

REPORT NUMBER: SPNCAP-CAL-22-003

**NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST**

**Hyundai Motor Company
2022 Hyundai Ioniq 5
Five Door SUV**

NHTSA No: M20224201

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



June 8, 2022

FINAL REPORT

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

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Date: June 8, 2022

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Date: June 8, 2022

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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16. Abstract A 32.20 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject 2022 Hyundai Ioniq 5 SE SUV in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on May 26, 2022. The impact velocity of the vehicle was 32.24 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle was 21°C. The target vehicle's maximum post-test static crush was 226 mm located at level 2. The test vehicle's occupant performance data is as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD (SID-IIs) (Serial No. 300)</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>281.550</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>G</td> <td>82</td> <td>44.921</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>2259.554</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38</td> <td>19.459</td> </tr> <tr> <td>Maximum Abdomen Rib Deflection</td> <td>mm</td> <td>45</td> <td>23.422</td> </tr> </tbody> </table> The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.						Measurement Description	Driver ATD (SID-IIs) (Serial No. 300)			Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	281.550	Resultant Lower Spine Acceleration	G	82	44.921	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2259.554	Maximum Thoracic Rib Deflection	mm	38	19.459	Maximum Abdomen Rib Deflection	mm	45	23.422
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17. Key Words New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs			18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, 1200 New Jersey Ave. SE Washington, D.C. 20590																													
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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY 2022 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. 693JJ920D00016. The purpose of this test is to generate comparative side impact performance in a 2022 Hyundai Ioniq 5 SE SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated March 2020.

SECTION 2 SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2022 Hyundai Ioniq 5 SE SUV. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.24 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on May 26, 2022. Pre-test and post-test photographs of the test vehicle and side impact dummy (SID-IIs) are included in Appendix A of this report.

One Part 572V (SID-IIs) dummy was placed in the driver designated seating position according to instructions specified in the OCWS Side NCAP Pole Laboratory Test Procedure, dated March 2020. The side impact event was documented by 11 cameras. Camera locations and other pertinent camera information are included on page 3-11 in this report.

The Part 572V (SID-IIs) dummy was instrumented accordingly:

- Head CG tri-axial accelerometers
- Thorax upper, middle, and lower rib displacement potentiometers
- Abdomen upper and lower rib displacement potentiometers
- Lower spine tri-axial accelerometers
- Iliac load cell
- Acetabulum load cell

Appendix B contains the dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report. Appendix D identifies all serial numbers, manufacturers, and calibration dates for test equipment, dummy sensors, potentiometers, and load cells used to collect data during the test.

Injury readings for the SID-IIs dummy were recorded as follows:

INJURY READINGS

Measurement Description	Driver ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC ₃₆)		1000	281.550
Resultant Lower Spine Acceleration	g	82	44.921
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2259.554
Maximum Thoracic Rib Deflection	mm	38*	19.459
Maximum Abdominal Rib Deflection	mm	45*	23.422

*Proposed IARV

Supplemental restraint information was recorded as follows:

SUPPLEMENTAL RESTRAINT INFORMATION

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	No	N/A		
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 – Torso/Pelvis	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 – 300

Data Anomalies:

- Left Sill A-Pillar Y Acceleration, Exceeded calibration range and saturated at 46.5 ms
- Left Front Sill Y Acceleration, Exceeded calibration range at 38.4 ms
- Load Cell Pole Barrier #1 Fy, Questionable data from 32.4 ms to 55.3 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 Systems Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Camera and instrumentation Data

Data Sheet No. 6 – Vehicle Accelerometer Data

Data Sheet No. 7 – Rigid Pole Load Cell Data

Data Sheet No. 8 – Post-Test Observations

Data Sheet No. 9 – Test Vehicle Profile Measurements

Data Sheet No. 10 – Test Vehicle Exterior Crush Measurements

Data Sheet No. 11 – Vehicle Damage Profile Distances

Data Sheet No. 12 – FMVSS No. 301 Static Rollover Results

Data Sheet No. 13 – Dummy / Vehicle Temperature and Humidity Stabilization Data

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

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

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

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

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

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
Test Date: 05/26/2022

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20224201
Model Year	2022
Make	Hyundai
Model	Ioniq 5
Body Style	SUV
VIN	KM8KM4AE4NU080624
Body Color	Gray
Odometer Reading (km/mi)	24 mi
Engine Displacement (L)	N/A
Type / No. Cylinders	Electric Vehicle
Engine Placement	N/A
Transmission Type	Automatic
Transmission Speeds	N/A
Overdrive	No
Final Drive	Rear 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 Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso / Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head / Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso / Pelvis Airbag	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	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	Hyundai Motor Company
Date of Manufacture	FEB / 2022
Vehicle Type	MPV

GVWR (kg)	2430
GAWR Front (kg)	1280
GAWR Rear (kg)	1370

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	-	5
Capacity Weight (VCW) (kg)				
DSC X 68.04 kg				340.2
Cargo Weight (RCLW) (kg)				49.8

(A)

(B)

(A-B)

VEHICLE SEAT TYPE

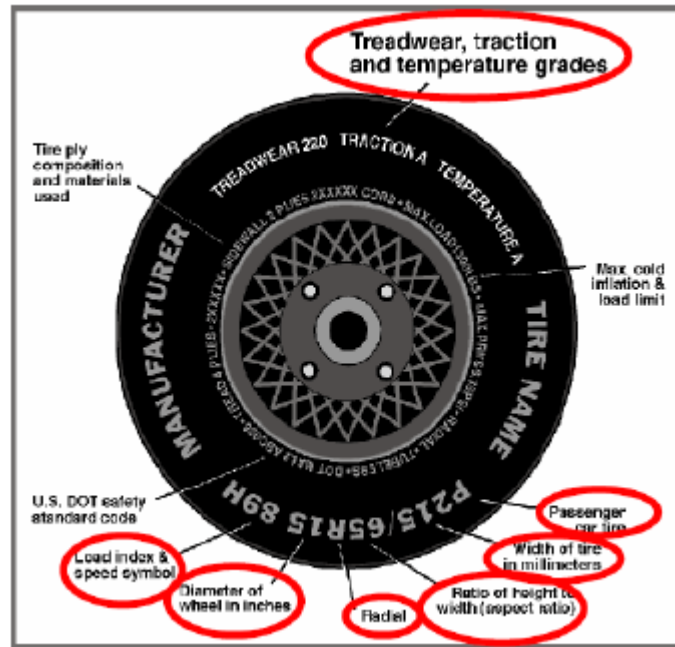
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front Seat	X						X
Rear or Second Row Seat		X				X	
Third Row seat							

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

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

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



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	260	260
Recommended Tire Size	235/55R19	235/55R19
Tire Size on Vehicle	235/55R19	235/55R19
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy A/S	Primacy A/S
Treadwear	540	540
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Polyamide	2 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	101H	101H
Tire Material	Rubber	Rubber
DOT Safety Code Left	B98F073X3721	B98F073X3621
DOT Safety Code Right	B98F073X3721	B98F073X3621

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

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	271	270	260	263
Tire Placard	kPa	260	260	260	260
Owner's Manual	kPa	260	260	260	260
As Tested	kPa	260	260	260	260

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	453	527		493.5	534.5		491	554	
Right	kg	478	493		491.5	523.5		467	539	
Ratio	%	47.7	52.3		48.2	51.8		46.7	53.3	
Totals	kg	931	1020	1951	985	1058	2043	958	1093	2051

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1951	(A)
Actual Weight of 1 P572V (SID-IIs) ATD Used	kg	50	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	49.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2050.8	(A+B+C)

Does the measured As Test Vehicle Weight lie within the required weight range
 (i.e. Calculated Test Vehicle Target Weight – 4.5 kg to – 9 kg)? ☒ Yes ☐ No

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	As Delivered	As Tested	Fully Loaded	Meets Rqmt***
Driver Door Sill Angle (front-to-rear)*	Deg	-0.50	-0.50	-0.70	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg	+0.40	+0.30	+0.30	Yes
Front Bumper-Line Angle (left-to-right)**	Deg	0.00	0.00	0.00	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg	+0.10	+0.10	0.00	Yes
Vehicle CG (Aft of Front Axle)	mm	1571	1556	1601	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	6	6	16	

* ND = Nose Down (-), NU = Nose Up (+)

** LD = Left Down (-), LU = Left Up (+)

*** The "As Tested" vehicle attitude measurements must be equal to or between the "As Delivered" and "Fully Loaded" vehicle attitude measurements. Indicate "Yes" or "No" for Meets Requirement

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

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	13
High Voltage Charger	2
Tire and First Aid Kit	3
Right Rear Tail Light	3.5
Ballast / Equipment Added	0

Test Height – Adjustable Suspension Setting, if Applicable	N/A
--	-----

Test Surface Markings

	Distance from 75° Impact Location Line (mm)
Fore 25 mm target	901
Aft 25 mm target	903

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

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

SEAT POSITIONING

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

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	22.3	13.3	17.8
Front Passenger Seat	17.3	14.0	15.7
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

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	17.8	26	Max	73	80	86
			Mid	40	47	53
			Min	6	13	19
Front Passenger Seat	15.7	22	Max	-	-	-
			Mid	9	14	22
			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	-	-	-

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

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

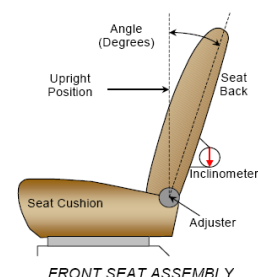
NHTSA No.: M20224201
 Test Date: 05/26/2022

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	260	Power	0	Power
Front Passenger Seat	260	27 (0-26)	0	0
Front Center Seat				
Struck Side Rear Seat	135	10 (0-9)	135	9
Non-Struck Side Rear Seat	135	10 (0-9)	135	9
Rear Center Seat	135	10 (0-9)	135	9

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned such that the dummy's head is level. 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 passenger seat back is positioned in accordance with the information provided by the manufacturer on Form No. 1 for the 5th percentile female dummy in a Side NCAP MDB test. The rear center and non-struck side rear passenger's seat back are set to match the struck-side rear seat back.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/Seated Dummy	64.3	Power	4.4	Power
Front Passenger Seat	60	30	4.0	-
Front Center Seat				
Struck Side Rear Seat	30	16 (0-15)	7.7	0
Non-Struck Side Rear Seat	30	16 (0-15)	7.7	0
Rear Center Seat	30	16 (0-15)	7.7	0

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. Zero is defined as the uppermost detent

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

HEAD RESTRAINT ADJUSTMENT

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

Seat	Total # of Positions	Placed in Position #
Driver Seat	6 (0-5)	Uppermost

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

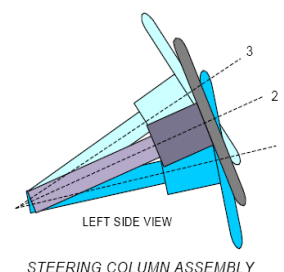
Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

STEERING COLUMN ADJUSTMENT

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

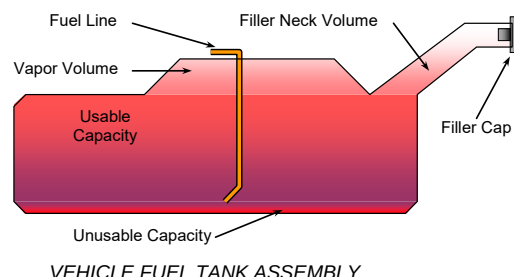
		Degrees	Fore / Aft Position (mm)
Lowermost	– Position 1	23.0	
Geometric Center	– Position 2	26.0	
Uppermost	– Position 3	28.1	
Telescoping Steering Wheel Travel			55
Test Position		26.0	22.5



FUEL PUMP

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

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



FUEL TANK CAPACITY DATA

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

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

N/A

Yes

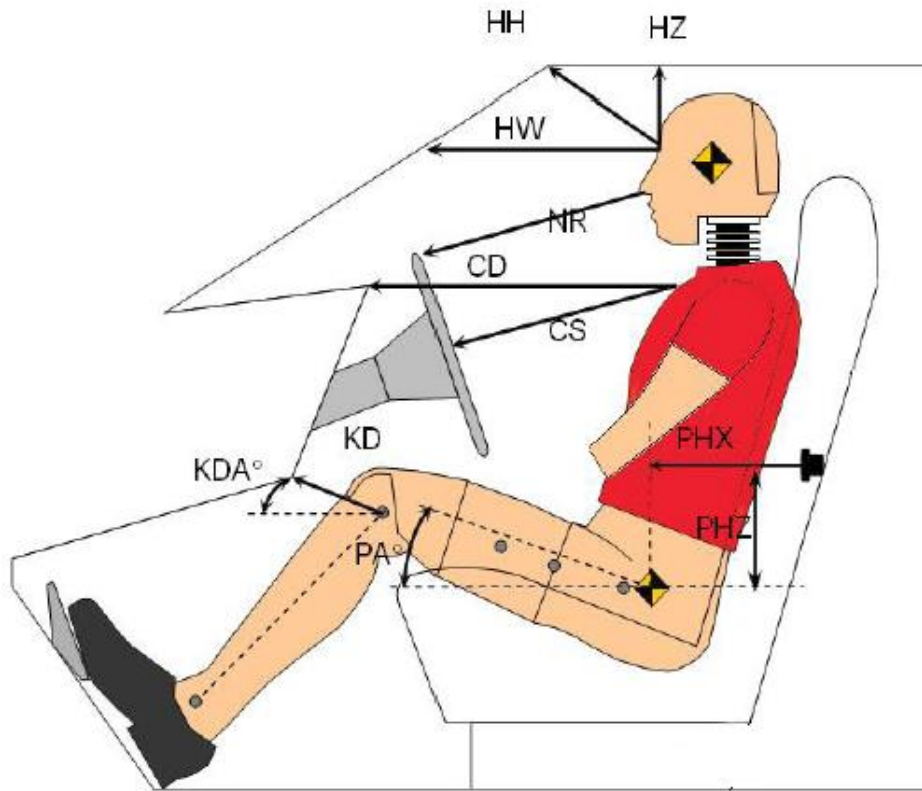
No

No

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022



Left Side View

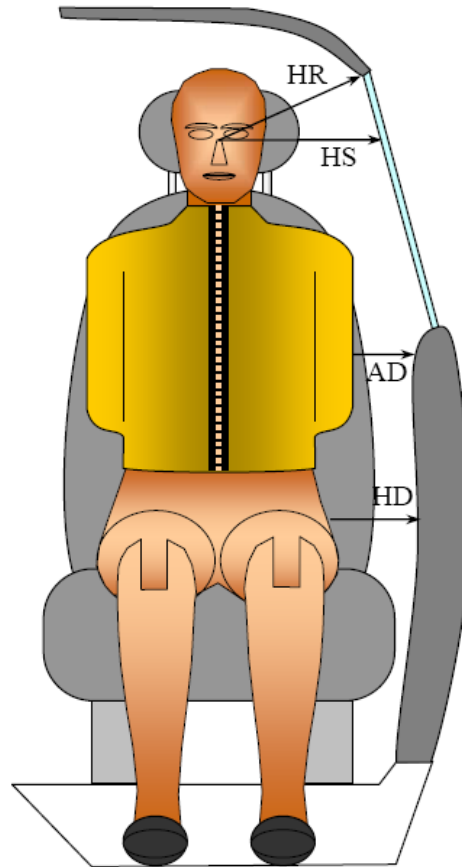
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver (Serial No. 300)	
		Length (mm)	Angle (°)
HH	Head to Header	283	
HW	Head to Windshield	599	
HZ	Head to Roof Liner	181	
NR	Nose to Rim	259	
CD	Chest to Dash	462	
CS	Chest to Steering Wheel	172	
KD(L) / KDA(L)°	Left Knee to Dash	115	35.1
KD(R) / KDA(R)°	Right Knee to Dash	113	30.1
PAX°	Pelvic Tilt Angle (X-Axis)		19.9
PAY°	Pelvic Tilt Angle (Y-Axis)		0.2
PHX	Hip Point to Striker (X-Axis)	393	
PHZ	Hip Point to Striker (Z-Axis)	140	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
Test Date: 05/26/2022



FRONT VIEW OF DUMMY

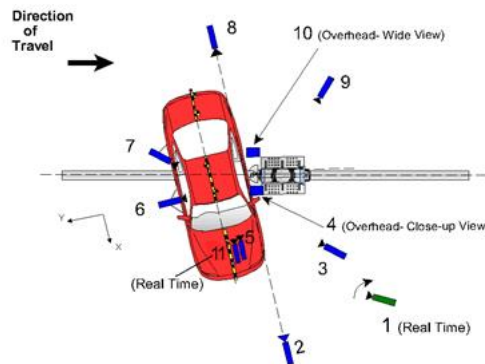
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver - Length (Serial No. 300)
HR	Head To Side Header	mm	255
HS	Head to Side Window	mm	397
AD	Arm to Door	mm	105
HD	Hip Point to Door	mm	205

DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
Test Date: 05/26/2022



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Real-time (24 - 30 fps) pan view of impact				Zoom	60
2	Front ground level - impact view	0	7778	-1705	28	1000
3	Impact side 45° - forward pole view	-1131	6263	-1534	24	1000
4	Overhead Close-up view of impact	363	0	-9227	24	1000
5	Onboard - dummy front view				25	1000
6	Onboard - dummy side view				12.5	1000
7	Onboard - dummy rear oblique view				12.5	1000
8	Rear ground level - impact view	0	-8324	-1678	24	1000
9	Impact side 45° - rearward pole view	4143	-3425	-1643	24	1000
10	Overhead wide - view of impact	-363	0	-9227	12.5	1000
11	Real-time (24 - 30 fps) - dummy front view				Zoom	60

Notes: Reference - From Point of Impact for X and Y; from Ground for Z
+X = Forward of vehicle, +Y = Right of vehicle, +Z = Down
* All measurements accurate to ± 6 mm. Vehicle is at a 75° angle to the rigid pole.

Comments: All cameras operated as intended.

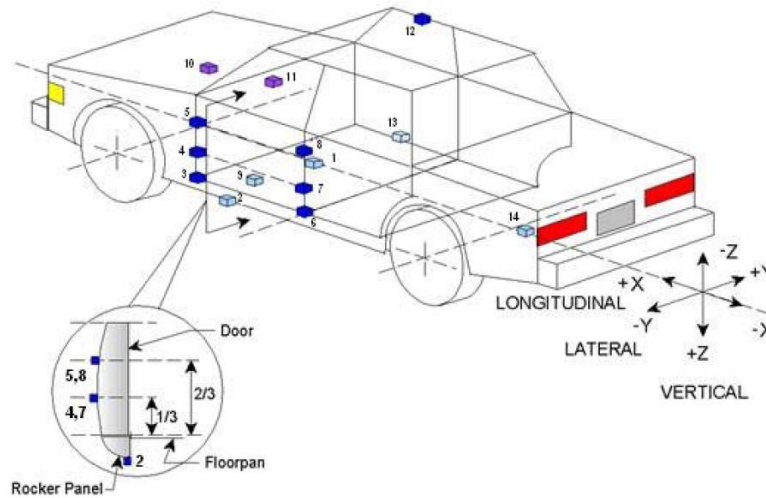
INSTRUMENTATION

Description	Number of Channels
Driver Dummy Channels	16
Vehicle Structure Accelerometers	18
Pole Load Cells	8
Total	42

DATA SHEET NO. 6 VEHICLE ACCELEROMETER DATA

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2146	-2	490
2	Left Floor Sill	2861	-664	433
3	A-Pillar Sill	3135	-655	437
4	A-Pillar Low	3269	-646	229
5	A-Pillar Mid	3154	-687	-272
6	B-Pillar Sill	2124	-662	429
7	B-Pillar Low	2162	-684	344
8	B-Pillar Mid	2118	-673	38
9	Driver Seat Track	1891	-576	447
10	Engine Top	3941	57	223
11	Firewall	3483	354	70
12	Right Roof	2259	630	-736
13	Right Floor Sill	2779	665	429
14	Rear Floorpan	717	15	225

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

DATA SHEET NO. 7
RIGID POLE LOAD CELL DATA

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
Test Date: 05/26/2022

POLE BARRIER



RIGID POLE LOAD CELL LOCATIONS

ID	Units	Height From Ground
1	mm	200
2	mm	590
3	mm	750
4	mm	1075
5	mm	1260
6	mm	1740
7	mm	1920
8	mm	2300

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
Test Date: 05/26/2022

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver Seat Dummy (SID-IIs)
Face	Curtain Airbag
Top of Head	Curtain Airbag
Left Side of Head	Curtain Airbag
Back of Head	Curtain Airbag & Headrest
Left Shoulder	Seatback & Torso/Pelvis Airbag
Upper Torso	Seatback
Lower Torso	Seatback
Left Hip	Seatpan & Torso/Pelvis Airbag
Left Knee	Driver Door

POST-TEST DOOR PERFORMANCE

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

POST-TEST SEAT PERFORMANCE

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

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

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
Test Date: 05/26/2022

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar Buckled
Sill Separation	None
Windshield Damage	Cracks along driver side & some separation along A-Pillar
Side Window Damage	Driver Window cracked throughout
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

VEHICLE SPEED, VEHICLE ANGLE AT IMPACT AND IMPACT POINT LOCATION DATA

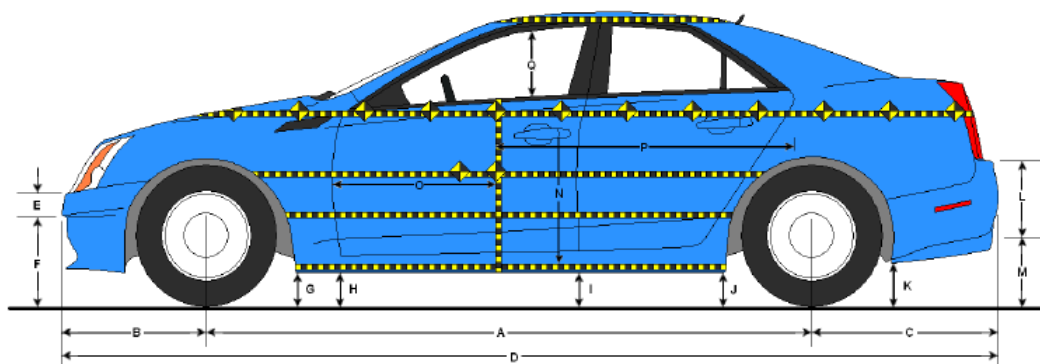
Measured Parameter	Units	Tolerance	Value
Vertical Impact Ref Line - Aft of Front Axle, Intended Impact Pt	mm		1150
Actual Impact Point - Aft of Front Axle	mm		1159
Horizontal Offset (+ forward / - rearward)	mm	+/- 38 *	-9
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	deg	75 +/- 3	75
Trap No. 1 Velocity - Primary	kph	31.4 to 33.0	32.24
Trap No. 2 Velocity - Redundant	kph	31.4 to 33.0	32.25

* Of Intended Impact Point

DATA SHEET NO. 9
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
Test Date: 05/26/2022



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

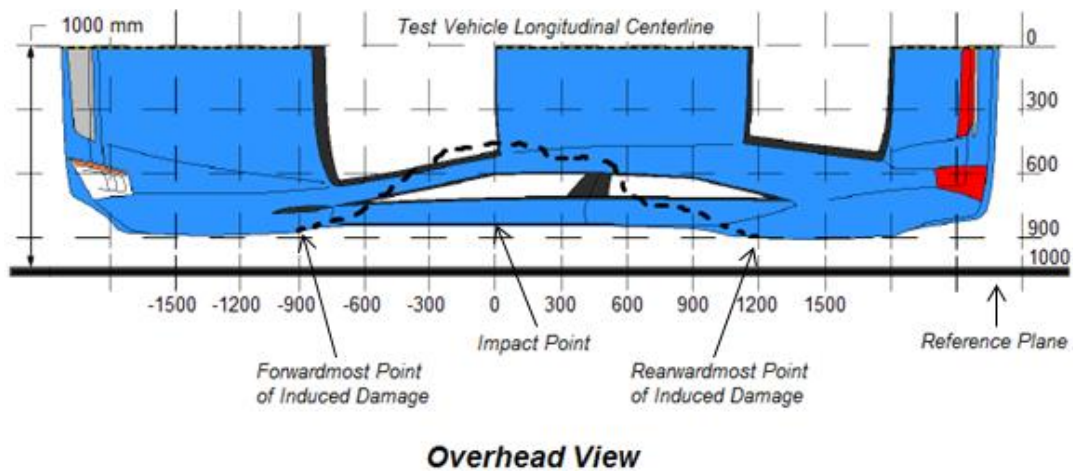
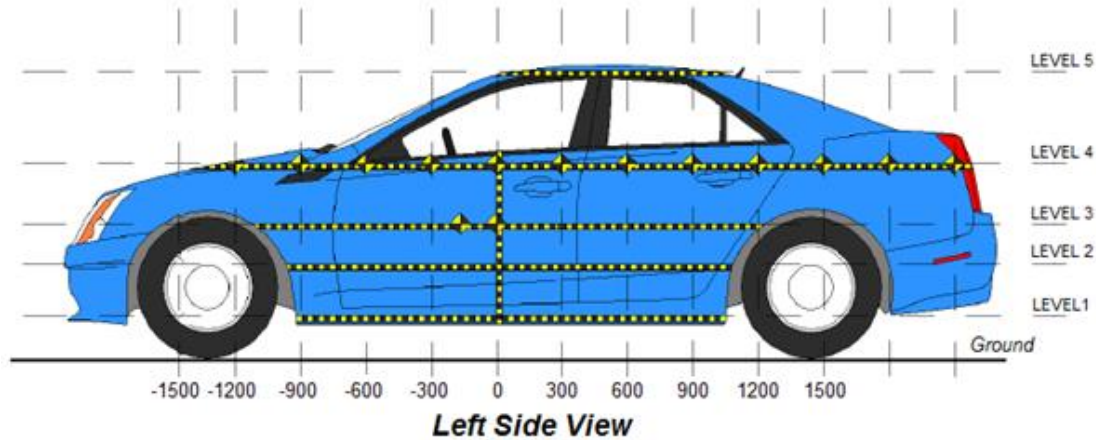
Code	Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	3005	2979	26
B	Front Axle to FSOV	845	863	-18
C	Rear Axle to RSOV	784	781	3
D	Total Length at Centerline	4634	4623	11
E	Front Bumper Thickness	125	125	0
F	Front Bumper Bottom to Ground	450	456	-6
G	Sill Height at Front Wheel Well	182	179	3
H	Sill Height at Front Door Leading Edge	182	182	0
I	Sill Height at B-Pillar	192	136	56
J1	Sill Height at Rear Wheel Well	200	195	5
J2	Pinch Weld Height at Rear Wheel Well	189	197	-8
K	Sill Height Aft of Rear Wheel Well	265	270	-5
L	Rear Bumper Thickness	211	211	0
M	Rear Bumper Bottom to Ground	512	500	12
N	Sill Height to Bottom of Front Window Sill	855	854	1
O	Front Door Leading Edge to Impact CL	620	588	32
P	Rear Door Trailing Edge to Impact CL	1724	1696	28
Q	Front Window Opening	420	411	9
R	Right Side Length	4567	4563	4
S	Left Side Length	4566	4551	15
T	Vehicle Width at B-Pillars	1874	1845	29
U	Front Wheel Track Width	1635	1635	0
V	Rear Wheel Track Width	1645	1645	0

* All measurements in mm with tolerance of ± 3 mm

DATA SHEET NO. 10 **TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	272	161	0
2	Occupant Hip Point	mm	650	226	0
3	Mid - Door	mm	711	219	0
4	Window Sill	mm	1024	178	0
5	Window Top	mm	1519	25	150

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. 10 ... (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: _____
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

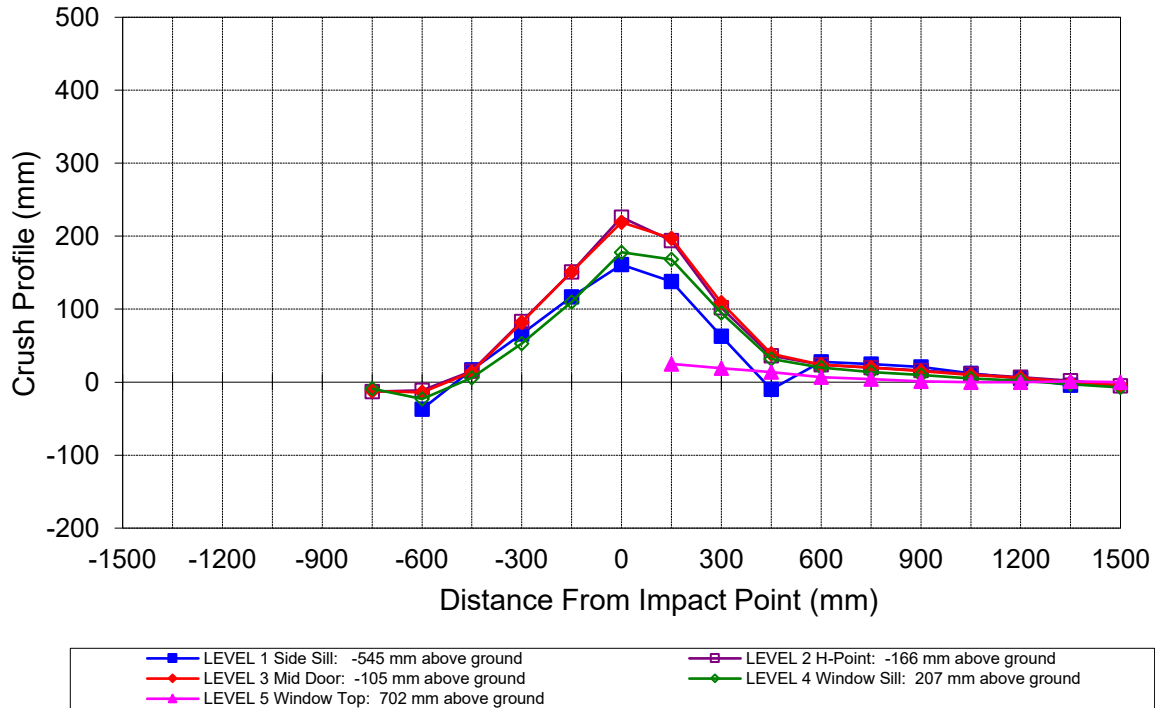
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500															
-1350															
-1200															
-1050															
-900															
-750		945	938	827			958	950	836			-13	-12	-9	
-600	916	927	923	839		953	938	937	862		-37	-11	-14	-23	
-450	916	922	919	849		899	907	905	843		17	15	14	6	
-300	916	921	917	856		850	838	835	803		66	83	82	53	
-150	915	920	916	864		798	769	765	754		117	151	151	110	
0	912	918	912	870		751	692	693	692		161	226	219	178	
150	910	915	914	877	630	772	721	717	709	605	138	194	197	168	25
300	905	911	917	883	643	842	809	808	788	624	63	102	109	95	19
450	901	915	921	887	648	911	879	882	855	634	-10	36	39	32	14
600	896	917	923	890	651	868	893	899	870	644	28	24	24	20	7
750	892	919	924	892	652	867	899	904	878	648	25	20	20	14	4
900	886	921	925	894	650	865	905	910	884	649	21	16	15	10	1
1050	882	923	927	895	647	870	912	917	890	647	12	11	10	5	0
1200	887	925	928	895	643	882	918	922	893	643	5	7	6	2	0
1350	896	928	929	893	632	900	926	929	896	631	-4	2	0	-3	1
1500		941	944	889	609		946	948	896	609		-5	-4	-7	0

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 the test based on an estimated impact point. The final distance from impact is determined after the final dummy positioning and the pole is aligned with the center of gravity of the dummy’s head.

DATA SHEET NO. 10 ... (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022



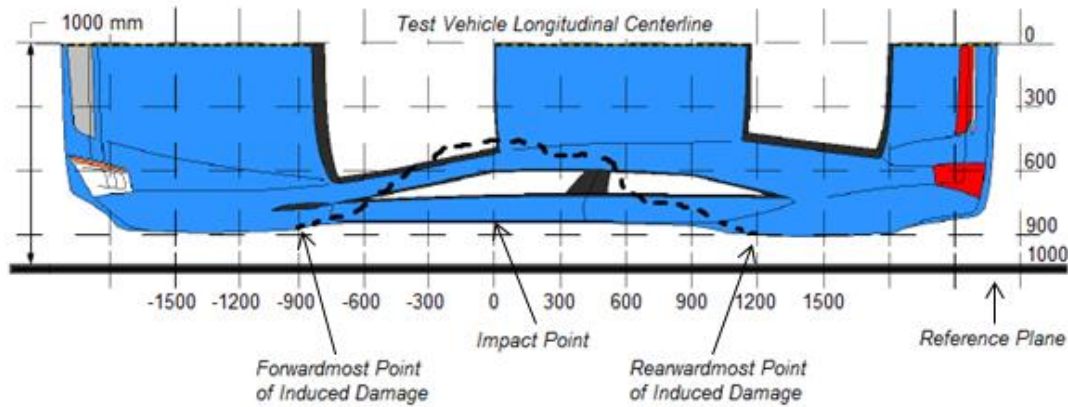
Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 11 **VEHICLE DAMAGE PROFILE DISTANCES**

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

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



Overhead View

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-750	3	50	62	-12
2	-300	3	165	83	82
3	150	3	283	86	197
4	600	3	101	77	24
5	1050	3	83	73	10
6	1500	3	52	56	-4

DATA SHEET NO. 12
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: <u>2022 Hyundai Ioniq 5 SE SUV</u>	NHTSA No.: <u>M20224201</u>
Test Program: <u>NCAP Side MDB Impact Test</u>	Test Date: <u>05/26/2022</u>
Test Time: <u>10:59 AM</u>	Temperature: <u>21° C</u>

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

FMVSS NO. 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	61	300	361
90° to 180°	60	300	360
180° to 270°	63	300	363
270° to 360°	65	300	365

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

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

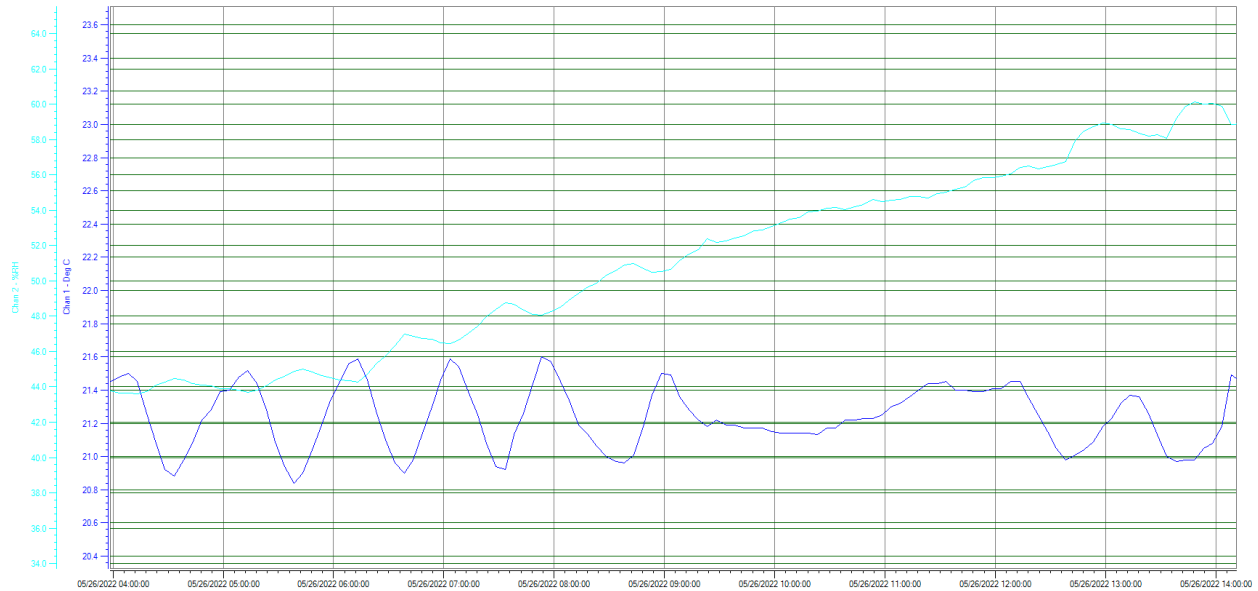
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 13
DUMMY / VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
Test Date: 05/26/2022



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 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

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 Battery
Nominal Voltage (Volts)	697 V
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Inside of propulsion battery (Rear side)
Auxiliary Battery Type	Lead-acid battery

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	Liquid solution, LiPF6 salt, Carbonate solvent
Electrolyte Fluid Specific Gravity	1.19 g/cm3
Electrolyte Fluid Kinematic Viscosity (centistokes)	2~3 cP @ 25°C
Electrolyte Fluid Color	Transparent & Pale Yellow
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Applied (Water-cooled type), Blue
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Outside Passenger Compartment

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
<i>For all battery types:</i> Voltage Range corresponding to useable energy of the battery:		
Minimum State of Charge	V	480
Maximum State of Charge	V	826
95% of Maximum	V	784.7
Test Voltage *	V	791
<i>For batteries that are rechargeable ONLY by an energy source on the vehicle:</i> Voltage range corresponding to useable energy of the battery :		
Minimum State of Charge	V	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	

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

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

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
Test Date: 05/26/2022

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

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Located at the rear of vehicle battery underneath vehicle
Details of Propulsion Battery Components	HV battery main cable is located at the rear side of the battery and is where the leads will be attached to read battery voltage.

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

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		49210189
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		1/29/2022

NOTES:

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

**PROPULSION BATTERY VOLTAGE, RESISTANCE &
ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS**

Measured Parameter	Symbol	Units	Value
Normal operating voltage range specified by the manufacturer	V_b	V	480 – 826
Propulsion Battery Voltage : (ready to drive position)	V_b	V	792
Propulsion Battery to Vehicle Chassis	V_1	V	555
Propulsion Battery to Vehicle Chassis	V_2	V	561
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	403,000
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	72.40
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	72.50
$R_{i1} = R_o * (1 + V_2/V_1) * [(V_1 - V_1')/V_1']$	R_{i1}	Ω	5,401,632
$R_{i2} = R_o * (1 + V_1/V_2) * [(V_2 - V_2')/V_2']$	R_{i2}	Ω	5,401,731
Lesser value of R_{i1} and R_{i2}	R_i	Ω	5,401,632
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	6,820

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

NOTES:

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

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

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		49210189
Internal Impedance Value	MΩ	10
Propulsion Battery Voltage (V_b)	V	6.51

NOTES:

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

ELECTRICAL ISOLATION MEASUREMENTS & IMPACT CALCULATIONS

Parameter	Value	Units		Value		Value	
$V_1 =$	1.10	V	Time:	4	Minutes	54	Seconds
$V_2 =$	5.51	V	Time:	4	Minutes	59	Seconds
$R_o =$	403,000	Ω	Time:		Minutes		Seconds
$V_1' =$	0.56	V	Time:	5	Minutes	5	Seconds
$V_2' =$	0.61	V	Time:	5	Minutes	16	Seconds
$R_{i1} =$	2,378,030	Ω	Time:	5	Minutes	5	Seconds
$R_{i2} =$	3,883,481	Ω	Time:	5	Minutes	16	Seconds
$R_i =$	2,378,030	Ω	Time:	5	Minutes	5	Seconds
$R_i/V_b =$	365,345	Ω/V	Time:	5	Minutes	5	Seconds

Is the Electrical Isolation Value $\geq 500 \Omega/V$ (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

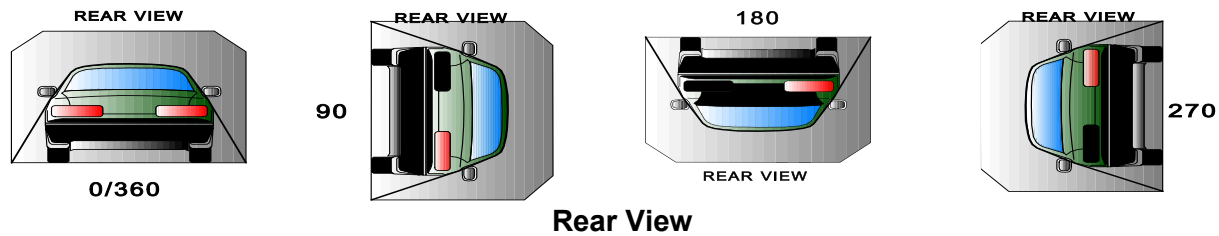
PROPULSION BATTERY SYSTEM COMPONENTS

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 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022



DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

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

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

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

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

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

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		49210189
Internal Impedance Value	MΩ	10
Propulsion Battery Voltage (V _b)	V	0.00

NOTES:

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

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

Test Vehicle: 2022 Hyundai Ioniq 5 SE SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20224201
 Test Date: 05/26/2022

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units		Minutes	Seconds
$V_1 =$	90°	0.00	V	Time:	1	19
	180°	0.00	V		9	32
	270°	0.01	V		15	43
	360°	0.00	V		22	21
$V_2 =$	90°	0.00	V	Time:	1	32
	180°	0.00	V		9	30
	270°	0.01	V		15	46
	360°	0.00	V		22	18
$V_1' =$	90°	0.00	V	Time:	1	51
	180°	0.00	V		9	51
	270°	0.01	V		15	52
	360°	0.00	V		22	25
$V_2' =$	90°	0.00	V	Time:	1	40
	180°	0.00	V		9	44
	270°	0.00	V		16	0
	360°	0.00	V		22	32
$R_{i1} =$	90°	Zero Volts	Ω	Time:	1	51
	180°	Zero Volts	Ω		9	51
	270°	0.00	Ω		15	52
	360°	Zero Volts	Ω		22	25
$R_{i2} =$	90°	Zero Volts	Ω	Time:	1	40
	180°	Zero Volts	Ω		9	44
	270°	Zero Volts	Ω		16	0
	360°	Zero Volts	Ω		22	32
$R_i =$	90°	Zero Volts	Ω	Time:	1	40
	180°	Zero Volts	Ω		9	44
	270°	Zero Volts	Ω		16	0
	360°	Zero Volts	Ω		22	25
$R_i/V_b =$	90°	Zero Volts	Ω/V	Time:	1	40
	180°	Zero Volts	Ω/V		9	44
	270°	Zero Volts	Ω/V		16	0
	360°	Zero Volts	Ω/V		22	25

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

APPENDIX A
PHOTOGRAPHS

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Figure A-1: As Delivered Right Front $\frac{3}{4}$ View of Test Vehicle



Figure A-2: As Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle



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

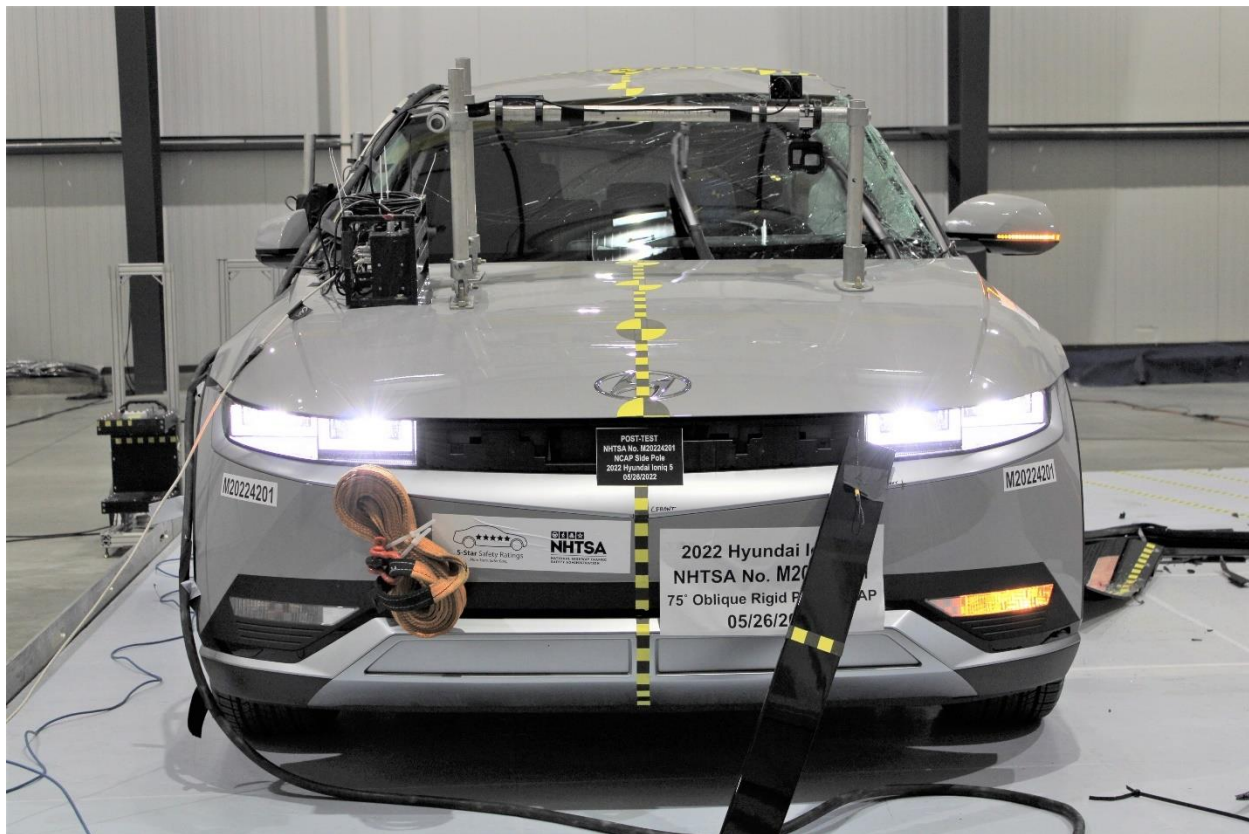


Figure A-4: Post-Test Frontal View of Test Vehicle



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



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



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



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



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



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

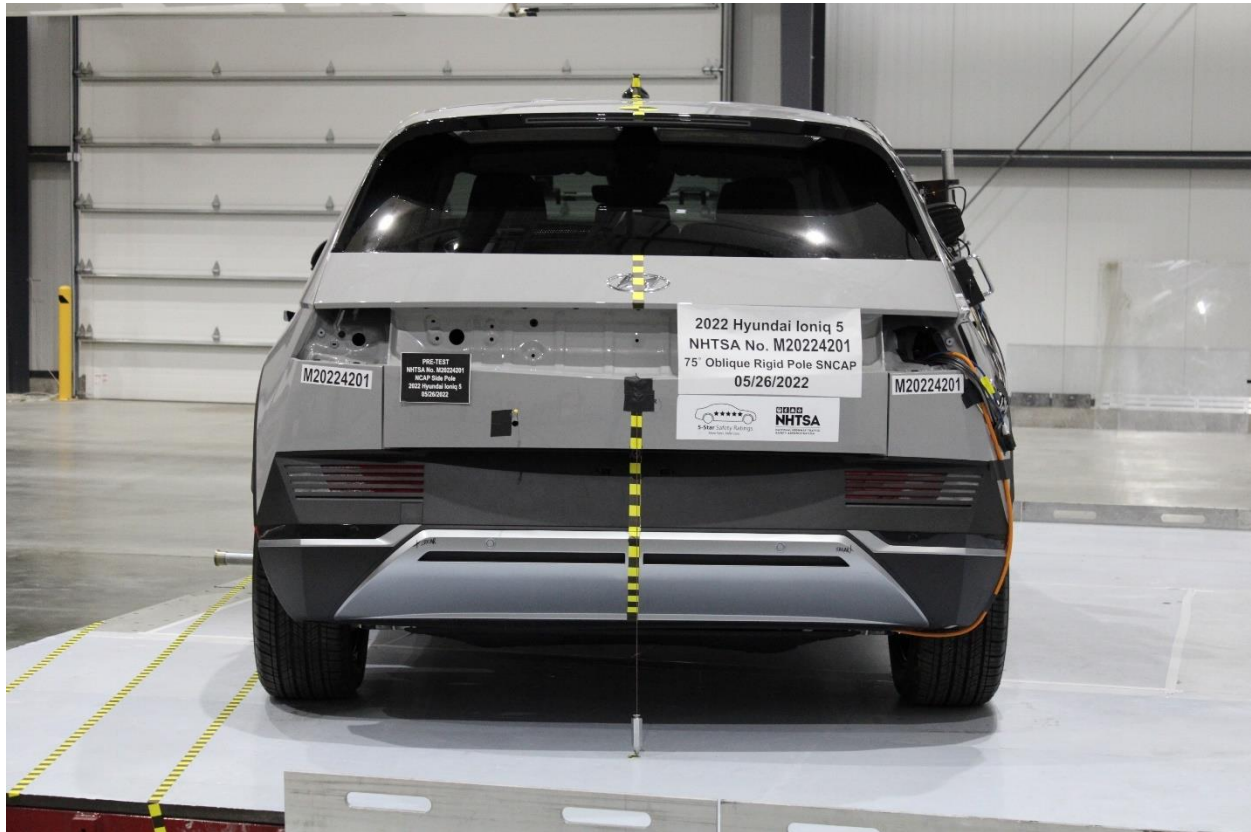


Figure A-11: Pre-Test Rear View of Test Vehicle

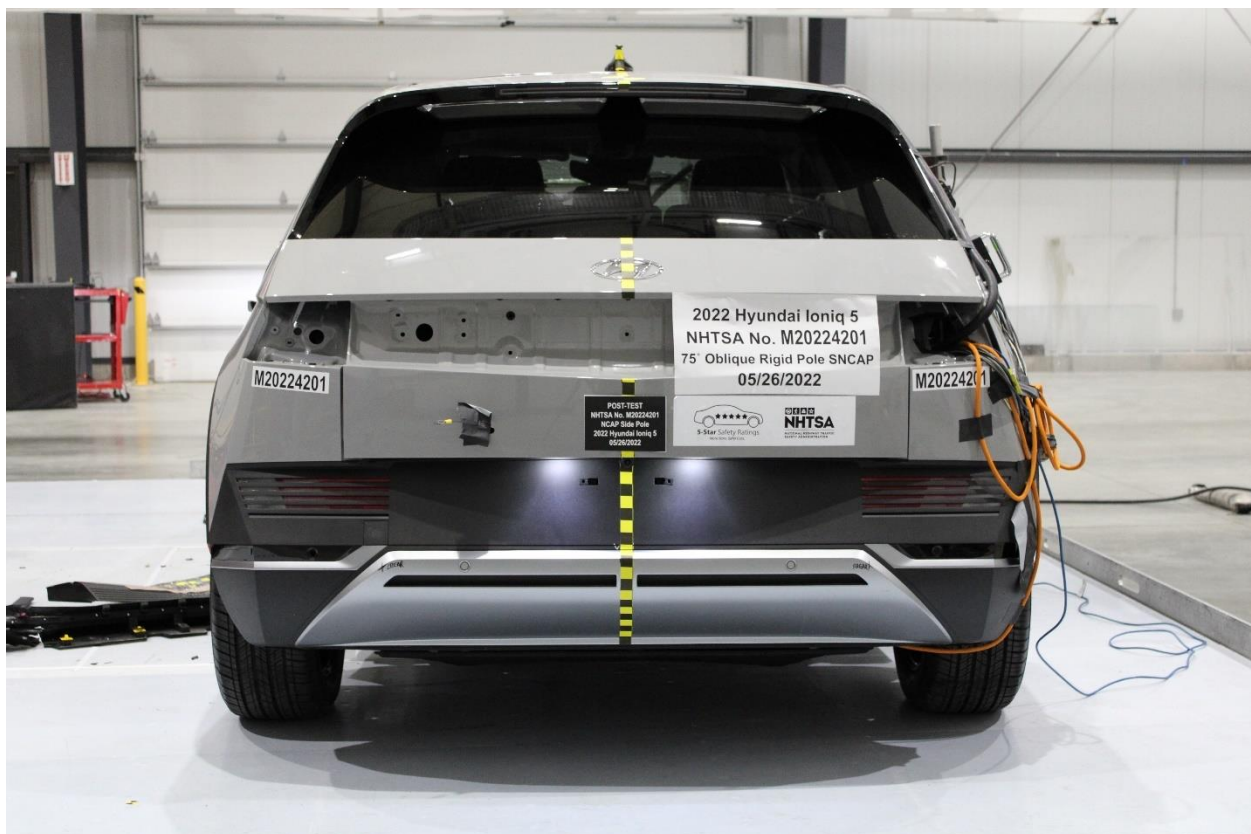


Figure A-12: Post-Test Rear View of Test Vehicle



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



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

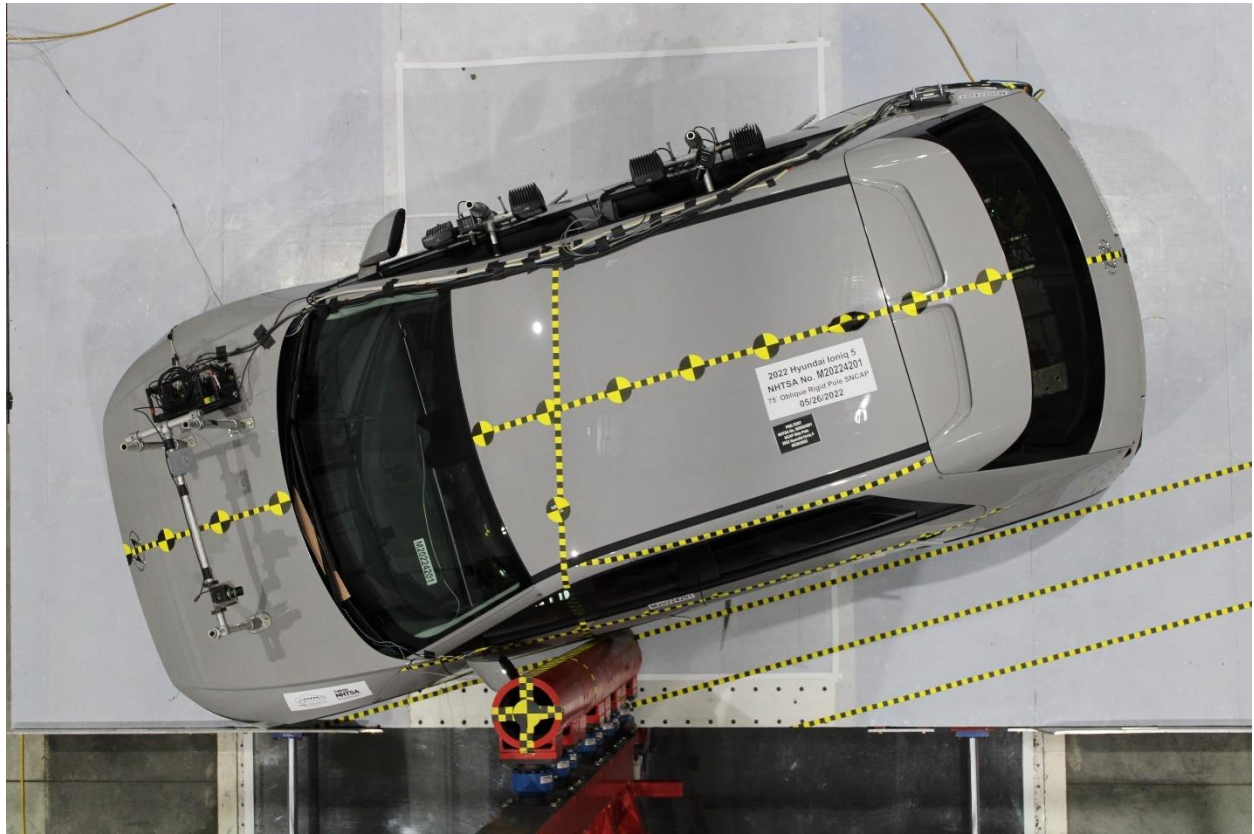


Figure A-15: Pre-Test Overhead View of Test Area

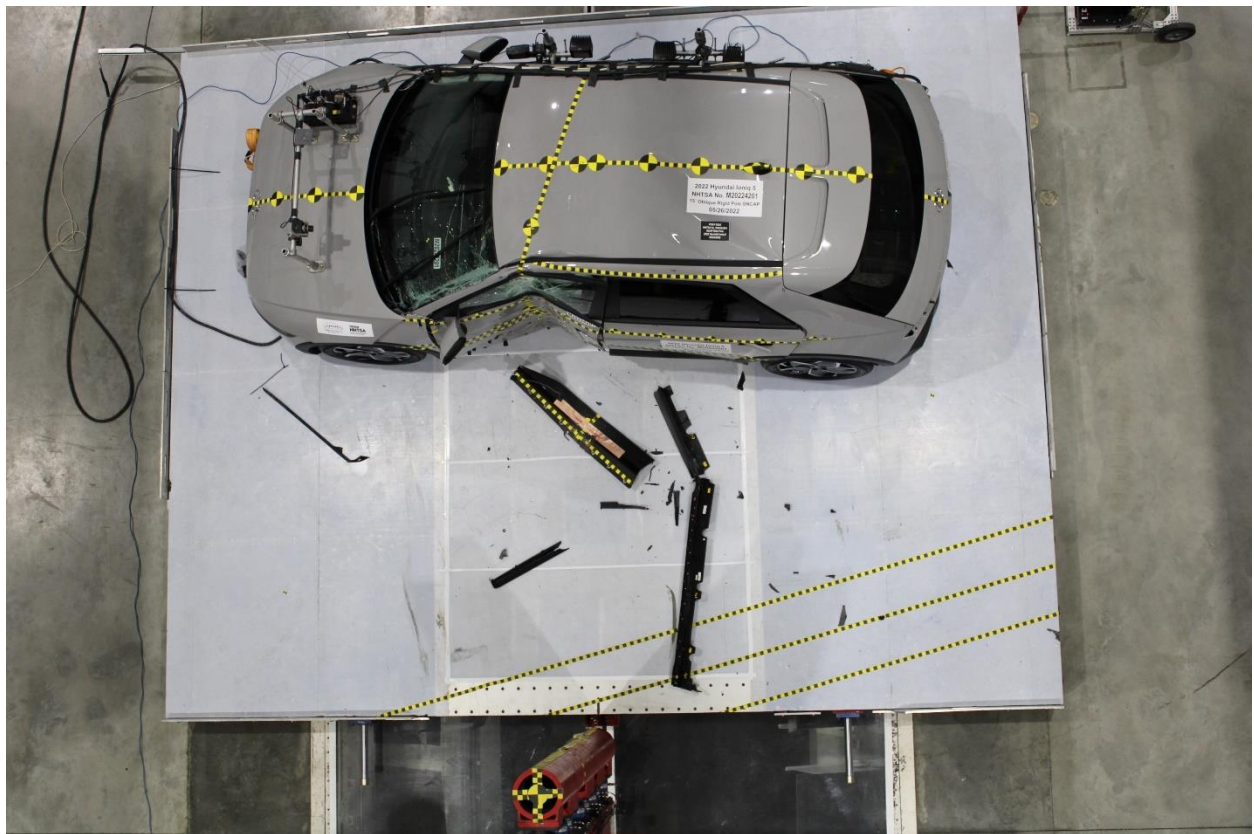


Figure A-16: Post-Test Overhead View of Test Area



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



Figure A-18: Pre-Test Right Side View of Pole Positioned Against Side of 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 Showing Impact Location



Figure A-21: Pre-Test Front Close-Up View of Dummy Head and Chest



Figure A-22: Post-Test Front Close-Up View of Dummy



Figure A-23: Pre-Test Left Side View of Dummy Showing Belt and Chalking



Figure A-24: Pre-Test Left Side View of Dummy Shoulder and Door Top View



Figure A-25: Post-Test Left Side View of Dummy Shoulder and Door Top View



Figure A-26: Pre-Test Frontal View of Seat Back Prior to Dummy Positioning



Figure A-27: Pre-Test Frontal Close-Up View of Dummy Head / Shoulders in Relation to Head Restraint



Figure A-28: Pre-Test Frontal View of Seat Pan Prior to Dummy Positioning



Figure A-29: Pre-Test Overhead View of Dummy Thighs on Seat Pan



Figure A-30: Pre-Test Left Side View of Dummy's Neck Showing Position of Adjustable Neck Bracket



Figure A-31: Pre-Test Left Side View of Dummy's Head Showing Dummy's Head is Level



Figure A-32: Pre-Test Placement of Dummy's Feet



Figure A-33: Pre-Test View of Belt Anchorage for Dummy



Figure A-34: Pre-Test Left Side View of Steering Wheel

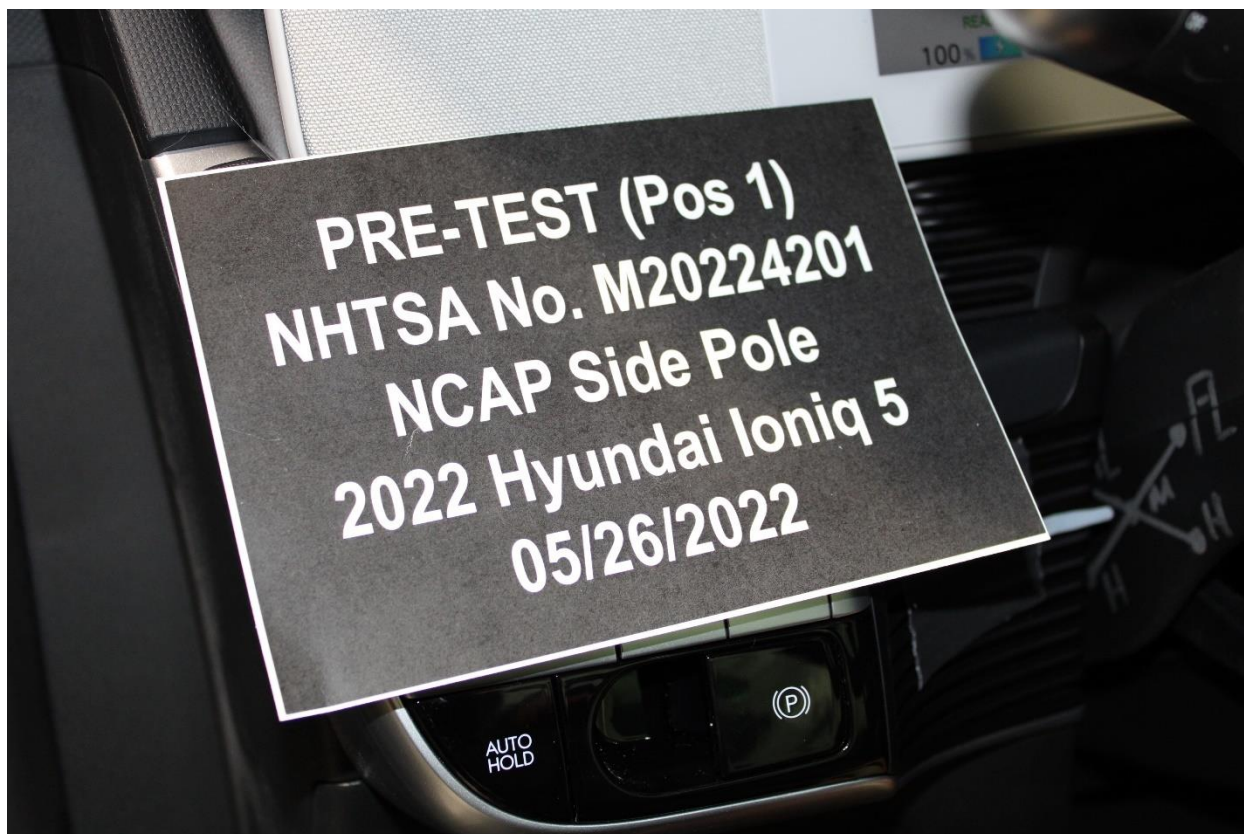


Figure A-35: Pre-Test View of Disengaged Parking Brake

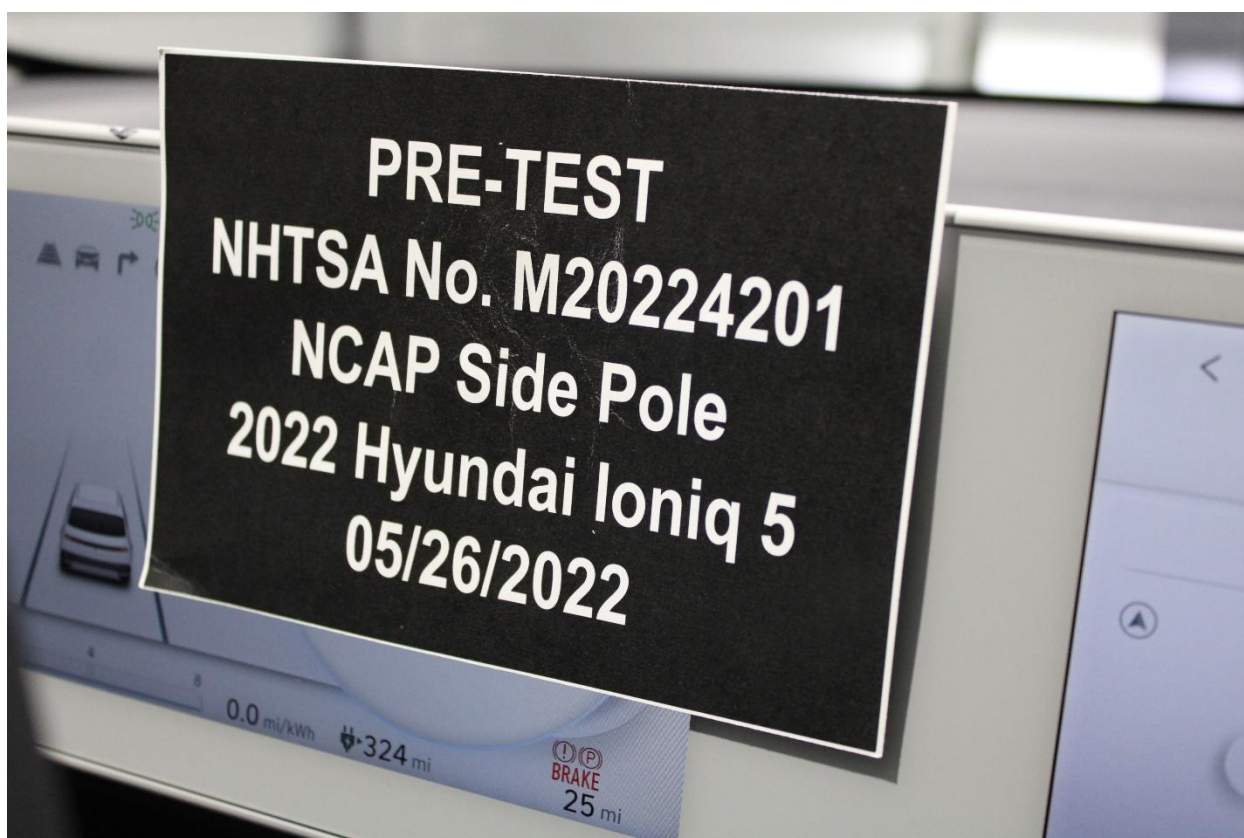


Figure A-36: Pre-Test View of Parking Brake



Figure A-37: Pre-Test Close-Up Left Side View of Driver Seat Track

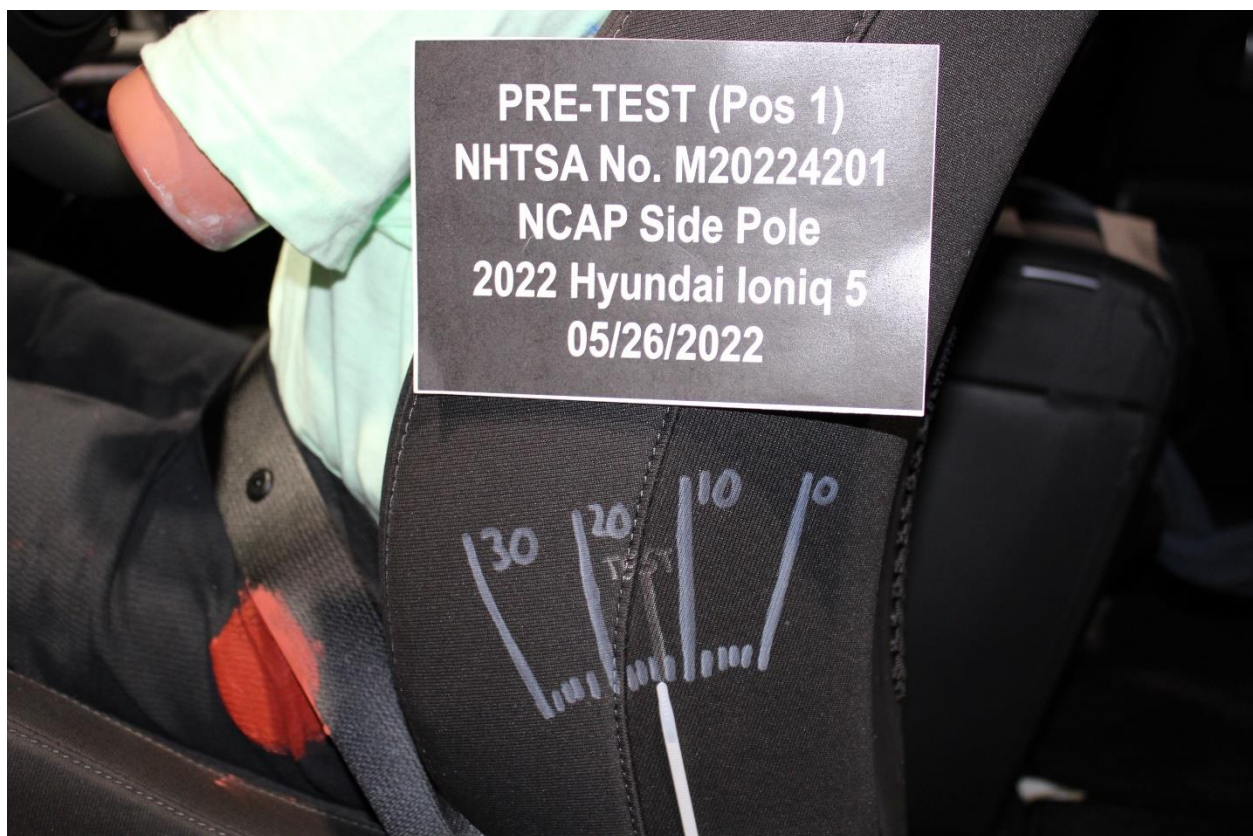


Figure A-38: Pre-Test Close-Up Left Side View of Driver Seat Back



Figure A-39: Pre-Test Close-Up View of Driver Seat Back or Head Restraint



Figure A-40: Pre-Test Dummy and Door Clearance View



Figure A-41: Post-Test Dummy and Door Clearance View



Figure A-42: Pre-Test Right Side View of Dummy and Front Seat of Occupant Compartment



Figure A-43: Post-Test Right Side View of Dummy and Front Seat of Occupant Compartment

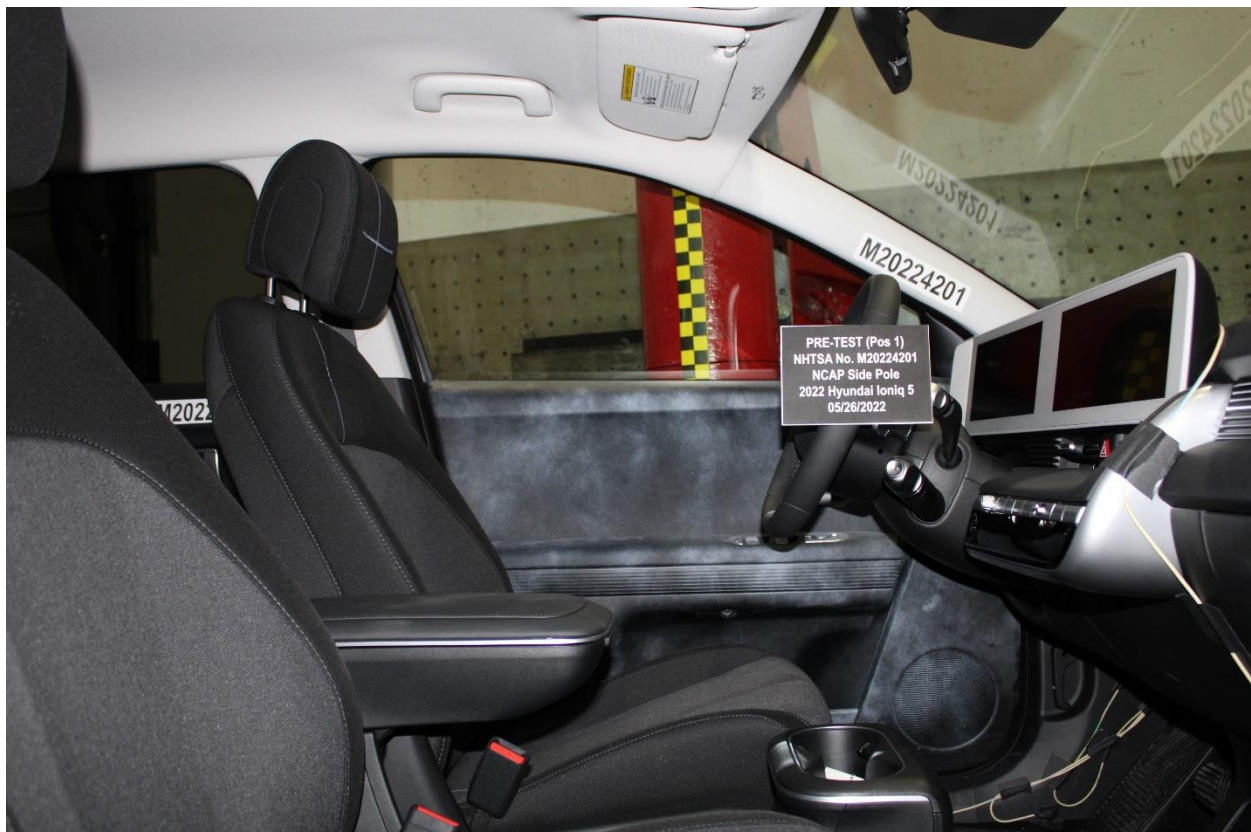


Figure A-44: Pre-Test Inner Door Panel View



Figure A-45: Post-Test Inner Door Panel View Showing Dummy Contact Location



Figure A-46: Post-Test Dummy Close-Up Head Contact with Vehicle Interior View



Figure A-47: Post-Test Dummy Close-Up Head Contact with Side Airbag View



Figure A-48: Post-Test Dummy Close-Up Torso Contact with Vehicle Interior View



Figure A-49: Post-Test Dummy Close-Up Torso Contact with Side Airbag View



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



Figure A-51: Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View



Figure A-52: Post-Test Dummy Close-Up Knee Contact with Vehicle Interior View



Figure A-53: Pre-Test Right Side View of Dummy and Rear Seat of Occupant Compartment



Figure A-54: Post-Test Inner Rear Passenger Torso Air Bag Deployment View



Figure A-55: Pre-Test View of Charging Port



Figure A-56: Post-Test View of Charging Port



Figure A-57: Close-Up View of Vehicle's Certification Label



Figure A-58: Close-Up View of Vehicle's Tire Information Placard or Label

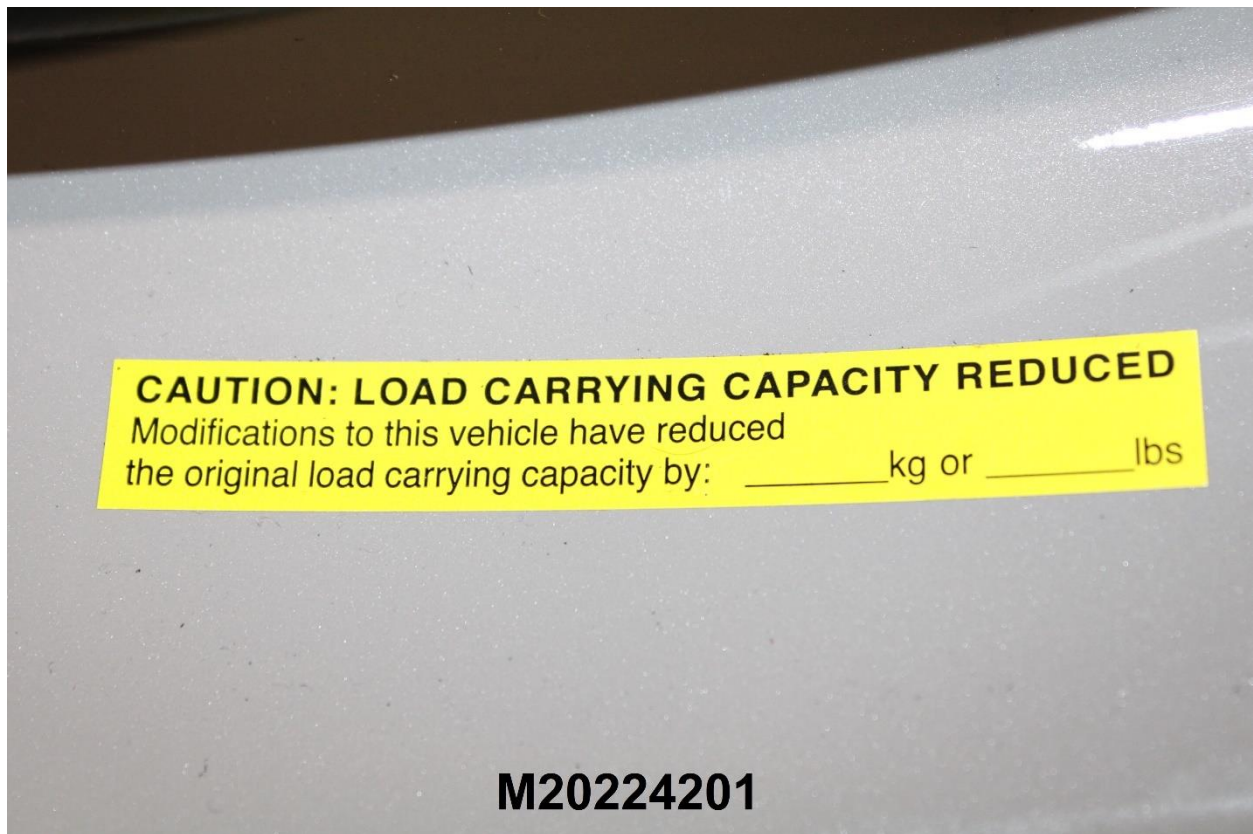


Figure A-58a: Close-Up View of Reduced Load Capacity Label

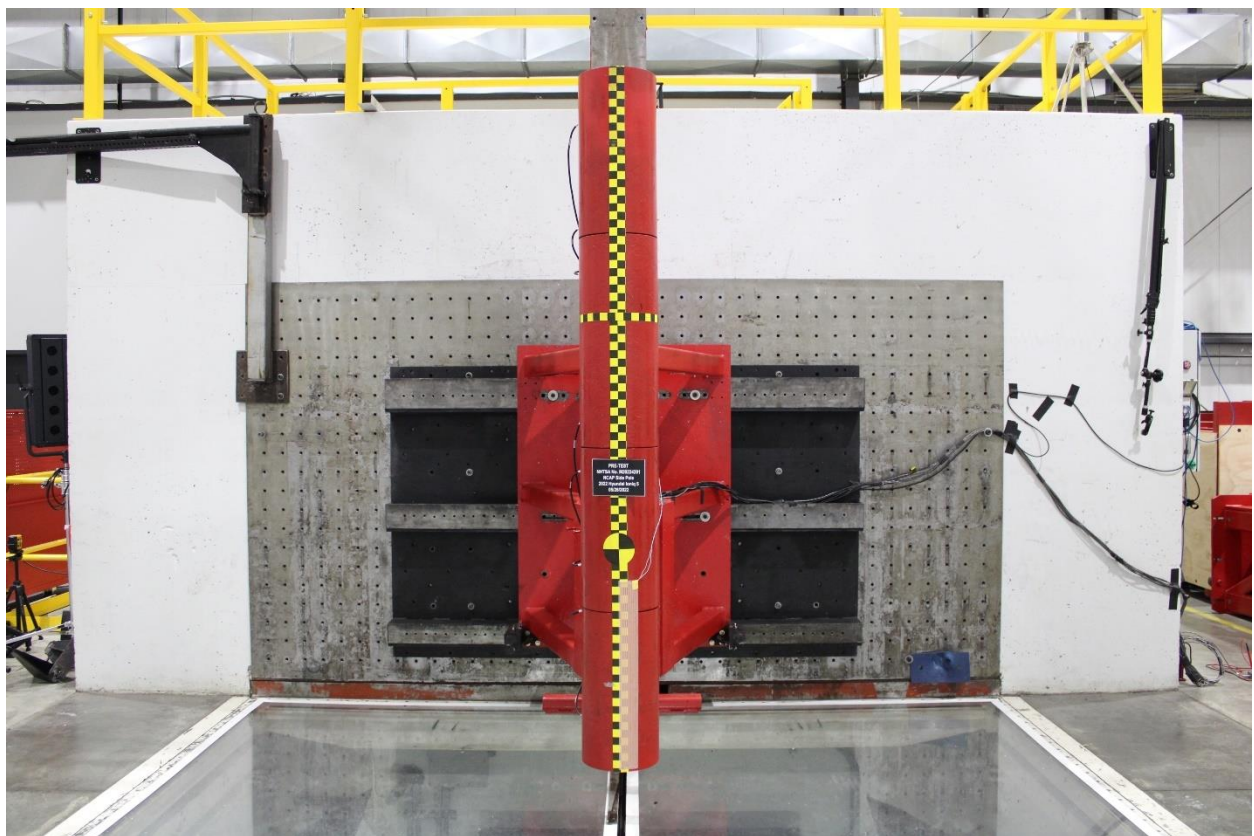


Figure A-59: Pre-Test Pole Barrier Front View



Figure A-60: Post-Test Pole Barrier Front View

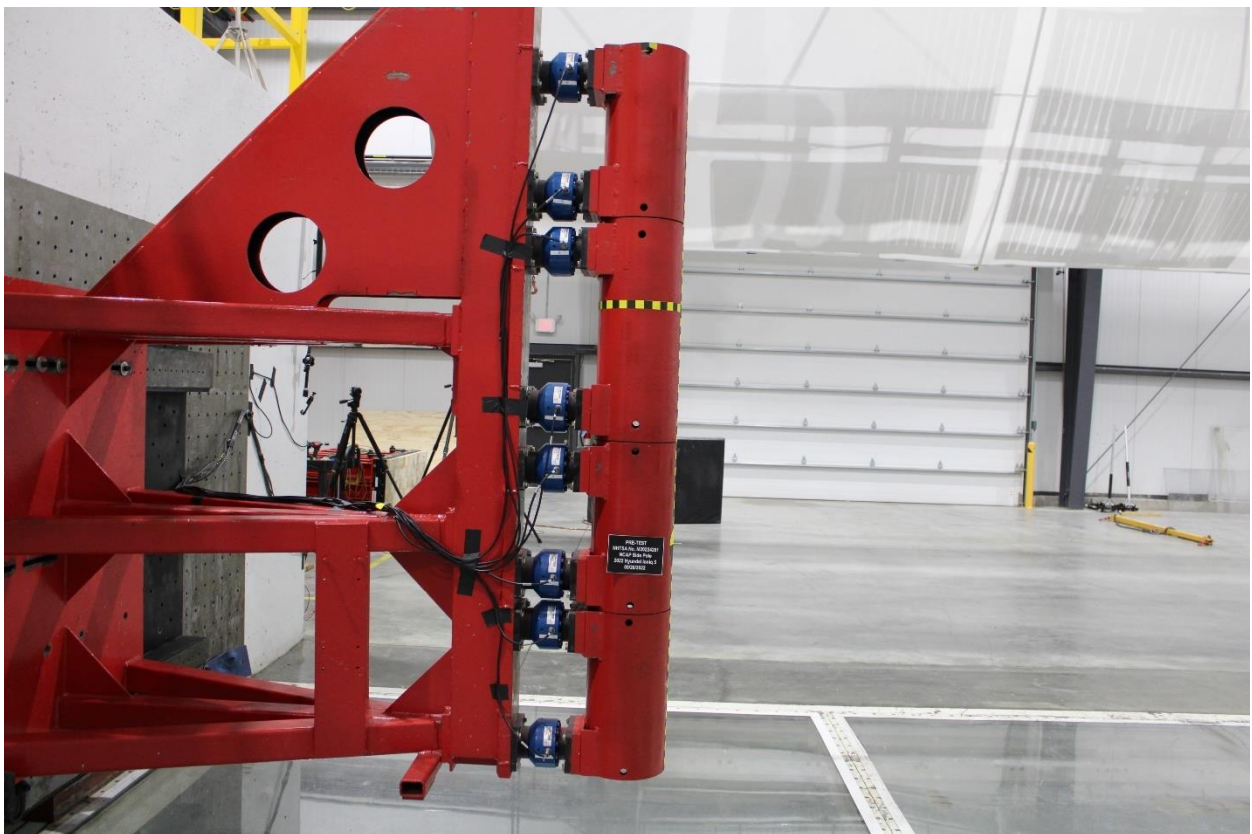


Figure A-61: Pre-Test Pole Barrier Side View

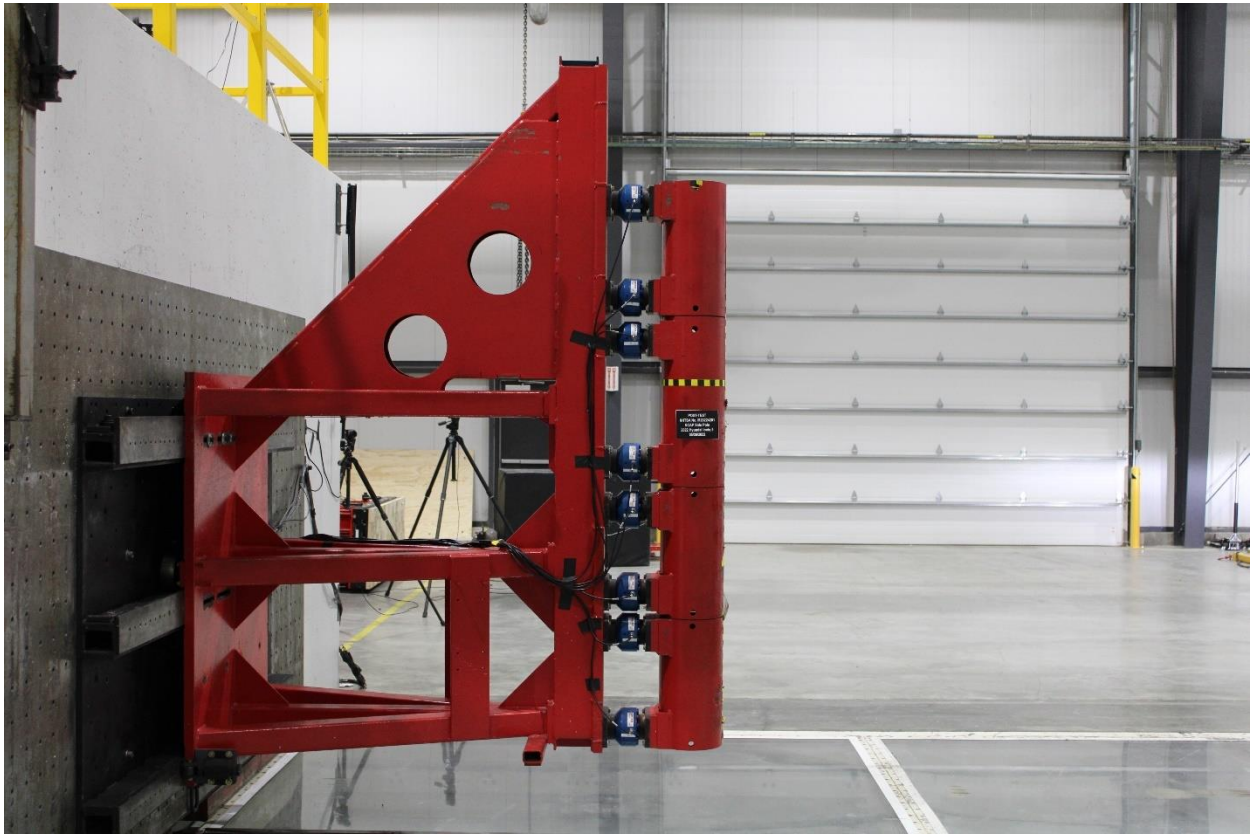


Figure A-62: Post-Test Pole Barrier Side View

Photo Not Available

Figure A-63: Pre-Test Ballast View



Figure A-64: Post-Test Primary and Redundant Speed Trap Read-Out



Figure A-65: FMVSS No. 301 Static Rollover 0 Degrees



Figure A-66: FMVSS No. 301 Static Rollover 90 Degrees

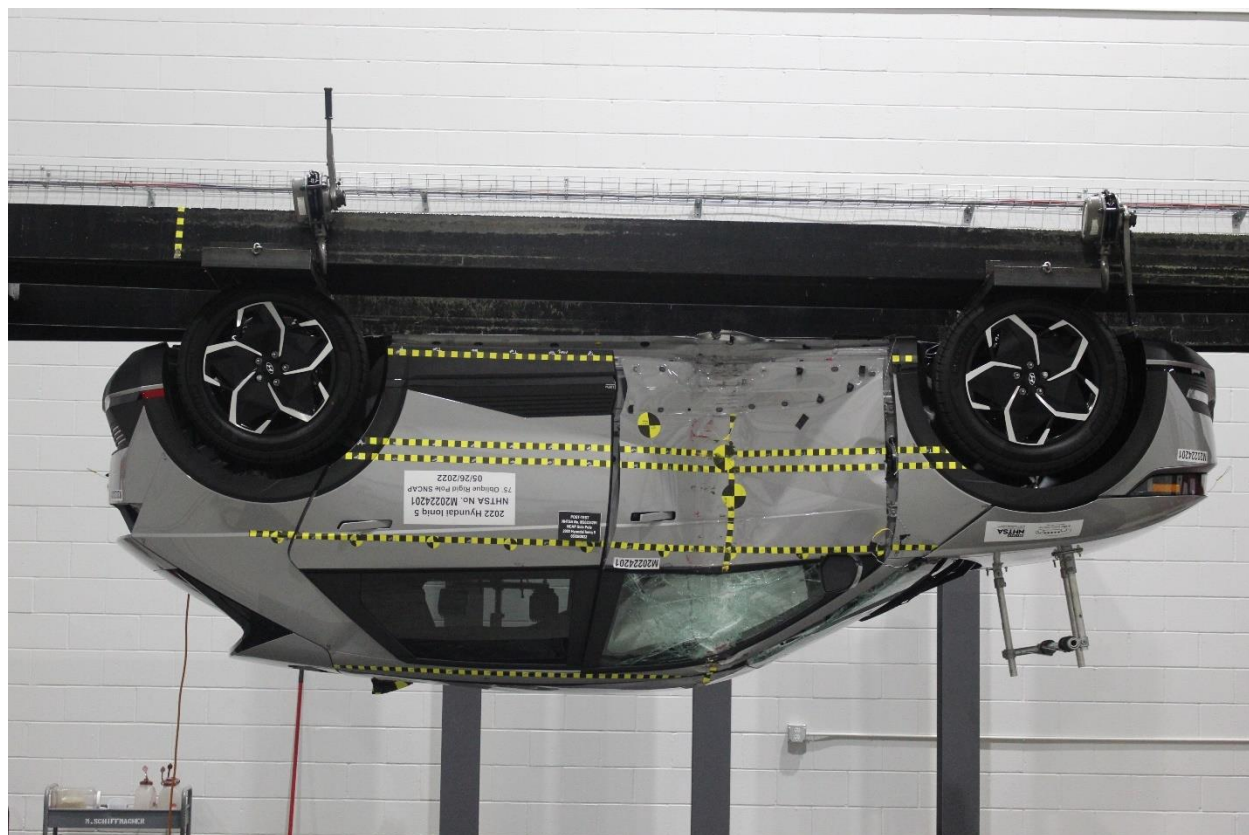


Figure A-67: FMVSS No. 301 Static Rollover 180 Degrees

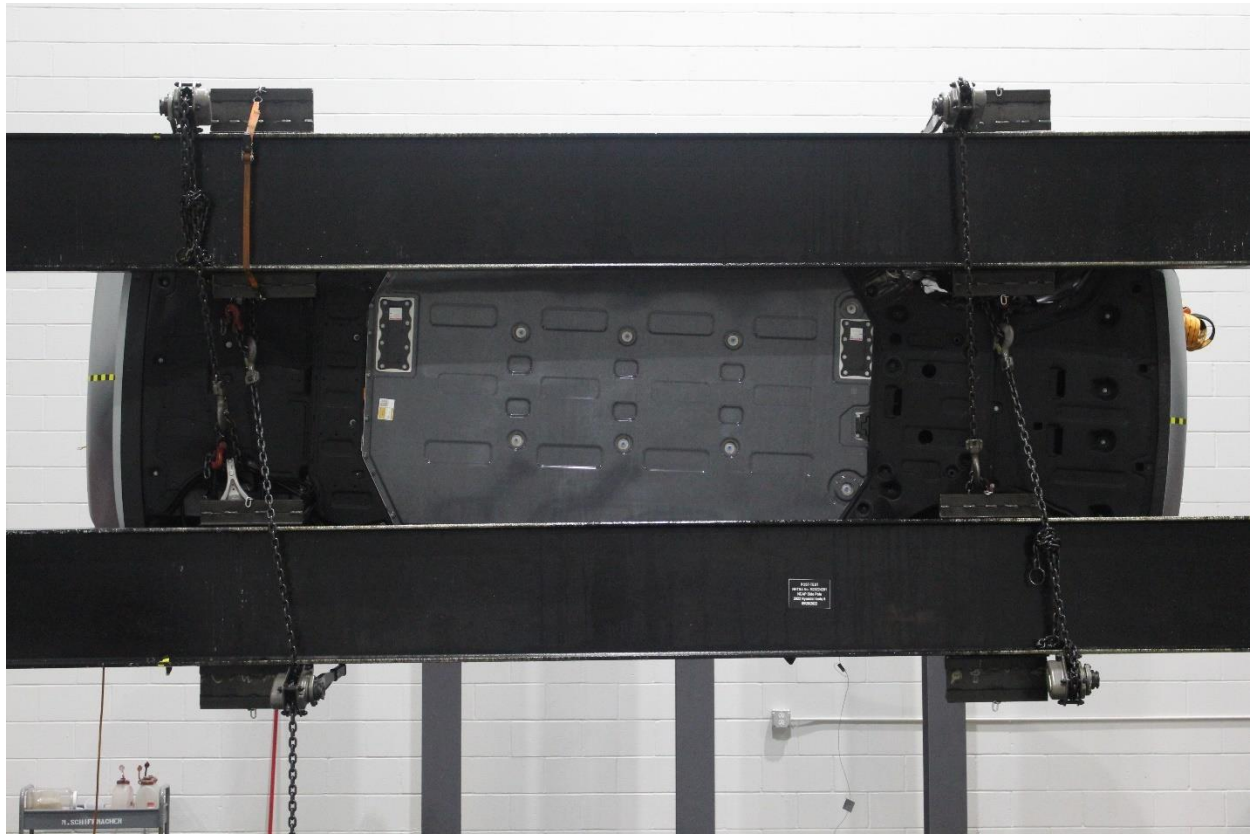


Figure A-68: FMVSS No. 301 Static Rollover 270 Degrees



Figure A-69: FMVSS No. 301 Static Rollover 360 Degrees

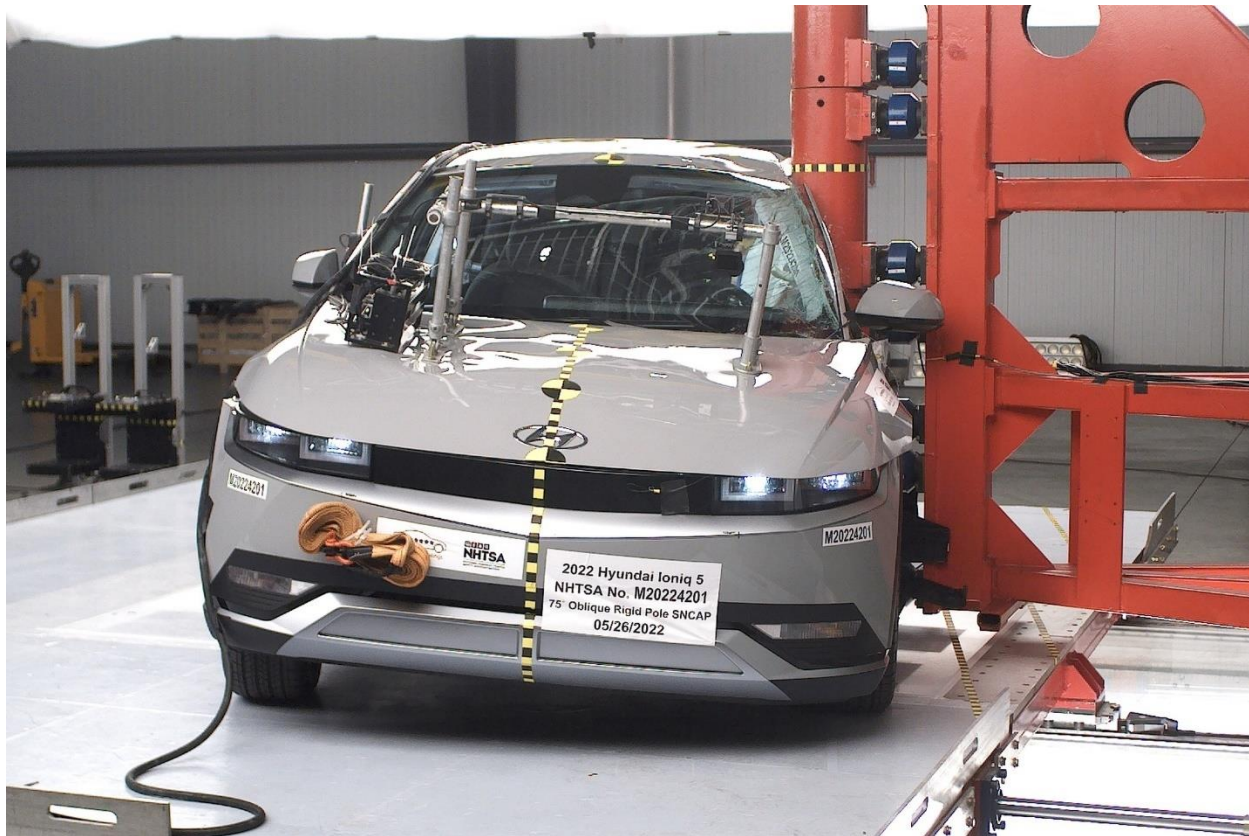


Figure A-70: Impact Event

SOLD TO: NY077 TOWNE HYUNDAI 3320 BOLTWHESTER BLVD. ORCHARD PARK NY 14127 VIN: KHM0MAEA4N0U08024 MODEL: S0412REZ ENGINE: EM17N7Z25S1D PORT OF ENTRY: PH CYBER GRAY: BLACK/BLACK EXTERIOR/SEAT COLOR: TRUCK TRANSPORT: 19 lbs / 9 gms ACCESSORY WEIGHT: EMISSIONS: This vehicle meets emissions requirements in all 50 states and is a CARB certified Zero Emission Vehicle (ZEV)	2022 IONIQ 5 SE RWD GOVERNMENT 5-STAR SAFETY RATINGS This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk. Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4236	IONIQ 5 - The first of its kind. Over 300 miles of All-Electric Range-Standard BlueLink EPA DOT Fuel Economy and Environment Electric Vehicle Fuel Economy MPGe You save \$3,500 in fuel costs over 5 years compared to the average new vehicle. Small SUV range from 14 to 129 MPGe. The best vehicle rates 142 MPGe. combined city/hwy city highway kWh-per 100 miles Driving Range 303 mi Charge Time: 8.5 hours (fastest) Annual fuel Cost \$600 Fuel Economy & Greenhouse Gas Rating Smog Rating This vehicle emits 0 grams CO₂ per mile. The test emits 0 grams CO₂ per mile (tailpipe only). Does not include emission from non-roadway activities, like use as a generator or pump. Achieved 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 \$5,600 to fuel for two years. Cost estimates are based on 15,000 miles per year at 13 per gallon EV. MPGs do not represent gas mileage equivalent. Vehicles emissions are a significant cause of climate change and smog. fueleconomy.gov Calculate personalized estimates and compare vehicles Smartphone QR Code
STANDARD FEATURES: MERICA'S BEST WARRANTY* 3-year/60,000-mile New Vehicle Warranty** 10-year/100,000-mile Powertrain Warranty** 10-year/100,000-mile Component Limited Mileage Warranty** 3-year/50,000-mile Anti-Rust Perforation Warranty** 3-year/50,000-mile Comprehensive Maintenance** Crossover Unlimited Roadside Assistance 1 limited warranty, see dealer for details ADVANCED SAFETY TECHNOLOGY Forward Collision-Avoidance Assist Blind-Spot Collision-Avoidance Assist: High Beam Assist Lane Keeping Assist: Lane Following Assist Rear Cross-Traffic Collision-Avoidance Assist Rear View Monitor: Rear Parking Sensors Adaptive Cruise Monitoring System w/ Individual Tire Indicator Rear Occupant Alert: Safe Exit Assist POWERTRAIN TECHNOLOGY 106kW Electric Motor (225 HP) 77.4kWh Lithium-Ion Polymer Battery System (600V) DC Ultra-Fast Charging Capability w/ SAC Combo Port 10 kW On-board Charger Single-Speed Reduction Gear: Column-Mounted Shifter Regenerative Brake Level Control Paddles EXTERIOR 19" Alloy Aero Wheels, Active Grille Shutters LED Auto Headlights, Daytime Running Lights, and Taillights Heated Side Mirrors with LED Turn Signal Indicators Auto-retracting flush door handles, Privacy Rear Glass Rear Spoiler with LED Center High-Mount Stop Light COMFORT & CONVENIENCE Cloth Trimmed Seats, Heated front seats 8-way Power Driver Seat w/ Lumbar Support Dual Telescoping Leather Steering Wheel Proximity Key w/ Push Button Start Front Air Temperature Control 12.3-inch Digital Instrument Cluster w/ EV Tech Display Electronic Console w/ Storage, 2nd Row Armrest w/ Cupholders 60/40 Split 2nd Row Folding Seats with Side & Recline Front & Rear USB Outputs, 12V Power Outlets 12.3-inch Navigation with Android Auto (TM) and Apple CarPlay (TM) Smart Cruise Control w/ Stop & Go Sunroof/Moon Hand-free Systems, Dynamic Voice Recognition AM/FM/HF Radio/Audio System	COMFORT & CONVENIENCE(contin.) 300MHz Radio with DAB Platinum Plus subscription; Not Available in HI & VT Bluetooth® Connected Services 3-years Standard (enrollment req) Bluetooth® Phone Control (3-year Complimentary Service) Bluetooth® Guidance Package (3-year Complimentary Service) Tire Mobility Kit Full Battery Charge Included Included Included Included Included Included Manufacturer's Suggested Retail Price: \$43,650.00 ADDED FEATURES: "Cargo Package" Cargo Tray, Cargo Net, and First Aid kit "Carpeted Floor Mats" "Wheel Locks" \$200.00 \$195.00 \$65.00	*Manufacturers suggested retail price includes manufacturer's recommended pre-delivery service, gasoline license and title fees state and local taxes and dealer installed options and accessories are not included in the manufacturers' suggested retail price. This label has been affixed to this vehicle by Hyundai Motor America, pursuant to the requirements of 15 U.S.C. 1201 et seq which prohibits its removal or alteration prior to delivery to the ultimate purchaser. PARTS CONTENT INFORMATION FOR VEHICLE IN THIS CERTIFICATE: U.S./CANADIAN PARTS CONTENT: MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA: 95 % Note: Parts content does not include final assembly, distribution, or other non-parts costs. FOR THIS VEHICLE: FINAL ASSEMBLY POINT: ULSAN, KOREA COUNTRY OF ORIGIN: KOREA ENGINE: KOREAN TRANSMISSION: KOREAN Total Price : \$45,355.00

Figure A-71: Monroney Label

NOTICE

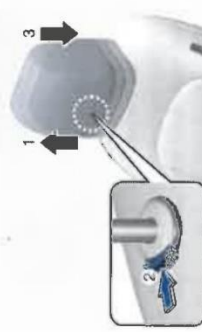
If you recline the seatback towards the front with the head restraint and seat cushion raised, the head restraint may come in contact with the survivor or other parts of the vehicle.

OH1038136

Front seat head restraints

ONE031076L

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



ONE031016N

Adjusting the height up and down

To raise the head restraint:

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

To lower the head restraint:

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

Figure A-72: Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



Figure A-73: Post-Test View of Shattered Vehicle Inner Door Panel



Figure 305-1: Auxiliary Power Module Warning Label

Photo Not Applicable

Figure 305-2: Power Inverter Warning Label



Figure 305-3 First Responder Warning Label



Figure 305-4: First Responder Warning Label Location



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



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



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



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



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



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



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



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



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

Photo Not Applicable

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

Photo Not Applicable

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

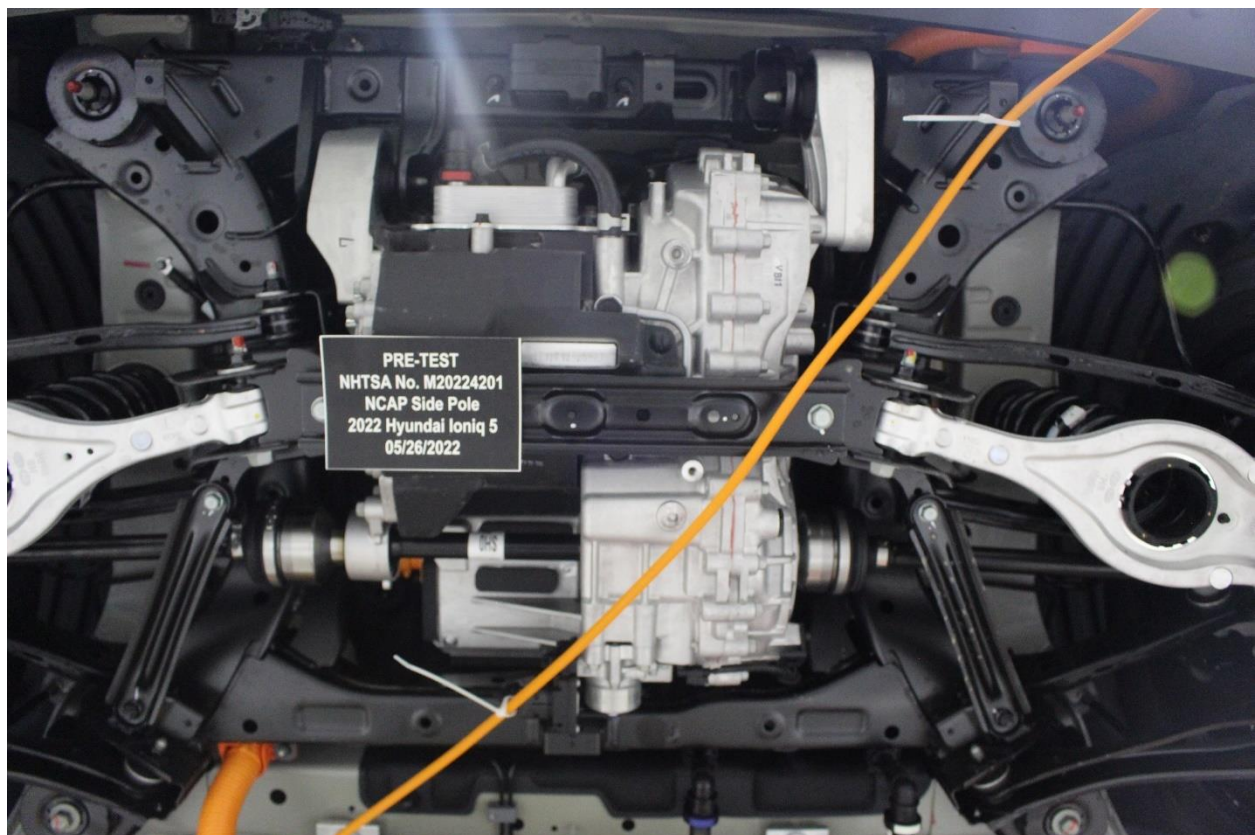


Figure 305-16: Pre-Impact View of Electric Propulsion Drive

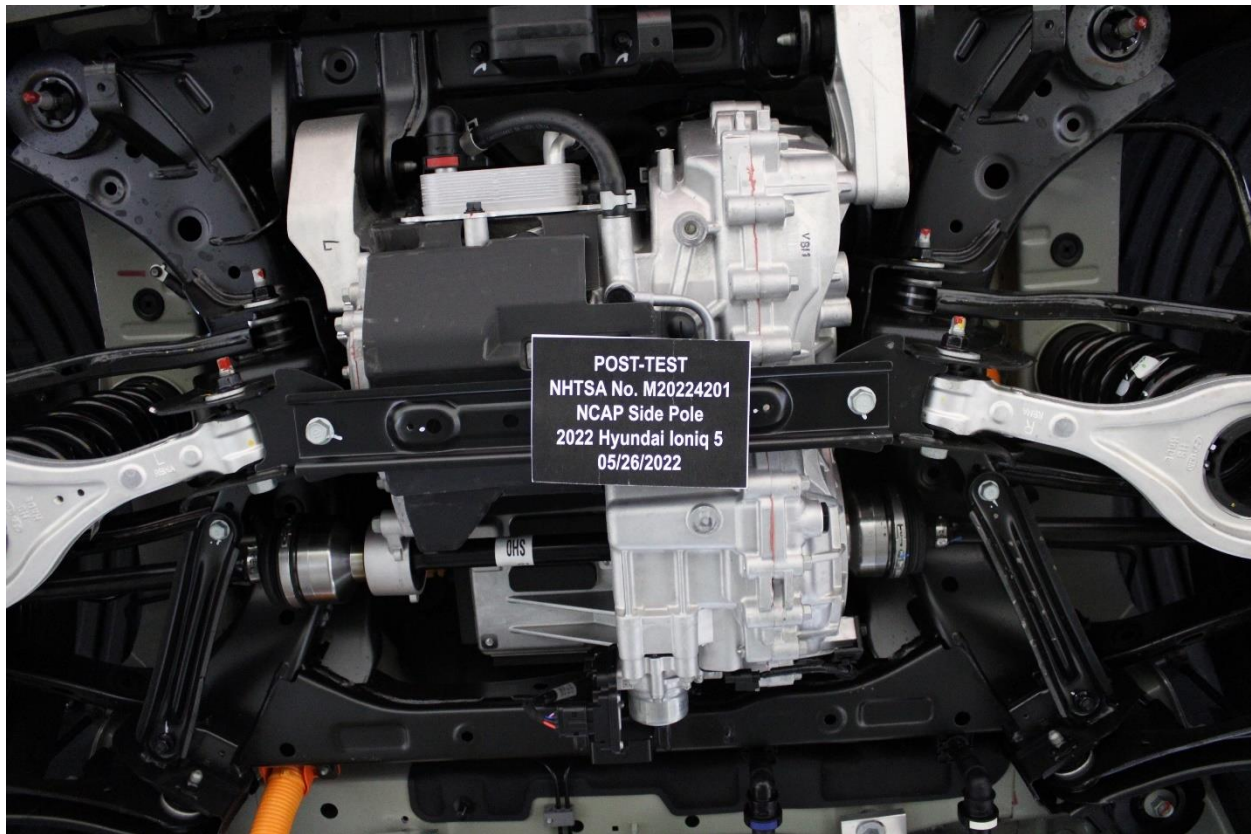


Figure 305-17: Post-Impact View of Electric Propulsion Drive



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

Photo Not Applicable

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



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



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



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



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



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



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

Photo Not Applicable

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

Photo Not Applicable

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



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

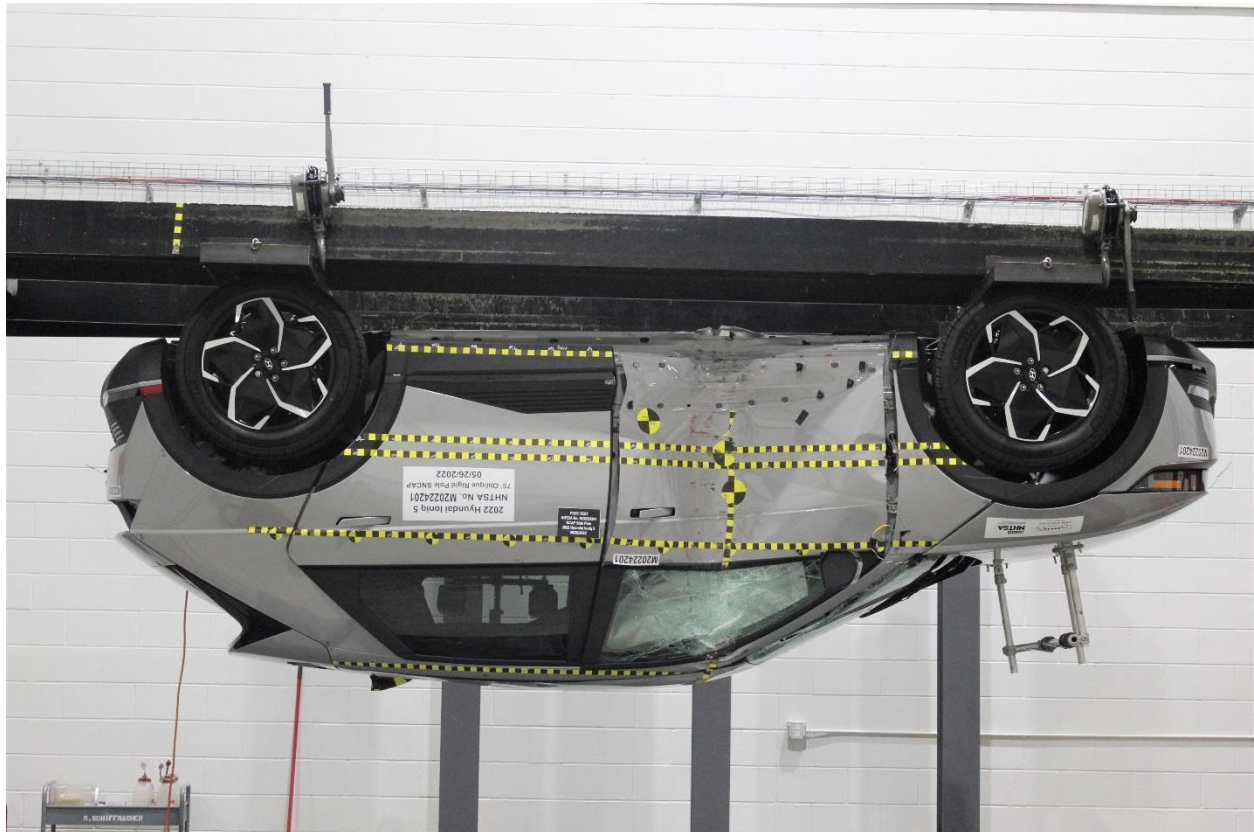


Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees

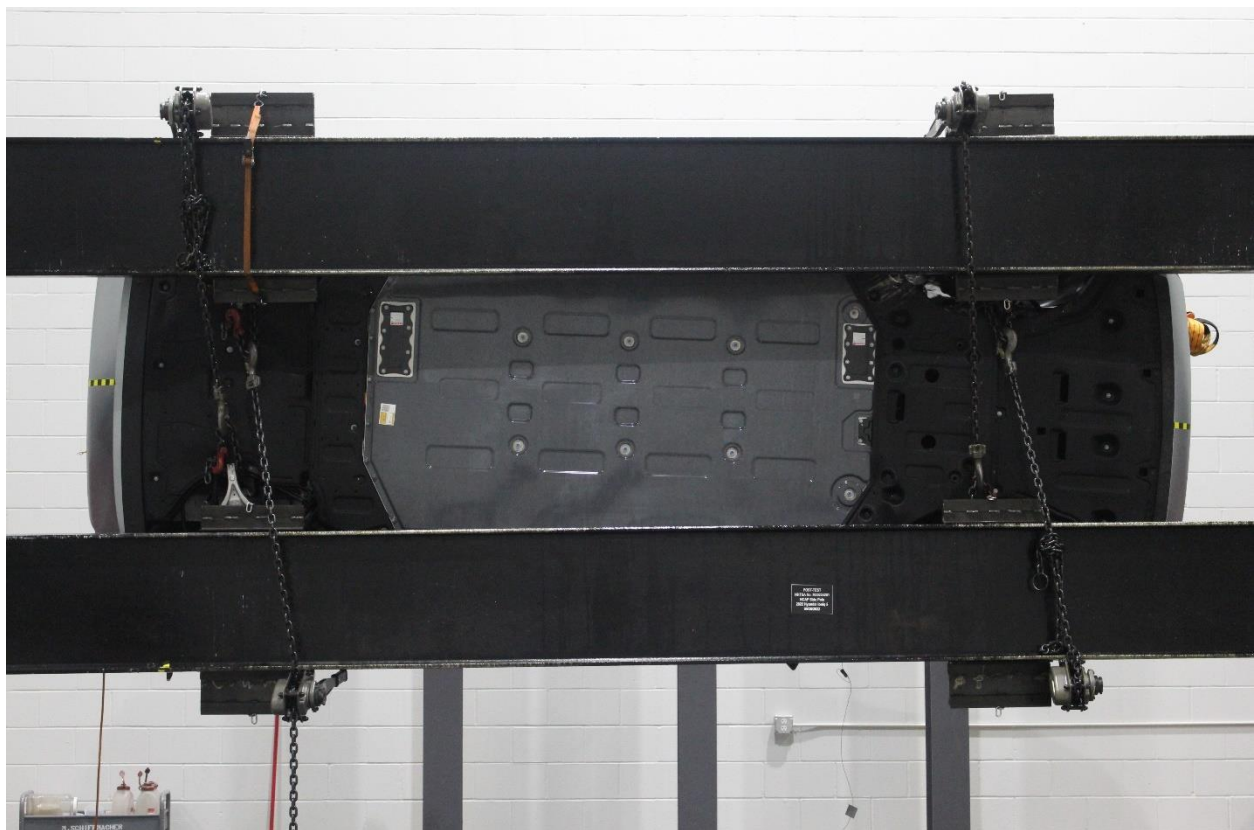


Figure 305-30: FMVSS No. 305 Static Rollover 270 Degrees



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



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



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

Photo Not Applicable

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



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

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

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

APPENDIX B

VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots

Driver Dummy Instrumentation Plots

Fig.	Description	Page
Plot 1	Driver Head Acceleration (X) Primary vs. Time	B-4
Plot 2	Driver Head Acceleration (Y) Primary vs. Time	B-4
Plot 3	Driver Head Acceleration (Z) Primary vs. Time	B-4
Plot 4	Driver Head Resultant Primary vs. Time	B-4
Plot 5	Driver Lower Spine T12 Acceleration (X) vs. Time	B-5
Plot 6	Driver Lower Spine T12 Acceleration (Y) vs. Time	B-5
Plot 7	Driver Lower Spine T12 Acceleration (Z) vs. Time	B-5
Plot 8	Driver Lower Spine T12 Resultant Acceleration vs. Time	B-5
Plot 9	Driver Iliac Wing Force on Impact Side (Y) vs. Time	B-6
Plot 10	Driver Acetabulum Force on Impact Side (Y) vs. Time	B-6
Plot 11	Driver Total Pelvis Force on Impact Side (Y) vs. Time	B-6

The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.NHTSA.gov

Additional Driver Dummy Instrumentation Data

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

Vehicle Instrumentation Data

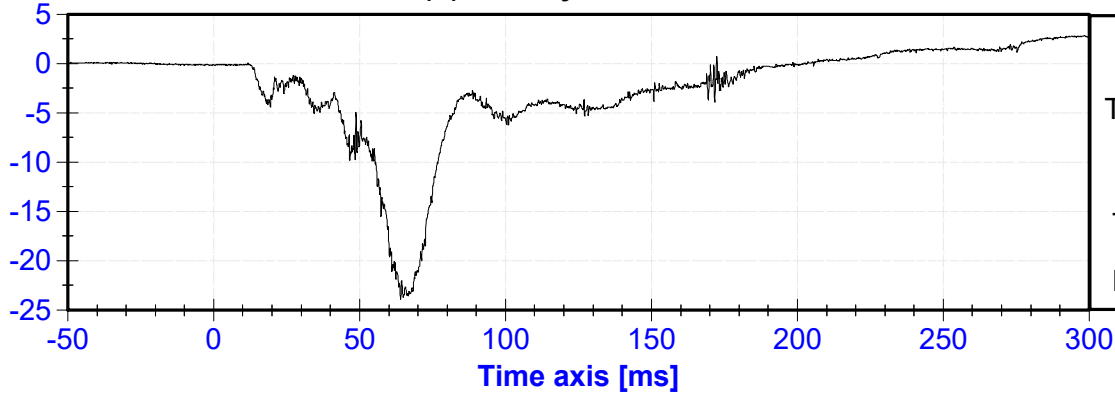
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration (Y)
Left Lower B-Pillar Acceleration (Y)
Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy Hip Point Acceleration (Y)
Engine Top Acceleration (X)
Engine Top Acceleration (Y)
Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration (Y)
Right Sill at Vertical Impact Reference Line Acceleration (Y)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)

Pole Instrumentation Data

Load Cell Pole Barrier #1 Force (Y)
Load Cell Pole Barrier #2 Force (Y)
Load Cell Pole Barrier #3 Force (Y)
Load Cell Pole Barrier #4 Force (Y)
Load Cell Pole Barrier #5 Force (Y)
Load Cell Pole Barrier #6 Force (Y)
Load Cell Pole Barrier #7 Force (Y)
Load Cell Pole Barrier #8 Force (Y)

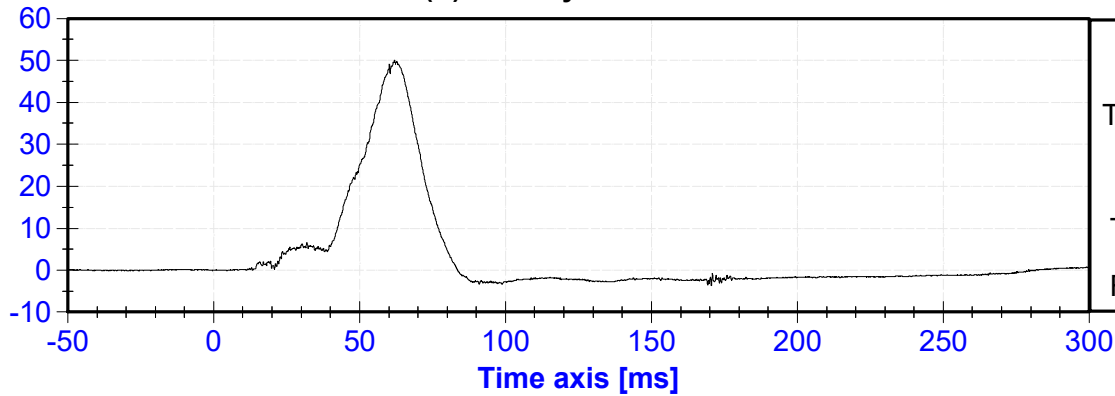
ACCELERATION [g's]

Driver Head Acceleration (X) Primary vs. Time



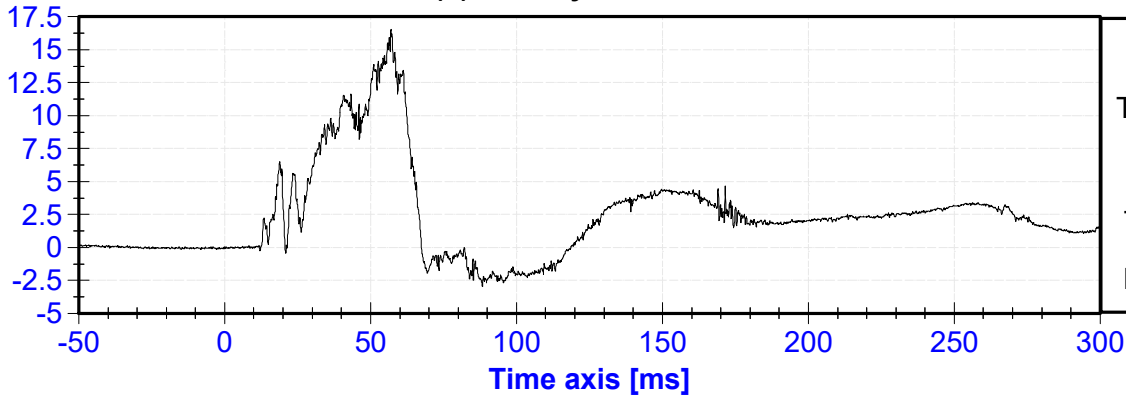
ACCELERATION [g's]

Driver Head Acceleration (Y) Primary vs. Time



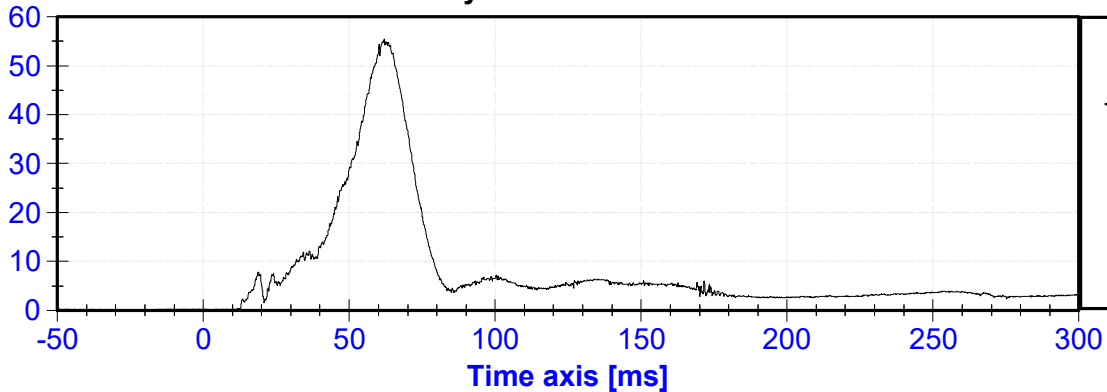
ACCELERATION [g's]

Driver Head Acceleration (Z) Primary vs. Time



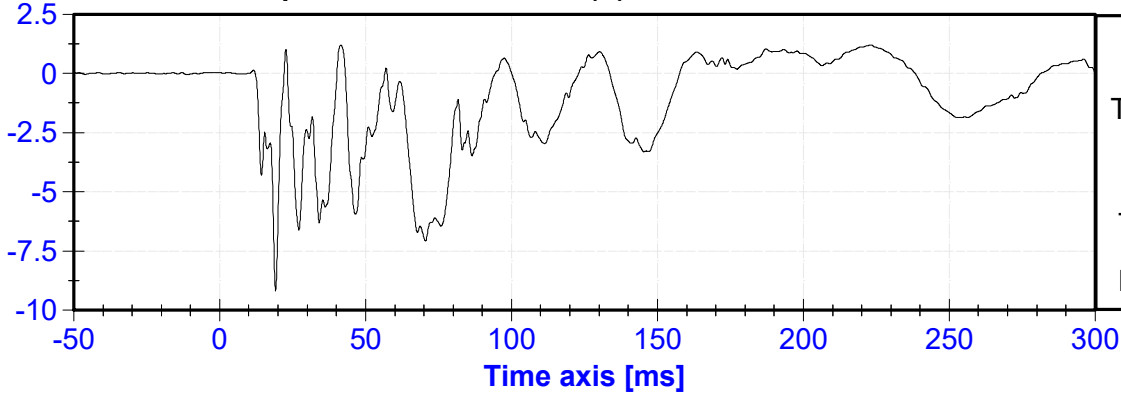
ACCELERATION [g's]

Driver Head Resultant Primary vs. Time



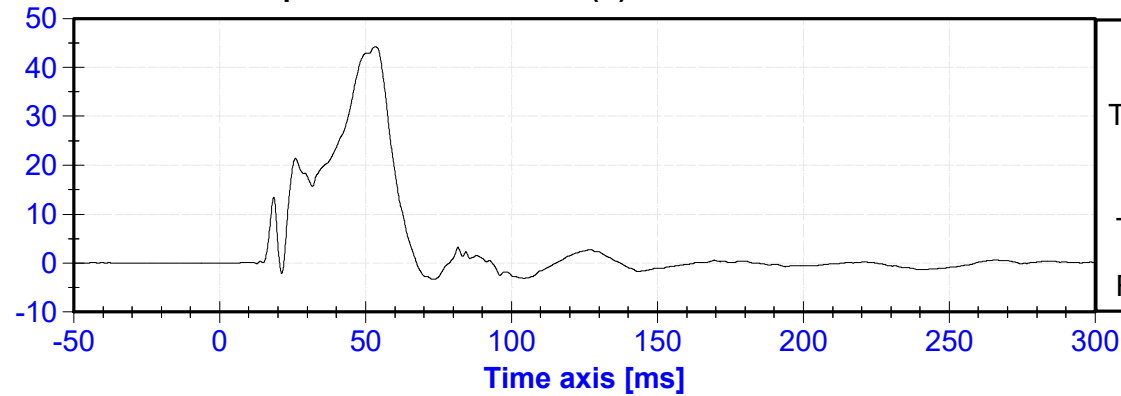
ACCELERATION [g's]

Driver Lower Spine T12 Acceleration (X) vs. Time



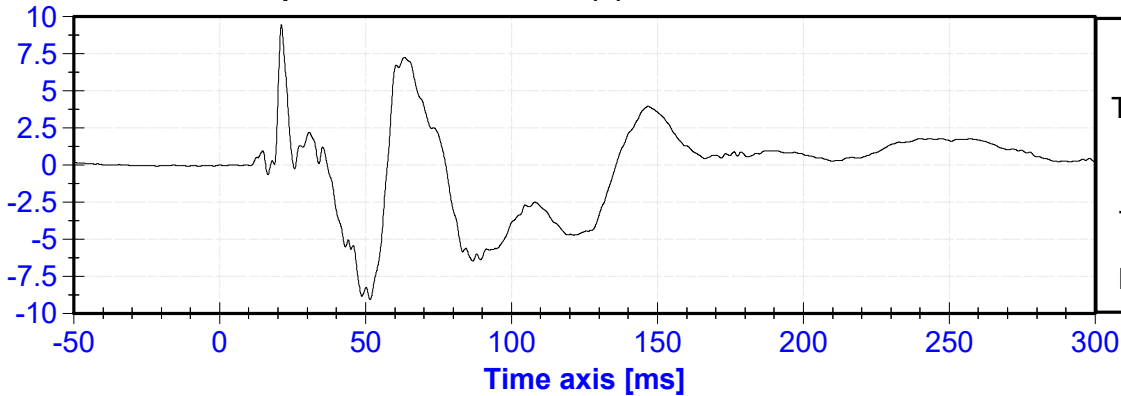
ACCELERATION [g's]

Driver Lower Spine T12 Acceleration (Y) vs. Time



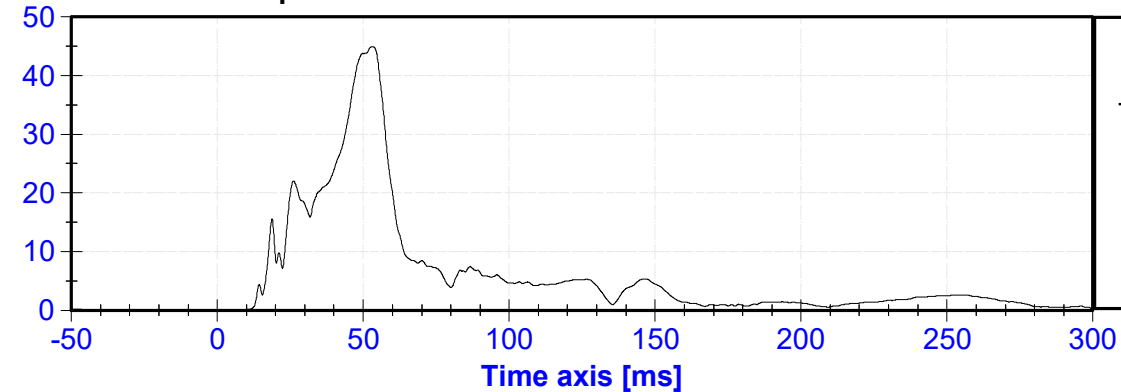
ACCELERATION [g's]

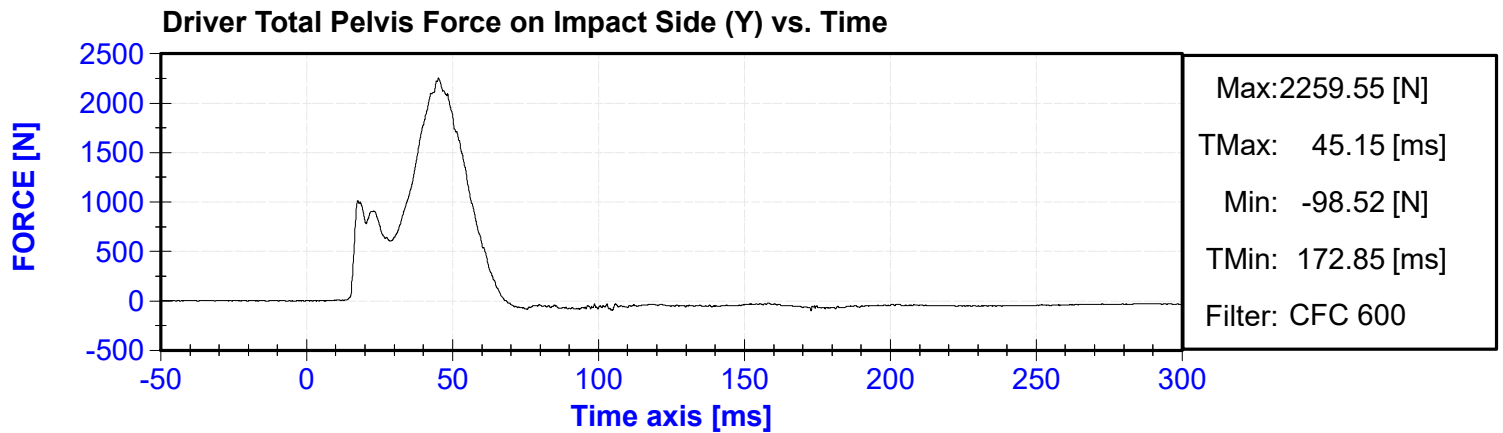
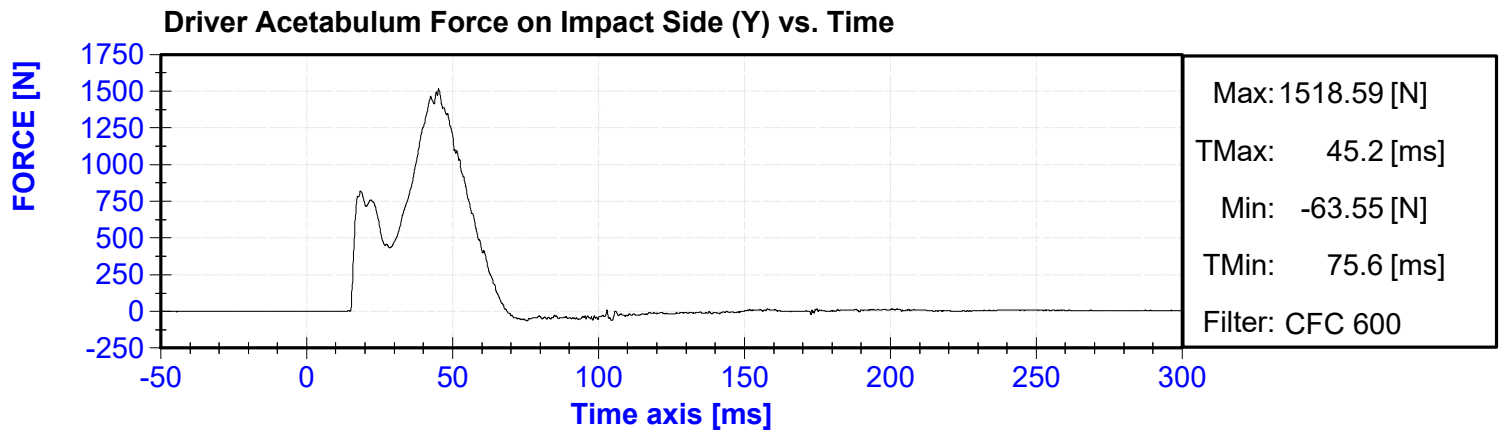
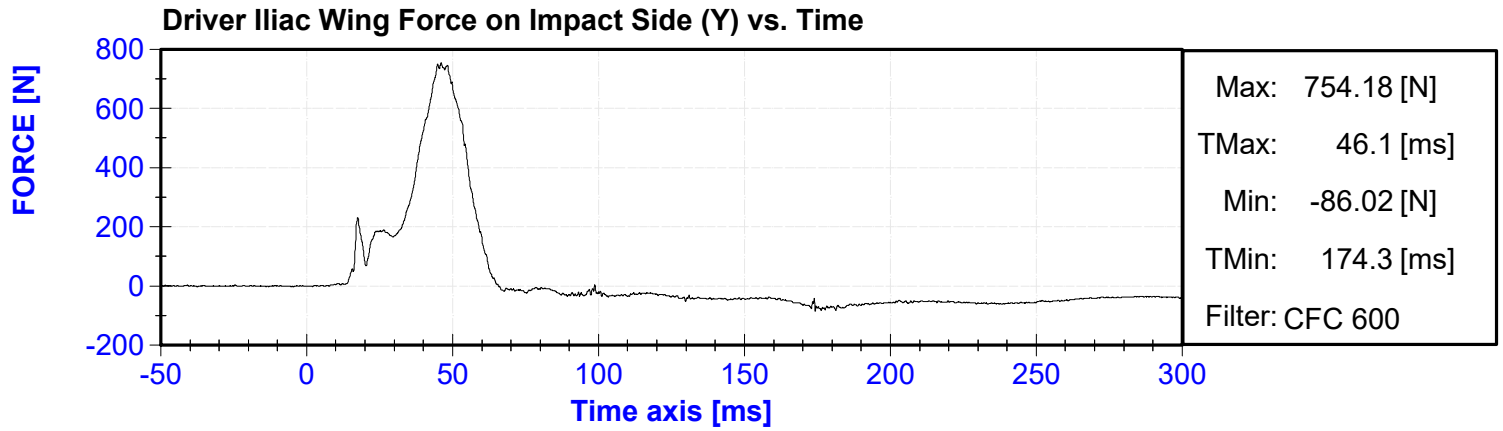
Driver Lower Spine T12 Acceleration (Z) vs. Time



ACCELERATION [g's]

Driver Lower Spine T12 Resultant Acceleration vs. Time





APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

SERIAL NO: 300

(CONFIGURED FOR LEFT SIDE IMPACT)

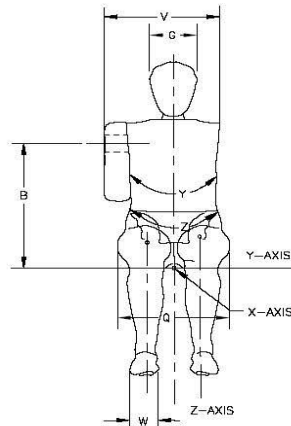
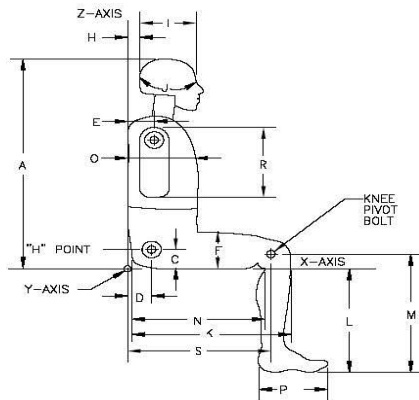


External Measurements - SID-IIs

Technician: K. Brogan

Date: 05/23/2022

Dummy Serial Number: 300



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	780	Pass
B	Shoulder Pivot Height	437	453	445	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	102	Pass
F	Thigh Clearance	119	135	125	Pass
G	Head Breadth	140	148	145	Pass
H	Head Back from Backline	40	46	42	Pass
I	Head Depth	178	188	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	430	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	250	Pass
S	Knee Joint to seatback	477	493	486	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	86	Pass
Y	Chest Circumference w/jacket	851	881	879	Pass
Z	Waist Circumference	761	791	775	Pass

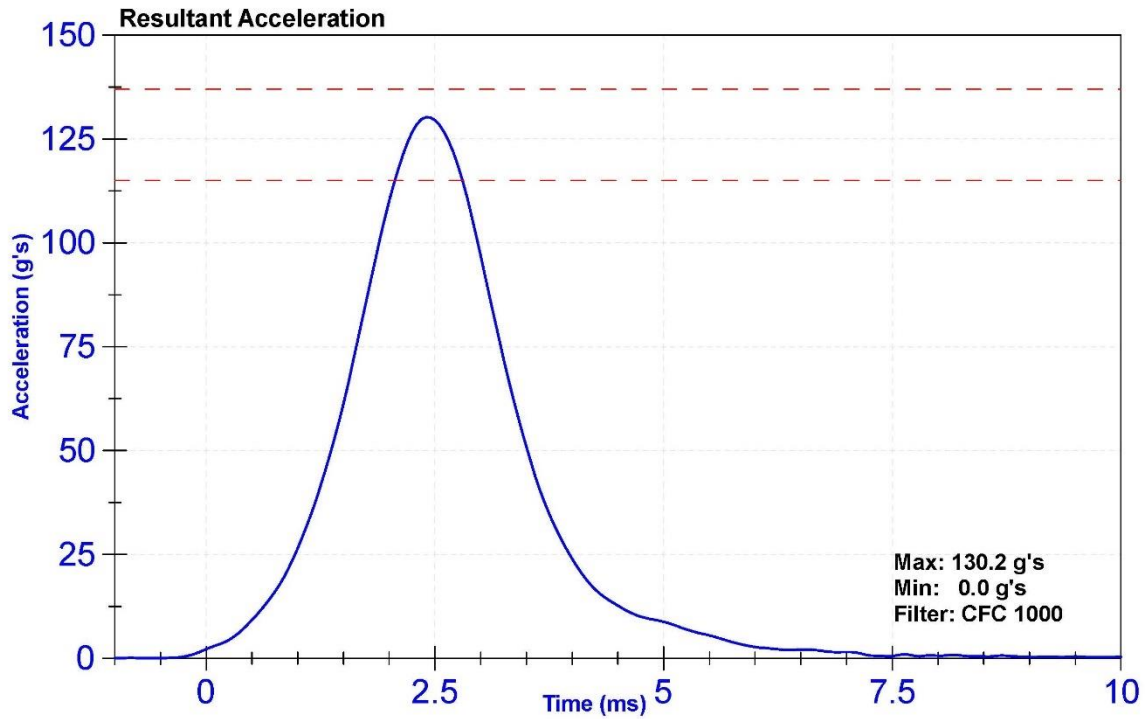
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

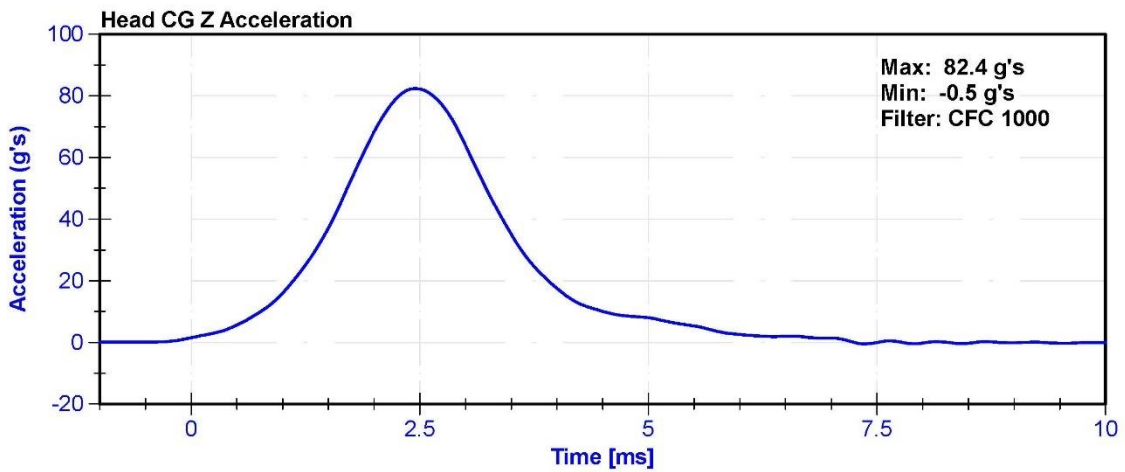
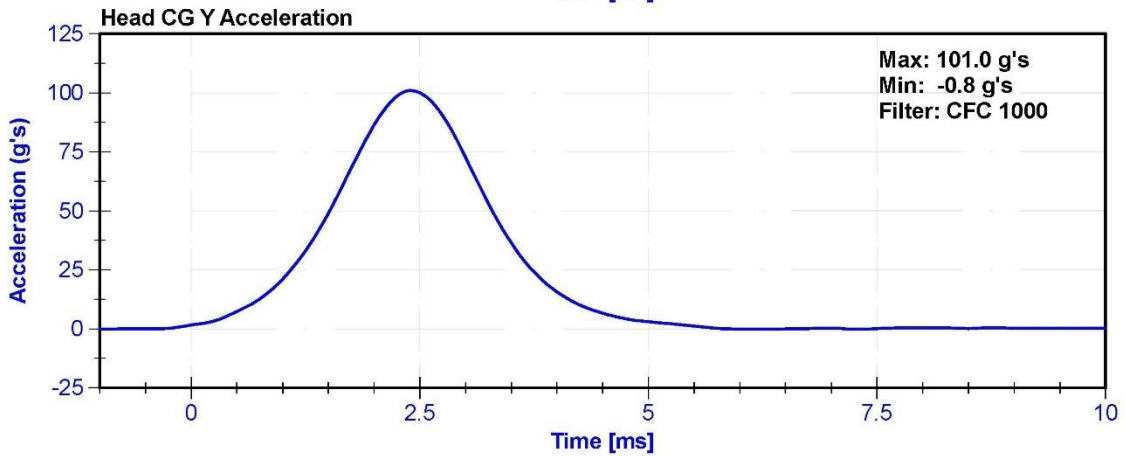
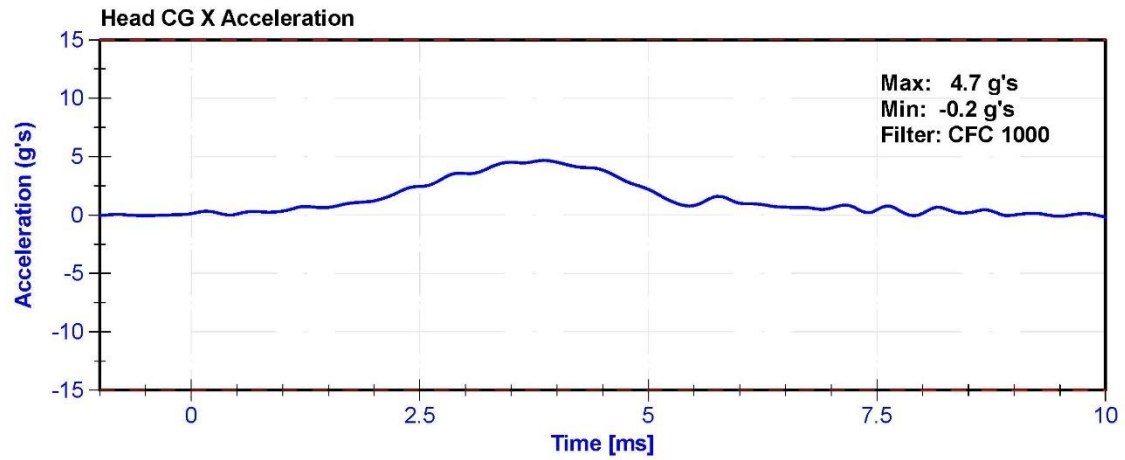
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.2	Pass
Humidity	10	70	%	35.4	Pass
Resultant Acceleration	115	137	g's	130.2	Pass
Oscillation	0	15	%	1.6	Pass
Fore-Aft Acceleration	-15	15	g's	4.7	Pass

Transducer Calibrations

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





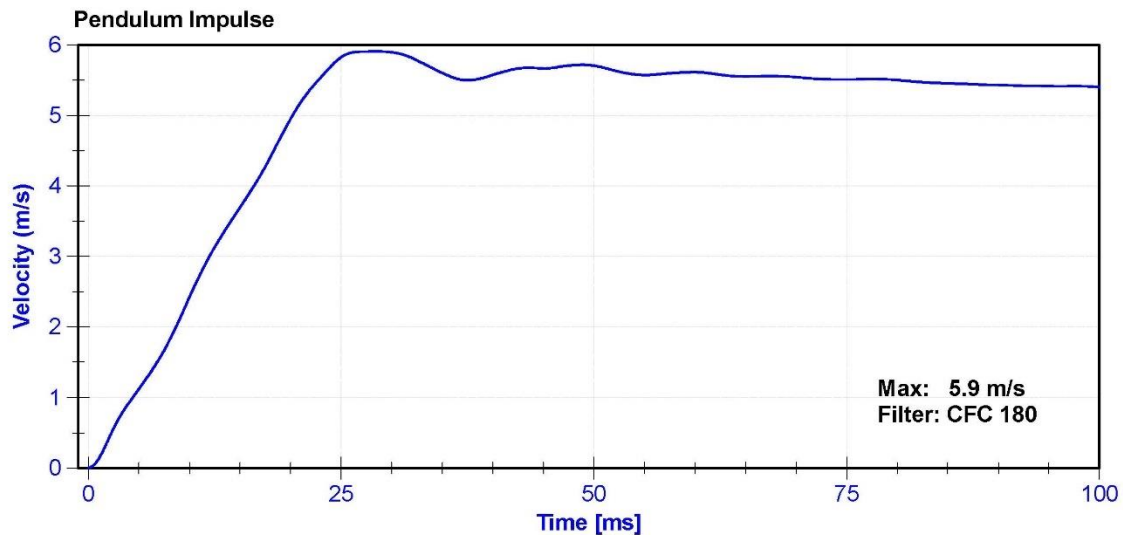
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

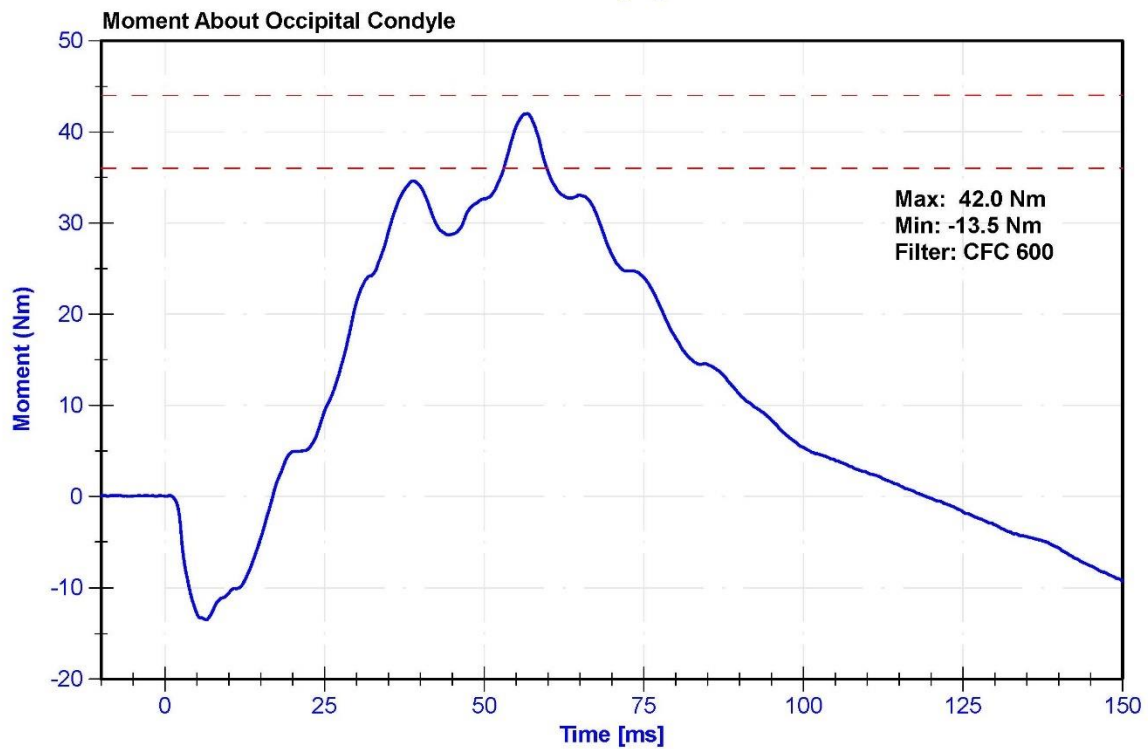
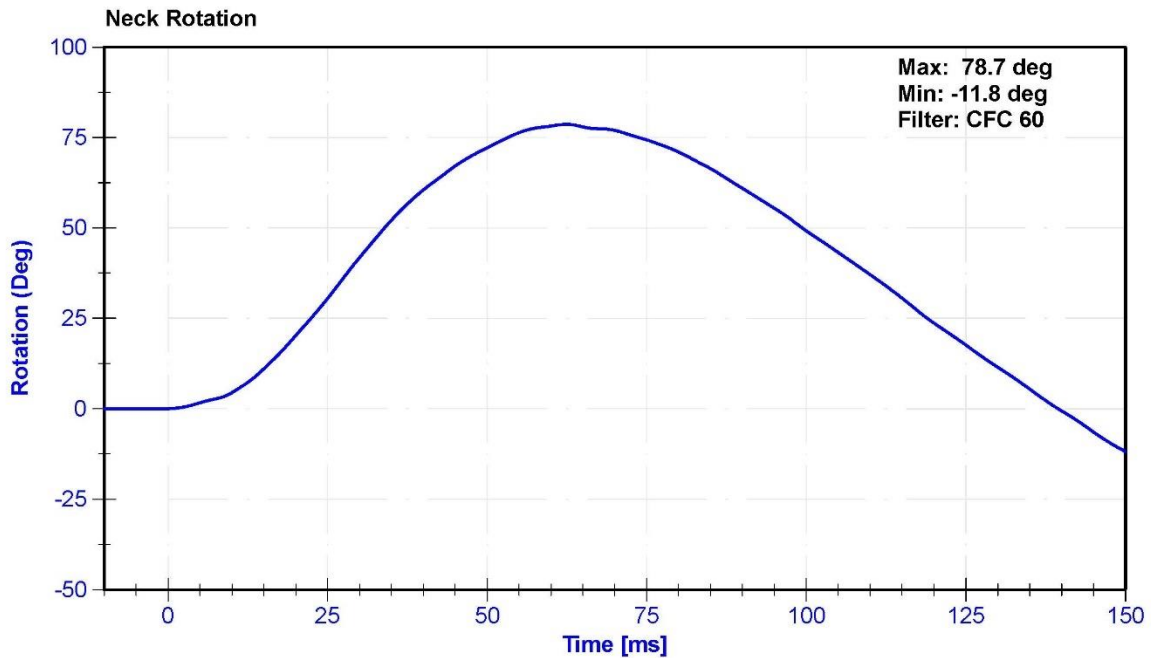
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	36.5	Pass
Velocity	5.51	5.63	m/s	5.572	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.42	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.69	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.95	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.83	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.91	Pass
Neck Rotation	71	81	deg	78.7	Pass
Time at Maximum Rotation	50	70	ms	62.4	Pass
Moment about the OC	36	44	Nm	42.0	Pass
Moment Decay to 0 Nm	102	126	ms	119.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231CT	10/28/2021	10/28/2022
Pendulum Potentiometer	Servo	4961	2/23/2022	2/23/2023
Condyle Potentiometer	Servo	DS185	11/12/2021	11/12/2022
Upper Neck Load Cell	Denton	1716A-1037-FY	6/29/2021	6/29/2022





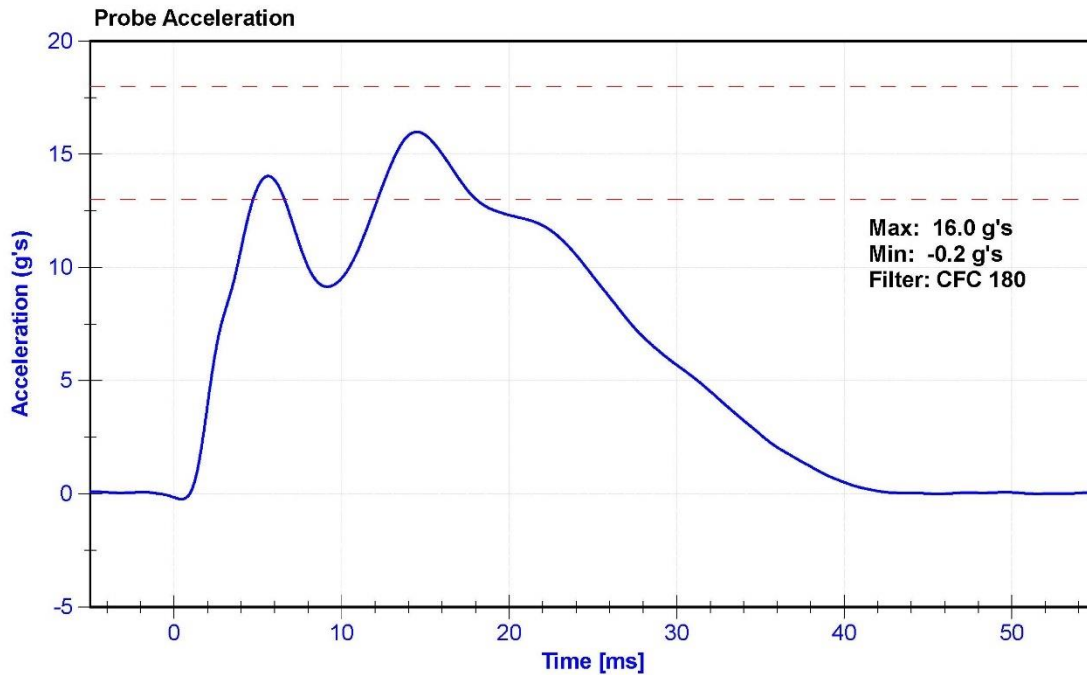
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

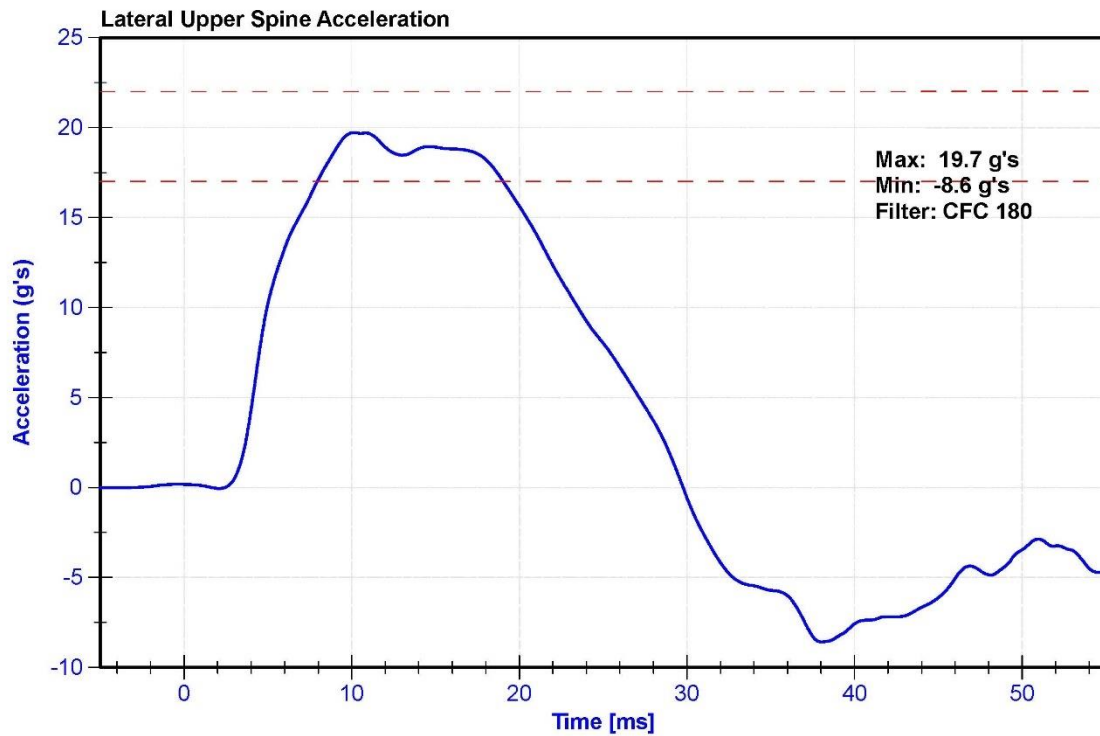
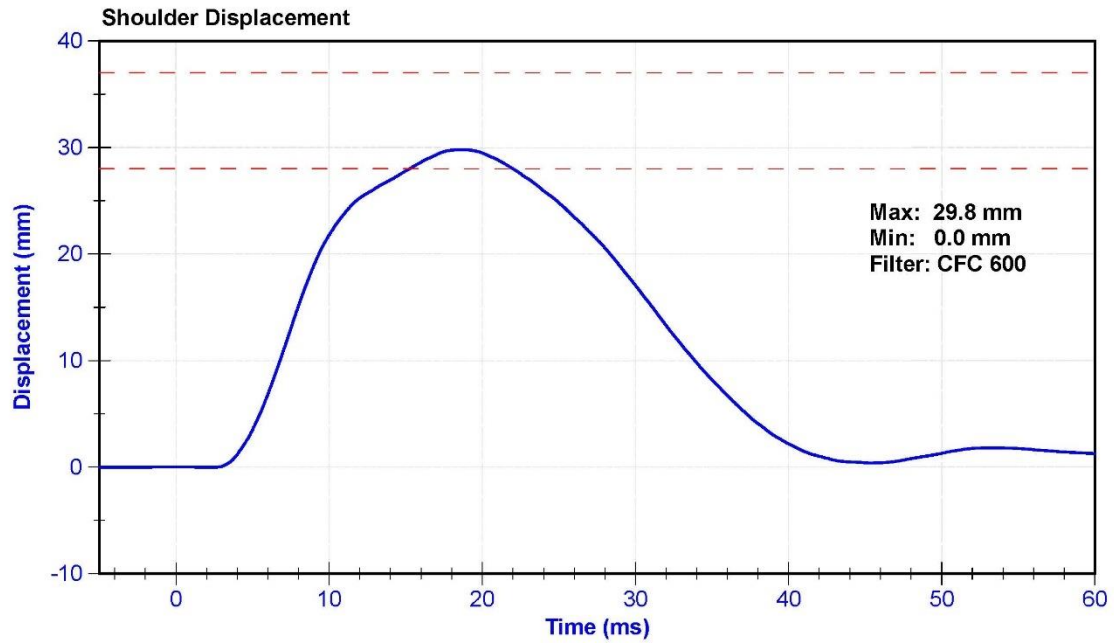
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	51.2	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	13	18	g's	16.0	Pass
Shoulder Deflection	28	37	mm	29.8	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	10/25/2022
Shoulder Potentiometer	Servo	053GFE	5/18/2022	11/16/2022
Upper Spine Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022





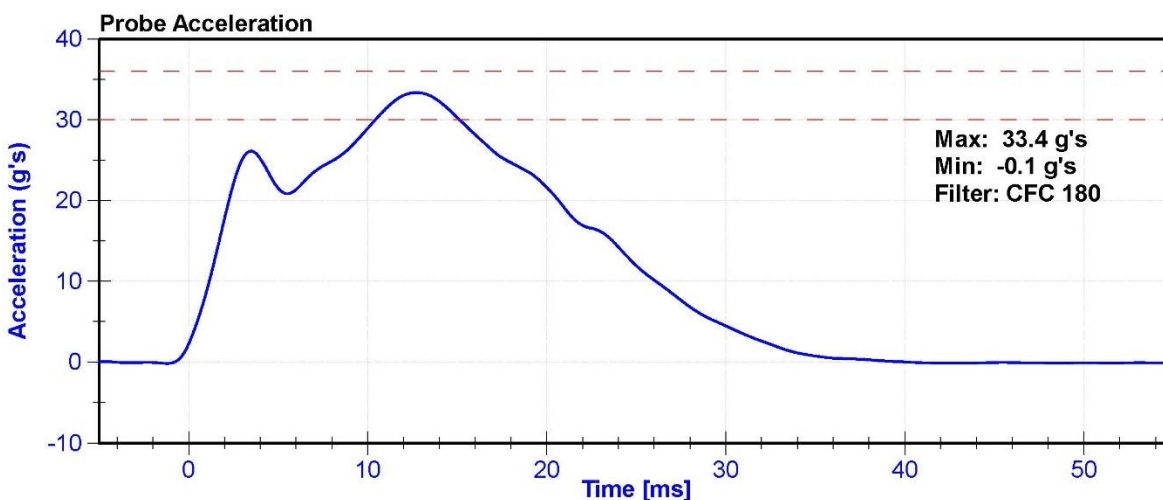
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

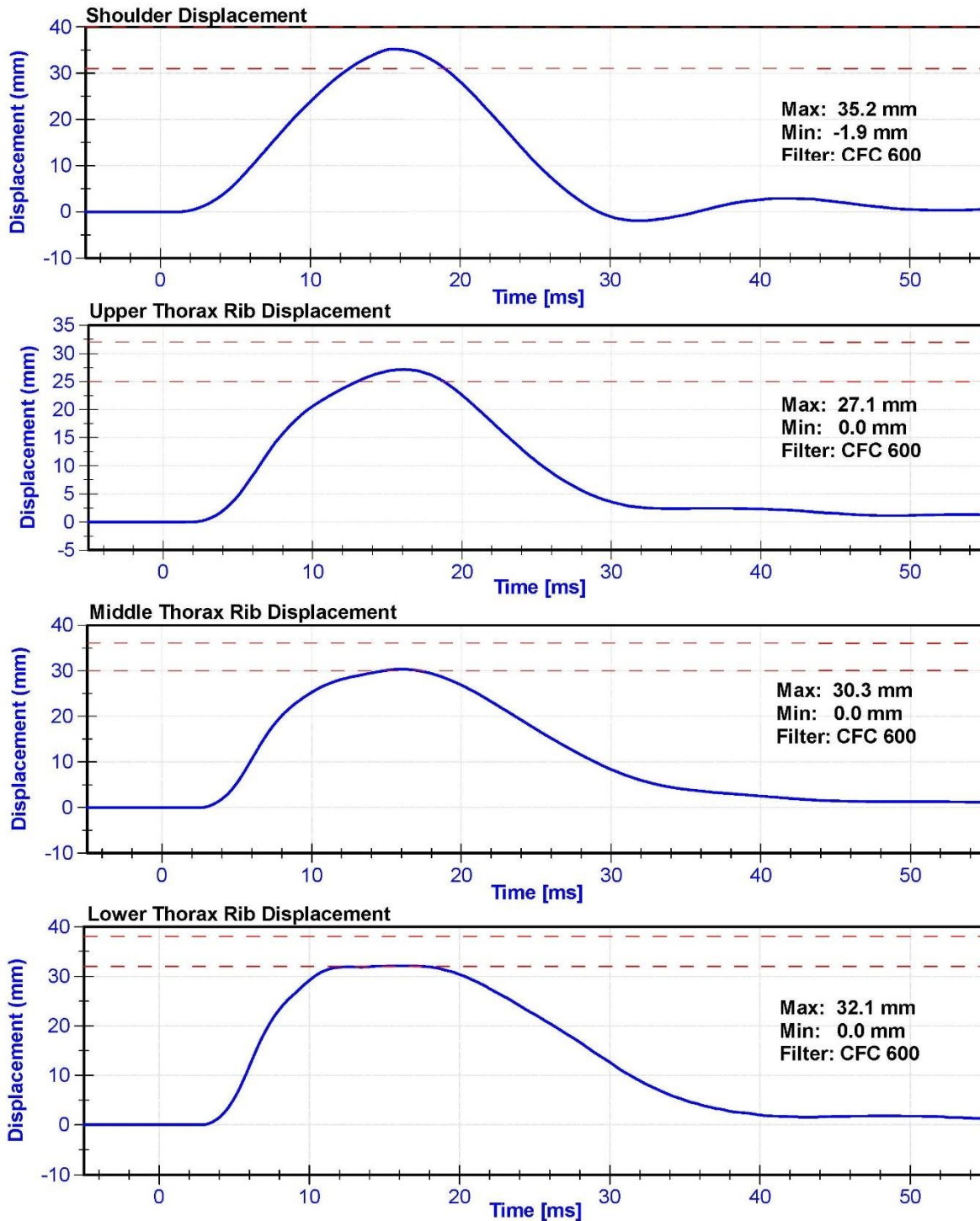
Results

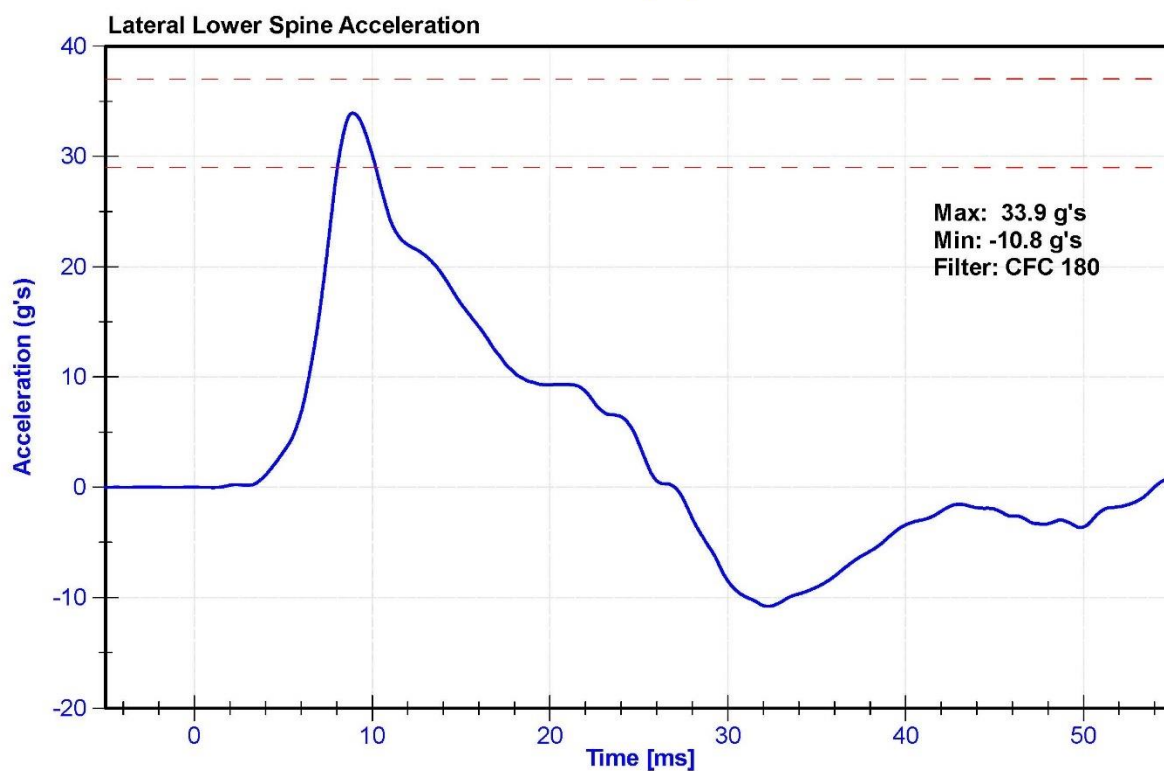
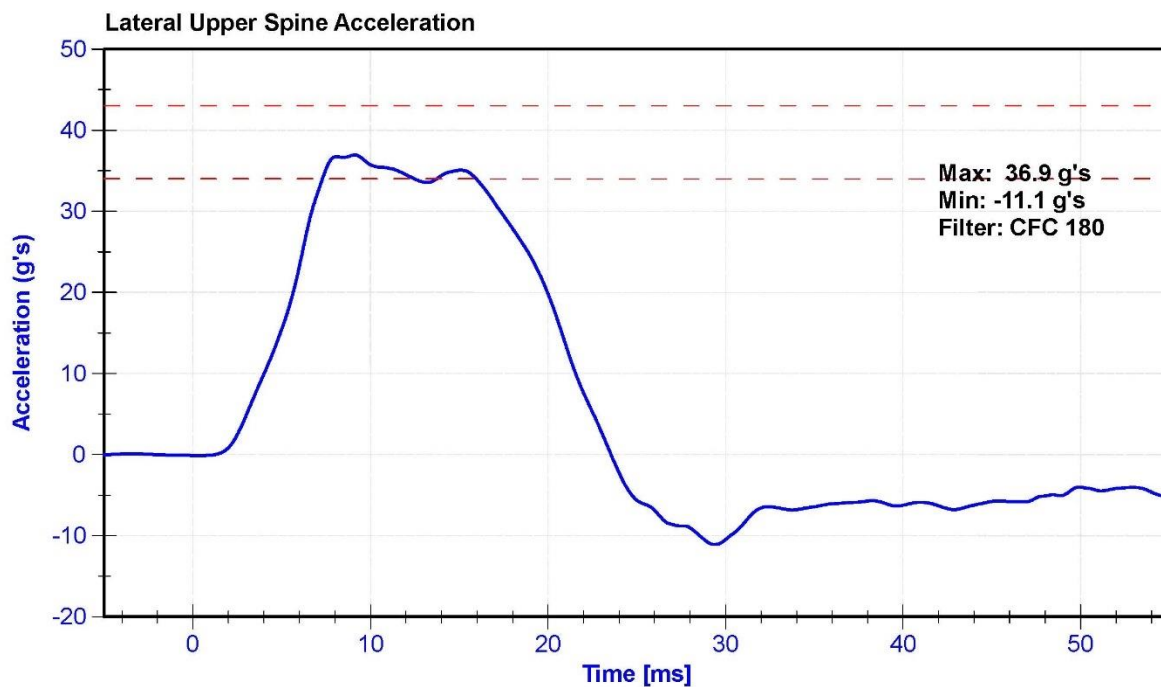
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	51.2	Pass
Velocity	6.6	6.8	m/s	6.74	Pass
Probe Acceleration after 5 ms	30	36	g's	33.4	Pass
Lateral Upper Spine Acceleration	34	43	g's	36.9	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.9	Pass
Shoulder Deflection	31	40	mm	35.2	Pass
Upper Thorax Rib Deflection	25	32	mm	27.1	Pass
Mid Thorax Rib Deflection	30	36	mm	30.3	Pass
Lower Thorax Rib Deflection	32	38	mm	32.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	10/25/2022
Upper Spine T1 Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022
Upper Spine T12 Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Shoulder Potentiometer	Servo	053GFE	5/18/2022	11/16/2022
Upper Thorax Rib Potentiometer	Servo	451GFE	5/18/2022	11/16/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	5/18/2022	11/16/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	5/18/2022	11/16/2022







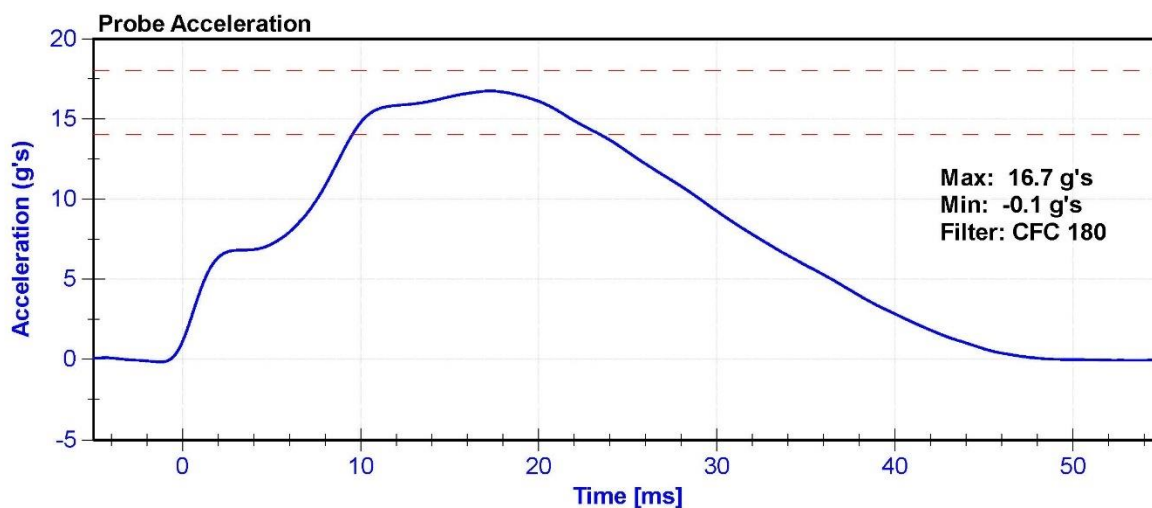
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

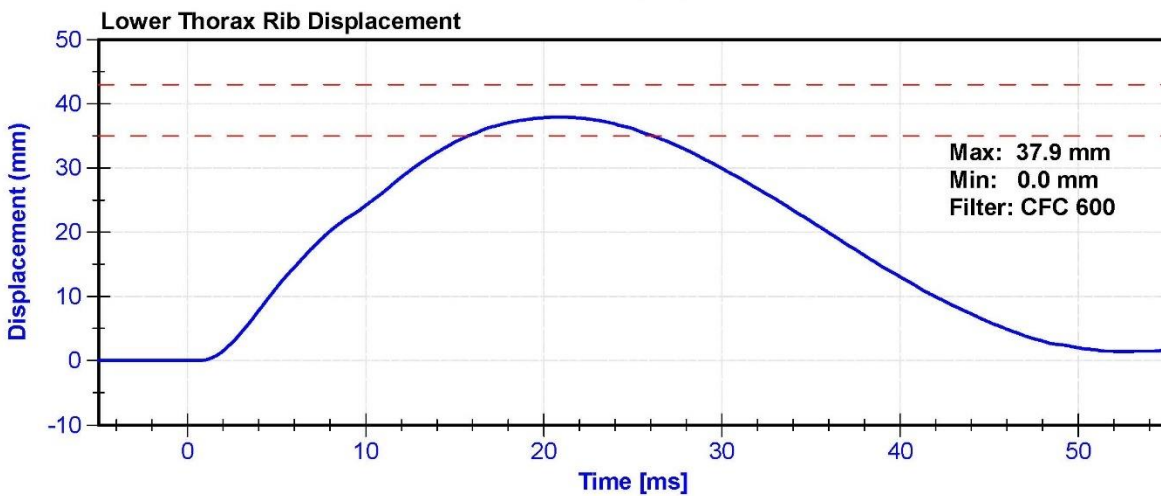
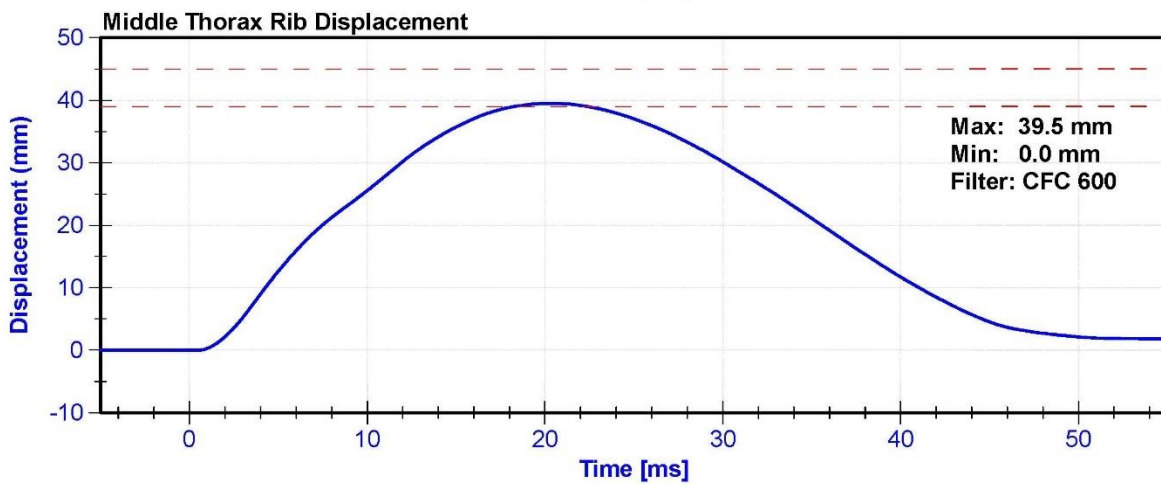
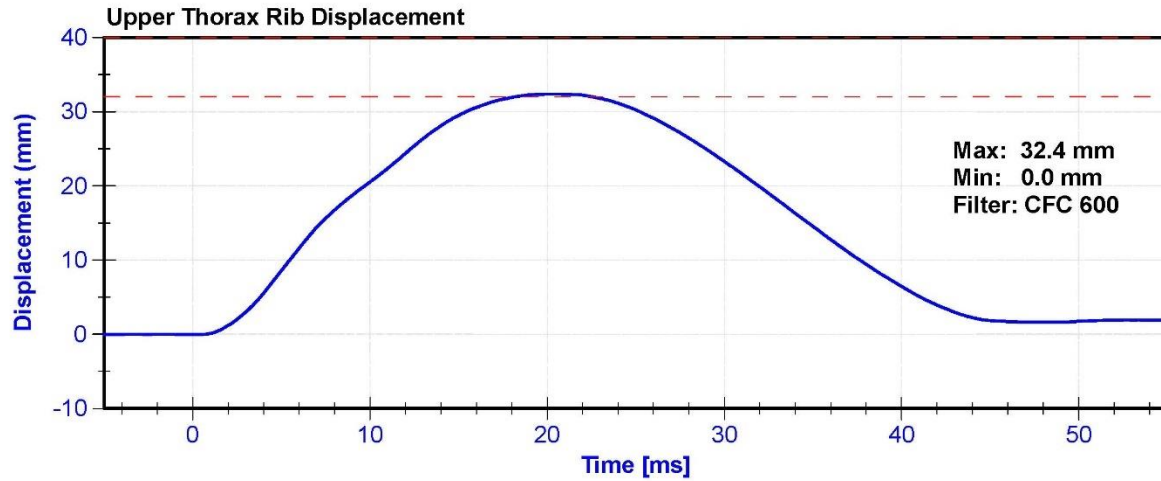
Results

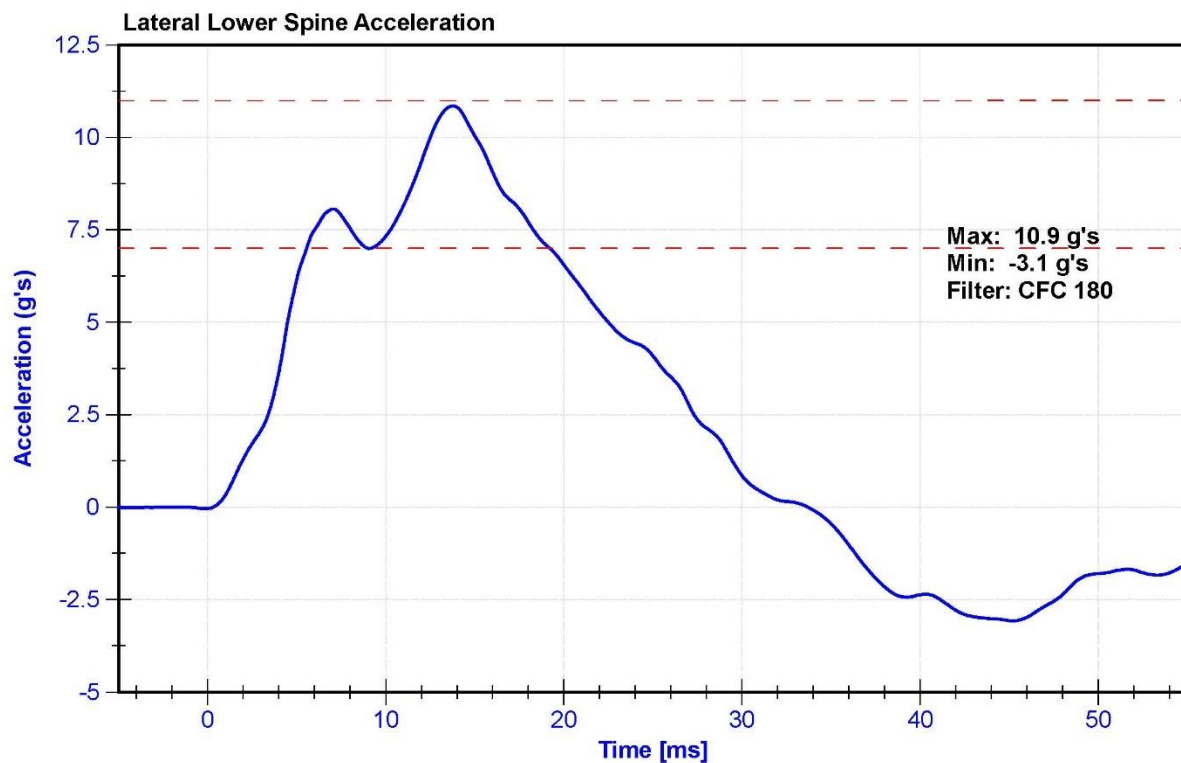
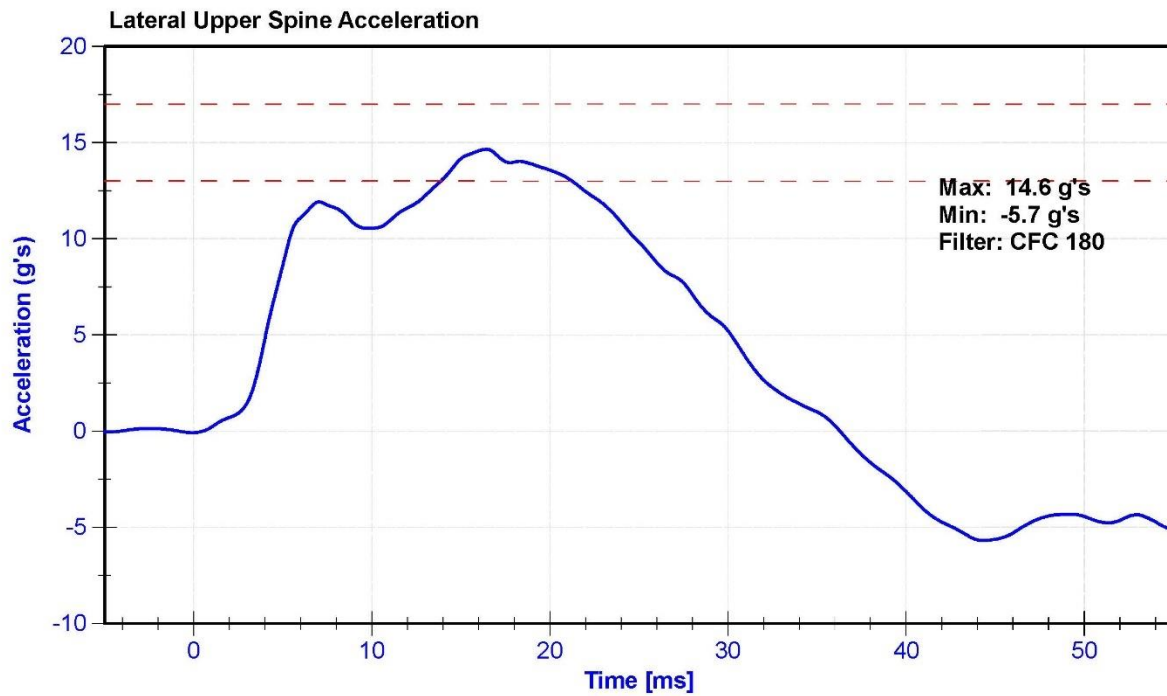
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	51.2	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	14	18	g's	16.7	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.6	Pass
Lateral Lower Spine Acceleration	7	11	g's	10.9	Pass
Upper Thorax Rib Deflection	32	40	mm	32.4	Pass
Middle Thorax Rib Deflection	39	45	mm	39.5	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	P51736	10/25/2021	10/25/2022
Upper Spine Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022
Lower Spine Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Upper Thorax Rib Potentiometer	Servo	451GFE	5/18/2022	11/16/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	5/18/2022	11/16/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	5/18/2022	11/16/2022







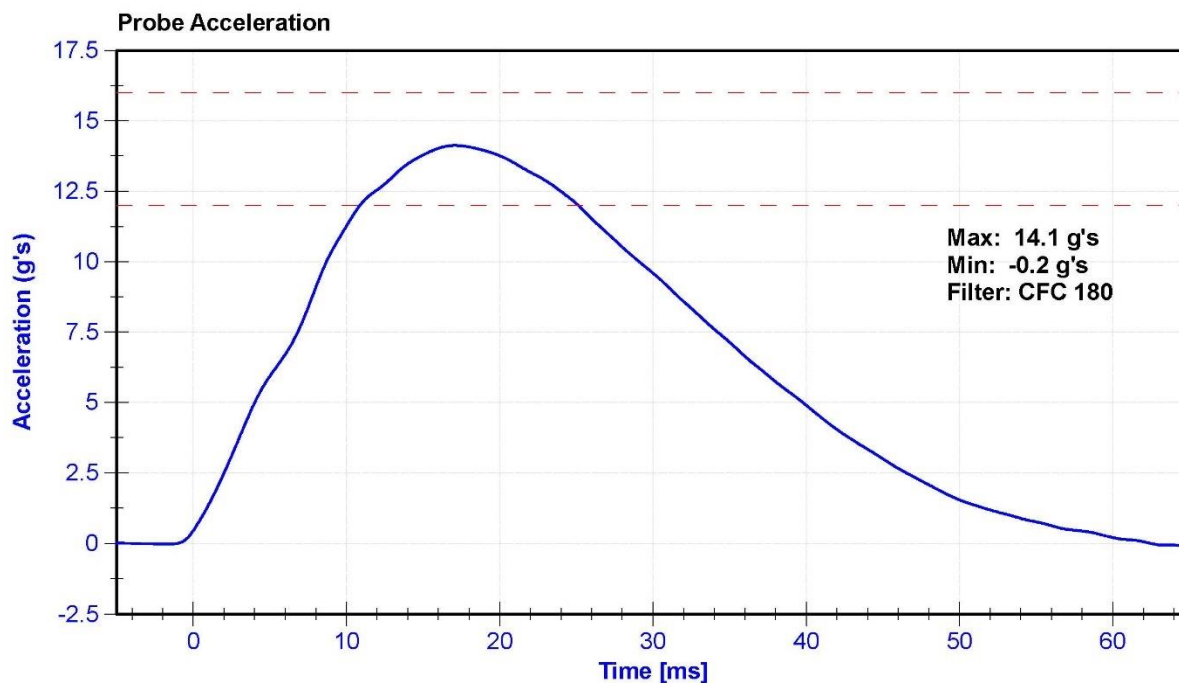
ATD Manufacturer	FTSS	Test Technician	B. Kirchner
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

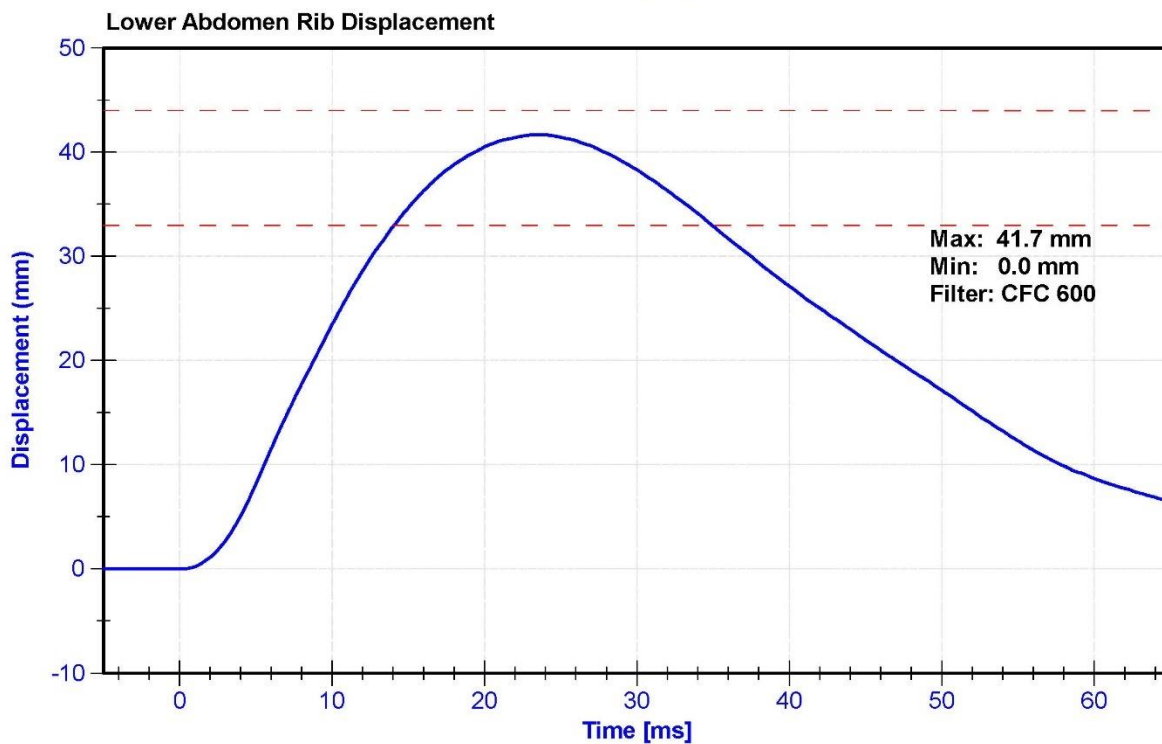
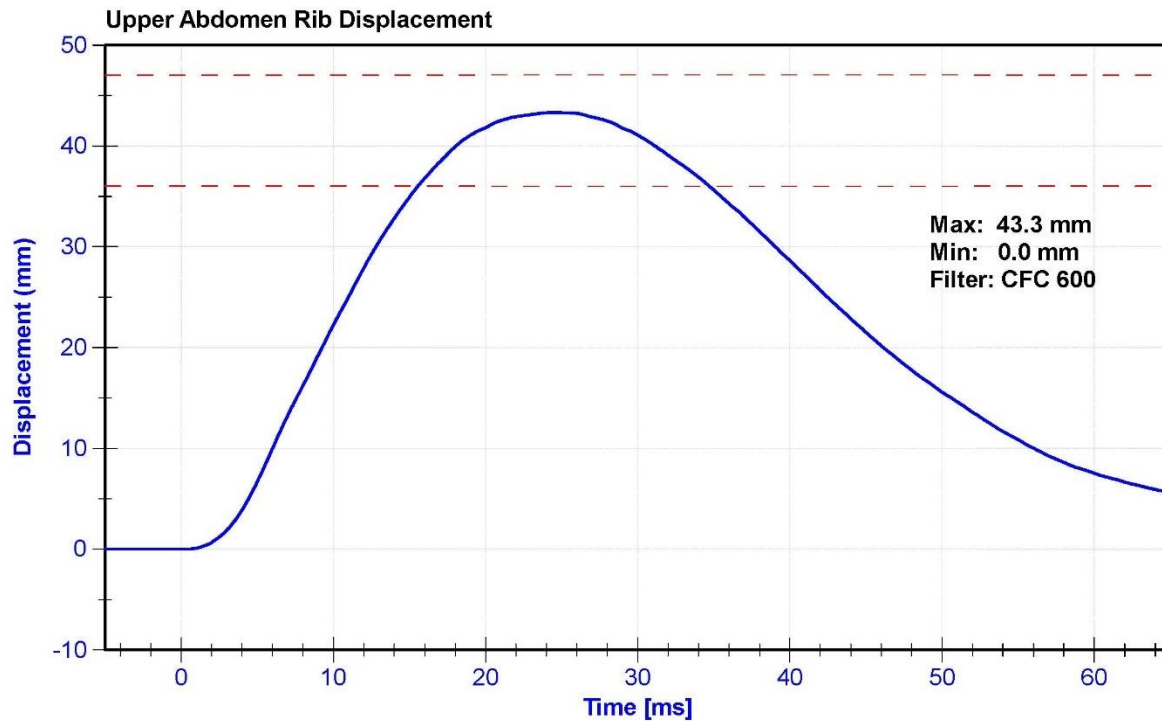
Results

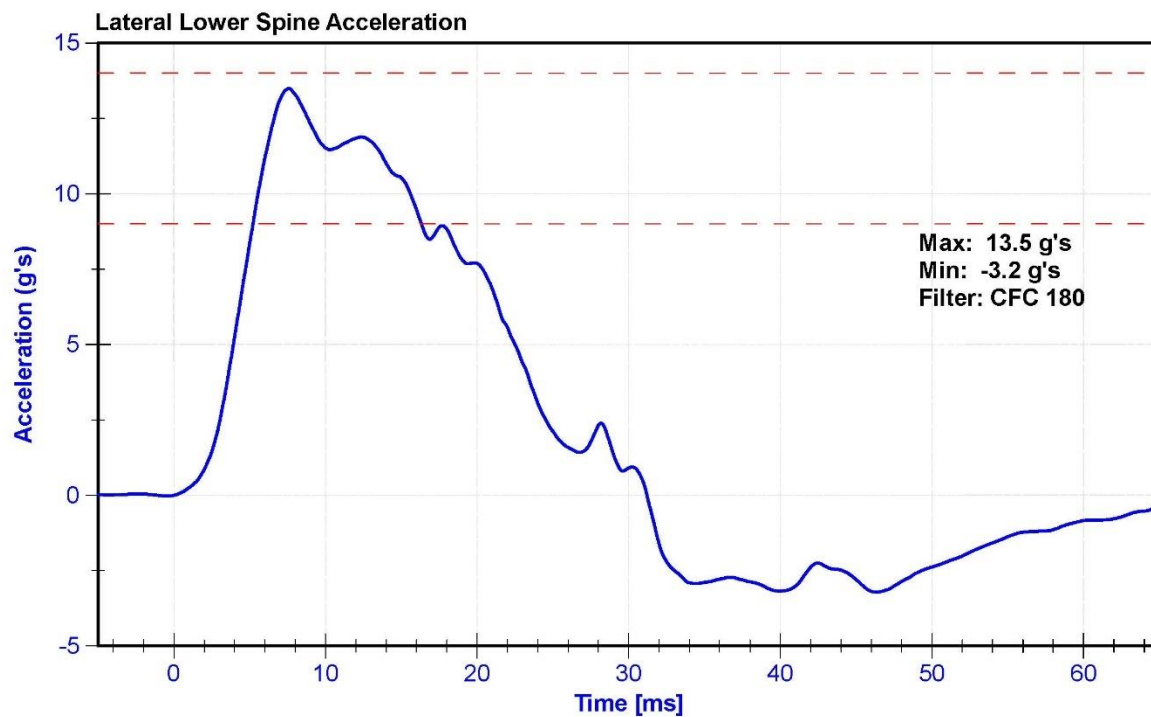
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	51.2	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	12	16	g's	14.1	Pass
Lateral Lower Spine Acceleration	9	14	g's	13.5	Pass
Upper Abdomen Rib Deflection	36	47	mm	43.3	Pass
Lower Abdomen Rib Deflection	33	44	mm	41.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2021	10/25/2022
Lower Spine Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Upper Abdomen Rib Potentiometer	Servo	307GFE	5/20/2022	11/18/2022
Lower Abdomen Rib Potentiometer	Servo	308GFE	5/18/2022	11/16/2022







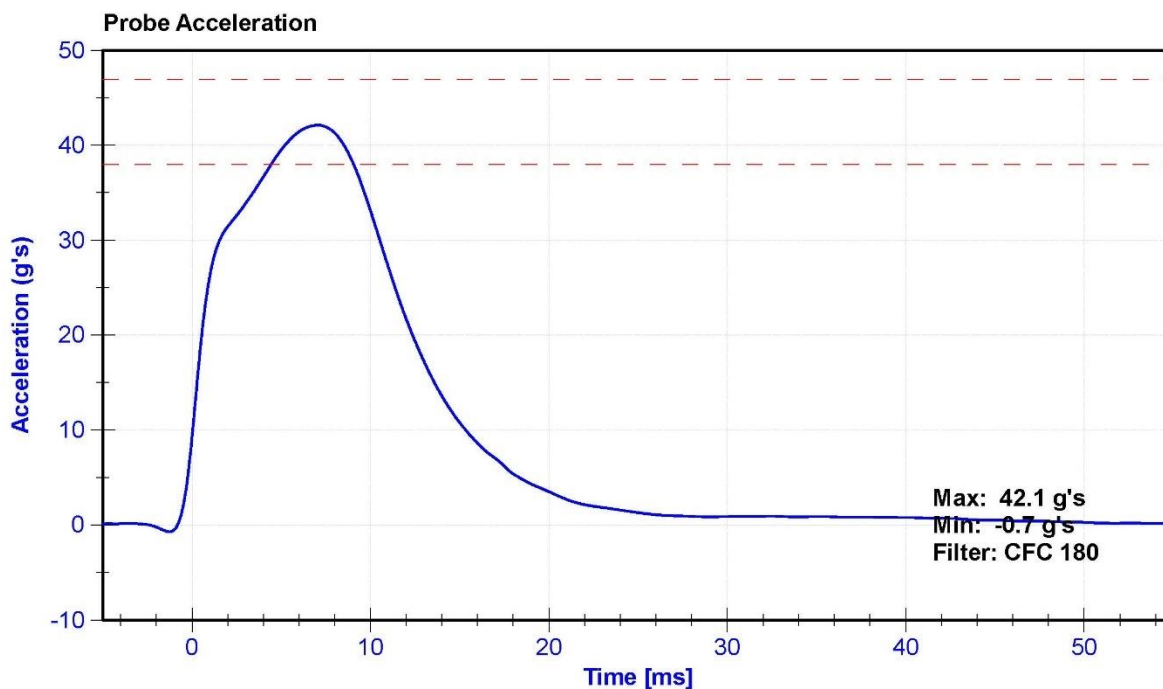
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

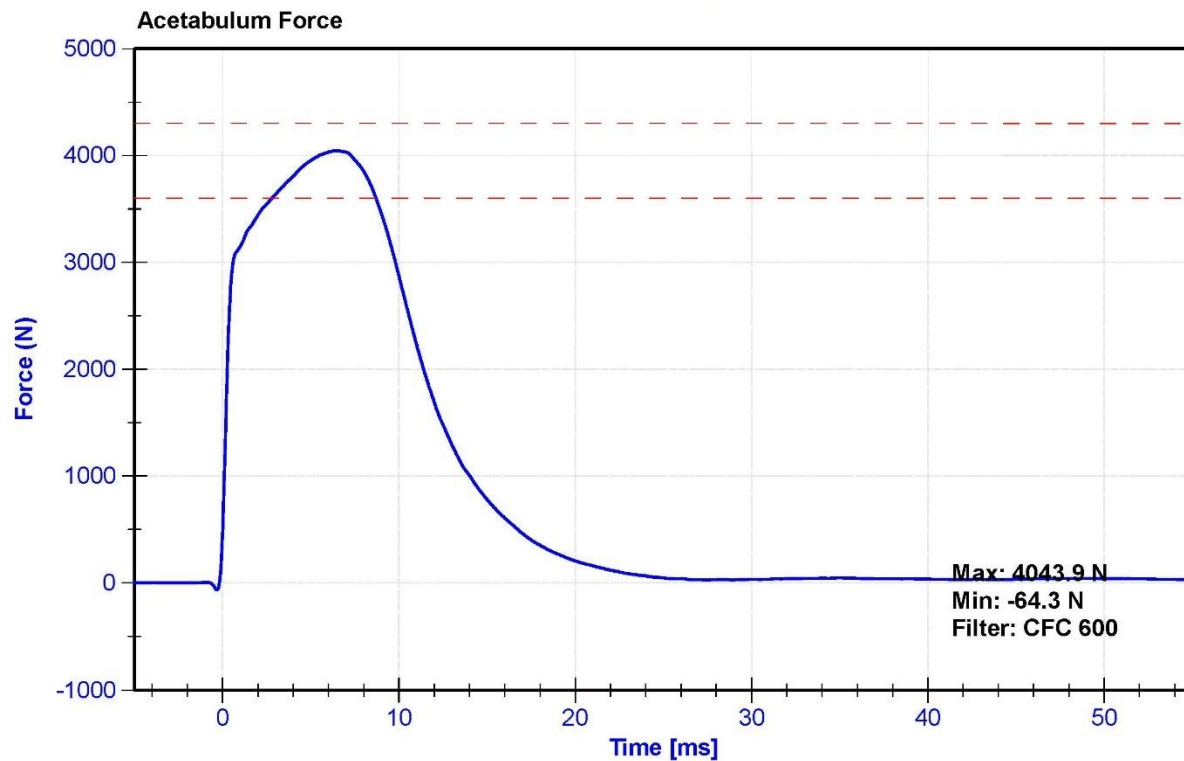
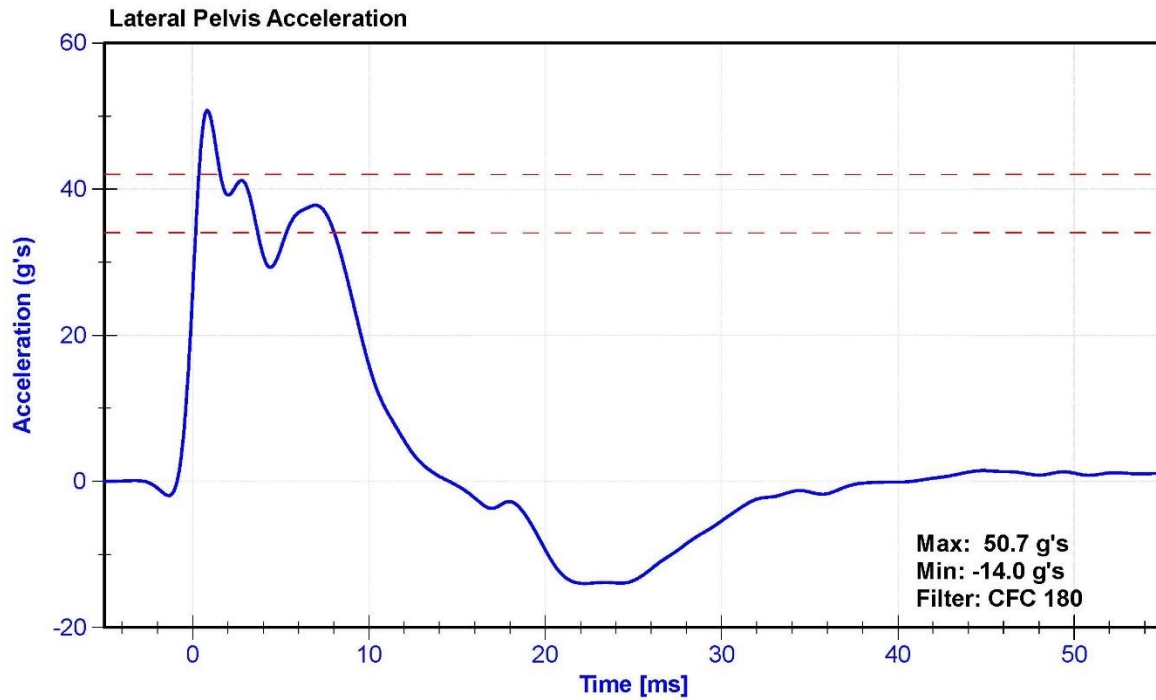
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	51.9	Pass
Velocity	6.6	6.8	m/s	6.60	Pass
Probe Acceleration	38	47	g's	42.1	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	37.8	Pass
Acetabulum Force	3600	4300	N	4043.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	10/25/2022
Pelvis Y Accelerometer	Endevco	P51731	5/17/2022	11/13/2022
Acetabulum Load Cell	Denton	275-FY	9/14/2021	9/14/2022
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A







CERTIFICATION

SID-11s Pelvis Plug Certification Test

Plug S/N 13067

Test Number 10387

Report Number 10422

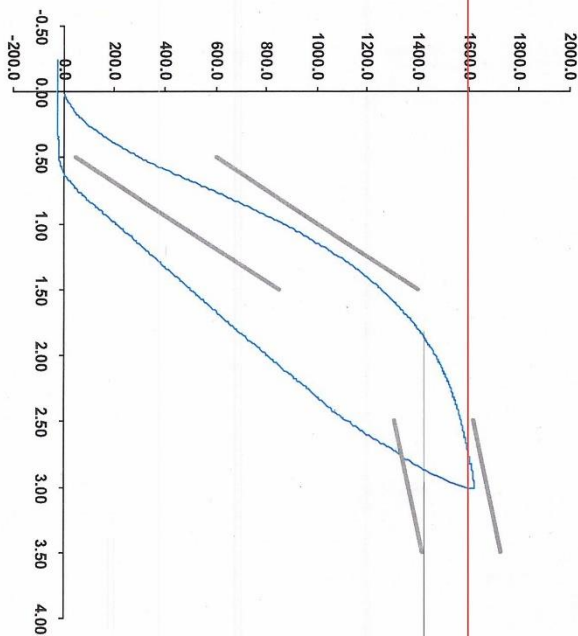
Test Date 7/30/2019 2:48:19 PM

Force (-N) vs Extension (-mm)

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

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

Notes:



Operator

Part Number 180-4450

Template No 107 08-Jul-21

SACO Research

By: _____ Date: _____

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



CRASH Impact Side
5/23/2022

SID-Ils Pelvis Plug Certification Test

Plug S/N 13904

Test Number 13378

Report Number 13423

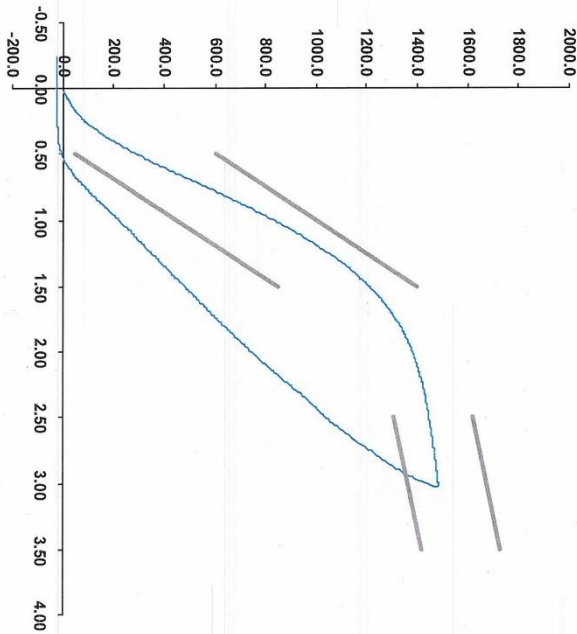
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Force (-N) vs Extension (-mm)

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	294	600
Force @ 1.5 mm (N)	1,212	1,400
Force @ 2.5 mm (N)	1,448	1,618
Force @ 3.0 mm (N)	1,483	1,673

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), 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



SID-IIS Pelvis Plug Certification Test

Plug S/N 13101

Test Number 10421

Report Number 10456

Test Date 7/30/2019 4:53:55 PM

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	278.90	50.00
Force @ 1.5 mm (N)	1,260.84	600.00
Force @ 2.5 mm (N)	1,605.72	1,400.00
Force @ 3.0 mm (N)	1,660.67	1,306.00
		1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000

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

Notes:

Operator

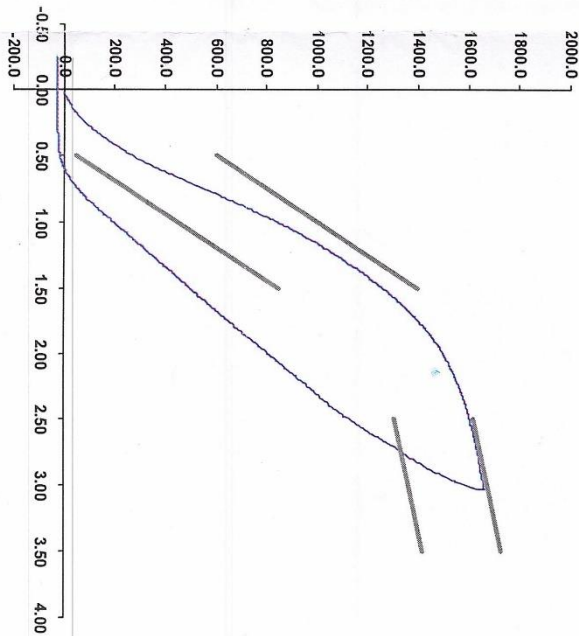
Part Number 180-4450

Template No 107 30-Jul-19
SACO Research

By: VC Date: 7/30/2019

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

Force (-N) vs Extension (-mm)



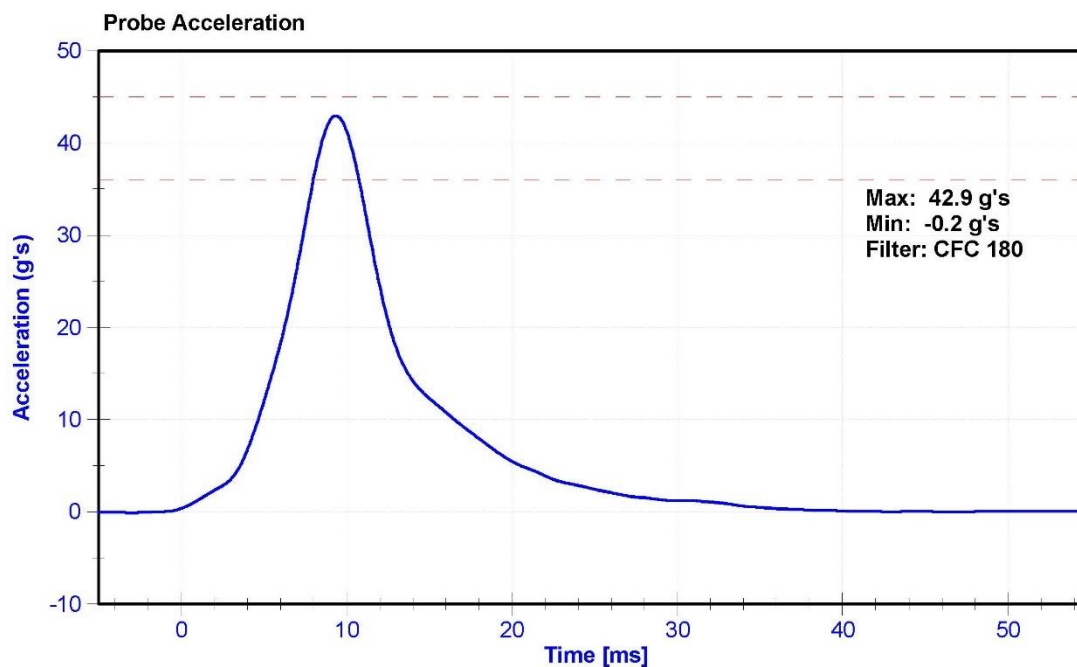
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

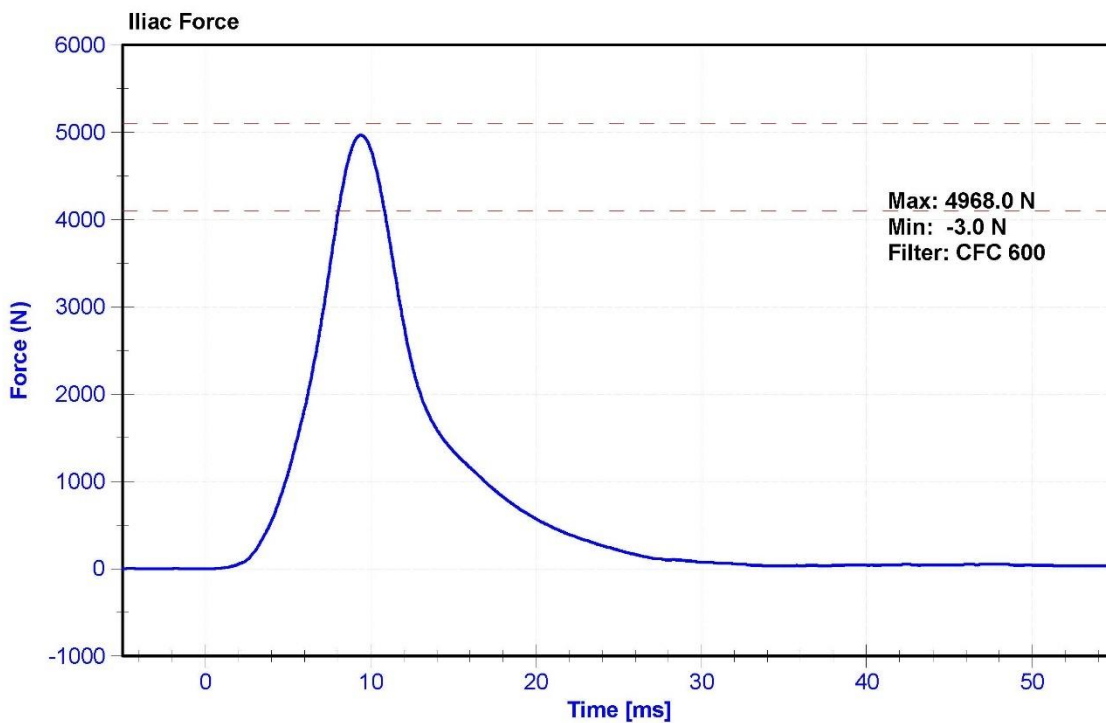
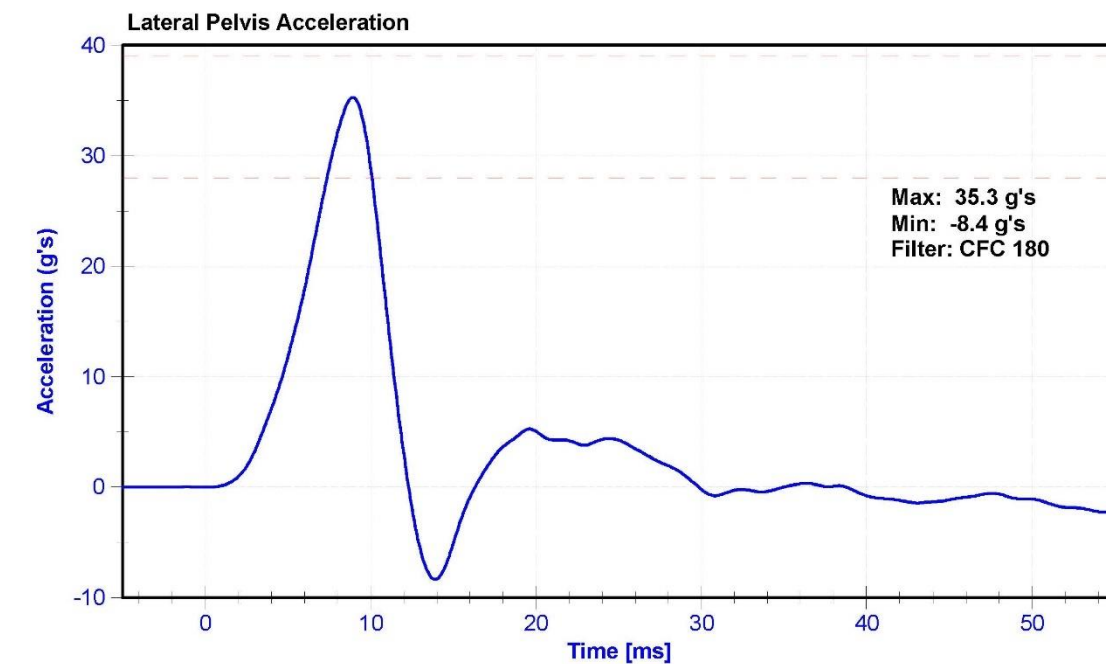
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	51.9	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	36	45	g's	42.9	Pass
Lateral Pelvis Acceleration	28	39	g's	35.3	Pass
Iliac Force	4100	5100	N	4968.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	10/25/2022
Pelvis Y Accelerometer	Endevco	P51731	5/17/2022	11/13/2022
Iliac Load Cell	Denton	279-FY	9/14/2021	9/14/2022





CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

SERIAL NO: 300

(CONFIGURED FOR LEFT SIDE IMPACT)

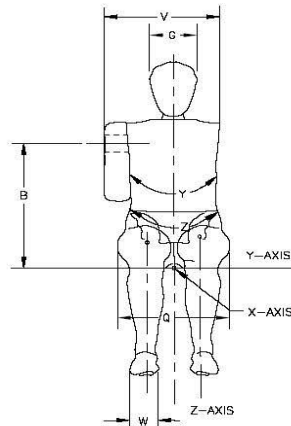
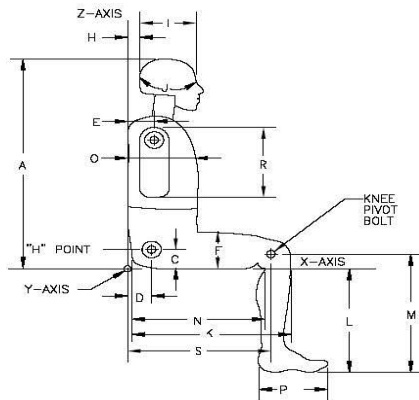


External Measurements - SID-IIs

Technician: K. Brogan

Date: 06/02/2022

Dummy Serial Number: 300



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	778	Pass
B	Shoulder Pivot Height	437	453	445	Pass
C	H-point Height	79	89	84	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	105	Pass
F	Thigh Clearance	119	135	125	Pass
G	Head Breadth	140	148	145	Pass
H	Head Back from Backline	40	46	42	Pass
I	Head Depth	178	188	182	Pass
J	Head Circumference	541	551	545	Pass
K	Buttock to Knee Length	514	540	528	Pass
L	Popliteal Height	343	369	362	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	432	Pass
O	Chest Depth w/o jacket	195	211	202	Pass
P	Foot Length	216	232	221	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	315	Pass
R	Arm Length	249	259	250	Pass
S	Knee Joint to seatback	477	493	486	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	86	Pass
Y	Chest Circumference w/jacket	851	881	879	Pass
Z	Waist Circumference	761	791	775	Pass

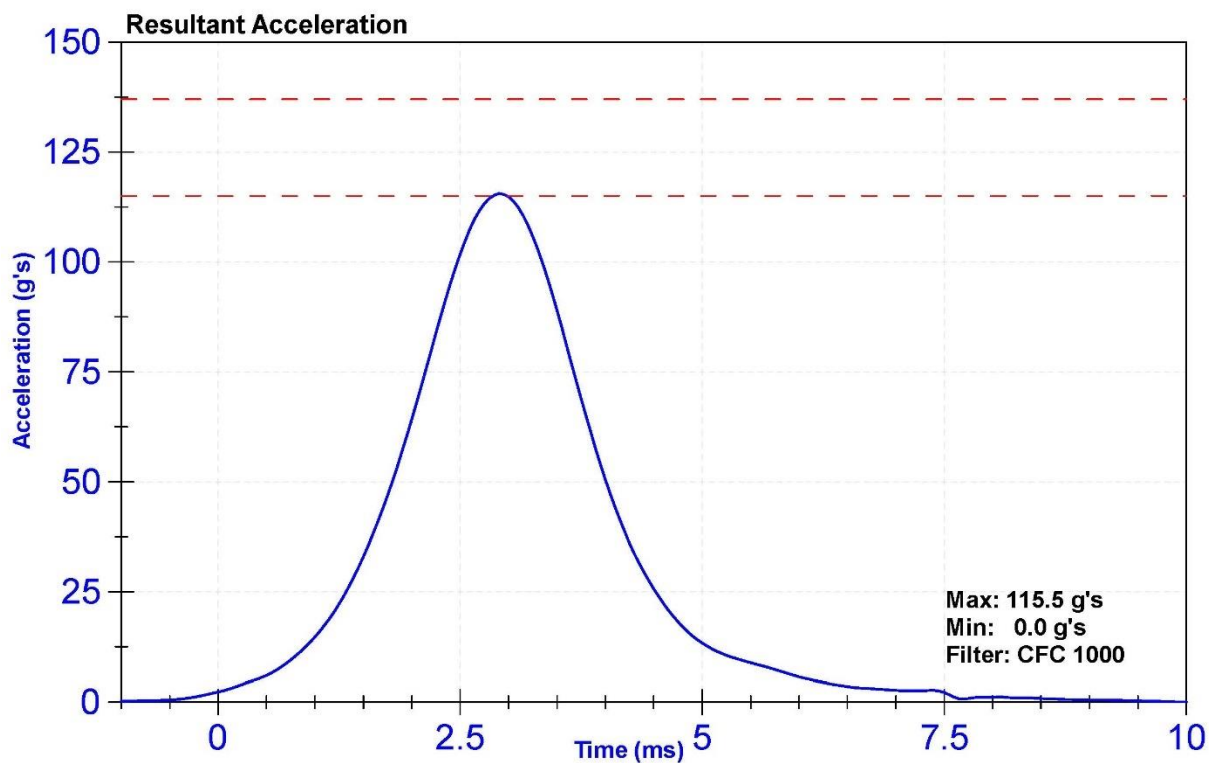
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

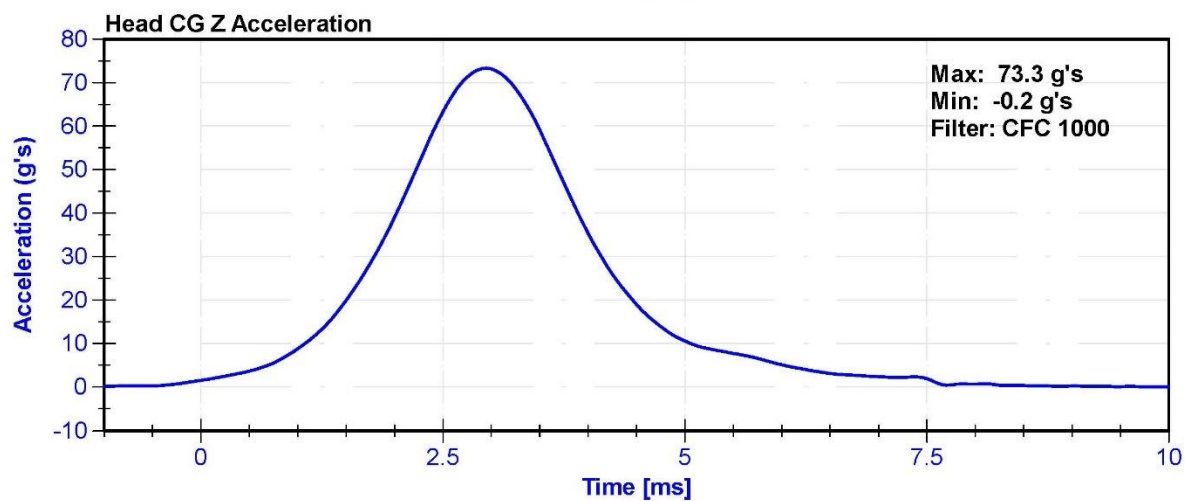
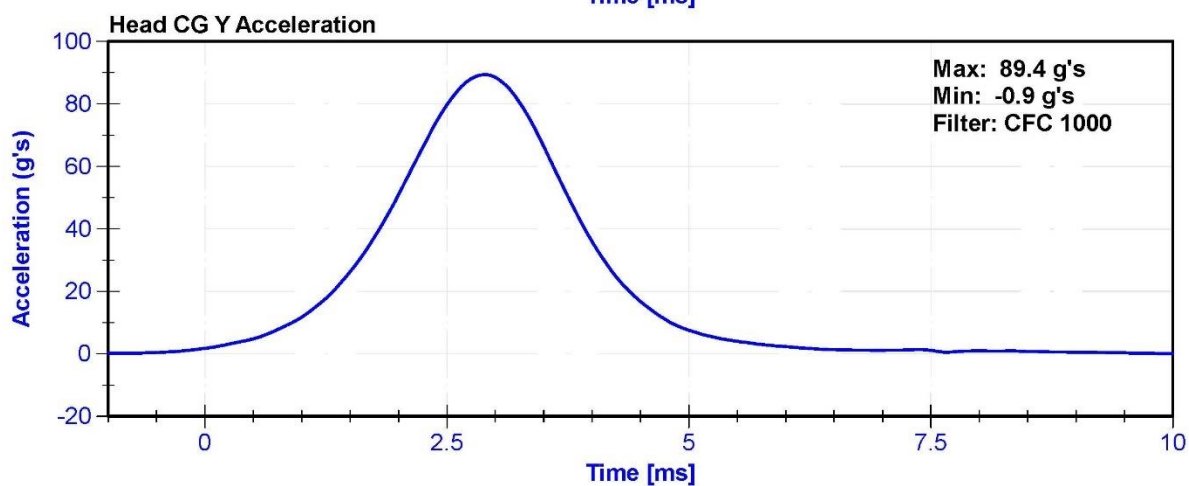
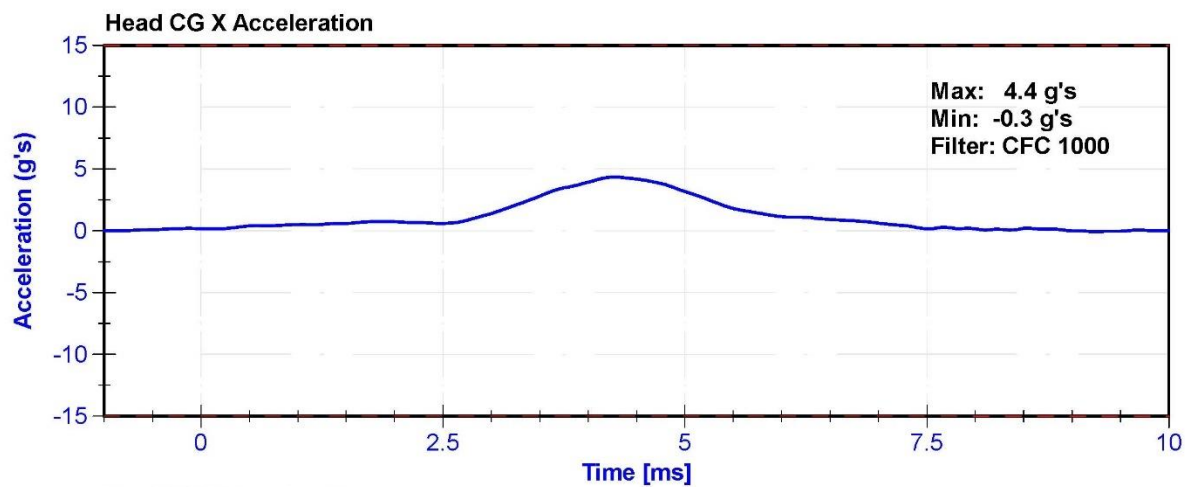
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	60.8	Pass
Resultant Acceleration	115	137	g's	115.5	Pass
Oscillation	0	15	%	2.3	Pass
Fore-Aft Acceleration	-15	15	g's	4.4	Pass

Transducer Calibrations

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





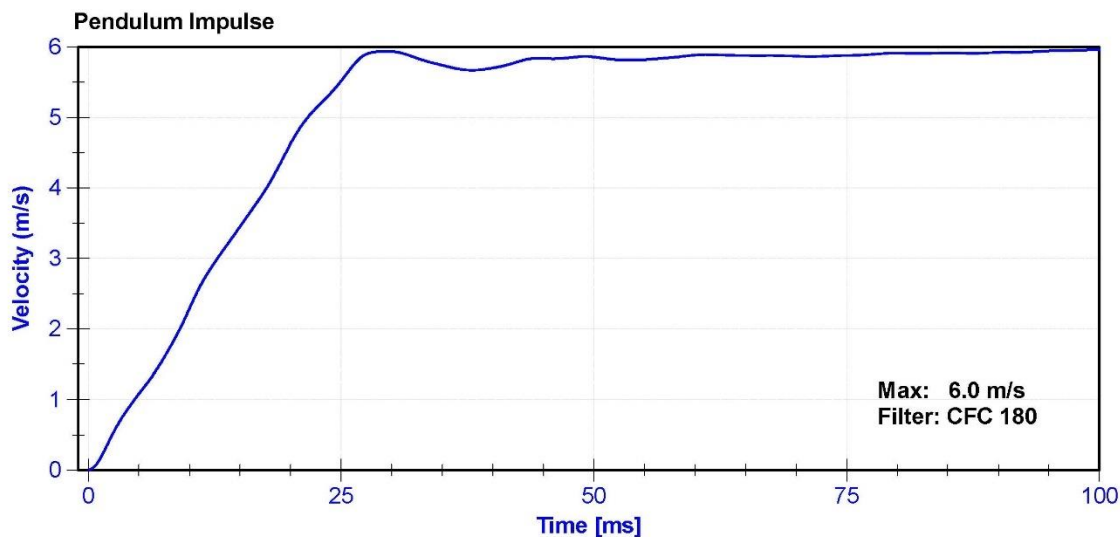
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

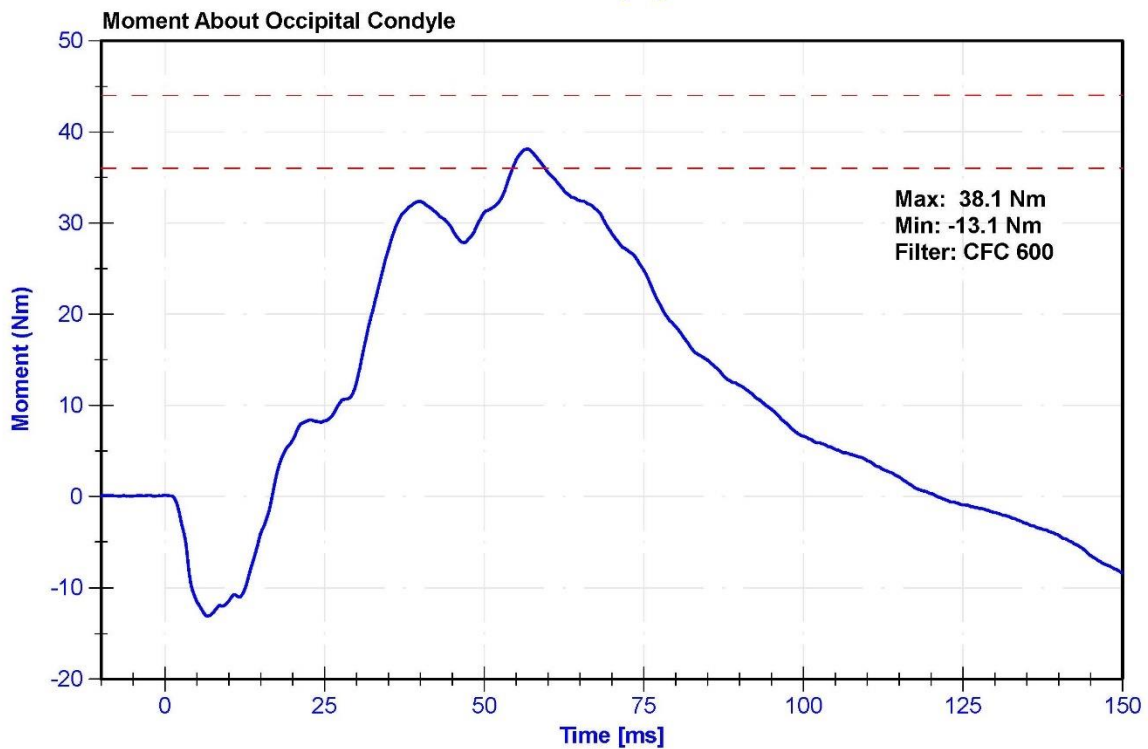
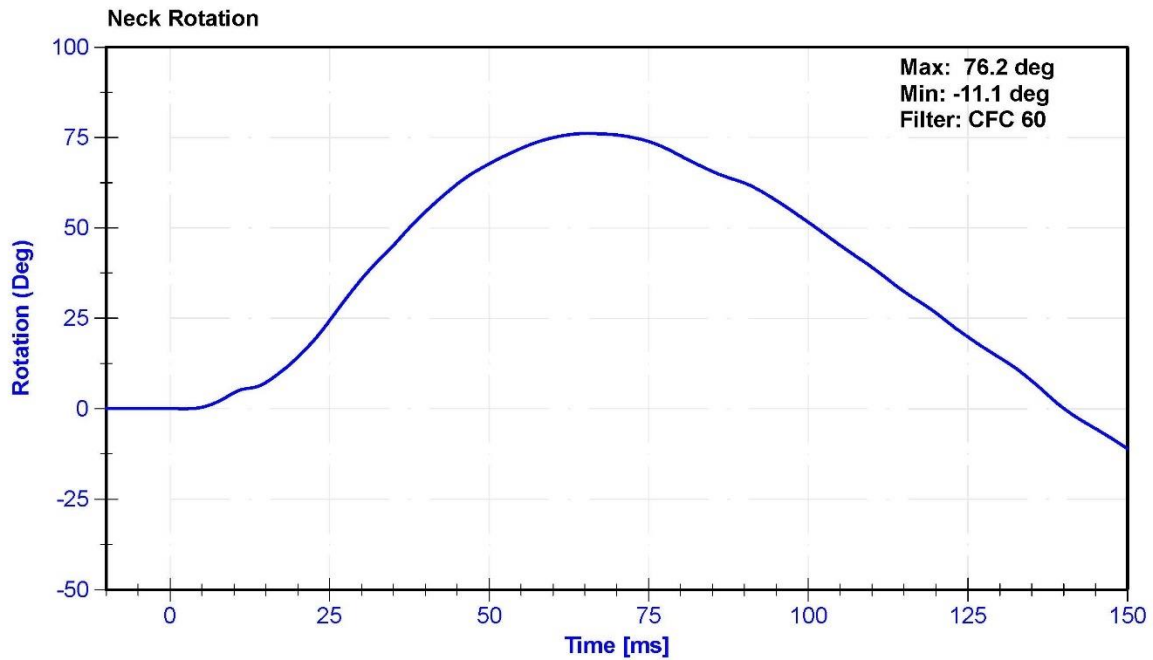
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	59	Pass
Velocity	5.51	5.63	m/s	5.565	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.29	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.45	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.63	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.52	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.96	Pass
Neck Rotation	71	81	deg	76.2	Pass
Time at Maximum Rotation	50	70	ms	65.3	Pass
Moment about the OC	36	44	Nm	38.1	Pass
Moment Decay to 0 Nm	102	126	ms	121.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231CT	10/28/2021	10/28/2022
Pendulum Potentiometer	Servo	4961	2/23/2022	2/23/2023
Condyle Potentiometer	Servo	DS185	11/12/2021	11/12/2022
Upper Neck Load Cell	Denton	1716A-1037-FY	6/29/2021	6/29/2022





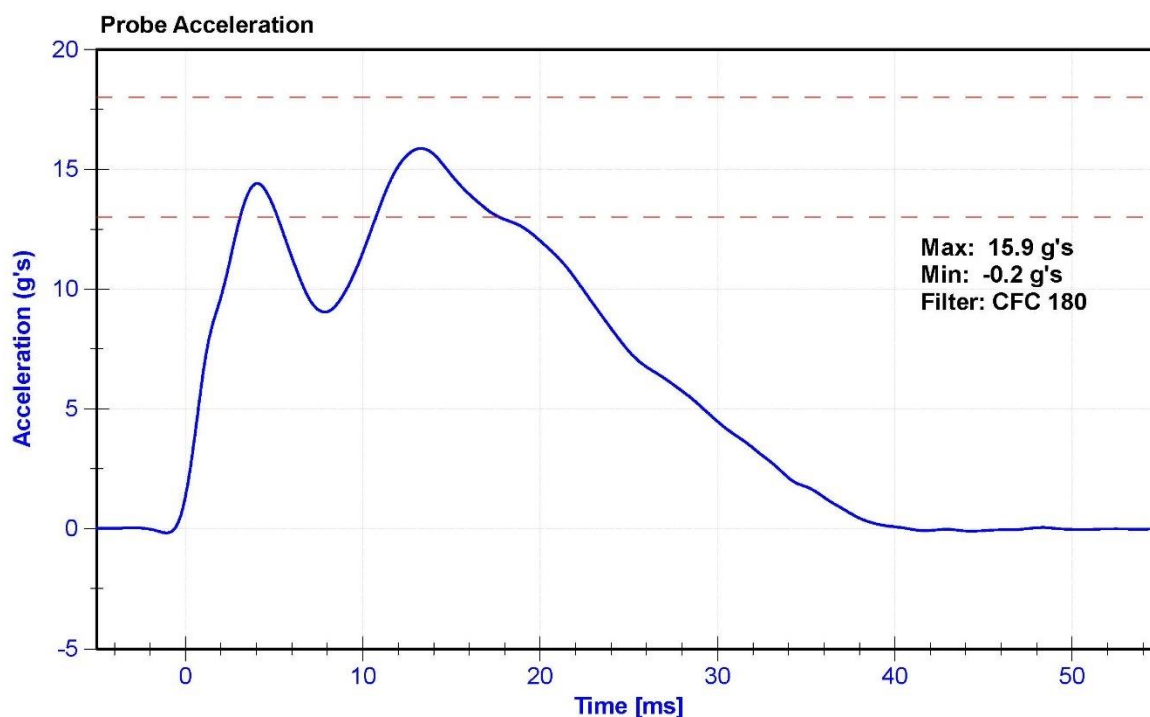
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

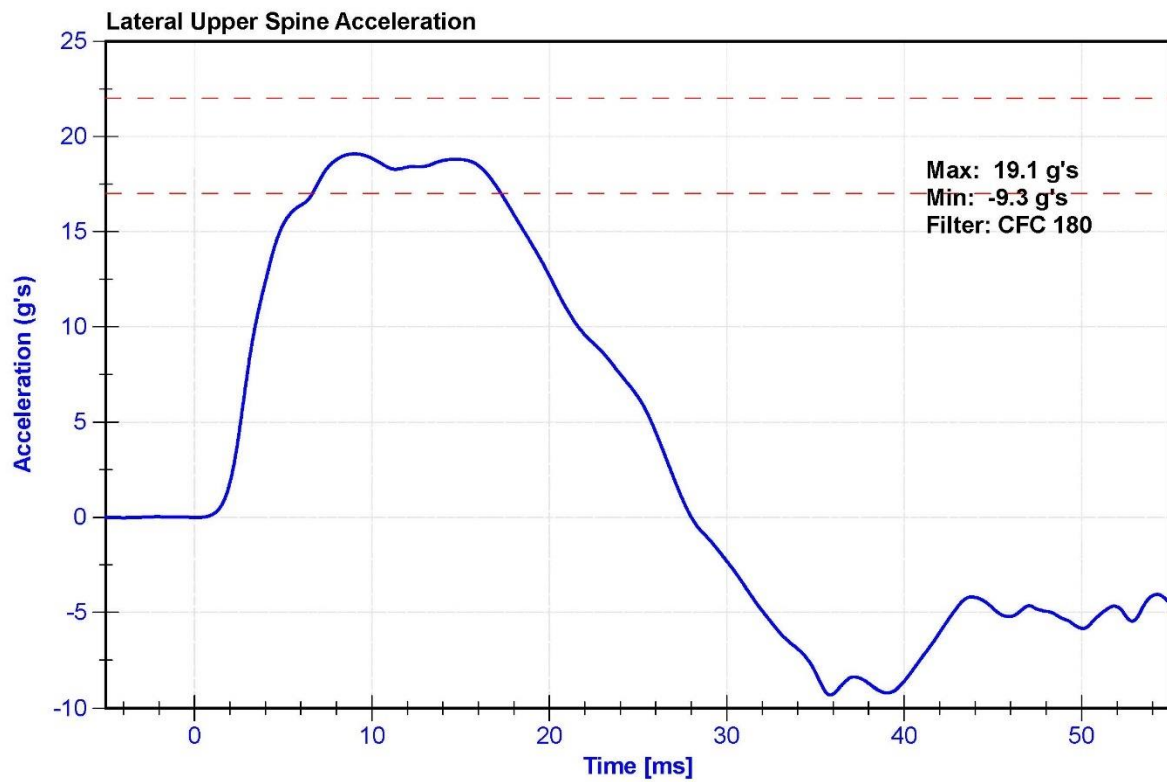
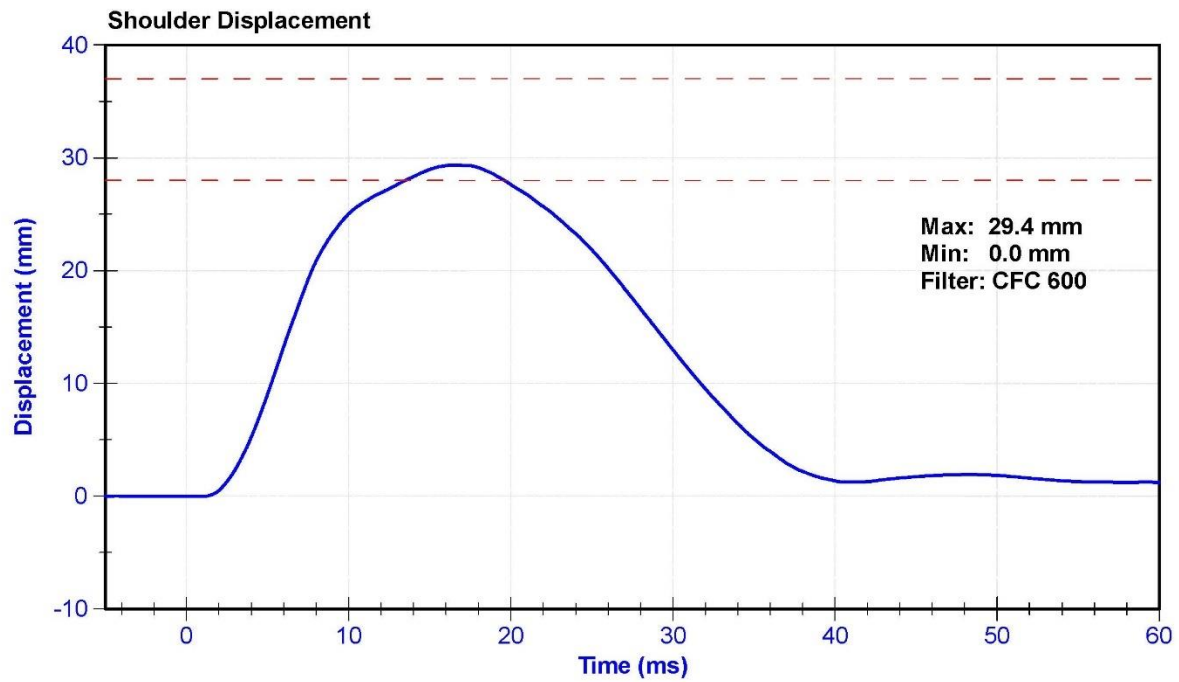
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	60.9	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	13	18	g's	15.9	Pass
Shoulder Deflection	28	37	mm	29.4	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.1	Pass

Transducer Calibrations

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





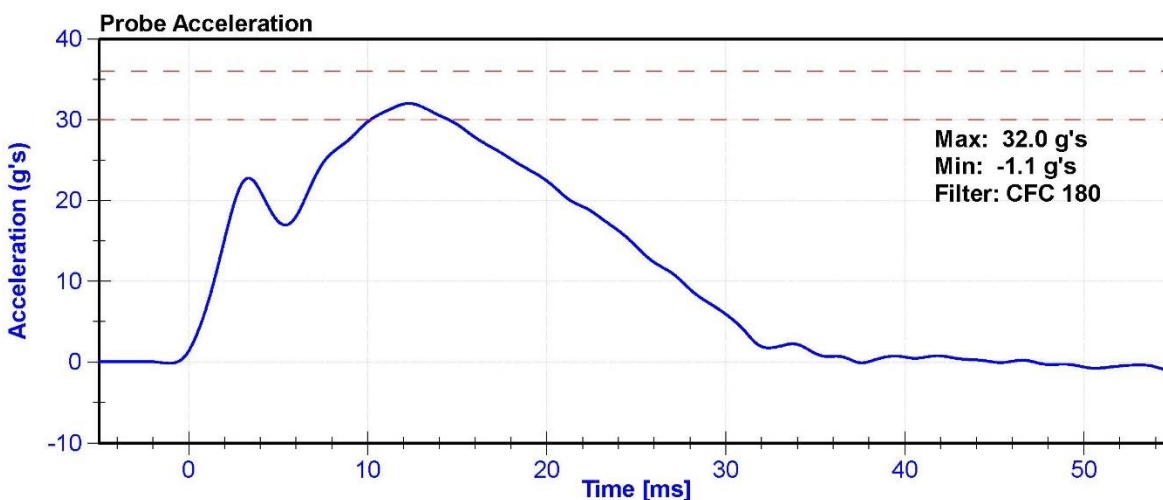
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

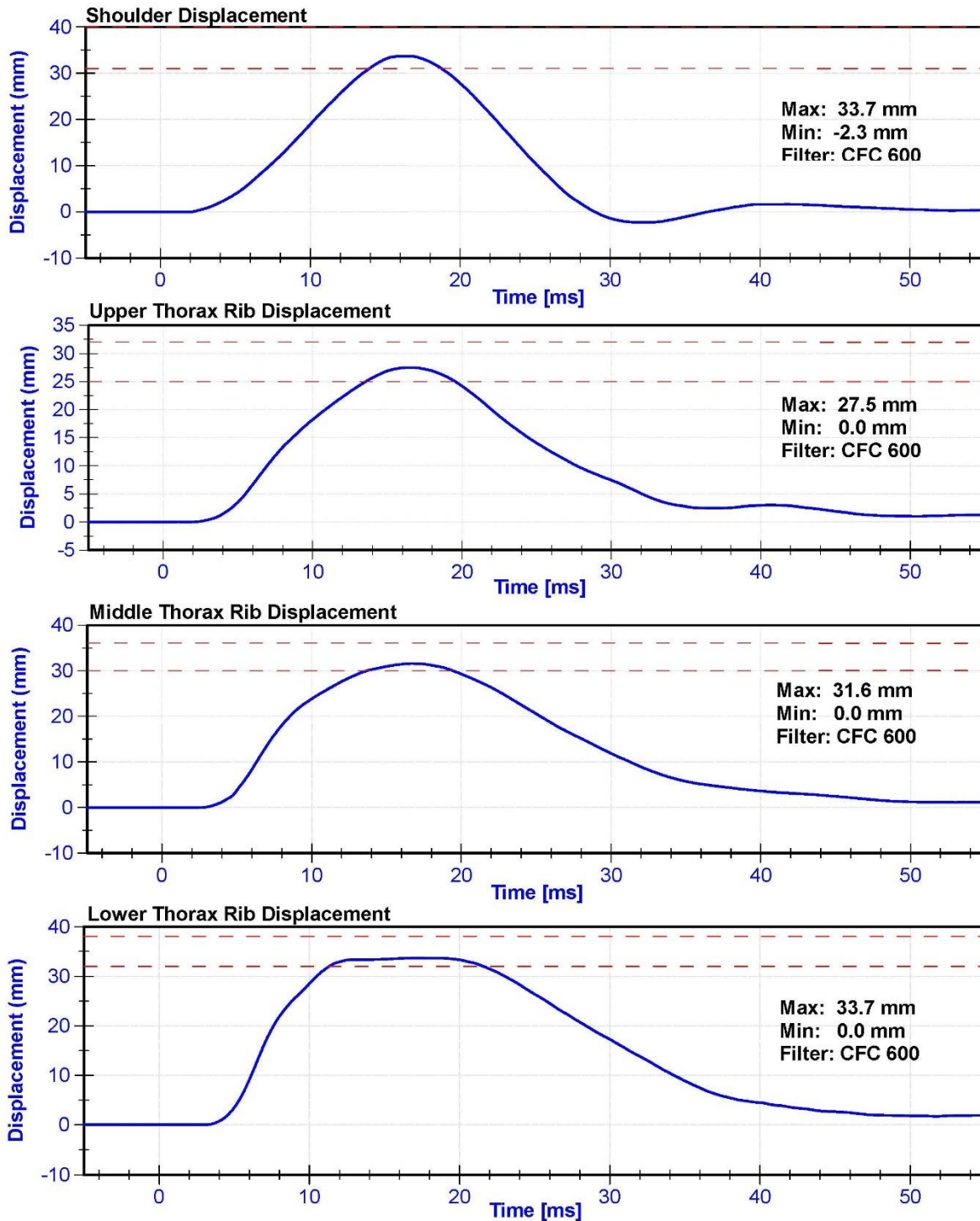
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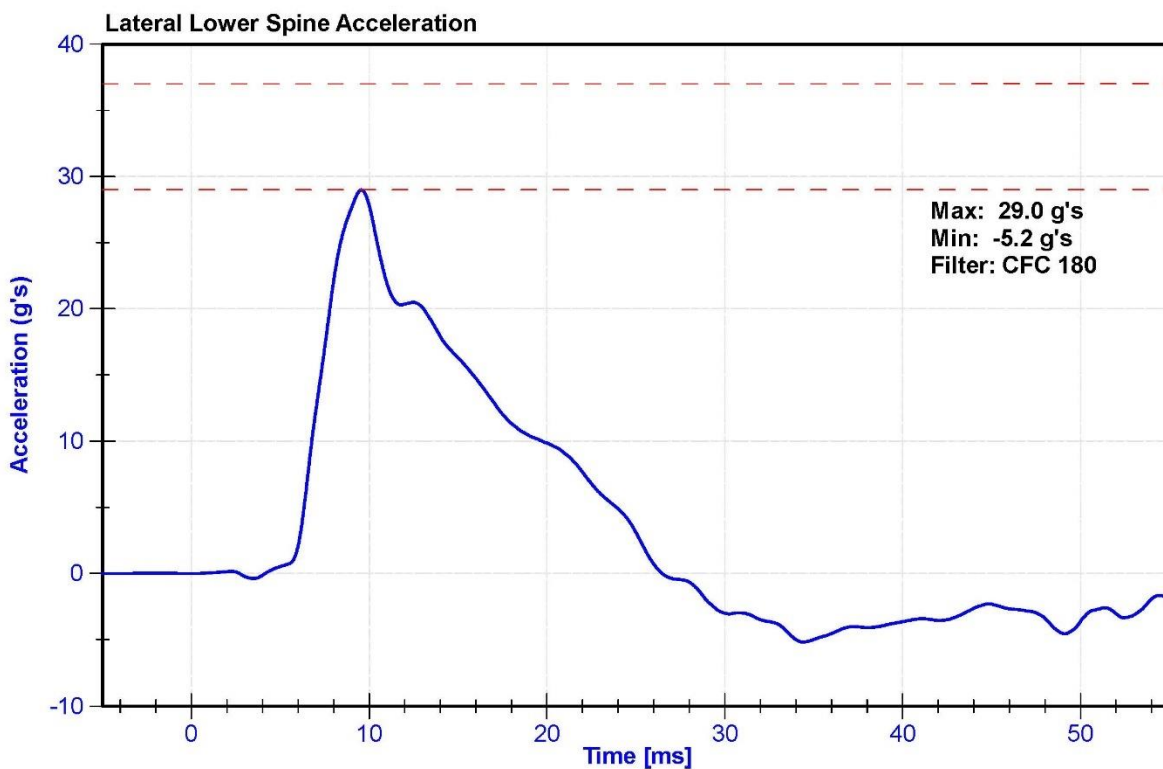
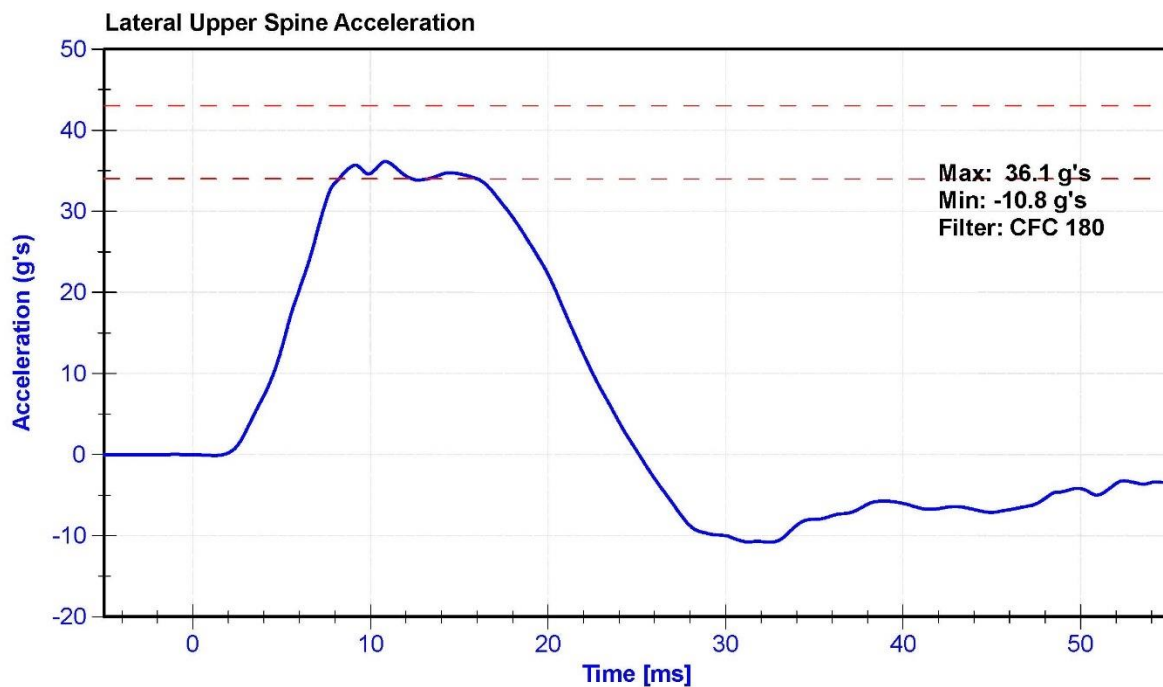
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	60.9	Pass
Velocity	6.6	6.8	m/s	6.75	Pass
Probe Acceleration after 5 ms	30	36	g's	32.0	Pass
Lateral Upper Spine Acceleration	34	43	g's	36.1	Pass
Lateral Lower Spine Acceleration	29	37	g's	29.0	Pass
Shoulder Deflection	31	40	mm	33.7	Pass
Upper Thorax Rib Deflection	25	32	mm	27.5	Pass
Mid Thorax Rib Deflection	30	36	mm	31.6	Pass
Lower Thorax Rib Deflection	32	38	mm	33.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Upper Spine T1 Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022
Upper Spine T12 Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Shoulder Potentiometer	Servo	053GFE	5/18/2022	11/16/2022
Upper Thorax Rib Potentiometer	Servo	451GFE	5/18/2022	11/16/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	5/18/2022	11/16/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	5/18/2022	11/16/2022







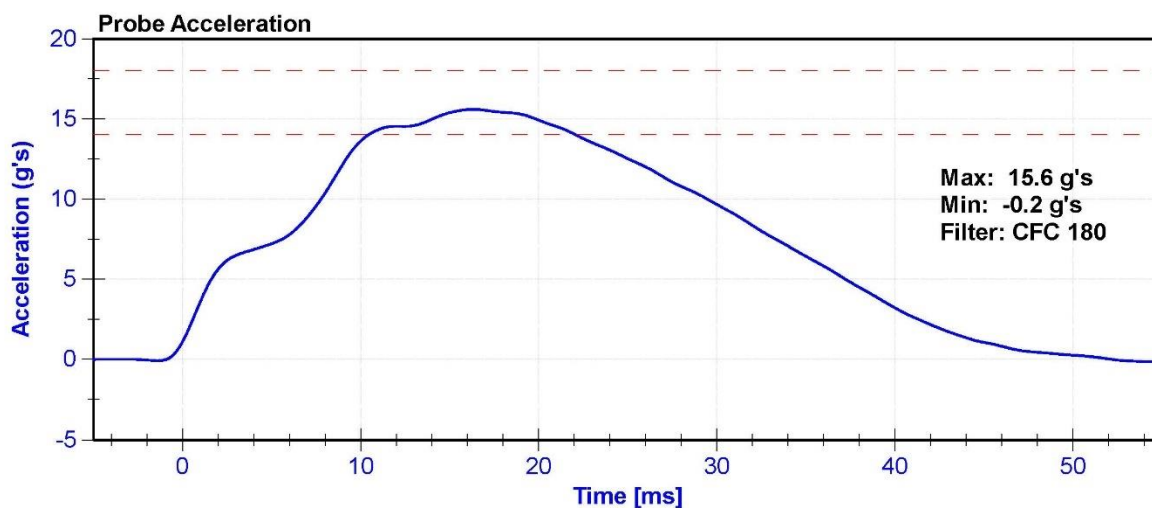
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

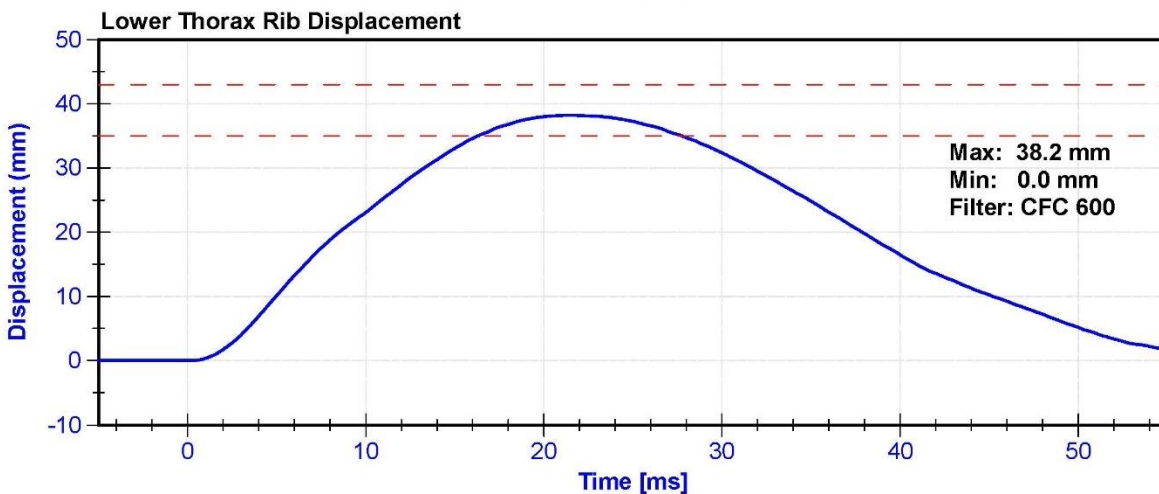
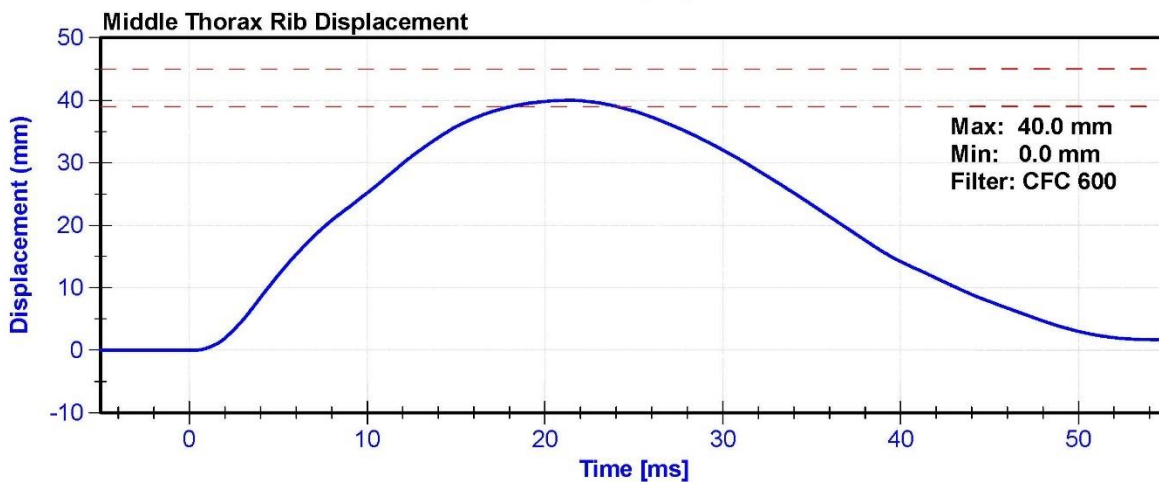
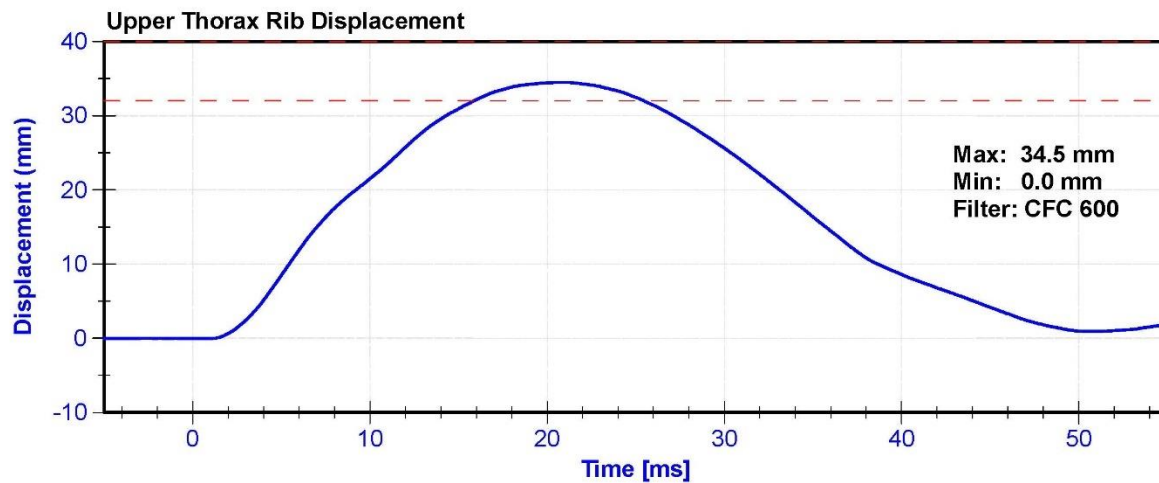
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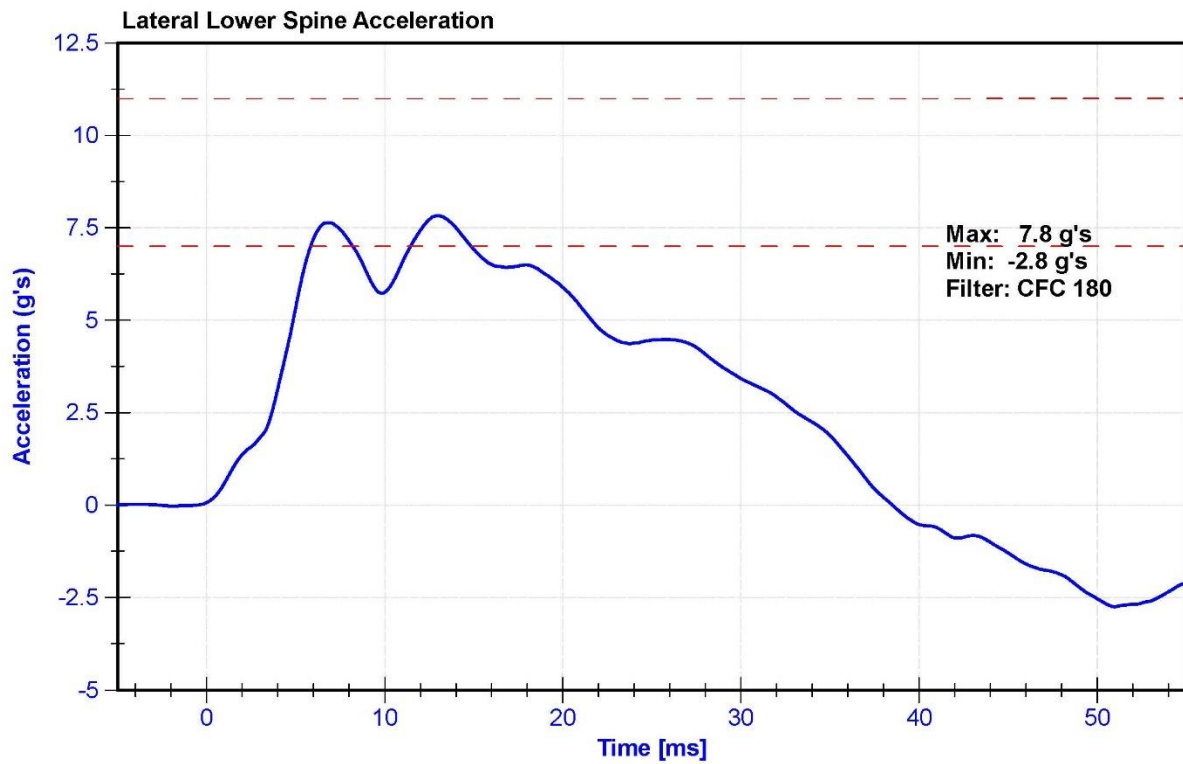
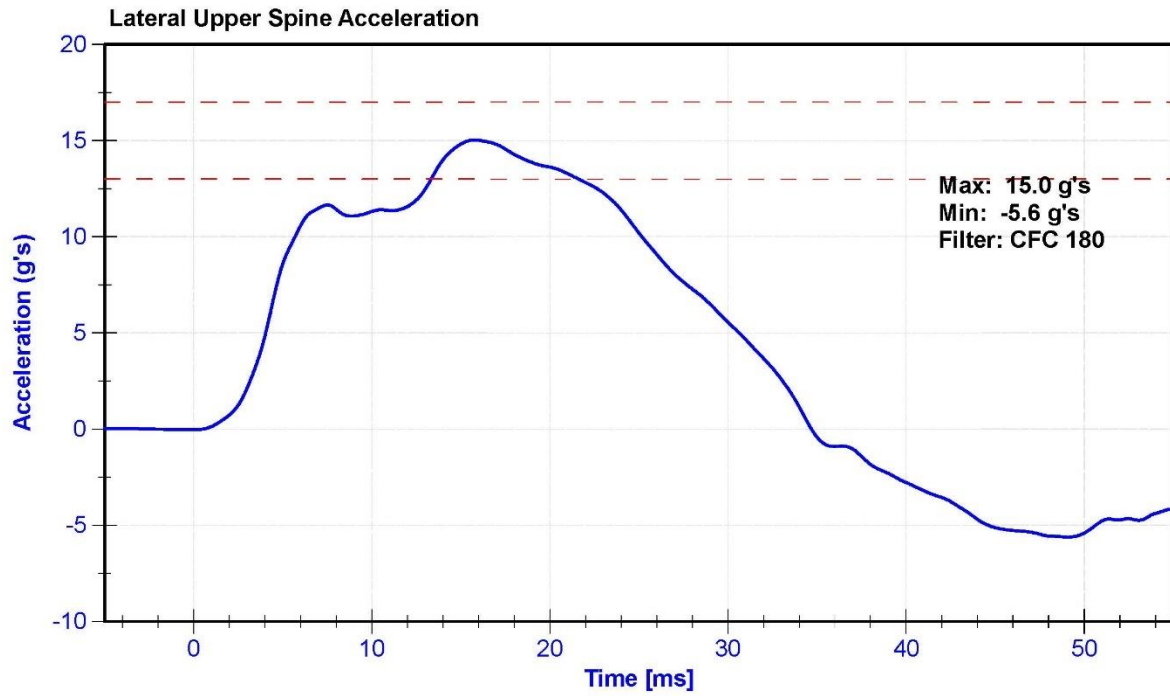
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	60.9	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	14	18	g's	15.6	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.0	Pass
Lateral Lower Spine Acceleration	7	11	g's	7.8	Pass
Upper Thorax Rib Deflection	32	40	mm	34.5	Pass
Middle Thorax Rib Deflection	39	45	mm	40.0	Pass
Lower Thorax Rib Deflection	35	43	mm	38.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	10/25/2022
Upper Spine Y Accelerometer	Endevco	T20880	5/17/2022	11/13/2022
Lower Spine Y Accelerometer	Endevco	P52071	5/17/2022	11/13/2022
Upper Thorax Rib Potentiometer	Servo	451GFE	5/18/2022	11/16/2022
Middle Thorax Rib Potentiometer	Servo	040GFE	5/18/2022	11/16/2022
Lower Thorax Rib Potentiometer	Servo	1156GFE	5/18/2022	11/16/2022







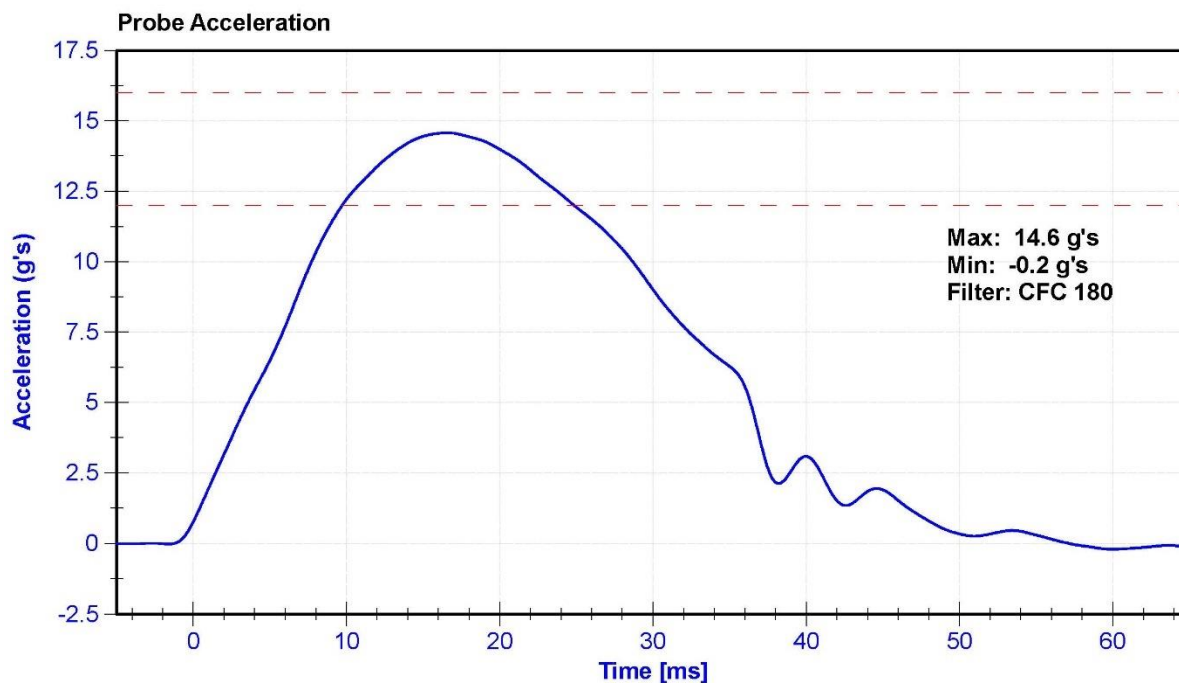
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

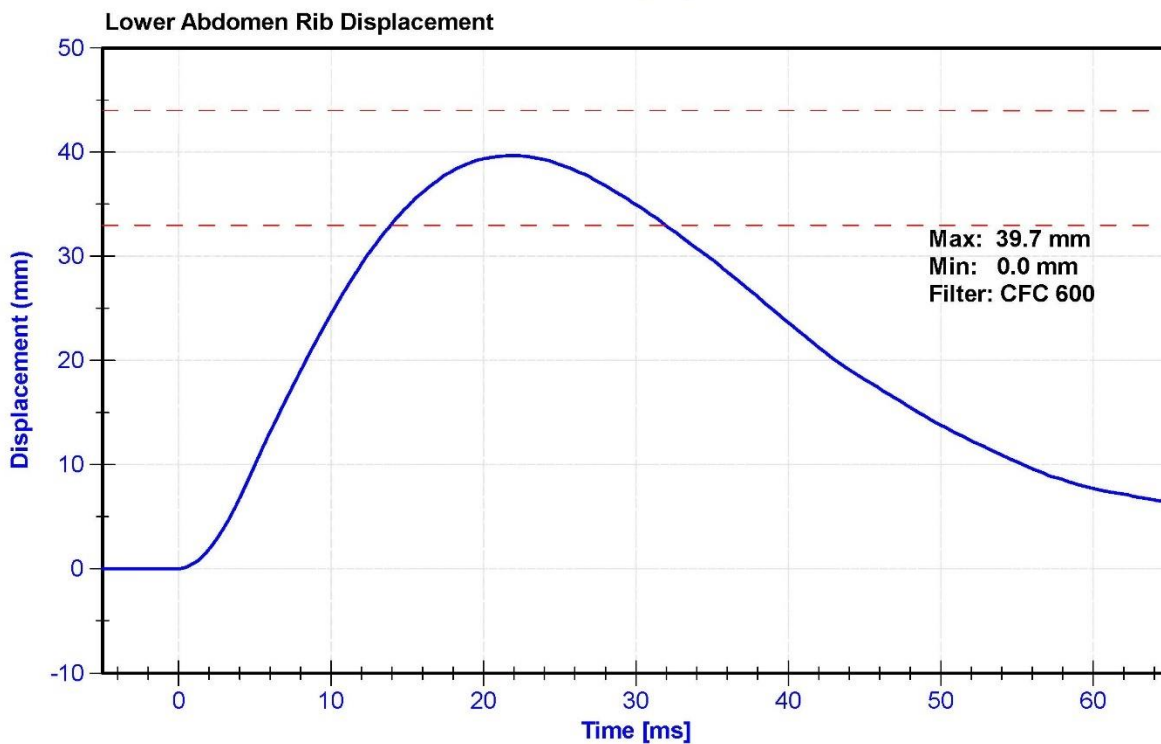
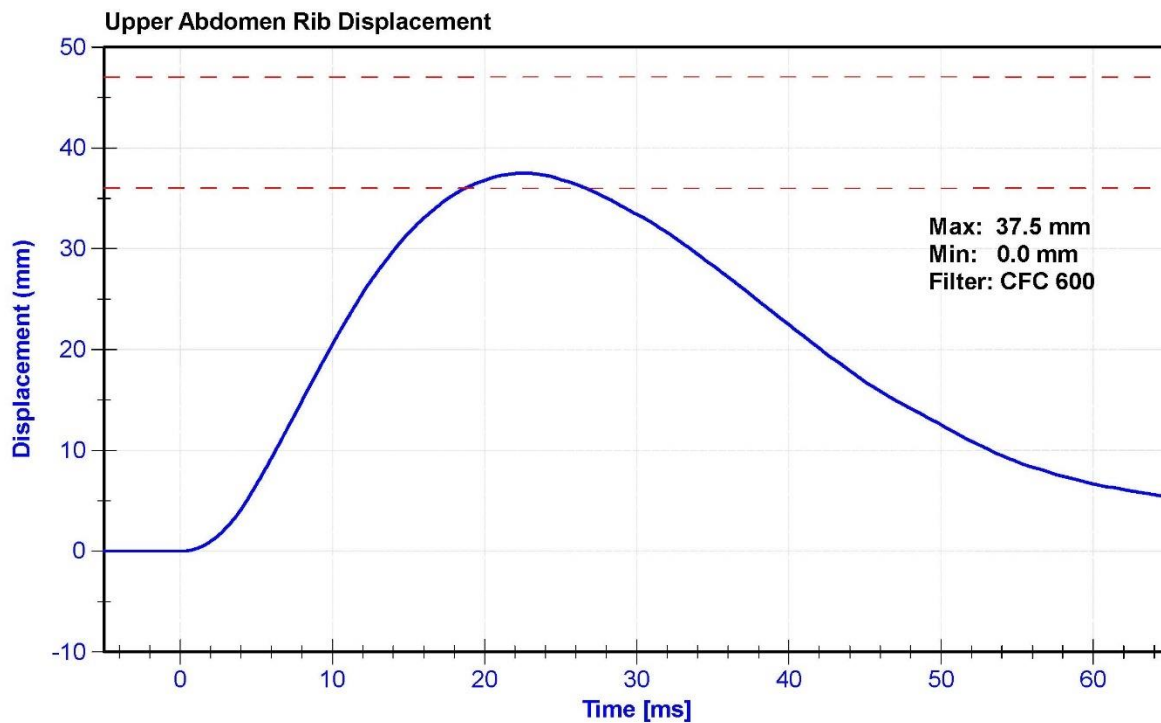
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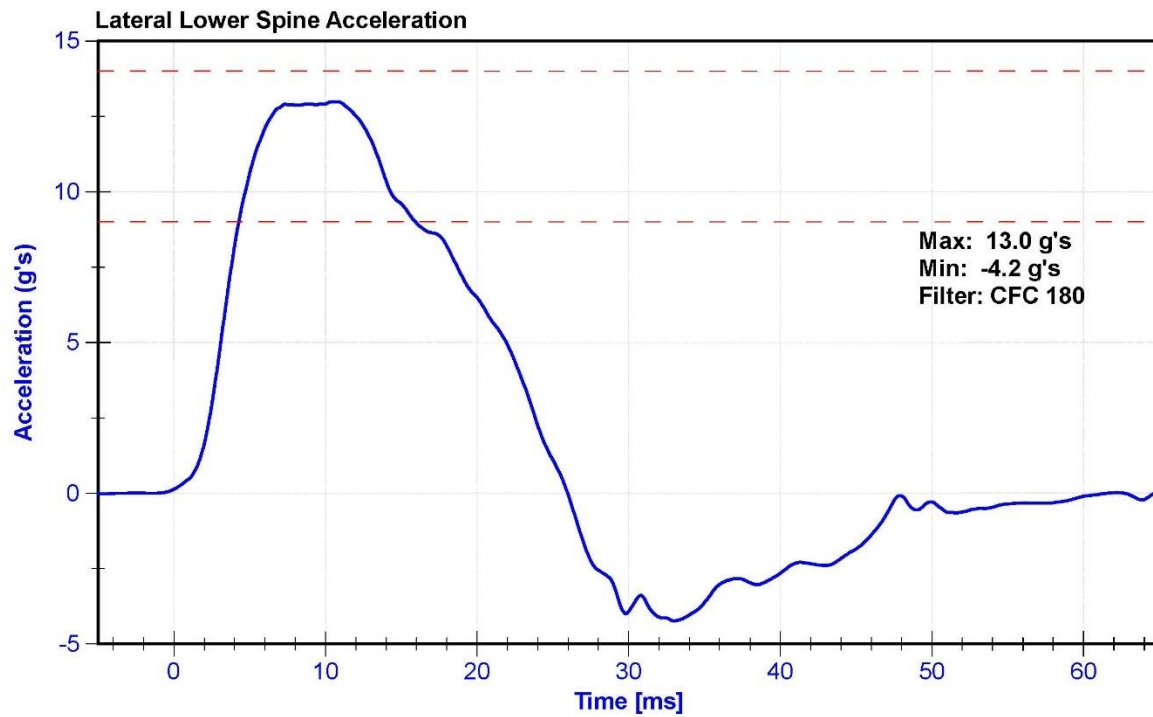
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	60.9	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	12	16	g's	14.6	Pass
Lateral Lower Spine Acceleration	9	14	g's	13.0	Pass
Upper Abdomen Rib Deflection	36	47	mm	37.5	Pass
Lower Abdomen Rib Deflection	33	44	mm	39.7	Pass

Transducer Calibrations

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







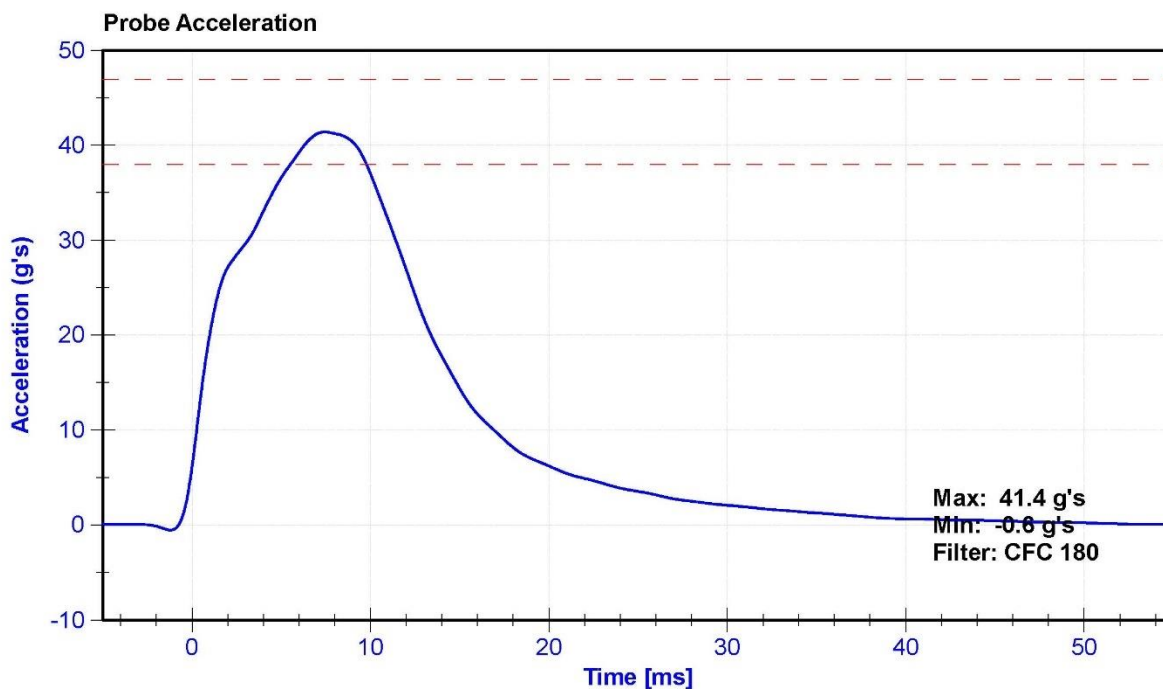
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

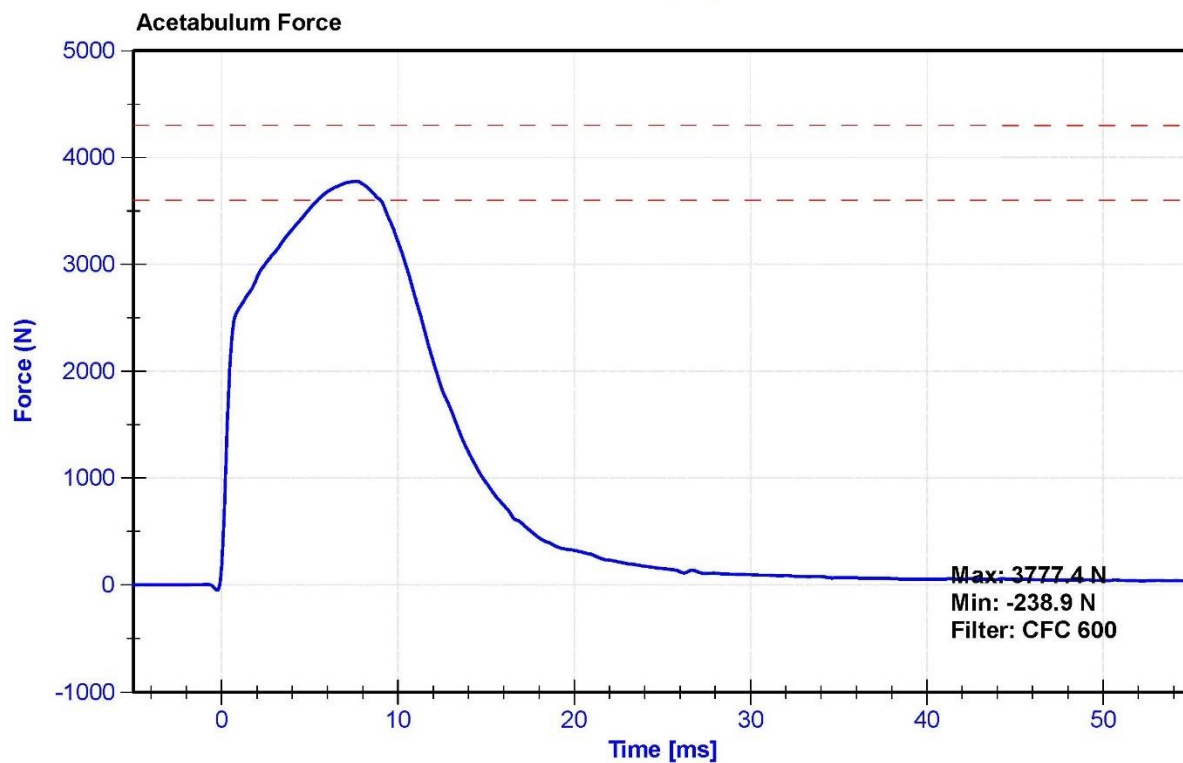
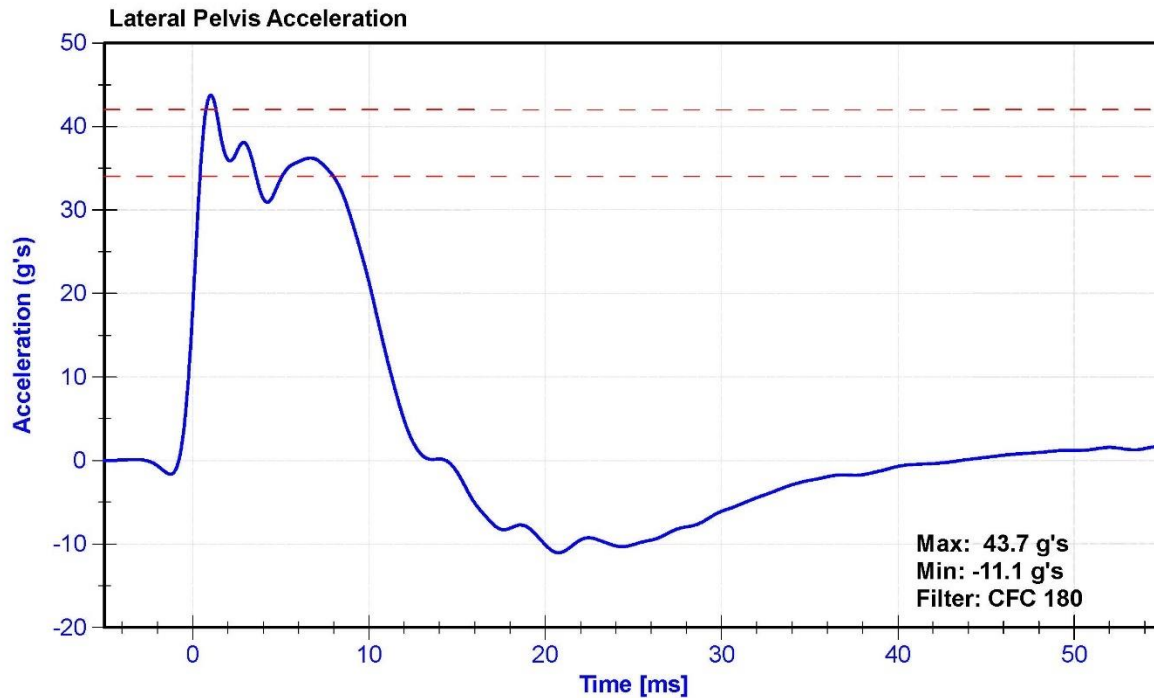
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	60.9	Pass
Velocity	6.6	6.8	m/s	6.76	Pass
Probe Acceleration	38	47	g's	41.4	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	36.2	Pass
Acetabulum Force	3600	4300	N	3777.4	Pass

Transducer Calibrations

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







NHTSA 300 CERT 6/2/2021

SID-11s Pelvis Plug Certification Test

Plug S/N 13967

Test Number 13441

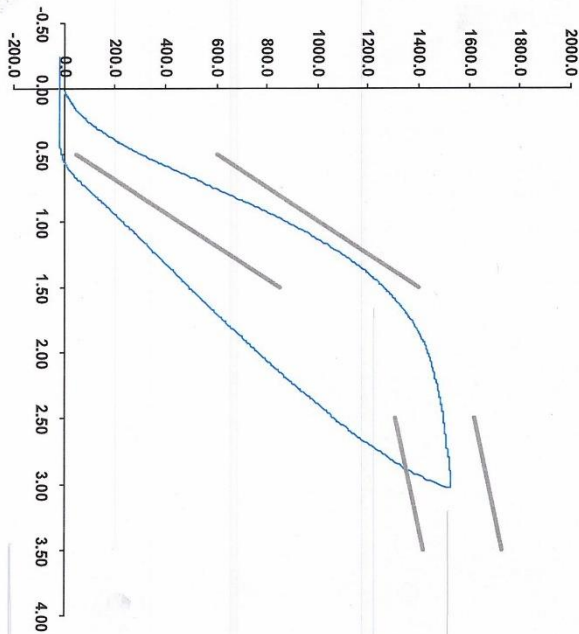
Report Number 13486

Test Date 5/22/2020 9:04:40 AM

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

Testing Machine STM-20 5965542
Load Cell S/N (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



NHTSA 300 CRASH 6/2/2022

SID-Ils Pelvis Plug Certification Test

Plug S/N 13663

Test Number 11311

Report Number 11349

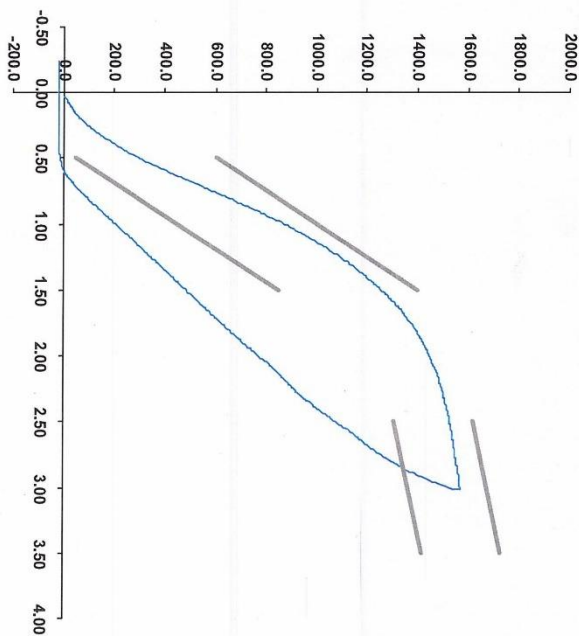
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Force (-N) vs Extension (-mm)

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	300	600
Force @ 1.5 mm (N)	1,261	1,400
Force @ 2.5 mm (N)	1,528	1,618
Force @ 3.0 mm (N)	1,570	1,673

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

Notes:



Operator

Part Number 180-4450

Template No 107 08-Jul-21
SACO Research

By: _____ Date: _____

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



NHTSA 300 Non-Impact 6/2/2022

SID-Ils Pelvis Plug Certification Test

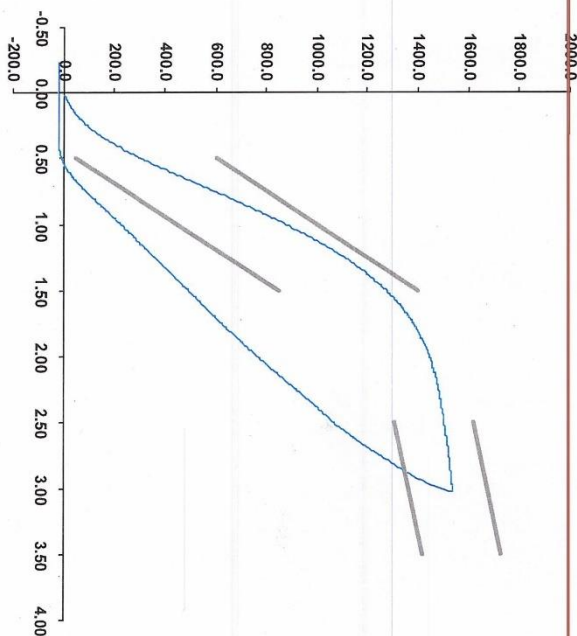
Force (-N) vs Extension (-mm)

Plug S/N 13891
Test Number 13365
Report Number 13410
Test Date 5/20/2020 8:13:29 PM

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

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Pretload 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
SACO Research

08-Jul-21

By: _____ Date: _____

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

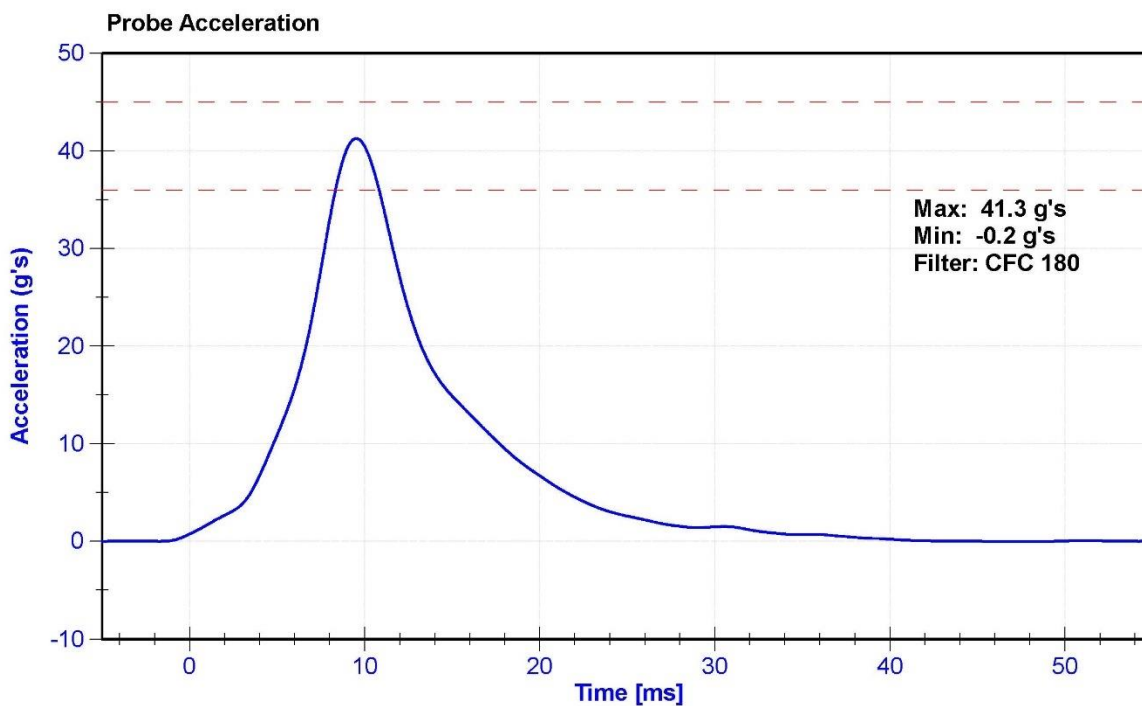
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

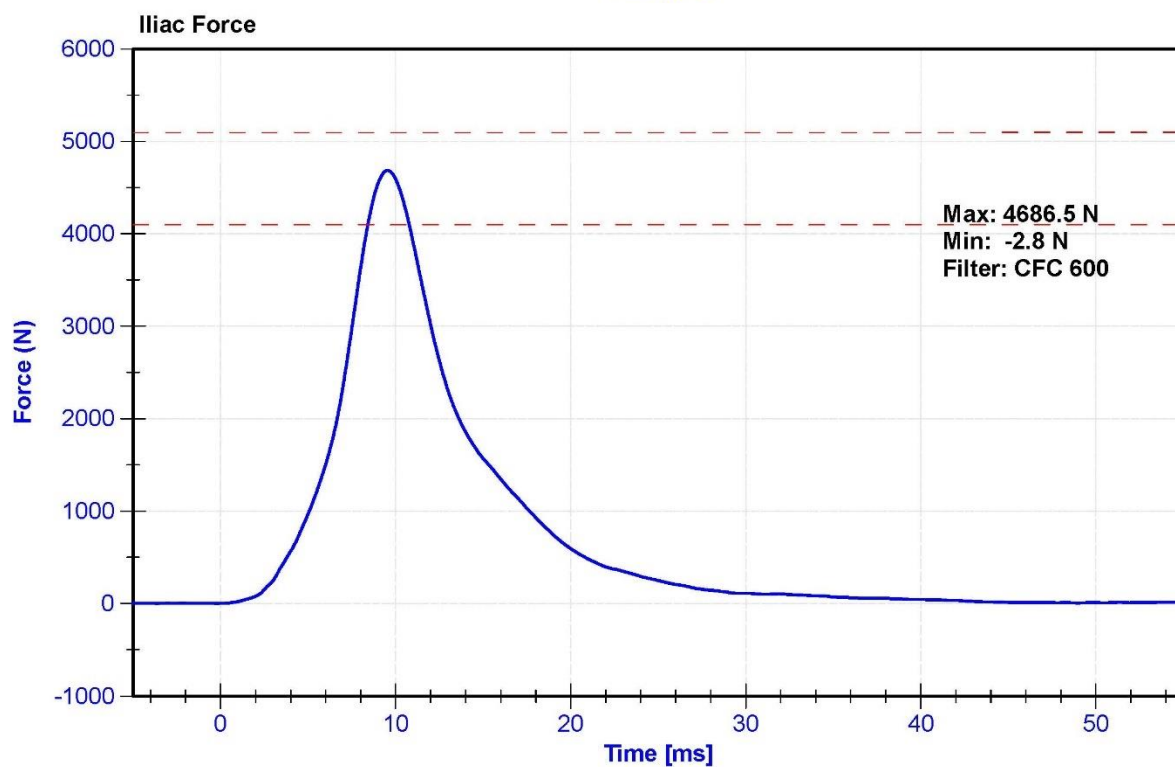
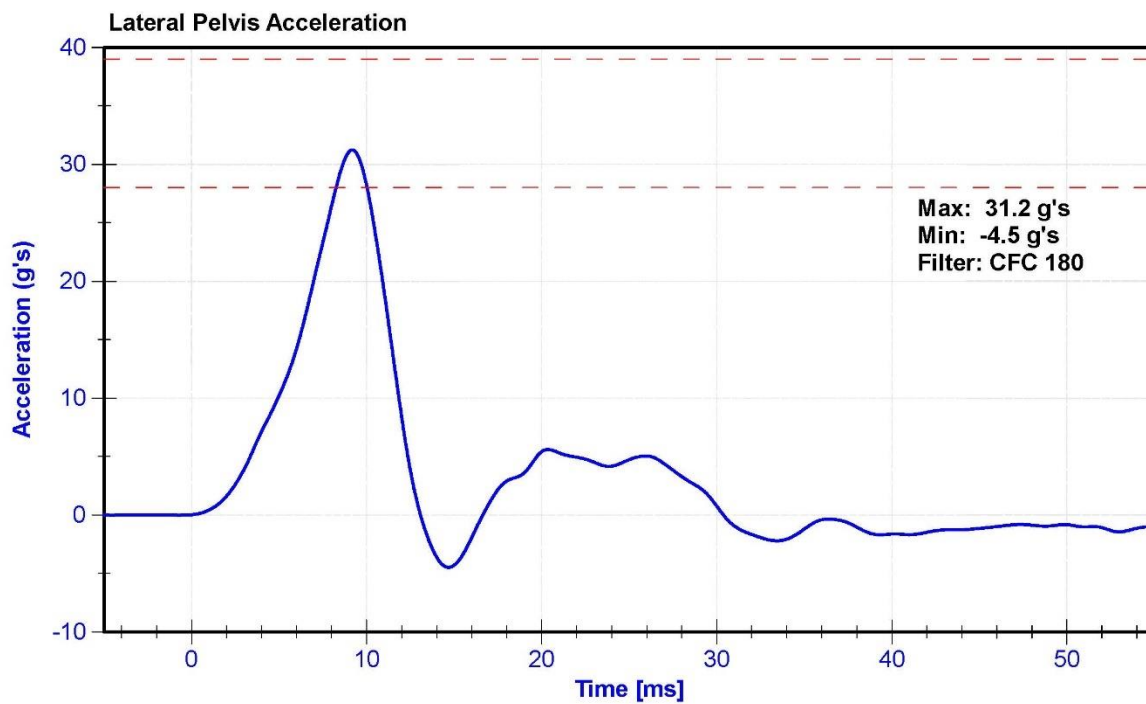
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	60.9	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	36	45	g's	41.3	Pass
Lateral Pelvis Acceleration	28	39	g's	31.2	Pass
Iliac Force	4100	5100	N	4686.5	Pass

Transducer Calibrations

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





APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (SID-IIs)

			SID-IIs S/N: 300			
			Serial Number	Manufacturer	Calibration Date	
Head Accelerometers			X	P59018	Endevco	5/17/2022
			Y	P79189	Endevco	5/17/2022
			Z	P58777	Endevco	5/17/2022
Head Accelerometers - Redundant			X	P68057	Endevco	5/17/2022
			Y	P58986	Endevco	5/17/2022
			Z	P52025	Endevco	5/17/2022
Displacement Potentiometer	Shoulder		Y			
	Thoracic Rib	Upper	Y	451GFE	Servo	5/18/2022
		Middle	Y	040GFE	Servo	5/18/2022
		Lower	Y	1156GFE	Servo	5/18/2022
	Abdominal Rib	Upper	Y	307GFE	Servo	5/20/2022
		Lower	Y	308GFE	Servo	5/18/2022
Lower Spine Accelerometers (T12)			X	P64003	Endevco	5/17/2022
			Y	P52071	Endevco	5/17/2022
			Z	P17283	Endevco	5/17/2022
Acetabulum Load Cell			Y	275-FY	Denton	9/14/2021
Lilac Wing Load Cell			Y	279-FY	Denton	9/14/2021
Pelvis Plug (Struck Side)				13904	SACO	5/20/2020
Pelvis Plug (Non-Struck Side)				13101	SACO	7/30/2019

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	A315967	Measurement	12/21/2021
Vehicle Center of Gravity	Y	A315973	Measurement	12/21/2021
Vehicle Center of Gravity	Z	A315975	Measurement	12/21/2021
Left Floor Sill	Y	A372870	Measurement	5/4/2022
A-Pillar Sill	Y	A414768	Measurement	12/24/2021
A-Pillar Low	Y	A290917	Measurement	2/10/2022
A-Pillar Mid	Y	A398306	Measurement	2/4/2022
B-Pillar Sill	Y	A315786	Measurement	4/20/2022
B-Pillar Low	Y	A291004	Measurement	4/18/2022
B-Pillar Mid	Y	A400033	Measurement	3/30/2022
Driver Seat	Y	A400005	Measurement	3/10/2022
Engine Top	X	A400022	Measurement	2/9/2022
Engine Top	Y	A400774	Measurement	2/25/2022
Firewall	Y	A413617	Measurement	12/15/2021
Right Roof	Y	A400009	Measurement	5/3/2022
Right Floor Sill	Y	A413611	Measurement	12/15/2021
Rear Floorpan	X	A399952	Measurement	4/25/2022
Rear Floorpan	Y	A405553	Measurement	4/25/2022

Table 3 – Pole Instrumentation

Pole Instrumentation	Serial Number	Manufacturer	Calibration Date
Load Cell 1	1220AF-1117023-F0	Interface	8/5/2021
Load Cell 2	1220AF-1117006-F0	Interface	8/5/2021
Load Cell 3	1220AF-1117025-F0	Interface	7/28/2021
Load Cell 4	1220AF-1117019-F0	Interface	8/2/2021
Load Cell 5	1220AF-1117011-F0	Interface	8/2/2021
Load Cell 6	1220AF-1117017-F0	Interface	8/2/2021
Load Cell 7	1220AF-1117035-F0	Interface	8/2/2021
Load Cell 8	1220AF-1057559-F0	Interface	8/2/2021