REPORT NUMBER: SINCAP-CAL-22-005

NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

Polestar Performance AB
2022 Polestar Polestar 2
Five Door Hatchback

NHTSA No: M20225902

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

June 5, 2023

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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Prepared by: Matthew Pronko Date: June 5, 2023
Matthew Pronko, Test Engineer

Approved by: Vanessa Hansen Date: June 5, 2023
Vanessa Hansen, Operations Program Manager

FINAL REPORT ACCEPTANCE BY OCWS:

_____
Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

_____
COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. SINCAP-CAL-22-005	***2. Government Accession No.***	***3. Recipient's Catalog No.***
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact MDB Testing of a 2022 Polestar Polestar 2 five Door Hatchback NHTSA No.: M20225902		***5. Report Date*** June 5, 2023 ***6. Performing Organization Code*** CAL
Matthew Pronko, Test Engineer Vanessa Hansen, Operations Program Manager		***8. Performing Organization Report No.*** CAL-DOT-2022-005
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225		***10. Work Unit No.*** ***11. Contract or Grant No.*** 693JJ920D000016
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave., SE Washington, D.C. 20590		***13. Type of Report and Period Covered:*** Final Test Report June 30, 2022 - June 5, 2023 ***14. Sponsoring Agency Code*** NRM-110
15. *Supplementary Notes*		

16. Abstract

A 55/28, (61.90kph / 38.5 mph), 90^0 Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2022 Polestar Polestar 2 five door hatchback 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 June 30, 2022.

The impact velocity of the Moving Deformable Barrier (MDB) was 61.91 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 223 mm located at level 3. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	N/A	1000	75.402
Maximum Thoracic Rib Deflection	mm	44	18.283
Total Abdominal Force	N	2500	580.656
Pubic Symphysis Force	N	6000	1160.167

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	N/A	1000	266.507
Lower Spine Resultant Acceleration	G	82	59.509
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3297.819
Maximum Thoracic Rib Deflection	mm	38*	29.651
Maximum Abdominal Rib Deflection	mm	45*	19.875

* *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.

17. Key Words New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs	***18. Distribution Statement*** Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave. SE Washington, D.C. 20590

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UNCLASSIFIED	UNCLASSIFIED	222	

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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2022 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number 693JJ920D000016. The purpose of this test is to generate comparative side impact performance in a 2022 Polestar Polestar 2 five door hatchback. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated March 2020.

SECTION 2

SUMMARY OF TEST RESULTS

A 2022 Polestar Polestar 2 five door hatchback 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 61.91 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 June 30, 2022. 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 March 2020. 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)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen forward, middle, and rear y-axis load cells
Lower spine (T12) tri-axial accelerometers
Public symphysis y-axis load cell

PASSENGER ATD (SID-IIs)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen upper rib and lower rib y-axis displacement potentiometers
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.

DUMMY INJURY VALUES

Measurement Description	Driver ATD (ES-2re)		
	Units	Threshold	Result
Head Injury Criteria (HIC36)		1000	75.402
Maximum Thorax Rib Deflection	mm	44	18.283
Combined Abdominal Force	N	2500	580.656
Pubic Symphysis Force	N	6000	1160.167

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC36)		1000	266.507
Lower Spine (T12) Resultant Acceleration	G	82	59.509
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3297.819
Maximum Thoracic Rib Deflection	mm	38*	29.651
Maximum Abdominal Rib Deflection	mm	45*	19.875

*Proposed IARV

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	Yes	No		
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	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Inner Seat Airbag	Yes	No	No	N/A

GENERAL COMMENTS:

1. P1 serial number – F033
2. P4 serial number – 300

Data Anomalies:

- Driver Head Acceleration X Redundant, Noise Spikes Present
- Left B-Pillar Lower Y, Exceeded calibration range and saturated at 9.3 ms
- Left B-Pillar Middle Y, Exceeded calibration range and saturated at 9.8 ms
- Left Rear Sill Y, Exceeded calibration range at 13.7 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

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Data Sheet No. 7 – MDB Accelerometer Locations

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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

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Data Sheet No. 305-3 – Pre-Impact Electrical Isolation Measurements and Calculations for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-4 – Post-Impact Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-5 –Static Rollover Test Data for Indicant FMVSS No. 305 Testing

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2022 Polestar Polestar 2 five door hatchback
NHTSA No.: M20225902
Test Program: NCAP Side MDB Impact Test
Test Date: 6/30/2022

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20225902
Model Year	2022
Make	Polestar
Model	Polestar 2
Body Style	Five Door Hatchback
VIN	LPSEG3KA1NL067732
Body Color	Black
Odometer Reading (km/mi)	10 mi
Engine Displacement (L)	N/A
Type/No. Cylinders	Electric
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	Direct Drive
Overdrive	Yes
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks (ADL)	Yes
Power Window Auto-Reverse	No
Other Optional Feature	-
Driver Front Air bag	Yes
Driver Curtain Air bag	Yes
Driver Head/Torso Air bag	No
Driver Torso Air bag	No
Driver Torso/Pelvis Air bag	Yes
Driver Pelvis Air bag	No
Driver Knee Air bag	Yes
Rear Pass. Curtain Air bag	Yes
Rear Pass. Head/Torso Air bag	No
Rear Pass. Torso Air bag	No
Rear Pass. Torso/Pelvis Air bag	No
Rear Pass. Pelvis Air bag	No
Driver Seat Belt Pretensioners	Yes
Rear Pass. Seat Belt Pretensioners	Yes
Driver Load Limiter	Yes
Rear Pass. Load Limiter	Yes
Driver & Pass Inner Torso Airbag	Yes

Does owner's manual provide instructions to turn off automatic door locks?	No

DATA FROM CERTIFICATION LABEL

Manufactured By	Polestar Performance AB
Date of Manufacture	12/21
Vehicle Type	Passenger Car

GVWR (kg)	2486
GAWR Front (kg)	1270
GAWR Rear (kg)	1297

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	N/A	5	
Capacity Weight (VCW) (kg)				420	(A)
DSC X 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				79.8	(A-B)

VEHICLE SEAT TYPE

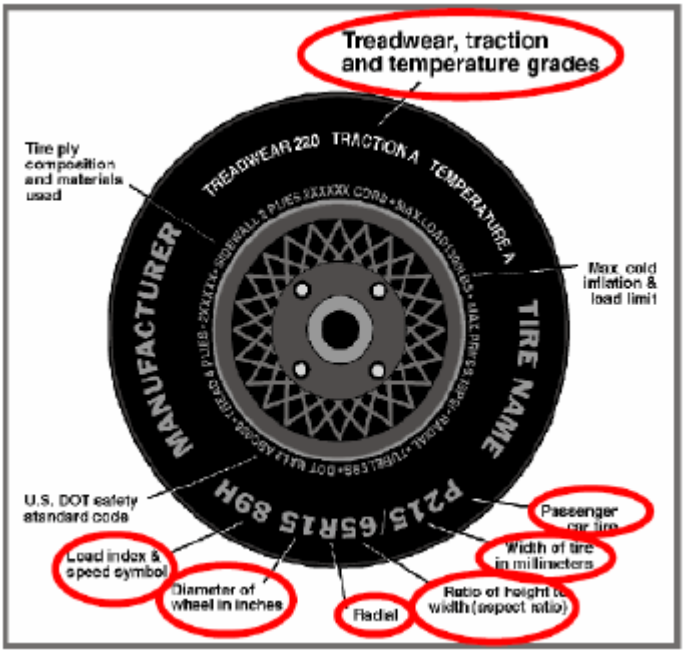
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front Seat	X					X	
Rear or Second Row Seat			X		X		
Third Row seat							

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

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

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)	340	340
Cold Pressure (kPa)	280	290
Recommended Tire Size	245/40R20	245/40R20
Tire Size on Vehicle	245/40R20	245/40R20
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy Tour A/S	Primacy Tour A/S
Treadwear	540	540
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Polyamide	2 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	99V	99V
Tire Material	Rubber	Rubber
DOT Safety Code Left	OCBJ00XX3621	OCBJ00XX3621
DOT Safety Code Right	OCBJ00XX3621	OCBJ00XX3621

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

Test Vehicle: 2022 Polestar Polestar 2 five door hatchback
NHTSA No.: M20225902
Test Program: NCAP Side MDB Impact Test
Test Date: 6/30/2022

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	344	348	357	352
Tire Placard	kPa	280	280	290	290
Owner's Manual	kPa	280	280	290	290
As Tested	kPa	280	280	290	290

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	221	221	221	221

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	542	461		592	530		586	550	
Right	kg	555.5	447.5		573	509		559	515	
Ratio	%	54.7	45.3		52.9	47.1		51.8	48.2	
Totals	kg	1097.5	908.5	2006.5	1165	1039	2204	1145	1065	2210

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2006.5	(A)
Sum of Actual Weight of 1 ES2re and 1 P572 ATD (SID-IIs)	kg	127	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	79.8	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	2212.8	(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)? [X] **Yes** [ ] **No**

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement**
LF	mm	804	794	Yes
RF	mm	805	796	Yes
RR	mm	806	802	Yes
LR	mm	797	797	Yes
Vehicle CG (Aft of Front Axle)	mm	1319	1290	
Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline)	mm	22	15	

**** 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:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Tool Kit	2
Jack	2
Ballast / Equipment Added	22.7

TEST SURFACE MARKINGS

	Distance from 63° Impact Angle Line (mm)
Fore 25 mm target	909
Aft 25 mm target	909
Pre-Impact Angle Line	236

Parallel Track Target	X Location (mm)	Y Location (mm)
A	0	0
B	2955	1555
C	2955	4455
D	0	3000

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

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

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	19.8	8.7	14.3
Front Passenger Seat	19.2	8.2	13.7
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	14.3	17	Max	60	75	91
			Mid	32	46	61
			Min	3	17	31
Front Passenger Seat	13.7	14	Max	54	69	86
			Mid	28	41	58
			Min	1	14	30
Front Center Seat*			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:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

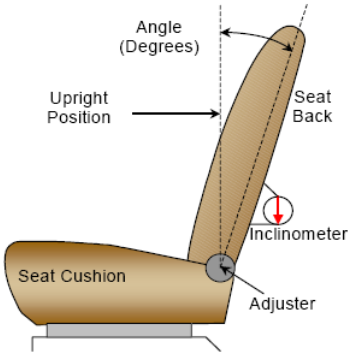
SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	260	Power	130	Power
Front Passenger Seat	262	Power	131	Power
Front Center Seat*				
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.



FRONT SEAT ASSEMBLY

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/ Seated Dummy	53.5	Infinite	19.1	Infinite
Front Passenger Seat	56.6	Infinite	19.0	Infinite
Front Center Seat*				
Struck Side Rear Seat w/ Seated Dummy	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat*	Fixed	Fixed	Fixed	Fixed

**if applicable*

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

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

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	4 (0-3)	0
Rear Seat	Fixed	Fixed

HEAD RESTRAINT ADJUSTMENT

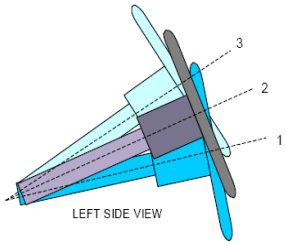
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	3 (0-2)	Uppermost
Rear Seat	Fixed	Fixed

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	22.1	
Geometric Center – Position 2	25.5	
Uppermost – Position 3	29.2	
Telescoping Steering Wheel Travel		55
Test Position	25.5	27.5

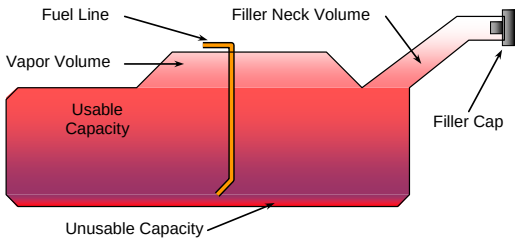


STEERING COLUMN ASSEMBLY

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 charge port located on the left rear of the vehicle.



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

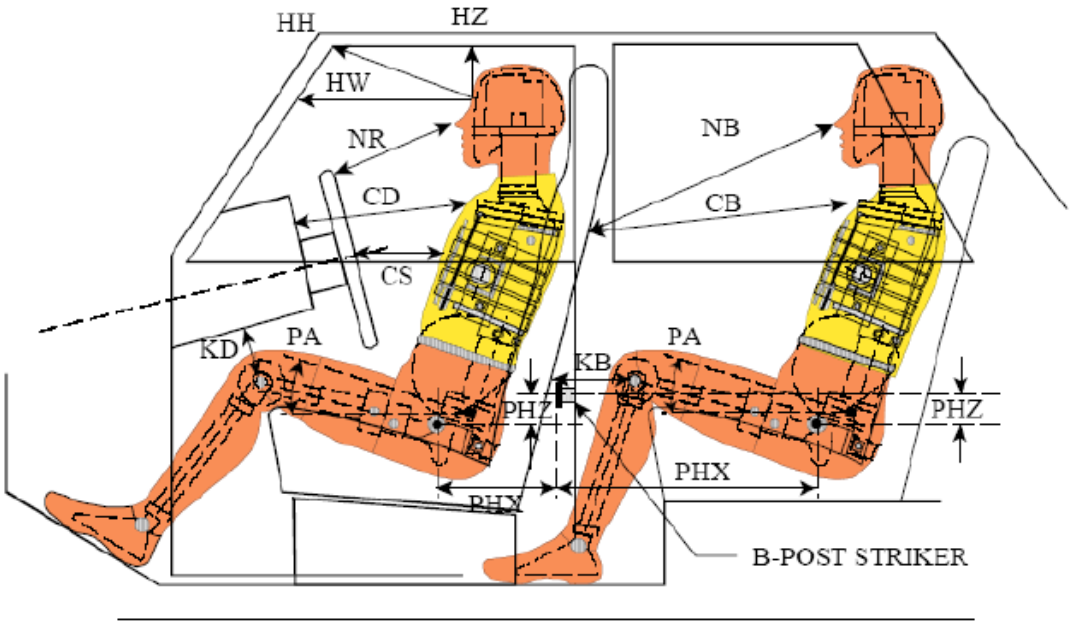
FUEL TANK CAPACITY

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

Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in Form No. 1? **N/A** **Yes** ☐ **No**

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022



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

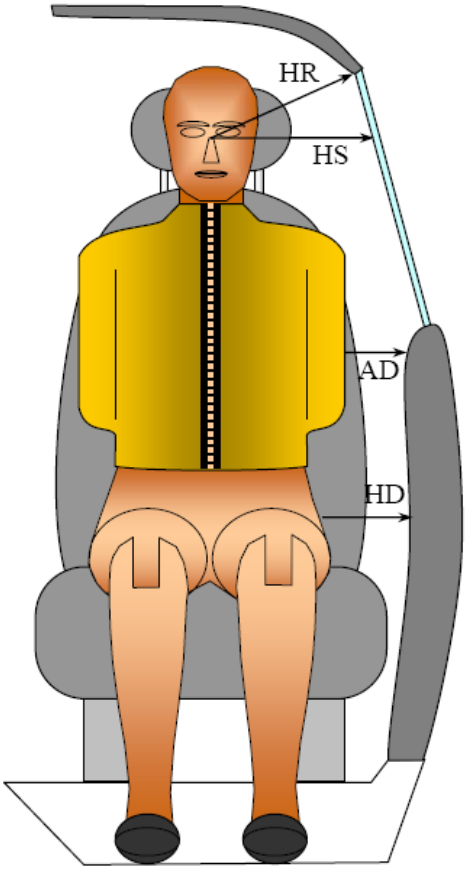
LEFT SIDE VIEW

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Description	Driver (Serial No. F033)		Passenger (Serial No.300)	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	451			
HW		Header to Windshield	669			
HZ	HZ	Head to Roof Liner	188		251	
NR	NB	Nose to Rim/Seat Back	467		534	
CD	CB	Chest to Dash/Seat Back	602		534	
CS		Chest to Steering Wheel	383			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	221	37.6	262	19.8
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	230	31.8	260	32.6
PAX°	PAX°	Pelvic Tilt Angle X		25.5		21.0
	PAY°	Pelvic Tilt Angle Y				0.2
PHX	PHX	Hip Point to Striker (X-Axis)	162		63	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	229		110	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022



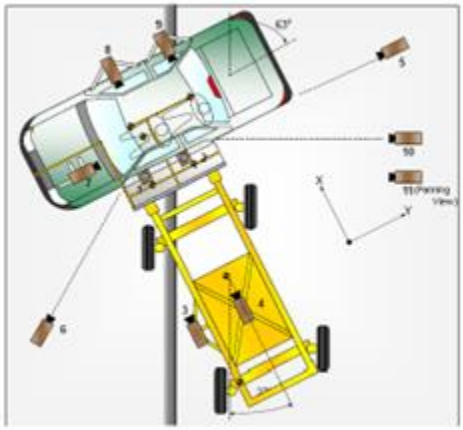
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver (Serial No. F033)	Passenger (Serial No. 300)
HR	Head to Side Header	mm	173	228
HS	Head to Side Window	mm	320	365
AD	Arm to Door	mm	119	128
HD	Hip Point to Door	mm	163	140

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2022 Polestar Polestar 2 five door hatchback NHTSA No.: M20225902
Test Program: NCAP Side MDB Impact Test Test Date: 6/30/2022



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	0	0	-8142	12.5	1000
2	Overhead Close-up	0	0	-8142	24	1000
3	Left Impact Point (MDB)	-1470	0	-847	25	1000
4	Side Overall (MDB)	-1140	878	-1587	8	1000
5	Rear	0	-8374	-1377	28	1000
6	Left Front	-2654	-6414	-1336	24	1000
7	Driver Front (OB)				25	1000
8	Driver Side (OB)				12.5	1000
9	Passenger Side (OB)				12.5	1000
10	Real-time Left Rear				Zoom	60
11	Real-time In run				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.*

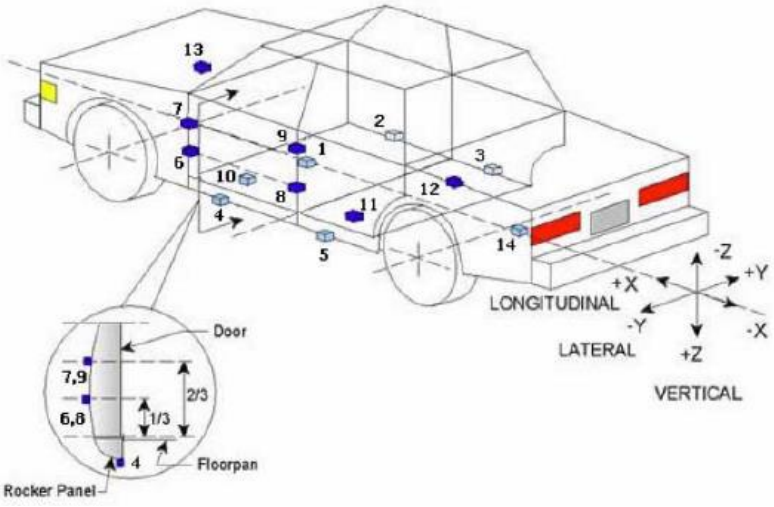
If applicable, explain why camera(s) did not operate as intended: All cameras operated normally

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	22
Vehicle Structure Accelerometers	24
MDB Accelerometers	7
Total	69

DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022



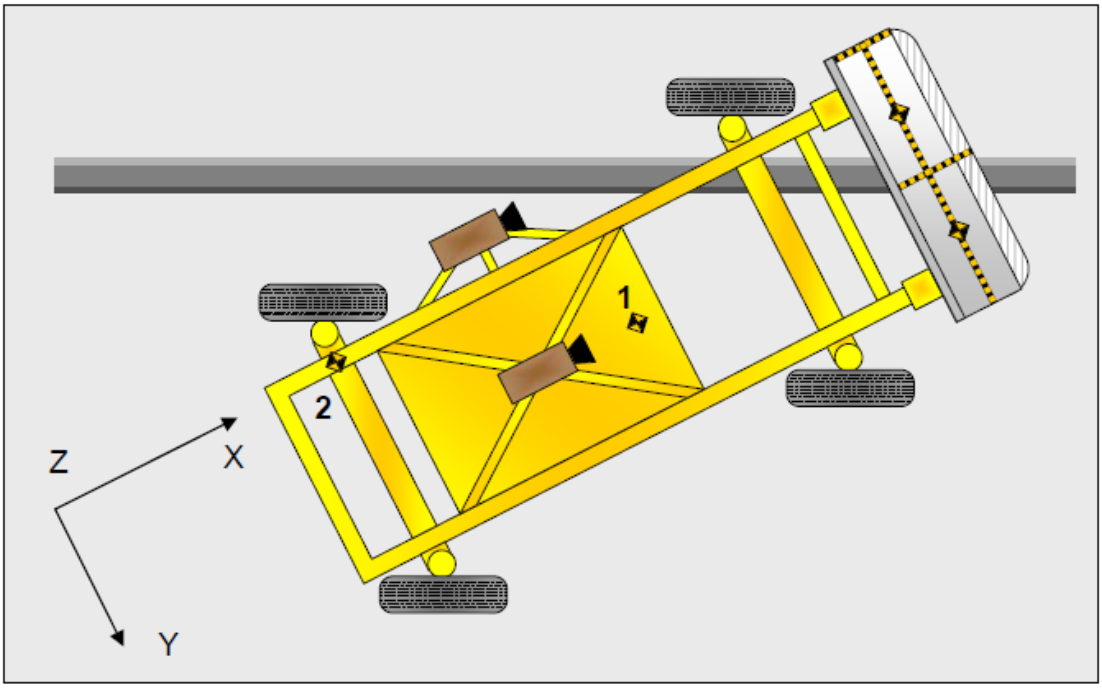
TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2264	-8	81
2	Right Sill at Front Seat	2863	631	286
3	Right Sill at Rear Seat	1943	650	282
4	Left Sill at Front Door	2834	-635	280
5	Left Sill at Rear Door	1953	-650	293
6	A-Post Lower	3269	-598	151
7	A-Post Middle	3146	-615	-390
8	B-Post Lower	2178	-684	-46
9	B-Post Middle	2112	-640	-362
10	Front Seat Track	2429	-545	326
11	Rear Seat Structure	1908	-358	202
12	Rt. Rear Occ. Compartment	2007	439	385
13	Engine Block	3735	87	-179
14	Rear Above Axle	1094	11	94

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

DATA SHEET NO. 7
MDB ACCELEROMETER LOCATIONS

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022



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)

Width between left and right contact switches (mm): **1475**

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	None	Curtain Airbag
Top of Head	None	Curtain Airbag
Left Side of Head	Side Headliner & Curtain Airbag	Curtain Airbag
Back of Head	Side Headliner & Headrest	Curtain Airbag, Side Header &
Left Shoulder	Torso/Pelvis Airbag & Curtain	Seatback & Passenger Door
Upper Torso	Seatback & Torso/Pelvis Airbag	Seatback
Lower Torso	Seatback & Torso/Pelvis Airbag	Seatback
Left Hip	Seatpan & Torso/Pelvis Airbag	Seatback & Passenger Door
Left Knee	Driver Door	Passenger 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 & C-Pillar Buckled
Sill Separation	None
Windshield Damage	None
Side Window Damage	Rear Passenger window
Other Notable Effects	None

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

Test Vehicle: 2022 Polestar Polestar 2 five door hatchback
NHTSA No.: M20225902
Test Program: NCAP Side MDB Impact Test
Test Date: 6/30/2022

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	Yes	No		
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	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Inner Seat Airbag	Yes	No	No	N/A

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2737
Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point)	mm		428
Actual Impact Point (Aft of Frontal Axle)	mm		428
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	0
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	0

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2022 Polestar Polestar 2 five door hatchback NHTSA No.: M20225902
Test Program: NCAP Side MDB Impact Test Test Date: 6/30/2022

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length Including Honeycomb Frame	4120
Wheelbase of Framework Carriage	260
CG Location of Front Axle	1120

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	396.0	291.5	687.5
Right	kg	377.5	301.0	678.5
Ratio	%	56.6	43.3	100.0
Totals	kg	773.5	592.5	1366.0

SPEED AND ANGLE AT IMPACT DATA

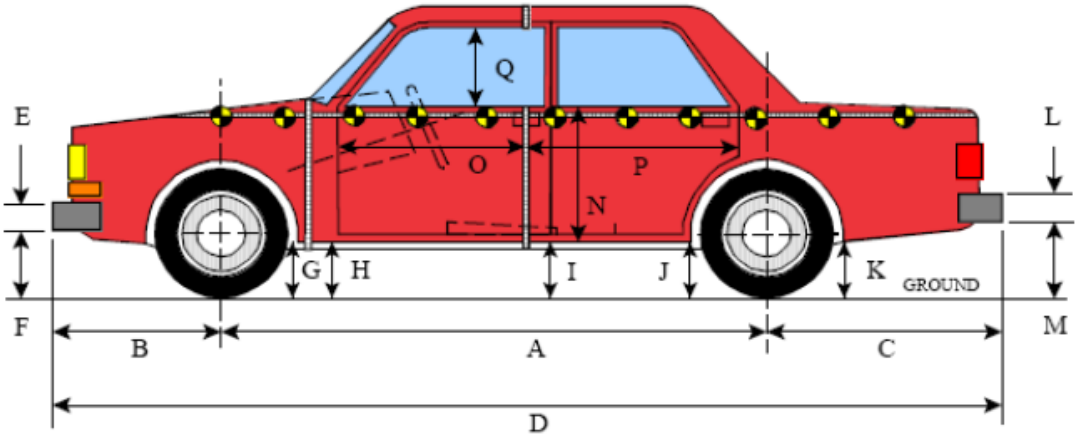
Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.10 to 62.70	61.91
Trap No. 2 Velocity (Redundant)	km/h	61.10 to 62.70	61.89
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63
MDB Crabbed angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27

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	300	Right	224
B	Top of Bumper	533	800	Left	130
C	Mid-Level	686	800	Left	177
D	Top of Stack	813	800	Left	200

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2022 Polestar Polestar 2 five door hatchback NHTSA No.: M20225902
Test Program: NCAP Side MDB Impact Test Test Date: 6/30/2022



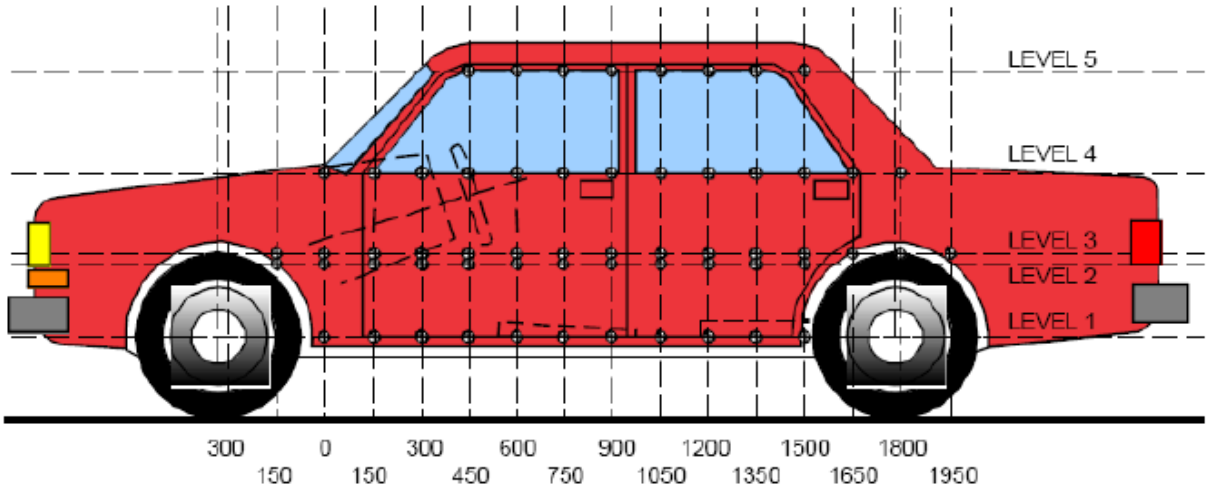
LEFT SIDE VIEW
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3mm

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2737	2735	-2
B	Front Axle to FSOV	854	856	2
C	Rear Axle to RSOV	1014	1018	4
D	Total Length at Centerline	4606	4609	3
E	Front Bumper Thickness	100	100	0
F	Front Bumper Bottom to Ground	424	421	-3
G	Sill Height at Front Wheel Well	184	185	1
H	Sill Height at Front Door Leading Edge	186	189	3
I	Sill Height at B Pillar	159	151	-8
J1	Sill Height at Rear Wheel Well	197	194	-3
J2	Pinch Weld Height at Rear Wheel Well	185	185	0
K	Sill Height Aft of Rear Wheel Well	263	267	4
L	Rear Bumper Thickness	165	165	0
M	Rear Bumper Bottom to Ground	476	485	9
N	Sill Height to Window Bottom of Front Window Sill	776	733	-43
O	Front Door Leading Edge to Impact CL	709	699	-10
P	Rear Door Trailing Edge to Impact CL	1371	1270	-101
Q	Front Window Opening	403	417	14
R	Right Side Length	4493	4497	4
S	Left Side Length	4496	4490	-6
T	Maximum Vehicle Width	1816	1693	-123

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2022 Polestar Polestar 2 five door hatchback NHTSA No.: M20225902
Test Program: NCAP Side MDB Impact Test Test Date: 6/30/2022



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	328	104	1050
2	Driver Hip Point	mm	532	201	1500
3	Mid-Door	mm	697	223	1650
4	Window Sill	mm	993	95	1800
5	Window Top	mm	1431	6	1200

*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: 2022 Polestar Polestar 2 five door hatchback NHTSA No.: M20225902
Test Program: NCAP Side MDB Impact Test Test Date: 6/30/2022

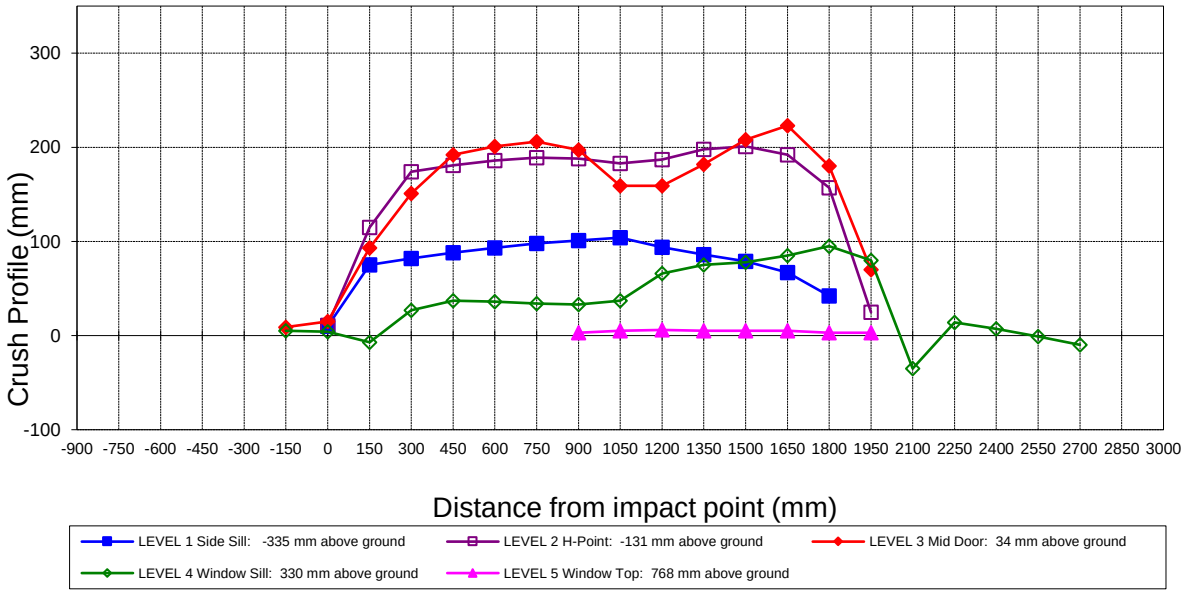
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	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			926	744				917	739				9	5	
0	896	909	909	769		886	898	890	765		10	11	19	4	
150	890	888	897	785		815	773	804	792		75	115	93	-7	
300	894	881	897	808		812	707	746	781		82	174	151	27	
450	898	880	898	823		810	699	706	786		88	181	192	37	
600	901	881	899	835		808	695	698	799		93	186	201	36	
750	904	882	900	838		806	693	694	804		98	189	206	34	
900	905	882	900	841	569	804	694	703	808	566	101	188	197	33	3
1050	907	883	900	843	576	803	700	741	806	571	104	183	159	37	5
1200	906	883	898	844	576	812	696	739	778	570	94	187	159	66	6
1350	905	882	895	844	571	819	684	713	769	566	86	198	182	75	5
1500	902	882	892	843	567	823	681	684	765	562	79	201	208	78	5
1650	898	885	892	841	562	831	693	669	756	557	67	192	223	85	5
1800	893	896	897	839	553	851	739	717	744	550	42	157	180	95	3
1950		911	911	833	540		886	841	753	537		25	70	80	3
2100				832					867					-35	
2250				823					809					14	
2400				814					807					7	
2550				805					806					-1	
2700				792					802					-10	
2850															
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

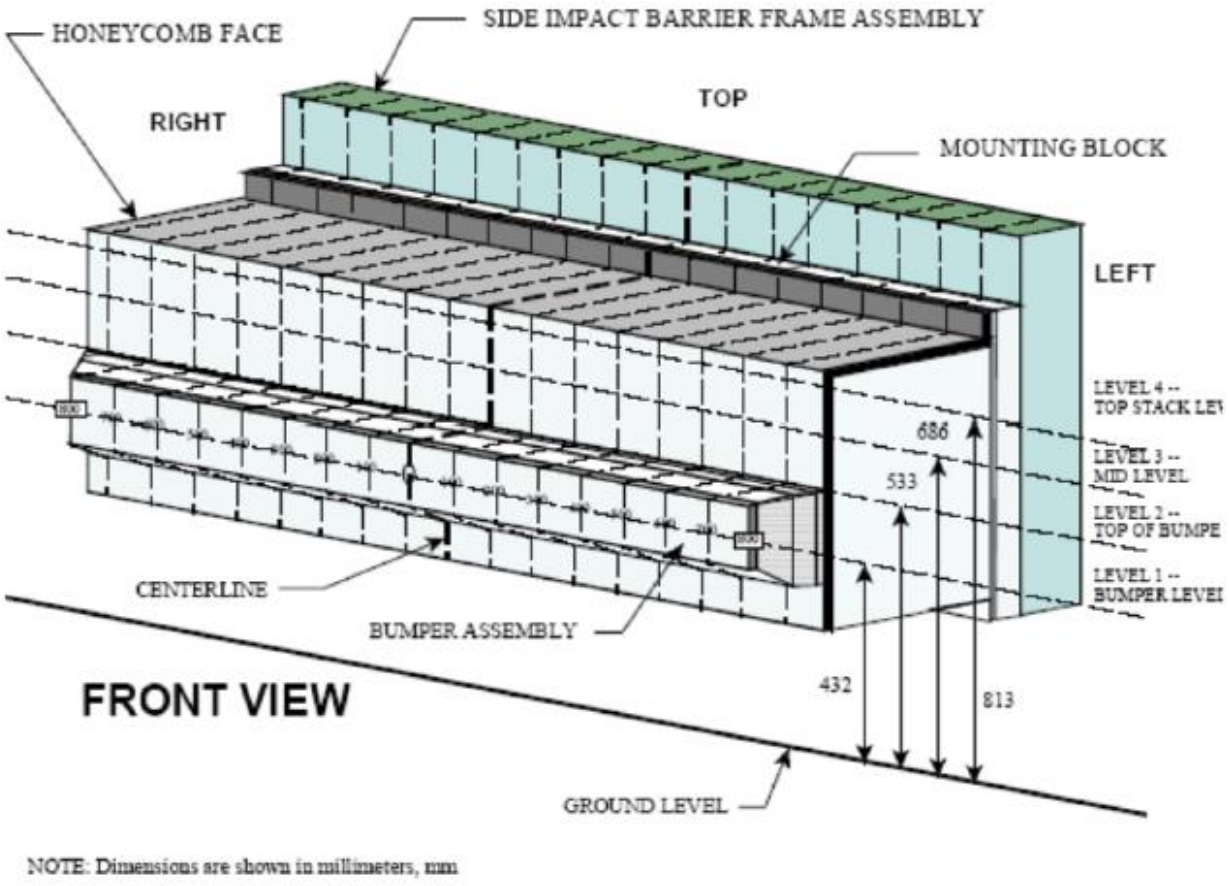
Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022



Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022



NOTE: Dimensions are shown in millimeters, mm

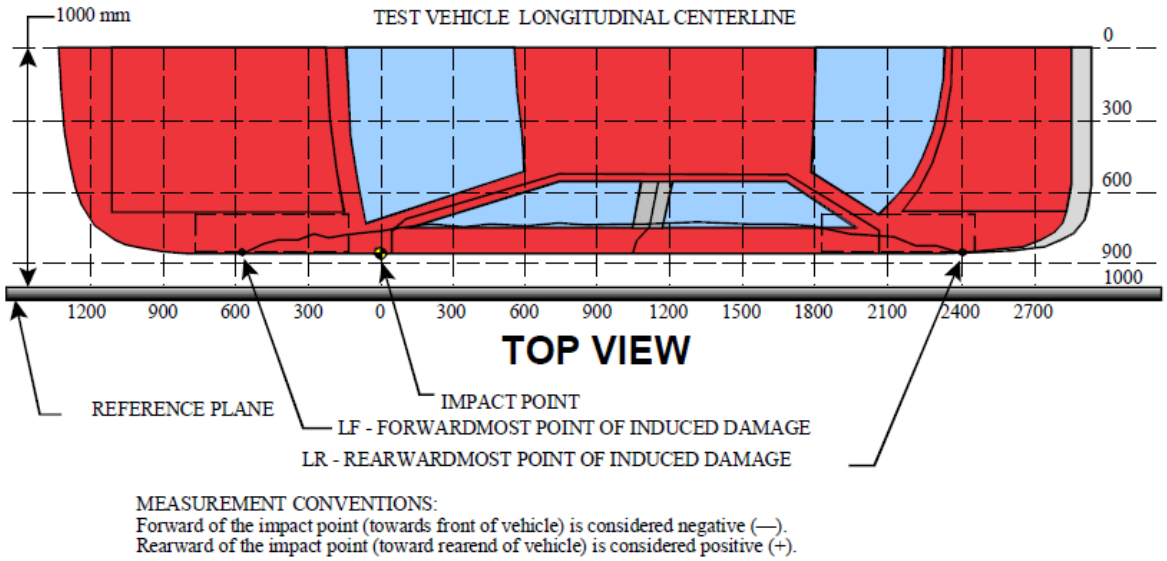
DEFORMABLE BARRIER STATIC CRUSH

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	800
1	218	215	215	216	216	224	214	210	208	206	204	202	201	198	198	202	218
2	114	114	114	110	108	111	108	107	100	102	102	103	101	98	97	103	130
3	40	37	44	68	76	96	103	104	68	47	40	40	45	55	81	121	177
4	21	34	47	62	86	133	130	103	76	70	65	70	80	85	104	142	200

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

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



MEASUREMENT CONVENTIONS:
Forward of the impact point (towards front of vehicle) is considered negative (—).
Rearward of the impact point (toward rearend of vehicle) is considered positive (+).

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-150	3	83	74	9
2	420	3	286	102	184
3	990	3	274	100	174
4	1560	3	322	108	214
5	2130	3	319	108	211
6	2700	3	159	89	70

MDB DAMAGE PROFILE DISTANCES

DPD	Distance From Center of MDB	Level	Post-Test (mm)*
1	800 mm left of center	1	218
2	480 mm left of center	1	199
3	160 mm left of center	1	205
4	160 mm right of center	1	213
5	480 mm right of center	1	216
6	800 mm right of center	1	218

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

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022
Test Time:	12:10 PM	Temperature:	21˚C

A. From impact until vehicle motion ceases: (Maximum allowable is 1 oz.) — 0 oz.

B. For the 5-minute period after motion ceases: (Maximum allowable is 5 oz.) — 0 oz.

C. For the following 25 minutes: (Maximum allowable is 1 oz./minute) — 0 oz.

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°	68	300	368
90° to 180°	67	300	367
180° to 270°	65	300	365
270° to 360°	68	300	368

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

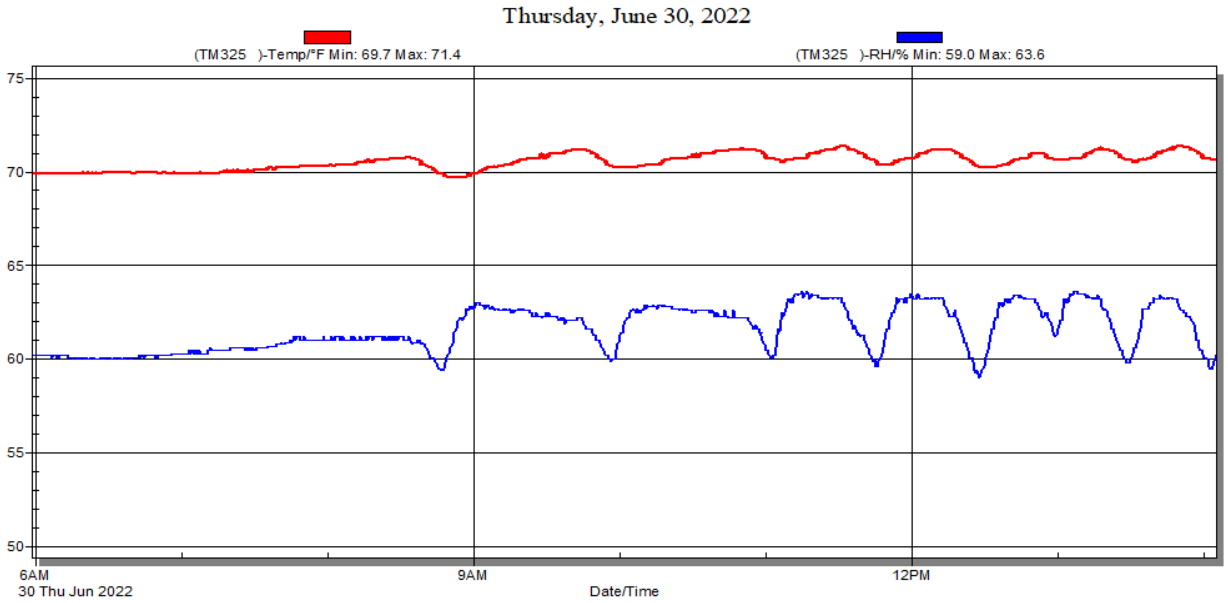
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

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:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022



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

DATA SHEET NO. 305-1
GENERAL TEST AND VEHICLE PARAMETER DATA FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Electric
Propulsion Battery Type	Li-ion NMC
Nominal Voltage (Volts)	396
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Inside Battery Distribution Unit
Auxiliary Battery Type	12 V Lead

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	Dry Cells
Electrolyte Fluid Specific Gravity	N/A
Electrolyte Fluid Kinematic Viscosity (centistokes)	N/A
Electrolyte Fluid Color	Neutral
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Glycol, Green
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Outside

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
For all battery types: Voltage Range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	396
Maximum State of Charge	V	451
95% of Maximum	V	428.5
Test Voltage *	V	449.3
For batteries that are rechargeable ONLY by an energy source on the vehicle: Voltage range corresponding to **useable energy** of the battery :		
Minimum State of Charge	V	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	

* *For all battery types-No less than 95% of Maximum Operating Voltage; for batteries that are rechargeable ONLY by an energy source on the vehicle-maximum practicable state of charge within normal operating range*.

DATA SHEET NO. 305-2
PRE-IMPACT DATA FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

VEHICLE CHASSIS GROUND PT(S) LOCATION(S) & PROPULSION BATTERY SYSTEM

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Ground point is located in the left rear trunk compartment.
Details of Propulsion Battery Components	Provided breakout box was used to read battery voltage

DATA SHEET NO. 305-3
PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		581
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		4/28/2022

NOTES:

- *The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 M Ω*
- *An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.*

PROPULSION BATTERY VOLTAGE, RESISTANCE & ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Measured Parameter	Symbol	Units	Value
Normal operating voltage range specified by the manufacturer	V_b	V	451
Propulsion Battery Voltage : (ready to drive position)	V_b	V	450.2
Propulsion Battery to Vehicle Chassis	V_1	V	428.8
Propulsion Battery to Vehicle Chassis	V_2	V	434.5
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	206,000
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	165.4
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	168.3
$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$	R_{i1}	Ω	660,472
$R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$	R_{i2}	Ω	647,386
Lesser value of R_{i1} and R_{i2}	R_i	Ω	647,386
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	1,438

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)? [X] Yes [ ] No (Fail)

NOTES:

- *The measurement shall be made with the propulsion battery connected to the vehicle propulsion system, and the vehicle in the "ready-to-drive" (propulsion motor(s) activated) position.*
- *If the voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.*
- *The known resistance Ro (in Ohms) should be approximately 500 times the nominal operating voltage of the vehicle (in volts) per SAE J1766*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*

DATA SHEET NO. 305-4
POST-IMPACT DATA FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		581
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		4/28/2022

NOTES:

- *The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 M Ω*
- *An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.*

ELECTRICAL ISOLATION MEASUREMENTS & IMPACT CALCULATIONS

Parameter	Value	Units		Value		Value	
V_b =	0.1	V	Time:	4	Minutes	50	Seconds
V_1 =	41.0	V	Time:	4	Minutes	56	Seconds
V_2 =	32.8	V	Time:	5	Minutes	3	Seconds
$R_{o\,=}$	206,000	Ω	Time:		Minutes		Seconds
V_1' =	0.6	V	Time:	4	Minutes	10	Seconds
V_2' =	0.4	V	Time:	5	Minutes	15	Seconds
R_{i1} =	24,967,200	Ω	Time:	5	Minutes	10	Seconds
R_{i2} =	37,543,500	Ω	Time:	5	Minutes	15	Seconds
R_i =	24,967,200	Ω	Time:	5	Minutes	10	Seconds
R_i/V_b =	249,672,000	Ω/V	Time:	5	Minutes	10	Seconds

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)?	X	Yes		No (Fail)

NOTES:

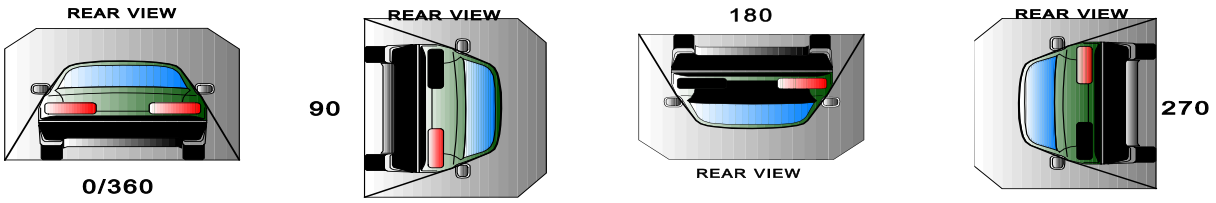
- *R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1'], R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2'], R_i = Lesser value of R_{i1} and R_{i2}*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*
- *Minimum Electrical Isolation Value is 500 Ω/V*

. PROPULSION BATTERY SYSTEM COMPONENTS

Measured Parameter	Comments	Passed	Failed
Propulsion Battery Module movement within the passenger compartment	None	X	
Intrusion of an outside Propulsion Battery Component into the passenger compartment	None	X	
Is propulsion battery electrolyte spillage visible in the passenger compartment?		X	

DATA SHEET NO. 305-5
STATIC ROLLOVER TEST DATA FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle:	2022 Polestar Polestar 2 five door hatchback	NHTSA No.:	M20225902
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/30/2022



Rear View

DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Rollover Stage	Rotation Time (spec. 1 -3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	8	5	6	8	7
90° to 180°	1	7	5	6	7	7
180° to 270°	1	5	5	6	5	7
270° to 360°	1	8	5	6	8	7

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

Rollover Stage	Propulsion Battery Electrolyte Spillage	Units	Spillage Location
0° to 90°	0.0	Liters	None
90° to 180°	0.0	Liters	None
180° to 270°	0.0	Liters	None
270° to 360°	0.0	Liters	None
Total Spillage	0.0	Liters	None

** FMVSS 305 Requirements: Maximum allowable propulsion battery electrolyte spillage is **5.0 Liters***

Is the total spillage of propulsion battery electrolyte greater than 5.0 Liters?		Yes (Fail)	X	No
Is propulsion battery electrolyte spillage visible in the passenger compartment?		Yes (Fail)	X	No

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		581
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		4/28/2022

NOTES:

- *The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 M Ω*
- *An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.*

DATA SHEET NO. 305-5
STATIC ROLLOVER TEST DATA FOR INDICANT FMVSS NO. 305 TESTING (CONT'D)

Test Vehicle: 2022 Polestar Polestar 2 five door hatchback NHTSA No.: M20225902
Test Program: NCAP Side MDB Impact Test Test Date: 6/30/2022

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units	R_o = 206,000 Ω	Minutes	Seconds
V_b =	90°	0.1	V	Time:	1	9
	180°	0.1	V		9	48
	270°	0.0	V		15	4
	360°	0.0	V		22	24
V_1 =	90°	2.90	V	Time:	1	12
	180°	4.80	V		9	51
	270°	0.00	V		15	8
	360°	0.00	V		22	30
V_2 =	90°	0.00	V	Time:	1	17
	180°	0.00	V		9	56
	270°	0.00	V		15	13
	360°	0.00	V		22	38
V_1' =	90°	0.10	V	Time:	1	22
	180°	0.00	V		10	3
	270°	0.00	V		15	19
	360°	0.00	V		22	43
V_2' =	90°	0.00	V	Time:	1	26
	180°	0.00	V		10	9
	270°	0.00	V		15	21
	360°	0.00	V		22	47
R_{i1} =	90°	5,768,000	Ω	Time:	1	22
	180°	Zero Volts	Ω		10	3
	270°	Zero Volts	Ω		15	19
	360°	Zero Volts	Ω		22	43
R_{i2} =	90°	Zero Volts	Ω	Time:	1	26
	180°	Zero Volts	Ω		10	9
	270°	Zero Volts	Ω		15	21
	360°	Zero Volts	Ω		22	47
R_i =	90°	5,768,000	Ω	Time:	1	22
	180°	Zero Volts	Ω		10	3
	270°	Zero Volts	Ω		15	21
	360°	Zero Volts	Ω		22	47
R_i/V_b =	90°	57,680,000	Ω/V	Time:	10	3
	180°	Zero Volts	Ω/V		10	9
	270°	Zero Volts	Ω/V		15	21
	360°	Zero Volts	Ω/V		1	26

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)? [X] Yes [ ] No (Fail)

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

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

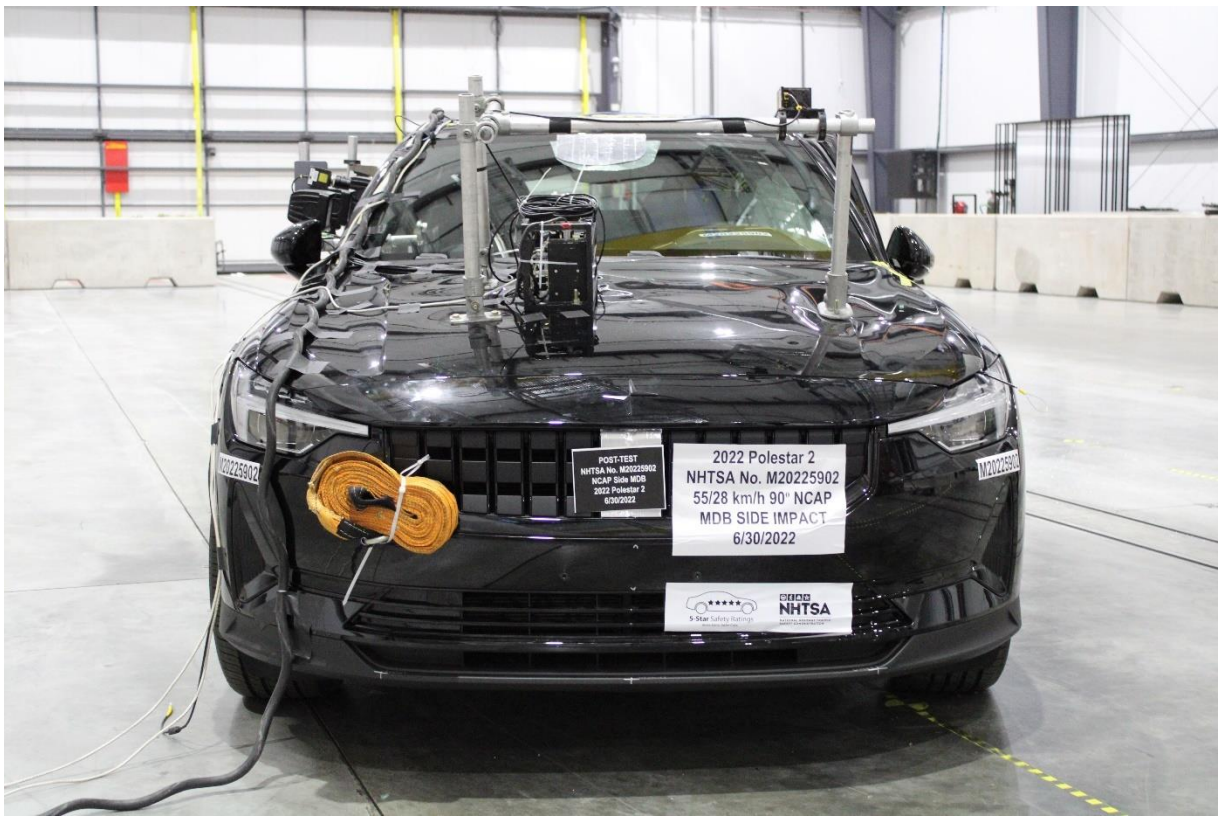


Figure A-4: Post-Test Frontal View of Test Vehicle

Figure A-5: Pre-Test Left Front ¾ View of Test Vehicle

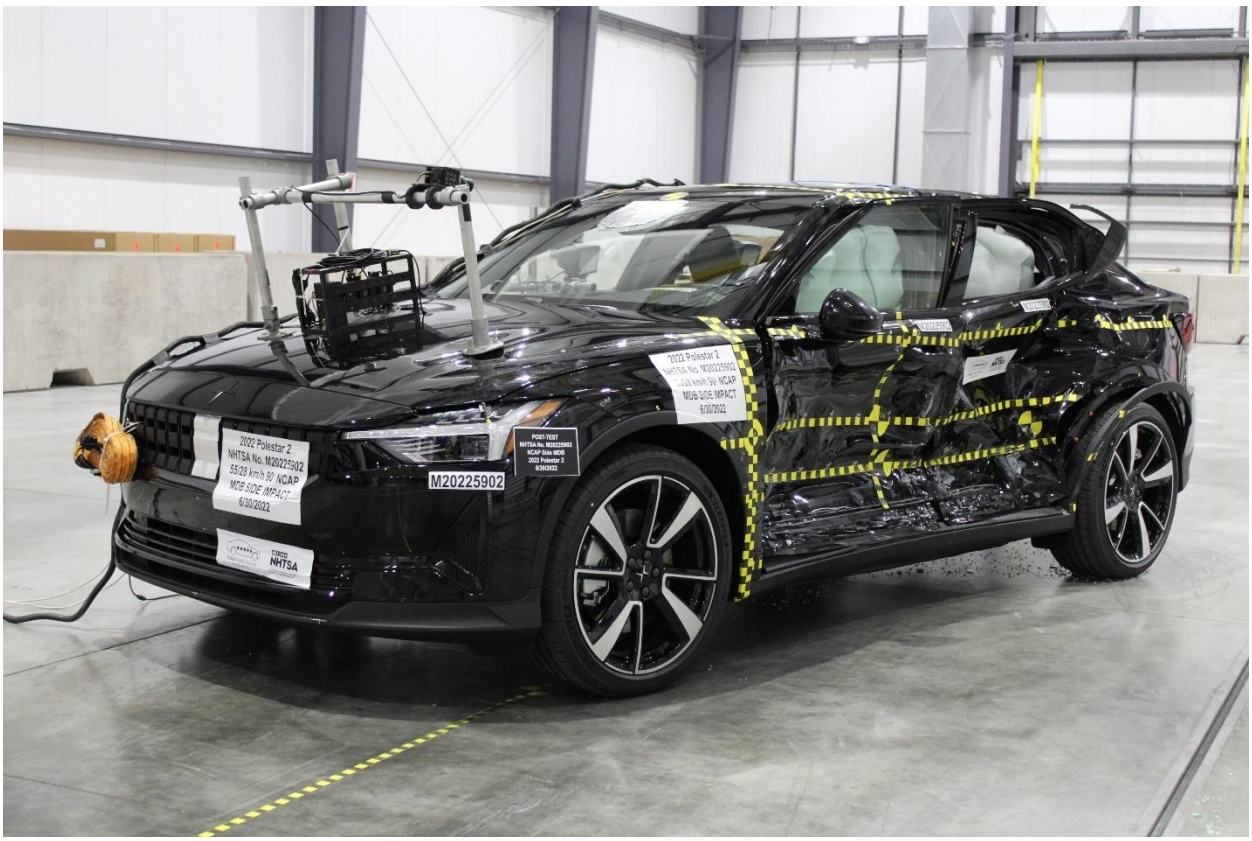


Figure A-6: Post-Test Left Front ¾ View of Test Vehicle

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 ¾ View of Test Vehicle

Figure A-10: Post-Test Left Rear ¾ View of Test Vehicle

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

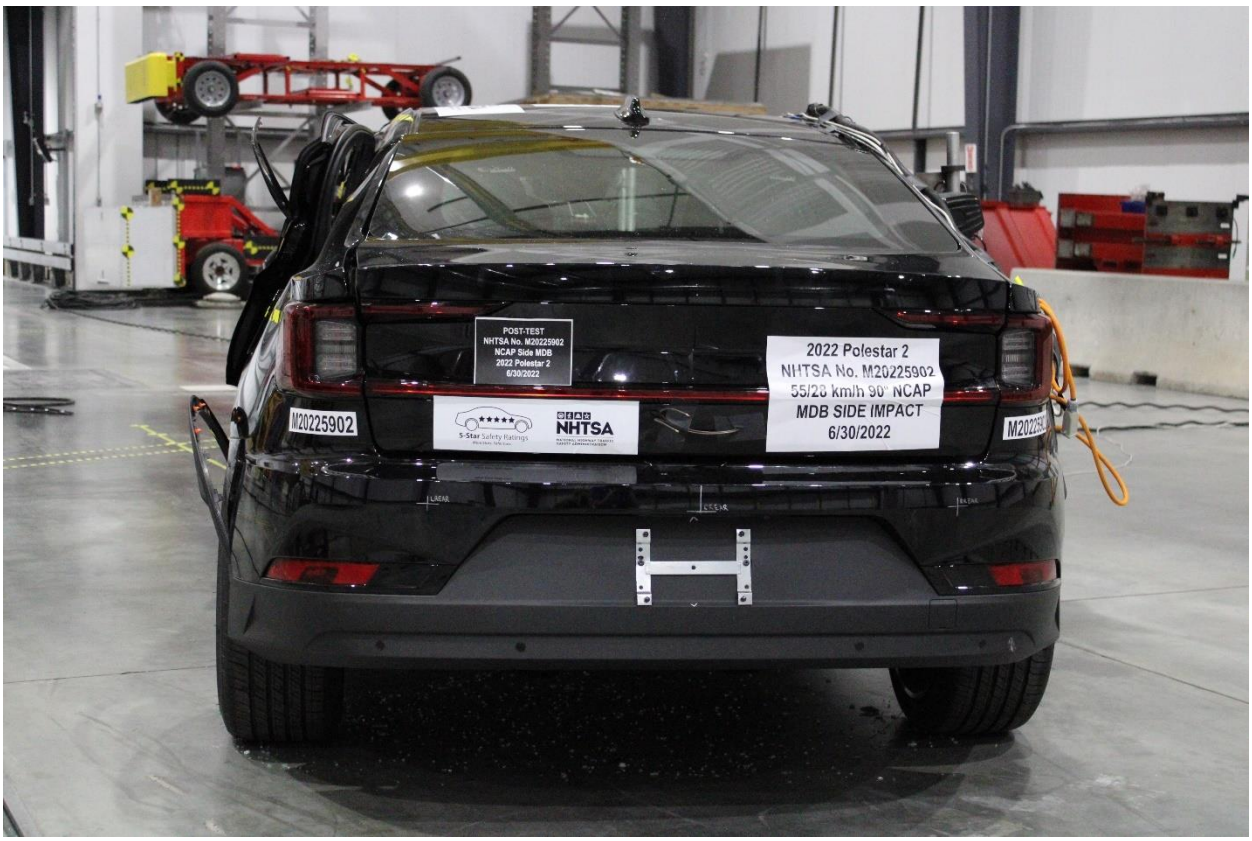


Figure A-12: Post-Test Rear Side View of Test Vehicle

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

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

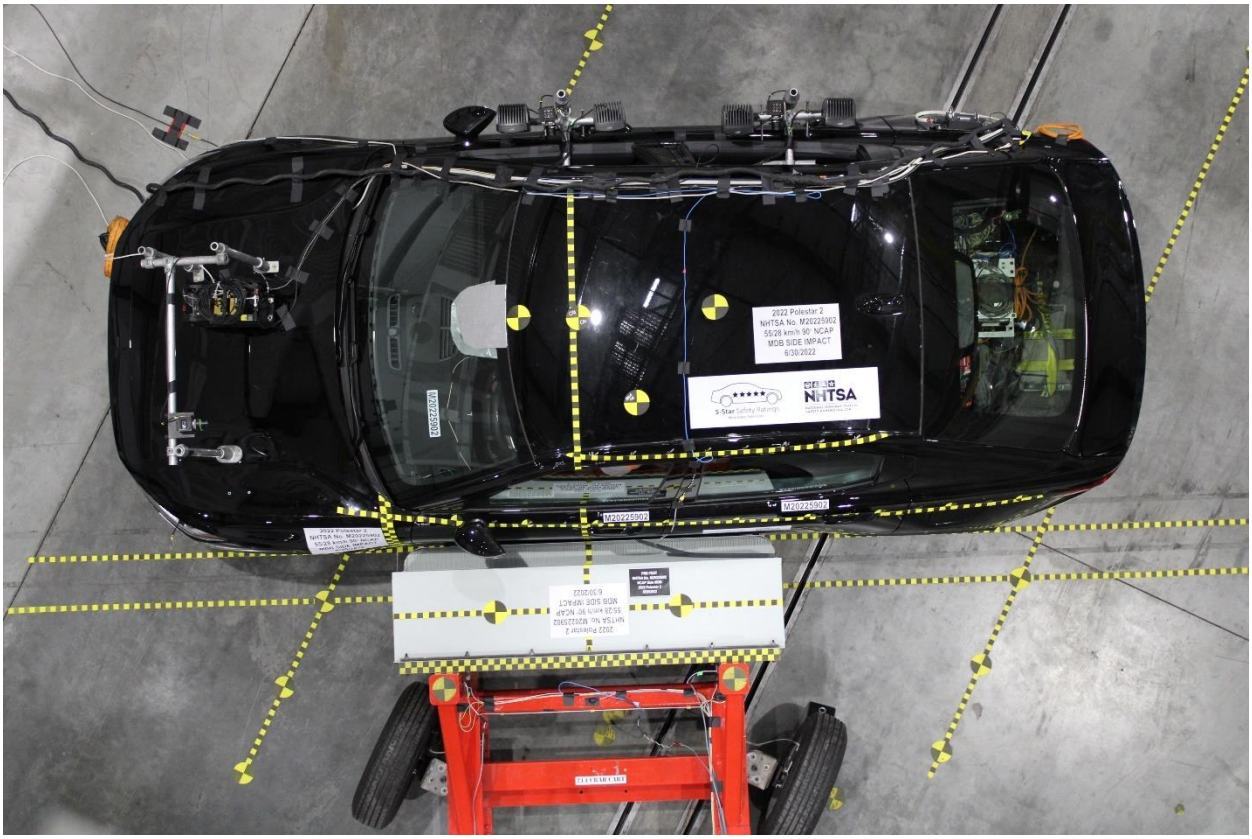


Figure A-15: Pre-Test Overhead View of the Test Area

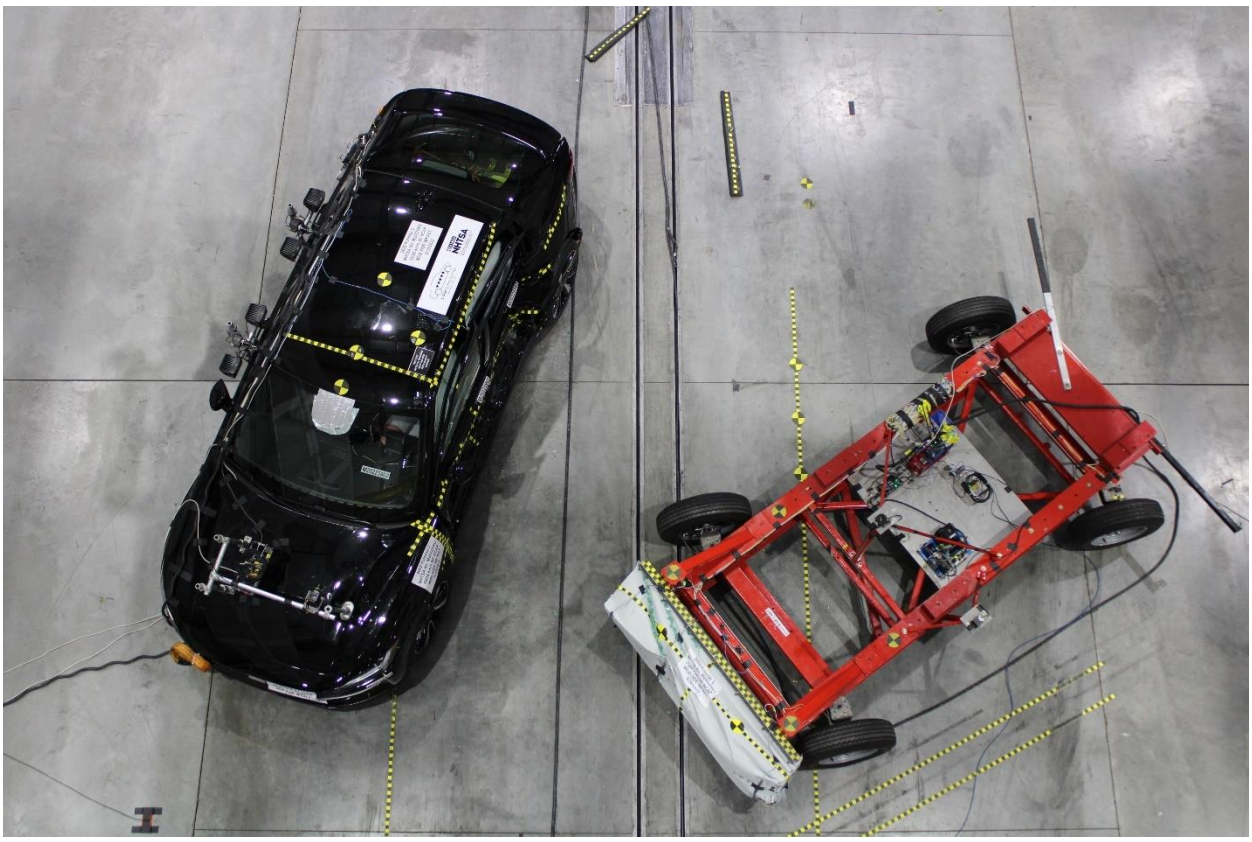


Figure A-16: Post-Test Overhead View of Test Area

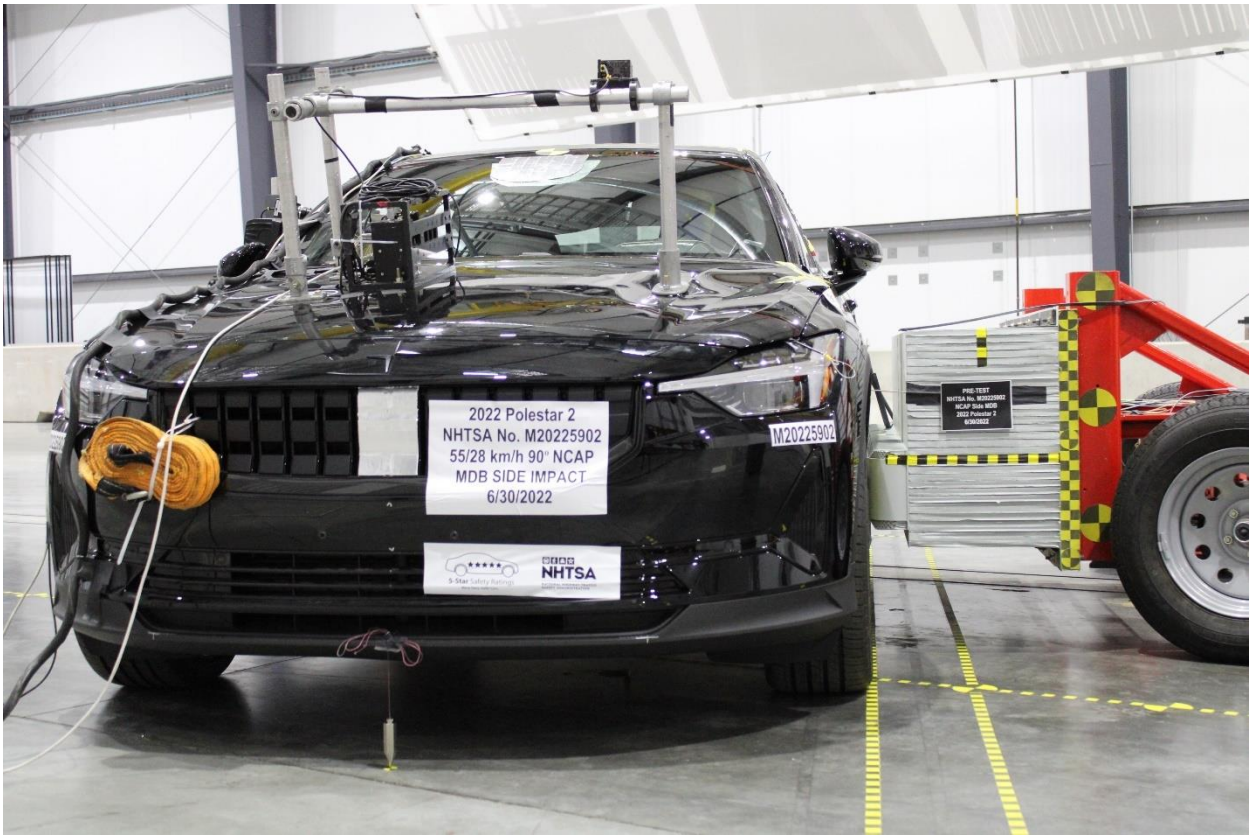


Figure A-17: Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle

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-21: Pre-Test Left Front Door Latch Close-Up

Figure A-22: Post-Test Left Front Door Latch Close-Up

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

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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

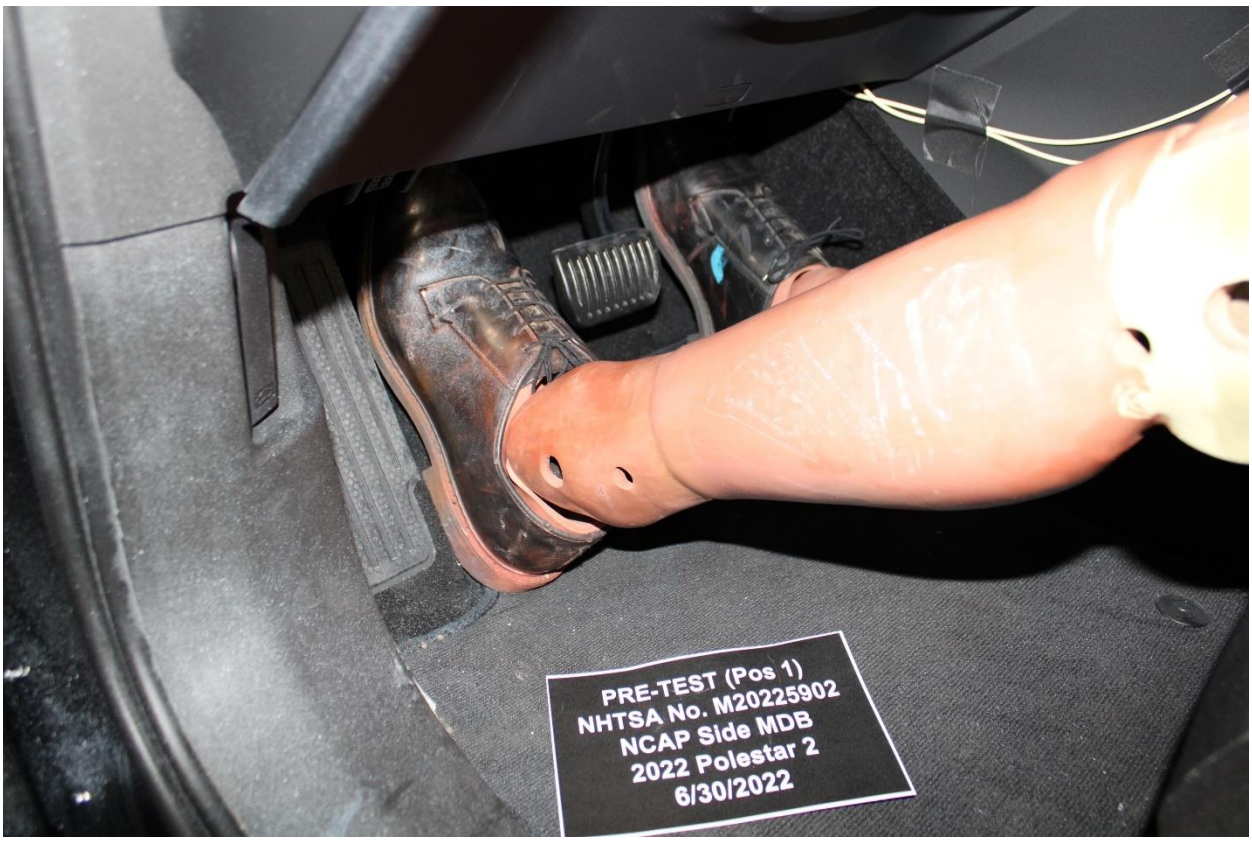

Figure A-34: Pre-Test Placement of Driver Dummy's Feet

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

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

Photo Not Applicable

Figure A-37: View of Disengaged Parking Brake

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

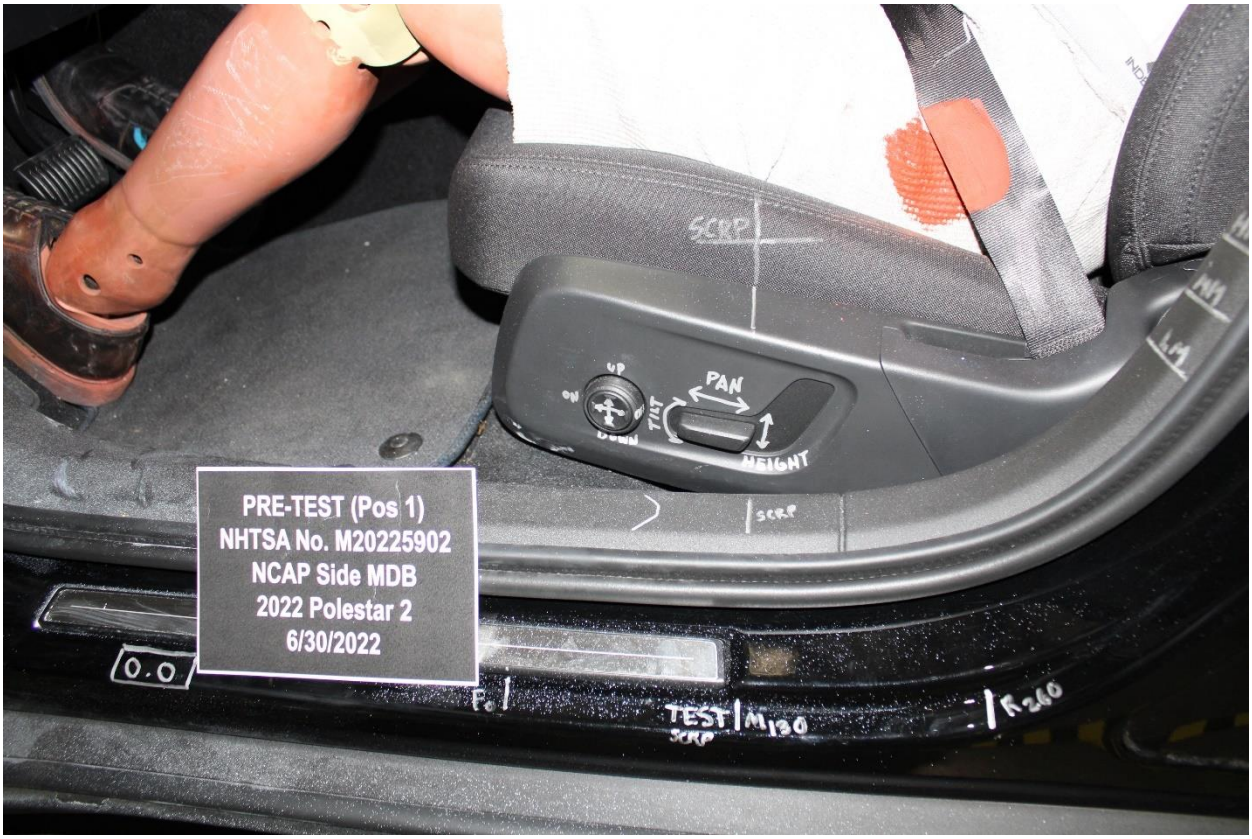

Figure A-39: Pre-test Close-Up Left Side View of Driver Seat Track

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

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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

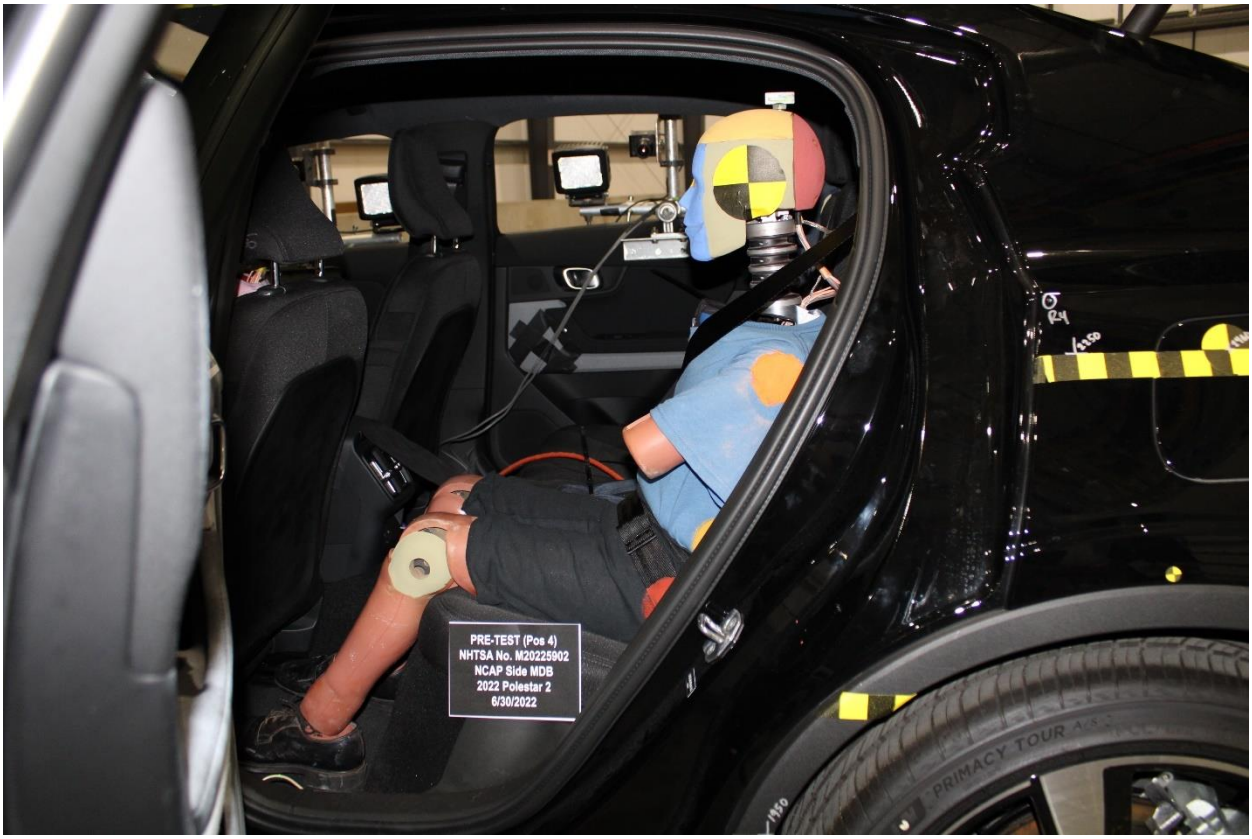


Figure A-55: Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking

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

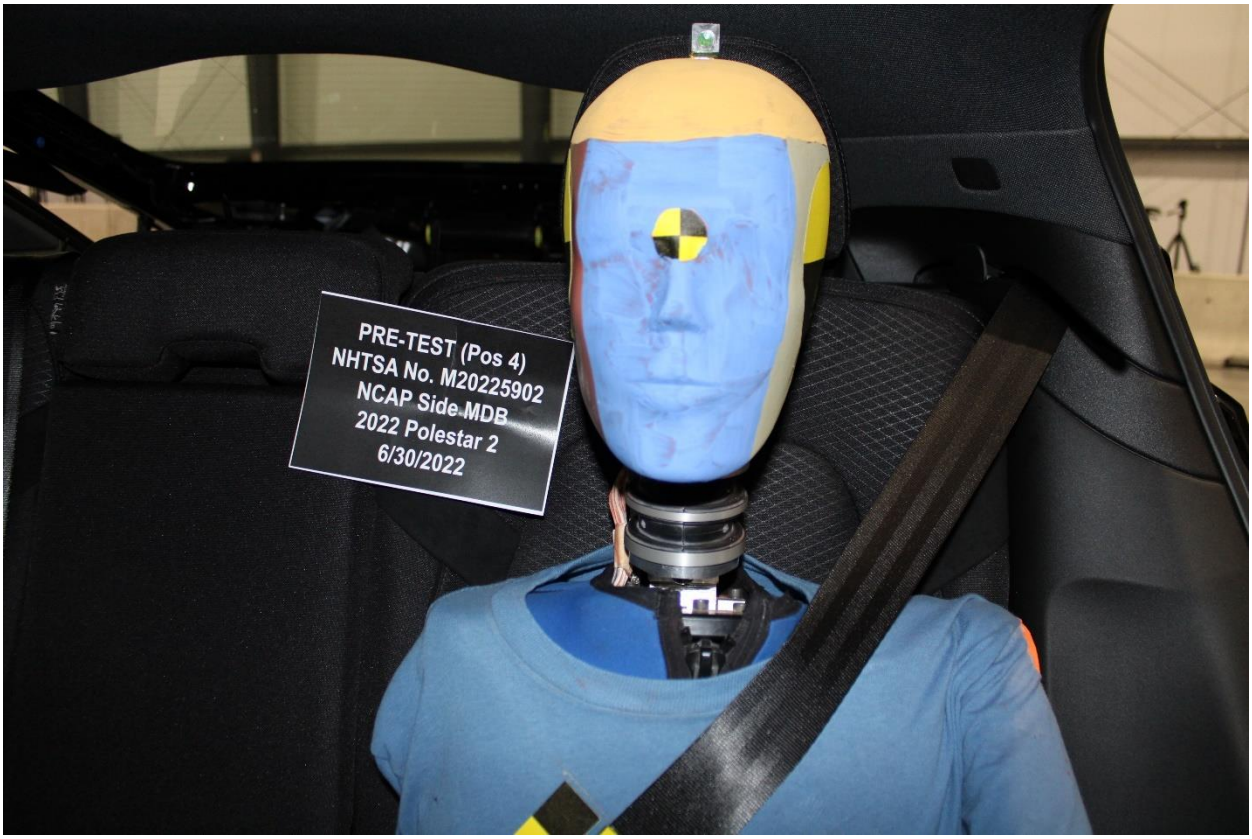


Figure A-59: Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint

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

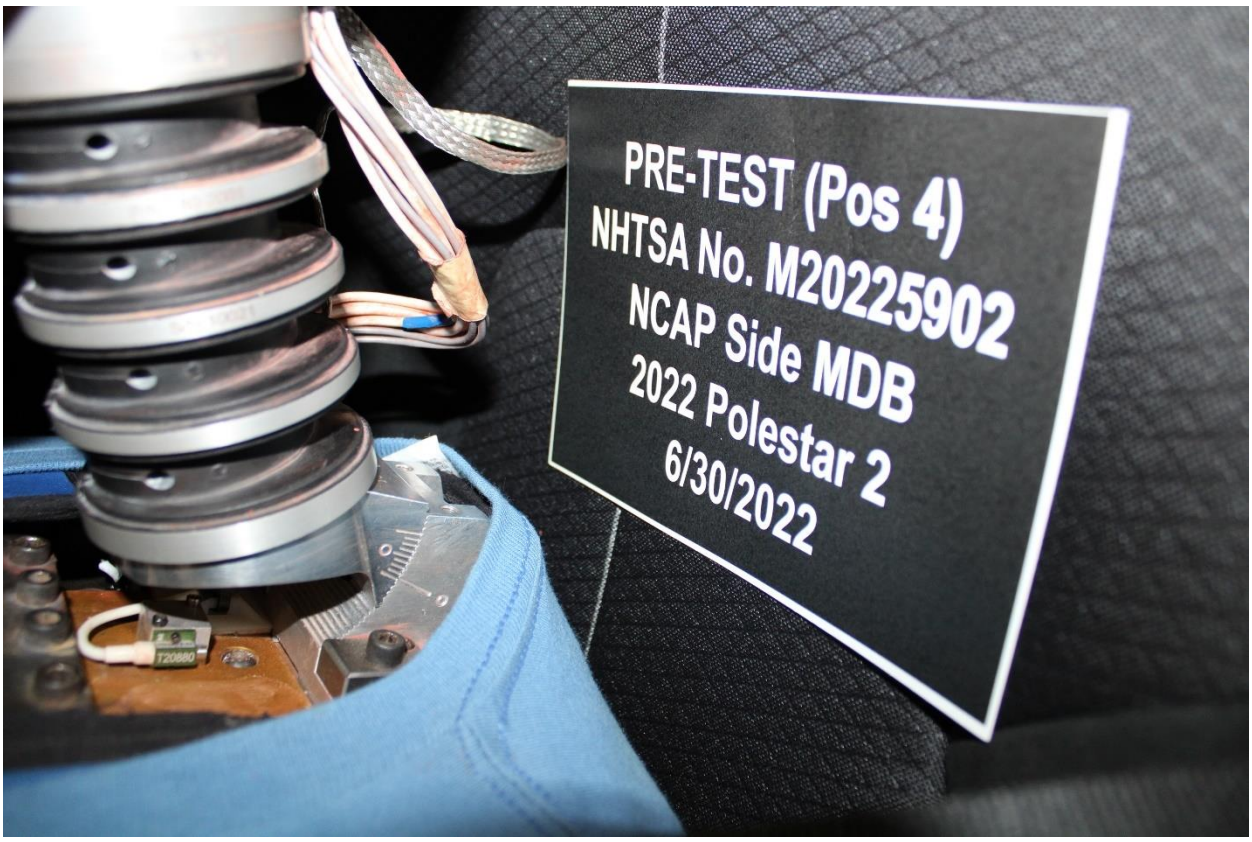


Figure A-62: Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket

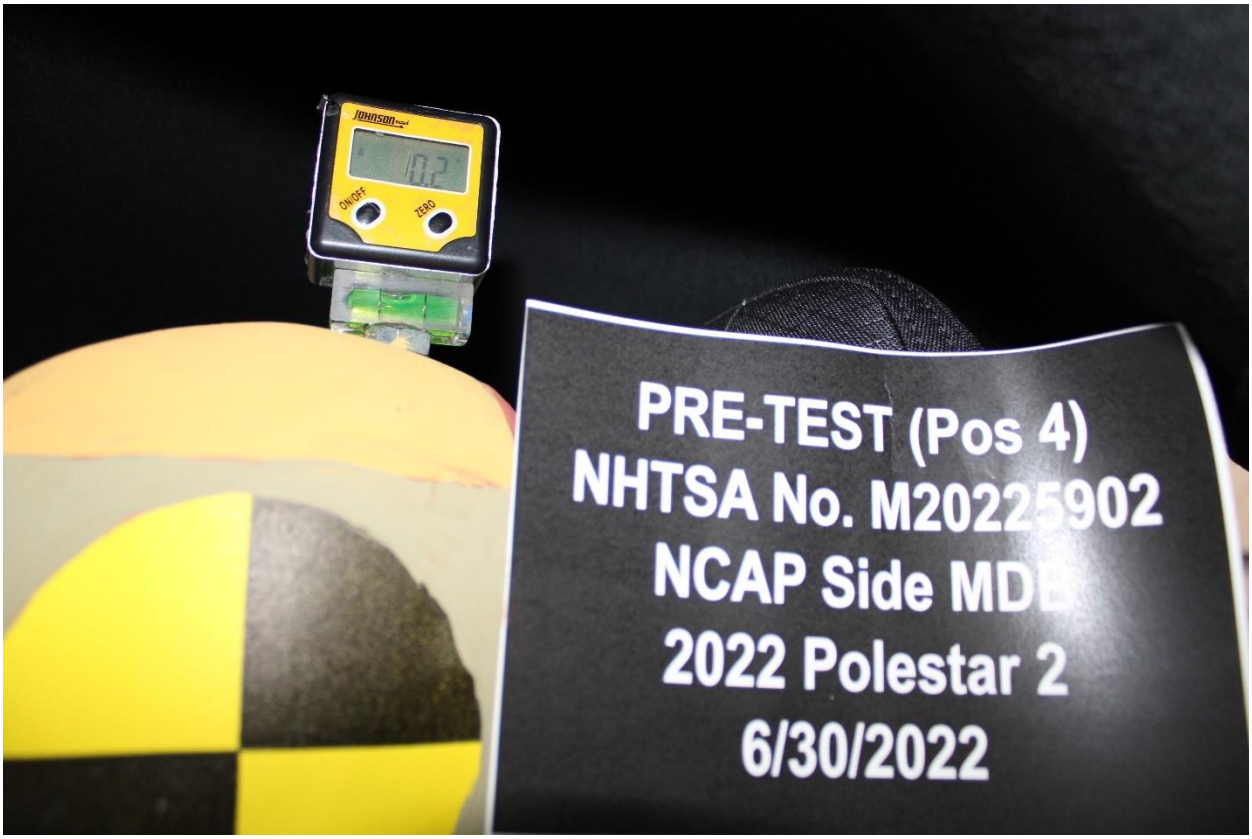


Figure A-63: Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level

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

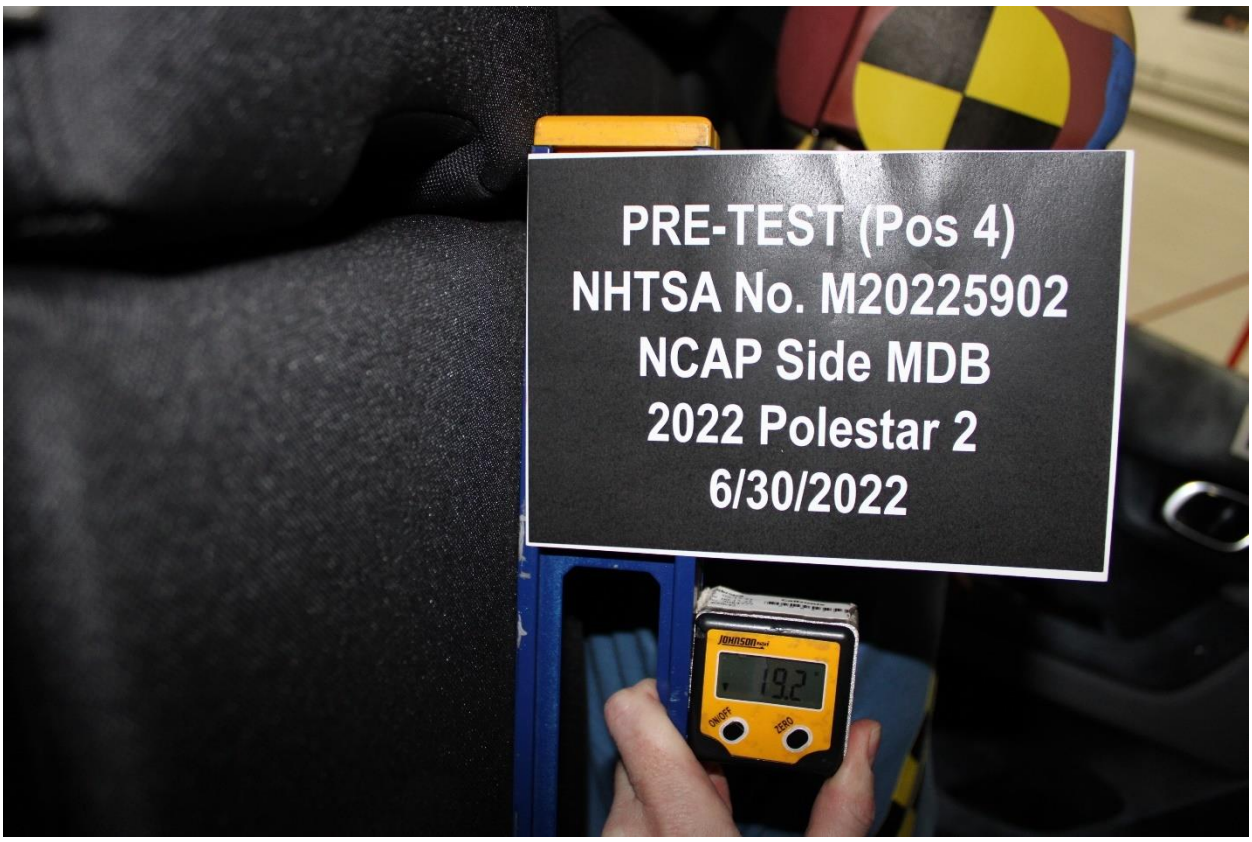


Figure A-68: Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint

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-75: Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View

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

Photo Not Applicable

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

Photo Not Applicable

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 Charging Port

Figure A-83: Post-Test View of Charging Port

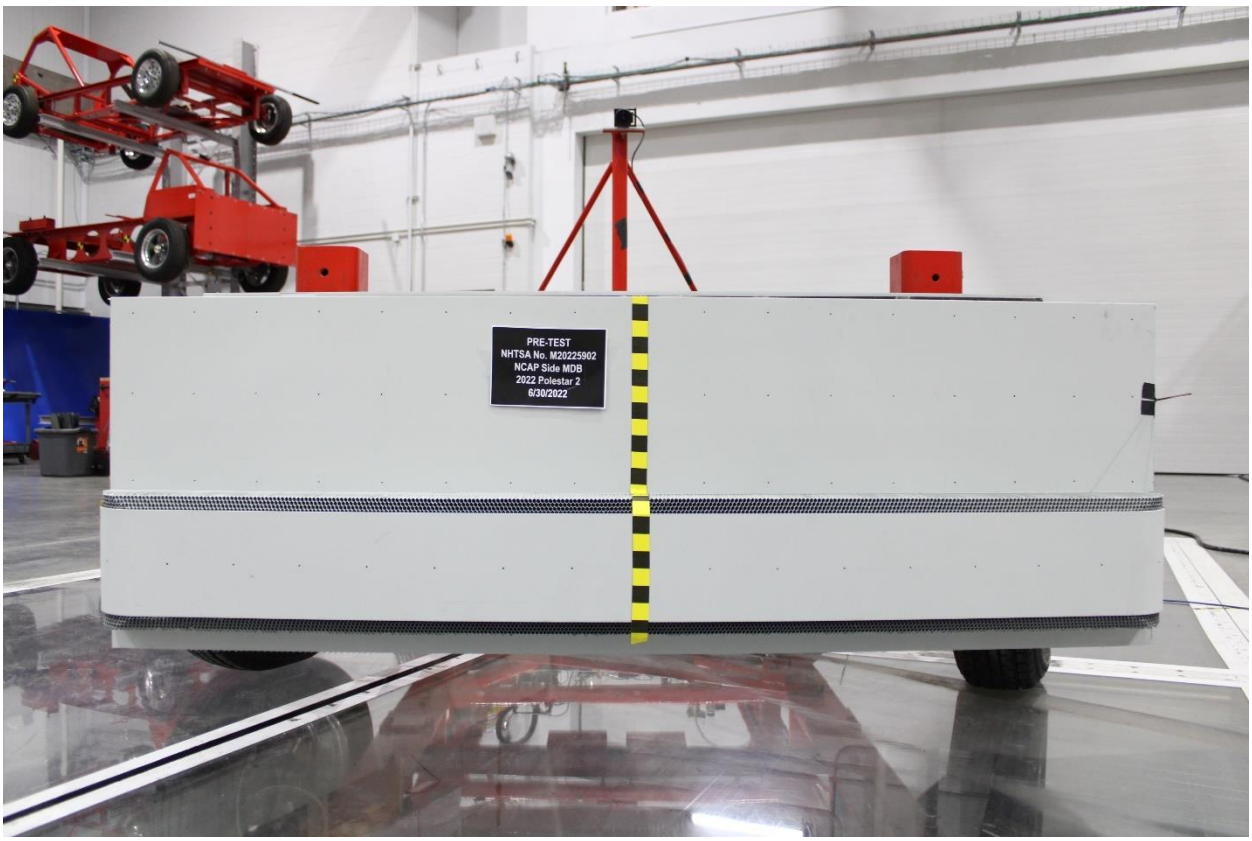


Figure A-84: Pre-Test Front View of MDB Impactor Face

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

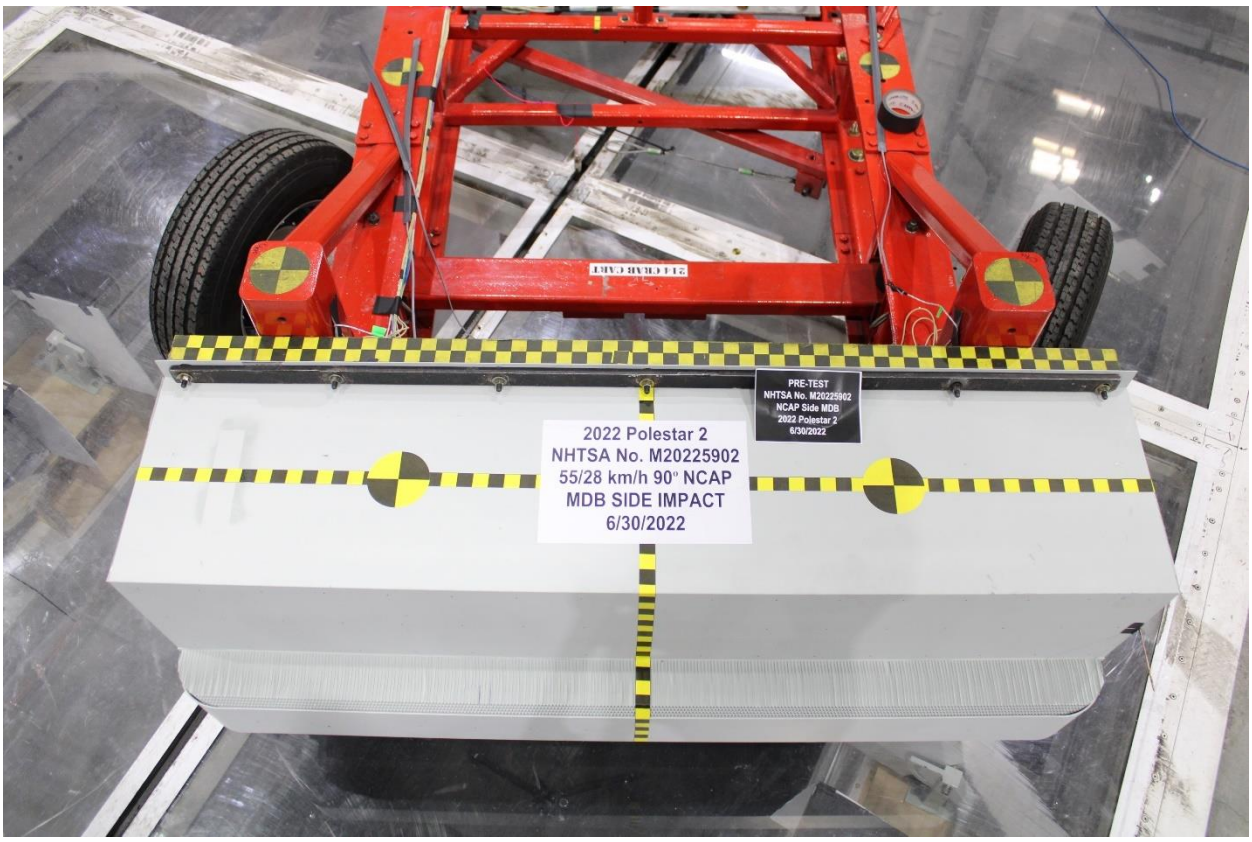


Figure A-86: Pre-Test Top View of MDB Impactor Face

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

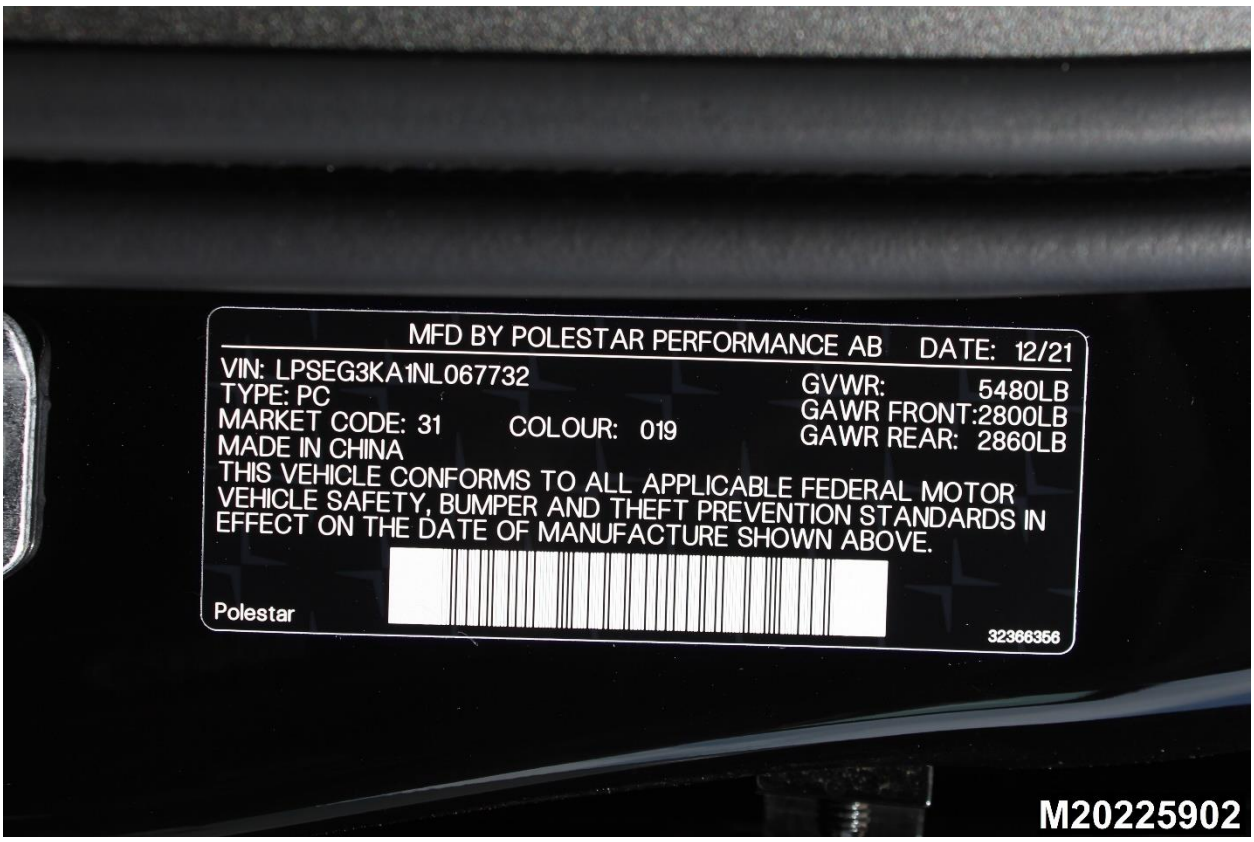


Figure A-92: Close-Up View of Vehicle's Certification Label

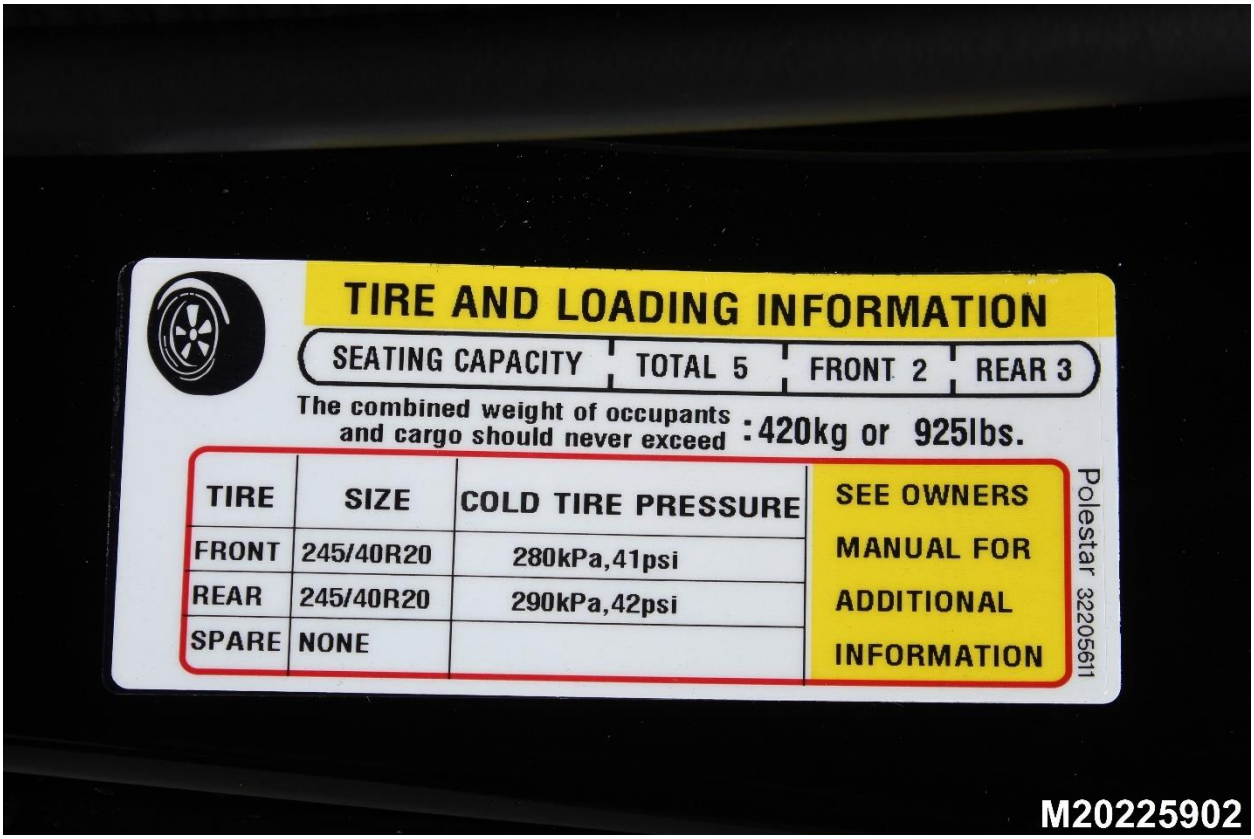


Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label

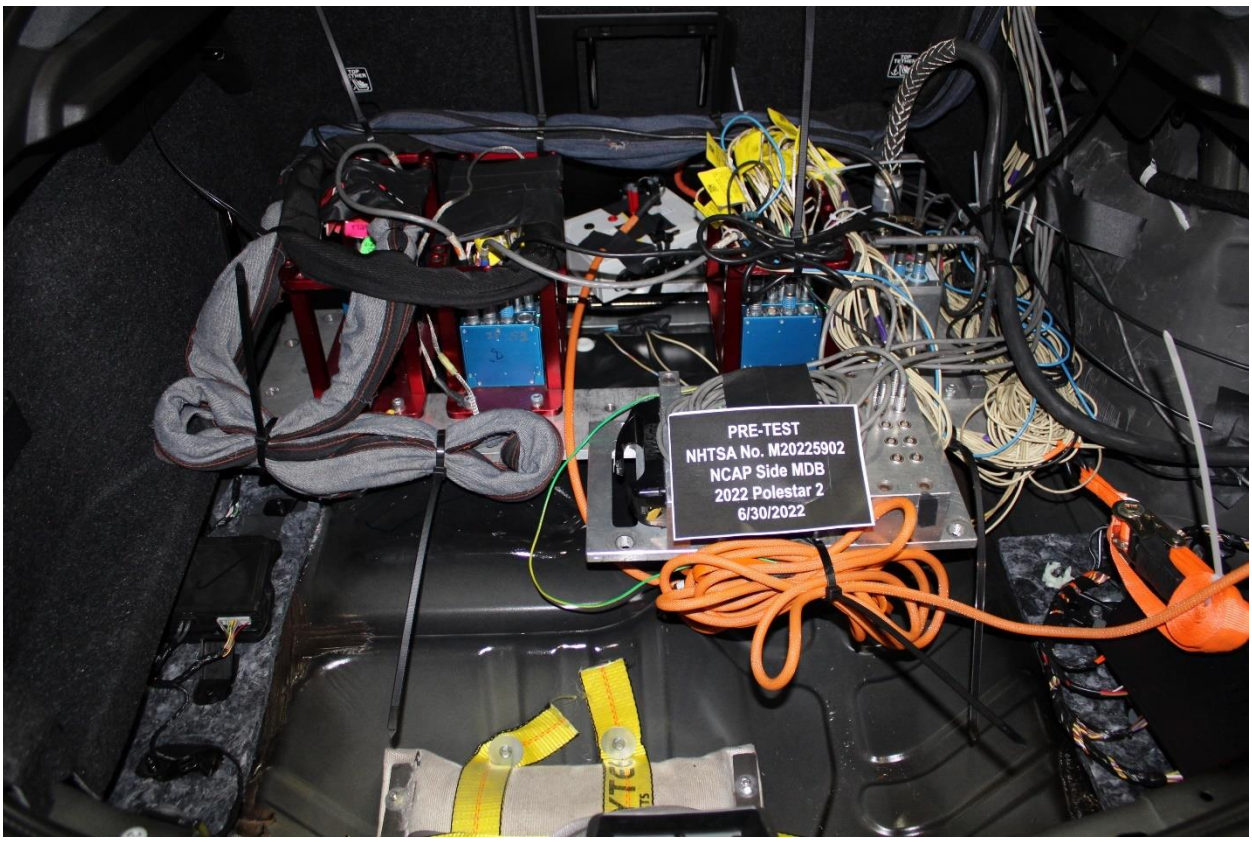


Figure A-94: Pre-Test Ballast View

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

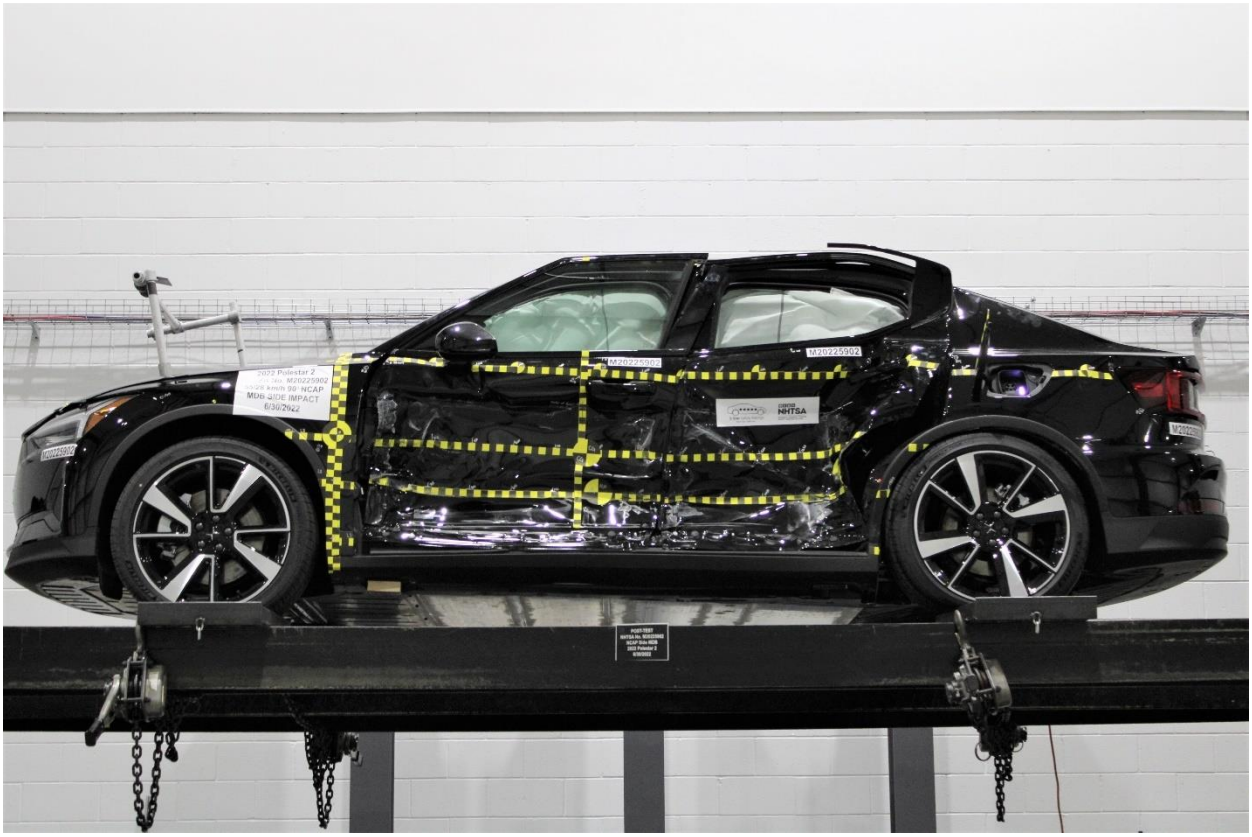


Figure A-96: FMVSS No. 301 Static Rollover 0 Degrees

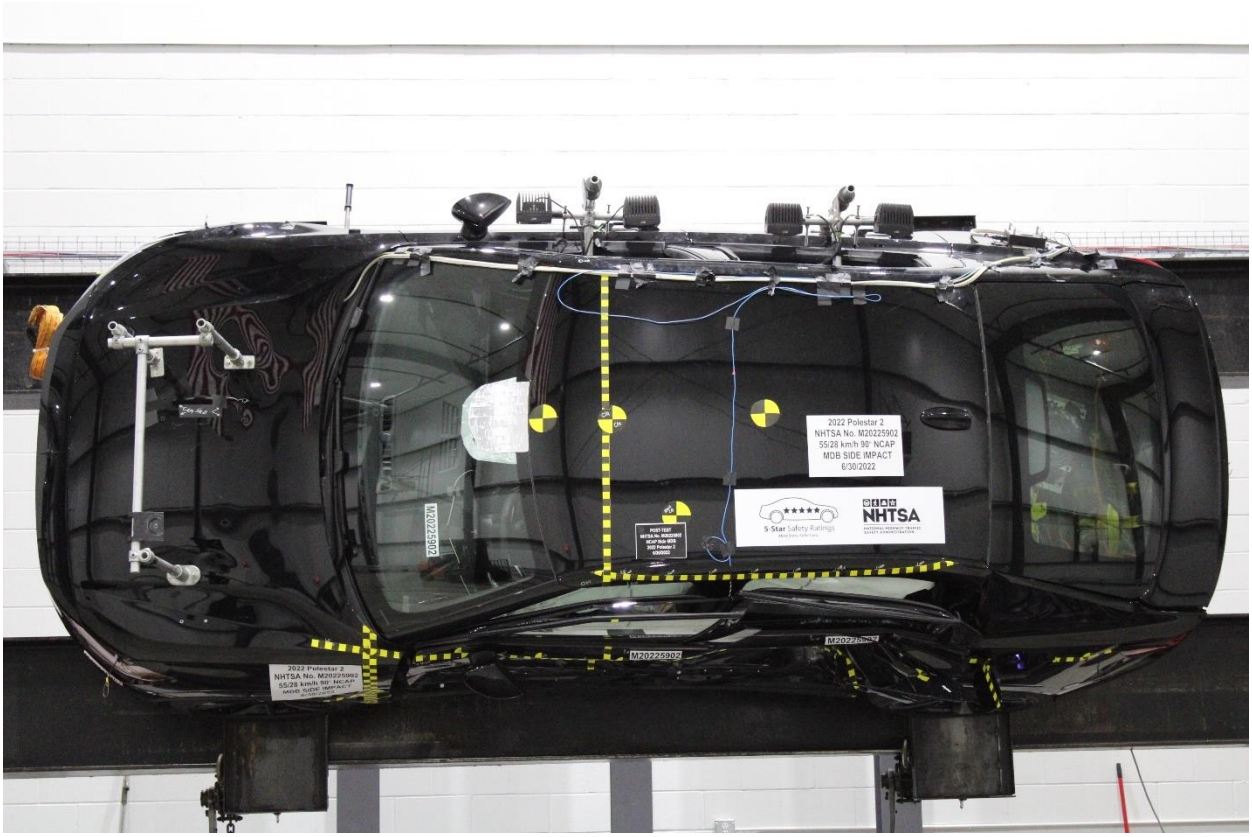


Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees

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

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

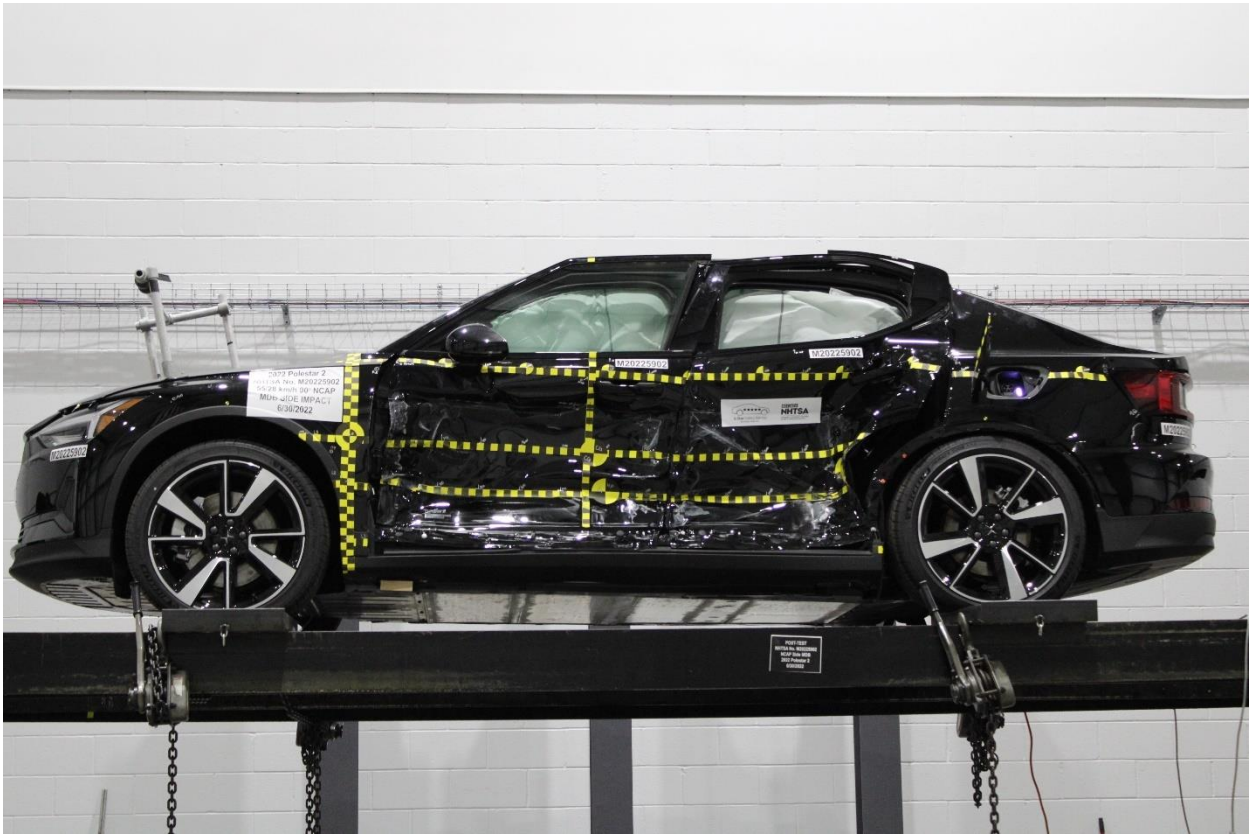


Figure A-100: FMVSS No. 301 Static Rollover 360 Degrees

Figure A-101: Impact Event

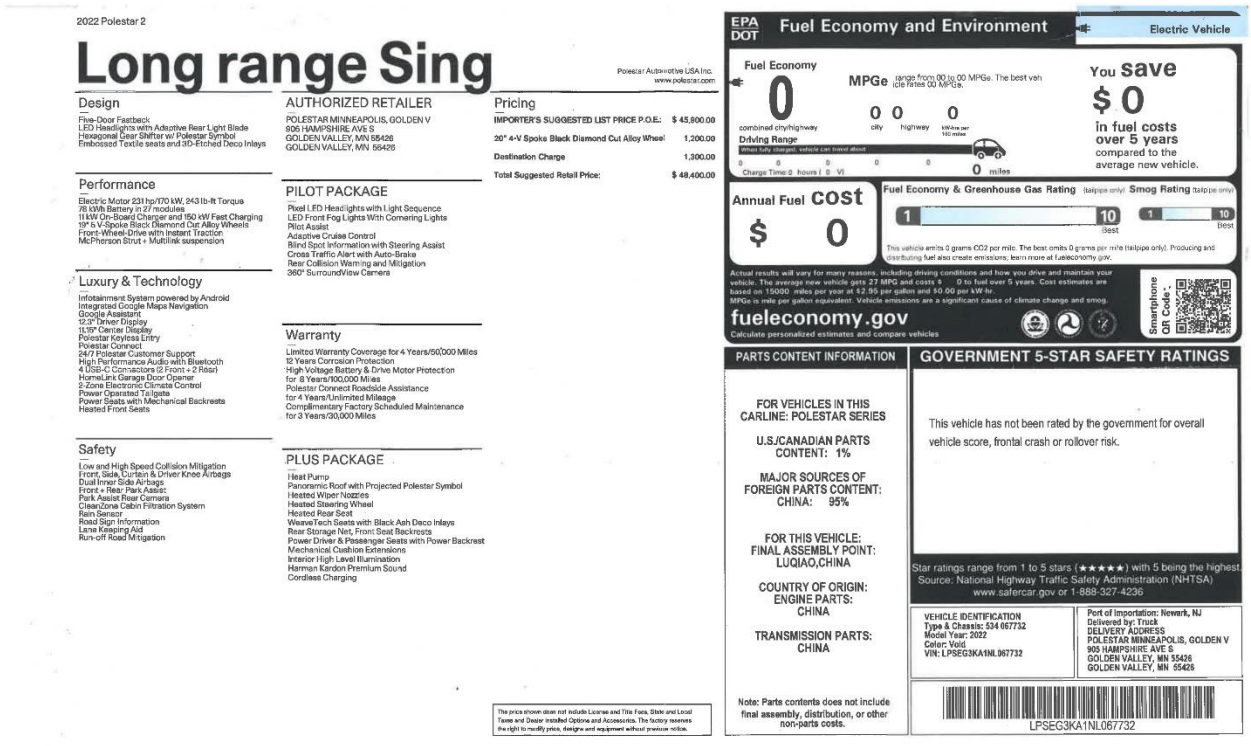


Figure A-102: Monroney Label

Adjusting the head restraint in the rear seat

Adjust the centre seat head restraint according to the height of the passenger.

Adjusting the centre seat head restraint

The centre seat head restraints must be adjusted according to the height of the passenger so that it covers the entire back of the head if possible. Push it up manually as required.

To move the restraint down, the button (see the picture) must be pressed while carefully pushing down the head restraint at the same time.

Related information

- Folding the backrest in the rear seat (p. 167)

WARNING

- Check that the backrests and head restraints in the rear seat are locked properly after being folded up.

IMPORTANT

There must be no objects in the rear seat when the backrest is to be folded. Nor may the seatbelts be connected. Otherwise there is a risk of damaging the upholstery in the rear seat.

NOTE

The front seats may need to be moved forward and/or the backrests may need to be adjusted to allow the rear backrests to be folded all the way forward.

168 Seats and steering wheel

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

Adjusting the head restraint in the rear seat

Adjust the centre seat head restraint according to the height of the passenger.

Adjusting the centre seat head restraint

The centre seat head restraints must be adjusted according to the height of the passenger so that it covers the entire back of the head if possible. Push it up manually as required.

To move the restraint down, the button (see the picture) must be pressed while carefully pushing down the head restraint at the same time.

Related information

- Folding the backrest in the rear seat (p. 167)

WARNING

- Check that the backrests and head restraints in the rear seat are locked properly after being folded up.

IMPORTANT

There must be no objects in the rear seat when the backrest is to be folded. Nor may the seatbelts be connected. Otherwise there is a risk of damaging the upholstery in the rear seat.

NOTE

The front seats may need to be moved forward and/or the backrests may need to be adjusted to allow the rear backrests to be folded all the way forward.

168 Seats and steering wheel

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

Figure 305-1: Auxiliary Power Module Warning Label

Photo Not Applicable

Figure 305-2: Power Inverter Warning Label

Figure 305-3 First Responder Warning Label

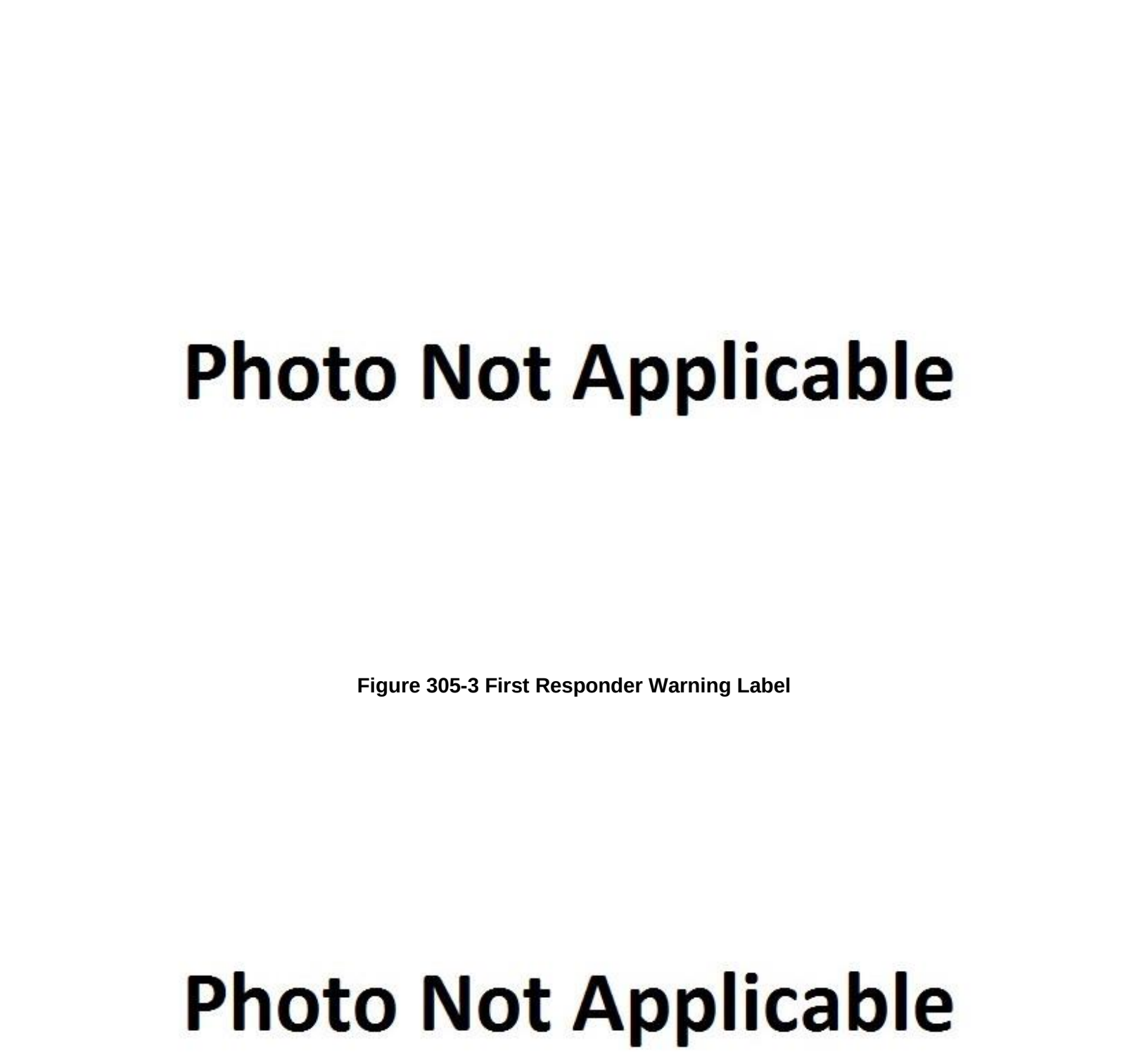


Figure 305-4: First Responder Warning Label Location

Photo Not Applicable

Figure 305-5: Other Vehicle Label Related to Electric Propulsion System

Figure 305-6: Manual High Voltage Service Disconnect in Place

Figure 305-7: Manual High Voltage Service Disconnect Removed (Show Plug)

Figure 305-8: Manual High Voltage Service Disconnect Removed Location

Figure 305-9: Pre-Impact View of Propulsion Battery

Figure 305-10: Post-Impact Front View of Propulsion Battery

Figure 305-11: Post-Impact Rear View of Propulsion Battery (if any part of it is visible)

Figure 305-12: Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

Figure 305-13: Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

Photo Not Applicable

Figure 305-14: Pre-Impact View of Propulsion Battery Module(s)

Photo Not Applicable

Figure 305-15: Post-Impact View of Propulsion Battery Module(s)

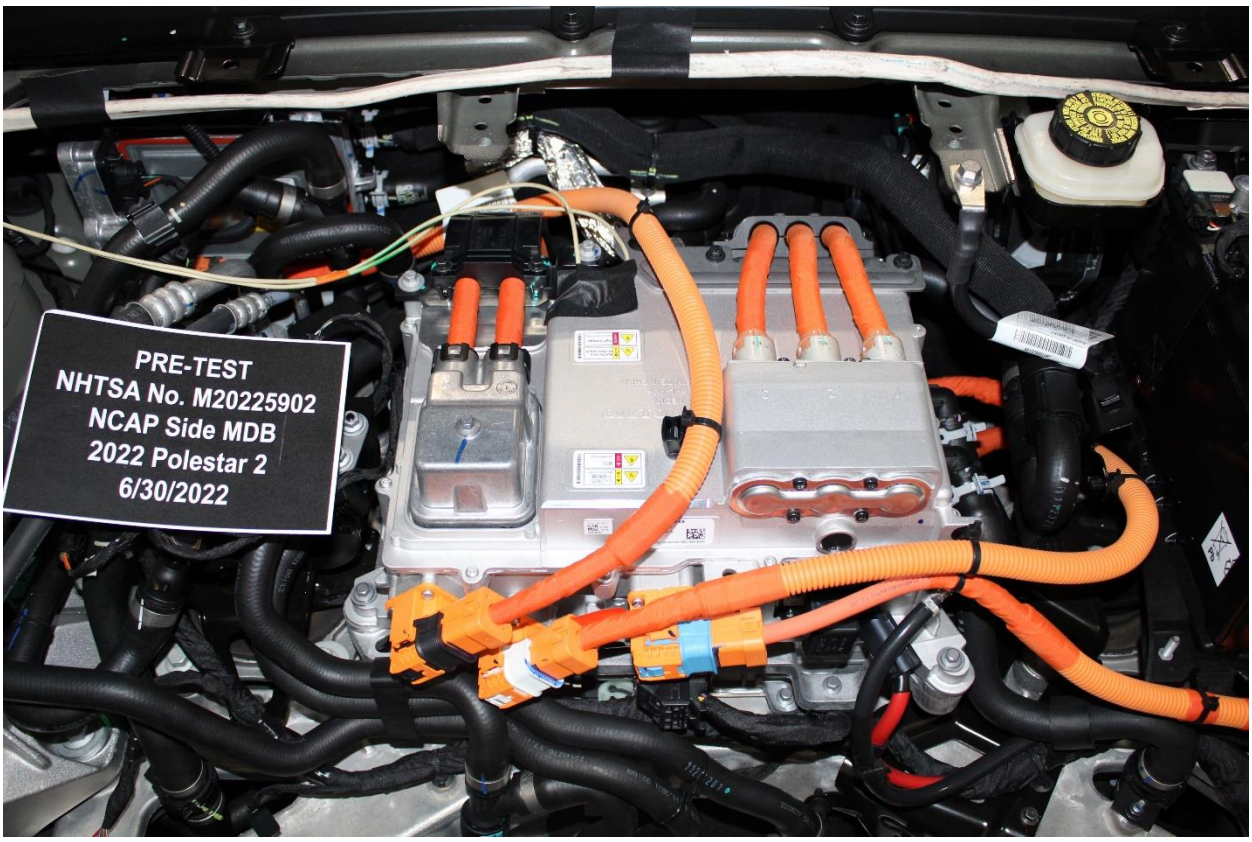


Figure 305-16: Pre-Impact View of Electric Propulsion Drive

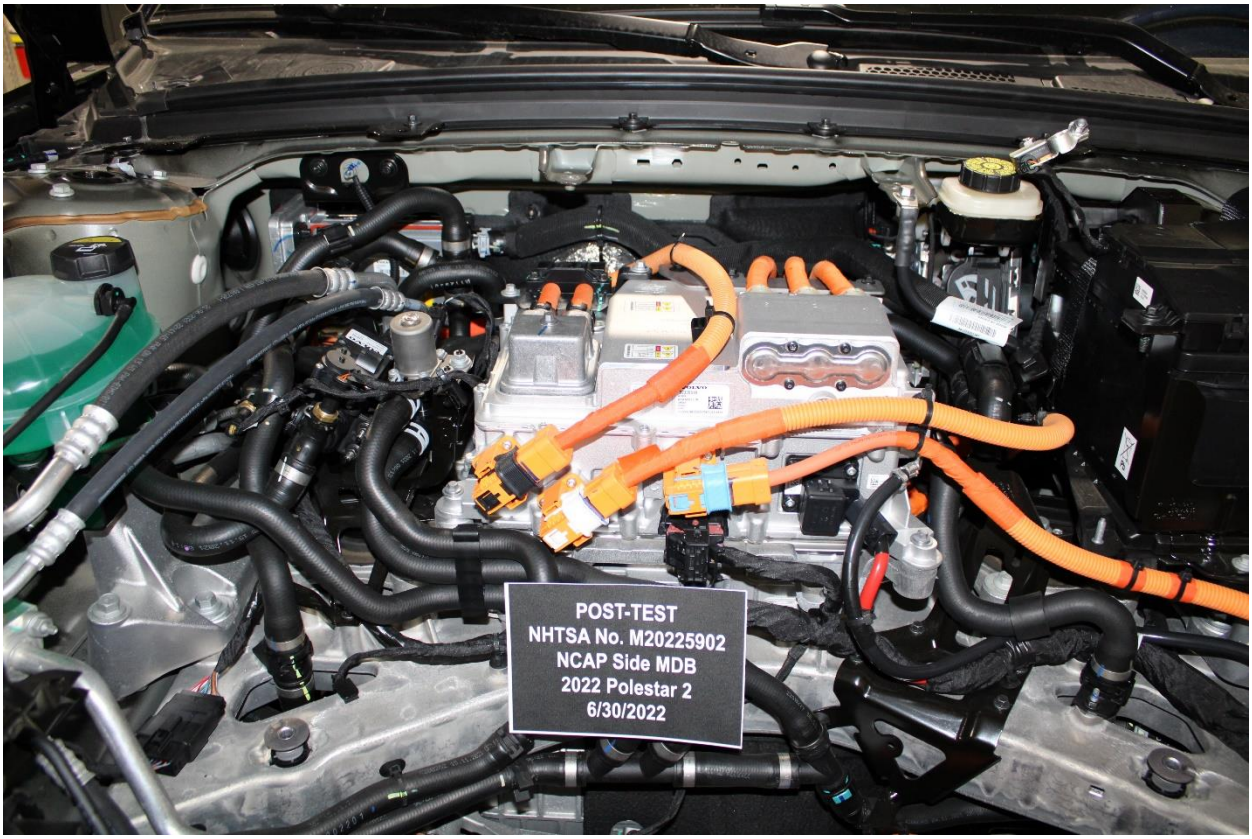


Figure 305-17: Post-Impact View of Electric Propulsion Drive

Figure 305-18: Pre-Impact View of High Voltage Interconnects

Photo Not Applicable

Figure 305-19: Pre-Impact View of Propulsion Battery Venting System

Figure 305-20: Pre-Impact View of Other Visible Electric Propulsion Components

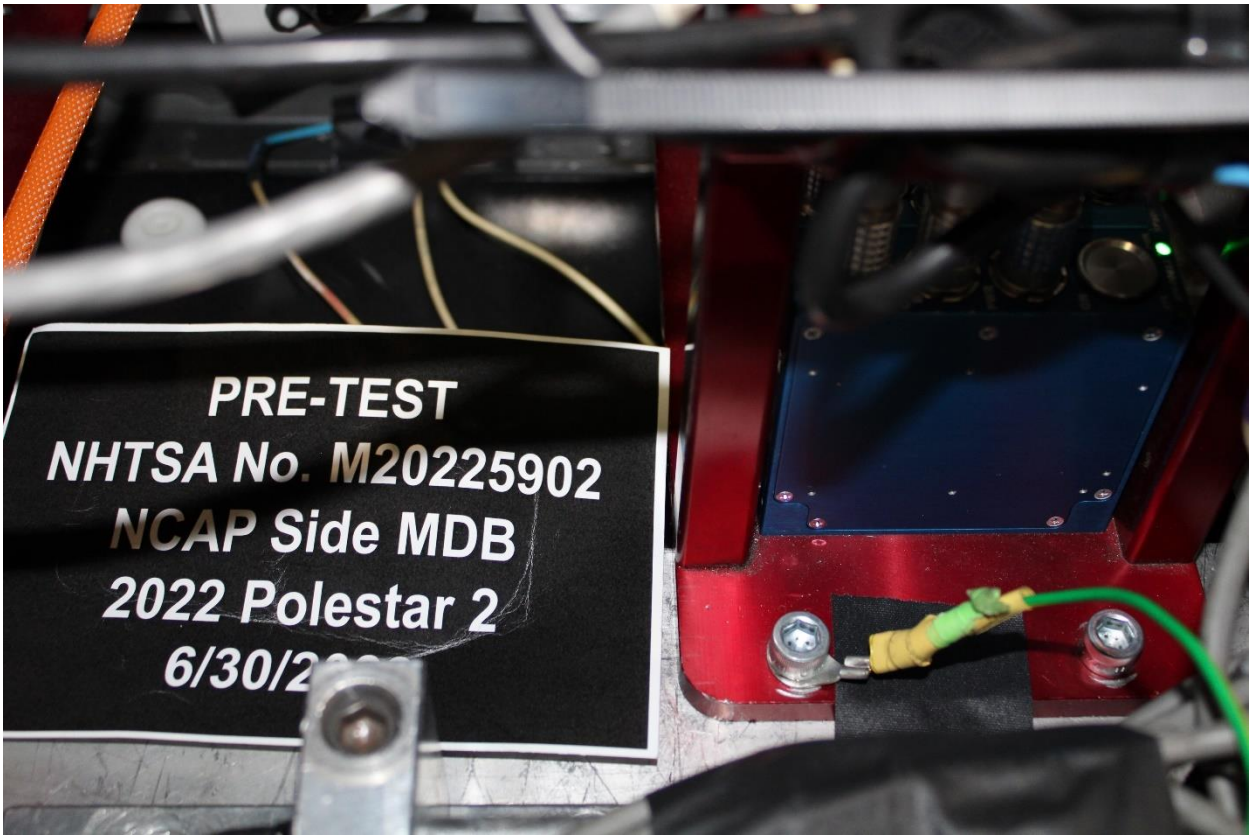


Figure 305-21: Pre-Impact View of Ground Lead Attached

Figure 305-22: Pre-Impact View of High Voltage Leads Attached

Figure 305-23: Pre-Impact Close Up View of High Voltage Leads Attached

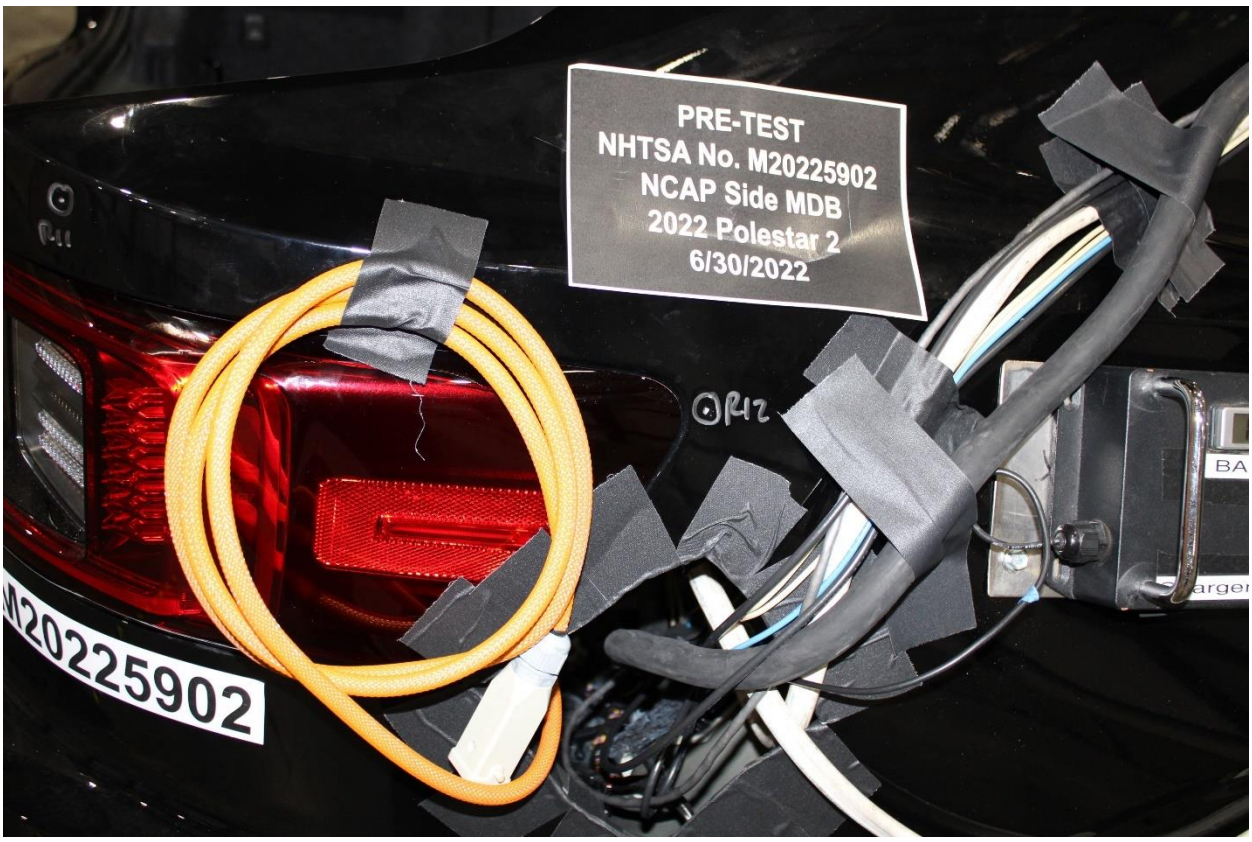


Figure 305-24: Pre-Impact View of Installed Test Interface Port

Figure 305-25: Post-Impact View of Installed Test Interface Port

Photo Not Applicable

Figure 305-26: Pre-Impact View of Other Test Devices

Photo Not Applicable

Figure 305-27: Post-Impact View of Other Test Devices

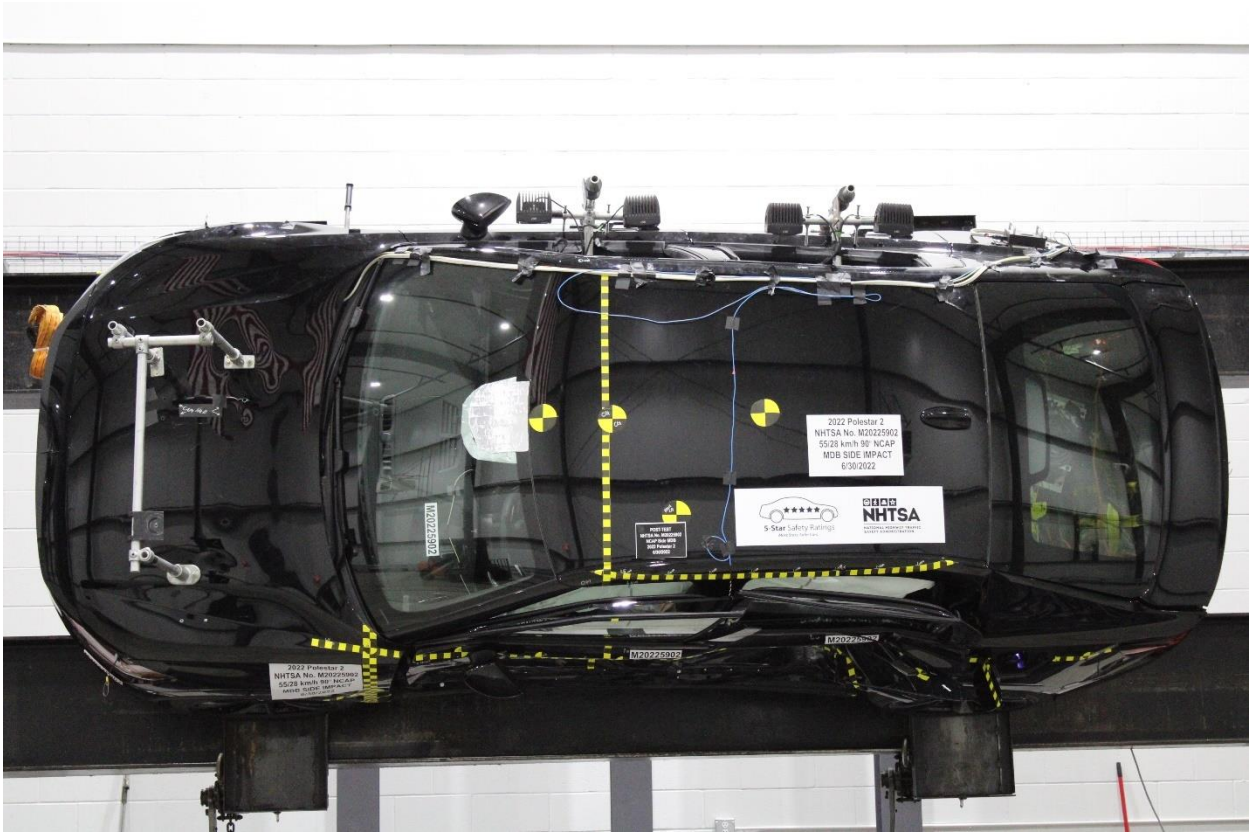


Figure 305-28: FMVSS No. 305 Static Rollover 90 Degrees

Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees

Figure 305-30: FMVSS No. 305 Static Rollover 270 Degrees

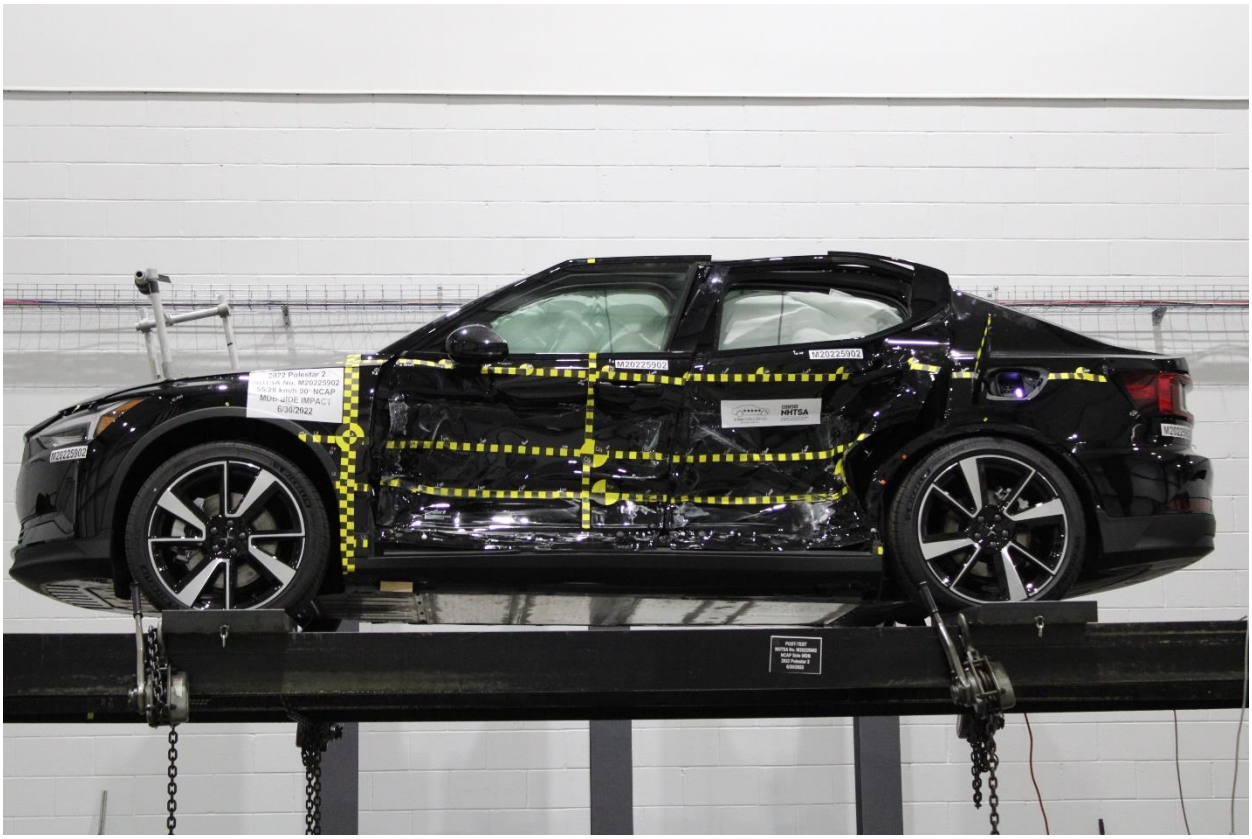


Figure 305-31: FMVSS No. 305 Static Rollover 360 Degrees

Figure 305-32: Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

Figure 305-33: Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

Photo Not Applicable

Figure 305-34: Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

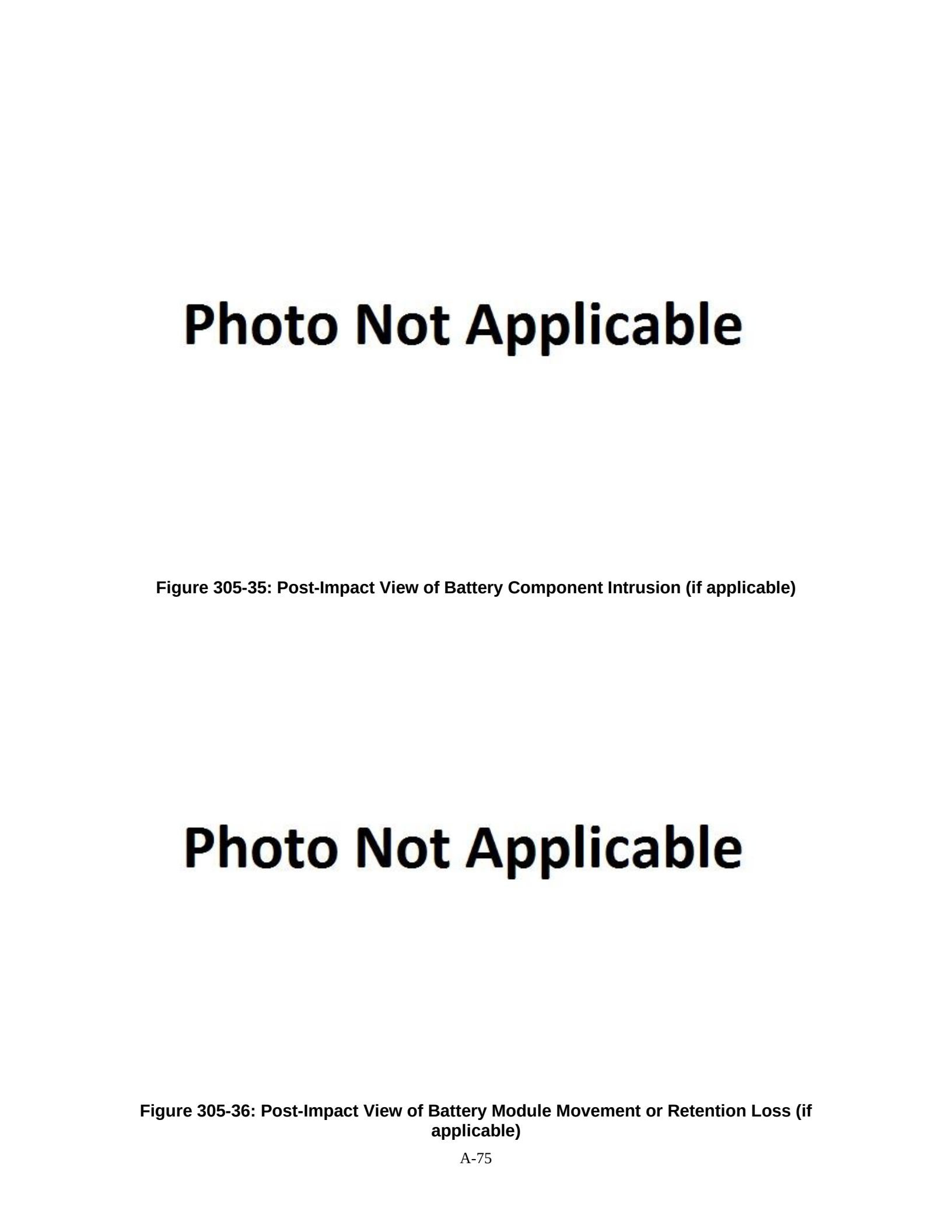


Figure 305-35: Post-Impact View of Battery Component Intrusion (if applicable)

Figure 305-36: Post-Impact View of Battery Module Movement or Retention Loss (if applicable)

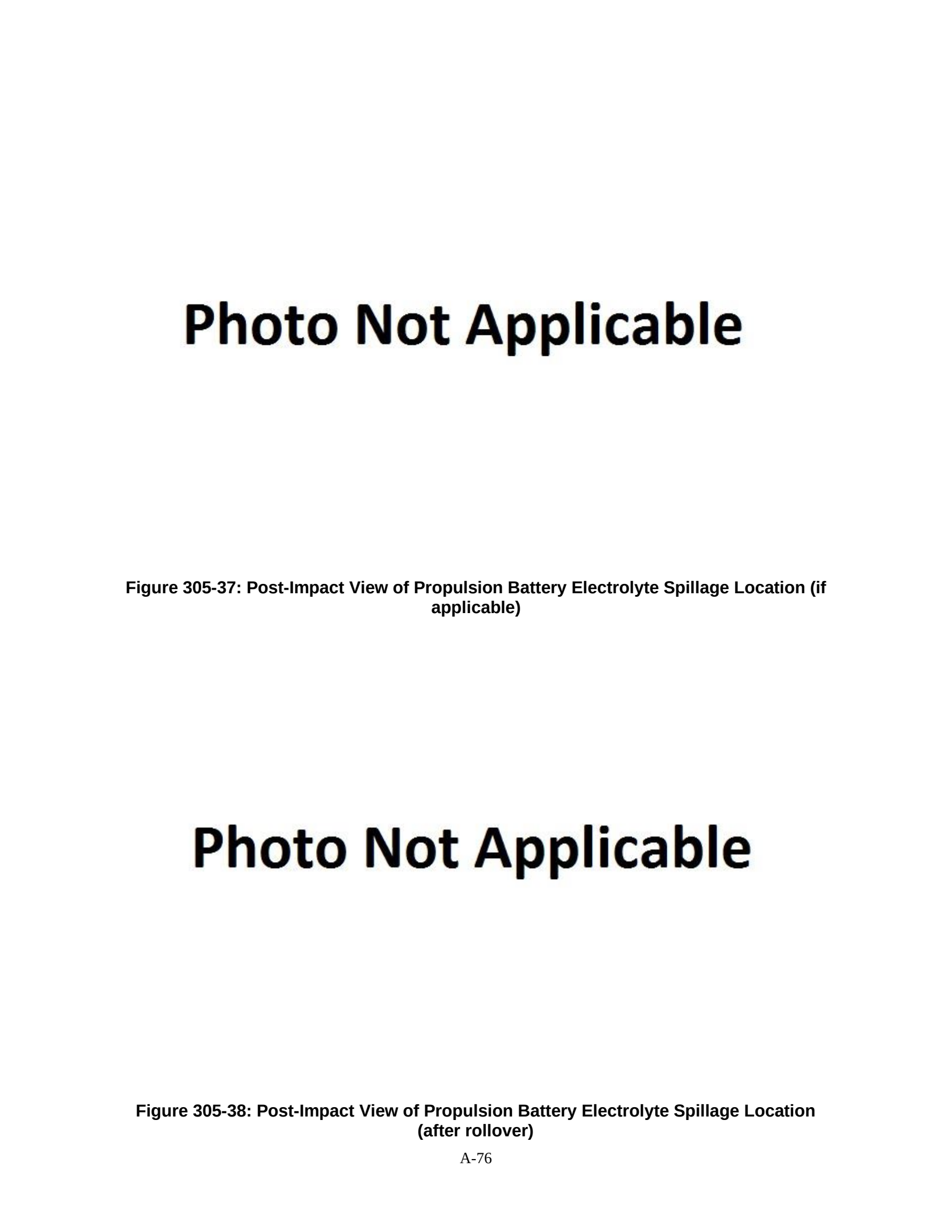


Figure 305-37: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (if applicable)

Figure 305-38: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (after rollover)

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots
Driver Dummy Instrumentation Plots

The following additional dummy and vehicle response data can be obtained from the Research and Development section of the NHTSA website. The website can be found at www.NHTSA.gov

Additional Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

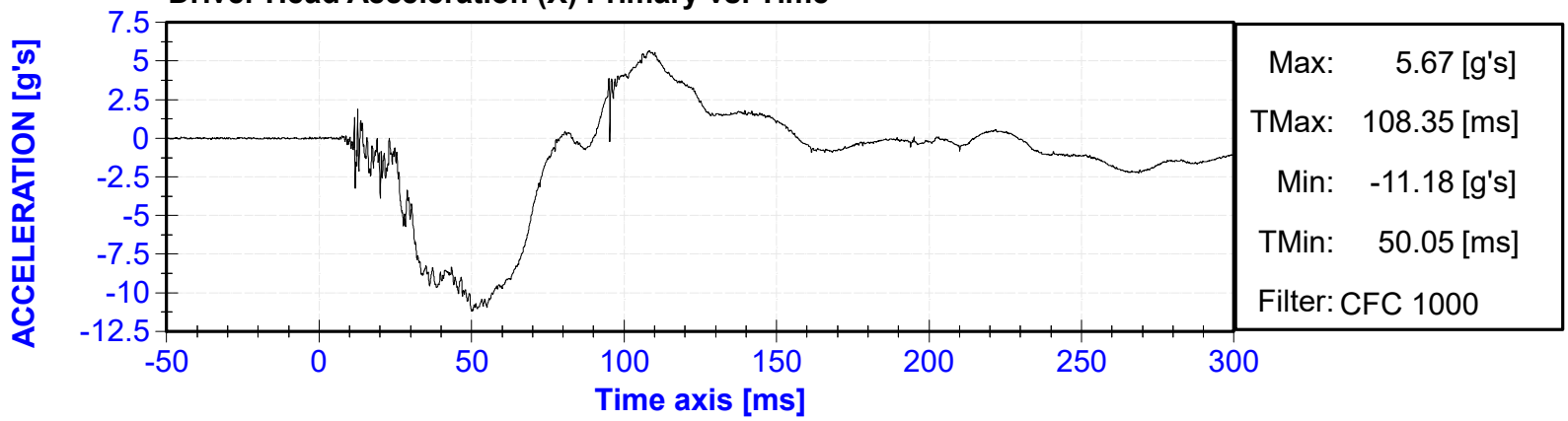
Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Structure Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

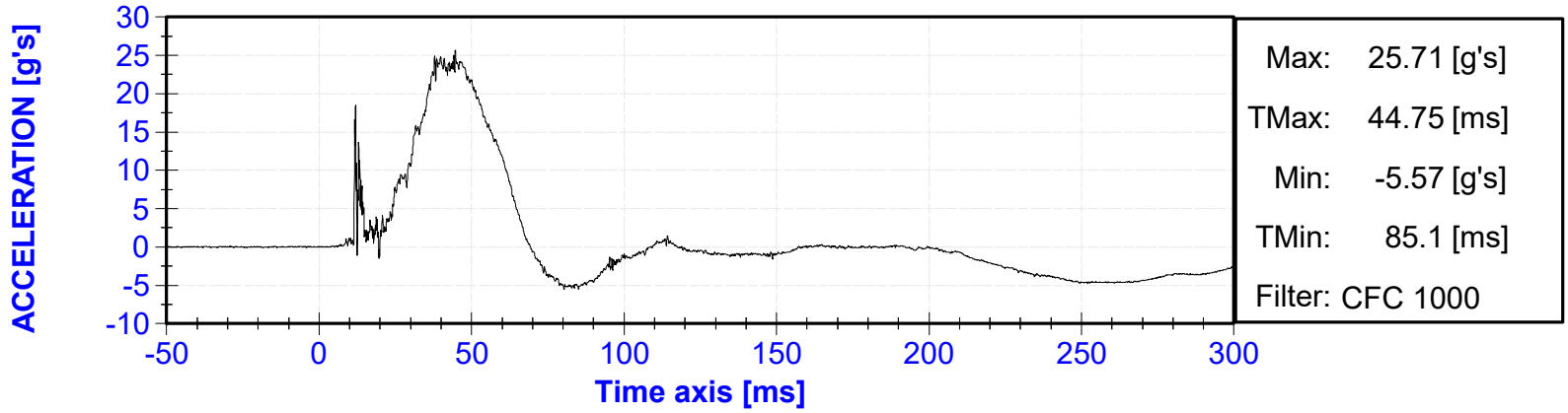
MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch

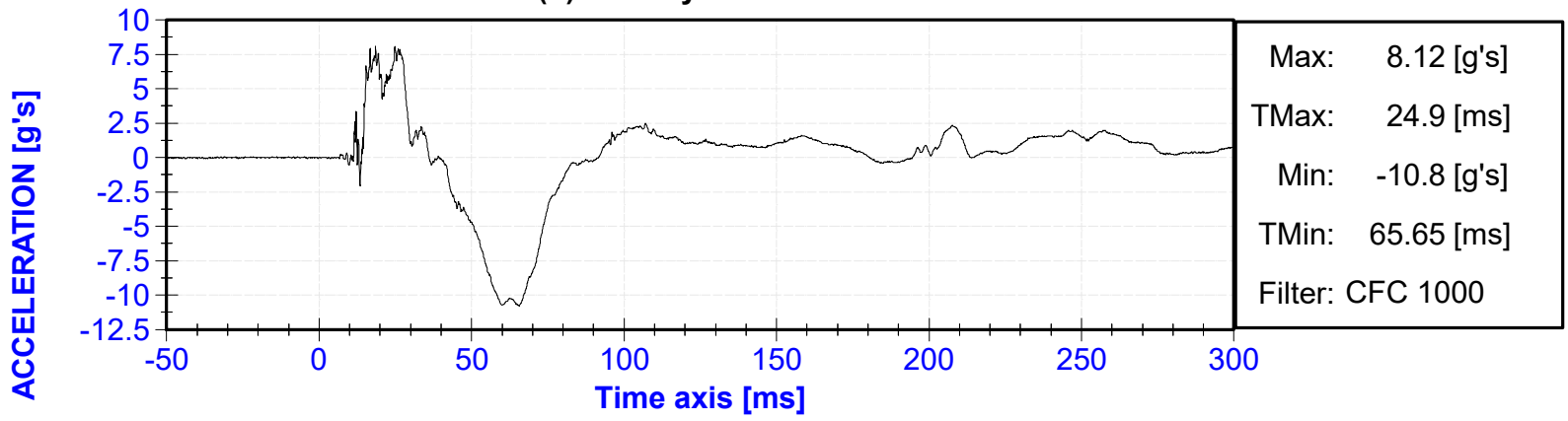
Driver Head Acceleration (X) Primary vs. Time



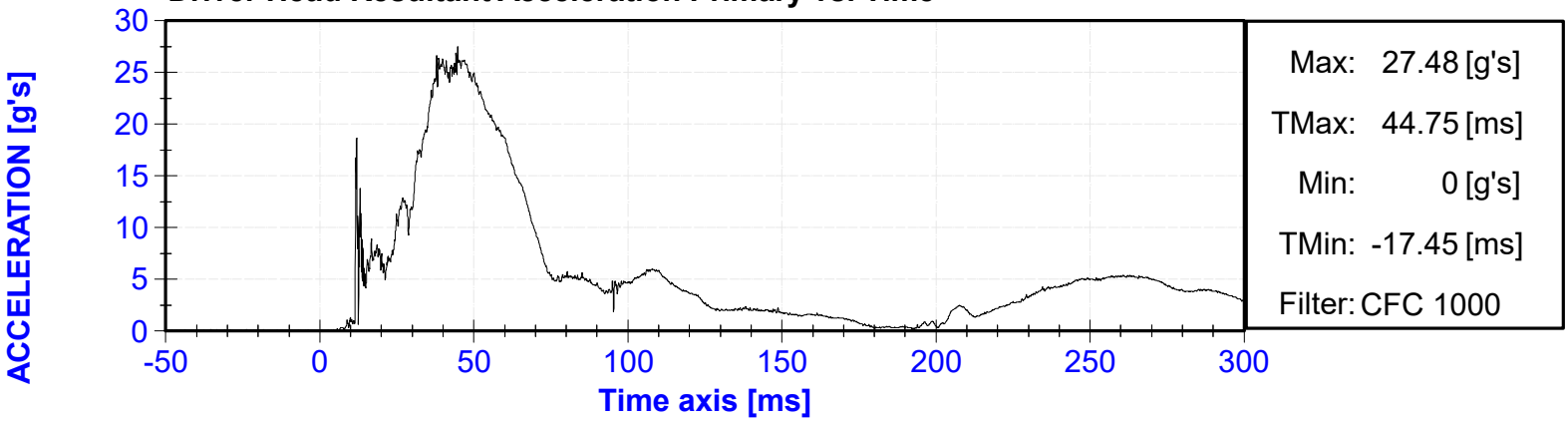
Driver Head Acceleration (Y) Primary vs. Time



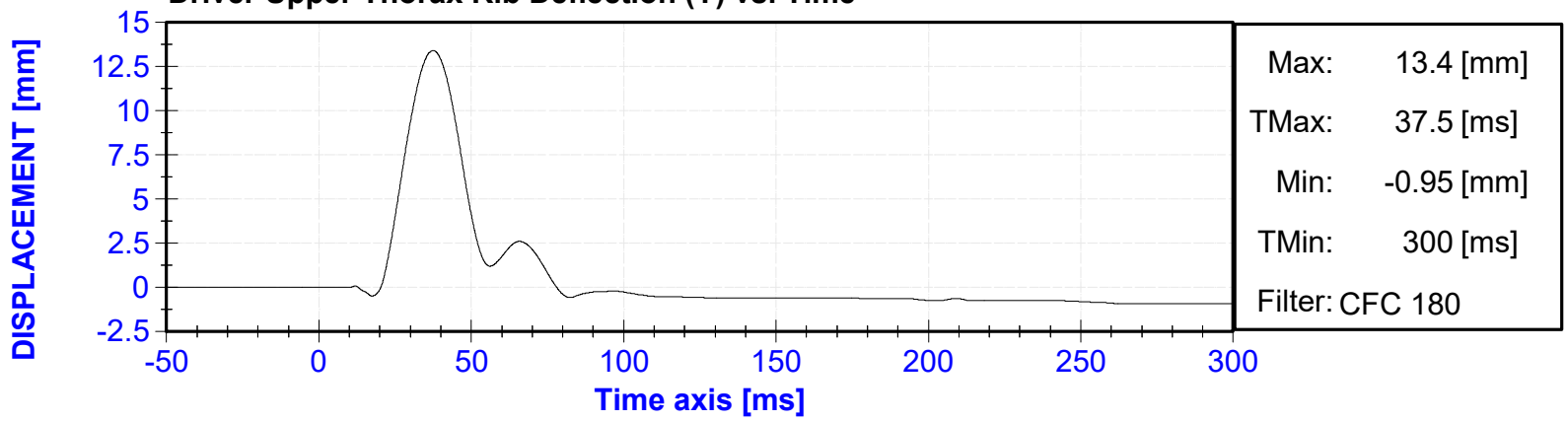
Driver Head Acceleration (Z) Primary vs. Time



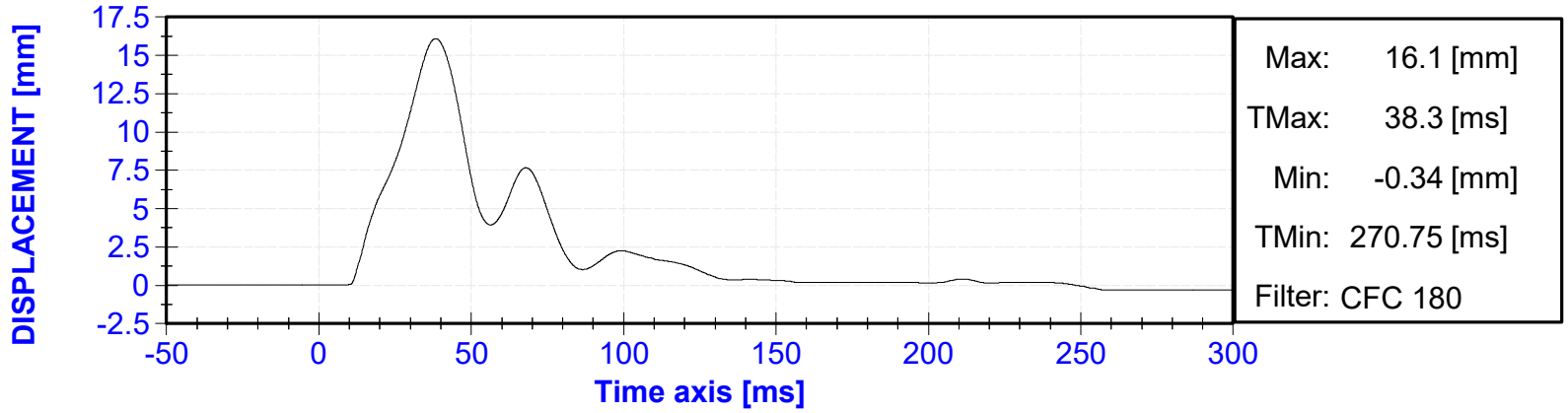
Driver Head Resultant Acceleration Primary vs. Time



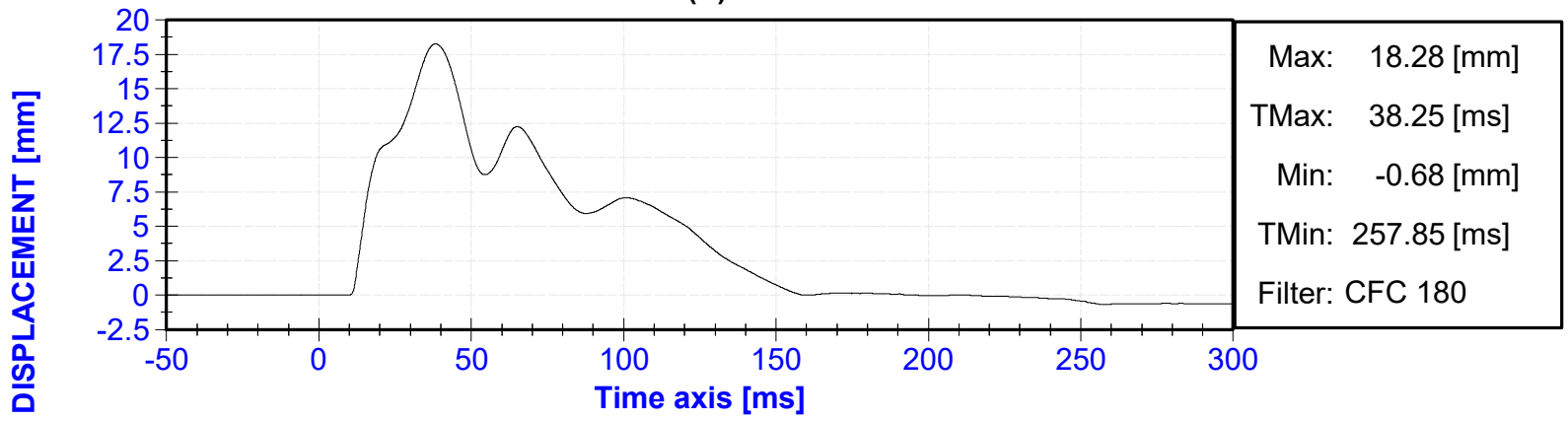
Driver Upper Thorax Rib Deflection (Y) vs. Time



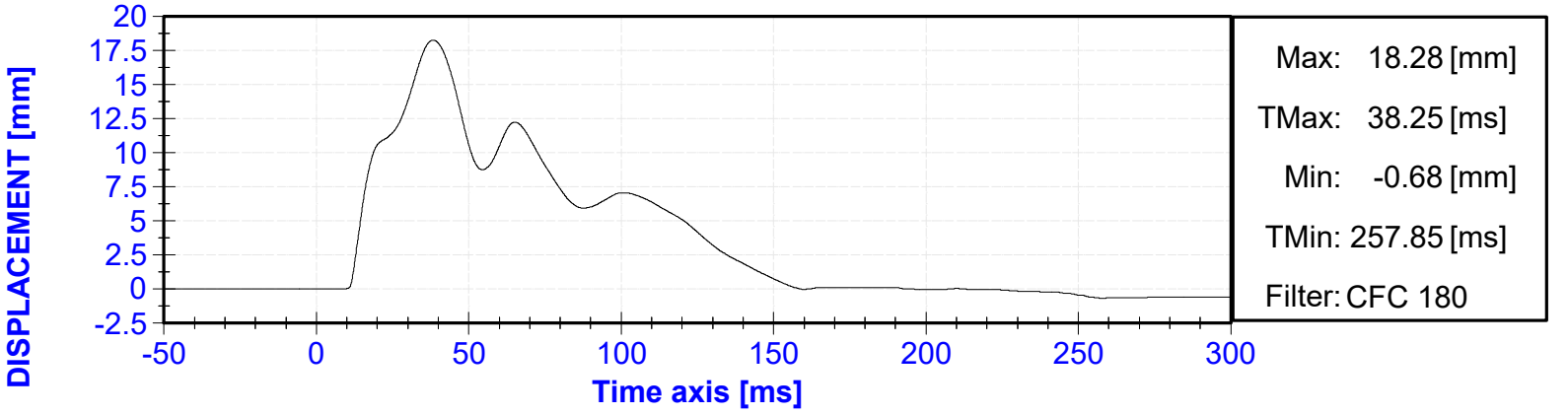
Driver Middle Thorax Rib Deflection (Y) vs. Time



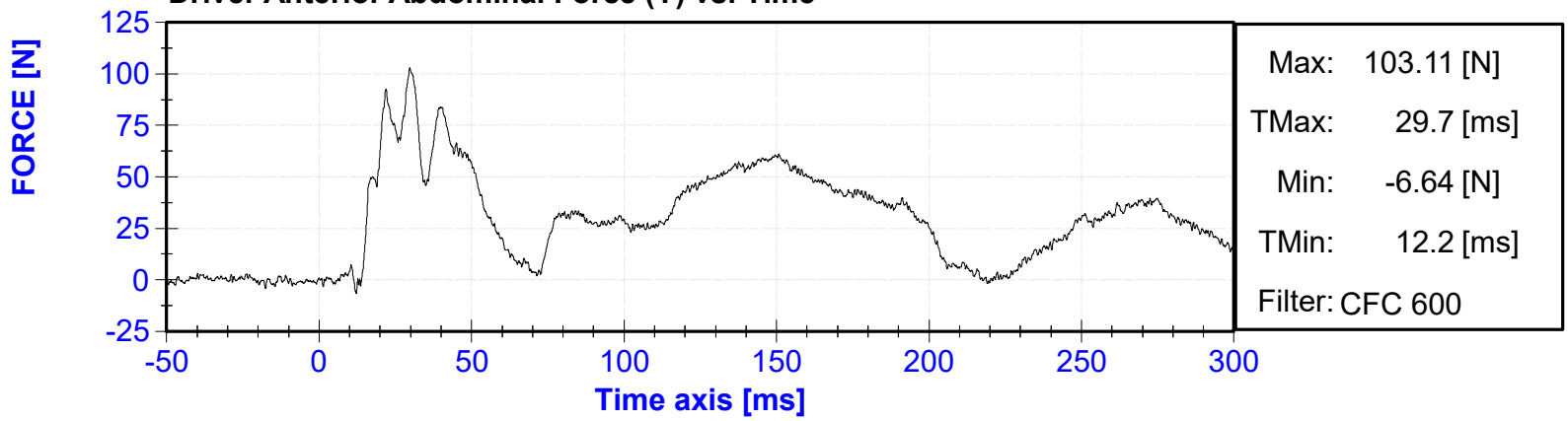
Driver Lower Thorax Rib Deflection (Y) vs. Time



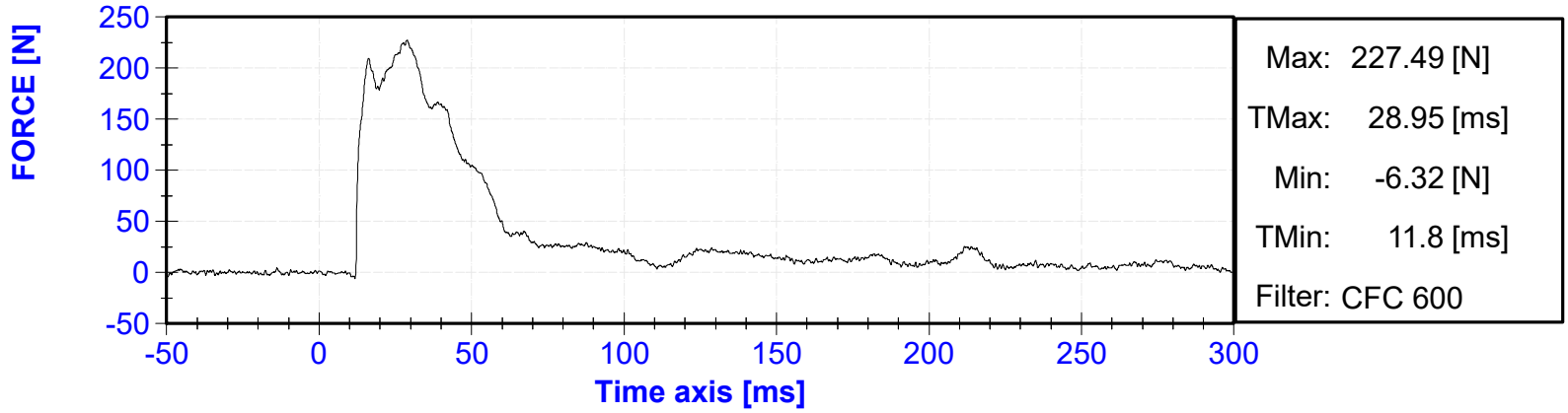
Driver Thorax Rib Deflection Maximum vs. Time



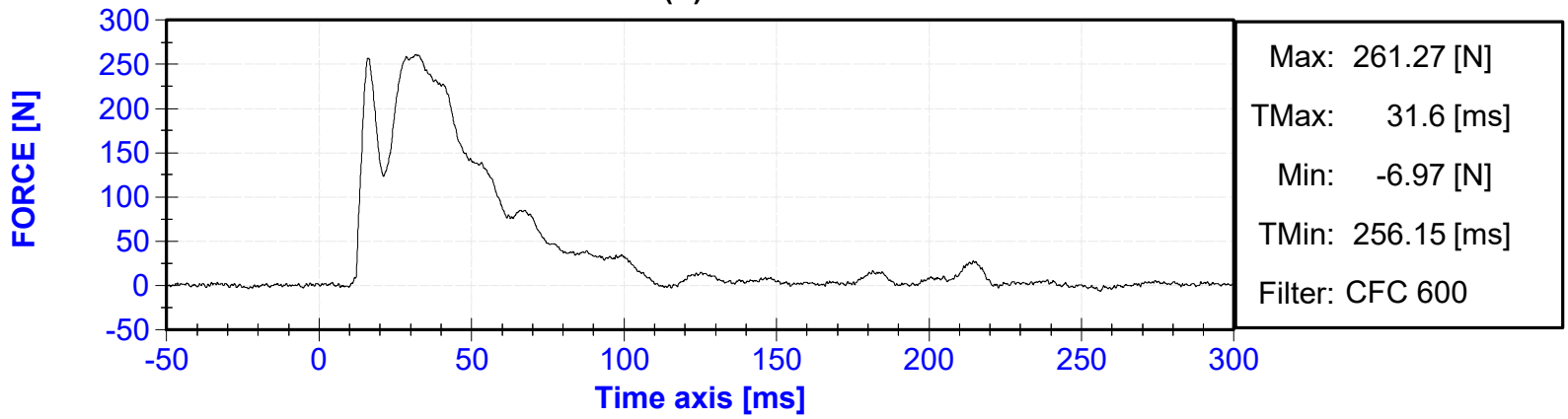
Driver Anterior Abdominal Force (Y) vs. Time



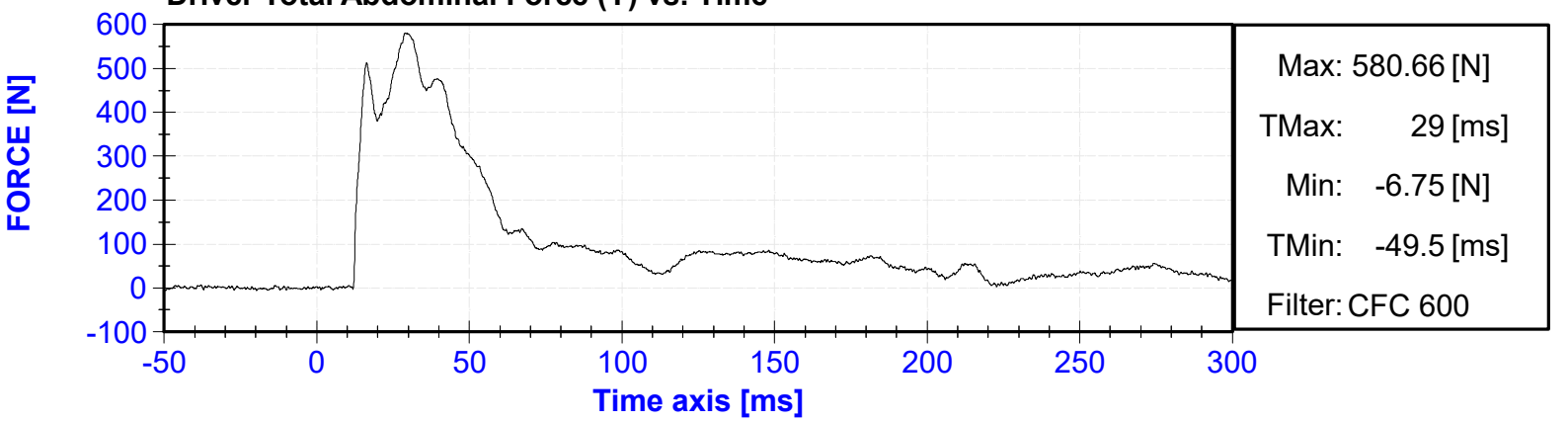
Driver Middle Abdominal Force (Y) vs. Time

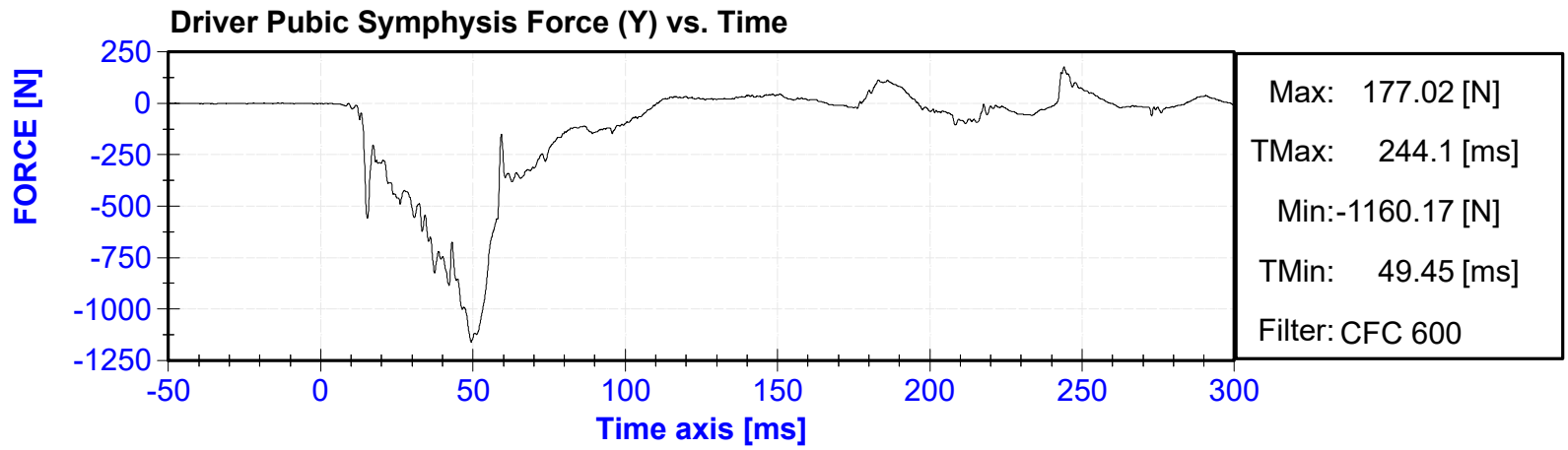


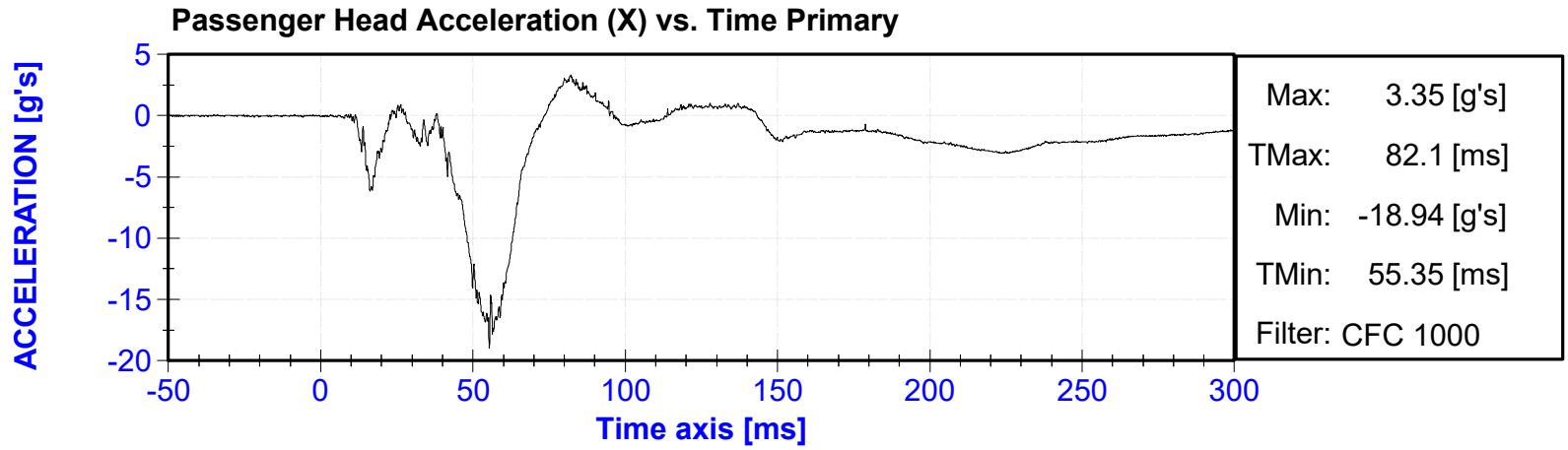
Driver Posterior Abdominal Force (Y) vs. Time

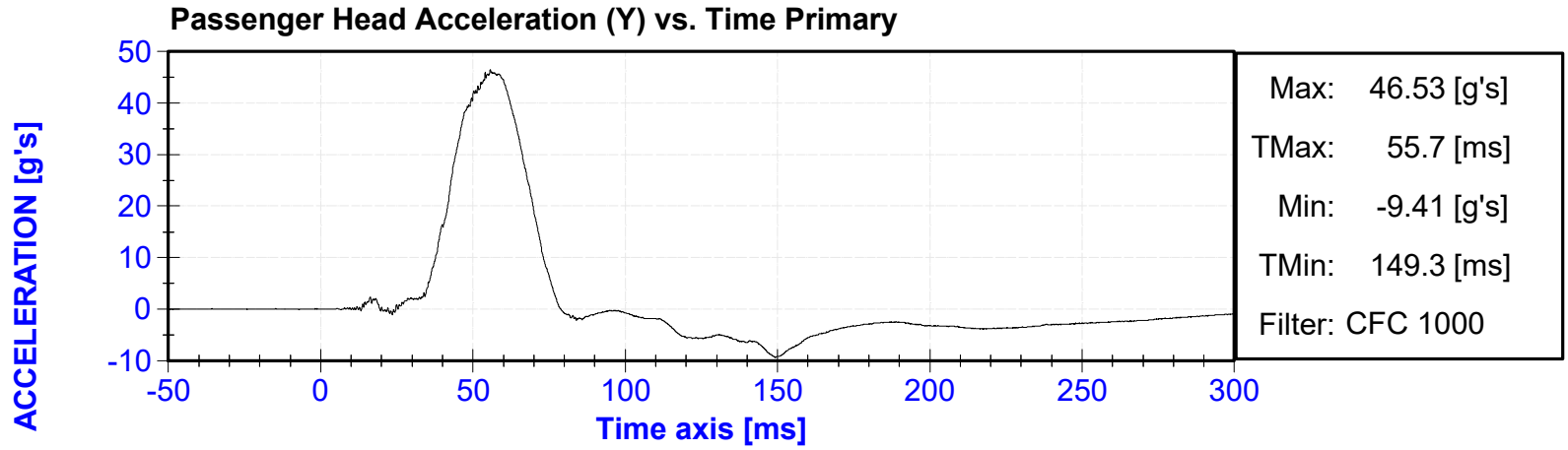


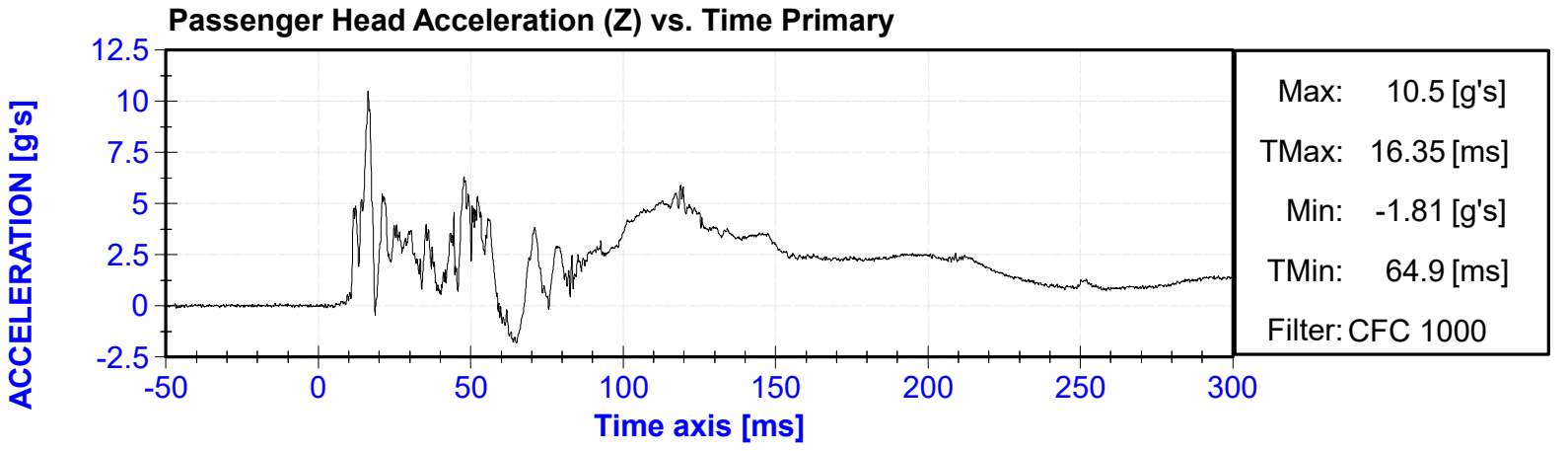
Driver Total Abdominal Force (Y) vs. Time



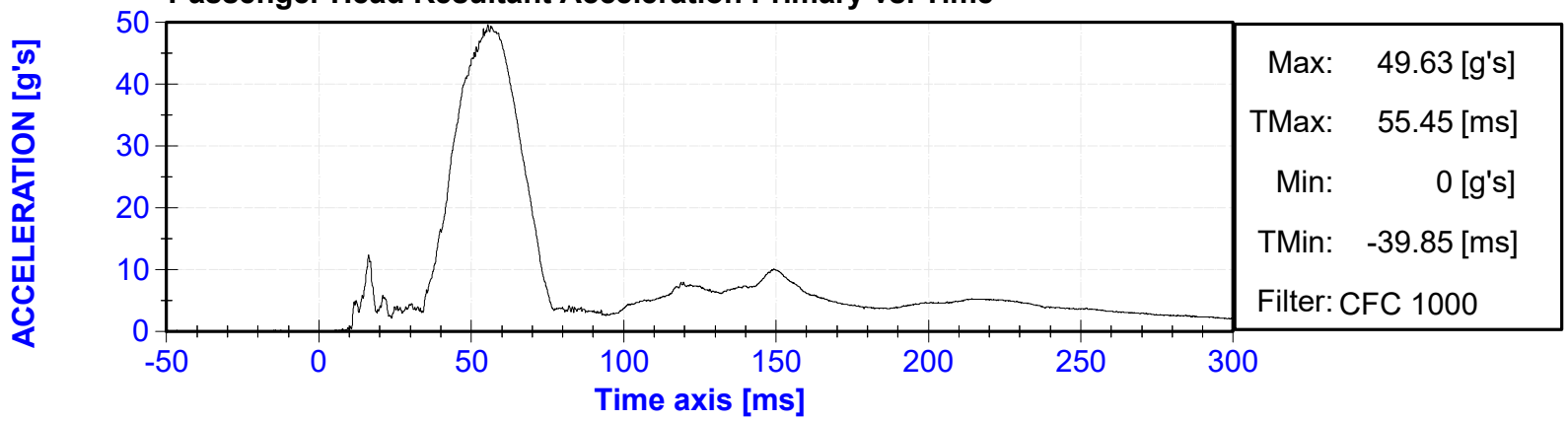

Driver Pubic Symphysis Force (Y) vs. Time
FORCE [N]
250
0
-250
-500
-750
-1000
-1250
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 177.02 [N]
TMax: 244.1 [ms]
Min: -1160.17 [N]
TMin: 49.45 [ms]
Filter: CFC 600


Passenger Head Acceleration (X) vs. Time Primary
ACCELERATION [g's]
5
0
-5
-10
-15
-20
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 3.35 [g's]
TMax: 82.1 [ms]
Min: -18.94 [g's]
TMin: 55.35 [ms]
Filter: CFC 1000

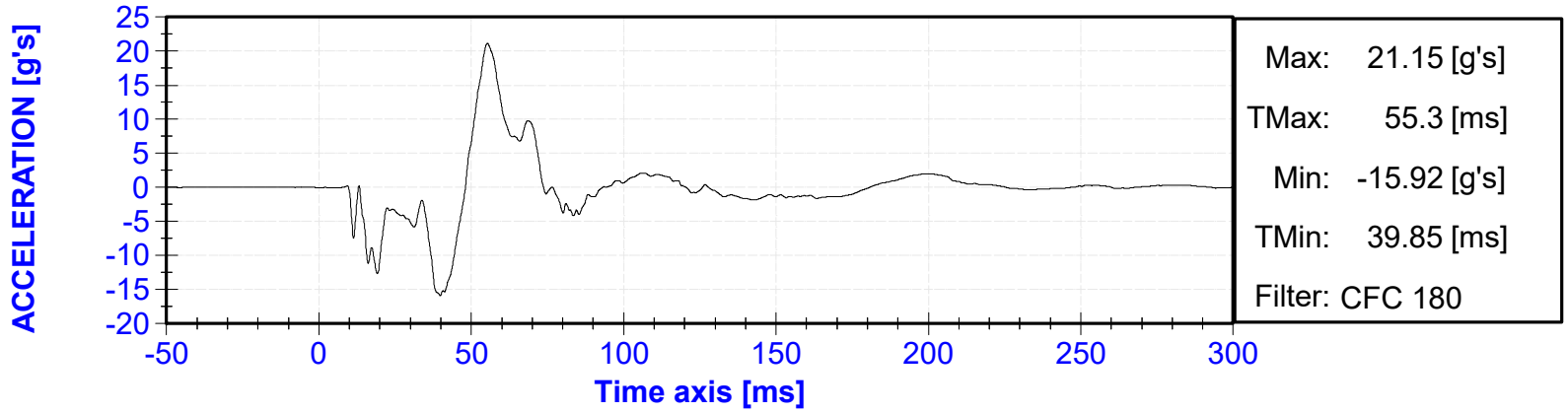

Passenger Head Acceleration (Y) vs. Time Primary
ACCELERATION [g's]
50
40
30
20
10
0
-10
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 46.53 [g's]
TMax: 55.7 [ms]
Min: -9.41 [g's]
TMin: 149.3 [ms]
Filter: CFC 1000


Passenger Head Acceleration (Z) vs. Time Primary
ACCELERATION [g's]
12.5
10
7.5
5
2.5
0
-2.5
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 10.5 [g's]
TMax: 16.35 [ms]
Min: -1.81 [g's]
TMin: 64.9 [ms]
Filter: CFC 1000

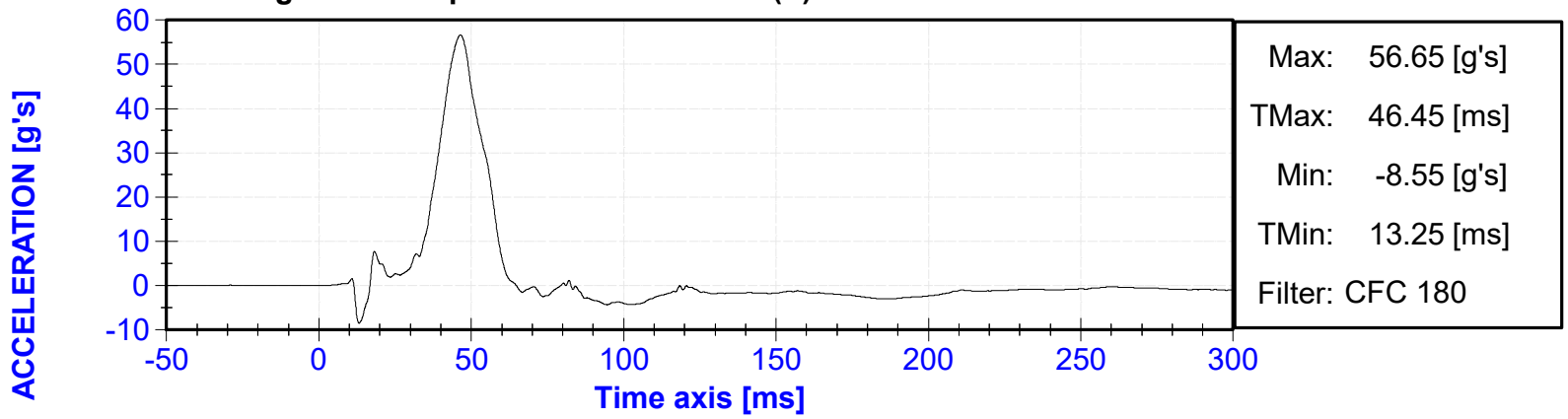
Passenger Head Resultant Acceleration Primary vs. Time



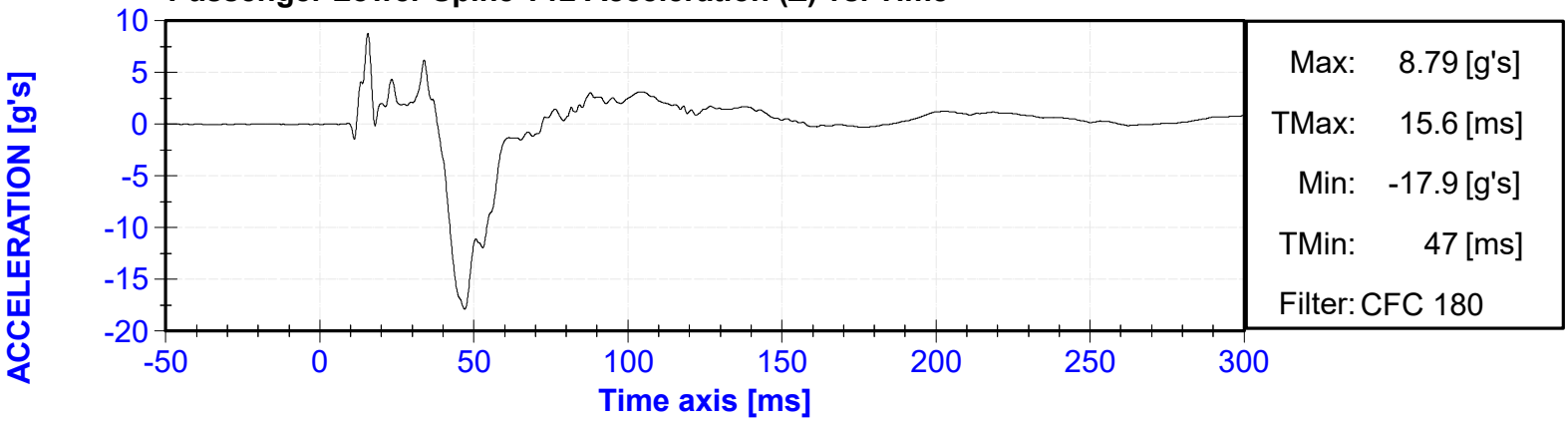
Passenger Lower Spine T12 Acceleration (X) vs. Time



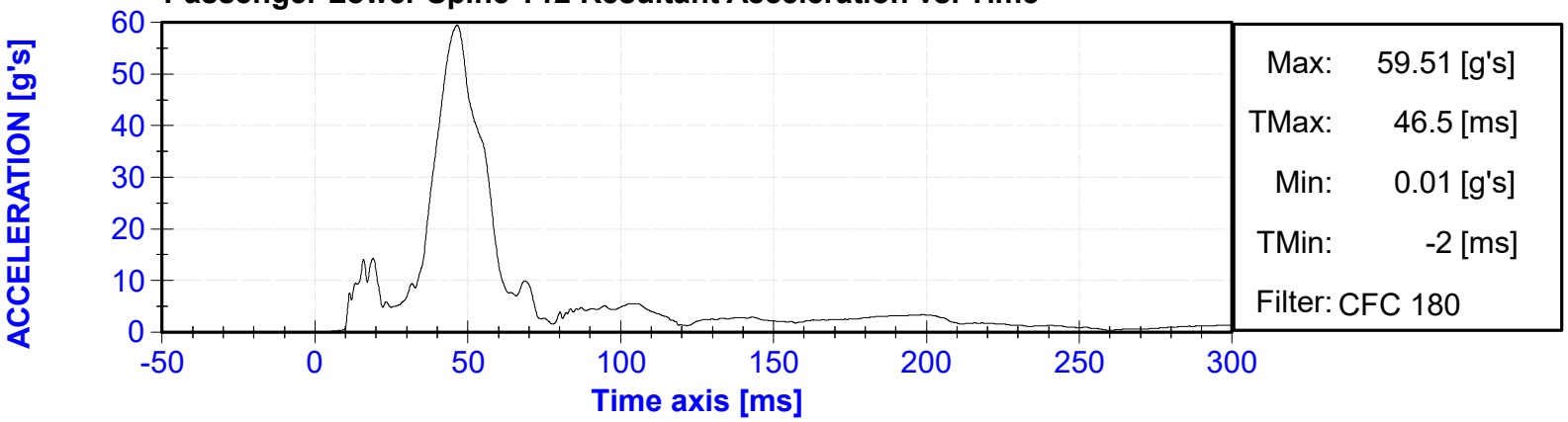
Passenger Lower Spine T12 Acceleration (Y) vs. Time



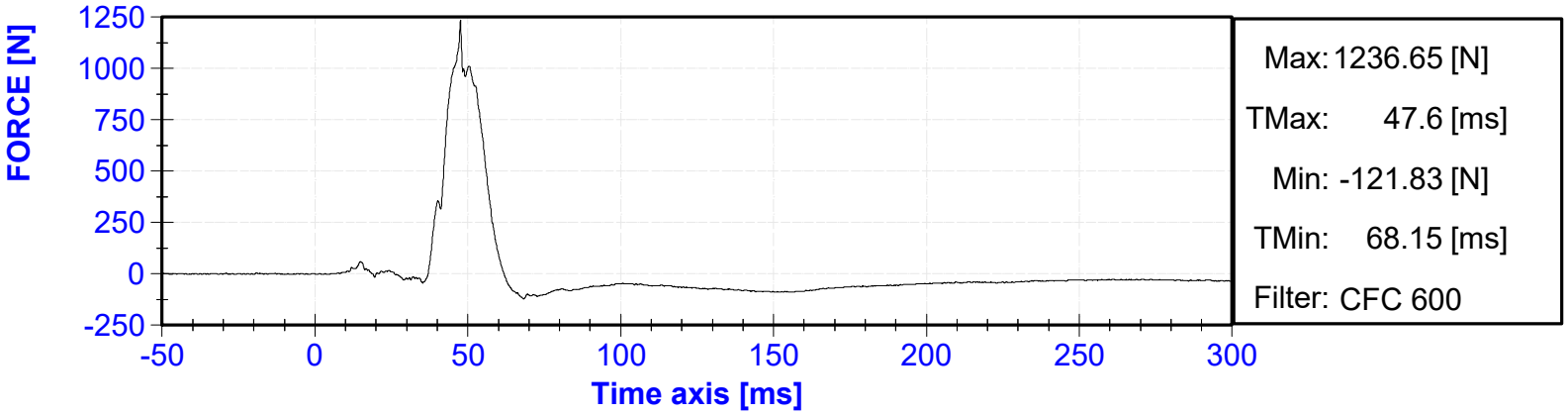
Passenger Lower Spine T12 Acceleration (Z) vs. Time



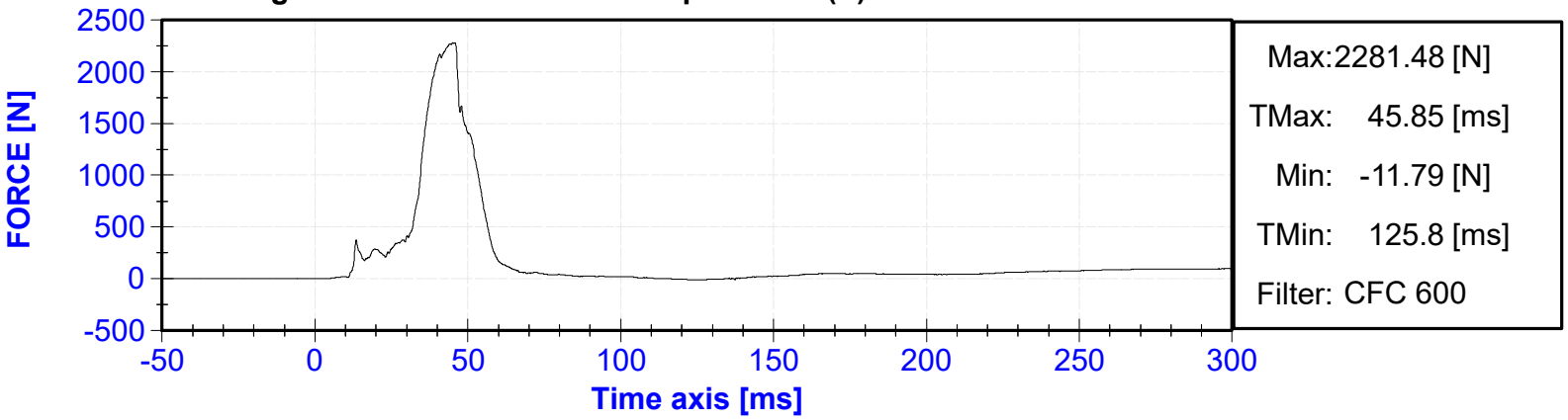
Passenger Lower Spine T12 Resultant Acceleration vs. Time



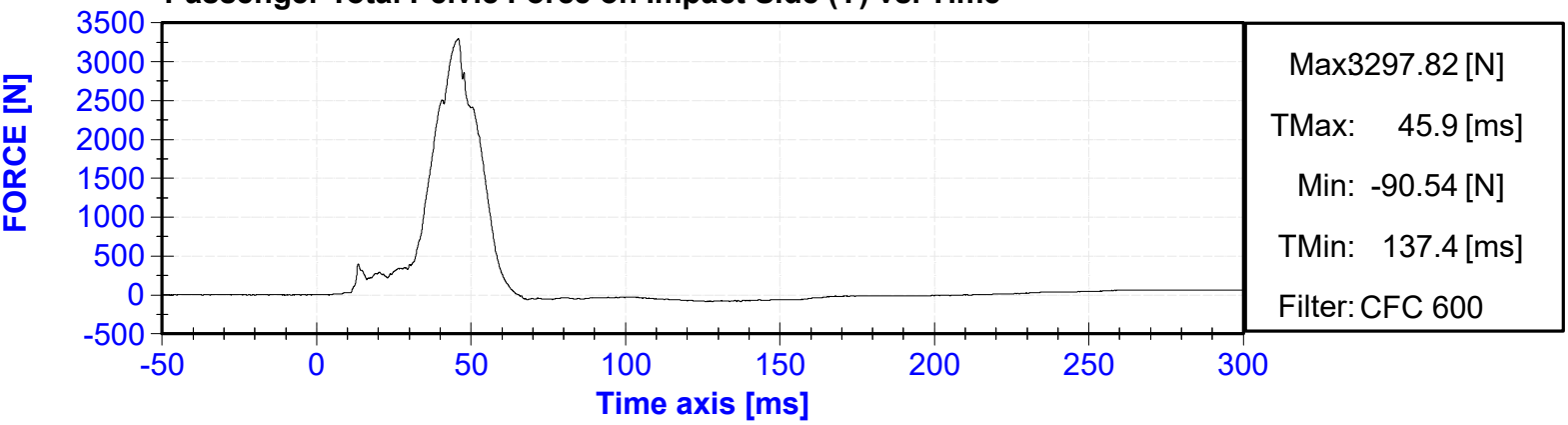
Passenger Iliac Force on Impact Side (Y) vs. Time



Passenger Acetabulum Force on Impact Side (Y) vs. Time



Passenger Total Pelvic Force on Impact Side (Y) vs. Time



APPENDIX C

DUMMY PERFORMANCE CALIBRATION TEST DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

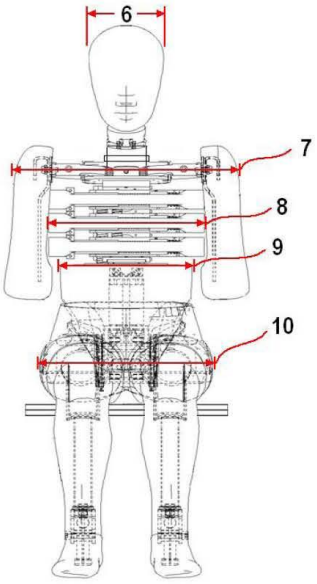
SERIAL NO: F033

(CONFIGURED FOR LEFT SIDE IMPACT)

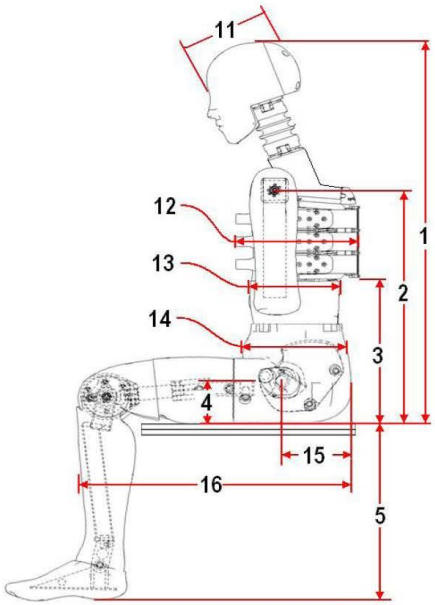
External Measurements - EuroSID-2re

Technician: K. Brogan Date: 06/27/2022

Dummy Serial Number: F033



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	565	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	350	Pass
4	Seat to Hip Joint (center of bolt)	97	103	100	Pass
5	Sole to Seat, Sitting	333	451	415	Pass
6	Head Width	152	158	155	Pass
7	Shoulder/Arm Width	461	479	469	Pass
8	Thorax Width	322	332	328	Pass
9	Abdomen Width	273	287	280	Pass
10	Pelvis Lap Width	359	373	365	Pass
11	Head Depth	196	206	200	Pass
12	Thorax Depth	262	272	265	Pass
13	Abdomen Depth	194	204	200	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	607	Pass

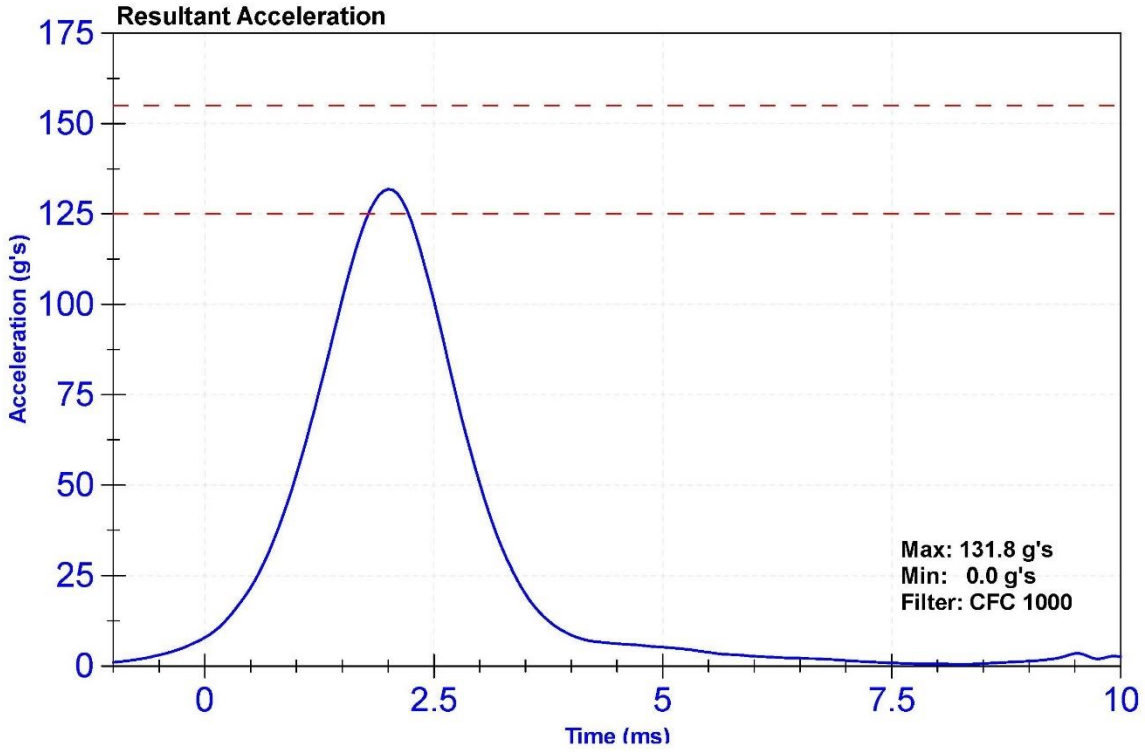
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

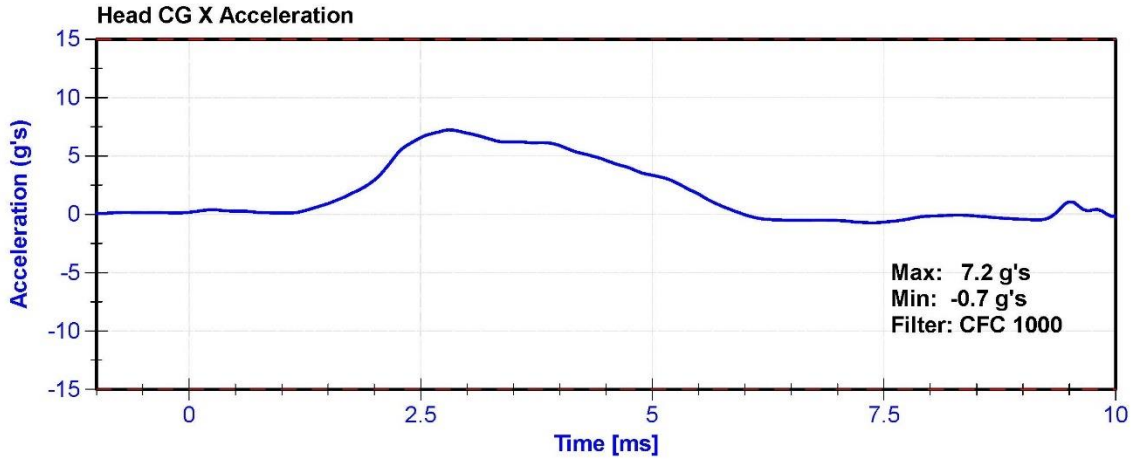
Results

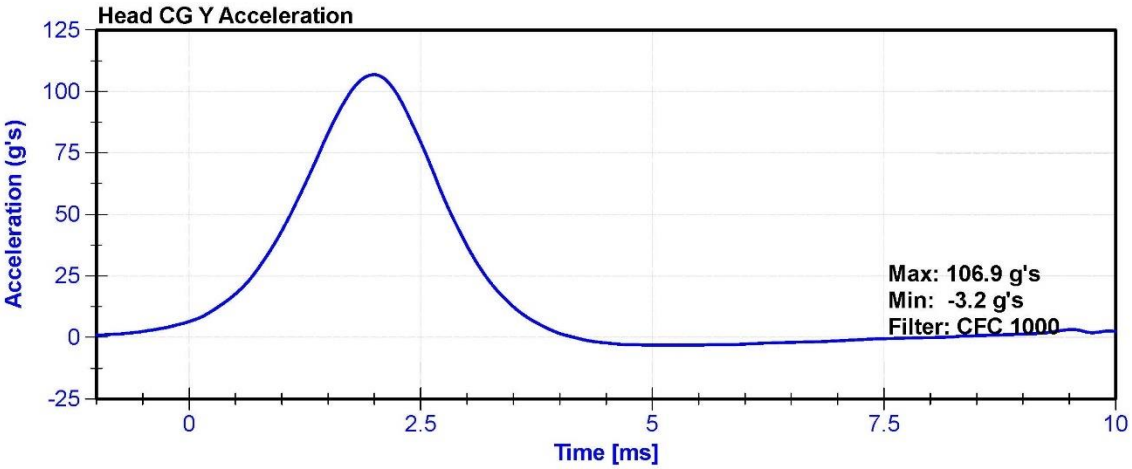
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	52.0	Pass
Resultant Acceleration	125	155	g's	131.8	Pass
Oscillation	0	15	%	2.63	Pass
Fore-Aft Acceleration	-15	15	g's	7.2	Pass

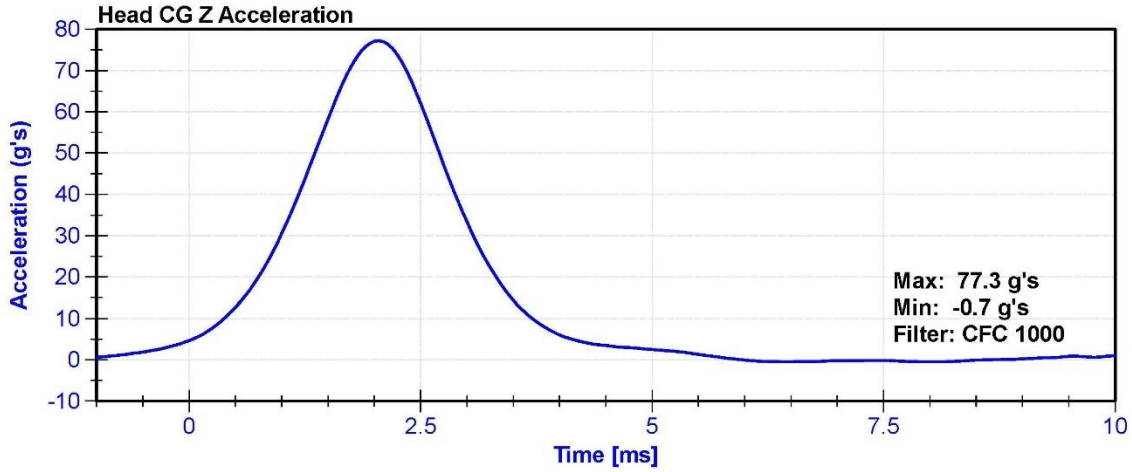
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P63861	1/31/2022	7/30/2022
Y Accelerometer	Endevco	P49216	1/31/2022	7/30/2022
Z Accelerometer	Endevco	P51303	1/31/2022	7/30/2022




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 7.2 g's
Min: -0.7 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 106.9 g's
Min: -3.2 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]
Max: 77.3 g's
Min: -0.7 g's
Filter: CFC 1000

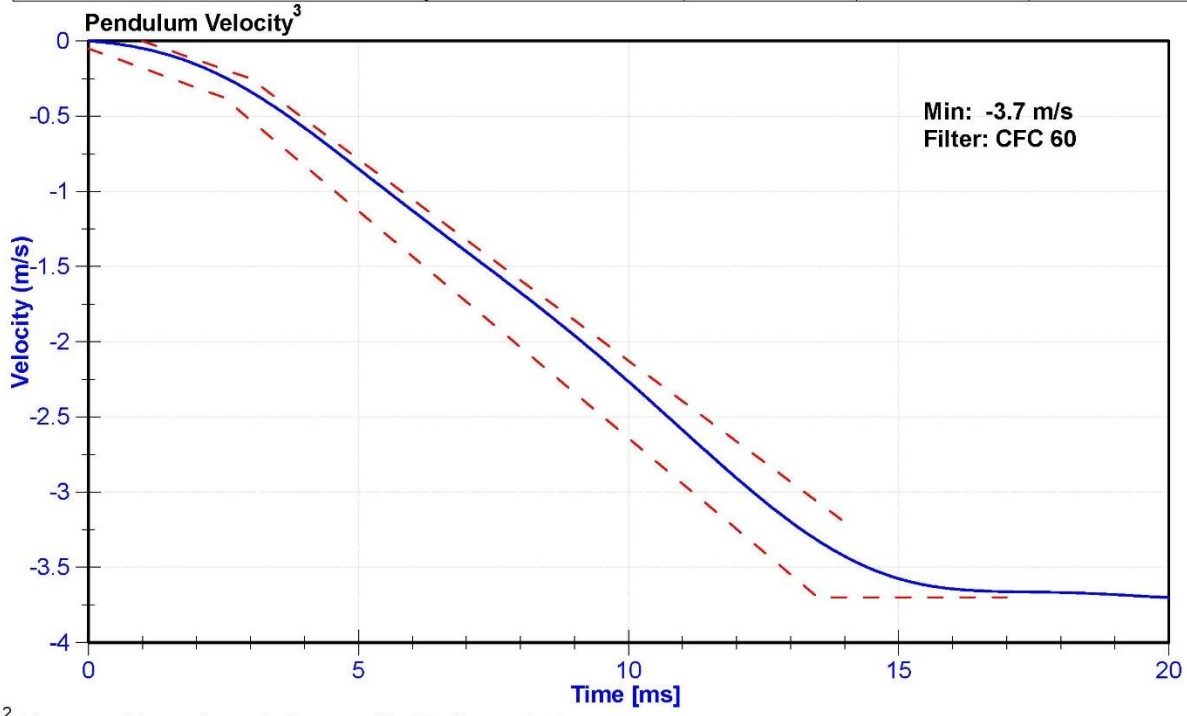
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

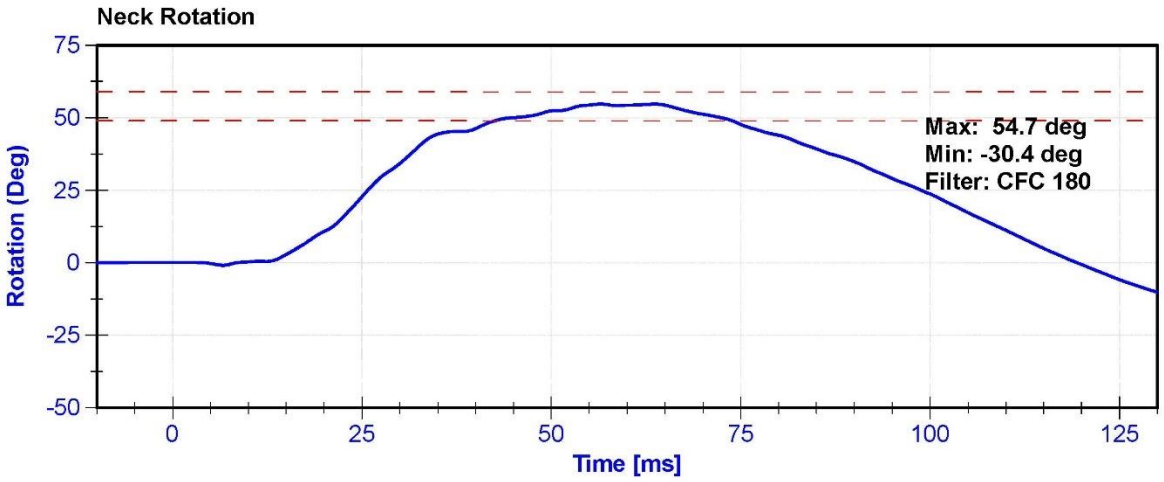
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	49.1	Pass
Velocity	3.3	3.5	m/s	3.42	Pass
Lateral Neck Rotation	49	59	deg	54.7	Pass
Time at Maximum Rotation	54	66	ms	56.5	Pass
Time of Rotation Decay from Maximum	53	88	ms	63.0	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

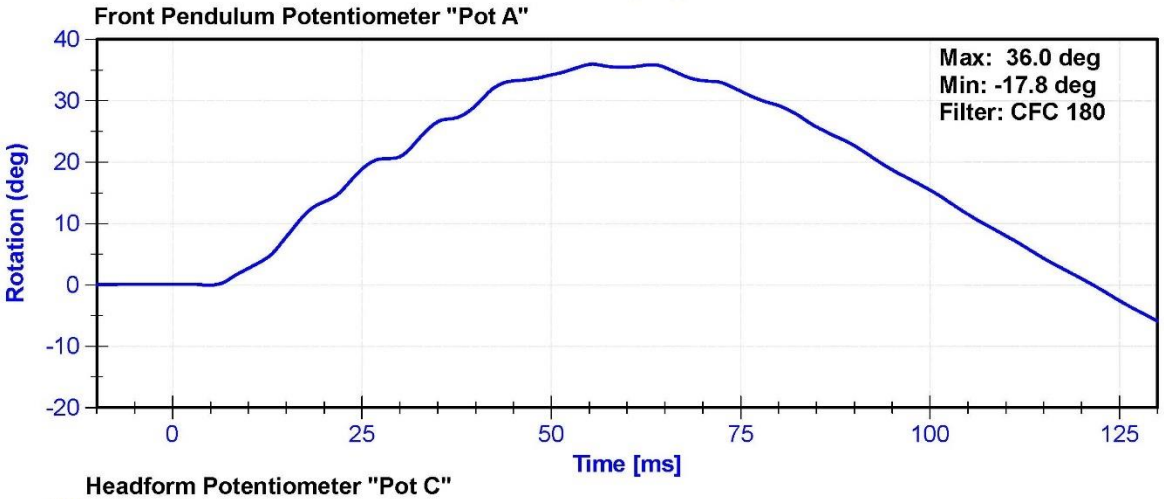
Transducer Calibrations

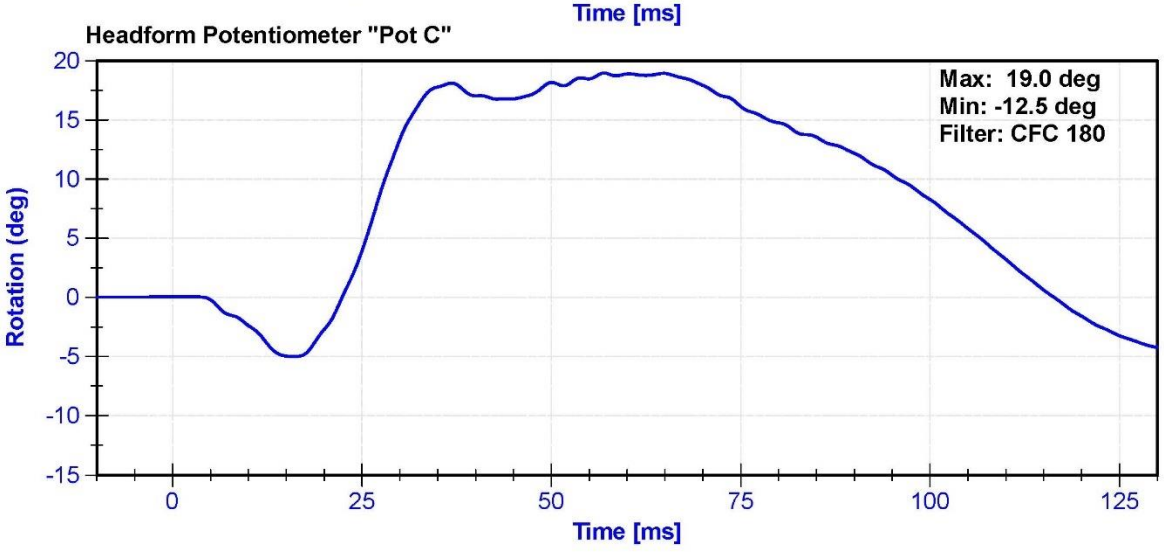
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Front Pendulum Potentiometer	Sfernice	094	10/1/2021	10/1/2022
Headform Potentiometer	Sfernice	095	10/1/2021	10/1/2022



[1,2] Upper and lower boundaries specified in Appendix I


Neck Rotation
Rotation (Deg)
Time [ms]
Max: 54.7 deg
Min: -30.4 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 36.0 deg
Min: -17.8 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 19.0 deg
Min: -12.5 deg
Filter: CFC 180

Appendix I

[2] Upper Boundary Corridor		[1] Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.0	-0.25	2.5	-0.375
14.0	-3.20	13.5	-3.7
		17.0	-3.7

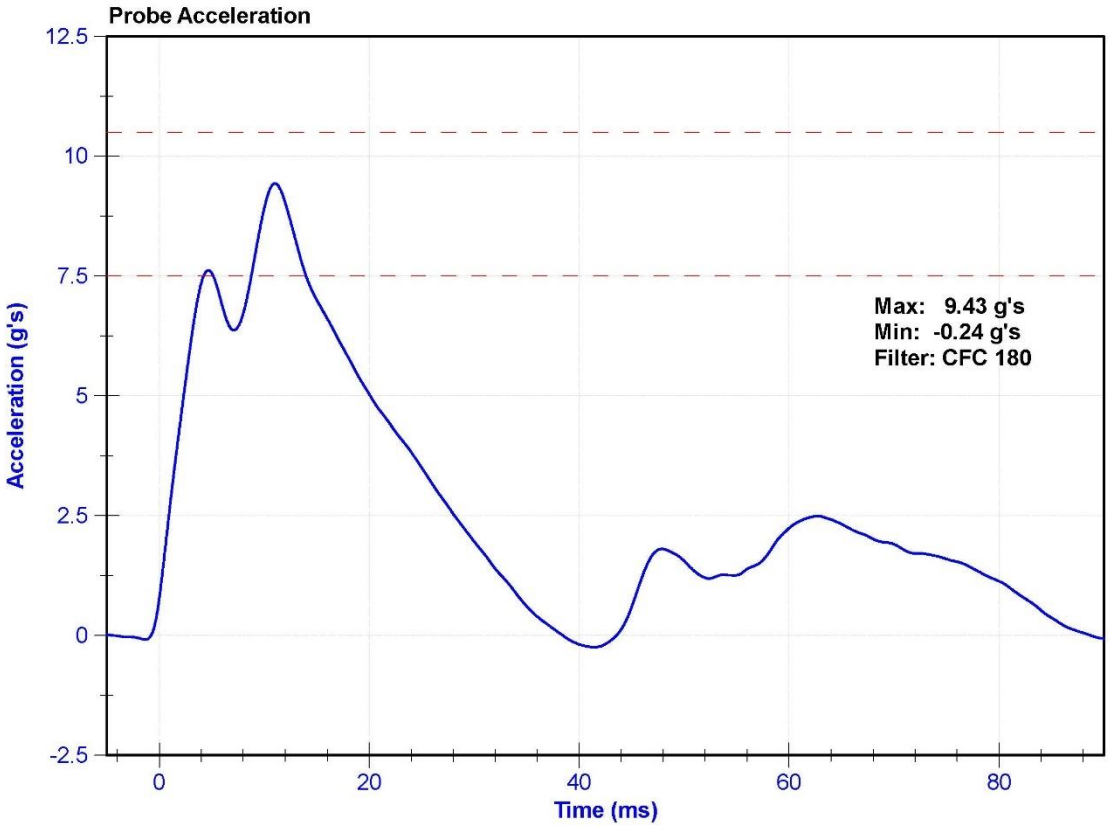
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	54.1	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	7.5	10.5	g's	9.43	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2021	10/25/2022



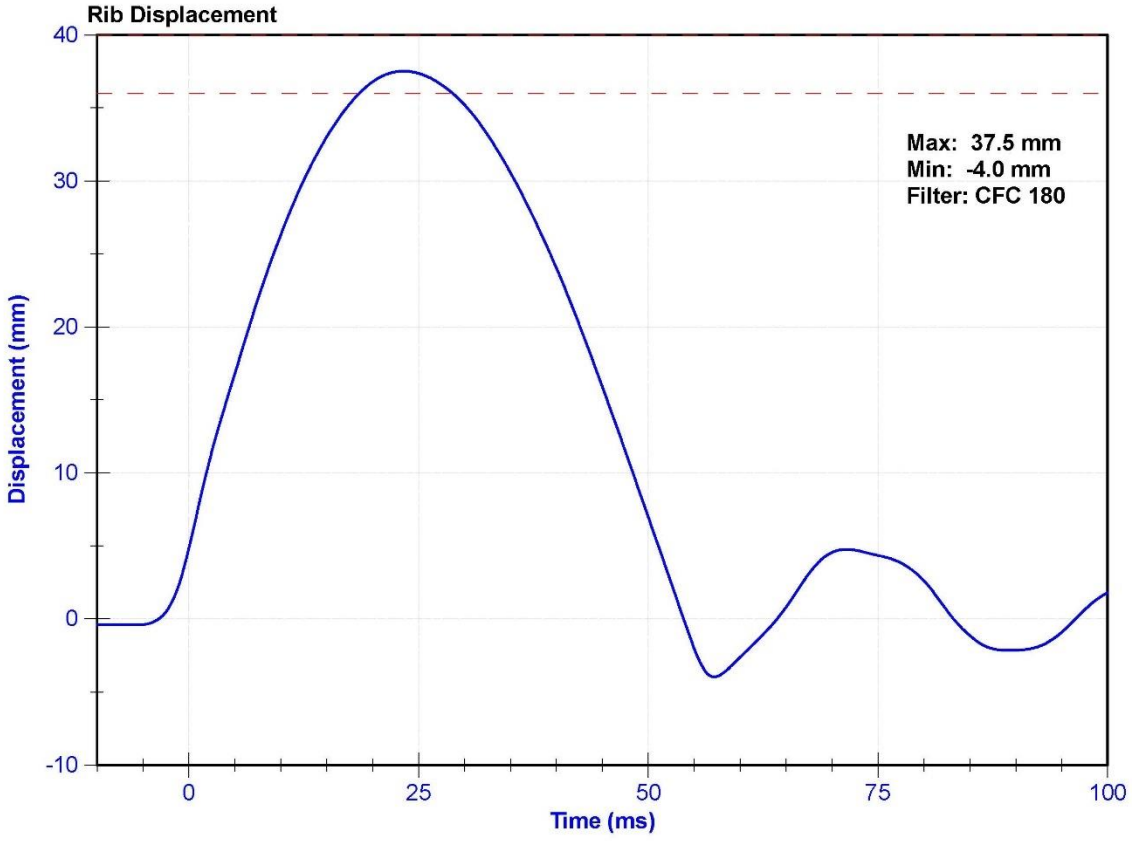
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	52.0	Pass
Rib Displacement	36	40	mm	37.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	2/1/2022	8/2/2022



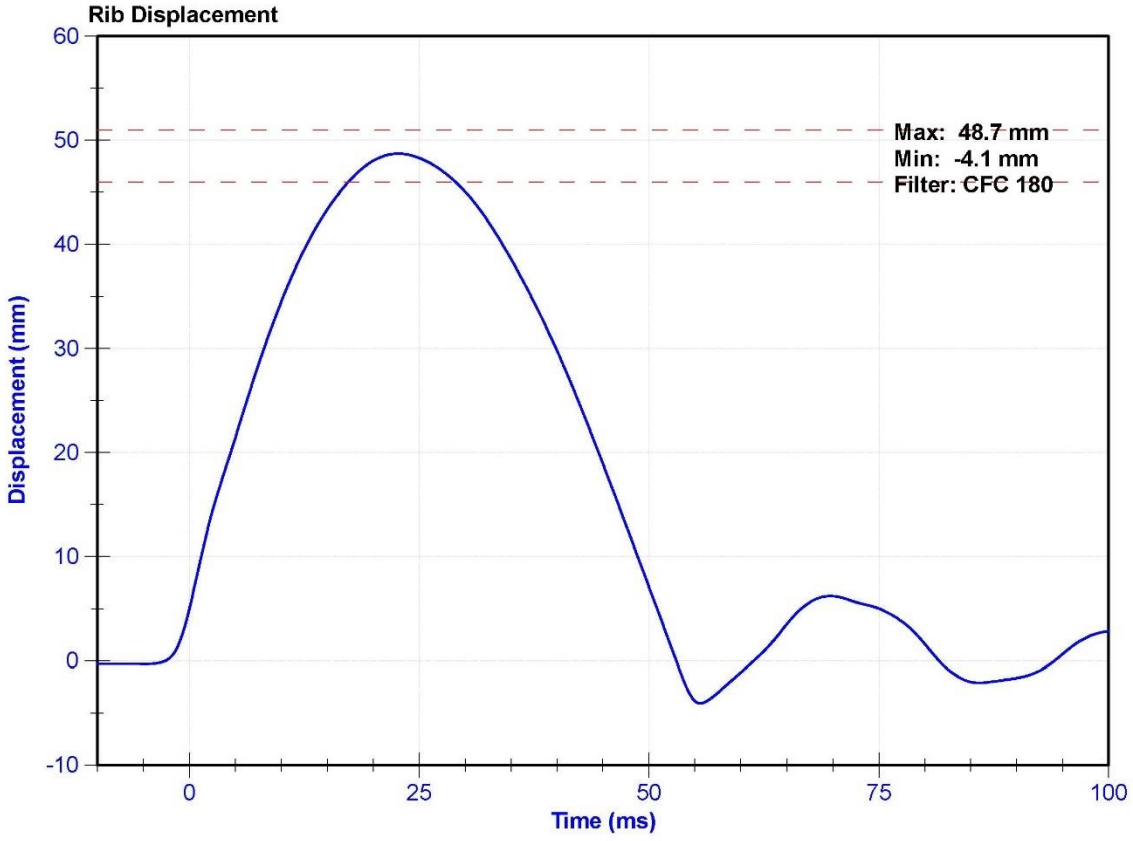
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	52.0	Pass
Rib Displacement	46	51	mm	48.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	2/1/2022	8/2/2022



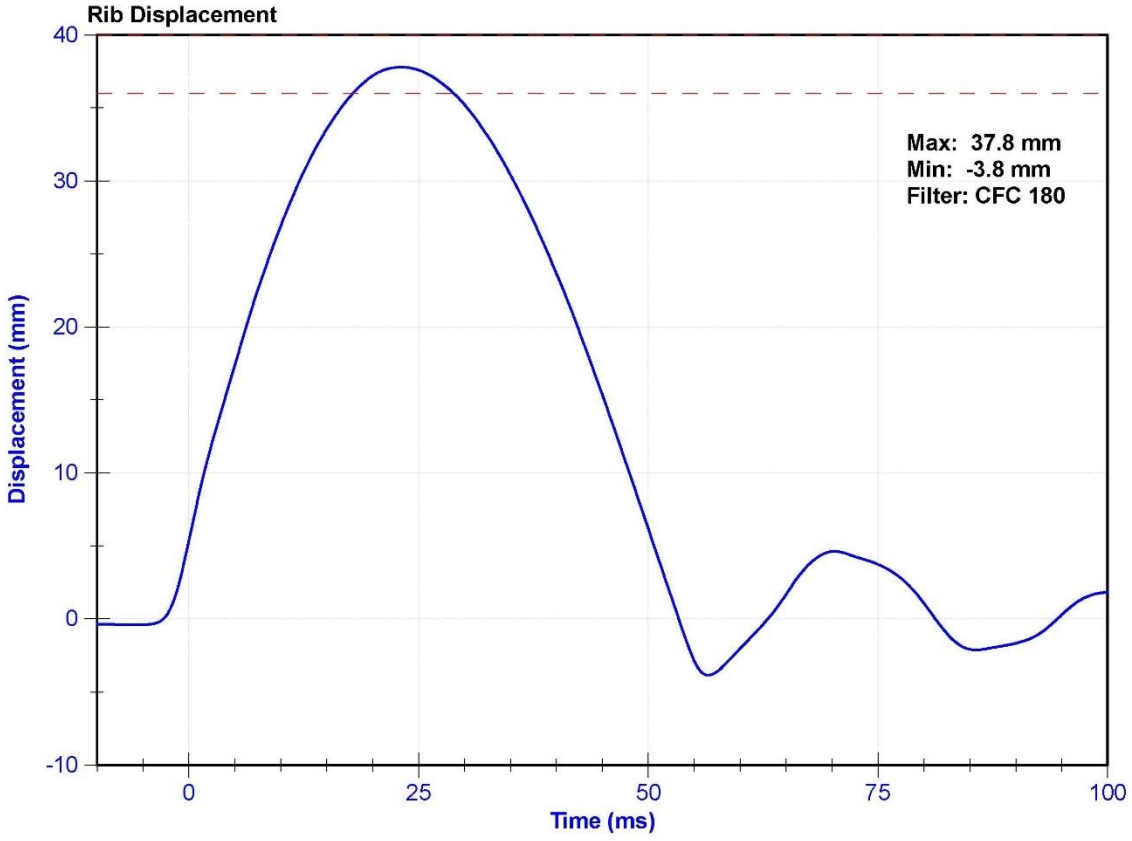
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	52.0	Pass
Rib Displacement	36	40	mm	37.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	2/1/2022	8/2/2022



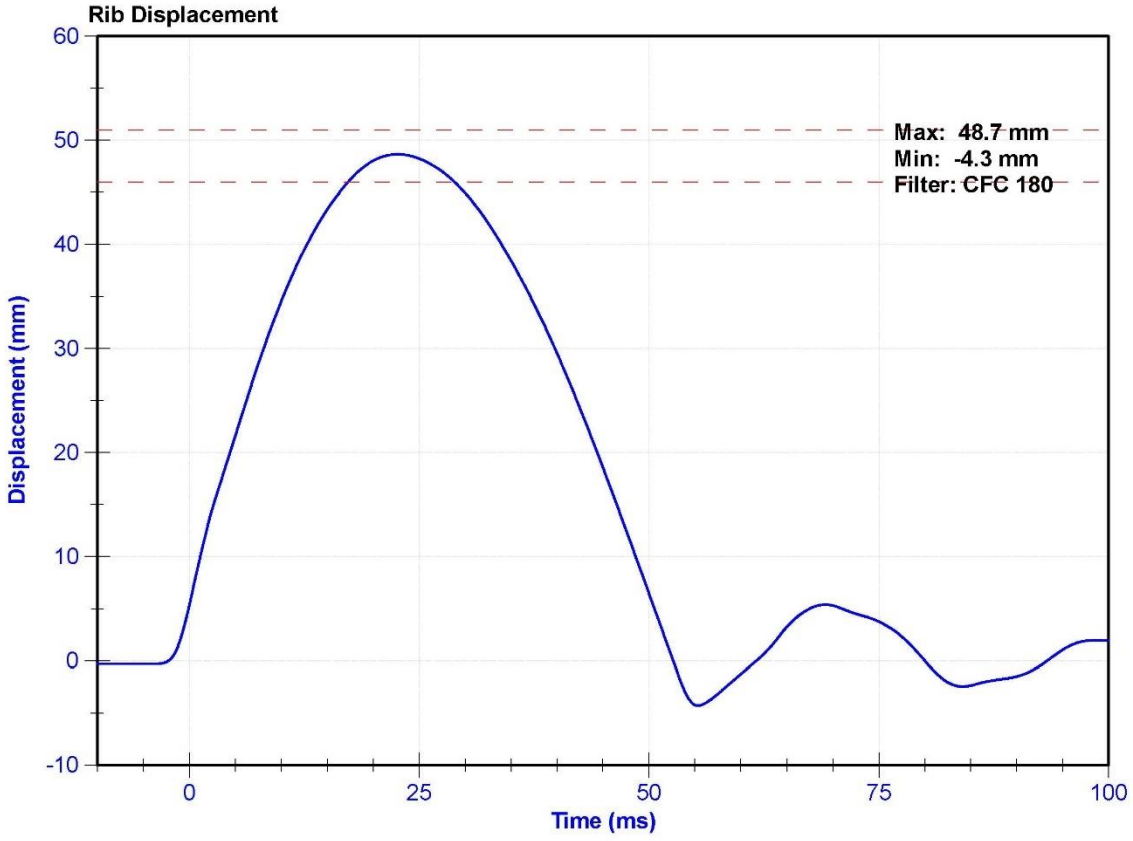
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	52.0	Pass
Rib Displacement	46	51	mm	48.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	2/1/2022	8/2/2022



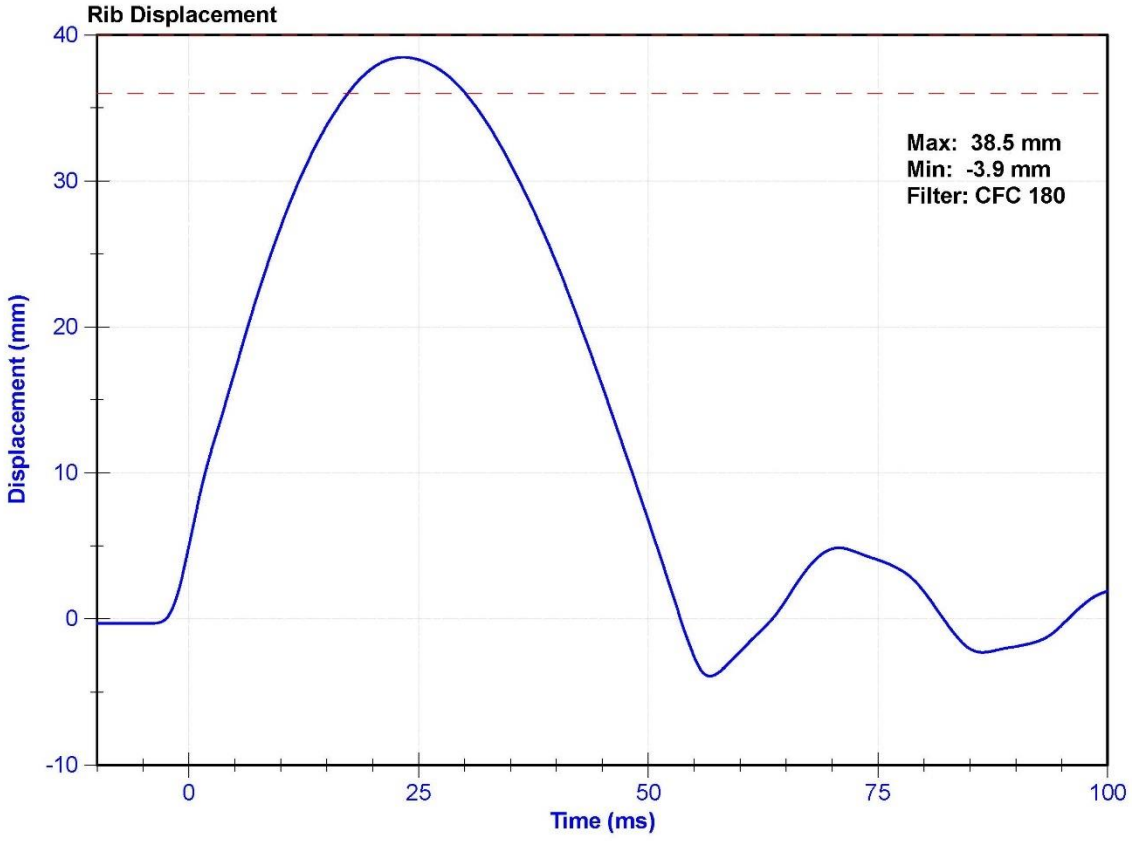
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	52.0	Pass
Rib Displacement	36	40	mm	38.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	2/1/2022	8/2/2022



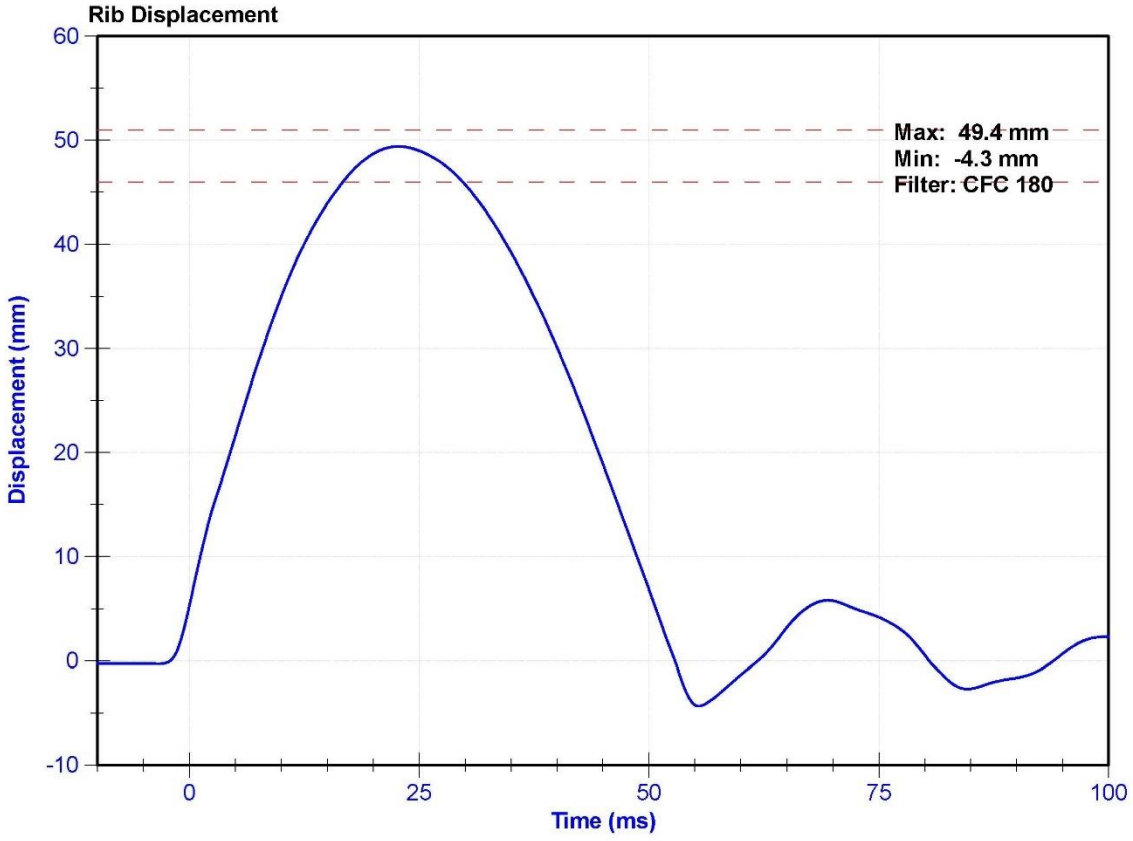
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	52.0	Pass
Rib Displacement	46	51	mm	49.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	2/1/2022	8/2/2022



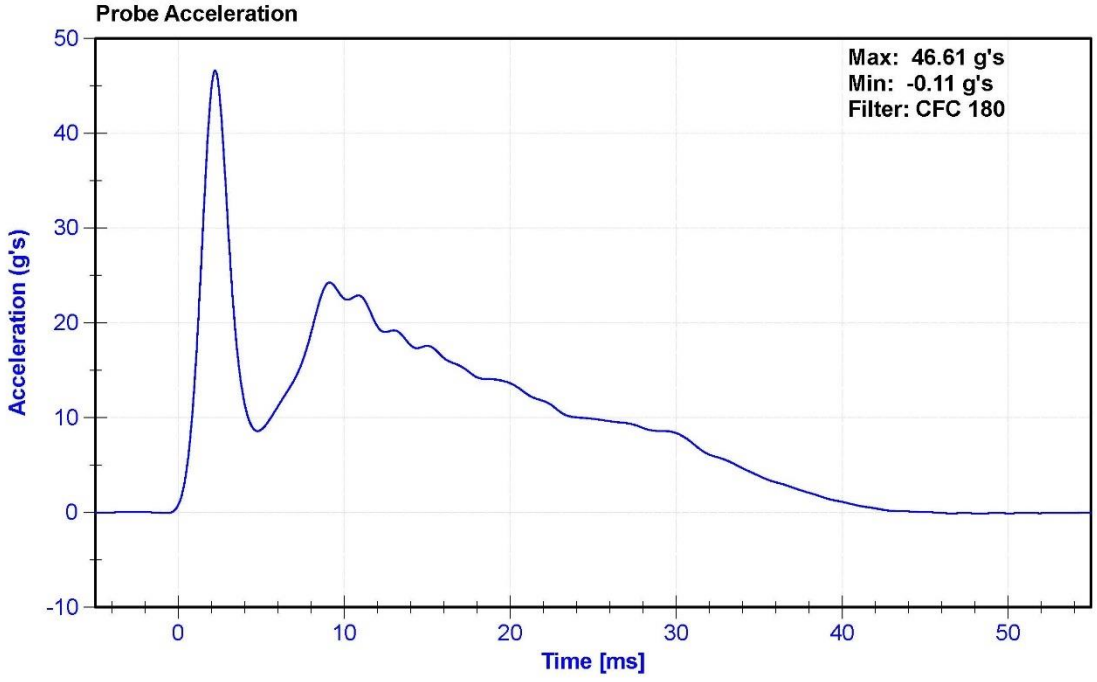
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

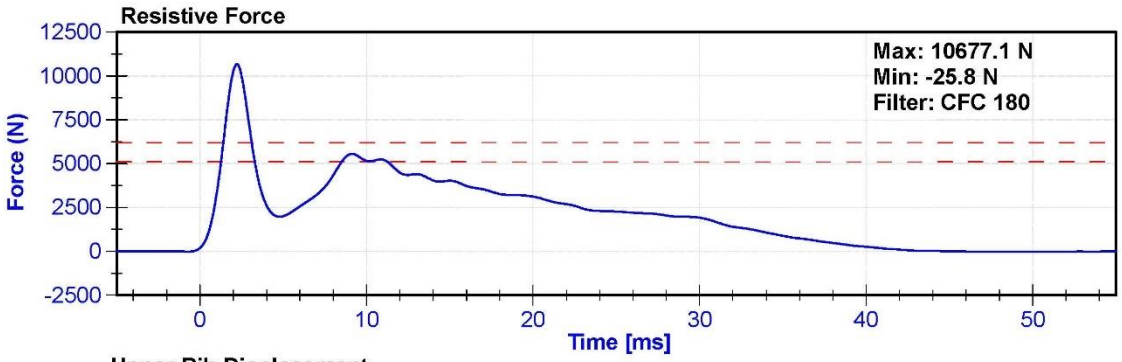
Results

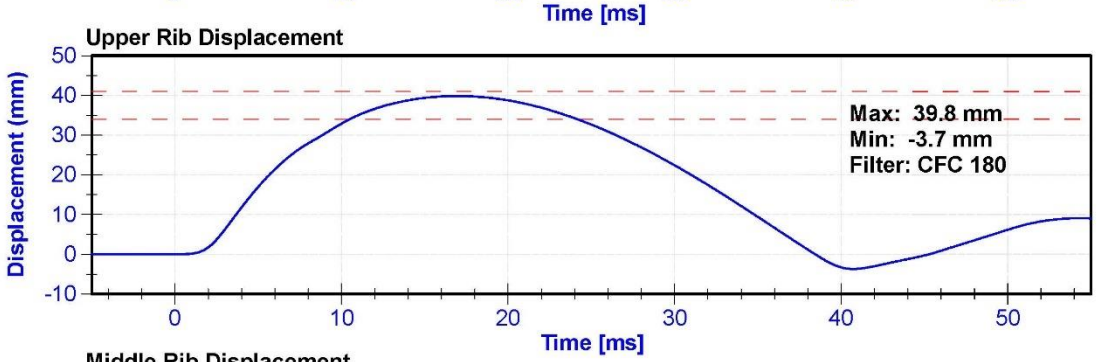
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	54.1	Pass
Velocity	5.4	5.6	m/s	5.53	Pass
Resistive Force after 6ms	5100	6200	N	5554.6	Pass
Upper Thorax Rib Deflection	34	41	mm	39.8	Pass
Mid Thorax Rib Deflection	37	45	mm	41.6	Pass
Lower Thorax Rib Deflection	37	44	mm	40.2	Pass

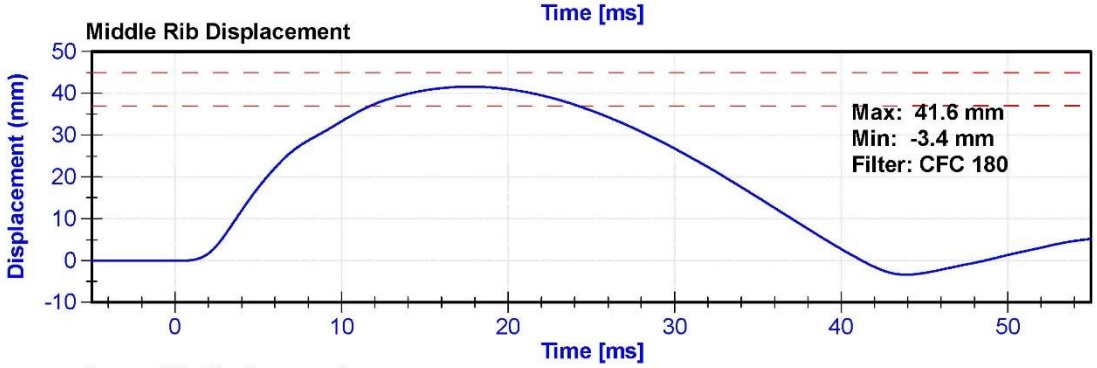
Transducer Calibrations

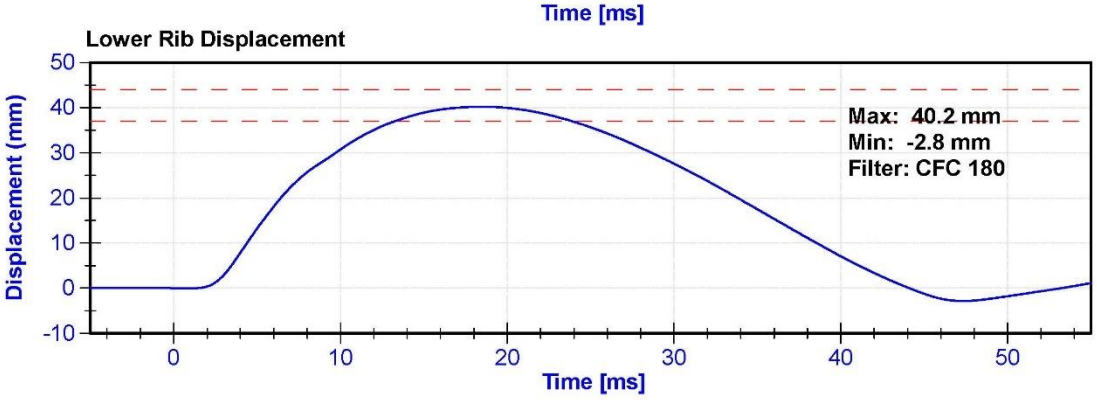
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2021	10/25/2022
Upper Thorax Rib Potentiometer	Honeywell	179GFE	2/1/2022	8/2/2022
Middle Thorax Rib Potentiometer	Honeywell	185GFE	2/1/2022	8/2/2022
Lower Thorax Rib Potentiometer	Honeywell	178GFE	2/1/2022	8/2/2022




Resistive Force
Max: 10677.1 N
Min: -25.8 N
Filter: CFC 180
Force (N)
12500
10000
7500
5000
2500
0
-2500
0
10
20
30
40
50
Time [ms]


Upper Rib Displacement
Max: 39.8 mm
Min: -3.7 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Middle Rib Displacement
Max: 41.6 mm
Min: -3.4 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Lower Rib Displacement
Max: 40.2 mm
Min: -2.8 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]

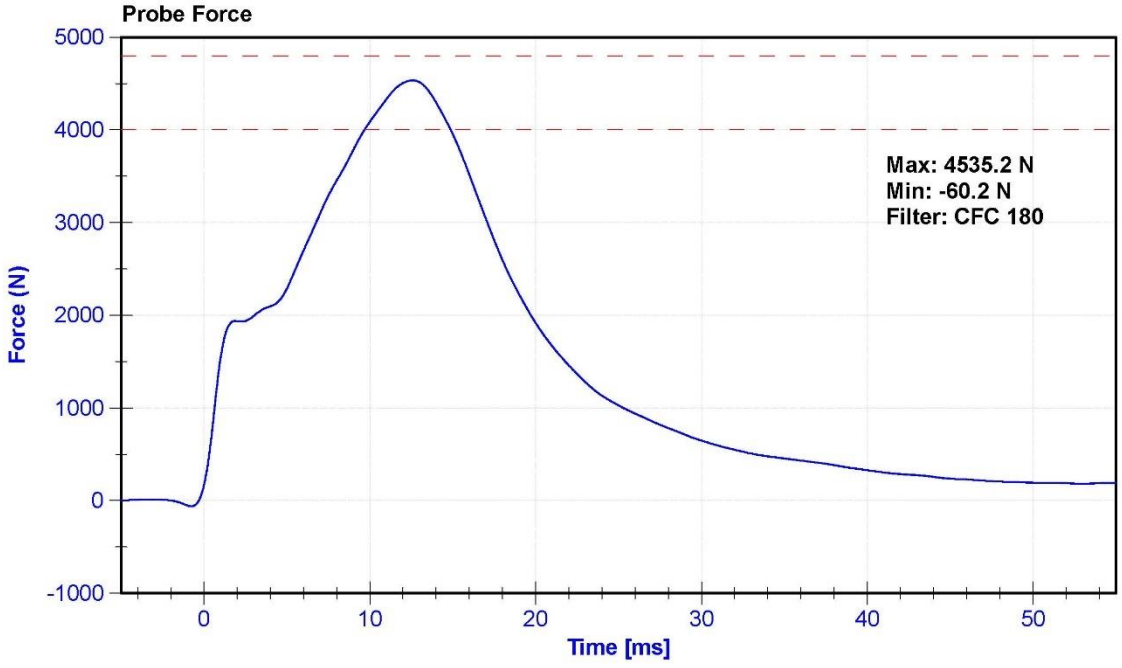
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

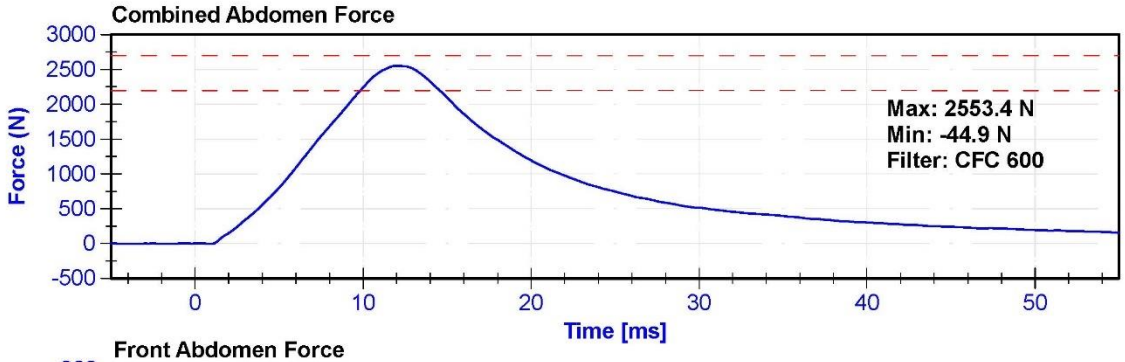
Results

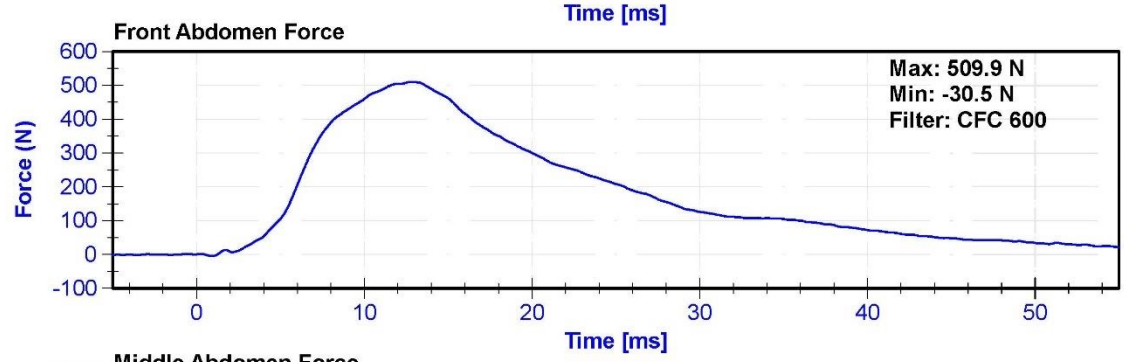
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	54.1	Pass
Velocity	3.9	4.1	m/s	4.04	Pass
Combined Abdomen Force	2200	2700	N	2553.4	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	12.00	Pass
Resistive Probe Force	4000	4800	N	4535.2	Pass
Time at Peak Resistive Force	10.6	13.0	ms	12.60	Pass

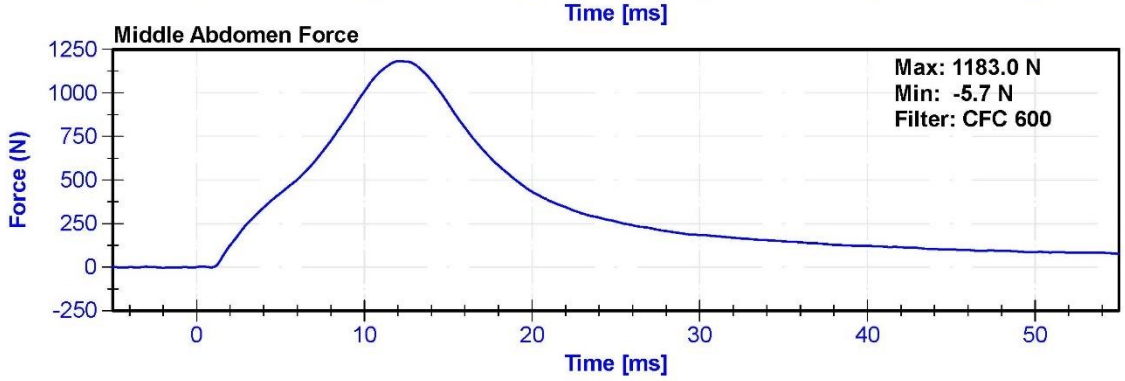
Transducer Calibrations

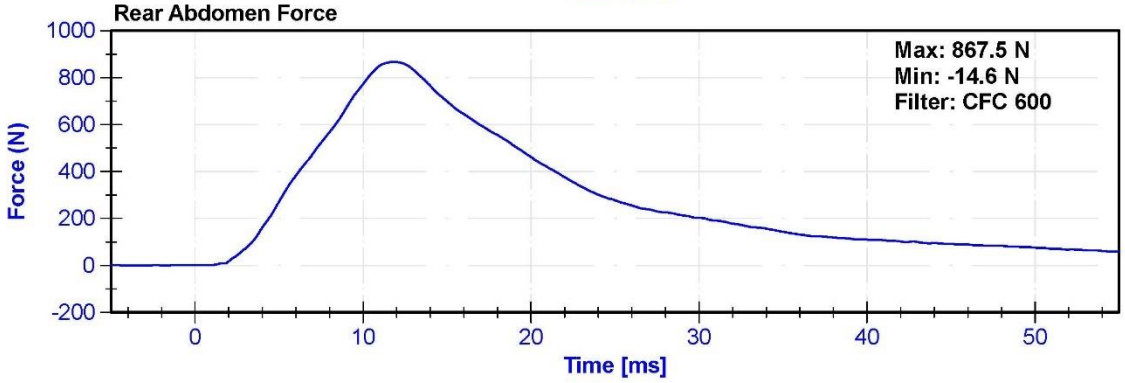
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	10/25/2022
Front Abdomen Load Cell	Denton	1512	8/2/2021	8/2/2022
Middle Abdomen Load Cell	Denton	1526	8/2/2021	8/2/2022
Rear Abdomen Load Cell	Denton	1516	8/2/2021	8/2/2022




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2553.4 N
Min: -44.9 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 509.9 N
Min: -30.5 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1183.0 N
Min: -5.7 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 867.5 N
Min: -14.6 N
Filter: CFC 600

ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

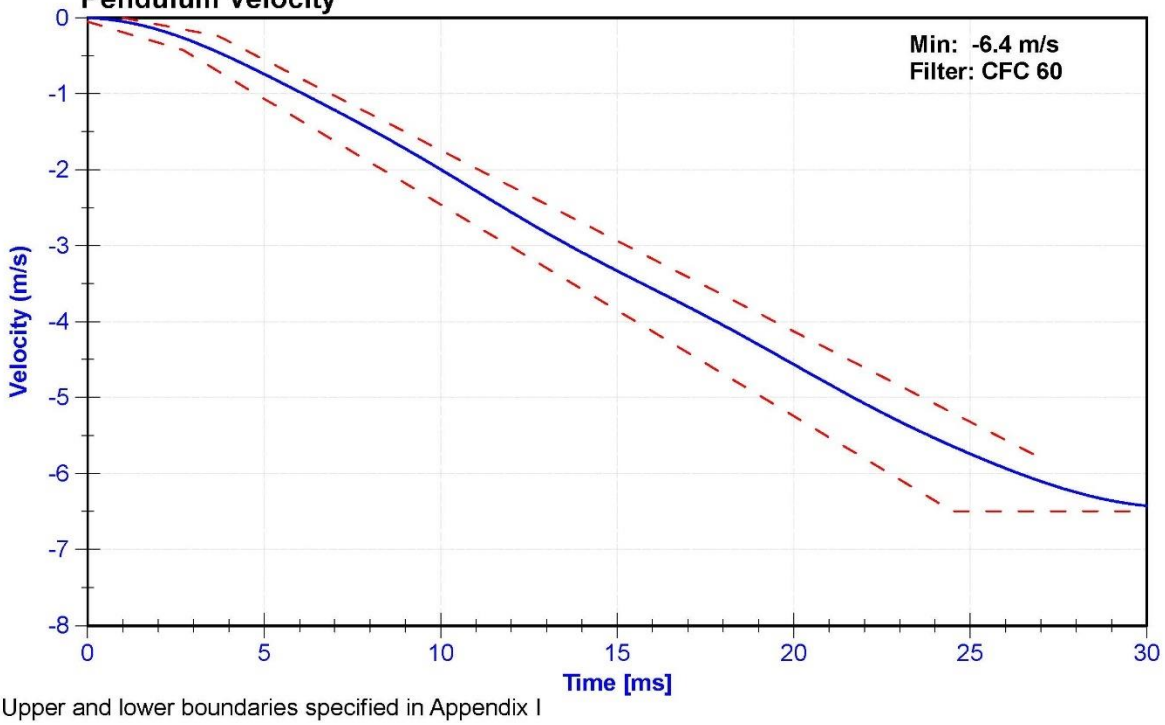
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	49.1	Pass
Velocity	5.95	6.15	m/s	6.026	Pass
Lateral Spine Rotation	45	55	deg	45.5	Pass
Time at Maximum Rotation	39	53	ms	43.4	Pass
Time of Decay to Zero Degrees	37	57	ms	37.2	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

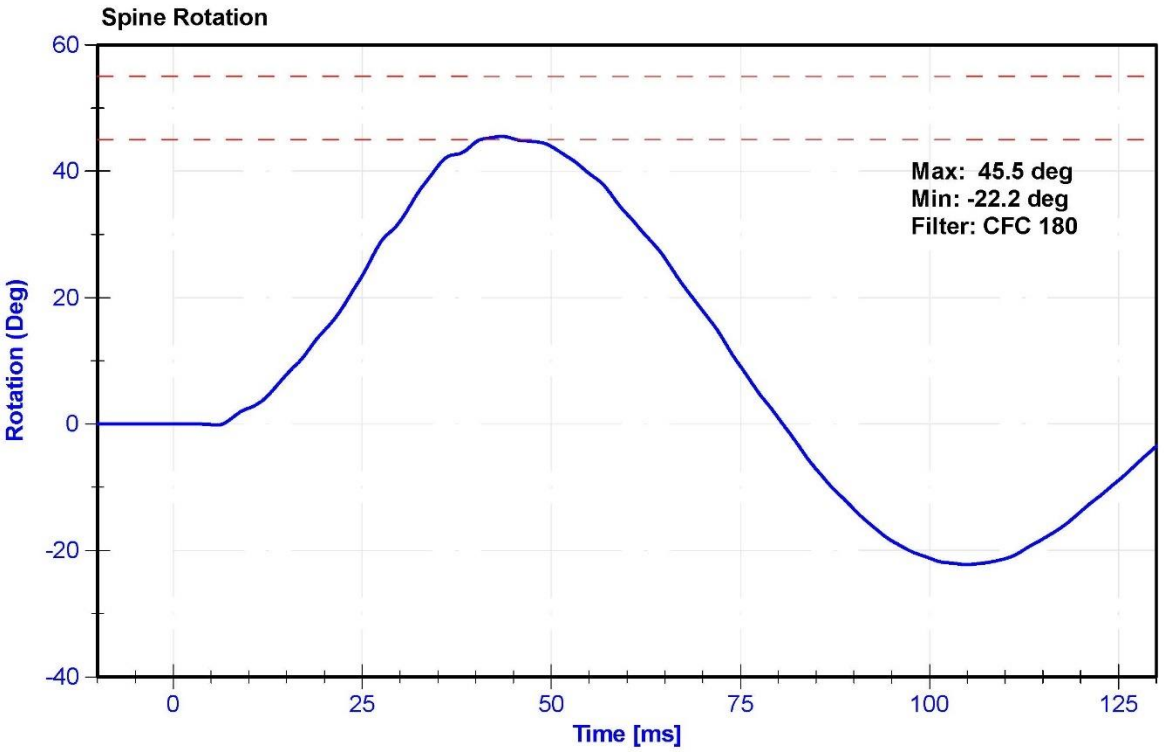
Transducer Calibrations

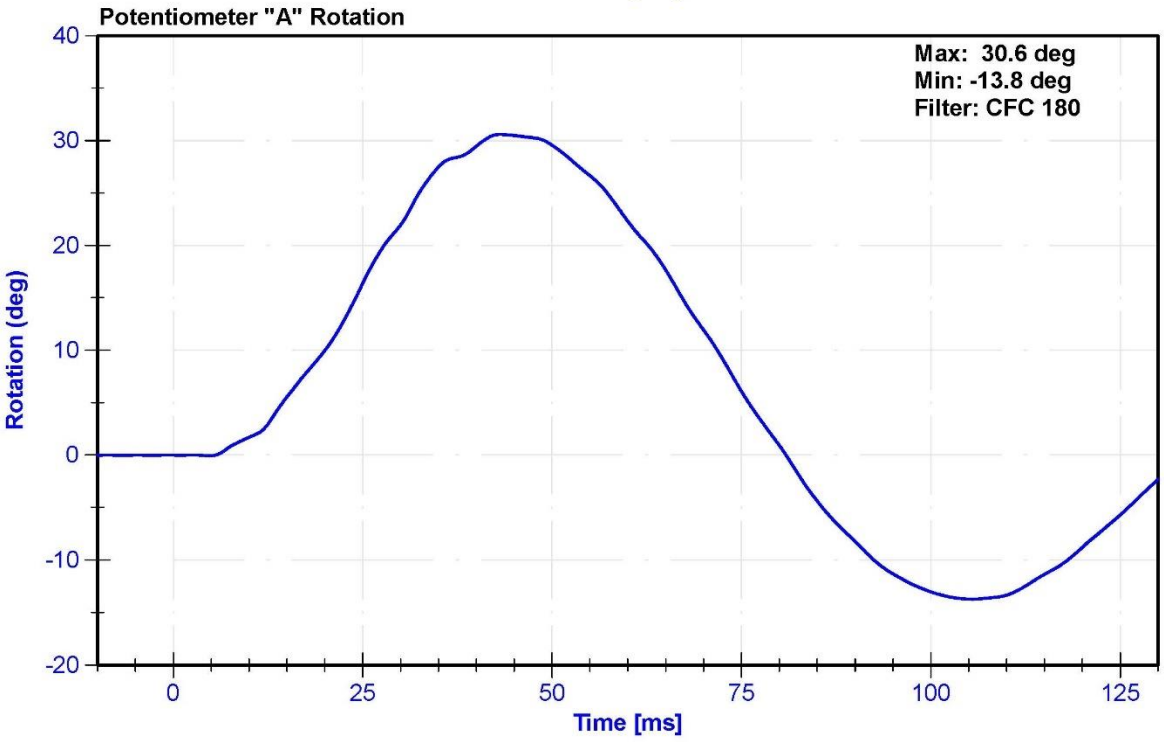
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Pendulum "A" Potentiometer	Sfernice	094	10/1/2021	10/1/2022
Condyle "B" Potentiometer	Sfernice	095	10/1/2021	10/1/2022

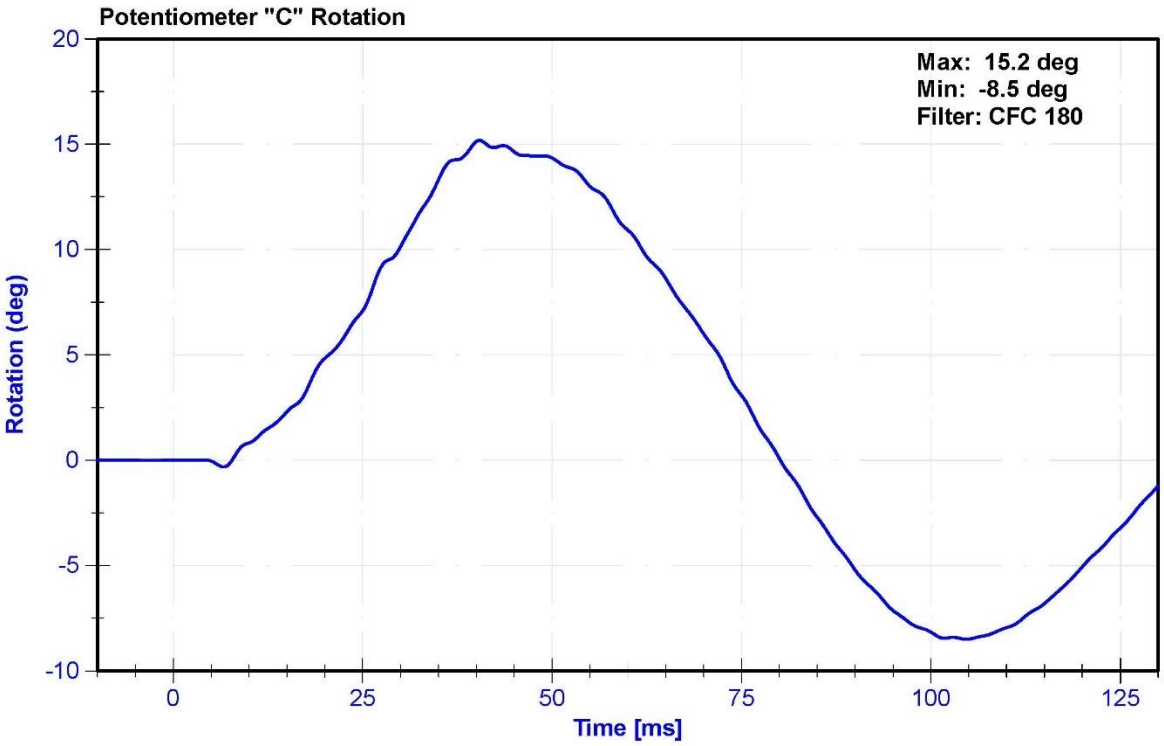
Pendulum Velocity[3]



[1,2] Upper and lower boundaries specified in Appendix I


Spine Rotation
Max: 45.5 deg
Min: -22.2 deg
Filter: CFC 180
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 30.6 deg
Min: -13.8 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]



Appendix I

[2] Upper Boundary Corridor		[1] Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.7	-0.24	2.7	-0.425
27.0	-5.80	24.5	-6.5
		30.0	-6.5

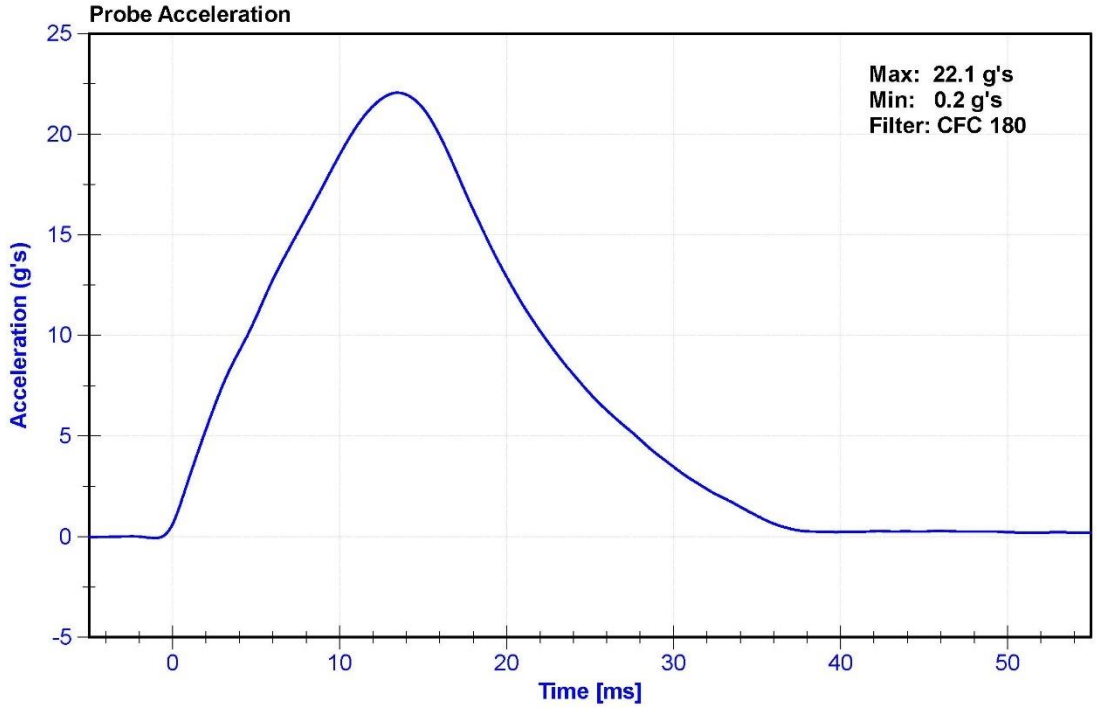
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

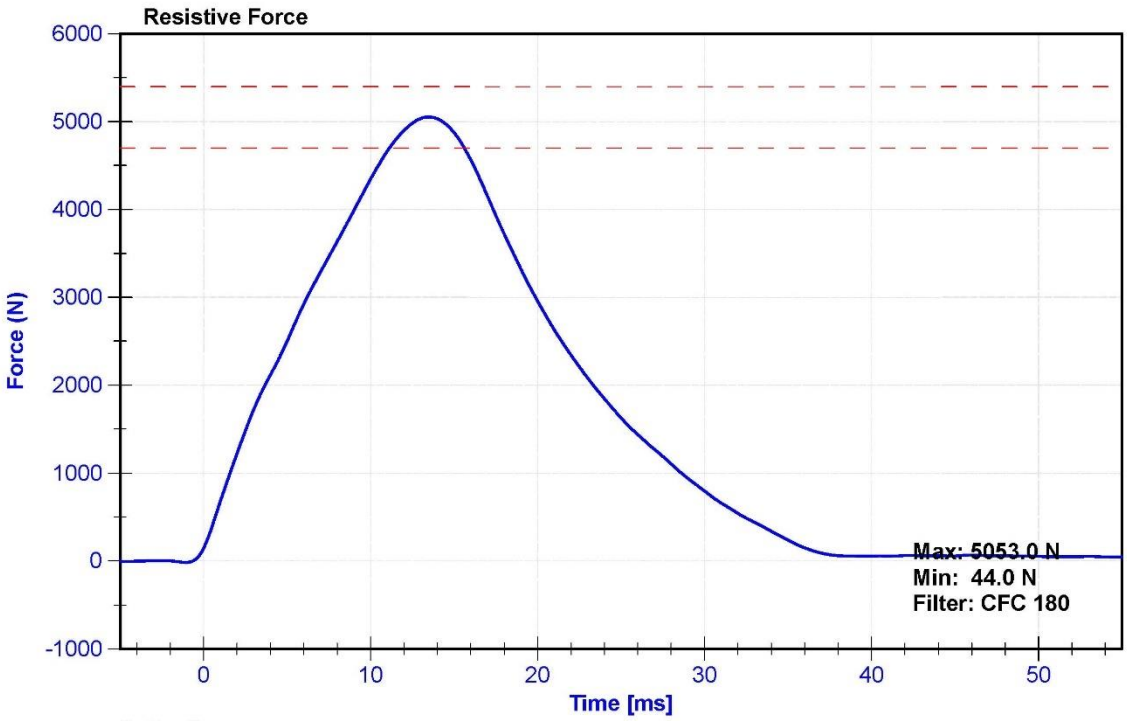
Results

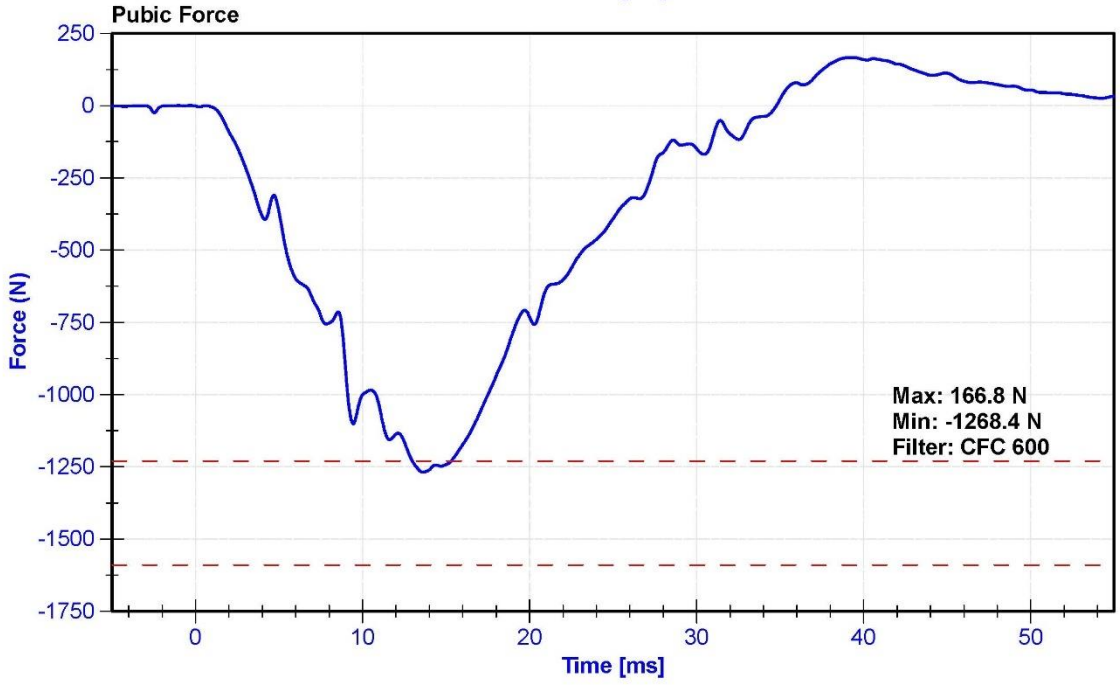
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	54.1	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Resistive Force	4700	5400	N	5053.0	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.45	Pass
Pubic Force	-1590	-1230	N	-1268.4	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.60	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	10/25/2022
Pubic Load Cell	Denton	464-FY	8/2/2021	8/2/2022




Resistive Force
Force (N)
Time [ms]
Max: 5053.0 N
Min: 44.0 N
Filter: CFC 180


Pubic Force
Force (N)
Time [ms]
Max: 166.8 N
Min: -1268.4 N
Filter: CFC 600

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

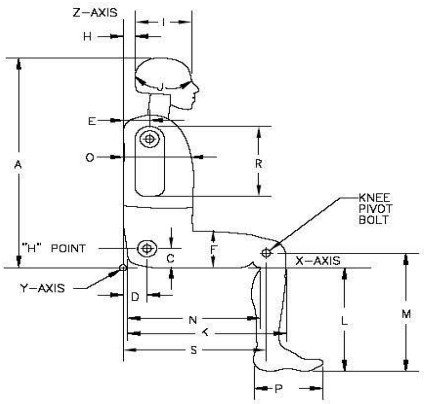
SERIAL No: 300

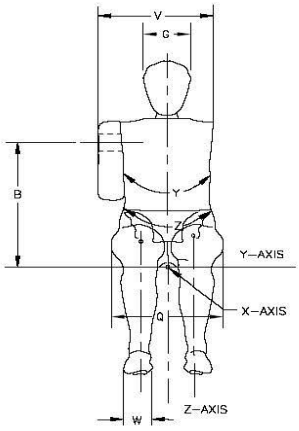
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Brogan Date: 06/28/2022

Dummy Serial Number: 300





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	778	Pass
B	Shoulder Pivot Height	437	453	445	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	105	Pass
F	Thigh Clearance	119	135	125	Pass
G	Head Breadth	140	148	145	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	182	Pass
J	Head Circumference	541	551	546	Pass
K	Buttock to Knee Length	514	540	528	Pass
L	Popliteal Height	343	369	362	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	432	Pass
O	Chest Depth w/o jacket	195	211	204	Pass
P	Foot Length	216	232	223	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	315	Pass
R	Arm Length	249	259	250	Pass
S	Knee Joint to seatback	477	493	486	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	86	Pass
Y	Chest Circumference w/jacket	851	881	879	Pass
Z	Waist Circumference	761	791	775	Pass

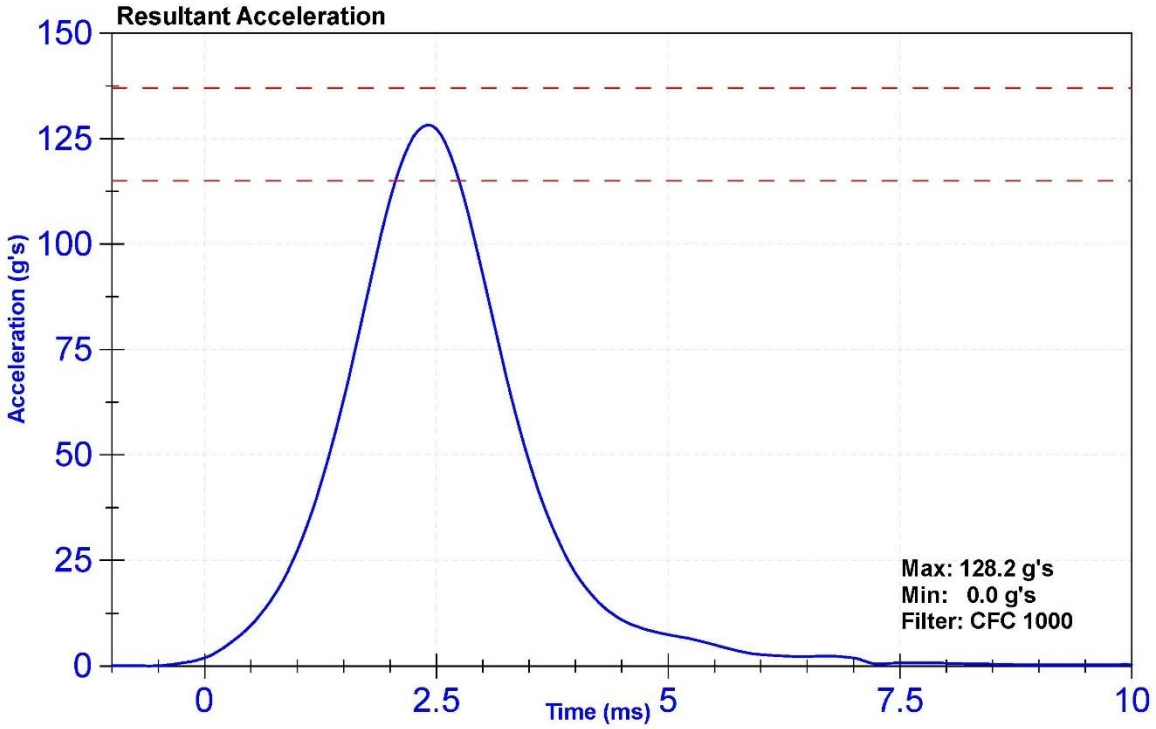
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

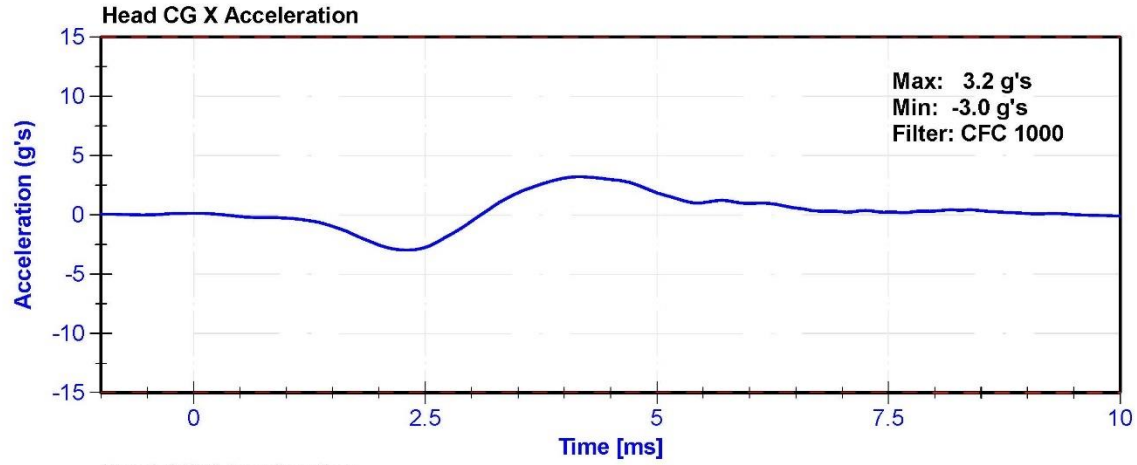
Results

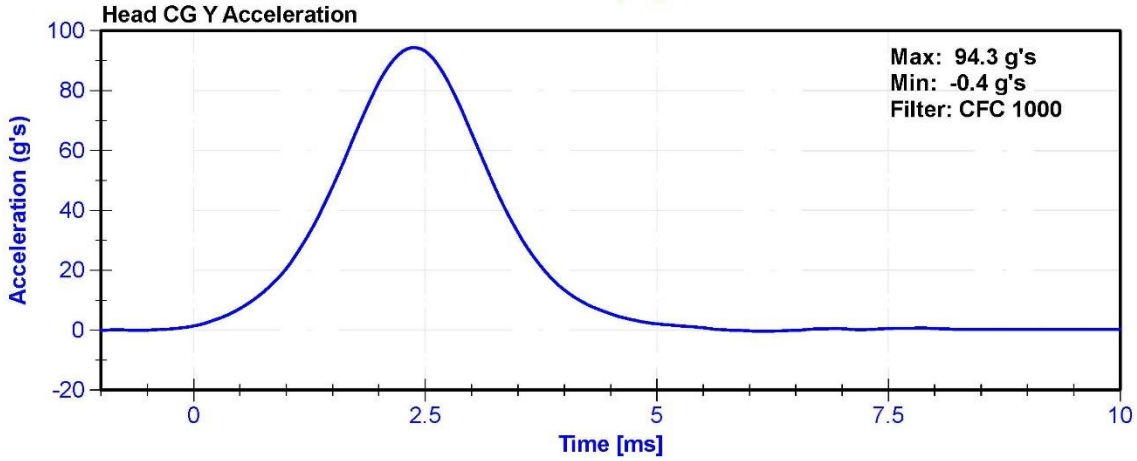
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	56	Pass
Resultant Acceleration	115	137	g's	128.2	Pass
Oscillation	0	15	%	1.8	Pass
Fore-Aft Acceleration	-15	15	g's	3.2	Pass

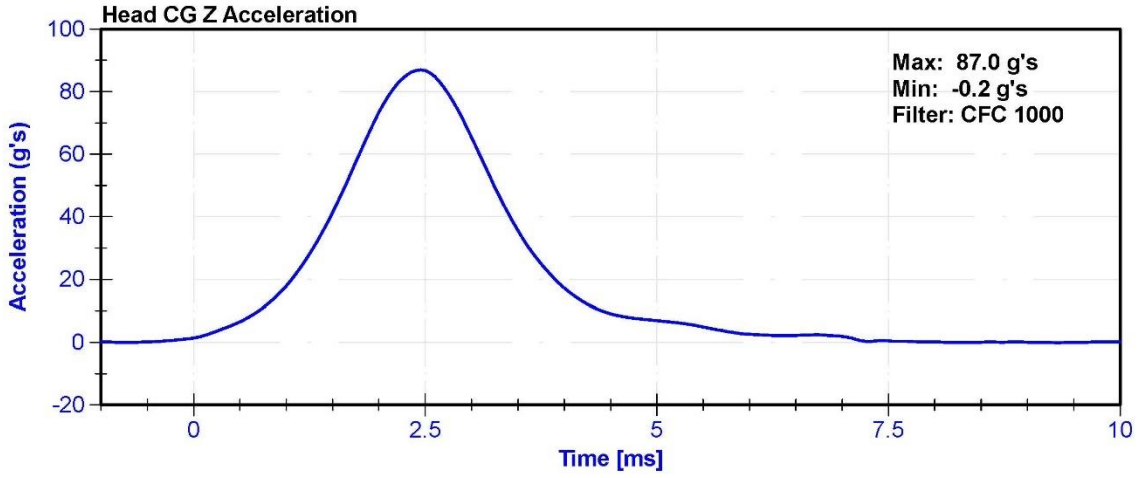
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P59018	5/17/2022	11/13/2022
Y Accelerometer	Endevco	P79189	5/17/2022	11/13/2022
Z Accelerometer	Endevco	P58777	5/17/2022	11/13/2022




Head CG X Acceleration
Max: 3.2 g's
Min: -3.0 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 94.3 g's
Min: -0.4 g's
Filter: CFC 1000
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 87.0 g's
Min: -0.2 g's
Filter: CFC 1000
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]

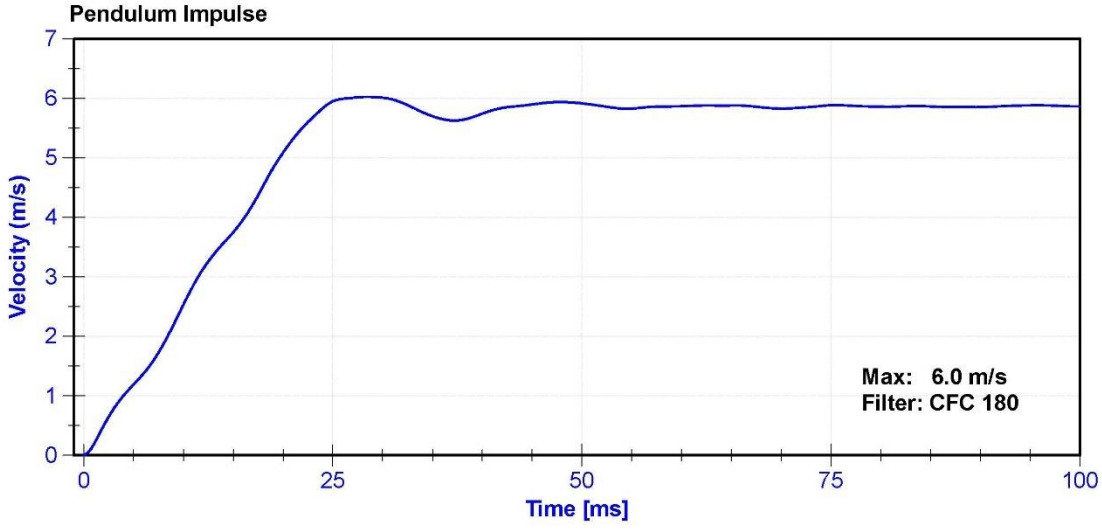
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

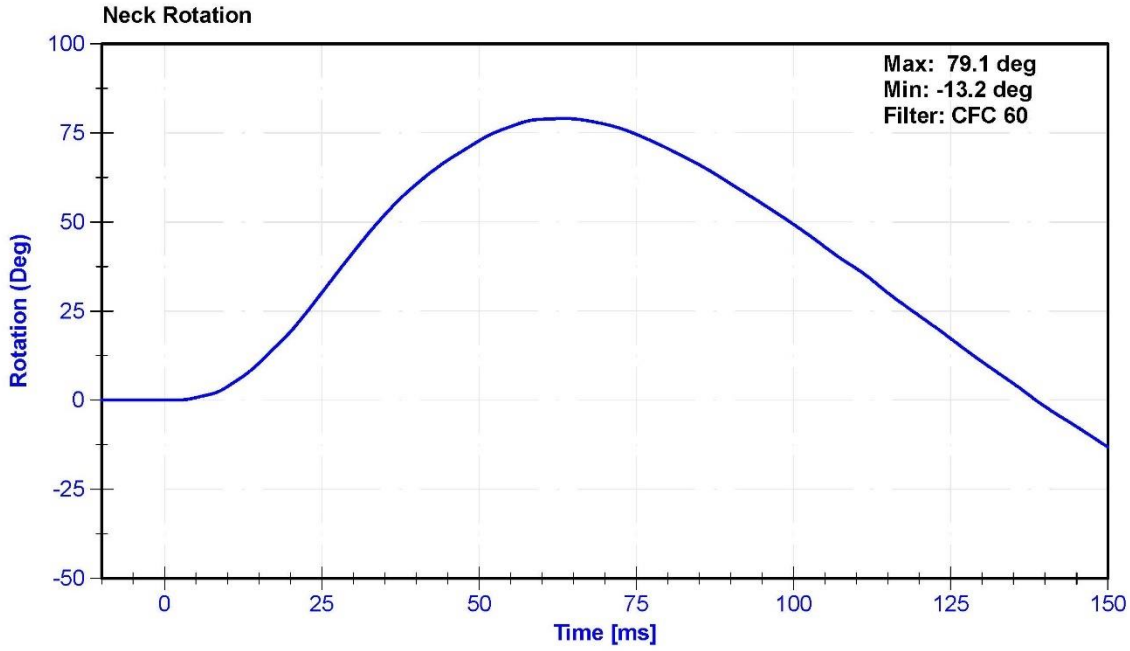
Results

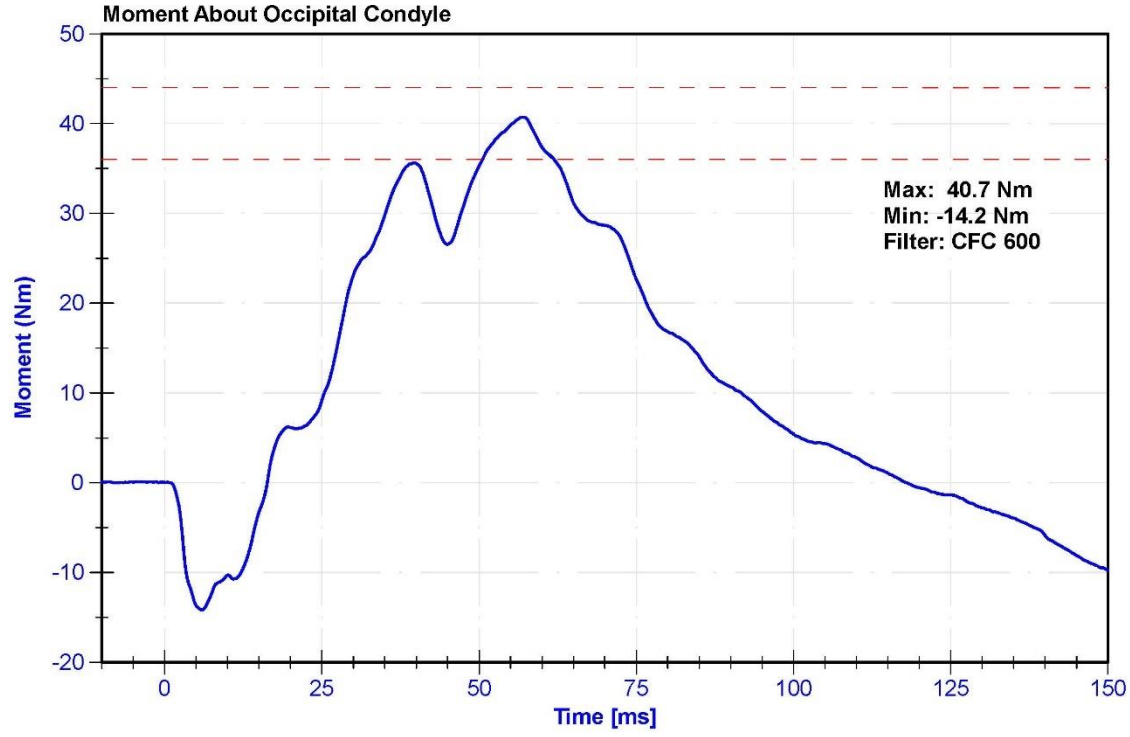
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	57.8	Pass
Velocity	5.51	5.63	m/s	5.627	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.53	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.75	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	5.09	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.95	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	6.02	Pass
Neck Rotation	71	81	deg	79.1	Pass
Time at Maximum Rotation	50	70	ms	63.6	Pass
Moment about the OC	36	44	Nm	40.7	Pass
Moment Decay to 0 Nm	102	126	ms	118.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	1/31/2022	7/30/2022
Pendulum Potentiometer	Servo	4961	2/23/2022	2/23/2023
Condyle Potentiometer	Servo	DS185	11/12/2021	11/12/2022
Upper Neck Load Cell	Denton	1716A-1037-FY	6/29/2021	6/29/2022




Neck Rotation
Max: 79.1 deg
Min: -13.2 deg
Filter: CFC 60
Rotation (Deg)
Time [ms]
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150


Moment About Occipital Condyle
Max: 40.7 Nm
Min: -14.2 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150

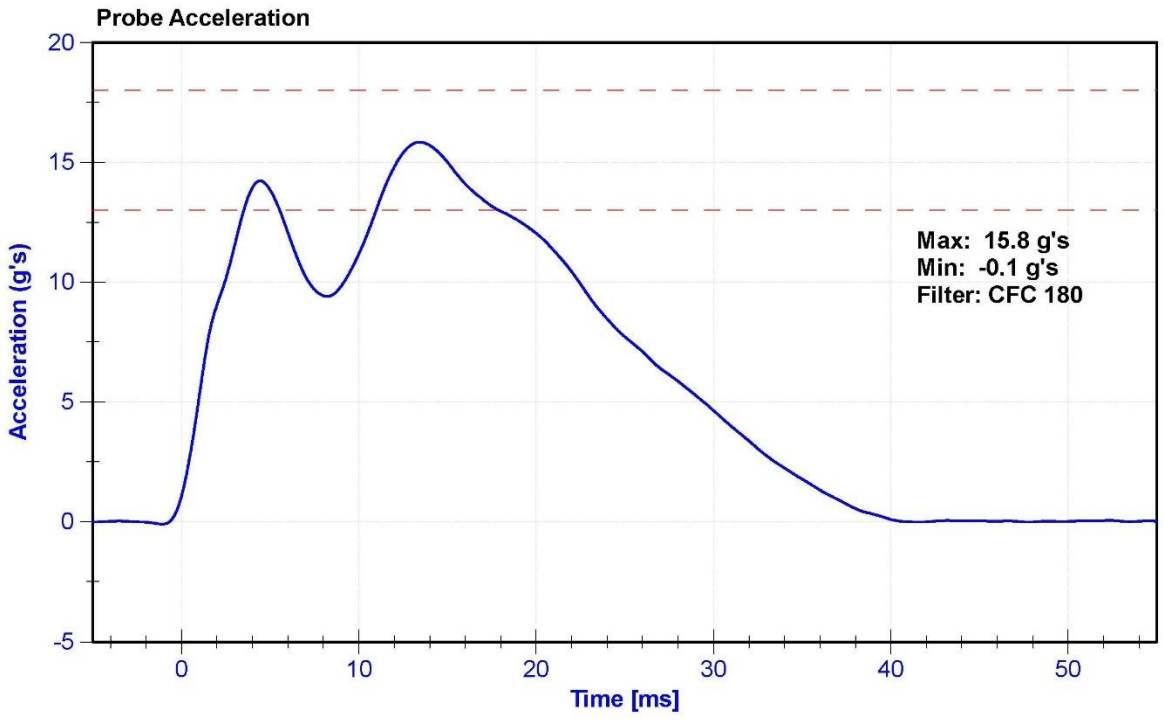
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

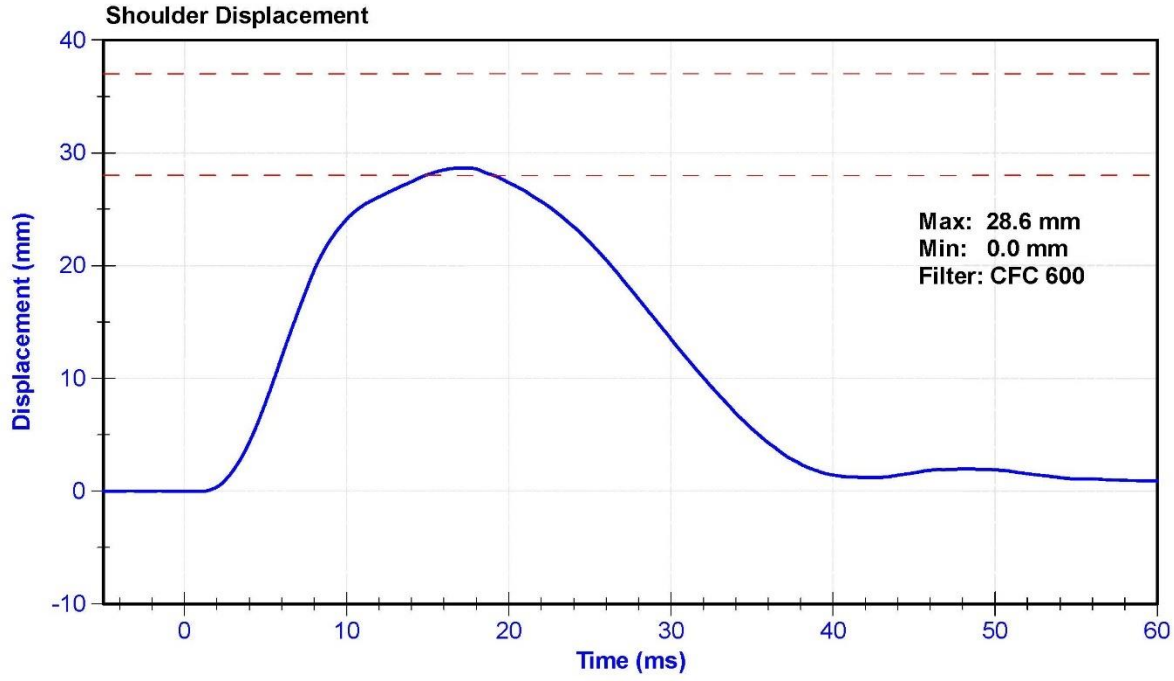
Results

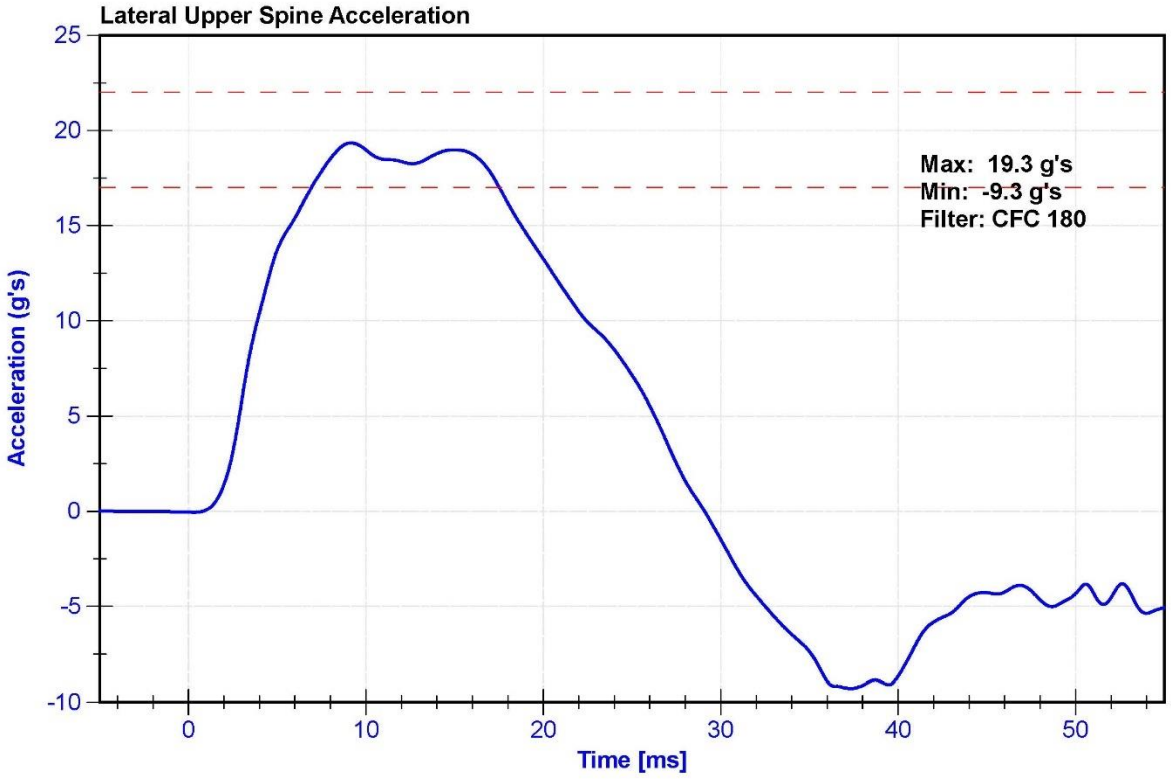
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	47.2	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	13	18	g's	15.8	Pass
Shoulder Deflection	28	37	mm	28.6	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Shoulder Potentiometer	Servo	053GFE	5/18/2022	11/16/2022
Upper Spine Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 28.6 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 19.3 g's
Min: -9.3 g's
Filter: CFC 180

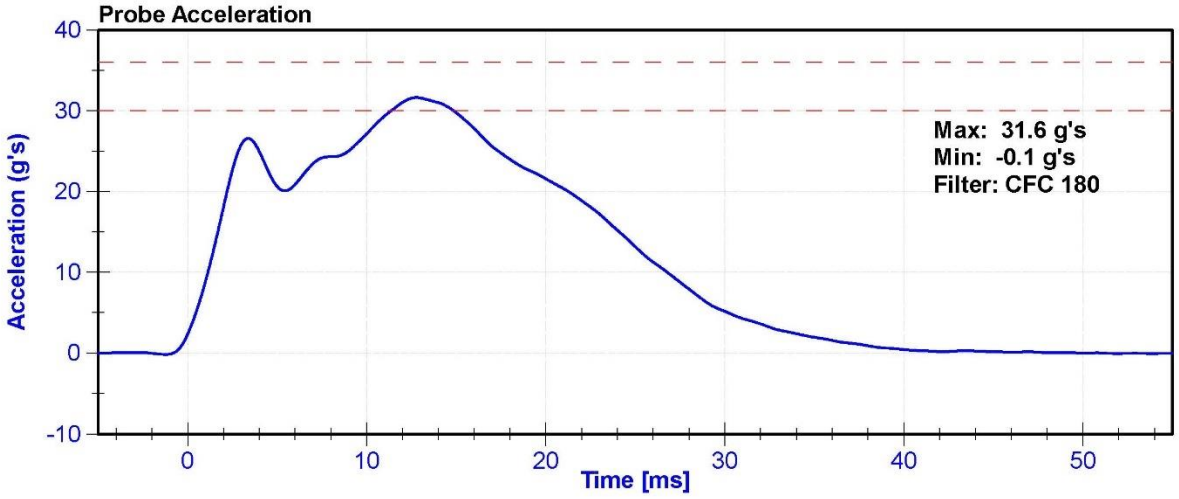
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

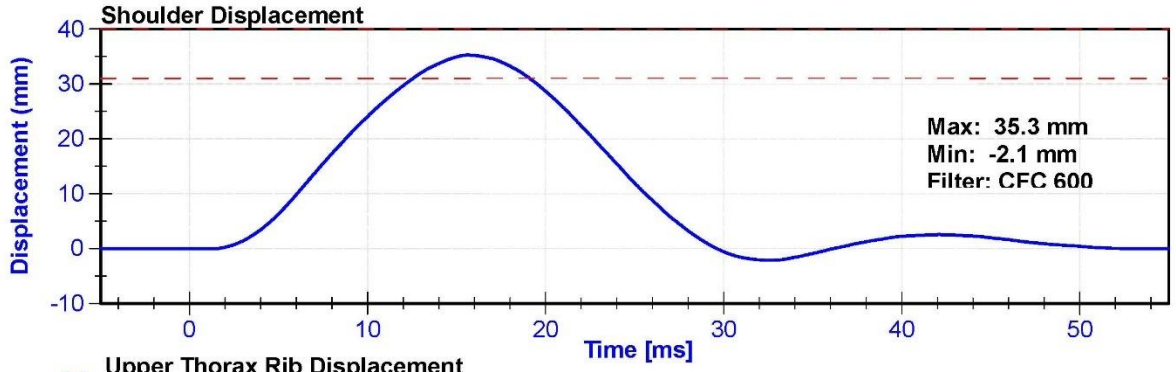
Results

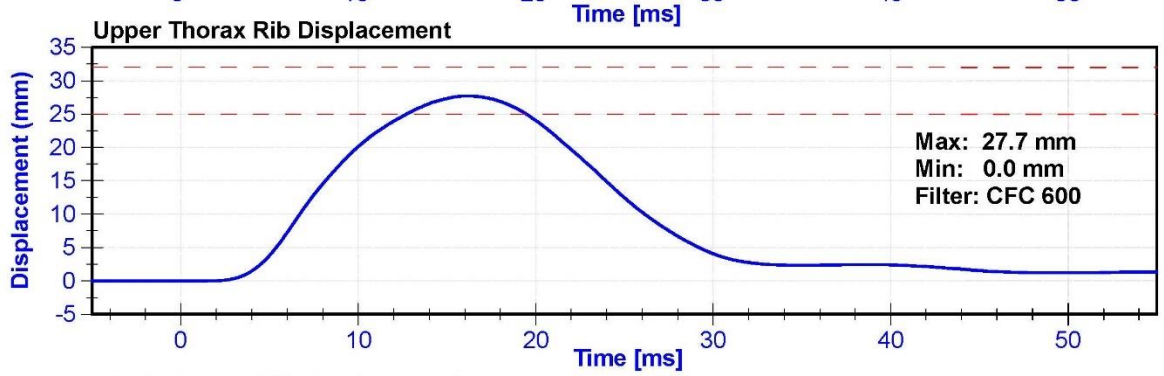
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	47.2	Pass
Velocity	6.6	6.8	m/s	6.74	Pass
Probe Acceleration after 5 ms	30	36	g's	31.6	Pass
Lateral Upper Spine Acceleration	34	43	g's	36.9	Pass
Lateral Lower Spine Acceleration	29	37	g's	30.6	Pass
Shoulder Deflection	31	40	mm	35.3	Pass
Upper Thorax Rib Deflection	25	32	mm	27.7	Pass
Mid Thorax Rib Deflection	30	36	mm	33.6	Pass
Lower Thorax Rib Deflection	32	38	mm	35.7	Pass

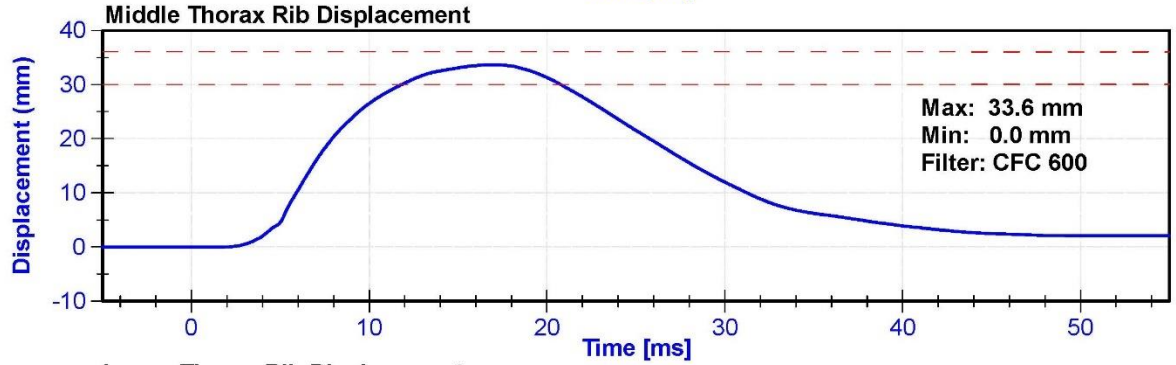
Transducer Calibrations

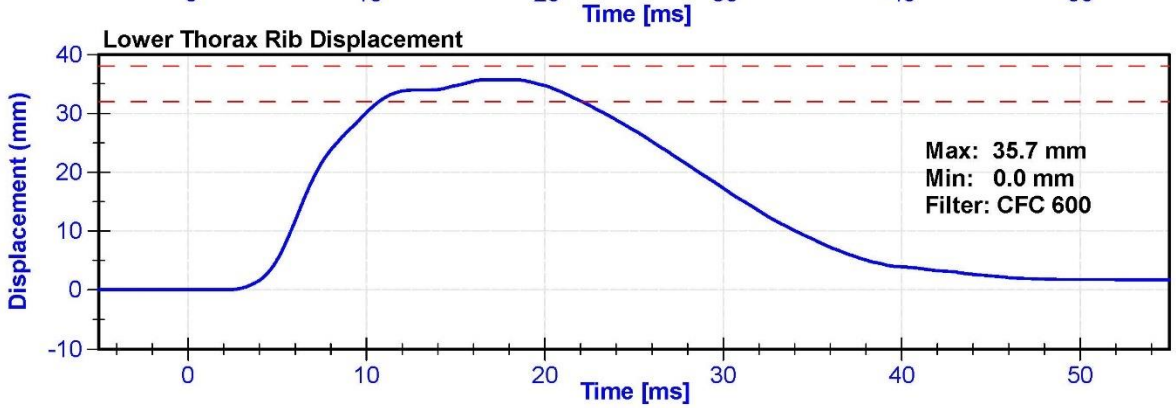
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Upper Spine T1 Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022
Upper Spine T12 Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Shoulder Potentiometer	Servo	053GFE	5/18/2022	11/16/2022
Upper Thorax Rib Potentiometer	Servo	2316GFE	6/27/2022	12/26/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	5/18/2022	11/16/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	5/18/2022	11/16/2022

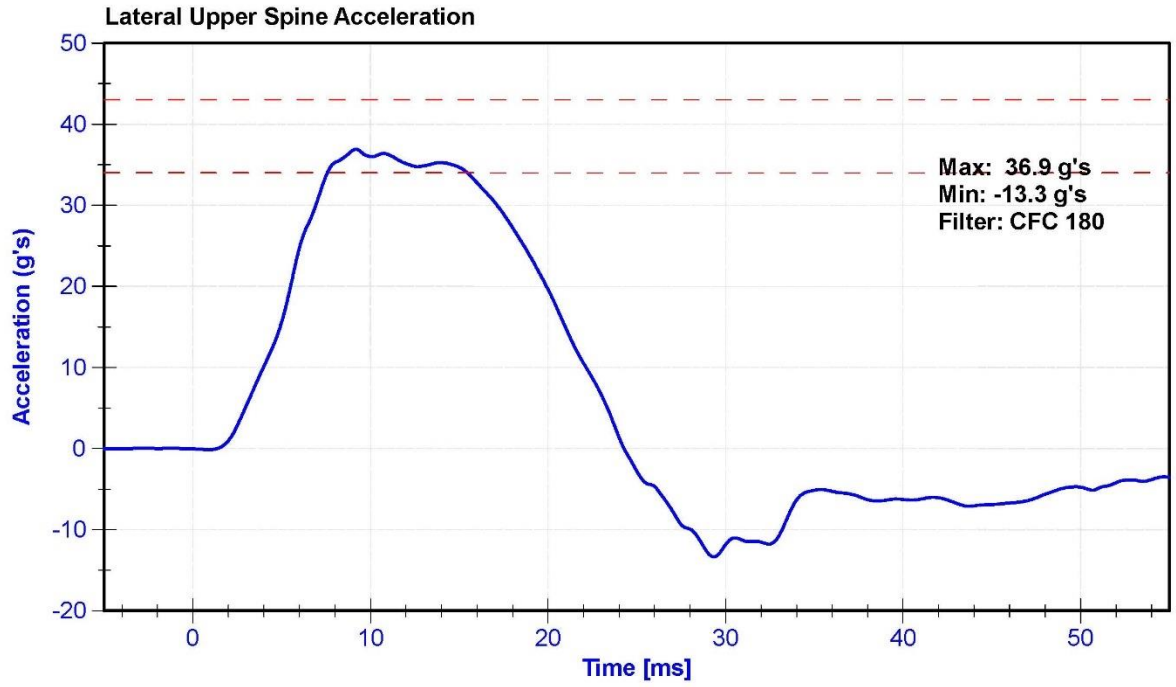


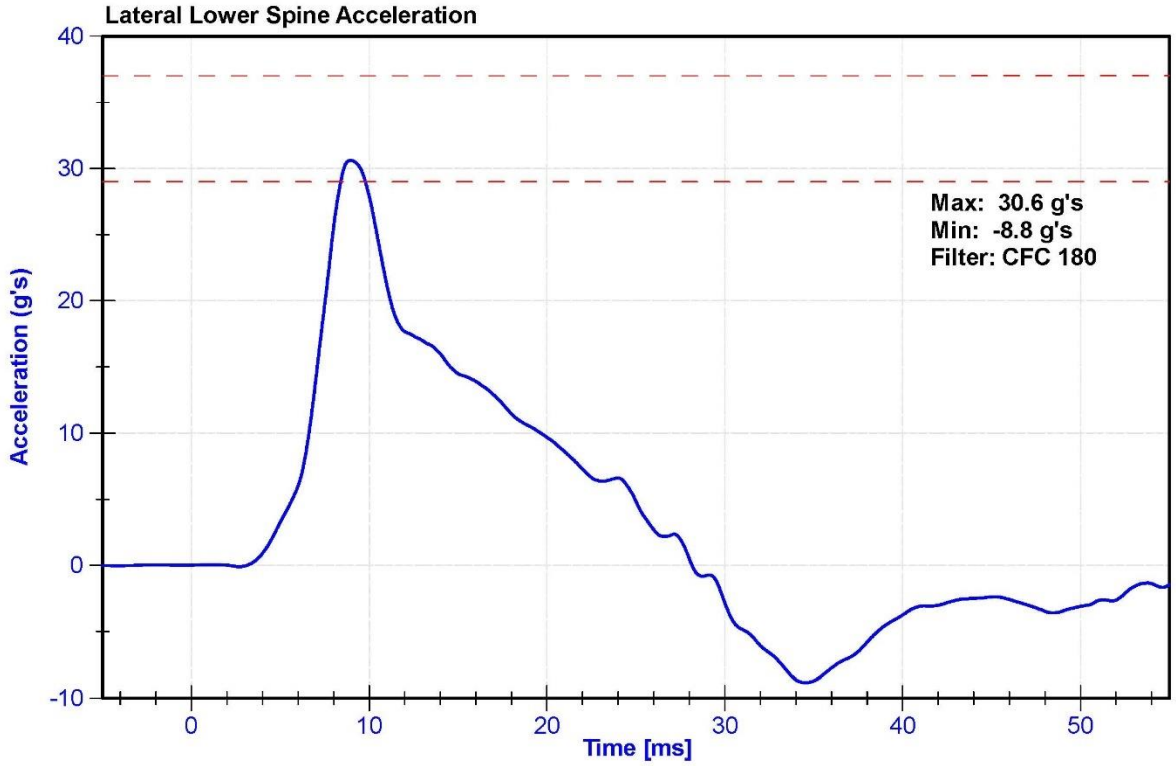

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 35.3 mm
Min: -2.1 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 27.7 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.6 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 35.7 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 36.9 g's
Min: -13.3 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 30.6 g's
Min: -8.8 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

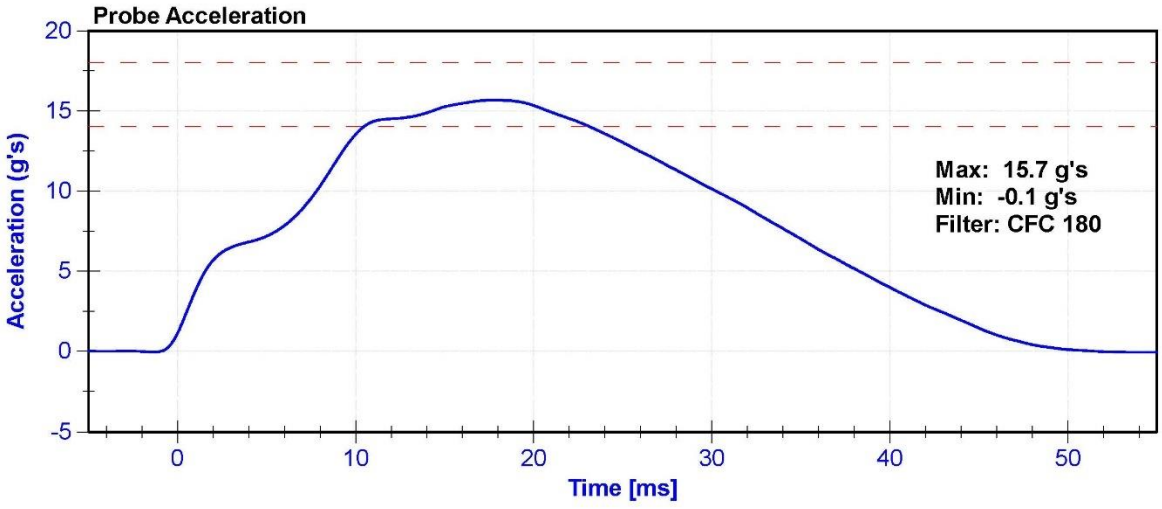
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

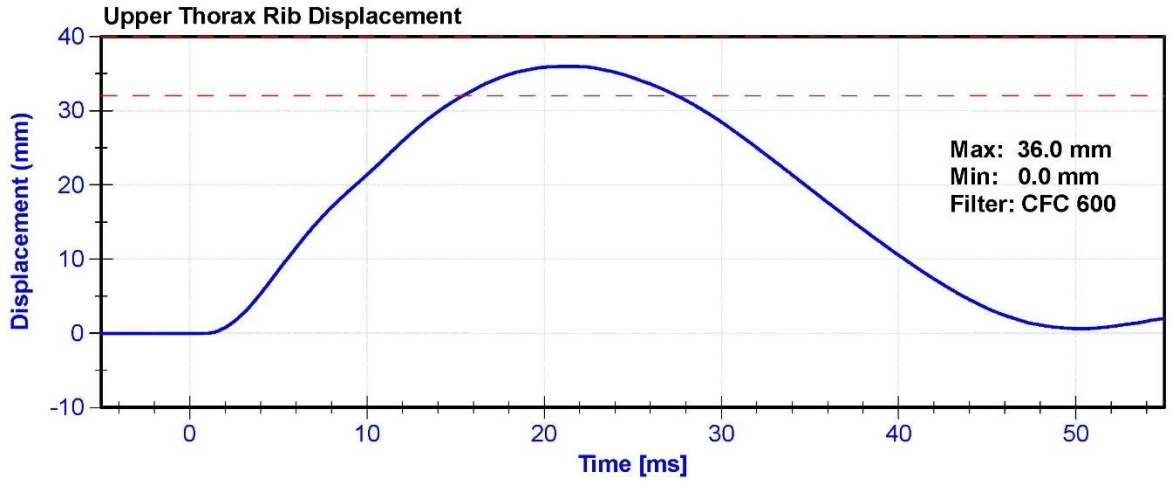
Results

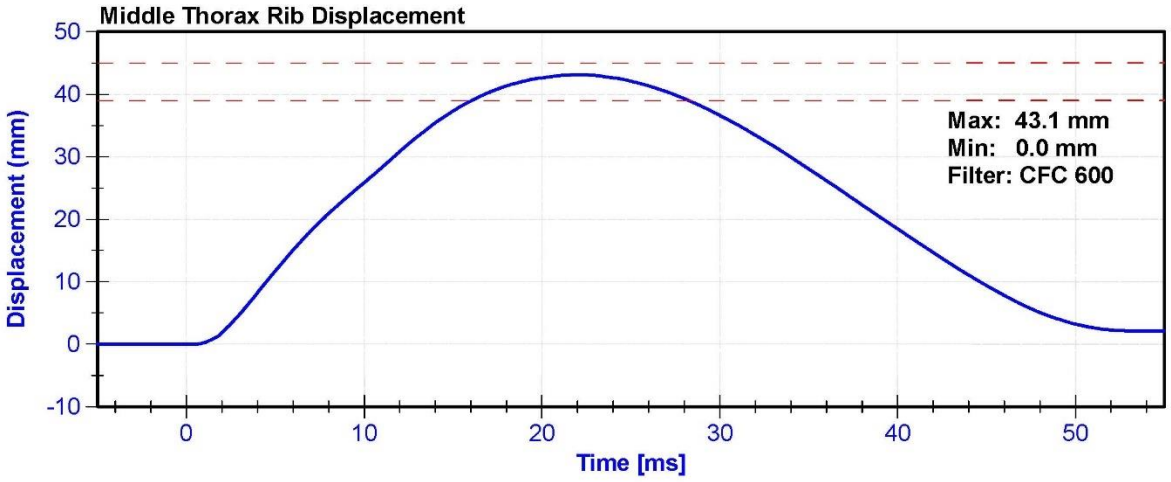
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	47.2	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	14	18	g's	15.7	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.7	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.2	Pass
Upper Thorax Rib Deflection	32	40	mm	36.0	Pass
Middle Thorax Rib Deflection	39	45	mm	43.1	Pass
Lower Thorax Rib Deflection	35	43	mm	40.2	Pass

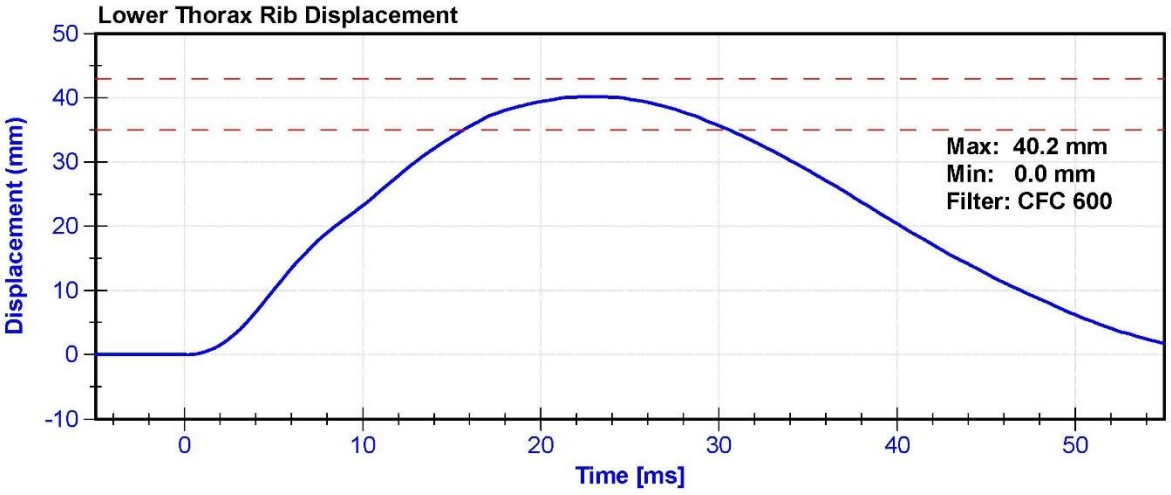
Transducer Calibrations

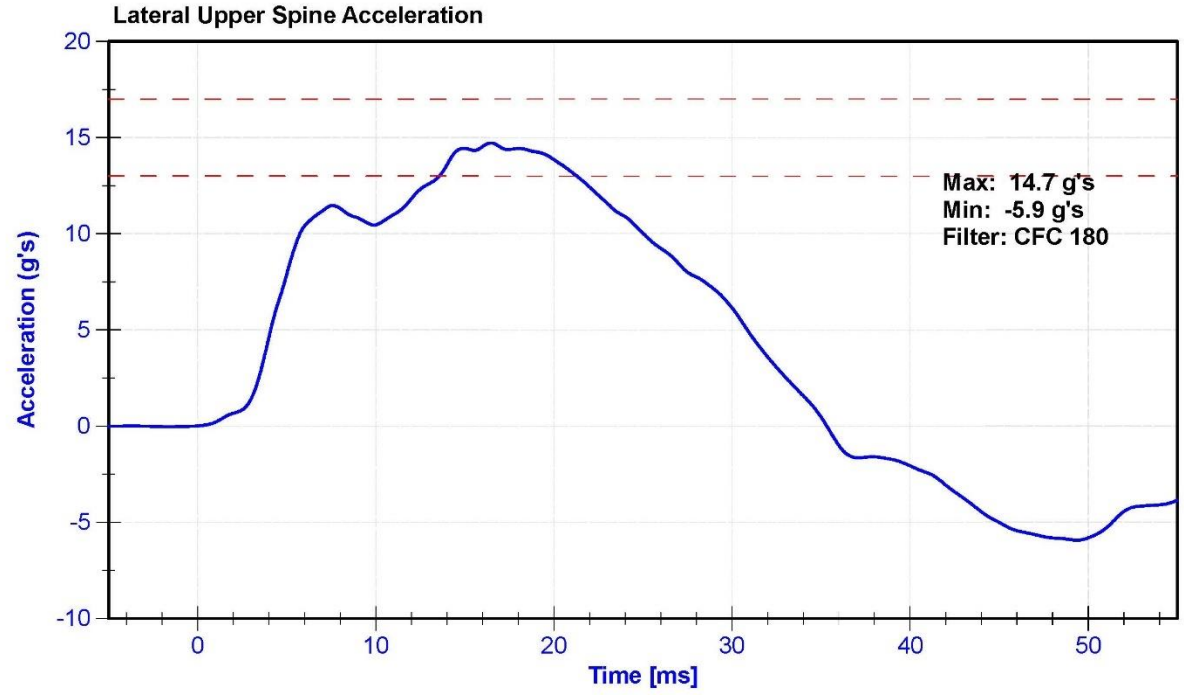
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Upper Spine Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022
Lower Spine Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Upper Thorax Rib Potentiometer	Servo	2316GFE	6/27/2022	12/26/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	5/18/2022	11/16/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	5/18/2022	11/16/2022

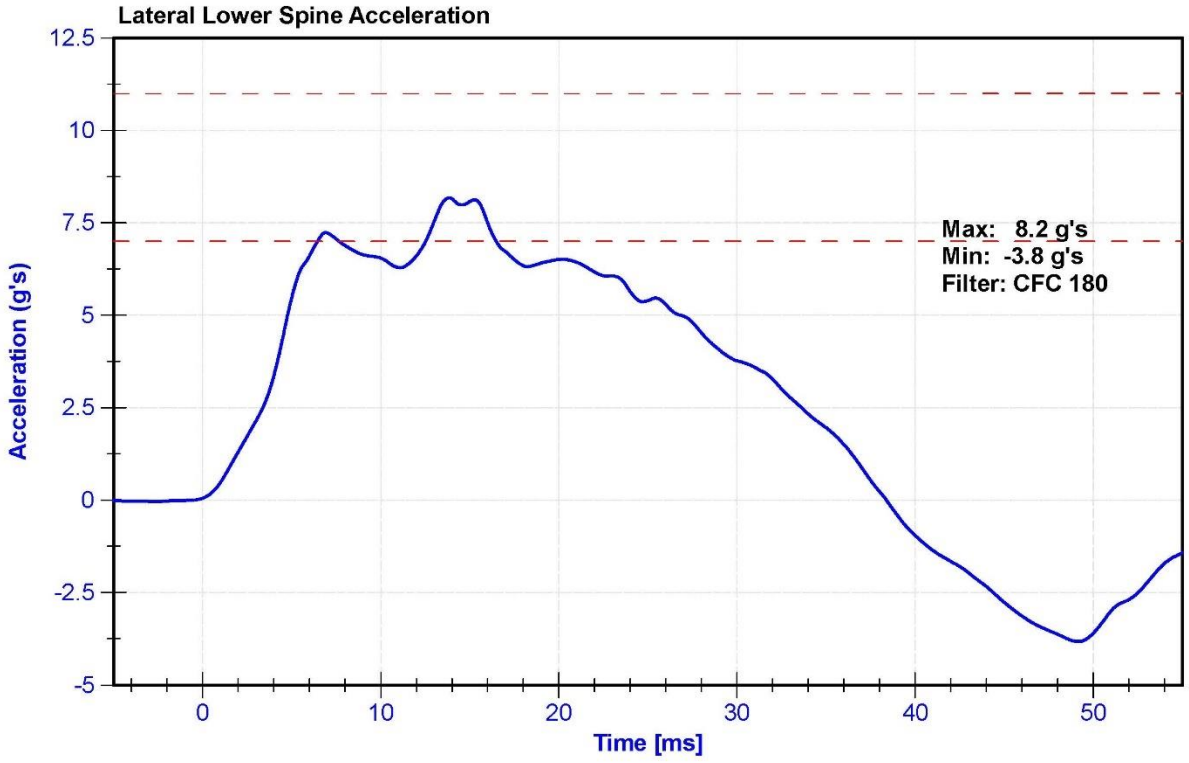



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 36.0 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 43.1 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.2 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 14.7 g's
Min: -5.9 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 8.2 g's
Min: -3.8 g's
Filter: CFC 180

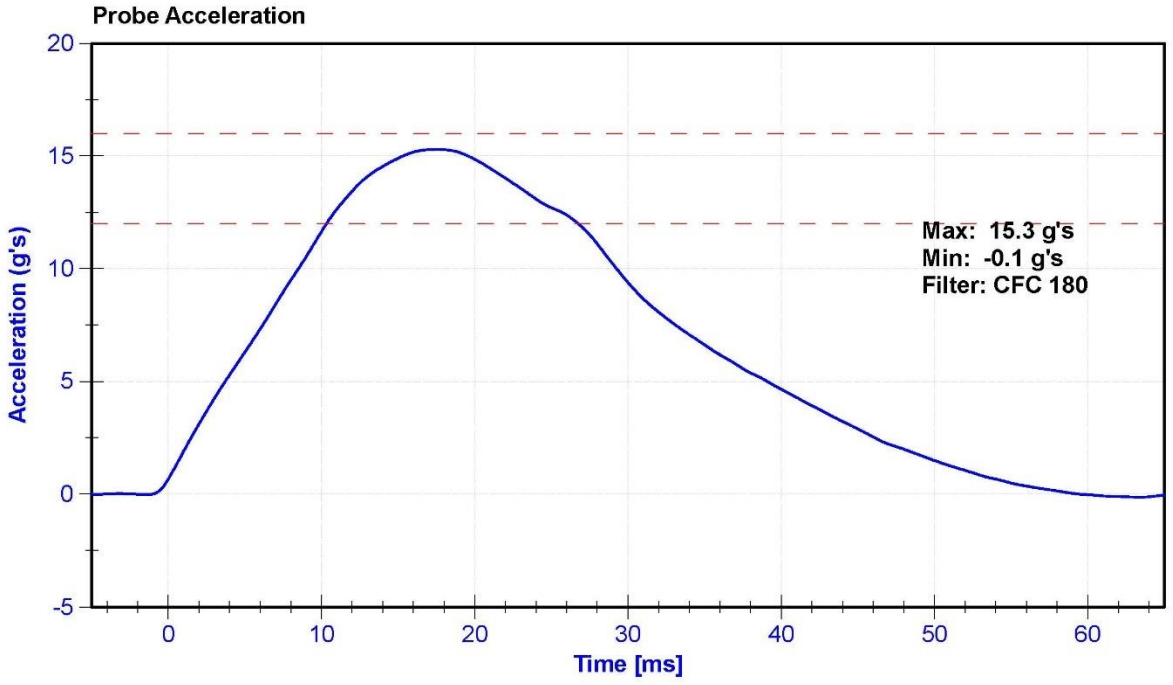
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

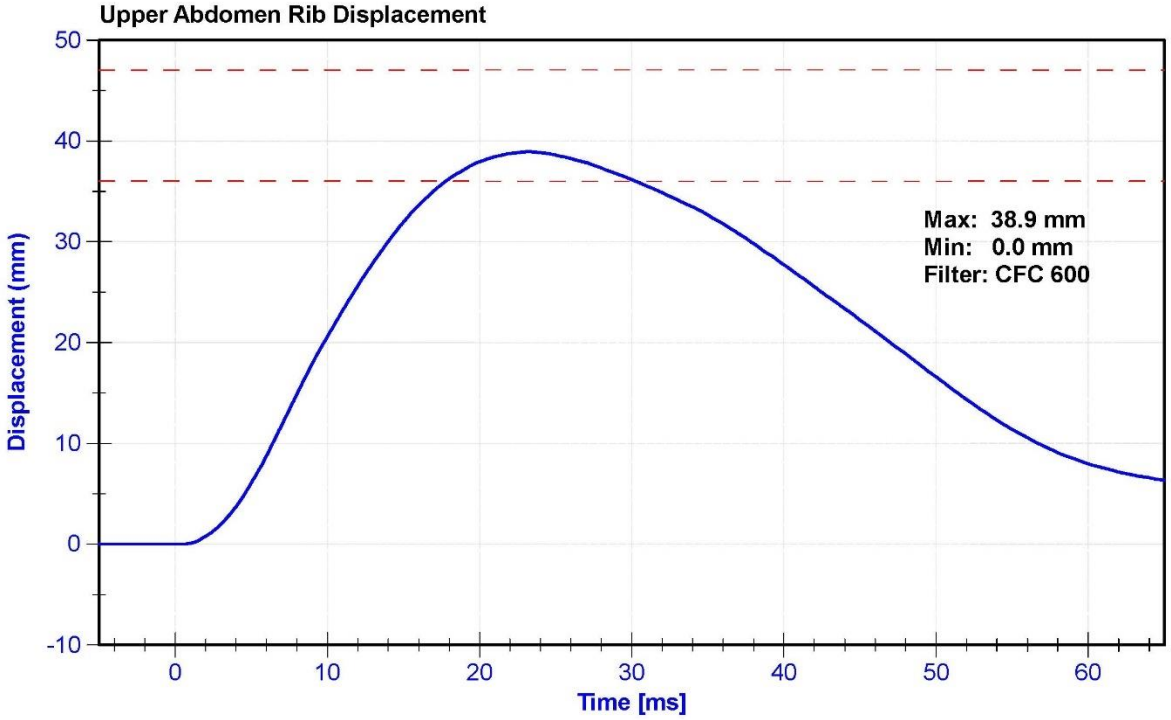
Results

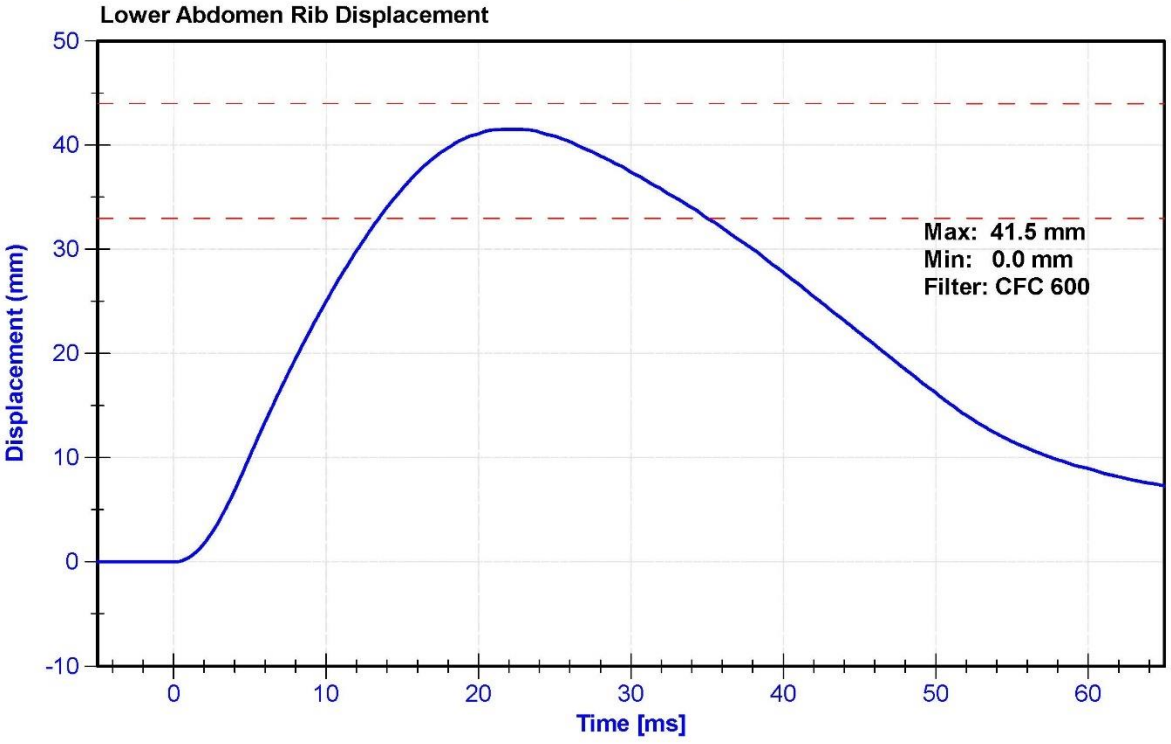
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	47.2	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	12	16	g's	15.3	Pass
Lateral Lower Spine Acceleration	9	14	g's	12.7	Pass
Upper Abdomen Rib Deflection	36	47	mm	38.9	Pass
Lower Abdomen Rib Deflection	33	44	mm	41.5	Pass

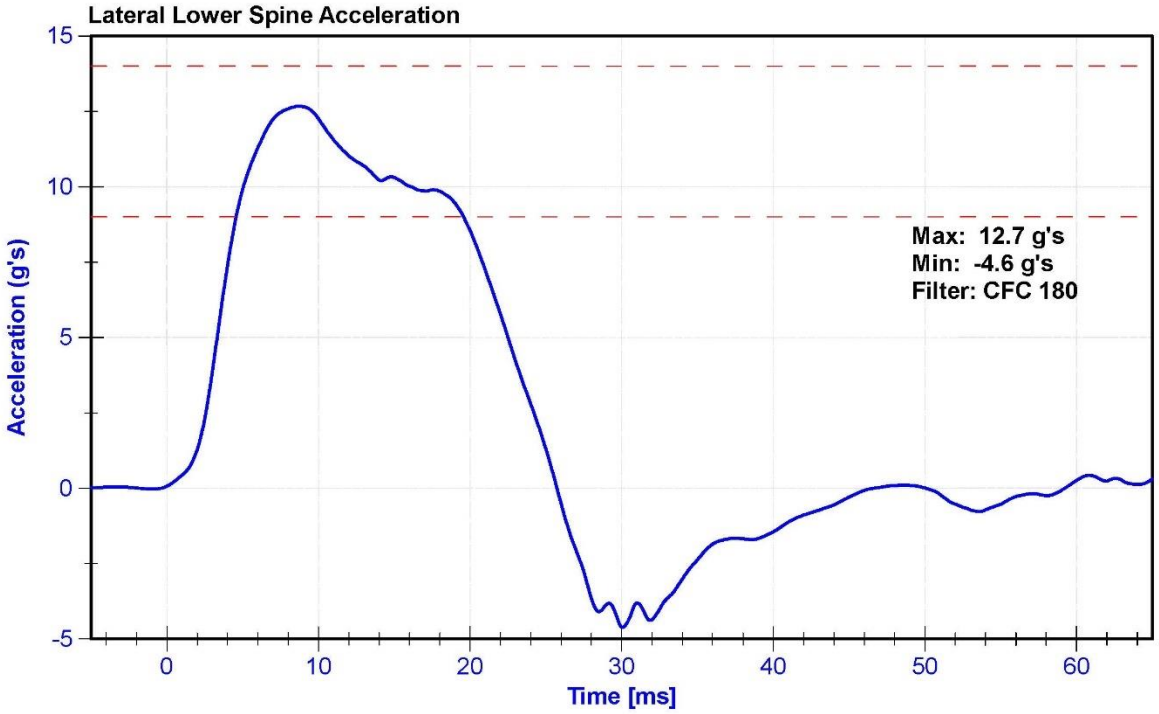
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Lower Spine Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Upper Abdomen Rib Potentiometer	Servo	307GFE	5/20/2022	11/18/2022
Lower Abdomen Rib Potentiometer	Servo	308GFE	5/18/2022	11/16/2022




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.9 mm
Min: 0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.5 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Max: 12.7 g's
Min: -4.6 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
15
10
5
0
-5
0
10
20
30
40
50
60

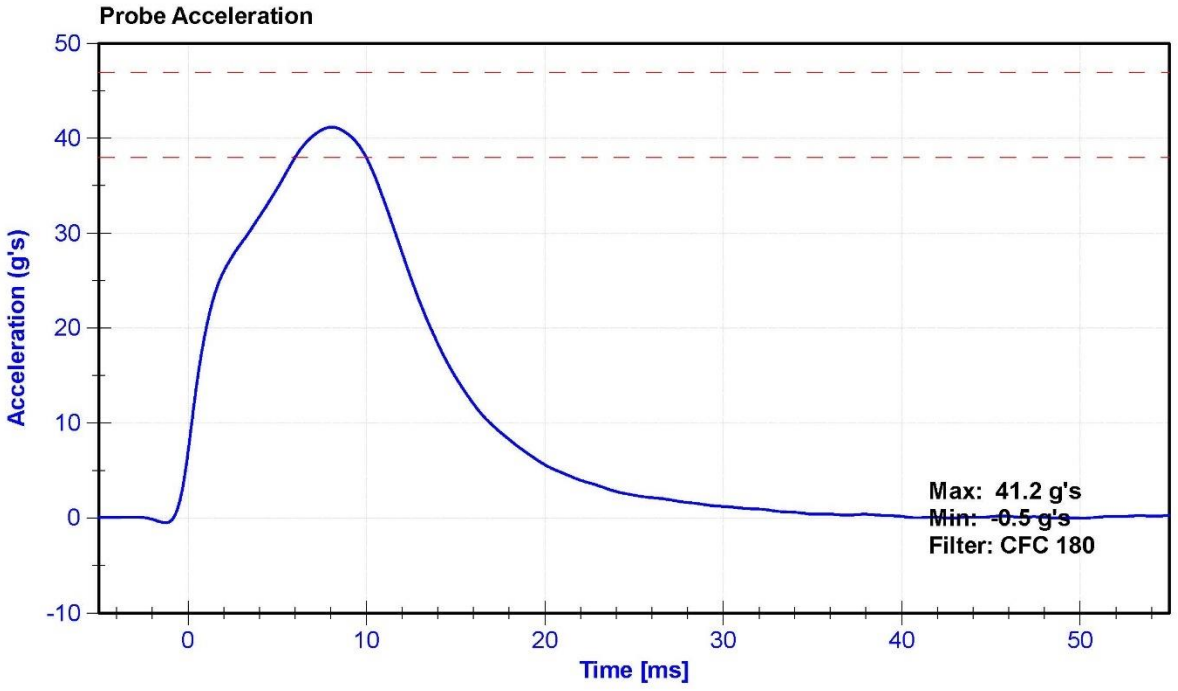
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

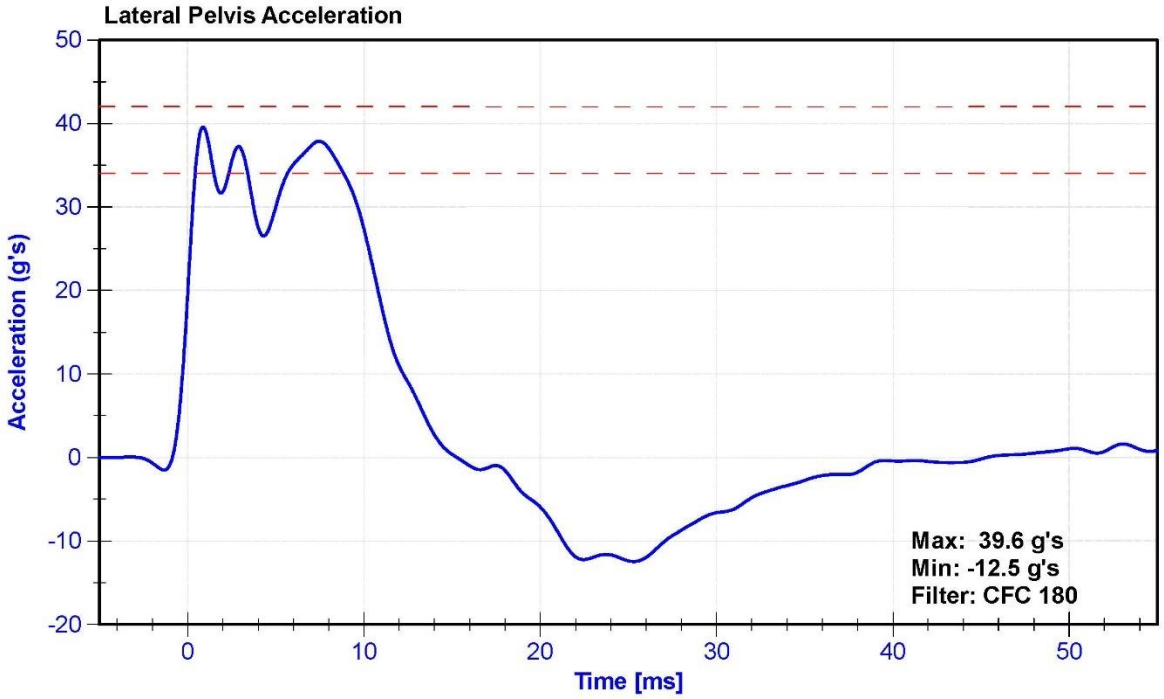
Results

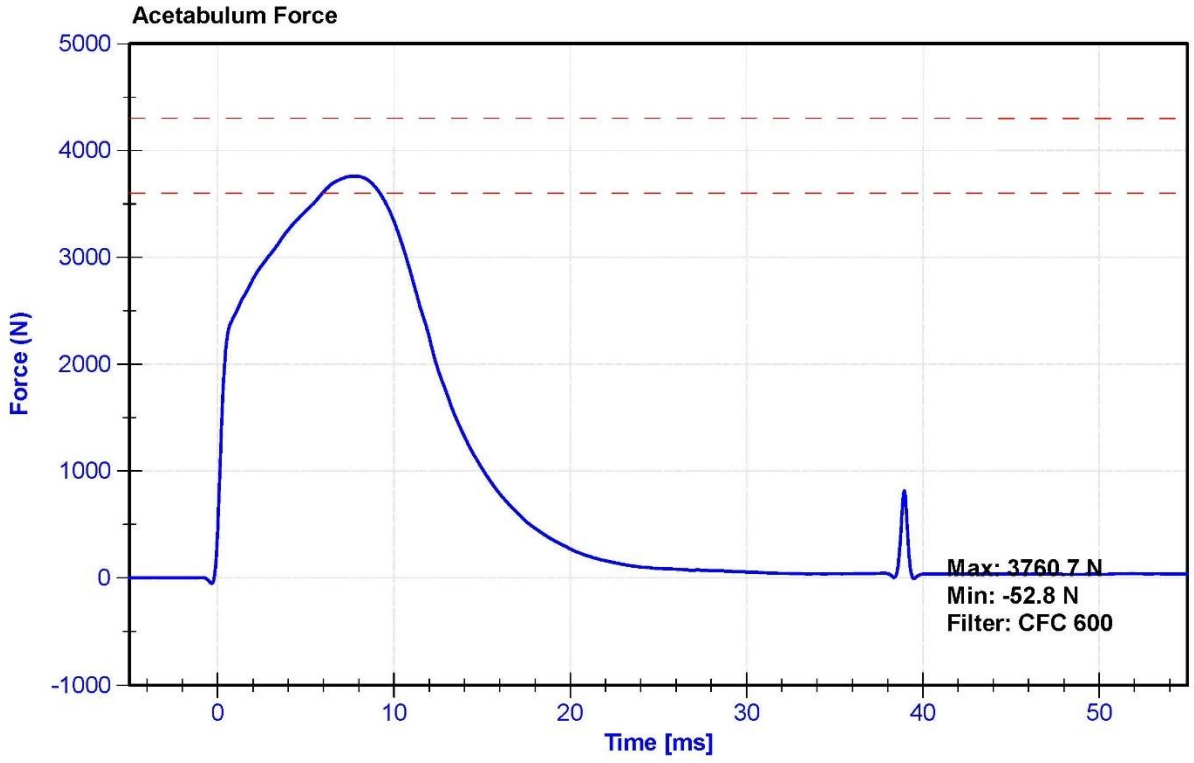
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	47.2	Pass
Velocity	6.6	6.8	m/s	6.75	Pass
Probe Acceleration	38	47	g's	41.2	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	37.9	Pass
Acetabulum Force	3600	4300	N	3760.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Pelvis Y Accelerometer	Endevco	P51731	5/17/2022	11/13/2022
Acetabulum Load Cell	Denton	275-FY	9/14/2021	9/14/2022
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 39.6 g's
Min: -12.5 g's
Filter: CFC 180


Acetabulum Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 3760.7 N
Min: -52.8 N
Filter: CFC 600

6/28/2022
CERT - 300

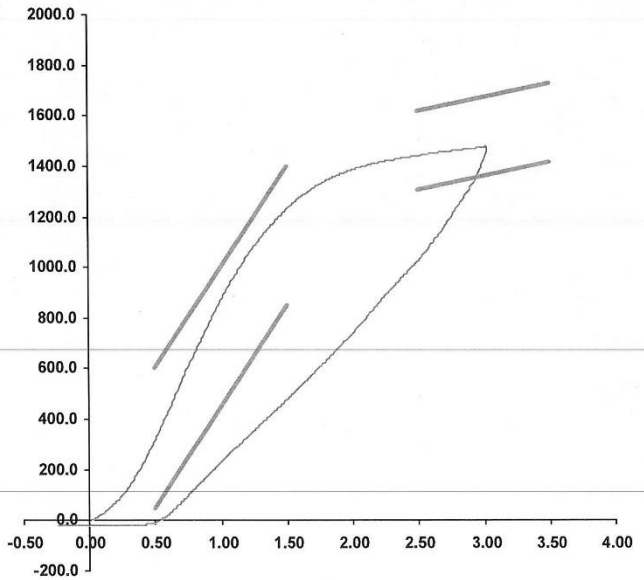
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 14085
Test Number 13559
Report Number 13604
Test Date 5/25/2020 12:03:36 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	321	50	600
Force @ 1.5 mm (N)	1,231	850	1,400
Force @ 2.5 mm (N)	1,442	1,306	1,618
Force @ 3.0 mm (N)	1,476	1,361	1,673

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Operator 14061

Part Number 180-4450

Template No 107 08-Jul-21
SACO Research

By : _____ Date : _____

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

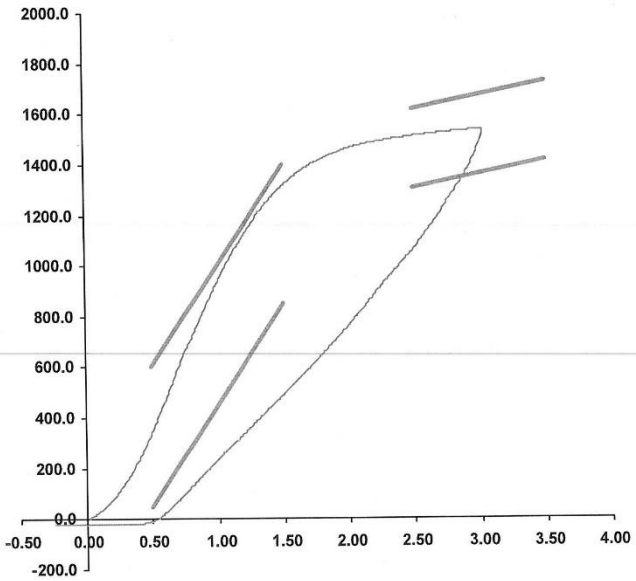
6/28/2022
CRASH1 -300

SID-IIs Pelvis Plug Certification Test

Plug S/N 14075
Test Number 13549
Report Number 13594
Test Date 5/25/2020 11:41:52 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	348	50	600
Force @ 1.5 mm (N)	1,317	850	1,400
Force @ 2.5 mm (N)	1,512	1,306	1,618
Force @ 3.0 mm (N)	1,539	1,361	1,673

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Operator 14061

Part Number 180-4450

Template No 107 08-Jul-21
SACO Research

By : _____ Date : _____

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

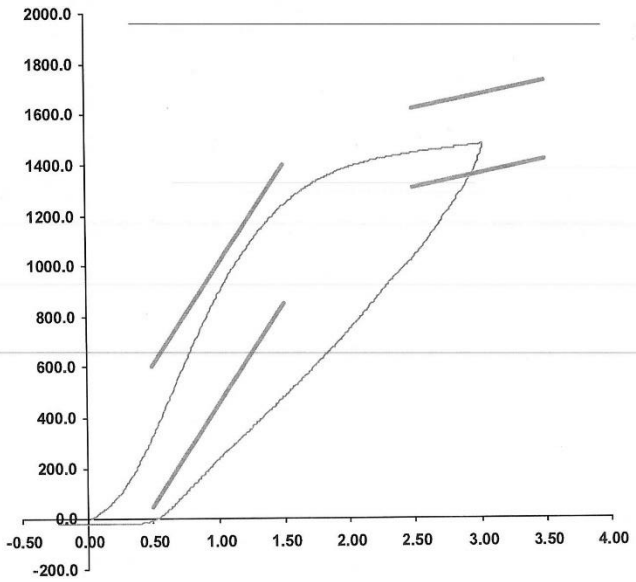
6/28/2021
Non-Impact - 300

SID-IIs Pelvis Plug Certification Test

Plug S/N 13942
Test Number 13416
Report Number 13461
Test Date 5/20/2020 10:19:50 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	333	50	600
Force @ 1.5 mm (N)	1,242	850	1,400
Force @ 2.5 mm (N)	1,445	1,306	1,618
Force @ 3.0 mm (N)	1,477	1,361	1,673

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (FI360947), 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 08-Jul-21
SACO Research

By : _____ Date : _____

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

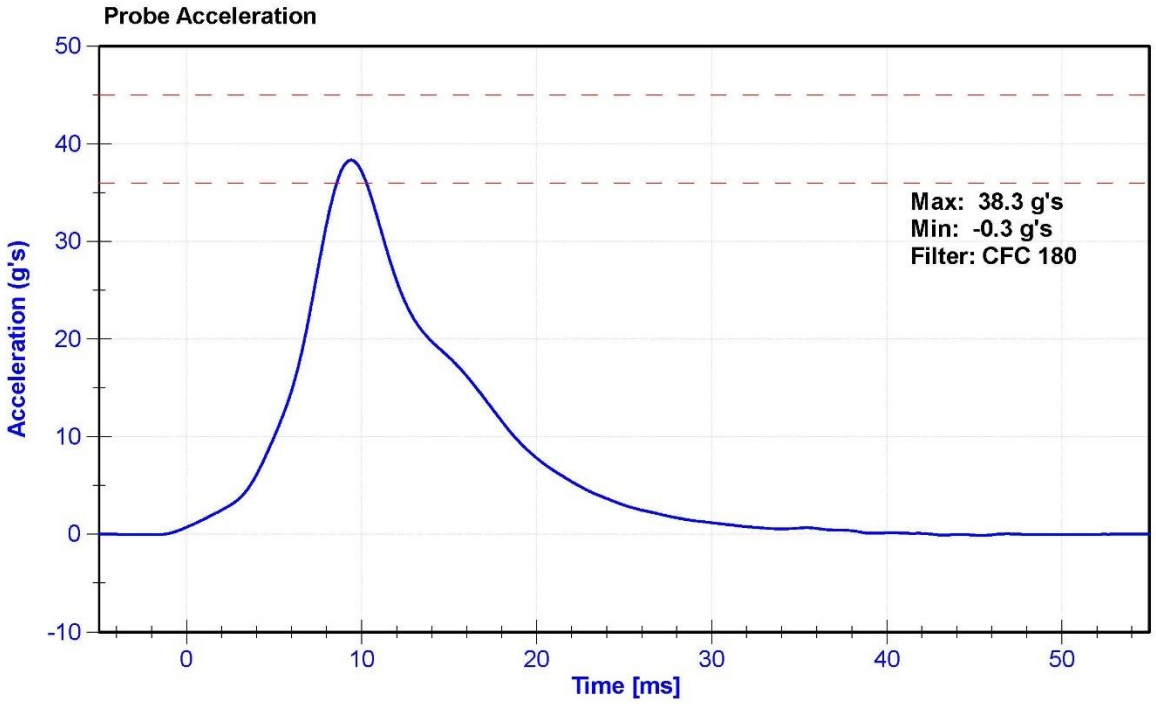
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

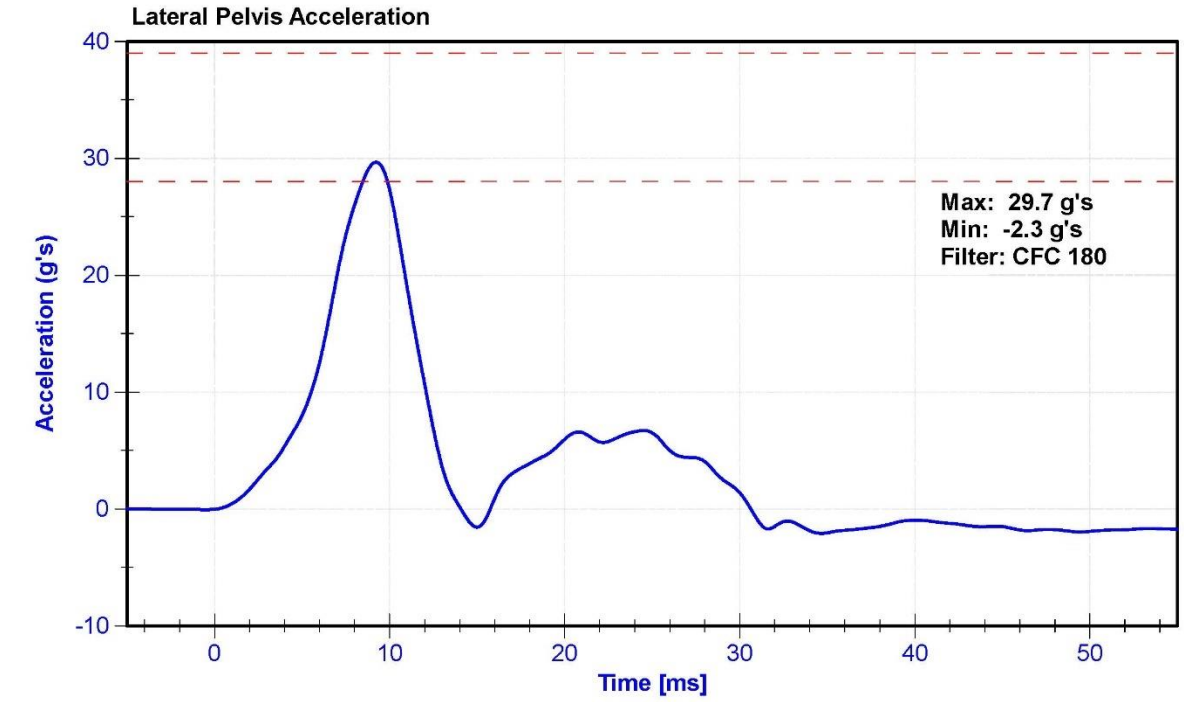
Results

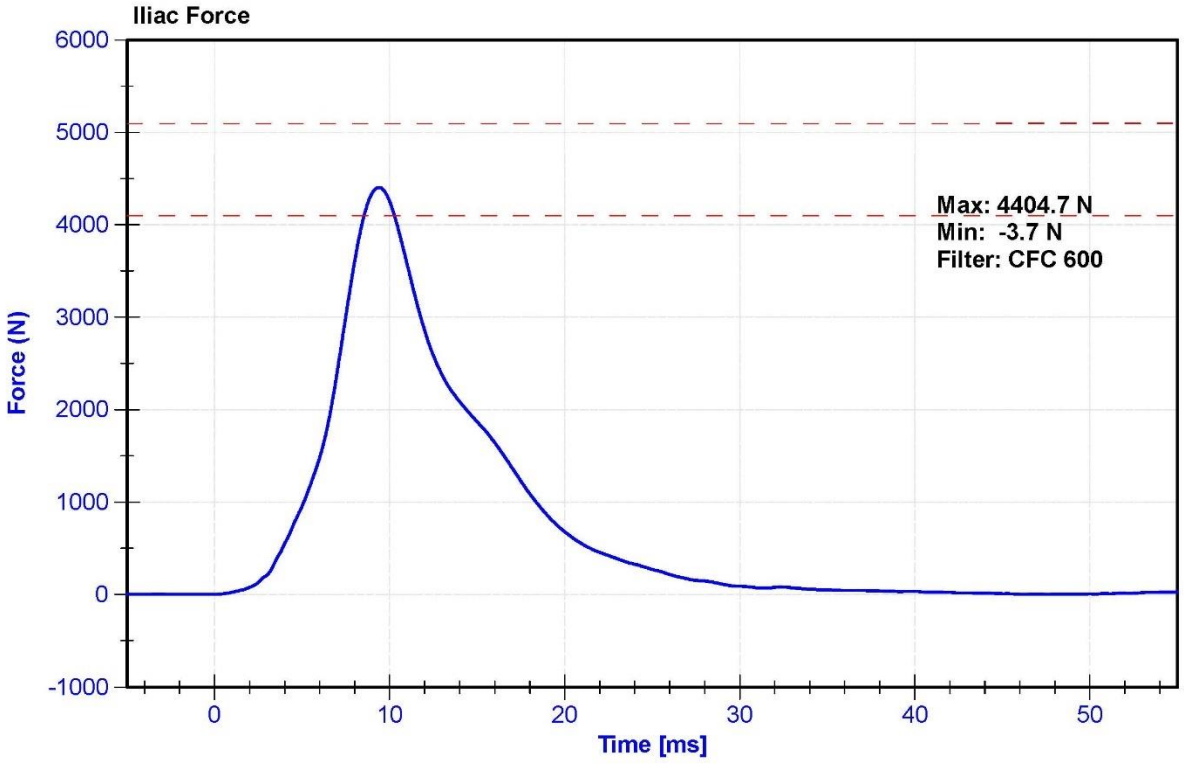
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	47.2	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Probe Acceleration	36	45	g's	38.3	Pass
Lateral Pelvis Acceleration	28	39	g's	29.7	Pass
Iliac Force	4100	5100	N	4404.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Pelvis Y Accelerometer	Endevco	P51731	5/17/2022	11/13/2022
Iliac Load Cell	Denton	279-FY	9/14/2021	9/14/2022




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 29.7 g's
Min: -2.3 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 4404.7 N
Min: -3.7 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

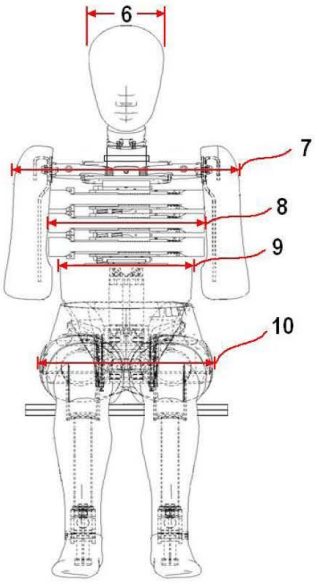
SERIAL NO: F033

(CONFIGURED FOR LEFT SIDE IMPACT)

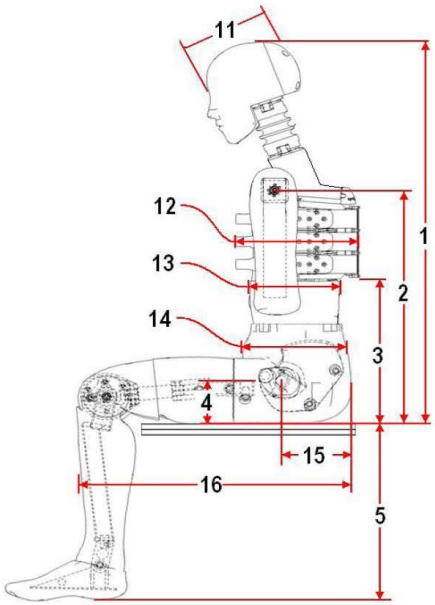
External Measurements - EuroSID-2re

Technician: K. Brogan Date: 07/06/2022

Dummy Serial Number: F033



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	566	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	349	Pass
4	Seat to Hip Joint (center of bolt)	97	103	100	Pass
5	Sole to Seat, Sitting	333	451	416	Pass
6	Head Width	152	158	155	Pass
7	Shoulder/Arm Width	461	479	469	Pass
8	Thorax Width	322	332	328	Pass
9	Abdomen Width	273	287	280	Pass
10	Pelvis Lap Width	359	373	365	Pass
11	Head Depth	196	206	200	Pass
12	Thorax Depth	262	272	265	Pass
13	Abdomen Depth	194	204	200	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	607	Pass

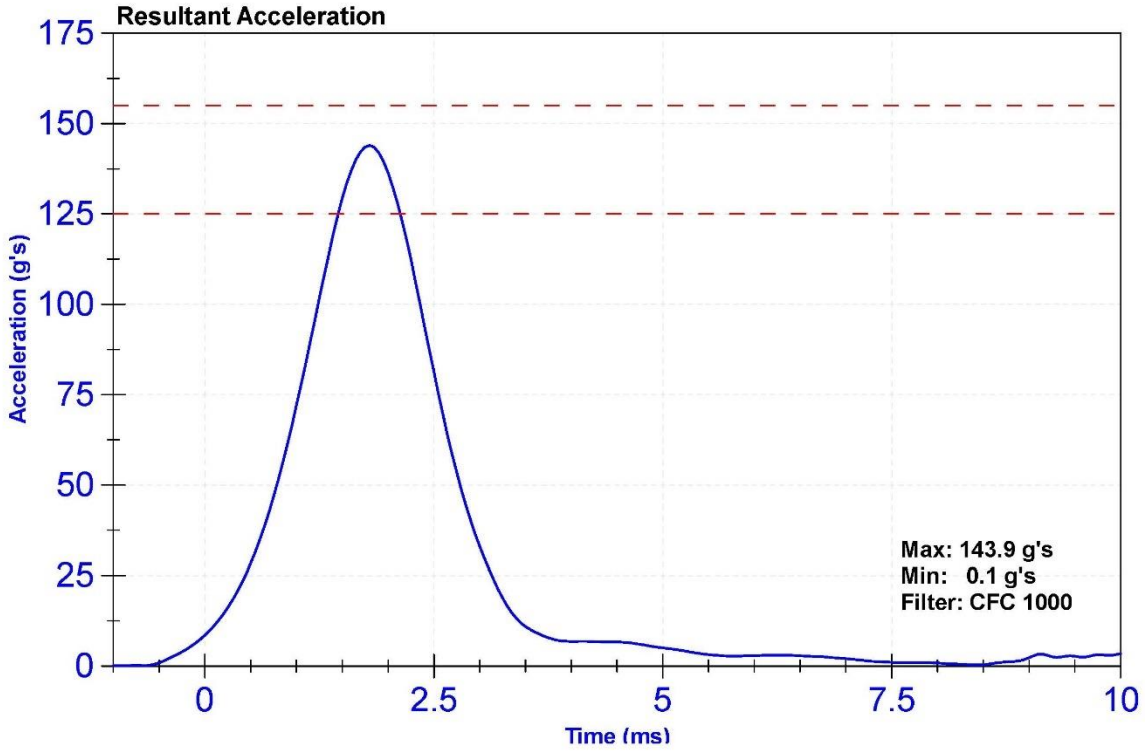
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

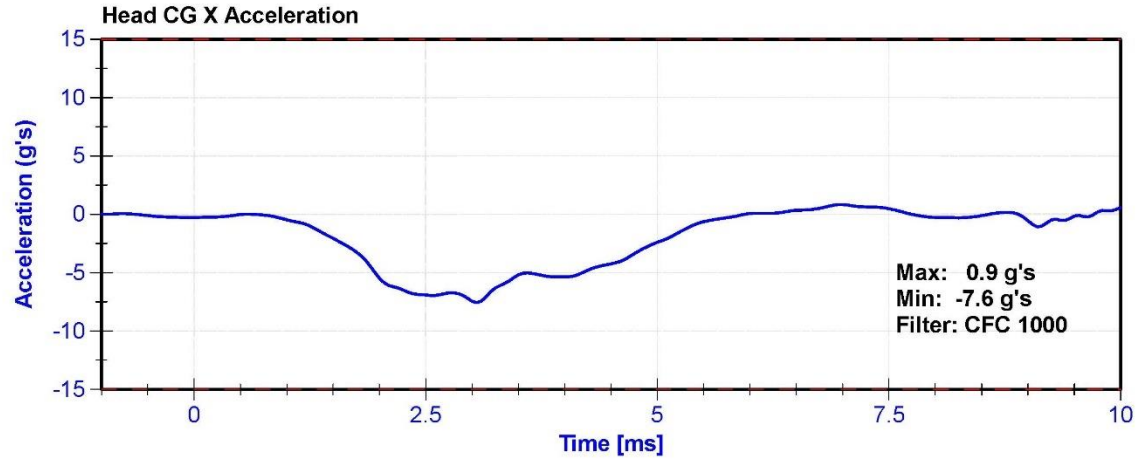
Results

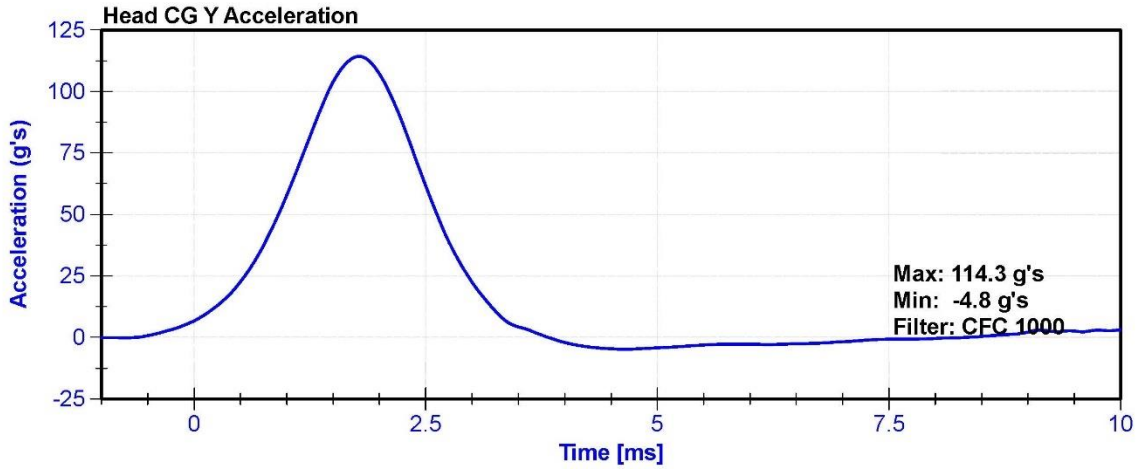
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	54.1	Pass
Resultant Acceleration	125	155	g's	143.9	Pass
Oscillation	0	15	%	4.76	Pass
Fore-Aft Acceleration	-15	15	g's	-7.6	Pass

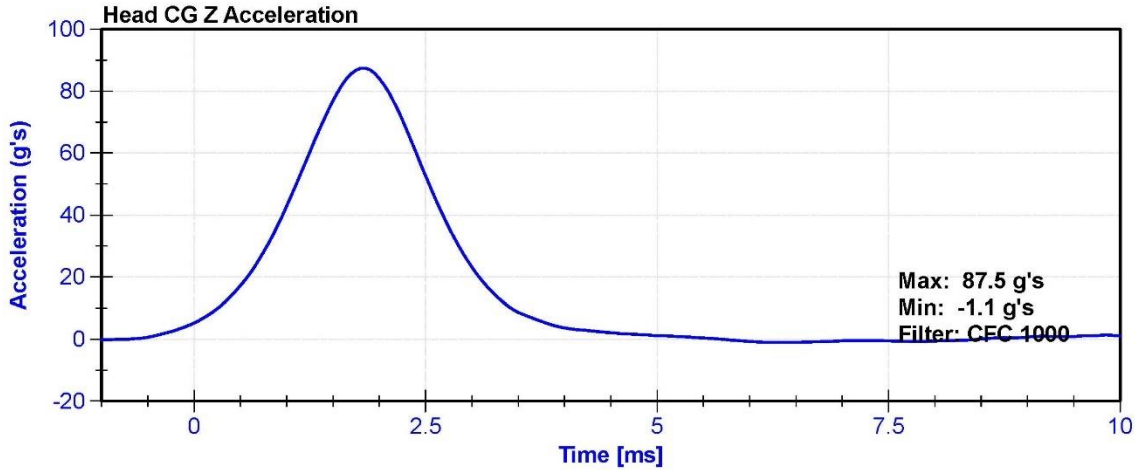
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P63861	1/31/2022	7/30/2022
Y Accelerometer	Endevco	P49216	1/31/2022	7/30/2022
Z Accelerometer	Endevco	P51303	1/31/2022	7/30/2022




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 0.9 g's
Min: -7.6 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 114.3 g's
Min: -4.8 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]
Max: 87.5 g's
Min: -1.1 g's
Filter: CFC 1000

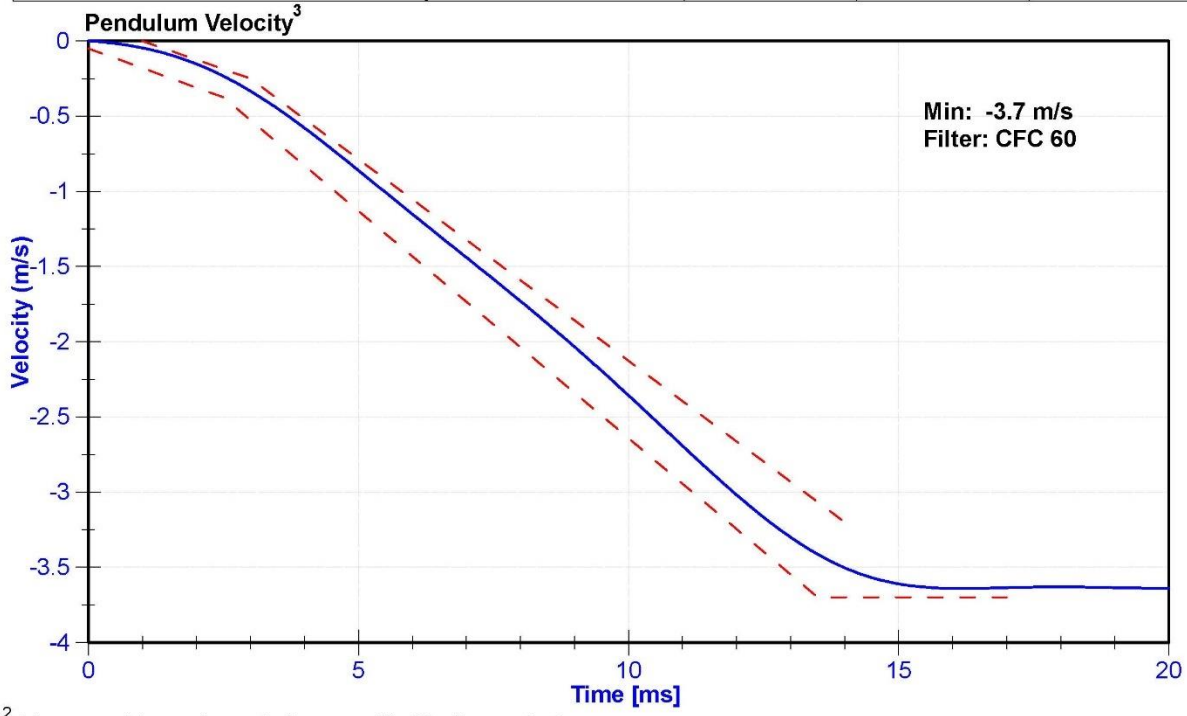
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

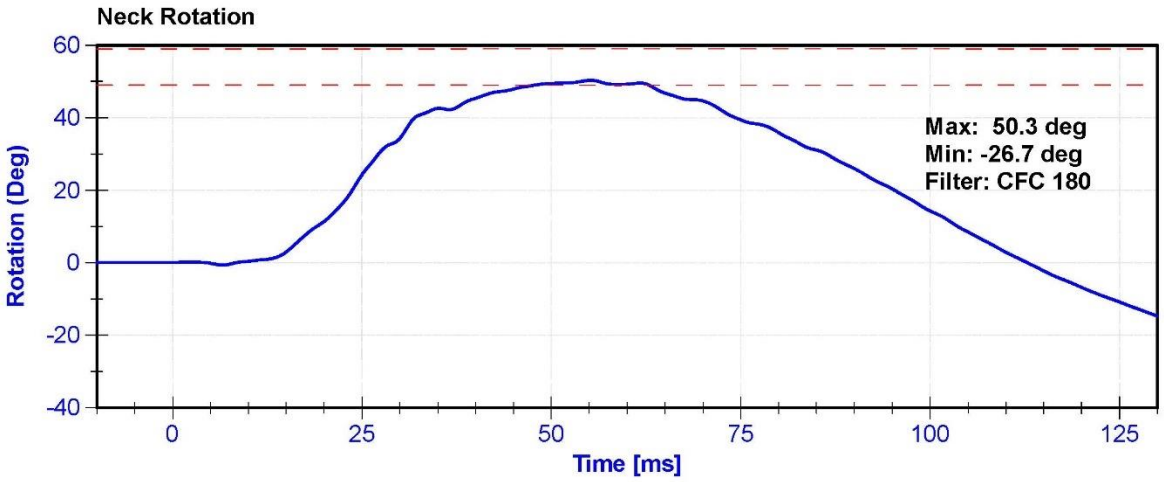
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	54.1	Pass
Velocity	3.3	3.5	m/s	3.38	Pass
Lateral Neck Rotation	49	59	deg	50.3	Pass
Time at Maximum Rotation	54	66	ms	55.2	Pass
Time of Rotation Decay from Maximum	53	88	ms	57.7	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

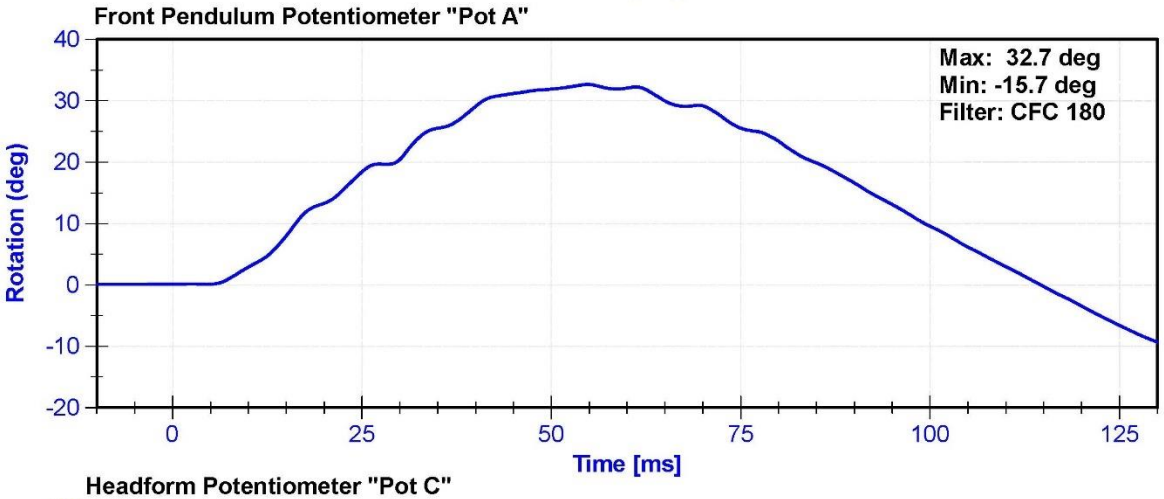
Transducer Calibrations

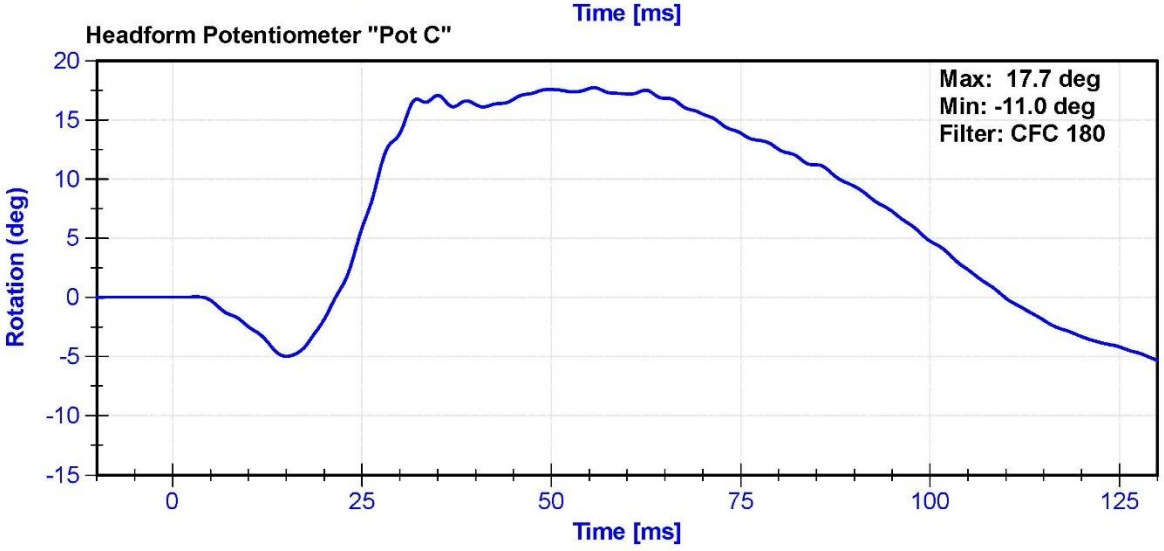
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Front Pendulum Potentiometer	Sfernice	094	10/1/2021	10/1/2022
Headform Potentiometer	Sfernice	095	10/1/2021	10/1/2022



[1,2] Upper and lower boundaries specified in Appendix I


Neck Rotation
Rotation (Deg)
Time [ms]
Max: 50.3 deg
Min: -26.7 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 32.7 deg
Min: -15.7 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 17.7 deg
Min: -11.0 deg
Filter: CFC 180

Appendix I

[2] Upper Boundary Corridor		[1] Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.0	-0.25	2.5	-0.375
14.0	-3.20	13.5	-3.7
		17.0	-3.7

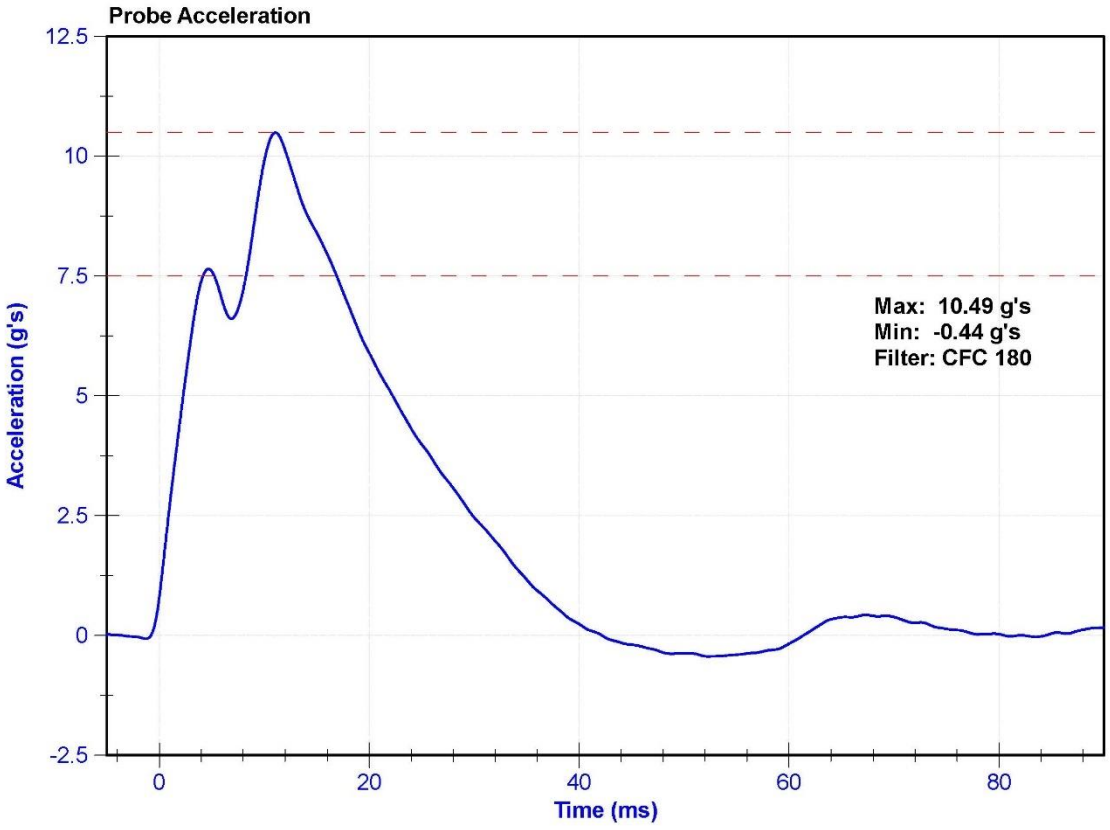
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	63.4	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Probe Acceleration	7.5	10.5	g's	10.49	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	T25885	10/25/2021	10/25/2022



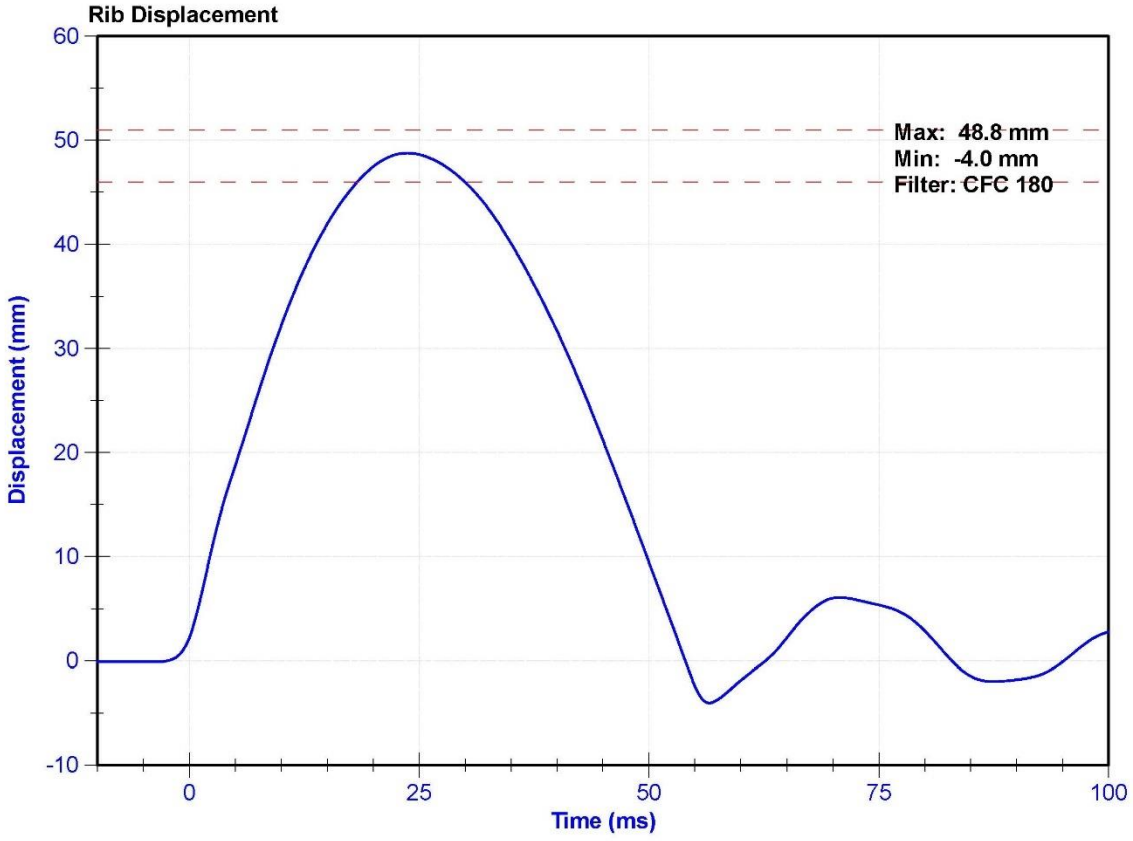
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	54.1	Pass
Rib Displacement	46	51	mm	48.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	2/1/2022	8/2/2022



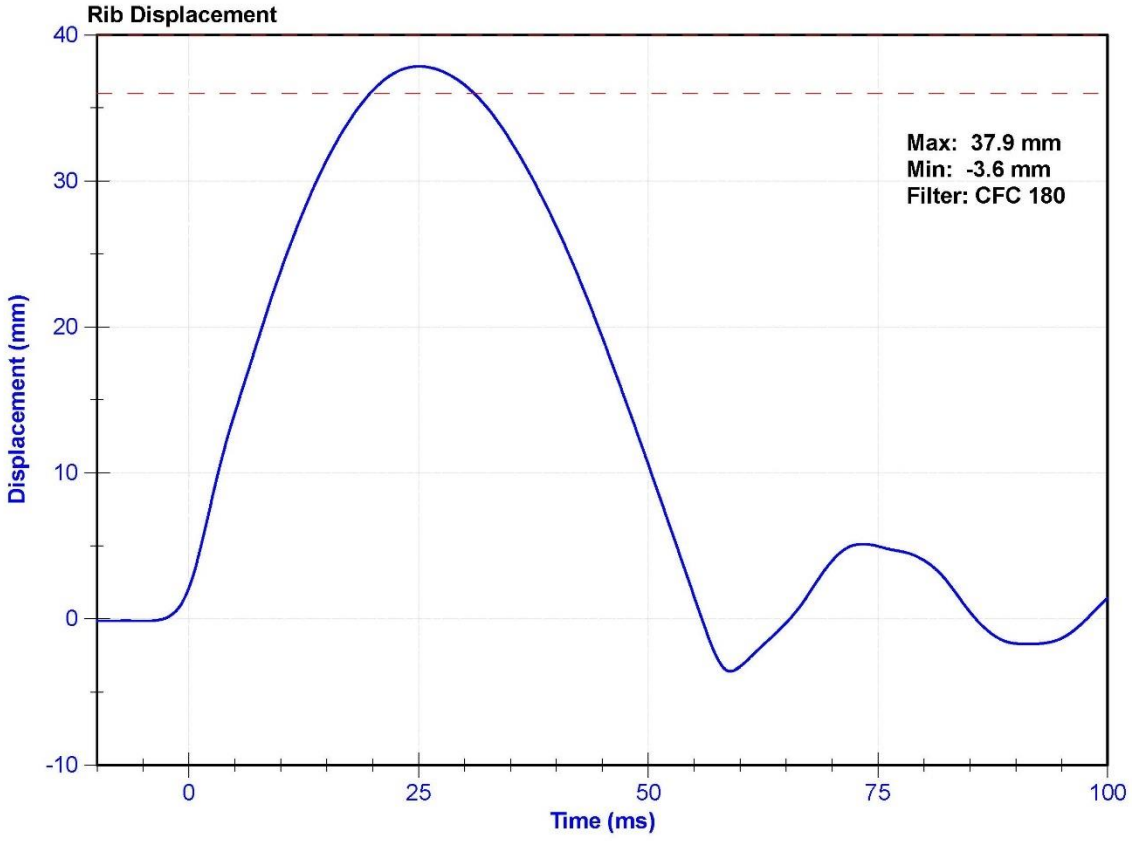
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	54.1	Pass
Rib Displacement	36	40	mm	37.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	2/1/2022	8/2/2022



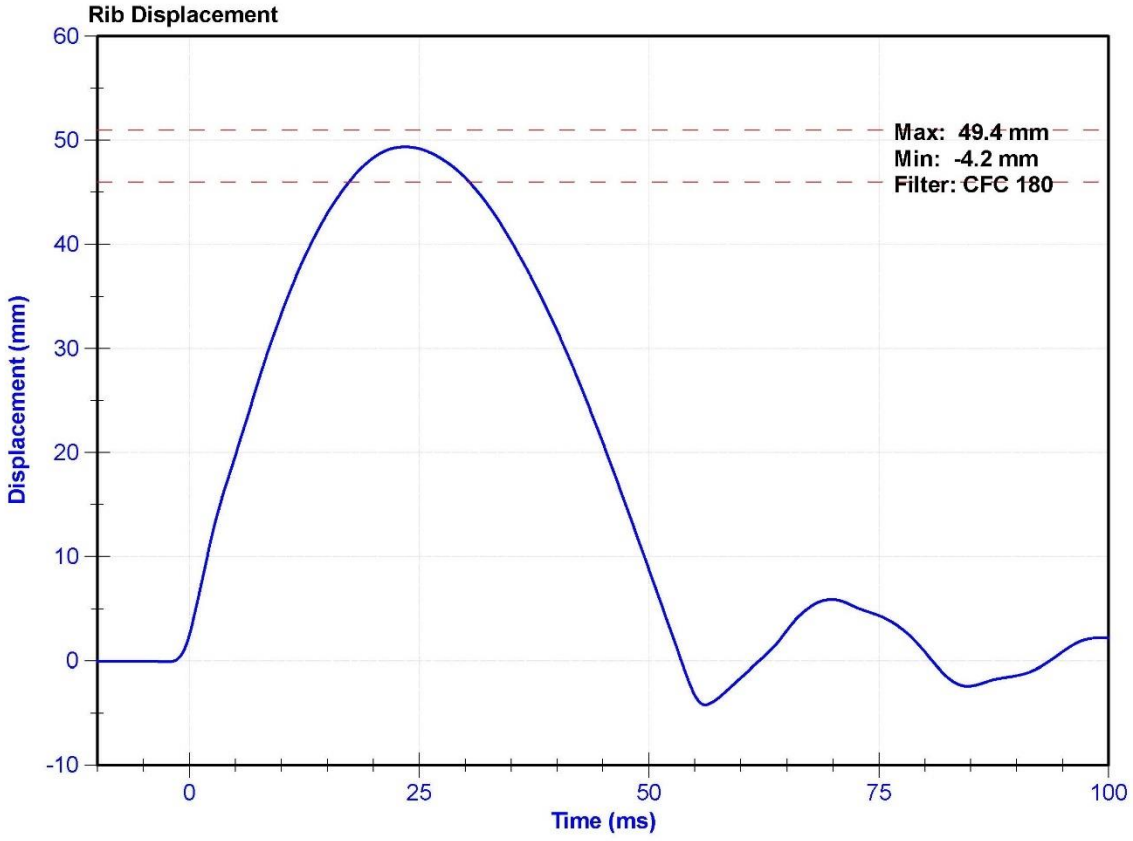
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	54.1	Pass
Rib Displacement	46	51	mm	49.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	2/1/2022	8/2/2022



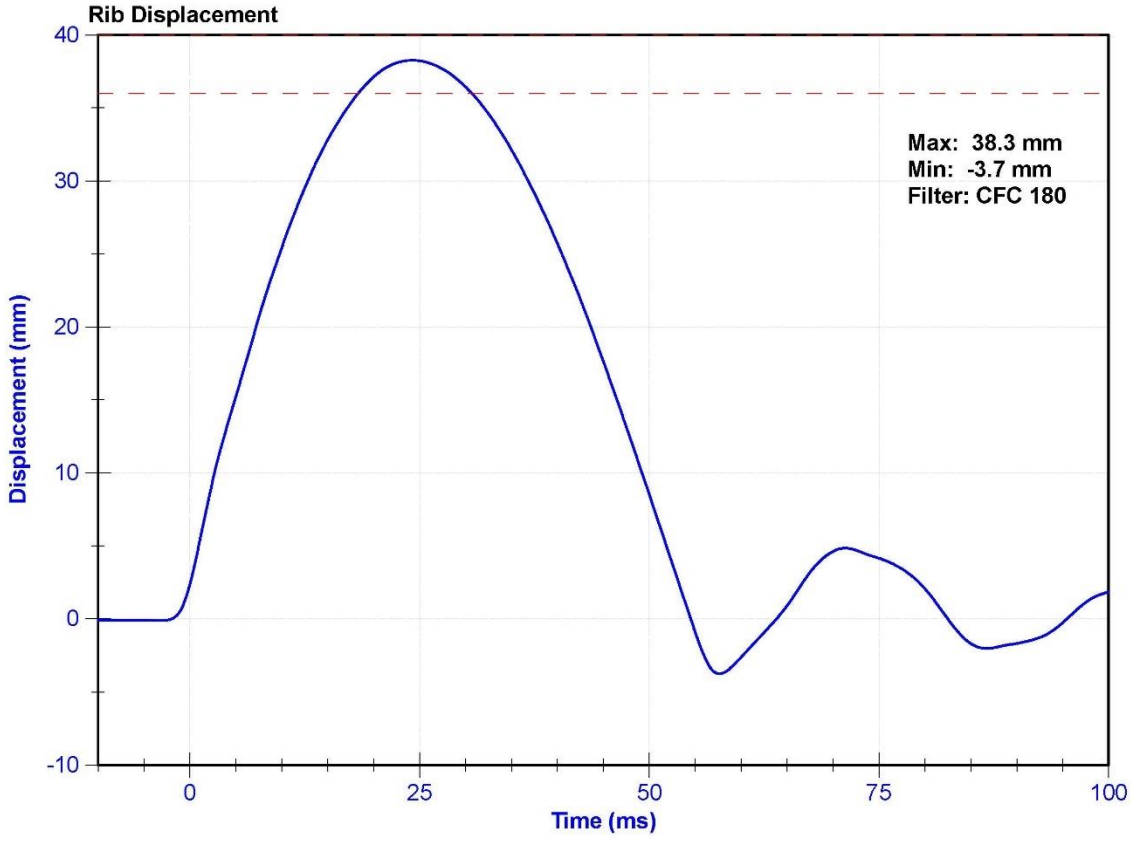
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	54.1	Pass
Rib Displacement	36	40	mm	38.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	2/1/2022	8/2/2022



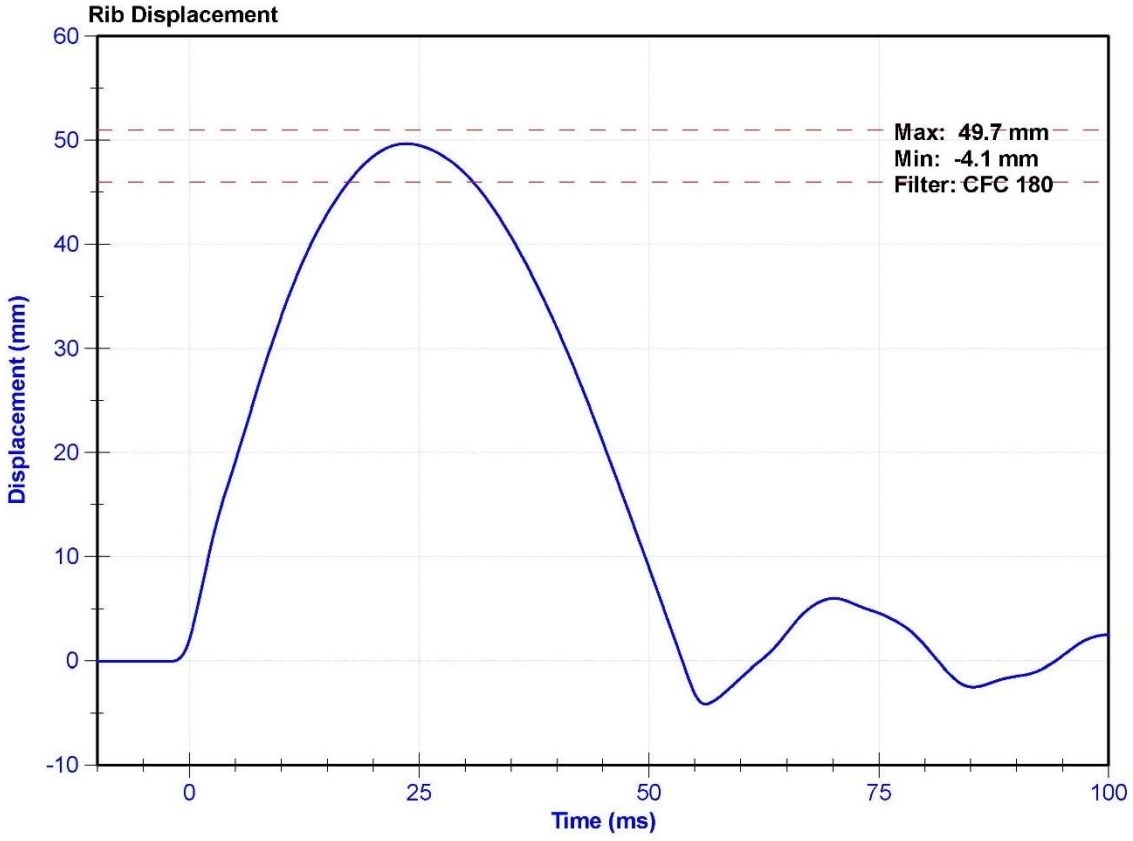
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	54.1	Pass
Rib Displacement	46	51	mm	49.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	2/1/2022	8/2/2022



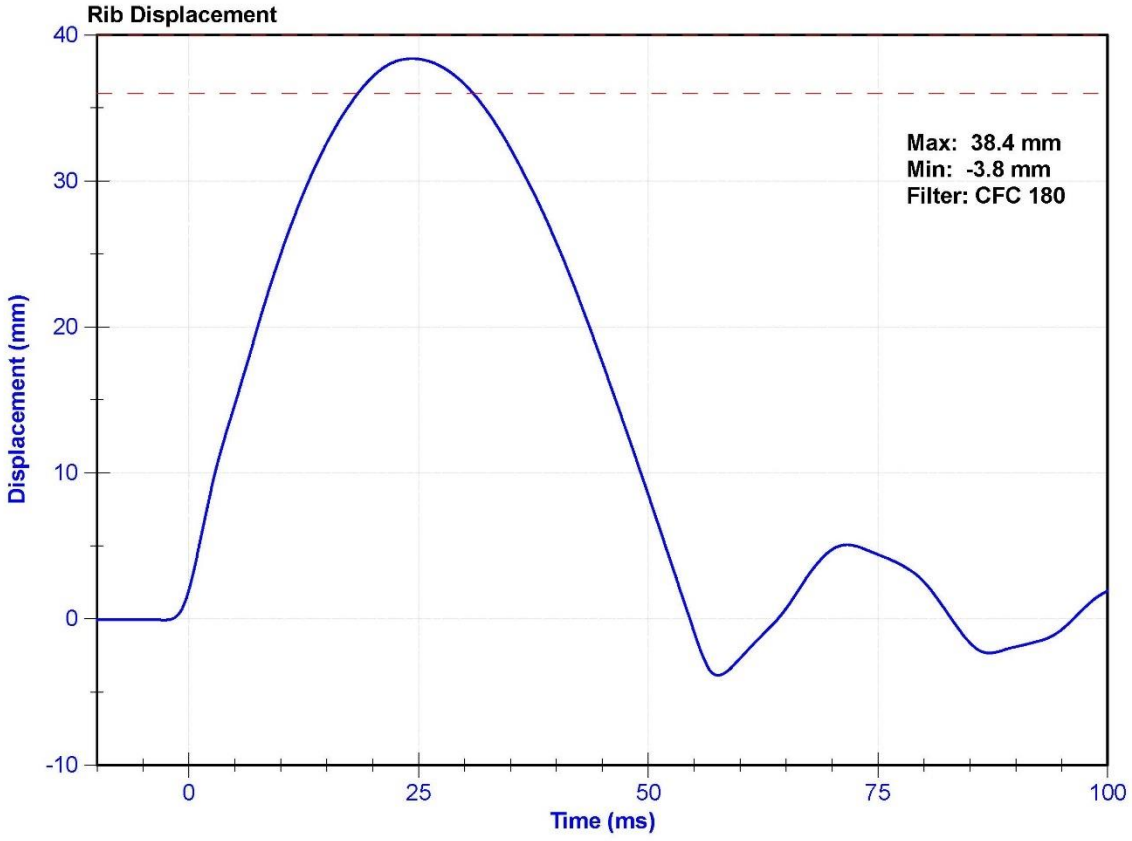
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	54.1	Pass
Rib Displacement	36	40	mm	38.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	2/1/2022	8/2/2022



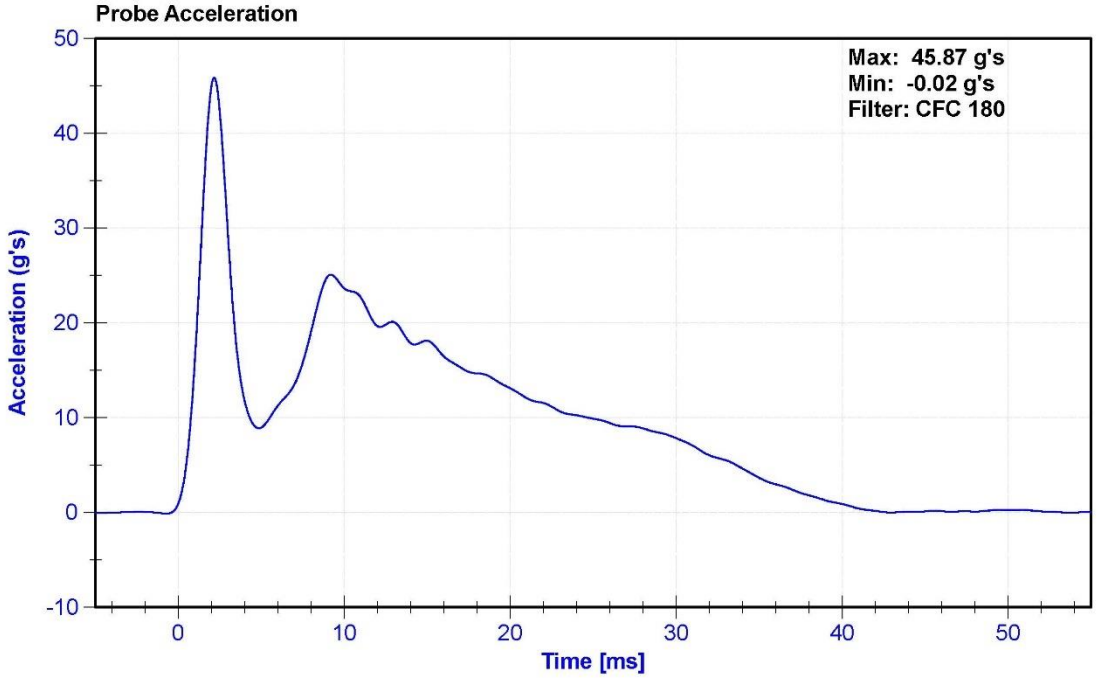
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

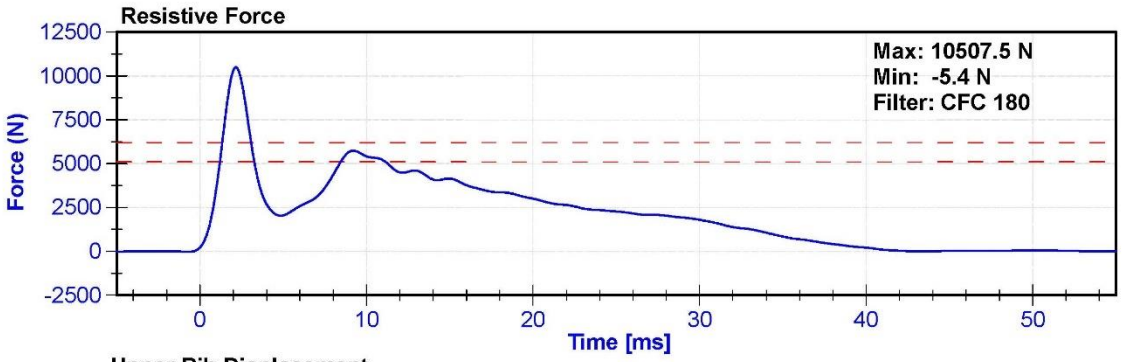
Results

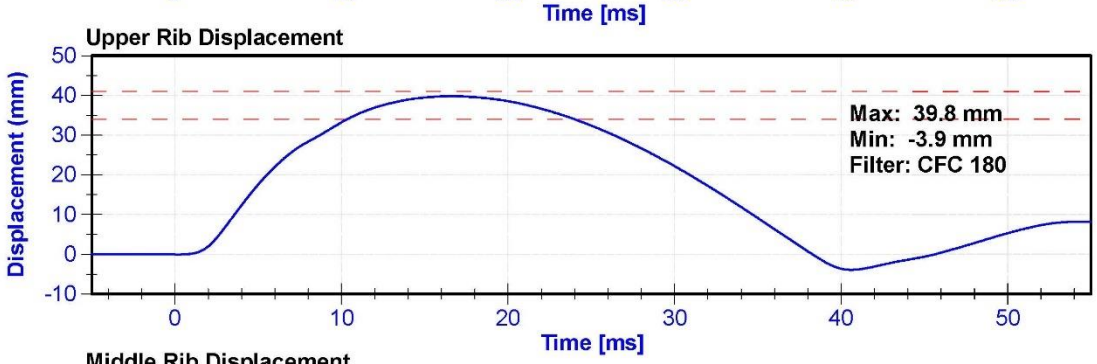
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	63.4	Pass
Velocity	5.4	5.6	m/s	5.55	Pass
Resistive Force after 6ms	5100	6200	N	5744.6	Pass
Upper Thorax Rib Deflection	34	41	mm	39.8	Pass
Mid Thorax Rib Deflection	37	45	mm	41.9	Pass
Lower Thorax Rib Deflection	37	44	mm	39.3	Pass

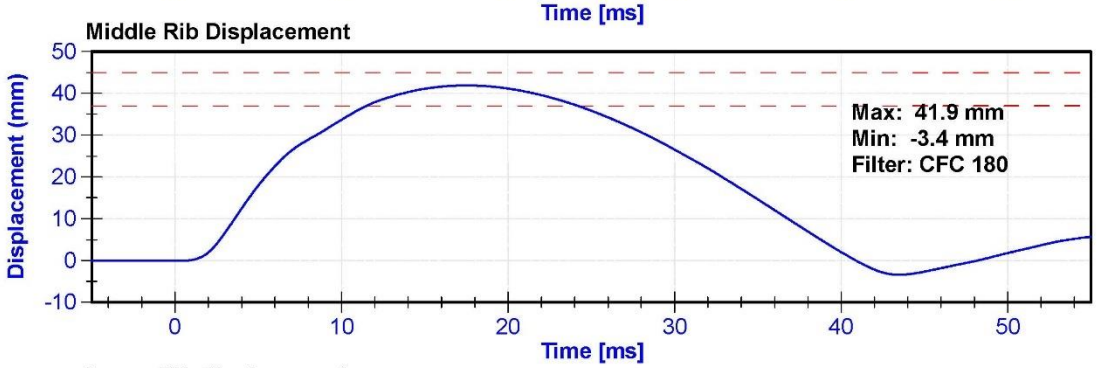
Transducer Calibrations

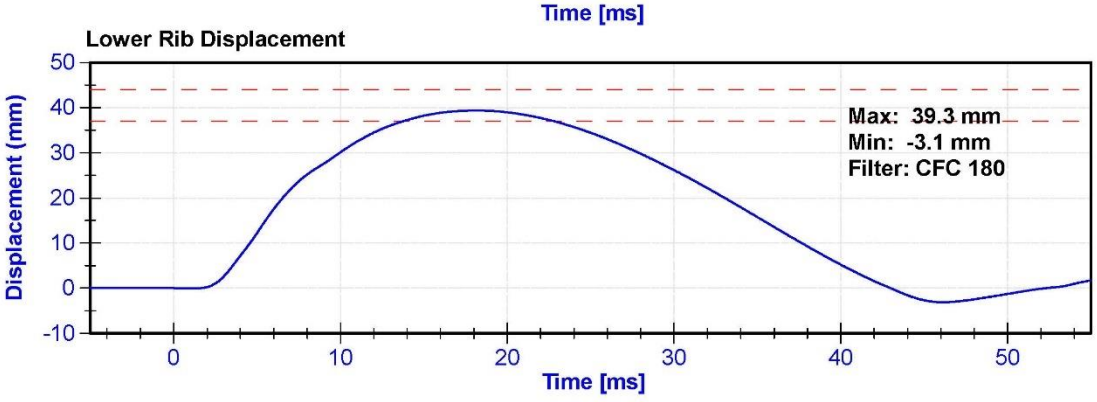
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Upper Thorax Rib Potentiometer	Honeywell	179GFE	2/1/2022	8/2/2022
Middle Thorax Rib Potentiometer	Honeywell	185GFE	2/1/2022	8/2/2022
Lower Thorax Rib Potentiometer	Honeywell	178GFE	2/1/2022	8/2/2022




Resistive Force
Max: 10507.5 N
Min: -5.4 N
Filter: CFC 180
Force (N)
Time [ms]


Upper Rib Displacement
Max: 39.8 mm
Min: -3.9 mm
Filter: CFC 180
Displacement (mm)
Time [ms]


Middle Rib Displacement
Max: 41.9 mm
Min: -3.4 mm
Filter: CFC 180
Displacement (mm)
Time [ms]


Lower Rib Displacement
Max: 39.3 mm
Min: -3.1 mm
Filter: CFC 180
Displacement (mm)
Time [ms]

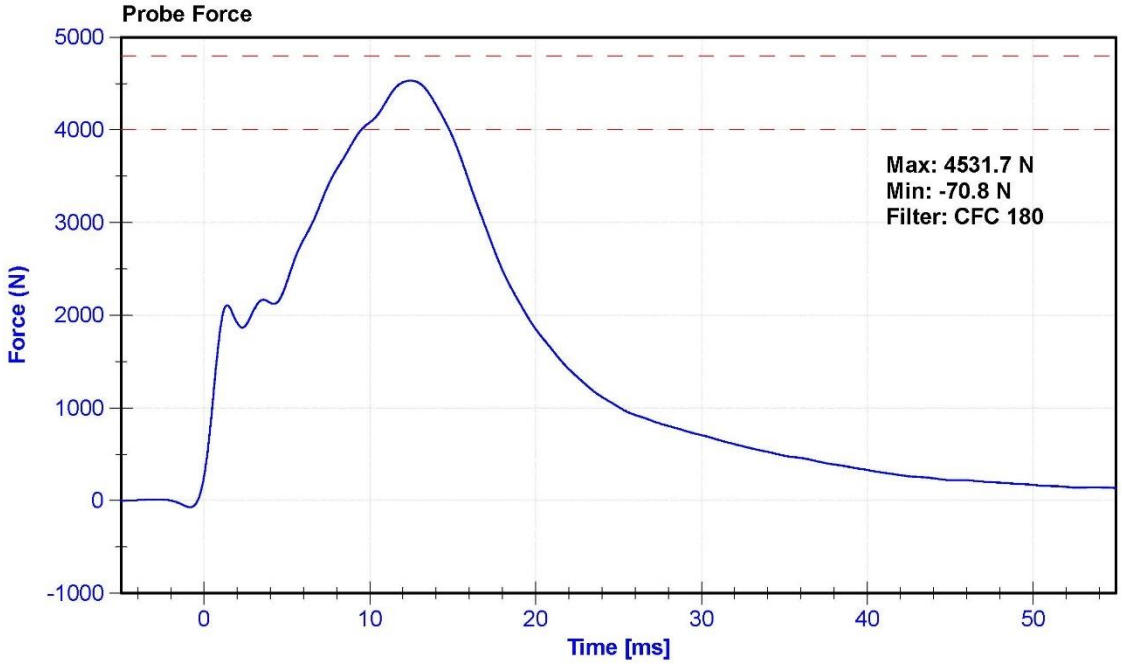
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

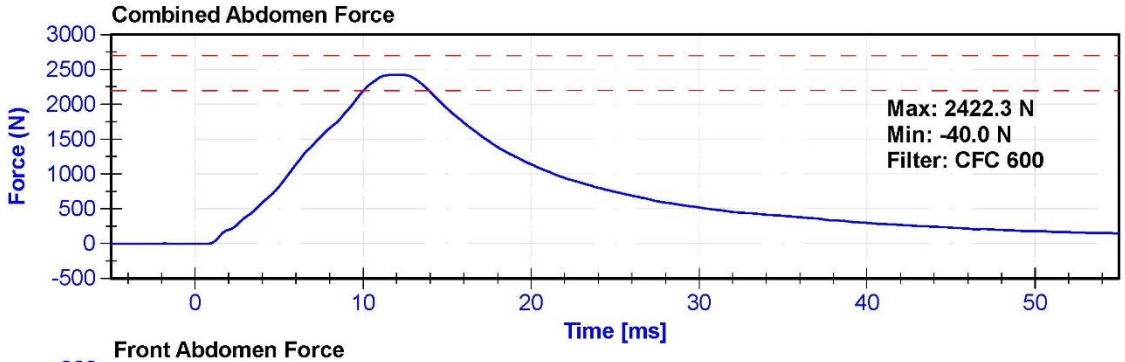
Results

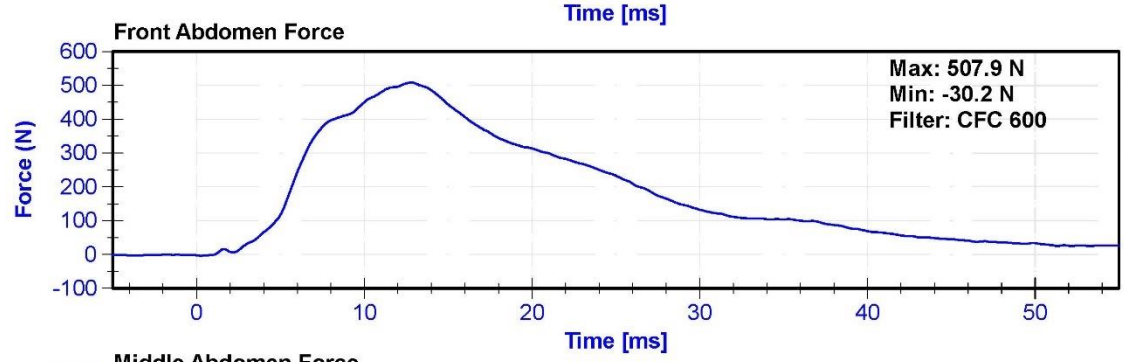
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	63.4	Pass
Velocity	3.9	4.1	m/s	4.04	Pass
Combined Abdomen Force	2200	2700	N	2422.3	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.80	Pass
Resistive Probe Force	4000	4800	N	4531.7	Pass
Time at Peak Resistive Force	10.6	13.0	ms	12.45	Pass

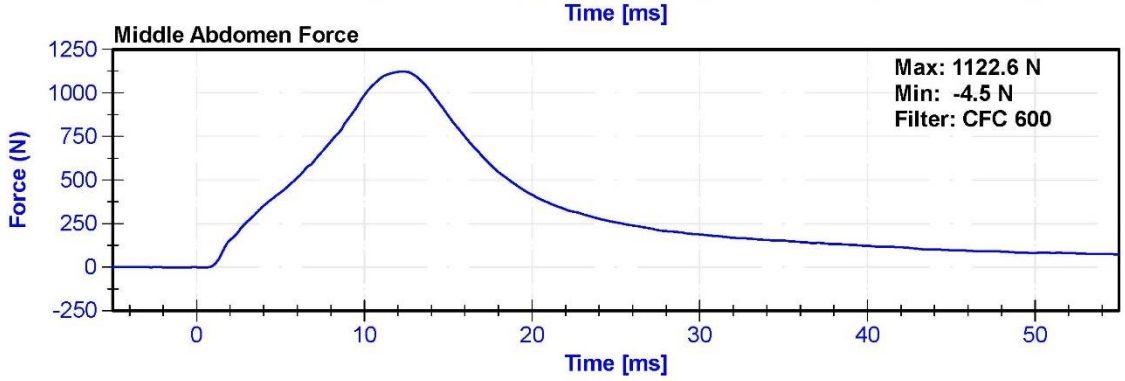
Transducer Calibrations

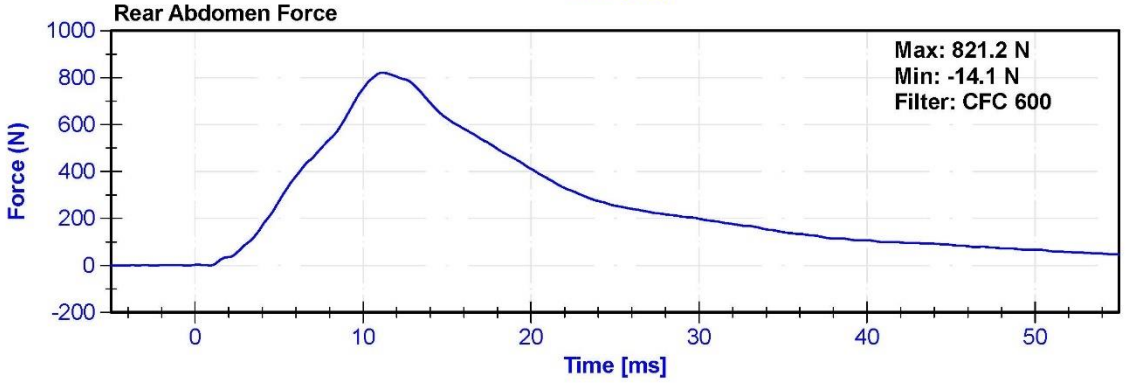
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Front Abdomen Load Cell	Denton	1512	8/2/2021	8/2/2022
Middle Abdomen Load Cell	Denton	1526	8/2/2021	8/2/2022
Rear Abdomen Load Cell	Denton	1516	8/2/2021	8/2/2022




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2422.3 N
Min: -40.0 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 507.9 N
Min: -30.2 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1122.6 N
Min: -4.5 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 821.2 N
Min: -14.1 N
Filter: CFC 600

ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

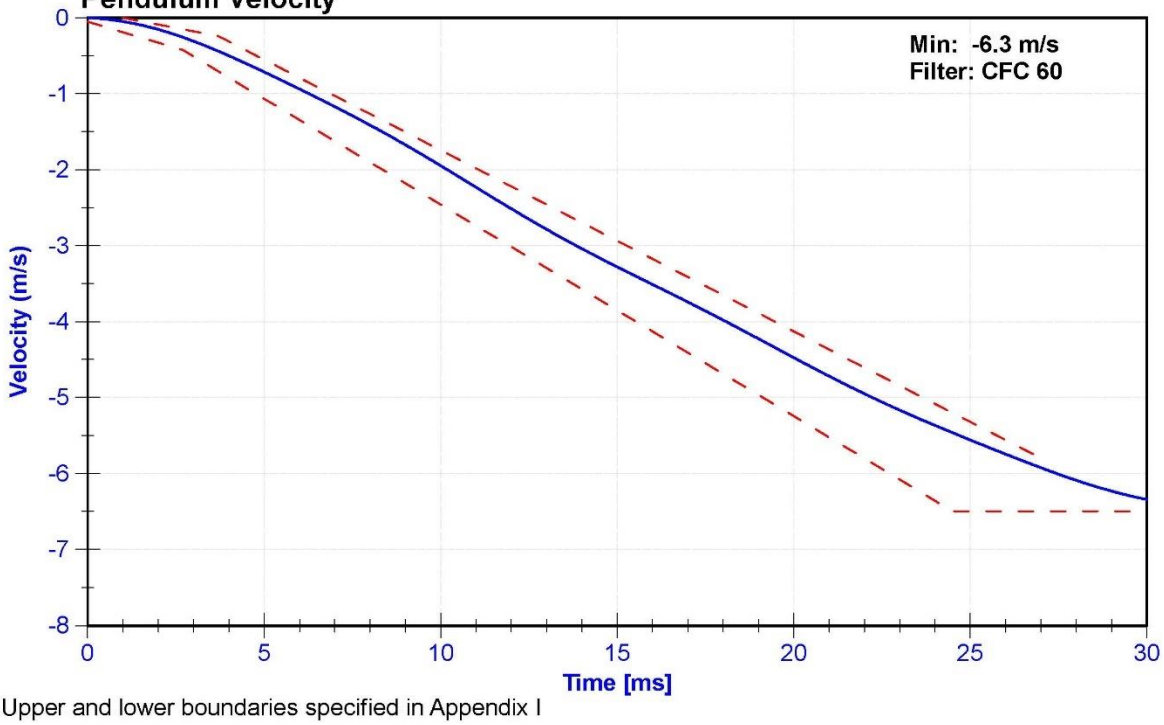
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	54.1	Pass
Velocity	5.95	6.15	m/s	6.025	Pass
Lateral Spine Rotation	45	55	deg	45.6	Pass
Time at Maximum Rotation	39	53	ms	43.4	Pass
Time of Decay to Zero Degrees	37	57	ms	37.5	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

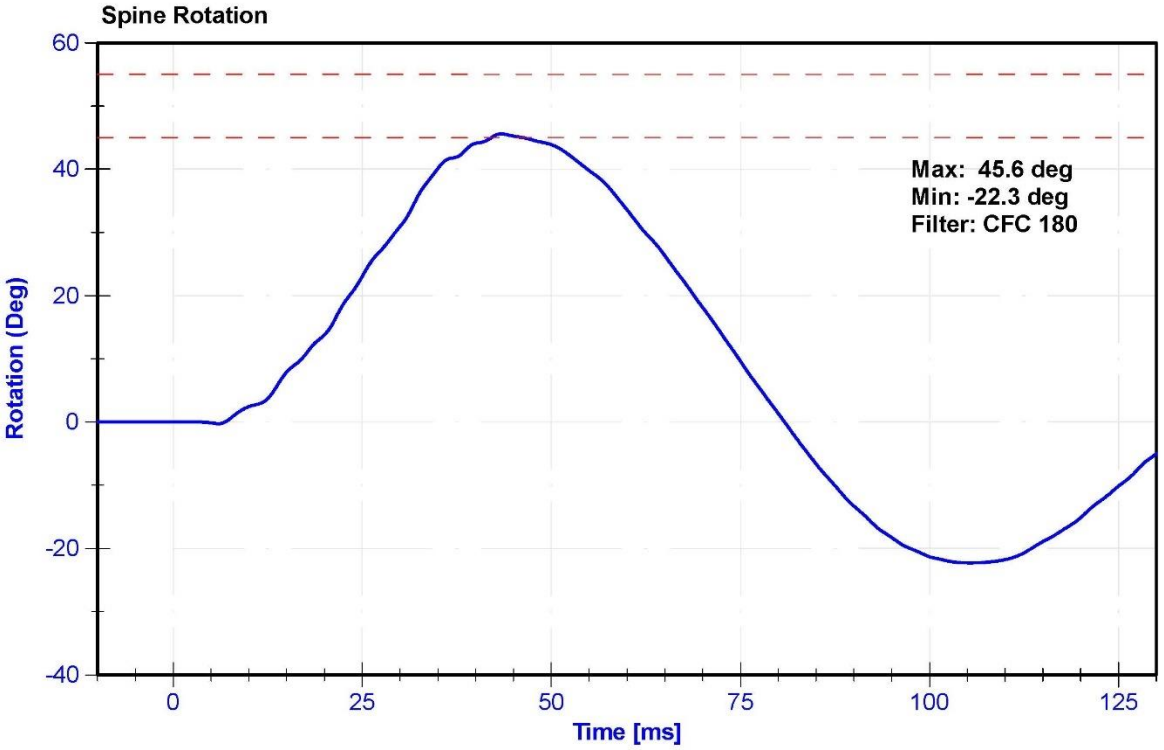
Transducer Calibrations

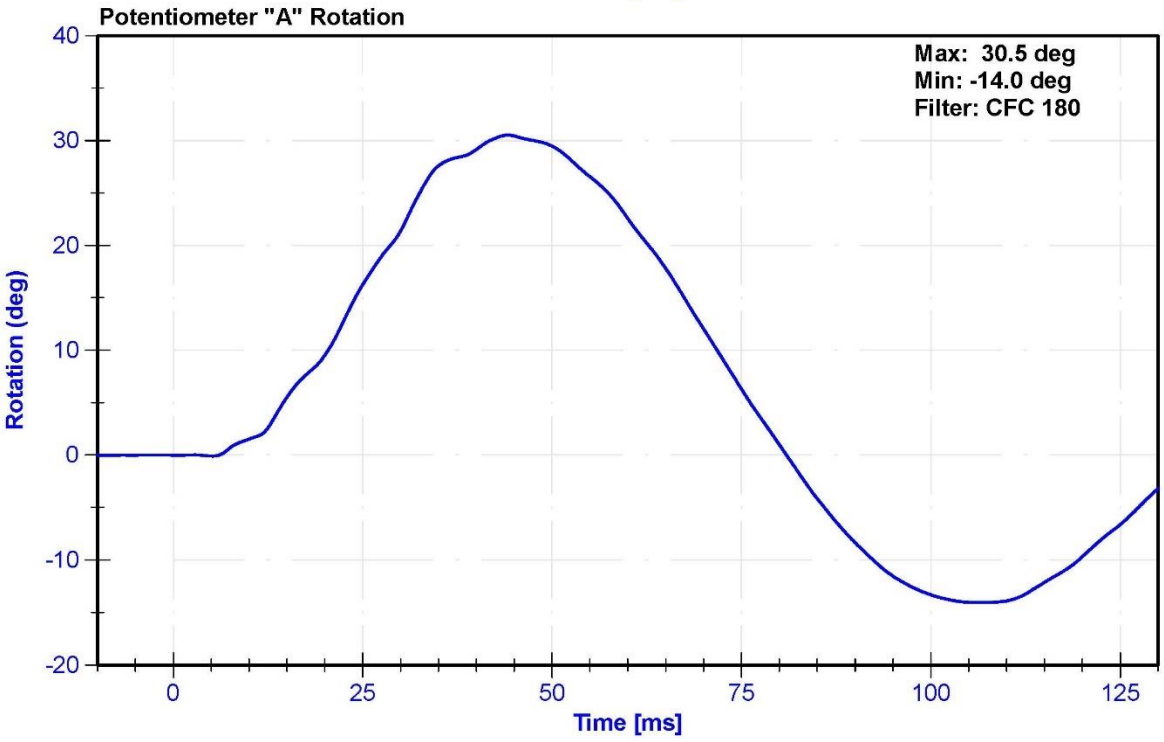
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Pendulum "A" Potentiometer	Sfernice	094	10/1/2021	10/1/2022
Condyle "B" Potentiometer	Sfernice	095	10/1/2021	10/1/2022

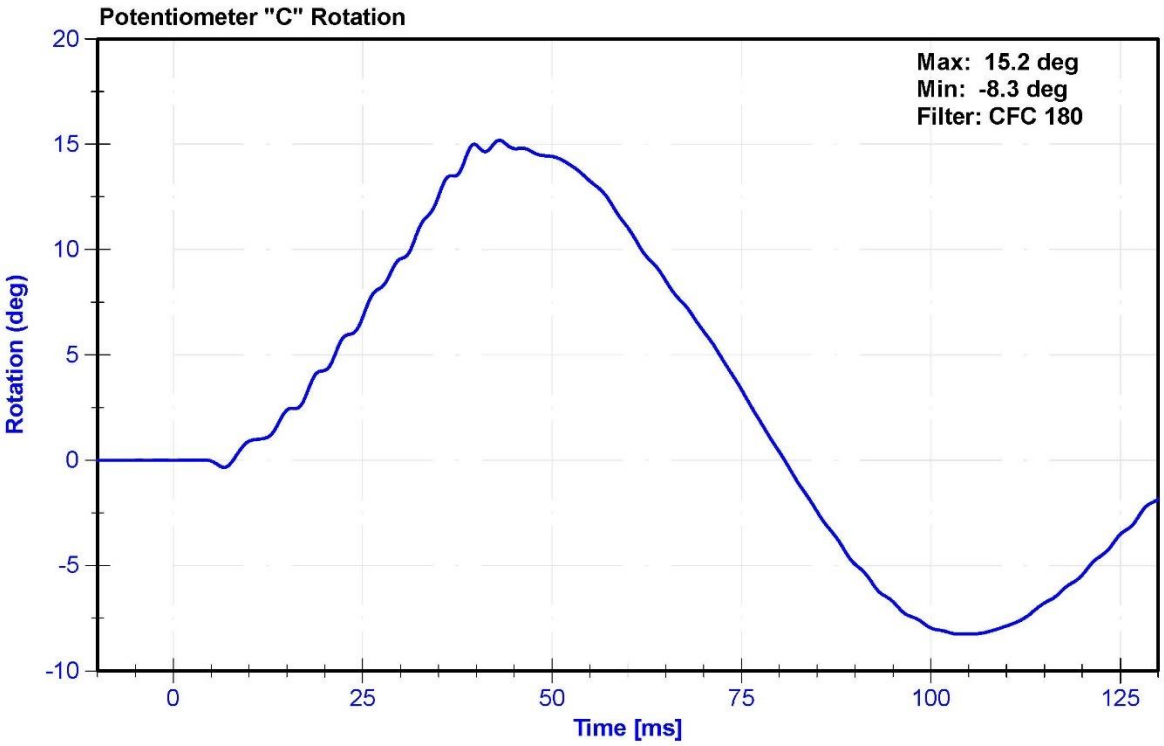
Pendulum Velocity[3]



[1,2] Upper and lower boundaries specified in Appendix I


Spine Rotation
Max: 45.6 deg
Min: -22.3 deg
Filter: CFC 180
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 30.5 deg
Min: -14.0 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]



Appendix I

[2] Upper Boundary Corridor		[1] Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.7	-0.24	2.7	-0.425
27.0	-5.80	24.5	-6.5
		30.0	-6.5

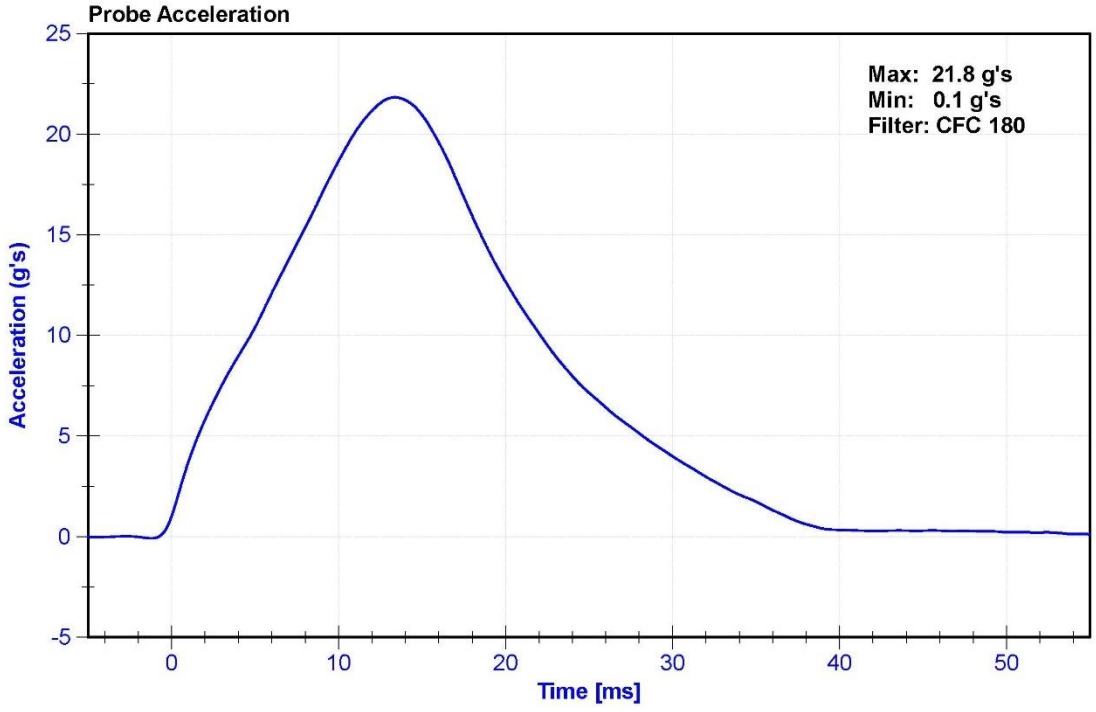
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

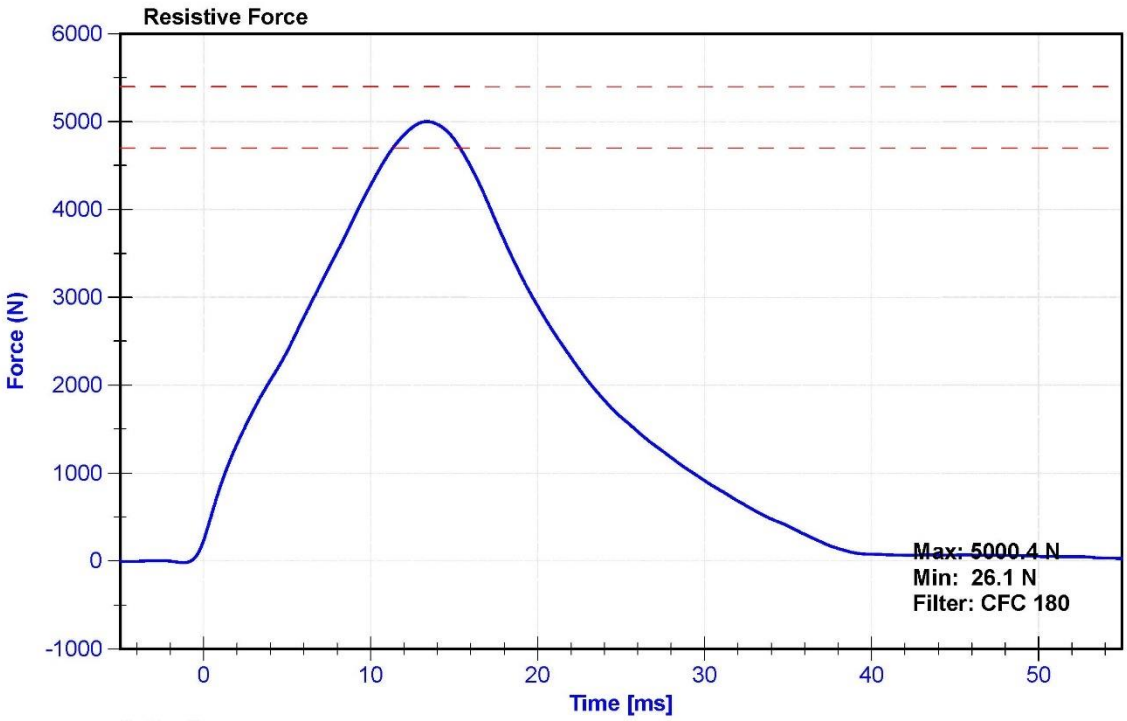
Results

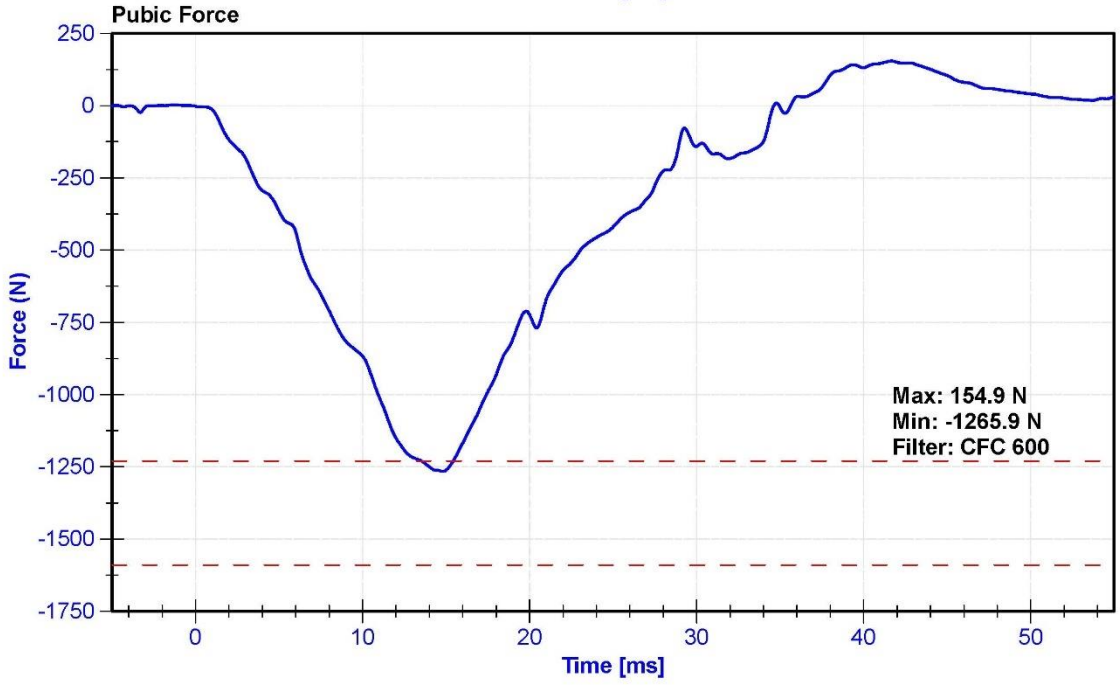
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	63.4	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Resistive Force	4700	5400	N	5000.4	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.35	Pass
Pubic Force	-1590	-1230	N	-1265.9	Pass
Time at Peak Pubic Force	12.2	17.0	ms	14.80	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Pubic Load Cell	Denton	464-FY	8/2/2021	8/2/2022




Resistive Force
Force (N)
Time [ms]
Max: 5000.4 N
Min: 26.1 N
Filter: CFC 180


Pubic Force
Force (N)
Time [ms]
Max: 154.9 N
Min: -1265.9 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

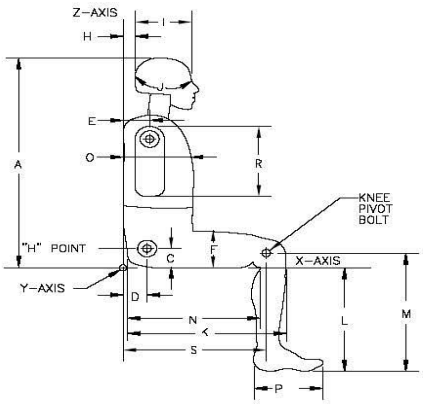
SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

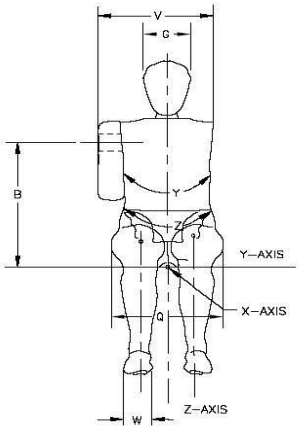
SERIAL No: 300

External Measurements - SID-IIs

Technician: K. Brogan Date: 07/06/2022

Dummy Serial Number: 300





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	778	Pass
B	Shoulder Pivot Height	437	453	445	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	105	Pass
F	Thigh Clearance	119	135	125	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	546	Pass
K	Buttock to Knee Length	514	540	528	Pass
L	Popliteal Height	343	369	363	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	432	Pass
O	Chest Depth w/o jacket	195	211	204	Pass
P	Foot Length	216	232	223	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	315	Pass
R	Arm Length	249	259	250	Pass
S	Knee Joint to seatback	477	493	486	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	86	Pass
Y	Chest Circumference w/jacket	851	881	879	Pass
Z	Waist Circumference	761	791	775	Pass

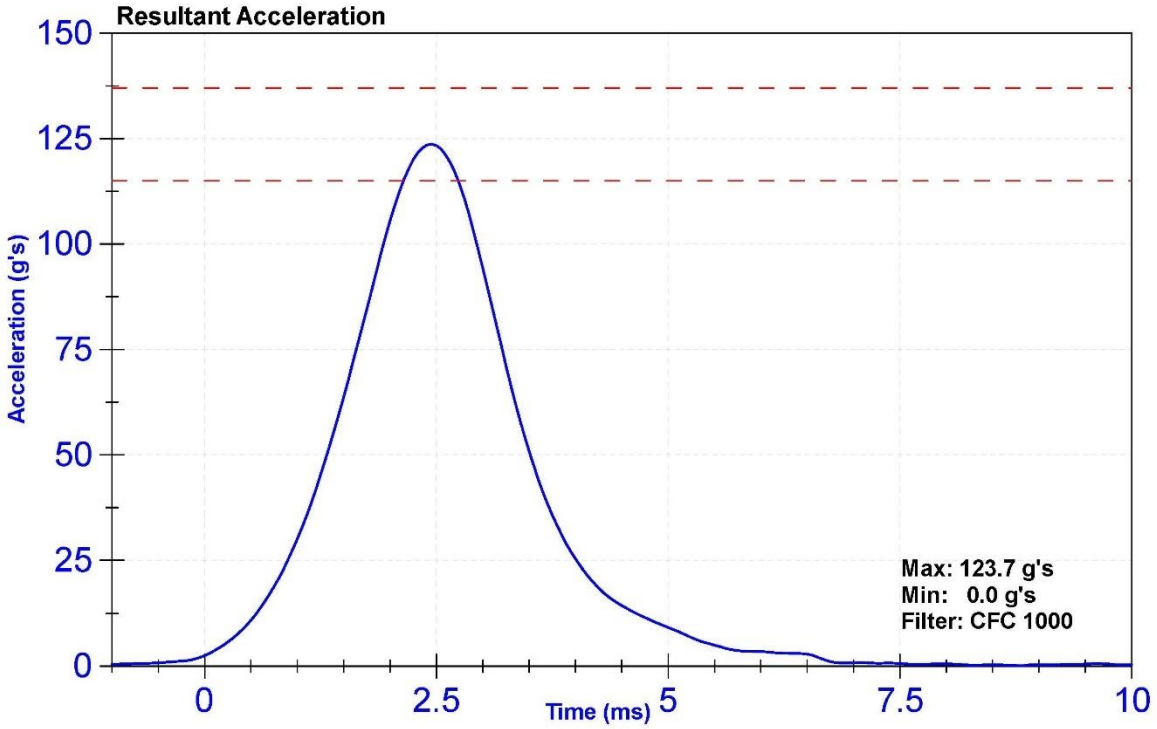
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

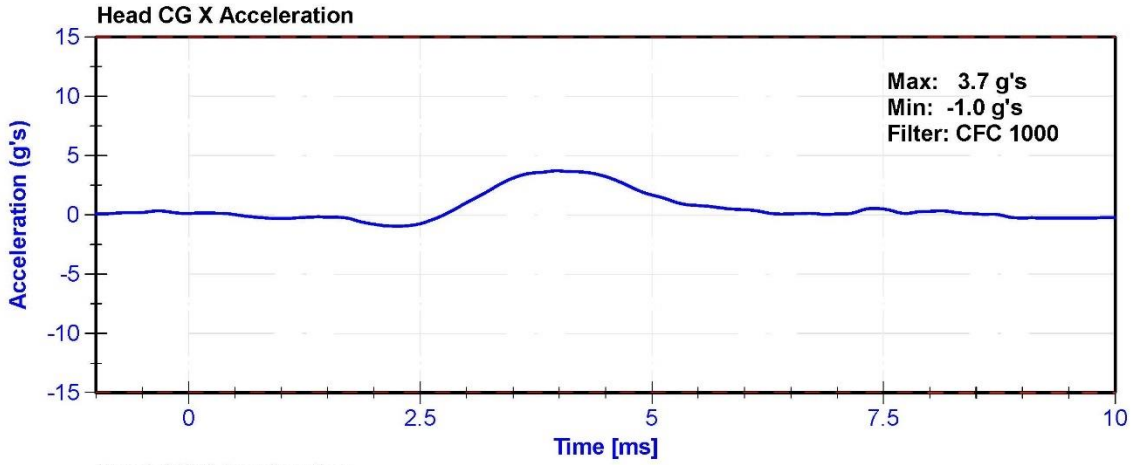
Results

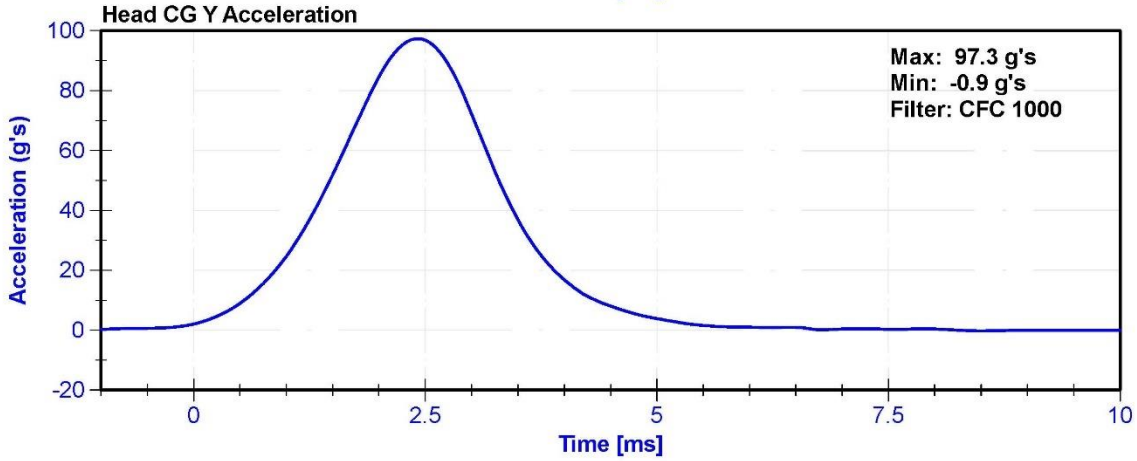
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	42.5	Pass
Resultant Acceleration	115	137	g's	123.7	Pass
Oscillation	0	15	%	0.9	Pass
Fore-Aft Acceleration	-15	15	g's	3.7	Pass

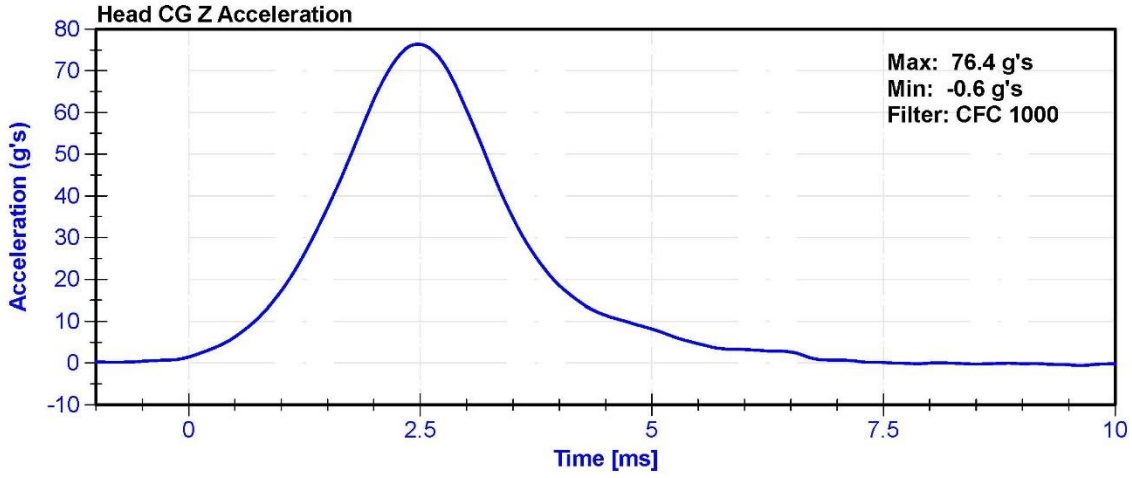
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P59018	5/17/2022	11/13/2022
Y Accelerometer	Endevco	P79189	5/17/2022	11/13/2022
Z Accelerometer	Endevco	P58777	5/17/2022	11/13/2022




Head CG X Acceleration
Max: 3.7 g's
Min: -1.0 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Y Acceleration
Max: 97.3 g's
Min: -0.9 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Z Acceleration
Max: 76.4 g's
Min: -0.6 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]

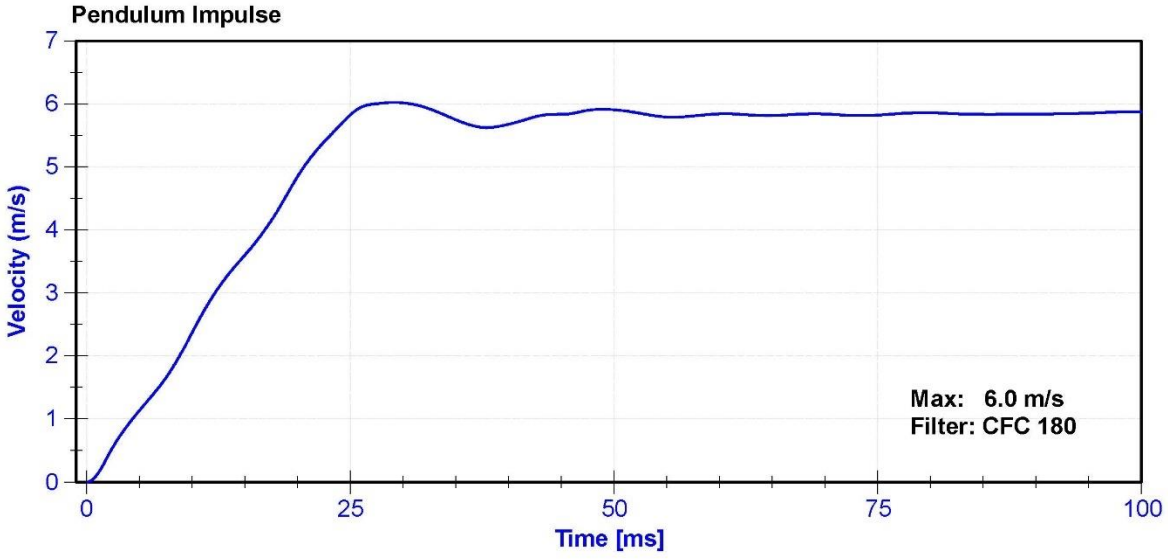
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

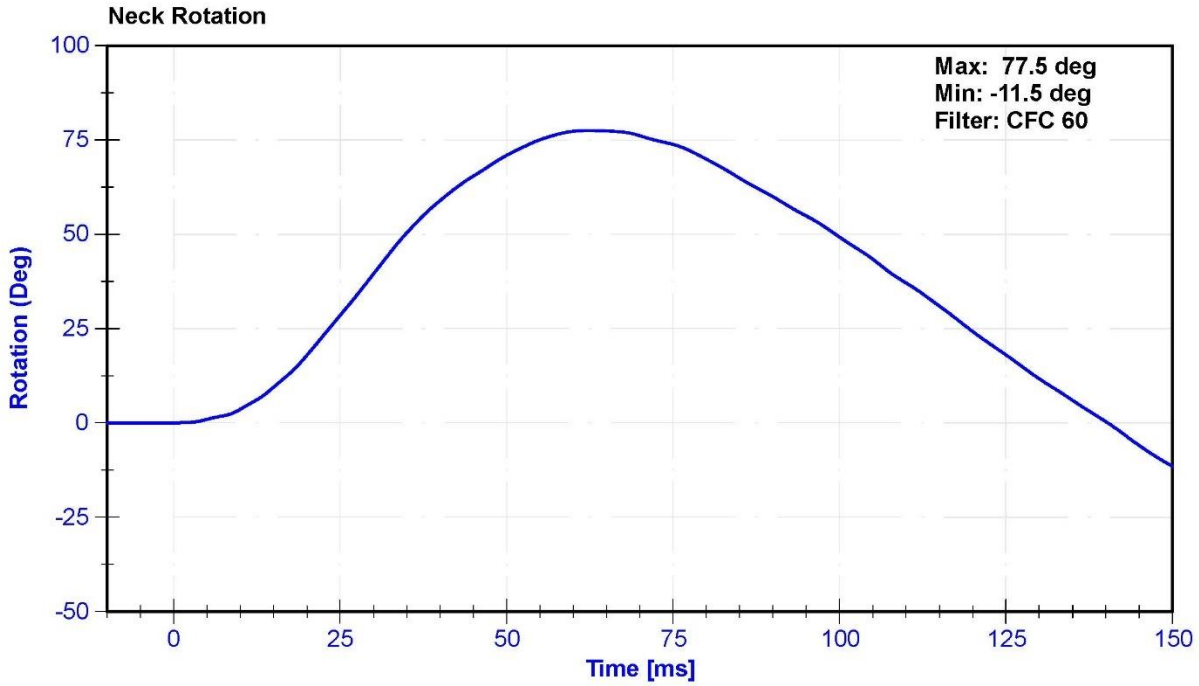
Results

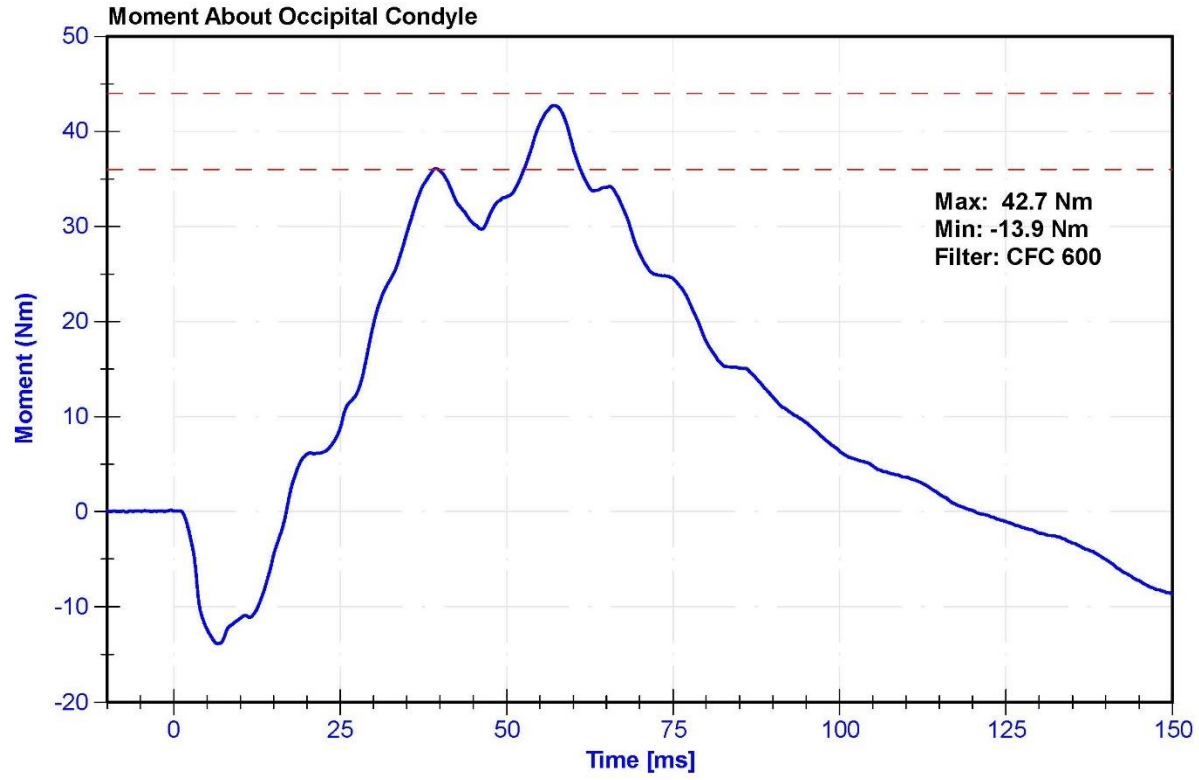
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	42.5	Pass
Velocity	5.51	5.63	m/s	5.593	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.37	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.60	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.85	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.83	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	6.02	Pass
Neck Rotation	71	81	deg	77.5	Pass
Time at Maximum Rotation	50	70	ms	62.3	Pass
Moment about the OC	36	44	Nm	42.7	Pass
Moment Decay to 0 Nm	102	126	ms	120.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231CT	10/28/2021	10/28/2022
Pendulum Potentiometer	Servo	4961	2/23/2022	2/23/2023
Condyle Potentiometer	Servo	DS185	11/12/2021	11/12/2022
Upper Neck Load Cell	Humanetics	1716A_1872-FY	6/13/2022	6/13/2023




Neck Rotation
Max: 77.5 deg
Min: -11.5 deg
Filter: CFC 60
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 42.7 Nm
Min: -13.9 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

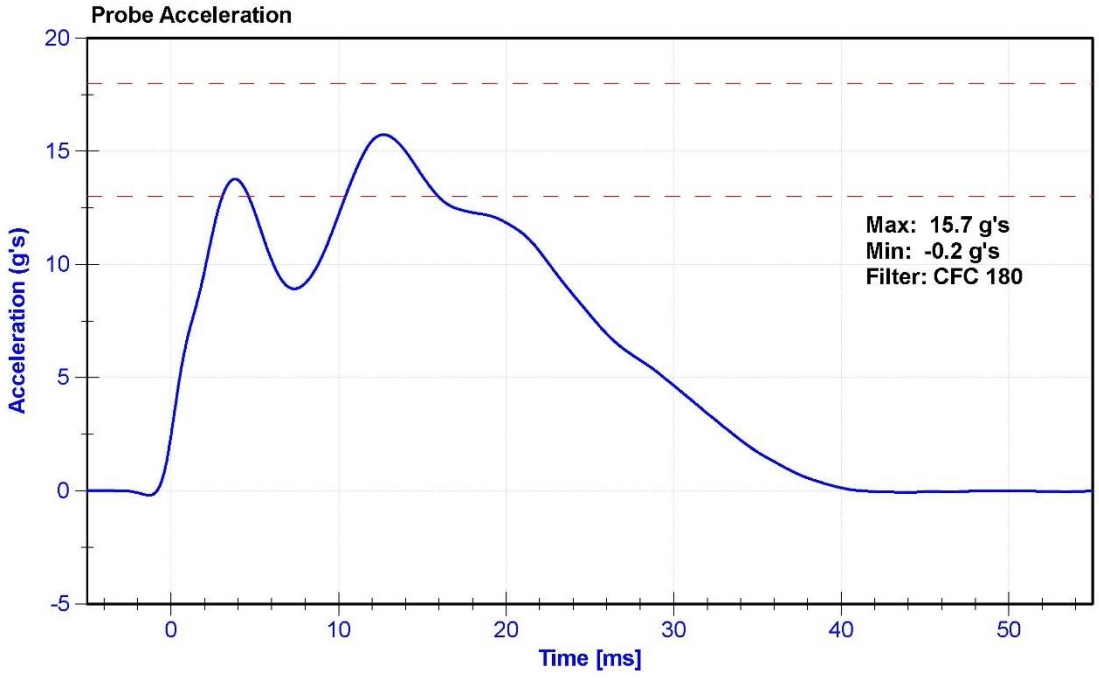
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

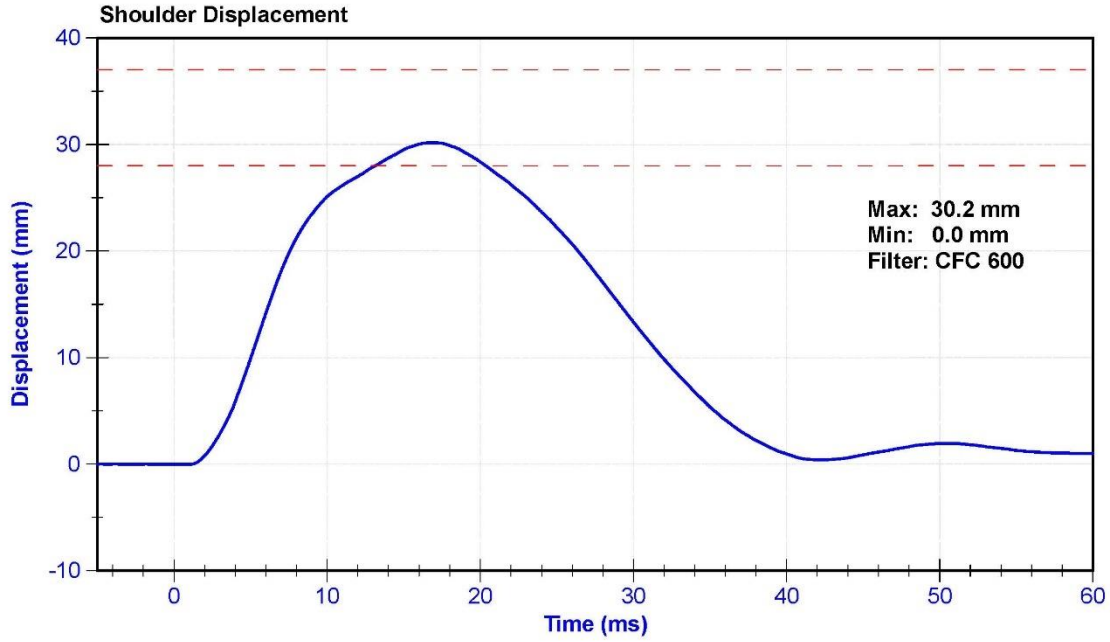
Results

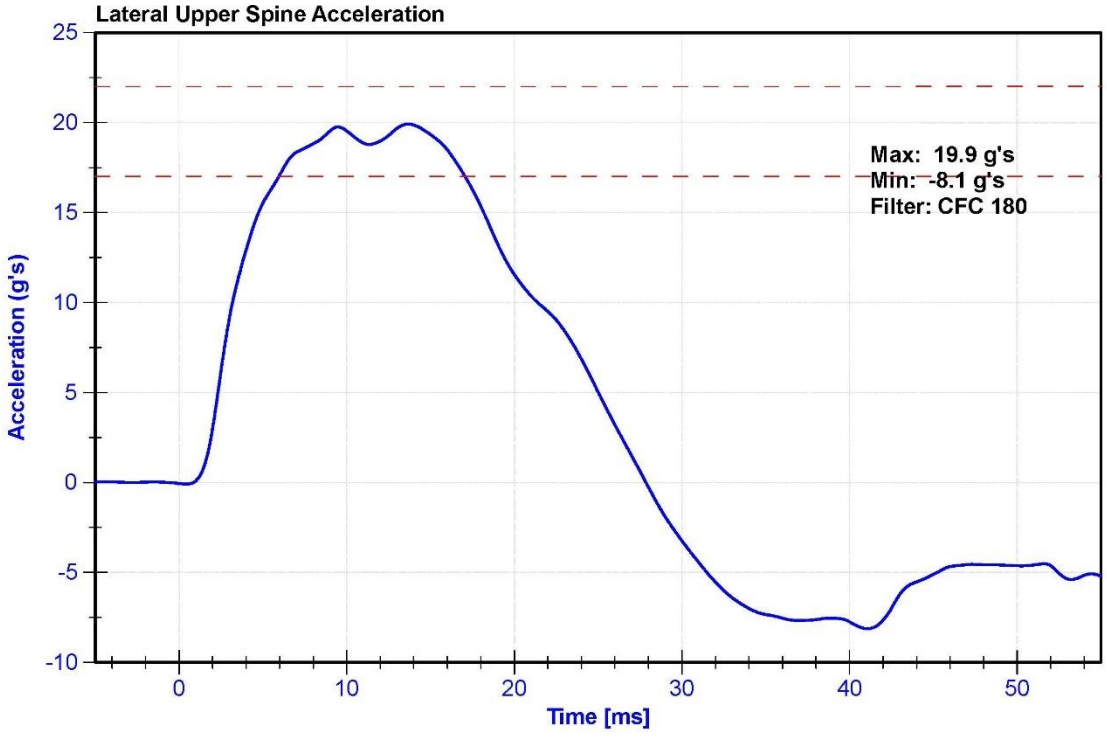
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	52.6	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	13	18	g's	15.7	Pass
Shoulder Deflection	28	37	mm	30.2	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Shoulder Potentiometer	Servo	053GFE	5/18/2022	11/16/2022
Upper Spine Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 30.2 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 19.9 g's
Min: -8.1 g's
Filter: CFC 180

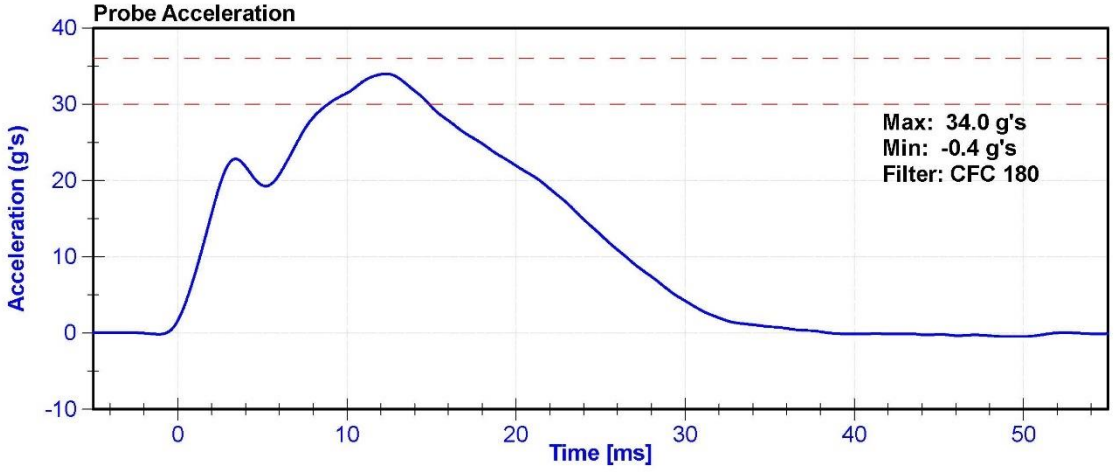
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

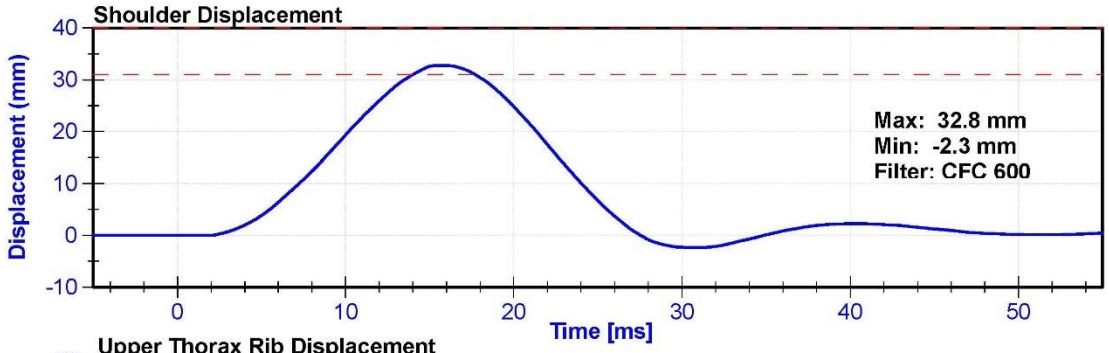
Results

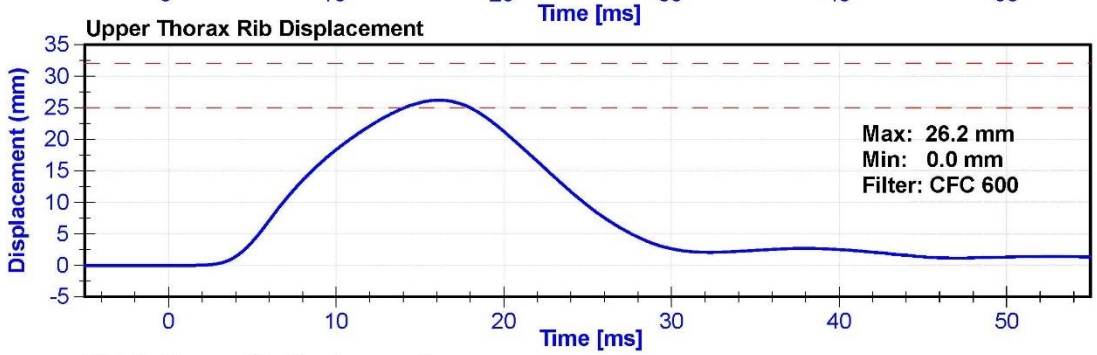
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	52.6	Pass
Velocity	6.6	6.8	m/s	6.74	Pass
Probe Acceleration after 5 ms	30	36	g's	34.0	Pass
Lateral Upper Spine Acceleration	34	43	g's	37.8	Pass
Lateral Lower Spine Acceleration	29	37	g's	31.0	Pass
Shoulder Deflection	31	40	mm	32.8	Pass
Upper Thorax Rib Deflection	25	32	mm	26.2	Pass
Mid Thorax Rib Deflection	30	36	mm	31.0	Pass
Lower Thorax Rib Deflection	32	38	mm	32.5	Pass

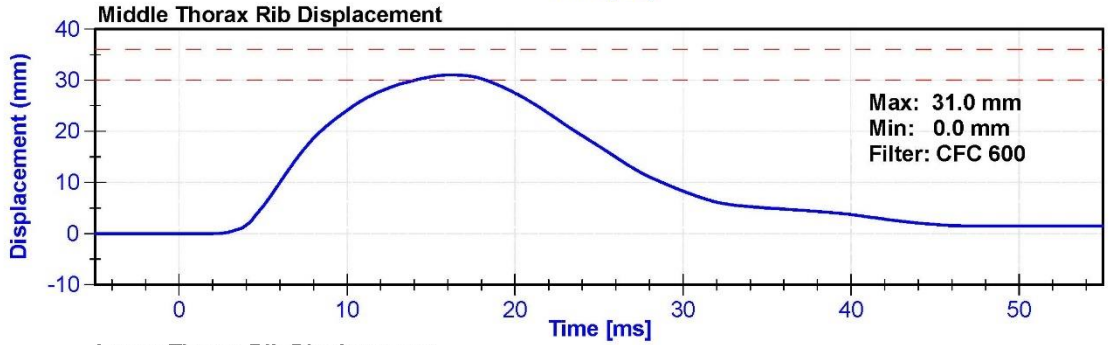
Transducer Calibrations

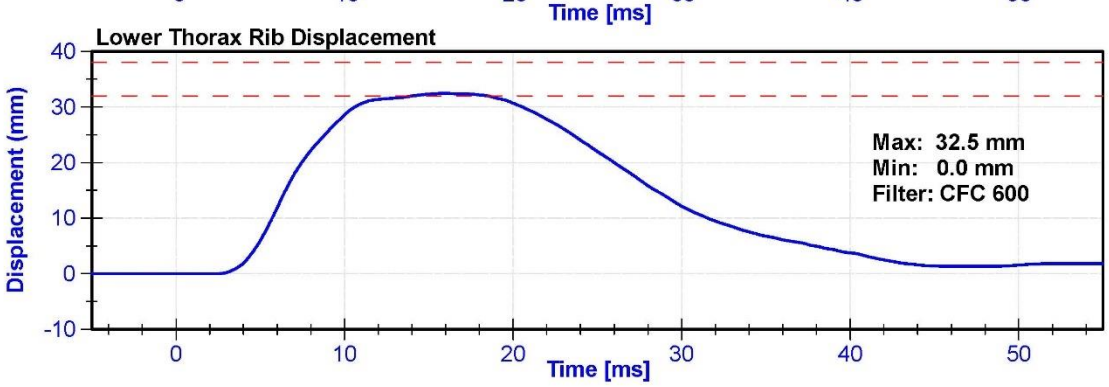
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Upper Spine T1 Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022
Upper Spine T12 Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Shoulder Potentiometer	Servo	053GFE	5/18/2022	11/16/2022
Upper Thorax Rib Potentiometer	Servo	2316GFE	6/27/2022	12/26/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	5/18/2022	11/16/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	5/18/2022	11/16/2022

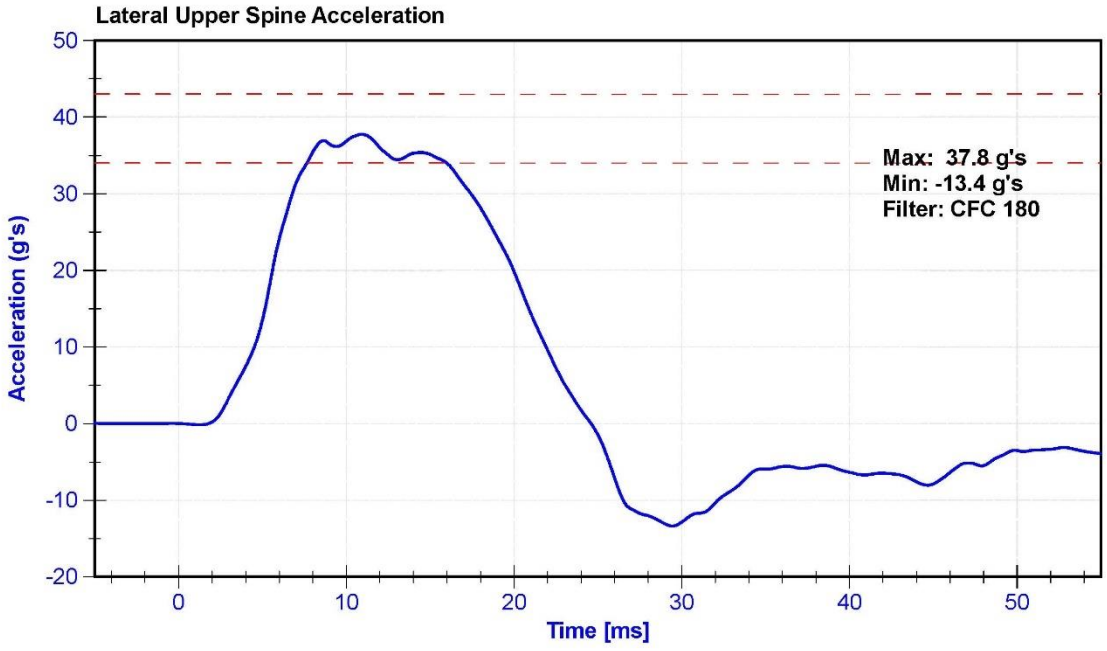


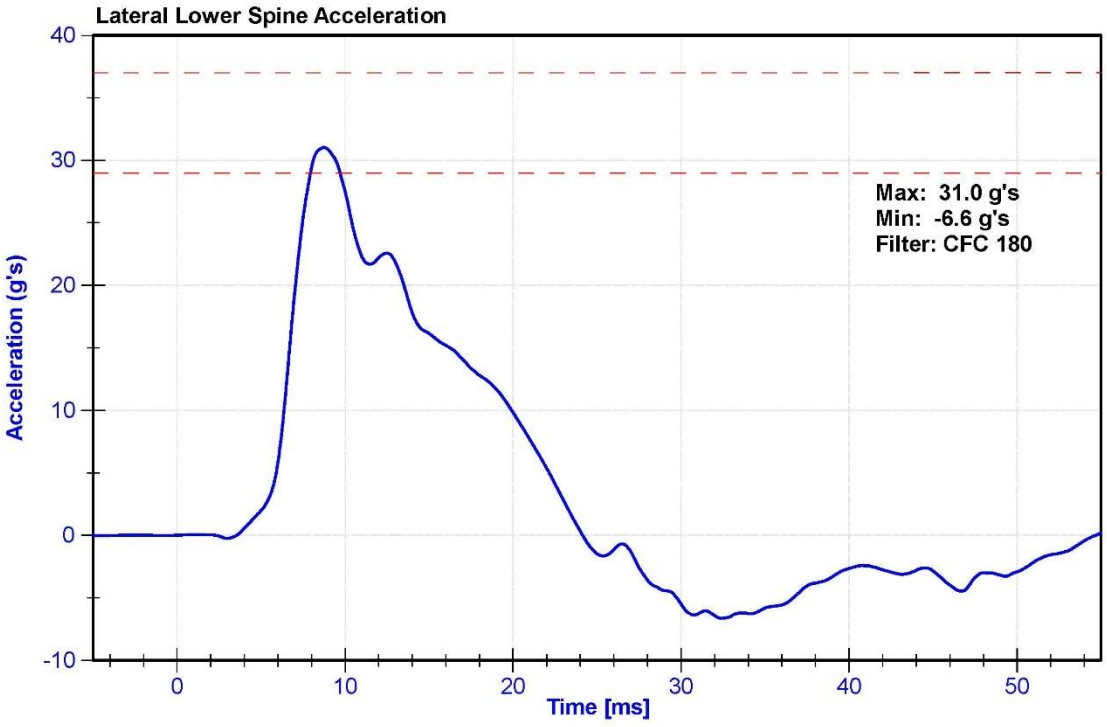

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 32.8 mm
Min: -2.3 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 26.2 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 31.0 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.5 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 37.8 g's
Min: -13.4 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 31.0 g's
Min: -6.6 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

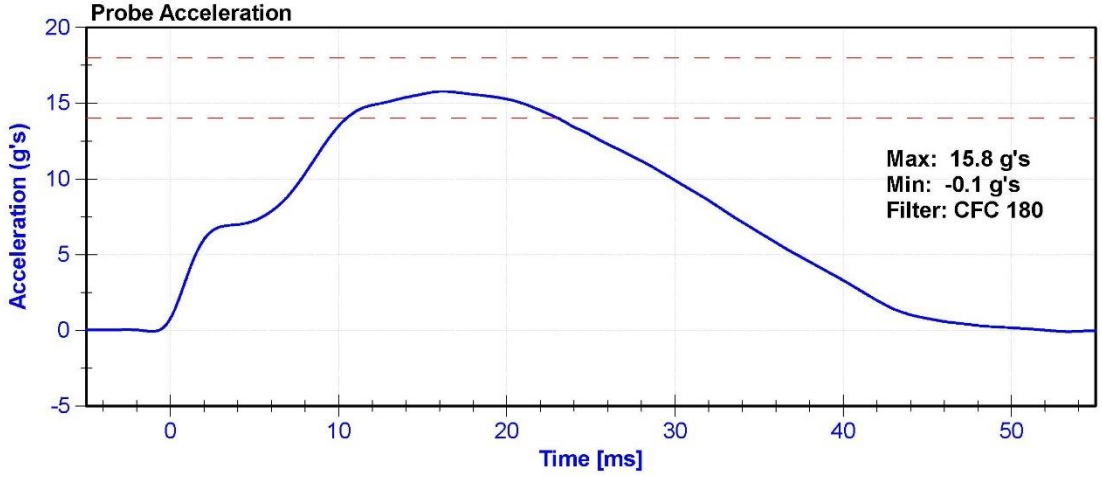
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

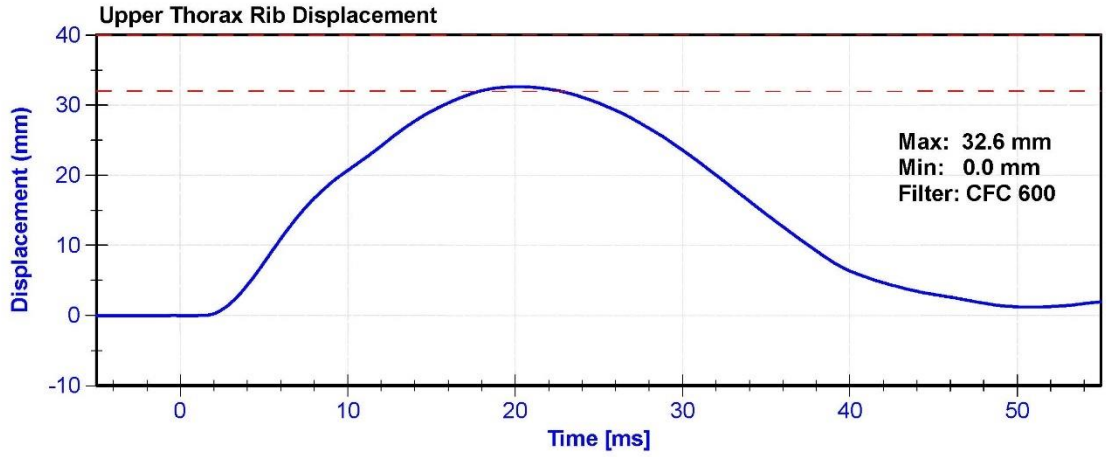
Results

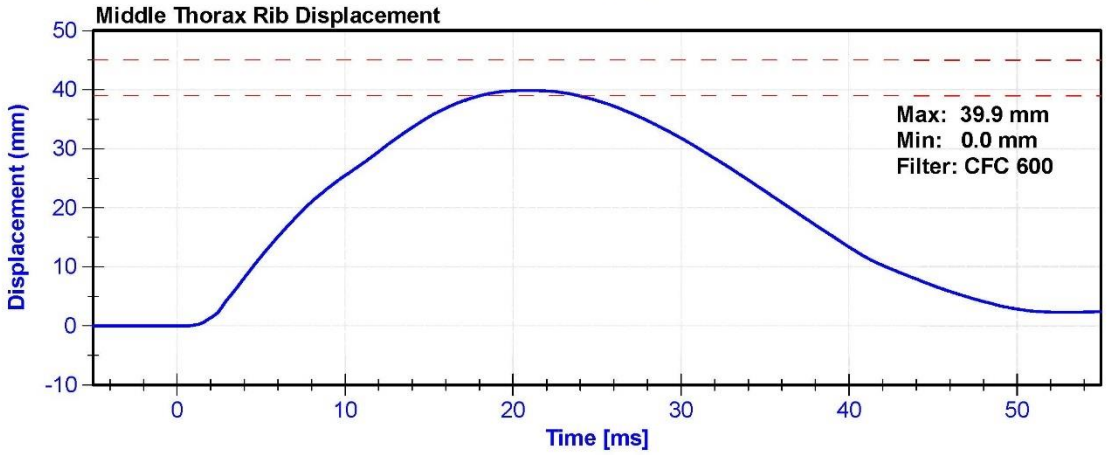
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	52.6	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	14	18	g's	15.8	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.2	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.2	Pass
Upper Thorax Rib Deflection	32	40	mm	32.6	Pass
Middle Thorax Rib Deflection	39	45	mm	39.9	Pass
Lower Thorax Rib Deflection	35	43	mm	37.5	Pass

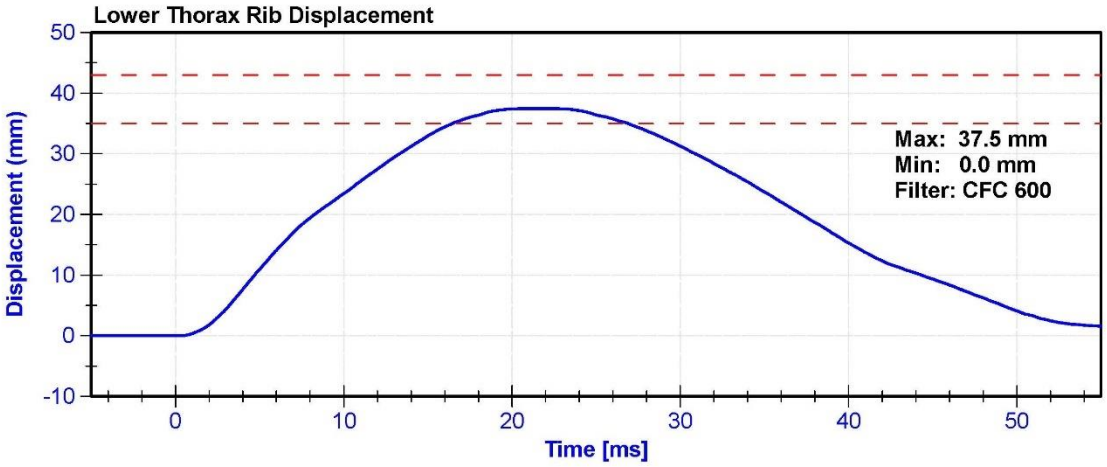
Transducer Calibrations

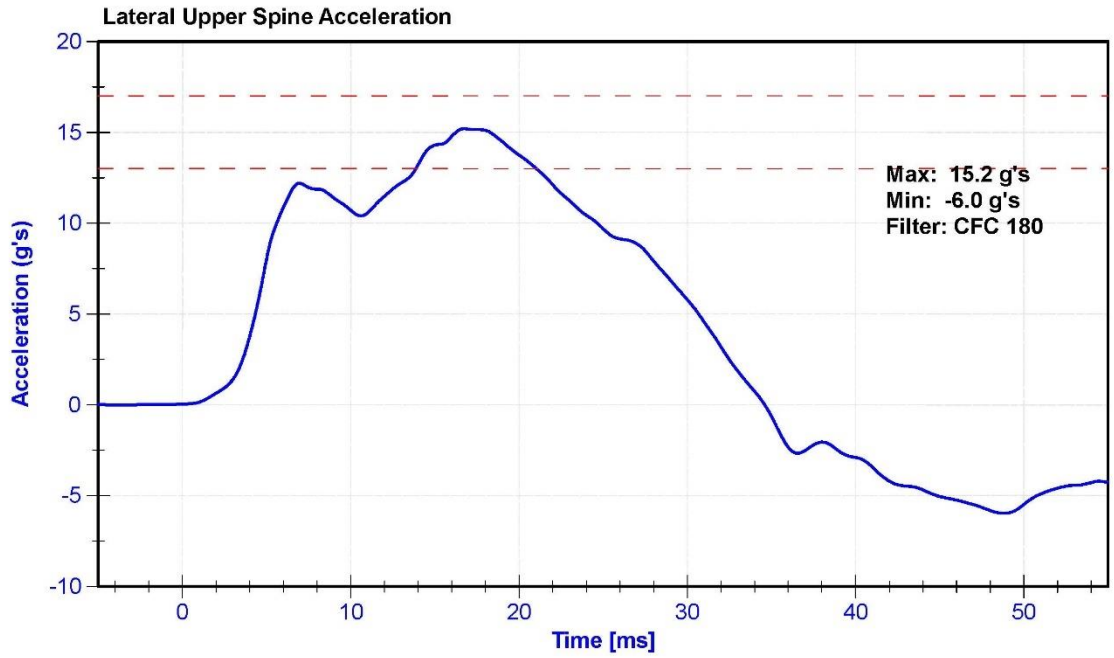
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Upper Spine Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022
Lower Spine Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Upper Thorax Rib Potentiometer	Servo	2316GFE	6/27/2022	12/26/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	5/18/2022	11/16/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	5/18/2022	11/16/2022

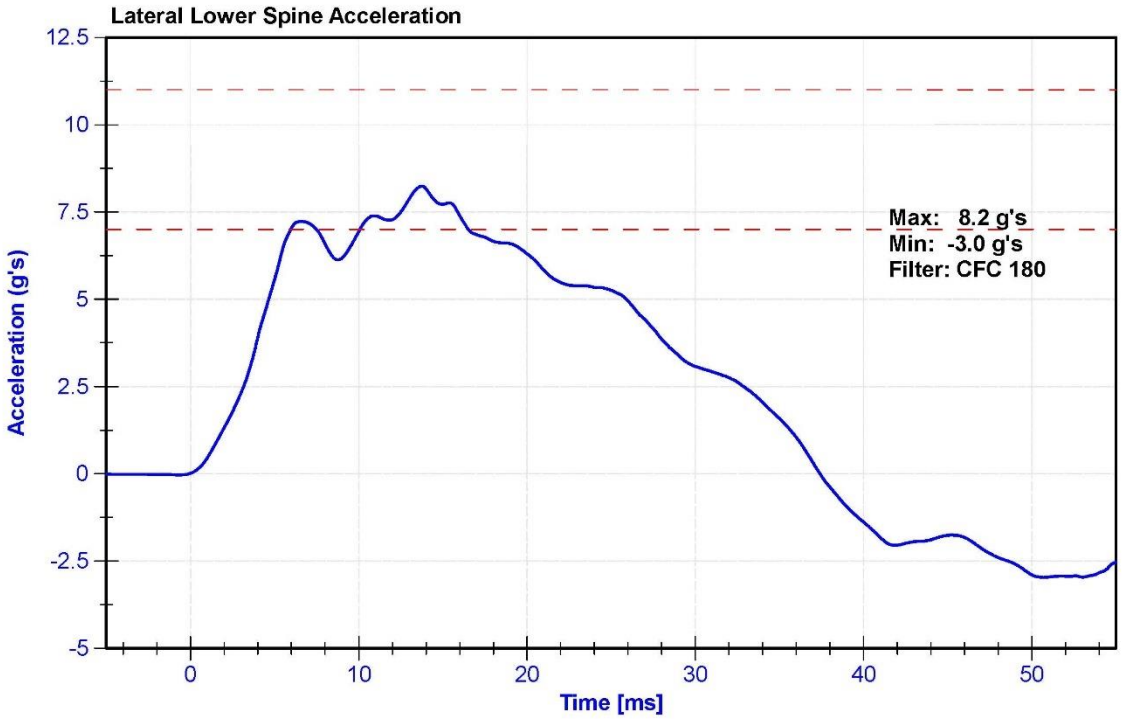



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.6 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 39.9 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.5 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 15.2 g's
Min: -6.0 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
20
15
10
5
0
-5
-10
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 8.2 g's
Min: -3.0 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50

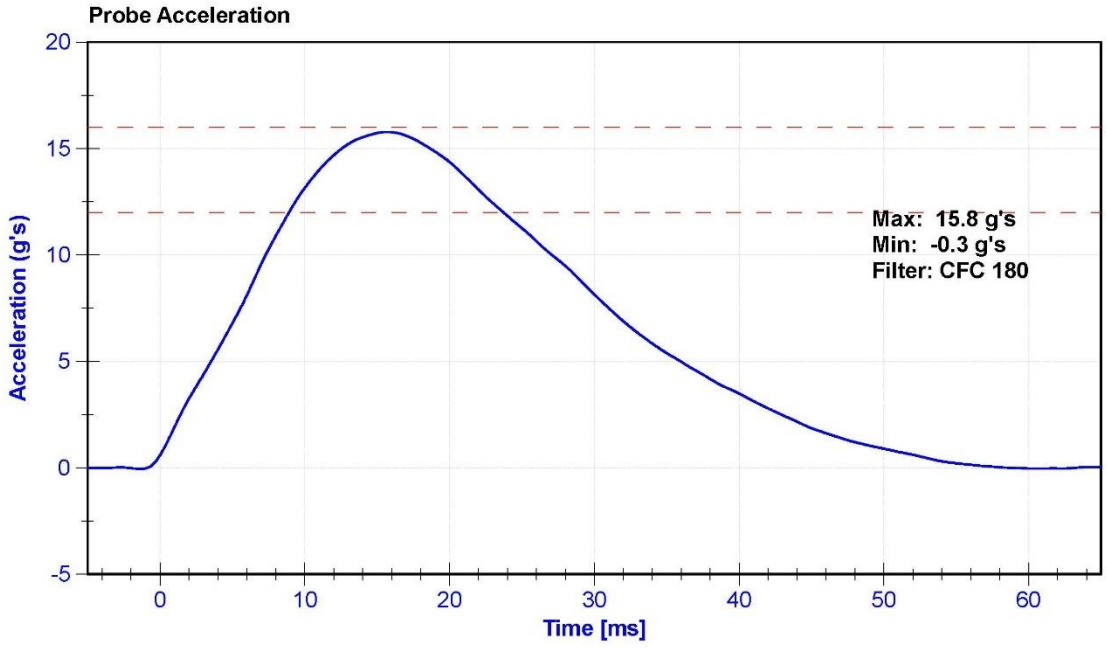
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

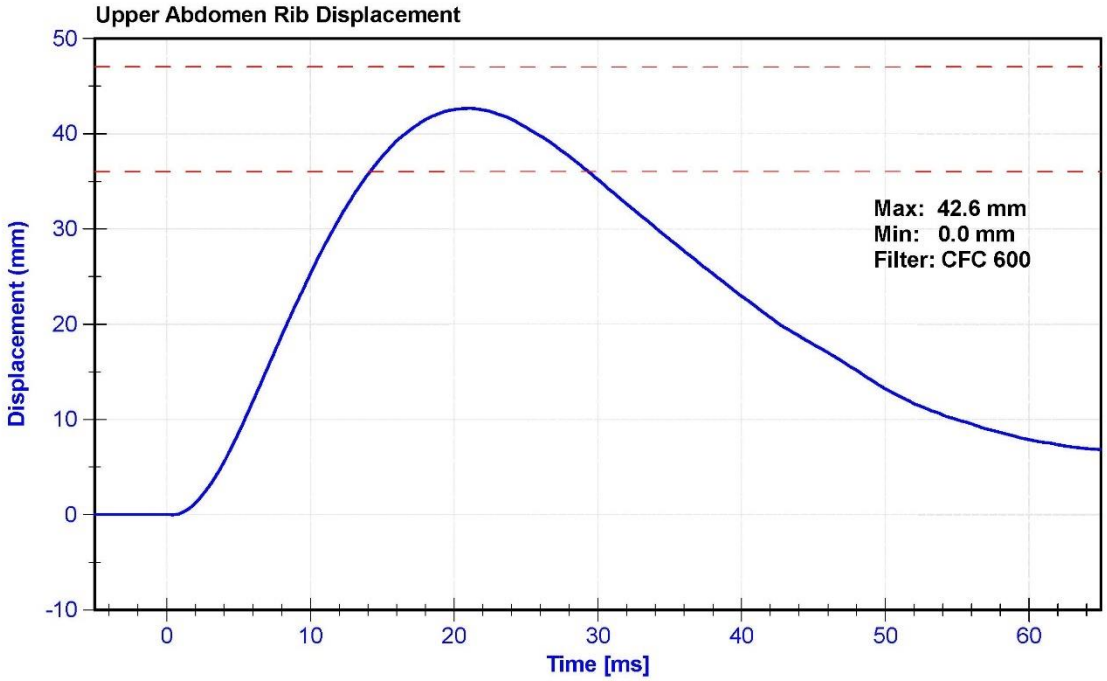
Results

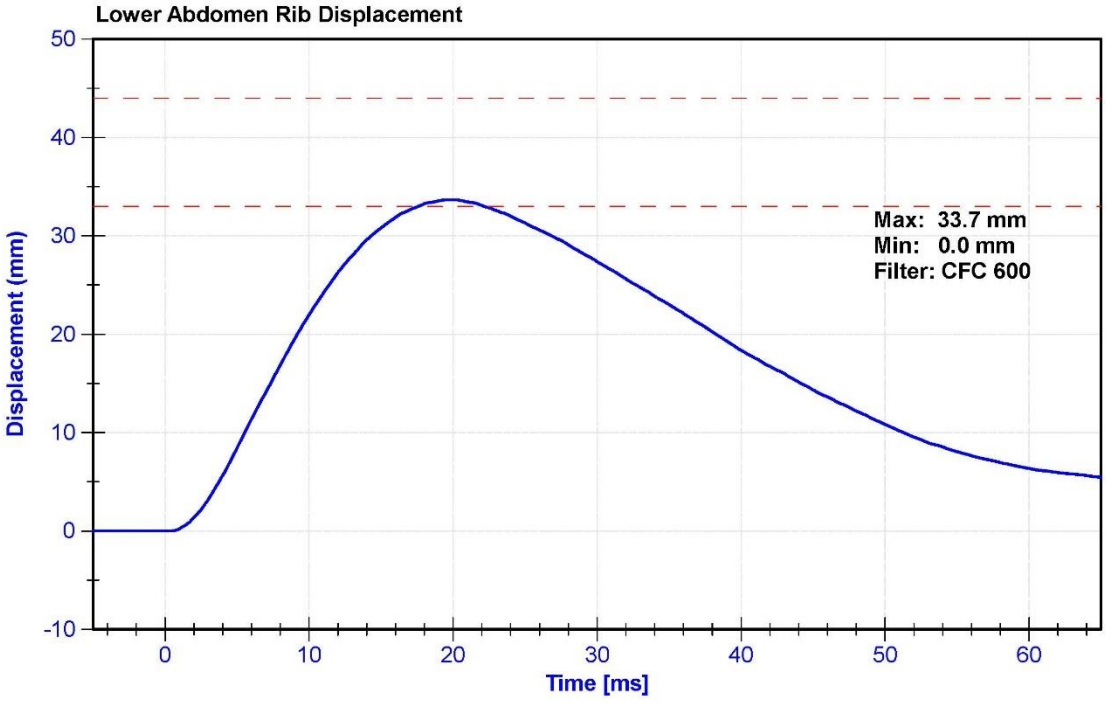
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	52.6	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	12	16	g's	15.8	Pass
Lateral Lower Spine Acceleration	9	14	g's	13.8	Pass
Upper Abdomen Rib Deflection	36	47	mm	42.6	Pass
Lower Abdomen Rib Deflection	33	44	mm	33.7	Pass

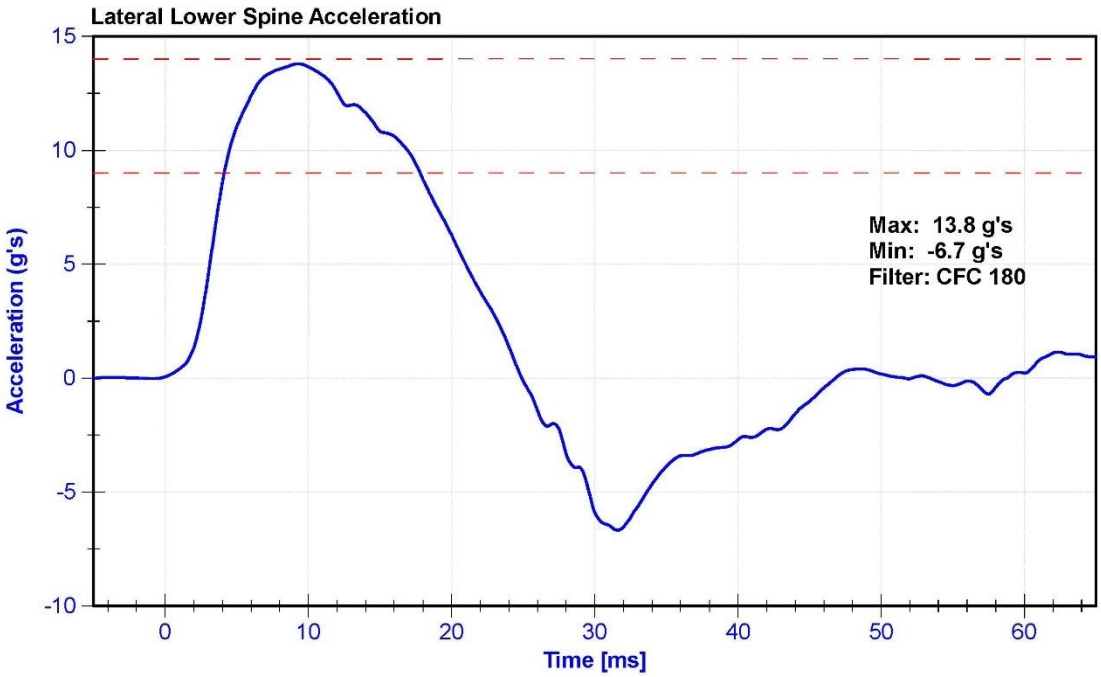
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Lower Spine Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Upper Abdomen Rib Potentiometer	Servo	307GFE	5/20/2022	11/18/2022
Lower Abdomen Rib Potentiometer	Servo	308GFE	5/18/2022	11/16/2022




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.6 mm
Min: 0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.7 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 13.8 g's
Min: -6.7 g's
Filter: CFC 180
15
10
5
0
-5
-10
0
10
20
30
40
50
60

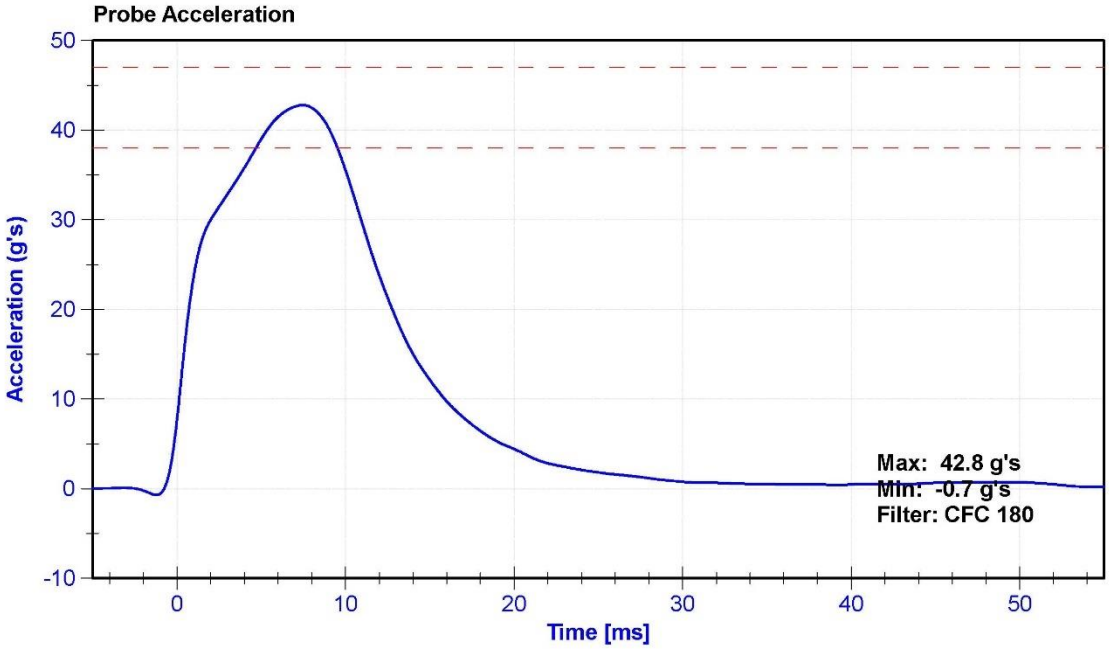
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

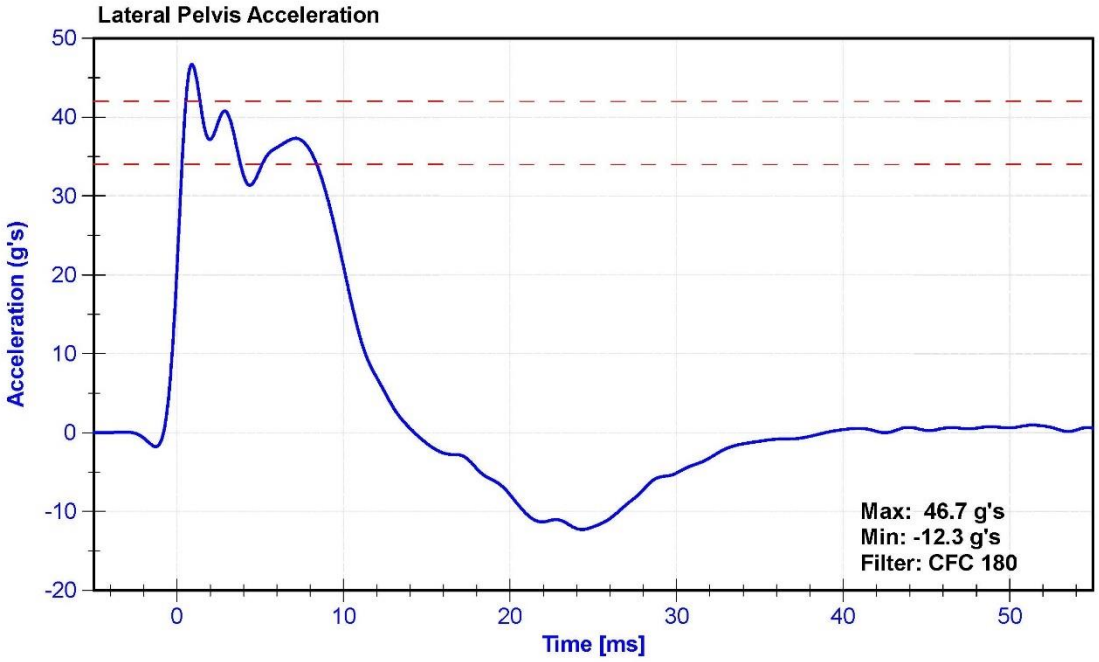
Results

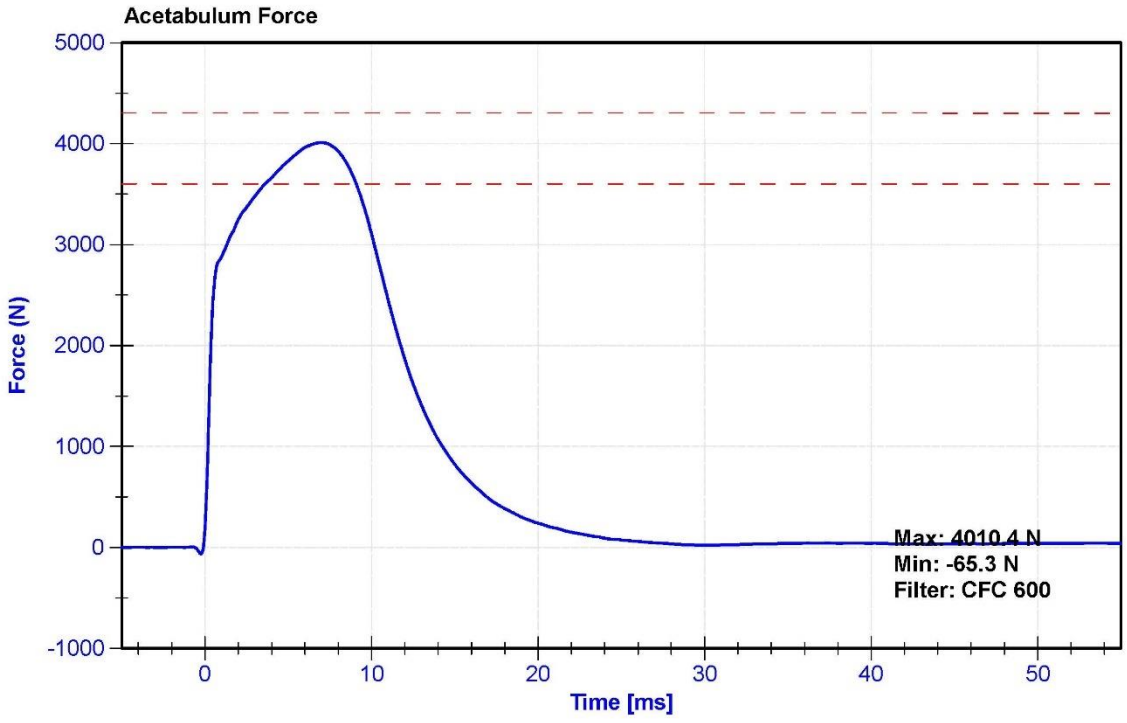
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	52.6	Pass
Velocity	6.6	6.8	m/s	6.75	Pass
Probe Acceleration	38	47	g's	42.8	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	37.3	Pass
Acetabulum Force	3600	4300	N	4010.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Pelvis Y Accelerometer	Endevco	P51731	5/17/2022	11/13/2022
Acetabulum Load Cell	Denton	275-FY	9/14/2021	9/14/2022
Certification Plug	SACO	15168	3/8/2021	N/A
Crash Test Plug	SACO	15470	9/22/2021	N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 46.7 g's
Min: -12.3 g's
Filter: CFC 180


Acetabulum Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4010.4 N
Min: -65.3 N
Filter: CFC 600

SACO RESEARCH

CRASH - IMPACT

7/1/22

SID-IIs Pelvis Plug Certification Test

Plug S/N 15470
Test Number 20189
Report Number 20243
Test Date 9/22/2021 8:07:47 AM

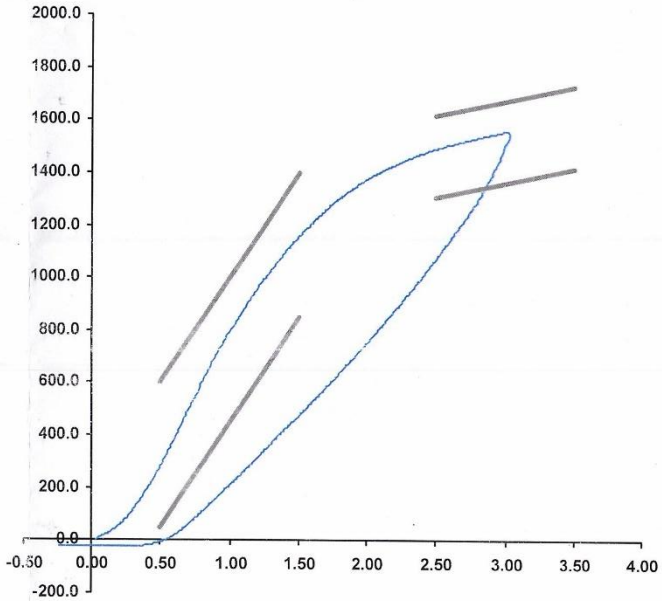
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	291	50	600
Force @ 1.5 mm (N)	1,161	850	1,400
Force @ 2.5 mm (N)	1,494	1,306	1,618
Force @ 3.0 mm (N)	1,561	1,361	1,673

Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 22-Sep-21
SACO Research

By : DC Date : 9/22/2021

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

SACO RESEARCH

CRASH
NON-IMPACT
7/1/22

SID-IIs Pelvis Plug Certification Test

Plug S/N 15170
Test Number 17886
Report Number 17935
Test Date 3/8/2021 12:06:15 PM

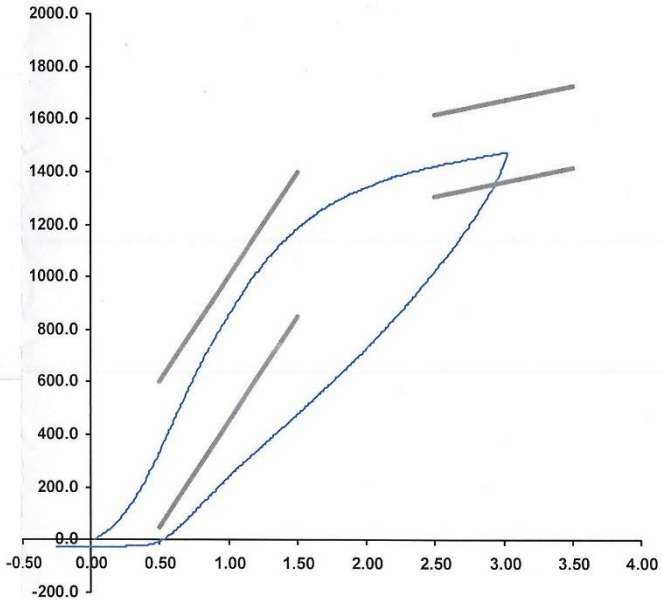
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	348	50	600
Force @ 1.5 mm (N)	1,189	850	1,400
Force @ 2.5 mm (N)	1,424	1,306	1,618
Force @ 3.0 mm (N)	1,474	1,361	1,673

Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 08-Mar-21
SACO Research

By : DC Date : 3/8/2021

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

SACO RESEARCH

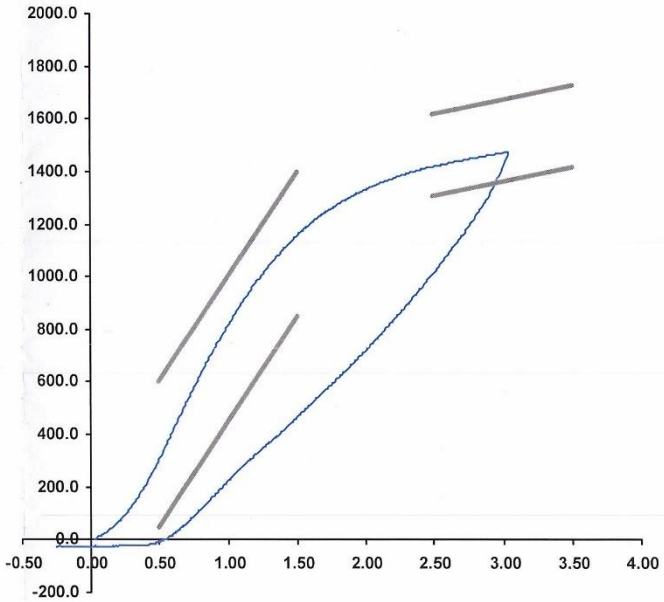
CERT 7/1/22

SID-IIs Pelvis Plug Certification Test

Plug S/N 15168
Test Number 17884
Report Number 17933
Test Date 3/8/2021 11:59:37 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	313	50	600
Force @ 1.5 mm (N)	1,158	850	1,400
Force @ 2.5 mm (N)	1,420	1,306	1,618
Force @ 3.0 mm (N)	1,472	1,361	1,673

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (FI360947), 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 08-Mar-21
SACO Research

By : DC Date : 3/8/2021

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

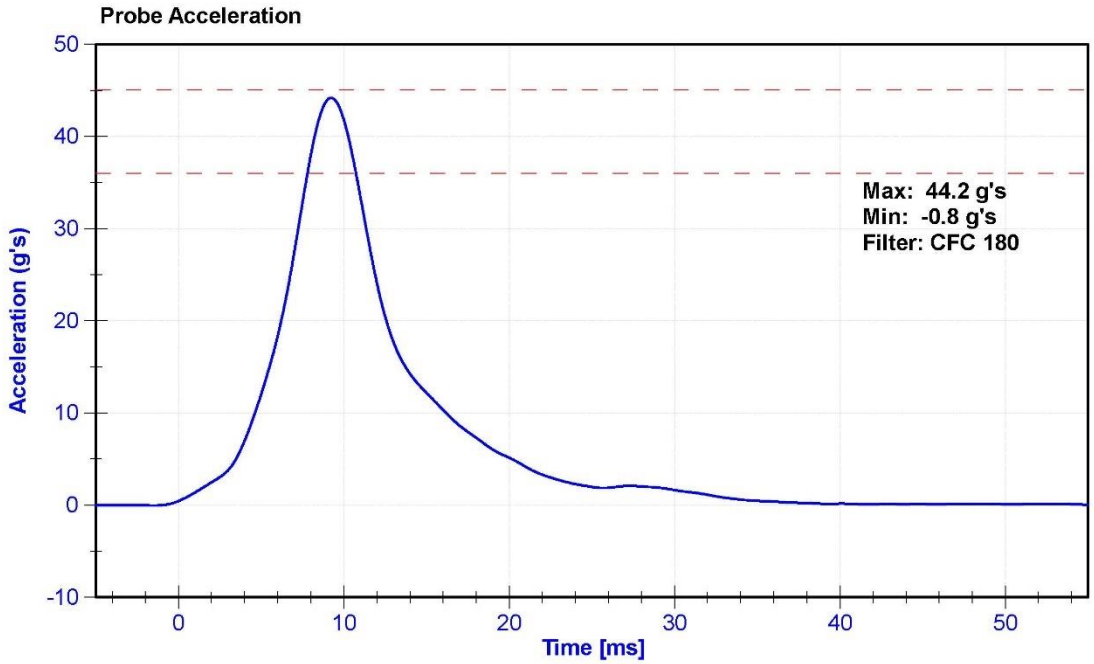
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

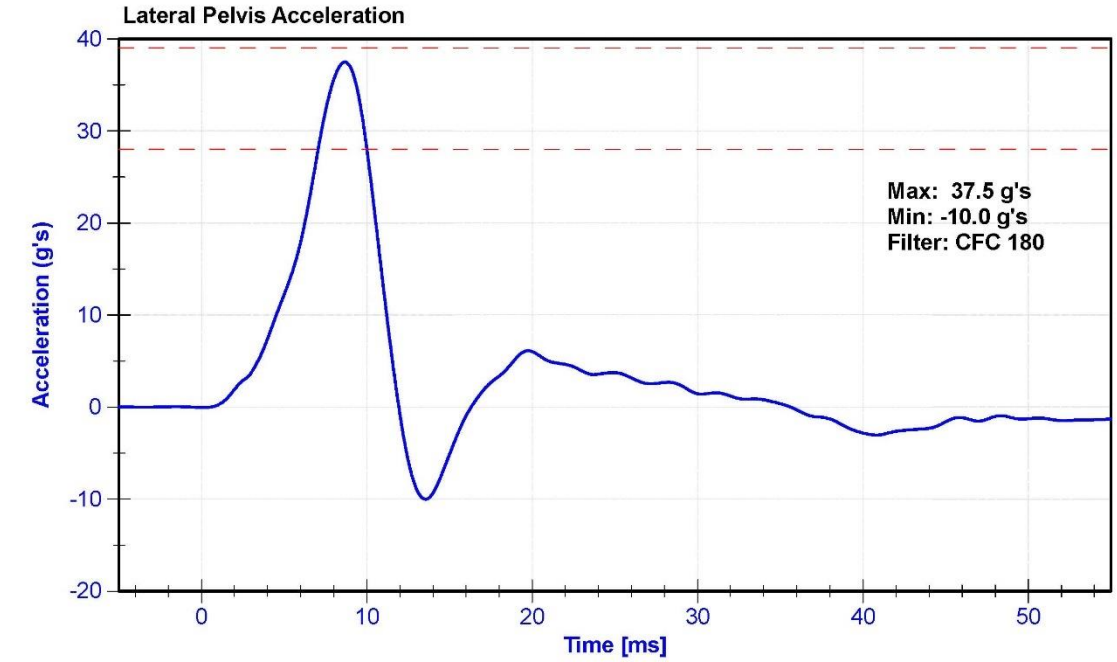
Results

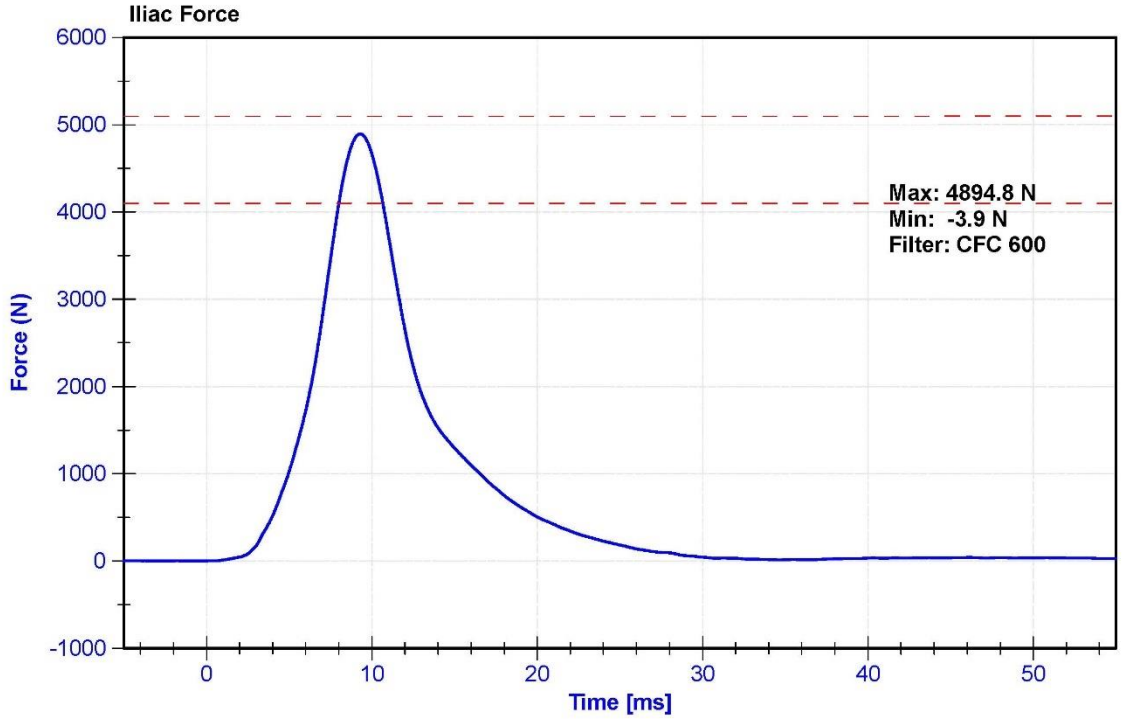
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	52.6	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	36	45	g's	44.2	Pass
Lateral Pelvis Acceleration	28	39	g's	37.5	Pass
Iliac Force	4100	5100	N	4894.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Pelvis Y Accelerometer	Endevco	P51731	5/17/2022	11/13/2022
Iliac Load Cell	Denton	279-FY	9/14/2021	9/14/2022




Lateral Pelvis Acceleration
Max: 37.5 g's
Min: -10.0 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]


Iliac Force
Max: 4894.8 N
Min: -3.9 N
Filter: CFC 600
Force (N)
Time [ms]

APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N: F033		
			Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers	Primary	X	P63861	Endevco	1/31/2022
		Y	P49216	Endevco	1/31/2022
		Z	P51303	Endevco	1/31/2022
	Redundant	X	P58868	Endevco	1/31/2022
		Y	P16755	Endevco	1/31/2022
		Z	P52132	Endevco	1/31/2022
Thorax Rib Displacement Potentiometers	Upper	Y	179GFE	Honeywell	2/1/2022
	Middle	Y	185GFE	Honeywell	2/1/2022
	Lower	Y	178GFE	Honeywell	2/1/2022
Abdomen Load Cells	Forward	Y	1512	Denton	8/2/2021
	Middle	Y	1526	Denton	8/2/2021
	Rear	Y	1516	Denton	8/2/2021
Lower Spine Accelerometers (T12)		X	P52009	Endevco	1/31/2022
		Y	P69803	Endevco	1/31/2022
		Z	P52033	Endevco	1/31/2022
Pubic Symphysis Load Cell		Y	464-FY	Denton	8/2/2021

TABLE 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N: 300		
				Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers		Primary	X	P59018	Endevco	5/17/2022
			Y	P79189	Endevco	5/17/2022
			Z	P58777	Endevco	5/17/2022
		Redundant	X	P68057	Endevco	5/17/2022
			Y	P58986	Endevco	5/17/2022
			Z	P52025	Endevco	5/17/2022
Displacement Potentiometers	Thoracic Rib	Upper	Y	2316GFE	Servo	6/27/2022
		Middle	Y	040GFE	Servo	5/18/2022
		Lower	Y	1156GFE	Servo	5/18/2022
	Abdominal Rib	Upper	Y	307GFE	Servo	5/20/2022
		Lower	Y	308GFE	Servo	5/18/2022
Lower Spine Accelerometers (T12)			X	P64003	Endevco	5/17/2022
			Y	P52071	Endevco	5/17/2022
			Z	P17283	Endevco	5/17/2022
Acetabulum Load Cell			Y	275-FY	Denton	9/14/2021
Iliac Wing Load Cell			Y	279-FY	Denton	9/14/2021
Pelvis Plug (struck side)				14075	SACO	5/25/2020
Pelvis Plug (non-struck side)				13942	SACO	5/20/2020

Table 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	A262061	Measurement Specialties	5/12/2022
	Vehicle Center of Gravity	Y	A280848	Measurement Specialties	5/12/2022
	Vehicle Center of Gravity	Z	A315737	Measurement Specialties	5/12/2022
2	Right Sill at Front Seat	X	A352316	Measurement Specialties	2/9/2022
	Right Sill at Front Seat	Y	A400754	Measurement Specialties	2/9/2022
	Right Sill at Front Seat	Z	A405578	Measurement Specialties	2/9/2022
3	Right Sill at Rear Seat	X	A374260	Measurement Specialties	6/16/2022
	Right Sill at Rear Seat	Y	A374262	Measurement Specialties	6/16/2022
	Right Sill at Rear Seat	Z	A372840	Measurement Specialties	6/16/2022
4	Left Sill at Front Door	Y	A431249	Measurement Specialties	3/22/2022
5	Left Sill at Rear Door	Y	A396620	Measurement Specialties	2/17/2022
6	Left A-Post Lower	Y	A431234	Measurement Specialties	3/21/2022
7	Left A-Post Middle	Y	A399999	Measurement Specialties	4/25/2022
8	Left B-Post Lower	Y	A284340	Measurement Specialties	4/28/2022
9	Left B-Post Middle	Y	A374332	Measurement Specialties	4/14/2022
10	Front Seat Track	Y	A428043	Measurement Specialties	3/2/2022
11	Rear Seat Track or Structure	Y	A428005	Measurement Specialties	3/1/2022
12	Right Rear Occ. Compartment	Y	A255996	Measurement Specialties	4/18/2022
13	Engine Block	X	A372801	Measurement Specialties	2/9/2022
	Engine Block	Y	A398334	Measurement Specialties	2/9/2022
14	Rear Floorpan Above Axle	X	A262047	Measurement Specialties	5/20/2022
	Rear Floorpan Above Axle	Y	A373193	Measurement Specialties	5/20/2022
	Rear Floorpan Above Axle	Z	A398666	Measurement Specialties	4/25/2022

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	A405546	Measurement Specialties	6/16/2022
MDB Center of Gravity	Y	A413593	Measurement Specialties	6/16/2022
MDB Center of Gravity	Z	A413602	Measurement Specialties	6/16/2022
Left Frame at Rear Axle Centerline	X	A372809	Measurement Specialties	6/16/2022
Left Frame at Rear Axle Centerline	Y	A372813	Measurement Specialties	6/16/2022