

REPORT NUMBER: SPNCAP-CAL-24-013

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

**Hyundai Motor Manufacturing Alabama, LLC
2024 Hyundai Santa Fe
5 Door SUV**

NHTSA No: M20244201

**PREPARED BY:
CALSPAN CORPORATION
P.O. BOX 400
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January 7, 2025

FINAL REPORT

**PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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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Date: January 7, 2025

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Vanessa Hansen, Operations Manager

Date: January 7, 2025

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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16. Abstract A 32.20 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject 2024 Hyundai Santa Fe 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 November 22, 2024. The impact velocity of the vehicle was 32.22 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 401 mm located at level 2. The test vehicle's occupant performance data is as follows:																																
<table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD (SID-IIs) (Serial No.300)</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC36)</td> <td></td> <td>1000</td> <td>155.107</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>G</td> <td>82</td> <td>38.173</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>2253.222</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38</td> <td>17.948</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45*</td> <td>15.589</td> </tr> </tbody> </table>						Measurement Description	Driver ATD (SID-IIs) (Serial No.300)			Units	Threshold	Result	Head Injury Criteria (HIC36)		1000	155.107	Resultant Lower Spine Acceleration	G	82	38.173	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2253.222	Maximum Thoracic Rib Deflection	mm	38	17.948	Maximum Abdominal Rib Deflection	mm	45*	15.589
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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. Washington, D.C. 20590																												
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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY 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 Santa Fe 5 Door SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standards 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 Santa Fe 5 Door SUV. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.22 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on November 22, 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 572U (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 572U (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	155.107
Resultant Lower Spine Acceleration	G	82	38.173
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2253.222
Maximum Thoracic Rib Deflection	mm	38	17.948
Maximum Abdominal Rib Deflection	mm	45*	15.589

*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	Yes	No		
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				

GENERAL COMMENTS:

1. P1 serial number - 300

Data Anomalies:

- Vehicle CG Z Acceleration, Exceeded calibration range at 54.3 ms
- Left Front Sill Y Acceleration, Exceeded calibration range at 43.6 ms
- Left Sill A-Pillar Y Acceleration, Exceeded calibration range at 46.3 ms
- Left Middle B-Pillar Y Acceleration, Exceeded calibration range at 11.1 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 - Test Vehicle Accelerometer Locations

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. 1
GENERAL TEST AND VEHICLE PARAMETER DATA**

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

NHTSA No.: M20244201
 Test Date: 11/22/2024

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20244201
Model Year	2024
Make	Hyundai
Model	Santa Fe
Body Style	SUV
VIN	5NMP14GL1RH062460
Body Color	Phantom Black Pearl
Odometer Reading (km/mi)	78 mi
Engine Displacement (L)	2.5
Type / No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	8-Speed
Overdrive	Yes
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks (ADL)	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	N/A
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso / Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head / Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso / Pelvis Airbag	Yes
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	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 Manufacturing Alabama, LLC
Date of Manufacture	Jul/15/24
Vehicle Type	MPV

GVWR (KG)	2510
GAWR Front (KG)	1340
GAWR Rear (KG)	1410

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	2	7
Vehicle Capacity Weight (VCW) (kg)				480
DSC x 68.0 kg				476
Cargo Weight (RCLW) (kg)				4

(A)
(B)
(A-B)

VEHICLE SEAT TYPE

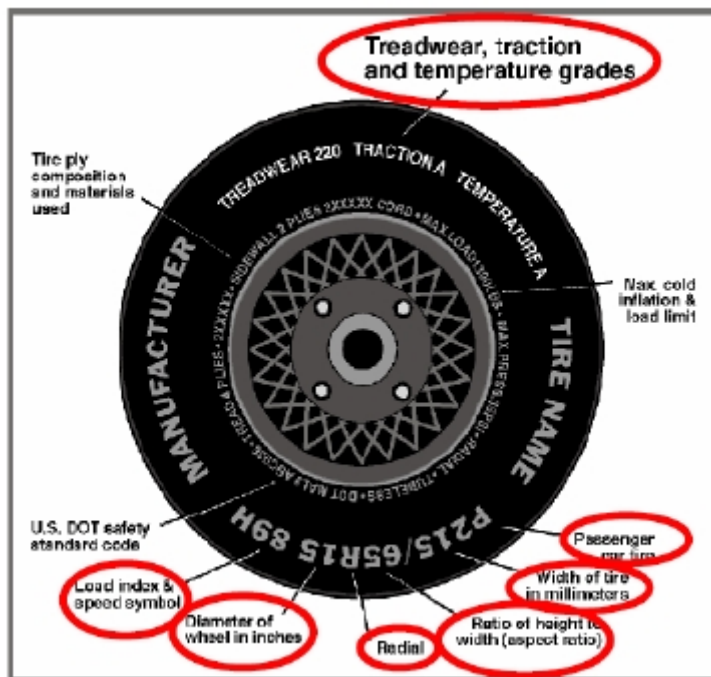
Seating Location	Type Of Seat Pan				Type Of Seat Back		
	Bucket	Bench	Split Bench	Contour	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front	X					X	
Rear or Second Row Seat			X			X	
Third Row seat			X		X		

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

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

NHTSA No.: M20244201
 Test Date: 11/22/2024

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)	240	240
Recommended Tire Size	235/60R18	235/60R18
Tire Size on Vehicle	235/60R18	235/60R18
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Assurance Finesse	Assurance Finesse
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	103H	103H
Tire Material	Rubber	Rubber
DOT Safety Code Left	1PL45JDTR1924	1PL45JDTR1924
DOT Safety Code Right	1PL45JDTR1924	1PL45JDTR1924

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

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

NHTSA No.: M20244201
 Test Date: 11/22/2024

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	232	235	233	235
Tire Placard	kPa	240	240	240	240
Owner's Manual	kPa	240	240	240	240
As Tested	kPa	240	240	240	240

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Rear	Total	Total	Front	Rear	Total
Left	kg	561.5	403		531	437		581.5	421.5	
Right	kg	516.5	397.5		545	413		528	401	
Ratio	%	57.4	42.6		55.9	44.1		57.4	42.6	
Totals	kg	1078	800.5	1878.5	1076	850	1926	1109.5	822.5	1932

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1878.5	(A)
Actual Weight of 1 P572V (SID-IIs) ATD Used	kg	50	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	4	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1932.5	(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	-0.3	-0.1	-0.1	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg	+0.55	+0.55	+0.65	Yes
Front Bumper-Line Angle (left-to-right)**	Deg	-0.25	-0.2	-0.15	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg	+0.15	-0.05	-0.2	Yes
Vehicle CG (Aft of Front Axle)	mm	1200	1243	1199	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	22	4	32	

* 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 Santa Fe 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20244201
 Test Date: 11/22/2024

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Spare Tire	15
Rear Lights	4
Trunk Carpeting	8
Ballast / Equipment Added	0

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

TEST SURFACE MARKING

	Distance from 75° Impact Location Line (mm)
Fore 25 mm target	978
Aft 25 mm target	977

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

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

NHTSA No.: M20244201
 Test Date: 11/22/2024

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	14.6	11.5	13.0
Front Passenger Seat	12.0	10.6	11.3
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

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	13.0	22	Max	-	-	-
			Mid	11	16.5	22
			Min	-	-	-
Front Passenger Seat	11.3	24	Max	-	-	-
			Mid	11.5	17	24
			Min	-	-	-
Front Center Seat*			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max			
			Mid			
			Min			
Non-Struck Side Rear Seat	Fixed	Fixed	Max			
			Mid			
			Min			
Rear Center Seat*	Fixed	Fixed	Max			
			Mid			
			Min			

**If applicable*

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

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

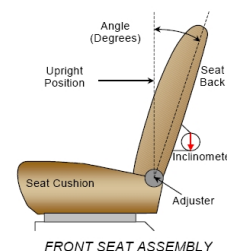
NHTSA No.: M20244201
 Test Date: 11/22/2024

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	221	35 (0-34)	0	0
Front Passenger Seat	240	38 (0-37)	0	0
Front Center Seat				
Struck Side Rear Seat	140	15 (0-14)	140	14
Non-Struck Side Rear Seat	140	15 (0-14)	140	14
Rear Center Seat	140	15 (0-14)	140	14

SEAT BACK ANGLE ADJUSTMENT

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



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/Seated Dummy	64.2	33 (0-32)	-13.4	5
Front Passenger Seat	64.1	33 (0-32)	-14.0	5
Front Center Seat				
Struck Side Rear Seat	22.0	12 (0-11)	3.3	0
Non-Struck Side Rear Seat	22.2	12 (0-11)	3.0	0
Rear Center Seat	22.0	12 (0-11)	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 & Forwardmost

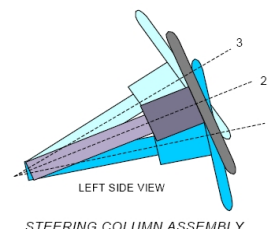
DATA SHEET NO. 2 ... (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

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

NHTSA No.: M20244201
 Test Date: 11/22/2024

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.

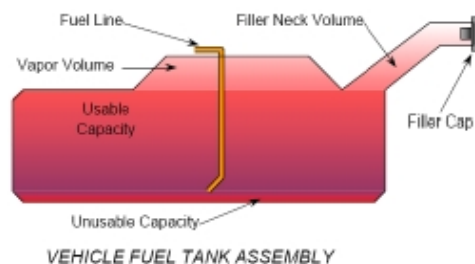


	Degrees	Fore / Aft Position (mm)
Lowermost - Position No. 1	24.1	
Geometric center - Position No. 2	26.6	
Uppermost - Position No. 3	29.0	
Telescoping Steering Wheel Travel		52
Test Position	26.6	26

FUEL PUMP

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

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



FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank" - see Form No. 1	67
Usable Capacity of "Optional Tank" - see Form No. 1	N/A
Usable Capacity of "Standard Tank" - see Owner's Manual	67
Usable Capacity of "Optional Tank" - see Owner's Manual	N/A
93% of Usable Capacity	62.3
Actual Amount of Solvent Used in Test	62.3
1/3 of Usable Capacity	22.3

Is the Actual Amount of Solvent Used in the test equal to 93% ±1% of the Usable

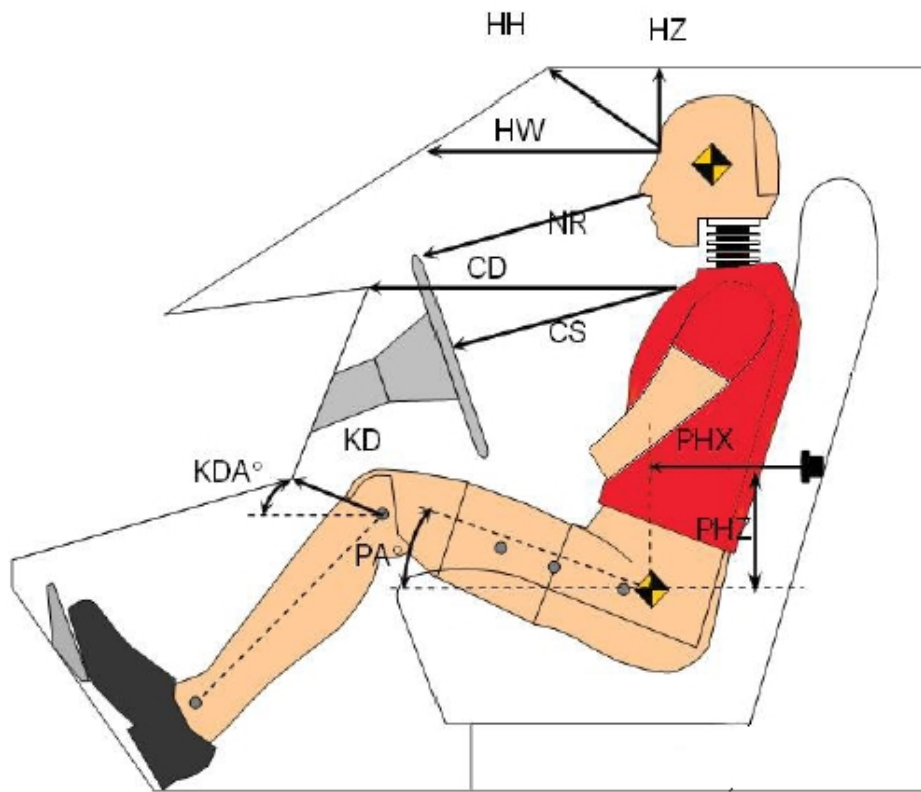
Capacity stated in Form No. 1?

Yes No

**DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

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

NHTSA No.: M20244201
 Test Date: 11/22/2024



Left Side View

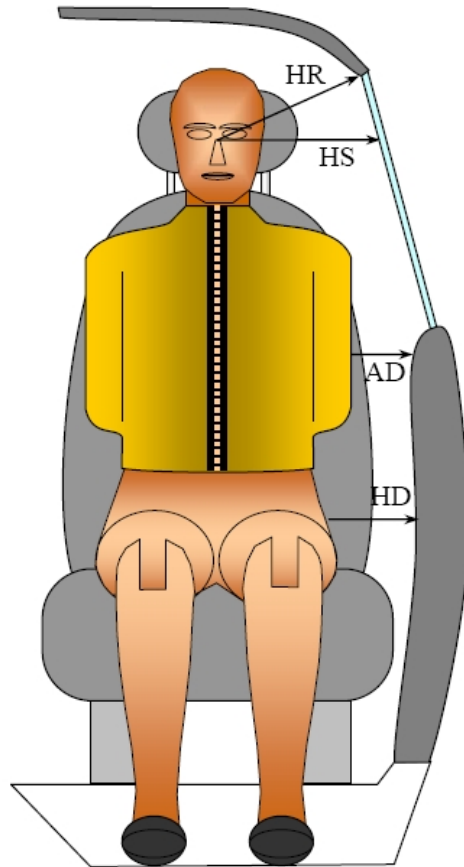
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver (Serial No. 300)	
		Length (mm)	Angle (°)
HH	Head to Header	333	
HW	Head to Windshield	660	
HZ	Head to Roof Liner	252	
NR	Nose to Rim	257	
CD	Chest to Dash	492	
CS	Chest to Steering Wheel	190	
KD(L) / KDA(L)°	Left Knee to Dash	157	32.3
KD(R) / KDA(R)°	Right Knee to Dash	125	26.6
PAX°	Pelvic Tilt Angle (X-Axis)		18.9
PAY°	Pelvic Tilt Angle (Y-Axis)		0.3
PHX	Hip Point to Striker (X-Axis)	309	
PHZ	Hip Point to Striker (Z-Axis)	271	

**DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS**

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

NHTSA No.: M20244201
 Test Date: 11/22/2024



FRONT VIEW OF DUMMY

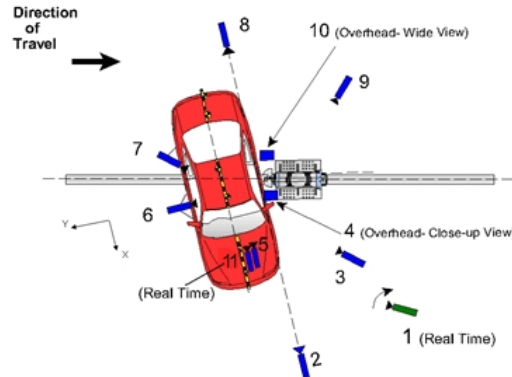
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver – Length (Serial No. 300)
HR	Head to Side Header	mm	307
HS	Head to Side Window	mm	406
AD	Arm to Door	mm	90
HD	H-Point to Door	mm	248

**DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA**

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

NHTSA No.: M20244201
 Test Date: 11/22/2024



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	30
2	Front ground level - impact view	7762	0	-1520	28	1000
3	Impact side 45° - forward pole view	5032	-735	-1420	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	-8910	0	-1501	28	1000
9	Impact side 45° - rearward pole view	-3921	-4120	-1543	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.

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

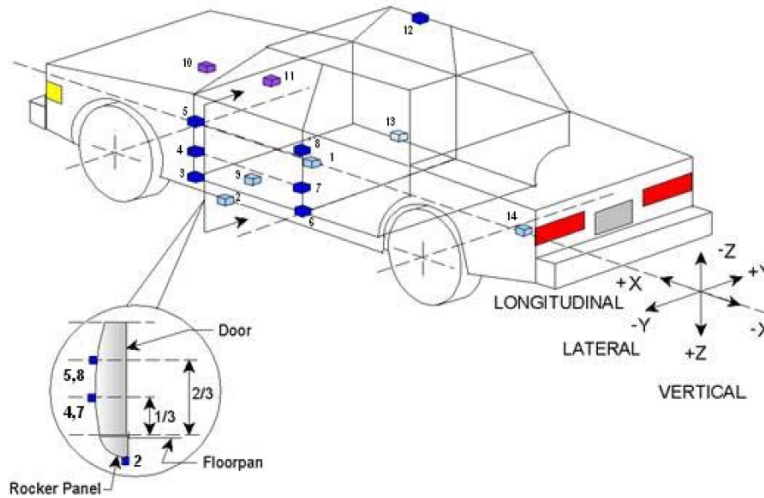
INSTRUMENTATION

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 Santa Fe 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20244201
 Test Date: 11/22/2024



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2263	-7	8
2	Left Floor Sill	2967	-674	-7
3	A-Pillar Sill	3324	-667	1
4	A-Pillar Low	3415	-652	-257
5	A-Pillar Mid	3293	-700	-755
6	B-Pillar Sill	2329	-679	-16
7	B-Pillar Low	2319	-704	-408
8	B-Pillar Mid	2295	-703	-737
9	Driver Seat Track	2632	-602	-44
10	Engine Top	4112	234	-472
11	Firewall	3665	-98	-473
12	Right Roof	2188	634	-1269
13	Right Floor Sill	2952	677	-12
14	Rear Floor Pan	505	46	-138

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 Santa Fe 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20244201
Test Date: 11/22/2024

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 Santa Fe 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20244201
 Test Date: 11/22/2024

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver Seat Dummy (SID-IIs)
Face	Torso/Pelvis Airbag & Curtain Airbag
Top of Head	Curtain Airbag
Left Side of Head	Torso/Pelvis Airbag & Curtain Airbag
Back of Head	Curtain Airbag & Headrest
Left Shoulder	Seatback & Torso/Pelvis Airbag
Upper Torso	Seatback
Lower Torso	Seatback & Torso/Pelvis Airbag
Left Hip	Torso/Pelvis Airbag & Seat Pan
Left Knee	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 Santa Fe 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20244201
 Test Date: 11/22/2024

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar, B-Pillar, and C-Pillar Buckled
Sill Separation	300 mm Along Impact Area
Windshield Damage	Cracked Throughout and some separation along A-Pillar
Side Window Damage	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	Yes	No		
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				

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

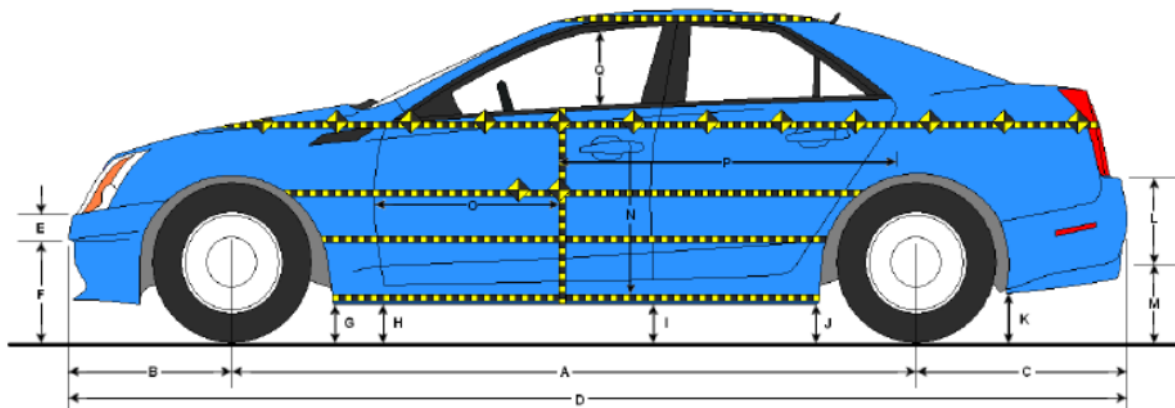
Measured Parameter	Units	Tolerance	Value
Vertical Impact Ref Line - Aft of Front Axle, Intended Impact Pt	mm		1113
Actual Impact Point - Aft of Front Axle	mm		1115
Horizontal Offset (+ forward / - rearward)	mm	+/- 38*	-2
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	deg	75 +/- 3	75
Trap No. 1 Velocity - Primary	kph	31.4 to 33.0	32.22
Trap No. 2 Velocity - Redundant	kph	31.4 to 33.0	32.16

*Of Intended Impact Point

DATA SHEET NO. 9
TEST VEHICLE PROFILE MEASUREMENTS

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

NHTSA No.: M20244201
Test Date: 11/22/2024



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

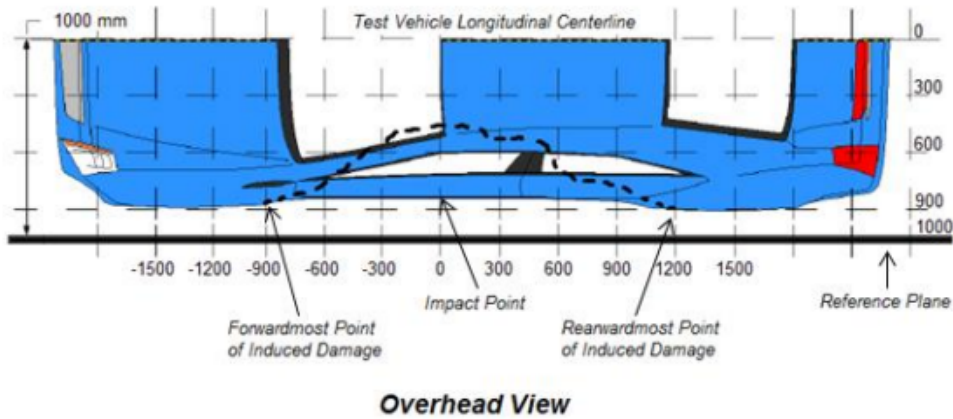
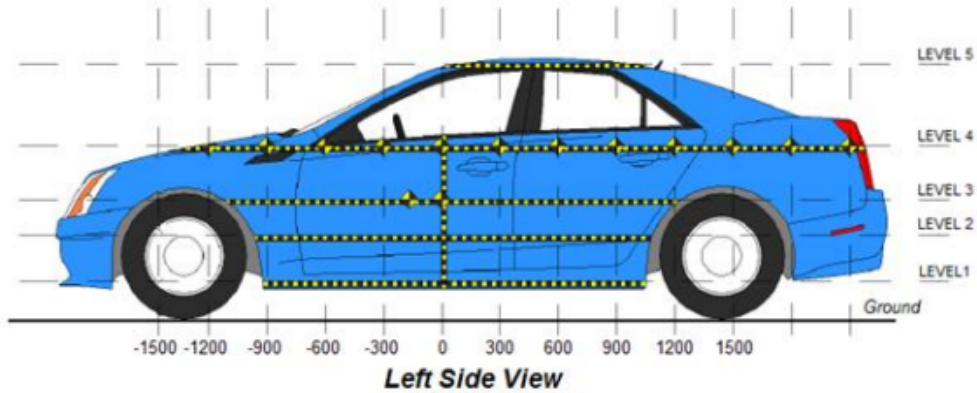
No.	Measurement Description	Pre-Test	Post-Test	Change
A	Vehicle Wheelbase	2817	2758	-59
B	Front Axle to FSOV	918	955	37
C	Rear Axle to RSOV	1095	1092	-3
D	Total Length at Centerline	4829	4805	-24
E	Front Bumper Thickness	115	115	0
F	Front Bumper Bottom to Ground	476	508	32
G	Sill Height at Front Wheel Well	251	249	-2
H	Sill Height at Front Door Leading Edge	250	249	-1
I	Sill Height at B Pillar	255	263	8
J1	Sill Height at Rear Wheel Well	258	277	19
J2	Pinch Weld Height at Rear Wheel Well	248	270	22
K	Sill Height Aft of Rear Wheel Well	285	300	15
L	Rear Bumper Thickness	110	110	0
M	Rear Bumper Bottom to Ground	450	461	11
N	Sill Height to Bottom of Front Window Sill	913	915	2
O	Front Door Leading Edge to Impact CL	611	514	-97
P	Rear Door Trailing Edge to Impact CL	1538	1449	-89
Q	Front Window Opening	444	430	-14
R	Right Side Length	4745	4747	2
S	Left Side Length	4748	4698	-50
T	Vehicle Width at B-Pillars	1902	1774	-128
U	Front Wheel Track width	1646	1636	-10
V	Rear Wheel Track Width	1656	1656	0

* All measurements in mm with tolerance of ± 3 mm

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

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

NHTSA No.: M20244201
 Test Date: 11/22/2024



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	371	369	0
2	Driver H-Point	mm	711	401	0
3	Mid-Door	mm	763	400	0
4	Window Sill	mm	1119	360	0
5	Window Top	mm	1628	176	0

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 Santa Fe 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20244201
 Test Date: 11/22/2024

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

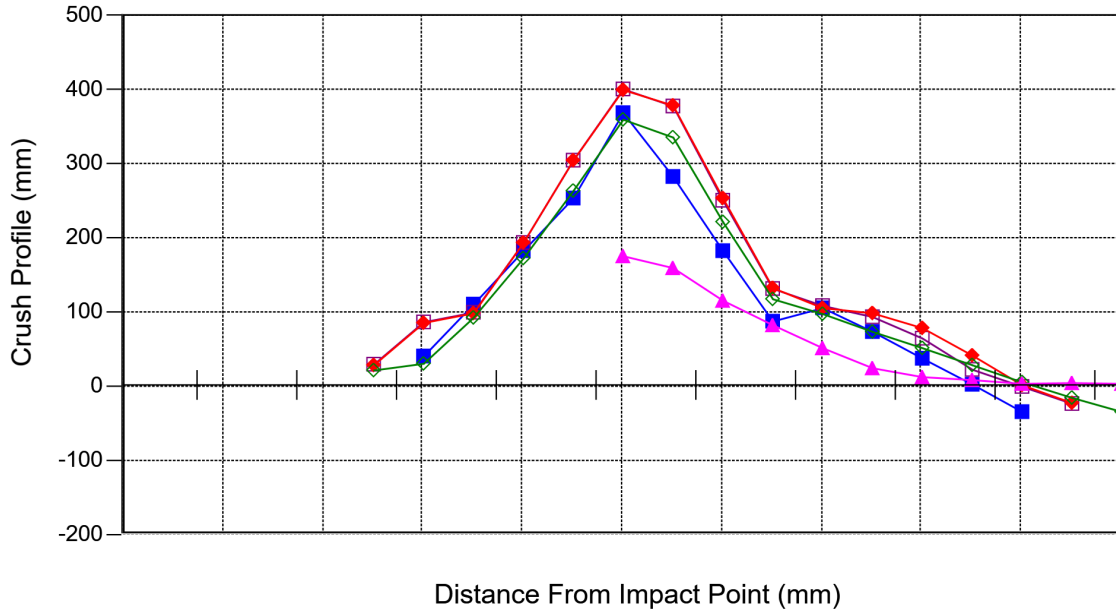
	Pre-Test					Post-Test					Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500															
-1350															
-1200															
-1050															
-900															
-750		951	952	866			921	923	844			30	29	22	
-600	928	950	946	880		887	863	860	849		41	87	86	31	
-450	928	946	944	887		817	846	845	794		111	100	99	93	
-300	929	947	946	894		746	753	752	721		183	194	194	173	
-150	930	949	948	899		676	644	643	635		254	305	305	264	
0	930	950	949	903	674	561	549	549	543	498	369	401	400	360	176
150	930	952	951	907	690	647	574	572	571	530	283	378	379	336	160
300	929	952	952	909	691	746	701	698	687	575	183	251	254	222	116
450	929	952	952	910	692	841	820	819	792	609	88	132	133	118	83
600	927	950	949	910	692	821	841	843	812	640	106	109	106	98	52
750	925	948	947	909	691	851	854	848	835	666	74	94	99	74	25
900	922	946	945	909	690	884	881	866	857	677	38	65	79	52	13
1050	919	943	943	907	688	916	920	901	878	679	3	23	42	29	9
1200	916	952	948	905	685	950	952	946	899	681	-34	0	2	6	4
1350		951	950	888	681		974	972	903	676		-23	-22	-15	5
1500				896	676				930	672				-34	4

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 Santa Fe 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20244201
 Test Date: 11/22/2024



— LEVEL 1 Side Sill: 371 mm above ground
 — LEVEL 2 H-Point: 711 mm above ground
 — LEVEL 3 Mid Door: 763 mm above ground
 — LEVEL 4 Window Sill: 1119 mm above ground
— LEVEL 5 Window Top: 1628 mm above ground

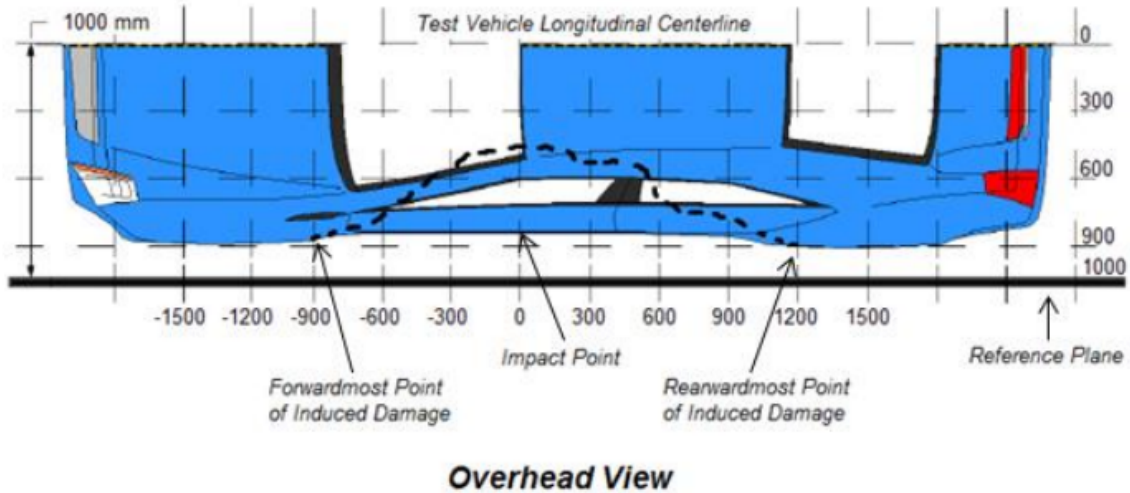
Vehicle Exterior Crush Measurements - Visual Representation

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

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

NHTSA No.: M20244201
 Test Date: 11/22/2024

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	-750	3	77	48	29
2	-330	3	229	54	175
3	90	3	437	50	387
4	510	3	171	49	122
5	930	3	127	55	72
6	1350	3	28	50	-22

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

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

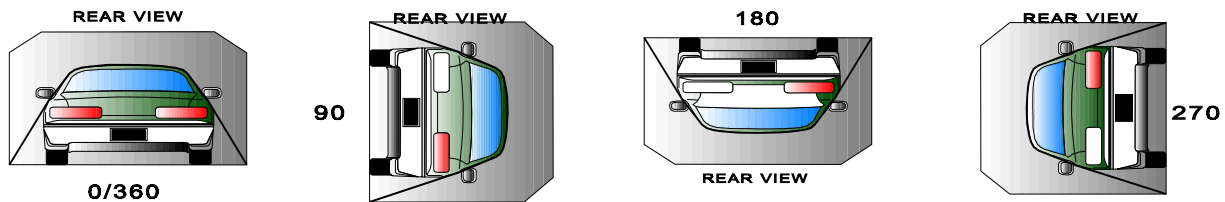
NHTSA No.: M20244201
 Test Date: 11/22/2024

Test Time: 9:39 AM

Temperature: 21 °C

- A. From impact until vehicle motion ceases: 0 oz
(Maximum allowable is 1 oz.)
- B. For the 5-minute period after motion ceases: 0 oz
(Maximum allowable is 5 oz.)
- C. For the following 25 minutes: 0 oz
(Maximum allowable is 1 oz.)

D. Spillage Detail: No Spillage



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	66	300	366
90° to 180°	68	300	368
180° to 270°	65	300	365
270° to 360°	66	300	366

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

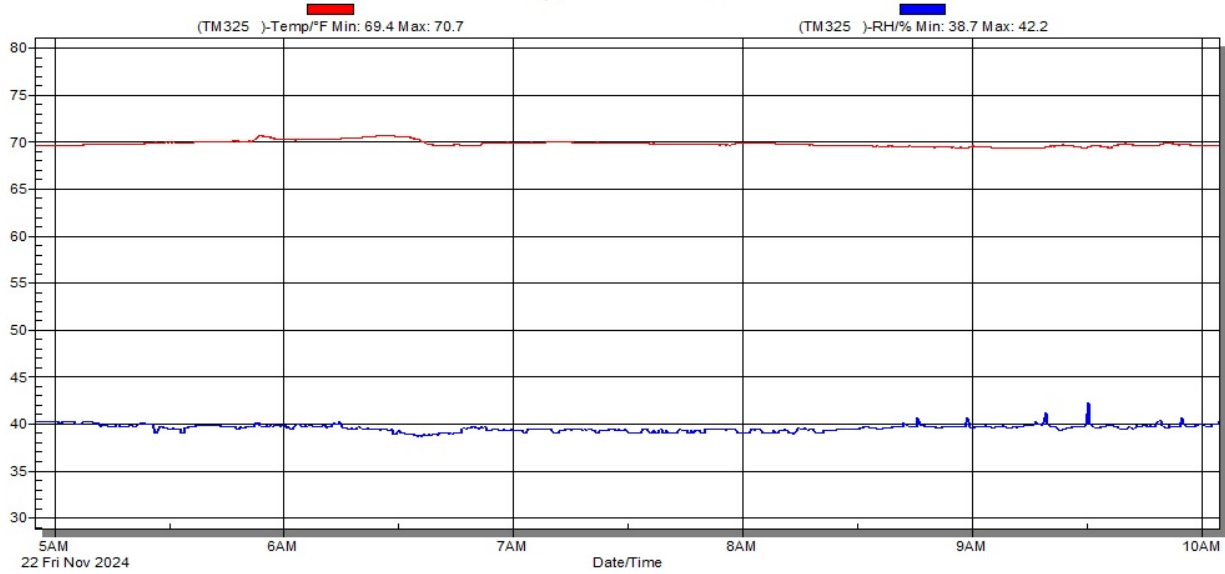
Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

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

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

NHTSA No.: M20244201
Test Date: 11/22/2024

Friday, November 22, 2024



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

APPENDIX A
PHOTOGRAPHS

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M20244201

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



M20244201

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



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

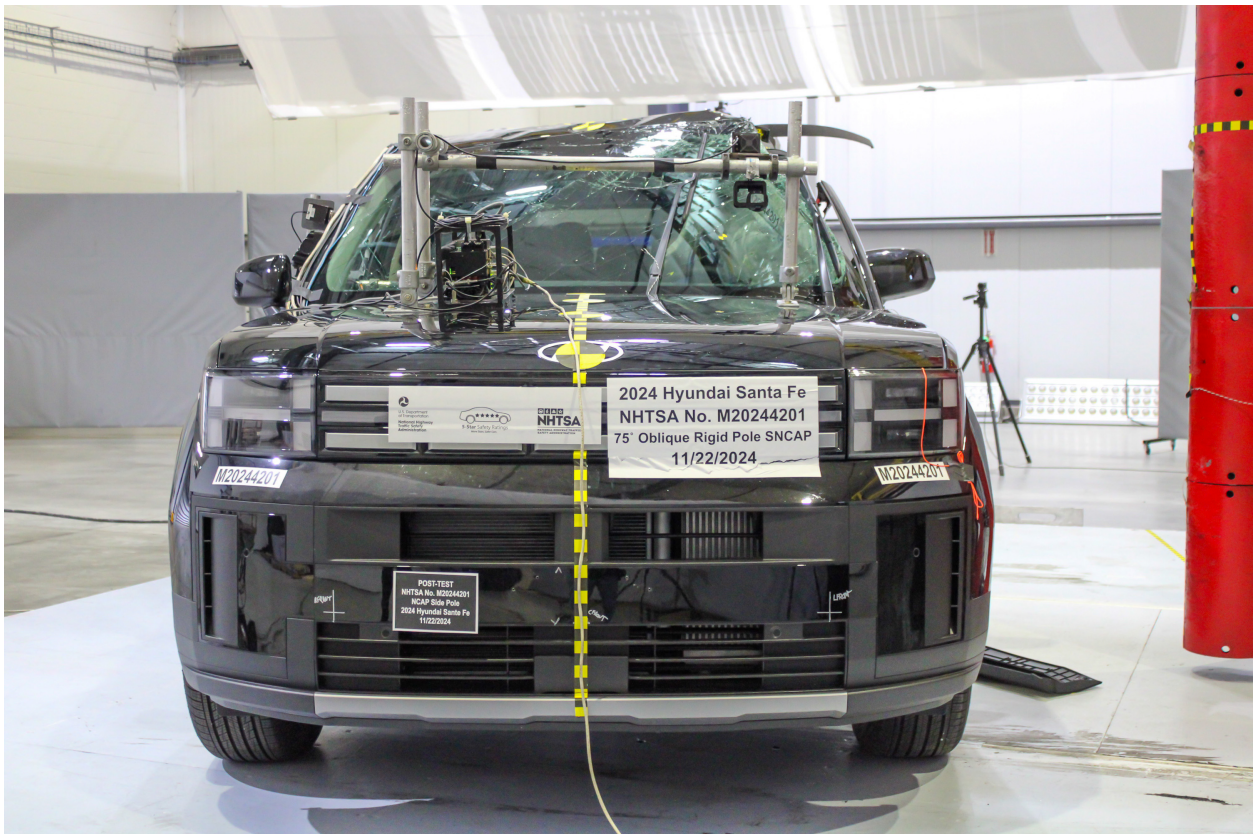


Figure A-4: Post-Test Frontal View of Test Vehicle



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

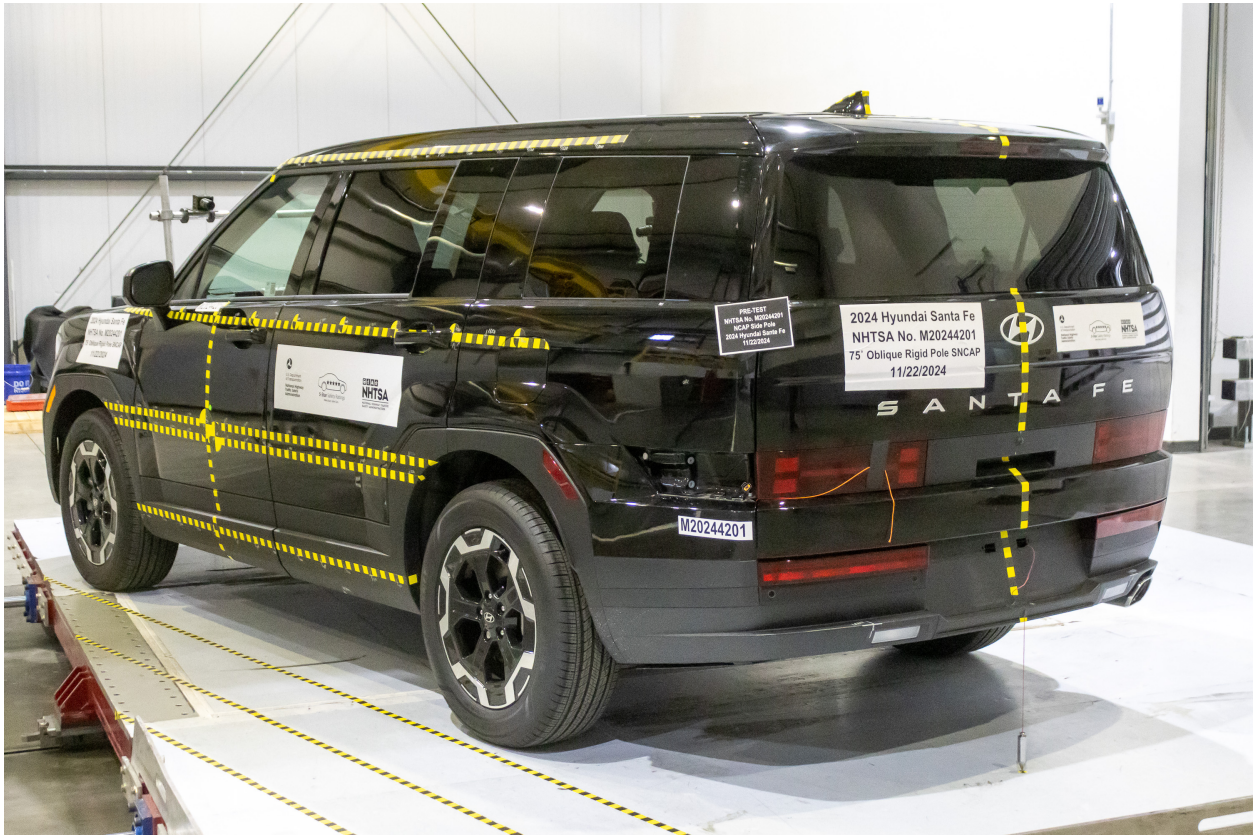


Figure A-9: Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



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

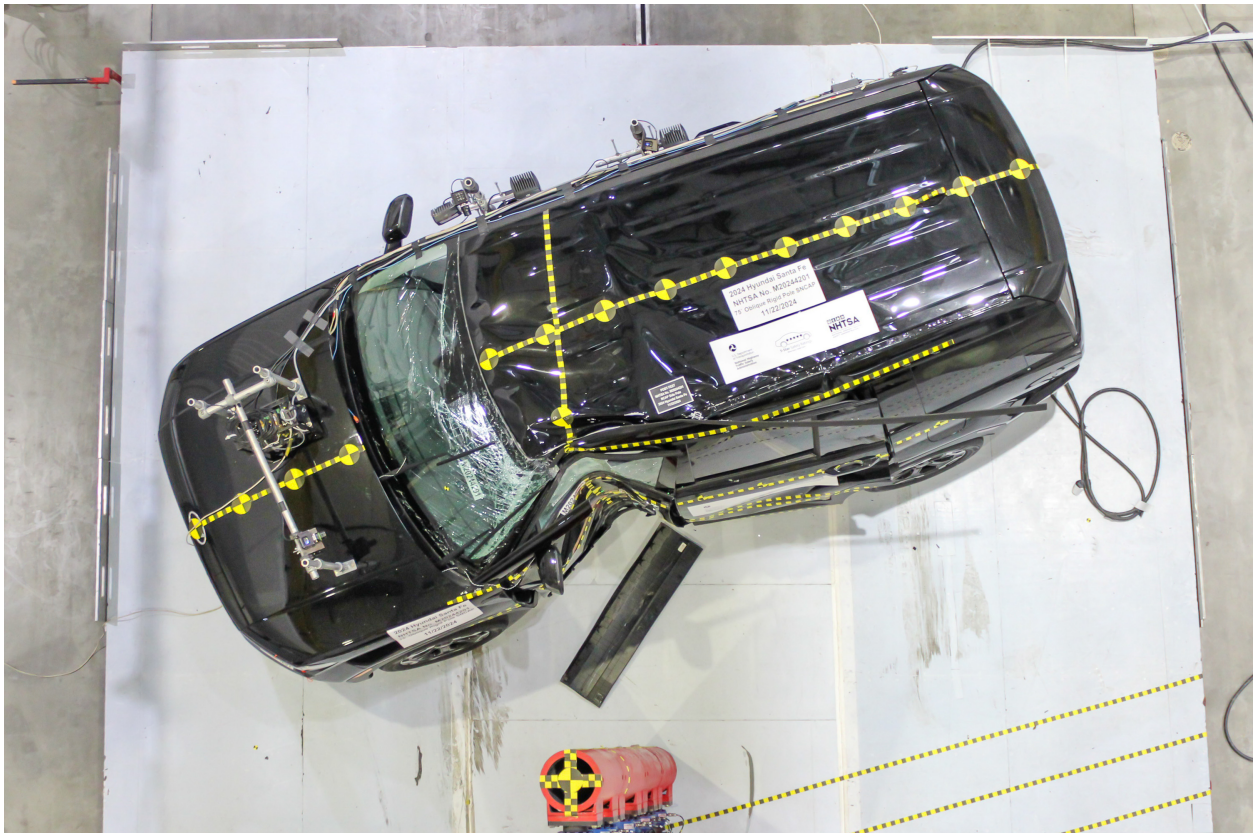


Figure A-16: Post-Test Overhead View of Test Area



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

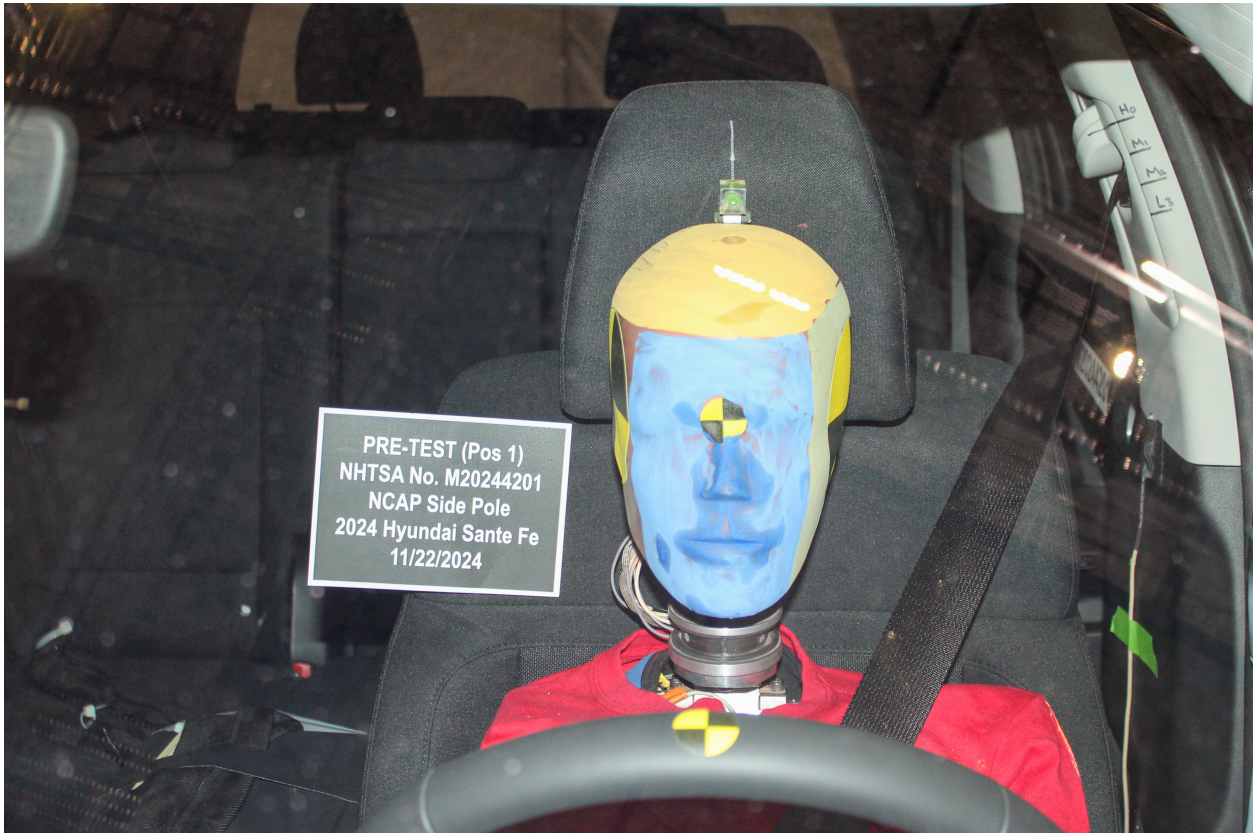


Figure A-21: Pre-Test Front Close-Up View of Dummy Head and Chest



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

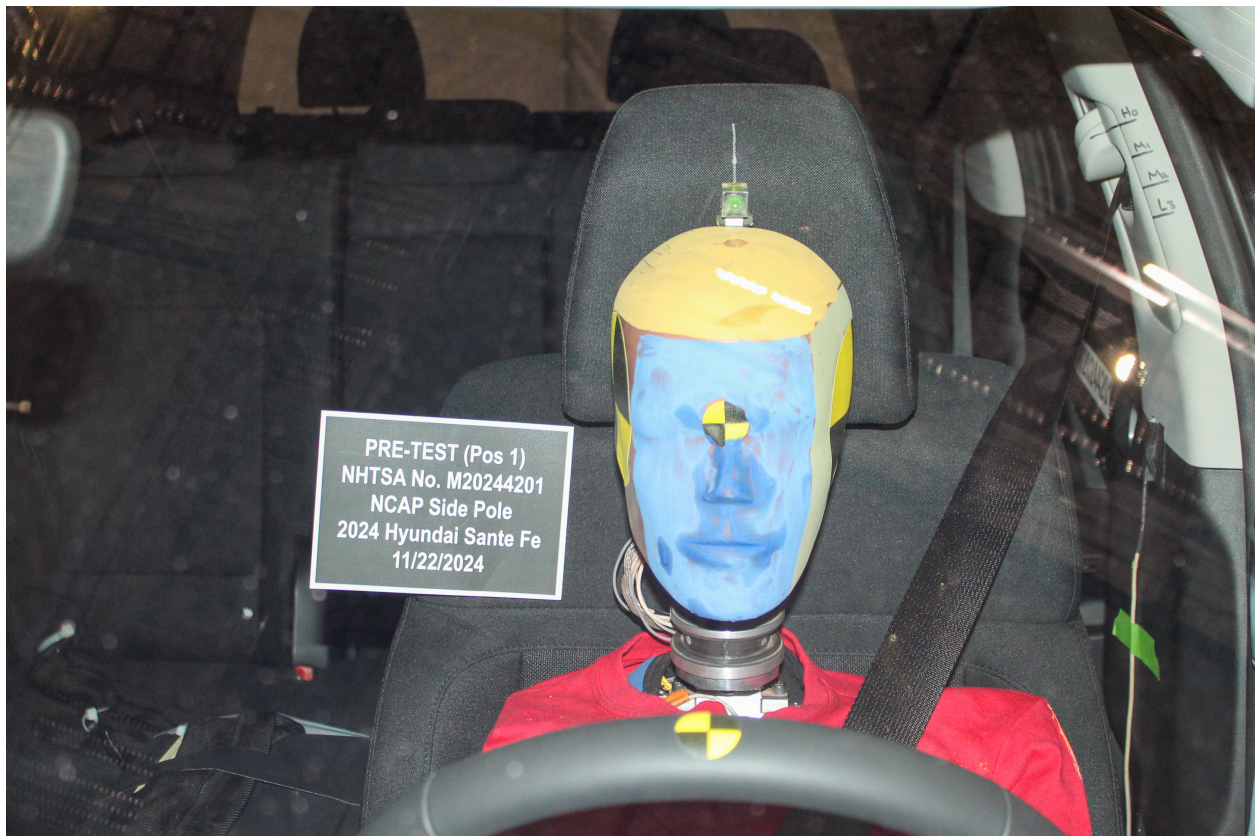


Figure A-27: Pre-Test Frontal Close-Up View of Dummy Head / Shoulders in Relation to Head Restraint



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



PRE-TEST (Pos 1)
NHTSA No. M20244201
NCAP Side Pole
2024 Hyundai Sante Fe
11/22/2024

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



PRE-TEST (Pos 1)
NHTSA No. M20244201
NCAP Side Pole
2024 Hyundai Sante Fe
11/22/2024

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



PRE-TEST (Pos 1)
NHTSA No. M20244201
NCAP Side Pole
2024 Hyundai Sante Fe
11/22/2024



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



M20244201

PRE-TEST (Pos 1)
NHTSA No. M20244201
NCAP Side Pole
2024 Hyundai Sante Fe
11/22/2024

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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



Figure A-55: Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



Figure A-56: Post-Test View of Fuel Filler Cap or Fuel Filler Neck



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



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

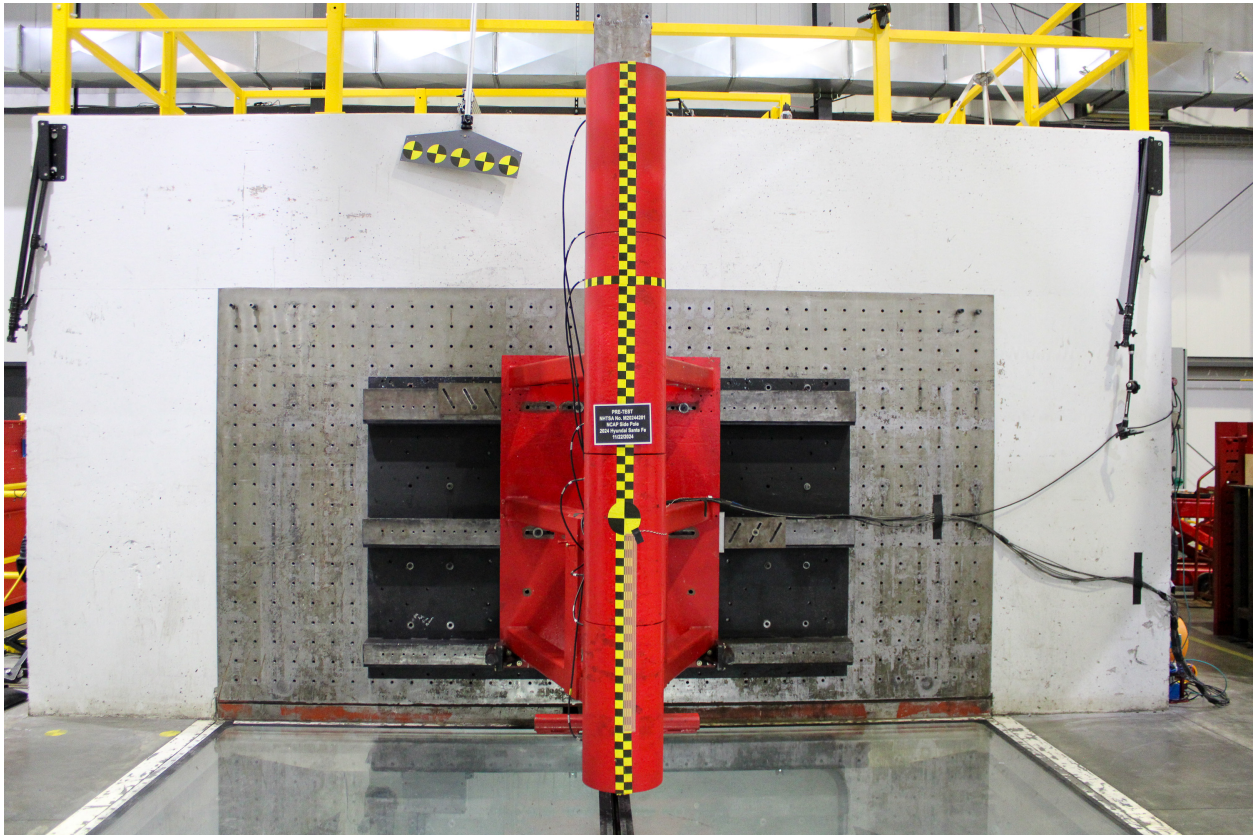


Figure A-59: Pre-Test Pole Barrier Front View

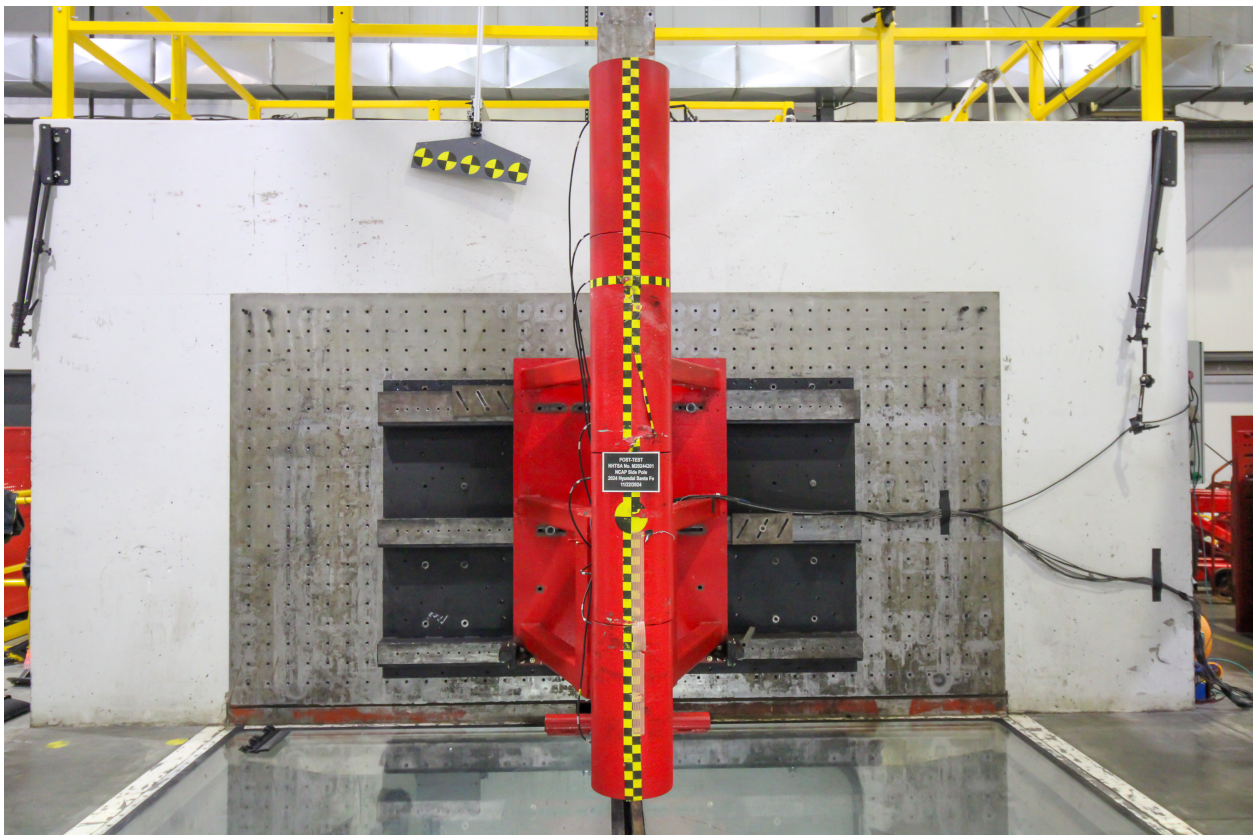


Figure A-60: Post-Test Pole Barrier Front View

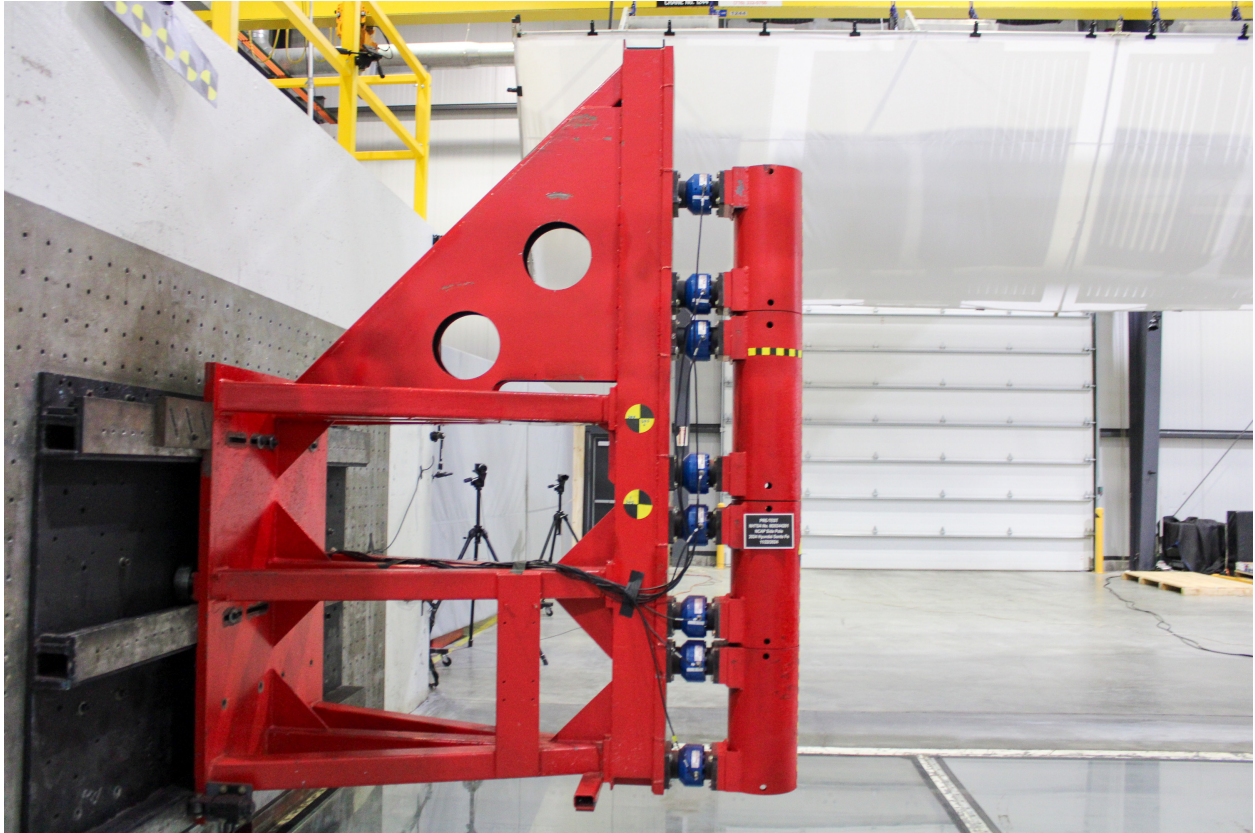


Figure A-61: Pre-Test Pole Barrier Side View



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

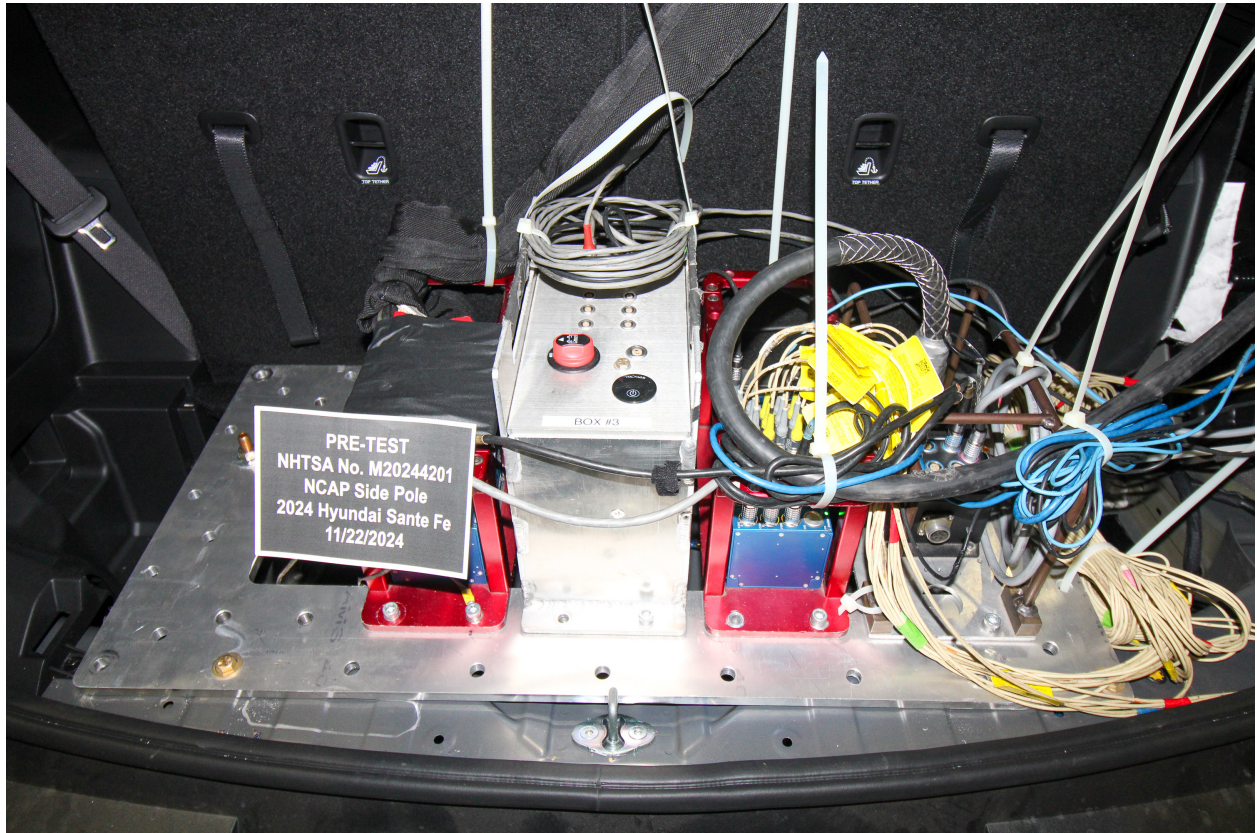


Figure A-63: Pre-Test Ballast View



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



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

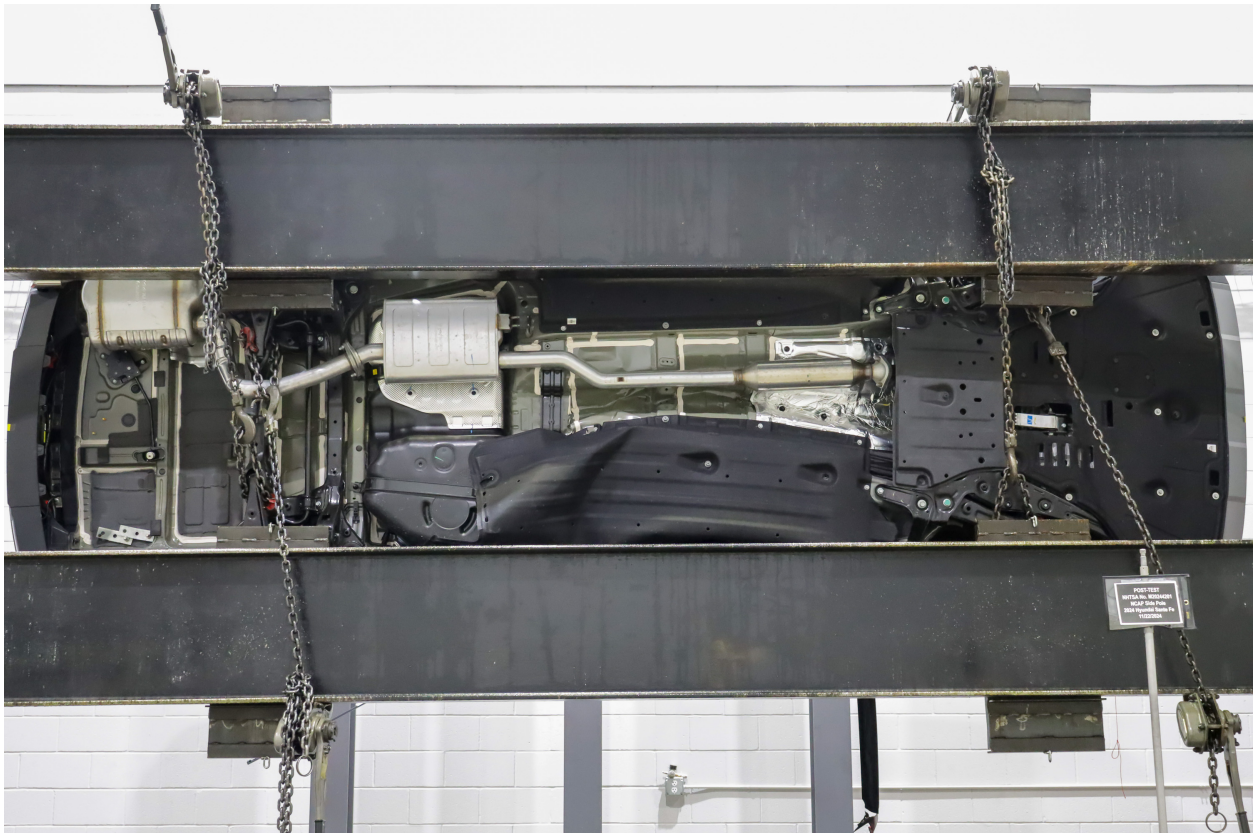


Figure A-66: FMVSS No. 301 Static Rollover 90 Degrees



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



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

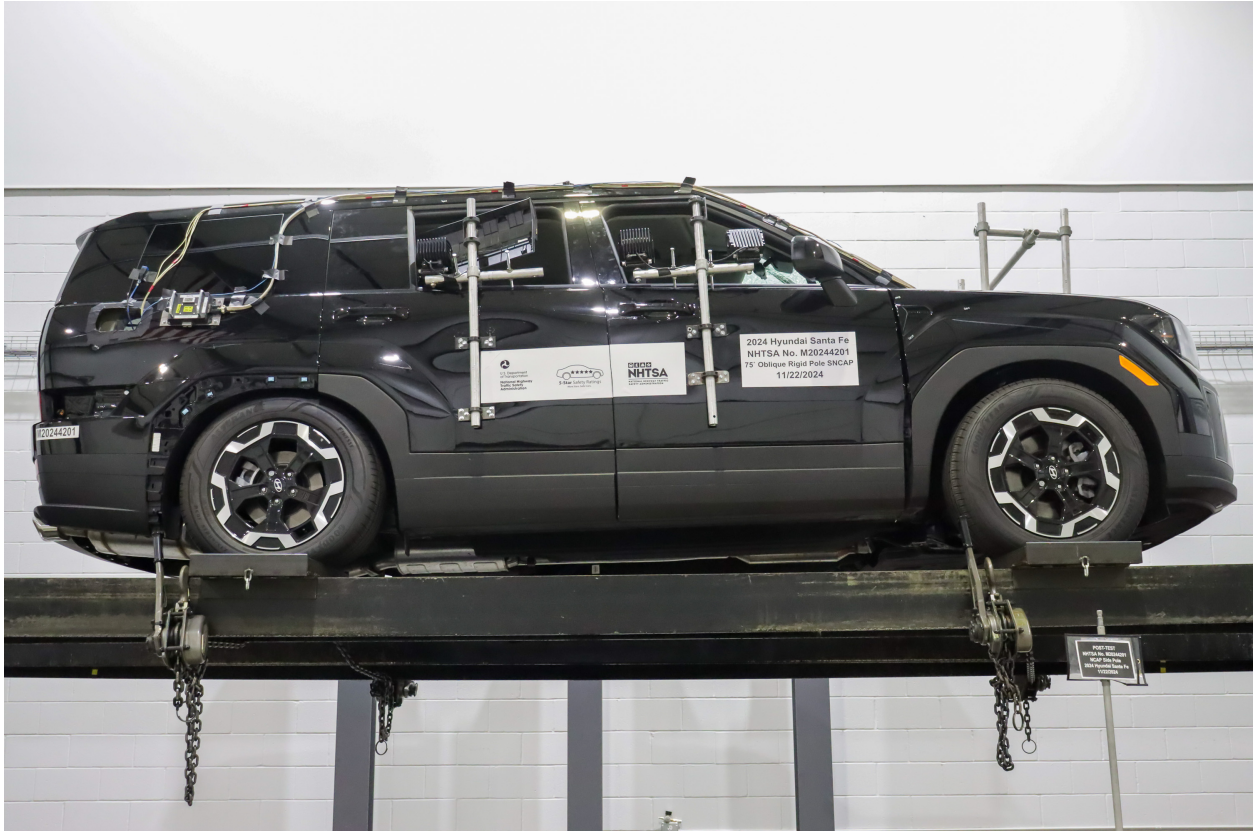


Figure A-69: FMVSS No. 301 Static Rollover 360 Degrees



Figure A-70: Impact Event



2024 SANTA FE SE 2.5T FWD

SOLD TO: W1039 SHIPPED TO: W1039 ROSEN HYUNDAI GREENFIELD 6139 S 27TH STREET GREENFIELD WI 53221		GOVERNMENT 5-STAR SAFETY RATINGS This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk. Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4236	
VIN: 5NMP14QL1RH062460 MODEL: 65402FT5 ENGINE: G4KPRK117331 PORT OF ENTRY: MA EXTERIOR COLOR: PHANTOM BLACK PEARL INTERIOR/SEAT COLOR: BLACK/BLACK TRANSPORT: TRUCK ACCESSORY WEIGHT: 15 lbs./ 7 kgs. EMISSIONS: This vehicle is certified to meet emission requirements in all 50 states		Manufacturer's Suggested Retail Price: \$33,950.00 ADDED FEATURES: *Cargo Net \$55.00 *Roadside Assistance Kit \$70.00 *First Aid Kit \$30.00 *All Season Floor Liners \$245.00	
STANDARD FEATURES: AMERICA'S BEST WARRANTY 5-year/60,000-mile New Vehicle Warranty* 10-year/100,000-mile Powertrain Warranty* 7-year/Unlimited-mile Anti-rust/perforation Warranty* 3-year/36,000-mile Complimentary Maintenance* 5-year/Unlimited-mile Roadside Assistance *Unlimited warranties, see dealer for details ADVANCED SAFETY TECHNOLOGY Forward Collision-Avoidance Assist Blind-Spot Collision Warning Rear Cross-Traffic Collision-Avoidance Assist Lane Following Assist / Lane Keeping Assist Driver Attention Warning Park Distance Warning - Forward/Reverse Rearview Camera POWERTRAIN TECHNOLOGY 2.5L Turbocharged 4-Cylinder Engine w/ GDI and MPI 8-speed Wet Dual Clutch Transmission w/ Paddle Shifters Idle Stop & Go (ISG) Electronic Parking Brake w/ Auto Hold EXTERIOR 18" Alloy Wheels LED Headlights & Daytime Running Lights LED Taillights Power Liftgate w/ Extra Wide Opening COMFORT & CONVENIENCE Proximity Key Entry w/ Push Button Start Air Conditioning w/ and Row Vents Smart Cruise Control w/ Stop & Go 60/40 Split Folding 2nd Row Seats 60/50 Split Folding 3rd Row Seats Front and 2nd Row USB Charging Ports 8-Directional Center Console Armrest Tilt & Telescopic Leather-Wrapped Steering Wheel Bluetooth Hands-Free System 12.3" Color Touchscreen Audio Display (w/ AM/FM/HD Radio8) Wireless Android Auto & Apple CarPlay SiriusXM® w/ 90-Day Platinum trial subscription. Not Available in AK & HI BlueLink® All-Inclusive Connected Services (enrollment required) Temporary Spare Tire Full Tank of Fuel		Inland Freight & Handling: \$1,415.00 Total Price: \$35,765.00	

NEXT-LEVEL 3-ROW SANTA FE.
FOR NEXT-LEVEL ADVENTURES.



EPA DOT Fuel Economy and Environment Fuel Economy 24 MPG combined city/hwy 4.2 gallons per 100 miles Small SUVs range from 14 to 118 MPG. The best vehicle rates 140 MPG.		Gasoline Vehicle You spend \$1,500 more in fuel costs over 5 years compared to the average new vehicle.	
Annual fuel Cost \$2,250		Fuel Economy & Greenhouse Gas Rating (tailpipe only) Smog Rating (tailpipe only) 1 5 10 Best 1 7 10 Best This vehicle emits 377 grams CO ₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and getting fuel also create emissions. 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 \$9,750 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$ 3.00 per gallon. 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			

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: 50 %
 MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA: 30 %

Note: Parts content does not include final assembly, distribution, or other non-parts costs.

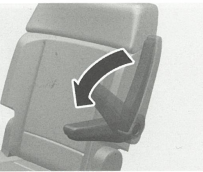
FOR THIS VEHICLE:
 FINAL ASSEMBLY POINT: MONTGOMERY, ALABAMA U.S.A.
 COUNTRY OF ORIGIN: U.S.A.
 ENGINE: U.S.A
 TRANSMISSION: KOREA

197 A 1

Figure A-71: Monroney Label

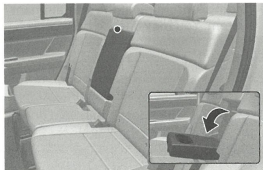
Armrest (2nd row seat)

6-seater



To adjust the armrest to a desired angle: Lift the armrest to slightly above the highest position, then lower it to the lowest position, then lift the armrest to position it to the desired angle.

7-seater



The armrest is located in the center of the rear seat. Pull the armrest down from the seatback to use it.

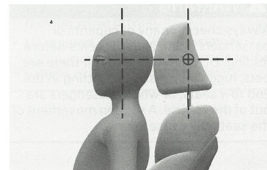
Head Restraints

The vehicle's front and rear seats have adjustable head restraints. The head restraints are designed to help protect passengers from whiplash and other neck and spinal injuries during a collision, especially a rear impact collision. When there are no occupants in the rear seats, adjust the rear head restraints to the lowest height to improve the driver's visibility.

WARNING

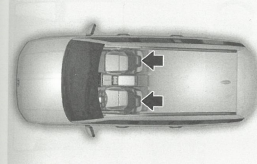
To help reduce, the risk of serious injury or death in a crash, take the following precautions when adjusting your head restraints:

- Always adjust the head restraints properly for all passengers BEFORE starting the vehicle.
- Never let anyone ride in a seat with the head restraints removed or reversed.
- Adjust the head restraints so that the middle of the head restraint is at the same height as the top of the eyes.



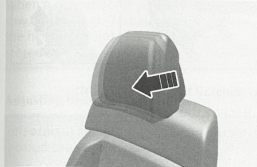
- Never adjust the driver's head restraint when the vehicle is moving.
- Make sure the head restraint is locked in place after adjustment.

Front seat head restraints



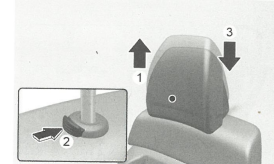
The driver's and front passenger's seats are equipped with adjustable head restraint for the passengers safety and comfort.

Forward and rearward adjustment



The head restraint may be adjusted forward to 3 different positions by pulling the head restraint forward to the desired detent. To adjust the head restraint to it's furthest rearwards position, pull it fully forward to the farthest position and release it.

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. Press 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

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

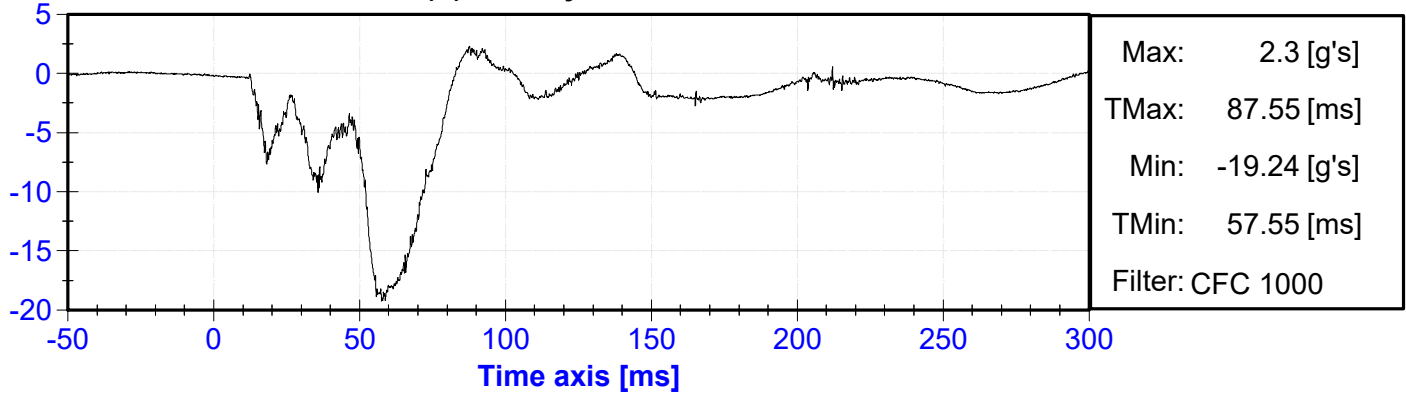
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration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

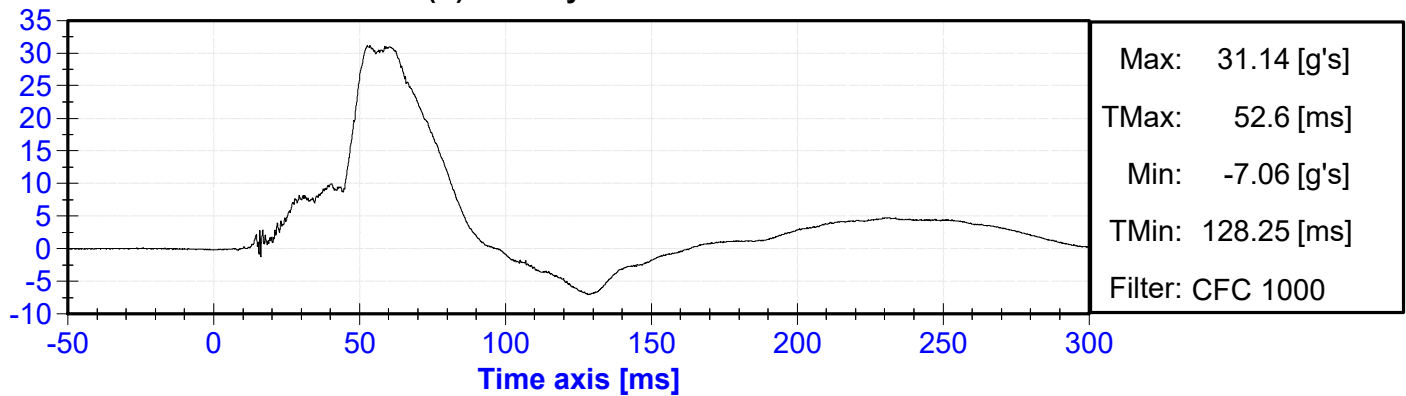
ACCELERATION [g's]

Driver Head Acceleration (X) Primary vs. Time



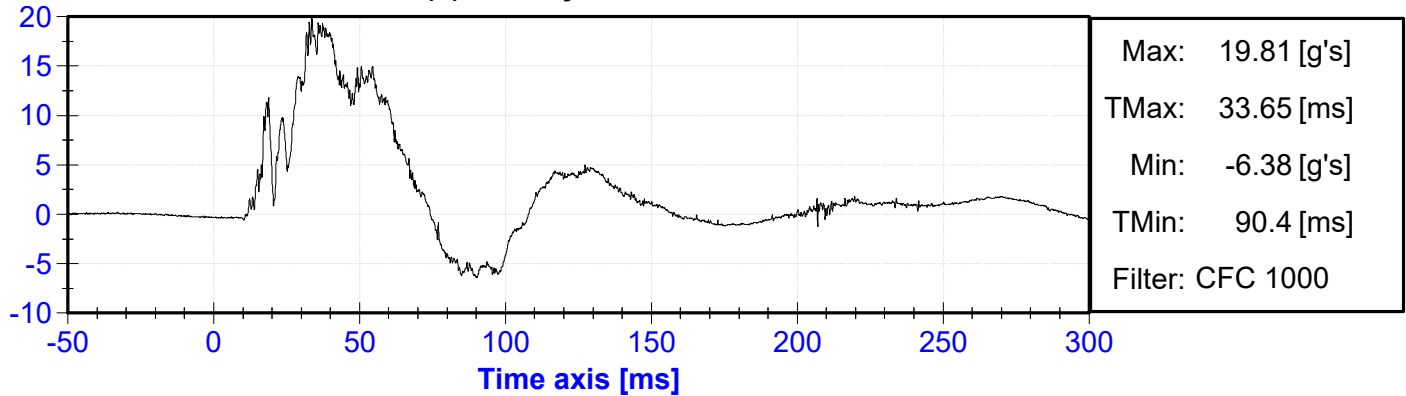
ACCELERATION [g's]

Driver Head Acceleration (Y) Primary vs. Time



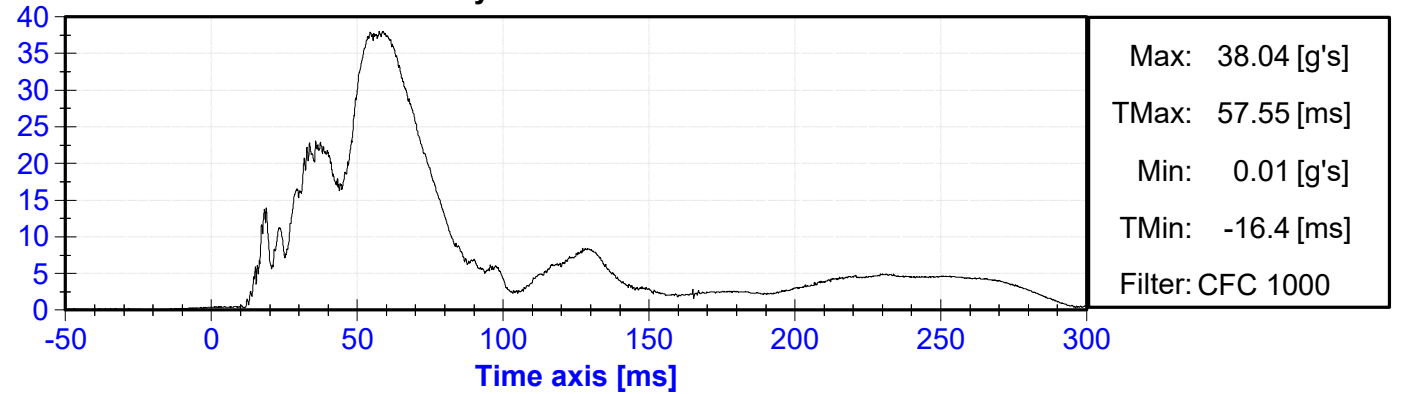
ACCELERATION [g's]

Driver Head Acceleration (Z) Primary vs. Time



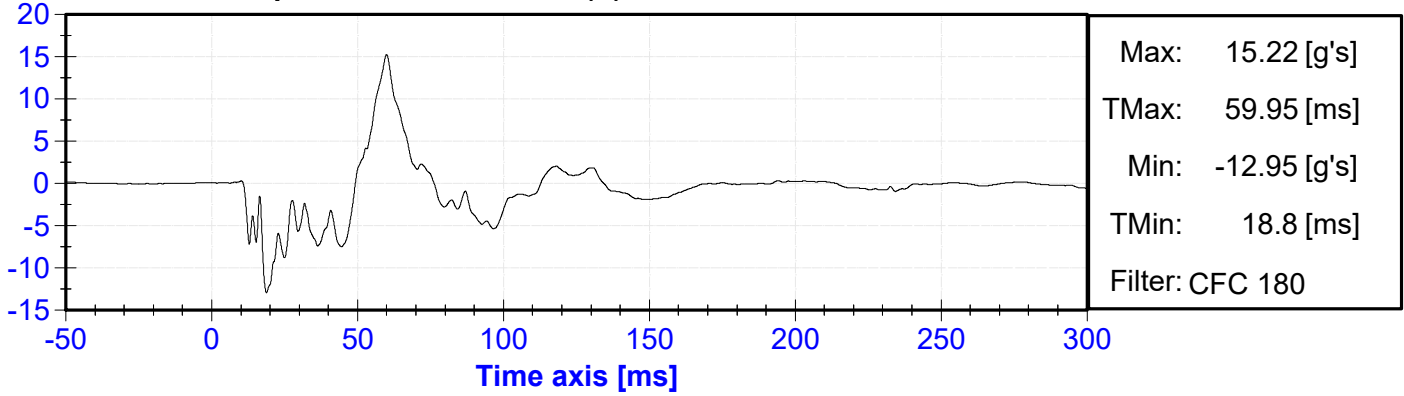
ACCELERATION [g's]

Driver Head Resultant Primary vs. Time



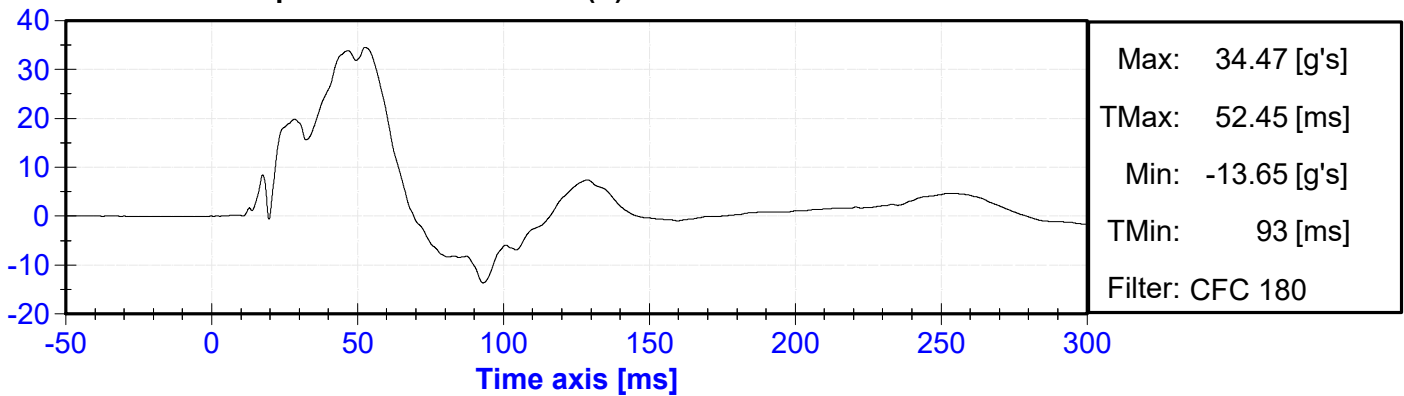
ACCELERATION [g's]

Driver Lower Spine T12 Acceleration (X) vs. Time



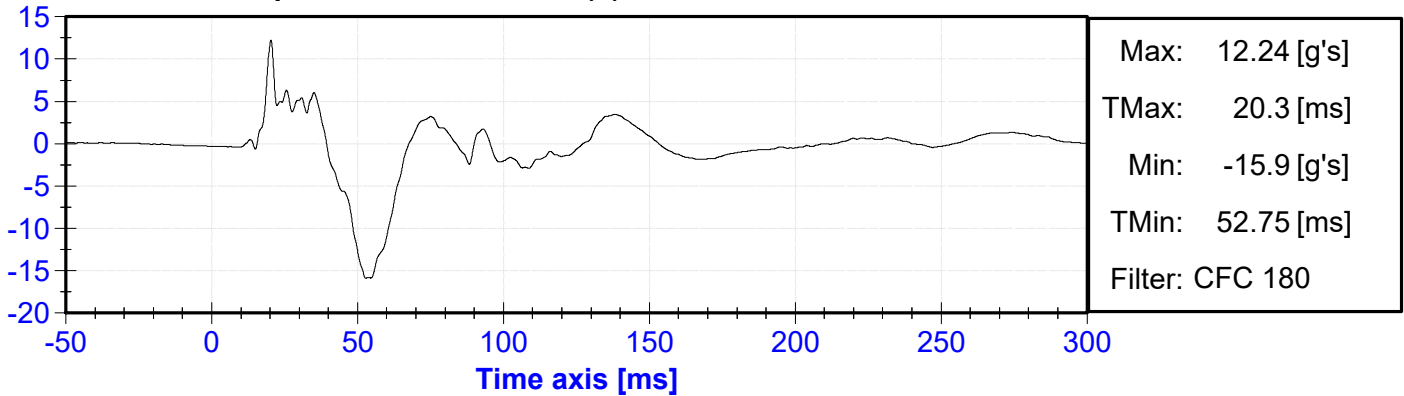
ACCELERATION [g's]

Driver Lower Spine T12 Acceleration (Y) vs. Time



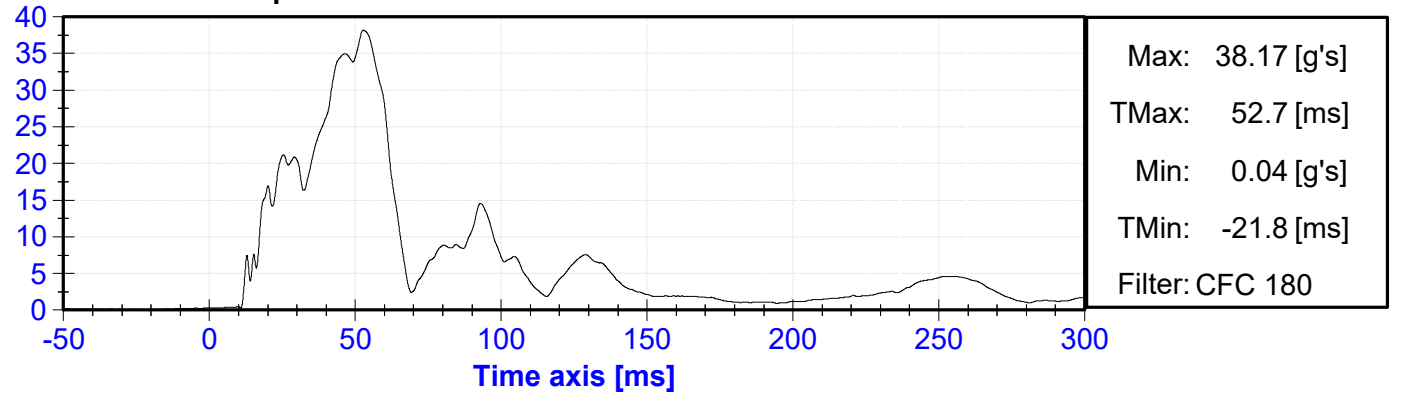
ACCELERATION [g's]

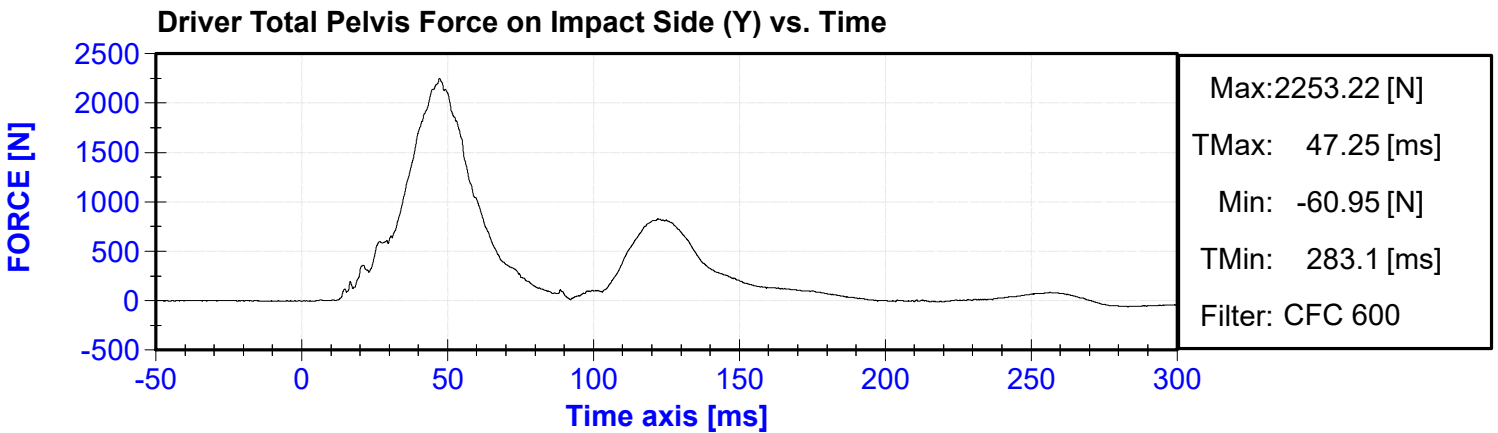
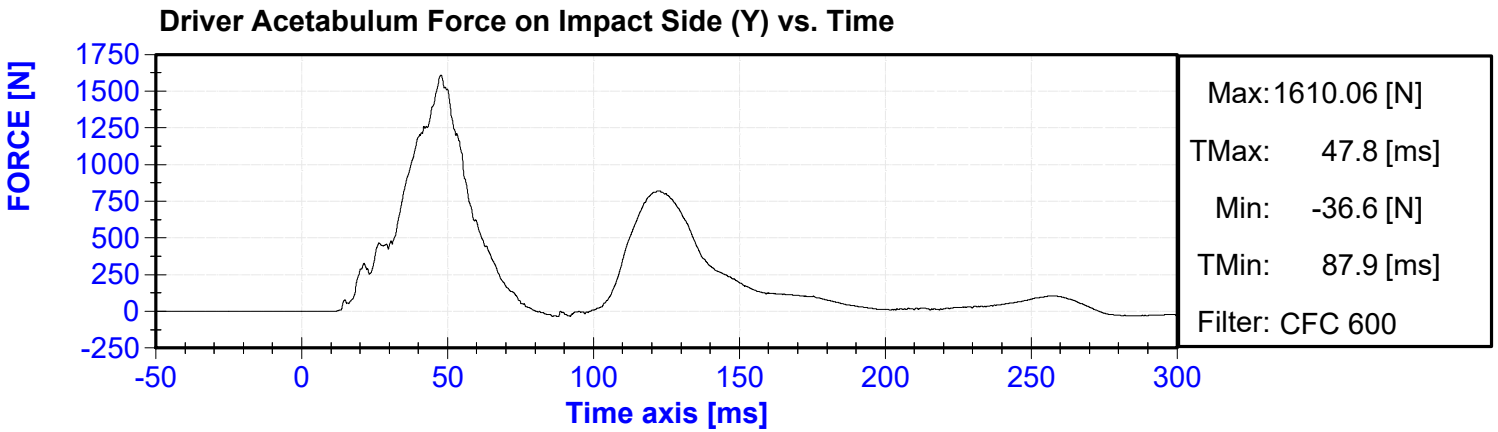
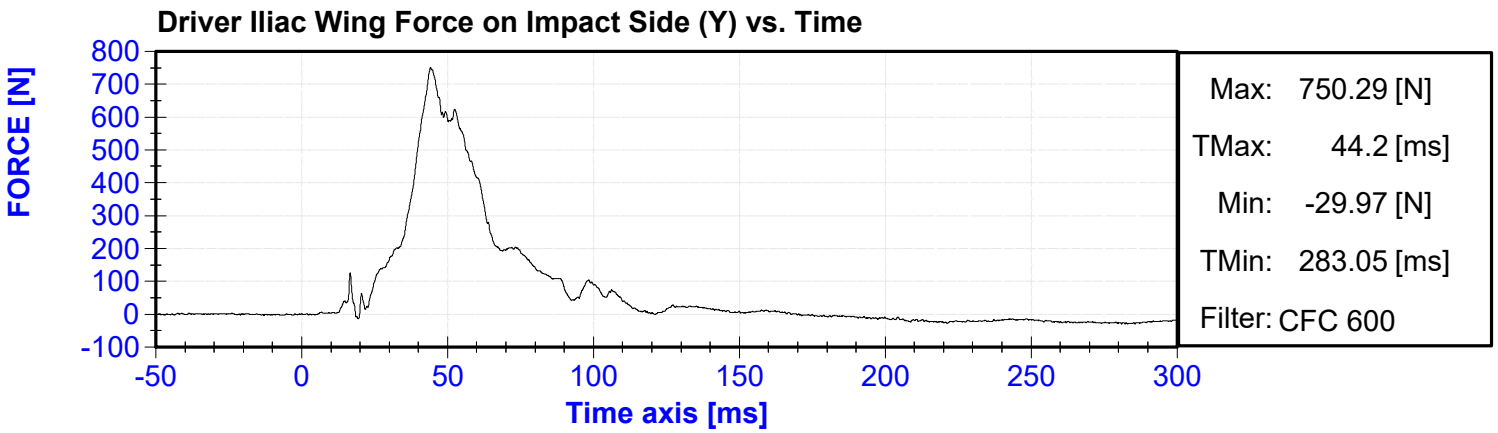
Driver Lower Spine T12 Acceleration (Z) vs. Time



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:300

(CONFIGURED FOR LEFT SIDE IMPACT)

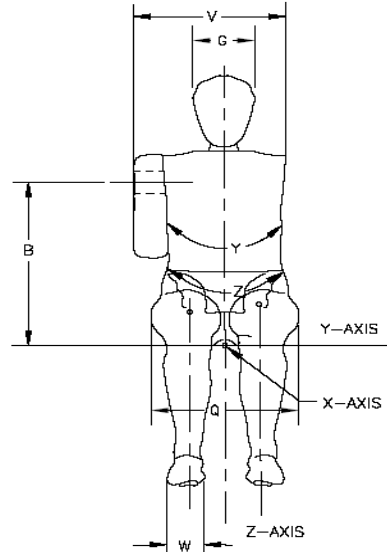
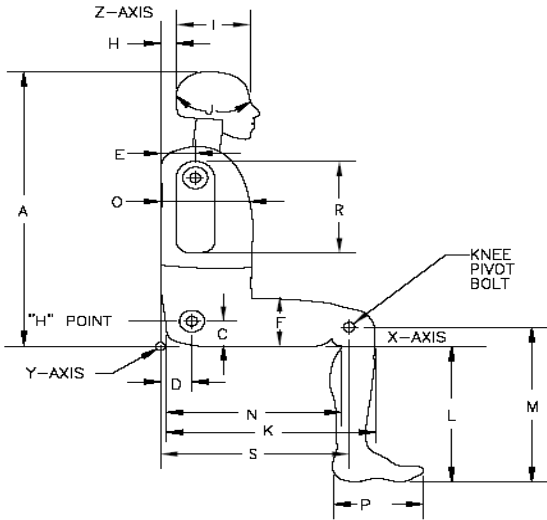


External Measurements - SID-IIs

Technician: J. Rios

Date: 11/20/2024

Dummy Serial Number: 300



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	782	Pass
B	Shoulder Pivot Height	437	453	439	Pass
C	H-point Height	79	89	81	Pass
D	H-point from seatback	141	151	142	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	125	Pass
G	Head Breadth	140	148	145	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	185	Pass
J	Head Circumference	541	551	548	Pass
K	Buttock to Knee Length	514	540	522	Pass
L	Popliteal Height	343	369	357	Pass
M	Knee Pivot to floor height	392	409	405	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	202	Pass
P	Foot Length	216	232	225	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	320	Pass
R	Arm Length	249	259	255	Pass
S	Knee Joint to seatback	477	493	488	Pass
V	Shoulder Width	341	357	351	Pass
W	Foot Width	78	94	80	Pass
Y	Chest Circumference w/jacket	851	881	868	Pass
Z	Waist Circumference	761	791	778	Pass

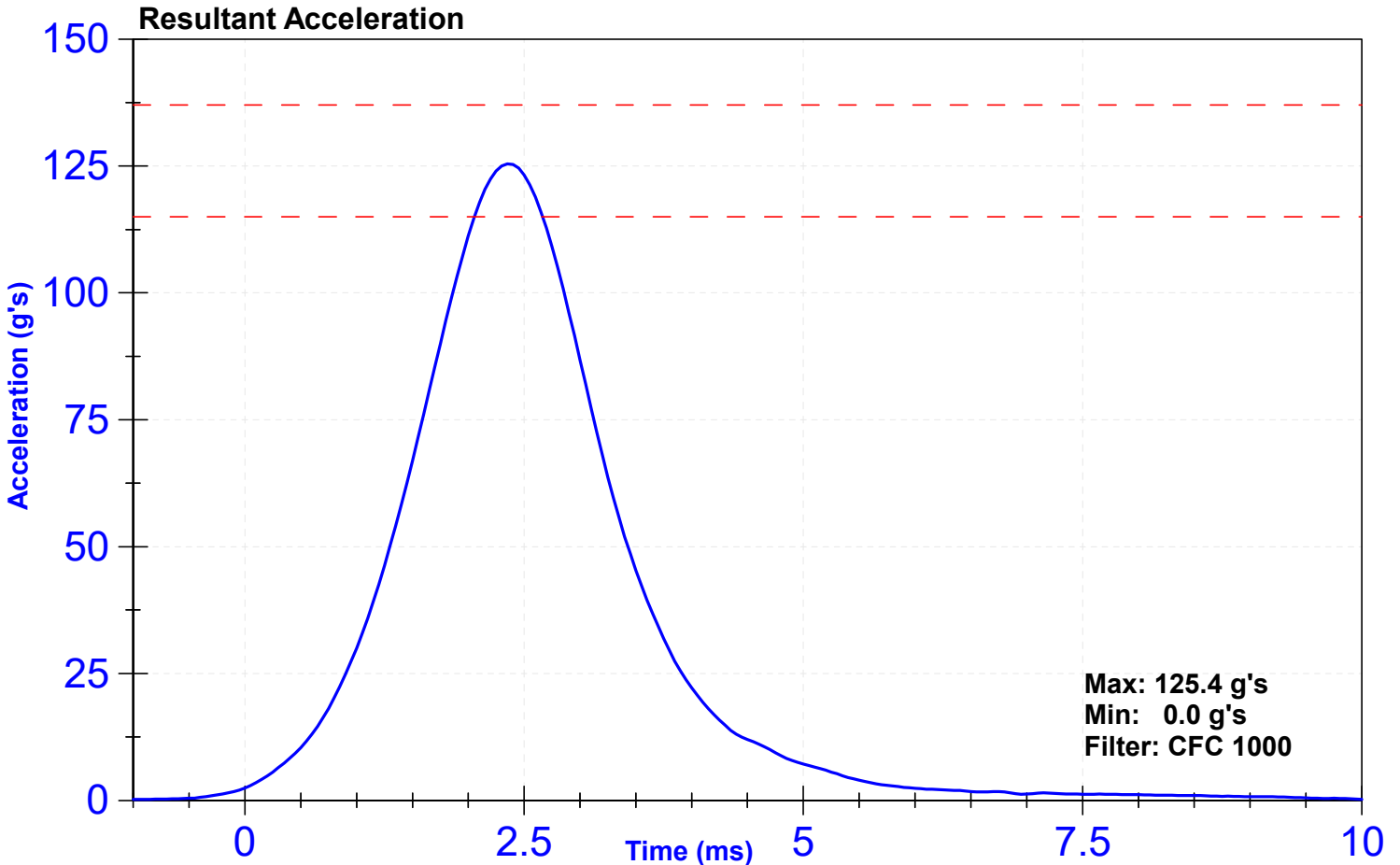
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

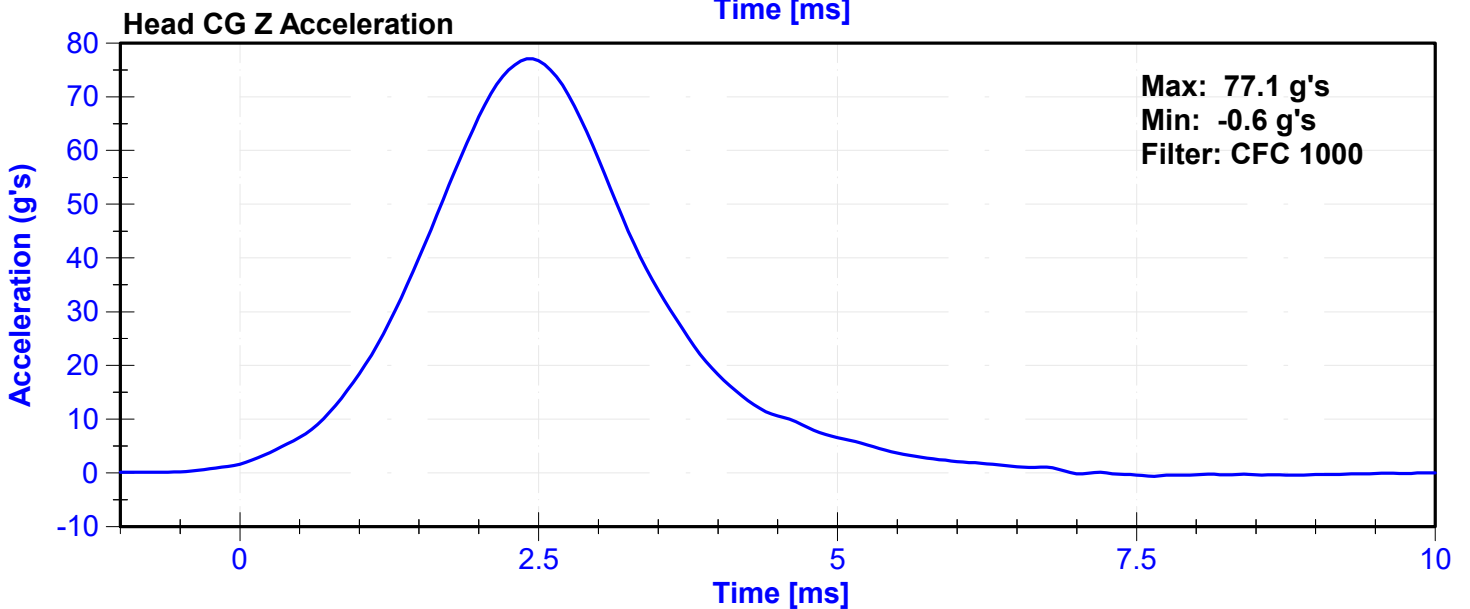
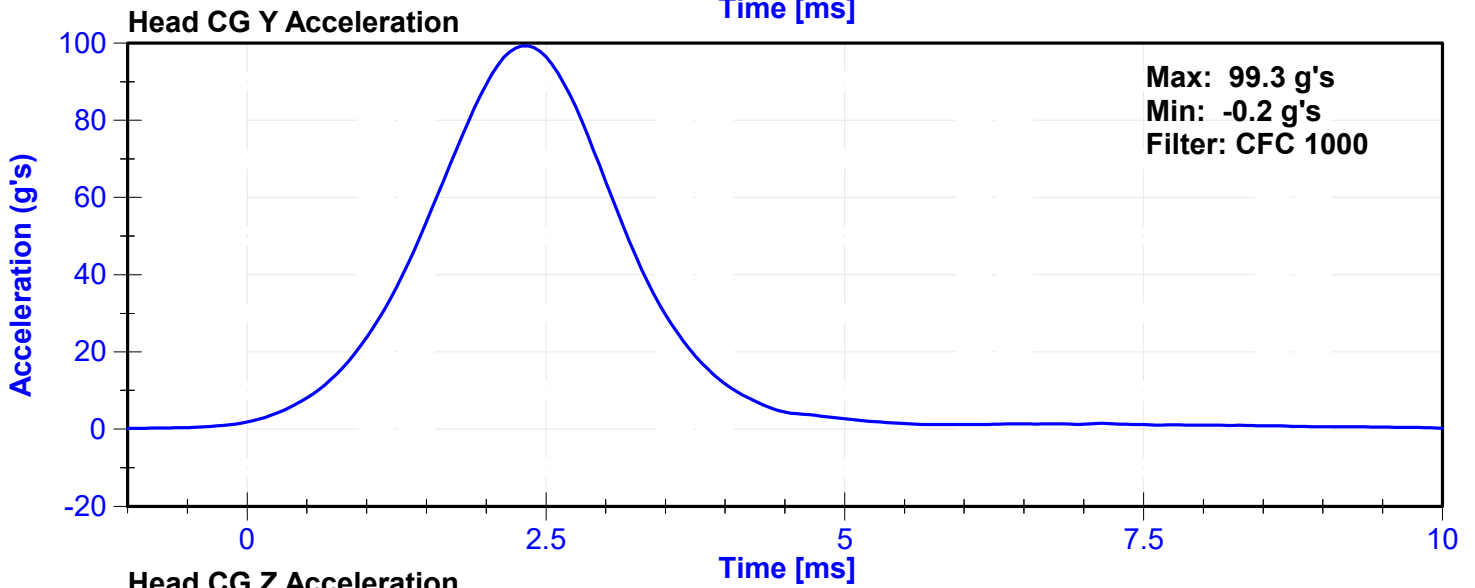
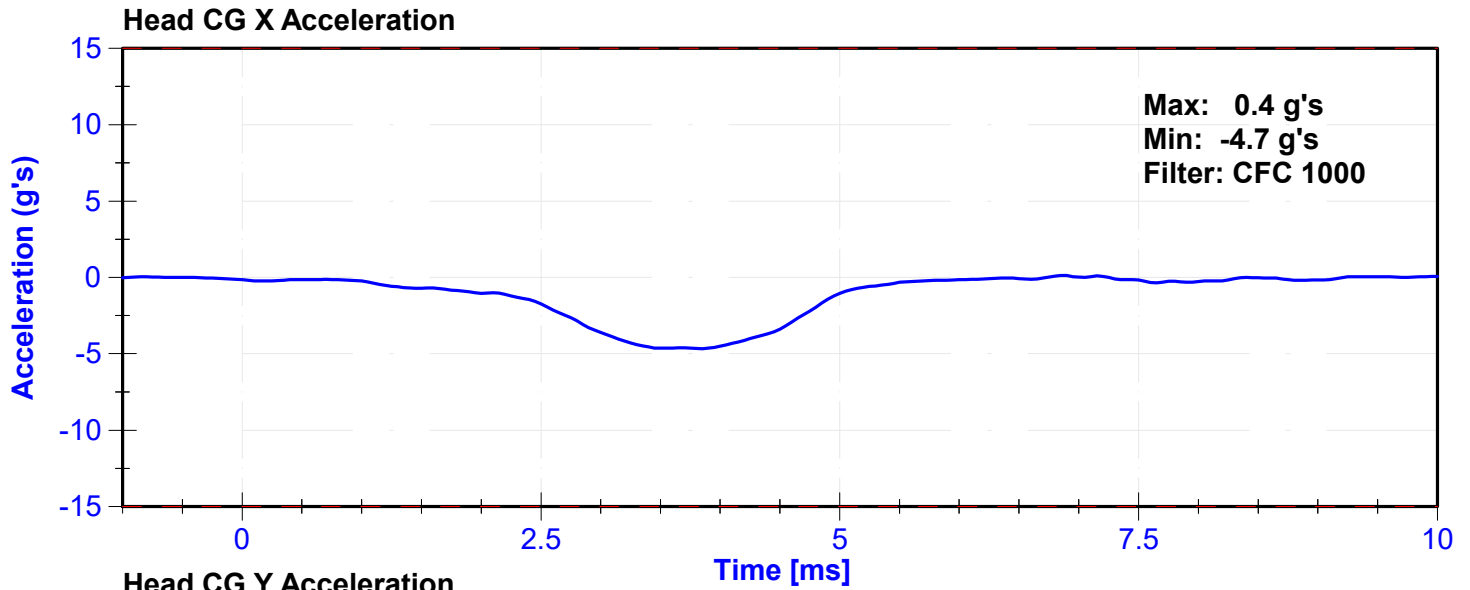
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	29	Pass
Resultant Acceleration	115	137	g's	125.4	Pass
Oscillation	0	15	%	1.3	Pass
Fore-Aft Acceleration	-15	15	g's	-4.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P59018	10/17/2024	4/15/2025
Y Accelerometer	Endevco	P79189	10/17/2024	4/15/2025
Z Accelerometer	Endevco	P79587	10/17/2024	4/15/2025





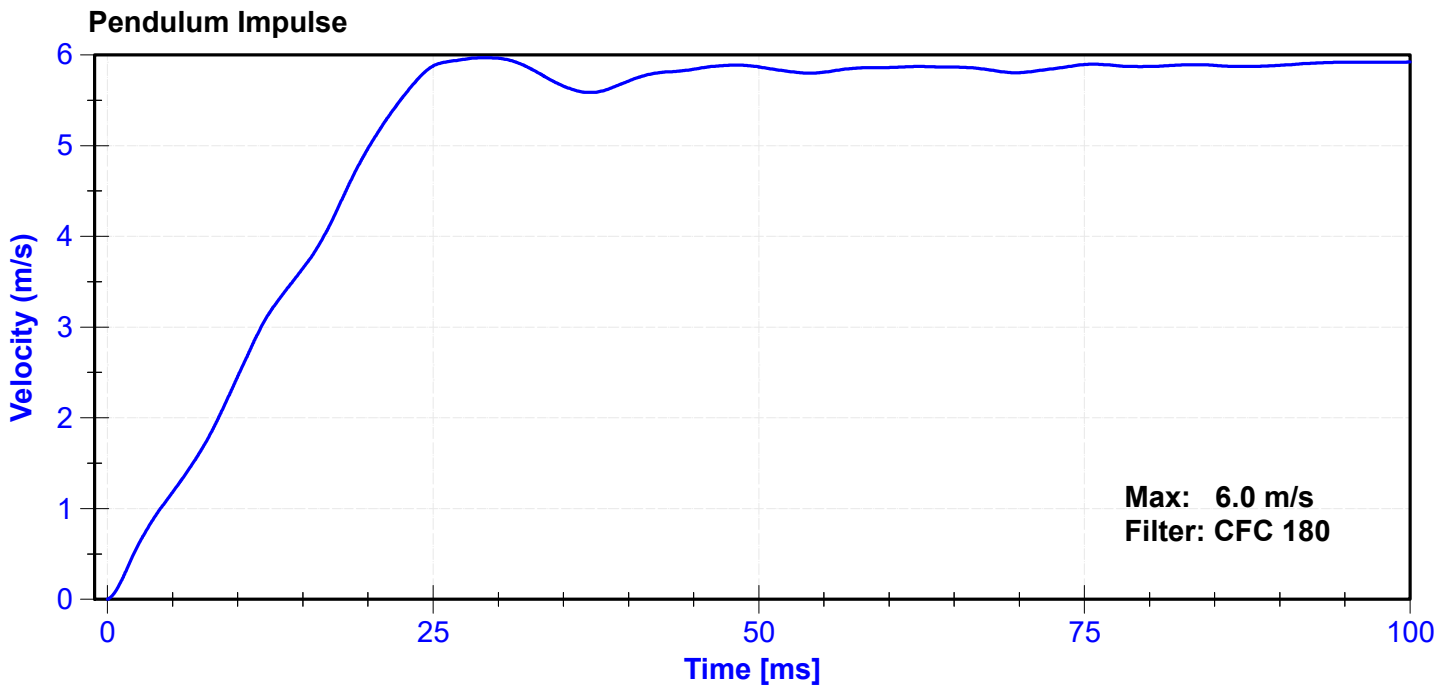
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

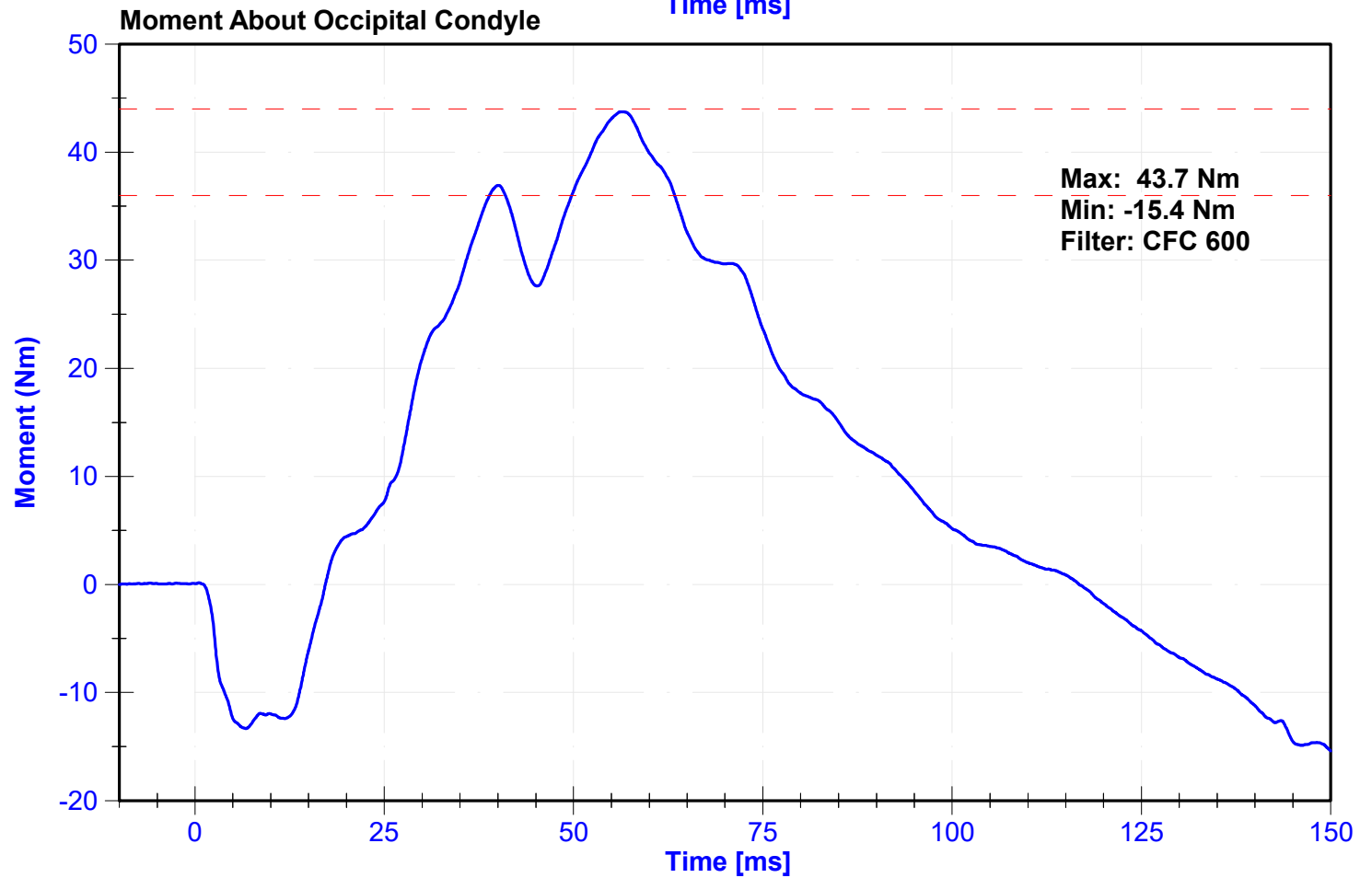
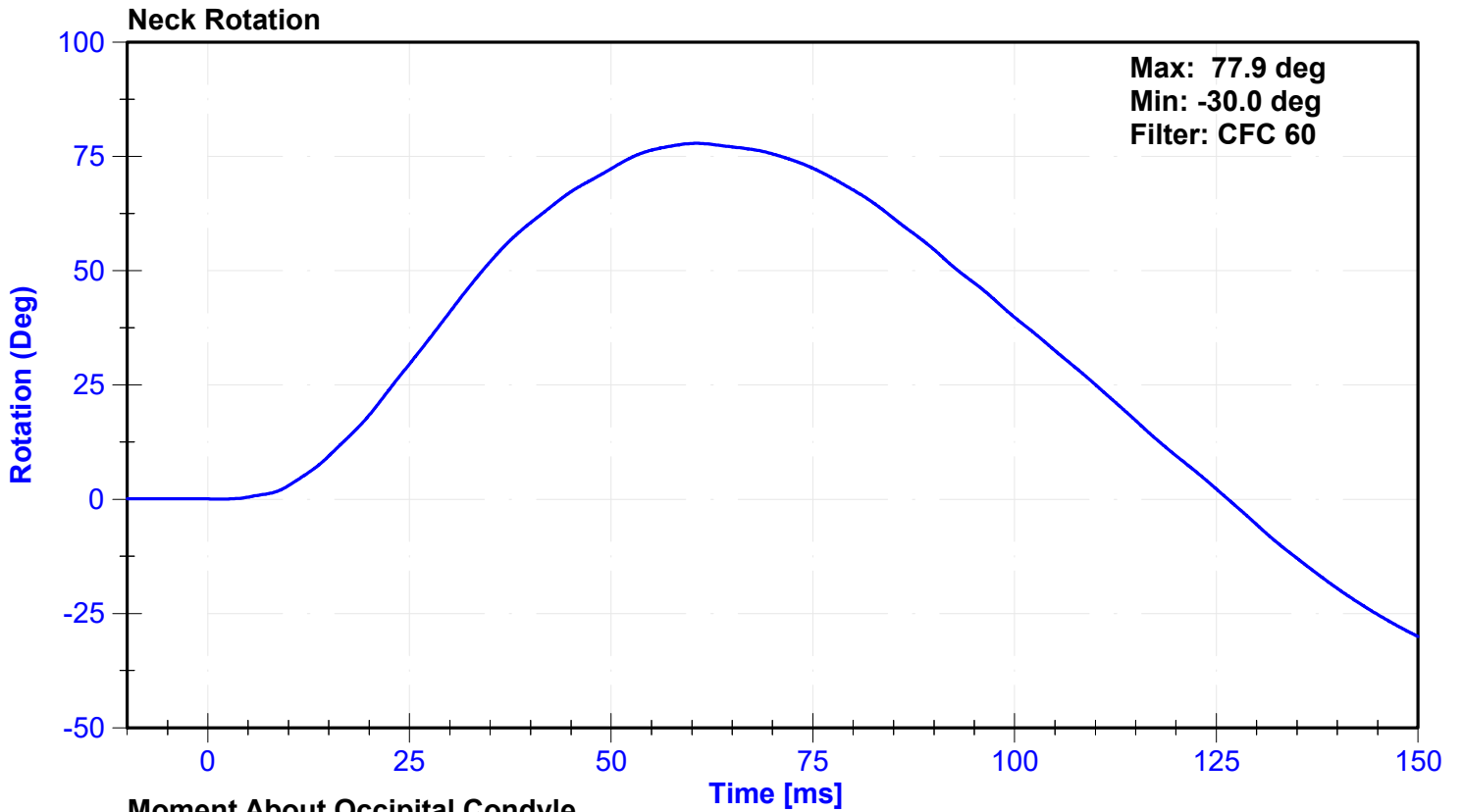
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	32	Pass
Velocity	5.51	5.63	m/s	5.579	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.46	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.65	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.97	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.88	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.97	Pass
Neck Rotation	71	81	deg	77.9	Pass
Time at Maximum Rotation	50	70	ms	60.6	Pass
Moment about the OC	36	44	Nm	43.7	Pass
Moment Decay to 0 Nm	102	126	ms	116.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	11/1/2024	11/1/2025
Pendulum Potentiometer	Servo	4961	9/23/2024	9/23/2025
Condyle Potentiometer	Servo	DS185	9/23/2024	9/23/2025
Upper Neck Load Cell	Denton	1716A_2187-FY	12/5/2023	12/4/2024





ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

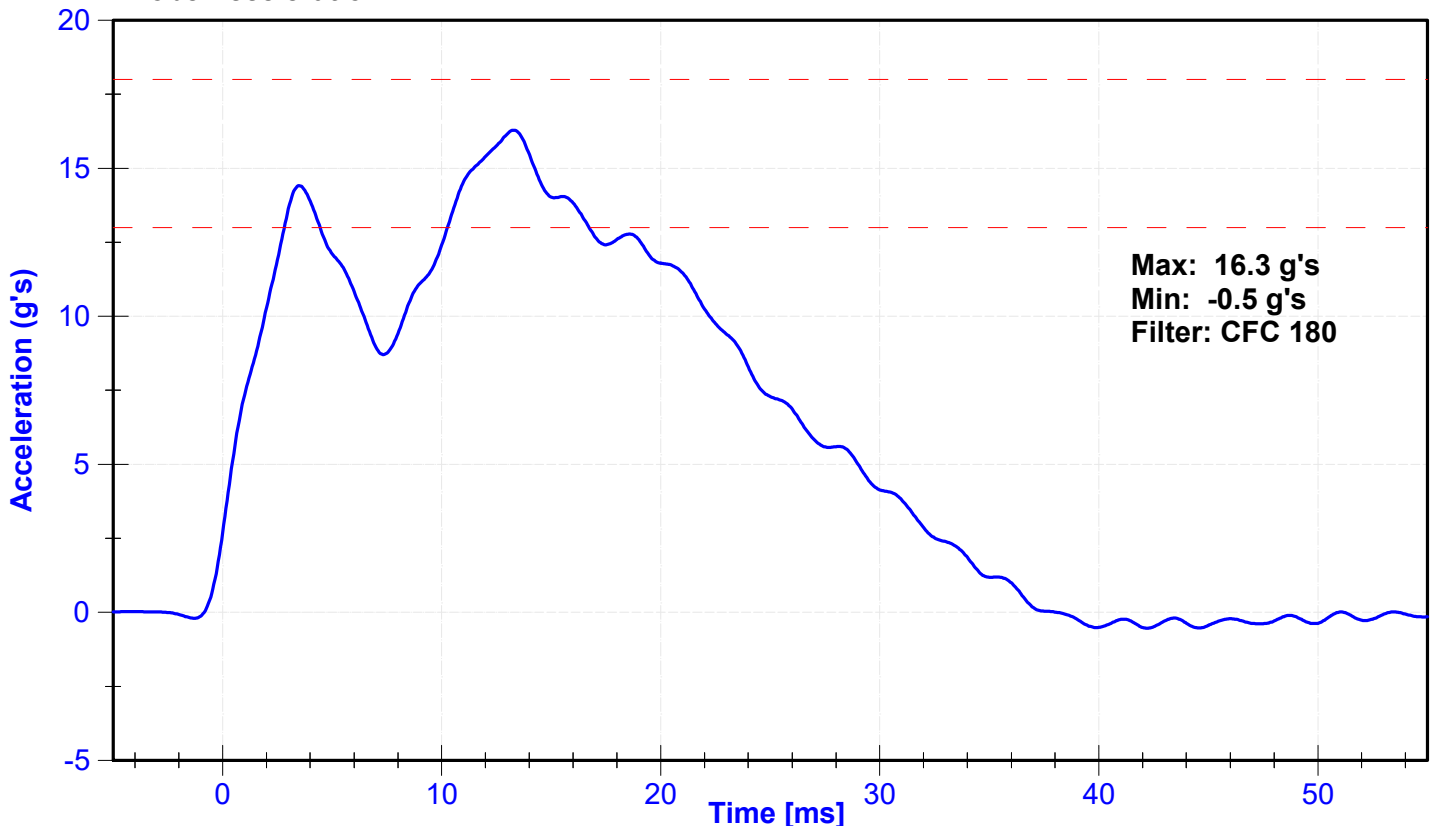
Results

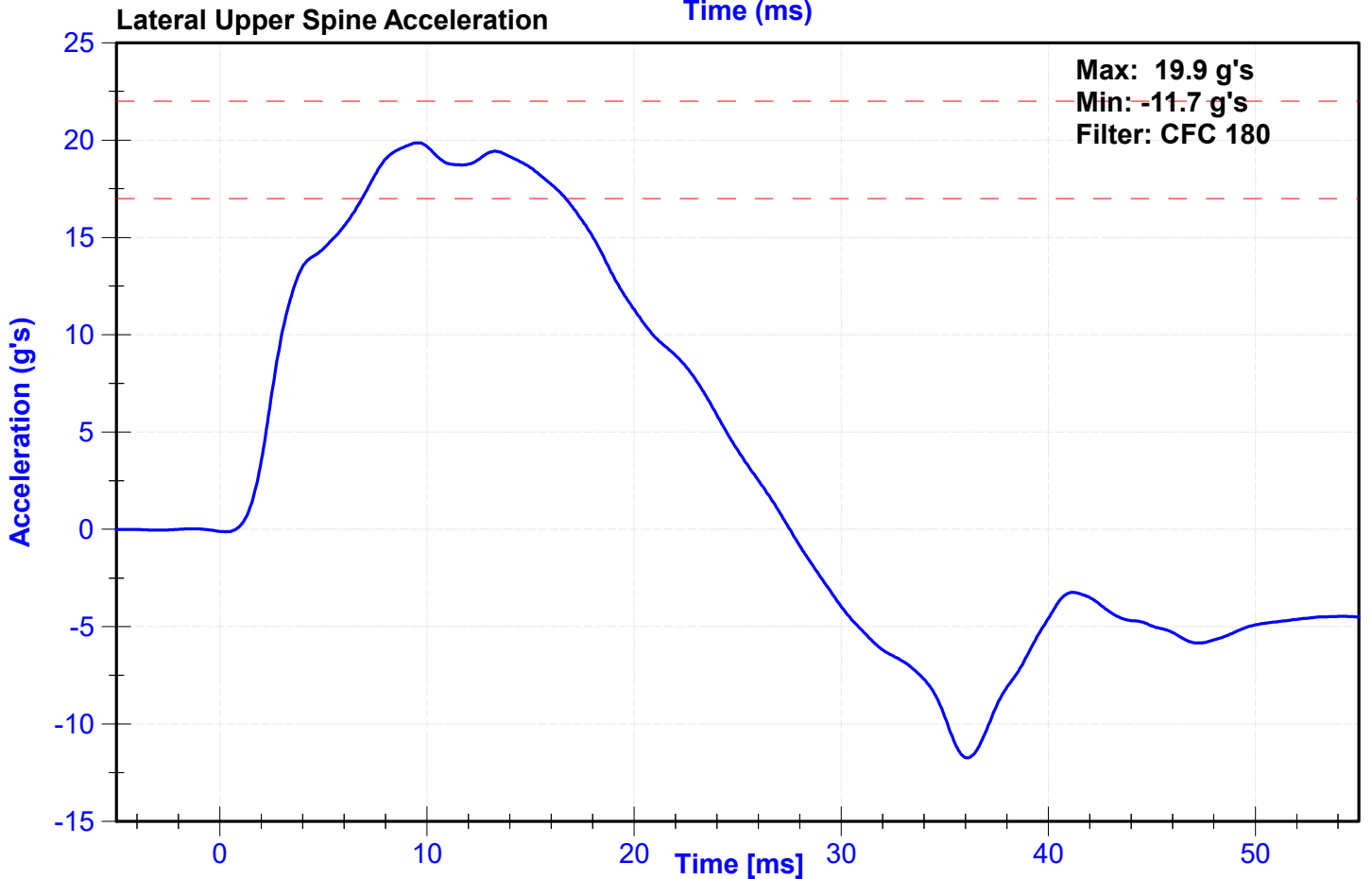
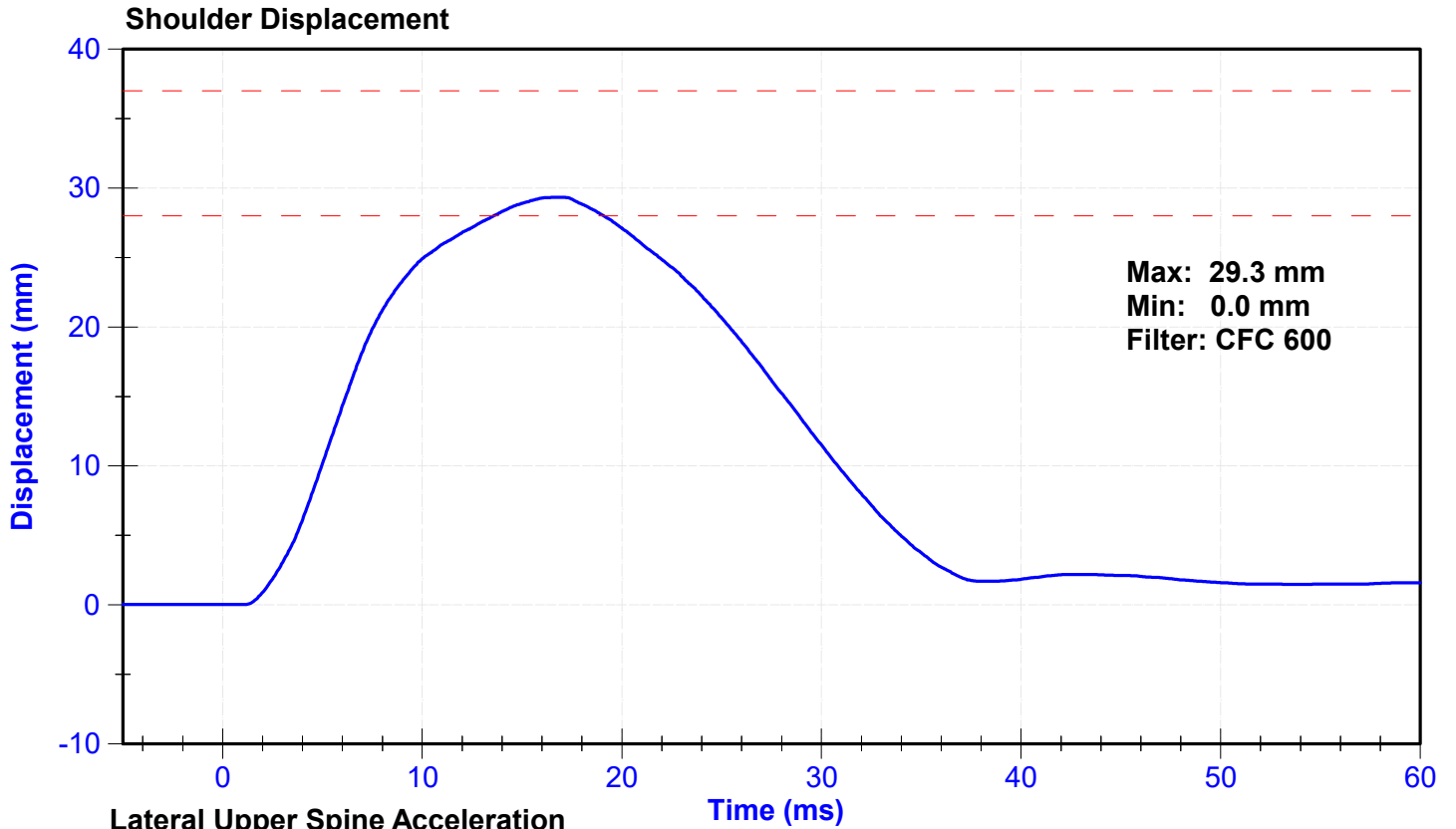
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	13	18	g's	16.3	Pass
Shoulder Deflection	28	37	mm	29.3	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Shoulder Potentiometer	Servo	053GFE	10/16/2024	4/16/2025
Upper Spine Y Accelerometer	Endevco	T20880	10/17/2024	4/15/2025

Probe Acceleration





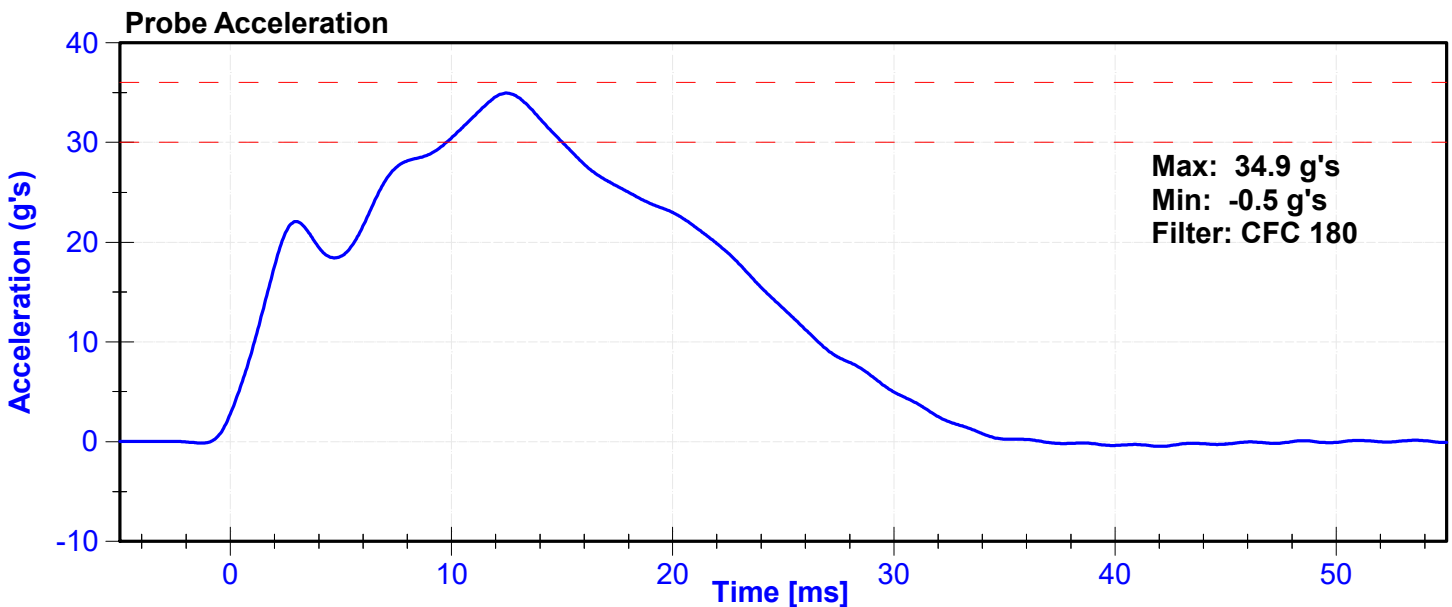
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

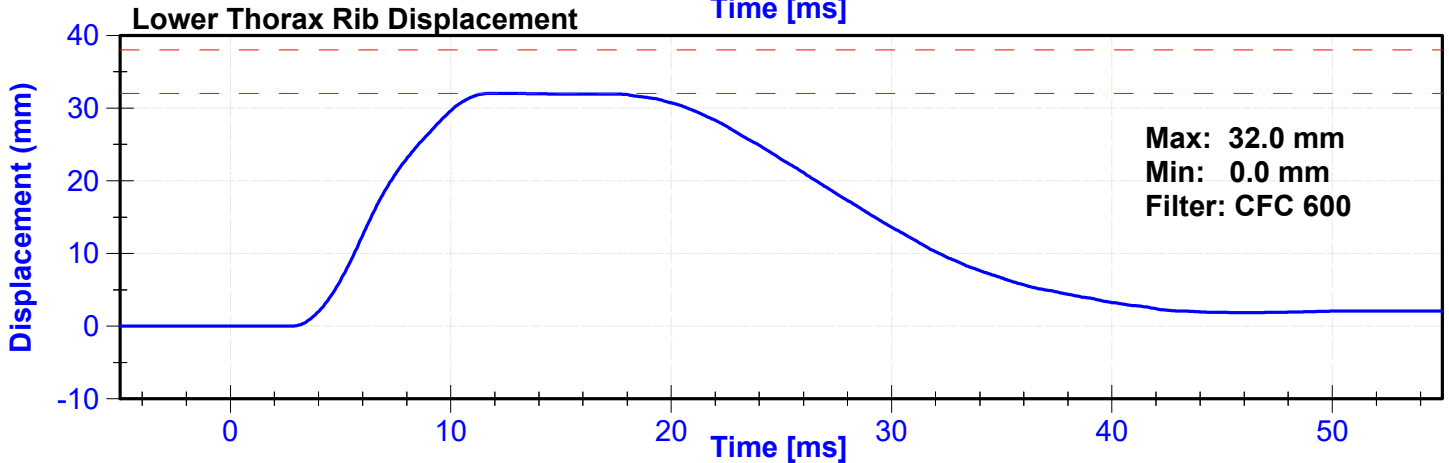
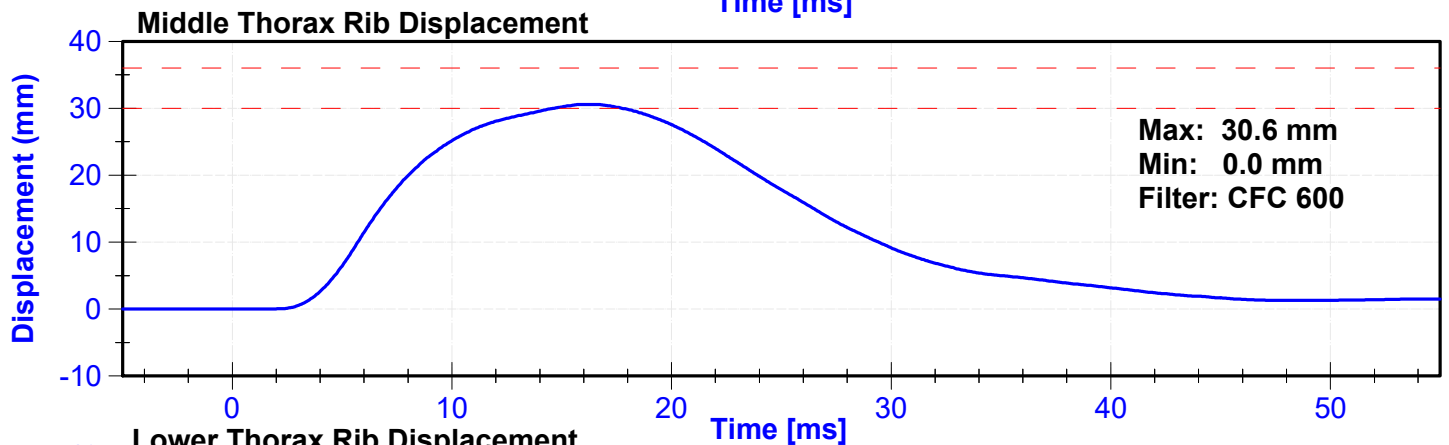
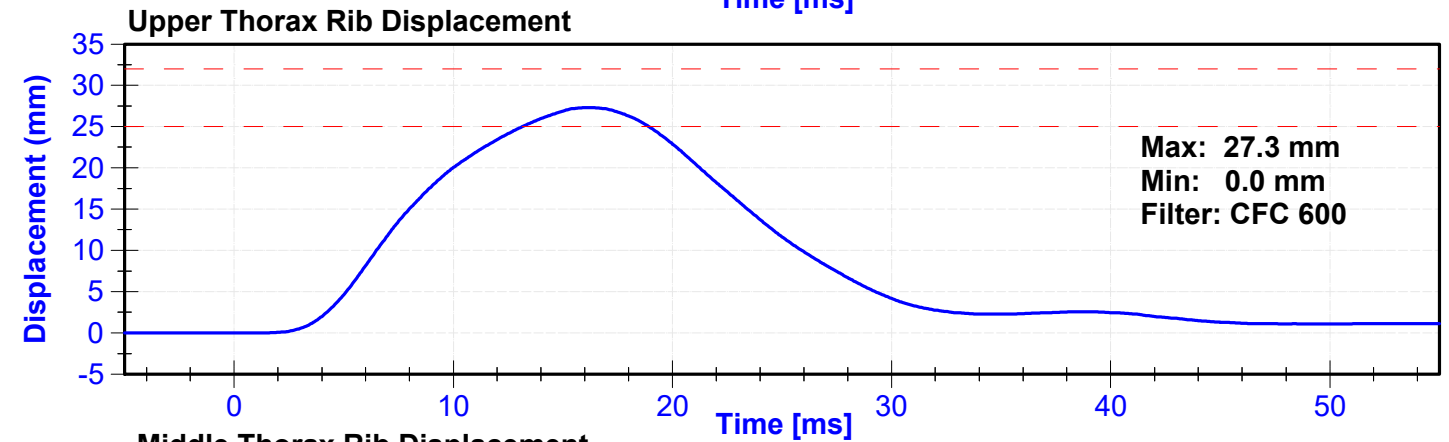
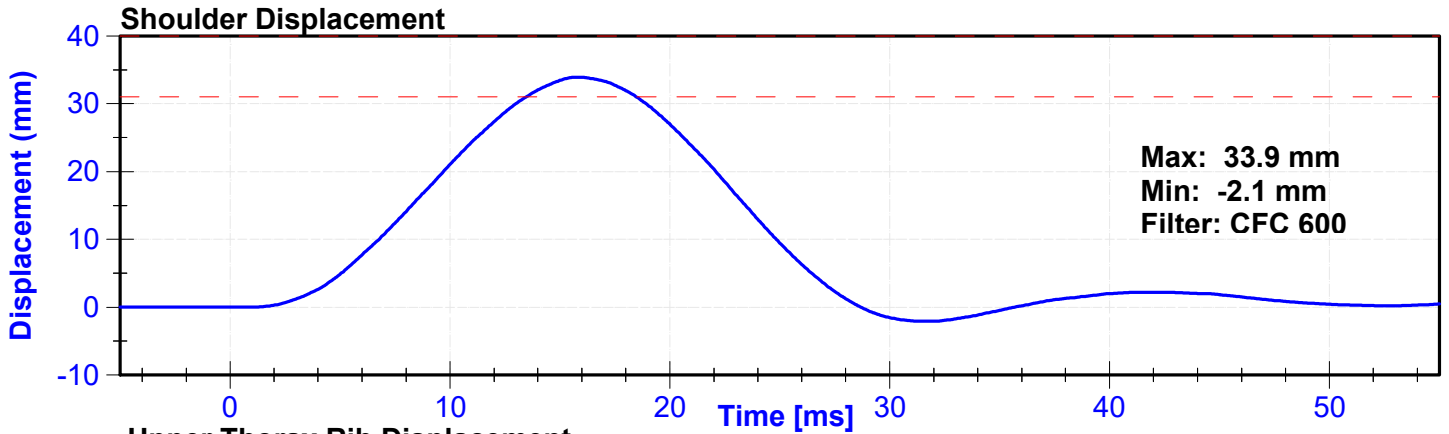
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	6.6	6.8	m/s	6.67	Pass
Probe Acceleration after 5 ms	30	36	g's	34.9	Pass
Lateral Upper Spine Acceleration	34	43	g's	34.7	Pass
Lateral Lower Spine Acceleration	29	37	g's	35.1	Pass
Shoulder Deflection	31	40	mm	33.9	Pass
Upper Thorax Rib Deflection	25	32	mm	27.3	Pass
Mid Thorax Rib Deflection	30	36	mm	30.6	Pass
Lower Thorax Rib Deflection	32	38	mm	32.0	Pass

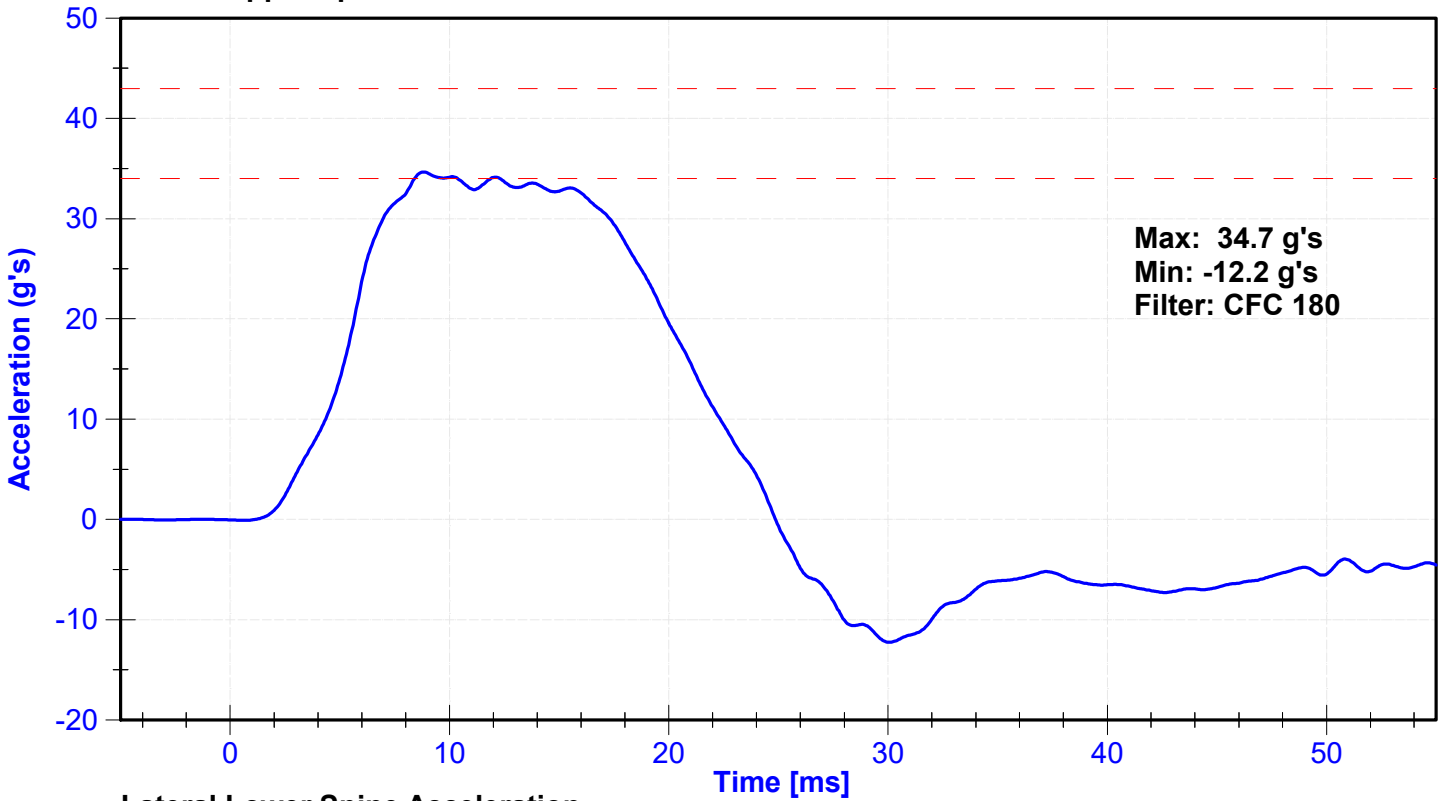
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Upper Spine T1 Y Accelerometer	Endevco	T20880	10/17/2024	4/15/2025
Upper Spine T12 Y Accelerometer	Endevco	P52071	10/17/2024	4/15/2025
Shoulder Potentiometer	Servo	053GFE	10/16/2024	4/16/2025
Upper Thorax Rib Potentiometer	Servo	2316GFE	10/16/2024	4/16/2025
Middle Thorax Rib Potentiometer	Servo	085GFE	10/16/2024	4/16/2025
Lower Thorax Rib Potentiometer	Servo	1156GFE	10/16/2024	4/16/2025

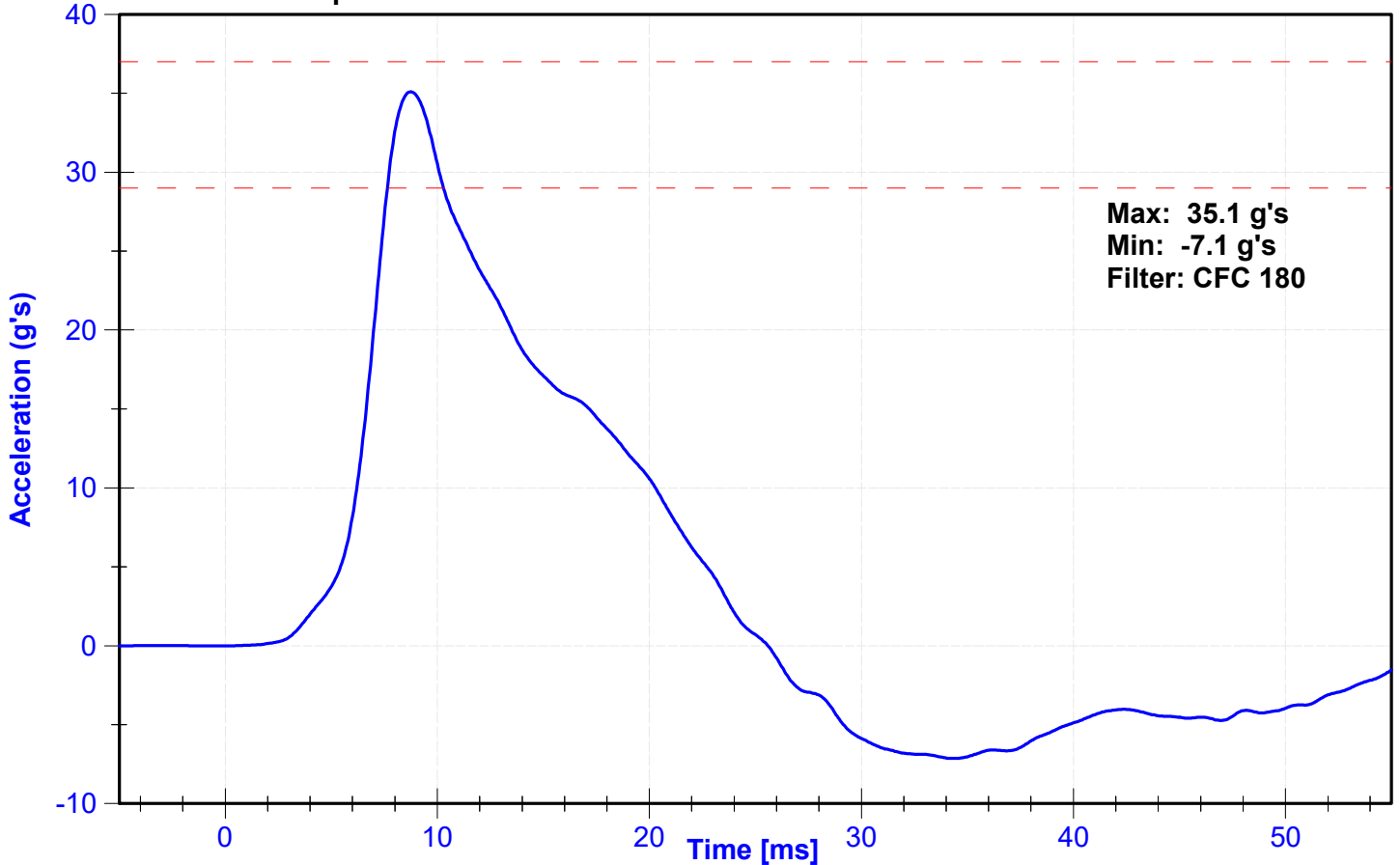




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



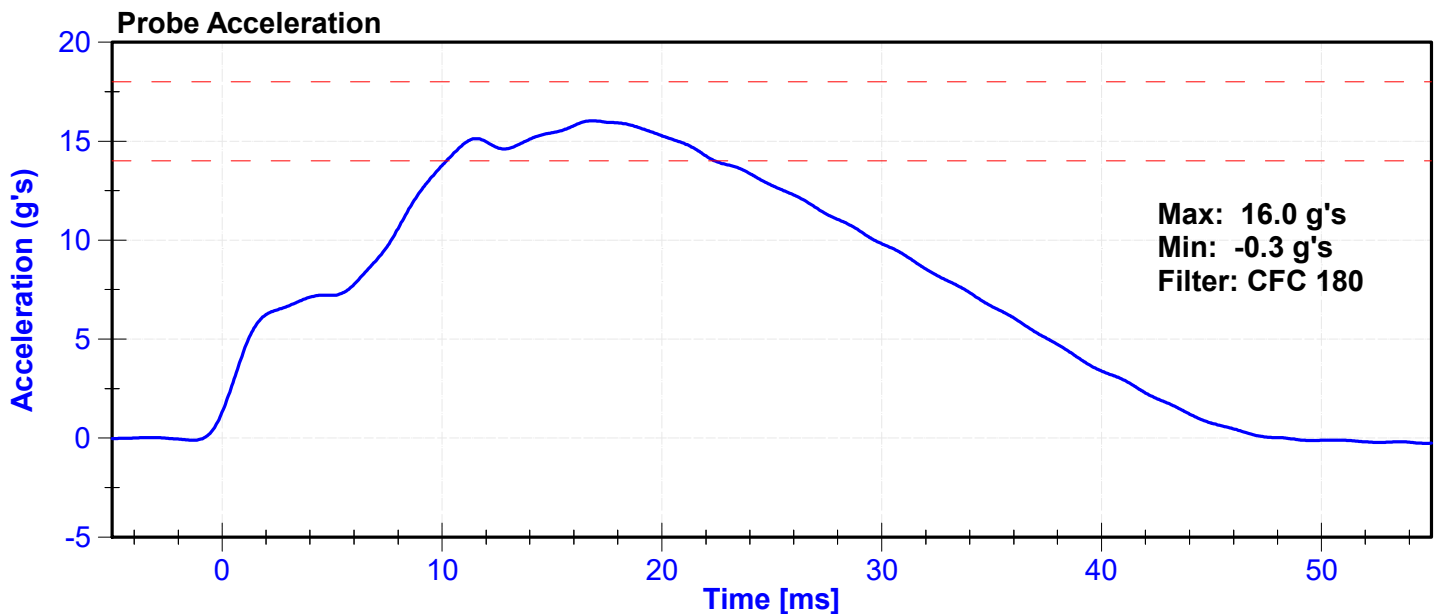
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

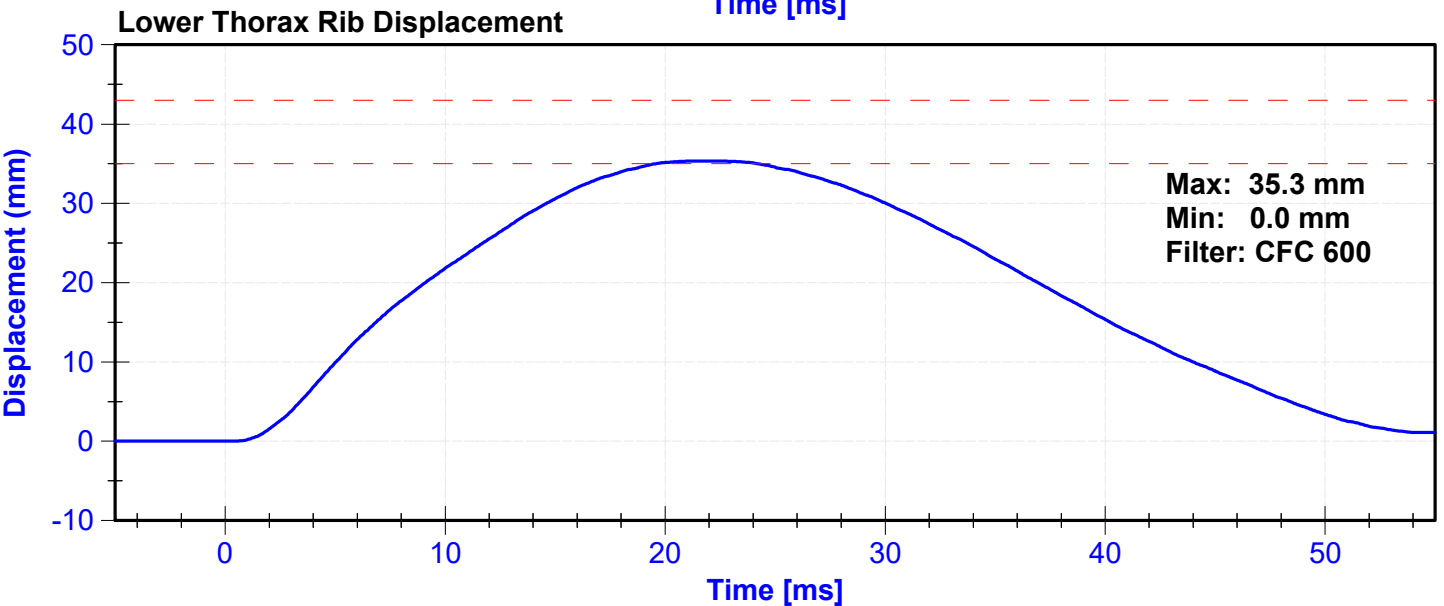
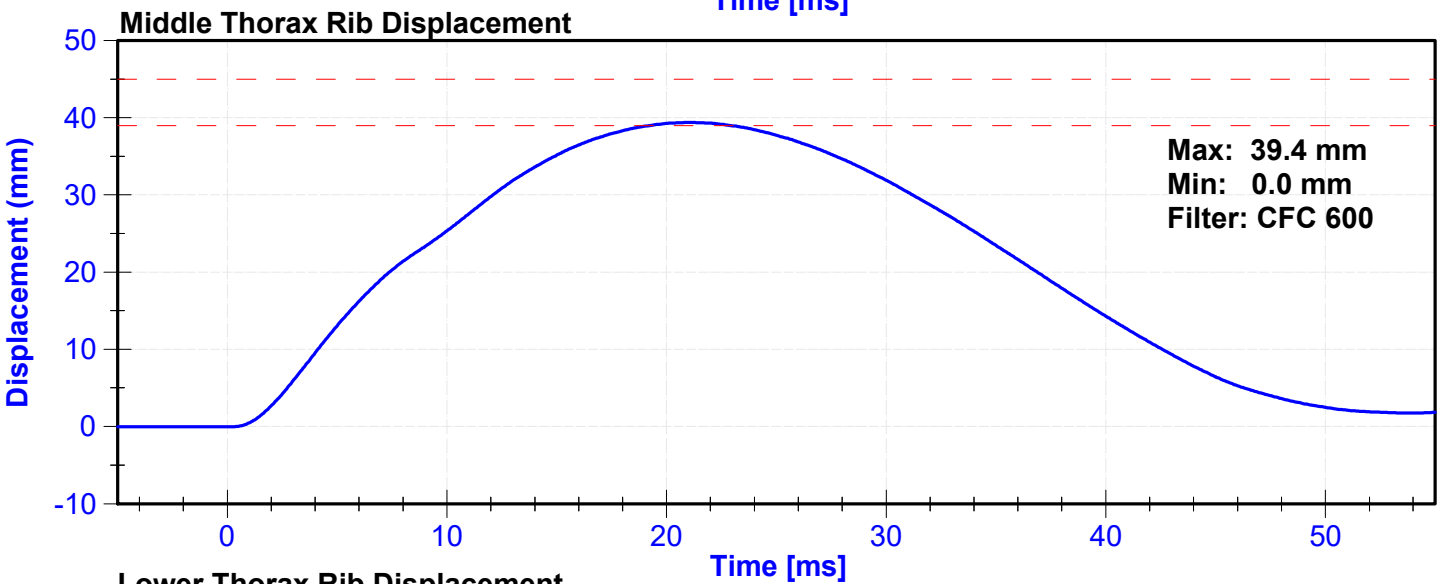
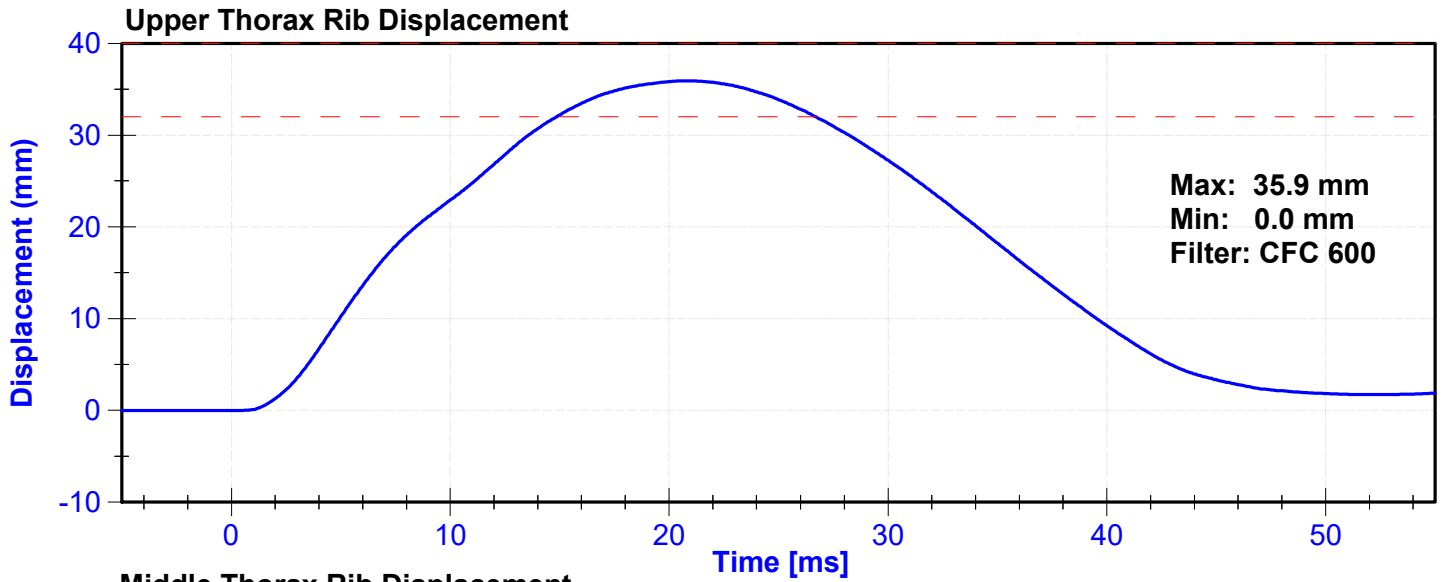
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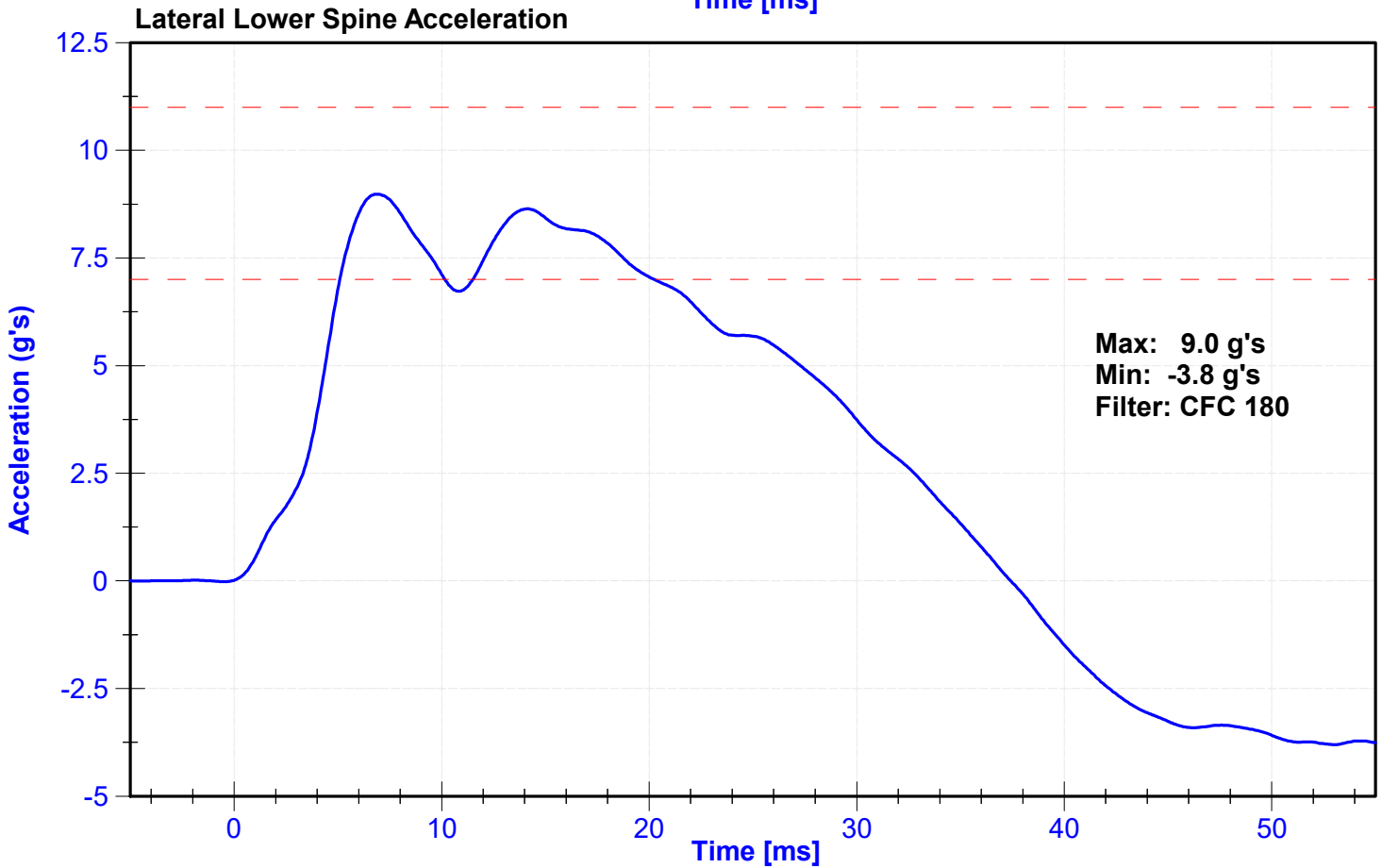
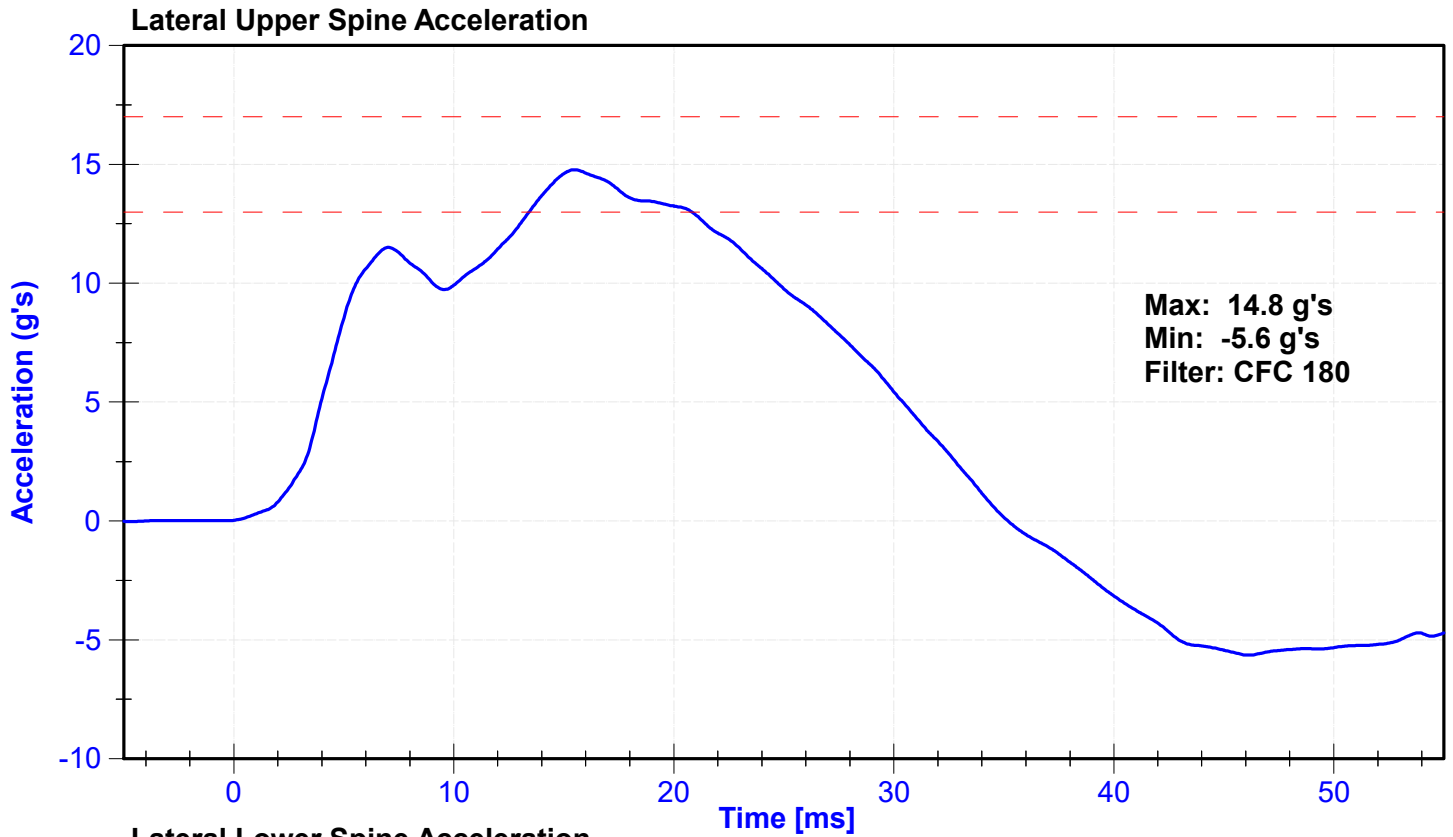
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	14	18	g's	16.0	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.8	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.0	Pass
Upper Thorax Rib Deflection	32	40	mm	35.9	Pass
Middle Thorax Rib Deflection	39	45	mm	39.4	Pass
Lower Thorax Rib Deflection	35	43	mm	35.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Upper Spine Y Accelerometer	Endevco	T20880	10/17/2024	4/15/2025
Lower Spine Y Accelerometer	Endevco	P52071	10/17/2024	4/15/2025
Upper Thorax Rib Potentiometer	Servo	2316GFE	10/16/2024	4/16/2025
Middle Thorax Rib Potentiometer	Servo	085GFE	10/16/2024	4/16/2025
Lower Thorax Rib Potentiometer	Servo	1156GFE	10/16/2024	4/16/2025







ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

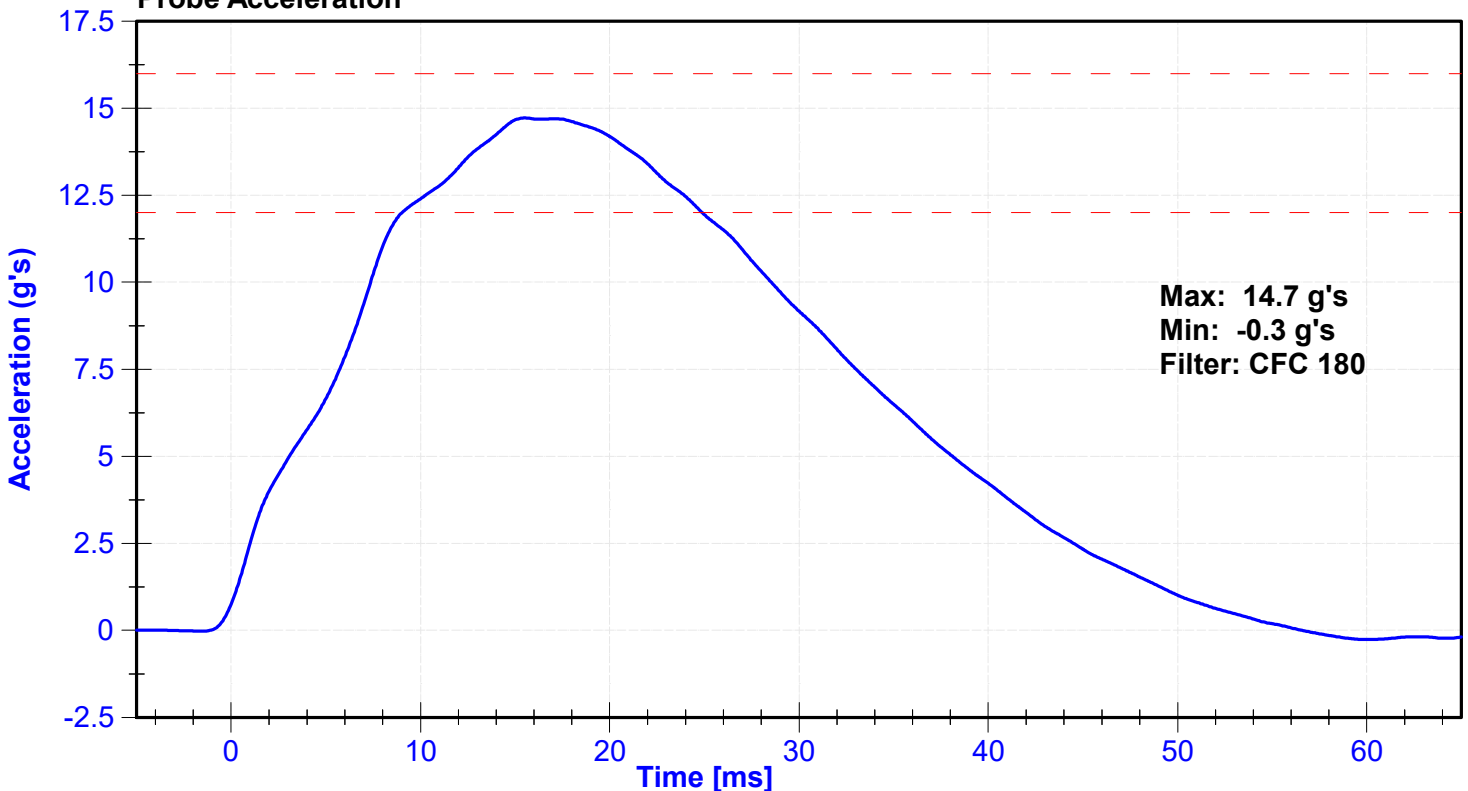
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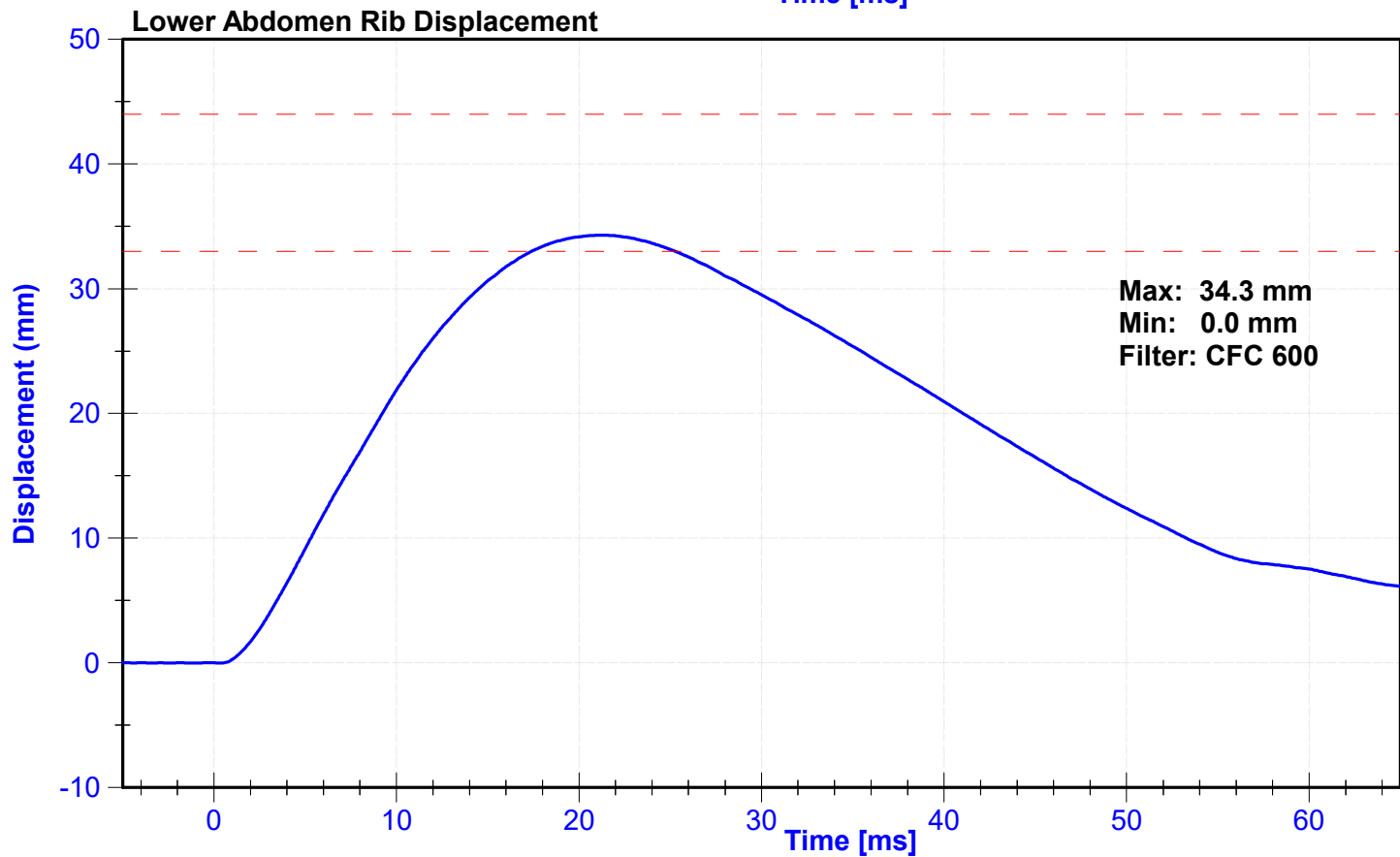
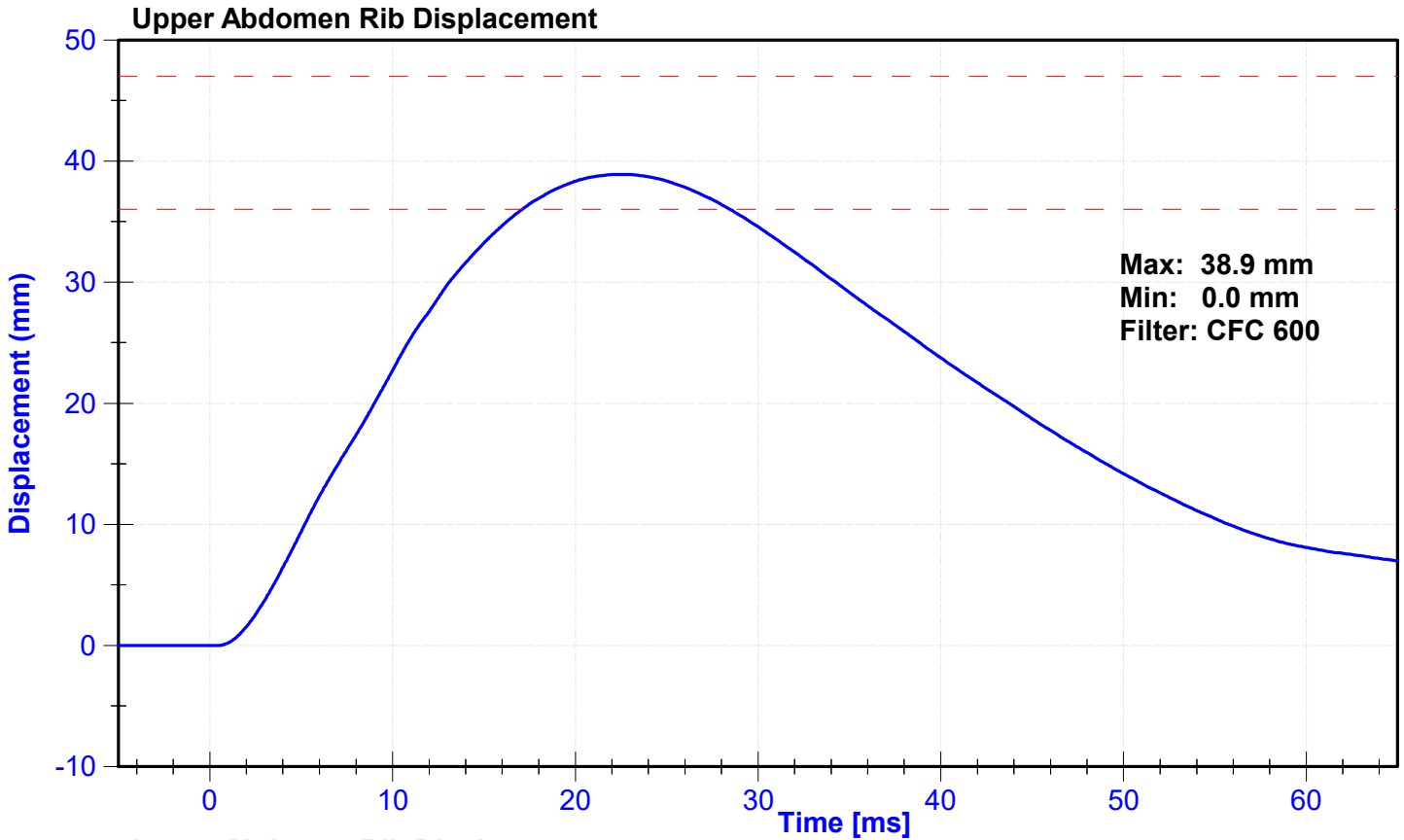
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	4.2	4.4	m/s	4.30	Pass
Probe Acceleration	12	16	g's	14.7	Pass
Lateral Lower Spine Acceleration	9	14	g's	13.1	Pass
Upper Abdomen Rib Deflection	36	47	mm	38.9	Pass
Lower Abdomen Rib Deflection	33	44	mm	34.3	Pass

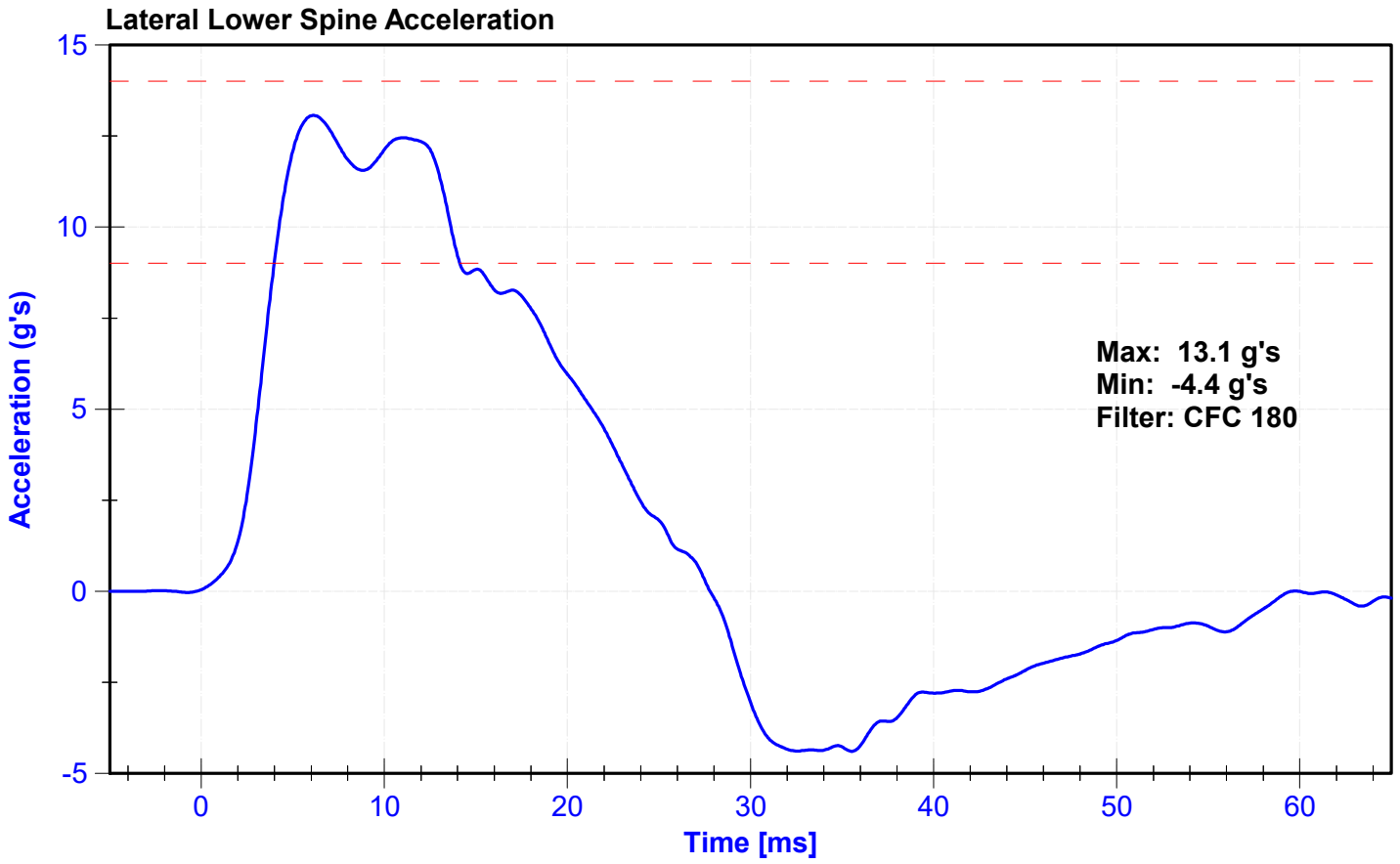
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Lower Spine Y Accelerometer	Endevco	P52071	10/17/2024	4/15/2025
Upper Abdomen Rib Potentiometer	Servo	074GFE	10/16/2024	4/16/2025
Lower Abdomen Rib Potentiometer	Servo	075GFE	10/16/2024	4/16/2025

Probe Acceleration







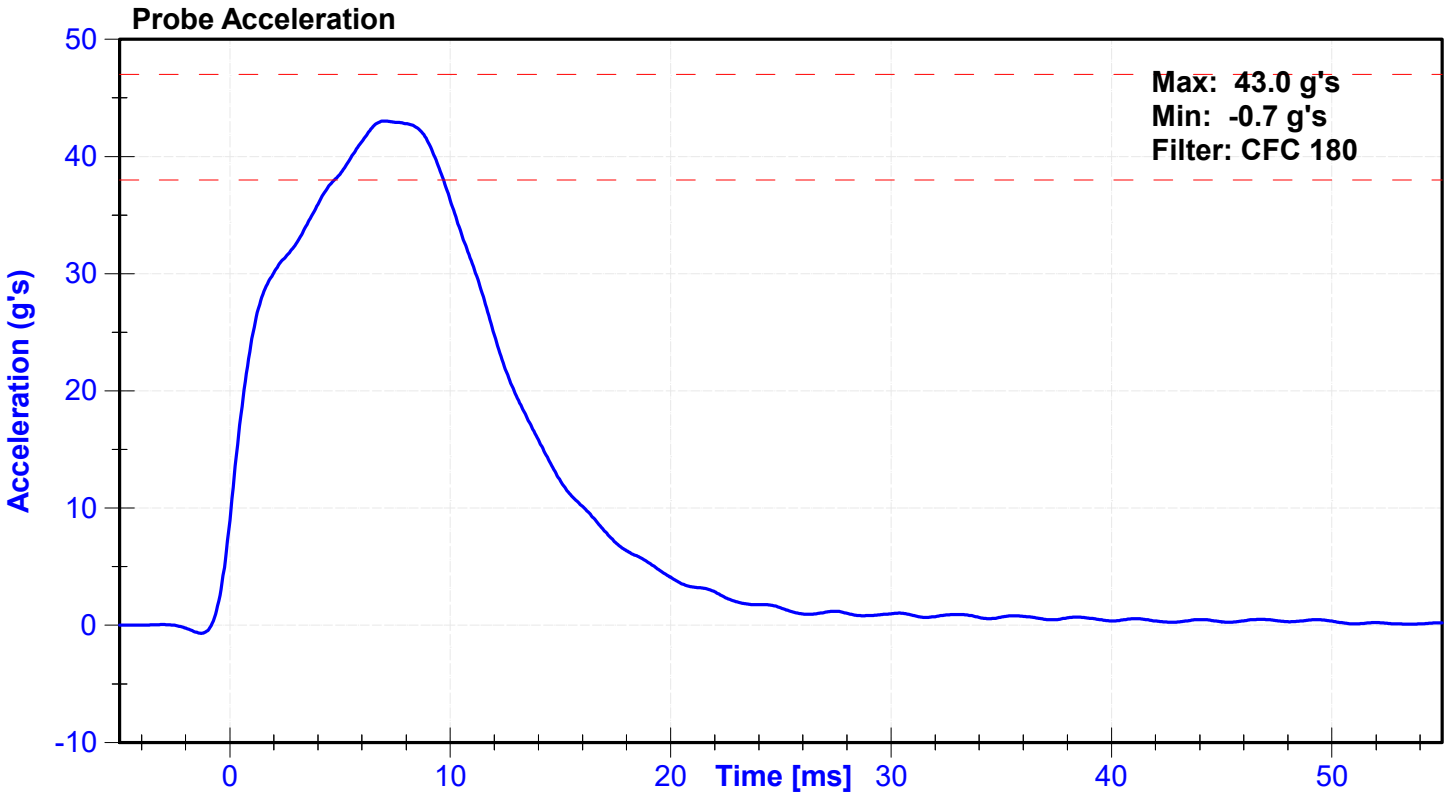
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

Results

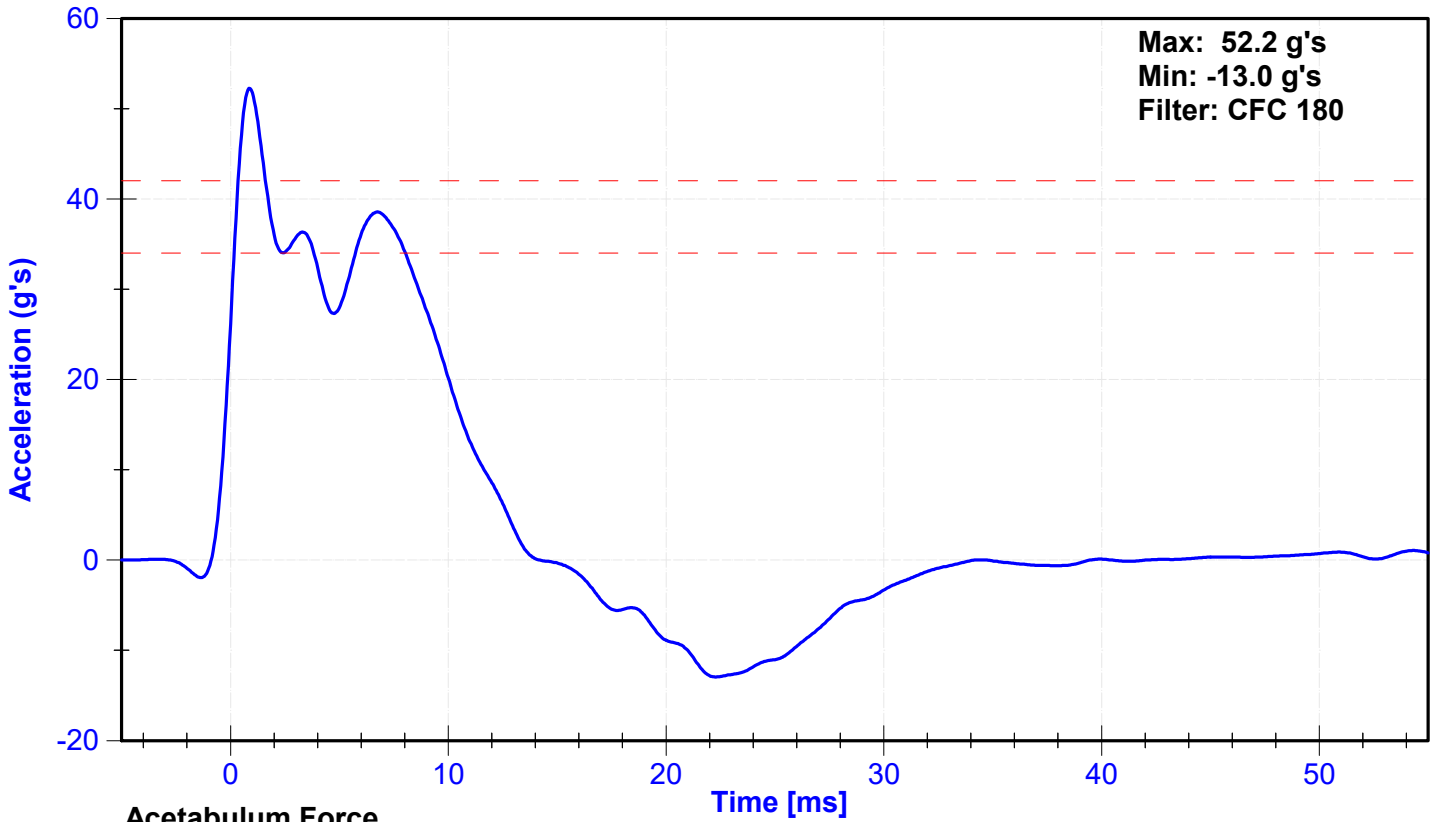
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	6.6	6.8	m/s	6.66	Pass
Probe Acceleration	38	47	g's	43.0	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	38.5	Pass
Acetabulum Force	3600	4300	N	3885.8	Pass

Transducer Calibrations

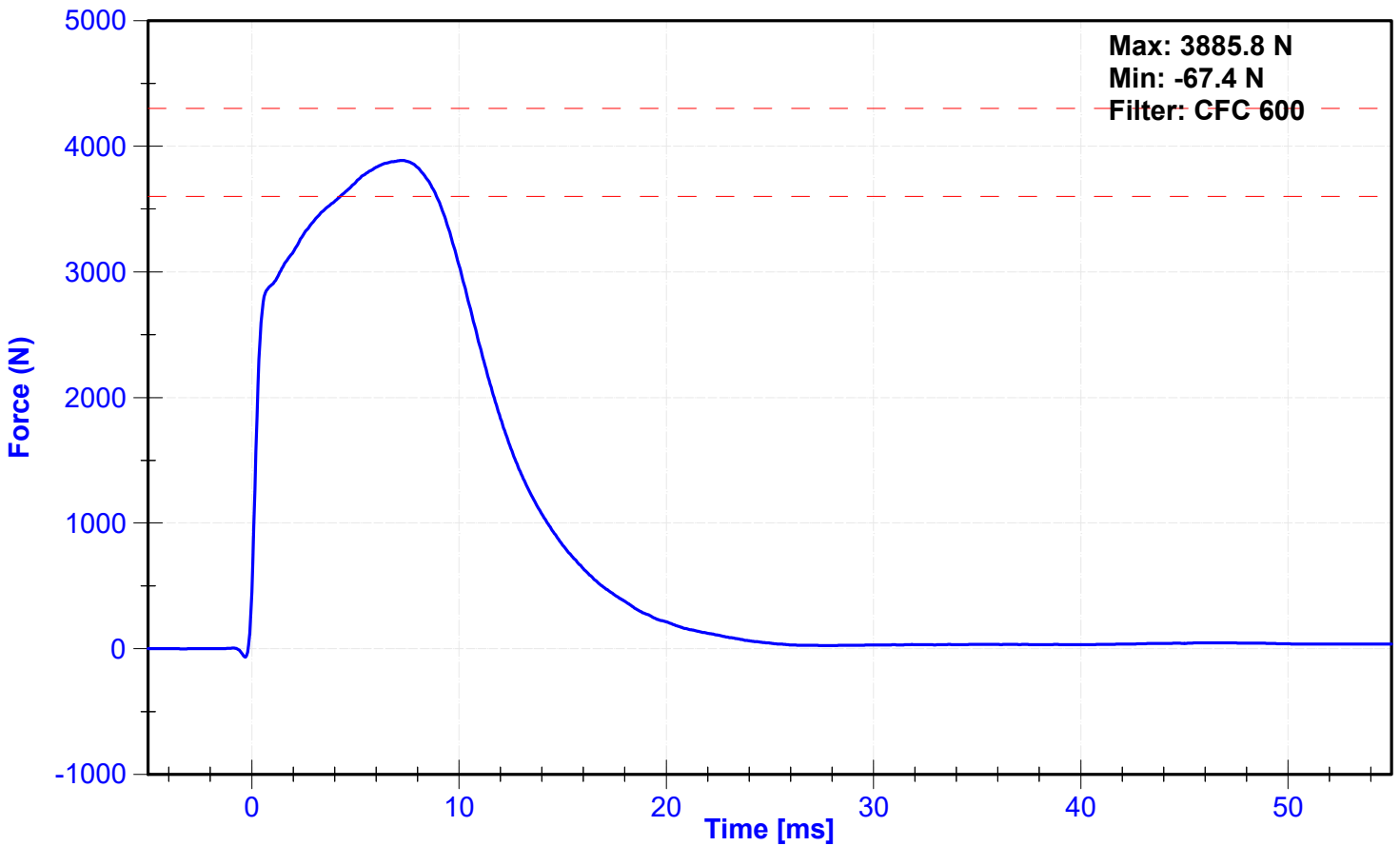
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Pelvis Y Accelerometer	Endevco	P51731	10/17/2024	4/15/2025
Acetabulum Load Cell	Denton	275-FY	10/28/2024	10/28/2025
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A



Lateral Pelvis Acceleration



Acetabulum Force





SID-IIs Pelvis Plug Certification Test

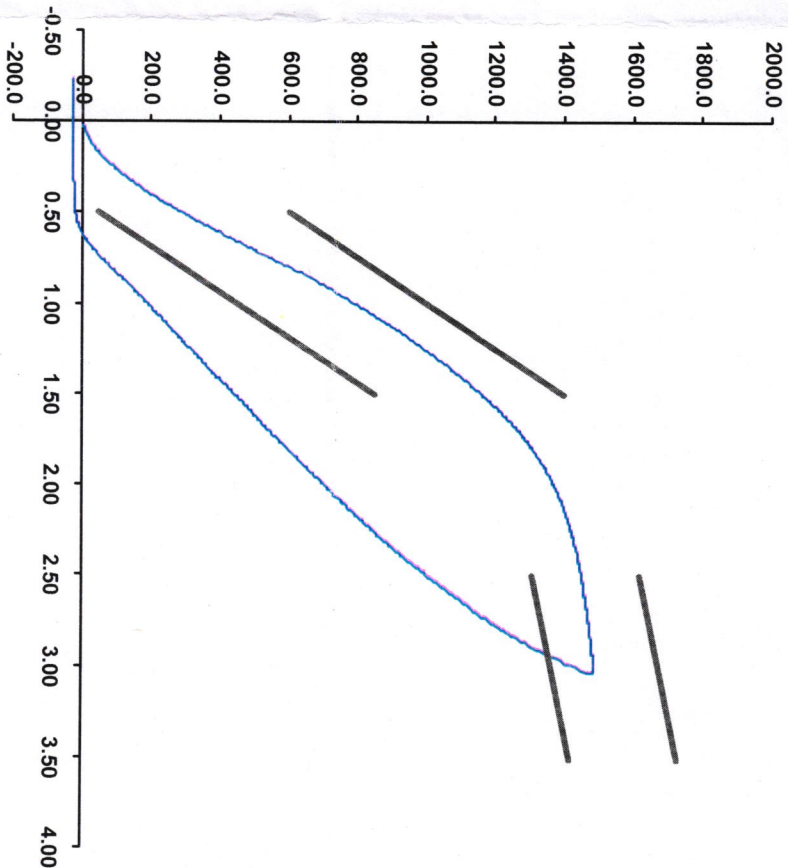
Plug S/N 16734
 Test Number 23534
 Report Number 23591
 Test Date 7/22/2022 12:53:57 PM

Force (-N) vs Extension (-mm)

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

Testing Machine STM-20 5965542
 Load Cell S/N (FI360947), Units (LBS) 1000
 Crosshead Speed (mm / min) or Rate 12.7
 Extension or Position Measured by XHD_100 (XHD100)

Notes:
 Cost Plug 11-20-24 300



Operator
 Part Number 180-4450

Template No 107 22-Jul-22
 SACO Research

By: *[Signature]* Date: *7/22/22*

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



SID-IIS Pelvis Plug Certification Test

Plug S/N 16691

Test Number 23491

Report Number 23548

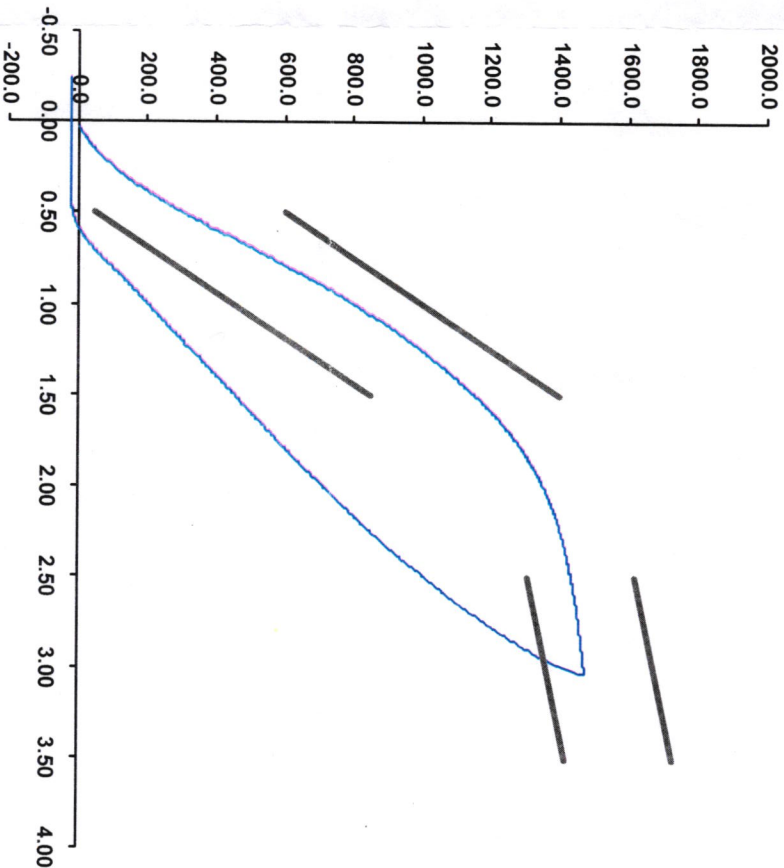
Test Date 7/22/2022 10:55:48 AM

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 (F1360947), Units (LBS) 1000

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

Notes:
 Impact Plug 11-80-84 300



Operator

Part Number 180-4450

Template No 107 22-Jul-22

SACO Research

By: DC

Date: 7/22/22

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



SID-11s Pelvis Plug Certification Test

Plug S/N 16742

Test Number 23542

Report Number 23599

Test Date 7/22/2022 1:09:16 PM

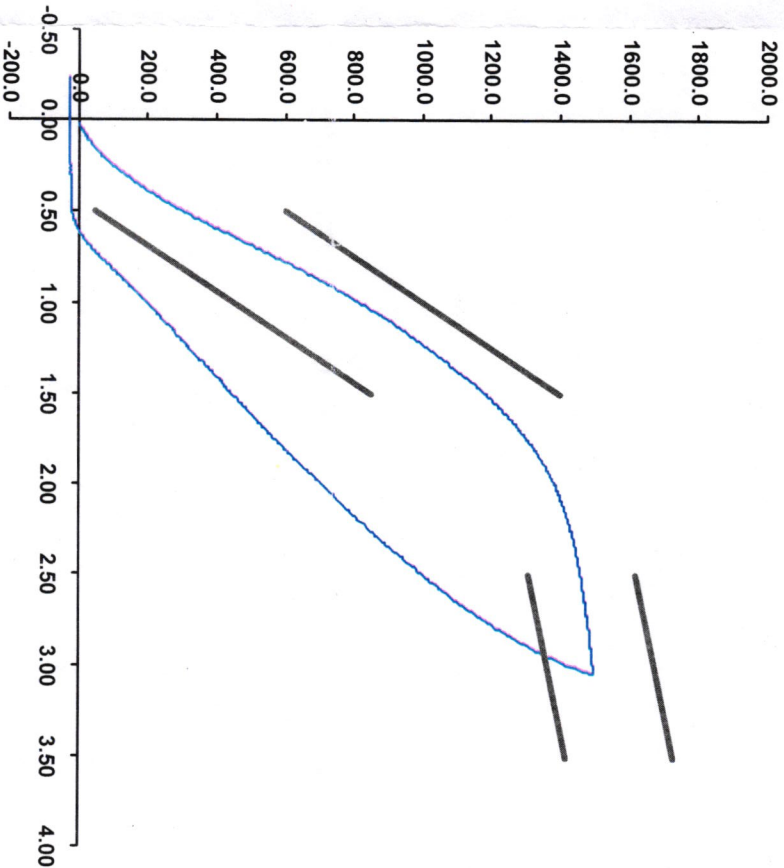
Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	50	600
Force @ 1.5 mm (N)	850	1,400
Force @ 2.5 mm (N)	1,306	1,618
Force @ 3.0 mm (N)	1,361	1,673

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: NON IMPACT 11-20-24 300

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 22-Jul-22

SACO Research

By: DC Date: 7/22/22

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

ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

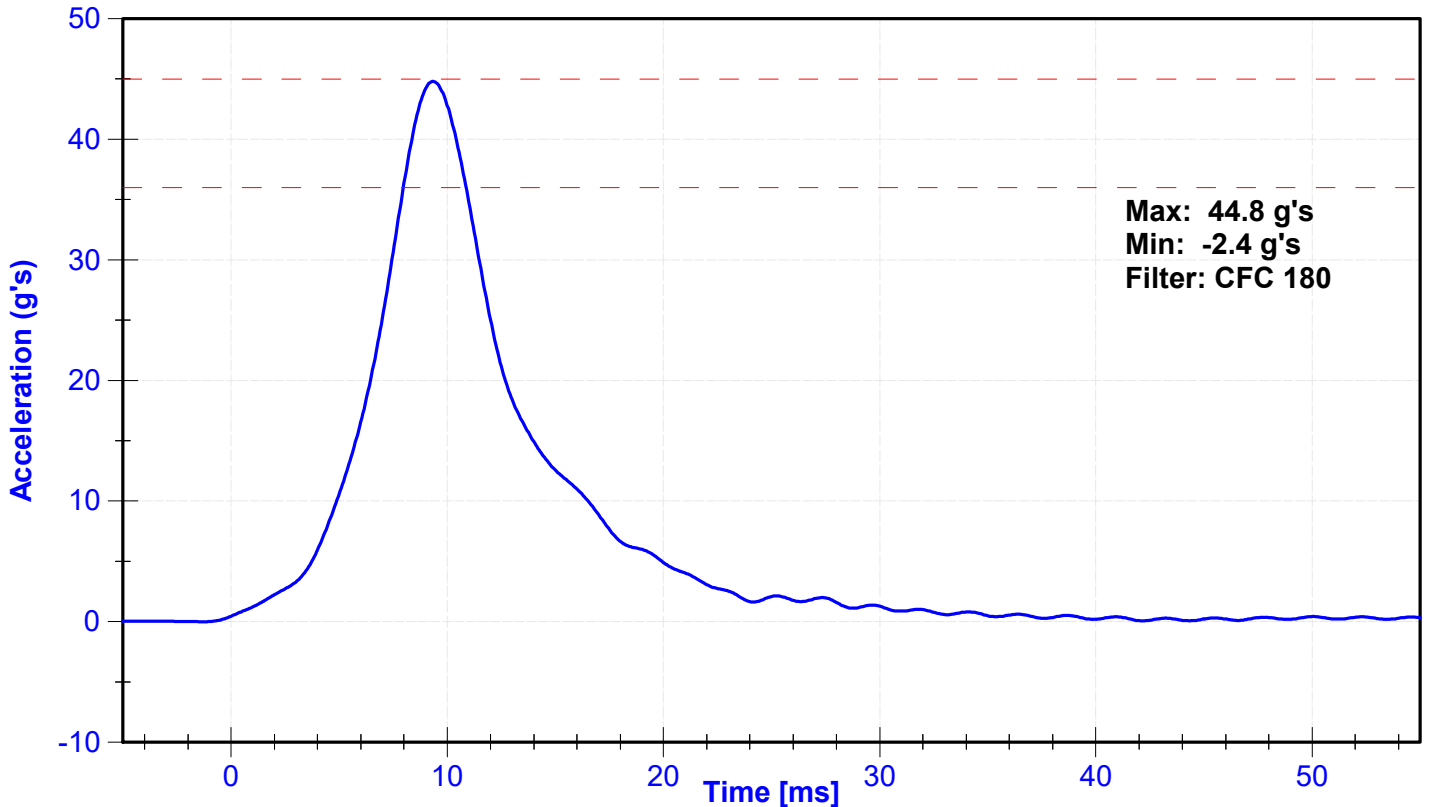
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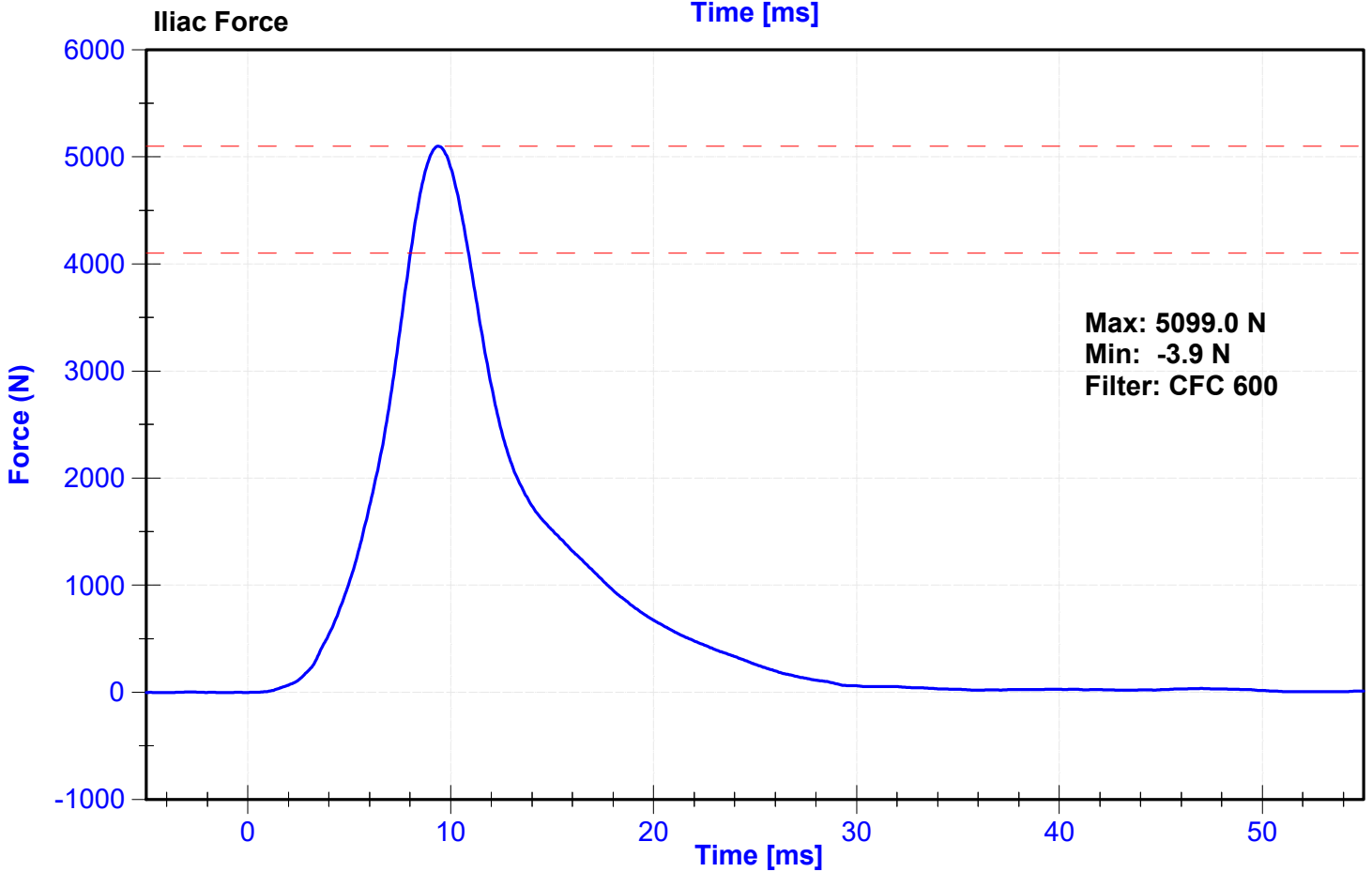
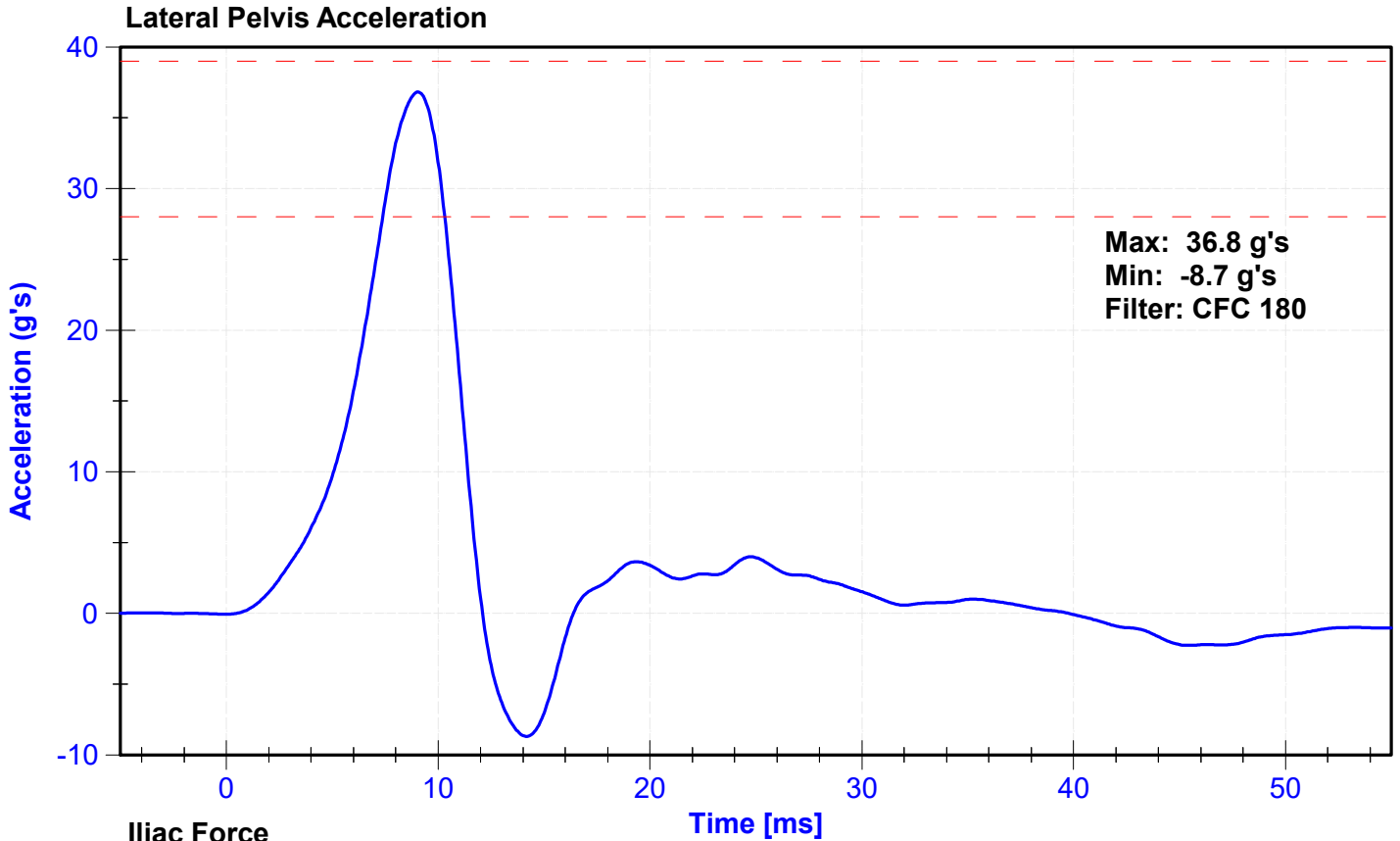
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	4.2	4.4	m/s	4.30	Pass
Probe Acceleration	36	45	g's	44.8	Pass
Lateral Pelvis Acceleration	28	39	g's	36.8	Pass
Iliac Force	4100	5100	N	5099.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Pelvis Y Accelerometer	Endevco	P51731	10/17/2024	4/15/2025
Iliac Load Cell	Denton	279-FY	10/28/2024	10/28/2025

Probe Acceleration





CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

SERIAL NO:300

(CONFIGURED FOR LEFT SIDE IMPACT)

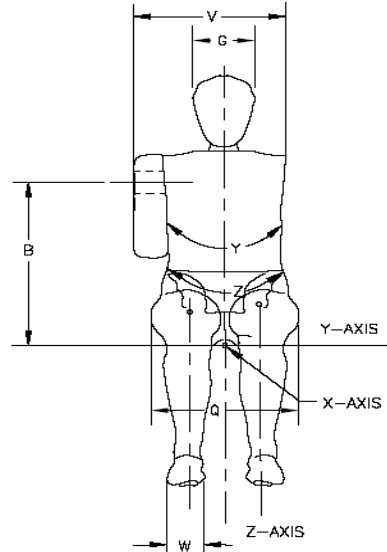
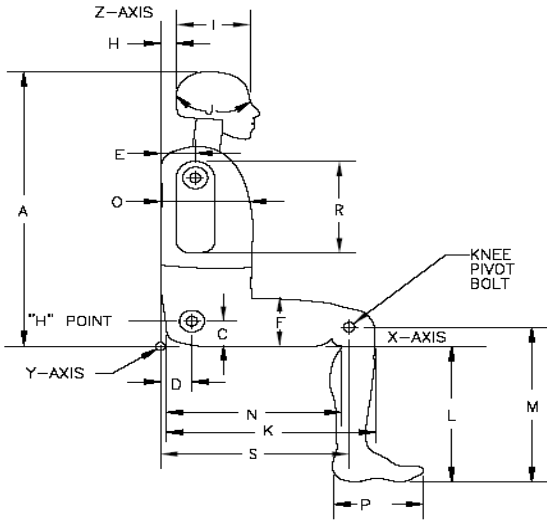


External Measurements - SID-IIs

Technician: J. Rios

Date: 11/23/2024

Dummy Serial Number: 300



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	786	Pass
B	Shoulder Pivot Height	437	453	438	Pass
C	H-point Height	79	89	81	Pass
D	H-point from seatback	141	151	144	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	126	Pass
G	Head Breadth	140	148	145	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	184	Pass
J	Head Circumference	541	551	548	Pass
K	Buttock to Knee Length	514	540	531	Pass
L	Popliteal Height	343	369	359	Pass
M	Knee Pivot to floor height	392	409	405	Pass
N	Buttock Popliteal Length	416	442	434	Pass
O	Chest Depth w/o jacket	195	211	202	Pass
P	Foot Length	216	232	223	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	320	Pass
R	Arm Length	249	259	252	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	80	Pass
Y	Chest Circumference w/jacket	851	881	872	Pass
Z	Waist Circumference	761	791	773	Pass

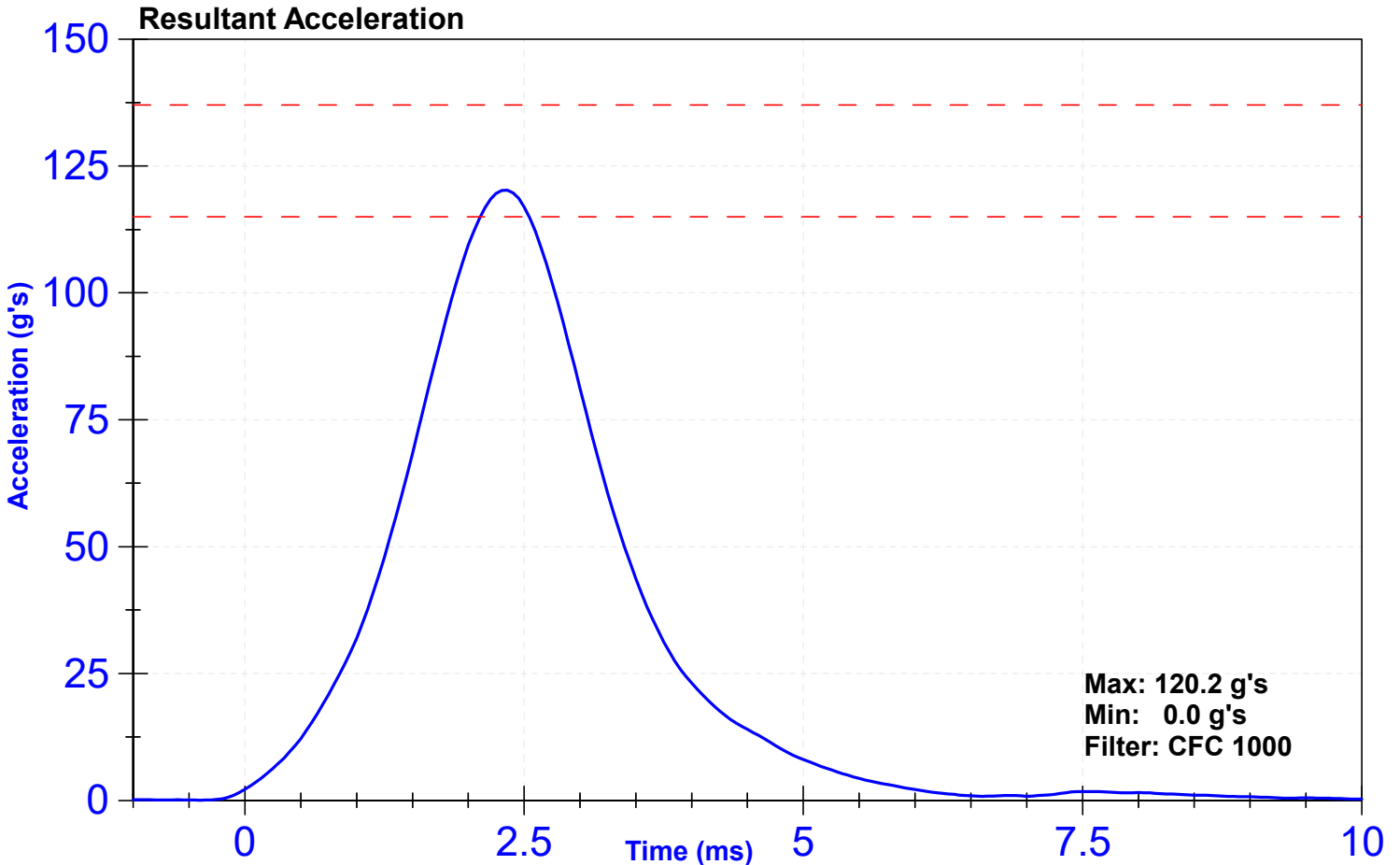
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

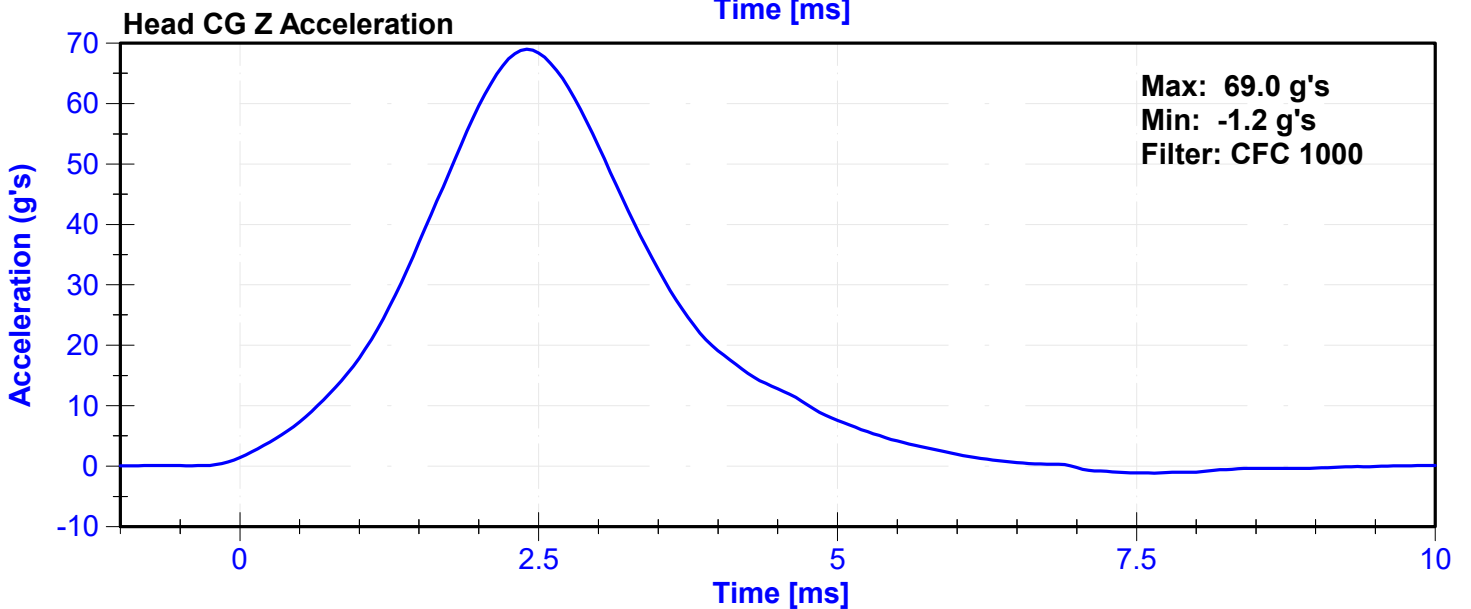
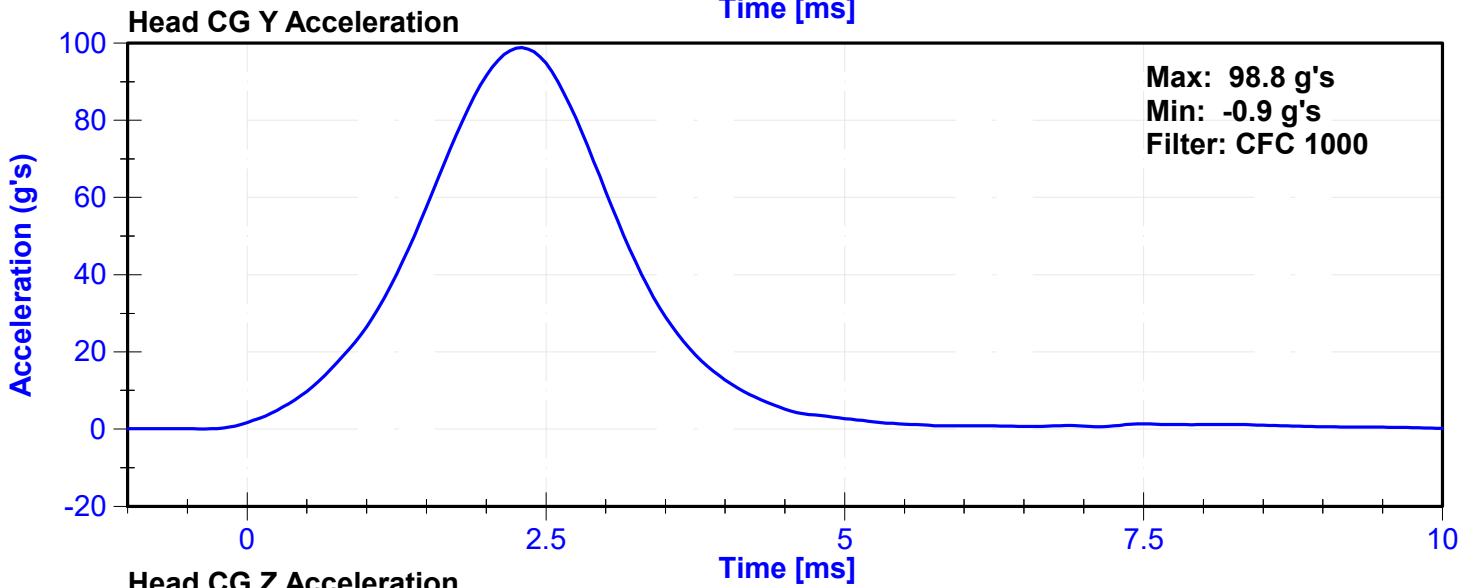
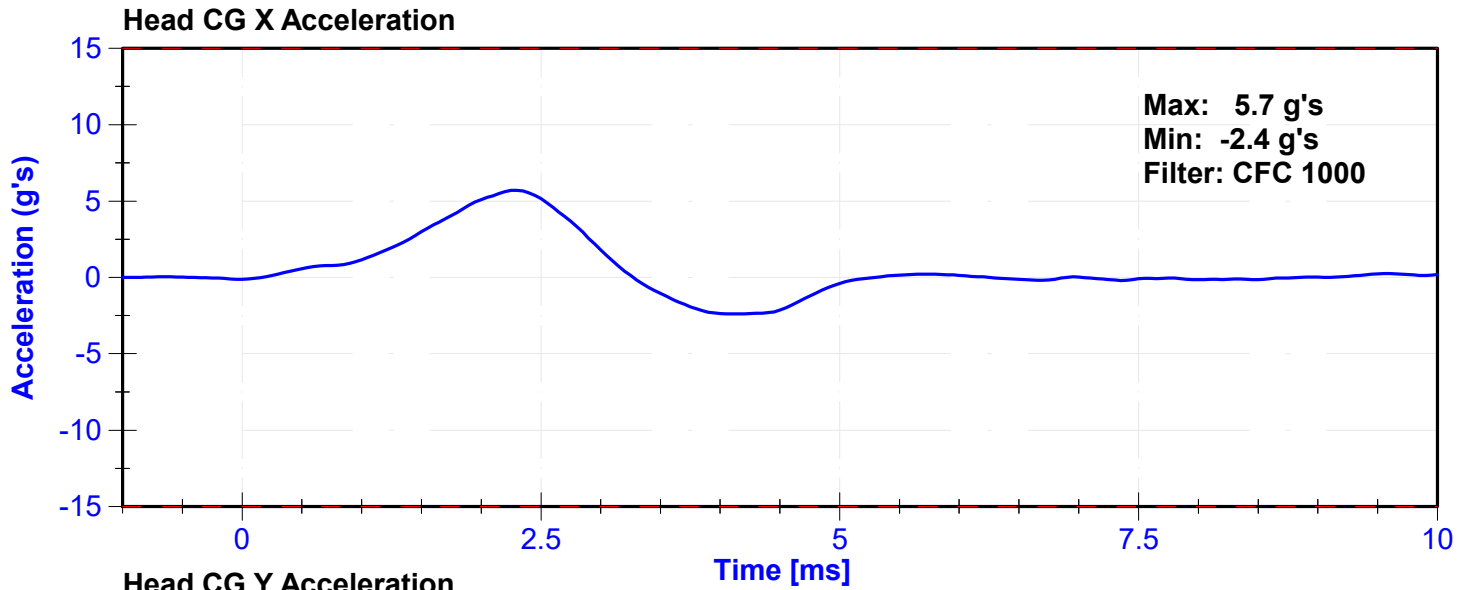
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	29	Pass
Resultant Acceleration	115	137	g's	120.2	Pass
Oscillation	0	15	%	1.4	Pass
Fore-Aft Acceleration	-15	15	g's	5.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P59018	10/17/2024	4/15/2025
Y Accelerometer	Endevco	P79189	10/17/2024	4/15/2025
Z Accelerometer	Endevco	P79587	10/17/2024	4/15/2025





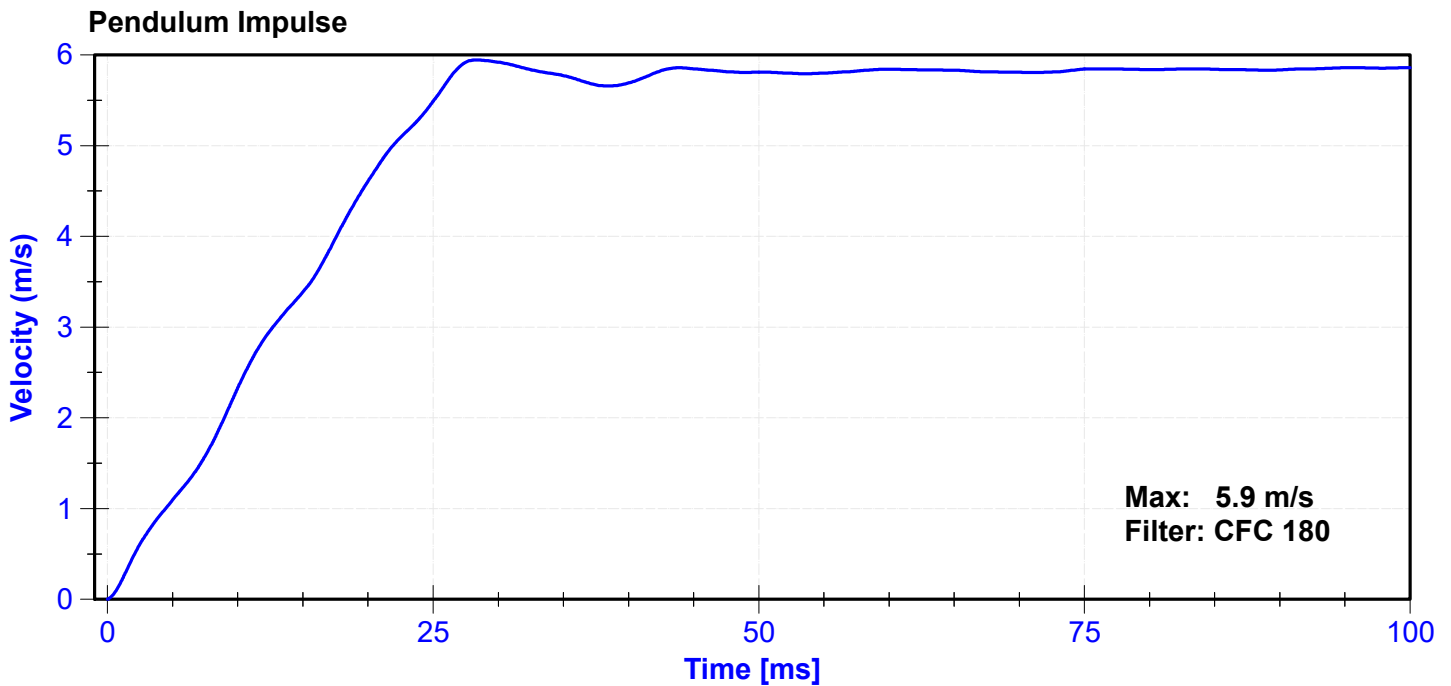
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

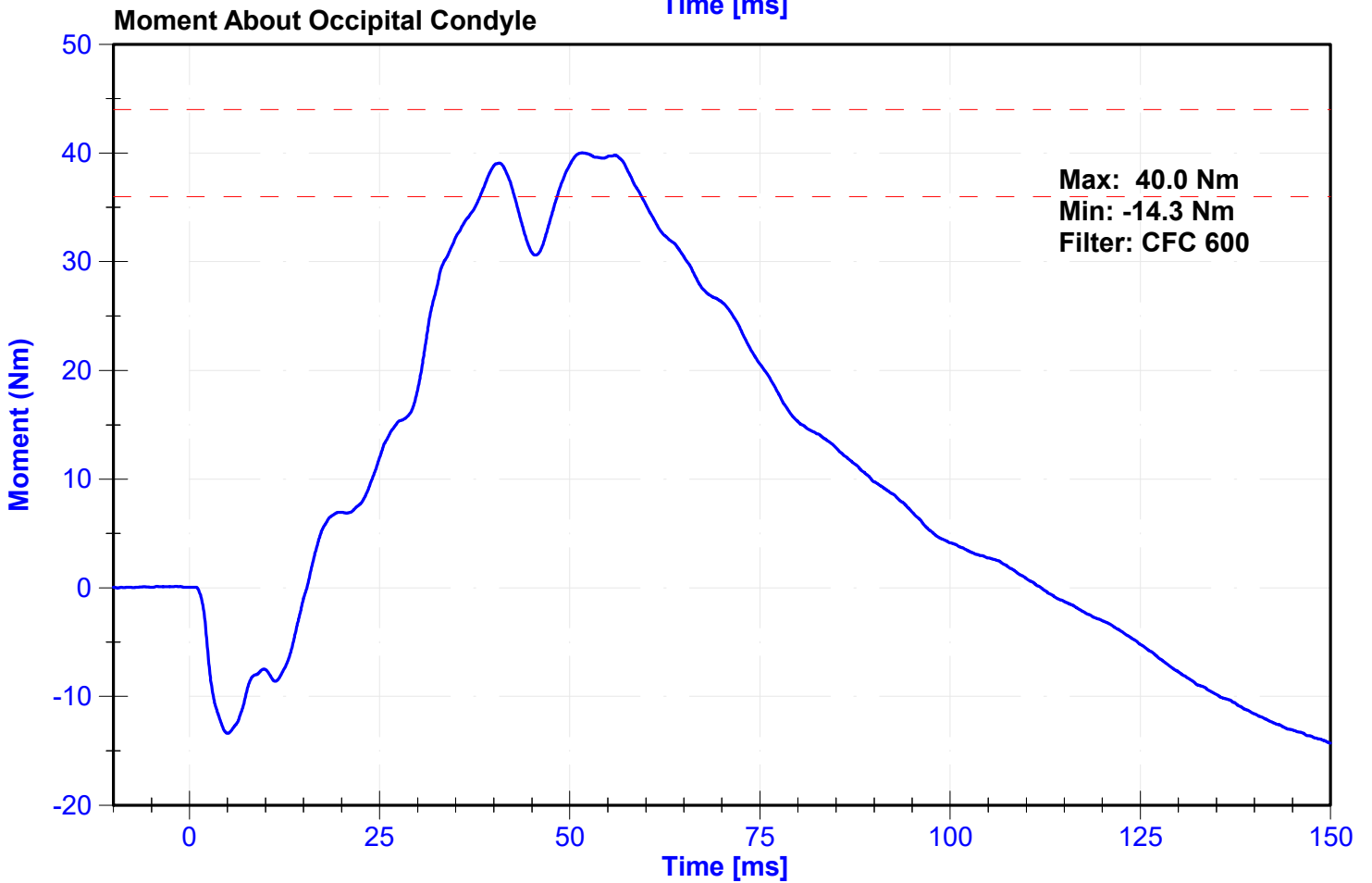
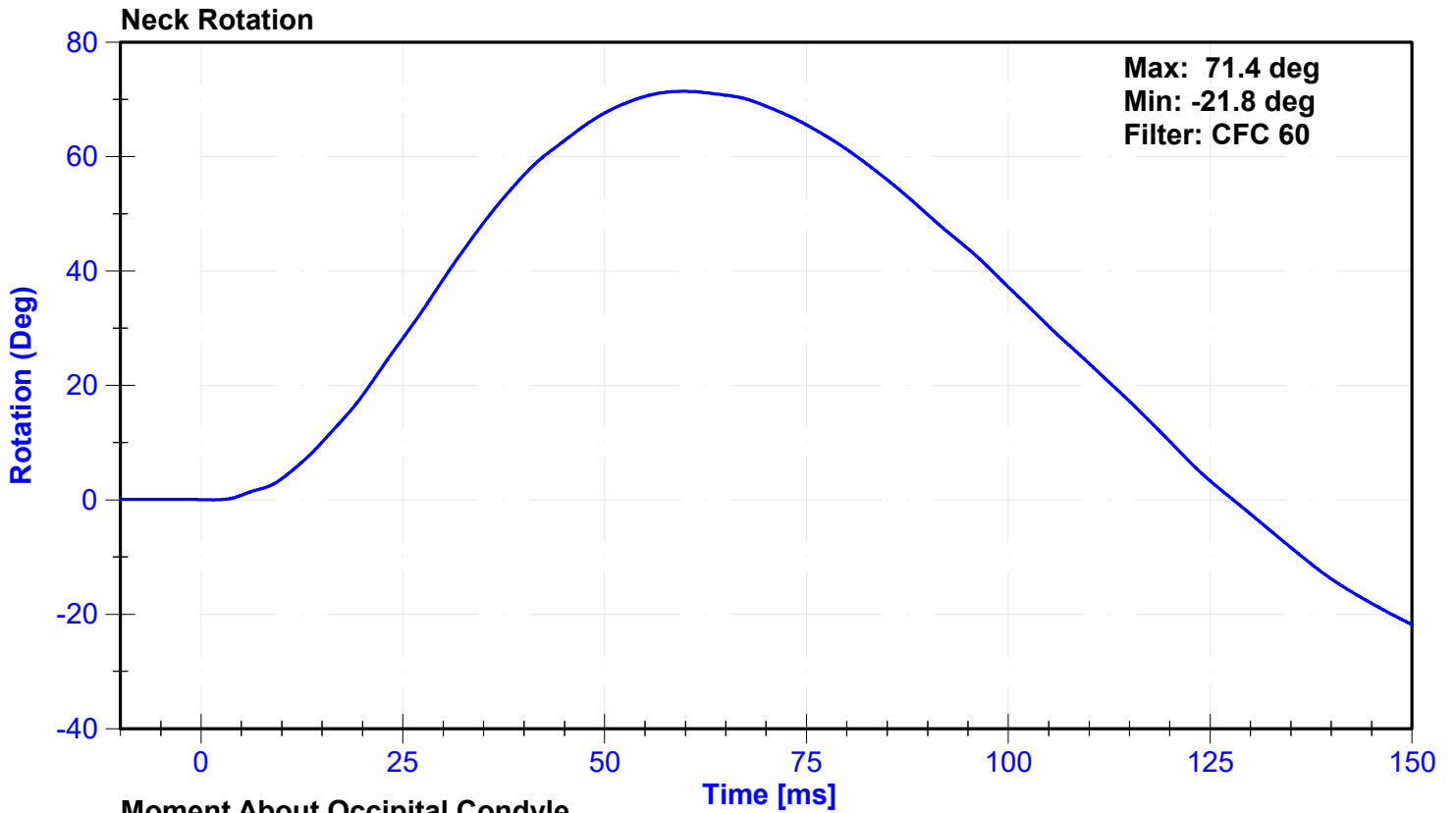
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	35	Pass
Velocity	5.51	5.63	m/s	5.579	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.33	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.39	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.61	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.49	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.94	Pass
Neck Rotation	71	81	deg	71.4	Pass
Time at Maximum Rotation	50	70	ms	59.7	Pass
Moment about the OC	36	44	Nm	40.0	Pass
Moment Decay to 0 Nm	102	126	ms	112.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	11/1/2024	11/1/2025
Pendulum Potentiometer	Servo	4961	9/23/2024	9/23/2025
Condyle Potentiometer	Servo	DS185	9/23/2024	9/23/2025
Upper Neck Load Cell	Denton	1716A_2187-FY	12/5/2023	12/4/2024





ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

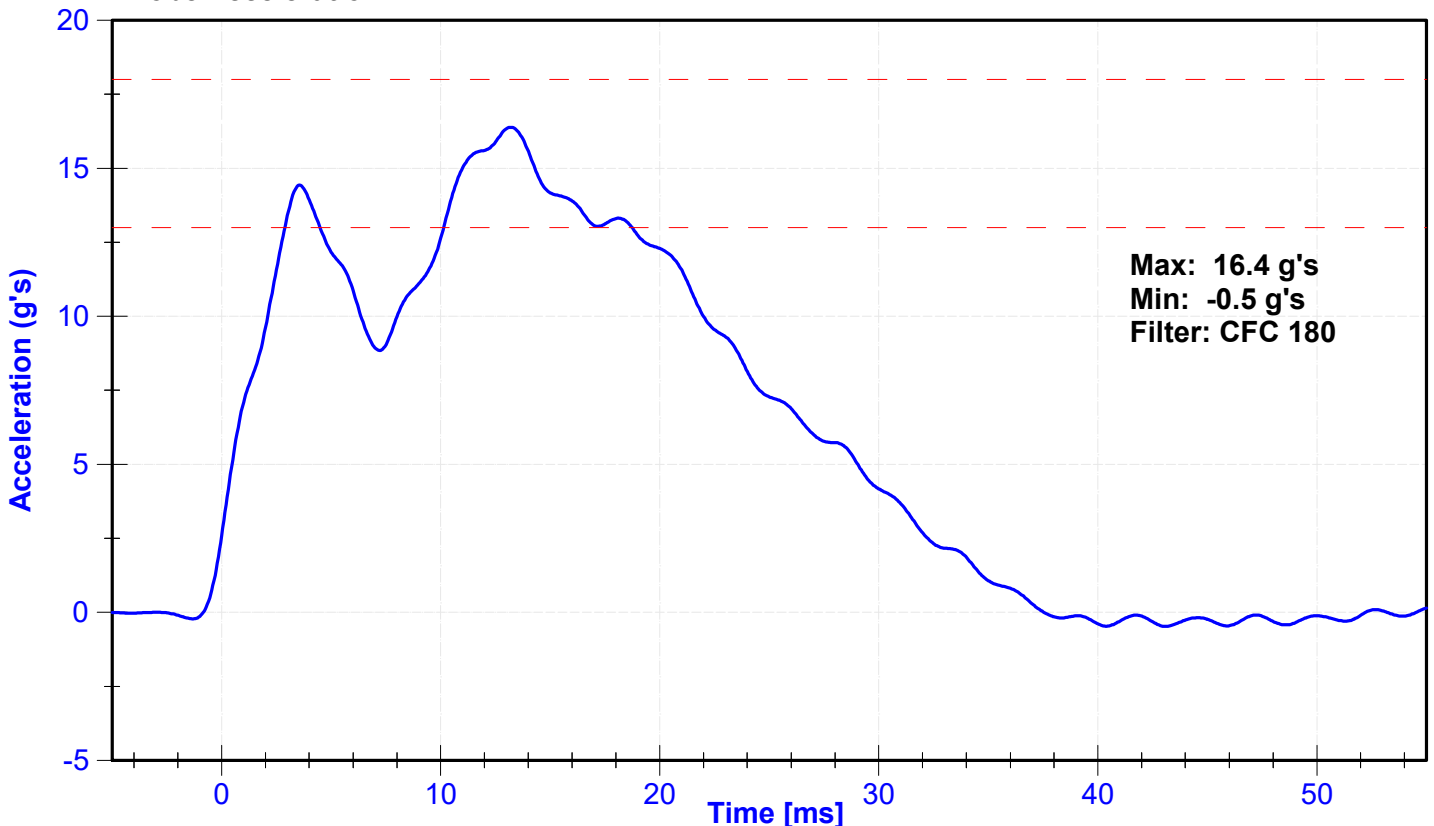
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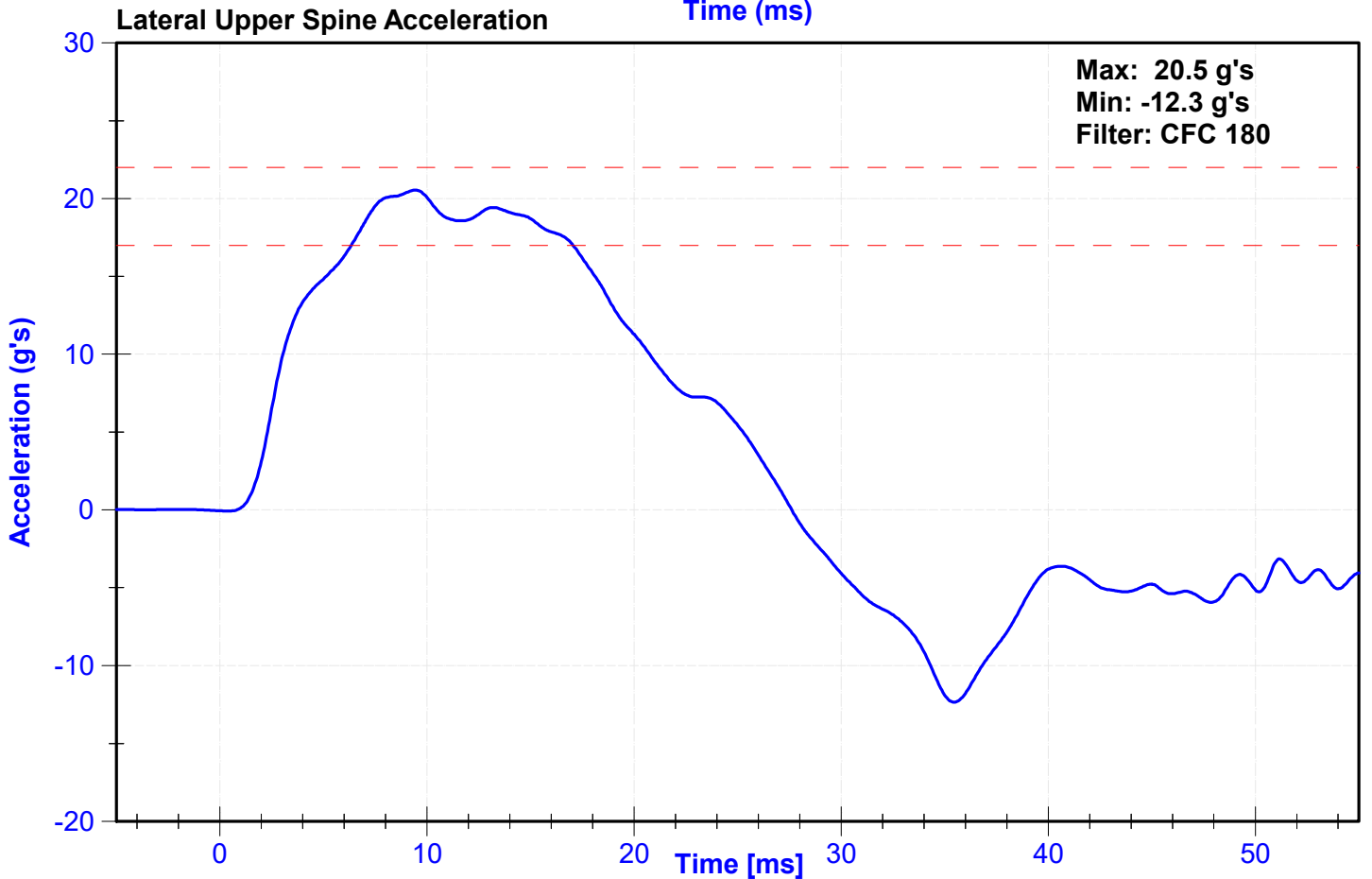
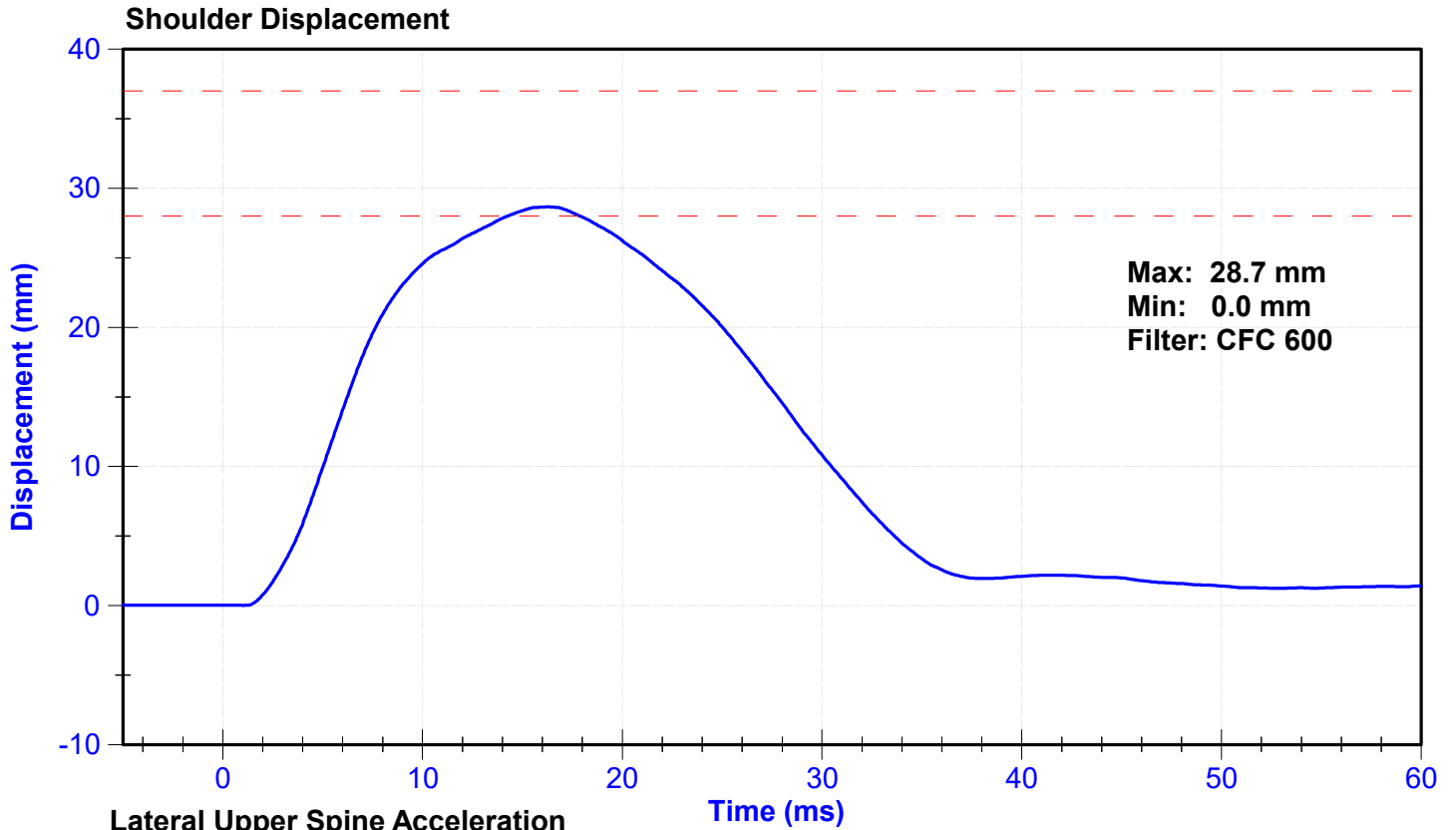
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	13	18	g's	16.4	Pass
Shoulder Deflection	28	37	mm	28.7	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Shoulder Potentiometer	Servo	053GFE	10/16/2024	4/16/2025
Upper Spine Y Accelerometer	Endevco	T20880	10/17/2024	4/15/2025

Probe Acceleration





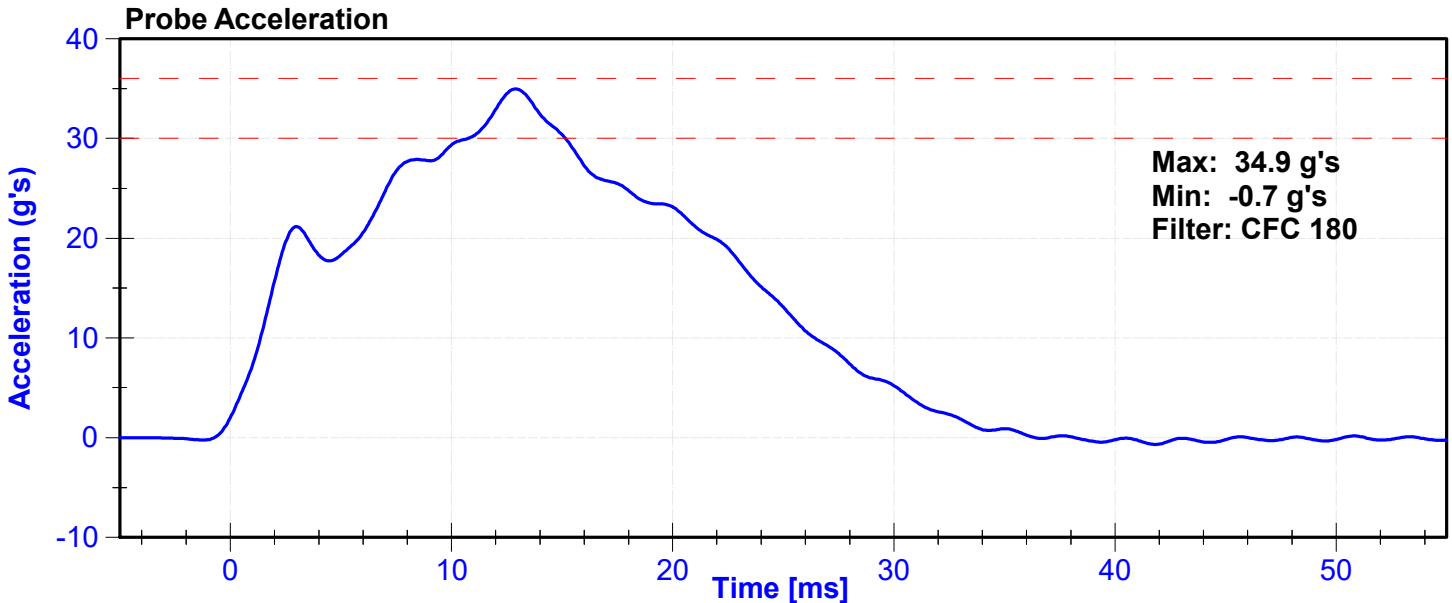
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

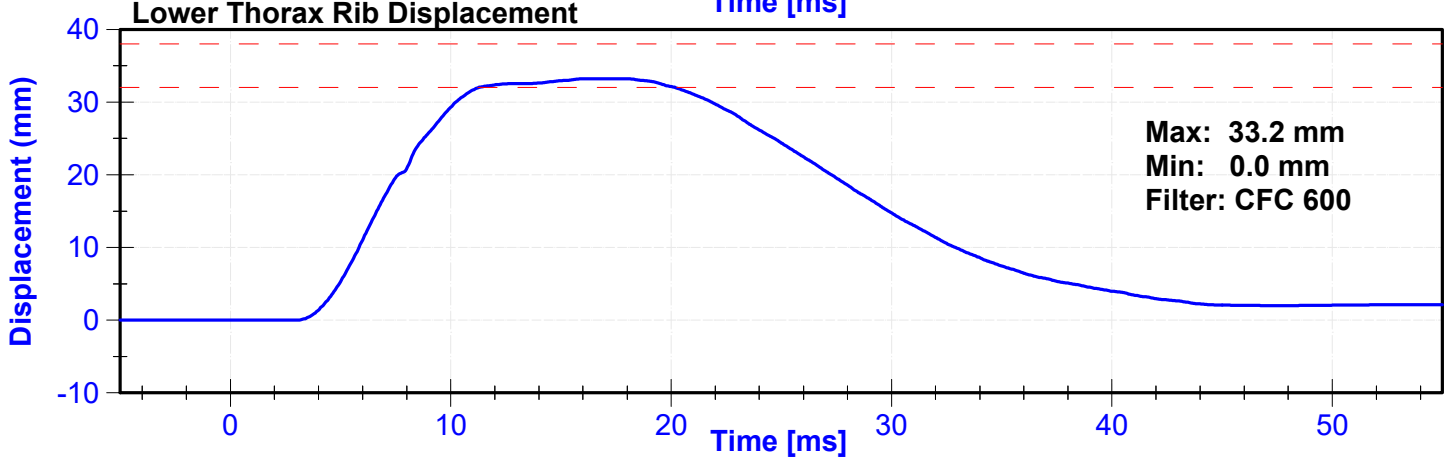
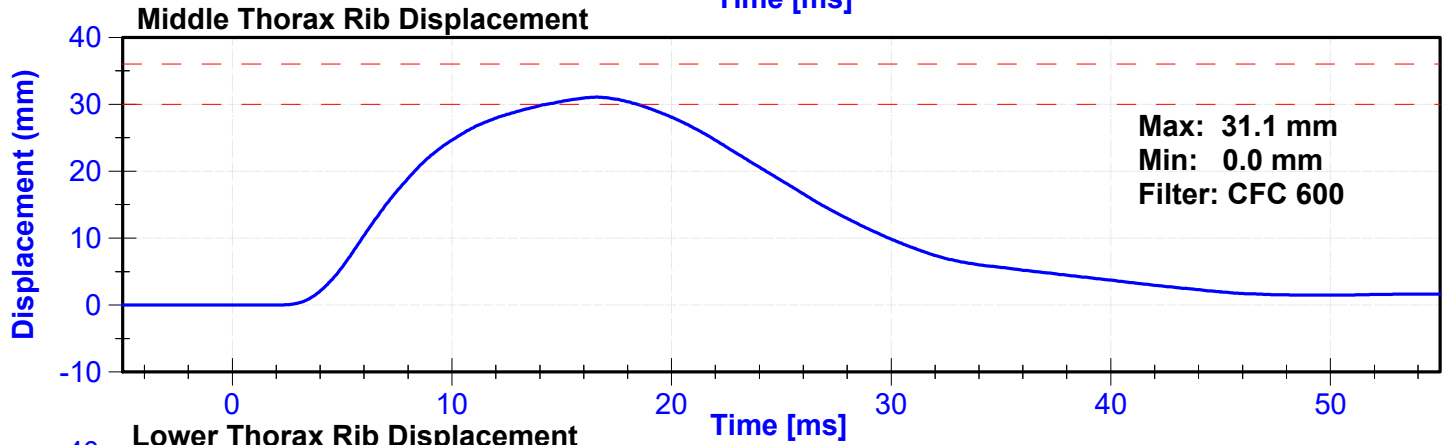
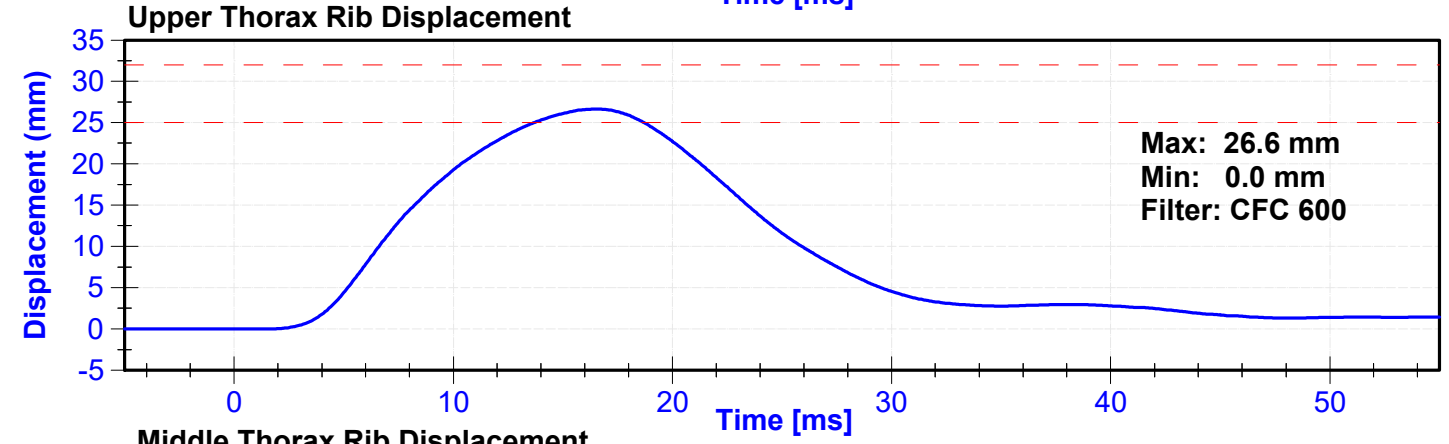
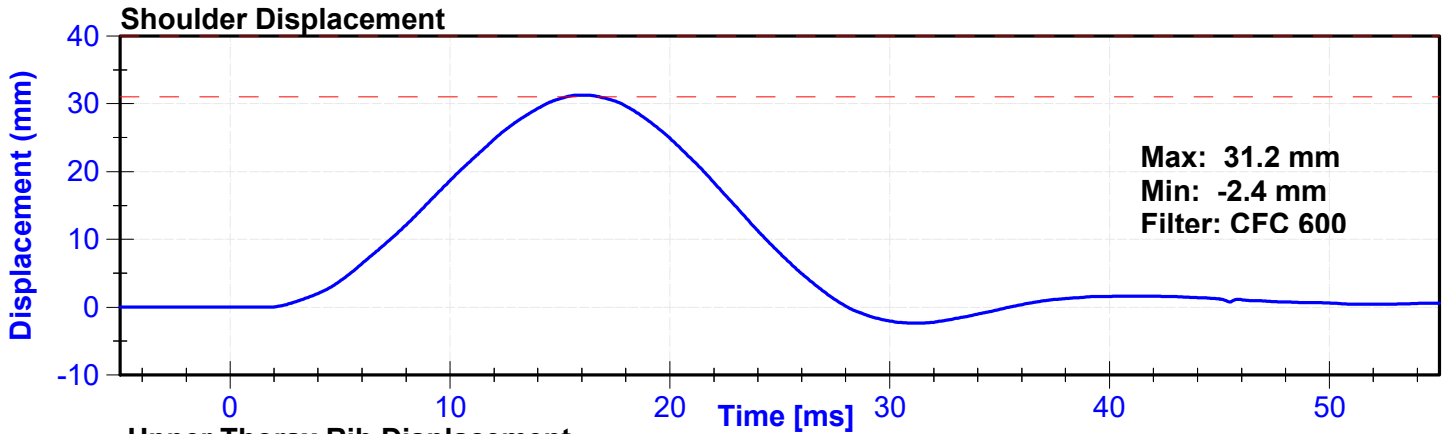
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	6.6	6.8	m/s	6.66	Pass
Probe Acceleration after 5 ms	30	36	g's	34.9	Pass
Lateral Upper Spine Acceleration	34	43	g's	35.4	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.3	Pass
Shoulder Deflection	31	40	mm	31.2	Pass
Upper Thorax Rib Deflection	25	32	mm	26.6	Pass
Mid Thorax Rib Deflection	30	36	mm	31.1	Pass
Lower Thorax Rib Deflection	32	38	mm	33.2	Pass

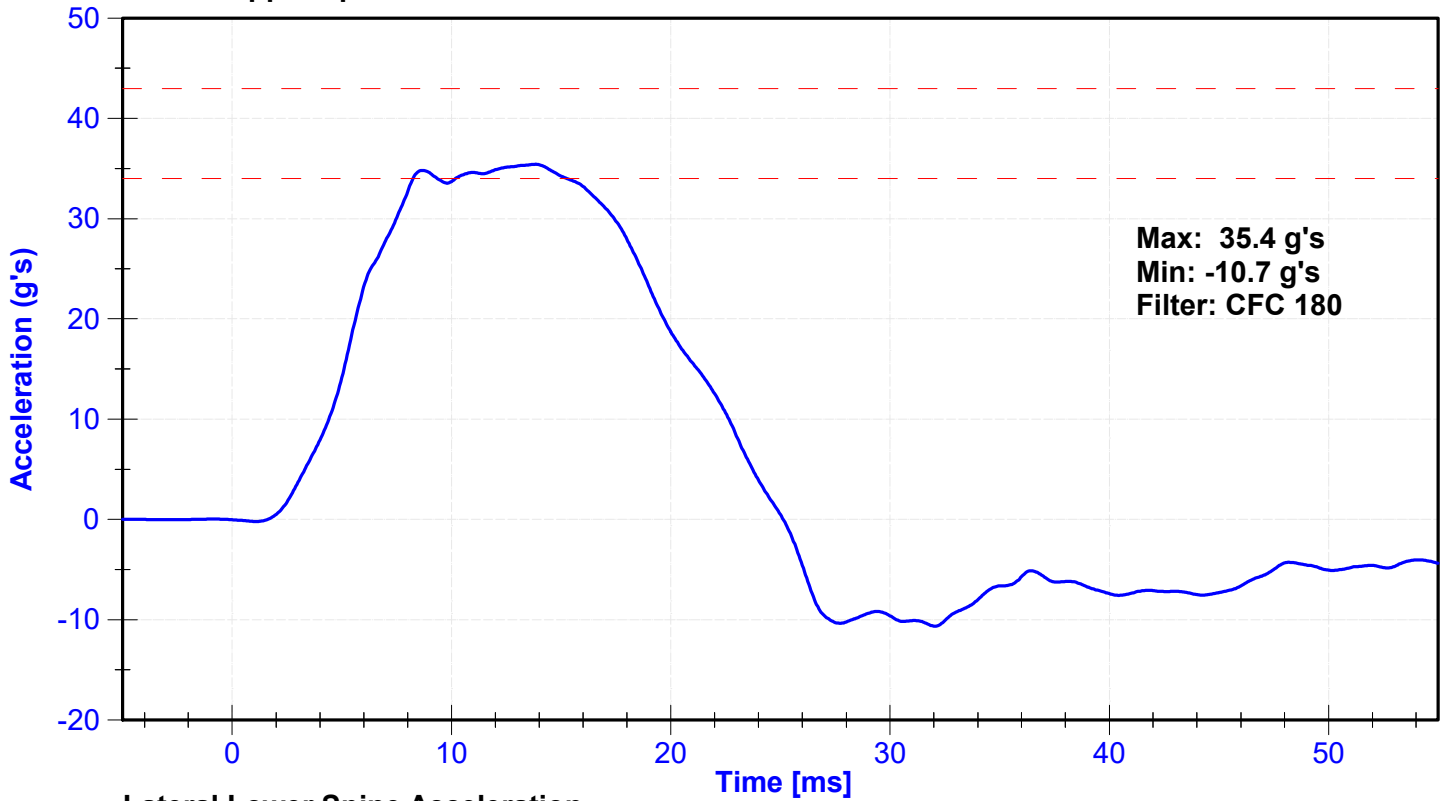
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Upper Spine T1 Y Accelerometer	Endevco	T20880	10/17/2024	4/15/2025
Upper Spine T12 Y Accelerometer	Endevco	P52071	10/17/2024	4/15/2025
Shoulder Potentiometer	Servo	053GFE	10/16/2024	4/16/2025
Upper Thorax Rib Potentiometer	Servo	2316GFE	10/16/2024	4/16/2025
Middle Thorax Rib Potentiometer	Servo	085GFE	10/16/2024	4/16/2025
Lower Thorax Rib Potentiometer	Servo	1156GFE	10/16/2024	4/16/2025

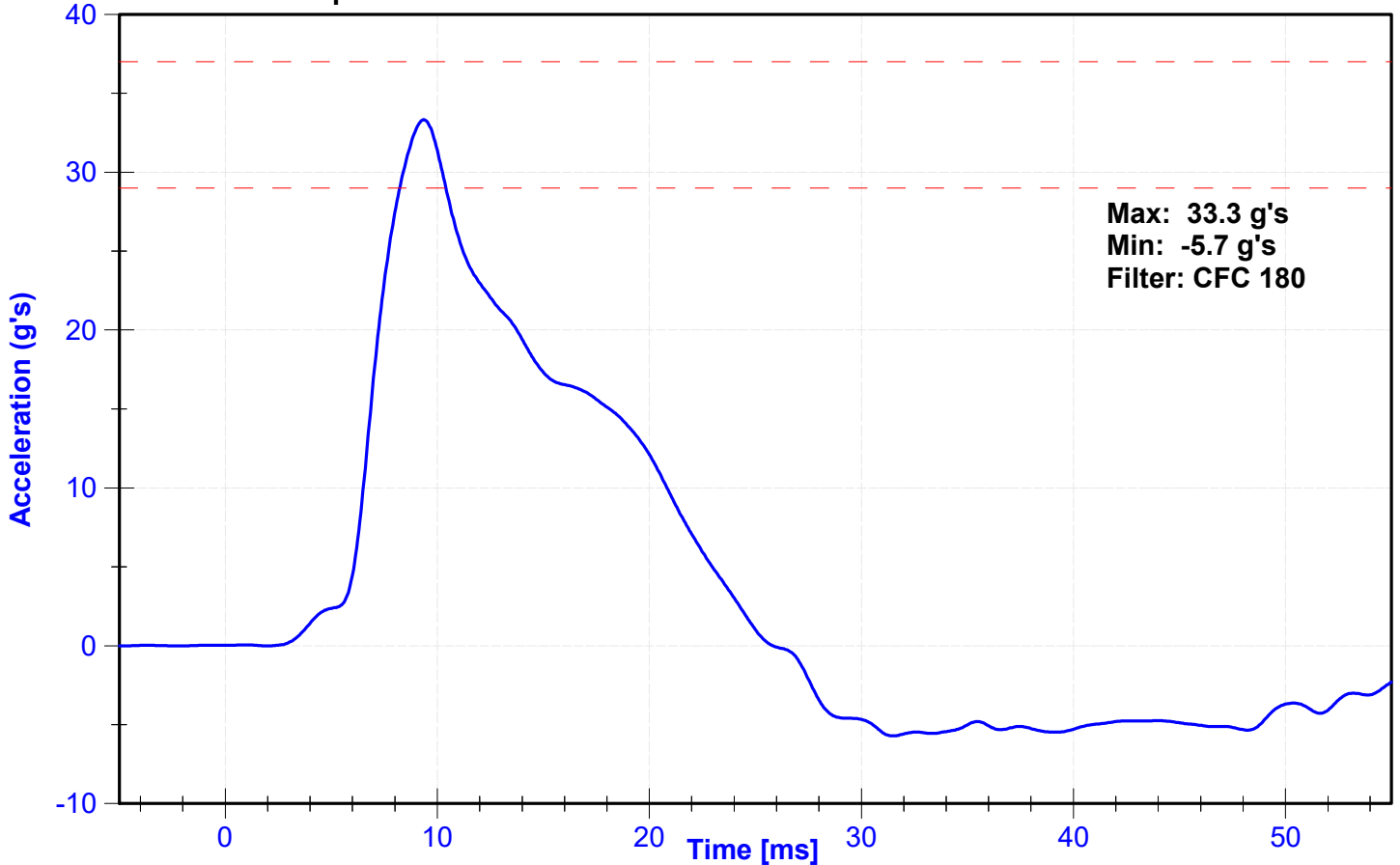




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



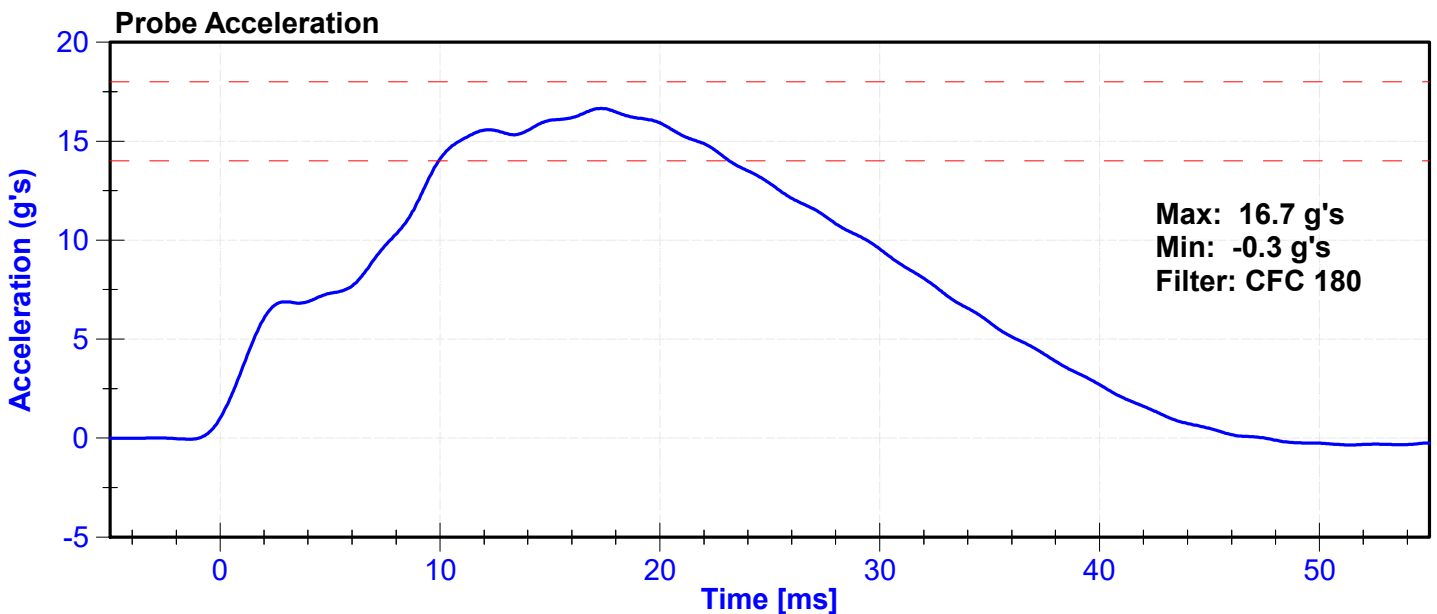
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

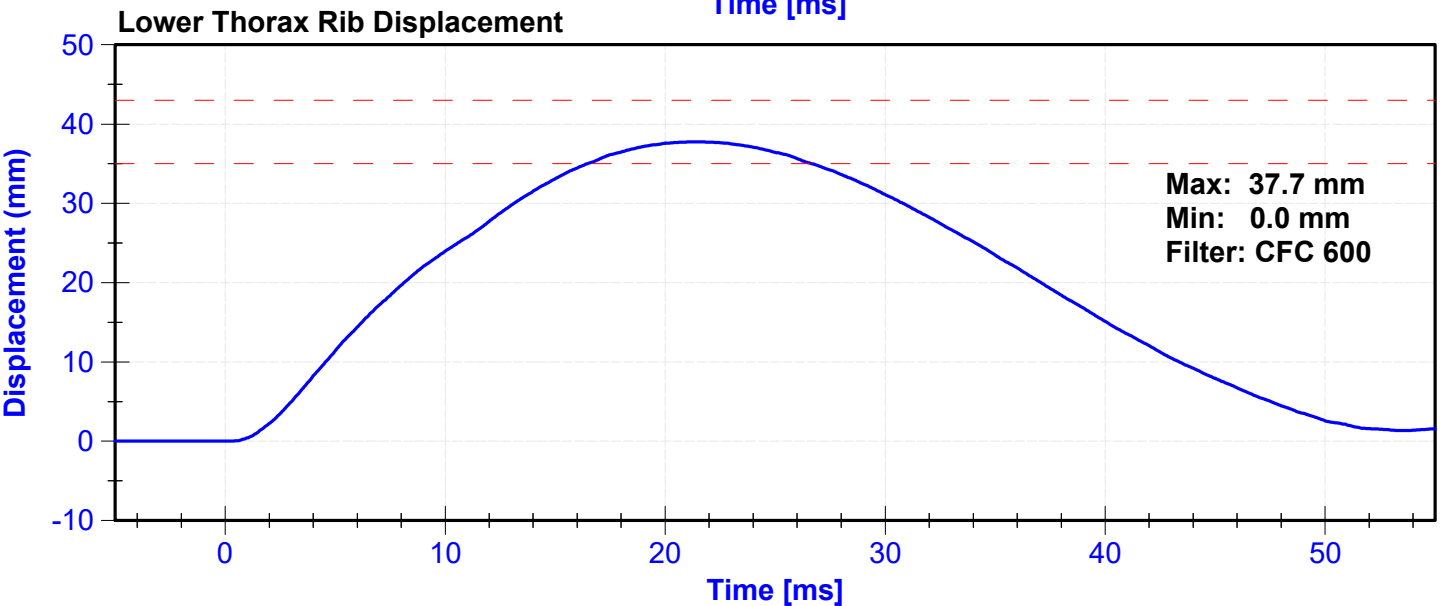
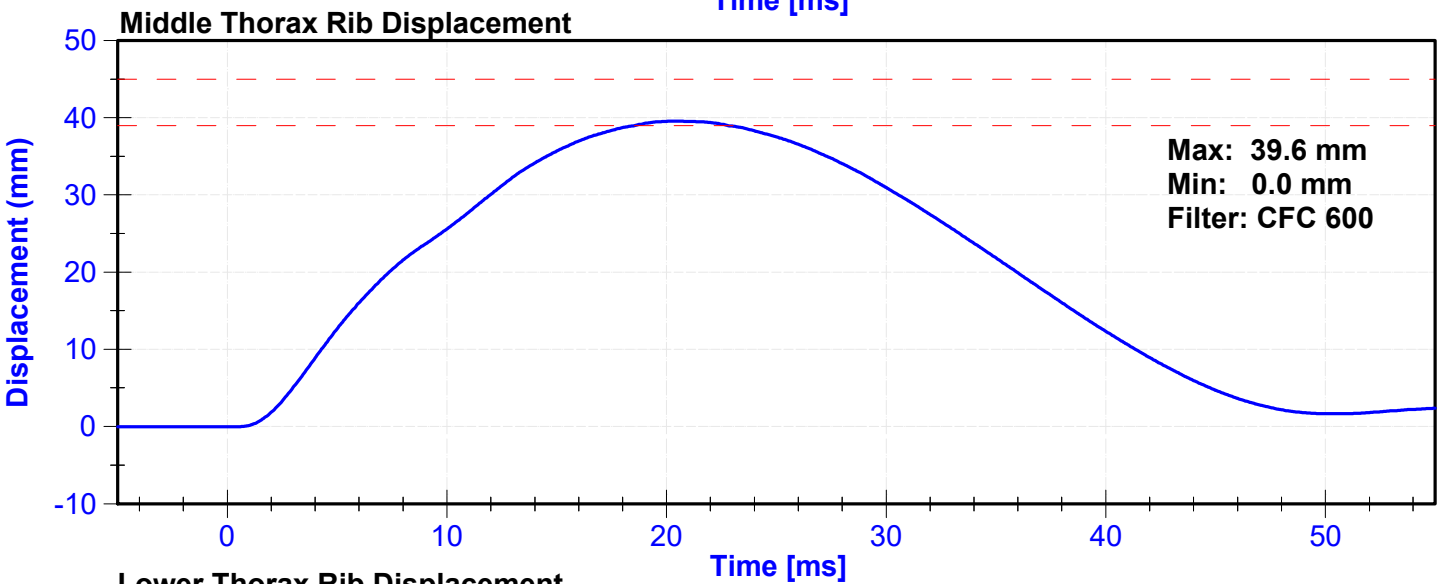
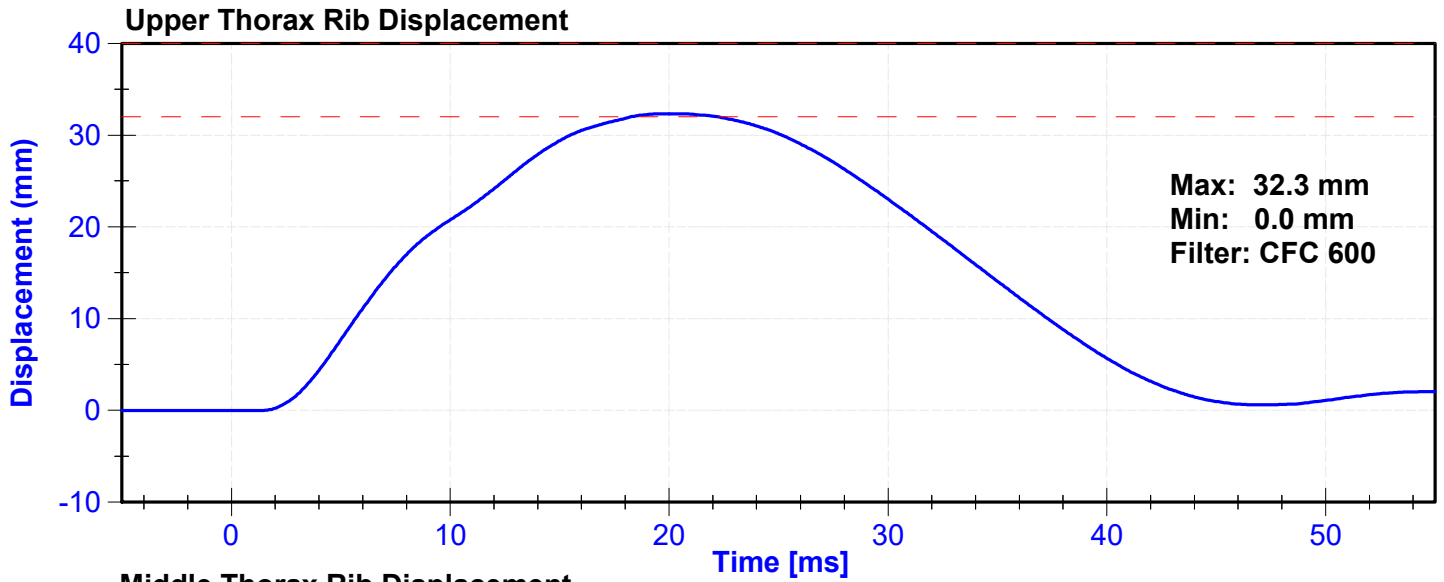
Results

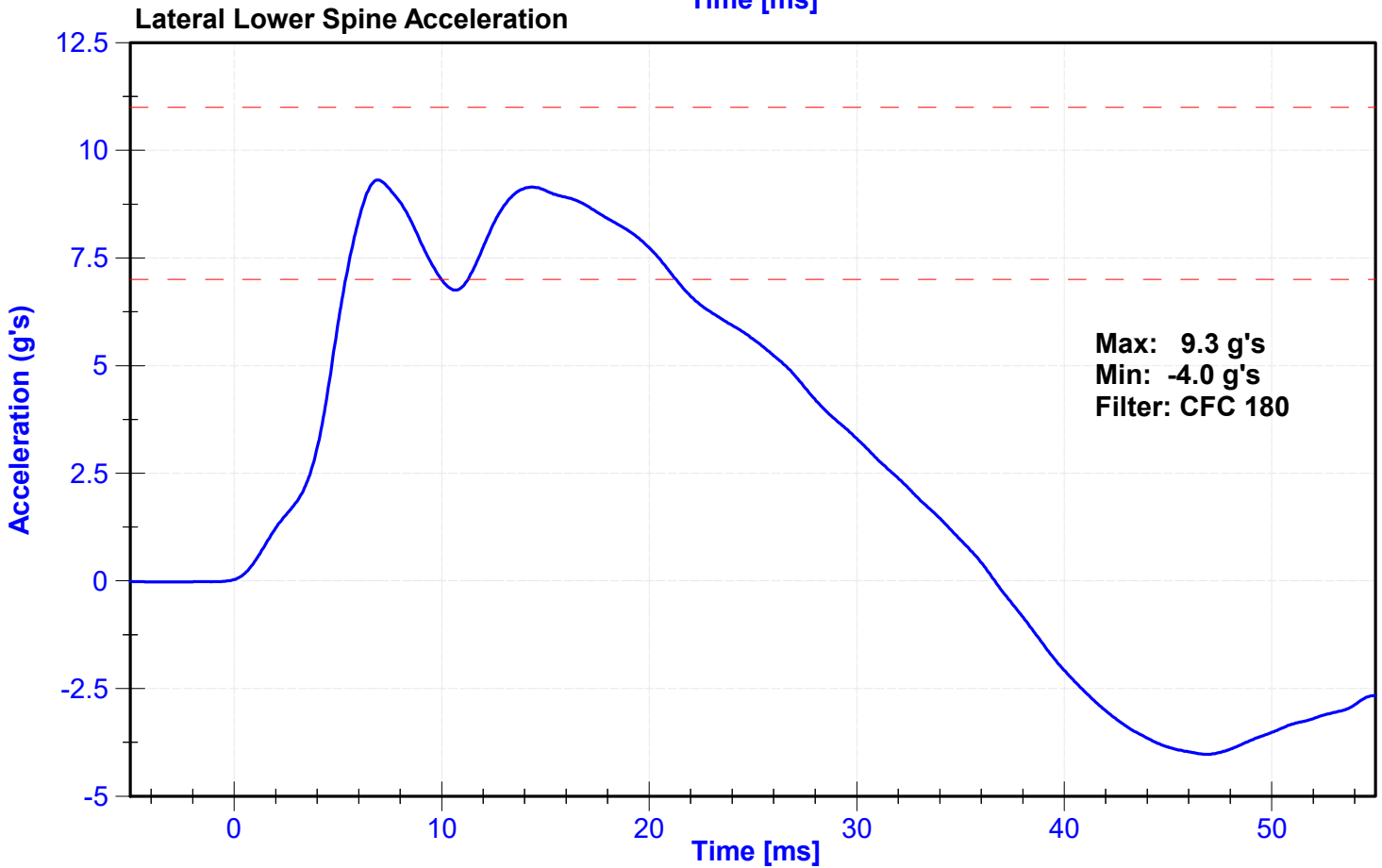
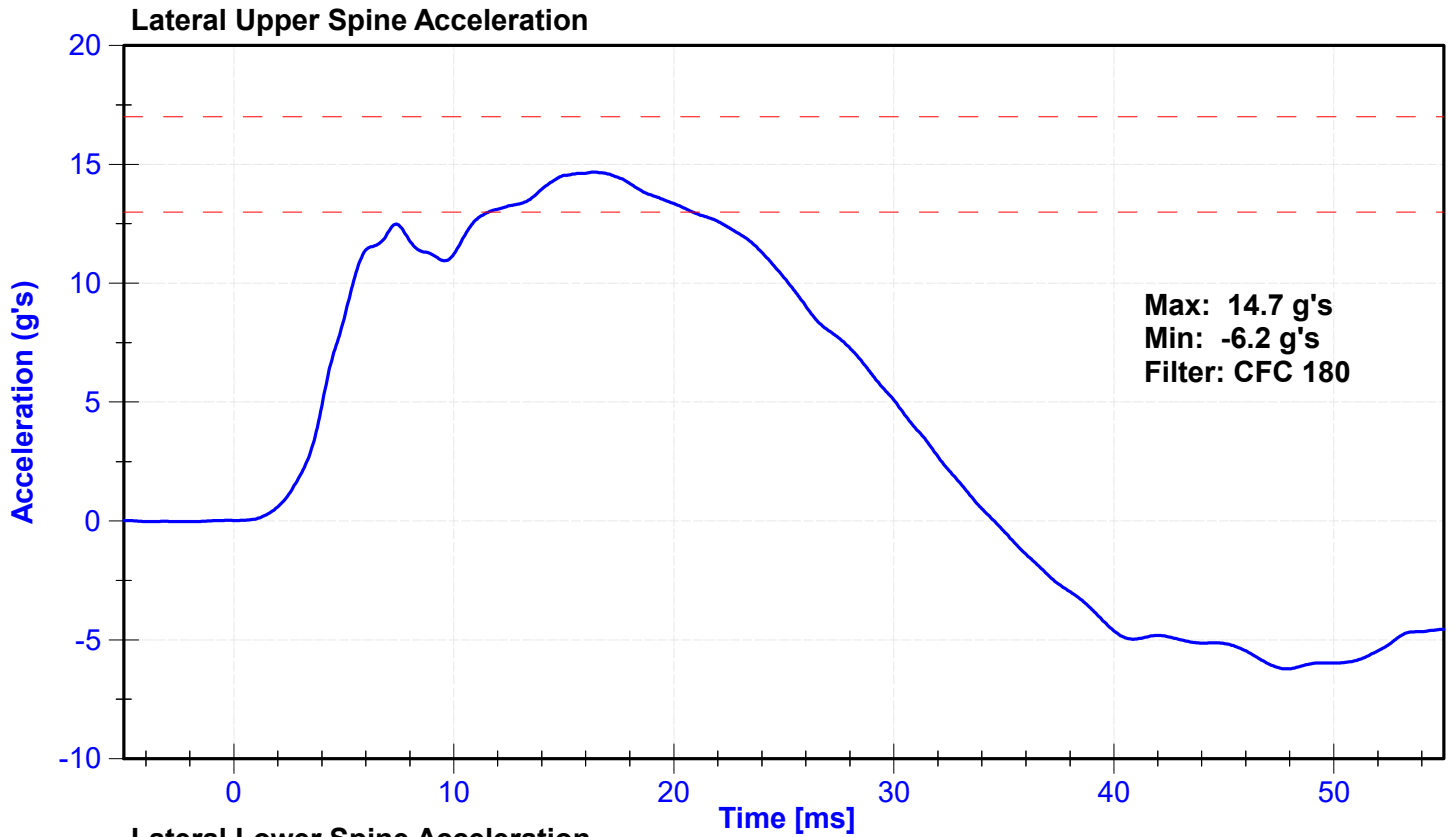
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	14	18	g's	16.7	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.7	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.3	Pass
Upper Thorax Rib Deflection	32	40	mm	32.3	Pass
Middle Thorax Rib Deflection	39	45	mm	39.6	Pass
Lower Thorax Rib Deflection	35	43	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Upper Spine Y Accelerometer	Endevco	T20880	10/17/2024	4/15/2025
Lower Spine Y Accelerometer	Endevco	P52071	10/17/2024	4/15/2025
Upper Thorax Rib Potentiometer	Servo	2316GFE	10/16/2024	4/16/2025
Middle Thorax Rib Potentiometer	Servo	085GFE	10/16/2024	4/16/2025
Lower Thorax Rib Potentiometer	Servo	1156GFE	10/16/2024	4/16/2025







ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

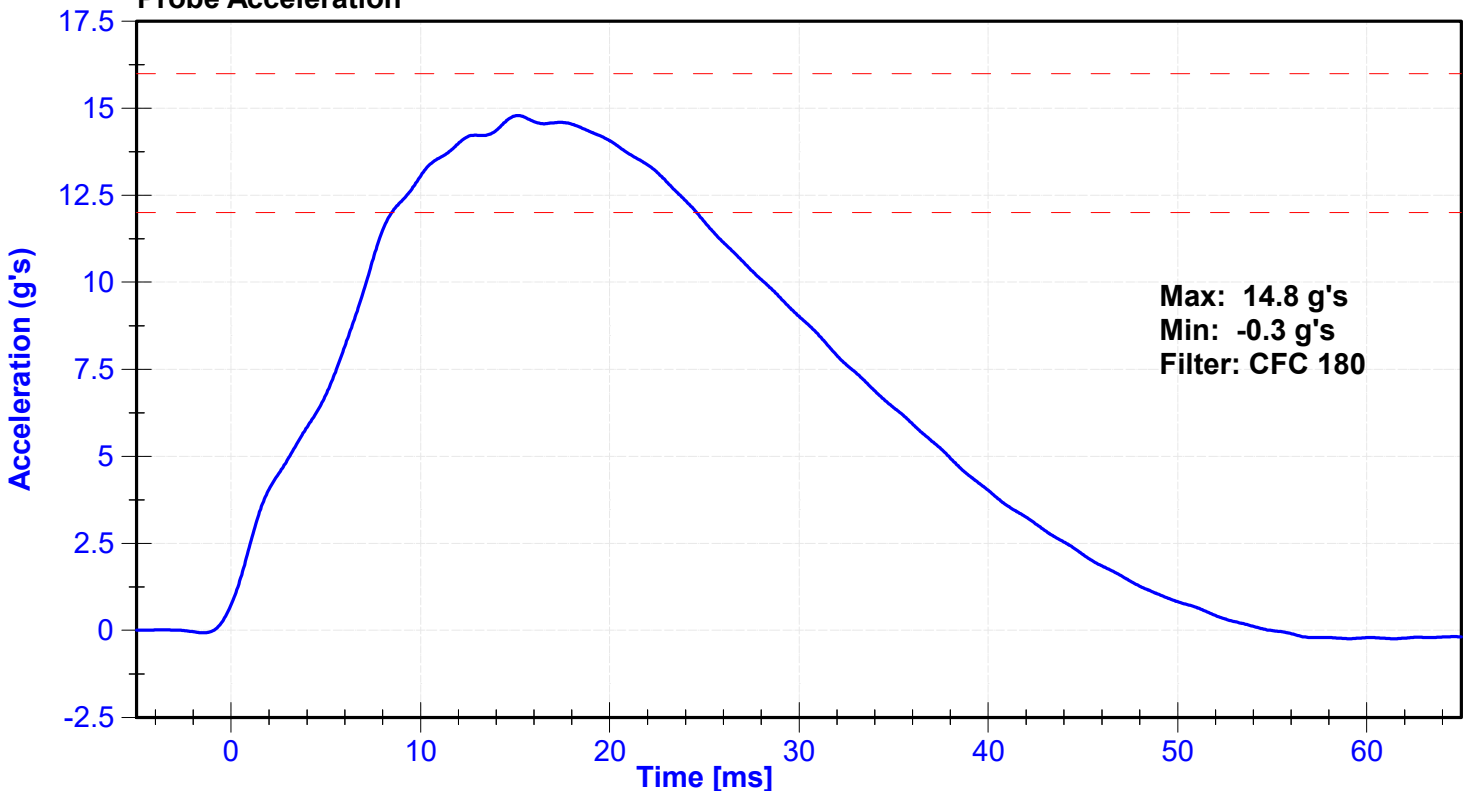
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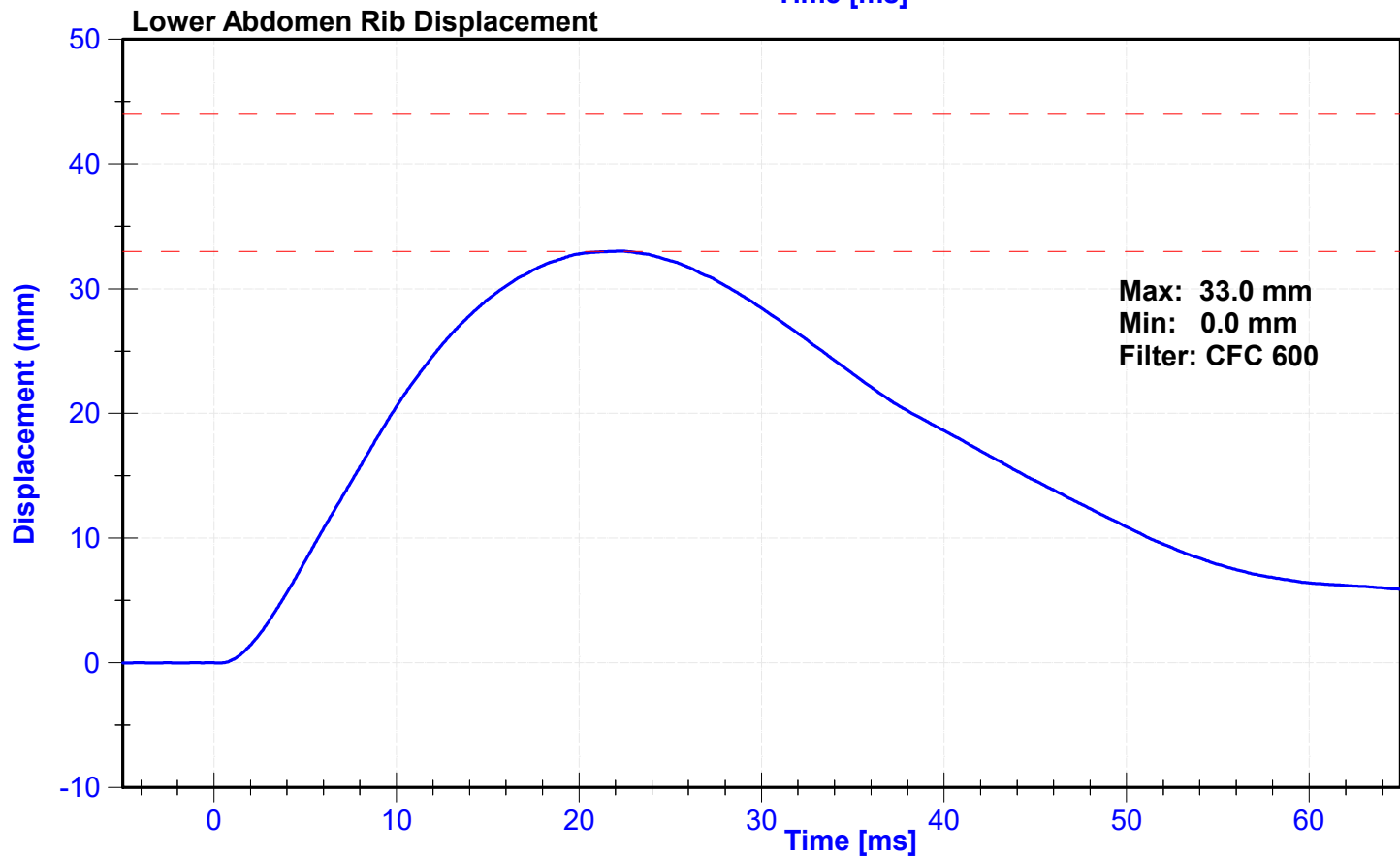
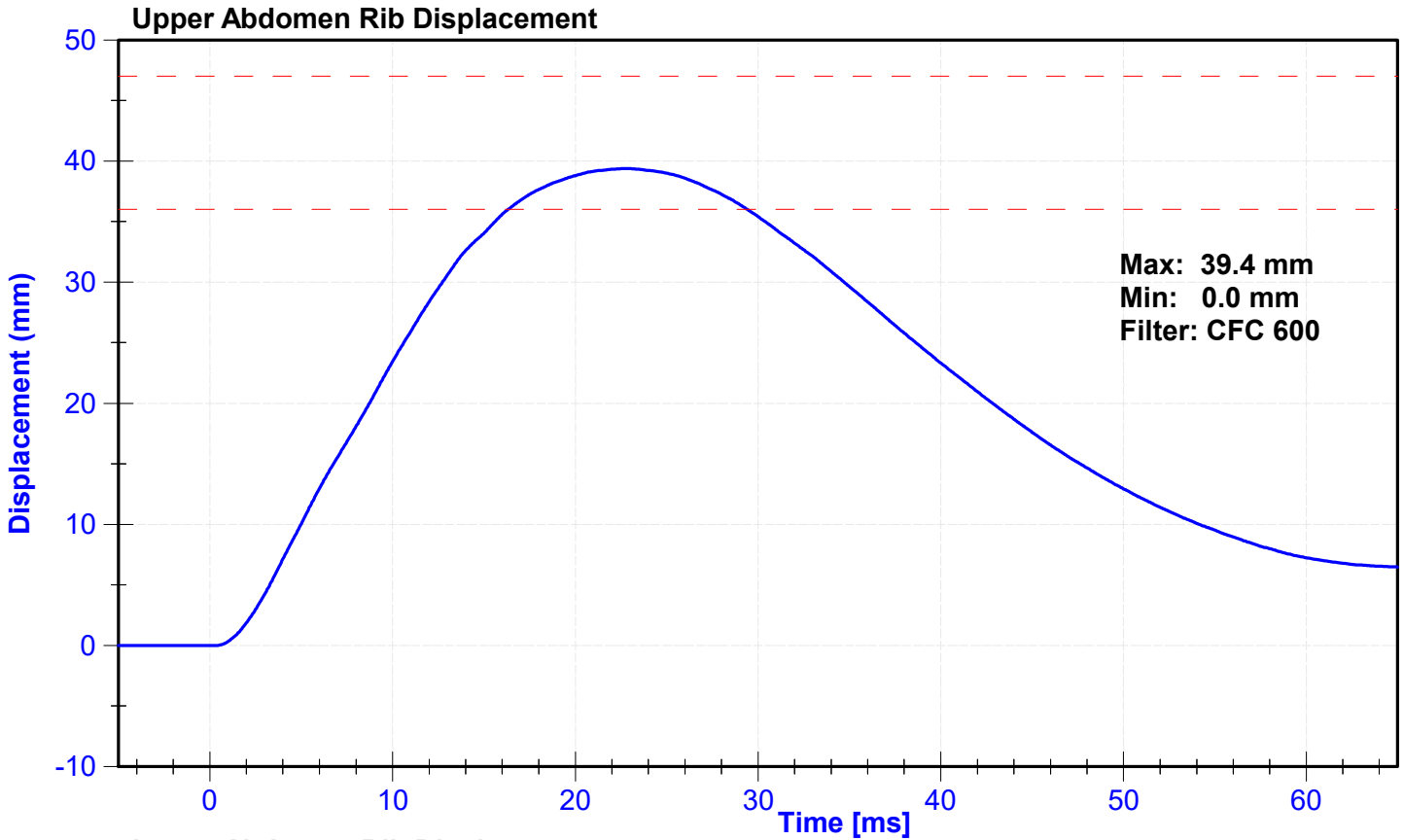
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	12	16	g's	14.8	Pass
Lateral Lower Spine Acceleration	9	14	g's	12.3	Pass
Upper Abdomen Rib Deflection	36	47	mm	39.4	Pass
Lower Abdomen Rib Deflection	33	44	mm	33.0	Pass

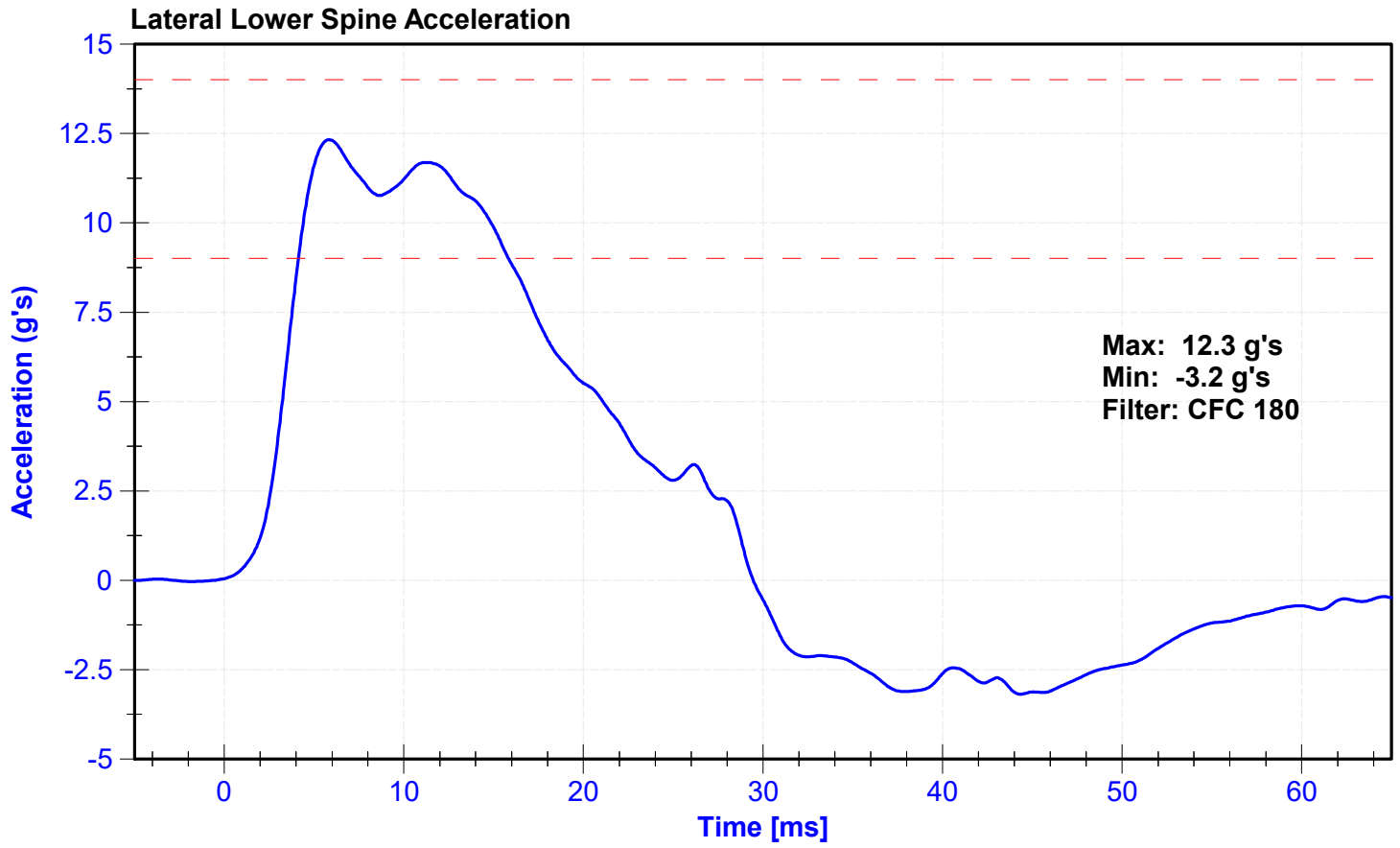
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Lower Spine Y Accelerometer	Endevco	P52071	10/17/2024	4/15/2025
Upper Abdomen Rib Potentiometer	Servo	074GFE	10/16/2024	4/16/2025
Lower Abdomen Rib Potentiometer	Servo	075GFE	10/16/2024	4/16/2025

Probe Acceleration







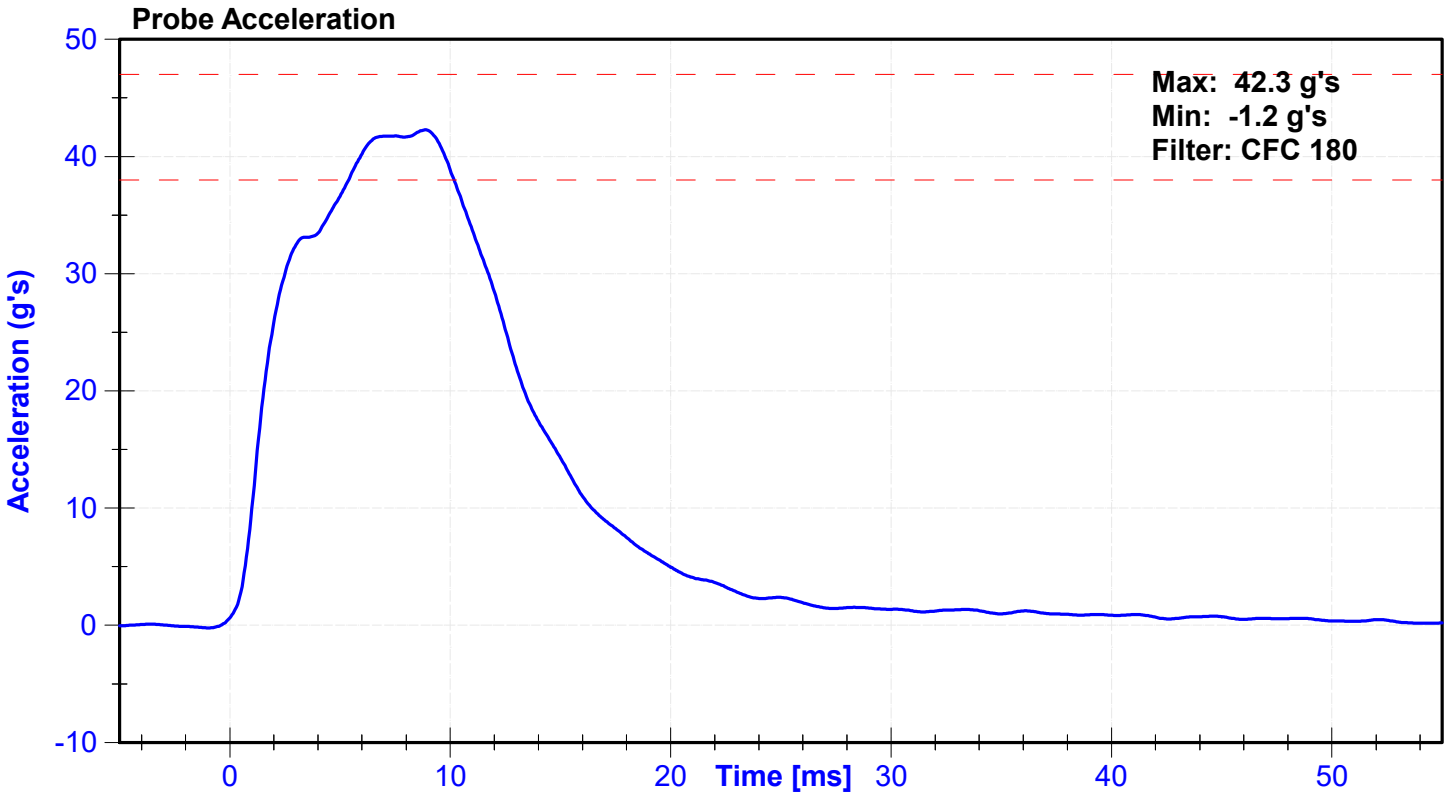
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

Results

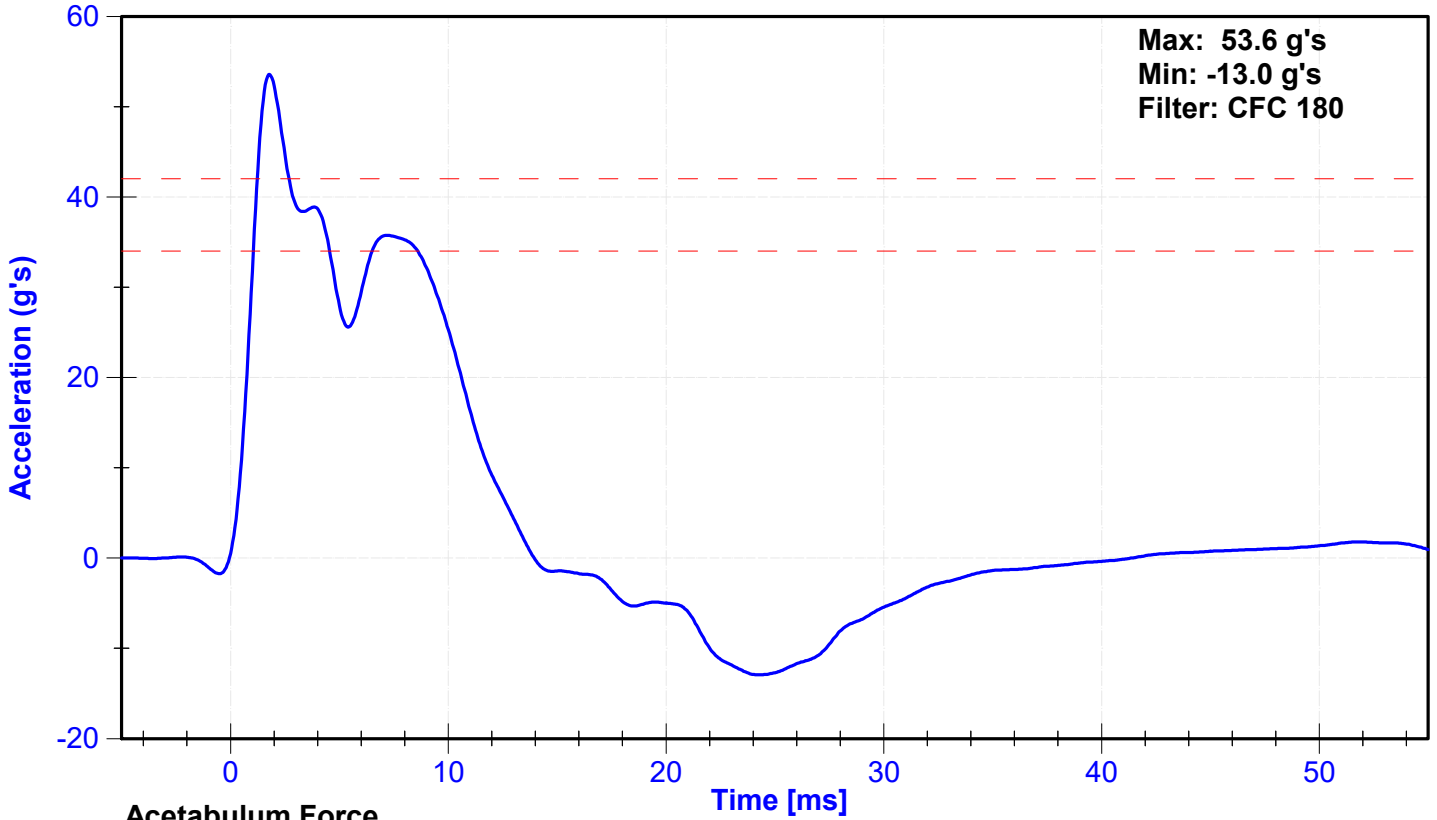
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	6.6	6.8	m/s	6.65	Pass
Probe Acceleration	38	47	g's	42.3	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	35.7	Pass
Acetabulum Force	3600	4300	N	3965.8	Pass

Transducer Calibrations

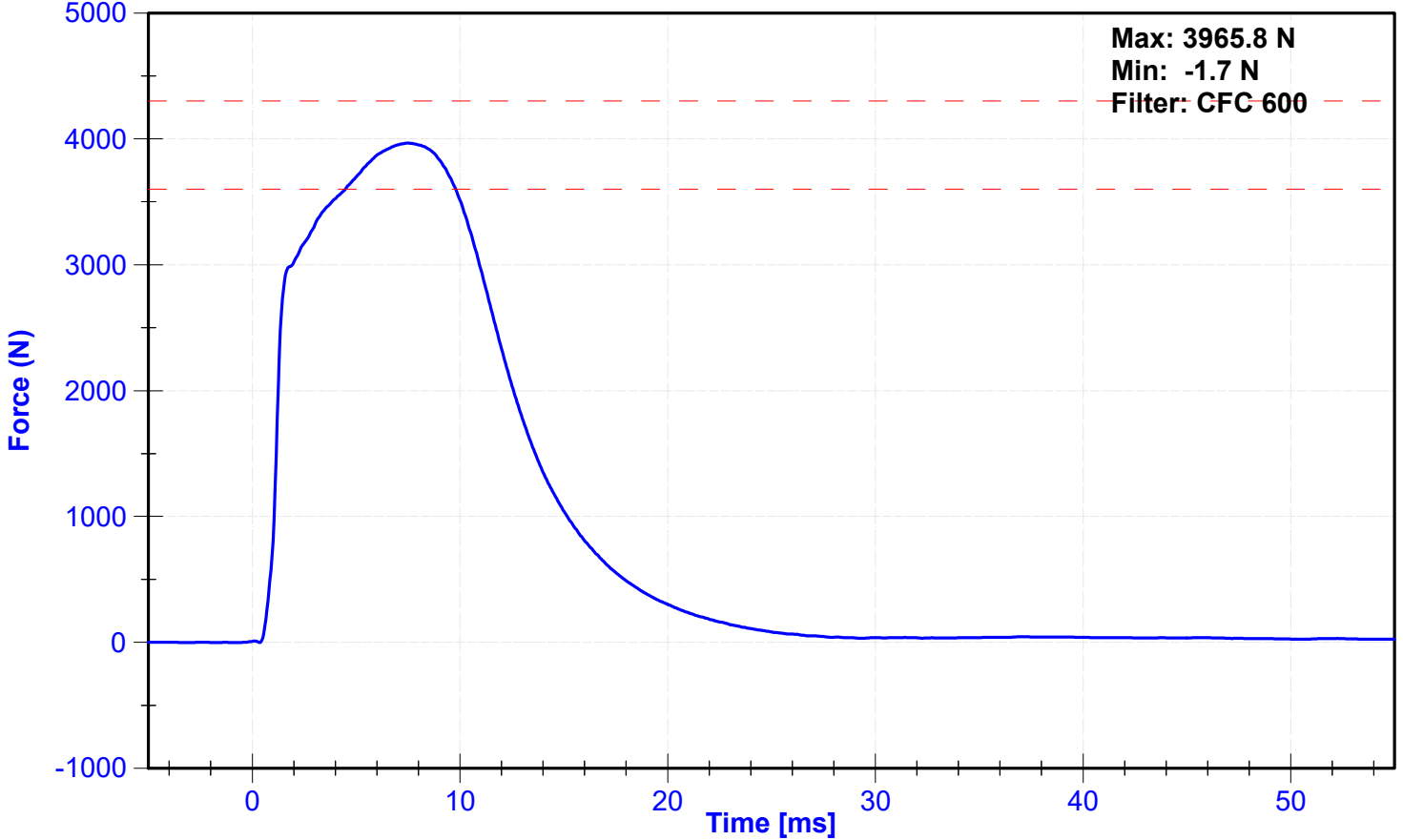
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Pelvis Y Accelerometer	Endevco	P51731	10/17/2024	4/15/2025
Acetabulum Load Cell	Denton	275-FY	10/28/2024	10/28/2025
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A



Lateral Pelvis Acceleration



Acetabulum Force





SID-IIs Pelvis Plug Certification Test

Plug S/N 16662

Test Number 23438

Report Number 23495

Test Date 7/21/2022 11:50:13 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

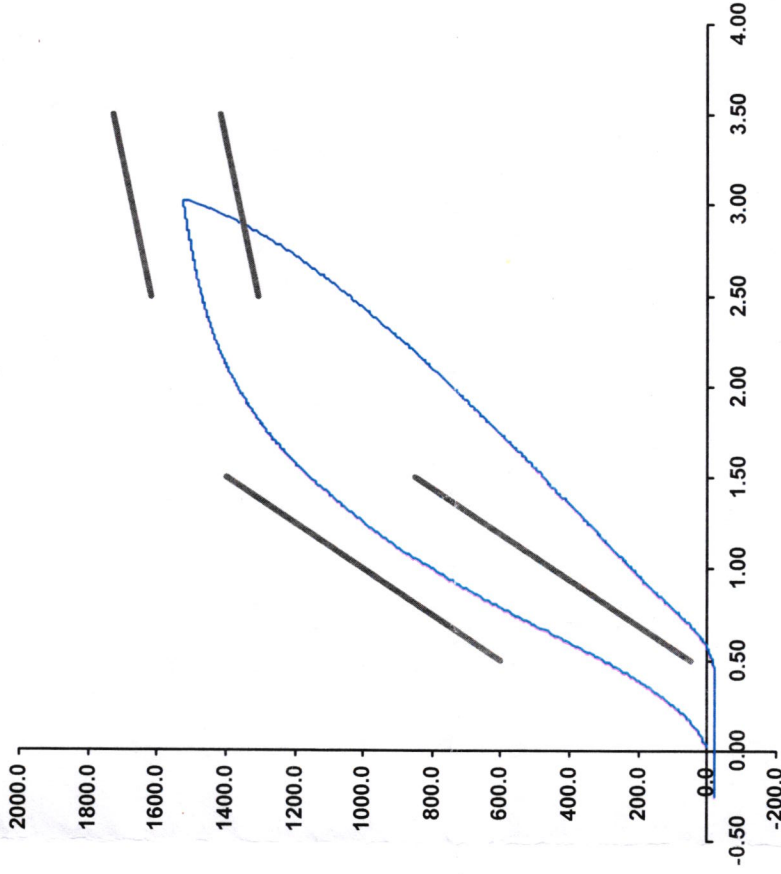
Load Cell S/N (F1360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes: **IMPACT 300 11-29-24**

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 21-Jul-22

SACO Research

By: **DC**

Date: **7/21/22**

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



SID-IIs Pelvis Plug Certification Test

Plug S/N 16664

Test Number 23440

Report Number 23497

Test Date 7/21/2022 11:53:46 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

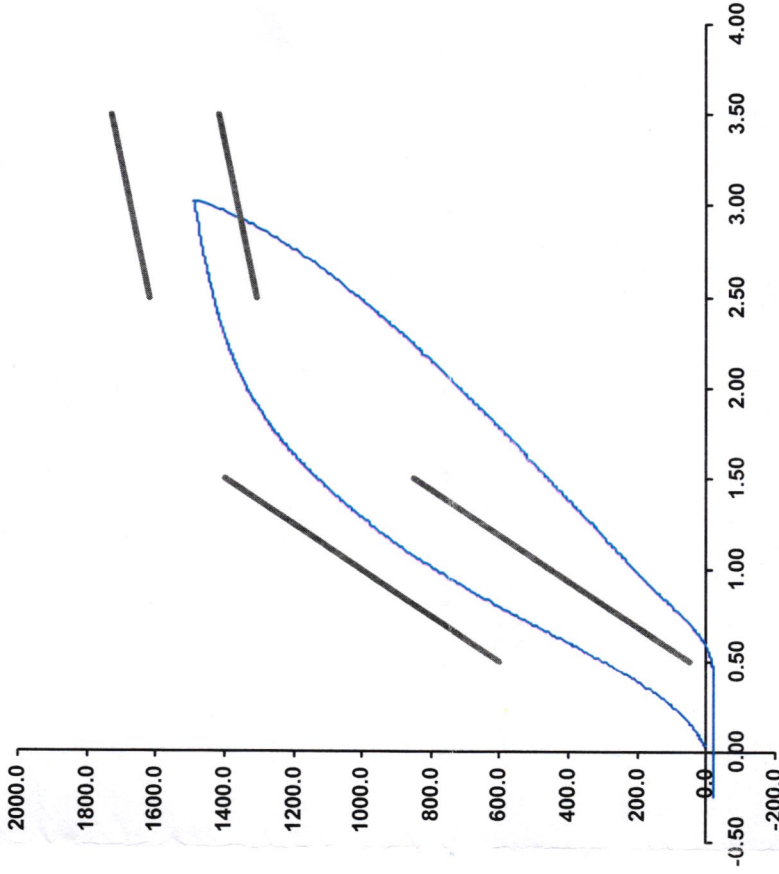
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes: NON IMPACT 300 11-22-24

Force (-N) vs Extension (-mm)



Operator _____

Part Number 180-4450

By: DC Date: 7/21/22

Template No 107 21-Jul-22

SACO Research



SID-IIs Pelvis Plug Certification Test

Plug S/N 16700

Test Number 23500

Report Number 23557

Test Date 7/22/2022 11:16:01 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

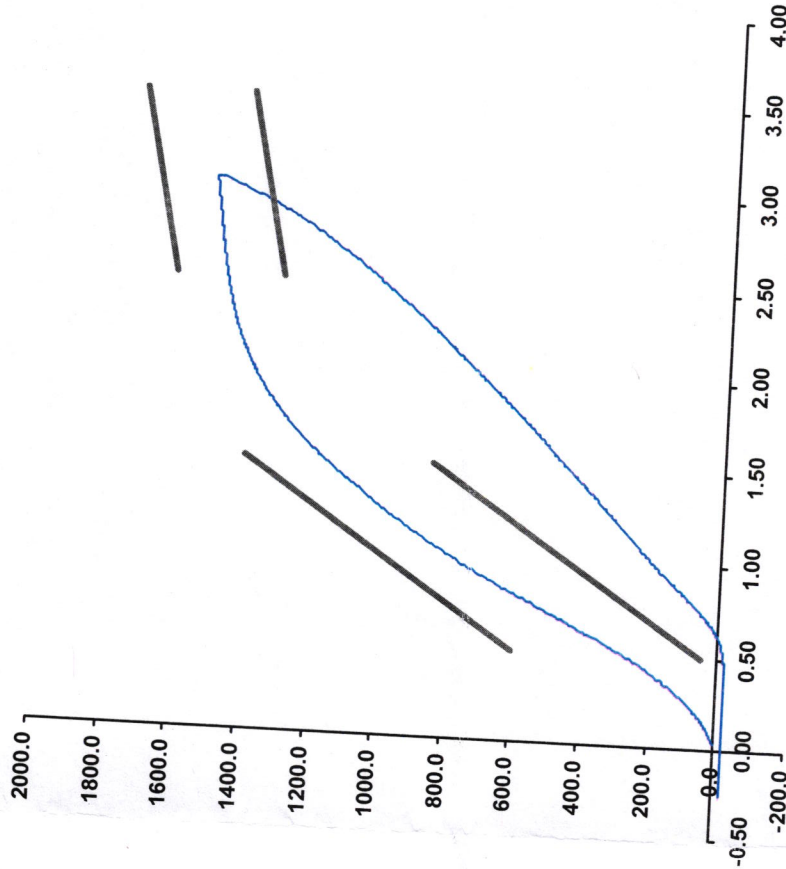
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes: Cert Plug 300 11-22-24

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 22-Jul-22

SACO Research

By: *Dr* Date: 7/22/22

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

ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	300	Laboratory Supervisor	J. Kinderman

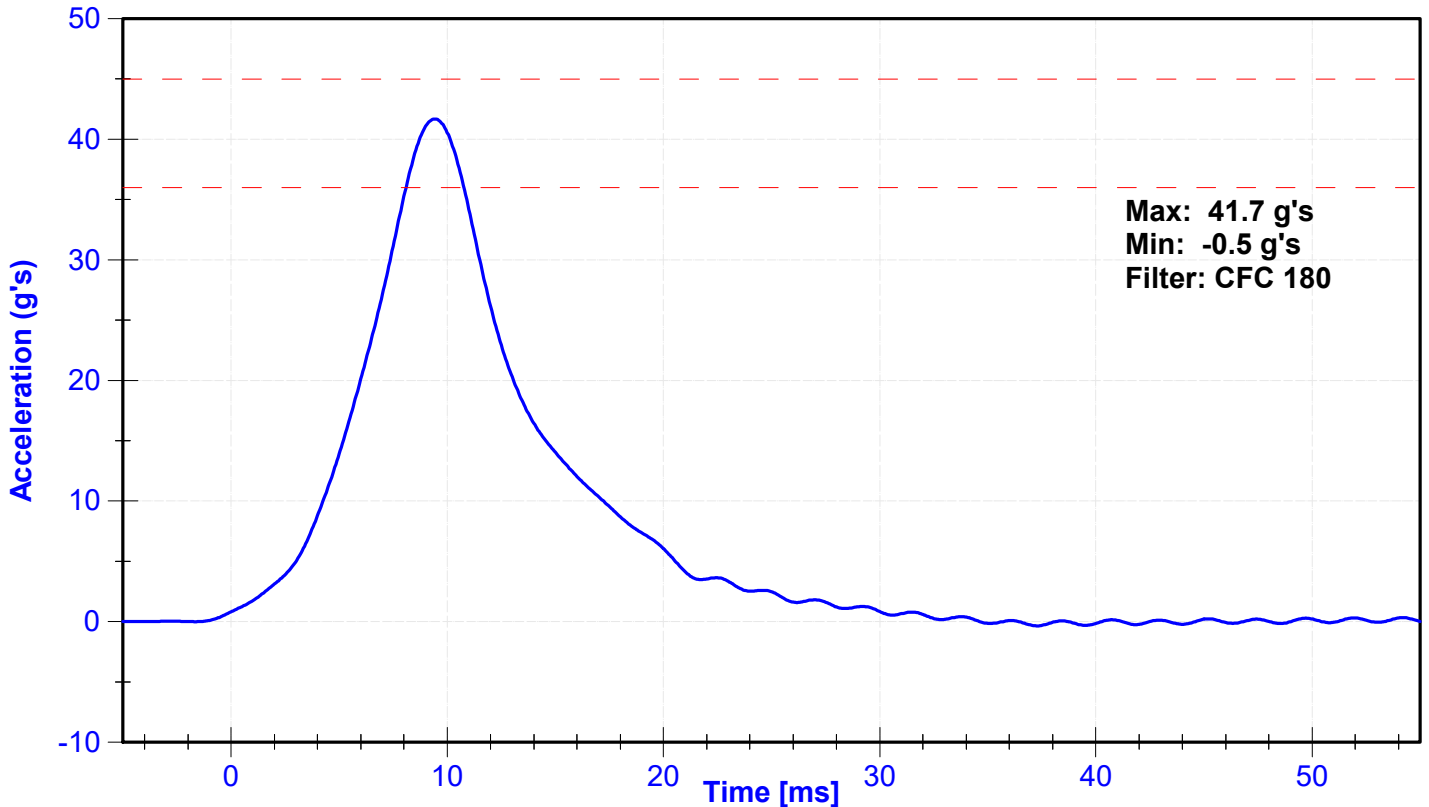
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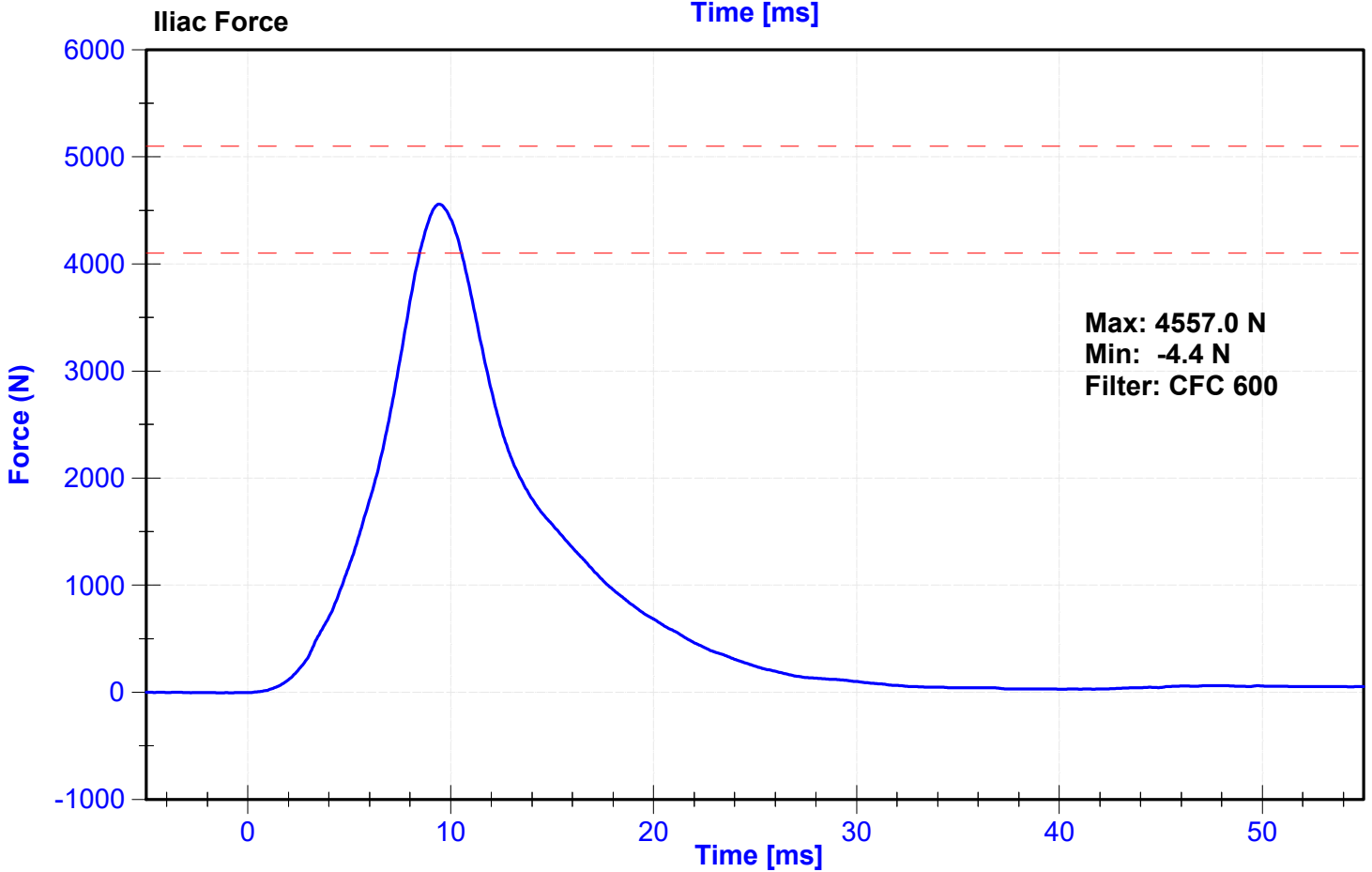
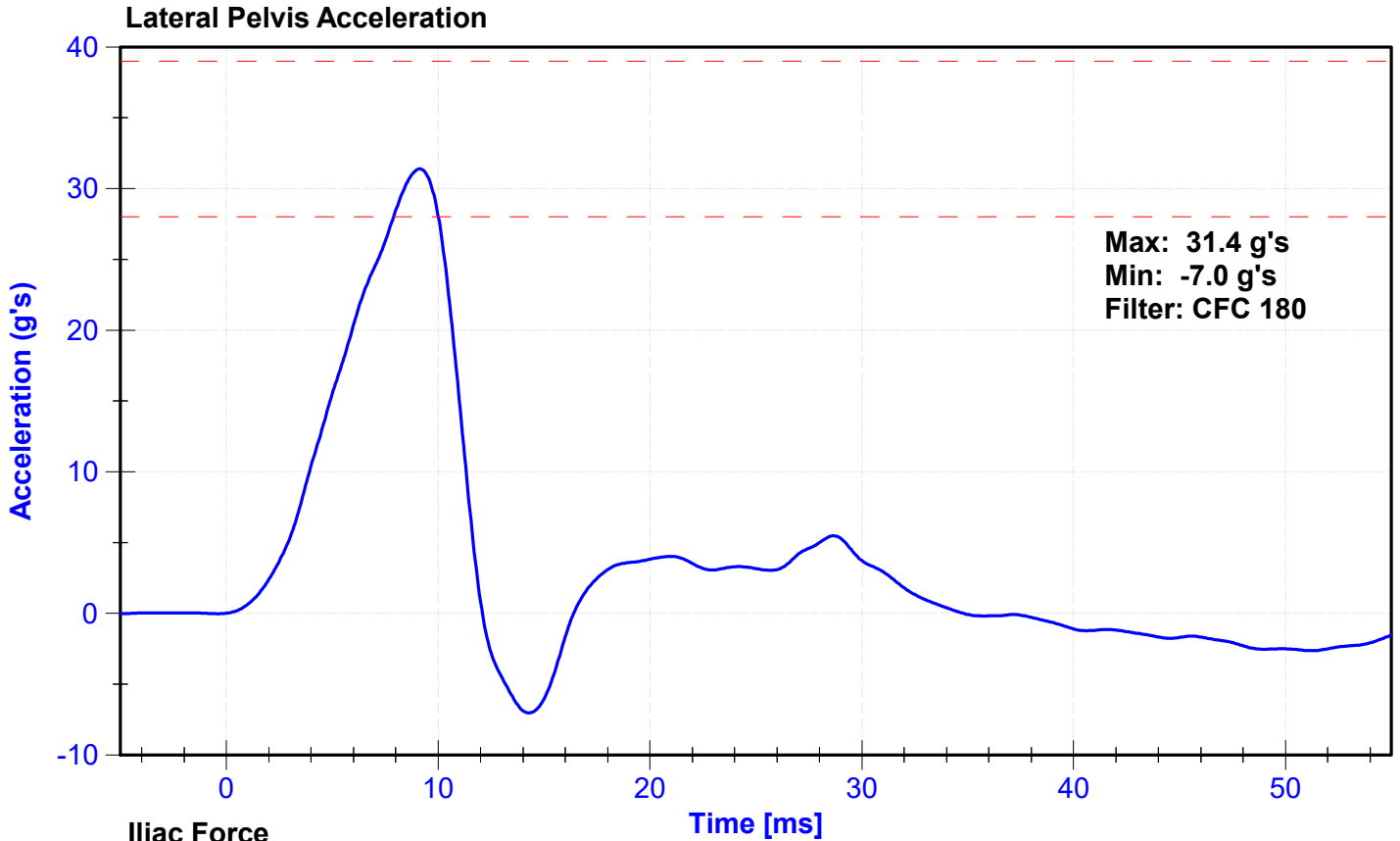
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	36	45	g's	41.7	Pass
Lateral Pelvis Acceleration	28	39	g's	31.4	Pass
Iliac Force	4100	5100	N	4557.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Pelvis Y Accelerometer	Endevco	P51731	10/17/2024	4/15/2025
Iliac Load Cell	Denton	279-FY	10/28/2024	10/28/2025

Probe Acceleration





APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (SID-IIs)

			SID-IIs S/N: 300			
			Serial Number	Manufacturer	Calibration Date	
Head Accelerometers		X	P59018	Endevco	10/17/2024	
		Y	P79189	Endevco	10/17/2024	
		Z	P79587	Endevco	10/17/2024	
Head Accelerometers - Redundant		X	P68057	Endevco	10/17/2024	
		Y	P58986	Endevco	10/17/2024	
		Z	P52025	Endevco	10/17/2024	
Displacement Potentiometer	Shoulder		Y			
	Thoracic Rib	Upper	Y	2316GFE	Servo	10/16/2024
		Middle	Y	085GFE	Servo	10/16/2024
		Lower	Y	1156GFE	Servo	10/16/2024
	Abdominal Rib	Upper	Y	074GFE	Servo	10/16/2024
		Lower	Y	075GFE	Servo	10/16/2024
Lower Spine Accelerometers (T12)		X	P64003	Endevco	10/17/2024	
		Y	P52071	Endevco	10/17/2024	
		Z	P17283	Endevco	10/17/2024	
Acetabulum Load Cell		Y	275-FY	Denton	10/28/2024	
Lilac Wing Load Cell		Y	279-FY	Denton	10/28/2024	
Pelvis Plug (Struck Side)			16691	SACO	07/222022	
Pelvis Plug (Non-Struck Side)			16742	SACO	07/222022	

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	A255984	Measurement Specialties	07/26/2024
Vehicle Center of Gravity	Y	A282760	Measurement Specialties	07/26/2024
Vehicle Center of Gravity	Z	A315972	Measurement Specialties	07/26/2024
Left Floor Sill	Y	G25562	Endevco	10/10/2024
A-Pillar Sill	Y	G25254	Endevco	07/16/2024
A-Pillar Low	Y	G23672	Endevco	08/20/2024
A-Pillar Mid	Y	A405623	Measurement Specialties	07/17/2024
B-Pillar Sill	Y	A373223	Measurement Specialties	10/18/2024
B-Pillar Low	Y	A372822	Measurement Specialties	10/16/2024
B-Pillar Mid	Y	A370928	Measurement Specialties	08/20/2024
Driver Seat	Y	G22439	Endevco	10/14/2024
Engine Top	X	A373244	Measurement Specialties	10/10/2024
Engine Top	Y	A431372	Measurement Specialties	10/10/2024
Firewall	Y	A373245	Measurement Specialties	07/26/2024
Right Roof	Y	A398641	Measurement Specialties	10/18/2024
Right Floor Sill	Y	G22717	Endevco	10/18/2024
Rear Floorpan	X	A335428	Measurement Specialties	09/17/2024
Rear Floorpan	Y	A373221	Measurement Specialties	09/17/2024

Table 3 – Pole Instrumentation

Pole Instrumentation	Serial Number	Manufacturer	Calibration Date
Load Cell 1	1220AF-1277329-F0	Interface	06/21/2024
Load Cell 2	1220AF-1117017-F0	Interface	06/21/2024
Load Cell 3	1220AF-1117025-F0	Interface	06/21/2024
Load Cell 4	1220AF-1130989-F0	Interface	06/21/2024
Load Cell 5	1220AF-1281288-F0	Interface	06/21/2024
Load Cell 6	1220AF-1281285-F0	Interface	06/21/2024
Load Cell 7	1220AF-1117035-F0	Interface	06/21/2024
Load Cell 8	1220AF-1117011-F0	Interface	06/21/2024