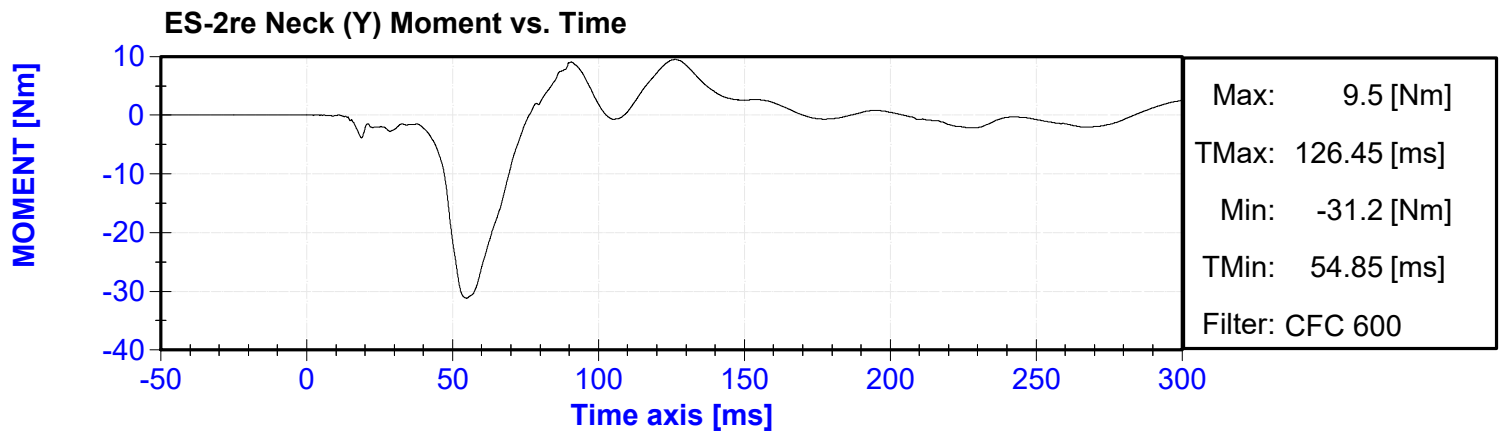
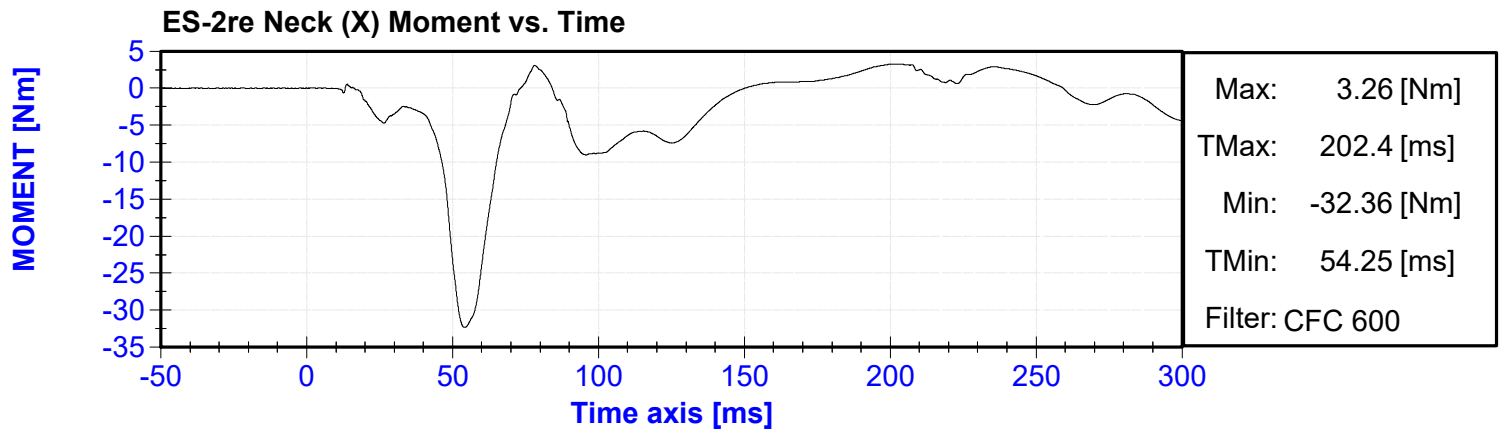


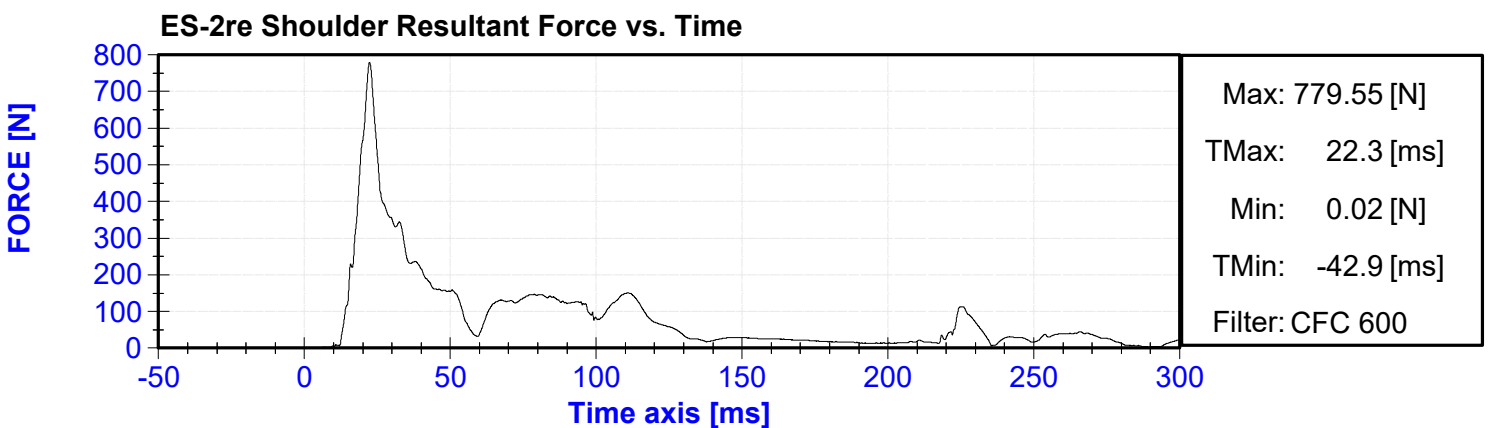
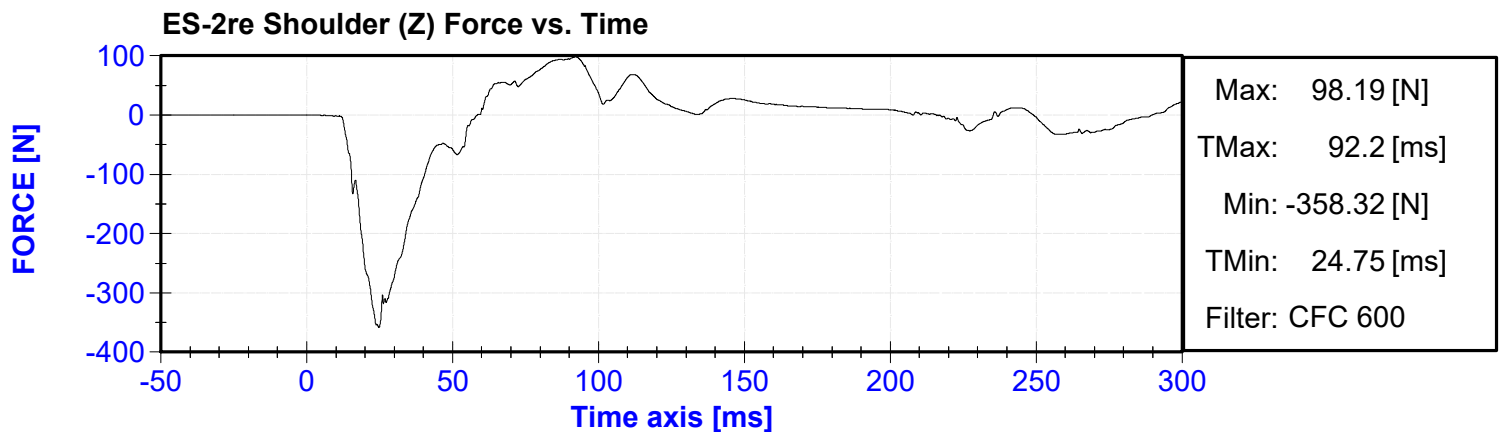
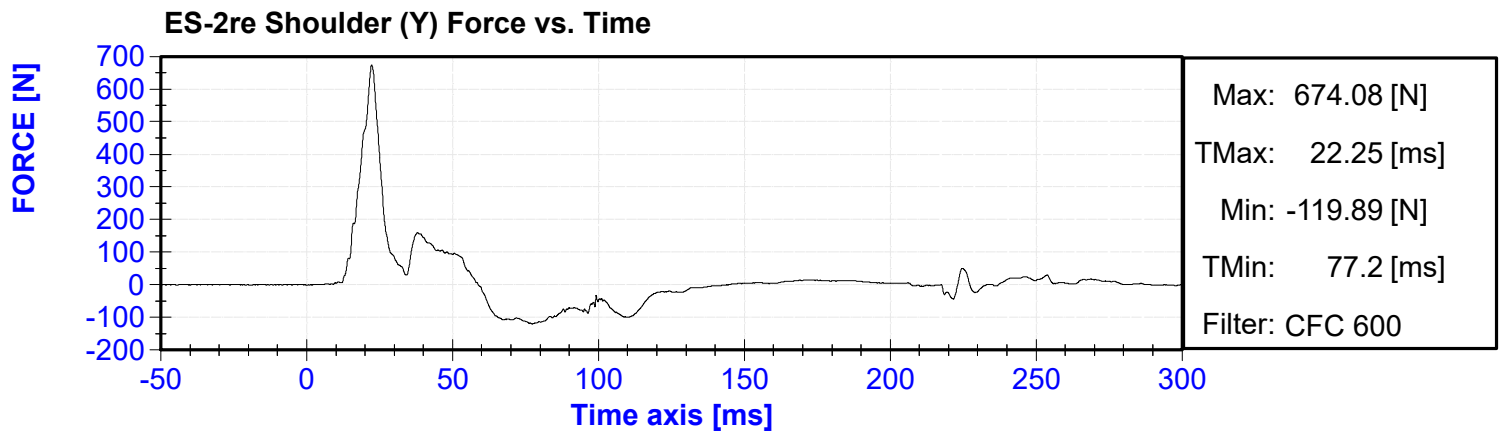
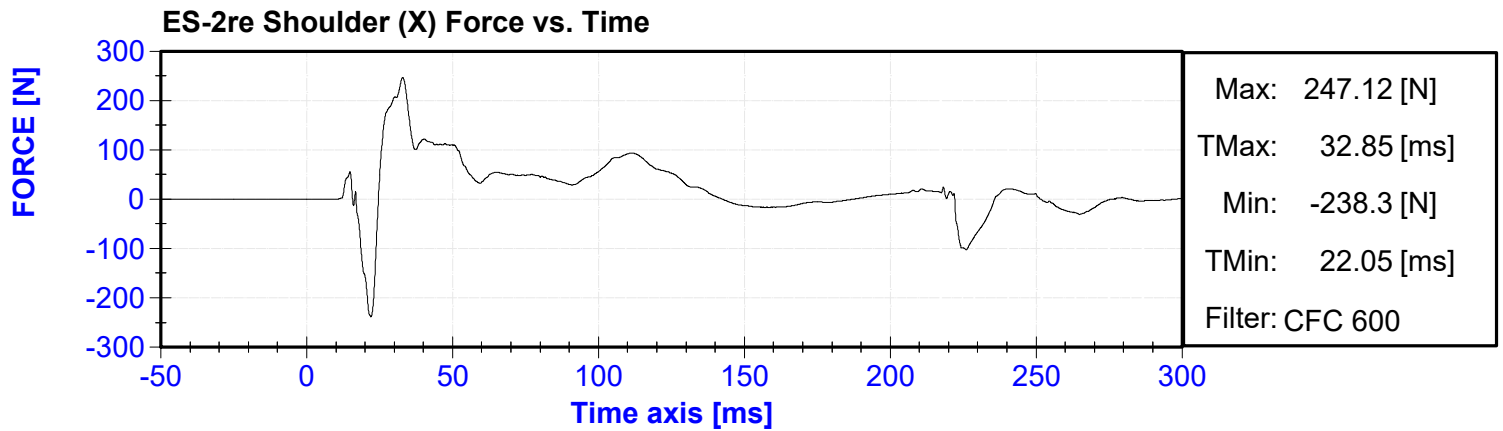
ANGULAR VEL [deg/s]

ES-2re Head Resultant Angular Velocity vs. Time



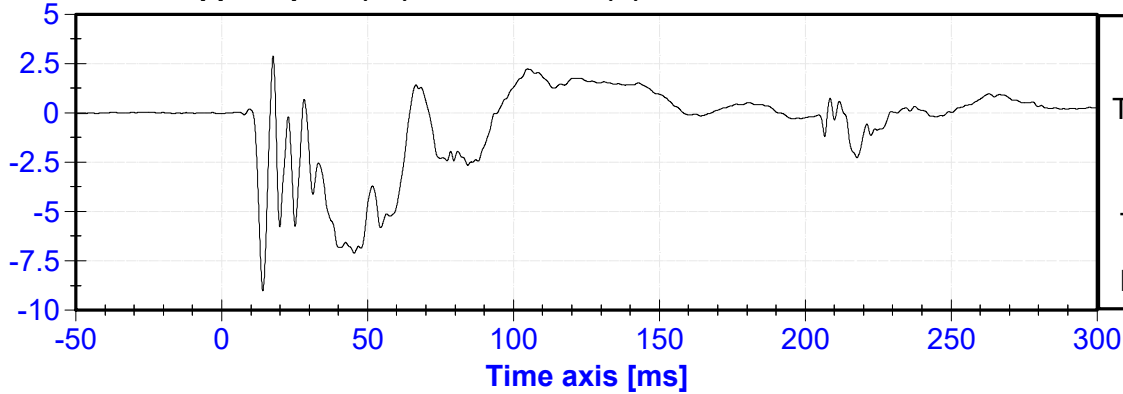






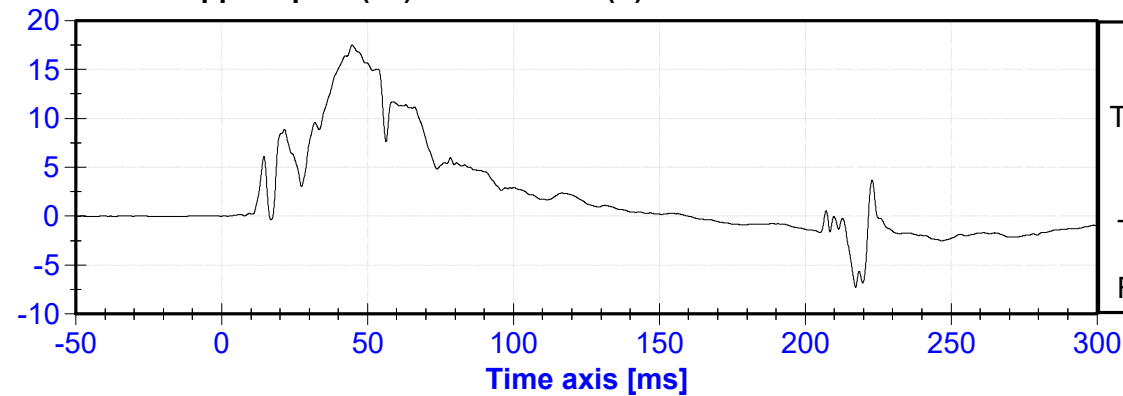
ACCELERATION [g's]

ES-2re Upper Spine (T1) Acceleration (X) vs. Time



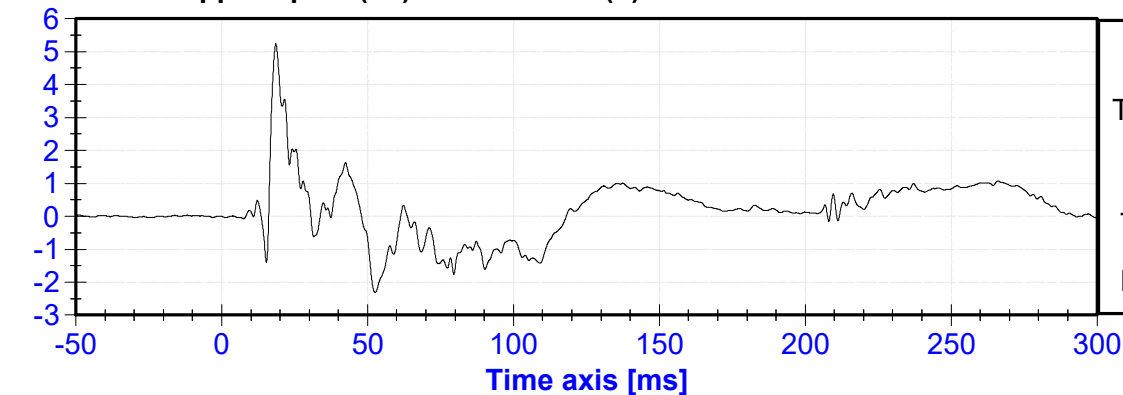
ACCELERATION [g's]

ES-2re Upper Spine (T1) Acceleration (Y) vs. Time



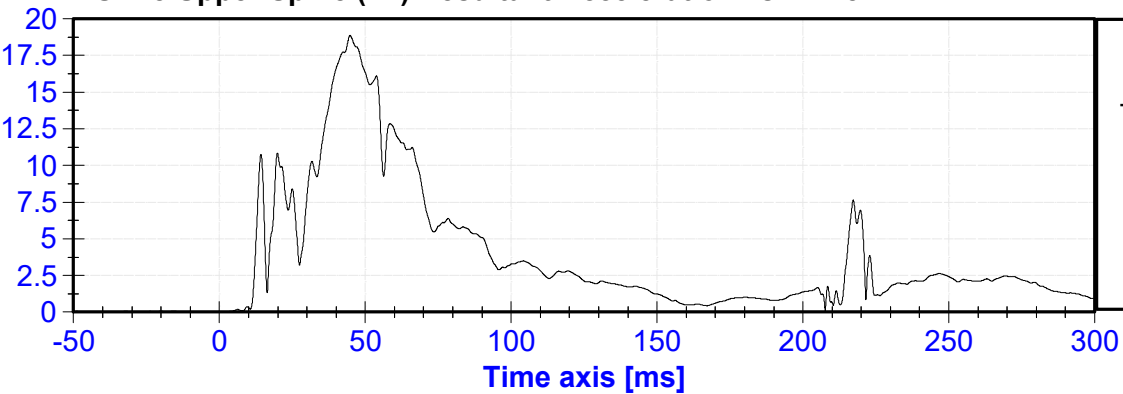
ACCELERATION [g's]

ES-2re Upper Spine (T1) Acceleration (Z) vs. Time



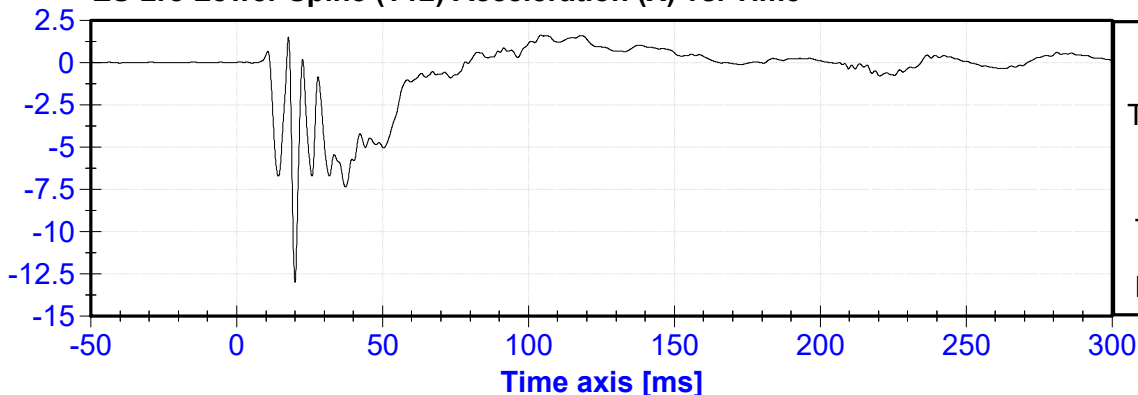
ACCELERATION [g's]

ES-2re Upper Spine (T1) Resultant Acceleration vs. Time



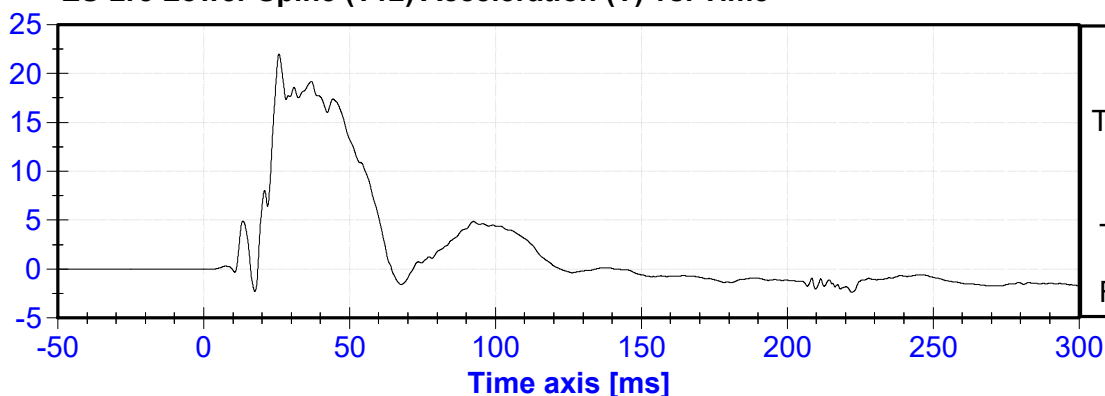
ACCELERATION [g's]

ES-2re Lower Spine (T12) Acceleration (X) vs. Time



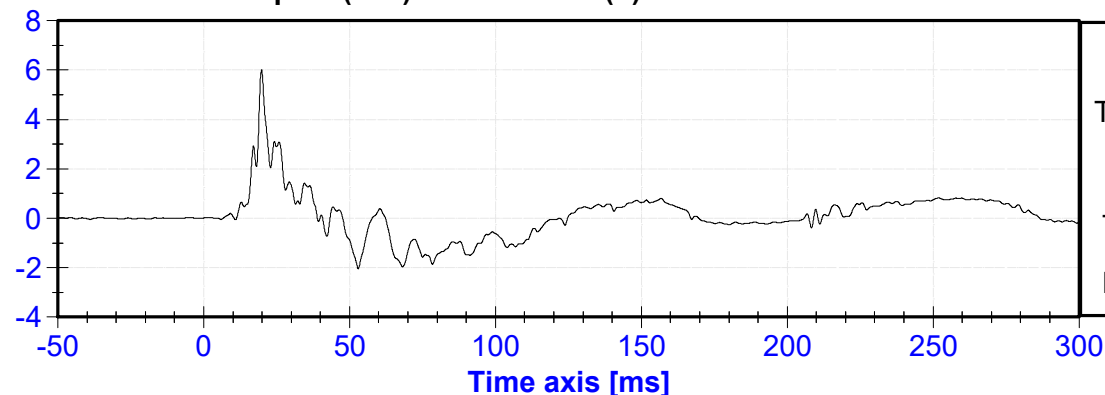
ACCELERATION [G's]

ES-2re Lower Spine (T12) Acceleration (Y) vs. Time



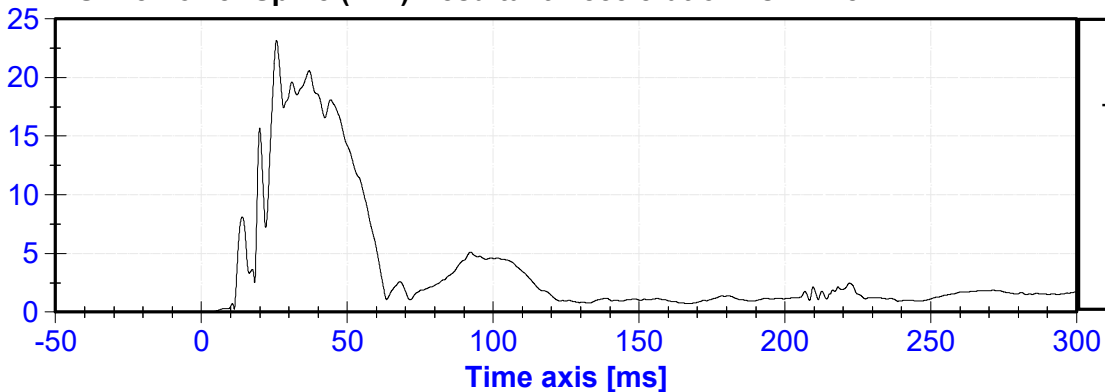
ACCELERATION [G's]

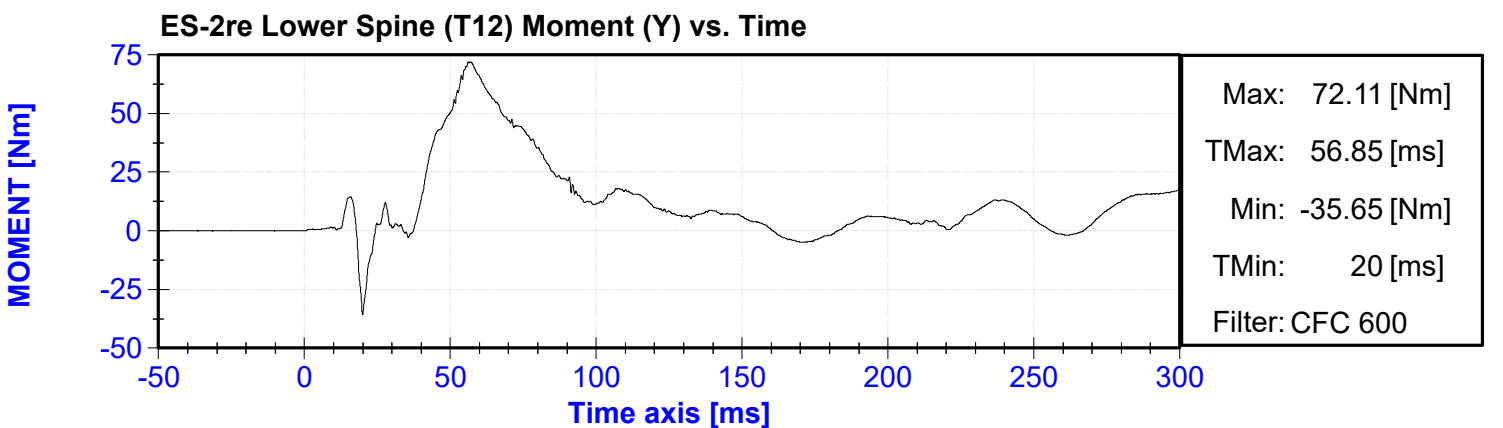
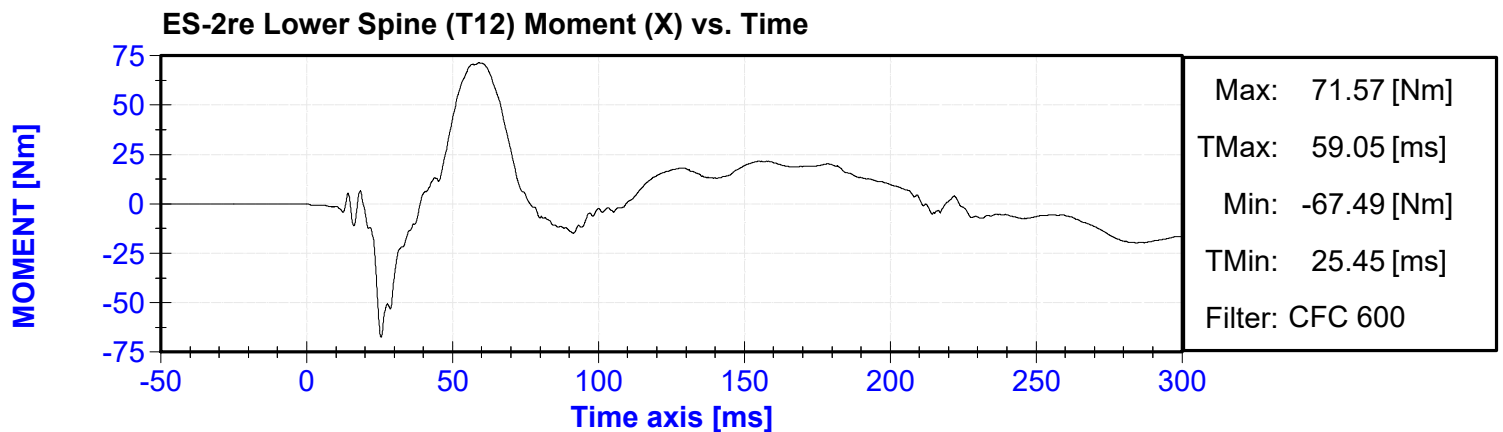
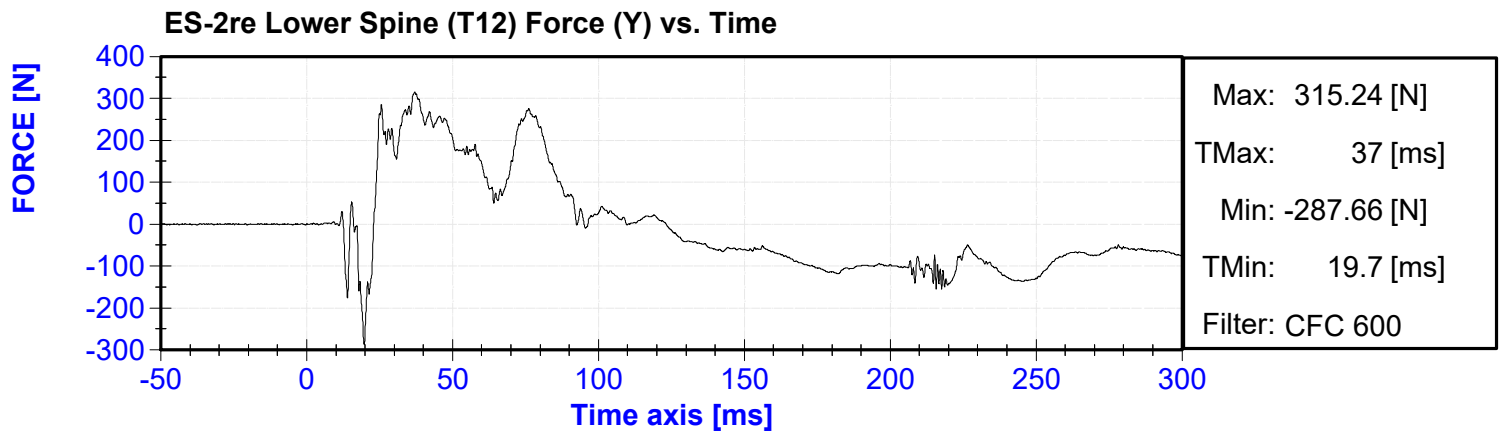
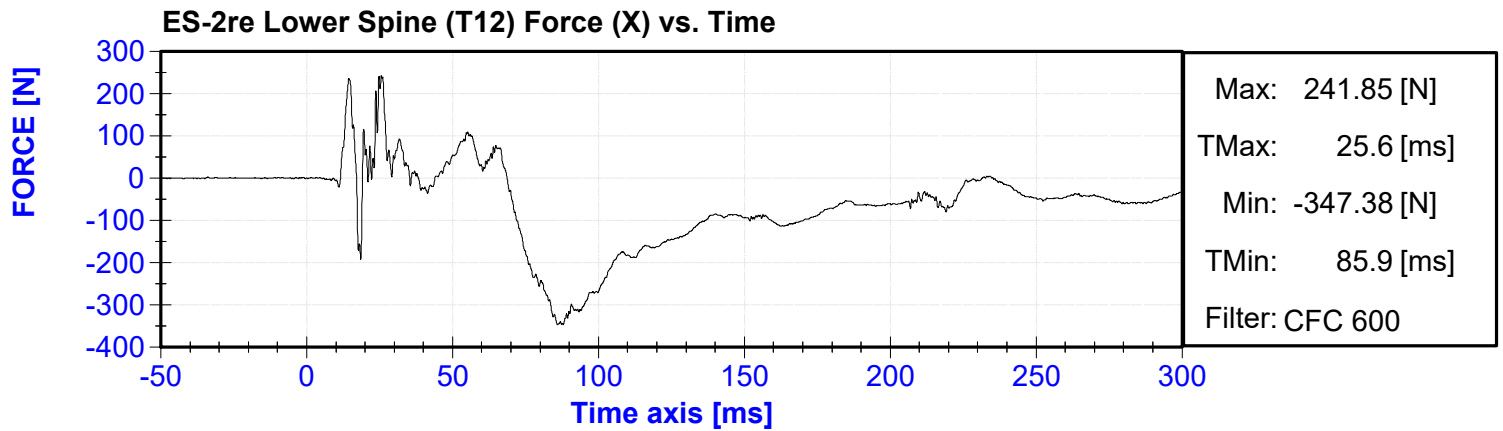
ES-2re Lower Spine (T12) Acceleration (Z) vs. Time



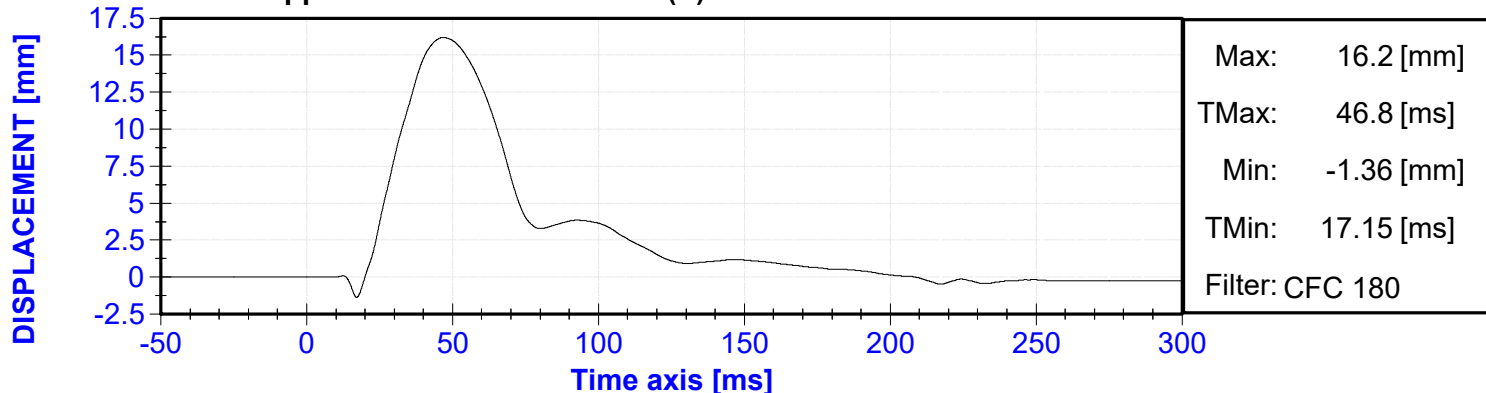
ACCELERATION [g's]

ES-2re Lower Spine (T12) Resultant Acceleration vs. Time

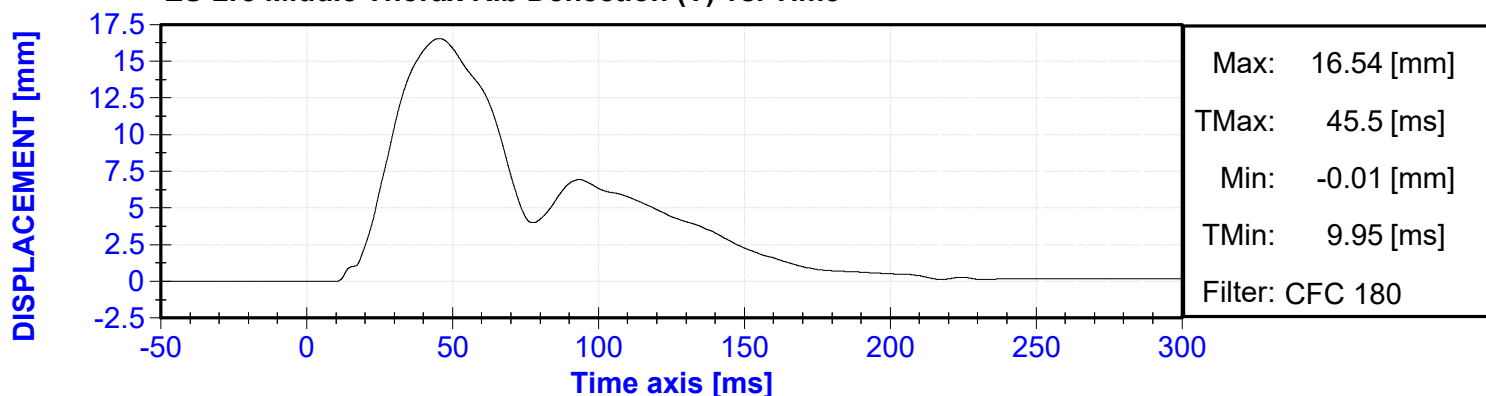




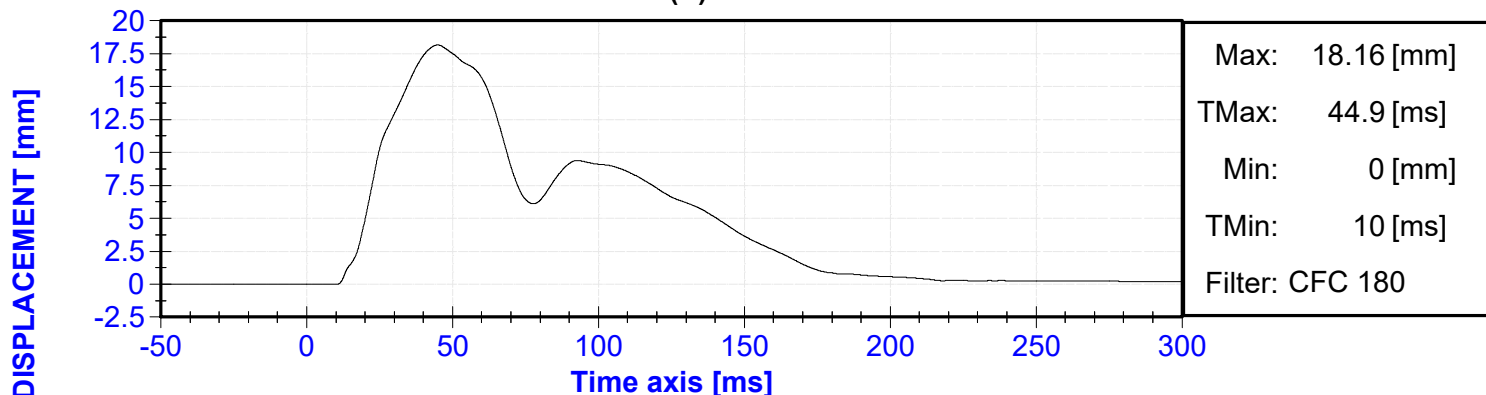
ES-2re Upper Thorax Rib Deflection (Y) vs. Time



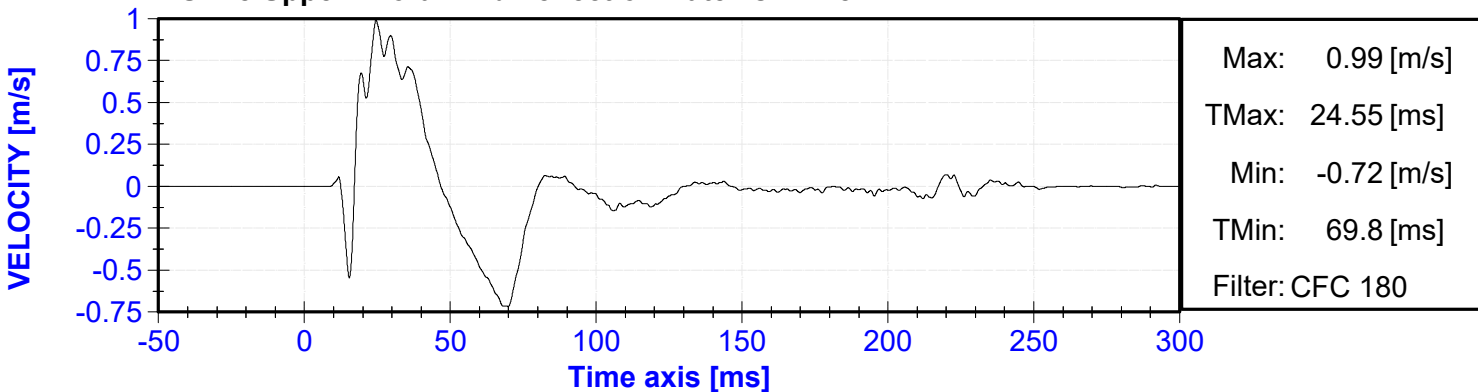
ES-2re Middle Thorax Rib Deflection (Y) vs. Time



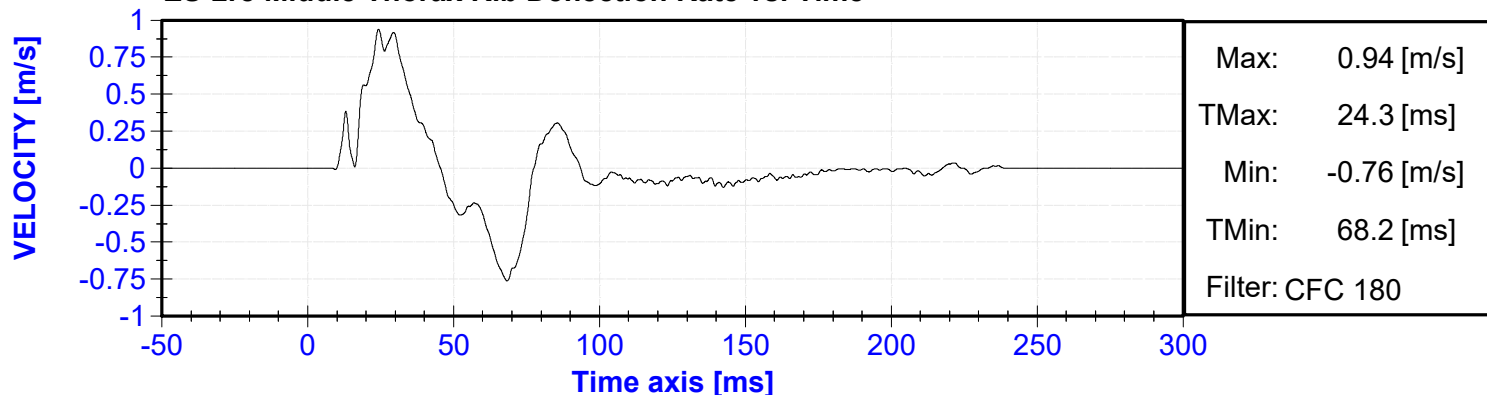
ES-2re Lower Thorax Rib Deflection (Y) vs. Time



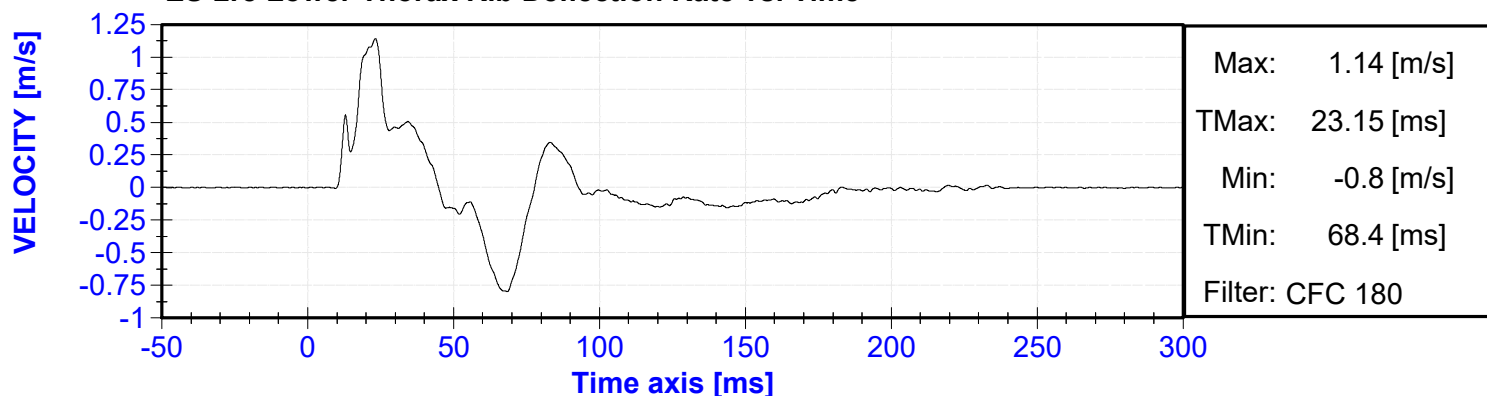
ES-2re Upper Thorax Rib Deflection Rate vs. Time



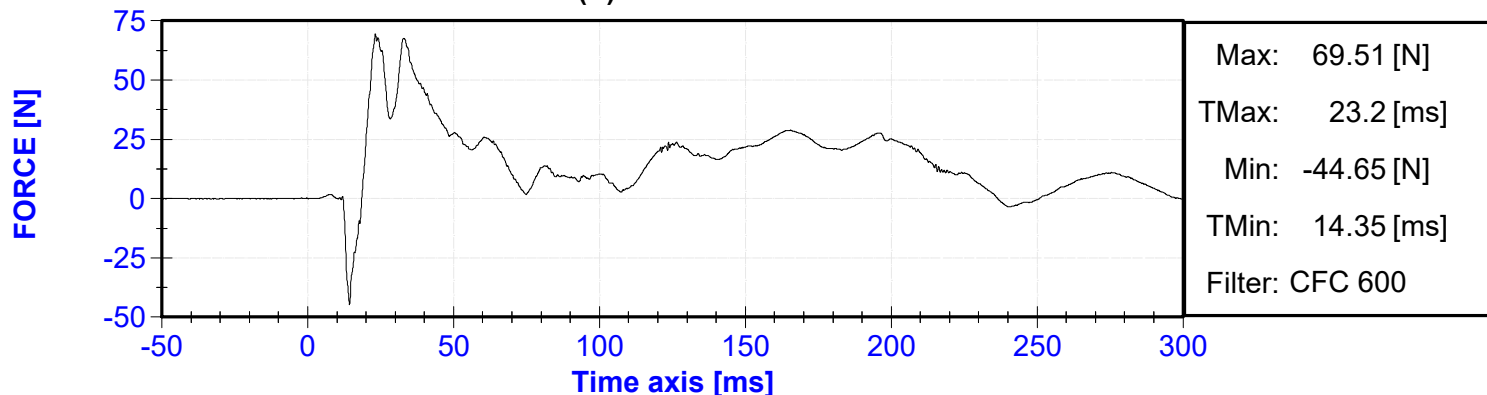
ES-2re Middle Thorax Rib Deflection Rate vs. Time



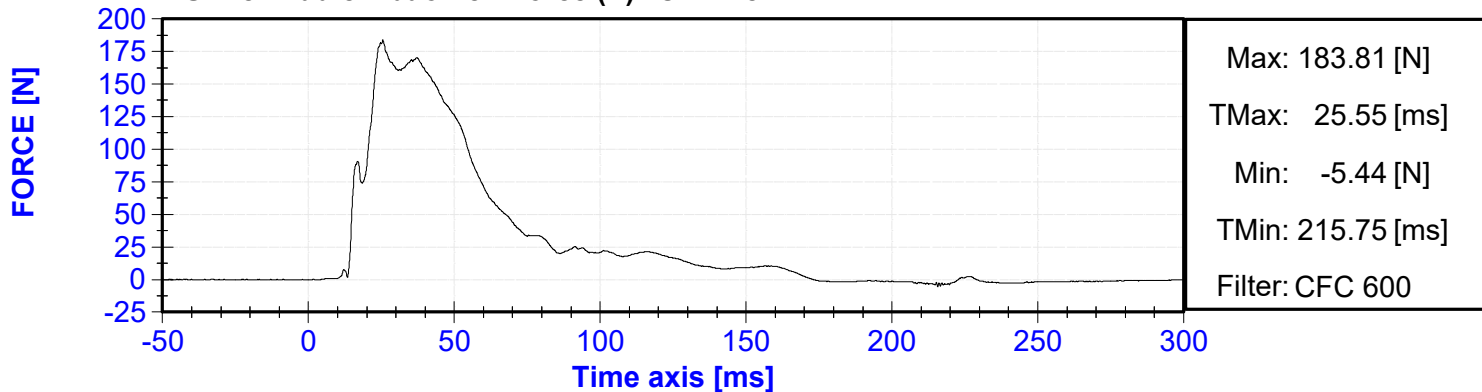
ES-2re Lower Thorax Rib Deflection Rate vs. Time



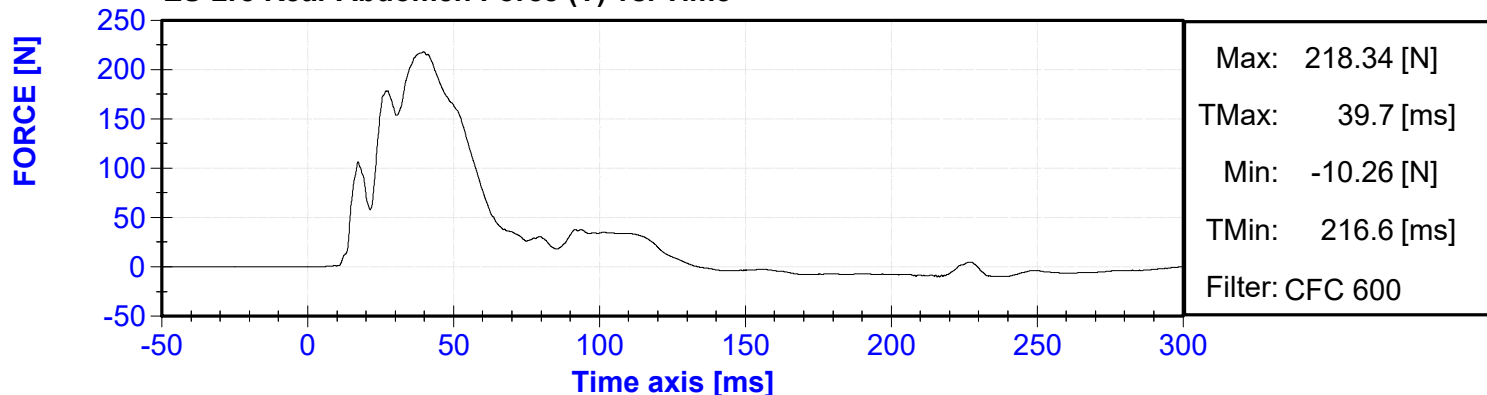
ES-2re Front Abdomen Force (Y) vs. Time



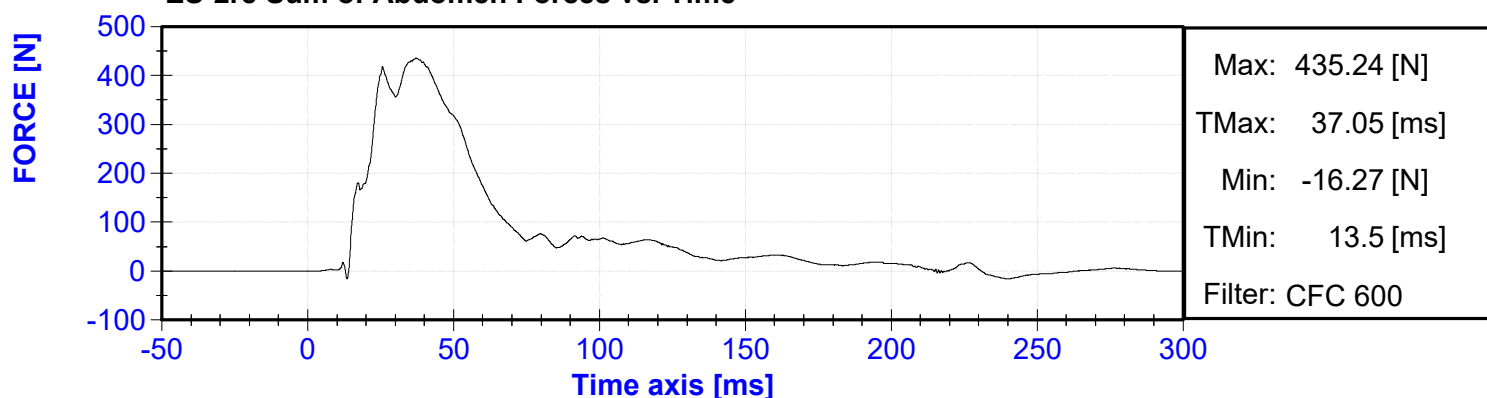
ES-2re Middle Abdomen Force (Y) vs. Time



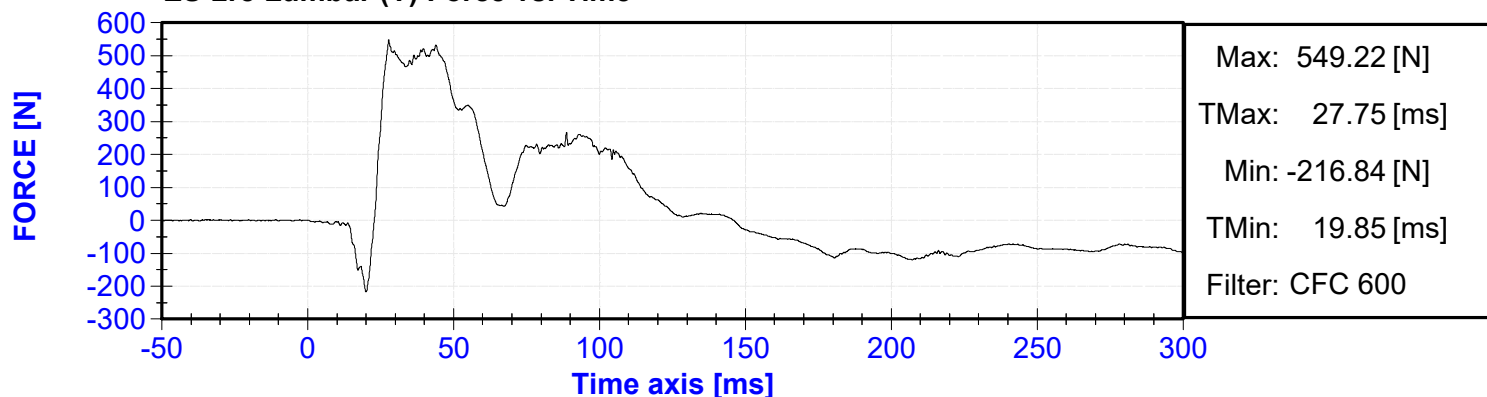
ES-2re Rear Abdomen Force (Y) vs. Time



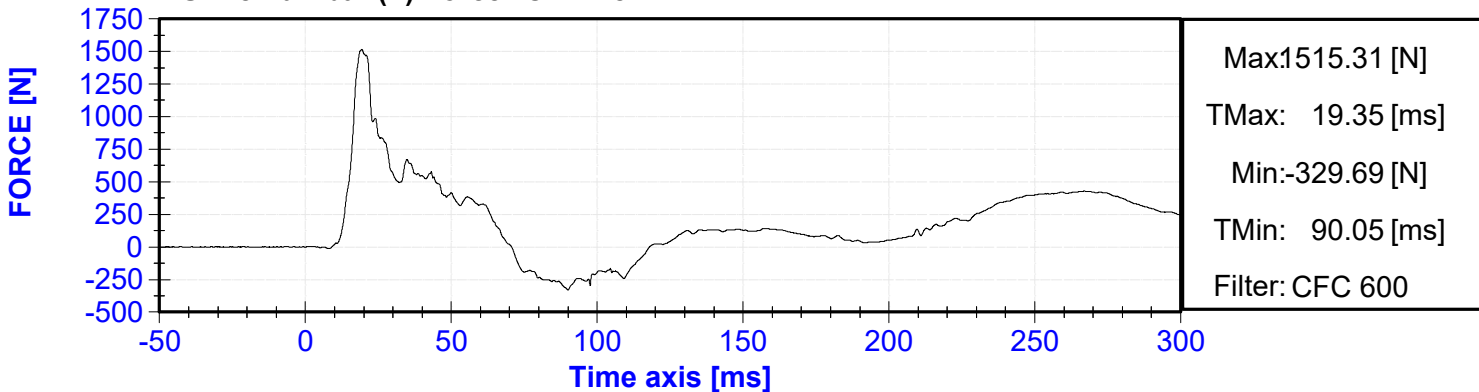
ES-2re Sum of Abdomen Forces vs. Time

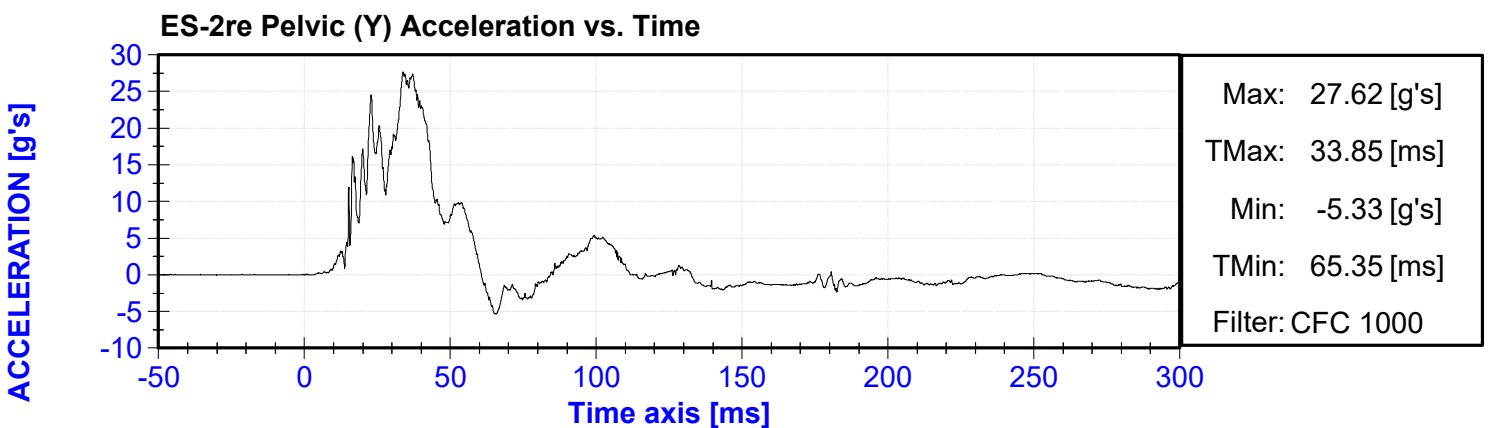
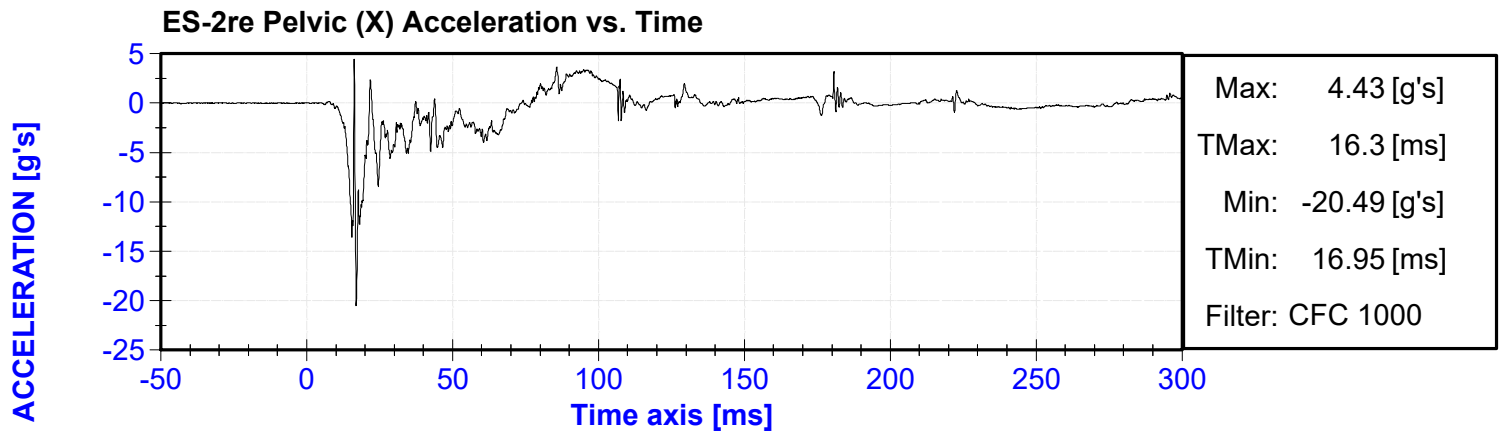
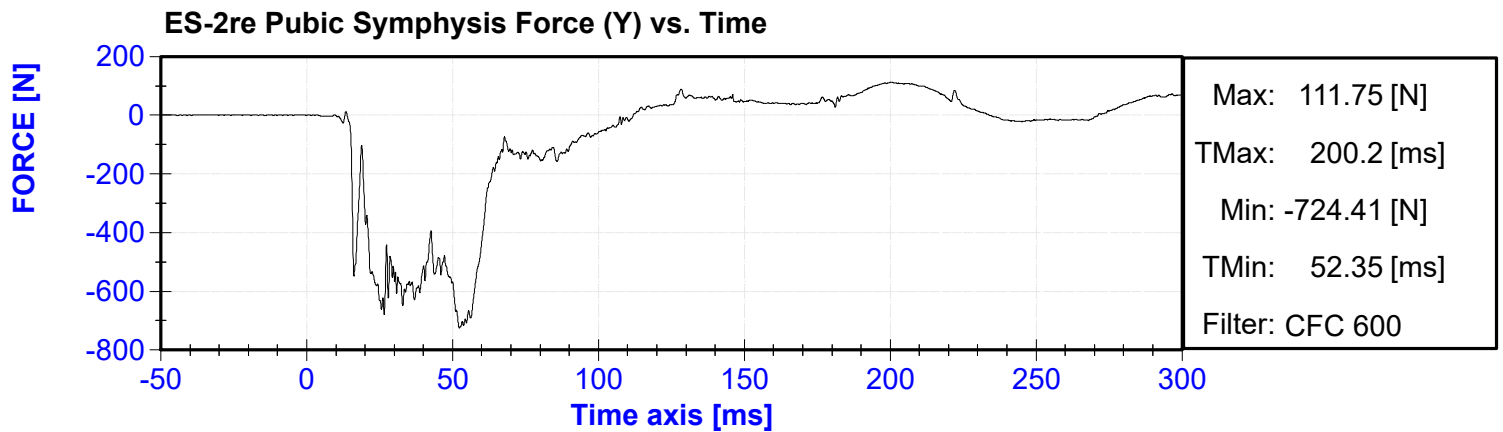
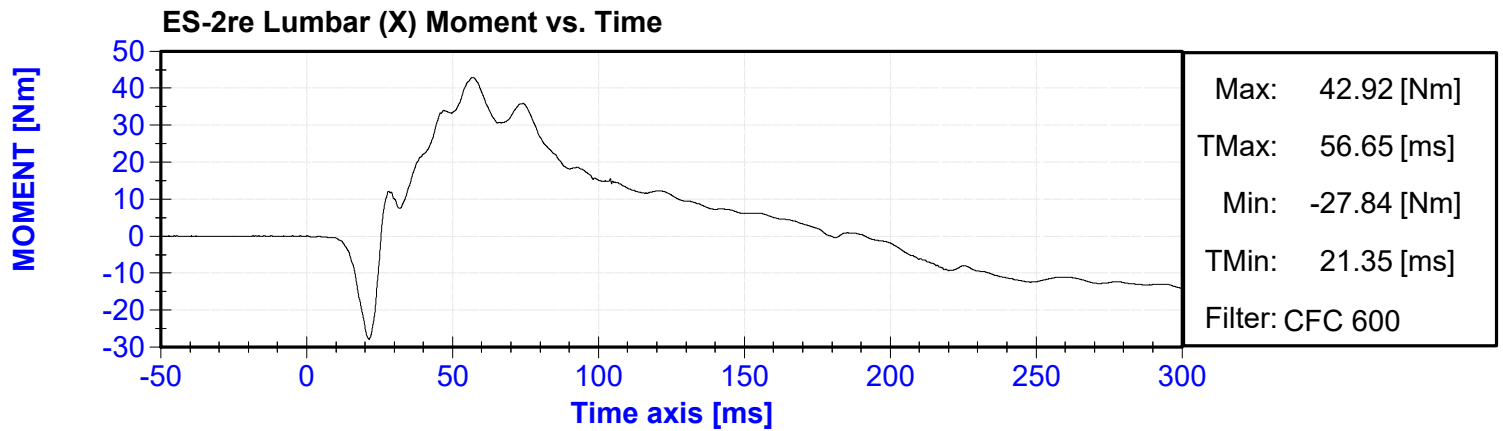


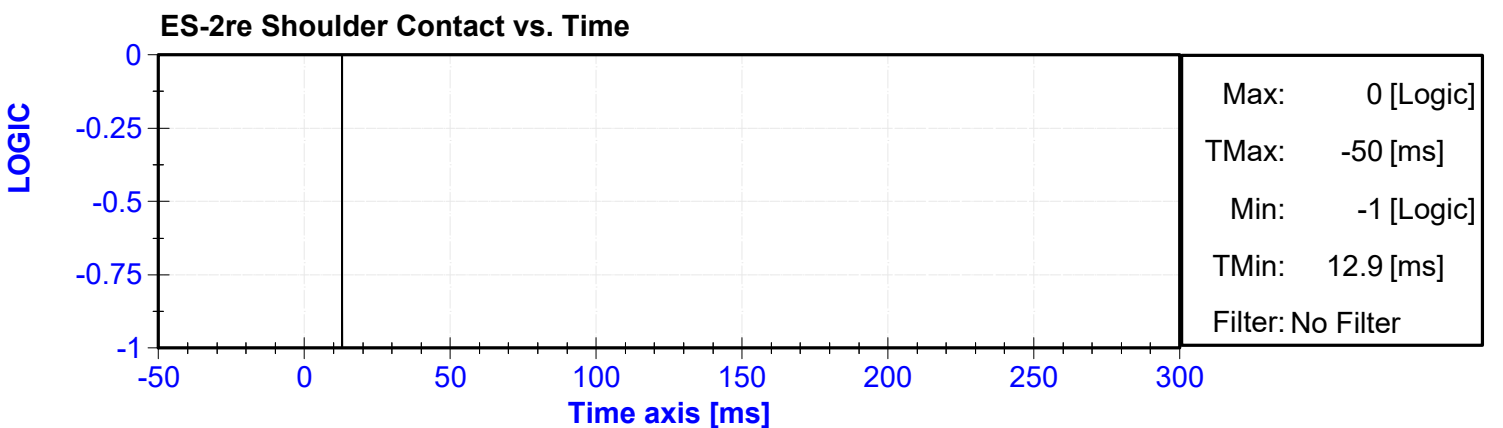
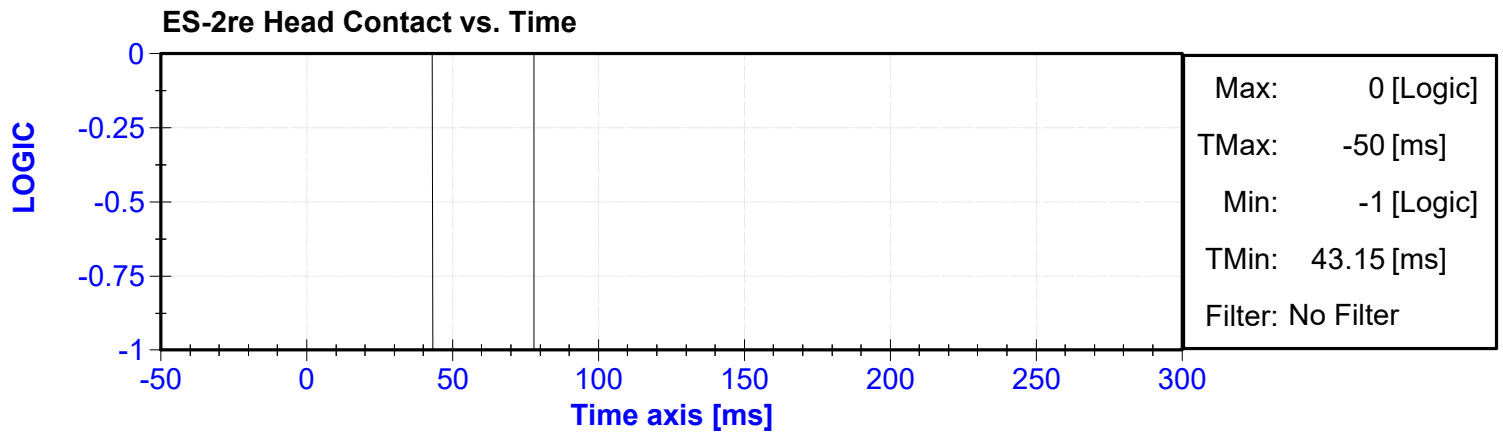
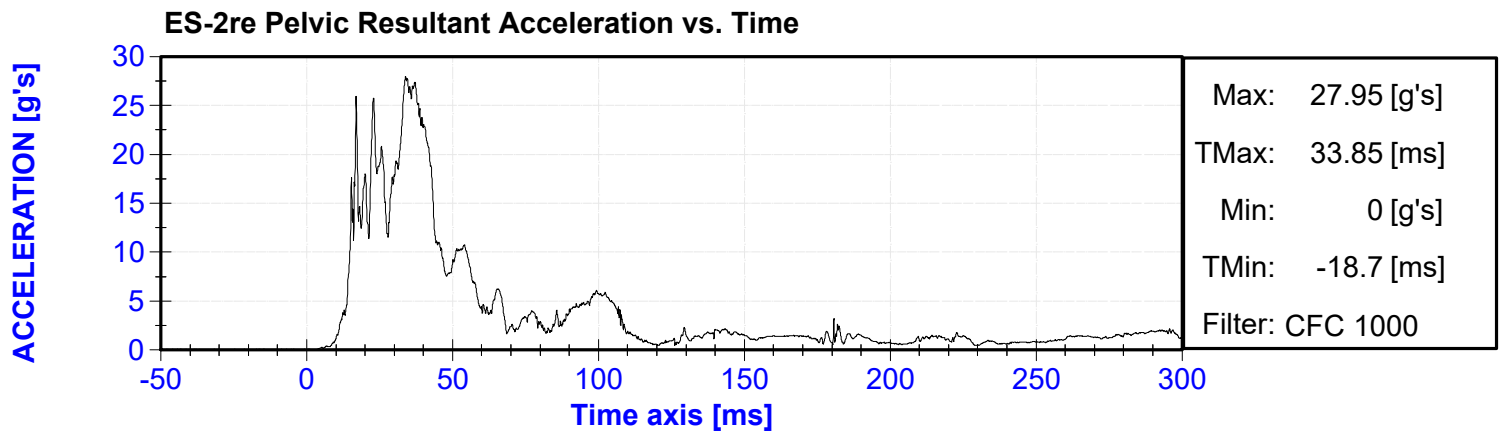
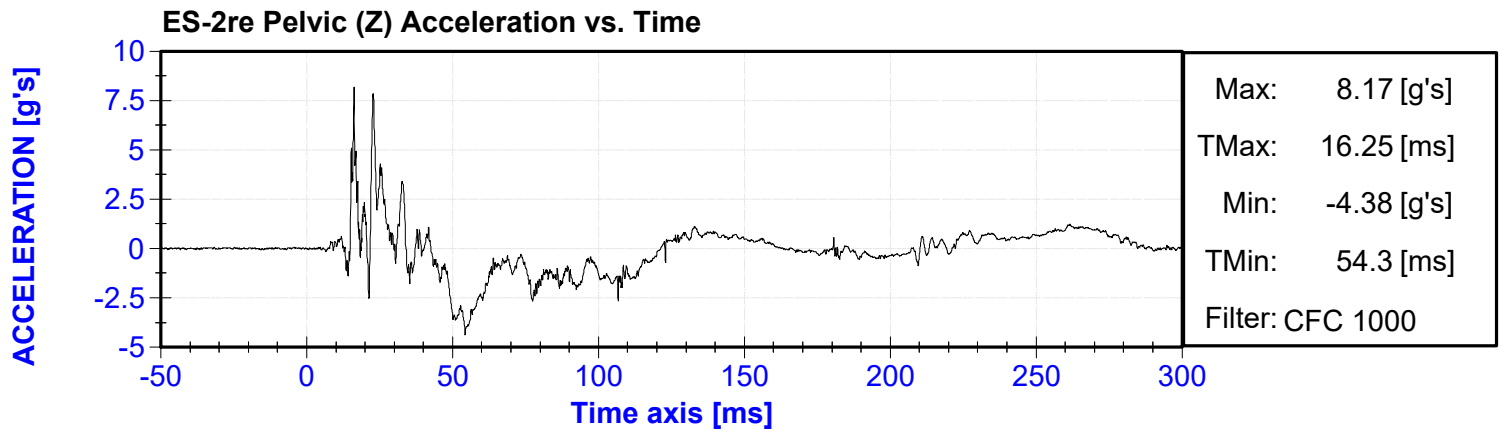
ES-2re Lumbar (Y) Force vs. Time

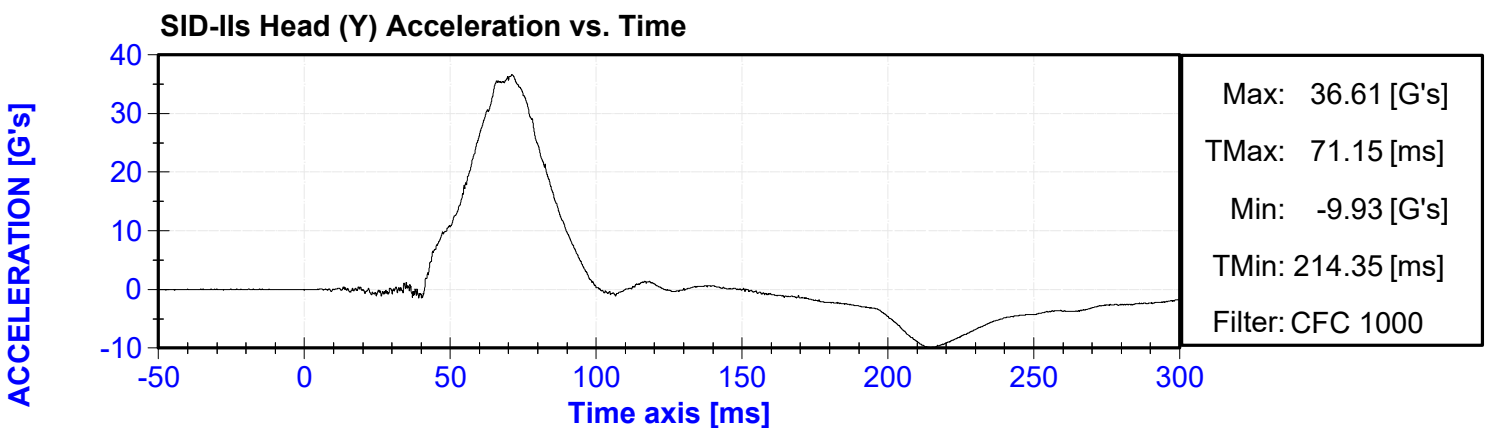
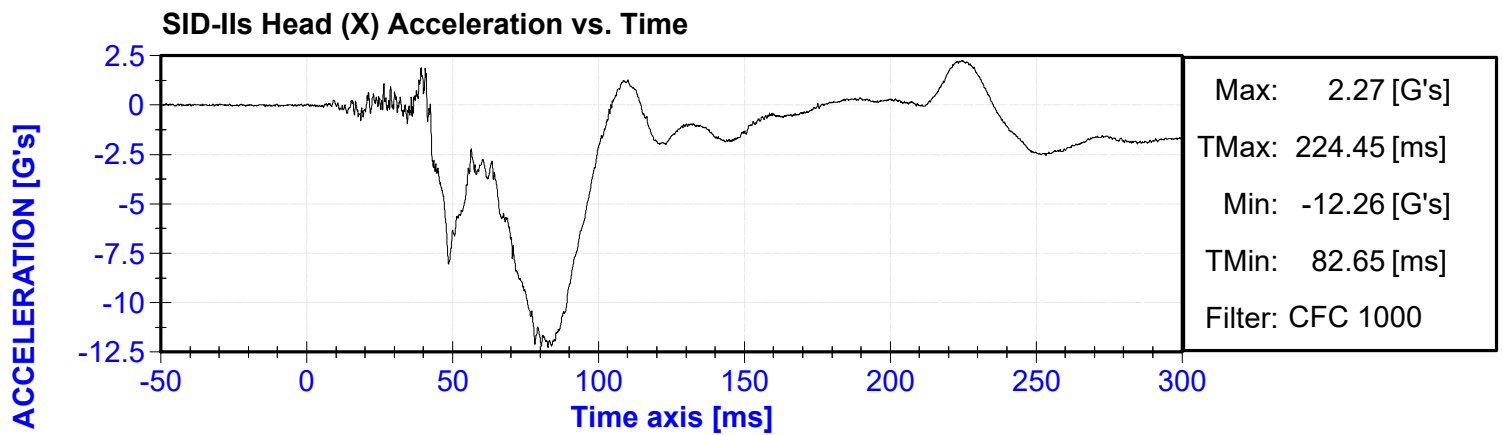
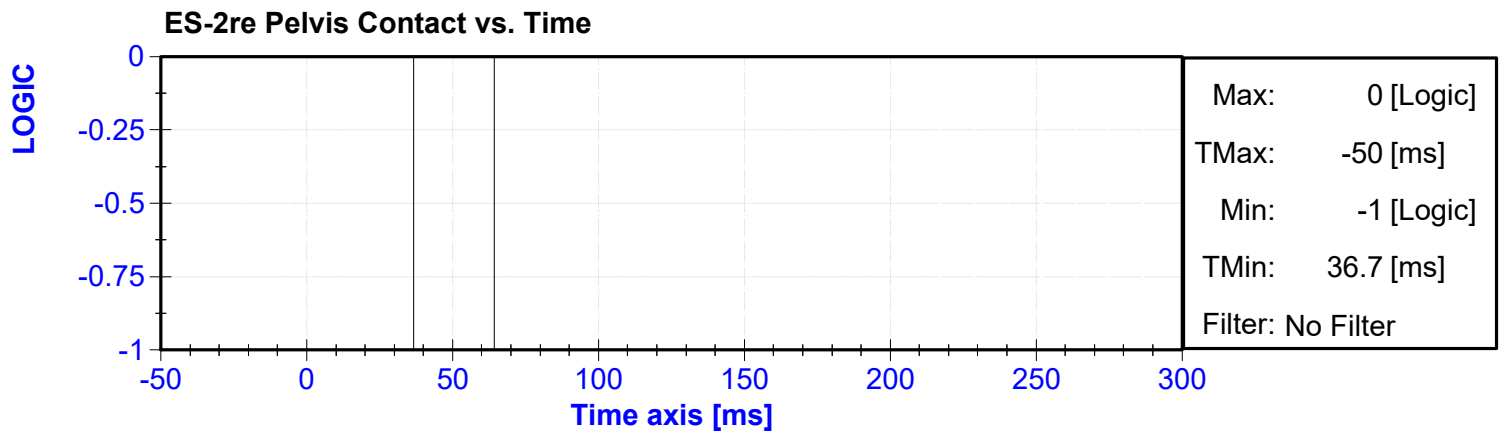
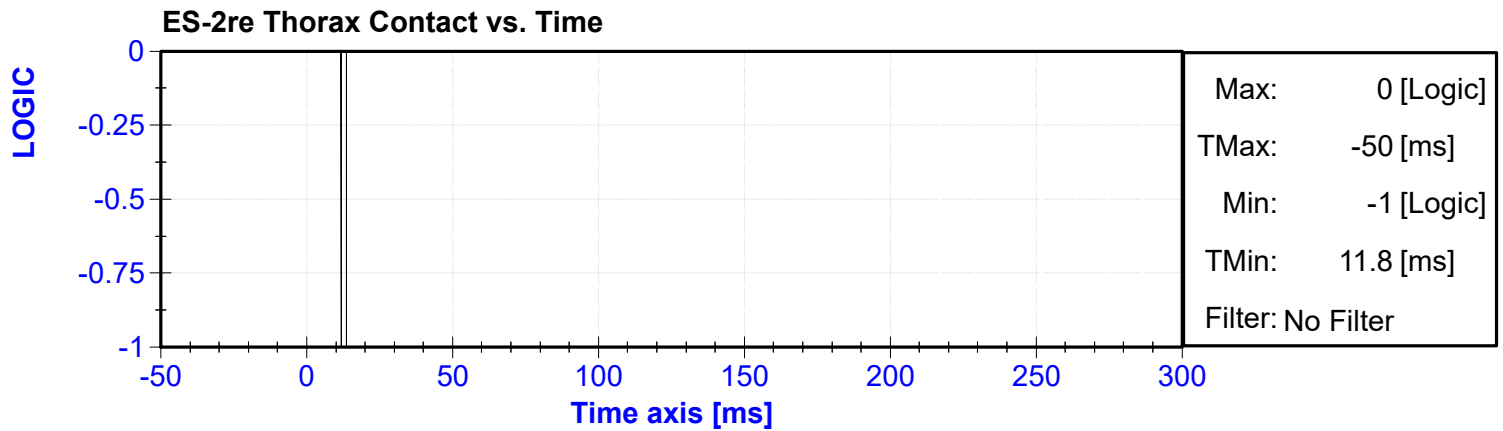


ES-2re Lumbar (Z) Force vs. Time



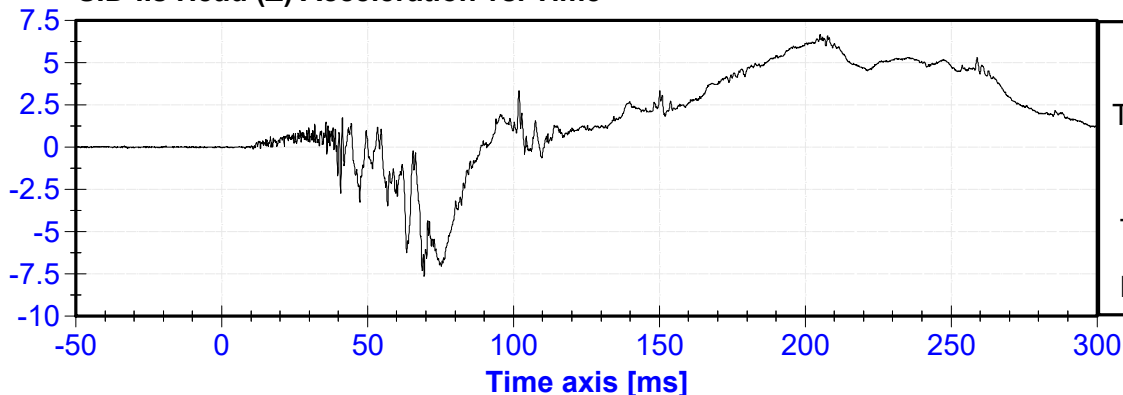






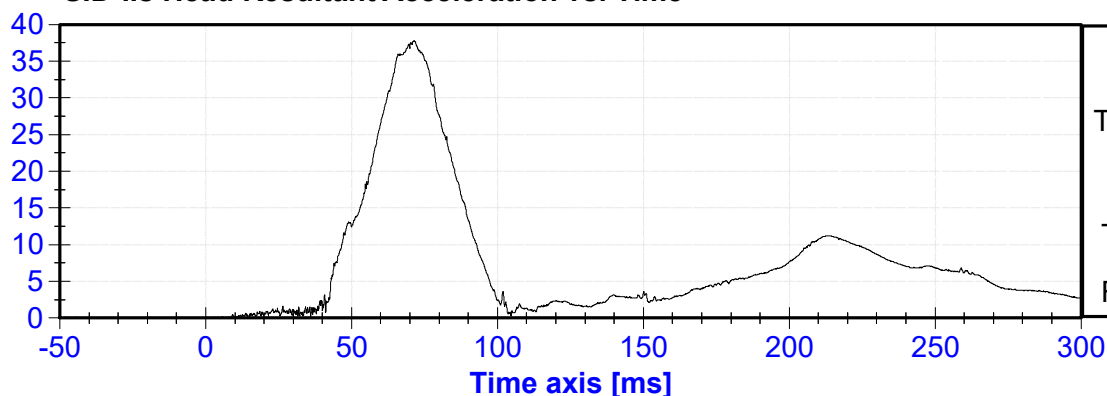
ACCELERATION [G's]

SID-Ils Head (Z) Acceleration vs. Time



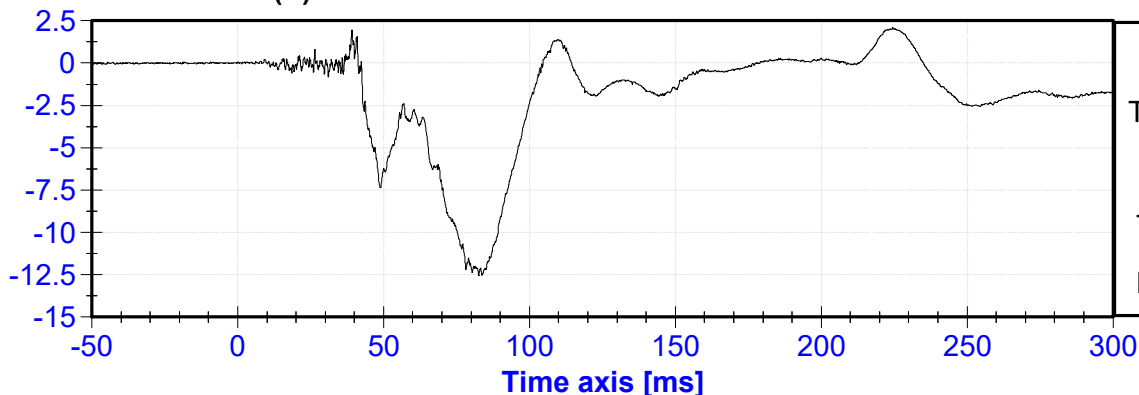
ACCELERATION [g's]

SID-Ils Head Resultant Acceleration vs. Time



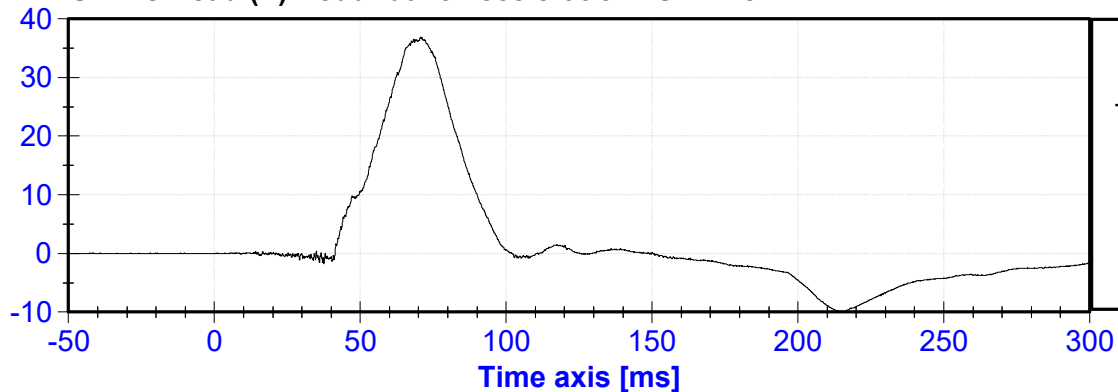
ACCELERATION [G's]

SID-Ils Head (X) Redundant Acceleration vs. Time



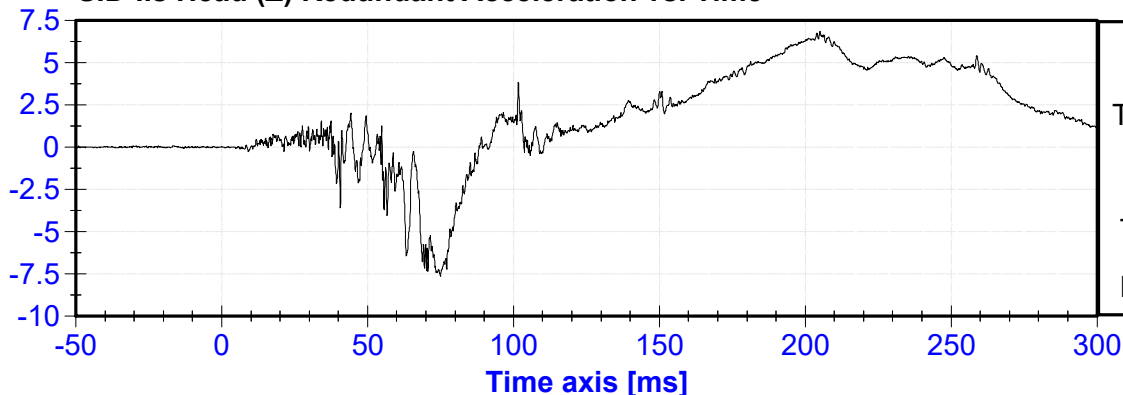
ACCELERATION [G's]

SID-Ils Head (Y) Redundant Acceleration vs. Time



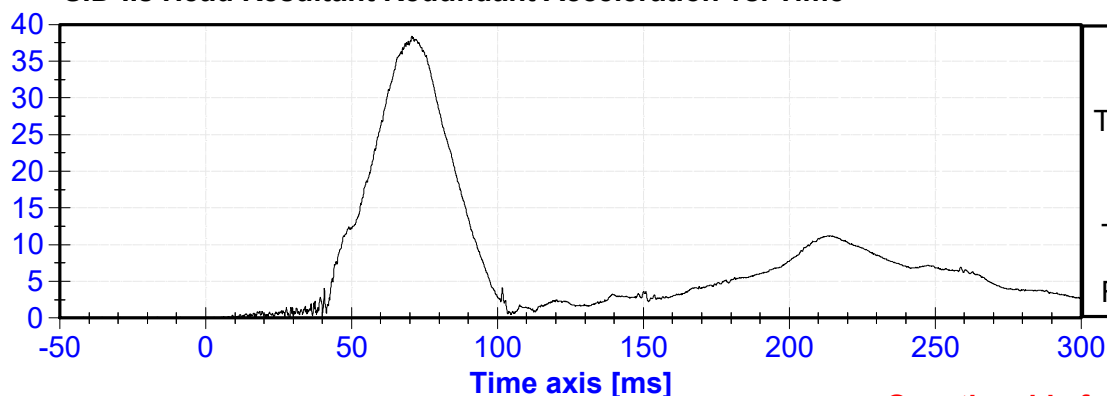
ACCELERATION [G's]

SID-IIs Head (Z) Redundant Acceleration vs. Time



ACCELERATION [g's]

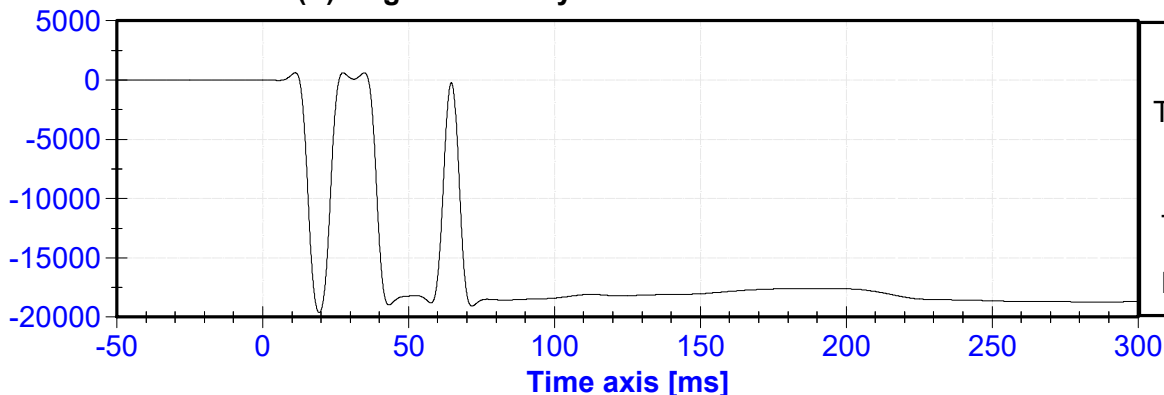
SID-IIs Head Resultant Redundant Acceleration vs. Time



Questionable from -50ms to 67.3ms

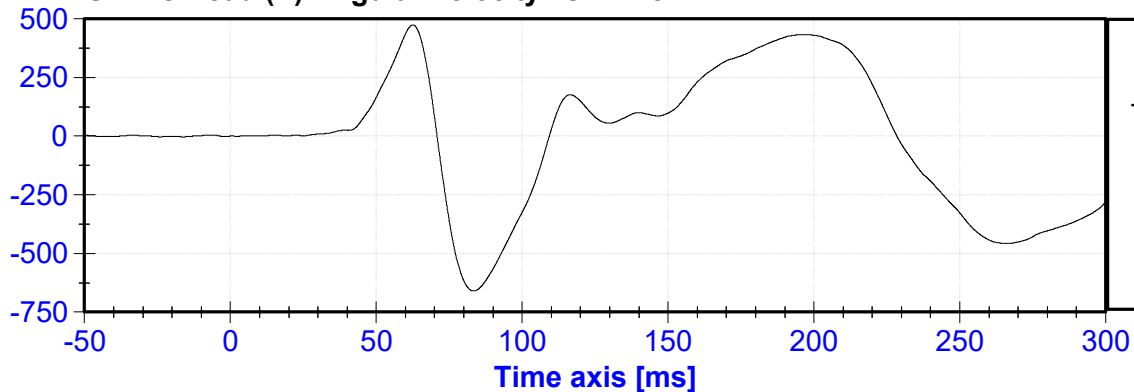
ANGULAR VEL [deg/s]

SID-IIs Head (X) Angular Velocity vs. Time

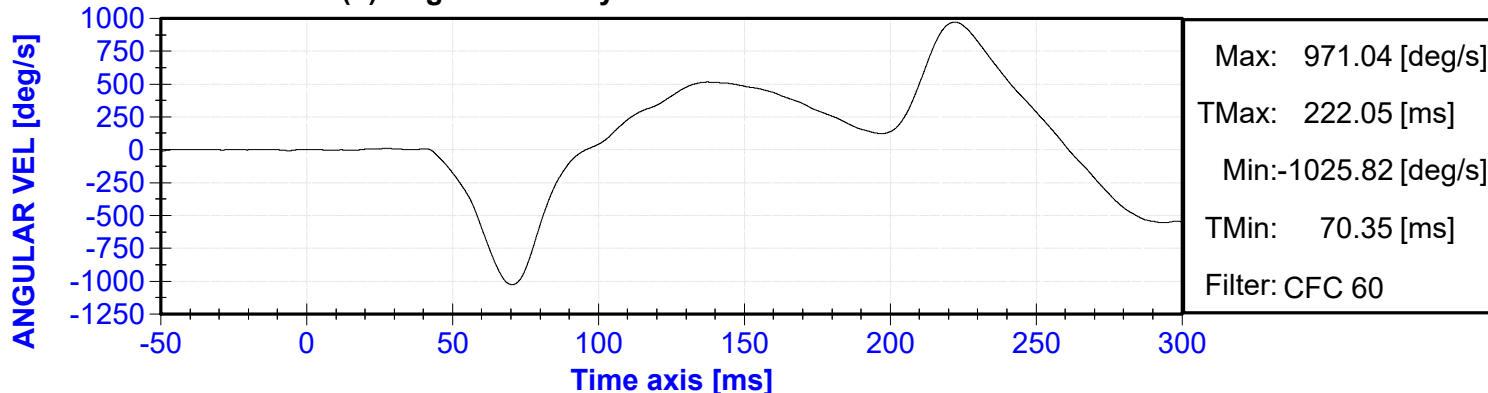


ANGULAR VEL [deg/s]

SID-IIs Head (Y) Angular Velocity vs. Time

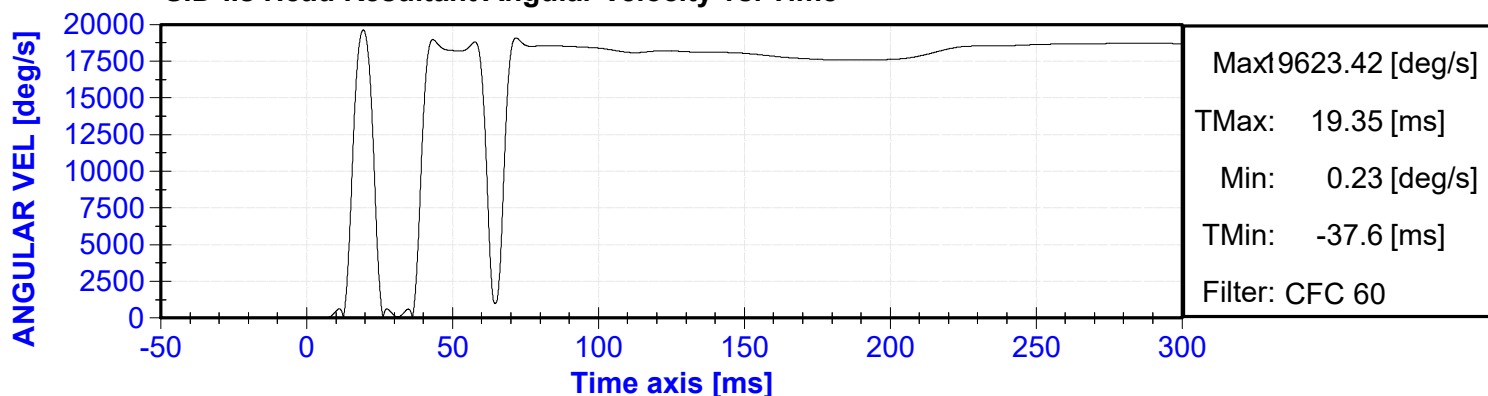


SID-IIs Head (Z) Angular Velocity vs. Time

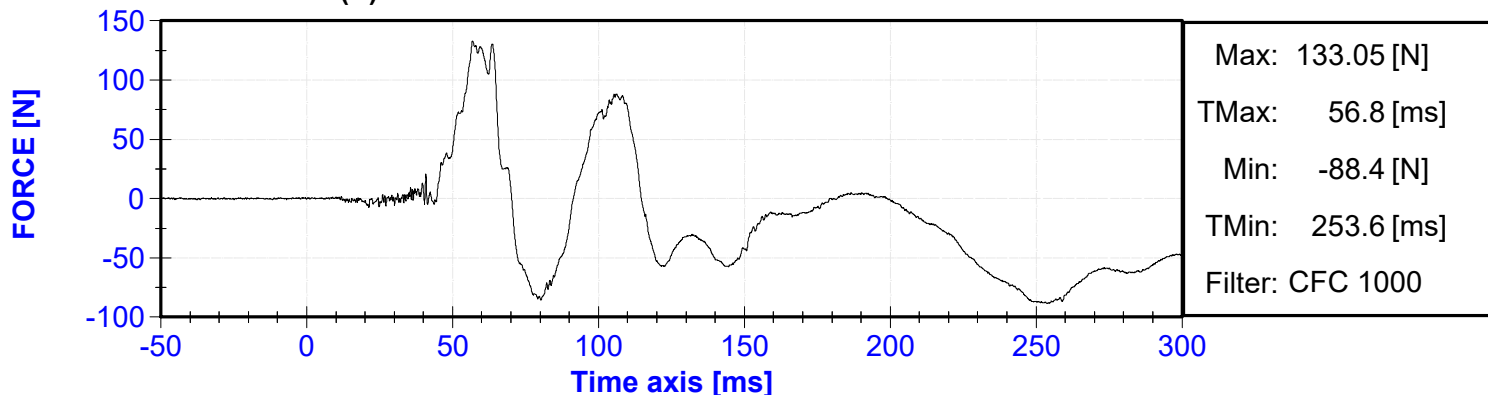


[1]/14HEADCG00S2AVXD questionable from -50ms to 67.3ms

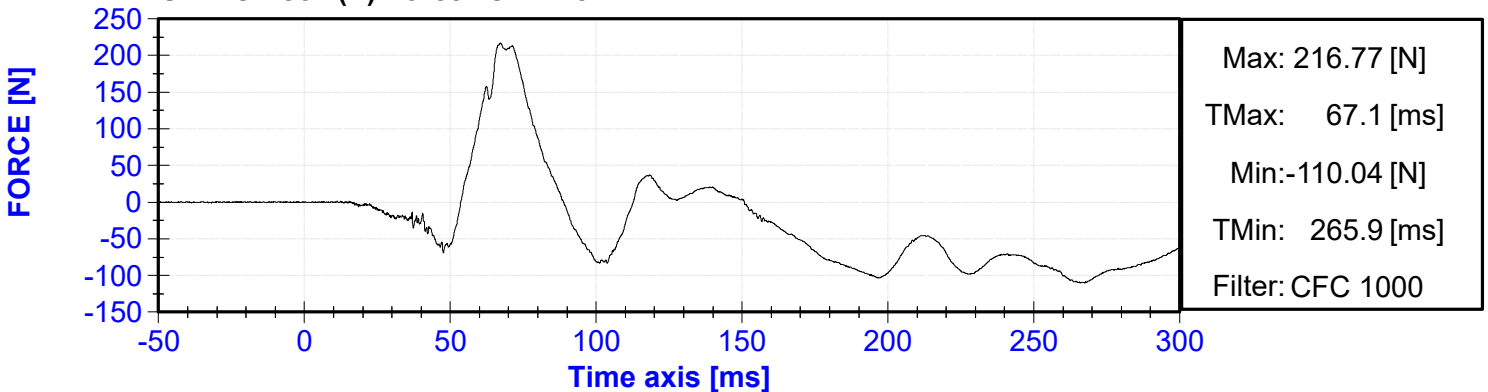
SID-IIs Head Resultant Angular Velocity vs. Time



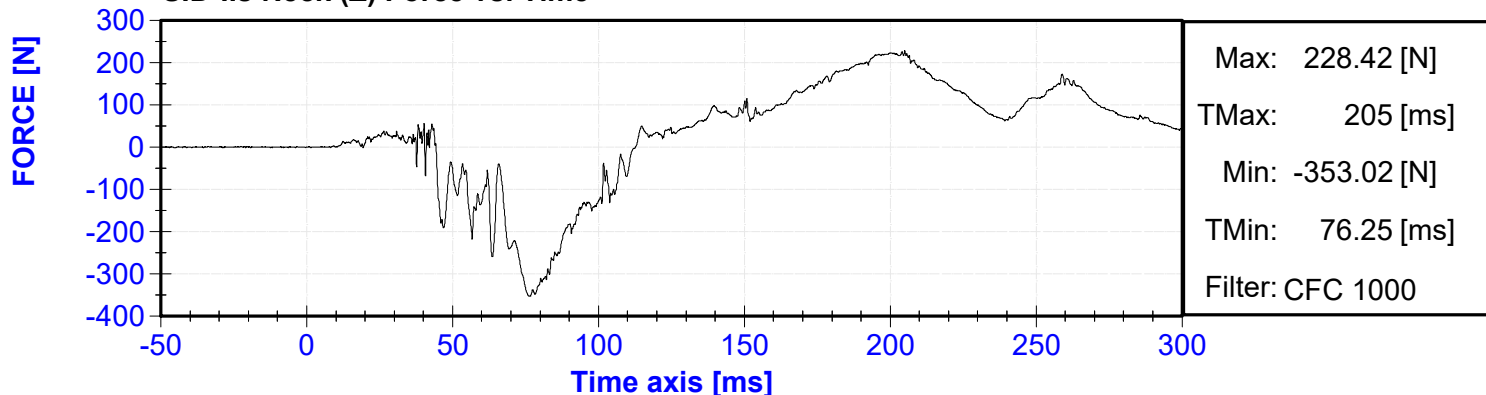
SID-IIs Neck (X) Force vs. Time



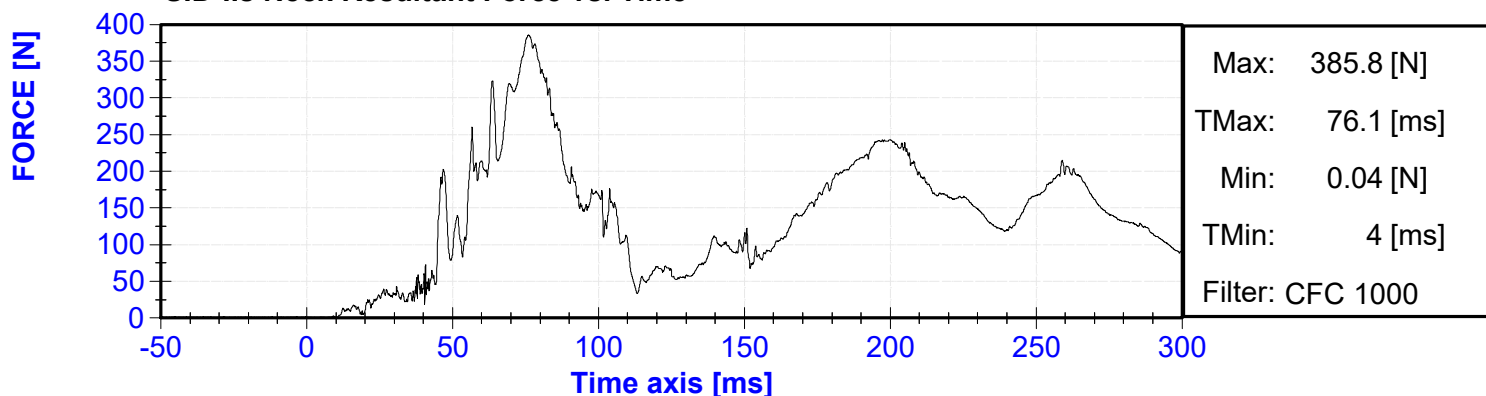
SID-IIs Neck (Y) Force vs. Time



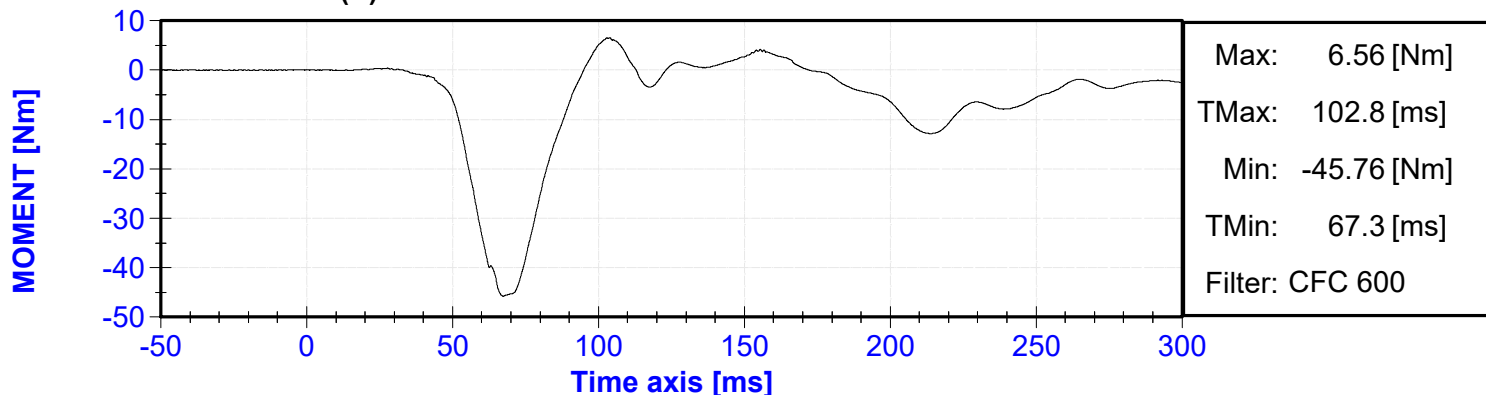
SID-IIs Neck (Z) Force vs. Time



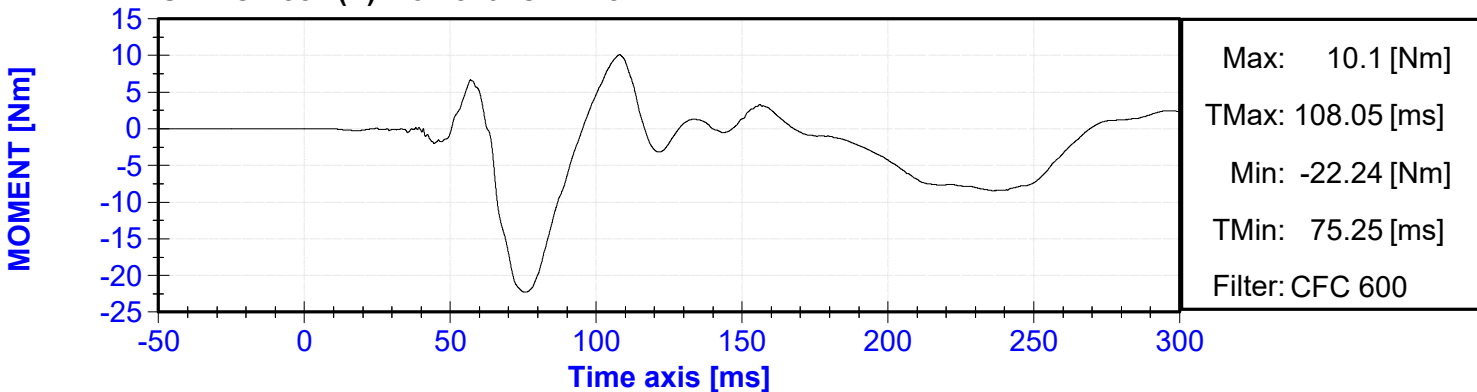
SID-IIs Neck Resultant Force vs. Time

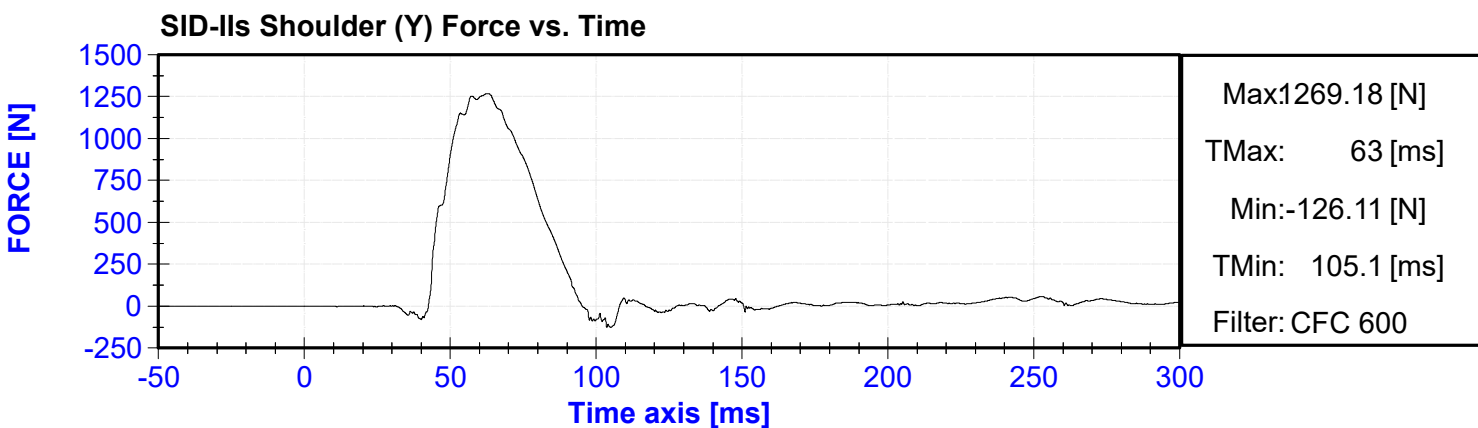
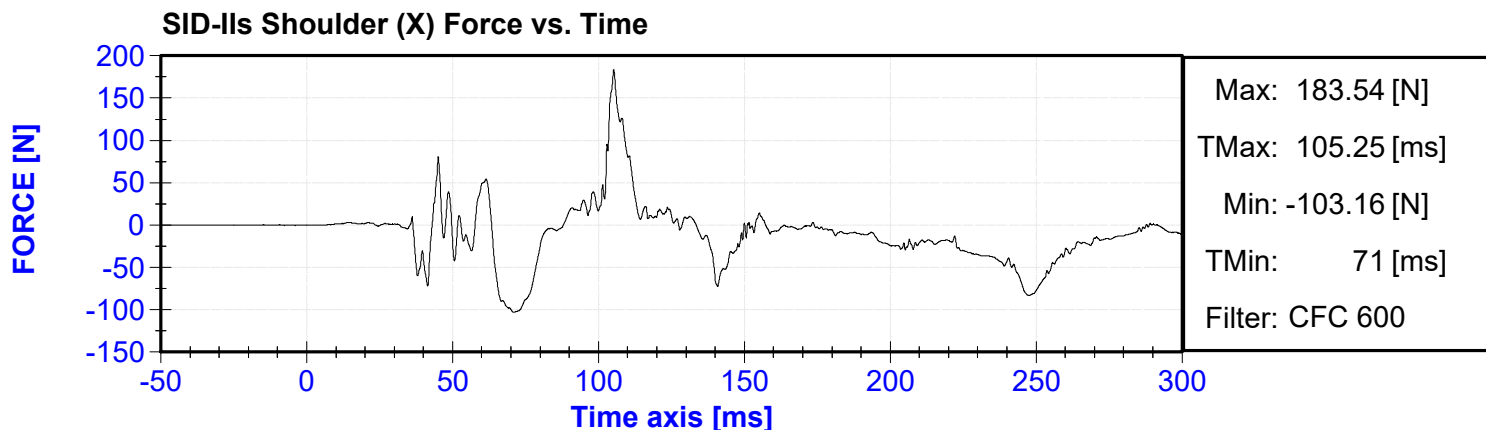
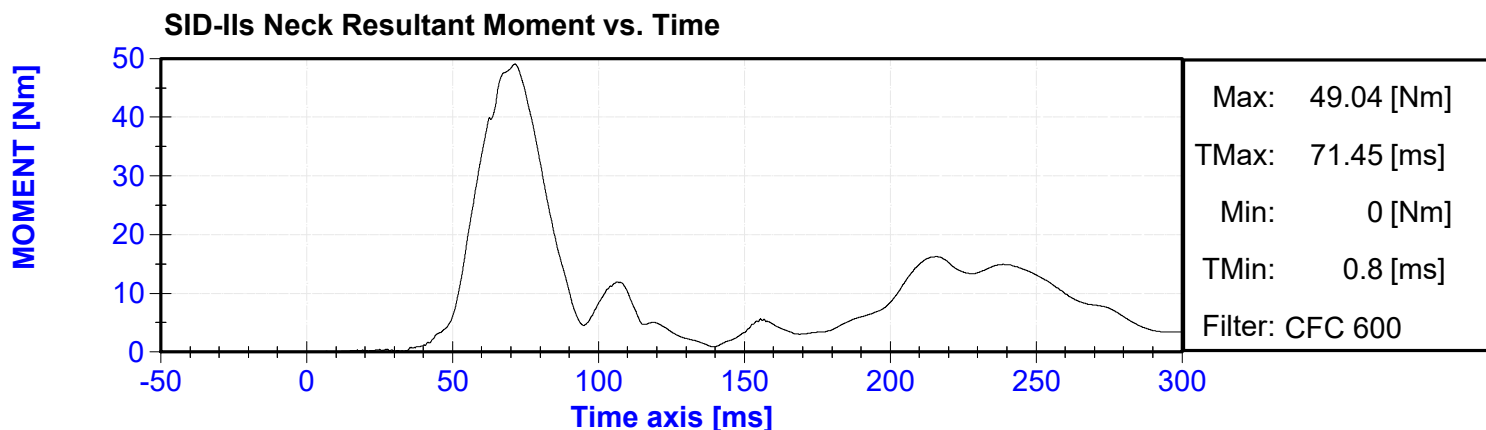
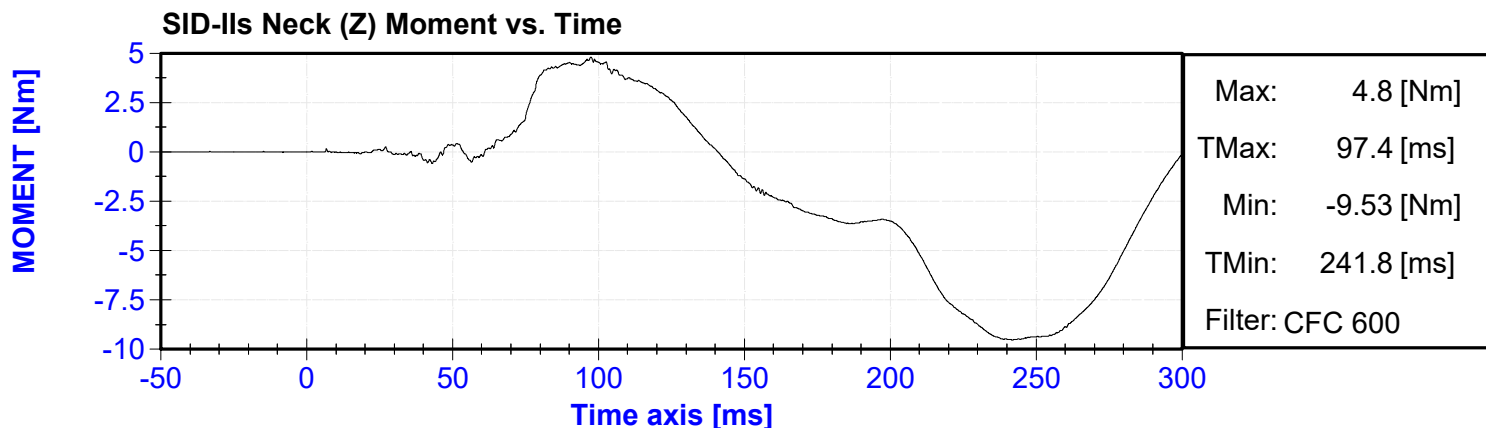


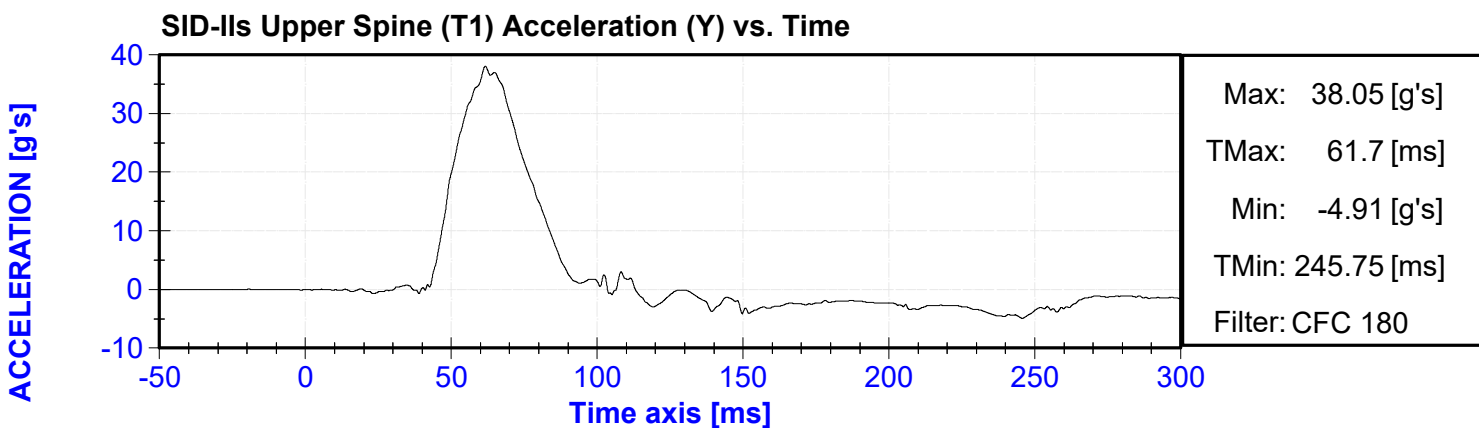
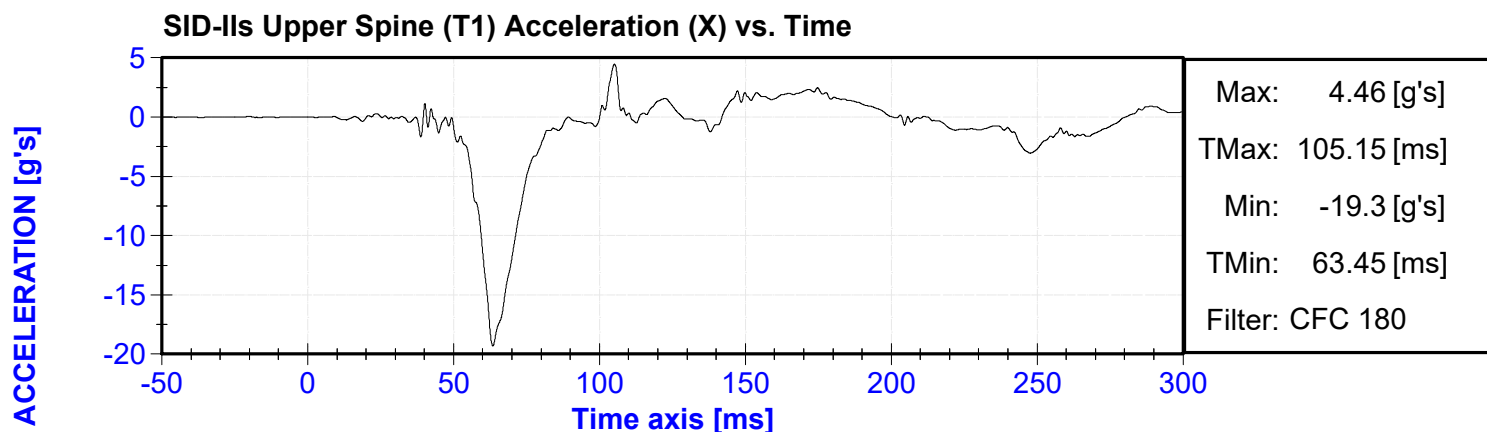
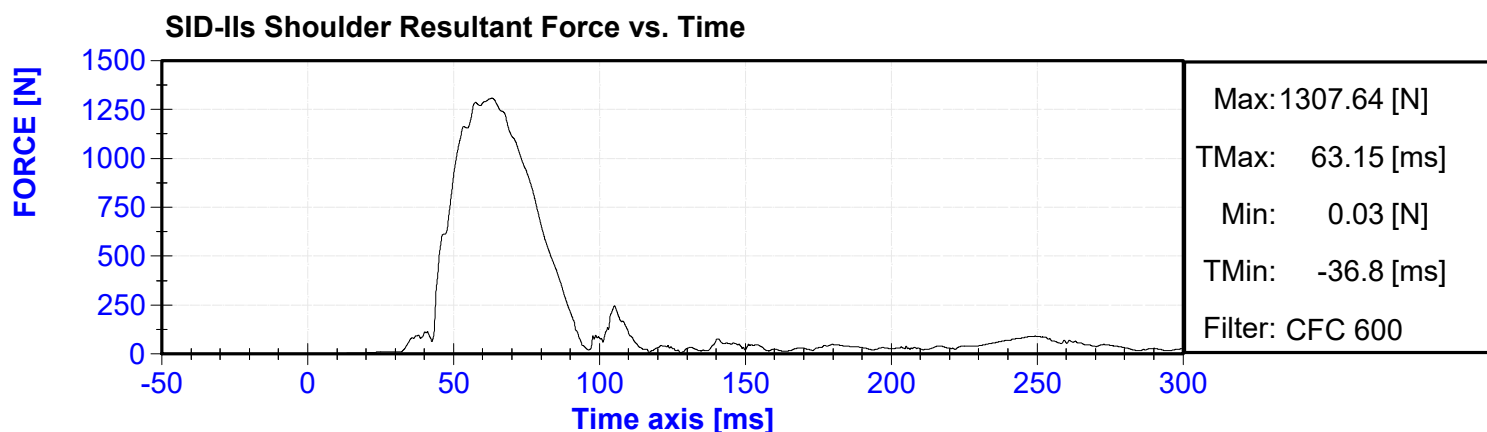
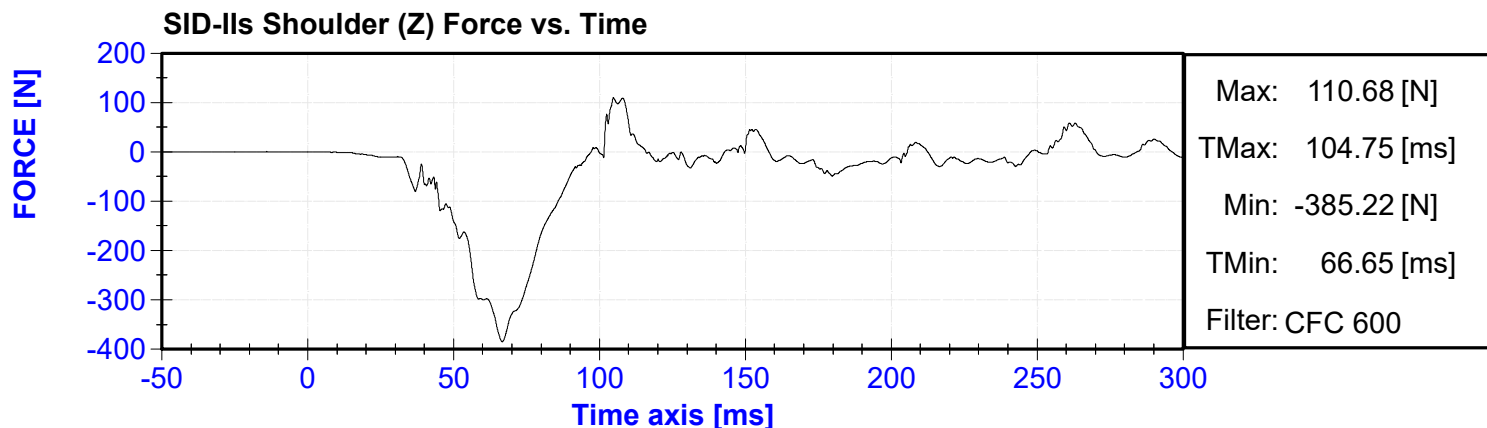
SID-IIs Neck (X) Moment vs. Time



SID-IIs Neck (Y) Moment vs. Time

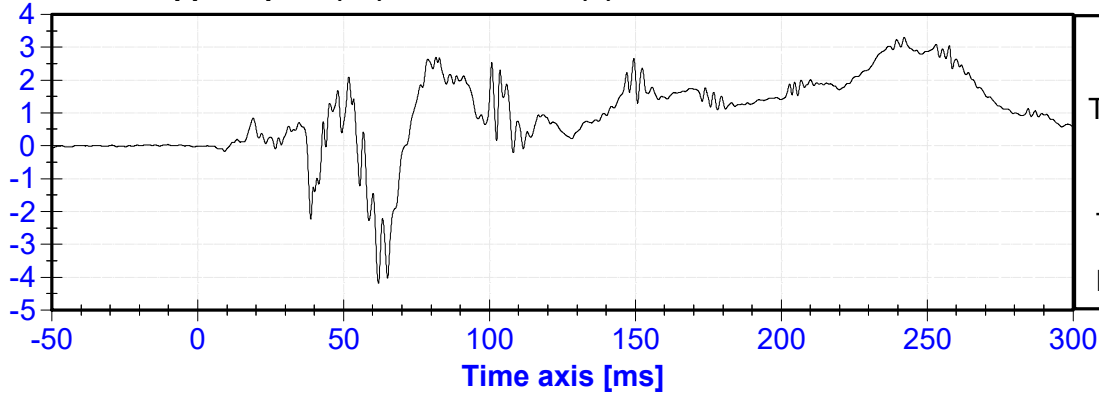






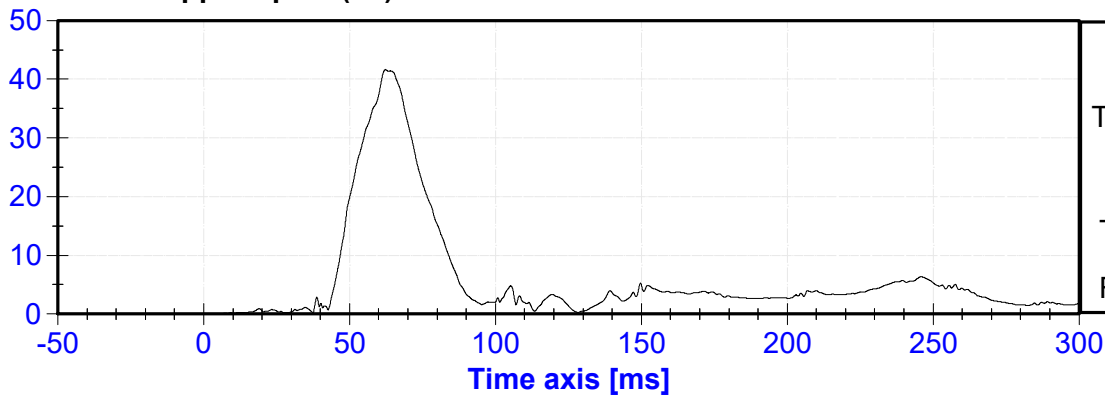
ACCELERATION [g's]

SID-IIs Upper Spine (T1) Acceleration (Z) vs. Time



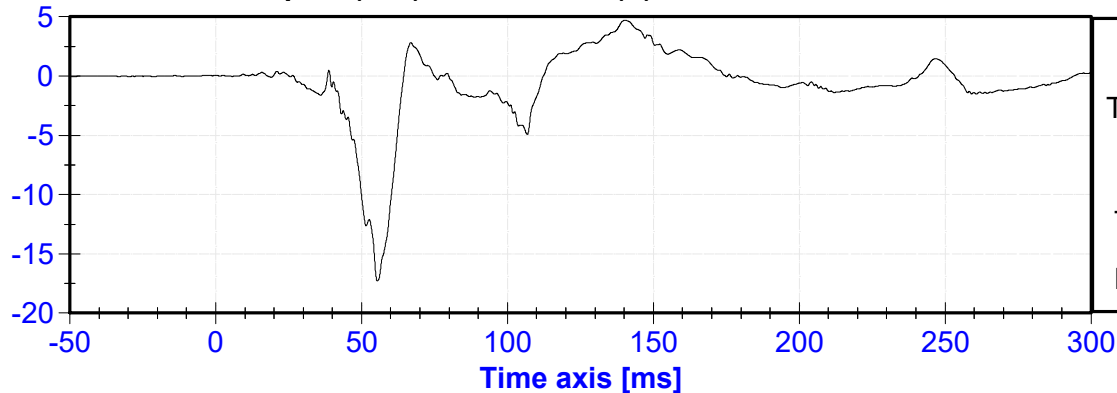
ACCELERATION [g's]

SID-IIs Upper Spine (T1) Resultant Acceleration vs. Time



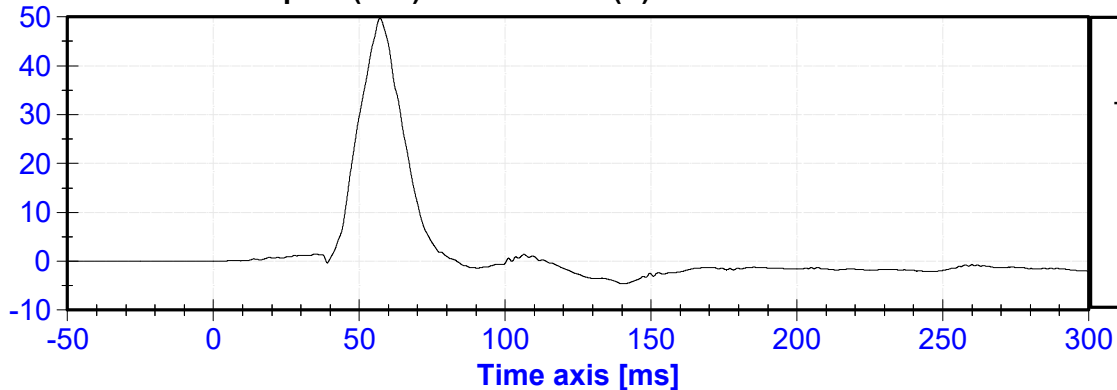
ACCELERATION [g's]

SID-IIs Lower Spine (T12) Acceleration (X) vs. Time



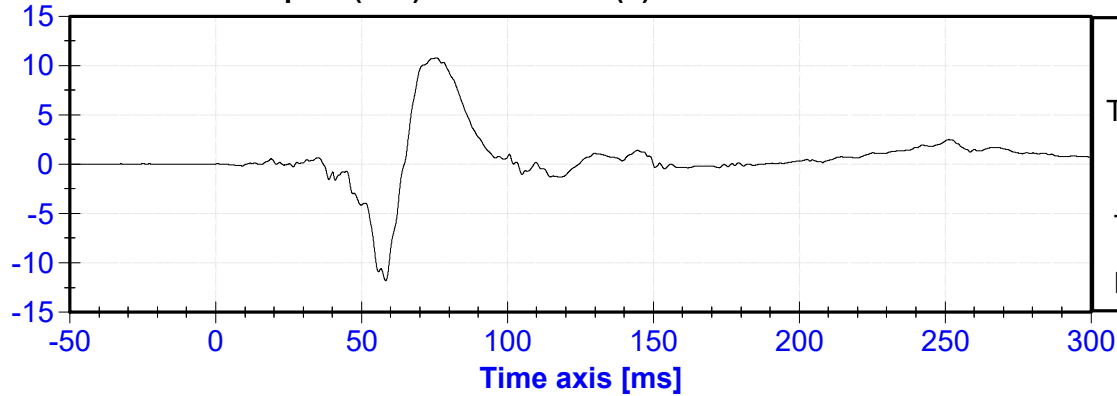
ACCELERATION [g's]

SID-IIs Lower Spine (T12) Acceleration (Y) vs. Time



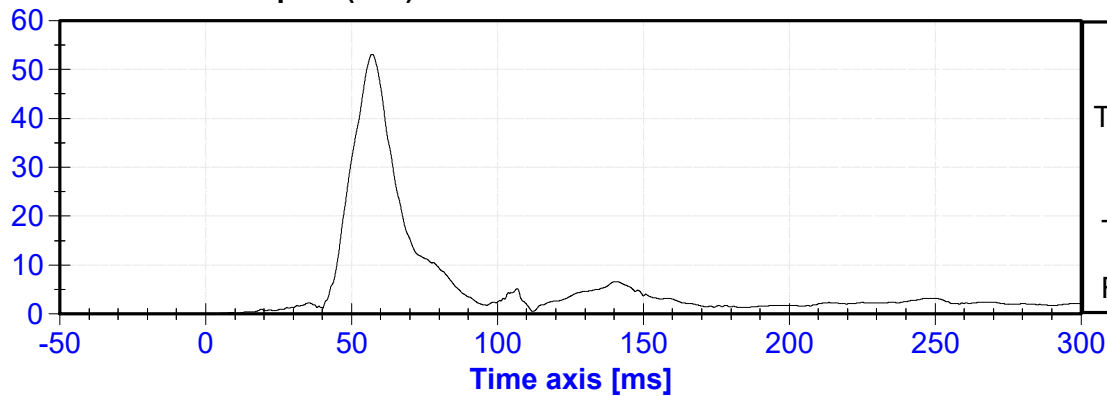
ACCELERATION [g's]

SID-IIs Lower Spine (T12) Acceleration (Z) vs. Time



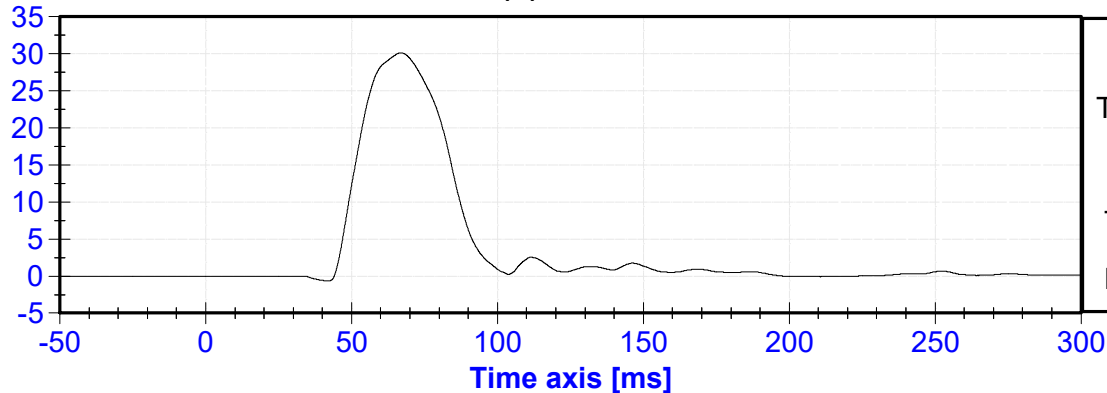
ACCELERATION [g's]

SID-IIs Lower Spine (T12) Resultant Acceleration vs. Time



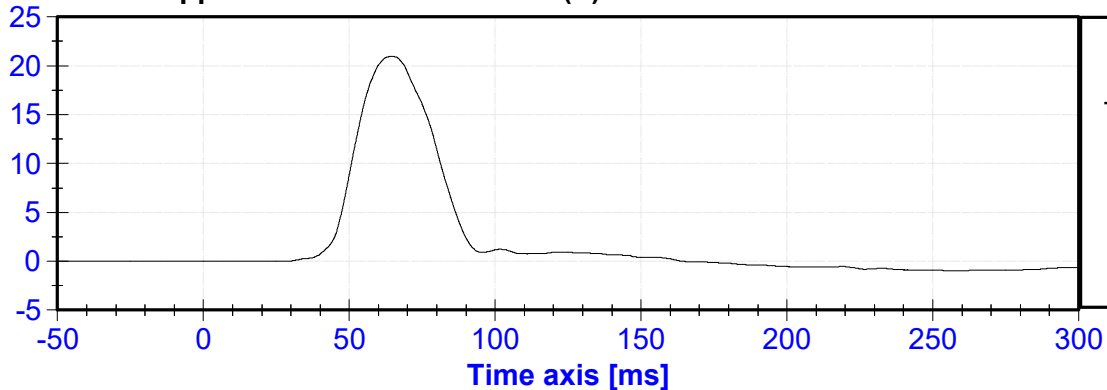
DISPLACEMENT [mm]

SID-IIs Shoulder Rib Deflection (Y) vs. Time

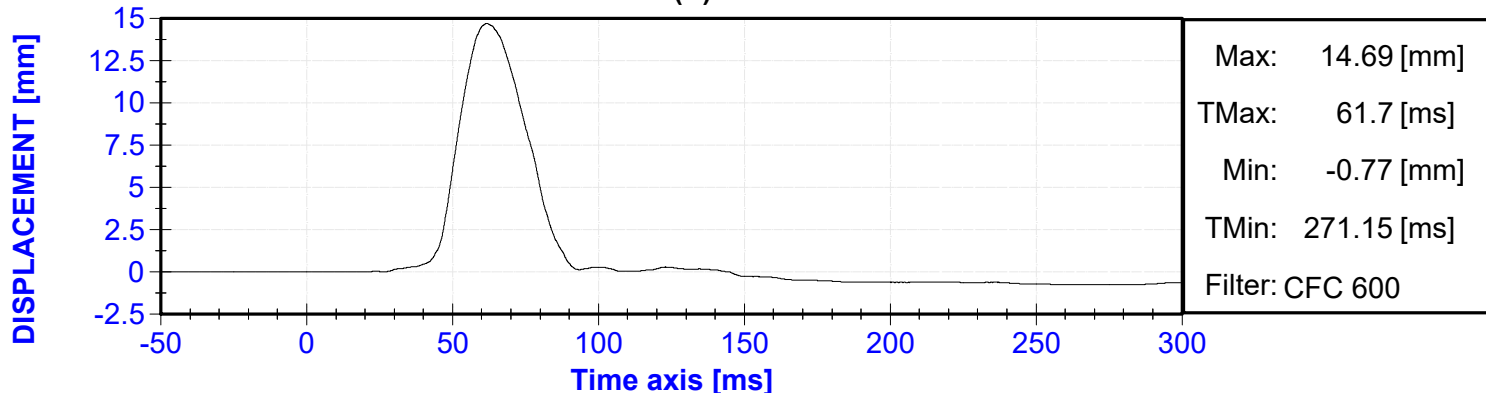


DISPLACEMENT [mm]

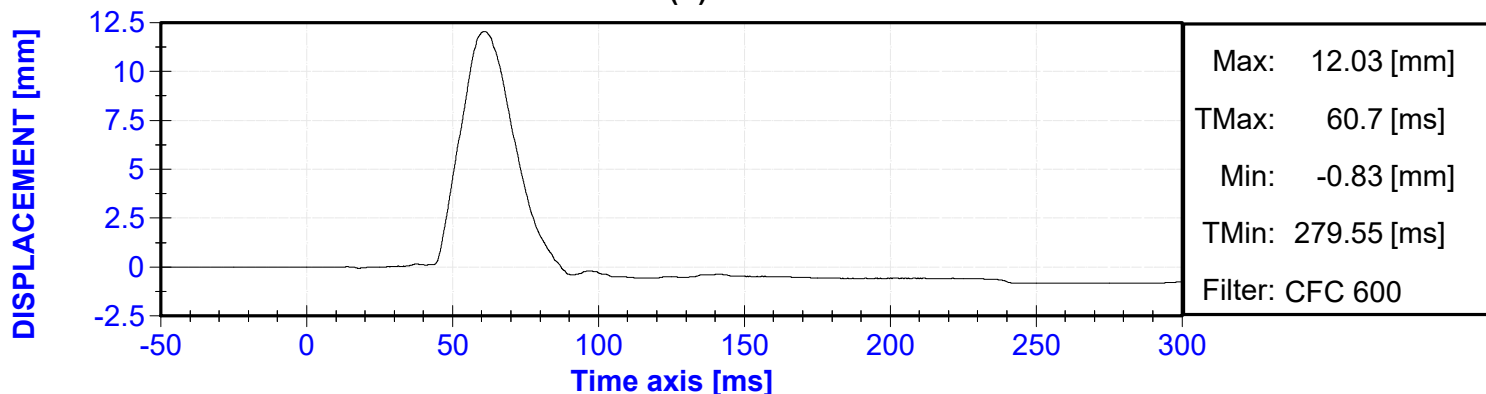
SID-IIs Upper Thorax Rib Deflection (Y) vs. Time



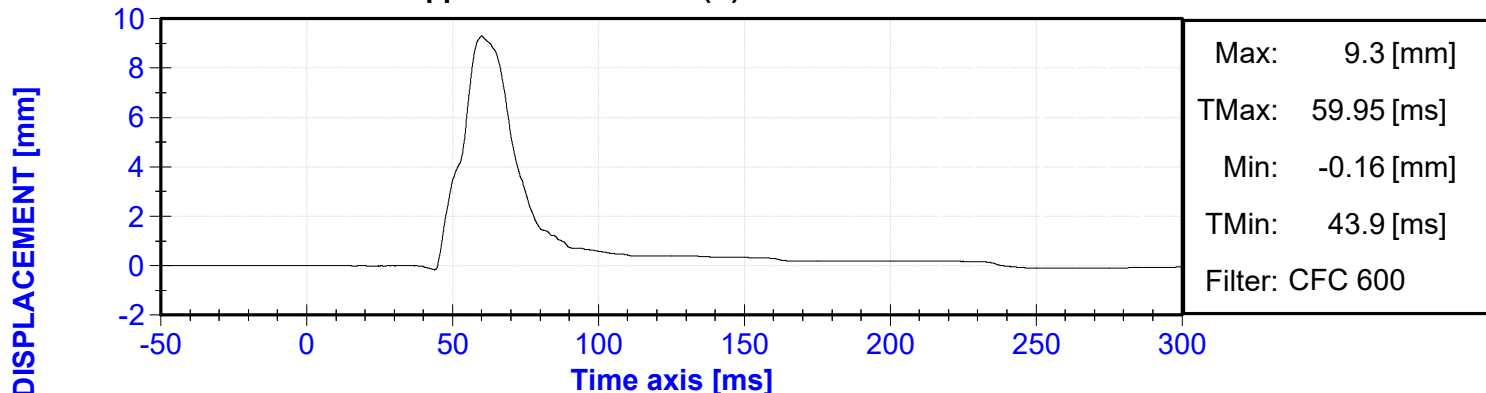
SID-IIs Middle Thorax Rib Deflection (Y) vs. Time



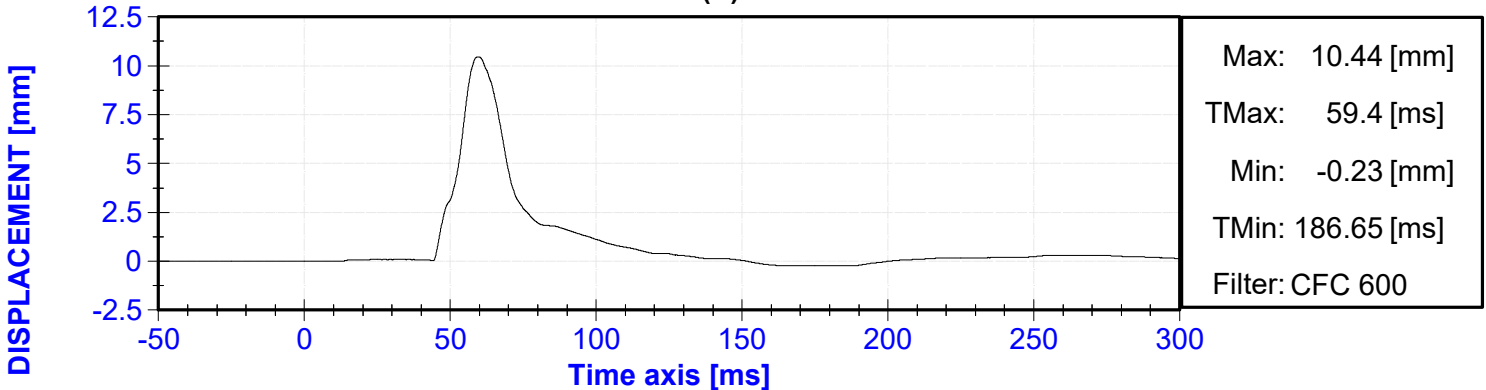
SID-IIs Lower Thorax Rib Deflection (Y) vs. Time



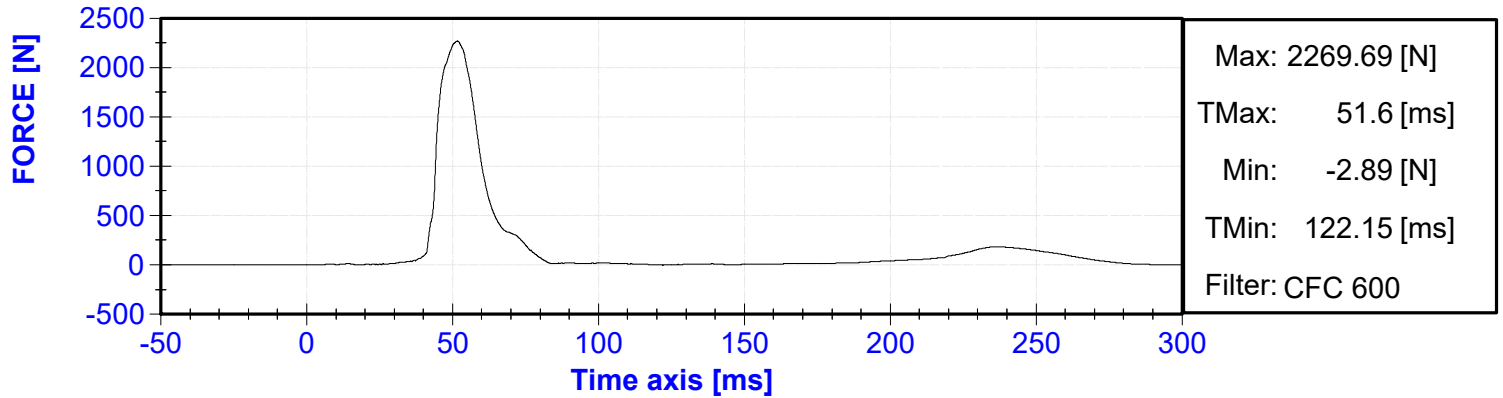
SID-IIs Abdomen Upper Rib Deflection (Y) vs. Time



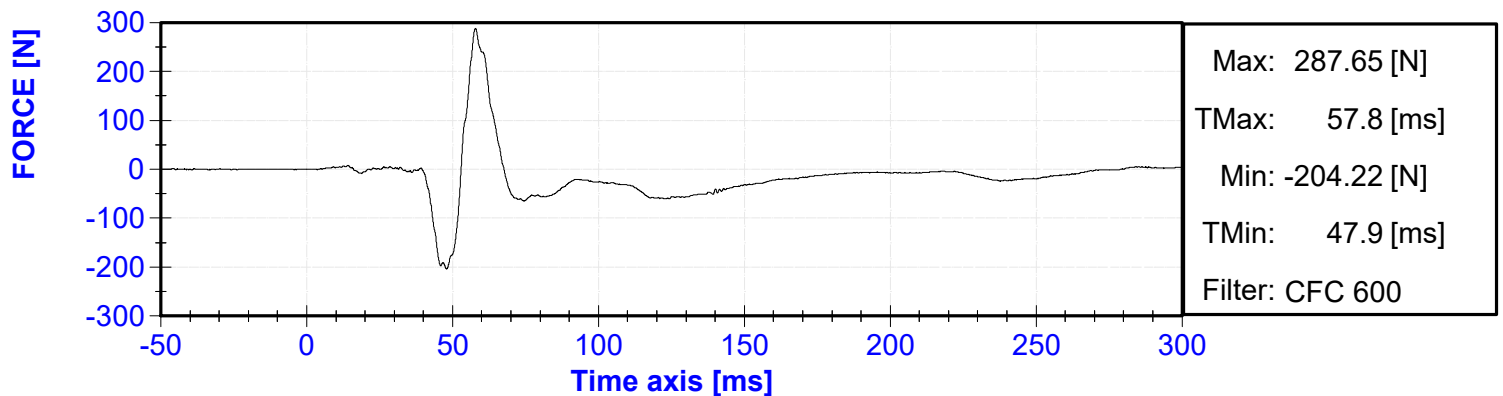
SID-IIs Abdomen Lower Rib Deflection (Y) vs. Time



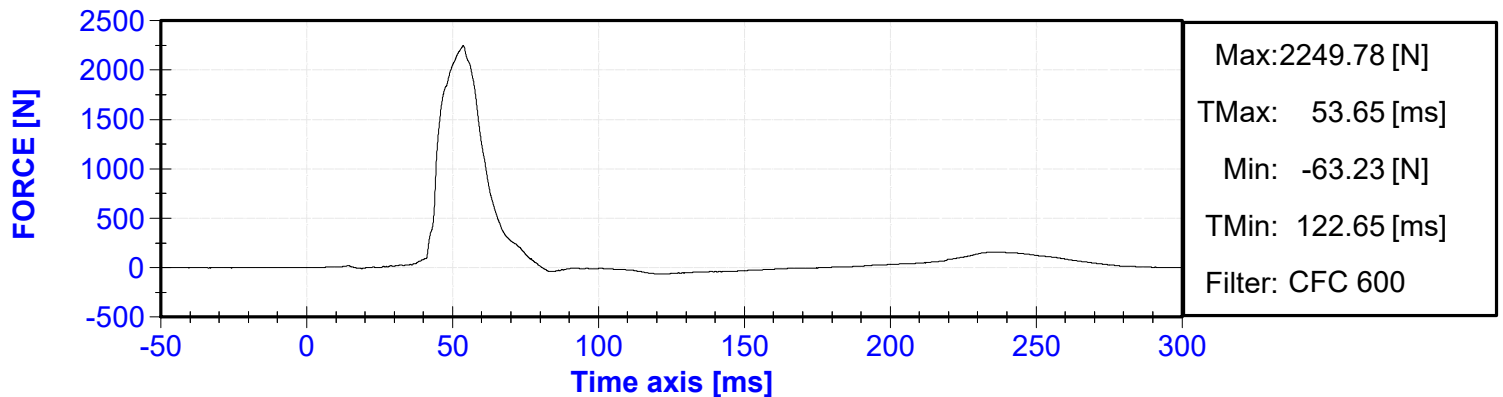
SID-Ils Acetabulum Force vs. Time



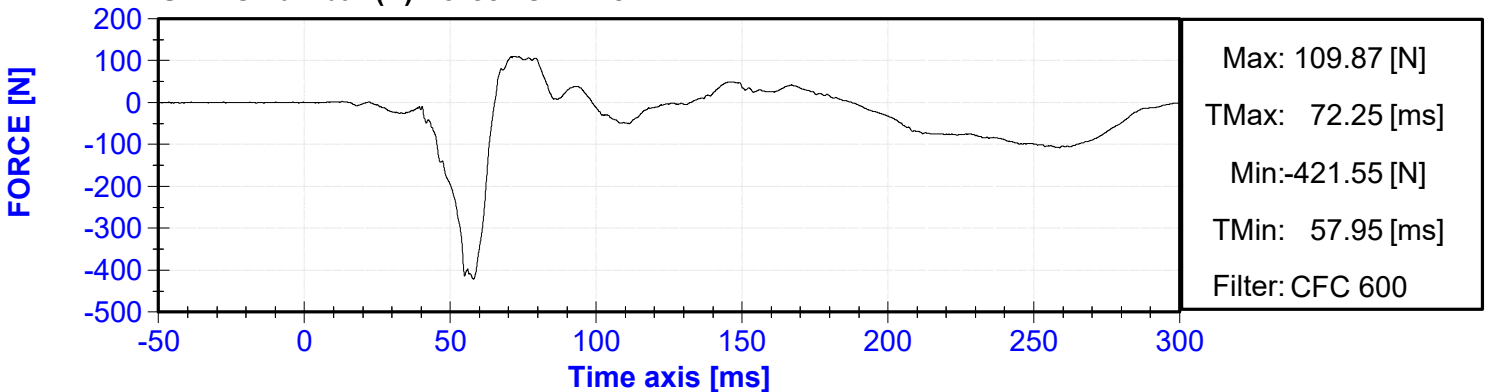
SID-Ils Iliac Force vs. Time



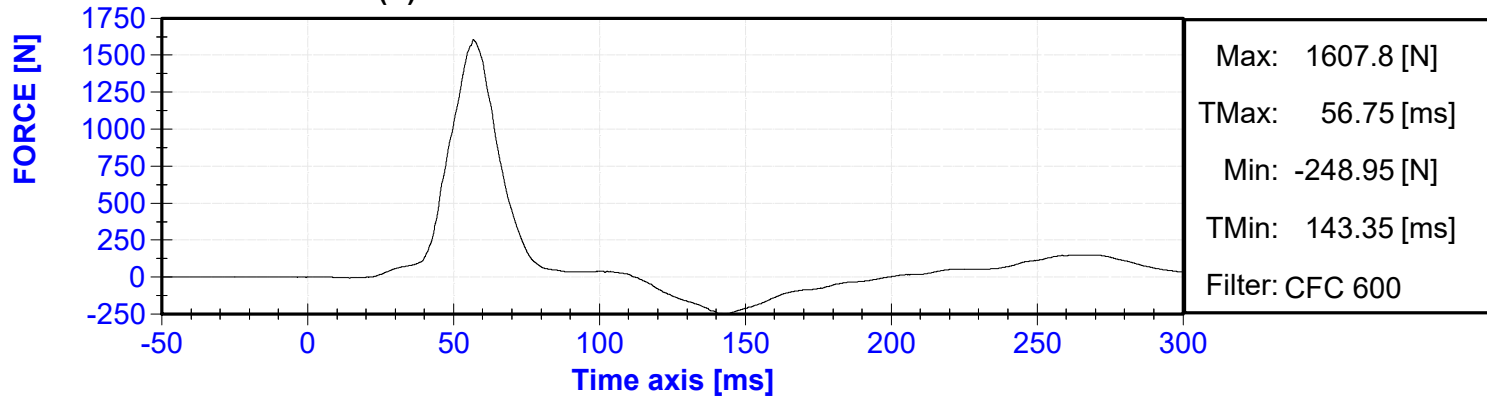
SID-Ils Sum of Iliac and Acetabulum Forces vs. Time



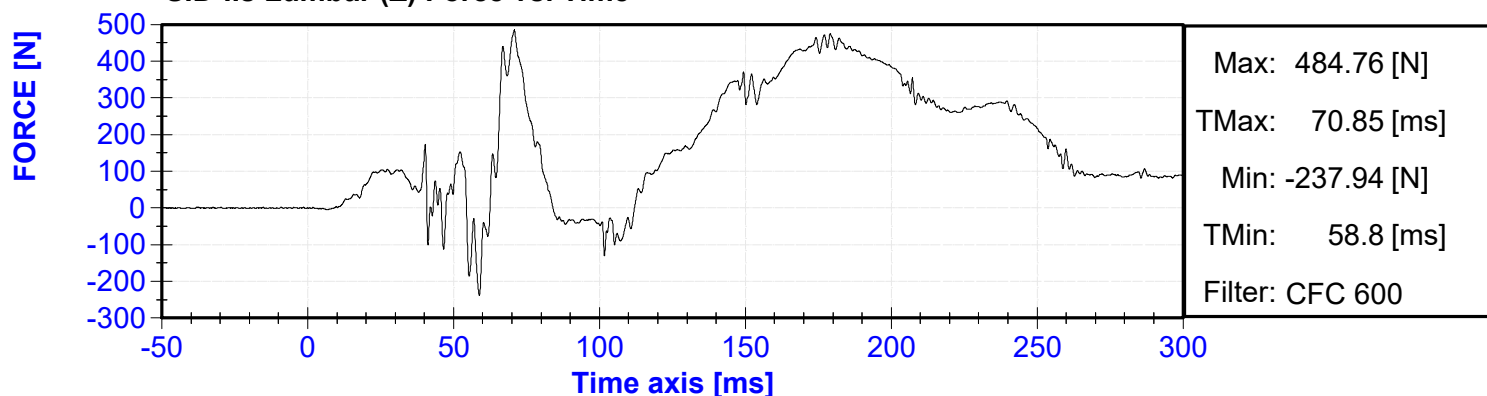
SID-Ils Lumbar (X) Force vs. Time



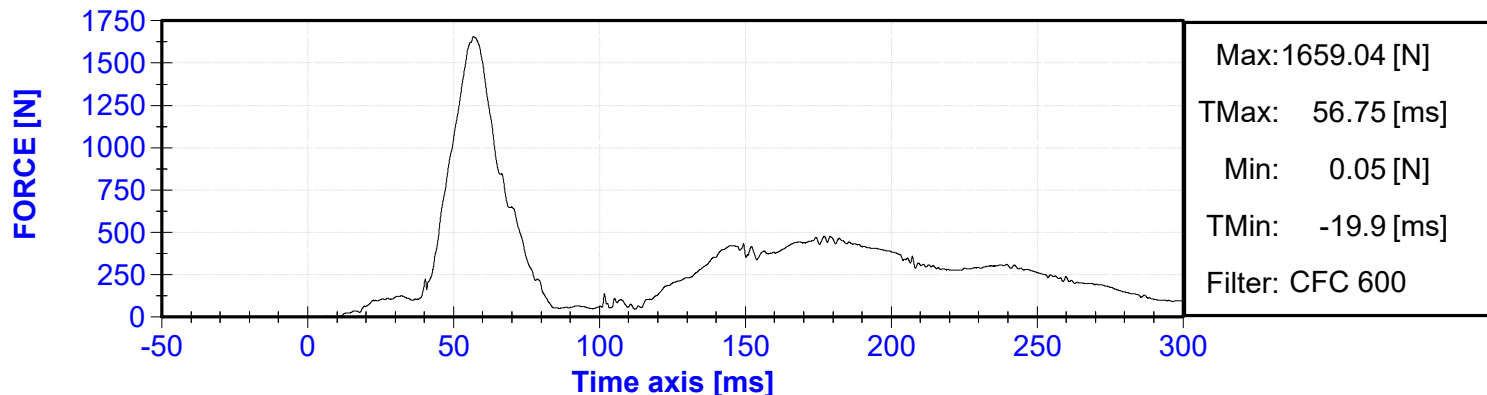
SID-IIs Lumbar (Y) Force vs. Time



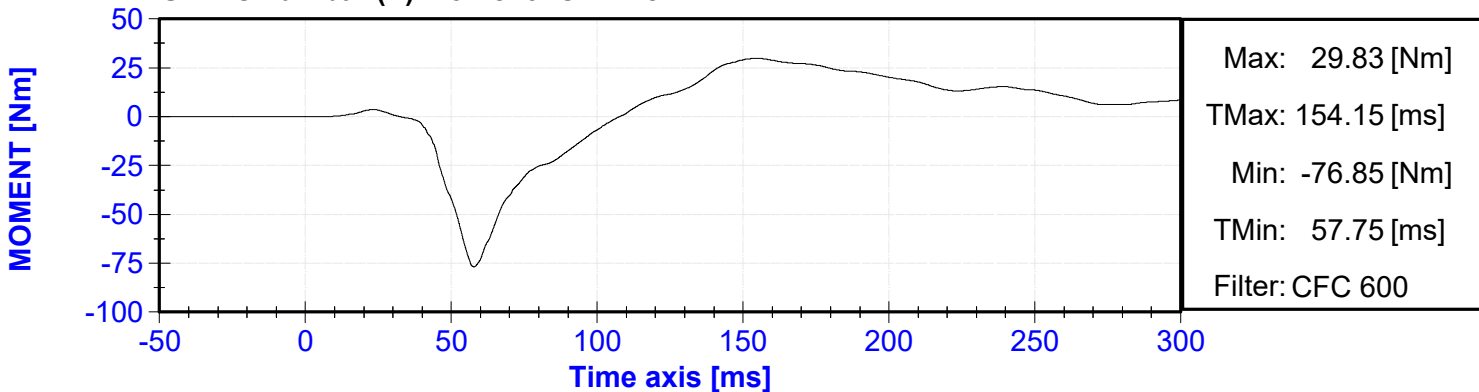
SID-IIs Lumbar (Z) Force vs. Time

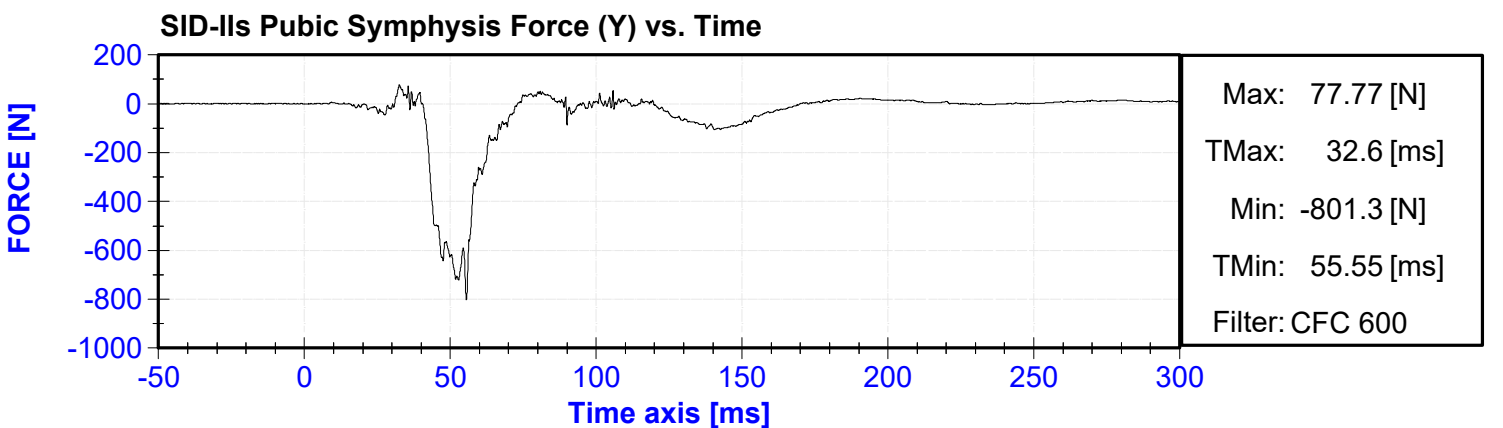
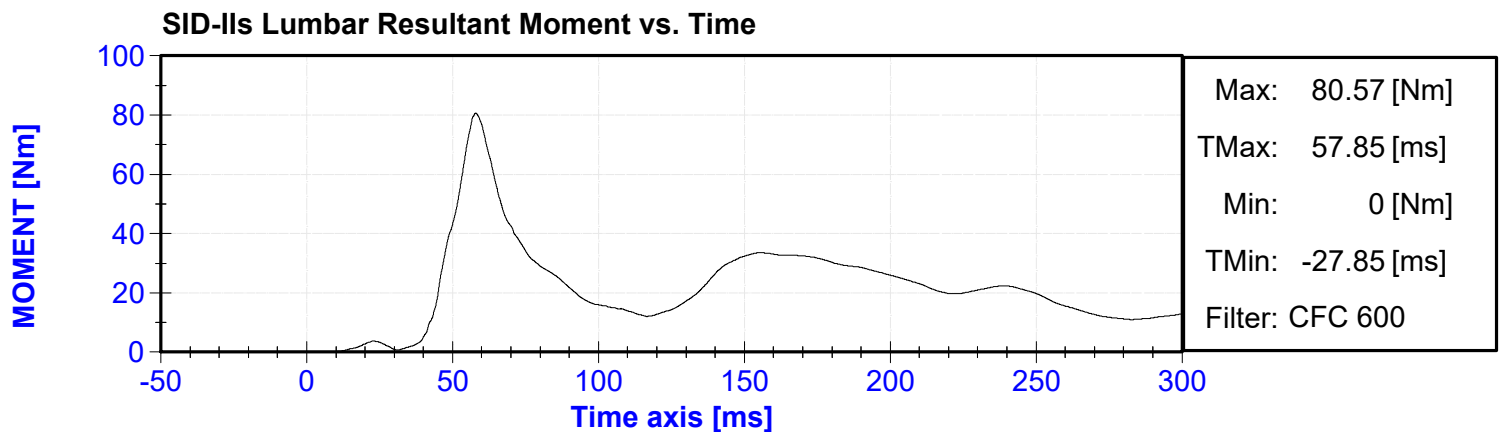
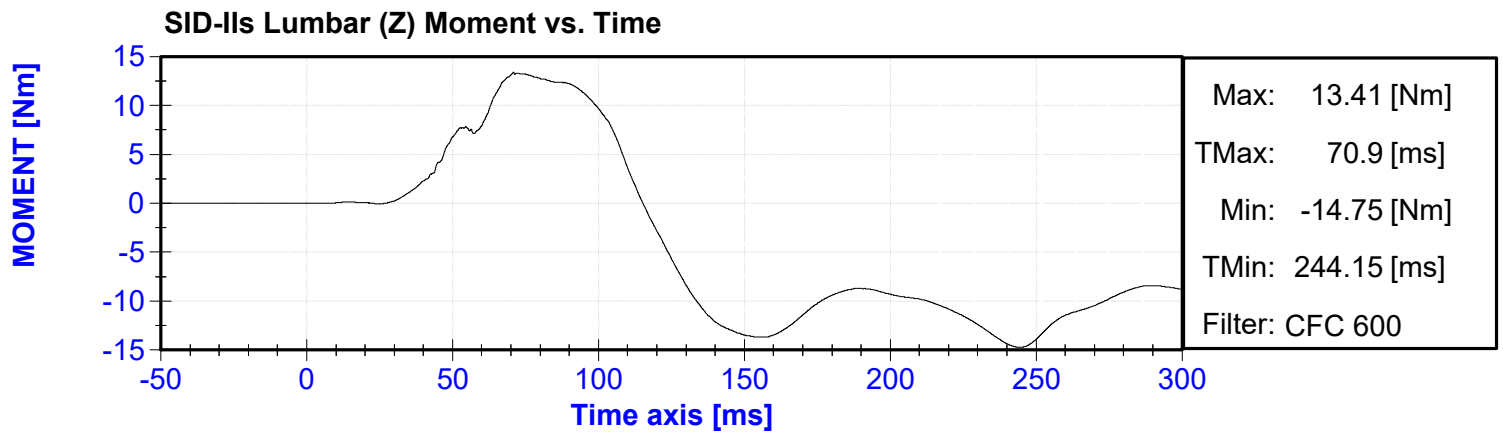
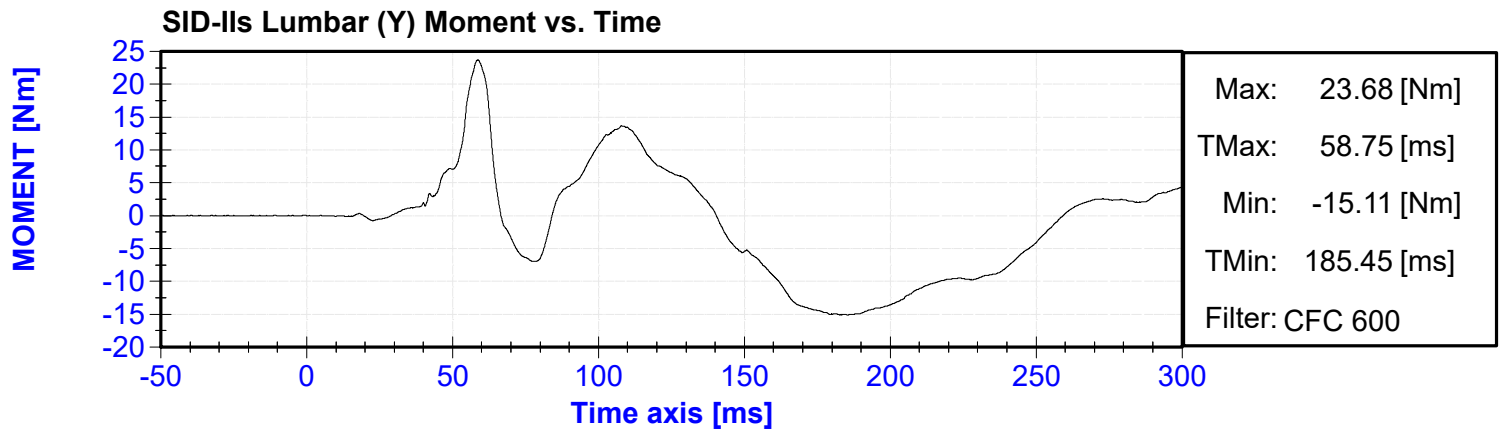


SID-IIs Lumbar Resultant Force vs. Time



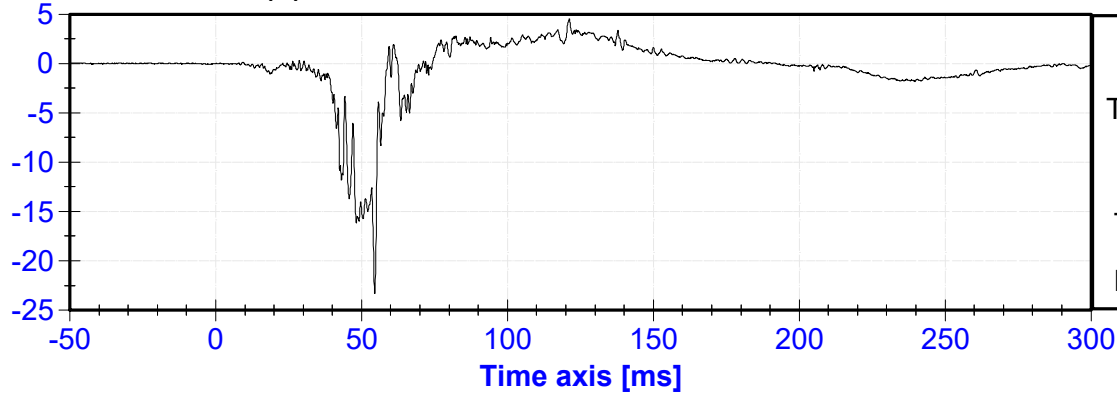
SID-IIs Lumbar (X) Moment vs. Time





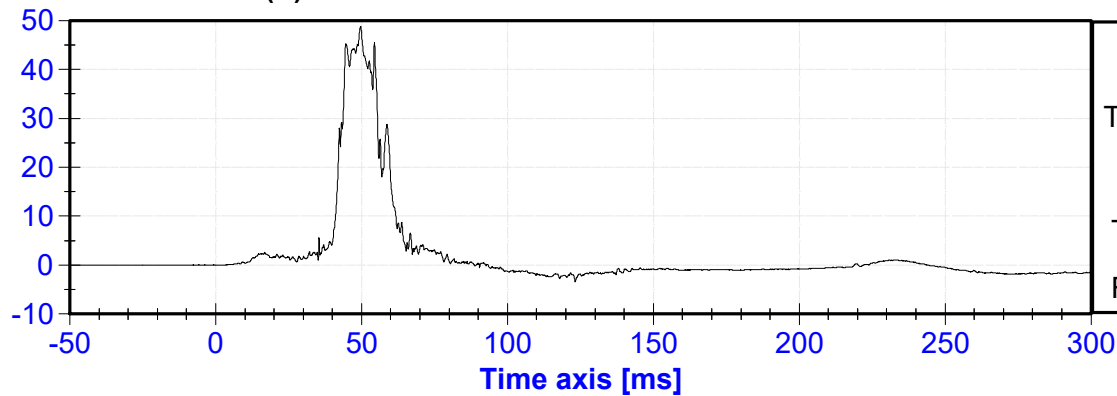
ACCELERATION [g's]

SID-IIs Pelvic (X) Acceleration vs. Time



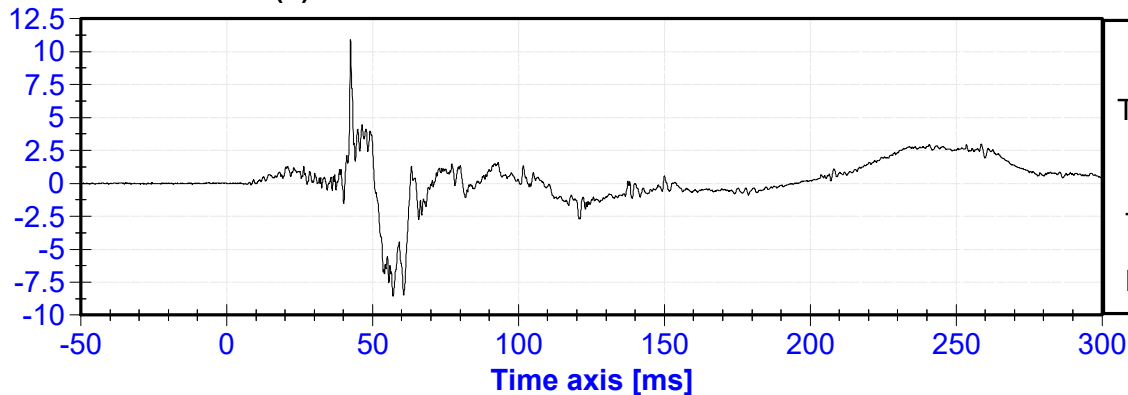
ACCELERATION [g's]

SID-IIs Pelvic (Y) Acceleration vs. Time



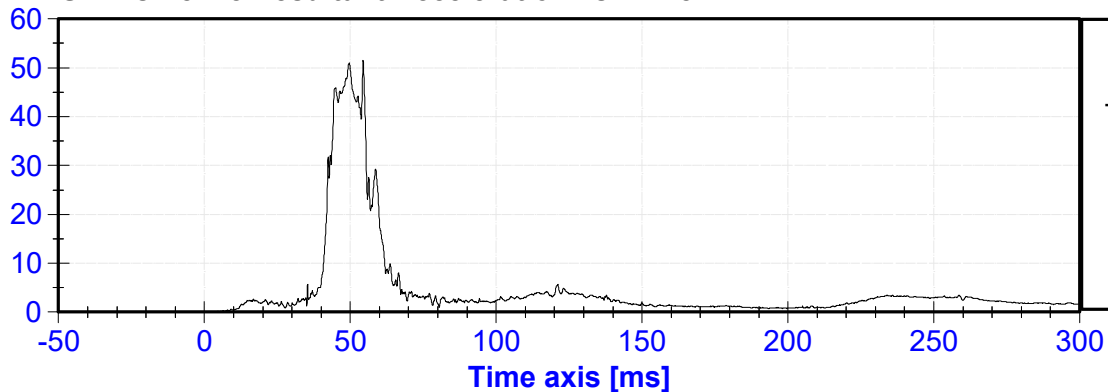
ACCELERATION [g's]

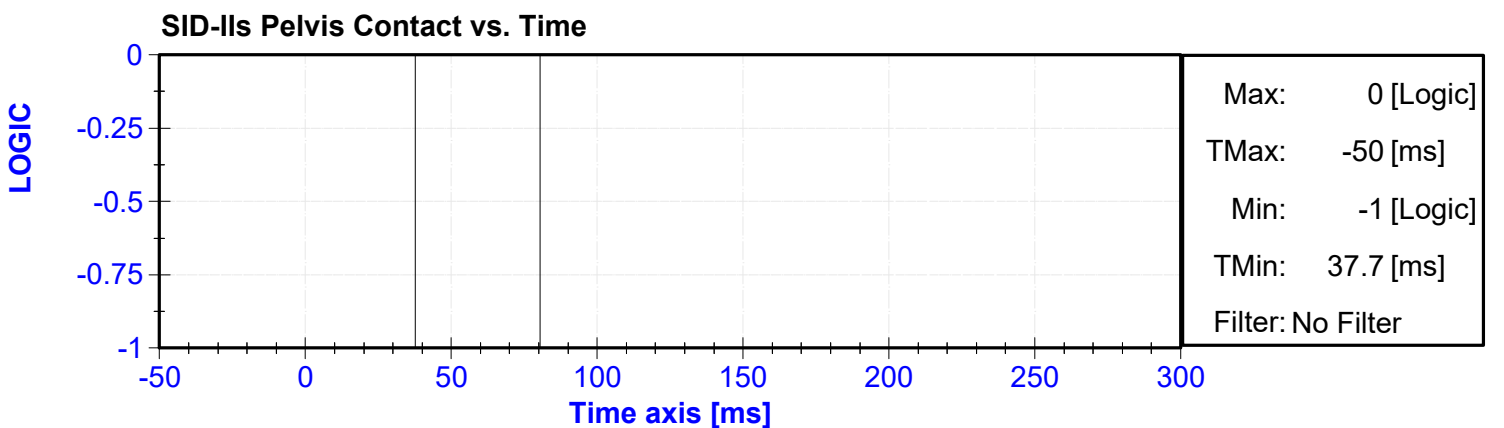
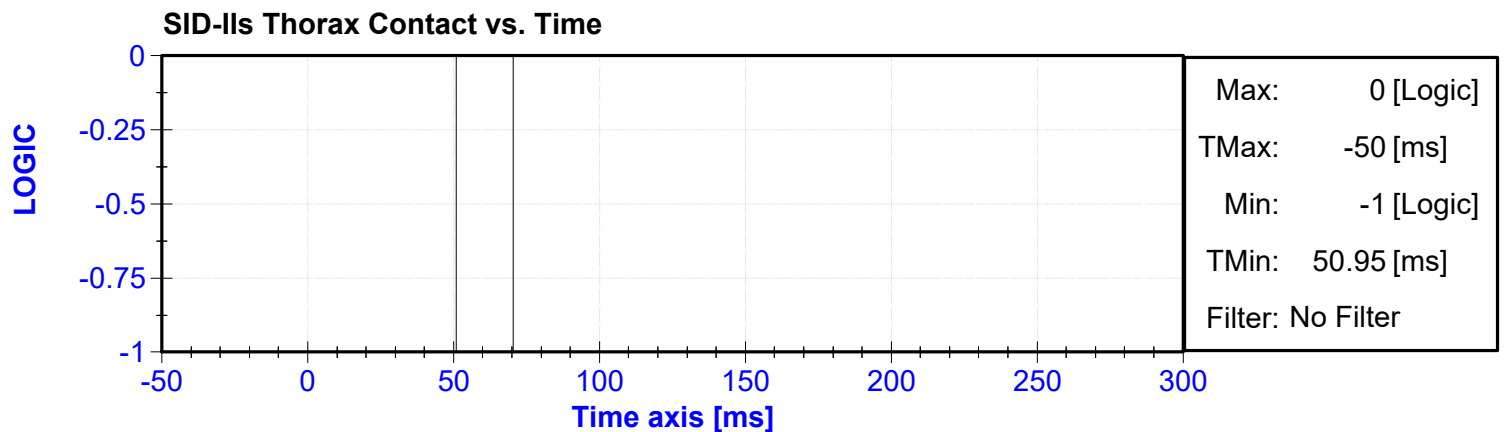
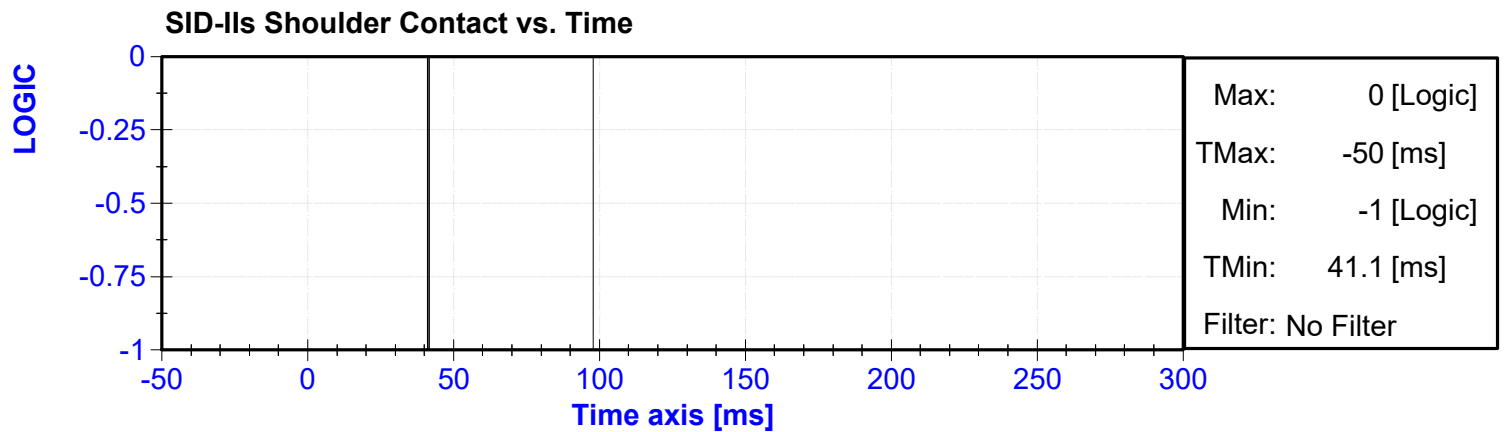
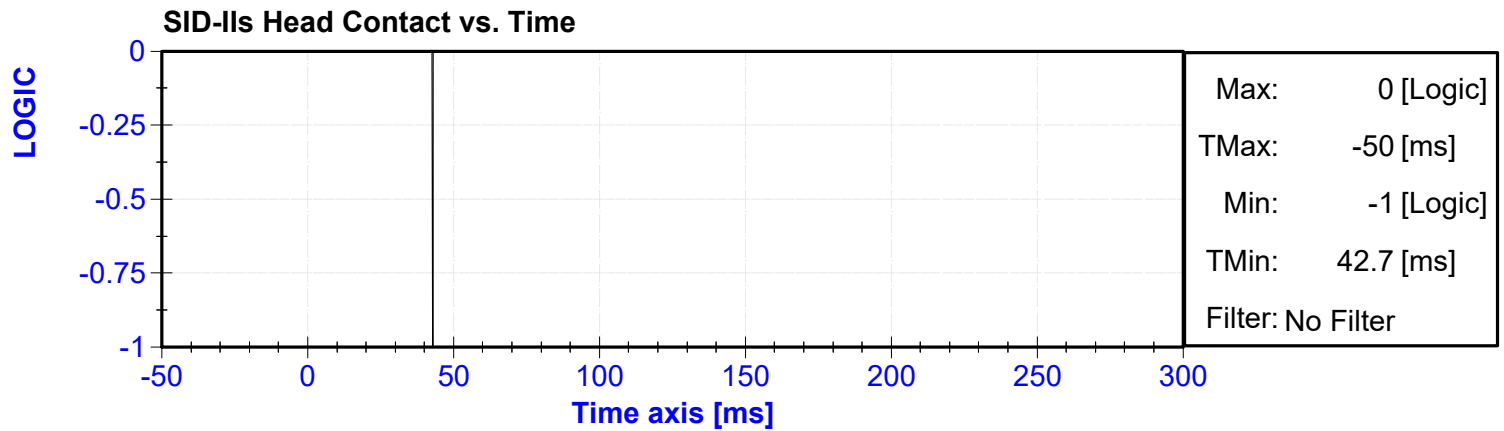
SID-IIs Pelvic (Z) Acceleration vs. Time



ACCELERATION [g's]

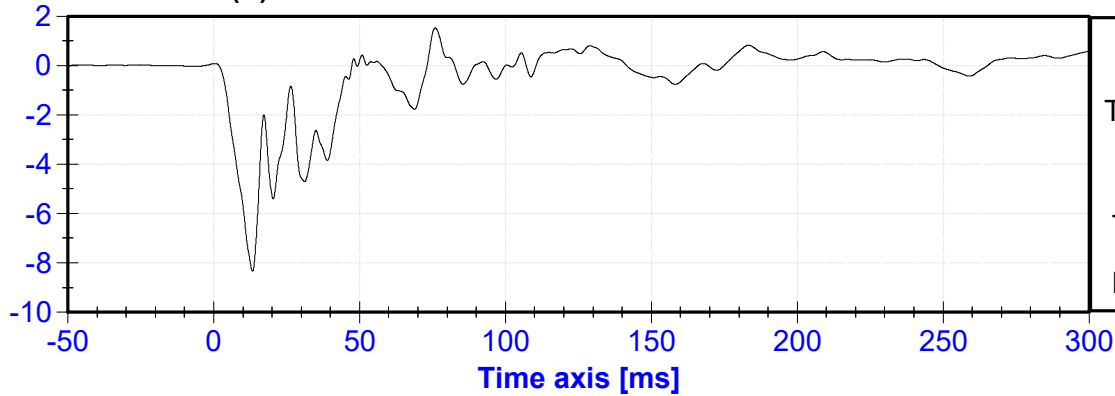
SID-IIs Pelvic Resultant Acceleration vs. Time





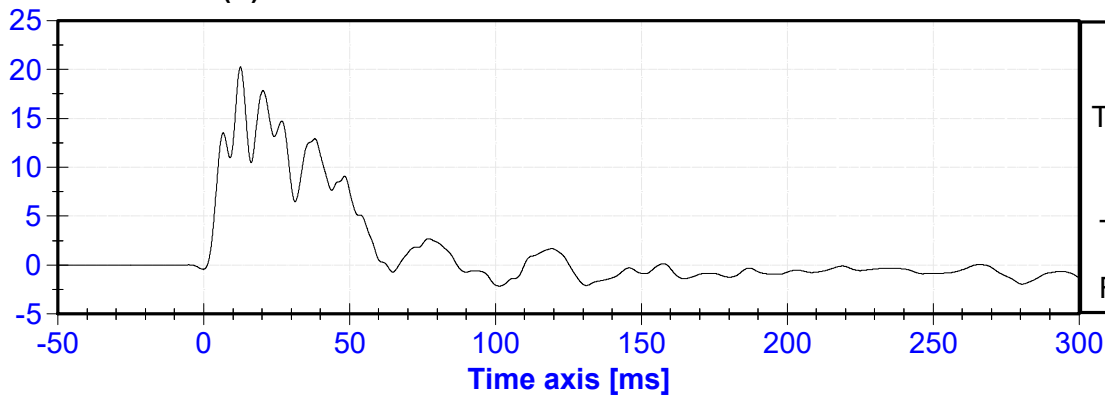
ACCELERATION [g's]

Vehicle CG (X) Acceleration vs. Time



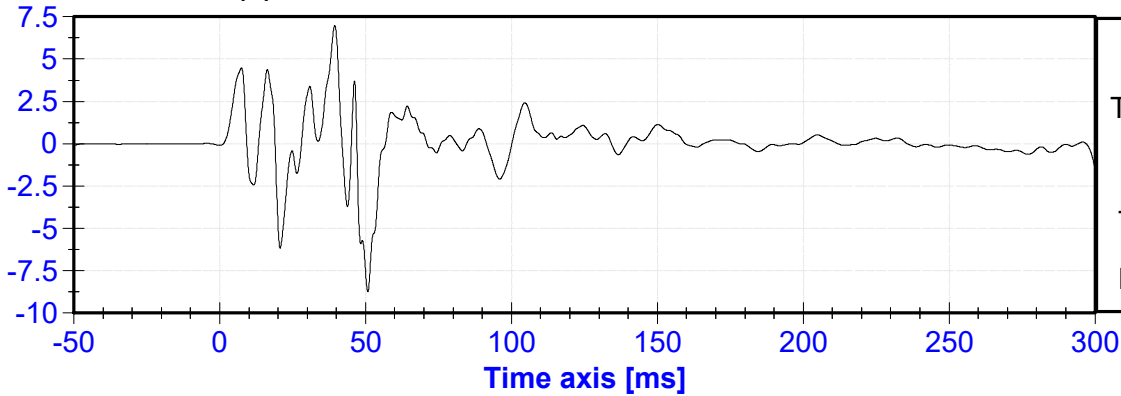
ACCELERATION [g's]

Vehicle CG (Y) Acceleration vs. Time



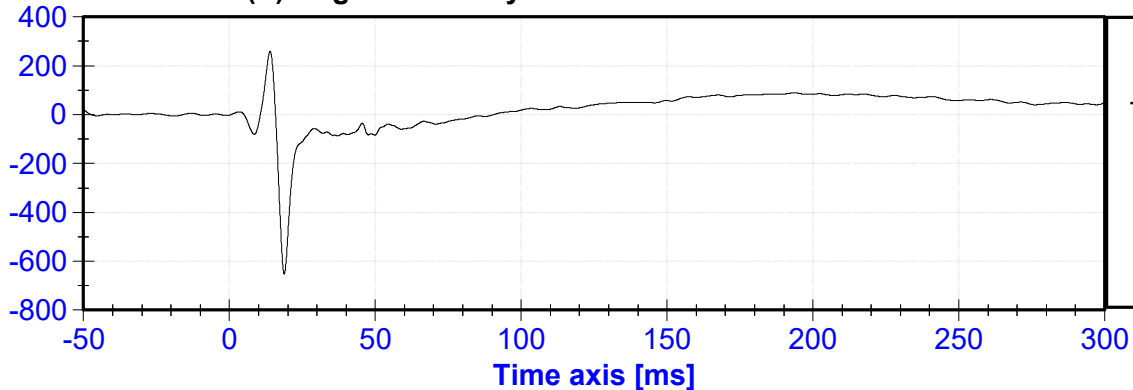
ACCELERATION [g's]

Vehicle CG (Z) Acceleration vs. Time



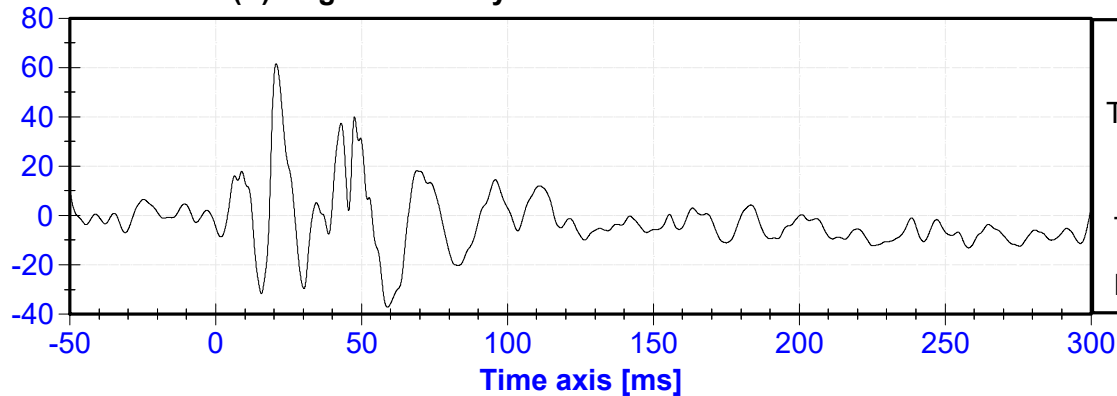
ANGULAR VEL [deg/s]

Vehicle CG (X) Angular Velocity vs. Time



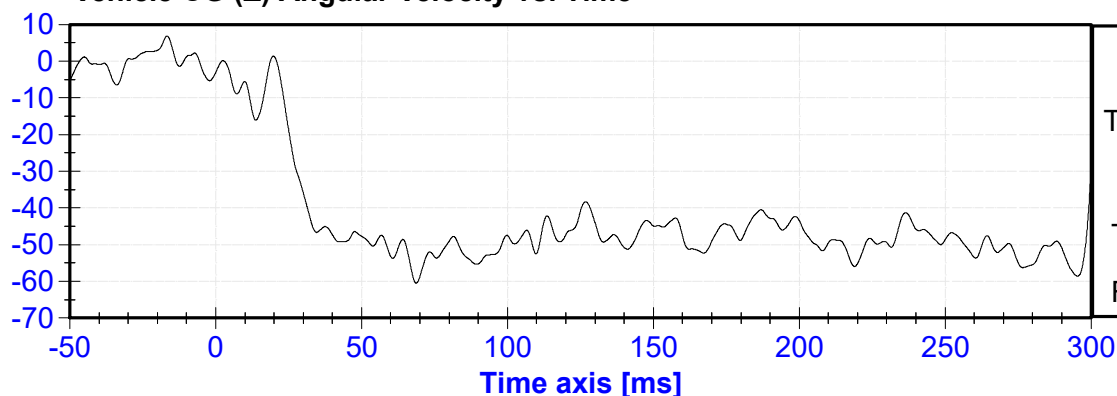
ANGULAR VEL [deg/s]

Vehicle CG (Y) Angular Velocity vs. Time



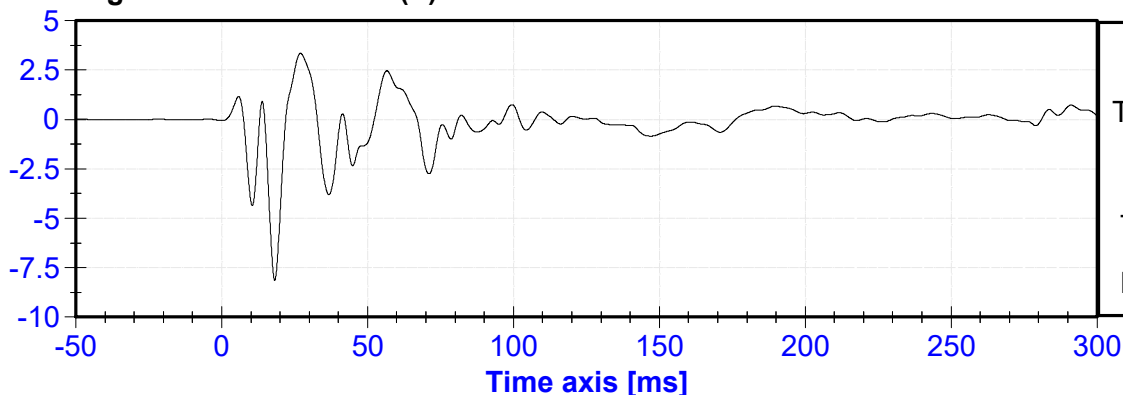
ANGULAR VEL [deg/s]

Vehicle CG (Z) Angular Velocity vs. Time



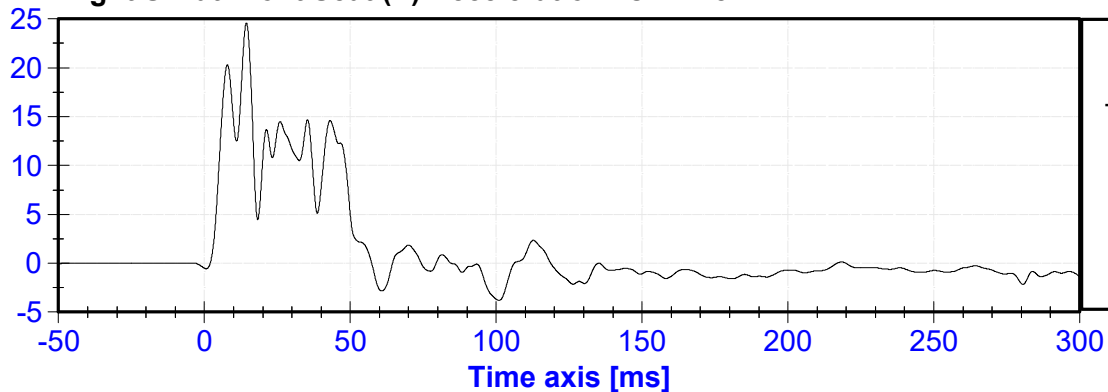
ACCELERATION [g's]

Right Sill at Front Seat (X) Acceleration vs. Time



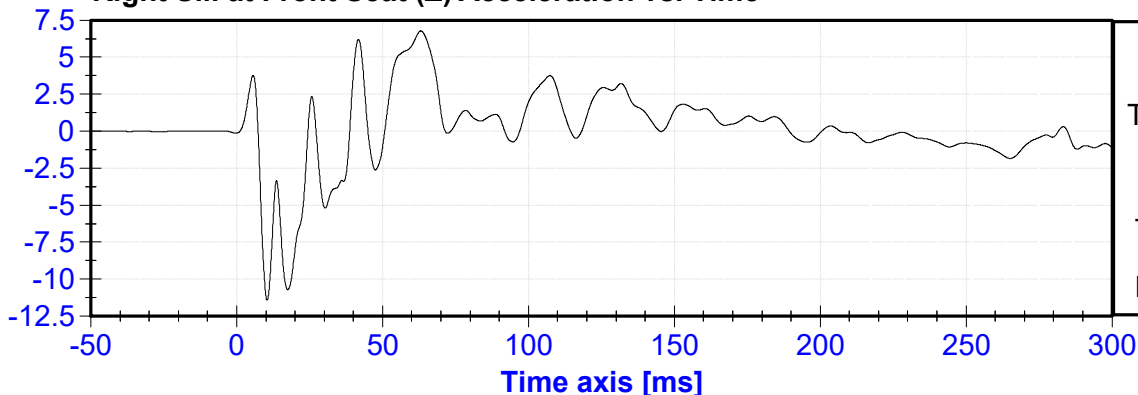
ACCELERATION [g's]

Right Sill at Front Seat (Y) Acceleration vs. Time



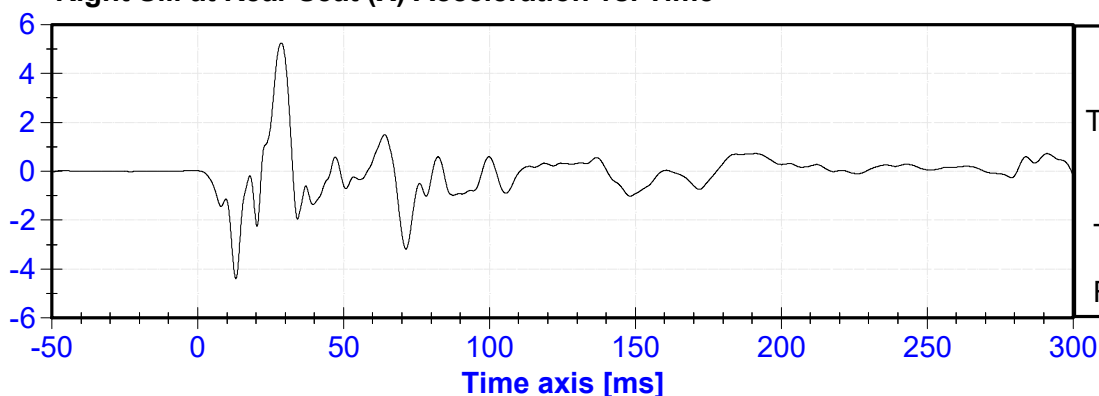
ACCELERATION [g's]

Right Sill at Front Seat (Z) Acceleration vs. Time



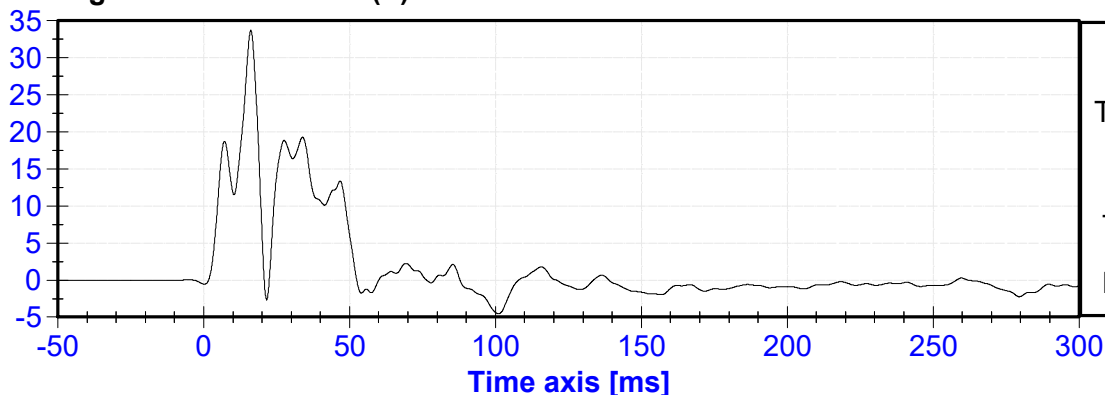
ACCELERATION [g's]

Right Sill at Rear Seat (X) Acceleration vs. Time



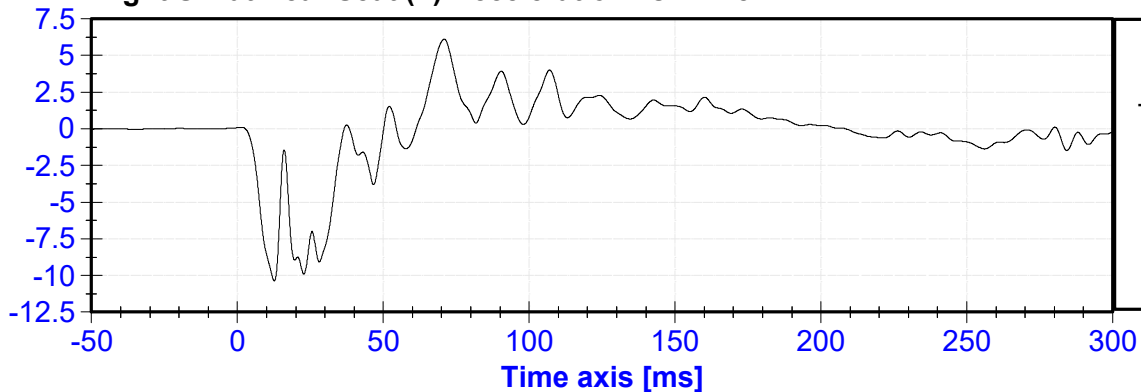
ACCELERATION [g's]

Right Sill at Rear Seat (Y) Acceleration vs. Time



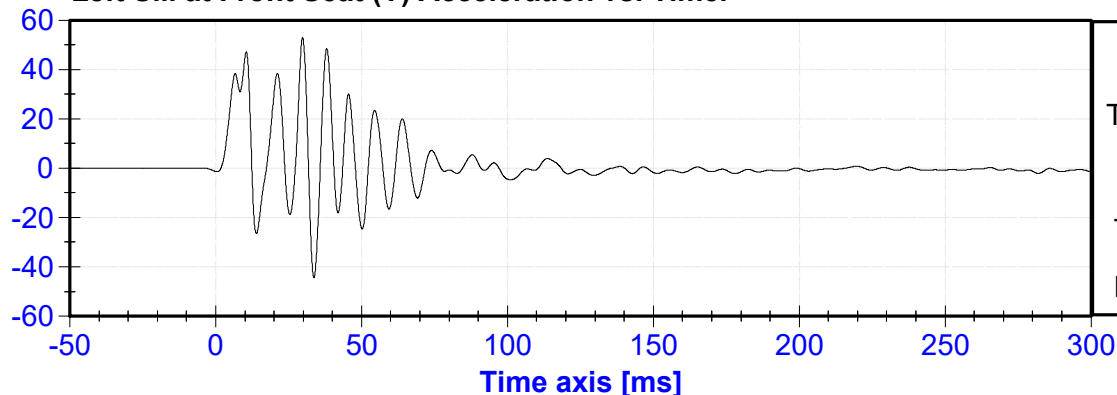
ACCELERATION [g's]

Right Sill at Rear Seat (Z) Acceleration vs. Time



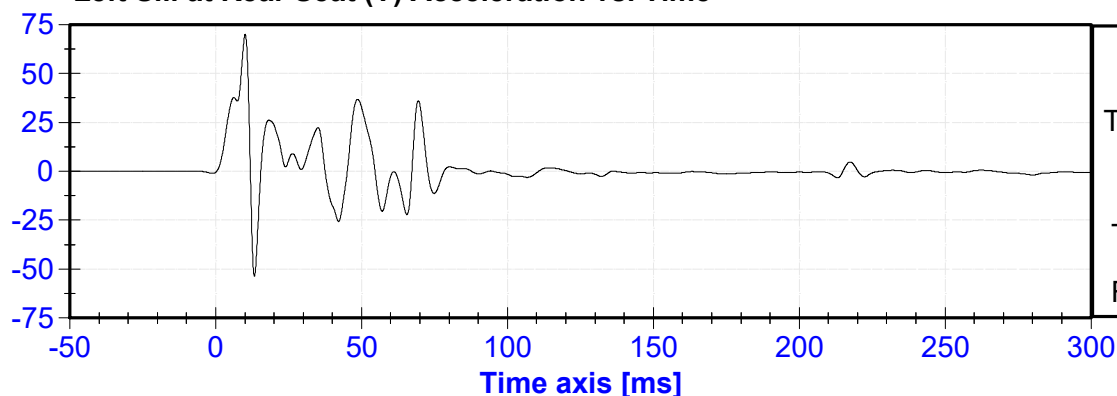
Left Sill at Front Seat (Y) Acceleration vs. Time.

ACCELERATION [g's]



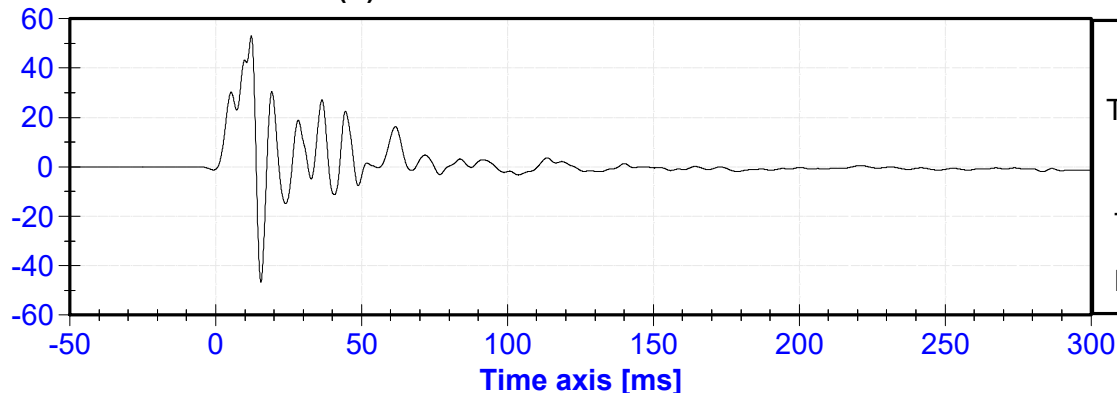
Left Sill at Rear Seat (Y) Acceleration vs. Time

ACCELERATION [g's]



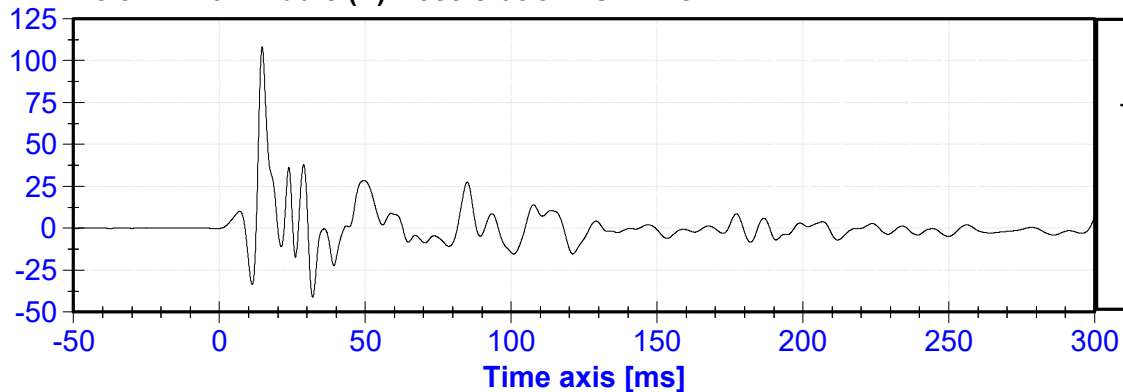
Left A-Pillar Lower (Y) Acceleration vs. Time

ACCELERATION [g's]



Left A-Pillar Middle (Y) Acceleration vs. Time

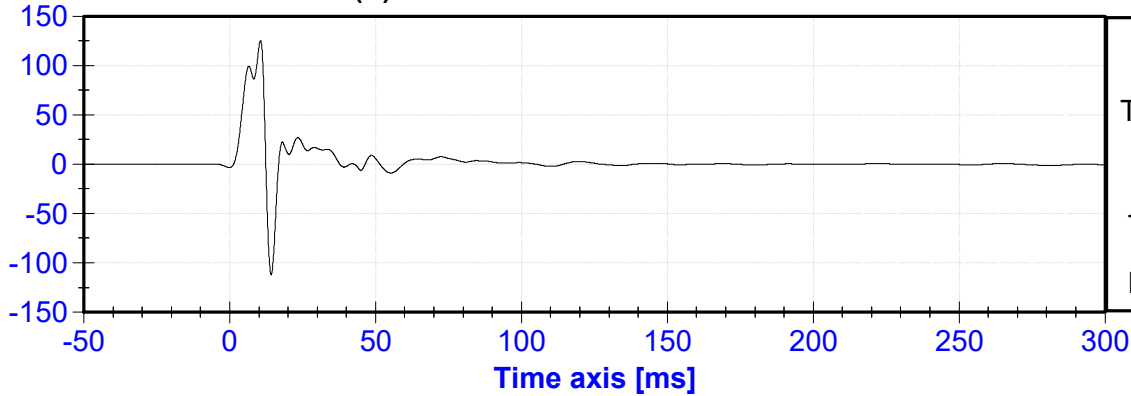
ACCELERATION [g's]



Exceeded calibration range and saturated at 11.4 ms 15.8 ms

ACCELERATION [g's]

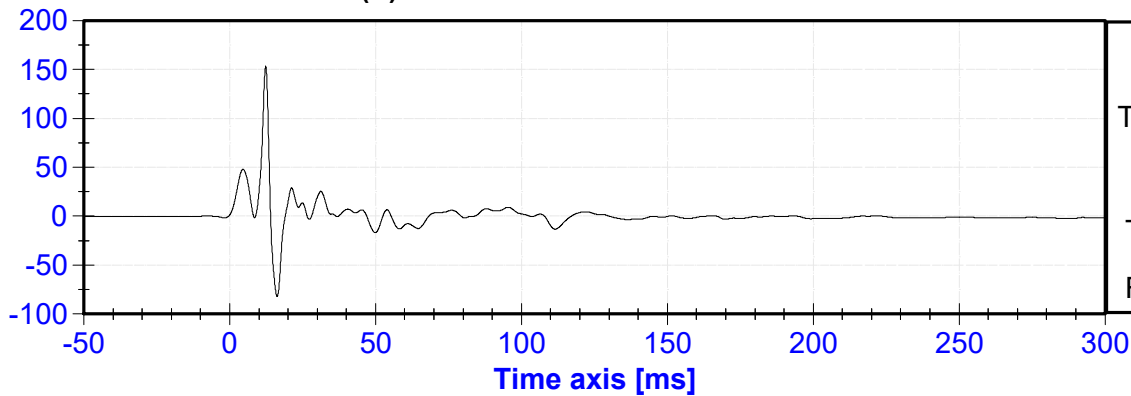
Left B-Pillar Lower (Y) Acceleration vs. Time



Exceeded calibration range and saturated at 10.6 ms

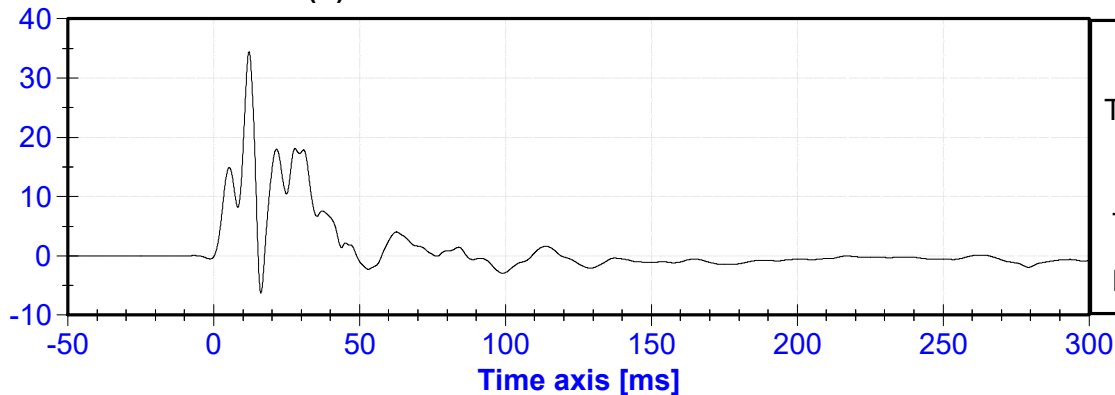
ACCELERATION [g's]

Left B-Pillar Middle (Y) Acceleration vs. Time



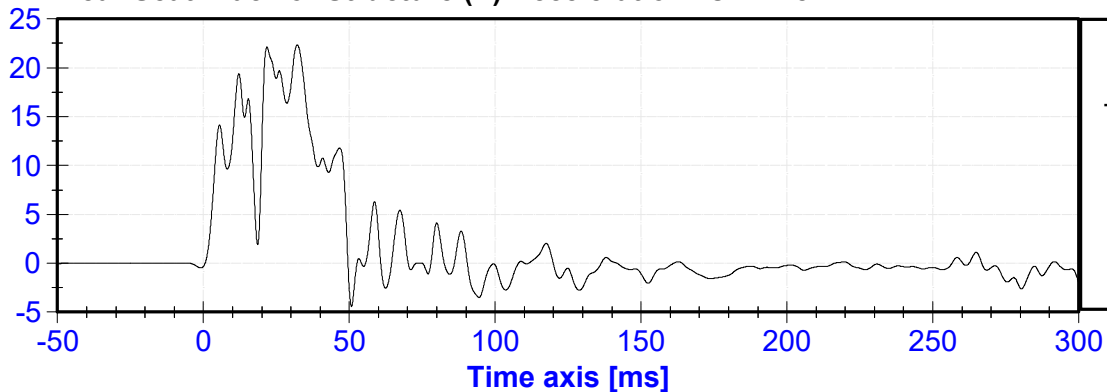
ACCELERATION [g's]

Front Seat Track (Y) Acceleration vs. Time



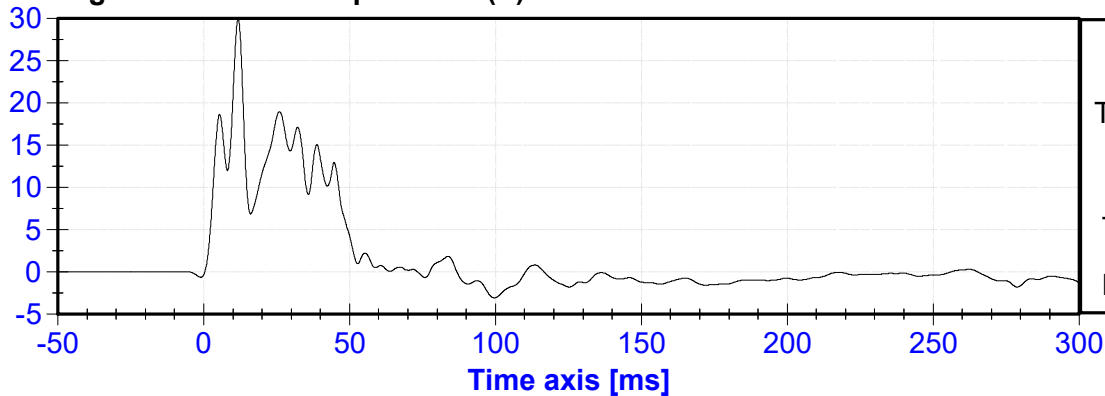
ACCELERATION [g's]

Rear Seat Track or Structure (Y) Acceleration vs. Time



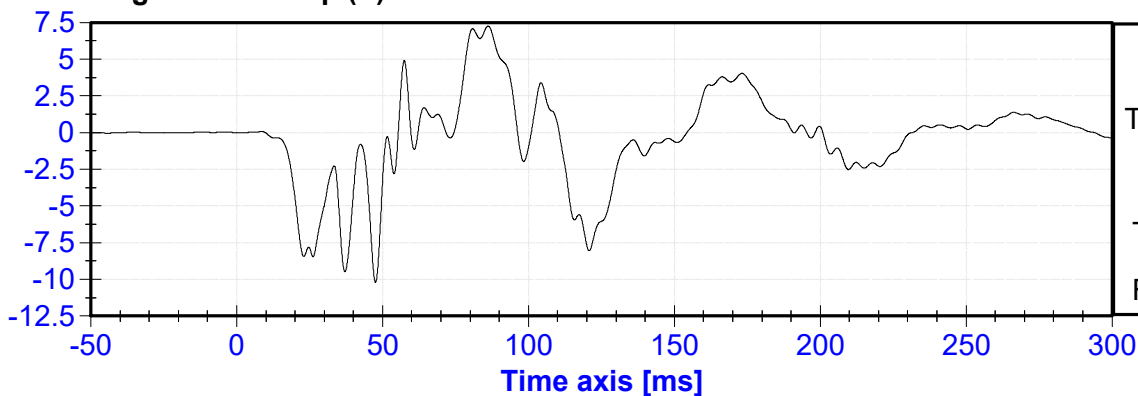
Right Rear Occ. Compartment (Y) Acceleration vs. Time

ACCELERATION [g's]



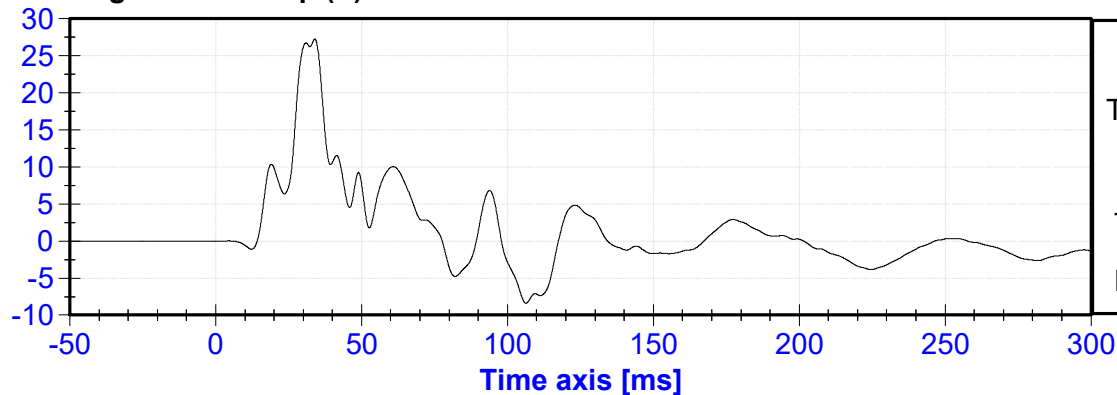
Engine Block Top (X) Acceleration vs. Time

ACCELERATION [g's]



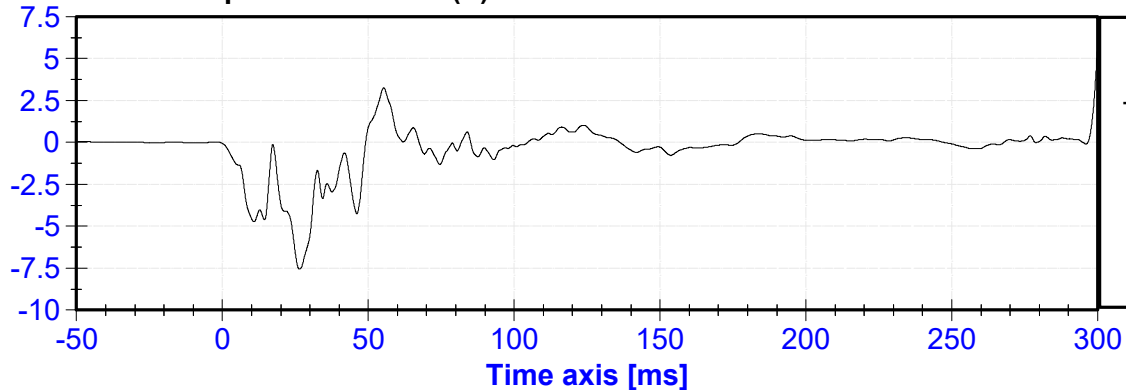
Engine Block Top (Y) Acceleration vs. Time

ACCELERATION [g's]



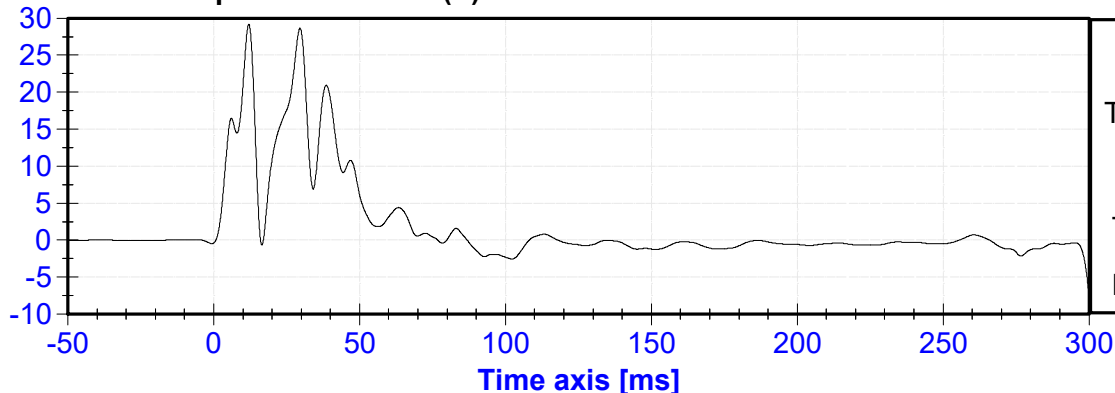
Rear Floorpan Above Axle (X) Acceleration vs. Time

ACCELERATION [g's]



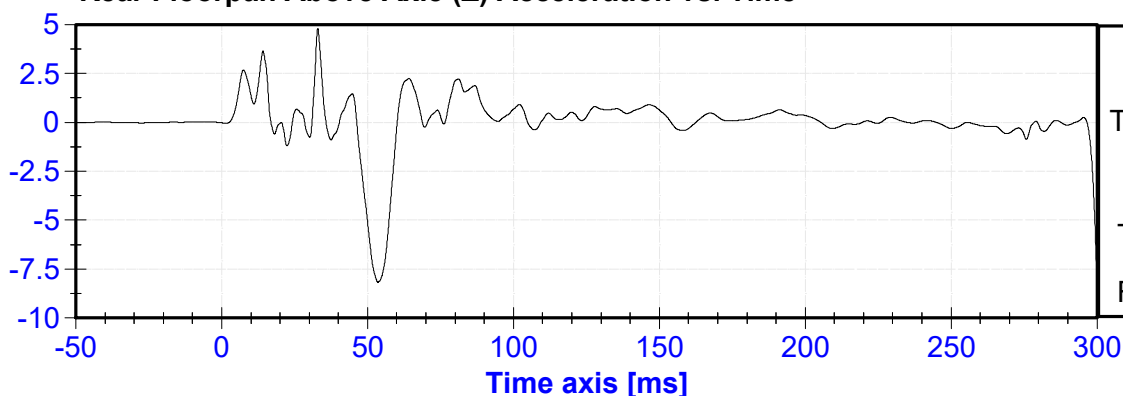
ACCELERATION [g's]

Rear Floorpan Above Axle (Y) Acceleration vs. Time



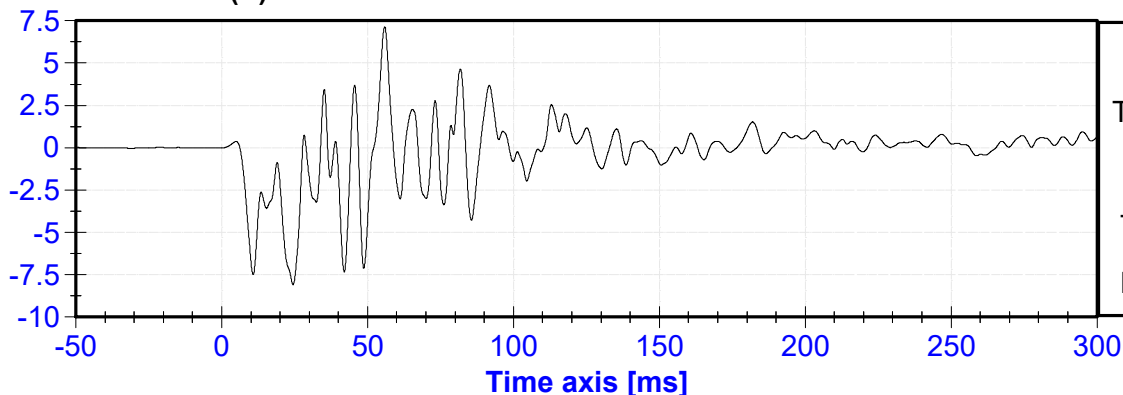
ACCELERATION [g's]

Rear Floorpan Above Axle (Z) Acceleration vs. Time



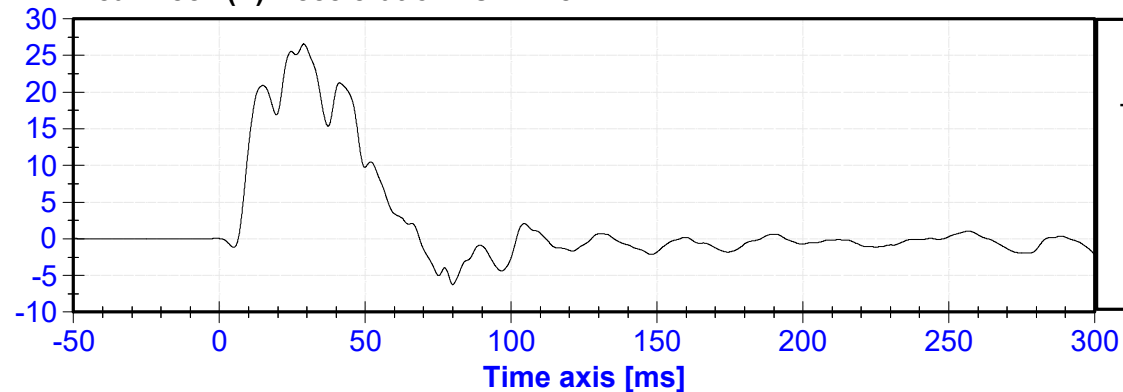
ACCELERATION [g's]

Rear Deck (X) Acceleration vs. Time



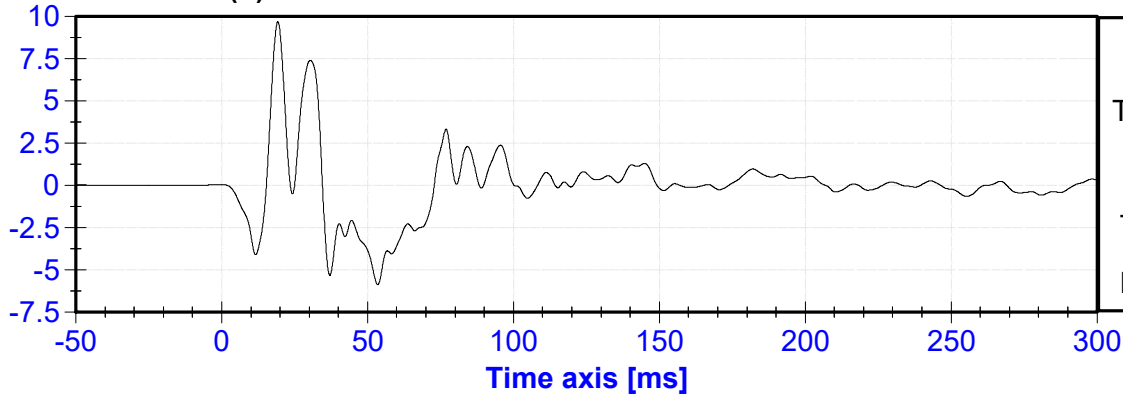
ACCELERATION [g's]

Rear Deck (Y) Acceleration vs. Time



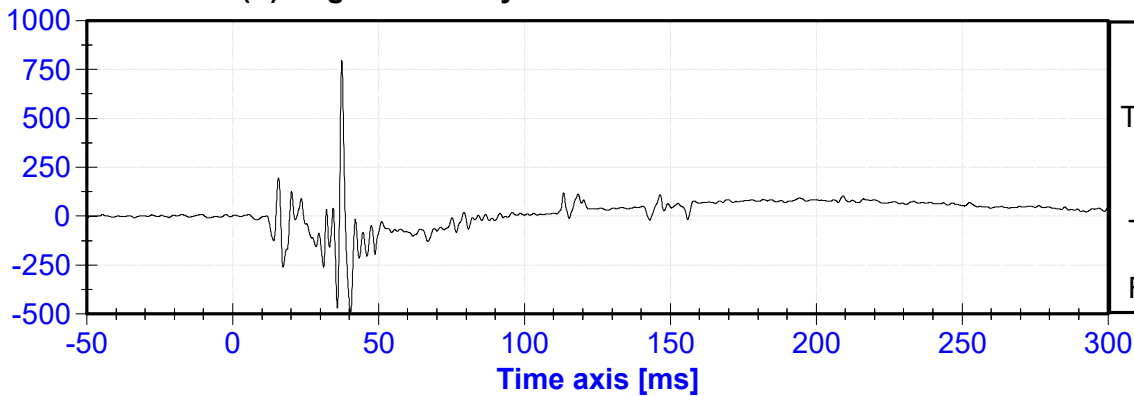
ACCELERATION [g's]

Rear Deck (Z) Acceleration vs. Time



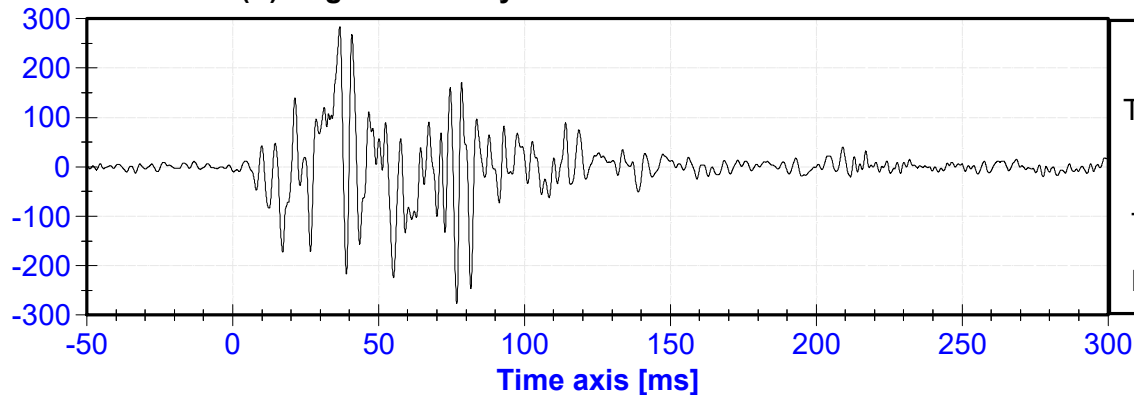
ANGULAR VEL [deg/s]

Rear Deck (X) Angular Velocity vs. Time



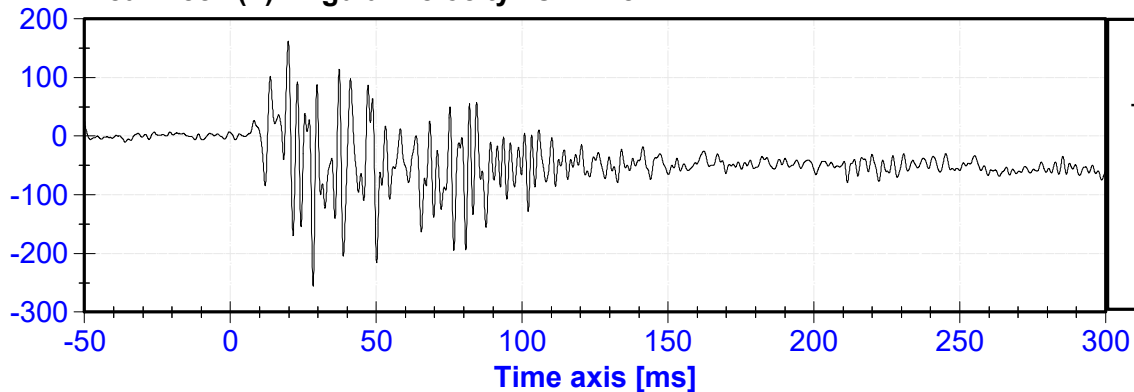
ANGULAR VEL [deg/s]

Rear Deck (Y) Angular Velocity vs. Time



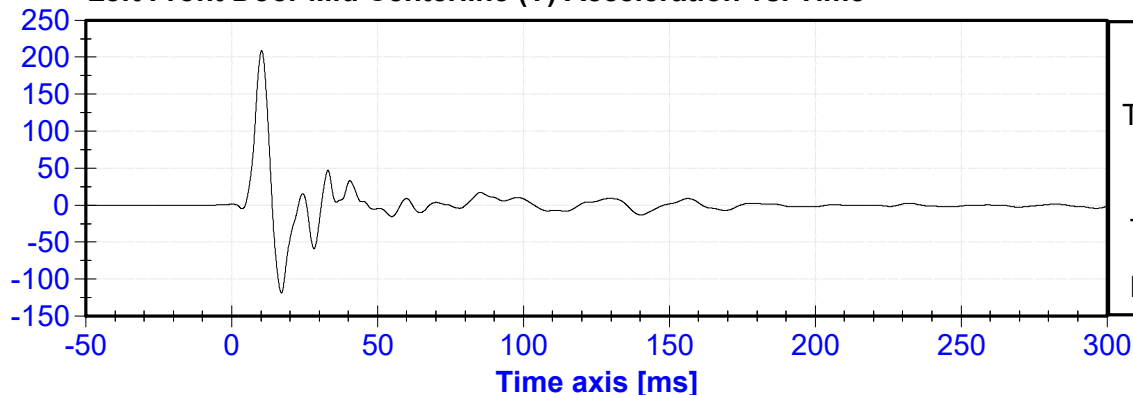
ANGULAR VEL [deg/s]

Rear Deck (Z) Angular Velocity vs. Time



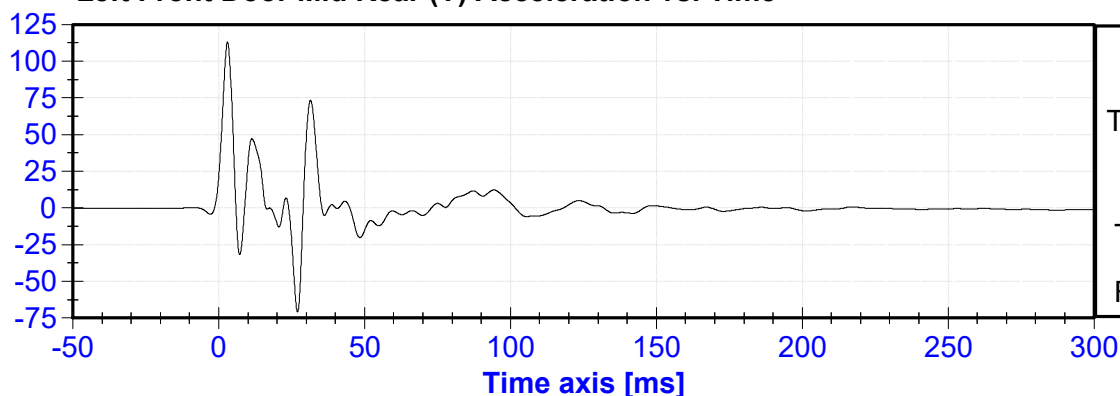
Left Front Door Mid Centerline (Y) Acceleration vs. Time

ACCELERATION [g's]



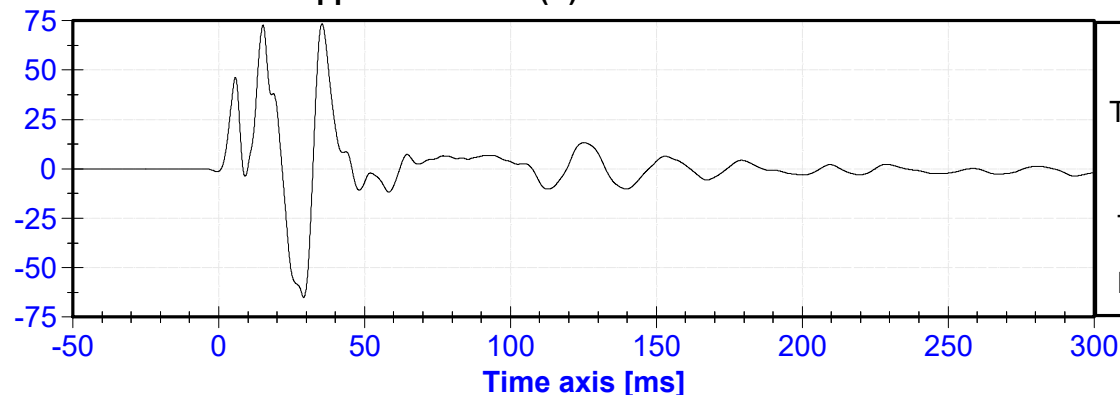
Left Front Door Mid Rear (Y) Acceleration vs. Time

ACCELERATION [g's]



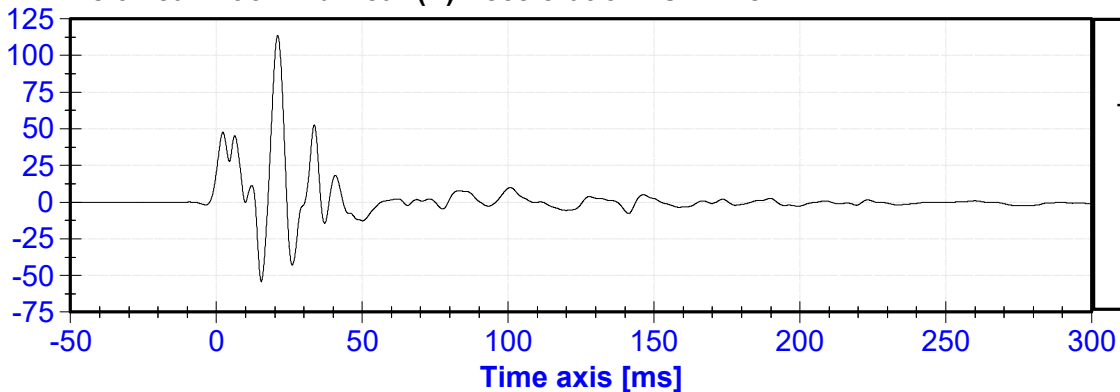
Left Front Door Upper Centerline (Y) Acceleration vs. Time

ACCELERATION [g's]



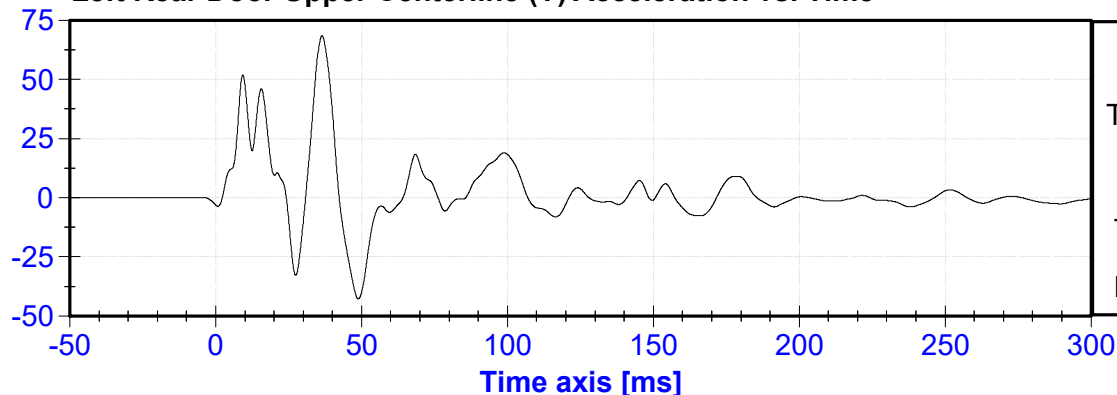
Left Rear Door Mid Rear (Y) Acceleration vs. Time

ACCELERATION [g's]



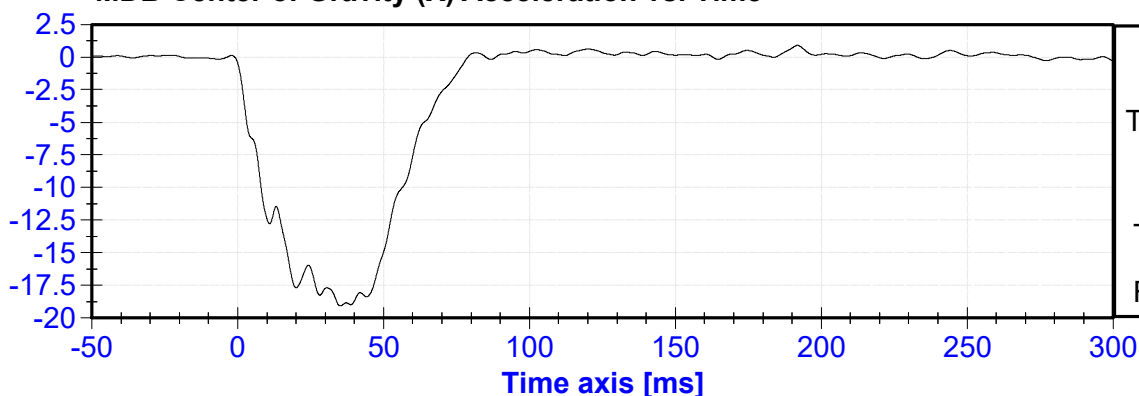
Left Rear Door Upper Centerline (Y) Acceleration vs. Time

ACCELERATION [g's]



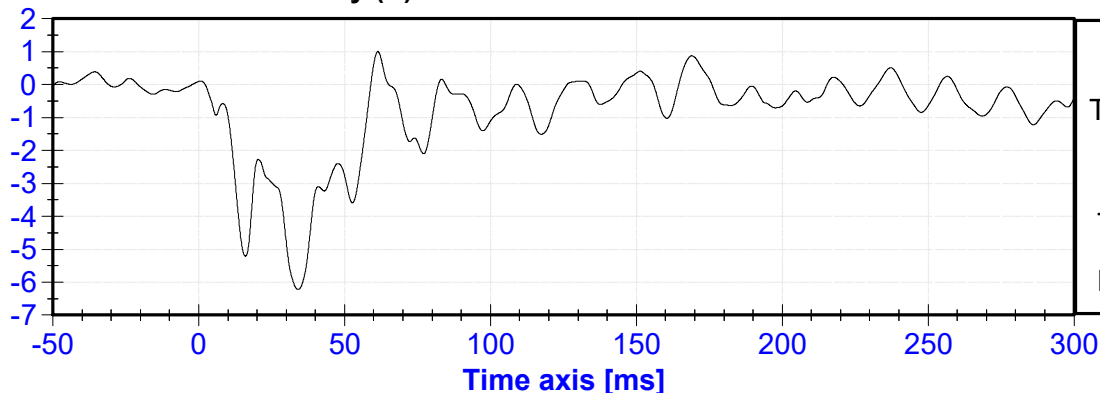
MDB Center of Gravity (X) Acceleration vs. Time

ACCELERATION [g's]



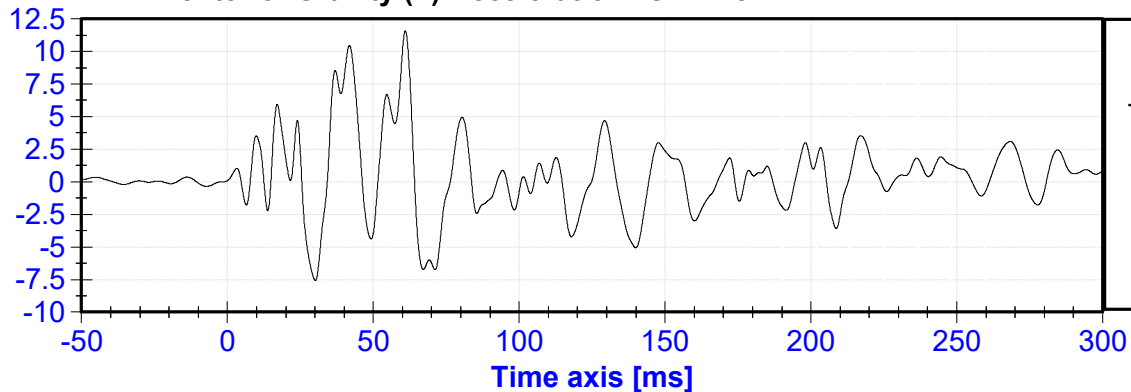
MDB Center of Gravity (Y) Acceleration vs. Time

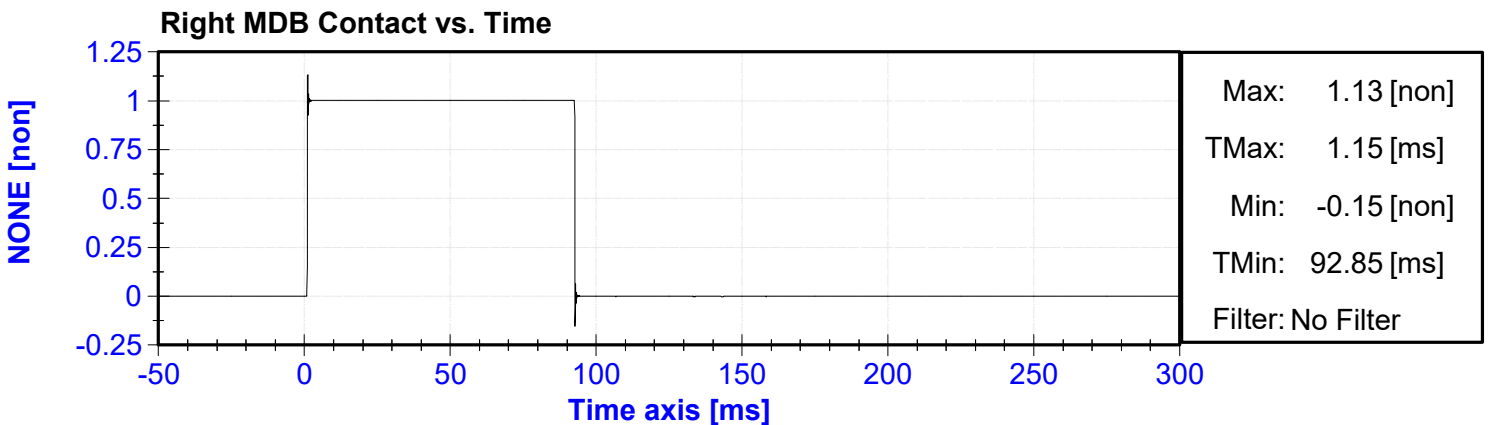
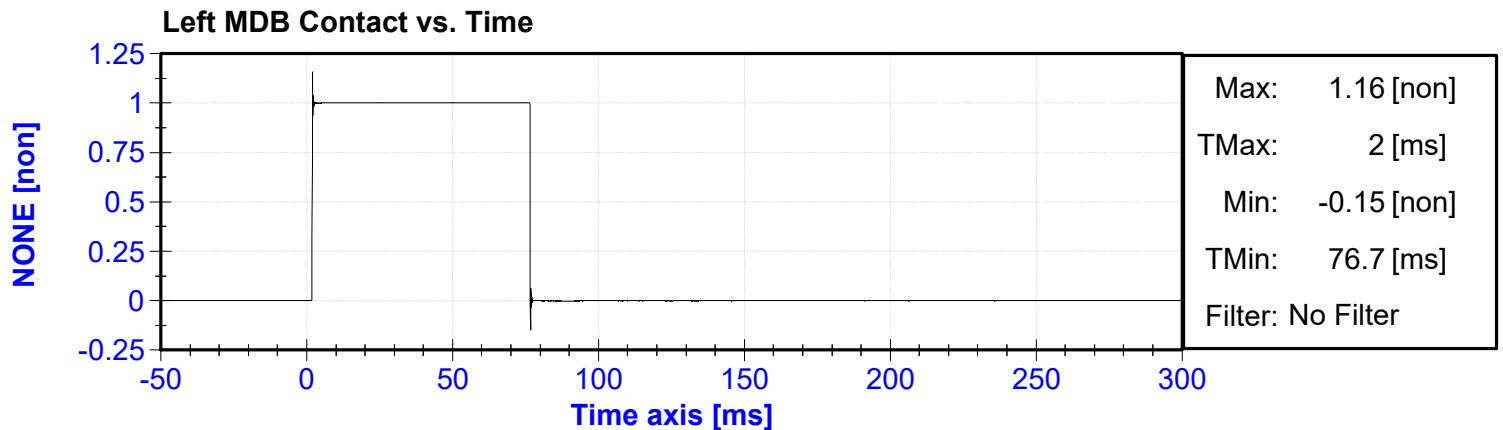
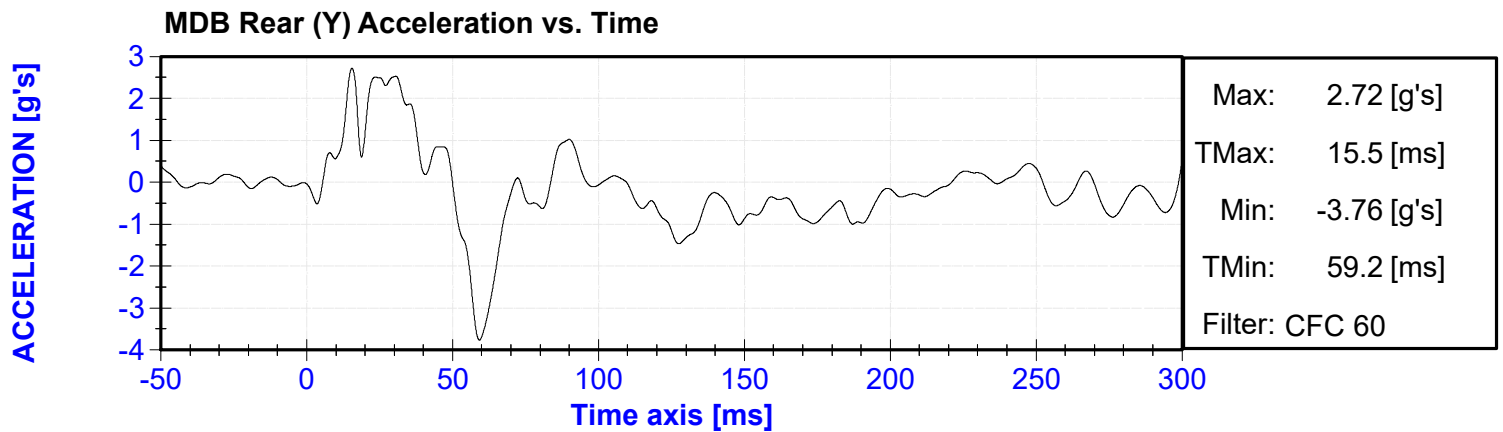
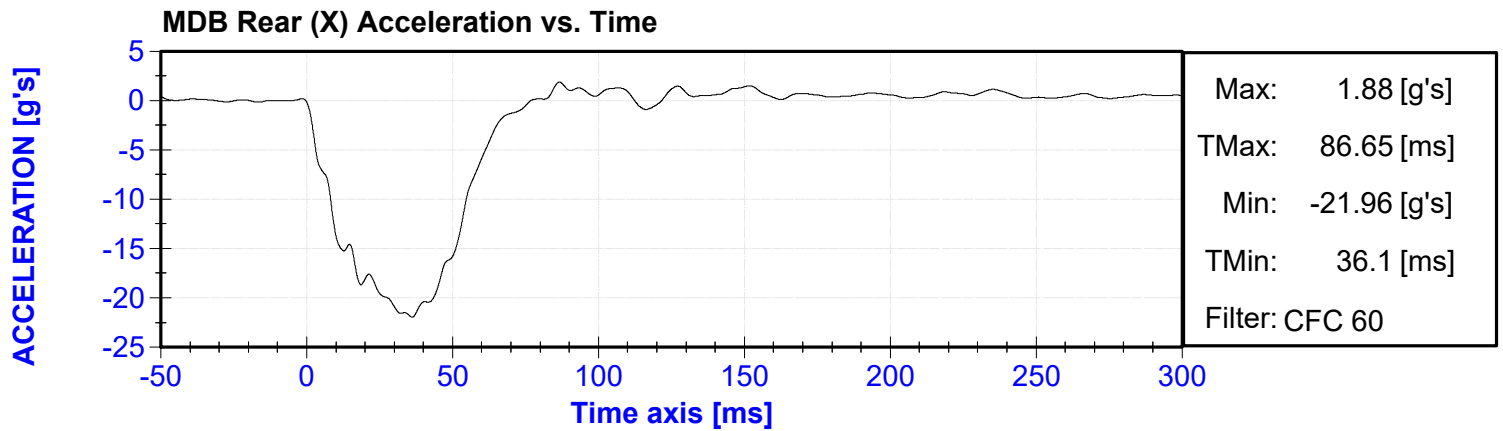
ACCELERATION [g's]



MDB Center of Gravity (Z) Acceleration vs. Time

ACCELERATION [g's]





APPENDIX C

DUMMY PERFORMANCE CALIBRATION TEST DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

SERIAL NO: F034

(CONFIGURED FOR LEFT SIDE IMPACT)

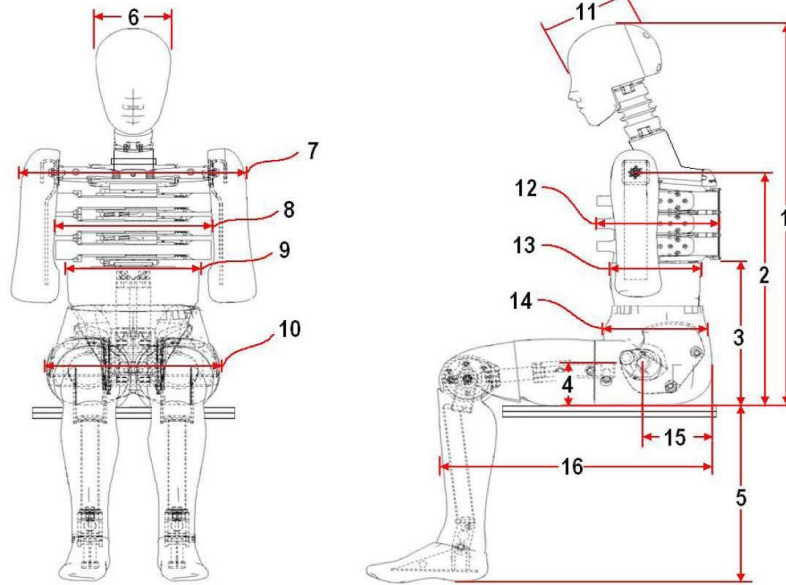


External Measurements - EuroSID-2re

Technician: K. Dutton

Date: 08/24/2020

Dummy Serial Number: F034



FRONT VIEW

SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	910	Pass
2	Seat to Shoulder Joint	558	572	569	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	352	Pass
4	Seat to Hip Joint (center of bolt)	97	103	101	Pass
5	Sole to Seat, Sitting	333	451	421	Pass
6	Head Width	152	158	154	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	329	Pass
9	Abdomen Width	273	287	285	Pass
10	Pelvis Lap Width	359	373	365	Pass
11	Head Depth	196	206	202	Pass
12	Thorax Depth	262	272	268	Pass
13	Abdomen Depth	194	204	202	Pass
14	Pelvis Depth	235	245	240	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	156	Pass
16	Back of Buttocks to Front Knee	597	615	609	Pass

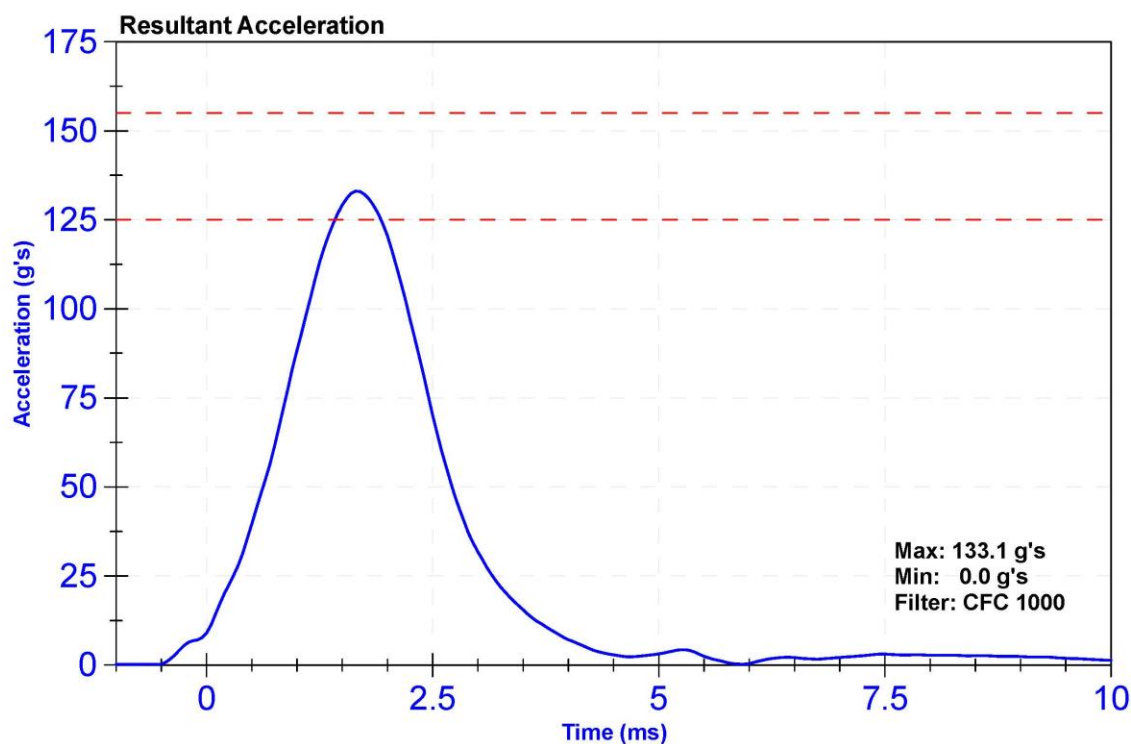
ATD Manufacturer	FTSS	Test Technician	P.Gentz
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

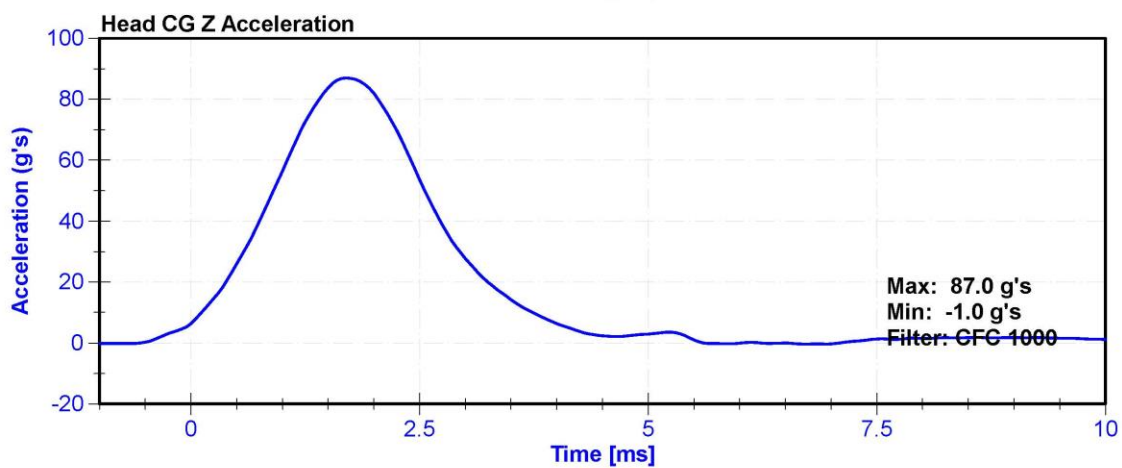
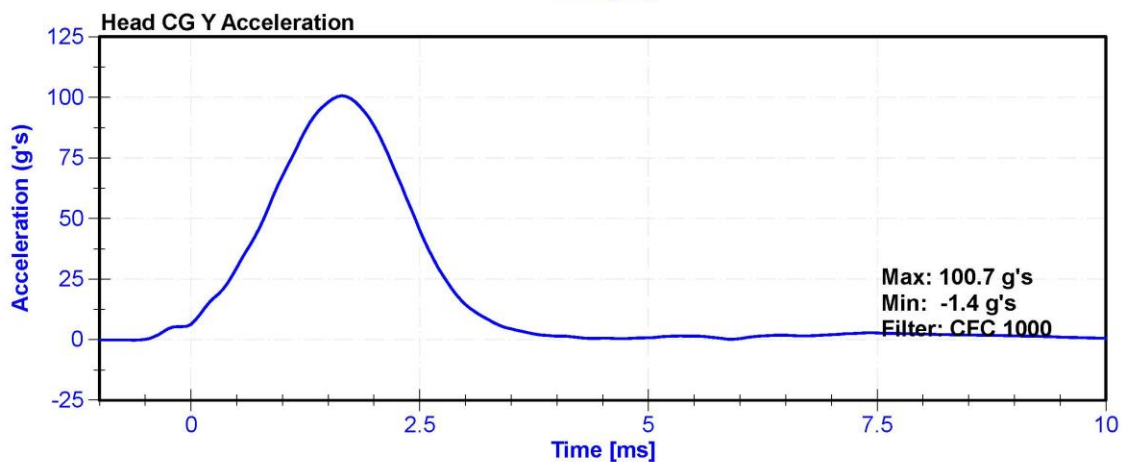
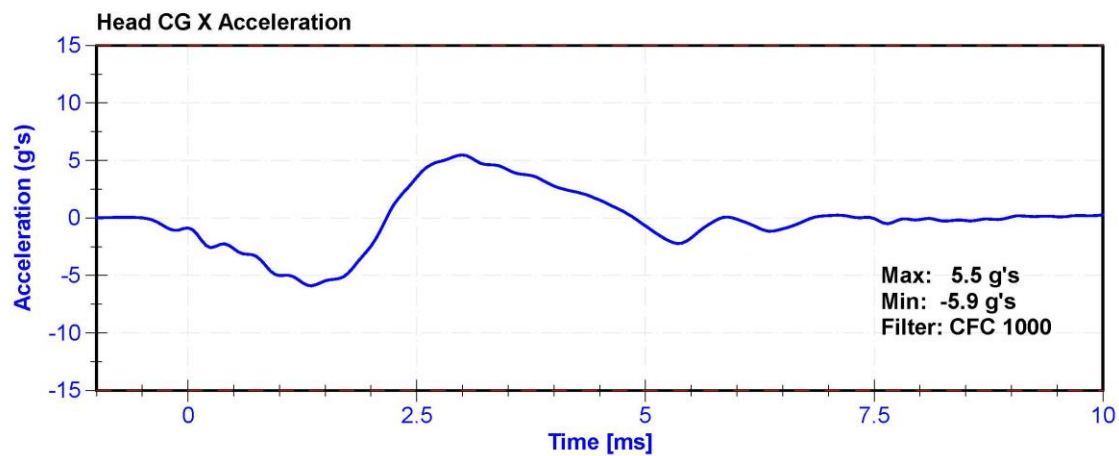
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	39.3	Pass
Resultant Acceleration	125	155	g's	133.1	Pass
Oscillation	0	15	%	3.24	Pass
Fore-Aft Acceleration	-15	15	g's	-5.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco 7264C	P51884	9/22/2020	3/23/2021
Y Accelerometer	Endevco 7264C	P73161	9/22/2020	3/23/2021
Z Accelerometer	Endevco 7264C	P79588	9/22/2020	3/23/2021





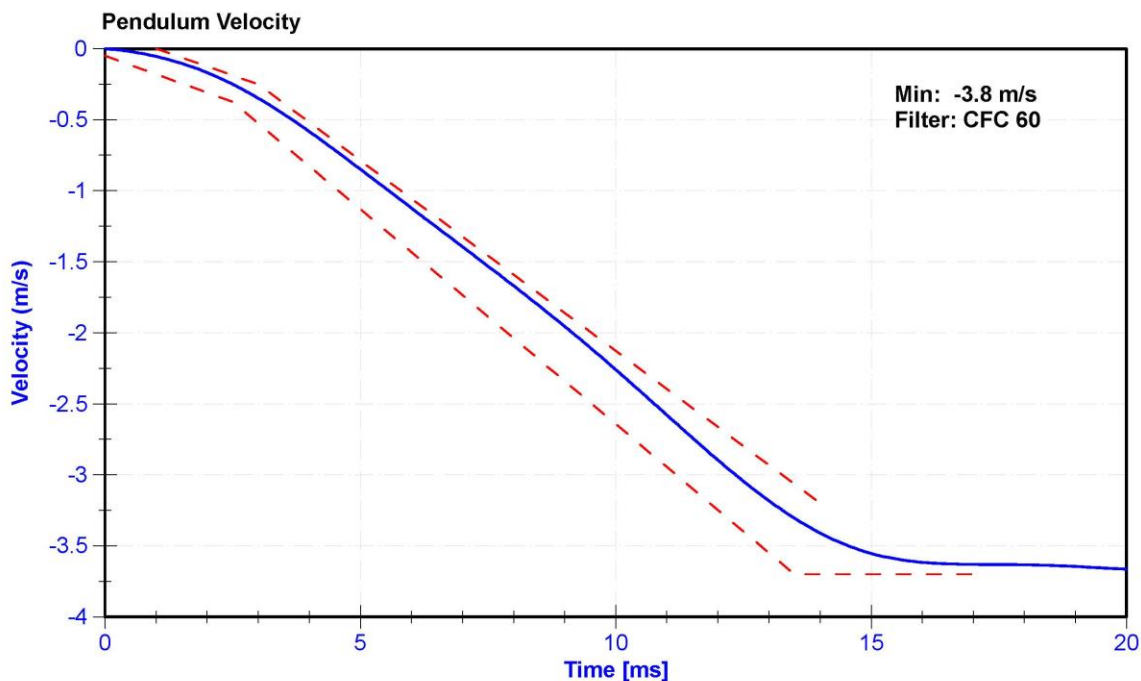
ATD Manufacturer	FTSS	Test Technician	K. Dutton
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

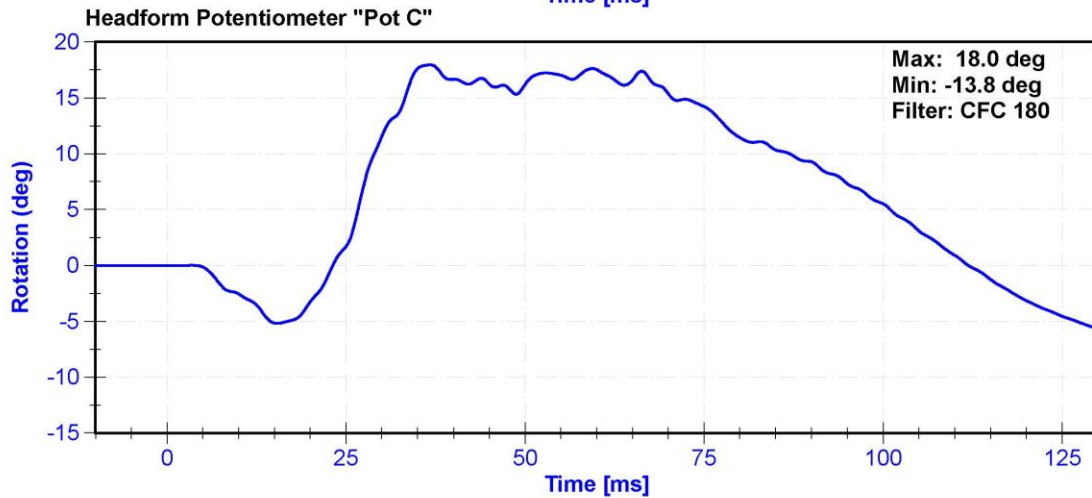
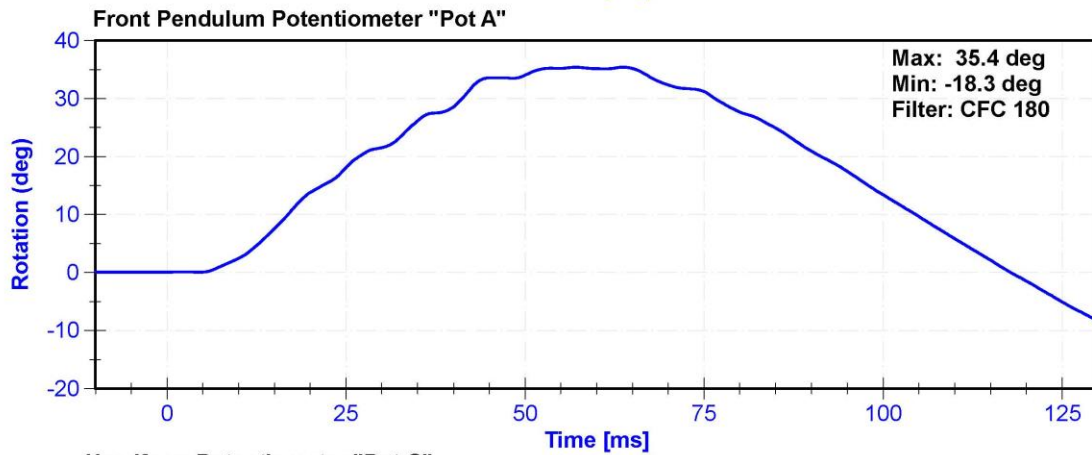
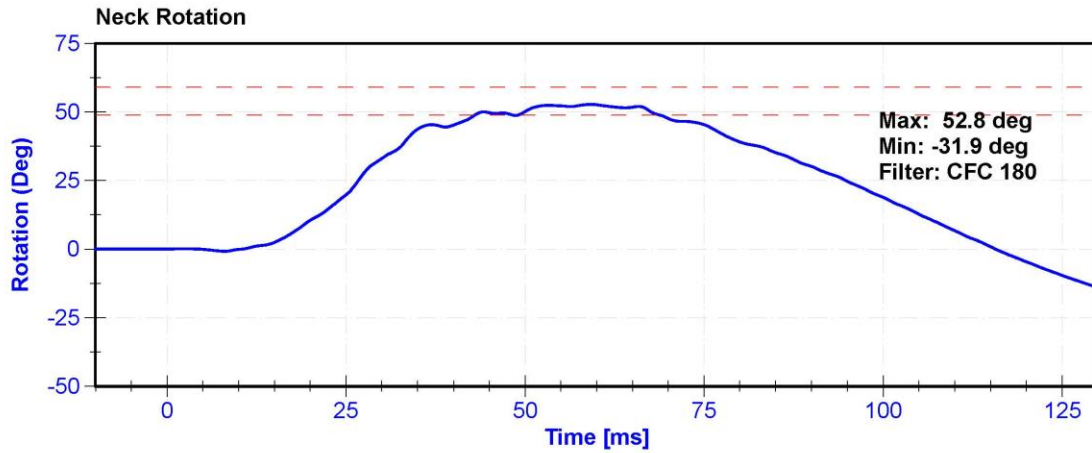
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	36.3	Pass
Velocity	3.3	3.5	m/s	3.35	Pass
Lateral Neck Rotation	49	59	deg	52.8	Pass
Time at Maximum Rotation	54	66	ms	59.3	Pass
Time of Rotation Decay from Maximum	53	88	ms	56.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503	2/6/2020	2/5/2021
Front Pendulum Potentiometer	SP22G	DS-094	8/18/2020	8/18/2021
Headform Potentiometer	SP22G	DS-095	8/18/2020	8/18/2021





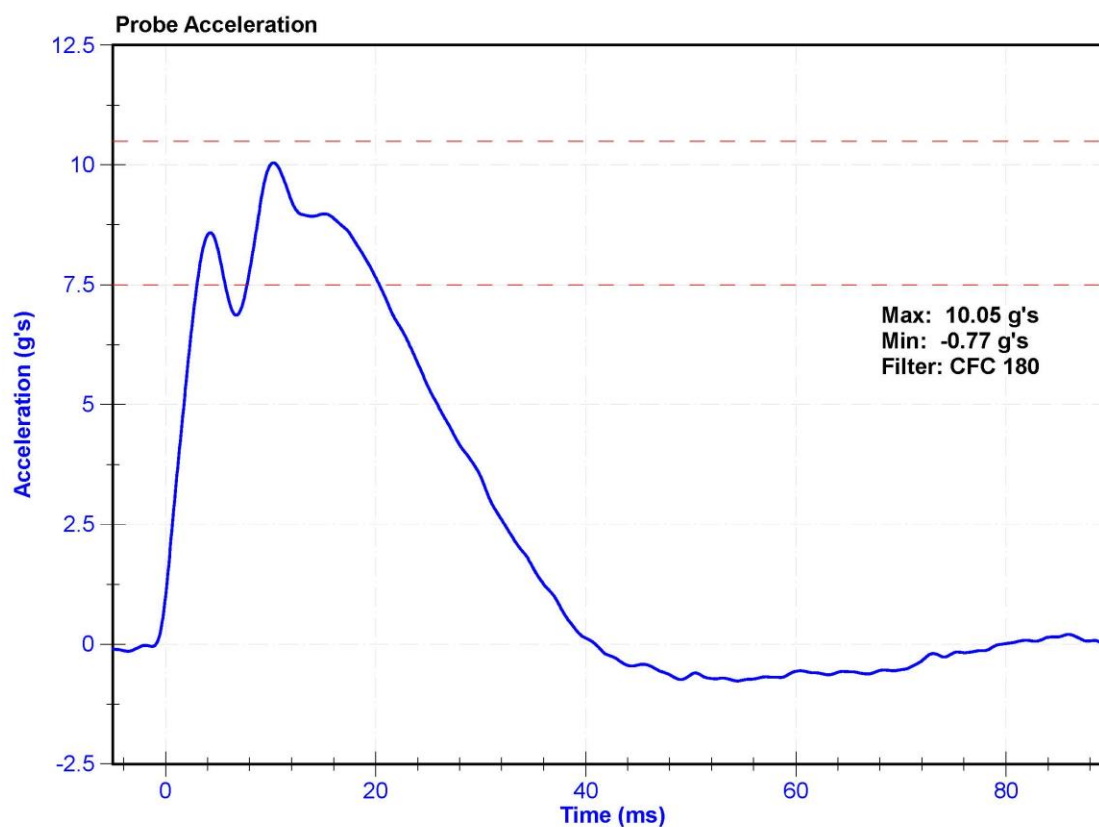
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	39.0	Pass
Velocity	4.2	4.4	m/s	4.40	Pass
Probe Acceleration	7.5	10.5	g's	10.05	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021



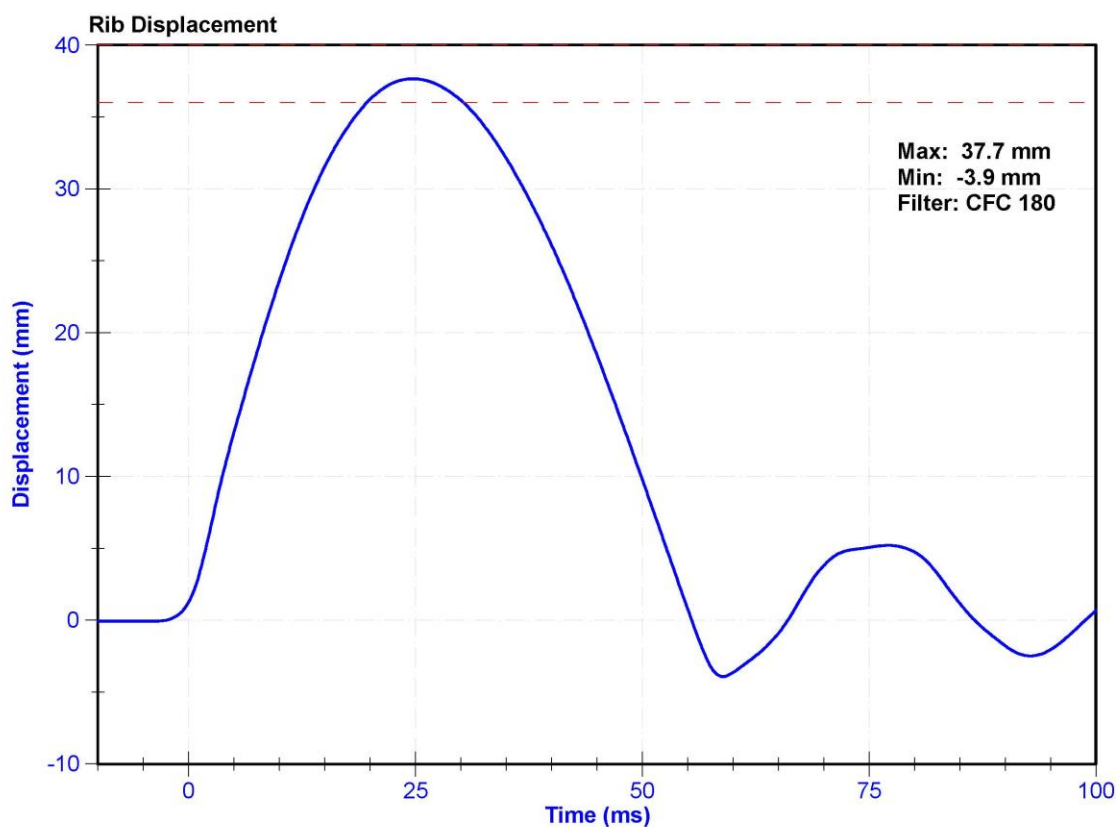
ATD Manufacturer	FTSS	Test Technician	M. Dudek
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	42.9	Pass
Rib Displacement	36	40	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	4/14/2020	10/13/2020



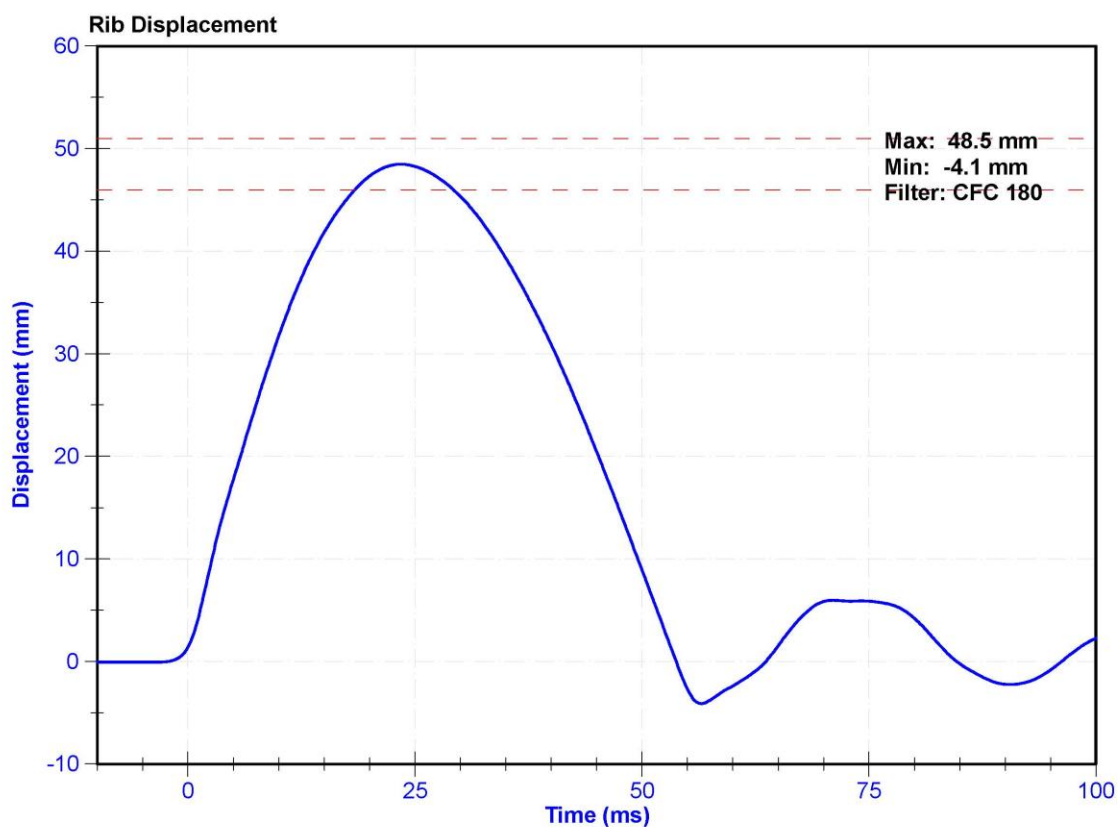
ATD Manufacturer	FTSS	Test Technician	M. Dudek
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	42.9	Pass
Rib Displacement	46	51	mm	48.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	4/14/2020	10/13/2020



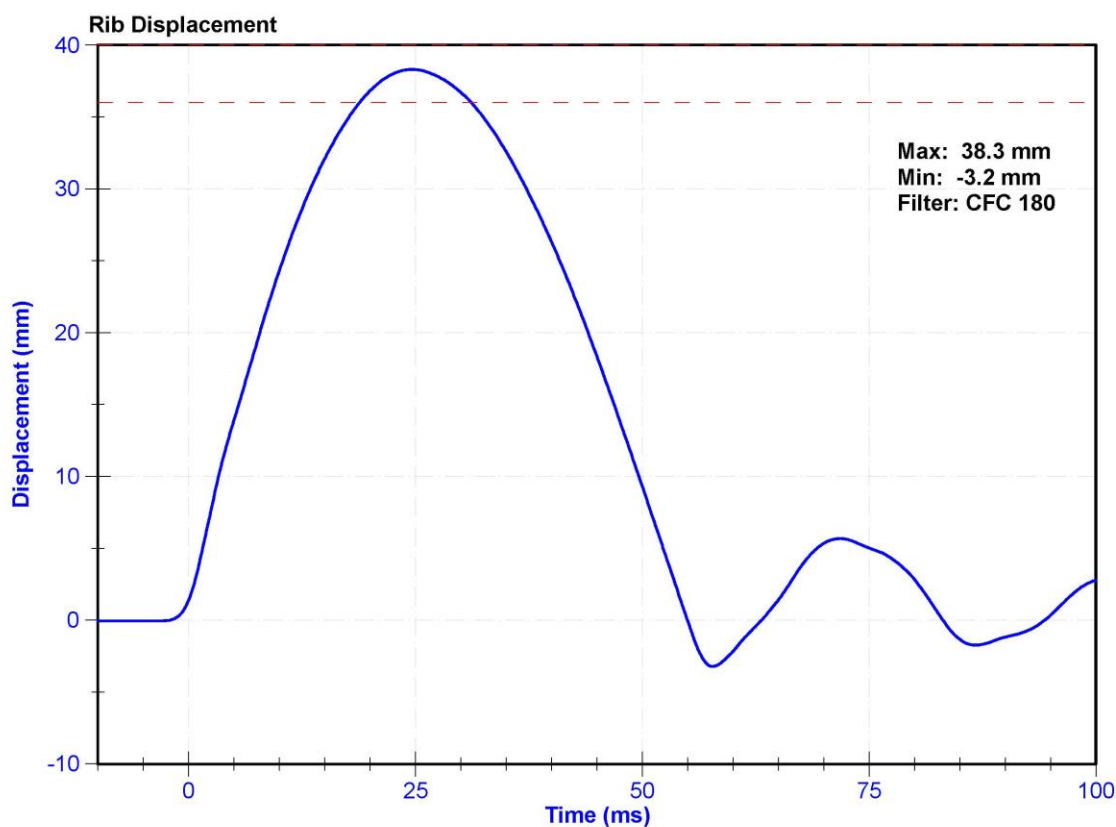
ATD Manufacturer	FTSS	Test Technician	M. Dudek
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	41.8	Pass
Rib Displacement	36	40	mm	38.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	4/14/2020	10/13/2020



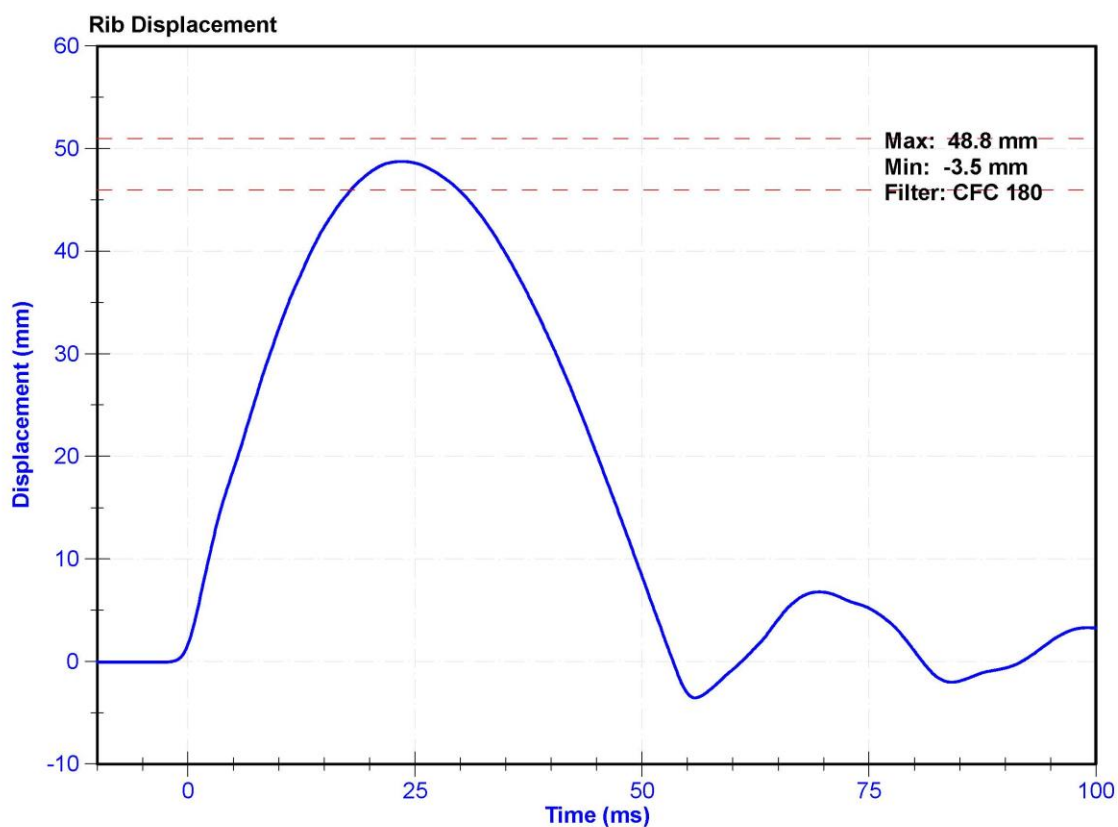
ATD Manufacturer	FTSS	Test Technician	M. Dudek
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	41.8	Pass
Rib Displacement	46	51	mm	48.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	4/14/2020	10/13/2020



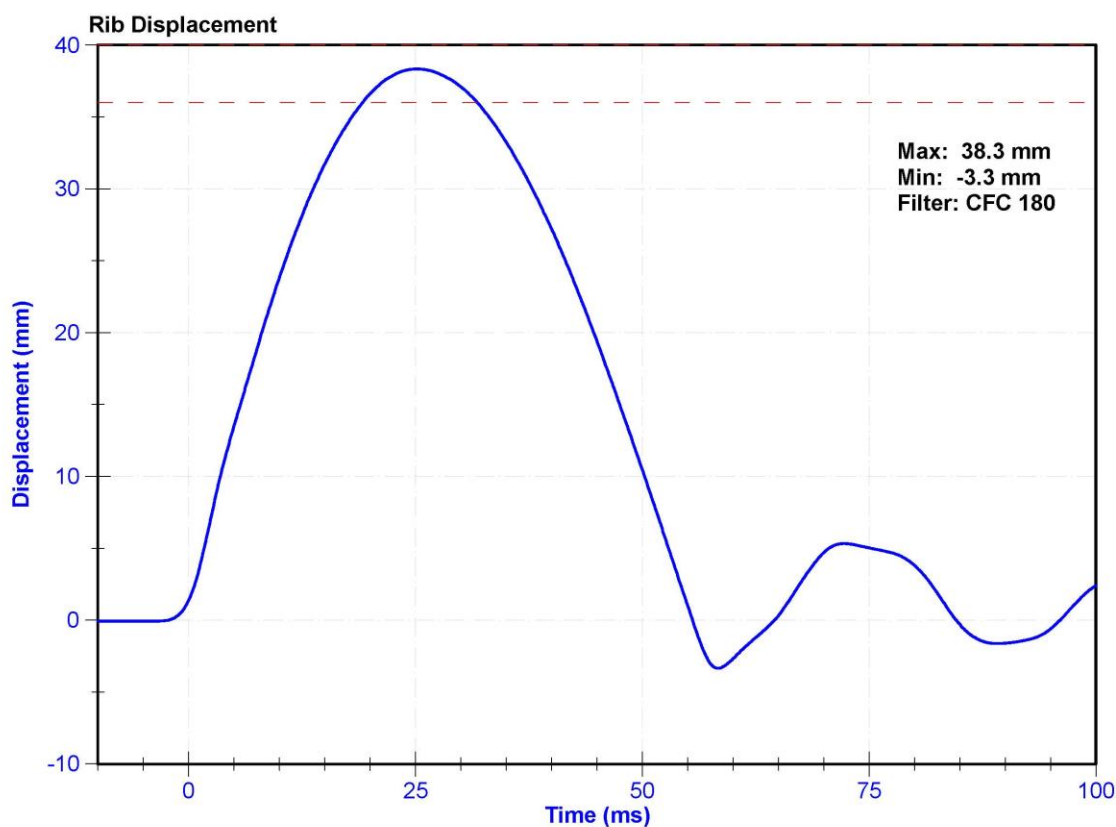
ATD Manufacturer	FTSS	Test Technician	M. Dudek
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	40.8	Pass
Rib Displacement	36	40	mm	38.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	4/14/2020	10/13/2020



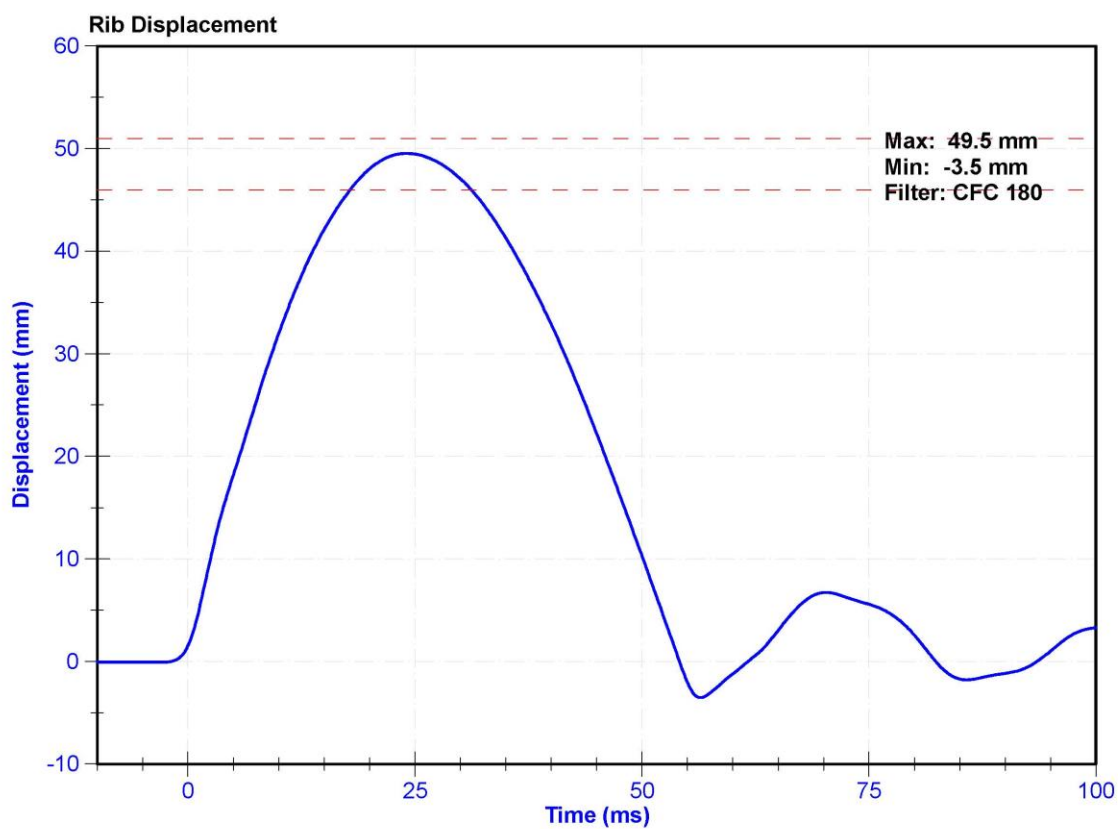
ATD Manufacturer	FTSS	Test Technician	M. Dudek
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	40.8	Pass
Rib Displacement	46	51	mm	49.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	4/14/2020	10/13/2020



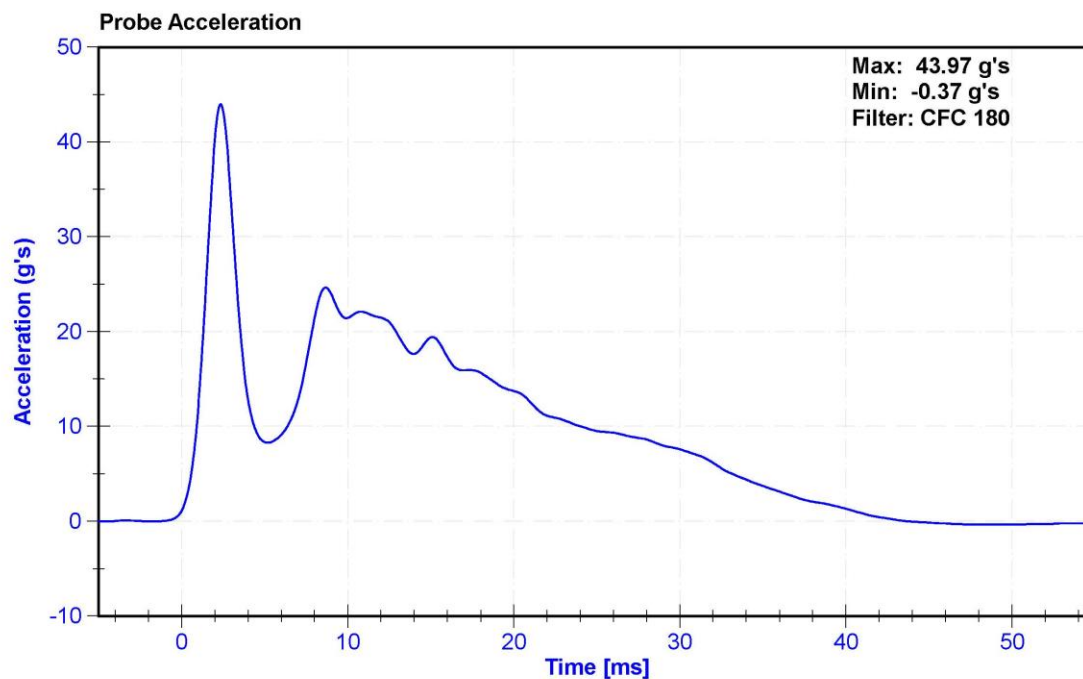
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

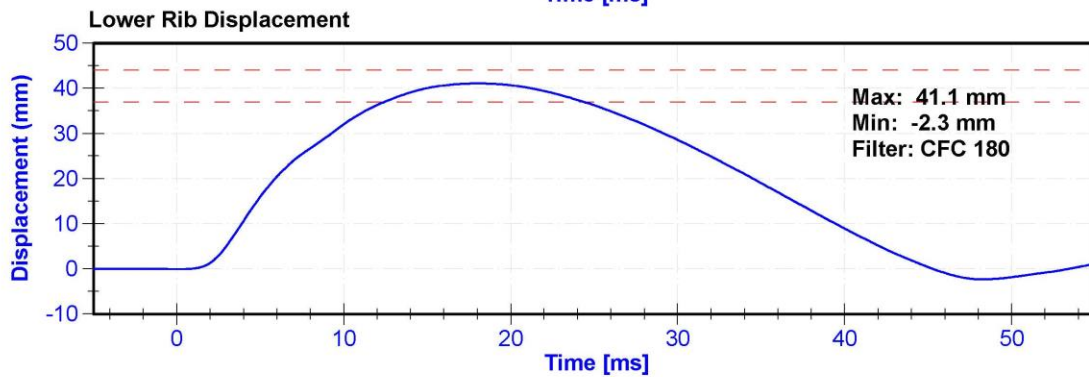
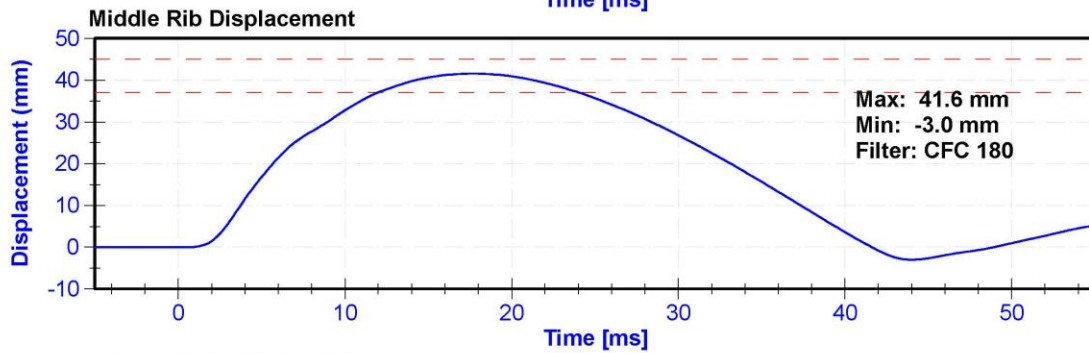
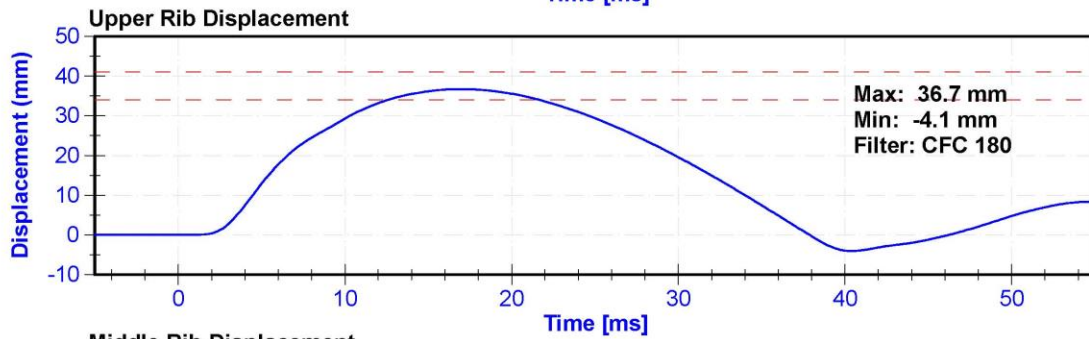
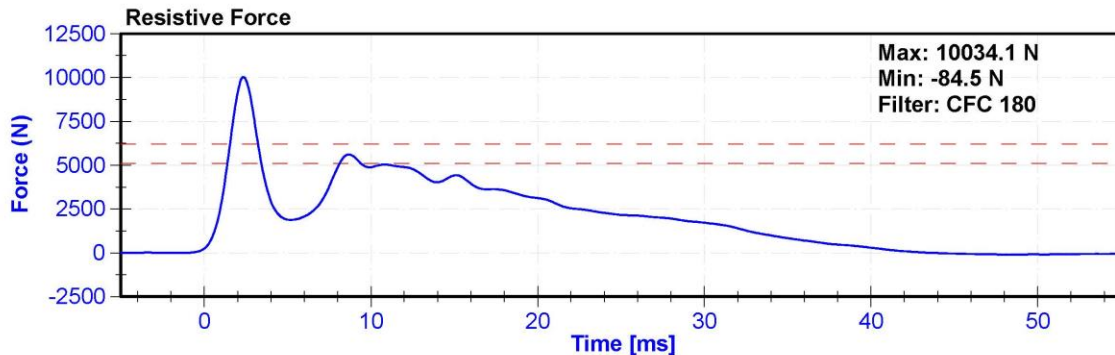
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	39.0	Pass
Velocity	5.4	5.6	m/s	5.44	Pass
Resistive Force after 6ms	5100	6200	N	5617.8	Pass
Upper Thorax Rib Deflection	34	41	mm	36.7	Pass
Mid Thorax Rib Deflection	37	45	mm	41.6	Pass
Lower Thorax Rib Deflection	37	44	mm	41.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Upper Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/8/2020	4/8/2021
Middle Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/8/2020	4/8/2021
Lower Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/8/2020	4/8/2021





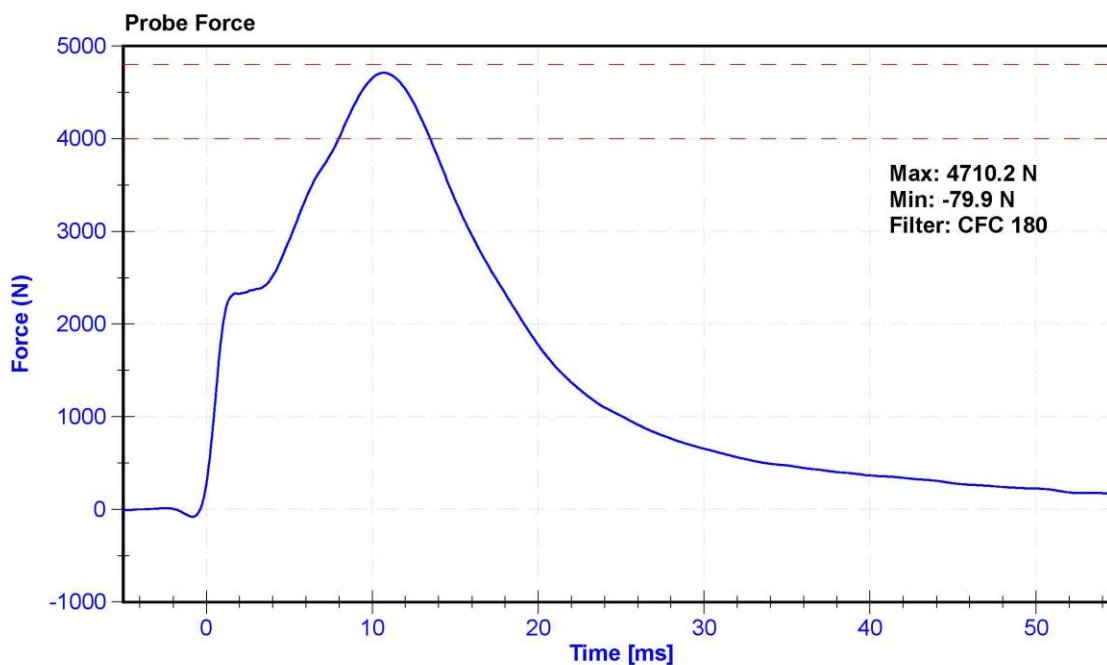
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K.Brogan

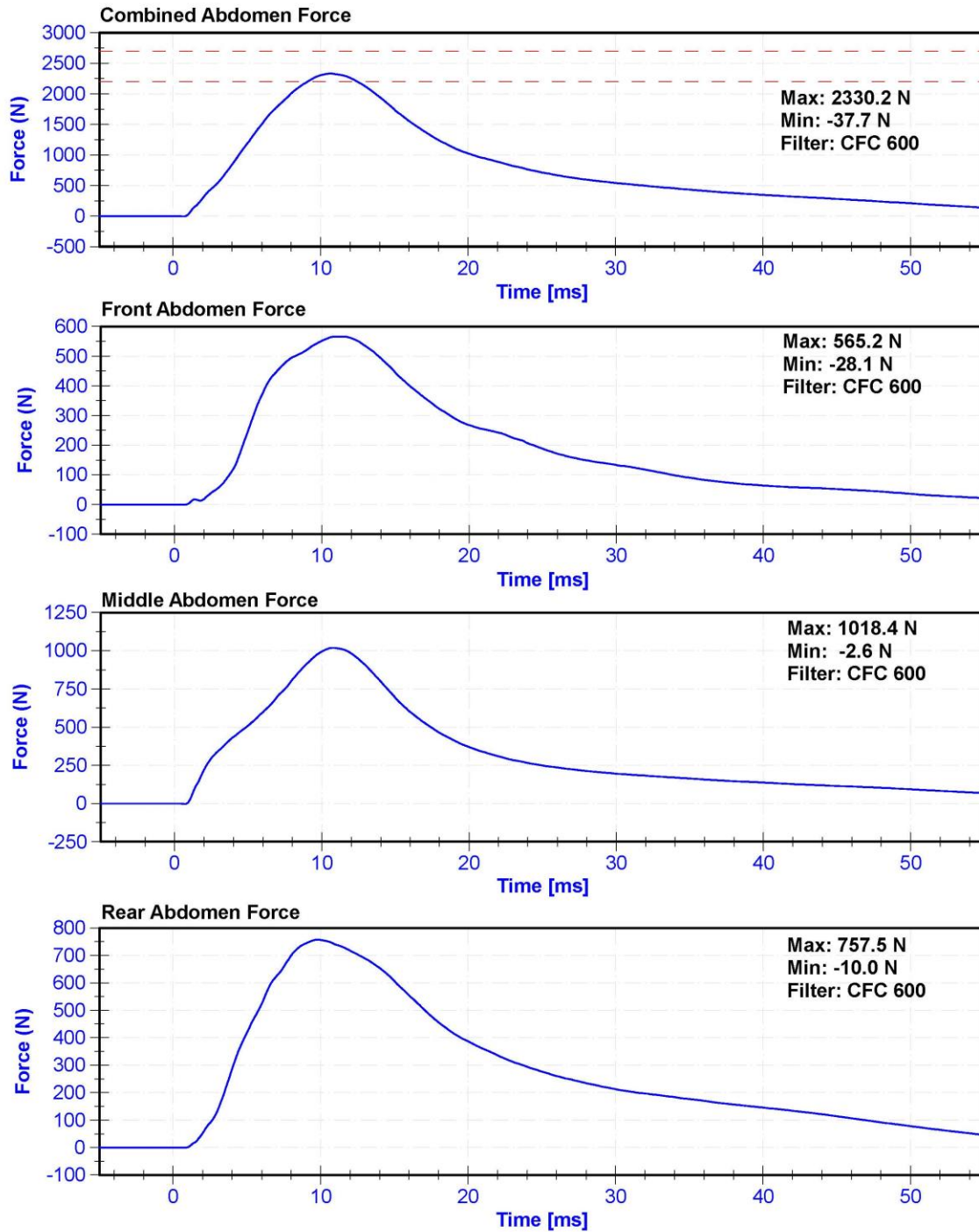
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	45	Pass
Velocity	3.9	4.1	m/s	4.07	Pass
Combined Abdomen Force	2200	2700	N	2330.2	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.65	Pass
Resistive Probe Force	4000	4800	N	4710.2	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.70	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Front Abdomen Load Cell	DENTON 2631J	LC-1524	3/19/2020	3/19/2021
Middle Abdomen Load Cell	DENTON 2631J	LC-1523	3/19/2020	3/19/2021
Rear Abdomen Load Cell	DENTON 2631J	LC-1530	3/19/2020	3/19/2021







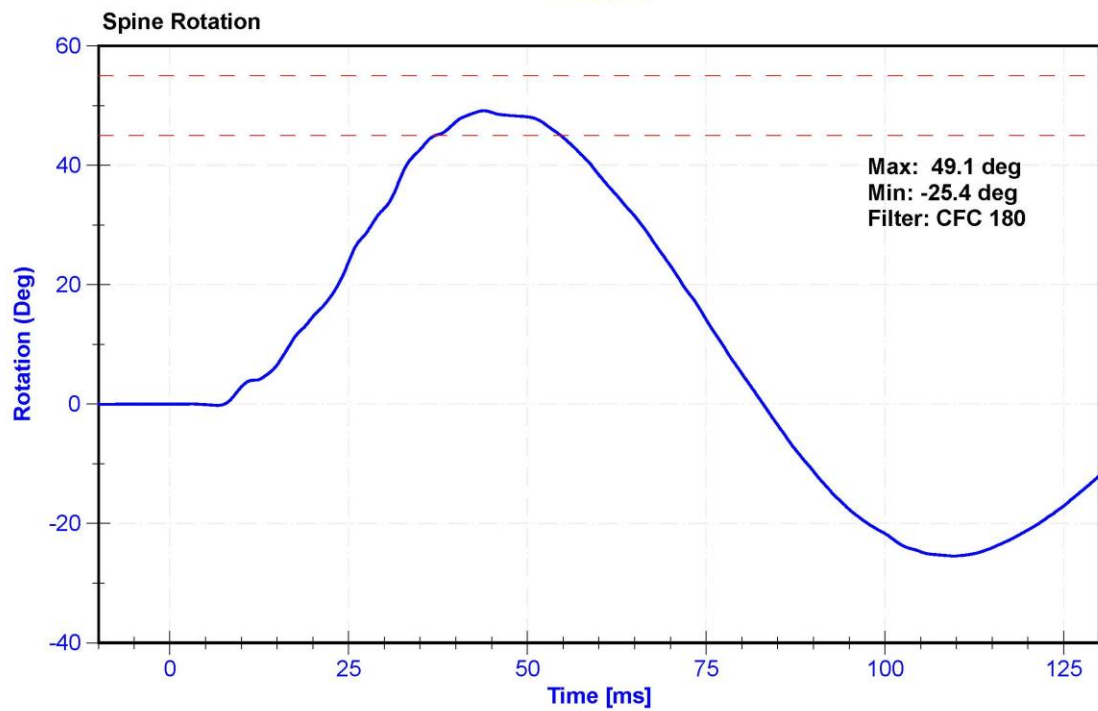
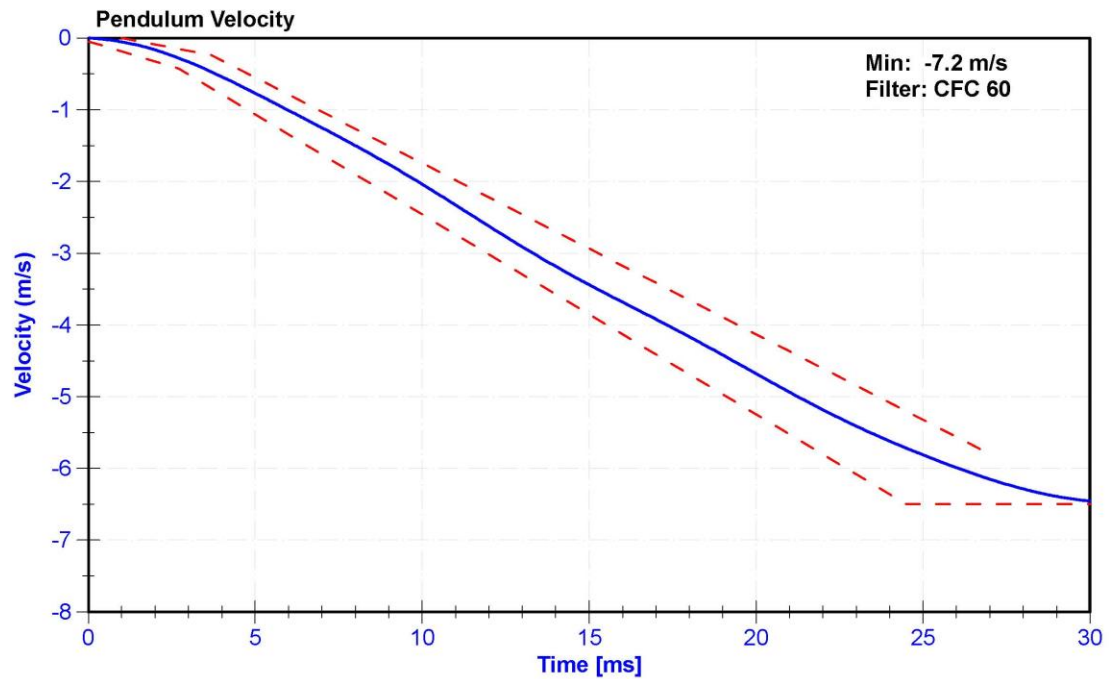
ATD Manufacturer	FTSS	Test Technician	K. Duton
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

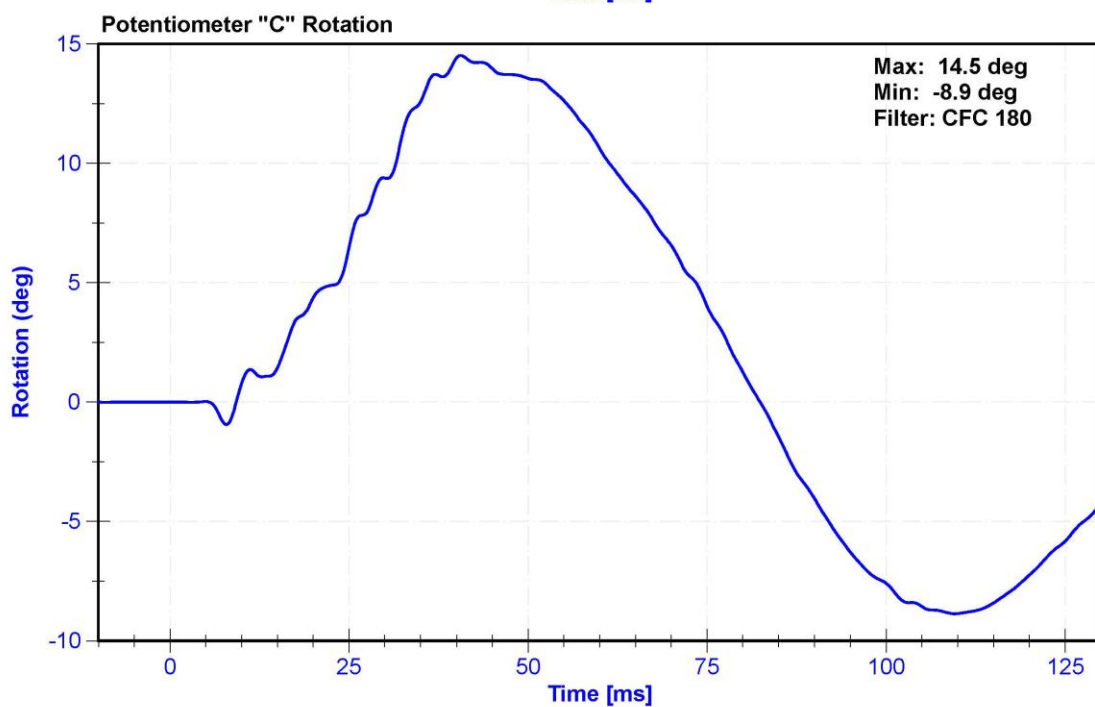
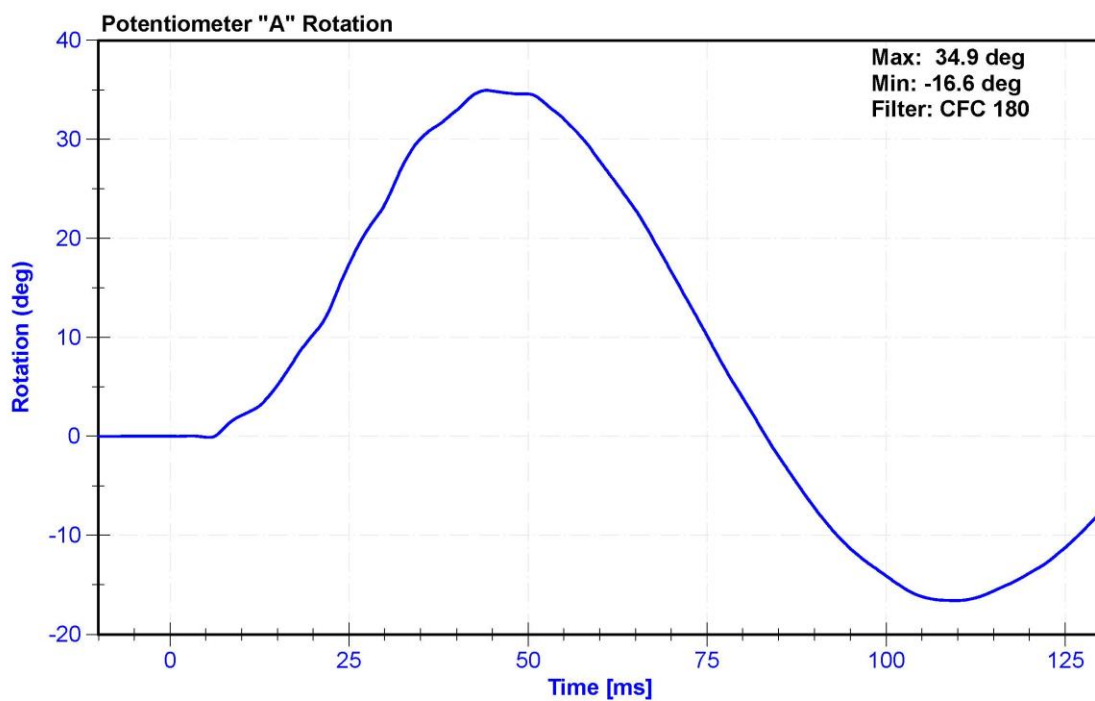
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	36.4	Pass
Velocity	5.95	6.15	m/s	6.005	Pass
Lateral Spine Rotation	45	55	deg	49.1	Pass
Time at Maximum Rotation	39	53	ms	43.9	Pass
Time of Decay to Zero Degrees	37	57	ms	39.1	Pass
Pulse within Corridor?	-	-	-		

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum "A" Potentiometer	SP22G	DS-094	8/18/2020	8/18/2021
Condyle "B" Potentiometer	SP22G	DS-095	8/18/2020	8/18/2021





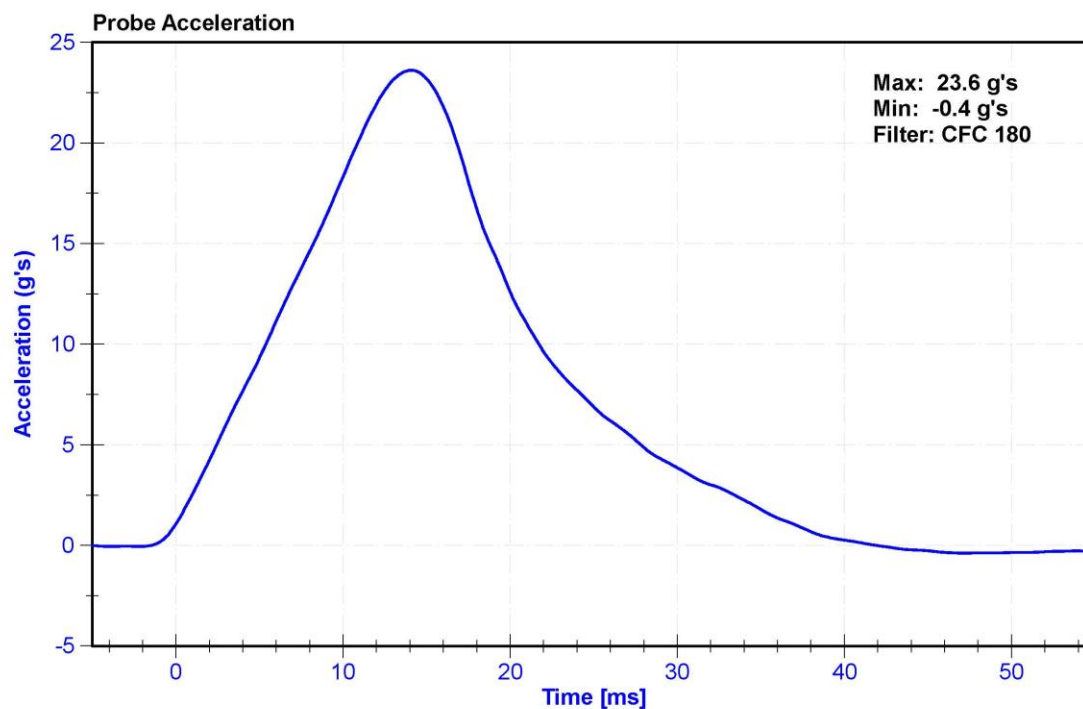
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

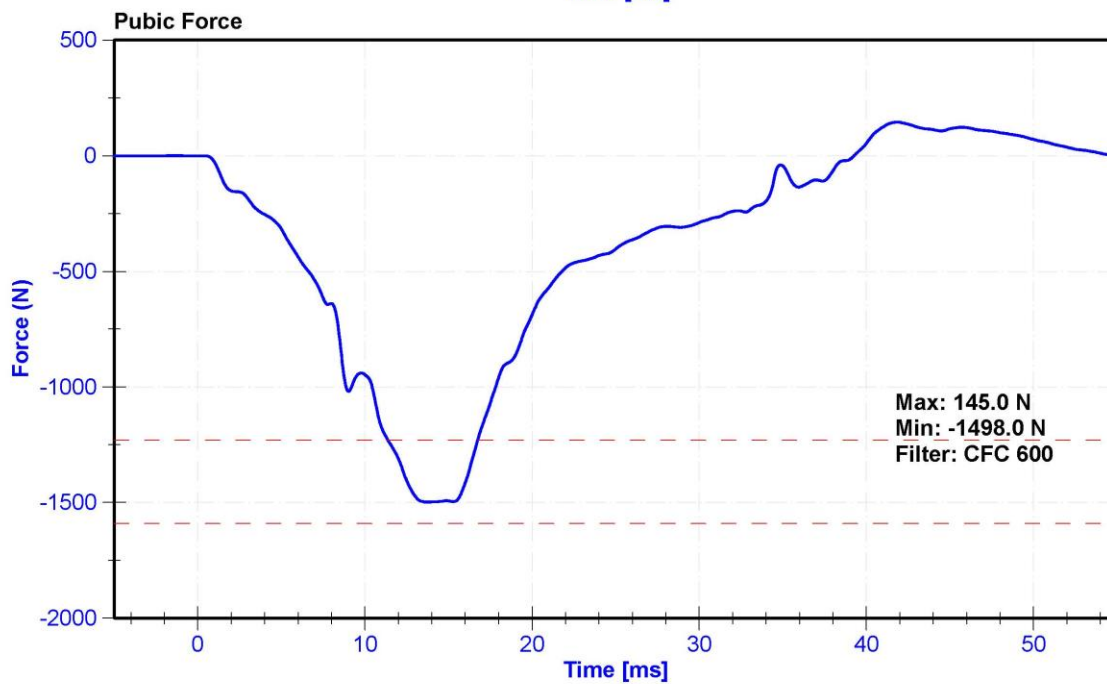
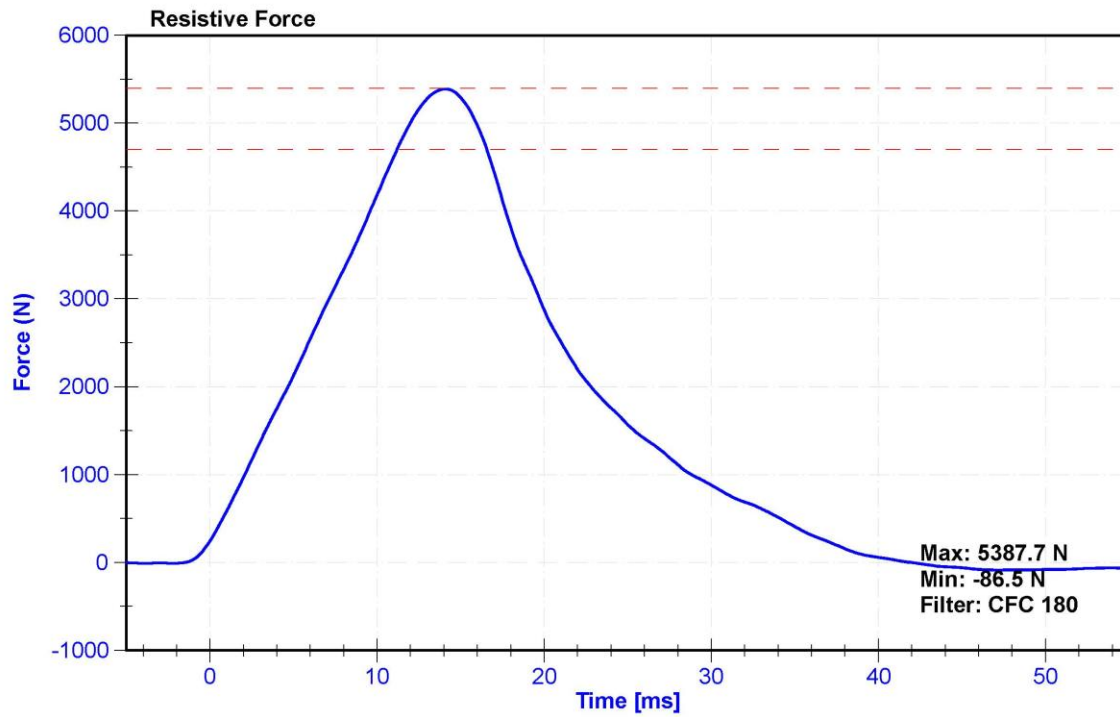
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	47.0	Pass
Velocity	4.2	4.4	m/s	4.40	Pass
Resistive Force	4700	5400	N	5387.7	Pass
Time at Peak Resistive Force	11.8	16.1	ms	14.10	Pass
Pubic Force	-1590	-1230	N	-1498.0	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.75	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Pubic Load Cell	Denton 3096JFL	30960459GFE	3/19/2020	3/19/2021





CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL No: 303

(CONFIGURED FOR LEFT SIDE IMPACT)

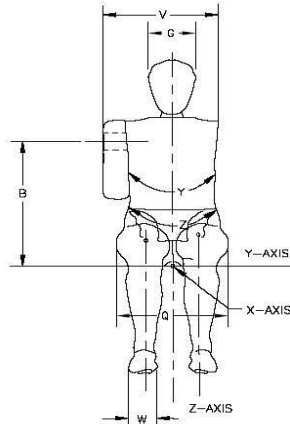
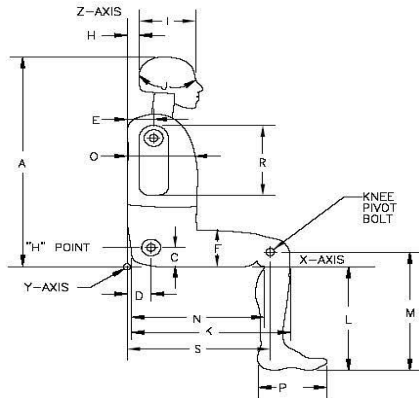


External Measurements - SID-IIs

Technician: K. Dutton

Date: 9/21/2020

Dummy Serial Number: 303



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	779	Pass
B	Shoulder Pivot Height	437	453	449	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	144	Pass
E	Shoulder Pivot from Backline	97	107	102	Pass
F	Thigh Clearance	119	135	128	Pass
G	Head Breadth	140	148	145	Pass
H	Head Back from Backline	40	46	42	Pass
I	Head Depth	178	188	181	Pass
J	Head Circumference	541	551	546	Pass
K	Buttock to Knee Length	514	540	530	Pass
L	Popliteal Height	343	369	358	Pass
M	Knee Pivot to floor height	392	409	404	Pass
N	Buttock Popliteal Length	416	442	436	Pass
O	Chest Depth w/o jacket	195	211	204	Pass
P	Foot Length	216	232	222	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	488	Pass
V	Shoulder Width	341	357	349	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	868	Pass
Z	Waist Circumference	761	791	772	Pass

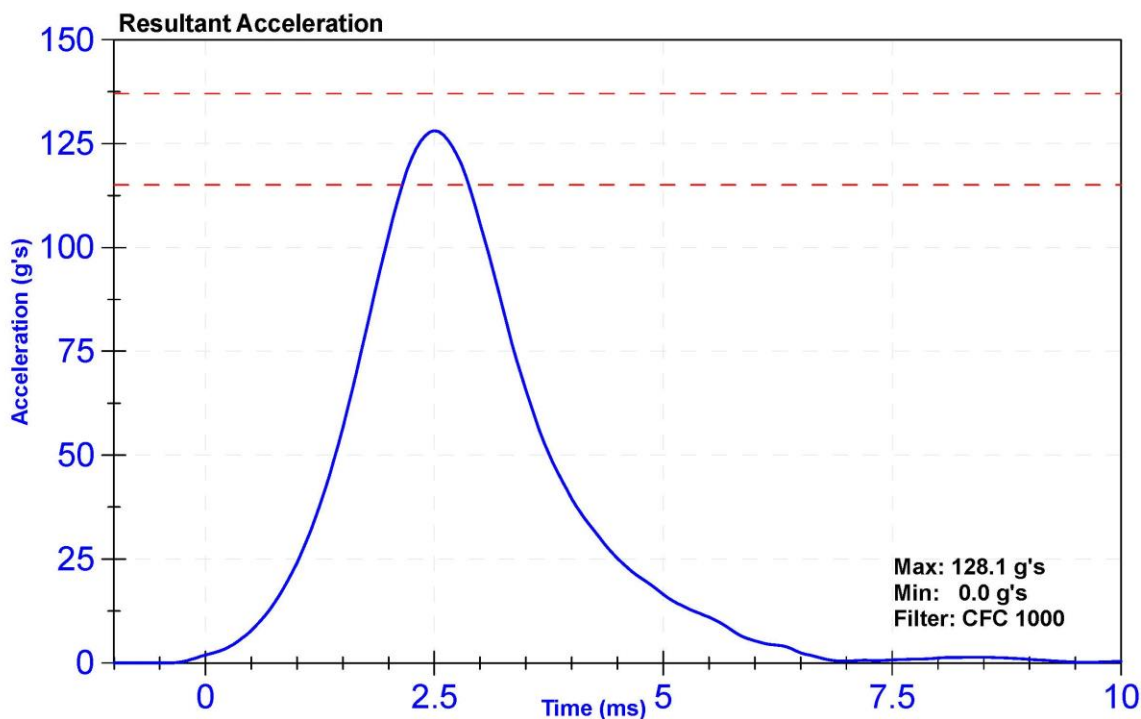
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	303	Laboratory Supervisor	K. Brogan

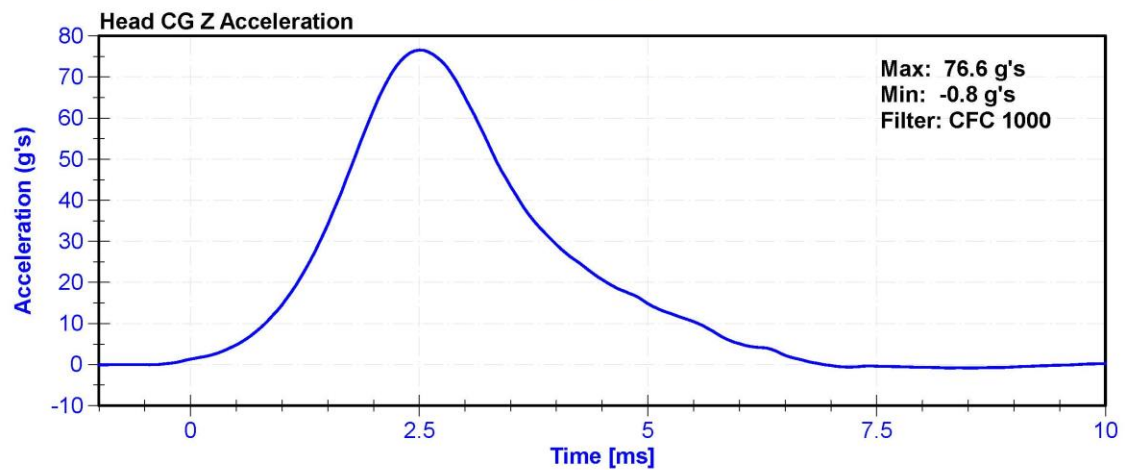
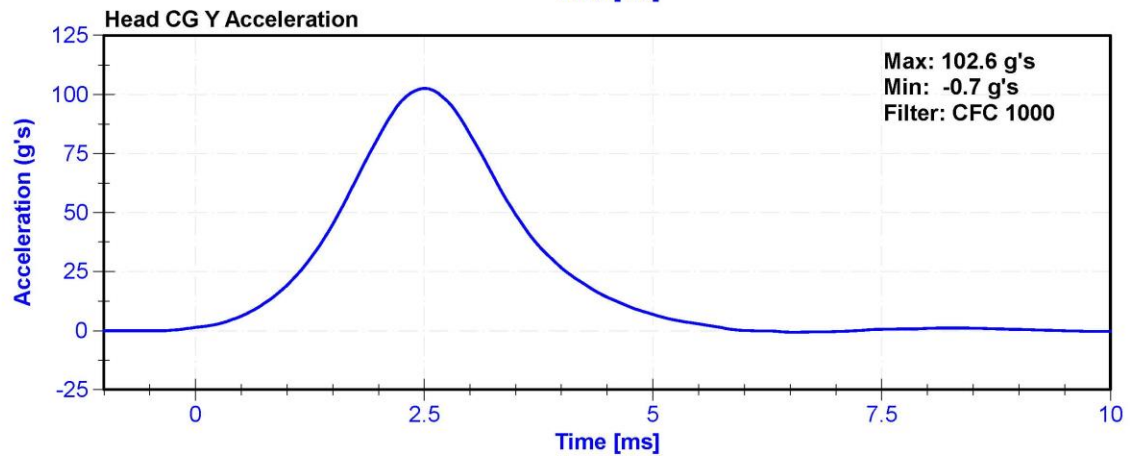
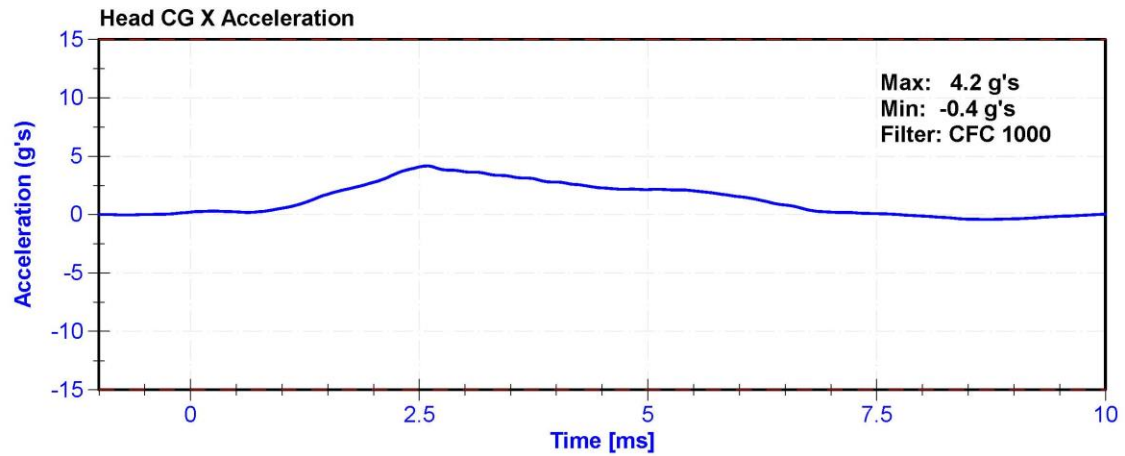
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	46.7	Pass
Resultant Acceleration	115	137	g's	128.1	Pass
Oscillation	0	15	%	1.0	Pass
Fore-Aft Acceleration	-15	15	g's	4.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P83431	9/18/2020	3/19/2021
Y Accelerometer	ENDEVCO 7264CT	AC-P75158	9/18/2020	3/19/2021
Z Accelerometer	ENDEVCO 7264CT	AC-P68077	9/18/2020	3/19/2021





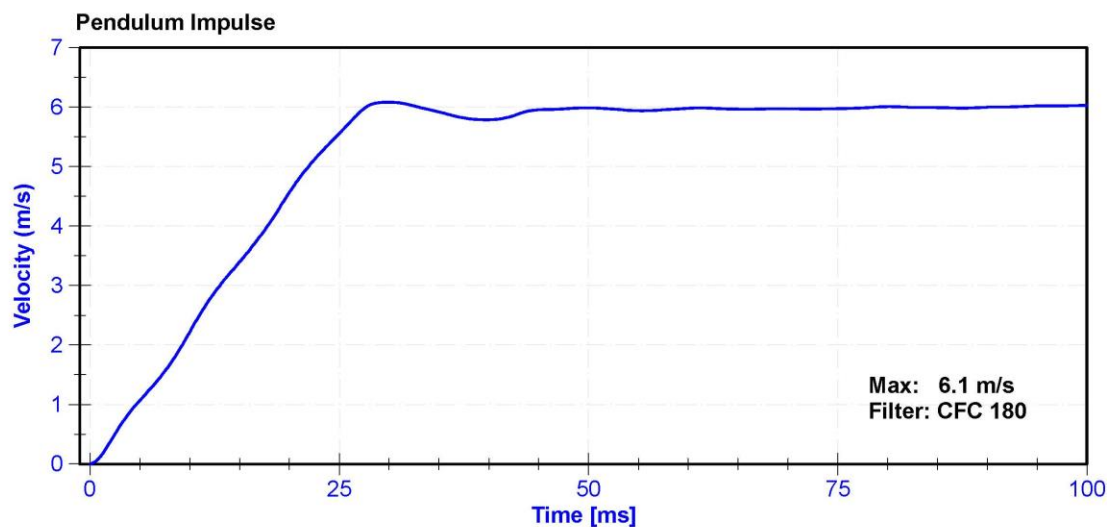
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	303	Laboratory Supervisor	K. Brogan

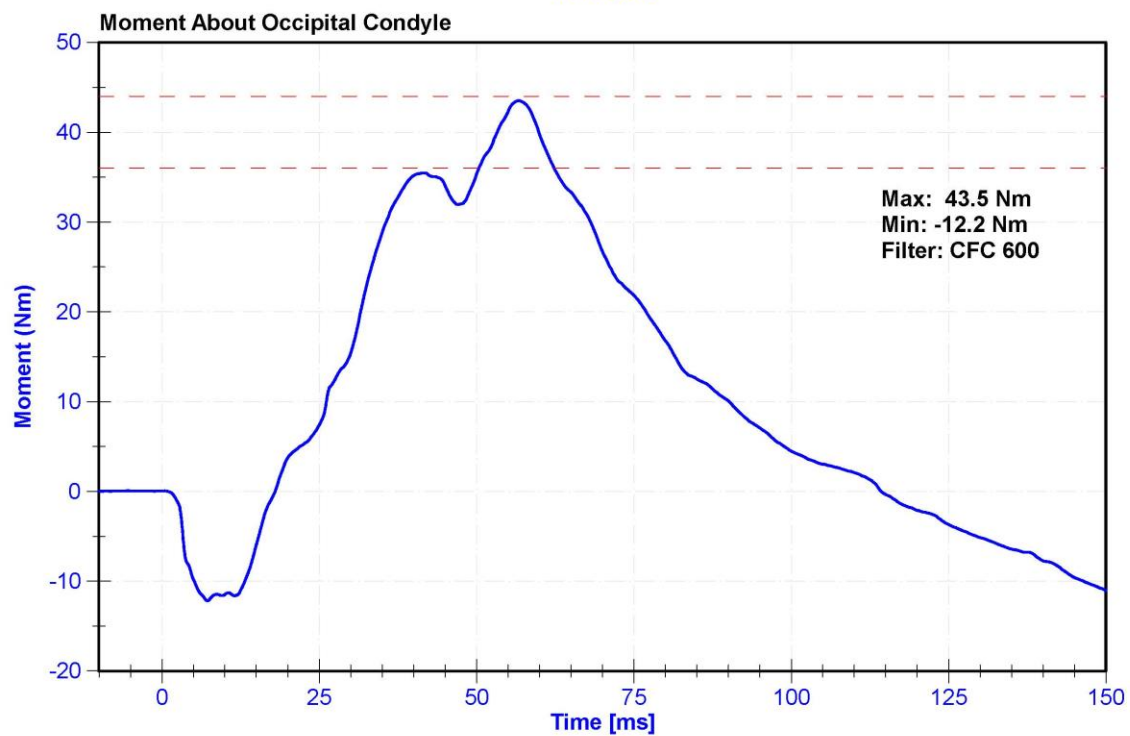
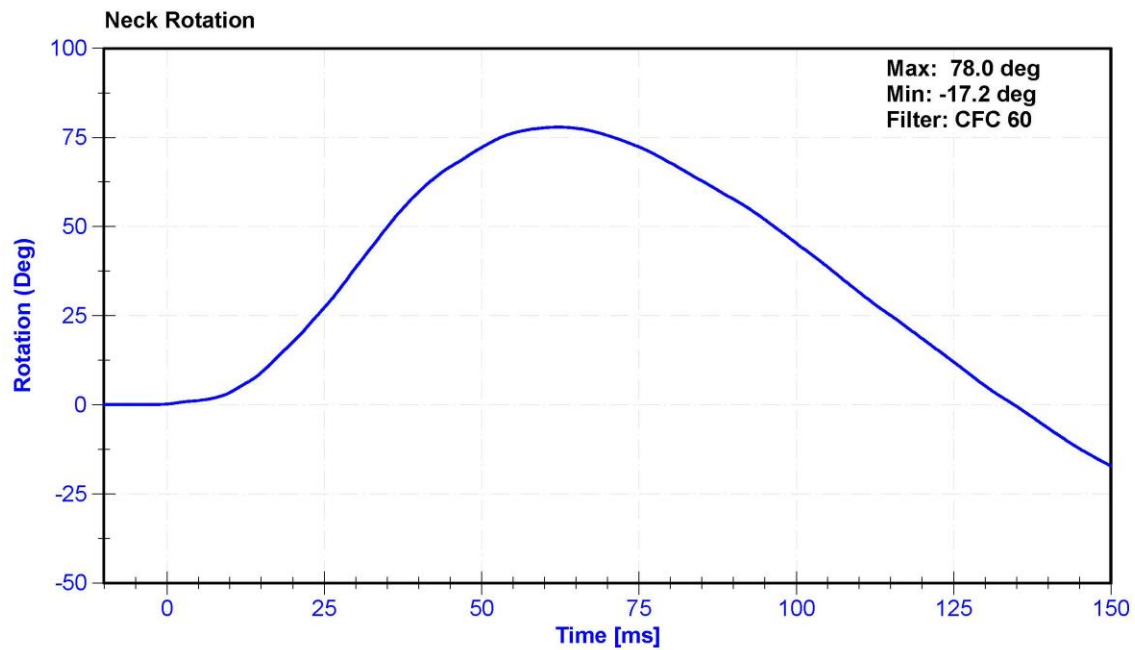
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	55.4	Pass
Velocity	5.51	5.63	m/s	5.549	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.22	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.39	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.56	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.55	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	6.08	Pass
Neck Rotation	71	81	deg	78.0	Pass
Time at Maximum Rotation	50	70	ms	62.2	Pass
Moment about the OC	36	44	Nm	43.5	Pass
Moment Decay to 0 Nm	102	126	ms	114.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum Potentiometer	Denton 78051-342	DS-184Pend	11/4/2019	11/3/2020
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/4/2019	11/3/2020
Upper Neck Load Cell	Denton 1716	17162019 FY	3/18/2020	3/18/2021





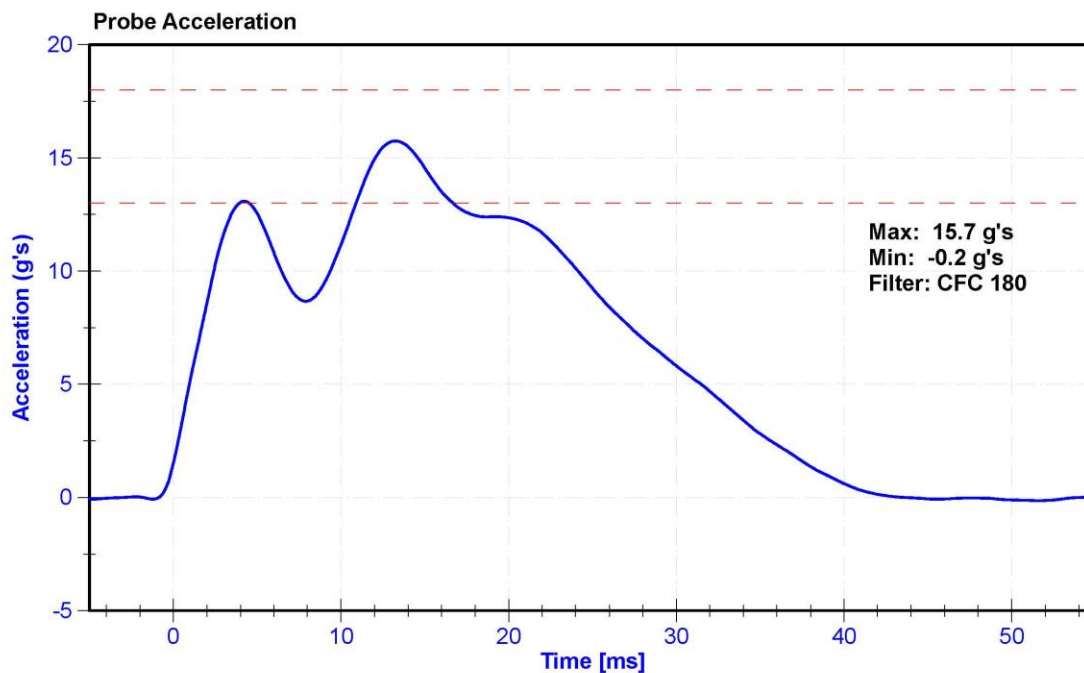
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	303	Laboratory Supervisor	K. Brogan

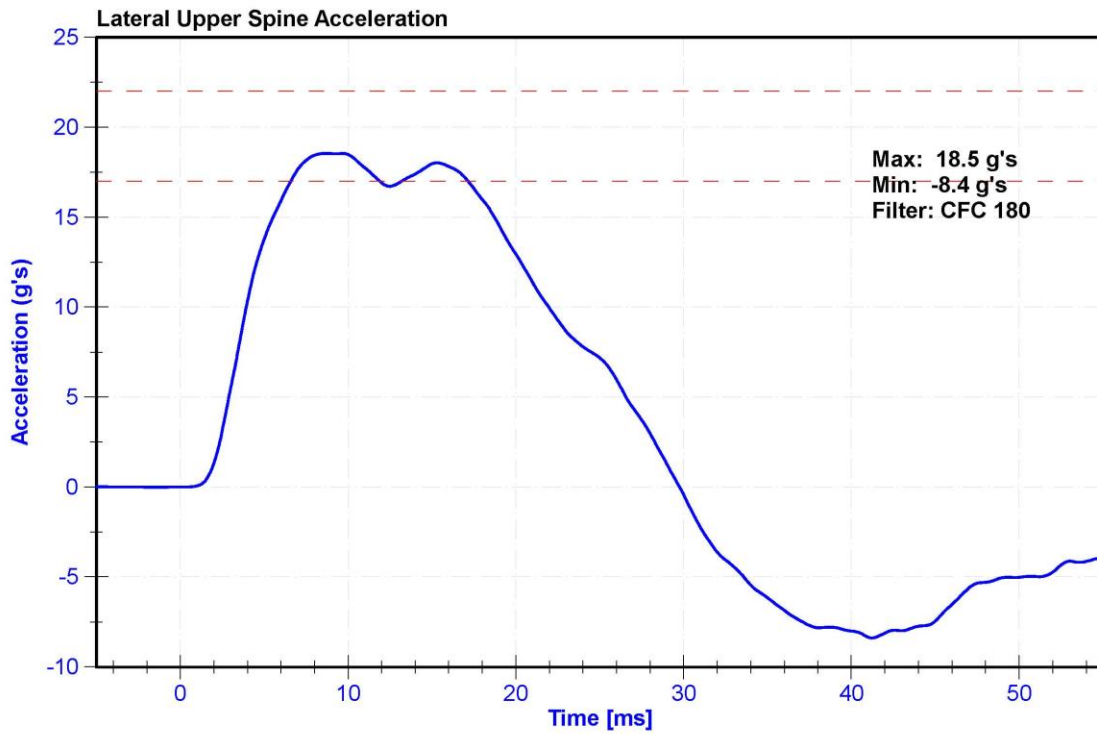
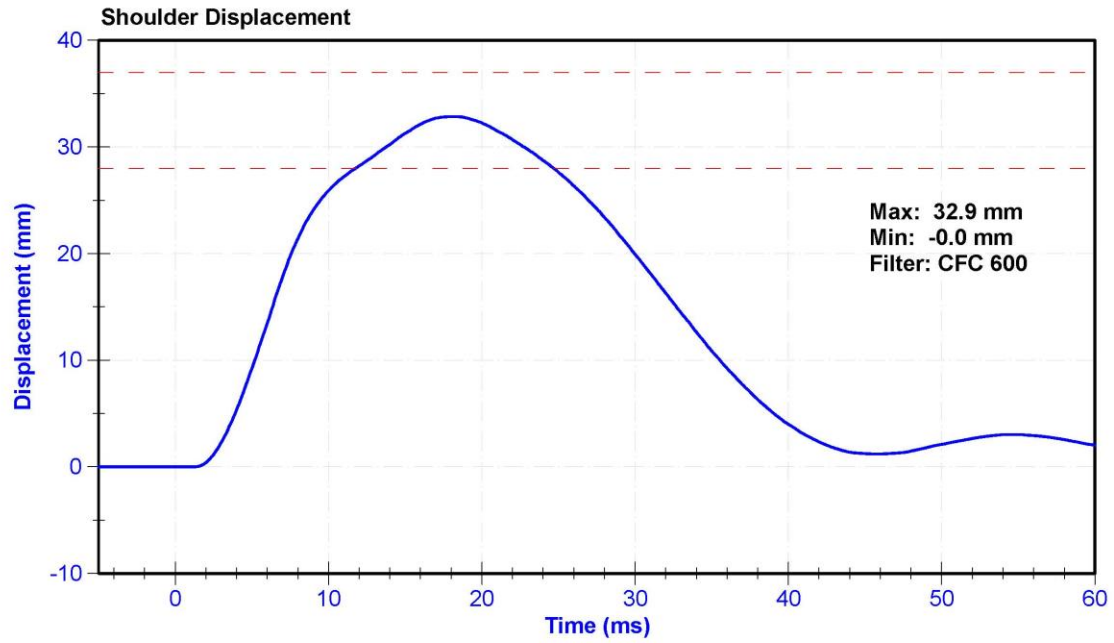
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	29	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	13	18	g's	15.7	Pass
Shoulder Deflection	28	37	mm	32.9	Pass
Lateral Upper Spine Acceleration	17	22	g's	18.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Shoulder Potentiometer	Servo 08TC1-3787	DS-030GFE	9/14/2020	9/14/2021
Upper Spine Y Accelerometer	Endevco 7264C	T20816	9/18/2020	3/19/2021





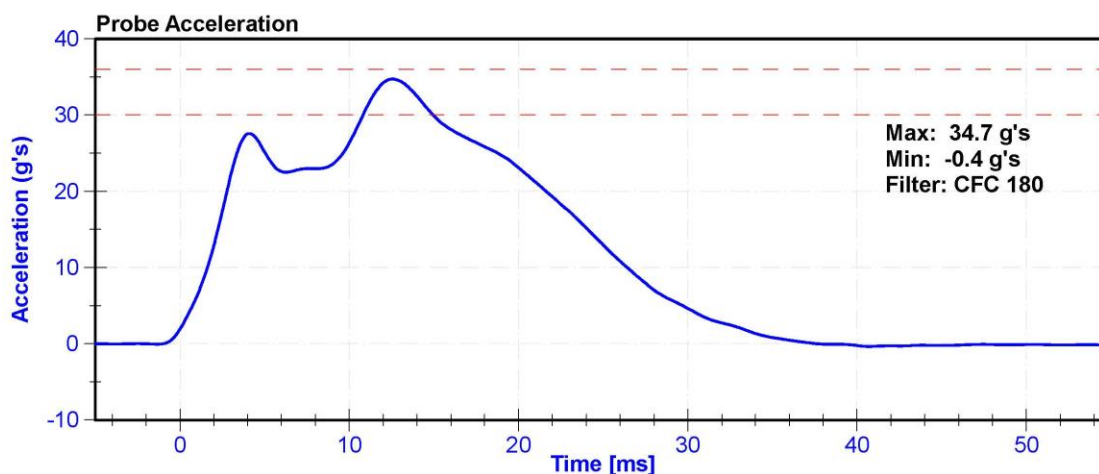
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	303	Laboratory Supervisor	K. Brogan

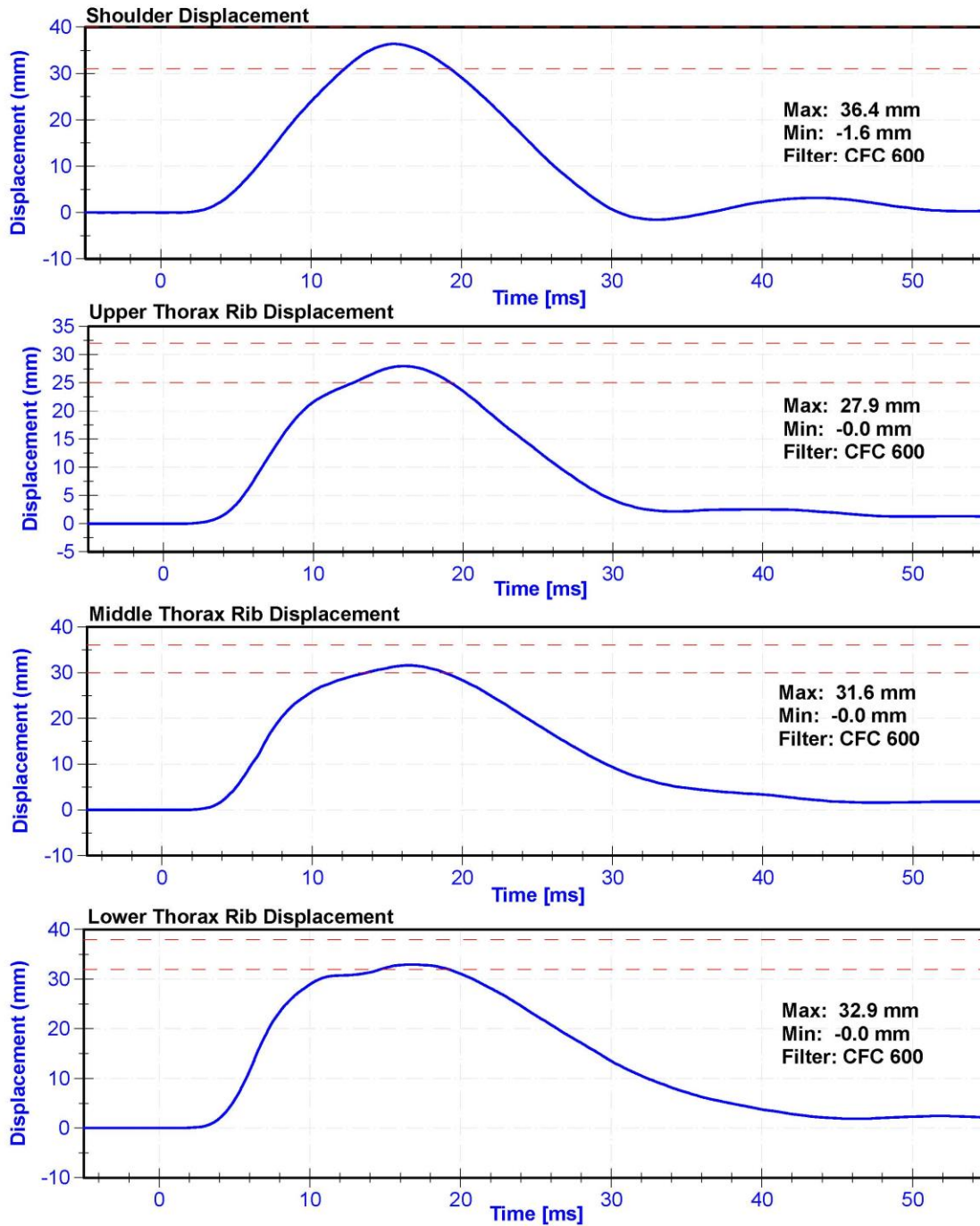
Results

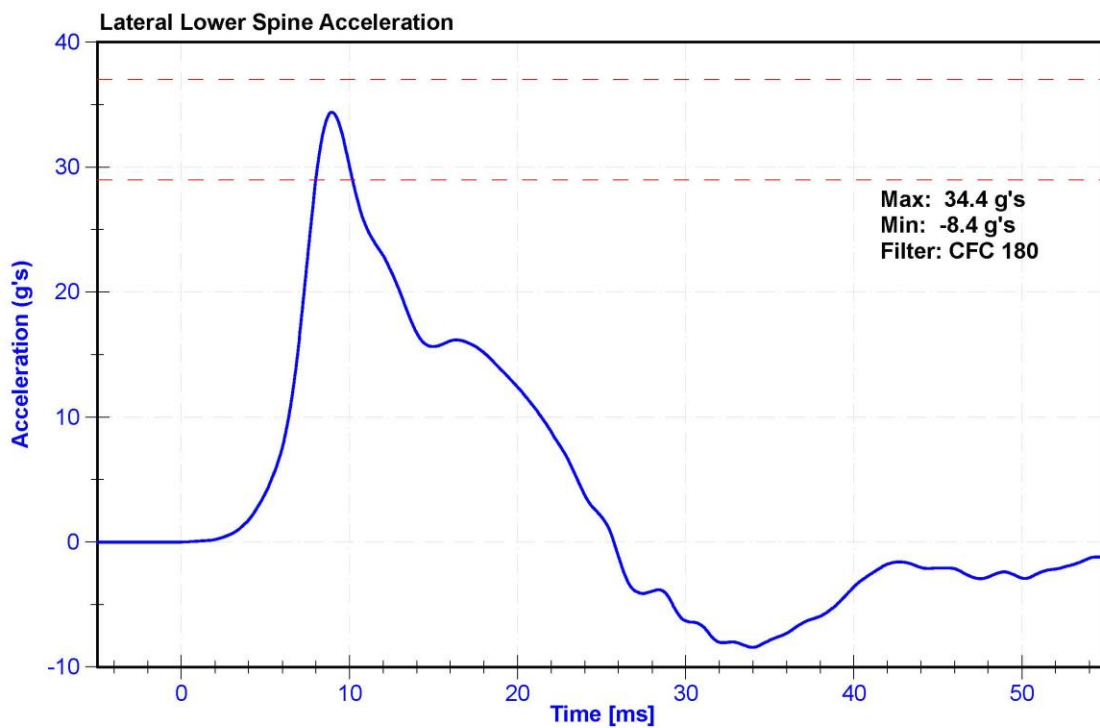
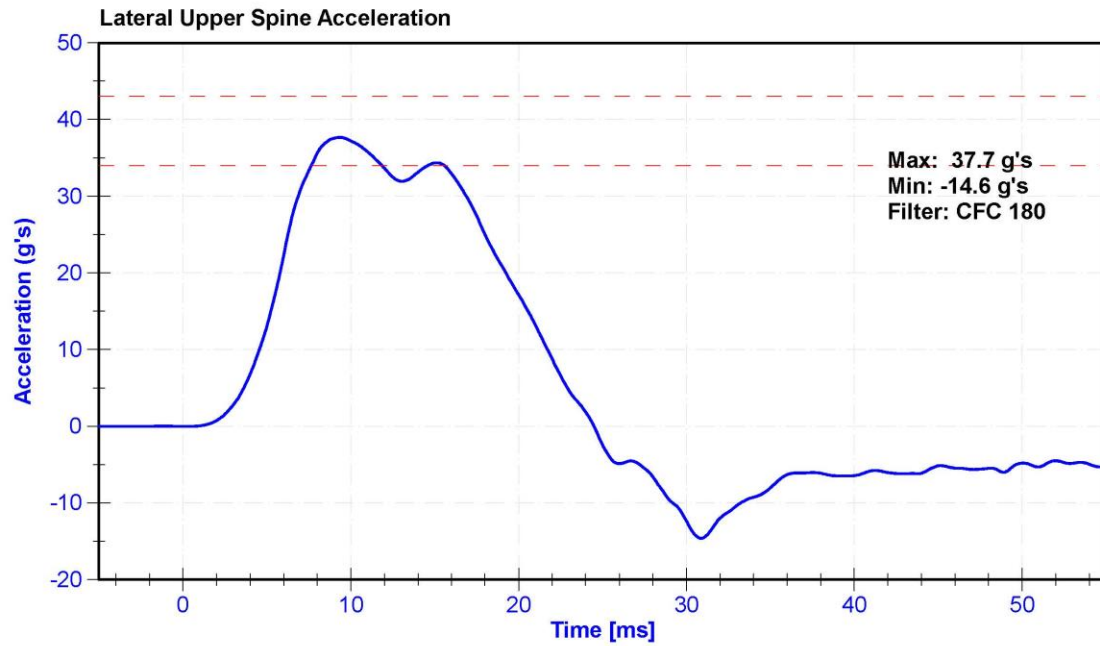
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	43.0	Pass
Velocity	6.6	6.8	m/s	6.64	Pass
Probe Acceleration after 5 ms	30	36	g's	34.7	Pass
Lateral Upper Spine Acceleration	34	43	g's	37.7	Pass
Lateral Lower Spine Acceleration	29	37	g's	34.4	Pass
Shoulder Deflection	31	40	mm	36.4	Pass
Upper Thorax Rib Deflection	25	32	mm	27.9	Pass
Mid Thorax Rib Deflection	30	36	mm	31.6	Pass
Lower Thorax Rib Deflection	32	38	mm	32.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Upper Spine T1 Y Accelerometer	Endevco 7264C	T20816	9/18/2020	3/19/2021
Upper Spine T12 Y Accelerometer	Endevco 7264C	P84353	9/18/2020	3/19/2021
Shoulder Potentiometer	Servo 08TC1-3787	DS-030GFE	9/14/2020	9/14/2021
Upper Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1199GFE	6/1/2020	6/1/2021
Middle Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1246GFE	6/1/2020	6/1/2021
Lower Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1256GFE	6/1/2020	6/1/2021







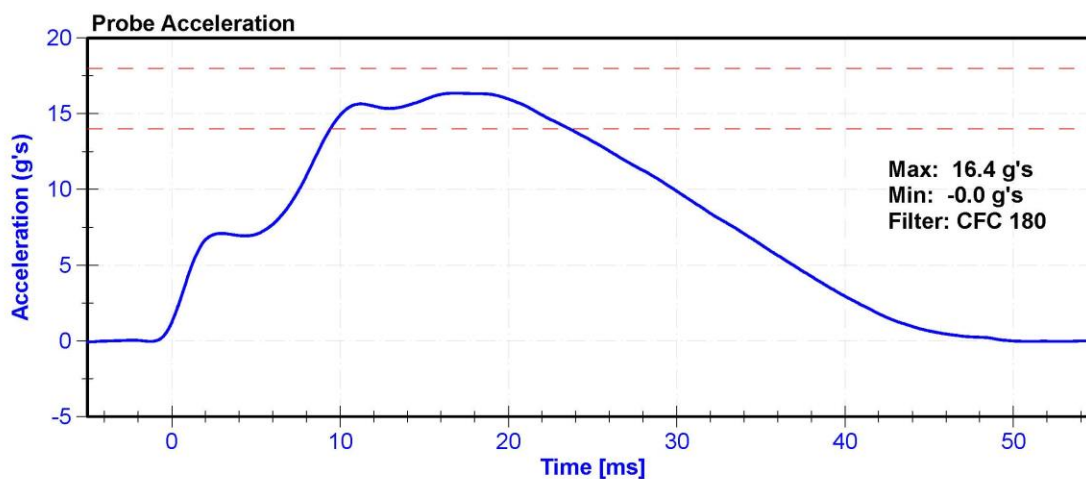
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	303	Laboratory Supervisor	K. Brogan

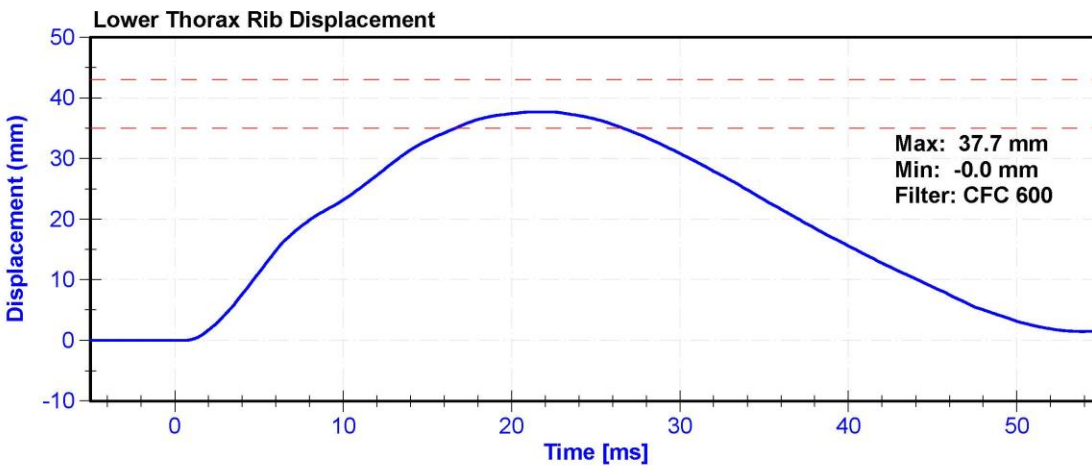
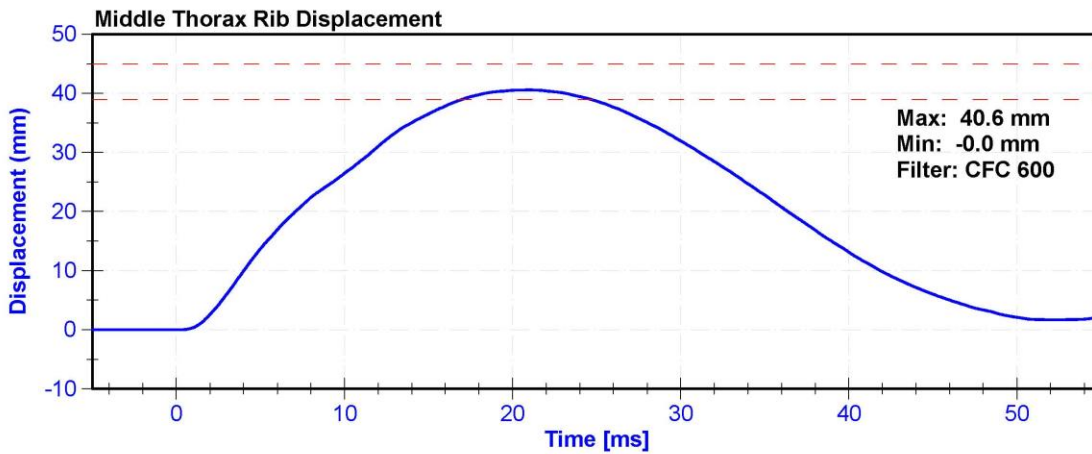
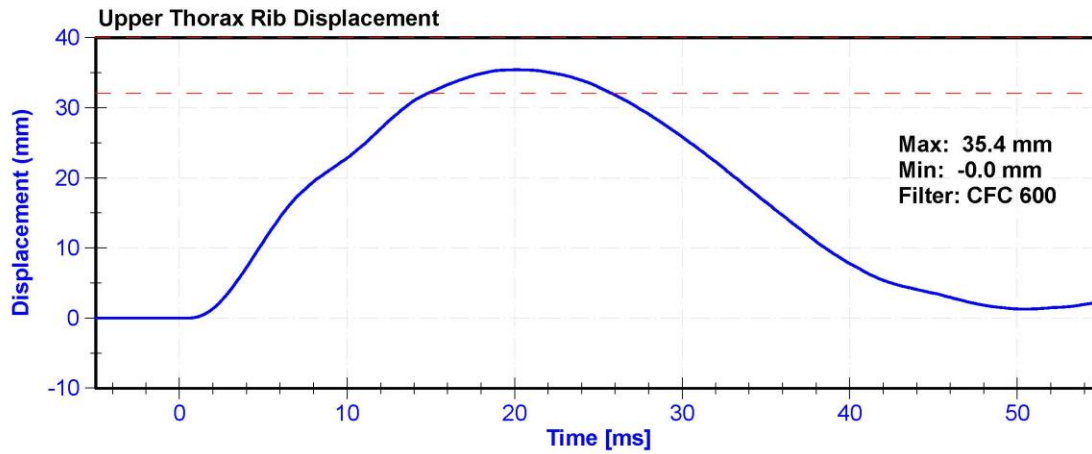
Results

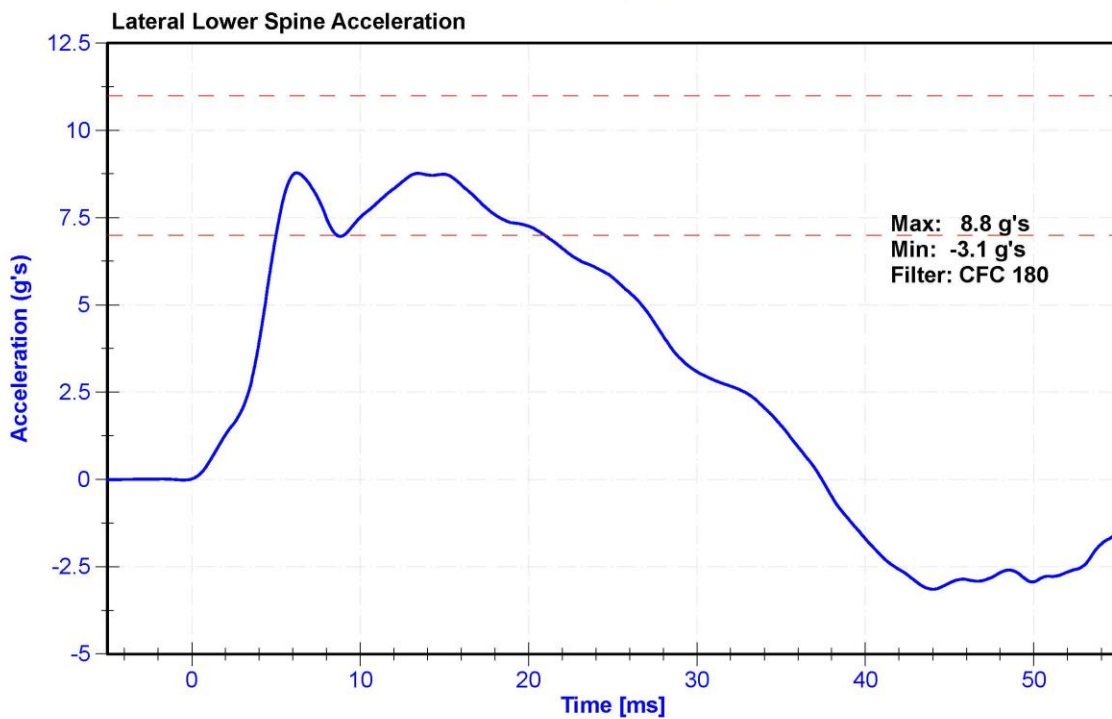
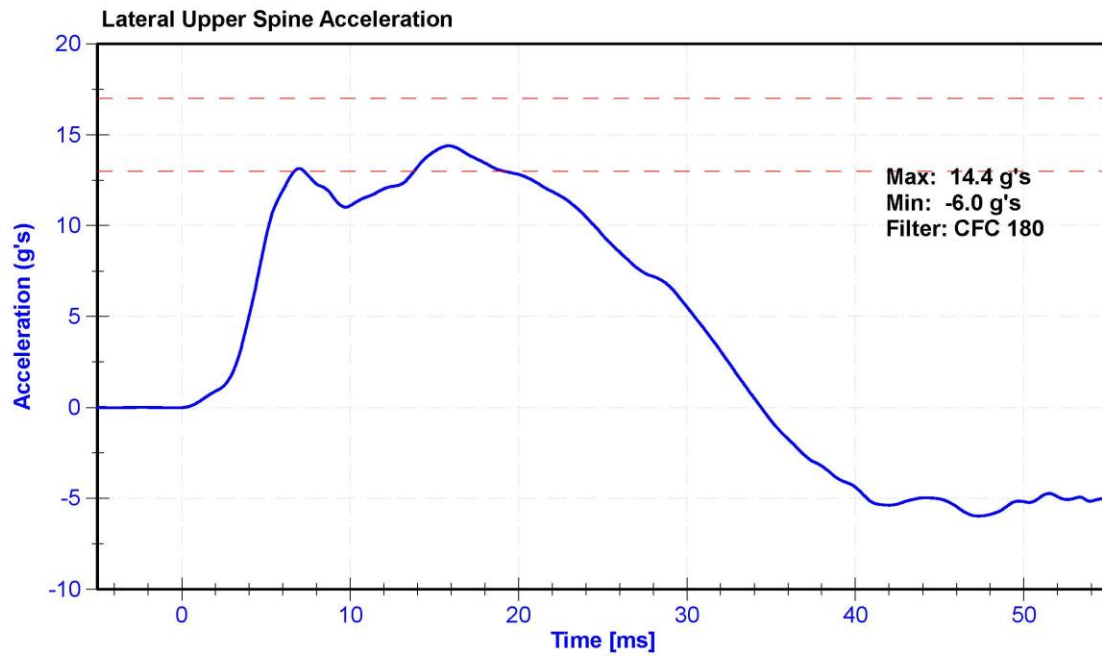
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	43	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	14	18	g's	16.4	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.4	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.8	Pass
Upper Thorax Rib Deflection	32	40	mm	35.4	Pass
Middle Thorax Rib Deflection	39	45	mm	40.6	Pass
Lower Thorax Rib Deflection	35	43	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Upper Spine Y Accelerometer	Endevco 7264C	T20816	9/18/2020	3/19/2021
Lower Spine Y Accelerometer	Endevco 7264C	P84353	9/18/2020	3/19/2021
Upper Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1199GFE	6/1/2020	6/1/2021
Middle Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1246GFE	6/1/2020	6/1/2021
Lower Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1256GFE	6/1/2020	6/1/2021







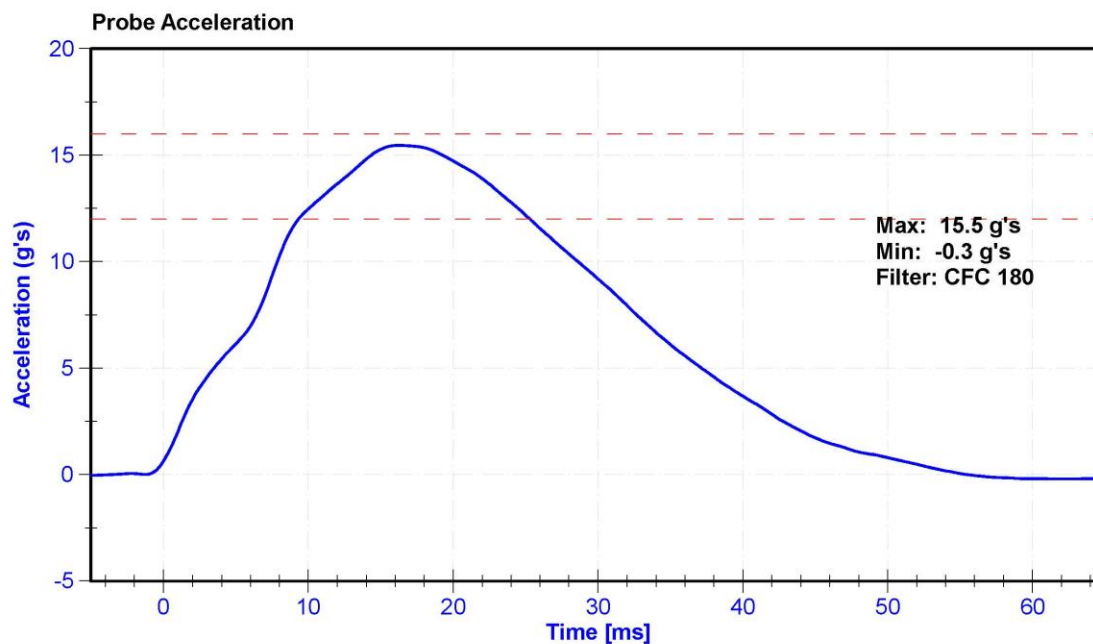
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	303	Laboratory Supervisor	K. Brogan

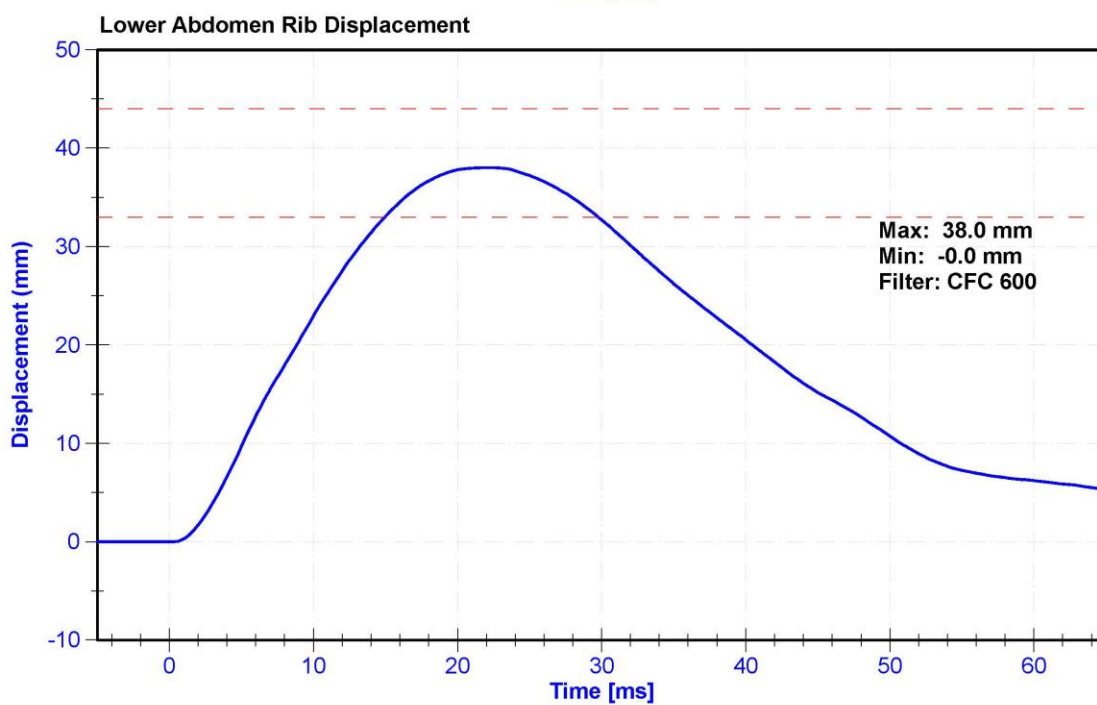
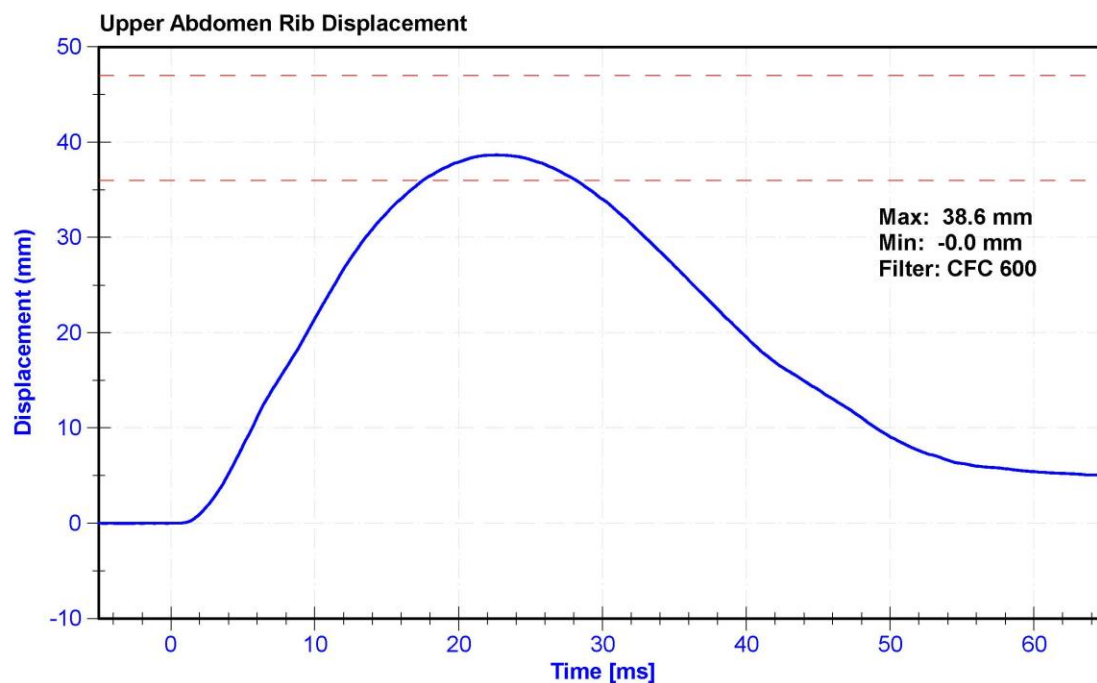
Results

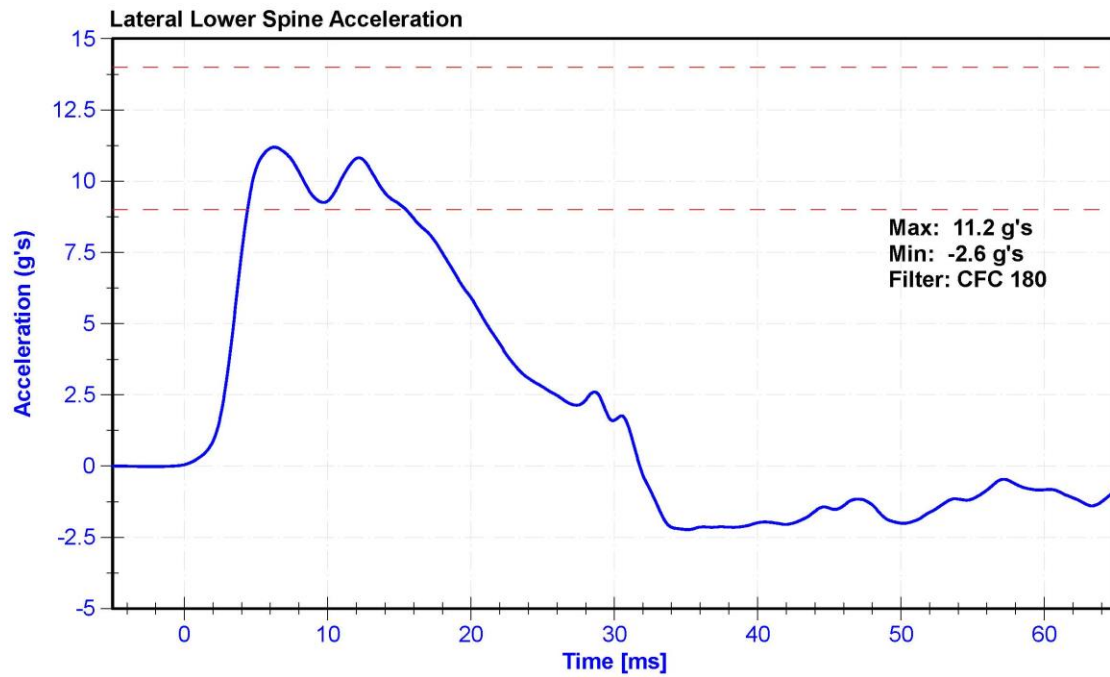
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	48.0	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	12	16	g's	15.5	Pass
Lateral Lower Spine Acceleration	9	14	g's	11.2	Pass
Upper Abdomen Rib Deflection	36	47	mm	38.6	Pass
Lower Abdomen Rib Deflection	33	44	mm	38.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Lower Spine Y Accelerometer	Endevco 7264C	P84353	9/18/2020	3/19/2021
Upper Abdomen Rib Potentiometer	Servo 08CT1-3725	DS-1274GFE	6/1/2020	6/1/2021
Lower Abdomen Rib Potentiometer	Servo 08CT1-3745	DS-2316GFE	5/28/2020	5/28/2021







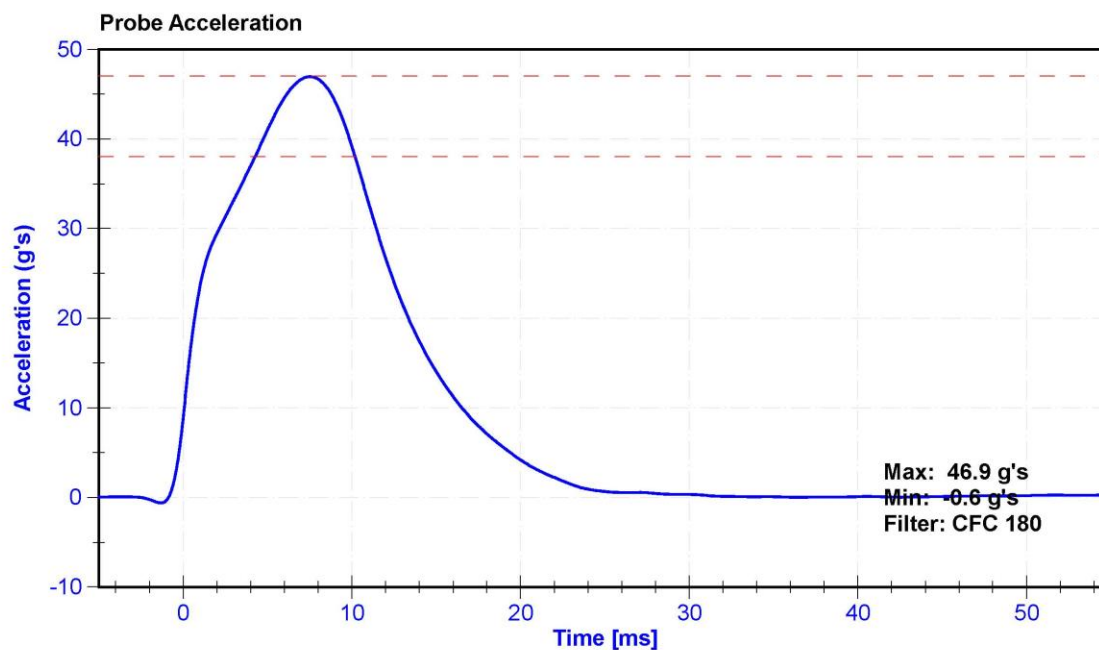
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	303	Laboratory Supervisor	K. Brogan

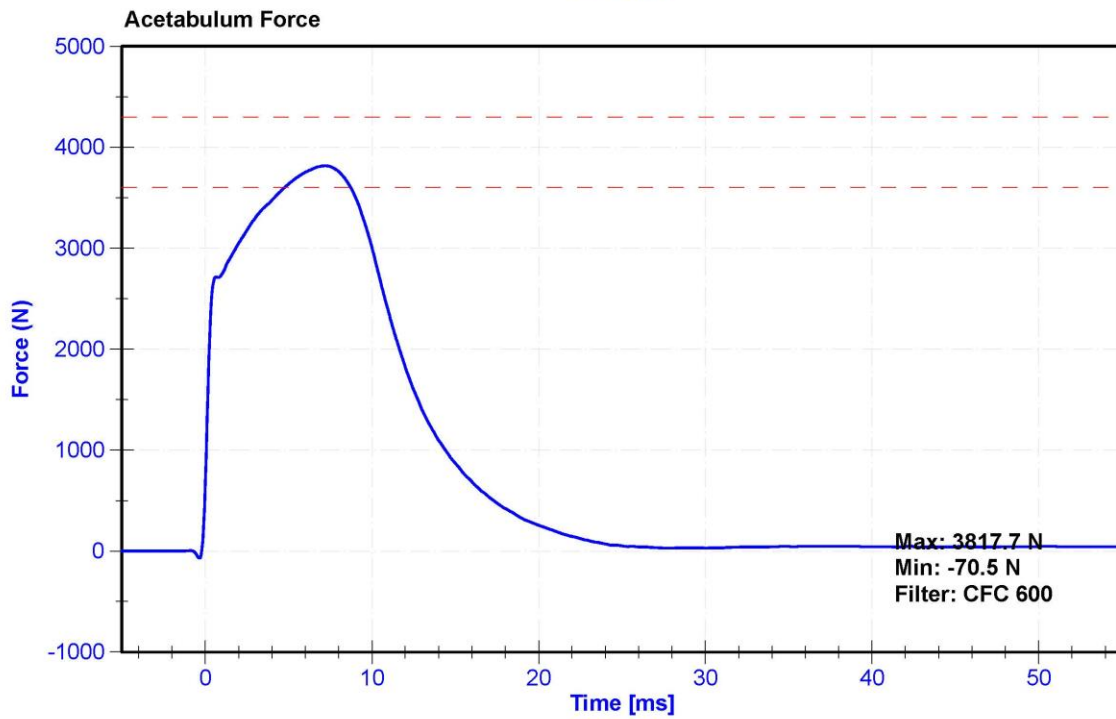
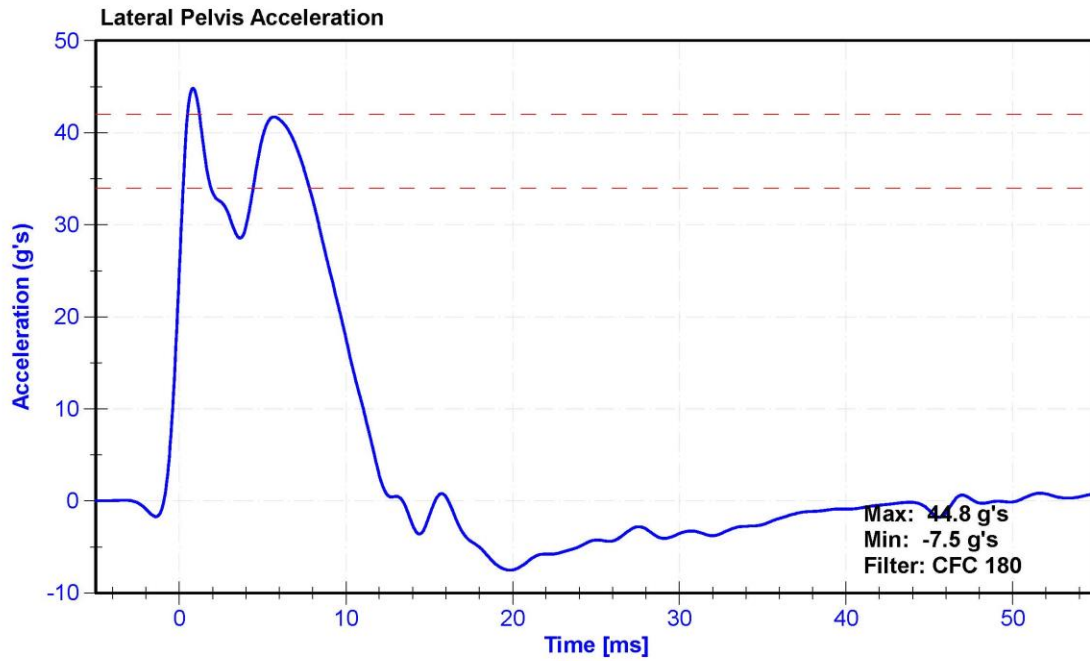
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	42.9	Pass
Velocity	6.6	6.8	m/s	6.68	Pass
Probe Acceleration	38	47	g's	46.9	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.5	Pass
Acetabulum Force	3600	4300	N	3817.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Pelvis Y Accelerometer	Endevco 7264C	P58744	9/18/2020	3/19/2021
Acetabulum Load Cell	Denton 3249J	LC-276Fy	7/23/2020	7/23/2021
Certification Plug	SACO	13519	9/23/2019	N/A
Crash Test Plug	SACO	13512	9/23/2019	N/A







SID-11s Pelvis Plug Certification Test

Plug S/N 13519

Test Number 11163

Report Number 11201

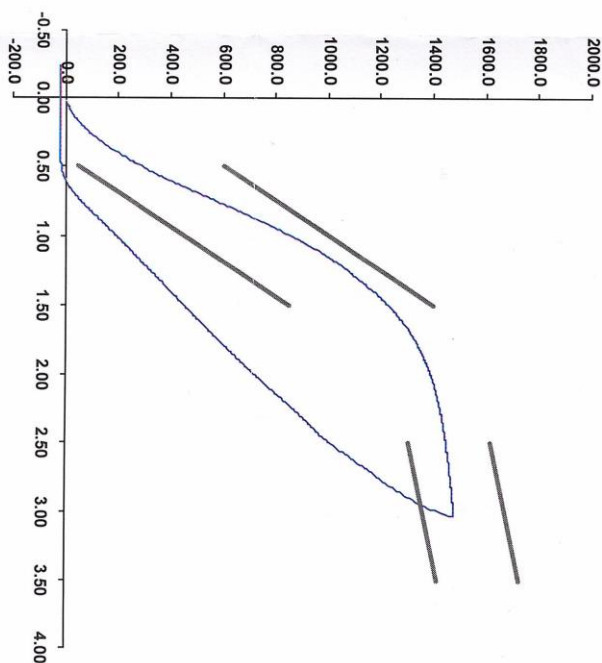
Test Date 9/23/2019 10:31:50 AM

Force (-N) vs Extension (-mm)

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	50.00	600.00
Force @ 1.5 mm (N)	850.00	1,400.00
Force @ 2.5 mm (N)	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,361.00	1,673.00

Testing Machine STM-20 596554;
Load Cell S/N (F1350947), Units (LBS) 1000
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator

Part Number 180-4450

Template No 107 23-Sep-19

SACO Research

By: RE

Date: 9/23/2019

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

303
Test 3 New Pelvis
9/24



303
Cush
9/23/2019

SID-11s Pelvis Plug Certification Test

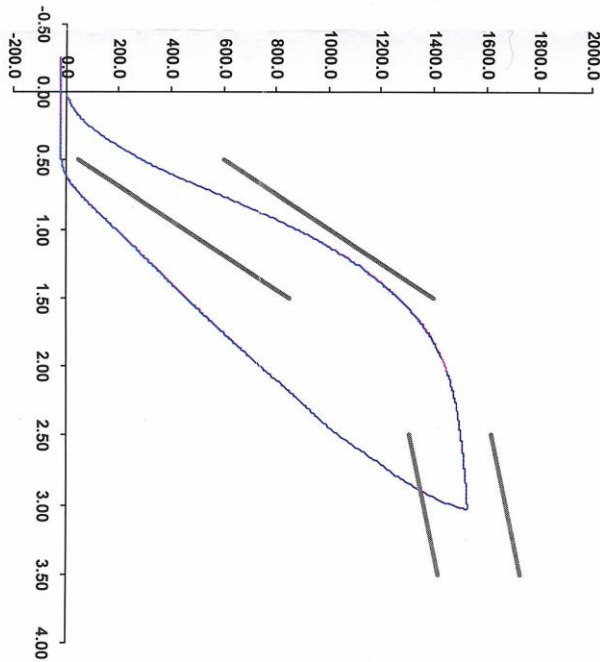
Plug S/N 13512
Test Number 11156
Report Number 11194
Test Date 9/23/2019 10:19:45 AM

Force (-N) vs Extension (-mm)

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	304.76	600.00
Force @ 1.5 mm (N)	1,275.97	1,400.00
Force @ 2.5 mm (N)	1,504.89	1,618.00
Force @ 3.0 mm (N)	1,530.51	1,673.00

Testing Machine STM-20 596554;
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator

Part Number 180-4450

Template No 107 23-Sep-19
SACO Research

By: DC Date: 9/23/2019
SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

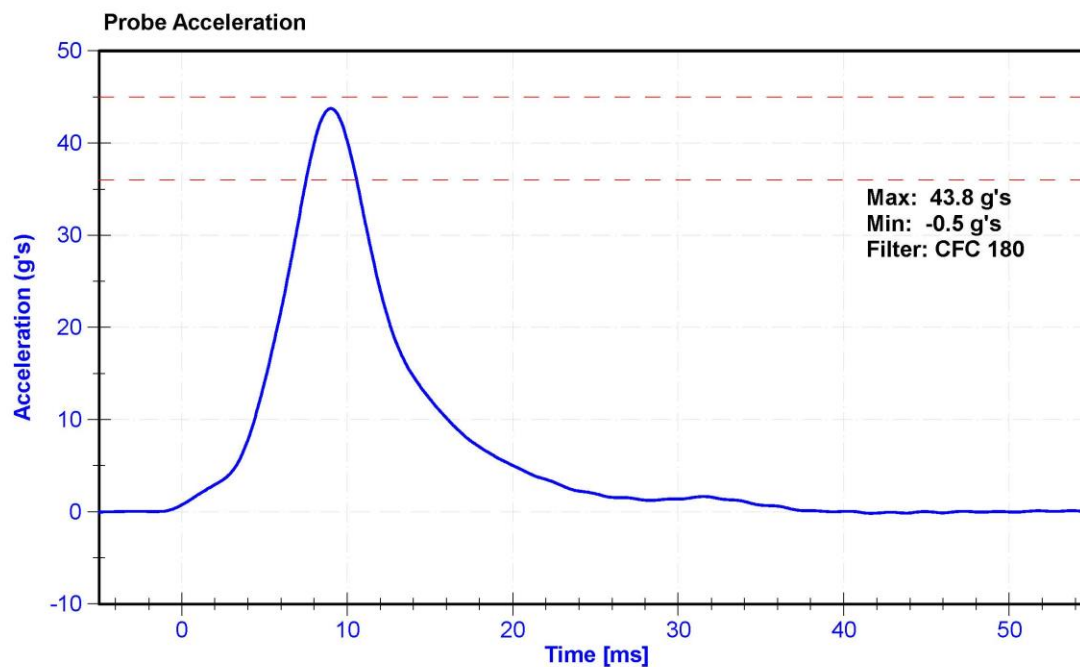
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	303	Laboratory Supervisor	D.Reinhard

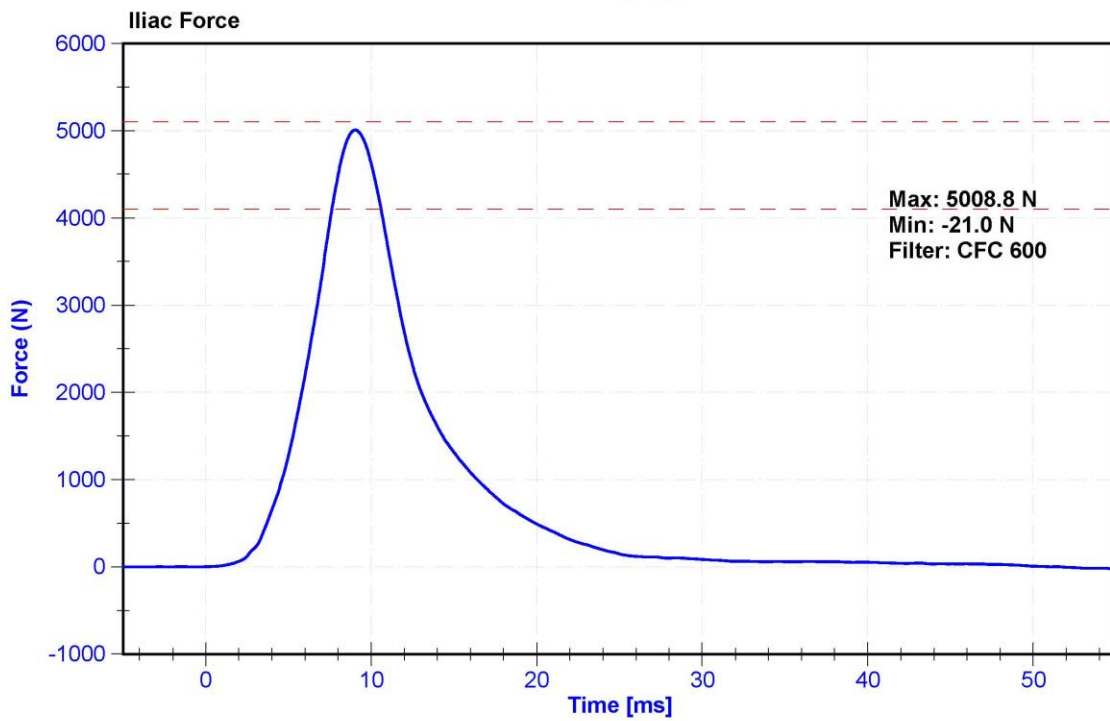
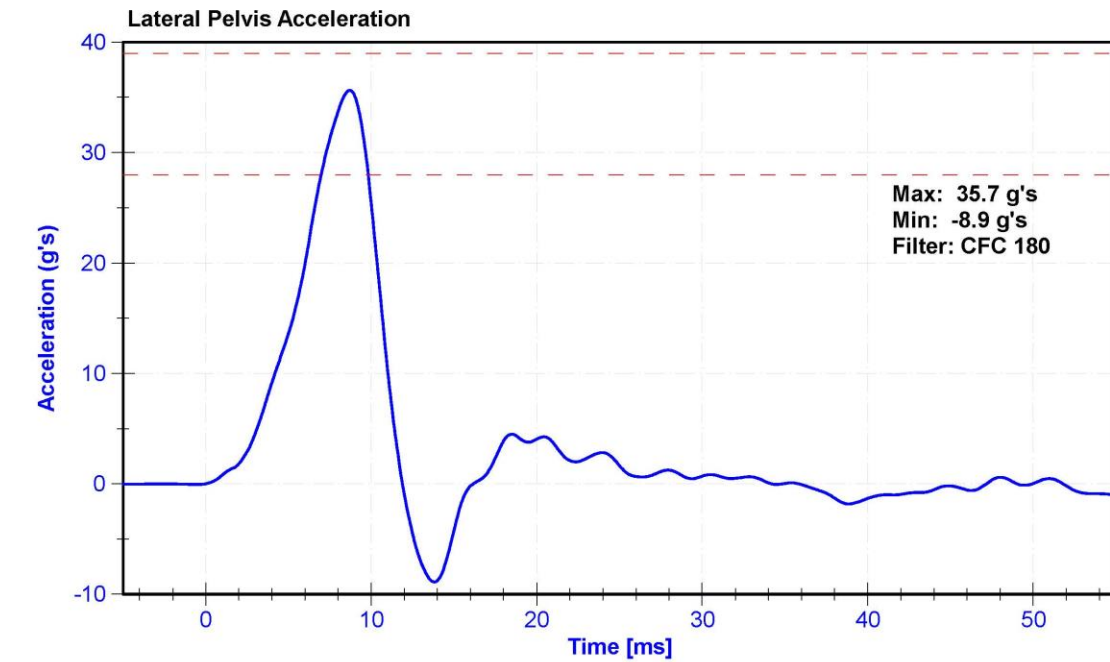
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	42.0	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	36	45	g's	43.8	Pass
Lateral Pelvis Acceleration	28	39	g's	35.7	Pass
Iliac Force	4100	5100	N	5008.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	1/28/2021
Pelvis Y Accelerometer	Endevco 7264C	P58744	9/18/2020	3/19/2021
Iliac Load Cell	DENTON 3228J	LC-280Fy	7/23/2020	7/23/2021





APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N F034		
			Serial Number	Manufacturer	Calibration Date
Head	Primary Accelerometers	X	AC-P52003	Endevco	4/15/2020
		Y	AC-P63981	Endevco	4/15/2020
		Z	AC-P51962	Endevco	4/15/2020
	Redundant Accelerometers	X	AC-P49204	Endevco	4/15/2020
		Y	AC-P83437	Endevco	4/15/2020
		Z	AC-P64007	Endevco	4/15/2020
	Angular Rate Sensors	X	ARS-7553 GFE	DTS	2/21/2020
		Y	ARS-14908GFE	DTS	2/21/2020
		Z	ARS-14909GFE	DTS	2/21/2020
Upper Neck Load Cell	Forces	X	40850139 GFE Fx	Denton	5/8/2020
		Y	40850139 GFE Fy	Denton	5/8/2020
		Z	40850139 GFE Fz	Denton	5/8/2020
	Moments	X	40850139 GFE Mx	Denton	5/8/2020
		Y	40850139 GFE My	Denton	5/8/2020
		Z	40850139 GFE Mz	Denton	5/8/2020
Shoulder Load Cell	Forces	X	31550145 GFE FX	Denton	10/9/2020
		Y	31550145 GFE FY	Denton	10/9/2020
		Z	31550145 GFE FZ	Denton	10/9/2020
Thorax Rib Displacement Potentiometers	Upper	Y	DS-183GFE	Honeywell	10/8/2020
	Middle	Y	DS-184GFE	Honeywell	10/8/2020
	Lower	Y	DS-182GFE	Honeywell	10/8/2020
Abdomen Load Cells	Forward	Y	LC-1524	Denton	3/19/2020
	Middle	Y	LC-1523	Denton	3/19/2020
	Rear	Y	LC-1530	Denton	3/19/2020
Spine	Upper (T1) Accelerometers	X	T21176	Endevco	5/22/2020
		Y	T20906	Endevco	5/22/2020
		Z	P82326	Endevco	5/22/2020
	Lower (T12) Accelerometers	X	AC-P17299	Endevco	4/15/2020
		Y	AC-P39731	Endevco	4/15/2020
		Z	AC-P22639	Endevco	4/15/2020
	Forces	X	42840162 GFE FX	Denton	6/19/2020
		Y	42840162 GFE FY	Denton	6/19/2020
	Moments	X	42840162 GFE MX	Denton	6/19/2020
		Y	42840162 GFE MY	Denton	6/19/2020
Lumbar Spine	Forces	Y	4130104 GFE FY	Denton	7/14/2020
		Z	4130104 GFE FZ	Denton	7/14/2020
	Moment	X	4130104 GFE MX	Denton	7/14/2020
Pelvis	Pubic Symphysis Load Cell	Y	30960459GFE	Denton	3/19/2020
	Accelerometers	X	P79591	Endevco	9/22/2020
		Y	P63840	Endevco	9/22/2020
		Z	P52012	Endevco	9/22/2020

TABLE 2 – Dummy Instrumentation (SID-IIs)

			SID-IIs S/N 303			
			Serial Number	Manufacturer	Calibration Date	
Head	Primary Accelerometers	X	AC-P83431	Endevco	9/18/2020	
		Y	AC-P75158	Endevco	9/18/2020	
		Z	AC-P68077	Endevco	9/18/2020	
	Redundant Accelerometers	X	AC-T20863	Endevco	9/18/2020	
		Y	AC-P52046	Endevco	9/18/2020	
		Z	AC-P52020	Endevco	9/18/2020	
	Angular Rate Sensors	X	ARS11335	DTS	8/4/2020	
		Y	ARS11059GFE	DTS	8/4/2020	
		Z	ARS14934GFE	DTS	8/4/2020	
Upper Neck Load Cell	Forces	X	17162187-FX	Denton	8/12/2020	
		Y	17162187-FY	Denton	8/12/2020	
		Z	17162187-FZ	Denton	8/12/2020	
	Moments	X	17162187-MX	Denton	8/12/2020	
		Y	17162187-MY	Denton	8/12/2020	
		Z	17162187-MZ	Denton	8/12/2020	
Shoulder Load Cell	Forces	X	IF-3440110 GFE Fx	FTSS	8/12/2020	
		Y	IF-3440110 GFE Fy	FTSS	8/12/2020	
		Z	IF-3440110 GFE Fz	FTSS	8/12/2020	
Displacement Potentiometers	Shoulder Rib		Y	DS-030GFE	SERVO	9/14/2020
	Thoracic Rib	Upper	Y	DS-1199GFE	SERVO	6/1/2020
		Middle	Y	DS-1246GFE	SERVO	6/1/2020
		Lower	Y	DS-1256GFE	SERVO	6/1/2020
	Abdominal Rib	Upper	Y	DS-1274GFE	SERVO	6/1/2020
		Lower	Y	DS-2316GFE	SERVO	5/28/2020
Spine	Upper (T1) Accelerometers	X	P64149	Endevco	9/18/2020	
		Y	T20816	Endevco	9/18/2020	
		Z	P82183	Endevco	9/18/2020	
	Lower (T12) Accelerometers	X	P75156	Endevco	9/18/2020	
		Y	P84353	Endevco	9/18/2020	
		Z	T21144	Endevco	9/18/2020	
Lumbar Spine	Forces	X	IF-4140107 GFE Fx	Humanetics	8/28/2020	
		Y	IF-4140107 GFE Fy	Humanetics	8/28/2020	
		Z	IF-4140107 GFE Fz	Humanetics	8/28/2020	
	Moments	X	IF-4140107 GFE Mx	Humanetics	8/28/2020	
		Y	IF-4140107 GFE My	Humanetics	8/28/2020	
		Z	IF-4140107 GFE Mz	Humanetics	8/28/2020	
Pelvis	Pubic Symphysis Load Cell	Y	31680139 GFE Fy	Denton	1/8/2020	
	Accelerometers	X	P52071	Endevco	9/18/2020	
		Y	P58744	Endevco	9/18/2020	
		Z	T20880	Endevco	9/18/2020	
		Acetabulum Load Cell		Y	LC-276Fy	Denton
Iliac Wing Load Cell		Y	LC-280Fy	Denton	7/23/2020	
Pelvis Plug (struck side)			13512	SACO	9/23/2019-	
Pelvis Plug (non-struck side)			-	-	-	

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	A284329	MSI	8/7/2020
		Y	A315787	MSI	8/7/2020
		Z	A315846	MSI	8/7/2020
2	Vehicle Center of Gravity Angular Rate	X	ARS0758	DTS	2/20/2020
		Y	ARS10590	DTS	6/9/2020
		Z	ARS-14957GFE	DTS	2/21/2020
3	Right Sill at Front Seat	X	A280841	MSI	9/18/2020
		Y	A315017	MSI	9/18/2020
		Z	A315921	MSI	9/18/2020
4	Right Sill at Rear Seat	X	A280825	MSI	9/1/2020
		Y	A280995	MSI	10/5/2020
		Z	A315760	MSI	9/2/2020
5	Left Sill at Front Door	Y	A282678	MSI	5/1/2020
6	Left Sill at Rear Door	Y	A301868	MSI	9/1/2020
7	Left Front Door Mid Centerline	Y	A290917	MSI	9/8/2020
8	Left Front Door Mid Rear	Y	A280882	MSI	9/1/2020
9	Left Front Door Upper Centerline	Y	A282647	MSI	8/18/2020
10	Left Rear Door Mid Rear	Y	A284297	MSI	5/5/2020
11	Left Rear Door Upper Centerline	Y	A284346	MSI	5/1/2020
12	Left A-Pillar Lower	Y	A284307	MSI	10/5/2020
13	Left A-Pillar Middle	Y	A255976	MSI	10/5/2020
14	Left B-Pillar Lower	Y	A283634	MSI	6/18/2020
15	Left B-Pillar Middle	Y	A335493	MSI	9/16/2020
16	Front Seat Track	Y	A301866	MSI	9/16/2020
17	Rear Seat Track or Structure	Y	A283640	MSI	8/18/2020
18	Right Rear Occ. Compartment	Y	A284231	MSI	5/1/2020
19	Engine Block	X	A315723	MSI	10/6/2020
		Y	A315793	MSI	10/6/2020
20	Rear Floorpan Above Axle	X	A335419	MSI	9/16/2020
		Y	A335441	MSI	9/16/2020
		Z	A335489	MSI	9/16/2020
21	Rear Deck	X	A315085	MSI	10/6/2020
		Y	A315181	MSI	10/6/2020
		Z	A315931	MSI	10/7/2020
22	Rear Deck Angular Velocity	X	ARS0752	DTS	6/9/2020
		Y	ARS12921	DTS	6/9/2020
		Z	ARS13866	DTS	6/9/2020

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB CG Acceleration	X	A315087	MSI	5/16/2020
	Y	A315096	MSI	5/17/2020
	Z	A315733	MSI	5/17/2020
MDB Rear Acceleration	X	1201-1000_A315983	Measurement Specialties	10/5/2020
	Y	1201-1000_A290947	Measurement Specialties	10/5/2020

APPENDIX E

Seating Procedure Worksheets and Plots

Vehicle	R20200190 - 2020 GMC Terrain			Technician	Vanessa Hansen		
VIN #				Position	Driver		
ATD	ES2re			Date	10/12/2020		
Test #	FMVSS 214 Side MDB - Compliance						
SCRL Angle	Max			ES2re Tilt Sensors		X	Y
	Min -			Head	0°±2		
	Difference	0					
	/2	0		T6	0°±2		
	Min +	0					
	Mid Angle	0		Pelvis	0°±2		
Seat Back Angle	W/Level °		HEAD REST POST			FINAL HEAD REST	
Seat Pan Angle	W/Level °		ANGLE			POST ANGLE	
Pelvis Angle	ES2re 0° +/- 2.5°		Manual Inclinometer		Tilt Sensor		
Collected Points							
Name	Meas X	Meas Y	Meas Z				
SBU -	2,212.81	-784.872	-273.972				
SBL -	2,216.92	-786.717	-238.869				
STRIKER -	2,248.88	-786.45	-259.177				
FOSB -							
FISB -							
ROSB -							
RISB -							
PCP - (Pedal Center Point)							
RHP - (Right Heel Point)							
LHP - (Left Heel Point)							
S0 -	2,740.46	-373.177	-511.278				
TS -	2,809.40	-366.102	-672.541				
BS -	2,670.87	-367.22	-348.289				
SC1 -	2,890.39	-460.511	-412.099				
OSCAR H-POINT -	2,376.12	-561.475	-140.832				
DR PROJECTED WSID H-POINT AT MID-POSITION -							
DRIVER STP 15.27 MID-POSITION -							
DRIVER STP STEP 18.6 TRIAL 1 -							
DR PROJECTED WSID H-POINT STEP 18.6.2 TRIAL 1 -							
DRIVER STP STEP 18.6 TRIAL 2 -							
DR PROJECTED WSID H-POINT STEP 18.6.2 TRIAL 2 -							
DRIVER STP STEP 18.6 TRIAL 3 -							
DR PROJECTED WSID H-POINT STEP 18.6.2 TRIAL 3 -							
RHDCG -							
3DLHCG -	2,251.41	-443.543	-840.122				
LHDCG -							
BON -	2,346.24	-366.308	-824.153				
TN -	2,356.56	-364.83	-783.005				
TC -	2,310.21	-365.478	-709.57				
SHLD R1 -							
THX R1 -	2,245.22	-525.47	-536.431				
THX R2 -	2,266.48	-529.046	-478.391				
THX R3 -	2,276.16	-525.961	-427.864				
ABD R1 -	2,290.33	-505.44	-352.745				
ABD R2 -							
TPS -	2,380.23	-546.485	-145.916				
C1 -	2,367.57	-367.7	-584.454				
C2 -	2,394.51	-365.696	-510.388				
C3 -	2,428.69	-364.979	-346.359				
SHT -	2,239.96	-601.63	-582.479				
E1 -	2,448.67	-639.009	-475.52				
P1 -							
H-POINT -	2,381.56	-493.28	-144.839				
H-POINT 2 -							
OK -	2,780.77	-535.978	-221.209				
IK -	2,795.39	-296.857	-216.272				
OA -	3,066.76	-520.476	78.768				
IA -	3,077.02	-241.681	81.925				
OH -	3,089.97	-484.465	193.449				
IH -	3,099.71	-187.708	188.314				
OP -	2,040.16	-448.113	-680.704				
R -	2,347.17	-366.538	-1,044.52				
H -	2,740.73	-366.845	-947.99				
W1 -	3,063.91	-365.748	-824.958				
W1 - Outside	3,081.84	-365.867	-823.152				
W2 - Outside	3,336.03	-369.27	-671.503				

Name	Cal X	Cal Y	Cal Z	Cal 3D Distance	Deg
HZ -			220		
HH -				413	
HW -	718				
NR -				466	
CD -				584	
CS -	346				
CBS -	242				
IKD -				177.5356183	
OKD -				191	
HR -				240	
HS -		332			
AD -		100			
HD -		204			
HLHL -				297	
KK -				240	
SH -				342	
HRA -					
H-POINT TOOL ANGLE -					Missing P1
TORSO ANGLE -					Missing LHDCG
WINDSHIELD ANGLE -					59.2

Rear Passenger SIDIIS Seating Worksheet

Vehicle	R20200190 - 2020 GMC Terrain	Technician	Vanessa Hansen
VIN #		Position	
ATD	SID2s	Date	10/12/2020
SEATING #	P4		

Seat Back Angle	W/Level °	HEAD REST	
Seat Pan Angle	W/Level °	POST ANGLE	

Pelvis Angle	Manual Inclinometer
---------------------	------------------------

Collected Points					
Name	Meas X	Meas Y	Meas Z		
SBU -					
SBL -					
STRIKER -	1,262.89	-800.951	-378.827		
FOSB -					
FISB -					
ROSB -					
RISB -					
RHP -					
LHP -					
OSCAR H-POINT -					
LHDCG -	1,284.40	-435.227	-757.001		
BON -	1,372.21	-360.185	-773.817		
TN -	1,396.46	-359.774	-745.033		
TC -	1,377.76	-361.368	-667.59		
C1 -	1,391.53	-361.458	-542.744		
SHT -	1,278.23	-566.08	-521.307		
E1 -	1,422.95	-578.667	-440.425		
P1 -					
H-POINT -	1,441.32	-451.091	-188.237		
H-POINT 2 -					
OK -	1,777.81	-465.533	-240.928		
IK -	1,780.53	-302.646	-239.675		
OA -	1,930.08	-463.639	67.758		
IA -	1,933.12	-291.14	61.901		
OH -	1,861.14	-452.715	146.988		
IH -	1,860.47	-257.851	143.716		
OP -	1,025.68	-422.979	-698.943		
R -	1,371.50	-360.306	-1,065.60		
SB -	2,002.01	-361.744	-626.536		
KBL -	2,084.09	-465.031	-340.645		
KBR -	2,087.32	-305.091	-330.735		
HRP -	1,371.83	-565.353	-968.186		
HSP -	1,369.69	-738.141	-776.402		
ADP -	1,422.90	-725.702	-439.46		
HDP -	1,440.75	-696.241	-190.904		
Calculated Measurements					
Name	Cal X	Cal Y	Cal Z	Cal 3D Distance	Deg
HZ -			292		
NB -				617	
CB -				616	
IKB -				320	
OKB -				322	
HR -				283	
HS -		378			
AD -		147			
HD -		245			
HLHL -				194.893	
KK -				163	
SH -				418	
HRA -					N/A
H-POINT TOOL ANGLE -					Missing P1
TORSO ANGLE -					43.1
SEATBACK ANGLE -					16.0