

REPORT NUMBER: SINCAP-CAL-21-007

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

**Ford Motor Co.
2021 Ford Mustang Mach-E
5 Door SUV**

NHTSA No: M20210217

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



September 16, 2024

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NRM-110
1200 NEW JERSEY AVE SE
WASHINGTON, D.C. 20590**

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Date: September 16, 2024

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Date: September 16, 2024

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: _____

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Matthew Pronko, Test Engineer Vanessa Hansen, Operations Program Manager		8. Performing Organization Report No. CAL-DOT-2021-007																																																			
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16. Abstract A 55/28, (61.90kph / 38.5 mph), 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2021 Ford Mustang Mach-E Five Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on April 1, 2022. The impact velocity of the Moving Deformable Barrier (MDB) was 61.71km/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 187 mm located at level 3. The test vehicle's occupant performance data is as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Measurement Description</th> <th colspan="3" style="text-align: center;">Driver ATD (ES-2re)</th> </tr> <tr> <th style="text-align: center;">Units</th> <th style="text-align: center;">IARV</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">57.963</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">44</td> <td style="text-align: center;">20.393</td> </tr> <tr> <td>Total Abdominal Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">2500</td> <td style="text-align: center;">786.623</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">6000</td> <td style="text-align: center;">1107.575</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Measurement Description</th> <th colspan="3" style="text-align: center;">Passenger ATD (SID-IIs)</th> </tr> <tr> <th style="text-align: center;">Units</th> <th style="text-align: center;">IARV</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">93.049</td> </tr> <tr> <td>Lower Spine Resultant Acceleration</td> <td style="text-align: center;">G</td> <td style="text-align: center;">82</td> <td style="text-align: center;">25.620</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td style="text-align: center;">N</td> <td style="text-align: center;">5525</td> <td style="text-align: center;">1185.550</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">38*</td> <td style="text-align: center;">9.006</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">45*</td> <td style="text-align: center;">9.592</td> </tr> </tbody> </table> * 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.				Measurement Description	Driver ATD (ES-2re)			Units	IARV	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	57.963	Maximum Thoracic Rib Deflection	mm	44	20.393	Total Abdominal Force	N	2500	786.623	Pubic Symphysis Force	N	6000	1107.575	Measurement Description	Passenger ATD (SID-IIs)			Units	IARV	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	93.049	Lower Spine Resultant Acceleration	G	82	25.620	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1185.550	Maximum Thoracic Rib Deflection	mm	38*	9.006	Maximum Abdominal Rib Deflection	mm	45*	9.592
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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2021 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-14-D-00352. The purpose of this test is to generate comparative side impact performance in a 2021 Ford Mustang Mach-E Five Door SUV. 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 2021 Ford Mustang Mach-E Five Door SUV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.71 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 April 1, 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	57.963
Maximum Thorax Rib Deflection	mm	44	20.393
Combined Abdominal Force	N	2500	786.623
Pubic Symphysis Force	N	6000	1107.575

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC36)		1000	93.049
Lower Spine (T12) Resultant Acceleration	G	82	25.620
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1185.550
Maximum Thoracic Rib Deflection	mm	38*	9.006
Maximum Abdominal Rib Deflection	mm	45*	9.592

*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	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

GENERAL COMMENTS:

1. P1 serial number – F033
2. P4 serial number – DG8012

Data Anomalies:

The following channel was questionable for

- Left Lower B-Pillar Y, Exceeded calibration range and saturated at 33.8 ms

SECTION 3
OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

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

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

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Camera and Instrumentation Data

Data Sheet No. 6 – Test Vehicle Accelerometer Locations

Data Sheet No. 7 – MDB Accelerometer Locations

Data Sheet No. 8 – Post-Test Observations

Data Sheet No. 9 – MDB Summary of Results

Data Sheet No. 10 – Test Vehicle Profile Measurements

Data Sheet No. 11 – Test Vehicle Exterior Crush Measurements

Data Sheet No. 12 – MDB Exterior Static Crush Measurements

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

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

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

Data Sheet No. 305-1 – General Test and Parameter Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-2 – Pre-Impact Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-3 – Pre-Impact Electrical Isolation Measurements and Calculations for
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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: 2021 Ford Mustang Mach-E Five Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210217
Test Date: 4/1/2022

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20210217	Traction Control System (TCS)	Yes
Model Year	2021	Auto-Leveling System	No
Make	Ford	Automatic Door Locks (ADL)	Yes
Model	Mustang Mach-E	Power Window Auto-Reverse	No
Body Style	SUV	Other Optional Feature	-
VIN	3FMTK1RMXMA62166	Driver Front Air bag	Yes
Body Color	Space White Metallic	Driver Curtain Air bag	Yes
Odometer Reading (km/mi)	14.1 miles	Driver Head/Torso Air bag	No
Engine Displacement (L)	N/A	Driver Torso Air bag	No
Type/No. Cylinders	Electric Vehicle	Driver Torso/Pelvis Air bag	Yes
Engine Placement	N/A	Driver Pelvis Air bag	No
Transmission Type	Direct Drive	Driver Knee Air bag	Yes
Transmission Speeds	Single Speed	Rear Pass. Curtain Air bag	Yes
Overdrive	Yes	Rear Pass. Head/Torso Air bag	No
Final Drive	Rear Wheel Drive	Rear Pass. Torso Air bag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Air bag	Yes
Sunroof/T-Top	No	Rear Pass. Pelvis Air bag	No
Running Boards	No	Driver Seat Belt Pretensioners	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioners	Yes
Power Seats	Yes	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	Yes
		Other Safety Restraint	-

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

No

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Co.	GVWR (kg)	2422
Date of Manufacture	12/21	GAWR Front (kg)	1098
Vehicle Type	MPV	GAWR Rear (kg)	1379

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	-	5	
Capacity Weight (VCW) (kg)				439	(A)
DSC X 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				98.8	(A-B)

VEHICLE SEAT TYPE

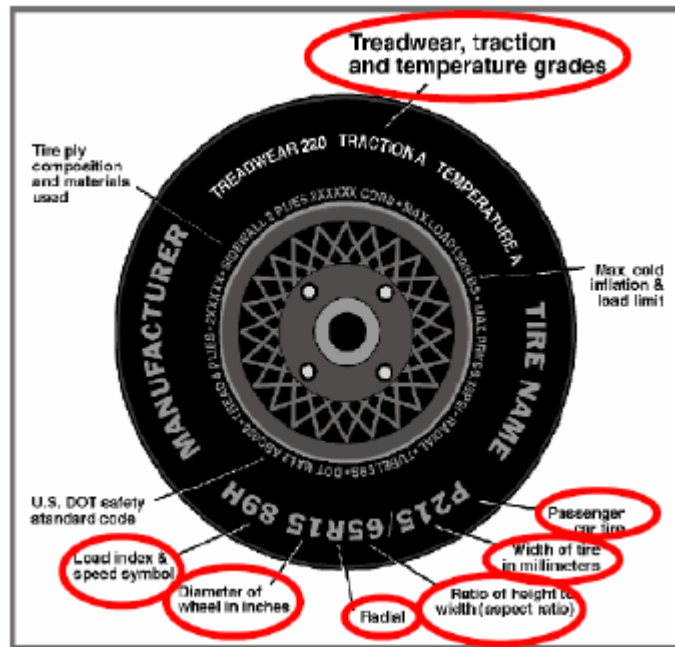
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front Seat	X						X
Rear or Second Row Seat			X		X		
Third Row seat							

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

Test Vehicle:	<u>2021 Ford Mustang Mach-E Five Door SUV</u>	NHTSA No.:	<u>M20210217</u>
Test Program:	<u>NCAP Side MDB Impact Test</u>	Test Date:	<u>4/1/2022</u>

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)	260	260
Recommended Tire Size	225/60R18	225/60R18
Tire Size on Vehicle	225/60R18	225/60R18
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy A/S	Primacy A/S
Treadwear	540	540
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 1 Polyamide, 2 Steel	2 Polyester, 1 Polyamide, 2 Steel
Load Index/Speed Symbol	104H	104H
Tire Material	Rubber	Rubber
DOT Safety Code Left	1M314020X2821	1M314020X2821
DOT Safety Code Right	1M314020X2821	1M314020X2821

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

Test Vehicle:	<u>2021 Ford Mustang Mach-E Five Door SUV</u>	NHTSA No.:	<u>M20210217</u>
Test Program:	<u>NCAP Side MDB Impact Test</u>	Test Date:	<u>4/1/2022</u>

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	273	257	270	264
Tire Placard	kPa	260	260	260	260
Owner's Manual	kPa	260	260	260	260
As Tested	kPa	260	260	260	260

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	470	529		517	610		517	630	
Right	kg	477	501		497	571		489	575	
Ratio	%	47.9	52.1		46.2	53.8		45.5	54.5	
Totals	kg	947	1030	1977	1014	1181	2195	1006	1205	2211

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1977	(A)
Sum of Actual Weight of 1 ES2re and 1 P572 ATD (SID-IIs)	kg	127	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	98.8	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	2202.8	(A+B+C)

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

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

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement**
LF	mm	859	858	Yes
RF	mm	860	865	Yes
RR	mm	861	858	Yes
LR	mm	853	855	Yes
Vehicle CG (Aft of Front Axle)	mm	1626	1605	
Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline)	mm	30	22	

*** 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:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	10
Tail light	1
Compressor	2
Ballast / Equipment Added	55

TEST SURFACE MARKINGS

	Distance from 63° Impact Angle Line (mm)
Fore 25 mm target	898
Aft 25 mm target	898
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:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022

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	17.0	11.7	14.4
Front Passenger Seat	16.6	11.5	14.1
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	14.4	17	Max	-	-	-
			Mid	11	17	24
			Min	-	-	-
Front Passenger Seat	14.1	19	Max	-	-	-
			Mid	12	19	24
			Min	-	-	-
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:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022

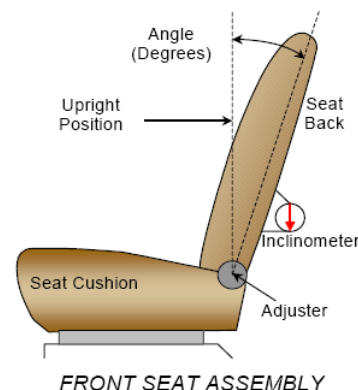
SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	255	Power	127.5	Power
Front Passenger Seat	255	38 (0-37)	131	19
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.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/ Seated Dummy	60.2	-	3.0	-
Front Passenger Seat	60.2	-	3.0	-
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:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022

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
Rear Seat	Fixed	Fixed

HEAD RESTRAINT ADJUSTMENT

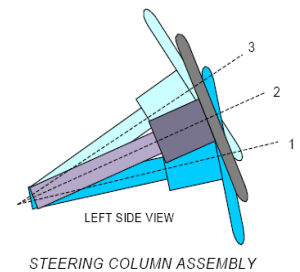
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	3	Uppermost
Rear Seat	2	Lowest

STEERING COLUMN ADJUSTMENT

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

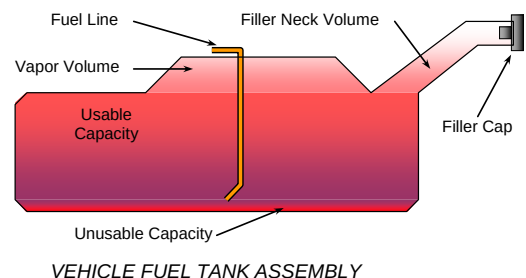
	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	20.3	
Geometric Center – Position 2	22.1	
Uppermost – Position 3	24.6	
Telescoping Steering Wheel Travel		65
Test Position	22.1	32.5



FUEL PUMP

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

The vehicle is equipped with an electric charge port on
 The Left front area.



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

Test Vehicle:	<u>2021 Ford Mustang Mach-E Five Door SUV</u>	NHTSA No.:	<u>M20210217</u>
Test Program:	<u>NCAP Side MDB Impact Test</u>	Test Date:	<u>4/1/2022</u>

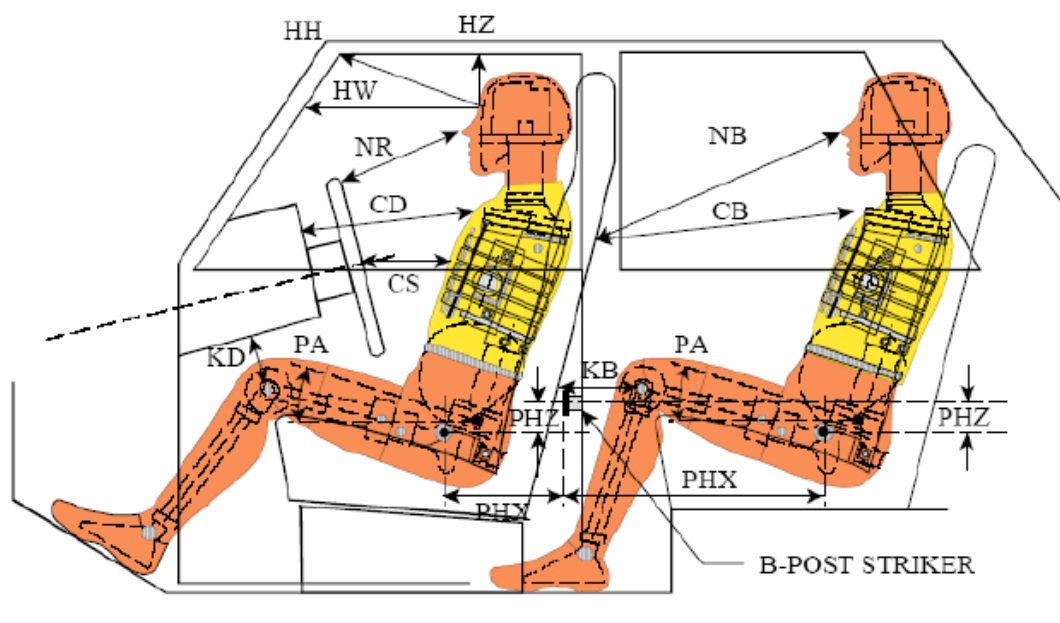
FUEL TANK CAPACITY

	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% $\pm$ 1% of the Usable Capacity stated in Form No. 1? ☒ N/A Yes ☐ No

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022



LEFT SIDE VIEW

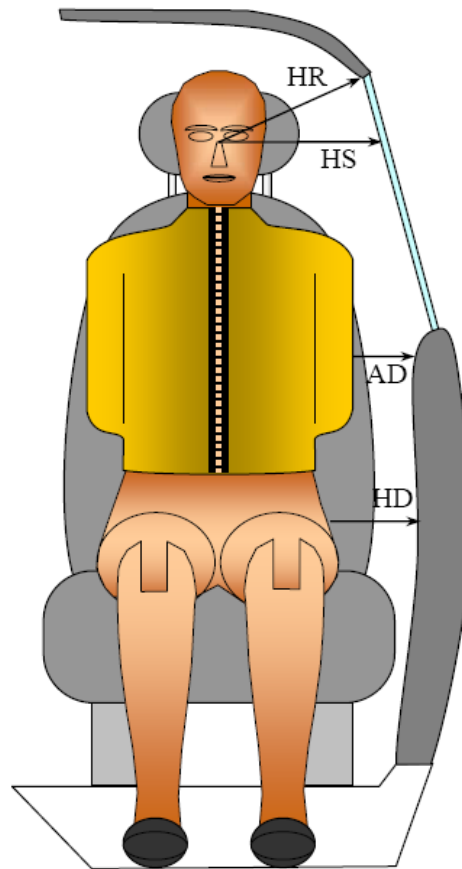
NOTE: 2-DOOR VEHICLE SHOWN.
 REAR DUMMY PHX & PHZ
 MEASUREMENTS FOR A 4-DOOR
 VEHICLE WOULD USE THE C-POST
 STRIKER AS A REFERENCE POINT

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Description	Driver (Serial No. F033)		Passenger (Serial No. DG8012)	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	411			
HW		Header to Windshield	582			
HZ	HZ	Head to Roof Liner	160		261	
NR	NB	Nose to Rim/Seat Back	432		600	
CD	CB	Chest to Dash/Seat Back	600		638	
CS		Chest to Steering Wheel	365			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	236	15.5	331	10.3
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	228	25.7	332	10.8
PAX°	PAX°	Pelvic Tilt Angle X		21.8		23.8
	PAY°	Pelvic Tilt Angle Y				0.3
PHX	PHX	Hip Point to Striker (X-Axis)	175		329	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	90		324	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022



FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver (Serial No. F033)	Passenger (Serial No. DG8012)
HR	Head to Side Header	mm	190	255
HS	Head to Side Window	mm	323	373
AD	Arm to Door	mm	95	165
HD	Hip Point to Door	mm	162	153

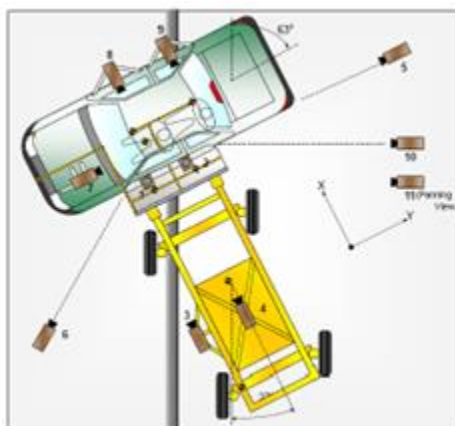
DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2021 Ford Mustang Mach-E Five Door SUV

NHTSA No.: M20210217

Test Program: NCAP Side MDB Impact Test

Test Date: 4/1/2022



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	0	-393	-8383	12.5	1000
2	Overhead Close-up	0	0	-8420	24	1000
3	Left Impact Point (MDB)	-1470	0	-847	25	1000
4	Side Overall (MDB)	-1140	878	-1587	8	1000
5	Rear	0	9434	-1362	28	1000
6	Left Front	-3228	-6049	-1469	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.*

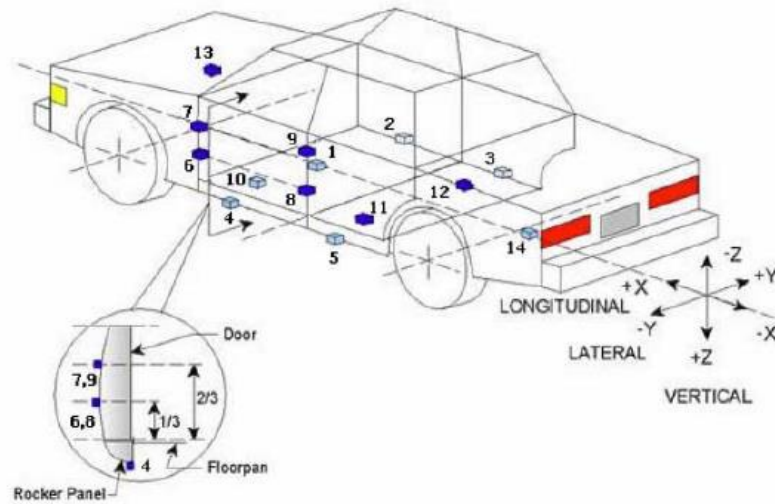
If applicable, explain why camera(s) did not operate as intended: All cameras operated normally

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:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022



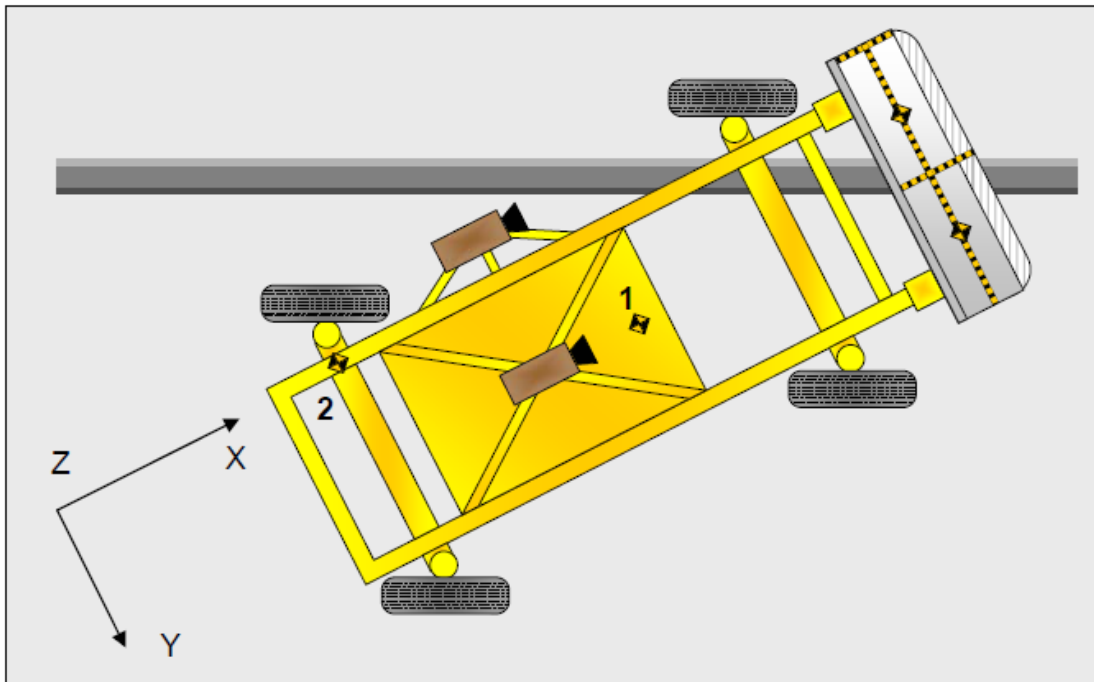
TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2242	1	397
2	Right Sill at Front Seat	2767	657	469
3	Right Sill at Rear Seat	1852	649	452
4	Left Sill at Front Door	2769	-656	481
5	Left Sill at Rear Door	1853	-646	476
6	A-Post Lower	3247	-637	262
7	A-Post Middle	3091	-634	-229
8	B-Post Lower	2097	-685	194
9	B-Post Middle	2054	-655	-202
10	Front Seat Track	2364	-549	463
11	Rear Seat Structure	1753	-386	375
12	Rt. Rear Occ. Compartment	1897	353	557
13	Engine Block	3754	-67	194
14	Rear Above Axle	939	-12	266

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:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022



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):

1482

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag
Top of Head	Curtain Airbag & Side Headliner	Curtain Airbag
Left Side of Head	Curtain Airbag & Side Headliner	Curtain Airbag
Back of Head	Curtain Airbag & Side Headliner & Headrest	Curtain Airbag & Center Seatback
Left Shoulder	Curtain Airbag	Seatback & Torso/Pelvis Airbag
Upper Torso	Seatback & Torso/Pelvis Airbag	Seatback & Torso/Pelvis Airbag
Lower Torso	Seatback & Torso/Pelvis Airbag	Seatback & Torso/Pelvis Airbag
Left Hip	Seatpan & Torso/Pelvis Airbag	Torso/Pelvis Airbag & 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	No*	No*	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

*Doors were able to be opened but not reclosed as vehicle is equipped to function this way.

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	Yes*	No	No	No
Seat Back Collapse	No	No	No	No

*Seatback moves slightly rearward after impact event was over.

POST-TEST STRUCTURAL OBSERVATIONS

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

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

Test Vehicle:	<u>2021 Ford Mustang Mach-E Five Door SUV</u>	NHTSA No.:	<u>M20210217</u>
Test Program:	<u>NCAP Side MDB Impact Test</u>	Test Date:	<u>4/1/2022</u>

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	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2984
Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point)	mm		508
Actual Impact Point (Aft of Frontal Axle)	mm		500
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	+8
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	0

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2021 Ford Mustang Mach-E Five Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210217
Test Date: 4/1/2022

MDB SPECIFICATIONS

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

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	396	291.5	687.5
Right	kg	377.5	301	678.5
Ratio	%	56.6	43.4	100
Totals	kg	773.5	592.5	1366

SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.10 to 62.70	61.71
Trap No. 2 Velocity (Redundant)	km/h	61.10 to 62.70	61.72
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.0

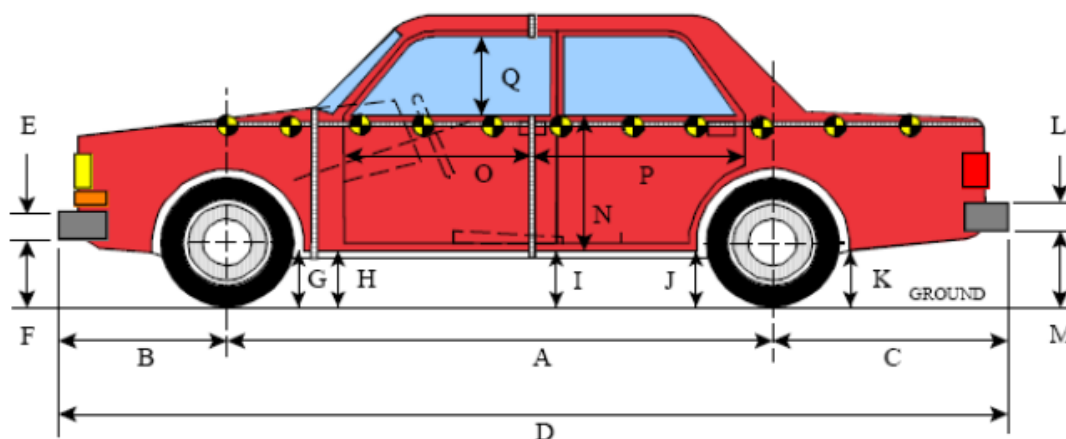
MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Right	285
B	Top of Bumper	533	800	Right	204
C	Mid-Level	686	800	Left	147
D	Top of Stack	813	800	Left	170

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2021 Ford Mustang Mach-E Five Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210217
 Test Date: 4/1/2022



LEFT SIDE VIEW

All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3 mm

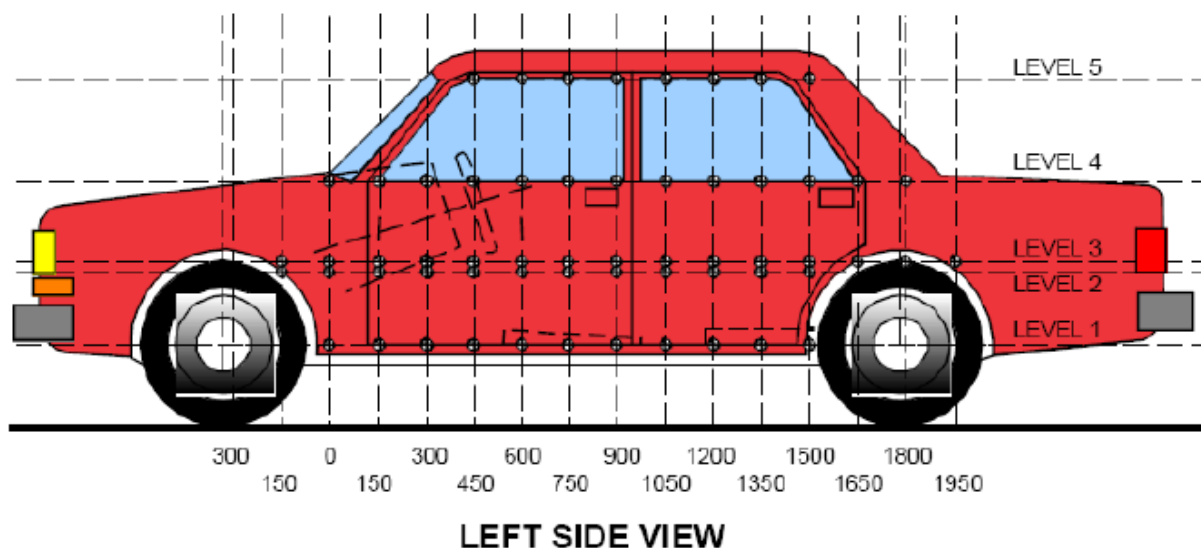
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2984	2984	0
B	Front Axle to FSOV	864	864	0
C	Rear Axle to RSOV	867	864	-3
D	Total Length at Centerline	4714	4712	-2
E	Front Bumper Thickness	255	255	0
F	Front Bumper Bottom to Ground	255	262	7
G	Sill Height at Front Wheel Well	190	197	7
H	Sill Height at Front Door Leading Edge	195	204	9
I	Sill Height at B Pillar	216	212	-4
J1	Sill Height at Rear Wheel Well	220	220	0
J2	Pinch Weld Height at Rear Wheel Well	199	196	-3
K	Sill Height Aft of Rear Wheel Well	263	268	5
L	Rear Bumper Thickness	155	155	0
M	Rear Bumper Bottom to Ground	550	555	5
N	Sill Height to Window Bottom of Front Window Sill	855	842	-13
O	Front Door Leading Edge to Impact CL	696	694	-2
P	Rear Door Trailing Edge to Impact CL	1554	1514	-40
Q	Front Window Opening	426	448	22
R	Right Side Length	4620	4621	1
S	Left Side Length	4620	4620	0
T	Maximum Vehicle Width	1845	1718	-127
U	Front wheel track width	1618	1586	-32
V	Rear wheel track width	1625	1609	-16

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2021 Ford Mustang Mach-E Five Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210217
 Test Date: 4/1/2022



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	277	21	1500
2	Driver Hip Point	mm	672	170	1650
3	Mid-Door	mm	754	187	1650
4	Window Sill	mm	1068	38	1950
5	Window Top	mm	1512	3	1500

*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: 2021 Ford Mustang Mach-E Five Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210217
 Test Date: 4/1/2022

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

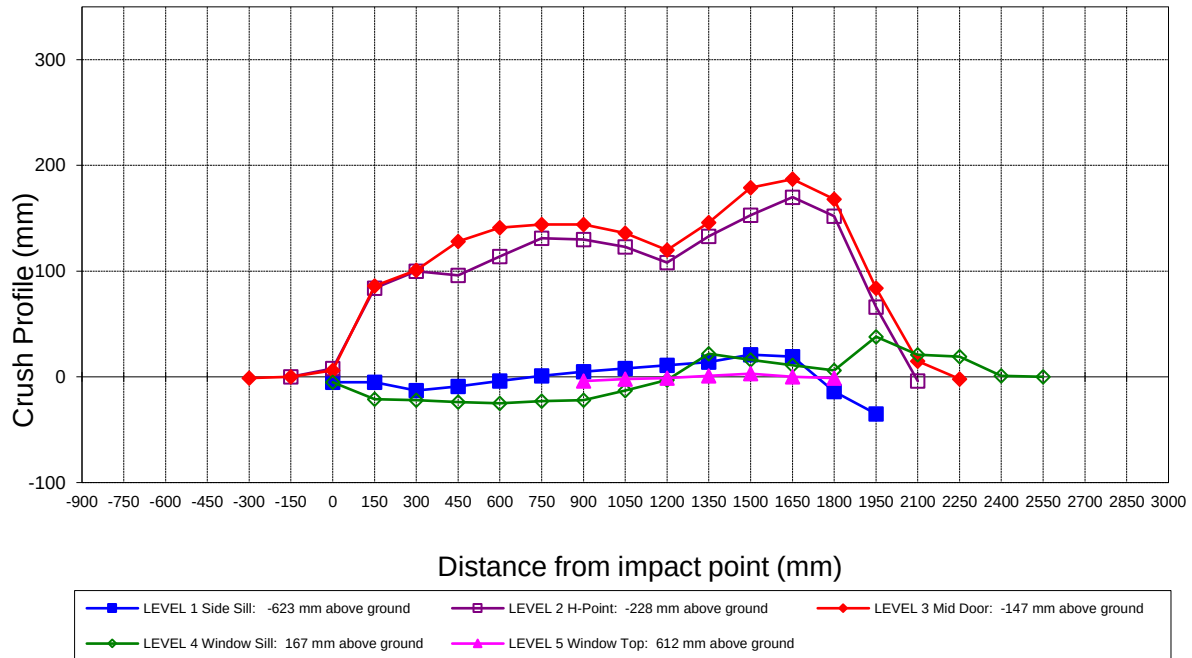
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300			940					941					-1		
-150		925	924				925	924				0	0		
0	895	919	919	817		900	911	916	822		-5	8	3	-5	
150	893	914	918	828		898	830	832	849		-5	84	86	-21	
300	891	910	916	838		904	810	815	860		-13	100	101	-22	
450	890	906	915	844		899	810	787	868		-9	96	128	-24	
600	888	902	913	849		892	788	772	874		-4	114	141	-25	
750	886	899	911	852		885	768	767	875		1	131	144	-23	
900	883	897	910	852	644	878	767	766	874	648	5	130	144	-22	-4
1050	880	895	909	852	657	872	772	773	865	659	8	123	136	-13	-2
1200	877	895	909	850	657	866	787	789	853	658	11	108	120	-3	-1
1350	875	894	907	846	655	861	761	761	824	654	14	133	146	22	1
1500	873	896	906	843	650	852	743	727	827	647	21	153	179	16	3
1650	880	899	905	838	642	861	729	718	827	642	19	170	187	11	0
1800	890	905	906	834	620	904	753	738	828	621	-14	152	168	6	-1
1950	892	917	915	840		927	851	831	802		-35	66	84	38	
2100		928	928	865			932	913	844			-4	15	21	
2250			940	874				942	855				-2	19	
2400				874					873					1	
2550				865					865					0	
2700															
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: 2021 Ford Mustang Mach-E Five Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: M20210217
 Test Date: 4/1/2022



Vehicle Exterior Crush Measurements - Visual Representation

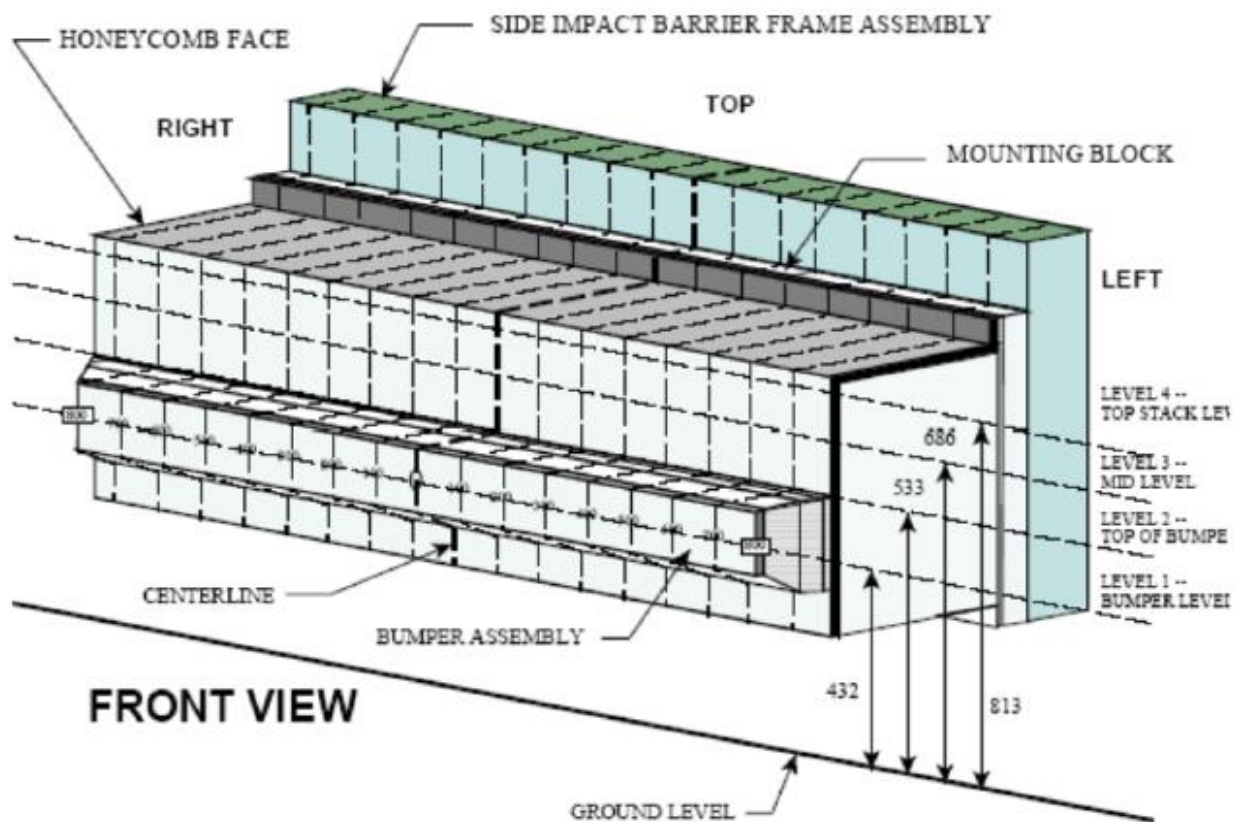
DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2021 Ford Mustang Mach-E Five Door SUV

NHTSA No.: M20210217

Test Program: NCAP Side MDB Impact Test

Test Date: 4/1/2022



NOTE: Dimensions are shown in millimeters, mm

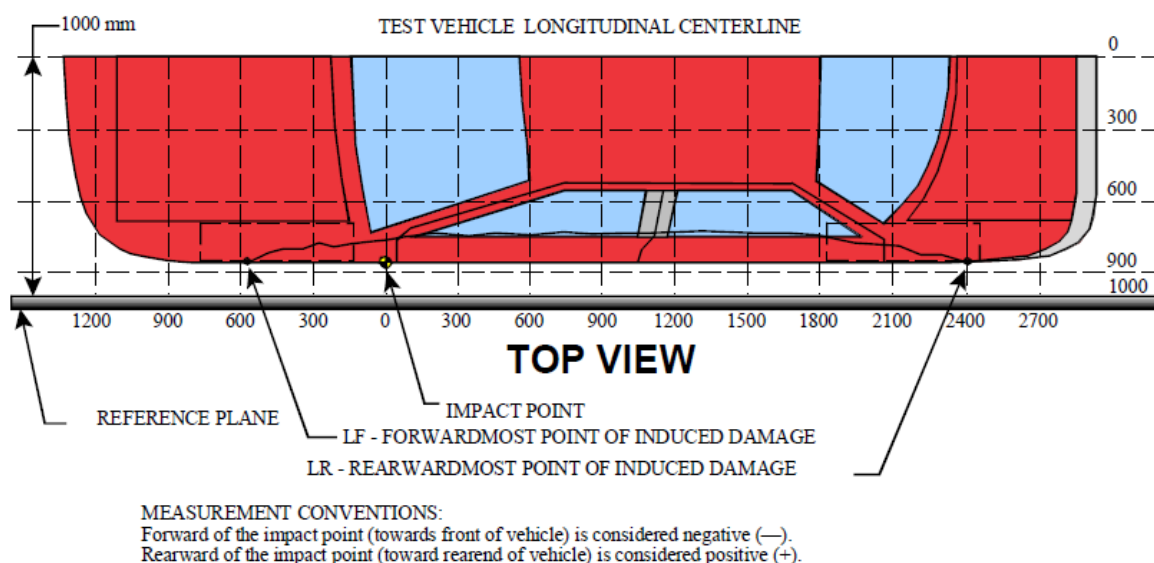
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
1	285	280	277	276	274	272	270	261	254	247	243	239	236	233	235	240	243
2	204	198	202	201	199	195	181	182	177	173	166	165	164	161	161	172	178
3	112	95	93	92	100	102	119	90	82	75	72	78	89	100	113	129	147
4	82	73	72	78	97	108	126	96	102	105	86	91	109	117	132	150	170

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

Test Vehicle:	<u>2021 Ford Mustang Mach-E Five Door SUV</u>	NHTSA No.:	<u>M20210217</u>
Test Program:	<u>NCAP Side MDB Impact Test</u>	Test Date:	<u>4/1/2022</u>

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



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-300	3	59	60	-1
2	210	3	175	83	92
3	720	3	232	89	143
4	1230	3	217	91	126
5	1740	3	270	94	176
6	2250	3	58	60	-2

MDB DAMAGE PROFILE DISTANCES

DPD	Distance From Center of MDB	Level	Post-Test (mm)*
1	800 mm left of center	1	243
2	480 mm left of center	1	234
3	160 mm left of center	1	244
4	160 mm right of center	1	266
5	480 mm right of center	1	276
6	800 mm right of center	1	285

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

Test Vehicle:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022
Test Time:	10:54 AM	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°	63	300	363
90° to 180°	65	300	365
180° to 270°	68	300	368
270° to 360°	65	300	365

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

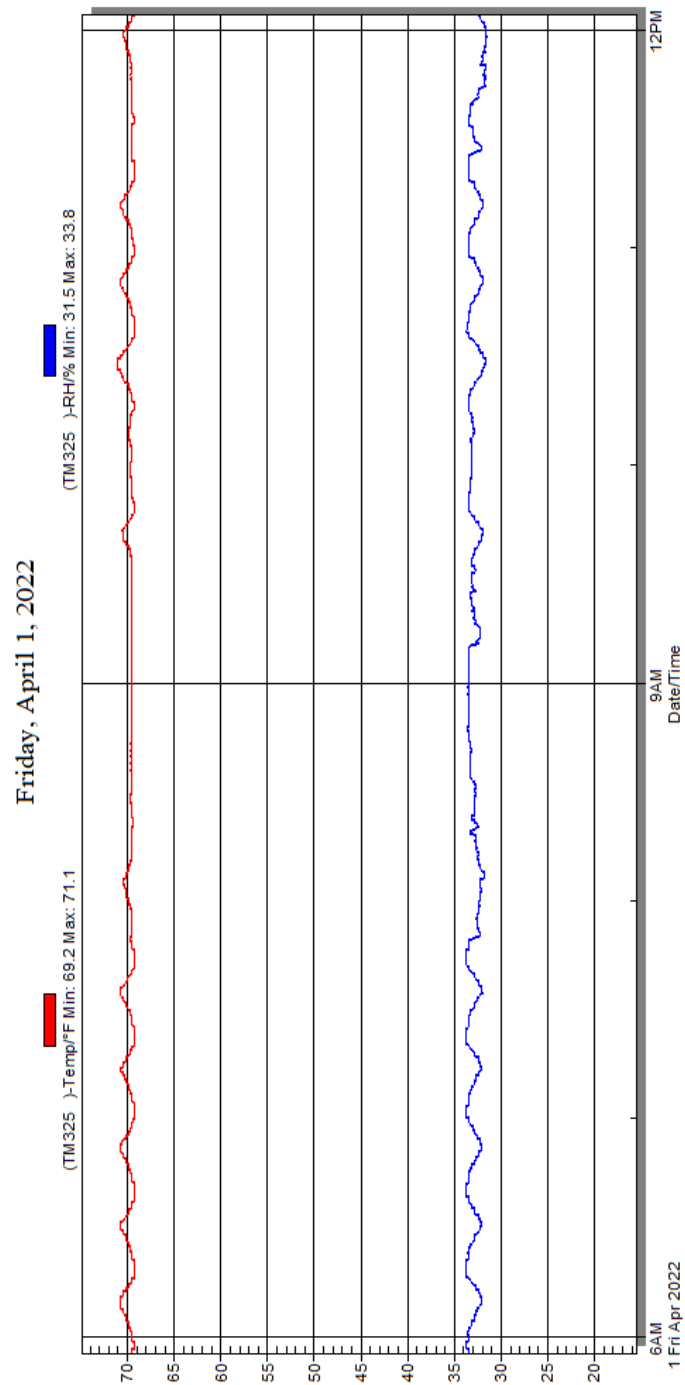
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°				
90° to 180°				
180° to 270°				
270° to 360°				

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:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022



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:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Electric
Propulsion Battery Type	Lithium-Ion
Nominal Voltage (Volts)	350.4
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Under Hood
Auxiliary Battery Type	12V Lead Acid

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	Carbonate Fluid
Electrolyte Fluid Specific Gravity	~1.1 g/cm ³
Electrolyte Fluid Kinematic Viscosity (centistokes)	~ 3 cP
Electrolyte Fluid Color	Colorless
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Yellow Pre-Diluted 50/50
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Outside

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
<i>For all battery types:</i> Voltage Range corresponding to useable energy of the battery:		
Minimum State of Charge	V	202
Maximum State of Charge	V	403
95% of Maximum	V	382.85
Test Voltage *	V	395.8
<i>For batteries that are rechargeable ONLY by an energy source on the vehicle:</i> 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:	<u>2021 Ford Mustang Mach-E Five Door SUV</u>	NHTSA No.:	<u>M20210217</u>
Test Program:	<u>NCAP Side MDB Impact Test</u>	Test Date:	<u>4/1/2022</u>

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

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Ground point is located on right rear quarter panel
Details of Propulsion Battery Components	The battery pack uses internal contactors for automatic disconnect. This battery pack has up to four high voltage negative outputs and up to four high voltage positive outputs that are live when the vehicle is keyed on. Those outputs are ISC (+), ISC (-), DCDC/Charger (+), DCDC/Charger (-), eAC/PTC (+), eAC/PTC (-), eFAD (+) [AWD only], and eFAD (-) [AWD only]. All positive outputs are connected to an electrical junction vehicle-side of a shared contactor. All negative outputs are independently fused. Therefore, it is recommended to measure voltage from ISC (+) to each negative output to assess the status of all automatic disconnects. See locations in images below. There is also a single pair of DC Fast Charge outputs attached to dedicated contactors that remain open during all drive events. Therefore, it is not recommended to monitor the status of these automatic disconnects.

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

Test Vehicle:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		58100115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		4/28/2021

NOTES:

- The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 MΩ
- 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	350.4
Propulsion Battery Voltage : (ready to drive position)	V_b	V	396.6
Propulsion Battery to Vehicle Chassis	V_1	V	316.0
Propulsion Battery to Vehicle Chassis	V_2	V	274.0
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	13.3
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	14.4
$R_{i1} = R_o * (1 + V_2/V_1) * [(V_1 - V_1')/V_1']$	R_{i1}	Ω	8,753,726
$R_{i2} = R_o * (1 + V_1/V_2) * [(V_2 - V_2')/V_2']$	R_{i2}	Ω	7,996,701
Lesser value of R_{i1} and R_{i2}	R_i	Ω	7,996,701
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	20,163

Is the Electrical Isolation Value $\geq 500 \Omega/V$ (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 R_o (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:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		58100115
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V _b)	V	12.4

NOTES:

- The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 MΩ
- 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 ₁ =	1.3	V	Time:	3	Minutes	25	Seconds
V ₂ =	10.5	V	Time:	3	Minutes	34	Seconds
R ₀ =	206,000	Ω	Time:		Minutes		Seconds
V ₁ ' =	1.0	V	Time:	3	Minutes	56	Seconds
V ₂ ' =	0.4	V	Time:	4	Minutes	13	Seconds
R _{i1} =	560,954	Ω	Time:	3	Minutes	56	Seconds
R _{i2} =	5,845,495	Ω	Time:	4	Minutes	13	Seconds
R _i =	560,954	Ω	Time:	4	Minutes	13	Seconds
R _i /V _b =	45,238	Ω/V	Time:	4	Minutes	13	Seconds

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

NOTES:

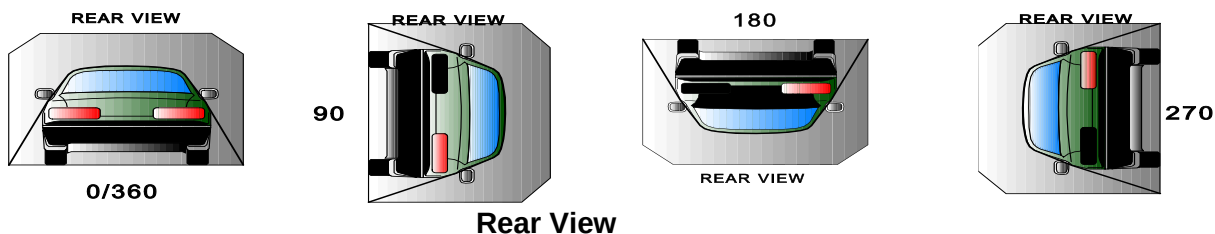
- $R_{i1} = R_0 * (1 + V_2/V_1) * [(V_1 - V_1')/V_1]$, $R_{i2} = R_0 * (1 + V_1/V_2) * [(V_2 - V_2')/V_2]$, R_i = Lesser value of R_{i1} and R_{i2}
- If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant
- Minimum 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?	None	X	

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

Test Vehicle: 2021 Ford Mustang Mach-E Five Door SUV NHTSA No.: M20210217
 Test Program: NCAP Side MDB Impact Test Test Date: 4/1/2022



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	Seconds	
0° to 90°	1	3	5	6	3	7
90° to 180°	1	5	5	6	5	7
180° to 270°	1	8	5	6	8	7
270° to 360°	1	5	5	6	5	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) ☒ No
 Is propulsion battery electrolyte spillage visible in the passenger compartment? ☐ Yes (Fail) ☒ No

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		58100115
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V _b)	V	0.001

NOTES:

- The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 MΩ
- 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:	2021 Ford Mustang Mach-E Five Door SUV	NHTSA No.:	M20210217
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/1/2022

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units		Minutes	Seconds
$V_1 =$	90°	0.0	V	Time:	3	21
	180°	0.0	V		8	12
	270°	0.0	V		14	17
	360°	0.0	V		22	15
$V_2 =$	90°	0.0	V	Time:	3	32
	180°	0.0	V		8	21
	270°	0.0	V		14	22
	360°	0.0	V		22	26
$V_1' =$	90°	0.0	V	Time:	3	41
	180°	0.0	V		8	33
	270°	0.0	V		14	29
	360°	0.0	V		22	31
$V_2' =$	90°	0.0	V	Time:	3	44
	180°	0.0	V		8	36
	270°	0.0	V		14	34
	360°	0.0	V		22	42
$R_{i1} =$	90°	Zero Volts	Ω	Time:	3	41
	180°	Zero Volts	Ω		8	33
	270°	Zero Volts	Ω		14	29
	360°	Zero Volts	Ω		22	31
$R_{i2} =$	90°	Zero Volts	Ω	Time:	3	44
	180°	Zero Volts	Ω		8	36
	270°	Zero Volts	Ω		14	34
	360°	Zero Volts	Ω		22	42
$R_i =$	90°	Zero Volts	Ω	Time:	3	41
	180°	Zero Volts	Ω		8	36
	270°	Zero Volts	Ω		14	29
	360°	Zero Volts	Ω		22	42
$R_i/V_b =$	90°	Zero Volts	Ω/V	Time:	3	41
	180°	Zero Volts	Ω/V		8	36
	270°	Zero Volts	Ω/V		14	29
	360°	Zero Volts	Ω/V		22	42

Is the Electrical Isolation Value $\geq 500 \Omega/V$ (Yes/No)?



Yes



No (Fail)

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PHOTOGRAPHS

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



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



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



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



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

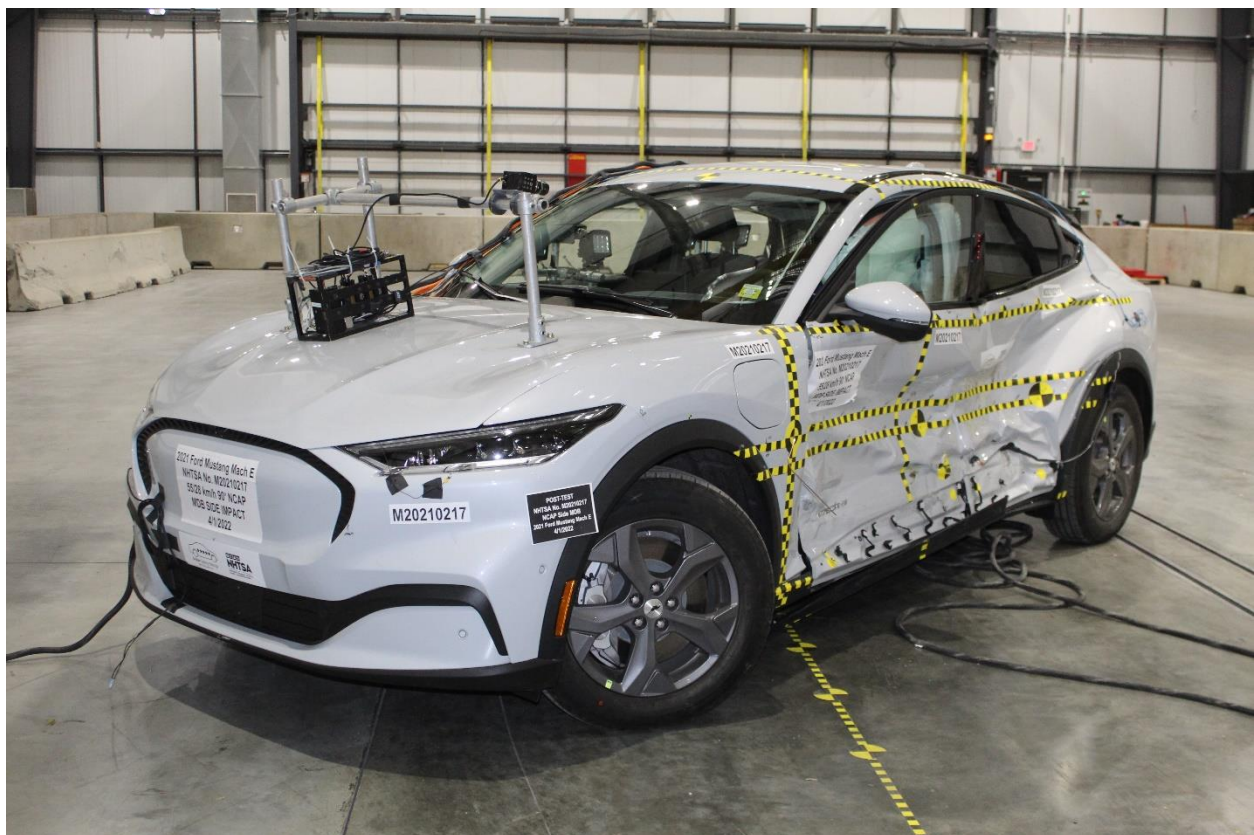


Figure A-6: Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



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



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



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



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

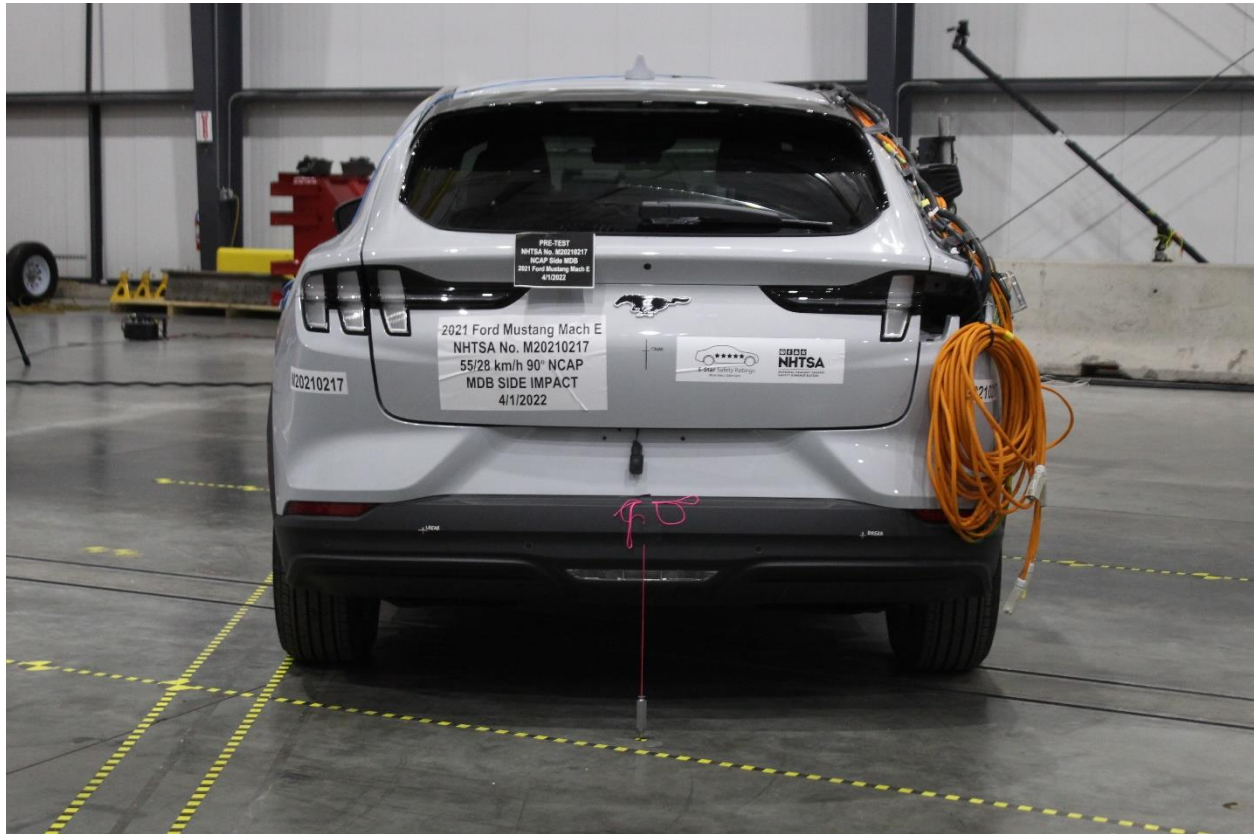


Figure A-11: Pre-Test Rear View of Test Vehicle



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



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



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

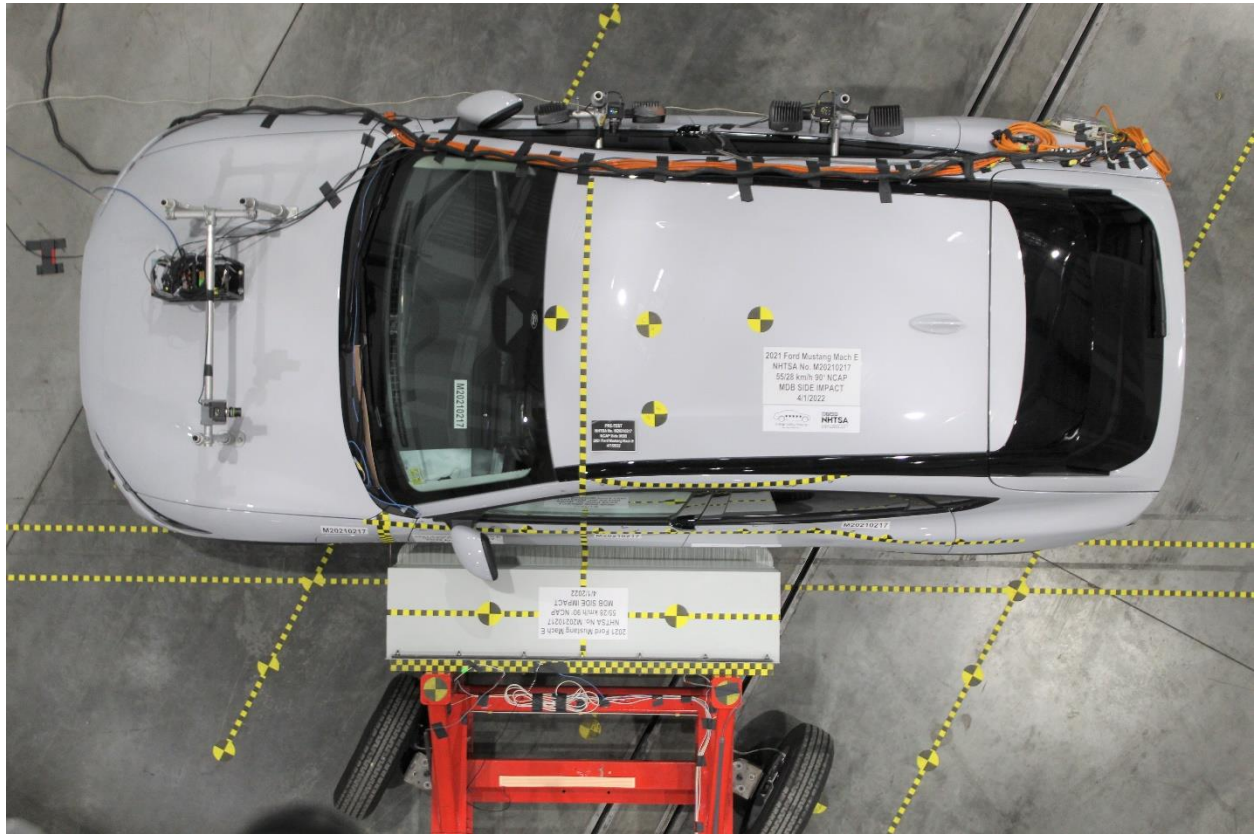


Figure A-15: Pre-Test Overhead View of the Test Area

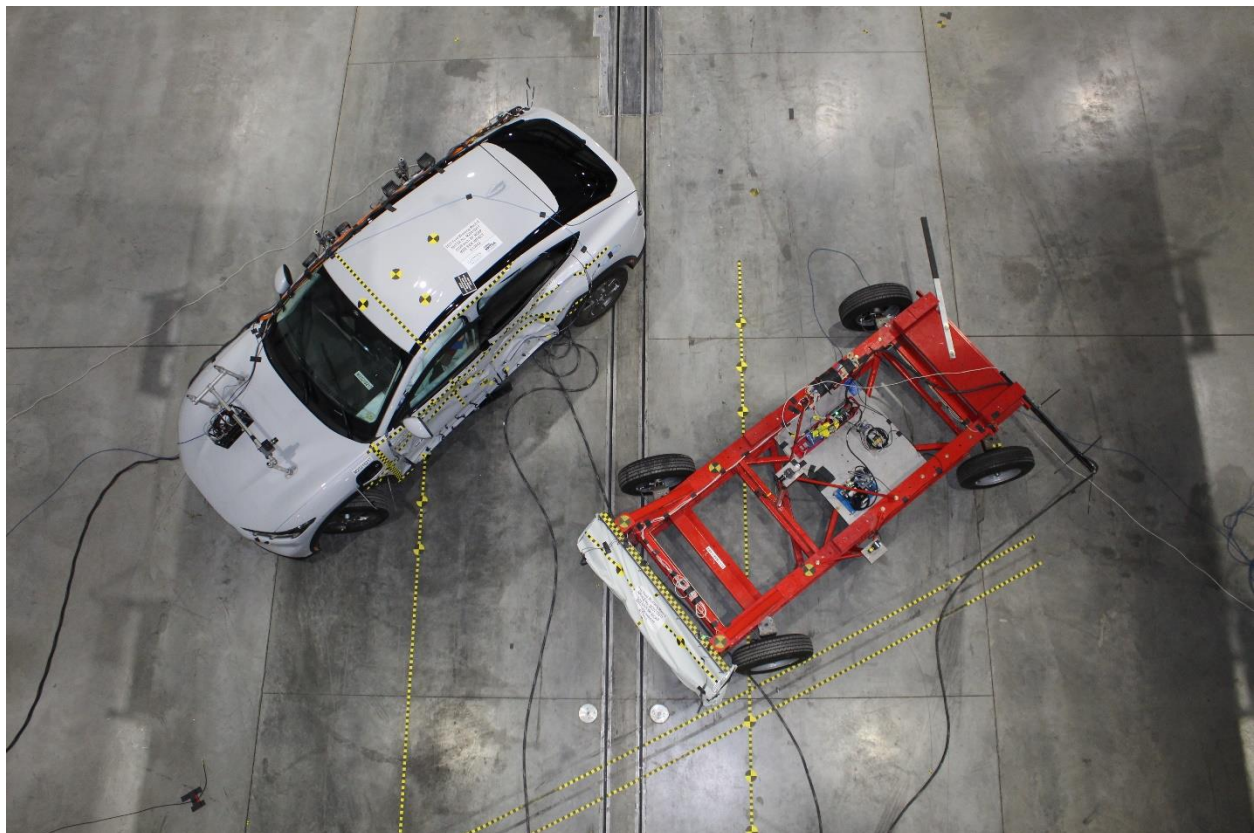


Figure A-16: Post-Test Overhead View of Test Area



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



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

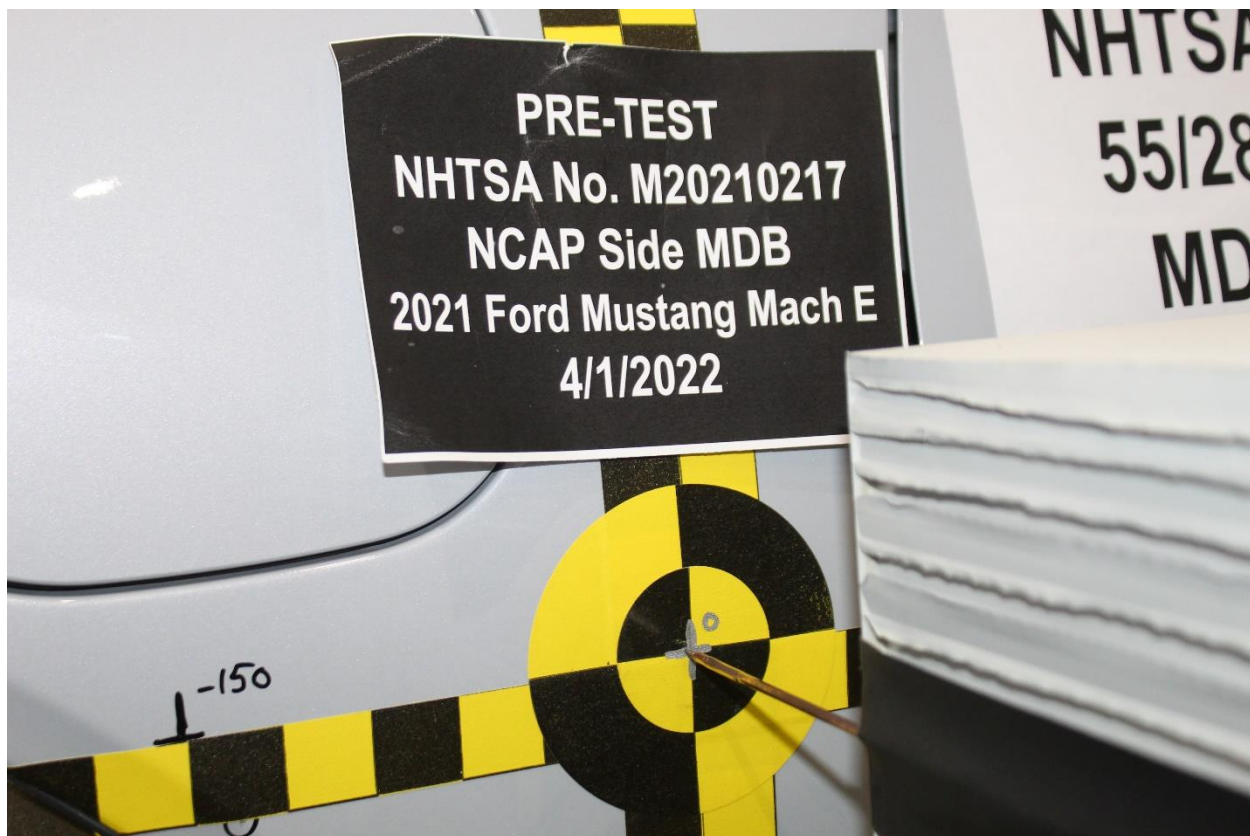


Figure A-19: Pre-Test Close-up View of Impact Point Target



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

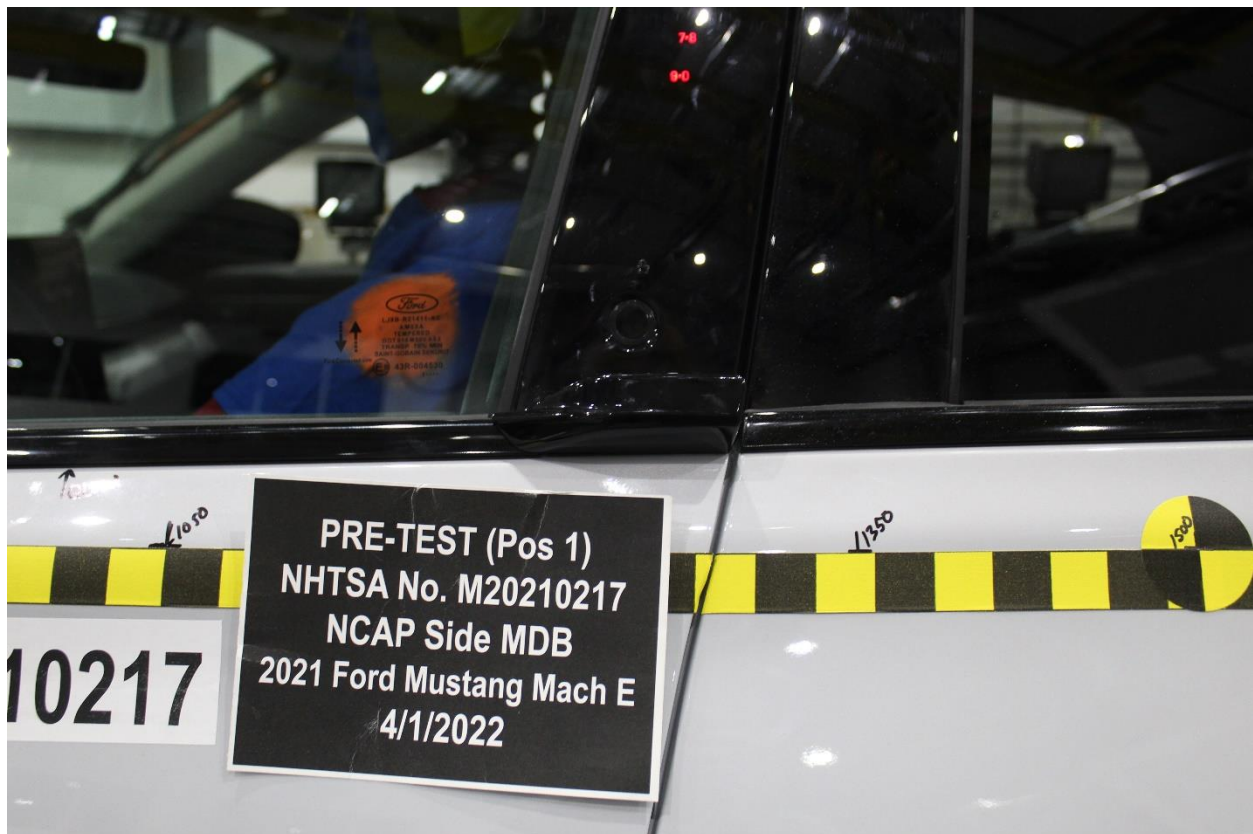


Figure A-21: Pre-Test Left Front Door Latch Close-Up

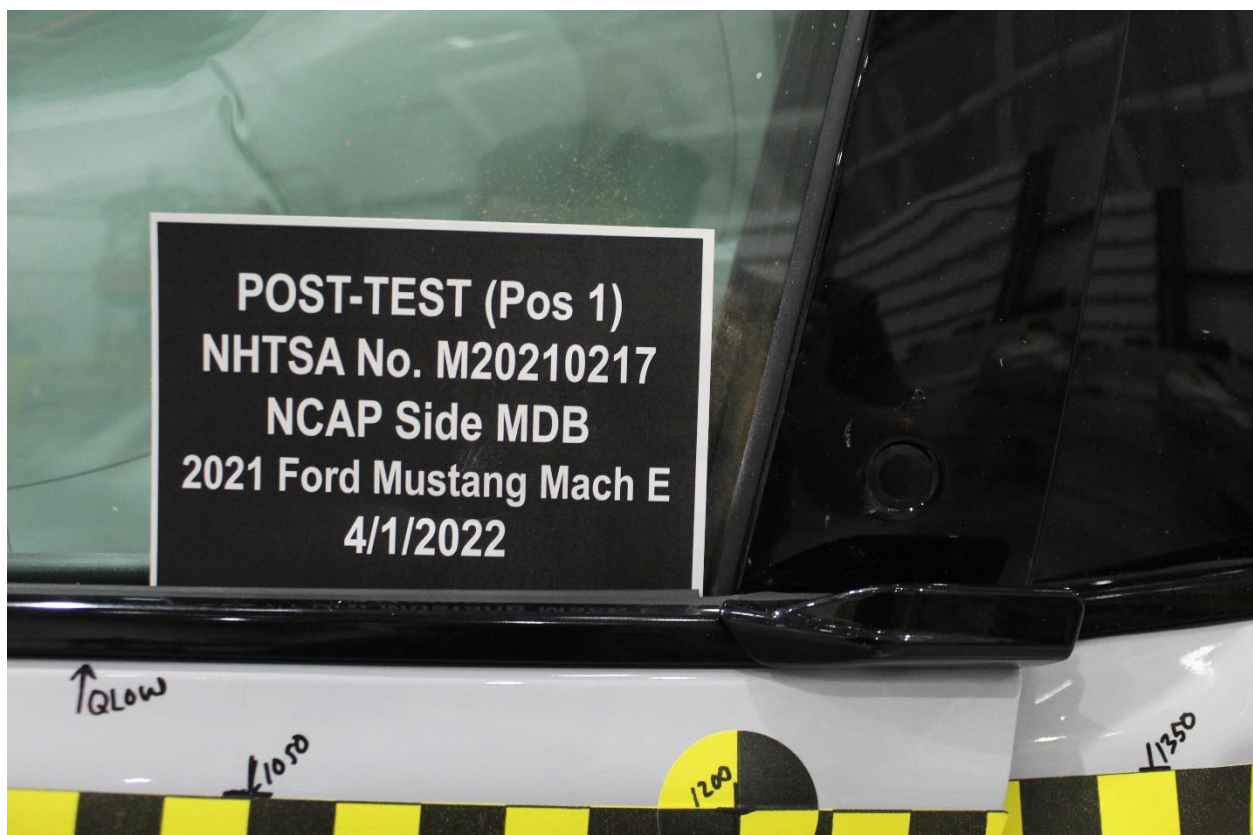


Figure A-22: Post-Test Left Front Door Latch Close-Up

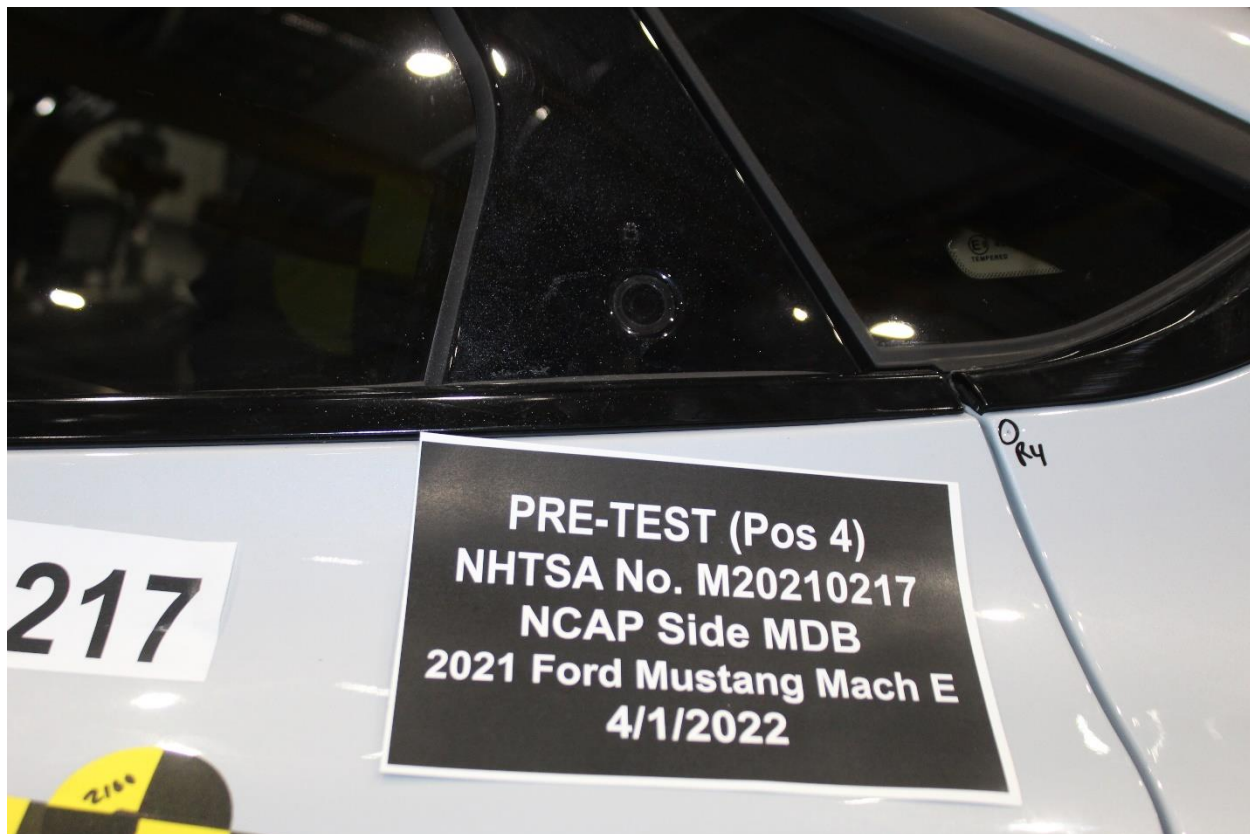


Figure A-23: Pre-Test Left Rear Door Latch Close-Up



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



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





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



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



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



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



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



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



Figure A-37: View of Disengaged Parking Brake



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

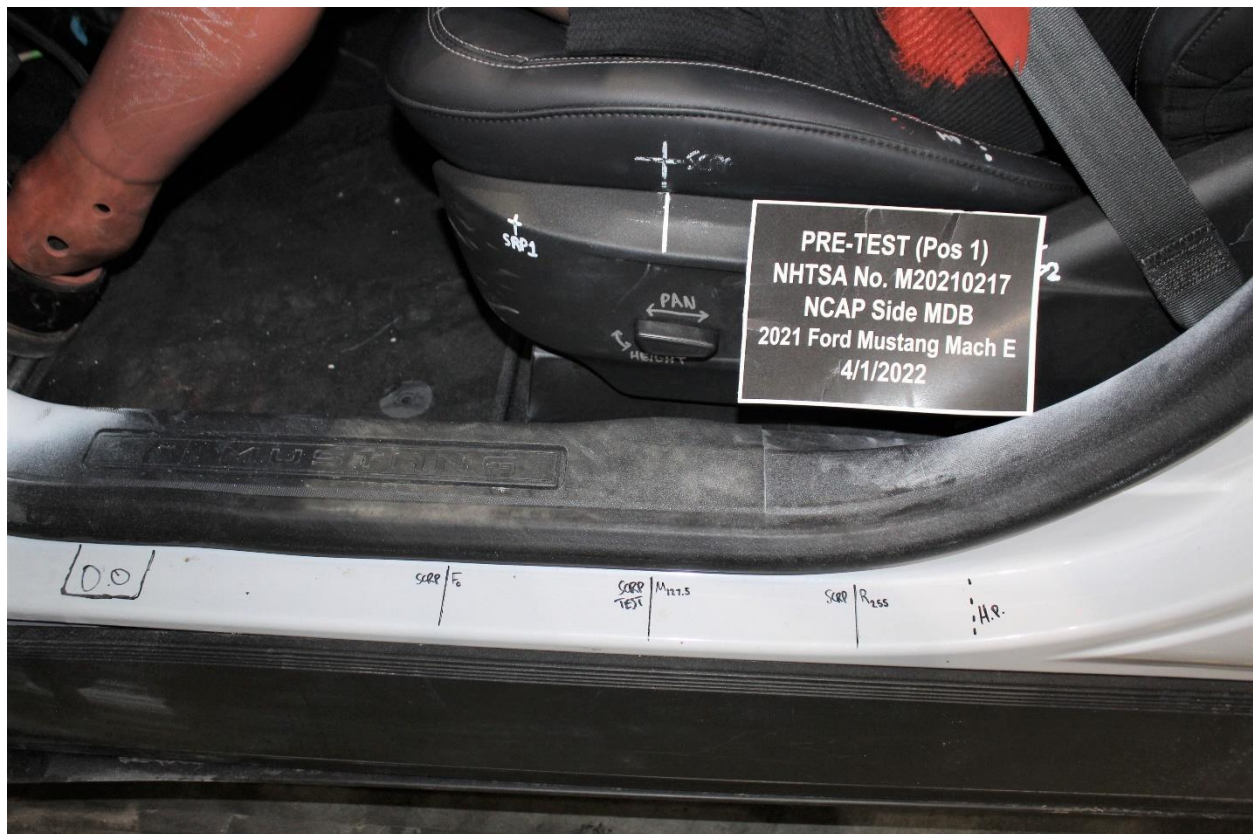


Figure A-39: Pre-test Close-Up Left Side View of Driver Seat Track



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



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



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



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



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



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



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



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



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

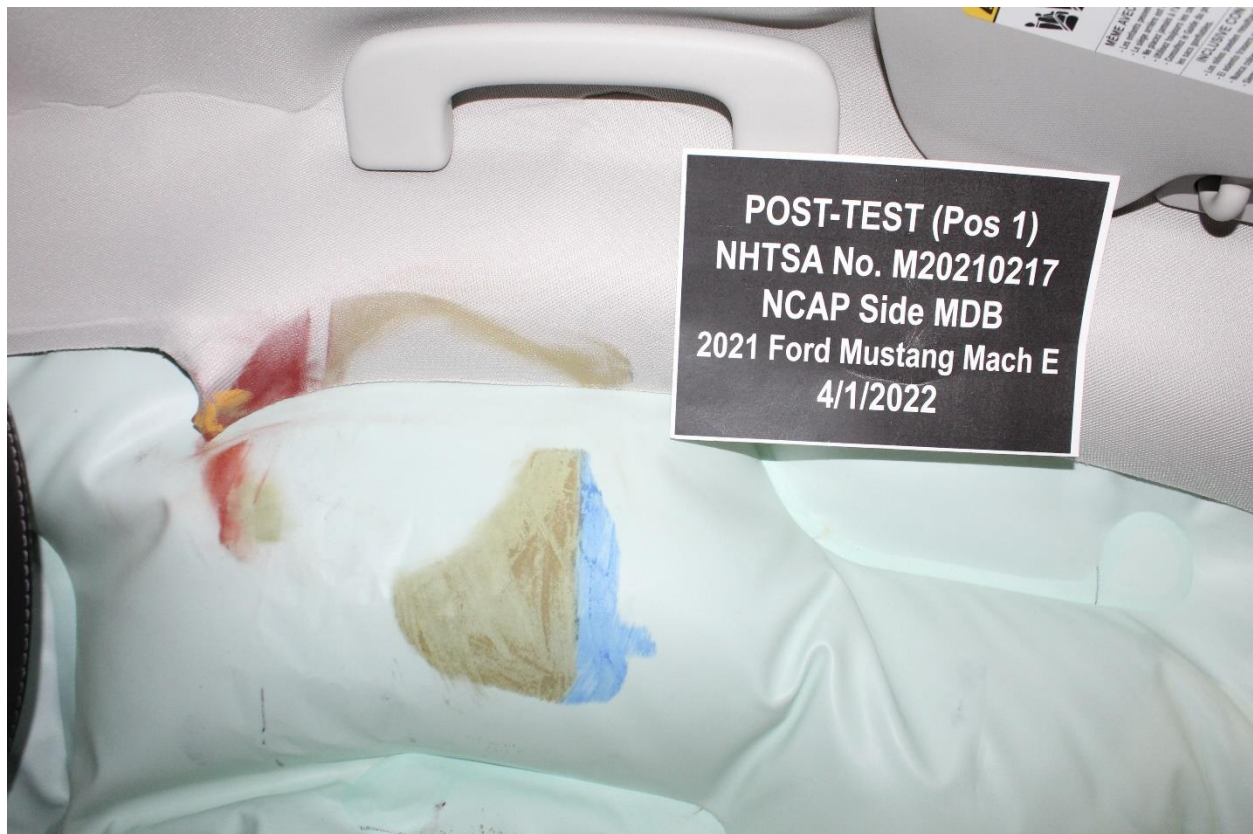


Figure A-49: Post-Test Driver Dummy Close-Up Head Contact with Side Air bag View



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



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



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



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



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



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



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



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



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



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



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



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



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

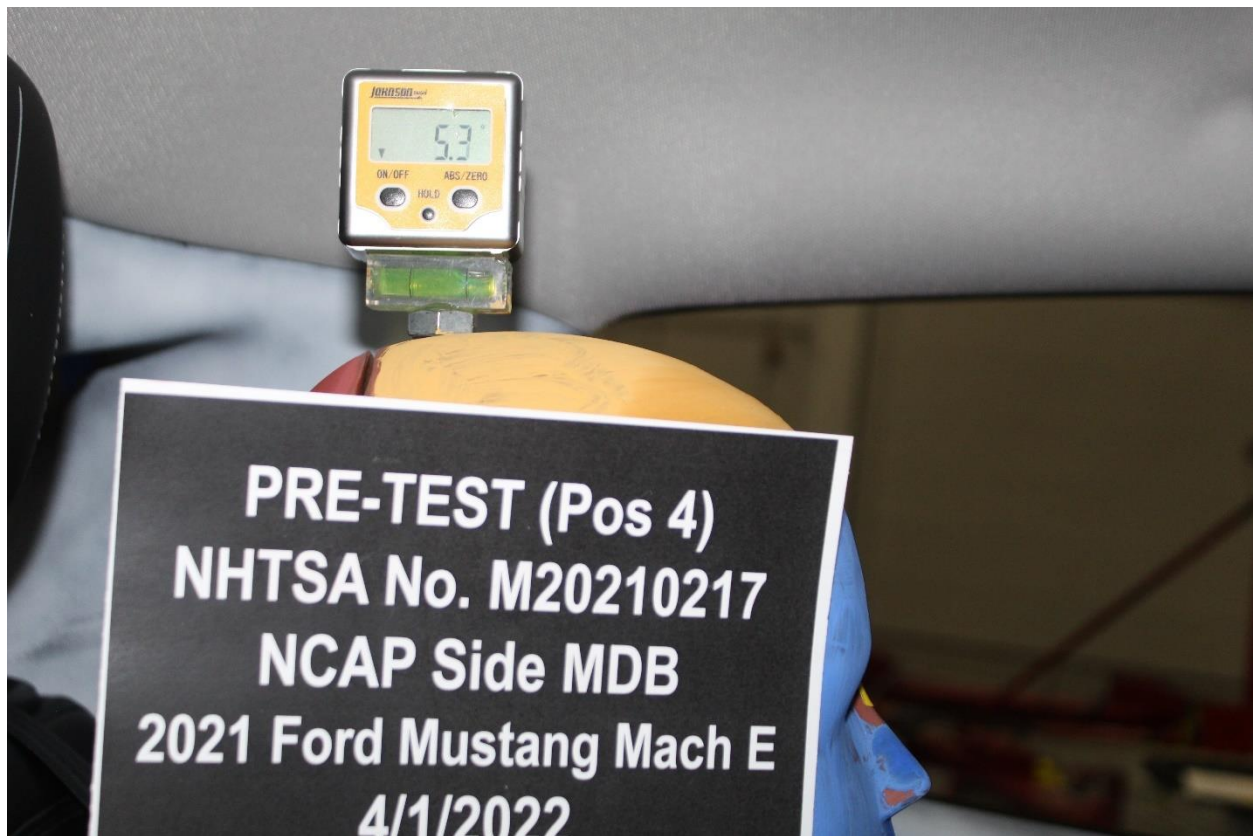


Figure A-63: Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level



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



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

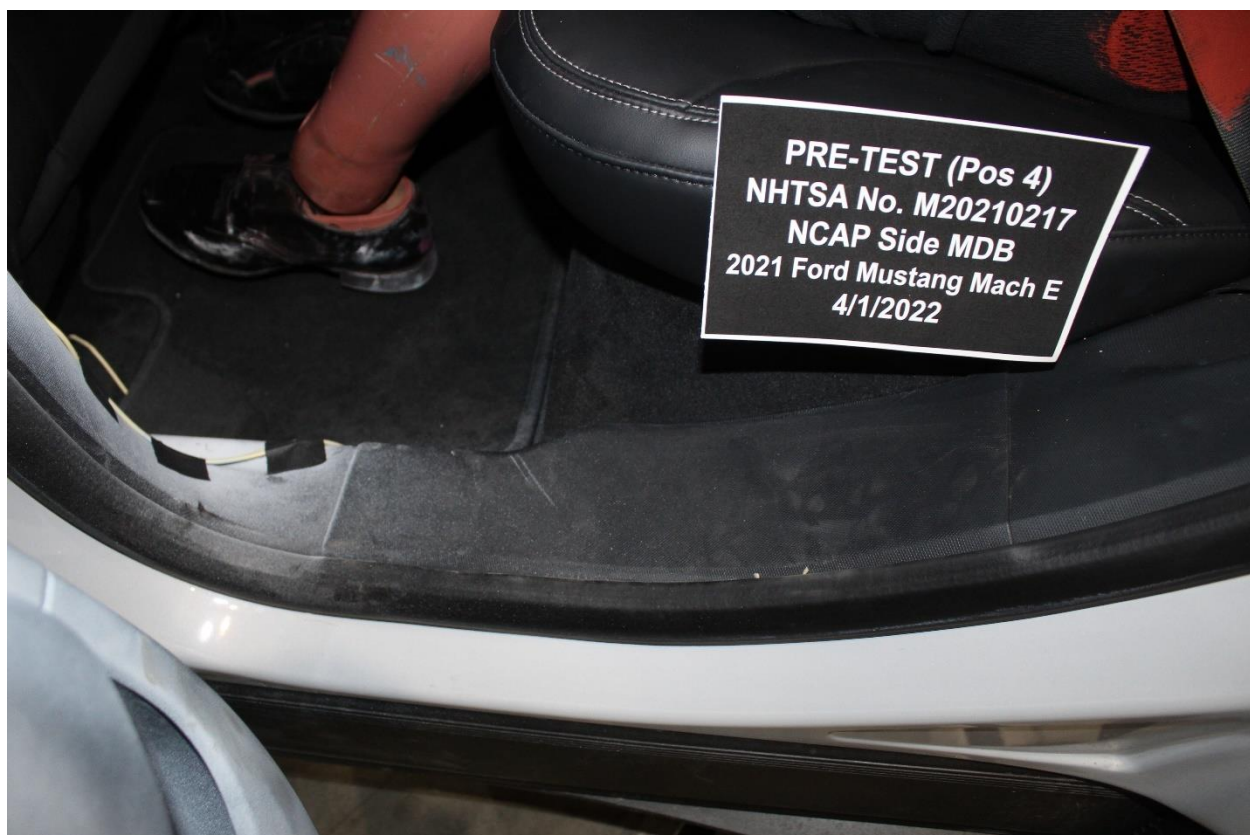


Figure A-66: Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



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



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



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



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



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



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



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

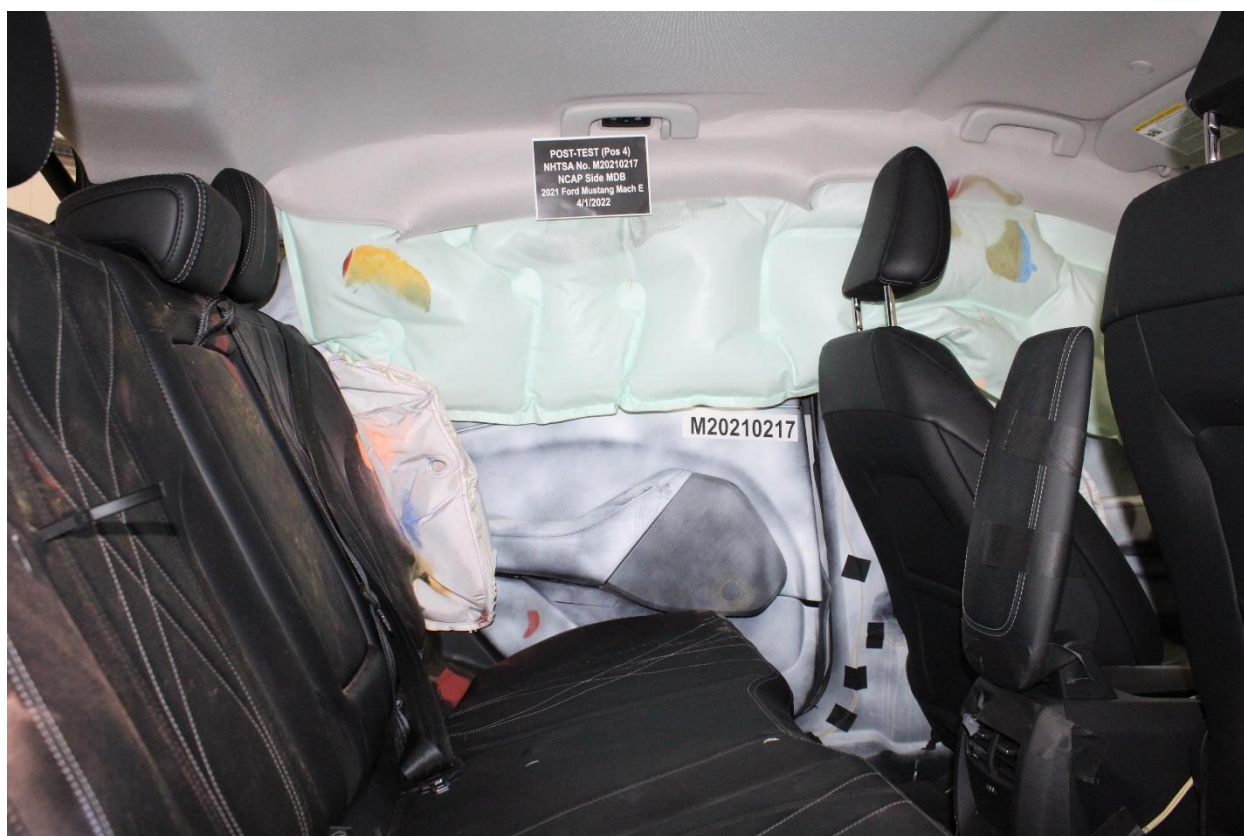


Figure A-74: Post-Test Rear Passenger Inner Door Panel View Showing Rear Passenger Dummy Contact Locations



Figure A-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

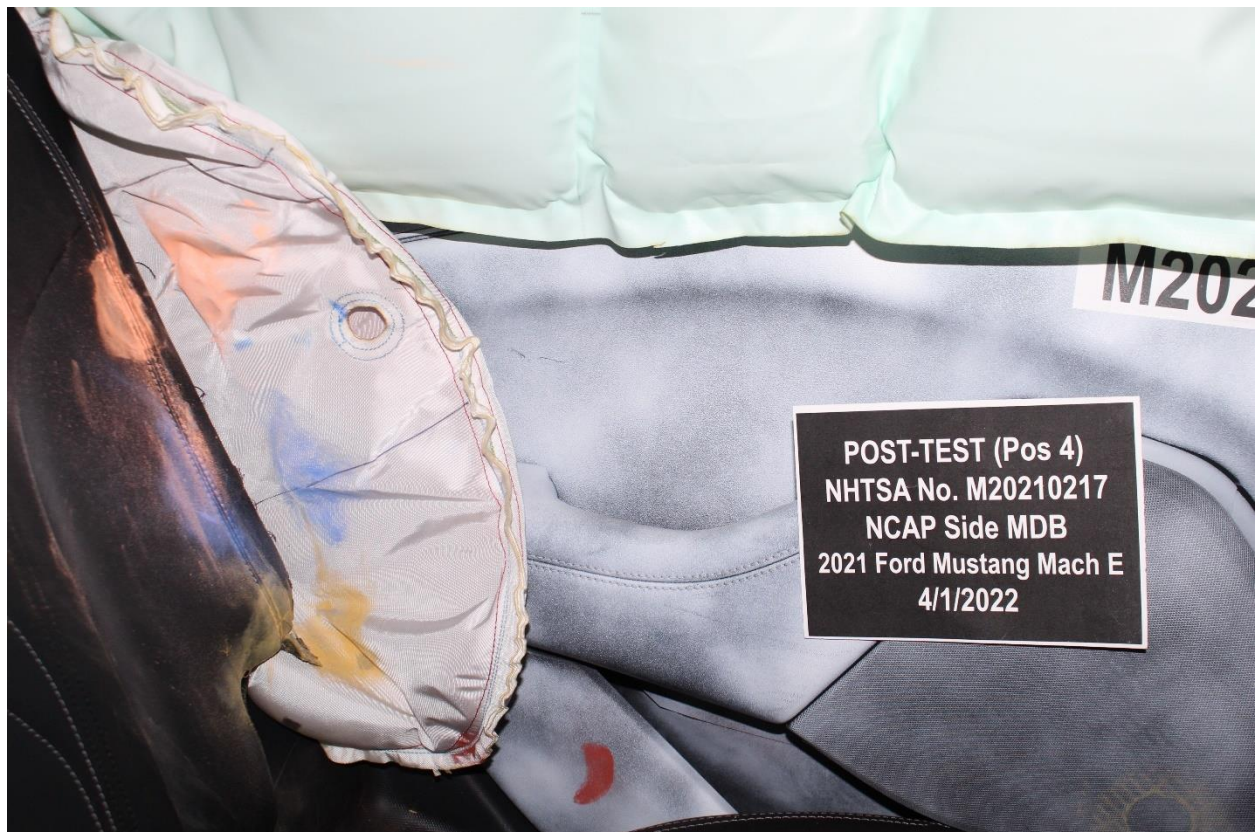


Figure A-78: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Air bag View



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



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



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



Figure A-82: Pre-Test View of Charging Port



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

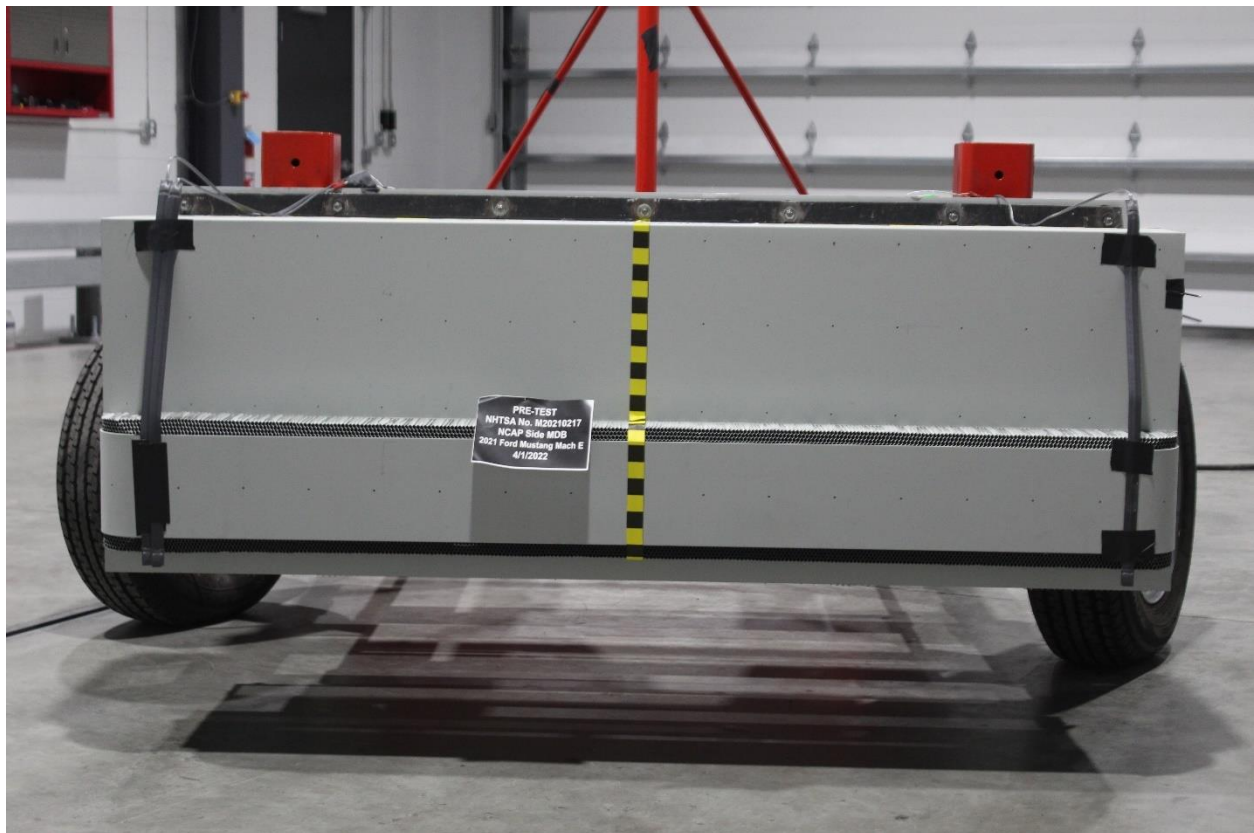


Figure A-84: Pre-Test Front View of MDB Impactor Face

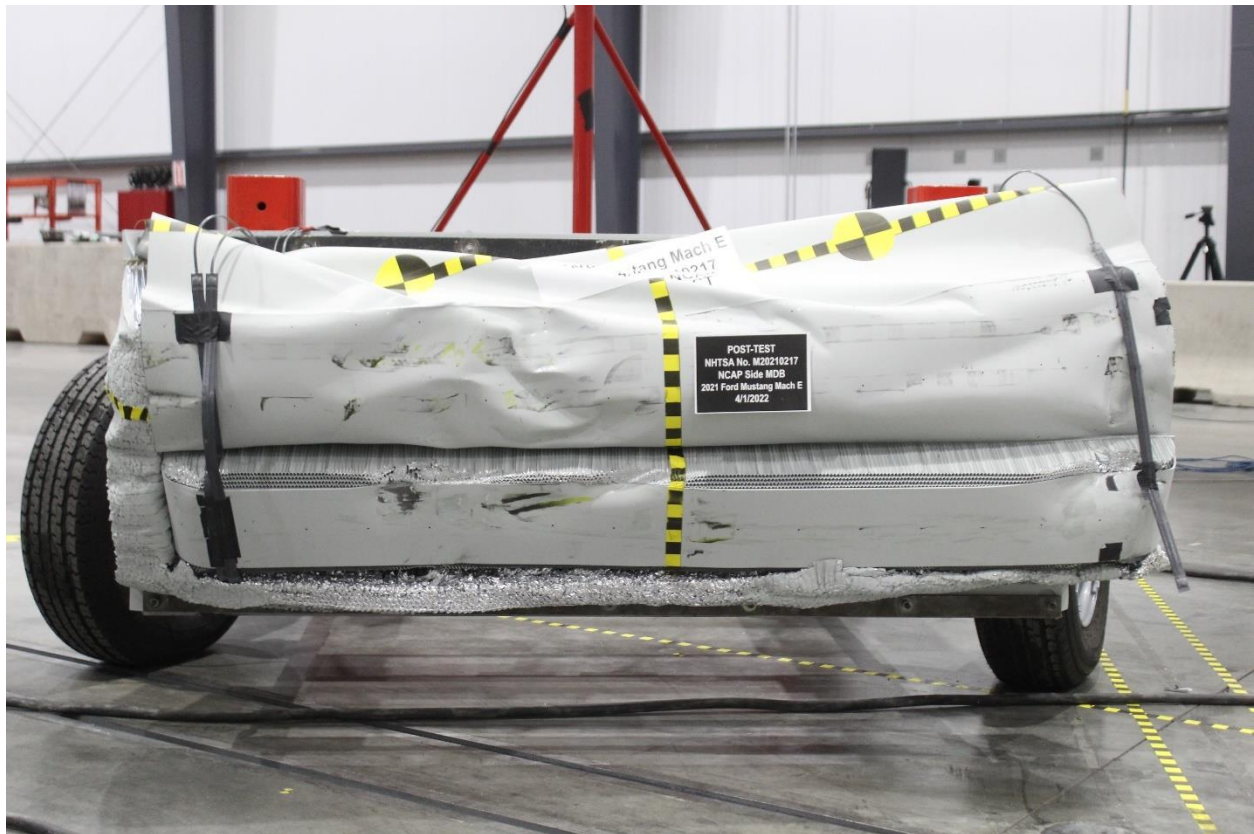


Figure A-85: Post-Test Front View of MDB Impactor Face



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

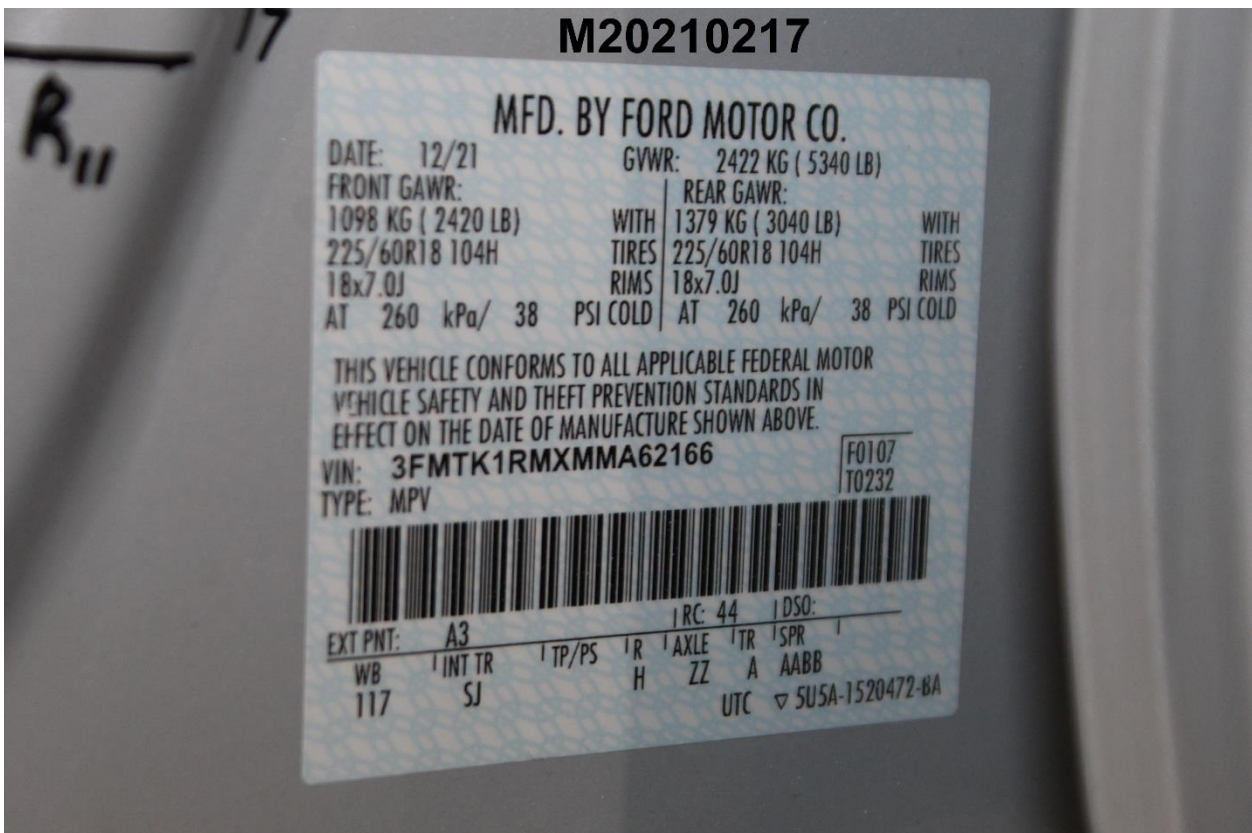


Figure A-92: Close-Up View of Vehicle's Certification Label

M20210217

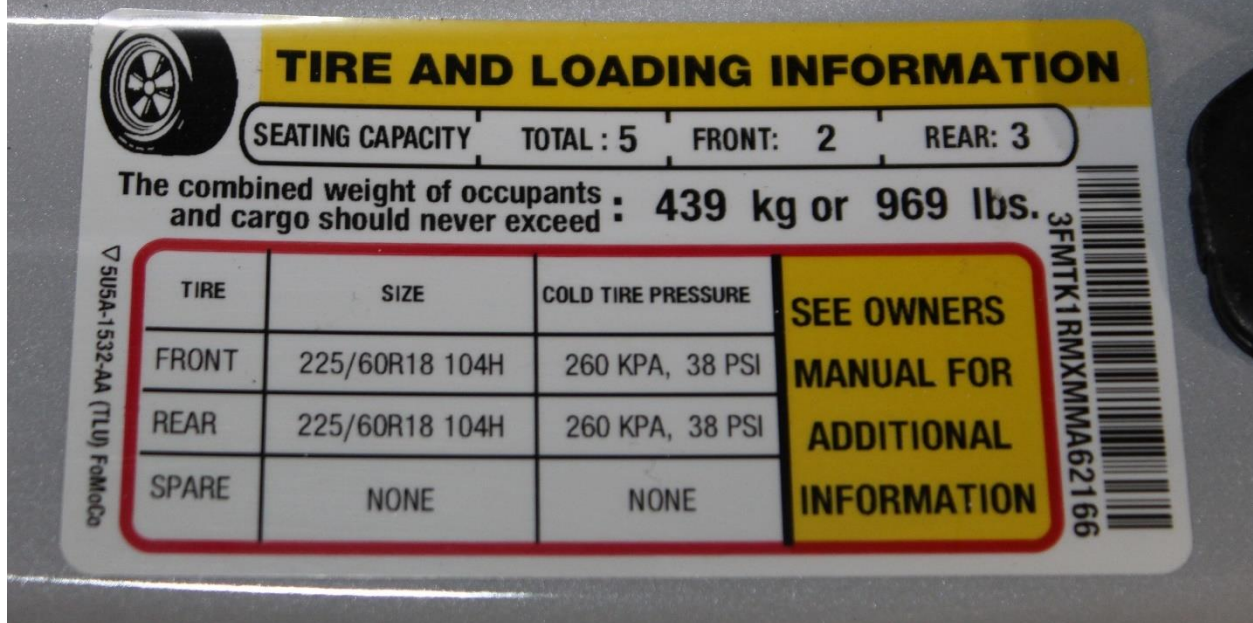


Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label

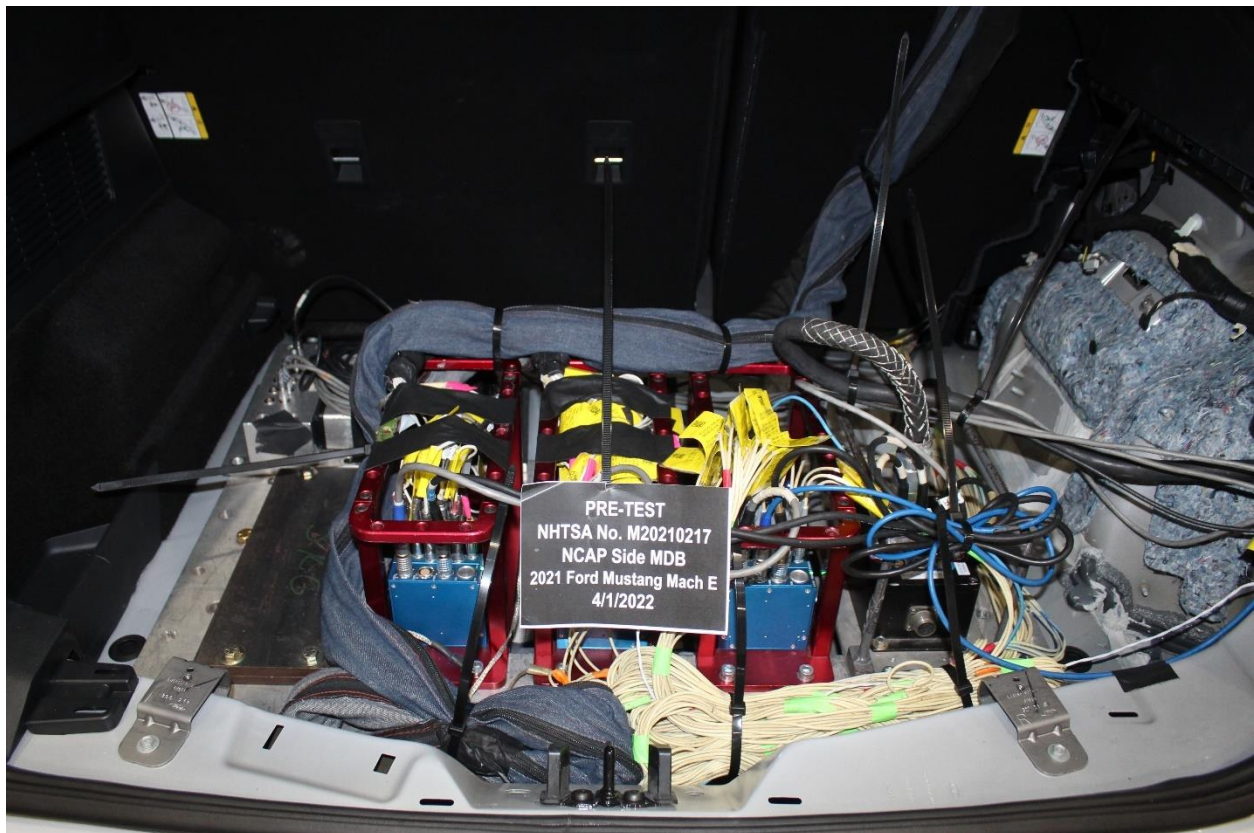


Figure A-94: Pre-Test Ballast View



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



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

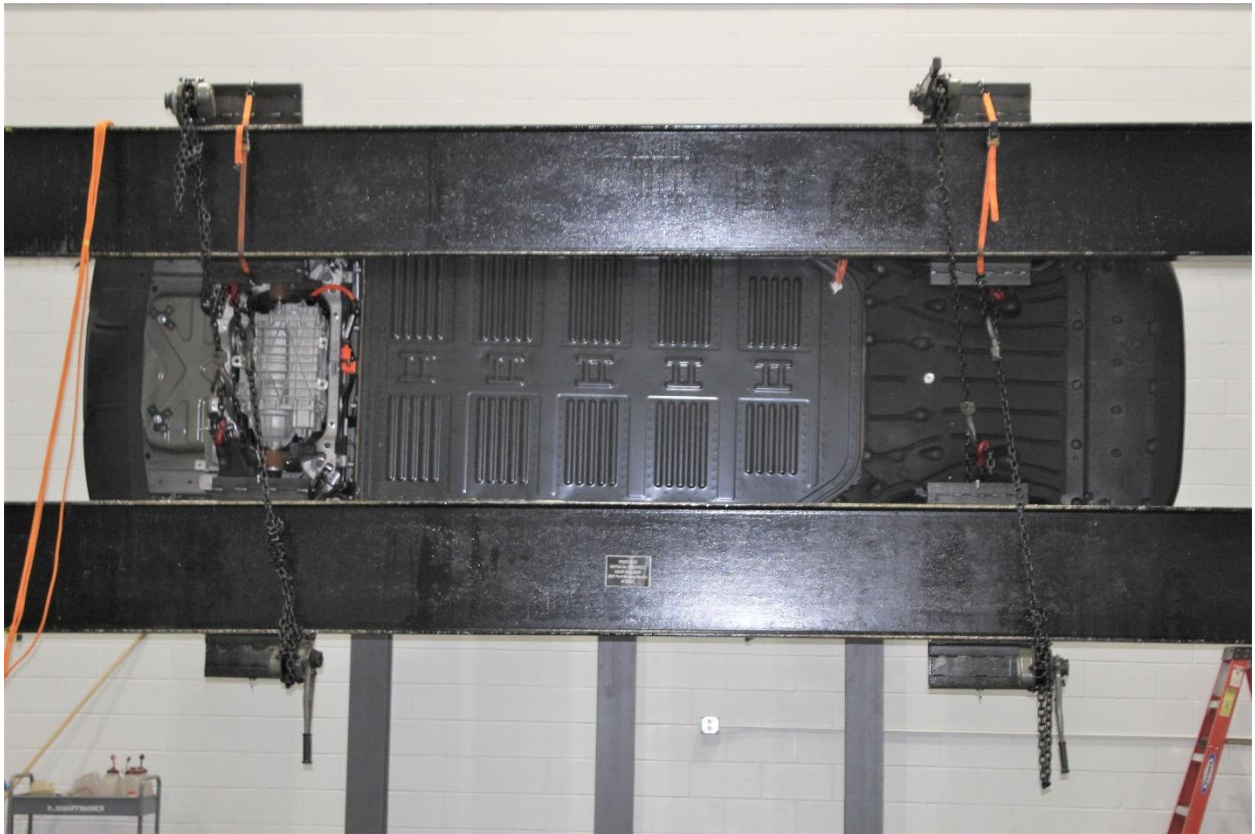


Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees

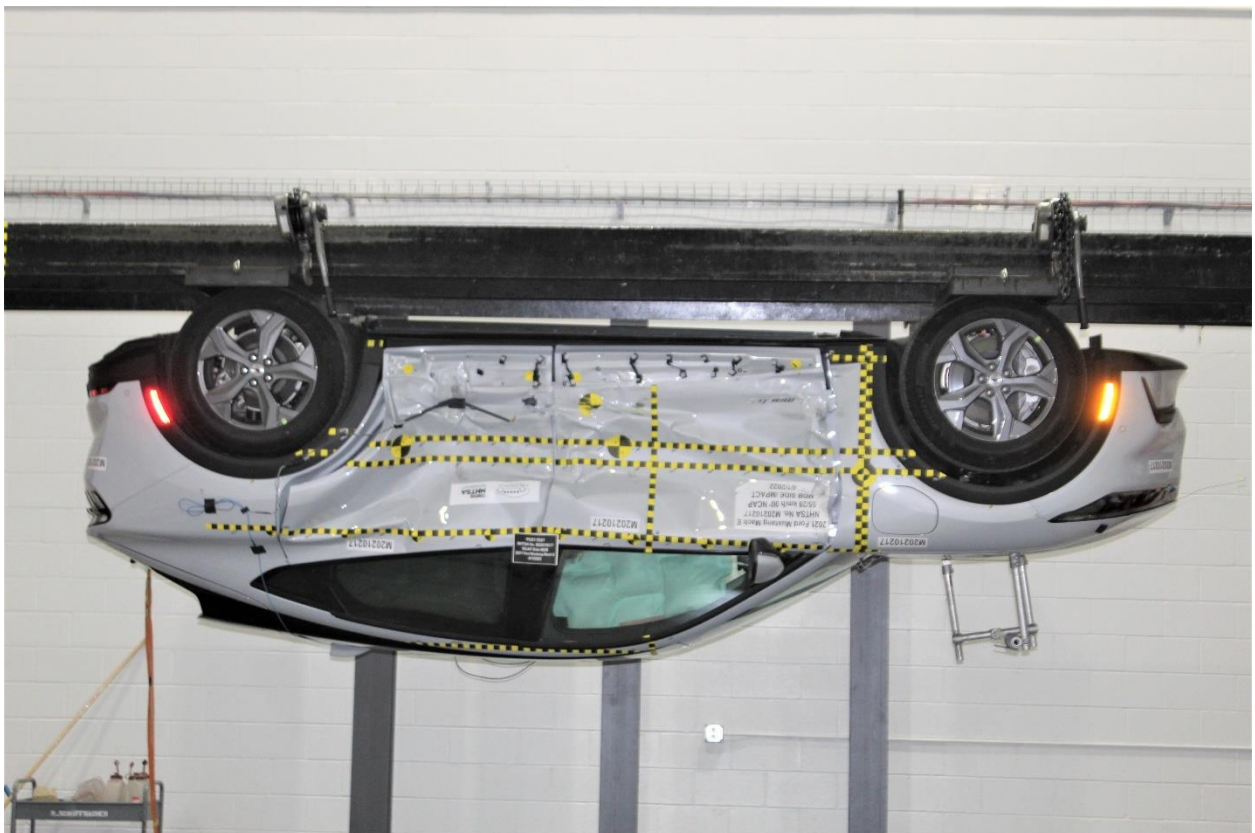


Figure A-98: FMVSS No. 301 Static Rollover 180 Degrees



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

VEHICLE DESCRIPTION				EPA DOT Fuel Economy and Environment	
Ford Go Further ford.com				Electric Vehicle	
MUSTANG MACH-E MM A62166 2021 SELECT RWD 5-PASSENGER 68KWH USABLE STD BATTERY SINGLE-SPEED TRANSMISSION				Fuel Economy 100 MPGe Small Station Wagons range from 24 to 118 MPGe. The best vehicle rates 141 MPGe. You save \$4,250 in fuel costs over 5 years compared to the average new vehicle.	
STANDARD EQUIPMENT INCLUDED AT NO EXTRA CHARGE				Annual fuel cost \$650 Fuel Economy & Greenhouse Gas Rating 10 (Best) Smog Rating (Best)	
EXTERIOR • ACTIVE GRILLE SHUTTERS • ELATCH - PUSH BUTTON OPEN • FRONT TRUNK - DRAINABLE • HEADLAMPS - WIPER ACTIVATED • HEADLAMPS-AUTO LED REFLECTOR • MIRRORS-PWR/HEATED/BLIND-SPOT • LED SIG/POY/PROJECTN LAMP • REAR SPOILER • TAILLAMPS-LED W/SEQUENTIAL TURN SIGNAL • WINDSHIELD WIPER DE-ICER • WIPERS - RAIN-SENSING				Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$7,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.13 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.	
INTERIOR • TOUCH UP/DOWN FRT/RR WIN • AUTO-DIM HEAVYVIEW MIRROR • DUAL ILLUM VANITY MIRRORS • DUAL ZONE AUTO CLIMATE CTL • 10" CLUSTER 10.2" DIGITAL SCR • POWER DRV SEAT - 8-WAY • POWERPOINTS - 12V • ROTARY GEAR SHIFT DIAL • SCUFF PLATE W/POY/GRAPHIC • SOFT WHL WRAP-STEERING • WHEEL W/LOCKED CONTROLS • SPLIT FOLD REAR SEAT • TL/TITLESCOPE STN COLUMN • USB A1/C1-1ST/2ND ROWS				WARRANTY • 5-YR/60,000 BUMPER / BUMPER • 5-YR/60,000 POWERTRAIN • 5-YR/60,000 ROADSIDE ASSIST • 5-YR/60,000 HV BATT/COMPON	
FUNCTIONAL • 10.5KW AC ONBOARD CHARGER • UP TO 115KW DC CHRG CAPABL • J1772 CCS COMBO CONNECTOR • REGENERATIVE BRAKING SYS • ONCTD BLT-IN NAVS-VR INC • FORD CO-PILOT360™ ASSIST2.0 • FORDPASS™ CONNECT 4GWI-FI • HOTSPOT TELEMATICS MODEM • INTELL ACCESS W/PUSH START • PHONE AS A KEY • REFRESH6 • SELECTABLE DRIVE MODES AND ONE PEDAL DRIVE • SYNC4A W/VR & 15.5" SCRIN • WIRELESS CHARGING PAD				SAFETY/SECURITY • ADVANCED SECURITY PACK • ADVANCETRAC™ • AIRBAG - DRIVER KNEE • AIRBAGS - DUAL STAGE FRONT • AIRBAGS - FRT/REAR SIDE • IMPACT & SIDE AIR CURTAIN • ELCTR STABILITY/TRACTN CTL • INDY TIRE PRESS MONIT SYS • LATCH CHILD SAFETY SYSTEM • SOS POST-CRASH ALERT SYS™	
INCLUDED ON THIS VEHICLE EQUIPMENT GROUP 100A (MSRP) 18" GRAY PNTD ALUM WHEELS 225/60R18 A/S BSW TYRES COMFORT/TECHNOLOGY PACKAGE FORD CO-PILOT360 ACTIVE 2.0 BLUECRUISE 360-DEGREE CAMERA HANDS-FREE FOOT-ACTV LIFTGATE HEATED FRONT SEATS HEATED STEERING WHEEL MEMORY DR SEAT/SIDE MIRRORS FRONT LICENSE PLATE BRACKET NO CHARGE				PRICE INFORMATION (MSRP) BASE PRICE \$42,895.00 TOTAL OPTIONS/OTHER 3,200.00 TOTAL VEHICLE & OPTIONS/OTHER 46,095.00 DESTINATION & DELIVERY 1,100.00	
				GOVERNMENT 5-STAR SAFETY RATINGS Overall Vehicle Score Not Rated Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight. Frontal Crash Driver Passenger Not Rated Based on the risk of injury in a frontal impact. Side Crash Front seat Rear seat Not Rated Based on the risk of injury in a side impact. Rollover Not Rated Based on the risk of rollover in a single-vehicle crash. Star ratings range from 1 to 5 stars (*****), with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4235	
SOLD TO Van Bortel Ford, Inc. 71 Marsh Rd. East Rochester, NY 14445				FORD PROTECT™ Insist on Ford Protect! The only extended service plan fully backed by Ford and honored at every Ford dealership in the U.S., Canada and Mexico. See your Ford dealer or visit www.FordProtect.com	
SHIP TO 44-2902 Q/T 2 SHIP THROUGH				3FMTK1RMXMMMA62166 	
Whether you decide to lease or finance your vehicle, you'll find the choices that are right for you. See your dealer for details or visit www.ford.com/finance.				WARNING: Operating, servicing and maintaining a passenger vehicle, pickup truck, van, or off-road vehicle can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your vehicle. For more information go to www.P65Warnings.ca.gov/passenger-vehicle.	

Figure A-102: Monroney Label

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

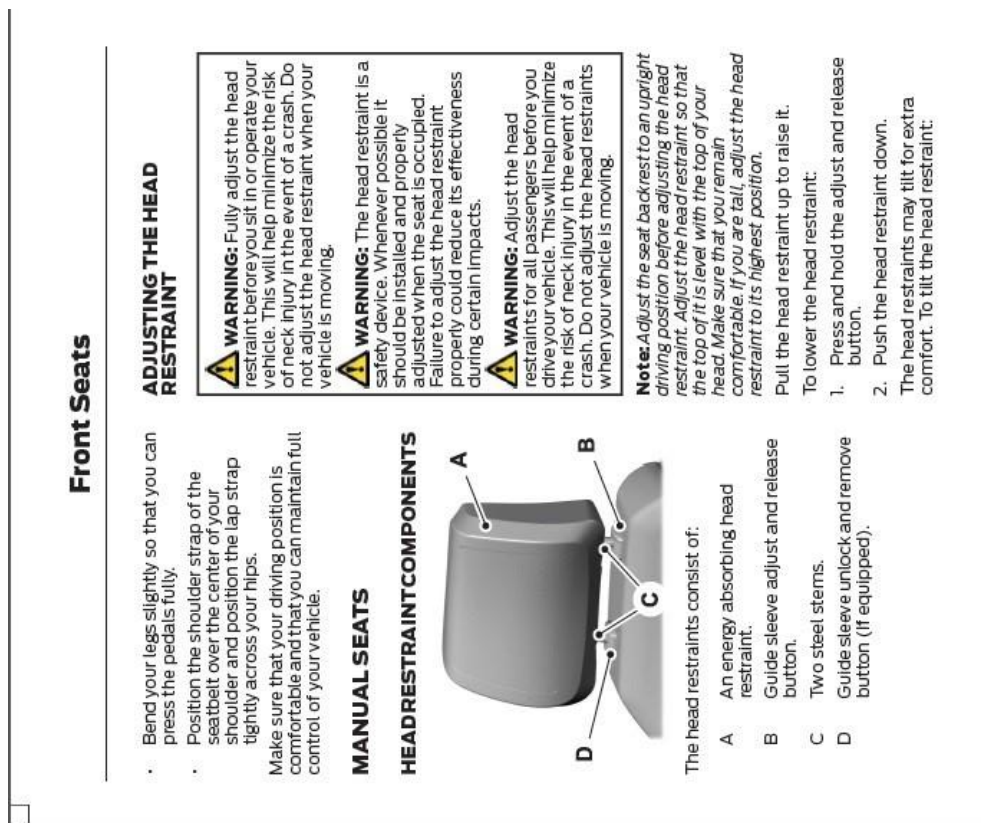


Figure A-104: Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual-Rear Restraints Not Adjustable

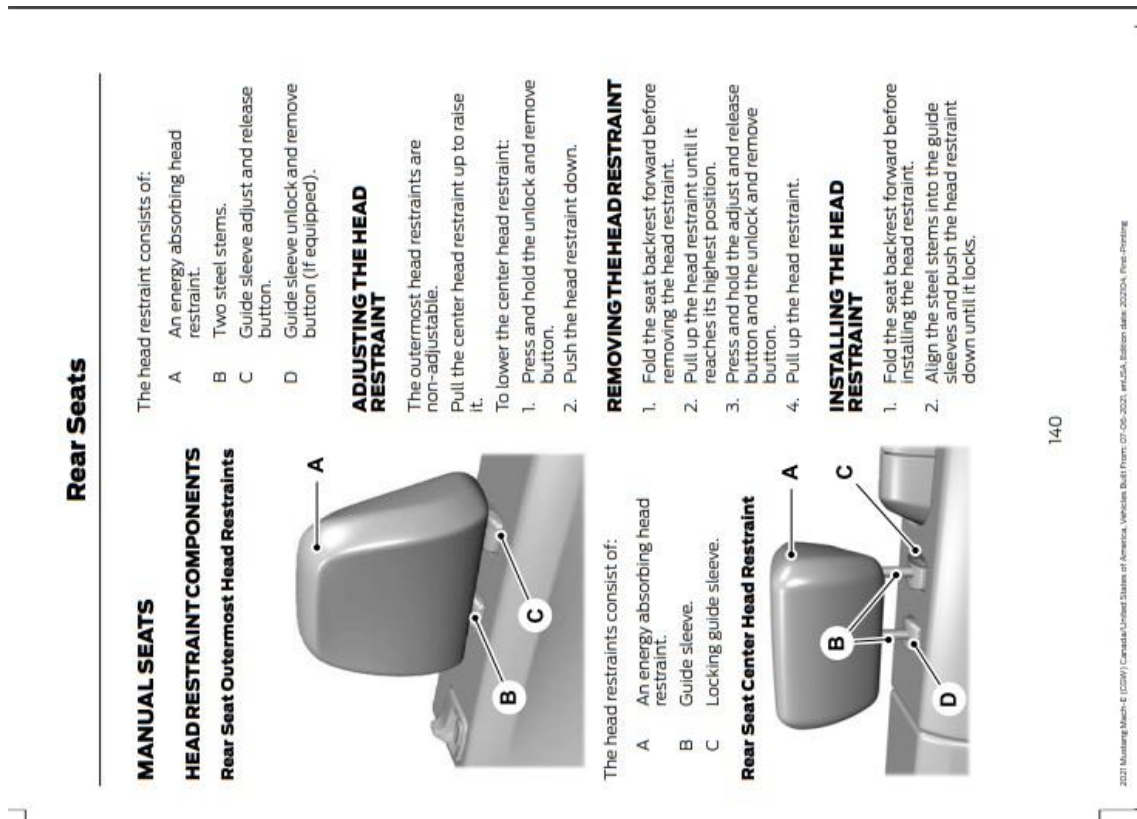




Figure 305-1: Auxiliary Power Module Warning Label



Figure 305-2: Power Inverter Warning Label

Photo Not Applicable

Figure 305-3 First Responder Warning Label

Photo Not Applicable

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

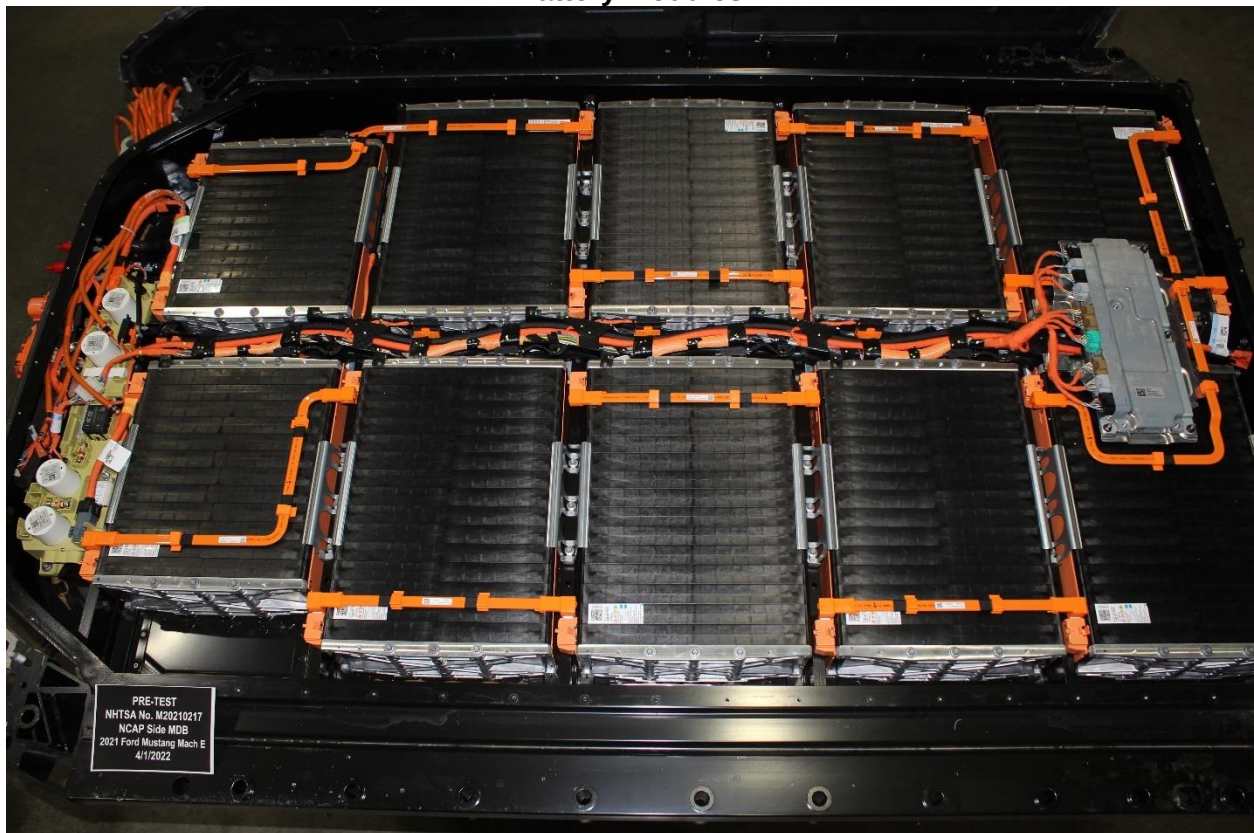


Figure 305-14: Pre-Impact View of Propulsion Battery Module(s)

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

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



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

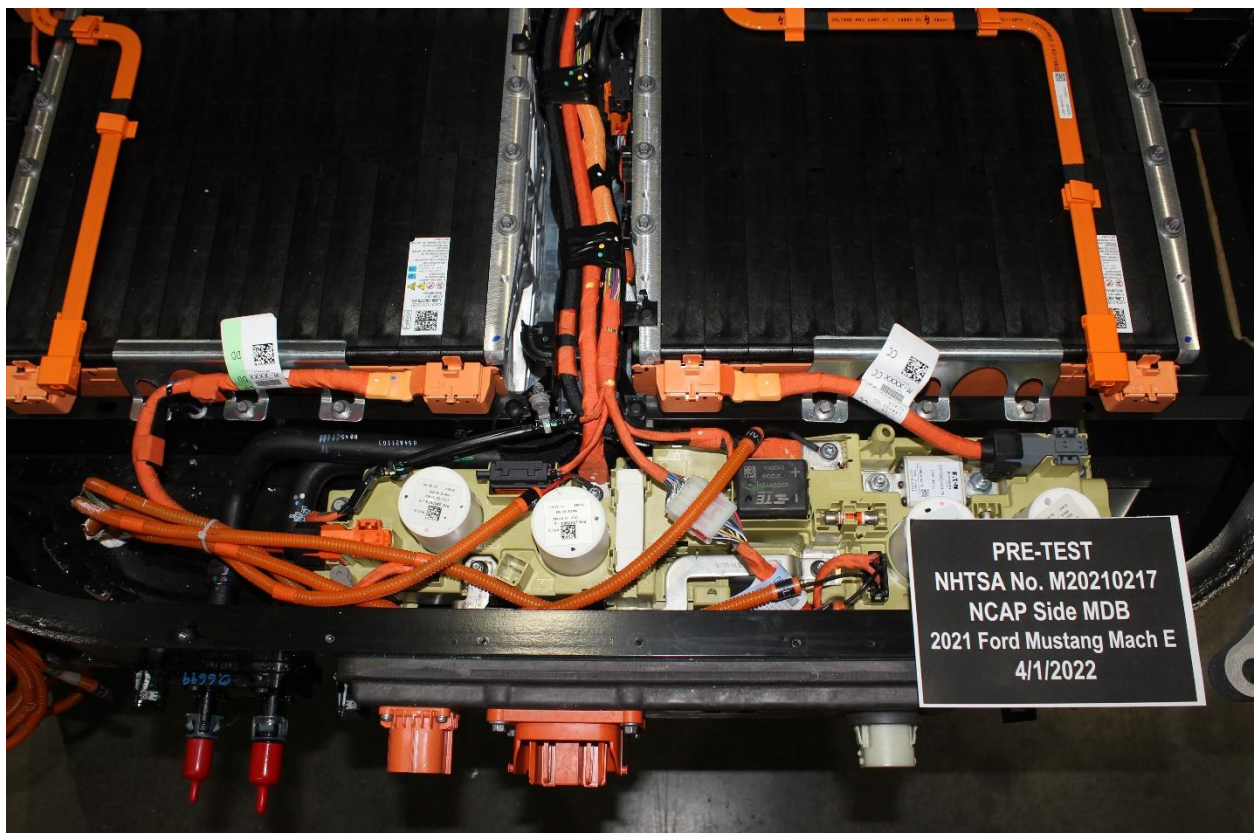


Figure 305-22: Pre-Impact View of High Voltage Leads Attached



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

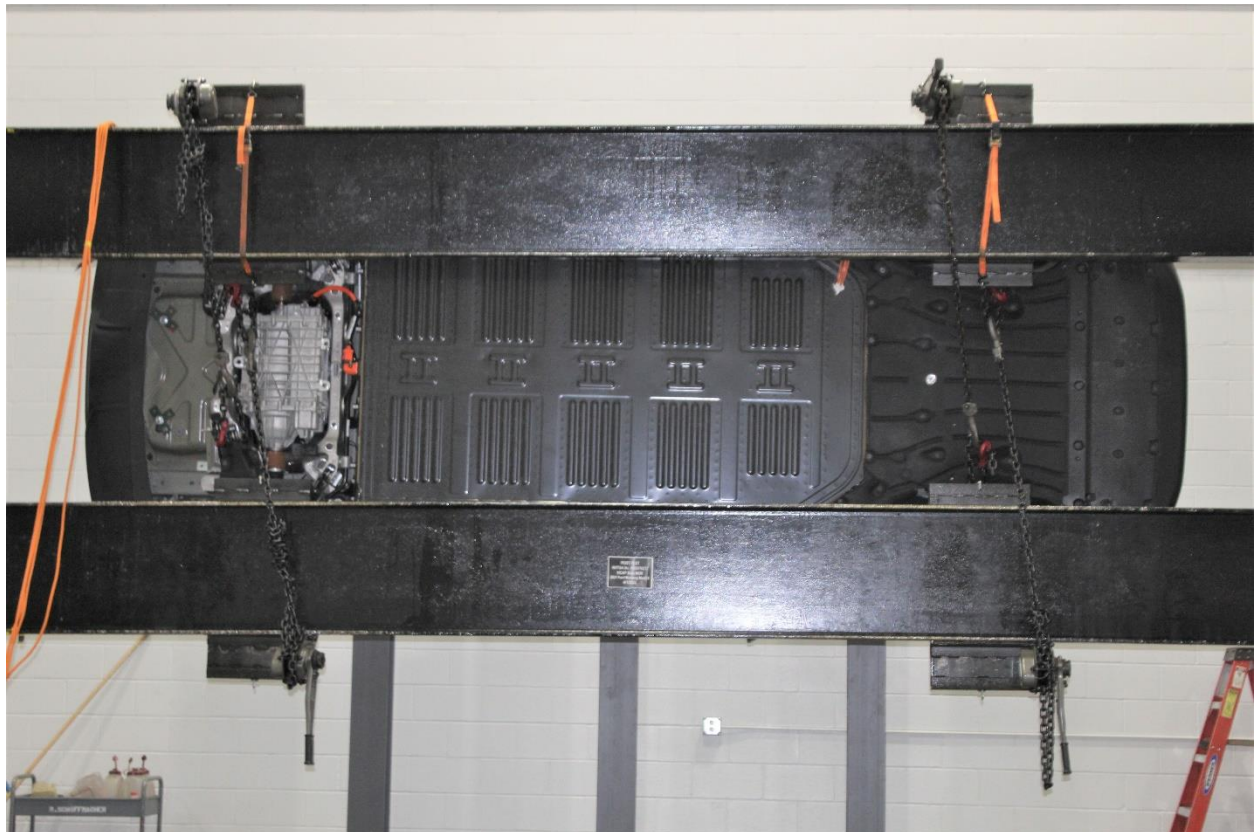


Figure 305-28: FMVSS No. 305 Static Rollover 90 Degrees

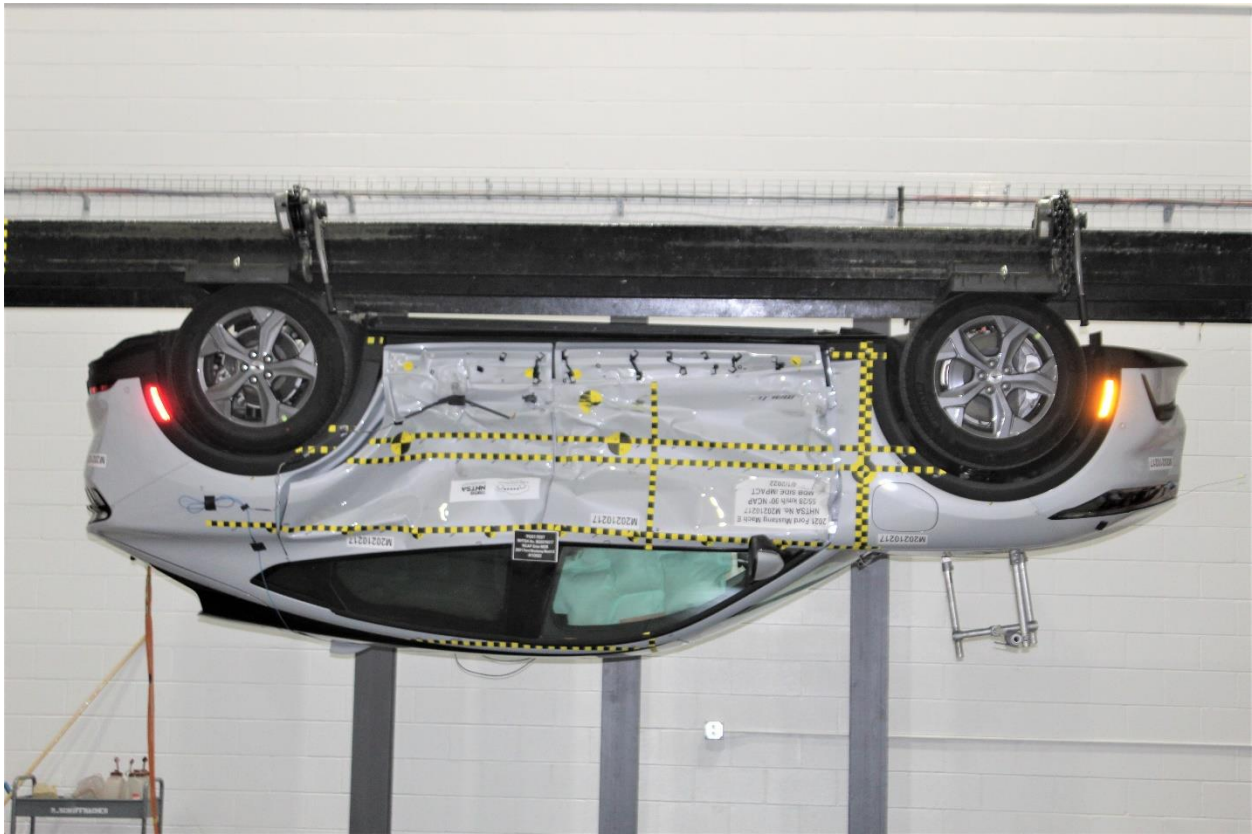


Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees



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)

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not 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 & Passenger Dummy Instrumentation Plots

Fig.	Description	Page
1	Driver Head Acceleration (X) Primary vs. Time	B-5
2	Driver Head Acceleration (Y) Primary vs. Time	B-5
3	Driver Head Acceleration (Z) Primary vs. Time	B-5
4	Driver Head Resultant Acceleration Primary vs. Time	B-5
5	Driver Upper Thorax Rib Deflection (Y) vs. Time	B-6
6	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-6
7	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-6
8	Driver Thorax Rib Deflection Maximum vs. Time	B-6
9	Driver Anterior Abdominal Force (Y) vs. Time	B-7
10	Driver Middle Abdominal Force (Y) vs. Time	B-7
11	Driver Posterior Abdominal Force (Y) vs. Time	B-7
12	Driver Total Abdominal Force (Y) vs. Time	B-7
13	Driver Pubic Symphysis Force (Y) vs. Time	B-8
14	Passenger Head Acceleration (X) vs. Time Primary	B-8
15	Passenger Head Acceleration (Y) vs. Time Primary	B-8
16	Passenger Head Acceleration (Z) vs. Time Primary	B-8
17	Passenger Head Resultant Acceleration Primary vs. Time	B-9
18	Passenger Lower Spine T12 Acceleration (X) vs. Time	B-9
19	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-9
20	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-9
21	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-10
22	Passenger Iliac Force on Impact Side (Y) vs. Time	B-10
23	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-10
24	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-10

The following additional data for this test 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

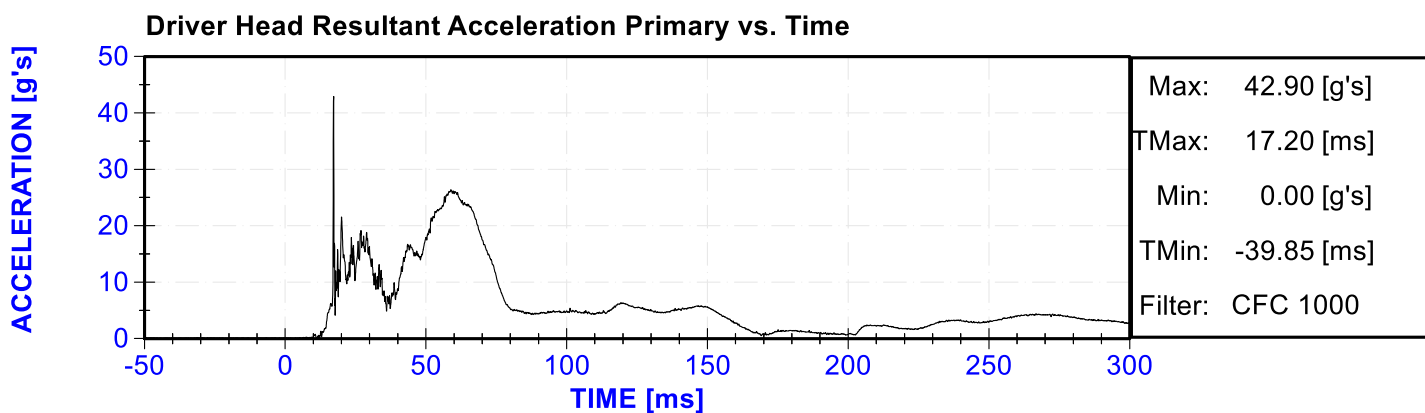
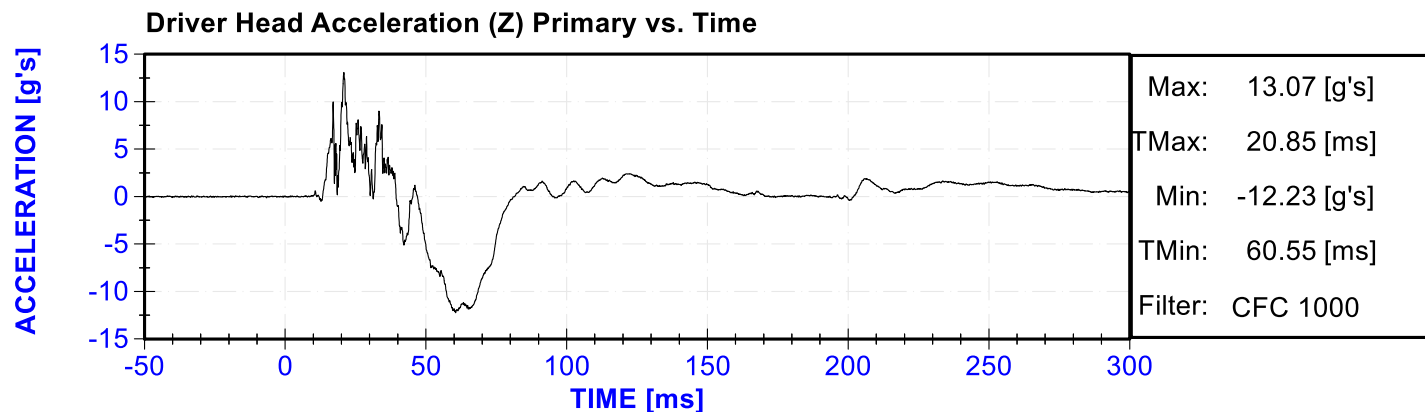
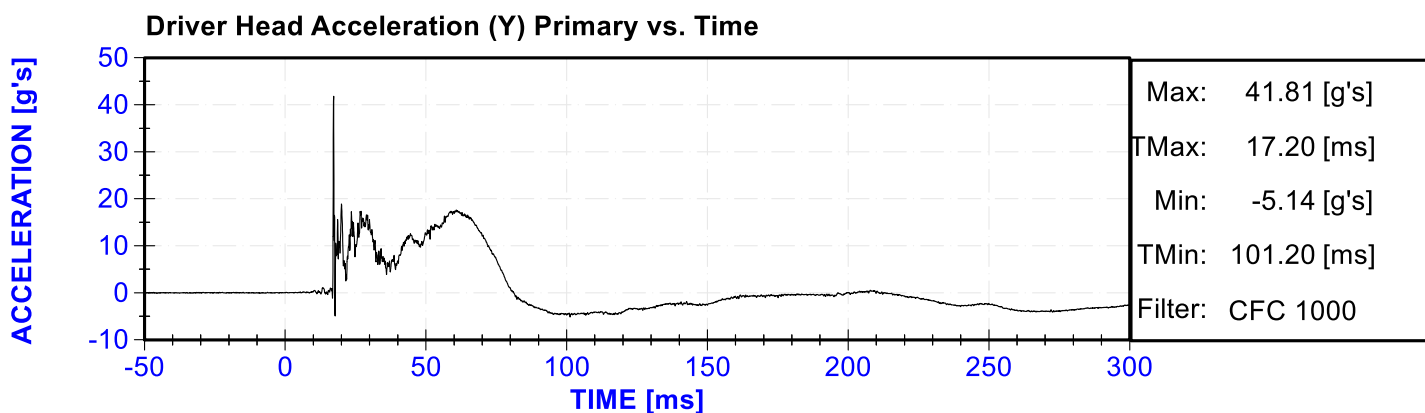
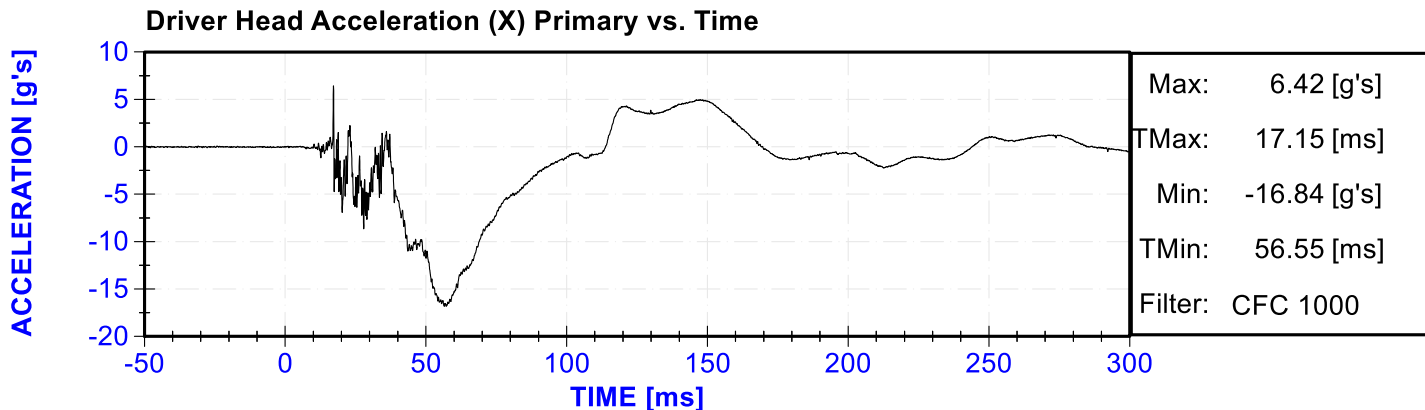
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Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
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Driver Head Acceleration Redundant (Y)
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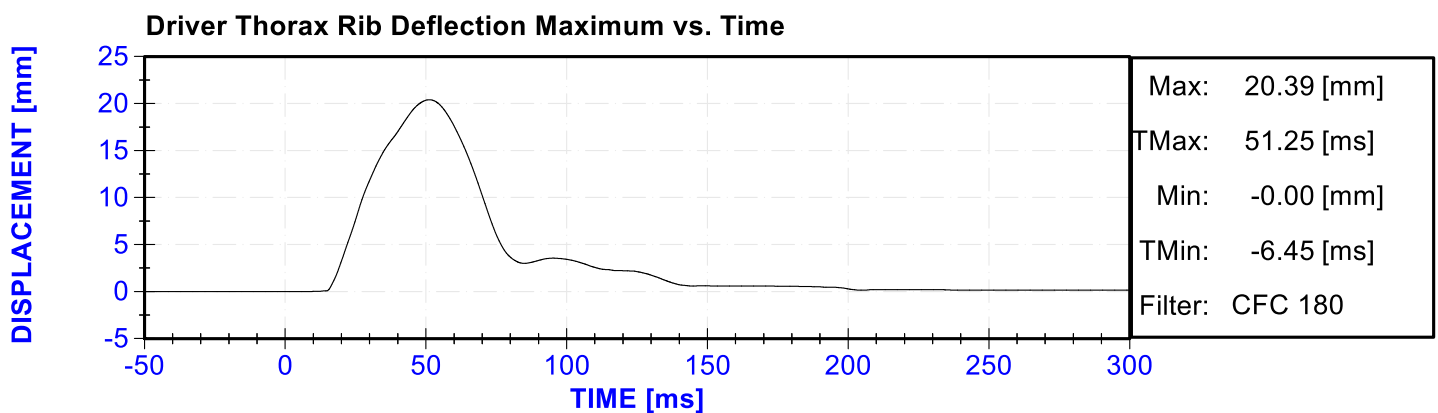
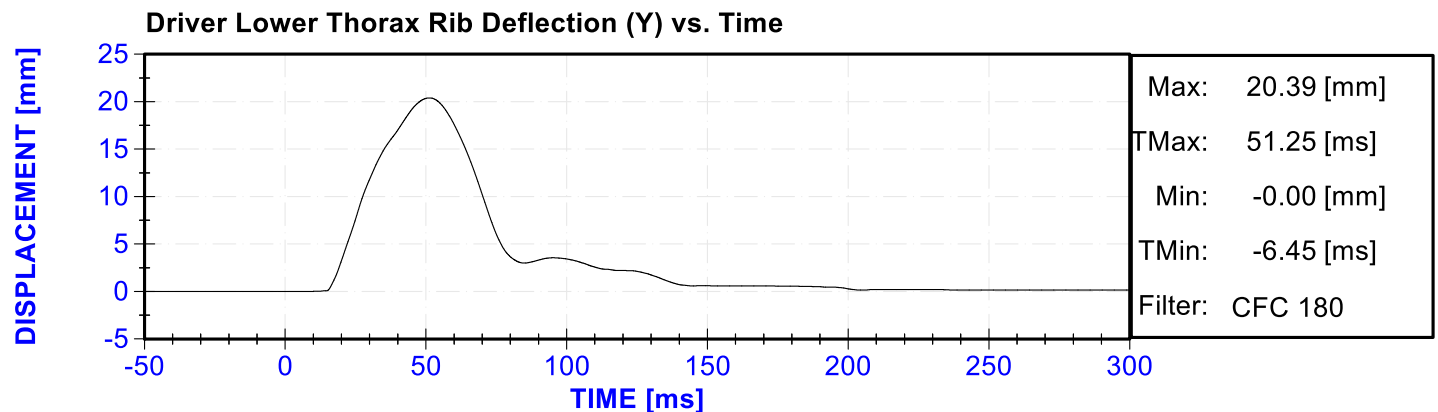
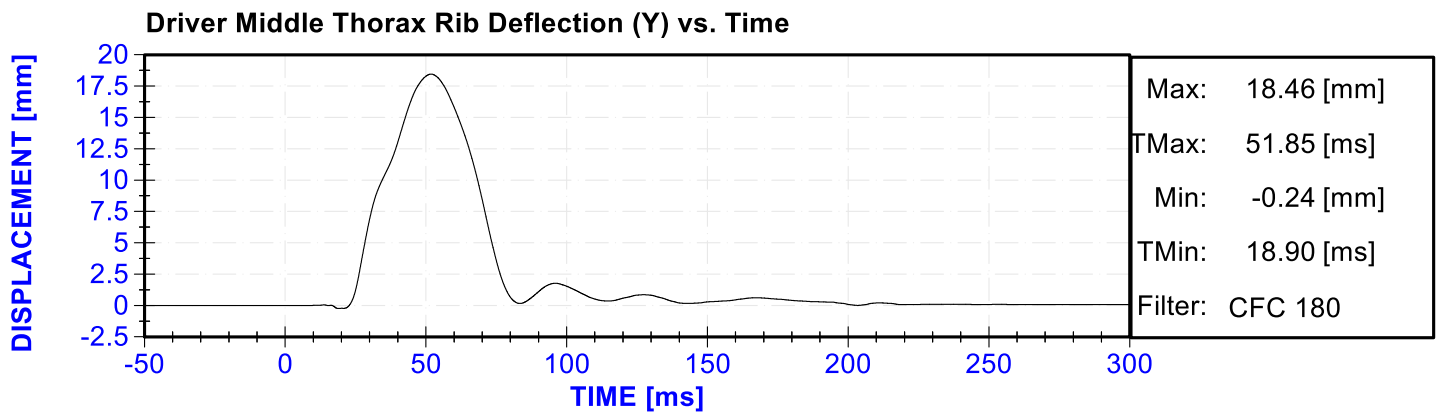
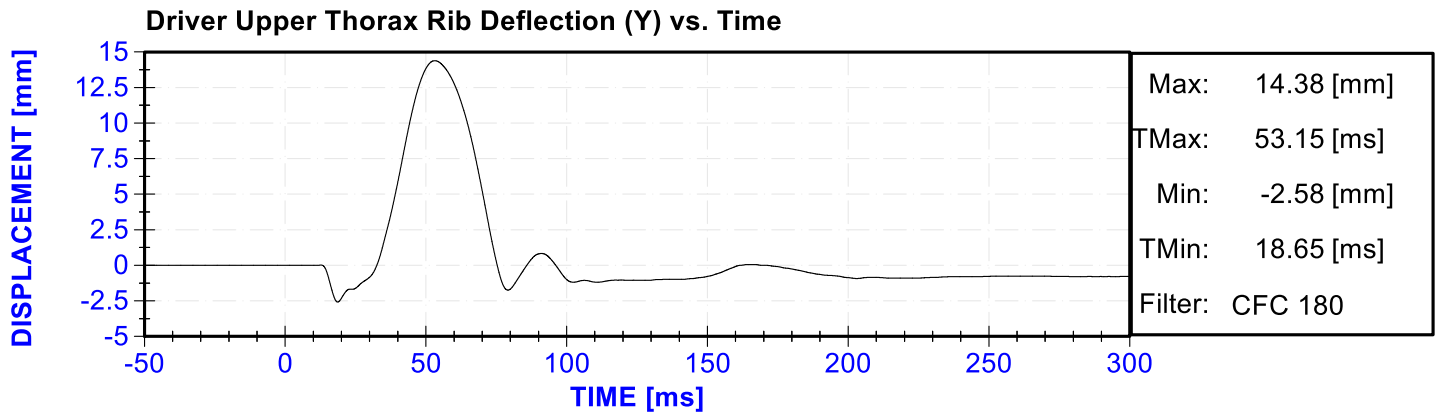
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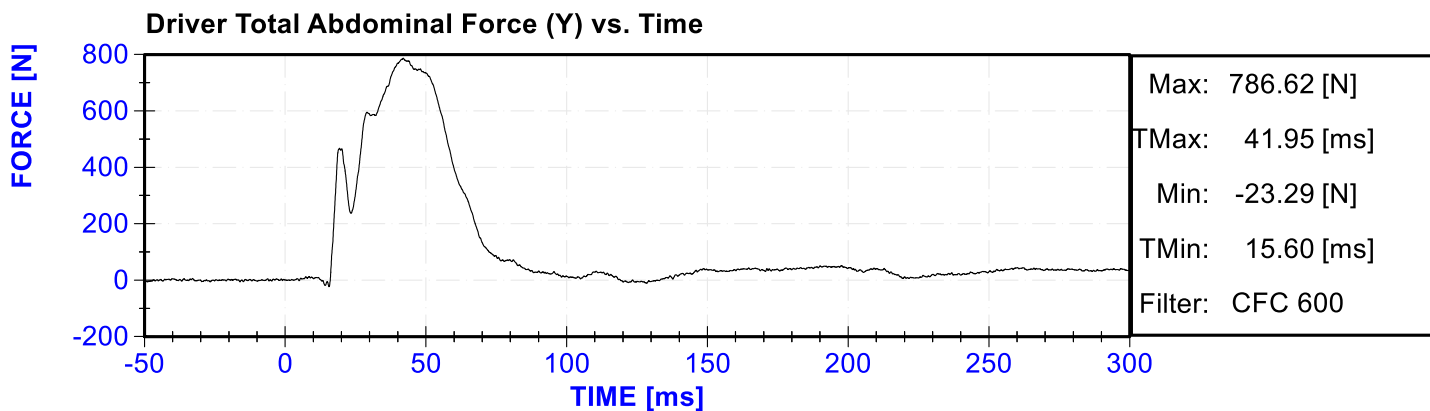
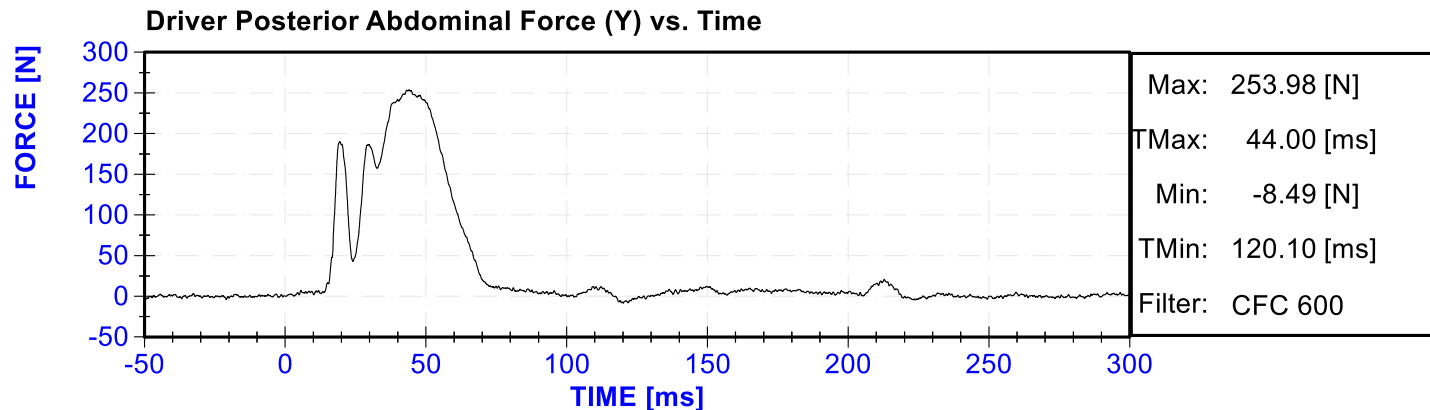
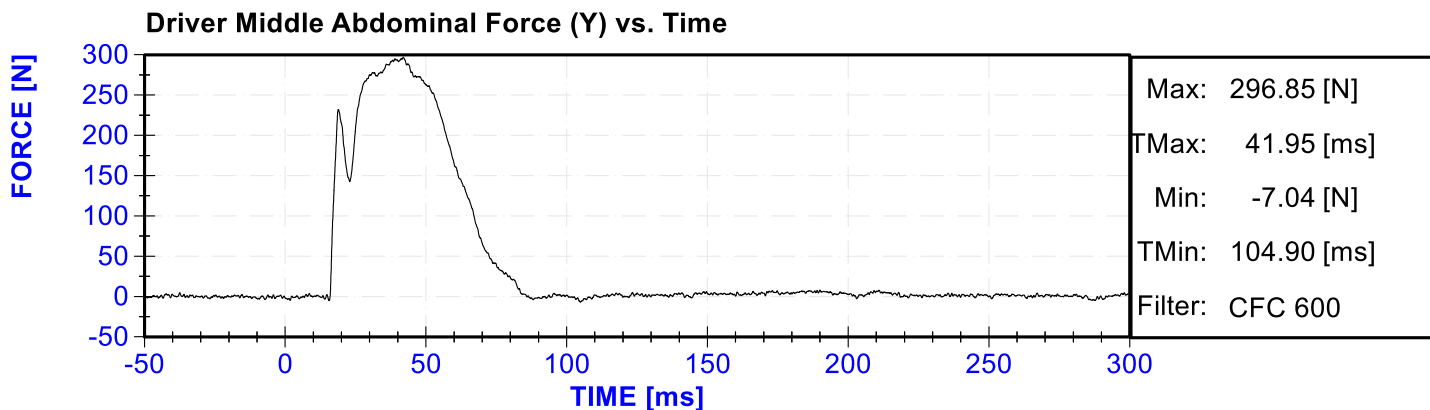
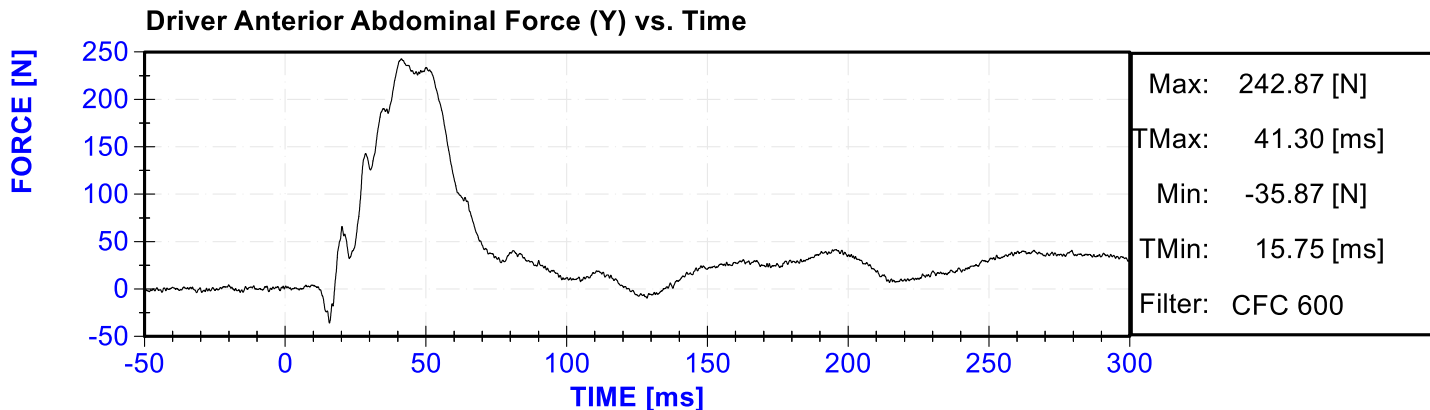
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Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
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Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill 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)
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Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

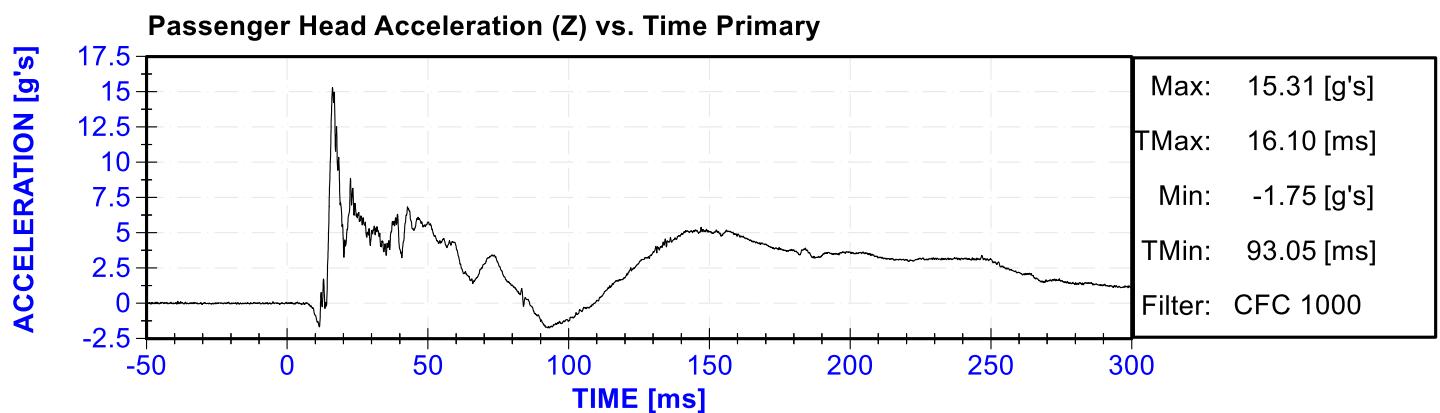
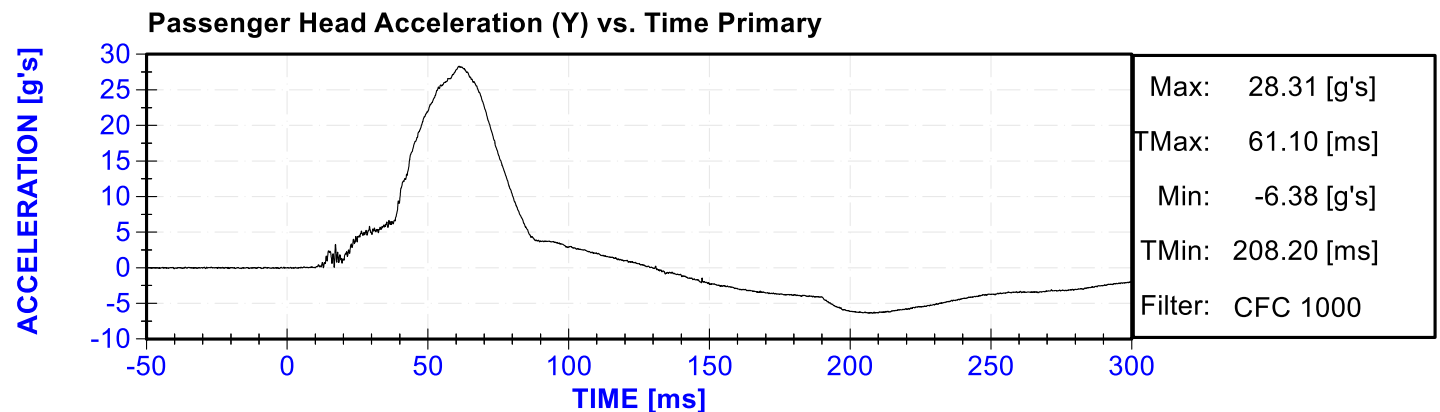
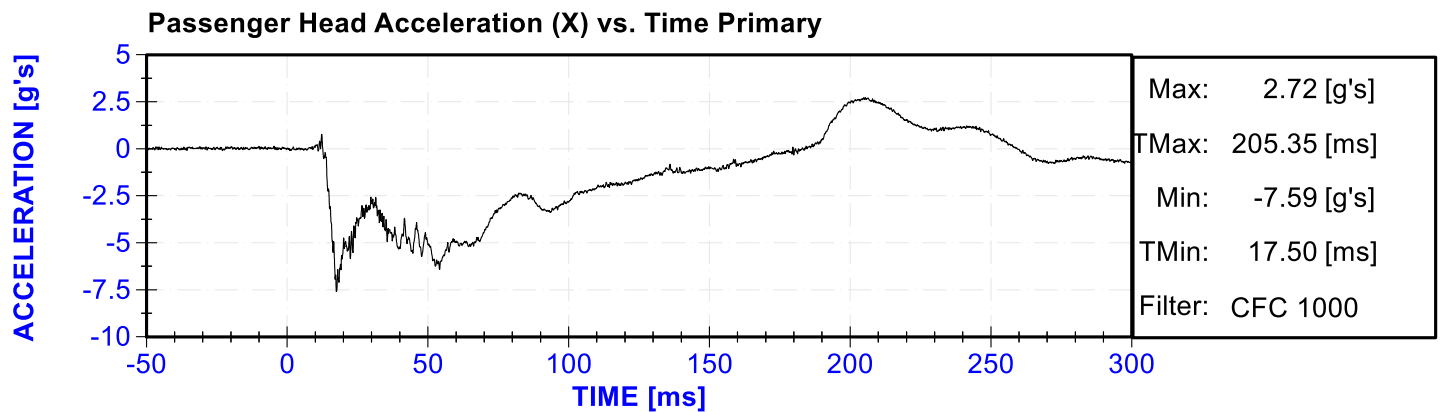
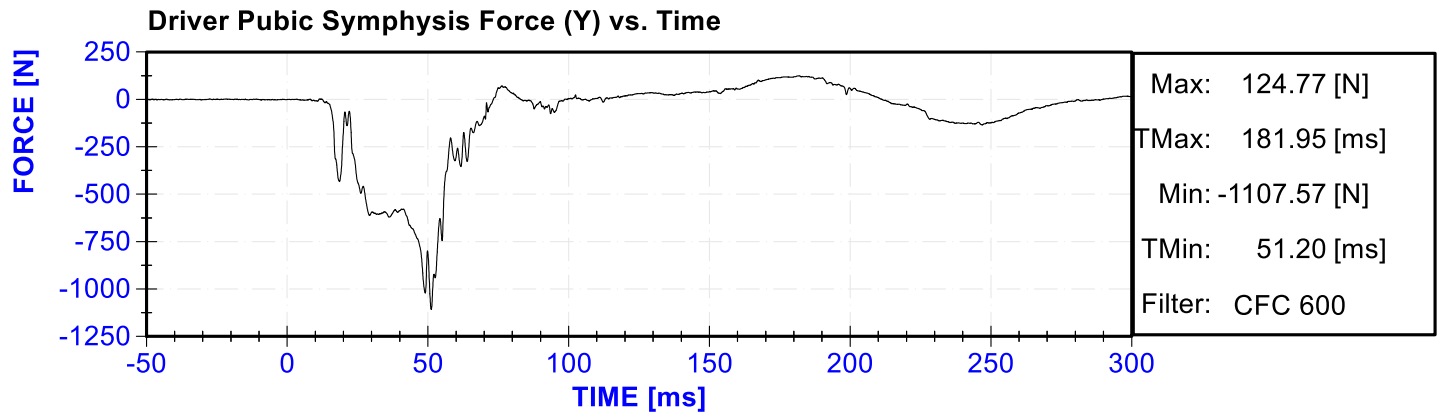
MDB Instrumentation Data

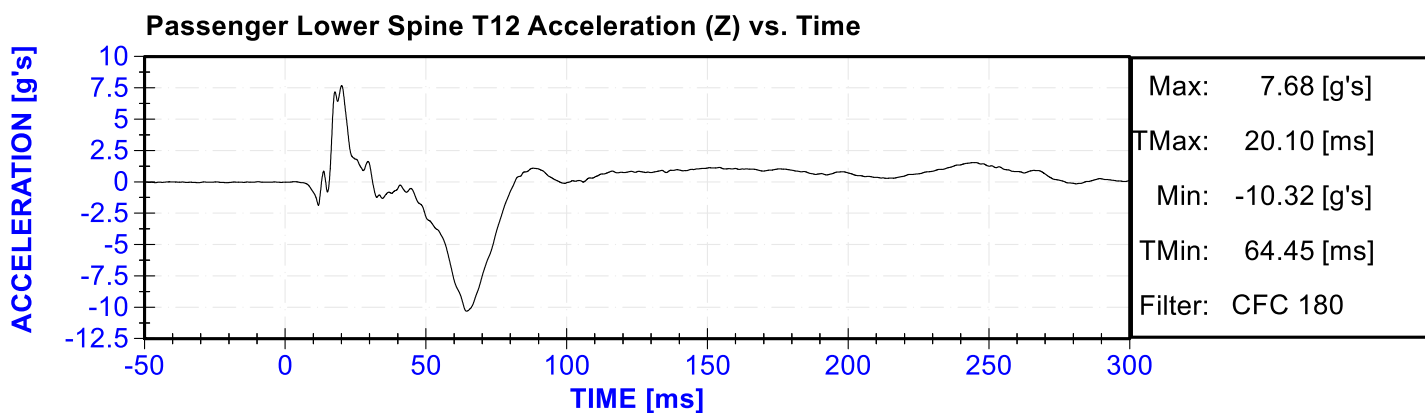
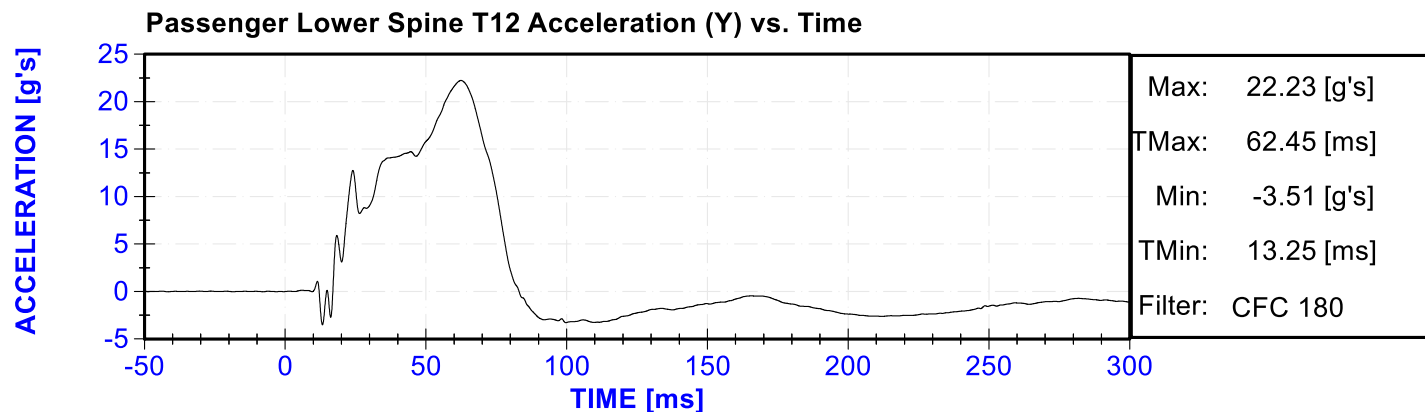
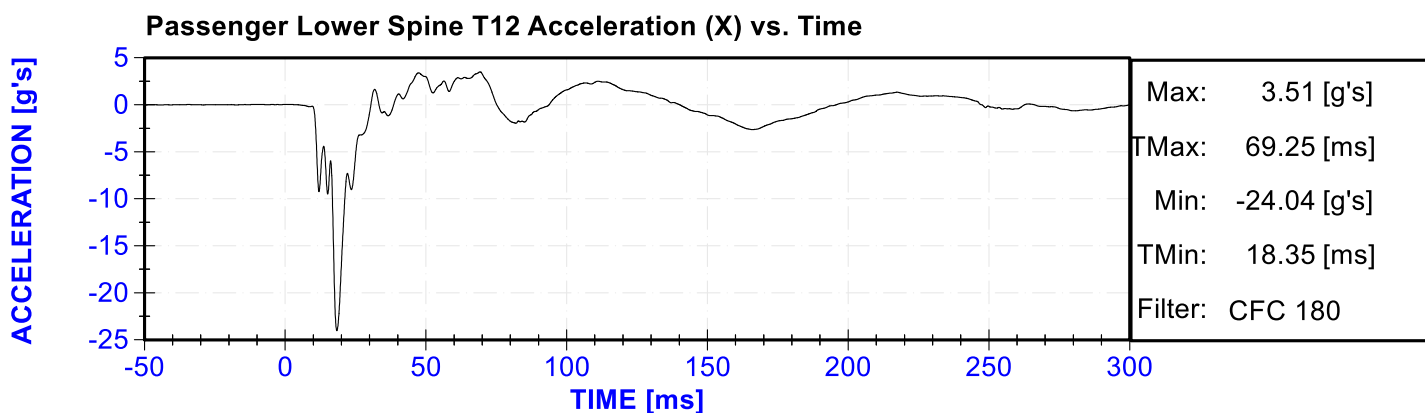
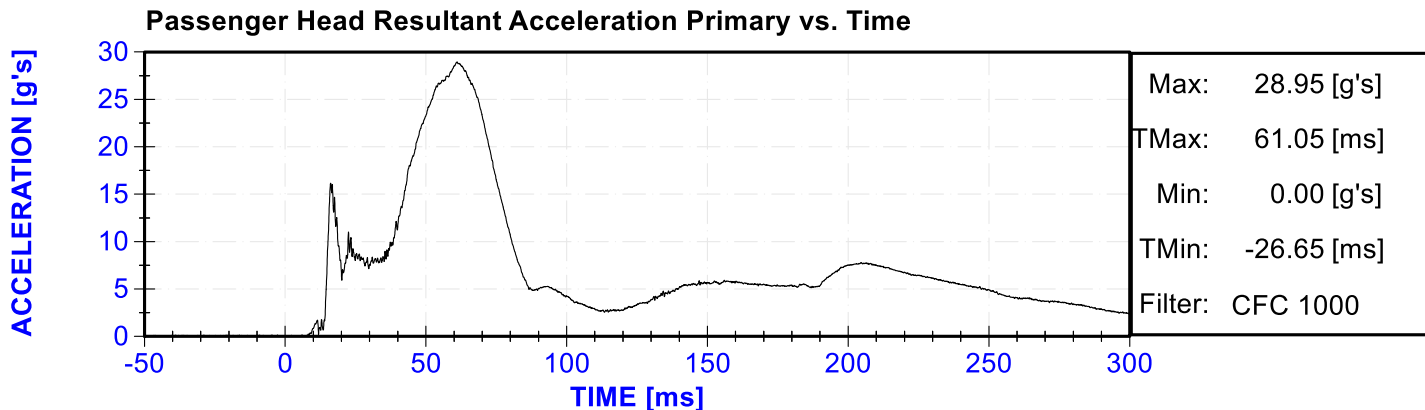
MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch

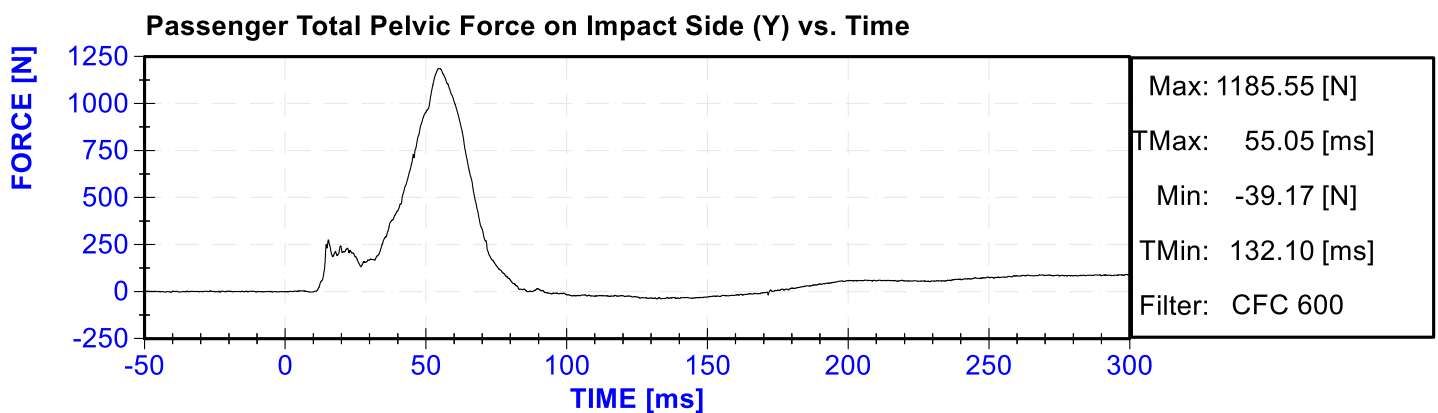
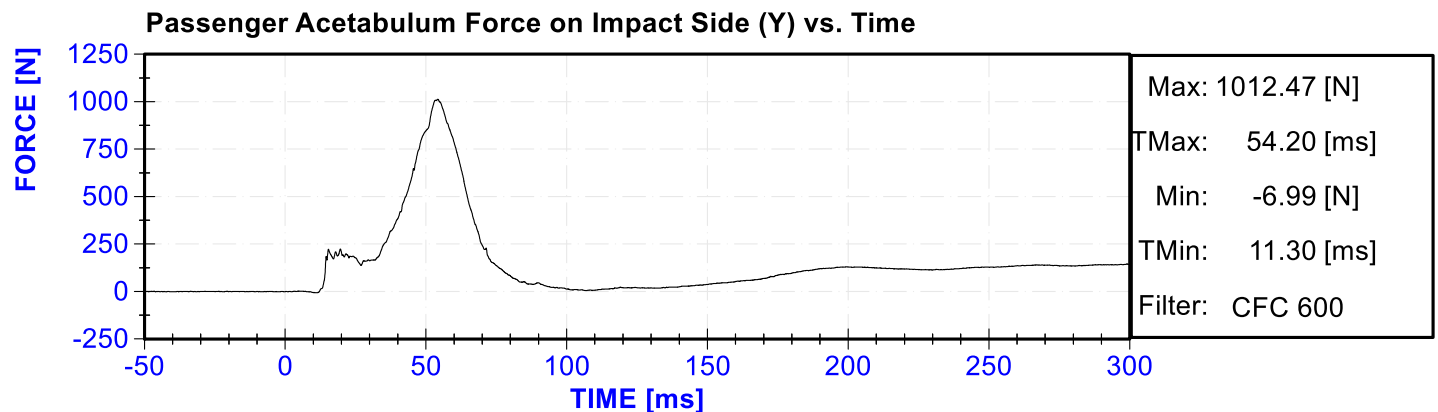
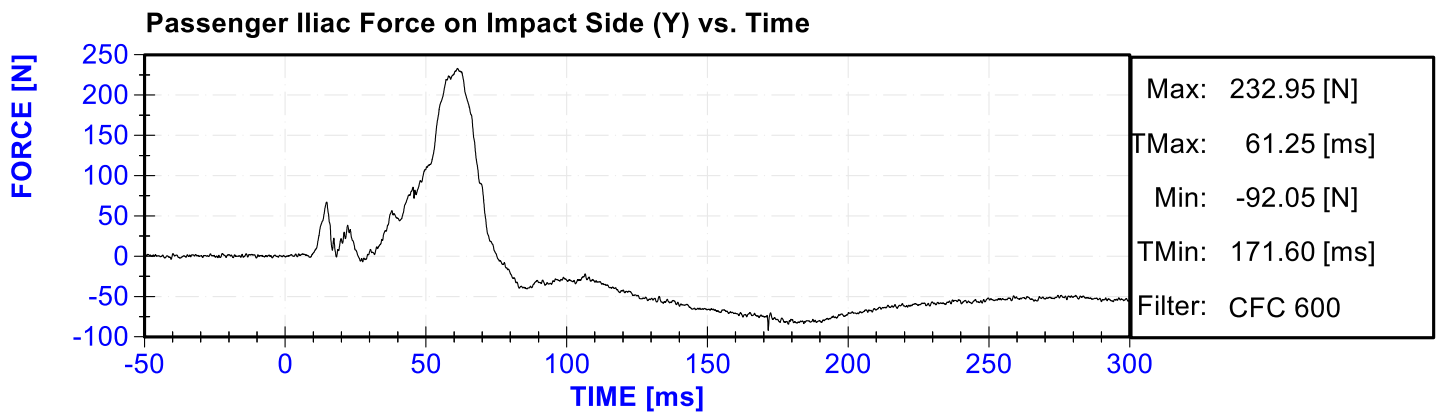
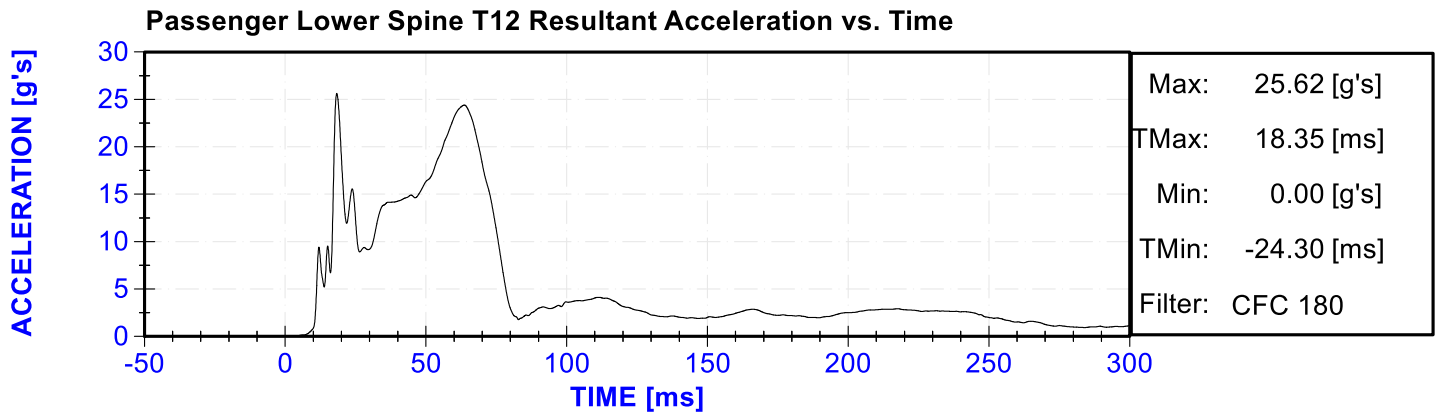












APPENDIX C

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)

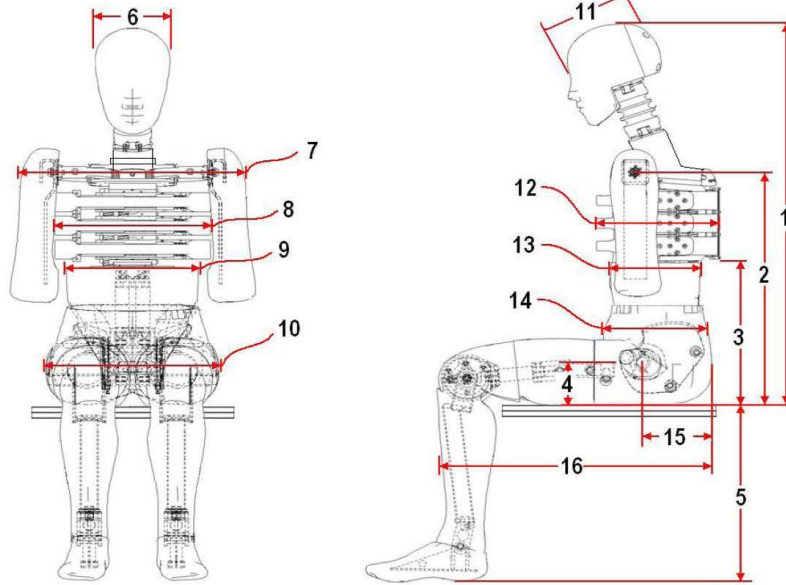


External Measurements - EuroSID-2re

Technician: J.Pericak

Date: 2/10/2022

Dummy Serial Number: F033



FRONT VIEW

SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	908	Pass
2	Seat to Shoulder Joint	558	572	565	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	351	Pass
4	Seat to Hip Joint (center of bolt)	97	103	100	Pass
5	Sole to Seat, Sitting	333	451	420	Pass
6	Head Width	152	158	155	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	327	Pass
9	Abdomen Width	273	287	285	Pass
10	Pelvis Lap Width	359	373	365	Pass
11	Head Depth	196	206	200	Pass
12	Thorax Depth	262	272	267	Pass
13	Abdomen Depth	194	204	200	Pass
14	Pelvis Depth	235	245	241	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	156	Pass
16	Back of Buttocks to Front Knee	597	615	610	Pass

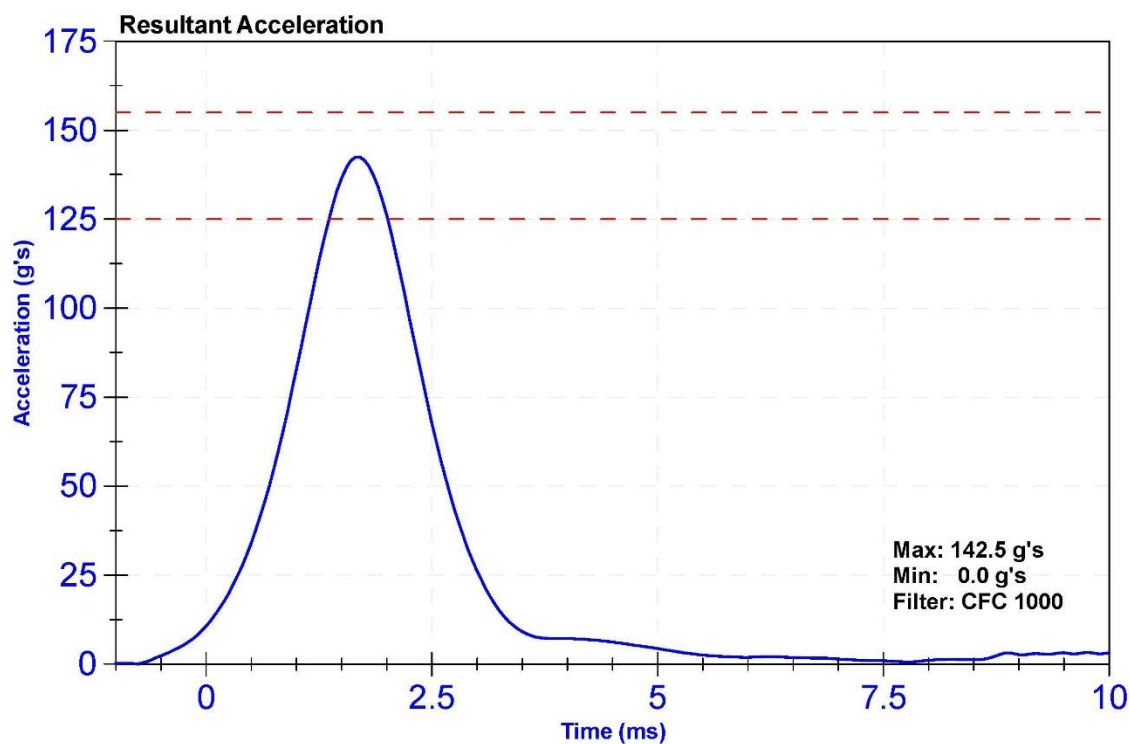
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

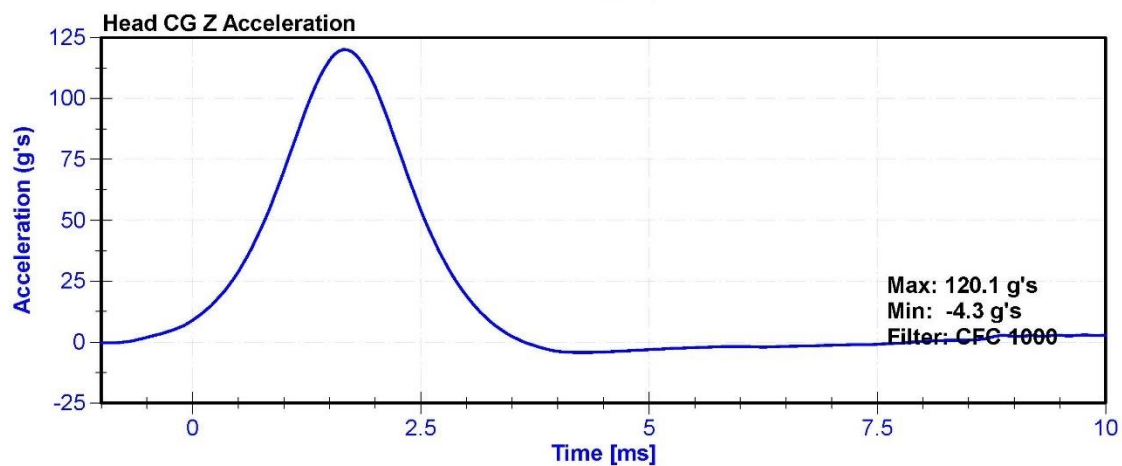
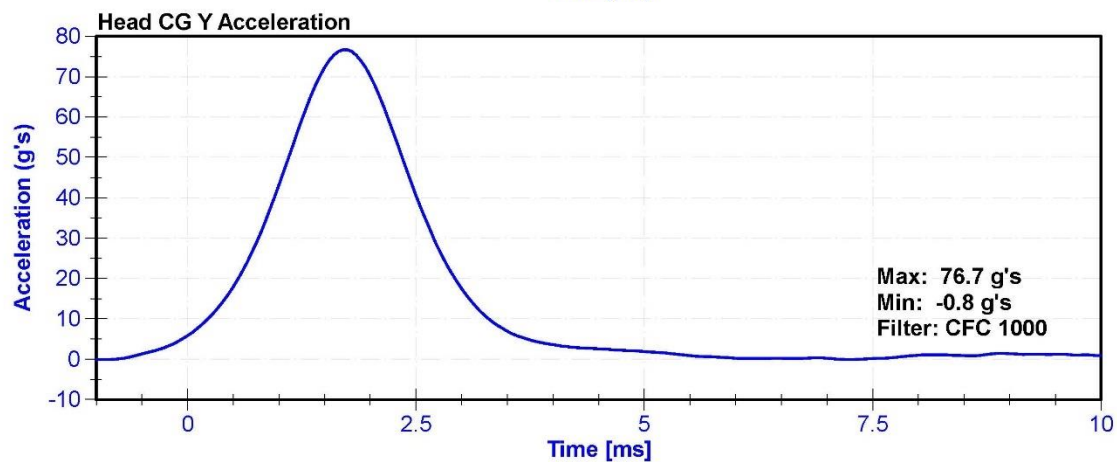
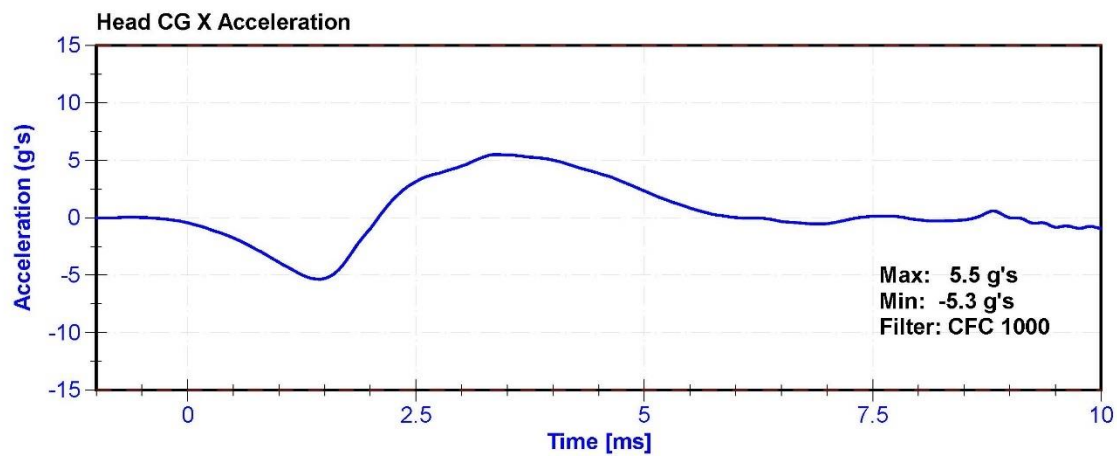
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	23.2	Pass
Resultant Acceleration	125	155	g's	142.5	Pass
Oscillation	0	15	%	5.08	Pass
Fore-Aft Acceleration	-15	15	g's	5.5	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	P51303	1/31/2022	7/30/2022
Z Accelerometer	Endevco	P49216	1/31/2022	7/30/2022





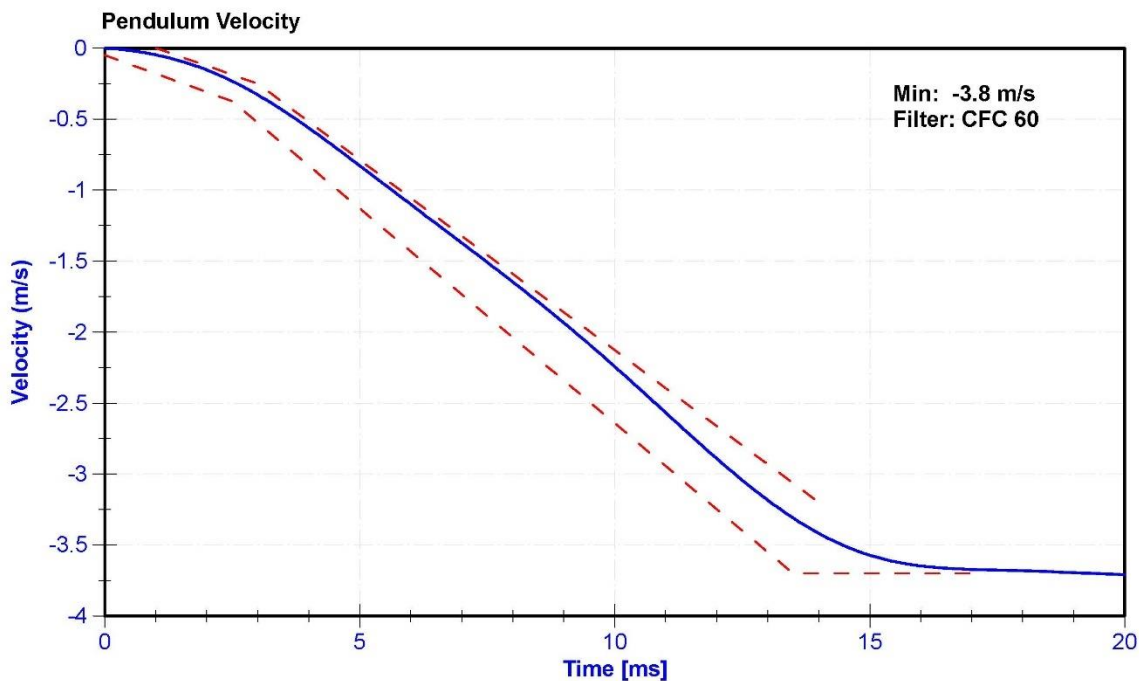
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

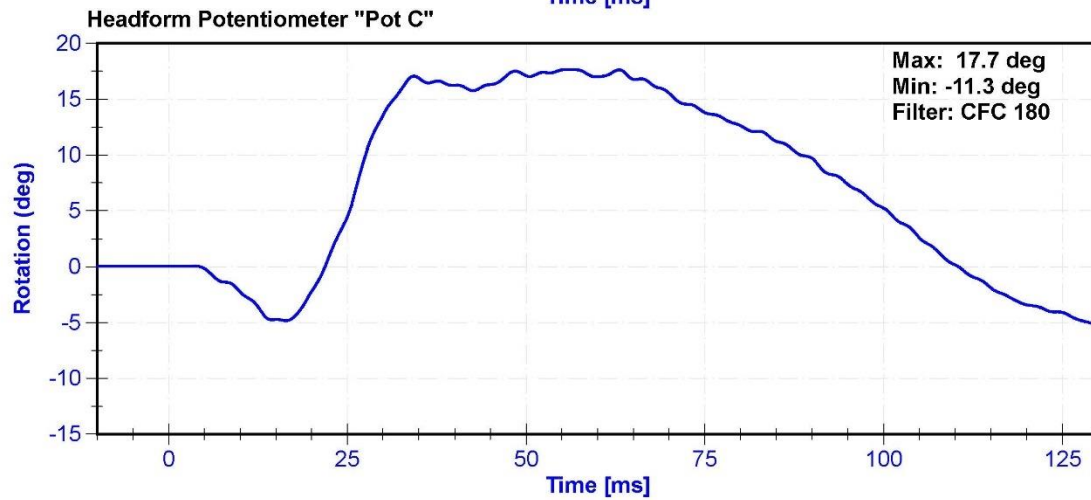
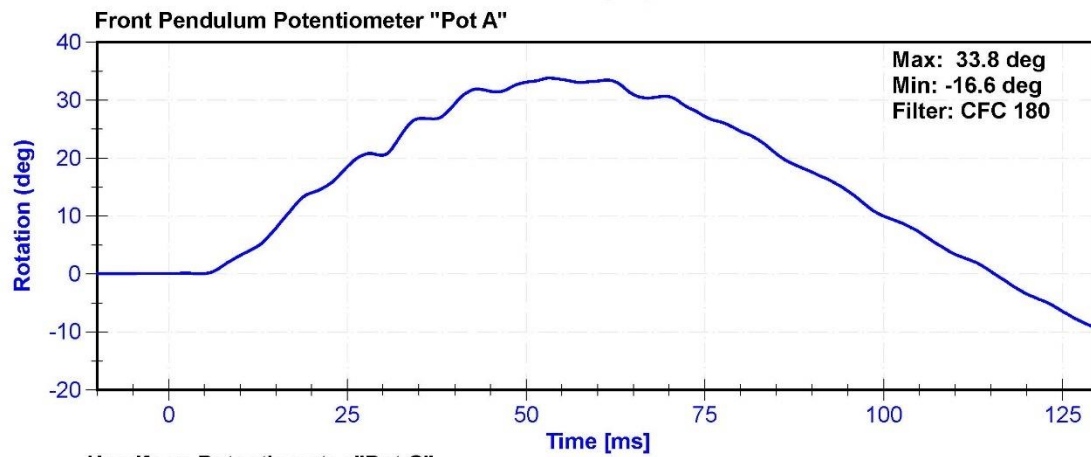
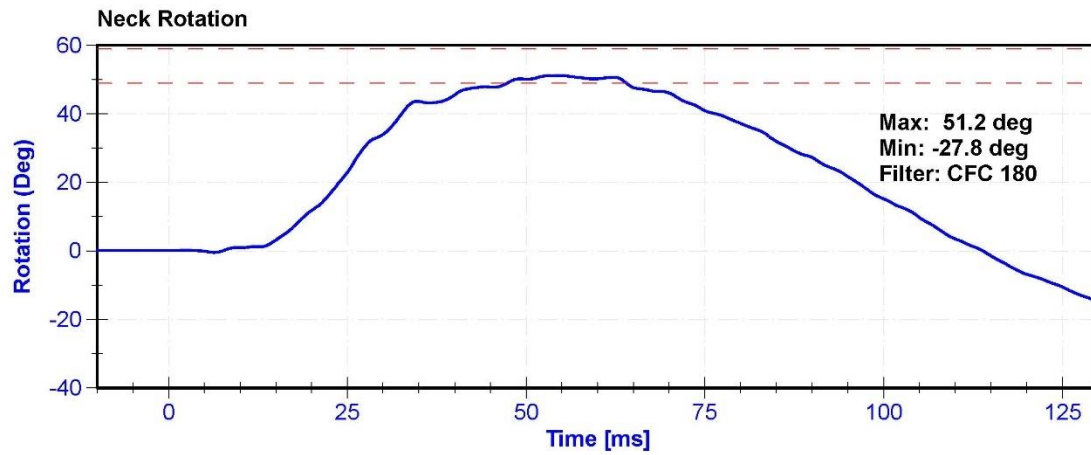
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	20.5	Pass
Velocity	3.3	3.5	m/s	3.41	Pass
Lateral Neck Rotation	49	59	deg	51.2	Pass
Time at Maximum Rotation	54	66	ms	54.9	Pass
Time of Rotation Decay from Maximum	53	88	ms	59.0	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	4/1/2022
Headform Potentiometer	Sfernice	095	10/1/2021	4/1/2022







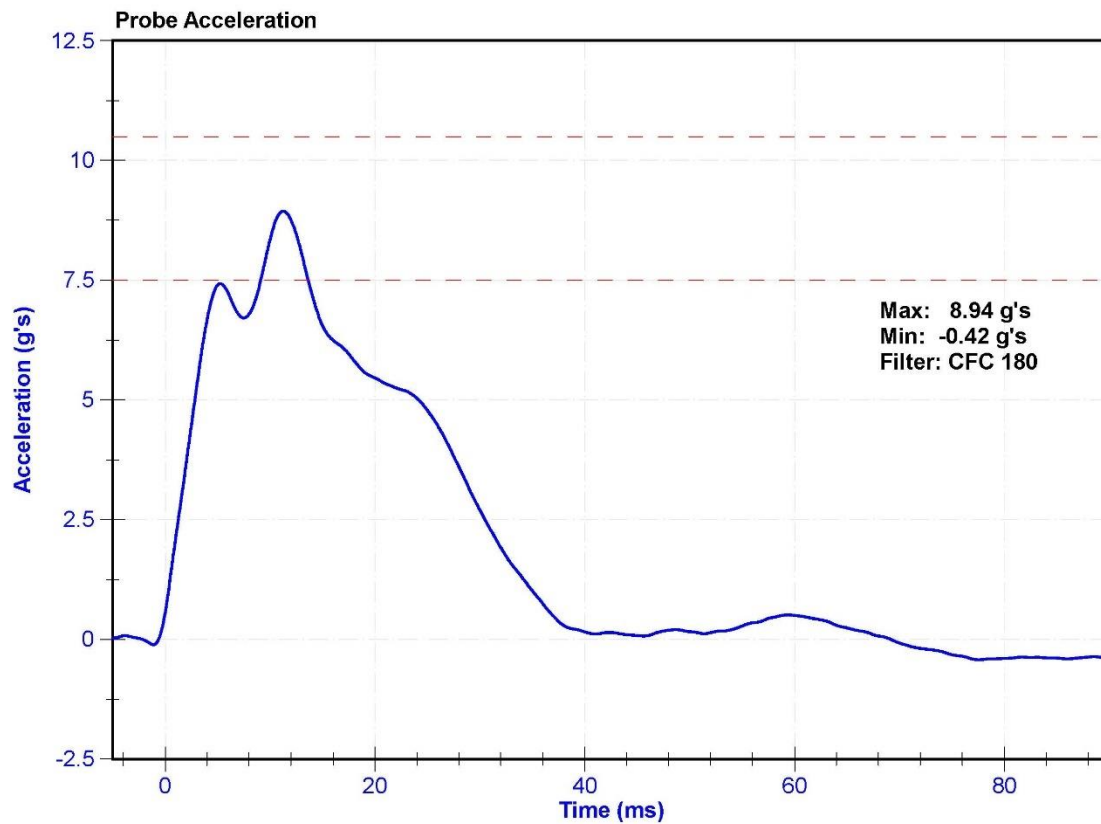
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	27.9	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	7.5	10.5	g's	8.94	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2021	4/23/2022



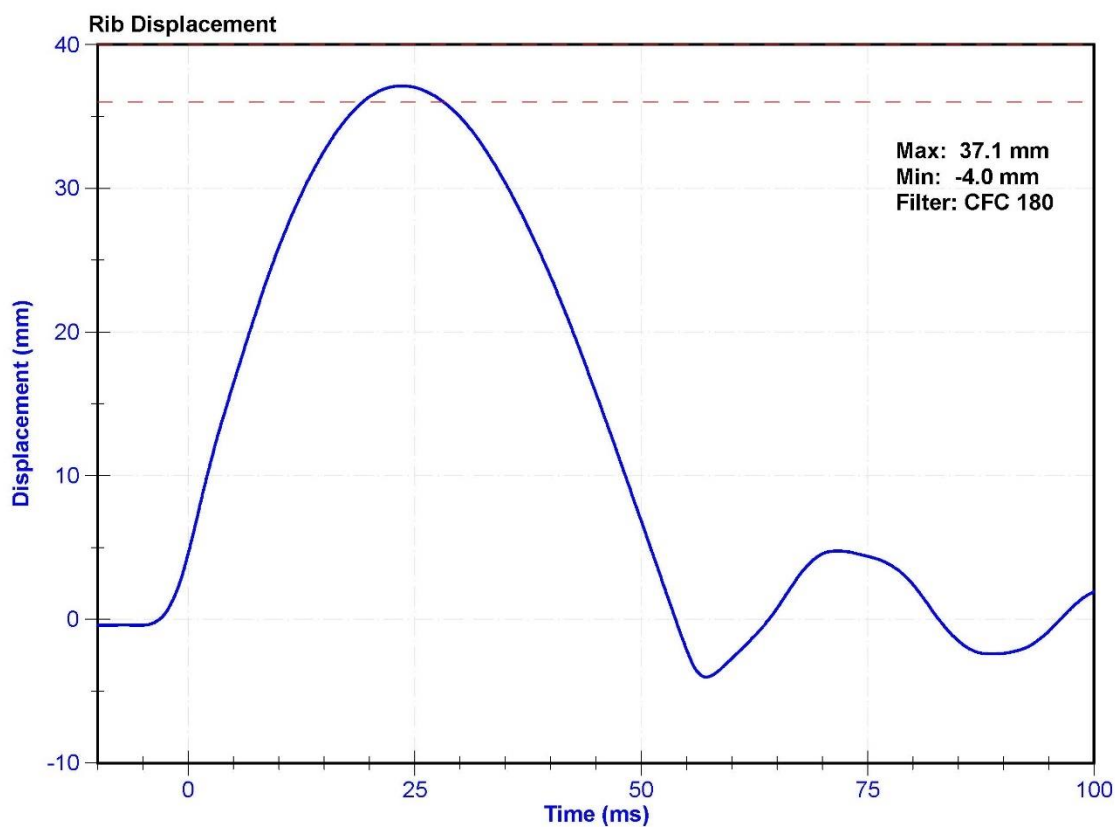
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	23.2	Pass
Rib Displacement	36	40	mm	37.1	Pass

Transducer Calibrations

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



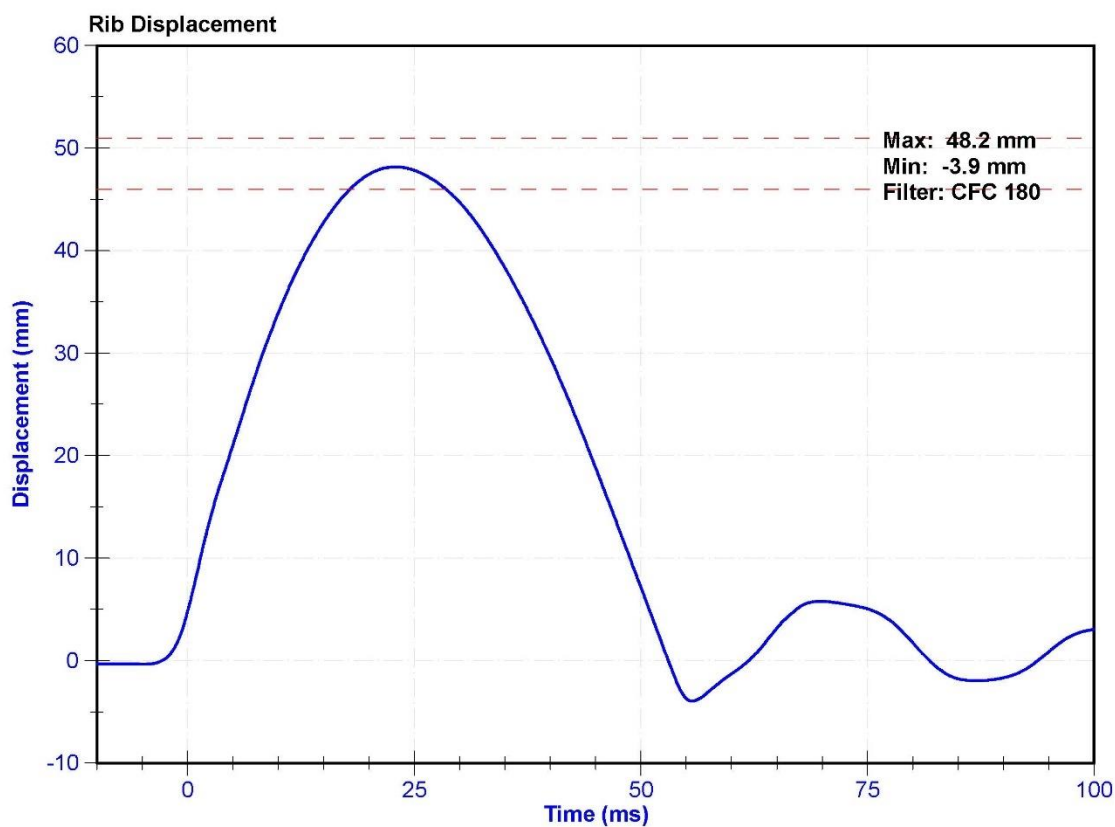
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	23.2	Pass
Rib Displacement	46	51	mm	48.2	Pass

Transducer Calibrations

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



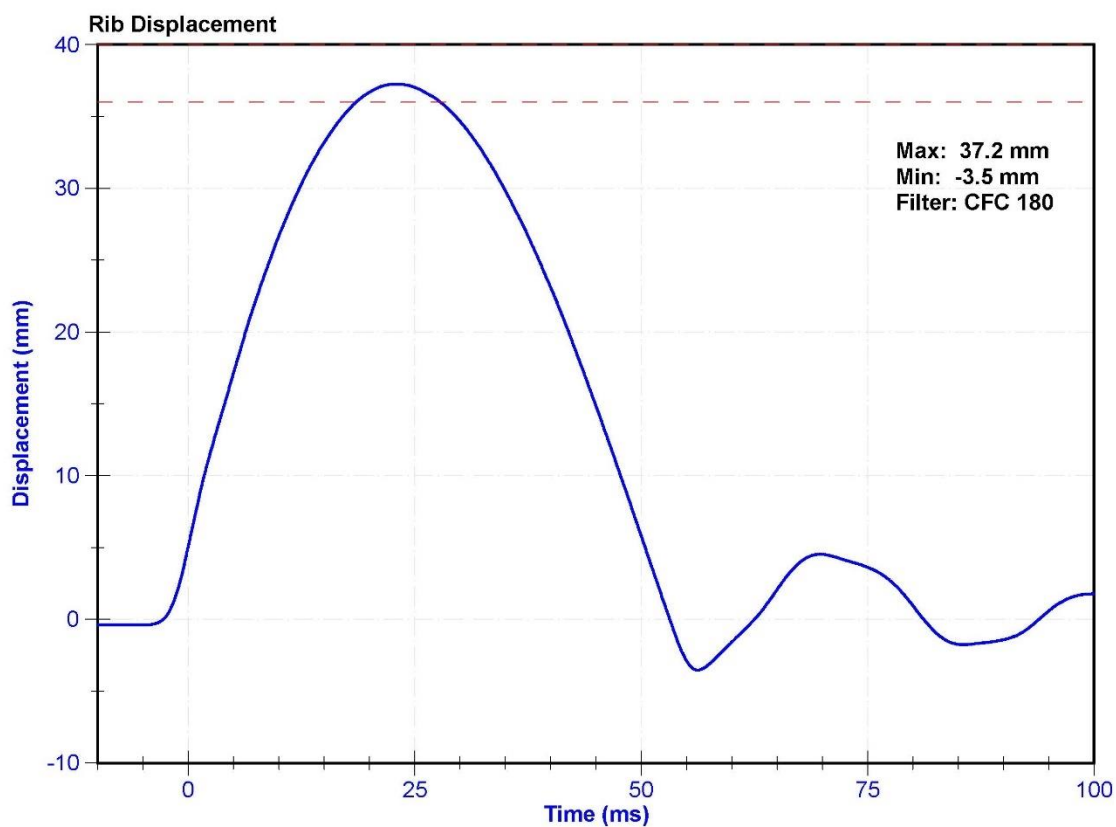
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	23.2	Pass
Rib Displacement	36	40	mm	37.2	Pass

Transducer Calibrations

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



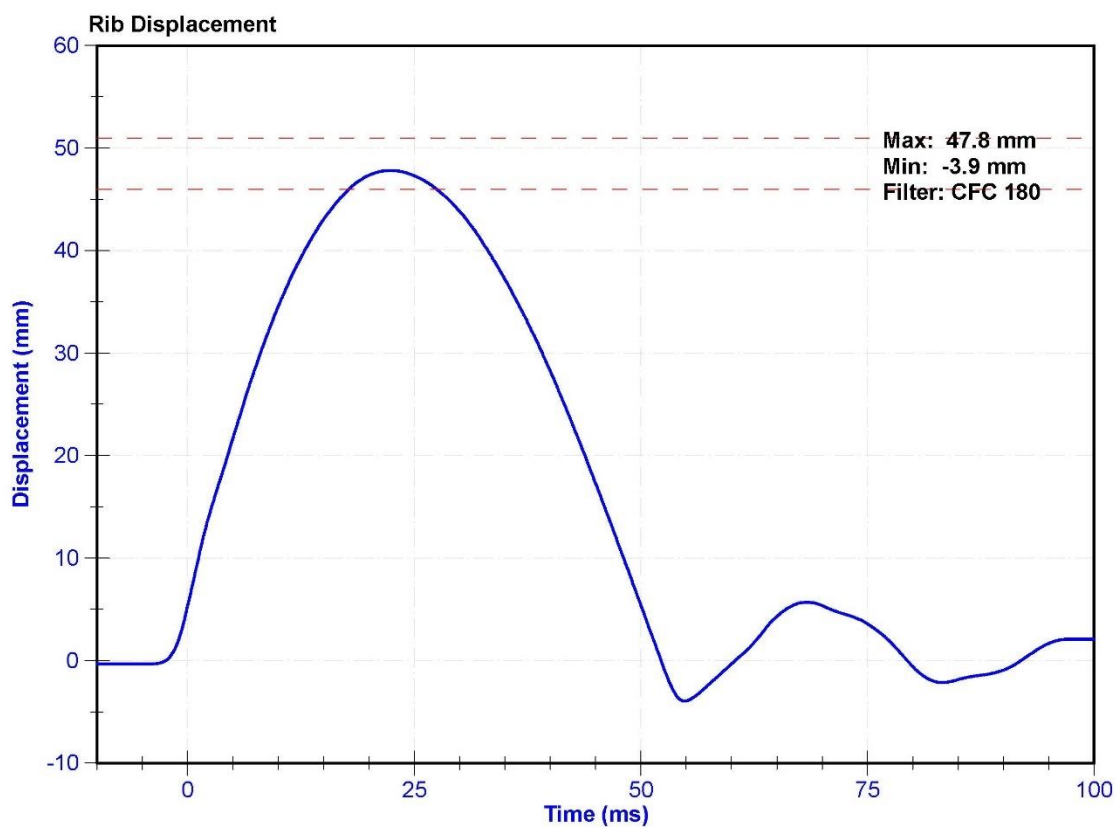
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	23.2	Pass
Rib Displacement	46	51	mm	47.8	Pass

Transducer Calibrations

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



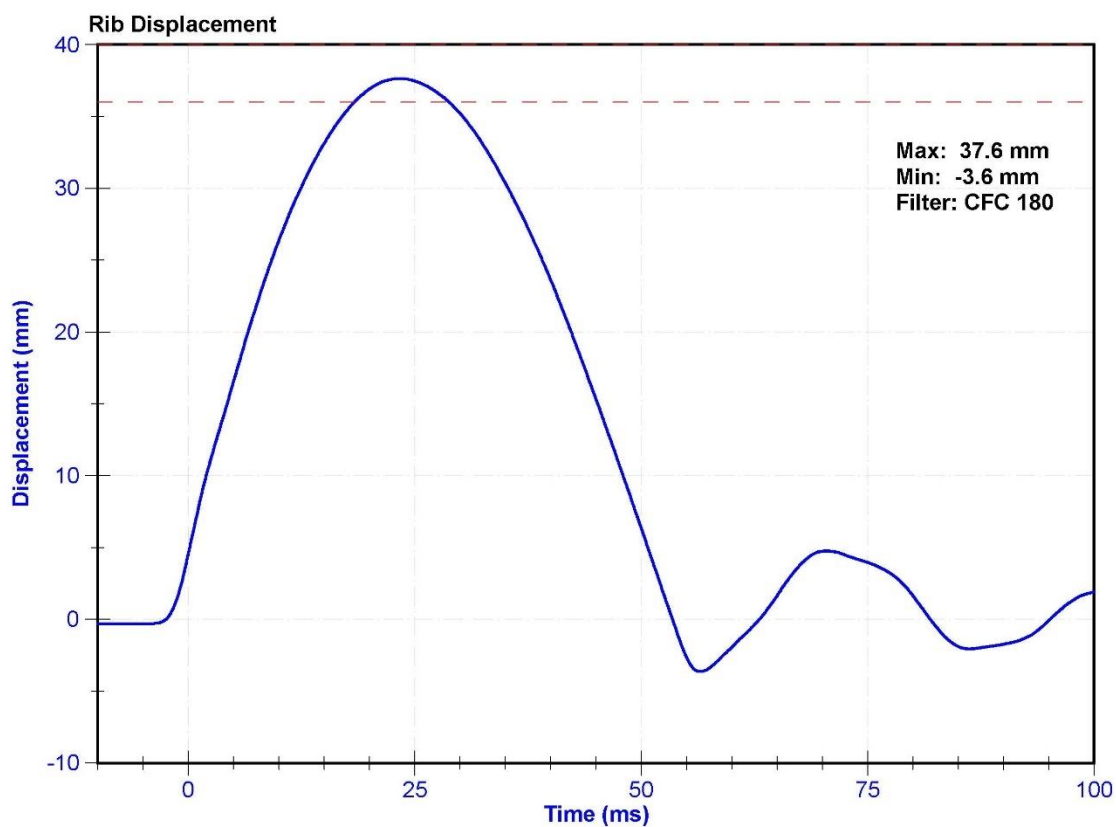
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	23.2	Pass
Rib Displacement	36	40	mm	37.6	Pass

Transducer Calibrations

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



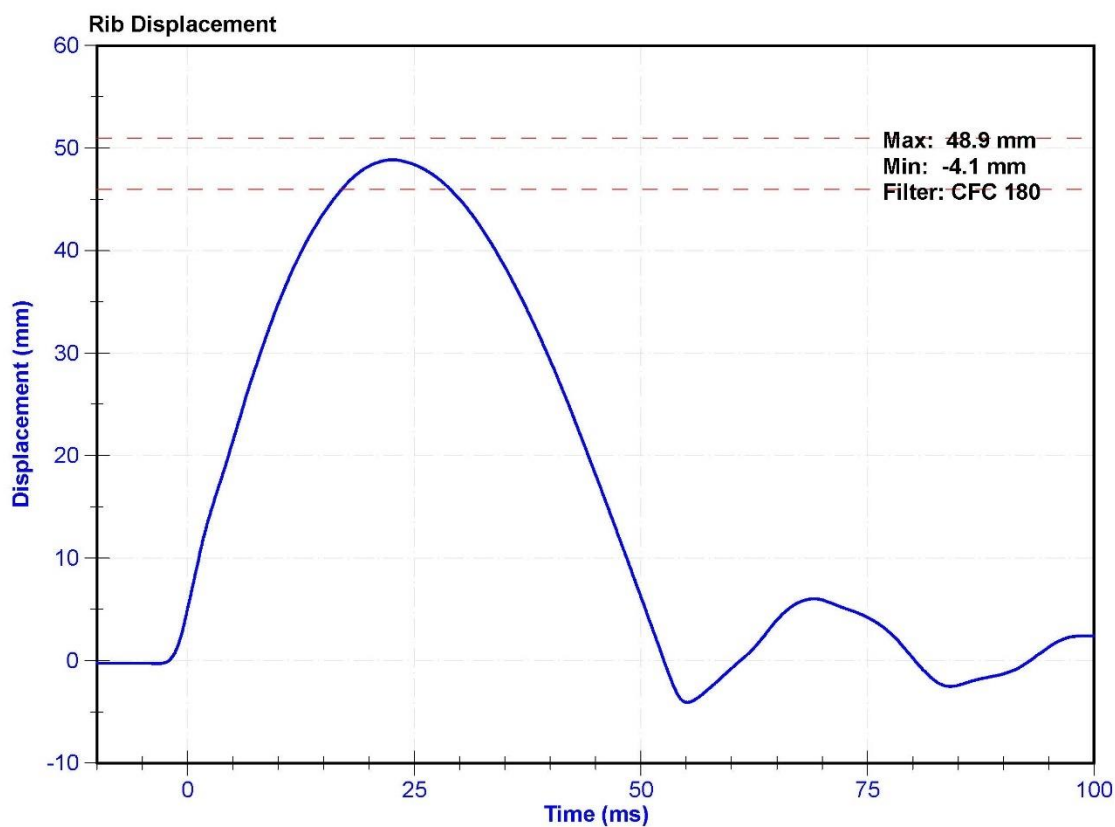
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	23.2	Pass
Rib Displacement	46	51	mm	48.9	Pass

Transducer Calibrations

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



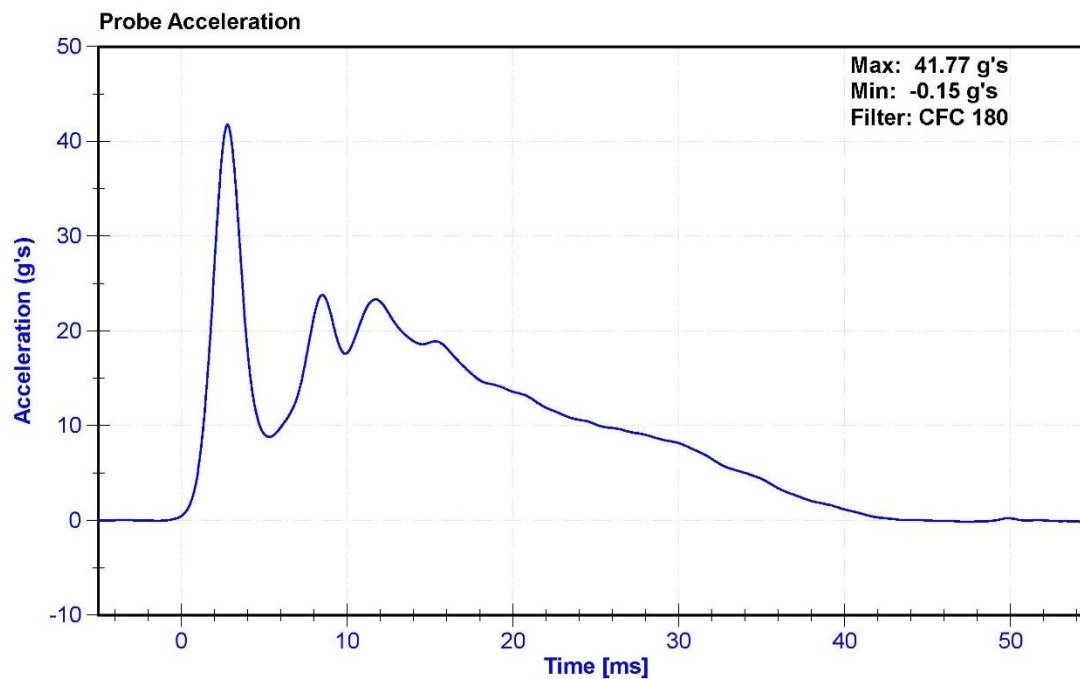
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

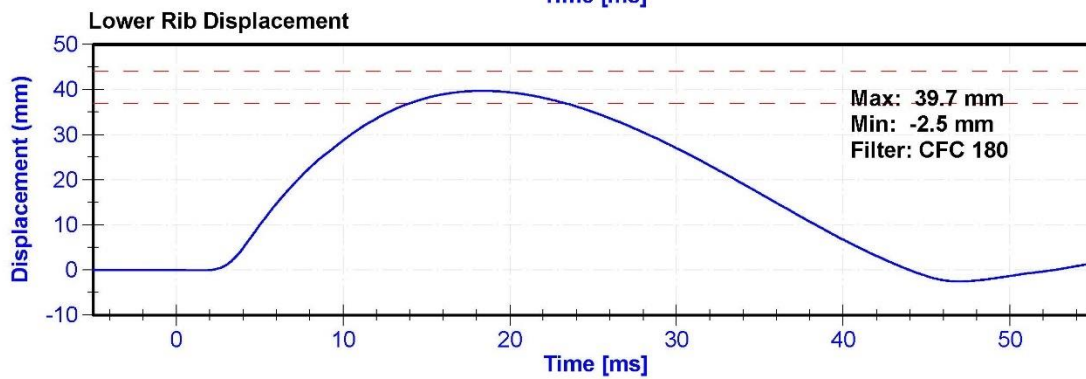
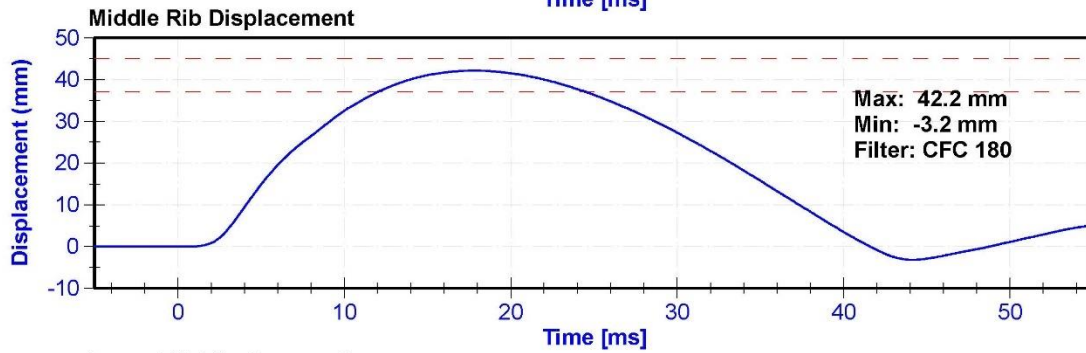
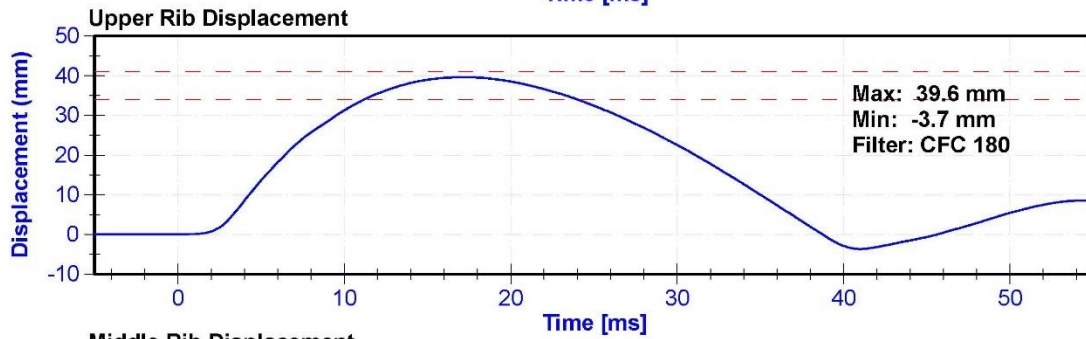
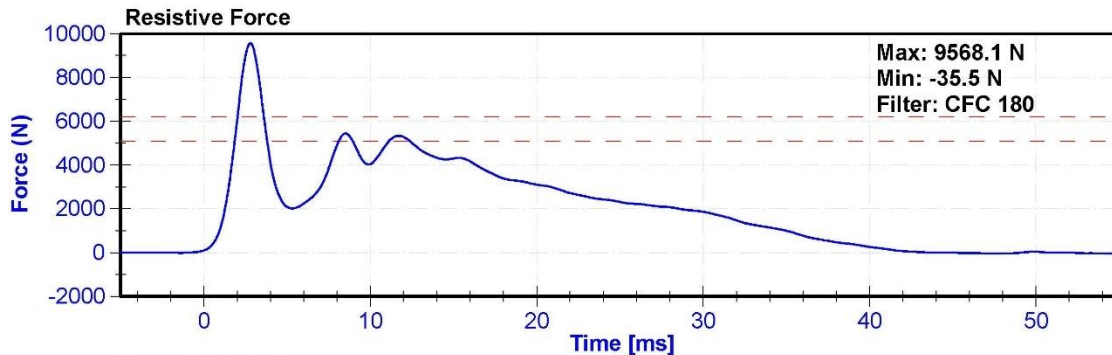
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	27.9	Pass
Velocity	5.4	5.6	m/s	5.47	Pass
Resistive Force after 6ms	5100	6200	N	5446.5	Pass
Upper Thorax Rib Deflection	34	41	mm	39.6	Pass
Mid Thorax Rib Deflection	37	45	mm	42.2	Pass
Lower Thorax Rib Deflection	37	44	mm	39.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
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





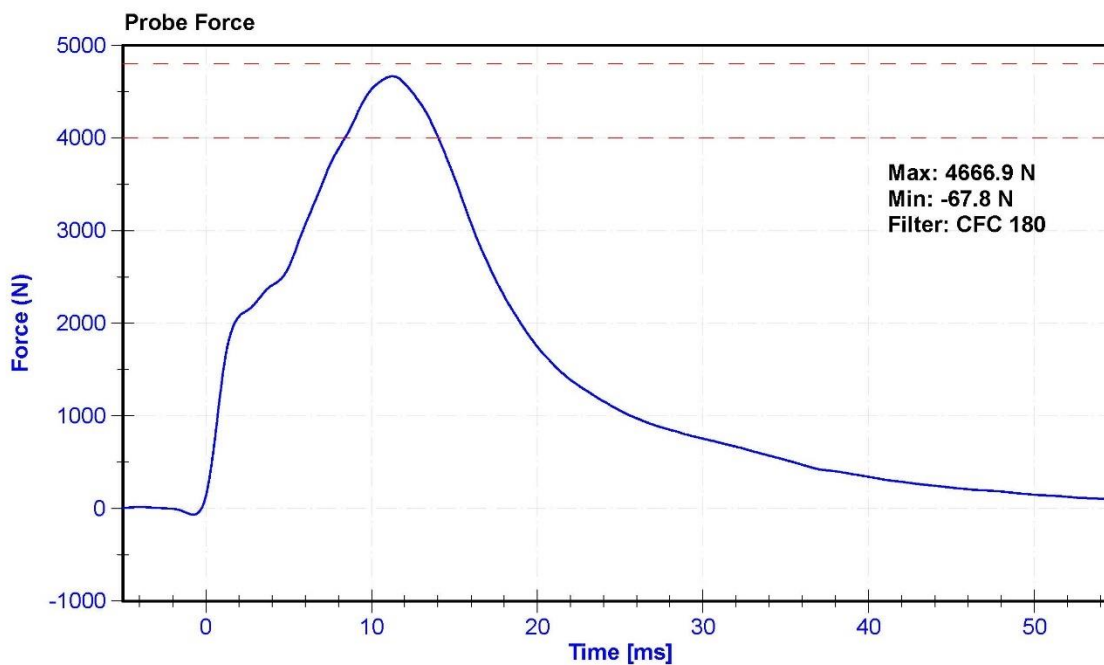
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

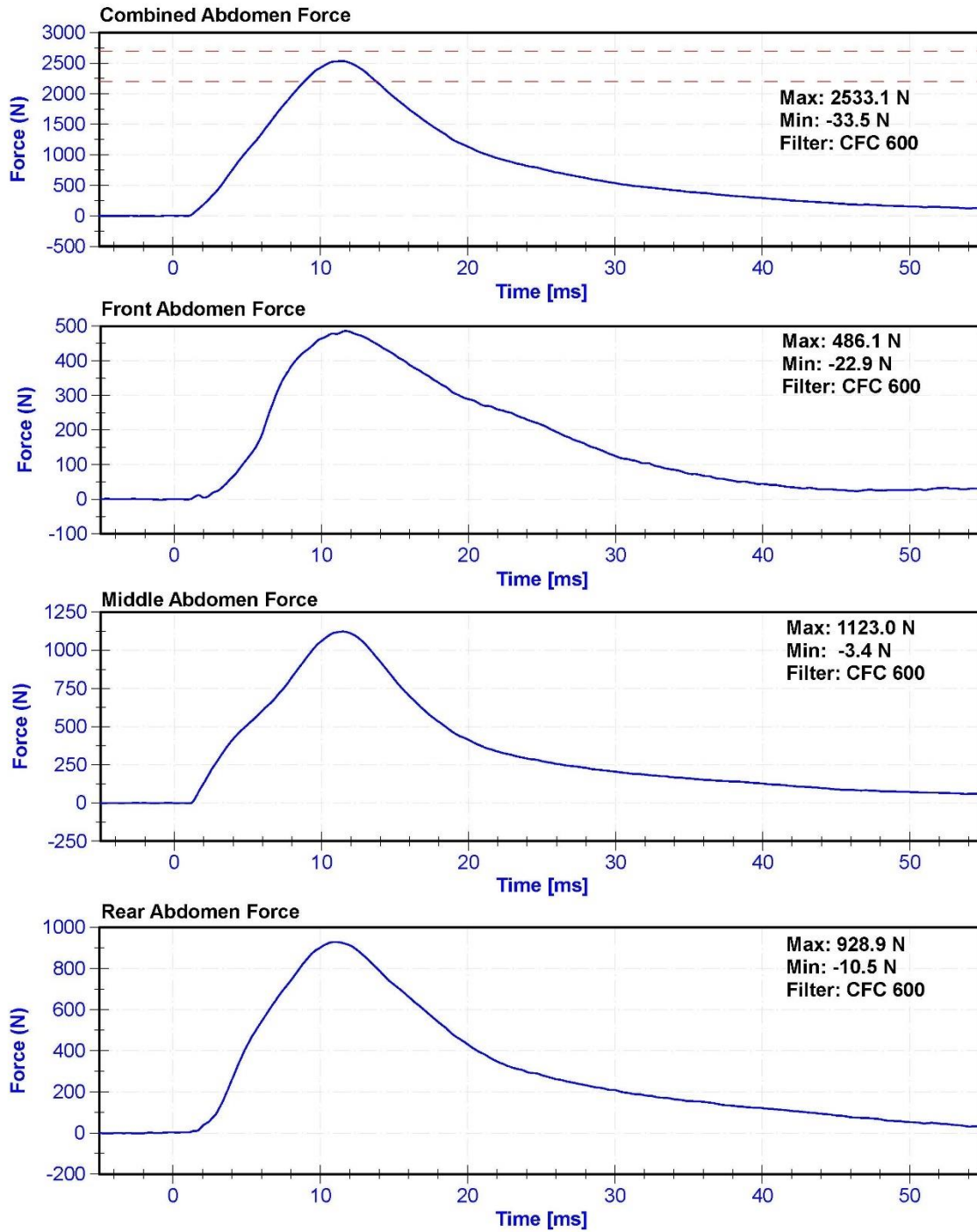
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	27.9	Pass
Velocity	3.9	4.1	m/s	4.07	Pass
Combined Abdomen Force	2200	2700	N	2533.1	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.45	Pass
Resistive Probe Force	4000	4800	N	4666.9	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.25	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
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	1512	8/2/2021	8/2/2022





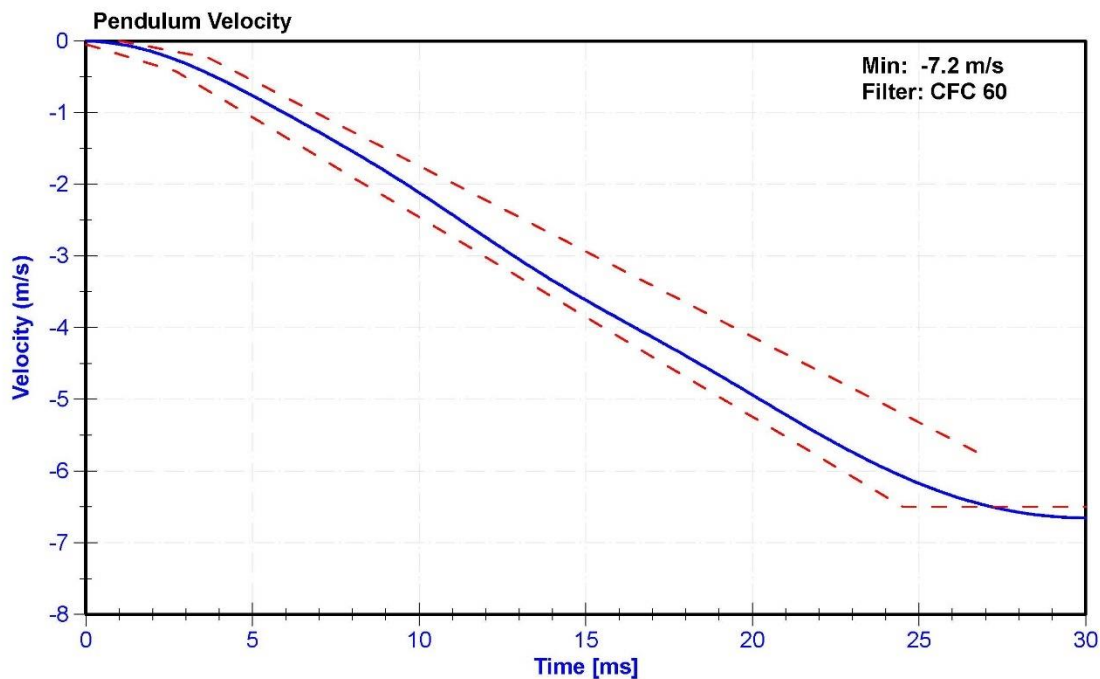
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

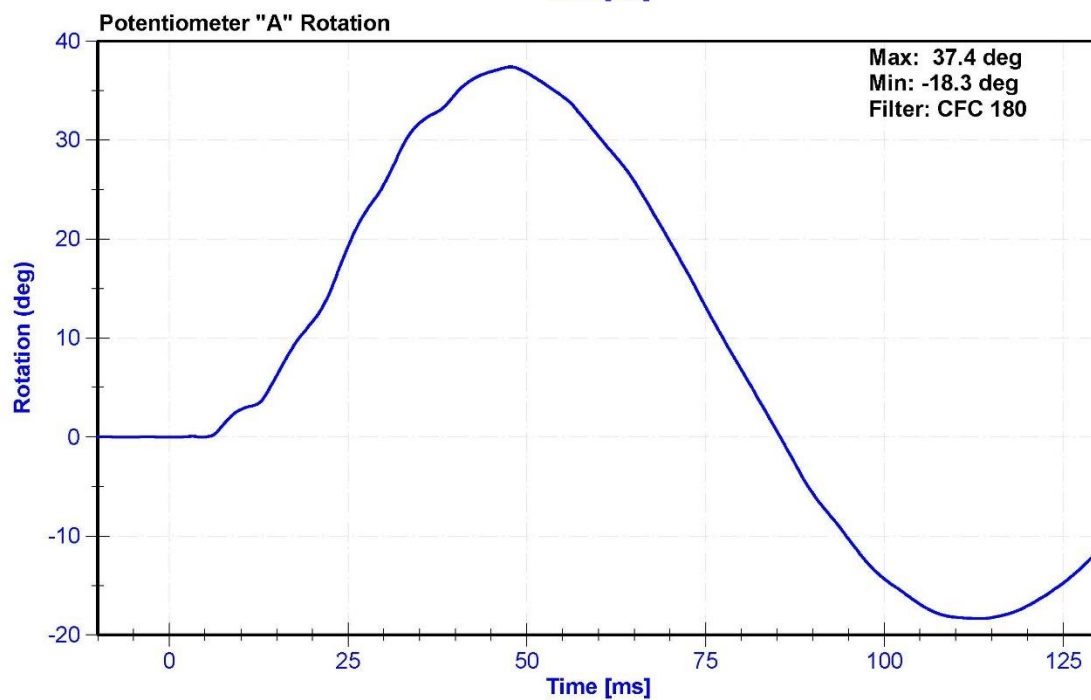
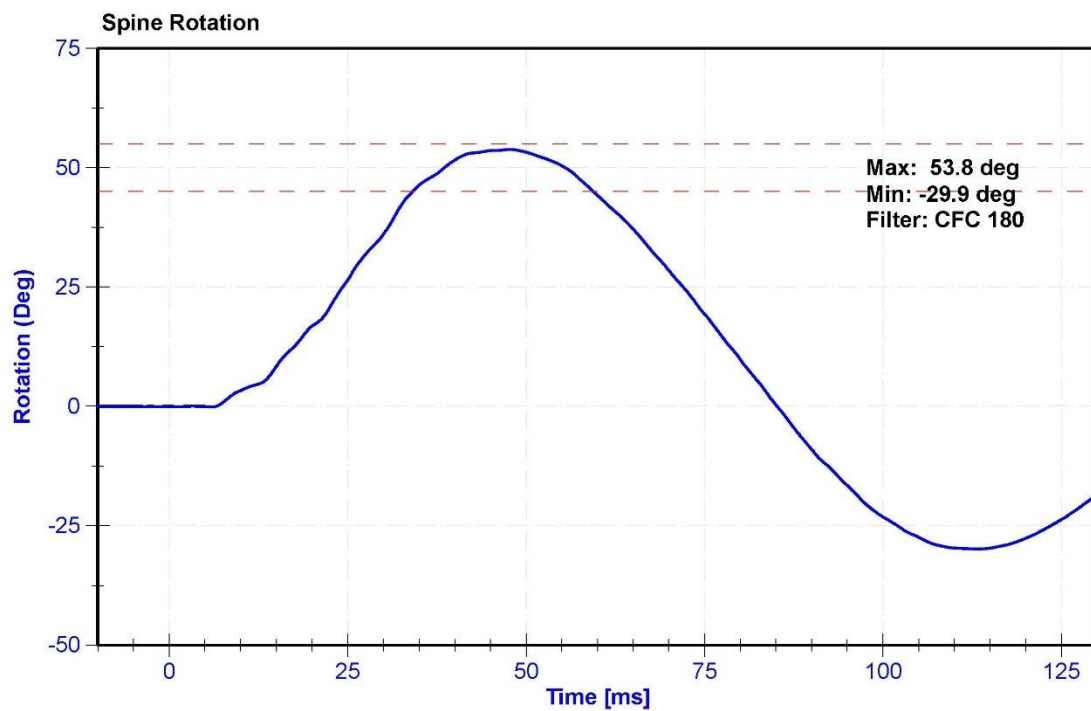
Results

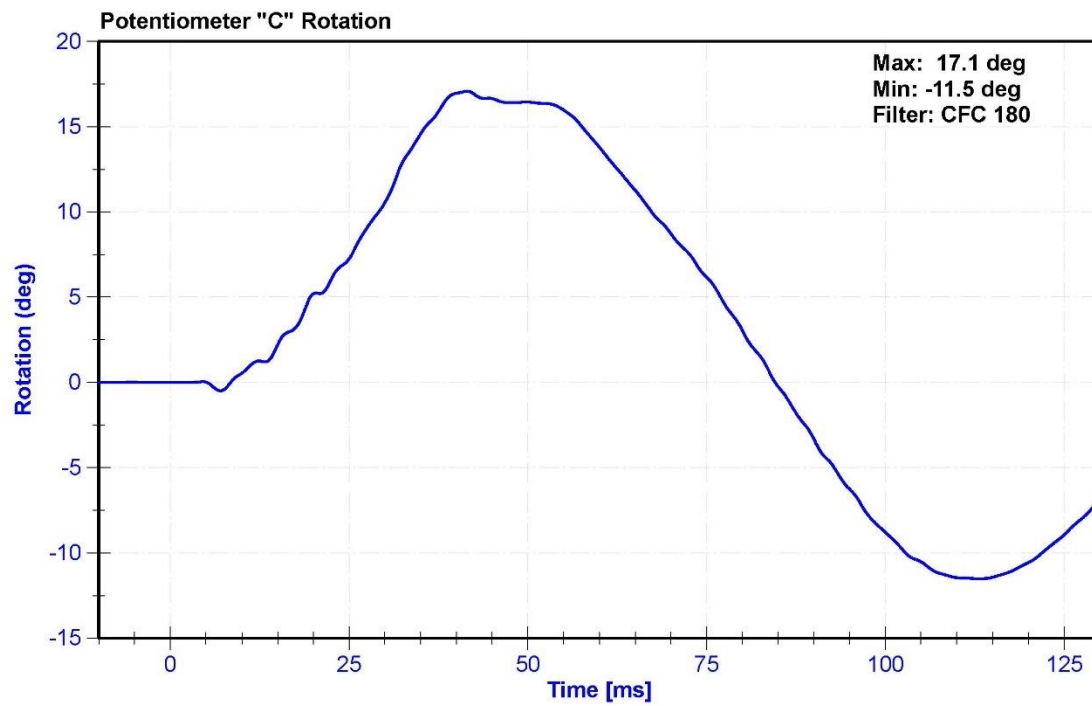
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	20.5	Pass
Velocity	5.95	6.15	m/s	6.134	Pass
Lateral Spine Rotation	45	55	deg	53.8	Pass
Time at Maximum Rotation	39	53	ms	47.8	Pass
Time of Decay to Zero Degrees	37	57	ms	37.4	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	4/1/2022
Condyle "B" Potentiometer	Sfernice	095	10/1/2021	4/1/2022







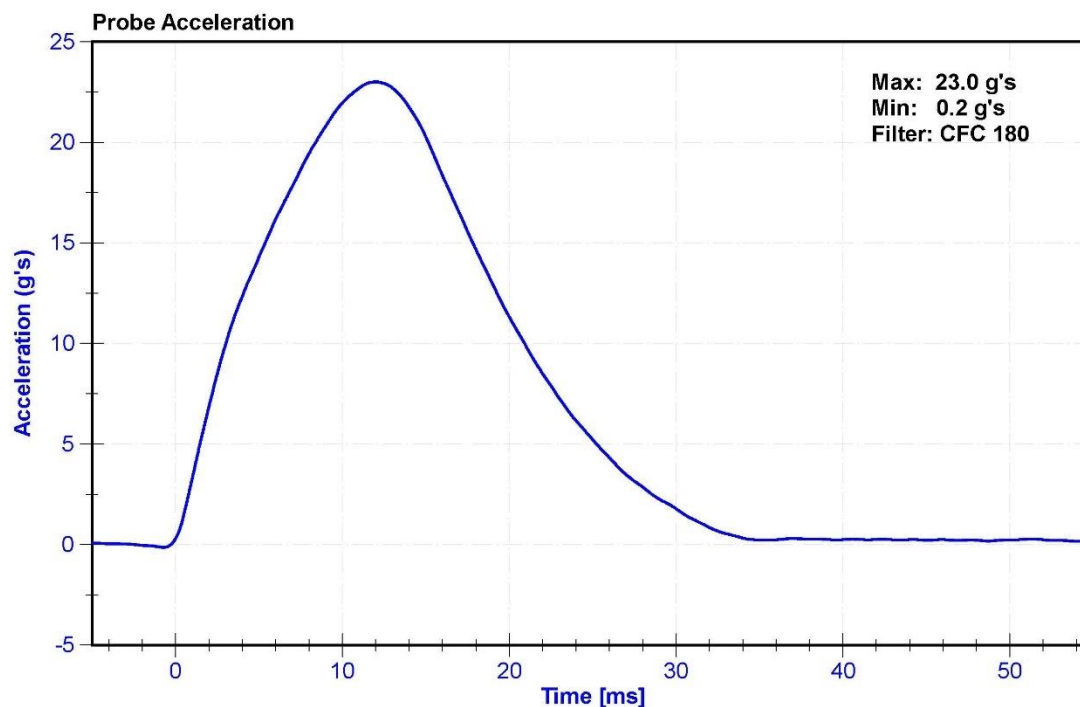
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

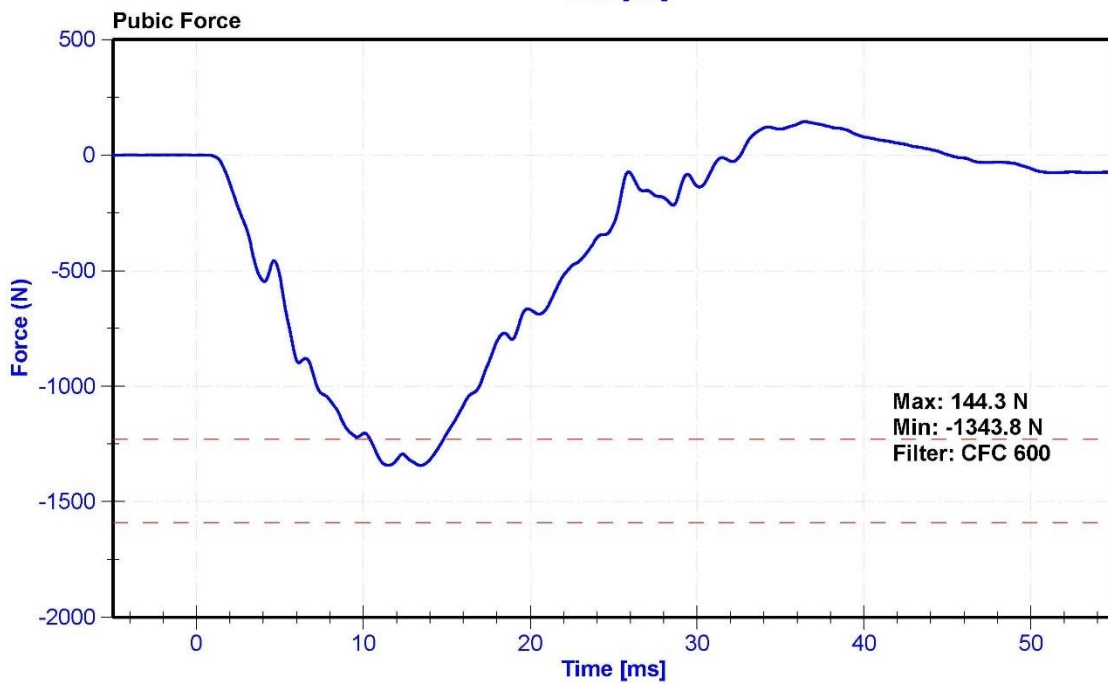
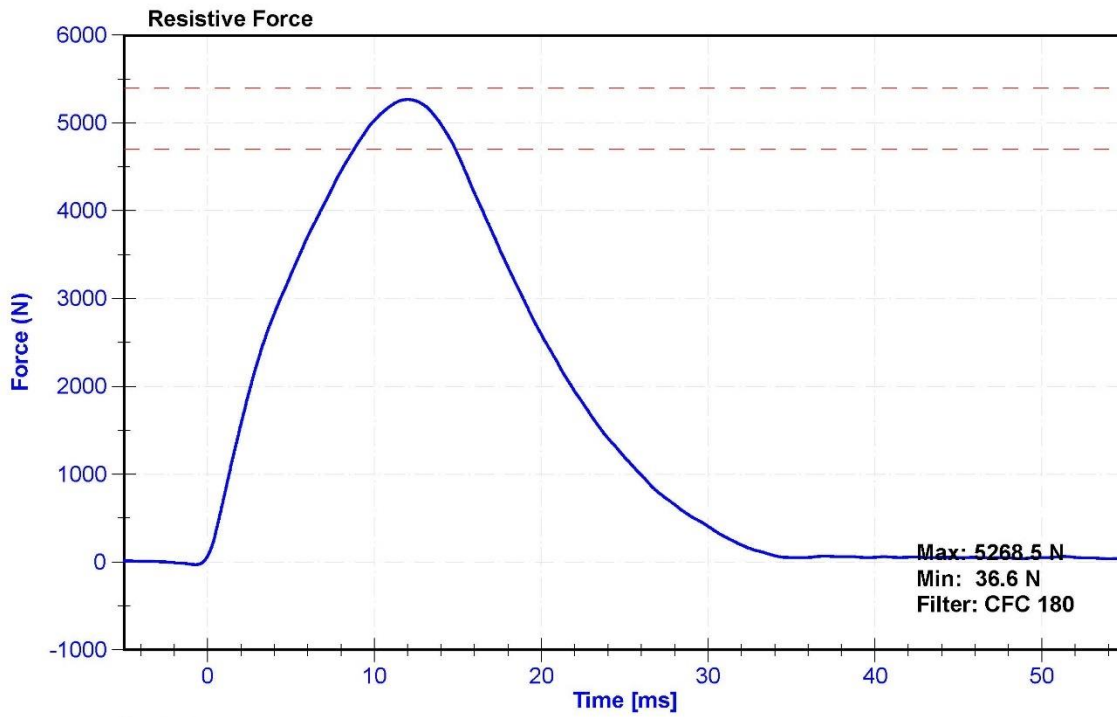
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	27.1	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Resistive Force	4700	5400	N	5268.5	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.00	Pass
Pubic Force	-1590	-1230	N	-1343.8	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.45	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Pubic Load Cell	Denton	464-FY	8/2/2021	8/2/2022





CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL No: DG8012

(CONFIGURED FOR LEFT SIDE IMPACT)

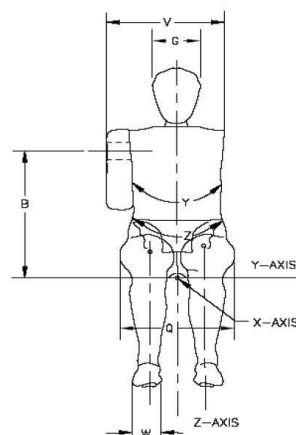
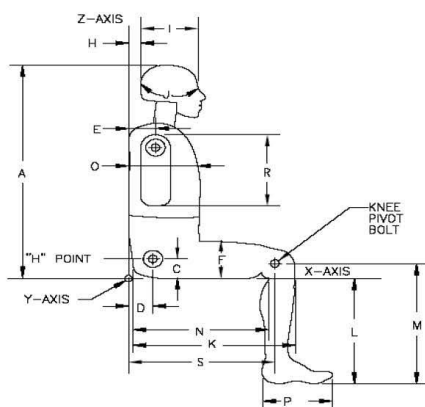


External Measurements - SID-IIs

Technician: J.Pericak

Date: 02/14/2022

Dummy Serial Number: DG8012



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	780	Pass
B	Shoulder Pivot Height	437	453	446	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	143	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	184	Pass
J	Head Circumference	541	551	545	Pass
K	Buttock to Knee Length	514	540	536	Pass
L	Popliteal Height	343	369	357	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	430	Pass
O	Chest Depth w/o jacket	195	211	209	Pass
P	Foot Length	216	232	225	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	321	Pass
R	Arm Length	249	259	250	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	348	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	870	Pass
Z	Waist Circumference	761	791	775	Pass

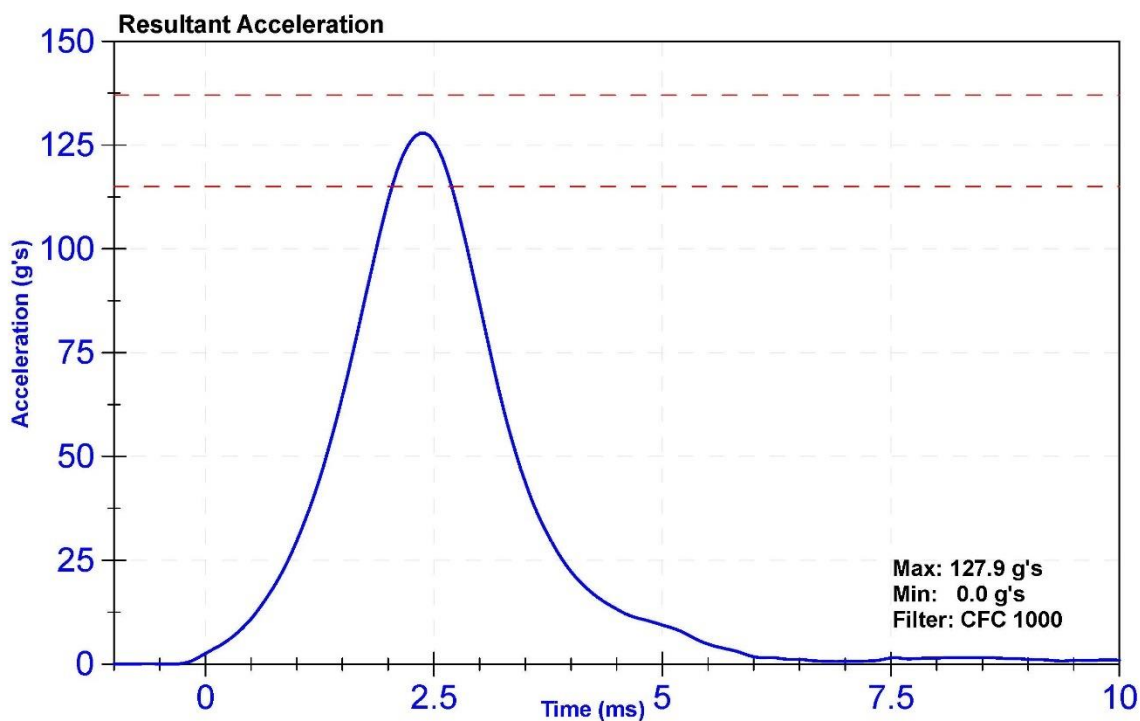
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

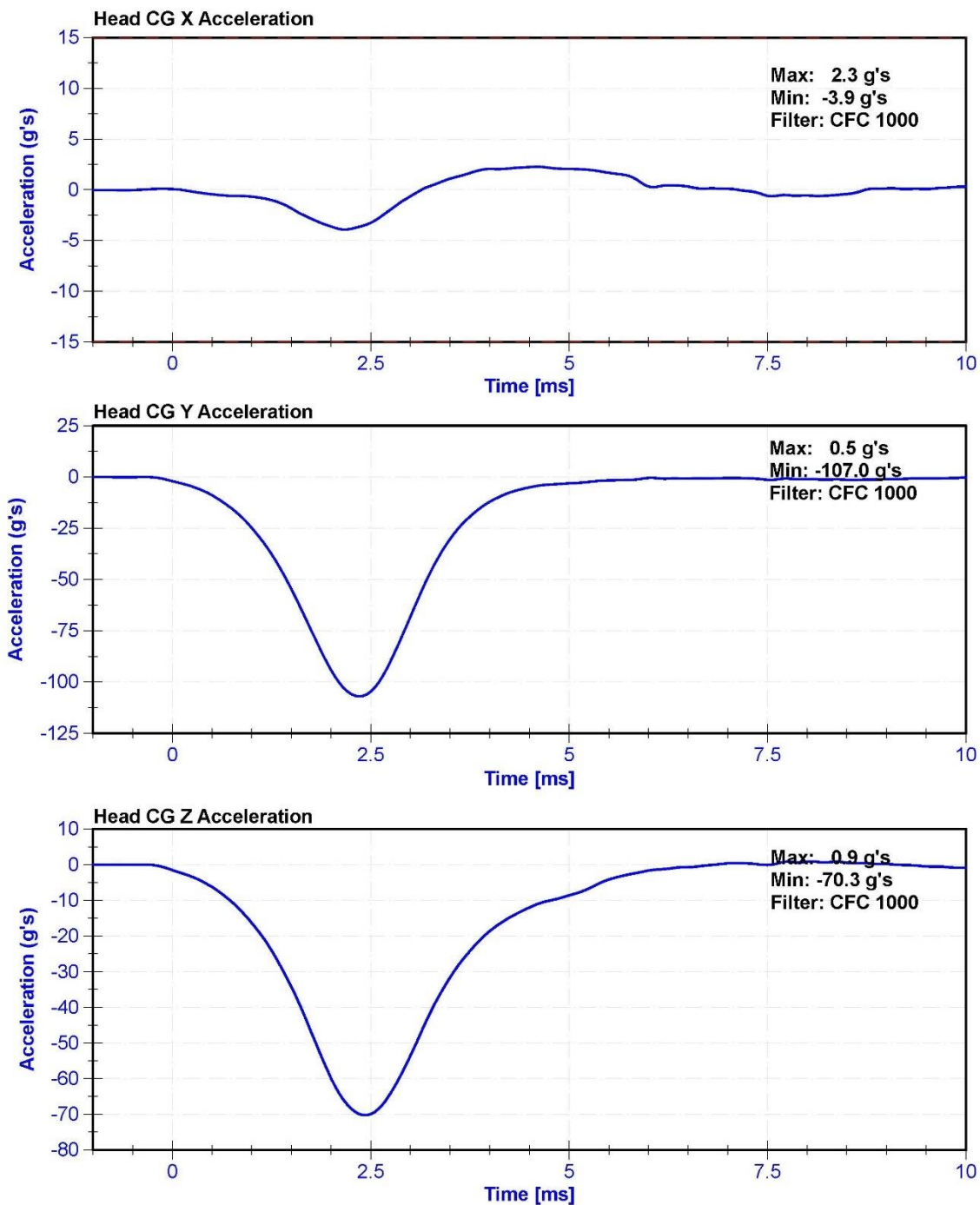
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	13.1	Pass
Resultant Acceleration	115	137	g's	127.9	Pass
Oscillation	0	15	%	1.2	Pass
Fore-Aft Acceleration	-15	15	g's	-3.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P74788	1/10/2022	7/9/2022
Y Accelerometer	Endevco	P83432	1/10/2022	7/9/2022
Z Accelerometer	Endevco	P83319	1/10/2022	7/9/2022





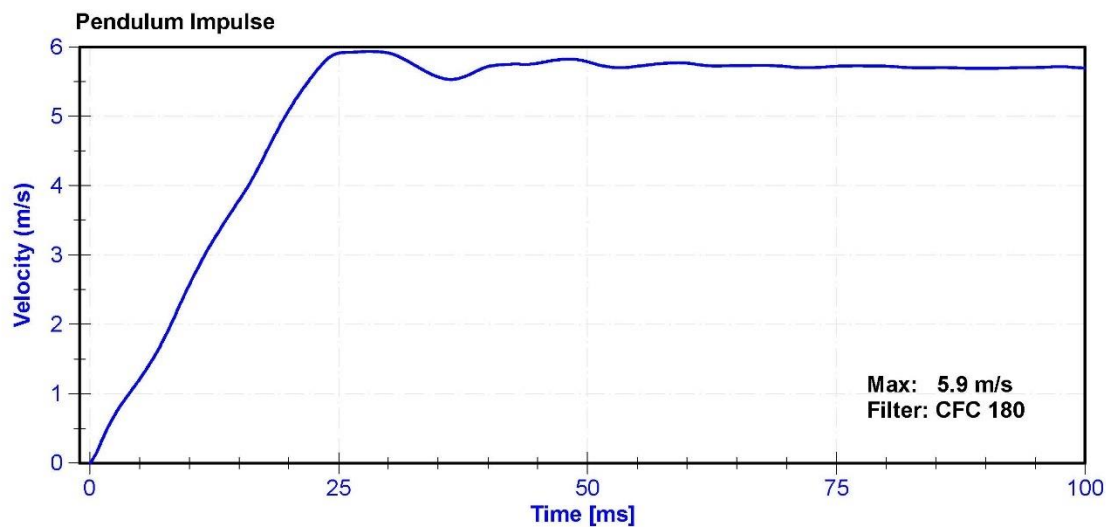
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

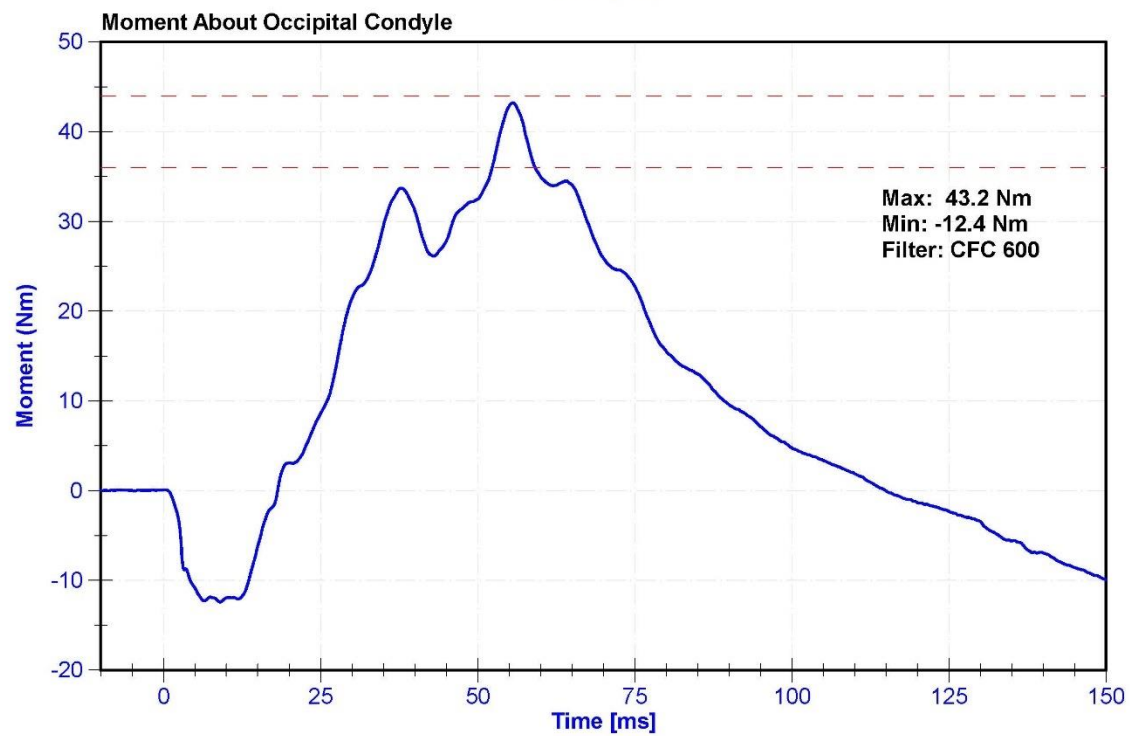
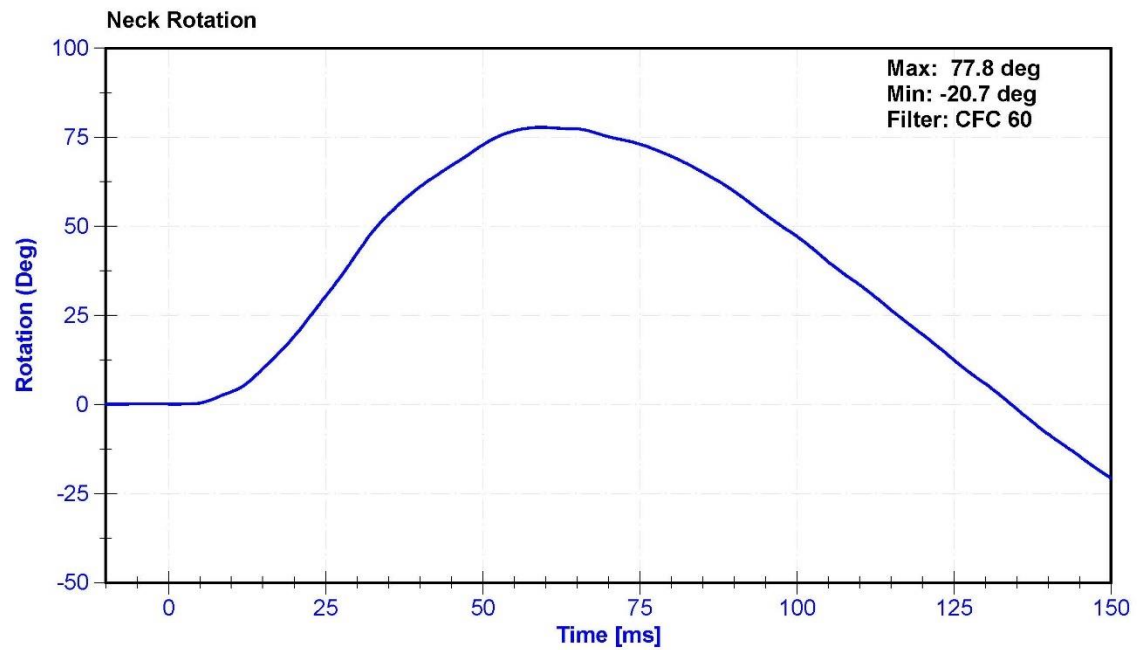
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	13	Pass
Velocity	5.51	5.63	m/s	5.588	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.57	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.79	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	5.08	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.91	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.93	Pass
Neck Rotation	71	81	deg	77.8	Pass
Time at Maximum Rotation	50	70	ms	59.3	Pass
Moment about the OC	36	44	Nm	43.2	Pass
Moment Decay to 0 Nm	102	126	ms	114.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231CT	10/28/2021	10/28/2022
Pendulum Potentiometer	MCB	WS1800057	11/30/2021	11/30/2022
Condyle Potentiometer	Servo	DS185 Pend H	11/12/2021	11/12/2022
Upper Neck Load Cell	Denton	1037-FY	06/29/2021	06/29/2022





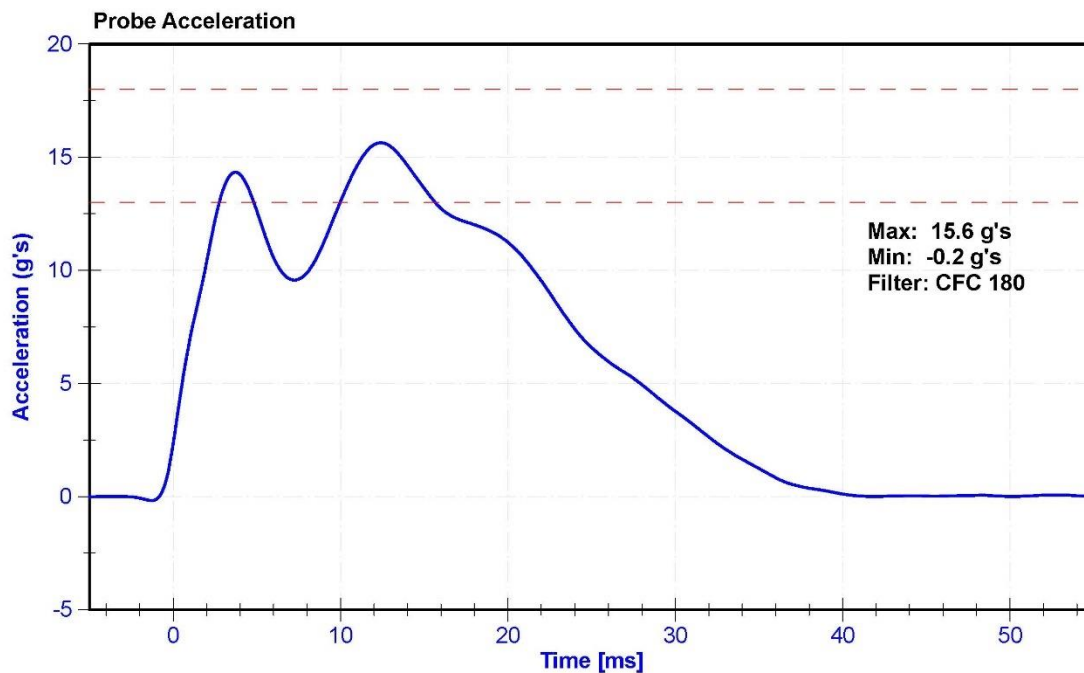
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

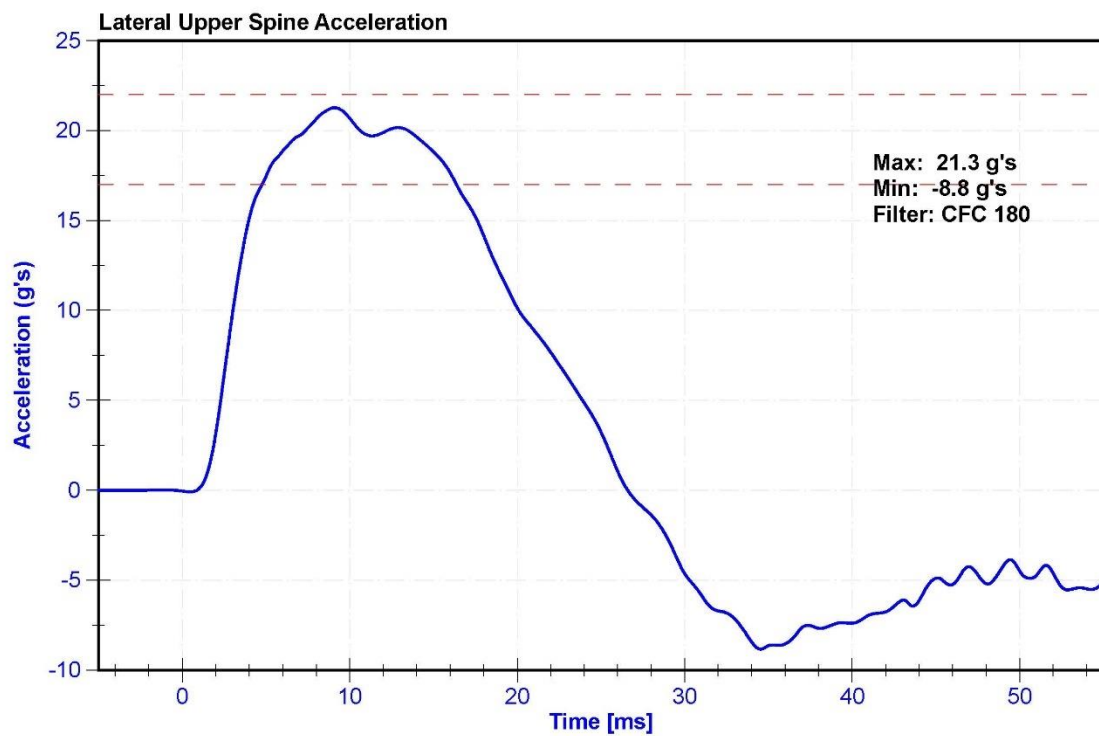
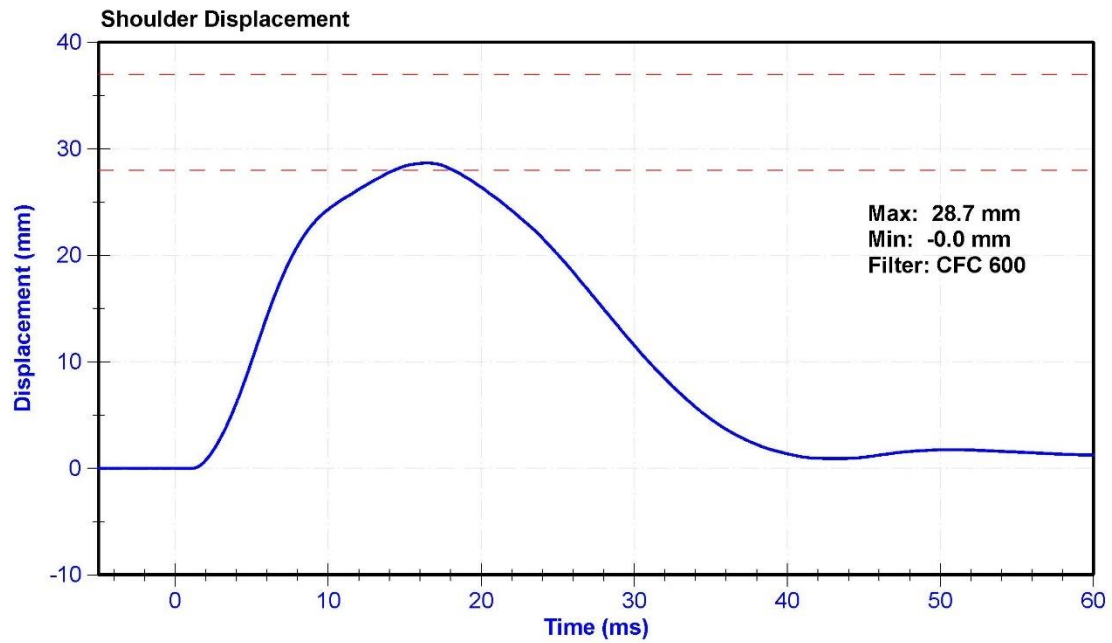
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	27.1	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	13	18	g's	15.6	Pass
Shoulder Deflection	28	37	mm	28.7	Pass
Lateral Upper Spine Acceleration	17	22	g's	21.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Shoulder Potentiometer	Servo	045GFE	1/12/2022	7/13/2022
Upper Spine Y Accelerometer	Endevco	P64148	1/10/2022	7/9/2022





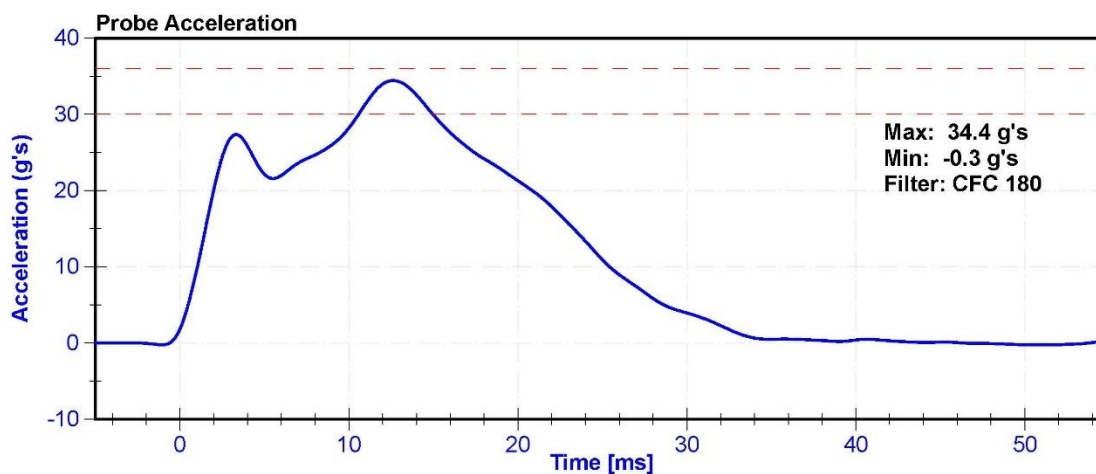
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

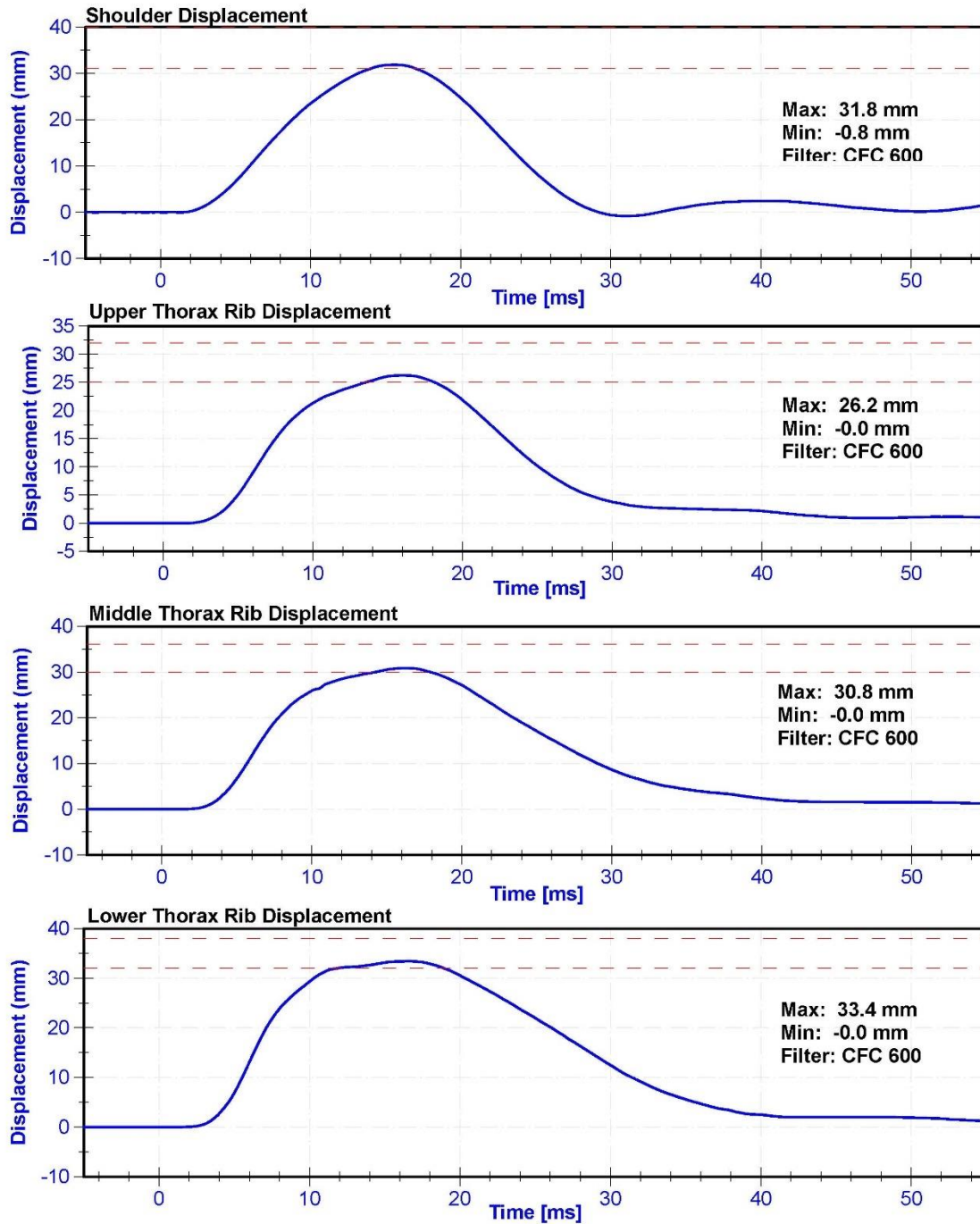
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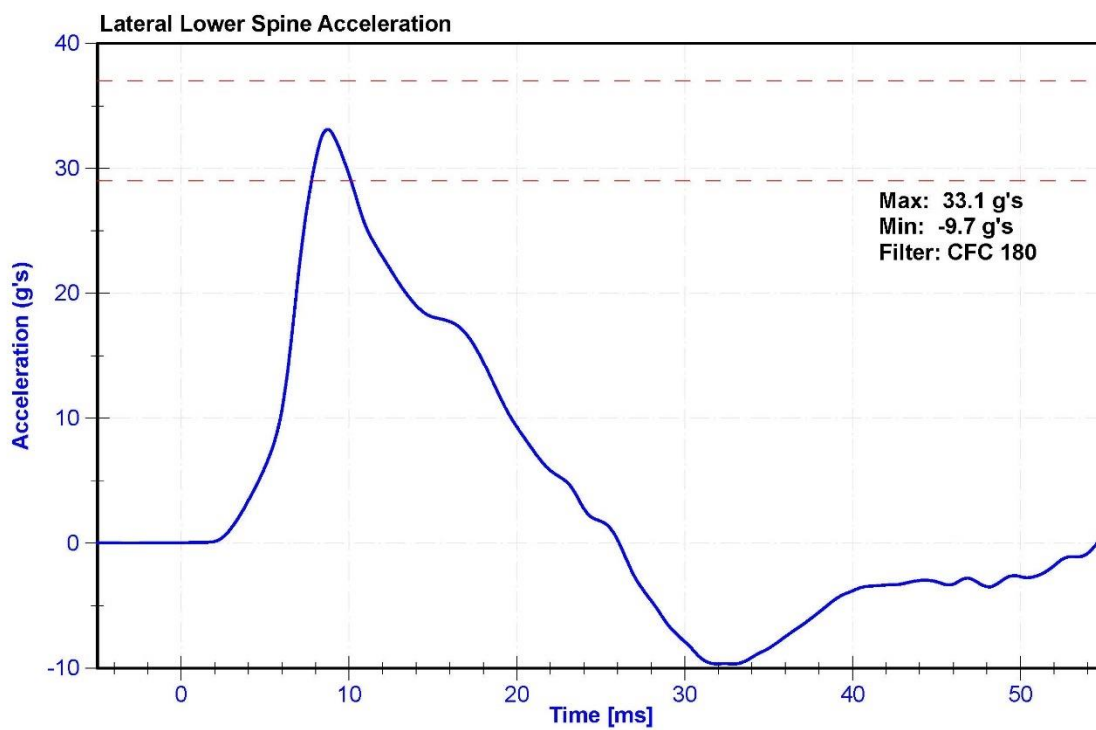
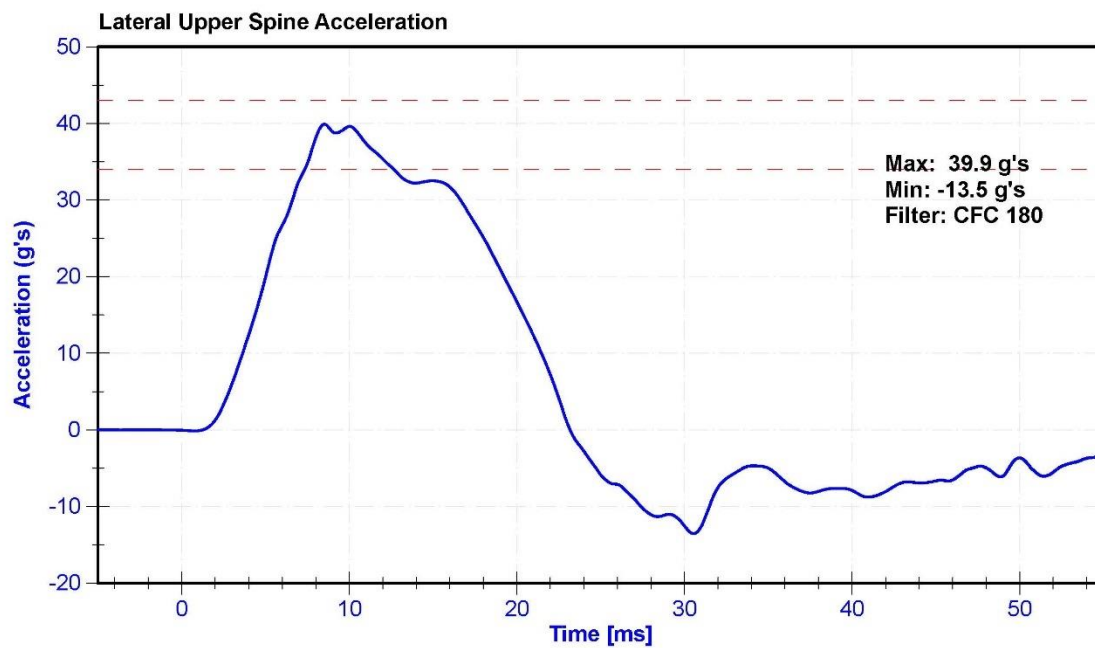
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	27.1	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration after 5 ms	30	36	g's	34.4	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.9	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.1	Pass
Shoulder Deflection	31	40	mm	31.8	Pass
Upper Thorax Rib Deflection	25	32	mm	26.2	Pass
Mid Thorax Rib Deflection	30	36	mm	30.8	Pass
Lower Thorax Rib Deflection	32	38	mm	33.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Upper Spine T1 Y Accelerometer	Endevco	P64148	1/10/2022	7/9/2022
Upper Spine T12 Y Accelerometer	Endevco	P51327	1/10/2022	7/9/2022
Shoulder Potentiometer	Servo	045GFE	1/12/2022	7/13/2022
Upper Thorax Rib Potentiometer	Servo	1199GFE	1/12/2022	7/13/2022
Middle Thorax Rib Potentiometer	Servo	1246GFE	1/13/2022	7/14/2022
Lower Thorax Rib Potentiometer	Servo	011GFE	1/12/2022	7/13/2022







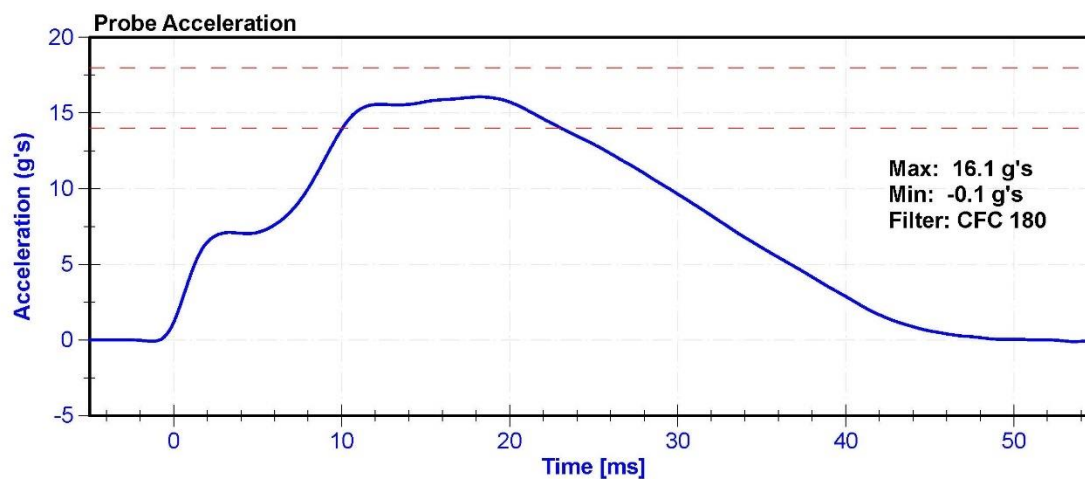
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

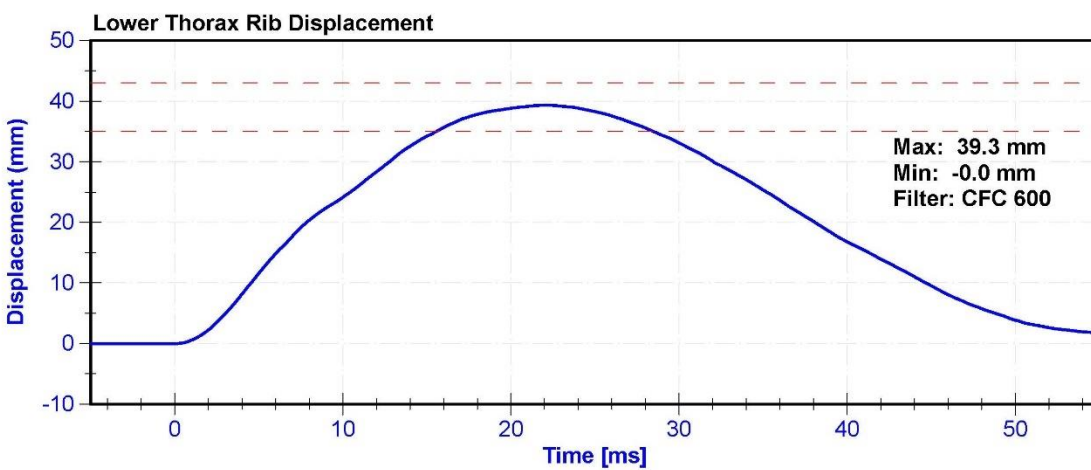
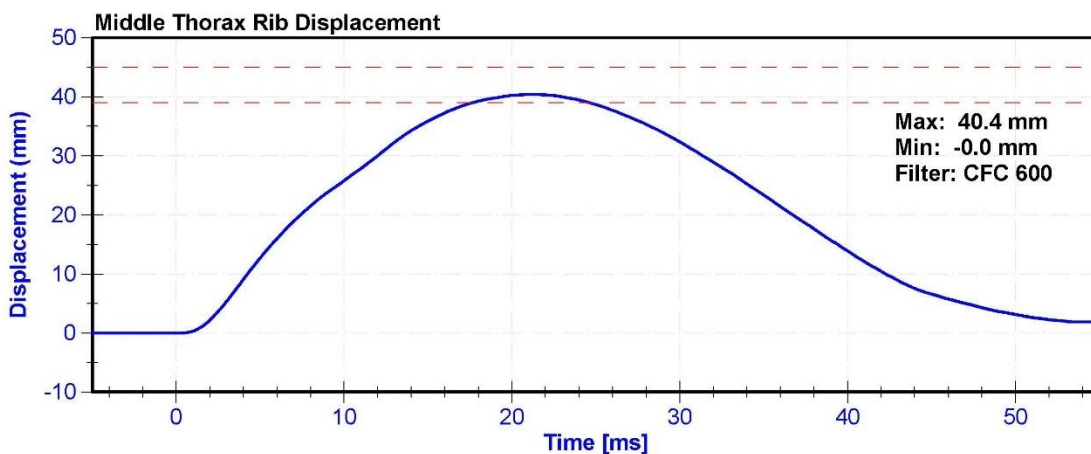
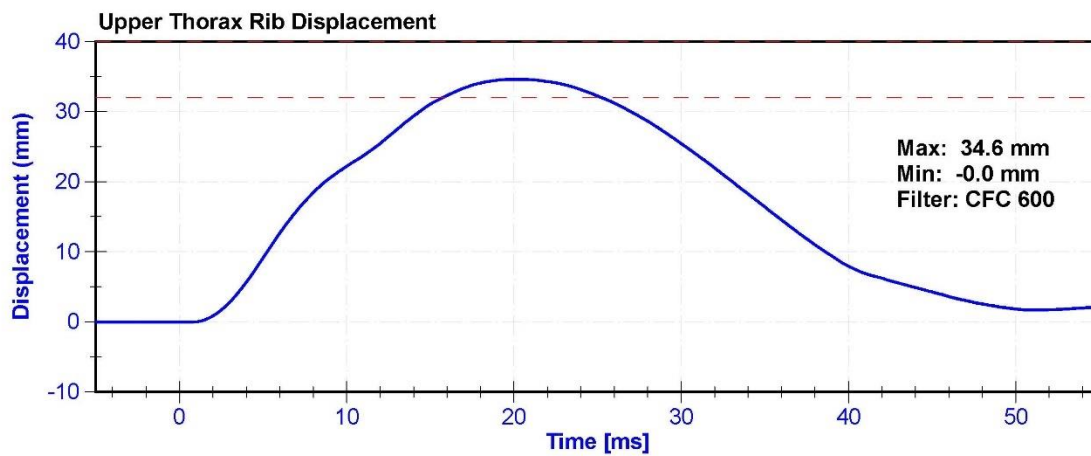
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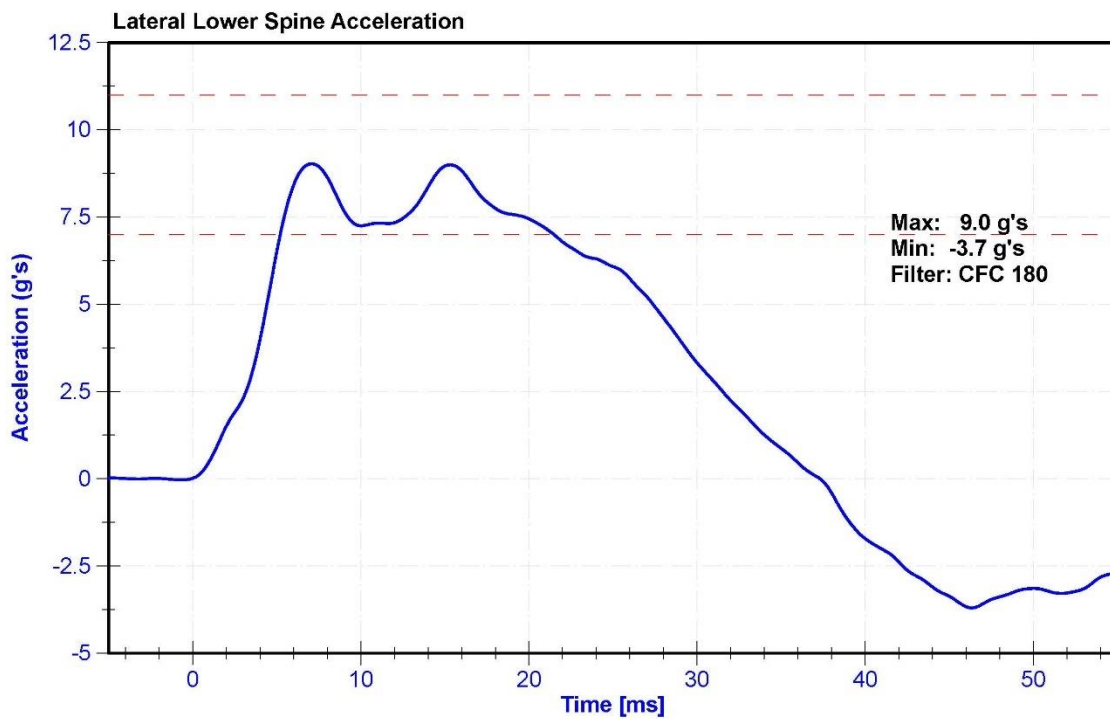
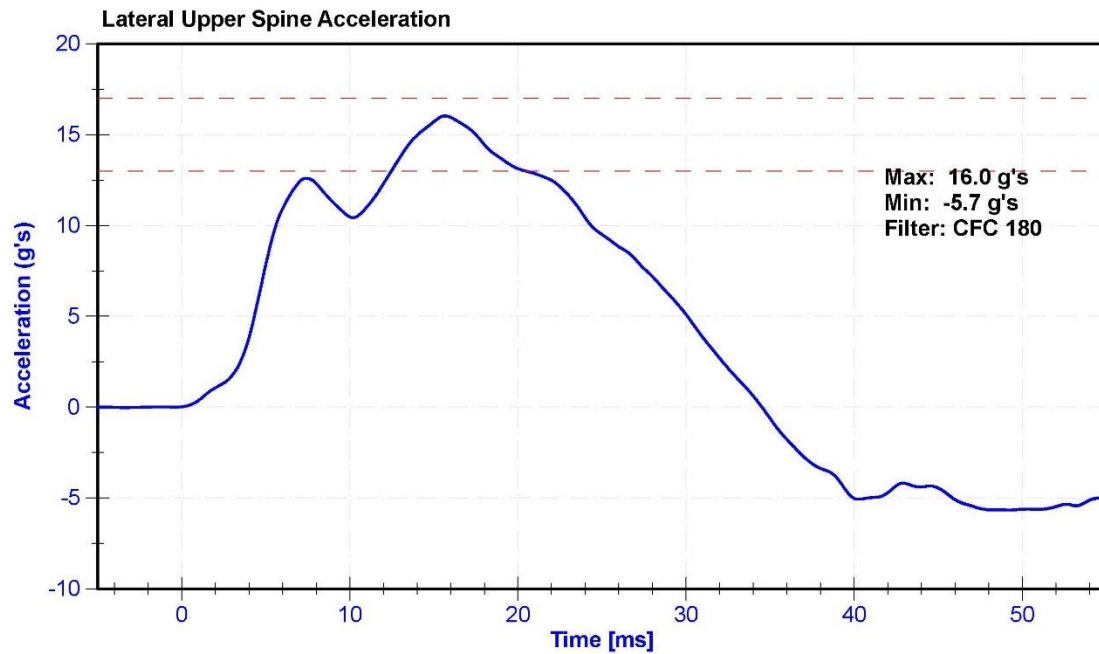
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	27.1	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	14	18	g's	16.1	Pass
Lateral Upper Spine Acceleration	13	17	g's	16.0	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.0	Pass
Upper Thorax Rib Deflection	32	40	mm	34.6	Pass
Middle Thorax Rib Deflection	39	45	mm	40.4	Pass
Lower Thorax Rib Deflection	35	43	mm	39.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Upper Spine Y Accelerometer	Endevco	P64148	1/10/2022	7/9/2022
Lower Spine Y Accelerometer	Endevco	P51327	1/10/2022	7/9/2022
Upper Thorax Rib Potentiometer	Servo	1199GFE	1/12/2022	7/13/2022
Middle Thorax Rib Potentiometer	Servo	1246GFE	1/13/2022	7/14/2022
Lower Thorax Rib Potentiometer	Servo	011GFE	1/12/2022	7/13/2022







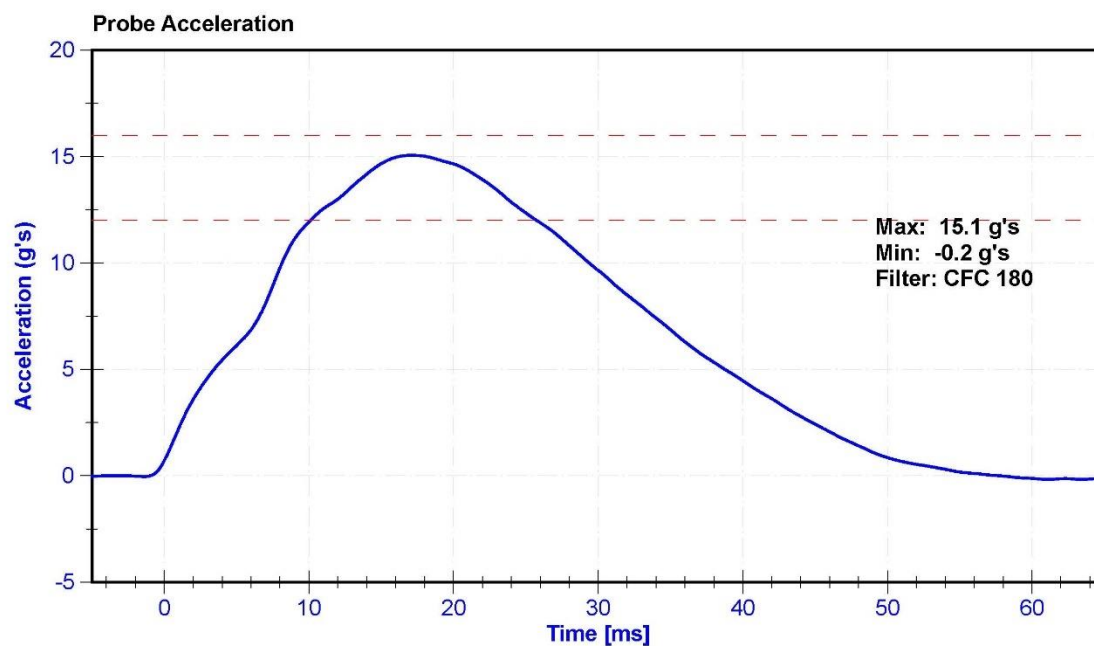
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

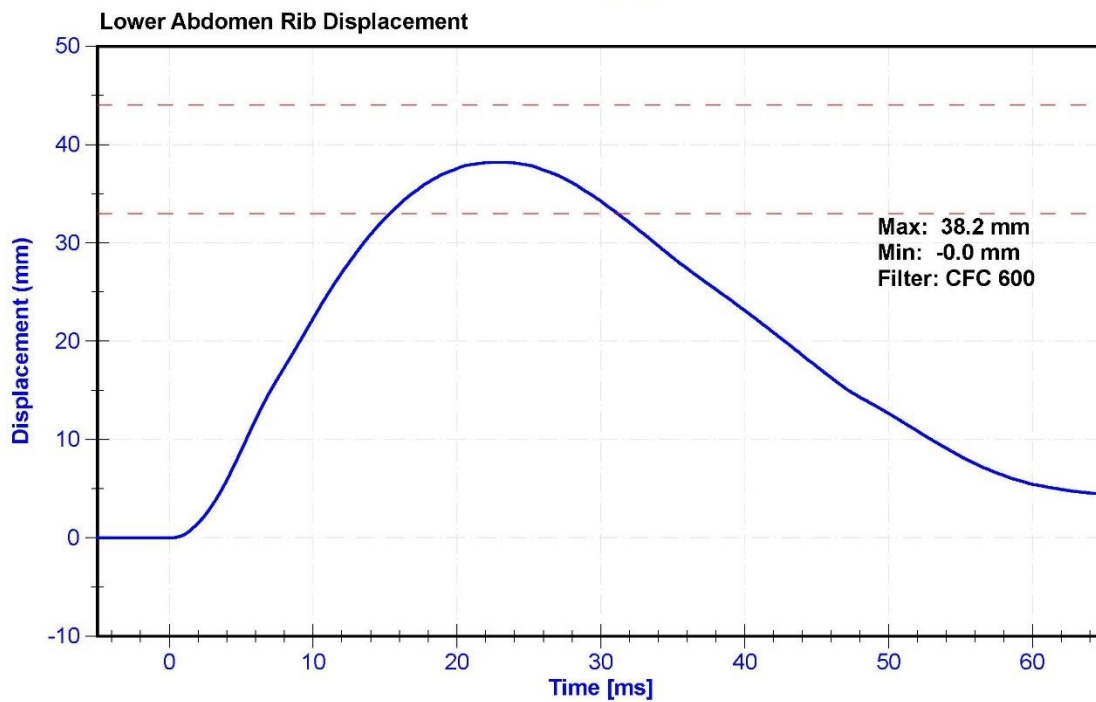
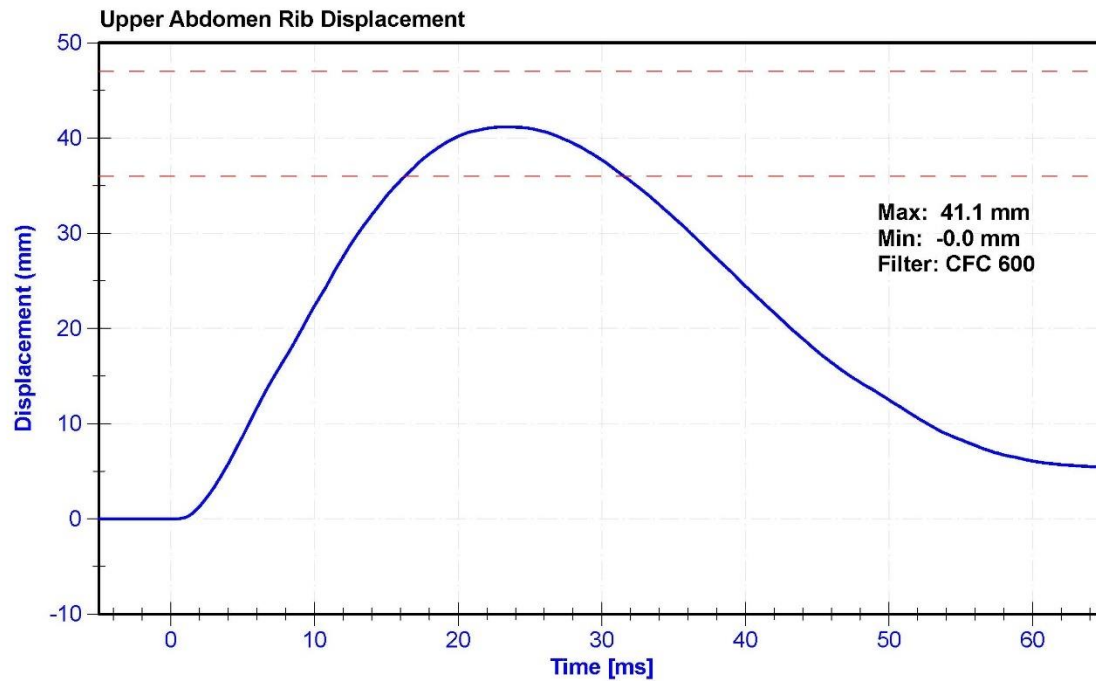
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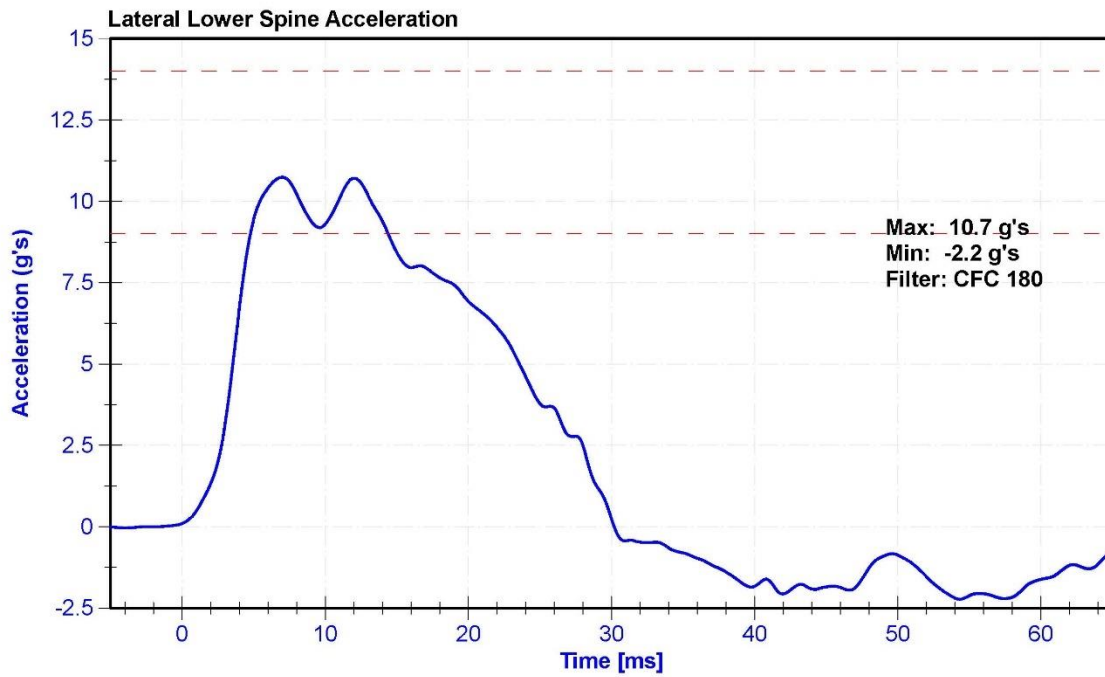
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	27.1	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	12	16	g's	15.1	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.7	Pass
Upper Abdomen Rib Deflection	36	47	mm	41.1	Pass
Lower Abdomen Rib Deflection	33	44	mm	38.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Lower Spine Y Accelerometer	Endevco	P51327	1/10/2022	7/9/2022
Upper Abdomen Rib Potentiometer	Servo	008GFE	1/12/2022	7/13/2022
Lower Abdomen Rib Potentiometer	Servo	041 GFE	1/12/2022	7/13/2022







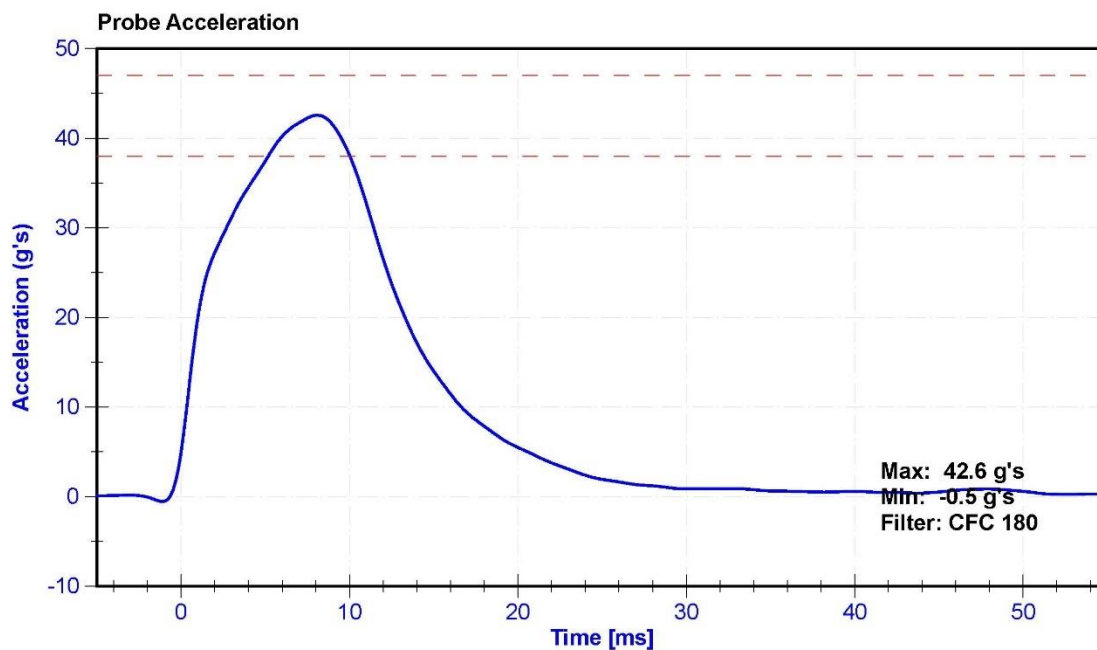
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

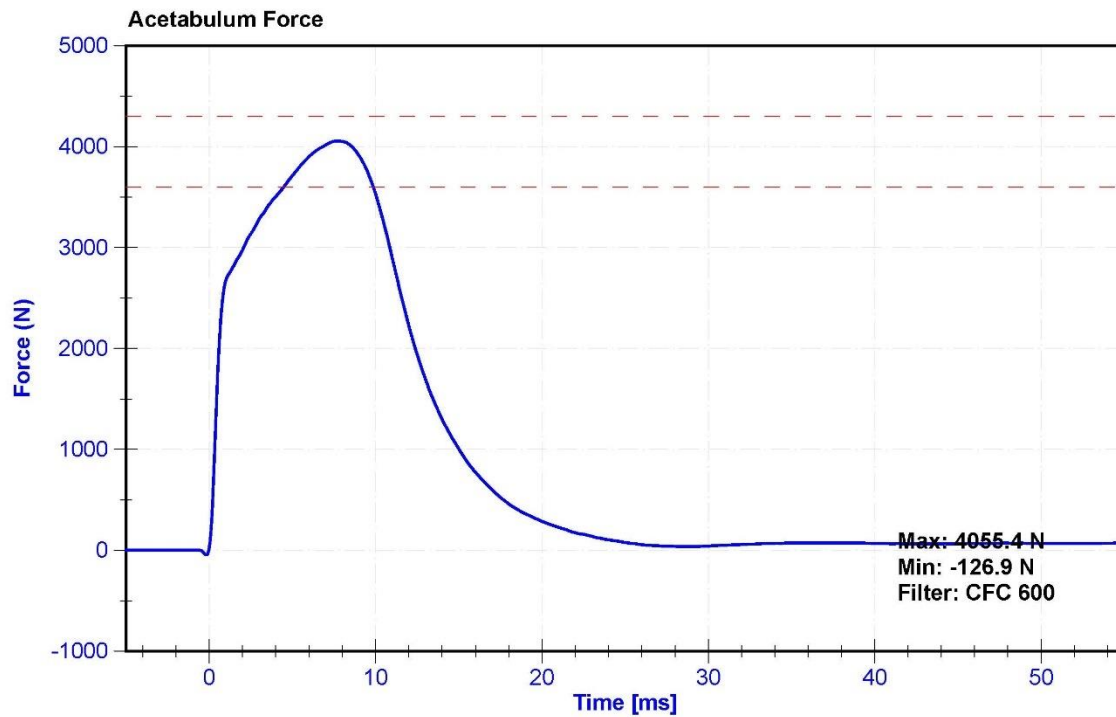
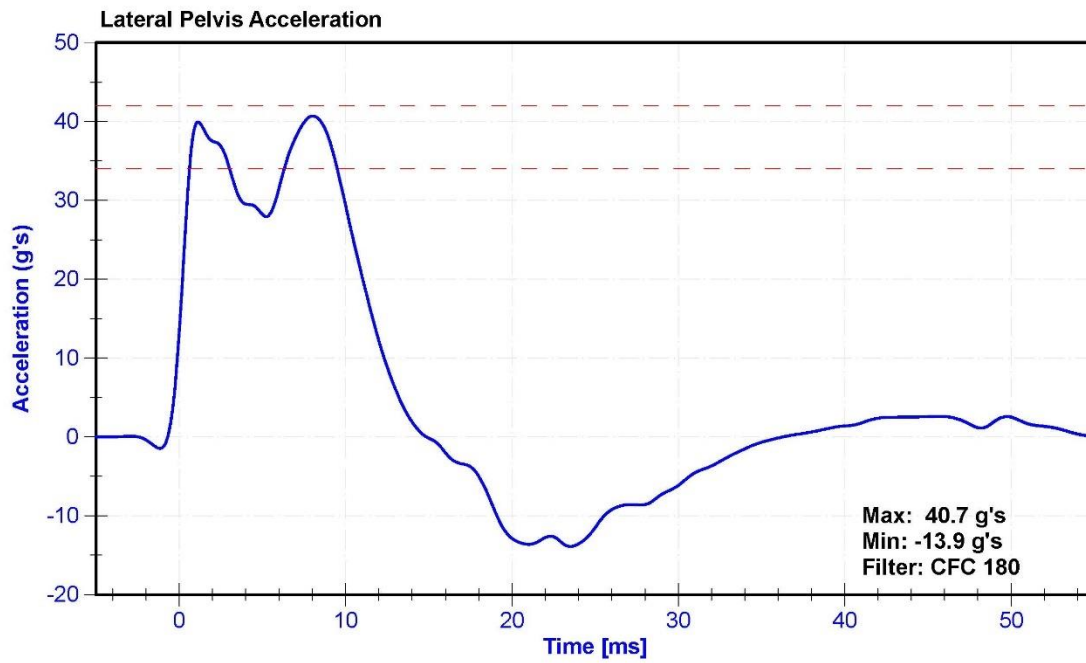
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	27.1	Pass
Velocity	6.6	6.8	m/s	6.68	Pass
Probe Acceleration	38	47	g's	42.6	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	40.7	Pass
Acetabulum Force	3600	4300	N	4055.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Pelvis Y Accelerometer	Endevco	P51875	1/10/2022	7/9/2022
Acetabulum Load Cell	Denton	276-FY	9/14/2021	9/14/2022
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A







D68012
CERT
2/11/2022

SID-11s Pelvis Plug Certification Test

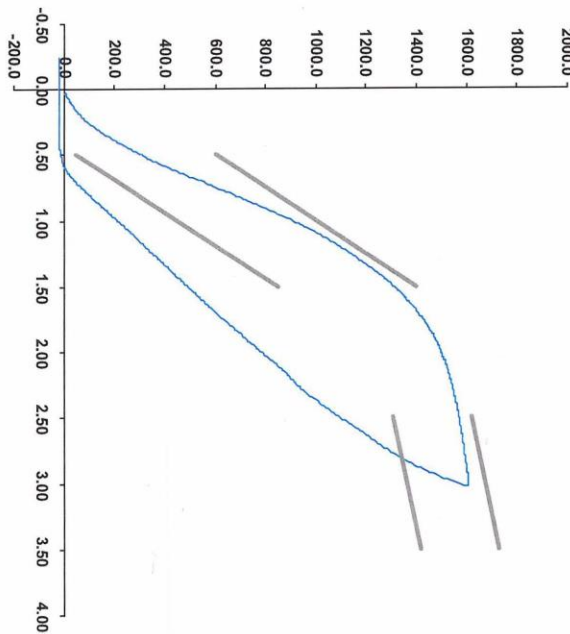
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Test Number 11300
Report Number 11338
Test Date 9/26/2019 12:11:28 PM

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

Testing Machine STM-20 596542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



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



DE8012
Crash
2/11/2022

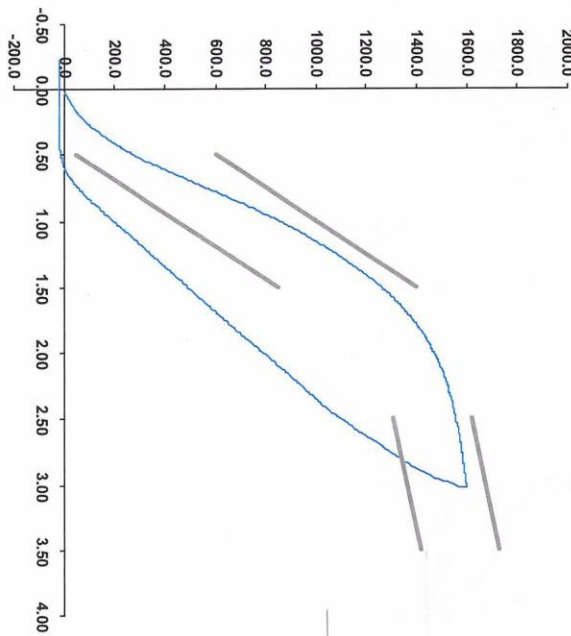
SID-IIs Pelvis Plug Certification Test

Plug S/N 13128
Test Number 10490
Report Number 10526
Test Date 8/5/2019 10:50:16 AM

Force (-N) vs Extension (-mm)

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

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured By XHD_100 (XHD100)



Notes:

Operator

Part Number 180-4450

Template No 107 08-Jul-21
SACO Research

By: _____ Date: _____

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



DE 8012
NonImpact

SID-11s Pelvis Plug Certification Test

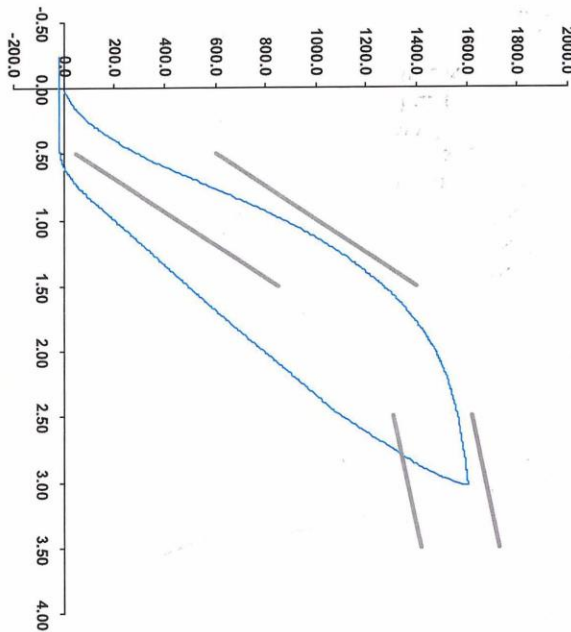
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Report Number 10425
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Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	50	600
Force @ 1.5 mm (N)	850	1,400
Force @ 2.5 mm (N)	1,306	1,618
Force @ 3.0 mm (N)	1,361	1,673

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured By XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



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

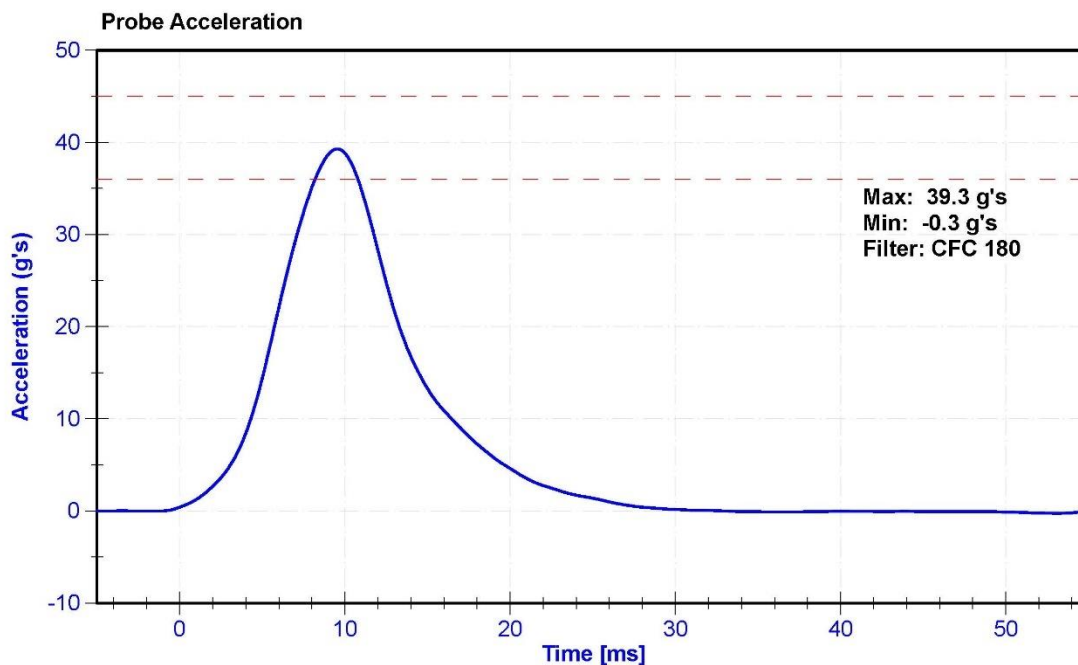
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

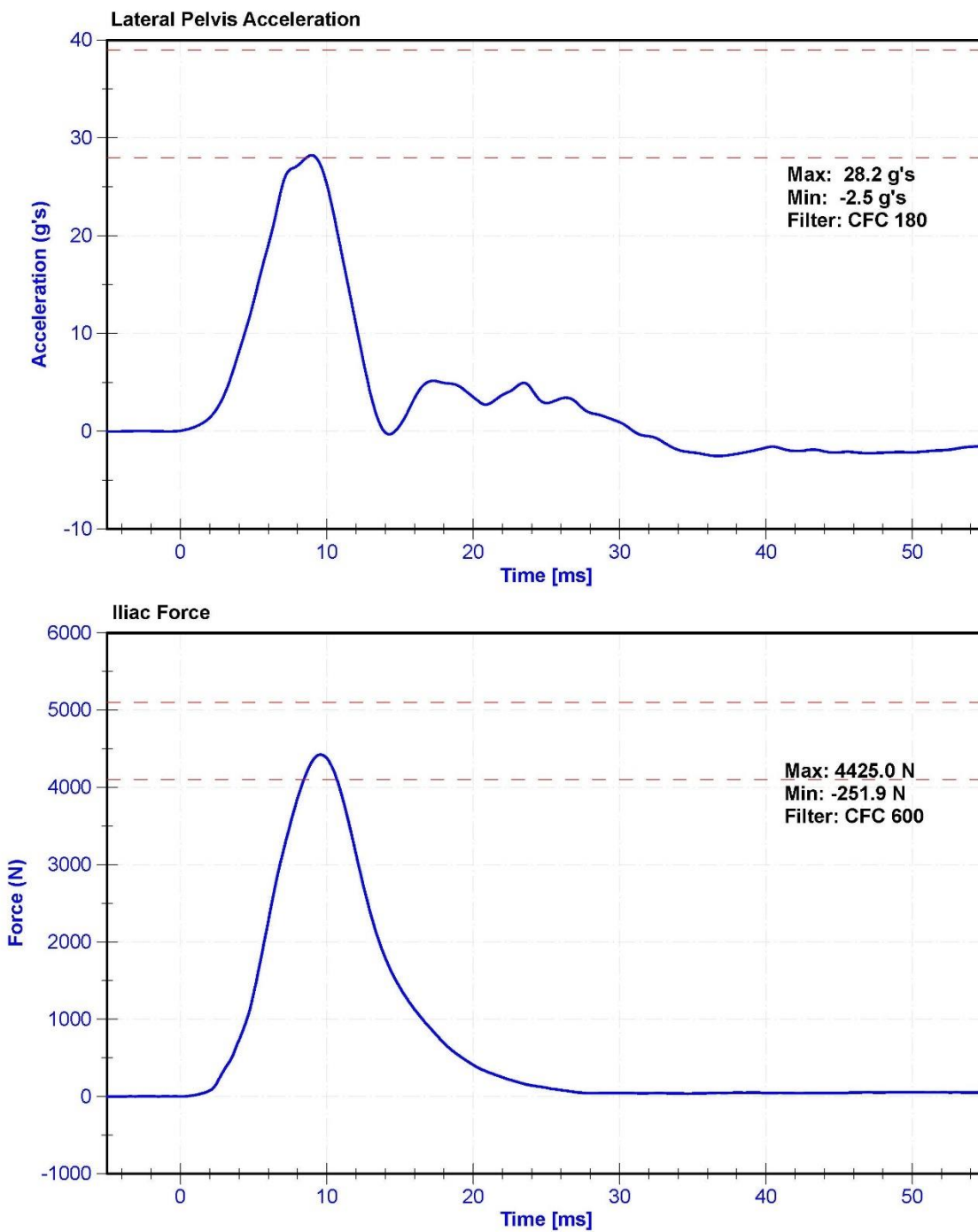
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	27.1	Pass
Velocity	4.2	4.4	m/s	4.39	Pass
Probe Acceleration	36	45	g's	39.3	Pass
Lateral Pelvis Acceleration	28	39	g's	28.2	Pass
Iliac Force	4100	5100	N	4425.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Pelvis Y Accelerometer	Endevco	P51875	1/10/2022	7/9/2022
Iliac Load Cell	Denton	290-FY	9/14/2021	9/14/2022





CALIBRATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

SERIAL NO: F033

(CONFIGURED FOR LEFT SIDE IMPACT)

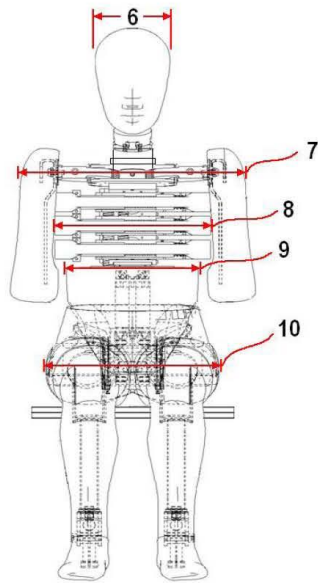


External Measurements - EuroSID-2re

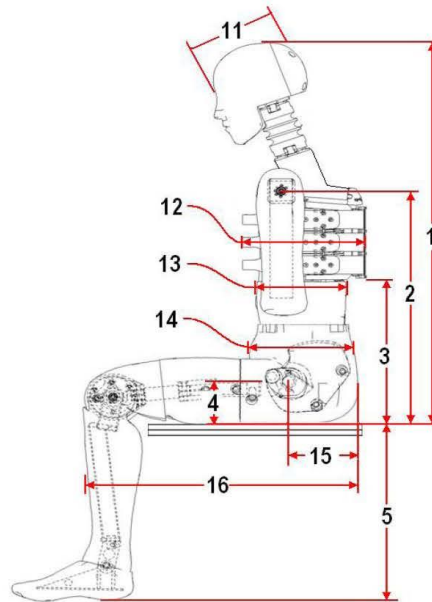
Technician: K. Brogan

Date: 04/07/2022

Dummy Serial Number: F033



FRONT VIEW



SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	908	Pass
2	Seat to Shoulder Joint	558	572	565	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	351	Pass
4	Seat to Hip Joint (center of bolt)	97	103	100	Pass
5	Sole to Seat, Sitting	333	451	420	Pass
6	Head Width	152	158	155	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	330	Pass
9	Abdomen Width	273	287	285	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	610	Pass

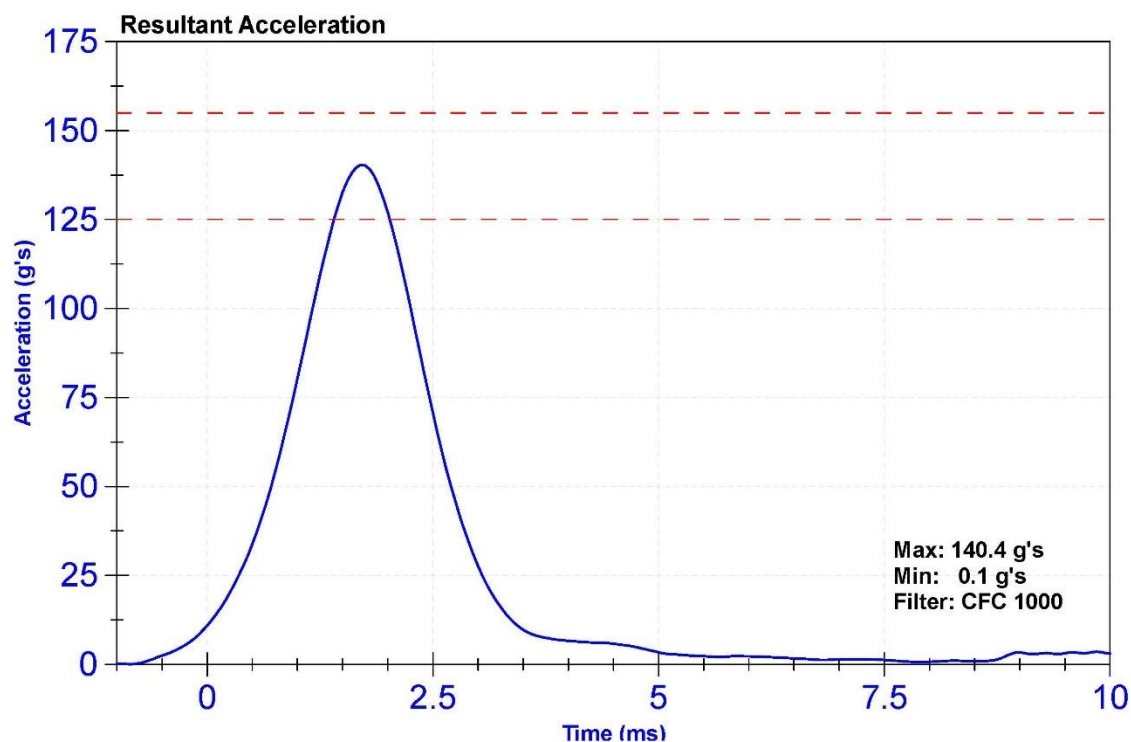
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

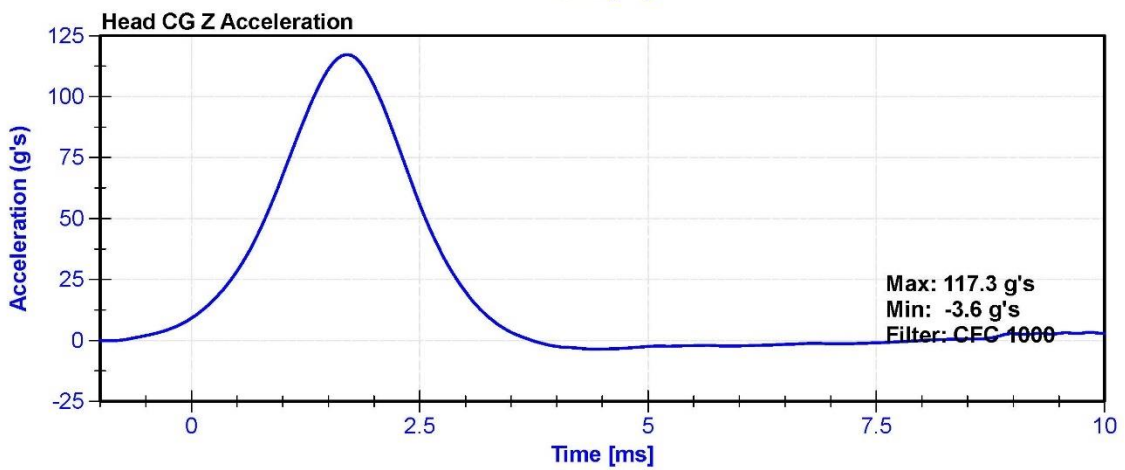
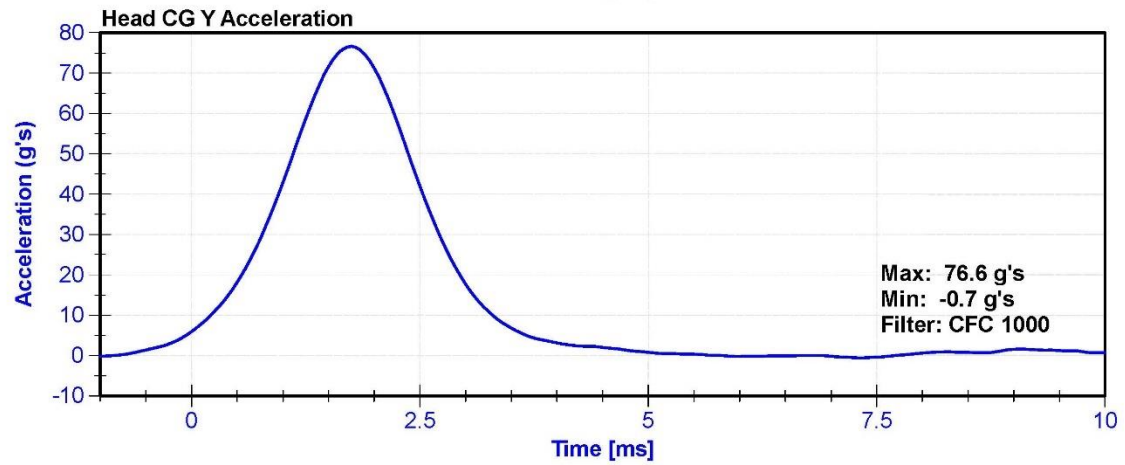
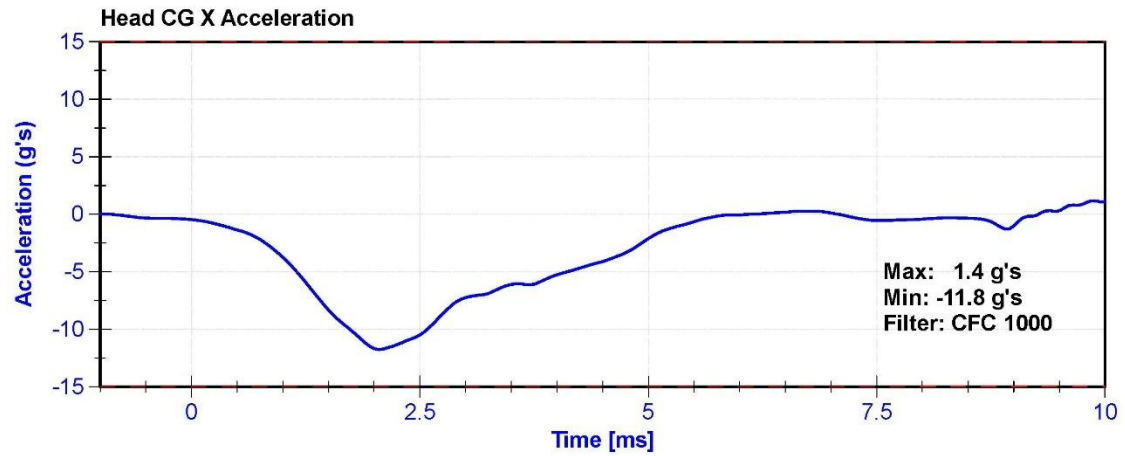
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	28.1	Pass
Resultant Acceleration	125	155	g's	140.4	Pass
Oscillation	0	15	%	2.54	Pass
Fore-Aft Acceleration	-15	15	g's	-11.8	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	P51303	1/31/2022	7/30/2022
Z Accelerometer	Endevco	P49216	1/31/2022	7/30/2022





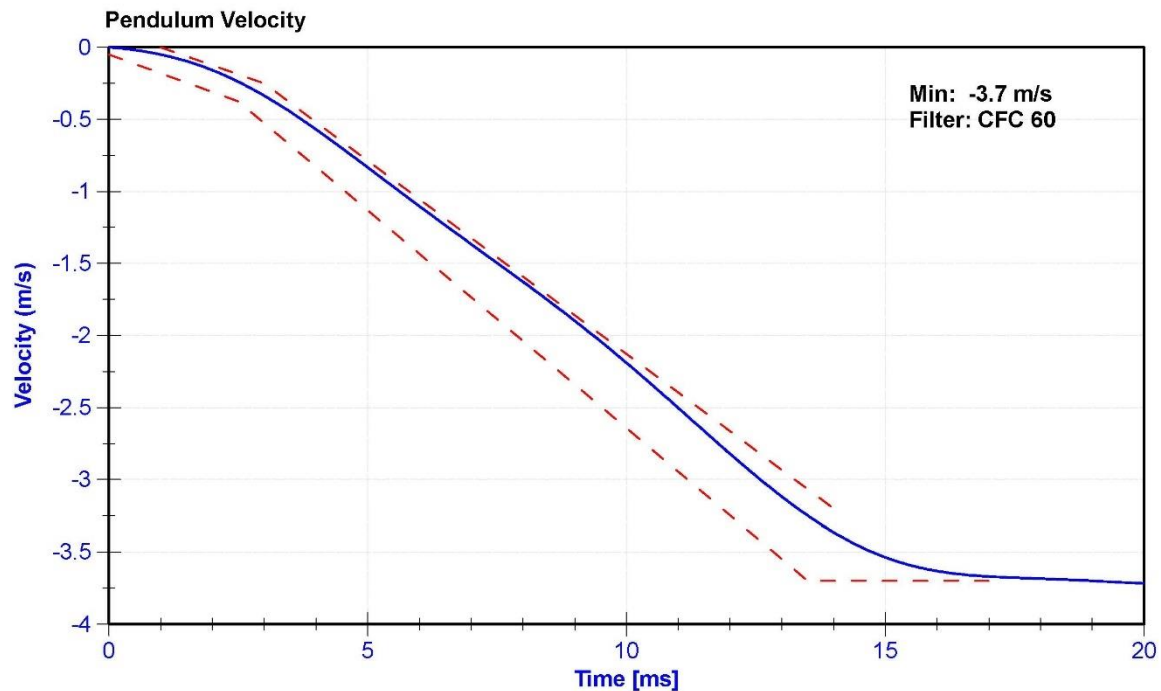
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

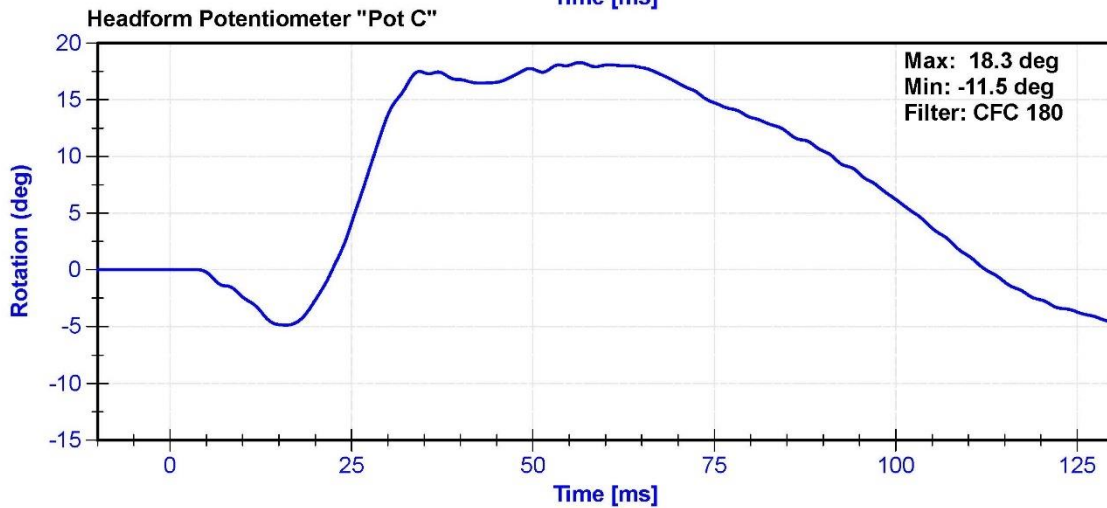
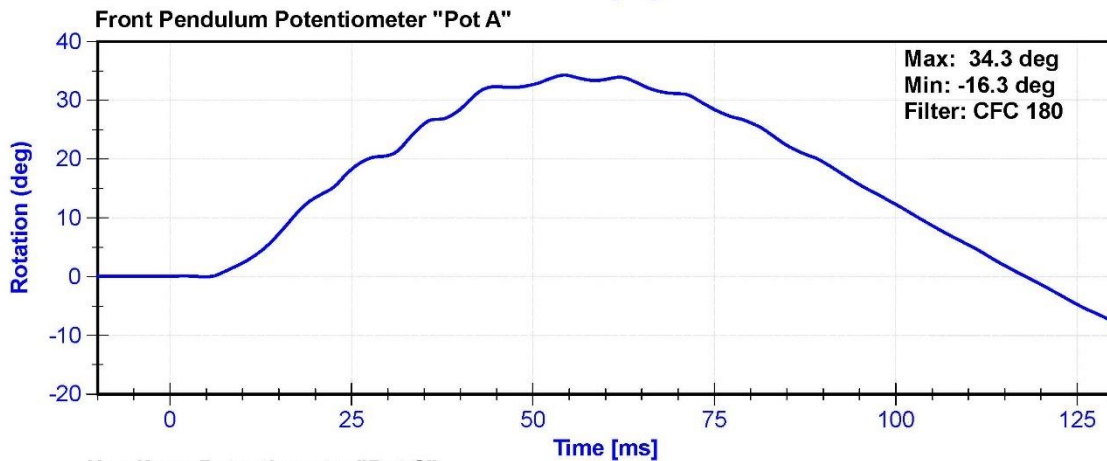
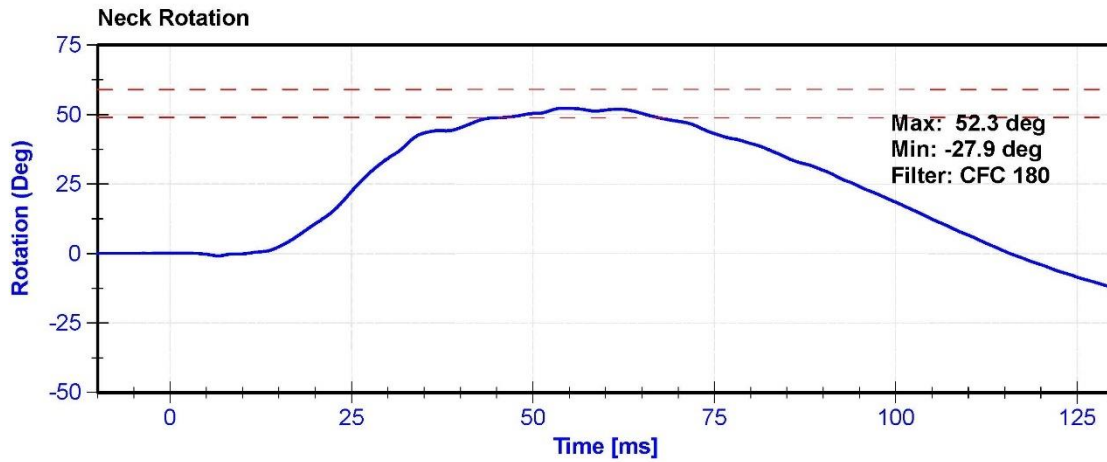
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	32.3	Pass
Velocity	3.3	3.5	m/s	3.41	Pass
Lateral Neck Rotation	49	59	deg	52.3	Pass
Time at Maximum Rotation	54	66	ms	54.1	Pass
Time of Rotation Decay from Maximum	53	88	ms	61.7	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





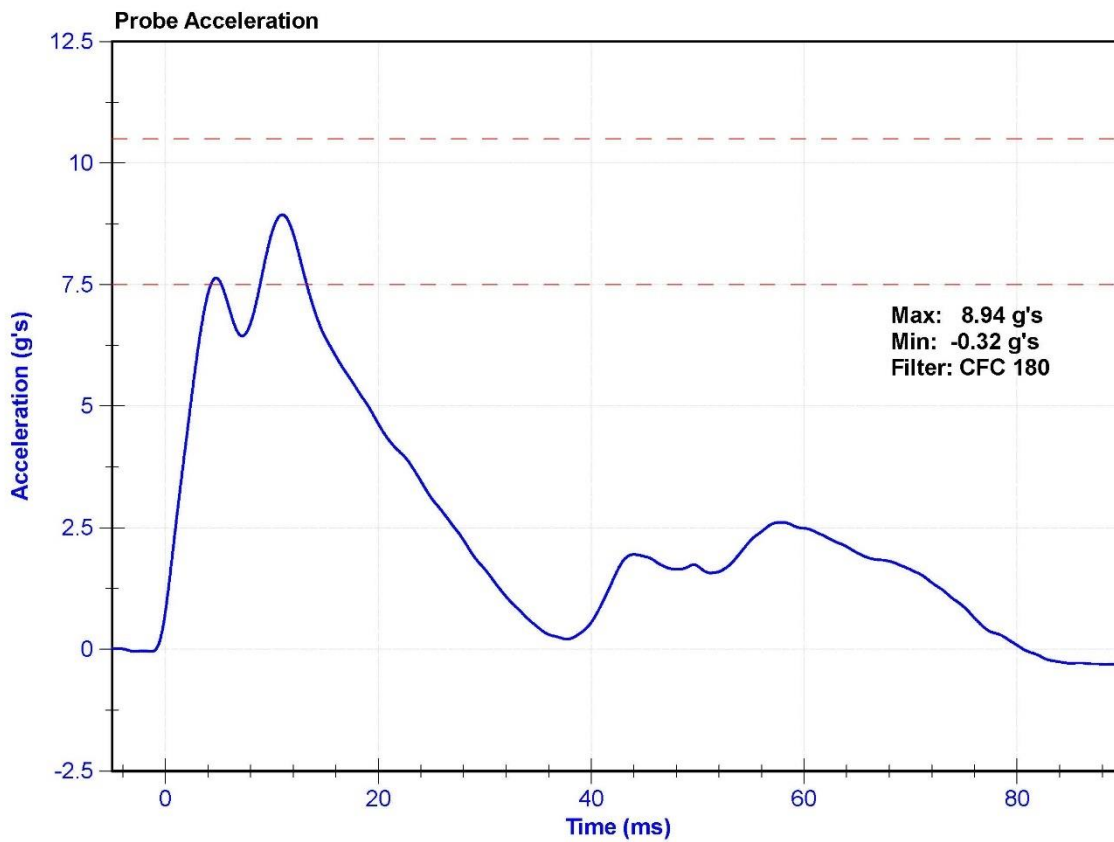
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	41.1	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	7.5	10.5	g's	8.94	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	T25885	10/25/2021	4/23/2022



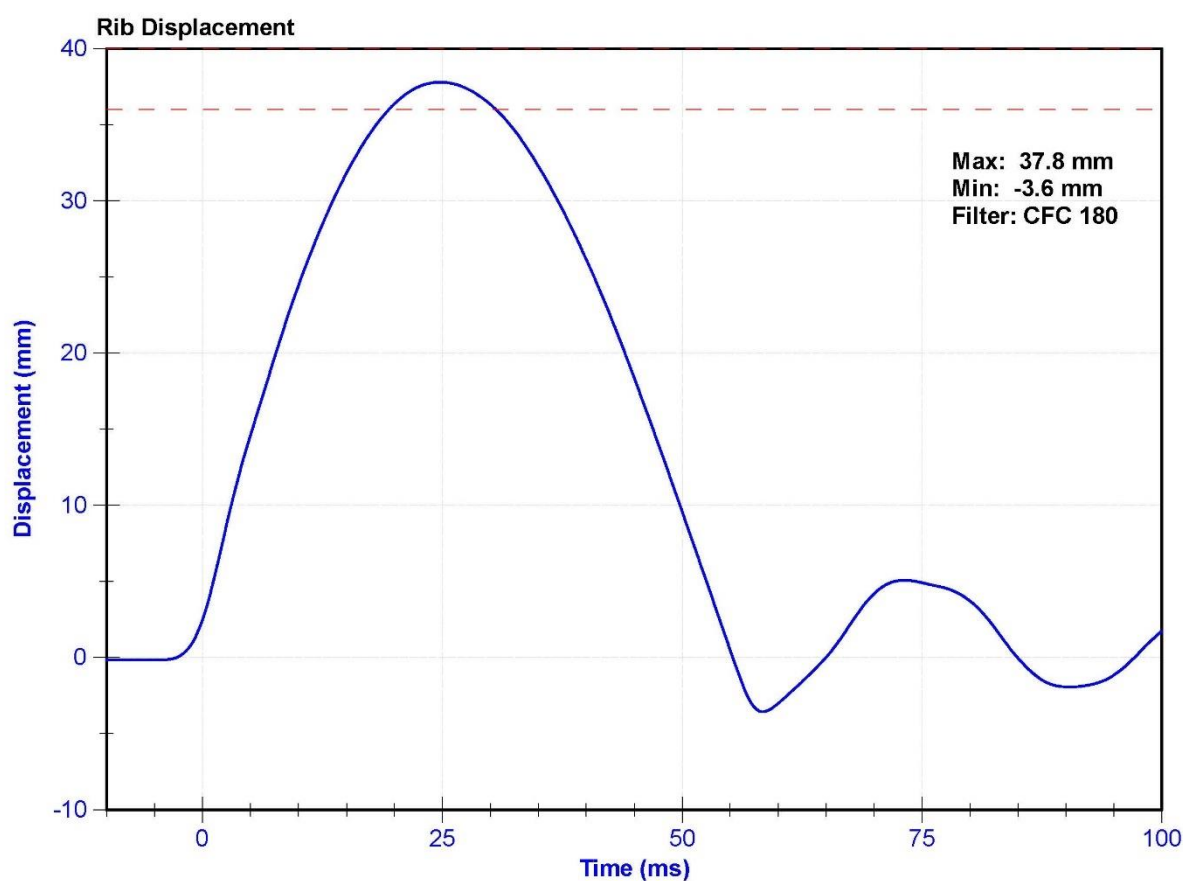
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	28.1	Pass
Rib Displacement	36	40	mm	37.8	Pass

Transducer Calibrations

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



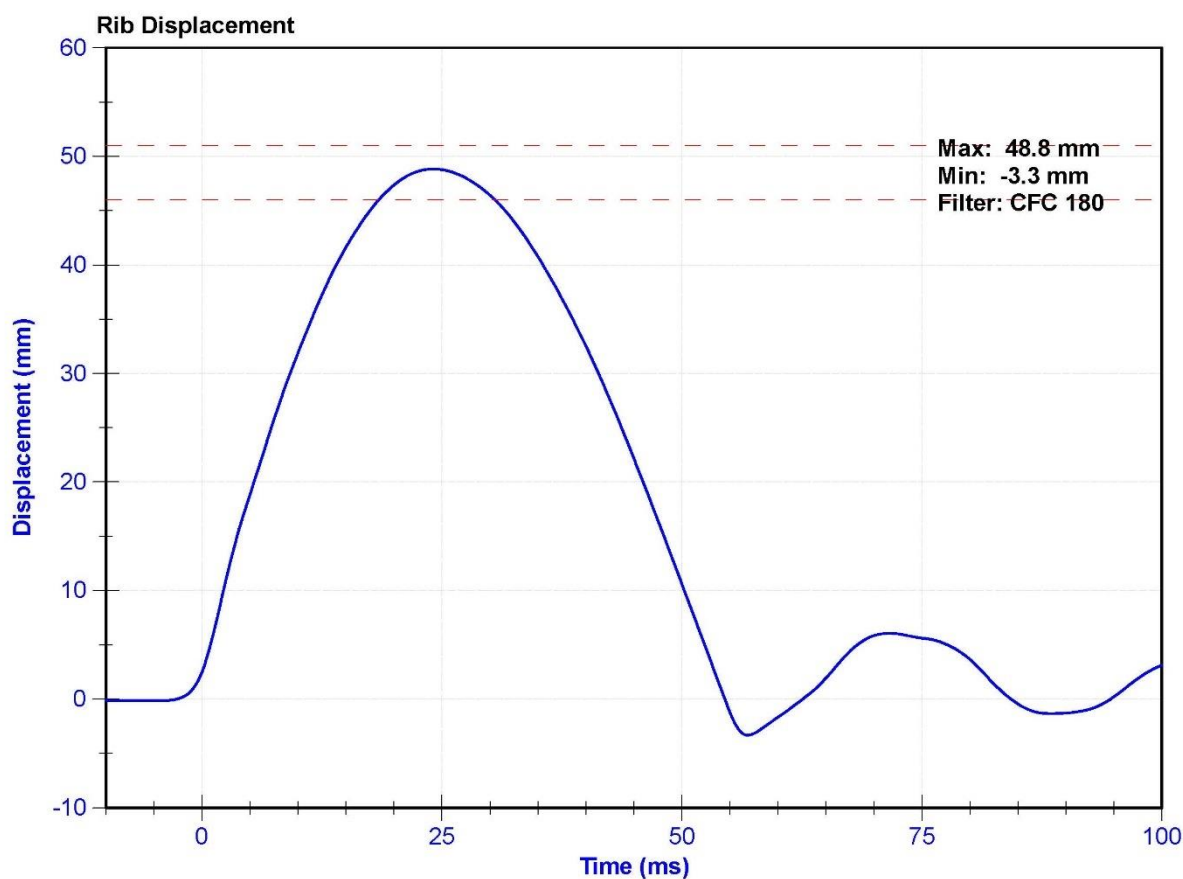
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	28.1	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



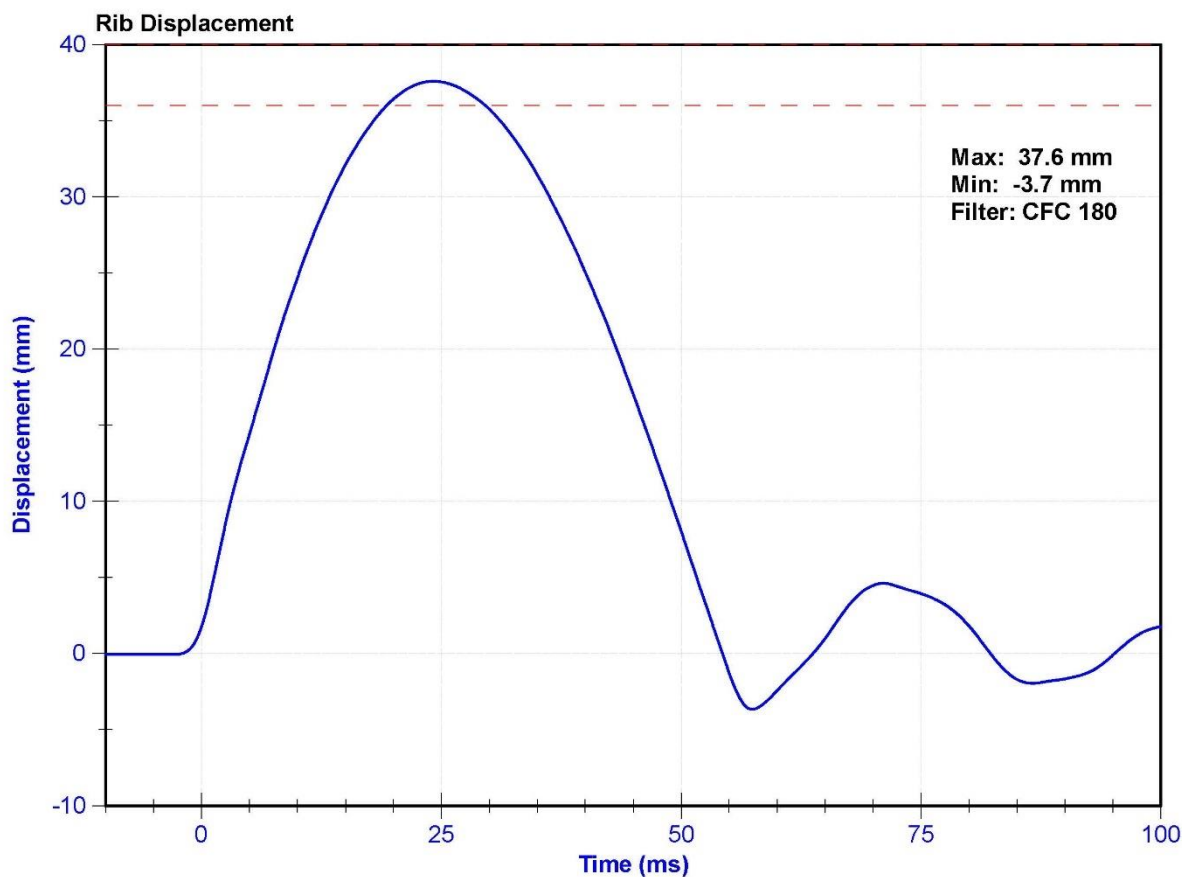
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	28.1	Pass
Rib Displacement	36	40	mm	37.6	Pass

Transducer Calibrations

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



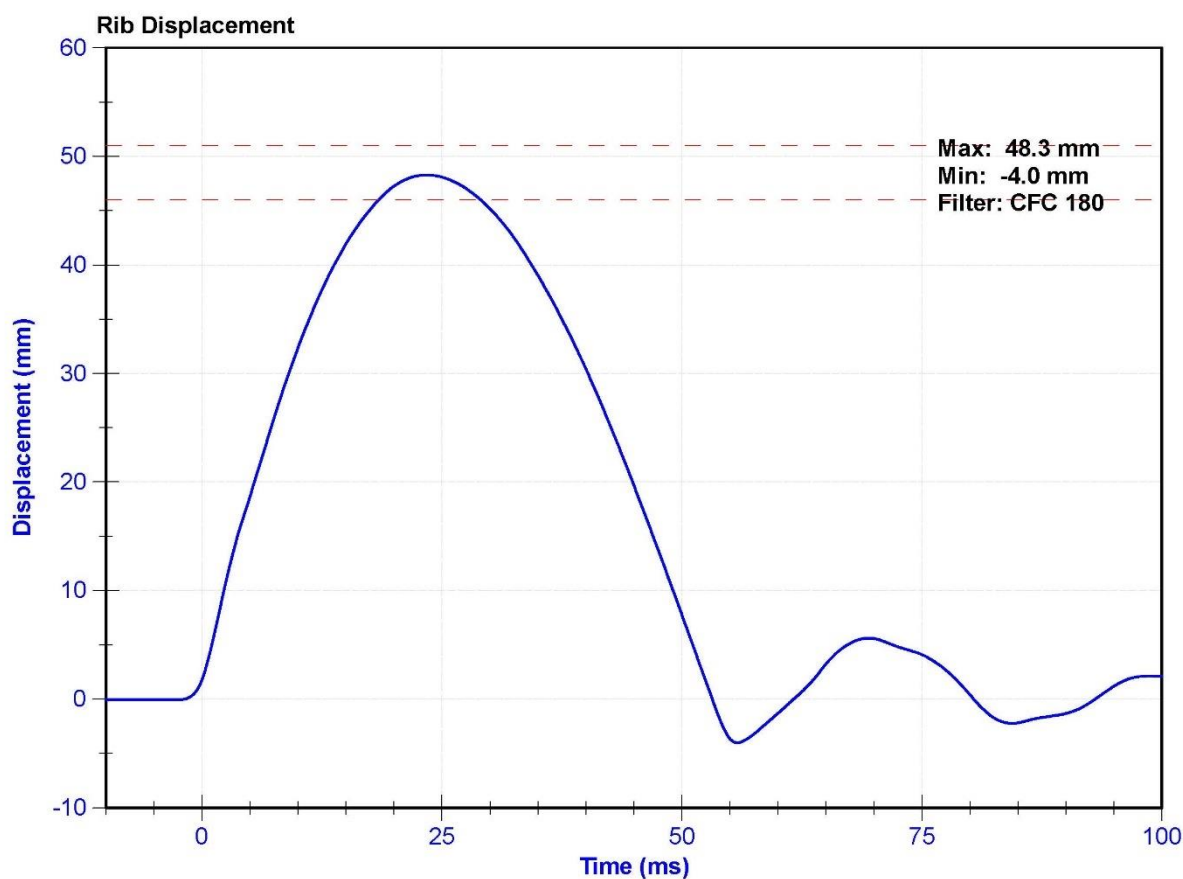
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	28.1	Pass
Rib Displacement	46	51	mm	48.3	Pass

Transducer Calibrations

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



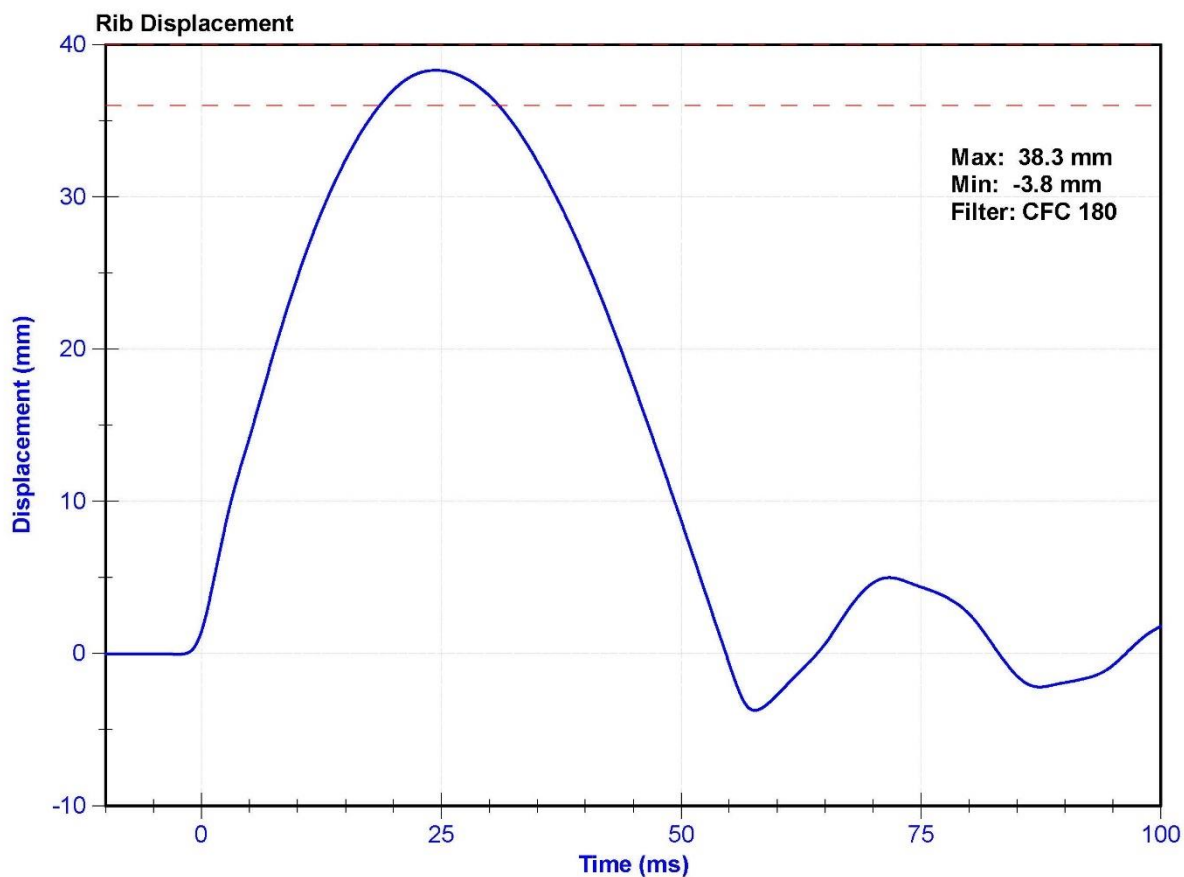
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	28.1	Pass
Rib Displacement	36	40	mm	38.3	Pass

Transducer Calibrations

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



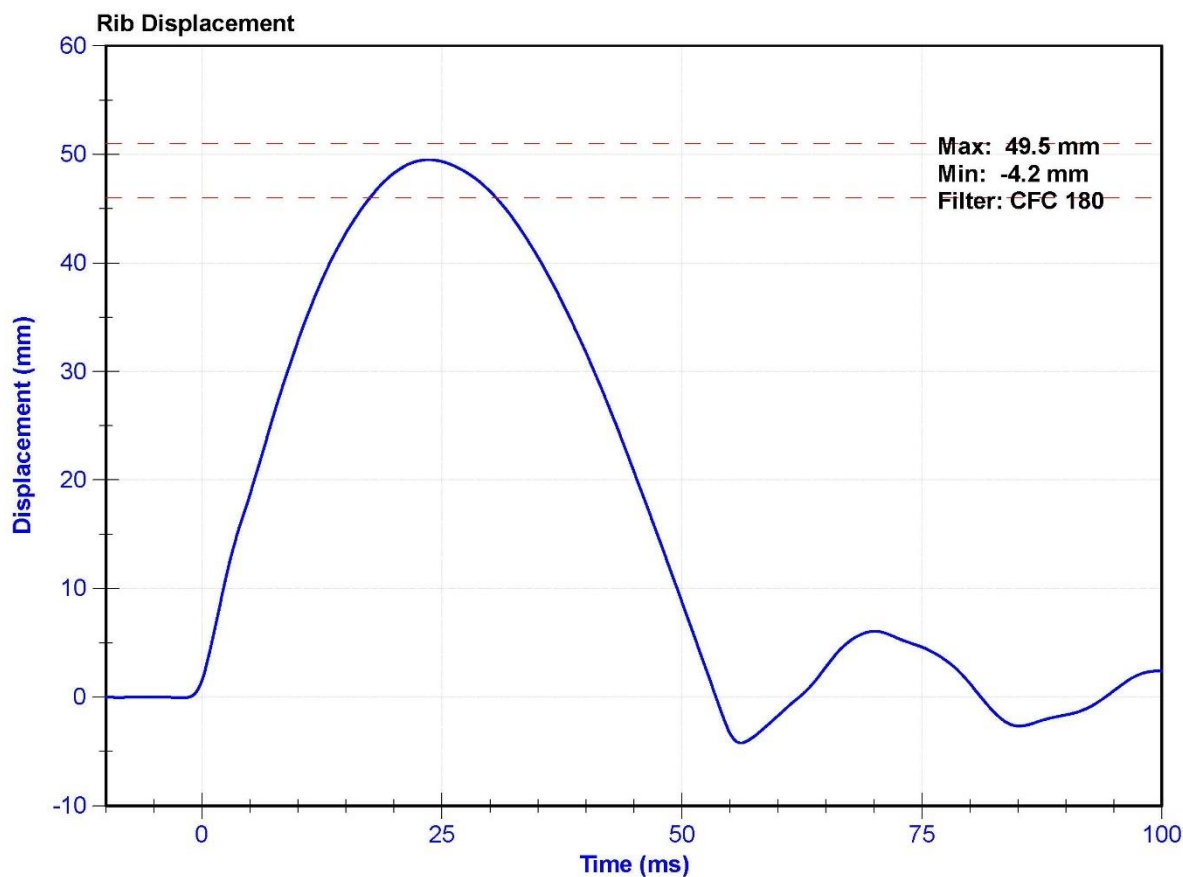
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	28.1	Pass
Rib Displacement	46	51	mm	49.5	Pass

Transducer Calibrations

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



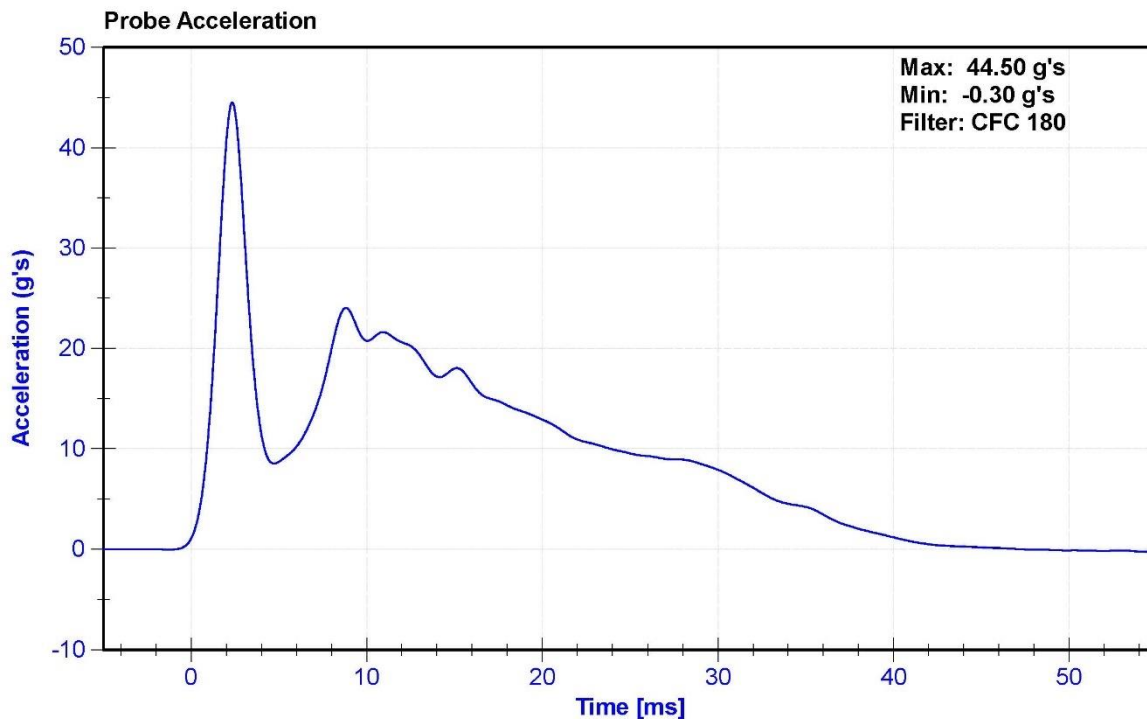
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

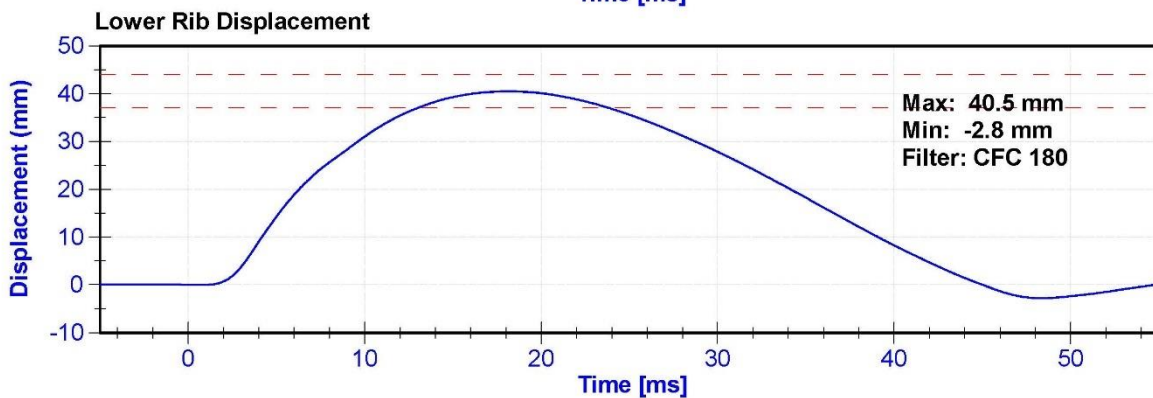
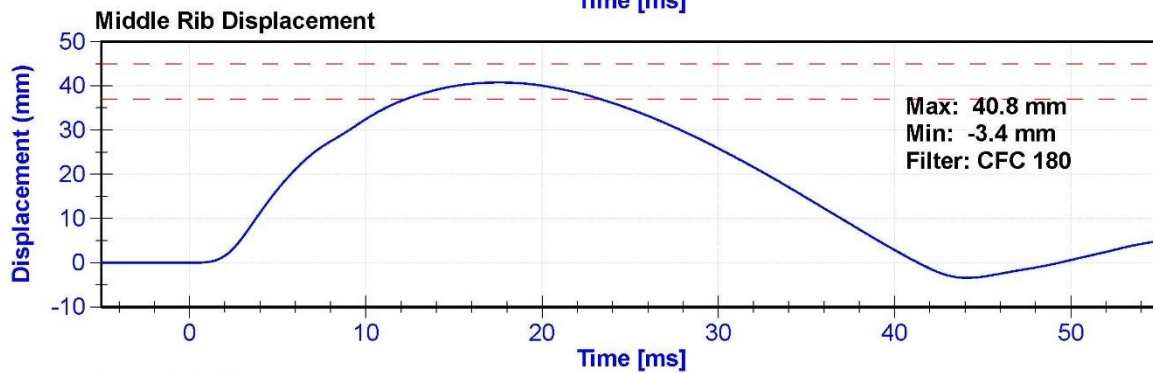
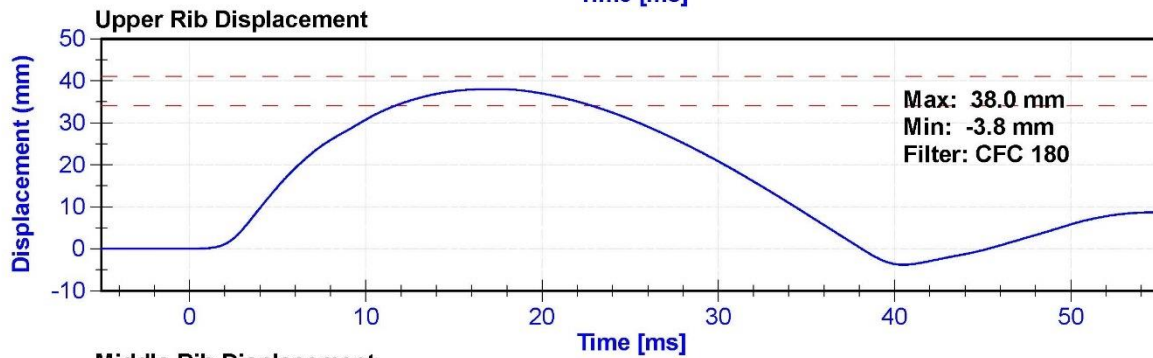
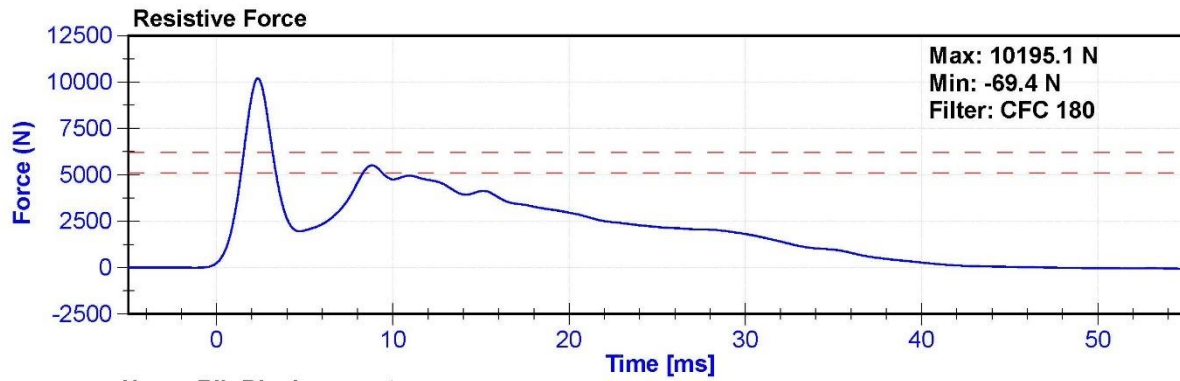
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	41.1	Pass
Velocity	5.4	5.6	m/s	5.41	Pass
Resistive Force after 6ms	5100	6200	N	5505.0	Pass
Upper Thorax Rib Deflection	34	41	mm	38.0	Pass
Mid Thorax Rib Deflection	37	45	mm	40.8	Pass
Lower Thorax Rib Deflection	37	44	mm	40.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
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





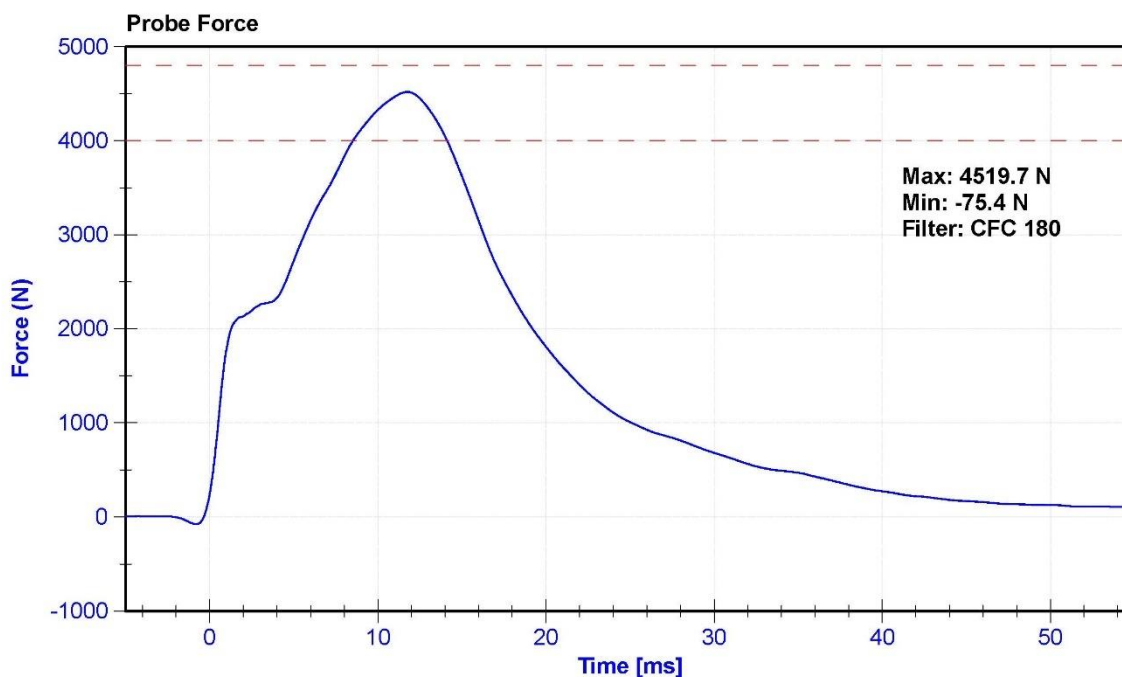
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

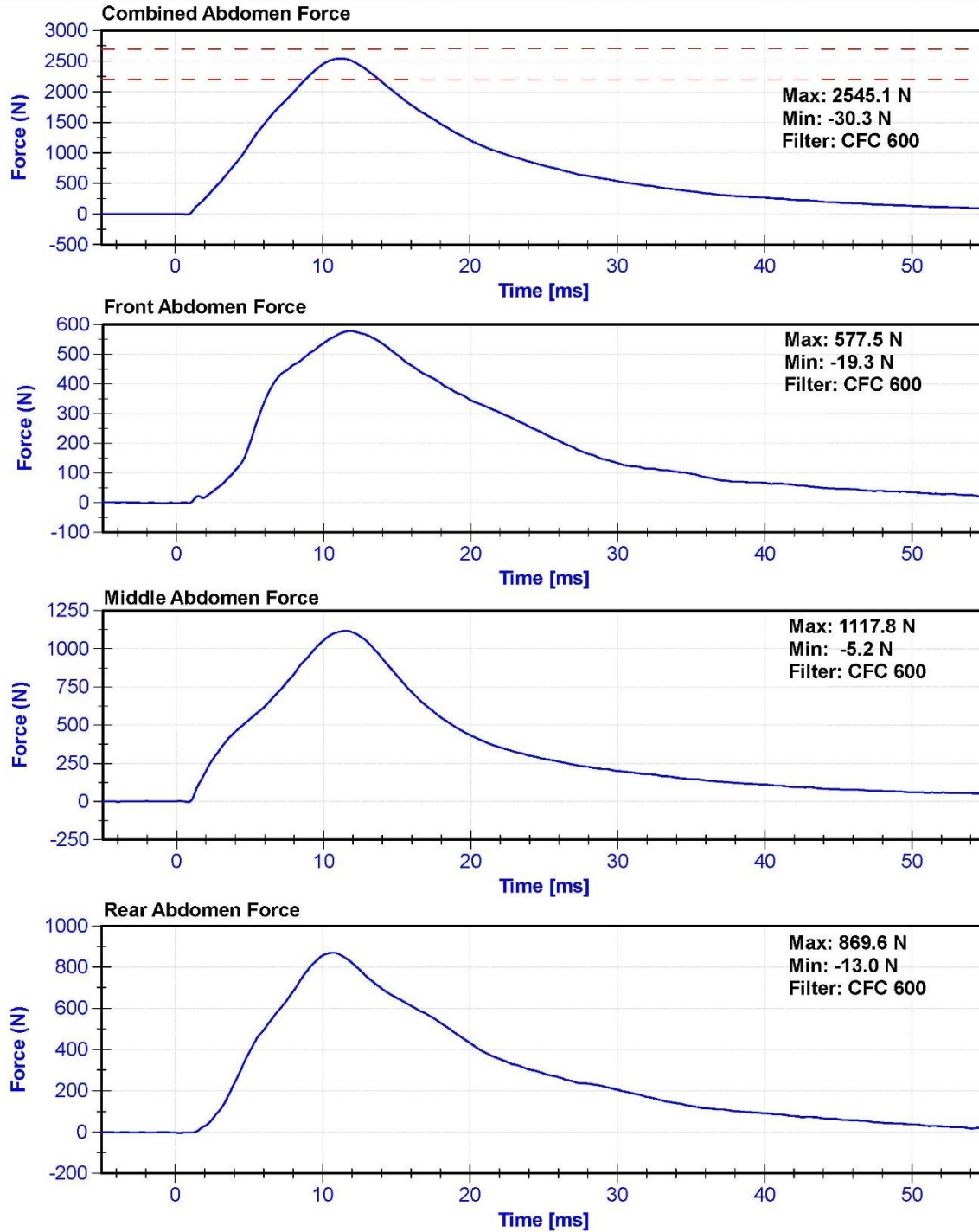
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	41.1	Pass
Velocity	3.9	4.1	m/s	4.05	Pass
Combined Abdomen Force	2200	2700	N	2545.1	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.20	Pass
Resistive Probe Force	4000	4800	N	4519.7	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.75	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
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	1512	8/2/2021	8/2/2022





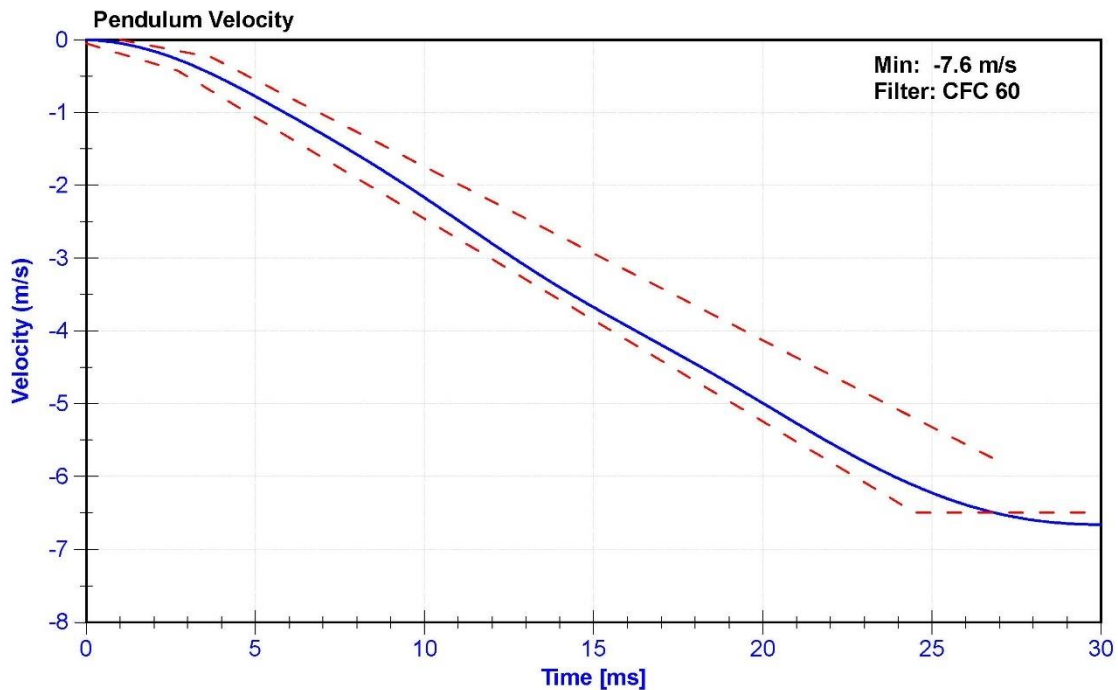
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

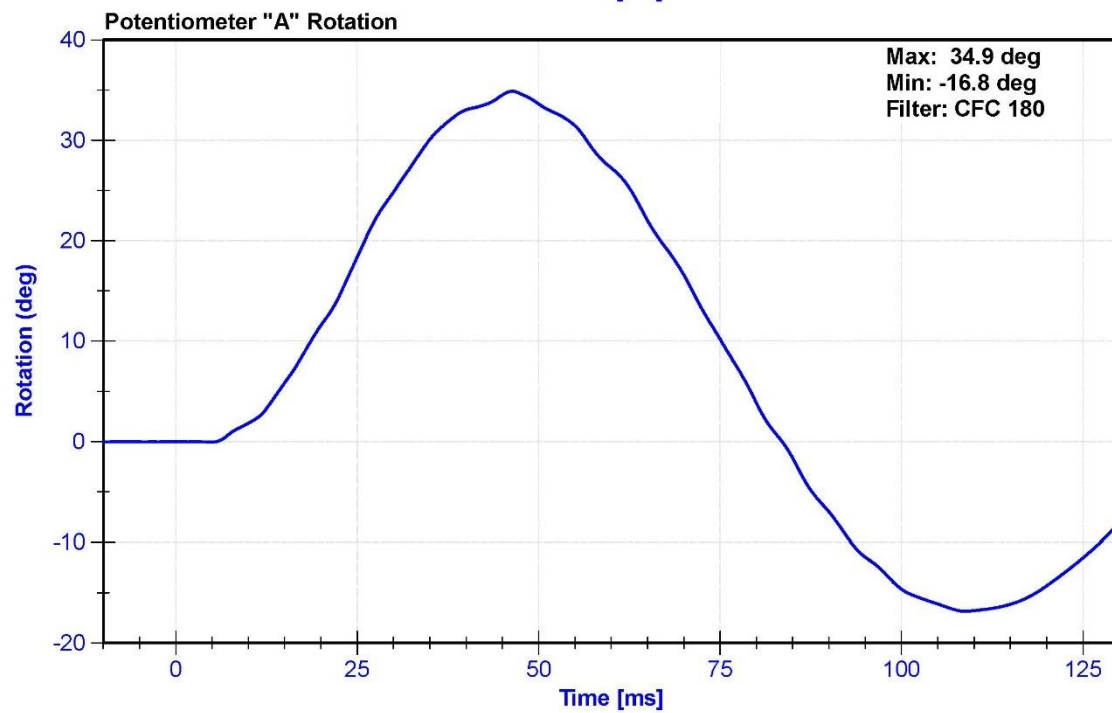
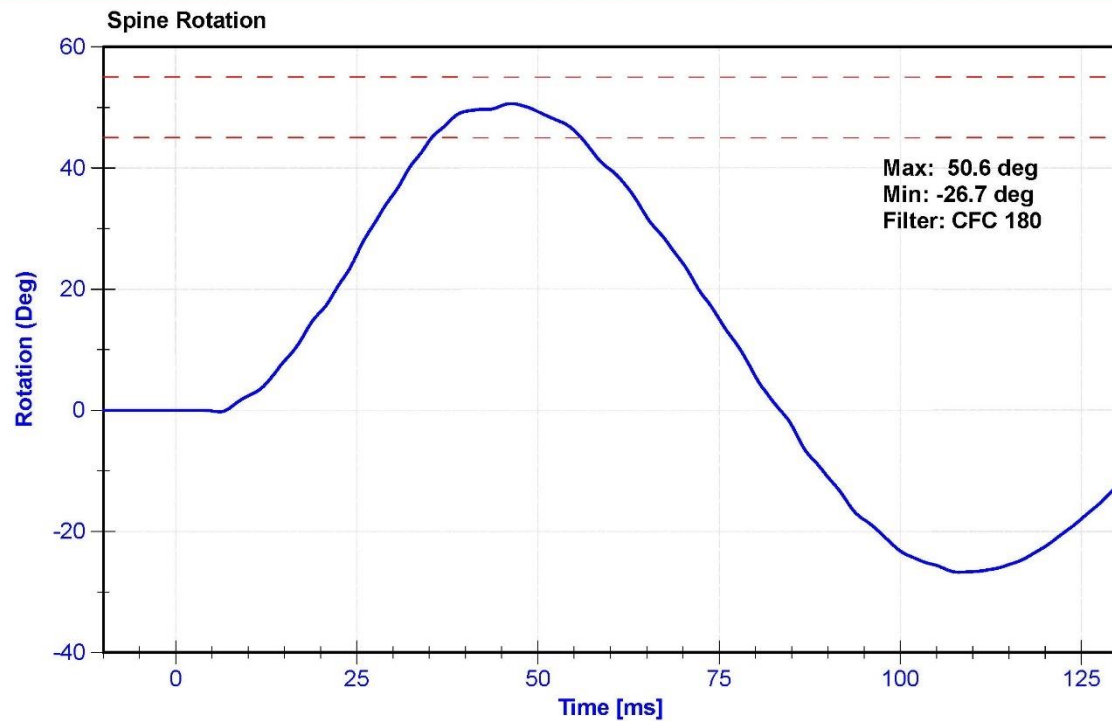
Results

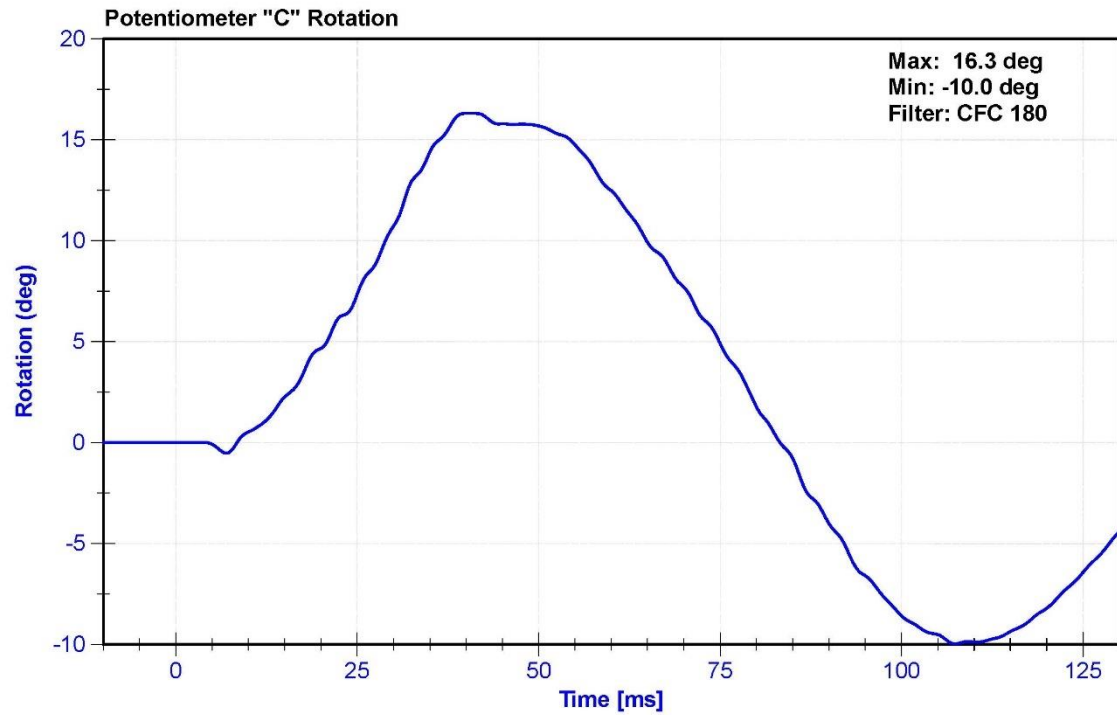
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	32.3	Pass
Velocity	5.95	6.15	m/s	6.142	Pass
Lateral Spine Rotation	45	55	deg	50.6	Pass
Time at Maximum Rotation	39	53	ms	46.3	Pass
Time of Decay to Zero Degrees	37	57	ms	37.2	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







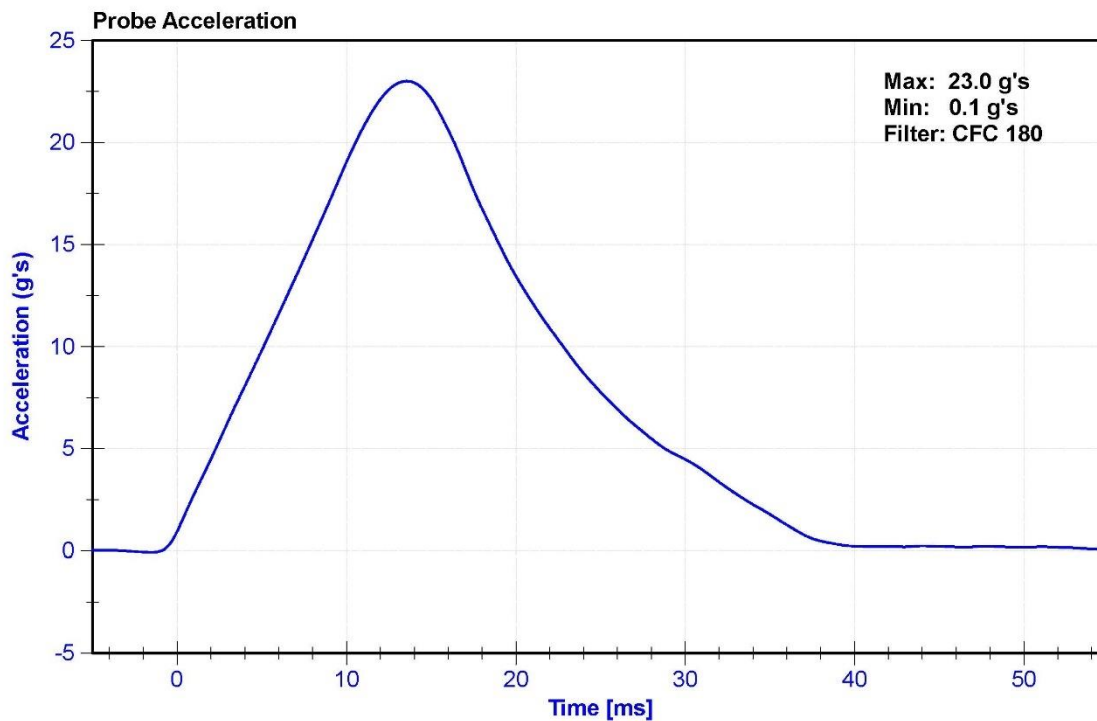
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

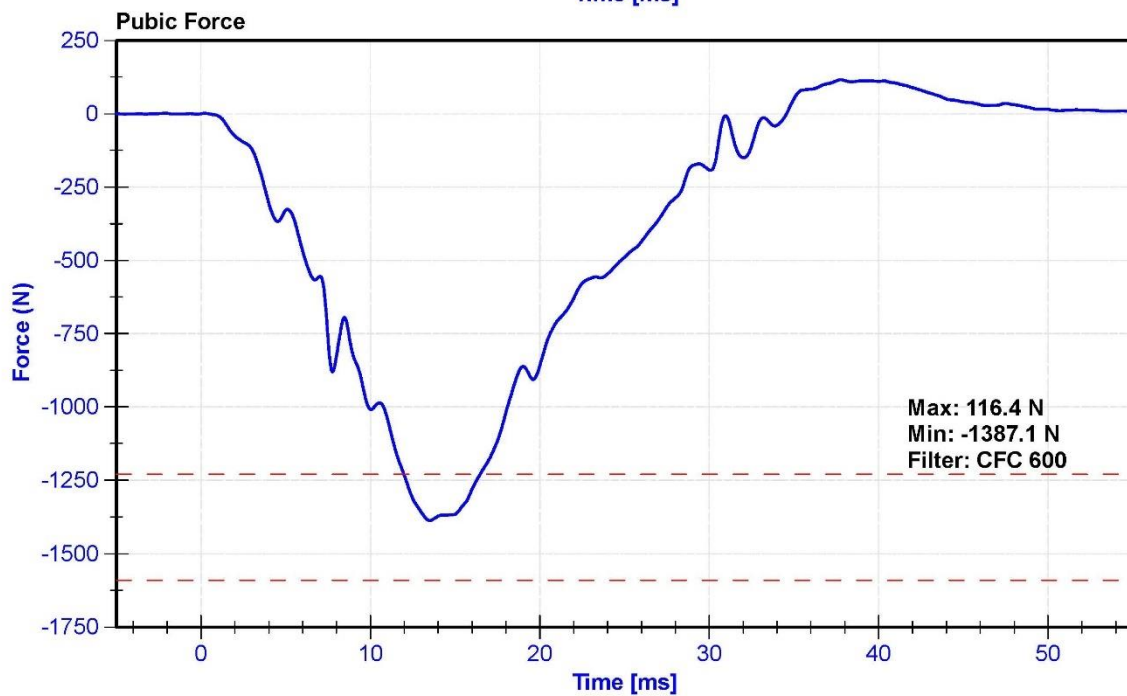
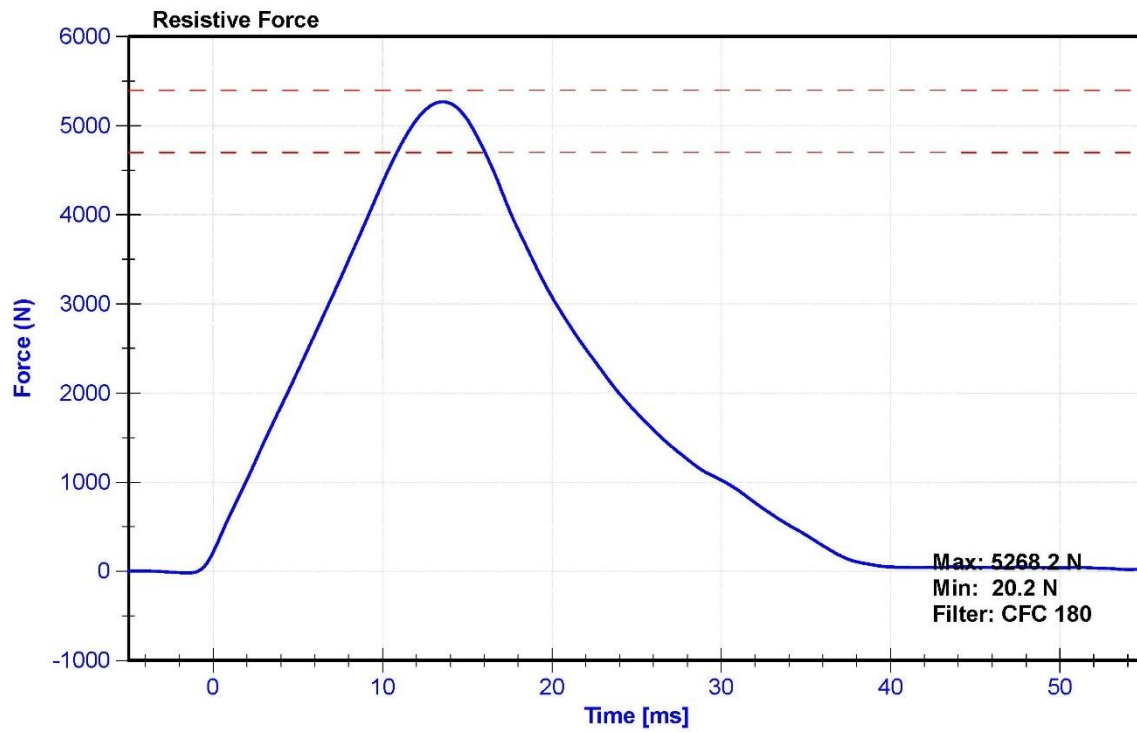
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	41.1	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Resistive Force	4700	5400	N	5268.2	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.55	Pass
Pubic Force	-1590	-1230	N	-1387.1	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.50	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Pubic Load Cell	Denton	464-FY	8/2/2021	8/2/2022





CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL No: DG8012

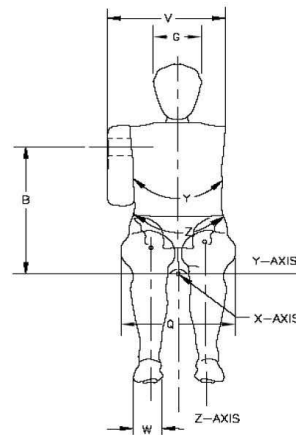
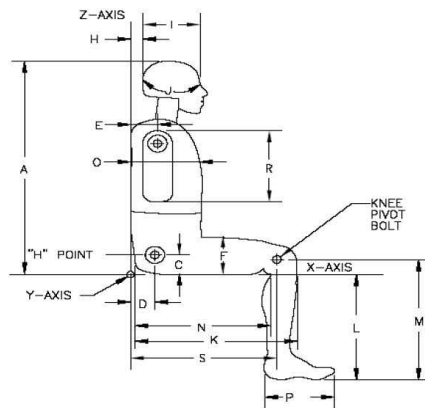


External Measurements - SID-IIs

Technician: J.Pericak

Date: 04/06/2022

Dummy Serial Number: DG8012



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	780	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	42	Pass
I	Head Depth	178	188	184	Pass
J	Head Circumference	541	551	545	Pass
K	Buttock to Knee Length	514	540	536	Pass
L	Popliteal Height	343	369	355	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	430	Pass
O	Chest Depth w/o jacket	195	211	209	Pass
P	Foot Length	216	232	225	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	320	Pass
R	Arm Length	249	259	250	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	348	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	870	Pass
Z	Waist Circumference	761	791	775	Pass

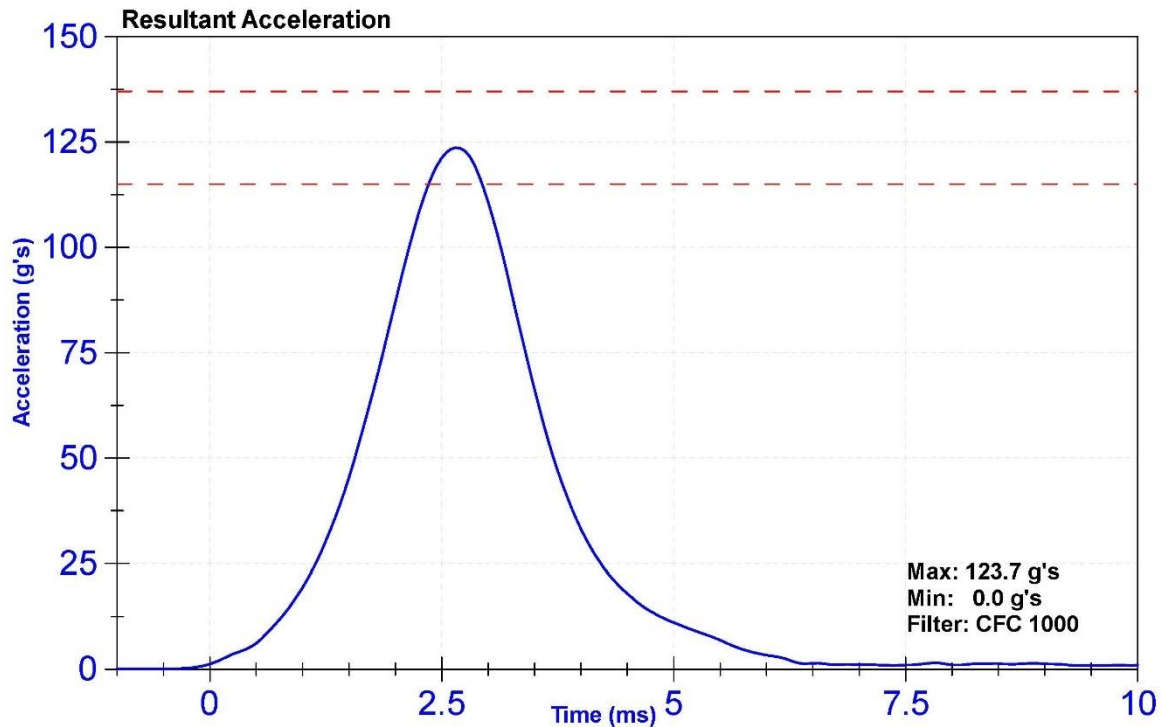
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

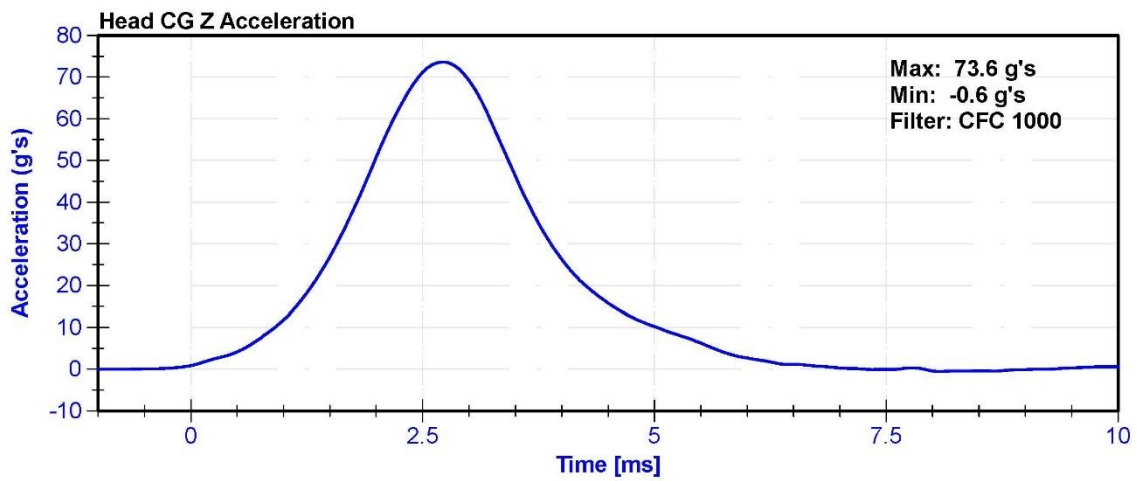
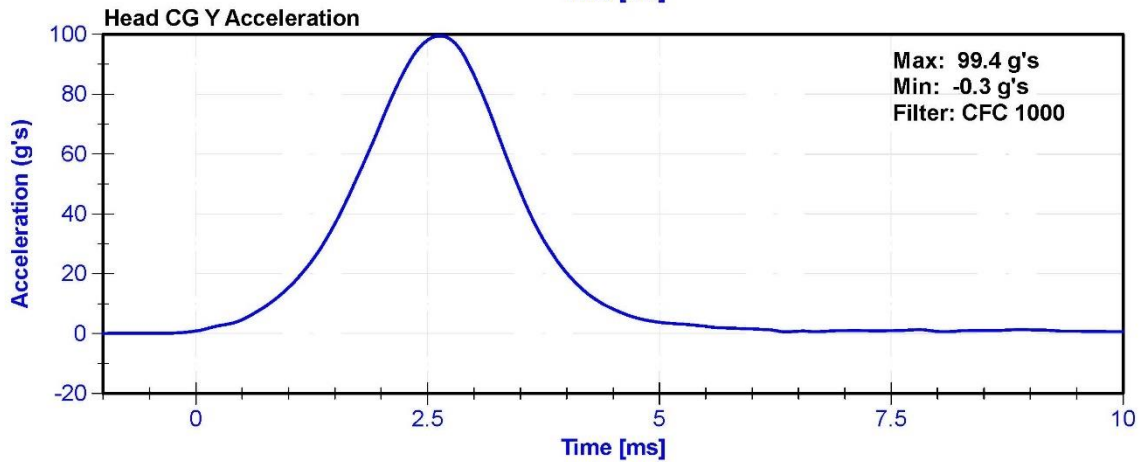
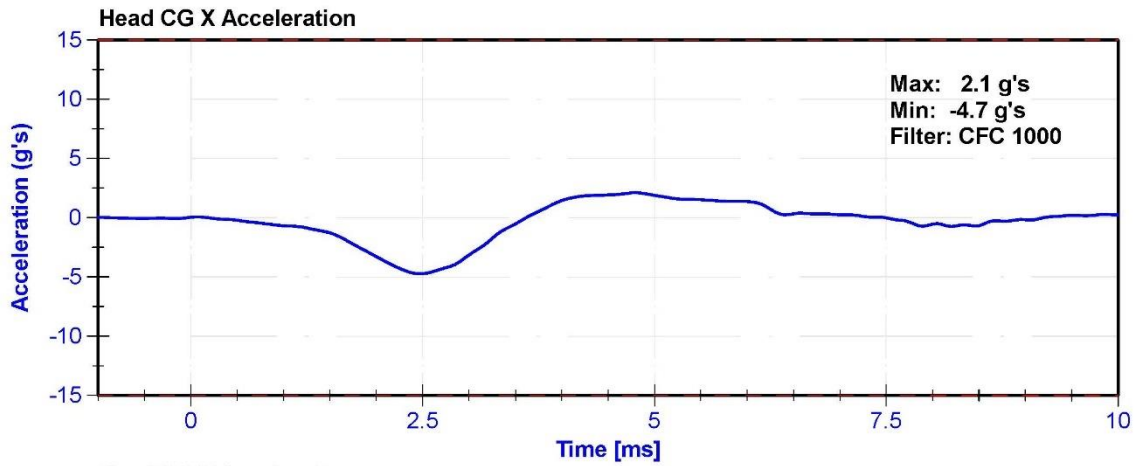
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Resultant Acceleration	115	137	g's	123.7	Pass
Oscillation	0	15	%	1.2	Pass
Fore-Aft Acceleration	-15	15	g's	-4.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P74788	1/10/2022	7/9/2022
Y Accelerometer	Endevco	P83432	1/10/2022	7/9/2022
Z Accelerometer	Endevco	P83319	1/10/2022	7/9/2022





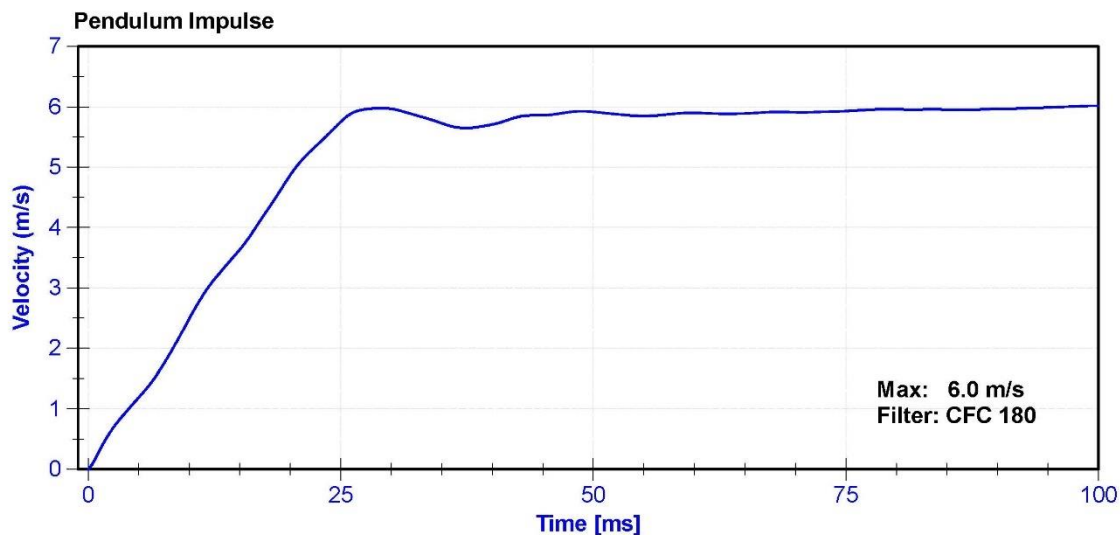
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

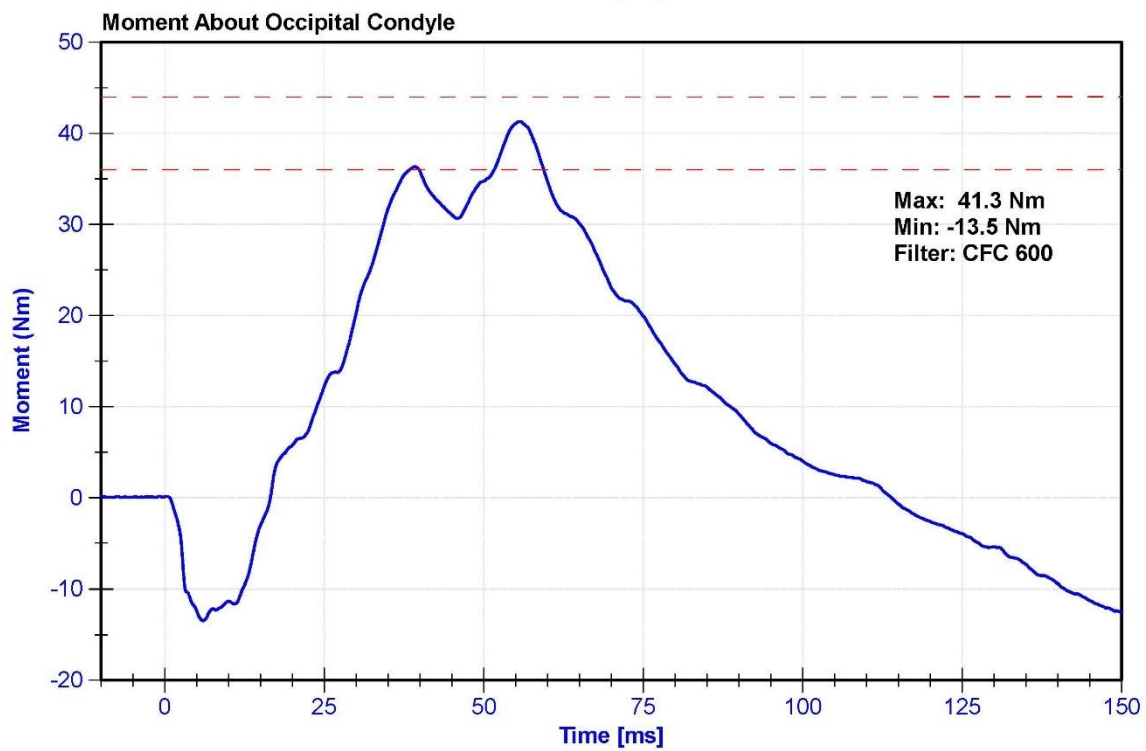
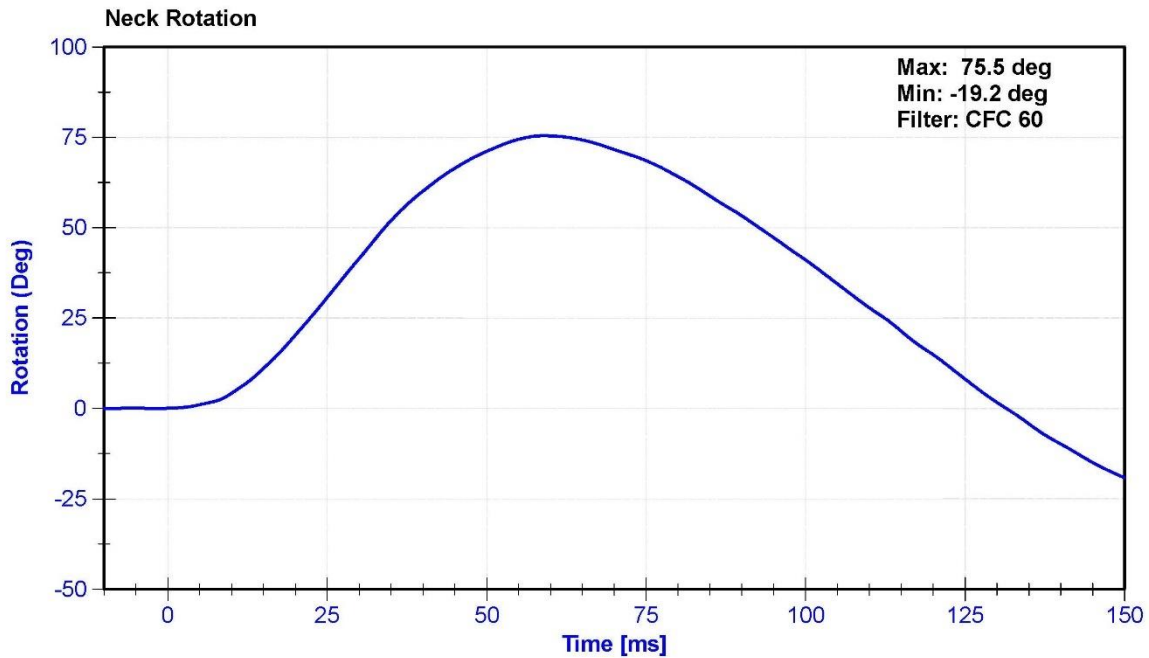
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	29	Pass
Velocity	5.51	5.63	m/s	5.595	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.49	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.63	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.87	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.75	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	6.01	Pass
Neck Rotation	71	81	deg	75.5	Pass
Time at Maximum Rotation	50	70	ms	59.0	Pass
Moment about the OC	36	44	Nm	41.3	Pass
Moment Decay to 0 Nm	102	126	ms	113.9	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				





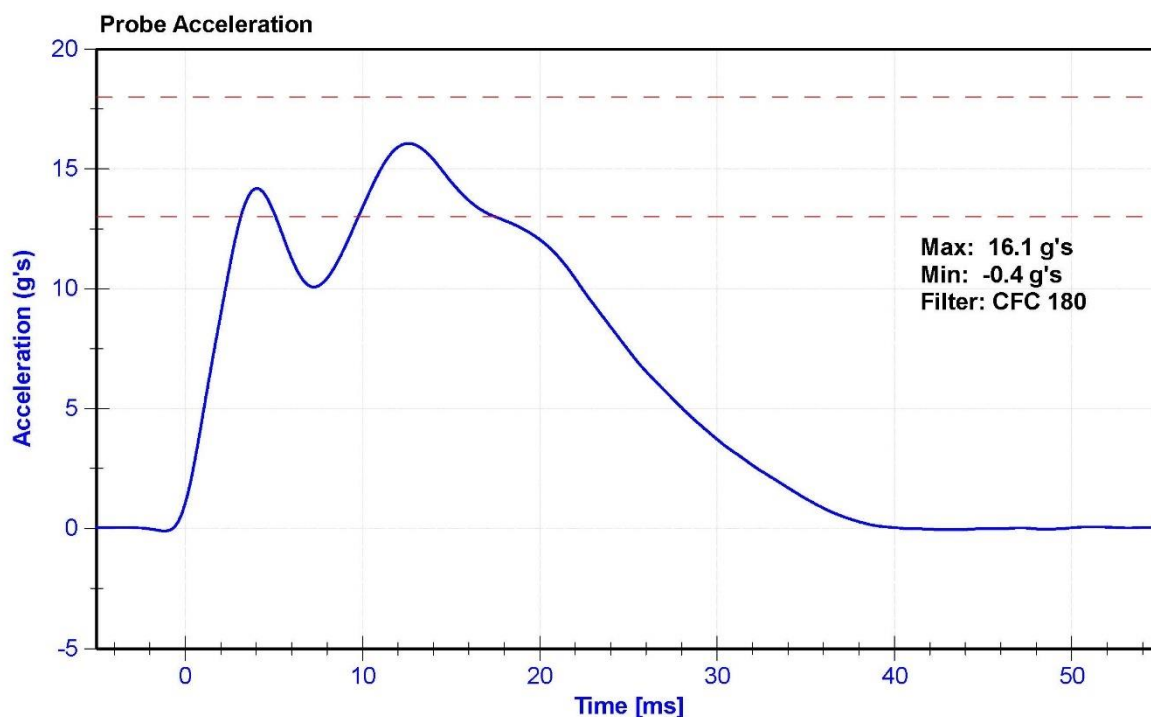
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

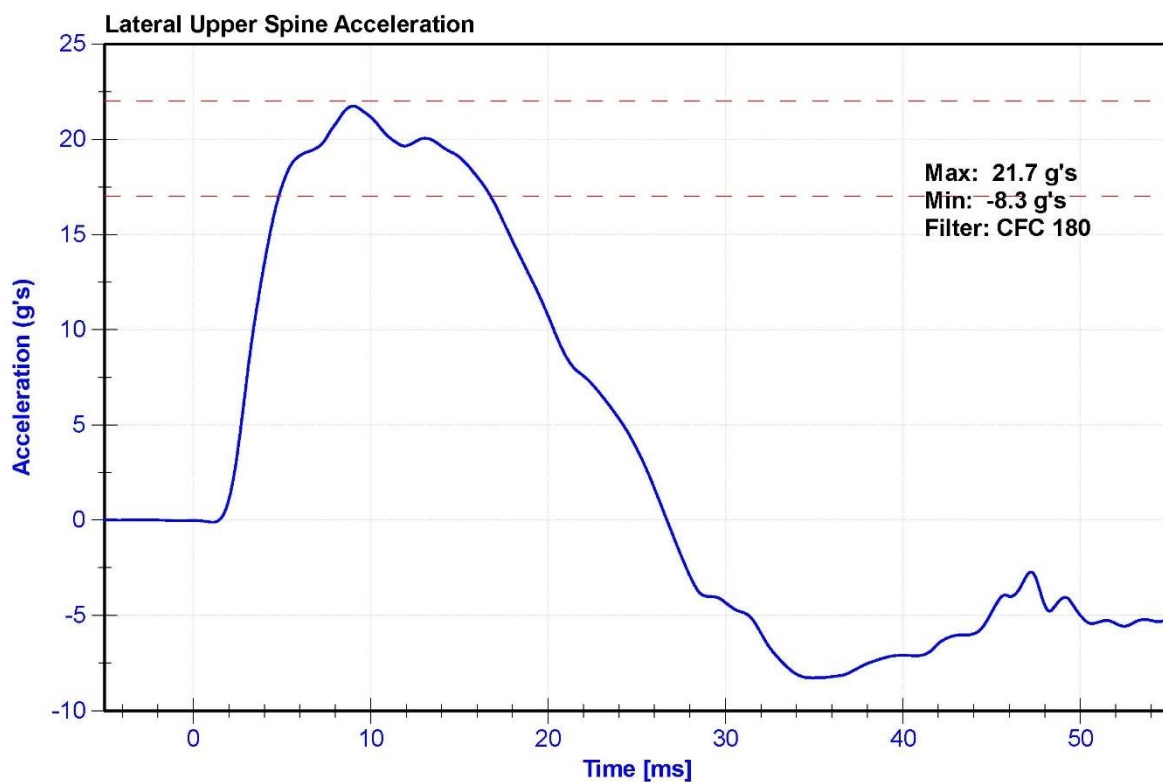
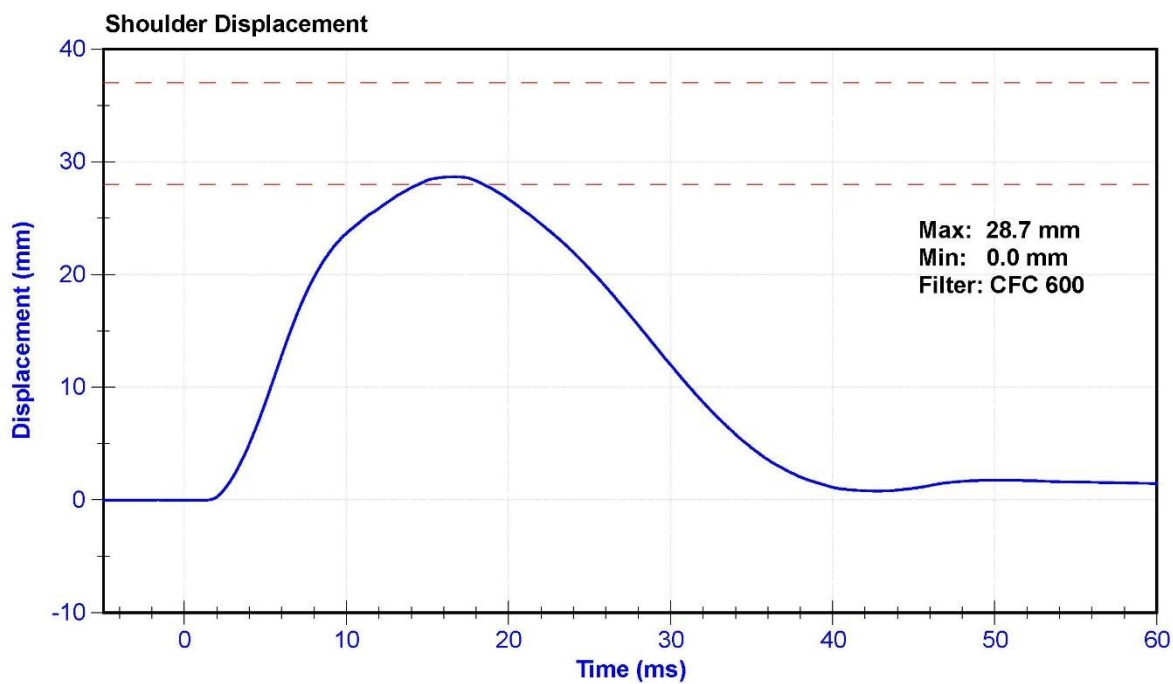
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	27.3	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	13	18	g's	16.1	Pass
Shoulder Deflection	28	37	mm	28.7	Pass
Lateral Upper Spine Acceleration	17	22	g's	21.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Shoulder Potentiometer	Servo	045GFE	1/12/2022	7/13/2022
Upper Spine Y Accelerometer	Endevco	P64148	1/10/2022	7/9/2022





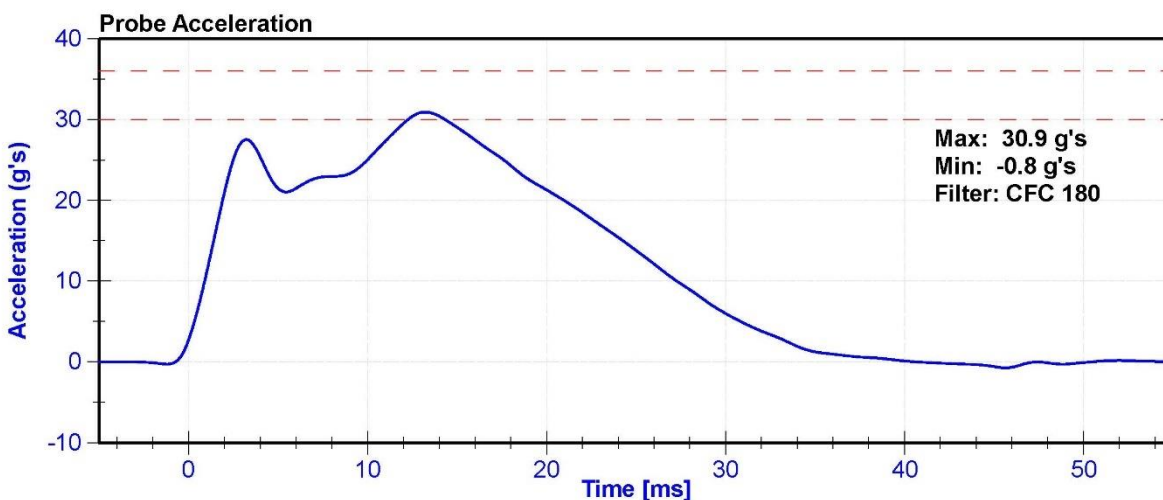
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

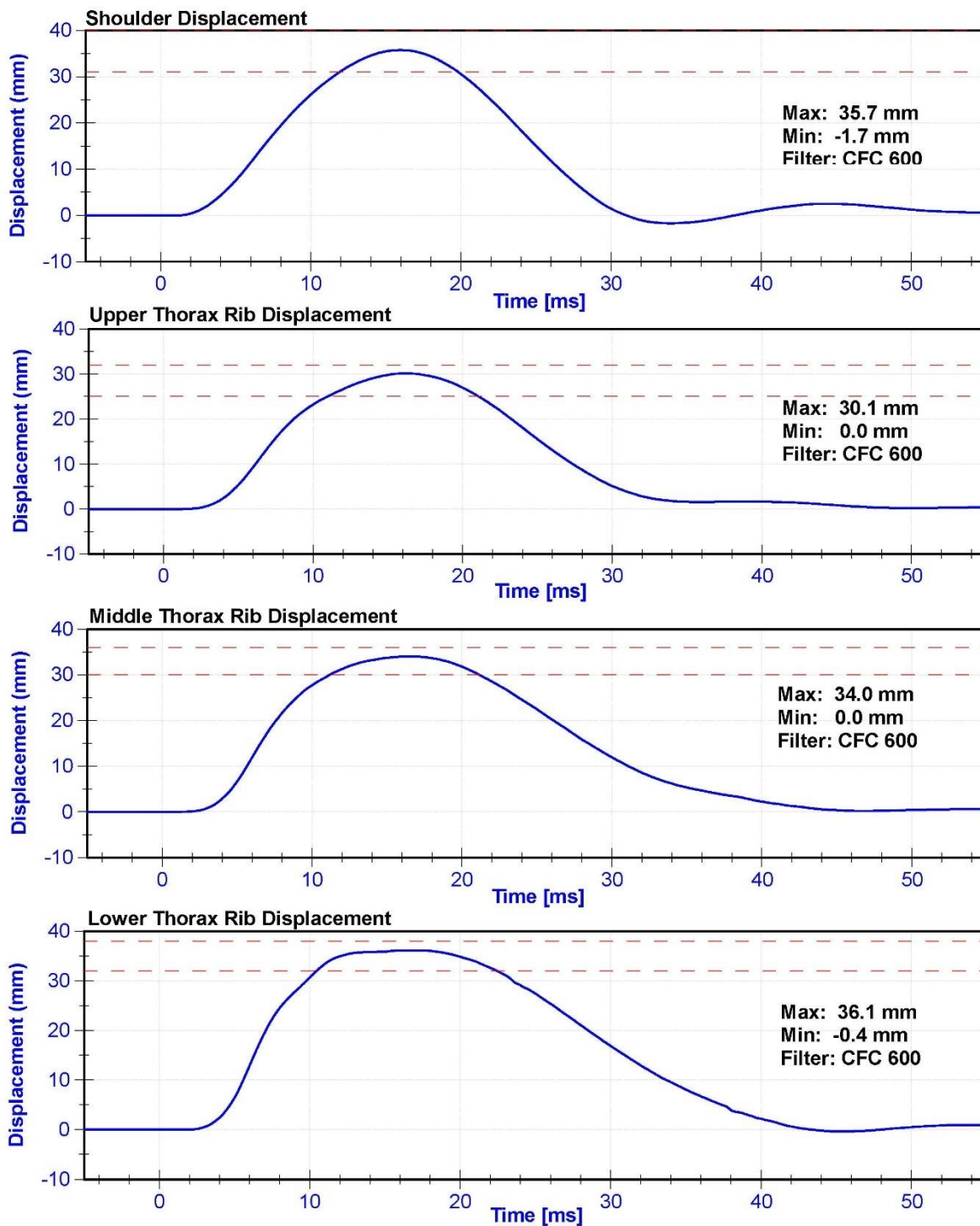
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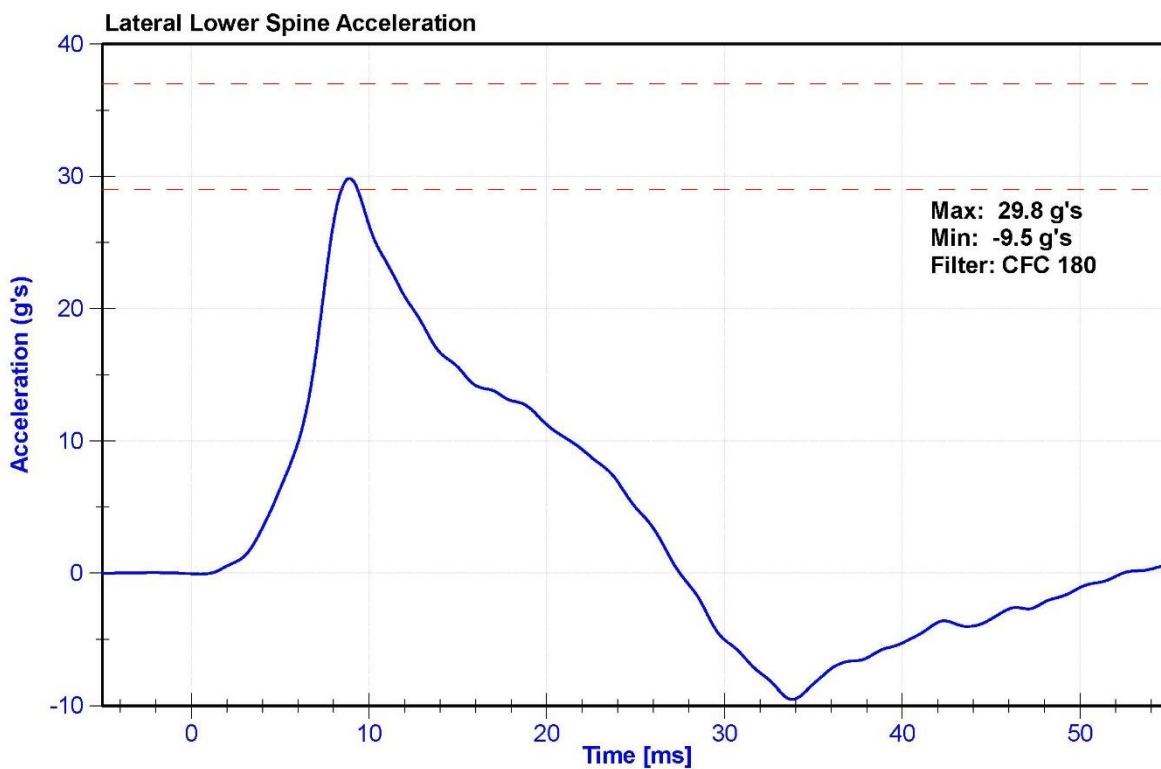
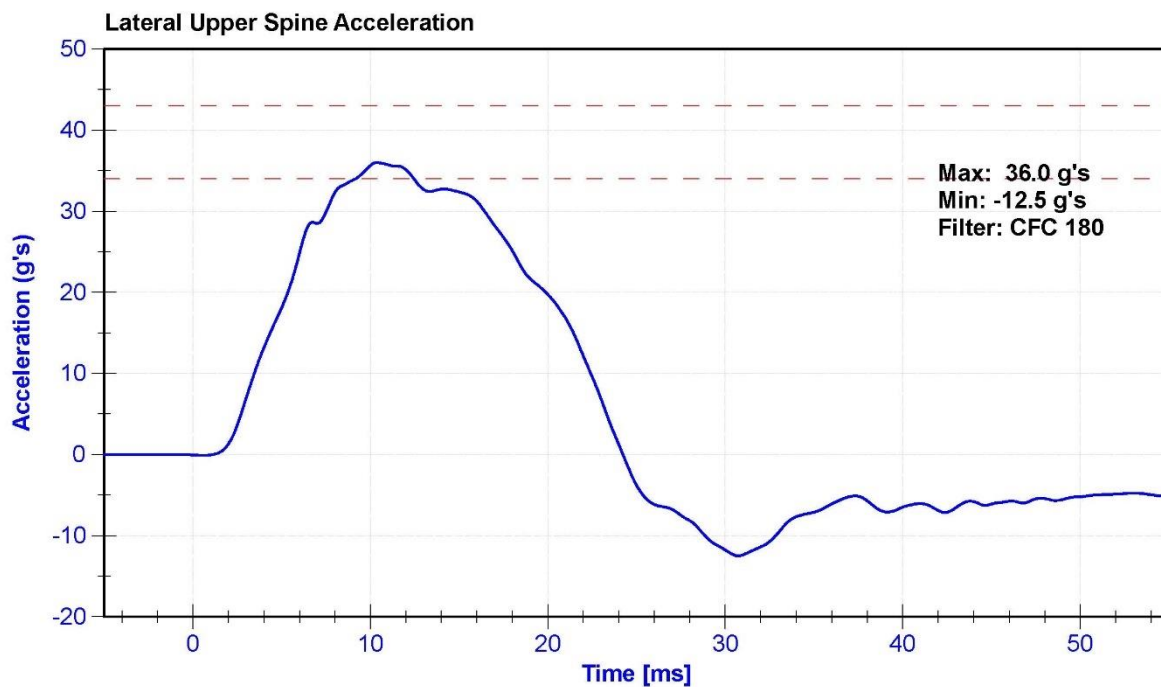
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	27.3	Pass
Velocity	6.6	6.8	m/s	6.68	Pass
Probe Acceleration after 5 ms	30	36	g's	30.9	Pass
Lateral Upper Spine Acceleration	34	43	g's	36.0	Pass
Lateral Lower Spine Acceleration	29	37	g's	29.8	Pass
Shoulder Deflection	31	40	mm	35.7	Pass
Upper Thorax Rib Deflection	25	32	mm	30.1	Pass
Mid Thorax Rib Deflection	30	36	mm	34.0	Pass
Lower Thorax Rib Deflection	32	38	mm	36.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Upper Spine T1 Y Accelerometer	Endevco	P64148	1/10/2022	7/9/2022
Upper Spine T12 Y Accelerometer	Endevco	P51327	1/10/2022	7/9/2022
Shoulder Potentiometer	Servo	045GFE	1/12/2022	7/13/2022
Upper Thorax Rib Potentiometer	Servo	1199GFE	1/12/2022	7/13/2022
Middle Thorax Rib Potentiometer	Servo	1246GFE	1/13/2022	7/14/2022
Lower Thorax Rib Potentiometer	Servo	011GFE	1/12/2022	7/13/2022







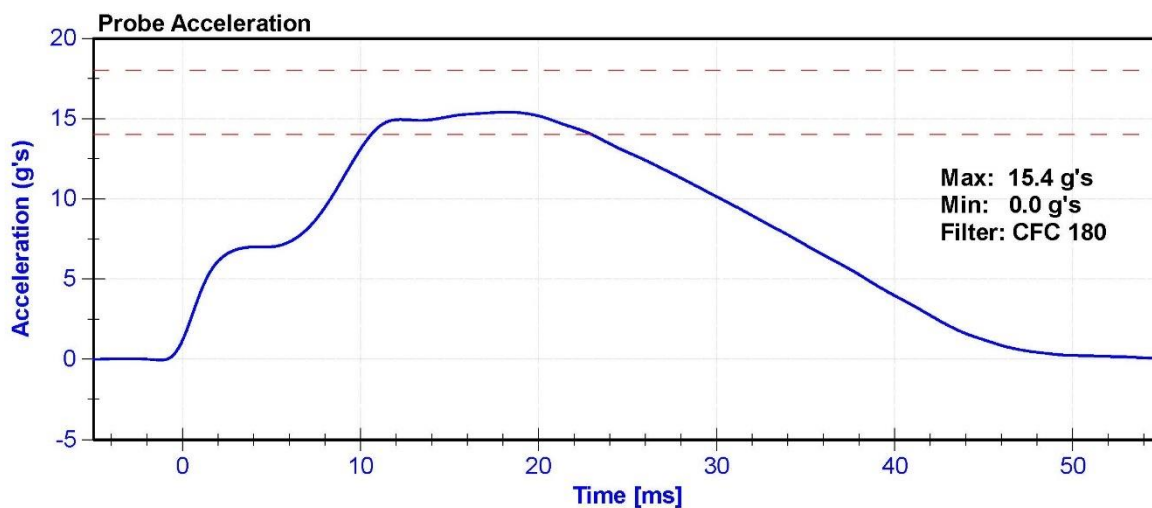
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

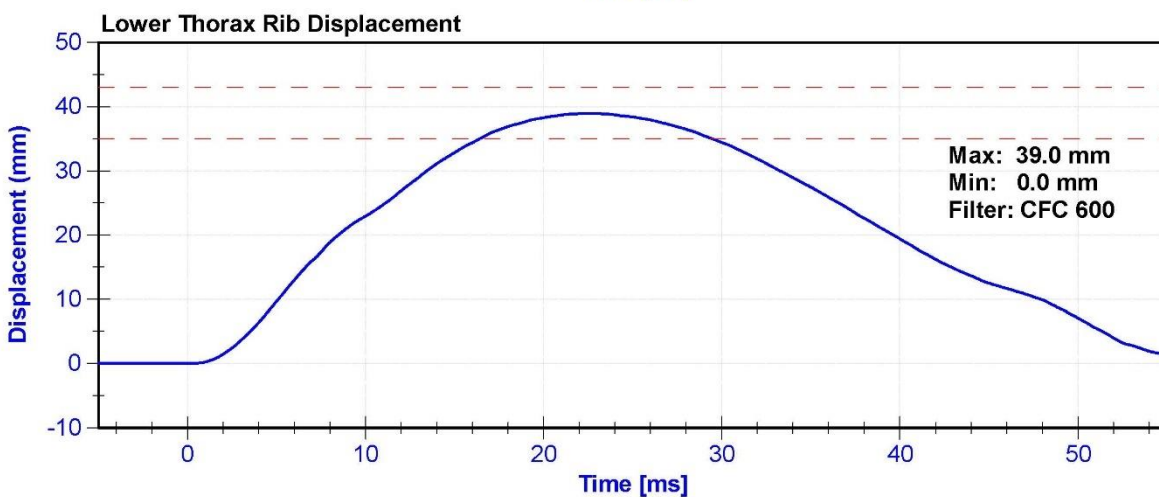
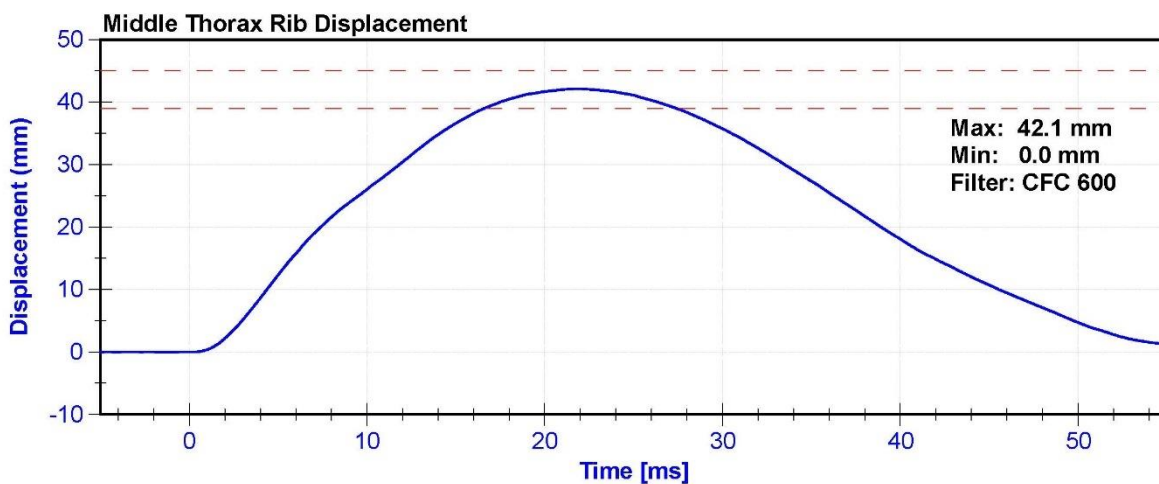
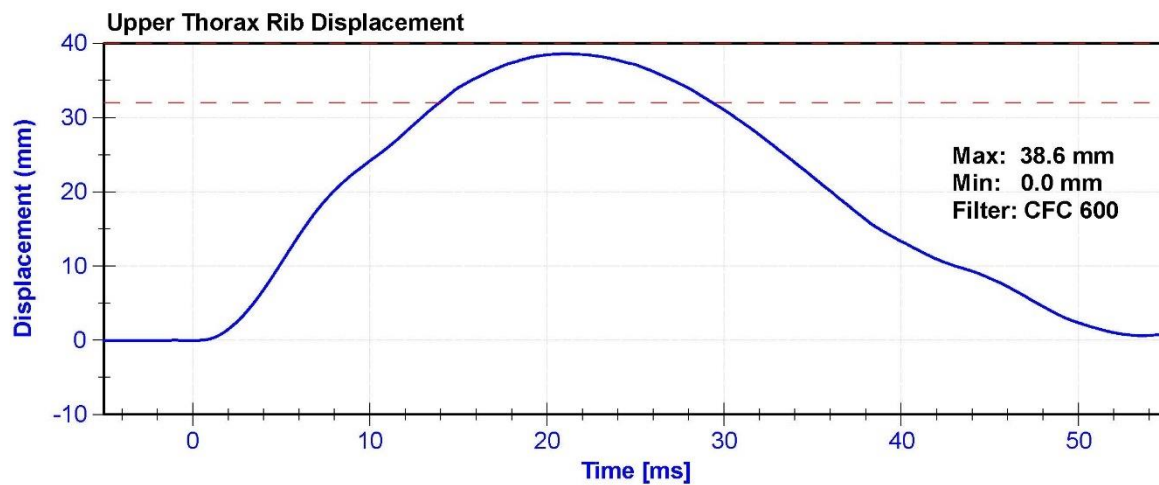
Results

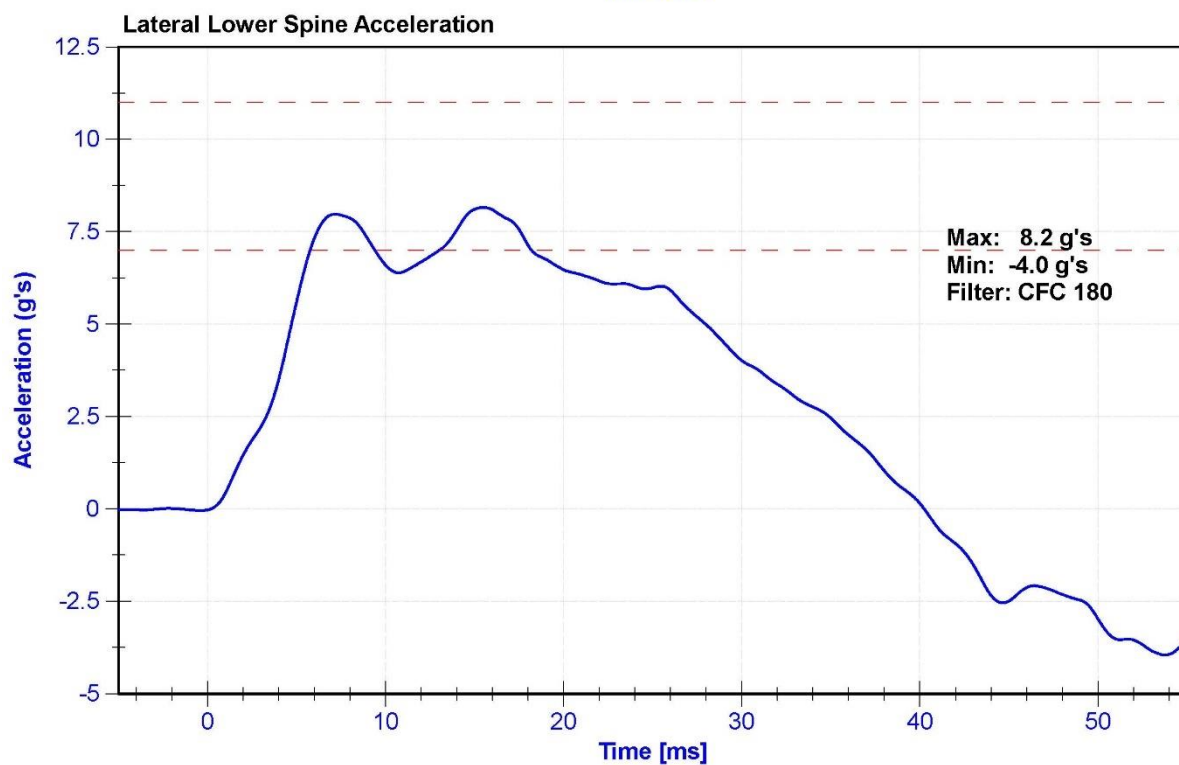
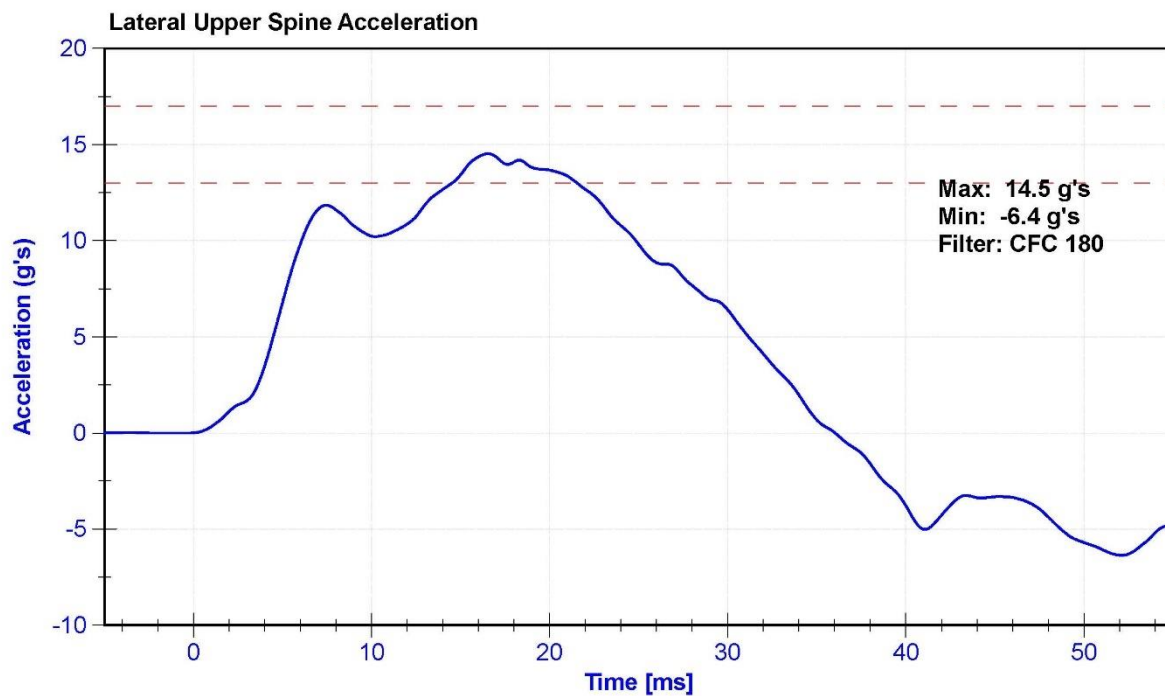
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	27.3	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	14	18	g's	15.4	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.5	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.2	Pass
Upper Thorax Rib Deflection	32	40	mm	38.6	Pass
Middle Thorax Rib Deflection	39	45	mm	42.1	Pass
Lower Thorax Rib Deflection	35	43	mm	39.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Upper Spine Y Accelerometer	Endevco	P64148	1/10/2022	7/9/2022
Lower Spine Y Accelerometer	Endevco	P51327	1/10/2022	7/9/2022
Upper Thorax Rib Potentiometer	Servo	1199GFE	1/12/2022	7/13/2022
Middle Thorax Rib Potentiometer	Servo	1246GFE	1/13/2022	7/14/2022
Lower Thorax Rib Potentiometer	Servo	011GFE	1/12/2022	7/13/2022







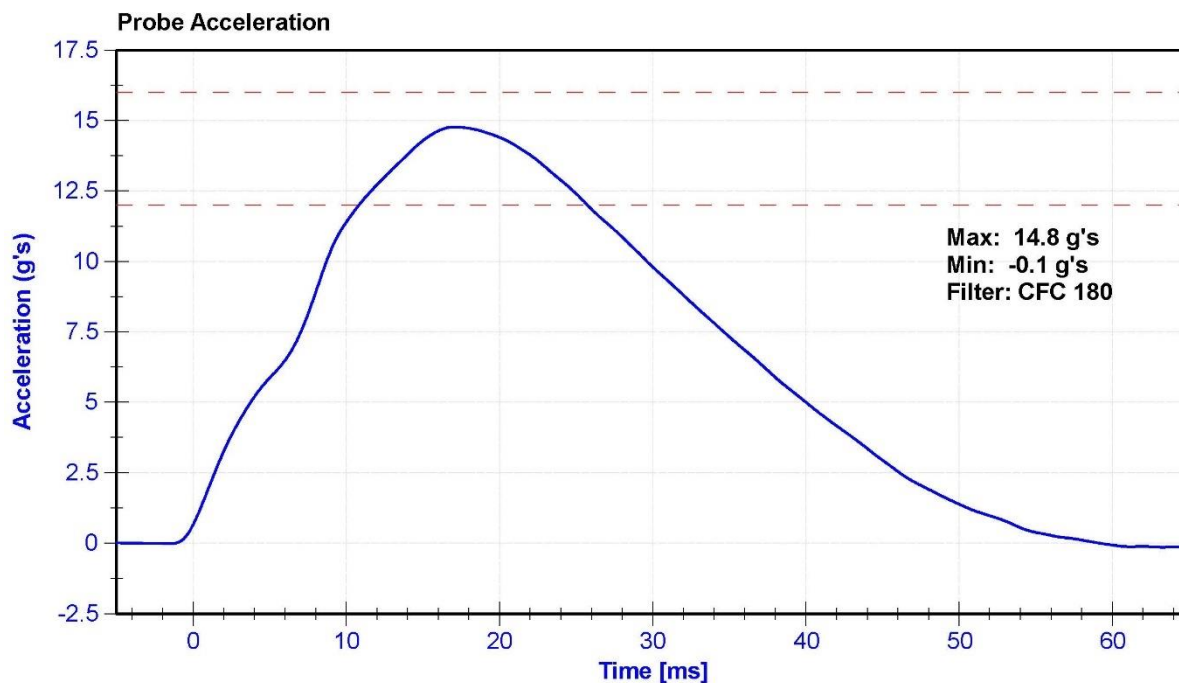
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

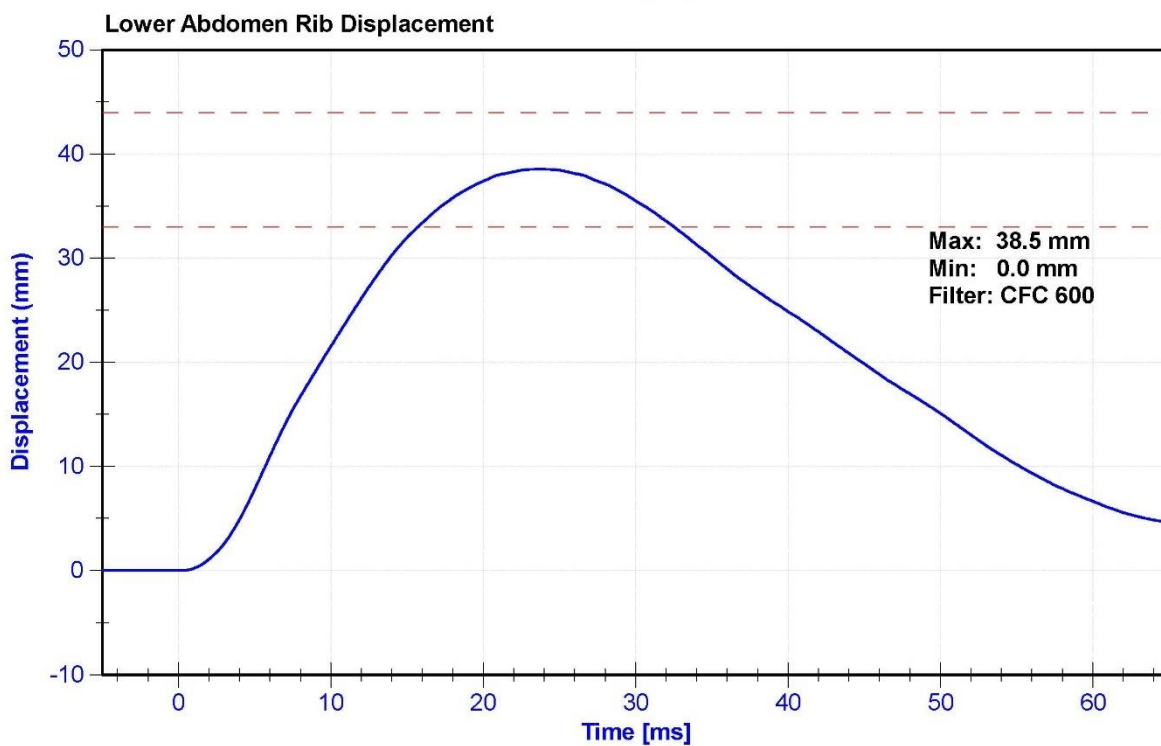
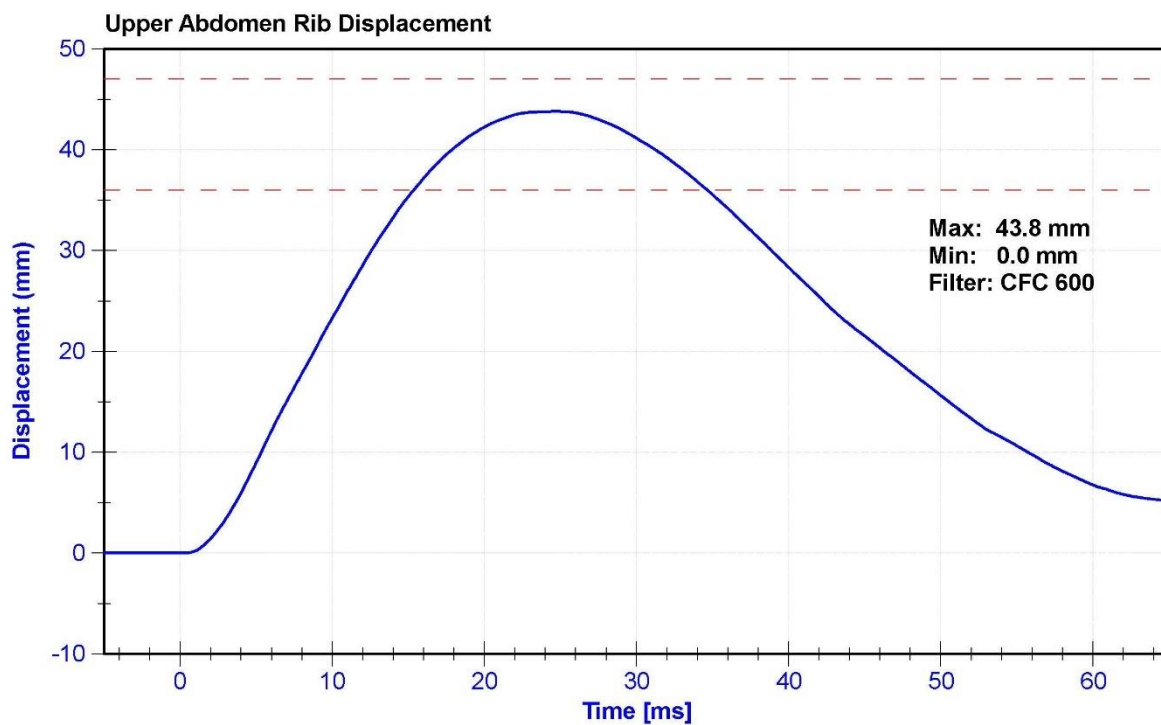
Results

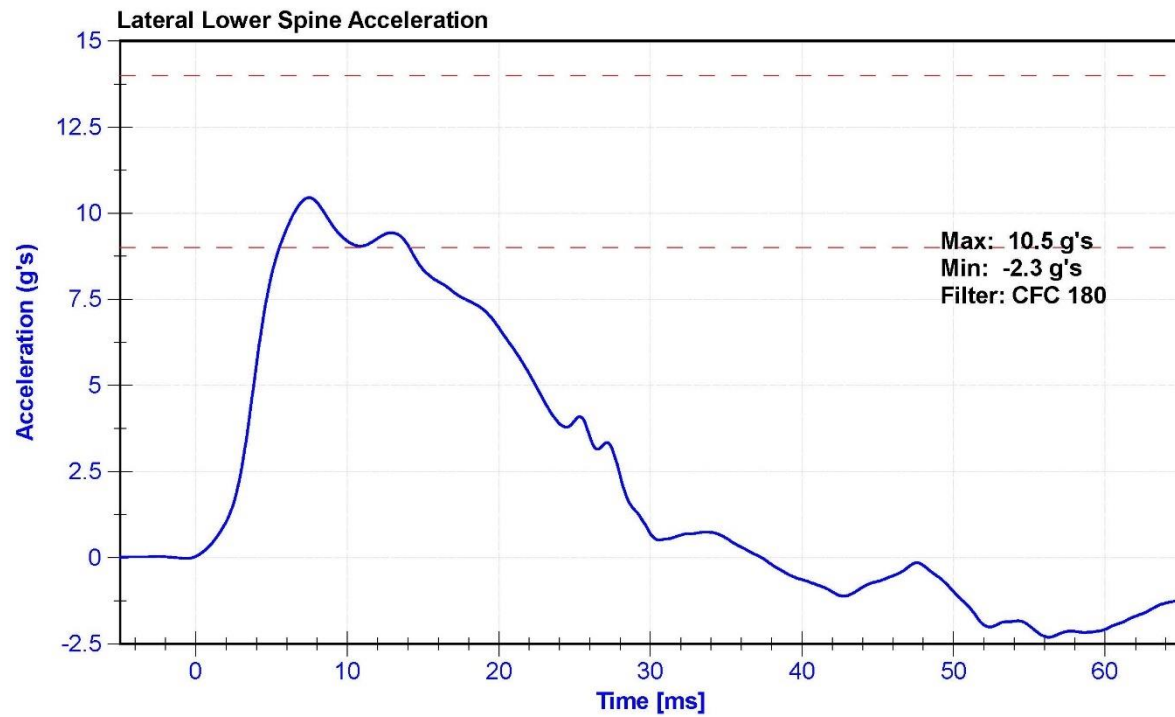
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	27.3	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	12	16	g's	14.8	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.5	Pass
Upper Abdomen Rib Deflection	36	47	mm	43.8	Pass
Lower Abdomen Rib Deflection	33	44	mm	38.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Lower Spine Y Accelerometer	Endevco	P51327	1/10/2022	7/9/2022
Upper Abdomen Rib Potentiometer	Servo	008GFE	1/12/2022	7/13/2022
Lower Abdomen Rib Potentiometer	Servo	041 GFE	1/12/2022	7/13/2022







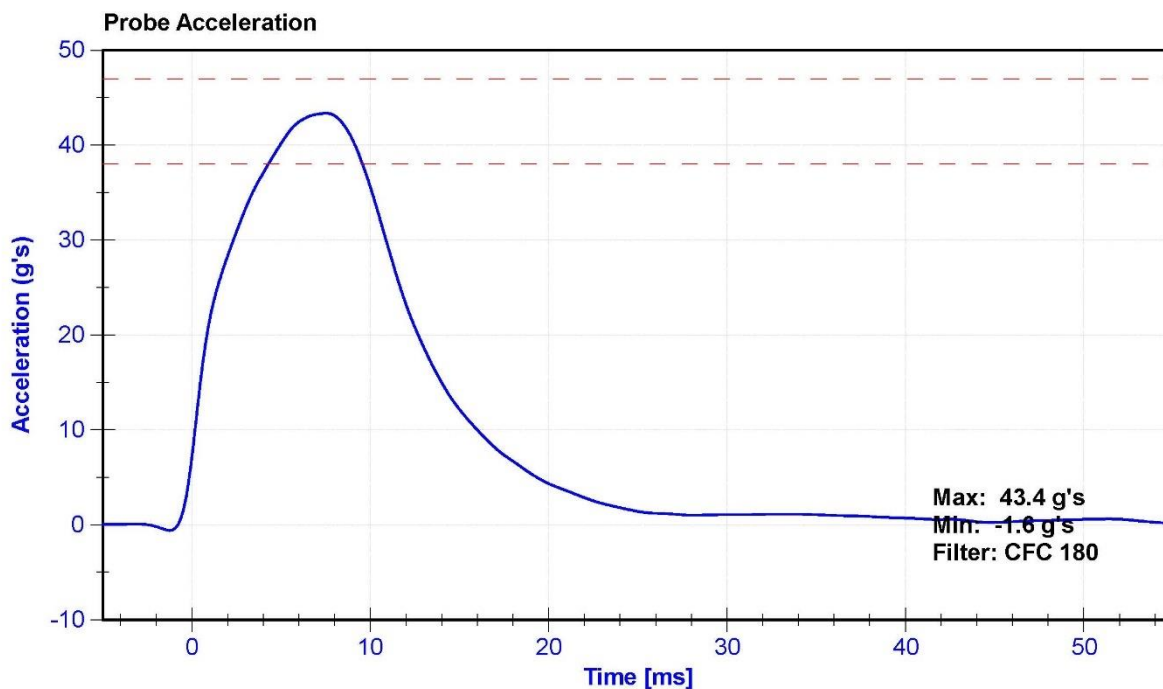
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

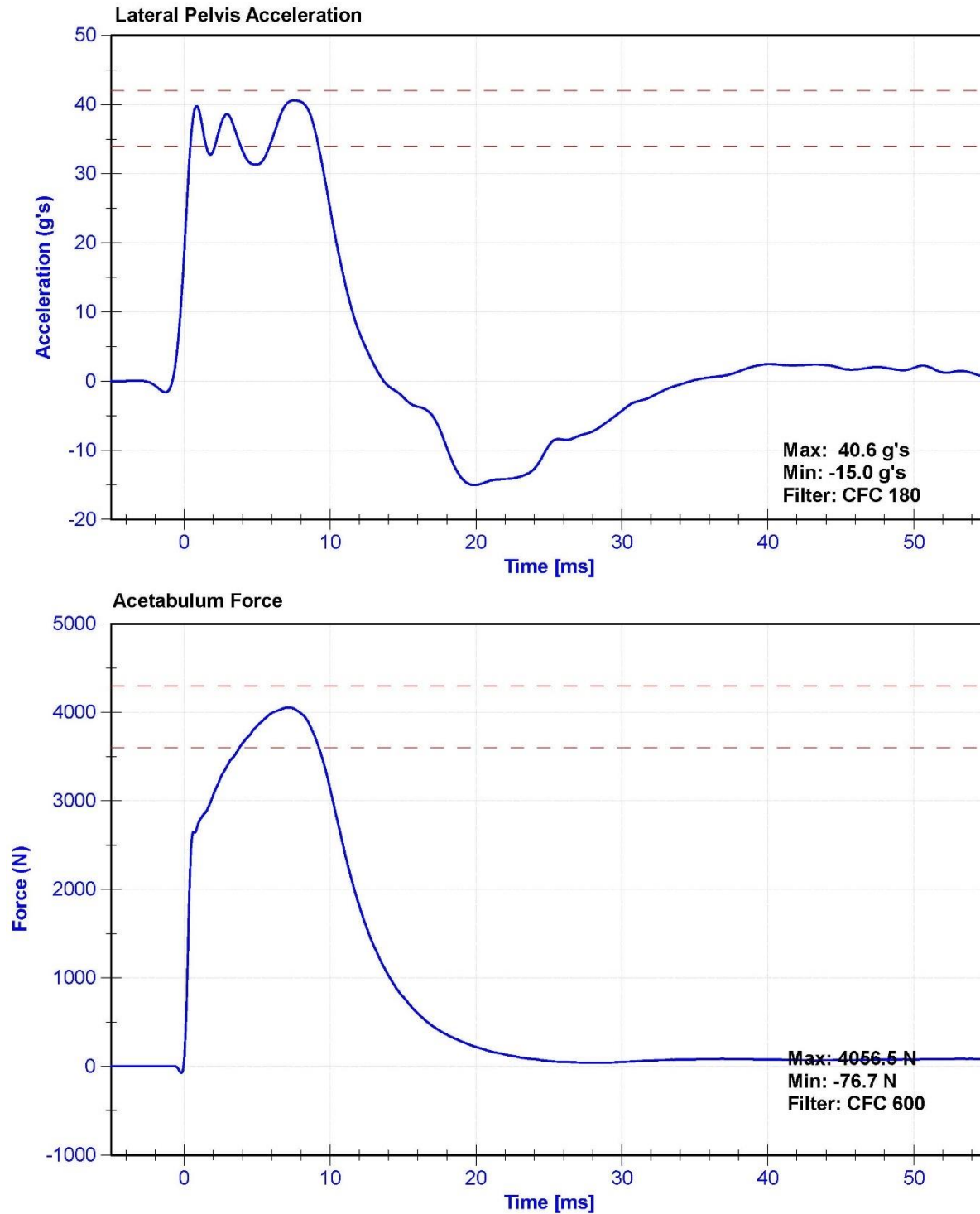
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	27.3	Pass
Velocity	6.6	6.8	m/s	6.61	Pass
Probe Acceleration	38	47	g's	43.4	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	40.6	Pass
Acetabulum Force	3600	4300	N	4056.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Pelvis Y Accelerometer	Endevco	P51875	1/10/2022	7/9/2022
Acetabulum Load Cell	Denton	276-FY	9/14/2021	9/14/2022
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A







DC-2012
cert
4-4-22

SID-lls Pelvis Plug Certification Test

Plug S/N 14063

Test Number 13537

Report Number 13582

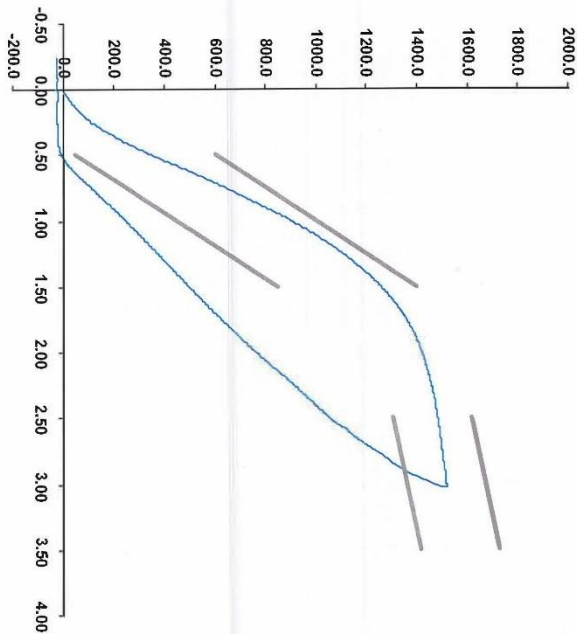
Test Date 5/25/2020 11:19:31 AM

Force (-N) vs Extension (-mm)

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

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator 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



Dog sled
Crash
4-4-22

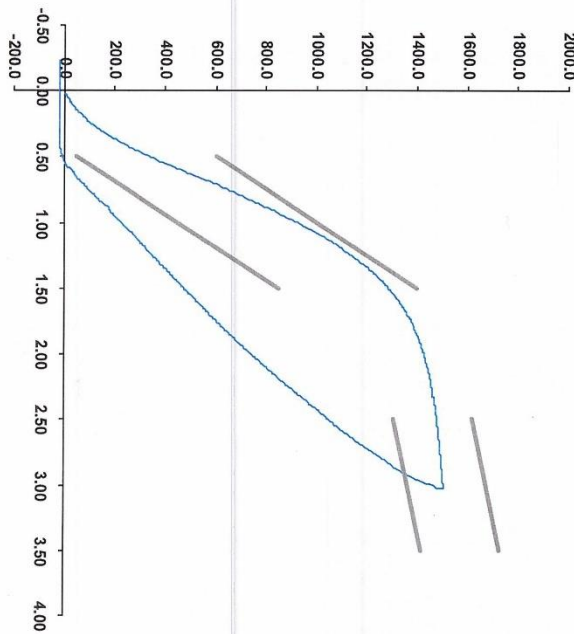
SID-11s Pelvis Plug Certification Test

Plug S/N 13831
Test Number 13292
Report Number 13337
Test Date 5/15/2020 11:31:02 AM

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

Testing Machine STM-20 5965542
Load Cell S/N (F1350947), Units (LBS) 1000
Crosshead Speed (mm/min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator DC	
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



SID-11s Pelvis Plug Certification Test

Plug S/N 13025

Test Number 10344

Report Number 10379

Test Date 7/30/2019 12:52:12 PM

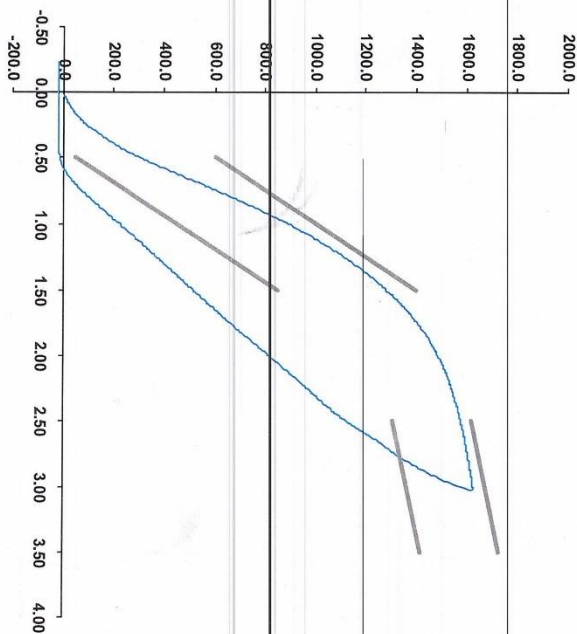
Force (-N) vs Extension (-mm)

DG-86012
Nontimp
4-6-22

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

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm/min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator

Part Number 180-4450

Template No 107 08-Jul-21
SACO Research

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

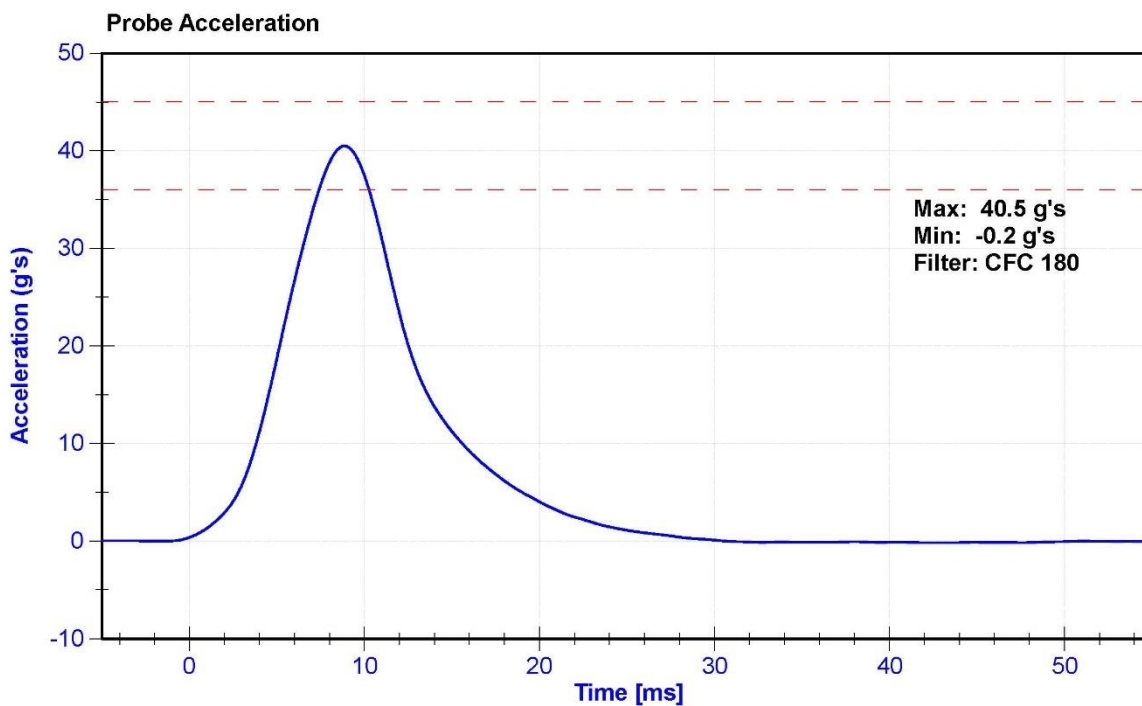
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

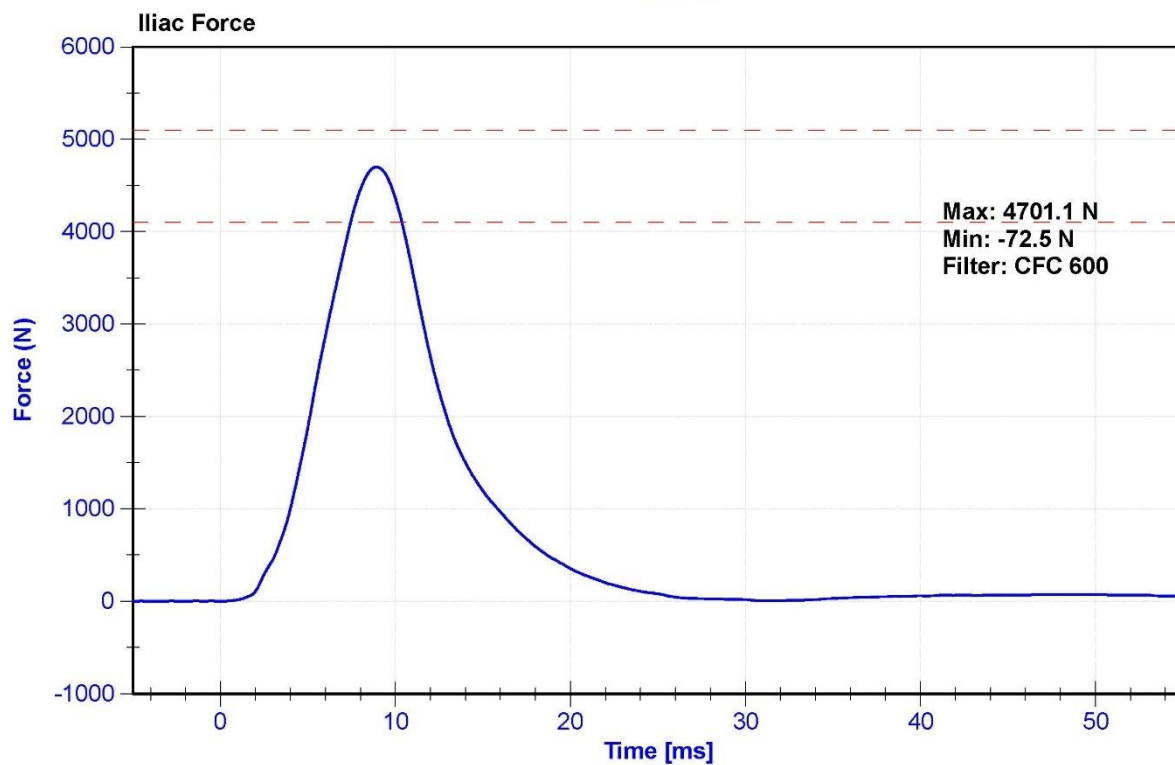
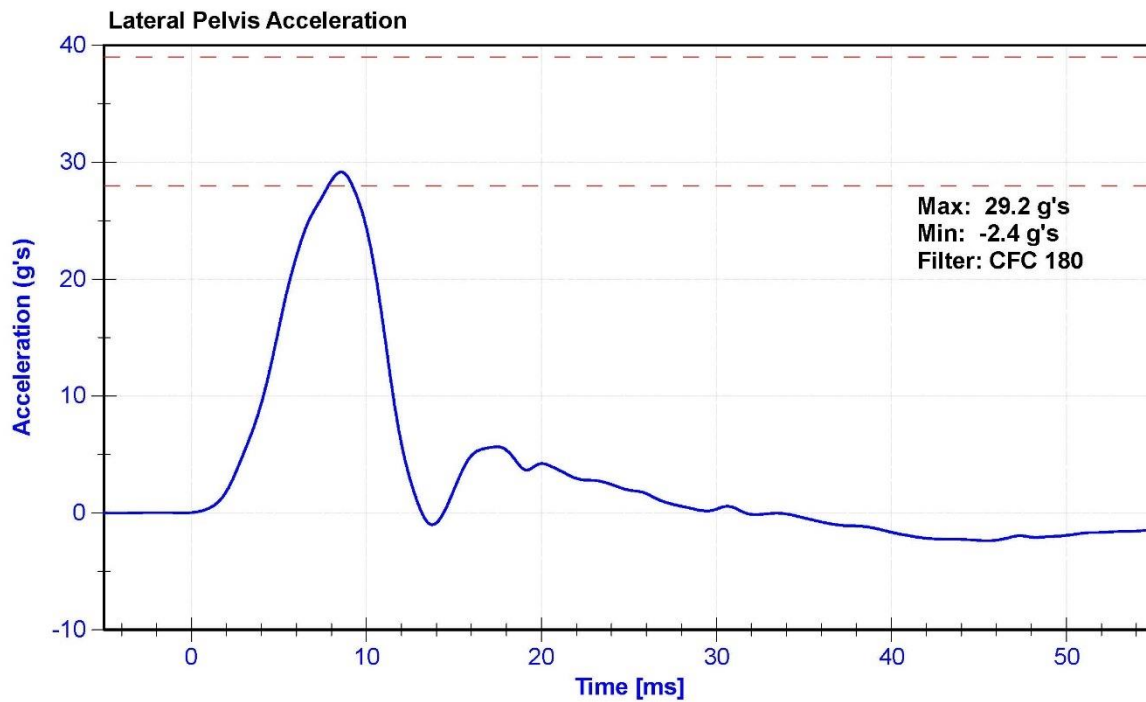
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	27.3	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	36	45	g's	40.5	Pass
Lateral Pelvis Acceleration	28	39	g's	29.2	Pass
Iliac Force	4100	5100	N	4701.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Pelvis Y Accelerometer	Endevco	P51875	1/10/2022	7/9/2022
Iliac Load Cell	Denton	290-FY	9/14/2021	9/14/2022





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: DG8012		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	P74788	Endevco	1/10/2022
			Y	P83432	Endevco	1/10/2022
			Z	P83319	Endevco	1/10/2022
		Redundant	X	P80334	Endevco	1/10/2022
			Y	P52155	Endevco	1/10/2022
			Z	P83322	Endevco	1/10/2022
Displacement Potentiometers	Thoracic Rib	Upper	Y	1199GFE	Servo	1/12/2022
		Middle	Y	1246GFE	Servo	1/13/2022
		Lower	Y	011GFE	Servo	1/12/2022
	Abdominal Rib	Upper	Y	008GFE	Servo	1/12/2022
		Lower	Y	041 GFE	Servo	1/12/2022
Lower Spine Accelerometers (T12)			X	P71272	Endevco	1/10/2022
			Y	P51327	Endevco	1/10/2022
			Z	P52067	Endevco	1/10/2022
Acetabulum Load Cell			Y	276-FY	Denton	9/14/2021
Iliac Wing Load Cell			Y	290-FY	Denton	9/14/2021
Pelvis Plug (struck side)				13128	SACO	8/5/2019
Pelvis Plug (non-struck side)				13070	SACO	7/30/2019

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	A315118	Measurement Specialties	3/9/2022
	Vehicle Center of Gravity	Y	A336634	Measurement Specialties	3/11/2022
	Vehicle Center of Gravity	Z	A350976	Measurement Specialties	3/11/2022
2	Right Sill at Front Seat	X	A398291	Measurement Specialties	3/11/2022
	Right Sill at Front Seat	Y	A398300	Measurement Specialties	3/11/2022
	Right Sill at Front Seat	Z	A398305	Measurement Specialties	3/11/2022
3	Right Sill at Rear Seat	X	A300131	Measurement Specialties	3/10/2022
	Right Sill at Rear Seat	Y	A301883	Measurement Specialties	3/10/2022
	Right Sill at Rear Seat	Z	A335432	Measurement Specialties	3/10/2022
4	Left Sill at Front Door	Y	A274250	Measurement Specialties	12/14/2021
5	Left Sill at Rear Door	Y	A405587	Measurement Specialties	10/5/2021
6	Left A-Post Lower	Y	A405537	Measurement Specialties	10/4/2021
7	Left A-Post Middle	Y	A398667	Measurement Specialties	12/28/2021
8	Left B-Post Lower	Y	A405564	Measurement Specialties	10/5/2021
9	Left B-Post Middle	Y	A400014	Measurement Specialties	2/4/2022
10	Front Seat Track	Y	A398297	Measurement Specialties	2/17/2022
11	Rear Seat Track or Structure	Y	A398293	Measurement Specialties	2/17/2022
12	Right Rear Occ. Compartment	Y	A405568	Measurement Specialties	10/5/2021
13	Engine Block	X	A280956	Measurement Specialties	12/29/2021
	Engine Block	Y	A281038	Measurement Specialties	12/29/2021
14	Rear Floorpan Above Axle	X	A315082	Measurement Specialties	3/9/2022
	Rear Floorpan Above Axle	Y	A374270	Measurement Specialties	3/9/2022
	Rear Floorpan Above Axle	Z	A374367	Measurement Specialties	3/9/2022

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	A336631	Measurement Specialties	12/29/2021
MDB Center of Gravity	Y	A352417	Measurement Specialties	12/29/2021
MDB Center of Gravity	Z	A352418	Measurement Specialties	12/29/2021
Left Frame at Rear Axle Centerline	X	A315961	Measurement Specialties	12/30/2021
Left Frame at Rear Axle Centerline	Y	A398329	Measurement Specialties	12/30/2021