REPORT NUMBER: SINCAP-CAL-20-005

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

Hyundai Motor Company
2021 Genesis GV80
5-door SUV

NHTSA No: O20214217

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

July 6, 2021

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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Prepared by: Matthew Pronko Date: July 6, 2021
Matthew Pronko, Test Engineer

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Vanessa Hansen, Operations Program Manager

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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4. Title and Subtitle Final Report of New Car Assessment Program Side Impact MDB Testing of a 2021 Genesis GV80 5-door SUV NHTSA No.: O20214217		***5. Report Date*** July 6, 2021 ***6. Performing Organization Code*** CAL
7. Author(s) Matthew Pronko, Test Engineer Vanessa Hansen, Operations Program Manager		***8. Performing Organization Report No.*** CAL-DOT-2021-005
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225		***10. Work Unit No.*** ***11. Contract or Grant No.*** DTNH22-14-D-00352
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave., SE, Room W43-410 Washington, D.C. 20590		***13. Type of Report and Period Covered:*** Final Test Report February 11, 2021 - July 6, 2021 ***14. Sponsoring Agency Code*** NRM-110
15. *Supplementary Notes*		

16. Abstract

A 55/28, (61.90kph / 38.5 mph), 90^0 Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2021 Genesis GV80 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 February 11, 2021.

The impact velocity of the Moving Deformable Barrier (MDB) was 61.97 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21°C. The target vehicle's maximum post-test static crush was 111 mm located at level 2. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	N/A	1000	29.280
Maximum Thoracic Rib Deflection	mm	44	12.940
Total Abdominal Force	N	2500	448.467
Pubic Symphysis Force	N	6000	1301.121

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	N/A	1000	69.607
Lower Spine Resultant Acceleration	G	82	25.909
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2035.534
Maximum Thoracic Rib Deflection	mm	38*	11.874
Maximum Abdominal Rib Deflection	mm	45*	14.459

* *Proposed IARV*

The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.

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

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UNCLASSIFIED	UNCLASSIFIED	195	

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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 Genesis GV80 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 Genesis GV80 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 61.97 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 February 11, 2021. 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
Pubic 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	29.280
Maximum Thorax Rib Deflection	mm	44	12.940
Combined Abdominal Force	N	2500	448.467
Pubic Symphysis Force	N	6000	1301.121

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC36)		1000	69.607
Lower Spine (T12) Resultant Acceleration	G	82	25.909
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2035.534
Maximum Thoracic Rib Deflection	mm	38*	11.874
Maximum Abdominal Rib Deflection	mm	45*	14.459

*Proposed IARV

SUPPLEMENTAL RESTRAINT INFORMATION

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Air bag	Yes	No		
Knee Air bag	Yes	No		
Side Air bag 1 - Curtain	Yes	Yes	Yes	Yes
Side Air bag 2 – Torso/Pelvis Air bag	Yes	Yes	No	N/A
Side Air bag 3 – Torso Airbag	No	N/A	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt Load Limiter	Yes	Yes	No	N/A
Driver Inboard Seat Airbag	Yes	Yes	No	N/A

GENERAL COMMENTS:

1. P1 serial number – F034
2. P4 serial number – 300

Data Anomalies:

The following channel was questionable for

- Left Sill at Rear Seat Y, Exceeded calibration range at 10.6 ms
- Left Lower B-Pillar Y, Exceeded calibration range at 9.8 ms
- Left Mid B-Pillar Y, Exceeded calibration range and saturated at 10.7 ms
- Left Front Sill Y, Questionable Data

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

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

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

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Camera and Instrumentation Data

Data Sheet No. 6 – Test Vehicle Accelerometer Locations

Data Sheet No. 7 – MDB Accelerometer Locations

Data Sheet No. 8 – Post-Test Observations

Data Sheet No. 9 – MDB Summary of Results

Data Sheet No. 10 – Test Vehicle Profile Measurements

Data Sheet No. 11 – Test Vehicle Exterior Crush Measurements

Data Sheet No. 12 – MDB Exterior Static Crush Measurements

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

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

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

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Genesis GV80 four door sedan NHTSA No.: O20214217
Test Program: NCAP Side MDB Impact Test Test Date: 2/11/2021

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20214217
Model Year	2021
Make	Genesis
Model	GV80
Body Style	Four Door Sedan
VIN	KMUHB4SB2MU039512
Body Color	Gold
Odometer Reading (km/mi)	40 miles
Engine Displacement (L)	2.5
Type/No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	8 – Speed
Overdrive	Yes
Final Drive	Rear Wheel Drive
Roof Rack	No
Sunroof/T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

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

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company
Date of Manufacture	Nov/2020
Vehicle Type	MPV

GVWR (kg)	2620
GAWR Front (kg)	1390
GAWR Rear (kg)	1485

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	N/A	5	
Capacity Weight (VCW) (kg)				410	(A)
DSC X 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				69.8	(A-B)

VEHICLE SEAT TYPE

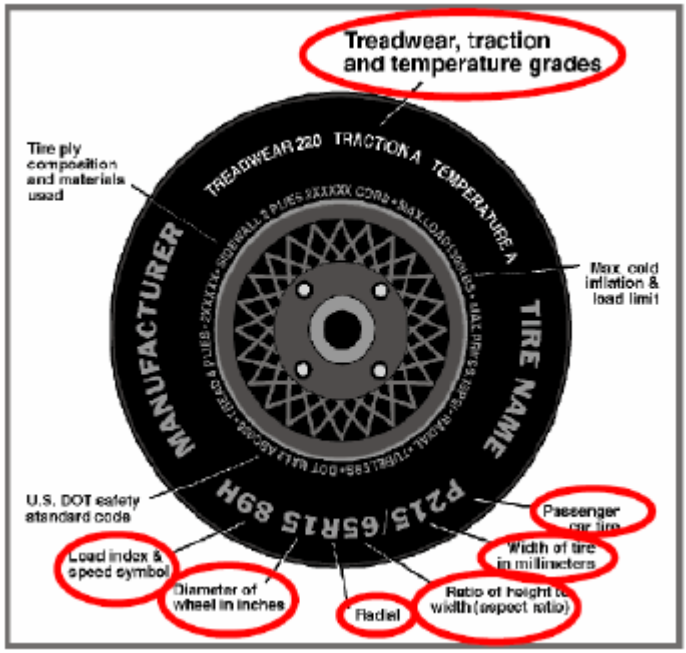
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front Seat	X						X
Rear or Second Row Seat			X			X	
Third Row seat							

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

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021

VEHICLE TIRE INFORMATION

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



TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	250
Recommended Tire Size	265/55R19	265/55R19
Tire Size on Vehicle	265/55R19	265/55R19
Tire Manufacturer	Pirelli	Pirelli
Tire Model	Scorpion Zero	Scorpion Zero
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1 Rayon	1 Rayon
Tire Plies Body	1 Rayon, 2 Steel, 2 Polyamide	1 Rayon, 2 Steel, 2 Polyamide
Load Index/Speed Symbol	109W	109W
Tire Material	Rubber	Rubber
DOT Safety Code Left	1UN9E735D0620	1UN9E735D0620
DOT Safety Code Right	1UN9E735D1620	1UN9E735D0520

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

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	212	219	238	239
Tire Placard	kPa	230	230	250	250
Owner's Manual	kPa	230	230	250	250
As Tested	kPa	230	230	250	250

MDB TIRE SPECIFICATIONS

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

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	507	524		565	591		550	609	
Right	kg	517	509		517	573		524	573	
Ratio	%	49.8	50.2		48.2	51.8		47.6	52.4	
Totals	kg	1024	1033	2057	1082	1164	2246	1074	1182	2256

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2057	(A)
Sum of Actual Weight of 1 ES2re and 1 P572 ATD (SID-IIs)	kg	127	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	69.8	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	2253.8	(A+B+C)

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

(i.e. Calculated Test Vehicle Target Weight – 4.5 kg to – 9 kg)? [X] **Yes** [ ] **No**

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement**
LF	mm	905	895	Yes
RF	mm	912	902	Yes
RR	mm	913	903	Yes
LR	mm	910	900	Yes
Vehicle CG (Aft of Front Axle)	mm	1547	1530	
Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline)	mm	23	25	

**** 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 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	25
Spare Tire	18
Jack	3
Tail Light	2
Right Rear Passenger Window	3
Ballast / Equipment Added	61.5

TEST SURFACE MARKINGS

	Distance from 63° Impact Angle Line (mm)
Fore 25 mm target	990
Aft 25 mm target	990
Pre-Impact Angle Line	236

Parallel Track Target	X Location (mm)	Y Location (mm)
A	0	0
B	2955	1555
C	2955	3555
D	0	3000

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

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021

SEAT POSITIONING

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

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	19.6	10.6	15.1
Front Passenger Seat	19.5	11.1	15.3
Front Center Seat*			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat*	Fixed	Fixed	Fixed

**if applicable*

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore/Aft	Forward-Most
Driver Seat	15.1	4	Max	58	70	83
			Mid	29	37	51.5
			Min	0	4	10
Front Passenger Seat	15.3	5	Max	60	65	70
			Mid	30	35	40
			Min	0	5	10
Front Center Seat*	N/A	N/A	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Non-Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Rear Center Seat*	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-

**if applicable*

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

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021

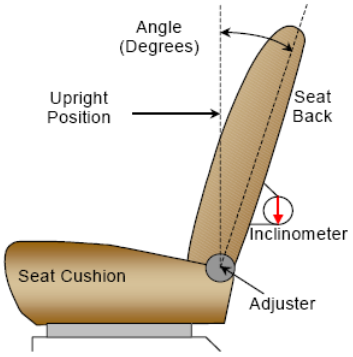
SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	255	N/A	128	N/A
Front Passenger Seat	250	N/A	125	N/A
Front Center Seat*				
Struck Side Rear Seat	78	9 (0-8)	78	8
Non-Struck Side Rear Seat	78	9 (0-8)	78	8
Rear Center Seat*	78	9 (0-8)	78	8

**if applicable*

SEAT BACK ANGLE ADJUSTMENT

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



FRONT SEAT ASSEMBLY

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/ Seated Dummy	65.4	N/A	1.5	N/A
Front Passenger Seat	65.4	N/A	1.5	N/A
Front Center Seat*				
Struck Side Rear Seat w/ Seated Dummy	26.3	14 (0-13)	2.2	0
Non-Struck Side Rear Seat	26.3	14 (0-13)	2.2	0
Rear Center Seat*	26.3	14 (0-13)	2.2	0

**if applicable*

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

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021

SEAT BELT ANCHORAGE ADJUSTMENT

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

	Total # of Positions	Placed in Position #
Driver Seat	4 (0-3)	0
Rear Seat	Fixed	Fixed

HEAD RESTRAINT ADJUSTMENT

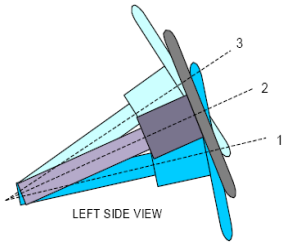
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	6 (0-5)	Uppermost/Forwardmost
Rear Seat	5 (0-4)	Lowermost

STEERING COLUMN ADJUSTMENT

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

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	23.0	
Geometric Center – Position 2	25.3	
Uppermost – Position 3	27.5	
Telescoping Steering Wheel Travel		55
Test Position	25.3	28

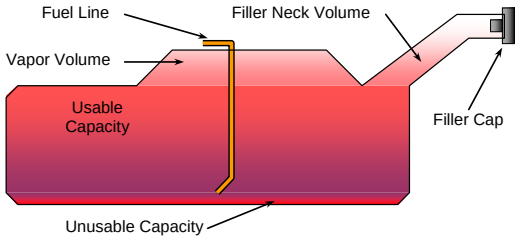


STEERING COLUMN ASSEMBLY

FUEL PUMP

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

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



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021

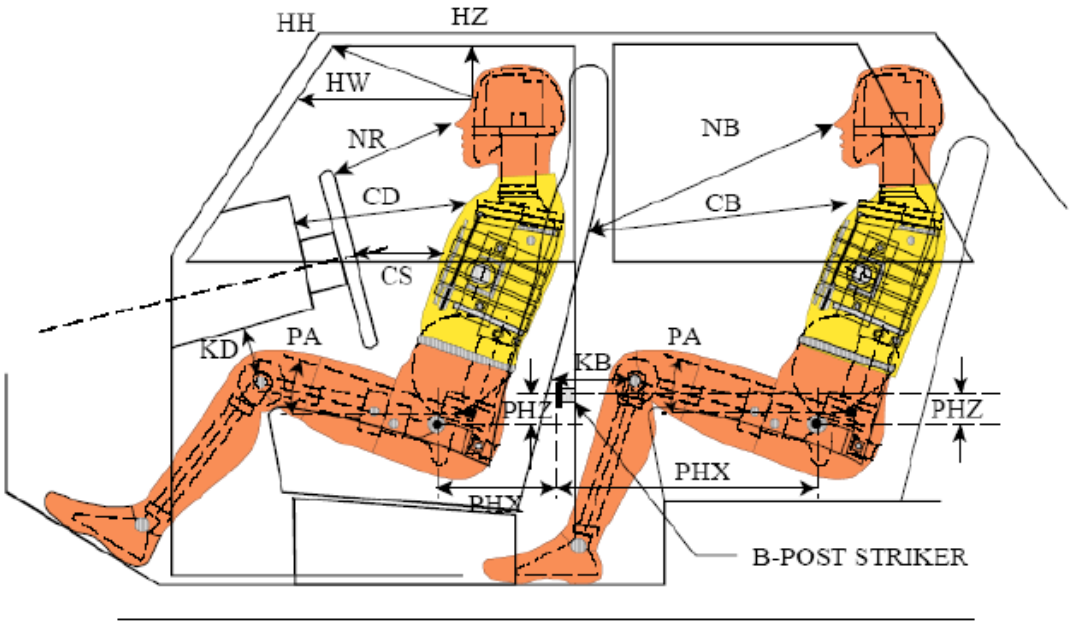
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	80
Usable Capacity of "Optional Tank" (see Form No. 1)	N/A
Usable Capacity of Standard Tank (see Owner's Manual)	80
Usable Capacity of Optional Tank (see Owner's Manual)	N/A
93% of Usable Capacity	74.4
Actual Amount of Solvent Used in Test	74.4
1/3 of Usable Capacity	26.7

Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in Form No. 1? [X] **Yes** [ ] **No**

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021



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

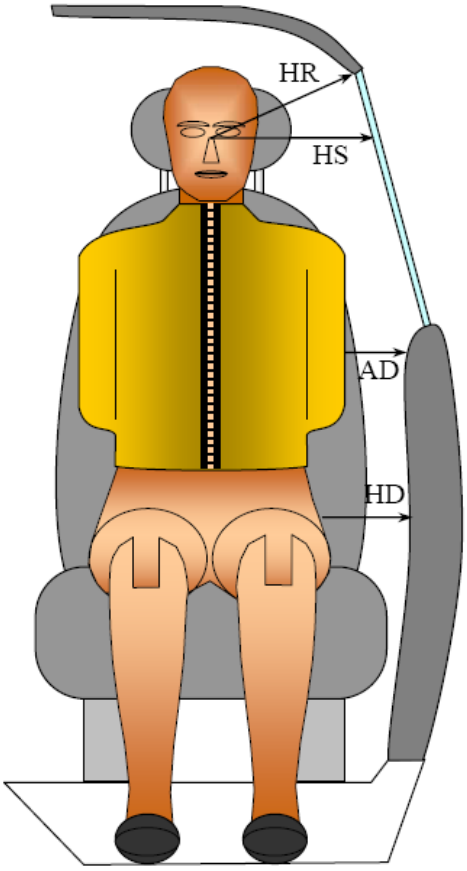
LEFT SIDE VIEW

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Description	Driver (Serial No. F034)		Passenger (Serial No.300)	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	347			
HW		Header to Windshield	642			
HZ	HZ	Head to Roof Liner	170		288	
NR	NB	Nose to Rim/Seat Back	425		532	
CD	CB	Chest to Dash/Seat Back	586		538	
CS		Chest to Steering Wheel	356			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	205	30.1	288	5.1
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	195	24.2	284	7.3
PAX°	PAX°	Pelvic Tilt Angle X		20.2		19.3
	PAY°	Pelvic Tilt Angle Y				0.2
PHX	PHX	Hip Point to Striker (X-Axis)	137		332	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	166		247	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021



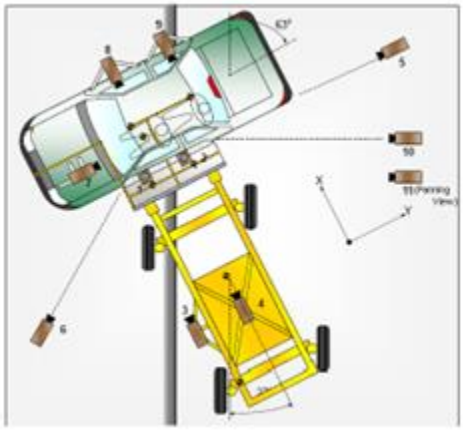
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver (Serial No. F034)	Passenger (Serial No. 300)
HR	Head to Side Header	mm	225	273
HS	Head to Side Window	mm	352	382
AD	Arm to Door	mm	108	170
HD	Hip Point to Door	mm	171	212

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2021 Genesis GV80 four door sedan NHTSA No.: O20214217
Test Program: NCAP Side MDB Impact Test Test Date: 2/11/2021



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	0	0	-8373	12.5	1000
2	Overhead Close-up	0	0	-8373	24	1000
3	Left Impact Point (MDB)				25	1000
4	Side Overall (MDB)				8	1000
5	Rear	0	10110	-1282	28	1000
6	Left Front	-3701	-4556	-1177	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.*

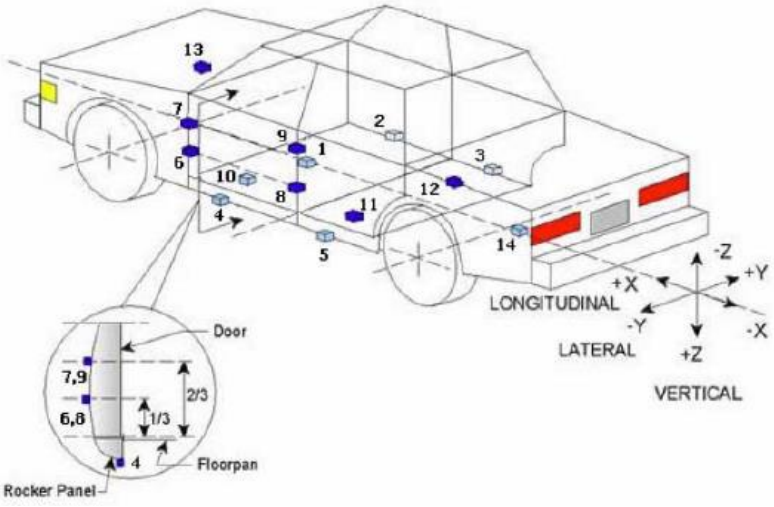
If applicable, explain why camera(s) did not operate as intended: All cameras operated normally

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	23
MDB Accelerometers	7
Total	62

DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021



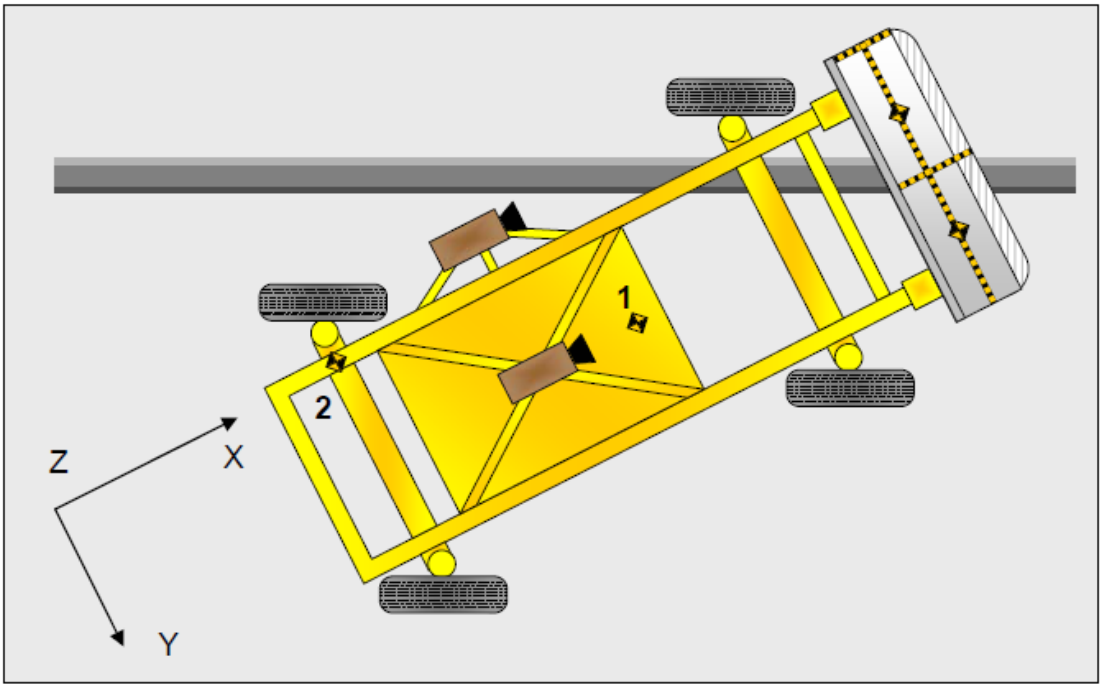
TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2829	5	-224
2	Right Sill at Front Seat	2922	711	7
3	Right Sill at Rear Seat	2032	709	4
4	Left Sill at Front Door	2907	-707	3
5	Left Sill at Rear Door	2043	-706	-3
6	A-Post Lower	3418	-657	-257
7	A-Post Middle	3285	-694	-733
8	B-Post Lower	2288	-711	-498
9	B-Post Middle	2309	-711	-250
10	Front Seat Track	2546	-606	-35
11	Rear Seat Structure	1970	-579	-13
12	Rt. Rear Occ. Compartment	2136	388	61
13	Engine Block	4143	41	-482
14	Rear Above Axle	1234	-4	-70

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 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021



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): 1485

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	None	None
Top of Head	Curtain Airbag, Side Header	Curtain Airbag
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Curtain Airbag, Side Header, Headrest	Curtain Airbag, Headrest
Left Shoulder	Curtain Airbag, Torso/Pelvis Airbag	Curtain & Torso Airbag, Seatback
Upper Torso	Torso/Pelvis Airbag, Seatback	Seatback
Lower Torso	Seatback	Torso Airbag, Seatback
Left Hip	Torso/Pelvis Airbag, Seatpan	Torso Airbag, Passenger Door
Left Knee	Driver Door	Passenger Door

POST-TEST DOOR PERFORMANCE

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

POST-TEST SEAT PERFORMANCE

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

POST-TEST STRUCTURAL OBSERVATIONS

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

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

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Air bag	Yes	No		
Knee Air bag	Yes	No		
Side Air bag 1 - Curtain	Yes	Yes	Yes	Yes
Side Air bag 2 - Torso/Pelvis Air bag	Yes	Yes	No	N/A
Side Air bag 3 – Torso Air bag	No	N/A	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt Load Limiter	Yes	Yes	No	N/A
Driver Center Seat Airbag	Yes	Yes	No	N/A

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2953
Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point)	mm		508
Actual Impact Point (Aft of Frontal Axle)	mm		508
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	0
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	0

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2021 Genesis GV80 four door sedan NHTSA No.: O20214217
Test Program: NCAP Side MDB Impact Test Test Date: 2/11/2021

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length Including Honeycomb Frame	4120
Wheelbase of Framework Carriage	2600
CG Location of Front Axle	1120

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	392.5	297.5	690.0
Right	kg	386.0	291.5	677.5
Ratio	%	57.4%	42.6	100.0
Totals	kg	778.5	589.0	1367.5

SPEED AND ANGLE AT IMPACT DATA

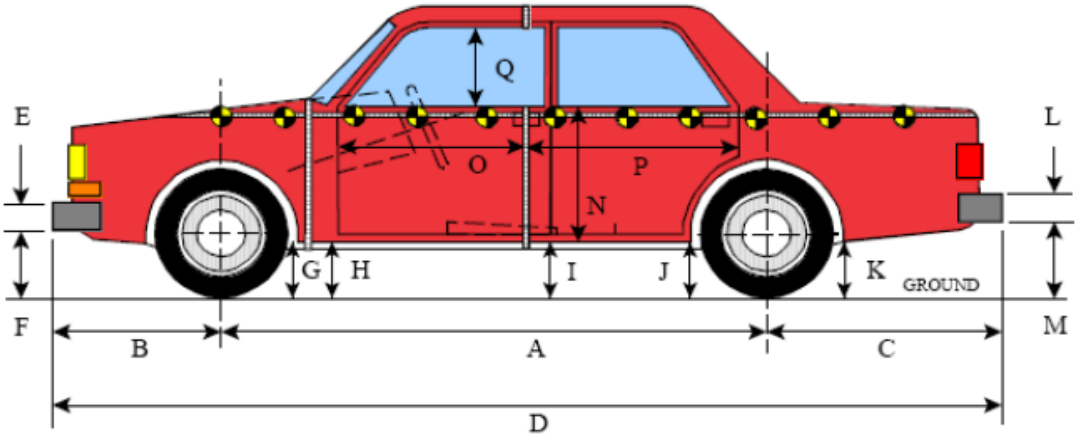
Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.10 to 62.70	61.97
Trap No. 2 Velocity (Redundant)	km/h	61.10 to 62.70	61.93
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed angle 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	700	Right	274
B	Top of Bumper	533	800	Left	209
C	Mid-Level	686	800	Left	191
D	Top of Stack	813	800	Left	239

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2021 Genesis GV80 four door sedan NHTSA No.: O20214217
Test Program: NCAP Side MDB Impact Test Test Date: 2/11/2021



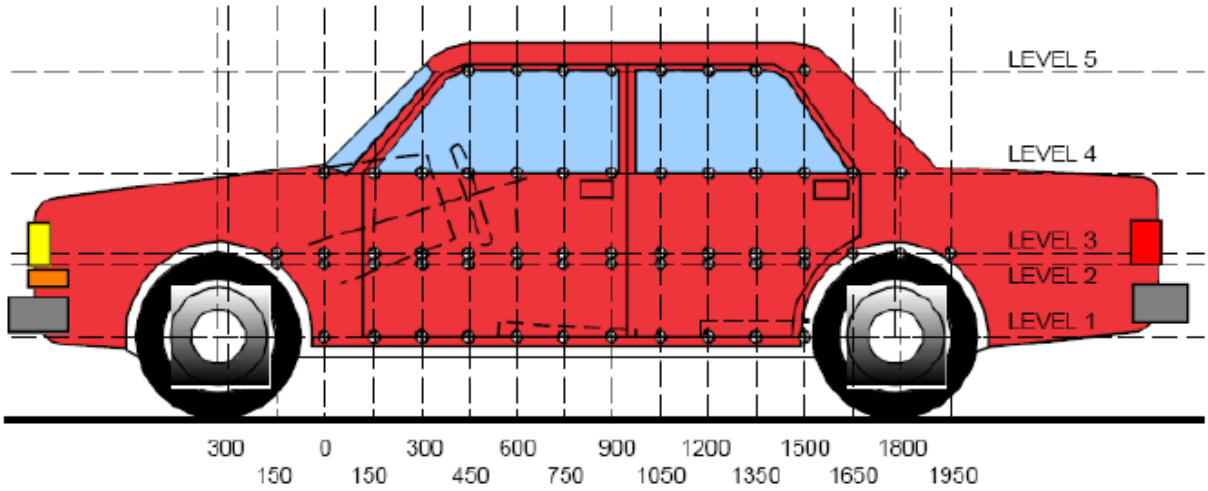
LEFT SIDE VIEW
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3mm

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2953	2963	10
B	Front Axle to FSOV	879	868	-11
C	Rear Axle to RSOV	1111	1111	0
D	Total Length at Centerline	4943	4942	-1
E	Front Bumper Thickness	182	182	0
F	Front Bumper Bottom to Ground	368	381	13
G	Sill Height at Front Wheel Well	252	251	-1
H	Sill Height at Front Door Leading Edge	254	236	-18
I	Sill Height at B Pillar	272	266	-6
J1	Sill Height at Rear Wheel Well	274	266	-8
J2	Pinch Weld Height at Rear Wheel Well	261	259	-2
K	Sill Height Aft of Rear Wheel Well	280	287	7
L	Rear Bumper Thickness	275	275	0
M	Rear Bumper Bottom to Ground	443	457	14
N	Sill Height to Window Bottom of Front Window Sill	930	965	35
O	Front Door Leading Edge to Impact CL	603	603	0
P	Rear Door Trailing Edge to Impact CL	1571	1562	-9
Q	Front Window Opening	429	437	8
R	Right Side Length	4869	4868	-1
S	Left Side Length	4867	4865	-2
T	Maximum Vehicle Width	1934	1895	-39
U	Front Wheel Track Width	1688	1685	-3
V	Rear Wheel Track Width	1690	1682	-8

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2021 Genesis GV80 four door sedan NHTSA No.: O20214217
Test Program: NCAP Side MDB Impact Test Test Date: 2/11/2021



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	305	29	1350
2	Driver Hip Point	mm	739	111	1500
3	Mid-Door	mm	876	87	1500
4	Window Sill	mm	1179	14	1200
5	Window Top	mm	1653	6	1500

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 Genesis GV80 four door sedan NHTSA No.: O20214217
Test Program: NCAP Side MDB Impact Test Test Date: 2/11/2021

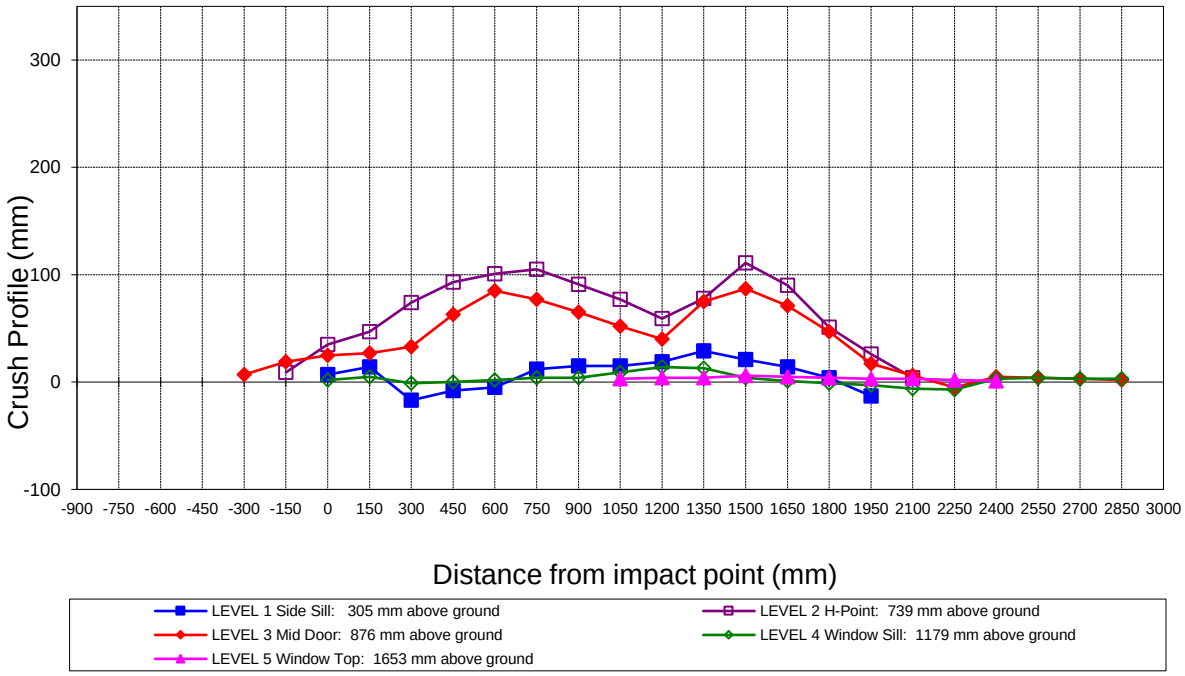
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	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			976					969					7		
-150		976	969				967	950				9	19		
0	912	968	968	813		905	933	937	811		7	35	31	2	
150	900	958	956	827		886	911	929	822		14	47	27	5	
300	876	953	954	834		893	879	921	835		-17	74	33	-1	
450	878	953	957	841		886	860	894	841		-8	93	63	0	
600	881	954	960	849		886	853	875	847		-5	101	85	2	
750	883	955	963	853		871	850	886	849		12	105	77	4	
900	885	956	965	857		870	865	900	853		15	91	65	4	
1050	886	956	965	860	654	871	879	913	851	651	15	77	52	9	3
1200	886	957	965	863	658	867	898	925	849	654	19	59	40	14	4
1350	886	956	964	862	658	857	878	889	849	654	29	78	75	13	4
1500	884	955	963	862	658	863	844	876	858	652	21	111	87	4	6
1650	882	957	962	860	656	868	867	891	859	651	14	90	71	1	5
1800	879	961	962	858	652	875	910	915	859	648	4	51	47	-1	4
1950	899	969	965	855	646	912	943	948	858	643	-13	26	17	-3	3
2100		975	972	850	638		971	966	856	635		4	6	-6	3
2250			974	845	624			979	852	622			-5	-7	2
2400			978	839	602			973	836	601			5	3	1
2550			978	829				974	825				4	4	
2700			976	817				973	814				3	3	
2850			959	804				957	801				2	3	
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

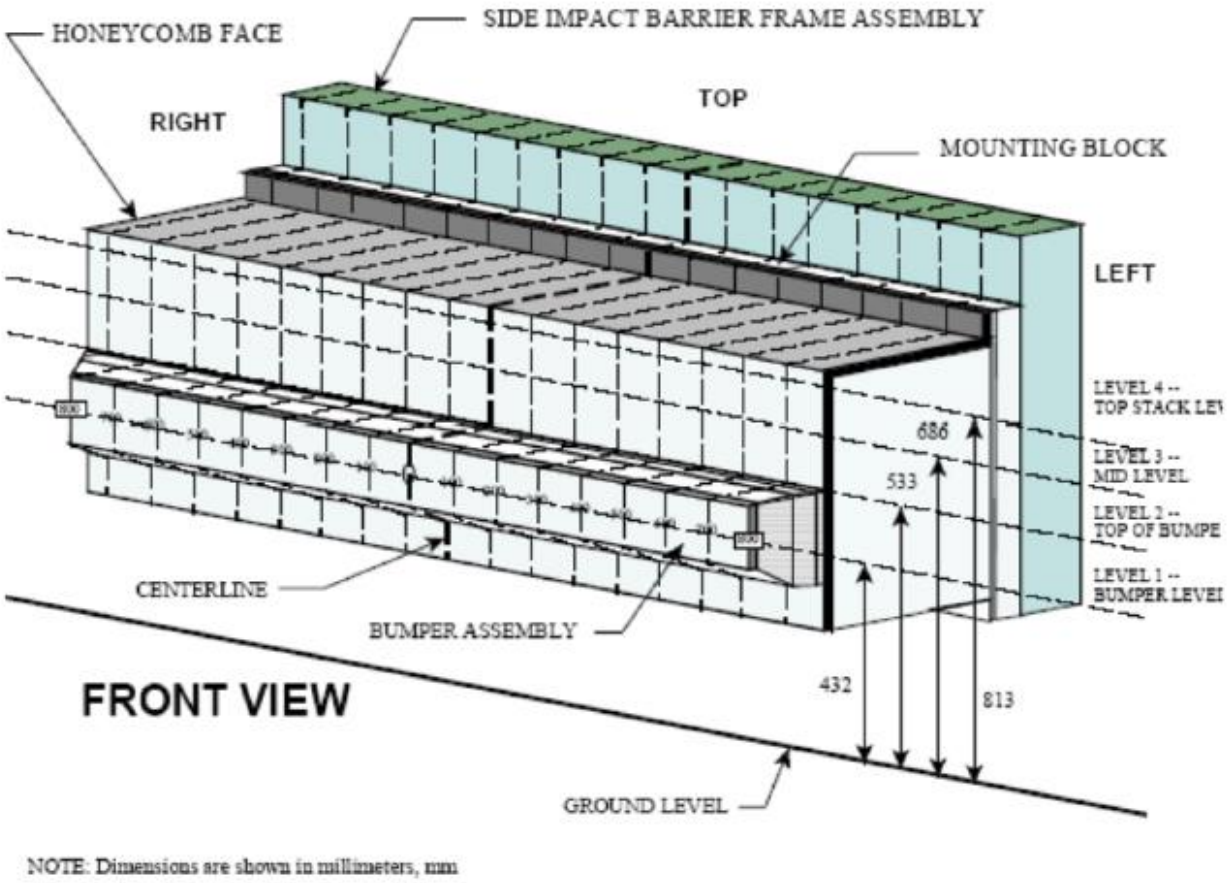
Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021



Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021



NOTE: Dimensions are shown in millimeters, mm

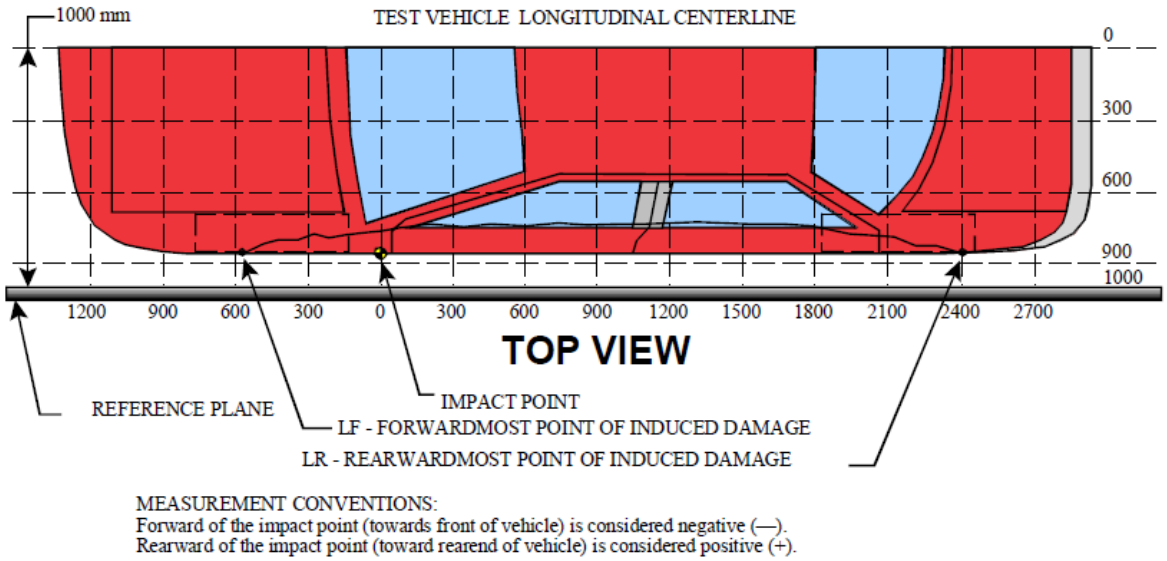
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
1	273	274	271	269	267	266	262	261	260	259	258	257	256	254	254	255	262
2	203	206	203	179	176	175	170	181	191	193	192	192	190	189	187	198	209
3	162	135	125	136	161	178	159	136	117	106	102	101	106	118	144	191	191
4	202	178	152	153	190	209	172	148	134	126	126	128	149	173	178	222	239

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021

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



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

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-300	3	31	24	7
2	330	3	84	45	39
3	960	3	95	35	60
4	1590	3	115	38	77
5	2220	3	24	26	-2
6	2850	3	43	41	2

MDB DAMAGE PROFILE DISTANCES

DPD	Distance From Center of MDB	Level	Post-Test (mm)*
1	800 mm left of center	1	262
2	480 mm left of center	1	254
3	160 mm left of center	1	258
4	160 mm right of center	1	262
5	480 mm right of center	1	269
6	800 mm right of center	1	273

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

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021
Test Time:	11:22 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°	68	300	368
90° to 180°	70	300	370
180° to 270°	62	300	362
270° to 360°	68	300	368

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

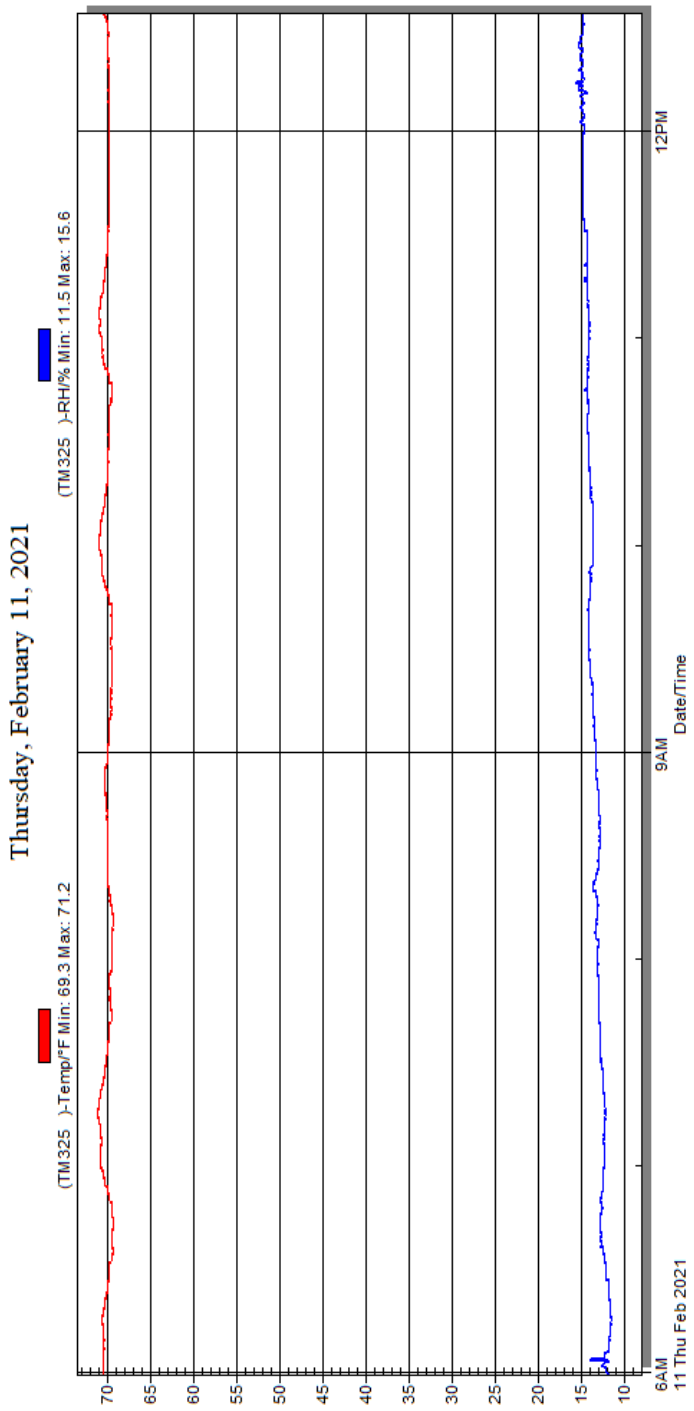
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

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

Test Vehicle:	2021 Genesis GV80 four door sedan	NHTSA No.:	O20214217
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/11/2021



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

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

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

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

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

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

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

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

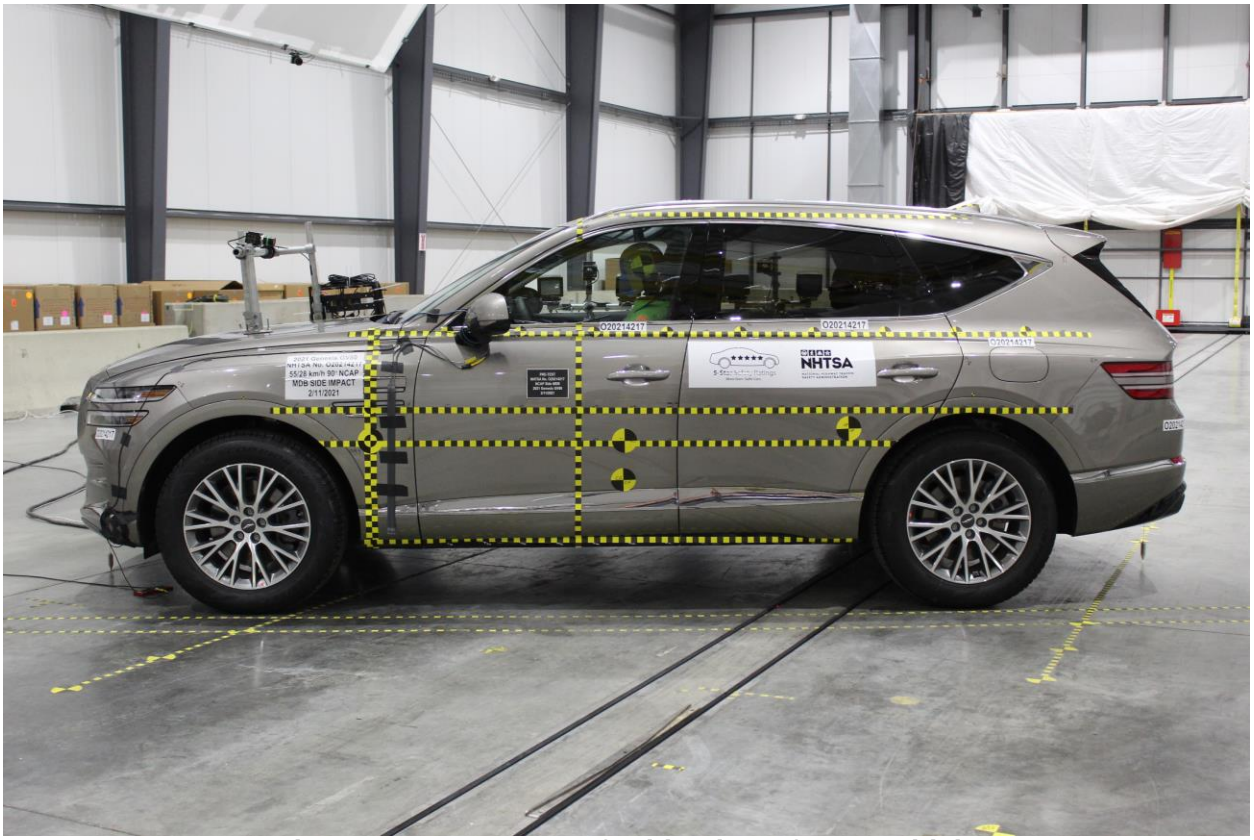


Figure A-7: Pre-Test Left Side View of Test Vehicle

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

Figure A-9: Pre-Test Left Rear ¾ View of Test Vehicle

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

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

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

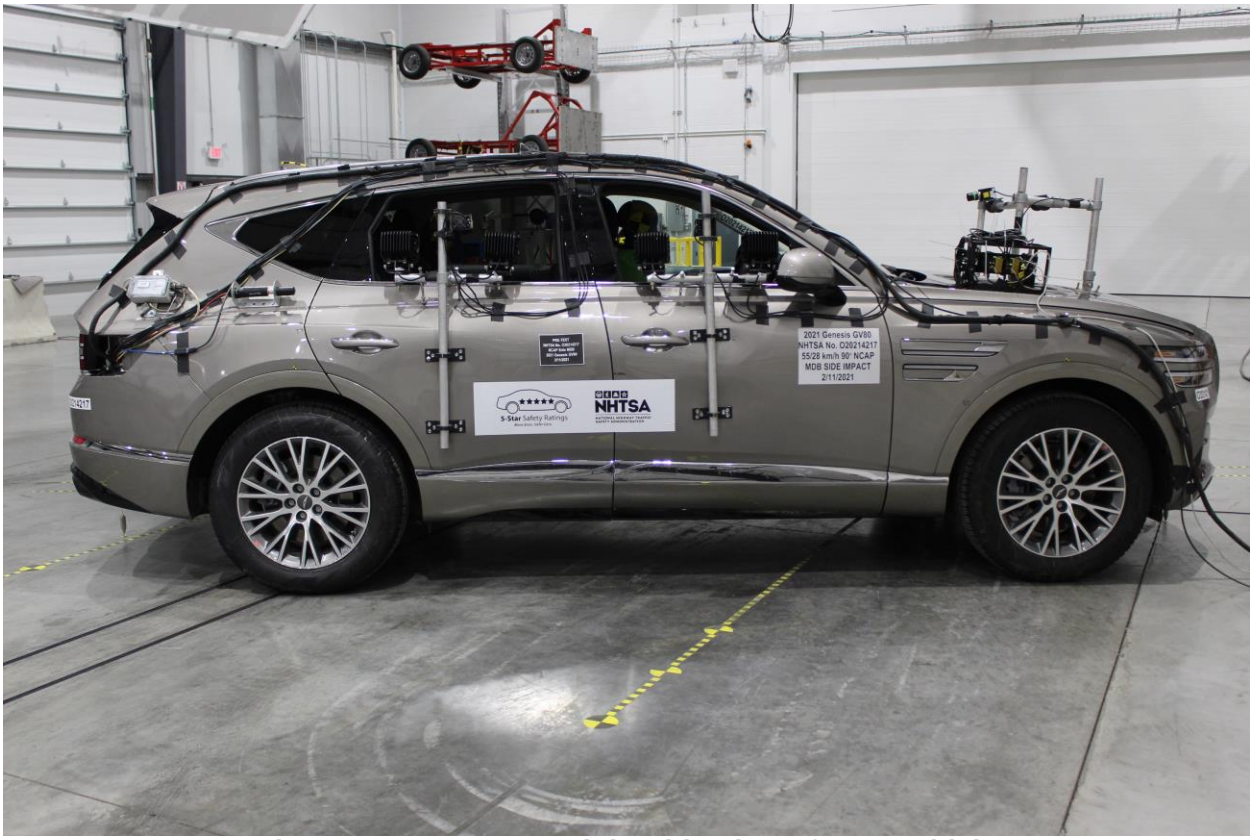


Figure A-13: Pre-Test Right Side View of Test Vehicle

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

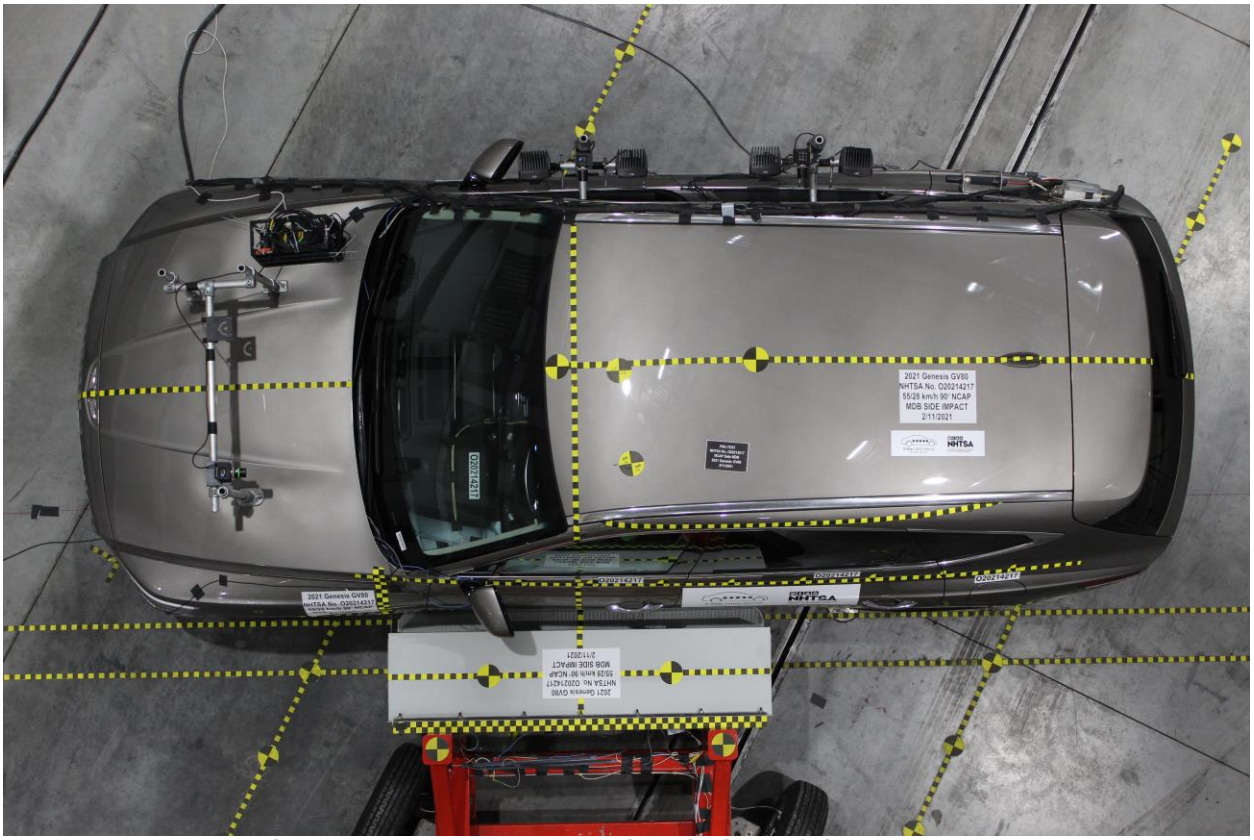


Figure A-15: Pre-Test Overhead View of the Test Area

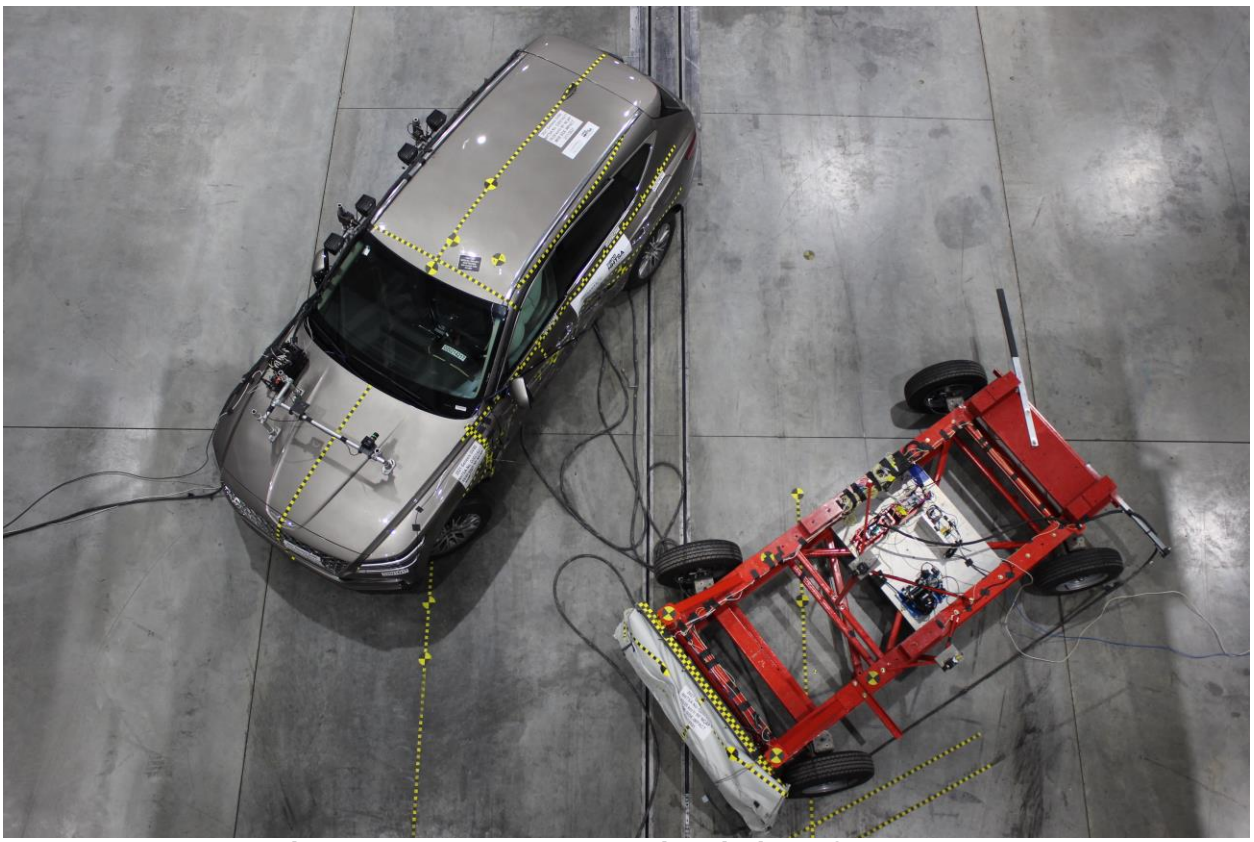


Figure A-16: Post-Test Overhead View of Test Area

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

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

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

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

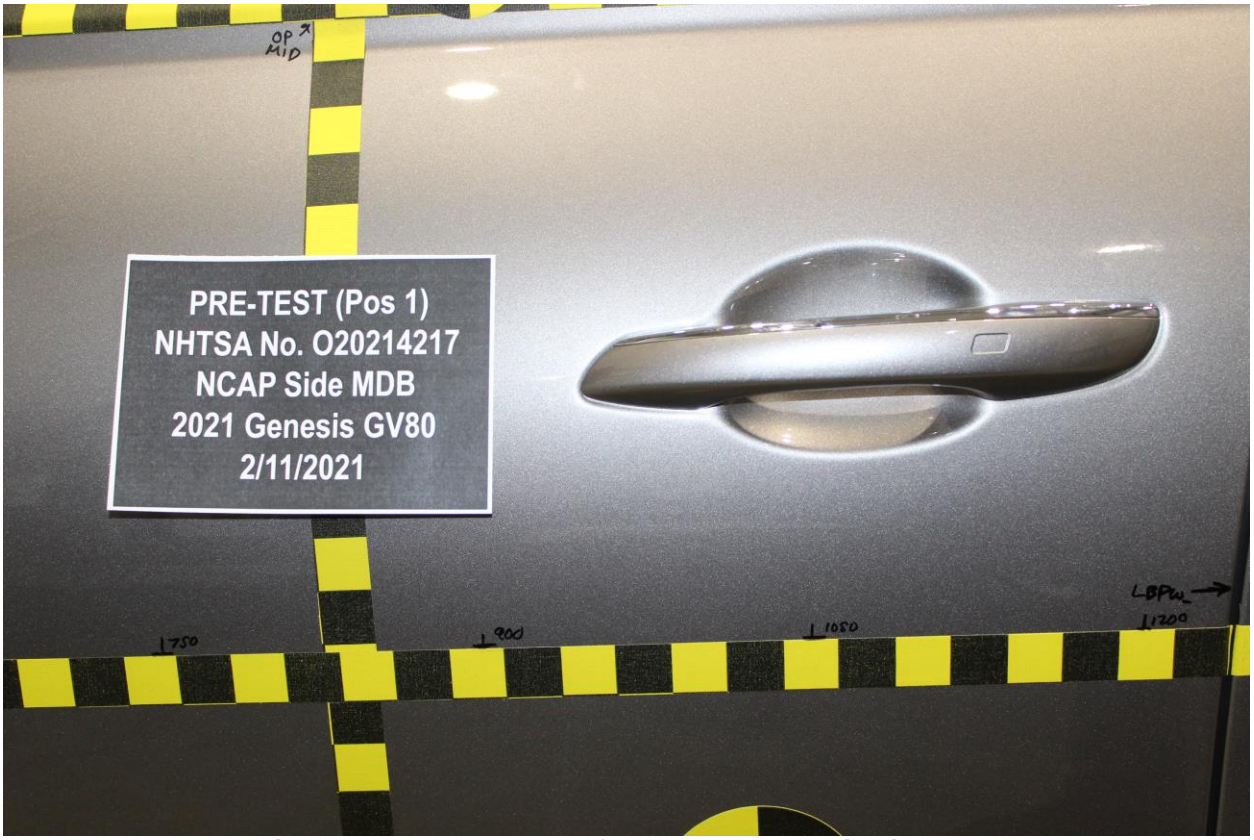


Figure A-21: Pre-Test Left Front Door Latch Close-Up

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

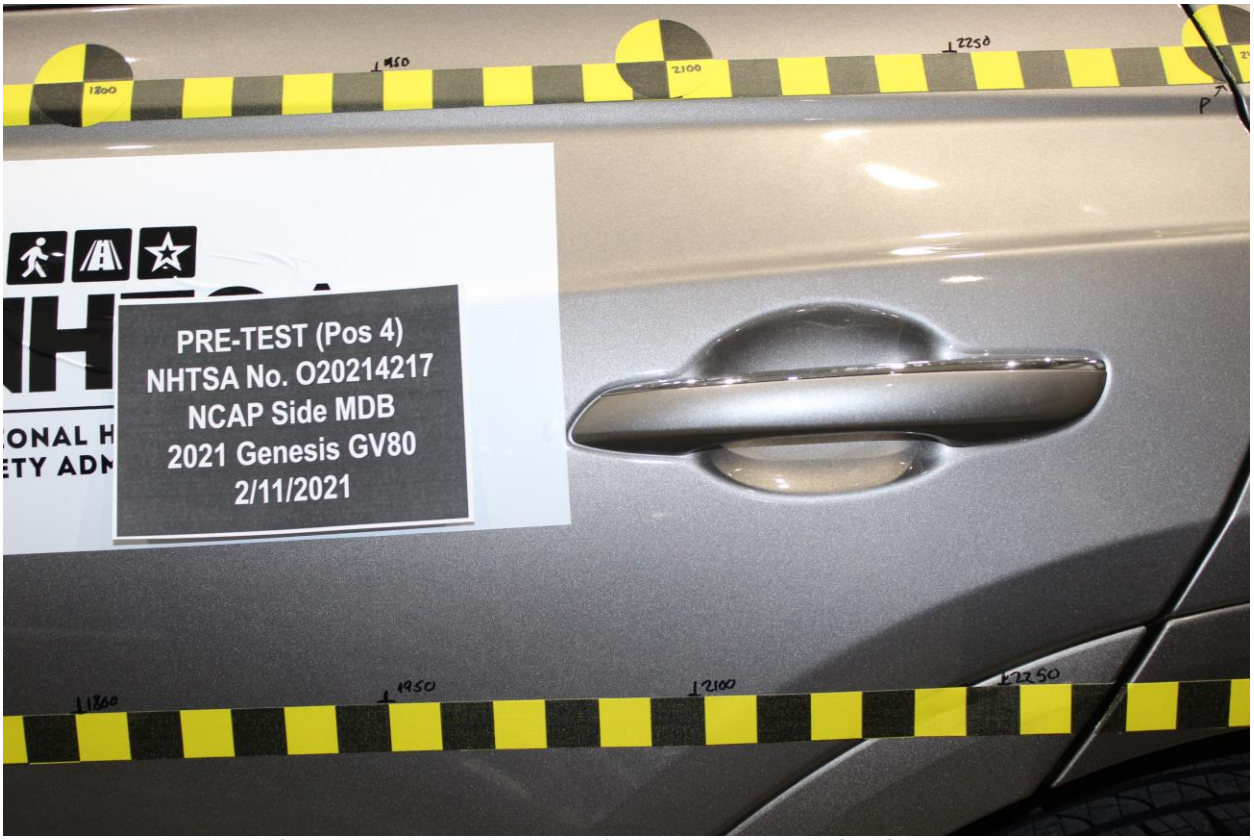


Figure A-23: Pre-Test Left Rear Door Latch Close-Up

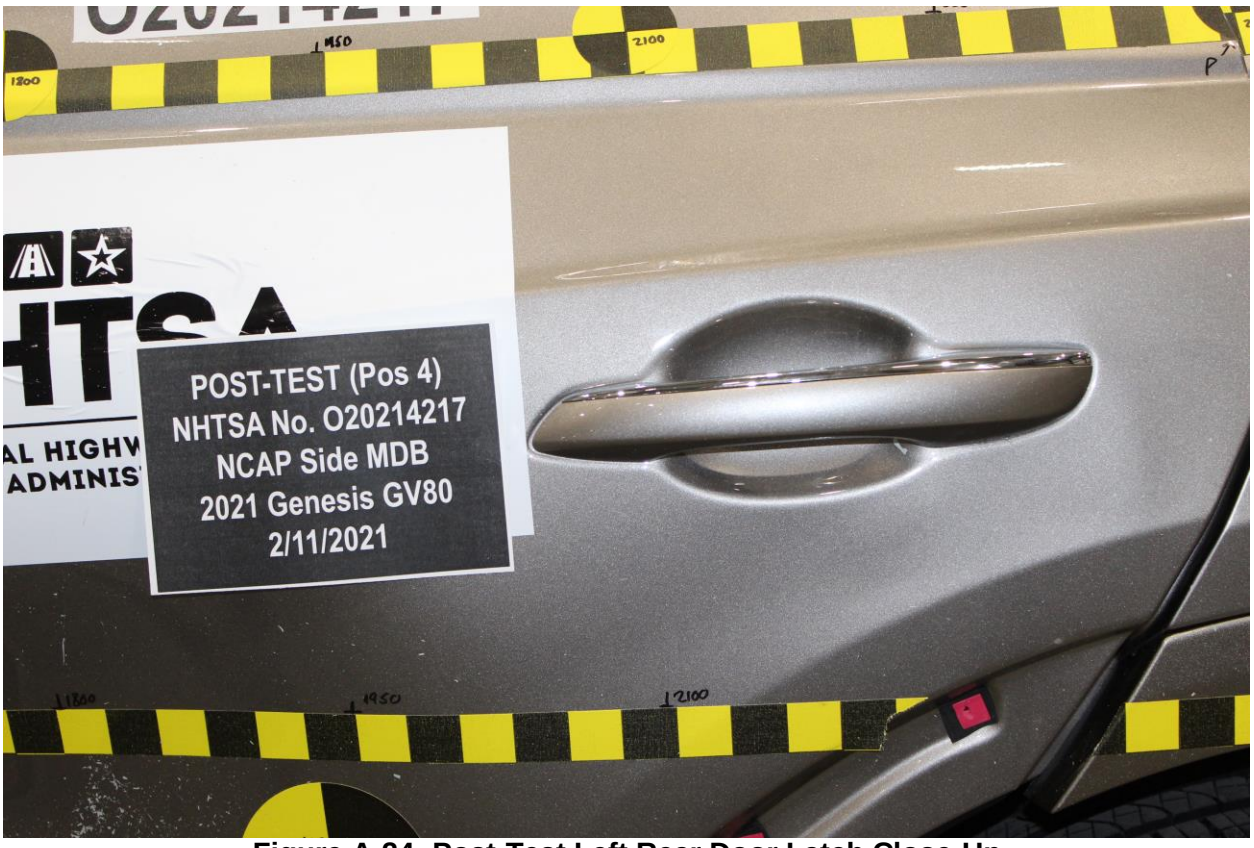


Figure A-24: Post-Test Left Rear Door Latch Close-Up

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

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

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

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

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

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

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

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

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

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

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

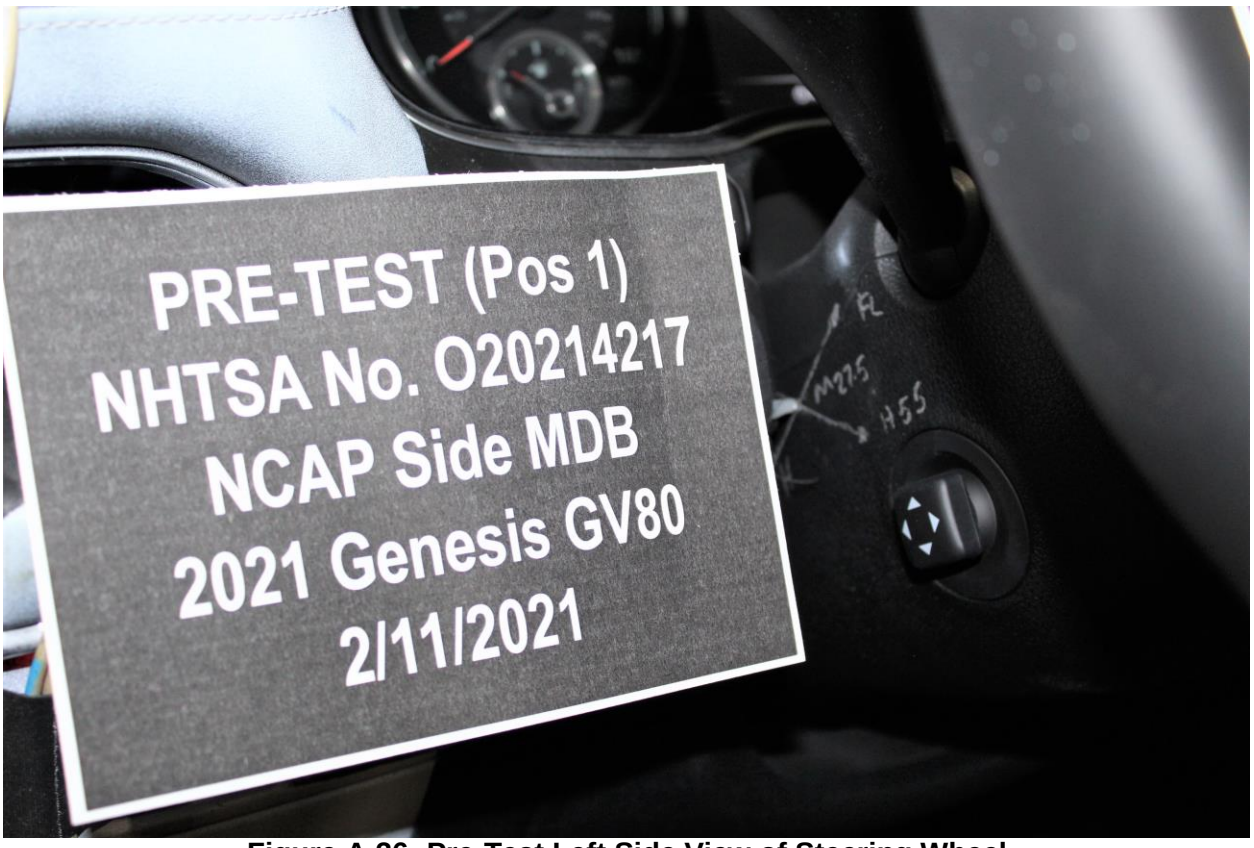


Figure A-36: Pre-Test Left Side View of Steering Wheel

Figure A-37: View of Disengaged Parking Brake

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

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

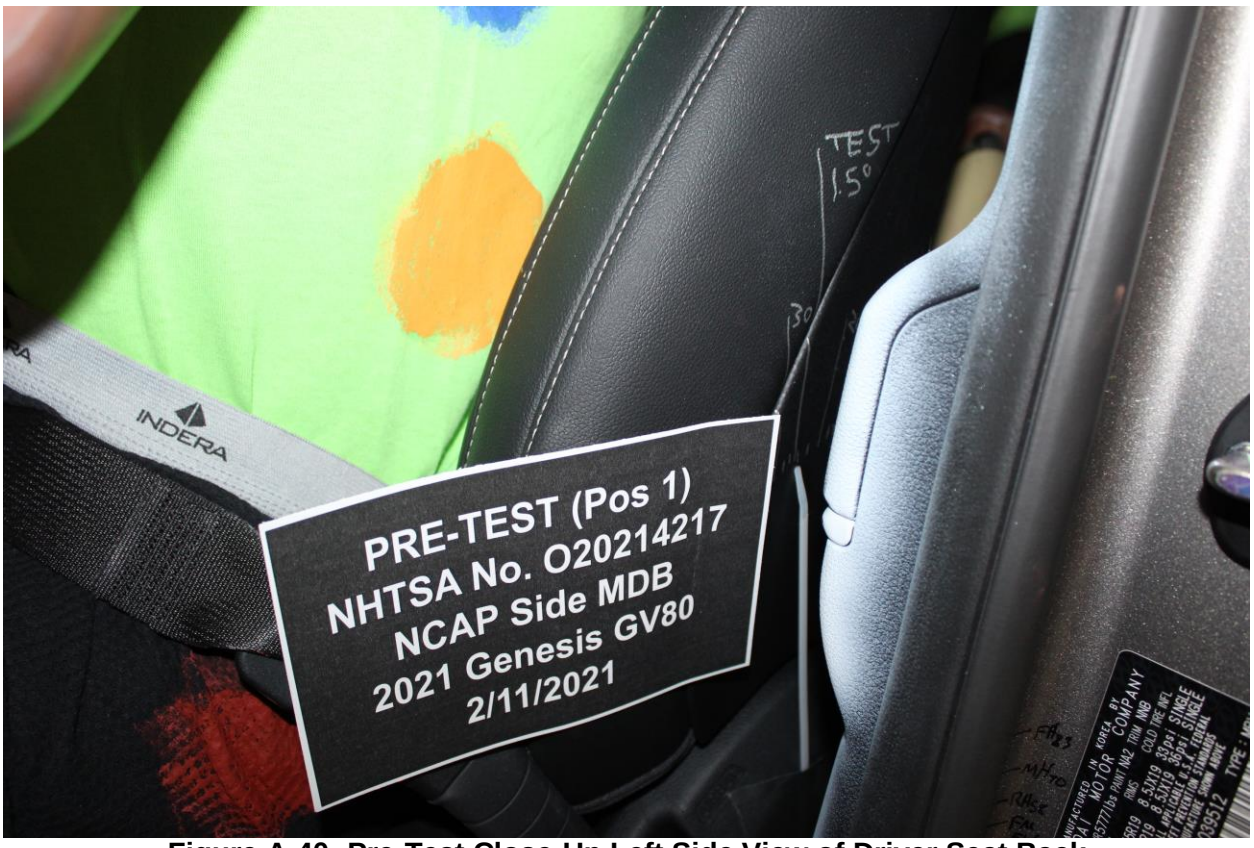


Figure A-40: Pre-Test Close-Up Left Side View of Driver Seat Back

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

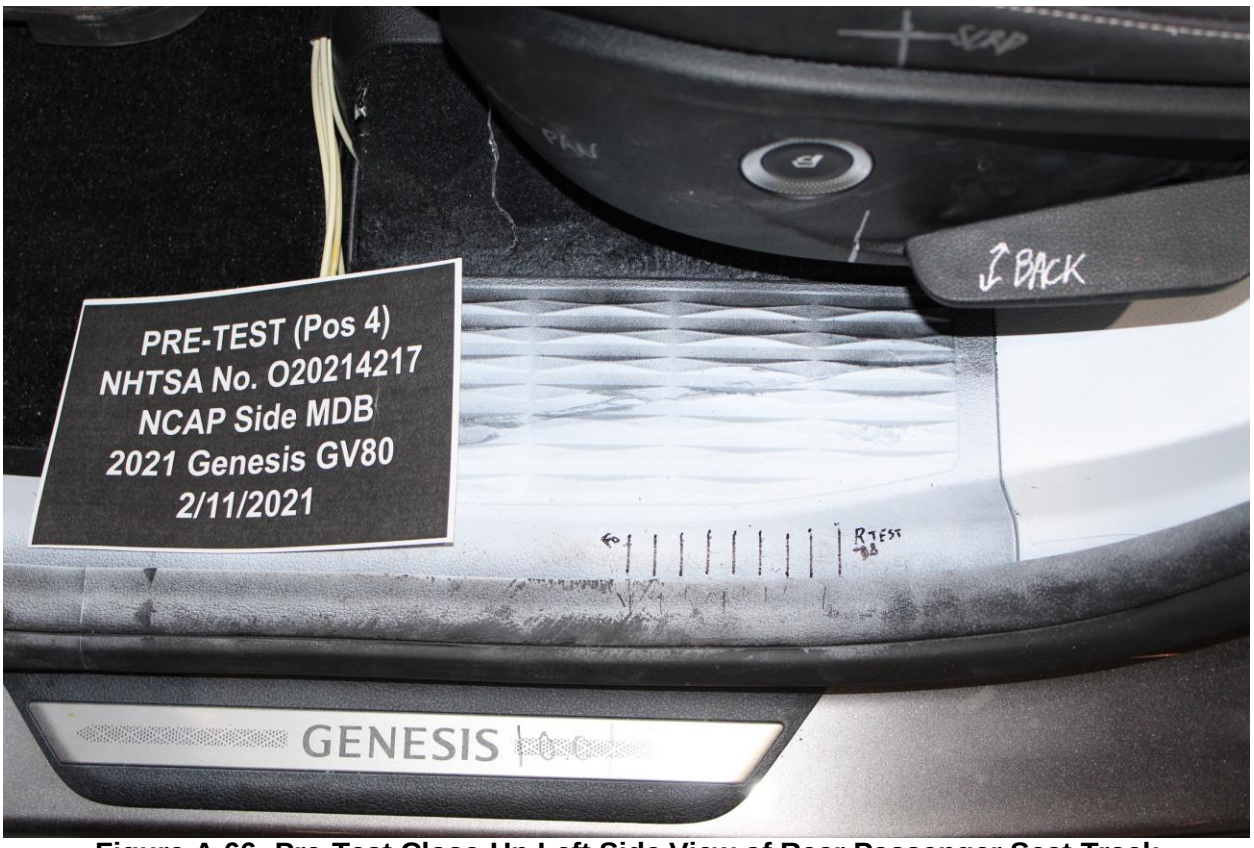


Figure A-66: Pre-Test Close-Up Left Side View of Rear Passenger Seat Track

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

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

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

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

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

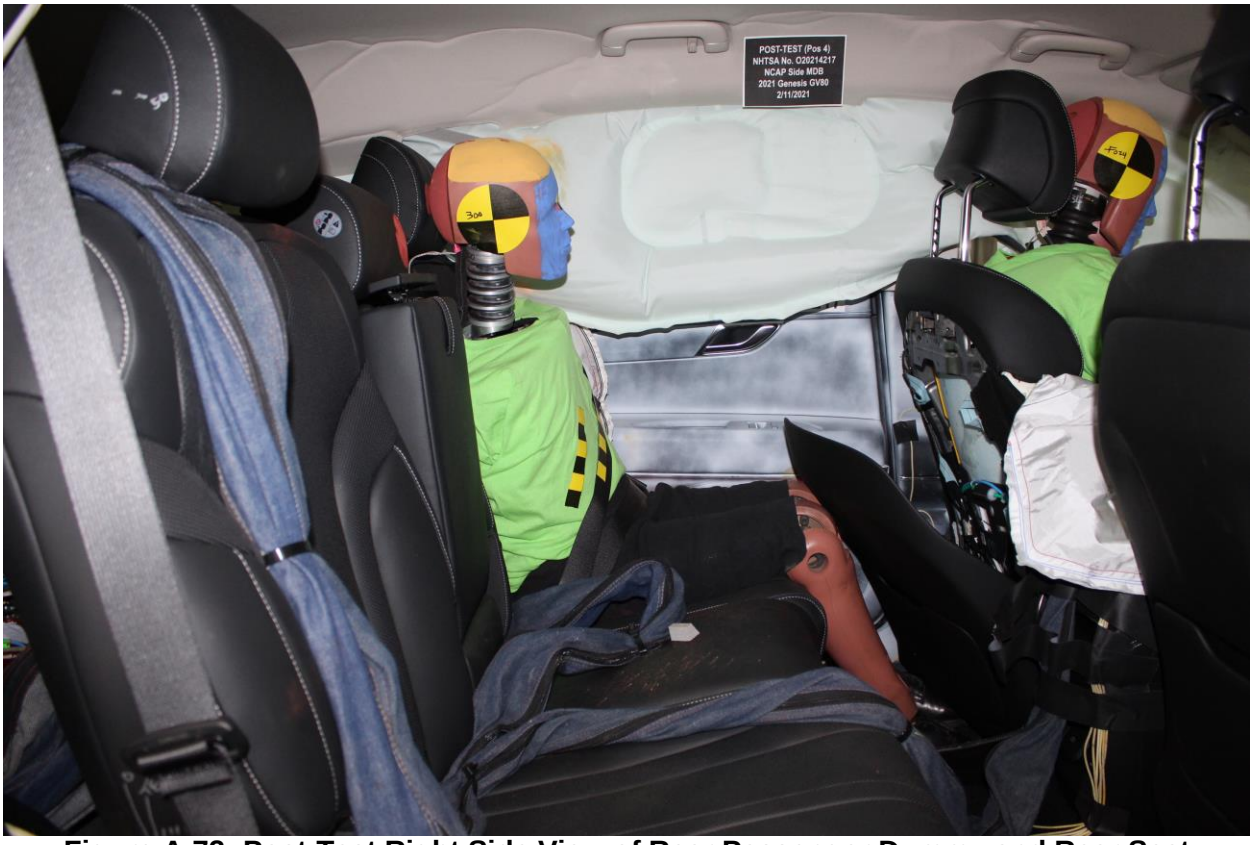


Figure A-72: Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment

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

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

Figure A-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

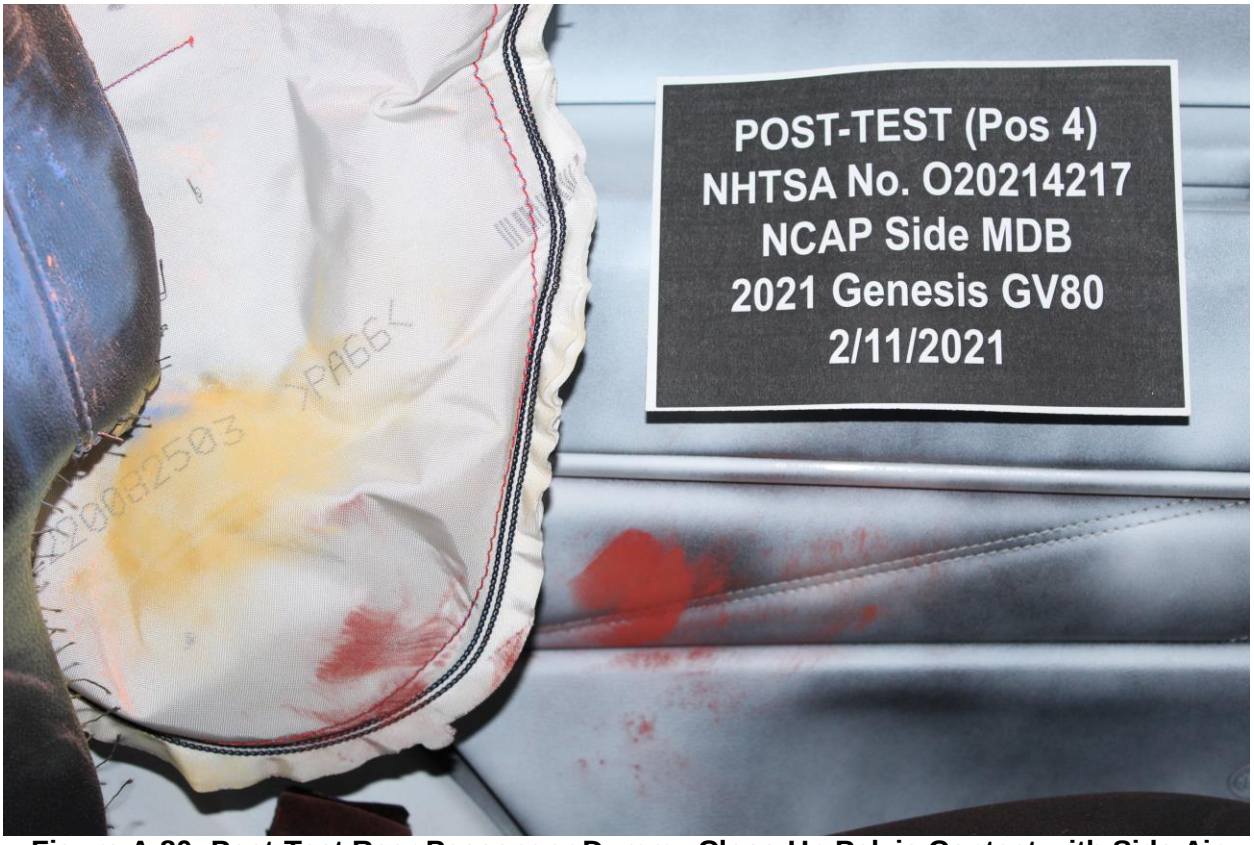


Figure A-80: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Air bag View

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

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

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

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

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

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

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

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

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

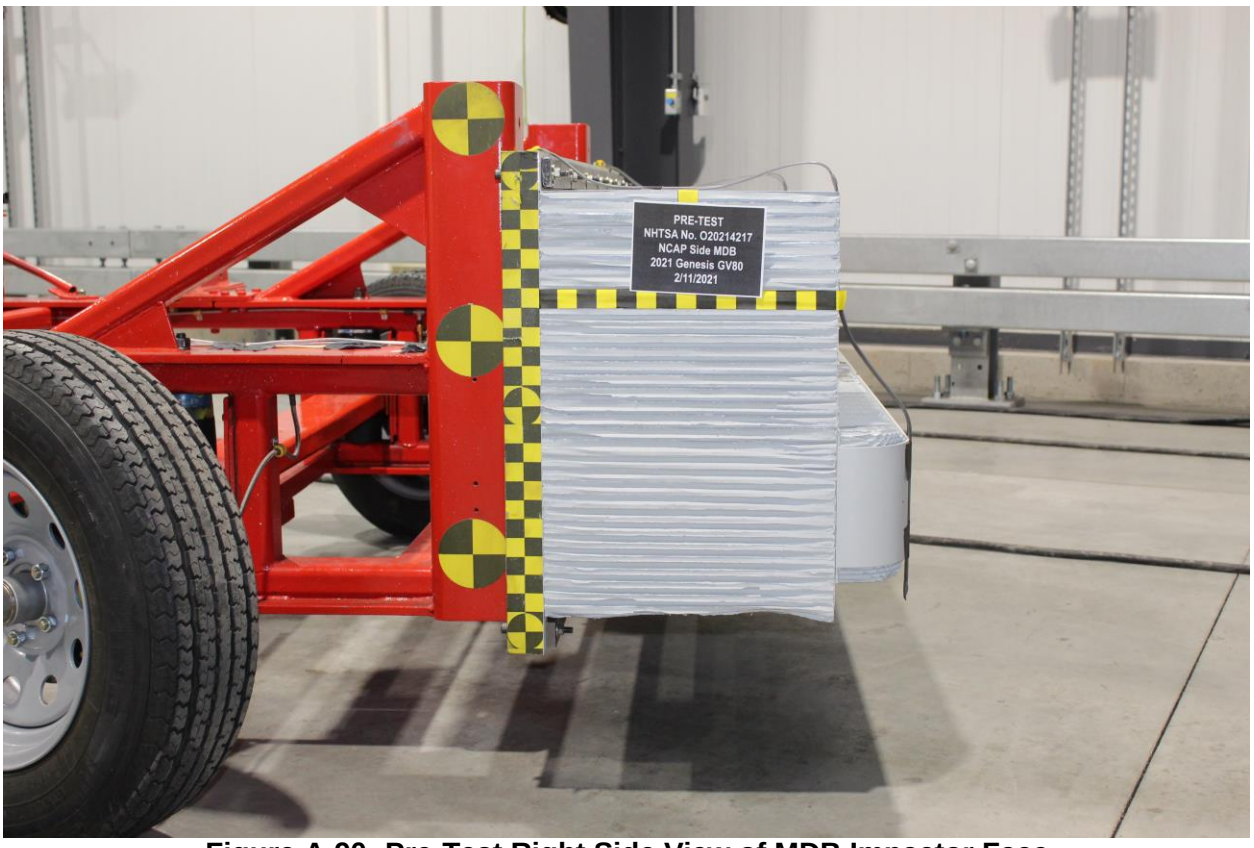


Figure A-90: Pre-Test Right Side View of MDB Impactor Face

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

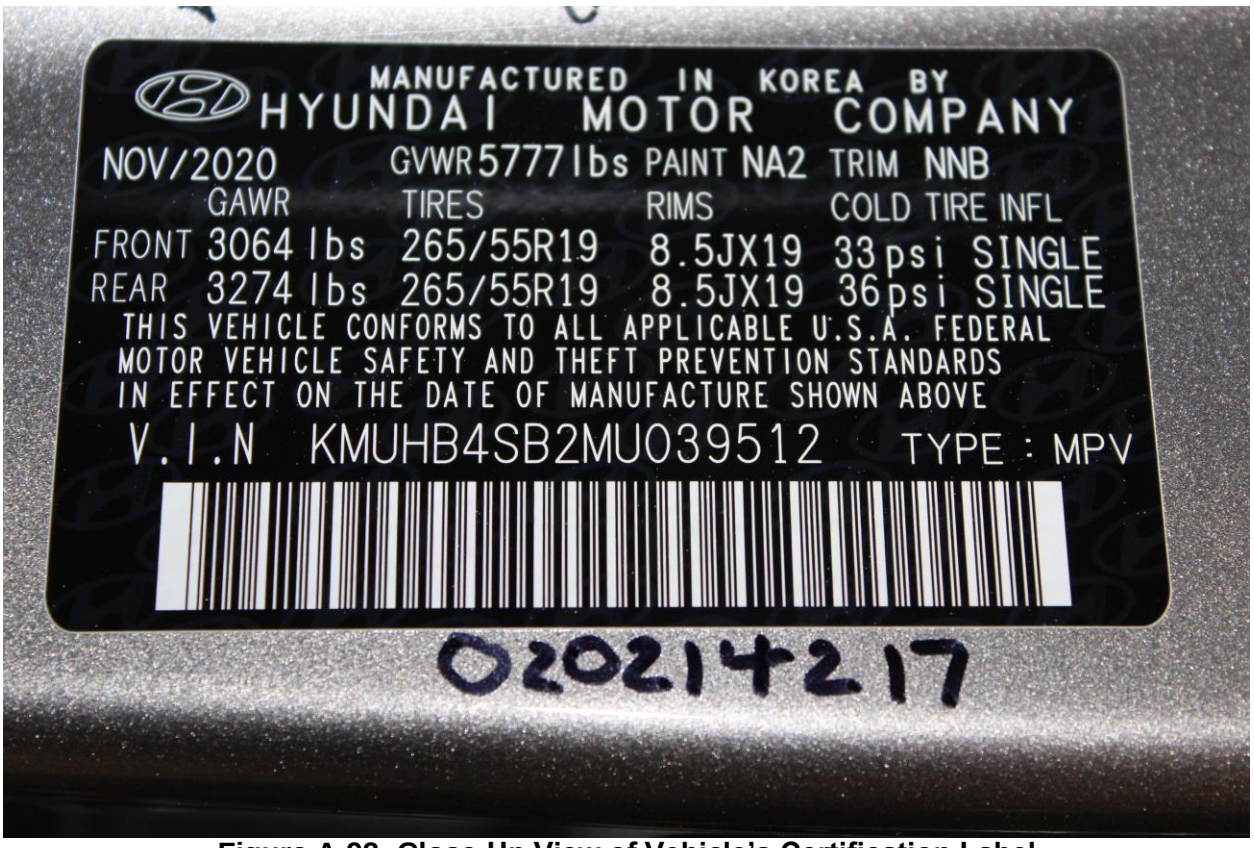


Figure A-92: Close-Up View of Vehicle's Certification Label

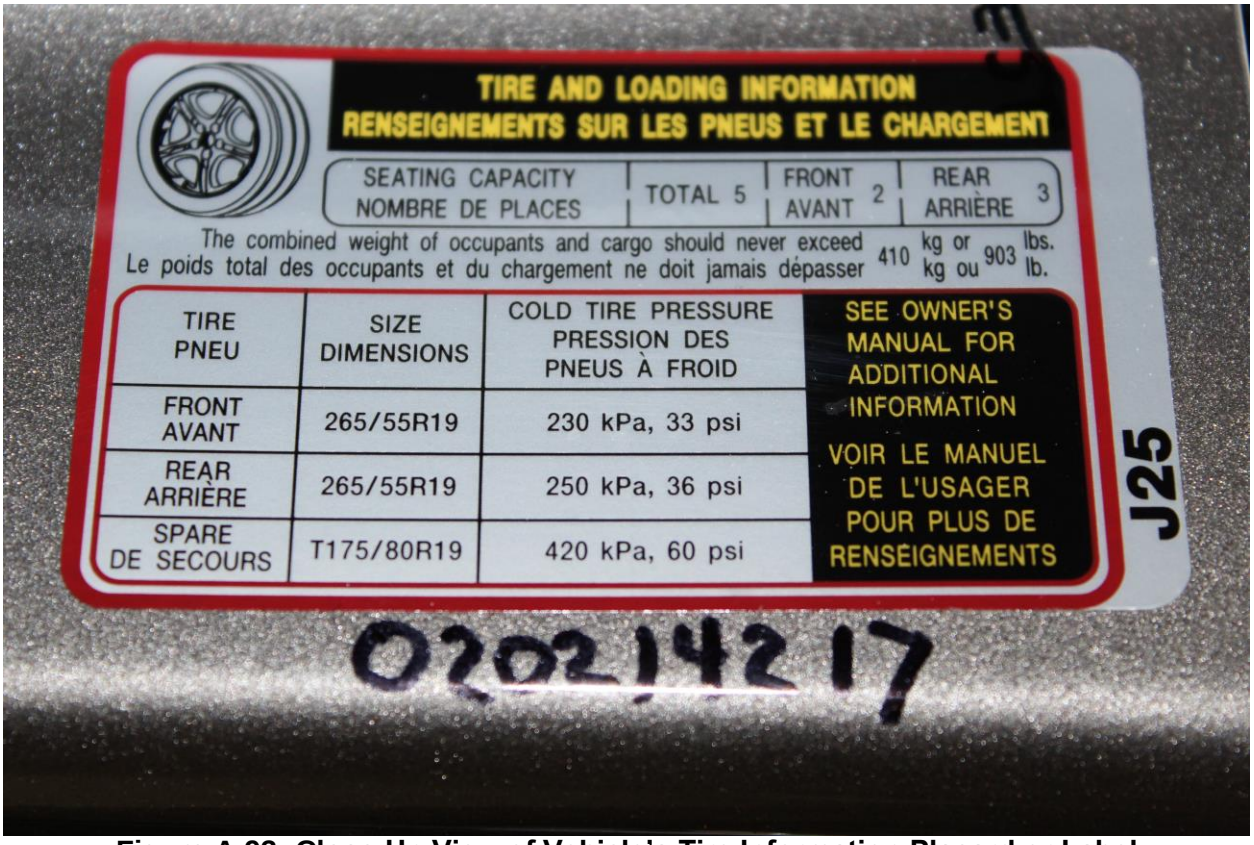


Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label

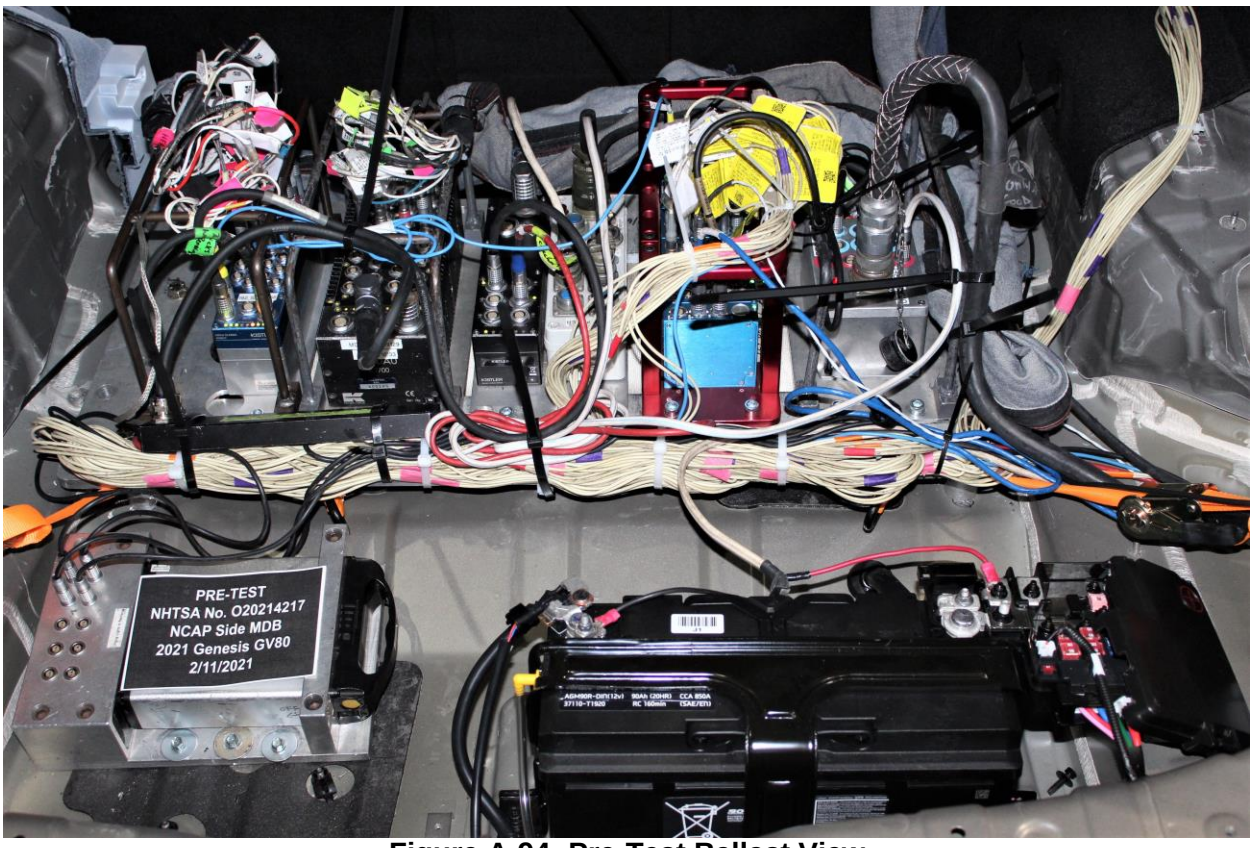


Figure A-94: Pre-Test Ballast View

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

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

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

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

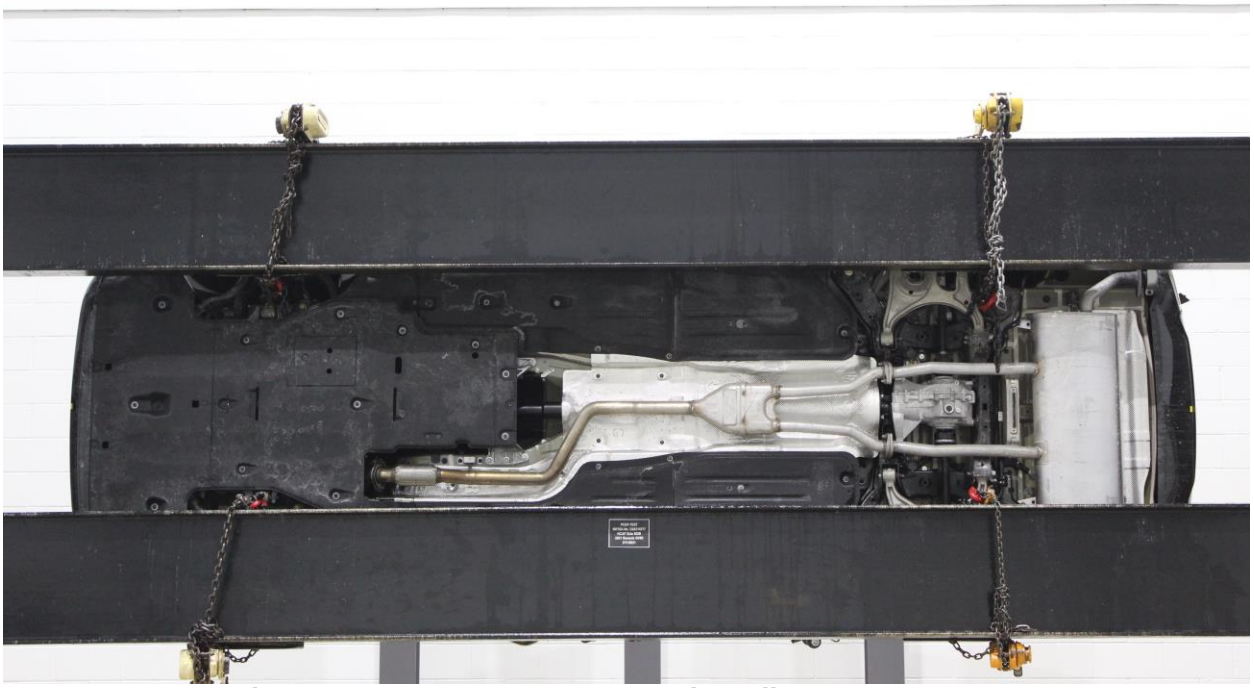


Figure A-99: FMVSS No. 301 Static Rollover 270 Degrees

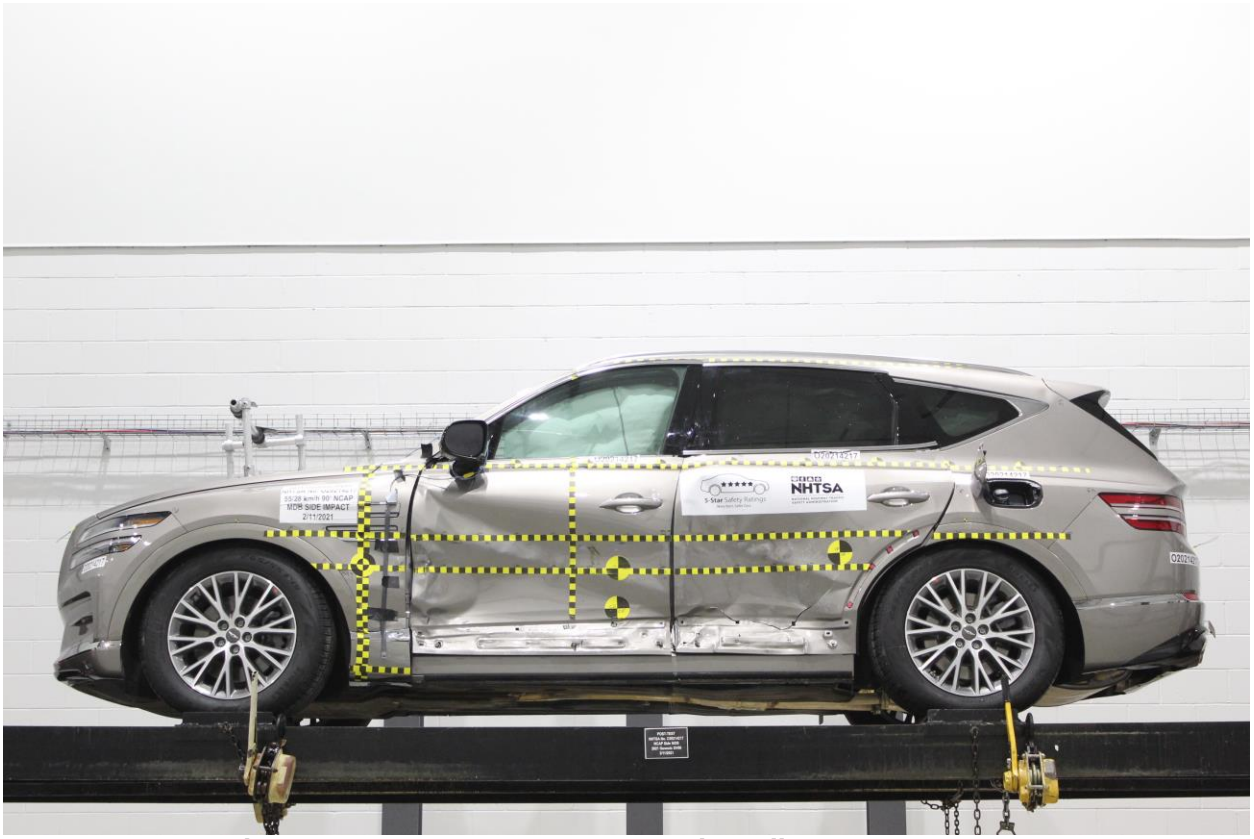


Figure A-100: FMVSS No. 301 Static Rollover 360 Degrees

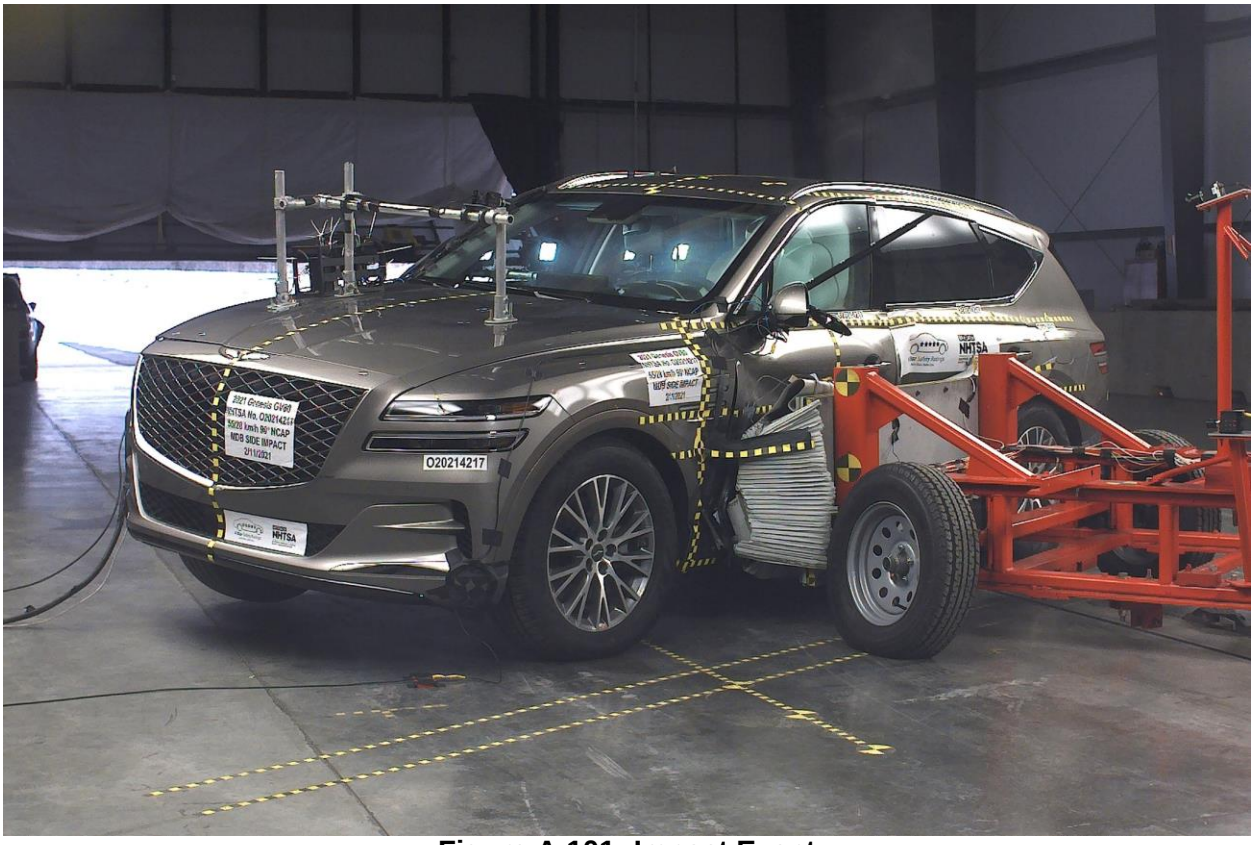


Figure A-101: Impact Event

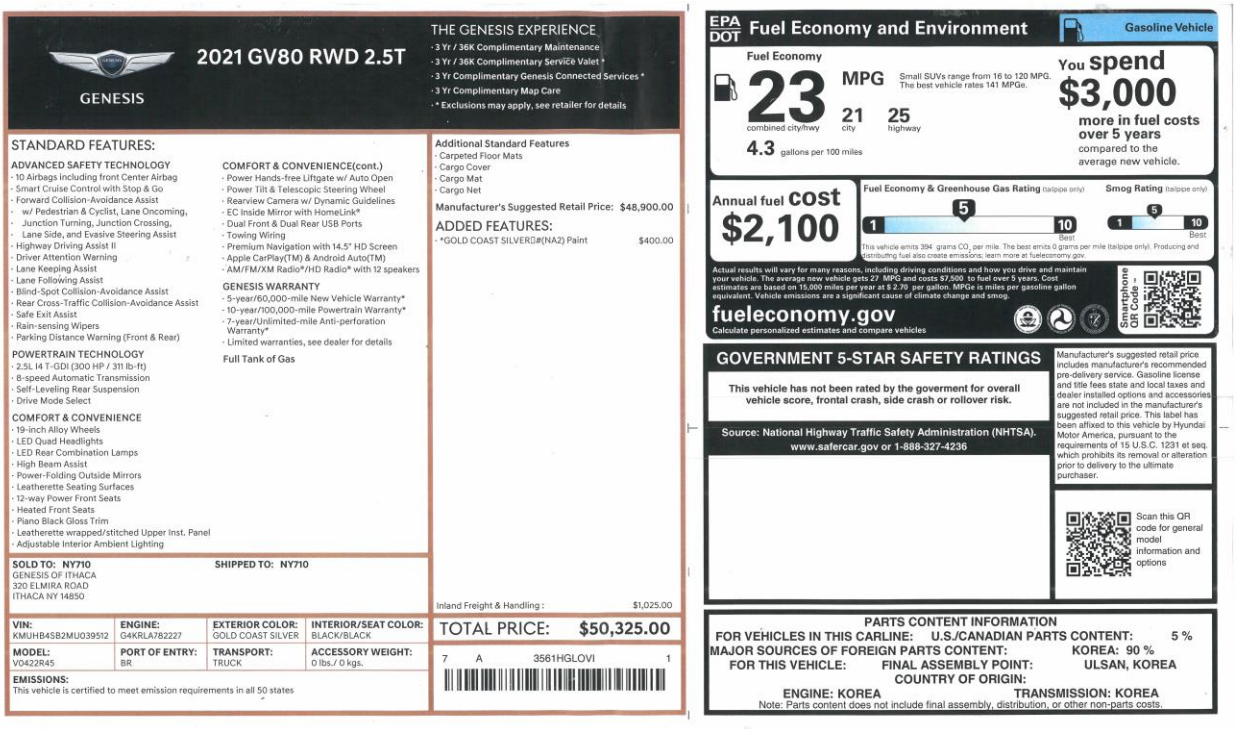


Figure A-102: Monroney Label

03

Front seat head restraints

OJX1039063L

The driver's and front passenger's seats are equipped with adjustable head restraints for the passengers safety and comfort.

OJX1039009

Adjusting the height up and down

To raise the head restraint:

1. Pull it up to the desired position (1).

To lower the head restraint:

1. Push and hold the release button (2) on the head restraint support.
2. Lower the head restraint to the desired position (3).

NOTICE

OH1038136

If you recline the seatback towards the front with the head restraint and seat cushion raised, the head restraint may come in contact with the sunvisor or other parts of the vehicle.

3-23

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

03

Second row seat head restraints

OJX1039129L

The second row seats are equipped with head restraints in all the seating positions for the passenger's safety and comfort.

OJX1039043

Removal/Reinstallation

To remove the head restraint:

1. Raise the head restraint as far as it can go.
2. Press the head restraint release button (1) while pulling the head restraint up (2).

To reinstall the head restraint:

1. Put the head restraint poles into the holes (3) while pressing the release button (1).
2. Adjust the head restraint to the appropriate height.

OJX1039042

Adjusting the height up and down

To raise the head restraint:

1. Pull it up to the desired position (1).

To lower the head restraint:

1. Push and hold the release button (2) on the head restraint support.
2. Lower the head restraint to the desired position (3).

3-25

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

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

Driver & Passenger Dummy Instrumentation Plots

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

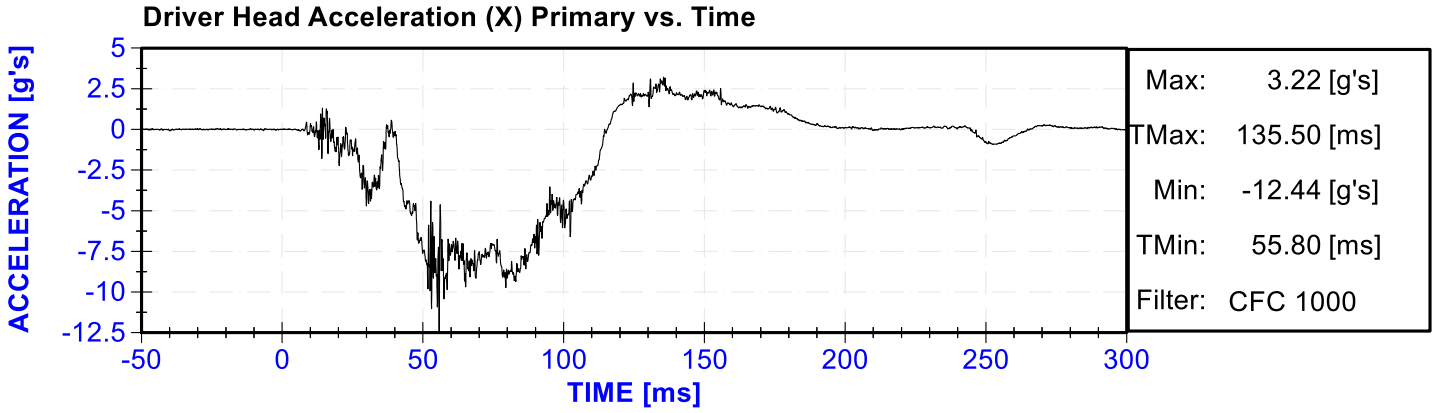
Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower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

Vehicle Instrumentation Data

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

MDB Instrumentation Data

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


Driver Head Acceleration (X) Primary vs. Time
ACCELERATION [g's]
TIME [ms]
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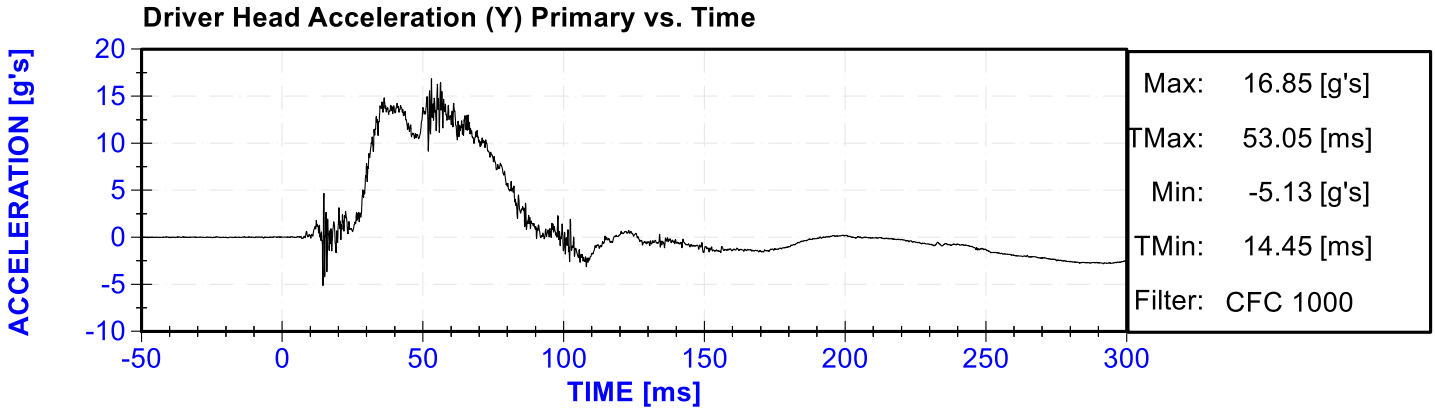
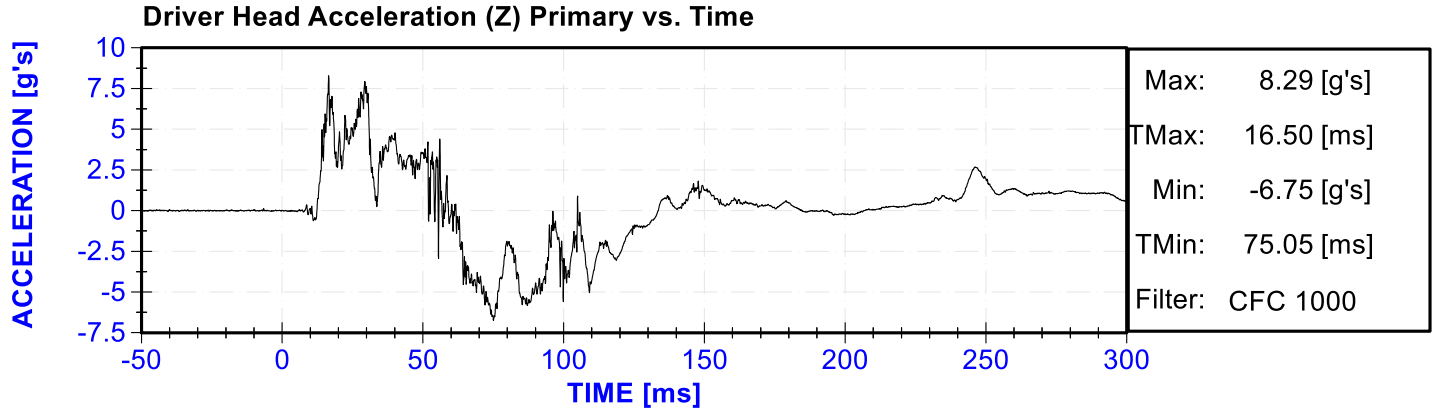
TMax: 135.50 [ms]
Min: -12.44 [g's]
TMin: 55.80 [ms]
Filter: CFC 1000


Driver Head Acceleration (Y) Primary vs. Time
ACCELERATION [g's]
TIME [ms]
Max: 16.85 [g's]
TMax: 53.05 [ms]
Min: -5.13 [g's]
TMin: 14.45 [ms]
Filter: CFC 1000


Driver Head Acceleration (Z) Primary vs. Time
ACCELERATION [g's]
TIME [ms]
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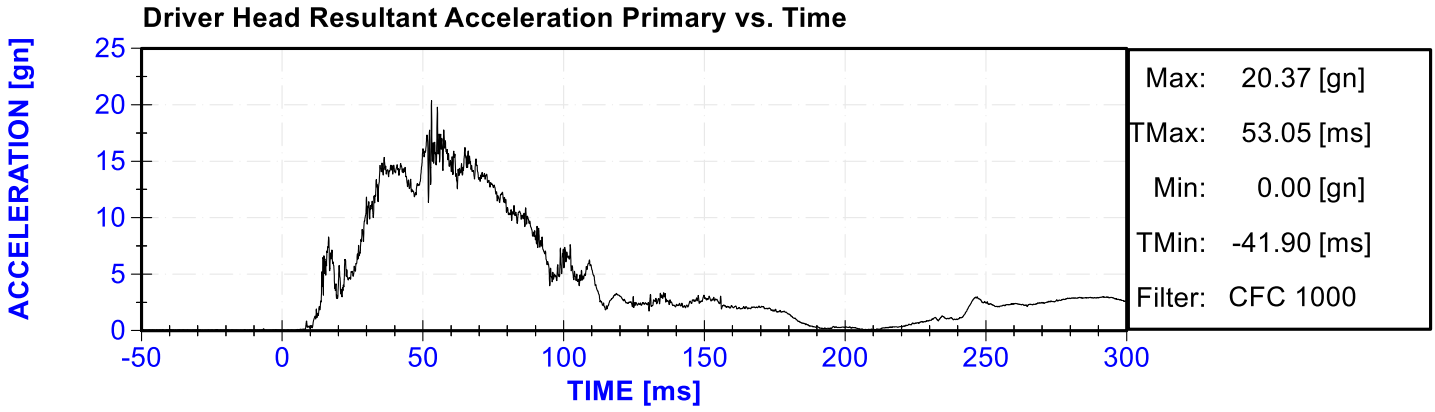
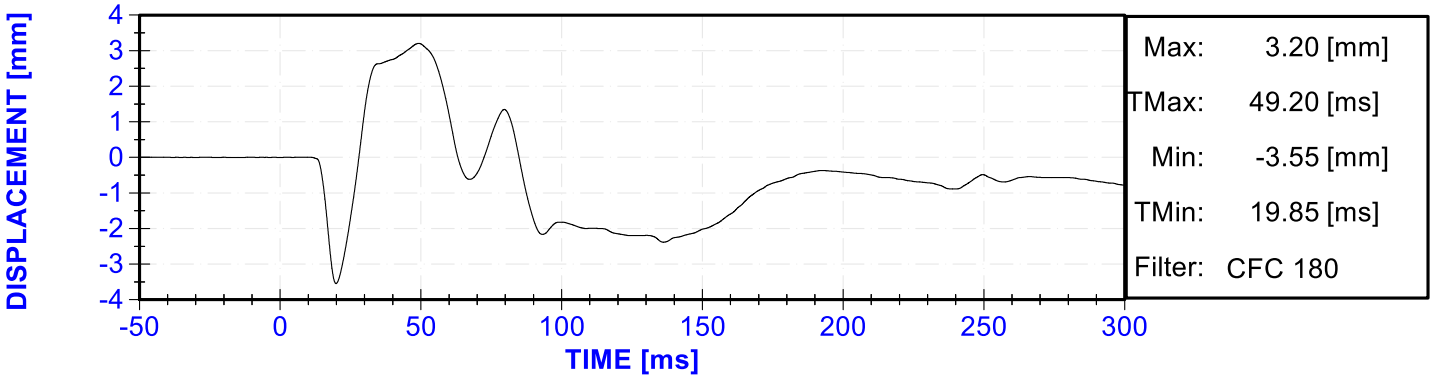
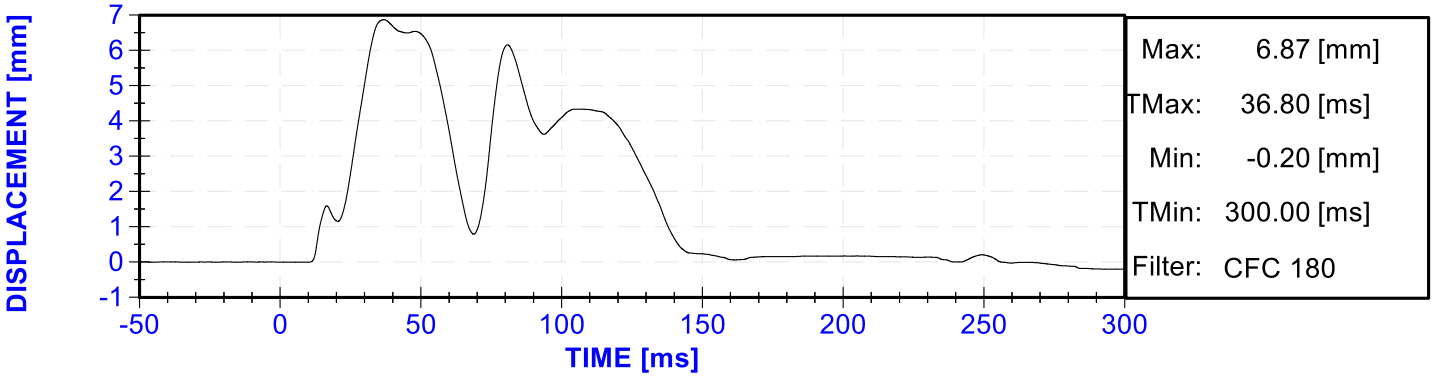
TMax: 16.50 [ms]
Min: -6.75 [g's]
TMin: 75.05 [ms]
Filter: CFC 1000


Driver Head Resultant Acceleration Primary vs. Time
ACCELERATION [gn]
TIME [ms]
Max: 20.37 [gn]
TMax: 53.05 [ms]
Min: 0.00 [gn]
TMin: -41.90 [ms]
Filter: CFC 1000

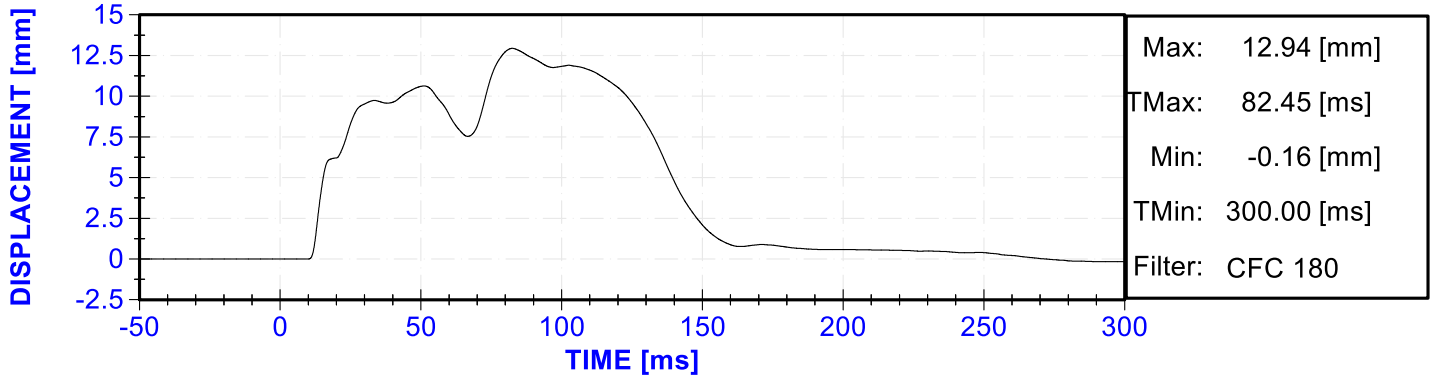
Driver Upper Thorax Rib Deflection (Y) vs. Time



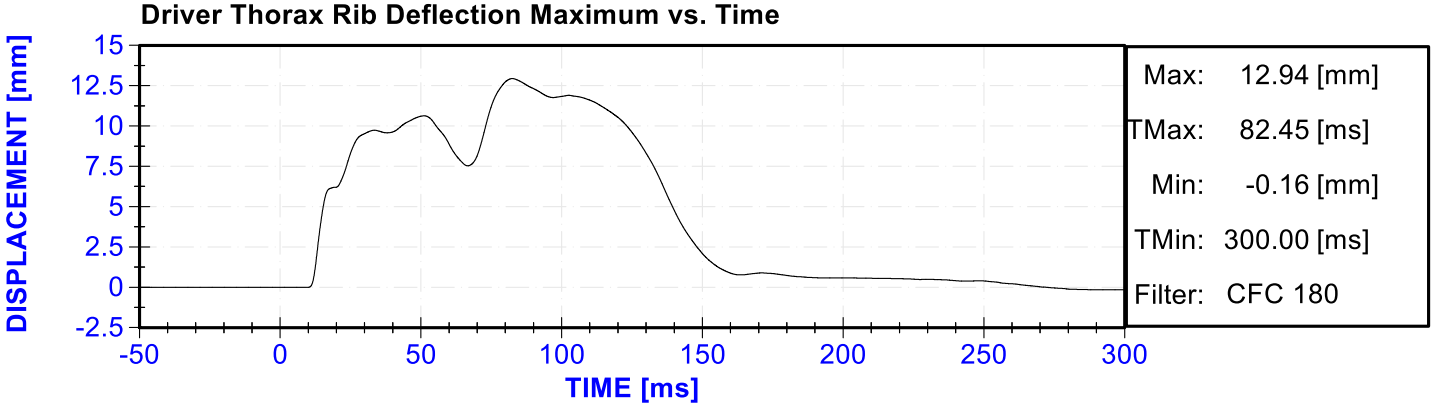
Driver Middle Thorax Rib Deflection (Y) vs. Time



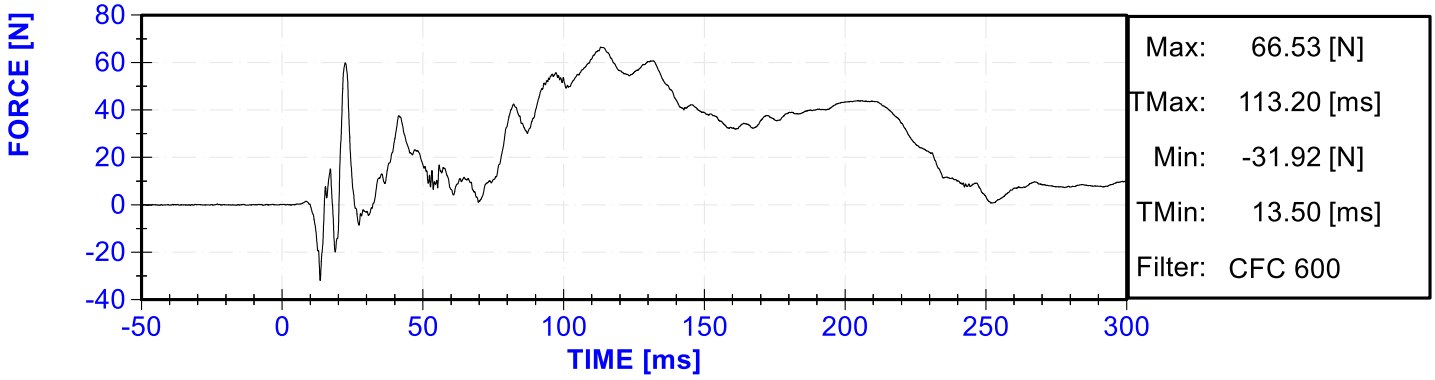
Driver Lower Thorax Rib Deflection (Y) vs. Time



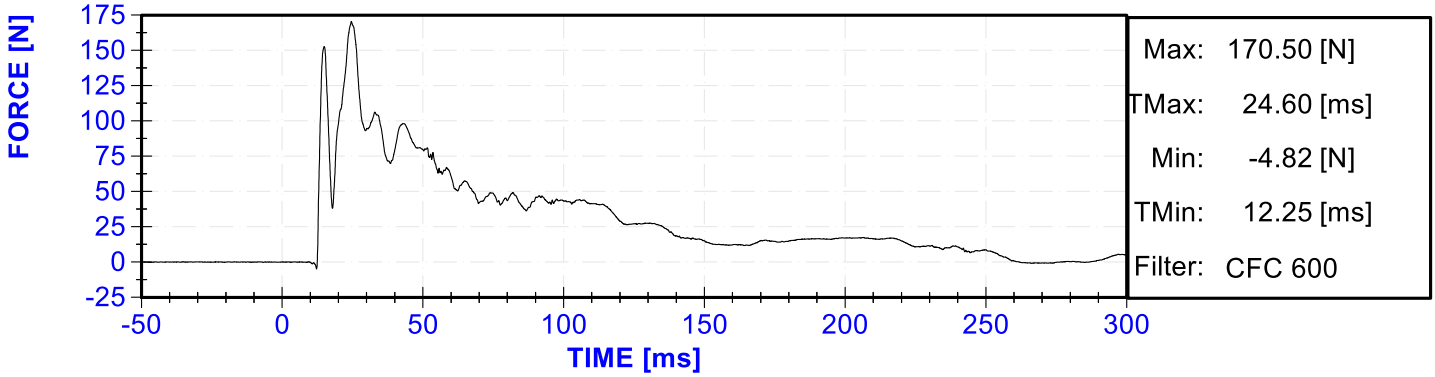
Driver Thorax Rib Deflection Maximum vs. Time



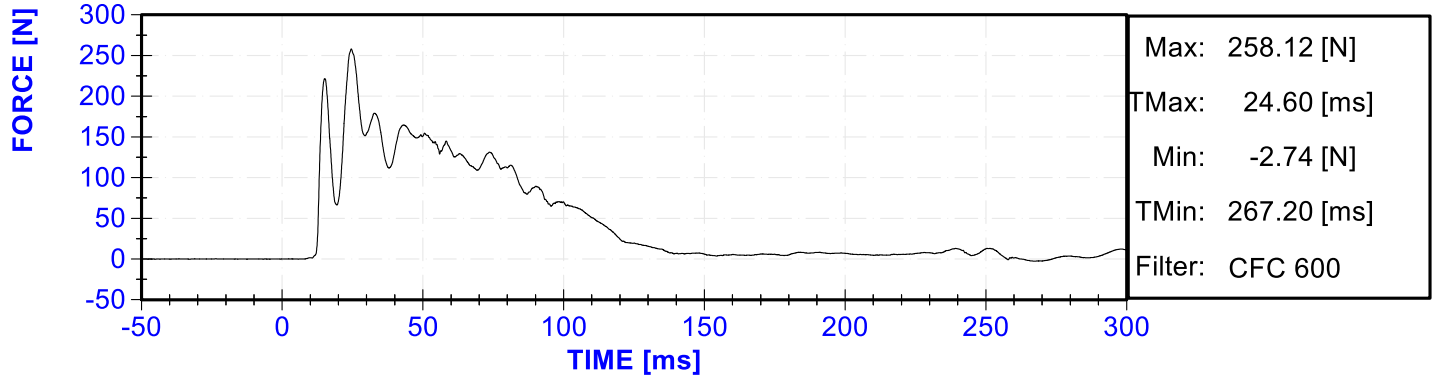
Driver Anterior Abdominal Force (Y) vs. Time



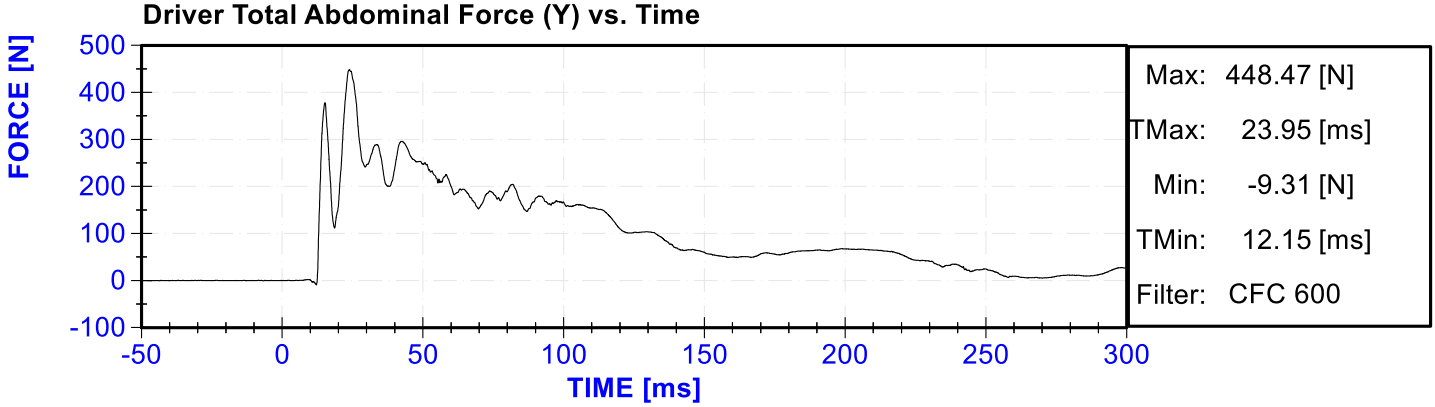
Driver Middle Abdominal Force (Y) vs. Time



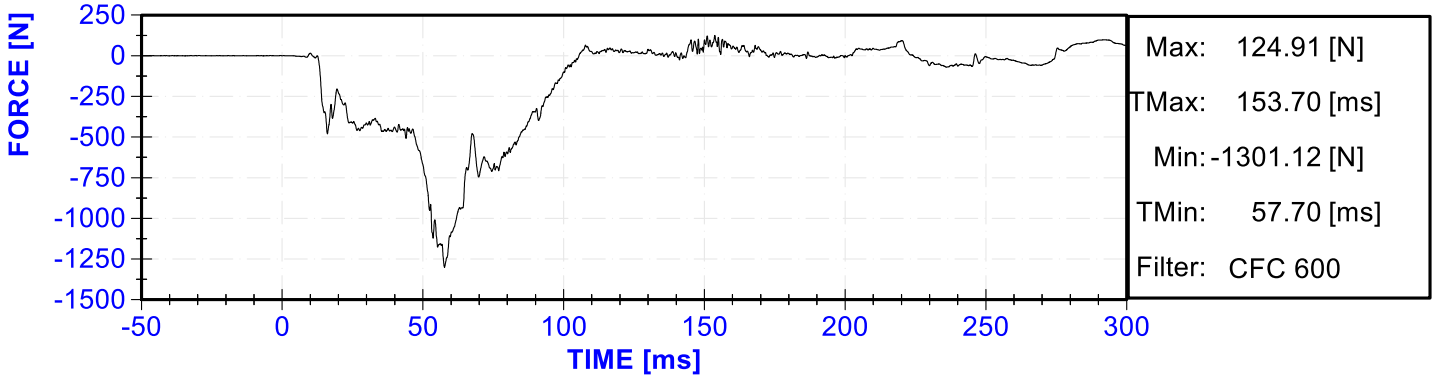
Driver Posterior Abdominal Force (Y) vs. Time



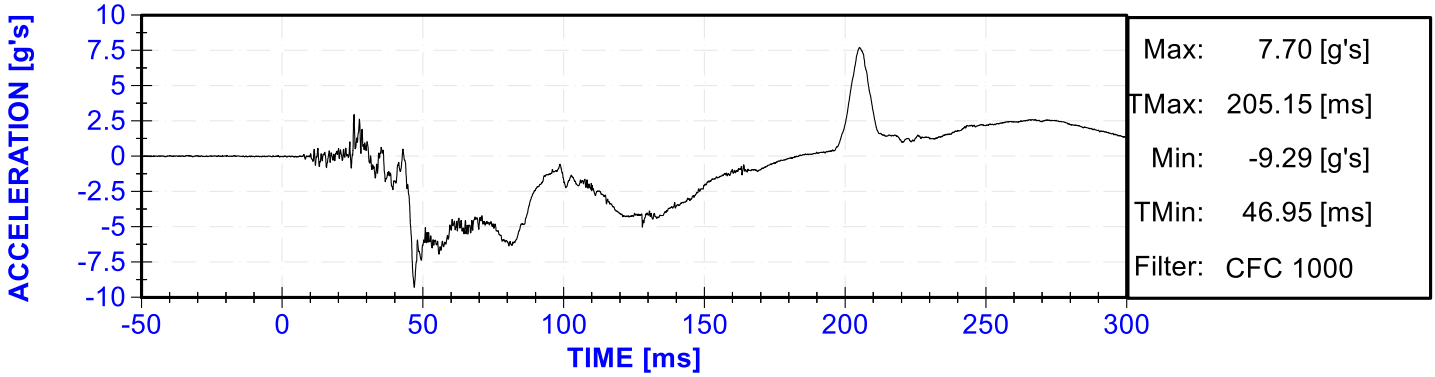
Driver Total Abdominal Force (Y) vs. Time



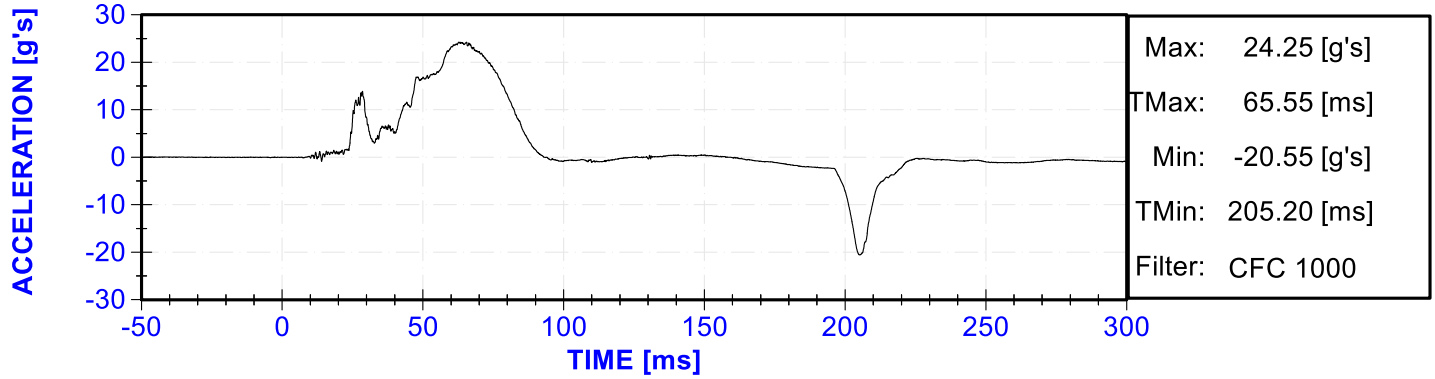
Driver Pubic Symphysis Force (Y) vs. Time



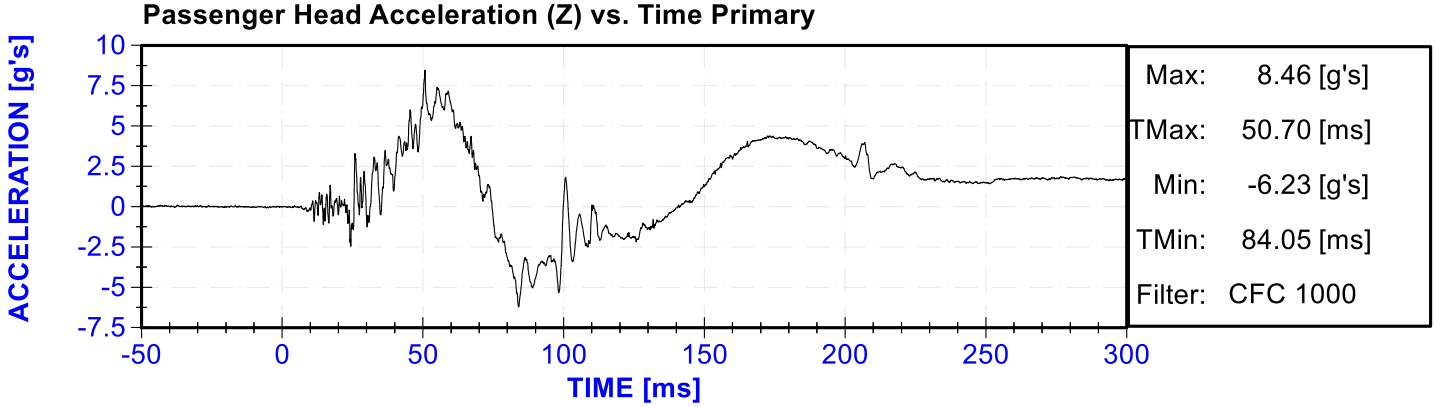
Passenger Head Acceleration (X) vs. Time Primary



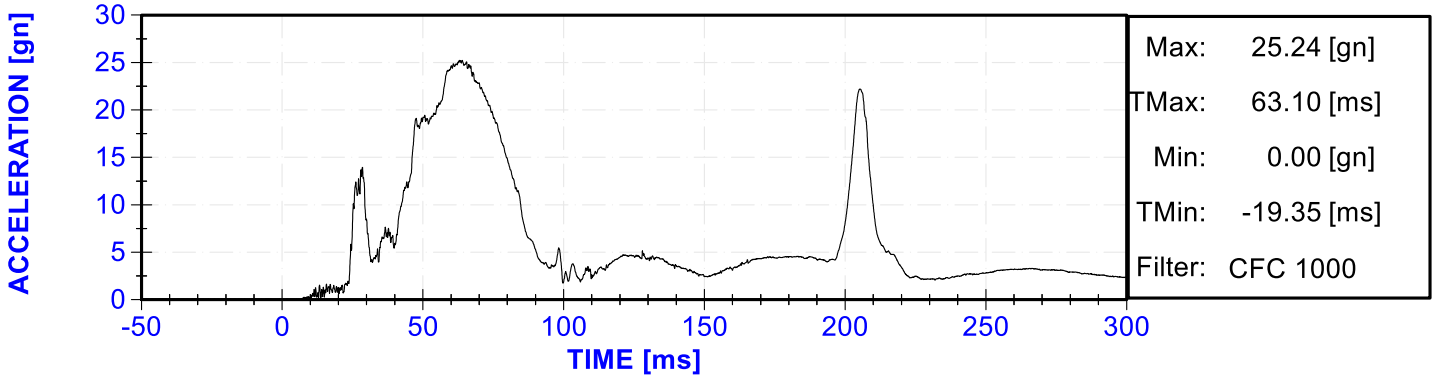
Passenger Head Acceleration (Y) vs. Time Primary



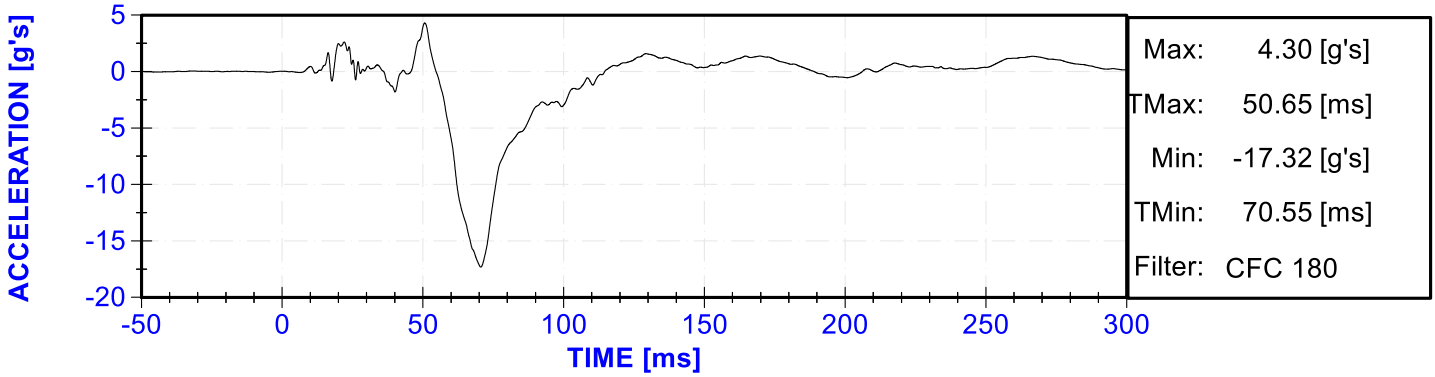
Passenger Head Acceleration (Z) vs. Time Primary



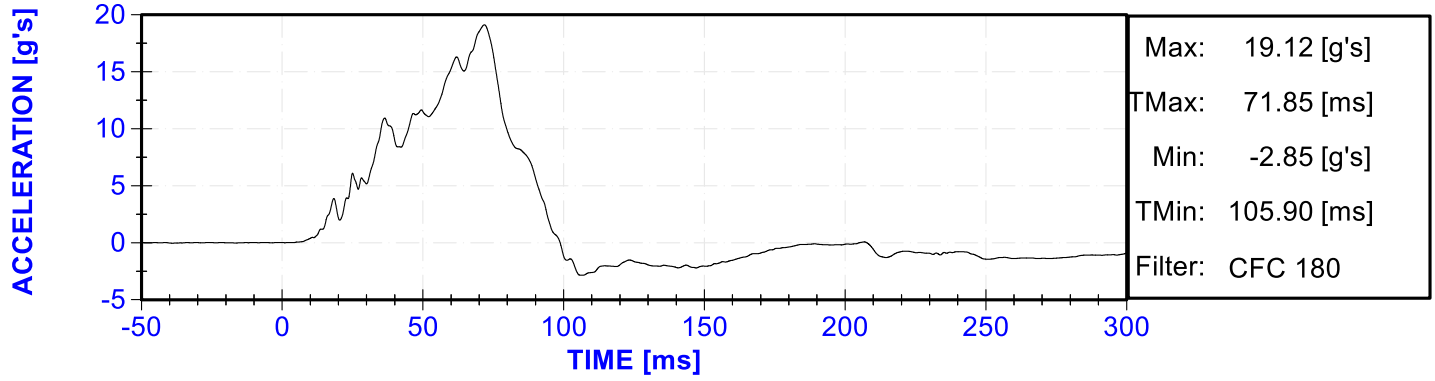
Passenger Head Resultant Acceleration Primary vs. Time



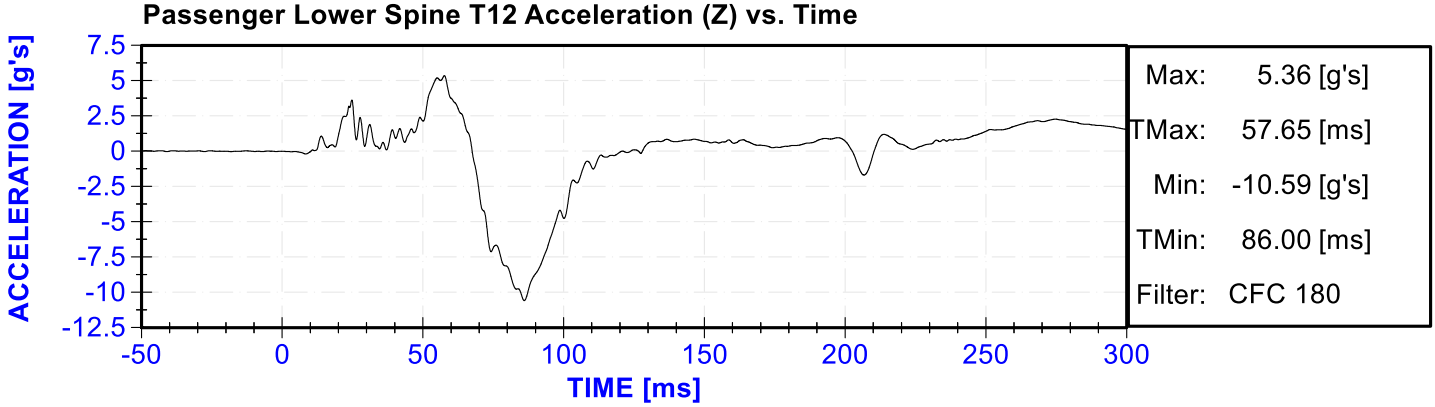
Passenger Lower Spine T12 Acceleration (X) vs. Time



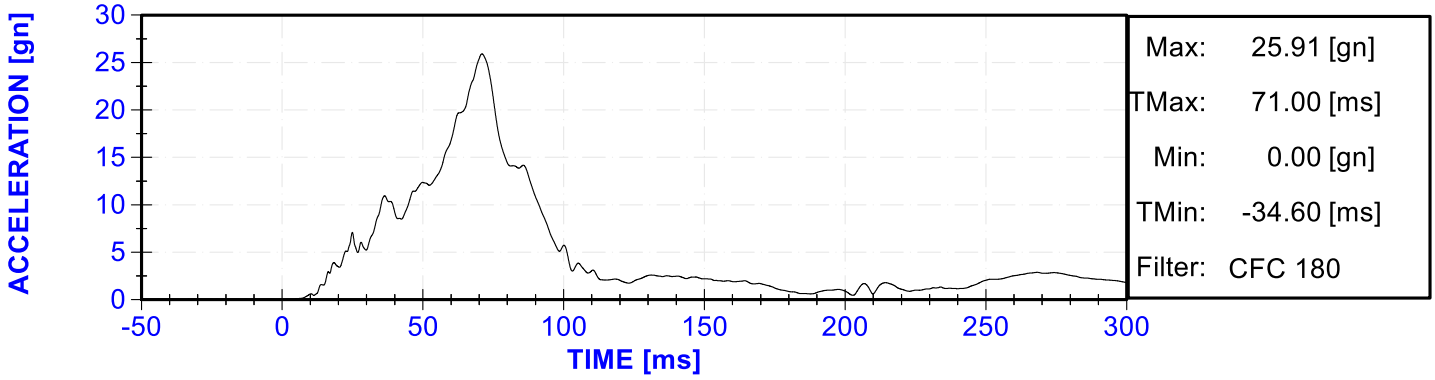
Passenger Lower Spine T12 Acceleration (Y) vs. Time



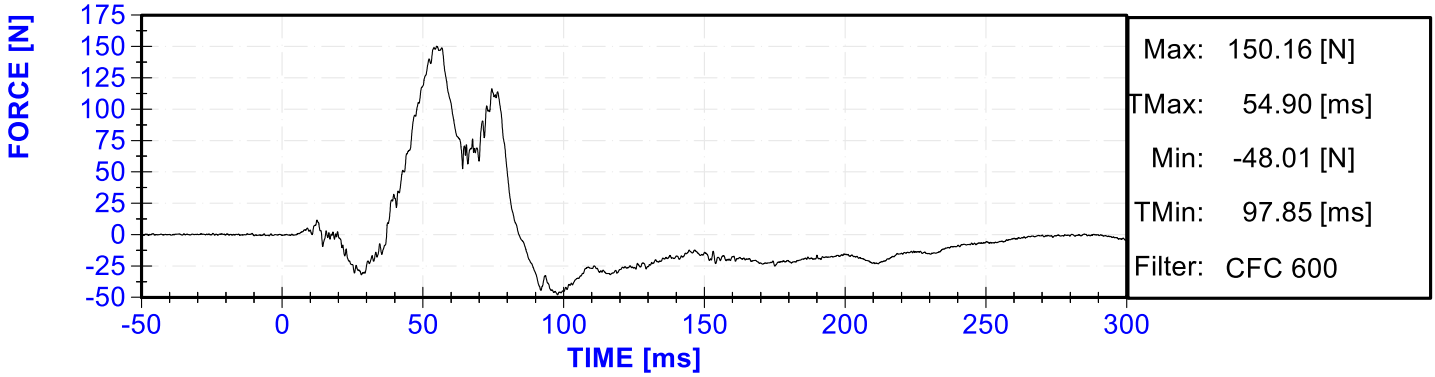
Passenger Lower Spine T12 Acceleration (Z) vs. Time



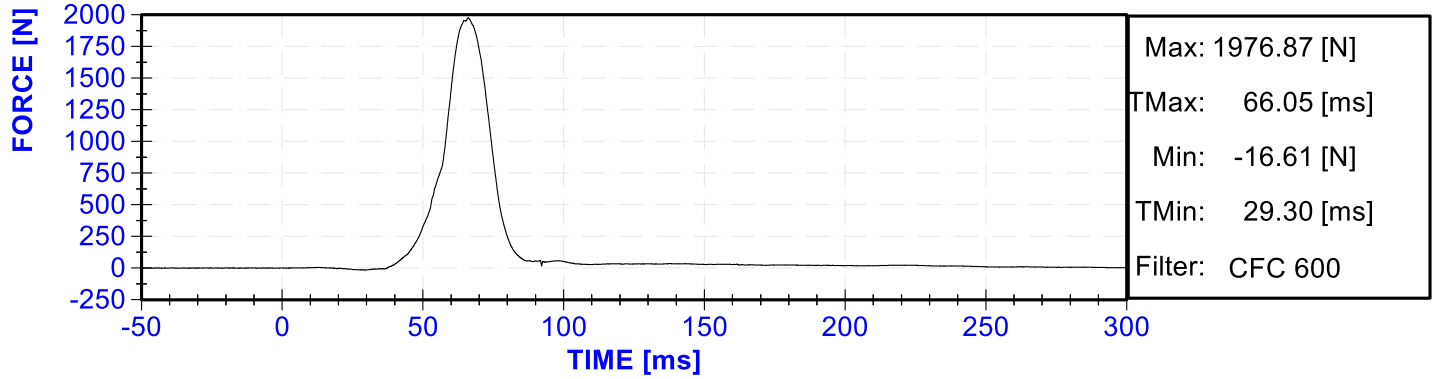
Passenger Lower Spine T12 Resultant Acceleration vs. Time



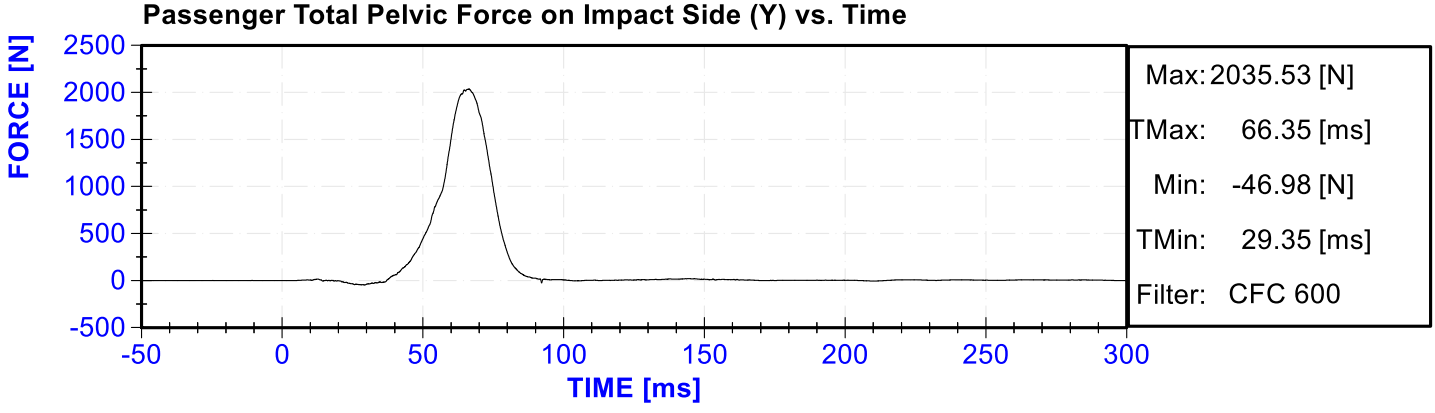
Passenger Iliac Force on Impact Side (Y) vs. Time



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



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



APPENDIX C

DUMMY PERFORMANCE CALIBRATION TEST DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

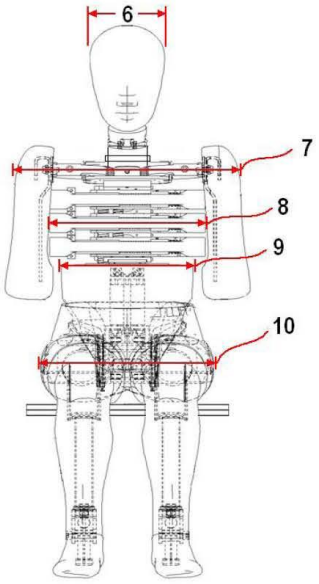
SERIAL NO: F034

(CONFIGURED FOR LEFT SIDE IMPACT)

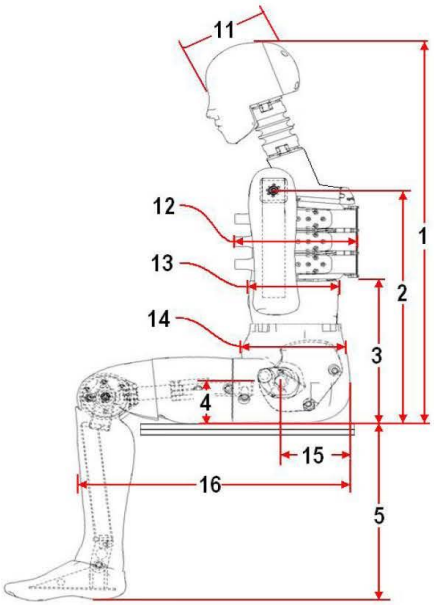
External Measurements - EuroSID-2re

Technician: K. Dutton Date: 2/5/2021

Dummy Serial Number: F034



FRONT VIEW



SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	914	Pass
2	Seat to Shoulder Joint	558	572	569	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	352	Pass
4	Seat to Hip Joint (center of bolt)	97	103	100	Pass
5	Sole to Seat, Sitting	333	451	425	Pass
6	Head Width	152	158	154	Pass
7	Shoulder/Arm Width	461	479	472	Pass
8	Thorax Width	322	332	329	Pass
9	Abdomen Width	273	287	285	Pass
10	Pelvis Lap Width	359	373	367	Pass
11	Head Depth	196	206	202	Pass
12	Thorax Depth	262	272	268	Pass
13	Abdomen Depth	194	204	202	Pass
14	Pelvis Depth	235	245	240	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	156	Pass
16	Back of Buttocks to Front Knee	597	615	609	Pass

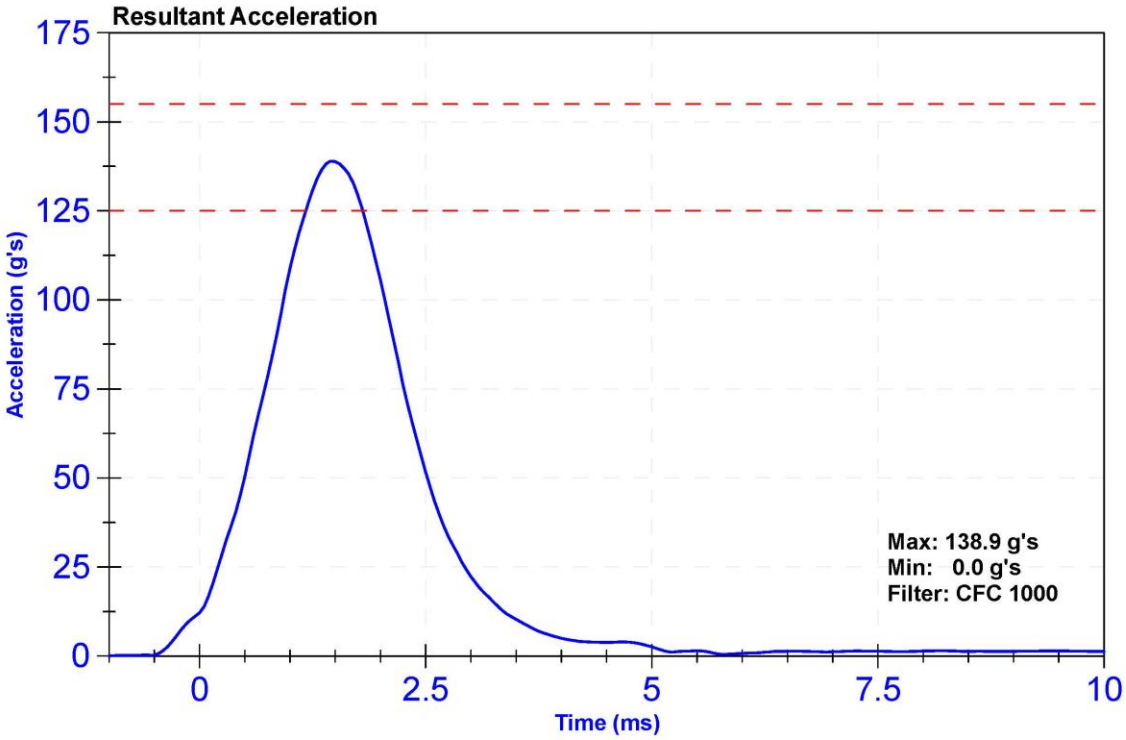
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

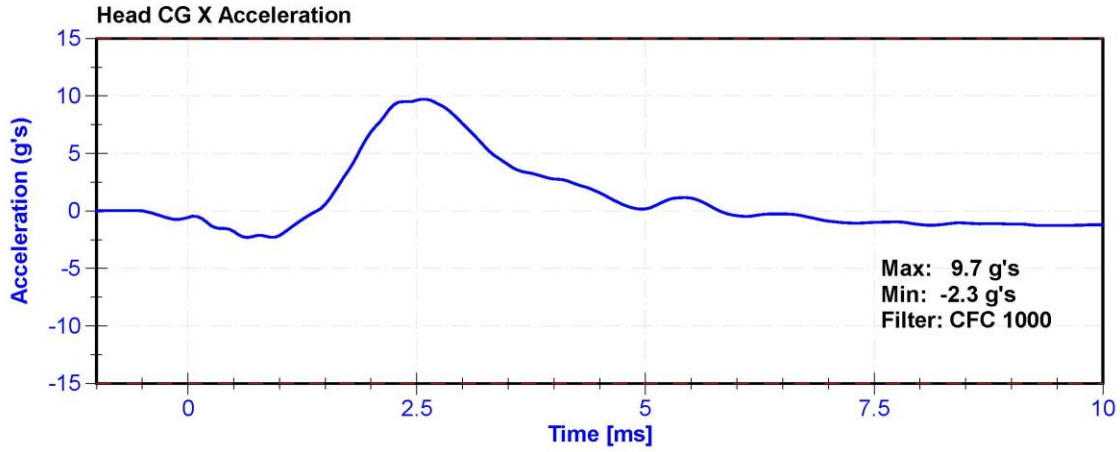
Results

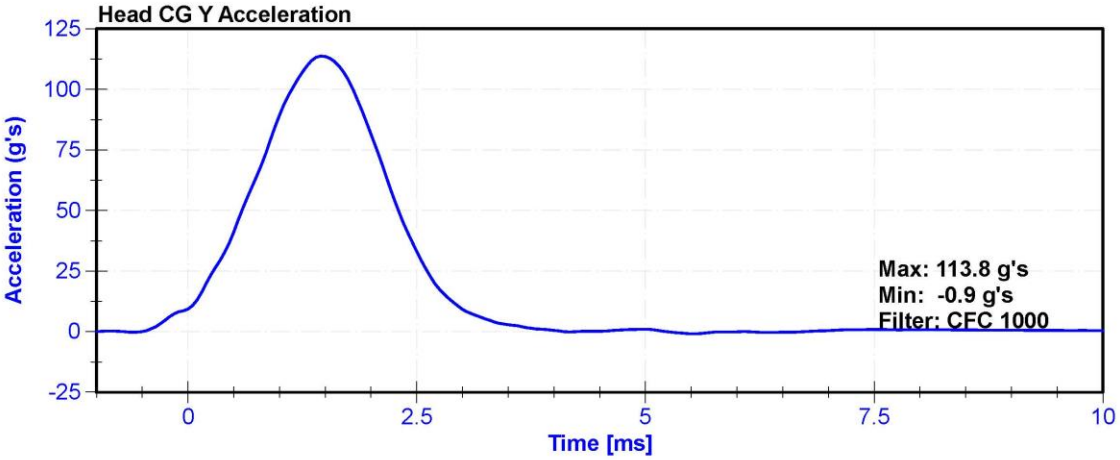
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	22	Pass
Resultant Acceleration	125	155	g's	138.9	Pass
Oscillation	0	15	%	2.86	Pass
Fore-Aft Acceleration	-15	15	g's	9.7	Pass

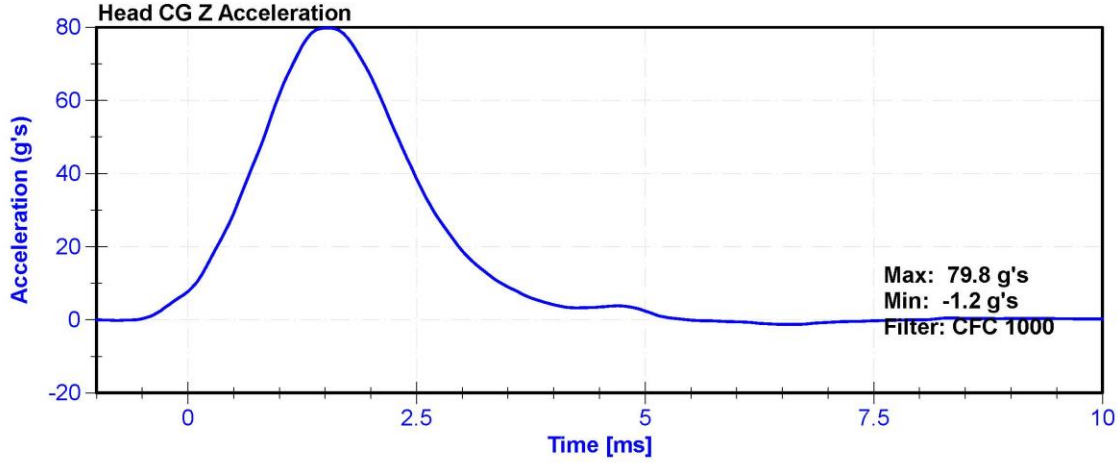
Transducer Calibrations

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




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 9.7 g's
Min: -2.3 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 113.8 g's
Min: -0.9 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]
Max: 79.8 g's
Min: -1.2 g's
Filter: CFC 1000

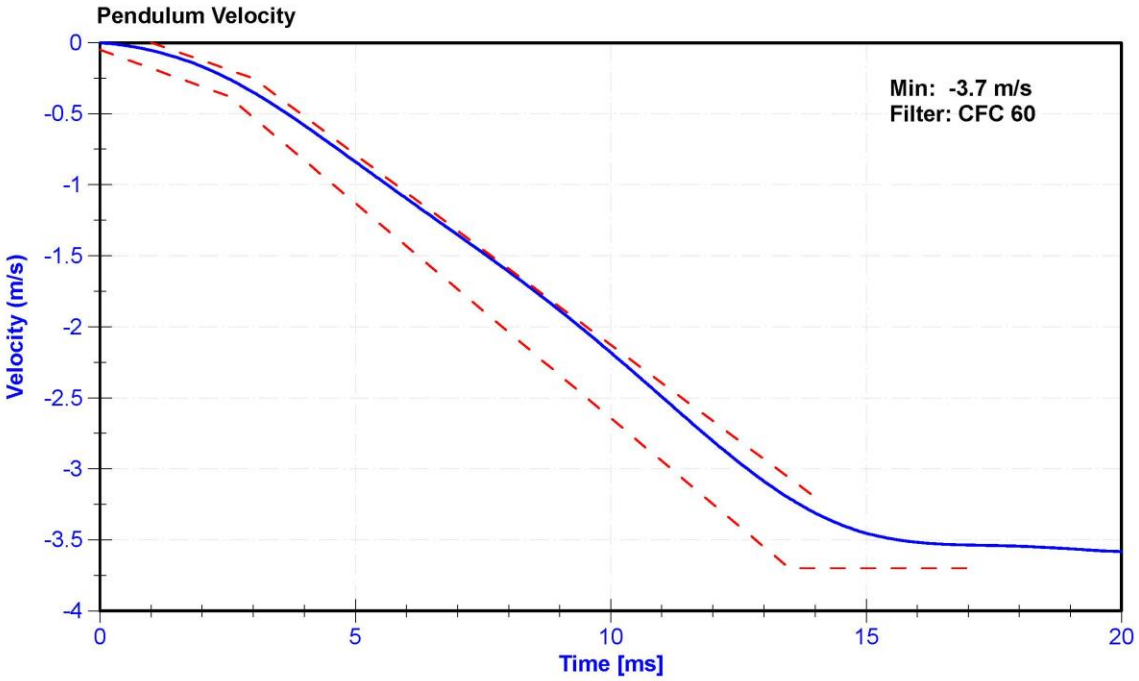
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

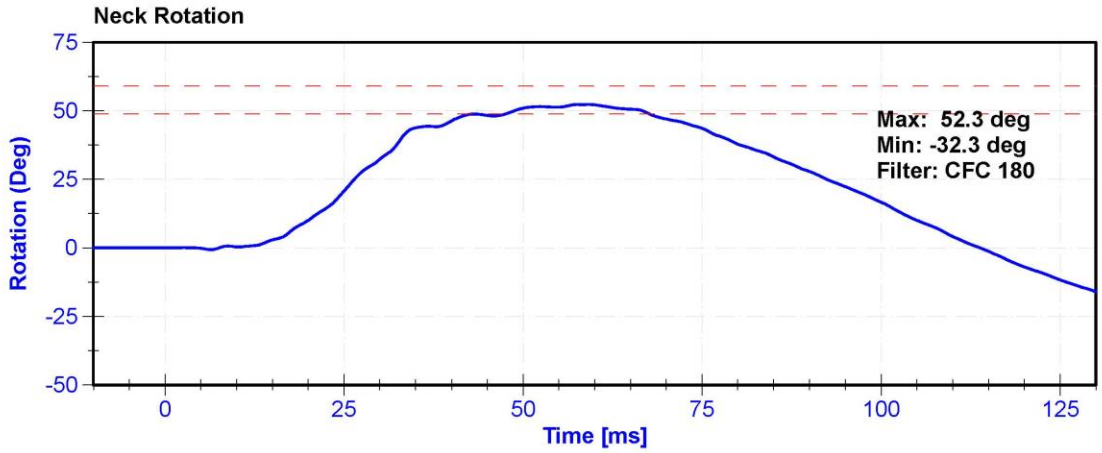
Results

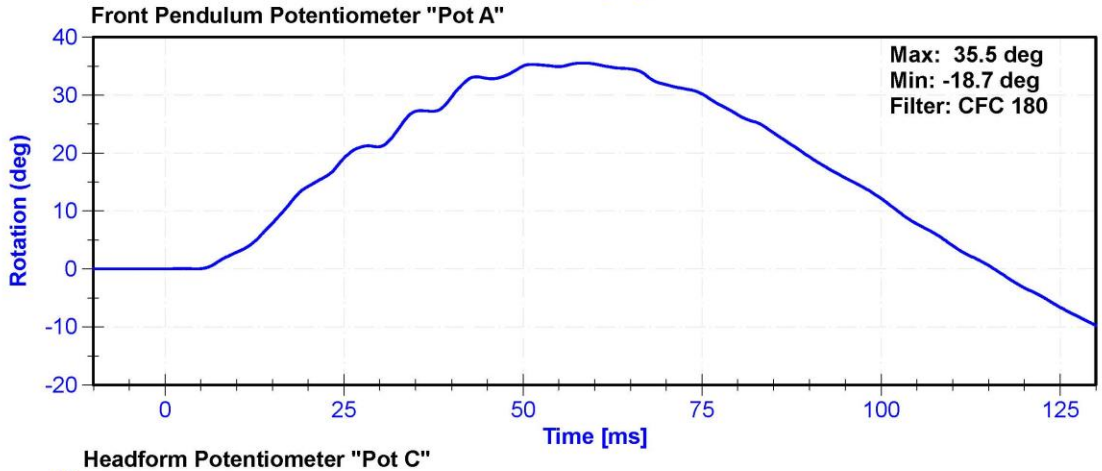
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	23.2	Pass
Velocity	3.3	3.5	m/s	3.38	Pass
Lateral Neck Rotation	49	59	deg	52.3	Pass
Time at Maximum Rotation	54	66	ms	59.2	Pass
Time of Rotation Decay from Maximum	53	88	ms	54.7	Pass

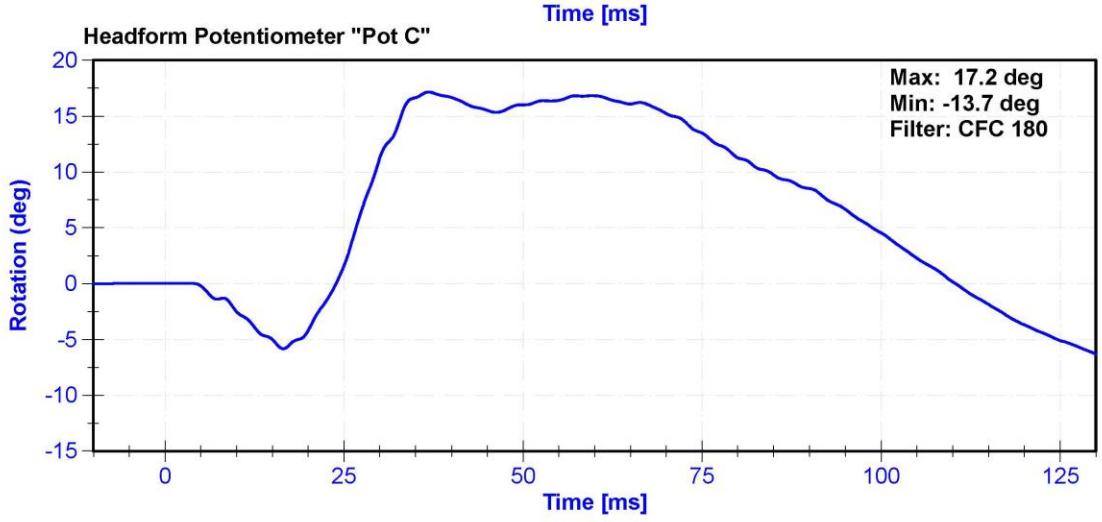
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231C TAC	C-C16503 Striker	2/5/2021	2/5/2022
Front Pendulum Potentiometer	SP22G	DS-094	8/18/2020	8/18/2021
Headform Potentiometer	SP22G	DS-095	8/18/2020	8/18/2021




Neck Rotation
Max: 52.3 deg
Min: -32.3 deg
Filter: CFC 180
Rotation (Deg)
Time [ms]


Front Pendulum Potentiometer "Pot A"
Max: 35.5 deg
Min: -18.7 deg
Filter: CFC 180
Rotation (deg)
Time [ms]


Headform Potentiometer "Pot C"
Max: 17.2 deg
Min: -13.7 deg
Filter: CFC 180
Rotation (deg)
Time [ms]

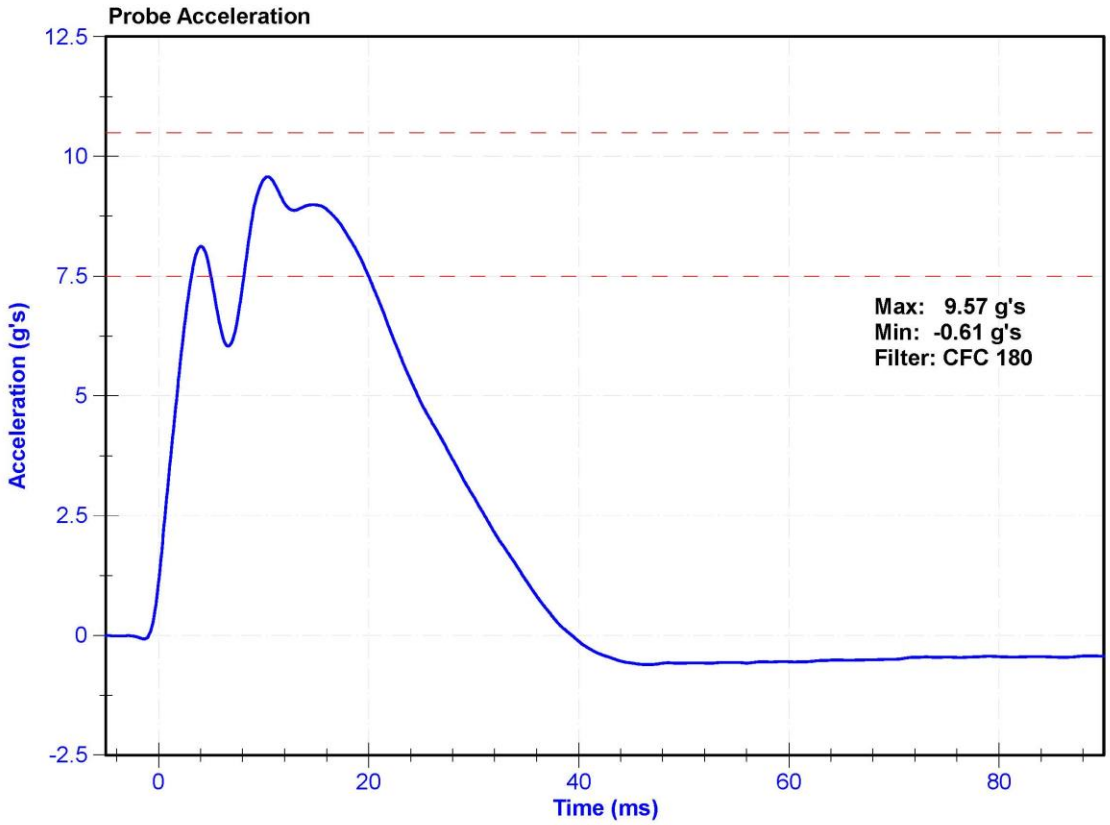
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	24.0	Pass
Velocity	4.2	4.4	m/s	4.40	Pass
Probe Acceleration	7.5	10.5	g's	9.57	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022



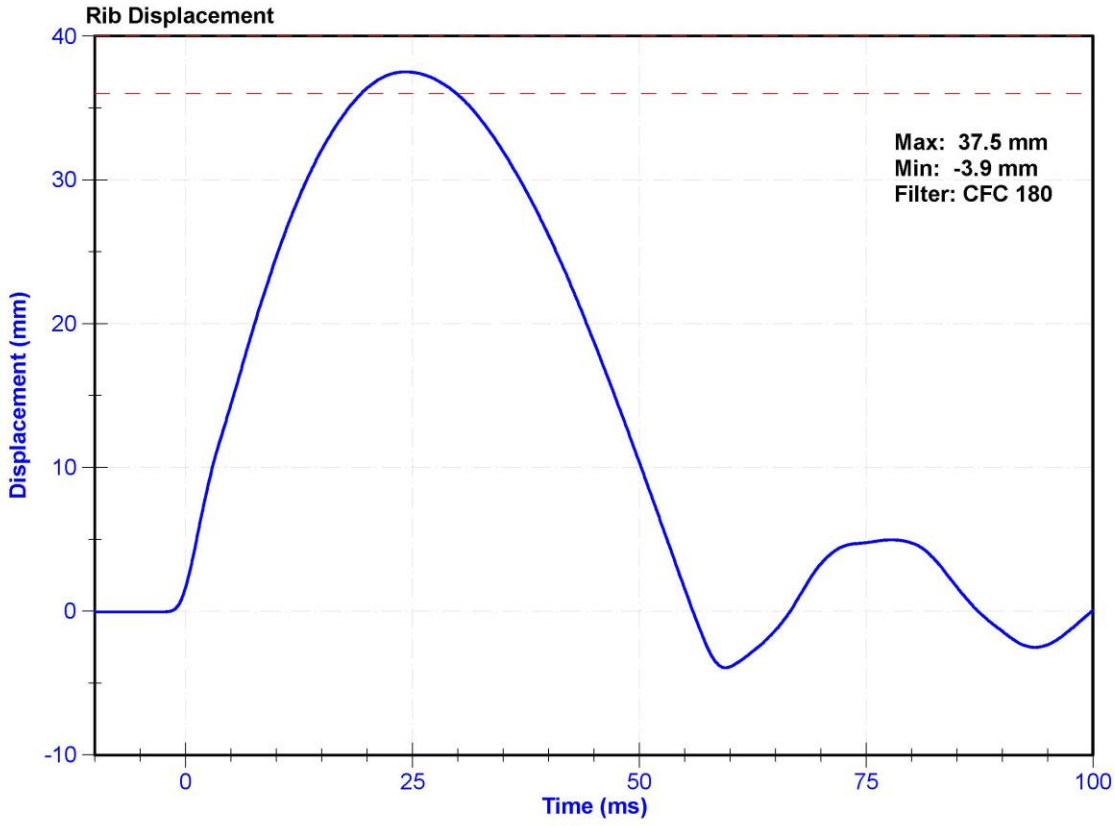
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	36	40	mm	37.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/8/2020	4/8/2021



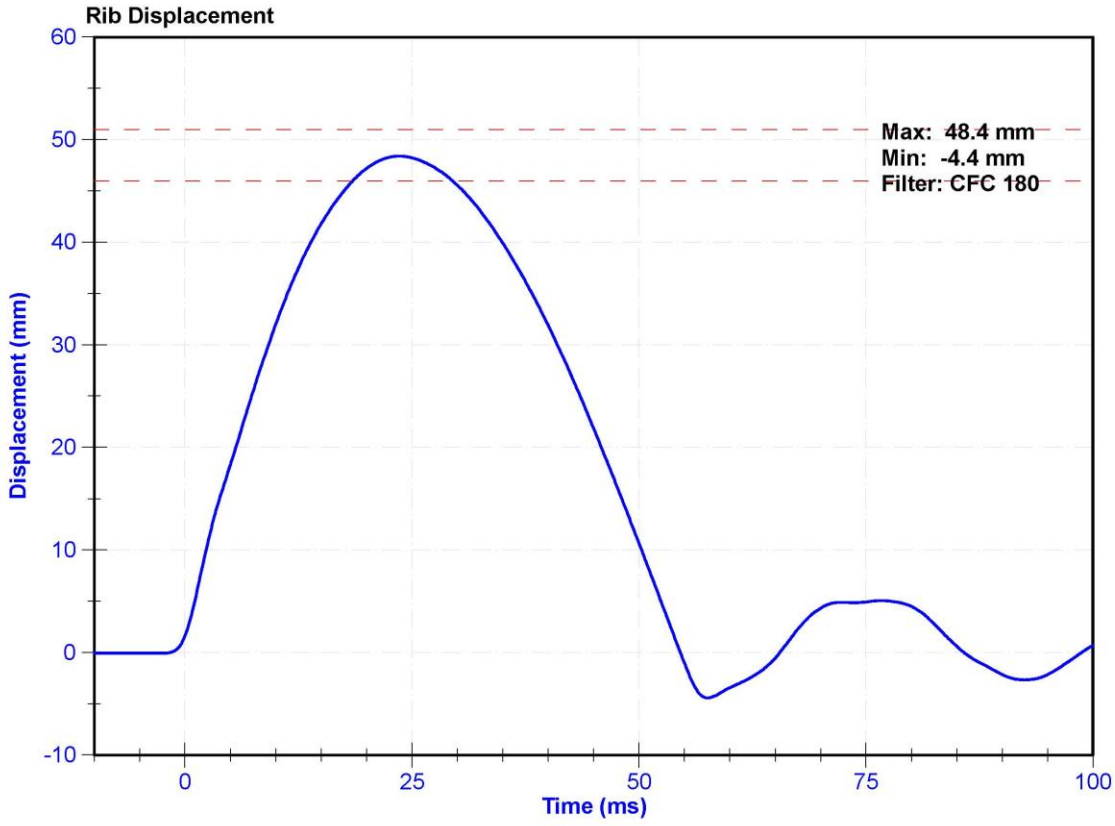
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	21.7	Pass
Rib Displacement	46	51	mm	48.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/8/2020	4/8/2021



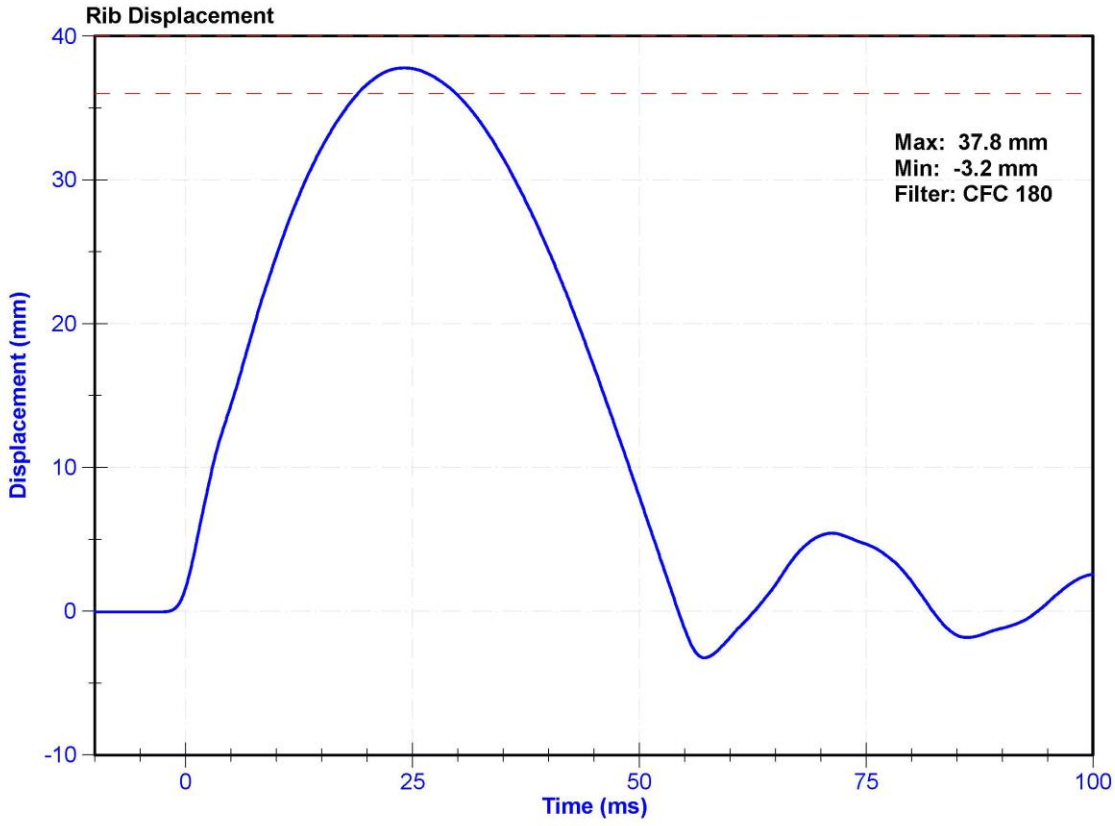
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	23.4	Pass
Rib Displacement	36	40	mm	37.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/8/2020	4/8/2021



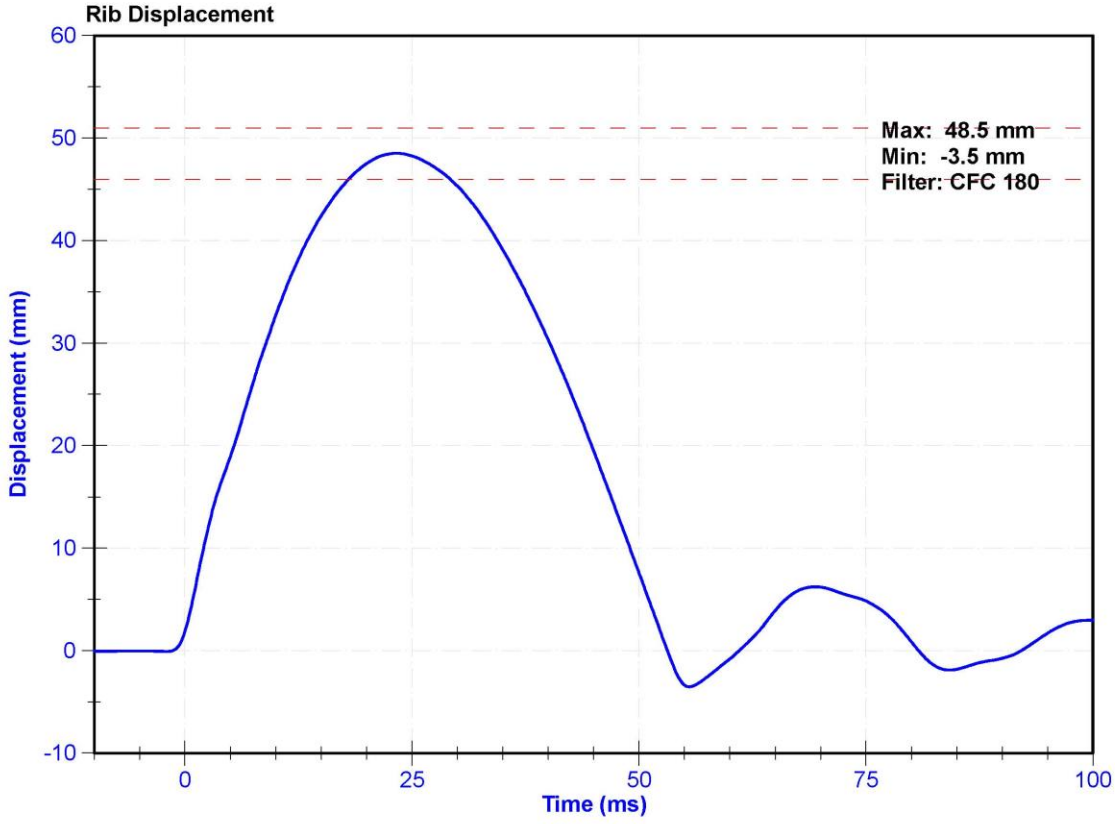
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	23.4	Pass
Rib Displacement	46	51	mm	48.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/8/2020	4/8/2021



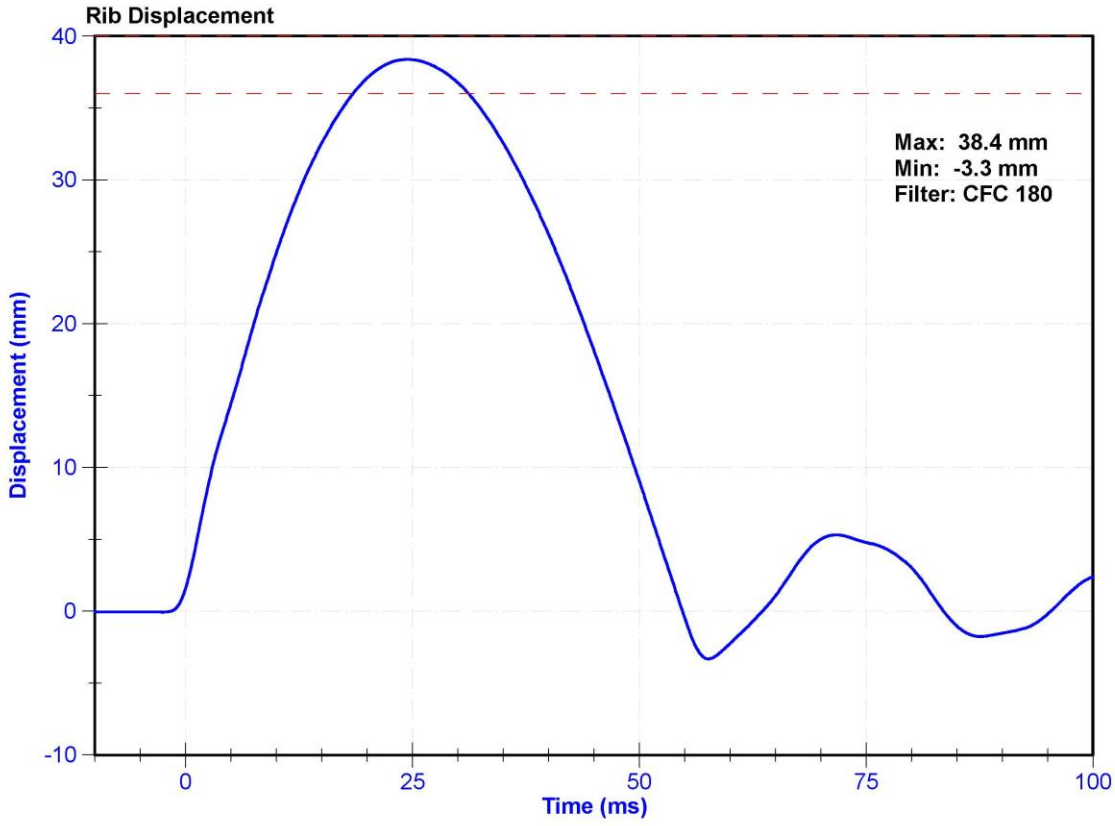
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	23.4	Pass
Rib Displacement	36	40	mm	38.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/8/2020	4/8/2021



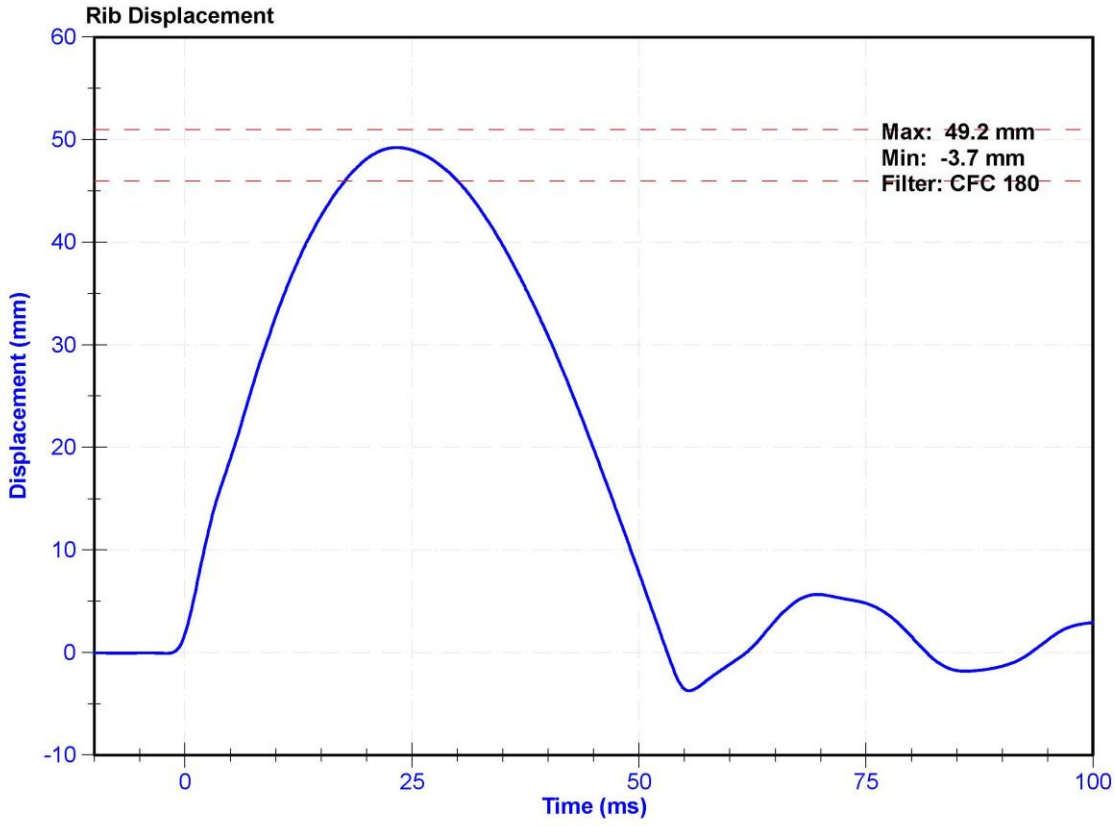
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	23.4	Pass
Rib Displacement	46	51	mm	49.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/8/2020	4/8/2021



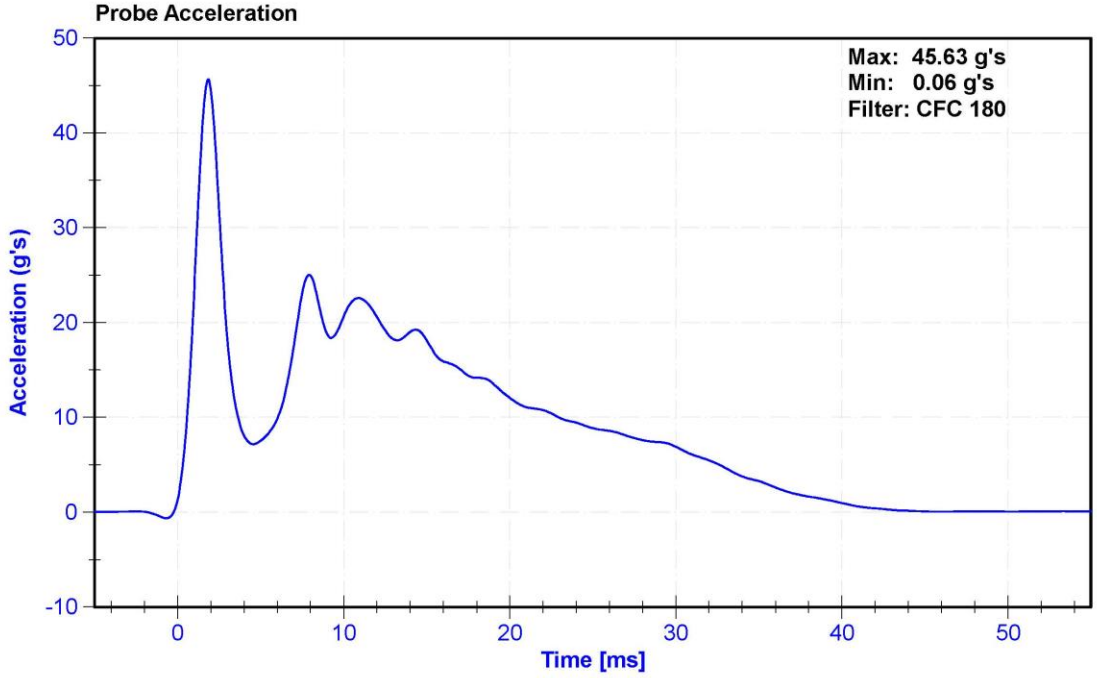
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

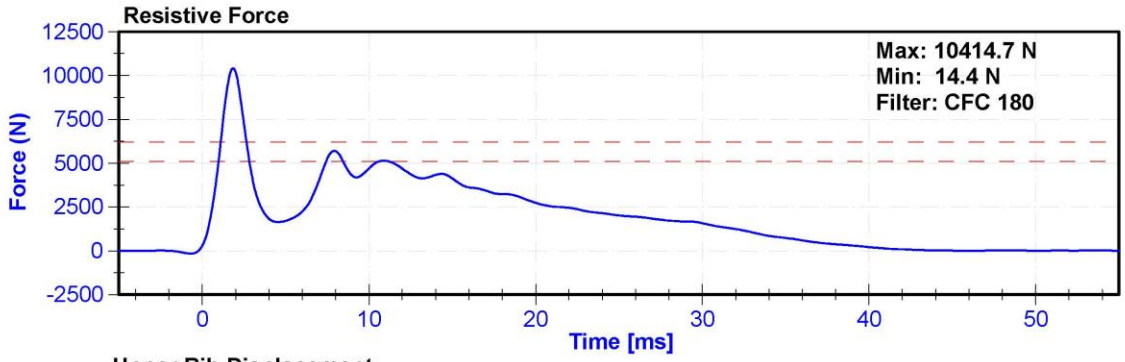
Results

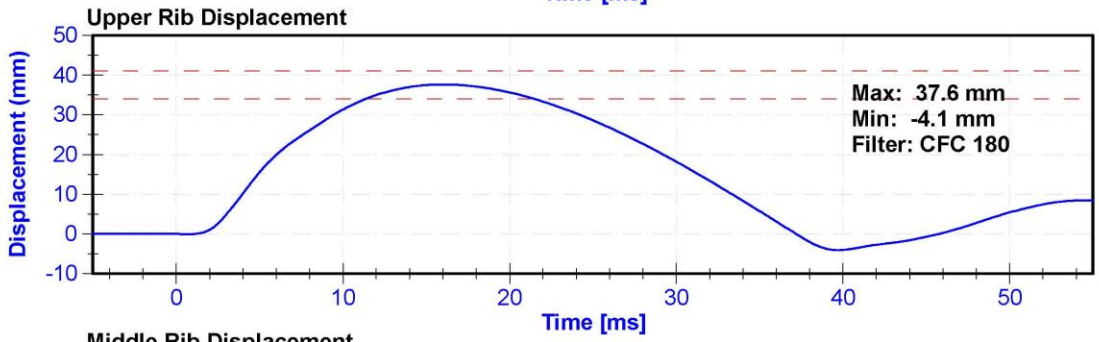
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	26.0	Pass
Velocity	5.4	5.6	m/s	5.44	Pass
Resistive Force after 6ms	5100	6200	N	5711.5	Pass
Upper Thorax Rib Deflection	34	41	mm	37.6	Pass
Mid Thorax Rib Deflection	37	45	mm	41.9	Pass
Lower Thorax Rib Deflection	37	44	mm	41.2	Pass

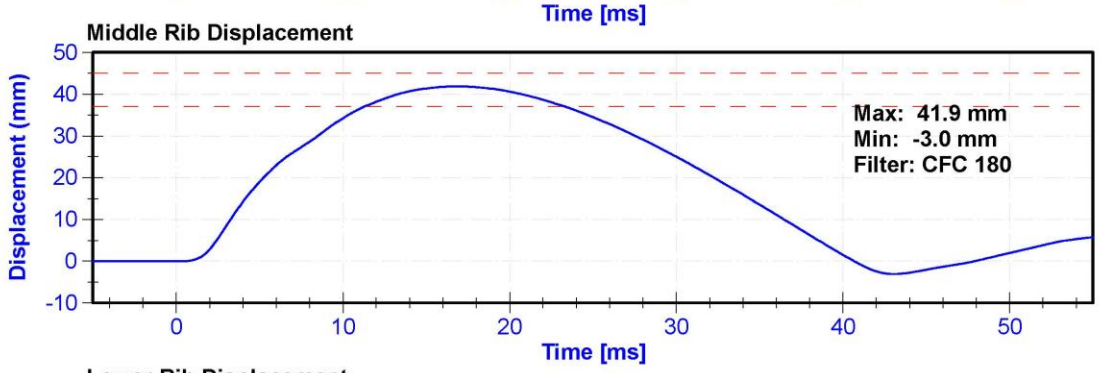
Transducer Calibrations

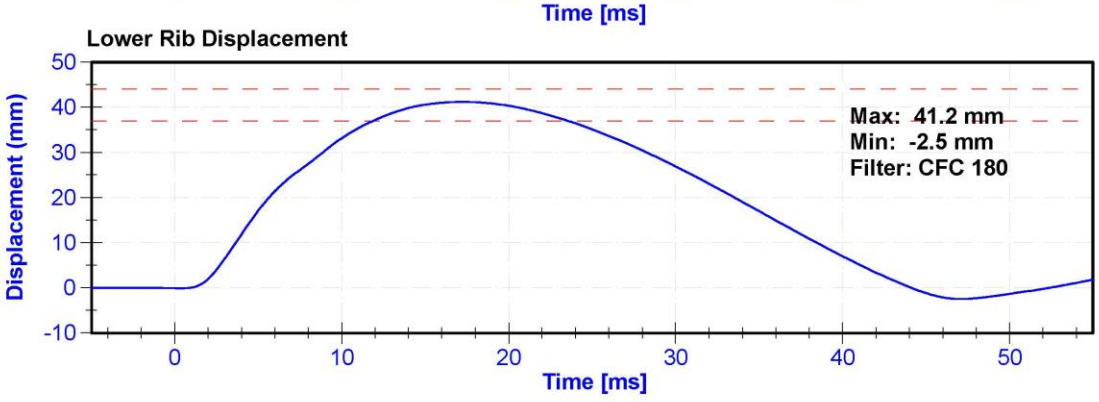
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264C-2K-TZ2	T25885	2/2/2021	2/2/2022
Upper Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/8/2020	4/8/2021
Middle Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/8/2020	4/8/2021
Lower Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/8/2020	4/8/2021




Resistive Force
Force (N)
Time [ms]
Max: 10414.7 N
Min: 14.4 N
Filter: CFC 180


Upper Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.6 mm
Min: -4.1 mm
Filter: CFC 180


Middle Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.9 mm
Min: -3.0 mm
Filter: CFC 180


Lower Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.2 mm
Min: -2.5 mm
Filter: CFC 180

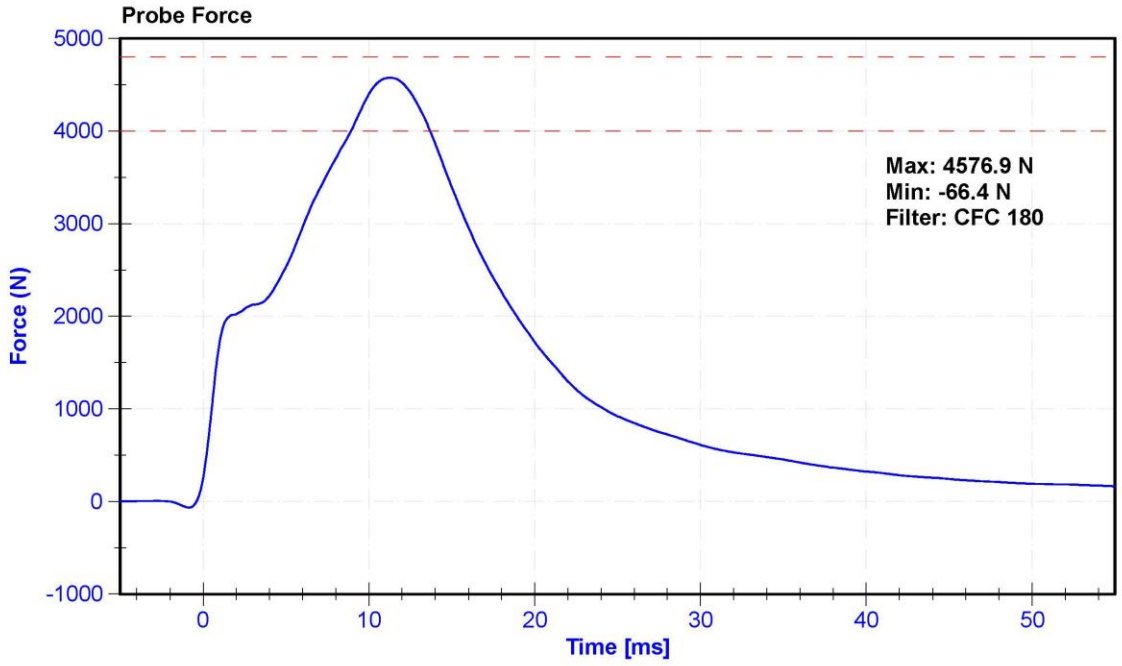
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	FO34	Laboratory Supervisor	K.Brogan

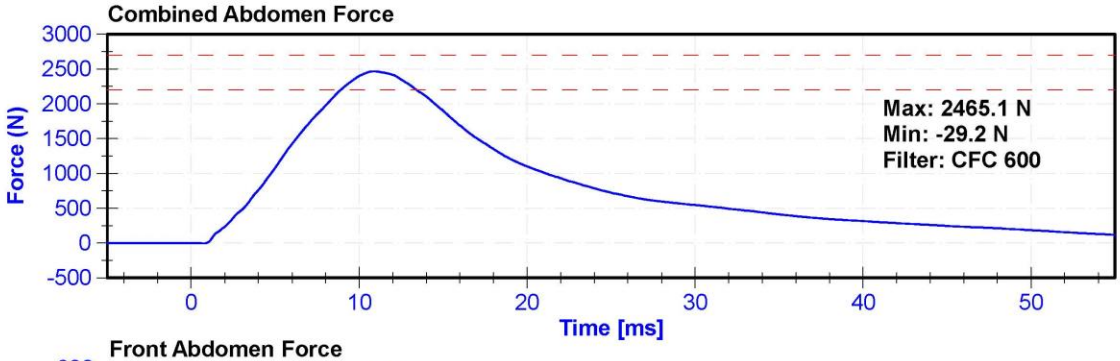
Results

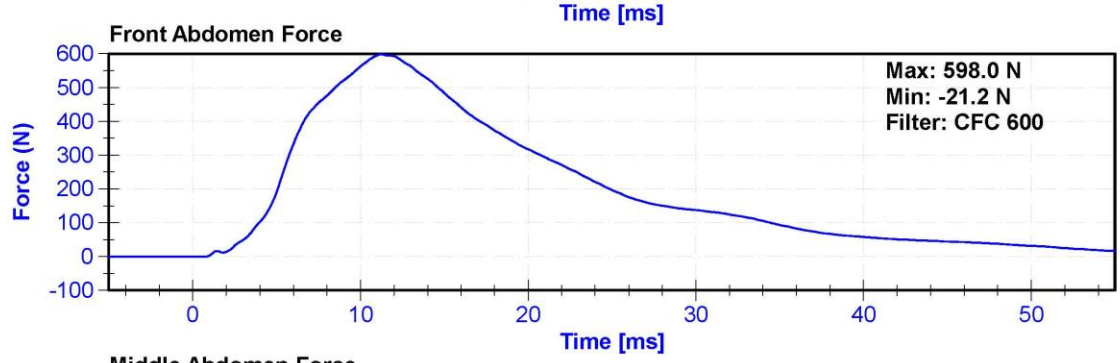
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	26	Pass
Velocity	3.9	4.1	m/s	4.09	Pass
Combined Abdomen Force	2200	2700	N	2465.1	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.85	Pass
Resistive Probe Force	4000	4800	N	4576.9	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.25	Pass

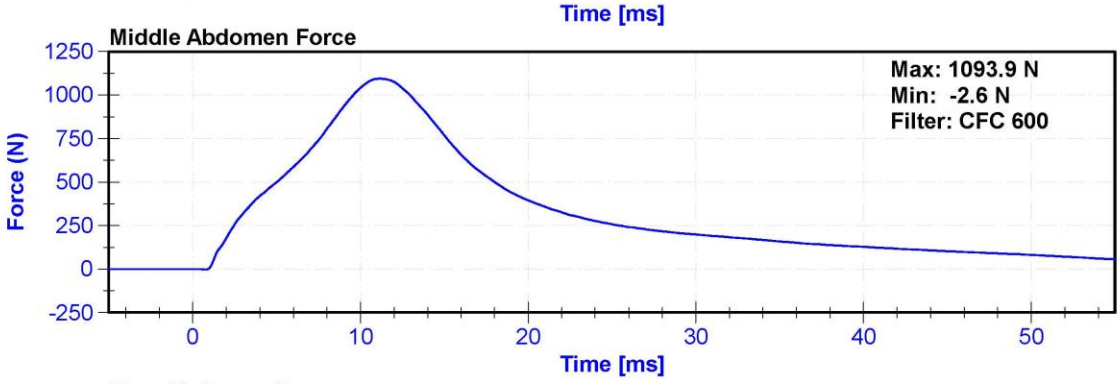
Transducer Calibrations

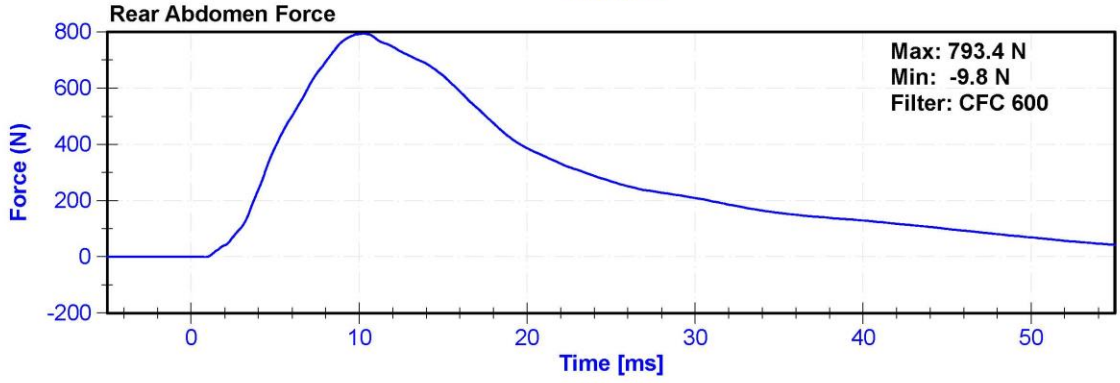
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Front Abdomen Load Cell	DENTON 2631J	LC-1524	3/19/2020	3/19/2021
Middle Abdomen Load Cell	DENTON 2631J	LC-1523	3/19/2020	3/19/2021
Rear Abdomen Load Cell	DENTON 2631J	LC-1530	3/19/2020	3/19/2021




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2465.1 N
Min: -29.2 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 598.0 N
Min: -21.2 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1093.9 N
Min: -2.6 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 793.4 N
Min: -9.8 N
Filter: CFC 600

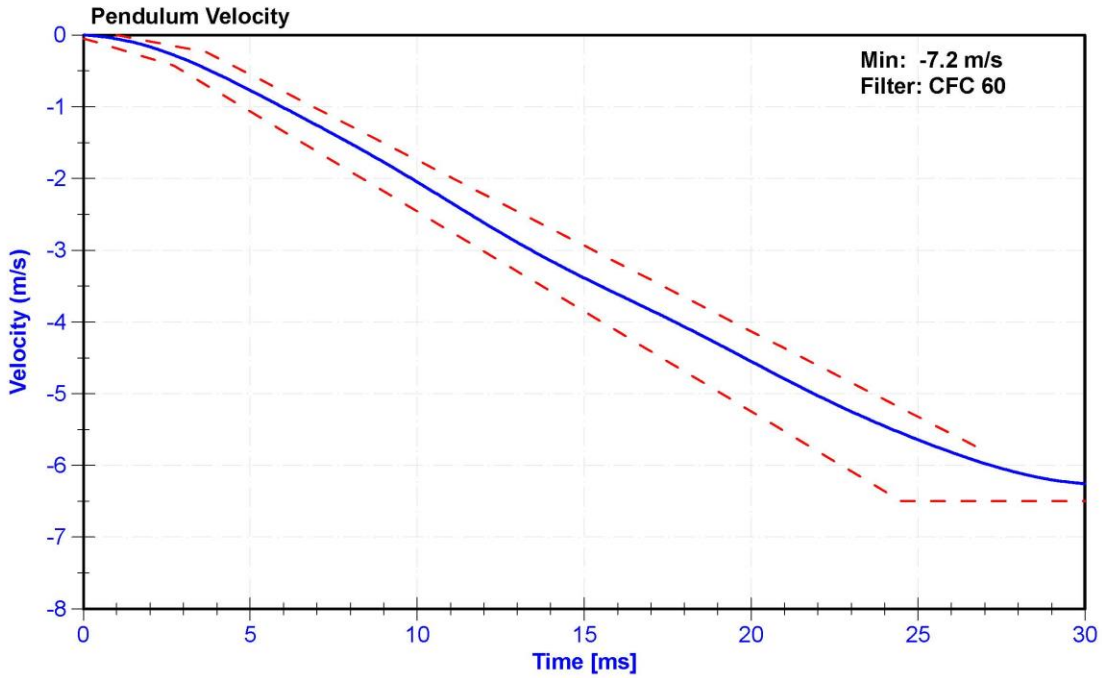
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

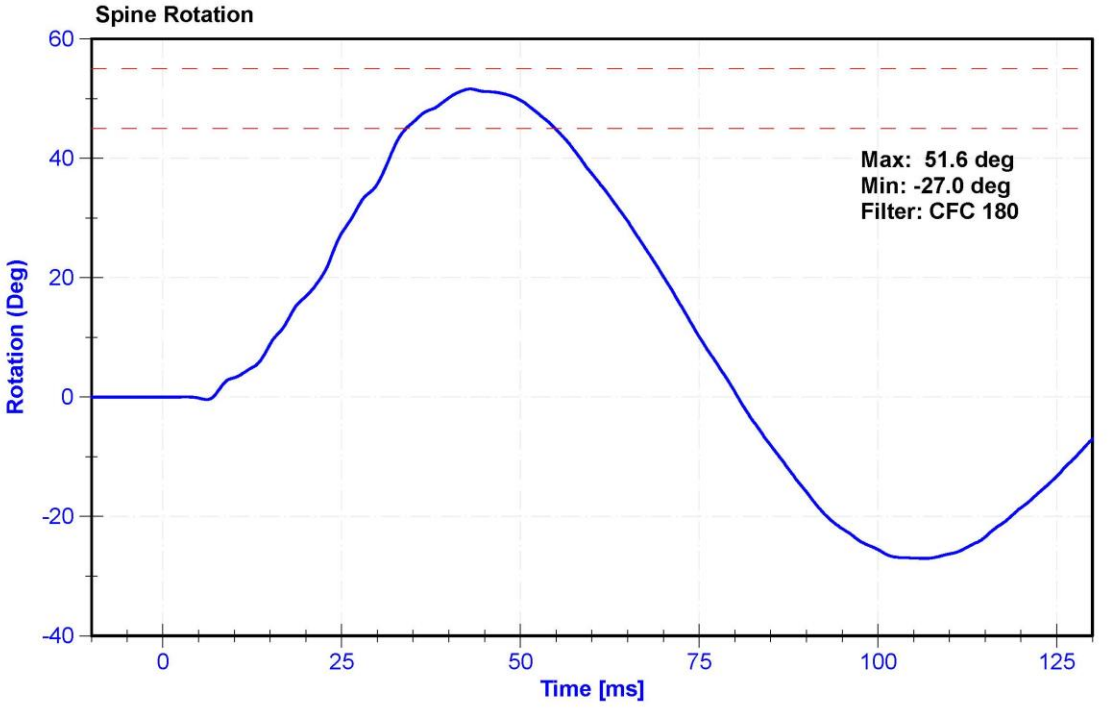
Results

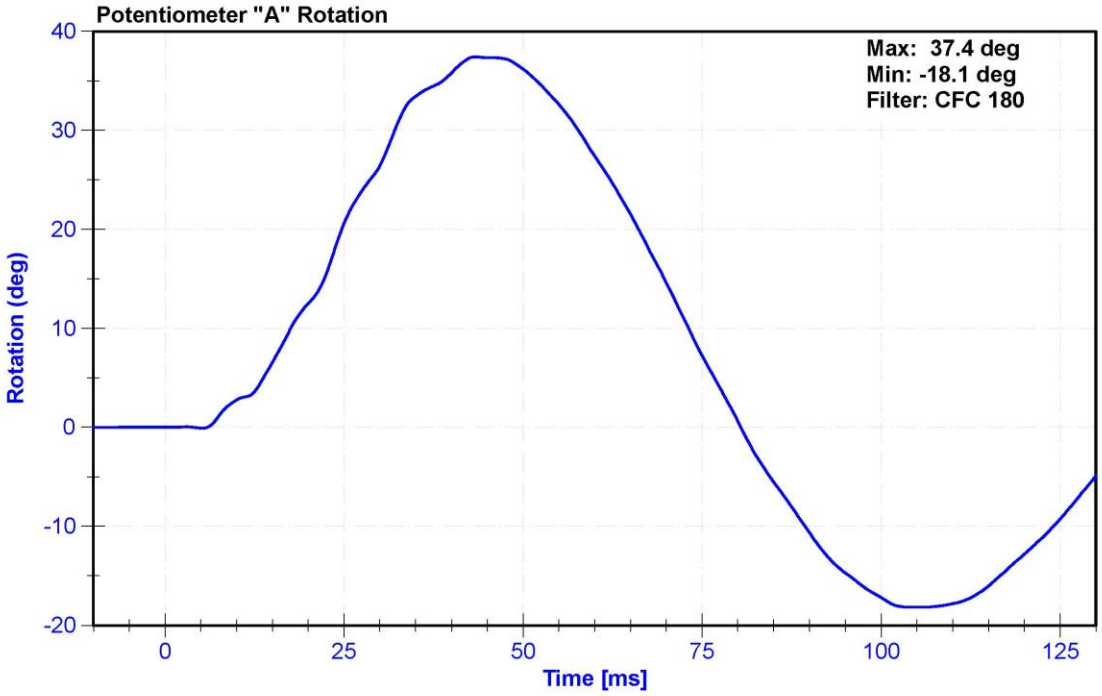
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	21.9	Pass
Velocity	5.95	6.15	m/s	6.046	Pass
Lateral Spine Rotation	45	55	deg	51.6	Pass
Time at Maximum Rotation	39	53	ms	43.0	Pass
Time of Decay to Zero Degrees	37	57	ms	37.4	Pass
Pulse within Corridor?	-	-	-		

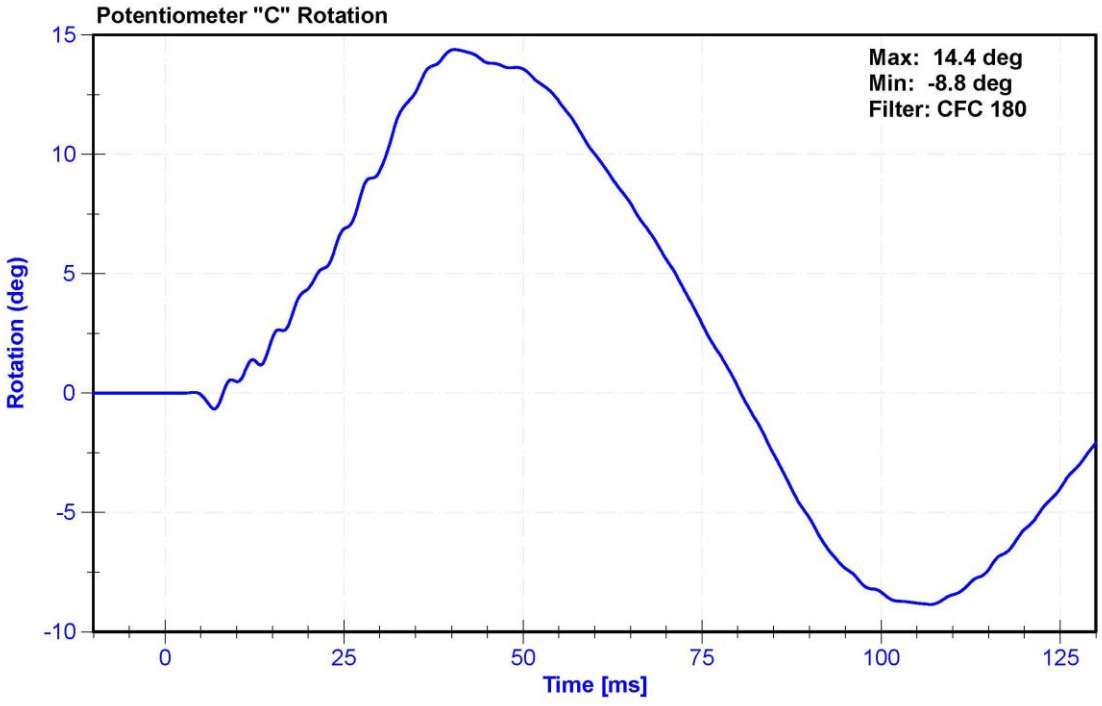
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/5/2021	2/5/2022
Pendulum "A" Potentiometer	SP22G	DS-094	8/18/2020	8/18/2021
Condyle "B" Potentiometer	SP22G	DS-095	8/18/2020	8/18/2021


Pendulum Velocity
Min: -7.2 m/s
Filter: CFC 60
Velocity (m/s)
0
-1
-2
-3
-4
-5
-6
-7
-8
0
5
10
15
20
25
30
Time [ms]


Spine Rotation
Max: 51.6 deg
Min: -27.0 deg
Filter: CFC 180
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 37.4 deg
Min: -18.1 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]


Potentiometer "C" Rotation
Max: 14.4 deg
Min: -8.8 deg
Filter: CFC 180
Rotation (deg)
15
10
5
0
-5
-10
0
25
50
75
100
125
Time [ms]

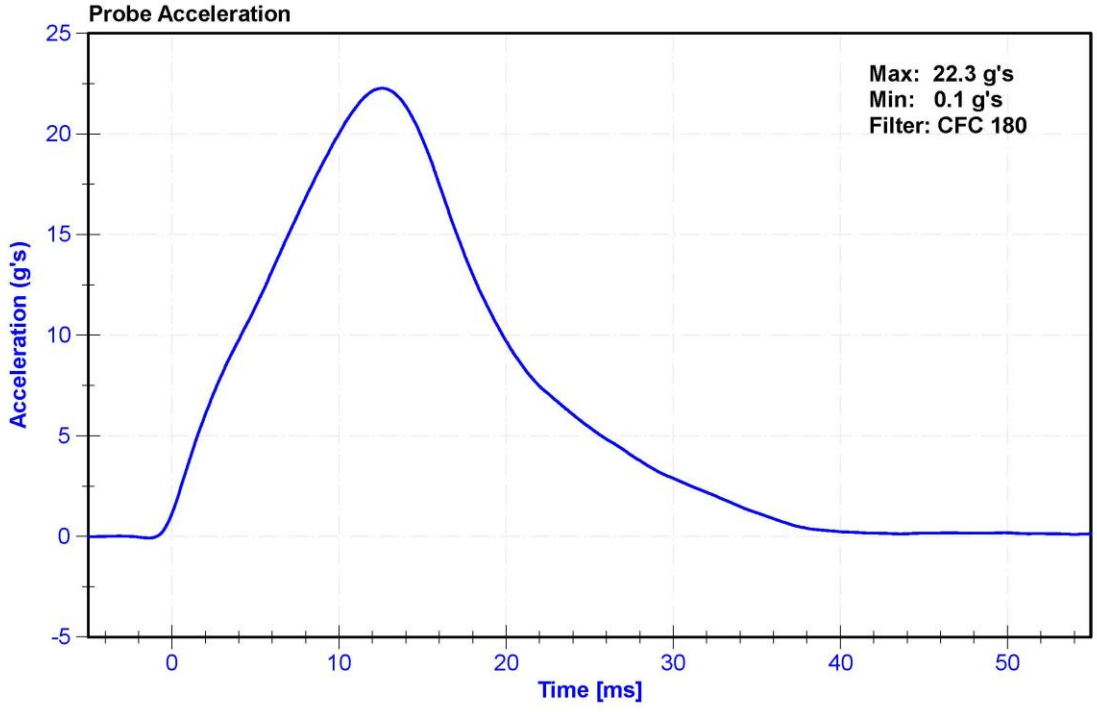
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

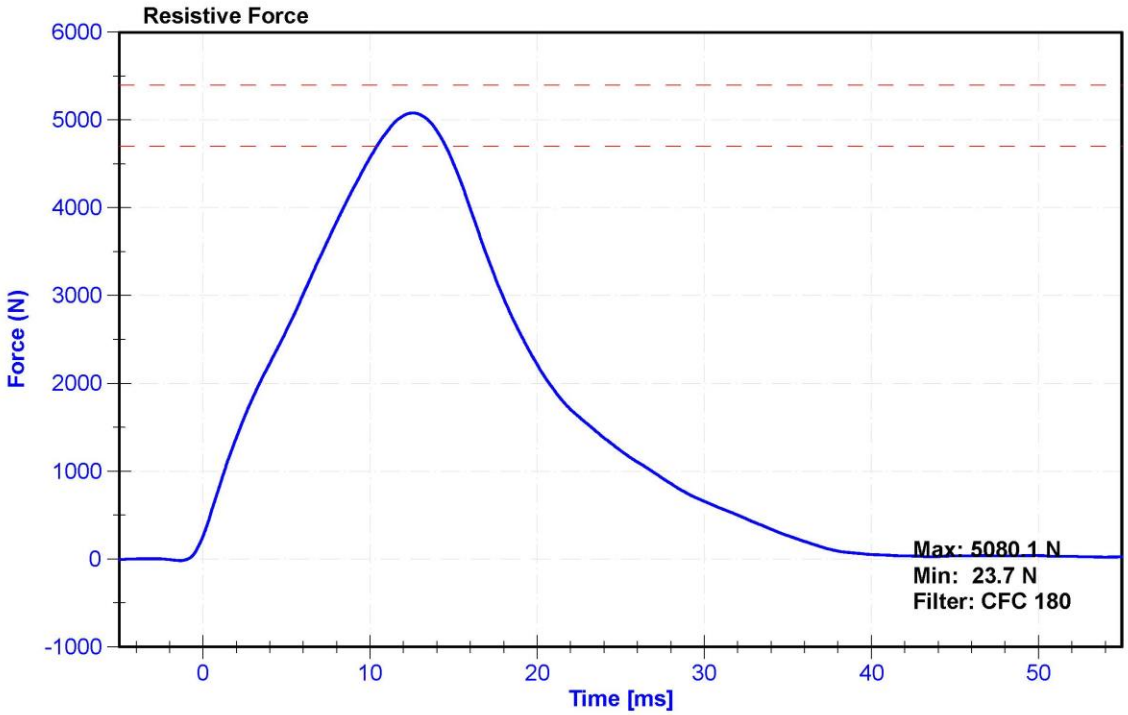
Results

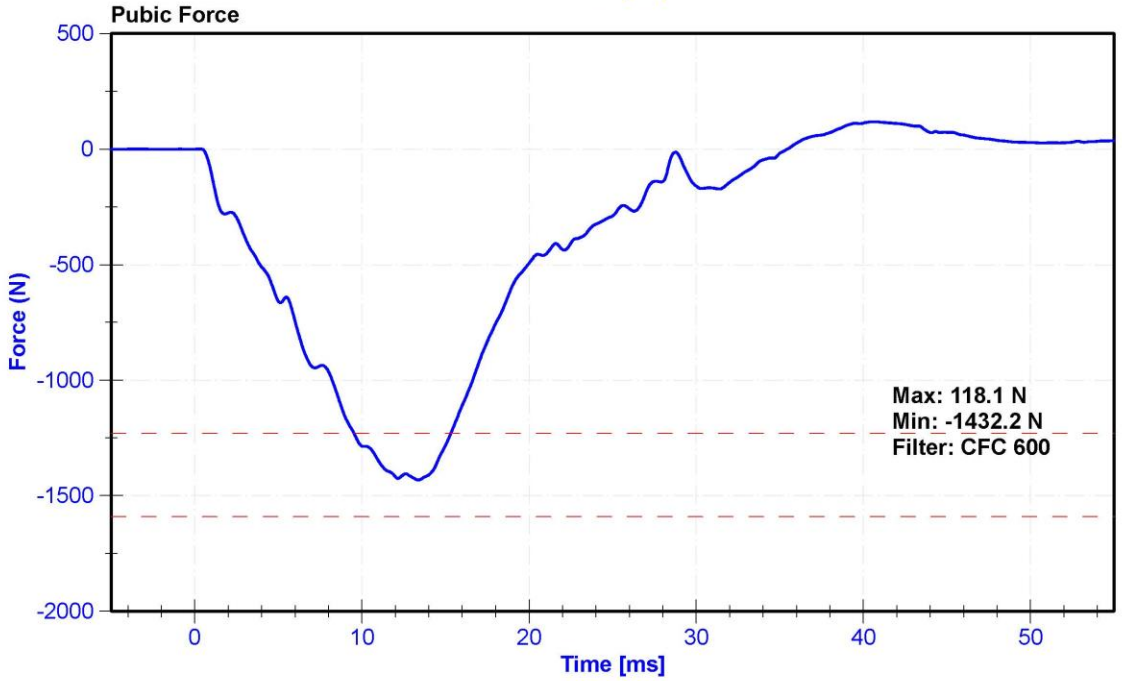
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	26.0	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Resistive Force	4700	5400	N	5080.1	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.55	Pass
Pubic Force	-1590	-1230	N	-1432.2	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.40	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C2	T25885	2/2/2021	2/2/2022
Pubic Load Cell	Denton 3096JFL	30960459GFE	3/19/2020	3/19/2021




Resistive Force
Force (N)
Time [ms]
Max: 5080.1 N
Min: 23.7 N
Filter: CFC 180


Pubic Force
Force (N)
Time [ms]
Max: 118.1 N
Min: -1432.2 N
Filter: CFC 600

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

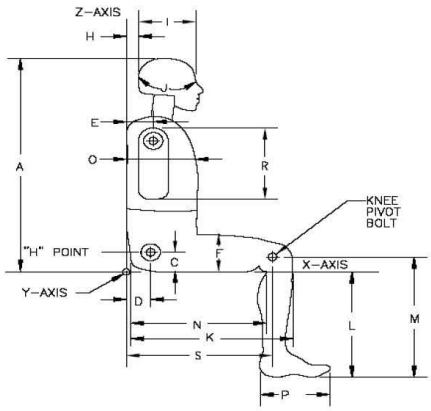
SERIAL No: 300

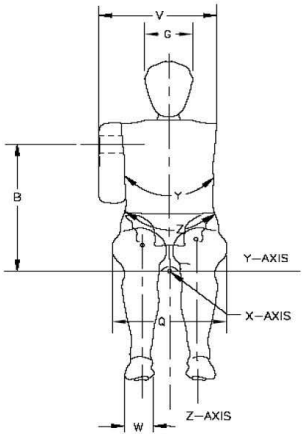
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Brogan Date: 02/05/2021

Dummy Serial Number: 300





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	781	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	103	Pass
F	Thigh Clearance	119	135	126	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	186	Pass
J	Head Circumference	541	551	544	Pass
K	Buttock to Knee Length	514	540	532	Pass
L	Popliteal Height	343	369	361	Pass
M	Knee Pivot to floor height	392	409	398	Pass
N	Buttock Popliteal Length	416	442	430	Pass
O	Chest Depth w/o jacket	195	211	208	Pass
P	Foot Length	216	232	220	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	317	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	484	Pass
V	Shoulder Width	341	357	352	Pass
W	Foot Width	78	94	83	Pass
Y	Chest Circumference w/jacket	851	881	875	Pass
Z	Waist Circumference	761	791	773	Pass

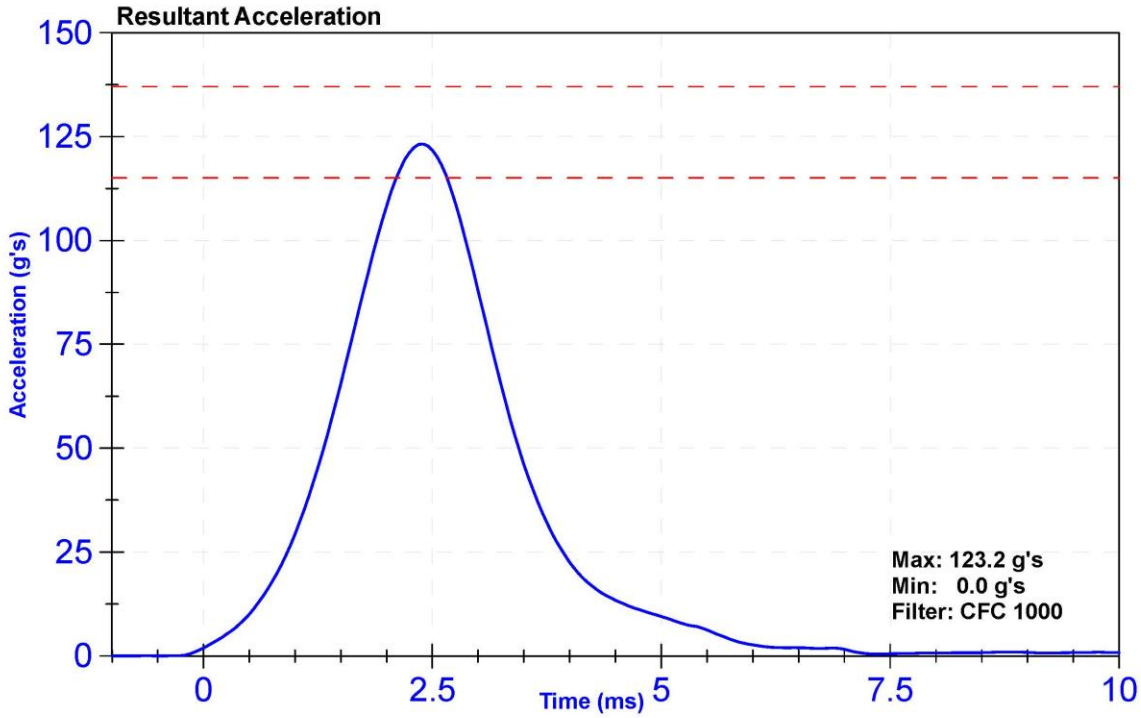
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

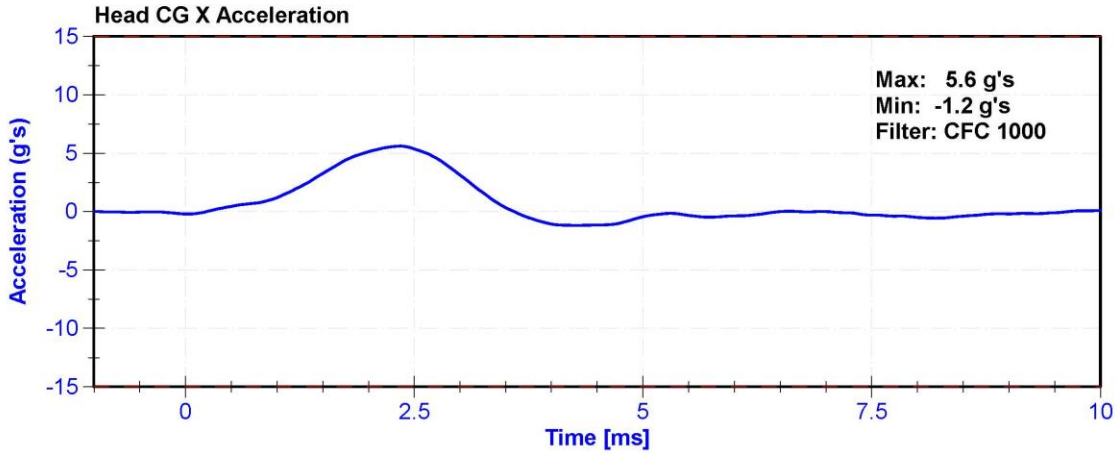
Results

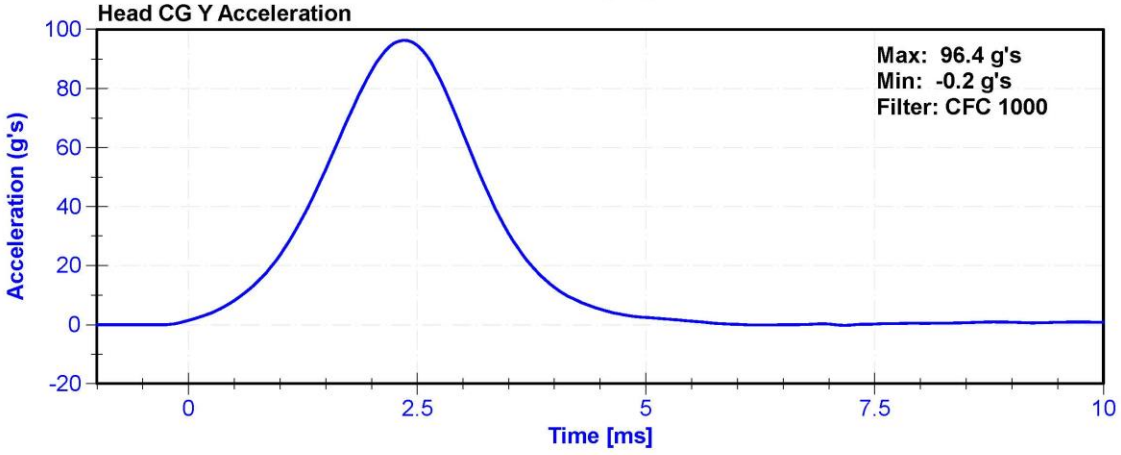
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23.2	Pass
Resultant Acceleration	115	137	g's	123.2	Pass
Oscillation	0	15	%	1.6	Pass
Fore-Aft Acceleration	-15	15	g's	5.6	Pass

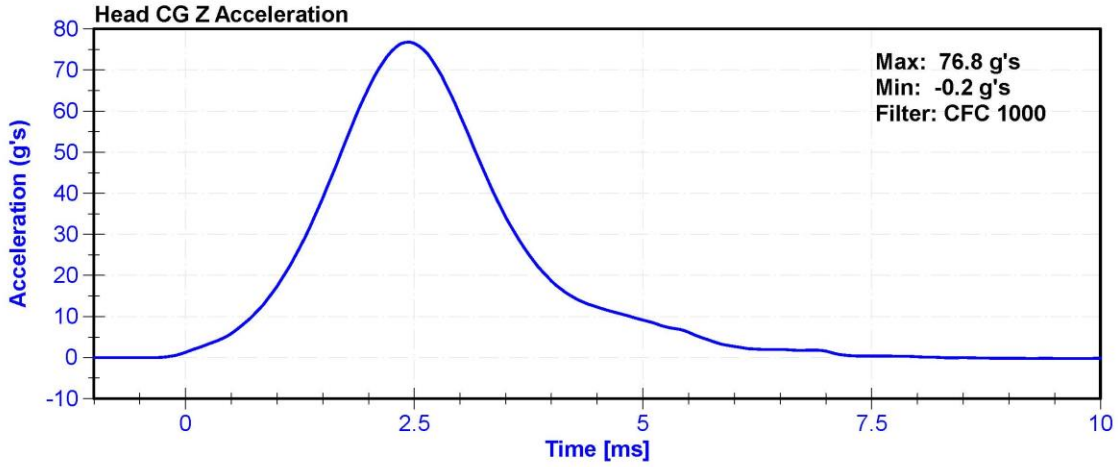
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P59018	11/10/2020	5/11/2021
Y Accelerometer	ENDEVCO 7264	AC-P79189	11/10/2020	5/11/2021
Z Accelerometer	ENDEVCO 7264CT	AC-P58777	11/10/2020	5/11/2021




Head CG X Acceleration
Max: 5.6 g's
Min: -1.2 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 96.4 g's
Min: -0.2 g's
Filter: CFC 1000
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 76.8 g's
Min: -0.2 g's
Filter: CFC 1000
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]

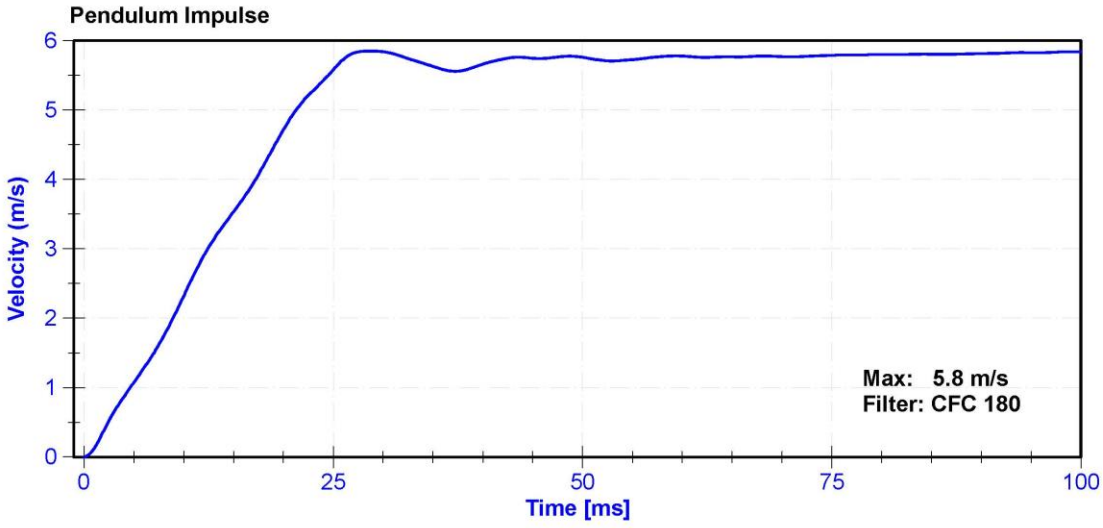
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

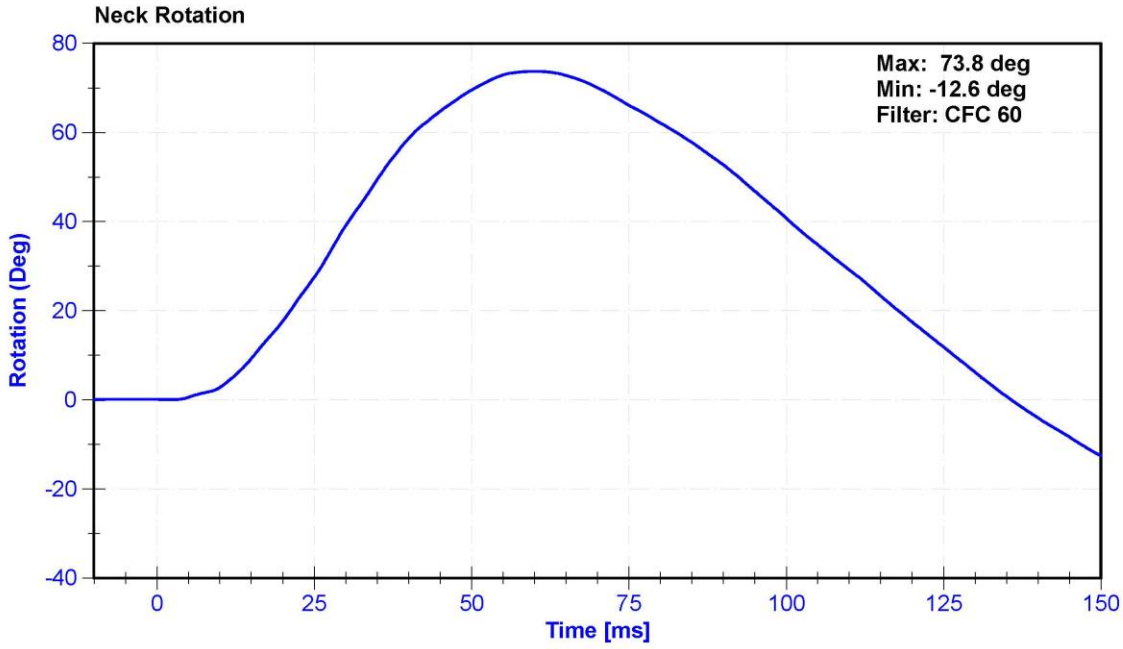
Results

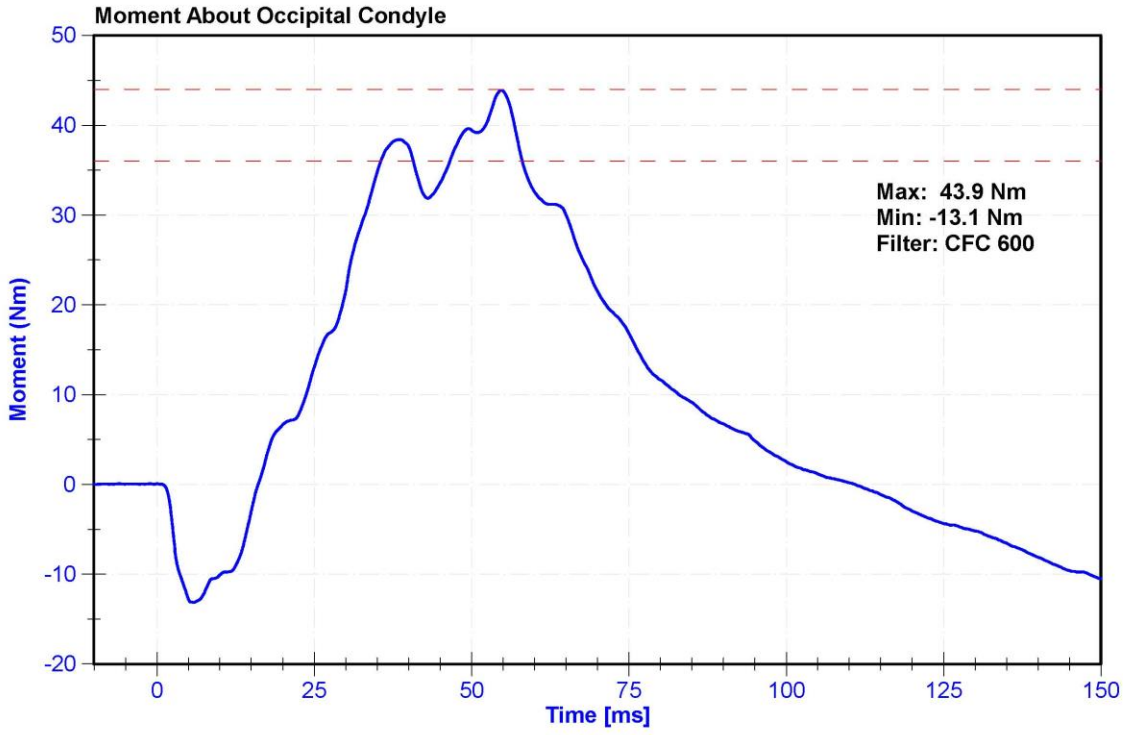
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	22.3	Pass
Velocity	5.51	5.63	m/s	5.584	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.32	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.53	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.71	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.58	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.85	Pass
Neck Rotation	71	81	deg	73.8	Pass
Time at Maximum Rotation	50	70	ms	60.0	Pass
Moment about the OC	36	44	Nm	43.9	Pass
Moment Decay to 0 Nm	102	126	ms	110.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/5/2021	2/5/2022
Pendulum Potentiometer	Denton 78051-342	DS-184Pend	11/6/2020	11/6/2021
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/6/2020	11/6/2021
Upper Neck Load Cell	Denton 1716	17162019 FY	3/18/2020	3/18/2021




Neck Rotation
Max: 73.8 deg
Min: -12.6 deg
Filter: CFC 60
Rotation (Deg)
80
60
40
20
0
-20
-40
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 43.9 Nm
Min: -13.1 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

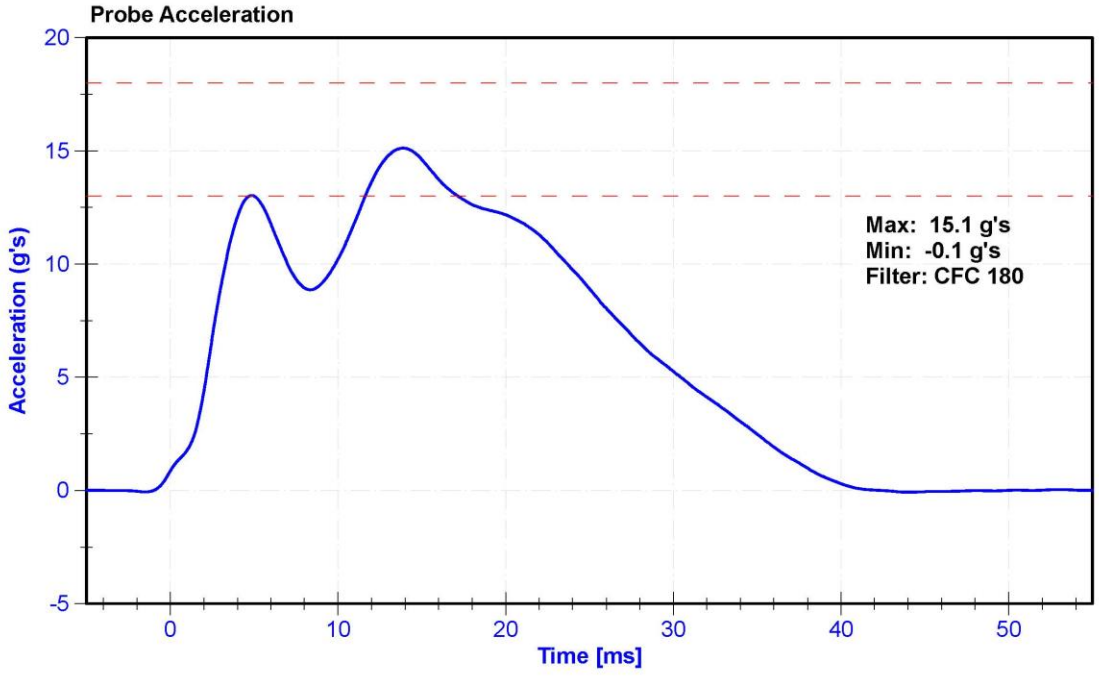
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

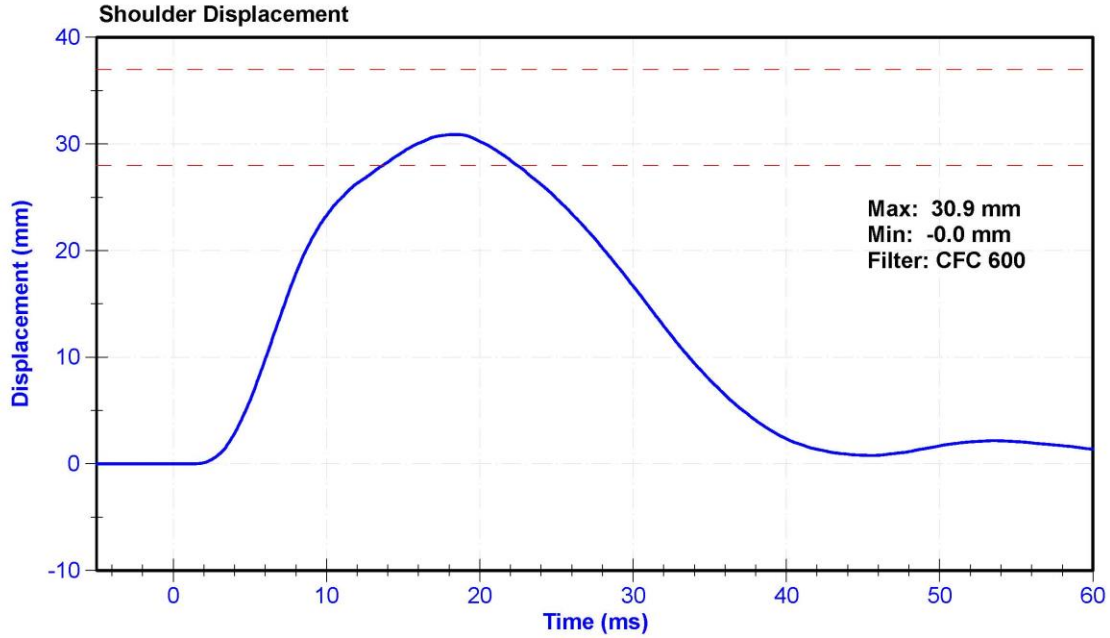
Results

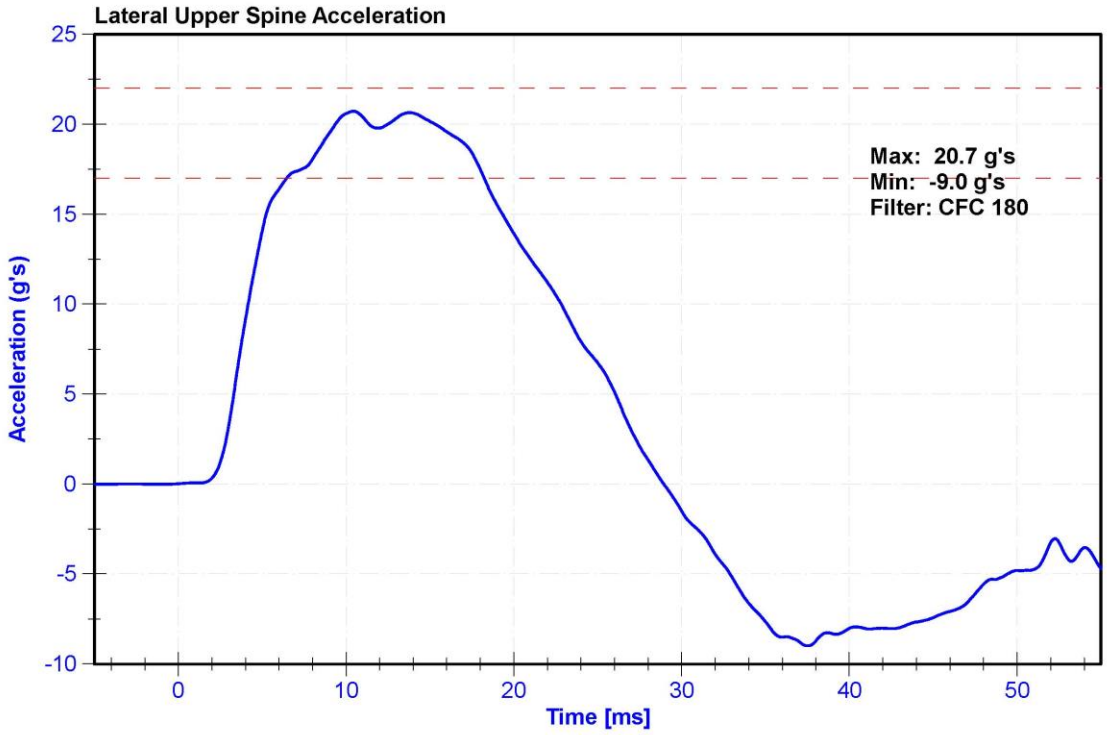
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	26	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	13	18	g's	15.1	Pass
Shoulder Deflection	28	37	mm	30.9	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Shoulder Potentiometer	Servo 08CT1-3725	DS-053 GFE	11/10/2020	5/11/2021
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P71281	11/9/2020	5/10/2021




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 30.9 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 20.7 g's
Min: -9.0 g's
Filter: CFC 180

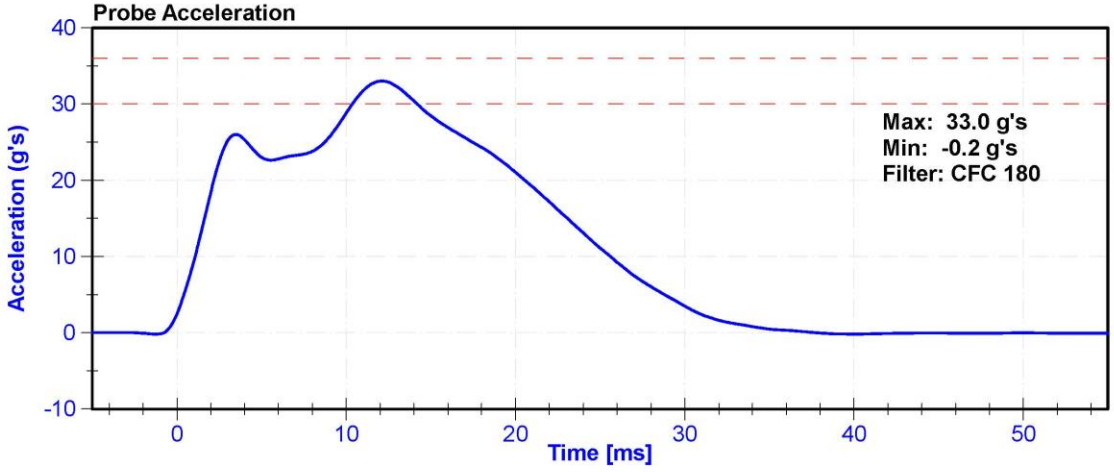
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

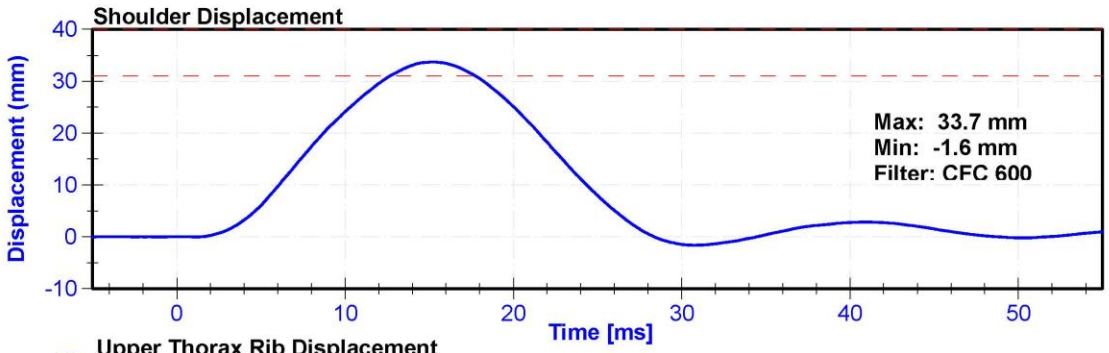
Results

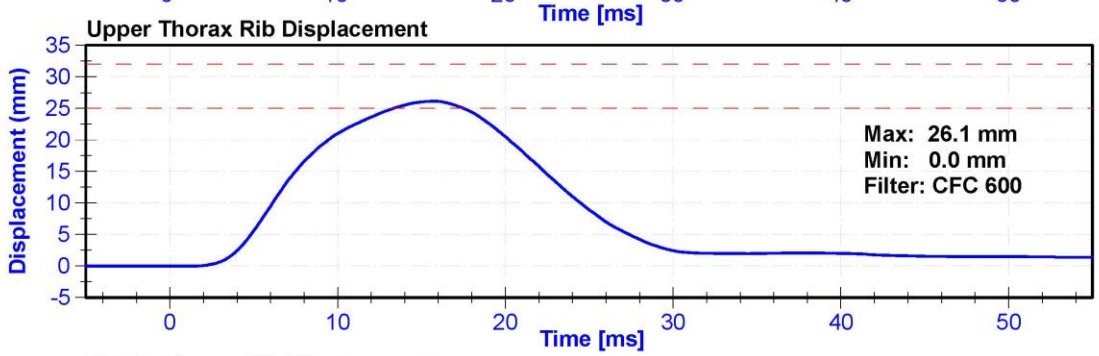
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	24.0	Pass
Velocity	6.6	6.8	m/s	6.74	Pass
Probe Acceleration after 5 ms	30	36	g's	33.0	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.4	Pass
Lateral Lower Spine Acceleration	29	37	g's	32.9	Pass
Shoulder Deflection	31	40	mm	33.7	Pass
Upper Thorax Rib Deflection	25	32	mm	26.1	Pass
Mid Thorax Rib Deflection	30	36	mm	31.5	Pass
Lower Thorax Rib Deflection	32	38	mm	33.5	Pass

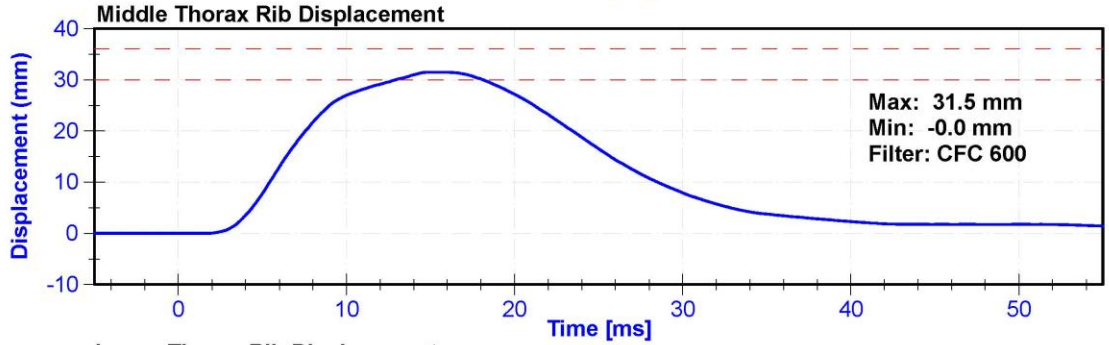
Transducer Calibrations

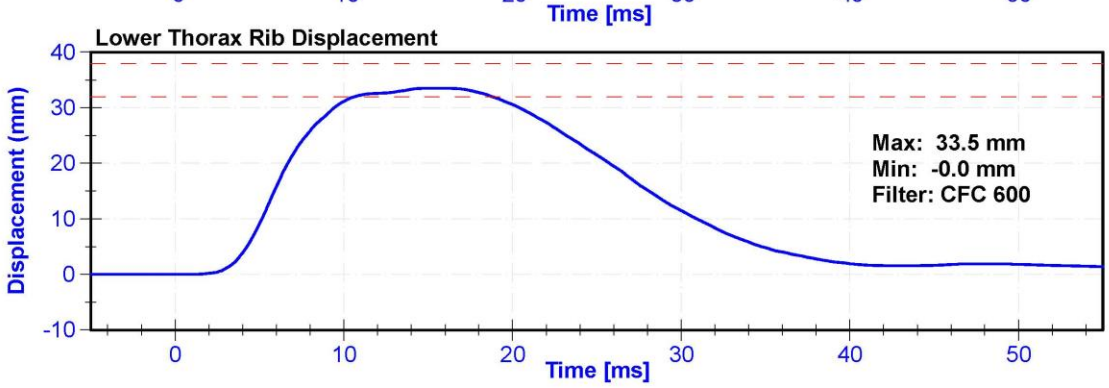
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P71281	11/9/2020	5/10/2021
Upper Spine T12 Y Accelerometer	ENDEVCO 7264	AC-P64147	11/9/2020	5/10/2021
Shoulder Potentiometer	Servo 08CT1-3725	DS-053 GFE	11/10/2020	5/11/2021
Upper Thorax Rib Potentiometer	Servo 08CT1-3725	DS-451GFE	11/10/2020	5/11/2021
Middle Thorax Rib Potentiometer	Servo 08TC1-3745	DS-040GFE	11/10/2020	5/11/2021
Lower Thorax Rib Potentiometer	Servo 08TC1-3725	DS-1156GFE	11/9/2020	5/10/2021

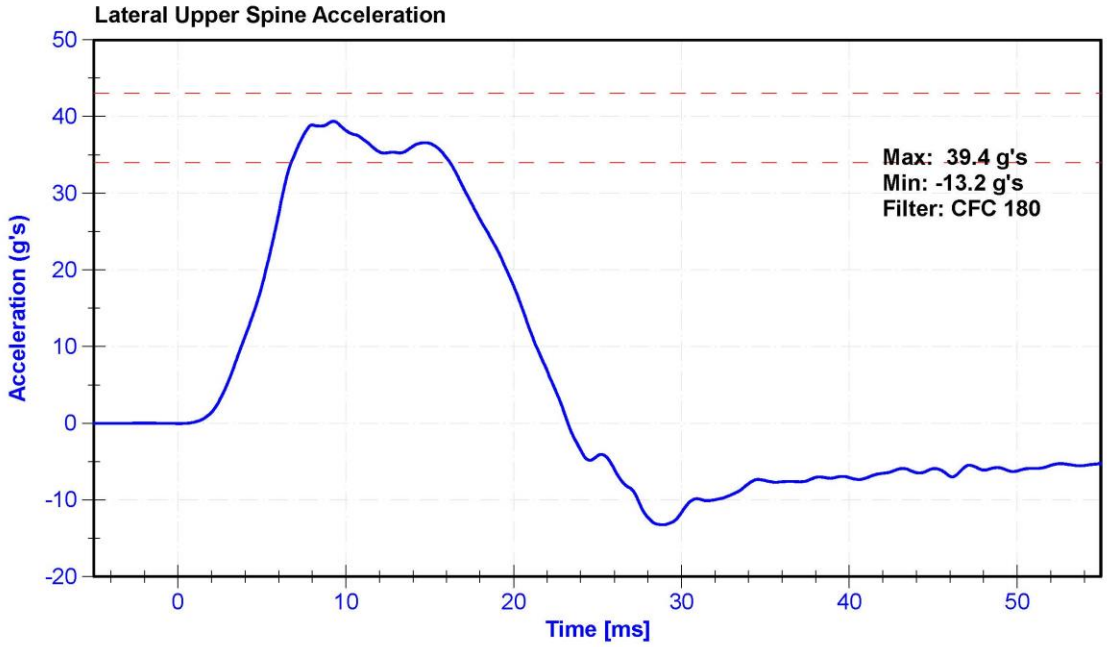


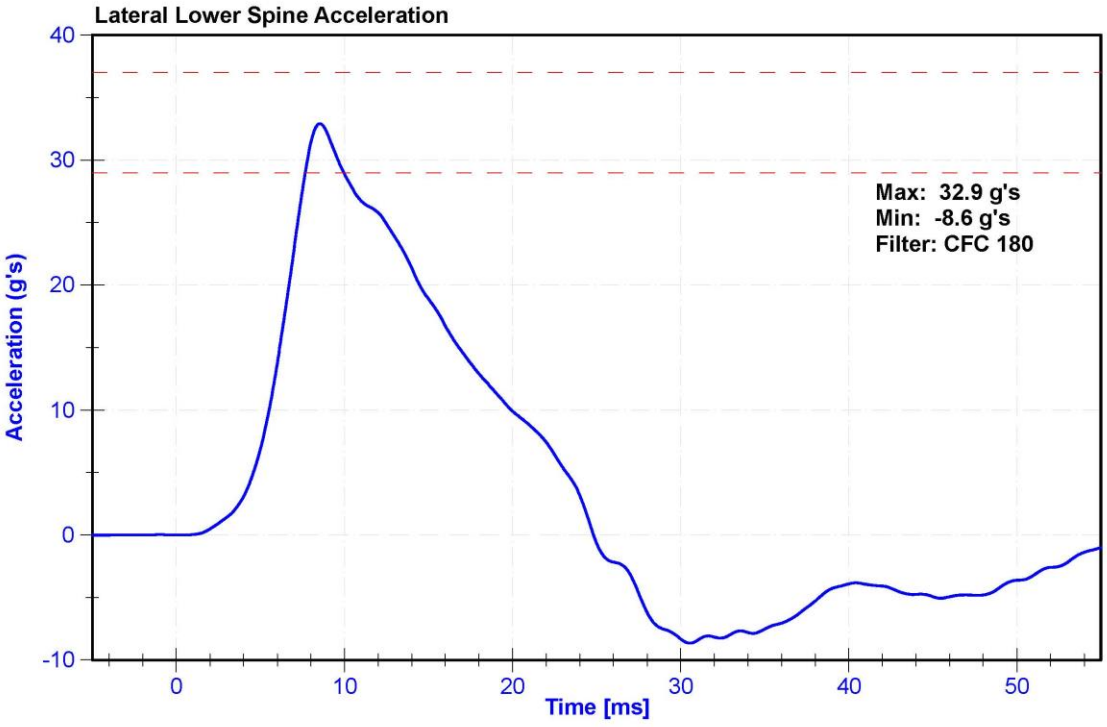

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 33.7 mm
Min: -1.6 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 26.1 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 31.5 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.5 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 39.4 g's
Min: -13.2 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 32.9 g's
Min: -8.6 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

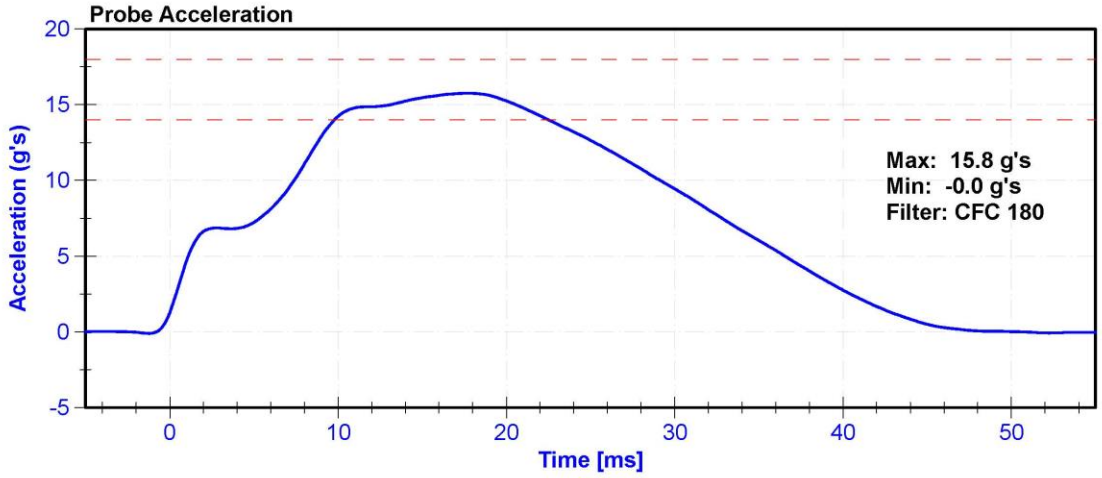
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

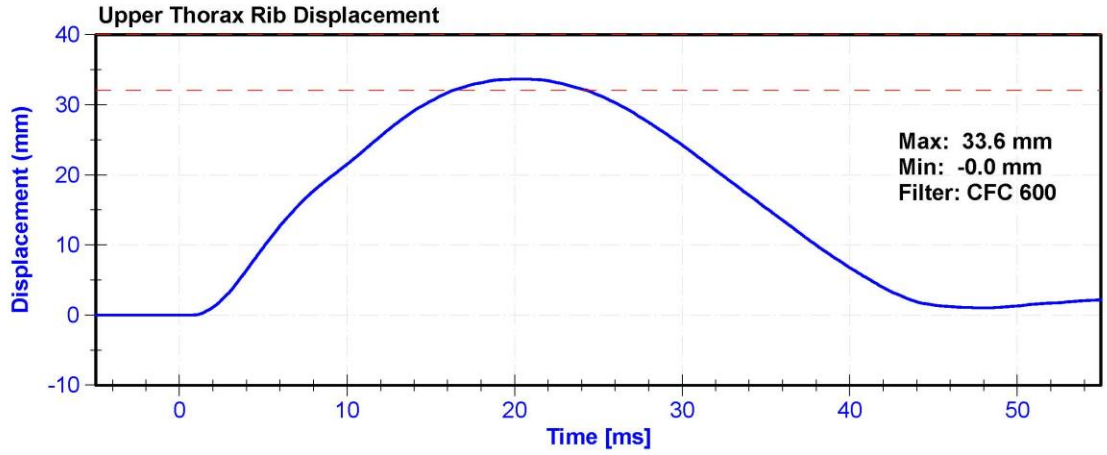
Results

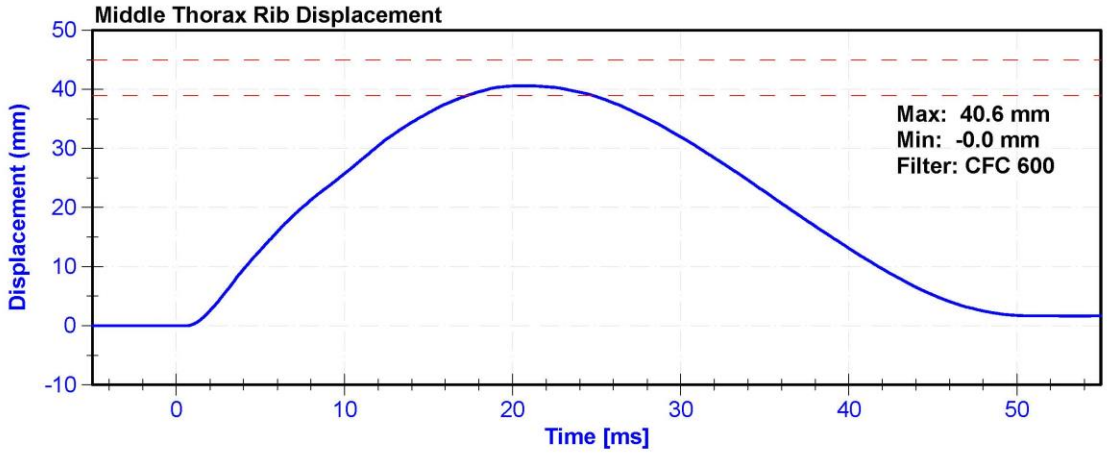
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	24	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Probe Acceleration	14	18	g's	15.8	Pass
Lateral Upper Spine Acceleration	13	17	g's	16.0	Pass
Lateral Lower Spine Acceleration	7	11	g's	10.1	Pass
Upper Thorax Rib Deflection	32	40	mm	33.6	Pass
Middle Thorax Rib Deflection	39	45	mm	40.6	Pass
Lower Thorax Rib Deflection	35	43	mm	38.4	Pass

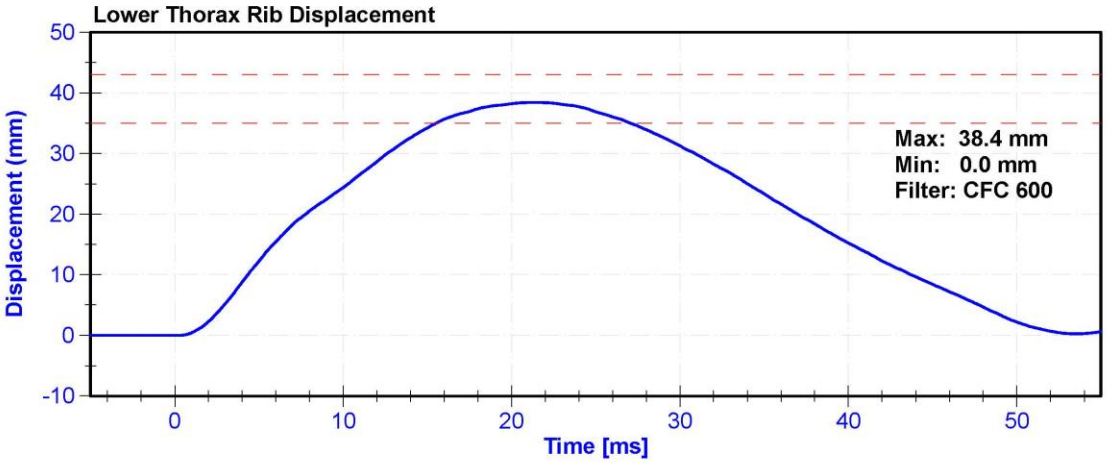
Transducer Calibrations

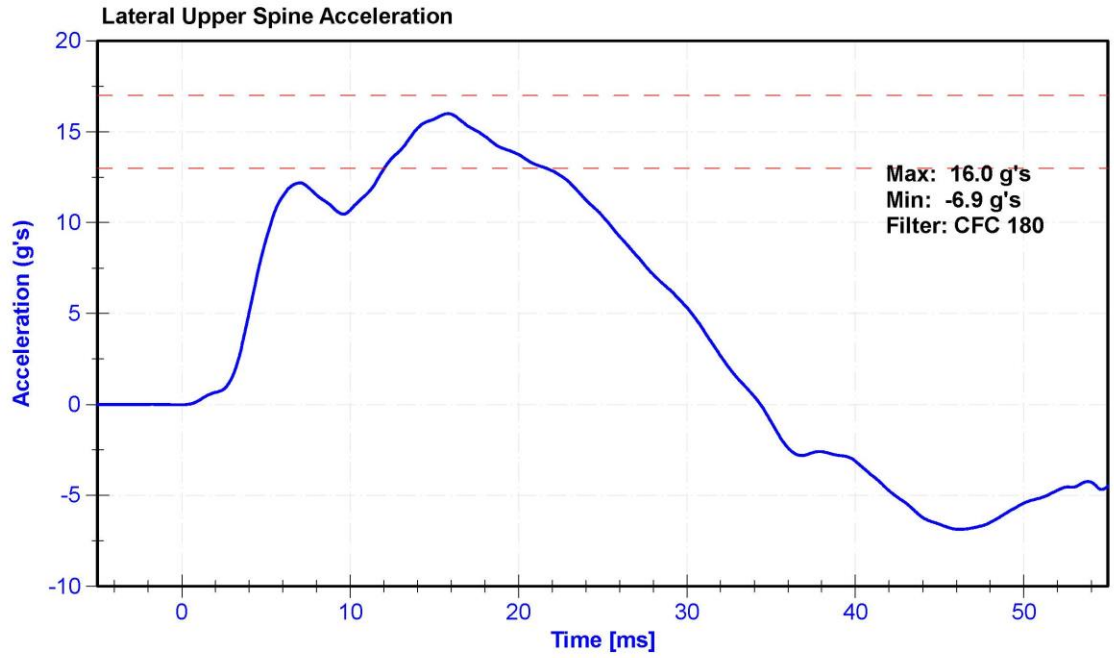
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P71281	11/9/2020	5/10/2021
Lower Spine Y Accelerometer	ENDEVCO 7264	AC-P64147	11/9/2020	5/10/2021
Upper Thorax Rib Potentiometer	Servo 08CT1-3725	DS-451GFE	11/10/2020	5/11/2021
Middle Thorax Rib Potentiometer	Servo 08TC1-3745	DS-040GFE	11/10/2020	5/11/2021
Lower Thorax Rib Potentiometer	Servo 08TC1-3725	DS-1156GFE	11/9/2020	5/10/2021

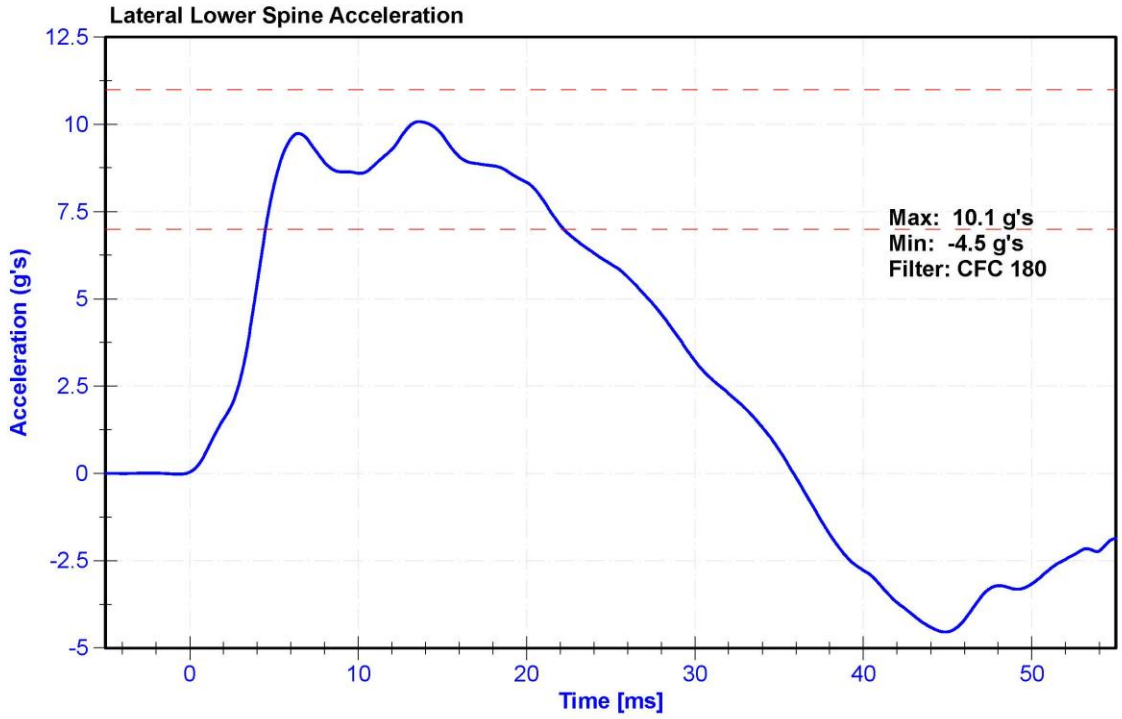



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.6 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.6 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.4 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 16.0 g's
Min: -6.9 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
20
15
10
5
0
-5
-10
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 10.1 g's
Min: -4.5 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50

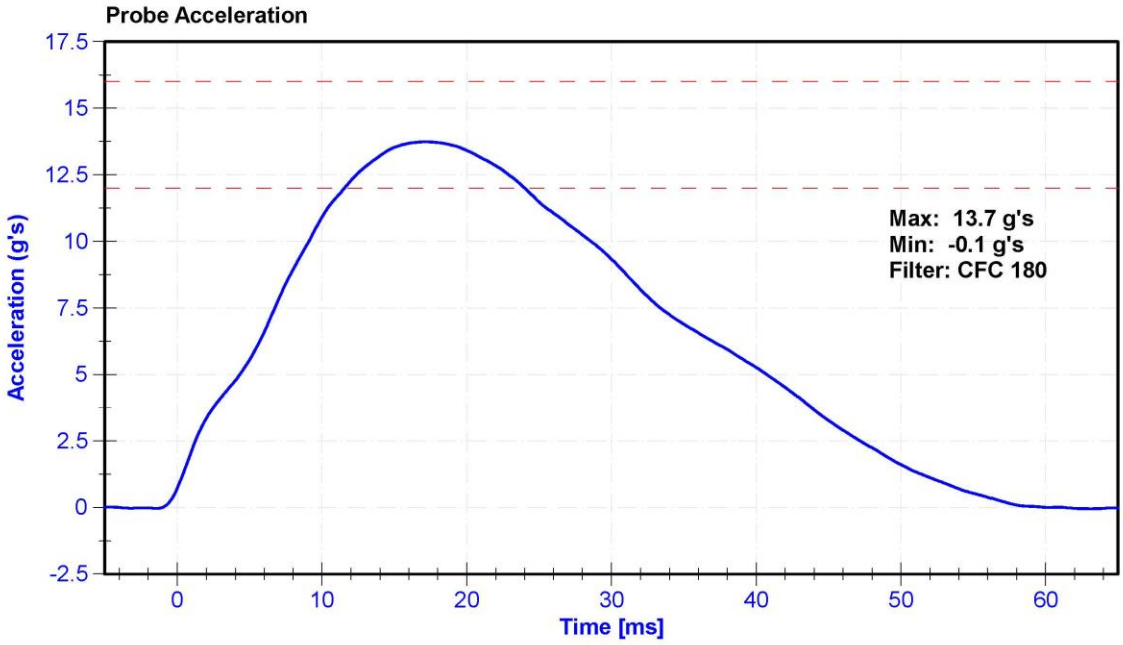
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

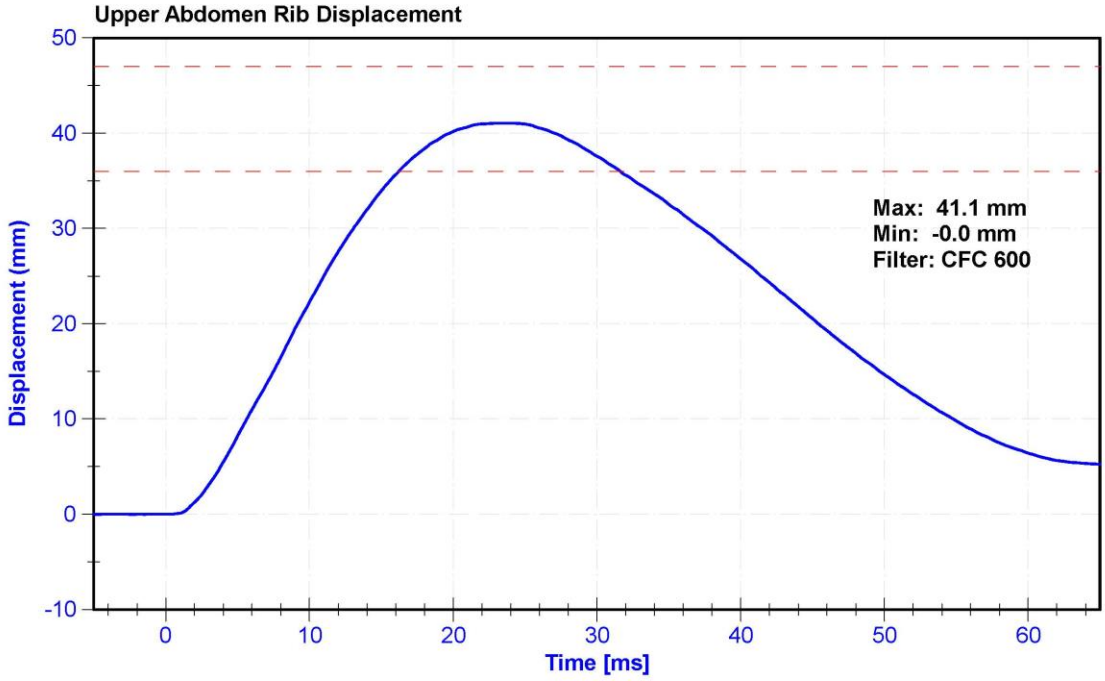
Results

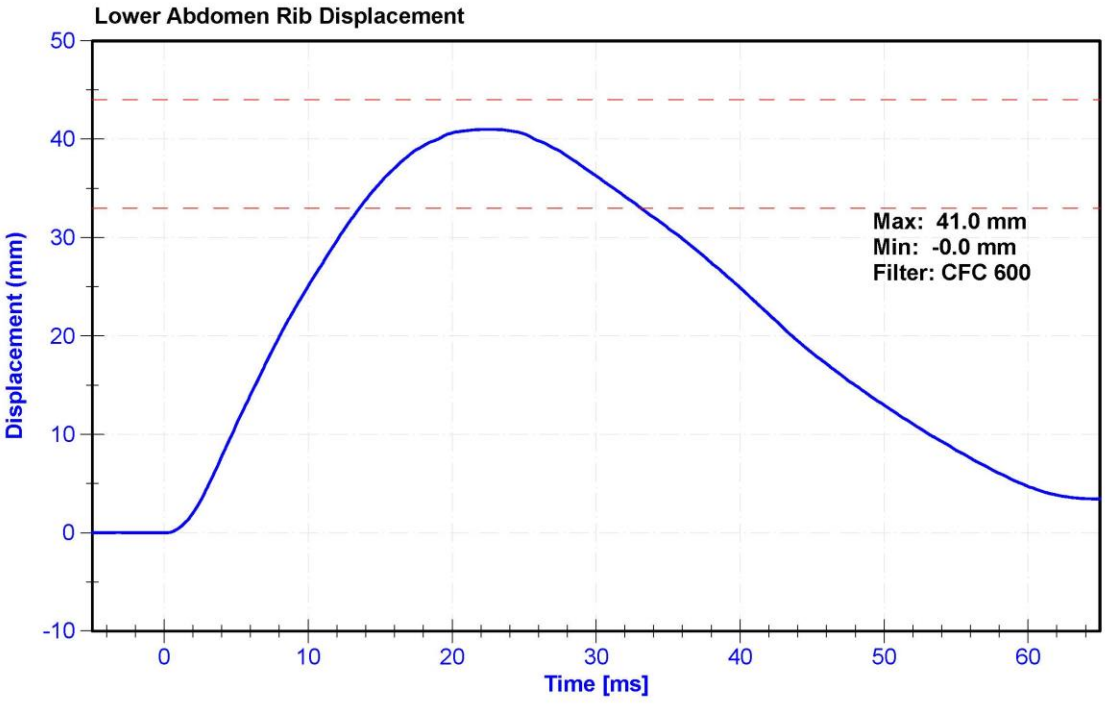
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	26.0	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	12	16	g's	13.7	Pass
Lateral Lower Spine Acceleration	9	14	g's	11.3	Pass
Upper Abdomen Rib Deflection	36	47	mm	41.1	Pass
Lower Abdomen Rib Deflection	33	44	mm	41.0	Pass

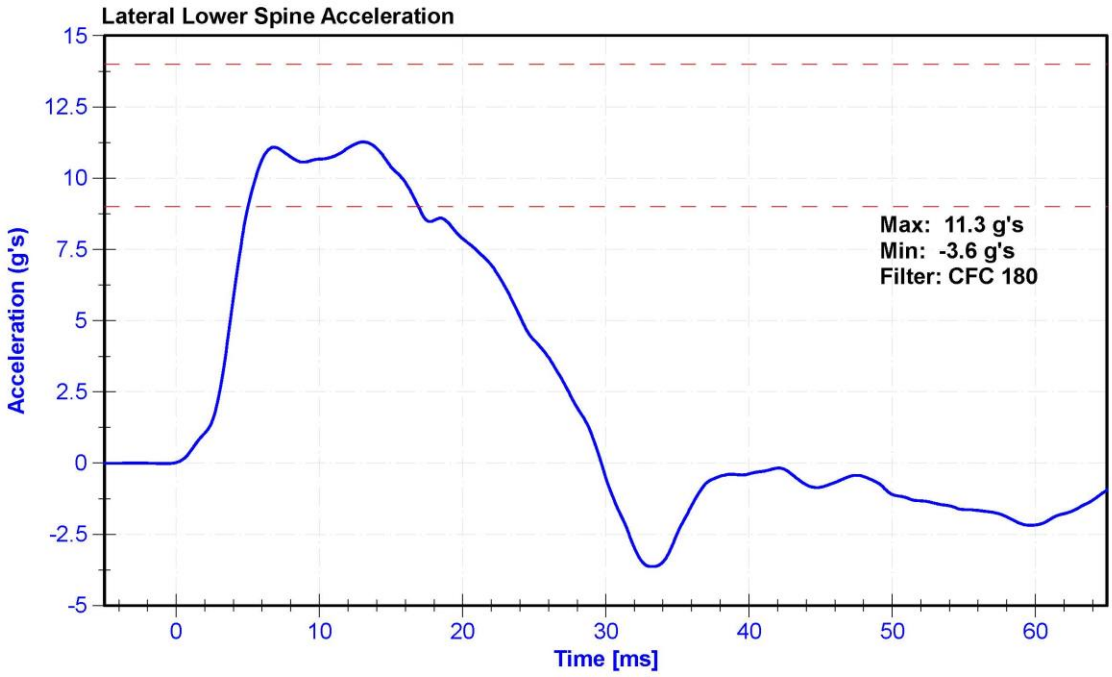
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264C-2K-TZ2	T25885	2/2/2021	2/2/2022
Lower Spine Y Accelerometer	ENDEVCO 7264	AC-P64147	11/9/2020	5/10/2021
Upper Abdomen Rib Potentiometer	Servo 08CT1-3725	DS-308GFE	11/10/2020	5/11/2021
Lower Abdomen Rib Potentiometer	Servo 08CT1-3725	DS-307GFE	11/10/2020	5/11/2021




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.1 mm
Min: -0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.0 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
60
Time [ms]
Max: 11.3 g's
Min: -3.6 g's
Filter: CFC 180

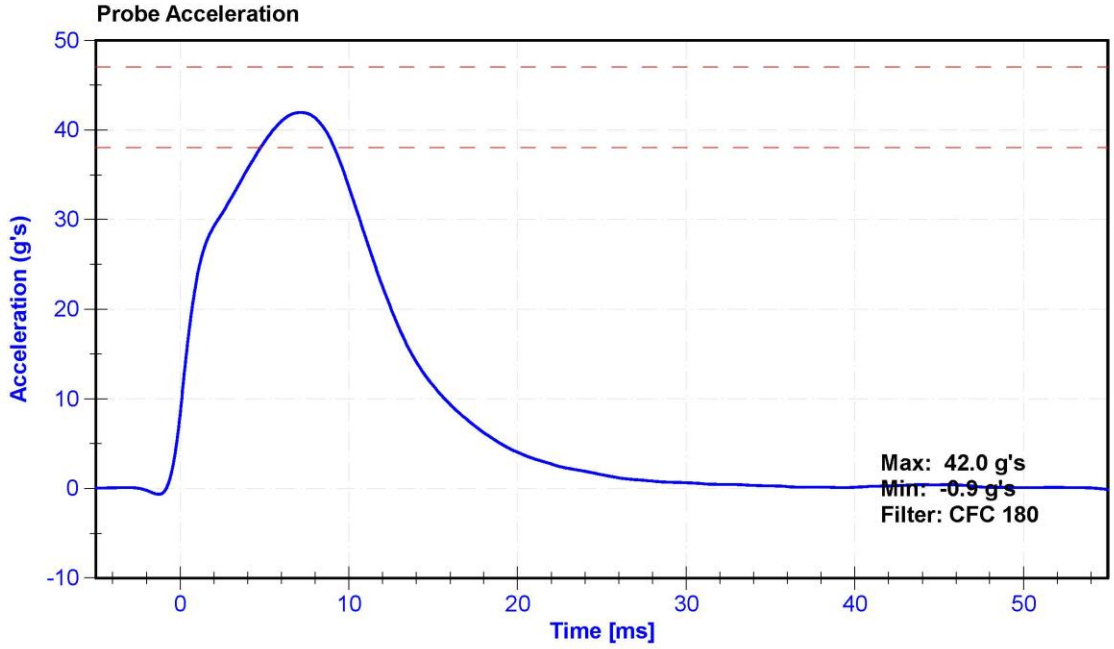
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

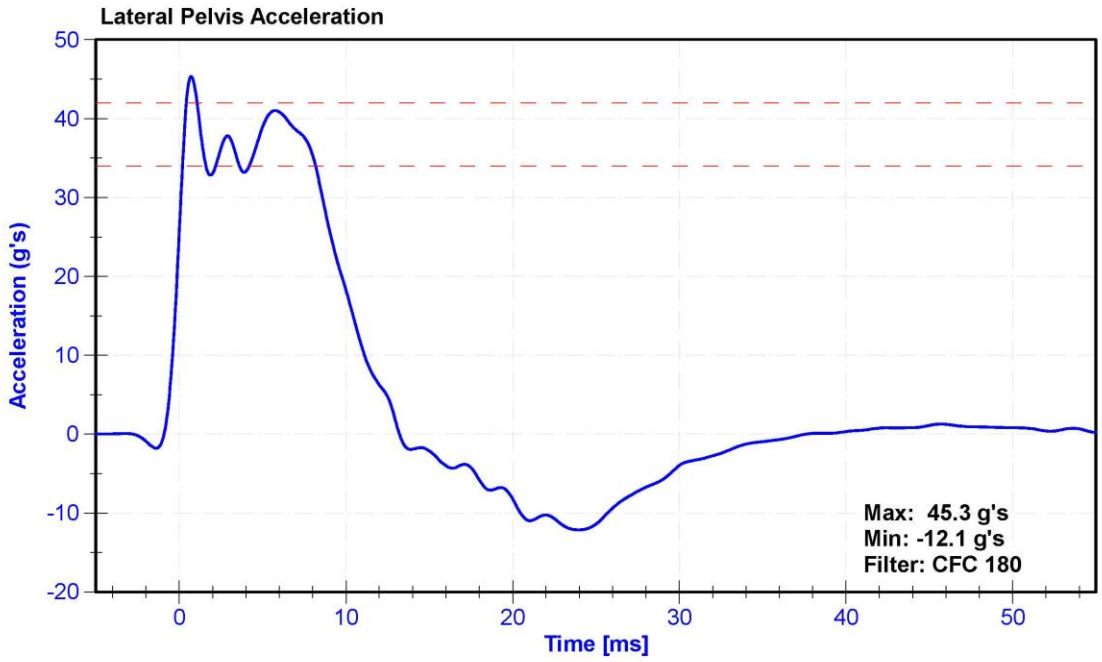
Results

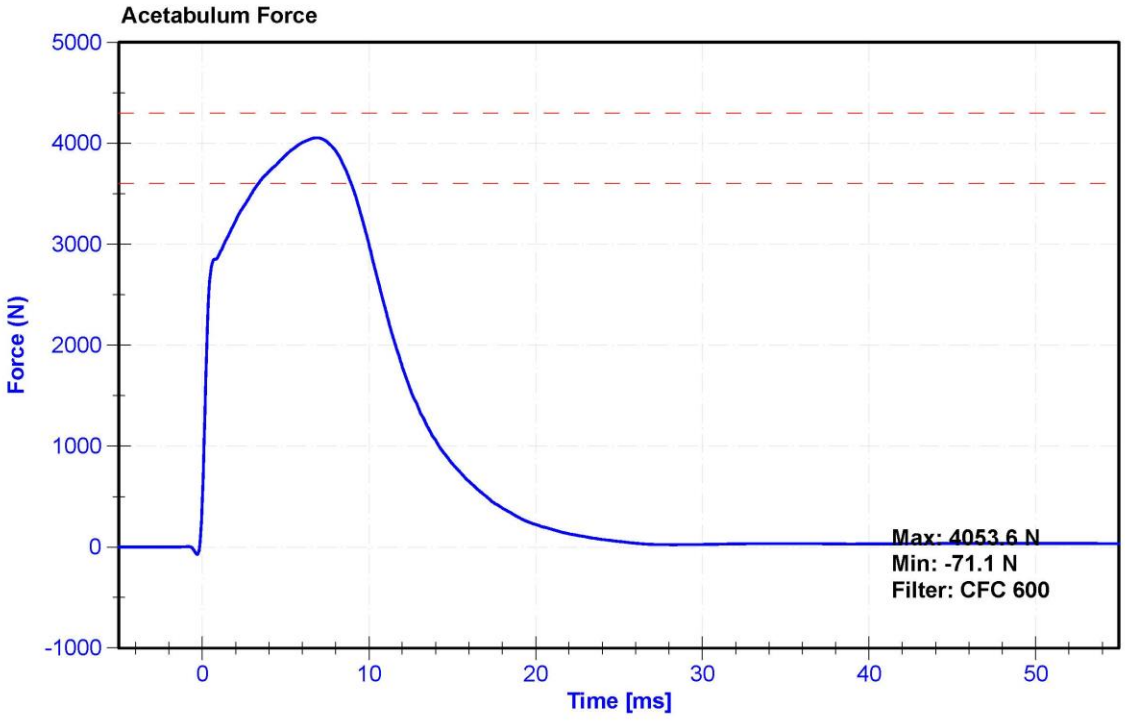
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	26	Pass
Velocity	6.6	6.8	m/s	6.68	Pass
Probe Acceleration	38	47	g's	42.0	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	40.8	Pass
Acetabulum Force	3600	4300	N	4053.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Pelvis Y Accelerometer	ENDEVCO 7264C	AC-P51731	11/9/2020	5/10/2021
Acetabulum Load Cell	Denton IF-520	LC-236Fy	3/18/2020	3/18/2021
Certification Plug	Humanetics	14133	6/28/2020	N/A
Crash Test Plug	Humanetics	13696	9/26/2019	N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 45.3 g's
Min: -12.1 g's
Filter: CFC 180


Acetabulum Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4053.6 N
Min: -71.1 N
Filter: CFC 600

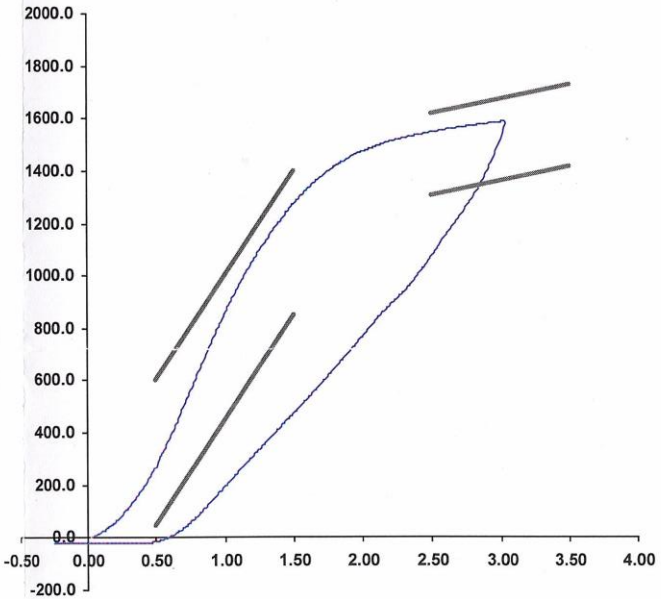
Crash
2/11

SID-IIs Pelvis Plug Certification Test

Plug S/N 13699
Test Number 11347
Report Number 11385
Test Date 9/26/2019 1:57:14 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	288.78	50.00	600.00
Force @ 1.5 mm (N)	1,283.32	850.00	1,400.00
Force @ 2.5 mm (N)	1,549.33	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,587.92	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 26-Sep-19
SACO Research

By : DC Date : 9/26/2019

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

2/5/300/21 Crash

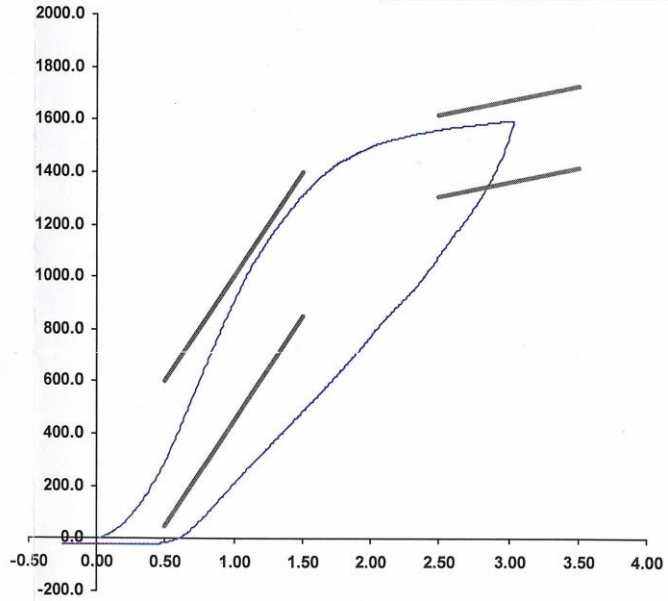
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 13696
Test Number 11344
Report Number 11382
Test Date 9/26/2019 1:52:28 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	304.67	50.00	600.00
Force @ 1.5 mm (N)	1,316.82	850.00	1,400.00
Force @ 2.5 mm (N)	1,563.70	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,597.56	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 26-Sep-19
SACO Research

By : DC Date : 9/26/2019

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

2/4/21
300 cont 1

SID-IIs Pelvis Plug Certification Test

Plug S/N 14133
Test Number 14171
Report Number 14216
Test Date 6/28/2020 11:41:27 AM

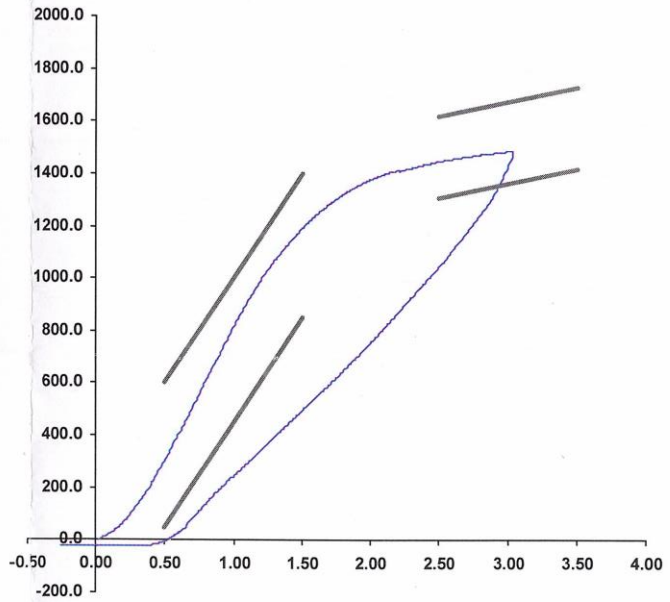
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	303.85	50.00	600.00
Force @ 1.5 mm (N)	1,190.11	850.00	1,400.00
Force @ 2.5 mm (N)	1,446.50	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,485.46	1,361.00	1,673.00

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

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

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 28-Jun-20
SACO Research

By : DG Date : 6-28-2020

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

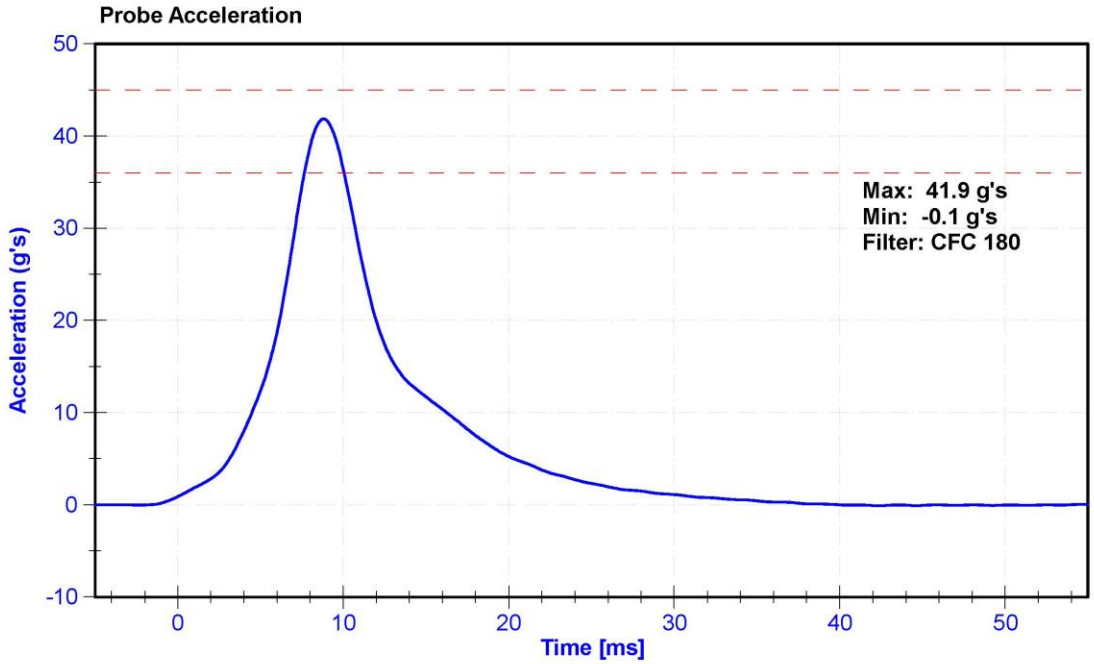
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	300	Laboratory Supervisor	D.Reinhard

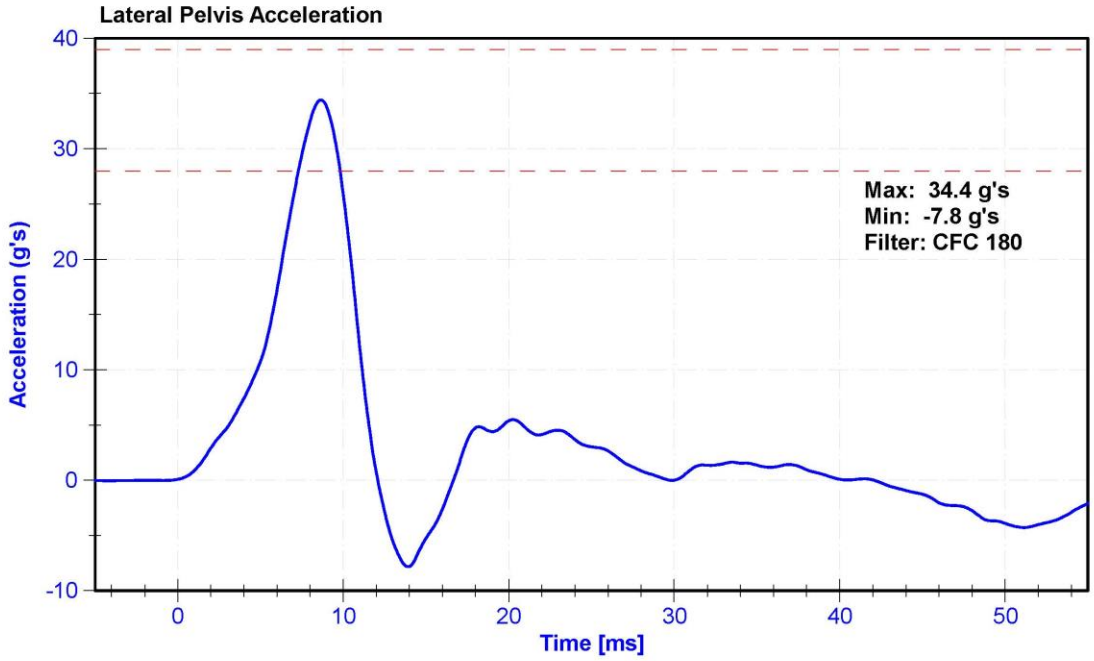
Results

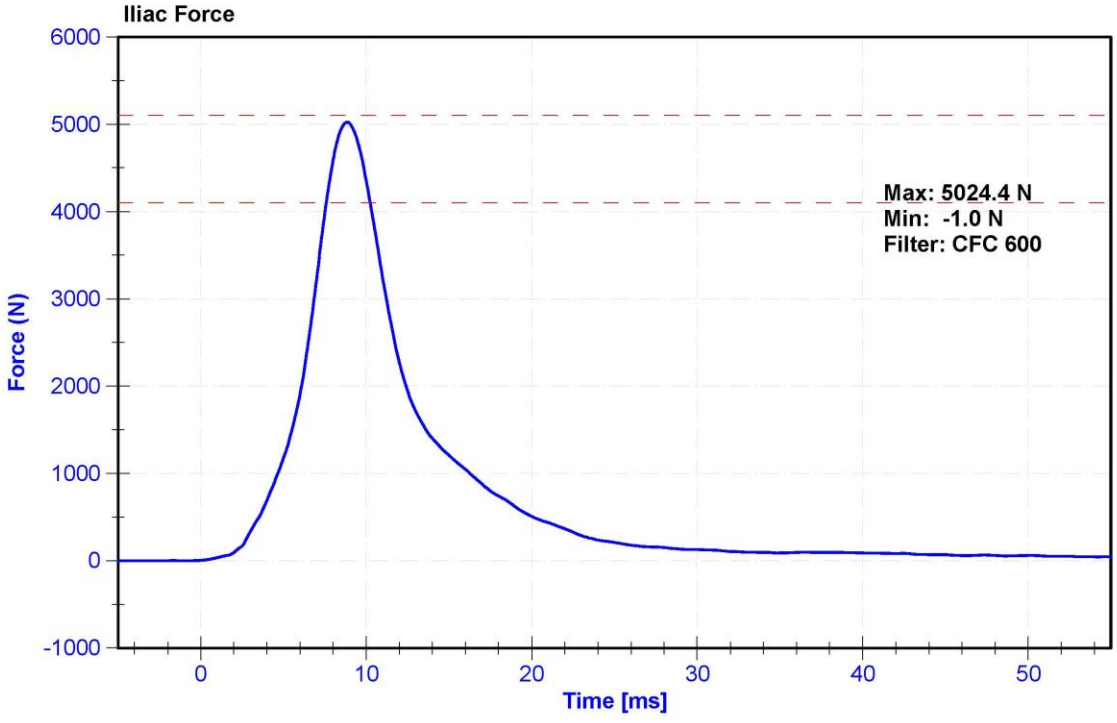
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	25.0	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	36	45	g's	41.9	Pass
Lateral Pelvis Acceleration	28	39	g's	34.4	Pass
Iliac Force	4100	5100	N	5024.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Pelvis Y Accelerometer	ENDEVCO 7264C	AC-P51731	11/9/2020	5/10/2021
Iliac Load Cell	DENTON 3228J	LC-279Fy	11/23/2020	11/23/2021




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 34.4 g's
Min: -7.8 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 5024.4 N
Min: -1.0 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

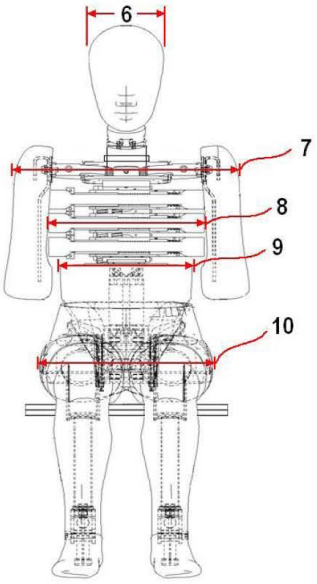
SERIAL NO: F034

(CONFIGURED FOR LEFT SIDE IMPACT)

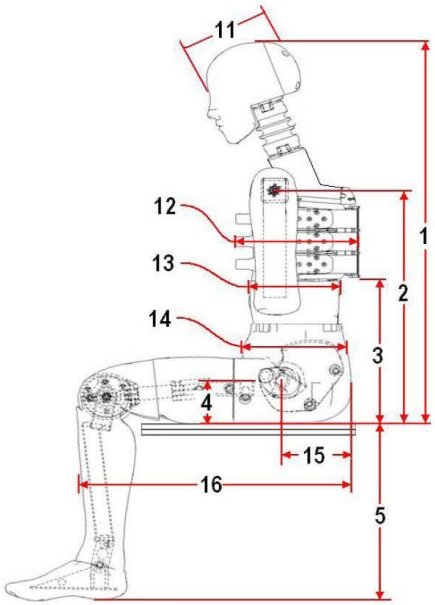
External Measurements - EuroSID-2re

Technician: K. Brogan Date: 2/11/2021

Dummy Serial Number: F034



FRONT VIEW



SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	914	Pass
2	Seat to Shoulder Joint	558	572	569	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	352	Pass
4	Seat to Hip Joint (center of bolt)	97	103	101	Pass
5	Sole to Seat, Sitting	333	451	425	Pass
6	Head Width	152	158	154	Pass
7	Shoulder/Arm Width	461	479	472	Pass
8	Thorax Width	322	332	329	Pass
9	Abdomen Width	273	287	284	Pass
10	Pelvis Lap Width	359	373	367	Pass
11	Head Depth	196	206	202	Pass
12	Thorax Depth	262	272	269	Pass
13	Abdomen Depth	194	204	202	Pass
14	Pelvis Depth	235	245	240	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	156	Pass
16	Back of Buttocks to Front Knee	597	615	609	Pass

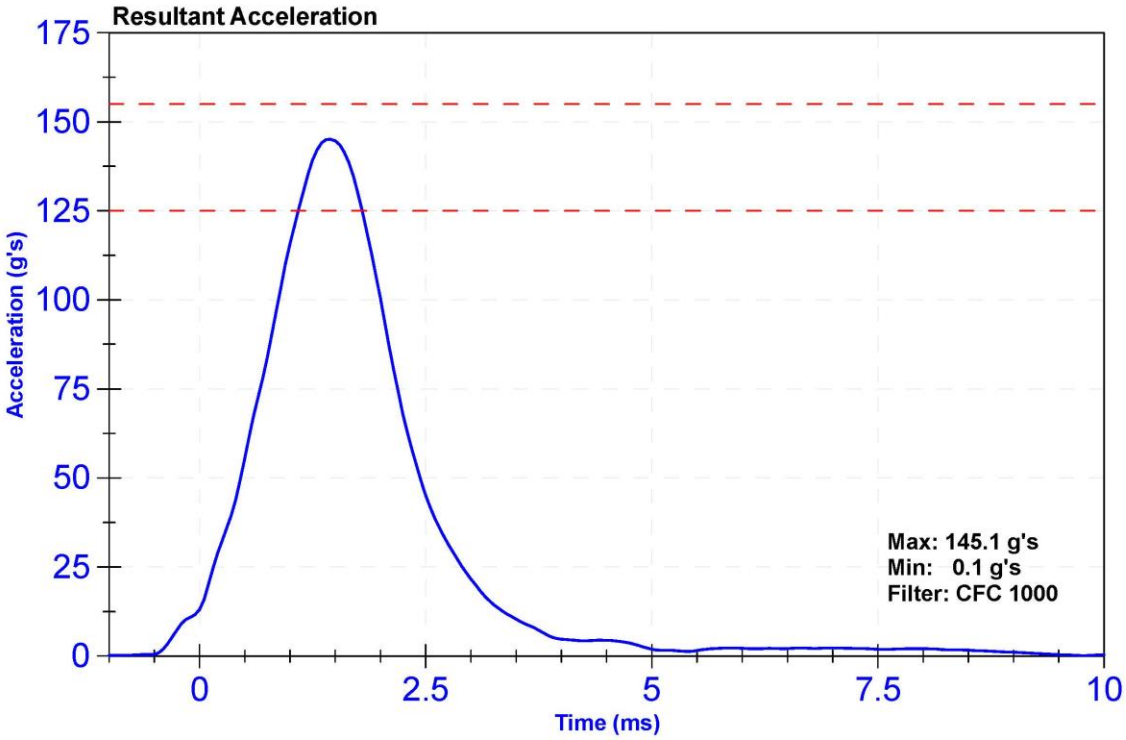
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

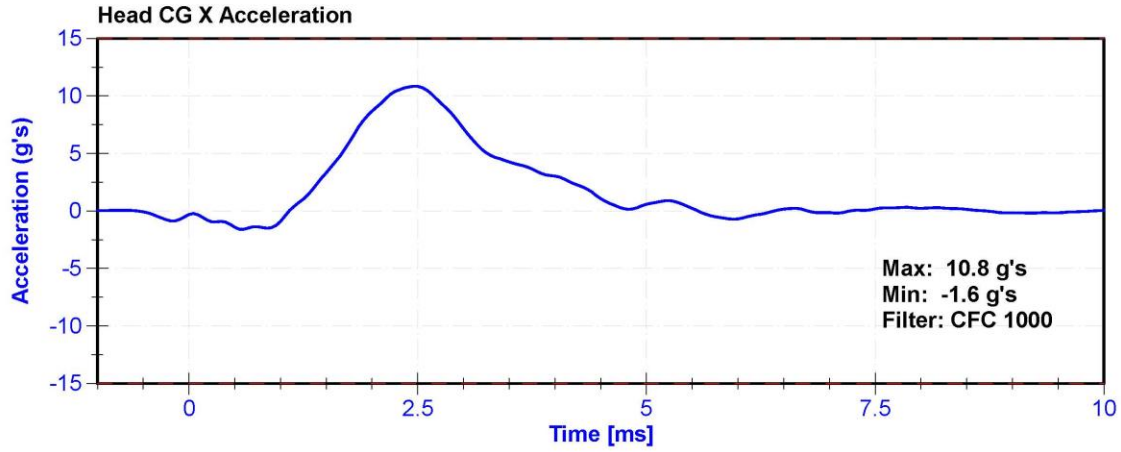
Results

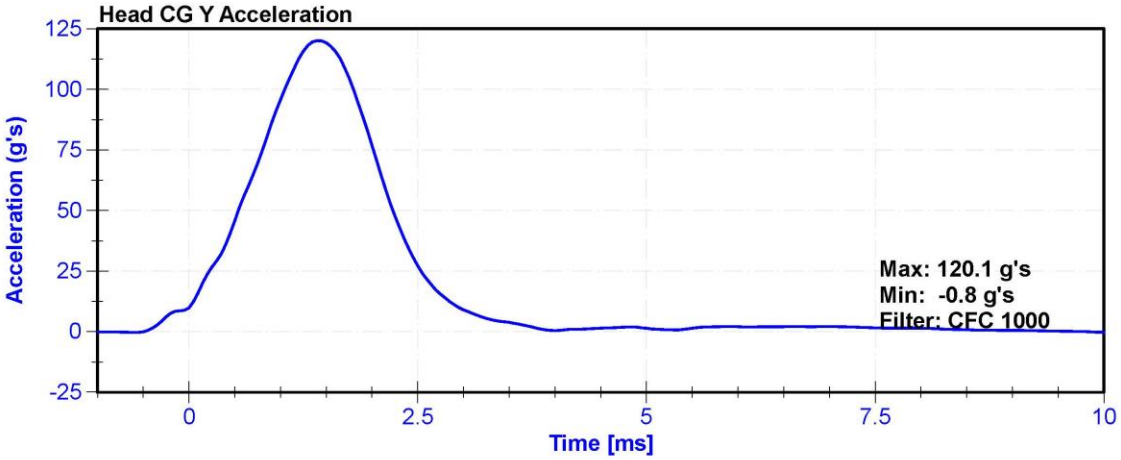
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Resultant Acceleration	125	155	g's	145.1	Pass
Oscillation	0	15	%	3.05	Pass
Fore-Aft Acceleration	-15	15	g's	10.8	Pass

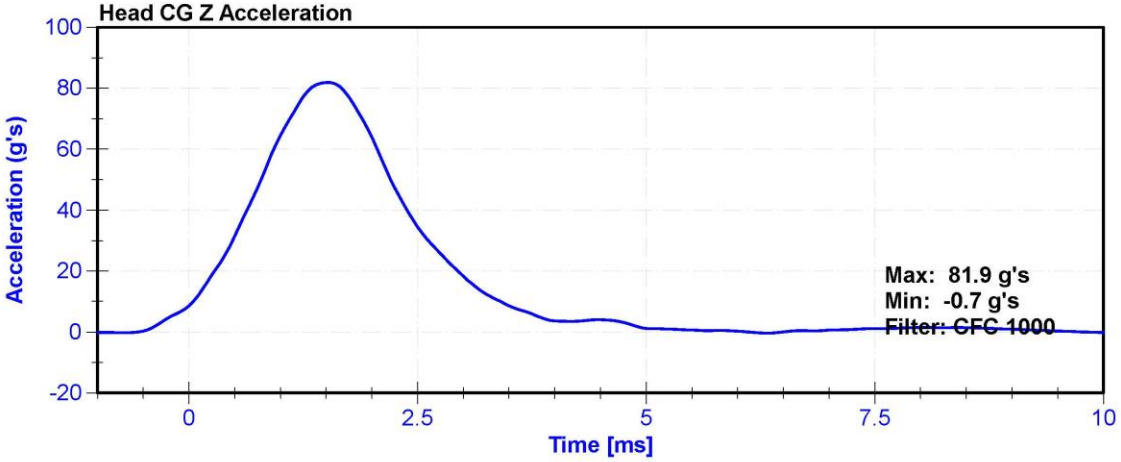
Transducer Calibrations

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




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 10.8 g's
Min: -1.6 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 120.1 g's
Min: -0.8 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]
Max: 81.9 g's
Min: -0.7 g's
Filter: CFC 1000

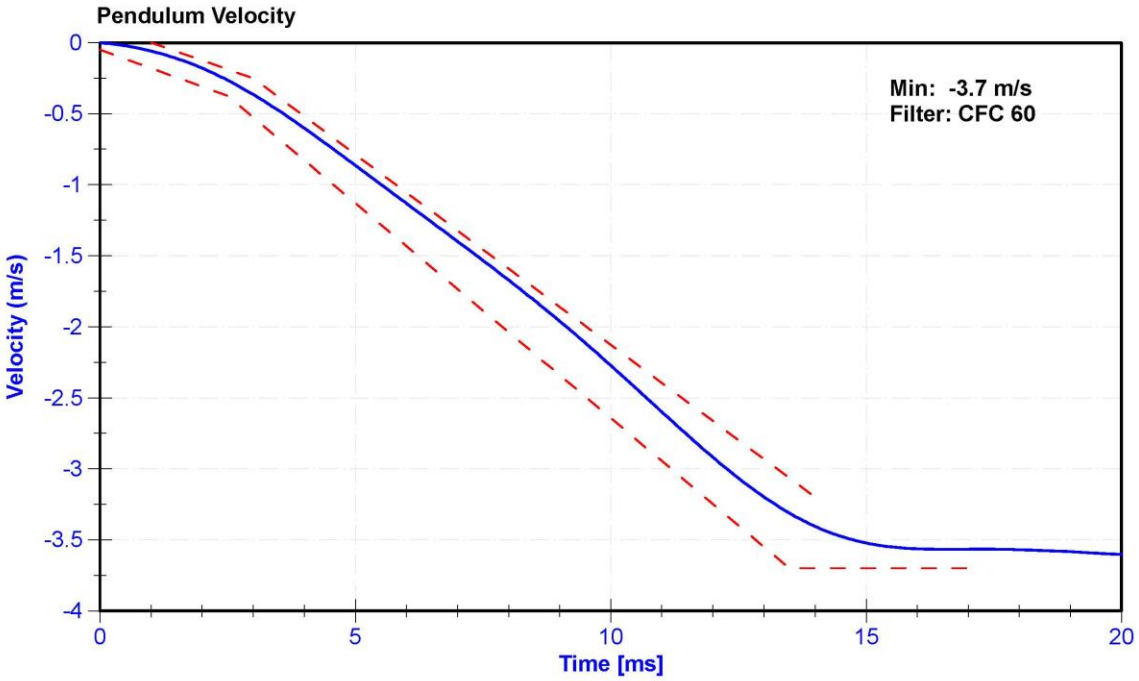
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

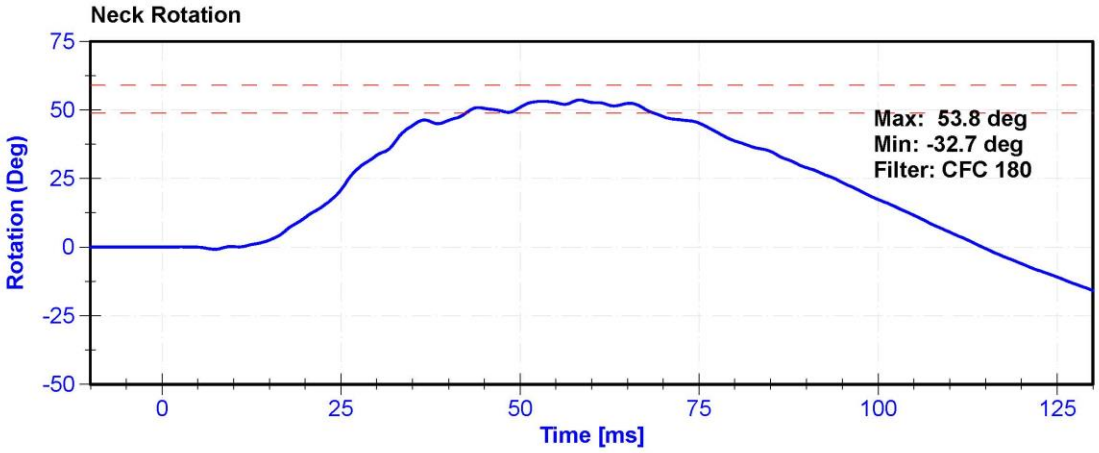
Results

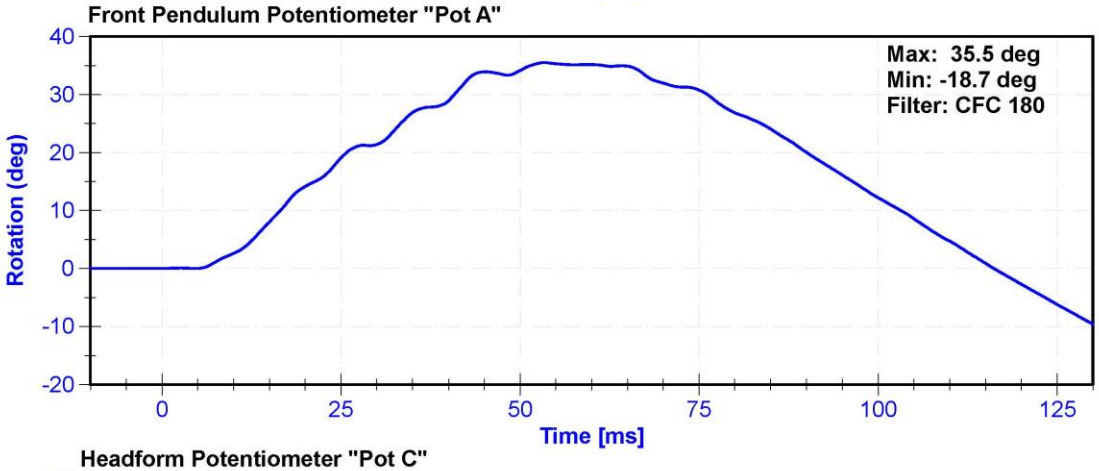
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	22.3	Pass
Velocity	3.3	3.5	m/s	3.42	Pass
Lateral Neck Rotation	49	59	deg	53.8	Pass
Time at Maximum Rotation	54	66	ms	58.3	Pass
Time of Rotation Decay from Maximum	53	88	ms	56.3	Pass

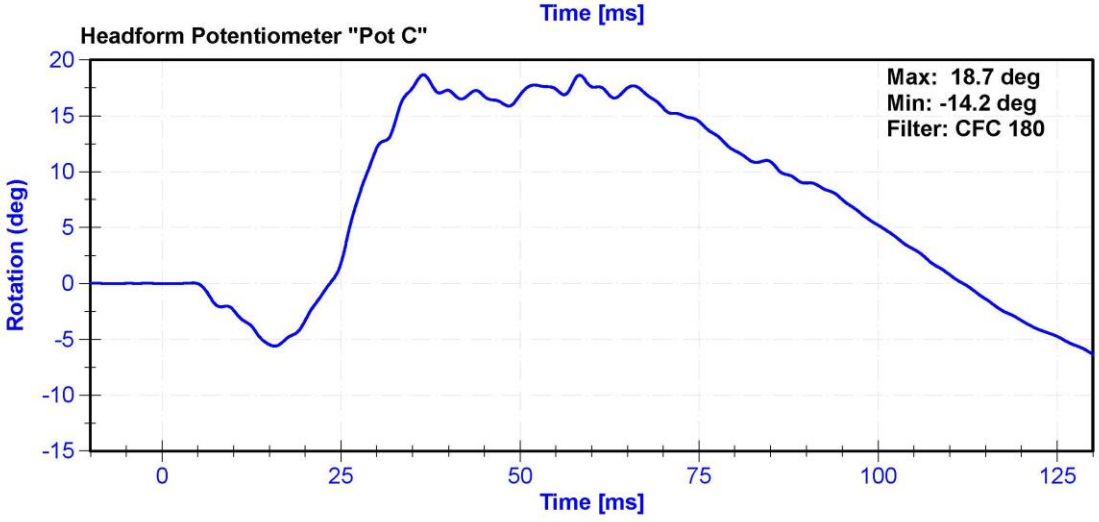
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503	2/5/2021	2/5/2022
Front Pendulum Potentiometer	SP22G	DS-094	8/18/2020	8/18/2021
Headform Potentiometer	SP22G	DS-095	8/18/2020	8/18/2021




Neck Rotation
Rotation (Deg)
Time [ms]
Max: 53.8 deg
Min: -32.7 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 35.5 deg
Min: -18.7 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 18.7 deg
Min: -14.2 deg
Filter: CFC 180

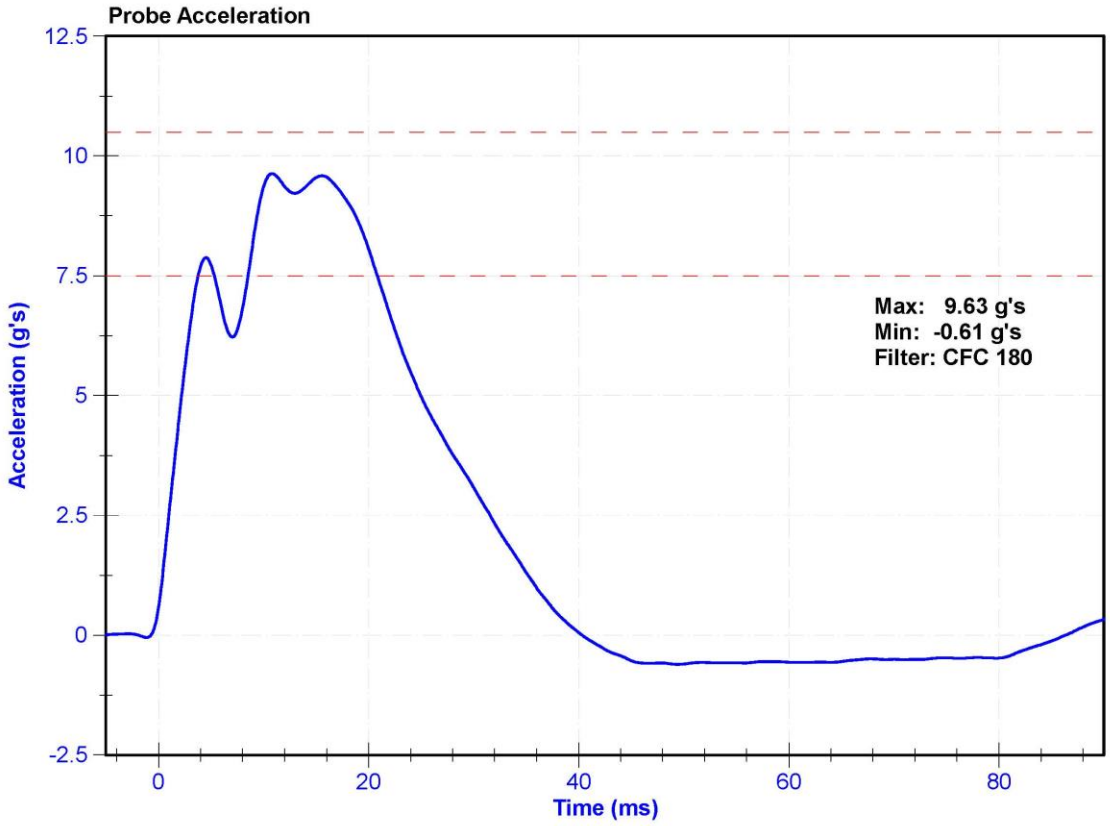
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	26.0	Pass
Velocity	4.2	4.4	m/s	4.39	Pass
Probe Acceleration	7.5	10.5	g's	9.63	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022



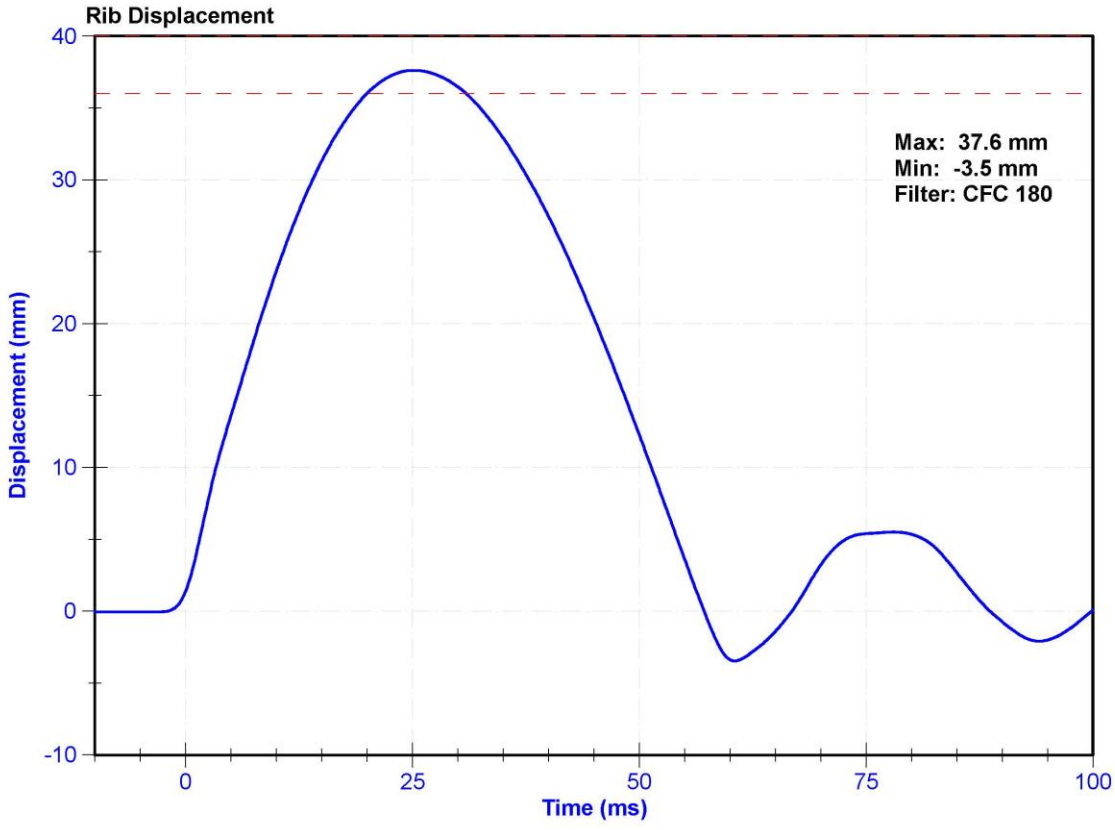
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Rib Displacement	36	40	mm	37.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/8/2020	4/8/2021



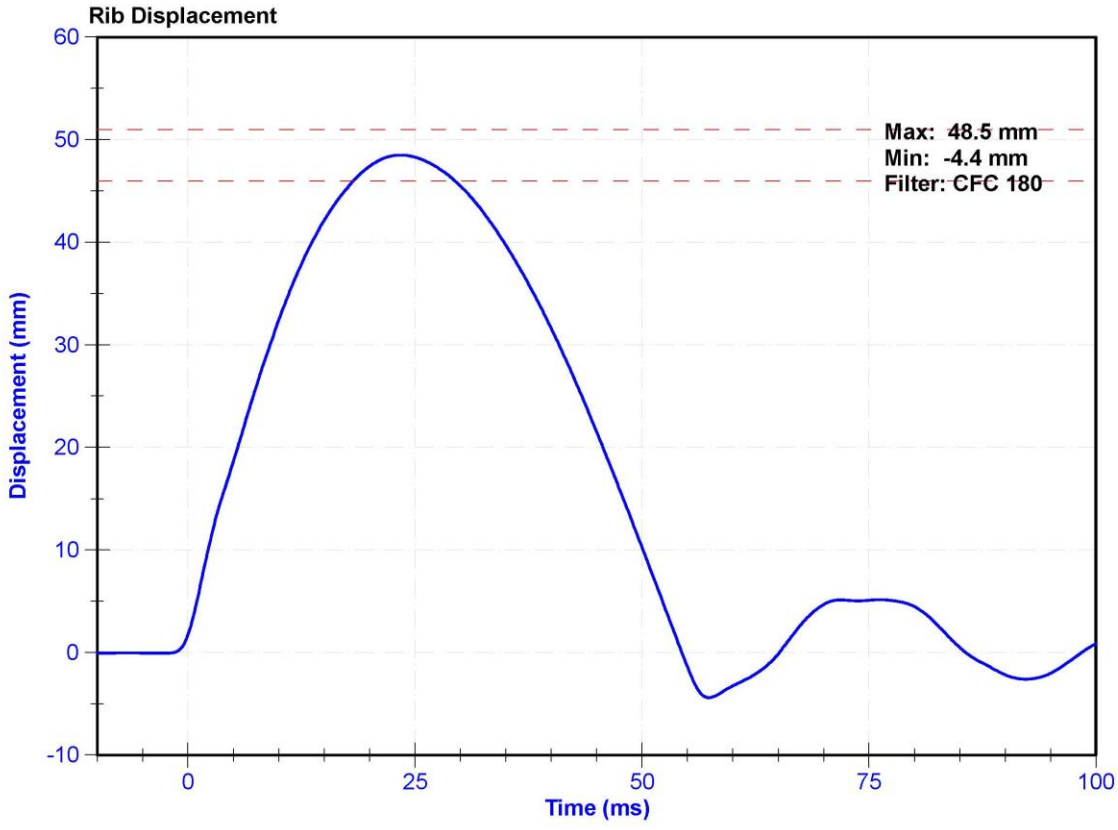
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Rib Displacement	46	51	mm	48.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/8/2020	4/8/2021



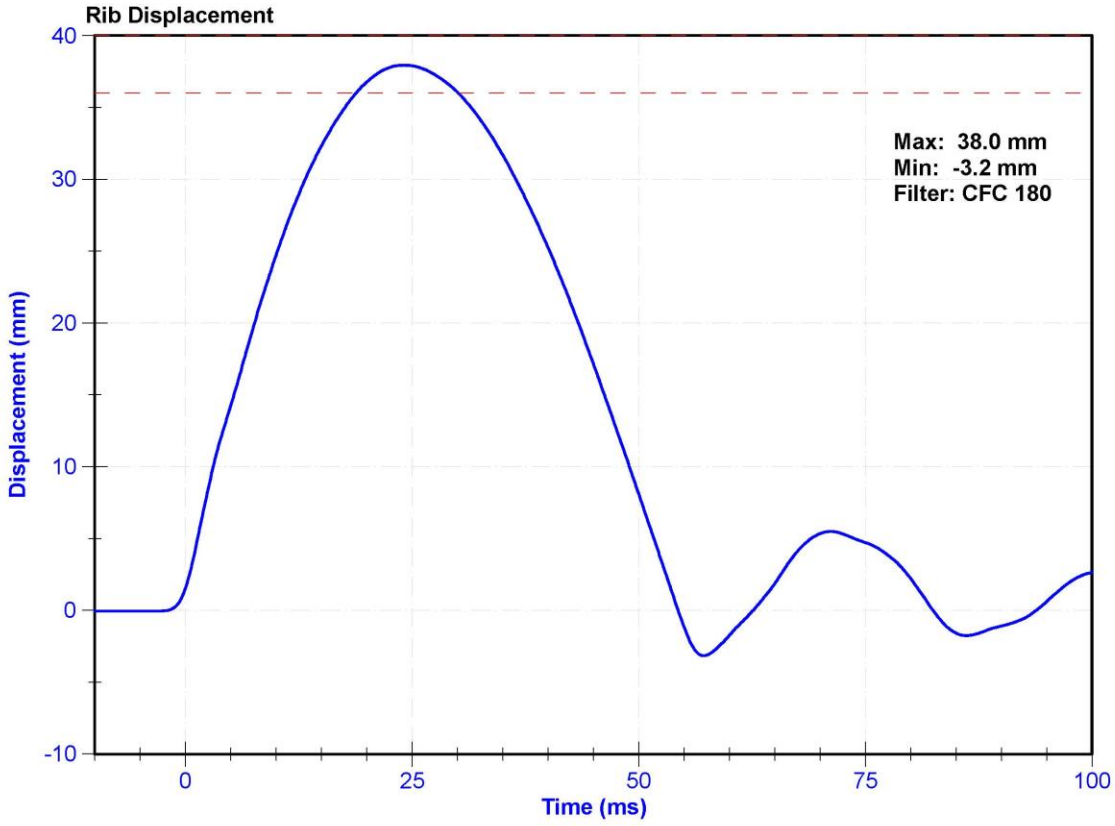
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Rib Displacement	36	40	mm	38.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/8/2020	4/8/2021



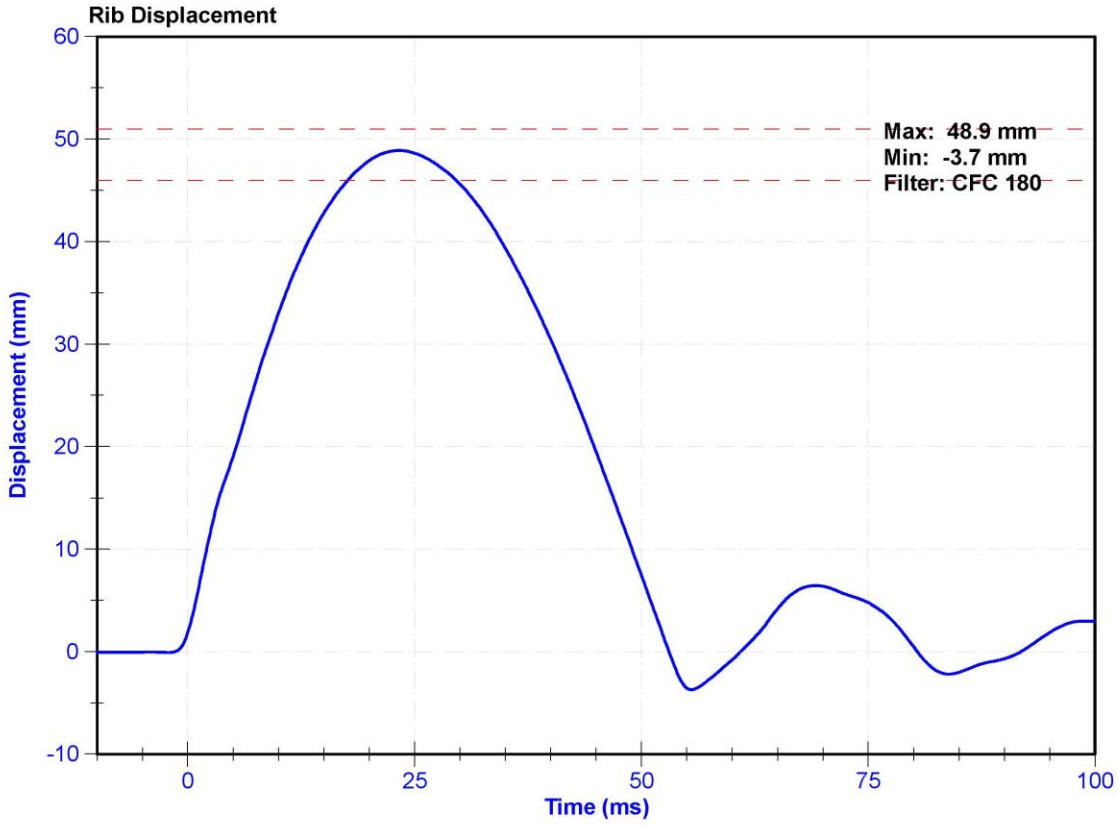
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Rib Displacement	46	51	mm	48.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/8/2020	4/8/2021



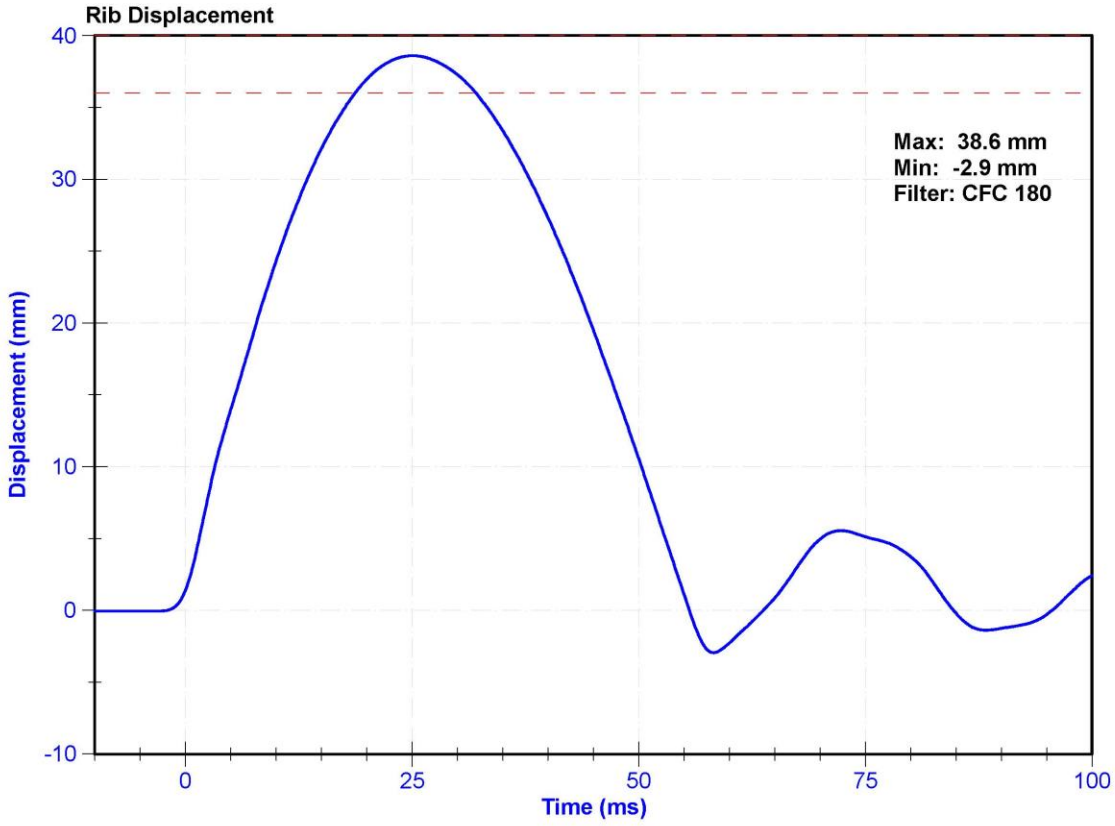
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Rib Displacement	36	40	mm	38.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/8/2020	4/8/2021



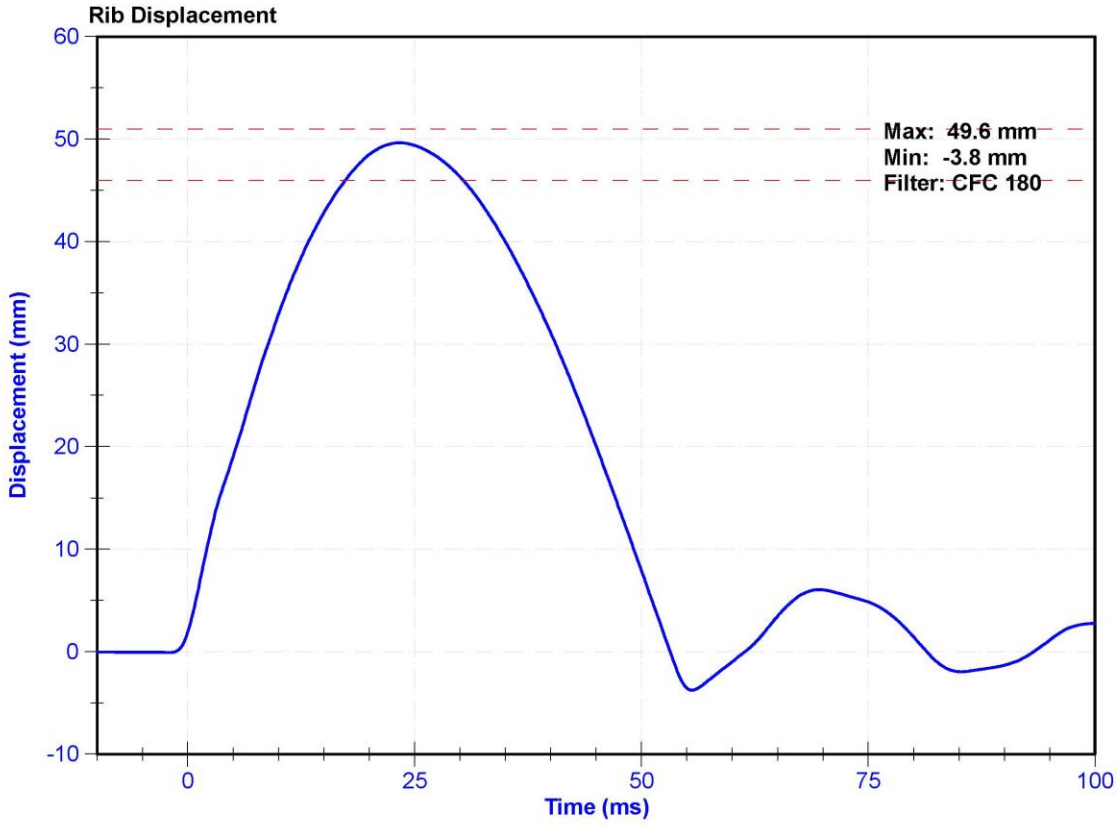
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Rib Displacement	46	51	mm	49.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/8/2020	4/8/2021



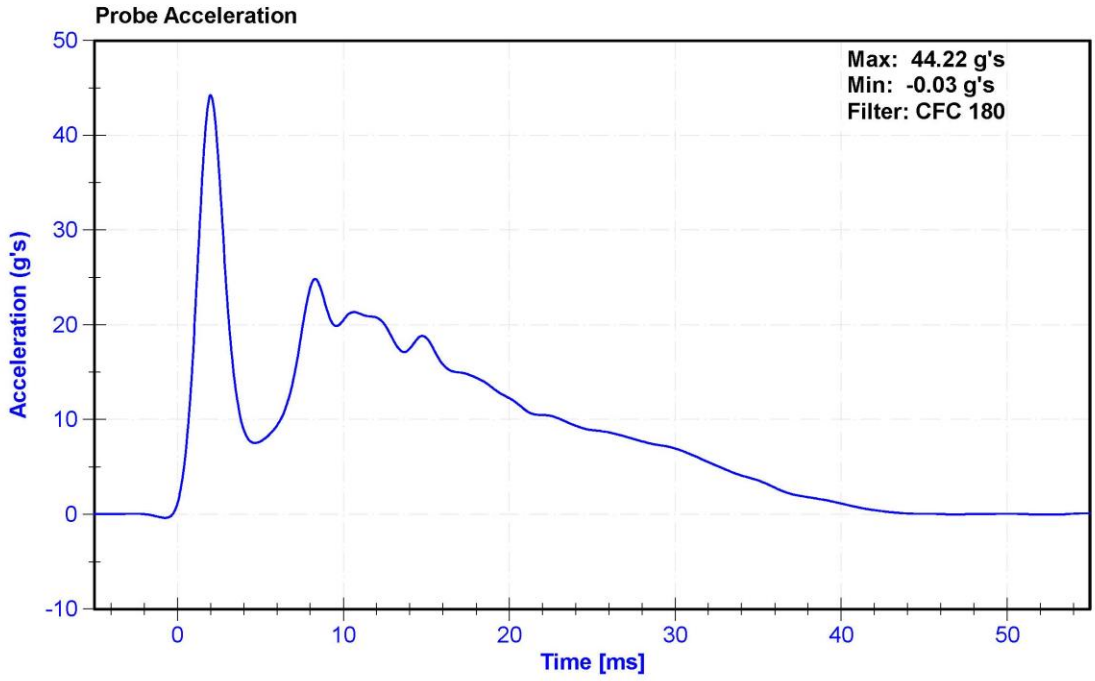
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

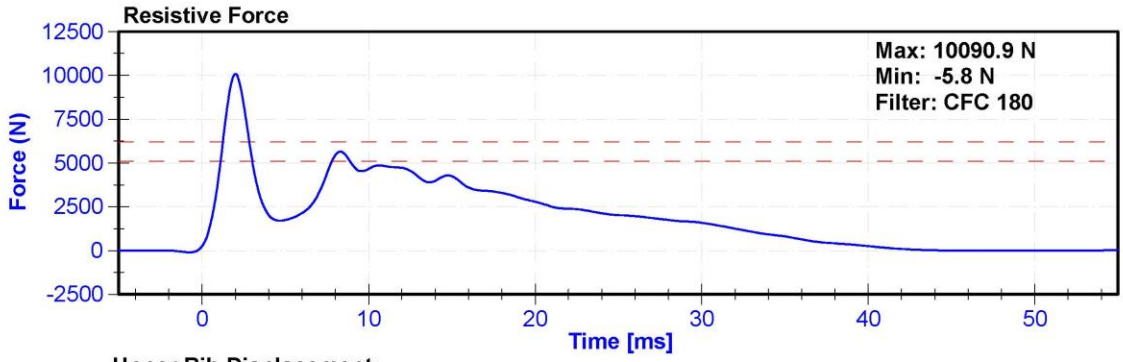
Results

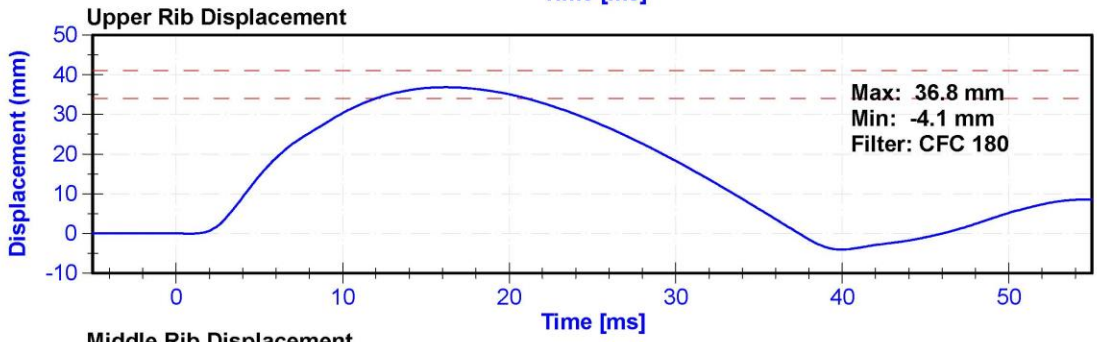
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	26.0	Pass
Velocity	5.4	5.6	m/s	5.44	Pass
Resistive Force after 6ms	5100	6200	N	5664.5	Pass
Upper Thorax Rib Deflection	34	41	mm	36.8	Pass
Mid Thorax Rib Deflection	37	45	mm	41.6	Pass
Lower Thorax Rib Deflection	37	44	mm	41.4	Pass

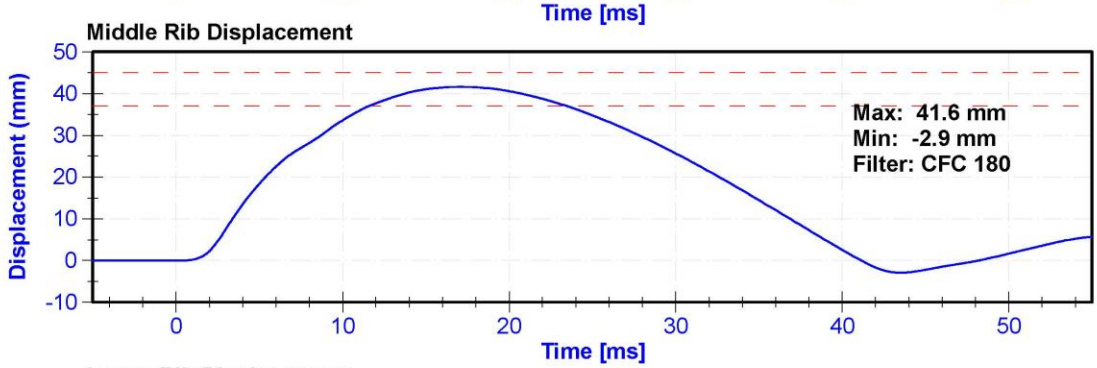
Transducer Calibrations

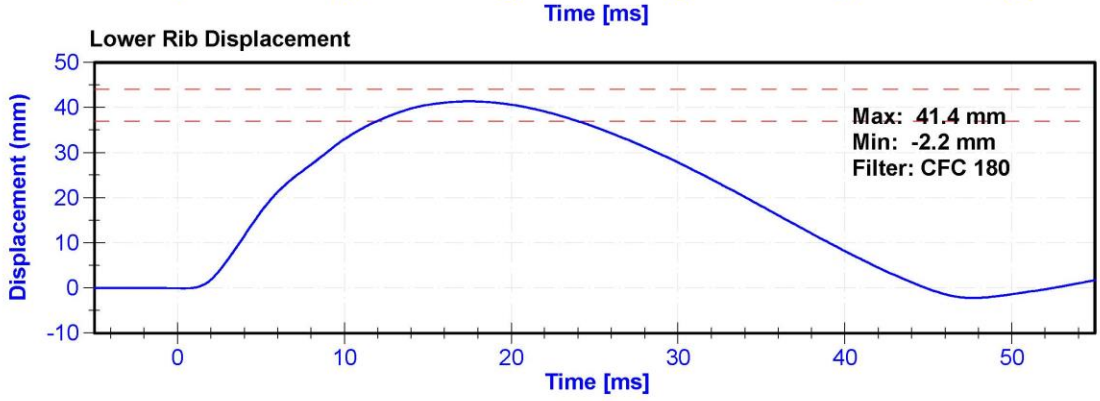
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264C-2K-TZ2	T25885	2/2/2021	2/2/2022
Upper Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/8/2020	4/8/2021
Middle Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/8/2020	4/8/2021
Lower Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/8/2020	4/8/2021




Resistive Force
Force (N)
12500
10000
7500
5000
2500
0
-2500
0
10
20
30
40
50
Time [ms]
Max: 10090.9 N
Min: -5.8 N
Filter: CFC 180


Upper Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 36.8 mm
Min: -4.1 mm
Filter: CFC 180


Middle Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 41.6 mm
Min: -2.9 mm
Filter: CFC 180


Lower Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 41.4 mm
Min: -2.2 mm
Filter: CFC 180

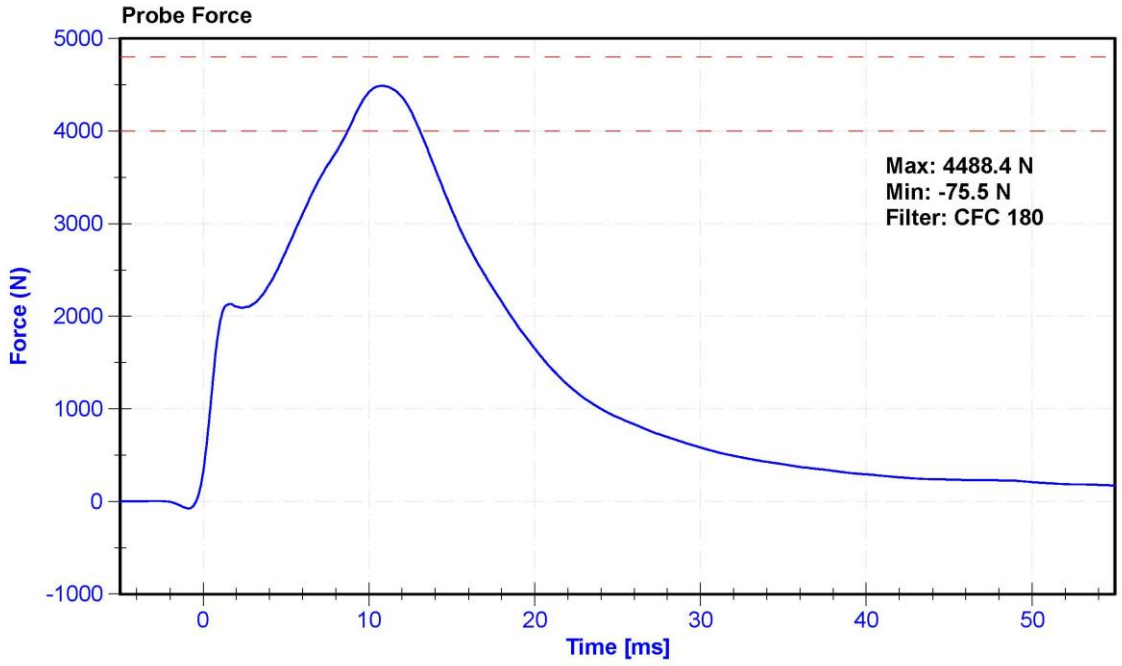
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K.Brogan

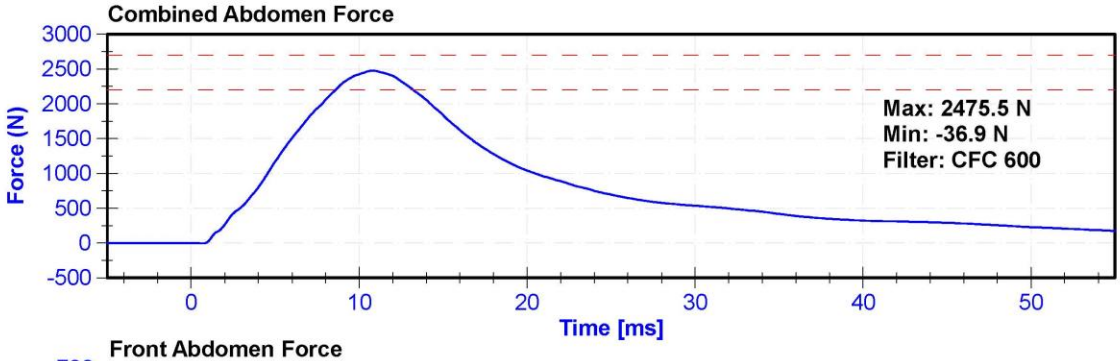
Results

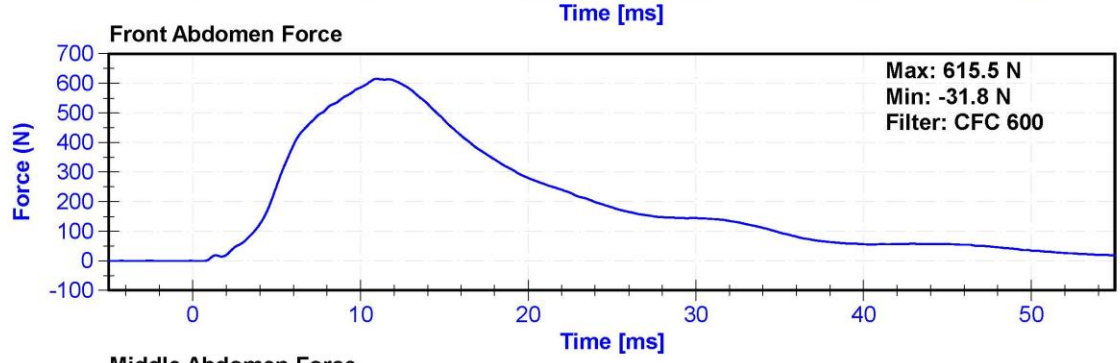
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	27	Pass
Velocity	3.9	4.1	m/s	4.09	Pass
Combined Abdomen Force	2200	2700	N	2475.5	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.80	Pass
Resistive Probe Force	4000	4800	N	4488.4	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.80	Pass

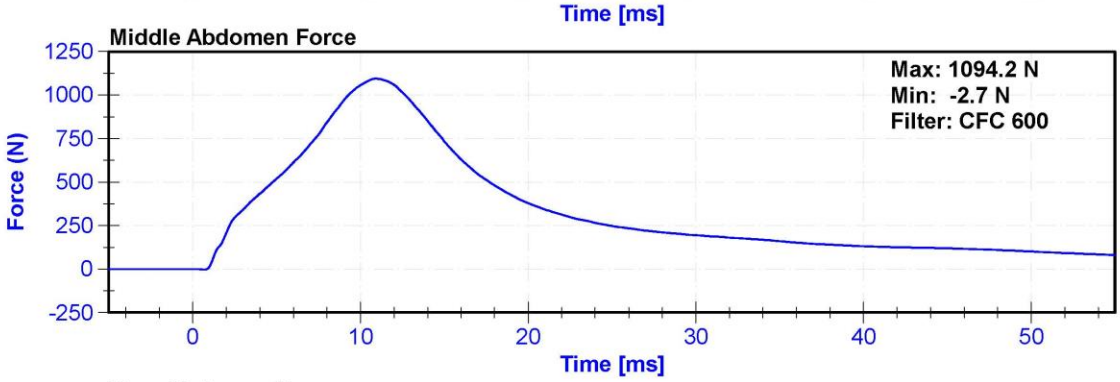
Transducer Calibrations

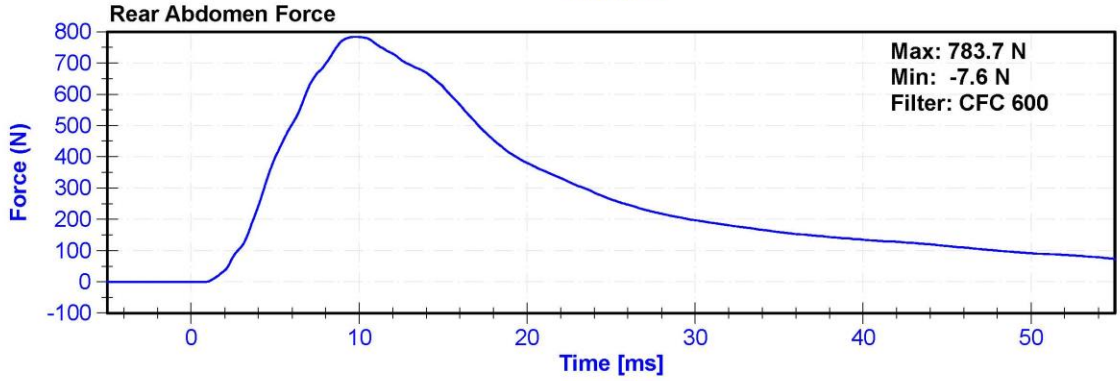
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Front Abdomen Load Cell	DENTON 2631J	LC-1524	3/19/2020	3/19/2021
Middle Abdomen Load Cell	DENTON 2631J	LC-1523	3/19/2020	3/19/2021
Rear Abdomen Load Cell	DENTON 2631J	LC-1530	3/19/2020	3/19/2021




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2475.5 N
Min: -36.9 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 615.5 N
Min: -31.8 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1094.2 N
Min: -2.7 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 783.7 N
Min: -7.6 N
Filter: CFC 600

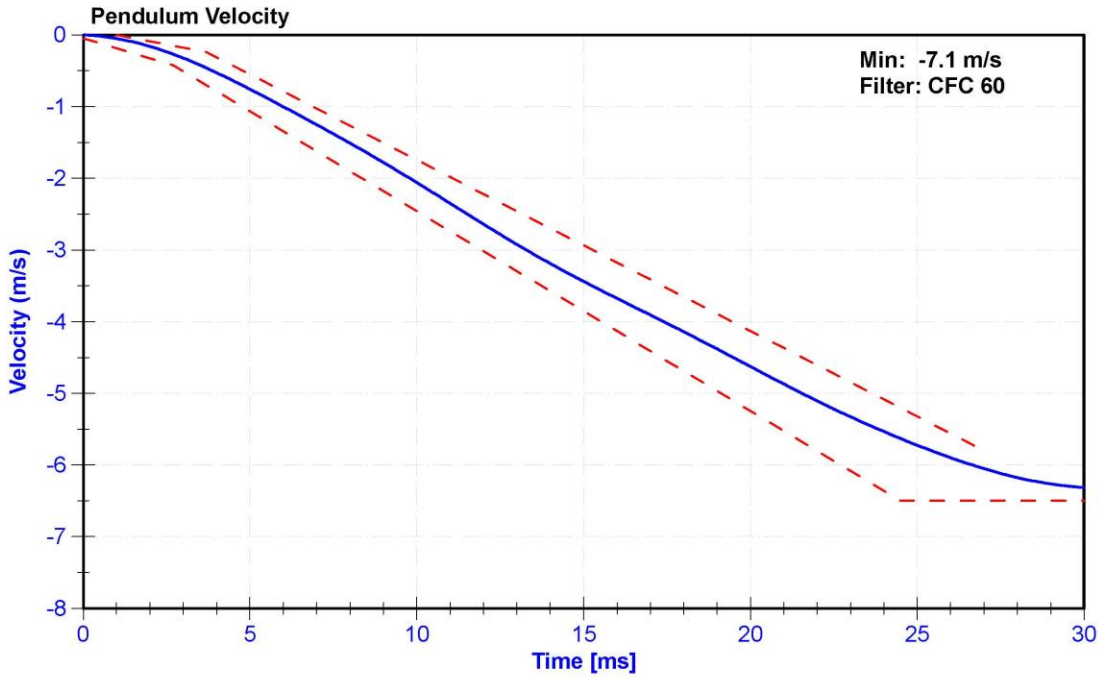
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

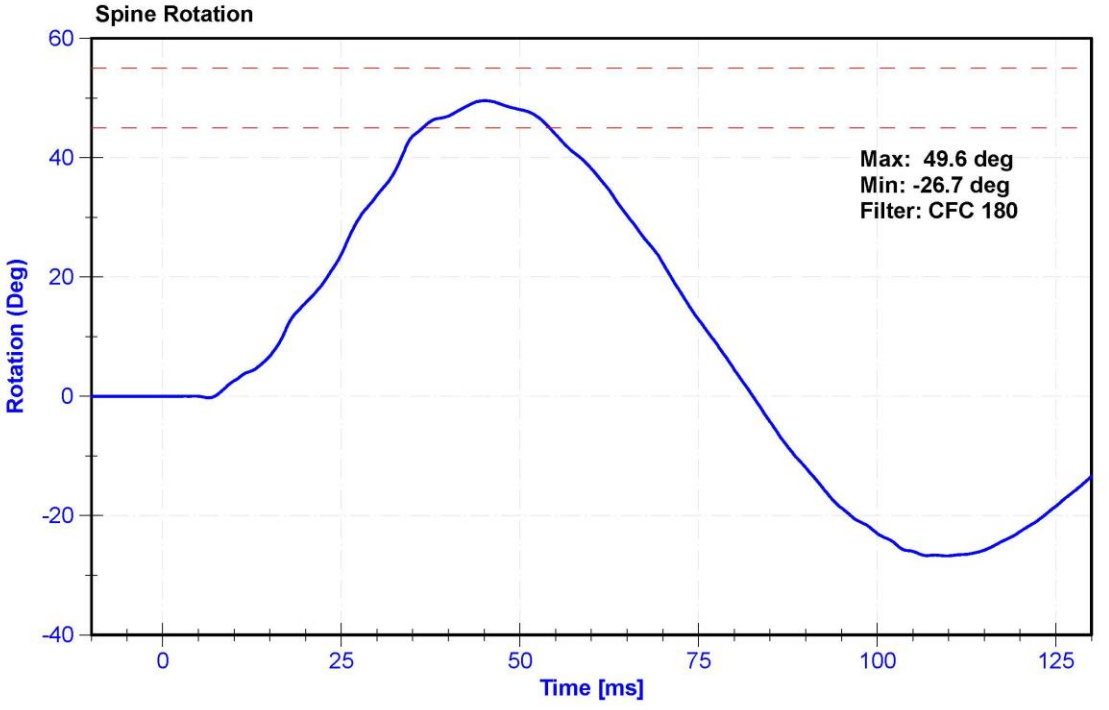
Results

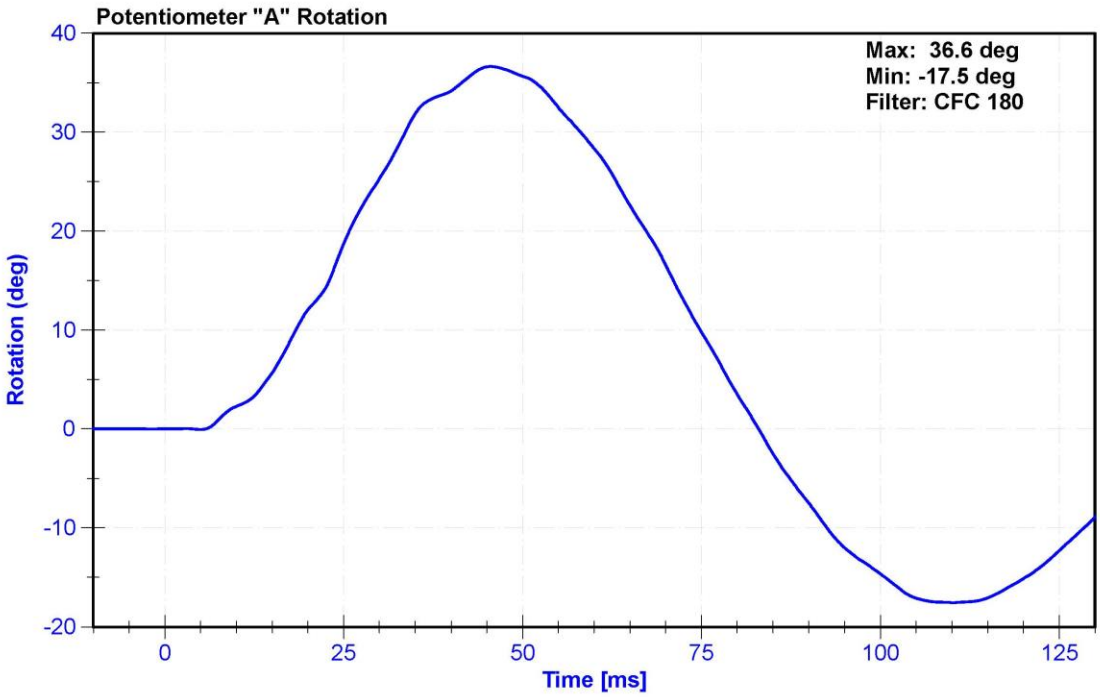
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.9	Pass
Humidity	10	70	%	22.3	Pass
Velocity	5.95	6.15	m/s	6.088	Pass
Lateral Spine Rotation	45	55	deg	49.6	Pass
Time at Maximum Rotation	39	53	ms	45.1	Pass
Time of Decay to Zero Degrees	37	57	ms	37.5	Pass
Pulse within Corridor?	-	-	-		

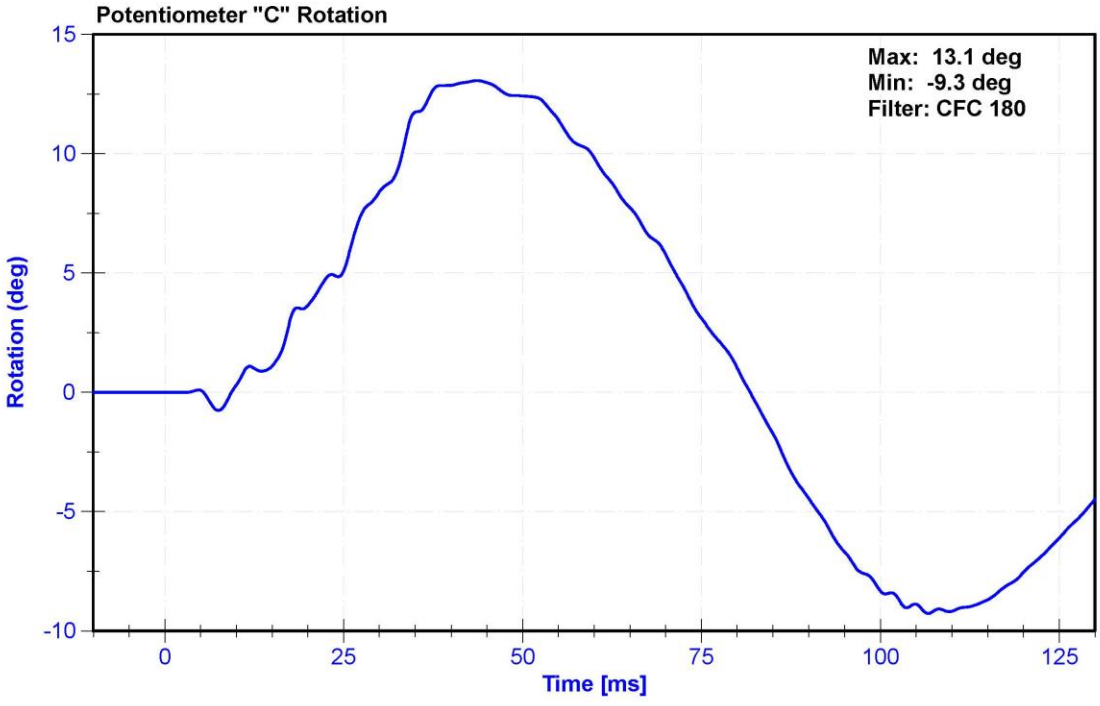
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/5/2021	2/5/2022
Pendulum "A" Potentiometer	SP22G	DS-094	8/18/2020	8/18/2021
Condyle "B" Potentiometer	SP22G	DS-095	8/18/2020	8/18/2021


Pendulum Velocity
Min: -7.1 m/s
Filter: CFC 60
Velocity (m/s)
0
-1
-2
-3
-4
-5
-6
-7
-8
0
5
10
15
20
25
30
Time [ms]


Spine Rotation
Max: 49.6 deg
Min: -26.7 deg
Filter: CFC 180
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 36.6 deg
Min: -17.5 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]


Potentiometer "C" Rotation
Max: 13.1 deg
Min: -9.3 deg
Filter: CFC 180
Rotation (deg)
15
10
5
0
-5
-10
0
25
50
75
100
125
Time [ms]

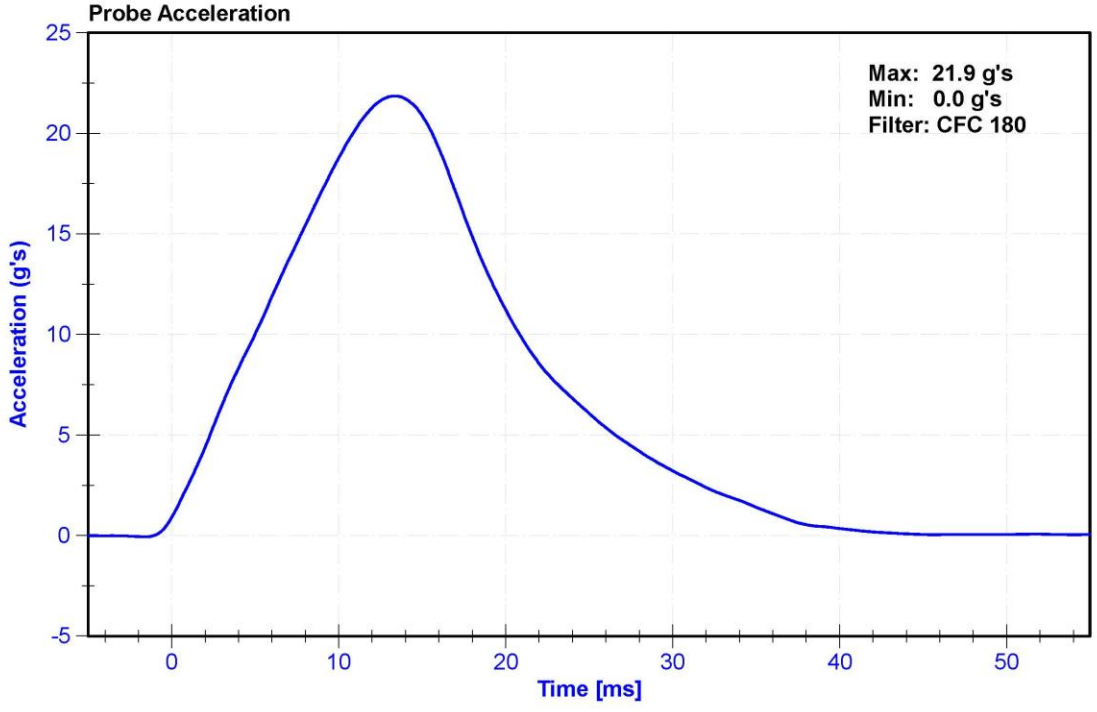
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

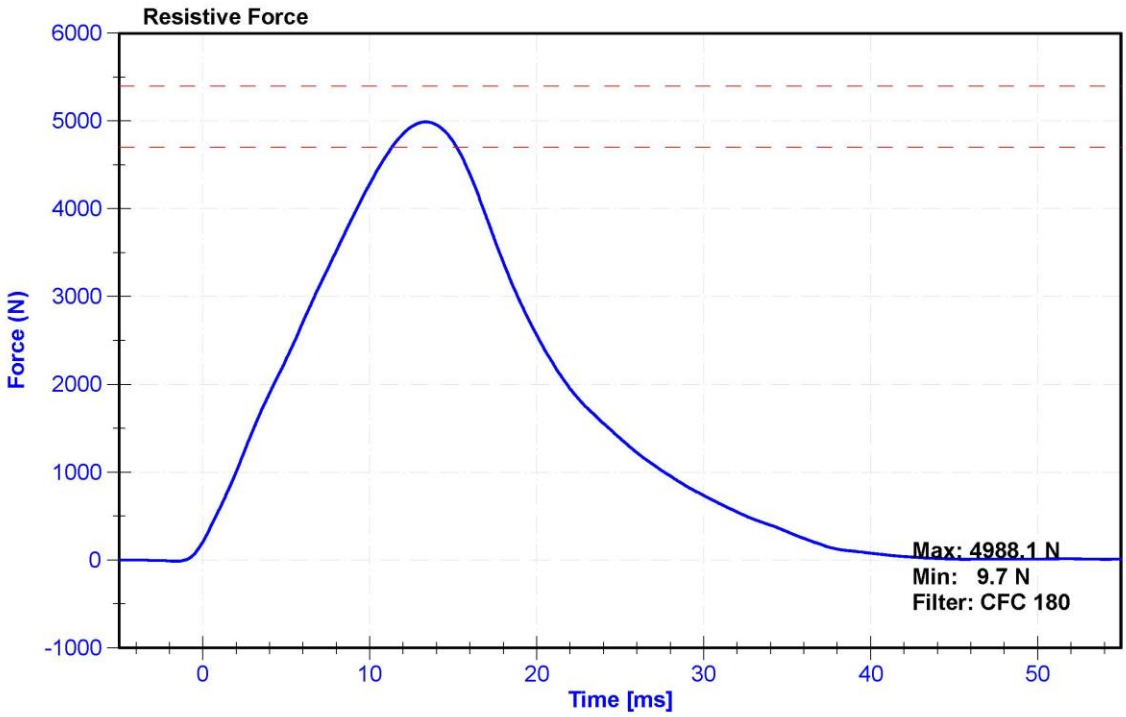
Results

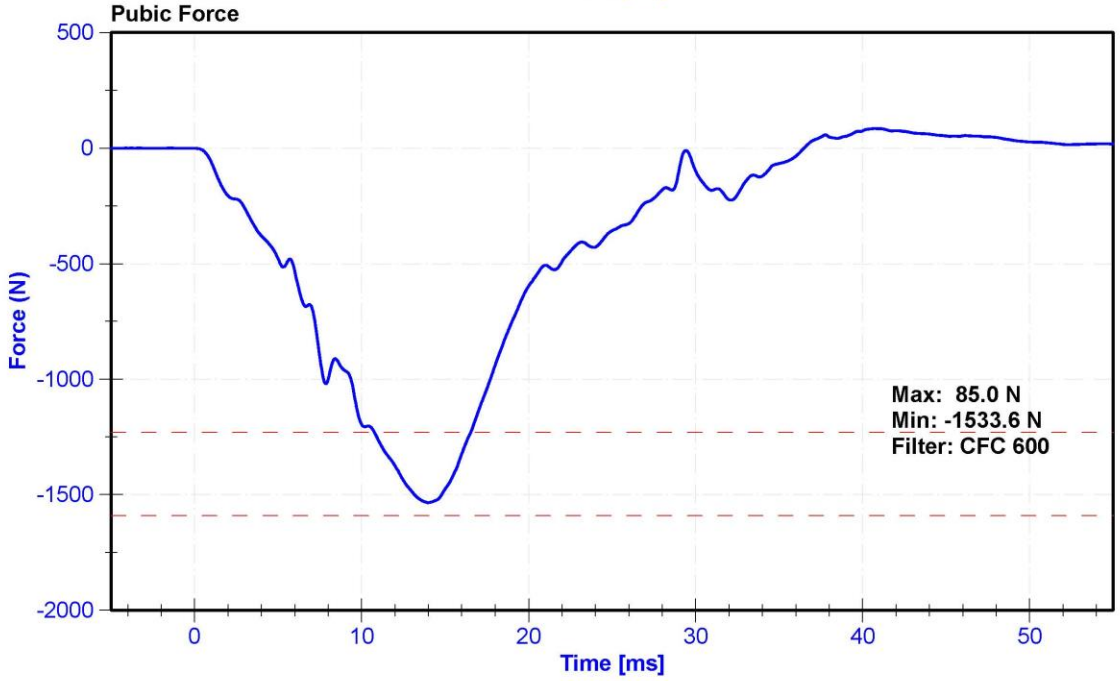
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	25.0	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Resistive Force	4700	5400	N	4988.1	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.35	Pass
Pubic Force	-1590	-1230	N	-1533.6	Pass
Time at Peak Pubic Force	12.2	17.0	ms	14.00	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Pubic Load Cell	Denton 3096JFL	30960459GFE	3/19/2020	3/19/2021




Resistive Force
Force (N)
Time [ms]
Max: 4988.1 N
Min: 9.7 N
Filter: CFC 180


Pubic Force
Force (N)
Time [ms]
Max: 85.0 N
Min: -1533.6 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

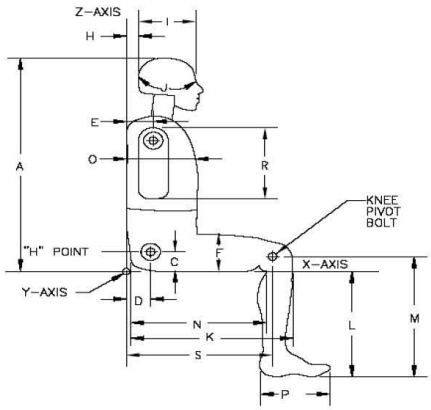
SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

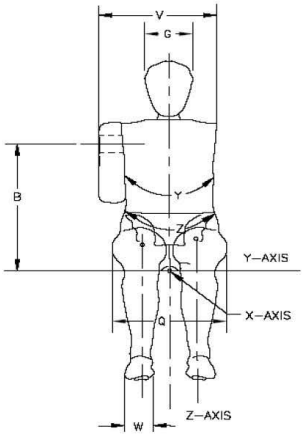
SERIAL No: 300

External Measurements - SID-IIs

Technician: K. Brogan Date: 02/11/2021

Dummy Serial Number: 300





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	781	Pass
B	Shoulder Pivot Height	437	453	445	Pass
C	H-point Height	79	89	84	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	126	Pass
G	Head Breadth	140	148	145	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	186	Pass
J	Head Circumference	541	551	544	Pass
K	Buttock to Knee Length	514	540	532	Pass
L	Popliteal Height	343	369	361	Pass
M	Knee Pivot to floor height	392	409	398	Pass
N	Buttock Popliteal Length	416	442	430	Pass
O	Chest Depth w/o jacket	195	211	208	Pass
P	Foot Length	216	232	220	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	317	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	484	Pass
V	Shoulder Width	341	357	352	Pass
W	Foot Width	78	94	83	Pass
Y	Chest Circumference w/jacket	851	881	875	Pass
Z	Waist Circumference	761	791	773	Pass

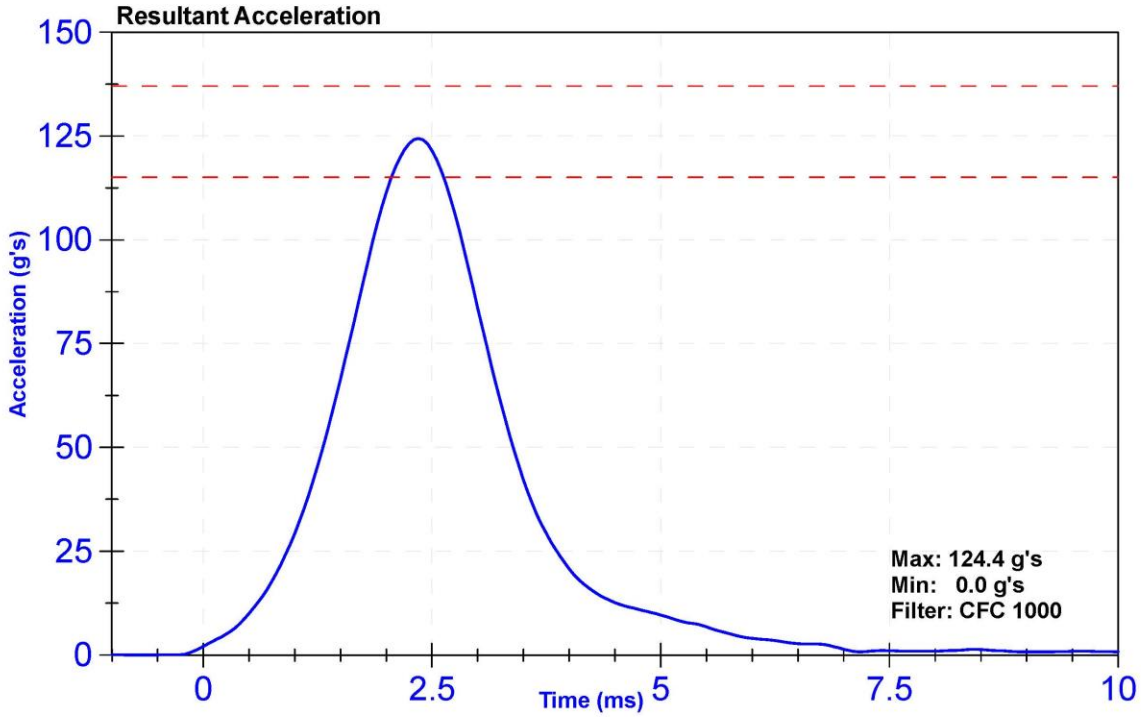
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

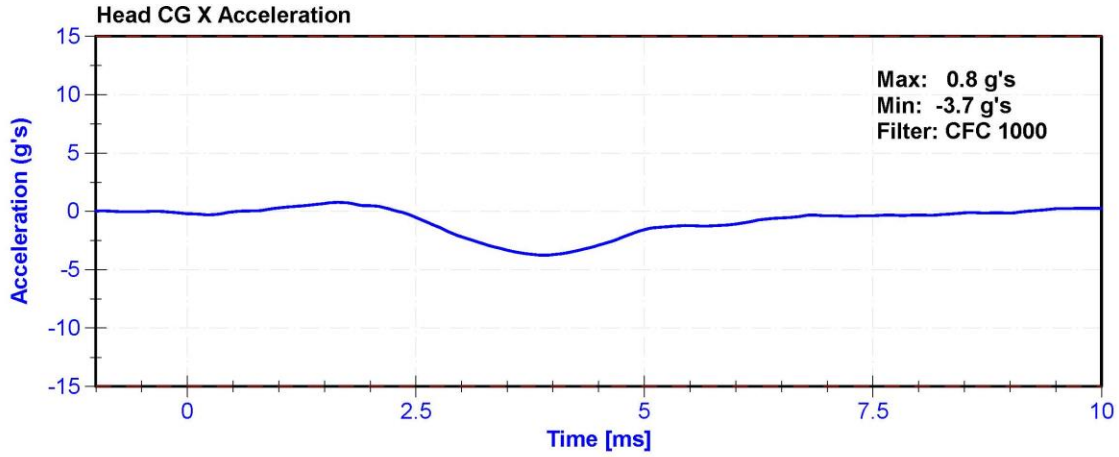
Results

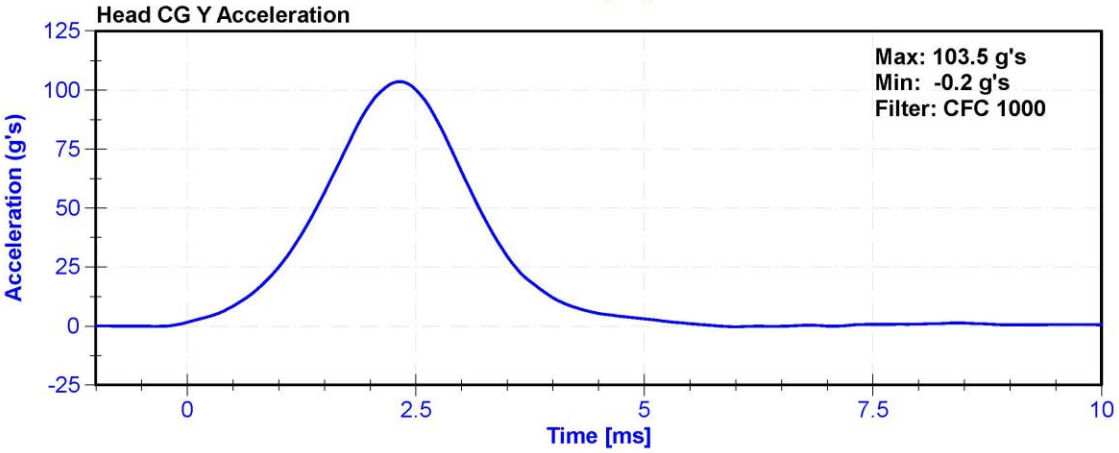
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Resultant Acceleration	115	137	g's	124.4	Pass
Oscillation	0	15	%	1.0	Pass
Fore-Aft Acceleration	-15	15	g's	-3.7	Pass

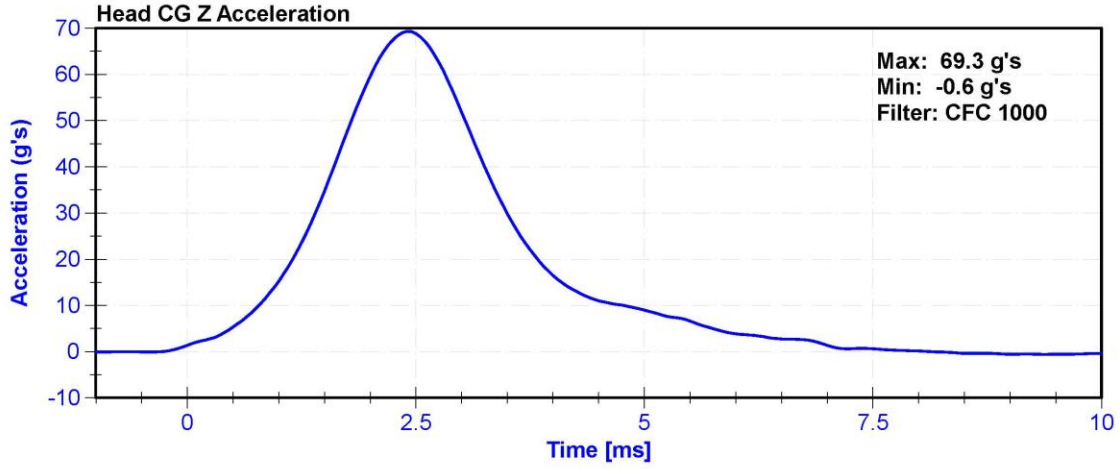
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P59018	11/10/2020	5/11/2021
Y Accelerometer	ENDEVCO 7264	AC-P79189	11/10/2020	5/11/2021
Z Accelerometer	ENDEVCO 7264CT	AC-P58777	11/10/2020	5/11/2021




Head CG X Acceleration
Max: 0.8 g's
Min: -3.7 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 103.5 g's
Min: -0.2 g's
Filter: CFC 1000
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 69.3 g's
Min: -0.6 g's
Filter: CFC 1000
Acceleration (g's)
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]

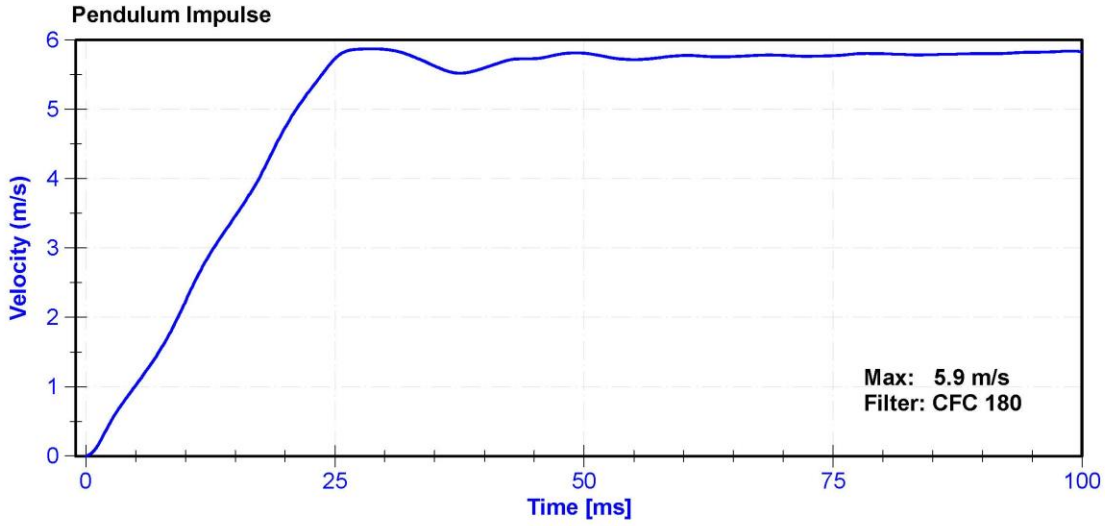
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

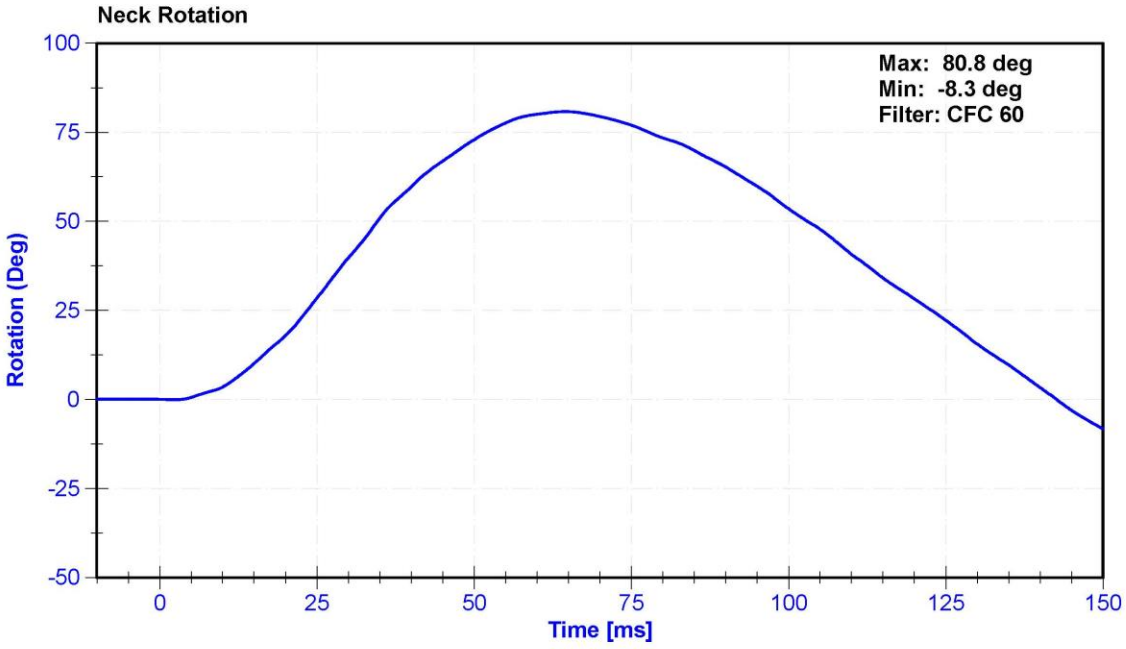
Results

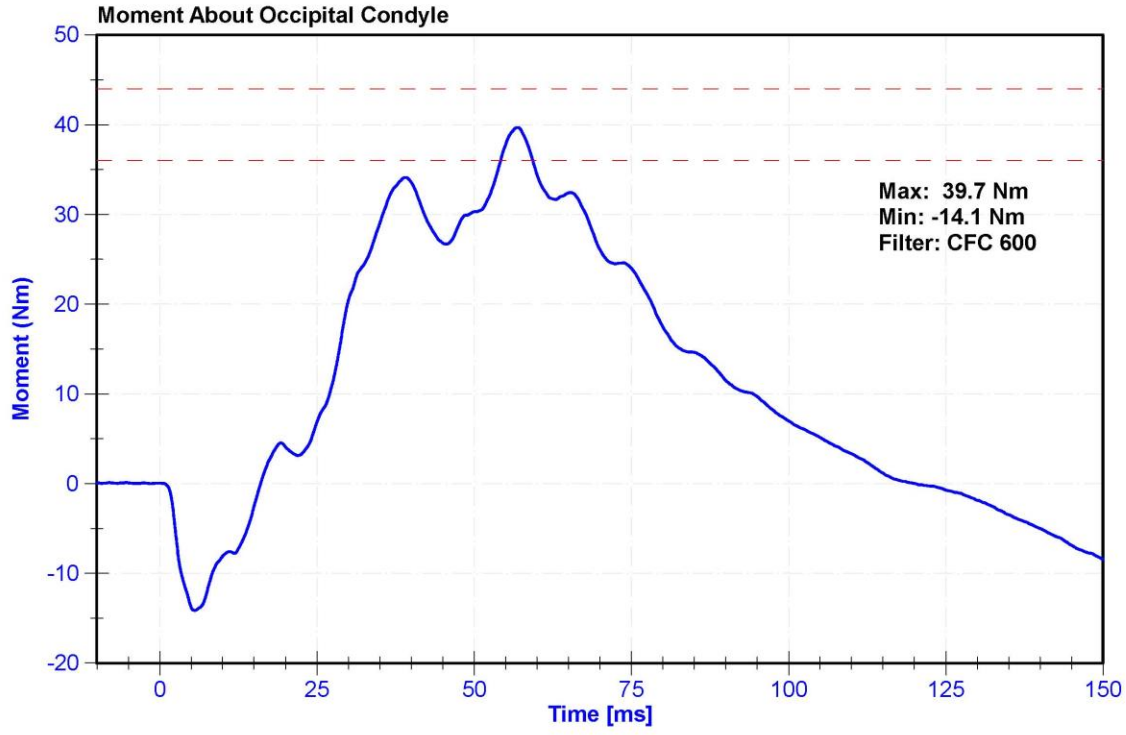
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	22.7	Pass
Velocity	5.51	5.63	m/s	5.584	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.23	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.46	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.73	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.73	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.87	Pass
Neck Rotation	71	81	deg	80.8	Pass
Time at Maximum Rotation	50	70	ms	64.5	Pass
Moment about the OC	36	44	Nm	39.7	Pass
Moment Decay to 0 Nm	102	126	ms	120.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/5/2021	2/5/2022
Pendulum Potentiometer	Denton 78051-342	DS-184Pend	11/6/2020	11/6/2021
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/6/2020	11/6/2021
Upper Neck Load Cell	Denton 1716	17162019 FY	3/18/2020	3/18/2021




Neck Rotation
Max: 80.8 deg
Min: -8.3 deg
Filter: CFC 60
Rotation (Deg)
Time [ms]
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150


Moment About Occipital Condyle
Max: 39.7 Nm
Min: -14.1 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150

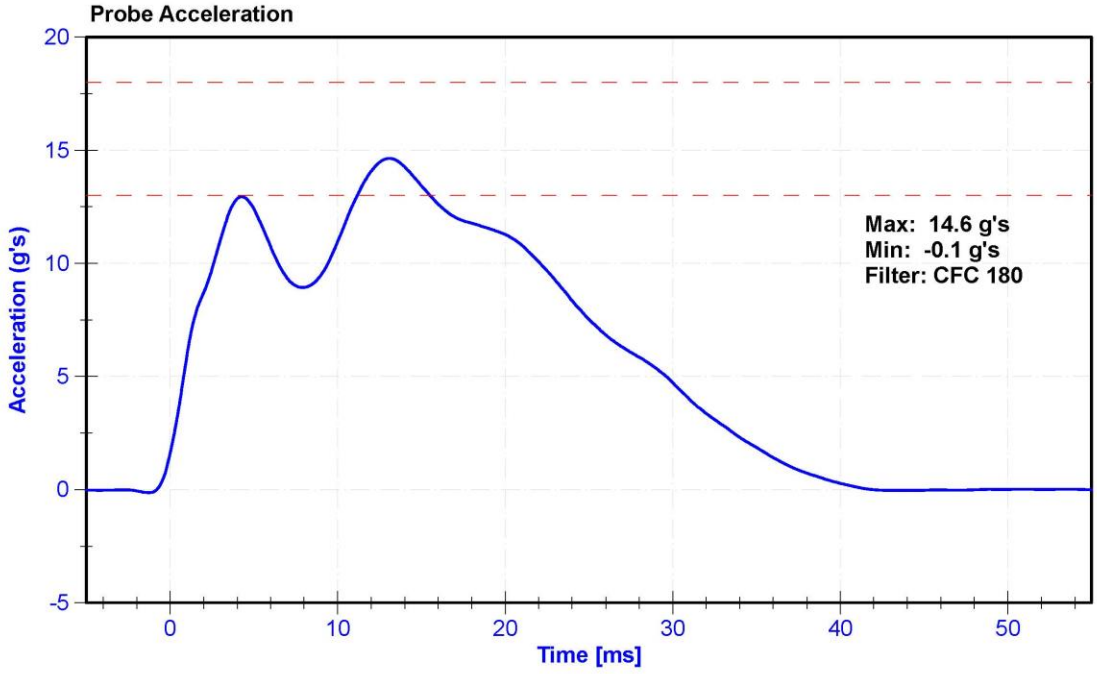
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

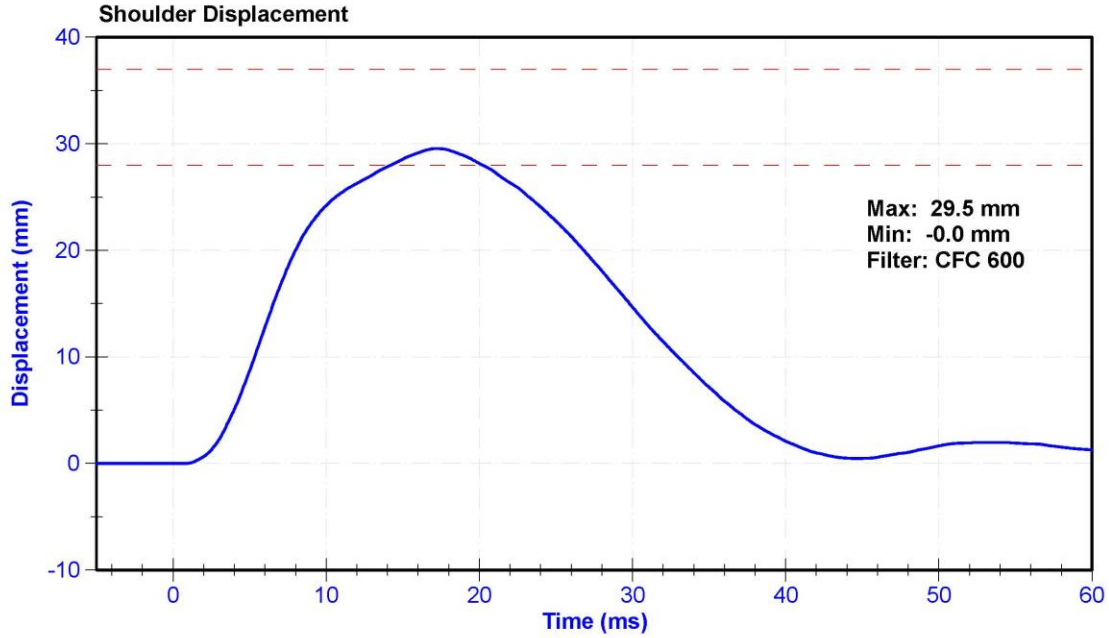
Results

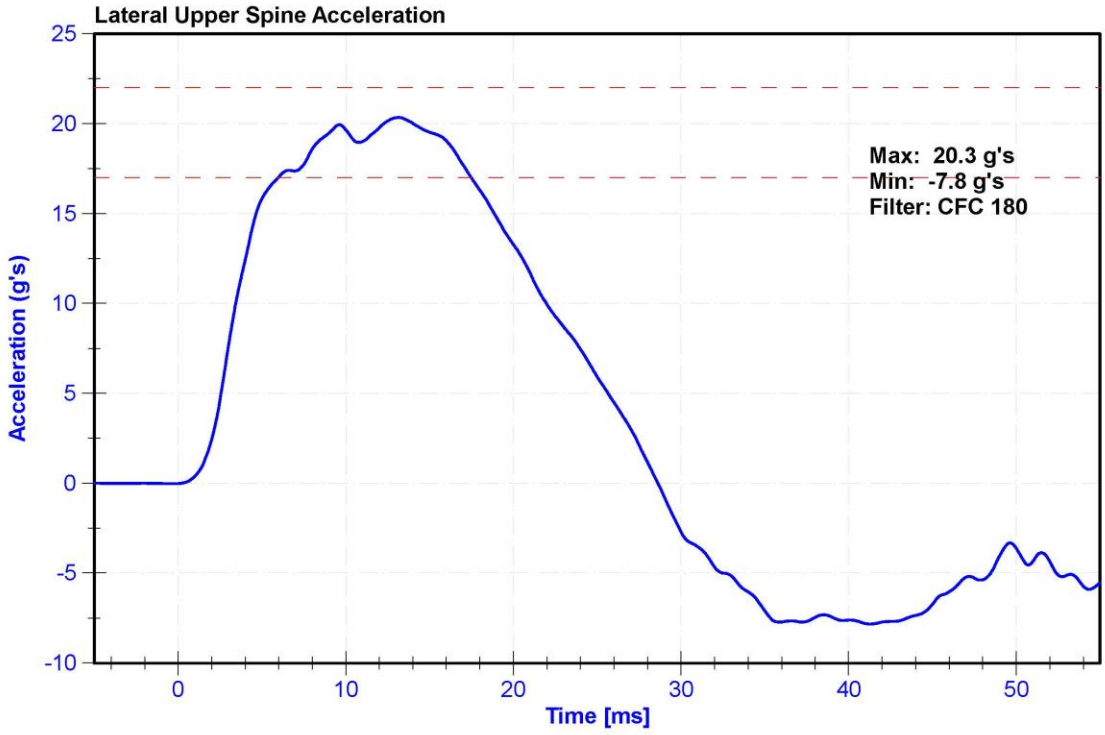
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	13	18	g's	14.6	Pass
Shoulder Deflection	28	37	mm	29.5	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Shoulder Potentiometer	Servo 08CT1-3725	DS-053 GFE	11/10/2020	5/11/2021
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P71281	11/9/2020	5/10/2021




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 29.5 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 20.3 g's
Min: -7.8 g's
Filter: CFC 180

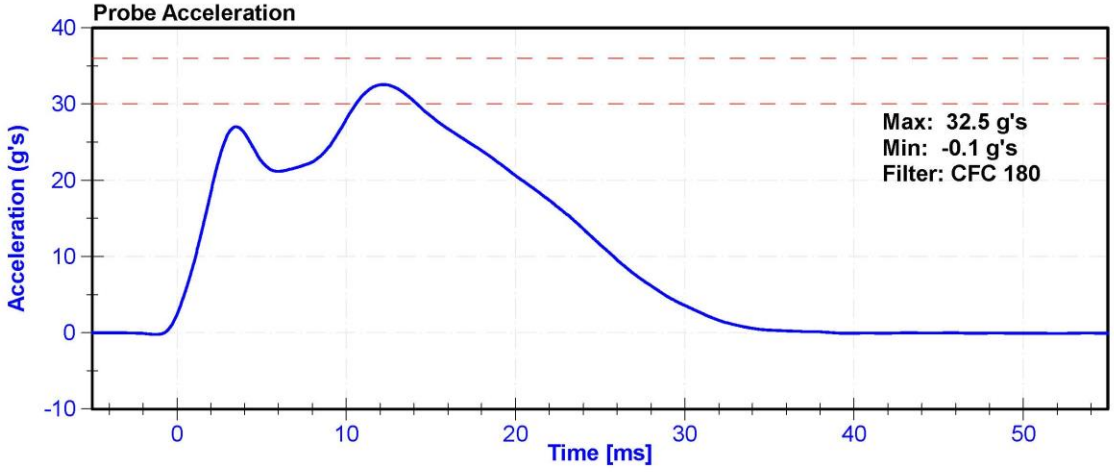
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

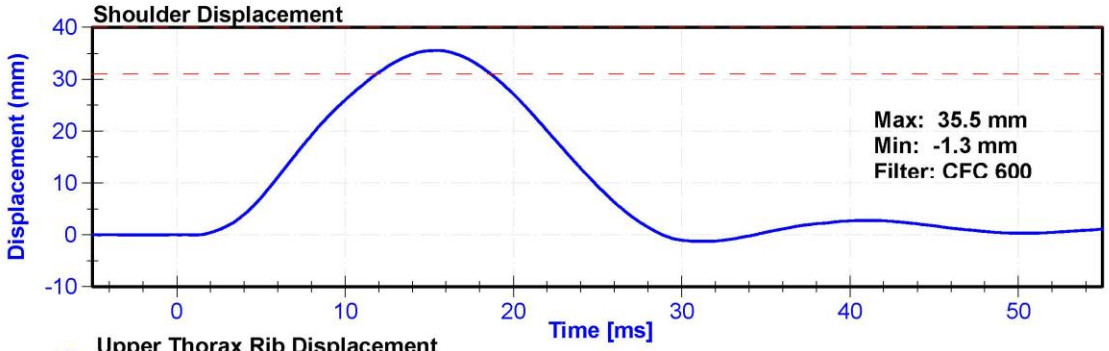
Results

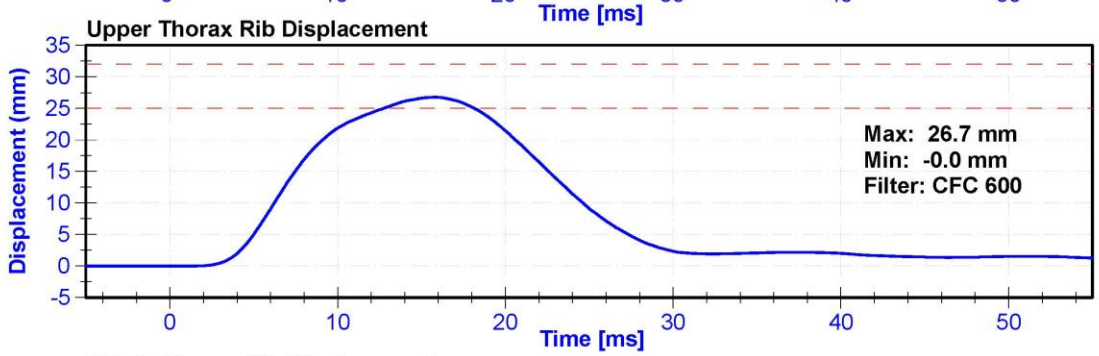
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	6.6	6.8	m/s	6.74	Pass
Probe Acceleration after 5 ms	30	36	g's	32.5	Pass
Lateral Upper Spine Acceleration	34	43	g's	40.3	Pass
Lateral Lower Spine Acceleration	29	37	g's	32.8	Pass
Shoulder Deflection	31	40	mm	35.5	Pass
Upper Thorax Rib Deflection	25	32	mm	26.7	Pass
Mid Thorax Rib Deflection	30	36	mm	31.3	Pass
Lower Thorax Rib Deflection	32	38	mm	32.4	Pass

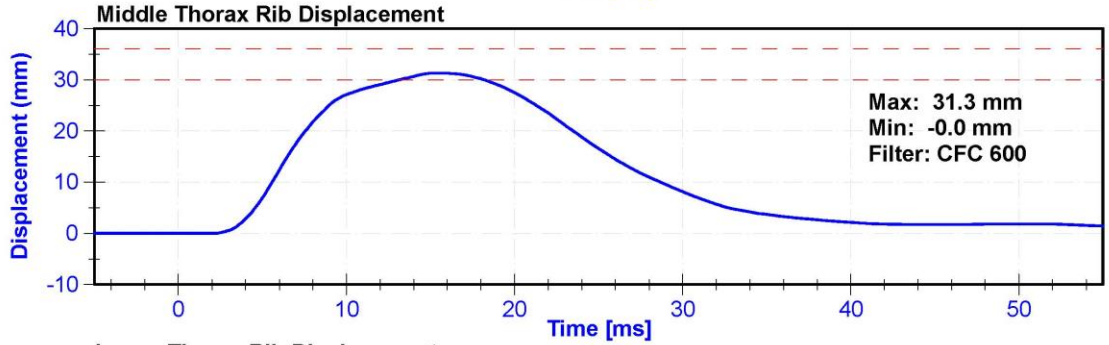
Transducer Calibrations

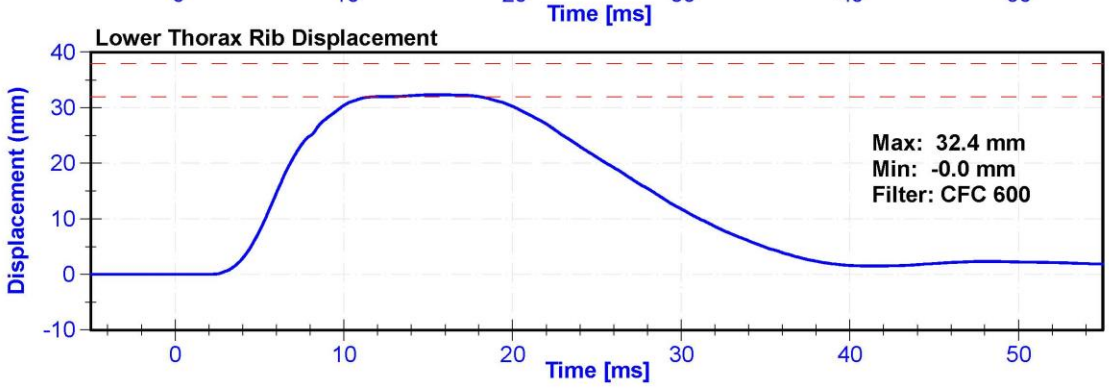
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P71281	11/9/2020	5/10/2021
Upper Spine T12 Y Accelerometer	ENDEVCO 7264	AC-P64147	11/9/2020	5/10/2021
Shoulder Potentiometer	Servo 08CT1-3725	DS-053 GFE	11/10/2020	5/11/2021
Upper Thorax Rib Potentiometer	Servo 08CT1-3725	DS-451GFE	11/10/2020	5/11/2021
Middle Thorax Rib Potentiometer	Servo 08TC1-3745	DS-040GFE	11/10/2020	5/11/2021
Lower Thorax Rib Potentiometer	Servo 08TC1-3725	DS-1156GFE	11/9/2020	5/10/2021

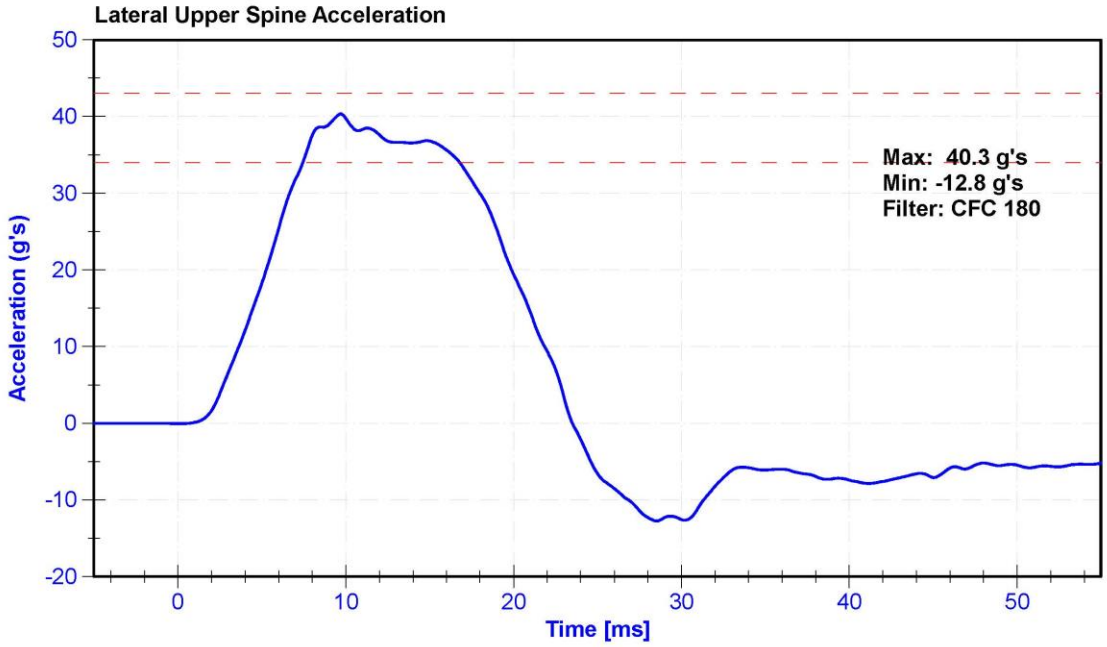


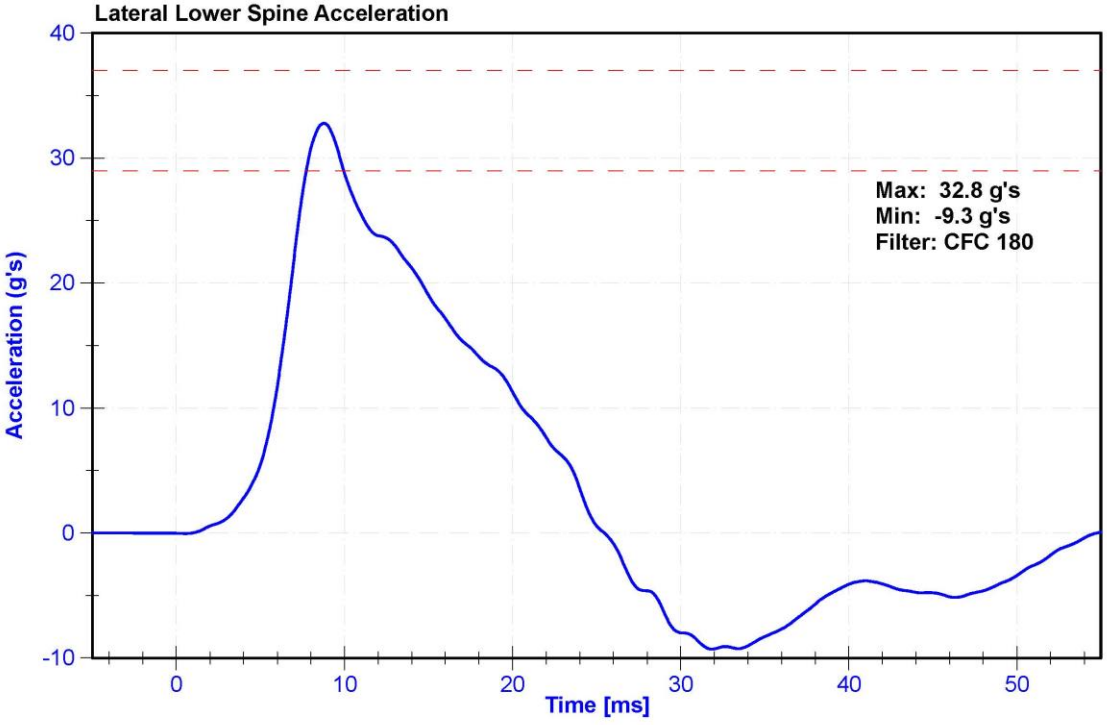

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 35.5 mm
Min: -1.3 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 26.7 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 31.3 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.4 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 40.3 g's
Min: -12.8 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]


Lateral Lower Spine Acceleration
Max: 32.8 g's
Min: -9.3 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]

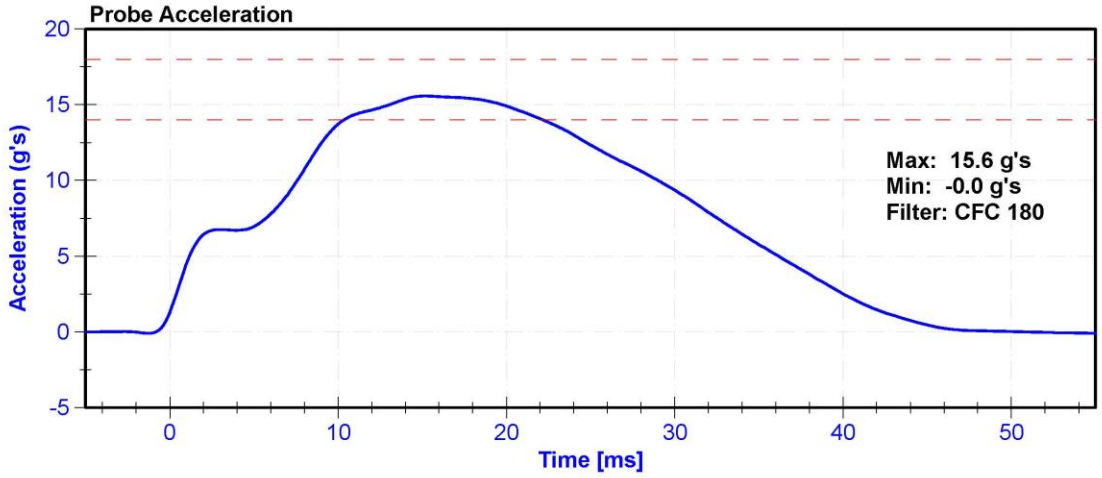
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

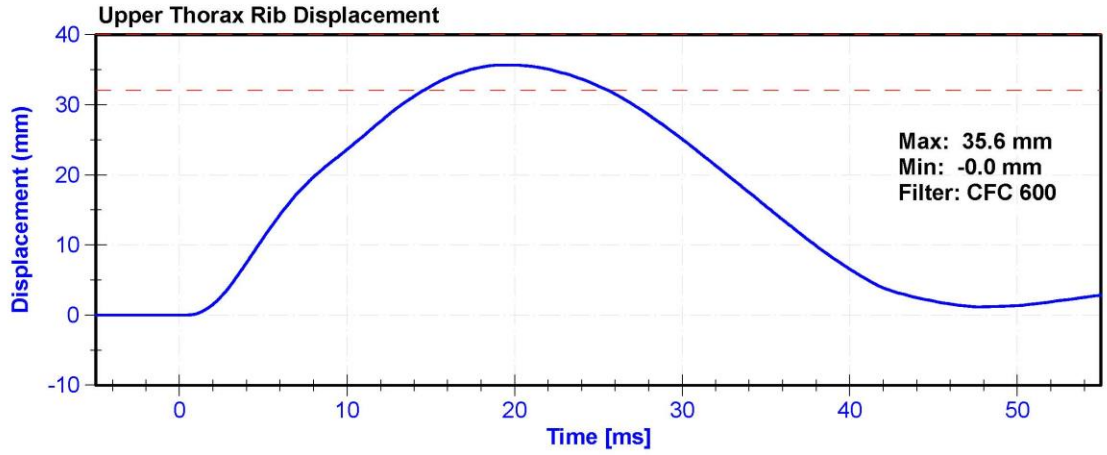
Results

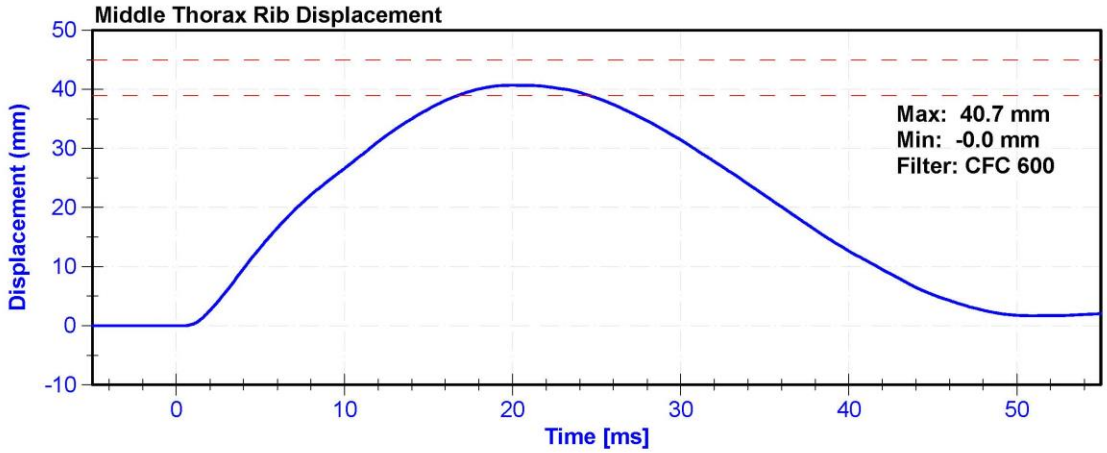
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	14	18	g's	15.6	Pass
Lateral Upper Spine Acceleration	13	17	g's	16.7	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.6	Pass
Upper Thorax Rib Deflection	32	40	mm	35.6	Pass
Middle Thorax Rib Deflection	39	45	mm	40.7	Pass
Lower Thorax Rib Deflection	35	43	mm	36.3	Pass

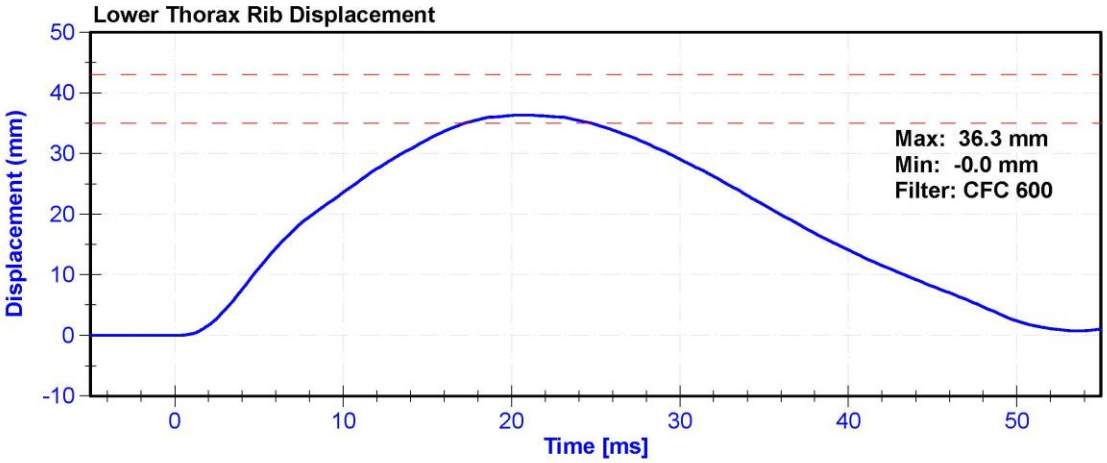
Transducer Calibrations

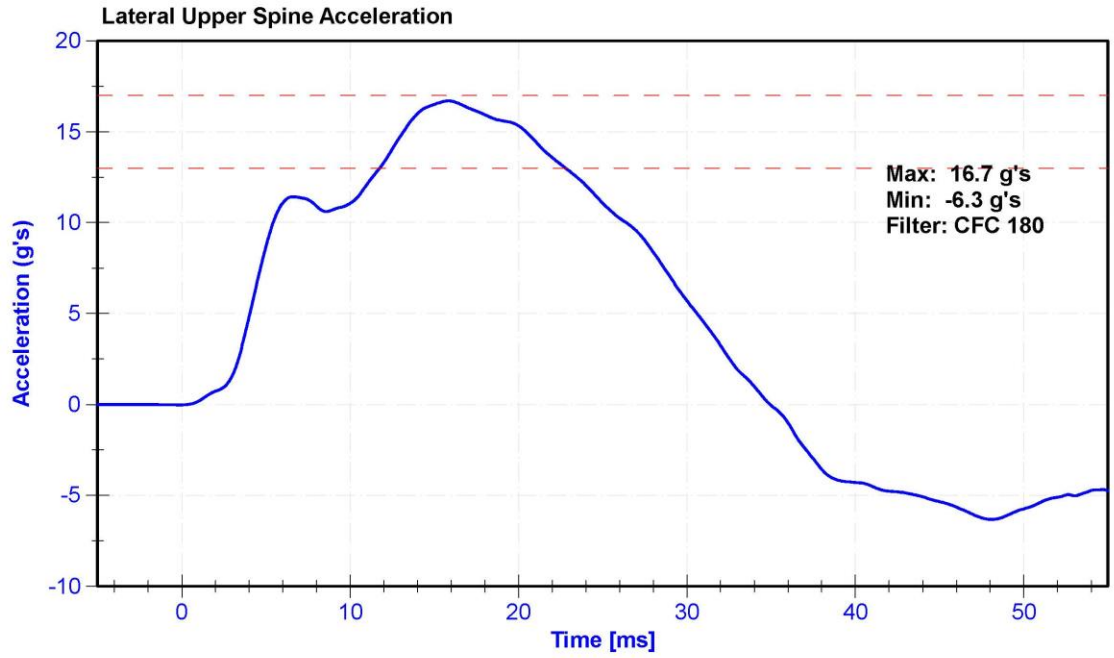
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P71281	11/9/2020	5/10/2021
Lower Spine Y Accelerometer	ENDEVCO 7264	AC-P64147	11/9/2020	5/10/2021
Upper Thorax Rib Potentiometer	Servo 08CT1-3725	DS-451GFE	11/10/2020	5/11/2021
Middle Thorax Rib Potentiometer	Servo 08TC1-3745	DS-040GFE	11/10/2020	5/11/2021
Lower Thorax Rib Potentiometer	Servo 08TC1-3725	DS-1156GFE	11/9/2020	5/10/2021

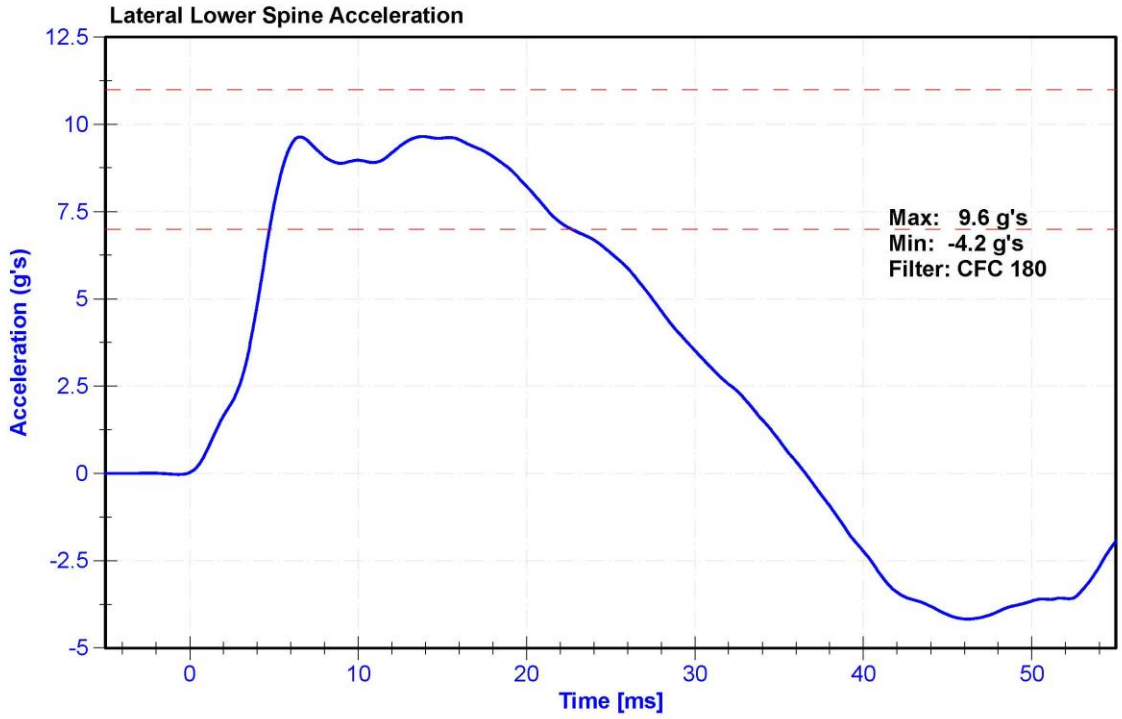



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 35.6 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.7 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 36.3 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 16.7 g's
Min: -6.3 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
20
15
10
5
0
-5
-10
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 9.6 g's
Min: -4.2 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50

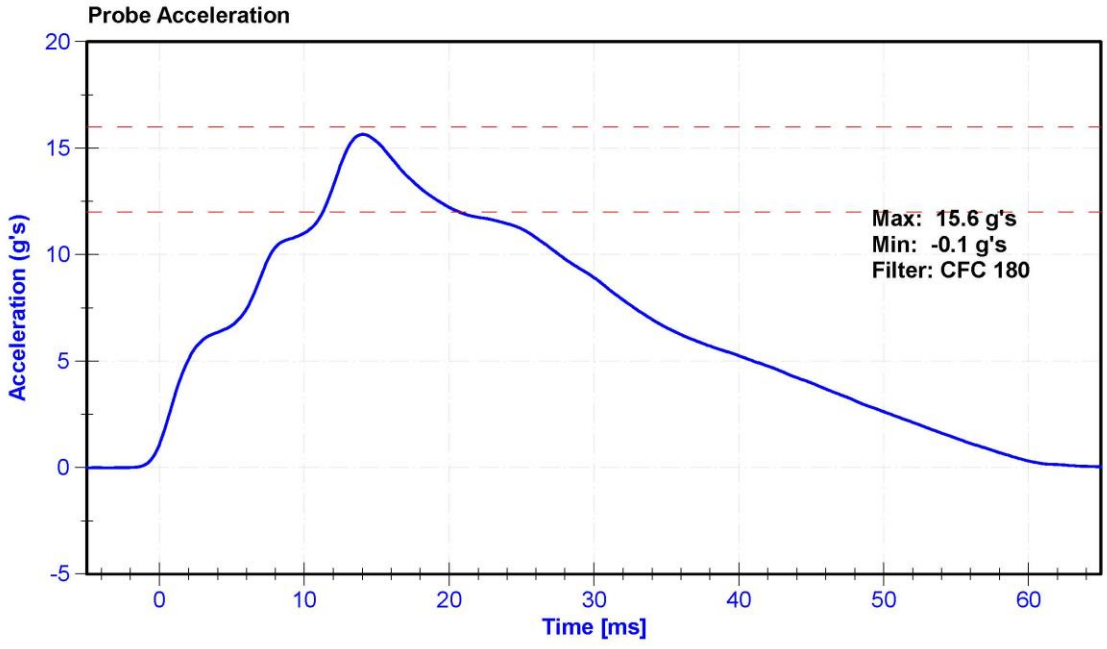
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

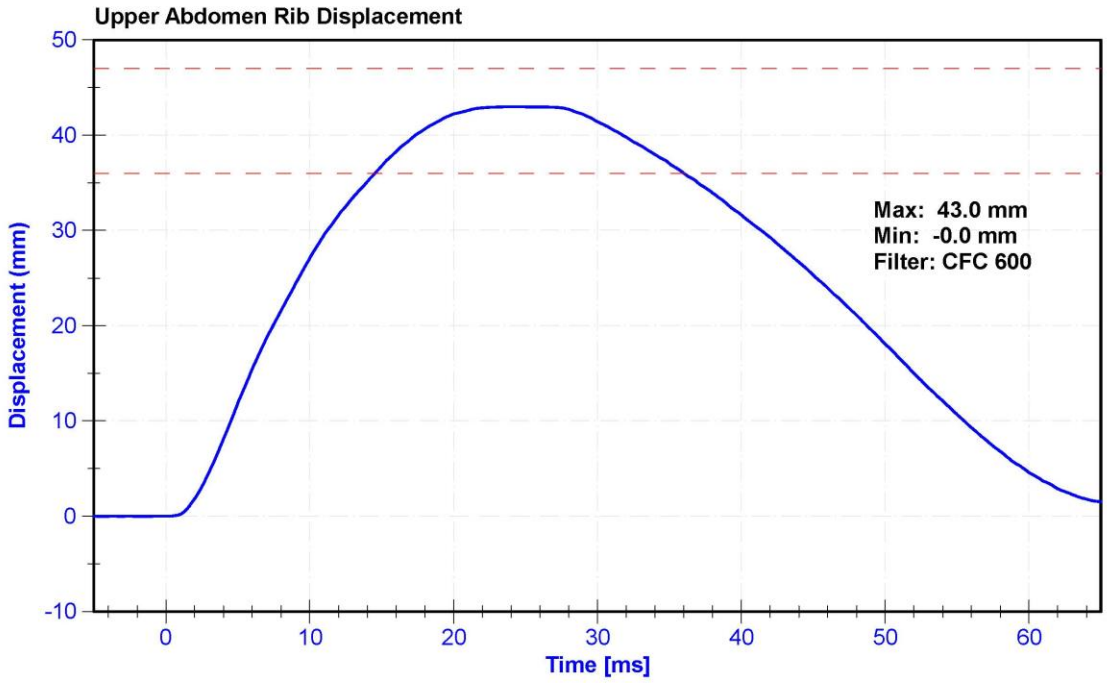
Results

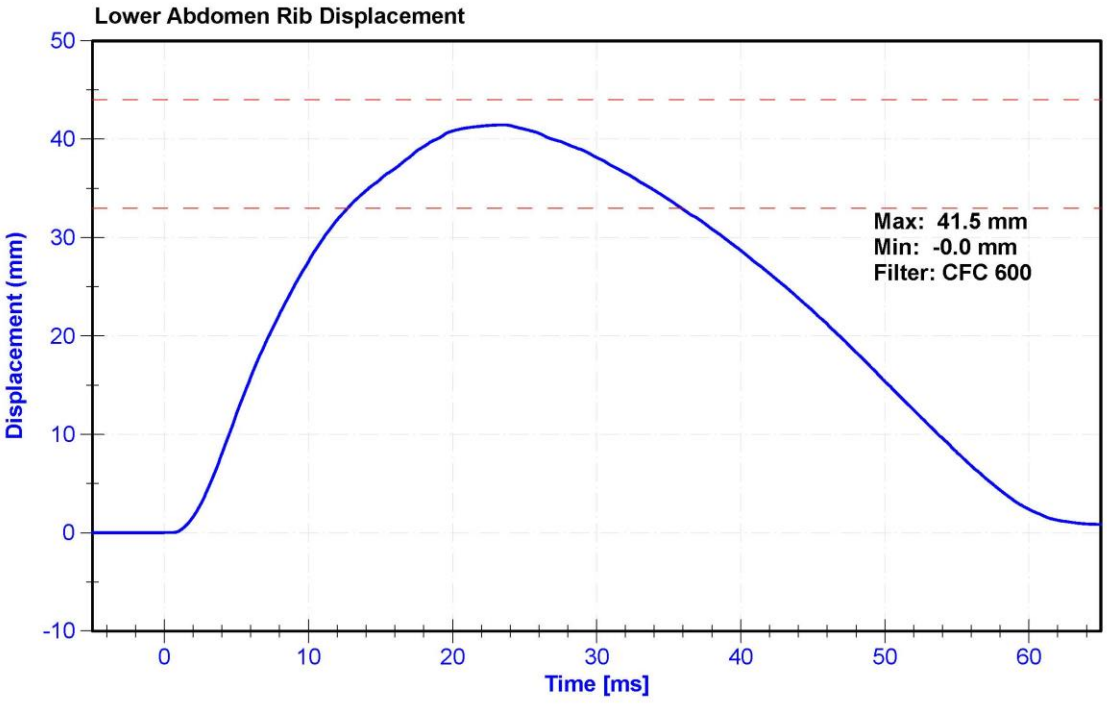
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	12	16	g's	15.6	Pass
Lateral Lower Spine Acceleration	9	14	g's	11.5	Pass
Upper Abdomen Rib Deflection	36	47	mm	43.0	Pass
Lower Abdomen Rib Deflection	33	44	mm	41.5	Pass

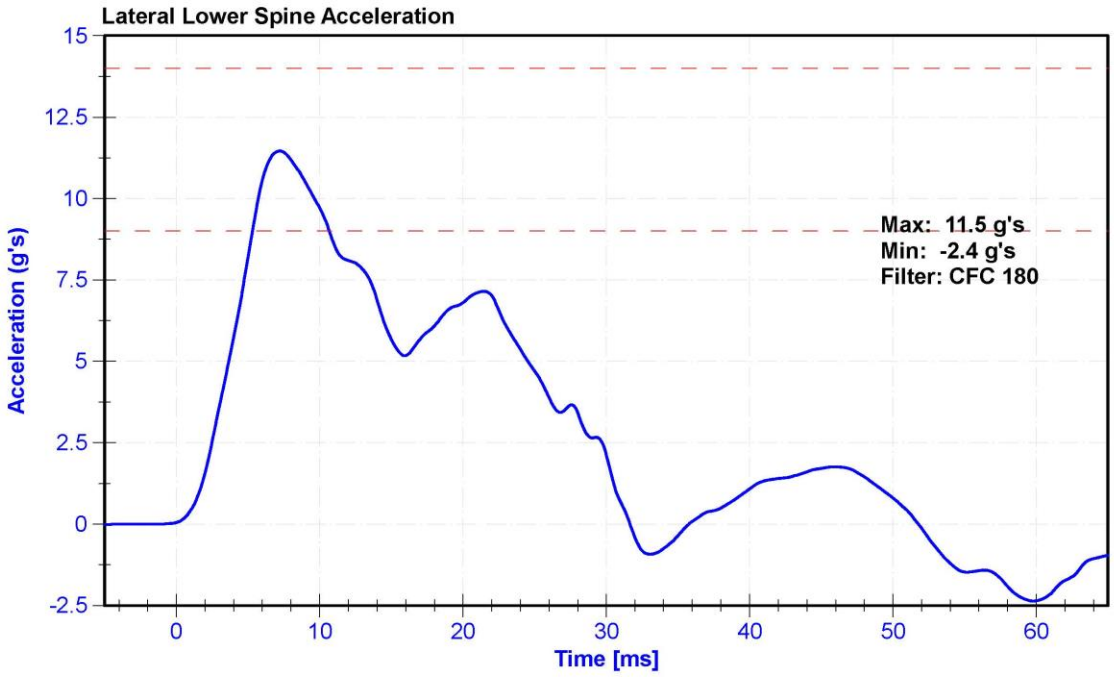
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Lower Spine Y Accelerometer	ENDEVCO 7264	AC-P64147	11/9/2020	5/10/2021
Upper Abdomen Rib Potentiometer	Servo 08CT1-3725	DS-308GFE	11/10/2020	5/11/2021
Lower Abdomen Rib Potentiometer	Servo 08CT1-3725	DS-307GFE	11/10/2020	5/11/2021




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 43.0 mm
Min: -0.0 mm
Filter: CFC 600


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


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
0
10
20
30
40
50
60
Time [ms]
Max: 11.5 g's
Min: -2.4 g's
Filter: CFC 180

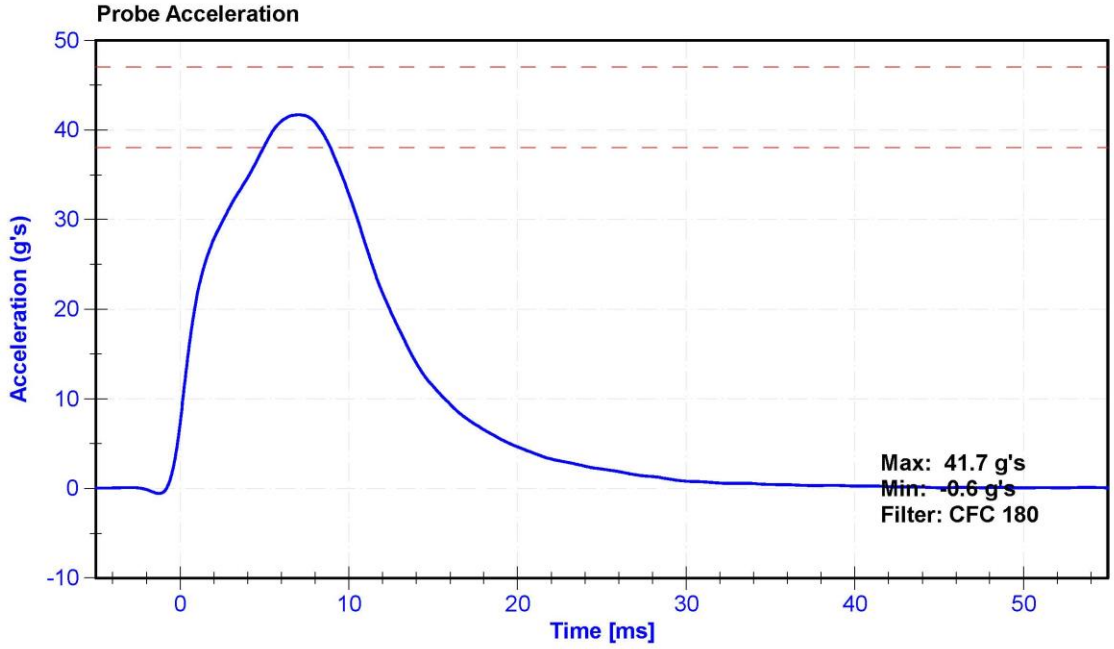
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

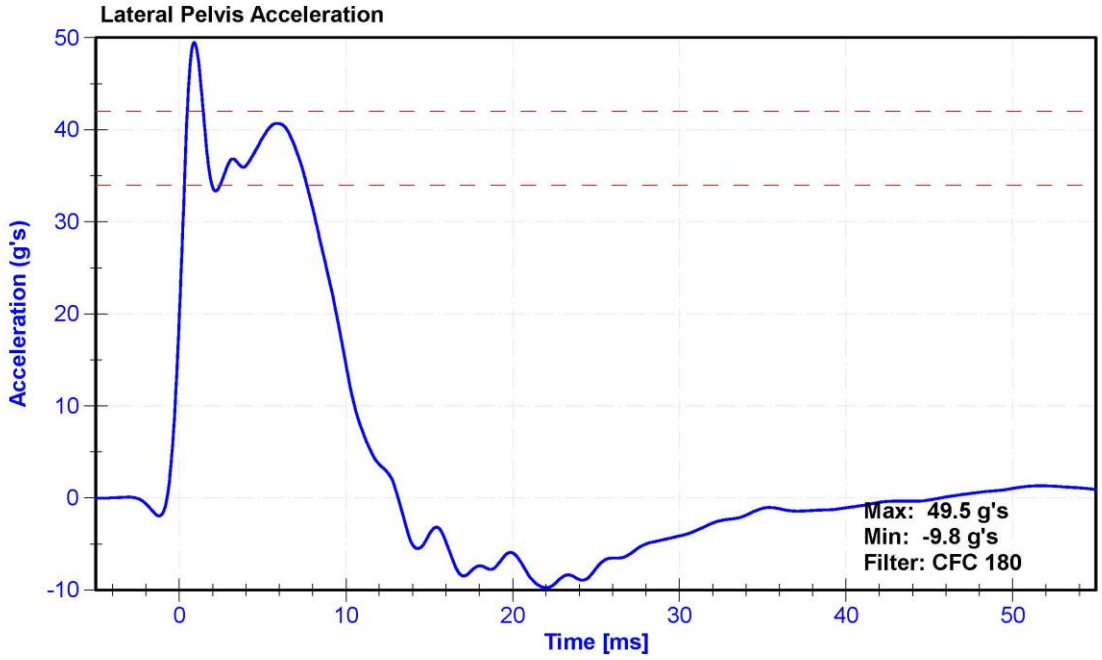
Results

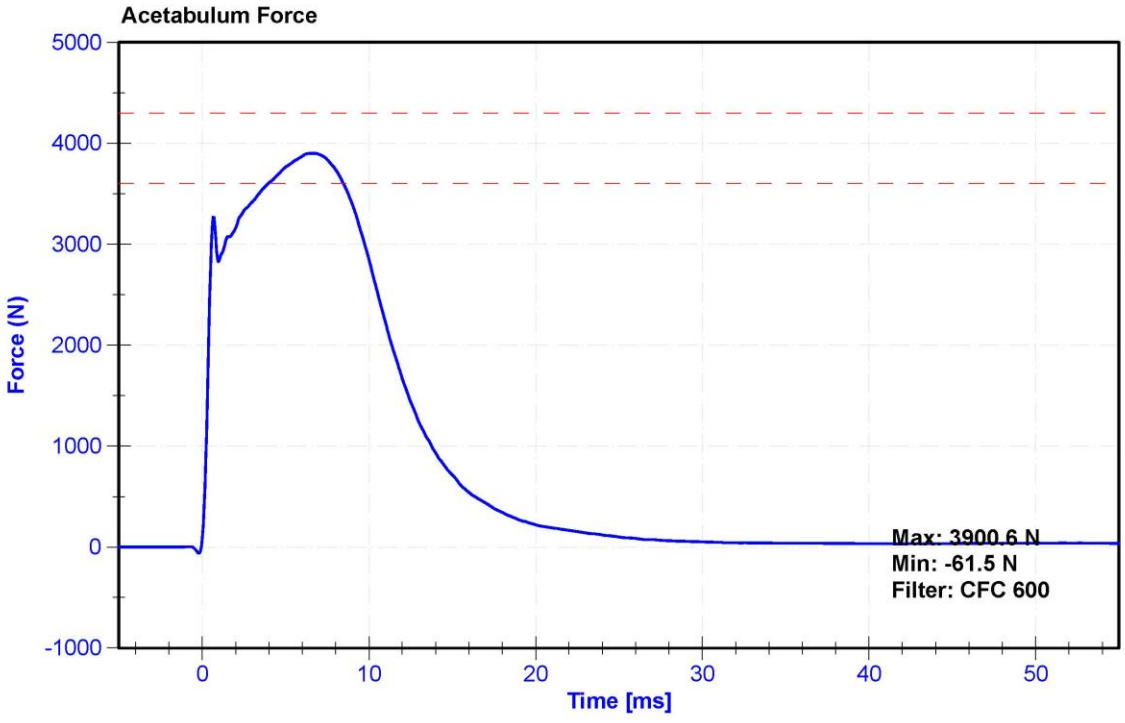
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	6.6	6.8	m/s	6.68	Pass
Probe Acceleration	38	47	g's	41.7	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	40.7	Pass
Acetabulum Force	3600	4300	N	3900.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Pelvis Y Accelerometer	ENDEVCO 7264C	AC-P51731	11/9/2020	5/10/2021
Acetabulum Load Cell	Denton IF-520	LC-236Fy	3/18/2020	3/18/2021
Certification Plug	SACO	13858	5/20/2020	N/A
Crash Test Plug	SACO	13701	9/26/2020	N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 49.5 g's
Min: -9.8 g's
Filter: CFC 180


Acetabulum Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 3900.6 N
Min: -61.5 N
Filter: CFC 600

SACO RESEARCH

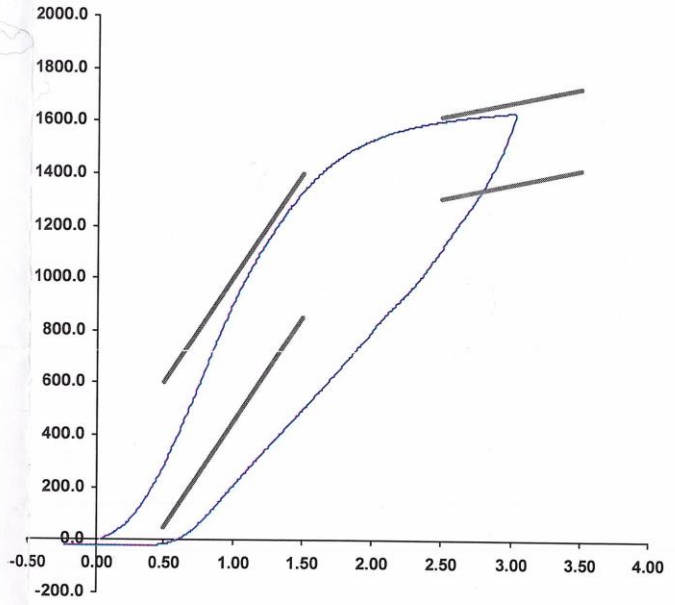
300 Crash 2/11/21 SV

SID-IIs Pelvis Plug Certification Test

Plug S/N 13701
Test Number 11349
Report Number 11387
Test Date 9/26/2019 1:59:45 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	304.95	50.00	600.00
Force @ 1.5 mm (N)	1,336.80	850.00	1,400.00
Force @ 2.5 mm (N)	1,603.42	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,635.05	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 26-Sep-19
SACO Research

By : DC Date : 9/26/2019

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

300
Non-Impact
2/11/21
SV

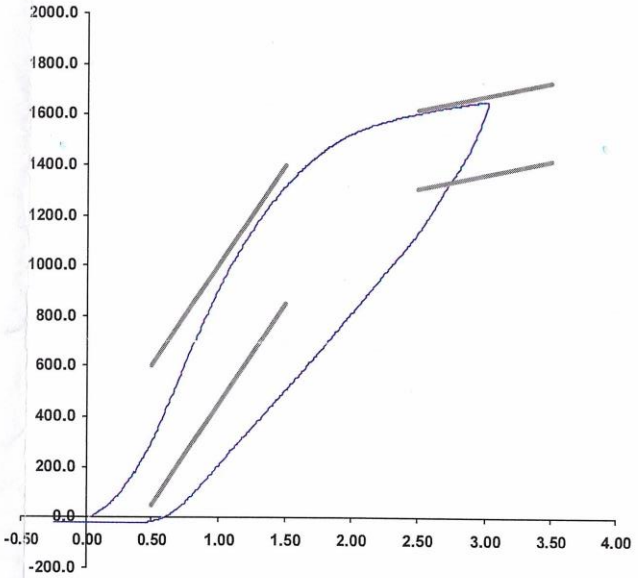
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 13042
Test Number 10362
Report Number 10397
Test Date 7/30/2019 1:17:25 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	314.46	50.00	600.00
Force @ 1.5 mm (N)	1,322.57	850.00	1,400.00
Force @ 2.5 mm (N)	1,607.66	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,654.24	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 **30-Jul-19**
SACO Research

By : DC Date : 7/30/2019

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

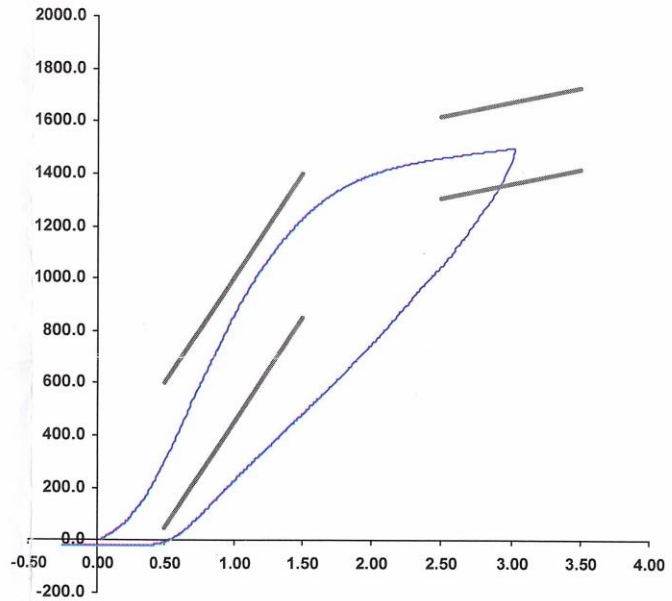
300
CoA 1
2/11/21
SV

SID-IIs Pelvis Plug Certification Test

Plug S/N 13858
Test Number 13332
Report Number 13377
Test Date 5/20/2020 6:34:22 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	311.53	50.00	600.00
Force @ 1.5 mm (N)	1,229.85	850.00	1,400.00
Force @ 2.5 mm (N)	1,460.40	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,496.59	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS) 1000
Preload Value (-N) 22.24
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 20-May-20
SACO Research

By : DC Date : 5/20/2020

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

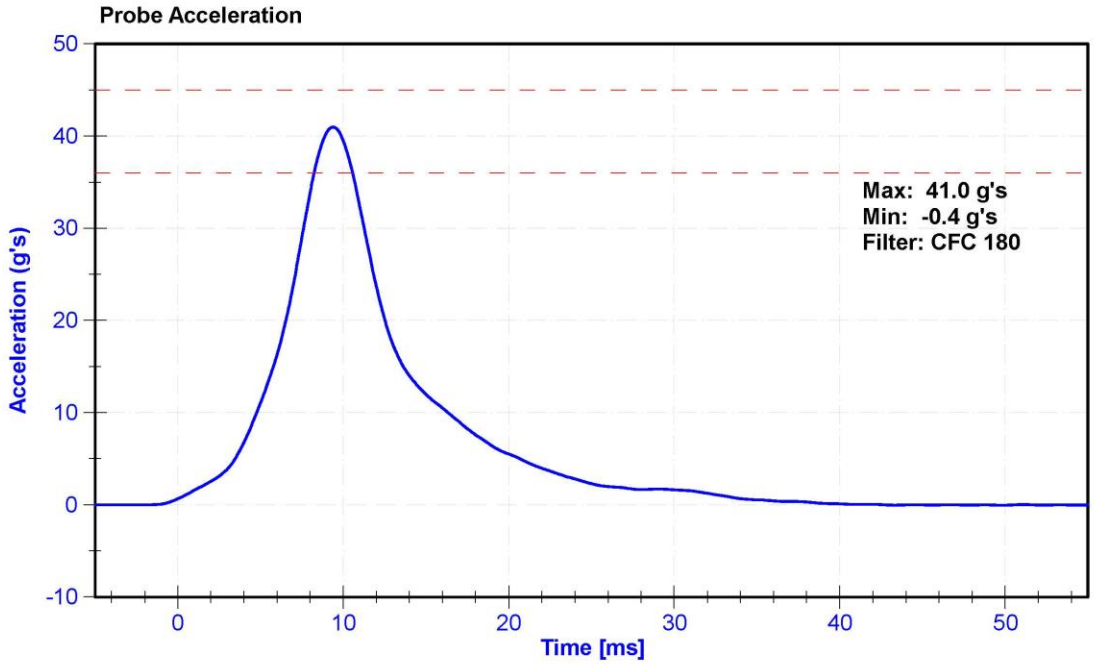
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	300	Laboratory Supervisor	S. Vacanti

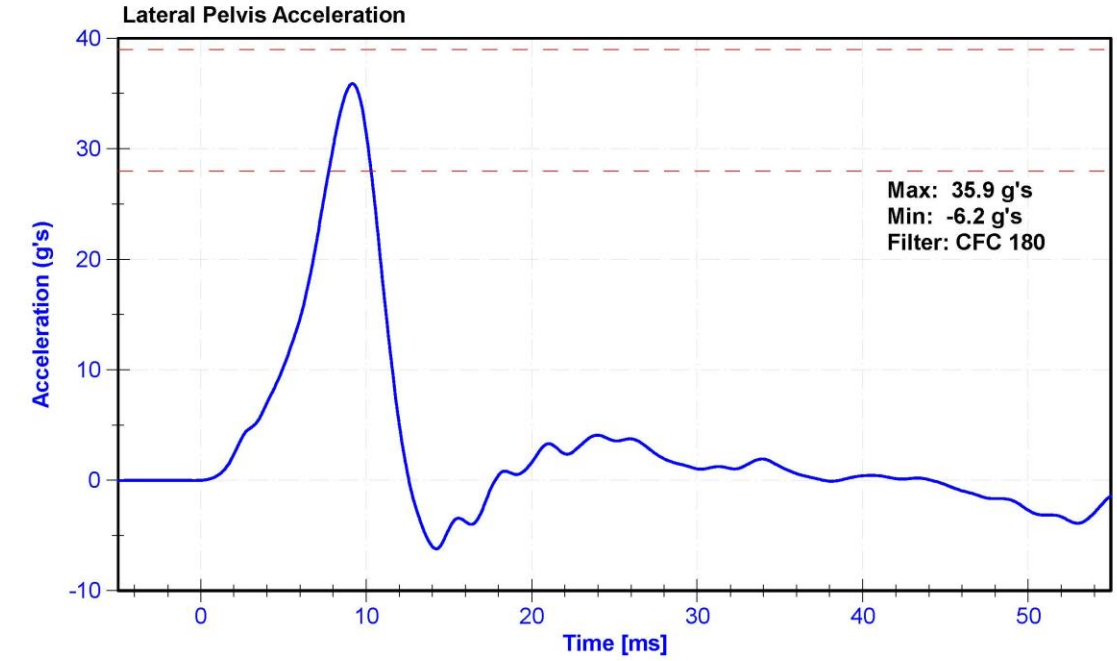
Results

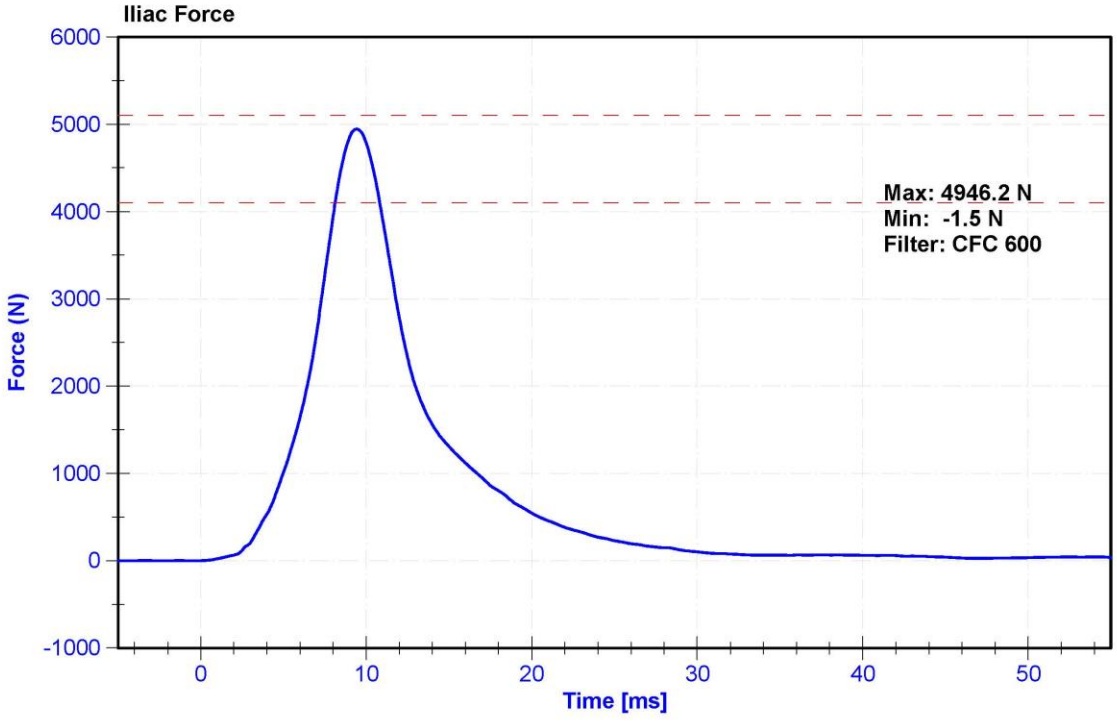
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	36	45	g's	41.0	Pass
Lateral Pelvis Acceleration	28	39	g's	35.9	Pass
Iliac Force	4100	5100	N	4946.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Pelvis Y Accelerometer	ENDEVCO 7264C	AC-P51731	11/9/2020	5/10/2021
Iliac Load Cell	DENTON 3228J	LC-279Fy	11/23/2020	11/23/2021




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 35.9 g's
Min: -6.2 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 4946.2 N
Min: -1.5 N
Filter: CFC 600

APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N: F034		
			Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers	Primary	X	P51884	Endevco	9/22/2020
		Y	P73161	Endevco	9/22/2020
		Z	P79588	Endevco	9/22/2020
	Redundant	X	P74963	Endevco	9/22/2020
		Y	P58864	Endevco	9/22/2020
		Z	AC-P52030	Endevco	11/13/2020
Thorax Rib Displacement Potentiometers	Upper	Y	DS-183GFE	Honeywell	10/8/2020
	Middle	Y	DS-184GFE	Honeywell	10/8/2020
	Lower	Y	DS-182GFE	Honeywell	10/8/2020
Abdomen Load Cells	Forward	Y	LC-1524	Denton	3/19/2020
	Middle	Y	LC-1523	Denton	3/19/2020
	Rear	Y	LC-1530	Denton	3/19/2020
Lower Spine Accelerometers (T12)		X	P52981	Endevco	9/22/2020
		Y	P82183	Endevco	9/18/2020
		Z	P51986	Endevco	9/22/2020
Pubic Symphysis Load Cell		Y	30960459GFE	Denton	3/19/2020

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N: 300		
				Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers		Primary	X	AC-P59018	Endevco	11/10/2020
			Y	AC-P79189	Endevco	11/10/2020
			Z	AC-P58777	Endevco	11/10/2020
		Redundant	X	AC-P68057	Endevco	11/10/2020
			Y	AC-P58986	Endevco	11/10/2020
			Z	AC-P52025	Endevco	11/10/2020
Displacement Potentiometers	Thoracic Rib	Upper	Y	DS-451GFE	Servo	11/10/2020
		Middle	Y	DS-040GFE	Servo	11/10/2020
		Lower	Y	DS-1156GFE	Servo	11/9/2020
	Abdominal Rib	Upper	Y	DS-308GFE	Servo	11/10/2020
		Lower	Y	DS-307GFE	Servo	11/10/2020
Lower Spine Accelerometers (T12)			X	AC-P64003	Endevco	11/9/2020
			Y	AC-P64147	Endevco	11/9/2020
			Z	AC-P58786	Endevco	11/9/2020
Acetabulum Load Cell			Y	LC-236Fy	DENTON	3/18/2020
Iliac Wing Load Cell			Y	LC-279Fy	DENTON	11/23/2020
Pelvis Plug (struck side)				13699	SACO	9/26/2019
Pelvis Plug (non-struck side)				13696	SACO	9/26/2019

Table 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	1201-1000_A315198	Measurement Specialties	10/19/2020
	Vehicle Center of Gravity	Y	1201-1000_A315855	Measurement Specialties	12/3/2020
	Vehicle Center of Gravity	Z	1201-1000_A352354	Measurement Specialties	9/28/2020
2	Right Sill at Front Seat	X	1201-1000_A197009	Measurement Specialties	10/27/2020
	Right Sill at Front Seat	Y	1201-1000_A217566	Measurement Specialties	10/27/2020
	Right Sill at Front Seat	Z	1201-1000_A284985	Measurement Specialties	10/27/2020
3	Right Sill at Rear Seat	X	1201-1000_A250353	Measurement Specialties	12/3/2020
	Right Sill at Rear Seat	Y	1201-1000_A250359	Measurement Specialties	12/3/2020
	Right Sill at Rear Seat	Z	1201-1000_A279970	Measurement Specialties	12/3/2020
4	Left Sill at Front Door	Y	1201-1000_A282636	Measurement Specialties	10/10/2020
5	Left Sill at Rear Door	Y	1201-1000_A280940	Measurement Specialties	10/10/2020
6	Left A-Post Lower	Y	1201-1000_A284346	Measurement Specialties	9/1/2020
7	Left A-Post Middle	Y	1201-1000_A372849	Measurement Specialties	11/20/2020
8	Left B-Post Lower	Y	1201-1000_A374349	Measurement Specialties	11/28/2020
9	Left B-Post Middle	Y	1201-1000_A372840	Measurement Specialties	11/20/2020
10	Front Seat Track	Y	1201-1000_A372841	Measurement Specialties	11/20/2020
11	Rear Seat Track or Structure	Y	1201-1000_A374318	Measurement Specialties	11/30/2020
12	Right Rear Occ. Compartment	Y	1201-1000_A300218	Measurement Specialties	11/13/2020
13	Engine Block	X	1201-1000_A374273	Measurement Specialties	12/1/2020
	Engine Block	Y	1201-1000_A374279	Measurement Specialties	12/1/2020
14	Rear Floorpan Above Axle	X	1201-1000_A262052	Measurement Specialties	12/3/2020
	Rear Floorpan Above Axle	Y	1201-1000_A280825	Measurement Specialties	9/1/2020
	Rear Floorpan Above Axle	Z	1201-1000_A350970	Measurement Specialties	9/28/2020

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	1201-1000_A315181	Measurement Specialties	10/6/2020
MDB Center of Gravity	Y	1201-1000_A315931	Measurement Specialties	10/7/2020
MDB Center of Gravity	Z	1201-1000_A315085	Measurement Specialties	10/6/2020
Left Frame at Rear Axle Centerline	X	1201-1000_A315983	Measurement Specialties	10/5/2020
Left Frame at Rear Axle Centerline	Y	1201-1000_A290947	Measurement Specialties	10/5/2020