

REPORT NUMBER: SPNCAP-CAL-24-004

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

**Hyundai Motor Company
2024 Hyundai Ioniq 5
5 Door SUV**

NHTSA No: O20244206

**PREPARED BY:
CALSPAN CORPORATION
P.O. BOX 400
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October 23, 2024

FINAL REPORT

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

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number 693JJ920D000016.

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Vanessa Hansen, Test Engineer

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. SPNCAP-CAL-24-004		2. Government Accession No.		3. Recipient's Catalog No.																												
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Pole Testing & FMVSS 305 Indicant Testing of a 2024 Hyundai Ioniq 5 5 Door SUV NHTSA No.: O20244206				5. Report Date October 23, 2024																												
				6. Performing Organization Code CAL																												
7. Author(s) Claire Hejaily, Test Engineer Vanessa Hansen, Test Engineer				8. Performing Organization Report No. CAL-DOT-2024-004																												
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225				10. Work Unit No.																												
				11. Contract or Grant No. 693JJ920D000016																												
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave., SE Washington, D.C. 20590				13. Type of Report and Period Covered: Final Test Report February 21, 2024 - October 23, 2024																												
				14. Sponsoring Agency Code NRM-110																												
15. Supplementary Notes																																
16. Abstract A 32.20 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject 2024 Hyundai Ioniq 5 5 Door 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 February 21, 2024. The impact velocity of the vehicle was 32.29 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 224 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.DG8012)</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>349.359</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>G</td> <td>82</td> <td>42.931</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>2384.687</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38</td> <td>23.268</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45*</td> <td>24.754</td> </tr> </tbody> </table>						Measurement Description	Driver ATD (SID-IIs) (Serial No.DG8012)			Units	Threshold	Result	Head Injury Criteria (HIC36)		1000	349.359	Resultant Lower Spine Acceleration	G	82	42.931	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2384.687	Maximum Thoracic Rib Deflection	mm	38	23.268	Maximum Abdominal Rib Deflection	mm	45*	24.754
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The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.																																
17. Key Words New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs				18. Distribution Statement <u>Copies of this report are available from:</u> National Highway Traffic Safety Administration Technical Information Services Division, 1200 New Jersey Ave. SE Washington, D.C. 20590																												
19. Security Class. (of this report) UNCLASSIFIED		20. Security Class. (of this page) UNCLASSIFIED		21. No. of Pages 153	22. Price																											

Form DOT F1700.7 (8-72)

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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY 2024 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. 693JJ920D000016. The purpose of this test is to generate comparative side impact performance in a 2024 Hyundai Ioniq 5 5 Door 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 2024 Hyundai Ioniq 5 5 Door SUV. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.29 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 21, 2024. 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 (HIC36)		1000	349.359
Resultant Lower Spine Acceleration	G	82	42.931
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2384.687
Maximum Thoracic Rib Deflection	mm	38	23.268
Maximum Abdominal Rib Deflection	mm	45*	24.754

*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
Front Airbag	Yes	No		
Knee Airbag	No	N/A		
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 - Torso/Pelvis Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other	N/A	N/A	N/A	N/A

GENERAL COMMENTS:

1. P1 serial number - DG8012

Data Anomalies:

- Left Front Sill Y Acceleration, Exceeded calibration range at 35.6 ms
- Left Sill A-Pillar Y Acceleration, Exceeded calibration range at 49 ms 53.4 ms
- Left Sill B-Pillar Y Acceleration, Exceeded calibration range at 44.8 ms
- Left Middle B-Pillar Y Acceleration, Exceeded calibration range and saturated at 13.1 ms
- Left Front Sill Y Acceleration, Exceeded calibration range at 35.6 ms
- Left Sill A-Pillar Y Acceleration, Exceeded calibration range at 49 ms 53.4 ms
- Left Sill B-Pillar Y Acceleration, Exceeded calibration range at 44.8 ms
- Left Middle B-Pillar Y Acceleration, Exceeded calibration range and saturated at 13.1 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: 2024 Hyundai Ioniq 5 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
Test Date: 02/21/2024

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20244206	Traction Control System (TCS)	Yes
Model Year	2024	Auto-Leveling System	No
Make	Hyundai	Automatic Door Locks (ADL)	Yes
Model	Ioniq 5	Power Window Auto-Reverse	Yes
Body Style	SUV	Other Optional Feature	N/A
VIN	KM8KM4DB8RU252306	Driver Front Airbag	Yes
Body Color	Atlas White	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	12 miles	Driver Head/Torso Airbag	No
Engine Displacement (L)	N/A	Driver Torso Airbag	No
Type / No. Cylinders	Electric Vehicle	Driver Torso / Pelvis Airbag	Yes
Engine Placement	N/A	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	No
Transmission Speeds	Direct Drive	Rear Pass. Curtain Airbag	Yes
Overdrive	Yes	Rear Pass. Head / Torso Airbag	No
Final Drive	Rear Wheel Drive	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso / Pelvis Airbag	Yes
Sunroof / T-Top	No	Rear Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioner	Yes
Power Seats	Yes	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	Yes
		Other Safety Restraint	N/A

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

No

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company	GVWR (KG)	2395
Date of Manufacture	OCT/2023	GAWR Front (KG)	1280
Vehicle Type	MPV	GAWR Rear (KG)	1370

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	N/A	5
Vehicle Capacity Weight (VCW) (kg)				430
DSC x 68.0 kg				340
Cargo Weight (RCLW) (kg)				90

(A)

(B)

(A-B)

VEHICLE SEAT TYPE

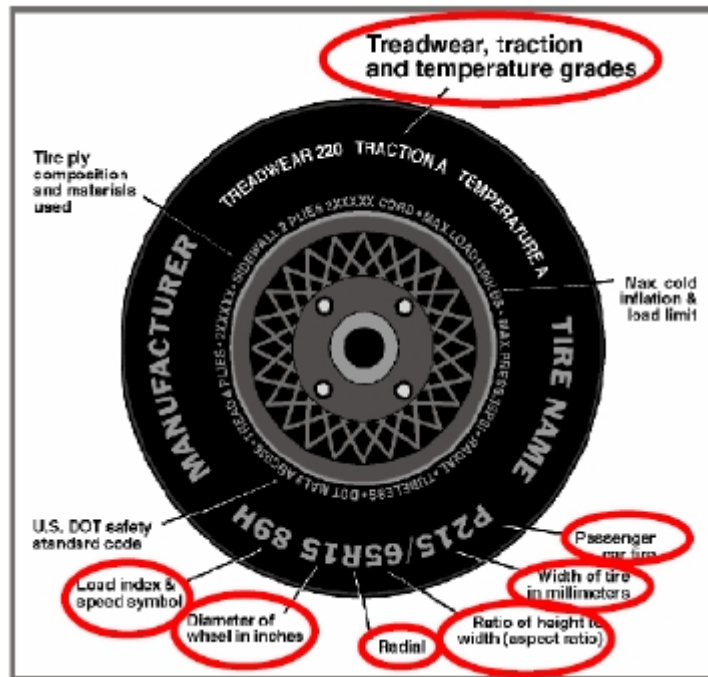
Seating Location	Type Of Seat Pan				Type Of Seat Back		
	Bucket	Bench	Split Bench	Contour	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front	X						X
Rear or Second Row Seat			X			X	
Third Row seat	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024

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)	250	250
Recommended Tire Size	235/55R19	235/55R19
Tire Size on Vehicle	235/55R19	235/55R19
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy	Primacy
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	1B98F0BLX2123	1B98F0BLX2123
DOT Safety Code Right	1B98F0BLX2123	1B98F0BLX2223

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

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	281	283	274	280
Tire Placard	kPa	250	250	250	250
Owner's Manual	kPa	250	250	250	250
As Tested	kPa	250	250	250	250

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	448	480		478	526		474	545	
Right	kg	457	470		475	511		466	513	
Ratio	%	48.8	51.2		47.9	52.1		47.0	53.0	
Totals	kg	905	950	1855	953	1037	1990	940	1058	1998

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1855	(A)
Actual Weight of 1 P572V (SID-IIs) ATD Used	kg	50	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	90	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1995	(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	+0.40	+0.35	+0.10	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg	+0.25	+0.25	+0.25	Yes
Front Bumper-Line Angle (left-to-right)**	Deg	+0.20	+0.35	+0.35	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg	+0.05	+0.15	+0.25	Yes
Vehicle CG (Aft of Front Axle)	mm	1538	1565	1591	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	0	-7	-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: 2024 Hyundai Ioniq 5 5 Door SUV	NHTSA No.: O20244206
Test Program: NCAP Side Pole Impact Test	Test Date: 02/21/2024

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	21
Undercarriage cover	2
Right Rear Window	3
Ballast / Equipment Added	31.8

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

TEST SURFACE MARKING

	Distance from 75° Impact Location Line (mm)
Fore 25 mm target	979
Aft 25 mm target	977

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

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024

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	20.9	12.6	16.8
Front Passenger Seat	16.7	13.6	15.2
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	16.8	16.8	Max	73	79	85
			Mid	39	45	51
			Min	6	12	18
Front Passenger Seat	15.2	15.2	Max	-	-	-
			Mid	-	-	-
			Min	9	16	22
Front Center Seat*			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max			
			Mid			
			Min			
Non-Struck Side Rear Seat	Fixed	Fixed	Max			
			Mid			
			Min			
Rear Center Seat*	Fixed	Fixed	Max			
			Mid			
			Min			

*If applicable

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

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV

NHTSA No.: O20244206

Test Program: NCAP Side Pole Impact Test

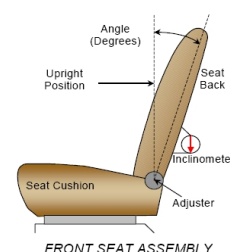
Test Date: 02/21/2024

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	64.6	Power	-8.0	Power
Front Passenger Seat	60.4	31 (0-30)	-8.3	5
Front Center Seat				
Struck Side Rear Seat	32.5	16 (0-15)	-3.3	0
Non-Struck Side Rear Seat	32.5	16 (0-15)	-3.3	0
Rear Center Seat	32.5	16 (0-15)	-3.3	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)	0

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)	Lowermost

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

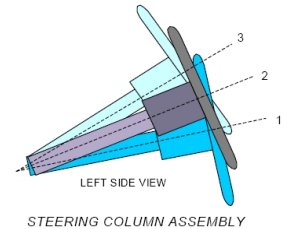
Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024

STEERING COLUMN POSITIONS

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.

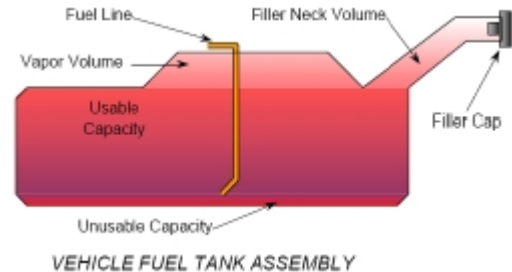
	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	23.5	
Geometric center position No. 2	26.0	
Uppermost position No. 3	28.4	
Telescoping Steering Wheel Travel		54
Test Position	26.0	27



FUEL PUMP

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

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



FUEL TANK CAPACITY

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

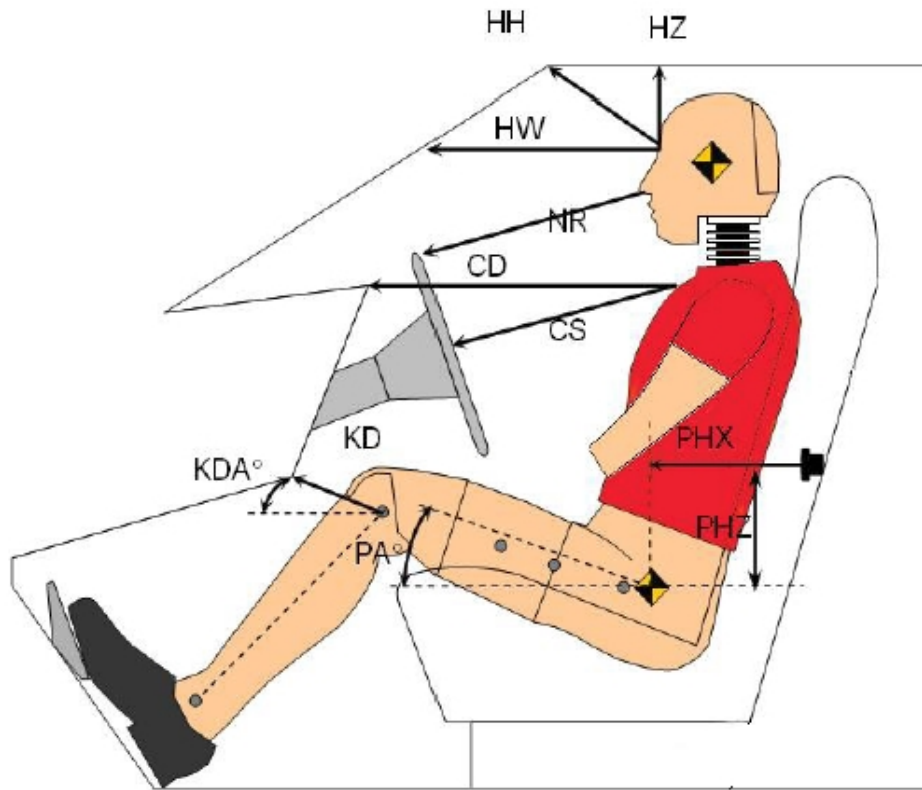
Is the Actual Amount of Solvent Used in the test equal to 93% $\pm$ 1% of the Usable

Capacity stated in Form No. 1? ☐ Yes ☐ No ☒ N/A

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024



Left Side View

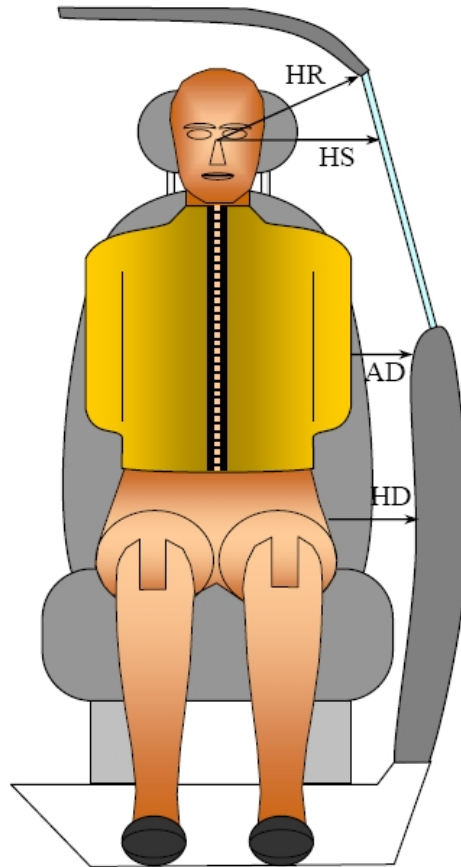
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver (Serial No. DG8012)	
		Length (mm)	Angle (°)
HH	Head to Header	287	
HW	Head to Windshield	605	
HZ	Head to Roof Liner	201	
NR	Nose to Rim	259	
CD	Chest to Dash	461	
CS	Chest to Steering Wheel	185	
KD(L) / KDA(L)°	Left Knee to Dash	106	29.6
KD(R) / KDA(R)°	Right Knee to Dash	104	29.2
PAX°	Pelvic Tilt Angle (X-Axis)		0.4
PAY°	Pelvic Tilt Angle (Y-Axis)		21.8
PHX	Hip Point to Striker (X-Axis)	396	
PHZ	Hip Point to Striker (Z-Axis)	144	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
Test Date: 02/21/2024



FRONT VIEW OF DUMMY

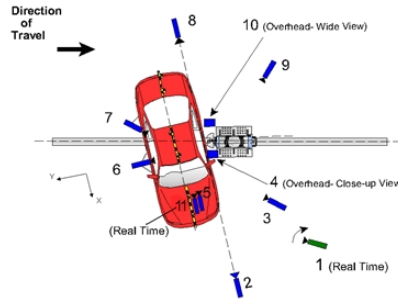
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver – Length (Serial No. DG8012)
HR	Head to Side Header	mm	269
HS	Head to Side Window	mm	399
AD	Arm to Door	mm	184
HD	H-Point to Door	mm	205

DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
Test Date: 02/21/2024



CAMERA LOCATIONS AND DATA

No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-time (24 - 30 fps) pan view of impact				Zoom	60
2	Front ground level - impact view	7084	0	-1570	28	1000
3	Impact side 45° - forward pole view	4822	-800	-1530	24	1000
4	Overhead Close-up view of impact	0	0	-9375	28	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	-8948	0	-1534	28	1000
9	Impact side 45° - rearward pole view	-4791	-3894	-1447	24	1000
10	Overhead wide - view of impact	0	0	-9375	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.

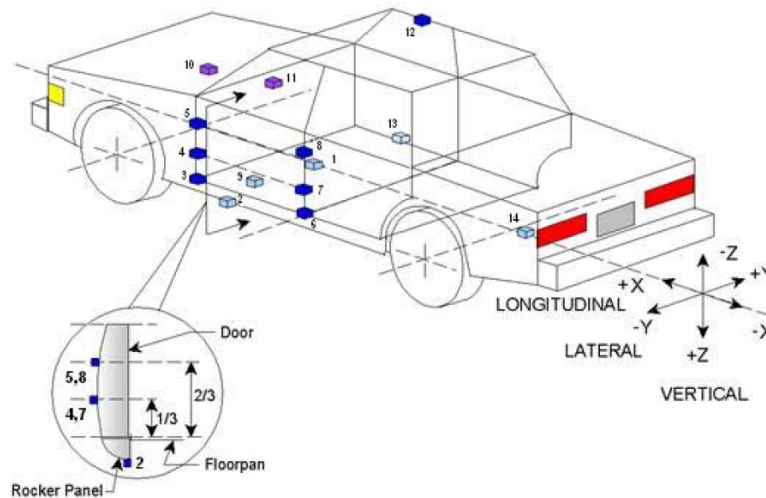
INSTRUMENTATION

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

DATA SHEET NO. 6 **TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
Test Date: 02/21/2024



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	1835	-6	527
2	Left Floor Sill	2787	-672	470
3	A-Pillar Sill	3198	-657	471
4	A-Pillar Low	3247	-651	251
5	A-Pillar Mid	3149	-687	-224
6	B-Pillar Sill	2151	-669	461
7	B-Pillar Low	2126	-676	88
8	B-Pillar Mid	2078	-683	-222
9	Seat	2449	-569	485
10	Engine	3828	-79	266
11	Firewall	3492	350	40
12	Roof	1996	609	-712
13	Right Floor Sill	2812	672	471
14	Rear Deck	726	51	275

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: 2024 Hyundai Ioniq 5 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
Test Date: 02/21/2024

POLE BARRIER



RIGID POLE LOAD CELL LOCATION

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: 2024 Hyundai Ioniq 5 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
Test Date: 02/21/2024

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	Seat Pan & Torso/Pelvis Airbag
Left Knee	Driver Door Trim

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: 2024 Hyundai Ioniq 5 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
Test Date: 02/21/2024

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar & C-Pillar Buckled
Sill Separation	None
Windshield Damage	Cracked Throughout
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
Front Airbag	Yes	No		
Knee Airbag	No	N/A		
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 - Torso/Pelvis Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other	N/A	N/A	N/A	N/A

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		1144
Actual Impact Point - Aft of Front Axle	mm		1144
Horizontal Offset (+ forward / - rearward)	mm		0
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	deg	+/- 3°	75
Trap No. 1 Velocity - Primary	kph	+/- 0.8 kph	32.29
Trap No. 2 Velocity - Redundant	kph	+/- 0.8 kph	32.38

*Of Intended Impact Point

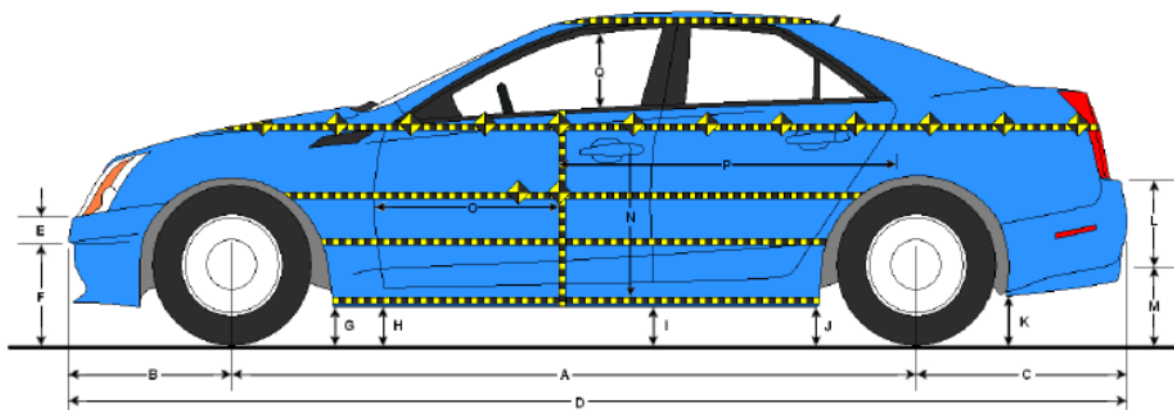
DATA SHEET NO. 9
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV

NHTSA No.: O20244206

Test Program: NCAP Side Pole Impact Test

Test Date: 02/21/2024



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

No.	Measurement Description	Pre-Test	Post-Test	Change
A	Vehicle Wheelbase	3004	2985	-19
B	Front Axle to FSOV	846	852	6
C	Rear Axle to RSOV	785	788	3
D	Total Vehicle Length at Centerline	4634	4625	-9
E	Front Bumper Thickness	120	120	0
F	Front Bumper Bottom to Ground	262	252	-10
G	Sill Height at Front Wheel Well	186	183	-3
H	Sill Height at Front Door Leading Edge	187	183	-4
I	Sill Height at B Pillar	190	202	12
J1	Sill Height at Rear Wheel Well	194	262	68
J2	Pinch Weld Height at Rear Wheel Well	185	196	11
K	Sill Height Aft of Rear Wheel Well	253	260	7
L	Rear Bumper Thickness	189	189	0
M	Rear Bumper Bottom to Ground	512	510	-2
N	Sill Height to Window Bottom Sill	851	852	1
O	Front Door Leading Edge to Impact CL	616	583	-33
P	Rear Door Trailing Edge to Impact CL	1730	1703	-27
Q	Front Window Opening	409	403	-6
R	Right Side Length	4561	4560	-1
S	Left Side Length	4561	4547	-14
T	Vehicle Width at B-Pillars	1876	1849	-27
U	Front Wheel Track width	1635	1635	0
V	Rear Wheel Track Width	1645	1645	0

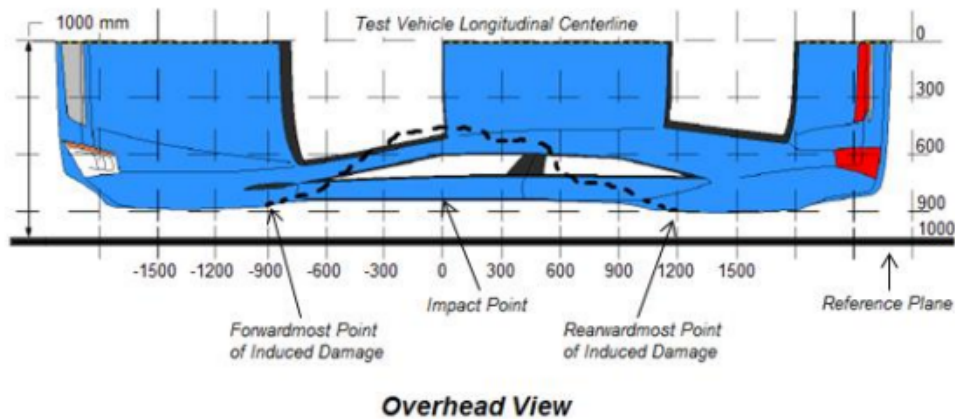
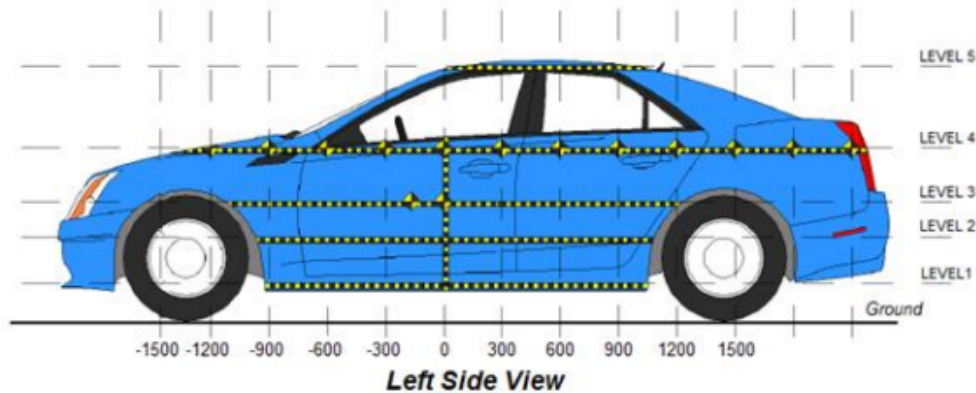
* All measurements in mm with tolerance of ± 3 mm

DATA SHEET NO.10 TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
Test Date: 02/21/2024

MAXIMUM EXTERIOR CRUSH MEASUREMENTS



Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	289	166	0
2	Occupant H-Point	mm	652	224	0
3	Mid-Door	mm	752	221	0
4	Window Sill	mm	1020	177	0
5	Window Top	mm	1520	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: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

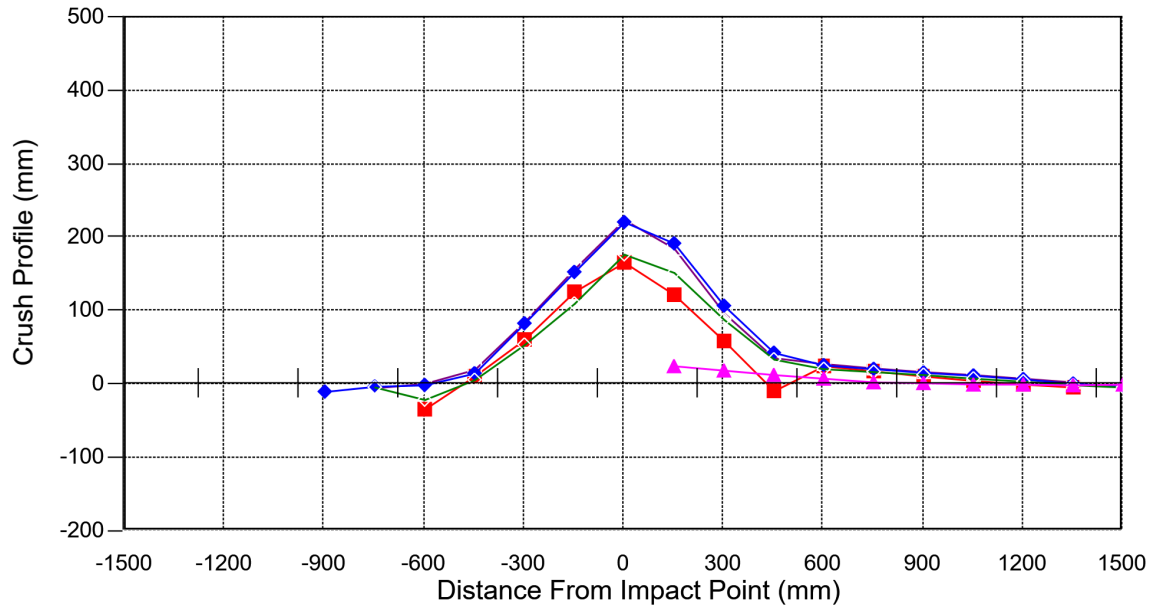
	Pre-Test					Post-Test					Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500															
-1350															
-1200															
-1050															
-900			946					956					-10		
-750		948	934	829			953	937	833			-5	-3	-4	
-600	928	930	922	841		962	929	923	862		-34	1	-1	-21	
-450	928	925	917	849		917	905	902	843		11	20	15	6	
-300	928	923	916	856		867	838	833	802		61	85	83	54	
-150	928	922	914	863		802	765	761	753		126	157	153	110	
0	926	920	917	869		760	696	696	692		166	224	221	177	
150	922	916	919	875	621	800	731	727	723	596	122	185	192	152	25
300	919	913	921	880	633	860	816	814	792	614	59	97	107	88	19
450	914	916	924	884	639	923	880	881	850	626	-9	36	43	34	13
600	909	919	925	888	642	884	891	899	867	634	25	28	26	21	8
750	904	920	926	890	642	886	898	905	873	639	18	22	21	17	3
900	898	922	927	893	641	887	905	911	880	639	11	17	16	13	2
1050	891	924	928	893	638	886	911	916	885	638	5	13	12	8	0
1200	892	925	928	893	631	892	917	921	889	631	0	8	7	4	0
1350	901	927	928	890	615	905	924	927	891	616	-4	3	1	-1	-1
1500			935	887	593			938	891	593			-3	-4	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: 2024 Hyundai Ioniq 5 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
Test Date: 02/21/2024



Vehicle Exterior Crush Measurements - Visual Representation

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

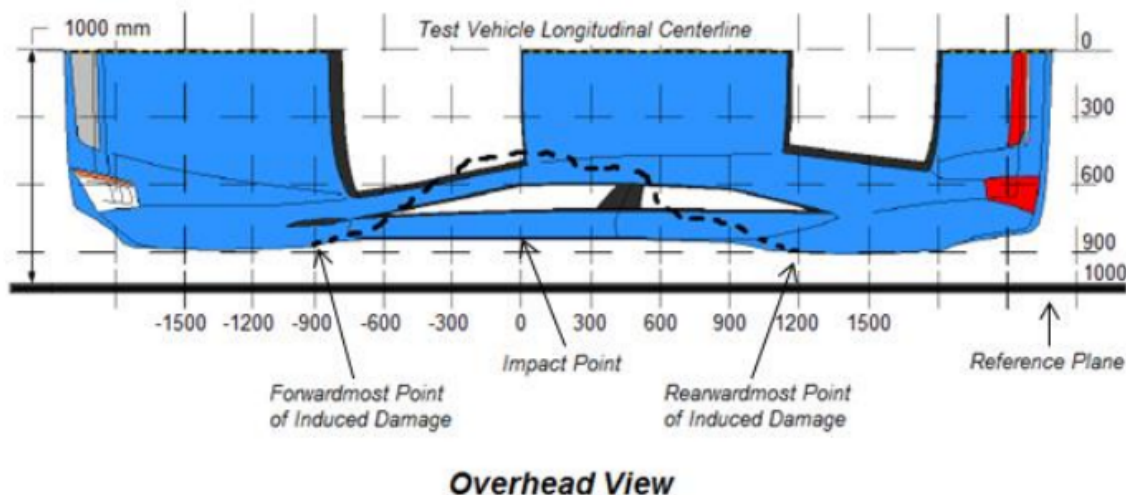
Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV

NHTSA No.: O20244206

Test Program: NCAP Side Pole Impact Test

Test Date: 02/21/2024

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



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-900	3	44	54	-10
2	-420	3	112	83	29
3	60	3	292	82	210
4	540	3	108	75	33
5	1020	3	85	72	13
6	1500	3	62	65	-3

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

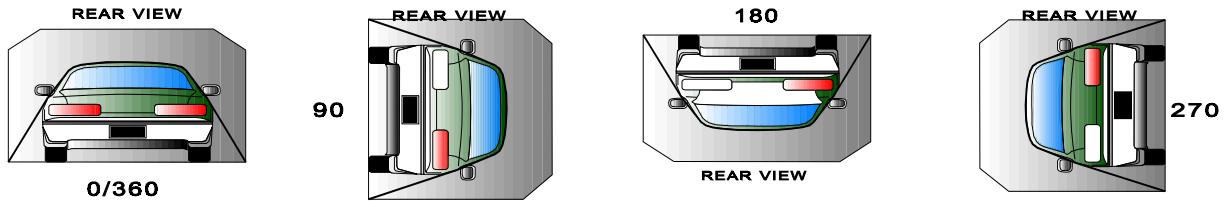
Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024

Test Time: 10:25 AM

Temperature: 21 °C

- A. From impact until vehicle motion ceases: N/A oz
 (Maximum allowable is 1 oz.)
- B. For the 5-minute period after motion ceases: N/A oz
 (Maximum allowable is 5 oz.)
- C. For the following 25 minutes: N/A oz
 (Maximum allowable is 1 oz.)
- D. Spillage Detail: Electric Vehicle



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°			
90° to 180°			
180° to 270°			
270° to 360°			

FMVSS 301 SPILLAGE TABLE

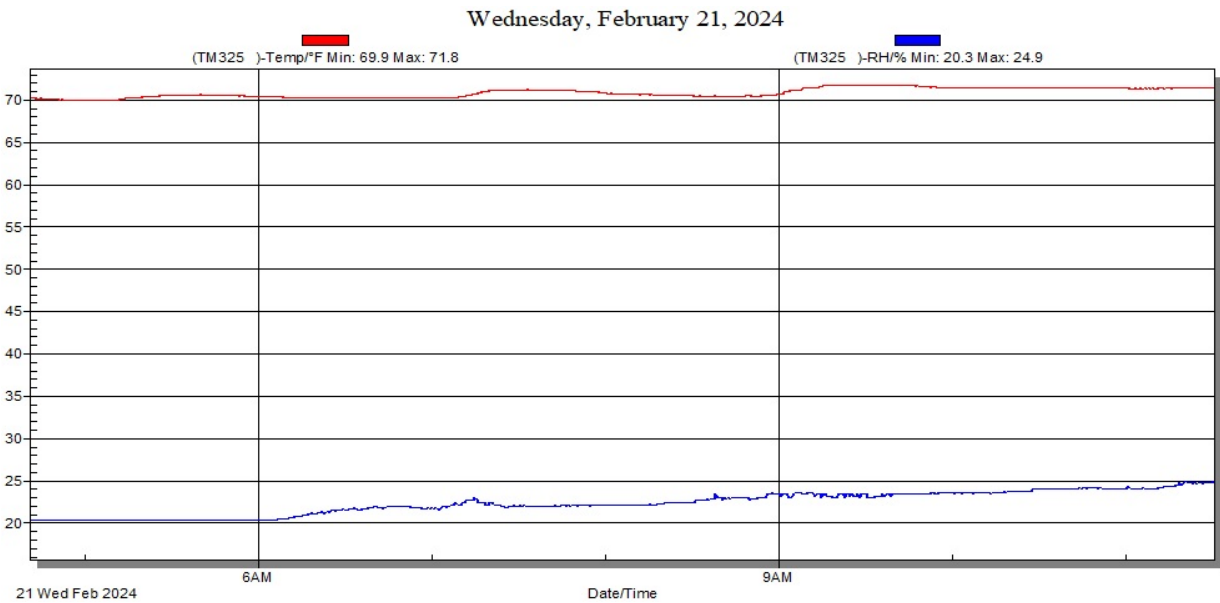
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°				
90° to 180°				
180° to 270°				
270° to 360°				

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

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

Test Vehicle: <u>2024 Hyundai Ioniq 5 5 Door SUV</u>	NHTSA No.: <u>O20244206</u>
Test Program: <u>NCAP Side Pole Impact Test</u>	Test Date: <u>02/21/2024</u>



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: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Electric
Propulsion Battery Type	Lithium-ion Polymer
Nominal Voltage (Volts)	697
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

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°
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

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	591.1
<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.
 Battery charge indicator on vehicle instrumentation cluster showed that SOC was at 98%.

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

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
Test Date: 02/21/2024

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

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Chassis ground is located on underside of vehicle body.
Details of Propulsion Battery Components	Additional high voltage system diagram provided in FMVSS 305 Form1.

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

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		51800115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		6/20/2024

NOTES:

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

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

Measured Parameter	Symbol	Units	Value
Normal operating voltage range specified by the manufacturer	V_b	V	480-826
Propulsion Battery Voltage: (ready to drive position)	V_b	V	591.1
Propulsion Battery to Vehicle Chassis	V_1	V	320.0
Propulsion Battery to Vehicle Chassis	V_2	V	320.0
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	300,000
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	7.7
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	7.8
$R_{i1} = R_o * (1 + V_2/V_1) * [(V_1 - V_1')/V_1']$	R_{i1}	Ω	24,335,065
$R_{i2} = R_o * (1 + V_1/V_2) * [(V_2 - V_2')/V_2']$	R_{i2}	Ω	24,015,385
Lesser value of R_{i1} and R_{i2}	R_i	Ω	24,015,385
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	40,628

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: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		51800115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Calibration Date		06/20/2024

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 _b =	13.9	V	Time:	2	Minutes	0	Seconds
V ₁ =	3.1	V	Time:	2	Minutes	8	Seconds
V ₂ =	10.1	V	Time:	2	Minutes	12	Seconds
R _o =	300,000	Ω					
V ₁ ' =	0.1	V	Time:	2	Minutes	16	Seconds
V ₂ ' =	0.5	V	Time:	2	Minutes	20	Seconds
R _{i1} =	38,322,581	Ω	Time:	2	Minutes	16	Seconds
R _{i2} =	7,527,921	Ω	Time:	2	Minutes	20	Seconds
R _i =	7,527,921	Ω/V	Time:	2	Minutes	20	Seconds
R _i /V _b =	541,577	Ω/V	Time:	2	Minutes	20	Seconds

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

NOTES:

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

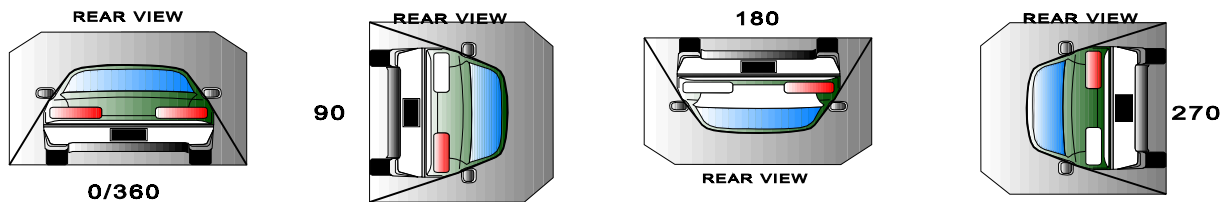
PROPULSION BATTERY SYSTEM COMPONENTS

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

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

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024



Rear View

DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Rollover Stage	Rotation Time (spec. 1 -3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval Minutes
	Minutes	Seconds	Minutes	Minutes	Seconds	
0° to 90°	1	16	5	6	16	7
90° to 180°	1	6	5	6	6	7
180° to 270°	1	8	5	6	8	7
270° to 360°	1	8	5	6	8	7

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

Rollover Stage	Propulsion Battery Electrolyte Spillage	Units	Spillage Location
0° to 90°	0	Liters	No Spillage
90° to 180°	0	Liters	No Spillage
180° to 270°	0	Liters	No Spillage
270° to 360°	0	Liters	No Spillage
Total Spillage	0	Liters	No Spillage

* 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.		51800115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Calibration Date		06/20/2024

NOTES:

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

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

Test Vehicle: 2024 Hyundai Ioniq 5 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244206
 Test Date: 02/21/2024

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units	$R_o=300,000 \Omega$	Minutes	Seconds
$V_b =$	90°	13.9	V	Time:	1	12
	180°	13.9	V		7	46
	270°	13.9	V		14	16
	360°	13.9	V		20	34
$V_1 =$	90°	5.5	V	Time:	1	26
	180°	5.0	V		8	2
	270°	5.8	V		14	29
	360°	5.8	V		20	45
$V_2 =$	90°	7.7	V	Time:	1	31
	180°	7.4	V		8	8
	270°	7.4	V		14	33
	360°	7.3	V		20	48
$V_1' =$	90°	0.5	V	Time:	1	36
	180°	0.4	V		8	14
	270°	0.5	V		14	37
	360°	0.5	V		20	51
$V_2' =$	90°	0.6	V	Time:	1	41
	180°	0.7	V		8	20
	270°	0.7	V		14	41
	360°	0.6	V		20	54
$R_{i1} =$	90°	7,200,000	Ω	Time:	1	36
	180°	8,556,000	Ω		8	14
	270°	7,237,241	Ω		14	37
	360°	7,182,414	Ω		20	51
$R_{i2} =$	90°	6,085,714	Ω	Time:	1	41
	180°	4,811,583	Ω		8	20
	270°	5,122,008	Ω		14	41
	360°	6,011,644	Ω		20	54
$R_i =$	90°	6,085,714	Ω	Time:	1	41
	180°	4,811,583	Ω		8	20
	270°	5,122,008	Ω		14	41
	360°	6,011,644	Ω		20	54
$R_i/V_b =$	90°	437,821	Ω/V	Time:	1	41
	180°	346,157	Ω/V		8	20
	270°	368,490	Ω/V		14	41
	360°	432,492	Ω/V		20	54

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

X

Yes

No (Fail)

APPENDIX A
PHOTOGRAPHS

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O20244206

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



O20244206

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

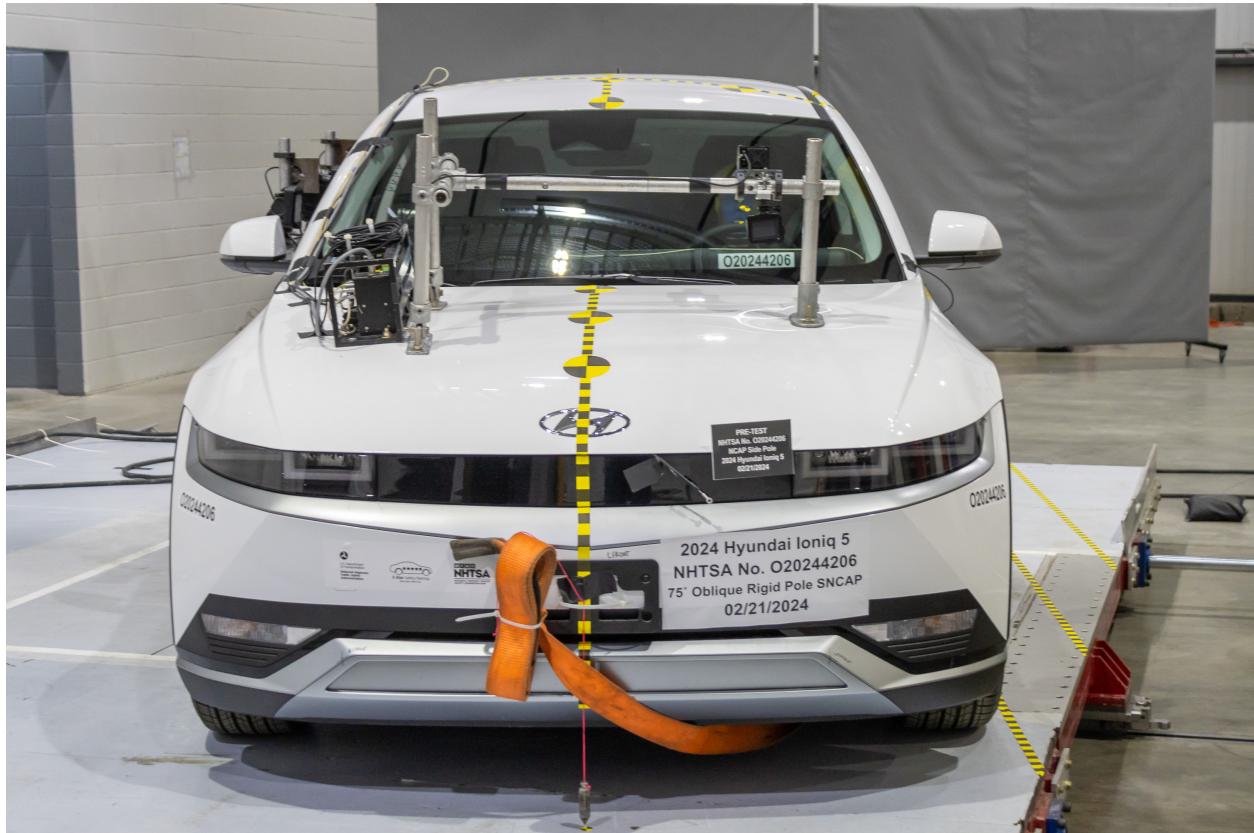


Figure A-3: Pre-Test Frontal View of Test Vehicle

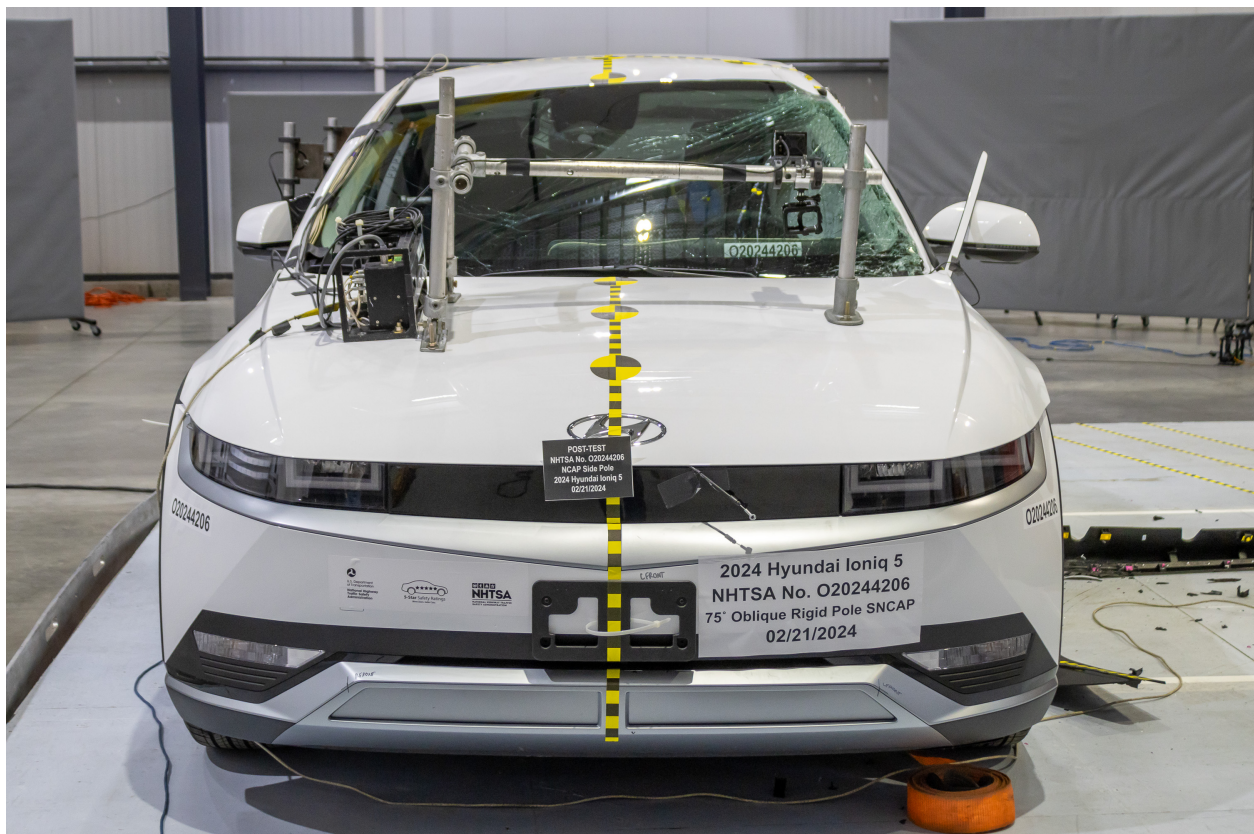


Figure A-4: Post-Test Frontal View of Test Vehicle



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

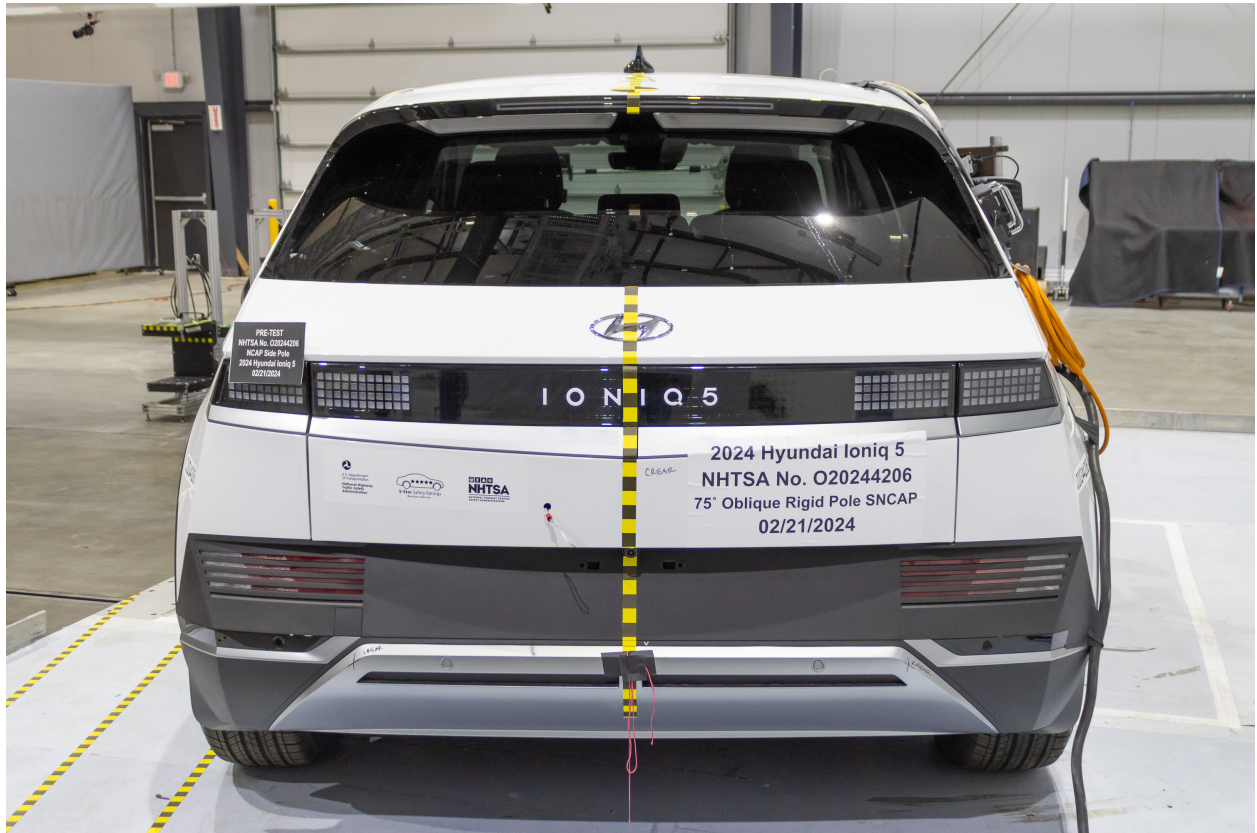


Figure A-11: Pre-Test Rear View of Test Vehicle

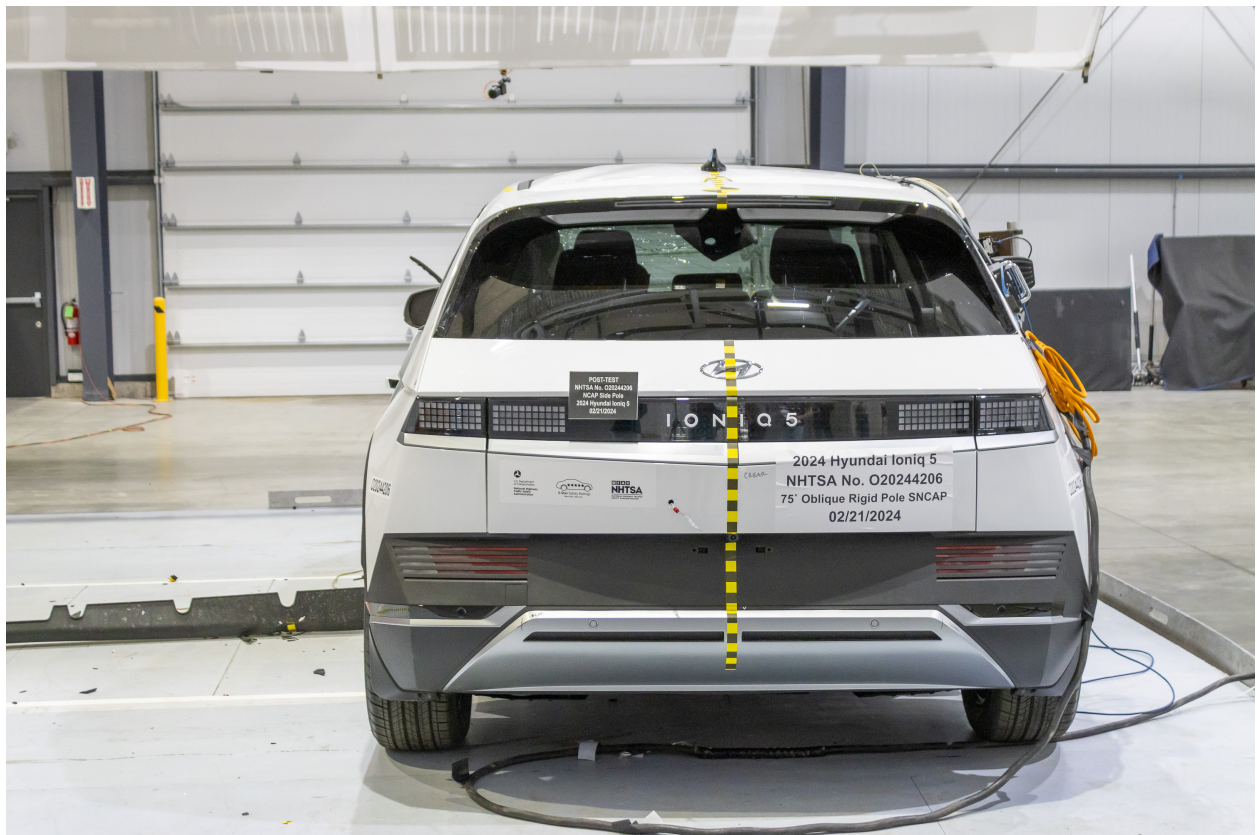


Figure A-12: Post-Test Rear View of Test Vehicle



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



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

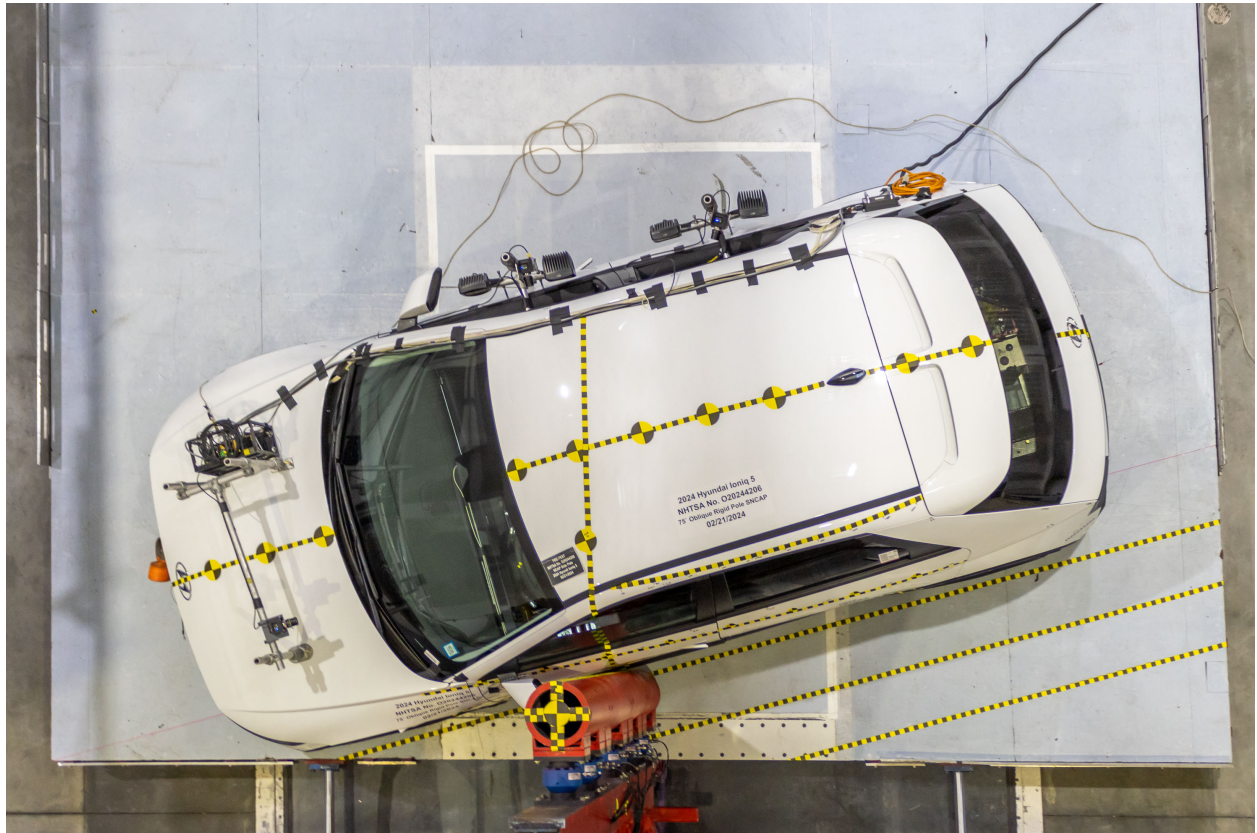


Figure A-15: Pre-Test Overhead View of Test Area

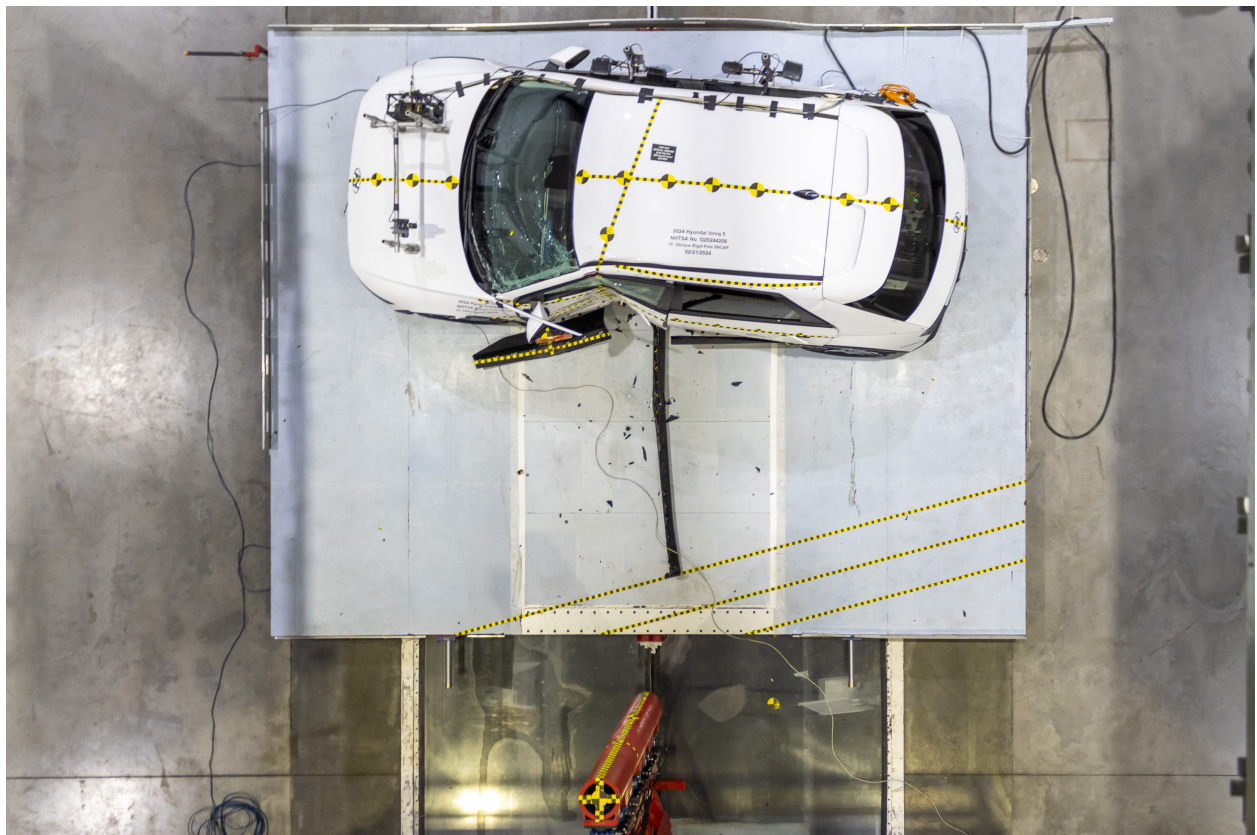


Figure A-16: Post-Test Overhead View of Test Area



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

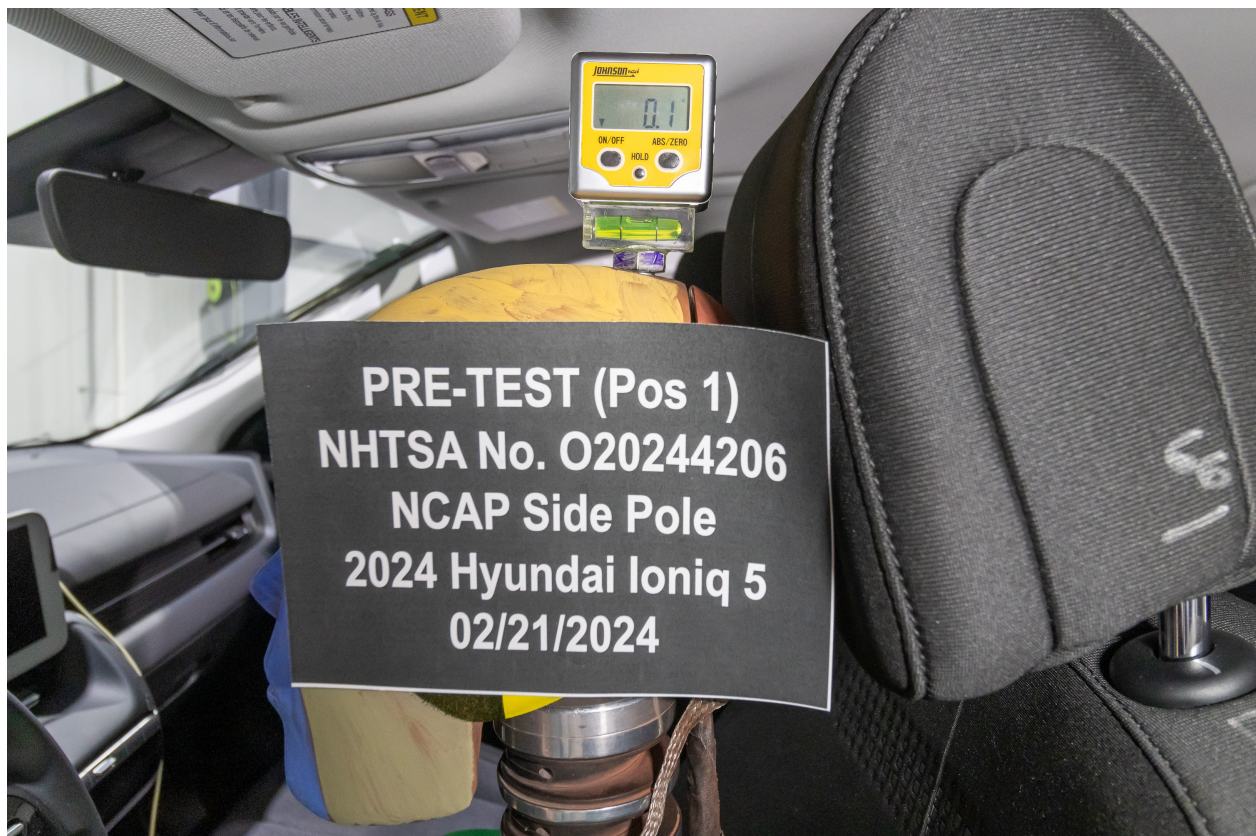


Figure A-31: Pre-Test Left Side View of Dummy's Head Showing Dummy's Head is Level



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

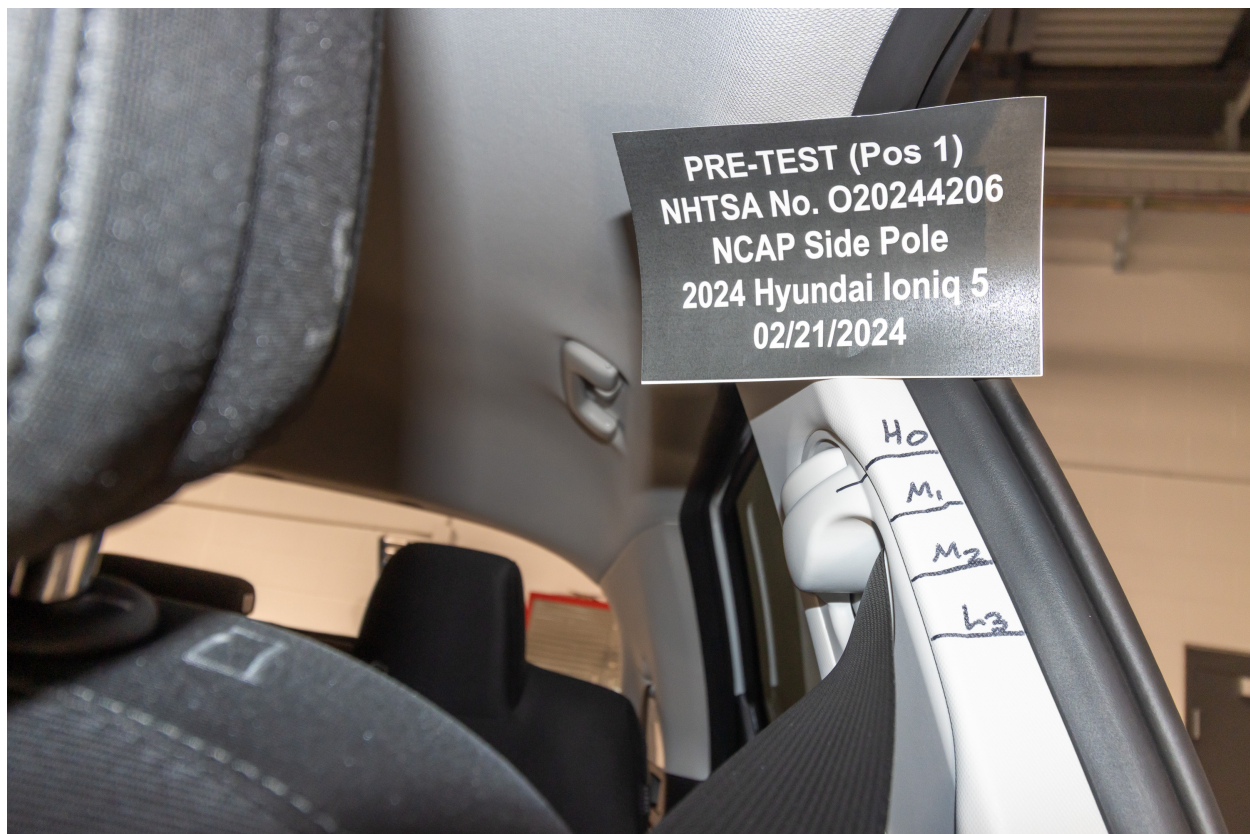


Figure A-33: Pre-Test View of Belt Anchorage for Dummy



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



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

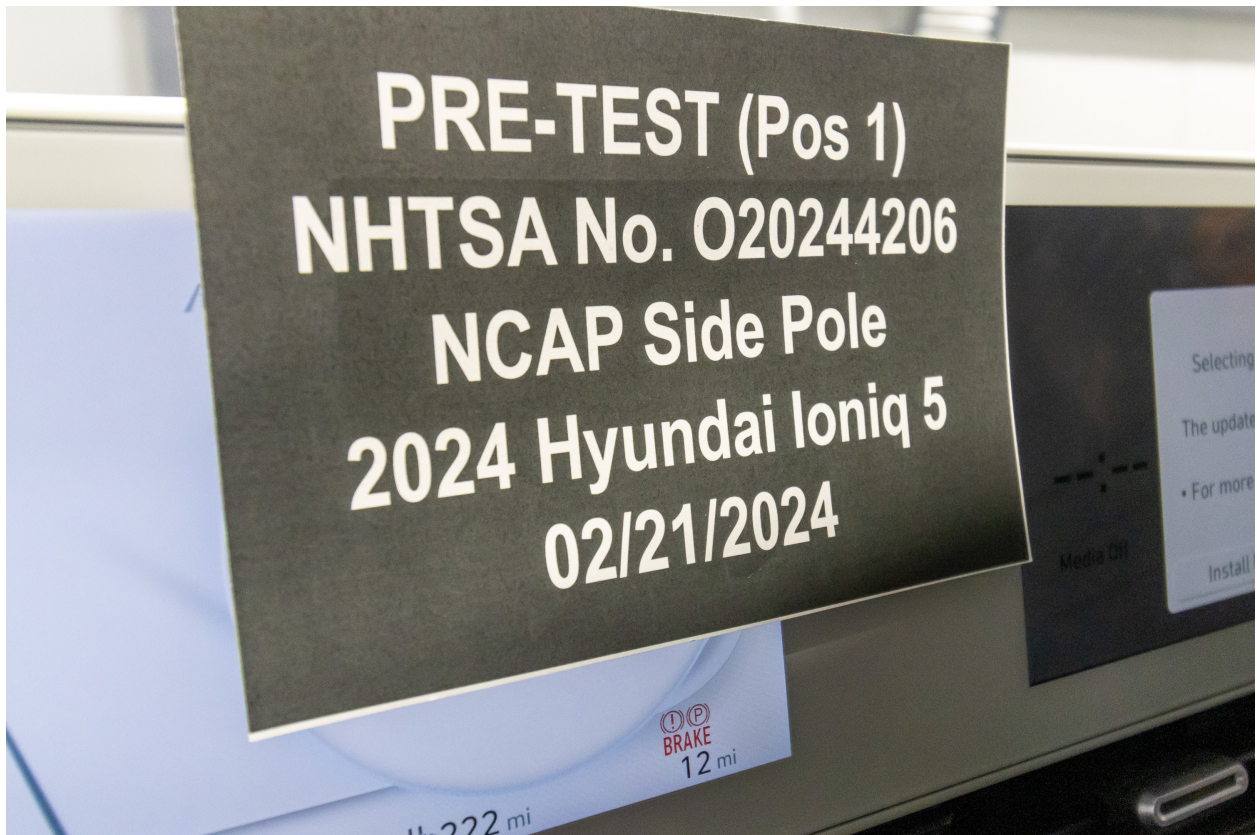


Figure A-36: Pre-Test View of Parking Brake



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

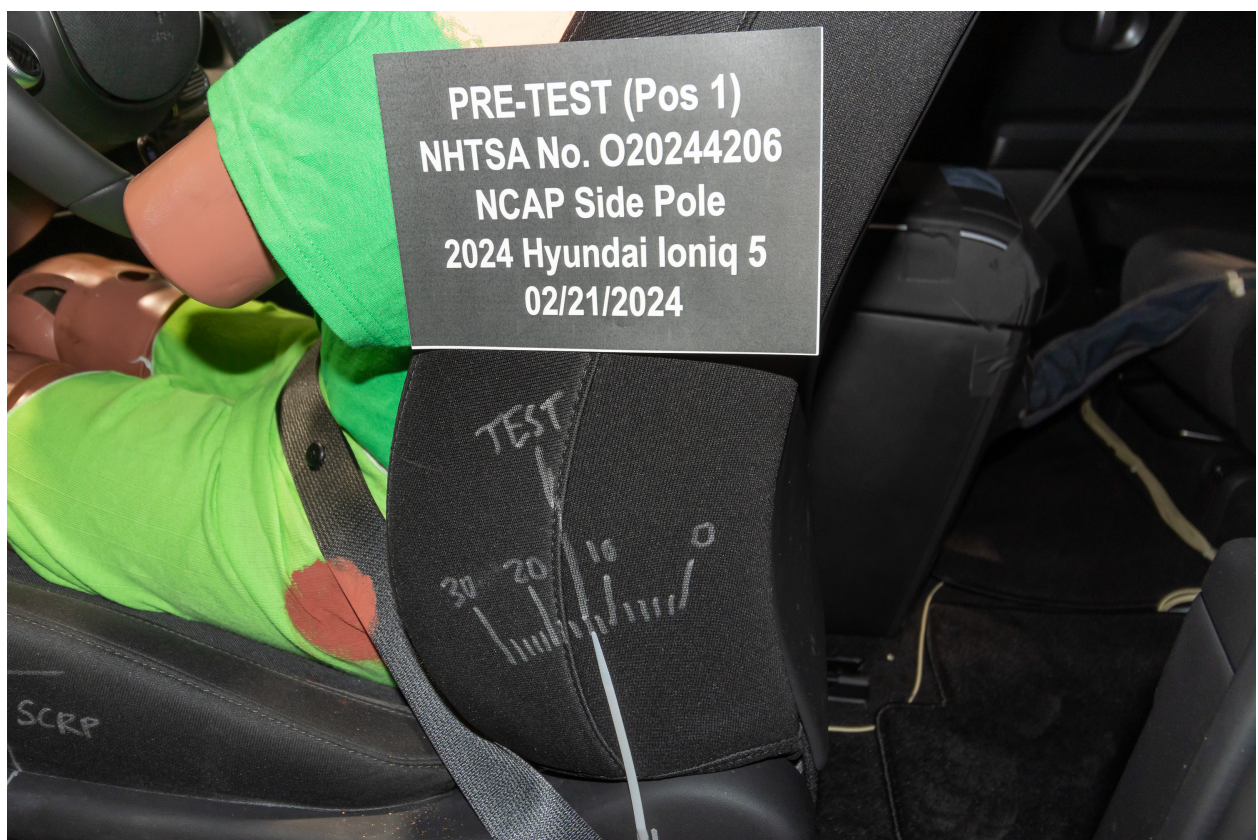


Figure A-38: Pre-Test Close-Up Left Side View of Driver Seat Back



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 Charging Port

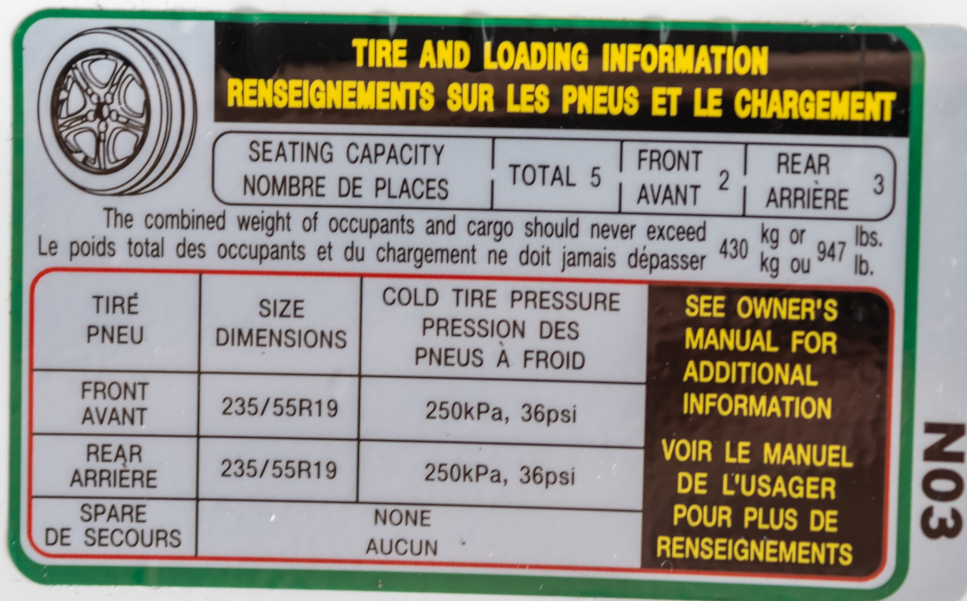


Figure A-56: Post-Test Charging Port



O20244206

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



O20244206

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



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

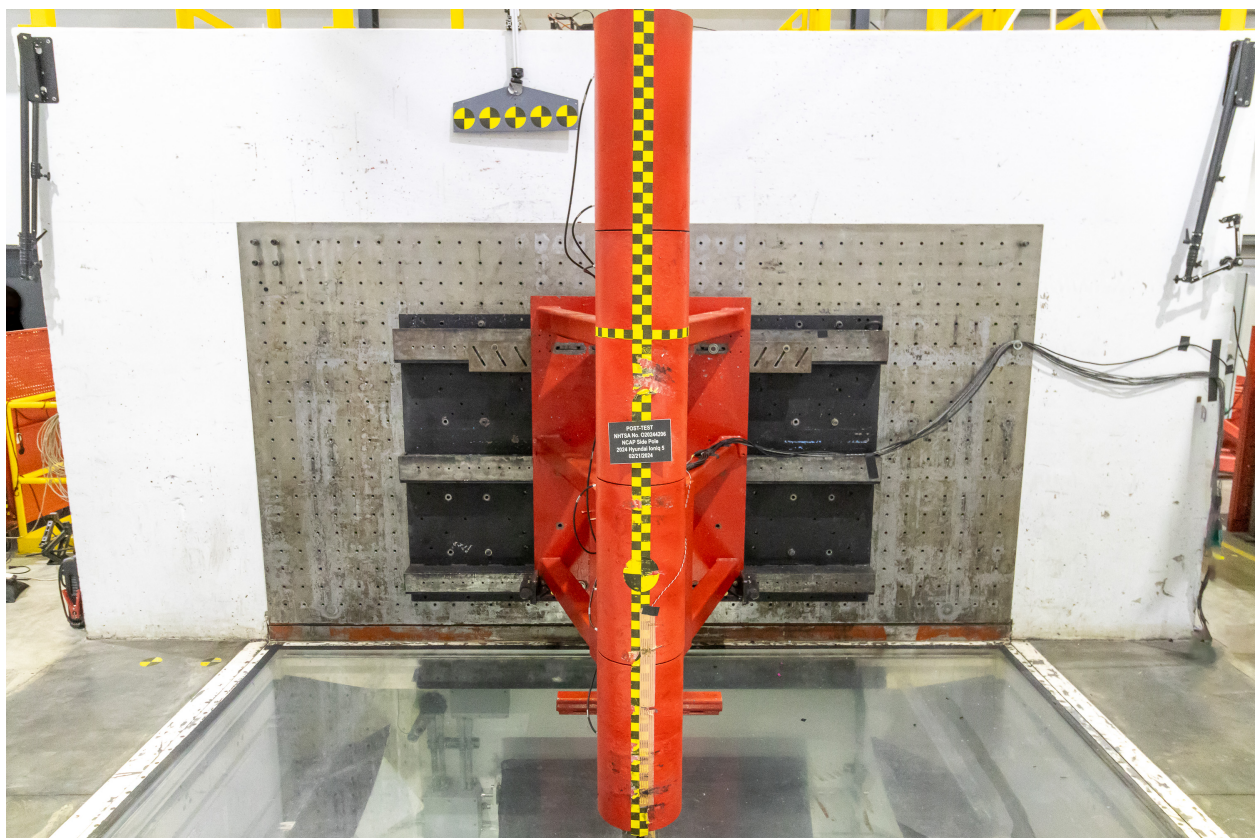


Figure A-60: Post-Test Pole Barrier Front View

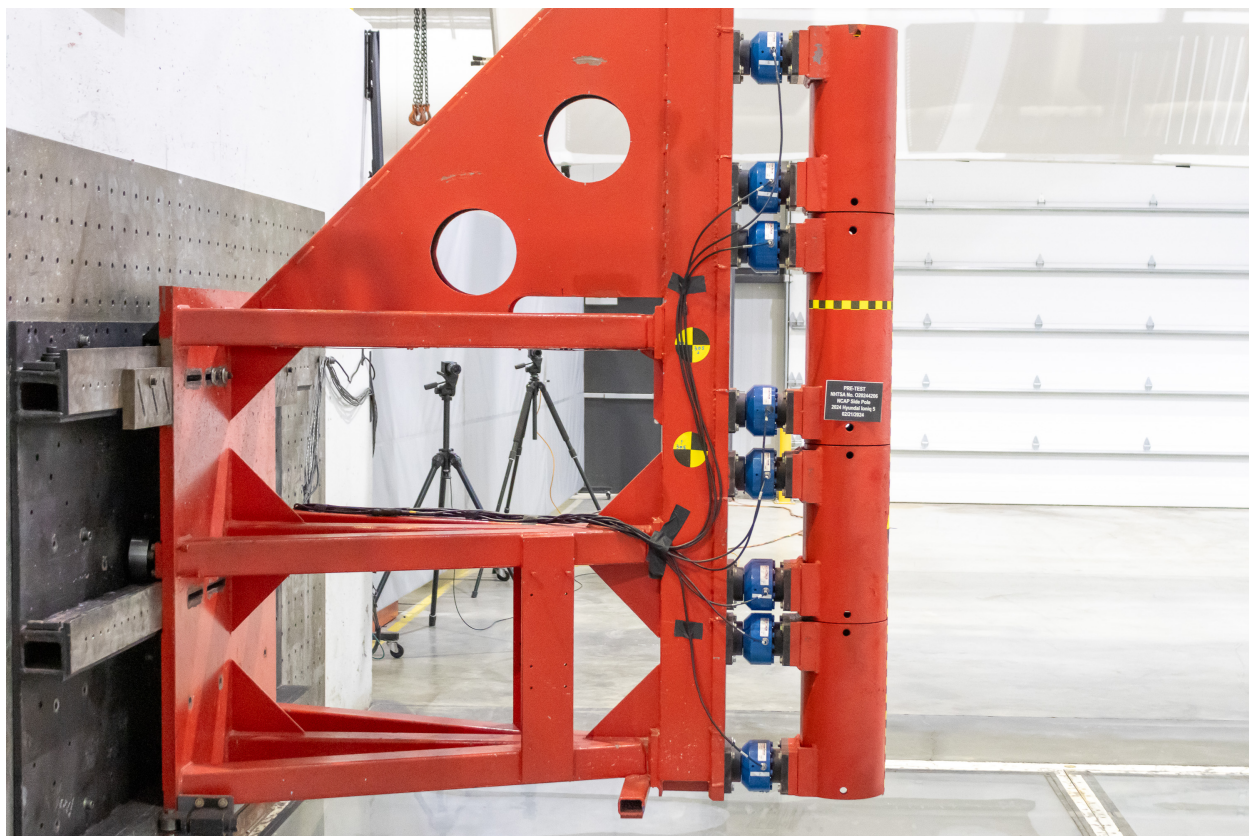


Figure A-61: Pre-Test Pole Barrier Side View

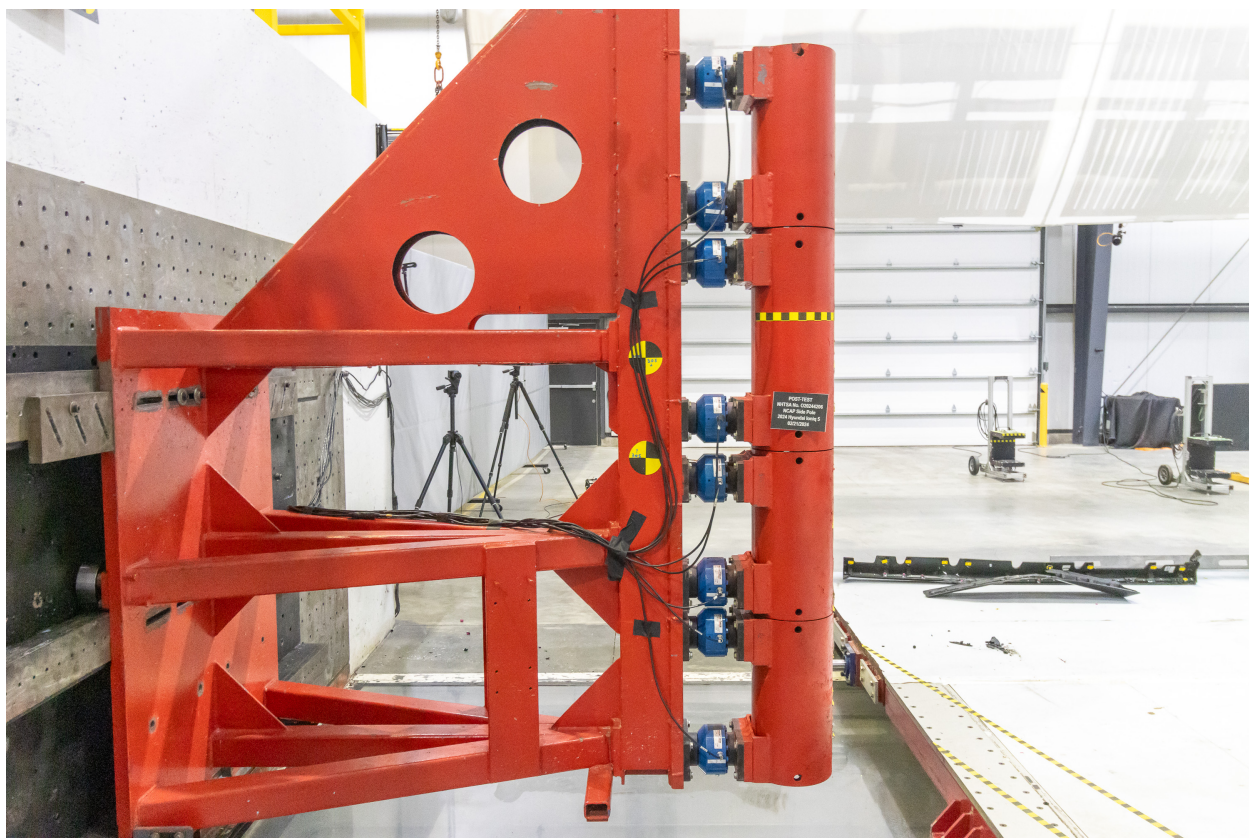


Figure A-62: Post-Test Pole Barrier Side View



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

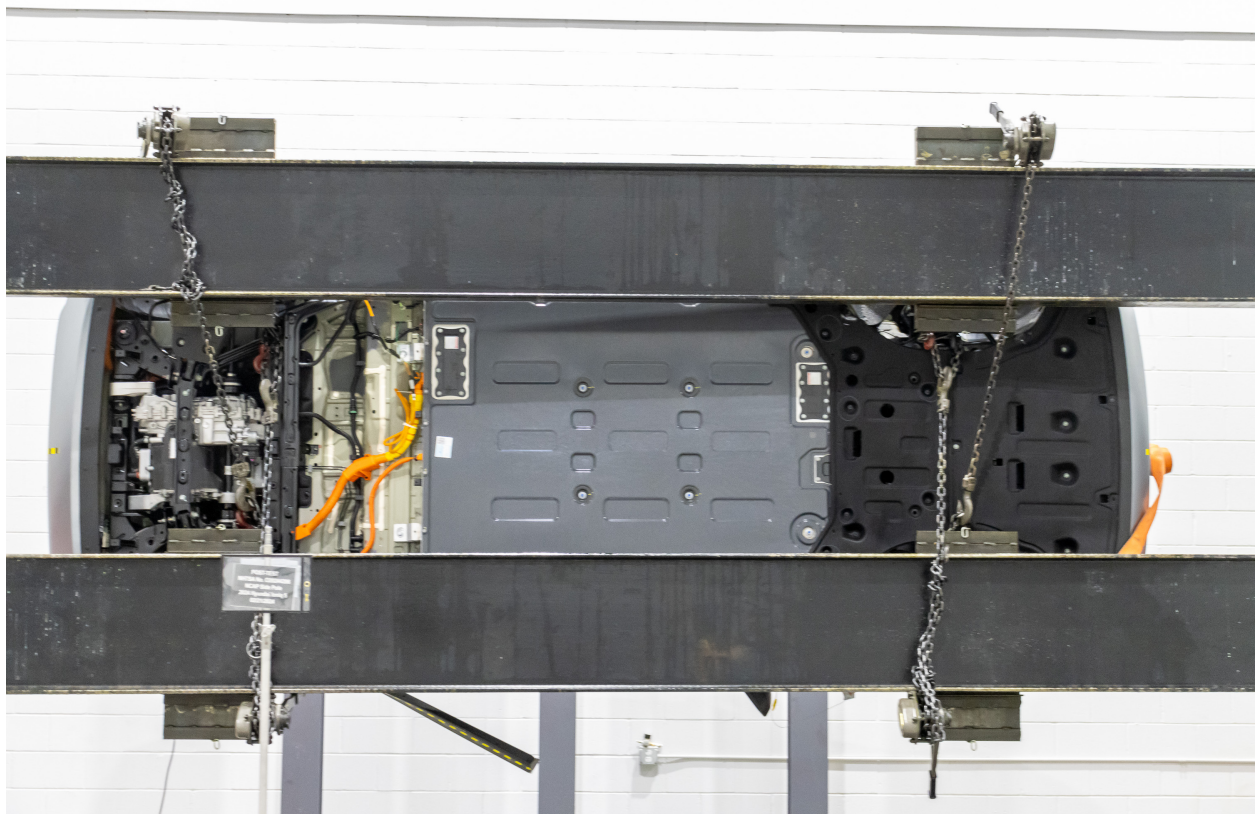


Figure A-68: FMVSS No. 301 Static Rollover 270 Degrees



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

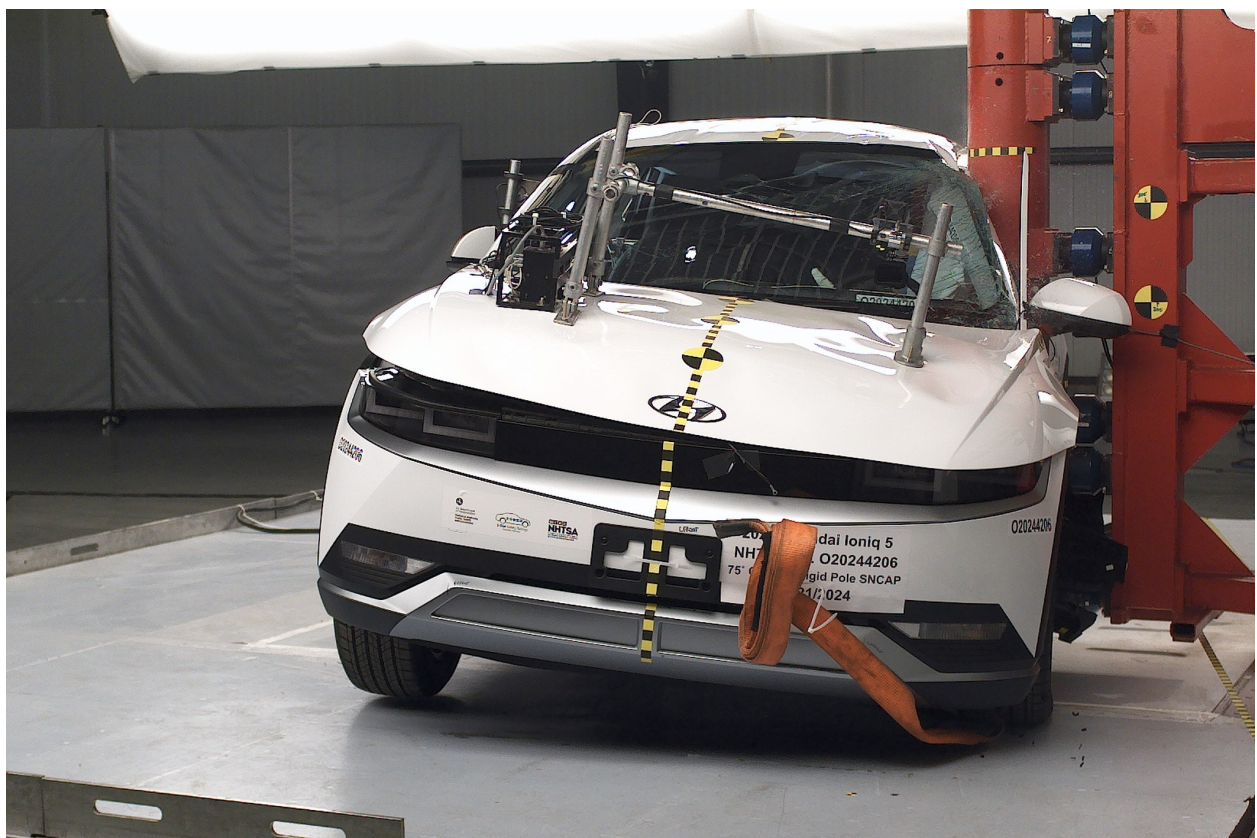


Figure A-70: Impact Event

Rated Electric SUV of 2023

Fuel Economy and Environment

Fuel Economy

110 MPGe Large Cars range from 14 to 140 MPGe. The best vehicle rates 140 MPGe.

combined city highway **127 94 31** MPGe

Driving Range **220 miles** (with 100 miles of charge)

Charge Time: 6.3 hours (slow)

You save \$6,250 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$700

Fuel Economy & Greenhouse Gas Rating (tailpipe only) **10** (Best)

Smog Rating (tailpipe only) **10** (Best)

This vehicle emits 0 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Does not include emission from generating electricity. Learn more at fuelconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 28 MPG and costs \$9,760 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$0.15 per kWh. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuelconomy.gov

Calculate personalized estimates and compare vehicles

HYUNDAI

SOLD TO: NY077
TOWN OF HYUNDAI
3525 SOUTHWESTERN BLVD.
ORCHARD PARK NY 14127

SHIPPED TO: NY077

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score **Not Rated**
Based on the combined rating of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

Crash	Driver	Passenger
★★★★	★★★★	★★★★

Side **Not Rated**
Based on the risk of injury in a side impact. Should ONLY be compared to other vehicles of similar size and weight.

Crash	Front seat	Rear seat
★★★★	★★★★	★★★★

Rollover **Not Rated**
Based on the risk of rollover in a single-vehicle crash.

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

STANDARD FEATURES:

AMERICA'S BEST WARRANTY
5-year/100,000-mile New Vehicle Warranty*
10-year/100,000-mile Powertrain Warranty*
10-year/100,000-mile Electric Vehicle System Warranty*
7-year/Unlimited-mile Anti-Perforation Warranty*
5-year/Unlimited-mile Complimentary Maintenance*
5-year/Unlimited-mile Roadside Assistance*
10-year/Unlimited-mile Complimentary Maintenance*

ADVANCED SAFETY TECHNOLOGIES
Front, Front Side, Side-Curtain, & Rear Side Airbags
Forward Collision-Avoidance Assist
Lane Keeping Assist, Lane Following Assist
Driver Attention Warning
Blind-Spot Collision-Avoidance Assist
Rear Cross-Traffic Collision-Avoidance Assist
Parking Distance Warning - Reverse
Rearview Camera
Safe Exit Assist
Immobilizer

POWERTRAIN TECHNOLOGY
Permanent Magnet Electric Motor
Lithium Ion Battery System with Preheating
DC Ultra-Fast Charging Capability
Shift-by-Wire Gear Selector
Regenerative Brake Level Control Paddles

EXTERIOR
19" Alloy Wheels
Active Grille Shutters
Automatic LED Headlights
LED Taillights and LED Daytime Running Lights

COMFORT & CONVENIENCE
Proximity Key w/ Push Button Start
Cloth-Trimmed Seats
Power Driver Seat w/ Lumbar Support
Heated Front Seats
Leather-Wrapped Steering Wheel
Smart Cruise Control
Highway Driving Assist
Dual Automatic Temperature Control
12.3" Digital Instrument Cluster
Front and Rear USB Ports
The Mobility Kit (in bed of spare tire)

MULTIMEDIA & CONNECTIVITY
12.3" Navigation System w/ AM/FM/HQ Radio(TM)

MULTIMEDIA & CONNECTIVITY(Cont.)
SiriusXM Radio w/ 90-Day trial subscription; not available in AK & HI
Android Auto(TM) & Apple CarPlay(TM)
Bluetooth® AB-Inclusive Connected Services (enrollment required)
Wi-Fi hotspot (trial with Bluetooth)
Full Battery Charge

Manufacturer's Suggested Retail Price: **\$41,650.00**

ADDED FEATURES:

*TINTED WINDOW	\$450.00
*Carpeted Floor Mats	\$210.00
*Cargo Net	\$55.00
*Charging Port Applique	\$60.00
*Cargo Mat, Up Seatback	\$120.00
*First Aid Kit	\$30.00
*Mud Guards	\$120.00
*Wheel Locks	\$70.00

Island Freight & Handling: \$1,335.00
Total Price: \$44,100.00

Manufacturer's 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 manufacturer's suggested retail price. This label has been affixed to this vehicle by Hyundai Motor America, pursuant to the requirements of 15 U.S.C. 1231 et seq. which prohibits its removal or alteration prior to delivery to the ultimate purchaser.

PARTS CONTENT INFORMATION FOR VEHICLE IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 1 %
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:
ENGINE: KOREA
TRANSMISSION: KOREA

341 A 3214GMORNI

Figure A-71: Monroney Label

3

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 sunvisor or other parts of the vehicle.

3-17

NOTICE

To prevent damage, NEVER hit or pull on the head restraints.

Front seat head restraints

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

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

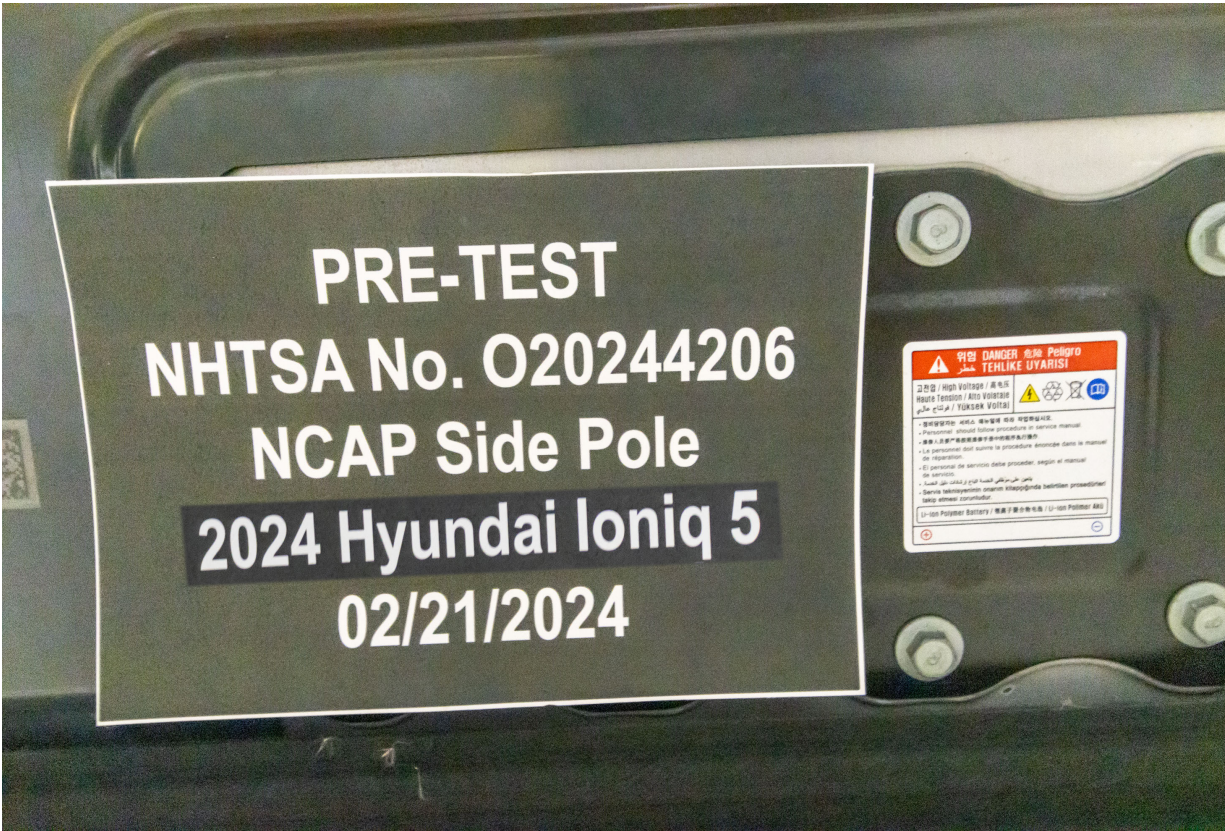


Figure 305-1: Auxiliary Power Module Warning Label



Figure 305-2: Power Inverter Warning Label



Figure 305-3 First Responder Warning Label

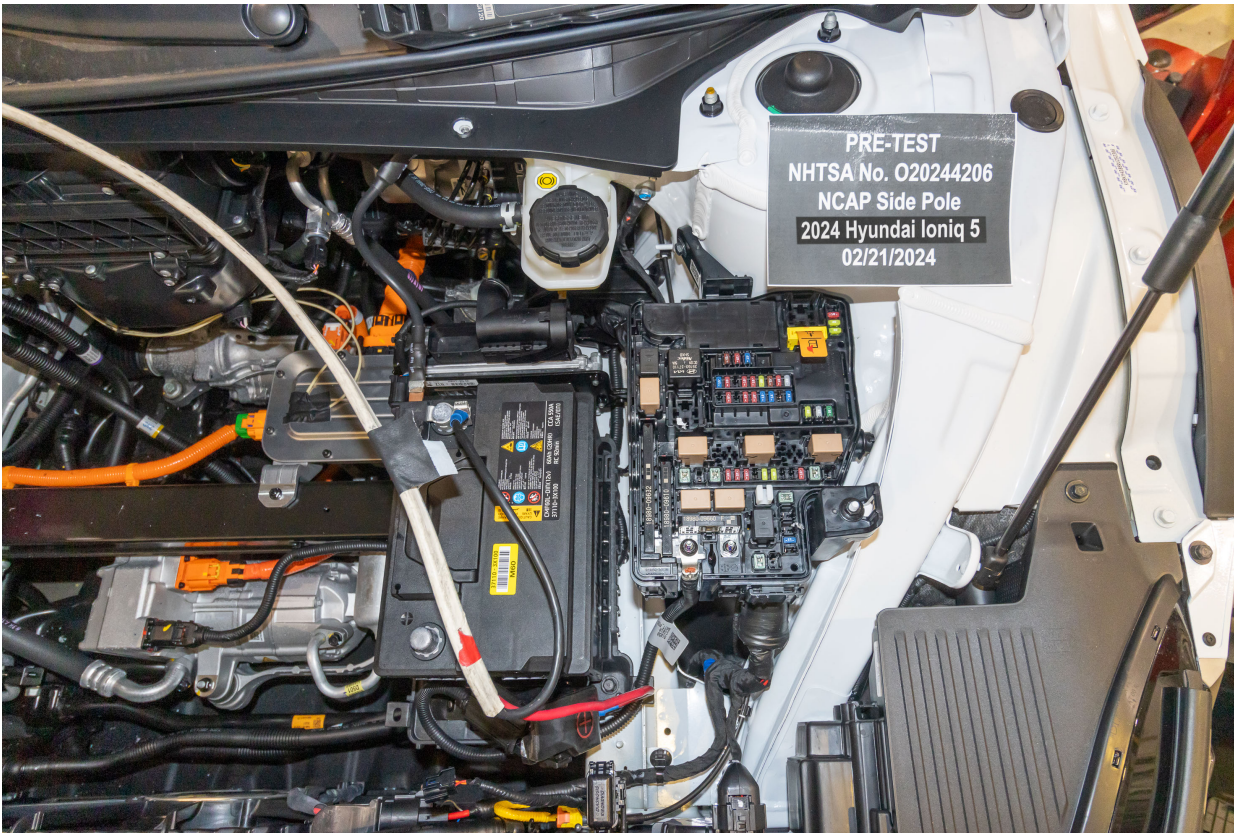


Figure 305-4: First Responder Warning Label Location

Photo Not Applicable

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



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



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

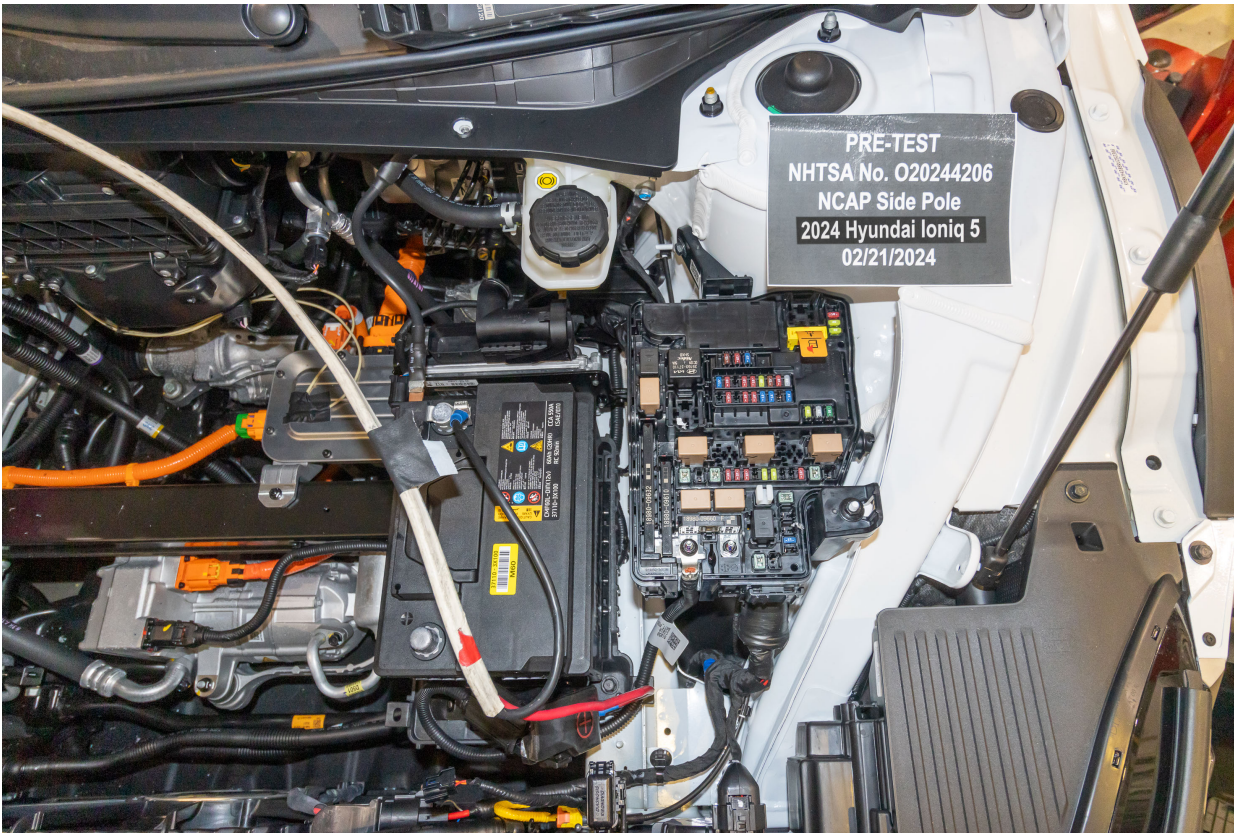


Figure 305-8: Manual High Voltage Service Disconnect Removed Location

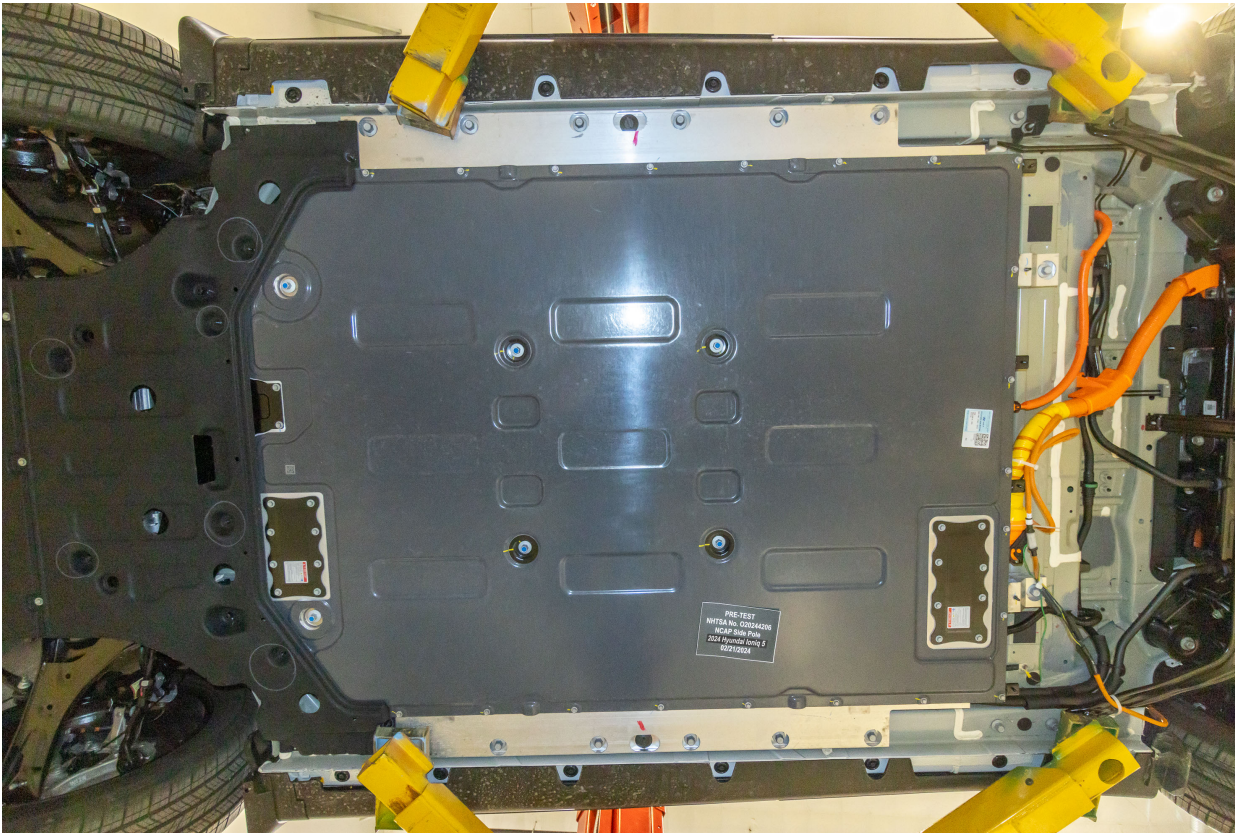


Figure 305-9: Pre-Impact View of Propulsion Battery



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



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

Photo Not Applicable

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

Photo Not Applicable

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)

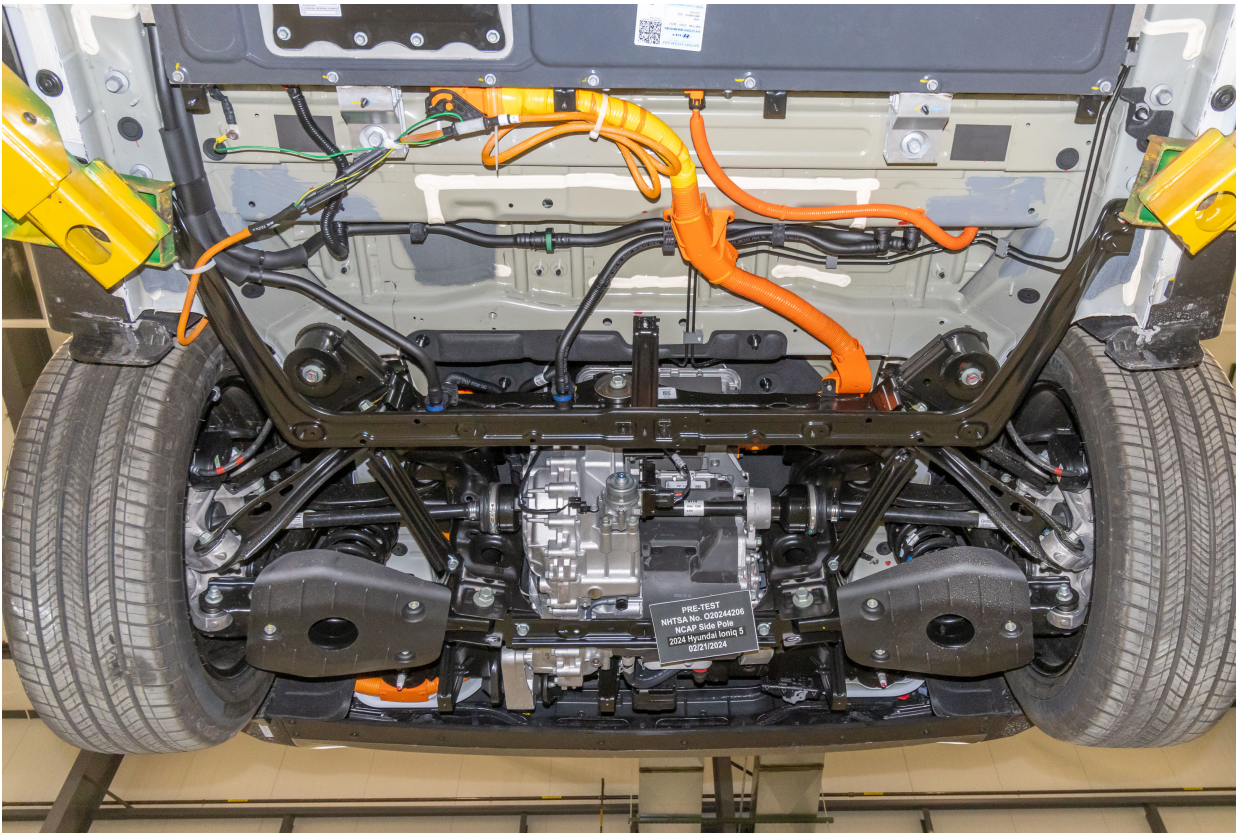


Figure 305-16: Pre-Impact View of Electric Propulsion Drive

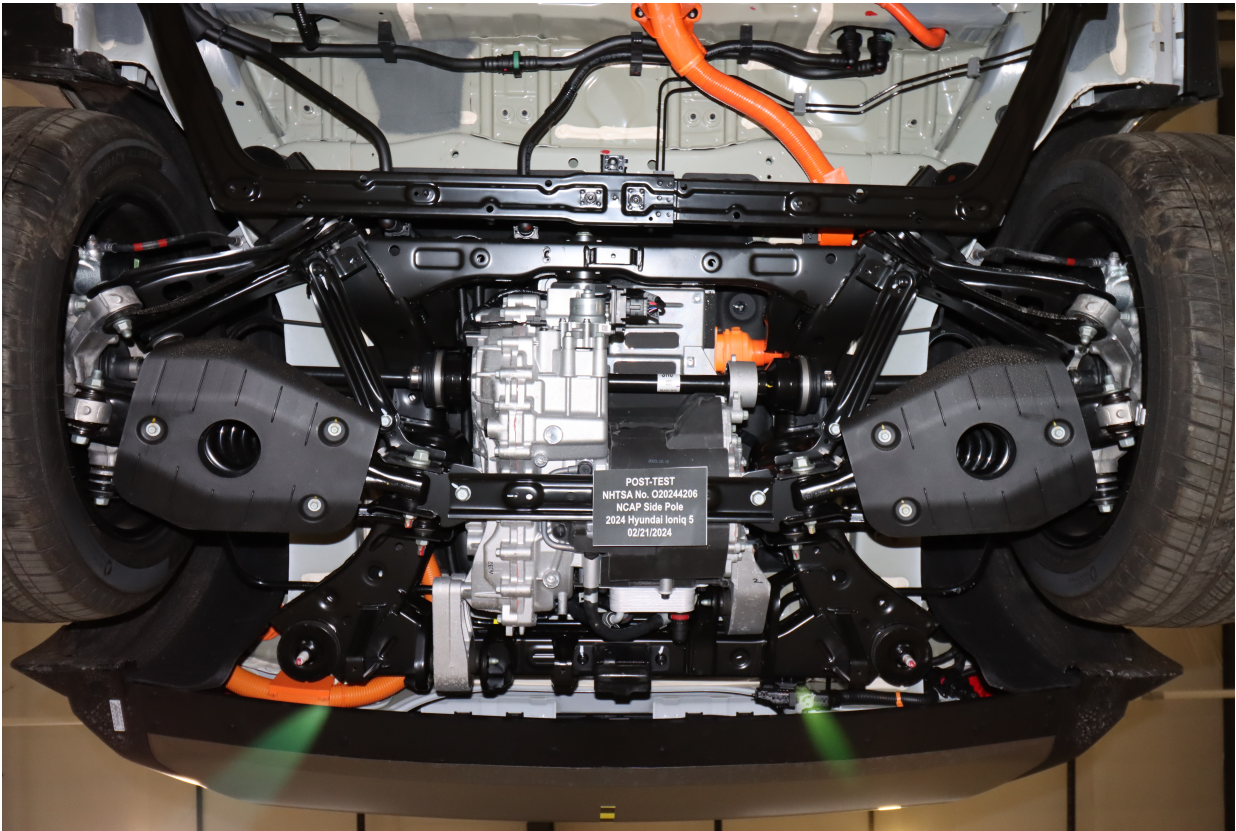


Figure 305-17: Post-Impact View of Electric Propulsion Drive



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

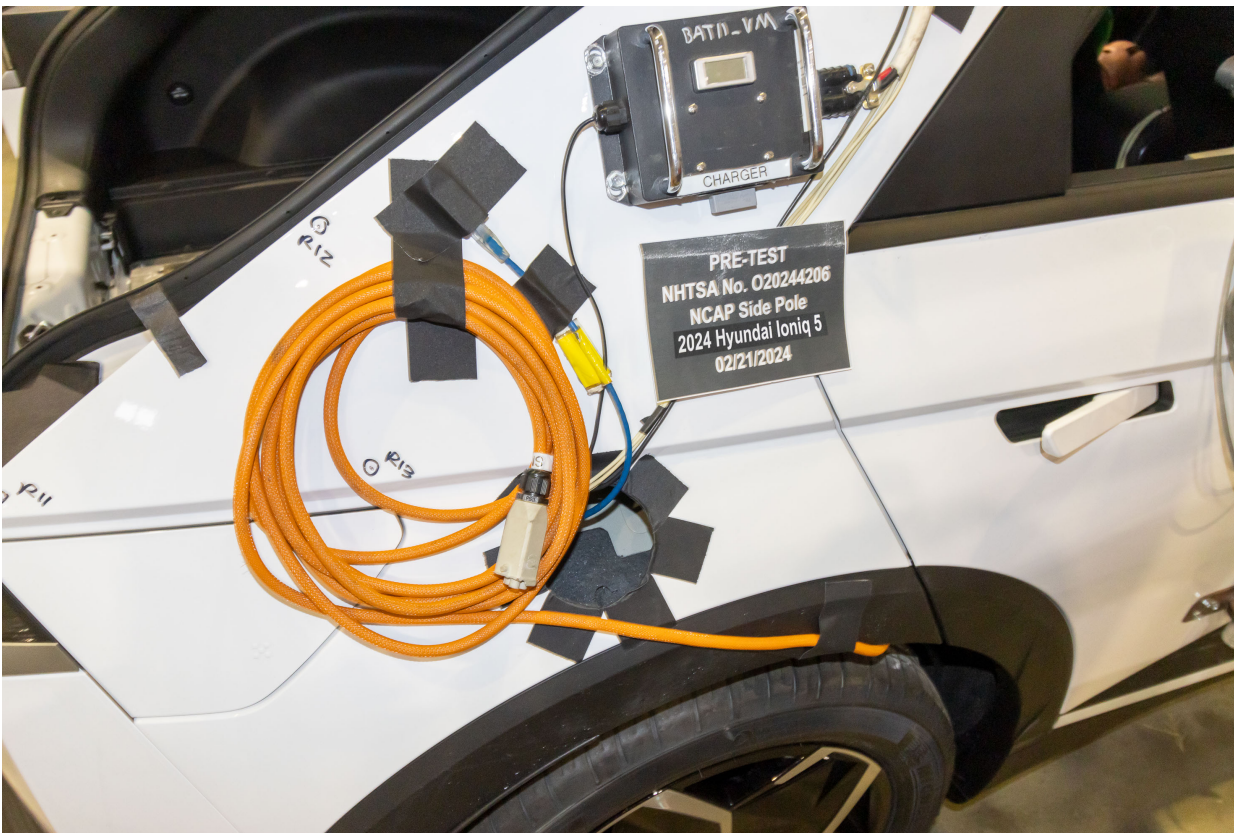


Figure 305-24: Pre-Impact View of Installed Test Interface Port

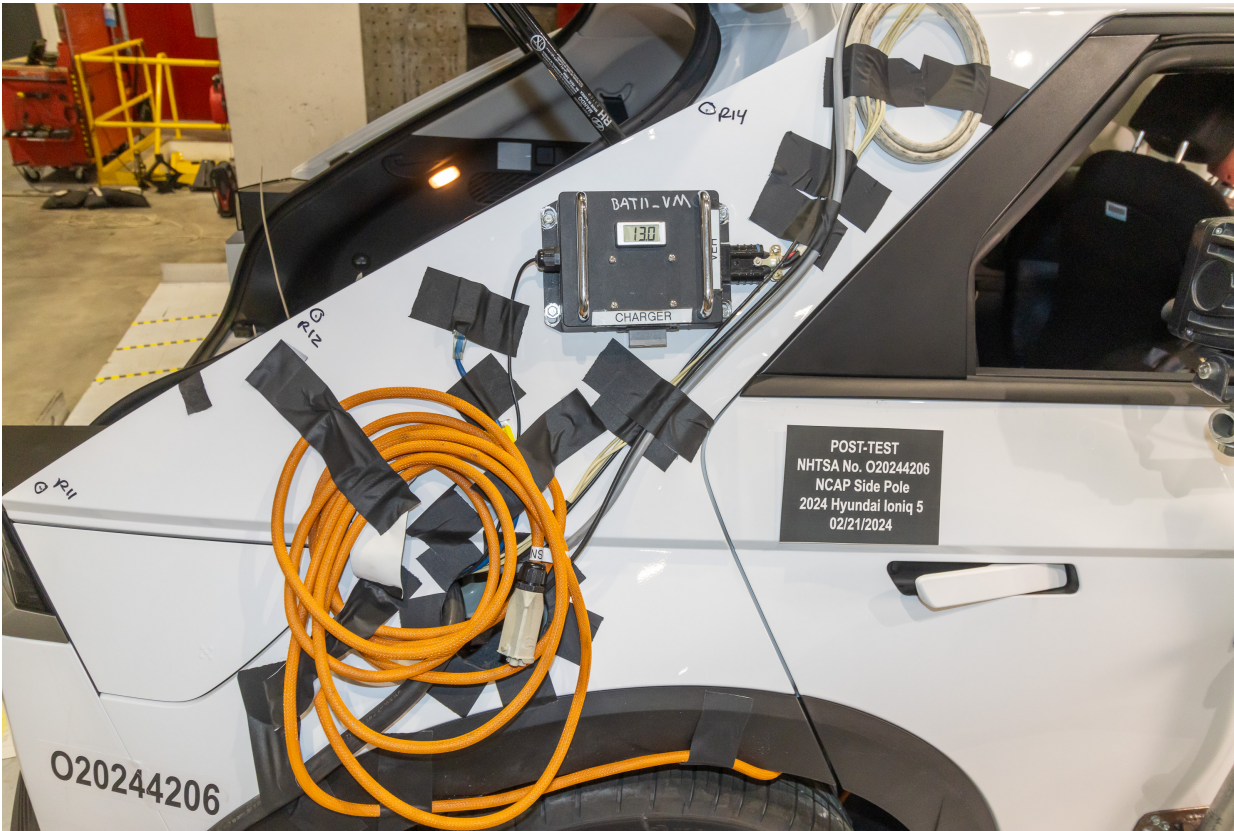


Figure 305-25: Post-Impact View of Installed Test Interface Port

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

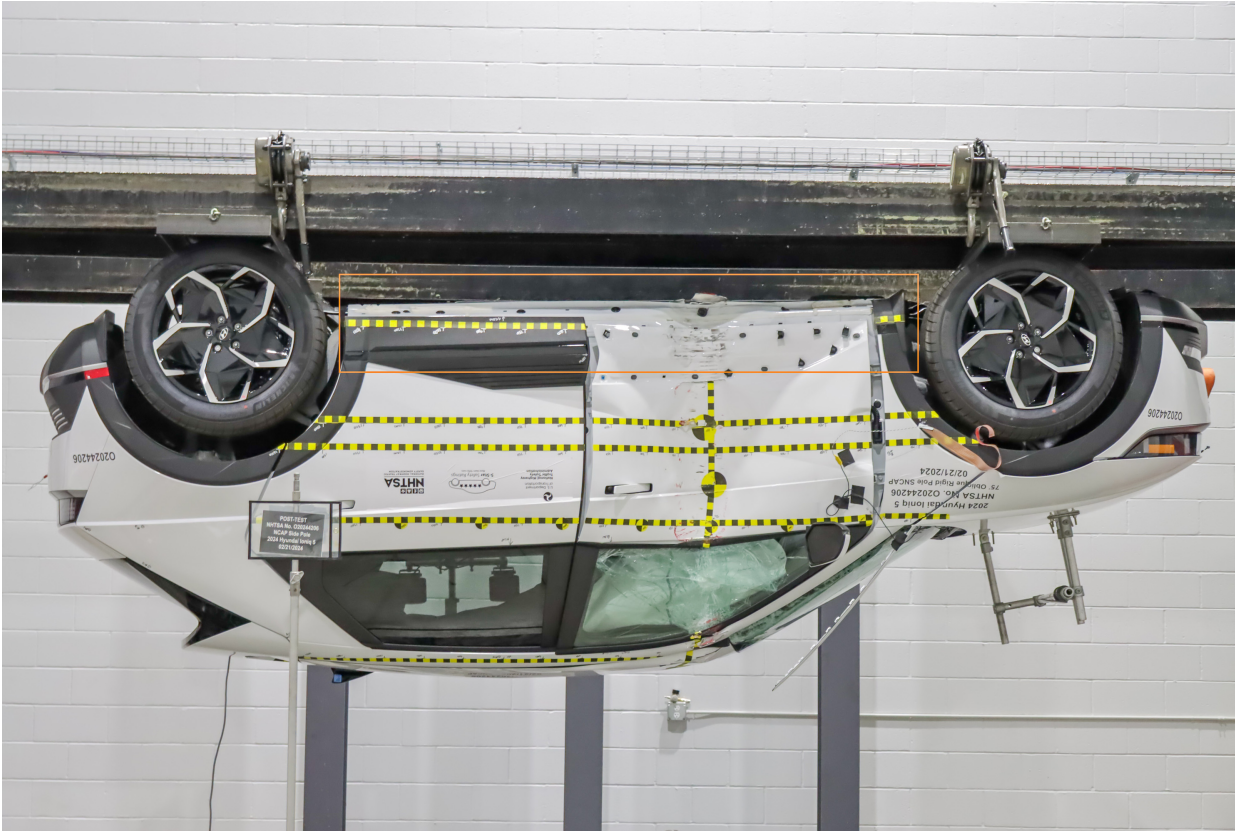


Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees

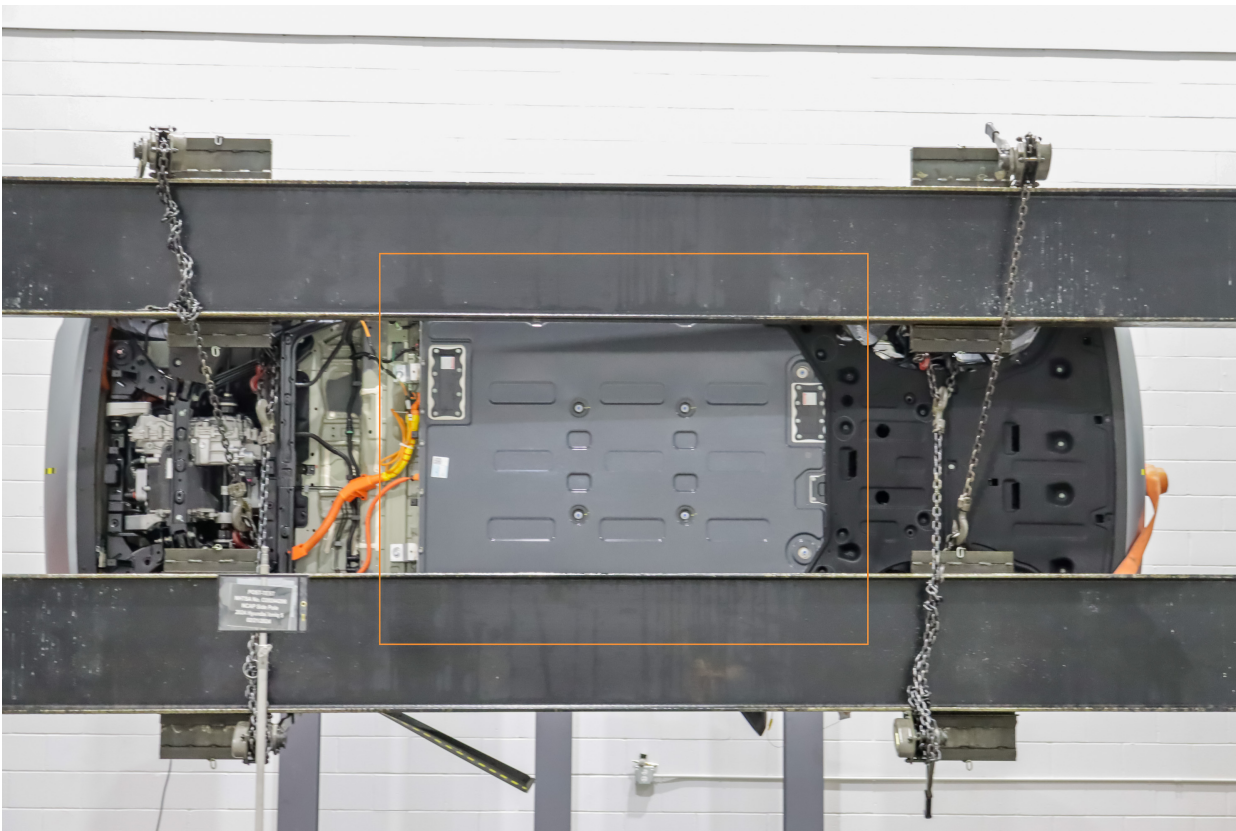


Figure 305-30: FMVSS No. 305 Static Rollover 270 Degrees



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)

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

Figure 305-39: Pre-Impact Charging Port View

Photo Not Applicable

Figure 305-38: Post-Impact Charging Port View

APPENDIX B

VEHICLE AND 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

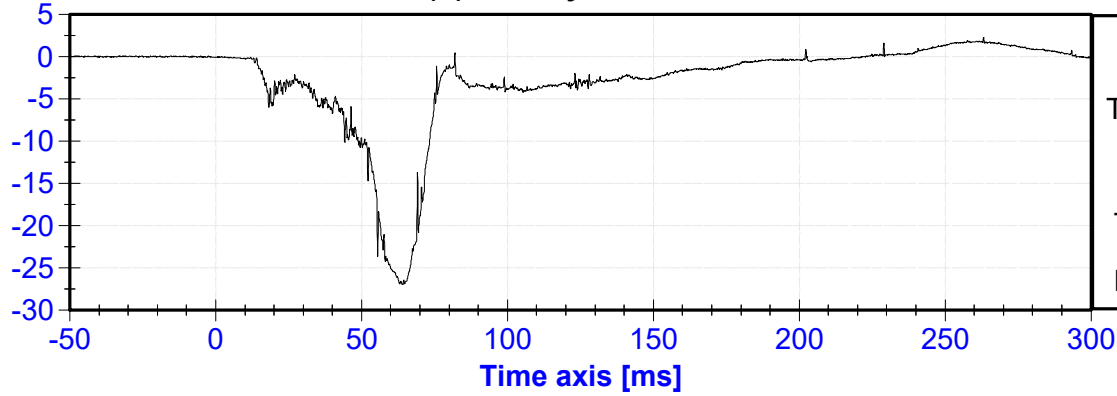
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration (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)

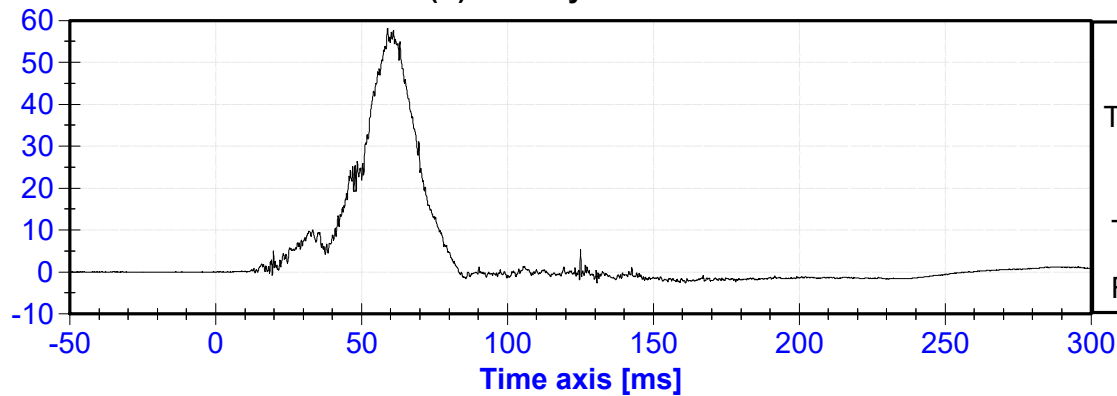
ACCELERATION [g's]

Driver Head Acceleration (X) Primary vs. Time



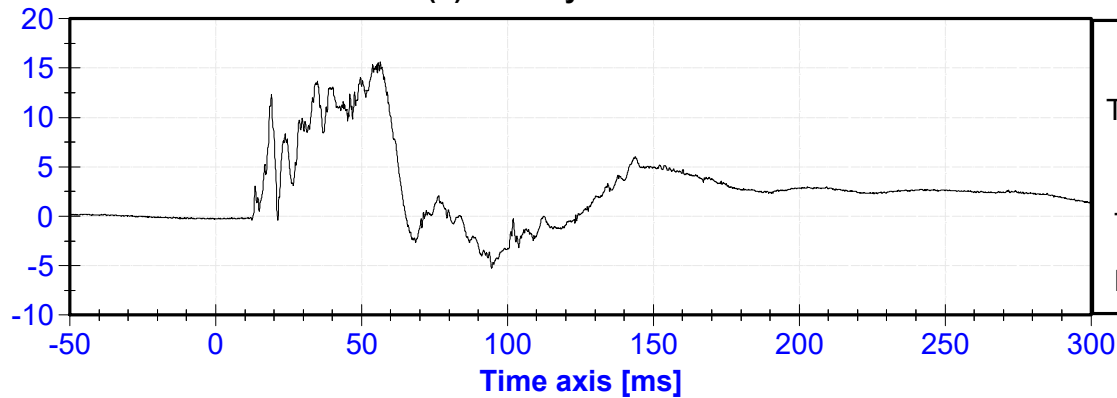
ACCELERATION [g's]

Driver Head Acceleration (Y) Primary vs. Time



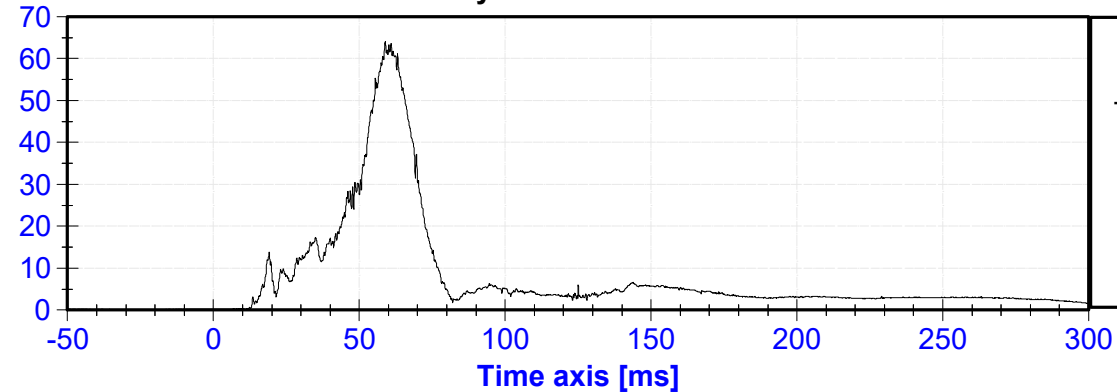
ACCELERATION [g's]

Driver Head Acceleration (Z) Primary vs. Time



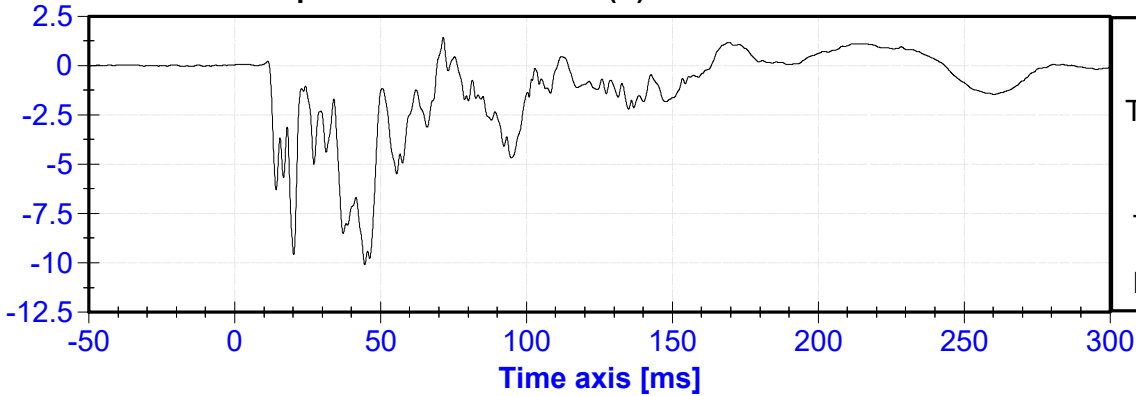
ACCELERATION [g's]

Driver Head Resultant Primary vs. Time



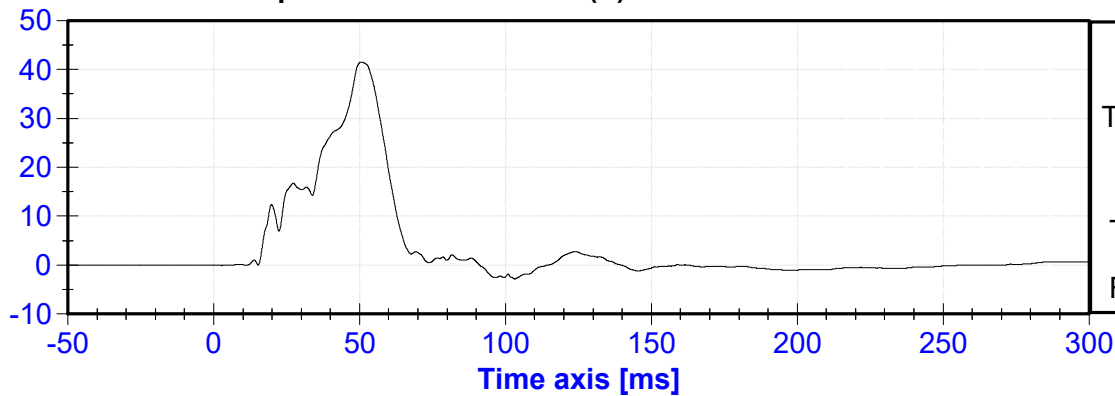
ACCELERATION [g's]

Driver Lower Spine T12 Acceleration (X) vs. Time



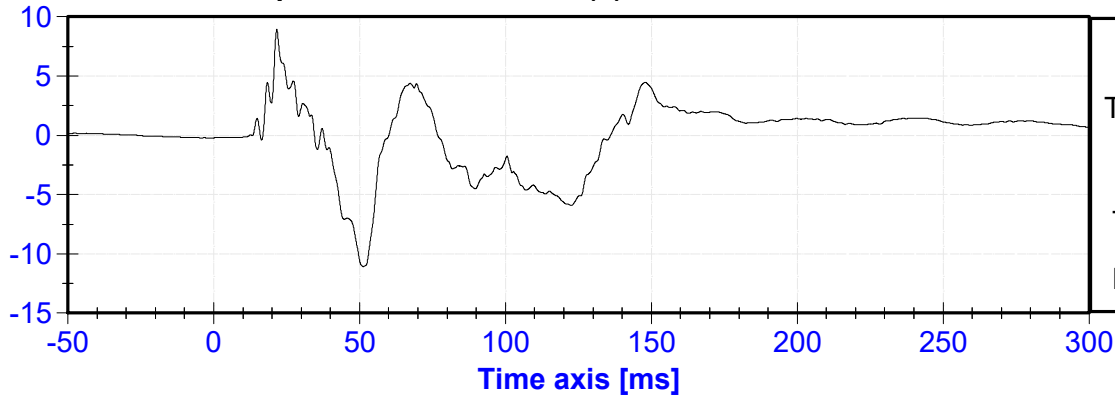
ACCELERATION [g's]

Driver Lower Spine T12 Acceleration (Y) vs. Time



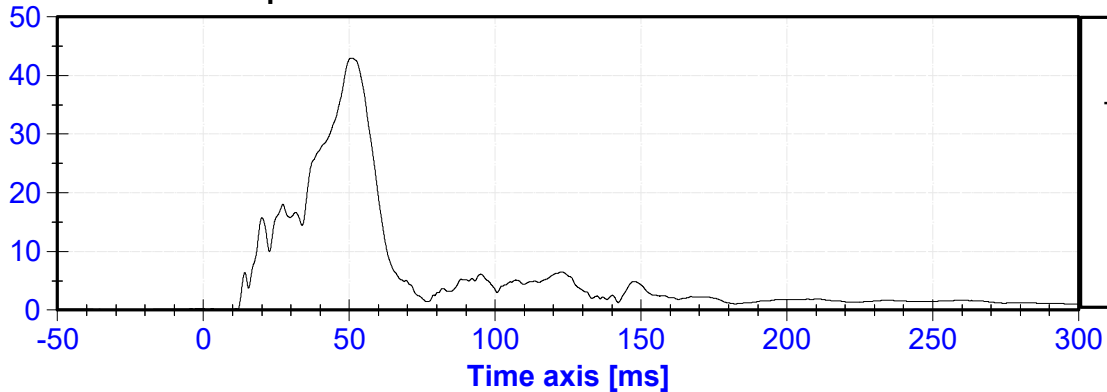
ACCELERATION [g's]

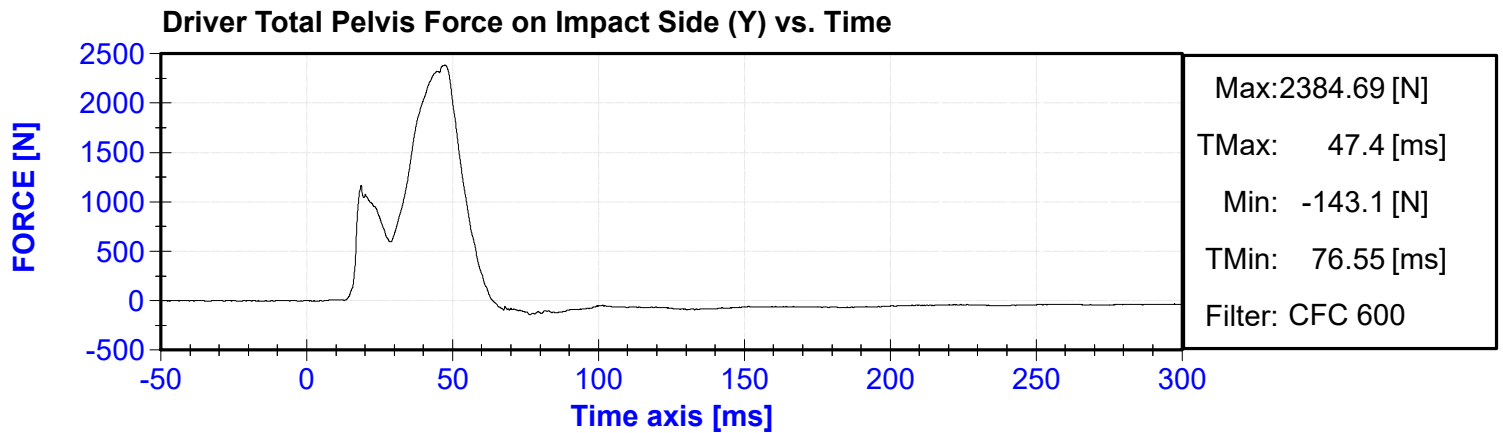
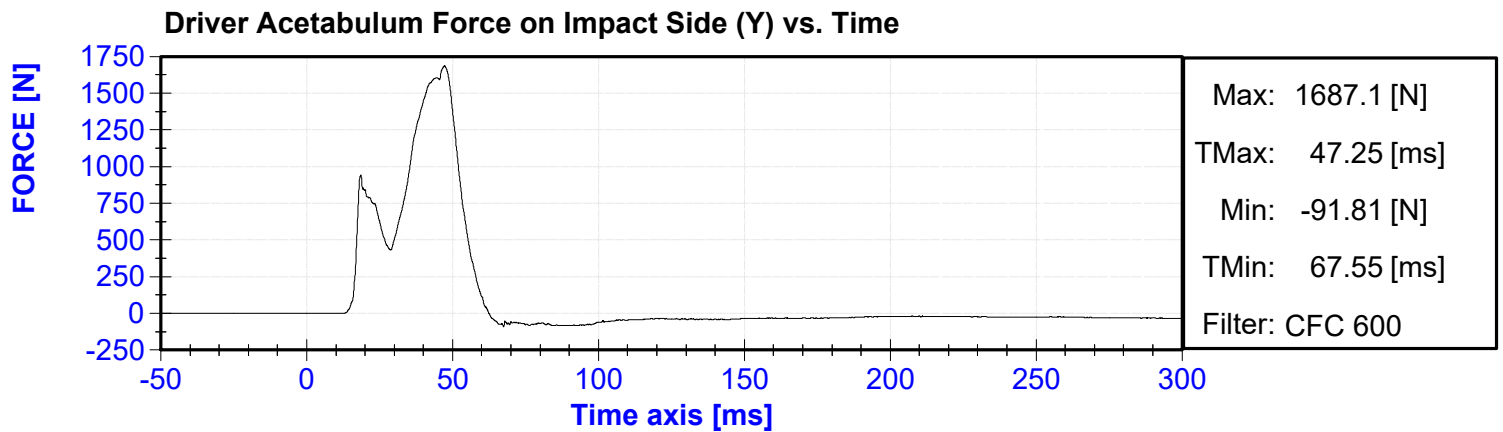
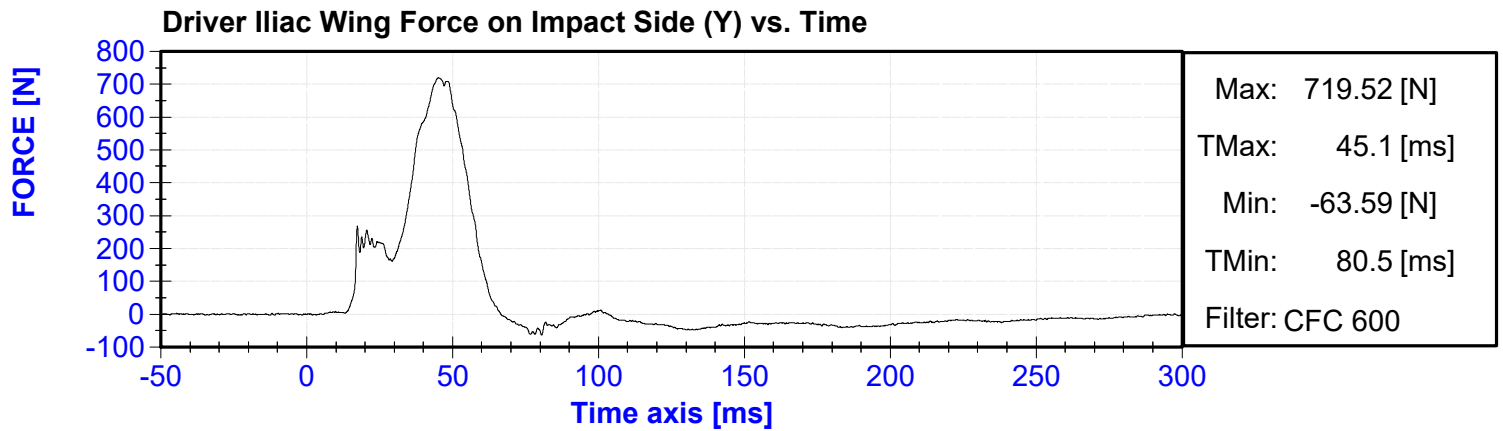
Driver Lower Spine T12 Acceleration (Z) vs. Time



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:DG8012

(CONFIGURED FOR LEFT SIDE IMPACT)

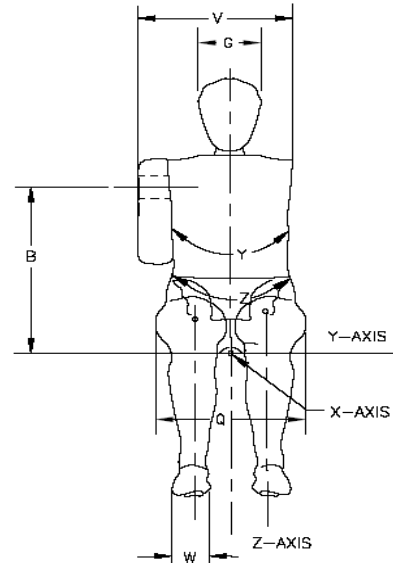
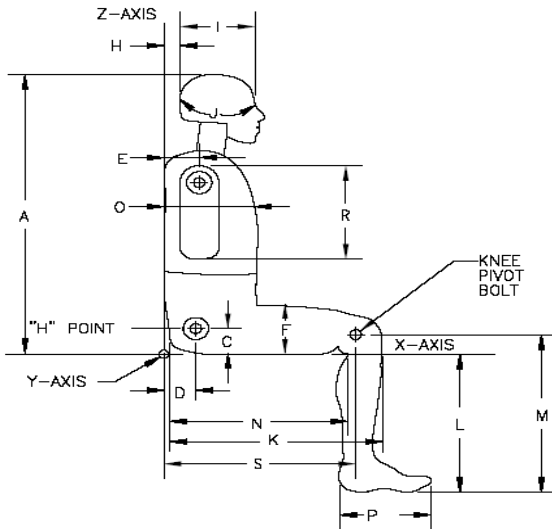


External Measurements - SID-IIs

Technician: **K. Brogan**

Date: **01/26/2024**

Dummy Serial Number: **DG8012**



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	782	Pass
B	Shoulder Pivot Height	437	453	447	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	129	Pass
G	Head Breadth	140	148	143	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	545	Pass
K	Buttock to Knee Length	514	540	530	Pass
L	Popliteal Height	343	369	362	Pass
M	Knee Pivot to floor height	392	409	399	Pass
N	Buttock Popliteal Length	416	442	438	Pass
O	Chest Depth w/o jacket	195	211	204	Pass
P	Foot Length	216	232	220	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	353	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	869	Pass
Z	Waist Circumference	761	791	780	Pass

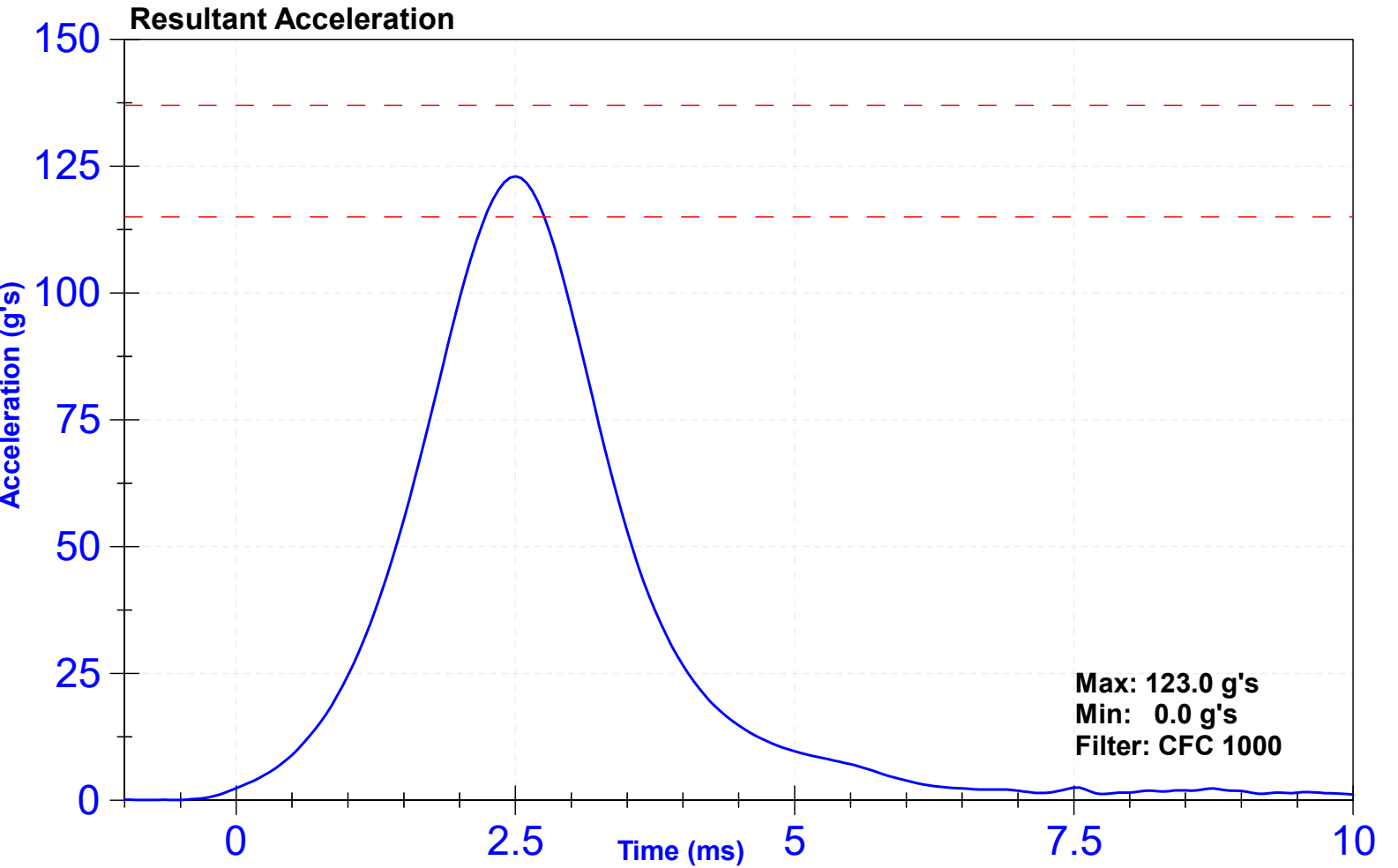
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

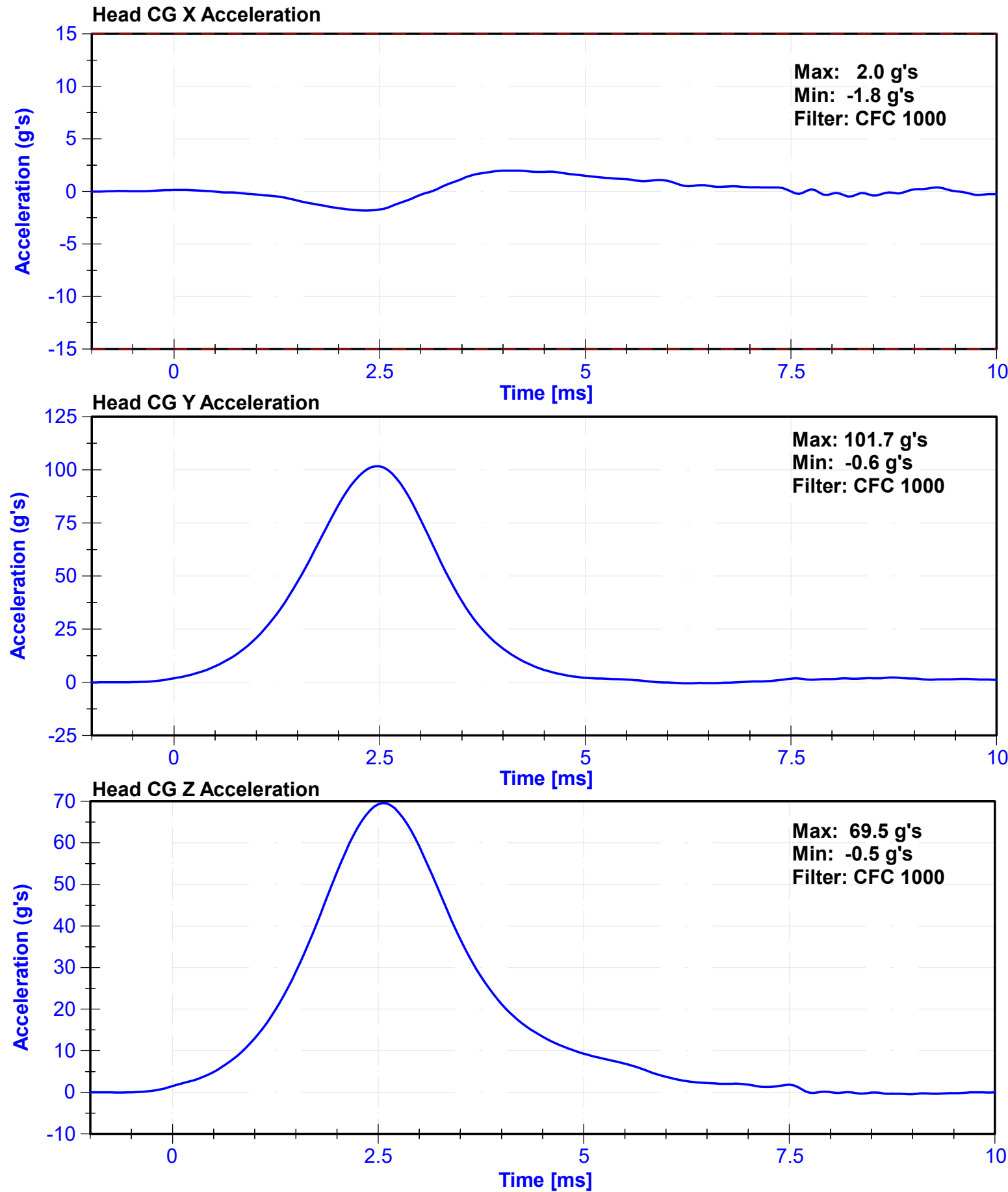
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	24	Pass
Resultant Acceleration	115	137	g's	123.0	Pass
Oscillation	0	15	%	2.0	Pass
Fore-Aft Acceleration	-15	15	g's	2.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P74788	11/16/2023	5/14/2024
Y Accelerometer	Endevco	P51668	11/16/2023	5/14/2024
Z Accelerometer	Endevco	P83319	11/16/2023	5/14/2024





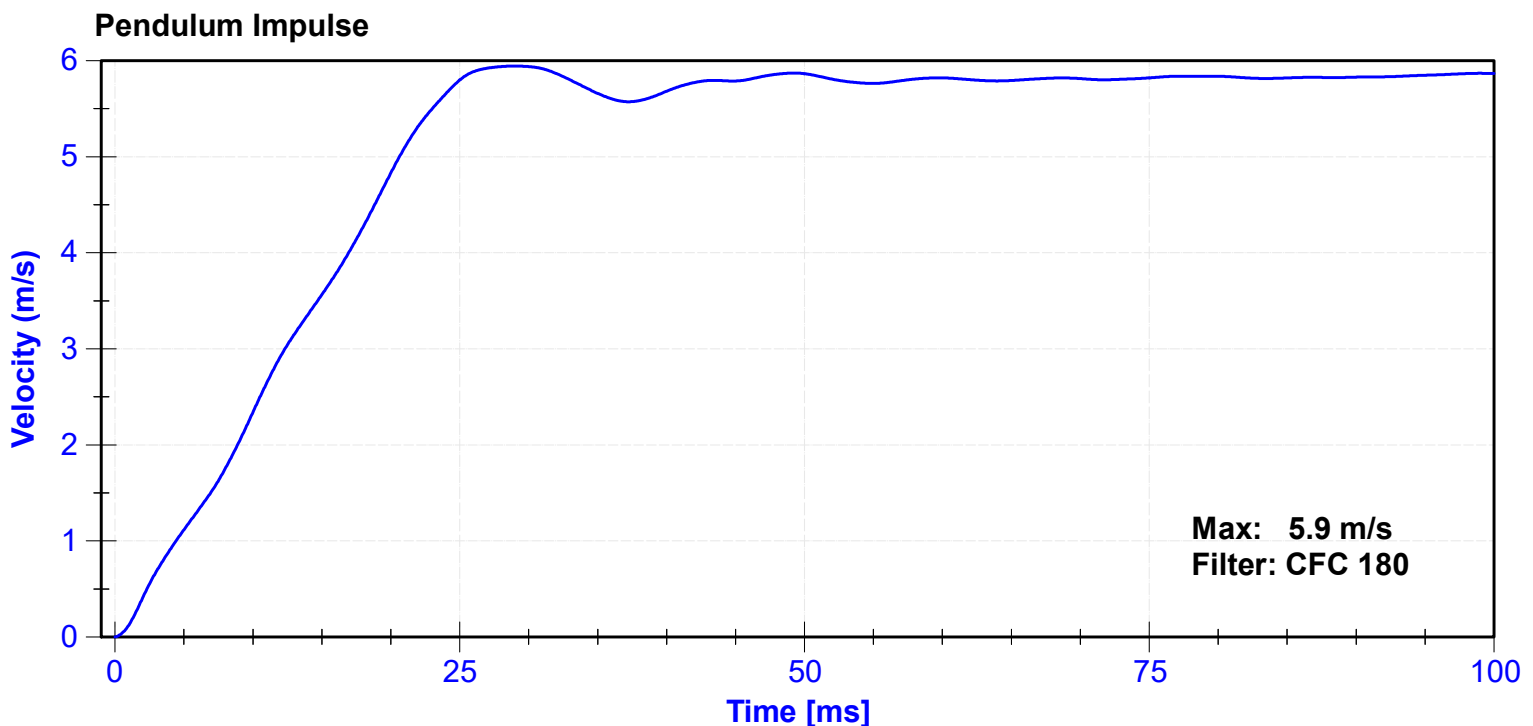
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

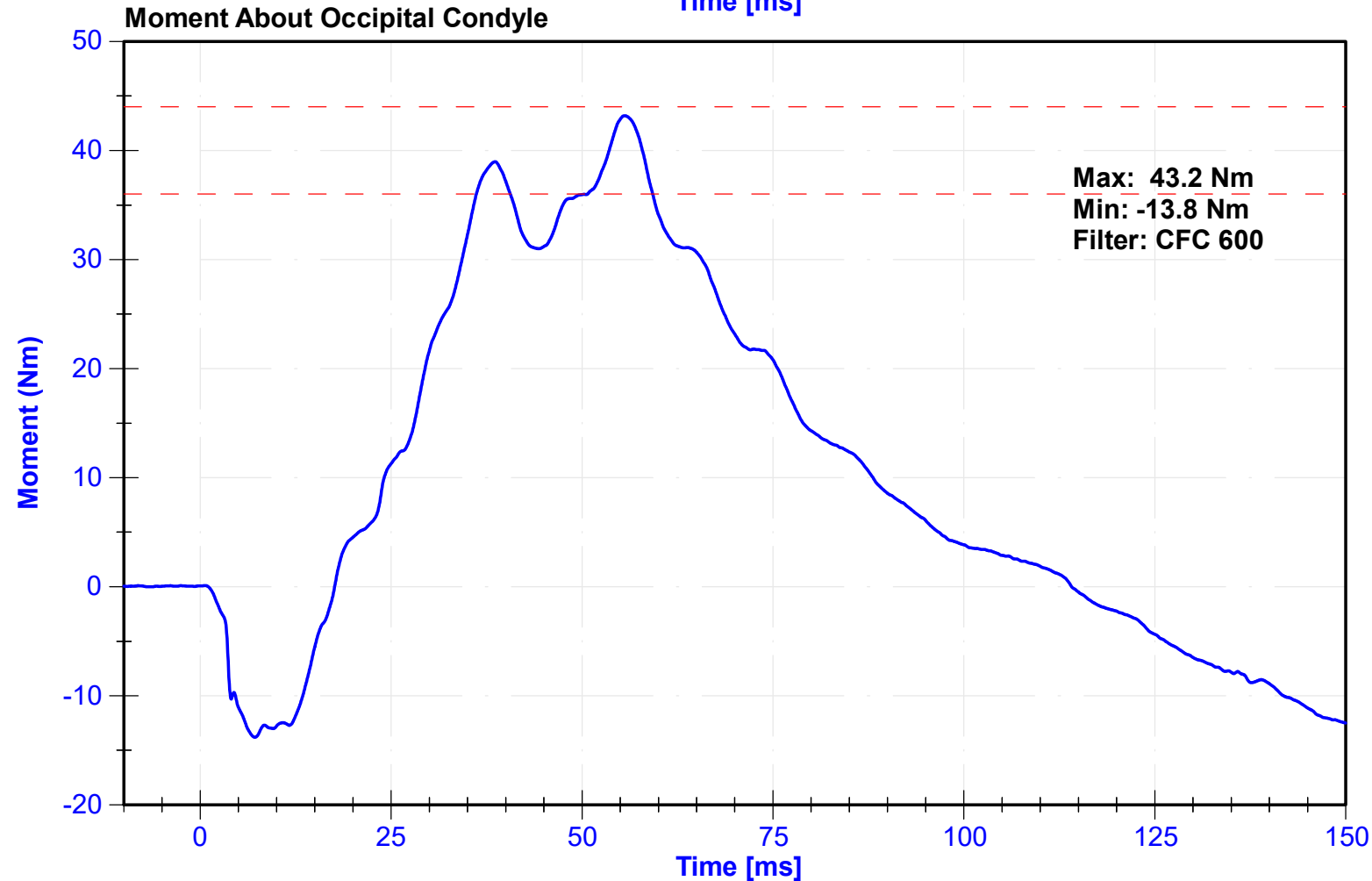
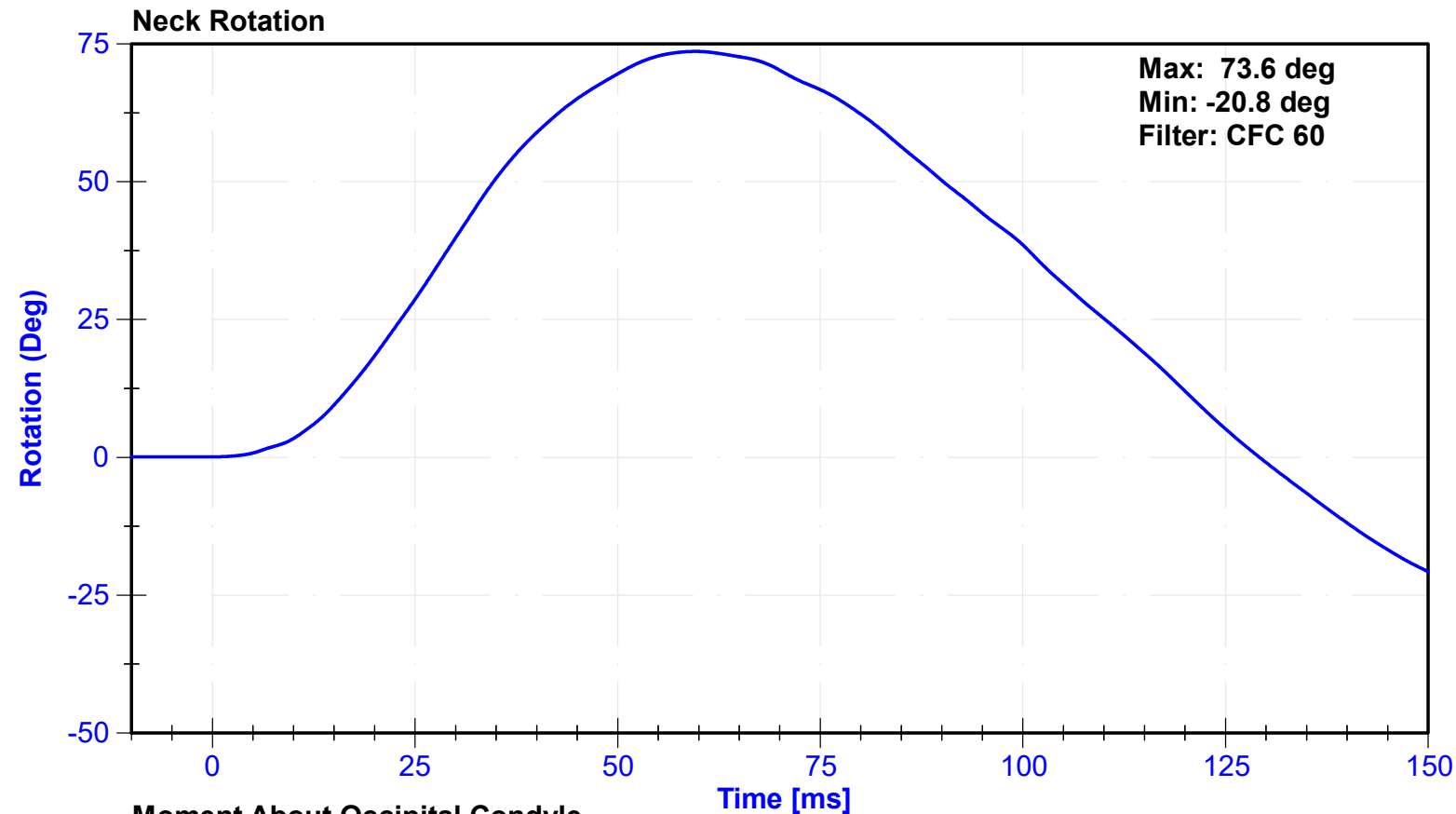
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	30	Pass
Velocity	5.51	5.63	m/s	5.527	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.34	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.56	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.83	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.80	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.94	Pass
Neck Rotation	71	81	deg	73.6	Pass
Time at Maximum Rotation	50	70	ms	59.6	Pass
Moment about the OC	36	44	Nm	43.2	Pass
Moment Decay to 0 Nm	102	126	ms	114.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	10/31/2023	4/28/2024
Pendulum Potentiometer	Servo	4961	10/2/2023	10/1/2024
Condyle Potentiometer	Servo	DS185	10/2/2023	10/1/2024
Upper Neck Load Cell	Denton	1716ATF_2184-FY	5/18/2023	5/17/2024





ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

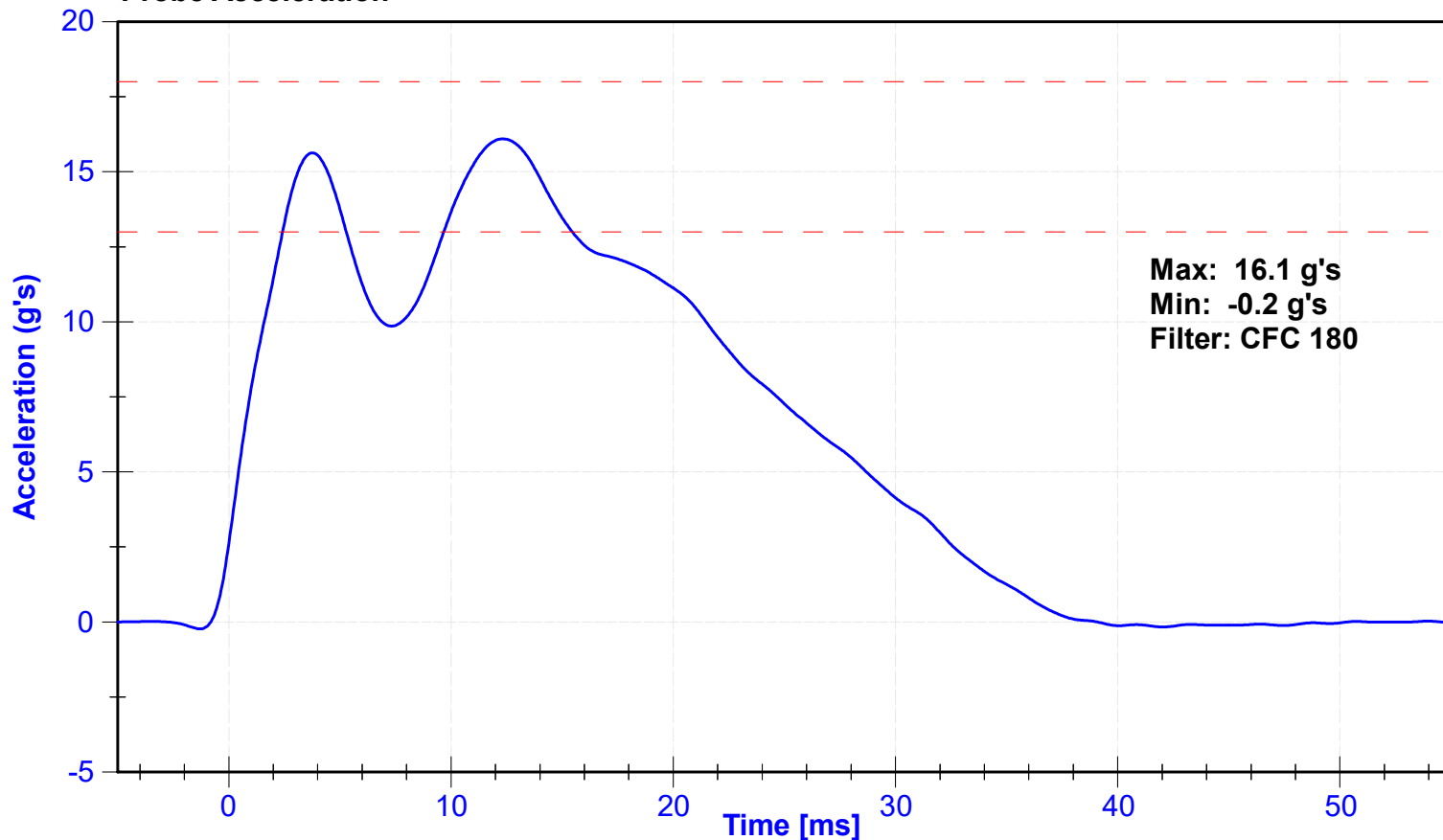
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	13	18	g's	16.1	Pass
Shoulder Deflection	28	37	mm	28.0	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.1	Pass

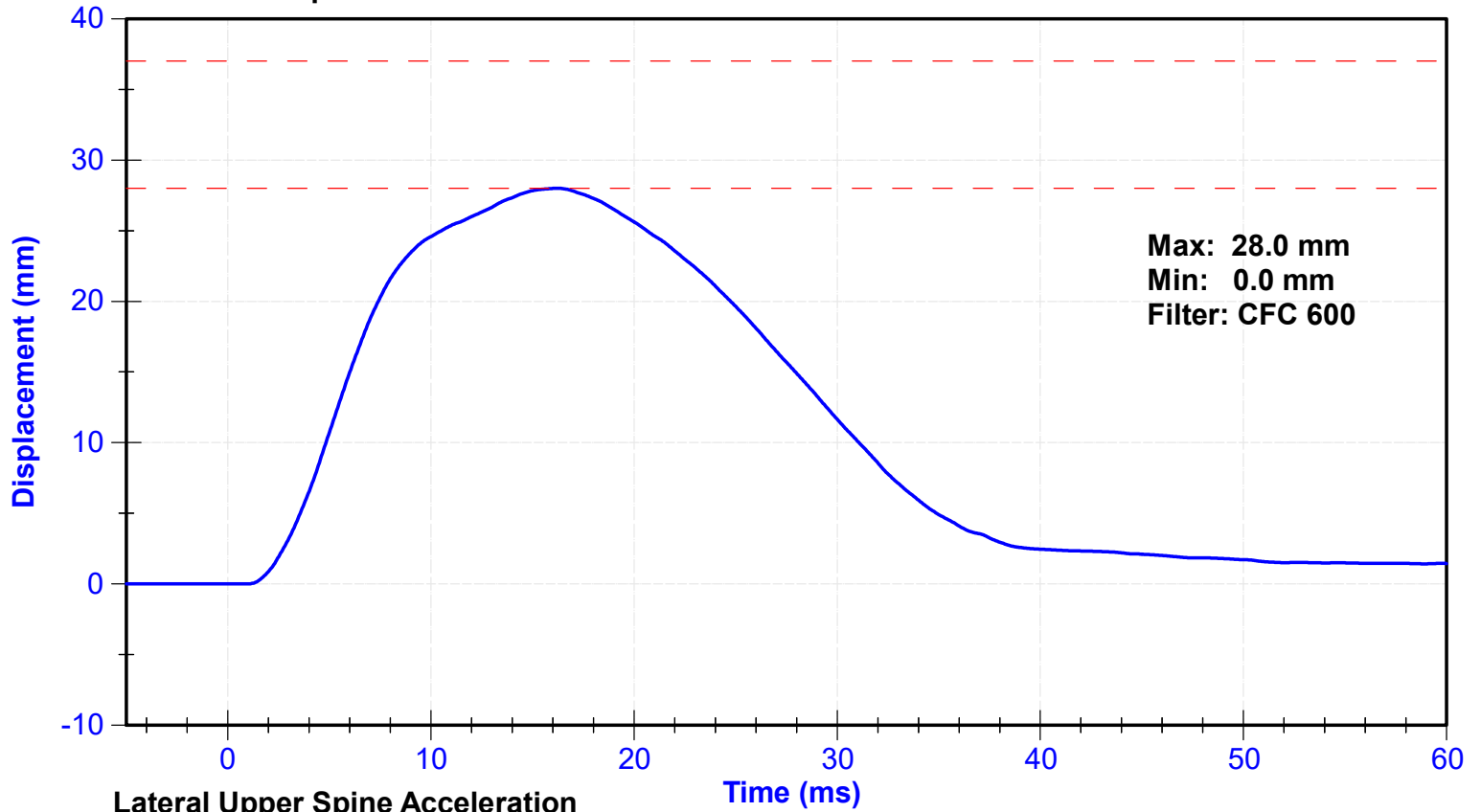
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024

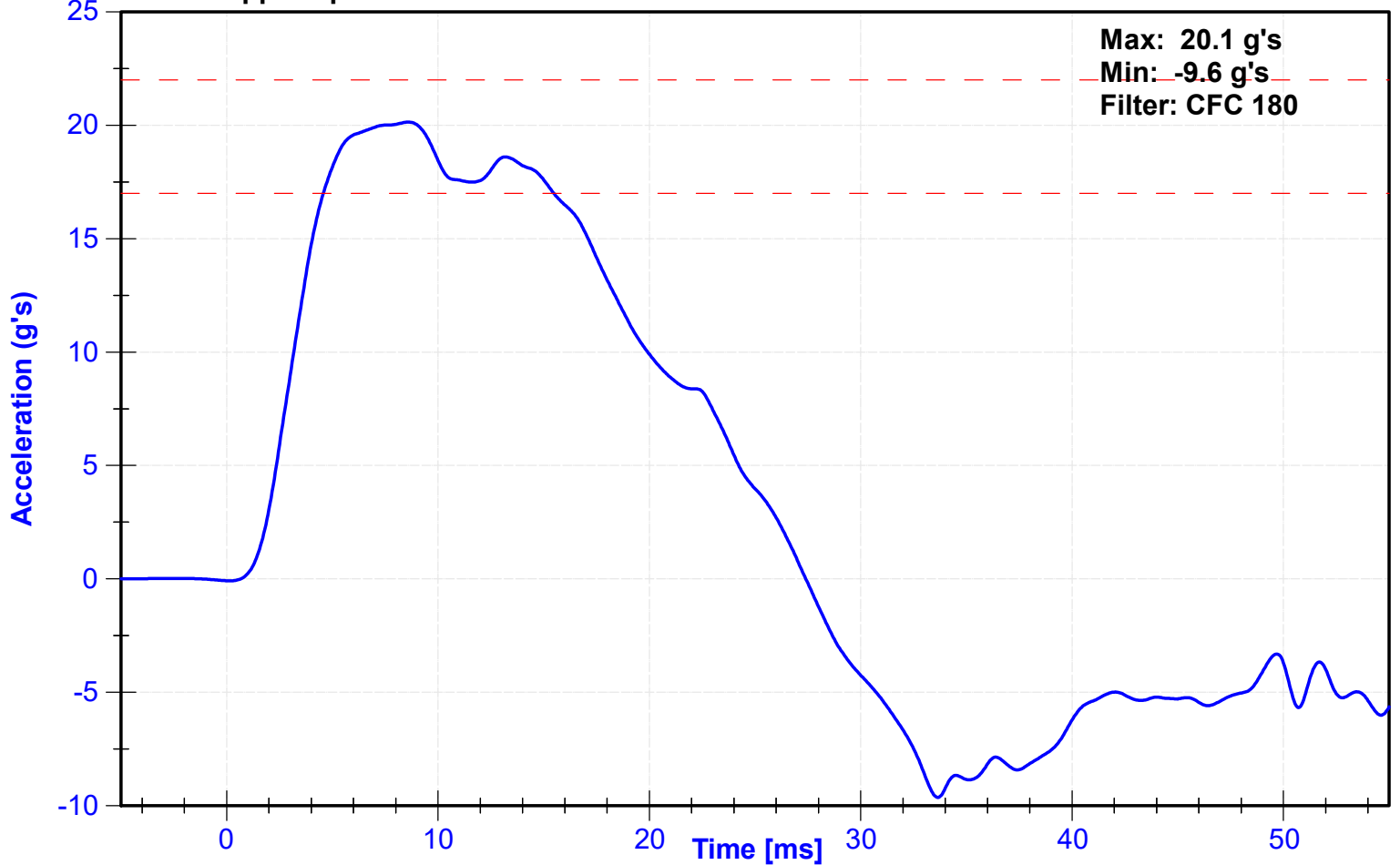
Probe Acceleration



Shoulder Displacement



Lateral Upper Spine Acceleration



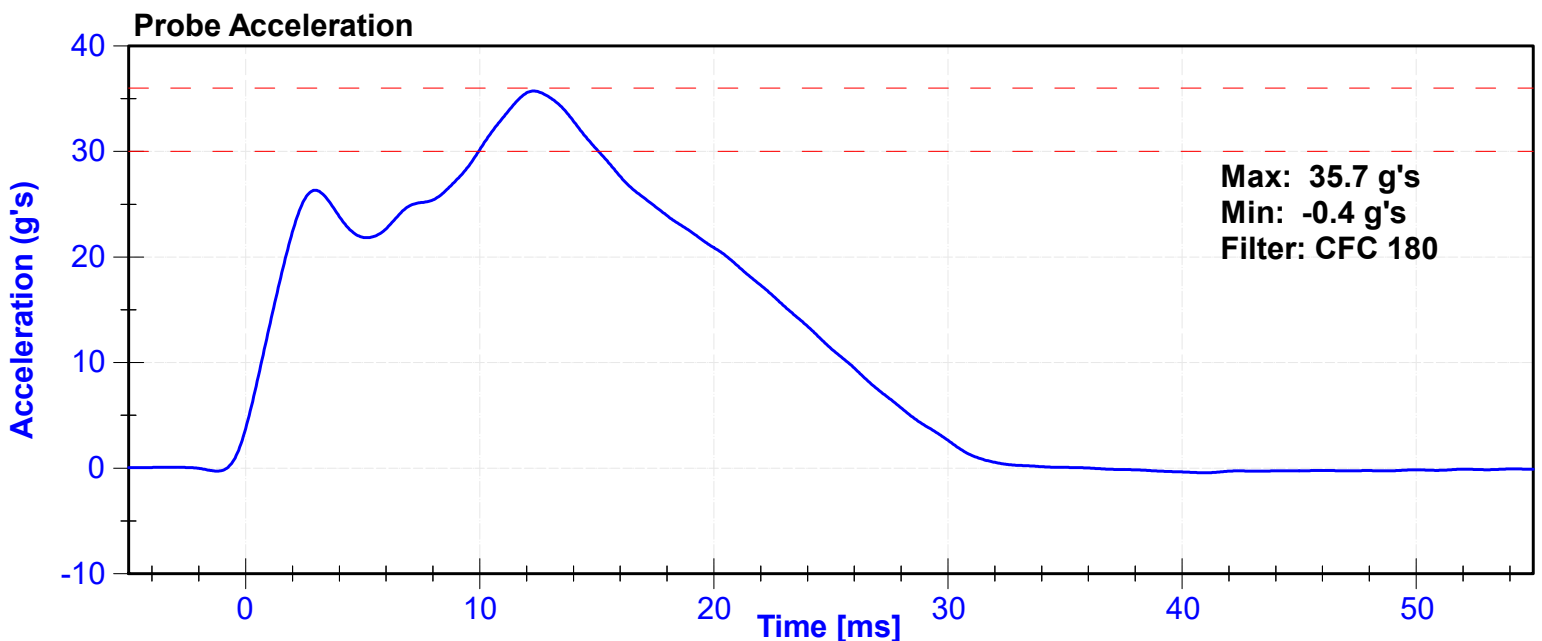
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

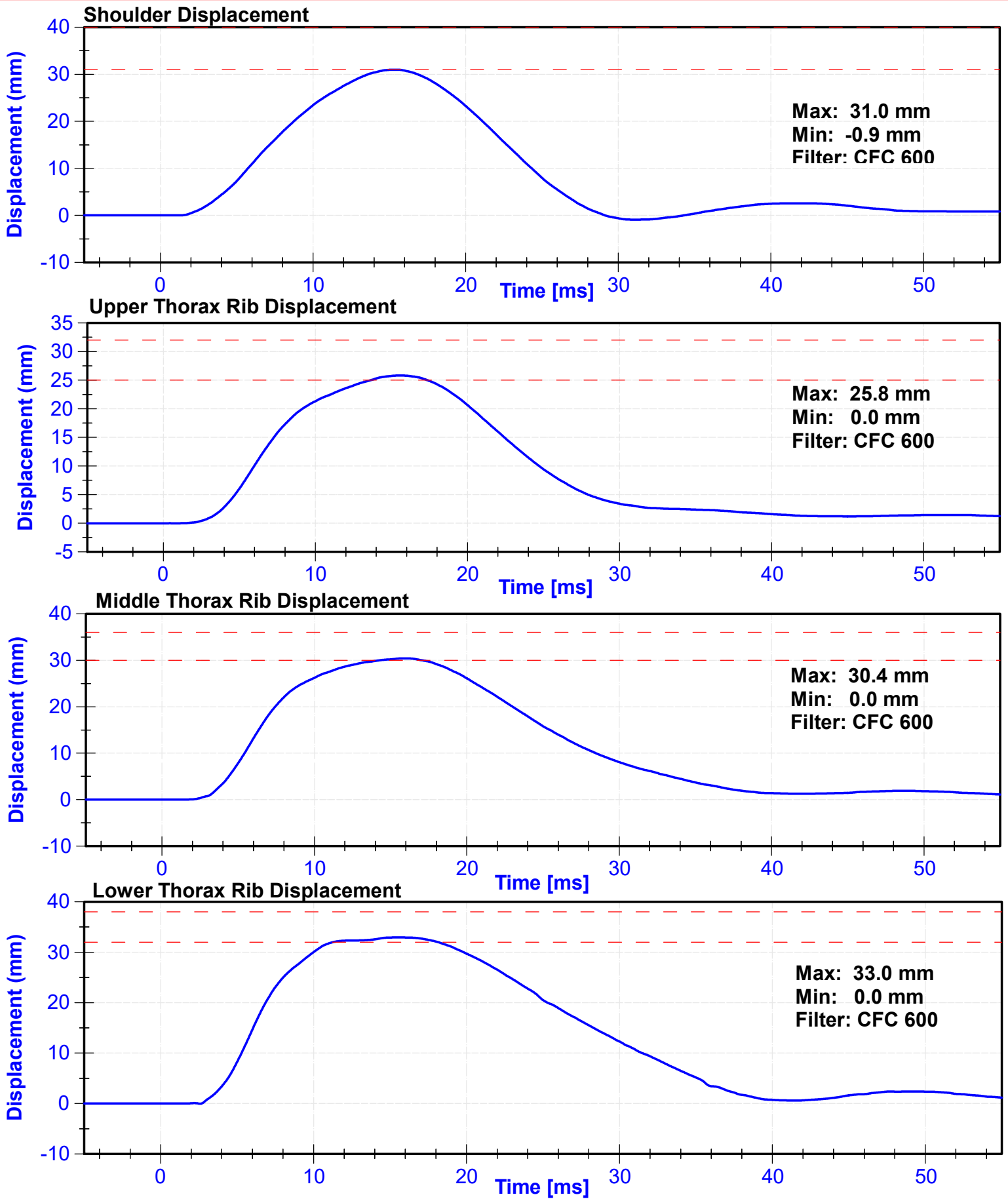
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	6.6	6.8	m/s	6.65	Pass
Probe Acceleration after 5 ms	30	36	g's	35.7	Pass
Lateral Upper Spine Acceleration	34	43	g's	40.0	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.3	Pass
Shoulder Deflection	31	40	mm	31.0	Pass
Upper Thorax Rib Deflection	25	32	mm	25.8	Pass
Mid Thorax Rib Deflection	30	36	mm	30.4	Pass
Lower Thorax Rib Deflection	32	38	mm	33.0	Pass

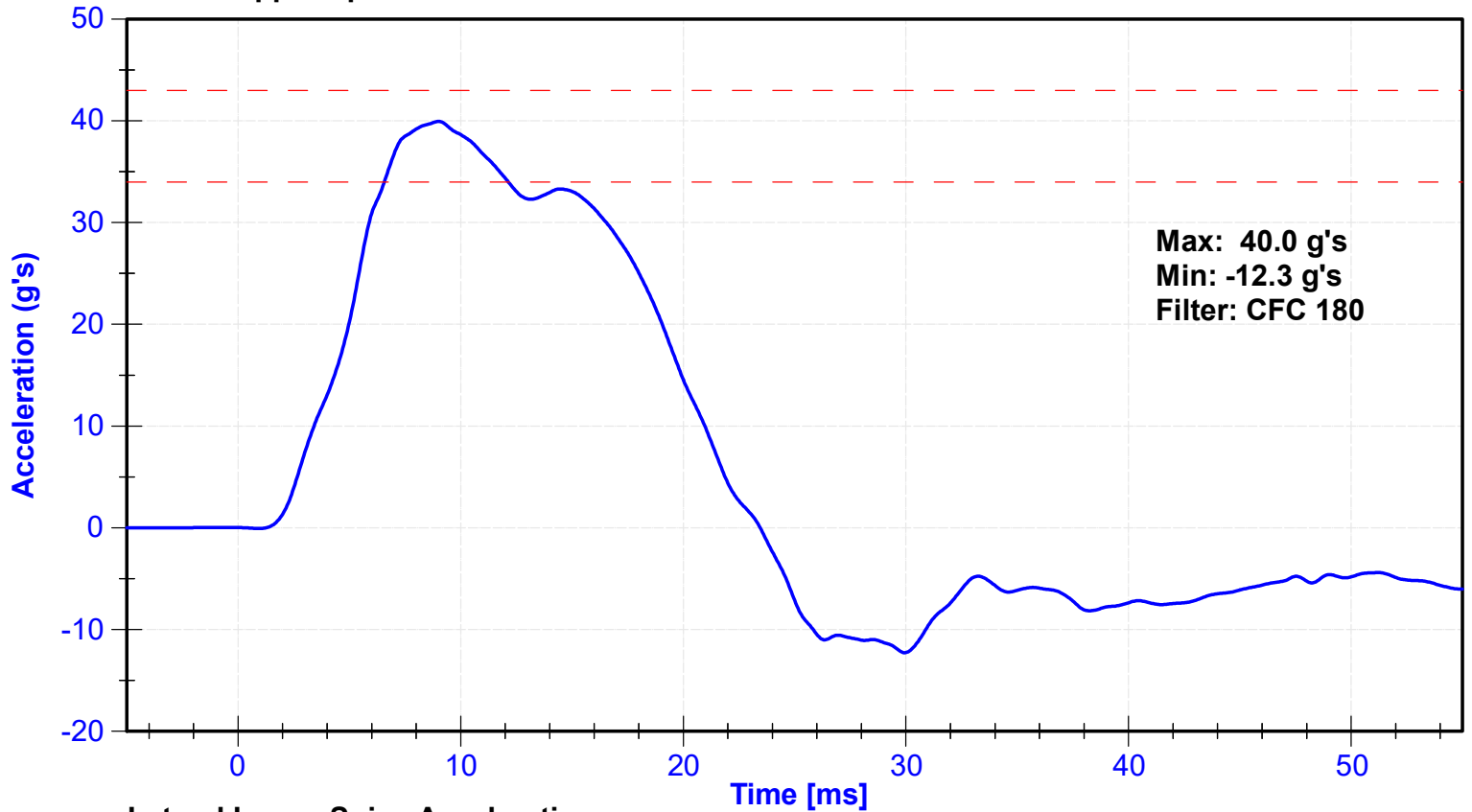
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Spine T1 Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Upper Spine T12 Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	11/17/2023	5/17/2024

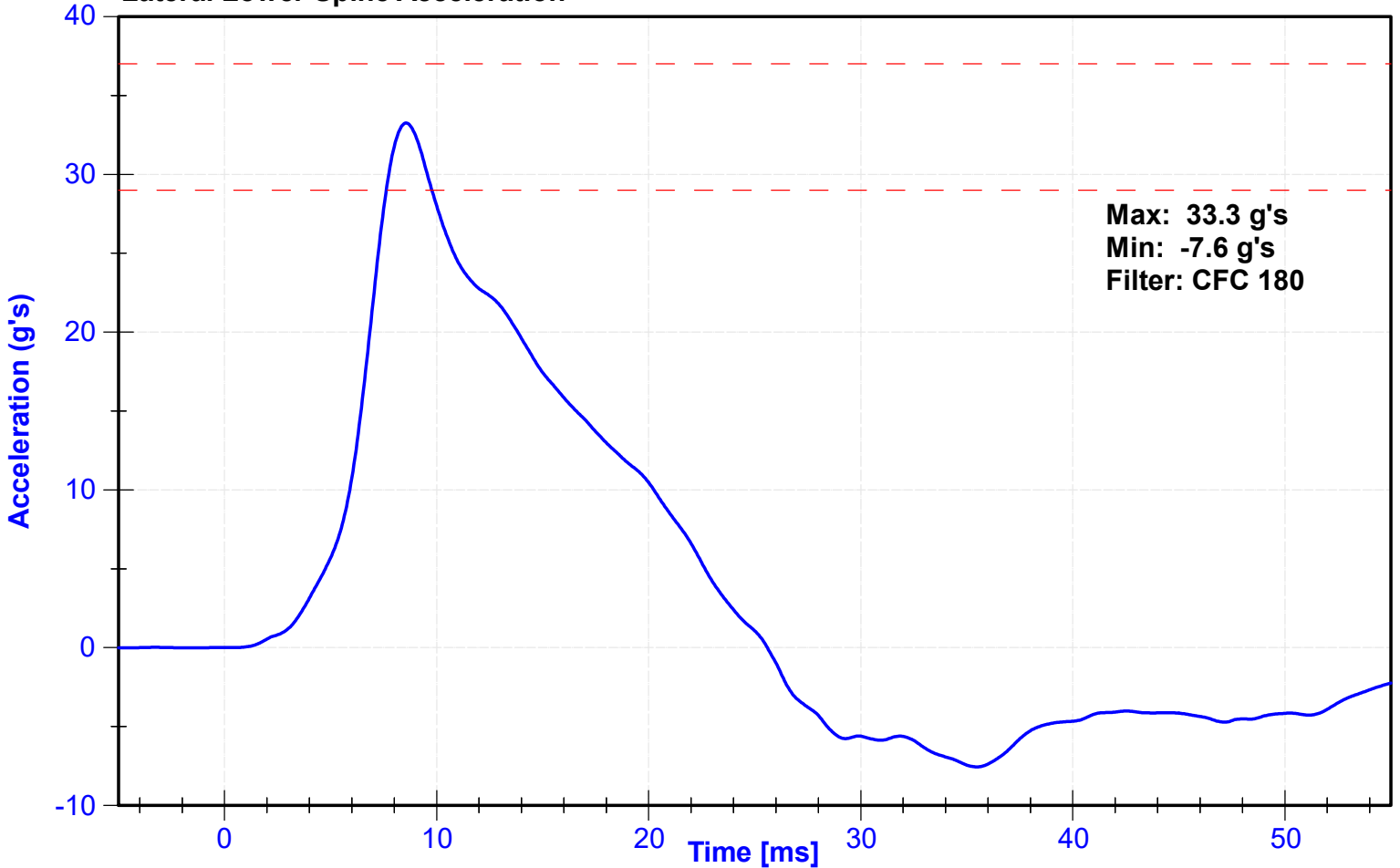




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



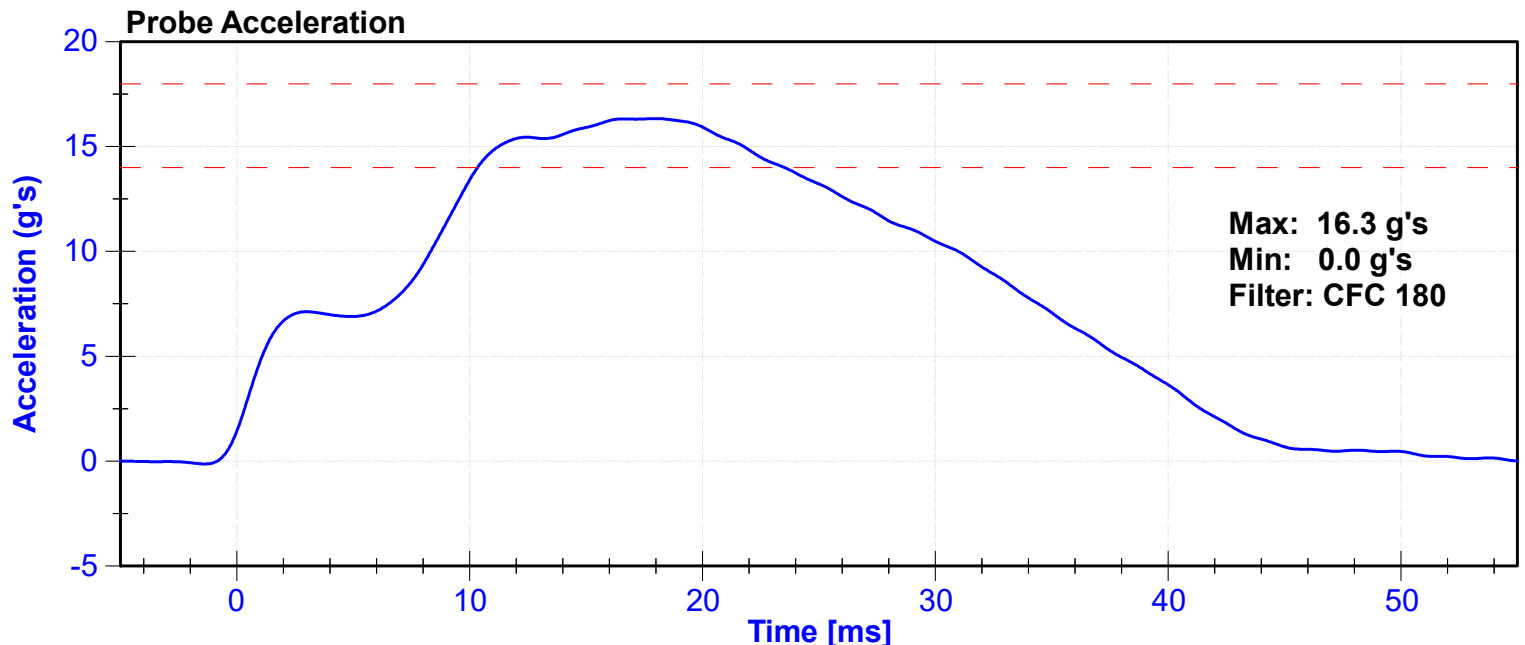
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

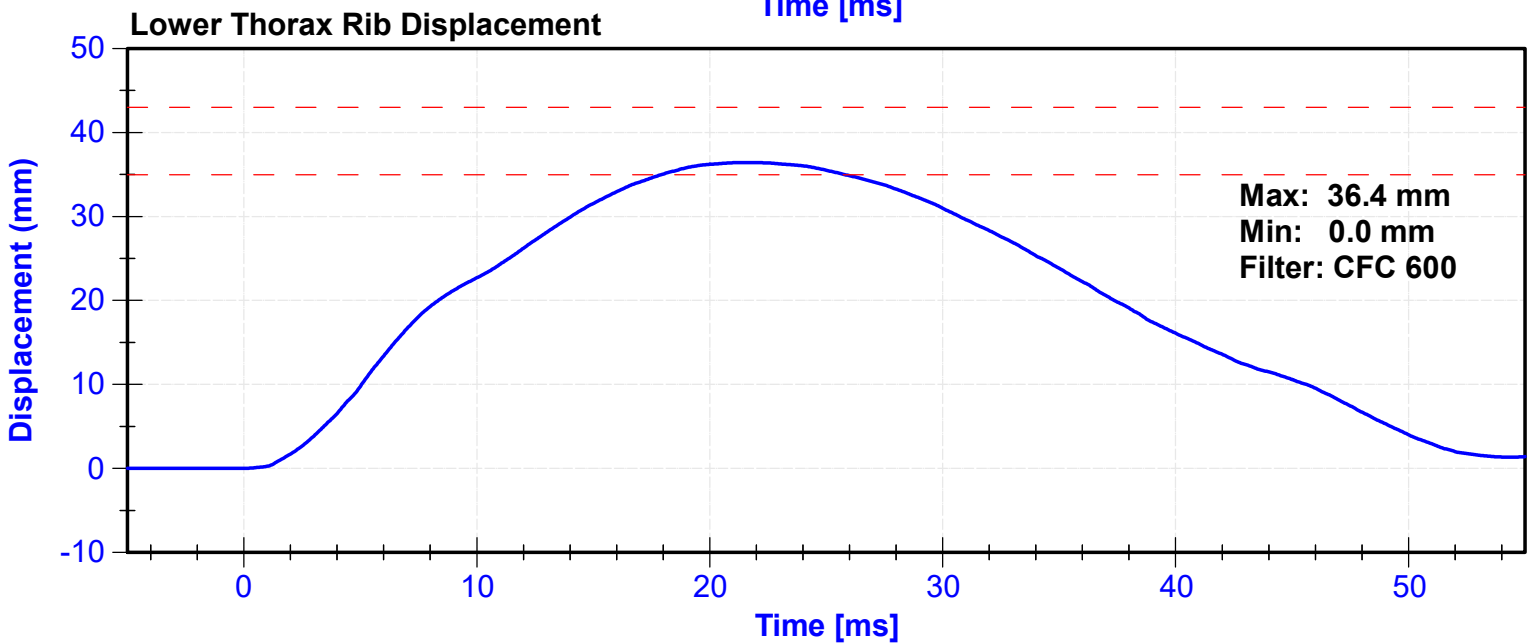
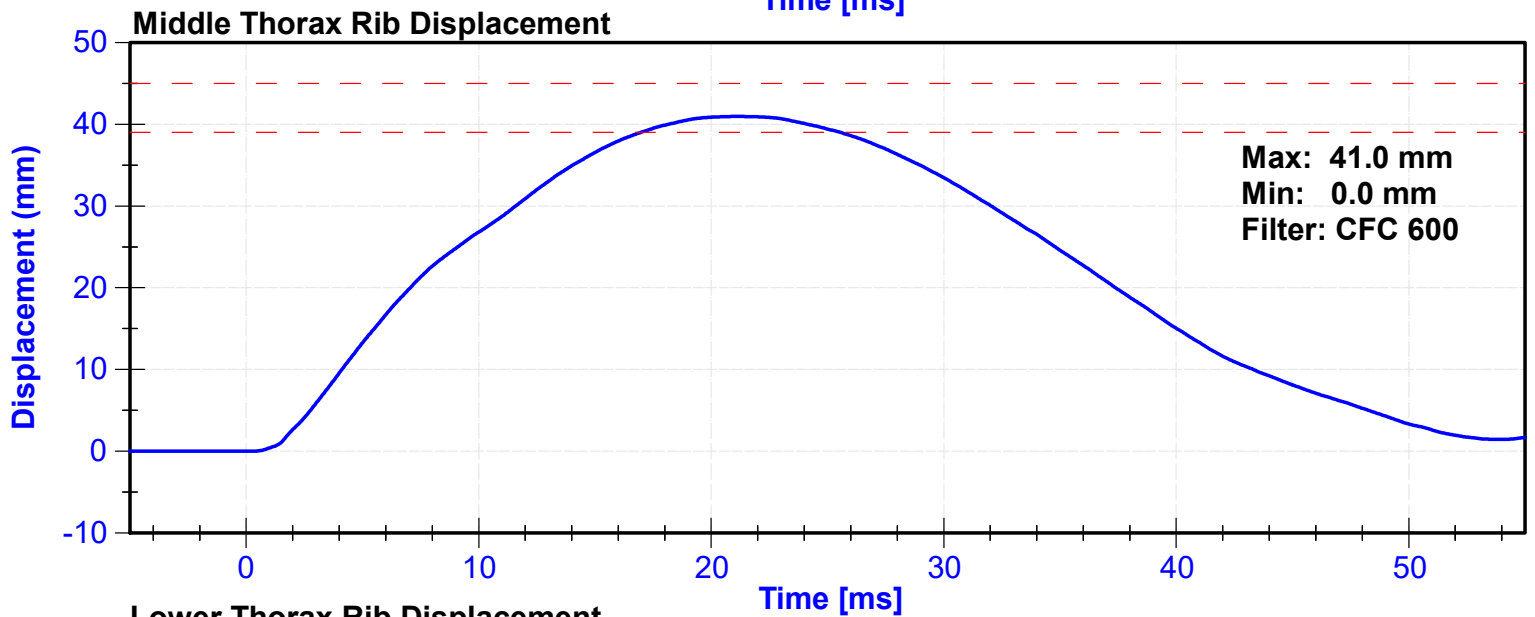
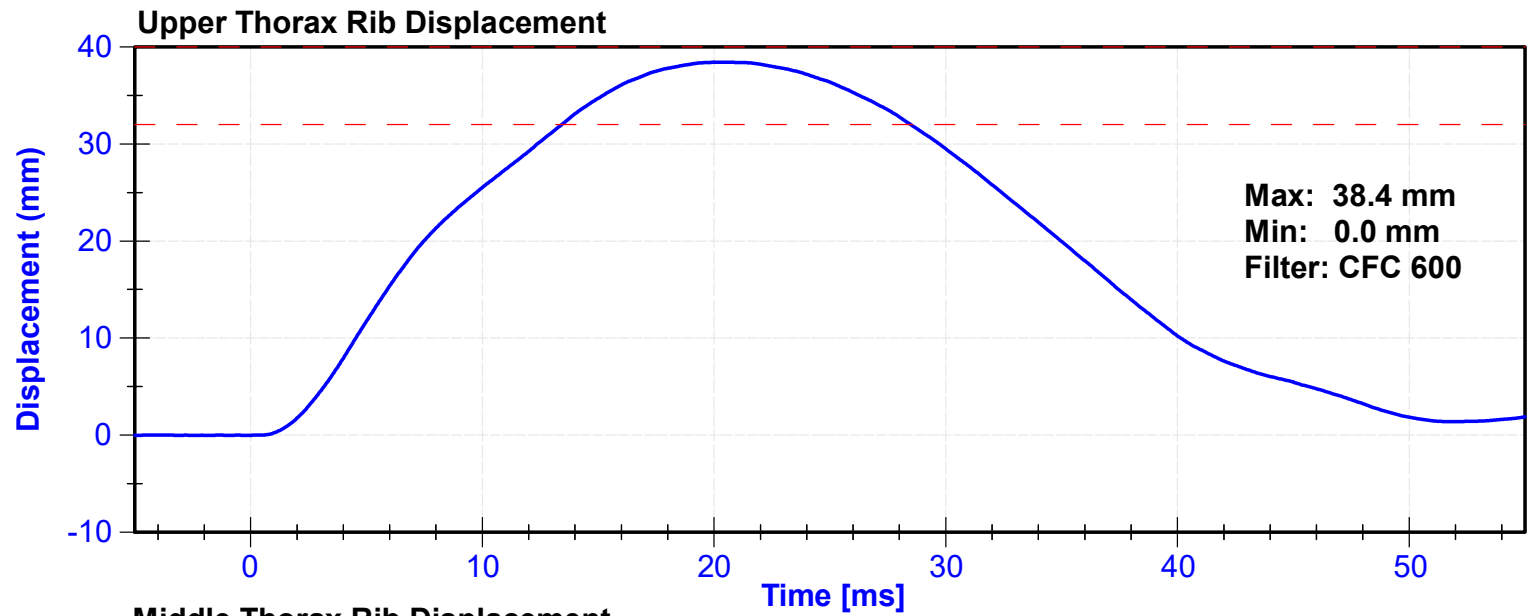
Results

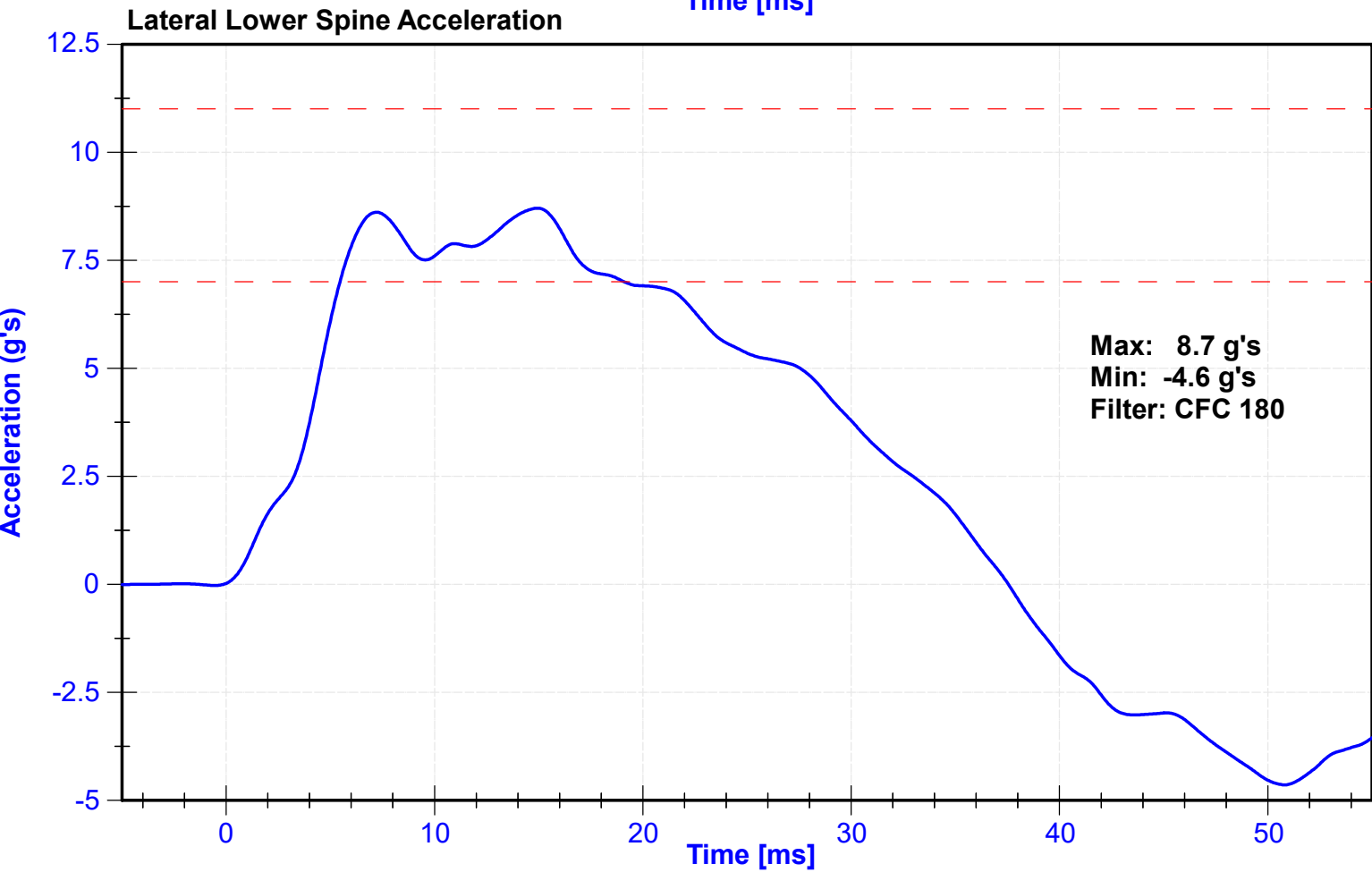
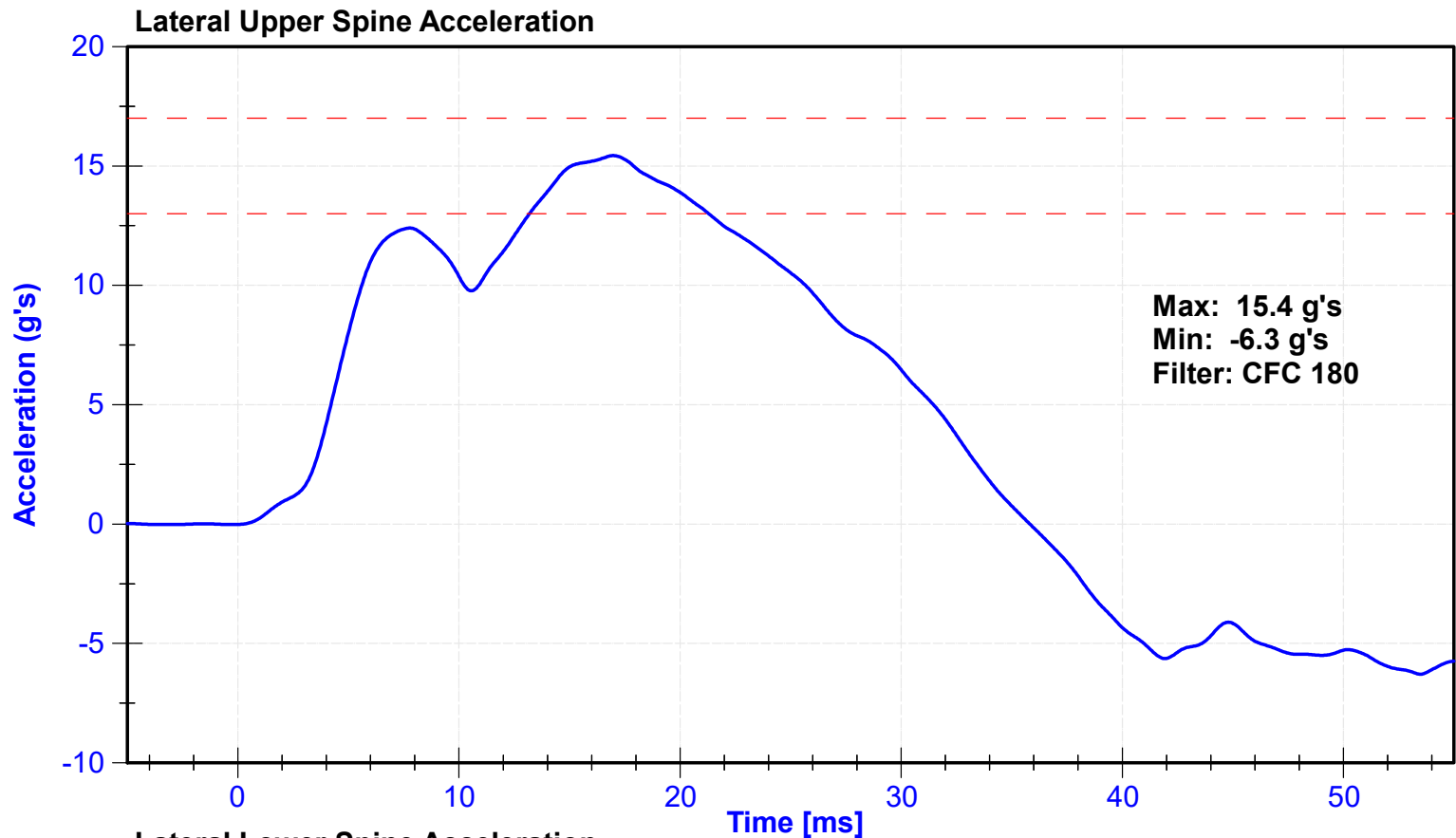
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	14	18	g's	16.3	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.4	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.7	Pass
Upper Thorax Rib Deflection	32	40	mm	38.4	Pass
Middle Thorax Rib Deflection	39	45	mm	41.0	Pass
Lower Thorax Rib Deflection	35	43	mm	36.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	11/17/2023	5/17/2024







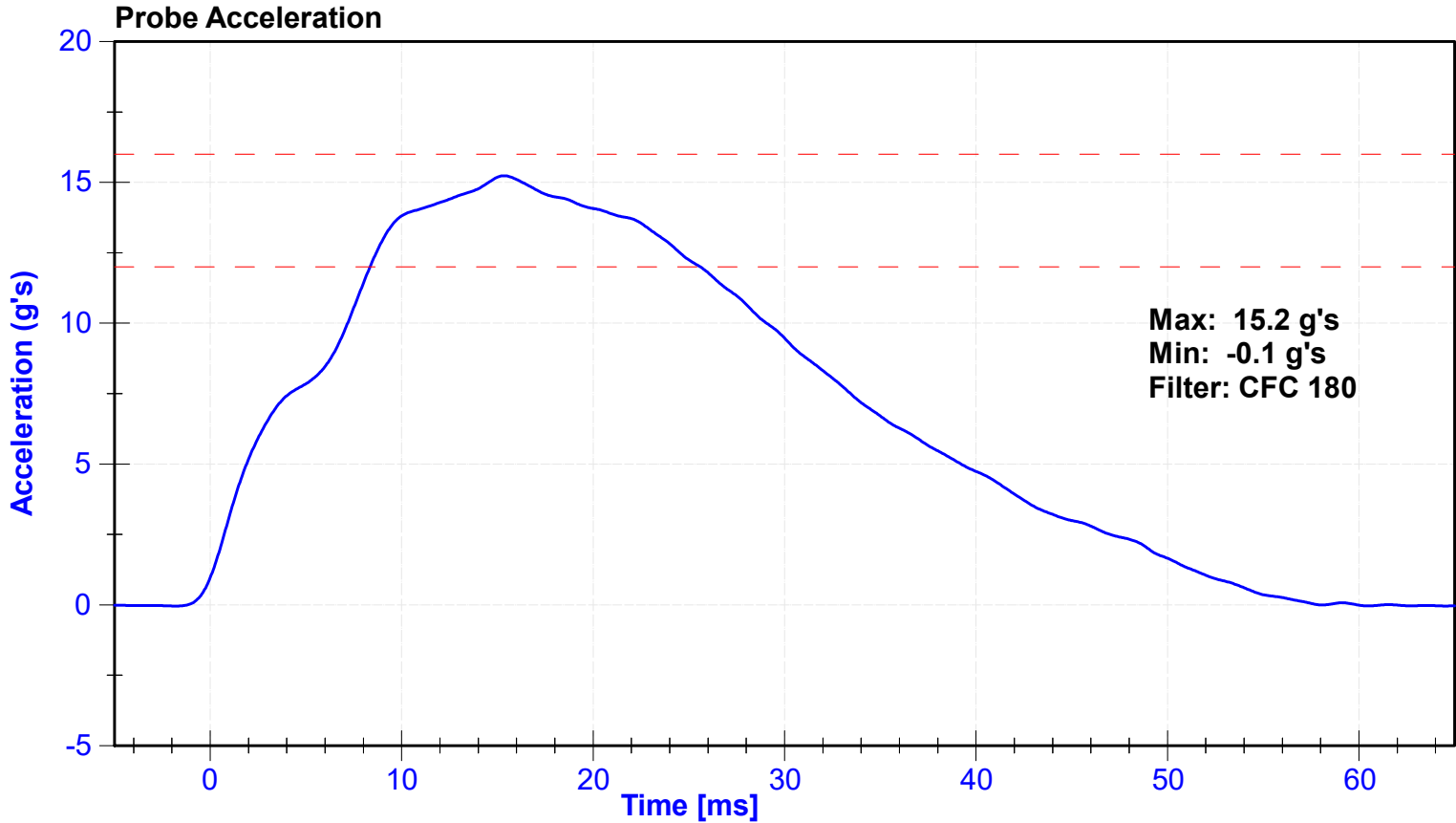
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

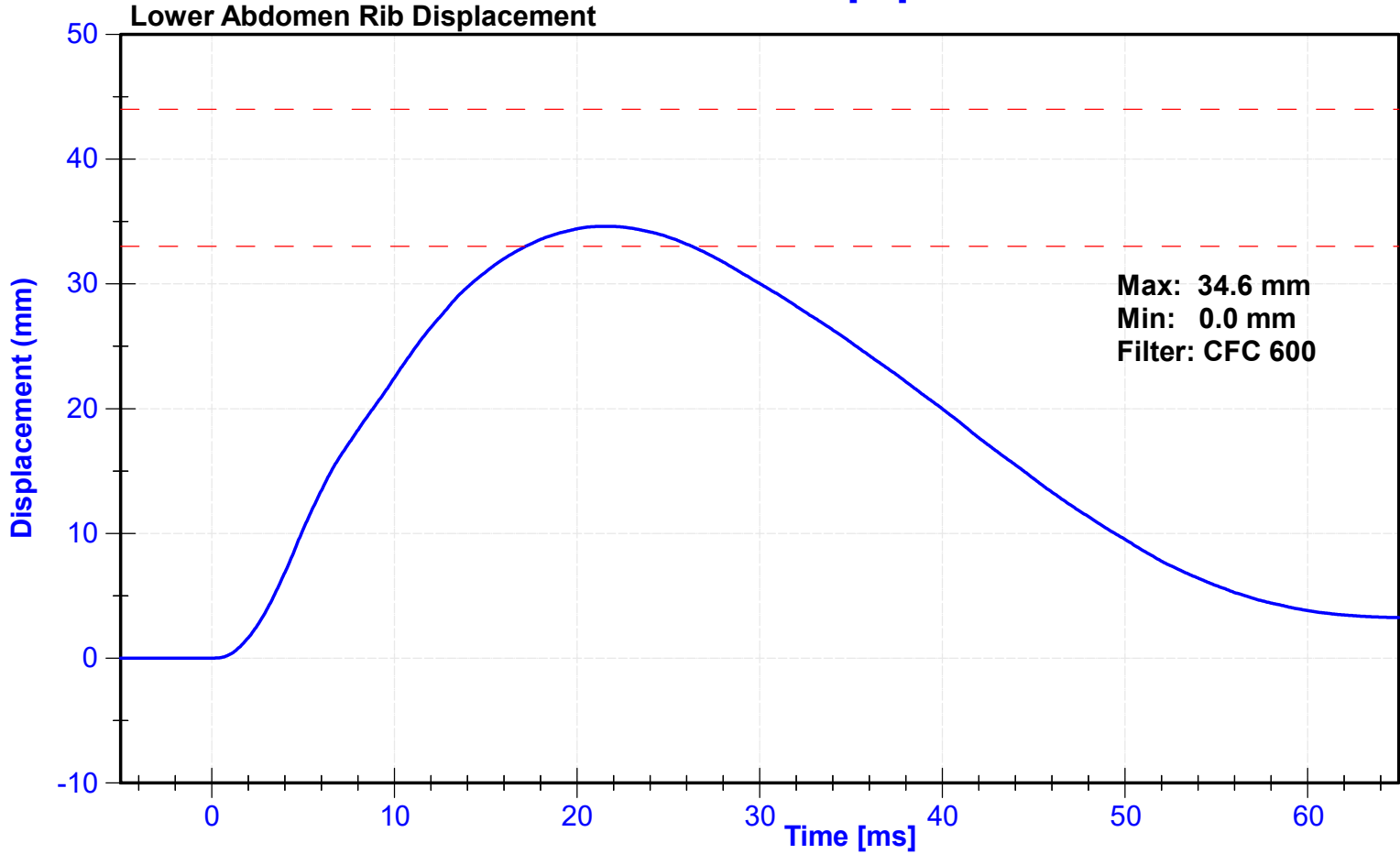
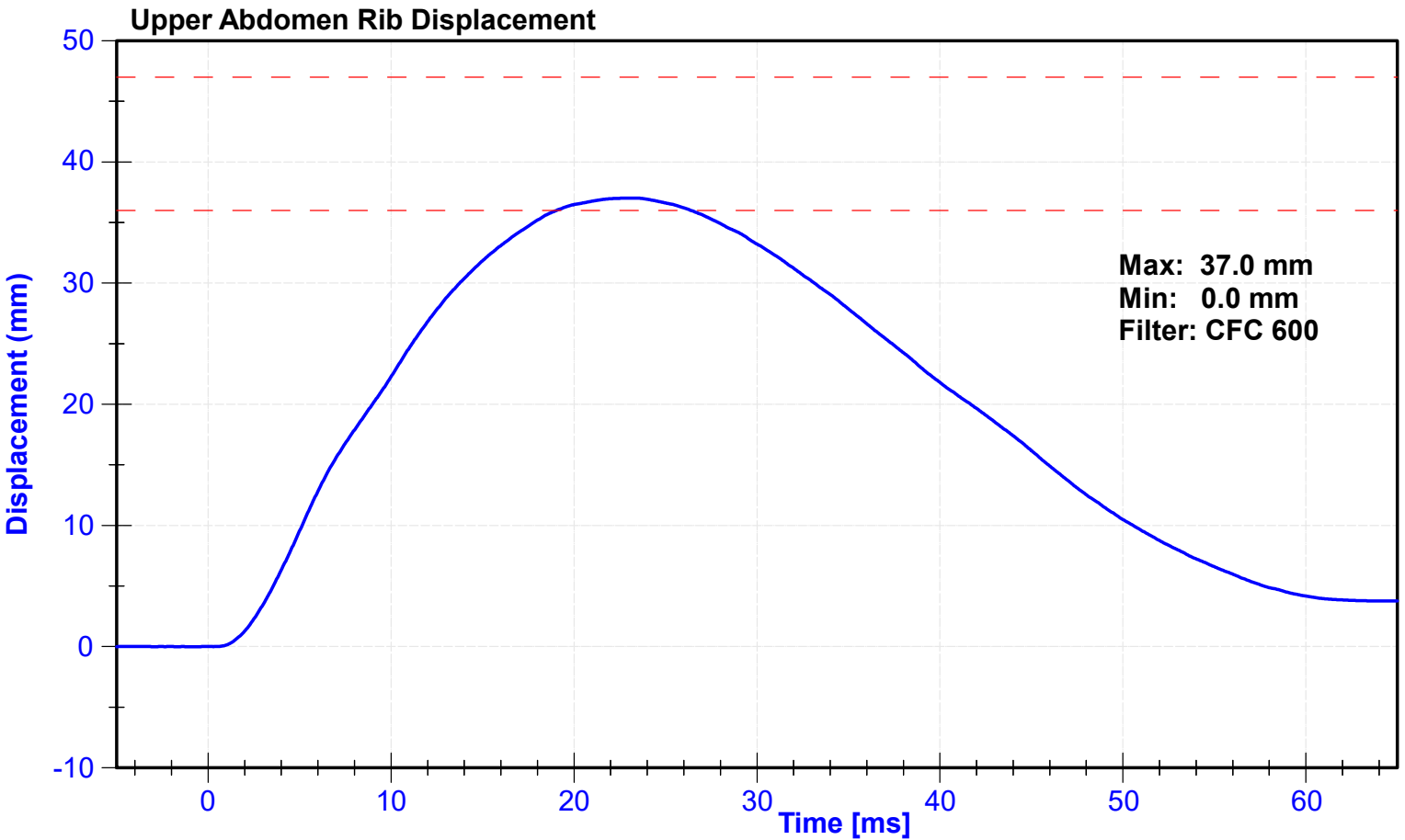
Results

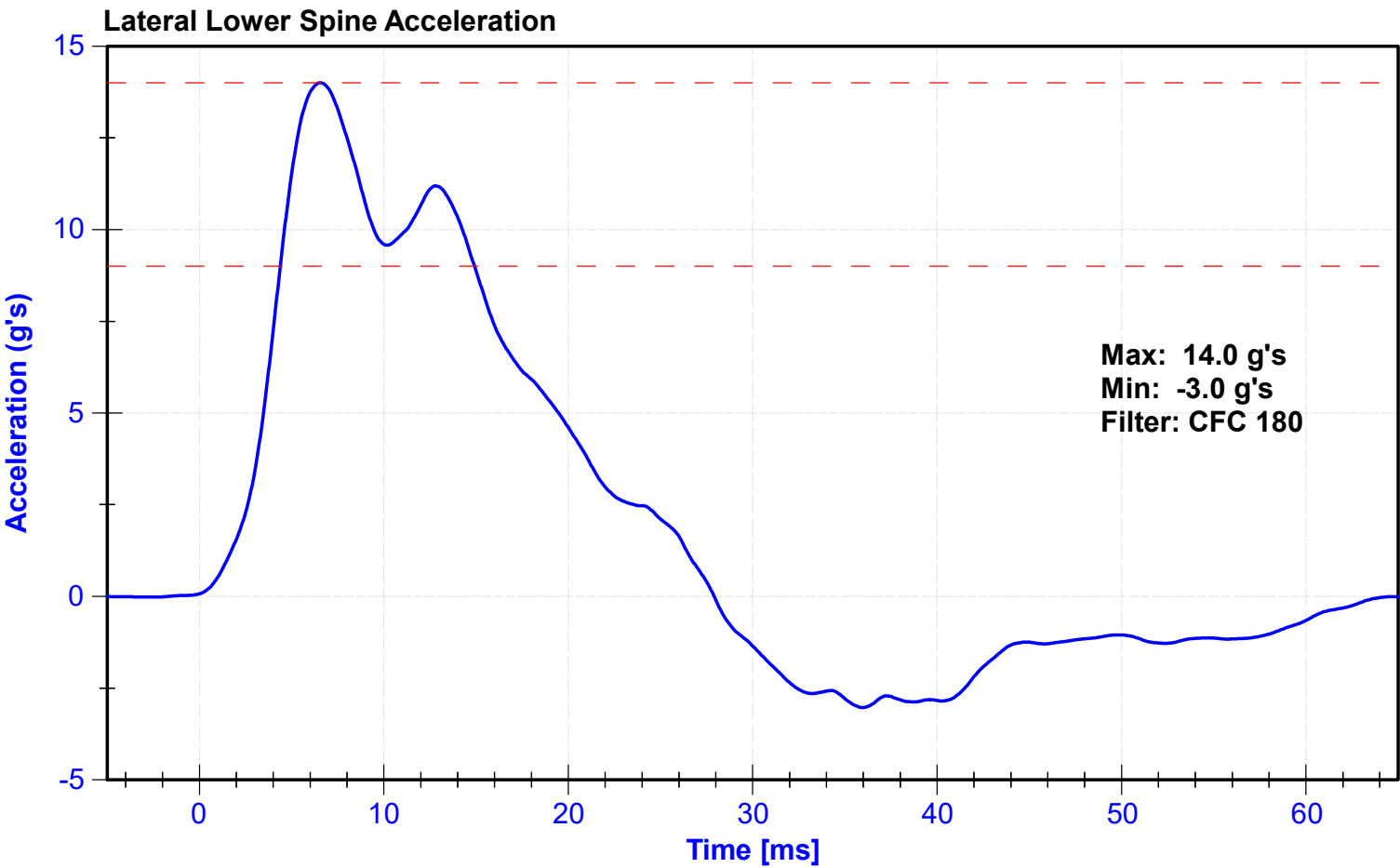
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	12	16	g's	15.2	Pass
Lateral Lower Spine Acceleration	9	14	g's	14.0	Pass
Upper Abdomen Rib Deflection	36	47	mm	37.0	Pass
Lower Abdomen Rib Deflection	33	44	mm	34.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Abdomen Rib Potentiometer	Servo	008GFE	11/17/2023	5/17/2024
Lower Abdomen Rib Potentiometer	Servo	046	11/17/2023	5/17/2024







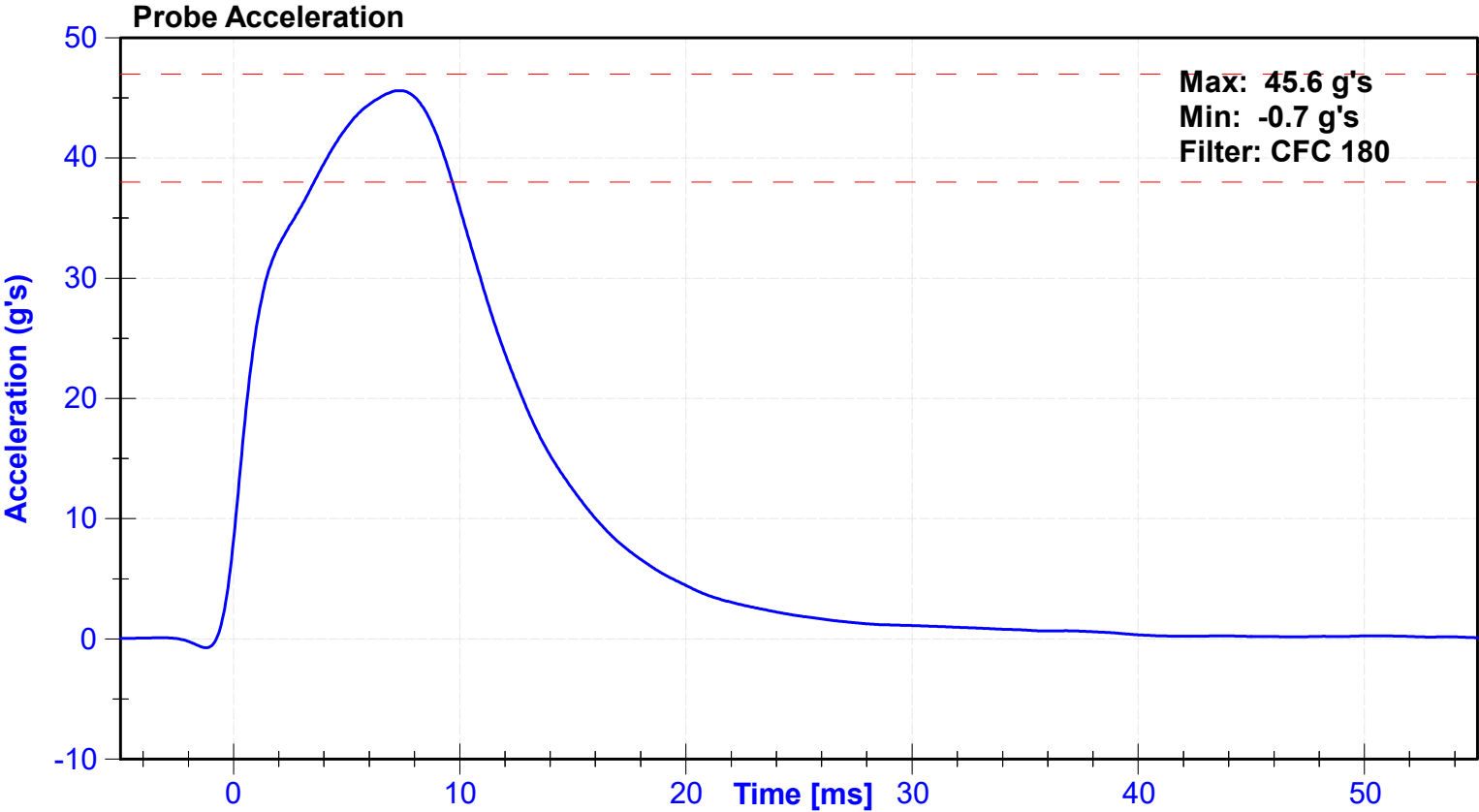
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

Results

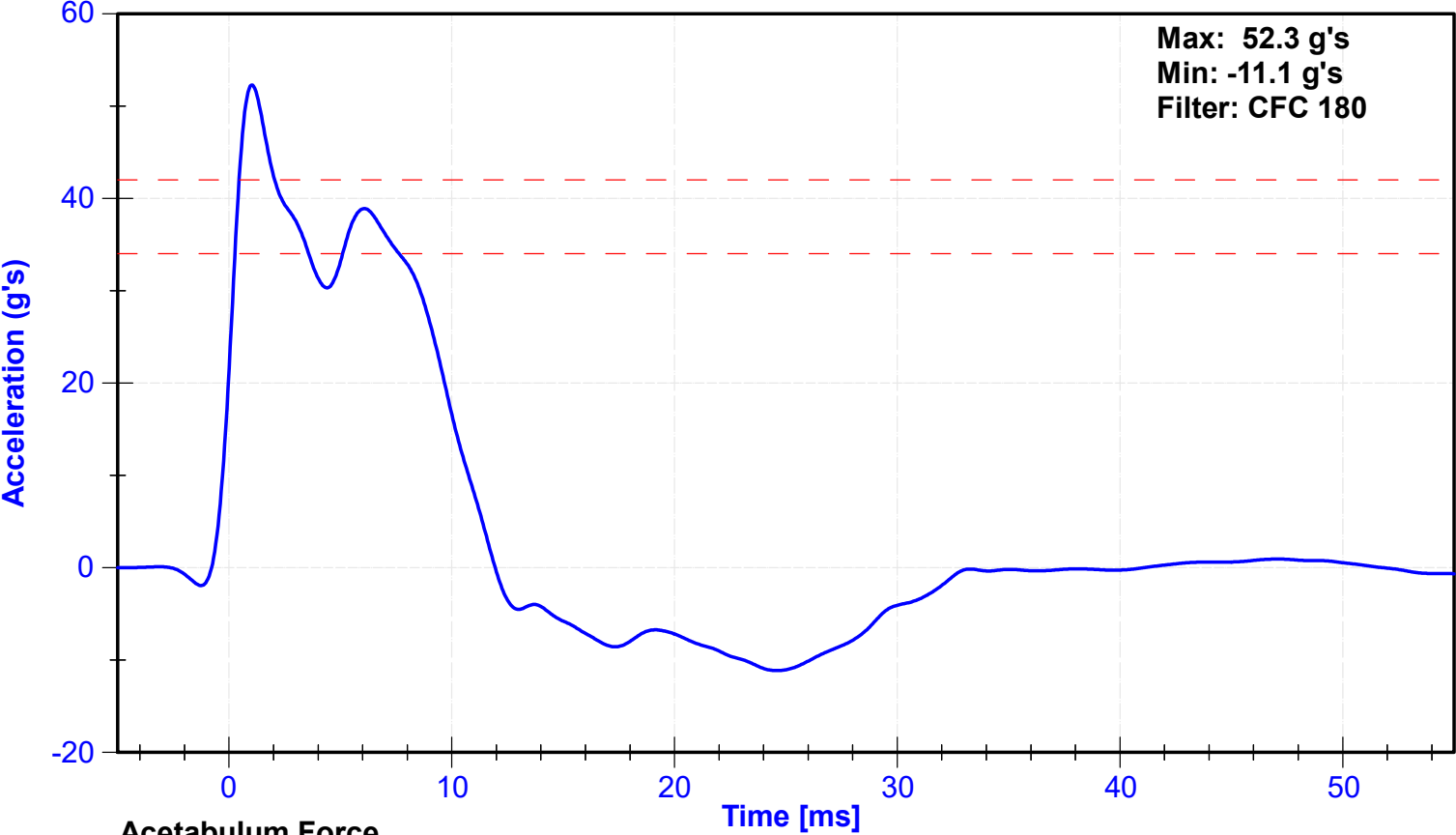
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	6.6	6.8	m/s	6.64	Pass
Probe Acceleration	38	47	g's	45.6	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	38.9	Pass
Acetabulum Force	3600	4300	N	4036.6	Pass

Transducer Calibrations

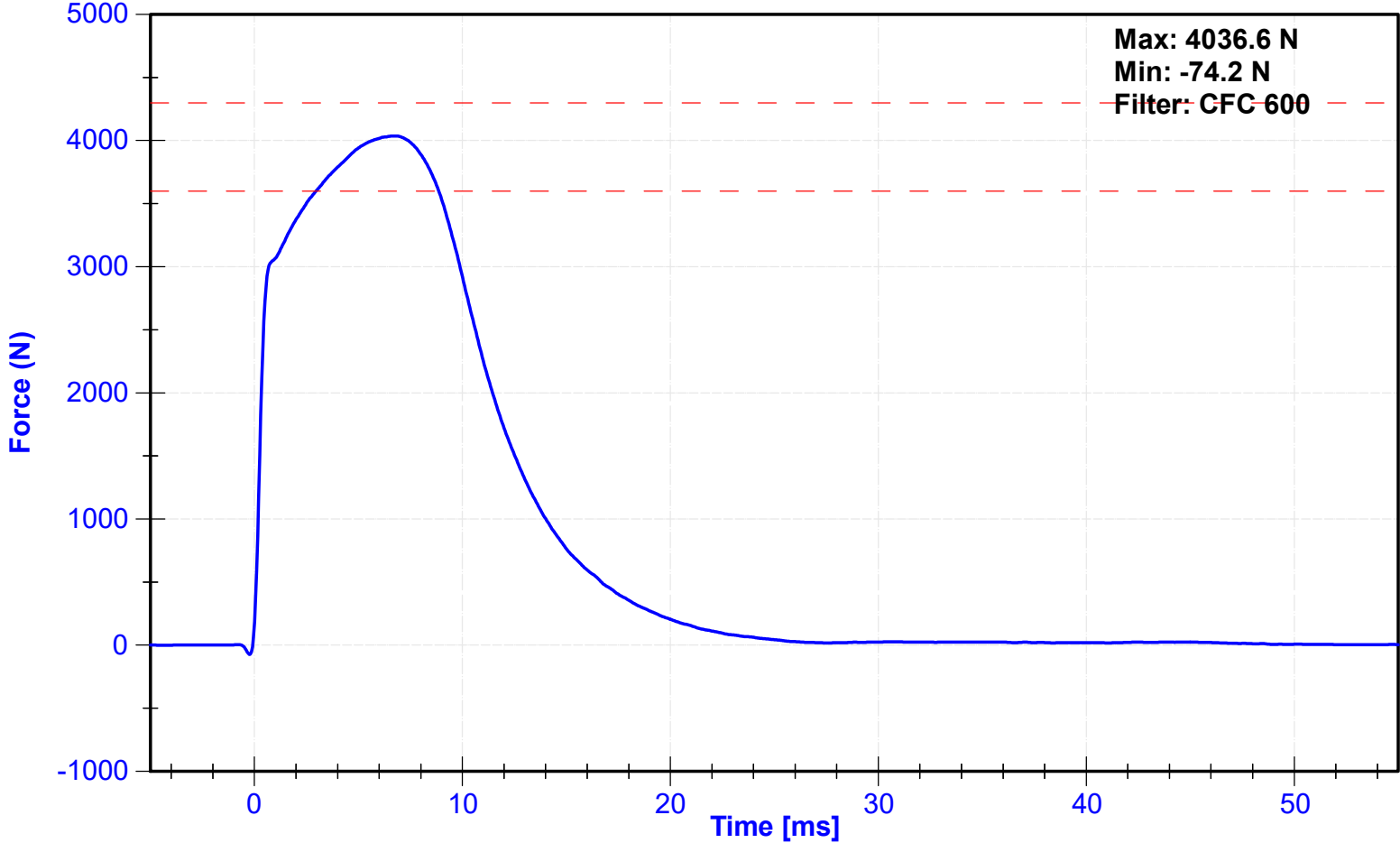
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pelvis Y Accelerometer	Endevco	P50078	11/16/2023	5/14/2024
Acetabulum Load Cell	Denton	270-FY	9/11/2023	9/10/2024
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A



Lateral Pelvis Acceleration



Acetabulum Force





cert hit 1
01-26-24

SID-IIs Pelvis Plug Certification Test

Plug S/N 16628
Test Number 23394
Report Number 23451

Test Date 7/20/2022 12:01:14 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

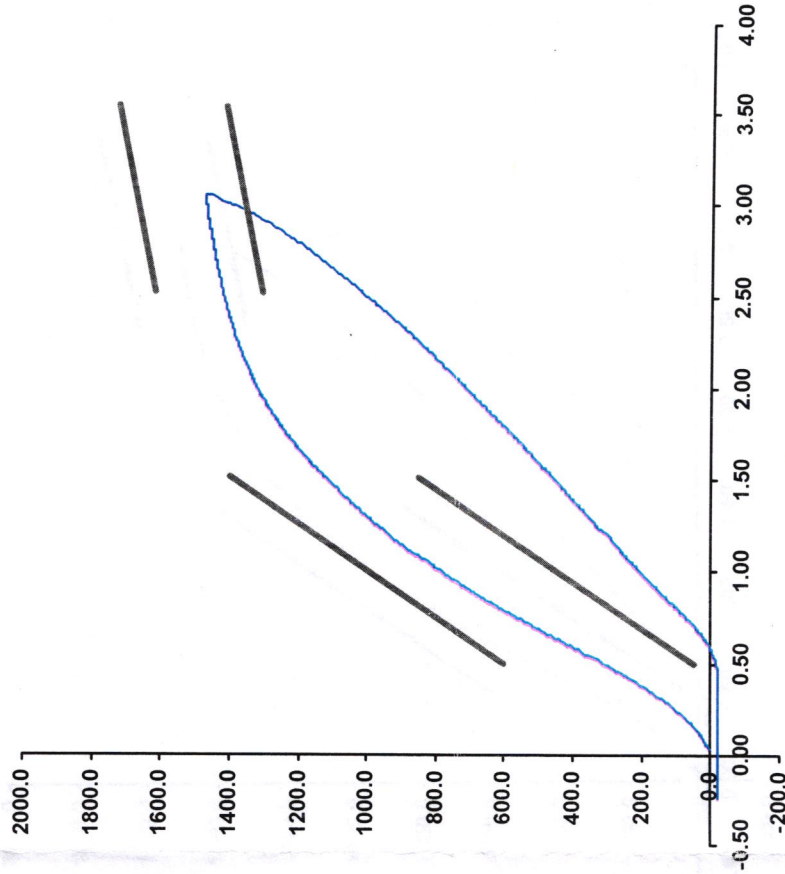
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 20-Jul-22

SACO Research

By : DC Date : 7/20/22

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



SID-IIs Pelvis Plug Certification Test

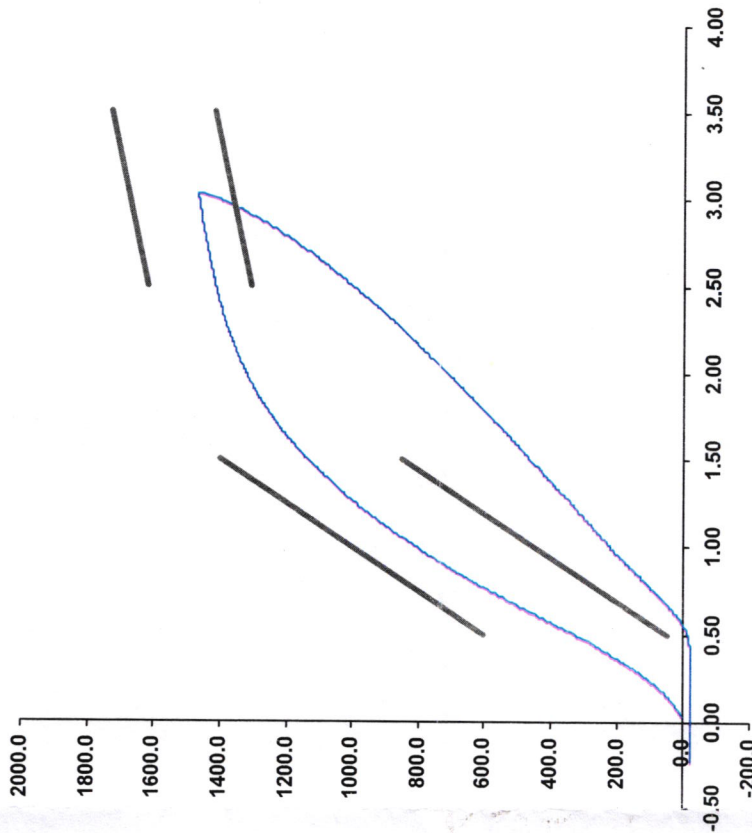
Plug S/N 16635

Test Number 23401

Report Number 23458

Test Date 7/20/2022 1:18:53 PM

Force (-N) vs Extension (-mm)



Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	333	600
Force @ 1.5 mm (N)	1,138	1,400
Force @ 2.5 mm (N)	1,415	1,618
Force @ 3.0 mm (N)	1,467	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 20-Jul-22
SACO Research

By: DC Date: 7/20/22
SACO Research 41735 Elm St. #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



SID-IIs Pelvis Plug Certification Test

Plug S/N 16633

Test Number 23399

Report Number 23456

Test Date 7/20/2022 1:09:52 PM

Indact side

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

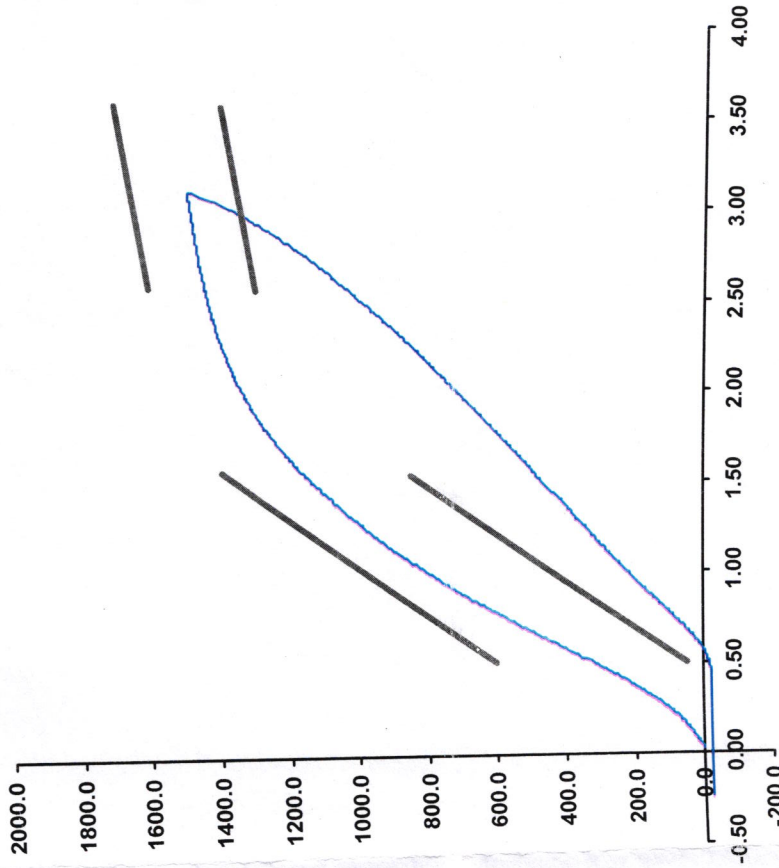
Testing Machine STM-20 5965542

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:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107

SACO Research

By: *DC*

Date: *7/20/22*

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

ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

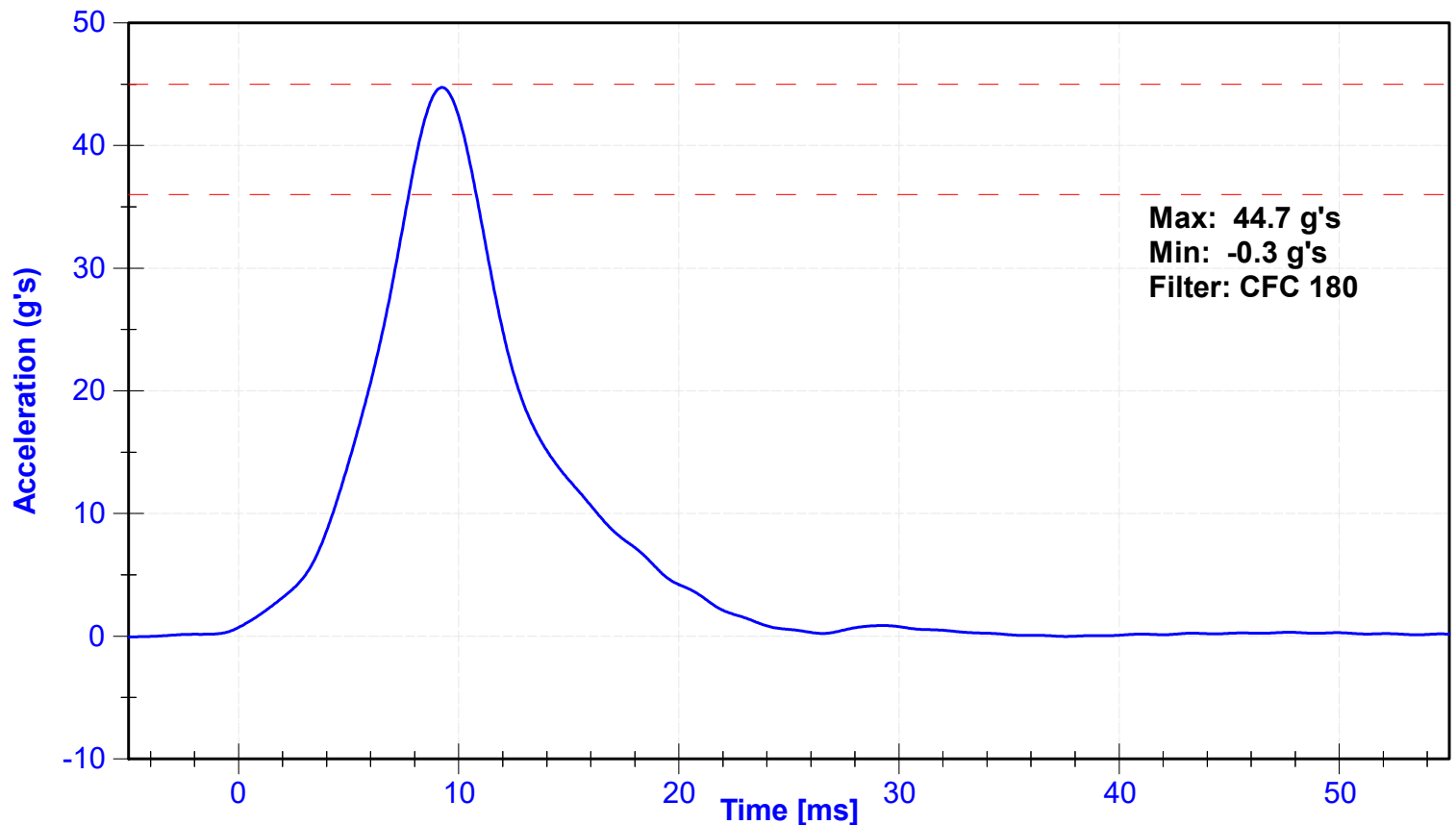
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	36	45	g's	44.7	Pass
Lateral Pelvis Acceleration	28	39	g's	37.3	Pass
Iliac Force	4100	5100	N	4804.2	Pass

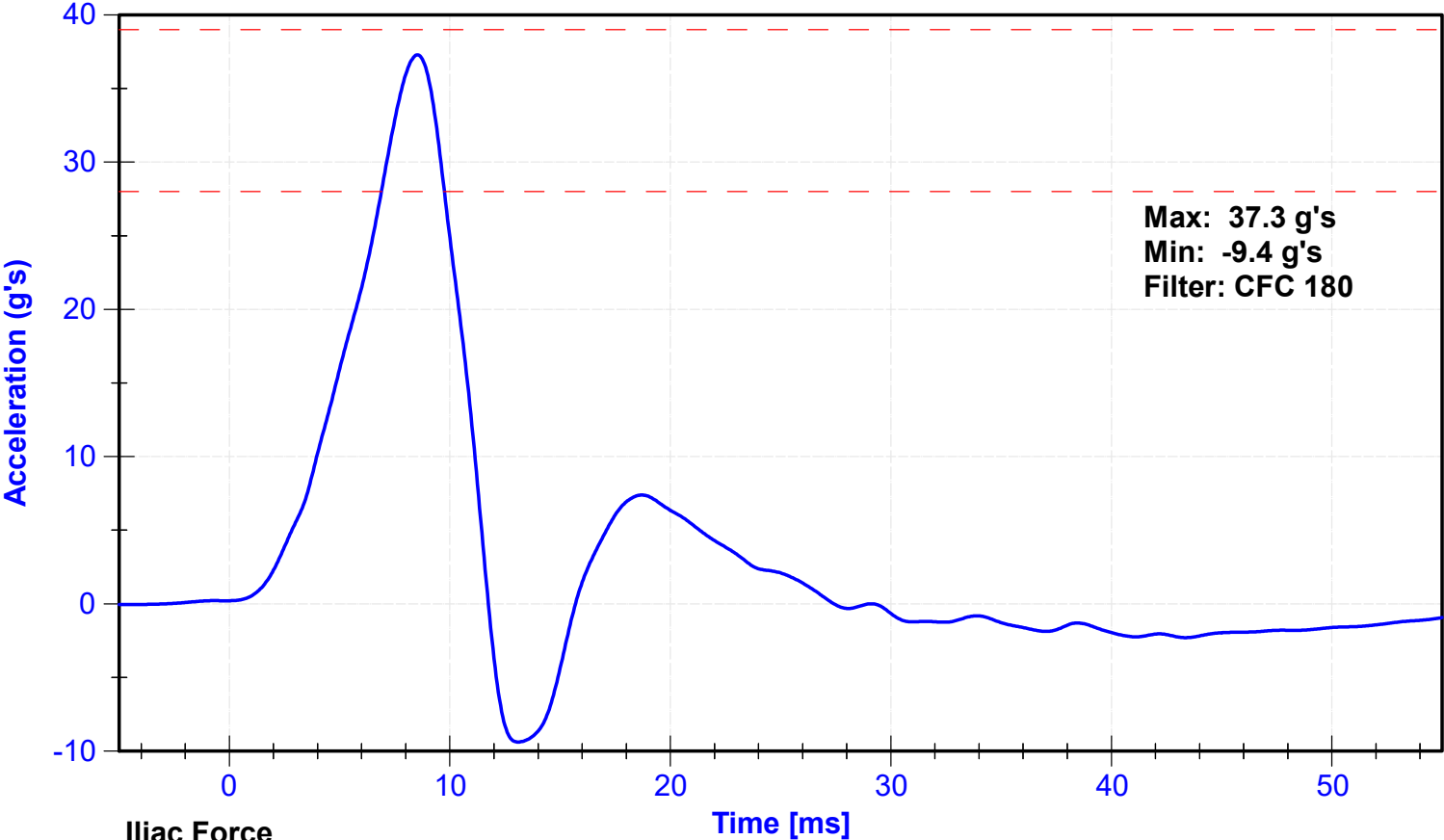
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pelvis Y Accelerometer	Endevco	P50078	11/16/2023	5/14/2024
Iliac Load Cell	Denton	280-FY	9/11/2023	9/10/2024

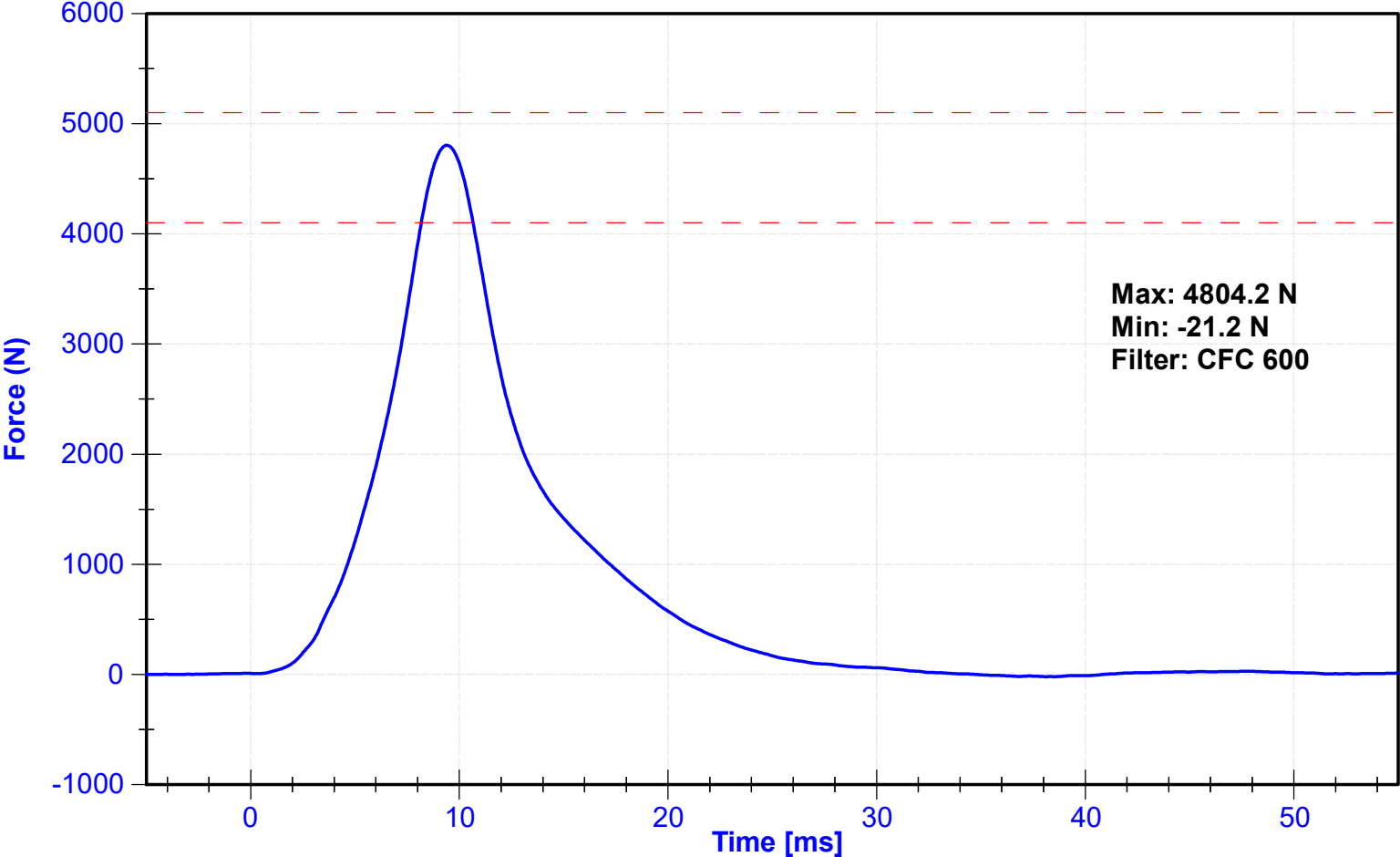
Probe Acceleration



Lateral Pelvis Acceleration



Iliac Force



CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

SERIAL NO:DG8012

(CONFIGURED FOR LEFT SIDE IMPACT)

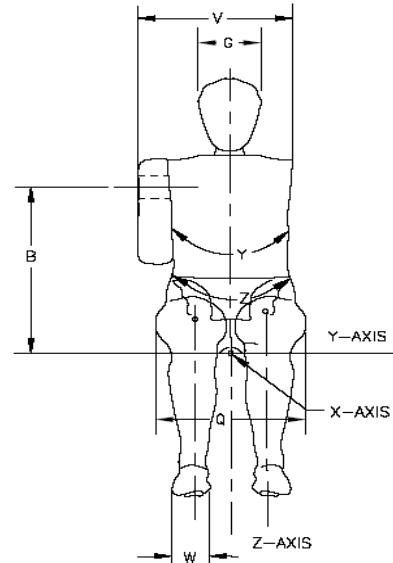
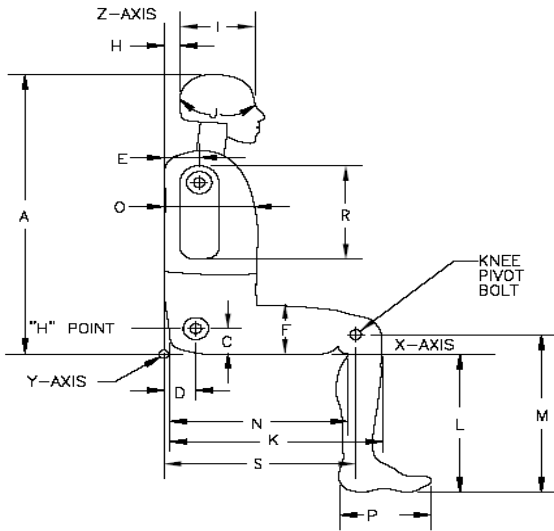


External Measurements - SID-IIs

Technician: **T. Roseman**

Date: **02/22/2024**

Dummy Serial Number: **DG8012**



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	783	Pass
B	Shoulder Pivot Height	437	453	447	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	104	Pass
F	Thigh Clearance	119	135	129	Pass
G	Head Breadth	140	148	143	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	545	Pass
K	Buttock to Knee Length	514	540	530	Pass
L	Popliteal Height	343	369	363	Pass
M	Knee Pivot to floor height	392	409	399	Pass
N	Buttock Popliteal Length	416	442	438	Pass
O	Chest Depth w/o jacket	195	211	204	Pass
P	Foot Length	216	232	220	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	255	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	353	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	869	Pass
Z	Waist Circumference	761	791	780	Pass

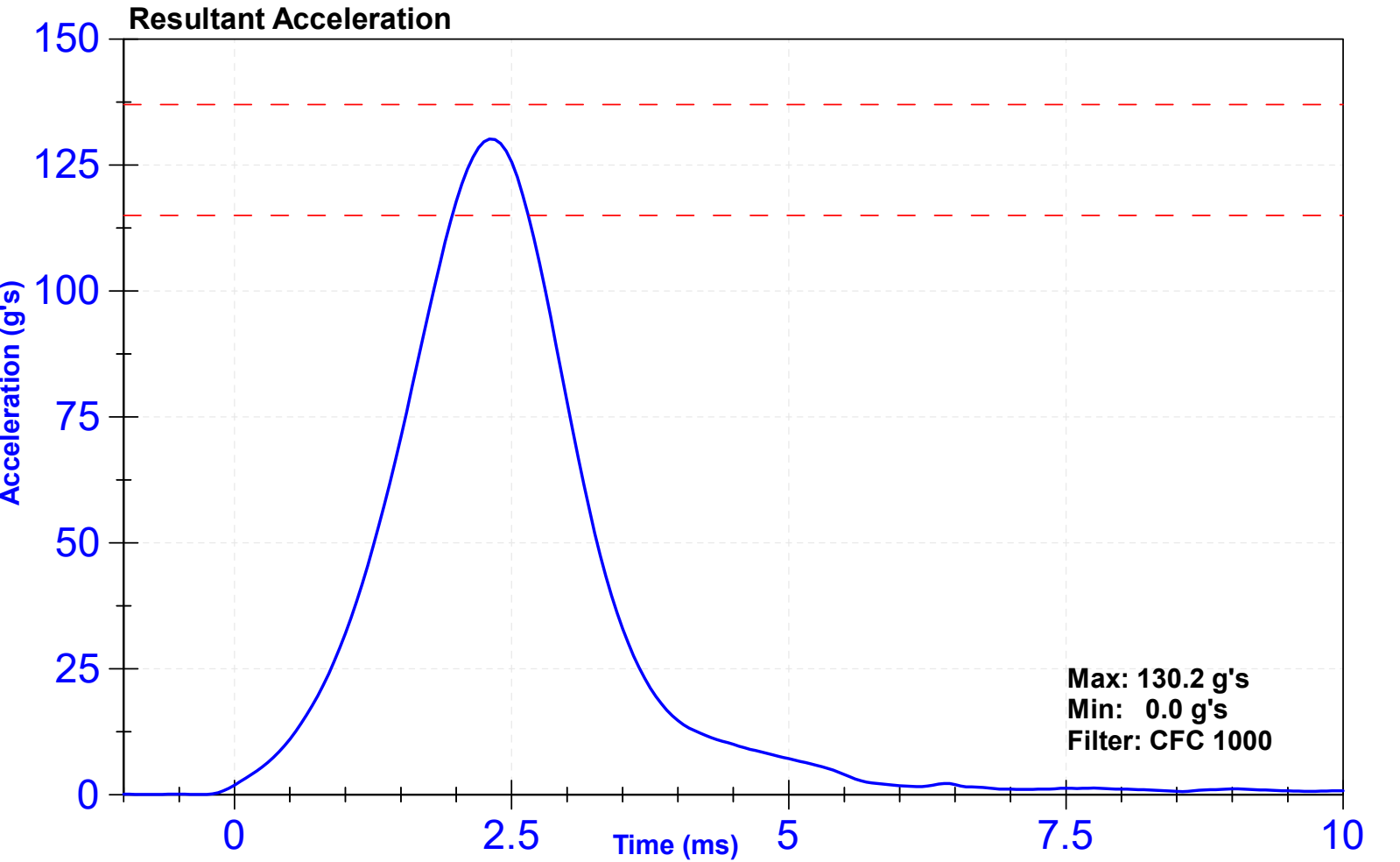
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

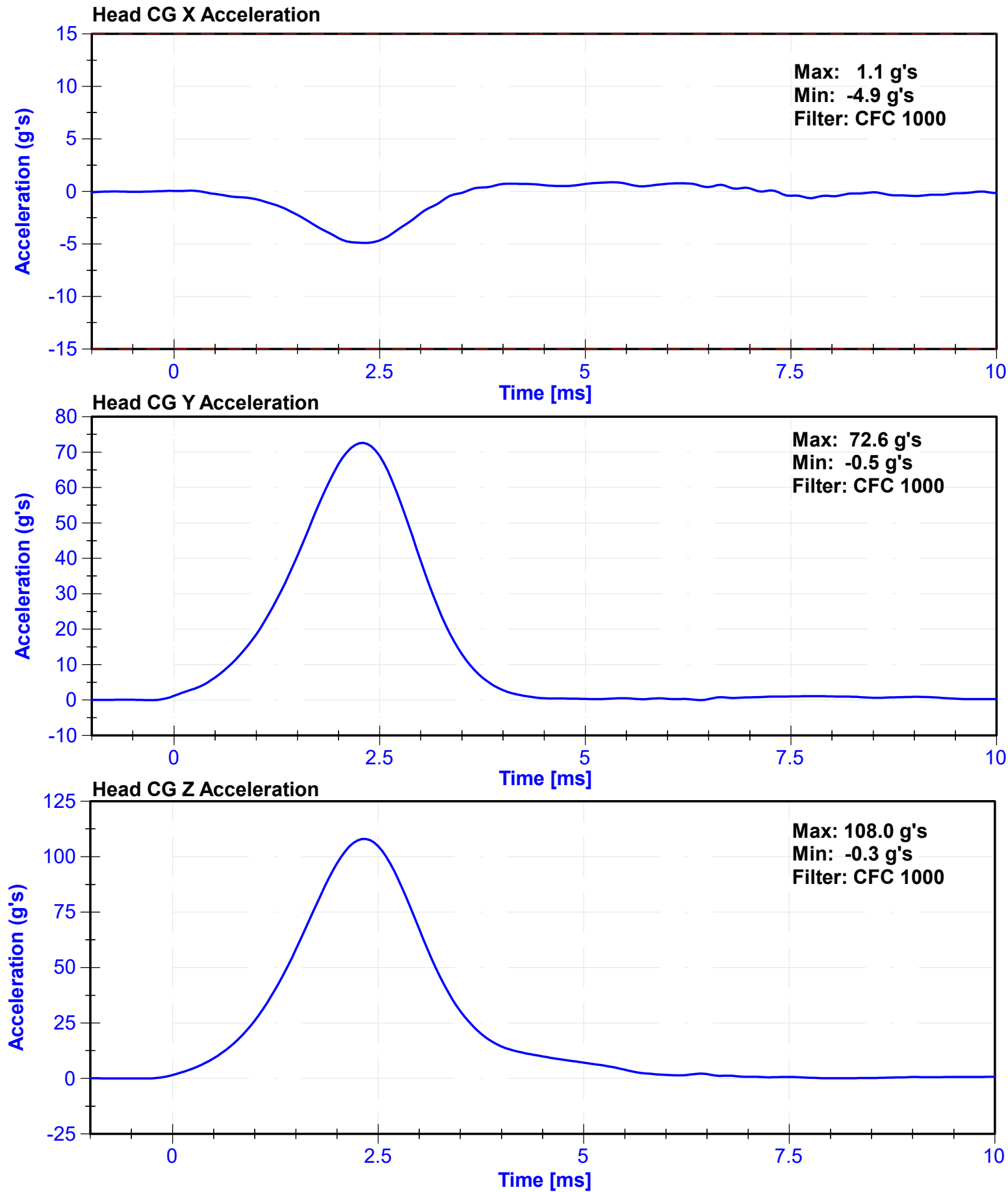
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21	Pass
Humidity	10	70	%	24	Pass
Resultant Acceleration	115	137	g's	130.2	Pass
Oscillation	0	15	%	1.7	Pass
Fore-Aft Acceleration	-15	15	g's	-4.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P74788	11/16/2023	5/14/2024
Y Accelerometer	Endevco	P51668	11/16/2023	5/14/2024
Z Accelerometer	Endevco	P83319	11/16/2023	5/14/2024





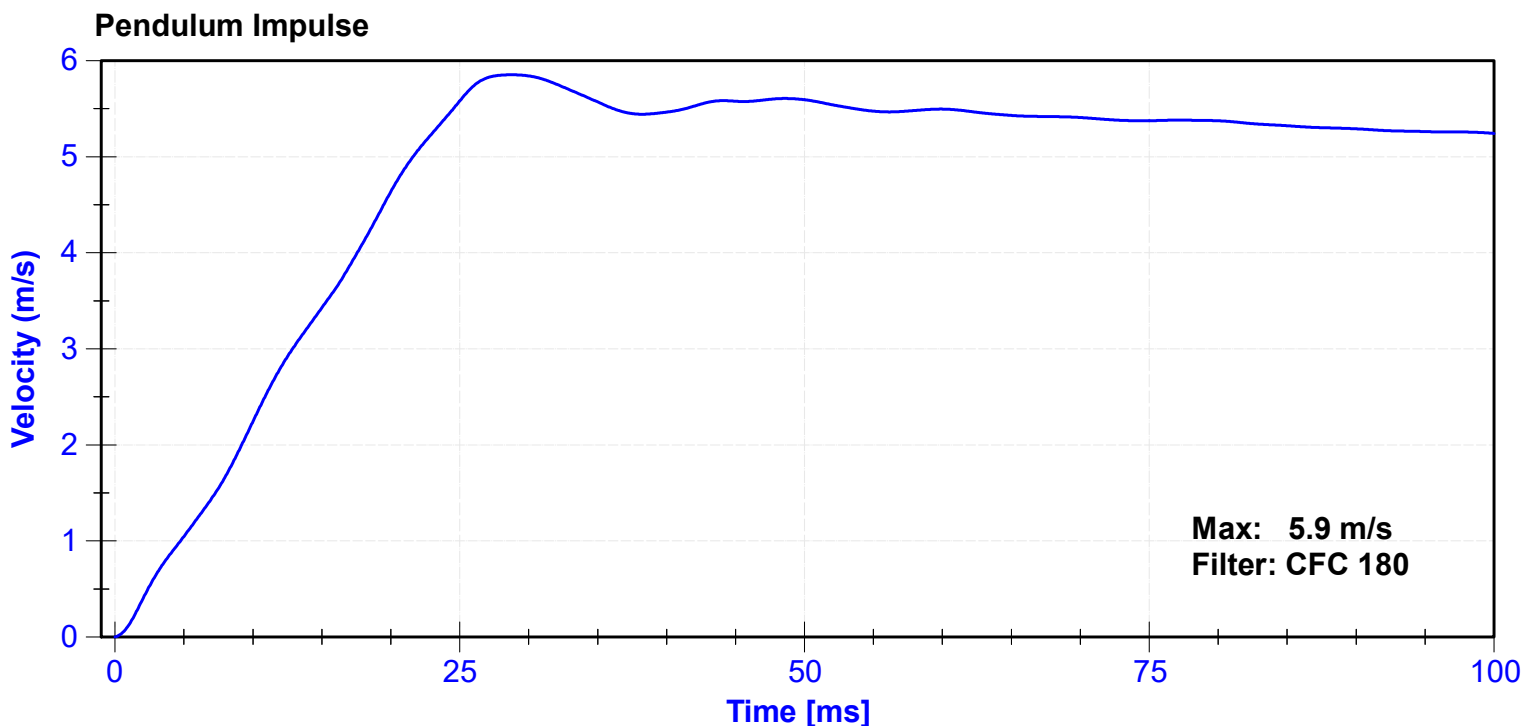
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

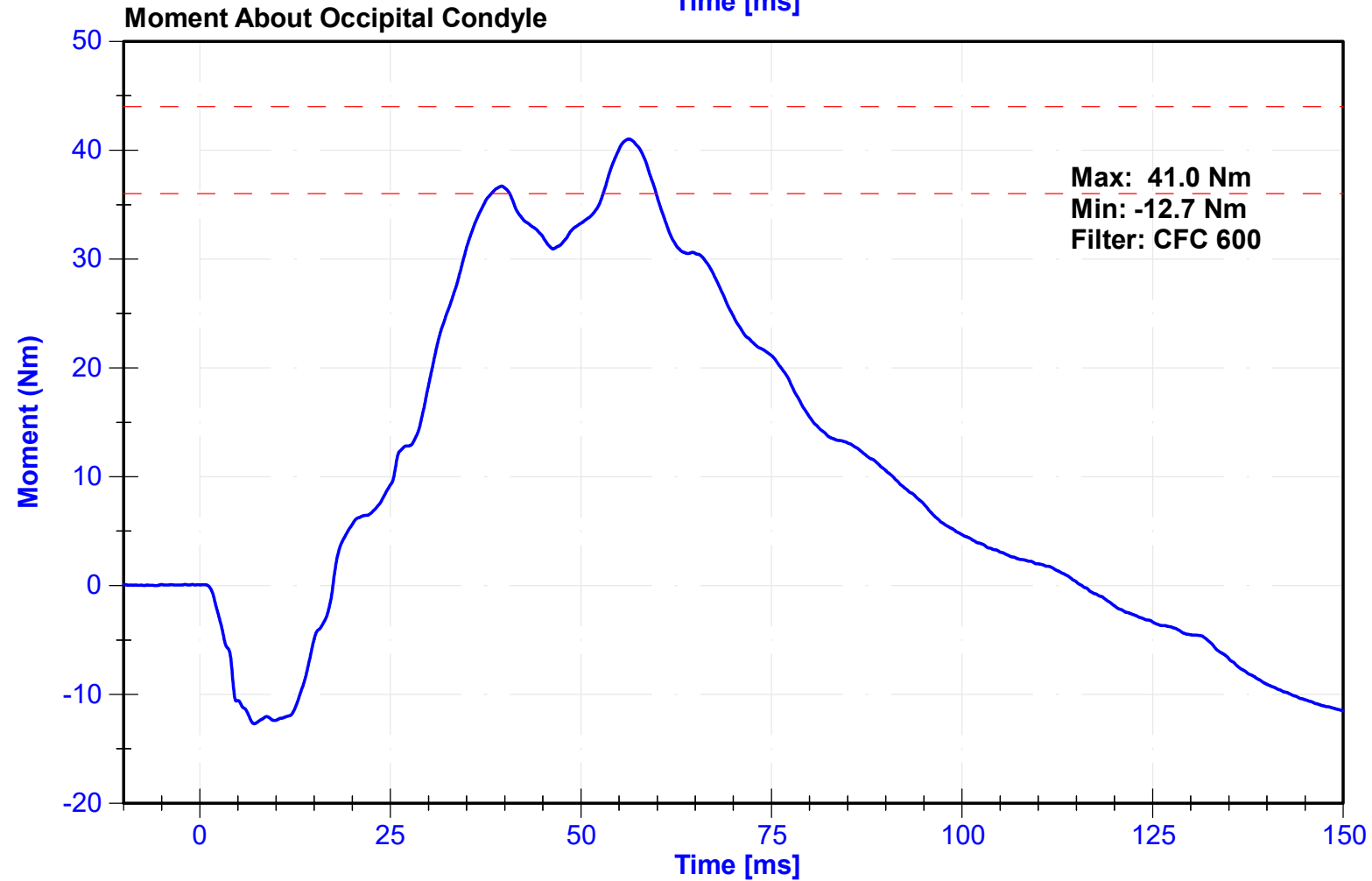
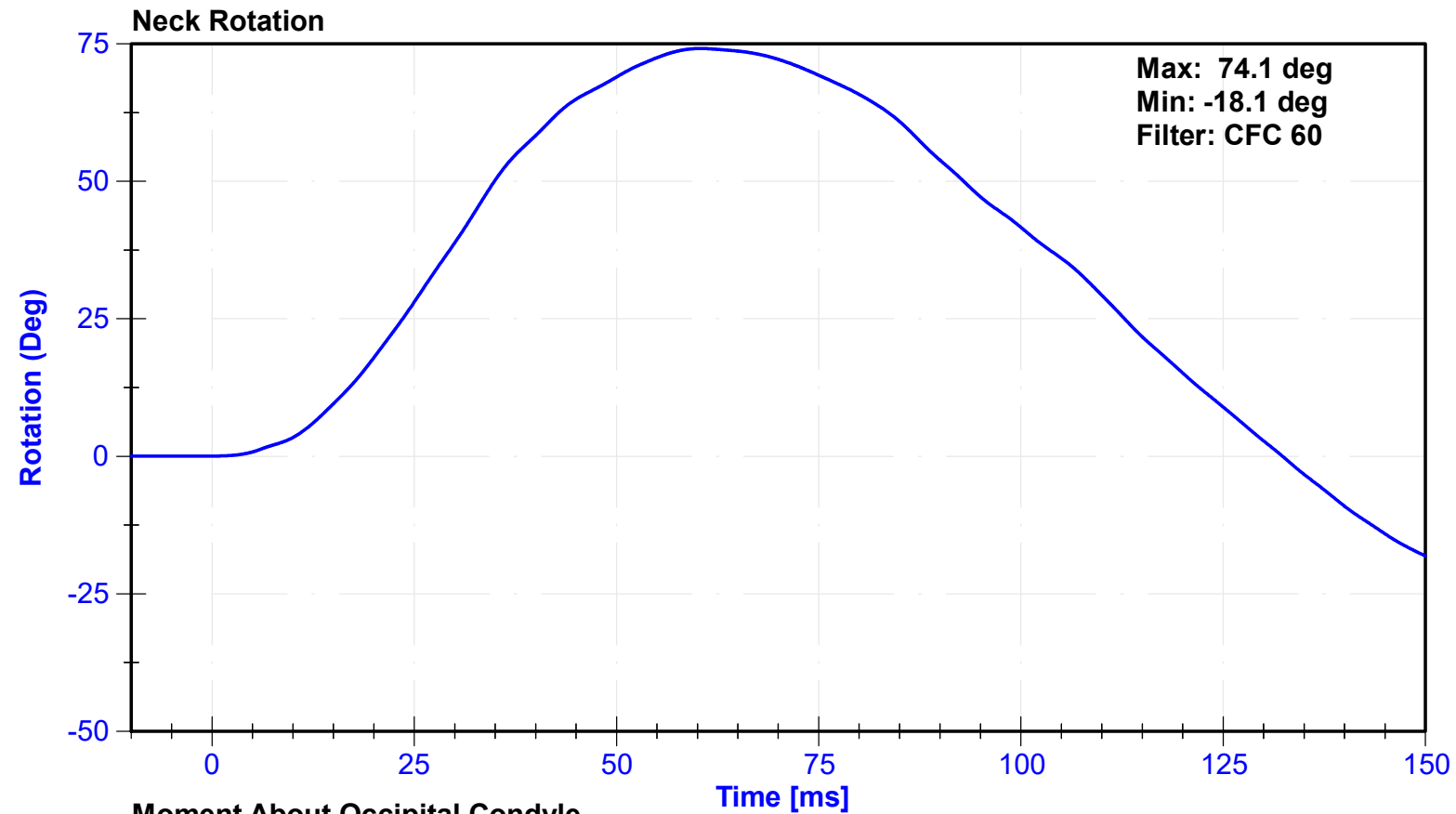
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21	Pass
Humidity	10	70	%	30	Pass
Velocity	5.51	5.63	m/s	5.532	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.24	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.43	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.64	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.58	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.85	Pass
Neck Rotation	71	81	deg	74.1	Pass
Time at Maximum Rotation	50	70	ms	60.4	Pass
Moment about the OC	36	44	Nm	41.0	Pass
Moment Decay to 0 Nm	102	126	ms	115.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	10/31/2023	4/28/2024
Pendulum Potentiometer	Servo	4961	10/2/2023	10/1/2024
Condyle Potentiometer	Servo	DS185	10/2/2023	10/1/2024
Upper Neck Load Cell	Denton	1716ATF_2184-FY	5/18/2023	5/17/2024





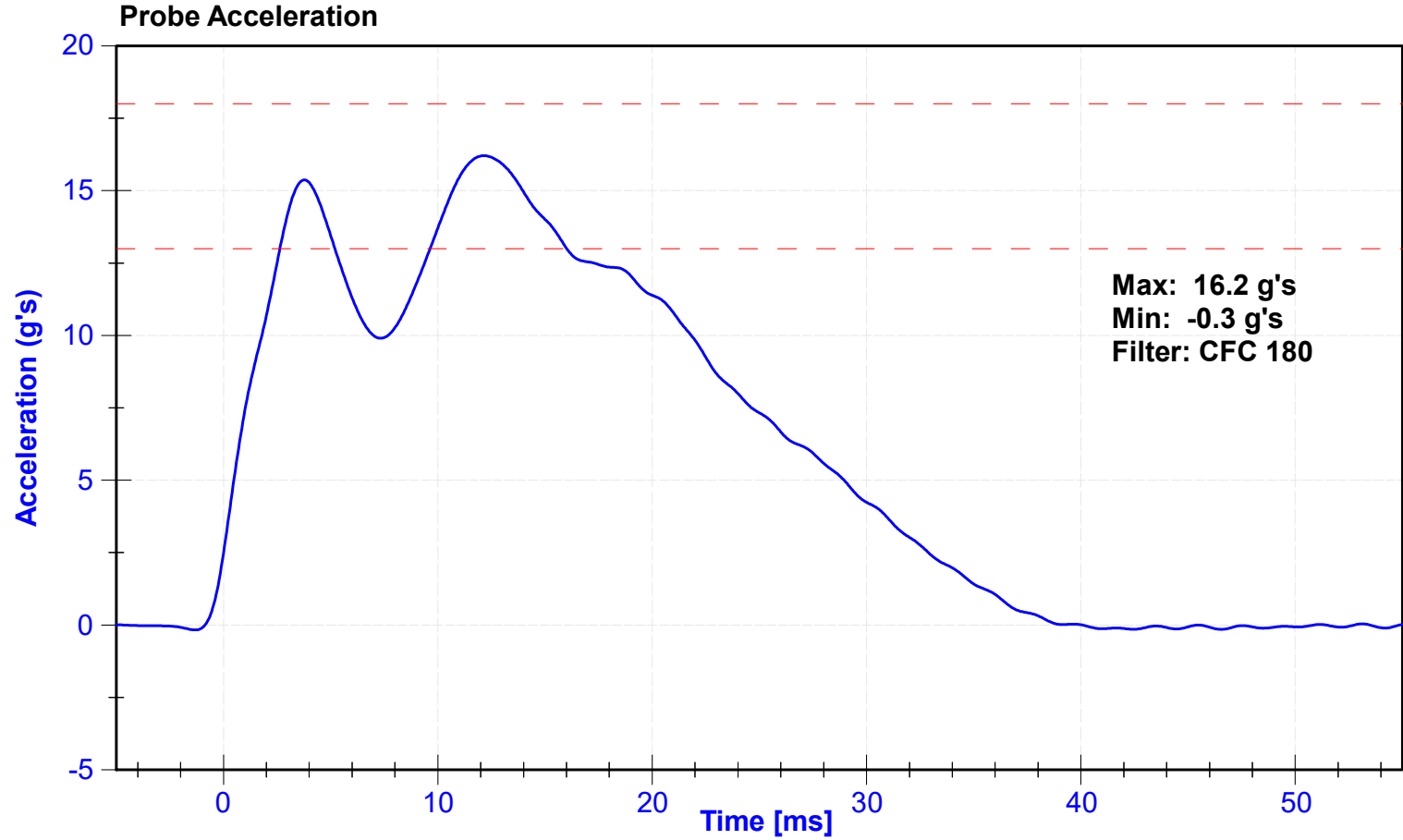
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

Results

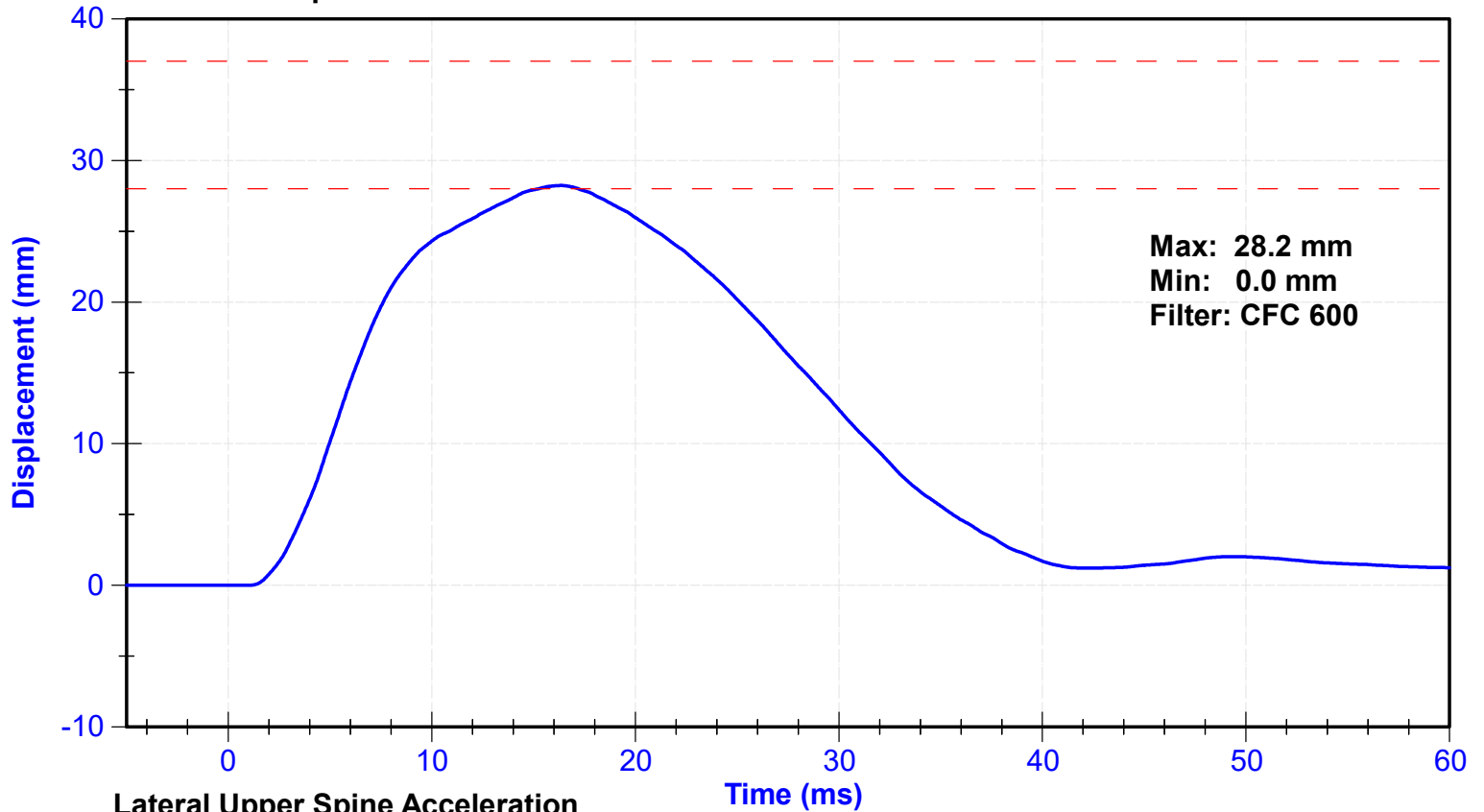
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.30	Pass
Probe Acceleration	13	18	g's	16.2	Pass
Shoulder Deflection	28	37	mm	28.2	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.6	Pass

Transducer Calibrations

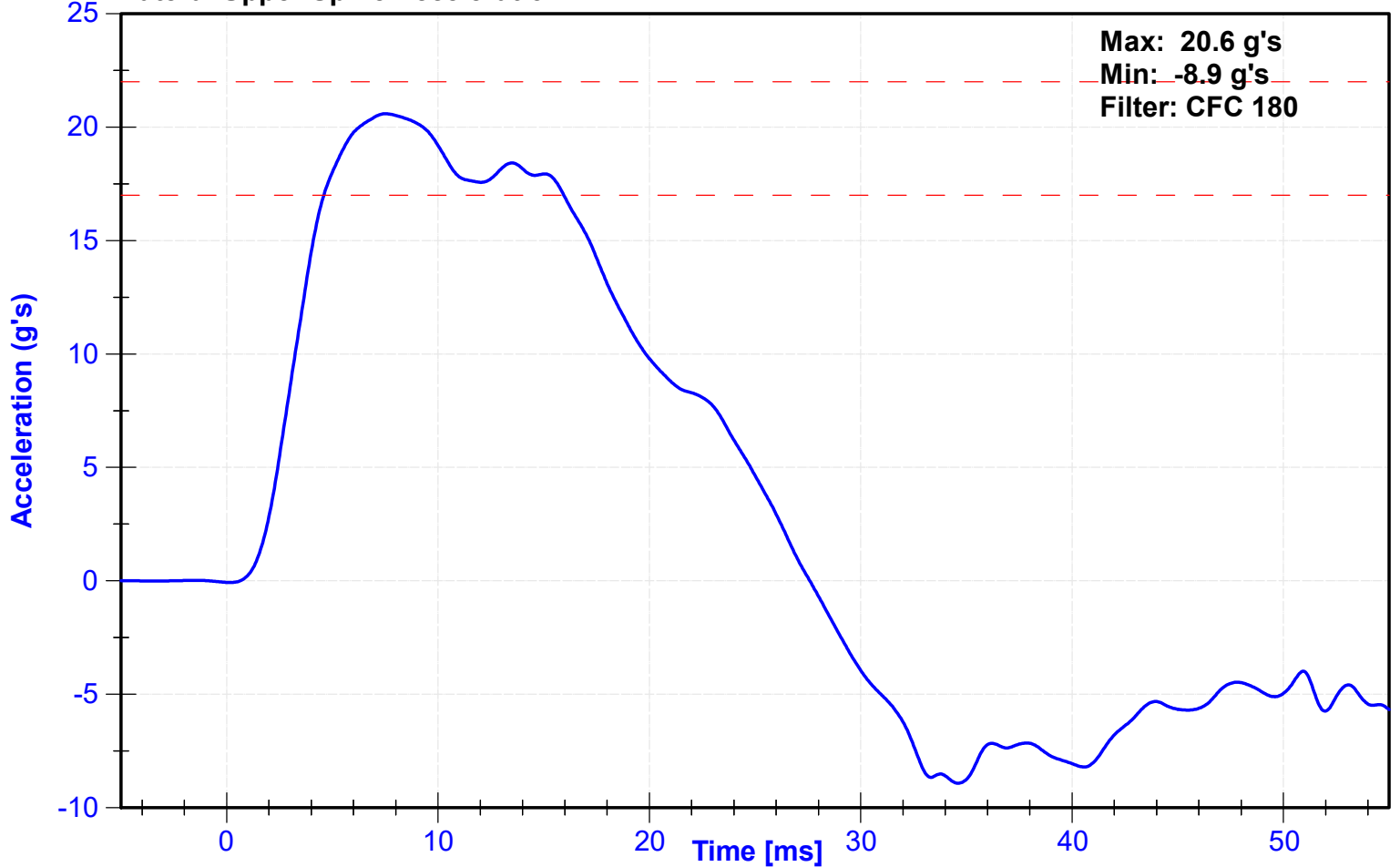
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024



Shoulder Displacement



Lateral Upper Spine Acceleration



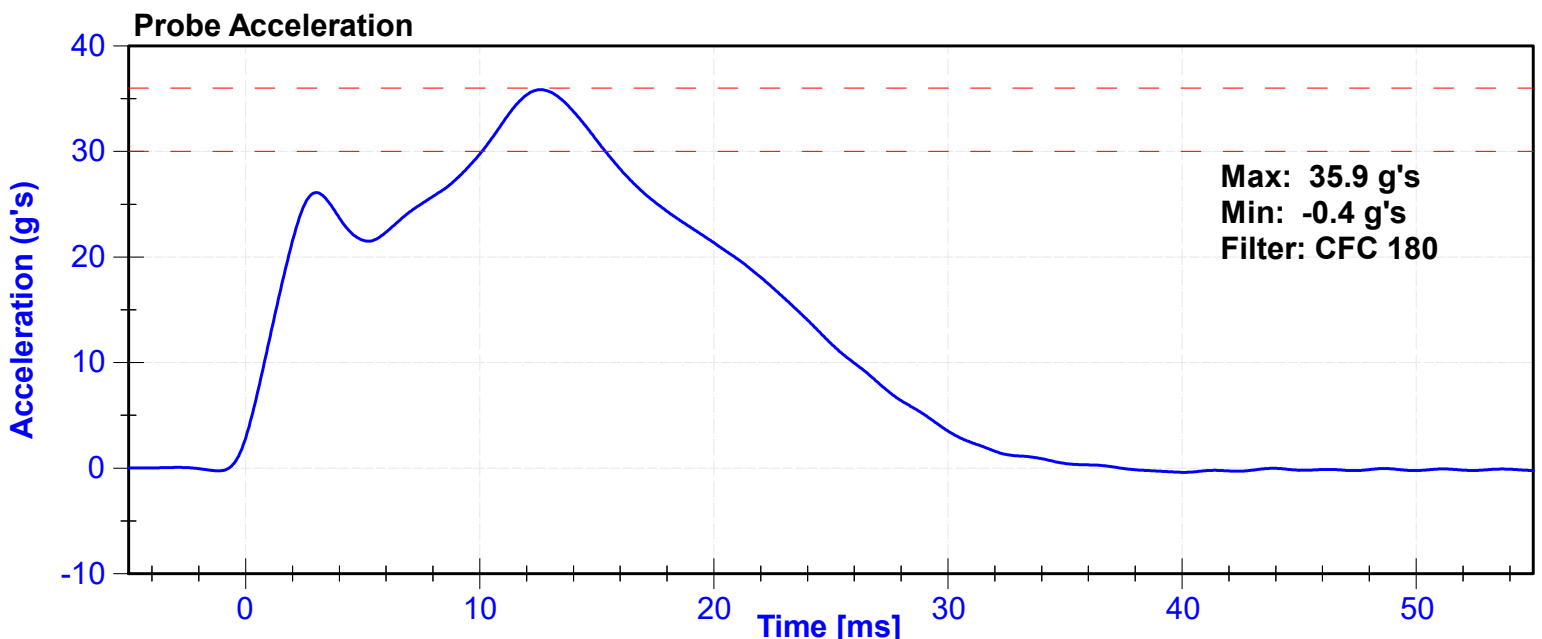
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

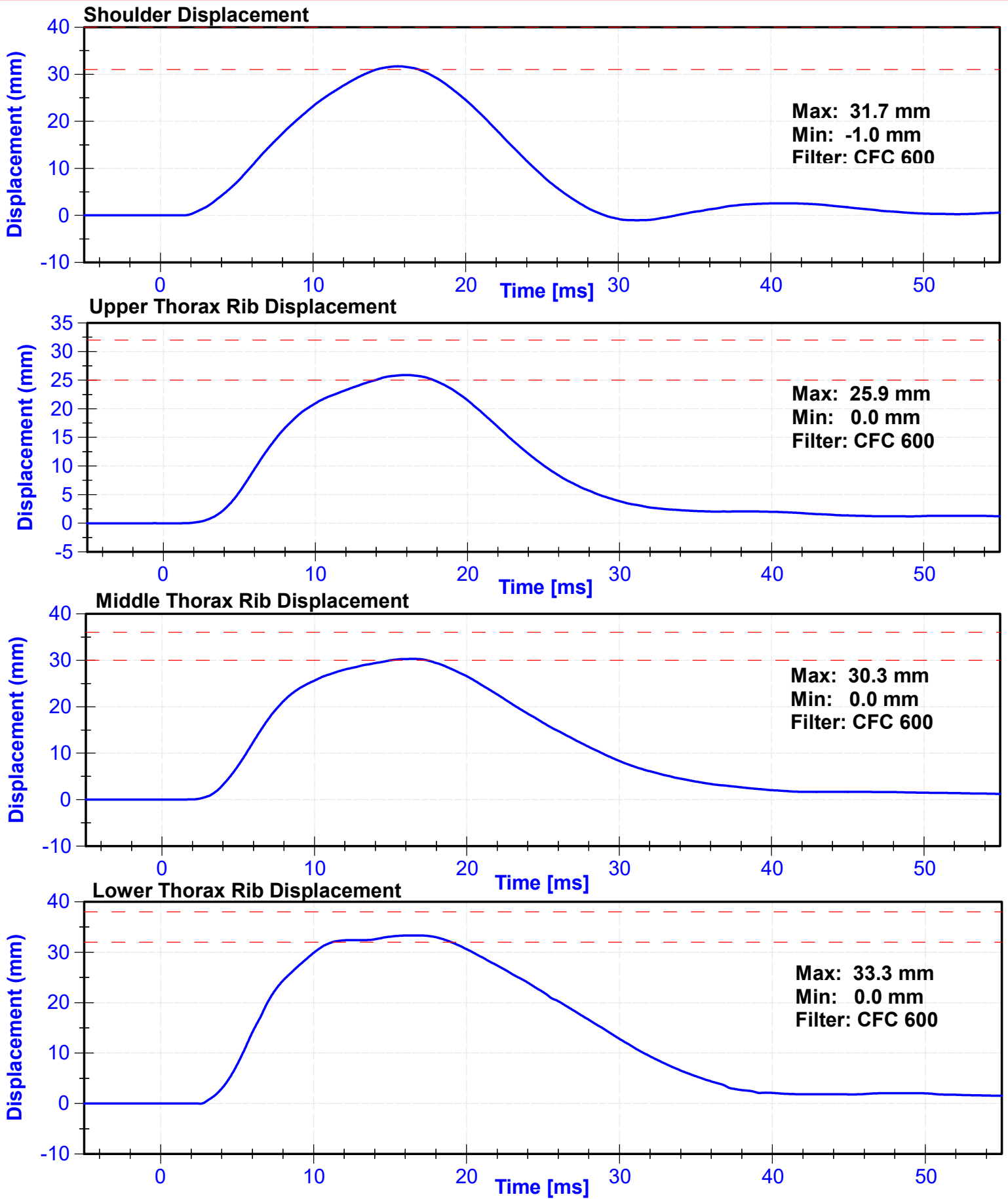
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	6.6	6.8	m/s	6.69	Pass
Probe Acceleration after 5 ms	30	36	g's	35.9	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.9	Pass
Lateral Lower Spine Acceleration	29	37	g's	34.4	Pass
Shoulder Deflection	31	40	mm	31.7	Pass
Upper Thorax Rib Deflection	25	32	mm	25.9	Pass
Mid Thorax Rib Deflection	30	36	mm	30.3	Pass
Lower Thorax Rib Deflection	32	38	mm	33.3	Pass

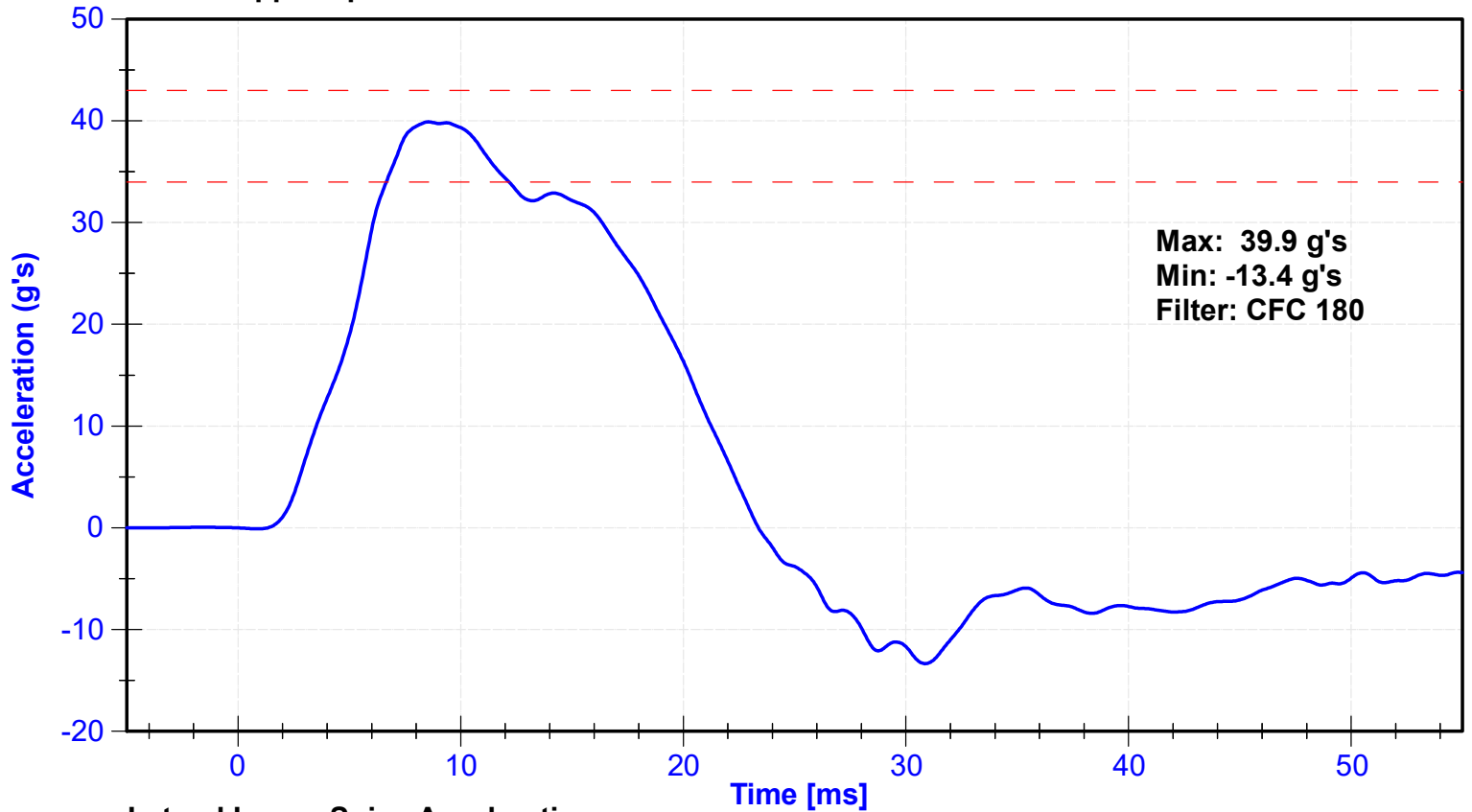
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Spine T1 Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Upper Spine T12 Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	11/17/2023	5/17/2024

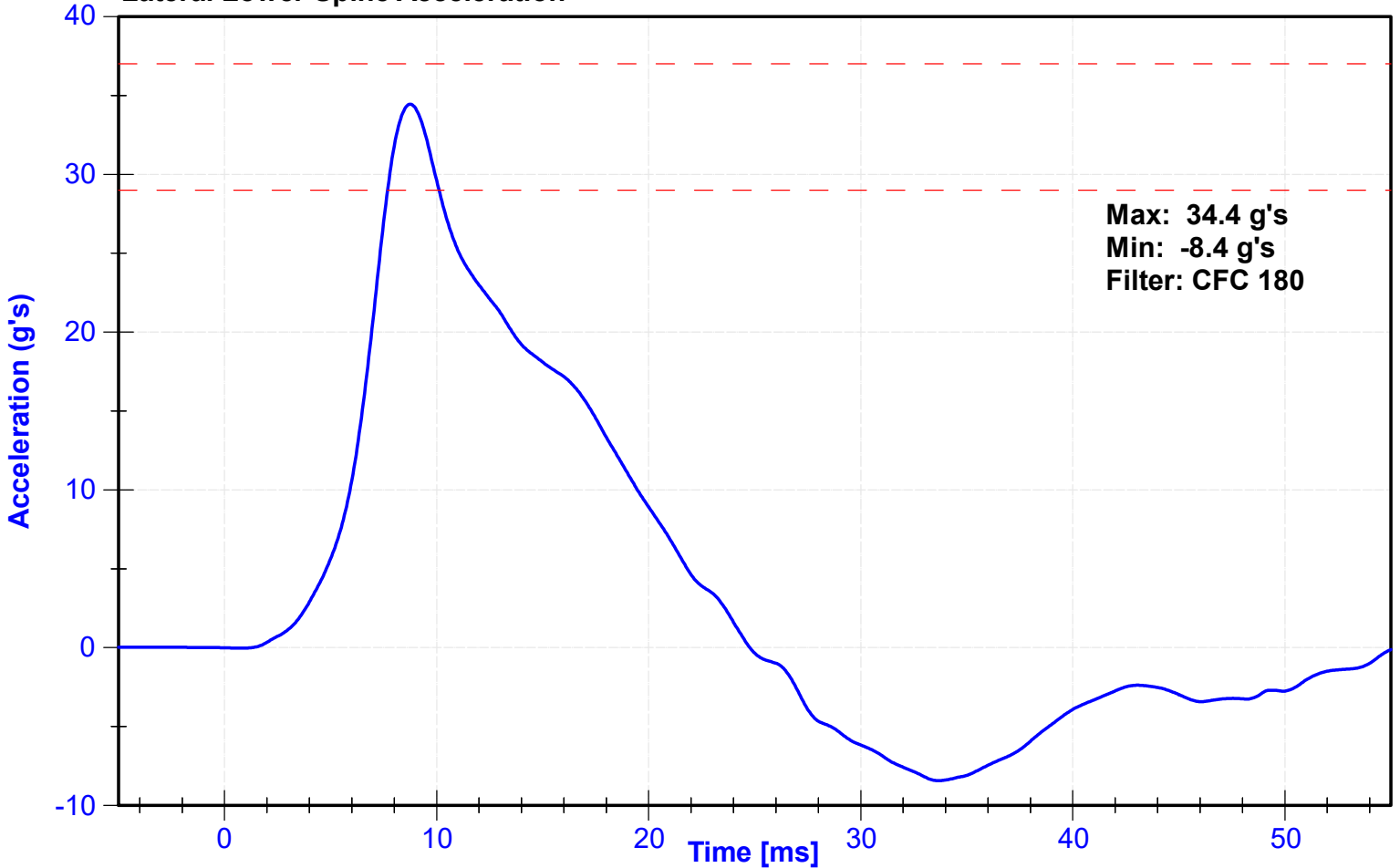




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



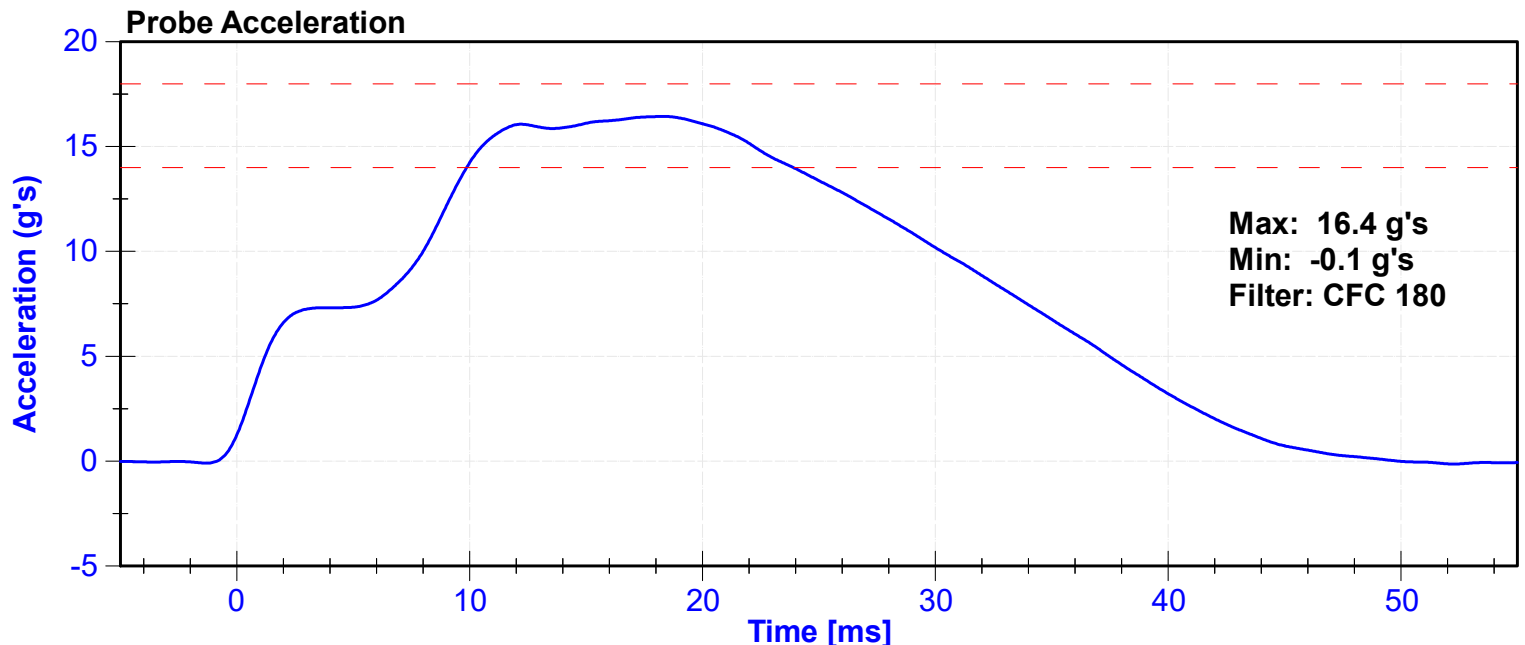
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

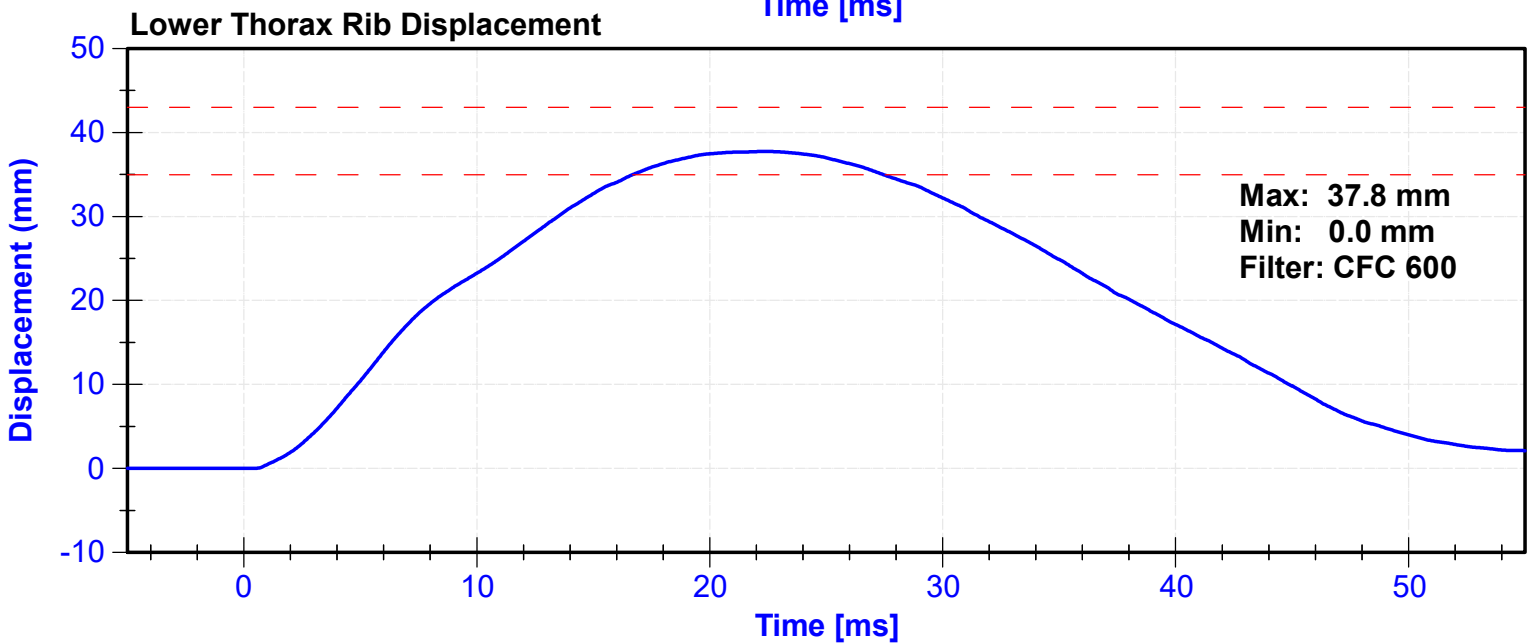
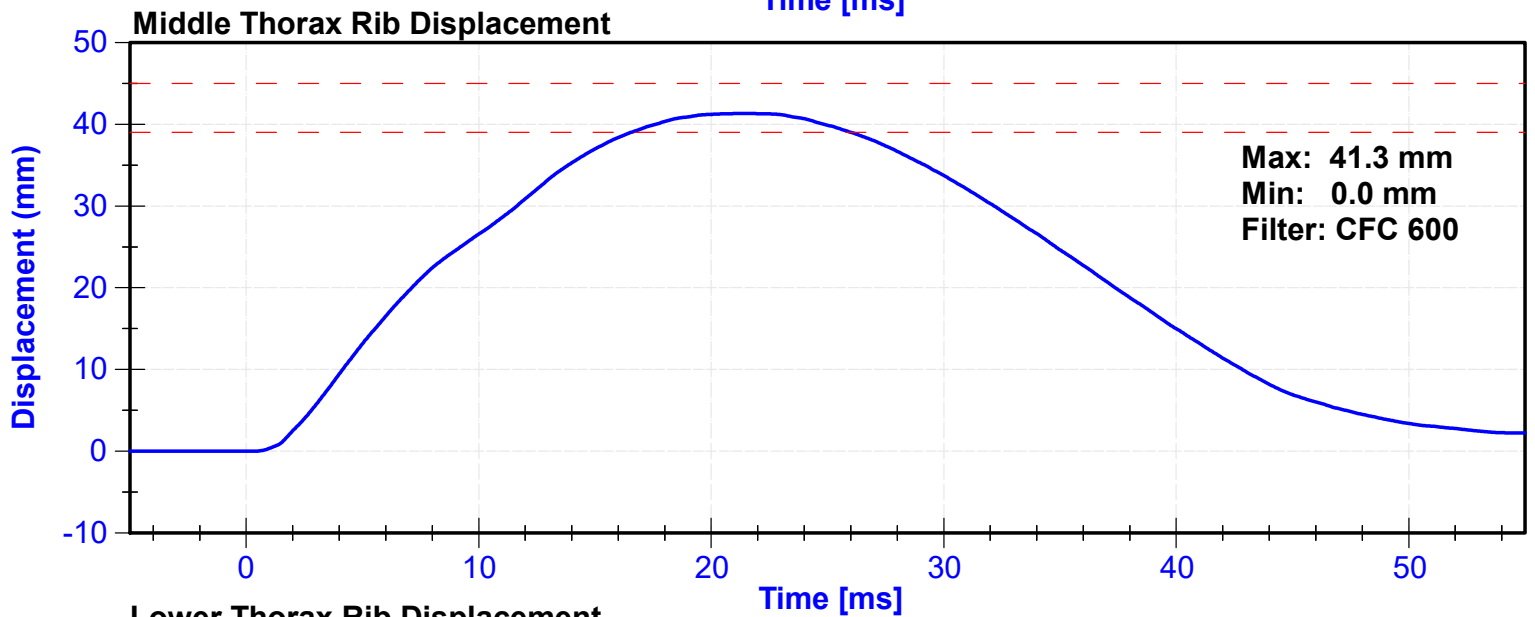
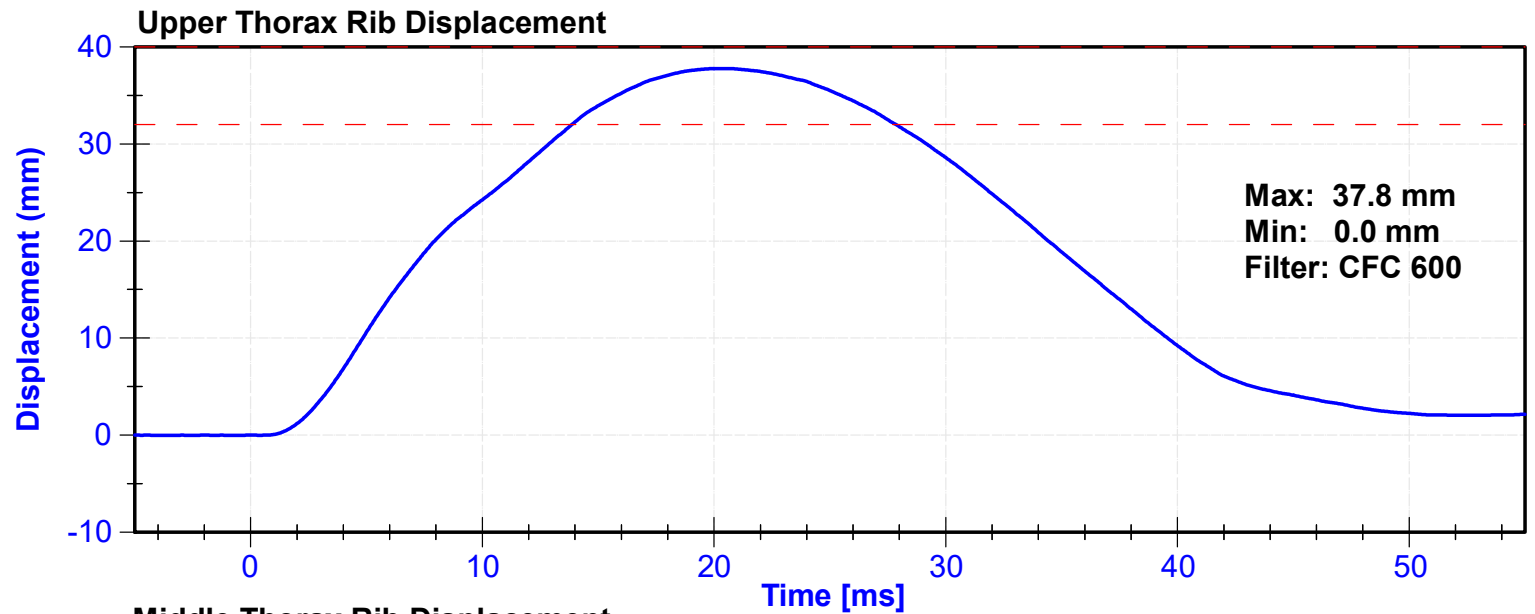
Results

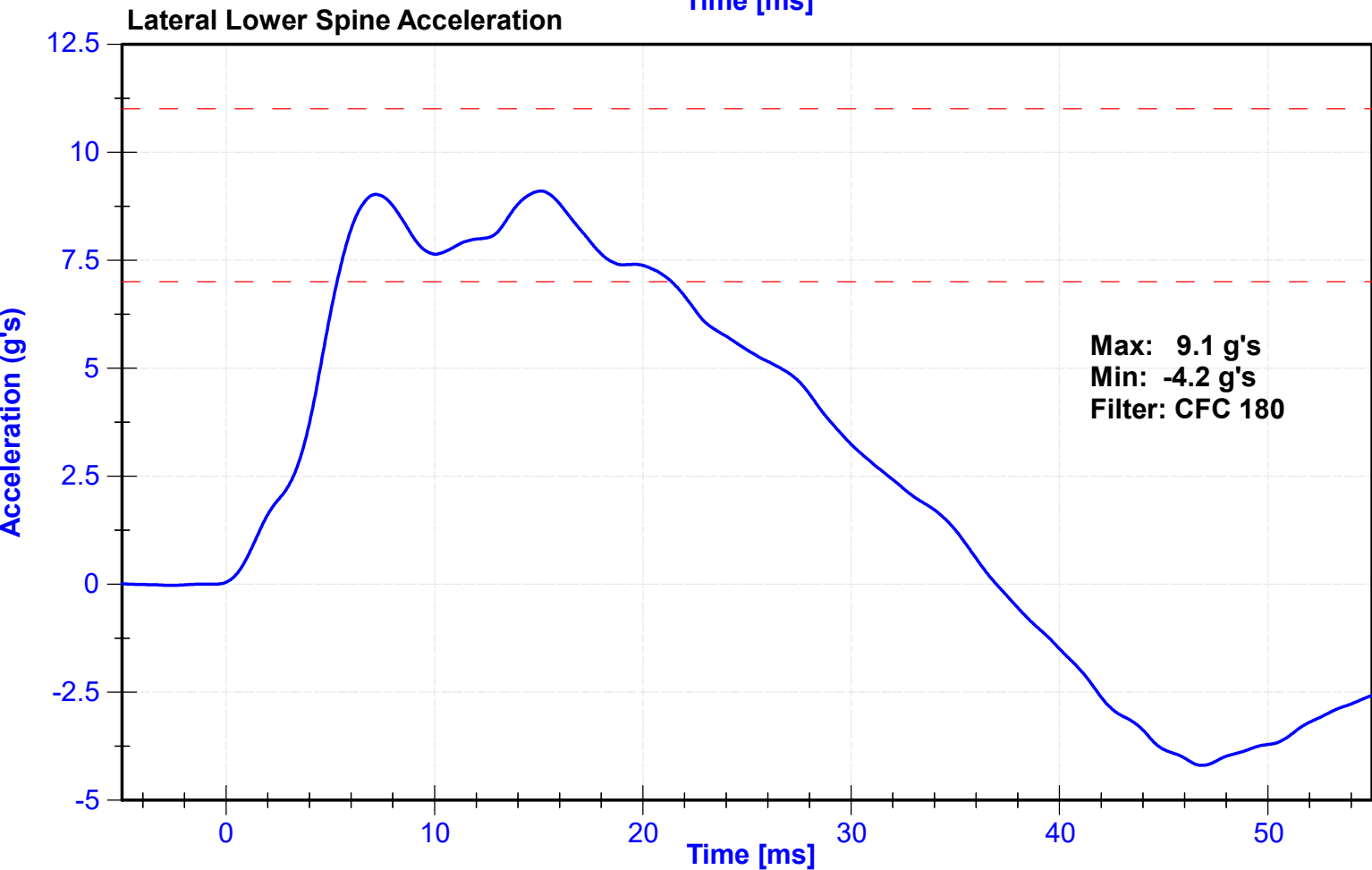
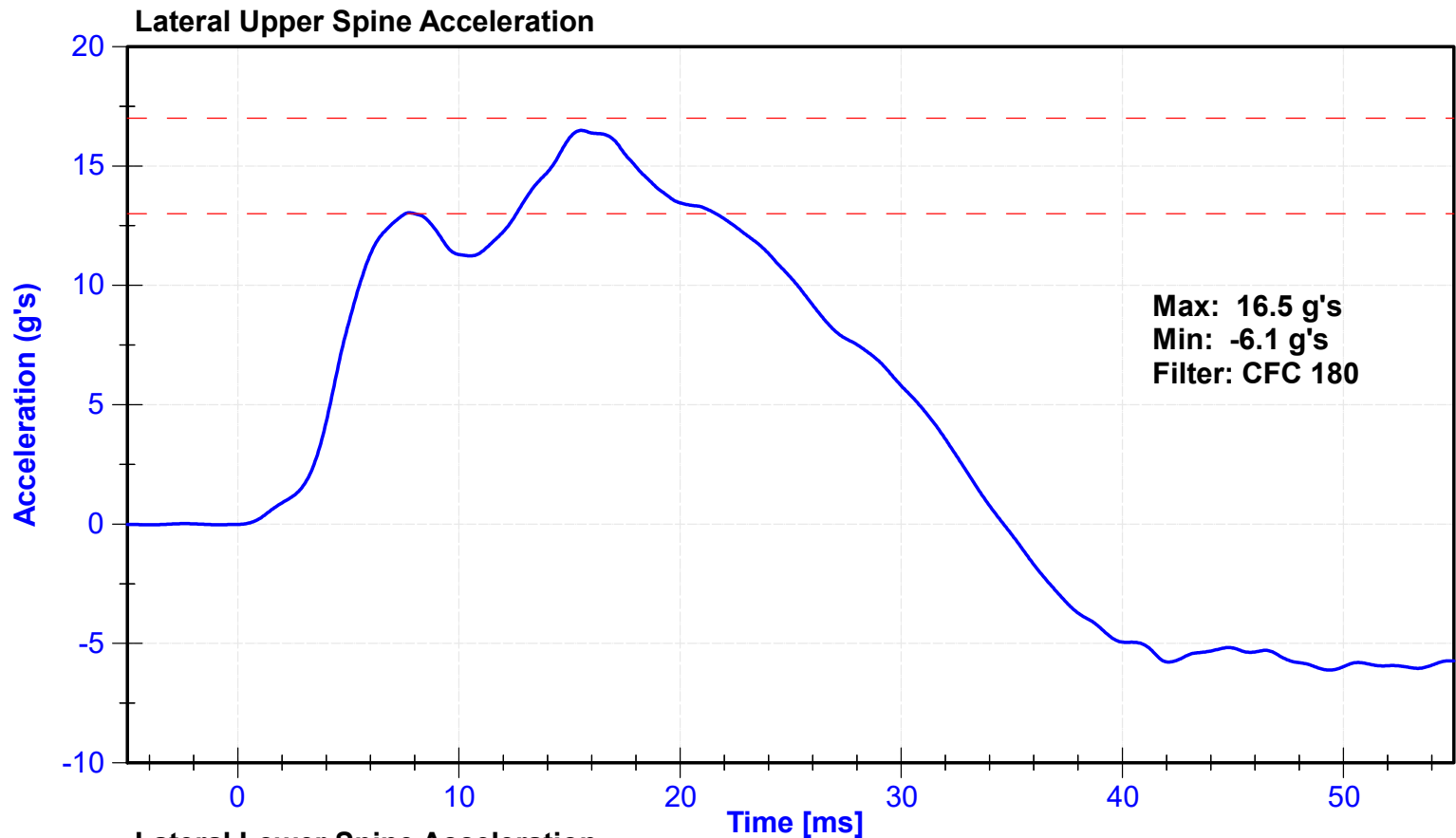
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	14	18	g's	16.4	Pass
Lateral Upper Spine Acceleration	13	17	g's	16.5	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.1	Pass
Upper Thorax Rib Deflection	32	40	mm	37.8	Pass
Middle Thorax Rib Deflection	39	45	mm	41.3	Pass
Lower Thorax Rib Deflection	35	43	mm	37.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	11/17/2023	5/17/2024







ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

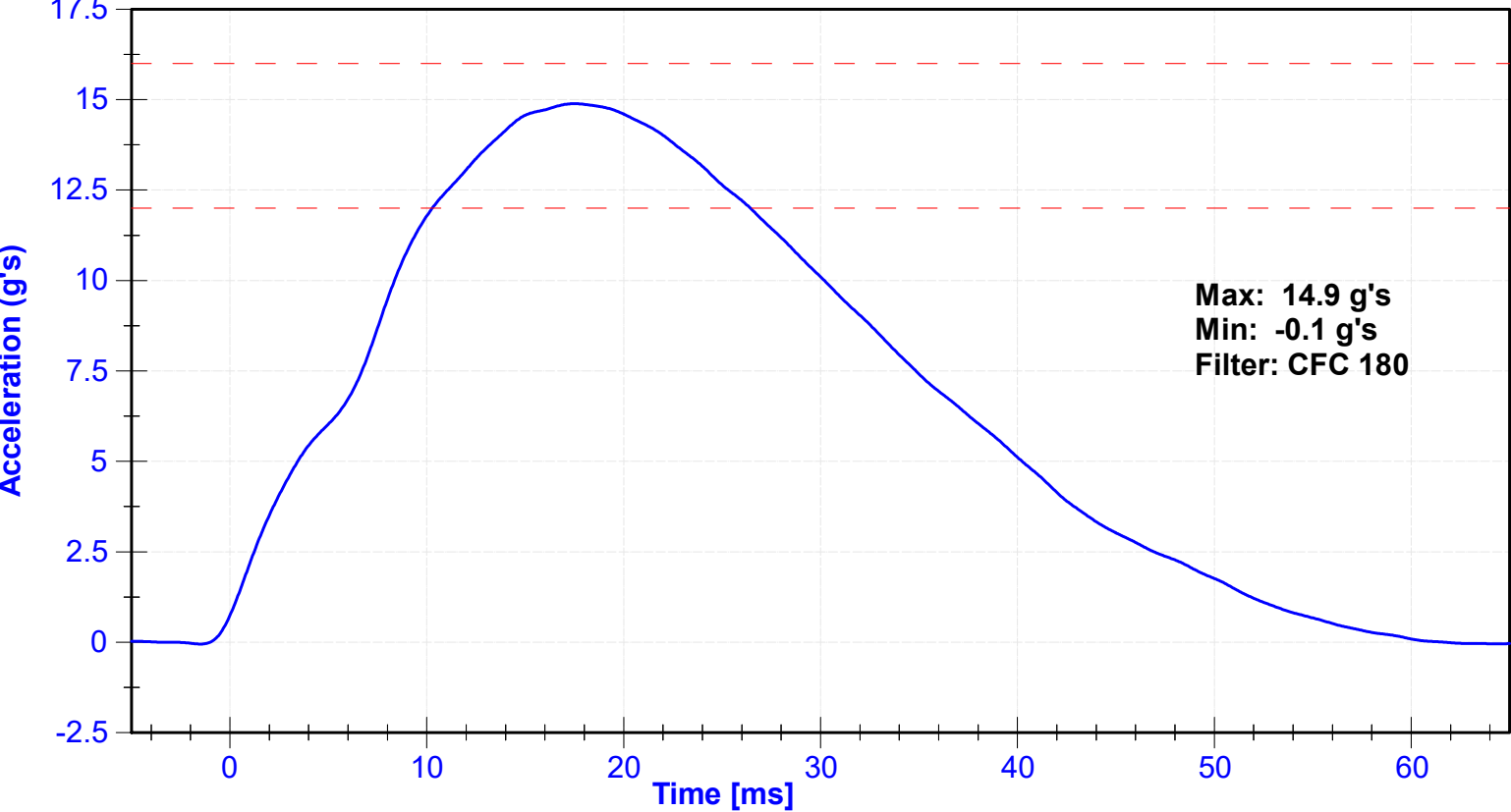
Results

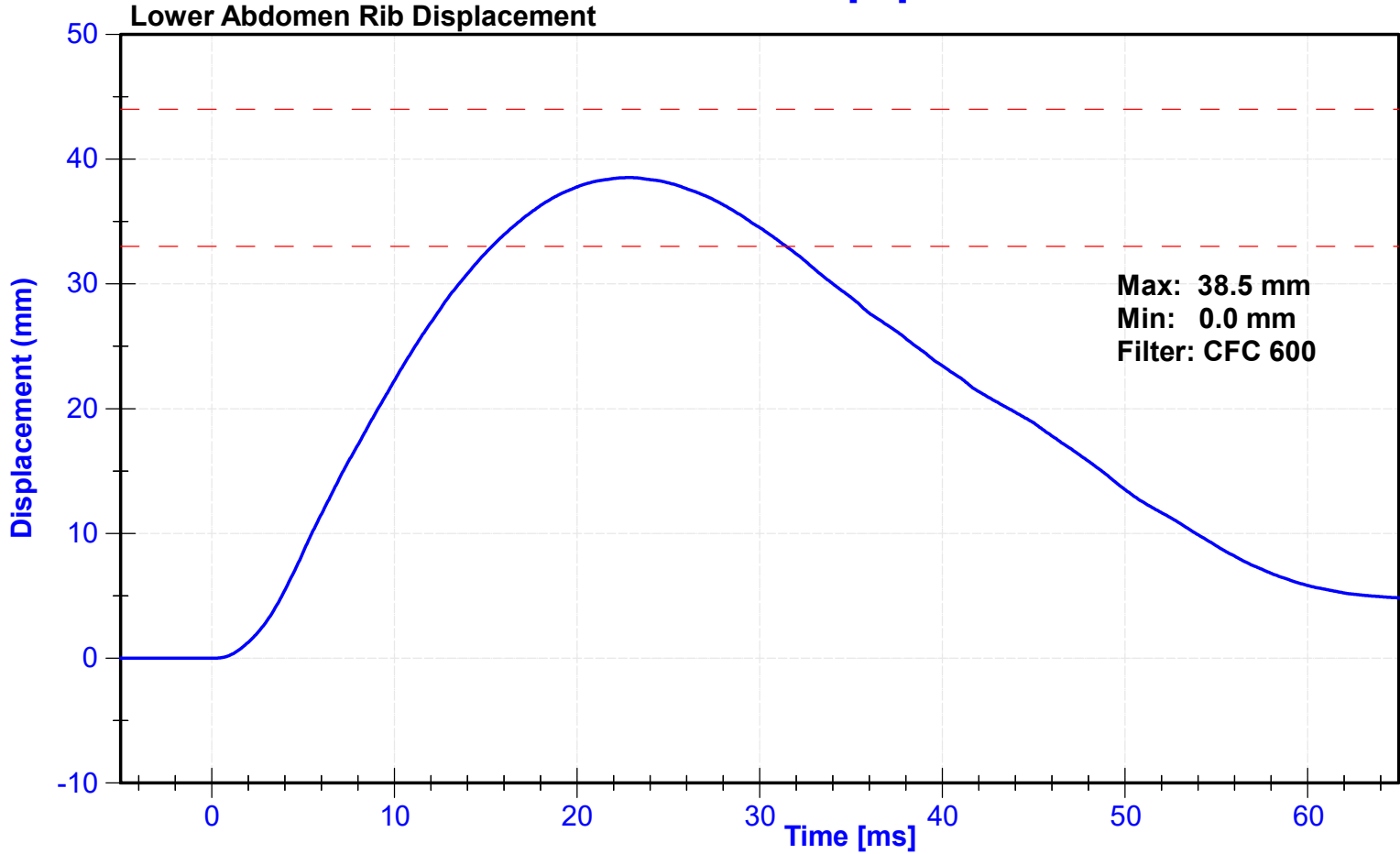
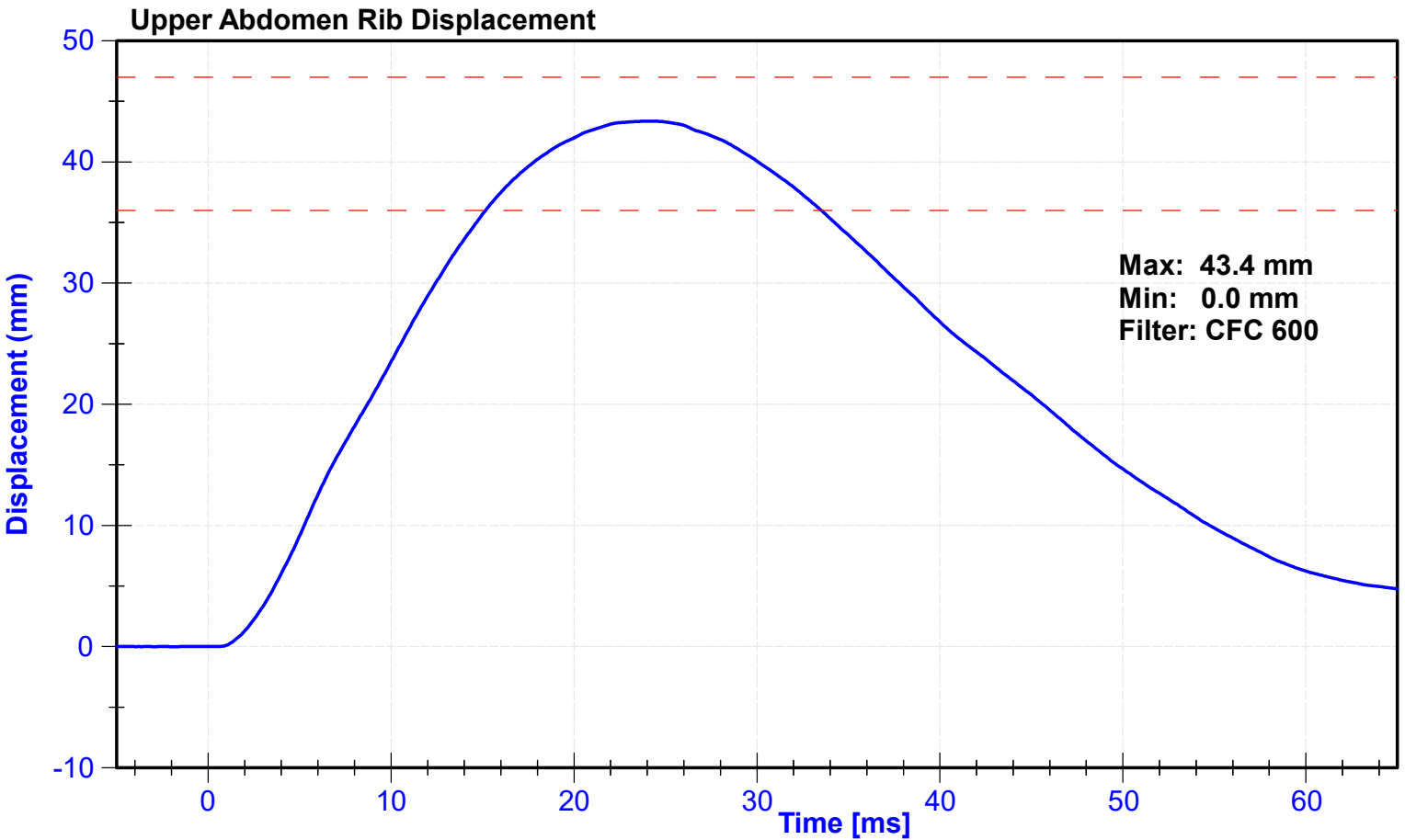
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	12	16	g's	14.9	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.6	Pass
Upper Abdomen Rib Deflection	36	47	mm	43.4	Pass
Lower Abdomen Rib Deflection	33	44	mm	38.5	Pass

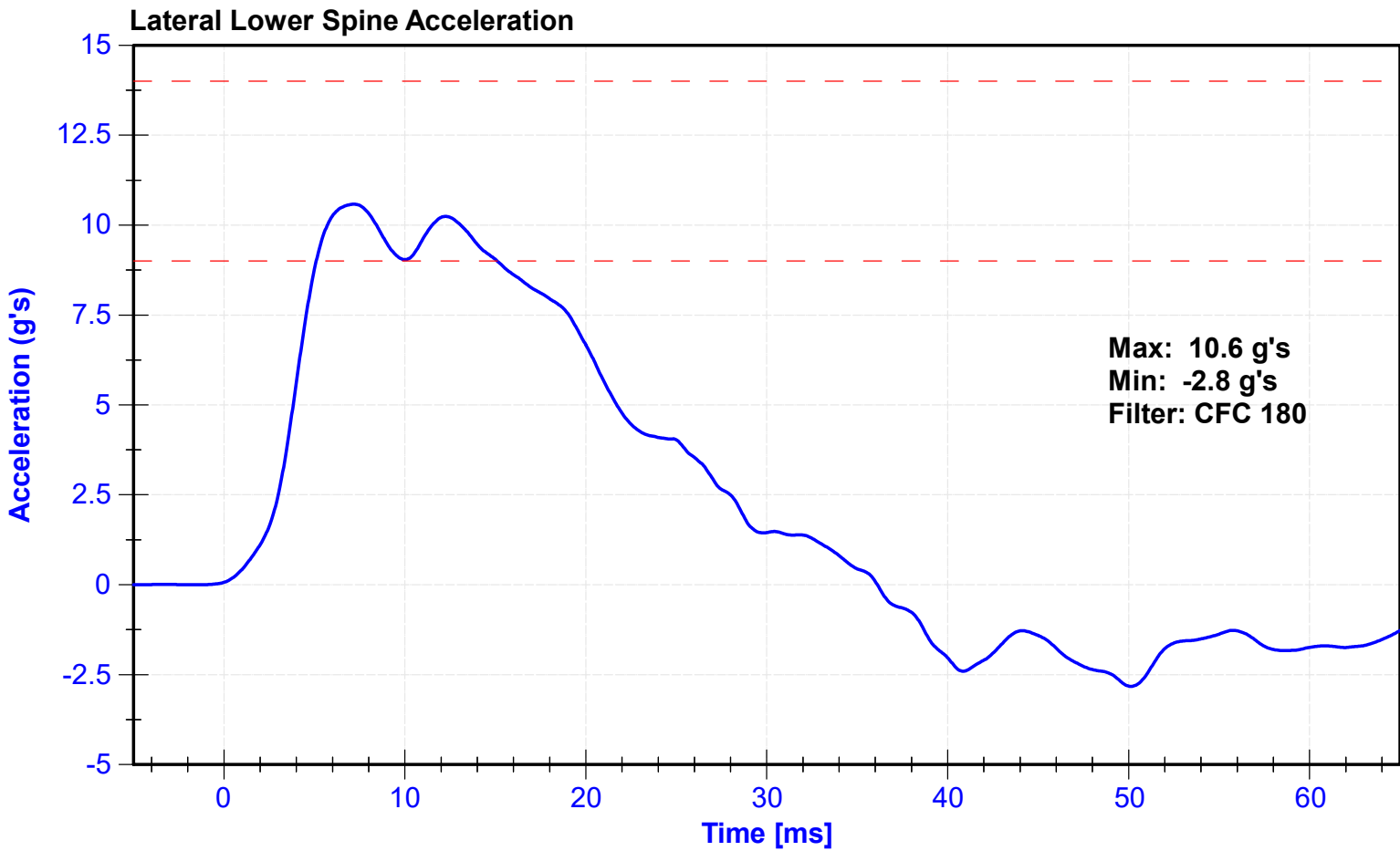
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Abdomen Rib Potentiometer	Servo	008GFE	11/17/2023	5/17/2024
Lower Abdomen Rib Potentiometer		046		

Probe Acceleration







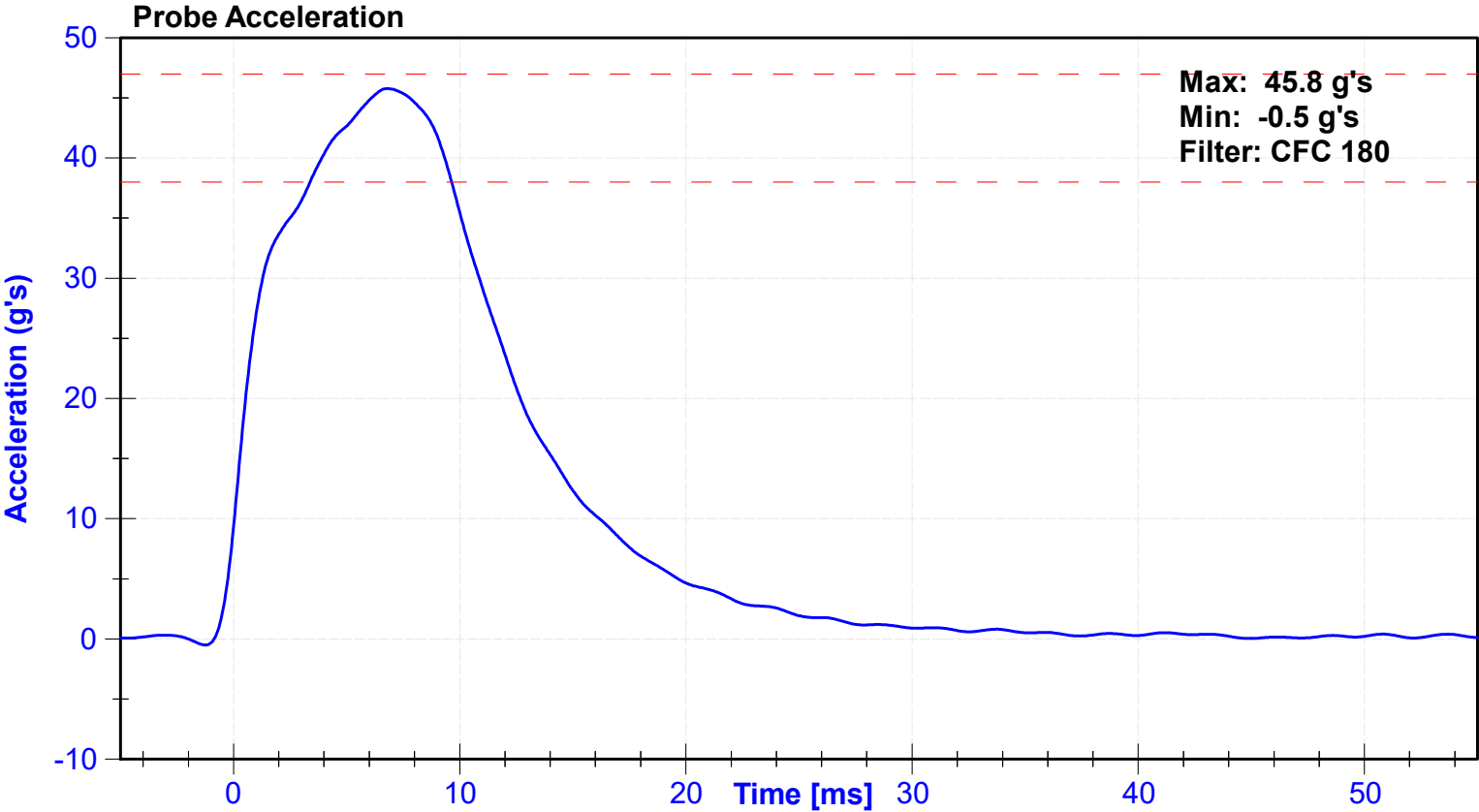
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

Results

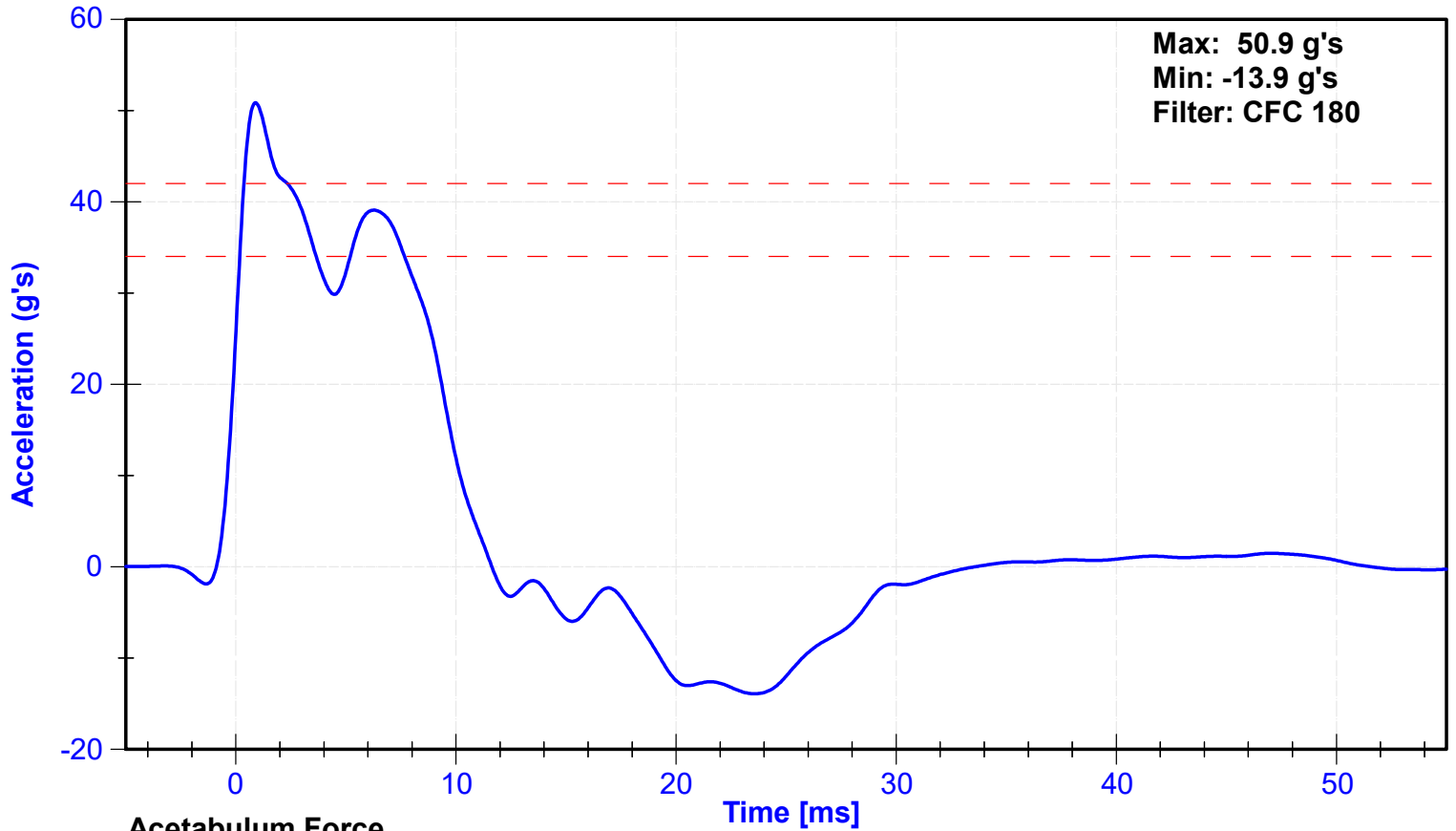
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	6.6	6.8	m/s	6.69	Pass
Probe Acceleration	38	47	g's	45.8	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	39.1	Pass
Acetabulum Force	3600	4300	N	4186.1	Pass

Transducer Calibrations

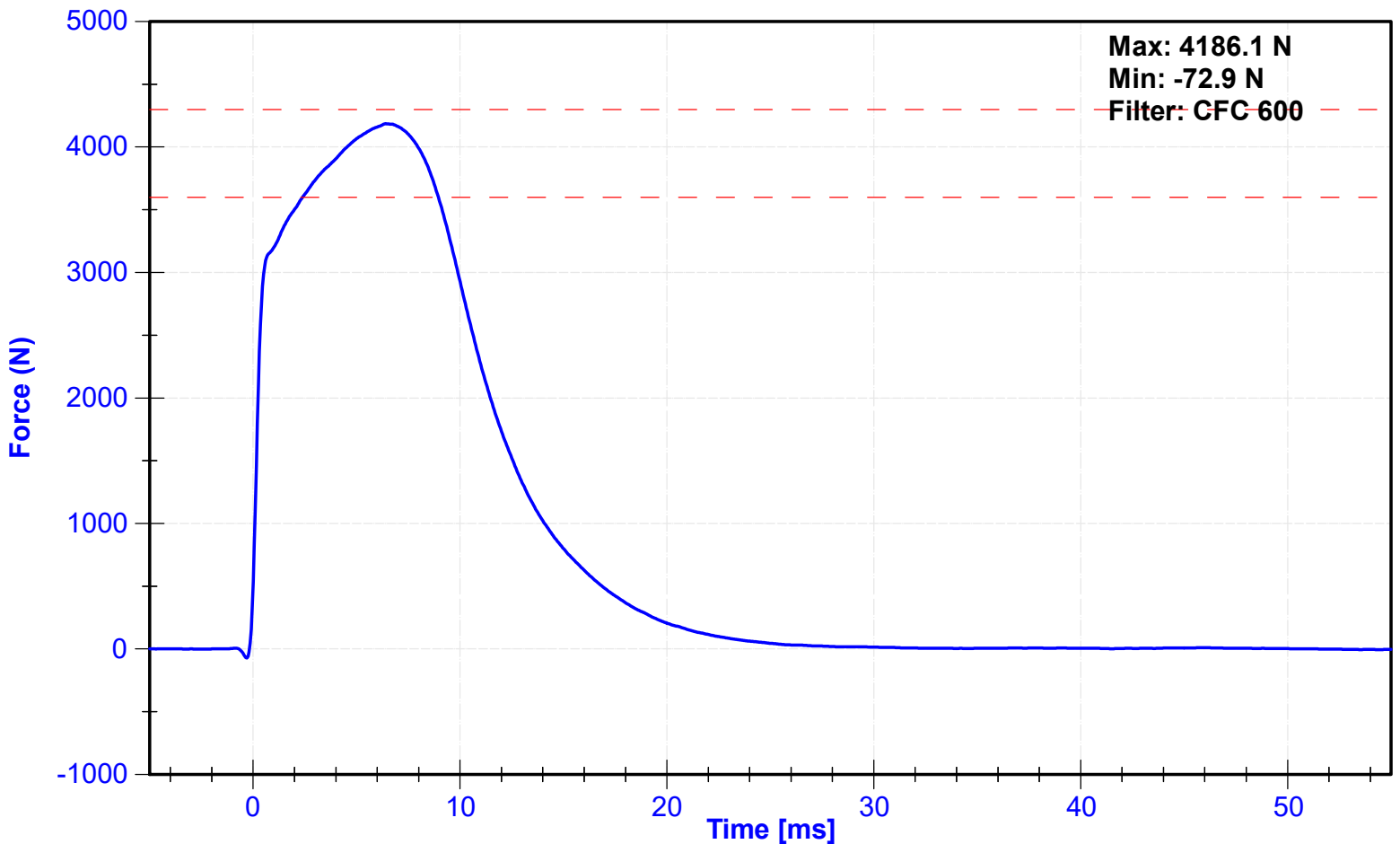
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pelvis Y Accelerometer	Endevco	P50078	11/16/2023	5/14/2024
Acetabulum Load Cell	Denton	270-FY	9/11/2023	9/10/2024
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A



Lateral Pelvis Acceleration



Acetabulum Force





D68012

Cert
2-23-24

SID-IIs Pelvis Plug Certification Test

Plug S/N 16347

Test Number 22914

Report Number 22971

Test Date 5/20/2022 12:43:51 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

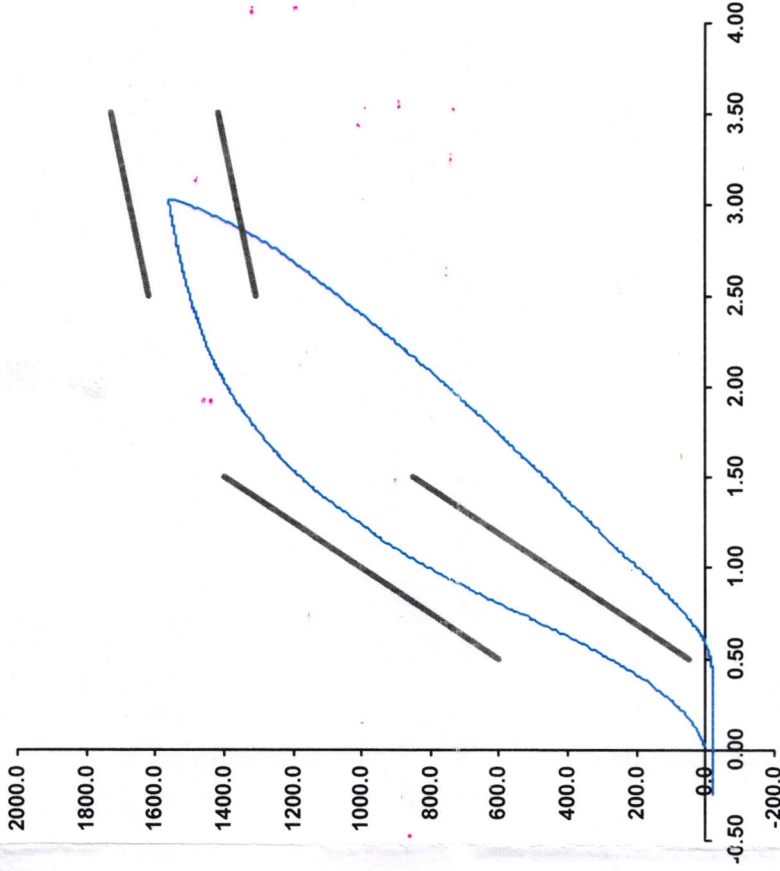
Load Cell S/N (F1360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107

20-May-22

SACO Research

By: DC

Date: 5/20/22

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



DG8012
IMPACT
2-23-24

SID-IIs Pelvis Plug Certification Test

Plug S/N 16424

Test Number 22993

Report Number 23051

Test Date 5/23/2022 10:46:51 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

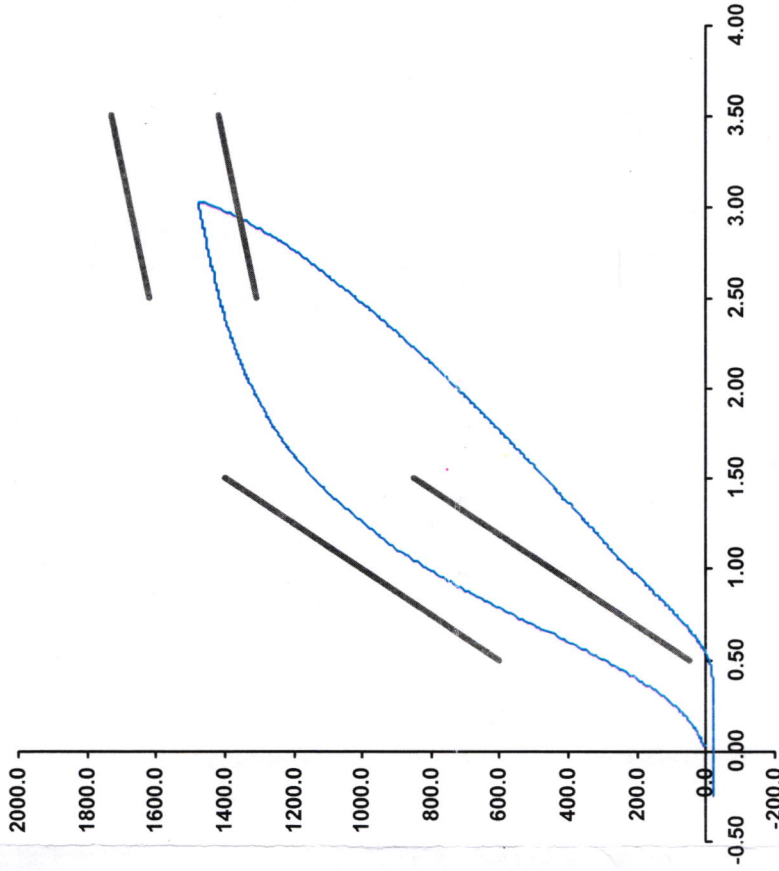
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107

23-May-22

SACO Research

By: DC

Date: 5/23/2022

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



D68012

now - IMPACT
2-23-24

SID-IIs Pelvis Plug Certification Test

Plug S/N 16421

Test Number 22990

Report Number 23048

Test Date 5/23/2022 10:31:44 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

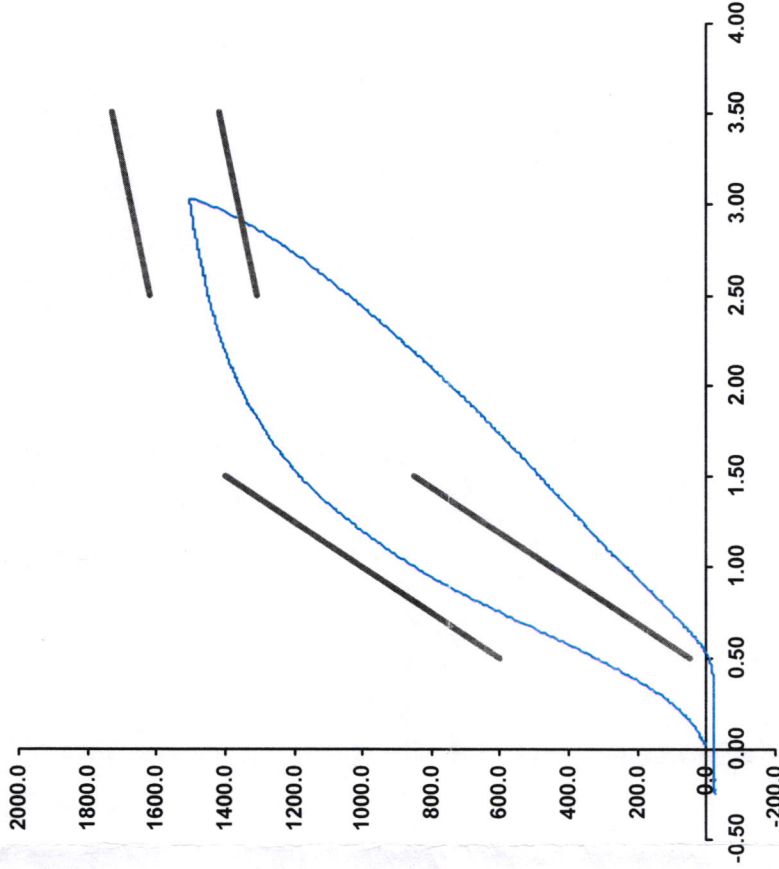
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 23-May-22

SACO Research

By: *DC* Date: 5/23/2022

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

ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

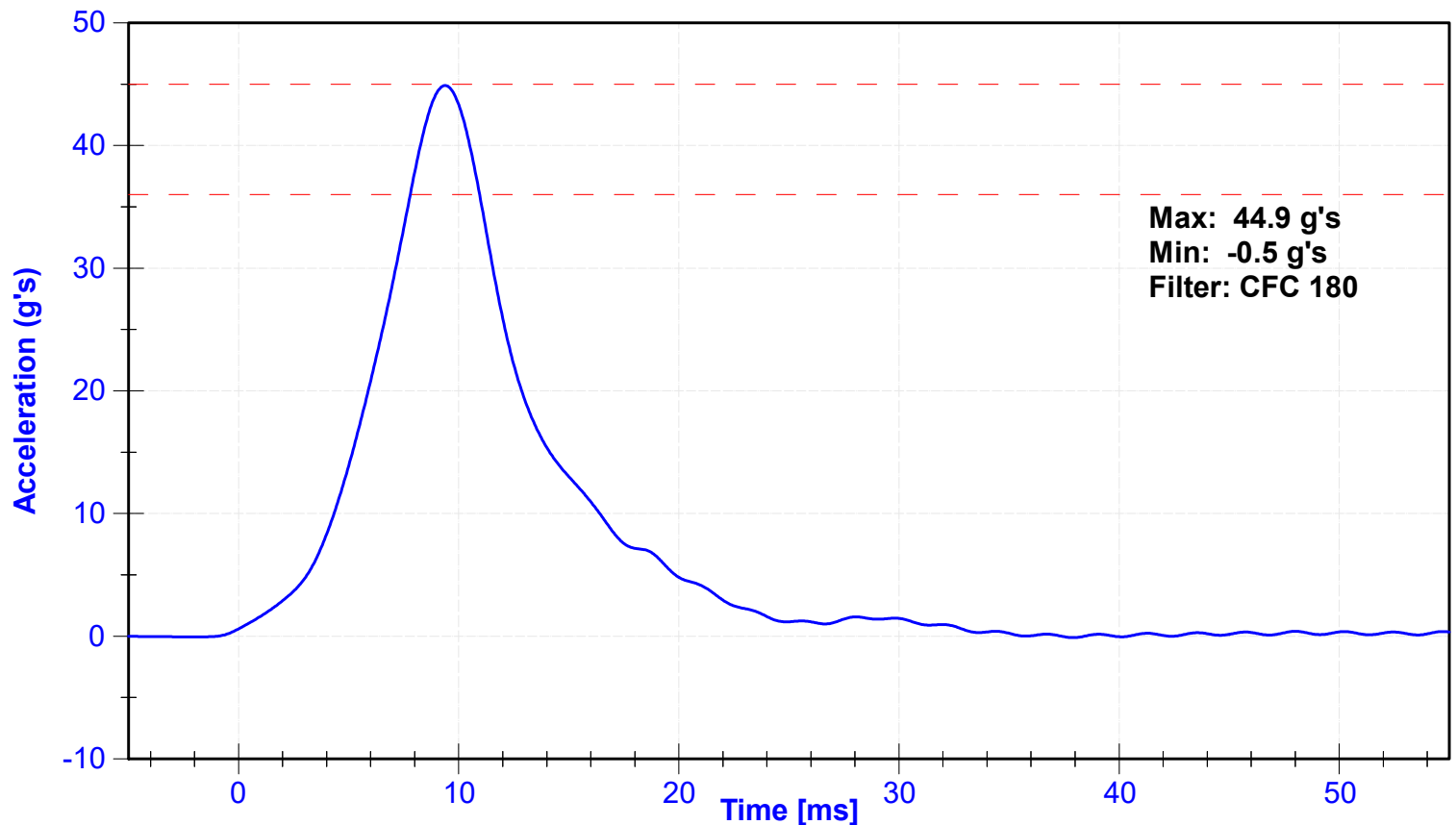
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	36	45	g's	44.9	Pass
Lateral Pelvis Acceleration	28	39	g's	35.8	Pass
Iliac Force	4100	5100	N	4901.3	Pass

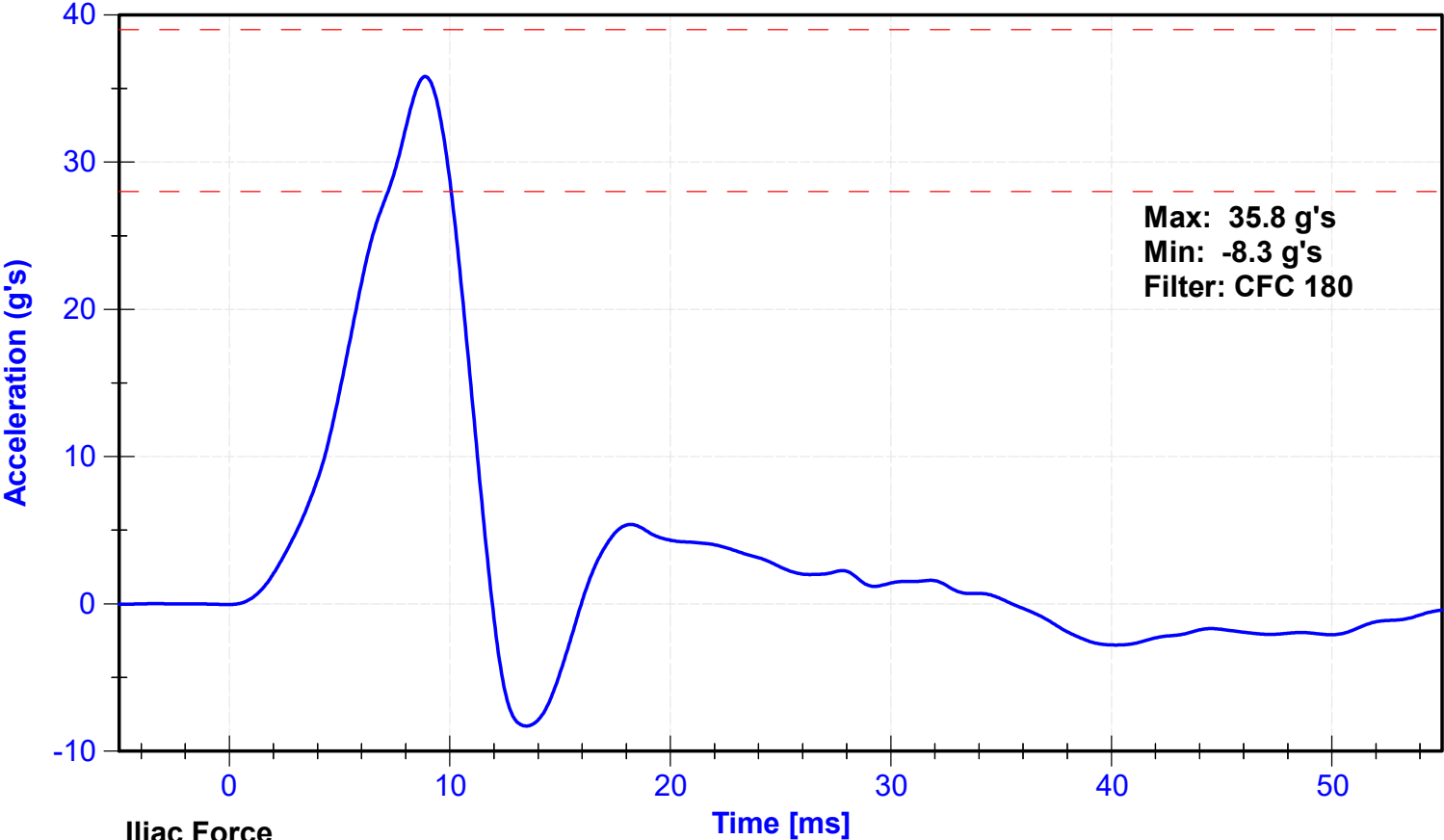
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pelvis Y Accelerometer	Endevco	P50078	11/16/2023	5/14/2024
Iliac Load Cell	Denton	280-FY	9/11/2023	9/10/2024

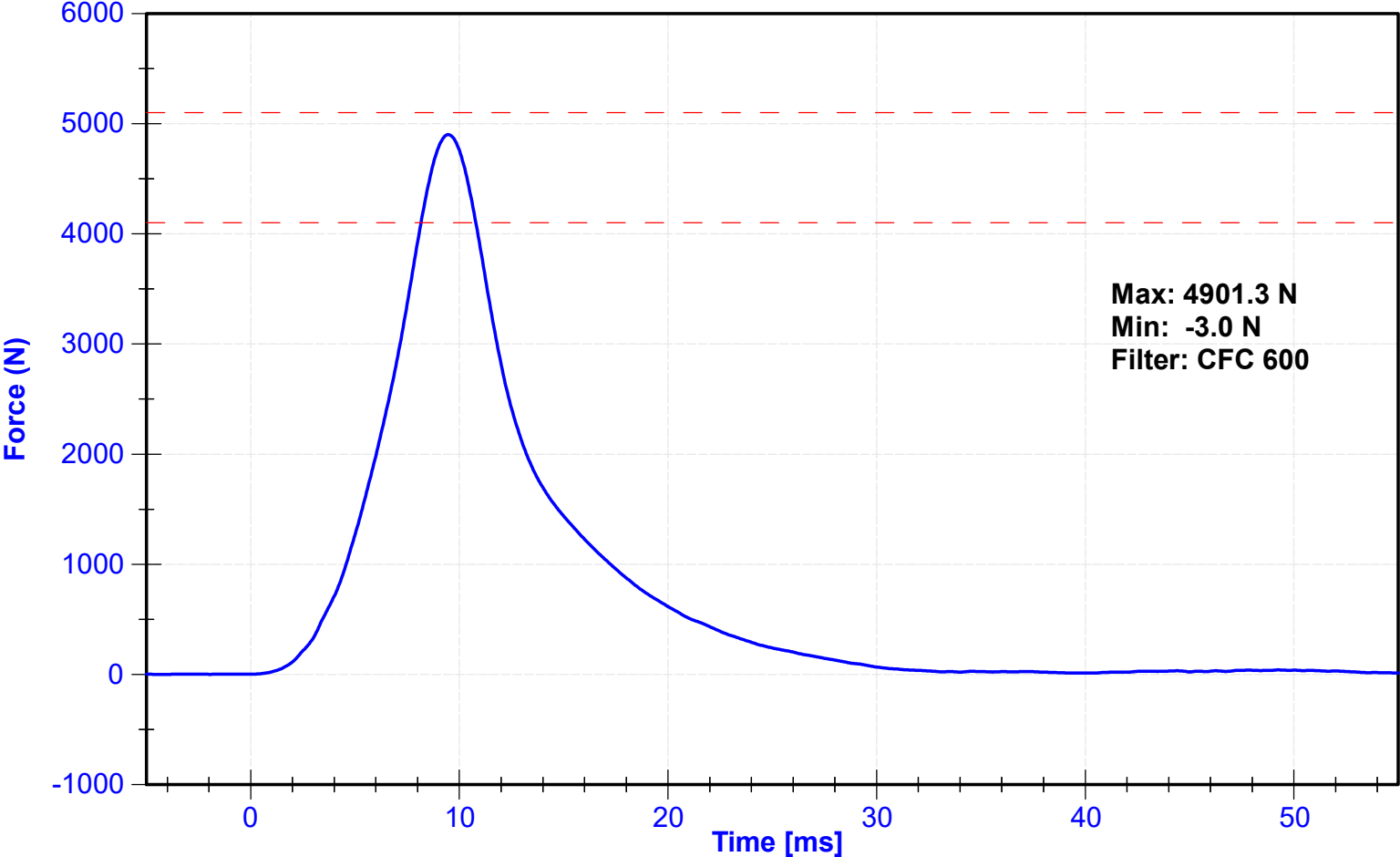
Probe Acceleration



Lateral Pelvis Acceleration



Iliac Force



APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (SID-IIs)

			SID-IIs S/N: DG8012			
			Serial Number	Manufacturer	Calibration Date	
Head Accelerometers			X	P74788	Endevco	11/16/2023
			Y	P51668	Endevco	11/16/2023
			Z	P83319	Endevco	11/16/2023
Head Accelerometers - Redundant			X	P80334	Endevco	11/16/2023
			Y	P52155	Endevco	11/16/2023
			Z	P83322	Endevco	11/16/2023
Displacement Potentiometer	Shoulder		Y			
	Thoracic Rib	Upper	Y	1199GFE	Servo	11/17/2023
		Middle	Y	1246GFE	Servo	11/17/2023
		Lower	Y	011GFE	Servo	11/17/2023
	Abdominal Rib	Upper	Y	008GFE	Servo	11/17/2023
		Lower	Y	046	Servo	11/17/2023
Lower Spine Accelerometers (T12)			X	P71272	Endevco	11/16/2023
			Y	P51327	Endevco	11/16/2023
			Z	P52067	Endevco	11/16/2023
Acetabulum Load Cell			Y	270-FY	Denton	09/11/2023
Lilac Wing Load Cell			Y	280-FY	Denton	09/11/2023
Pelvis Plug (Struck Side)				16628	SACO	07/20/2022
Pelvis Plug (Non-Struck Side)				16635	SACO	07/20/2022

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	G23852	Endevco	01/30/2024
Vehicle Center of Gravity	Y	G23853	Endevco	01/30/2024
Vehicle Center of Gravity	Z	G23856	Endevco	01/30/2024
Left Floor Sill	Y	G24312	Endevco	11/10/2023
A-Pillar Sill	Y	G24336	Endevco	11/10/2023
A-Pillar Low	Y	G24230	Endevco	09/11/2023
A-Pillar Mid	Y	G24319	Endevco	11/10/2023
B-Pillar Sill	Y	G24321	Endevco	11/09/2023
B-Pillar Low	Y	G24327	Endevco	11/10/2023
B-Pillar Mid	Y	G24231	Endevco	09/11/2023
Driver Seat	Y	G24311	Endevco	11/09/2023
Engine Top	X	G22596	Endevco	09/27/2023
Engine Top	Y	A400002	Measurement Specialties	09/25/2023
Firewall	Y	G24322	Endevco	11/09/2023
Right Roof	Y	G24313	Endevco	11/09/2023
Right Floor Sill	Y	G24310	Endevco	11/10/2023
Rear Floorpan	X	A398664	Measurement Specialties	01/30/2024
Rear Floorpan	Y	A405552	Measurement Specialties	01/30/2024

Table 3 – Pole Instrumentation

Pole Instrumentation	Serial Number	Manufacturer	Calibration Date
Load Cell 1	1220AF-1277329-F0	Interface	07/18/2023
Load Cell 2	1220AF-1117017-F0	Interface	07/18/2023
Load Cell 3	1220AF-1117025-F0	Interface	07/18/2023
Load Cell 4	1220AF-1130989-F0	Interface	07/18/2023
Load Cell 5	1220AF-1281288-F0	Interface	07/18/2023
Load Cell 6	1220AF-1281285-F0	Interface	07/18/2023
Load Cell 7	1220AF-1117035-F0	Interface	07/18/2023
Load Cell 8	1220AF-1117011-F0	Interface	07/18/2023