REPORT NUMBER: SINCAP-CAL-22-001

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

KIA Corporation
2022 KIA Niro EV EX
SUV

NHTSA No: M20224211

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

May 12, 2022

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NRM-110
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Prepared by: Matthew Pronko Date: May 12, 2022
Matthew Pronko, Test Engineer

Approved by: Vanessa Hansen Date: May 12, 2022
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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SINCAP-CAL-22-001		

4. Title and Subtitle	5. Report Date
Final Report of New Car Assessment Program Side Impact MDB Testing and FMVSS No. 305 indicant testing of a 2022 KIA Niro EV EX SUV NHTSA No.: M20224211	May 12, 2022
	6. Performing Organization Code CAL
7. Author(s) Matthew Pronko, Test Engineer Vanessa Hansen, Operations Program Manager	**8. Performing Organization Report No.** CAL-DOT-2022-001
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225	**10. Work Unit No.**
	11. Contract or Grant No. 693JJ920D000016
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave., SE, Room W43-410 Washington, D.C. 20590	**13. Type of Report and Period Covered:** Final Test Report February 7, 2022 - May 12, 2022
	14. Sponsoring Agency Code NRM-110

15. *Supplementary Notes*
None

16. Abstract

A 55/28, (61.90kph / 38.5 mph), 90^0 Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2022 KIA Niro EV EX 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 7, 2022.

The impact velocity of the Moving Deformable Barrier (MDB) was 61.52 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 204 mm located at level 3. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	N/A	1000	131.911
Maximum Thoracic Rib Deflection	mm	44	19.673
Total Abdominal Force	N	2500	724.627
Pubic Symphysis Force	N	6000	1263.496

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	N/A	1000	84.546
Lower Spine Resultant Acceleration	G	82	57.101
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2713.385
Maximum Thoracic Rib Deflection	mm	38*	19.509
Maximum Abdominal Rib Deflection	mm	45*	22.575

* *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	18. Distribution Statement
New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs	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	220	

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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2022 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number 693JJ920D000016. The purpose of this test is to generate comparative side impact performance in a 2022 KIA Niro EV EX 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 2022 KIA Niro EC EX 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 61.52 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 7, 2022. Pre-test and post-test photographs of the test vehicle, the MDB and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated March 2020. The side impact event was documented by 9 high-speed and 2 real-time cameras. Camera locations are included in this report.

The Dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen forward, middle, and rear y-axis load cells
Lower spine (T12) tri-axial accelerometers
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	131.911
Maximum Thorax Rib Deflection	mm	44	19.673
Combined Abdominal Force	N	2500	724.627
Pubic Symphysis Force	N	6000	1263.496

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC36)		1000	84.546
Lower Spine (T12) Resultant Acceleration	G	82	57.101
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2713.385
Maximum Thoracic Rib Deflection	mm	38*	19.509
Maximum Abdominal Rib Deflection	mm	45*	22.575

*Proposed IARV

SUPPLEMENTAL RESTRAINT INFORMATION

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

GENERAL COMMENTS:

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

Data Anomalies:

The following channel was questionable for:

- Left Front Sill Y Acceleration, Exceeded calibration range at 8.6 ms
- Left B-Pillar Lower Y Acceleration, Exceeded calibration range at 9.7 ms 19 ms 35.5 ms
- Left B-Pillar Middle Y Acceleration, Exceeded calibration range at 13.7 ms
- Left Rear Sill Y Acceleration, Exceeded calibration range at 7.6 ms

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

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

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

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

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Data Sheet No. 7 – MDB Accelerometer Locations

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Data Sheet No. 10 – Test Vehicle Profile Measurements

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

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

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

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

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2022 KIA Niro EV EX SUV NHTSA No.: M20224211
Test Program: NCAP Side MDB Impact Test Test Date: 02/07/2022

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20224211
Model Year	2022
Make	KIA
Model	Niro EV EX
Body Style	SUV
VIN	KNDCC3LG1N5138574
Body Color	Blue
Odometer Reading (km/mi)	11
Engine Displacement (L)	-
Type/No. Cylinders	Electric Vehicle
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	Direct Drive
Overdrive	Yes
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

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

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

DATA FROM CERTIFICATION LABEL

Manufactured By	KIA Corporation
Date of Manufacture	11/21
Vehicle Type	MPV

GVWR (kg)	2230
GAWR Front (kg)	1160
GAWR Rear (kg)	1160

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)				385	(A)
DSC X 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				44.8	(A-B)

VEHICLE SEAT TYPE

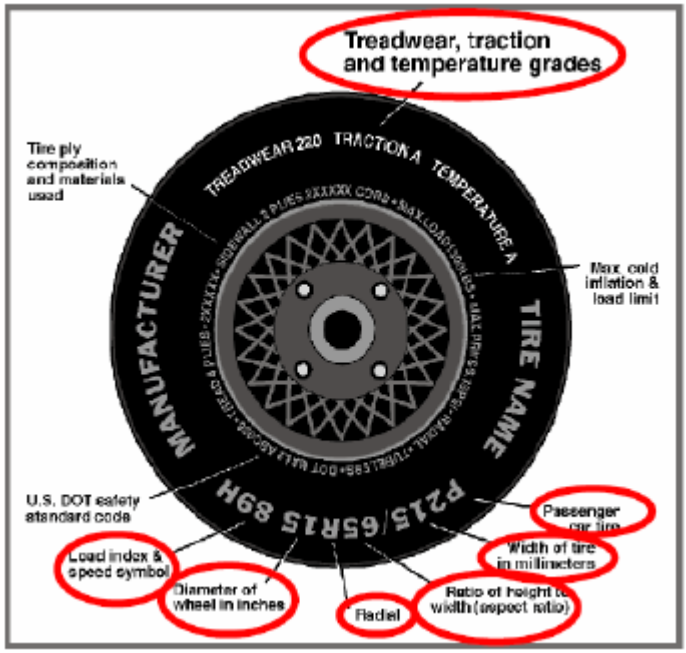
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front Seat	X						X
Rear or Second Row Seat			X		X		
Third Row seat							

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

VEHICLE TIRE INFORMATION

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



TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	250	250
Recommended Tire Size	215/55R17	215/55R17
Tire Size on Vehicle	215/55R17	215/55R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy MXV4	Primacy MXV4
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 1 Polyamide, 2 Steel	2 Polyester, 1 Polyamide, 2 Steel
Load Index/Speed Symbol	94V	94V
Tire Material	Rubber	Rubber
DOT Safety Code Left	B33F01VX2621	B33F01VX2621
DOT Safety Code Right	B33F01VX2621	B33F01VX2621

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

Test Vehicle: 2022 KIA Niro EV EX SUV NHTSA No.: M20224211
Test Program: NCAP Side MDB Impact Test Test Date: 2/7/2022

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	240	240	242	242
Tire Placard	kPa	250	250	250	250
Owner's Manual	kPa	250	250	250	250
As Tested	kPa	250	250	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	221	221	221	221

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	463	423		512	471		523	479	
Right	kg	477	380		488	437		473	440	
Ratio	%	54	46		52	48		52	48	
Totals	kg	940	803	1743	1000	908	1908	996	919	1915

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1743	(A)
Sum of Actual Weight of 1 ES2re and 1 P572 ATD (SID-IIs)	kg	127	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	44.8	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1914.8	(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	816	814	Yes
RF	mm	821	813	Yes
RR	mm	819	816	Yes
LR	mm	809	811	Yes
Vehicle CG (Aft of Front Axle)	mm	1295	1283	
Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline)	mm	36	24	

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

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

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Tail lights & Wiper motor	5
Trunk carpeting & Plastics	16
Air pump kit	3
Rear valance	4
Head rest & vibration damper	5
Passenger Window	6
Ballast / Equipment Added	0

TEST SURFACE MARKINGS

	Distance from 63° Impact Angle Line (mm)
Fore 25 mm target	896
Aft 25 mm target	897
Pre-Impact Angle Line	236

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

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

SEAT POSITIONING

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

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	19.0	12.3	15.6
Front Passenger Seat	15.0	12.1	13.5
Front Center Seat*			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat*	Fixed	Fixed	Fixed

**if applicable*

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore/Aft	Forward-Most
Driver Seat	15.6	6	Max	50	55	61
			Mid	25	31	38
			Min	0	6	10
Front Passenger Seat	13.5	20	Max	-	-	-
			Mid	15	20	25
			Min	-	-	-
Front Center Seat*			Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Non-Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Rear Center Seat*	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-

**if applicable*

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

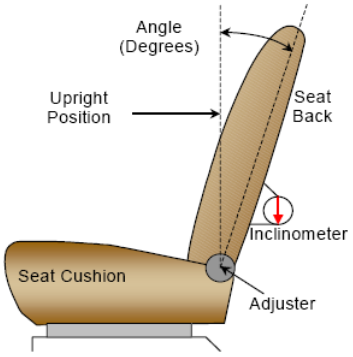
SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	252	Power	126	Power
Front Passenger Seat	252	63 (0-62)	126	31
Front Center Seat*				
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat*	Fixed	Fixed	Fixed	Fixed

**if applicable*

SEAT BACK ANGLE ADJUSTMENT

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



FRONT SEAT ASSEMBLY

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/ Seated Dummy	58	-	0.4	-
Front Passenger Seat	57.8	-	1.2	7
Front Center Seat*				
Struck Side Rear Seat w/ Seated Dummy	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat*	Fixed	Fixed	Fixed	Fixed

**if applicable*

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

SEAT BELT ANCHORAGE ADJUSTMENT

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

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

HEAD RESTRAINT ADJUSTMENT

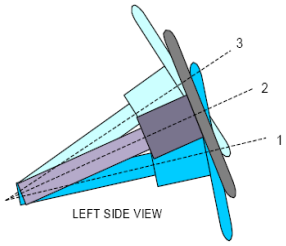
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	6	0 - Uppermost
Rear Seat	3	3 - Lowermost

STEERING COLUMN ADJUSTMENT

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

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	20.9	
Geometric Center – Position 2	23.7	
Uppermost – Position 3	26.5	
Telescoping Steering Wheel Travel		50
Test Position	23.7	25

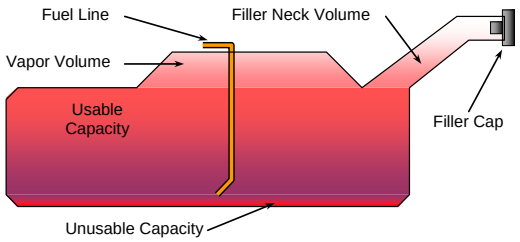


STEERING COLUMN ASSEMBLY

FUEL PUMP

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

The vehicle is an electric vehicle. The charge port is on the left front bumper of the vehicle.



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

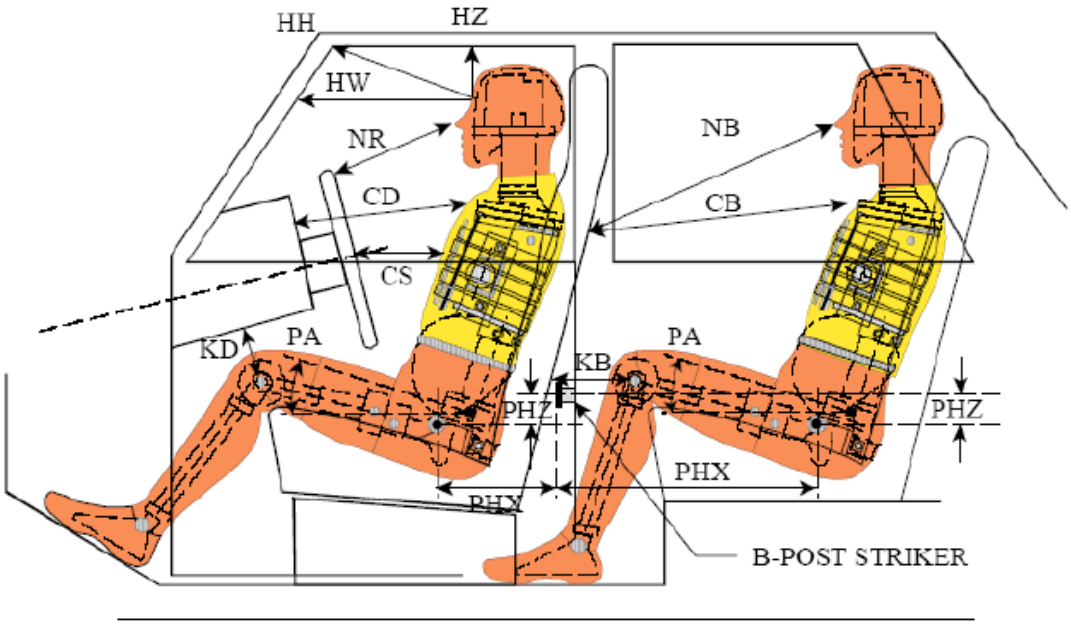
FUEL TANK CAPACITY

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

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

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022



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

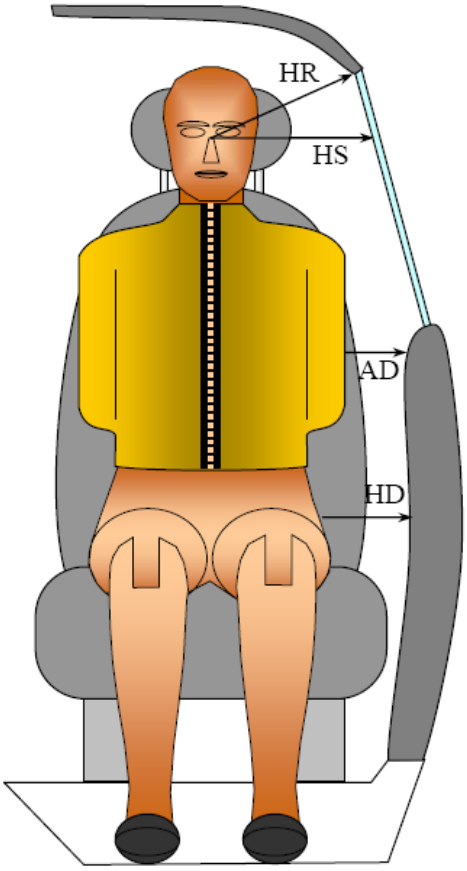
LEFT SIDE VIEW

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Description	Driver (Serial No. F033)		Left Rear Passenger (Serial No.300)	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	343			
HW		Header to Windshield	579			
HZ	HZ	Head to Roof Liner	156		282	
NR	NB	Nose to Rim/Seat Back	397		618	
CD	CB	Chest to Dash/Seat Back	530		605	
CS		Chest to Steering Wheel	322			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	194	19.8	345	4.2
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	168	22.4	340	4.5
PAX°	PAX°	Pelvic Tilt Angle X		19.5		19.8
	PAY°	Pelvic Tilt Angle Y				0.3
PHX	PHX	Hip Point to Striker (X-Axis)	208		220	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	231		219	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022



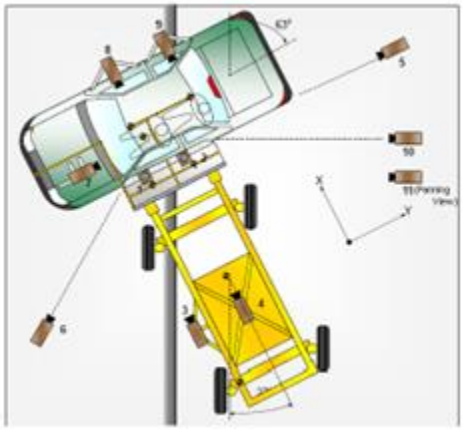
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver (Serial No. F033)	Left Rear Passenger (Serial No. 300)
HR	Head to Side Header	mm	204	254
HS	Head to Side Window	mm	319	353
AD	Arm to Door	mm	118	167
HD	Hip Point to Door	mm	158	189

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2022 KIA Niro EV EX SUV NHTSA No.: M20224211
Test Program: NCAP Side MDB Impact Test Test Date: 2/7/2022



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	0	-702	-8230	12.5	1000
2	Overhead Close-up	0	0	-8230	24	1000
3	Left Impact Point (MDB)	-1470	0	-847	25	1000
4	Side Overall (MDB)	-1140	878	-1587	8	1000
5	Rear	0	8652	-1415	28	1000
6	Left Front	-4137	-5938	-1405	24	1000
7	Driver Front (OB)				25	1000
8	Driver Side (OB)				12.5	1000
9	Passenger Side (OB)				12.5	1000
10	Real-time Left Rear				Zoom	60
11	Real-time In run				Zoom	60

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

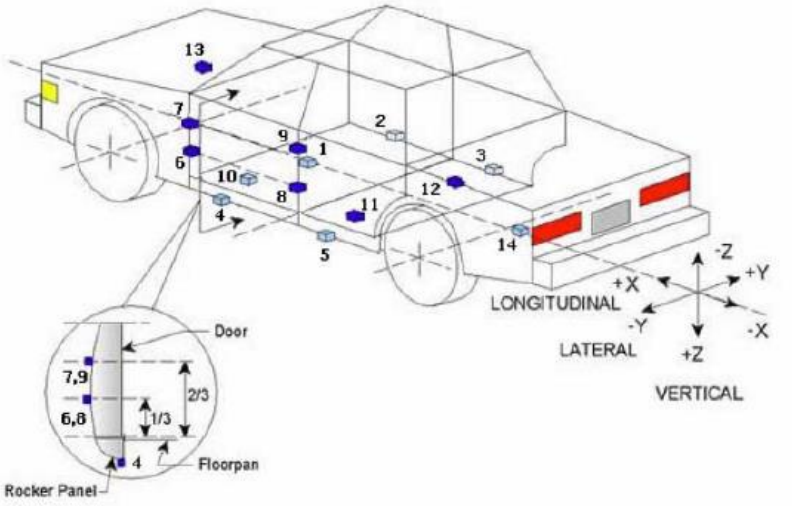
If applicable, explain why camera(s) did not operate as intended: All cameras operated normally.

INSTRUMENTATION

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

DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022



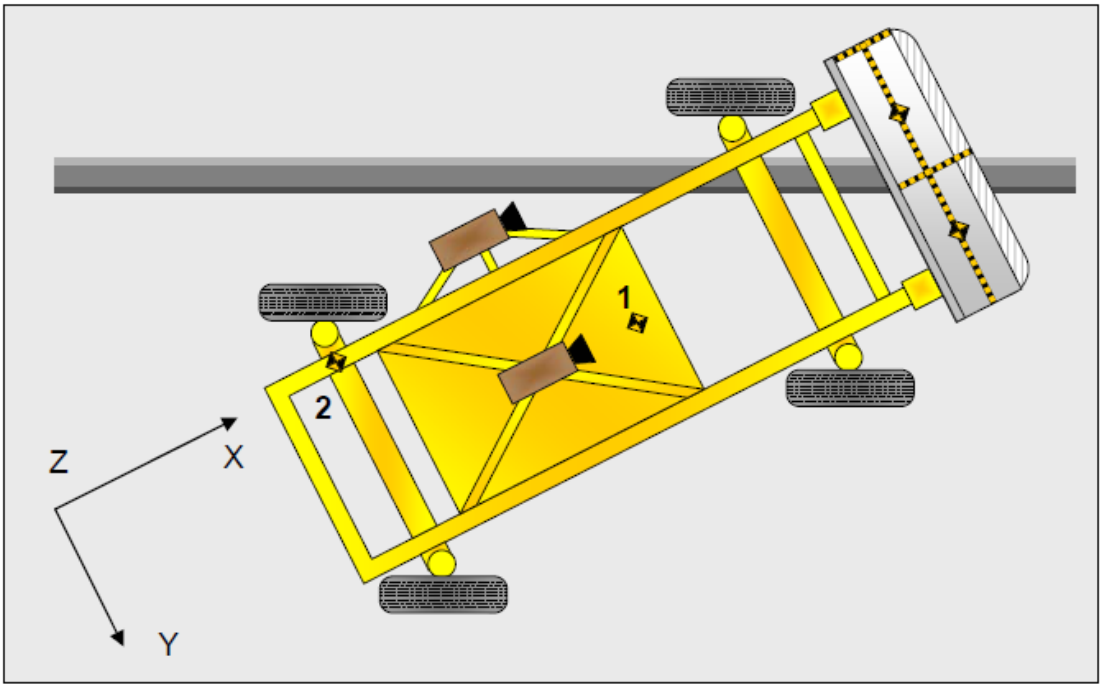
TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2433	-4	-83
2	Right Sill at Front Seat	2611	655	232
3	Right Sill at Rear Seat	1677	656	225
4	Left Sill at Front Door	2581	-652	243
5	Left Sill at Rear Door	1681	-650	222
6	A-Post Lower	2923	-641	191
7	A-Post Middle	3051	-634	86
8	B-Post Lower	1923	-663	-69
9	B-Post Middle	1880	-648	-408
10	Front Seat Track	2204	-552	206
11	Rear Seat Structure	1619	-309	116
12	Rt. Rear Occ. Compartment	1770	401	252
13	Engine Block	3688	162	-122
14	Rear Above Axle	930	-5	78

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

DATA SHEET NO. 7
MDB ACCELEROMETER LOCATIONS

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022



MDB ACCELEROMETER LOCATIONS

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

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

Width between left and right contact switches (mm): 1409

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2022 KIA Niro EV EX SUV NHTSA No.: M20224211
Test Program: NCAP Side MDB Impact Test Test Date: 2/7/2022

TEST DUMMY INFORMATION AND CONTACT POINTS

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

*Driver Seat moved rearward after impact event – seat control button pinched

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:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2699
Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point)	mm		409
Actual Impact Point (Aft of Frontal Axle)	mm		398
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	+11
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	-6

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2022 KIA Niro EV EX SUV NHTSA No.: M20224211
Test Program: NCAP Side MDB Impact Test Test Date: 2/7/2022

MDB SPECIFICATIONS

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

MDB WEIGHTS

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

SPEED AND ANGLE AT IMPACT DATA

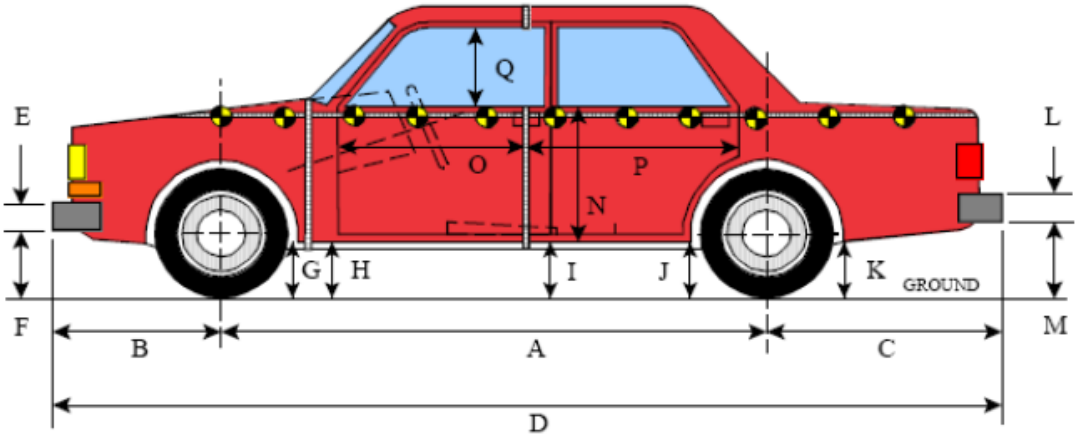
Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.10 to 62.70	61.52
Trap No. 2 Velocity (Redundant)	km/h	61.10 to 62.70	61.55
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed angle 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	246
B	Top of Bumper	533	800	Right	132
C	Mid-Level	686	800	Left	140
D	Top of Stack	813	800	Left	124

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2022 KIA Niro EV EX SUV NHTSA No.: M20224211
Test Program: NCAP Side MDB Impact Test Test Date: 2/7/2022



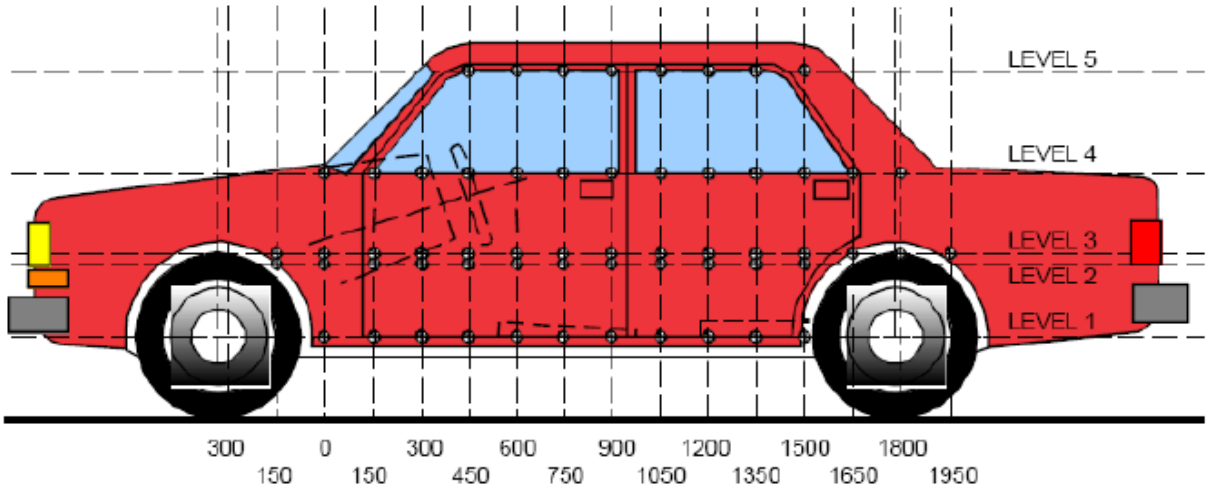
LEFT SIDE VIEW
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3mm

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2699	2717	18
B	Front Axle to FSOV	885	872	-13
C	Rear Axle to RSOV	786	777	-9
D	Total Length at Centerline	4369	4366	-3
E	Front Bumper Thickness	165	164	-1
F	Front Bumper Bottom to Ground	474	473	-1
G	Sill Height at Front Wheel Well	218	223	5
H	Sill Height at Front Door Leading Edge	218	226	8
I	Sill Height at B Pillar	200	209	9
J1	Sill Height at Rear Wheel Well	229	203	-26
J2	Pinch Weld Height at Rear Wheel Well	221	226	5
K	Sill Height Aft of Rear Wheel Well	300	307	7
L	Rear Bumper Thickness	241	242	1
M	Rear Bumper Bottom to Ground	398	408	10
N	Sill Height to Window Bottom of Front Window Sill	750	687	-63
O	Front Door Leading Edge to Impact CL	770	729	-41
P	Rear Door Trailing Edge to Impact CL	1363	1343	-20
Q	Front Window Opening	437	456	19
R	Right Side Length	4283	4283	0
S	Left Side Length	4283	4282	-1
T	Maximum Vehicle Width	1793	1641	-152
U	Front Wheel Track Width	1560	1560	0
V	Rear Wheel Track Width	1554	1558	4

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2022 KIA Niro EV EX SUV NHTSA No.: M20224211
Test Program: NCAP Side MDB Impact Test Test Date: 2/7/2022



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	363	81	1650
2	Driver Hip Point	mm	629	194	1650
3	Mid-Door	mm	735	204	900
4	Window Sill	mm	1004	71	1200
5	Window Top	mm	1495	5	1500

*window top level bent outward from original position

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

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

Test Vehicle: 2022 KIA Niro EV EX SUV NHTSA No.: M20224211
Test Program: NCAP Side MDB Impact Test Test Date: 2/7/2022

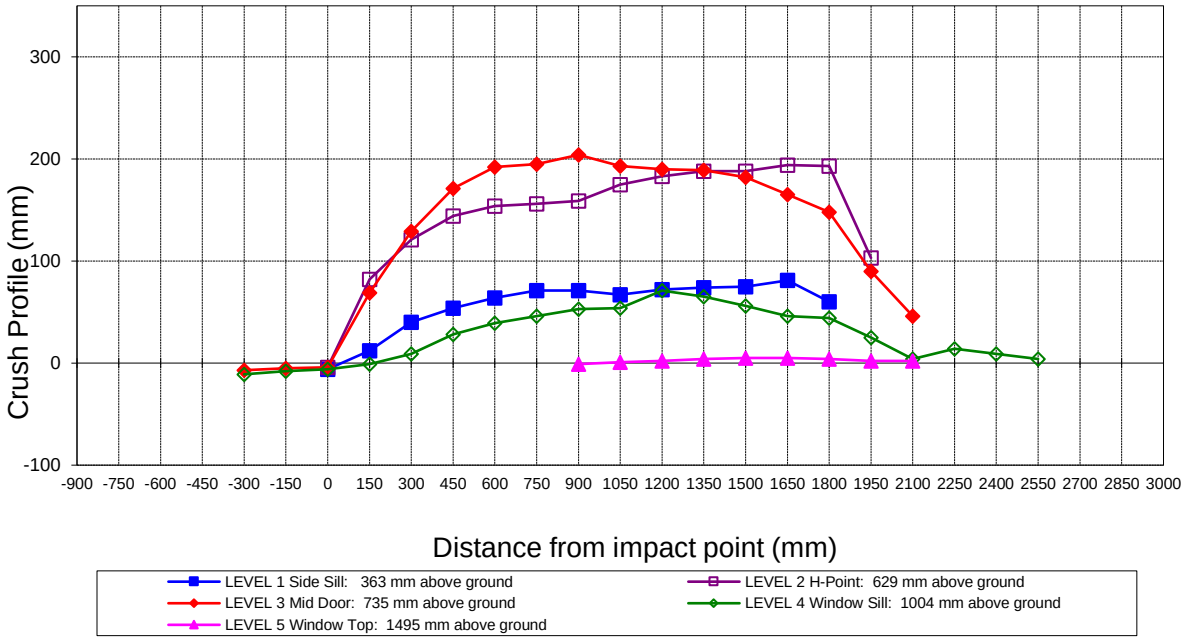
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300			897	791				904	802				-7	-11	
-150			893	797				898	805				-5	-8	
0	882	893	893	798		888	897	894	804		-6	-4	-1	-6	
150	865	883	884	802		853	801	815	803		12	82	69	-1	
300	856	879	883	813		816	758	754	804		40	121	129	9	
450	858	879	883	823		804	735	712	795		54	144	171	28	
600	862	878	883	833		798	724	691	794		64	154	192	39	
750	865	877	884	841		794	721	689	795		71	156	195	46	
900	866	876	885	848	602	795	717	681	795	603	71	159	204	53	-1
1050	865	876	886	852	607	798	701	693	798	606	67	175	193	54	1
1200	864	875	886	854	607	792	692	696	783	605	72	183	190	71	2
1350	861	875	885	855	608	787	687	696	790	604	74	188	189	65	4
1500	860	874	883	856	607	785	686	701	800	602	75	188	182	56	5
1650	862	877	881	854	606	781	683	716	808	601	81	194	165	46	5
1800	870	888	883	853	602	810	695	735	809	598	60	193	148	44	4
1950		894	893	880	594		791	803	855	592		103	90	25	2
2100			898	874	577			852	870	575			46	4	2
2250				846					832					14	
2400				841					832					9	
2550				832					828					4	
2700															
2850															
3000															

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

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

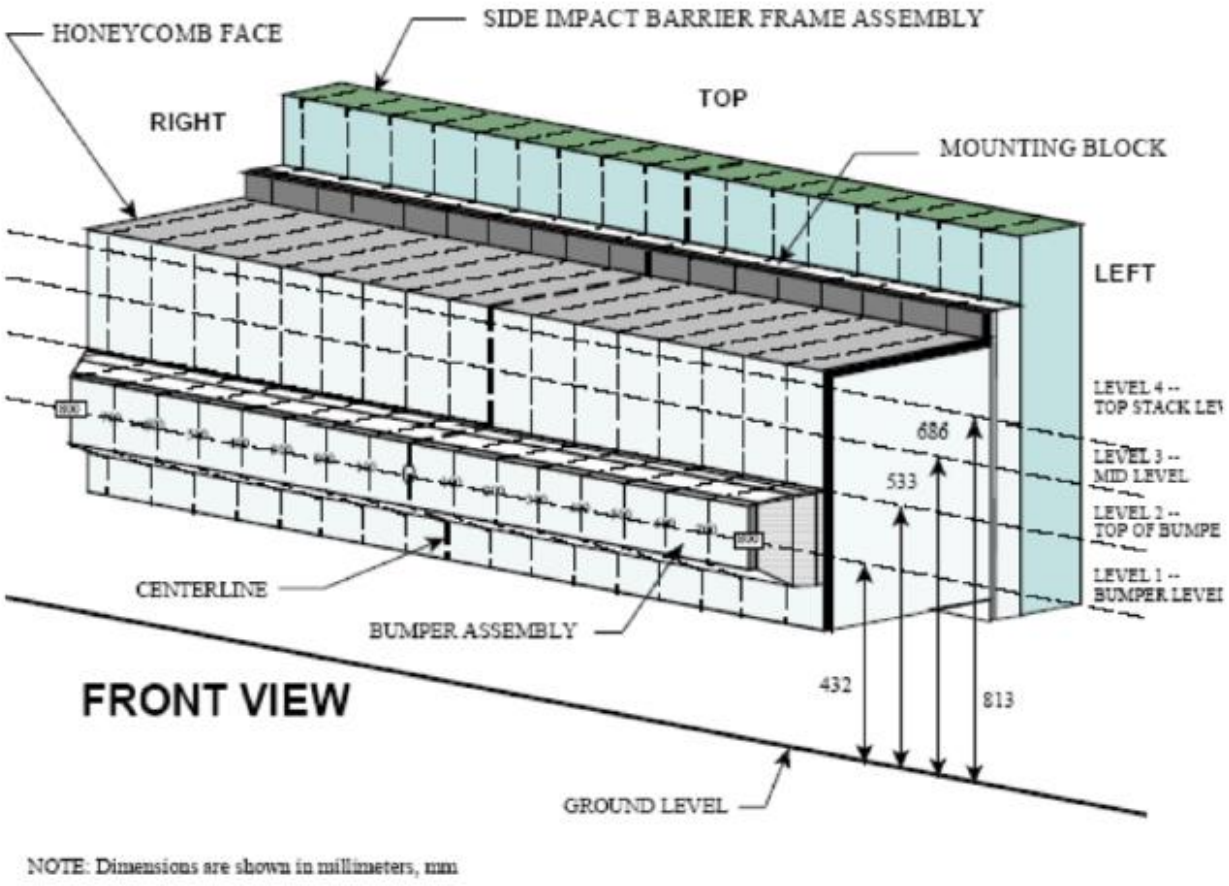
Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022



Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022



NOTE: Dimensions are shown in millimeters, mm

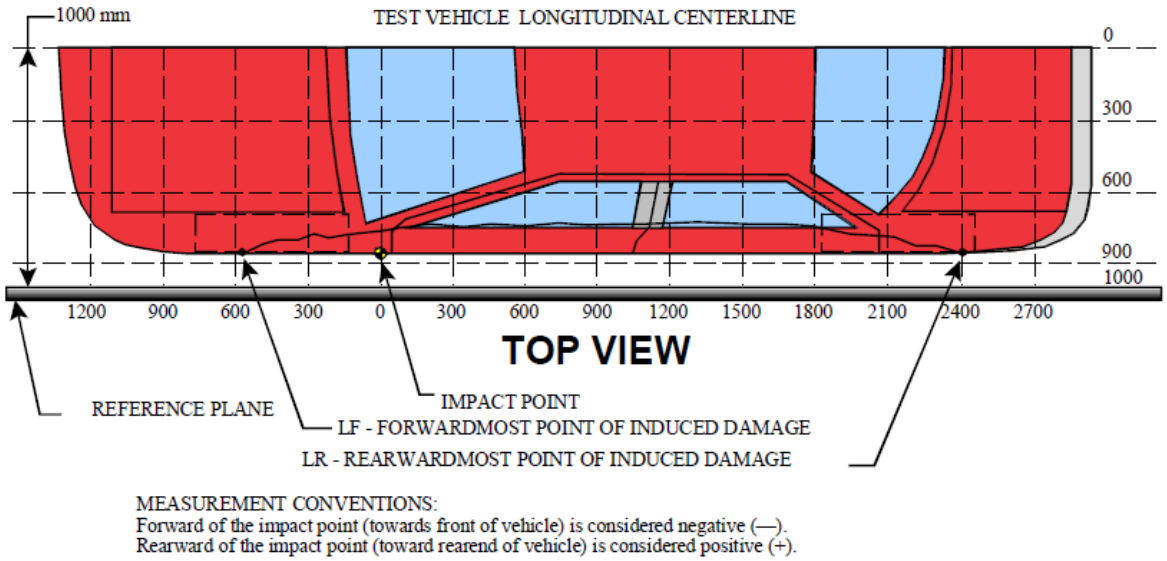
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
1	245	246	242	240	239	237	234	232	229	225	223	221	218	216	219	229	240
2	132	129	126	121	120	117	114	114	104	101	86	75	63	57	61	79	108
3	70	55	45	40	38	40	52	63	27	26	23	21	24	34	58	98	140
4	106	83	62	51	48	58	86	91	52	38	35	40	44	50	61	85	124

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

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	96	103	-7
2	180	3	197	116	81
3	660	3	310	117	193
4	1140	3	305	114	191
5	1620	3	287	119	168
6	2100	3	148	102	46

MDB DAMAGE PROFILE DISTANCES

DPD	Distance From Center of MDB	Level	Post-Test (mm)*
1	800 mm left of center	1	240
2	480 mm left of center	1	217
3	160 mm left of center	1	224
4	160 mm right of center	1	233
5	480 mm right of center	1	240
6	800 mm right of center	1	245

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/07/2022
Test Time:	12:46 PM	Temperature:	21˚C

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

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

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

D. Spillage Details: — No Spillage Occurred

FMVSS NO. 301 STATIC ROLLOVER DATA

ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	74	300	374
90° to 180°	63	300	363
180° to 270°	60	300	360
270° to 360°	69	300	369

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

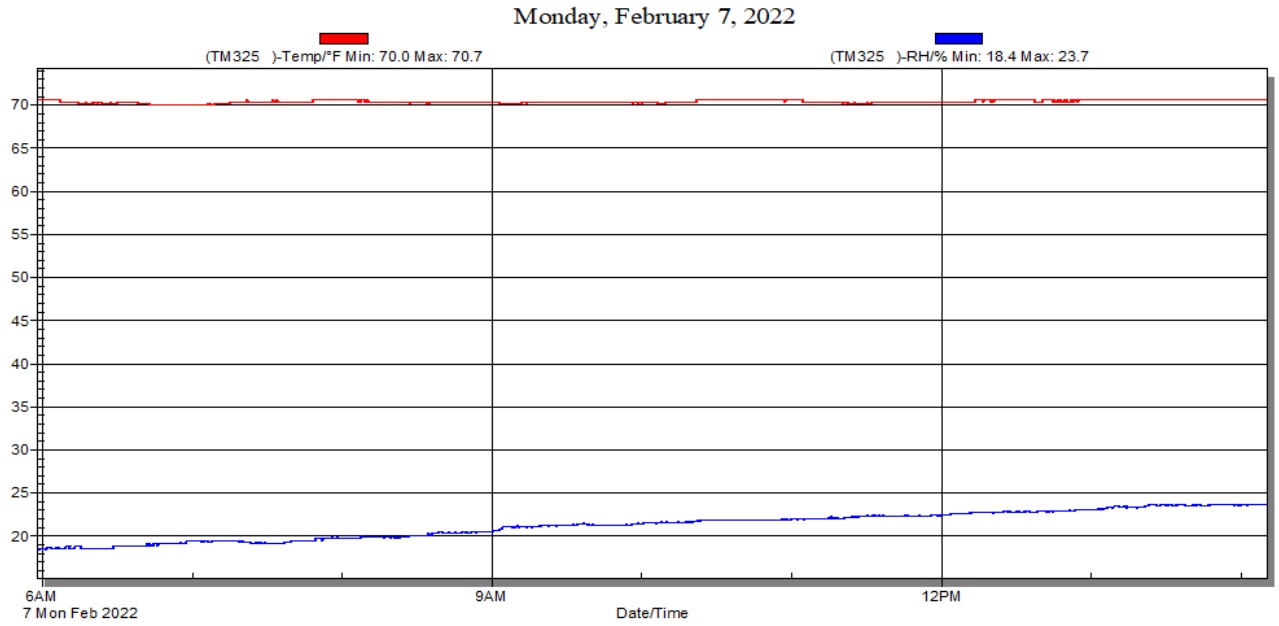
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022



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

DATA SHEET NO. 305-1

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Electric
Propulsion Battery Type	Lithium-ion Polymer
Nominal Voltage (Volts)	356
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Under Hood
Auxiliary Battery Type	12V

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	LiPF6 Salt, Carbonate Solvent
Electrolyte Fluid Specific Gravity	1.23
Electrolyte Fluid Kinematic Viscosity (centistokes)	3cps @ 25°C
Electrolyte Fluid Color	Transparent/Pale Yellow
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Water, Ethylene glycol, Blue
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Outside

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
For all battery types: Voltage Range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	245
Maximum State of Charge	V	421.4
95% of Maximum	V	400.3
Test Voltage *	V	405.3
For batteries that are rechargeable ONLY by an energy source on the vehicle: Voltage range corresponding to **useable energy** of the battery :		
Minimum State of Charge	V	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	

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

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

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

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Ground wire was attached to the under hood cross brace on the vehicle body.
Details of Propulsion Battery Components	All battery components are internal to the battery located on the underside of the vehicle.

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		40950061
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		2/9/2021

NOTES:

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

PROPULSION BATTERY VOLTAGE, RESISTANCE & ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Measured Parameter	Symbol	Units	Value
Normal operating voltage range specified by the manufacturer	V_b	V	245 – 421.4
Propulsion Battery Voltage : (ready to drive position)	V_b	V	405.3
Propulsion Battery to Vehicle Chassis	V_1	V	280
Propulsion Battery to Vehicle Chassis	V_2	V	282
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	281,000
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	58.3
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	58.8
$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$	R_{i1}	Ω	2,144,775
$R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$	R_{i2}	Ω	2,125,741
Lesser value of R_{i1} and R_{i2}	R_i	Ω	2,125,741
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	5,245

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

NOTES:

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

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		40950061
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V_b)	V	0.187

NOTES:

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

ELECTRICAL ISOLATION MEASUREMENTS & IMPACT CALCULATIONS

Parameter	Value	Units		Value		Value	
V_1 =	0.040	V	Time:	1	Minutes	25	Seconds
V_2 =	0.044	V	Time:	1	Minutes	38	Seconds
$R_{o\,=}$	281,000	Ω	Time:		Minutes		Seconds
V_1' =	0.001	V	Time:	1	Minutes	46	Seconds
V_2' =	0.020	V	Time:	1	Minutes	51	Seconds
R_{i1} =	23,013,900	Ω	Time:	1	Minutes	46	Seconds
R_{i2} =	643,745	Ω	Time:	1	Minutes	51	Seconds
R_i =	643,745	Ω	Time:	1	Minutes	51	Seconds
R_i/V_b =	3,442,489	Ω/V	Time:	1	Minutes	51	Seconds

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

NOTES:

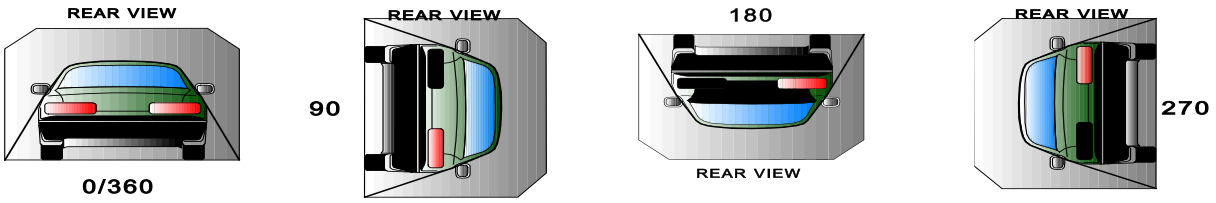
- *R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1'], R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2'], R_i = Lesser value of R_{i1} and R_{i2}*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*
- *Minimum Electrical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

. PROPULSION BATTERY SYSTEM COMPONENTS

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

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

Test Vehicle:	2022 KIA Niro EV EX SUV	NHTSA No.:	M20224211
Test Program:	NCAP Side MDB Impact Test	Test Date:	2/7/2022



Rear View

DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Rollover Stage	Rotation Time (spec. 1 -3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	14	5	6	14	7
90° to 180°	1	3	5	6	3	7
180° to 270°	1	0	5	6	0	7
270° to 360°	1	9	5	6	9	7

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

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

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

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

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		40950061
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V_b)	V	0.001

NOTES:

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

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

Test Vehicle: 2022 KIA Niro EV EX SUV
NHTSA No.: M20224211
Test Program: NCAP Side MDB Impact Test
Test Date: 2/7/2022

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units		Minutes	Seconds
V_1 =	90°	0.003	V	Time:	1	19
	180°	0.003	V		9	26
	270°	0.003	V		16	23
	360°	0.002	V		22	4
V_2 =	90°	0.002	V	Time:	1	23
	180°	0.002	V		9	33
	270°	0.002	V		16	28
	360°	0.003	V		22	11
V_1' =	90°	0.002	V	Time:	1	25
	180°	0.001	V		9	38
	270°	0.002	V		16	33
	360°	0.001	V		22	16
V_2' =	90°	0.001	V	Time:	1	27
	180°	0.001	V		9	43
	270°	0.001	V		16	37
	360°	0.001	V		22	18
R_{i1} =	90°	234,167	Ω	Time:	1	25
	180°	936,667	Ω		9	38
	270°	234,167	Ω		16	33
	360°	702,500	Ω		22	16
R_{i2} =	90°	702,500	Ω	Time:	1	27
	180°	702,500	Ω		9	43
	270°	702,500	Ω		16	37
	360°	936,667	Ω		22	18
R_i =	90°	234,167	Ω	Time:	1	25
	180°	702,500	Ω		9	43
	270°	234,167	Ω		16	37
	360°	702,500	Ω		22	16
R_i/V_b =	90°	1,252,228	Ω/V	Time:	9	38
	180°	3,756,684	Ω/V		9	43
	270°	1,252,228	Ω/V		16	37
	360°	3,756,684	Ω/V		1	27

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

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

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

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

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

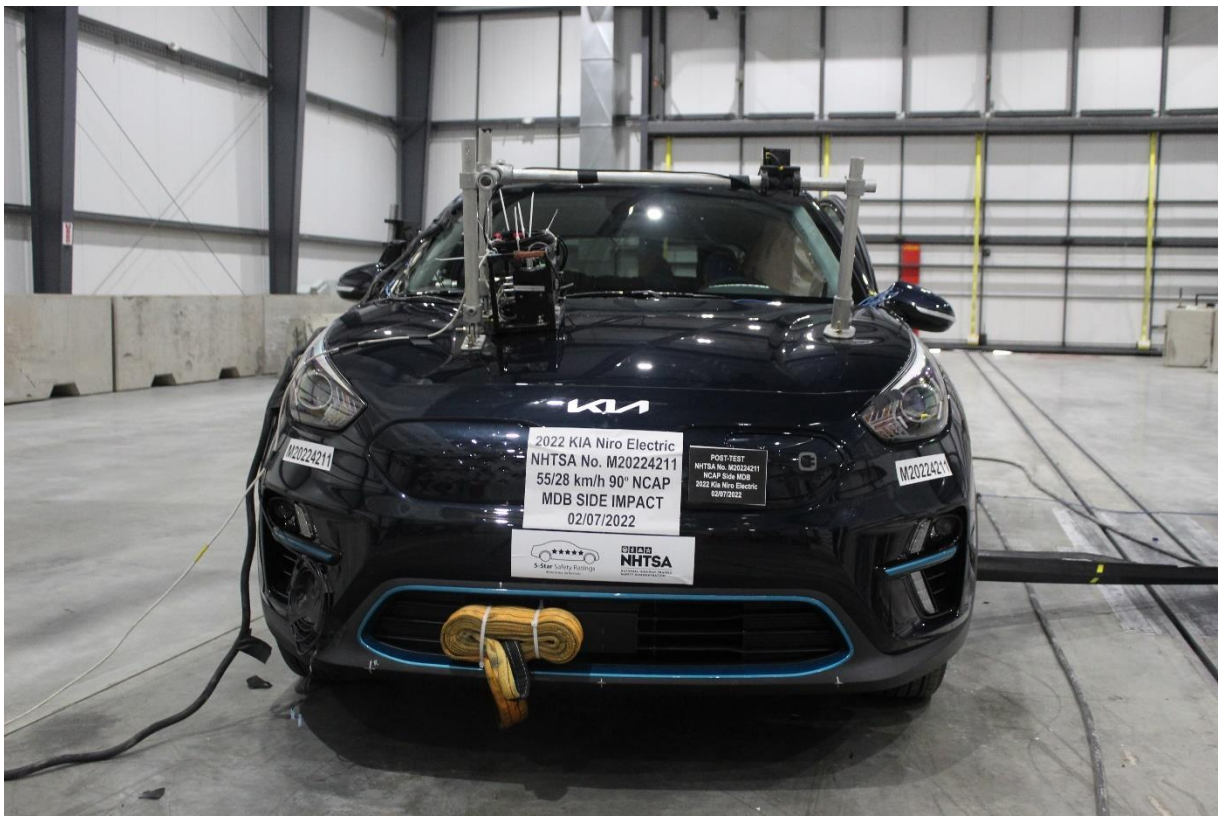


Figure A-4: Post-Test Frontal View of Test Vehicle

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

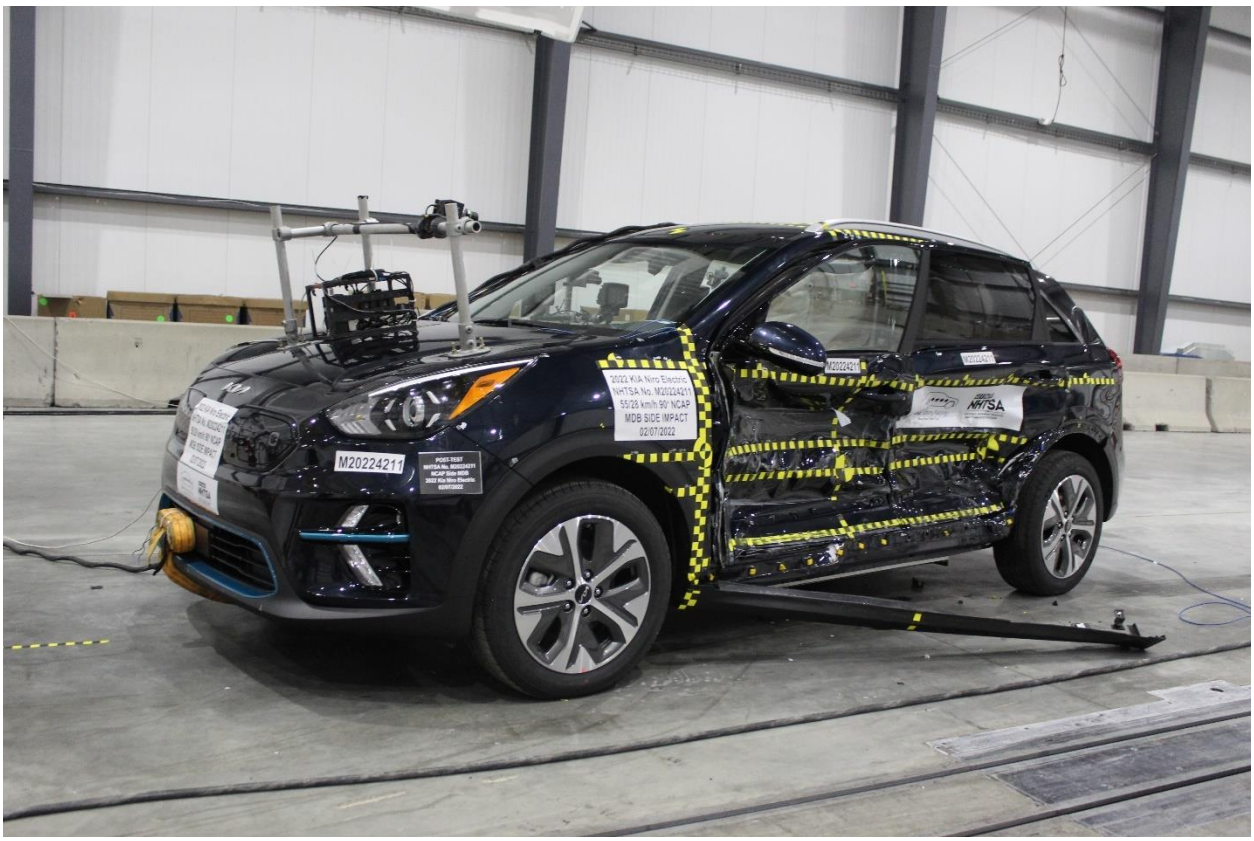


Figure A-6: Post-Test Left Front ¾ View of Test Vehicle

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

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

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

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

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

Figure A-12: Post-Test Rear 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

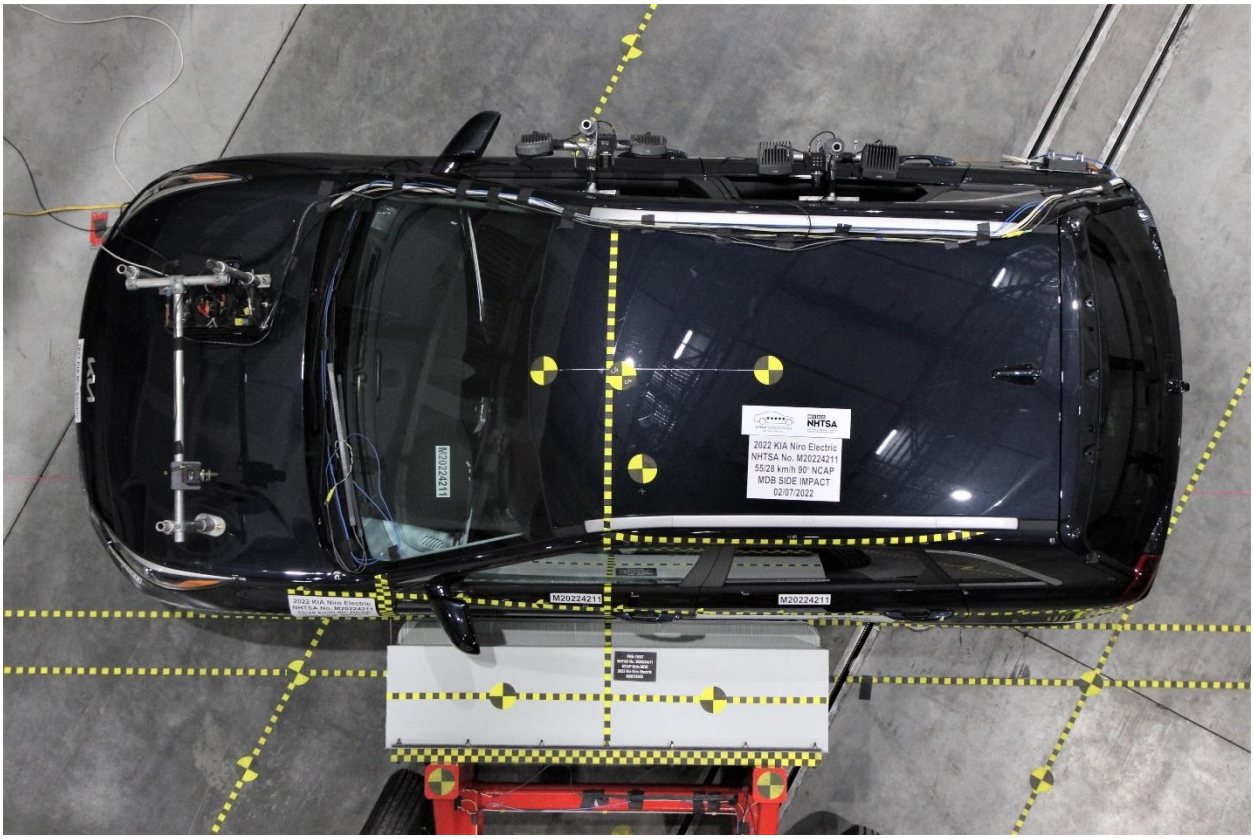


Figure A-15: Pre-Test Overhead View of the Test Area

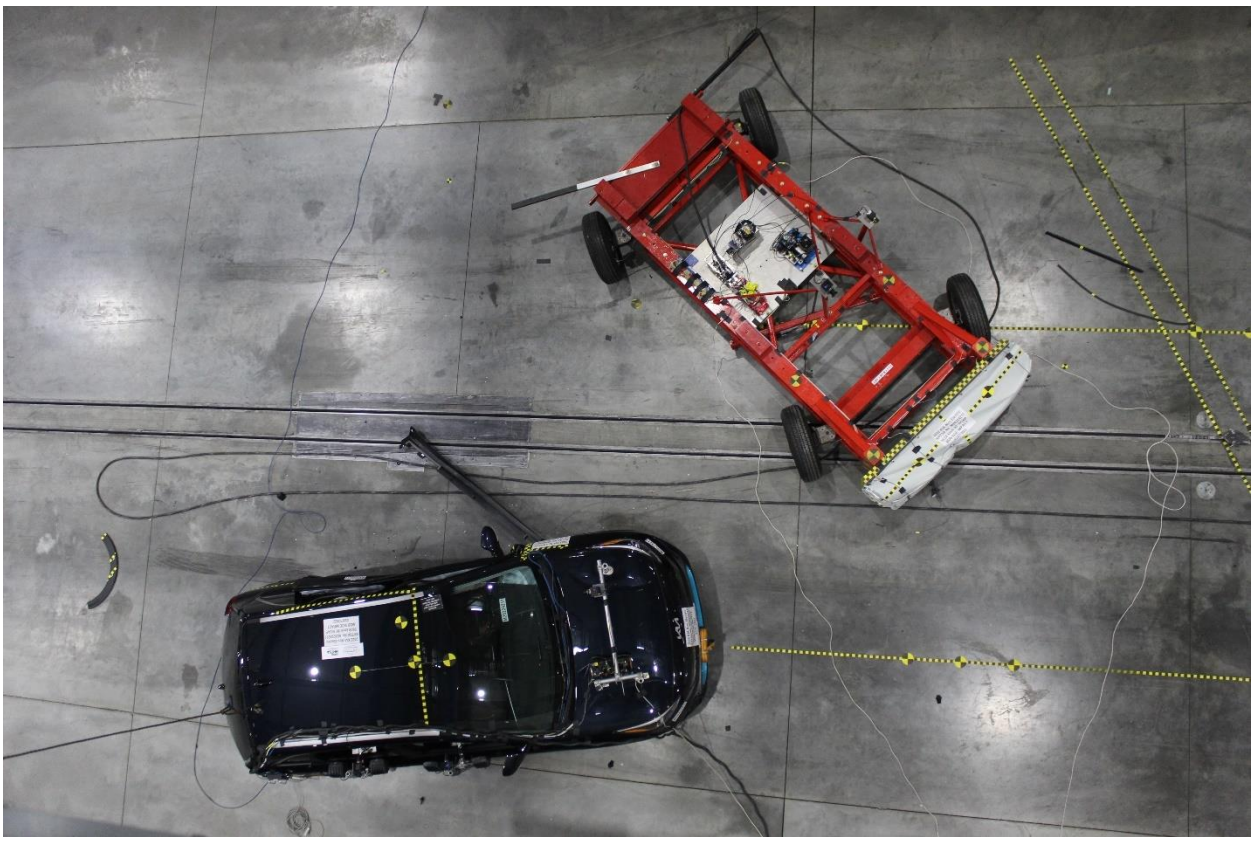


Figure A-16: Post-Test Overhead View of Test Area

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

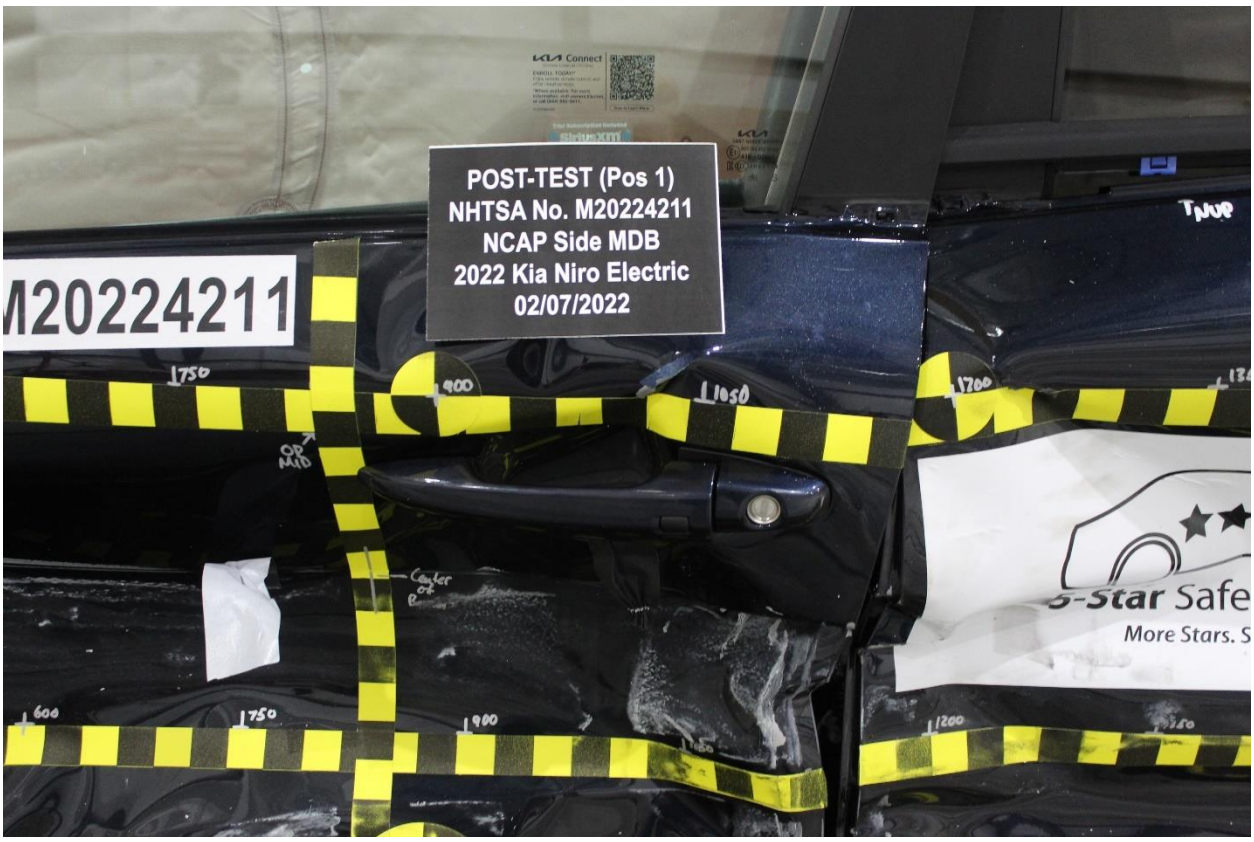


Figure A-22: Post-Test Left Front Door Latch Close-Up

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

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

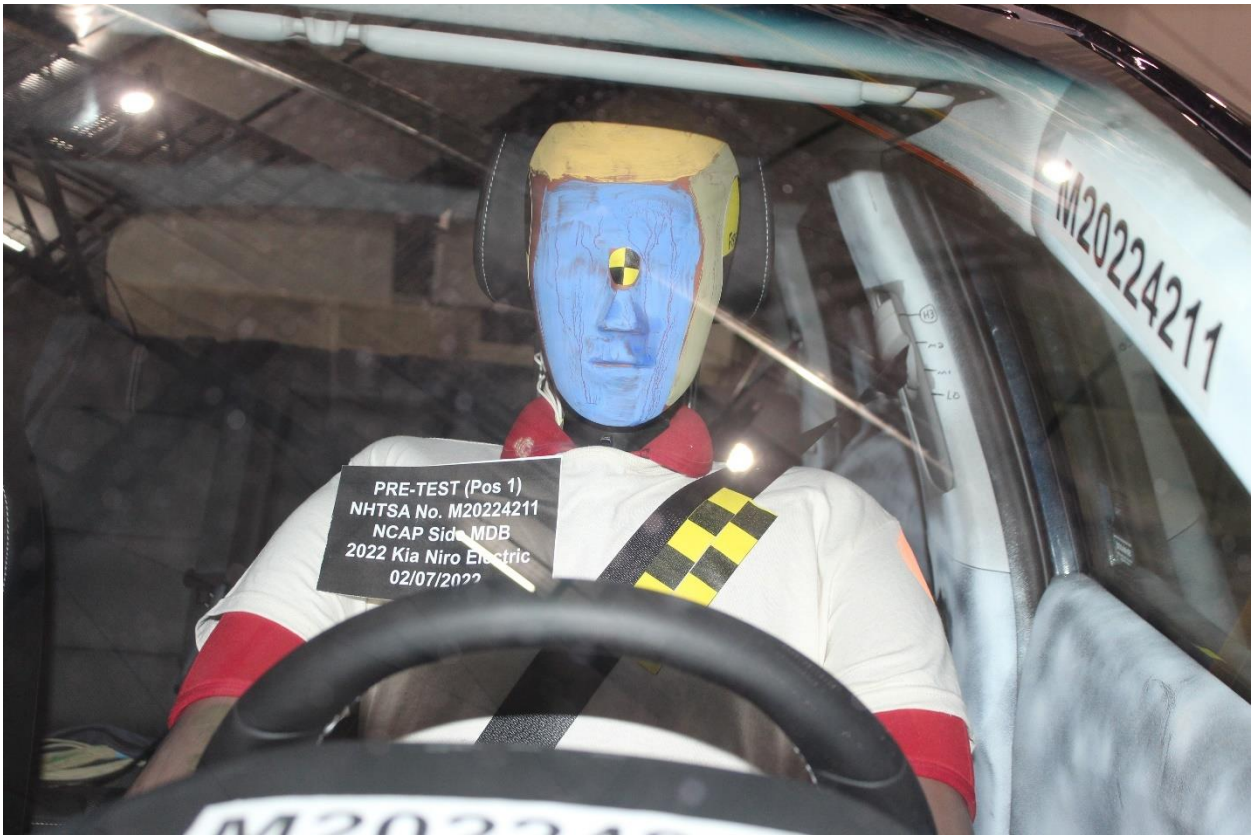


Figure A-25: Pre-Test Front Close-up View of Driver Dummy

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

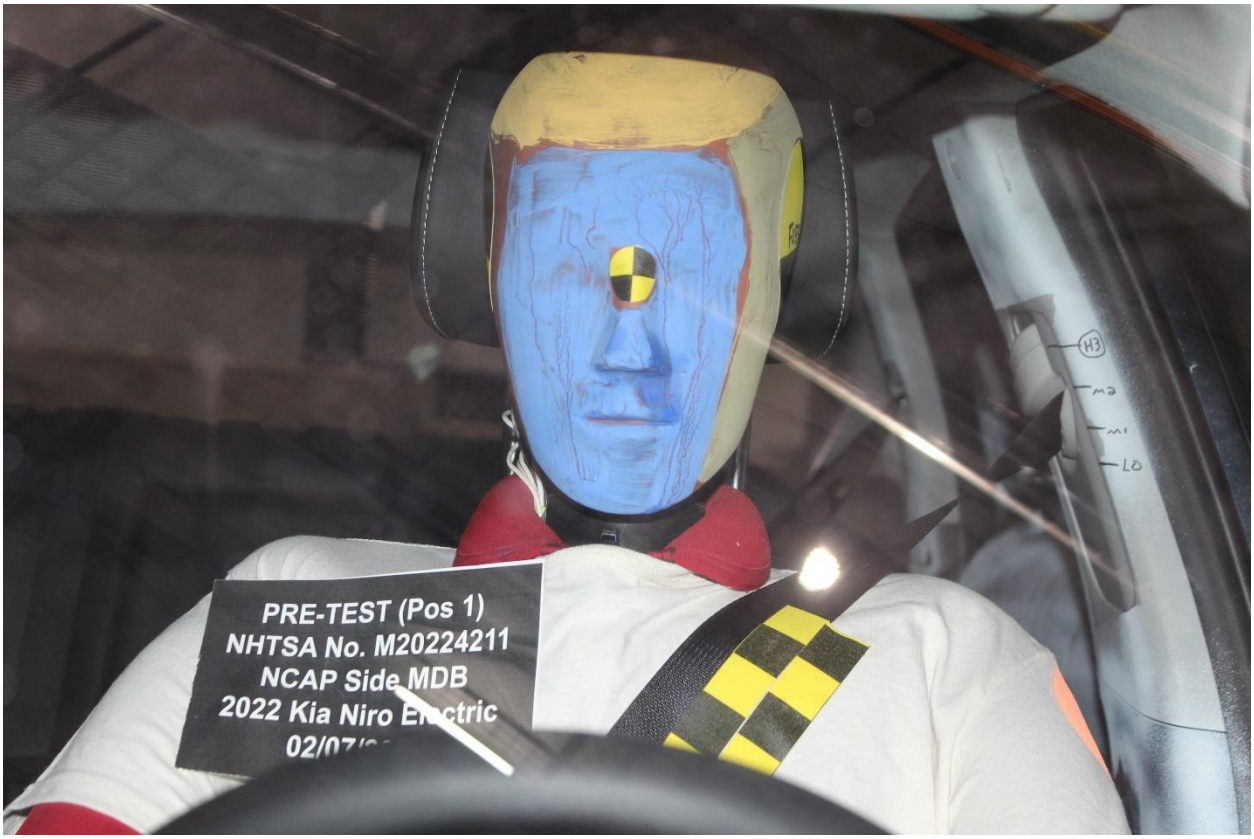


Figure A-31: Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint

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

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

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

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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

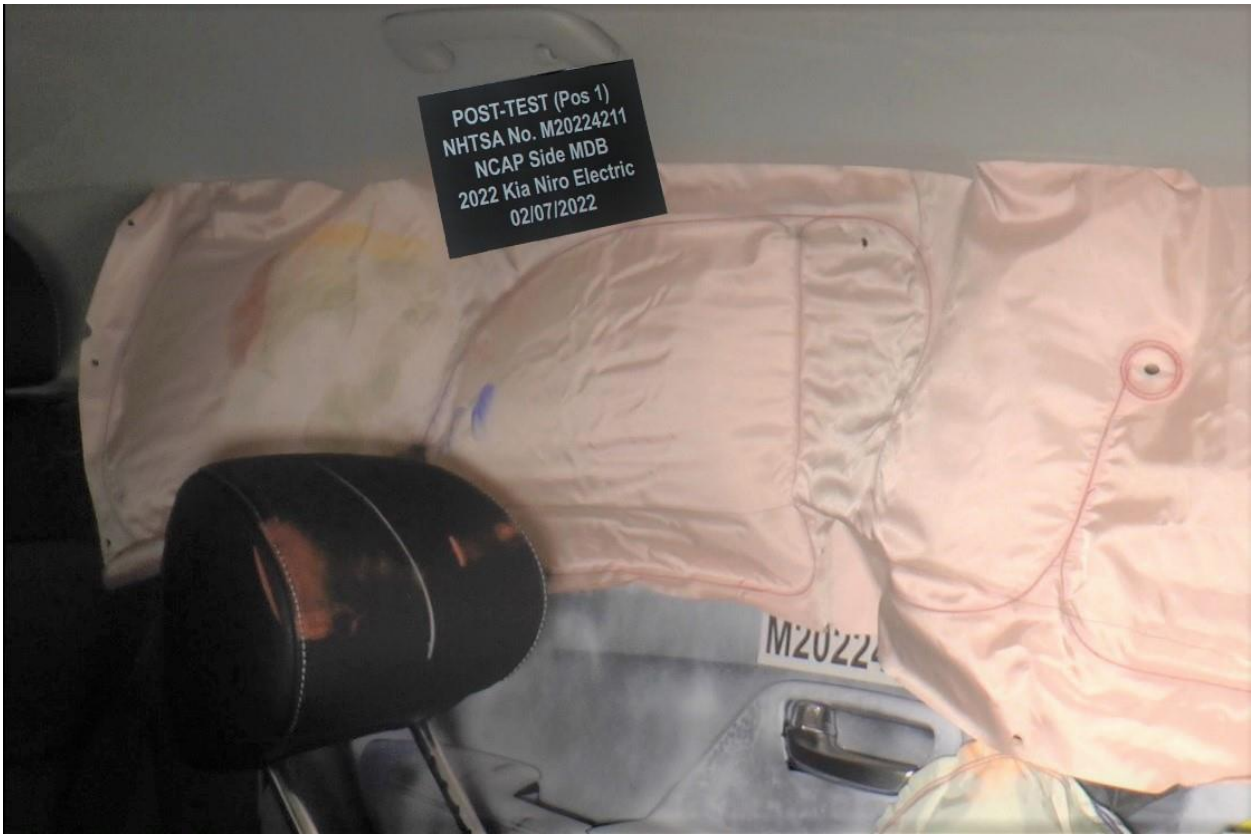

Figure A-48: Post-Test Driver Dummy Close-Up Head Contact with Vehicle View

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

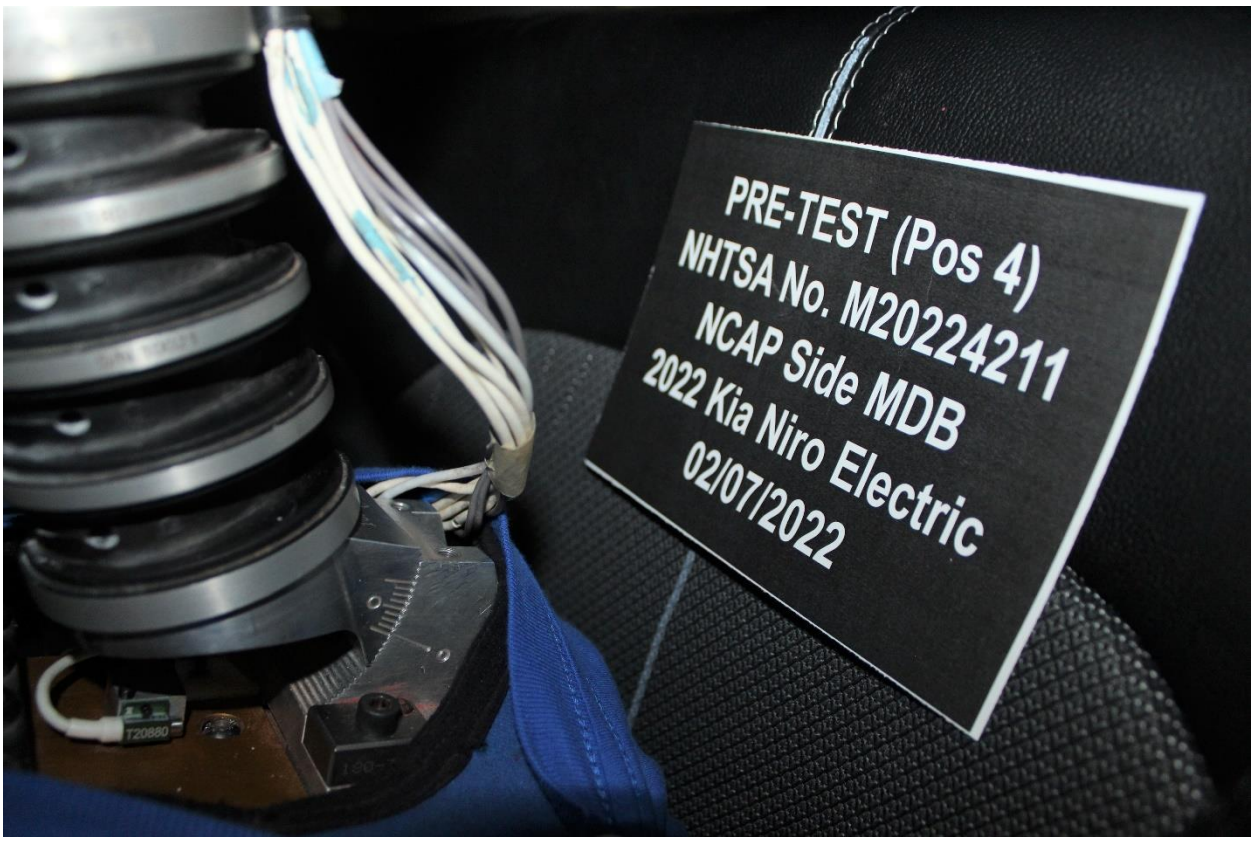

Figure A-62: Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket

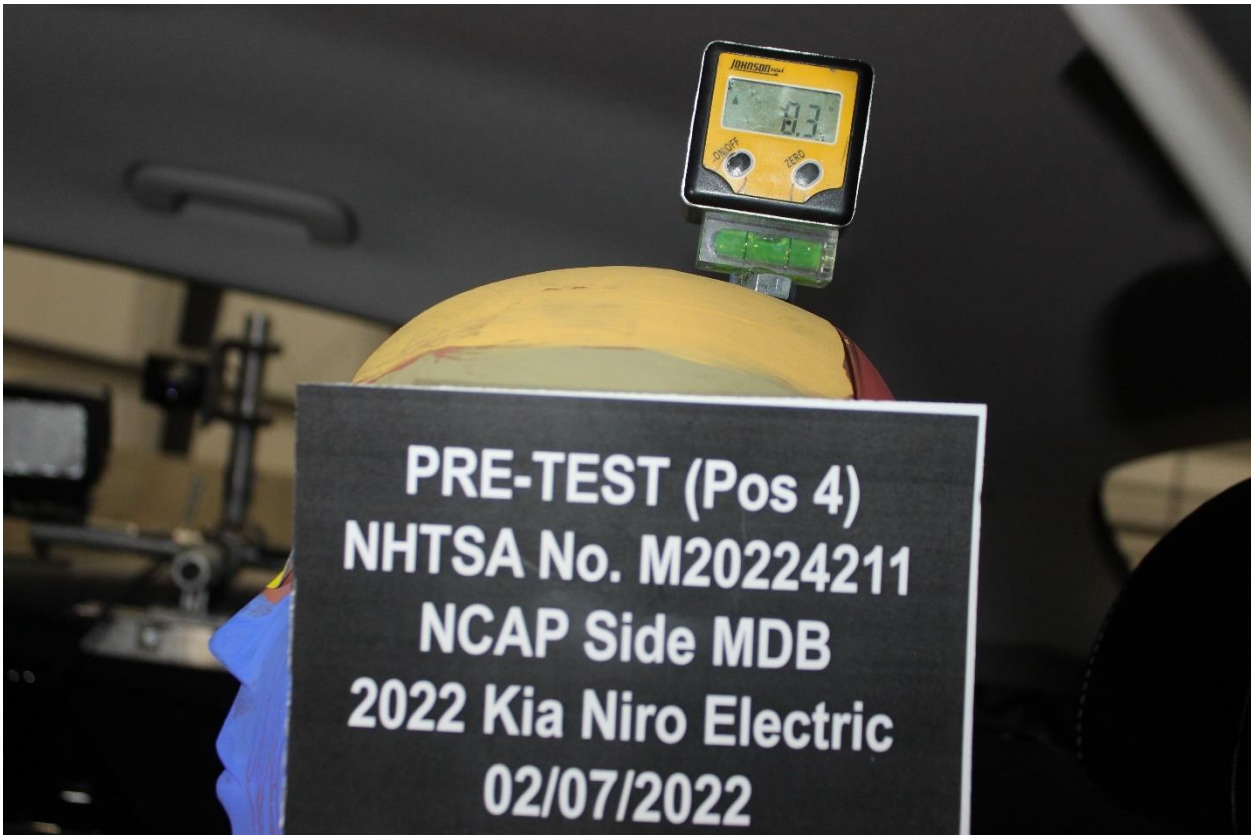

Figure A-63: Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level

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

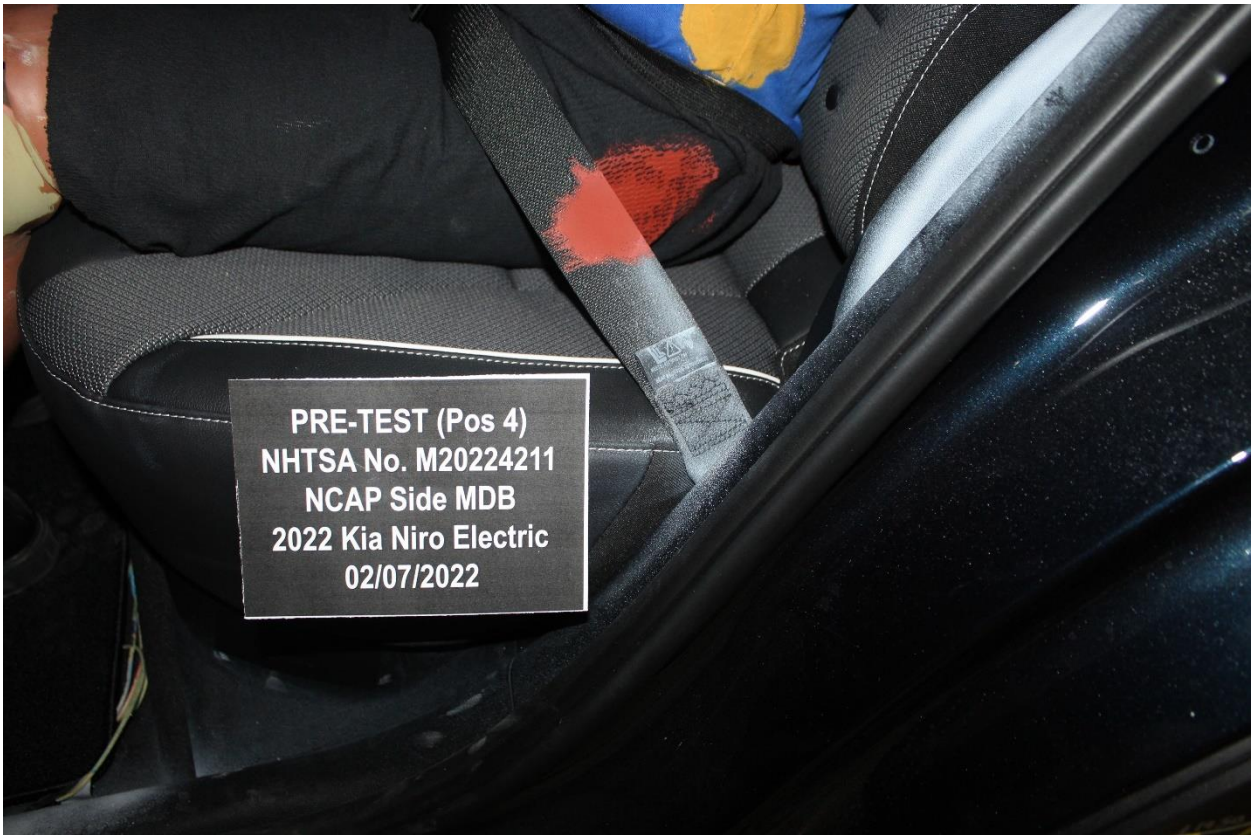

Figure A-67: Pre-Test Close-Up Left Side View of Rear Passenger Seat Back

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

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

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

Photo Not Applicable

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

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

Photo Not Applicable

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

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

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

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

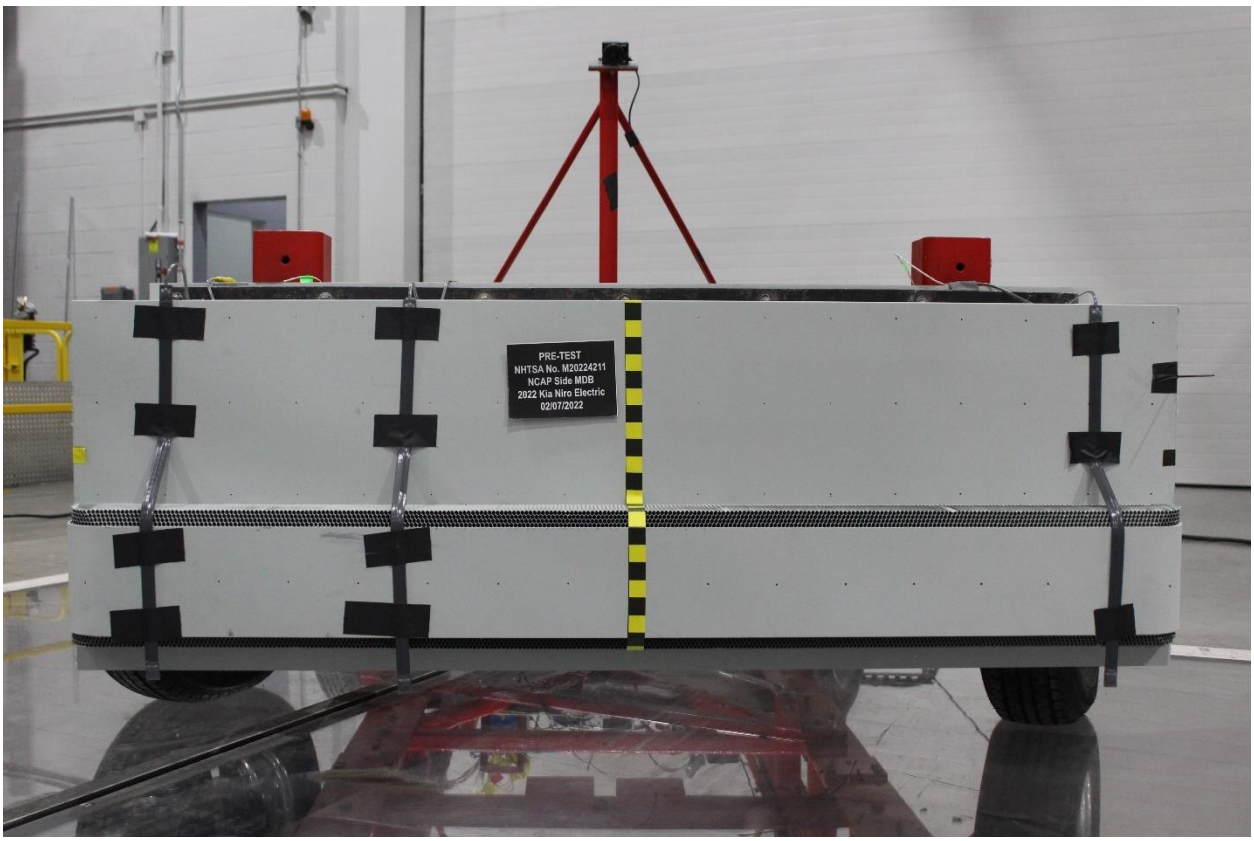


Figure A-84: Pre-Test Front View of MDB Impactor Face

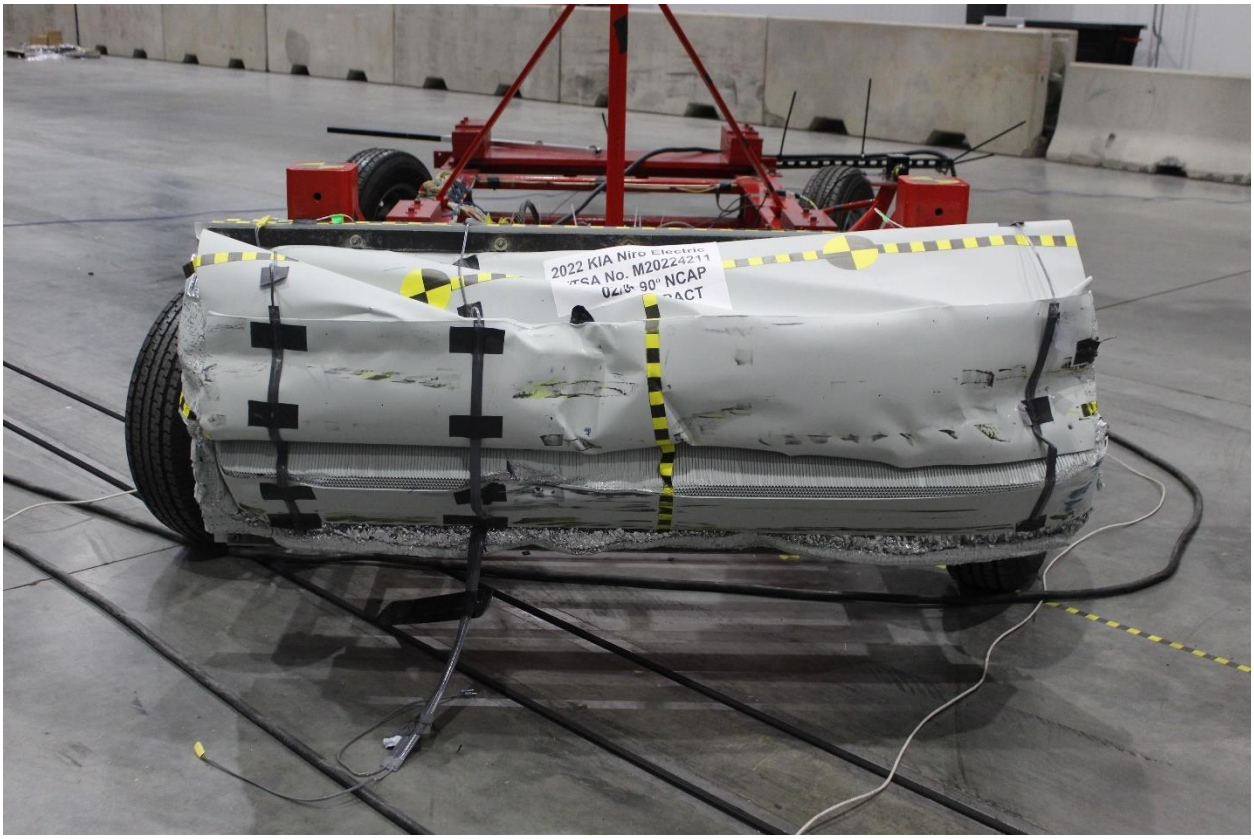


Figure A-85: Post-Test Front View of MDB Impactor Face

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

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

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

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

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

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

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

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

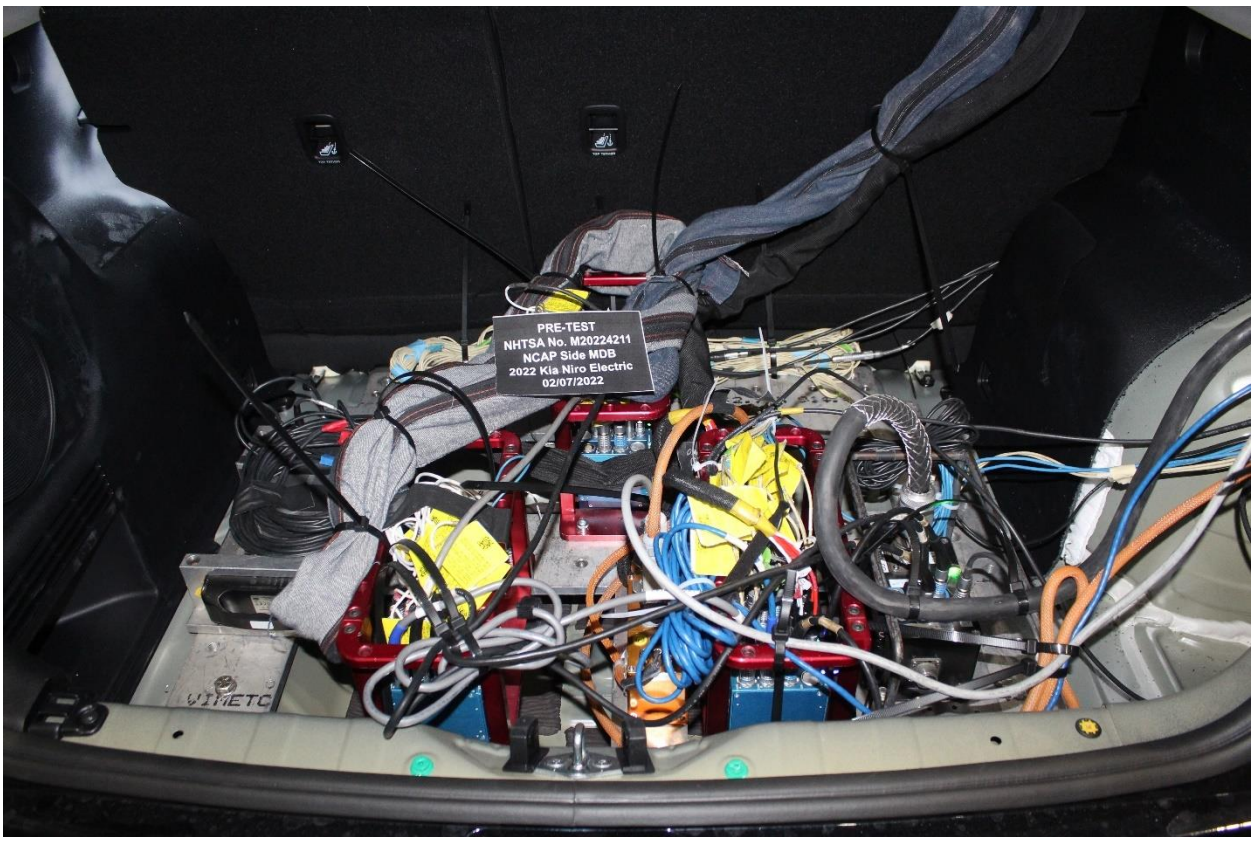


Figure A-94: Pre-Test Ballast View

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

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

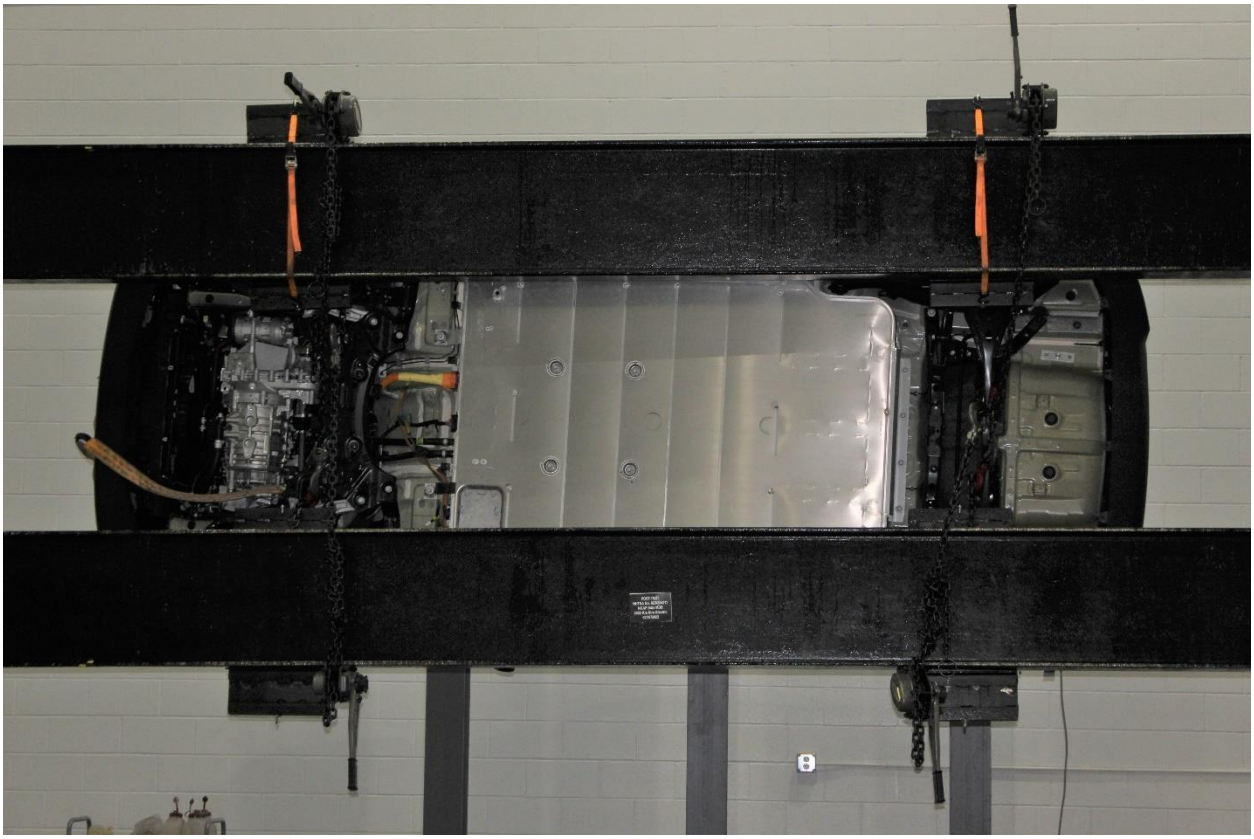


Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees

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

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

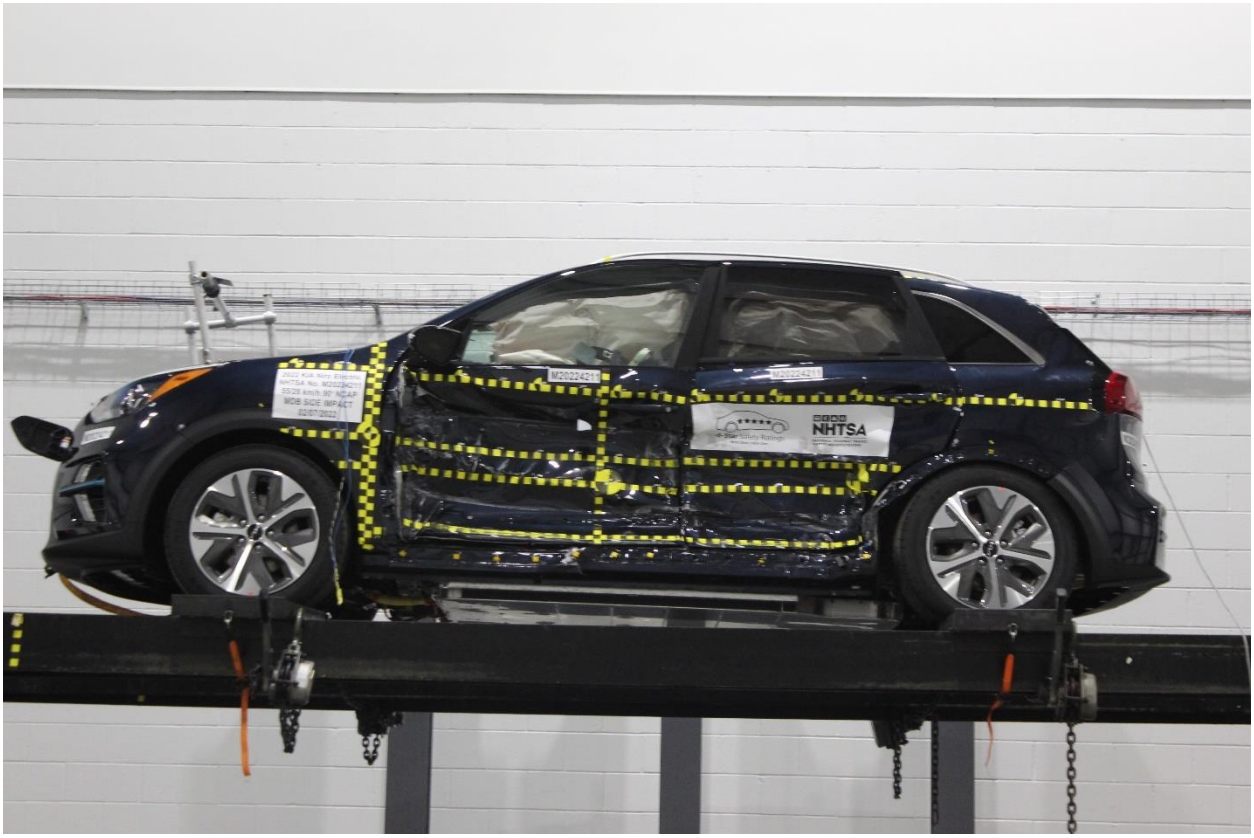
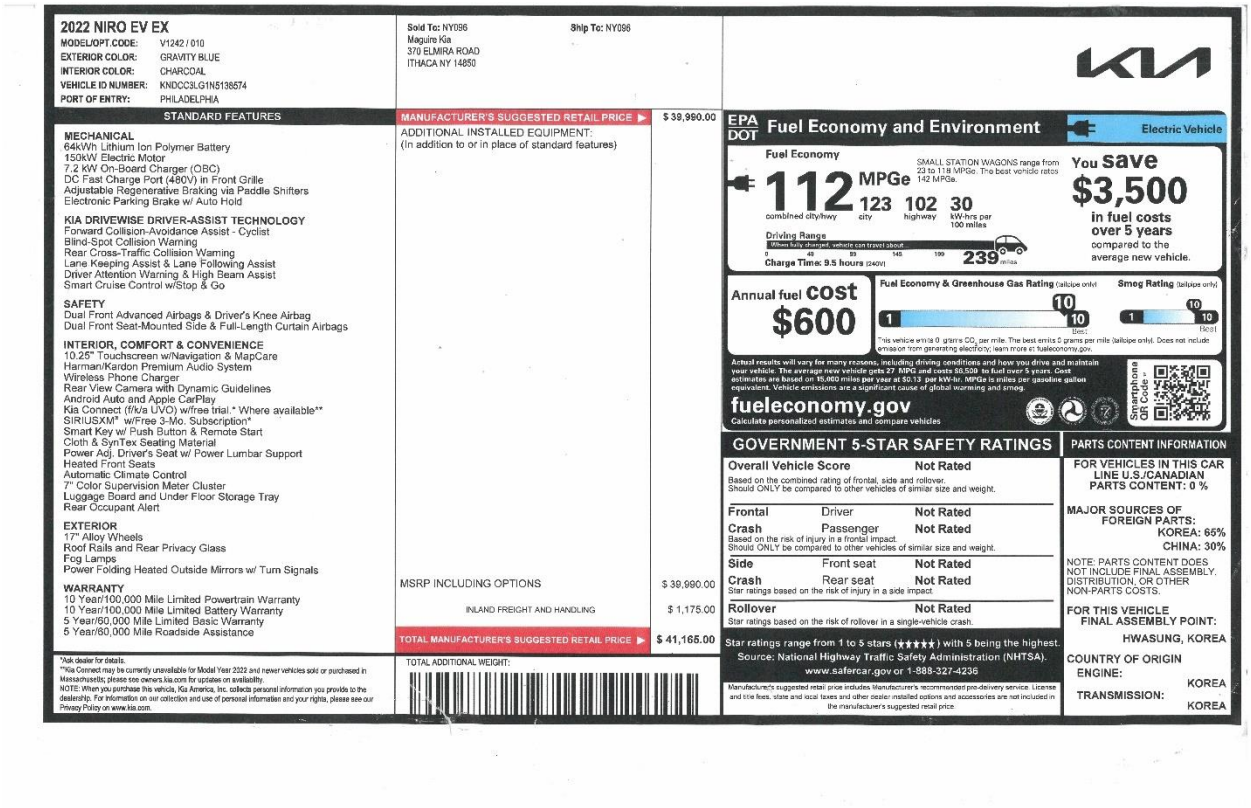


Figure A-100: FMVSS No. 301 Static Rollover 360 Degrees

Figure A-101: Impact Event



2022 NIRO EV EX
MODEL/OPT.CODE: V1242 / 010
EXTERIOR COLOR: GRAVITY BLUE
INTERIOR COLOR: CHARCOAL
VEHICLE ID NUMBER: KNDCC3LG1N5138574
PORT OF ENTRY: PHILADELPHIA

Sold To: NY096
Maguire Kia
370 ELMIRA ROAD
ITHACA NY 14850

Ship To: NY096

STANDARD FEATURES

MECHANICAL
64kWh Lithium Ion Polymer Battery
150kW Electric Motor
7.2 kW On-Board Charger (OBC)
DC Fast Charge Port (480V) in Front Grille
Adjustable Regenerative Braking via Paddle Shifters
Electronic Parking Brake w/ Auto Hold

KIA DRIVEWISE DRIVER-ASSIST TECHNOLOGY
Forward Collision-Avoidance Assist - Cyclist
Blind-Spot Collision Warning
Rear Cross-Traffic Collision Warning
Lane Keeping Assist & Lane Following Assist
Driver Attention Warning & High Beam Assist
Smart Cruise Control w/Stop & Go

SAFETY
Dual Front Advanced Airbags & Driver's Knee Airbag
Dual Front Seat-Mounted Side & Full-Length Curtain Airbags

INTERIOR, COMFORT & CONVENIENCE
10.25" Touchscreen w/Navigation & MapCare
Harman/Kardon Premium Audio System
Wireless Phone Charger
Rear View Camera with Dynamic Guidelines
Android Auto and Apple CarPlay
Kia Connect (f/k/a UVO) w/free trial.* Where available**
SIRIUSXM® w/Free 3-Mo. Subscription*
Smart Key w/ Push Button & Remote Start
Cloth & SynTex Seating Material
Power Adj. Driver's Seat w/ Power Lumbar Support
Heated Front Seats
Automatic Climate Control
7" Color Supervision Meter Cluster
Luggage Board and Under Floor Storage Tray
Rear Occupant Alert

EXTERIOR
17" Alloy Wheels
Roof Rails and Rear Privacy Glass
Fog Lamps
Power Folding Heated Outside Mirrors w/ Turn Signals

WARRANTY
10 Year/100,000 Mile Limited Powertrain Warranty
10 Year/100,000 Mile Limited Battery Warranty
5 Year/60,000 Mile Limited Basic Warranty
5 Year/60,000 Mile Roadside Assistance

*Ask dealer for details.
**Kia Connect may be currently unavailable for Model Year 2022 and newer vehicles sold or purchased in Massachusetts; please see owners.kia.com for updates on availability.
NOTE: When you purchase this vehicle, Kia America, Inc. collects personal information you provide to the dealership. For information on our collection and use of personal information and your rights, please see our Privacy Policy on www.kia.com.

MANUFACTURER'S SUGGESTED RETAIL PRICE ▶	$ 39,990.00
ADDITIONAL INSTALLED EQUIPMENT: (In addition to or in place of standard features)	
MSRP INCLUDING OPTIONS	$ 39,990.00
INLAND FREIGHT AND HANDLING	$ 1,175.00
TOTAL MANUFACTURER'S SUGGESTED RETAIL PRICE ▶	$ 41,165.00

TOTAL ADDITIONAL WEIGHT:

EPA DOT Fuel Economy and Environment — Electric Vehicle

Fuel Economy
112 MPGe combined city/hwy
123 city
102 highway
30 kW-hrs per 100 miles
SMALL STATION WAGONS range from 23 to 118 MPGe. The best vehicle rates 142 MPGe.
Driving Range
When fully charged, vehicle can travel about
0 49 99 149 199
239 miles
Charge Time: 9.5 hours (240V)

You save $3,500 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost $600

Fuel Economy & Greenhouse Gas Rating (tailpipe only): 1 10 Best
Smog Rating (tailpipe only): 1 10 Best
*This vehicle emits 0 grams CO_2 per mile. The best emits 0 grams per mile (tailpipe only). Does not include emissions from generating electricity; learn more at fueleconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs $6,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $0.13 per kW-hr. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of global warming and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles
Smartphone QR Code

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score		Not Rated
Based on the combined rating of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.		
Frontal Crash	Driver	Not Rated
	Passenger	Not Rated
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
Side Crash	Front seat	Not Rated
	Rear seat	Not Rated
Star ratings based on the risk of injury in a side impact.		
Rollover		Not Rated
Star ratings based on the risk of rollover in a single-vehicle crash.		

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.
Source: National Highway Traffic Safety Administration (NHTSA).
www.safercar.gov or 1-888-327-4236

Manufacturer's suggested retail price includes Manufacturer's recommended pre-delivery service. License and title fees, state and local taxes and other dealer installed options and accessories are not included in the manufacturer's suggested retail price.

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CAR LINE U.S./CANADIAN PARTS CONTENT: 0 %

MAJOR SOURCES OF FOREIGN PARTS:
KOREA: 65%
CHINA: 30%

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

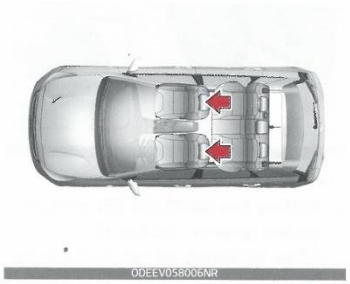
FOR THIS VEHICLE FINAL ASSEMBLY POINT:
HWASUNG, KOREA

COUNTRY OF ORIGIN
ENGINE: KOREA
TRANSMISSION: KOREA

Figure A-102: Monroney Label

Headrest for front seat

The driver's and front passenger's seats are equipped with a headrest for the occupant's safety and comfort.



The headrest not only provides comfort for the driver and front passenger, but also helps protect the head and neck in the event of a rear collision.

For maximum effectiveness in case of an accident, the headrest should be adjusted so the middle of the headrest is at the same height of the center of gravity of an occupant's head. Generally, the center of gravity of most people's head is similar with the height of the top of their eyes.

Also, adjust the headrest as close to your head as possible. For this reason, the use of a cushion that holds the body away from the seatback is not recommended.

⚠ WARNING

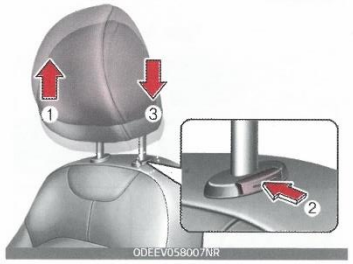
Headrest removal/adjustment

- Do not operate the vehicle with the headrests removed. Headrests can provide critical neck and head support in a crash.
- Do not adjust the headrest height while the vehicle is in motion. Driver may lose control of the vehicle.

⚠ CAUTION

Excessive pulling or pushing may damage the headrest.

Adjusting the height up and down



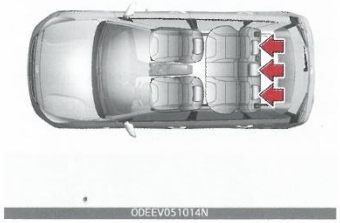
To raise the headrest:

1. Pull it up to the desired position (1).
2. To lower the headrest, push and hold the release button (2) on the headrest support.
3. Lower the headrest to the desired position (3).

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

Headrest for rear seat

The rear seat is equipped with headrests in all the seating positions for the occupant's safety and comfort.

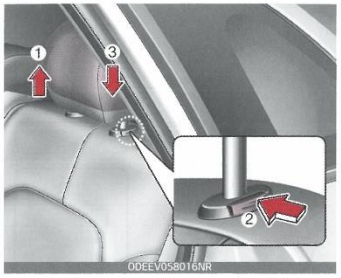


The headrest not only provides comfort for passengers, but also helps protect the head and neck in the event of a collision.

For maximum effectiveness in case of an accident, the headrest should be adjusted so the middle of the headrest is at the same height of the center of gravity of an occupant's head. Generally, the center of gravity of most people's heads is similar with the height as the top of their eyes.

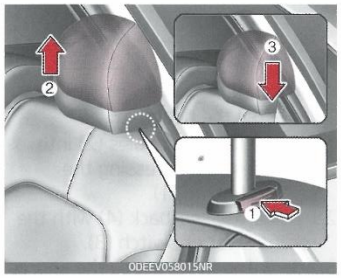
Also, adjust the headrest as close to your head as possible. For this reason, the use of a cushion that holds the body away from the seatback is not recommended.

Adjusting the height up and down



- To raise the headrest, pull it up to the desired position (1).
- To lower the headrest, push and hold the release button (2) on the headrest support and lower the headrest to the desired position (3).

Removal and reinstallation



- To remove the headrest, raise it as far as it can go then press the release button (1) while pulling the headrest upward (2).
- To reinstall the headrest, put the headrest poles (3) into the holes

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

Figure 305-1: Auxiliary Power Module Warning Label

Figure 305-2: Power Inverter Warning Label

Figure 305-3 First Responder Warning Label

Figure 305-4: First Responder Warning Label Location

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

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

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

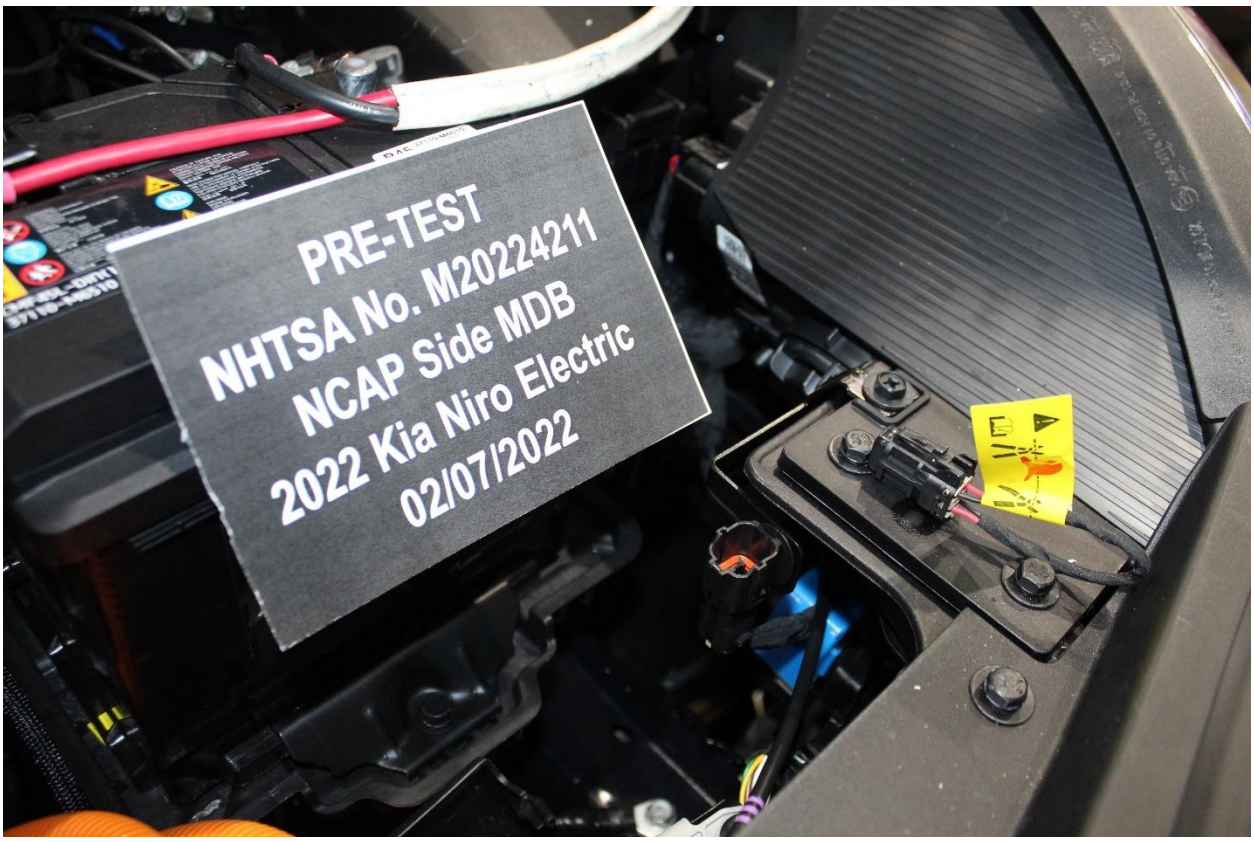


Figure 305-8: Manual High Voltage Service Disconnect Removed Location

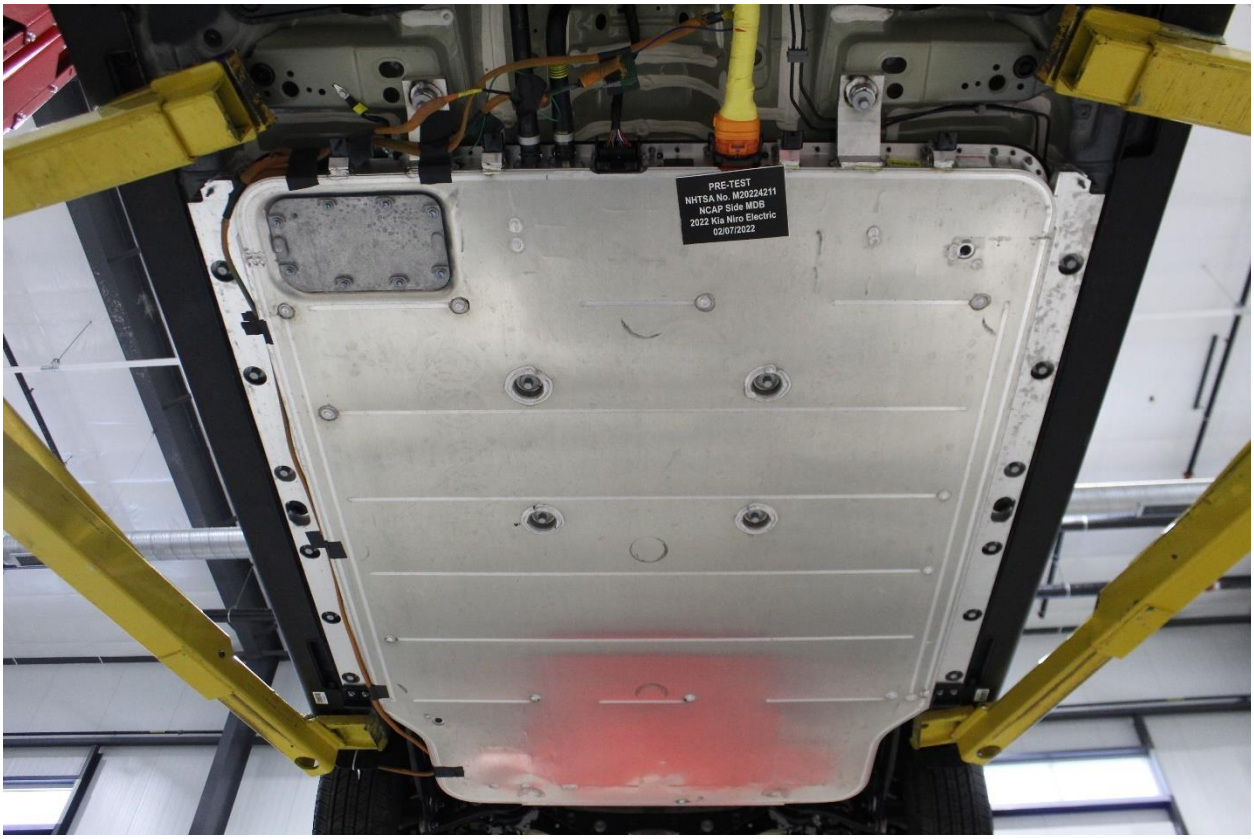


Figure 305-9: Pre-Impact View of Propulsion Battery

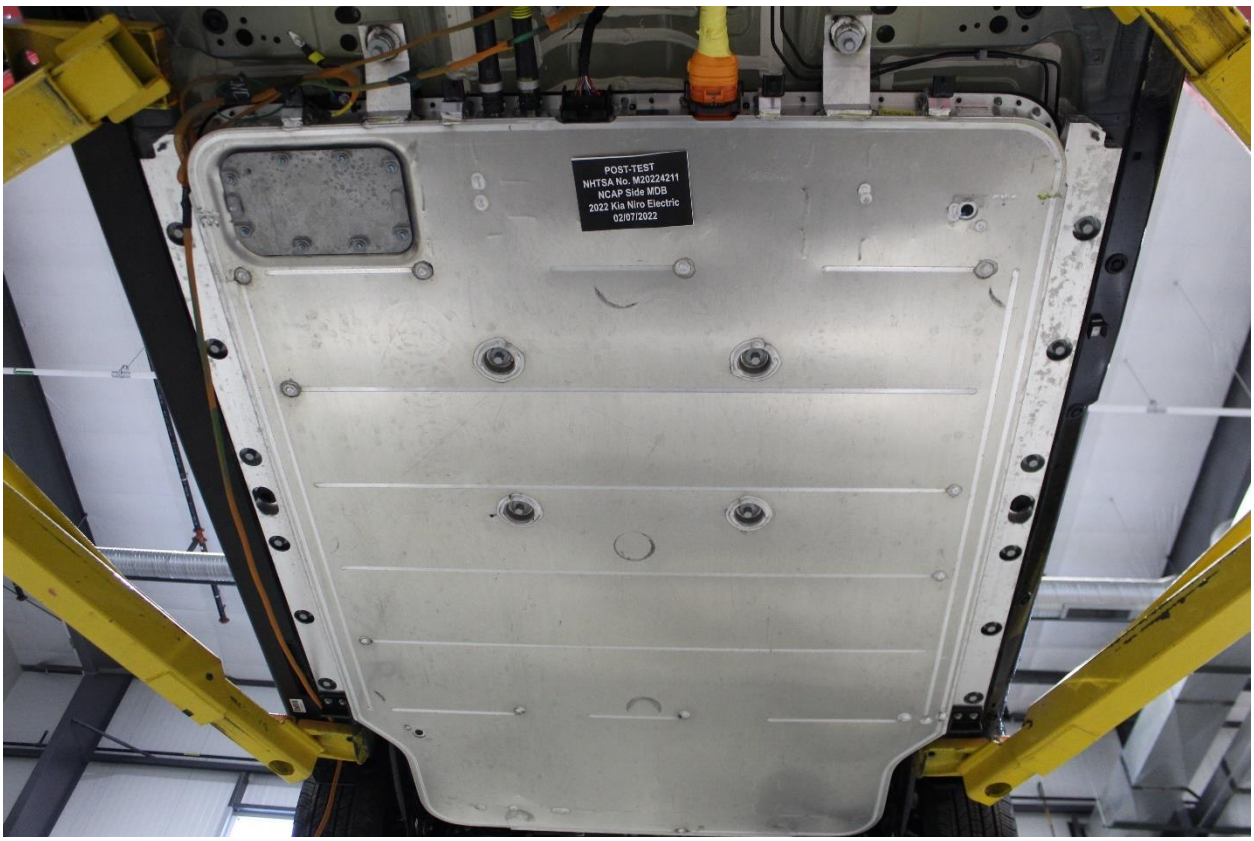


Figure 305-10: Post-Impact Front View of Propulsion Battery

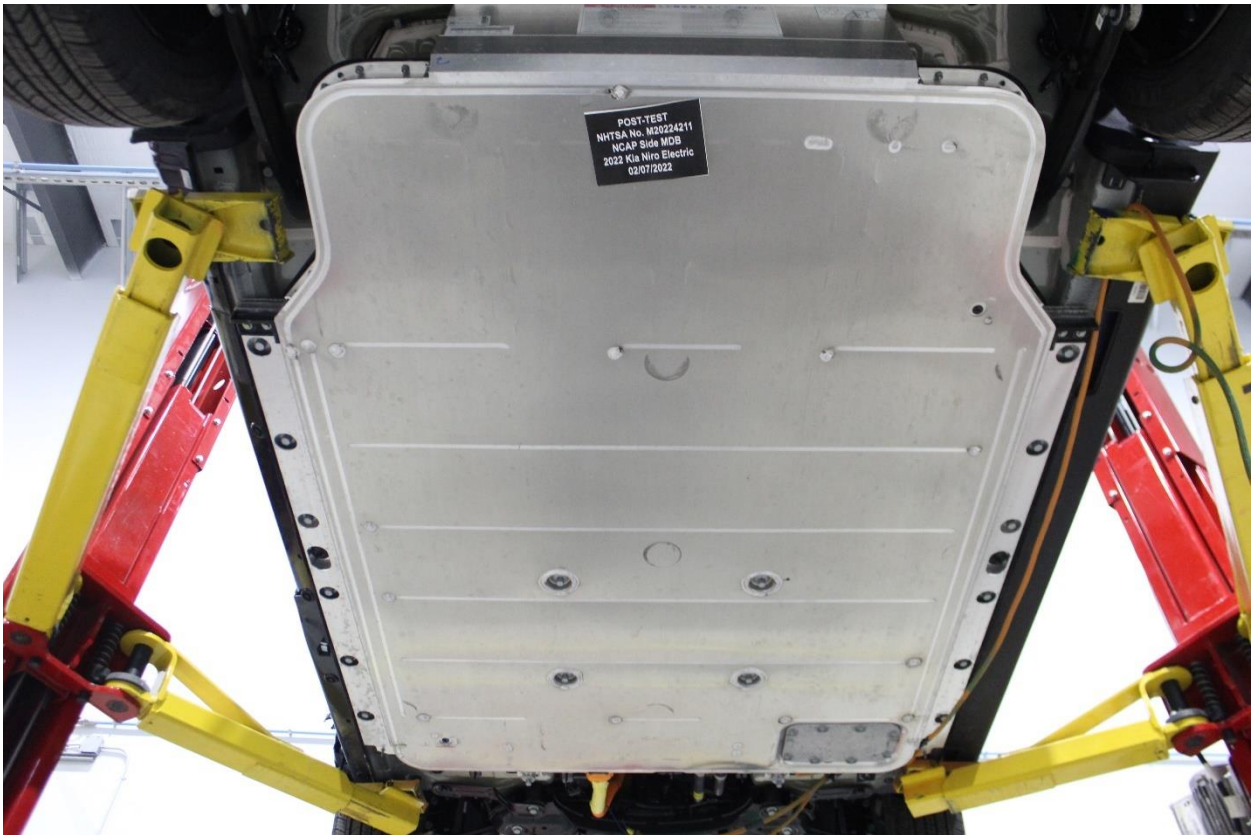


Figure 305-11: Post-Impact Rear View of Propulsion Battery (if any part of it is visible)

Photo Not Applicable

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

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

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

Photo Not Applicable

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

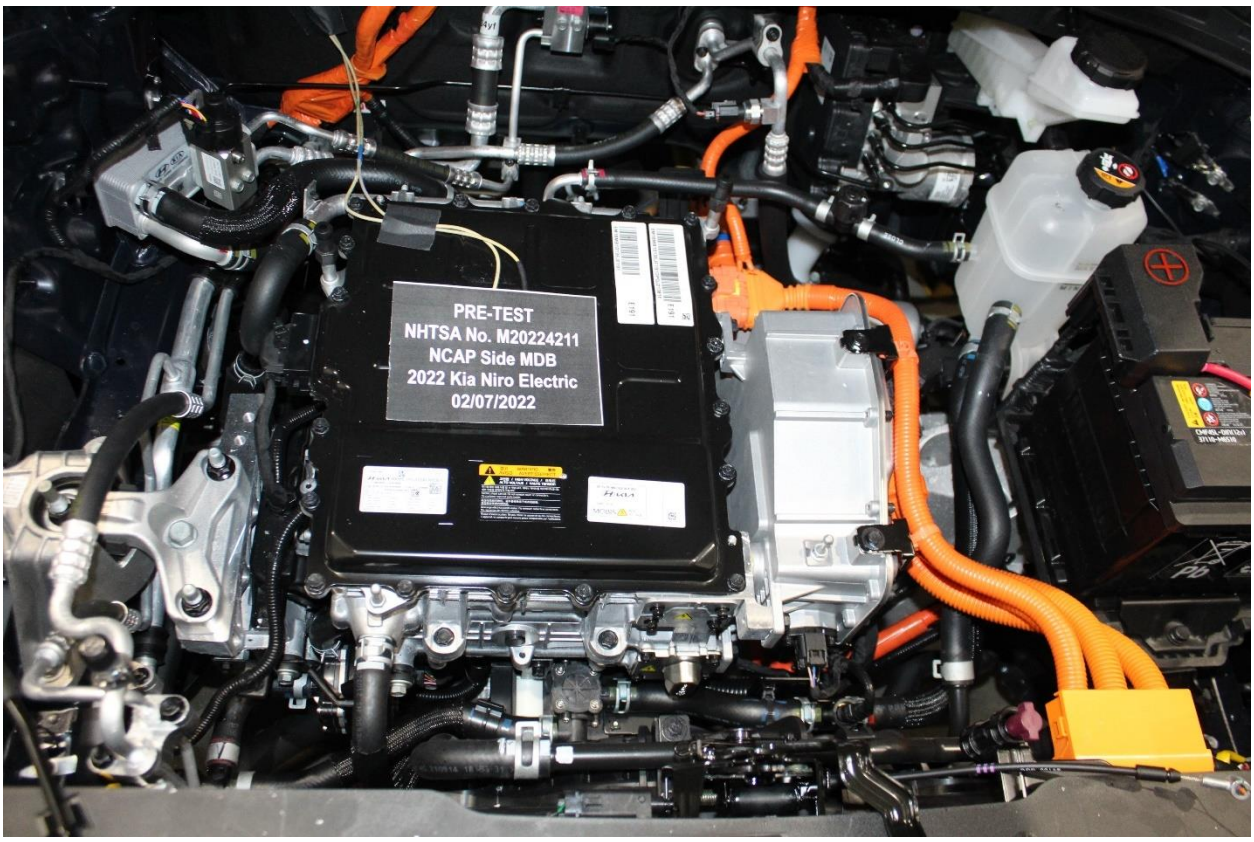


Figure 305-16: Pre-Impact View of Electric Propulsion Drive

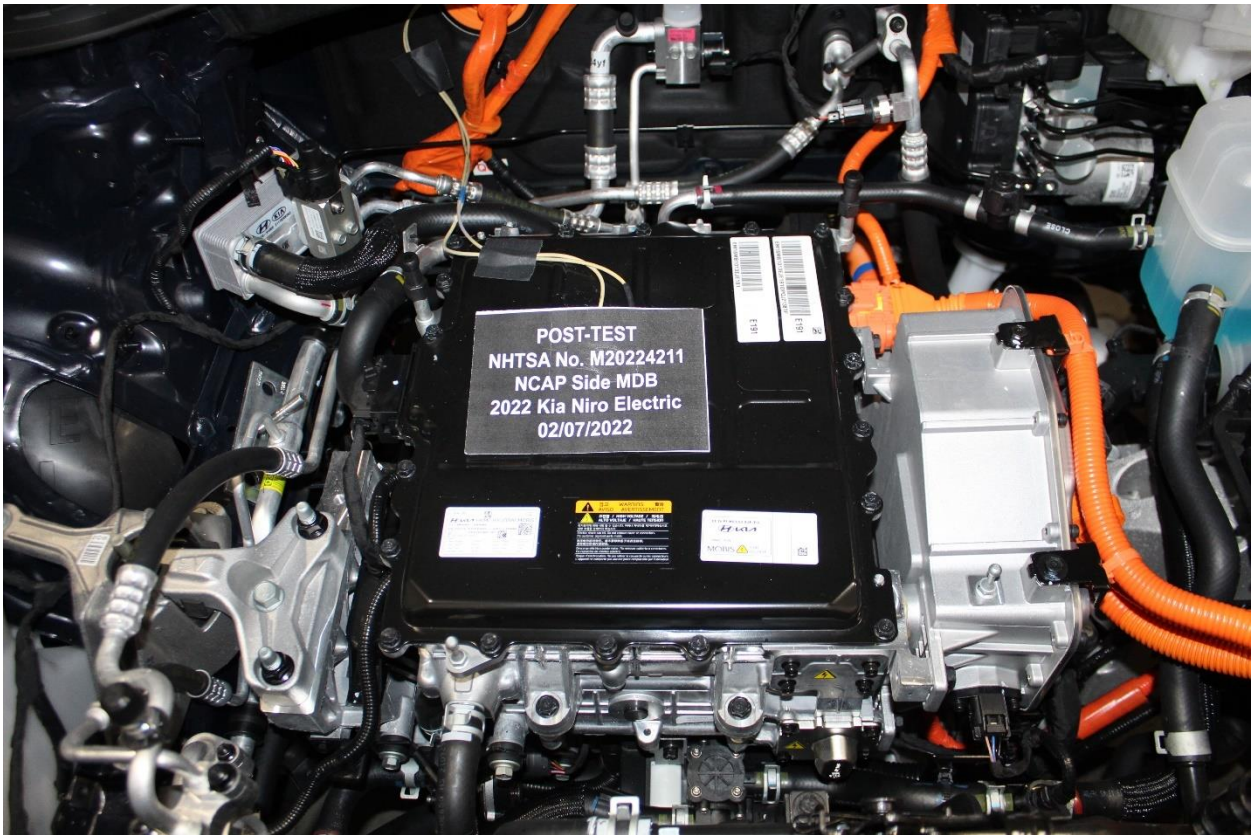


Figure 305-17: Post-Impact View of Electric Propulsion Drive

Photo Not Applicable

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

Photo Not Applicable

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

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

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

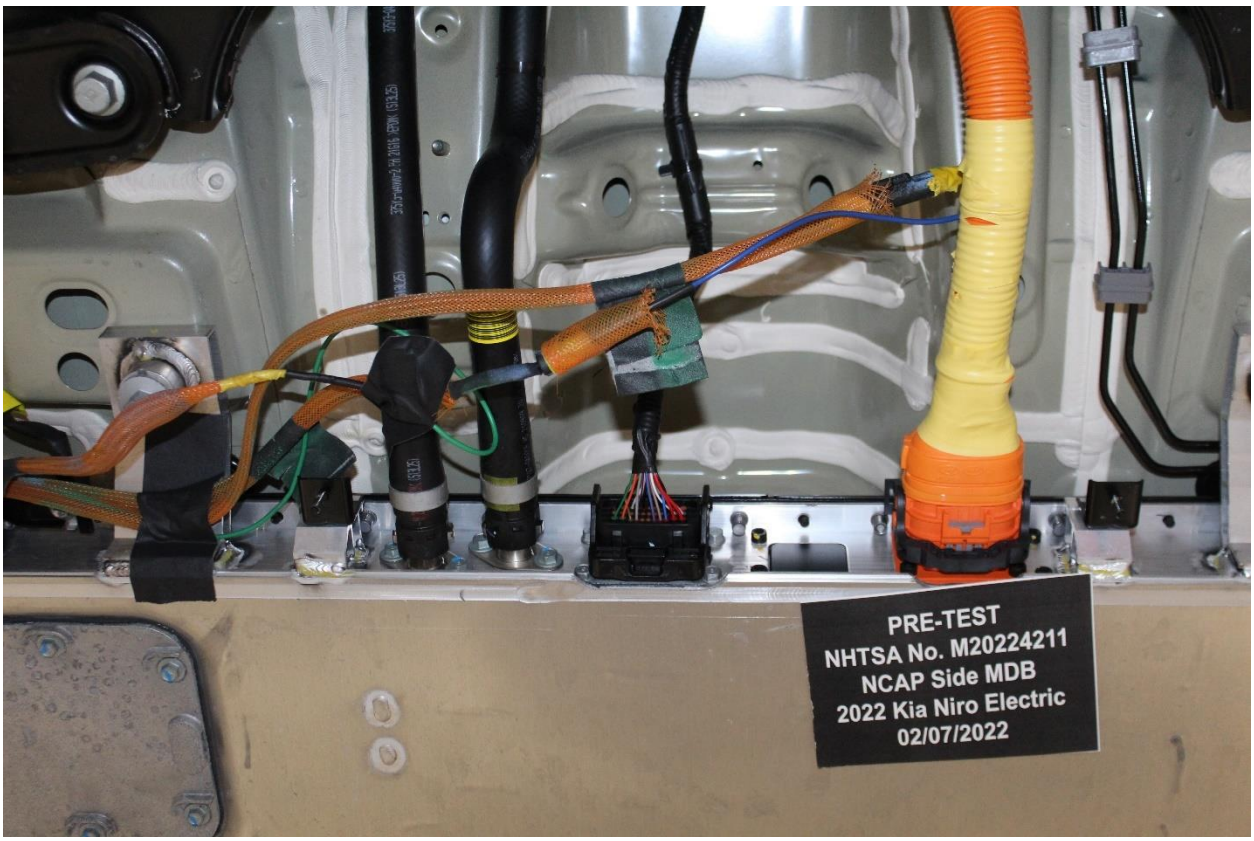


Figure 305-22: Pre-Impact View of High Voltage Leads Attached

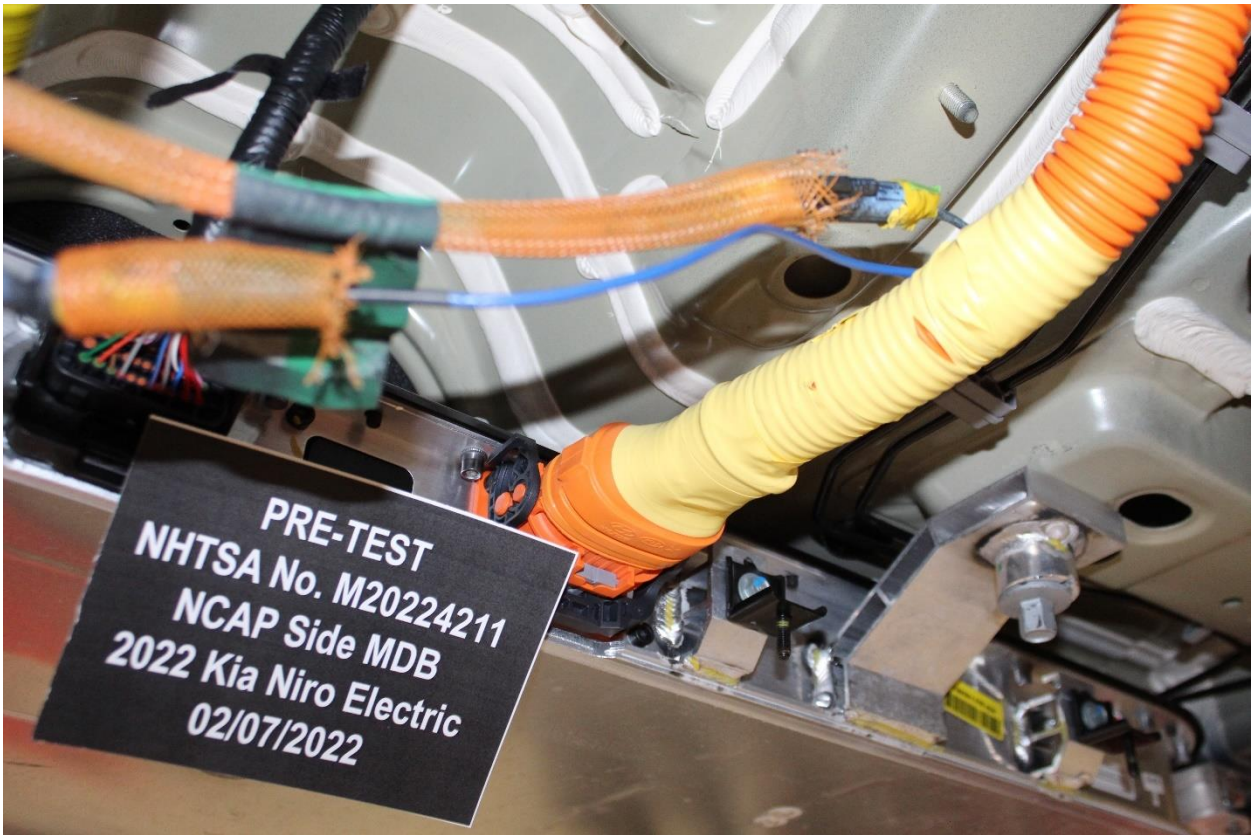


Figure 305-23: Pre-Impact Close Up View of High Voltage Leads Attached

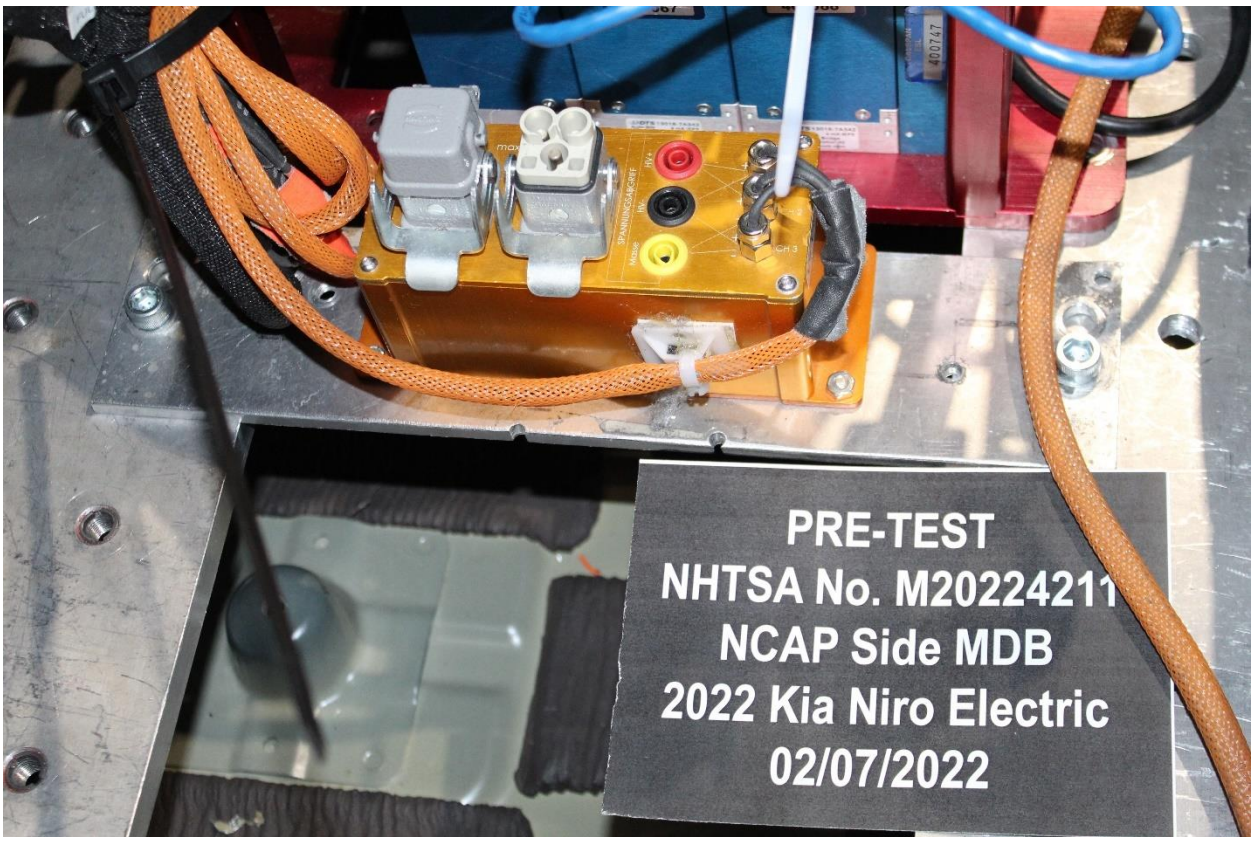


Figure 305-24: Pre-Impact View of Installed Test Interface Port

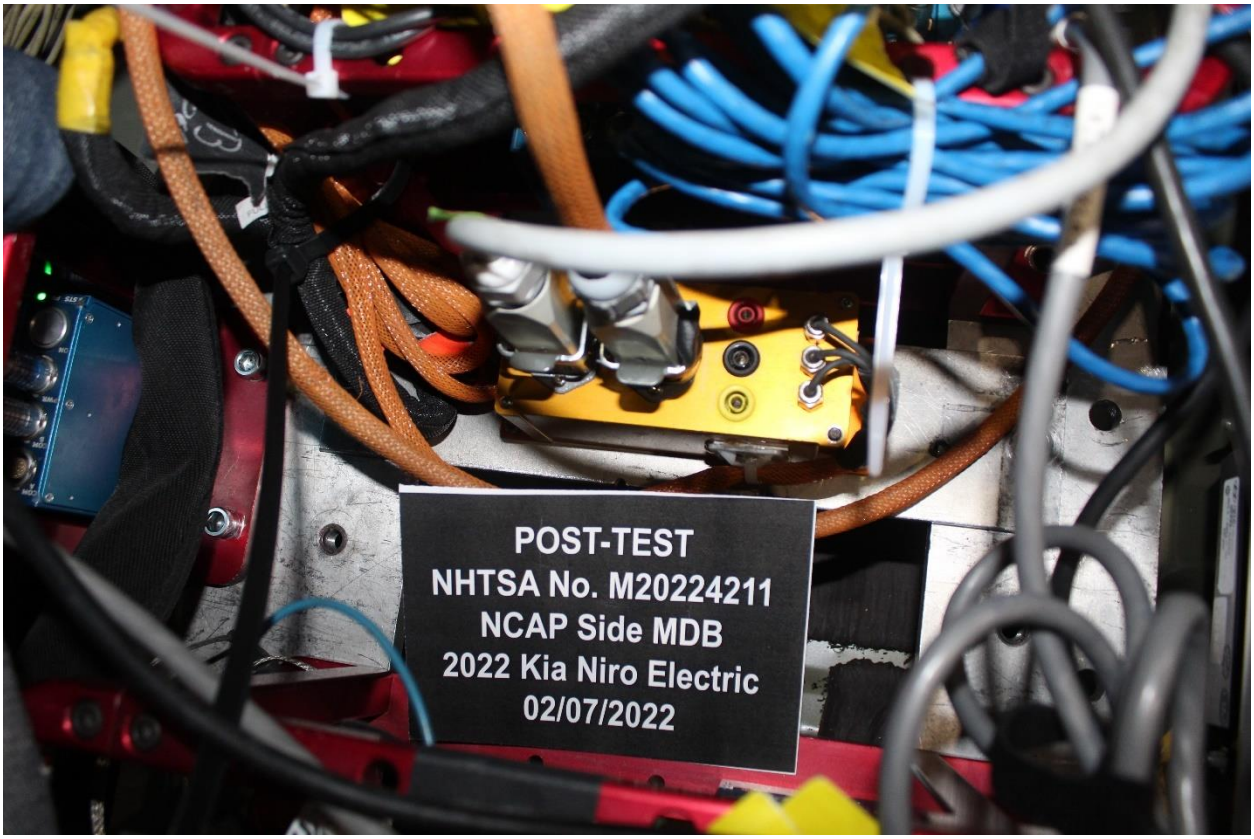


Figure 305-25: Post-Impact View of Installed Test Interface Port

Photo Not Applicable

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

Photo Not Applicable

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

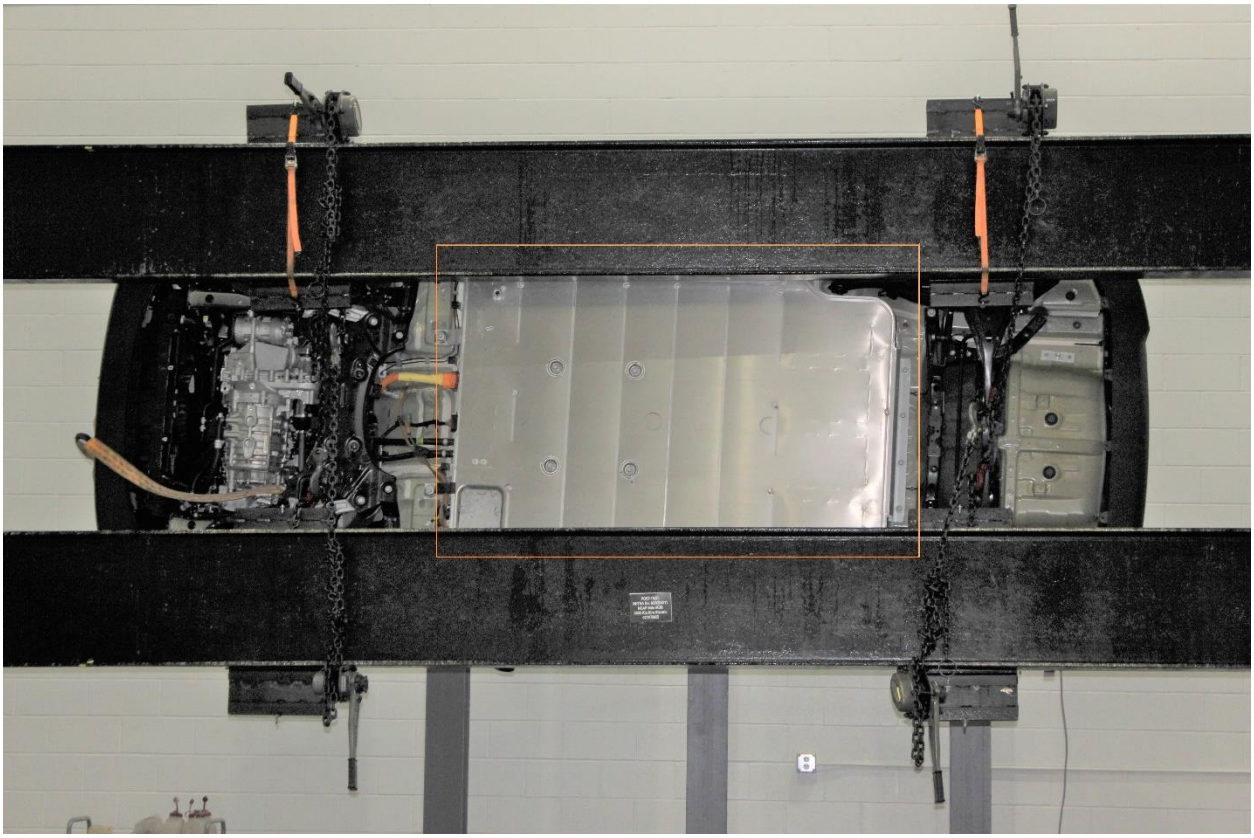


Figure 305-28: FMVSS No. 305 Static Rollover 90 Degrees

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

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

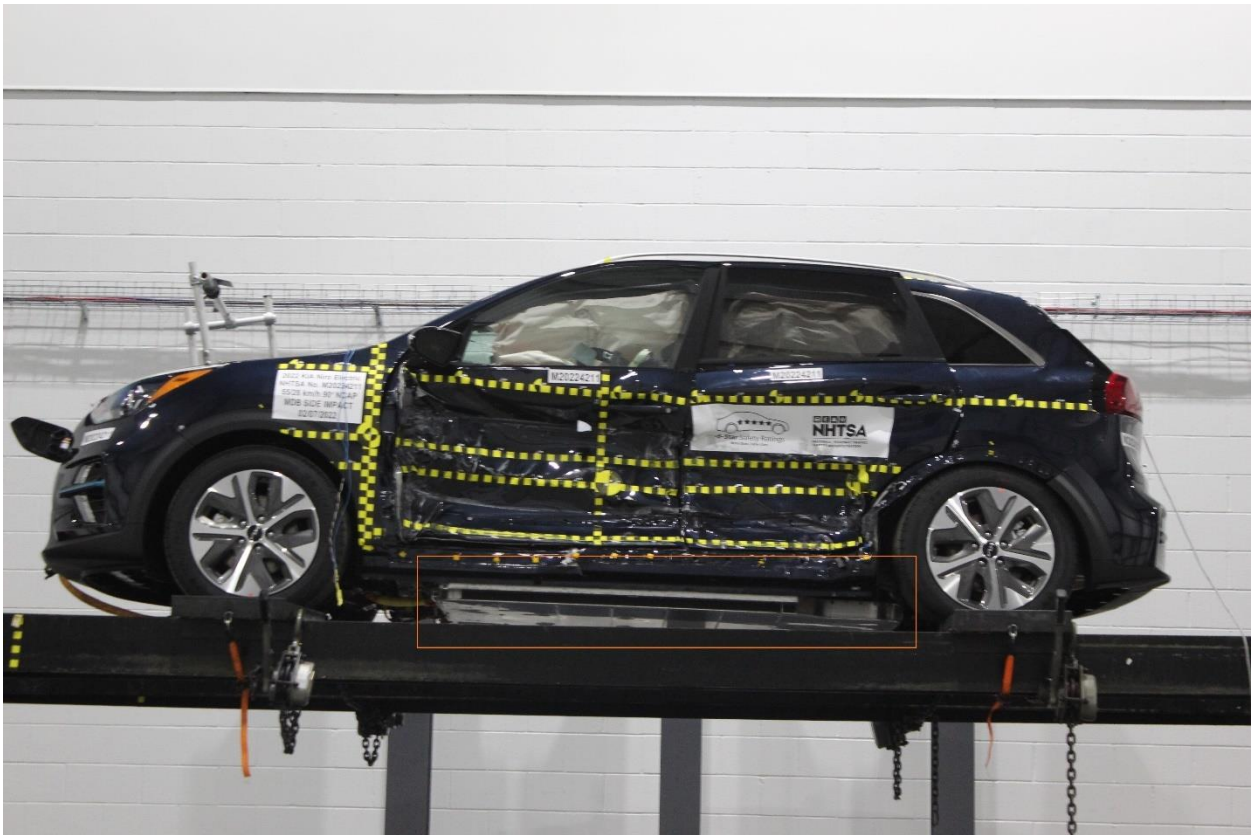


Figure 305-31: FMVSS No. 305 Static Rollover 360 Degrees

Photo Not Applicable

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

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

Photo Not Applicable

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

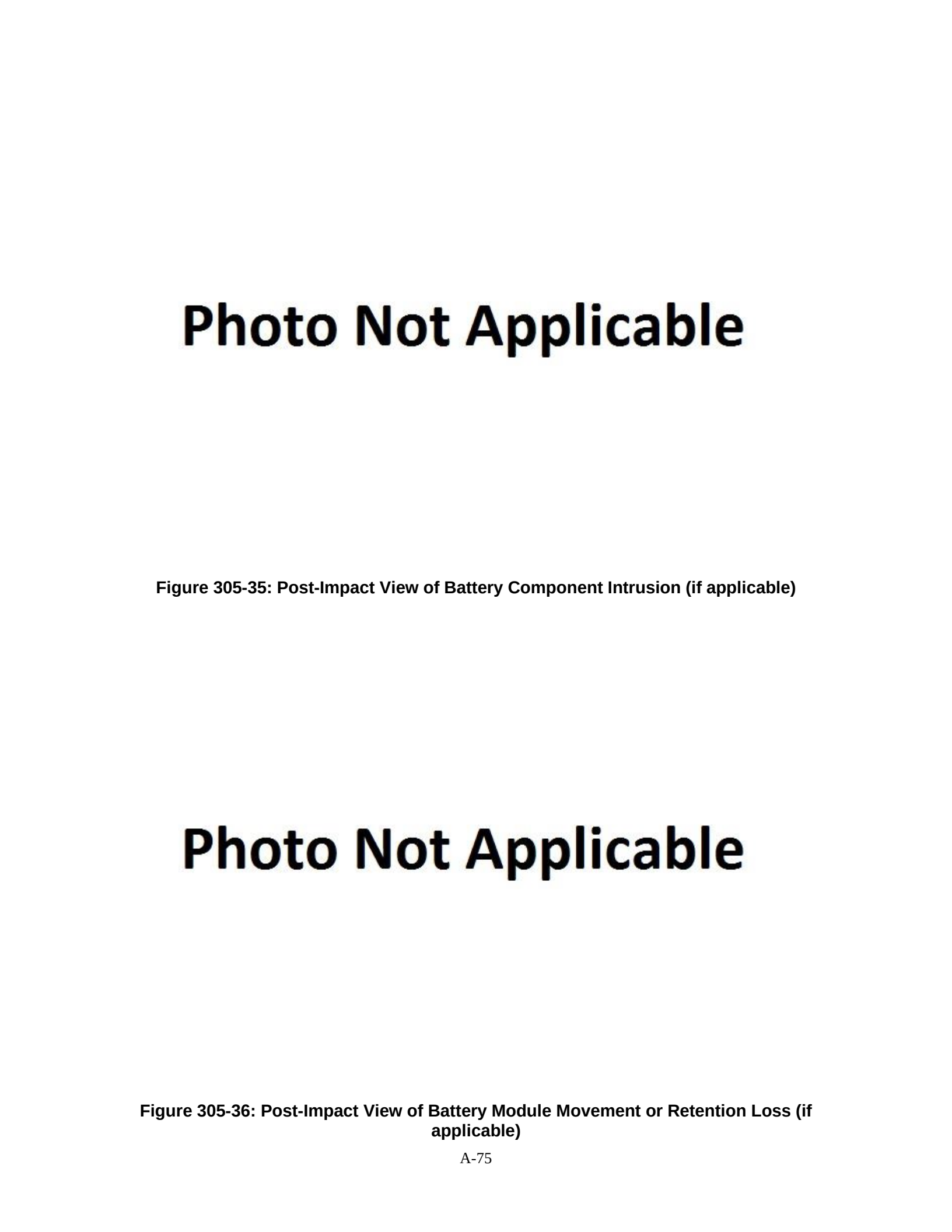


Figure 305-35: Post-Impact View of Battery Component Intrusion (if applicable)

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

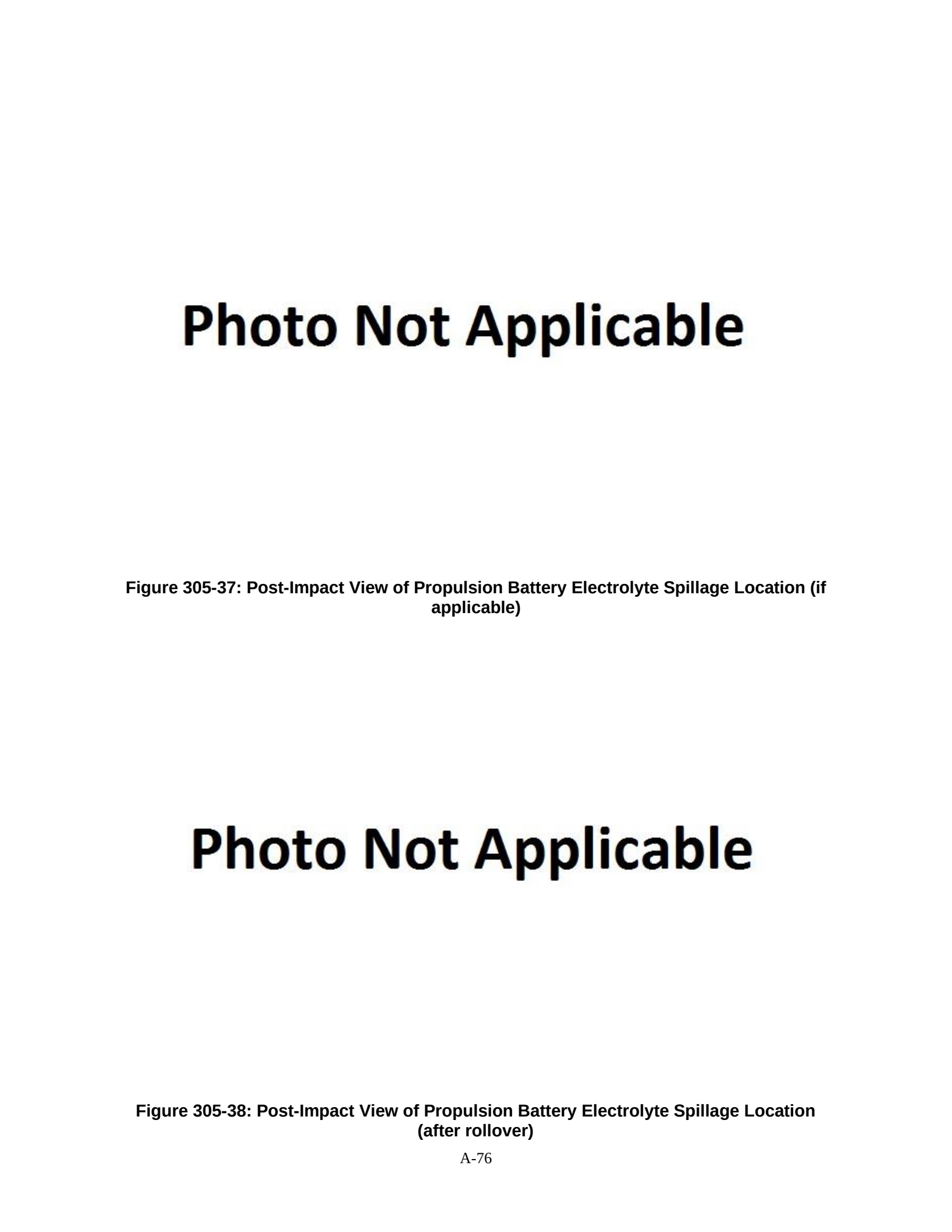


Figure 305-37: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (if applicable)

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

APPENDIX B

VEHICLE 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)

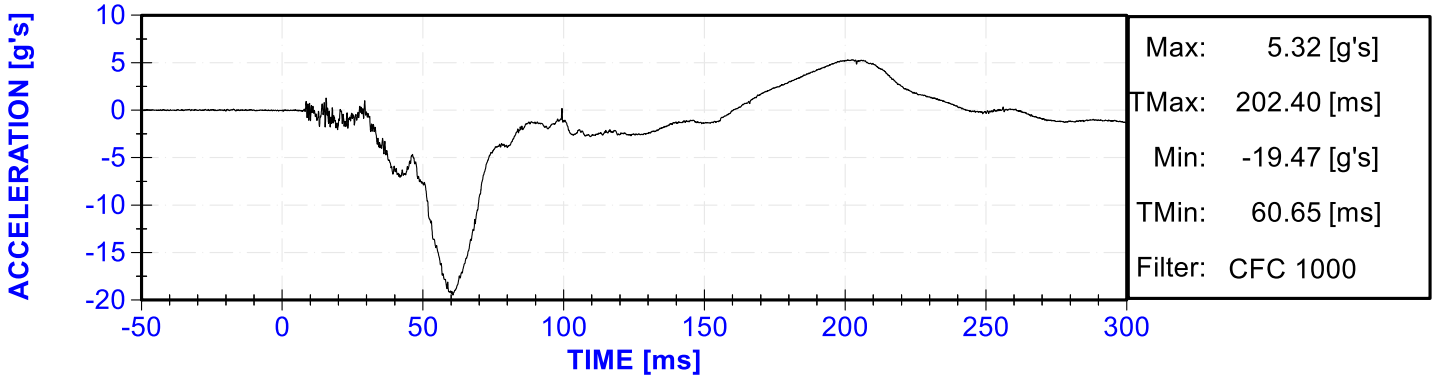
Vehicle Instrumentation Data

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)

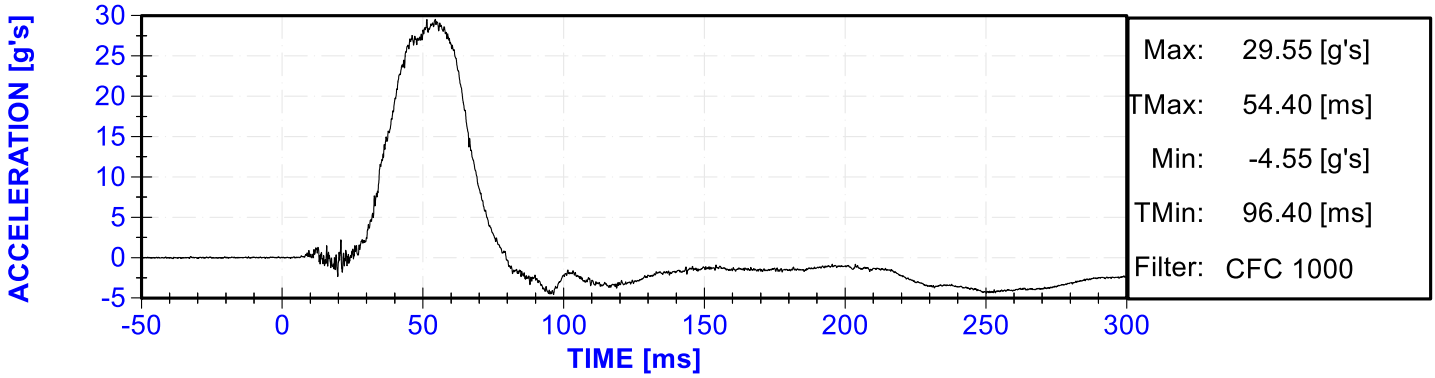
MDB Instrumentation Data

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

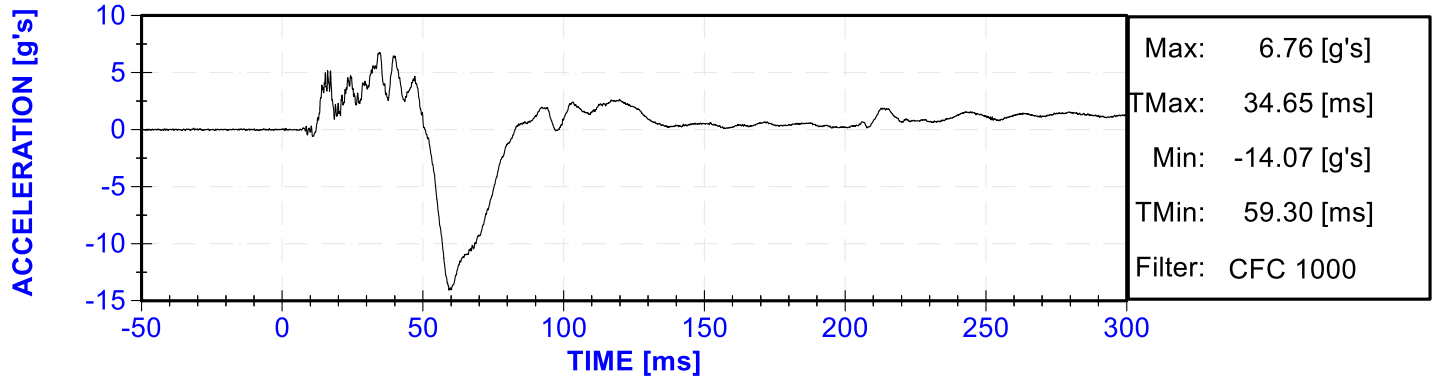
Driver Head Acceleration (X) Primary vs. Time



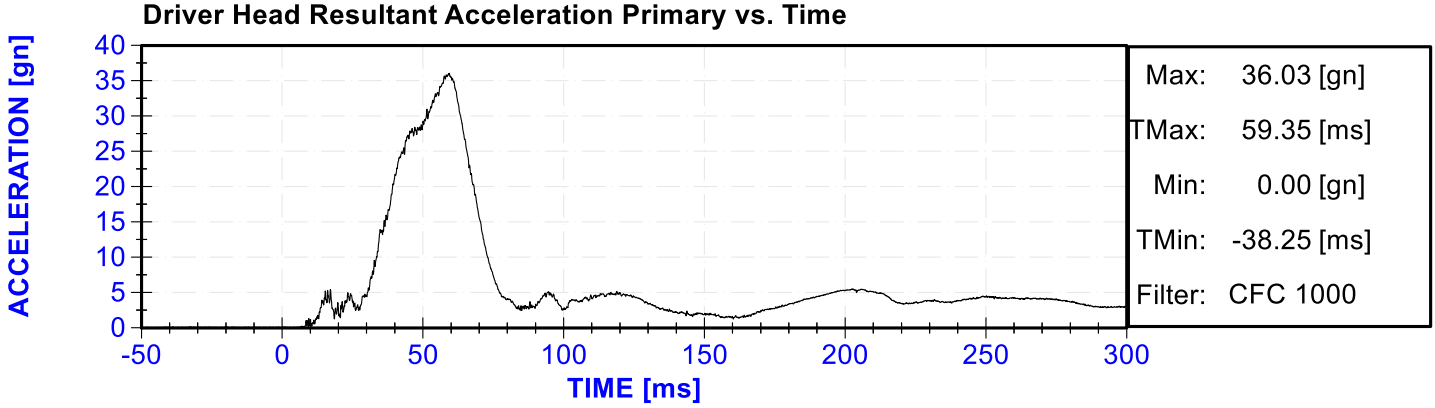
Driver Head Acceleration (Y) Primary vs. Time



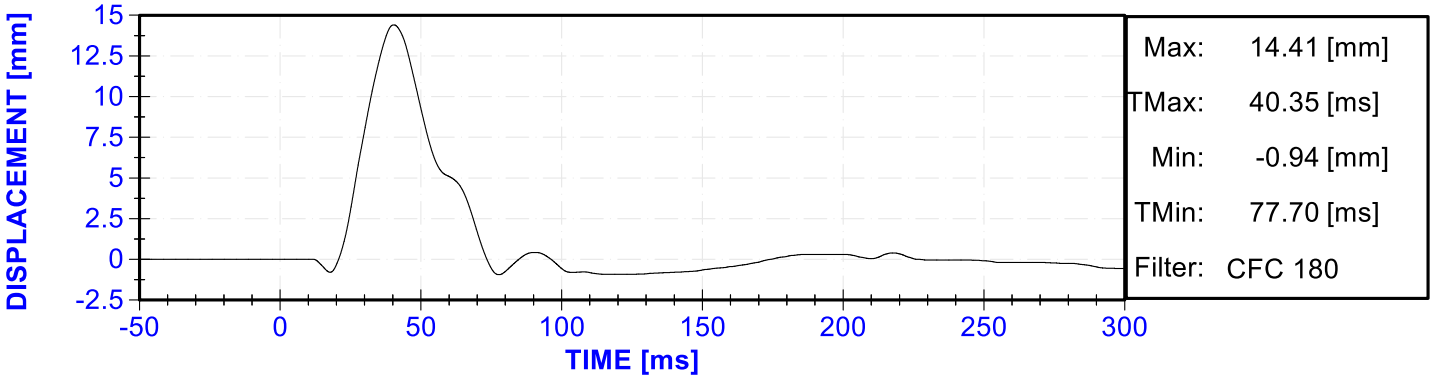
Driver Head Acceleration (Z) Primary vs. Time



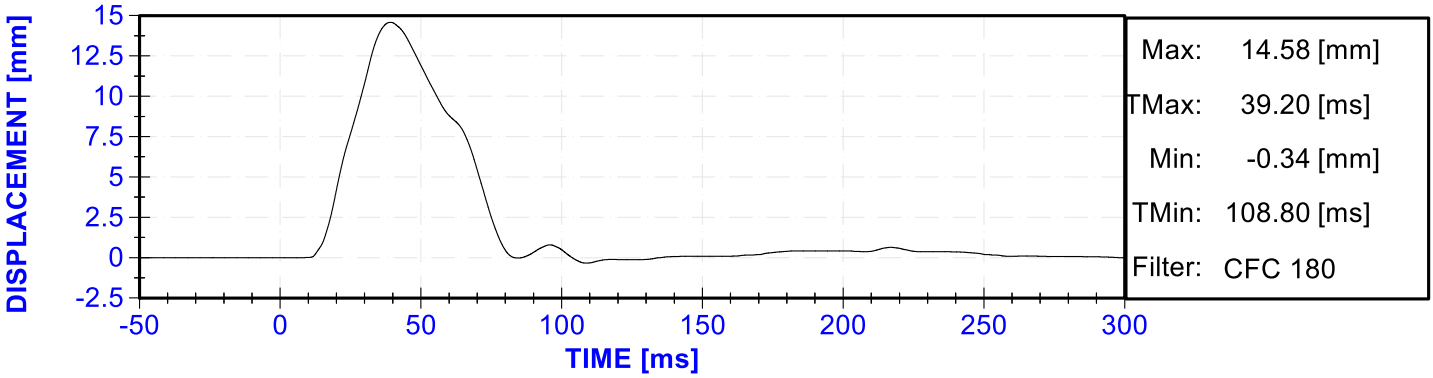
Driver Head Resultant Acceleration Primary vs. Time



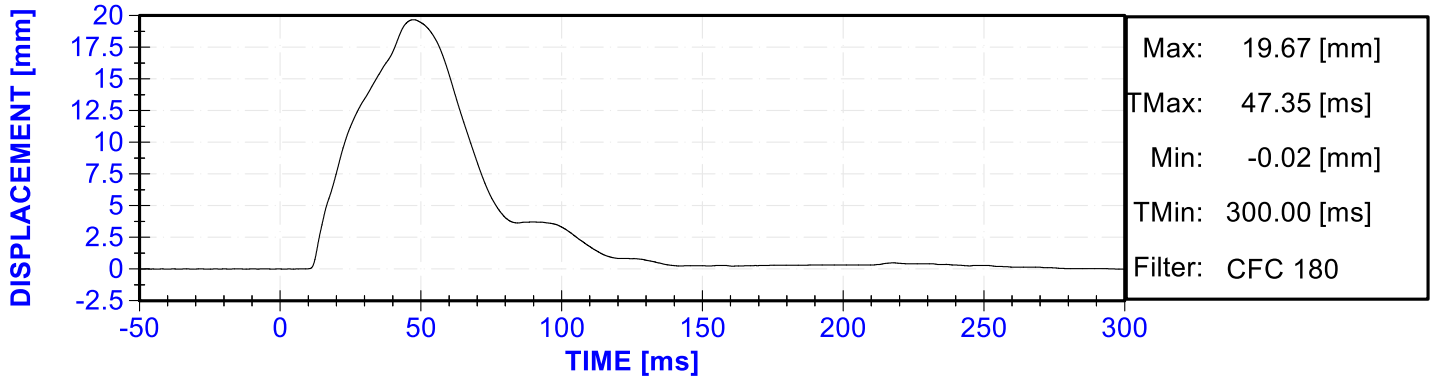
Driver Upper Thorax Rib Deflection (Y) vs. Time



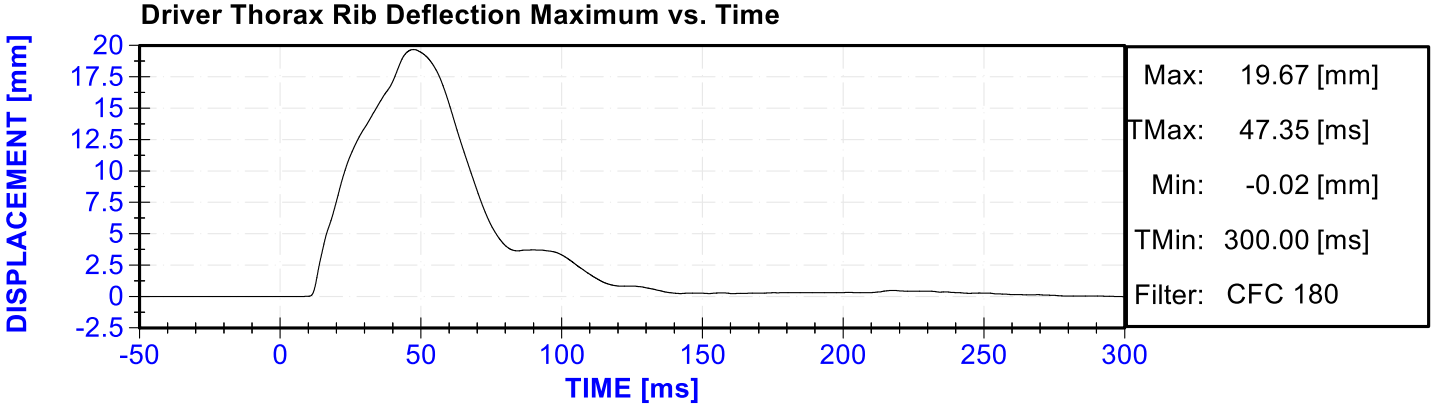
Driver Middle Thorax Rib Deflection (Y) vs. Time



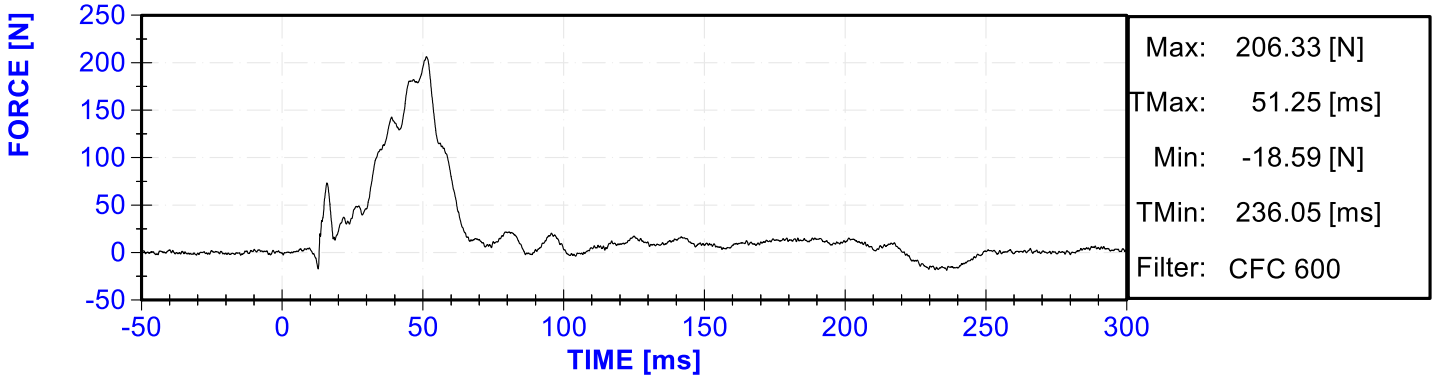
Driver Lower Thorax Rib Deflection (Y) vs. Time



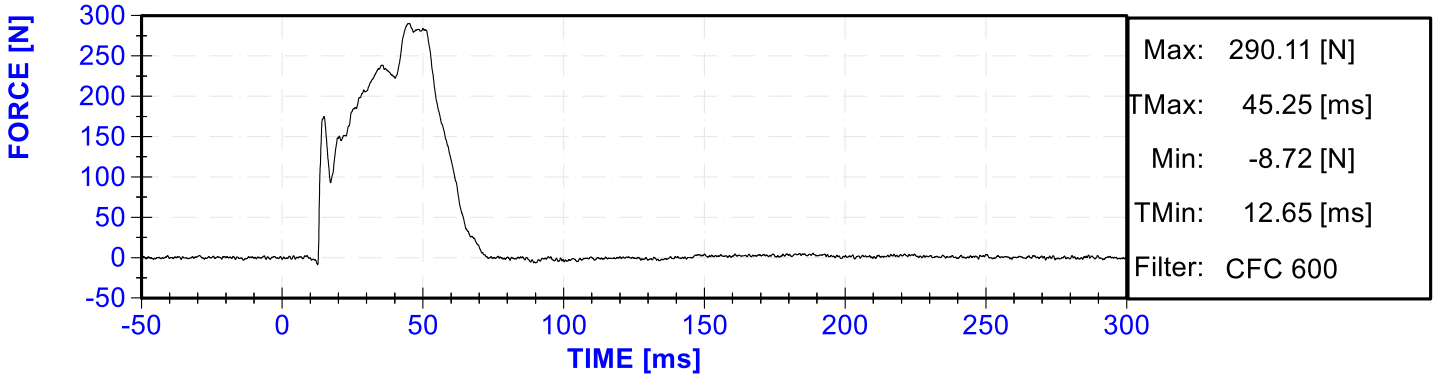
Driver Thorax Rib Deflection Maximum vs. Time



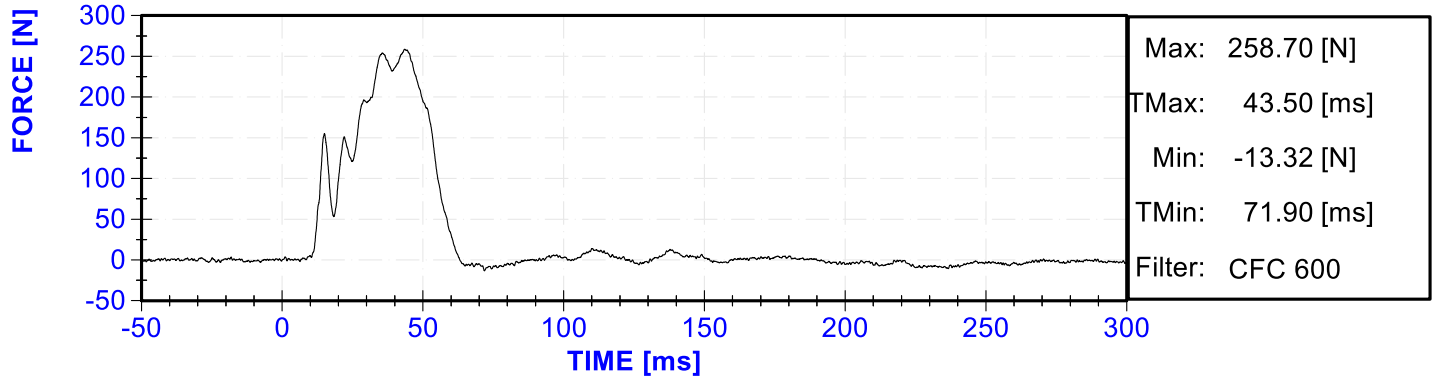
Driver Anterior Abdominal Force (Y) vs. Time



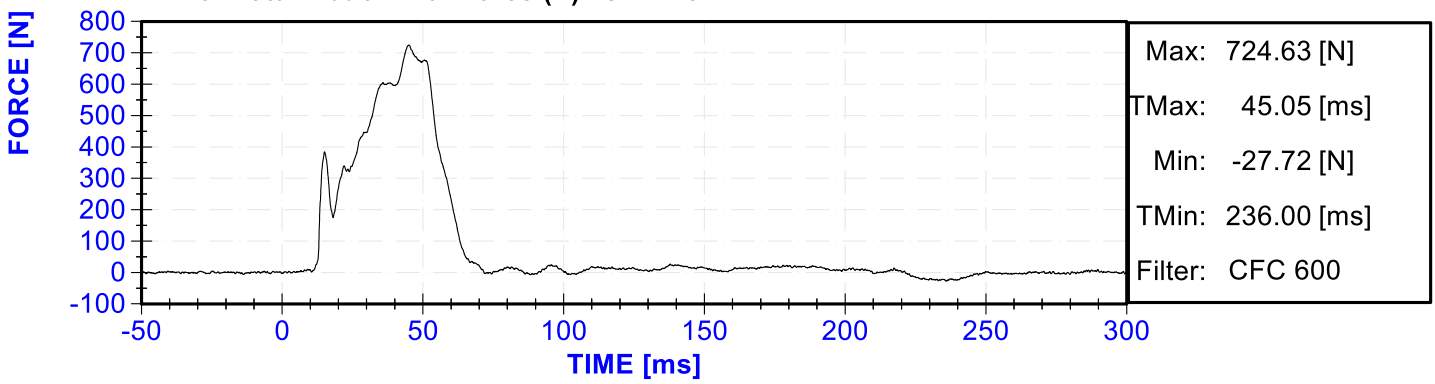
Driver Middle Abdominal Force (Y) vs. Time



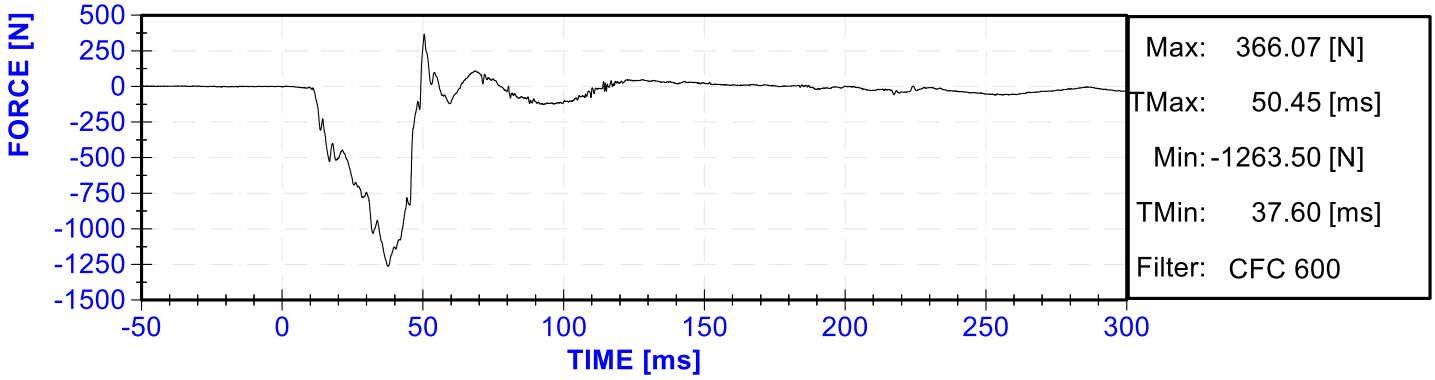
Driver Posterior Abdominal Force (Y) vs. Time



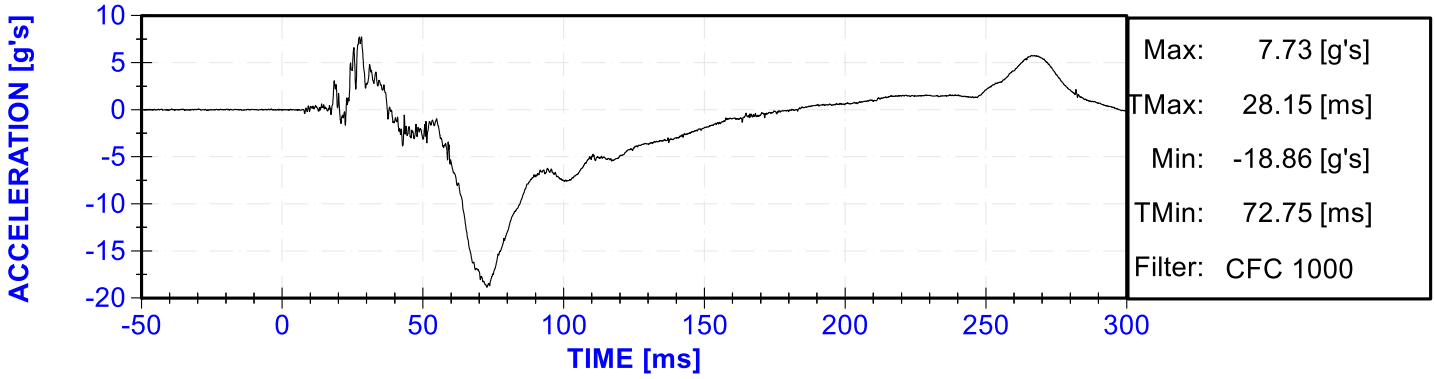
Driver Total Abdominal Force (Y) vs. Time



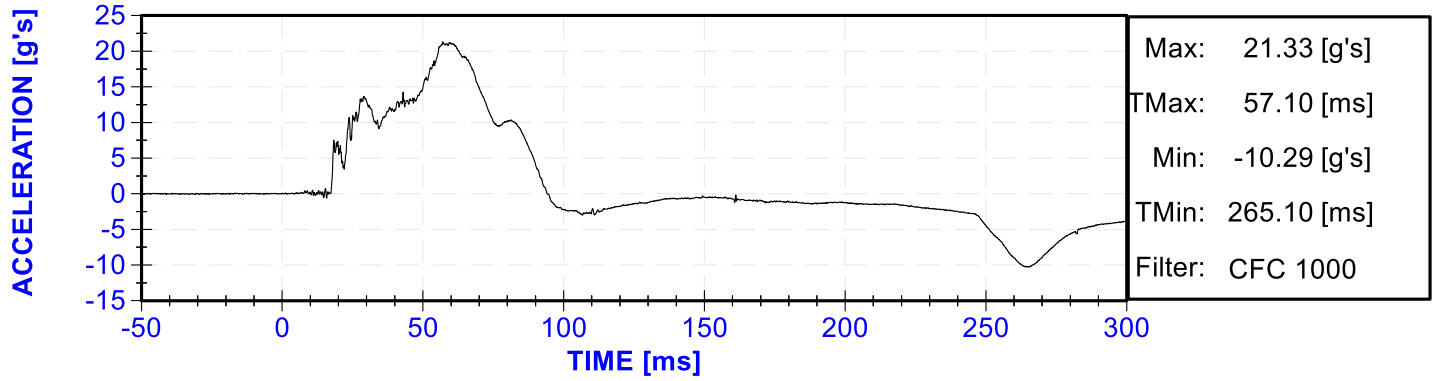
Driver Pubic Symphysis Force (Y) vs. Time



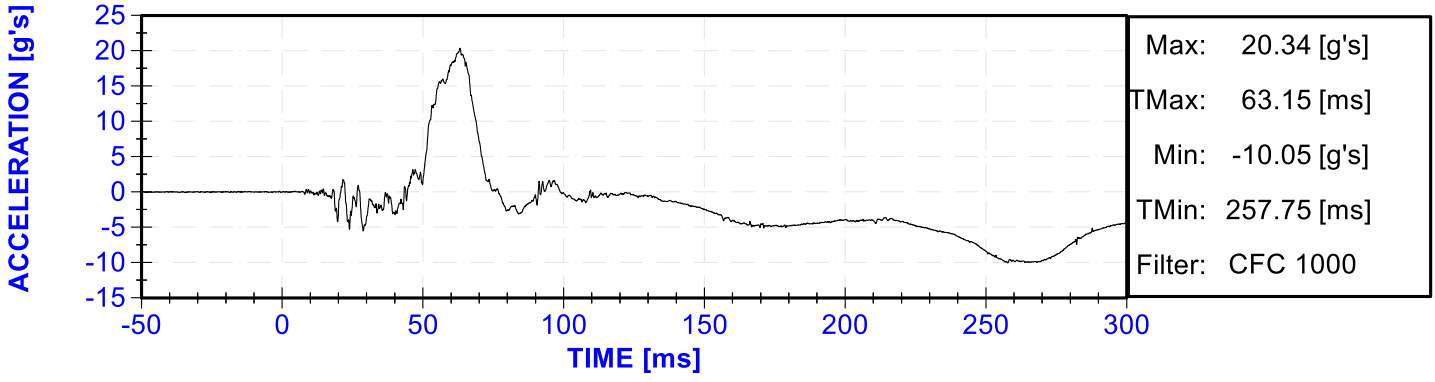
Passenger Head Acceleration (X) vs. Time Primary



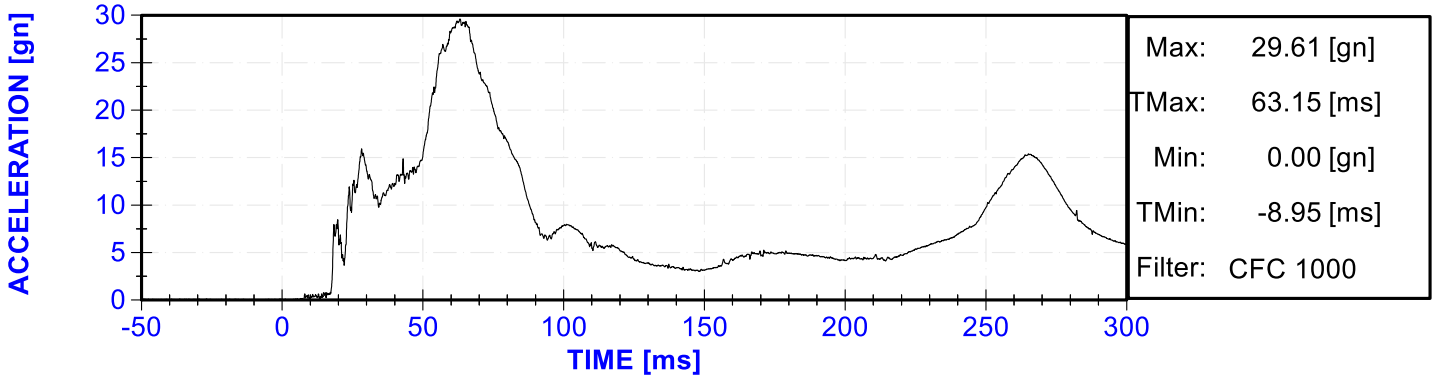
Passenger Head Acceleration (Y) vs. Time Primary



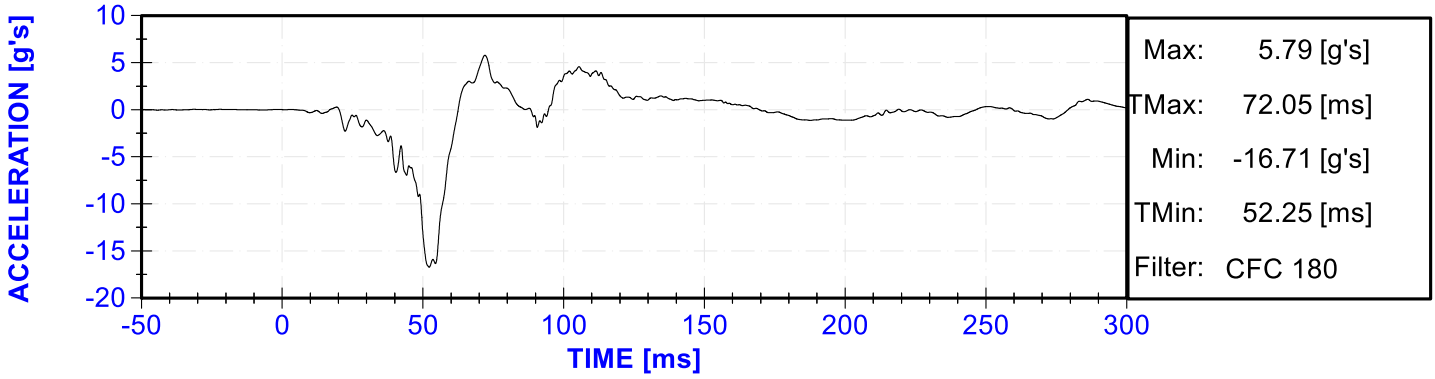
Passenger Head Acceleration (Z) vs. Time Primary



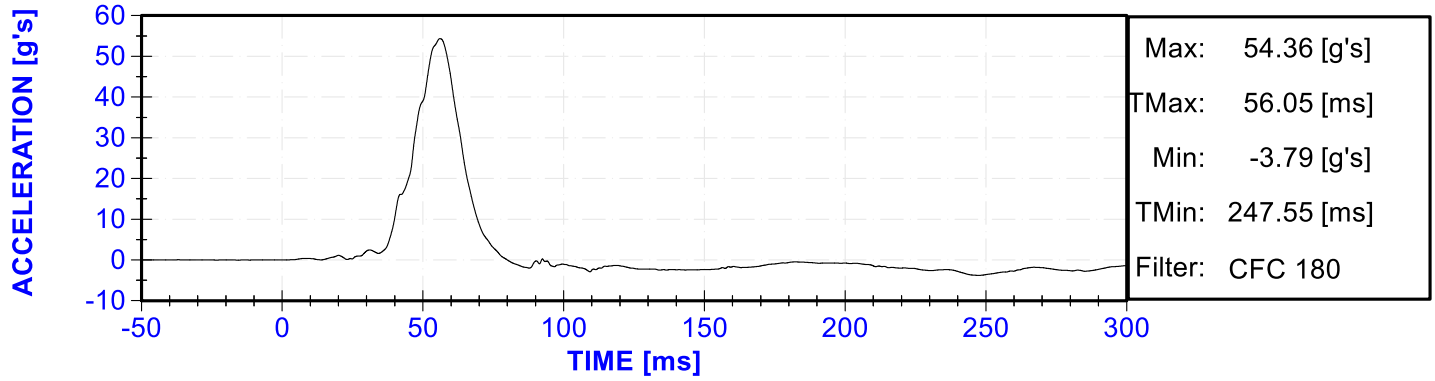
Passenger Head Resultant Acceleration Primary vs. Time



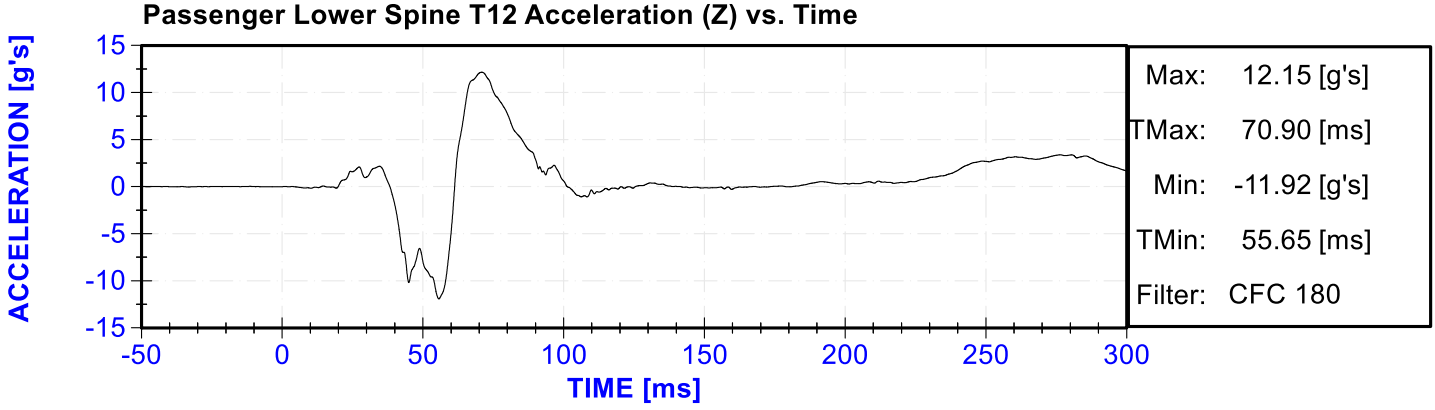
Passenger Lower Spine T12 Acceleration (X) vs. Time



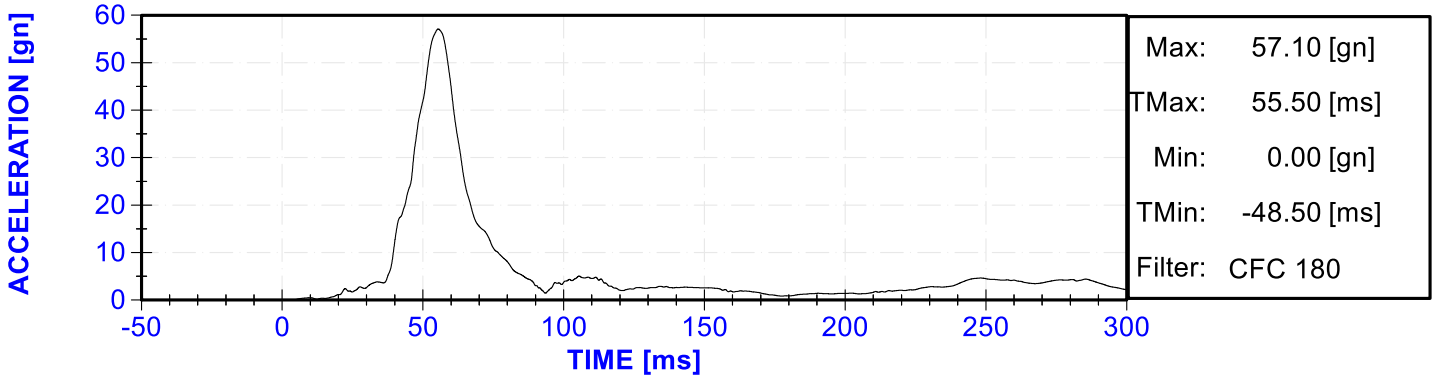
Passenger Lower Spine T12 Acceleration (Y) vs. Time



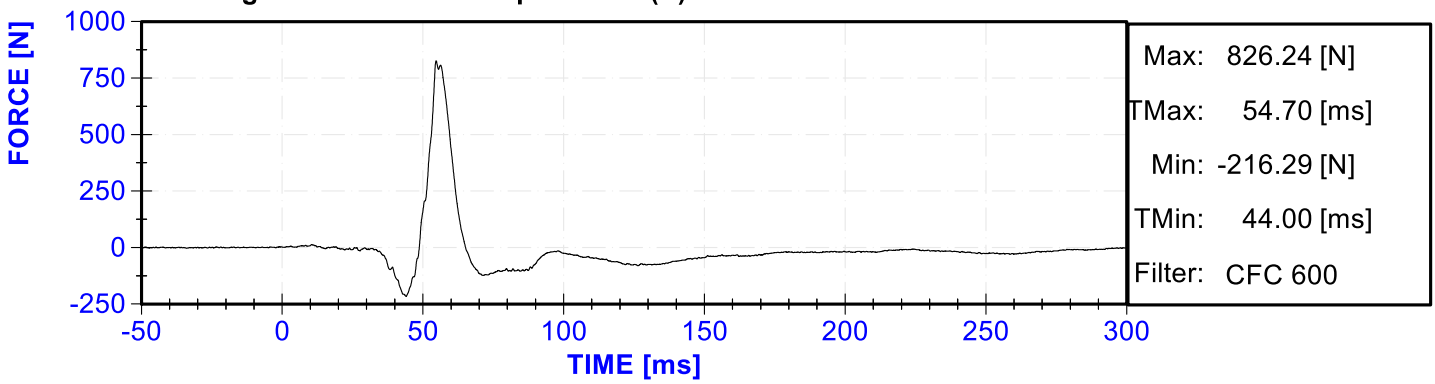
Passenger Lower Spine T12 Acceleration (Z) vs. Time



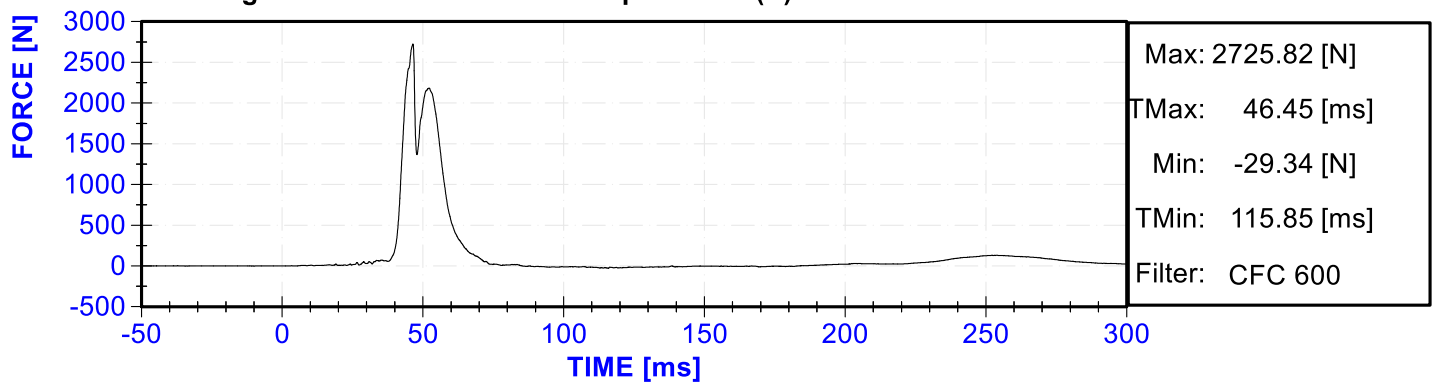
Passenger Lower Spine T12 Resultant Acceleration vs. Time



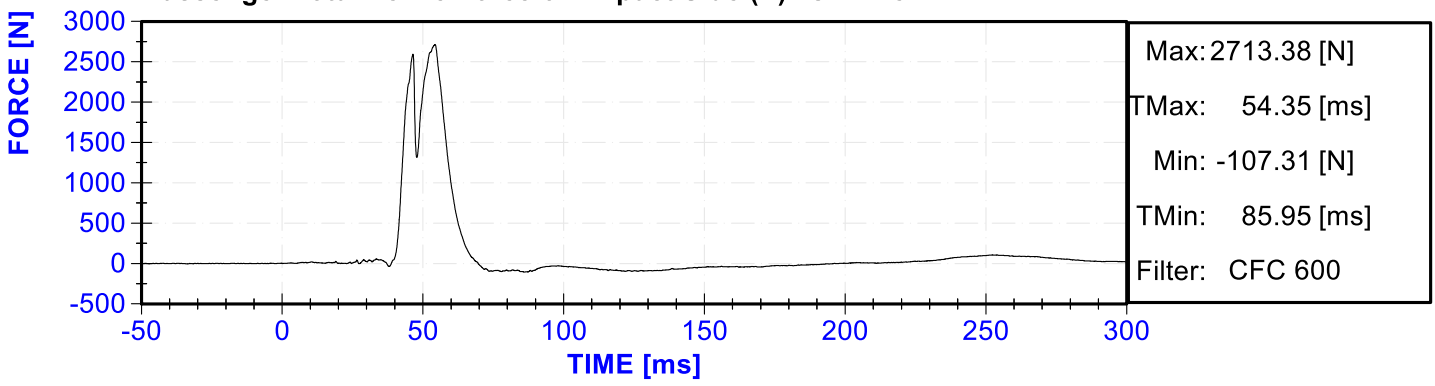
Passenger Iliac Force on Impact Side (Y) vs. Time



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

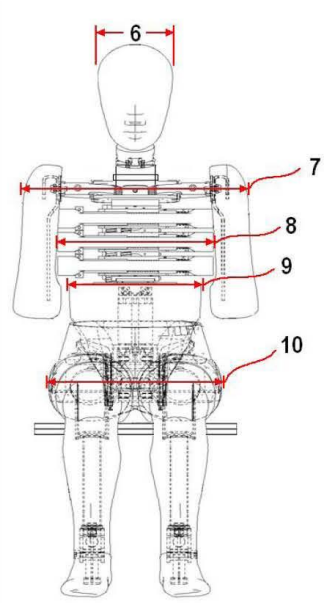
SERIAL NO: F033

(CONFIGURED FOR LEFT SIDE IMPACT)

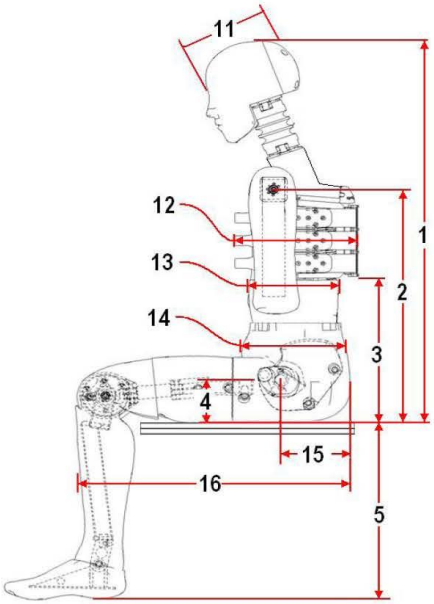
External Measurements - EuroSID-2re

Technician: J.Pericak Date: 2/3/2022

Dummy Serial Number: F033



FRONT VIEW



SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	910	Pass
2	Seat to Shoulder Joint	558	572	567	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	351	Pass
4	Seat to Hip Joint (center of bolt)	97	103	98	Pass
5	Sole to Seat, Sitting	333	451	429	Pass
6	Head Width	152	158	155	Pass
7	Shoulder/Arm Width	461	479	472	Pass
8	Thorax Width	322	332	327	Pass
9	Abdomen Width	273	287	285	Pass
10	Pelvis Lap Width	359	373	365	Pass
11	Head Depth	196	206	201	Pass
12	Thorax Depth	262	272	267	Pass
13	Abdomen Depth	194	204	199	Pass
14	Pelvis Depth	235	245	241	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	156	Pass
16	Back of Buttocks to Front Knee	597	615	609	Pass

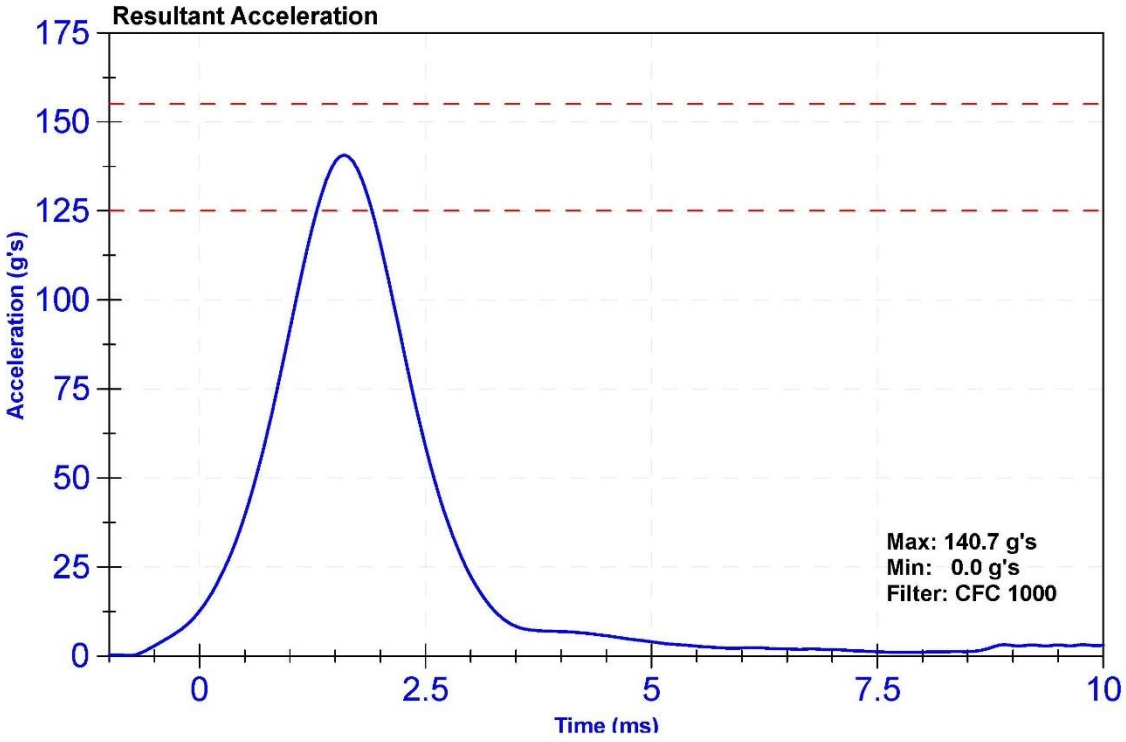
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

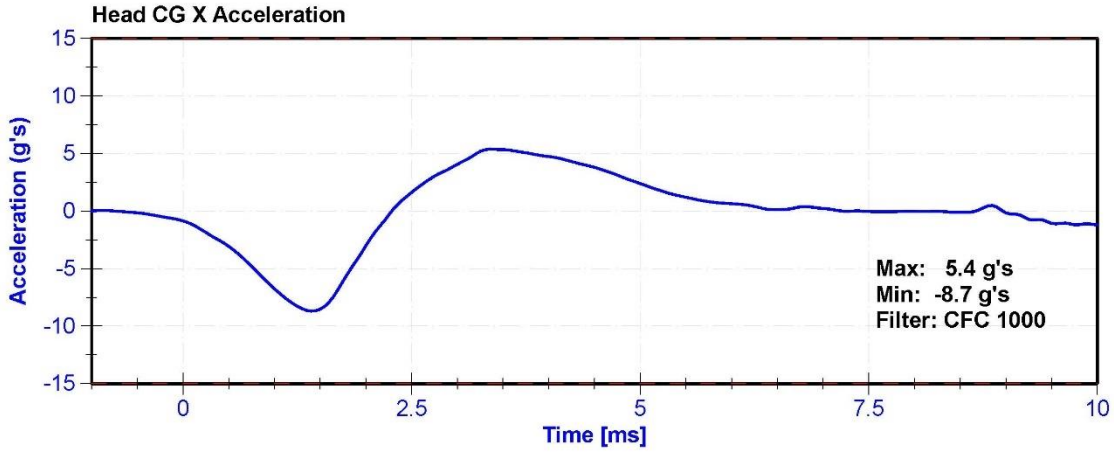
Results

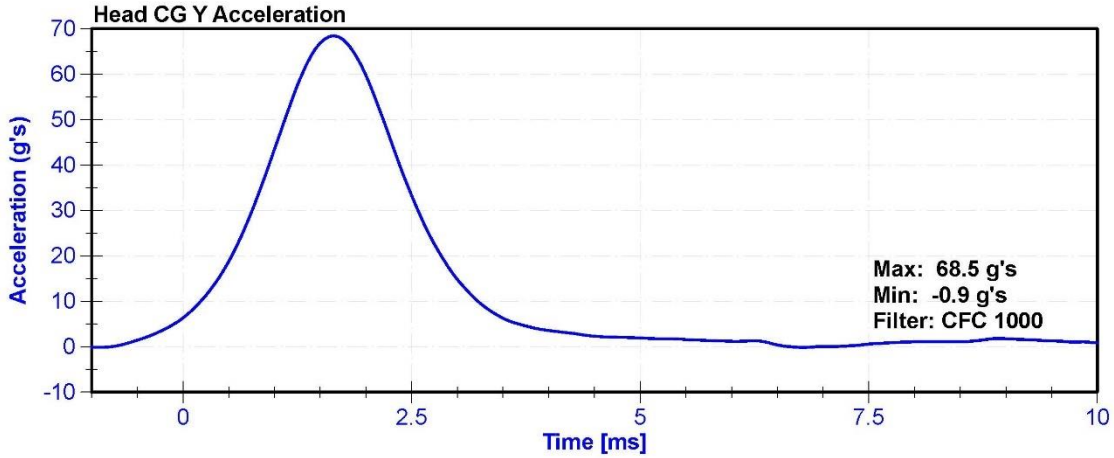
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	32.4	Pass
Resultant Acceleration	125	155	g's	140.7	Pass
Oscillation	0	15	%	2.26	Pass
Fore-Aft Acceleration	-15	15	g's	-8.7	Pass

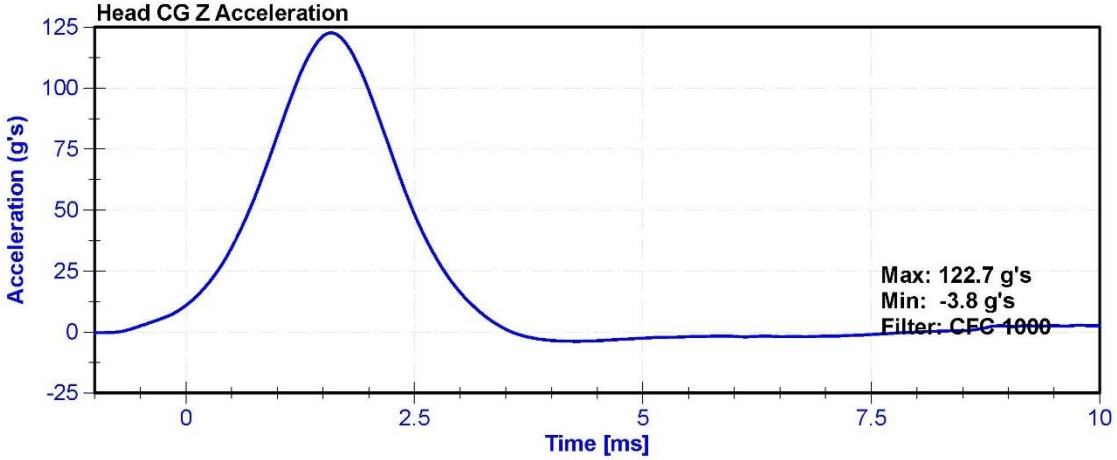
Transducer Calibrations

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




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 5.4 g's
Min: -8.7 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]
Max: 68.5 g's
Min: -0.9 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 122.7 g's
Min: -3.8 g's
Filter: CFC 1000

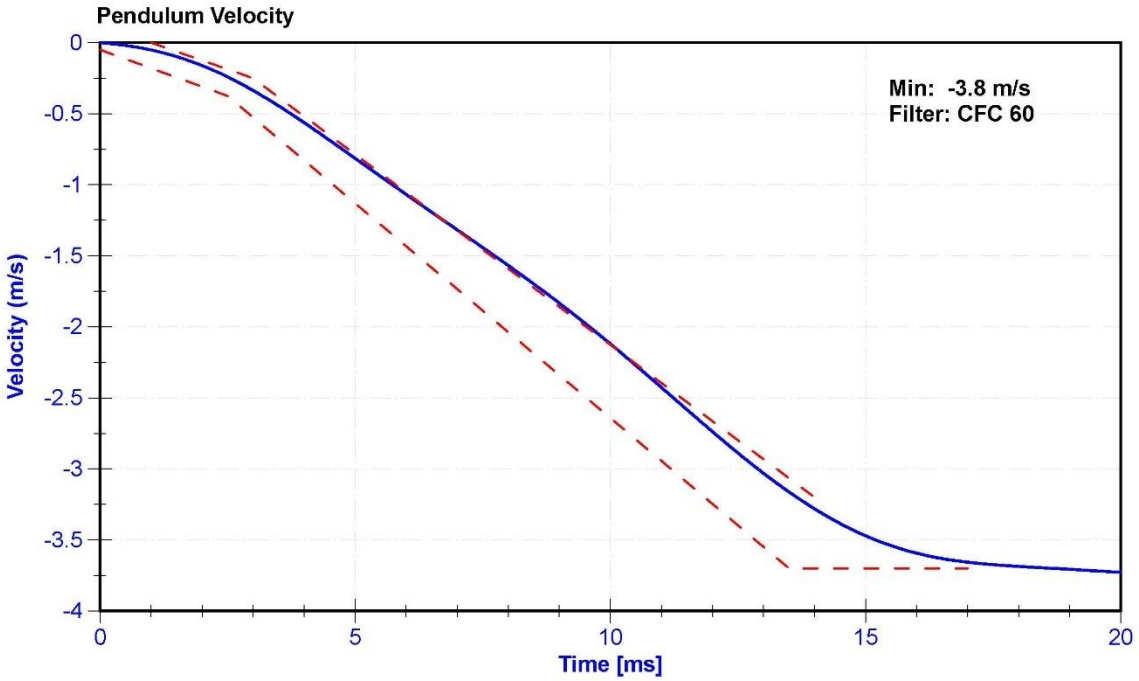
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

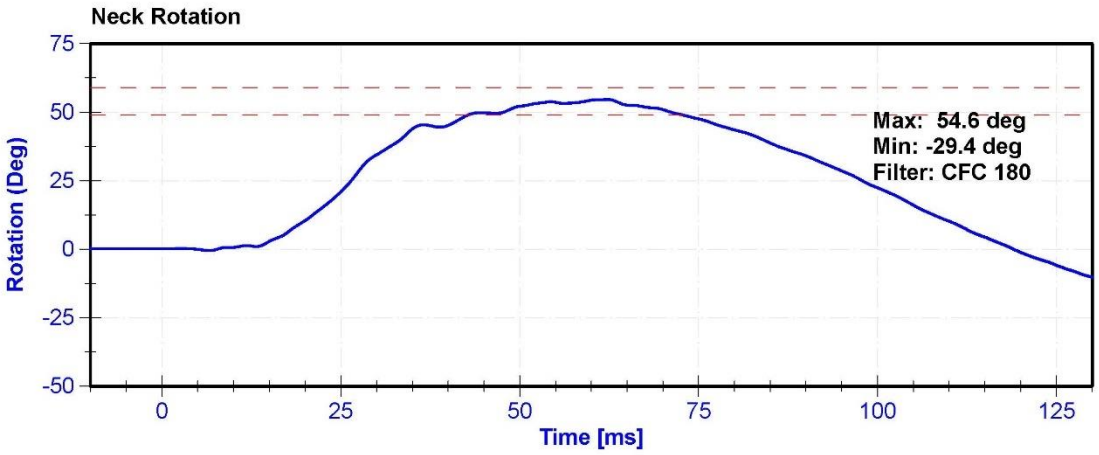
Results

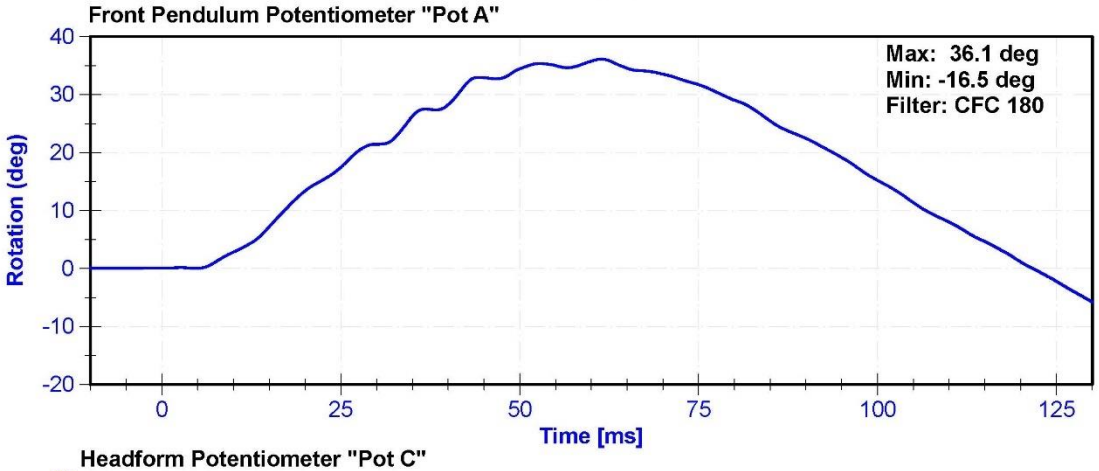
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	19	Pass
Velocity	3.3	3.5	m/s	3.41	Pass
Lateral Neck Rotation	49	59	deg	54.6	Pass
Time at Maximum Rotation	54	66	ms	62.2	Pass
Time of Rotation Decay from Maximum	53	88	ms	56.8	Pass

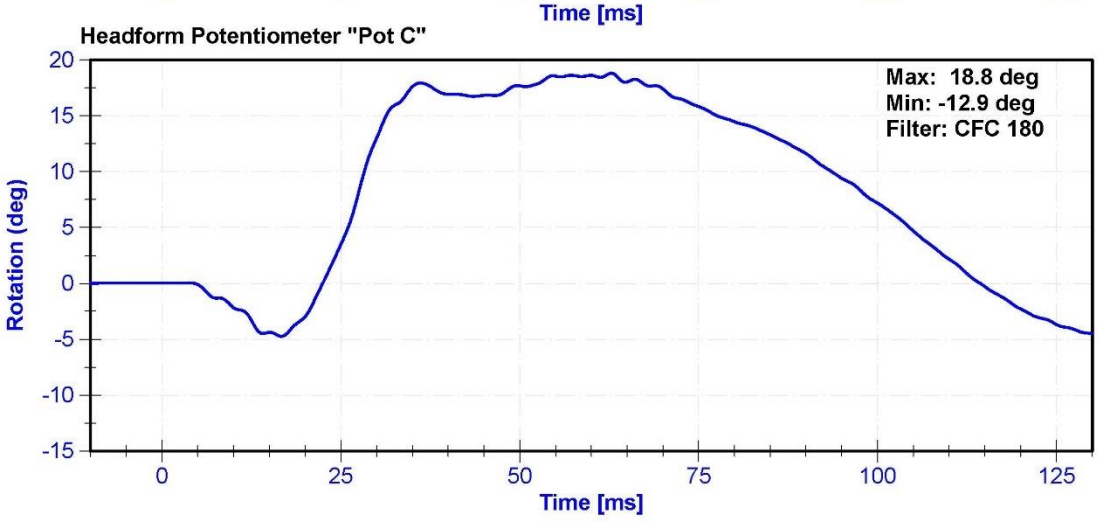
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Front Pendulum Potentiometer	Sfernice	094	10/1/2021	4/1/2022
Headform Potentiometer	Sfernice	095	10/1/2021	4/1/2022




Neck Rotation
Rotation (Deg)
Time [ms]
Max: 54.6 deg
Min: -29.4 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 36.1 deg
Min: -16.5 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 18.8 deg
Min: -12.9 deg
Filter: CFC 180

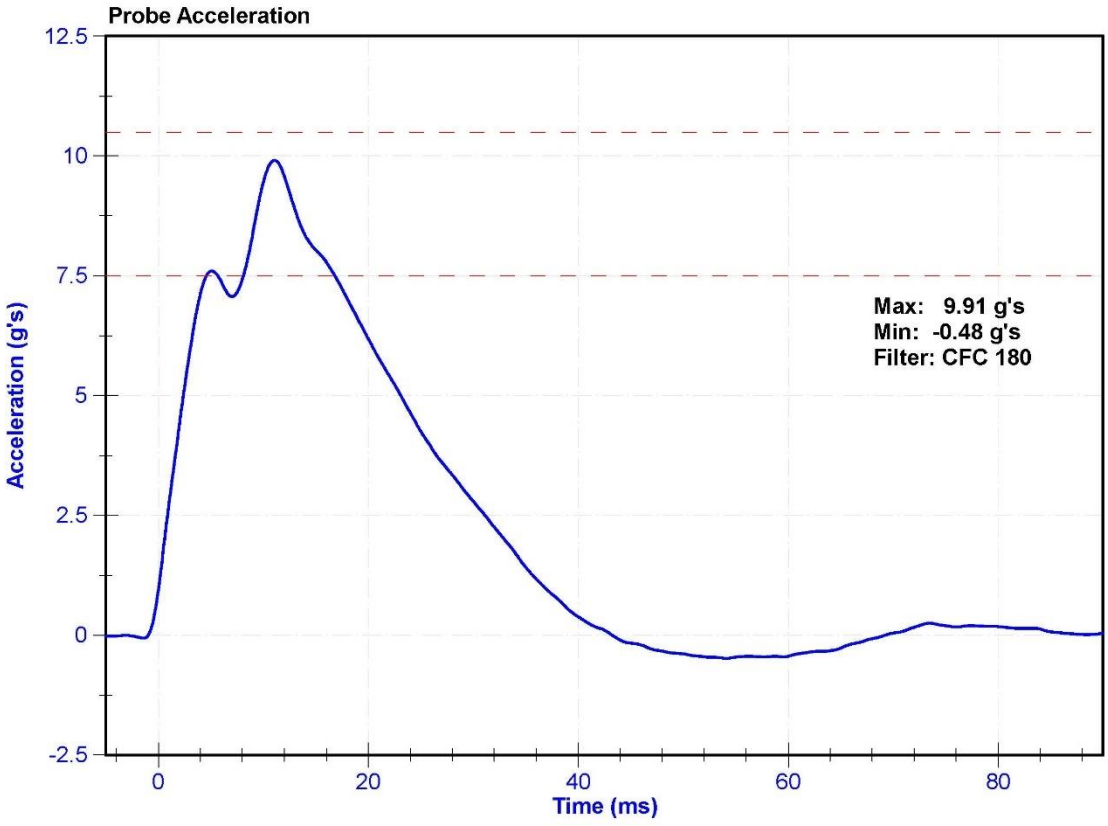
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	7.5	10.5	g's	9.91	Pass

Transducer Calibrations

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



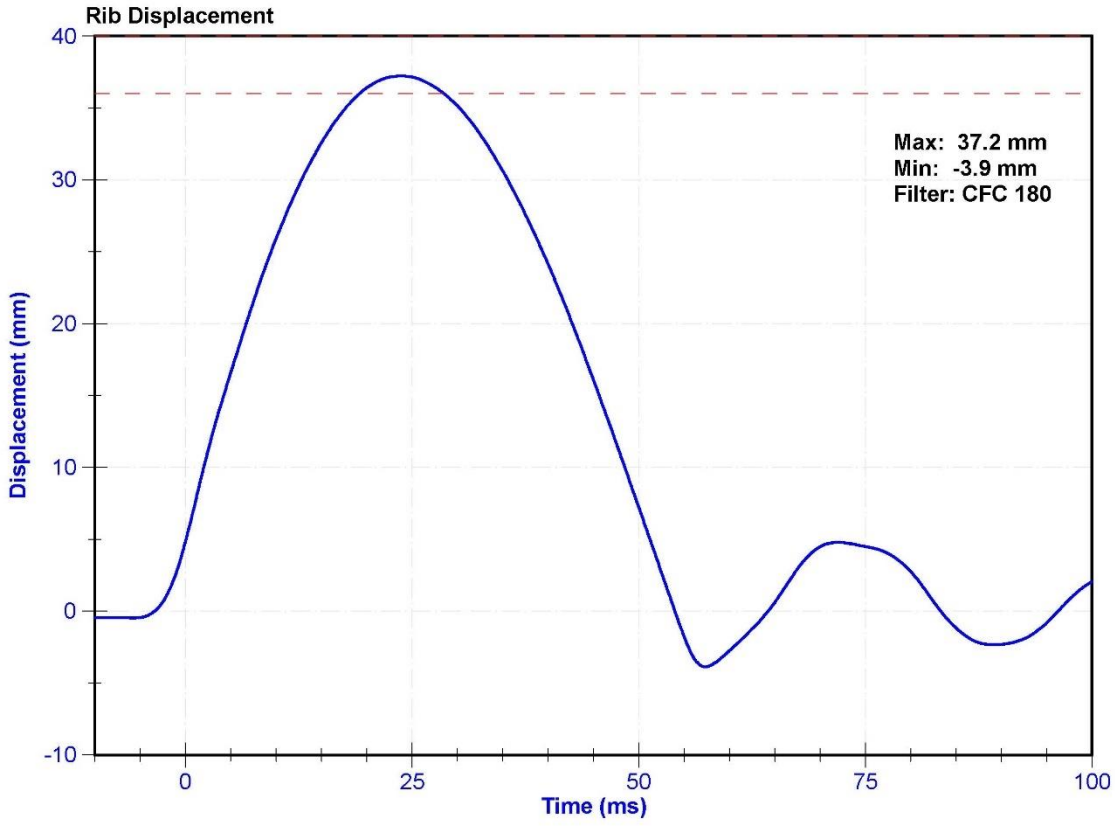
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	53.0	Pass
Rib Displacement	36	40	mm	37.2	Pass

Transducer Calibrations

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



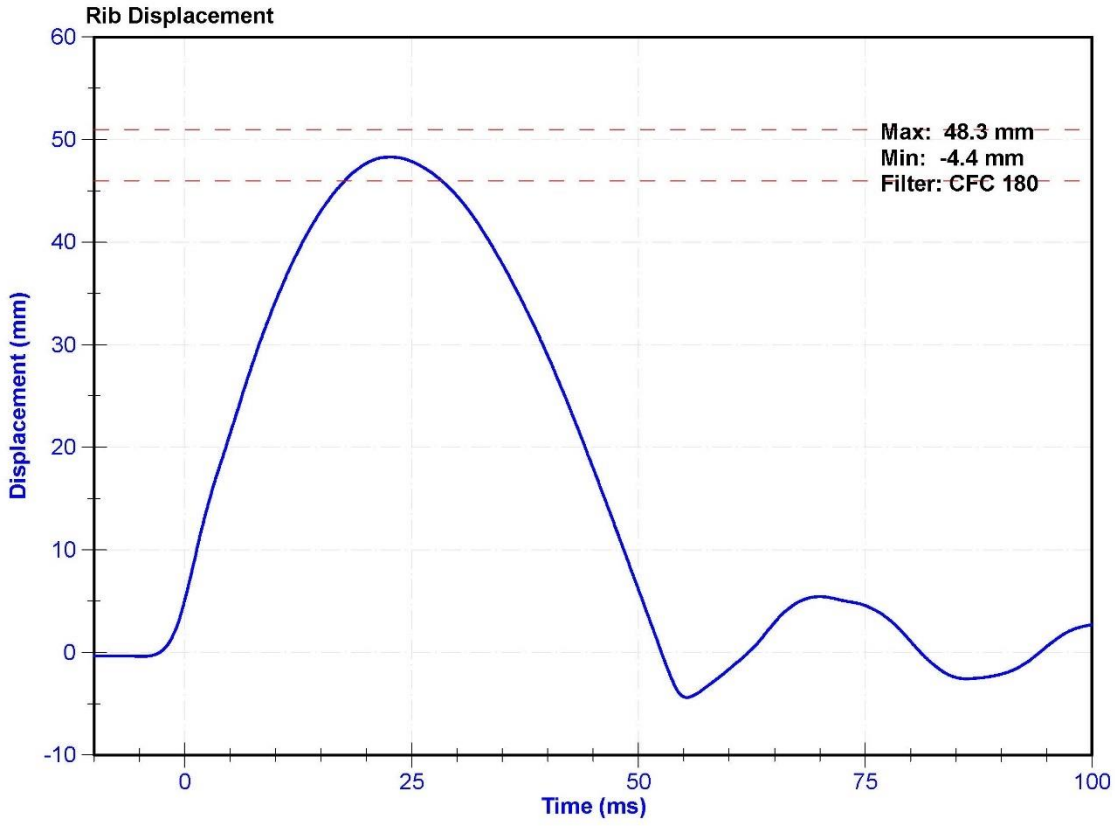
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	53.0	Pass
Rib Displacement	46	51	mm	48.3	Pass

Transducer Calibrations

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



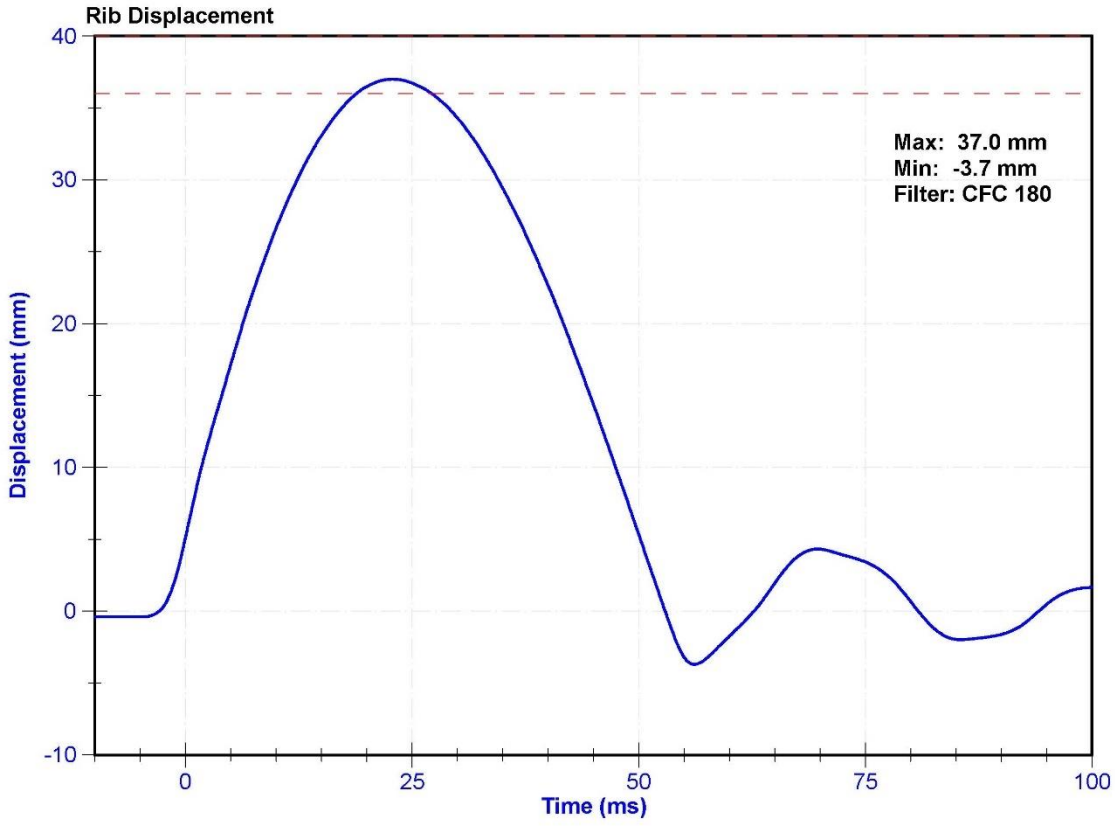
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	53.0	Pass
Rib Displacement	36	40	mm	37.0	Pass

Transducer Calibrations

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



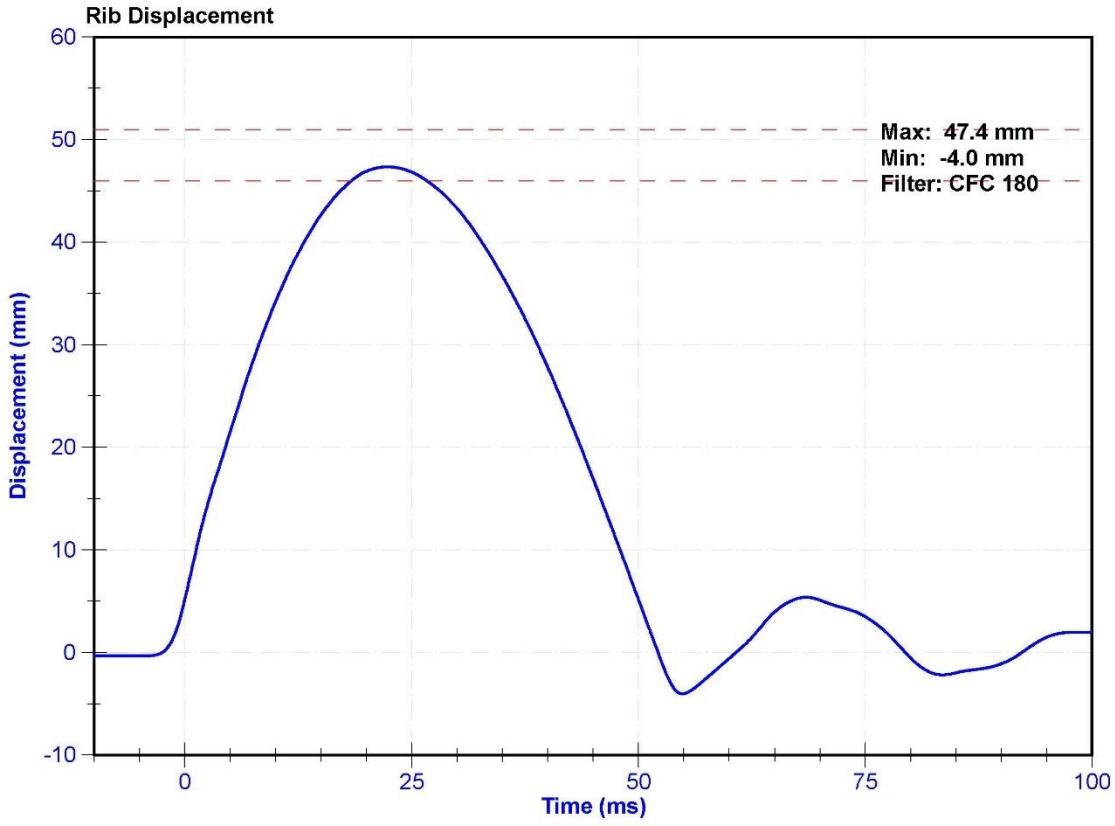
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	53.0	Pass
Rib Displacement	46	51	mm	47.4	Pass

Transducer Calibrations

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



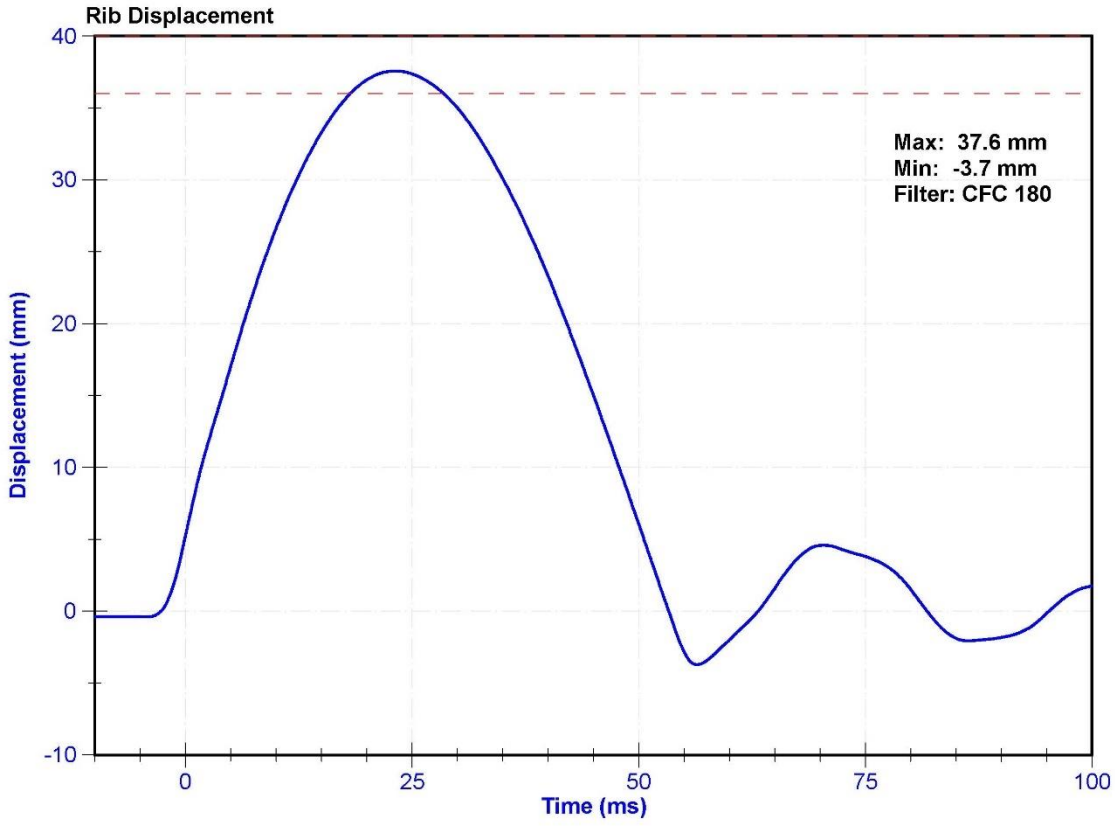
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	53.0	Pass
Rib Displacement	36	40	mm	37.6	Pass

Transducer Calibrations

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



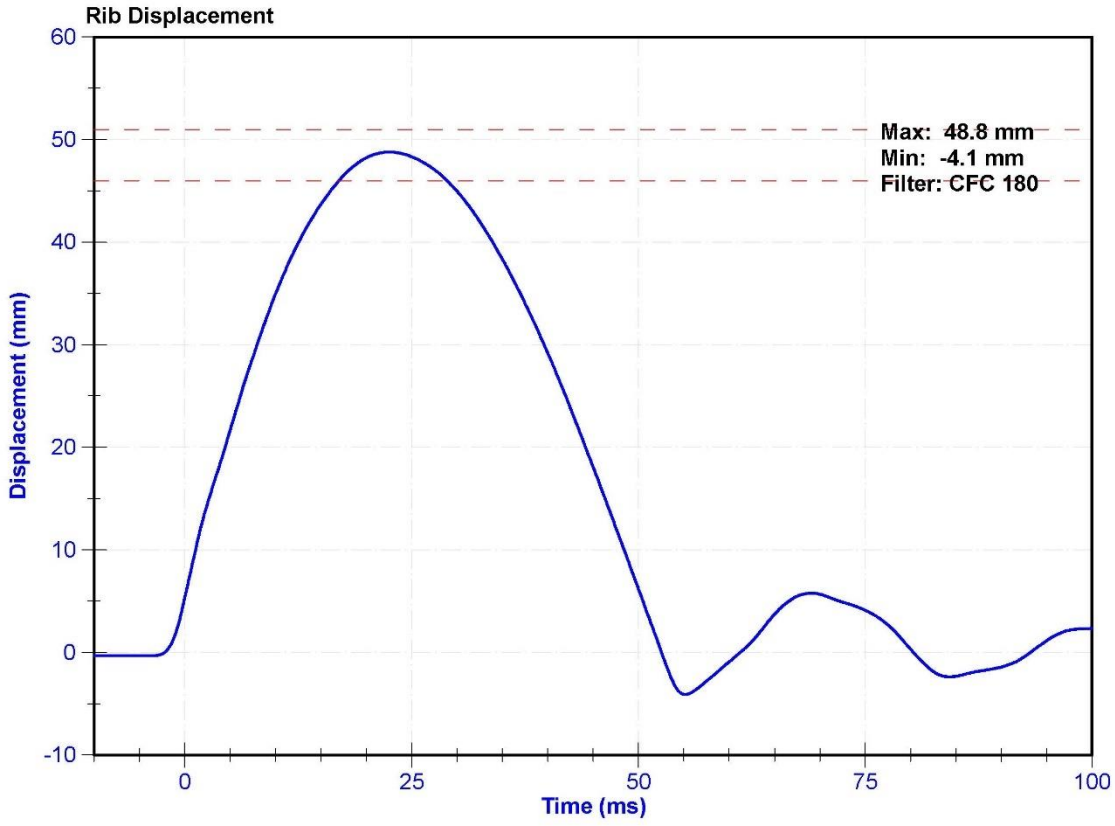
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

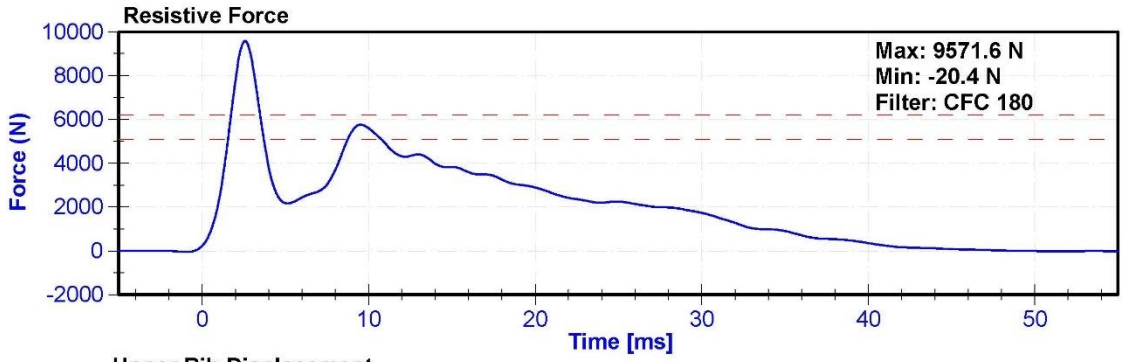
Results

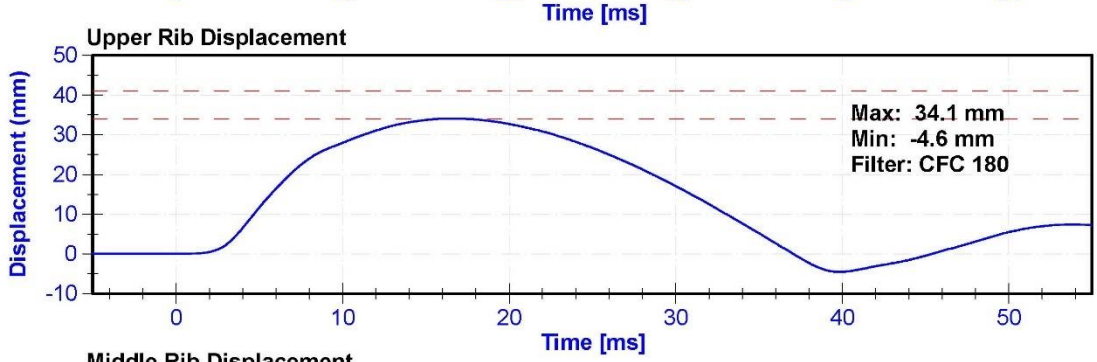
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	53.0	Pass
Rib Displacement	46	51	mm	48.8	Pass

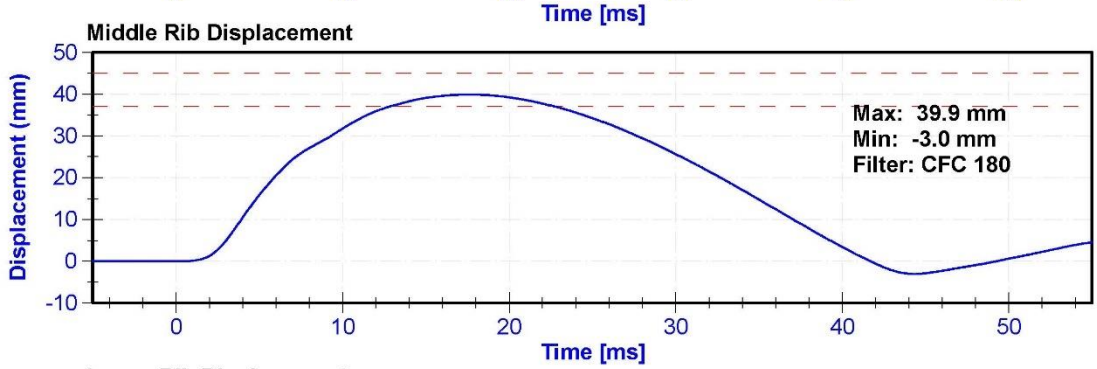
Transducer Calibrations

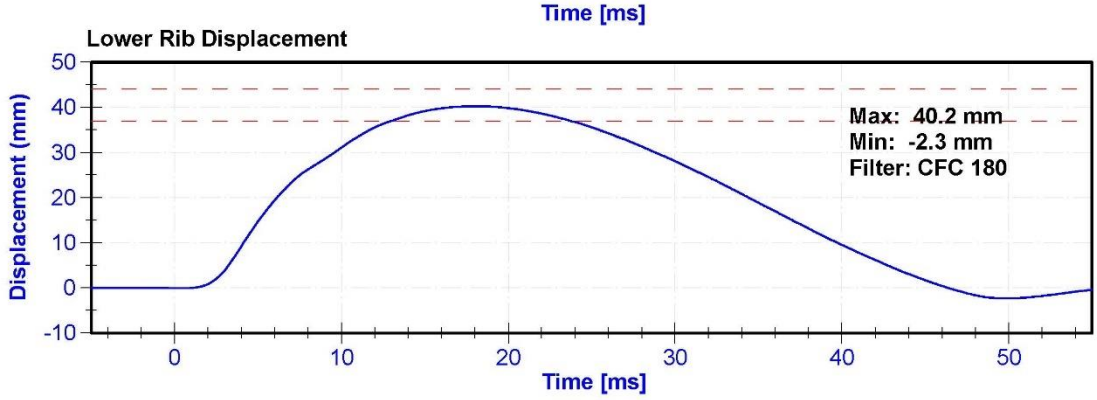
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	2/1/2022	8/2/2022




Resistive Force
Max: 9571.6 N
Min: -20.4 N
Filter: CFC 180
Force (N)
10000
8000
6000
4000
2000
0
-2000
0
10
20
30
40
50
Time [ms]


Upper Rib Displacement
Max: 34.1 mm
Min: -4.6 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Middle Rib Displacement
Max: 39.9 mm
Min: -3.0 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Lower Rib Displacement
Max: 40.2 mm
Min: -2.3 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]

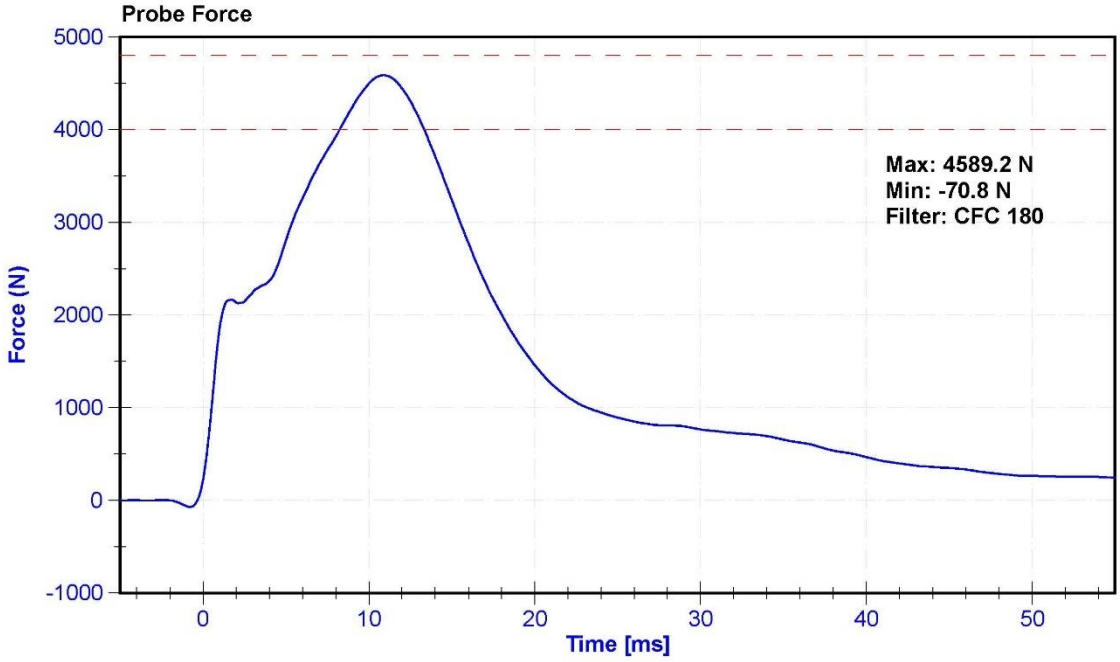
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

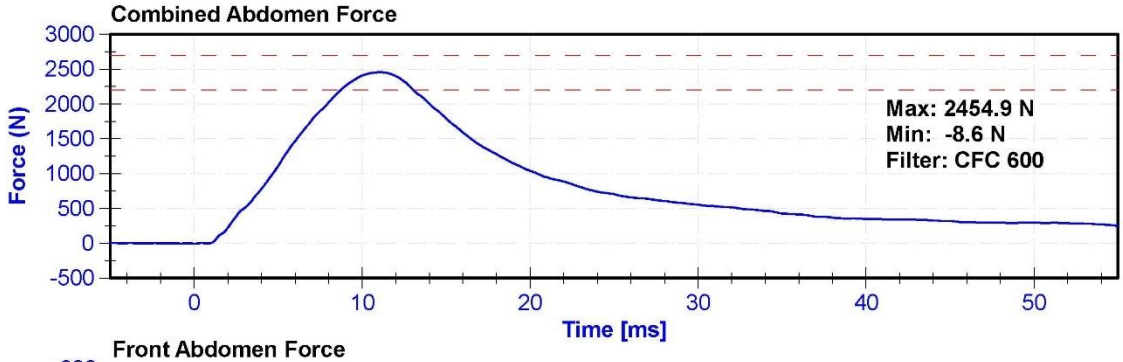
Results

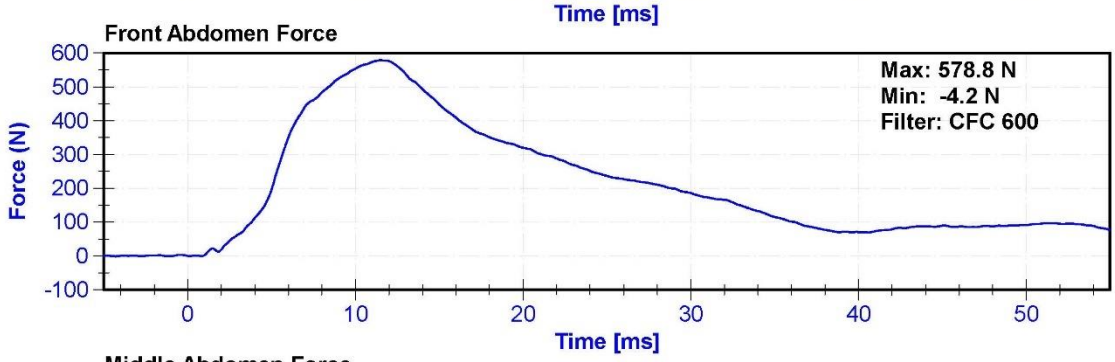
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	27	Pass
Velocity	3.9	4.1	m/s	4.07	Pass
Combined Abdomen Force	2200	2700	N	2454.9	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.05	Pass
Resistive Probe Force	4000	4800	N	4589.2	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.90	Pass

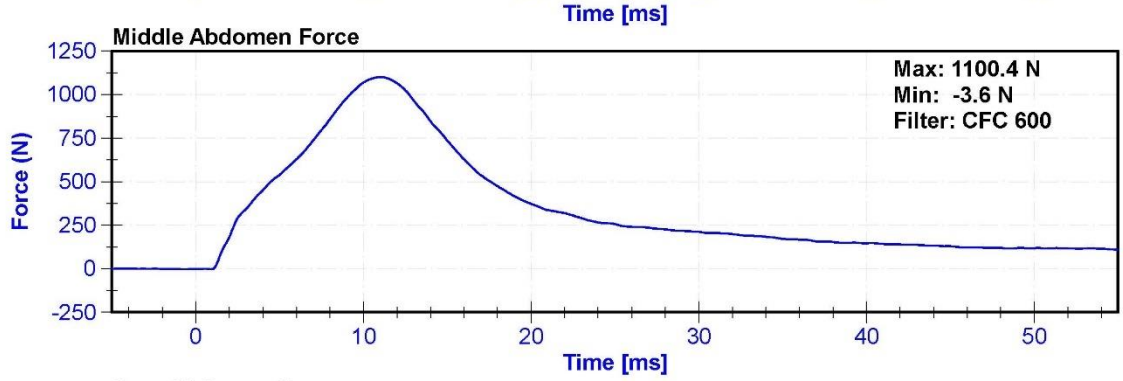
Transducer Calibrations

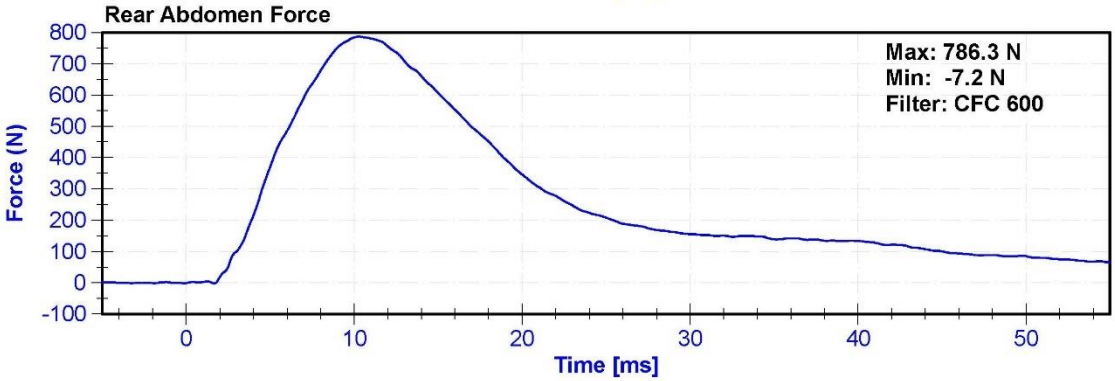
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Front Abdomen Load Cell	Denton	1512	8/2/2021	8/2/2022
Middle Abdomen Load Cell	Denton	1526	8/2/2021	8/2/2022
Rear Abdomen Load Cell	Denton	1512	8/2/2021	8/2/2022




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2454.9 N
Min: -8.6 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 578.8 N
Min: -4.2 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1100.4 N
Min: -3.6 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 786.3 N
Min: -7.2 N
Filter: CFC 600

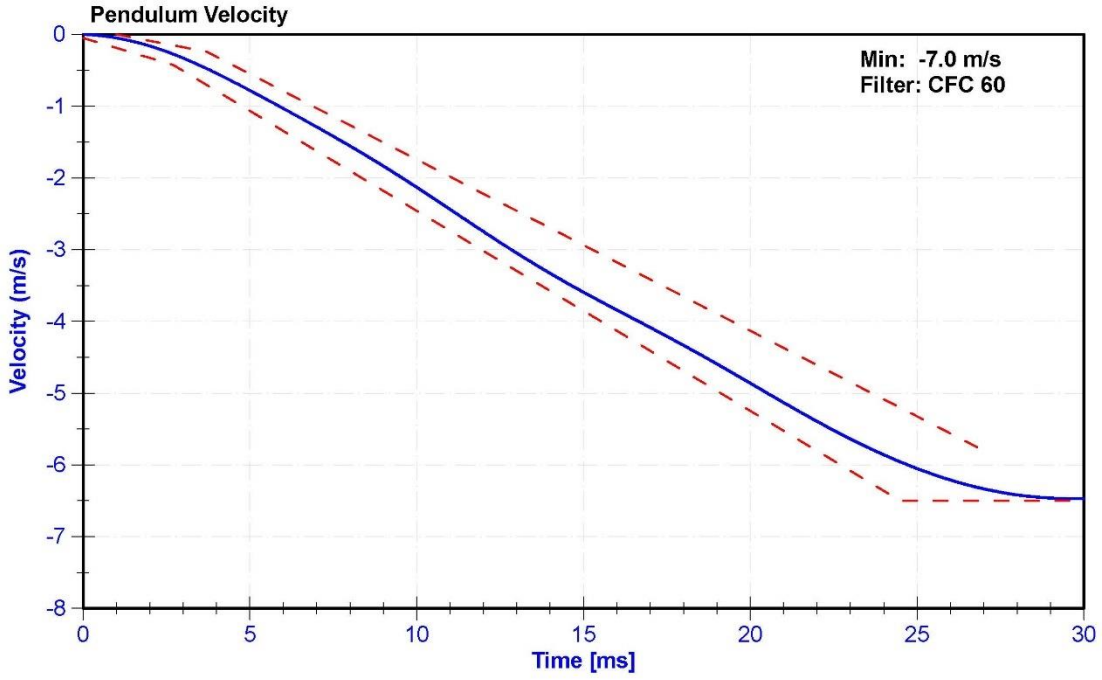
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

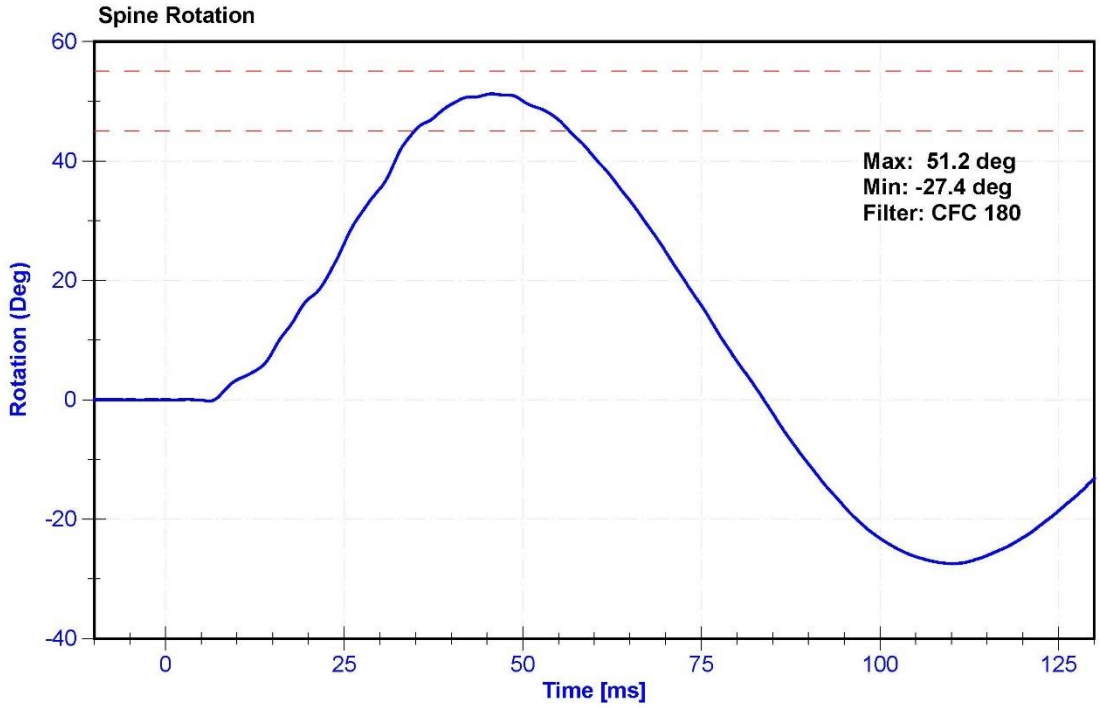
Results

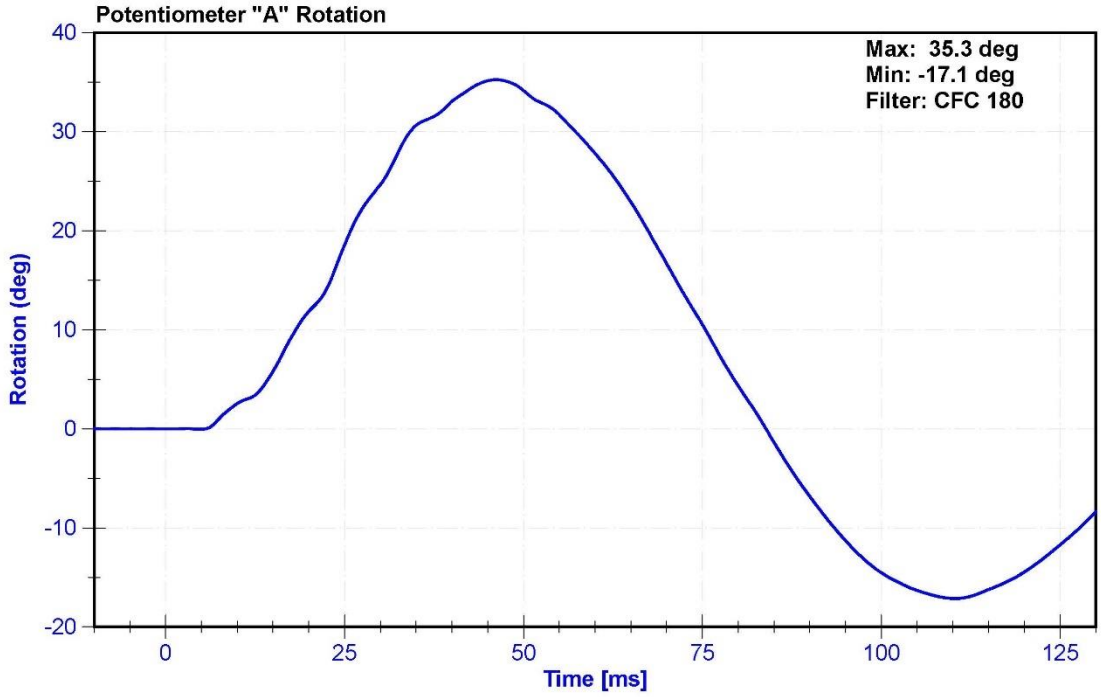
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	19	Pass
Velocity	5.95	6.15	m/s	5.997	Pass
Lateral Spine Rotation	45	55	deg	51.2	Pass
Time at Maximum Rotation	39	53	ms	45.6	Pass
Time of Decay to Zero Degrees	37	57	ms	38.2	Pass

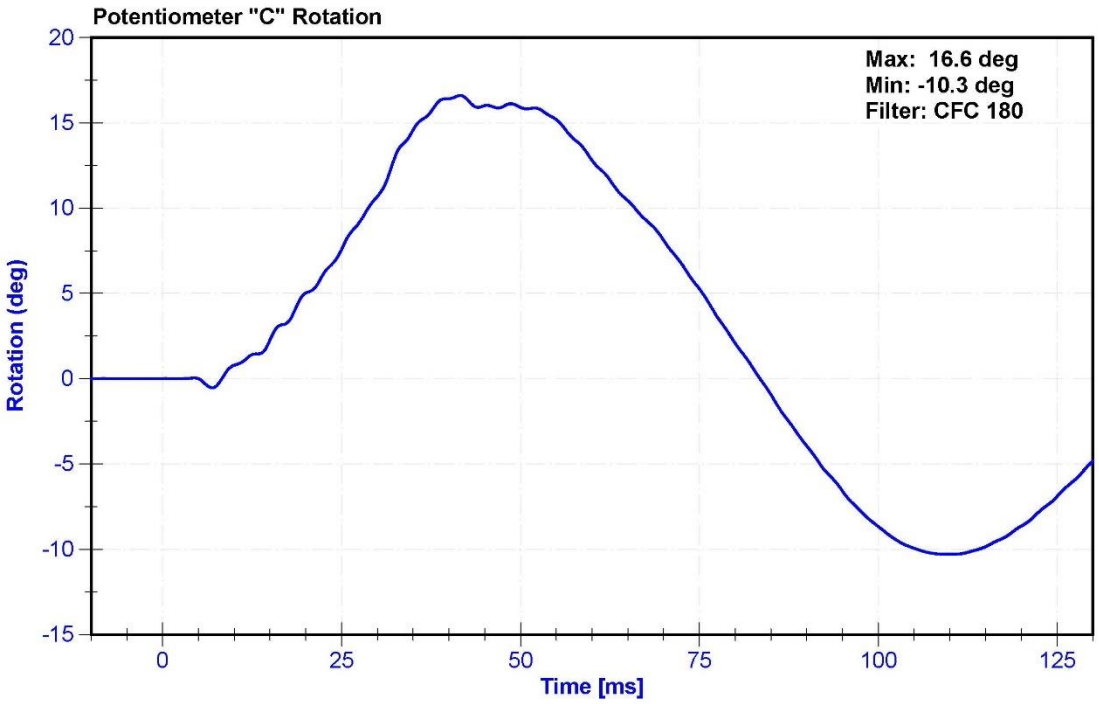
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Pendulum "A" Potentiometer	Sfernice	094	10/1/2021	4/1/2022
Condyle "B" Potentiometer	Sfernice	095	10/1/2021	4/1/2022




Spine Rotation
Max: 51.2 deg
Min: -27.4 deg
Filter: CFC 180
Rotation (Deg)
Time [ms]
60
40
20
0
-20
-40
0
25
50
75
100
125


Potentiometer "A" Rotation
Max: 35.3 deg
Min: -17.1 deg
Filter: CFC 180
Rotation (deg)
Time [ms]
40
30
20
10
0
-10
-20
0
25
50
75
100
125


Potentiometer "C" Rotation
Max: 16.6 deg
Min: -10.3 deg
Filter: CFC 180
Rotation (deg)
20
15
10
5
0
-5
-10
-15
0
25
50
75
100
125
Time [ms]

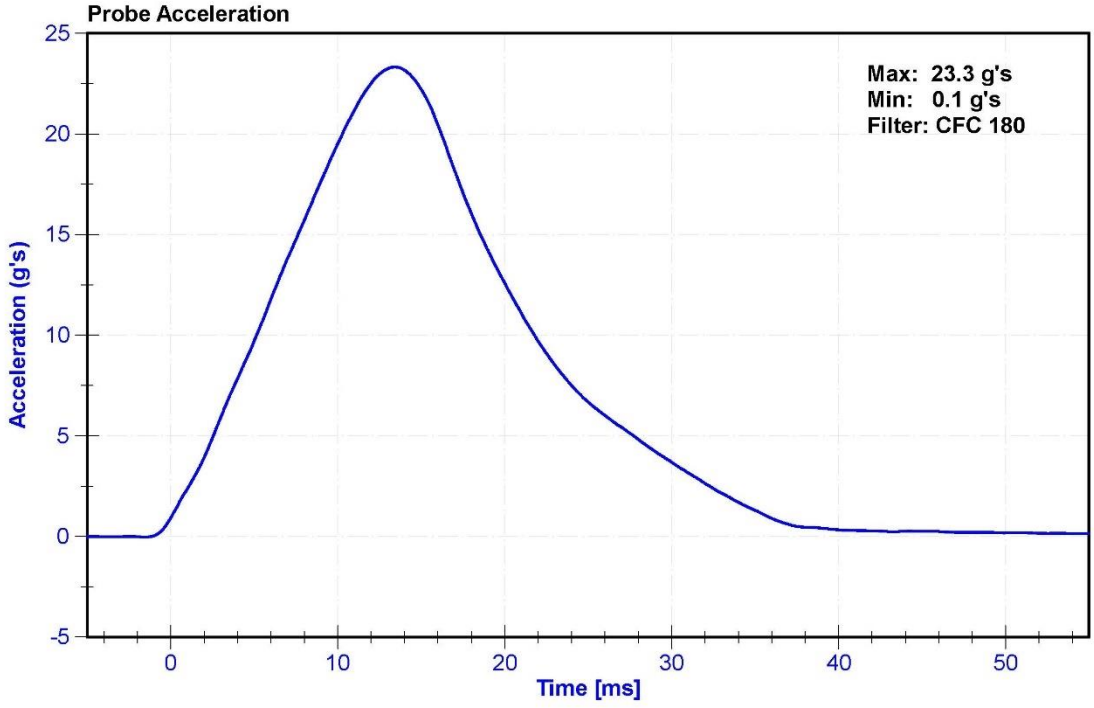
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

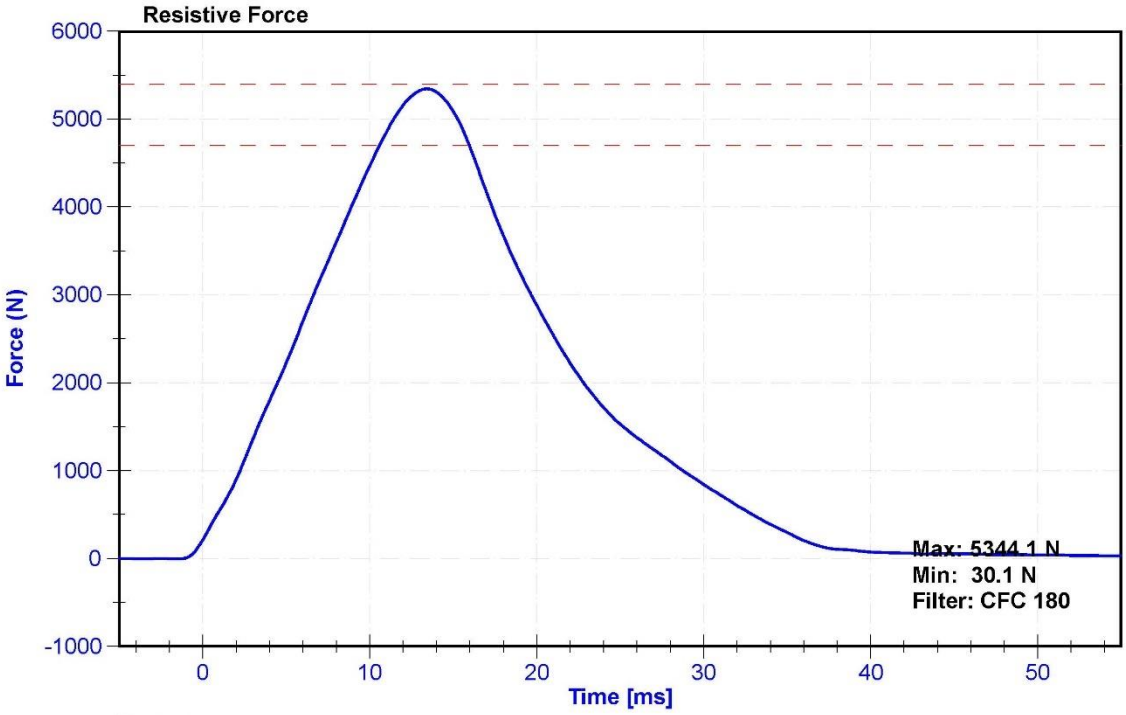
Results

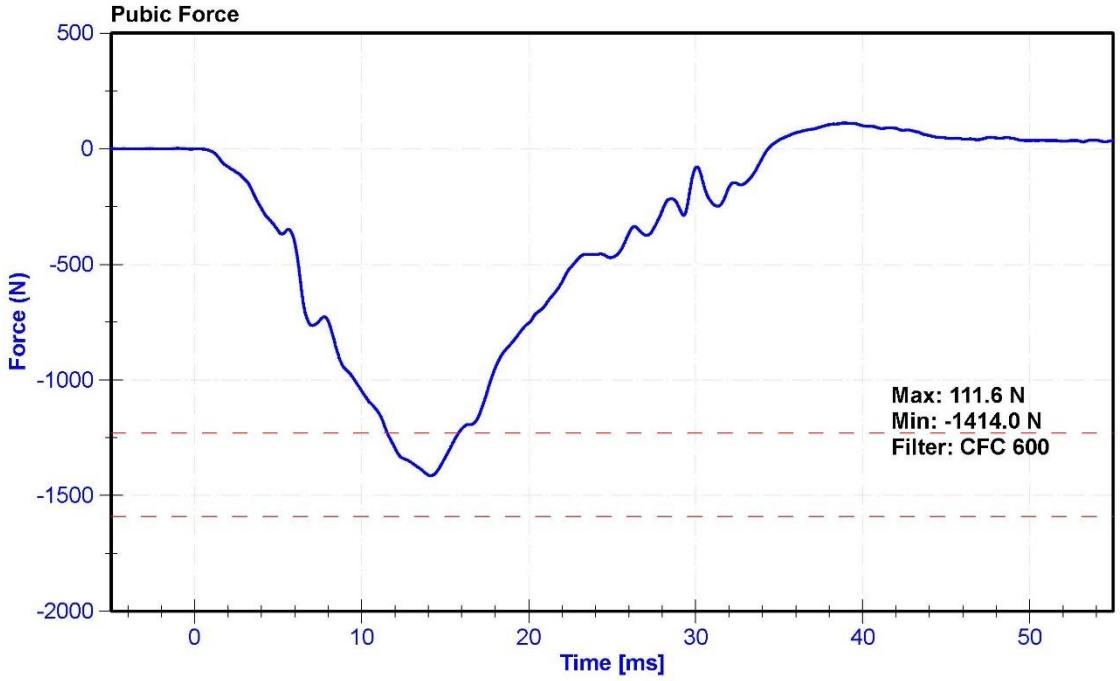
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Resistive Force	4700	5400	N	5344.1	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.45	Pass
Pubic Force	-1590	-1230	N	-1414.0	Pass
Time at Peak Pubic Force	12.2	17.0	ms	14.15	Pass

Transducer Calibrations

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




Resistive Force
Force (N)
Time [ms]
Max: 5344.1 N
Min: 30.1 N
Filter: CFC 180


Pubic Force
Force (N)
Time [ms]
Max: 111.6 N
Min: -1414.0 N
Filter: CFC 600

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

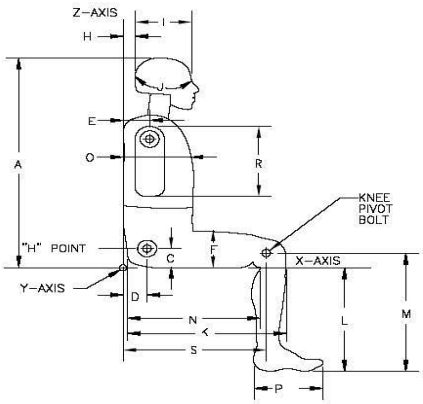
SERIAL No: 300

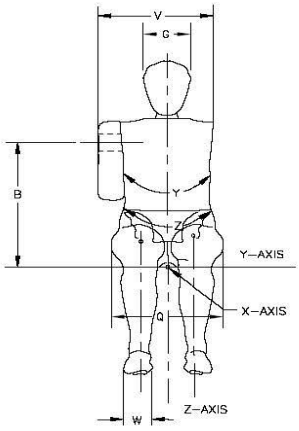
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: J.Pericak Date: 1/12/2022

Dummy Serial Number: 300





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	785	Pass
B	Shoulder Pivot Height	437	453	448	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	123	Pass
G	Head Breadth	140	148	146	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	185	Pass
J	Head Circumference	541	551	547	Pass
K	Buttock to Knee Length	514	540	531	Pass
L	Popliteal Height	343	369	362	Pass
M	Knee Pivot to floor height	392	409	402	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	203	Pass
P	Foot Length	216	232	221	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	253	Pass
S	Knee Joint to seatback	477	493	487	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	84	Pass
Y	Chest Circumference w/jacket	851	881	879	Pass
Z	Waist Circumference	761	791	772	Pass

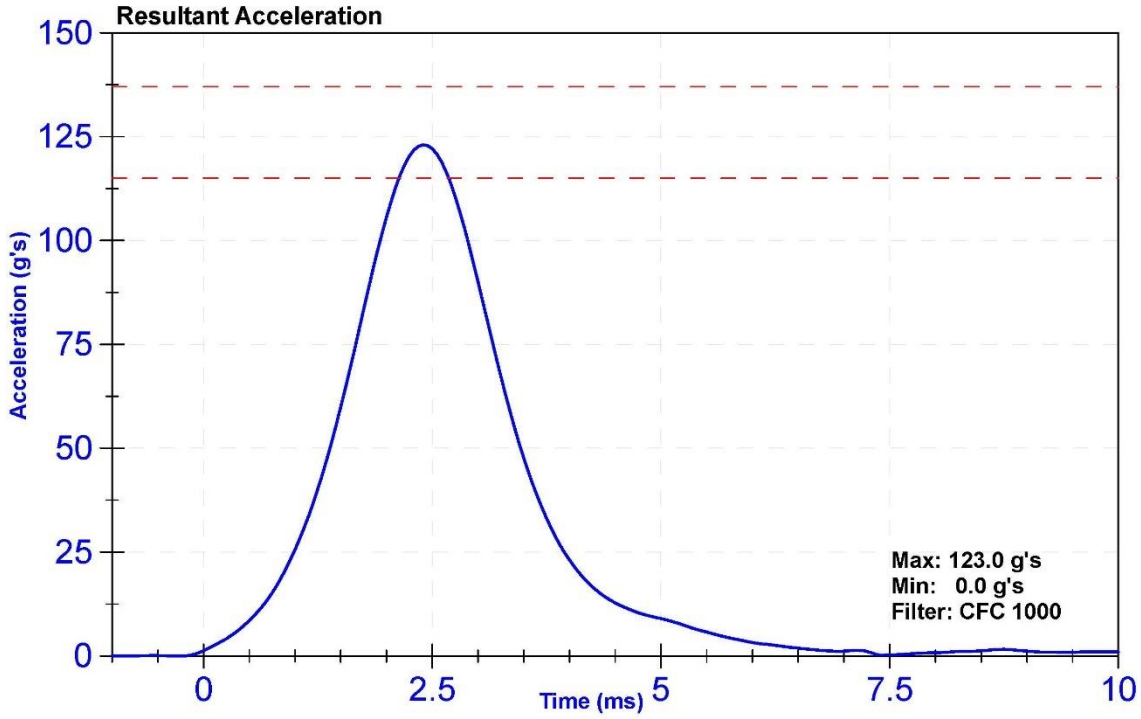
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

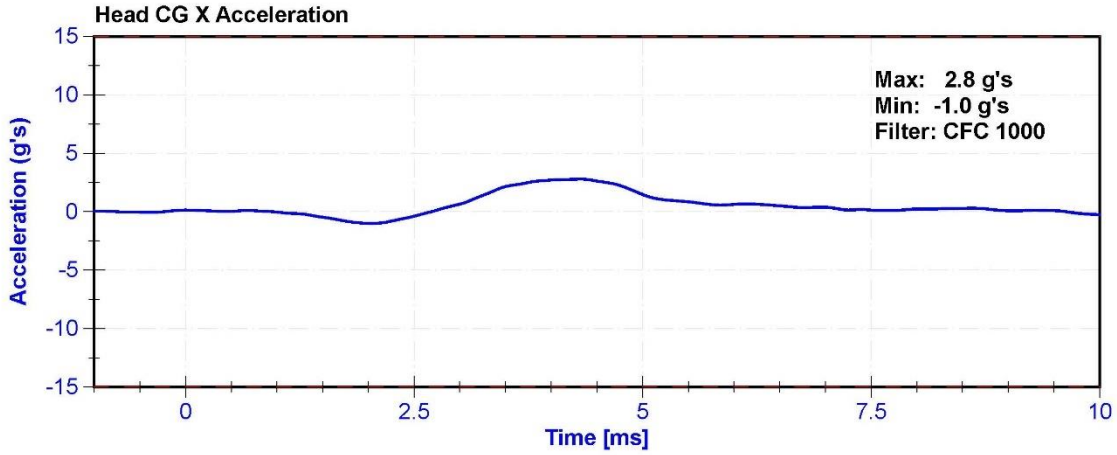
Results

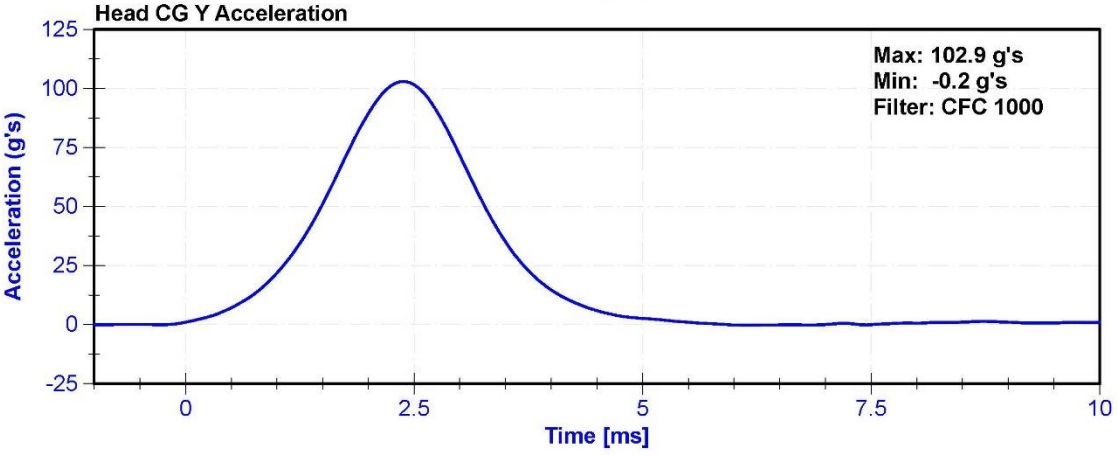
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	21	Pass
Resultant Acceleration	115	137	g's	123.0	Pass
Oscillation	0	15	%	1.3	Pass
Fore-Aft Acceleration	-15	15	g's	2.8	Pass

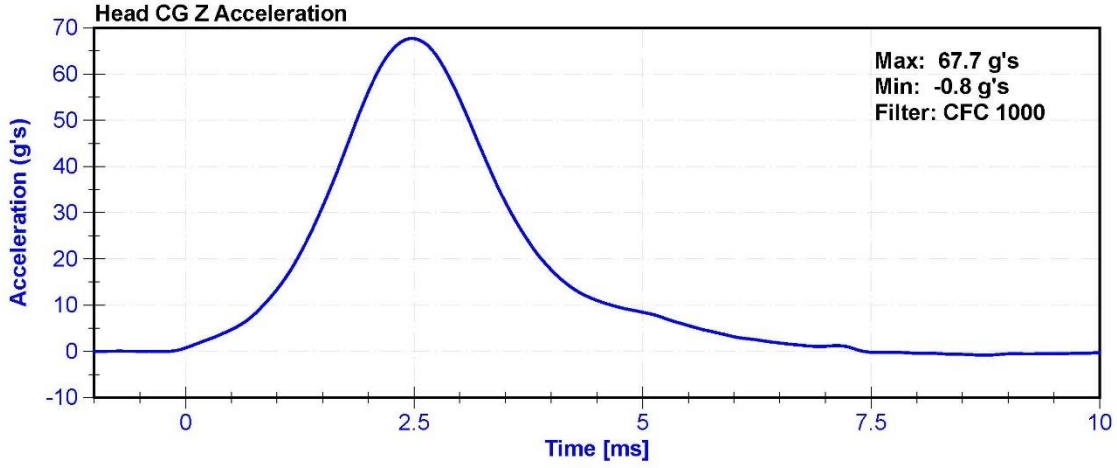
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P59018	11/19/2021	5/18/2022
Y Accelerometer	Endevco	P79189	11/19/2021	5/18/2022
Z Accelerometer	Endevco	P58777	11/19/2021	5/18/2022




Head CG X Acceleration
Max: 2.8 g's
Min: -1.0 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 102.9 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: 67.7 g's
Min: -0.8 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]

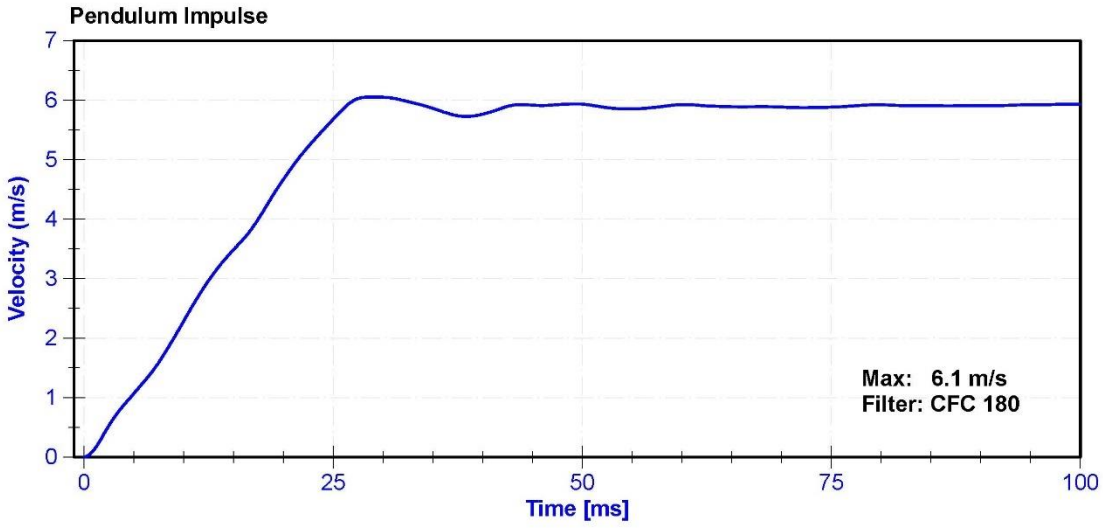
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

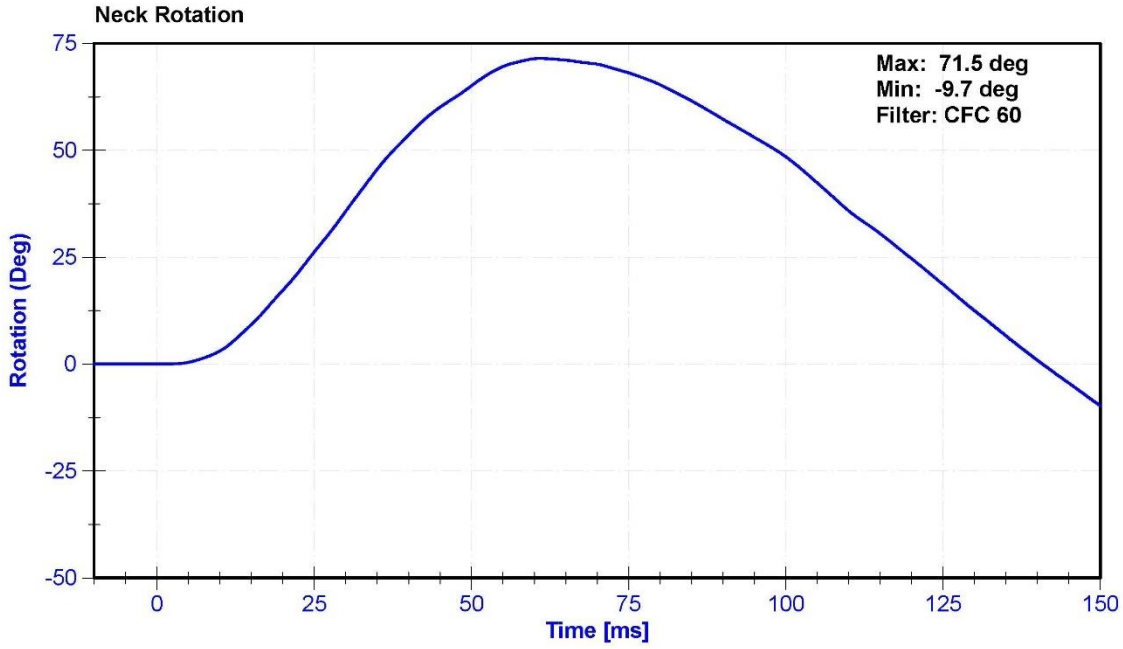
Results

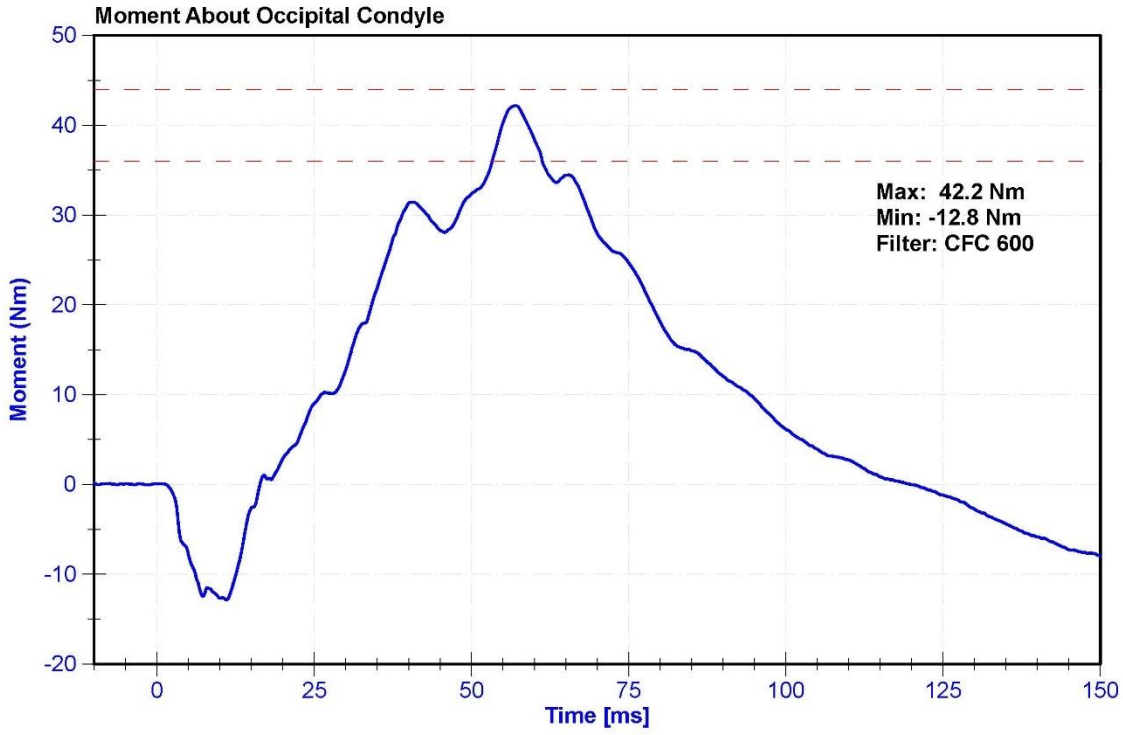
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	23	Pass
Velocity	5.51	5.63	m/s	5.577	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.28	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.48	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.66	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.67	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	6.05	Pass
Neck Rotation	71	81	deg	71.5	Pass
Time at Maximum Rotation	50	70	ms	60.9	Pass
Moment about the OC	36	44	Nm	42.2	Pass
Moment Decay to 0 Nm	102	126	ms	119.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231CT	10/28/2021	10/28/2022
Pendulum Potentiometer	Servo	DS184 Pend	11/12/2021	11/12/2022
Condyle Potentiometer	Servo	DS185 Pend H	11/12/2021	11/12/2022
Upper Neck Load Cell	Denton	1037-FY	06/29/2021	06/29/2022




Neck Rotation
Max: 71.5 deg
Min: -9.7 deg
Filter: CFC 60
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 42.2 Nm
Min: -12.8 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

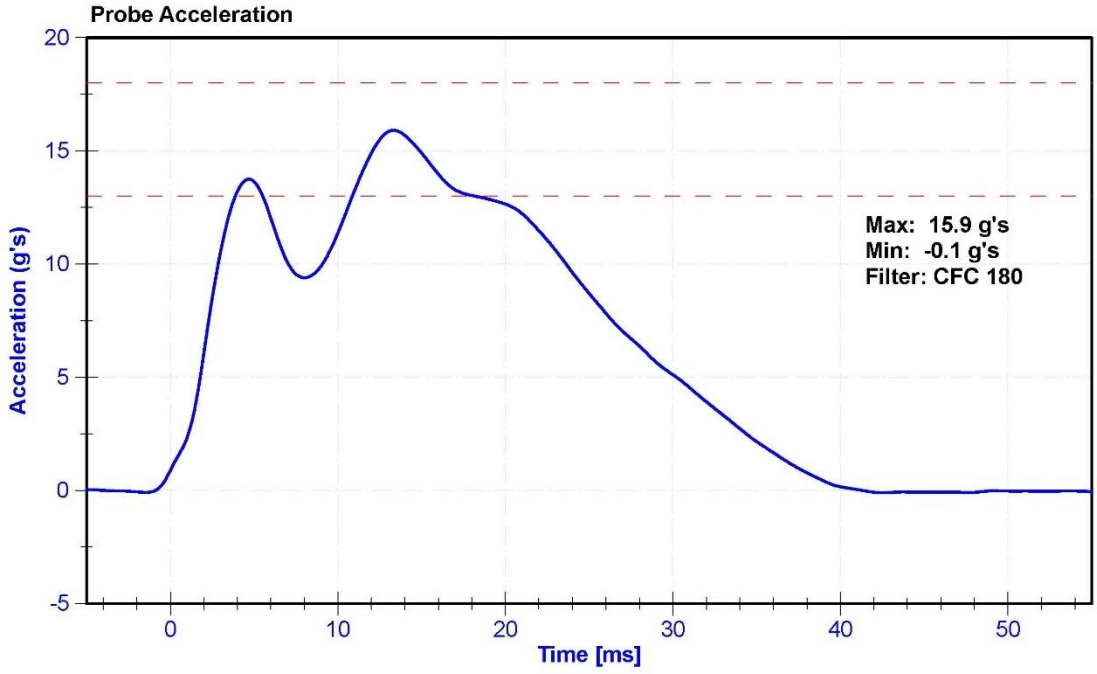
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

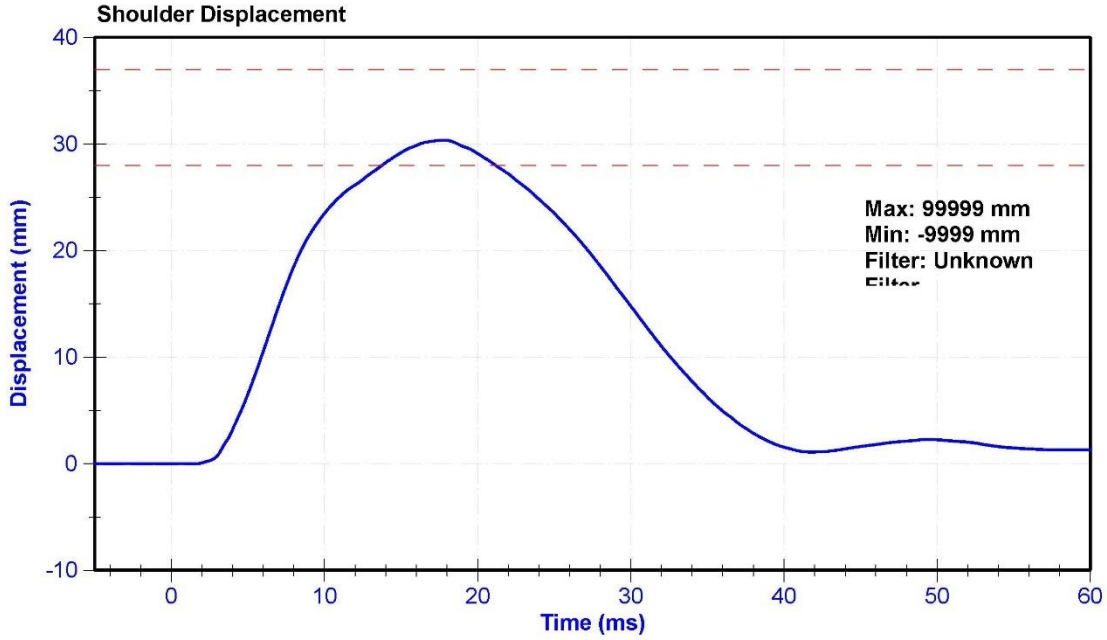
Results

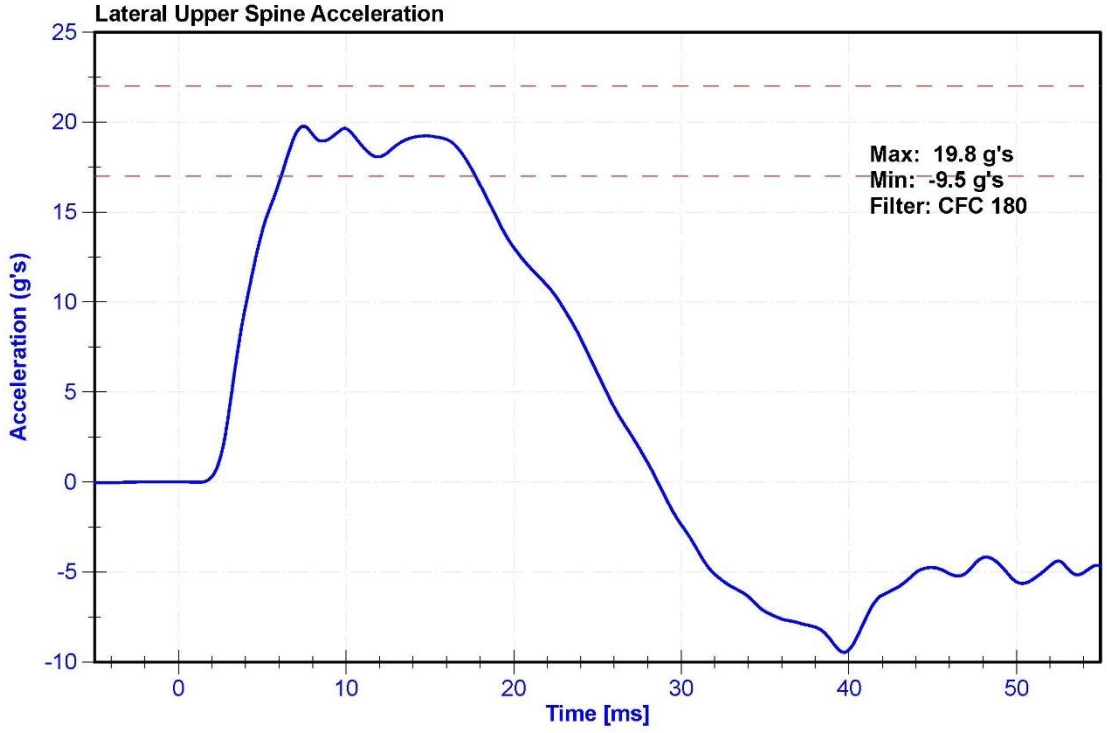
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	13	18	g's	15.9	Pass
Shoulder Deflection	28	37	mm	30.4	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Shoulder Potentiometer	Servo	053GFE	11/22/2021	5/23/2022
Upper Spine Y Accelerometer	Endevco	T20880	11/19/2021	5/18/2022




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 99999 mm
Min: -9999 mm
Filter: Unknown


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 19.8 g's
Min: -9.5 g's
Filter: CFC 180

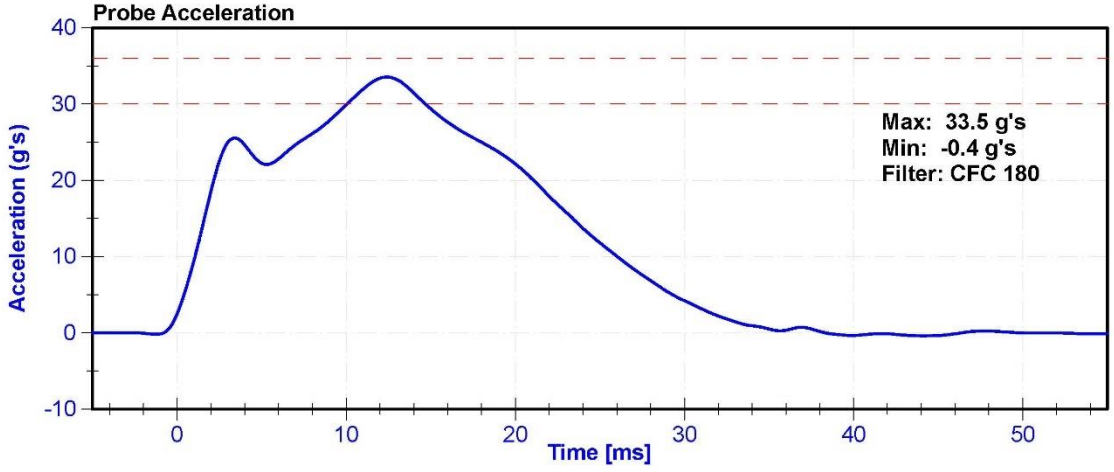
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

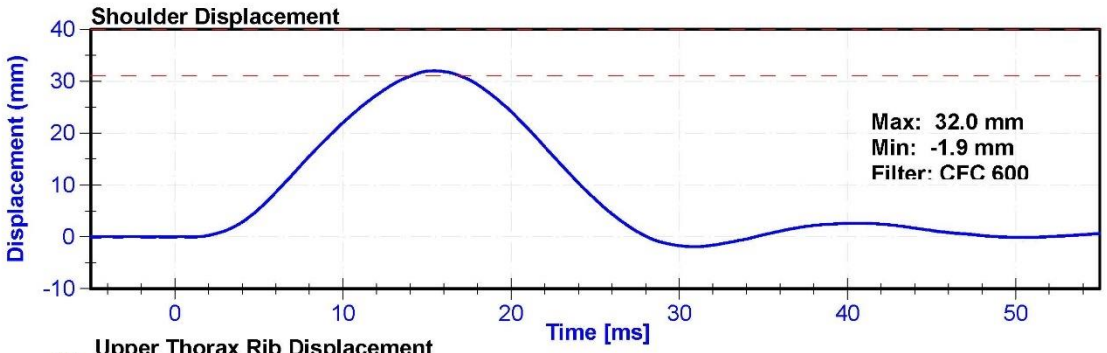
Results

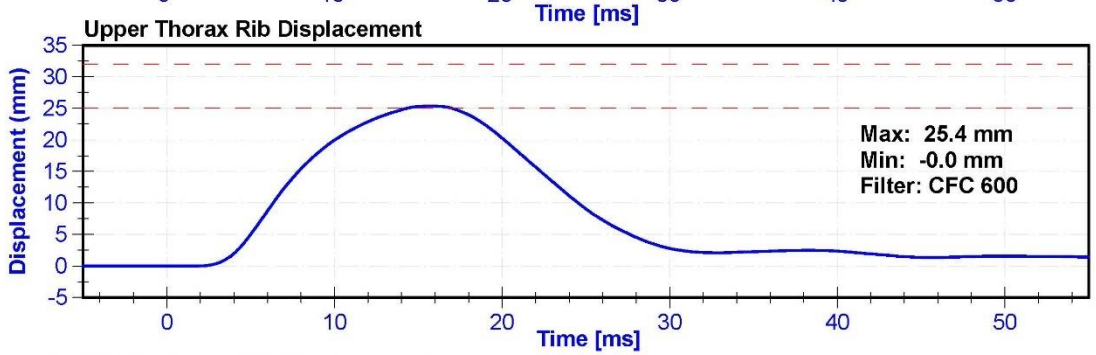
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	27	Pass
Velocity	6.6	6.8	m/s	6.60	Pass
Probe Acceleration after 5 ms	30	36	g's	33.5	Pass
Lateral Upper Spine Acceleration	34	43	g's	38.3	Pass
Lateral Lower Spine Acceleration	29	37	g's	32.5	Pass
Shoulder Deflection	31	40	mm	32.0	Pass
Upper Thorax Rib Deflection	25	32	mm	25.4	Pass
Mid Thorax Rib Deflection	30	36	mm	31.5	Pass
Lower Thorax Rib Deflection	32	38	mm	33.8	Pass

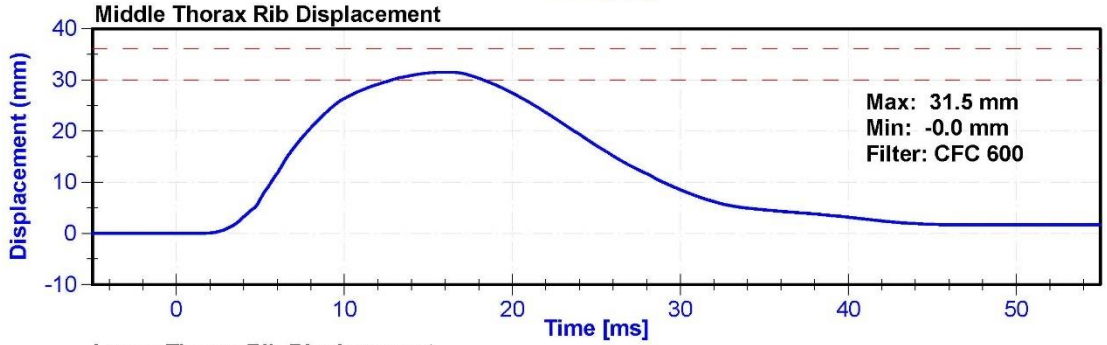
Transducer Calibrations

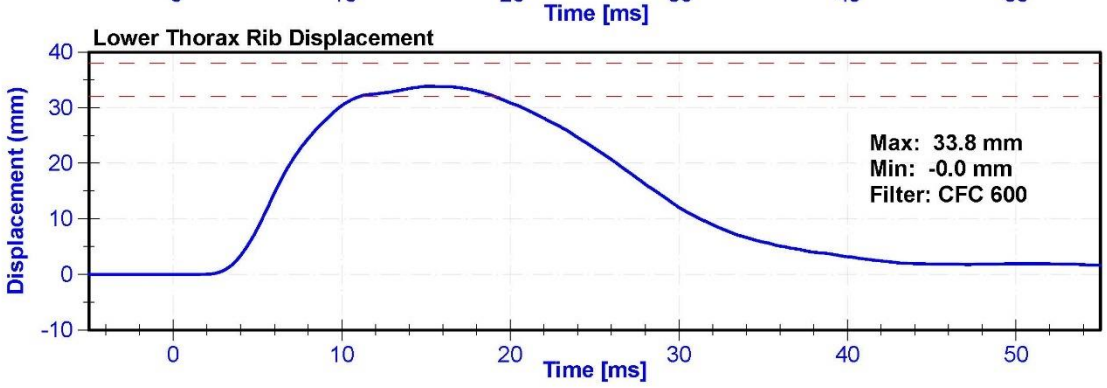
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Upper Spine T1 Y Accelerometer	Endevco	T20880	11/19/2021	5/18/2022
Upper Spine T12 Y Accelerometer	Endevco	P52071	11/19/2021	5/18/2022
Shoulder Potentiometer	Servo	053GFE	11/22/2021	5/23/2022
Upper Thorax Rib Potentiometer	Servo	451GFE	11/22/2021	5/23/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	11/22/2021	5/23/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	8/30/2021	2/28/2022

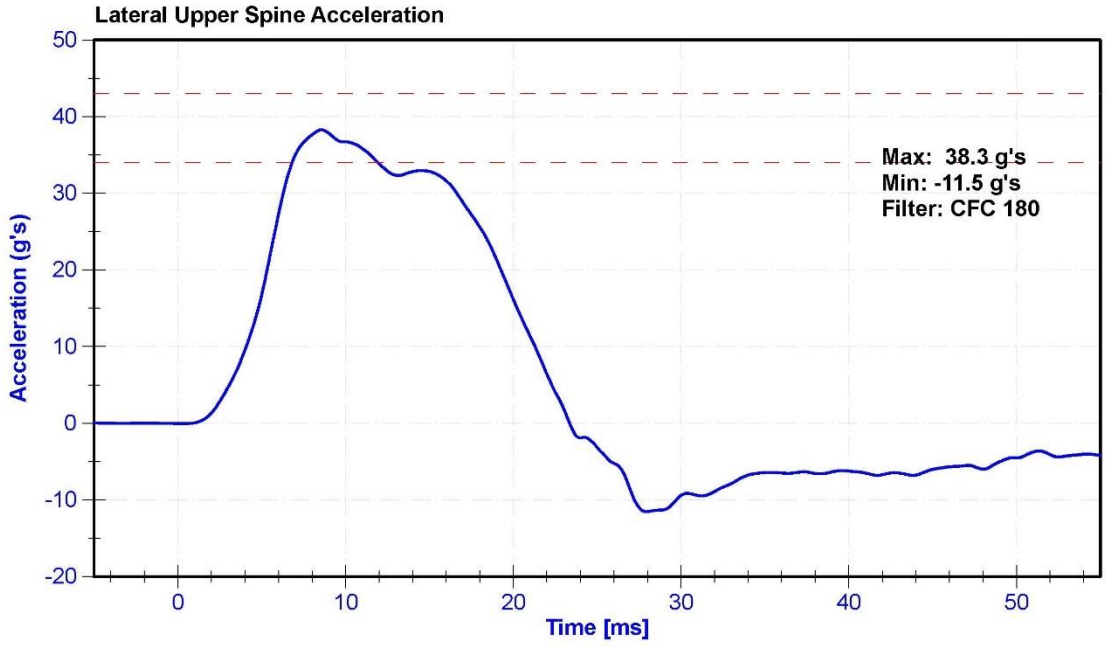


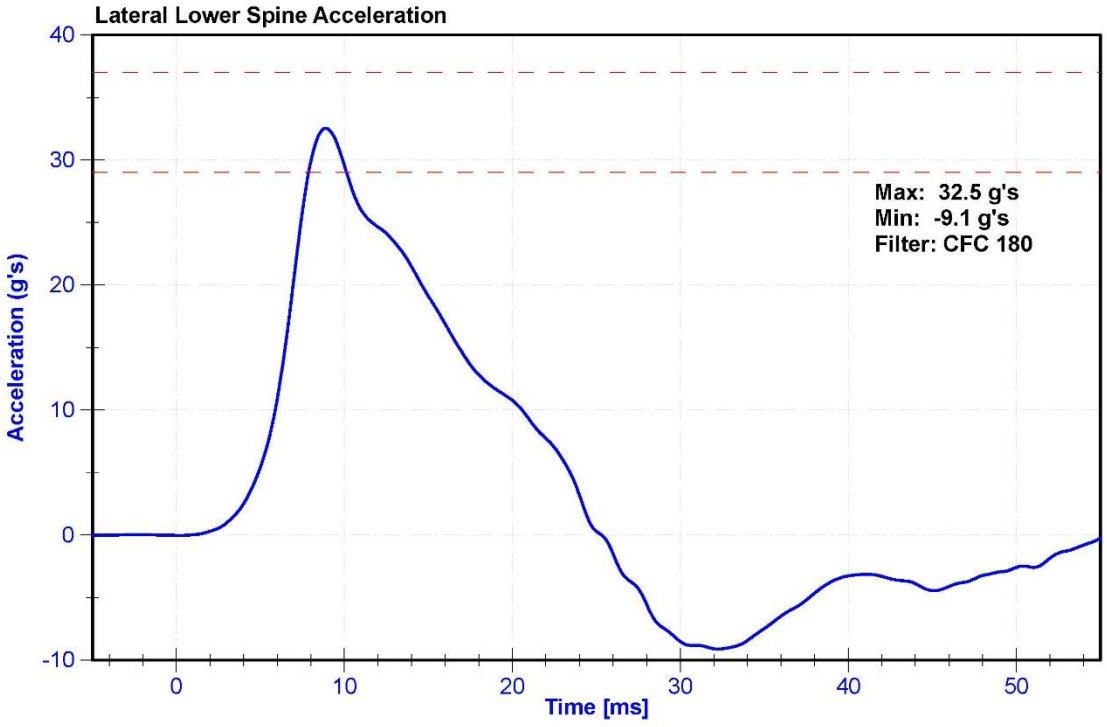

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 32.0 mm
Min: -1.9 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 25.4 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: 33.8 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 38.3 g's
Min: -11.5 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: 32.5 g's
Min: -9.1 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

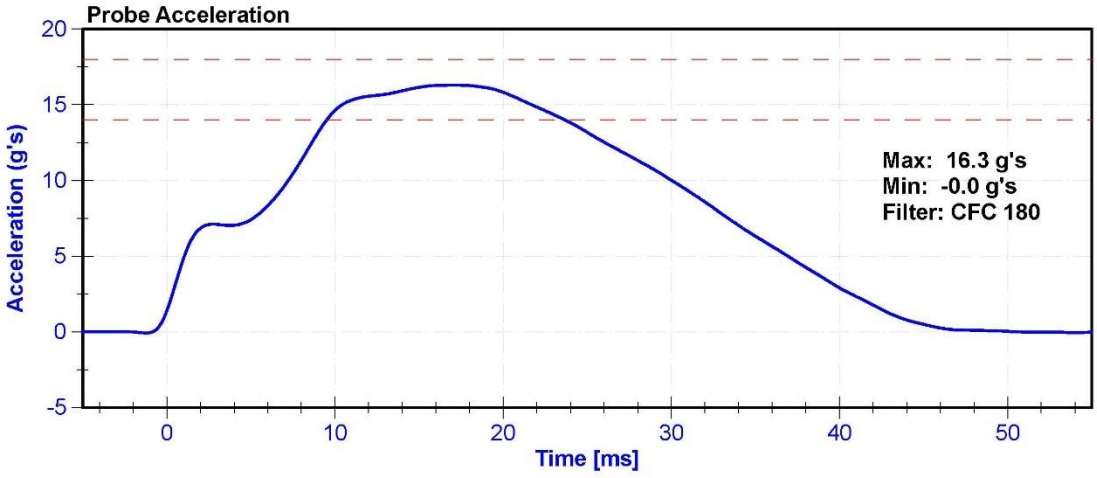
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

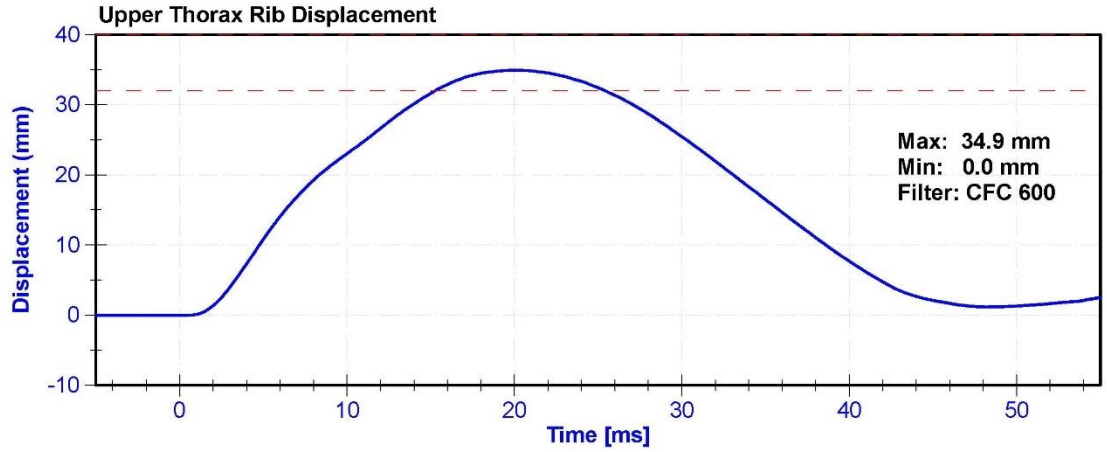
Results

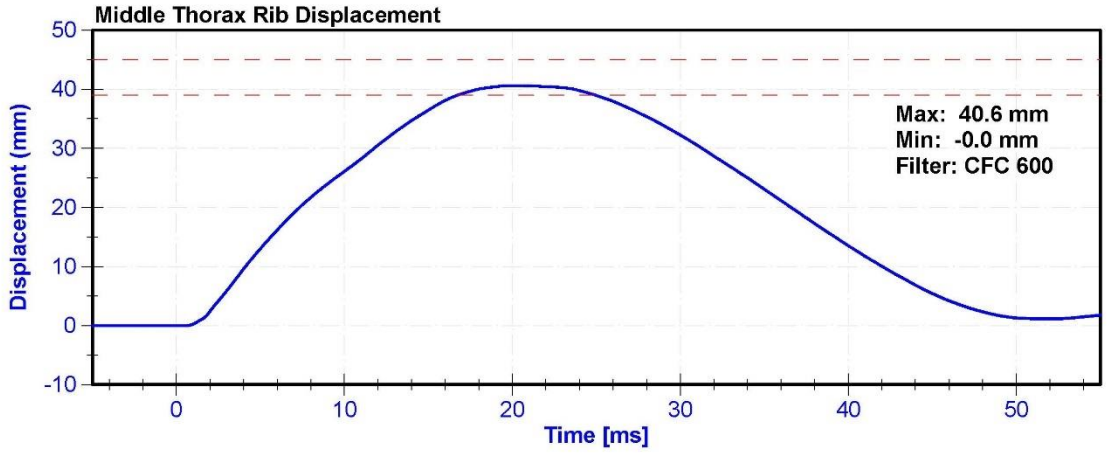
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Probe Acceleration	14	18	g's	16.3	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.1	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.5	Pass
Upper Thorax Rib Deflection	32	40	mm	34.9	Pass
Middle Thorax Rib Deflection	39	45	mm	40.6	Pass
Lower Thorax Rib Deflection	35	43	mm	37.3	Pass

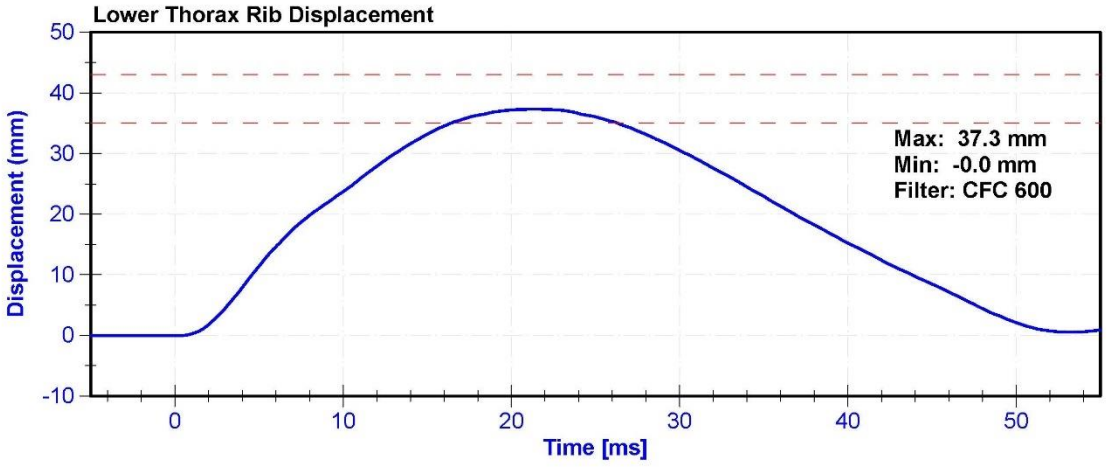
Transducer Calibrations

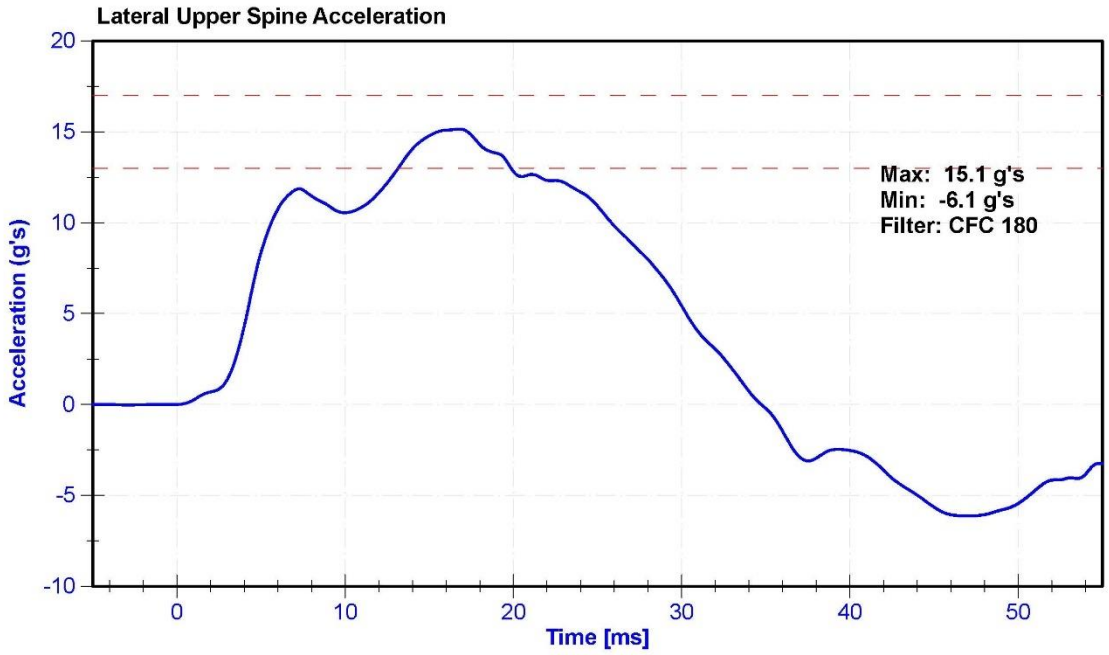
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Upper Spine Y Accelerometer	Endevco	T20880	11/19/2021	5/18/2022
Lower Spine Y Accelerometer	Endevco	P52071	11/19/2021	5/18/2022
Upper Thorax Rib Potentiometer	Servo	451GFE	11/22/2021	5/23/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	11/22/2021	5/23/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	8/30/2021	2/28/2022

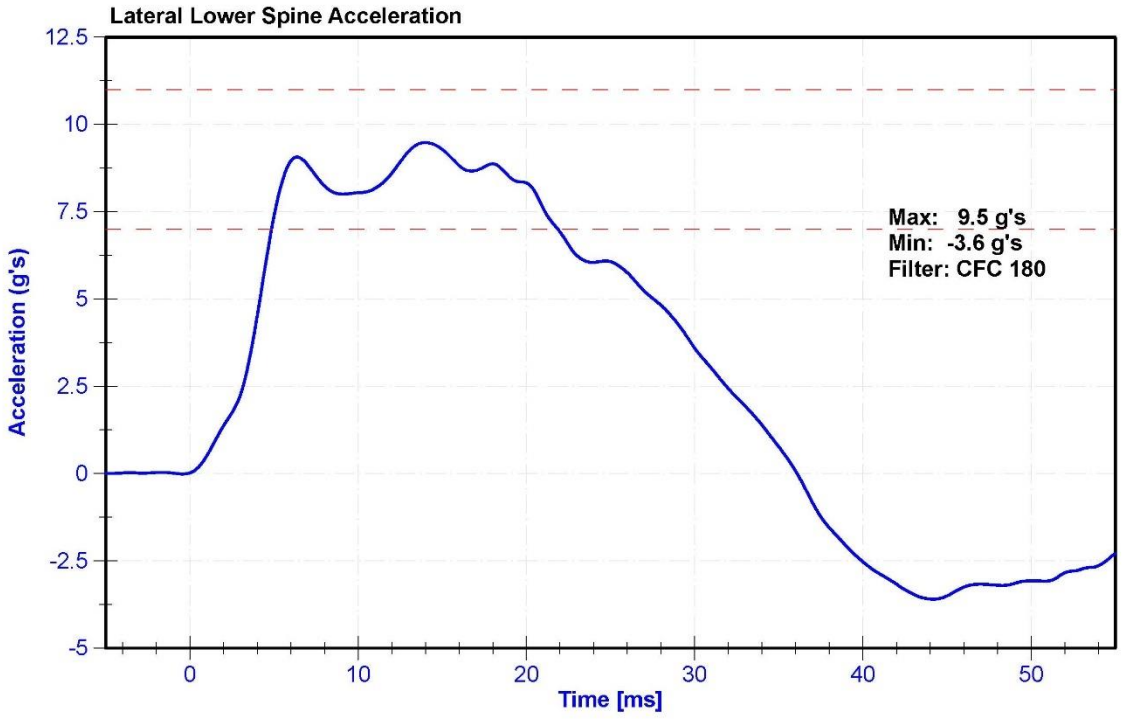



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 34.9 mm
Min: 0.0 mm
Filter: CFC 600


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: 37.3 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 15.1 g's
Min: -6.1 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: 9.5 g's
Min: -3.6 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

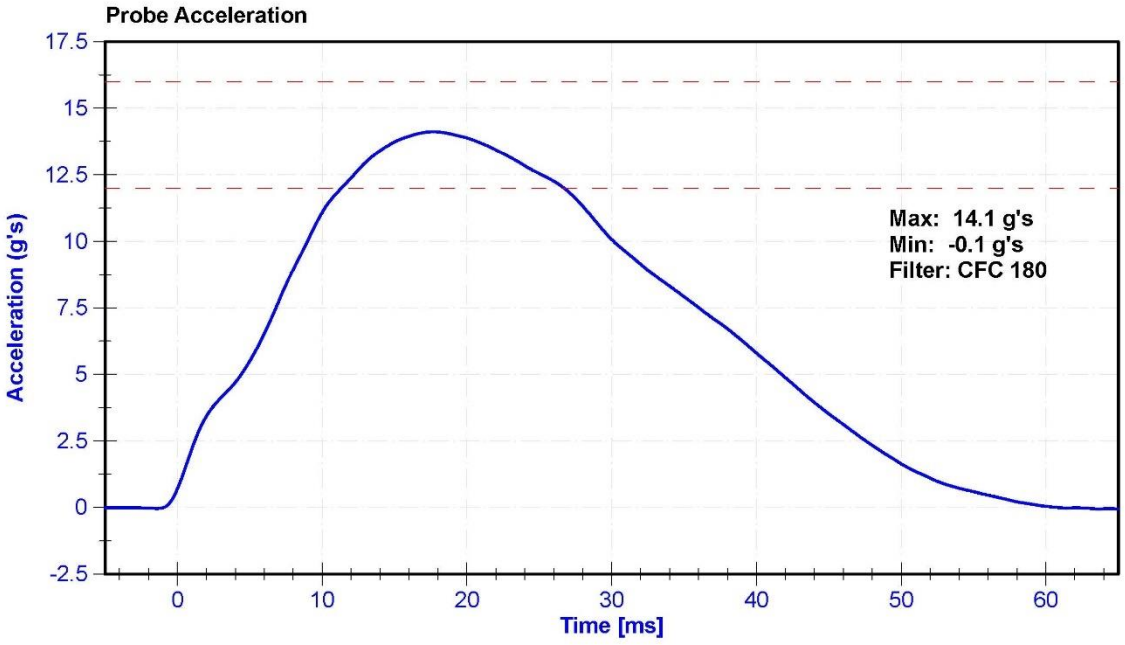
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

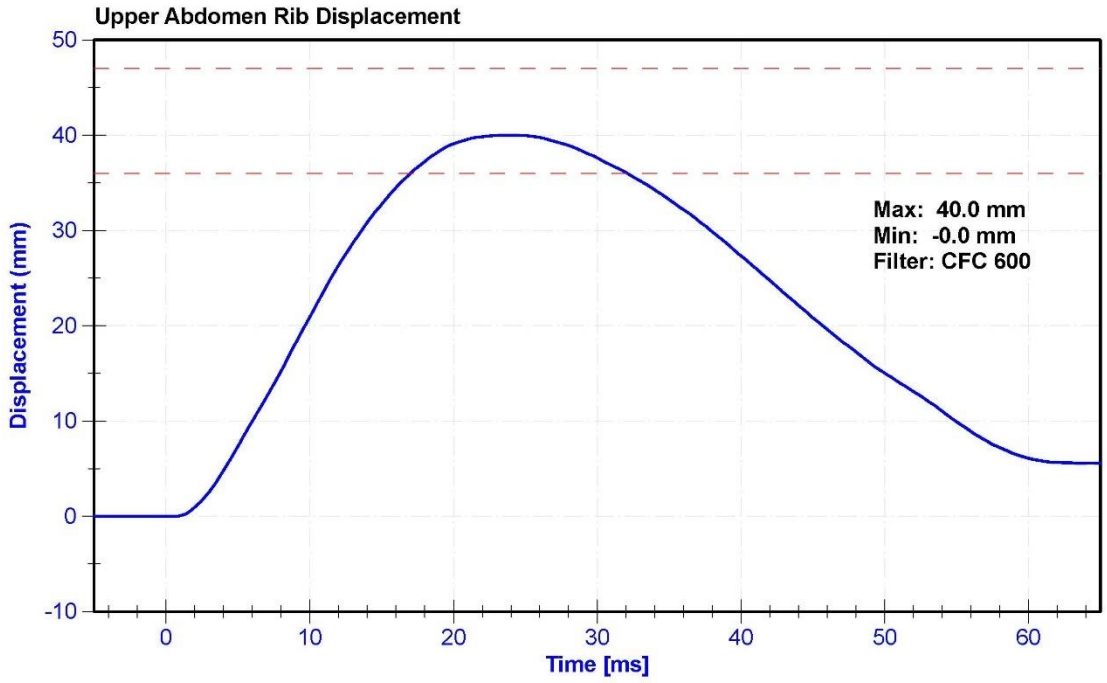
Results

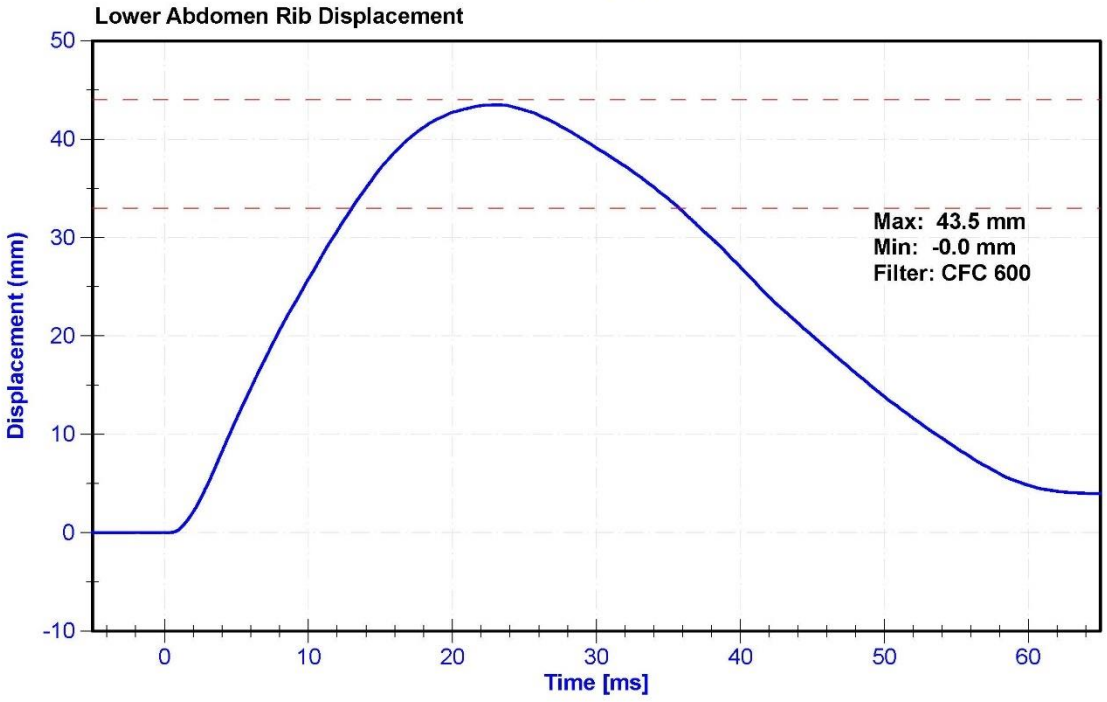
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.30	Pass
Probe Acceleration	12	16	g's	14.1	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.7	Pass
Upper Abdomen Rib Deflection	36	47	mm	40.0	Pass
Lower Abdomen Rib Deflection	33	44	mm	43.5	Pass

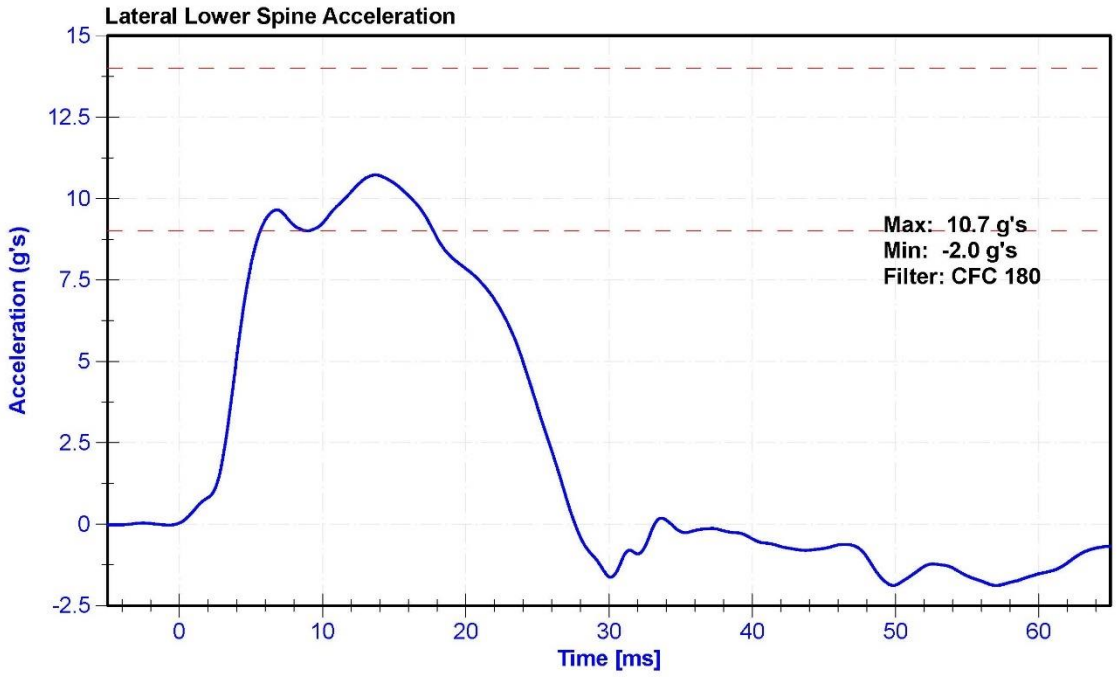
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Lower Spine Y Accelerometer	Endevco	P52071	11/19/2021	5/18/2022
Upper Abdomen Rib Potentiometer	Servo	307GFE	11/22/2021	5/23/2022
Lower Abdomen Rib Potentiometer	Servo	308GFE	11/22/2021	5/23/2022




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.0 mm
Min: -0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 43.5 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: 10.7 g's
Min: -2.0 g's
Filter: CFC 180

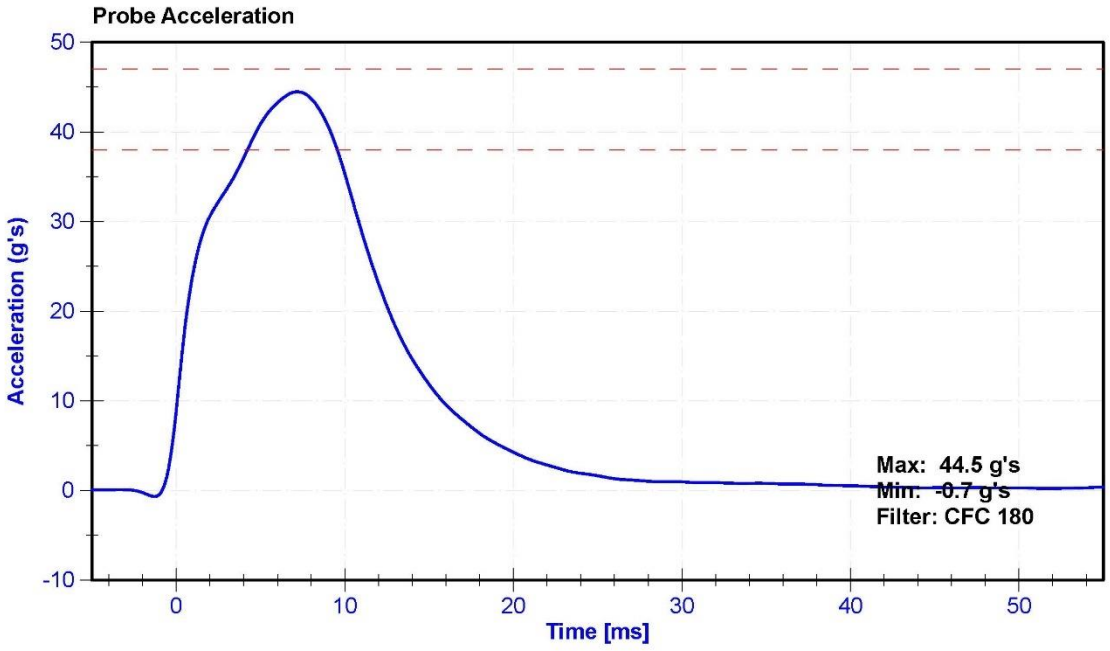
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

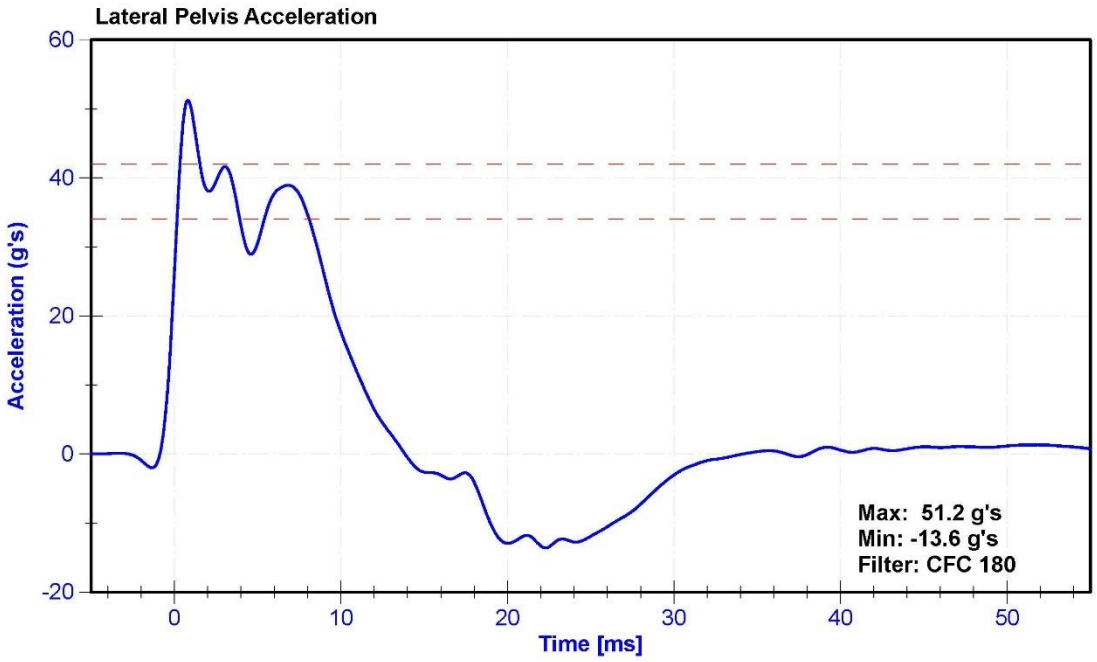
Results

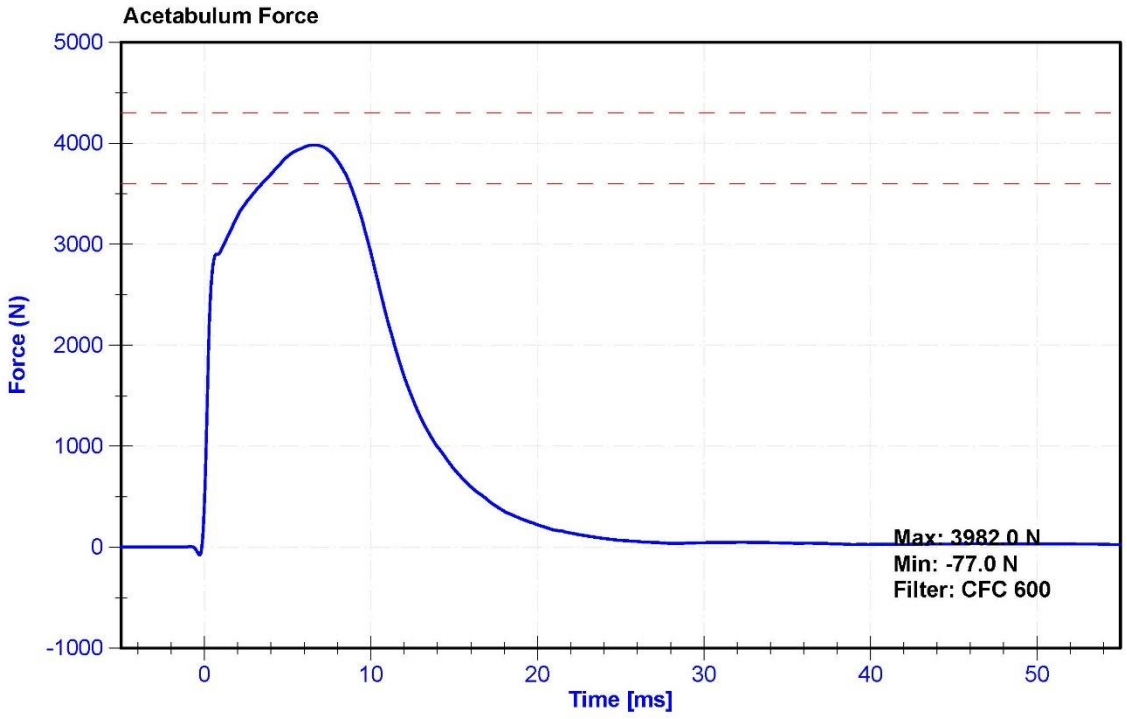
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	27	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration	38	47	g's	44.5	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	38.9	Pass
Acetabulum Force	3600	4300	N	3982.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Pelvis Y Accelerometer	Endevco	P51731	11/19/2021	5/18/2022
Acetabulum Load Cell	Denton	275-FY	9/14/2021	9/14/2022
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A




Lateral Pelvis Acceleration
Acceleration (g's)
60
40
20
0
-20
0
10
20
30
40
50
Time [ms]
Max: 51.2 g's
Min: -13.6 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: 3982.0 N
Min: -77.0 N
Filter: CFC 600

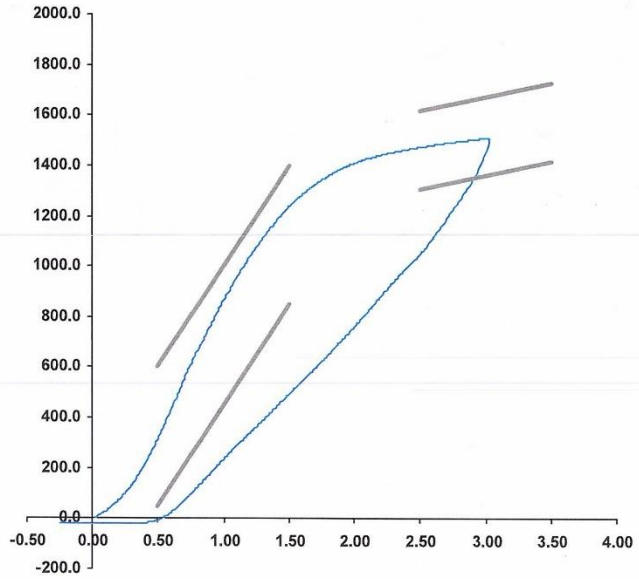
Cert 1-12-22

SID-IIs Pelvis Plug Certification Test

Plug S/N 14074
Test Number 13548
Report Number 13593
Test Date 5/25/2020 11:40:39 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	316	50	600
Force @ 1.5 mm (N)	1,239	850	1,400
Force @ 2.5 mm (N)	1,475	1,306	1,618
Force @ 3.0 mm (N)	1,510	1,361	1,673

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator 14061

Part Number 180-4450

Template No 107 08-Jul-21
SACO Research

By : _____ Date : _____

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

Crash H12-22

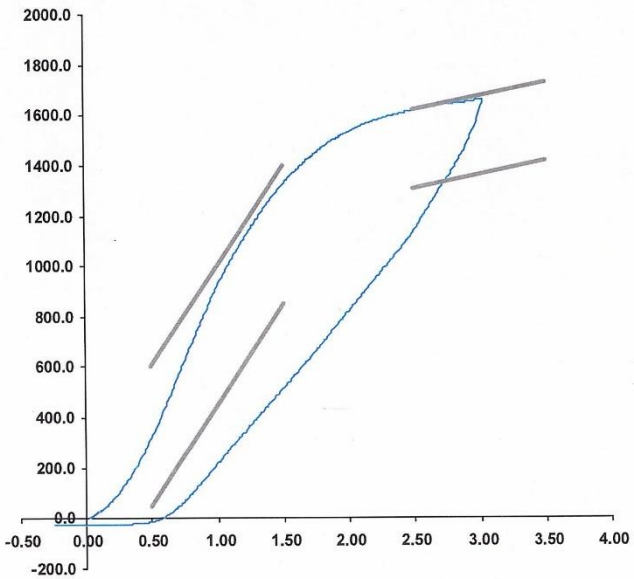
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 13053
Test Number 10373
Report Number 10408
Test Date 7/30/2019 2:31:02 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	323	50	600
Force @ 1.5 mm (N)	1,325	850	1,400
Force @ 2.5 mm (N)	1,618	1,306	1,618
Force @ 3.0 mm (N)	1,658	1,361	1,673

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 08-Jul-21
SACO Research

By : _____ Date : _____

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

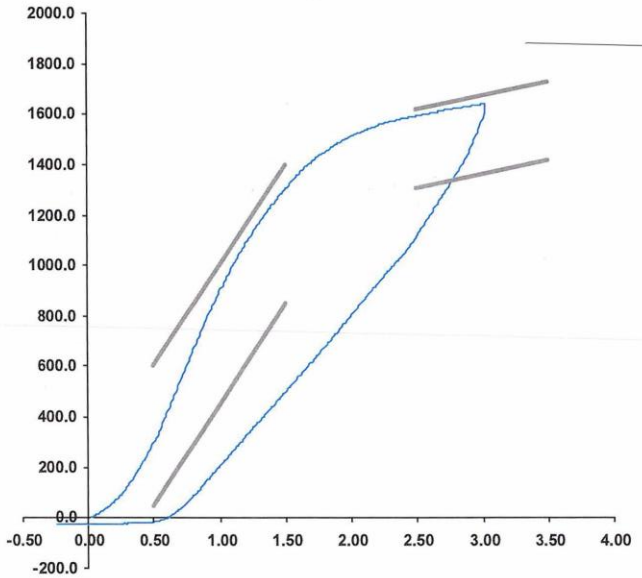
300
Non-Impact

SID-IIs Pelvis Plug Certification Test

Plug S/N 13094
Test Number 10414
Report Number 10449
Test Date 7/30/2019 4:44:31 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	305	50	600
Force @ 1.5 mm (N)	1,305	850	1,400
Force @ 2.5 mm (N)	1,595	1,306	1,618
Force @ 3.0 mm (N)	1,640	1,361	1,673

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 08-Jul-21
SACO Research

By : _____ Date : _____

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

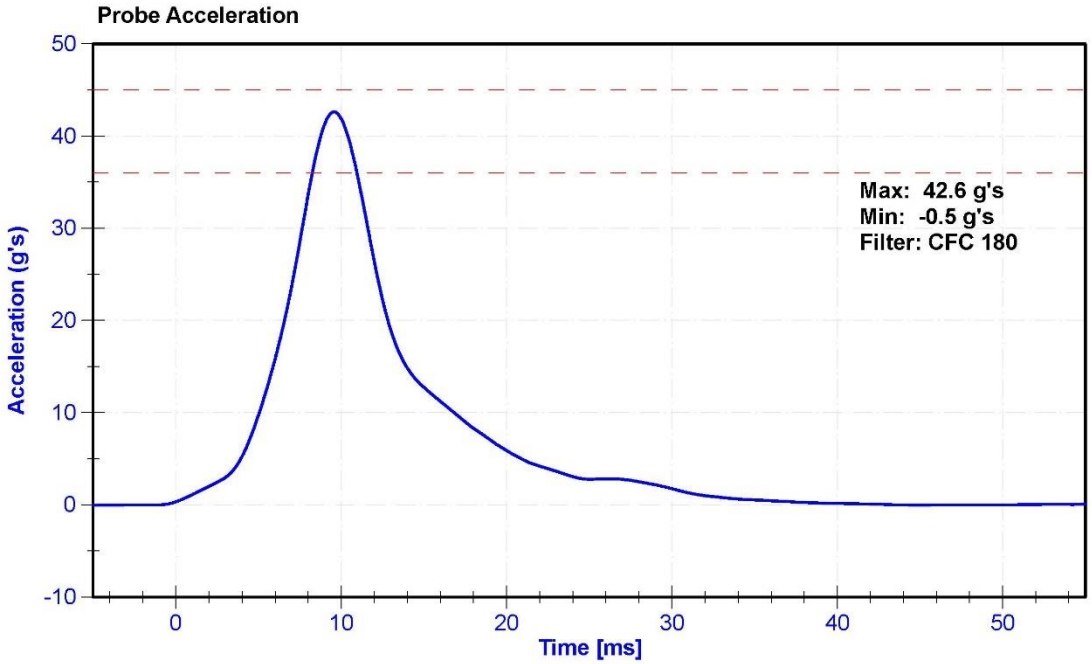
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

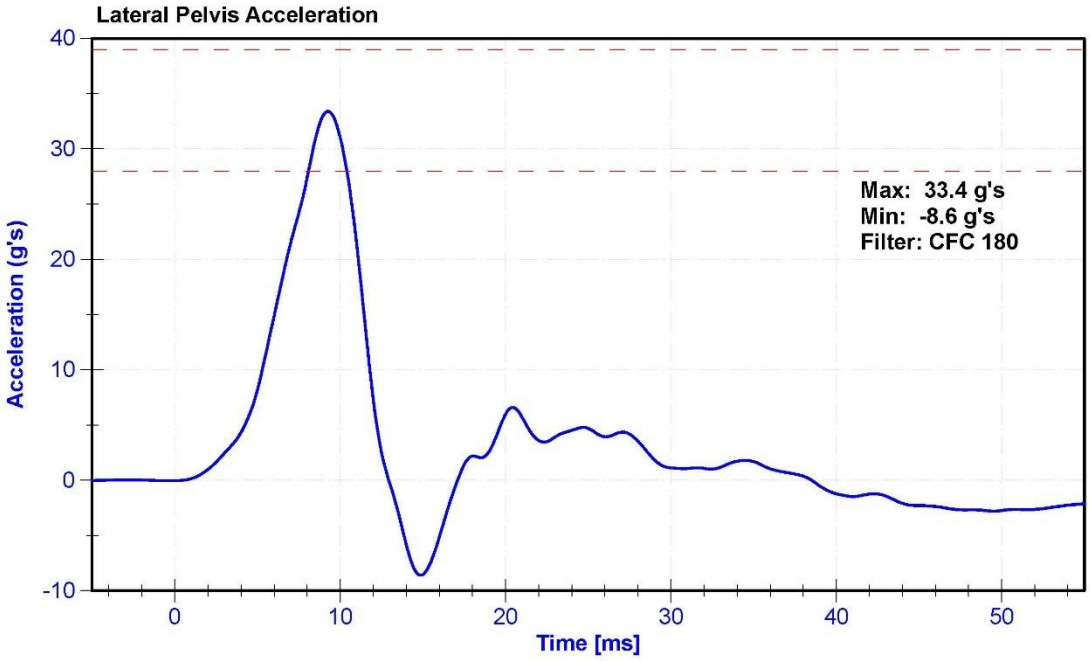
Results

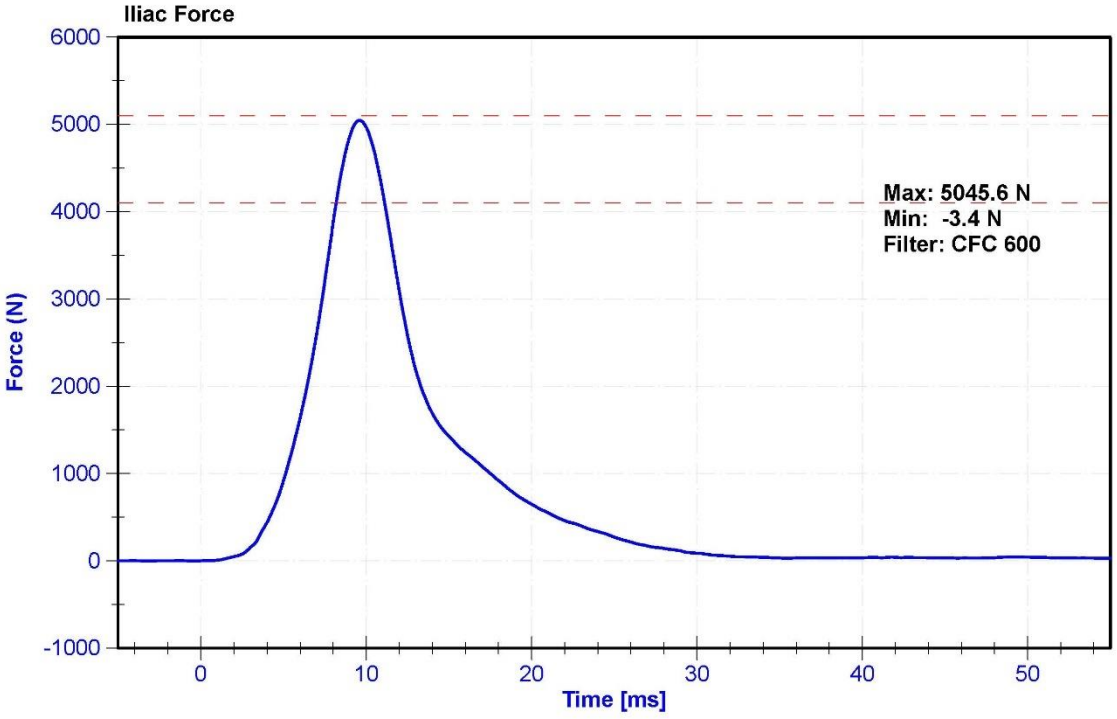
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.25	Pass
Probe Acceleration	36	45	g's	42.6	Pass
Lateral Pelvis Acceleration	28	39	g's	33.4	Pass
Iliac Force	4100	5100	N	5045.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Pelvis Y Accelerometer	Endevco	P51731	11/19/2021	5/18/2022
Iliac Load Cell	Denton	279-FY	9/14/2021	9/14/2022




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 33.4 g's
Min: -8.6 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 5045.6 N
Min: -3.4 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

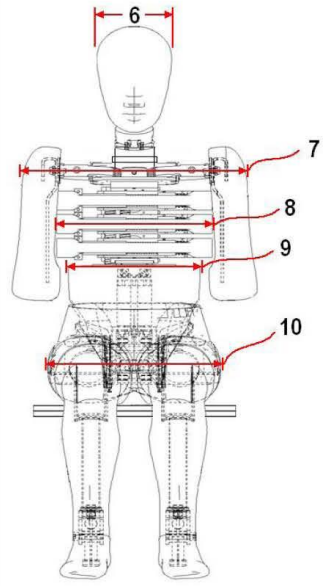
SERIAL NO: F033

(CONFIGURED FOR LEFT SIDE IMPACT)

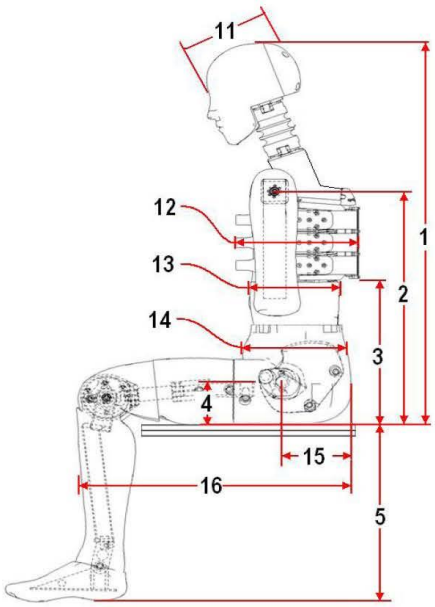
External Measurements - EuroSID-2re

Technician: J.Pericak Date: 2/10/2022

Dummy Serial Number: F033



FRONT VIEW



SIDE VIEW

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

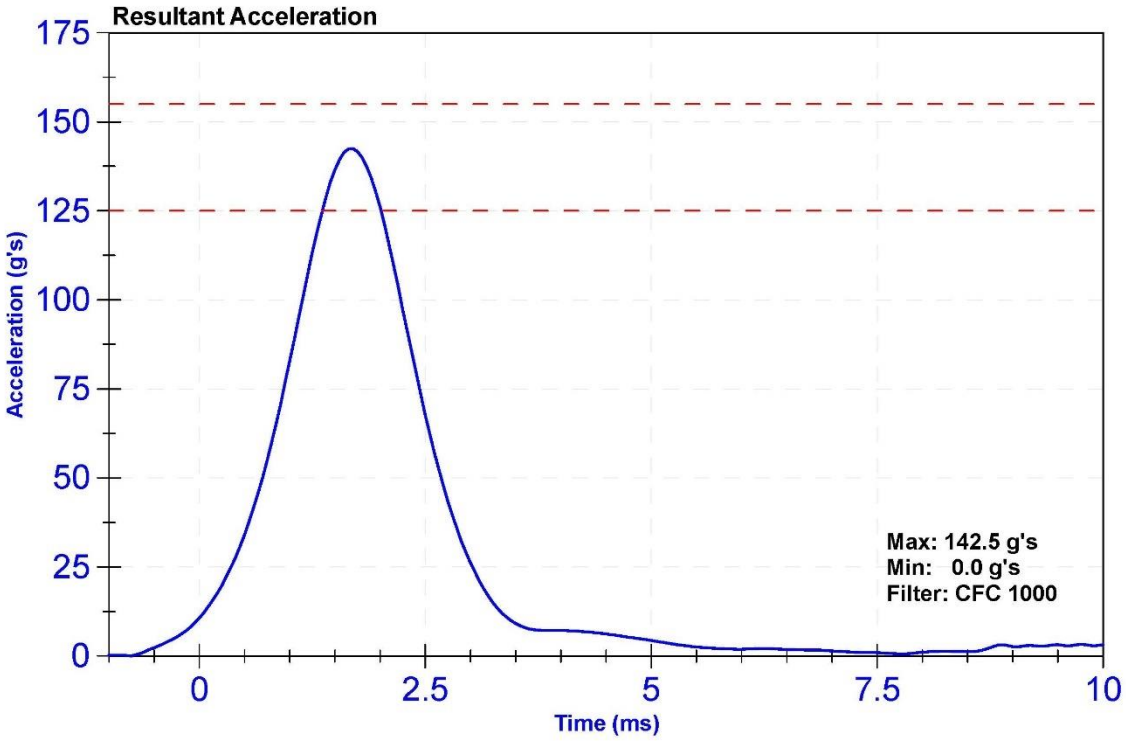
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

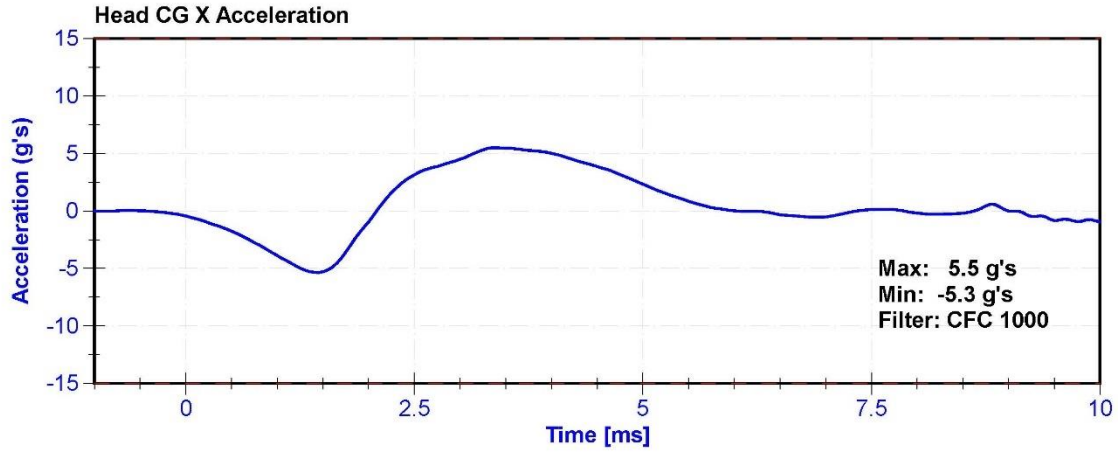
Results

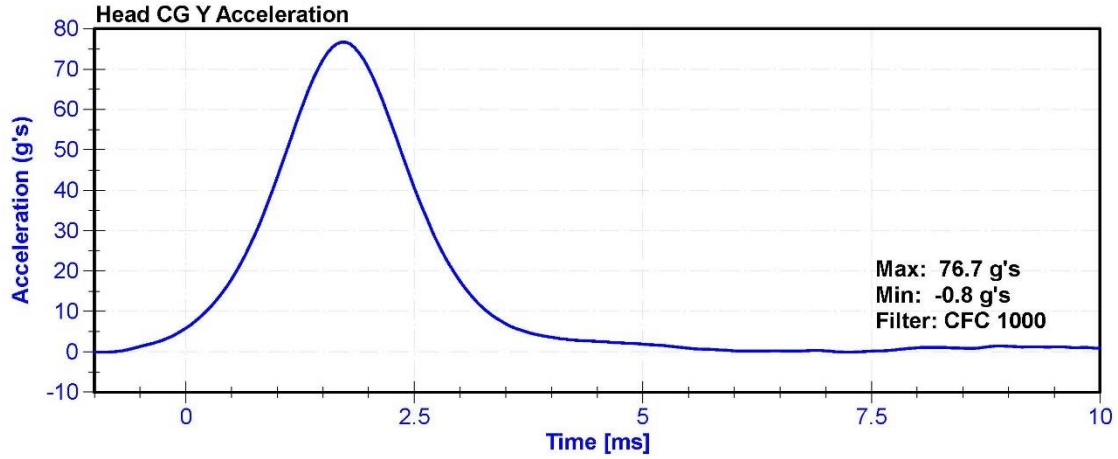
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	23.2	Pass
Resultant Acceleration	125	155	g's	142.5	Pass
Oscillation	0	15	%	5.08	Pass
Fore-Aft Acceleration	-15	15	g's	5.5	Pass

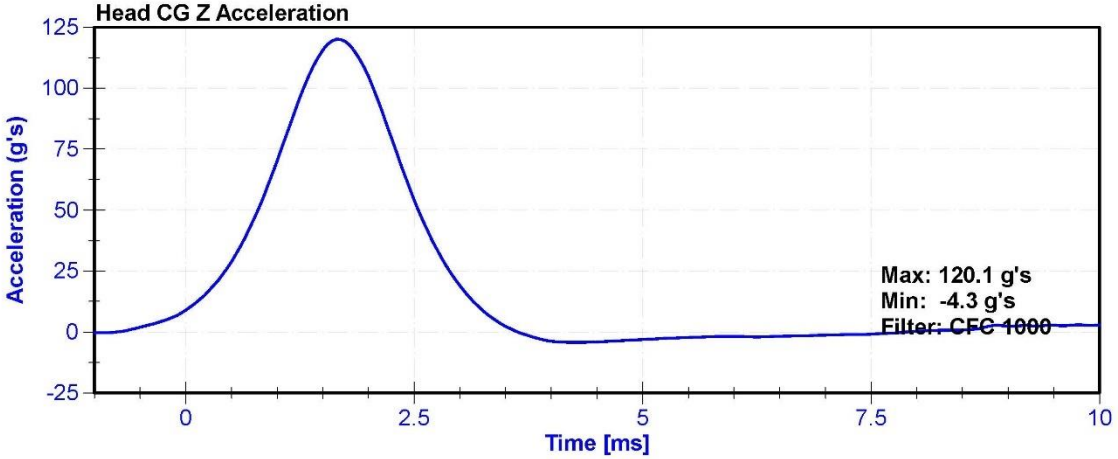
Transducer Calibrations

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




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 5.5 g's
Min: -5.5 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]
Max: 76.7 g's
Min: -0.8 g's
Filter: CFC 1000


Head CG Z 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: -4.3 g's
Filter: CFC 1000

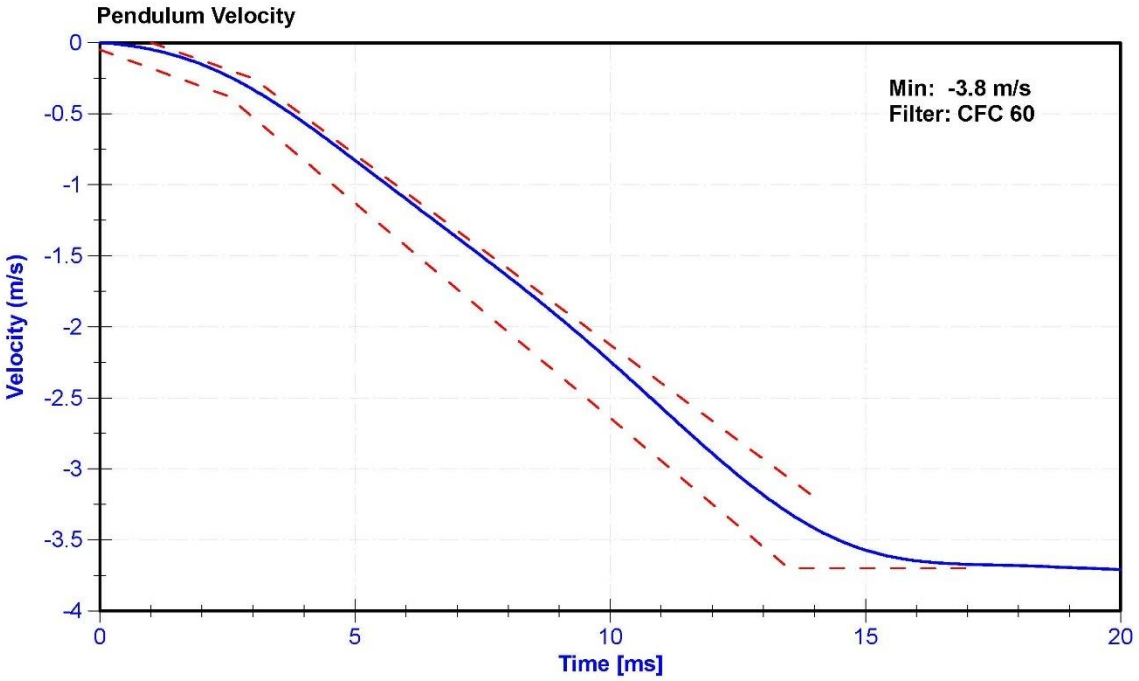
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

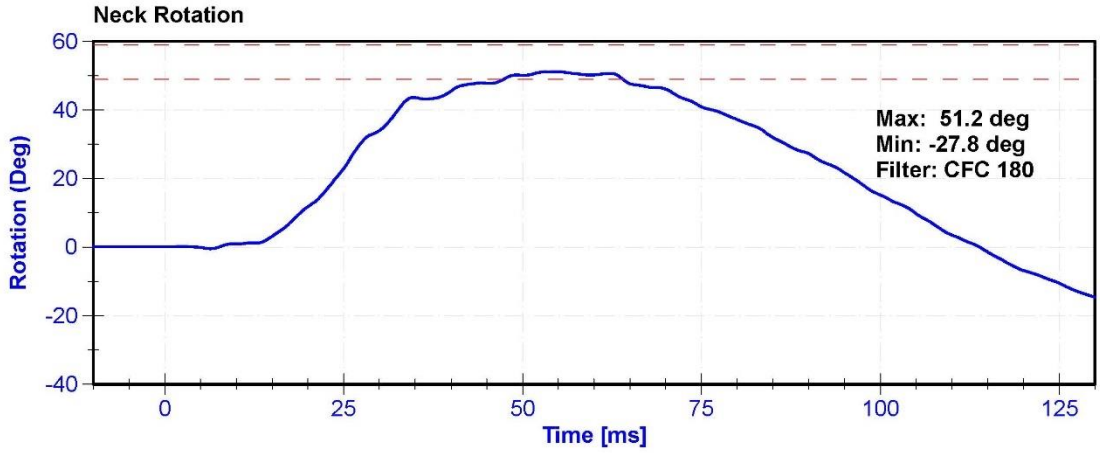
Results

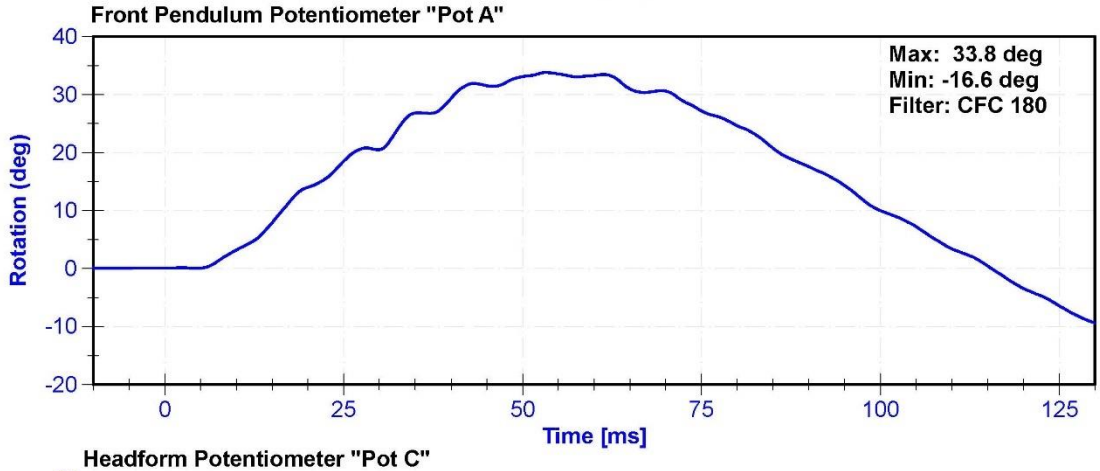
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	20.5	Pass
Velocity	3.3	3.5	m/s	3.41	Pass
Lateral Neck Rotation	49	59	deg	51.2	Pass
Time at Maximum Rotation	54	66	ms	54.9	Pass
Time of Rotation Decay from Maximum	53	88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

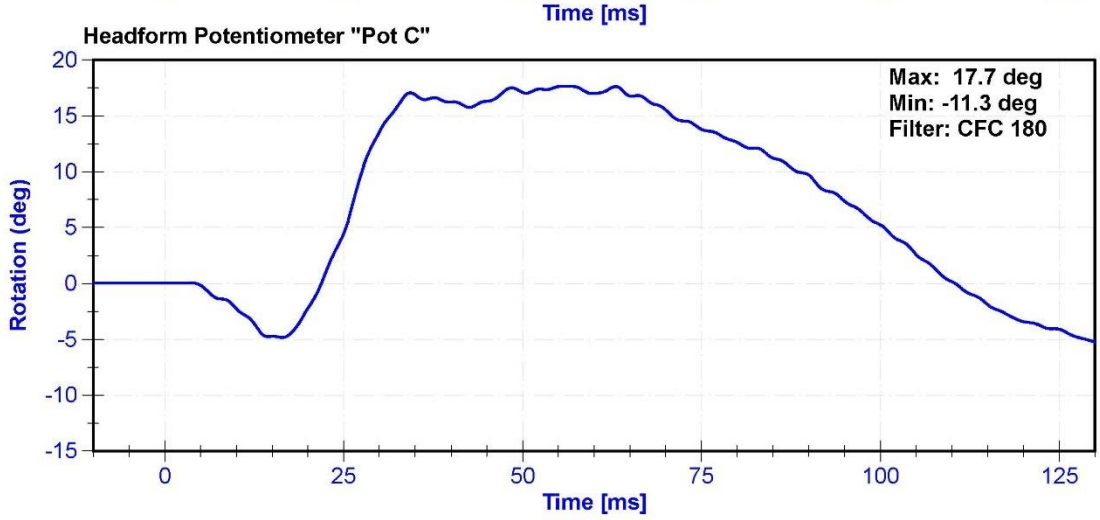
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Front Pendulum Potentiometer	Sfernice	094	10/1/2021	4/1/2022
Headform Potentiometer	Sfernice	095	10/1/2021	4/1/2022




Neck Rotation
Rotation (Deg)
Time [ms]
Max: 51.2 deg
Min: -27.8 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 33.8 deg
Min: -16.6 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 17.7 deg
Min: -11.3 deg
Filter: CFC 180

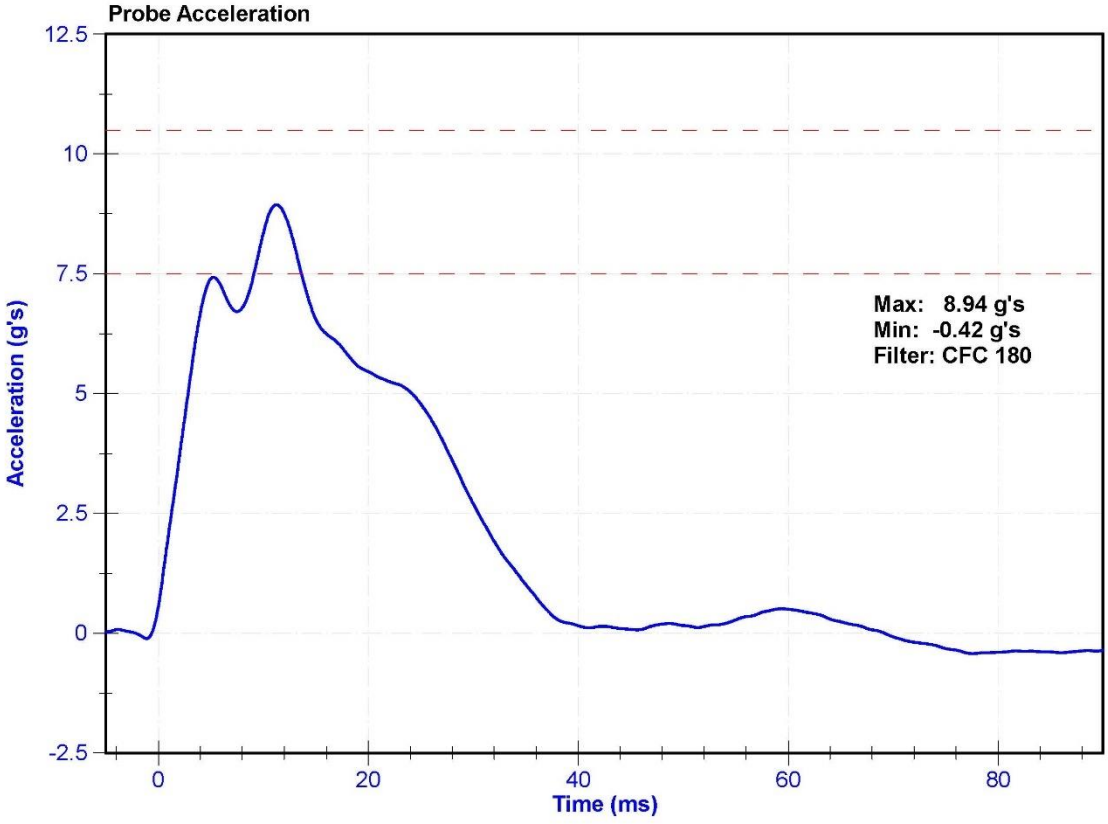
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

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

Transducer Calibrations

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



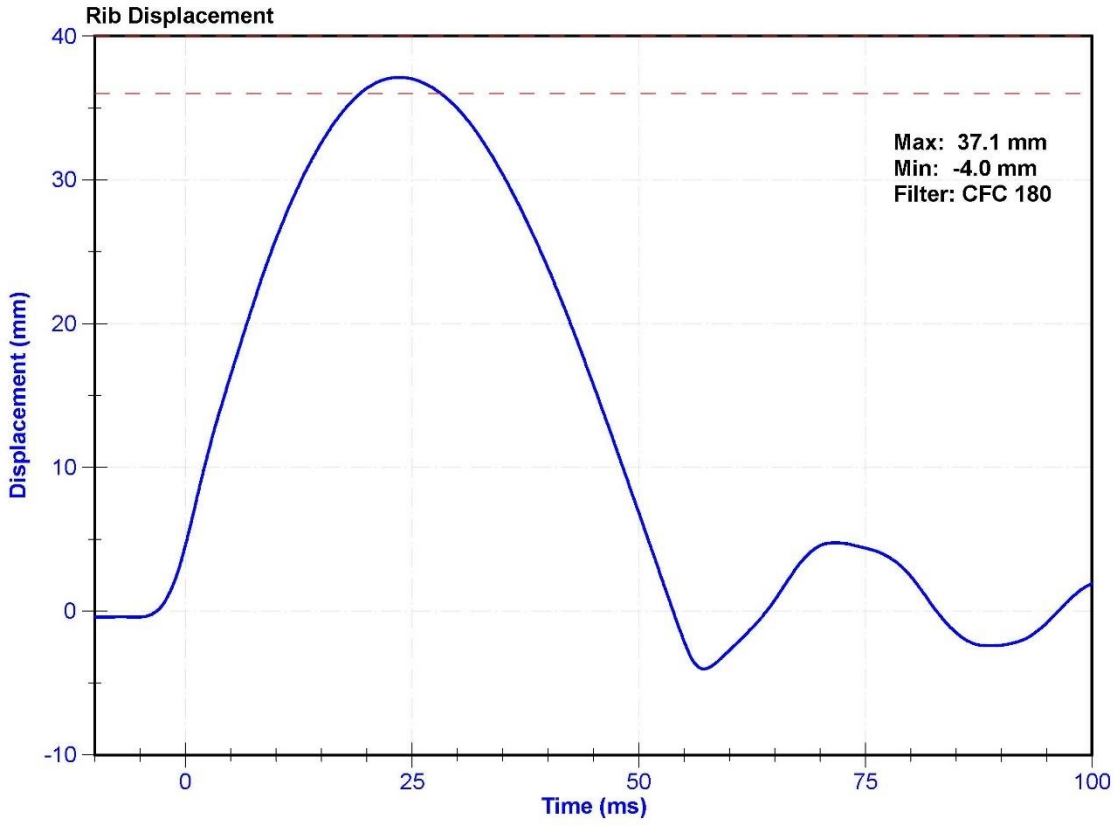
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

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

Transducer Calibrations

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



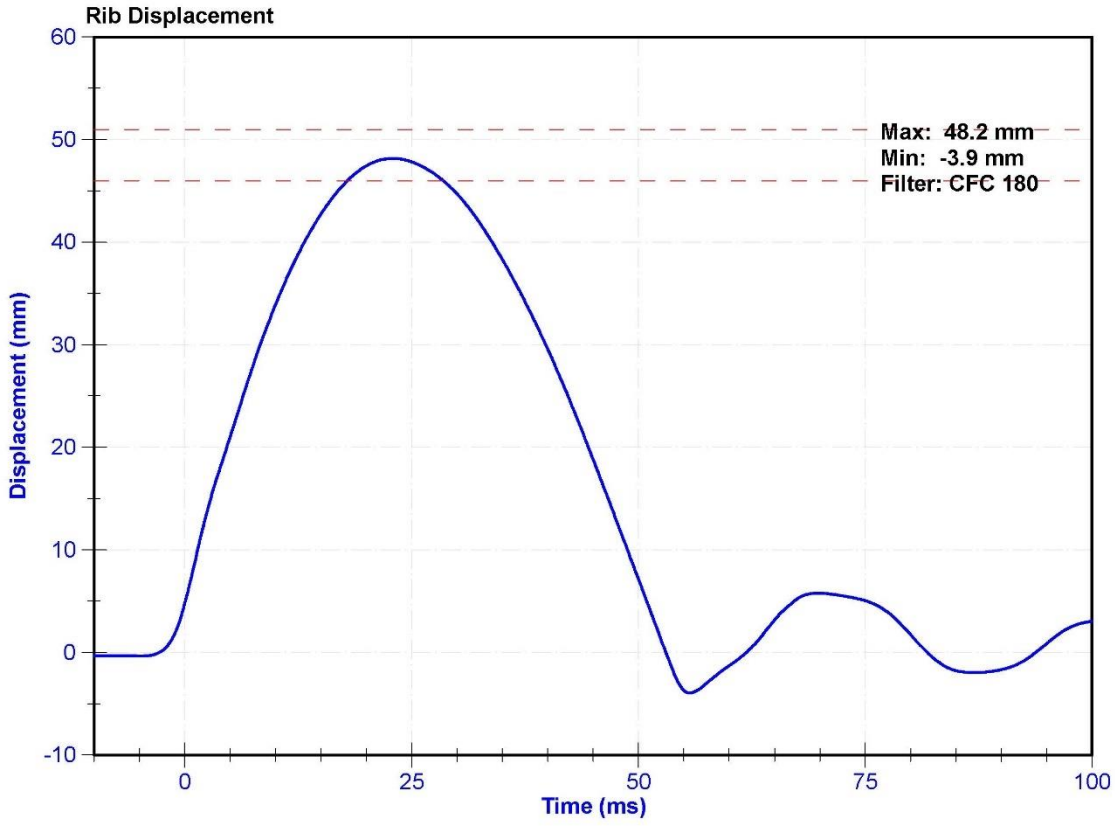
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

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

Transducer Calibrations

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



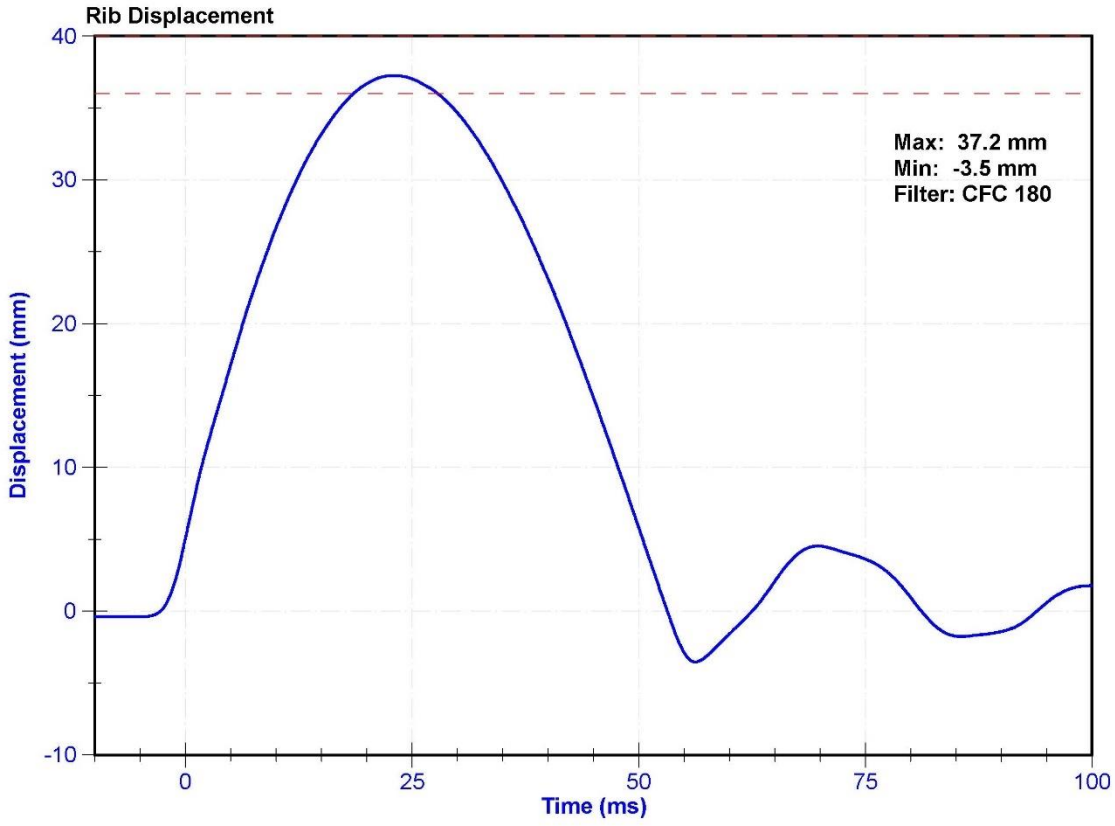
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

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

Transducer Calibrations

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



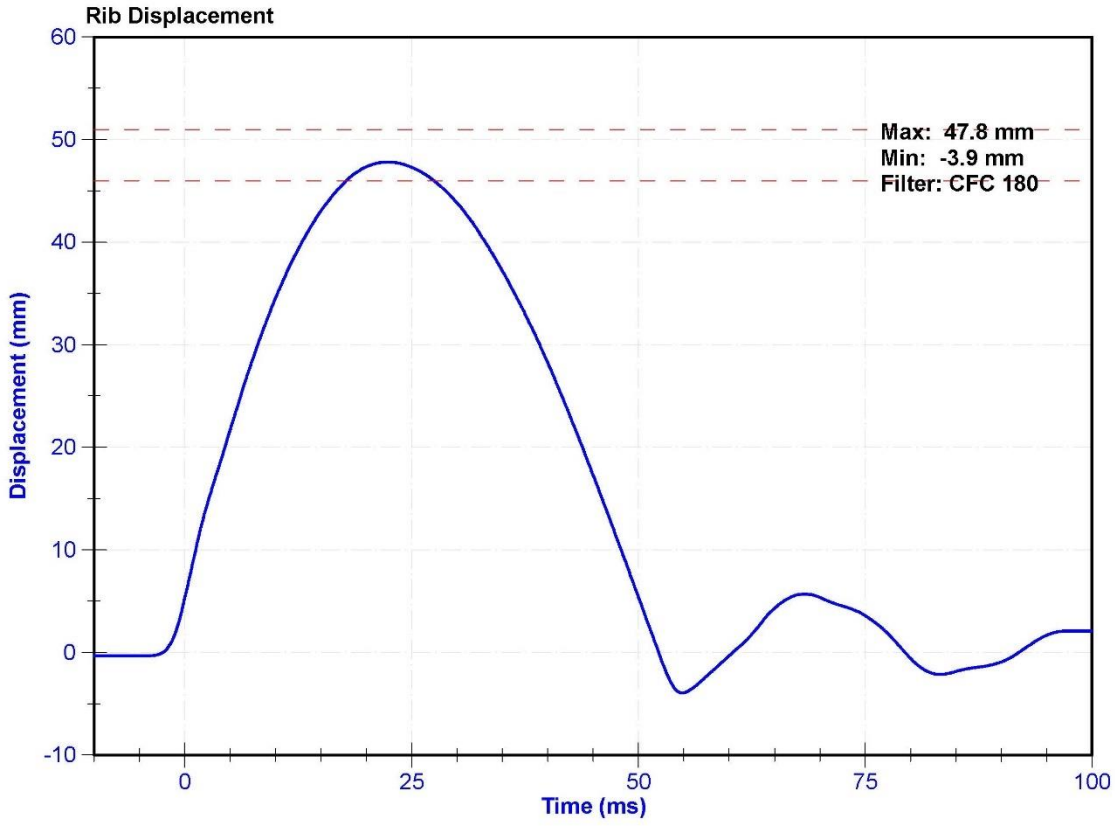
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

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

Transducer Calibrations

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



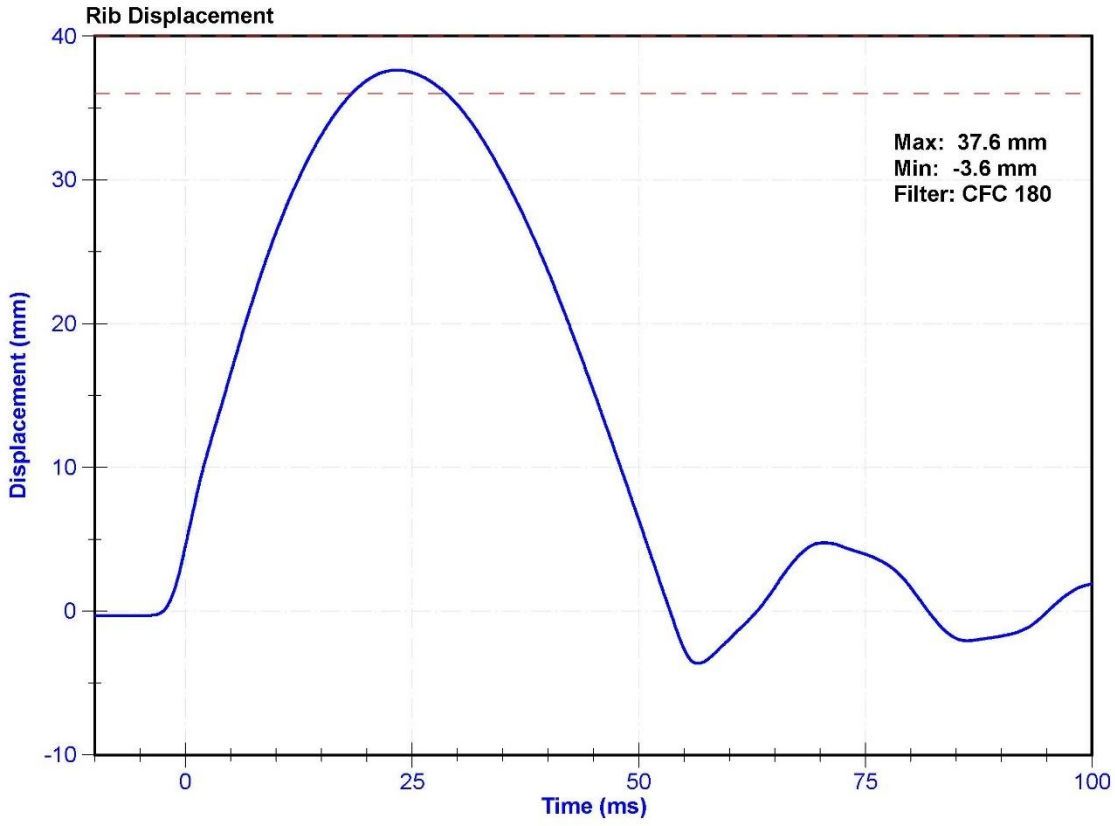
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

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

Transducer Calibrations

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



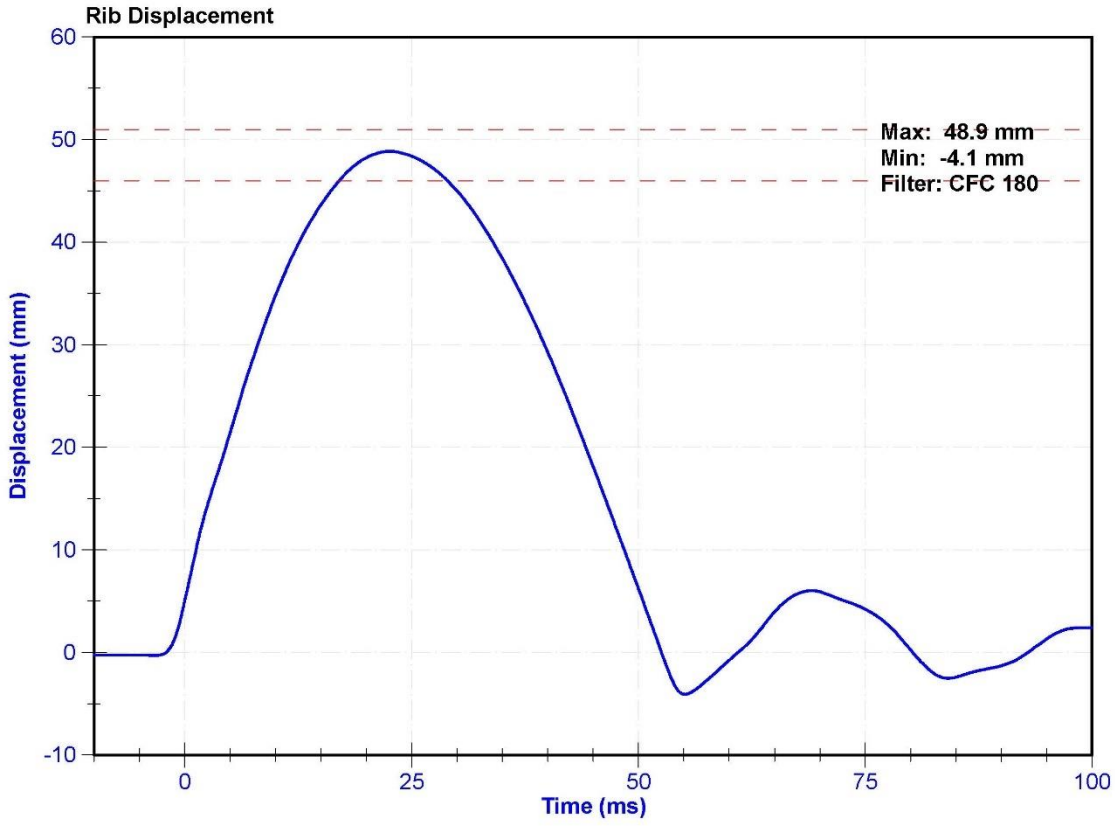
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

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

Transducer Calibrations

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



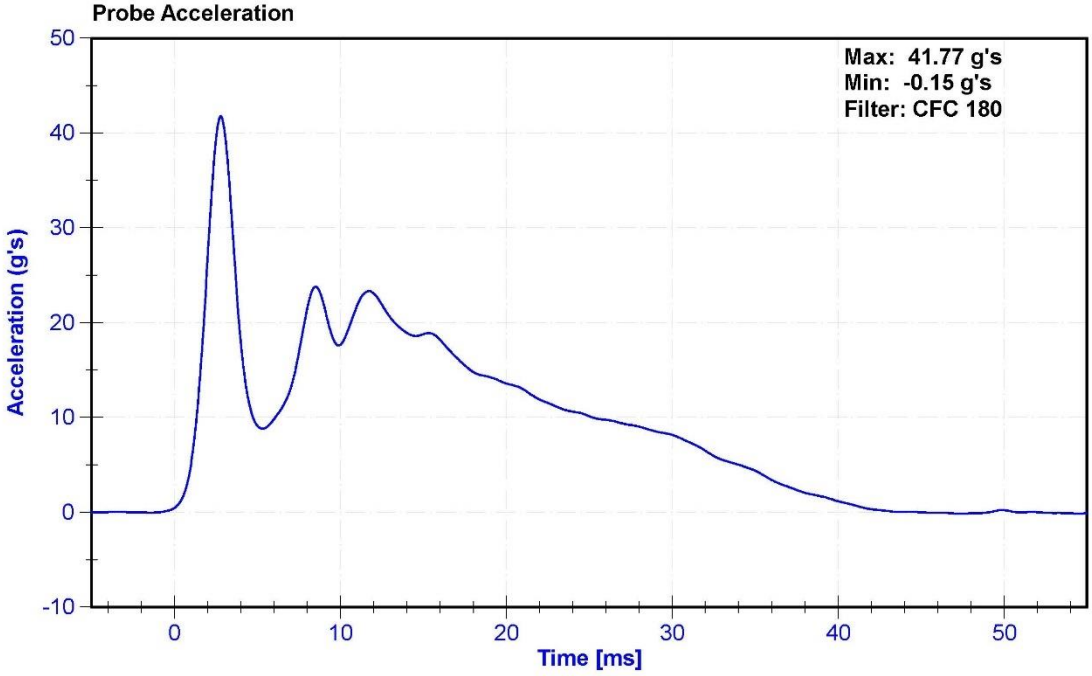
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

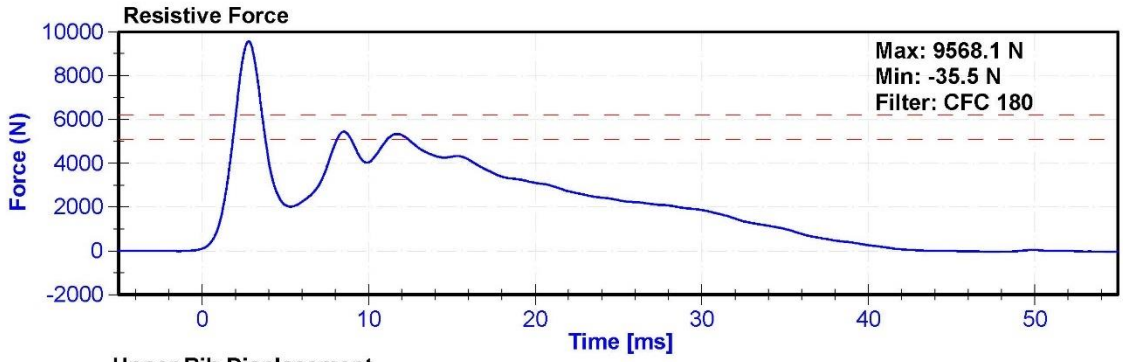
Results

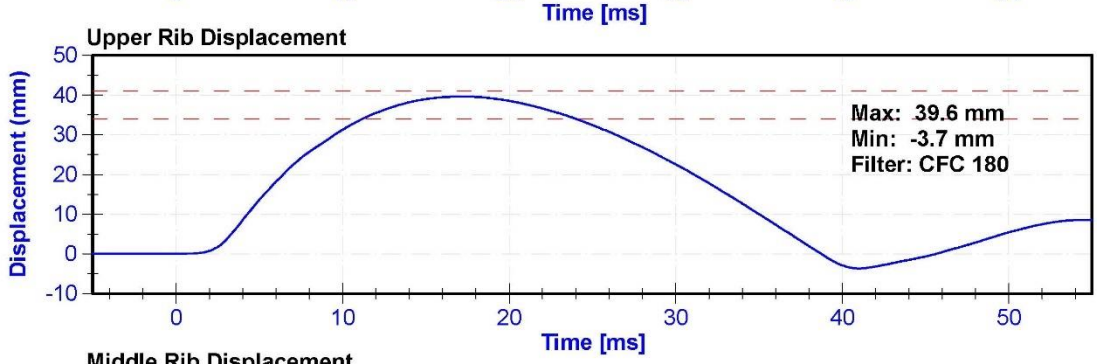
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	27.9	Pass
Velocity	5.4	5.6	m/s	5.47	Pass
Resistive Force after 6ms	5100	6200	N	5446.5	Pass
Upper Thorax Rib Deflection	34	41	mm	39.6	Pass
Mid Thorax Rib Deflection	37	45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

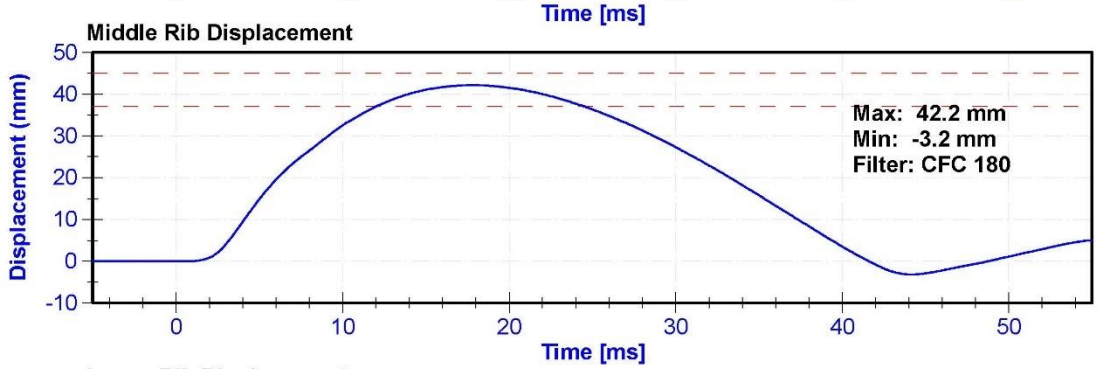
Transducer Calibrations

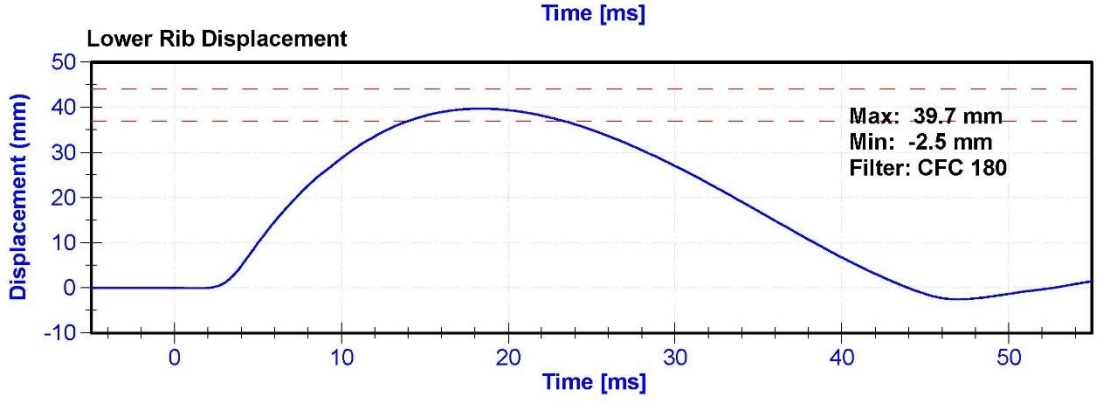
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Upper Thorax Rib Potentiometer	Honeywell	179GFE	2/1/2022	8/2/2022
Middle Thorax Rib Potentiometer	Honeywell	185GFE	2/1/2022	8/2/2022
Lower Thorax Rib Potentiometer	Honeywell	178GFE	2/1/2022	8/2/2022




Resistive Force
Max: 9568.1 N
Min: -35.5 N
Filter: CFC 180
Force (N)
Time [ms]


Upper Rib Displacement
Max: 39.6 mm
Min: -3.7 mm
Filter: CFC 180
Displacement (mm)
Time [ms]


Middle Rib Displacement
Max: 42.2 mm
Min: -3.2 mm
Filter: CFC 180
Displacement (mm)
Time [ms]


Lower Rib Displacement
Max: 39.7 mm
Min: -2.5 mm
Filter: CFC 180
Displacement (mm)
Time [ms]

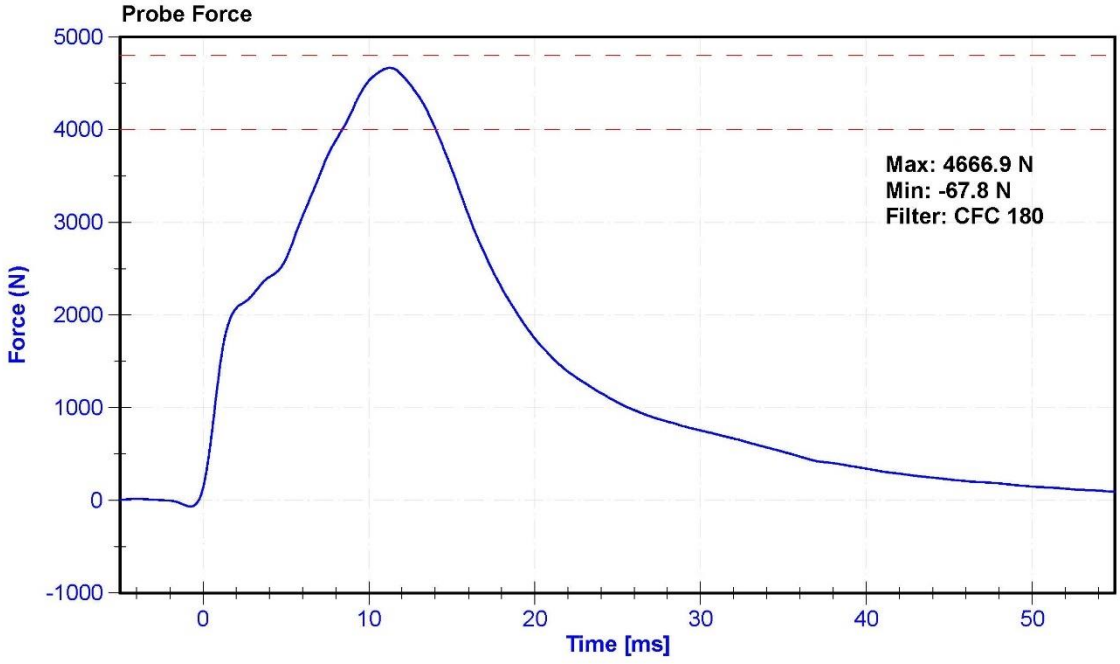
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

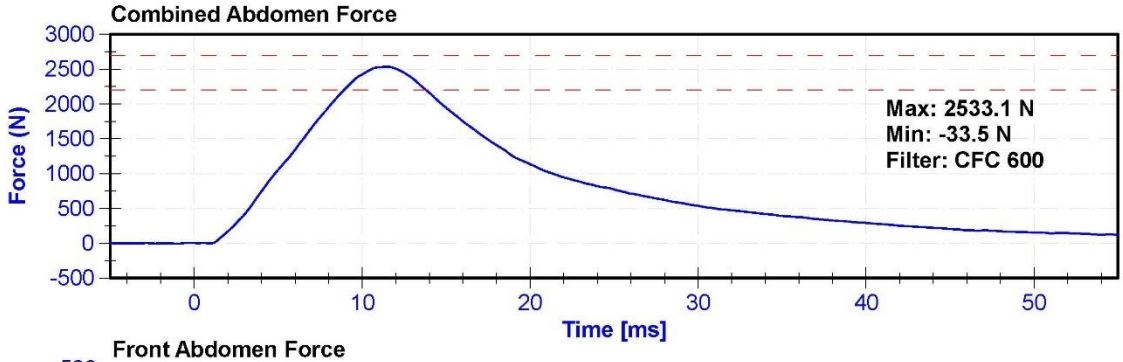
Results

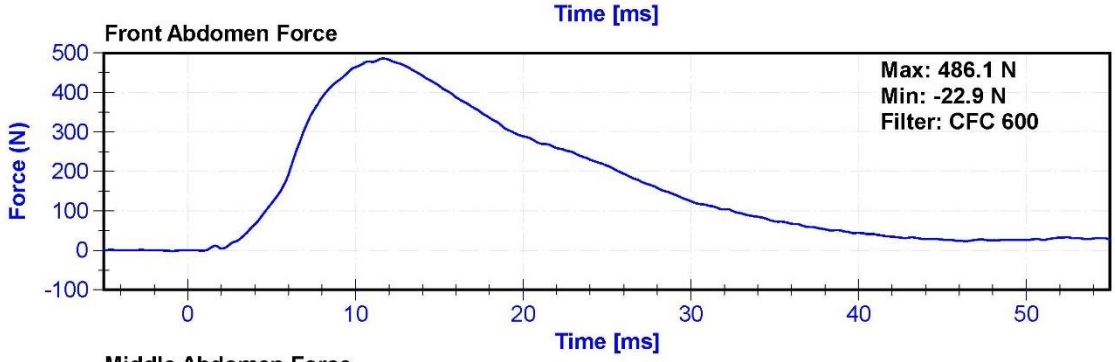
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	27.9	Pass
Velocity	3.9	4.1	m/s	4.07	Pass
Combined Abdomen Force	2200	2700	N	2533.1	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.45	Pass
Resistive Probe Force	4000	4800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

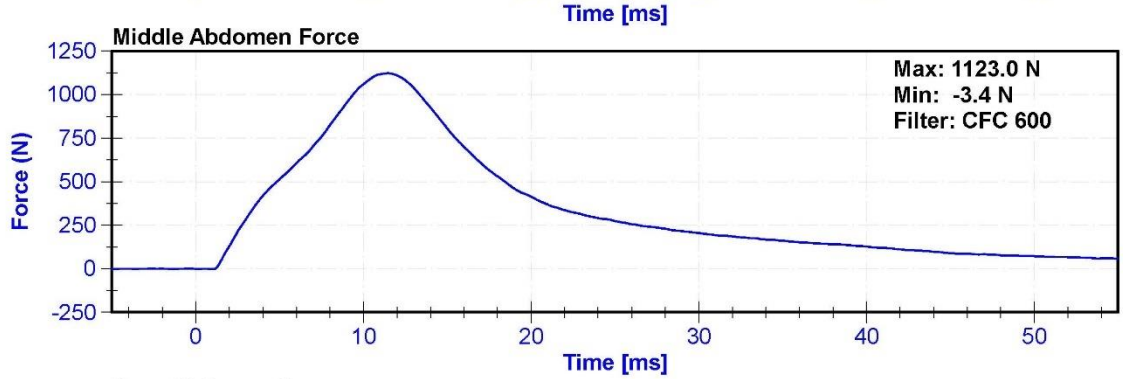
Transducer Calibrations

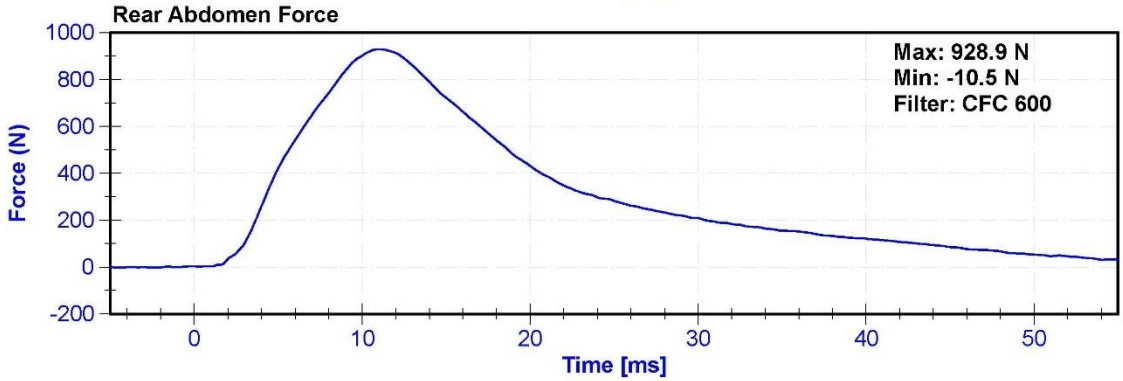
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Front Abdomen Load Cell	Denton	1512	8/2/2021	8/2/2022
Middle Abdomen Load Cell	Denton	1526	8/2/2021	8/2/2022
Rear Abdomen Load Cell	Denton	1512	8/2/2021	8/2/2022




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2533.1 N
Min: -33.5 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 486.1 N
Min: -22.9 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1123.0 N
Min: -3.4 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 928.9 N
Min: -10.5 N
Filter: CFC 600

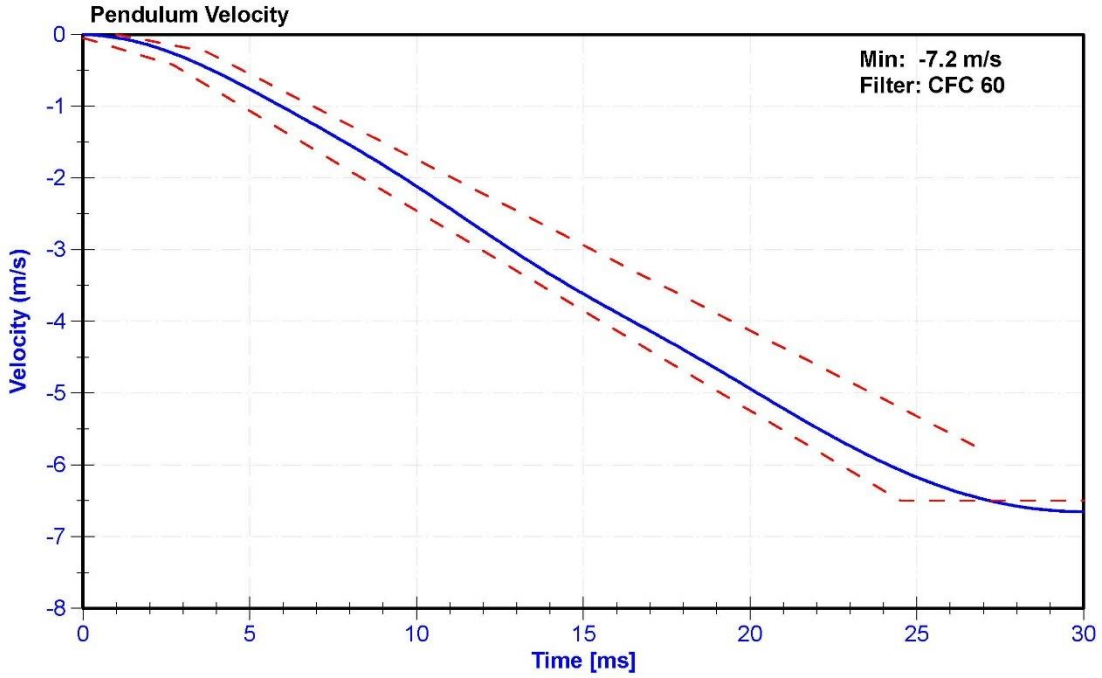
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

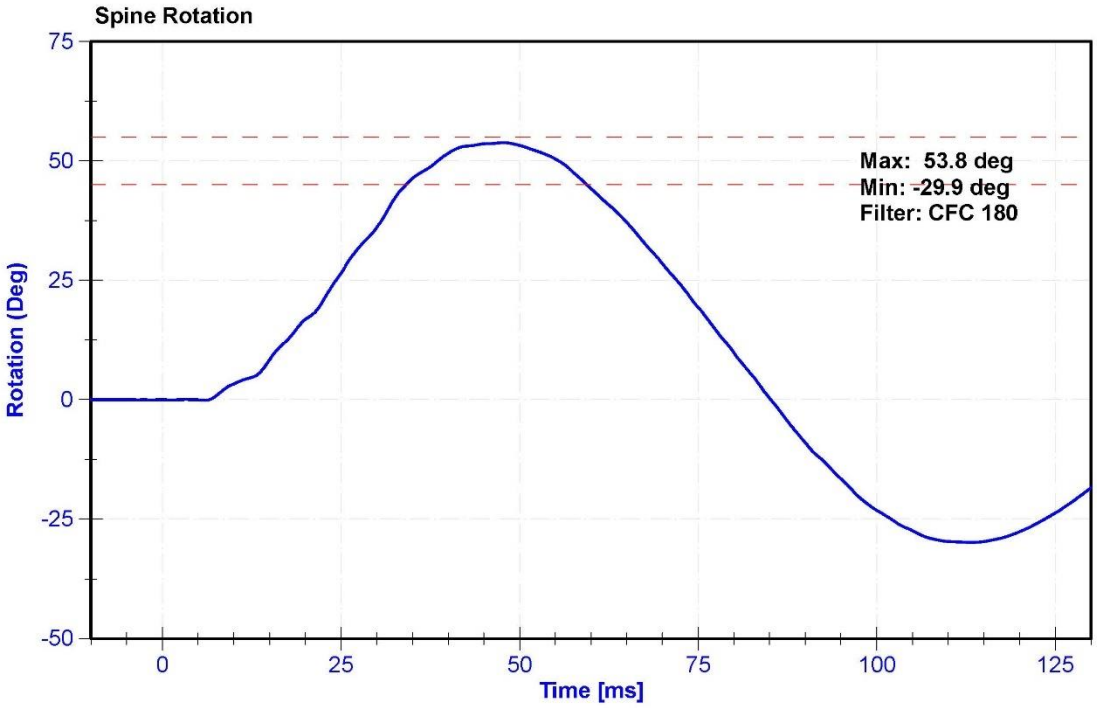
Results

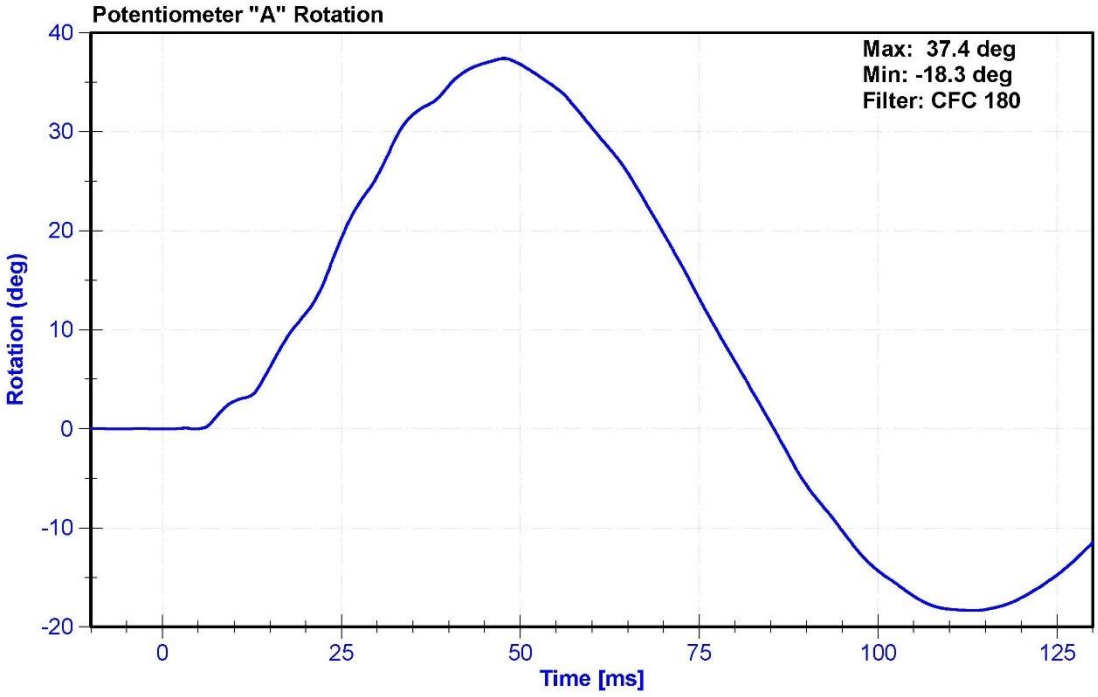
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	20.5	Pass
Velocity	5.95	6.15	m/s	6.134	Pass
Lateral Spine Rotation	45	55	deg	53.8	Pass
Time at Maximum Rotation	39	53	ms	47.8	Pass
Time of Decay to Zero Degrees	37	57	ms	37.4	Pass

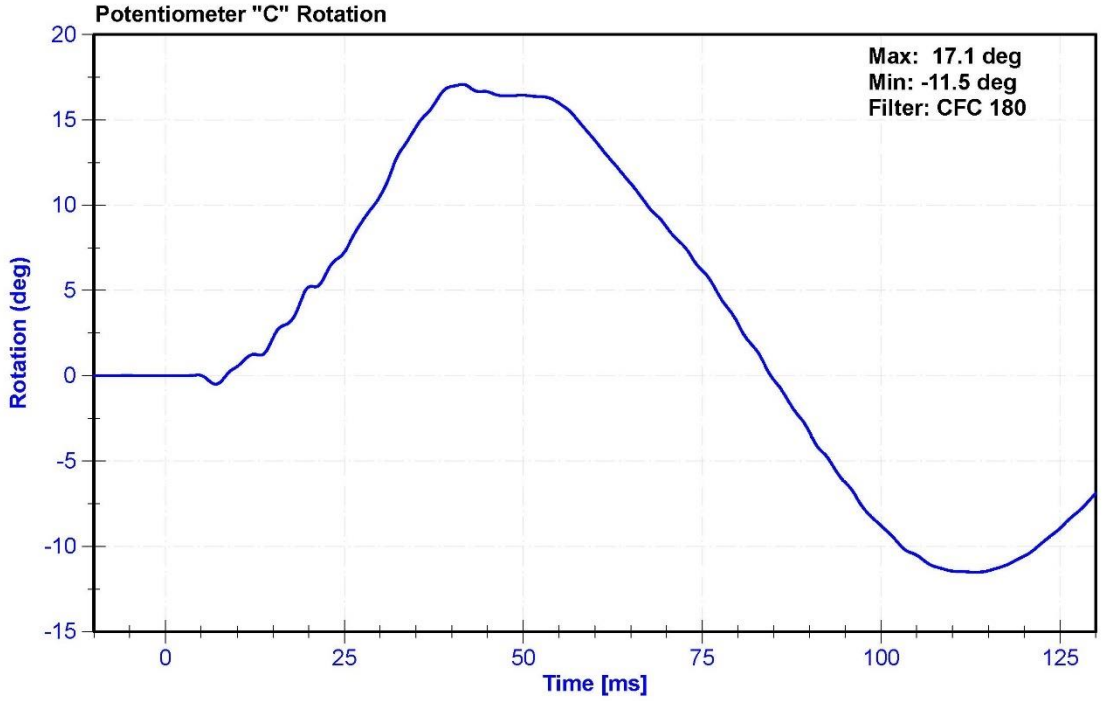
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Pendulum "A" Potentiometer	Sfernice	094	10/1/2021	4/1/2022
Condyle "B" Potentiometer	Sfernice	095	10/1/2021	4/1/2022




Spine Rotation
Max: 53.8 deg
Min: -29.9 deg
Filter: CFC 180
Rotation (Deg)
Time [ms]
75
50
25
0
-25
-50
0
25
50
75
100
125


Potentiometer "A" Rotation
Max: 37.4 deg
Min: -18.3 deg
Filter: CFC 180
Rotation (deg)
Time [ms]
40
30
20
10
0
-10
-20
0
25
50
75
100
125


Potentiometer "C" Rotation
Max: 17.1 deg
Min: -11.5 deg
Filter: CFC 180
Rotation (deg)
20
15
10
5
0
-5
-10
-15
0
25
50
75
100
125
Time [ms]

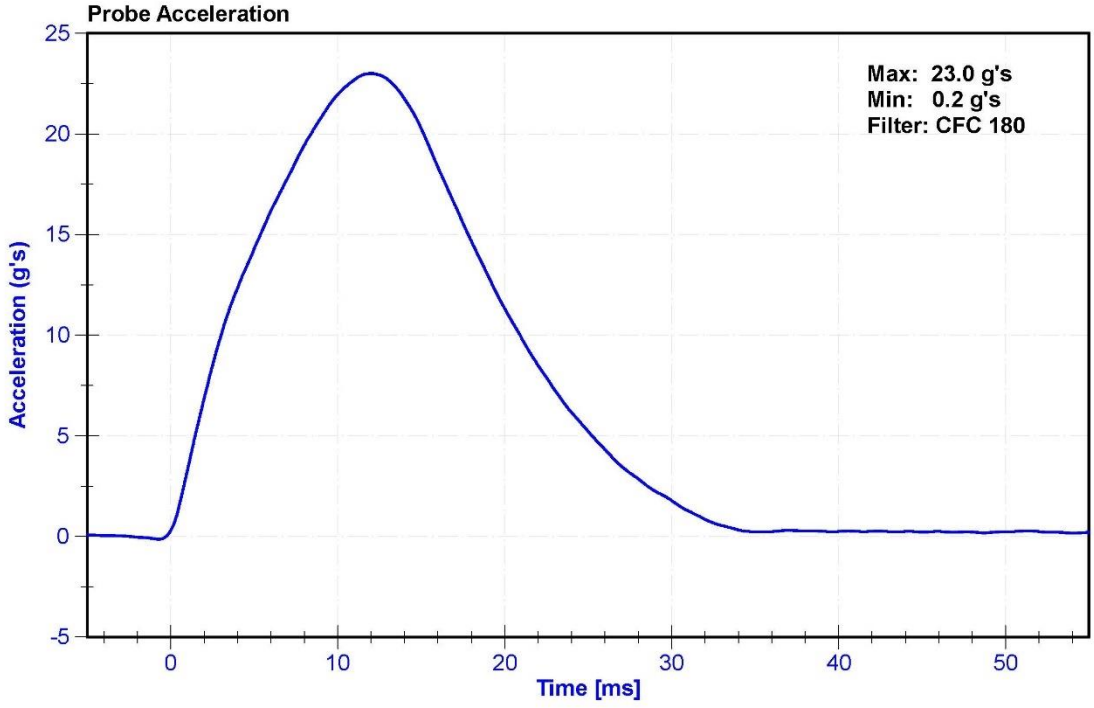
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

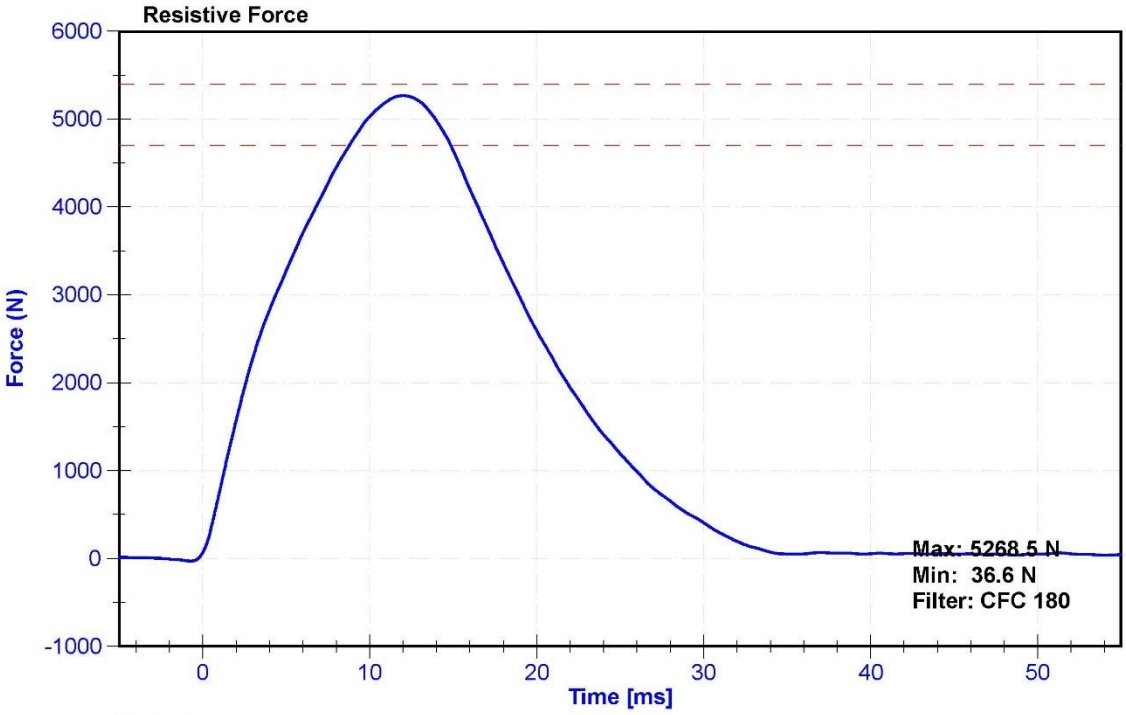
Results

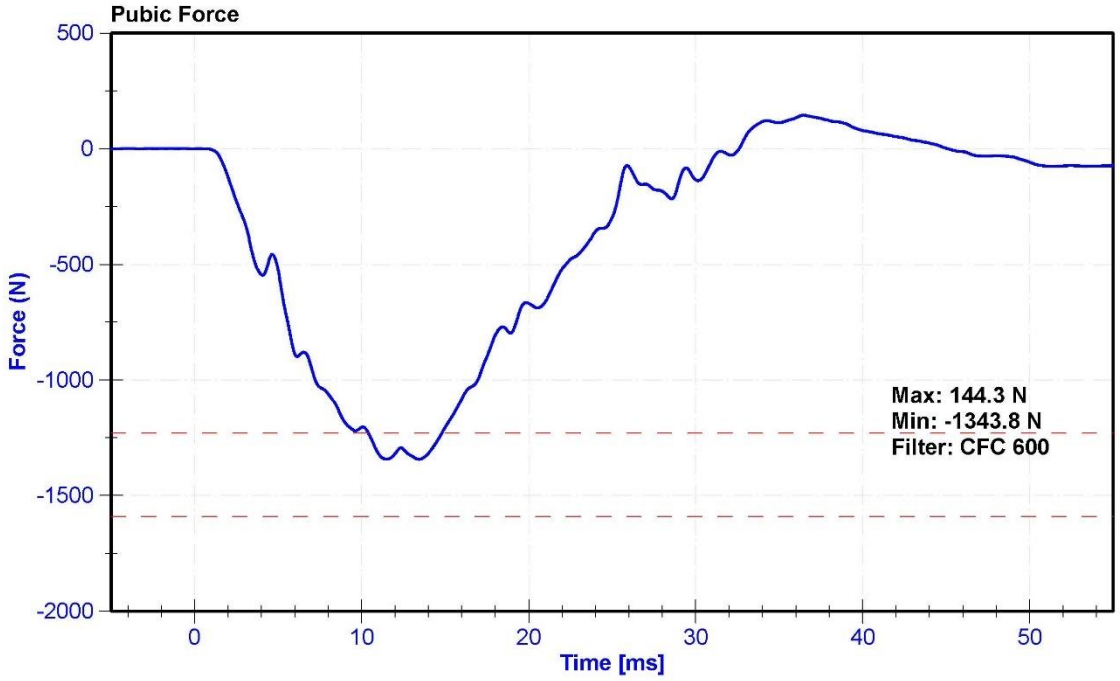
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	27.1	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Resistive Force	4700	5400	N	5268.5	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.00	Pass
Pubic Force	-1590	-1230	N	-1343.8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

Transducer Calibrations

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




Resistive Force
Force (N)
Time [ms]
Max: 5268.5 N
Min: 36.6 N
Filter: CFC 180


Pubic Force
Force (N)
Time [ms]
Max: 144.3 N
Min: -1343.8 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

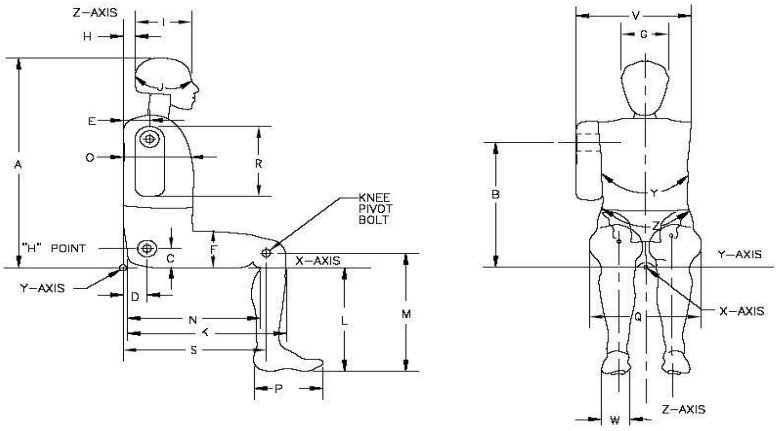
SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL No: 300

External Measurements - SID-IIs

Technician: J.Pericak Date: 2/10/2022

Dummy Serial Number: 300



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	782	Pass
B	Shoulder Pivot Height	437	453	448	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	125	Pass
G	Head Breadth	140	148	146	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	185	Pass
J	Head Circumference	541	551	545	Pass
K	Buttock to Knee Length	514	540	525	Pass
L	Popliteal Height	343	369	362	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	202	Pass
P	Foot Length	216	232	221	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	315	Pass
R	Arm Length	249	259	253	Pass
S	Knee Joint to seatback	477	493	487	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	86	Pass
Y	Chest Circumference w/jacket	851	881	879	Pass
Z	Waist Circumference	761	791	775	Pass

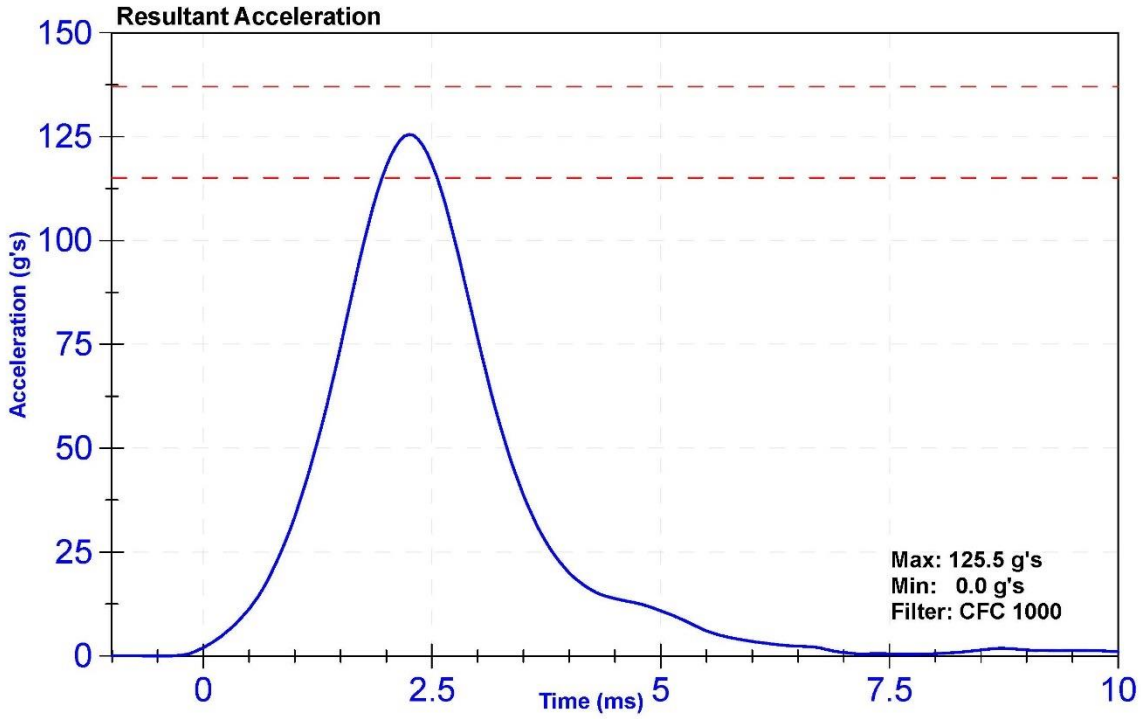
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

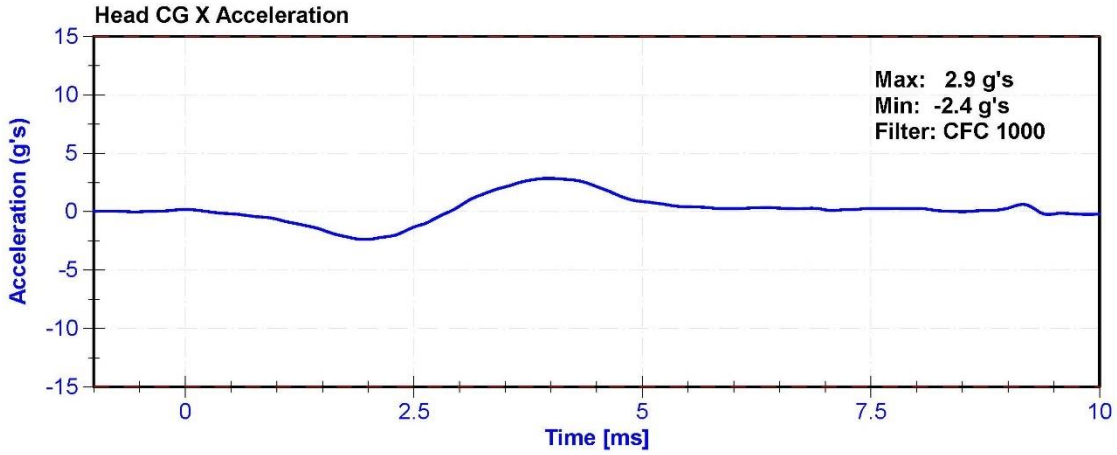
Results

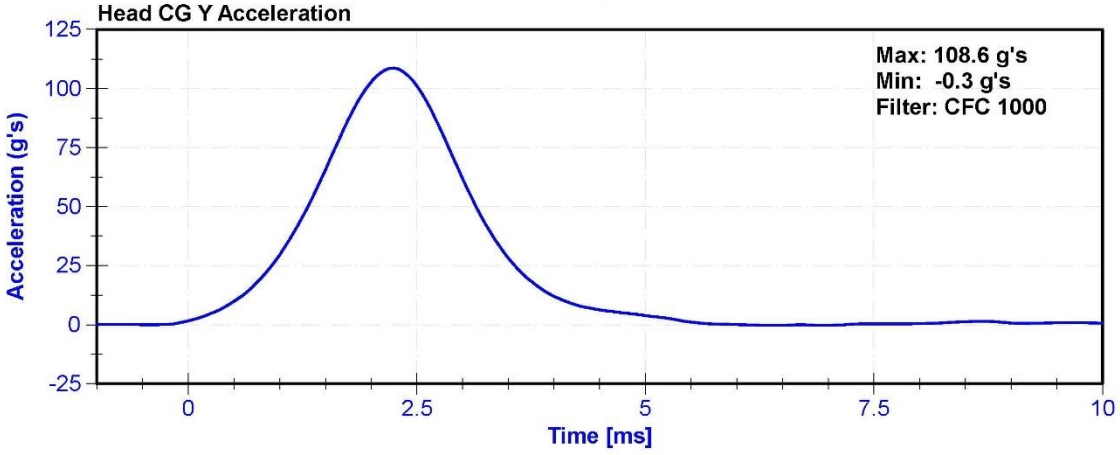
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	19.6	Pass
Resultant Acceleration	115	137	g's	125.5	Pass
Oscillation	0	15	%	1.4	Pass
Fore-Aft Acceleration	-15	15	g's	2.9	Pass

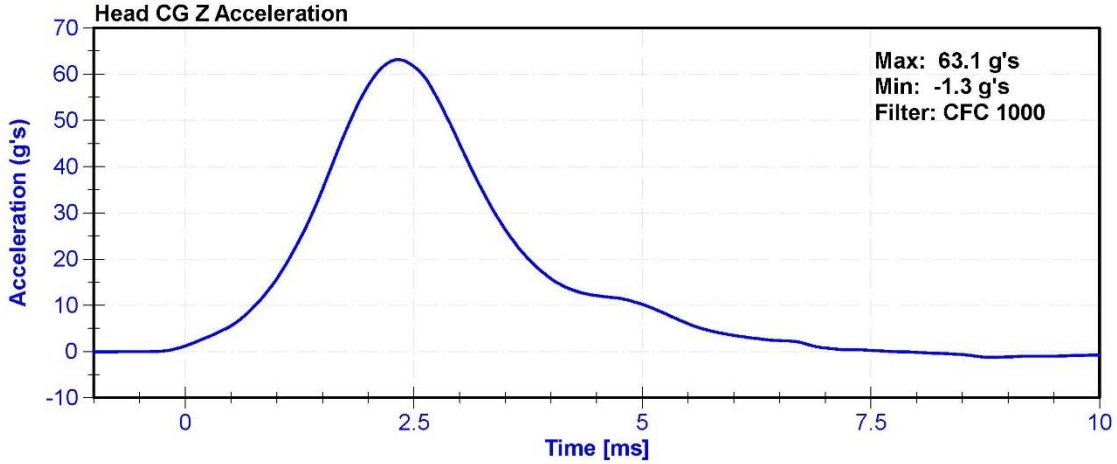
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P59018	11/19/2021	5/18/2022
Y Accelerometer	Endevco	P79189	11/19/2021	5/18/2022
Z Accelerometer	Endevco	P58777	11/19/2021	5/18/2022




Head CG X Acceleration
Max: 2.9 g's
Min: -2.4 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Y Acceleration
Max: 108.6 g's
Min: -0.3 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Z Acceleration
Max: 63.1 g's
Min: -1.3 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]

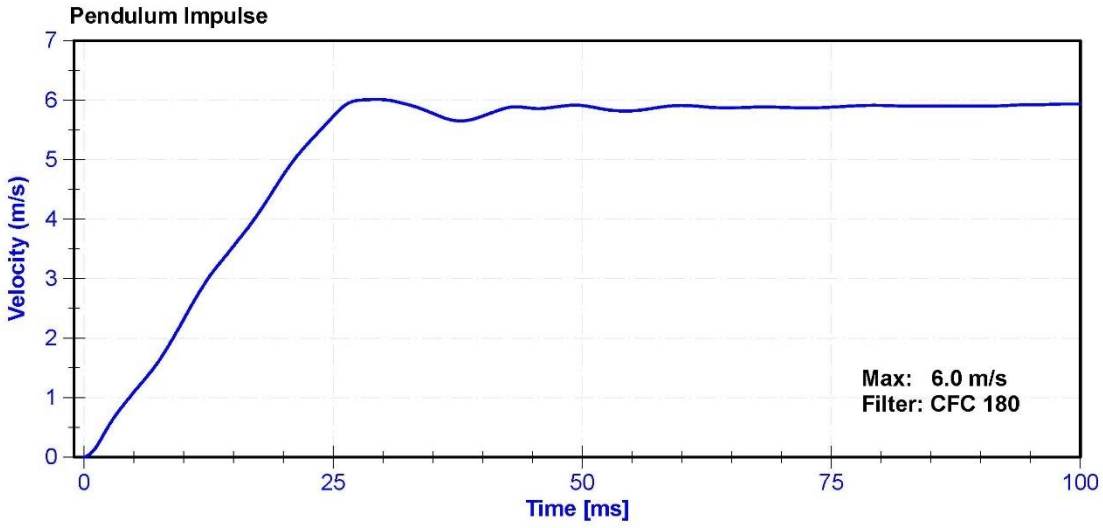
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

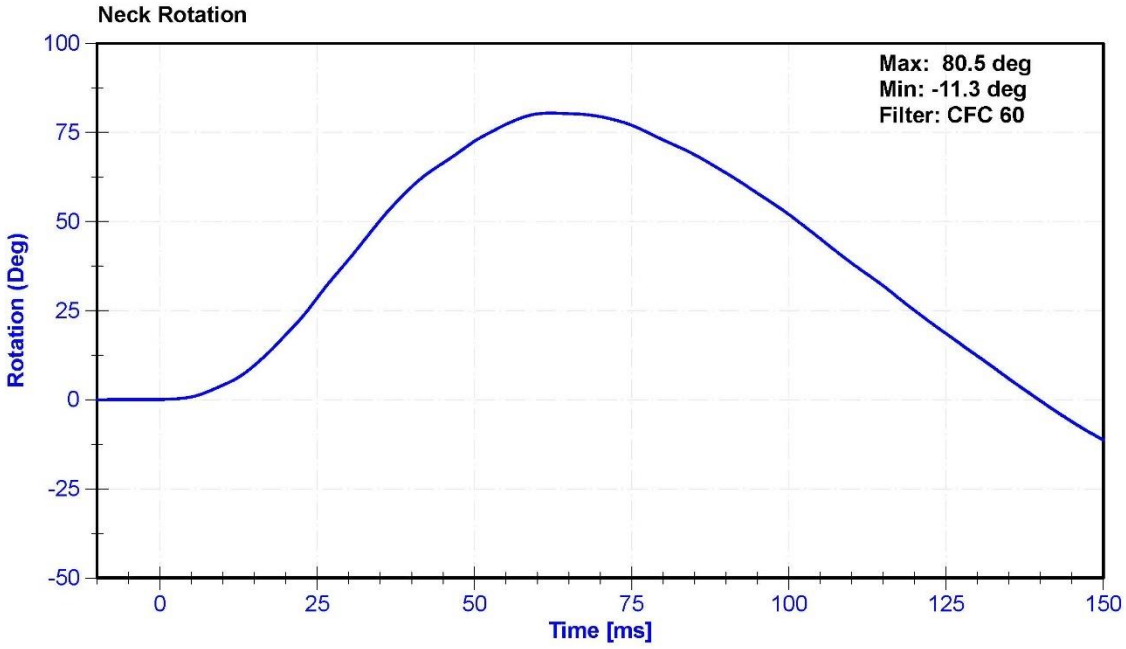
Results

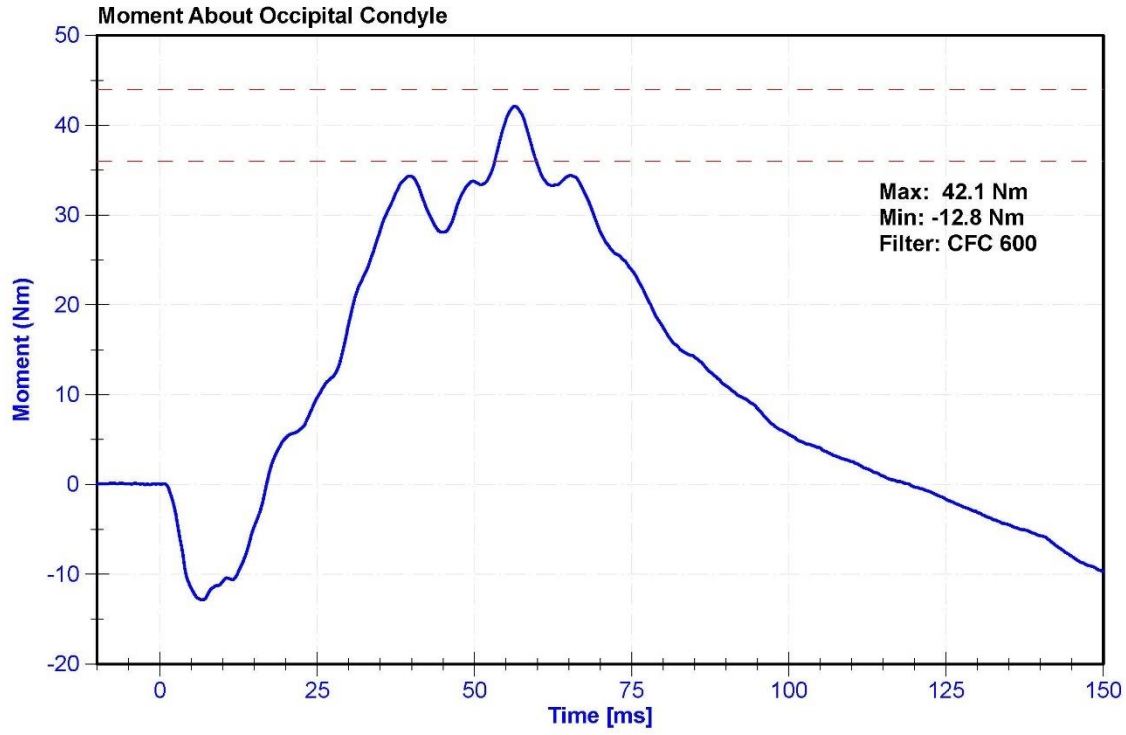
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	22.6	Pass
Velocity	5.51	5.63	m/s	5.573	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.31	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.55	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.74	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.72	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	6.01	Pass
Neck Rotation	71	81	deg	80.5	Pass
Time at Maximum Rotation	50	70	ms	62.1	Pass
Moment about the OC	36	44	Nm	42.1	Pass
Moment Decay to 0 Nm	102	126	ms	119.3	Pass

Transducer Calibrations

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




Neck Rotation
Max: 80.5 deg
Min: -11.3 deg
Filter: CFC 60
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 42.1 Nm
Min: -12.8 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

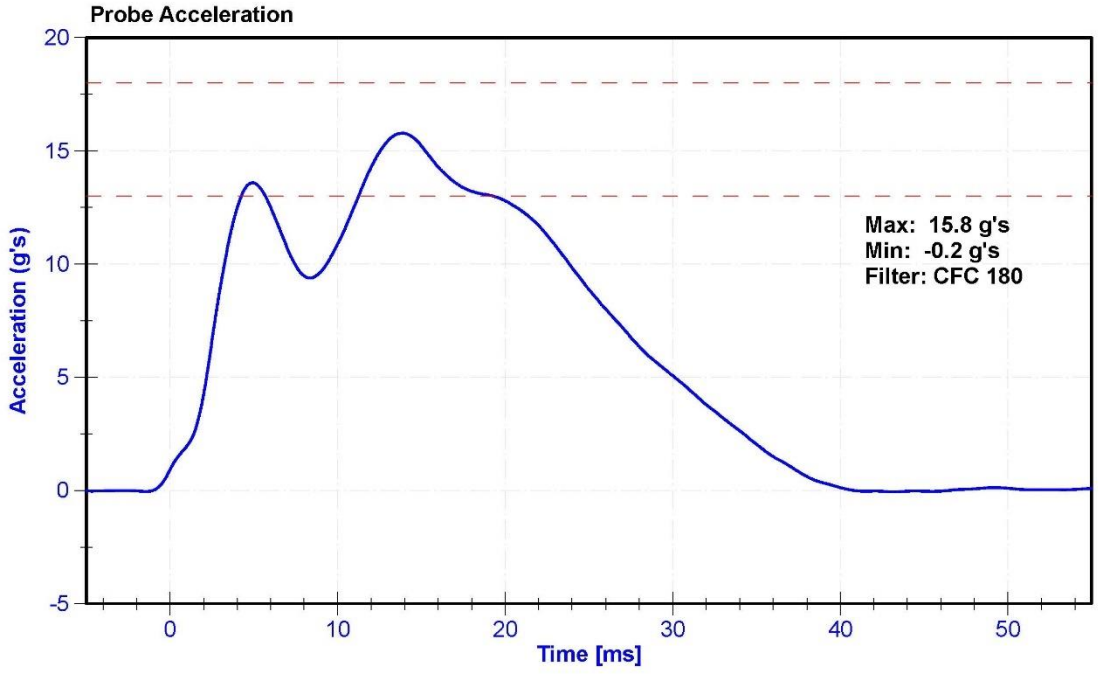
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

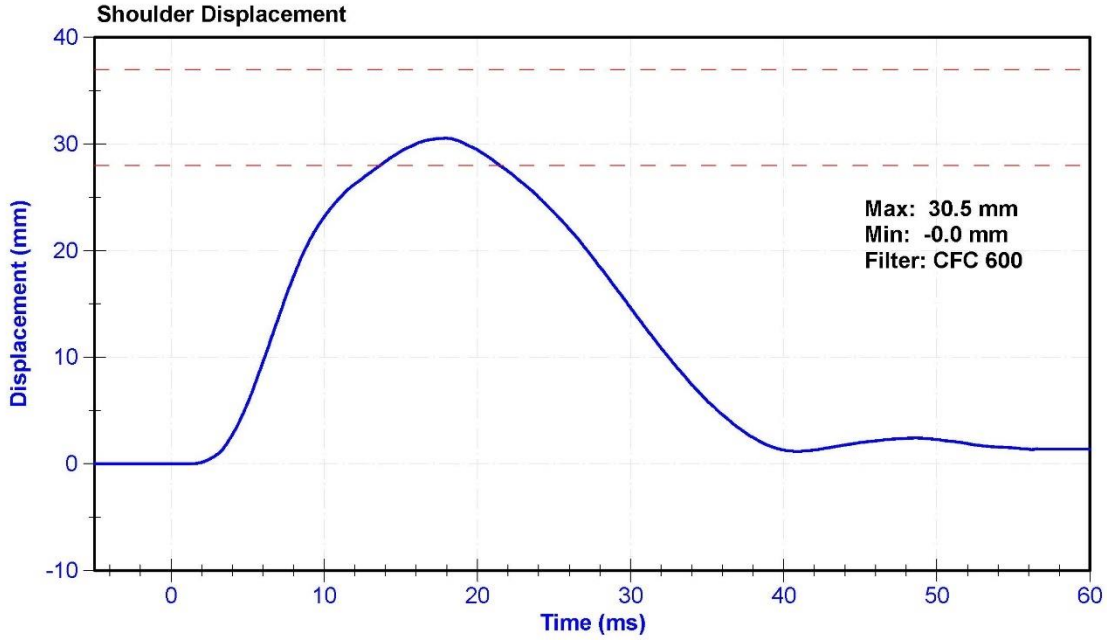
Results

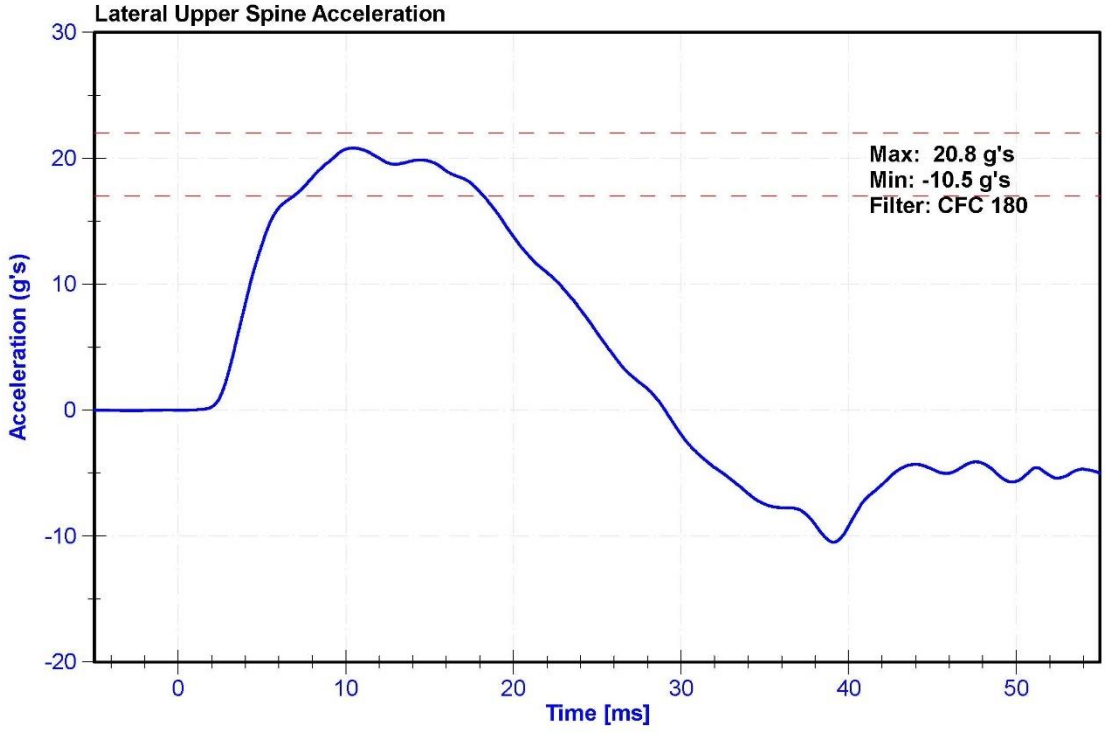
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	13	18	g's	15.8	Pass
Shoulder Deflection	28	37	mm	30.5	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Shoulder Potentiometer	Servo	053GFE	11/22/2021	5/23/2022
Upper Spine Y Accelerometer	Endevco	T20880	11/19/2021	5/18/2022




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 30.5 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 20.8 g's
Min: -10.5 g's
Filter: CFC 180

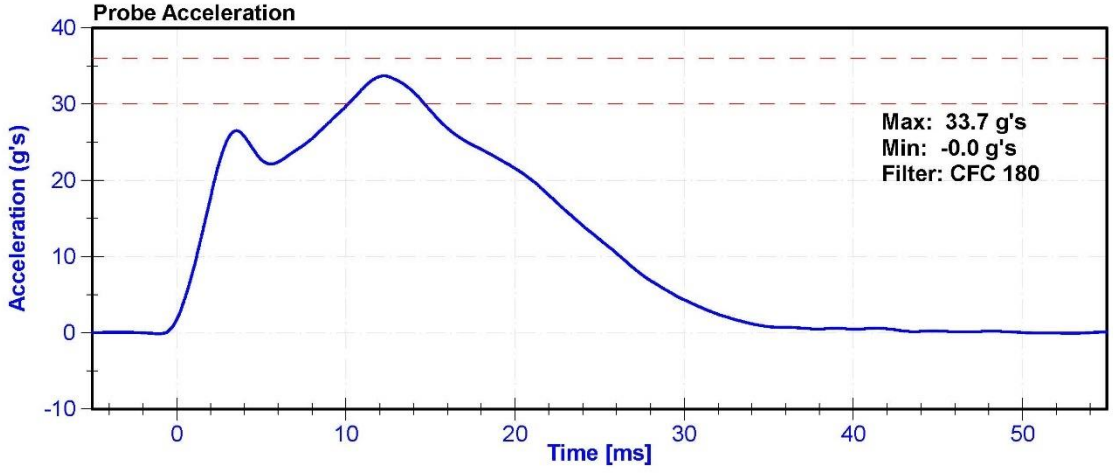
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

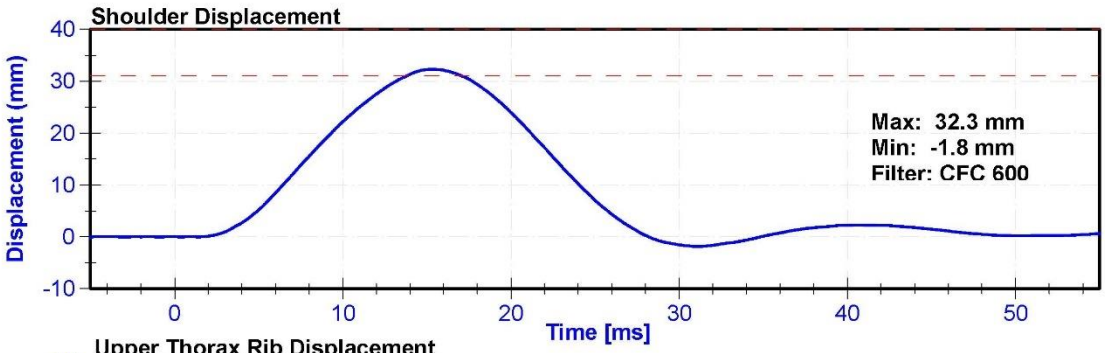
Results

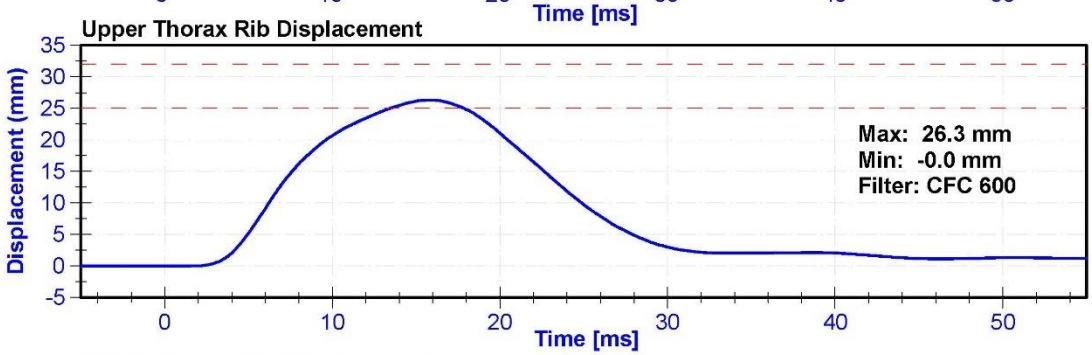
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	23	Pass
Velocity	6.6	6.8	m/s	6.73	Pass
Probe Acceleration after 5 ms	30	36	g's	33.7	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.4	Pass
Lateral Lower Spine Acceleration	29	37	g's	32.2	Pass
Shoulder Deflection	31	40	mm	32.3	Pass
Upper Thorax Rib Deflection	25	32	mm	26.3	Pass
Mid Thorax Rib Deflection	30	36	mm	32.0	Pass
Lower Thorax Rib Deflection	32	38	mm	34.2	Pass

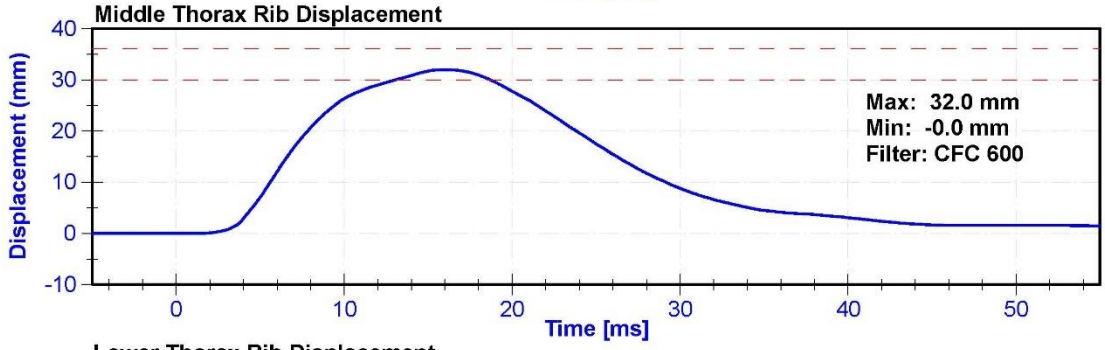
Transducer Calibrations

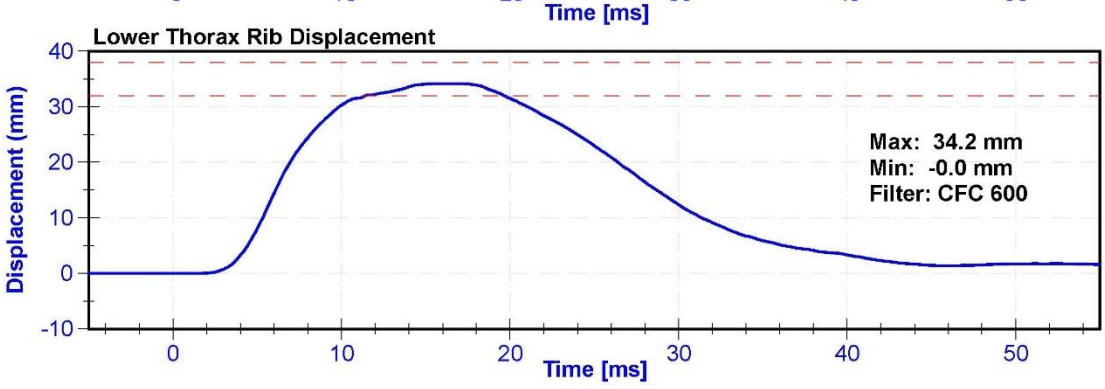
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Upper Spine T1 Y Accelerometer	Endevco	T20880	11/19/2021	5/18/2022
Upper Spine T12 Y Accelerometer	Endevco	P52071	11/19/2021	5/18/2022
Shoulder Potentiometer	Servo	053GFE	11/22/2021	5/23/2022
Upper Thorax Rib Potentiometer	Servo	451GFE	11/22/2021	5/23/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	11/22/2021	5/23/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	11/22/2021	5/23/2022

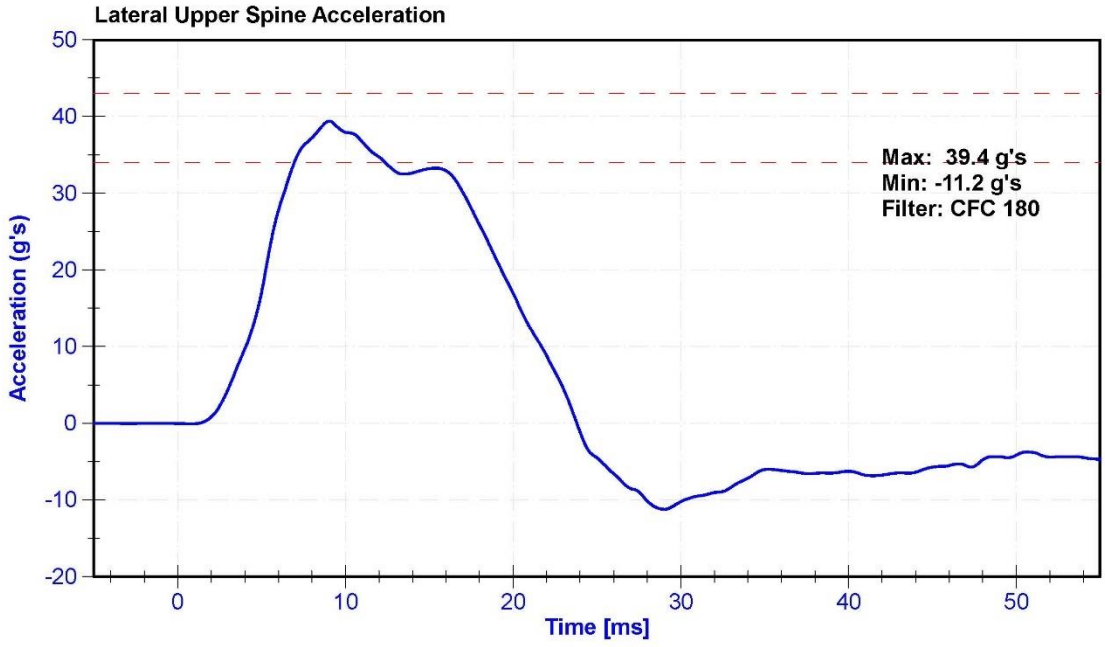


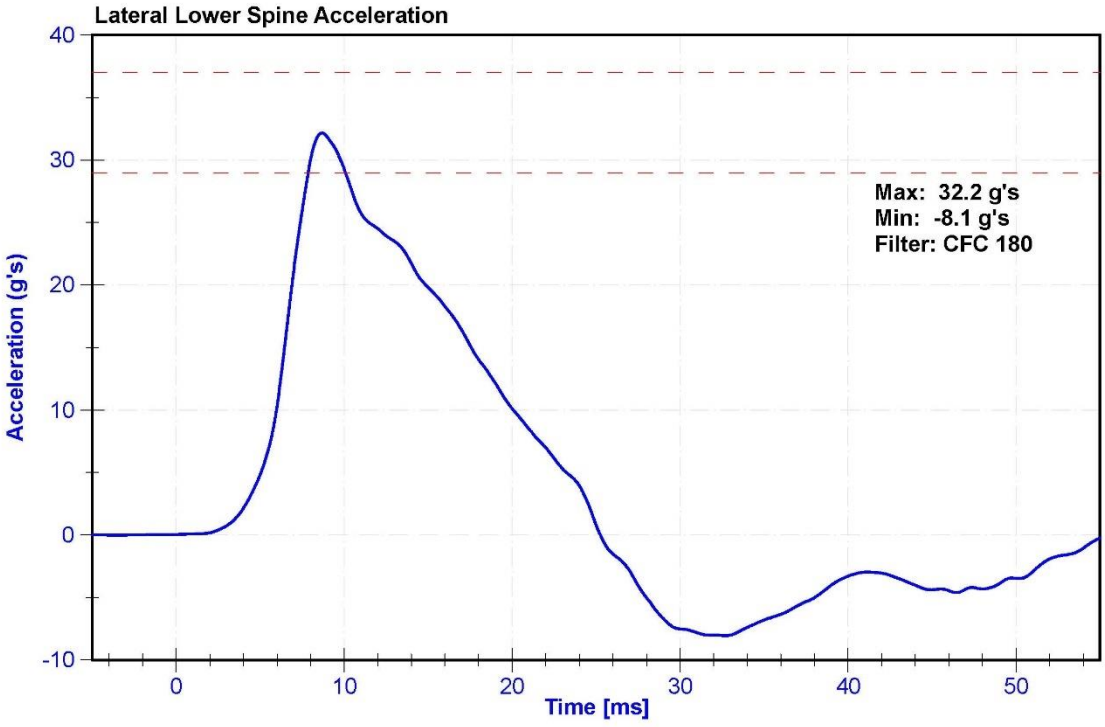

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 32.3 mm
Min: -1.8 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 26.3 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.0 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 34.2 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 39.4 g's
Min: -11.2 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: 32.2 g's
Min: -8.1 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

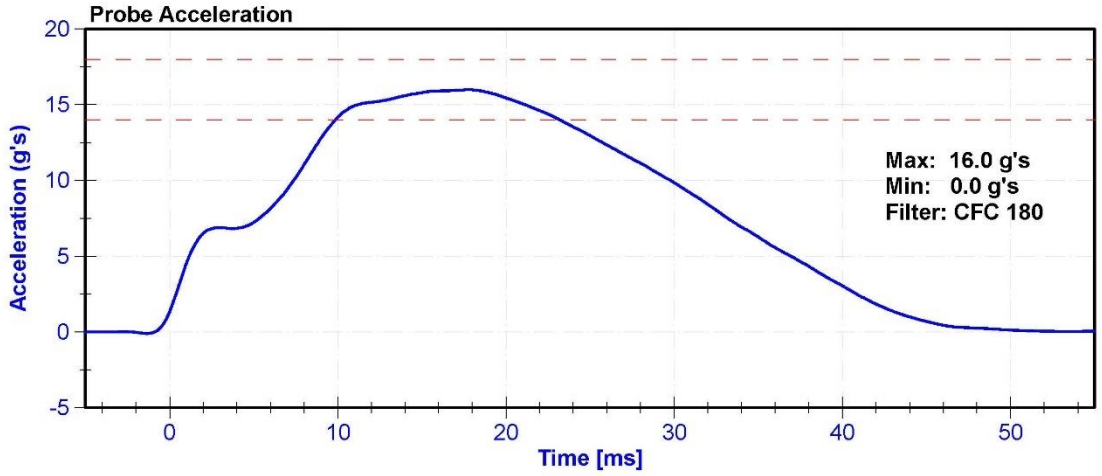
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

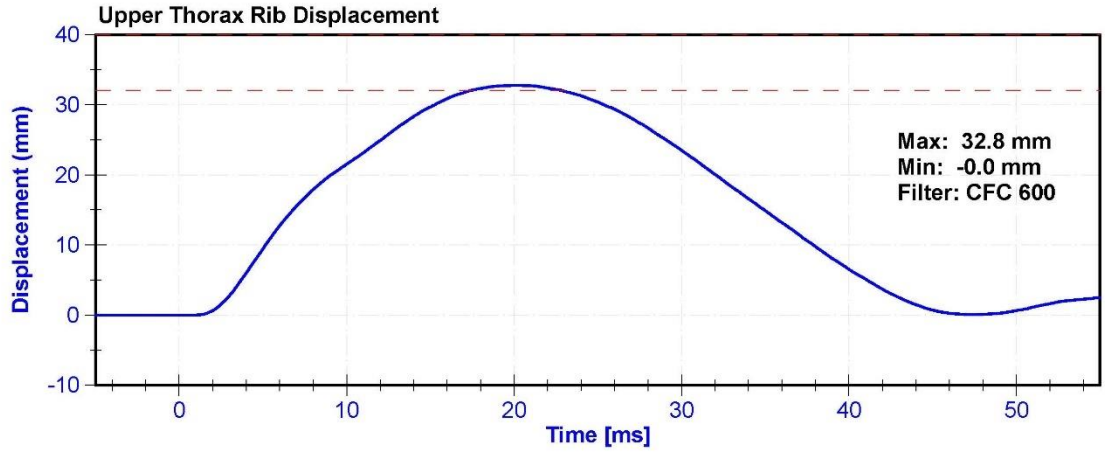
Results

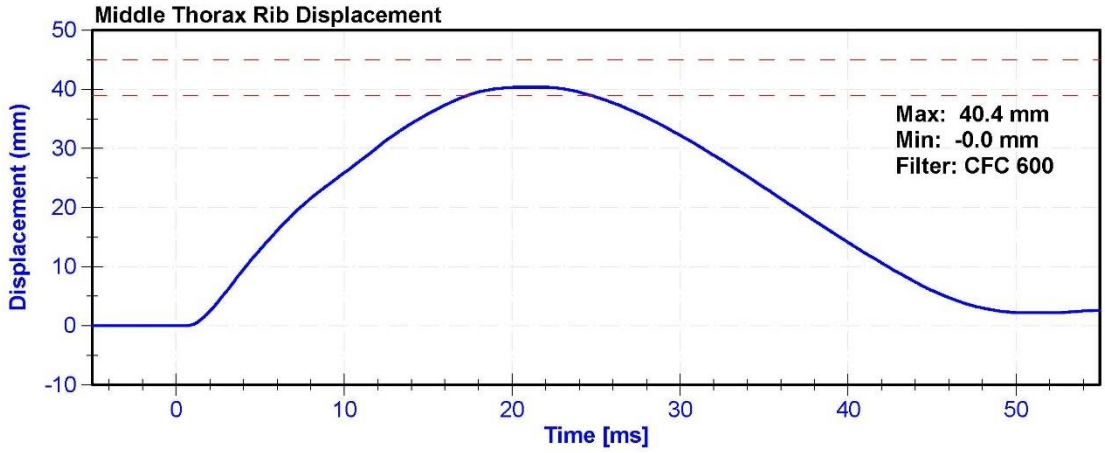
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	14	18	g's	16.0	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.7	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.6	Pass
Upper Thorax Rib Deflection	32	40	mm	32.8	Pass
Middle Thorax Rib Deflection	39	45	mm	40.4	Pass
Lower Thorax Rib Deflection	35	43	mm	37.9	Pass

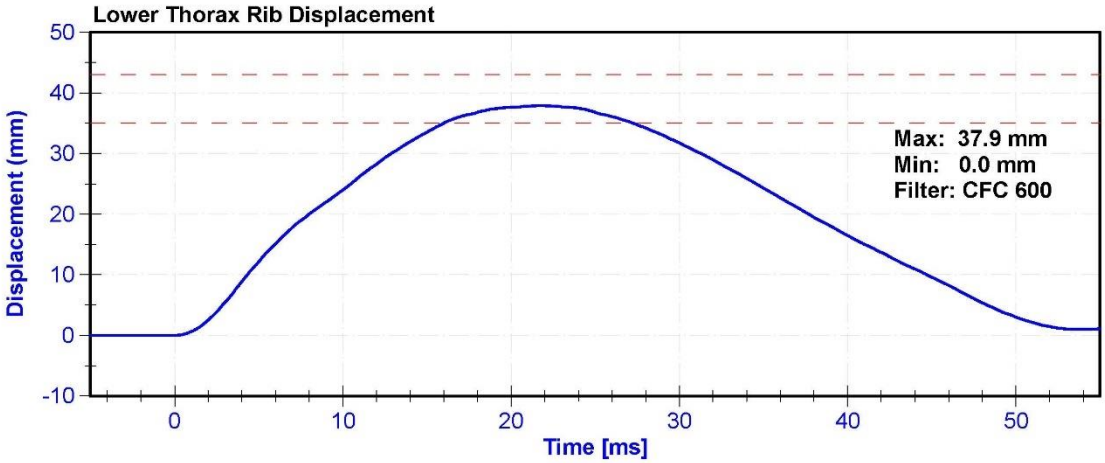
Transducer Calibrations

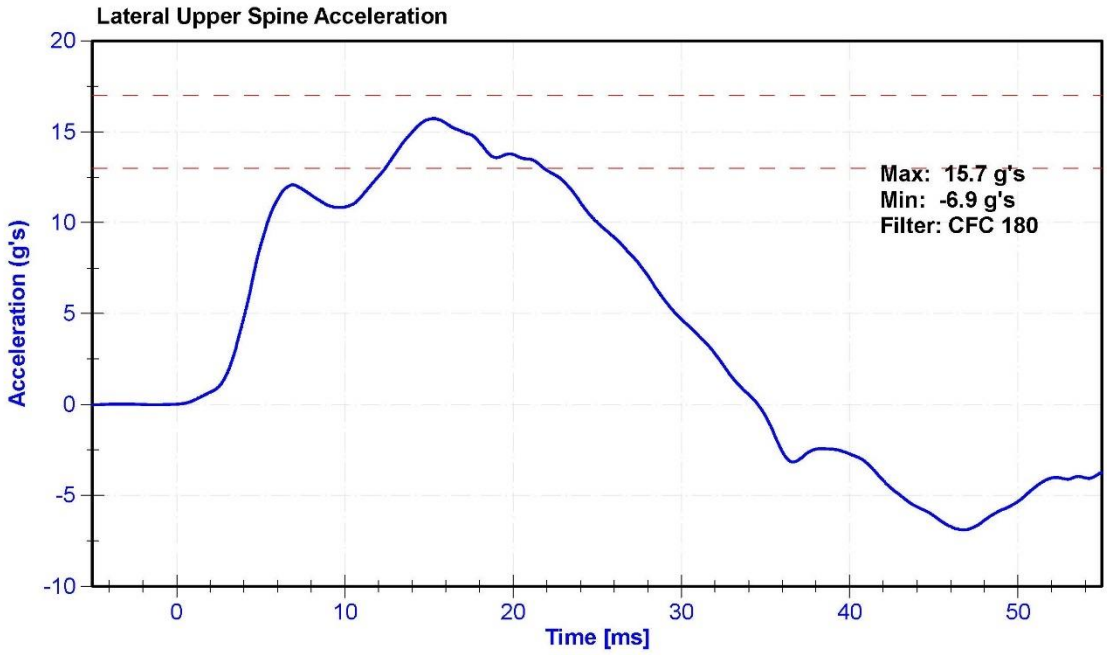
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Upper Spine Y Accelerometer	Endevco	T20880	11/19/2021	5/18/2022
Lower Spine Y Accelerometer	Endevco	P52071	11/19/2021	5/18/2022
Upper Thorax Rib Potentiometer	Servo	451GFE	11/22/2021	5/23/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	11/22/2021	5/23/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	11/22/2021	5/23/2022

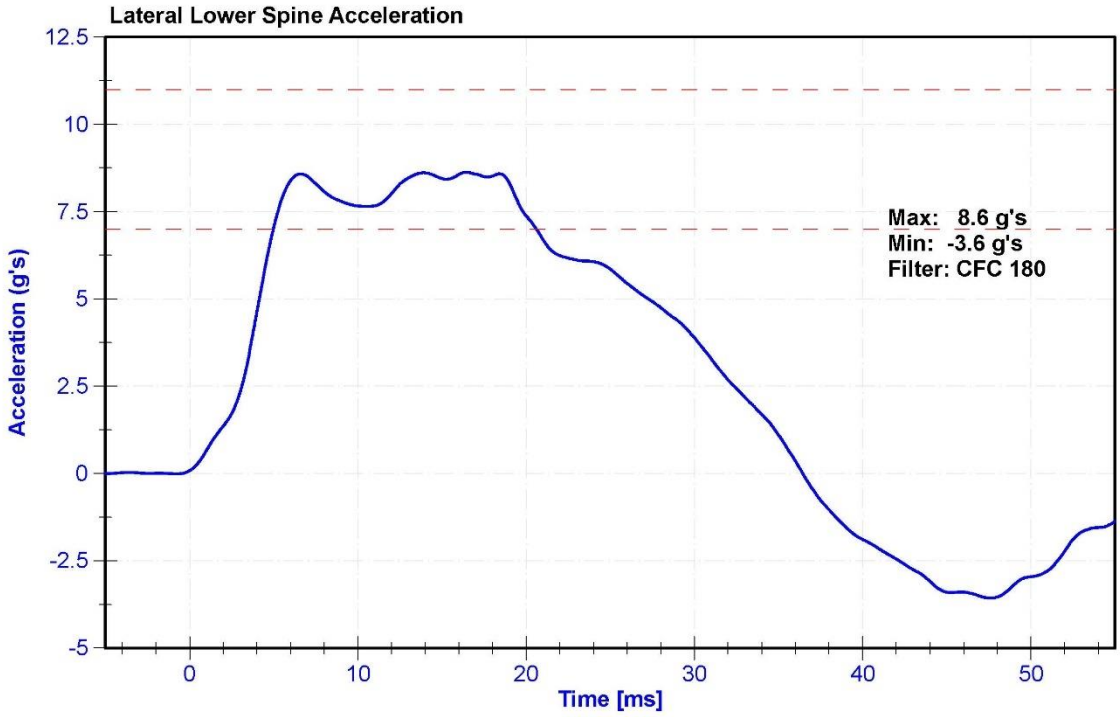



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.8 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.4 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.9 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 15.7 g's
Min: -6.9 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 8.6 g's
Min: -3.6 g's
Filter: CFC 180

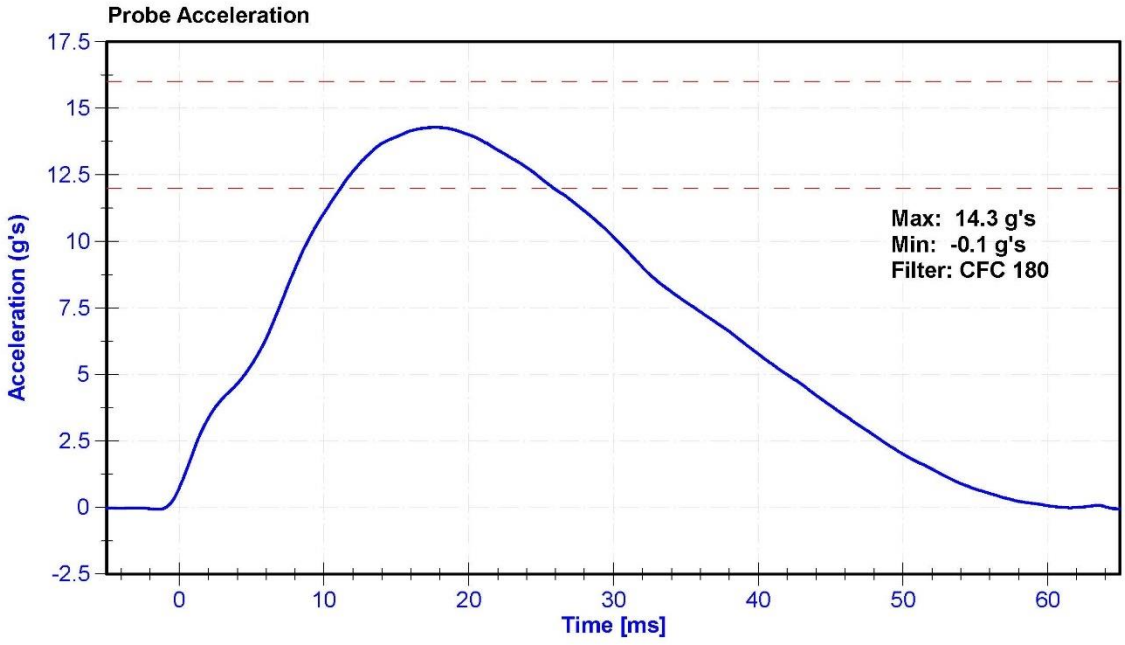
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

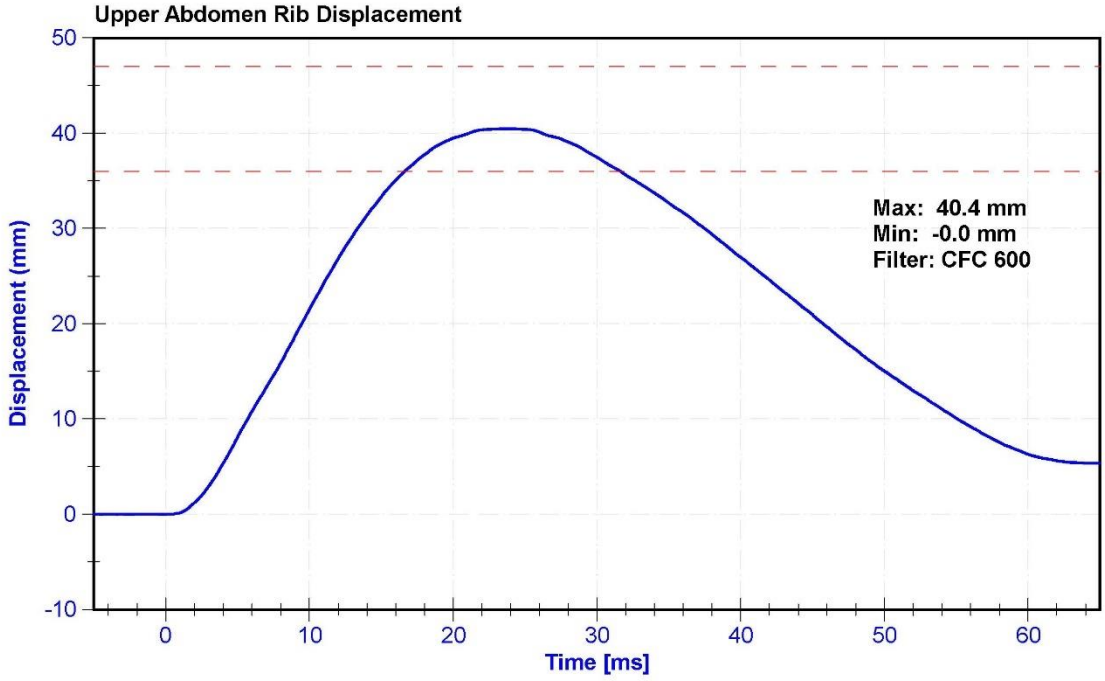
Results

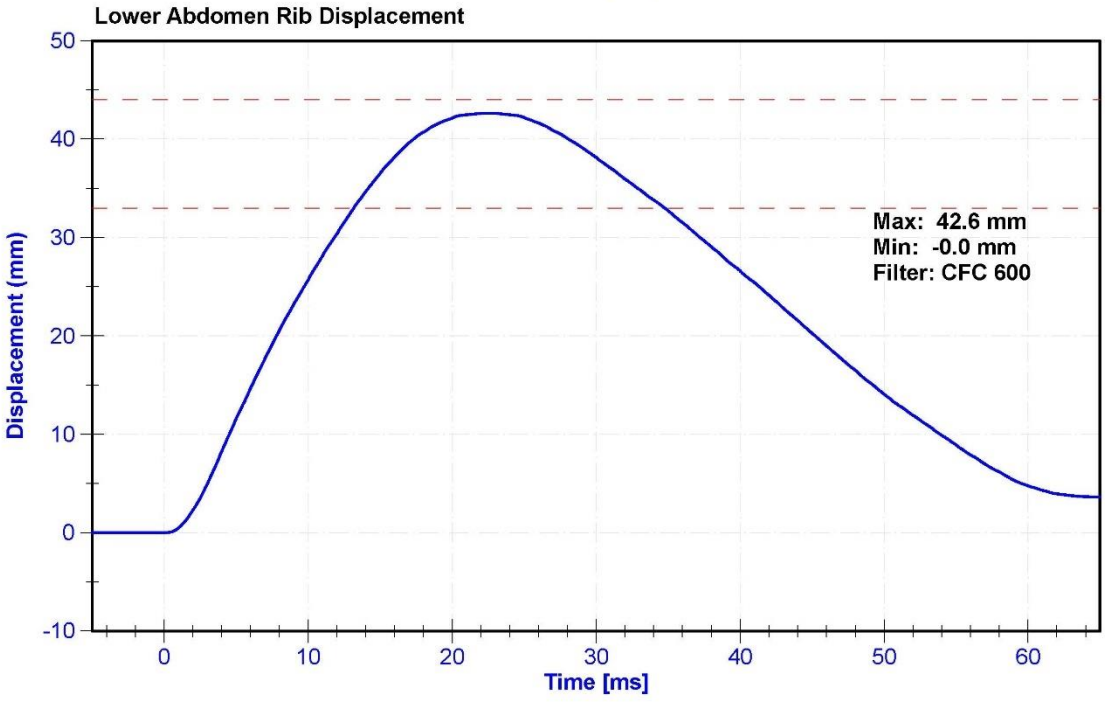
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	12	16	g's	14.3	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.0	Pass
Upper Abdomen Rib Deflection	36	47	mm	40.4	Pass
Lower Abdomen Rib Deflection	33	44	mm	42.6	Pass

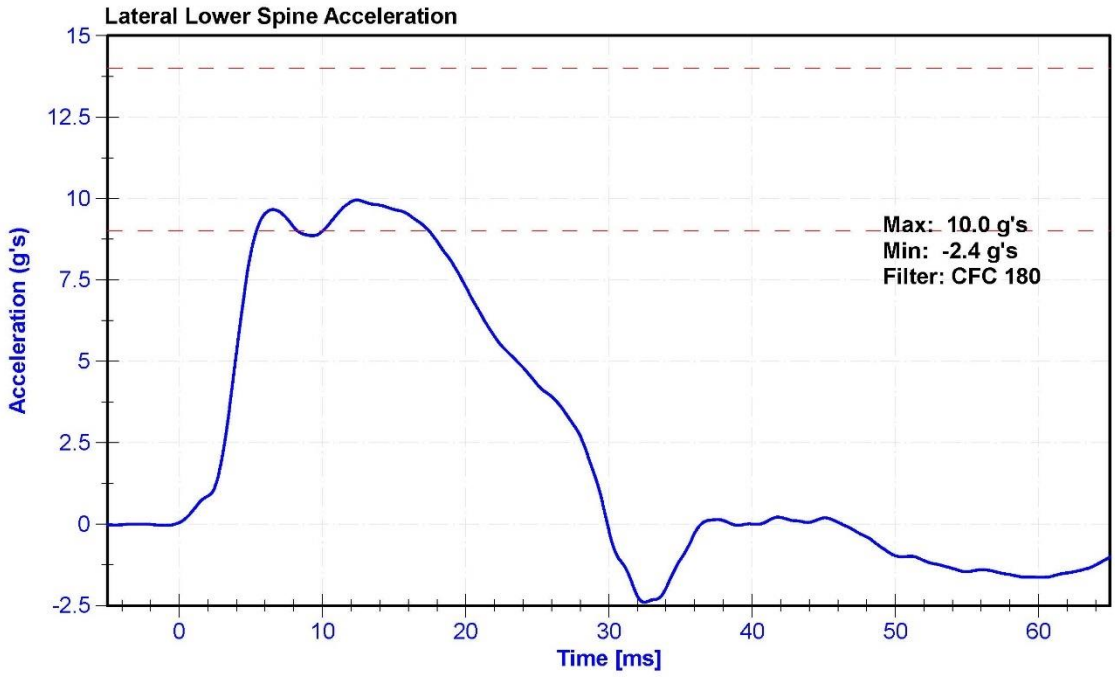
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Lower Spine Y Accelerometer	Endevco	P52071	11/19/2021	5/18/2022
Upper Abdomen Rib Potentiometer	Servo	307GFE	11/22/2021	5/23/2022
Lower Abdomen Rib Potentiometer	Servo	308GFE	11/22/2021	5/23/2022




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.4 mm
Min: -0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.6 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: 10.0 g's
Min: -2.4 g's
Filter: CFC 180

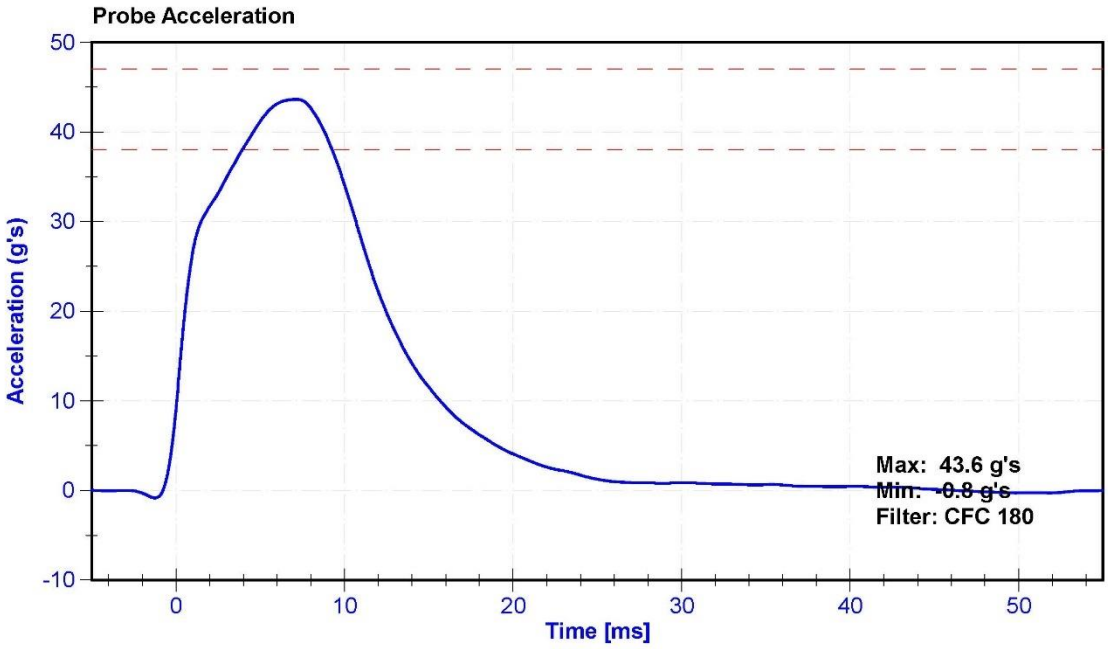
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

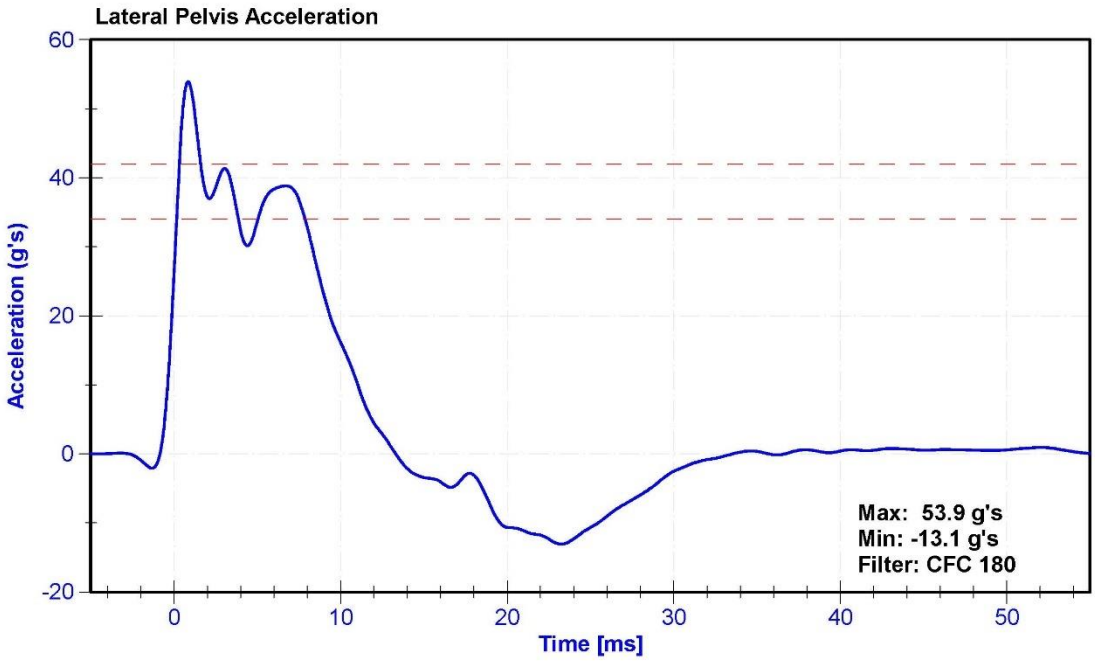
Results

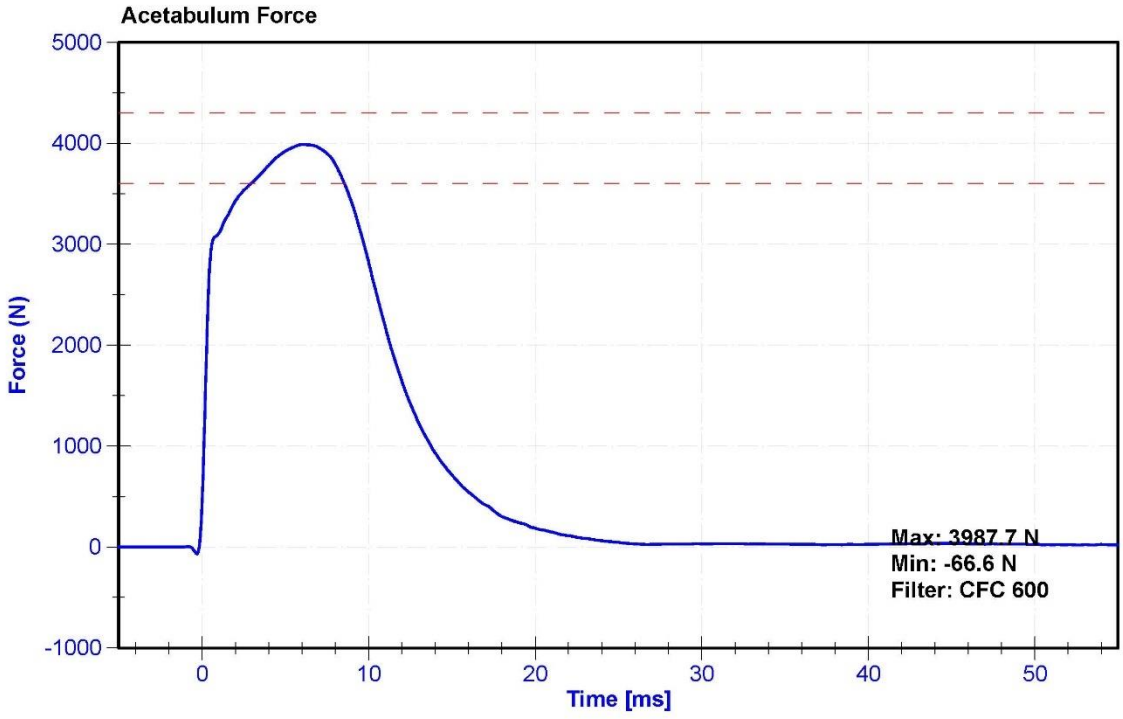
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	23	Pass
Velocity	6.6	6.8	m/s	6.66	Pass
Probe Acceleration	38	47	g's	43.6	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	38.8	Pass
Acetabulum Force	3600	4300	N	3987.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Pelvis Y Accelerometer	Endevco	P51731	11/19/2021	5/18/2022
Acetabulum Load Cell	Denton	275-FY	9/14/2021	9/14/2022
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A




Lateral Pelvis Acceleration
Acceleration (g's)
60
40
20
0
-20
0
10
20
30
40
50
Time [ms]
Max: 53.9 g's
Min: -13.1 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: 3987.7 N
Min: -66.6 N
Filter: CFC 600

300
Cert 2
3/16/21

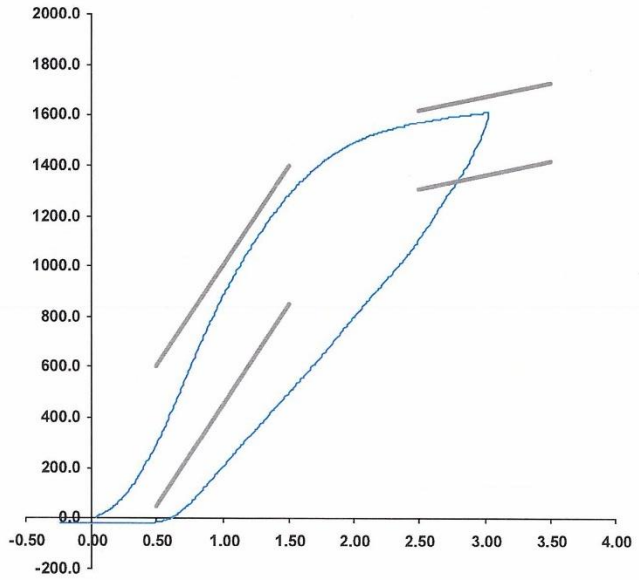
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 13120
Test Number 10481
Report Number 10517
Test Date 8/5/2019 10:33:53 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	295	50	600
Force @ 1.5 mm (N)	1,285	850	1,400
Force @ 2.5 mm (N)	1,573	1,306	1,618
Force @ 3.0 mm (N)	1,611	1,361	1,673

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 08-Jul-21
SACO Research

By : _____ Date : _____

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

300
Crash
2-6-2022

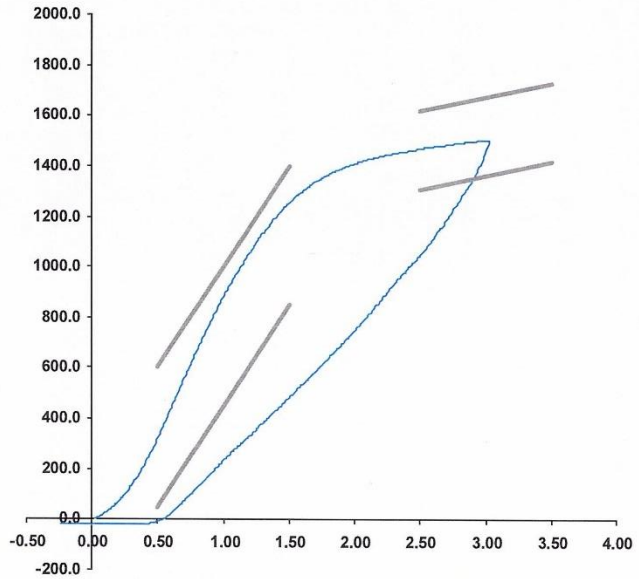
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 13908
Test Number 13382
Report Number 13427
Test Date 5/20/2020 8:39:26 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	329	50	600
Force @ 1.5 mm (N)	1,255	850	1,400
Force @ 2.5 mm (N)	1,469	1,306	1,618
Force @ 3.0 mm (N)	1,505	1,361	1,673

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 08-Jul-21
SACO Research

By : _____ Date : _____

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

300
Non-Impact
2-8-2022

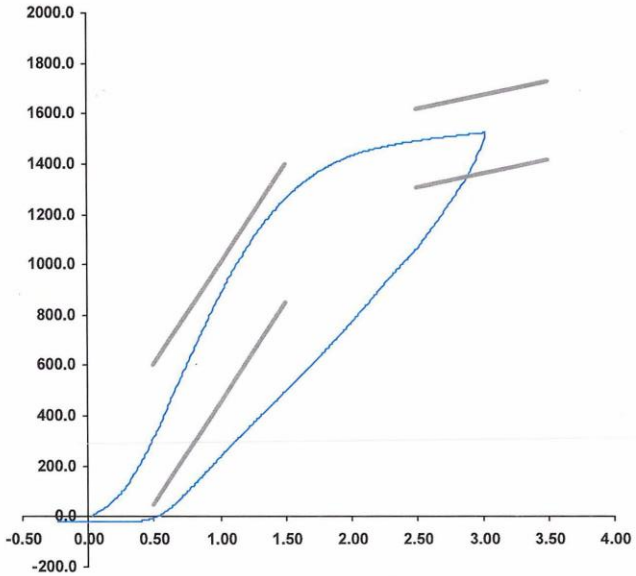
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 14000
Test Number 13474
Report Number 13519
Test Date 5/22/2020 11:10:54 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	319	50	600
Force @ 1.5 mm (N)	1,262	850	1,400
Force @ 2.5 mm (N)	1,492	1,306	1,618
Force @ 3.0 mm (N)	1,523	1,361	1,673

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 08-Jul-21
SACO Research

By : _____ Date : _____

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

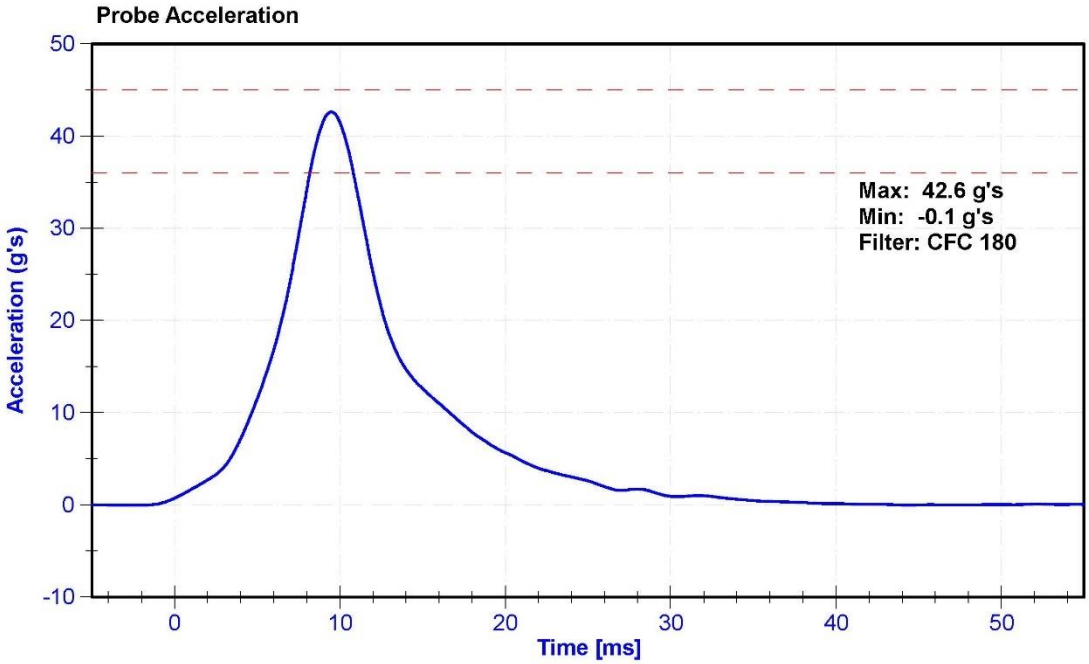
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

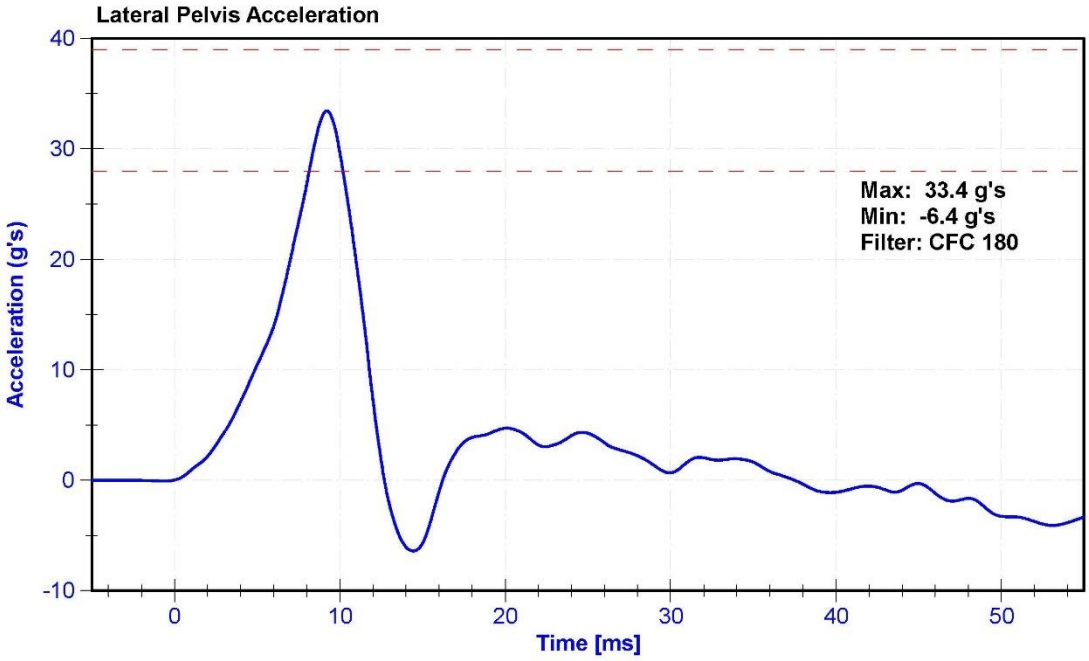
Results

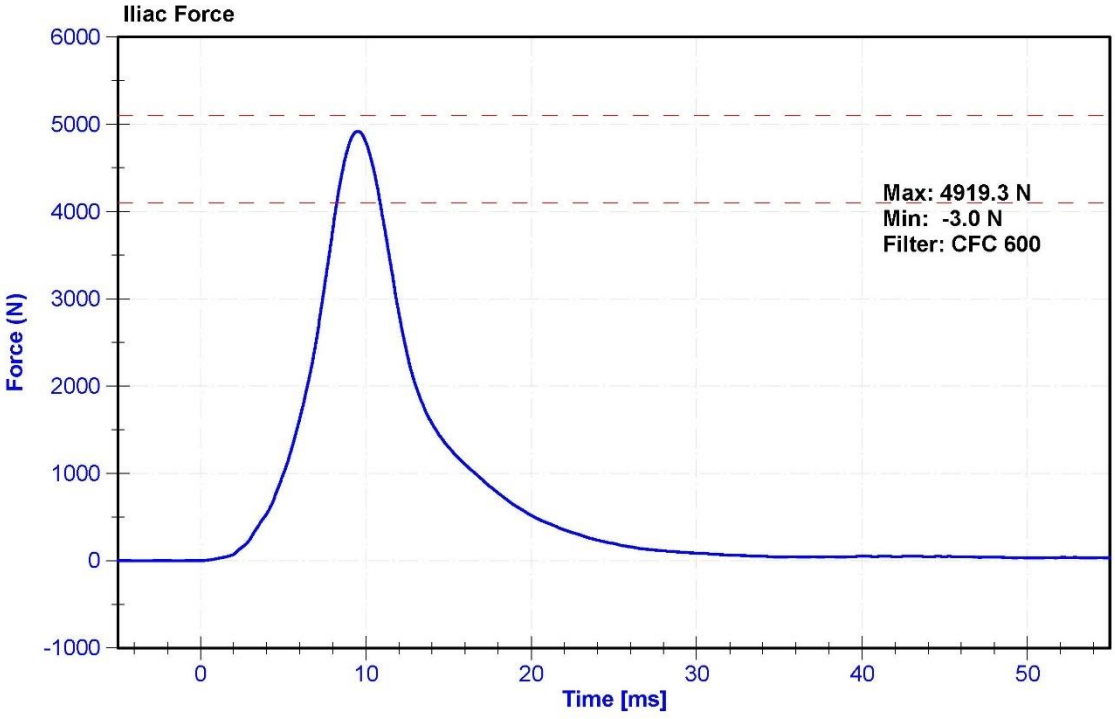
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	36	45	g's	42.6	Pass
Lateral Pelvis Acceleration	28	39	g's	33.4	Pass
Iliac Force	4100	5100	N	4919.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022
Pelvis Y Accelerometer	Endevco	P51731	11/19/2021	5/18/2022
Iliac Load Cell	Denton	279-FY	9/14/2021	9/14/2022




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 33.4 g's
Min: -6.4 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 4919.3 N
Min: -3.0 N
Filter: CFC 600

APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N: F033		
			Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers	Primary	X	7264C-2000-TZ-2_P63861	Endevco	1/31/2022
		Y	7264C-2000-TZ-2_P49216	Endevco	1/31/2022
		Z	7264C-2000-TZ-2_P51303	Endevco	1/31/2022
	Redundant	X	7264C-2000-TZ-2_P58868	Endevco	1/31/2022
		Y	7264C-2000-TZ-2_P16755	Endevco	1/31/2022
		Z	7264C-2000-TZ-2_P52132	Endevco	1/31/2022
Thorax Rib Displacement Potentiometers	Upper	Y	MLT-38000203_179GFE	Honeywell	2/1/2022
	Middle	Y	MLT-38000203_185GFE	Honeywell	2/1/2022
	Lower	Y	MLT-38000203_178GFE	Honeywell	2/1/2022
Abdomen Load Cells	Forward	Y	2631J_1512	Denton	8/2/2021
	Middle	Y	2631J_1526	Denton	8/2/2021
	Rear	Y	2631J_1516	Denton	8/2/2021
Lower Spine Accelerometers (T12)		X	7264C-2000-TZ-2_P52009	Endevco	1/31/2022
		Y	7264C-2000-TZ-2_P69803	Endevco	1/31/2022
		Z	7264C-2000-TZ-2_P52033	Endevco	1/31/2022
Pubic Symphysis Load Cell		Y	3096JFL_464-FY	Denton	8/2/2021

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N: 300		
				Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers		Primary	X	7264C-2000-TZ-2_P59018	Endevco	11/19/2021
			Y	7264C-2000-TZ-2_P79189	Endevco	11/19/2021
			Z	7264C-2000-TZ-2_P58777	Endevco	11/19/2021
		Redundant	X	7264C-2000-TZ-2_P68057	Endevco	11/19/2021
			Y	7264C-2000-TZ-2_P58986	Endevco	11/19/2021
			Z	7264C-2000-TZ-2_P52025	Endevco	11/19/2021
Displacement Potentiometers	Thoracic Rib	Upper	Y	08TC1-3725_451GFE	Servo	11/22/2021
		Middle	Y	08TC1-3725_040GFE	Servo	11/22/2021
		Lower	Y	08TC1-3725_1156GFE	Servo	11/22/2021
	Abdominal Rib	Upper	Y	0BTC1-3725_307GFE	Servo	11/22/2021
		Lower	Y	08TC1-3725_308GFE	Servo	11/22/2021
Lower Spine Accelerometers (T12)			X	7264C-2000-TZ-2_P64003	Endevco	11/19/2021
			Y	7264C-2000-TZ-2_P52071	Endevco	11/19/2021
			Z	7264C-2000-TZ-2_P17283	Endevco	11/19/2021
Acetabulum Load Cell			Y	3249J_275-FY	Denton	9/14/2021
Iliac Wing Load Cell			Y	3228J_279-FY	Denton	9/14/2021
Pelvis Plug (struck side)				13053	SACO	7/30/2019
Pelvis Plug (non-struck side)				13094	SACO	7/30/2019

Table 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	1201-1000_A315178	Measurement Specialties	8/24/2021
	Vehicle Center of Gravity	Y	1201-1000_A315814	Measurement Specialties	8/24/2021
	Vehicle Center of Gravity	Z	1201-1000_A315828	Measurement Specialties	8/24/2021
2	Right Sill at Front Seat	X	1201-1000_A300131	Measurement Specialties	9/24/2021
	Right Sill at Front Seat	Y	1201-1000_A301883	Measurement Specialties	9/24/2021
	Right Sill at Front Seat	Z	1201-1000_A335432	Measurement Specialties	9/24/2021
3	Right Sill at Rear Seat	X	1201-1000_A373194	Measurement Specialties	11/12/2021
	Right Sill at Rear Seat	Y	1201-1000_A373197	Measurement Specialties	11/12/2021
	Right Sill at Rear Seat	Z	1201-1000_A373202	Measurement Specialties	11/12/2021
4	Left Sill at Front Door	Y	1201-1000_A274233	Measurement Specialties	11/11/2021
5	Left Sill at Rear Door	Y	1201-1000_A315179	Measurement Specialties	11/9/2021
6	Left A-Post Lower	Y	1201-1000_A315839	Measurement Specialties	9/9/2021
7	Left A-Post Middle	Y	1201-1000_A284277	Measurement Specialties	9/10/2021
8	Left B-Post Lower	Y	1201-1000_A284362	Measurement Specialties	11/12/2021
9	Left B-Post Middle	Y	1201-1000_A280869	Measurement Specialties	12/14/2021
10	Front Seat Track	Y	1201-1000_A372873	Measurement Specialties	11/9/2021
11	Rear Seat Track or Structure	Y	1201-1000_A315125	Measurement Specialties	8/31/2021
12	Right Rear Occ. Compartment	Y	1201-1000_A284910	Measurement Specialties	11/16/2021
13	Engine Block	X	1201-1000_A282709	Measurement Specialties	11/16/2021
	Engine Block	Y	1201-1000_A293488	Measurement Specialties	11/16/2021
14	Rear Floorpan Above Axle	X	1201-1000_A280914	Measurement Specialties	8/31/2021
	Rear Floorpan Above Axle	Y	1201-1000_A351008	Measurement Specialties	8/31/2021
	Rear Floorpan Above Axle	Z	1201-1000_A352369	Measurement Specialties	8/31/2021

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	1201-1000_A370956	Measurement Specialties	12/21/2021
MDB Center of Gravity	Y	1201-1000_A370958	Measurement Specialties	12/21/2021
MDB Center of Gravity	Z	1201-1000_A374219	Measurement Specialties	12/21/2021
Left Frame at Rear Axle Centerline	X	1201-1000_A315961	Measurement Specialties	12/30/2021
Left Frame at Rear Axle Centerline	Y	1201-1000_A398329	Measurement Specialties	12/30/2021