

REPORT NUMBER: SPNCAP-CAL-24-001

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

**Hyundai Motor Manufacturing Alabama, LLC
2024 Hyundai Tucson
5 Door SUV**

NHTSA No: O20244202

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



October 23, 2024

FINAL REPORT

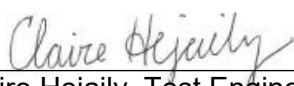
**PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVE SE
WASHINGTON, D.C. 20590**

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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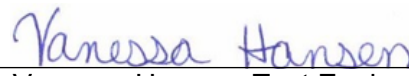
Prepared
by:



Claire Hejaily, Test Engineer

Date: October 23, 2024

Approved
by:



Vanessa Hansen, Test Engineer

Date: October 23, 2024

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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16. Abstract A 32.20 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject 2024 Hyundai Tucson 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 December 1, 2023. The impact velocity of the vehicle was 32.27 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 331 mm located at level 3. The test vehicle's occupant performance data is as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD (SID-IIs) (Serial No.DG8012)</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC36)</td> <td></td> <td>1000</td> <td>252.459</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>G</td> <td>82</td> <td>36.433</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>2433.745</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38</td> <td>23.373</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45*</td> <td>20.619</td> </tr> </tbody> </table> The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.						Measurement Description	Driver ATD (SID-IIs) (Serial No.DG8012)			Units	Threshold	Result	Head Injury Criteria (HIC36)		1000	252.459	Resultant Lower Spine Acceleration	G	82	36.433	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2433.745	Maximum Thoracic Rib Deflection	mm	38	23.373	Maximum Abdominal Rib Deflection	mm	45*	20.619
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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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Form DOT F1700.7 (8-72)

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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY 2024 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. 693JJ920D000016. The purpose of this test is to generate comparative side impact performance in a 2024 Hyundai Tucson 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 Tucson 5 Door SUV. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.27 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on December 1, 2023. 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	252.459
Resultant Lower Spine Acceleration	G	82	36.433
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2433.745
Maximum Thoracic Rib Deflection	mm	38	23.373
Maximum Abdominal Rib Deflection	mm	45*	20.619

*Proposed IARV

Supplemental restraint information was recorded as follows:

SUPPLEMENTAL RESTRAINT INFORMATION

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

GENERAL COMMENTS:

1. P1 serial number - DG8012

Data Anomalies:

- Left Middle A-Pillar Y Acceleration, Exceeded calibration range at 26.8 ms
- Left Middle B-Pillar Y Acceleration, Exceeded calibration range at 12.5 ms

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

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

Data Sheet No. 2 - Seat, Seat Belt, Steering Wheel Adjustment and Fuel Systems Data

Data Sheet No. 3 - Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 - Dummy Lateral Clearance Dimensions

Data Sheet No. 5 - Camera and instrumentation Data

Data Sheet No. 6 - Vehicle Accelerometer Data

Data Sheet No. 7- Rigid Pole Load Cell Data

Data Sheet No. 8 - Post-Test Observations

Data Sheet No. 9 - Test Vehicle Profile Measurements

Data Sheet No. 10 - Test Vehicle Exterior Crush Measurements

Data Sheet No. 11 - Vehicle Damage Profile Distances

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

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

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

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

NHTSA No.: O20244202
Test Date: 12/01/2023

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20244202	Traction Control System (TCS)	Yes
Model Year	2024	Auto-Leveling System	No
Make	Hyundai	Automatic Door Locks (ADL)	Yes
Model	Tucson	Power Window Auto-Reverse	Yes
Body Style	SUV	Other Optional Feature	-
VIN	5NMJB3DE9RH325118	Driver Front Airbag	Yes
Body Color	Gray	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	327 mi	Driver Head/Torso Airbag	No
Engine Displacement (L)	2.5	Driver Torso Airbag	No
Type / No. Cylinders	I4	Driver Torso / Pelvis Airbag	Yes
Engine Placement	Transverse	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	No
Transmission Speeds	8-Speed	Rear Pass. Curtain Airbag	Yes
Overdrive	Yes	Rear Pass. Head / Torso Airbag	No
Final Drive	Front Wheel Drive	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso / Pelvis Airbag	Yes
Sunroof / T-Top	No	Rear Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioner	No
Power Seats	Yes	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	No
		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	GVWR	3000
Date of Manufacture	SEP/15/23	GAWR Front	1260
Vehicle Type	MPV	GAWR Rear	1200

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	N/A	5	
Vehicle Capacity Weight (VCW) (kg)				420	(A)
DSC x 68.0 kg				340	(B)
Cargo Weight (RCLW) (kg)				80	(A-B)

VEHICLE SEAT TYPE

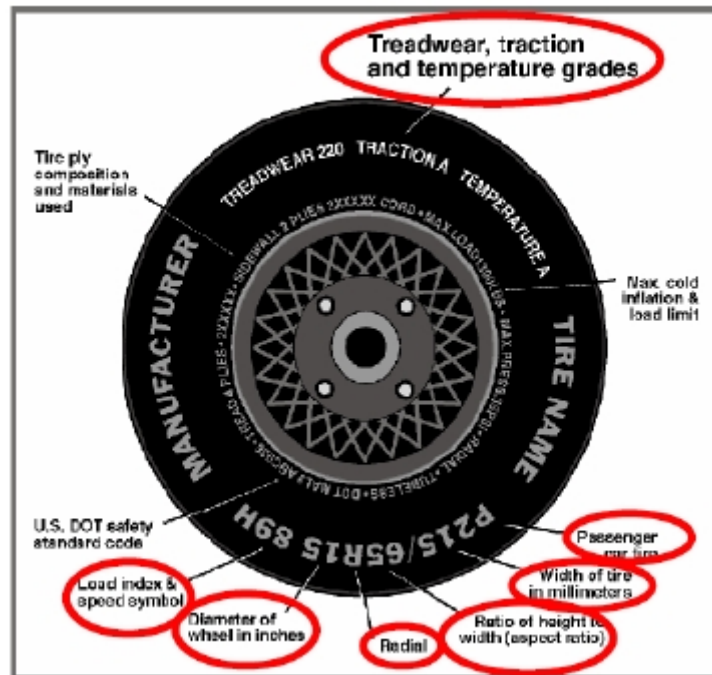
Seating Location	Type Of Seat Pan				Type Of Seat Back		
	Bucket	Bench	Split Bench	Contour	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front	X						X
Rear or Second Row Seat			X			X	
Third Row seat	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

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

NHTSA No.: O20244202
 Test Date: 12/01/2023

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	235/65R17	235/65R17
Tire Size on Vehicle	235/65R17	235/65R17
Tire Manufacturer	KUMHO	KUMHO
Tire Model	Crugen HP71	Crugen HP71
Treadwear	540	540
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Steel, 2 Polyester, 1 Polyamide	2 Steel, 2 Polyester, 1 Polyamide
Load Index / Speed Symbol	104H	104H
Tire Material	Rubber	Rubber
DOT Safety Code Left	0005AYA8E	0005AYA8E 3623
DOT Safety Code Right	0005AYA8E 3423	0005AYA8E

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

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

NHTSA No.: O20244202
 Test Date: 12/01/2023

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	204	225	227	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	475	332		483	375		498	375	
Right	kg	456	317		471	374		453	376	
Ratio	%	58.9	41.1		56	44		55.8	44.1	
Totals	kg	931	649	1580	954	749	1703	951	751	1702

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1580	(A)
Actual Weight of 1 P572V (SID-IIs) ATD Used	kg	50	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	80	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1710	(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	+0.55	+0.3	+0.30	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg	-0.85	-0.75	-0.75	Yes
Front Bumper-Line Angle (left-to-right)**	Deg	+0.15	+0.15	-0.05	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg	+0.85	+0.85	+1.25	Yes
Vehicle CG (Aft of Front Axle)	mm	1132	1212	1216	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	18	6	21	

* 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 Tucson 5 Door SUV	NHTSA No.: O20244202
Test Program: NCAP Side Pole Impact Test	Test Date: 12/01/2023

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	5
Spare Tire & Jack	16
Optional Equipment	13
Ballast / Equipment Added	63.5

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

TEST SURFACE MARKING

	Distance from 75° Impact Location Line (mm)
Fore 25 mm target	1033
Aft 25 mm target	1034

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

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

NHTSA No.: O20244202
 Test Date: 12/01/2023

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	21.3	13.0	17.2
Front Passenger Seat	FIXED	FIXED	FIXED
Front Center Seat			
Struck Side Rear Seat	FIXED	FIXED	FIXED
Non-Struck Side Rear Seat	FIXED	FIXED	FIXED
Rear Center Seat	FIXED	FIXED	FIXED

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	17.2	49	Max	70	76	82
			Mid	38	43	49
			Min	4	11	16
Front Passenger Seat	FIXED	FIXED	Max			
			Mid			
			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 Tucson 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

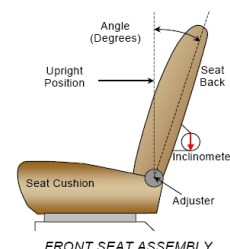
NHTSA No.: O20244202
 Test Date: 12/01/2023

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	240	Power	0	Power
Front Passenger Seat	240	39 (0-38)	0	0
Front Center Seat				
Struck Side Rear Seat	FIXED	FIXED	FIXED	FIXED
Non-Struck Side Rear Seat	FIXED	FIXED	FIXED	FIXED
Rear Center Seat	FIXED	FIXED	FIXED	FIXED

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	Power	6.65	Power
Front Passenger Seat	58.2	30 (0-29)	6.35	4
Front Center Seat				
Struck Side Rear Seat	24.2	13 (0-12)	4.4	0
Non-Struck Side Rear Seat	24.1	13 (0-12)	4.3	0
Rear Center Seat	24.1	13 (0-12)	4.3	0

SEAT BELT ANCHORAGE ADJUSTMENT

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

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

HEAD RESTRAINT ADJUSTMENT

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

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

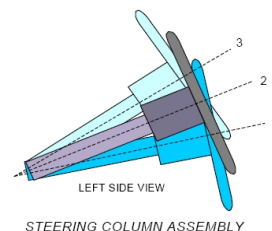
DATA SHEET NO. 2 ... (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

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

NHTSA No.: O20244202
 Test Date: 12/01/2023

STEERING COLUMN POSITIONS

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

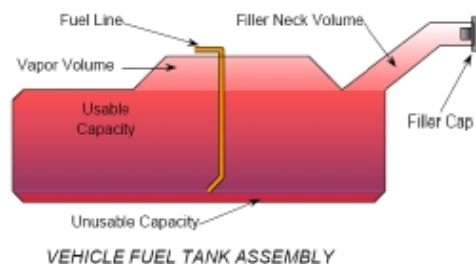


	Degrees	Fore / Aft Position (mm)
Lowermost - Position No. 1	23.6	
Geometric center - Position No. 2	26.2	
Uppermost - Position No. 3	28.8	
Telescoping Steering Wheel Travel		56
Test Position	26.2	28

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	54.09
Usable Capacity of "Optional Tank" - see Form No. 1	N/A
Usable Capacity of "Standard Tank" - see Owner's Manual	54.09
Usable Capacity of "Optional Tank" - see Owner's Manual	N/A
93% of Usable Capacity	50.3
Actual Amount of Solvent Used in Test	50.3
1/3 of Usable Capacity	18.03

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

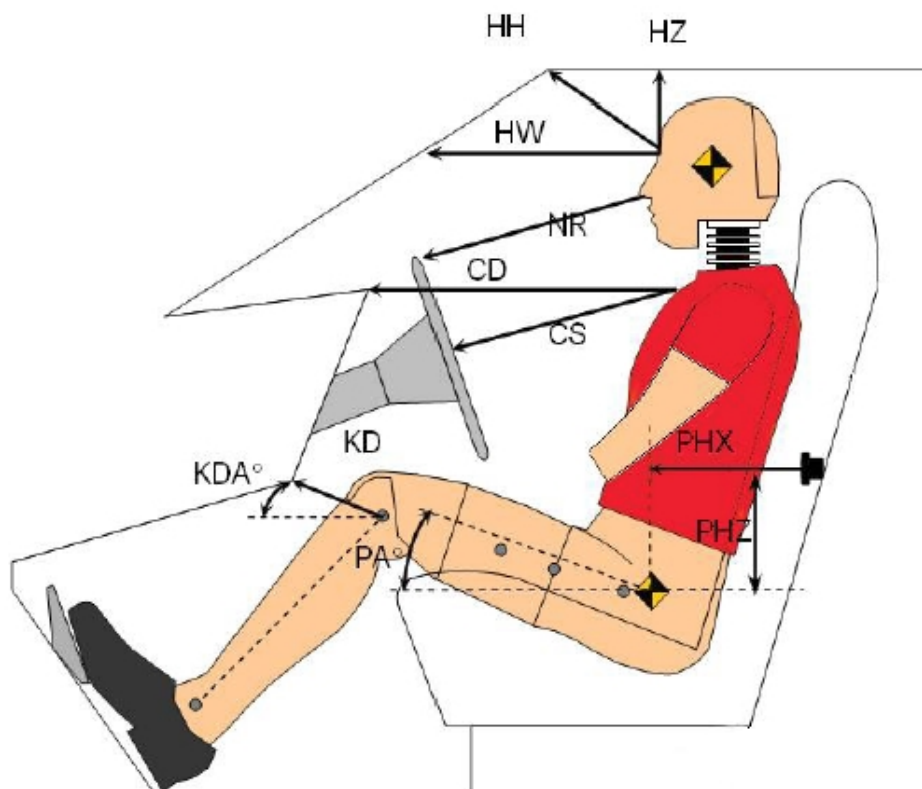
Capacity stated in Form No. 1?

☒ Yes ☐ No

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

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

NHTSA No.: O20244202
 Test Date: 12/01/2023



Left Side View

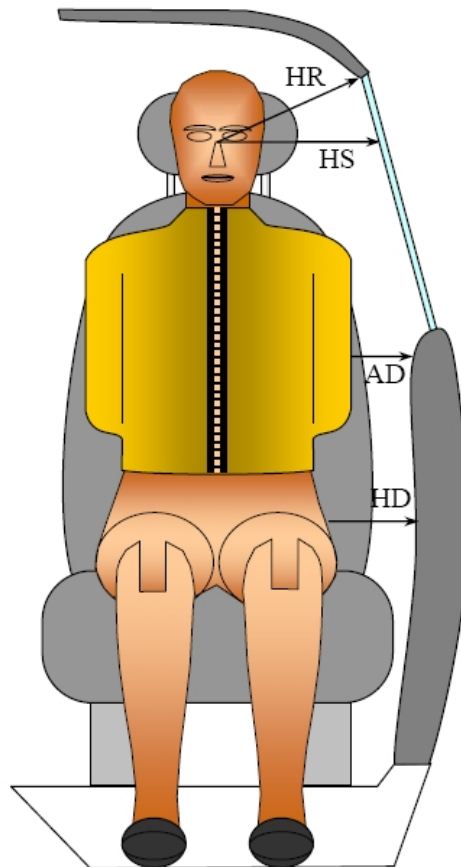
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver (Serial No. DG8012)	
		Length (mm)	Angle (°)
HH	Head to Header	289	
HW	Head to Windshield	610	
HZ	Head to Roof Liner	199	
NR	Nose to Rim	258	
CD	Chest to Dash	425	
CS	Chest to Steering Wheel	188	
KD(L) / KDA(L)°	Left Knee to Dash	107	38.3
KD(R) / KDA(R)°	Right Knee to Dash	108	35.3
PAX°	Pelvic Tilt Angle (X-Axis)		19.1
PAY°	Pelvic Tilt Angle (Y-Axis)		0.2
PHX	Hip Point to Striker (X-Axis)	324	
PHZ	Hip Point to Striker (Z-Axis)	167	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

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

NHTSA No.: O20244202
Test Date: 12/01/2023



FRONT VIEW OF DUMMY

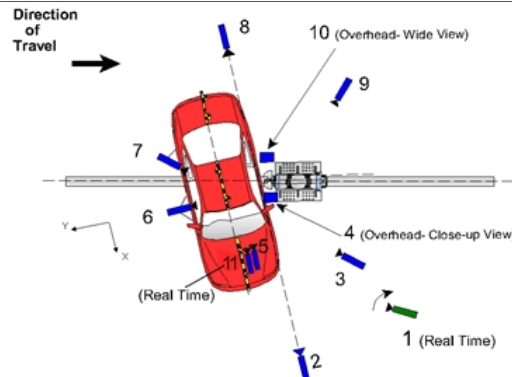
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver – Length (Serial No. DG8012)
HR	Head to Side Header	mm	253
HS	Head to Side Window	mm	374
AD	Arm to Door	mm	159
HD	H-Point to Door	mm	178

DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

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

NHTSA No.: O20244202
Test Date: 12/01/2023



CAMERA LOCATIONS AND DATA

No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-time (24 - 30 fps) pan view of impact				Zoom	60
2	Front ground level - impact view	7123	0	-1546	28	1000
3	Impact side 45° - forward pole view	4897	-610	-1435	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	-7536	0	-1486	28	1000
9	Impact side 45° - rearward pole view	-4252	-3283	-1456	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.

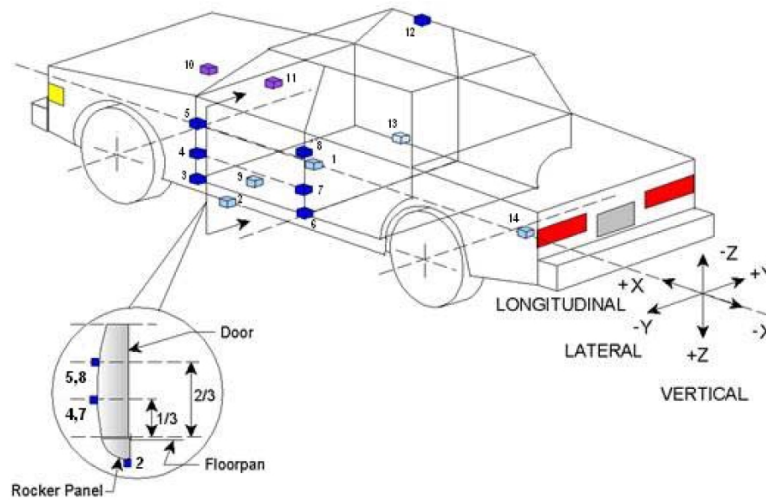
INSTRUMENTATION

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 Tucson 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244202
Test Date: 12/01/2023



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2087	-10	102
2	Left Floor Sill	2922	-670	98
3	A-Pillar Sill	3120	-667	105
4	A-Pillar Low	3288	-632	-145
5	A-Pillar Mid	3151	-654	-628
6	B-Pillar Sill	2063	-674	95
7	B-Pillar Low	2127	-687	-206
8	B-Pillar Mid	2099	-668	-566
9	Driver Seat Track	2418	-569	51
10	Engine Top	3909	367	-371
11	Firewall	3487	205	-395
12	Right Roof	2281	617	-1093
13	Right Floor Sill	2861	675	99
14	Rear Floor Pan	993	3	35

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 Tucson 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244202
Test Date: 12/01/2023

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 Tucson 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244202
Test Date: 12/01/2023

TEST DUMMY INFORMATION AND CONTACT POINTS

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

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 Tucson 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244202
Test Date: 12/01/2023

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar & B-Pillar buckled
Sill Separation	330 mm at impact area
Windshield Damage	cracked throughout with separation along A-Pillar and driver bottom
Side Window Damage	Driver window shattered during impact
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

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

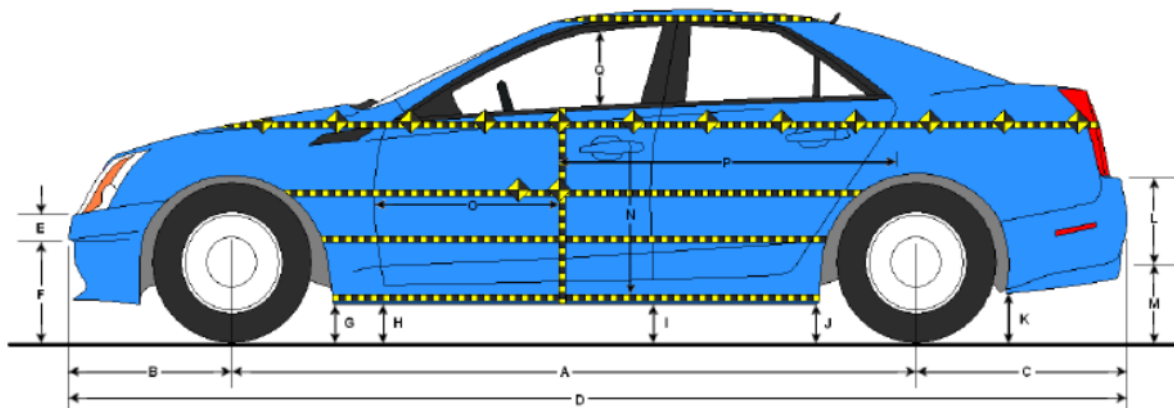
Measured Parameter	Units	Tolerance	Value
Vertical Impact Ref Line - Aft of Front Axle, Intended Impact Pt	mm		1111
Actual Impact Point - Aft of Front Axle	mm		1114
Horizontal Offset (+ forward / - rearward)	mm	+/- 38*	-3
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	deg	75 +/- 3	75
Trap No. 1 Velocity - Primary	kph	31.4 to 33.0	32.27
Trap No. 2 Velocity - Redundant	kph	31.4 to 33.0	32.24

*Of Intended Impact Point

DATA SHEET NO. 9
TEST VEHICLE PROFILE MEASUREMENTS

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

NHTSA No.: O20244202
Test Date: 12/01/2023



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

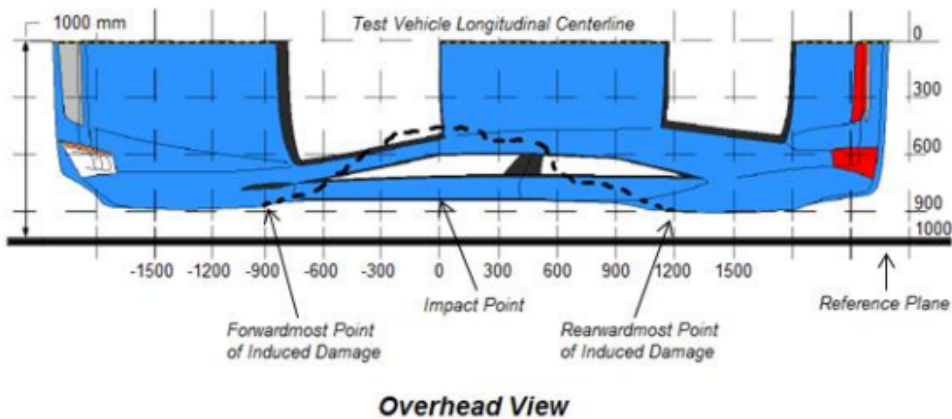
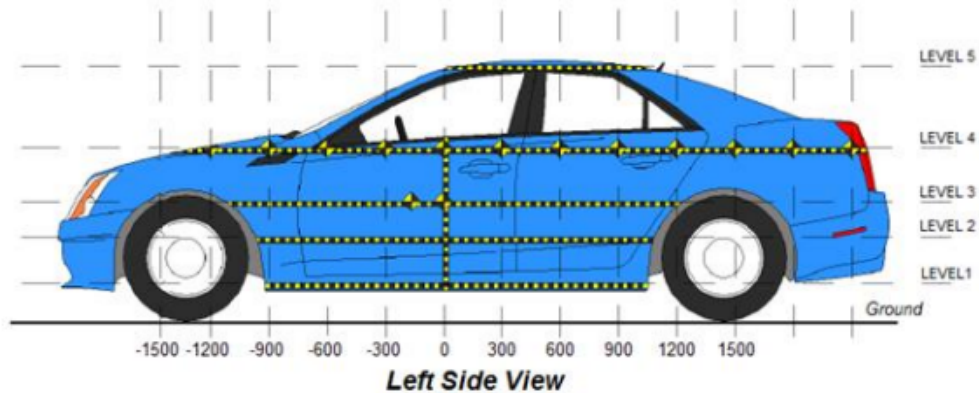
No.	Measurement Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	2756	2689	-67
B	Front Axle to FSOV	895	925	30
C	Rear Axle to RSOV	977	982	5
D	Total Length at Centerline	4628	4596	-32
E	Front Bumper Thickness	105	105	0
F	Front Bumper Bottom to Ground	481	503	22
G	Sill Height at Front Wheel Well	250	236	-14
H	Sill Height at Front Door Leading Edge	250	241	-9
I	Sill Height at B Pillar	245	261	16
J1	Sill Height at Rear Wheel Well	244	273	29
J2	Pinch Weld Height at Rear Wheel Well	237	263	26
K	Sill Height Aft of Rear Wheel Well	289	295	6
L	Rear Bumper Thickness	86	86	0
M	Rear Bumper Bottom to Ground	497	486	-11
N	Sill Height to Bottom of Front Window Sill	892	895	3
O	Front Door Leading Edge to Impact CL	613	533	-80
P	Rear Door Trailing Edge to Impact CL	1536	1472	-64
Q	Front Window Opening	421	418	-3
R	Right Side Length	4528	4524	-4
S	Left Side Length	4533	4478	-55
T	Vehicle Width at B-Pillars	1817	1742	-75
U	Front Wheel Track width	1617	1621	4
V	Rear Wheel Track Width	1626	1631	5

* All measurements in mm with tolerance of ± 3 mm

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

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

NHTSA No.: O20244202
 Test Date: 12/01/2023



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	365	298	0
2	Driver H-Point	mm	713	329	150
3	Mid-Door	mm	799	331	150
4	Window Sill	mm	1080	260	150
5	Window Top	mm	1606	46	300

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 Tucson 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244202
 Test Date: 12/01/2023

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

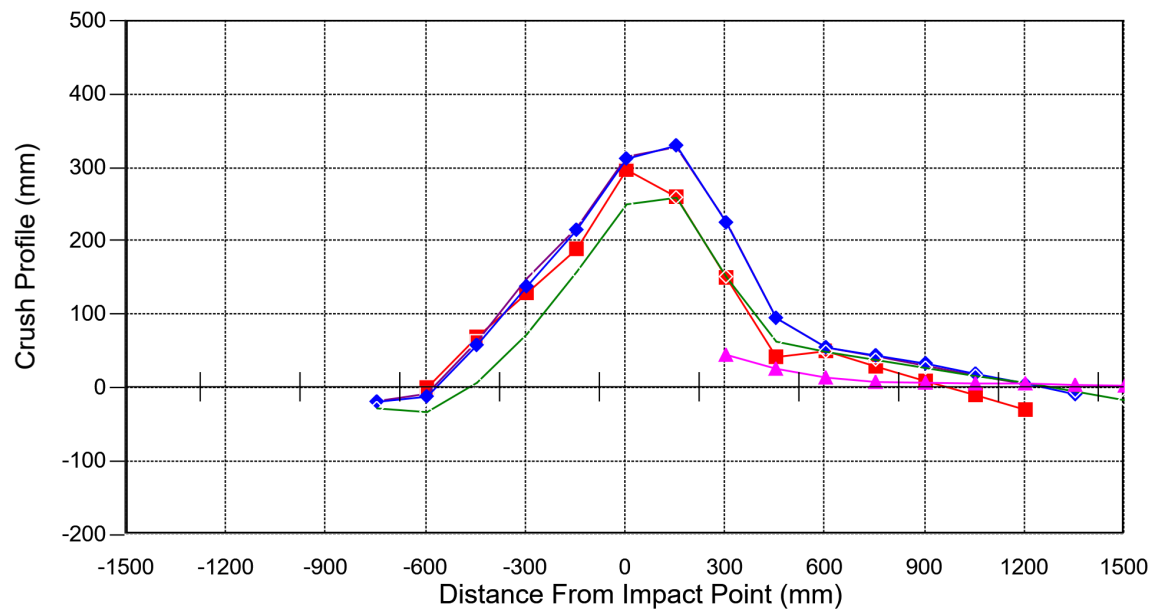
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500															
-1350															
-1200															
-1050															
-900															
-750		927	934	817			944	952	844			-17	-18	-27	
-600	905	929	926	823		904	936	937	855		1	-7	-11	-32	
-450	902	916	916	823		832	852	857	815		70	64	59	8	
-300	902	904	905	826		772	754	766	752		130	150	139	74	
-150	902	906	903	829		712	687	687	670		190	219	216	159	
0	901	909	906	837		603	593	593	586		298	316	313	251	
150	901	910	908	841		640	581	577	581		261	329	331	260	
300	901	909	909	845	605	750	682	683	693	559	151	227	226	152	46
450	902	908	909	848	610	859	812	813	784	583	43	96	96	64	27
600	902	904	907	854	610	851	848	851	804	595	51	56	56	50	15
750	902	900	904	861	607	872	856	859	822	598	30	44	45	39	9
900	906	913	906	873	604	896	882	872	845	596	10	31	34	28	8
1050	911	925	919	874	594	920	907	899	857	587	-9	18	20	17	7
1200	913	934	933	871	583	942	928	926	863	576	-29	6	7	8	7
1350			927	865	566			935	869	561			-8	-4	5
1500				860	546				876	542				-16	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 Tucson 5 Door SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244202
 Test Date: 12/01/2023



— LEVEL 1 Side Sill: 365 mm above ground — LEVEL 2 H-Point: 713 mm above ground — LEVEL 3 Mid Door: 799 mm above ground — LEVEL 4 Window Sill: 1080 mm above ground
 — LEVEL 5 Window Top: 1606 mm above ground

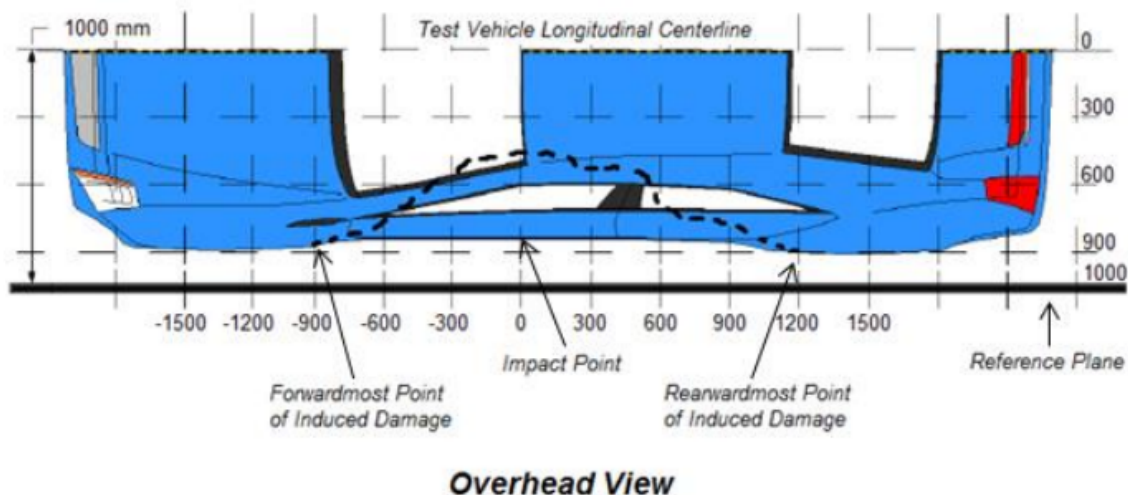
Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO.11 VEHICLE DAMAGE PROFILE DISTANCE

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

NHTSA No.: O20244202
Test Date: 12/01/2023

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	48	66	-18
2	-330	3	216	93	123
3	90	3	417	93	324
4	510	3	172	92	80
5	930	3	123	91	32
6	1350	3	65	73	-8

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

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

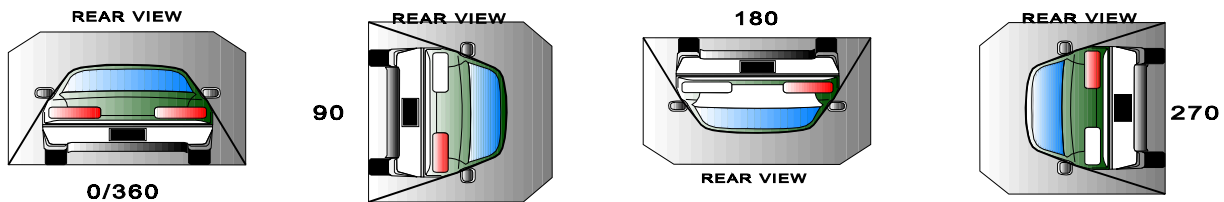
NHTSA No.: O20244202
Test Date: 12/01/2023

Test Time: 9:12 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 Occurred



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	72	300	372
90° to 180°	65	300	365
180° to 270°	65	300	365
270° to 360°	64	300	364

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	

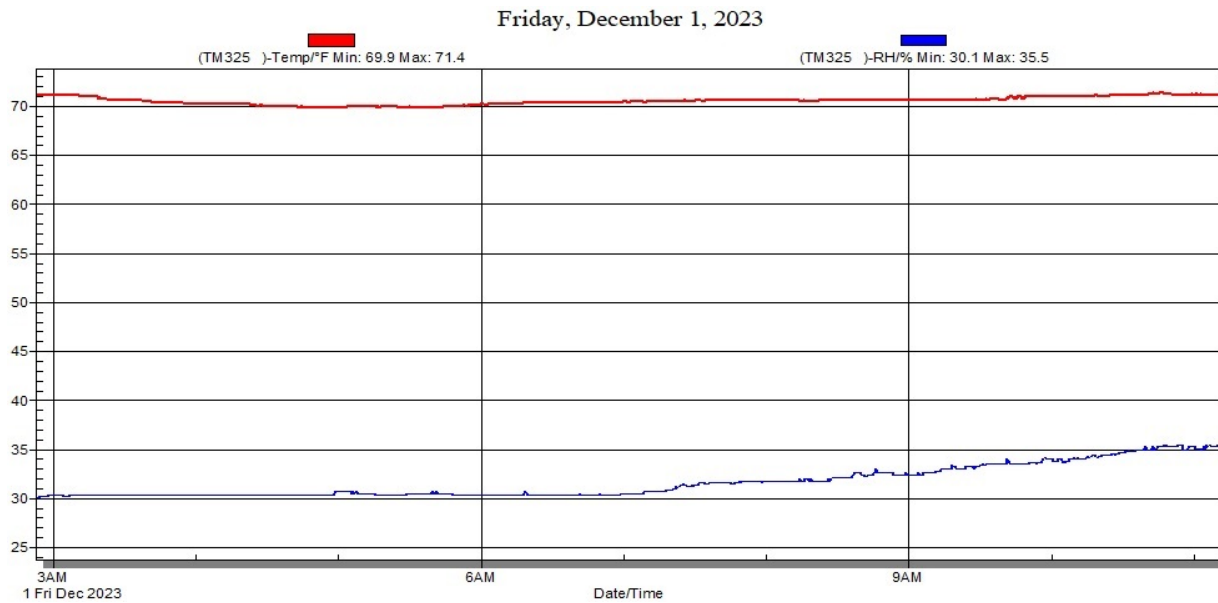
SOLVENT SPILLAGE LOCATION TABLE

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 Tucson 5 Door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20244202
Test Date: 12/01/2023



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

APPENDIX A
PHOTOGRAPHS

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



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



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



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



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



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



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



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



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



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



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

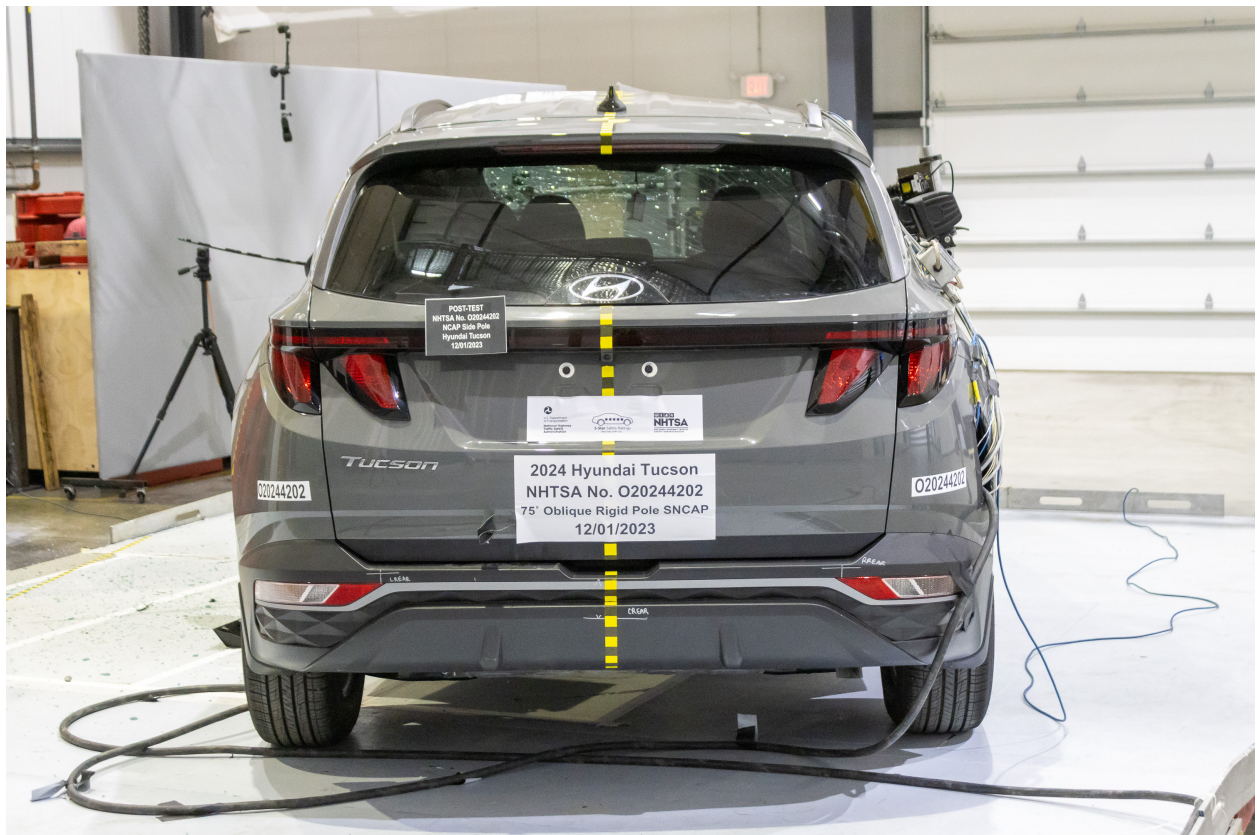


Figure A-12: Post-Test Rear View of Test Vehicle



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



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

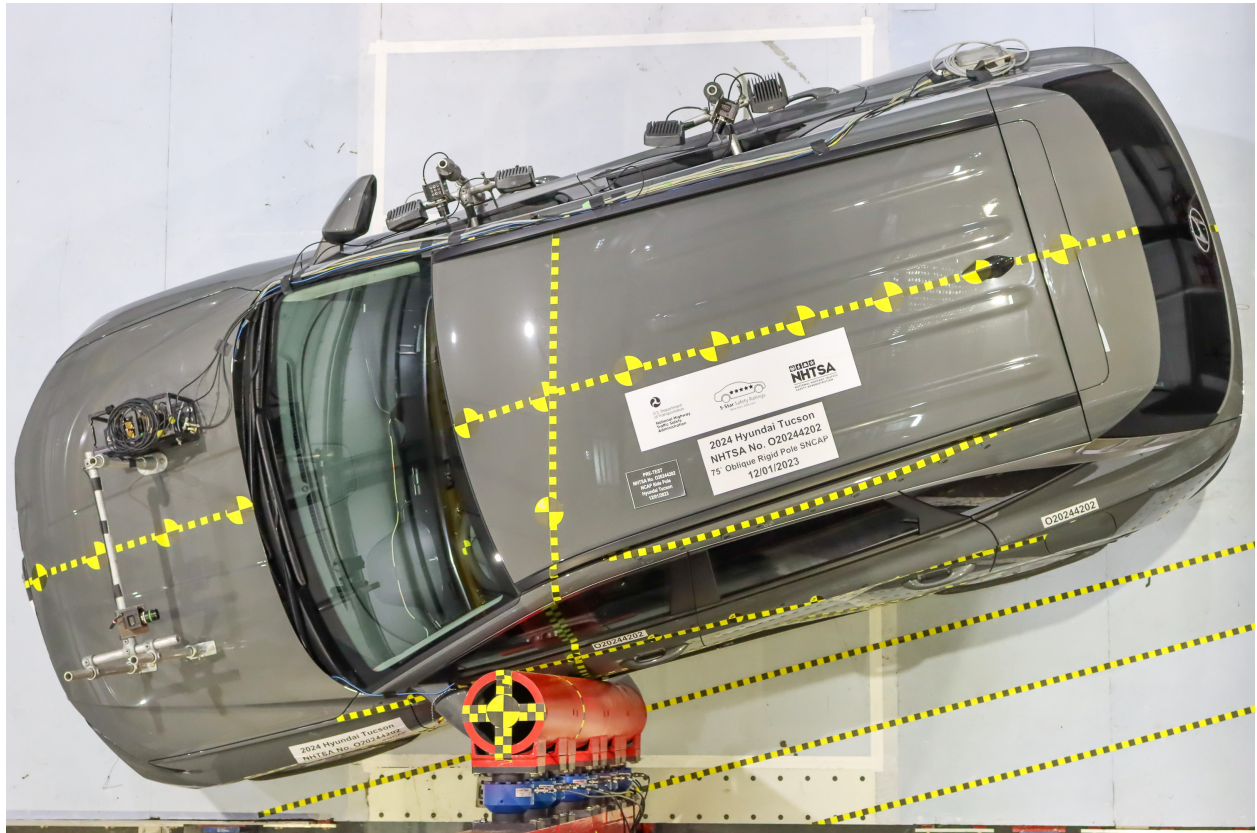


Figure A-15: Pre-Test Overhead View of Test Area

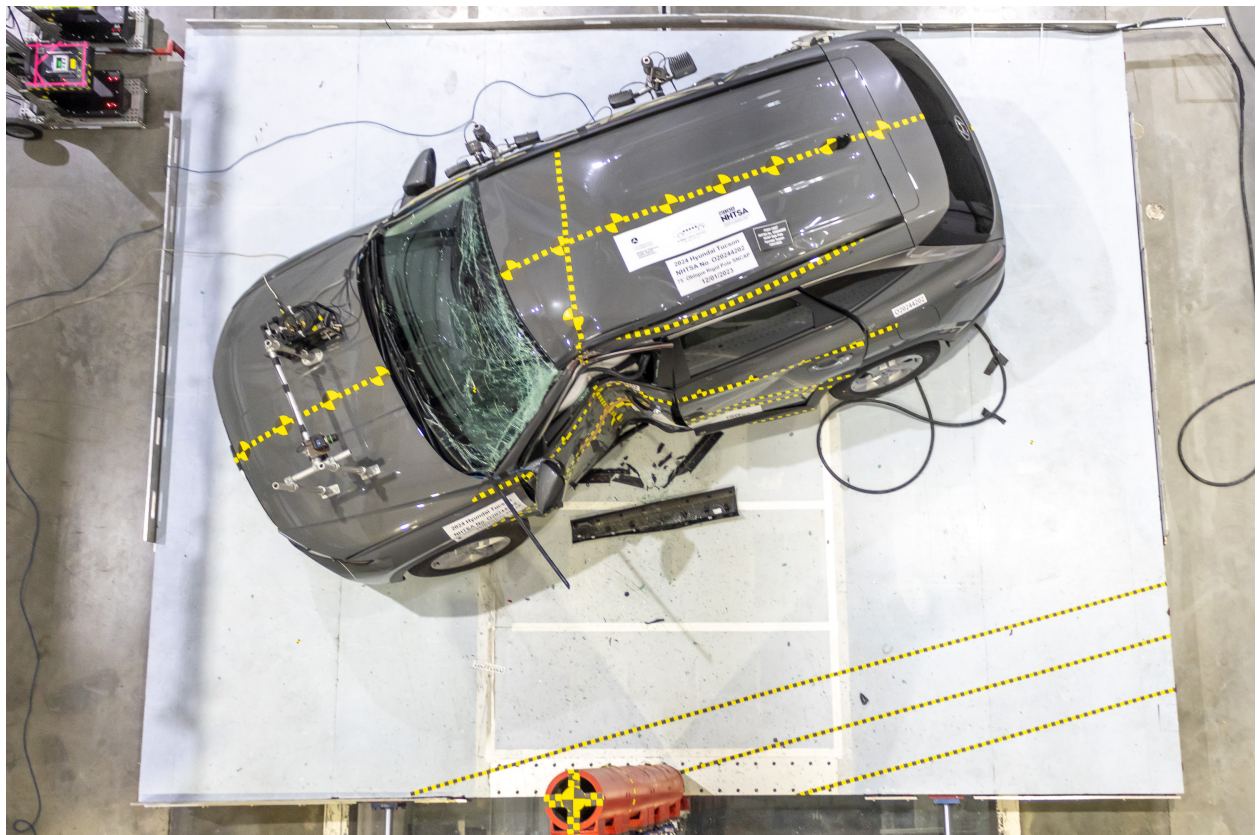


Figure A-16: Post-Test Overhead View of Test Area



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



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



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



Figure A-20: Post-Test Close-Up View of Impact Point Target Showing Impact Location



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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

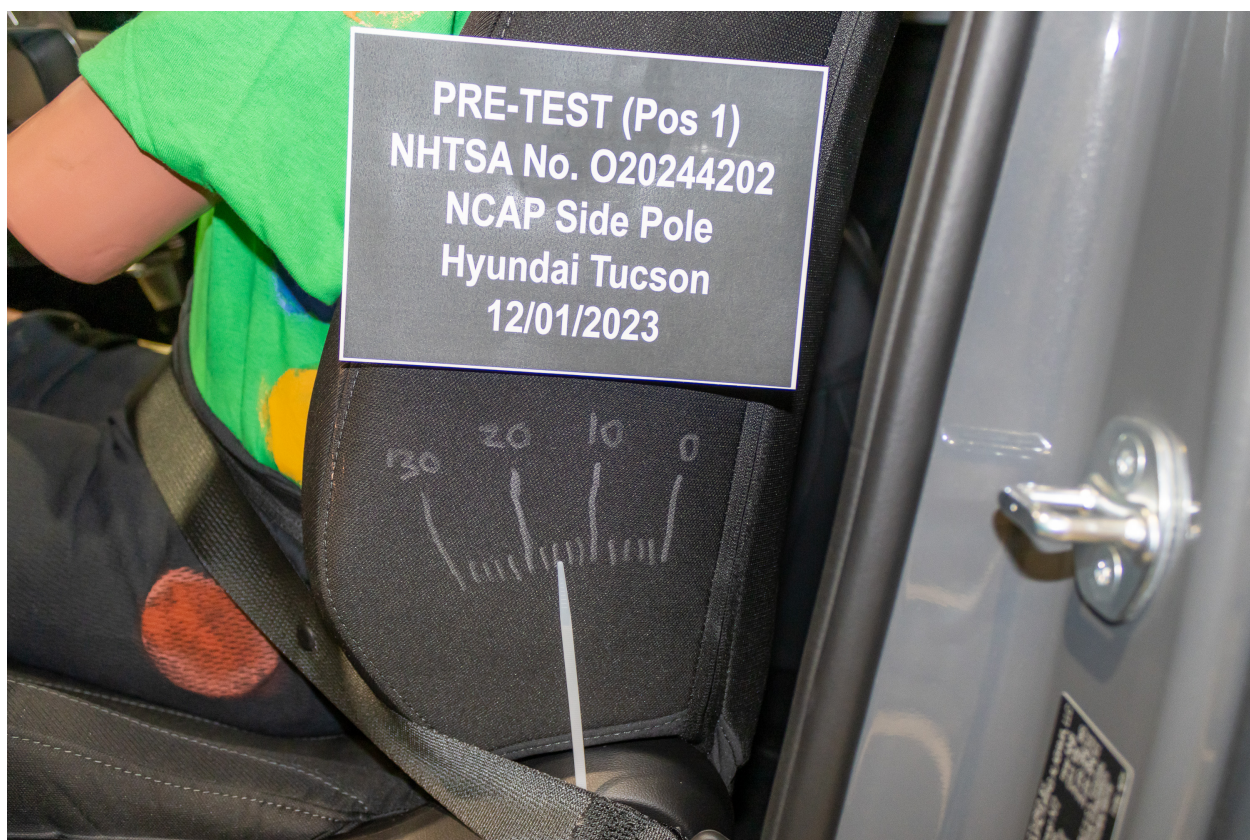


Figure A-38: Pre-Test Close-Up Left Side View of Driver Seat Back

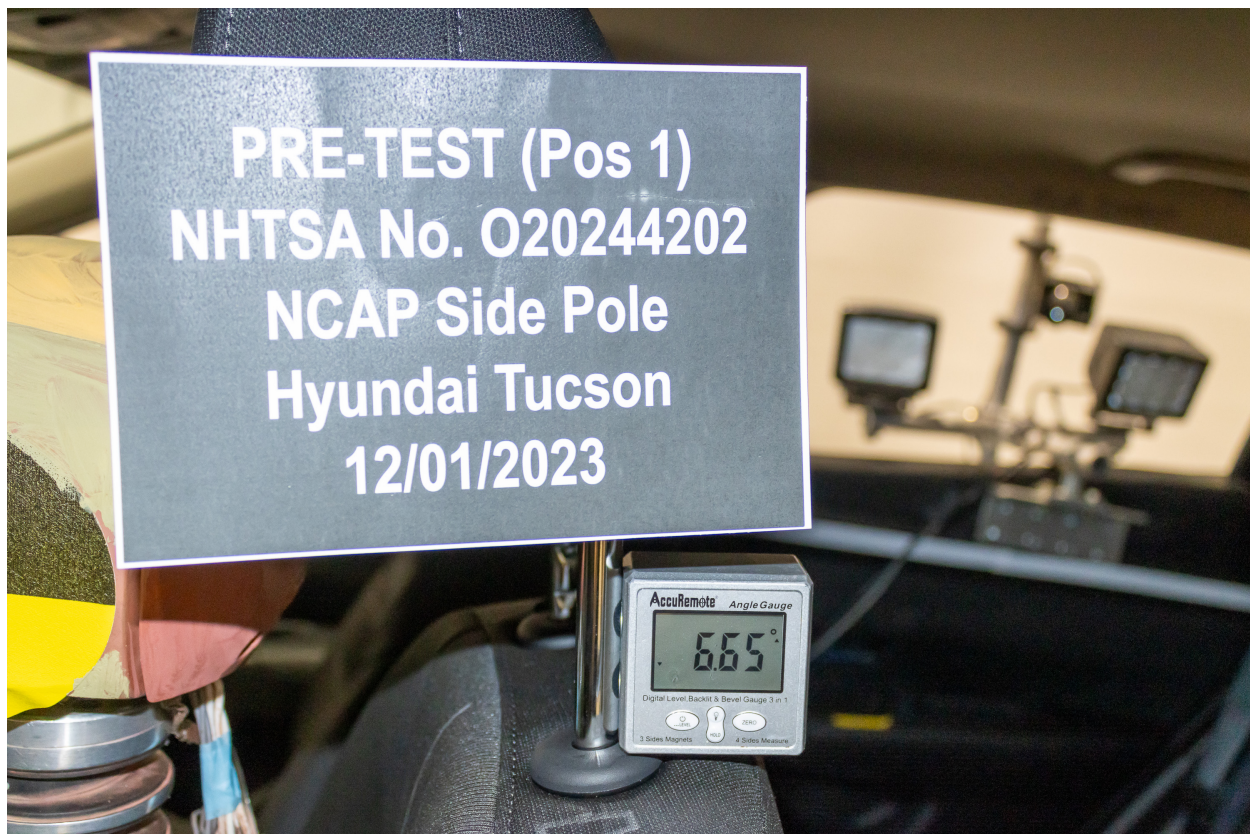


Figure A-39: Pre-Test Close-Up View of Driver Seat Back or Head Restraint



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



Figure A-55: Pre-Test View of 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

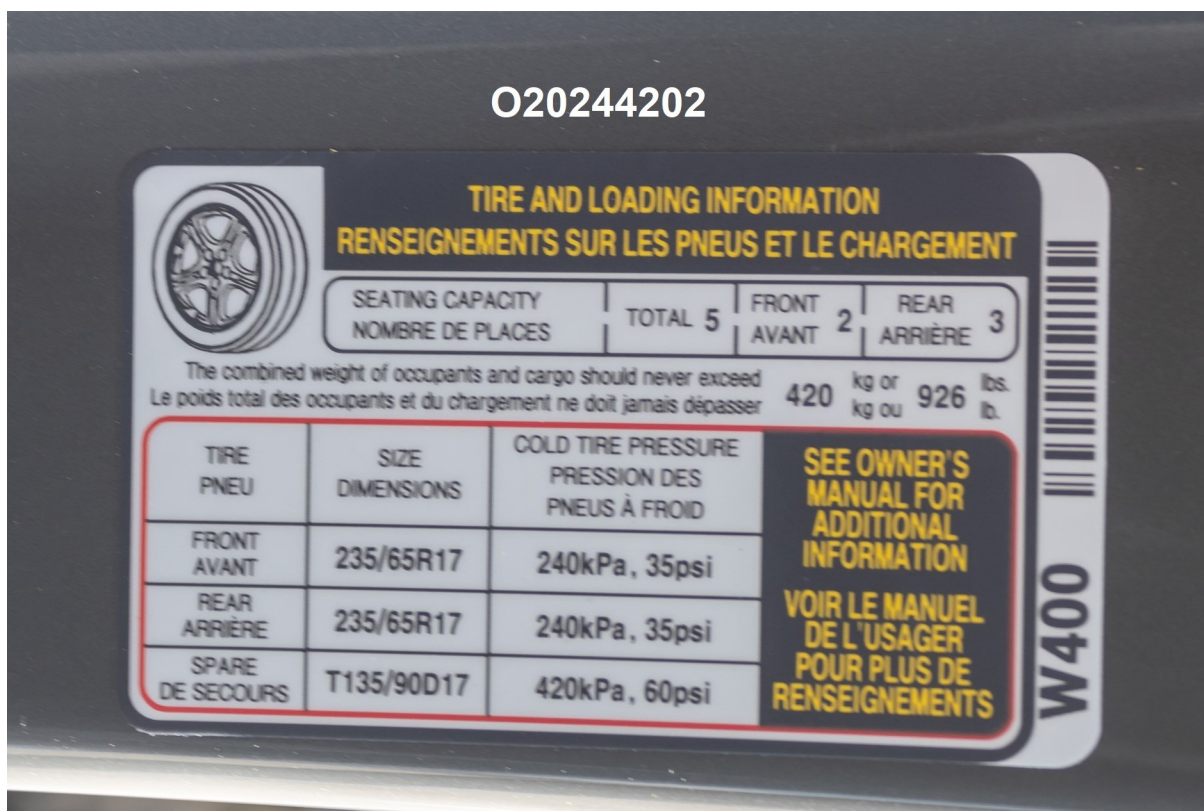


Figure A-58: Close-Up View of Vehicle's Tire Information Placard or Label

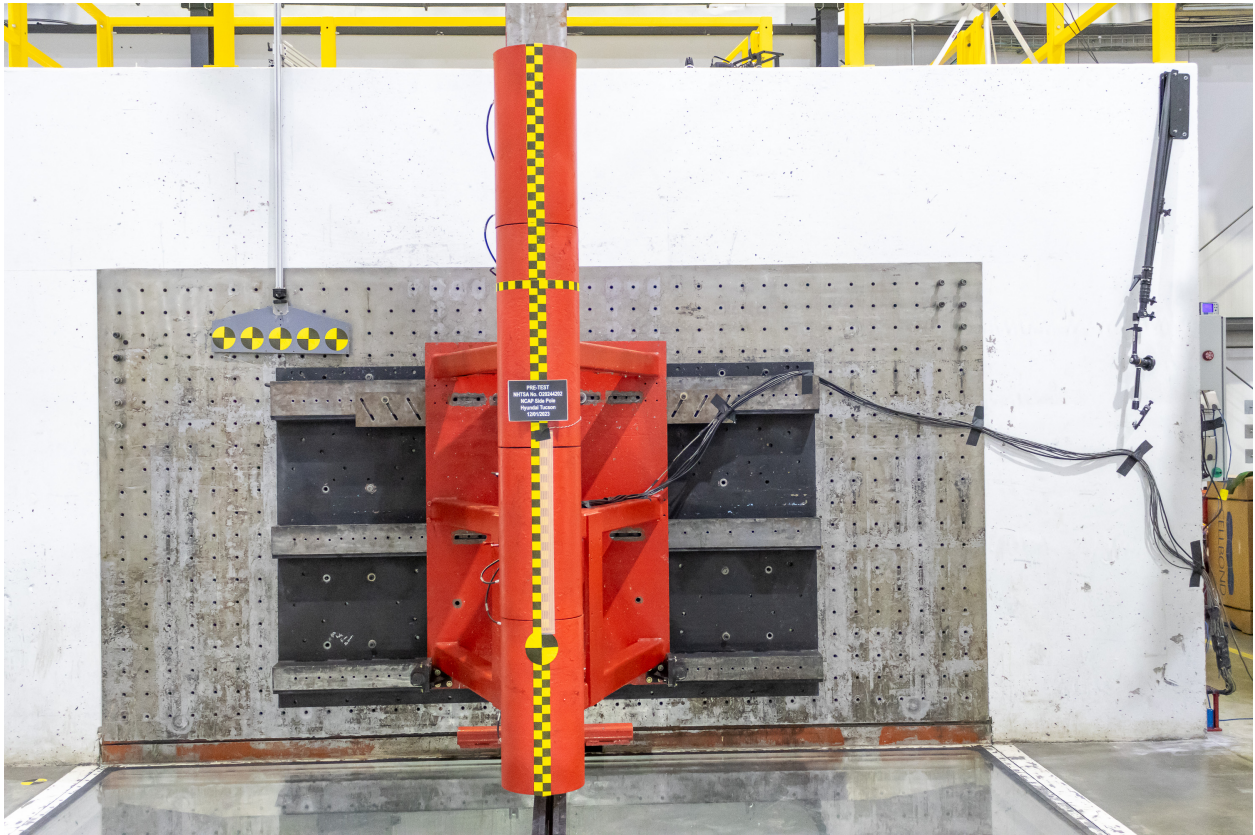


Figure A-59: Pre-Test Pole Barrier Front View

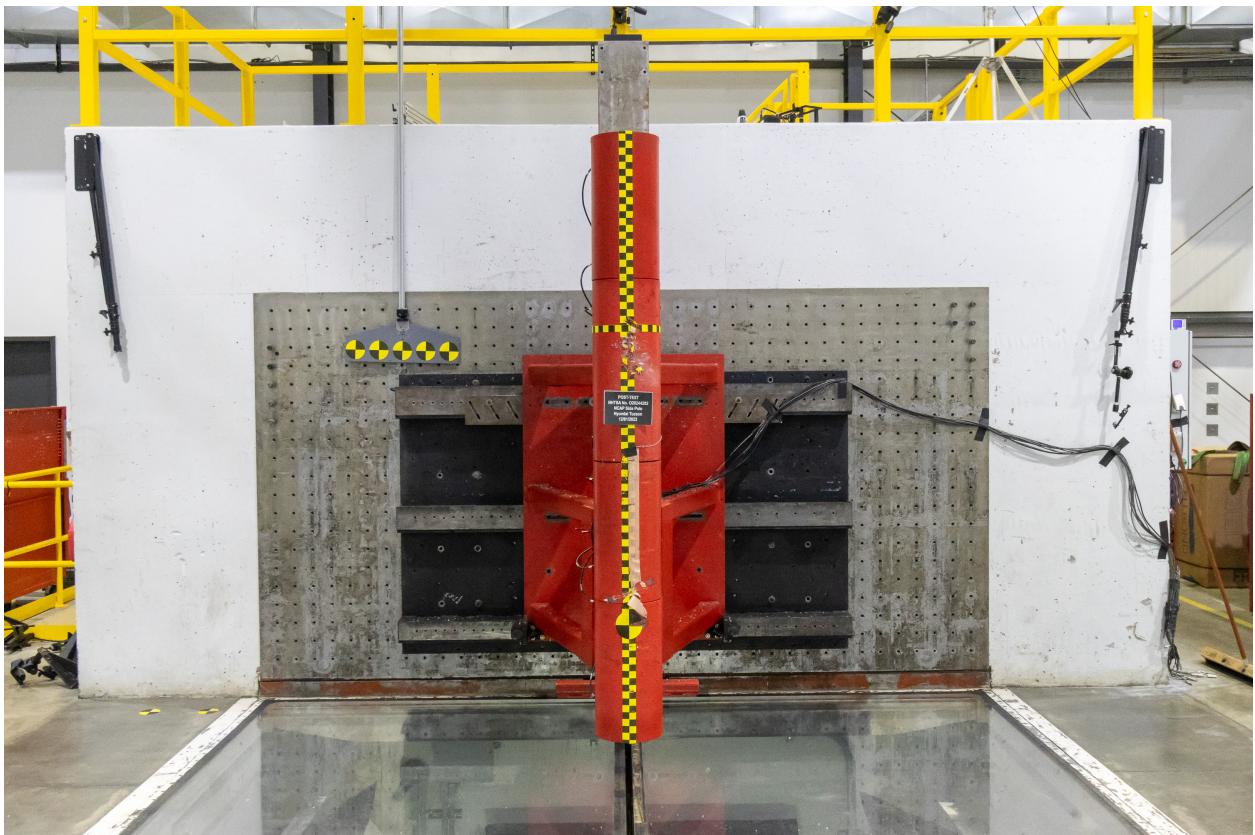


Figure A-60: Post-Test Pole Barrier Front View

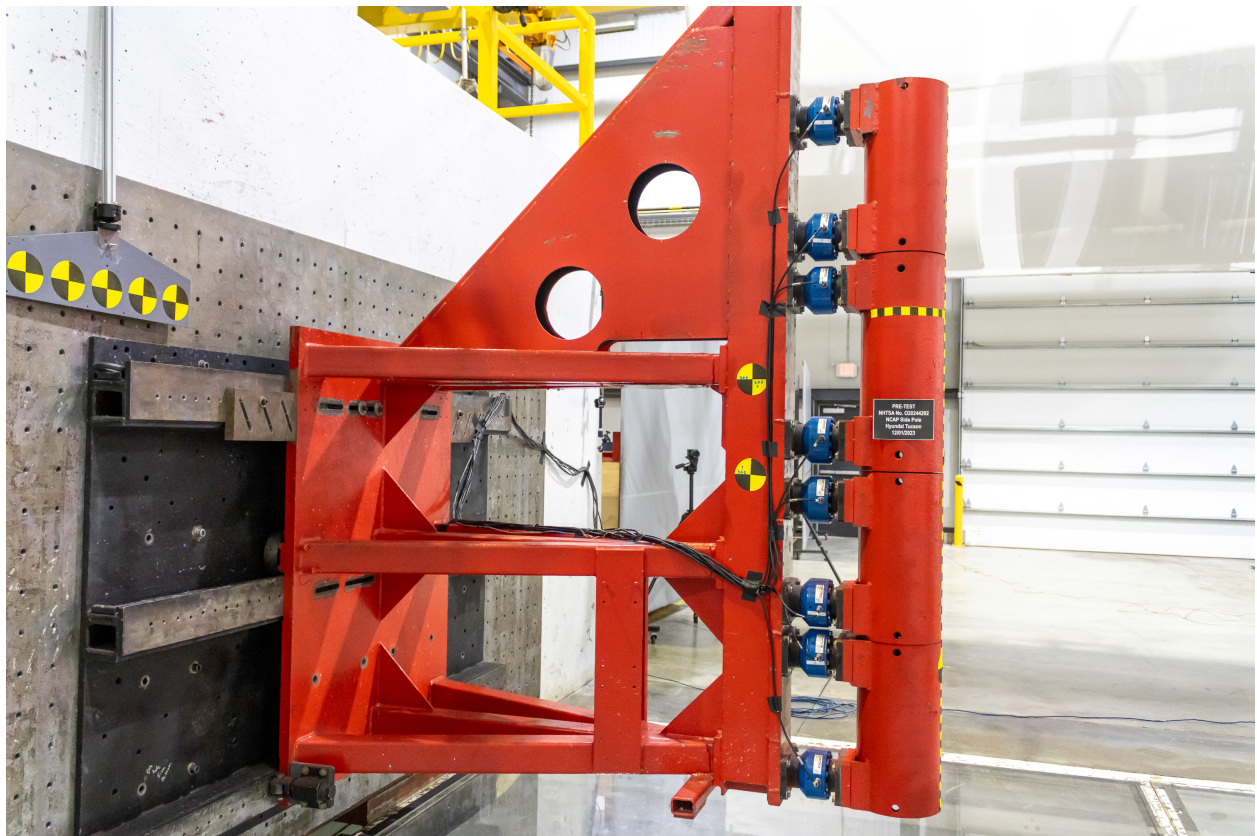


Figure A-61: Pre-Test Pole Barrier Side View

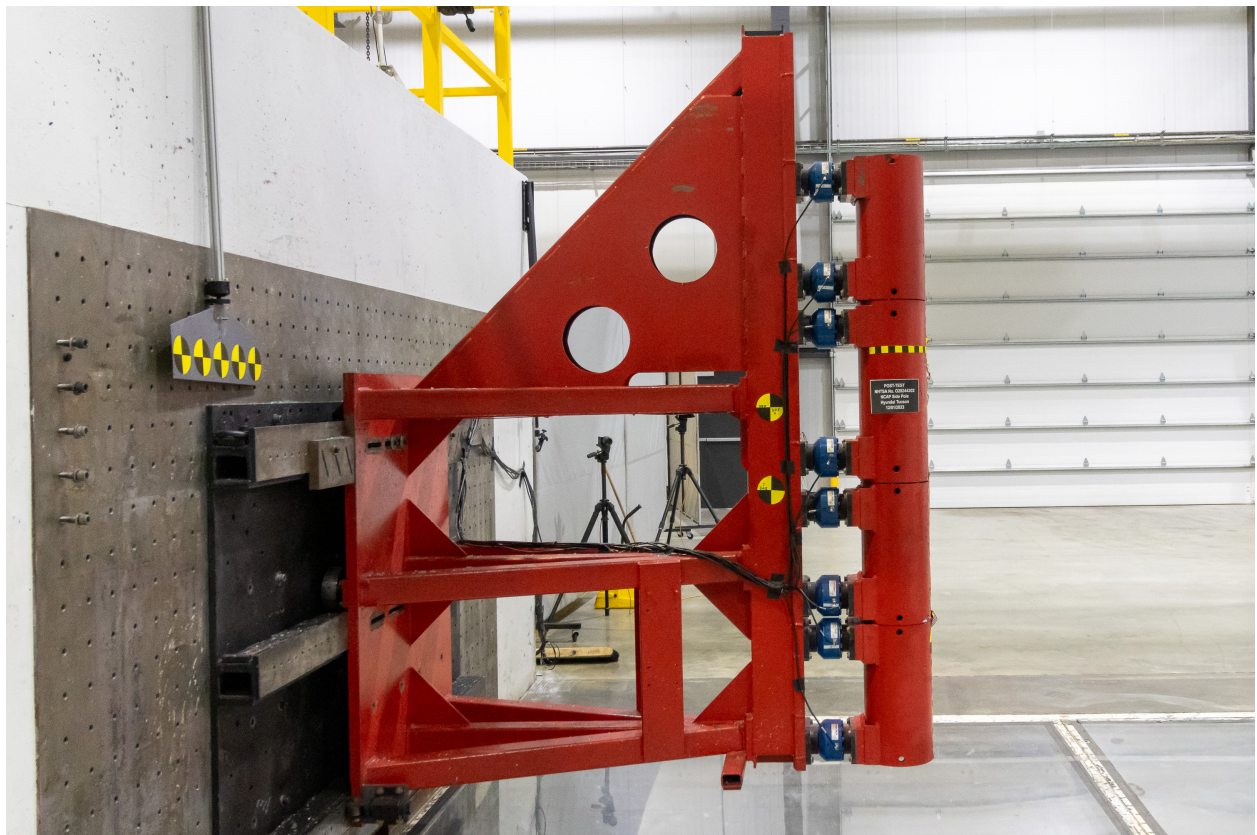


Figure A-62: Post-Test Pole Barrier Side View



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

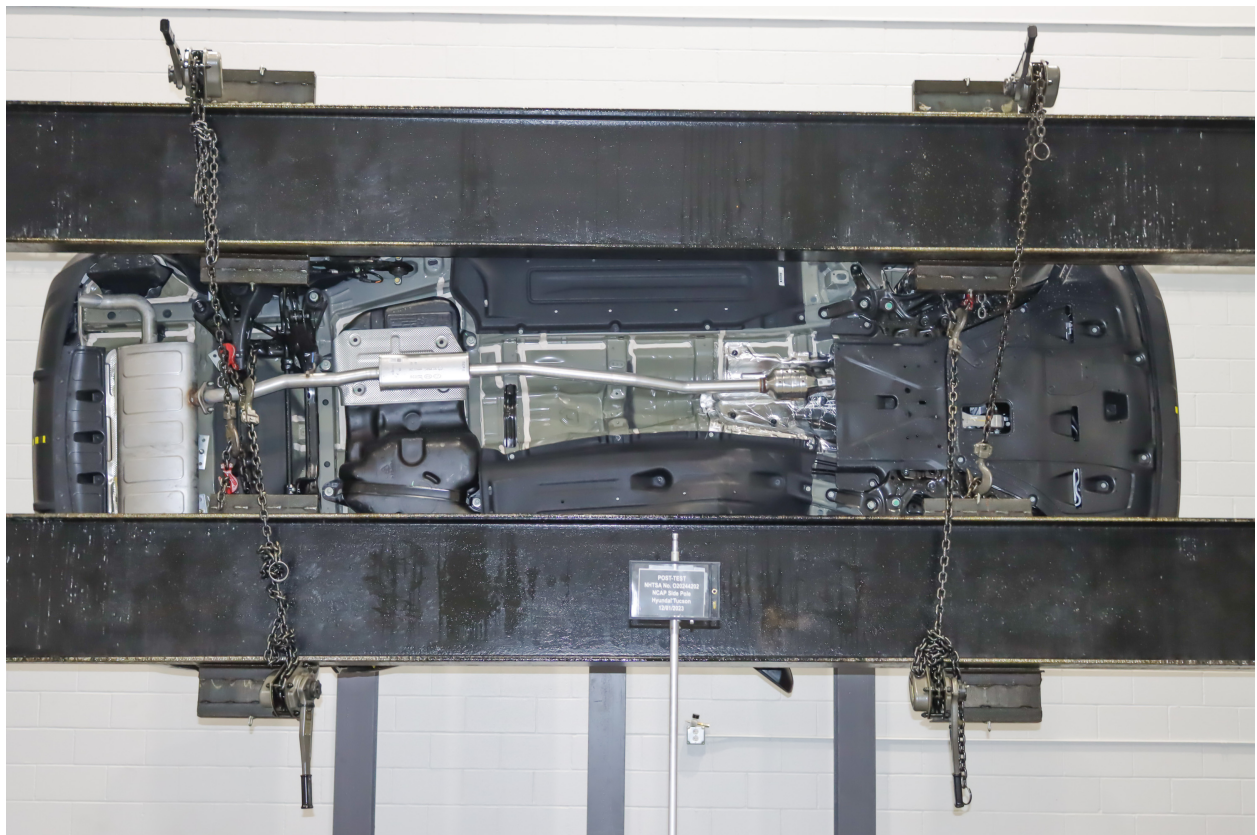


Figure A-66: FMVSS No. 301 Static Rollover 90 Degrees



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 TUCSON SEL FWD

SOLD TO: NY152
MAGUIRE HYUNDAI OF GRAND ISLAND
1910 ALVIN ROAD
GRAND ISLAND NY 14072

SHIPPED TO: NY152

VIN: 5NMB3DE9RH326118
MODEL: 85432F45
ENGINE: G4K9PK271979
PORT OF ENTRY: MA
EXTERIOR COLOR: HAMPTON GRAY
INTERIOR/SEAT COLOR: BLACK/BLACK
TRANSPORT: TRUCK
ACCESSORY WEIGHT: 20 lbs / 9 kgs.

EMISSIONS: This vehicle meets California Emissions regulations and is Certified as a Super Ultra Low Emission Vehicle (SULEV)

GOVERNMENT 5-STAR SAFETY RATINGS

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

Frontal	Driver	Passenger
★★★★★	★★★★★	★★★★★

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

Side	Front seat	Rear seat
★★★★★	★★★★★	★★★★★

Crash **Not Rated**
Based on the risk of injury in a side impact.

Rollover **★★★★★**
Based on the risk of rollover in a single-vehicle crash.

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

STANDARD FEATURES:

AMERICA'S BEST WARRANTY

5-year/60,000-mile New Vehicle Warranty*

10-year/100,000-mile Powertrain Warranty*

7-year/Unlimited-mile Anti-perforation Warranty*

3-year/50,000-mile Complimentary Maintenance*

5-year/Unlimited-mile Roadside Assistance

*Limited warranty, see dealer for details

ADVANCED SAFETY TECHNOLOGIES

Front, Front Side, Side-Curtain, & Rear Side Airbags

Forward Collision-Avoidance Assist

Lane Keeping Assist, Lane Following Assist

Driver Attention Warning

Blind-Spot Collision-Avoidance Assist

Rear Cross-Traffic Collision-Avoidance Assist

Rearview Camera

Safe Exit Warning

Immobilizer

POWERTRAIN TECHNOLOGY

Smartstream 2.5L 4-cylinder Engine w/ Idle Stop & Go

8-speed Automatic Transmission w/ SHIFTRONIC®

EXTERIOR

17" Alloy Wheels

Roof Side Rails

Automatic LED Headlights

LED Daytime Running Lights

COMFORT & CONVENIENCE

Proximity Key w/ Push Button Start

Hands-free Smart Power Liftgate w/ Auto Open

Power Driver's Seat w/ Lumbar Support

Heated Front Seats

Smart Cruise Control

Dual Automatic Temperature Control; Rear Air Vents

MULTIMEDIA & CONNECTIVITY

8.0" Display Audio w/ AM/FM/HD Radio(TM)

SiriusXM® Radio w/ 90-day trial subscription.

Not Available in AK & HI

Android Auto(TM) & Apple CarPlay(R)

Wireless Phone Charger

Digital Key

BlueLink® AI-Inclusive Connected Services (enrollment required)

Full Tank of Fuel

Manufacturer's Suggested Retail Price:

\$29,400.00

ADDED FEATURES:

*Carpeted Floor Mats

*Cargo Net

*Reversible Cargo Tray

*Cargo Cover

*Roadside Assistance Kit

*First Aid Kit

*Kid Guards

*Rear Bumper Applique

*Wheel Locks

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Hyundai TUCSON was named 2023 Best Compact SUV for Families by U.S. News & World Report



Fuel Economy and Environment

Gasoline Vehicle

Fuel Economy

28 MPG
combined city/hwy

25 city
32 highway

3.6 gallons per 100 miles

Small SUVs range from 14 to 123 MPG. The best vehicle rates 140 MPG.

You Save \$0
in fuel costs over 5 years compared to the average new vehicle.

Annual fuel Cost \$1,950

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

1 6 10 Best

This vehicle emits 323 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions; learn more at fuelconomy.gov.

Smog Rating (tailpipe only)

1 7 10 Best

This vehicle emits 323 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates 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 \$ 3.60 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: 35 %

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:

ENGINE: U.S.A.

TRANSMISSION: U.S.A.

261

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Figure A-71: Monroney Label

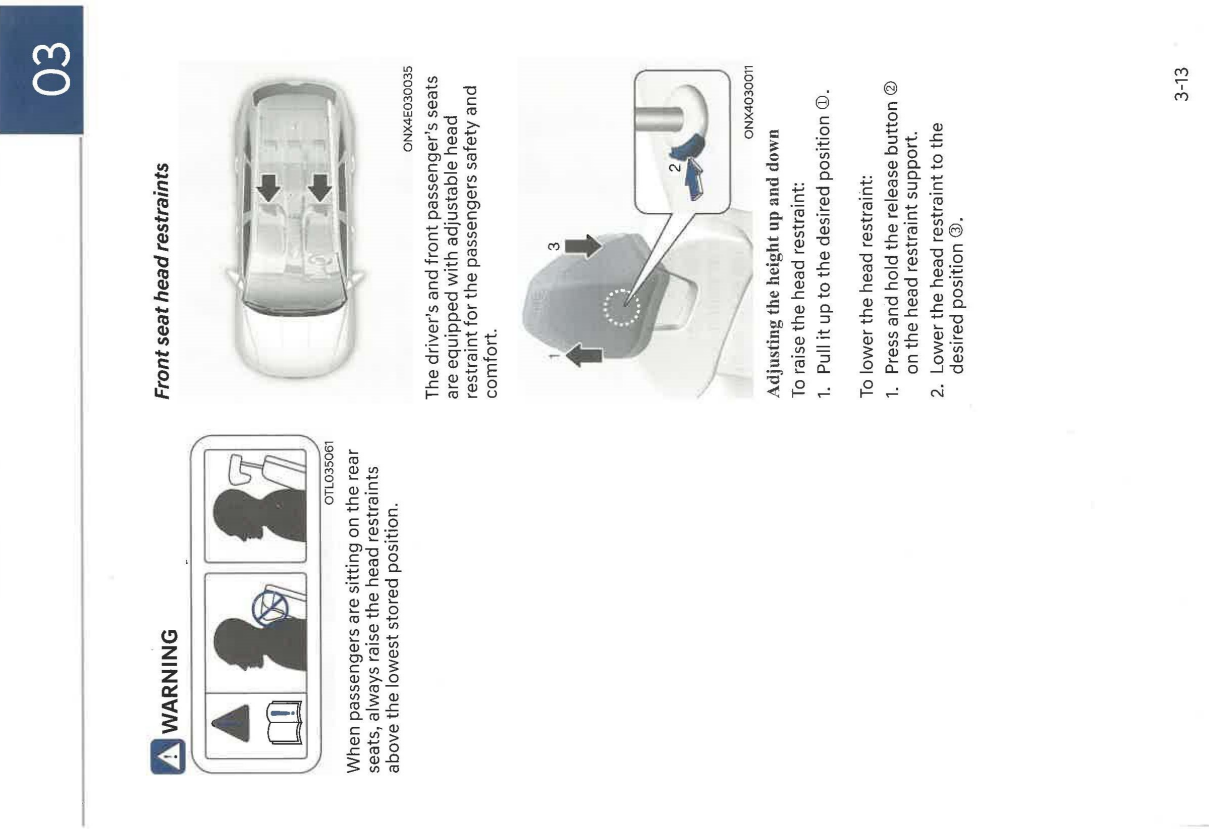


Figure A-72: Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



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

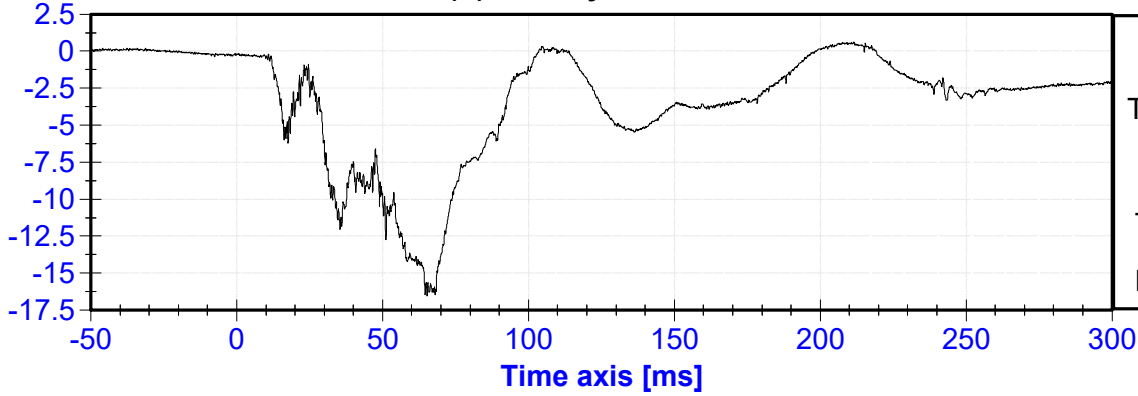
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration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

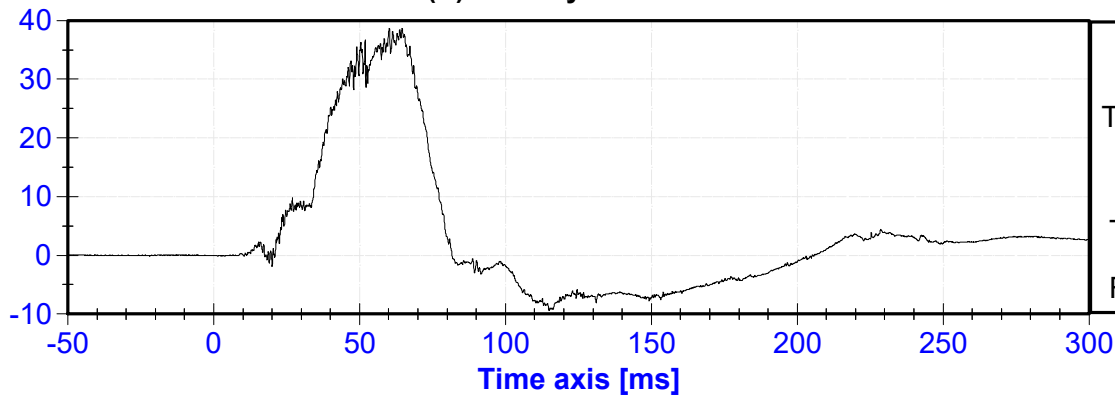
ACCELERATION [g's]

Driver Head Acceleration (X) Primary vs. Time



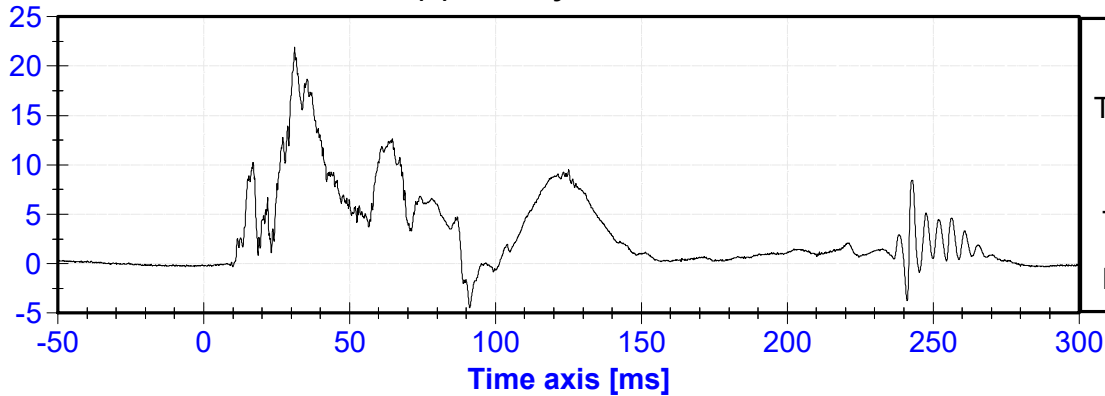
ACCELERATION [g's]

Driver Head Acceleration (Y) Primary vs. Time



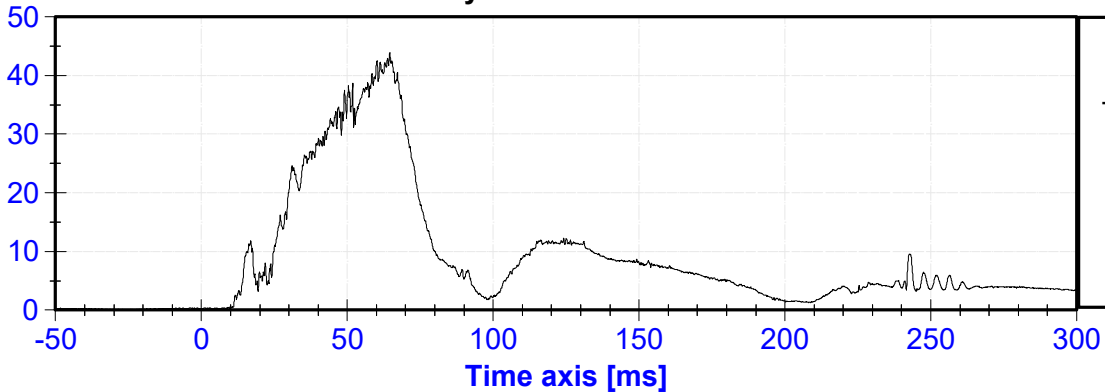
ACCELERATION [g's]

Driver Head Acceleration (Z) Primary vs. Time



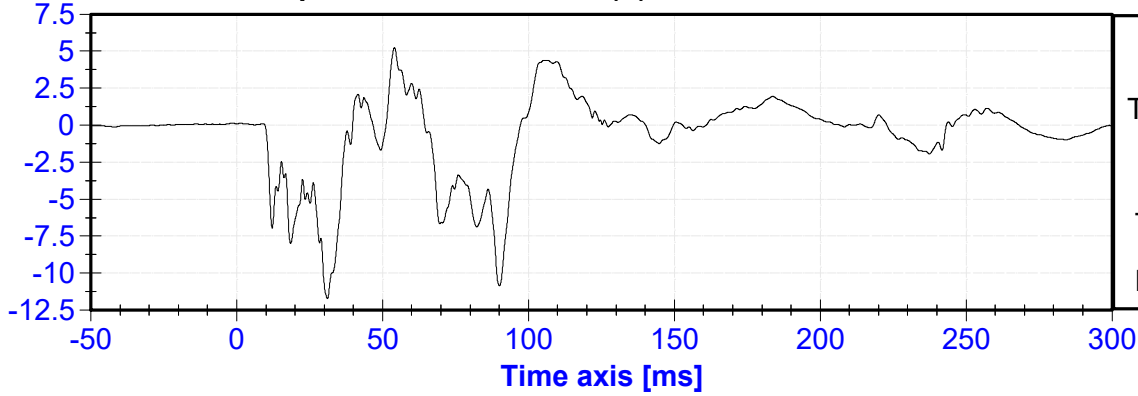
ACCELERATION [g's]

Driver Head Resultant Primary vs. Time



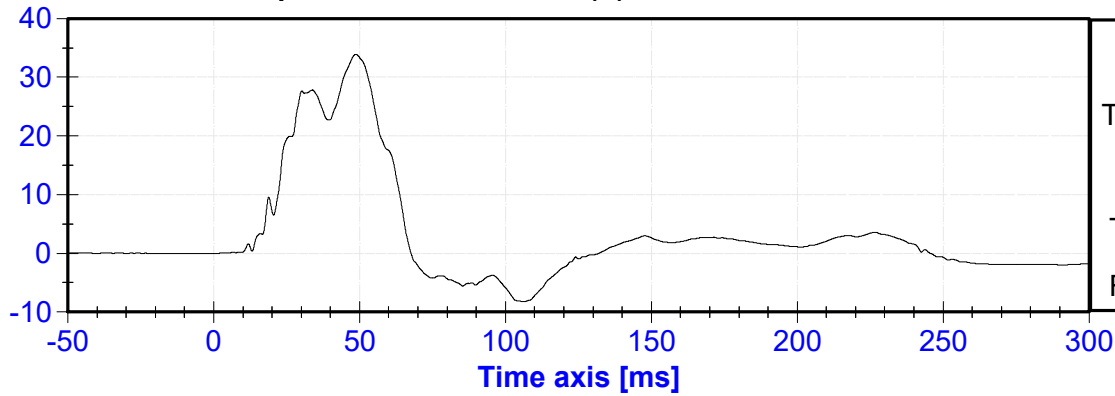
ACCELERATION [g's]

Driver Lower Spine T12 Acceleration (X) vs. Time



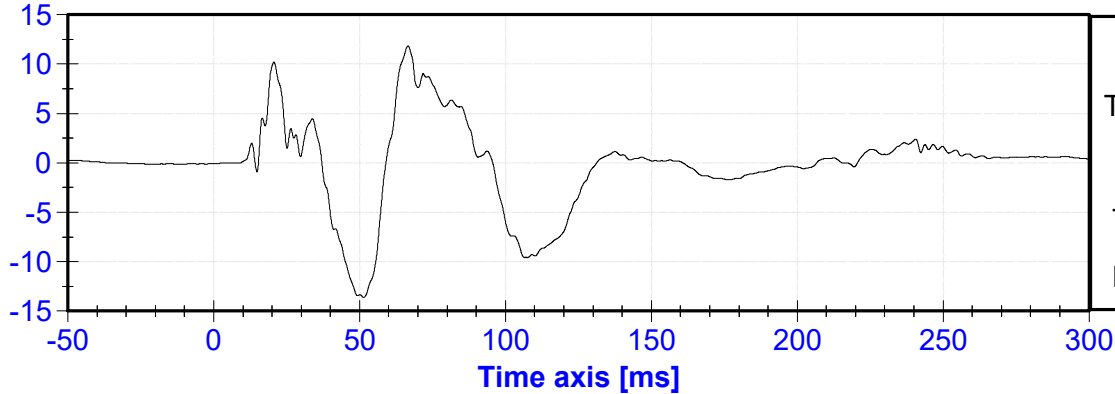
ACCELERATION [g's]

Driver Lower Spine T12 Acceleration (Y) vs. Time



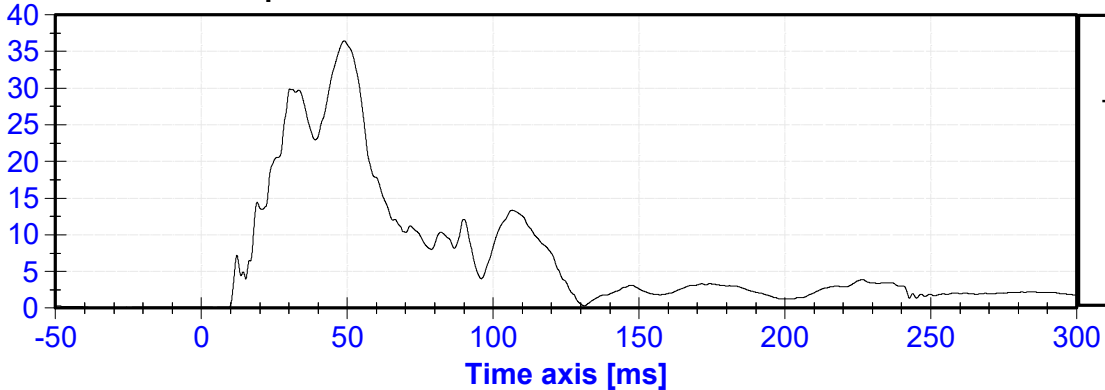
ACCELERATION [g's]

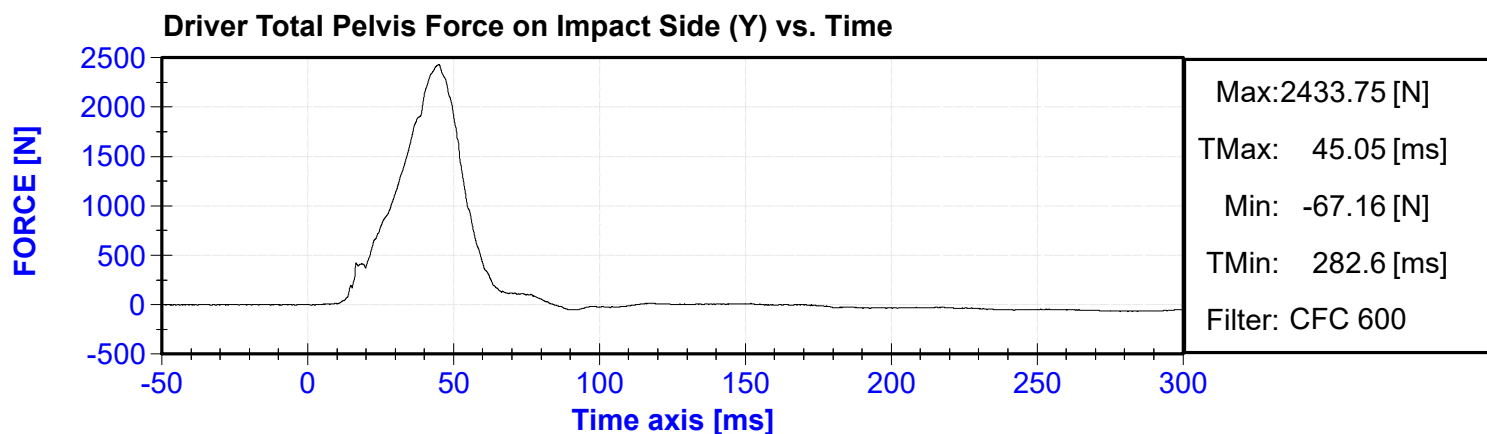
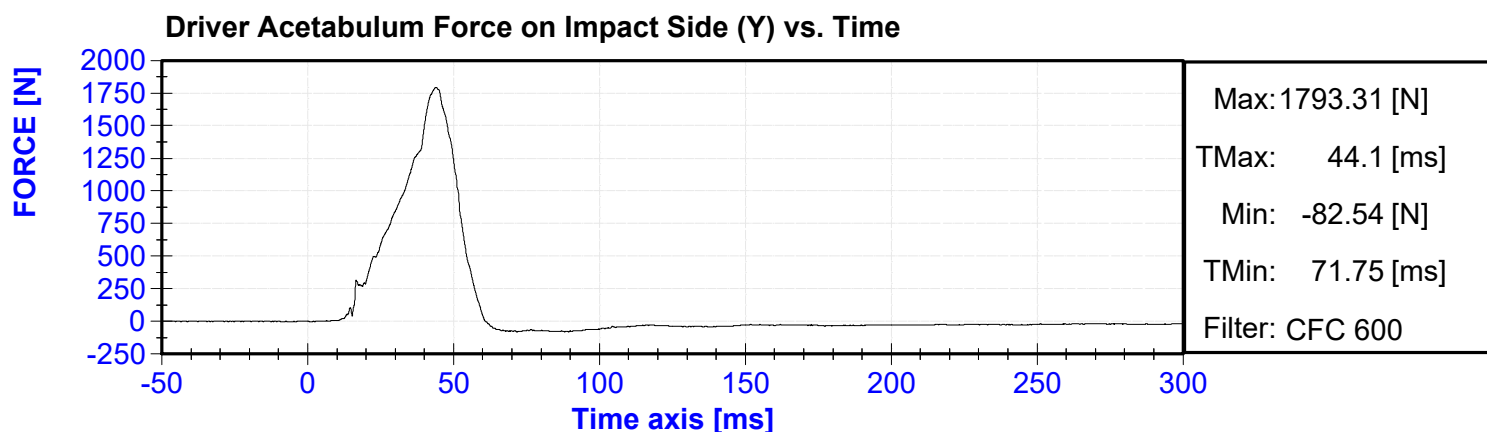
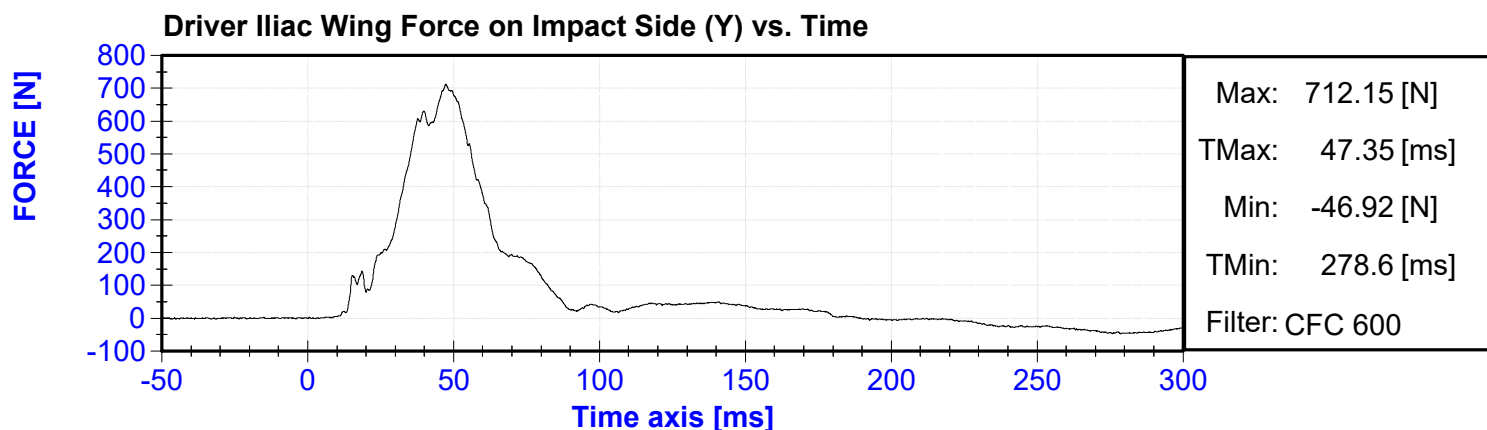
Driver Lower Spine T12 Acceleration (Z) vs. Time



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:DG8012

(CONFIGURED FOR LEFT SIDE IMPACT)

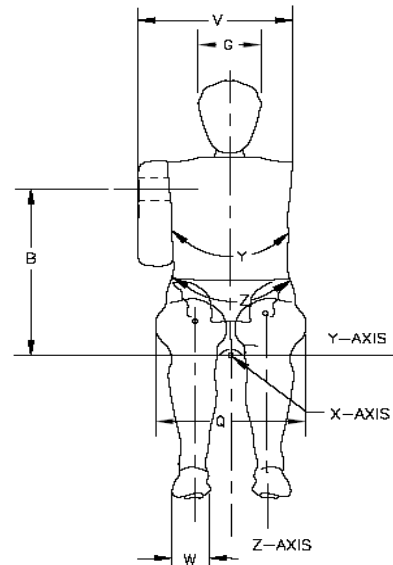
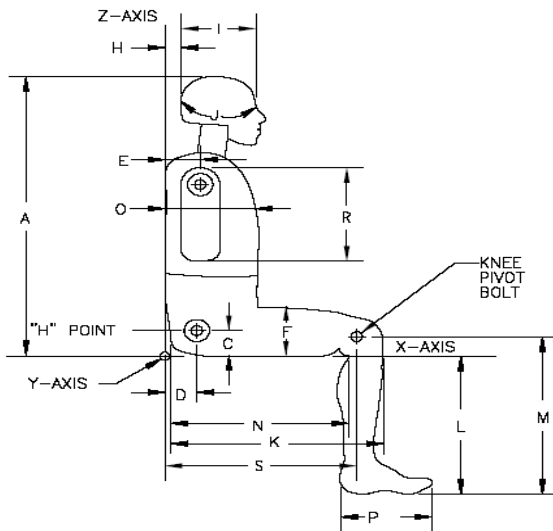


External Measurements - SID-IIs

Technician: **K. Brogan**

Date: **11/30/2023**

Dummy Serial Number: **DG8012**



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	782	Pass
B	Shoulder Pivot Height	437	453	447	Pass
C	H-point Height	79	89	82	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	129	Pass
G	Head Breadth	140	148	143	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	544	Pass
K	Buttock to Knee Length	514	540	530	Pass
L	Popliteal Height	343	369	360	Pass
M	Knee Pivot to floor height	392	409	399	Pass
N	Buttock Popliteal Length	416	442	437	Pass
O	Chest Depth w/o jacket	195	211	200	Pass
P	Foot Length	216	232	220	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	869	Pass
Z	Waist Circumference	761	791	778	Pass

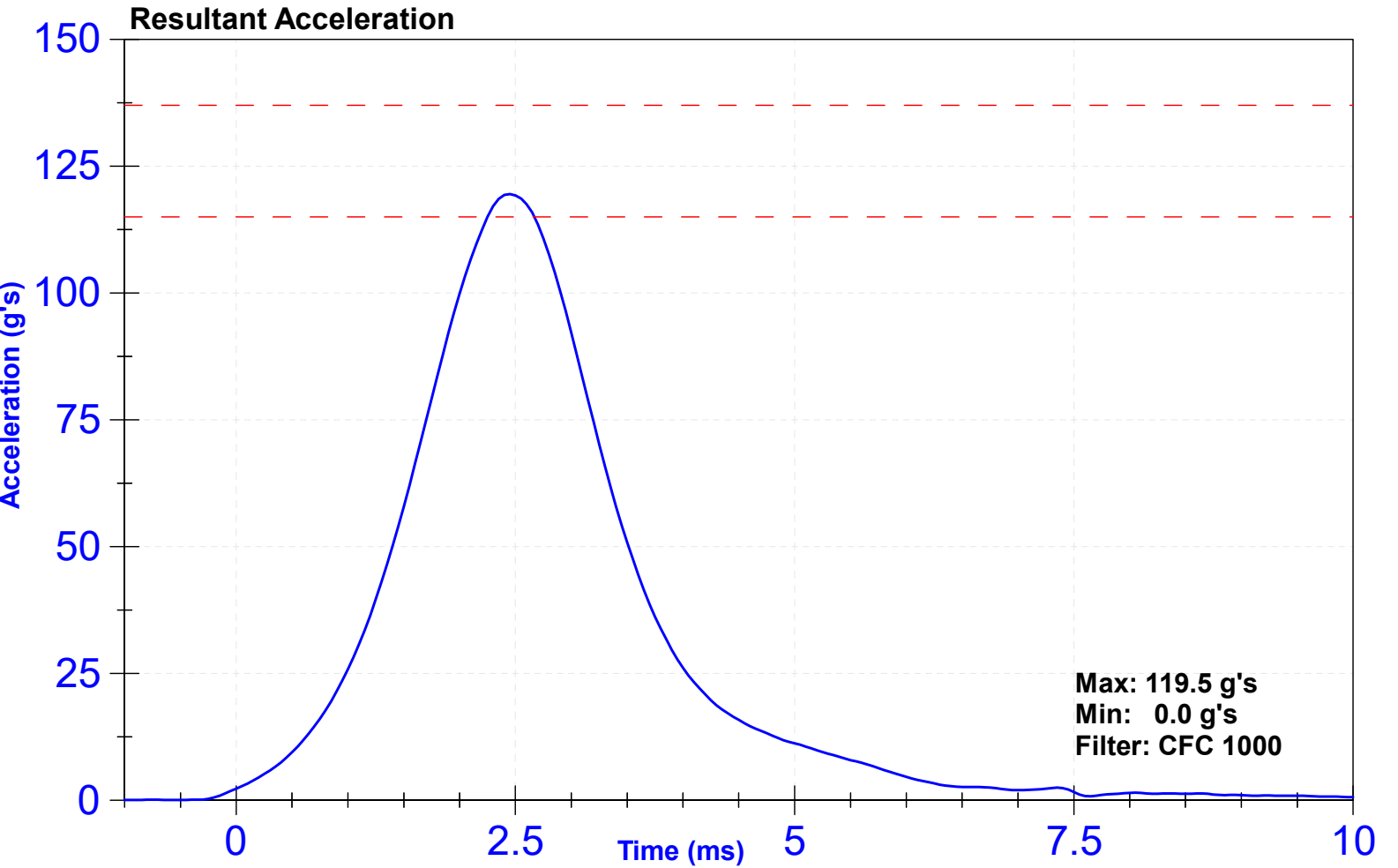
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

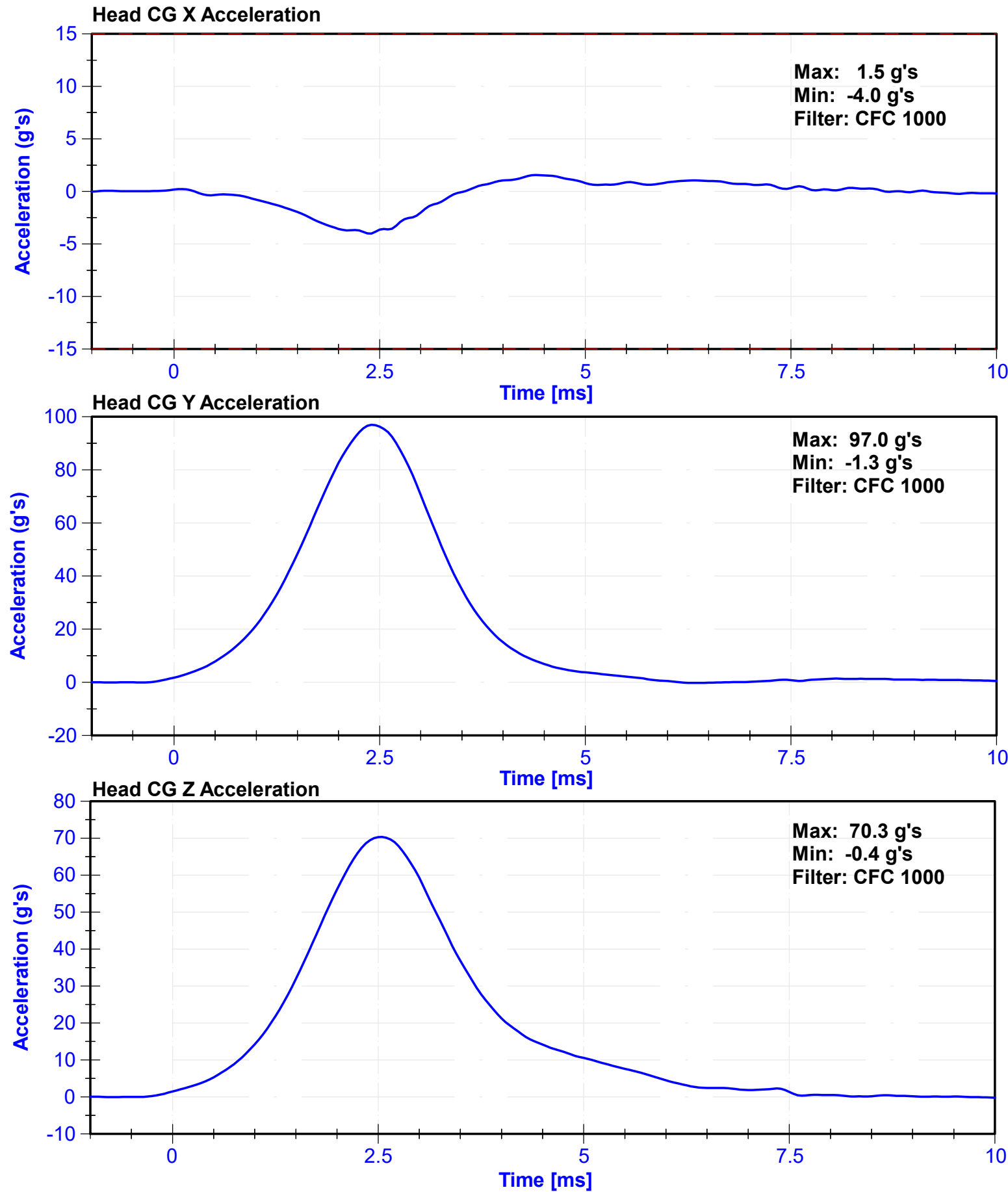
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	20	Pass
Resultant Acceleration	115	137	g's	119.5	Pass
Oscillation	0	15	%	2.0	Pass
Fore-Aft Acceleration	-15	15	g's	-4.0	Pass

Transducer Calibrations

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





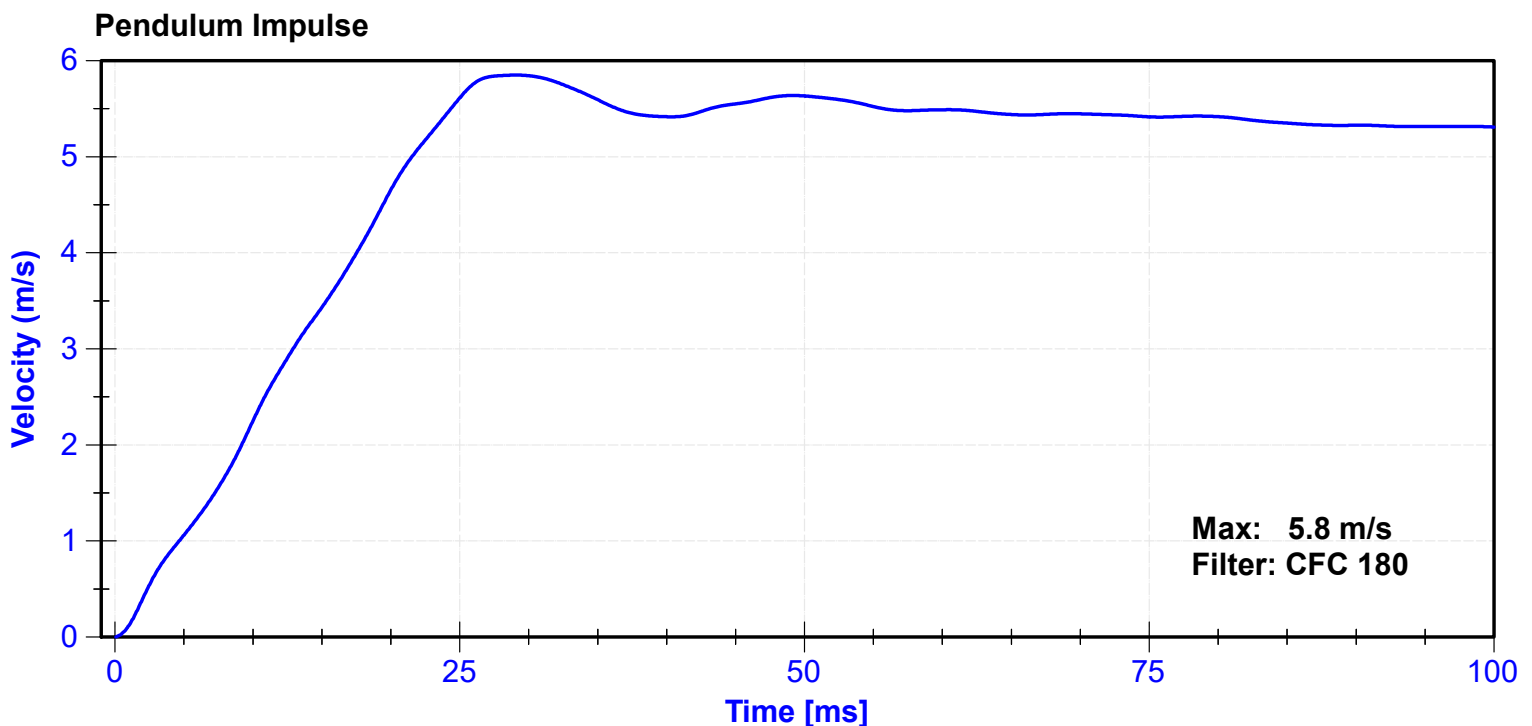
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

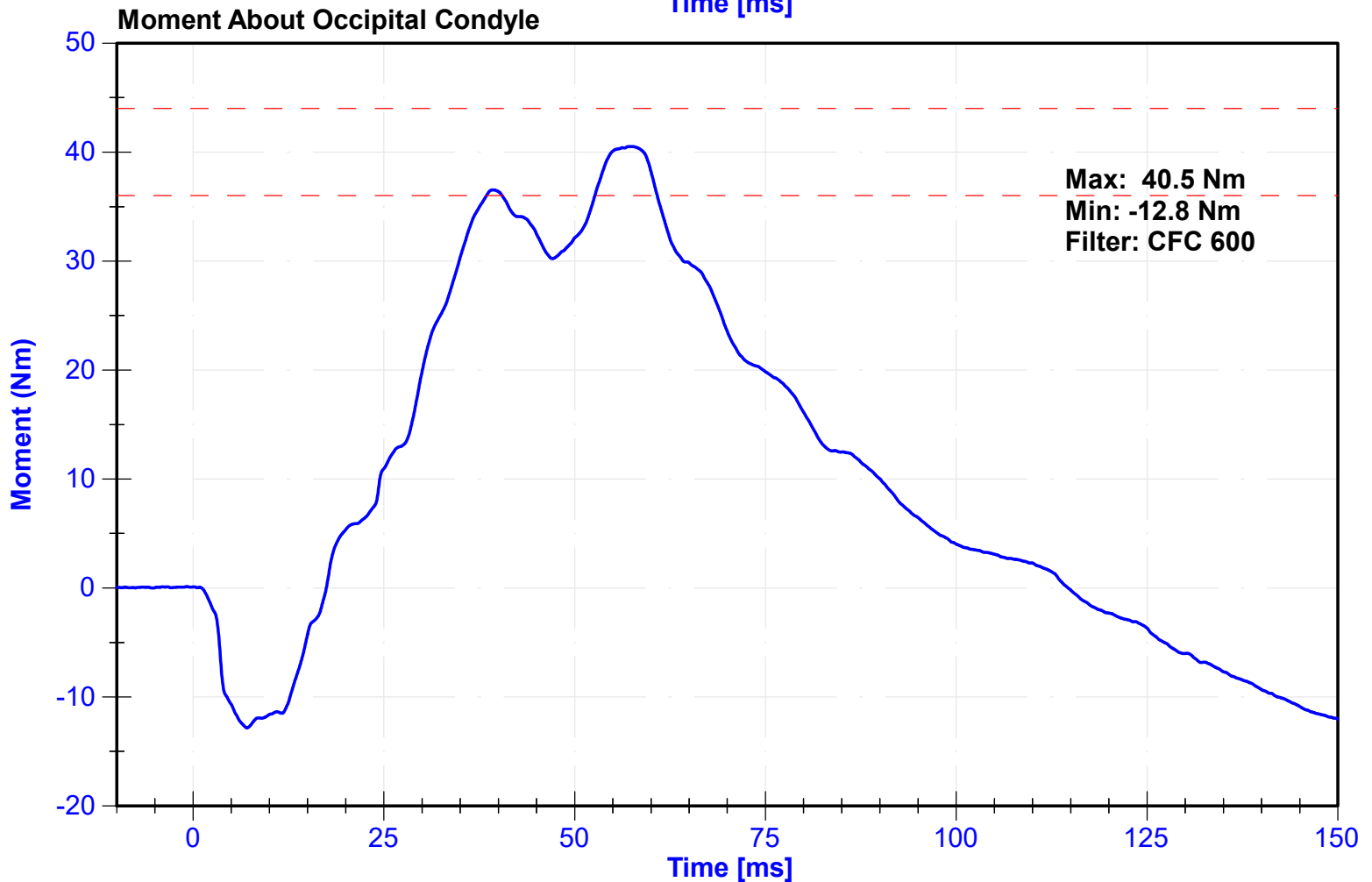
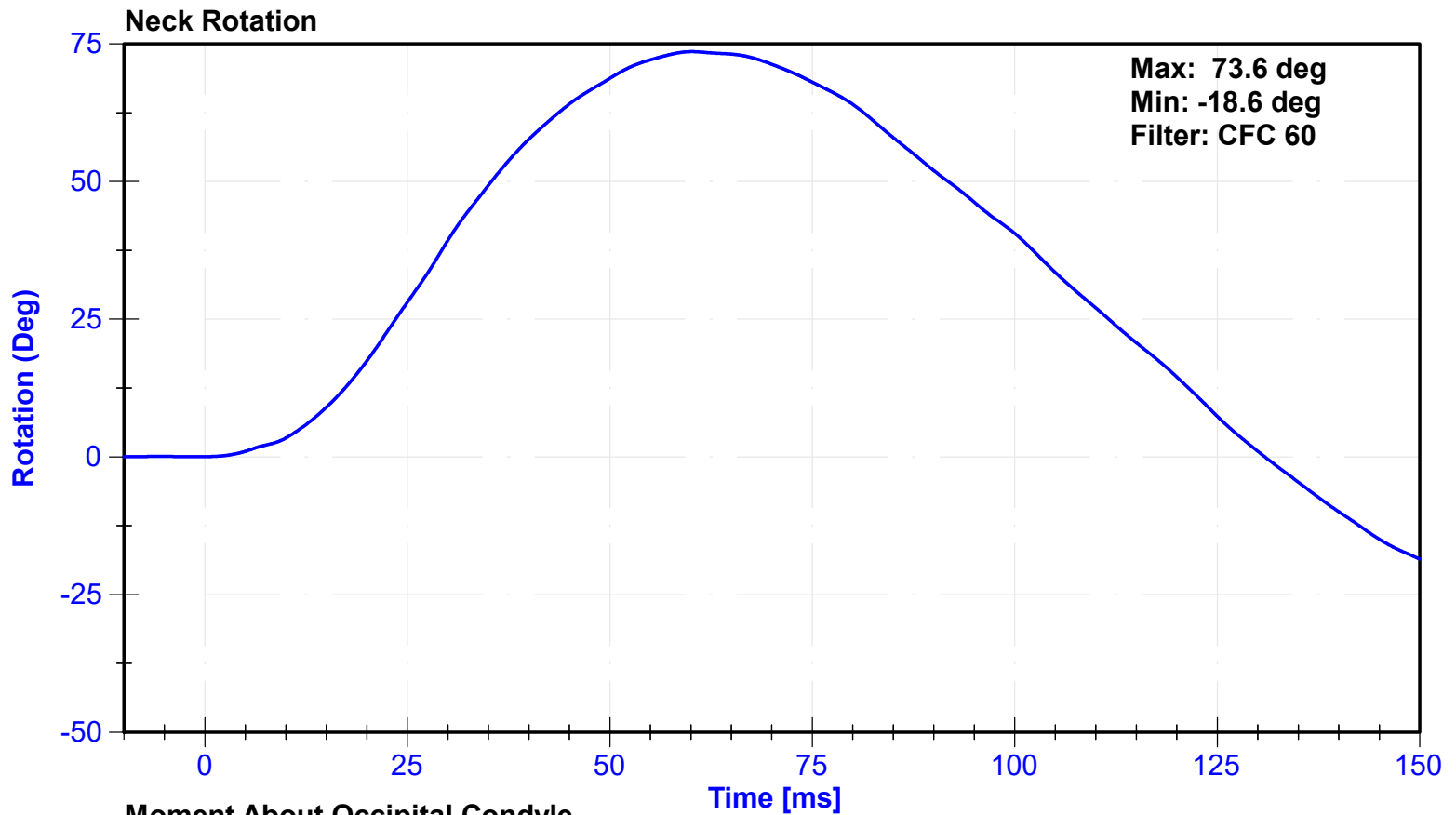
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	20	Pass
Velocity	5.51	5.63	m/s	5.513	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.25	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.43	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.65	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.61	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.85	Pass
Neck Rotation	71	81	deg	73.6	Pass
Time at Maximum Rotation	50	70	ms	60.1	Pass
Moment about the OC	36	44	Nm	40.5	Pass
Moment Decay to 0 Nm	102	126	ms	114.6	Pass

Transducer Calibrations

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





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

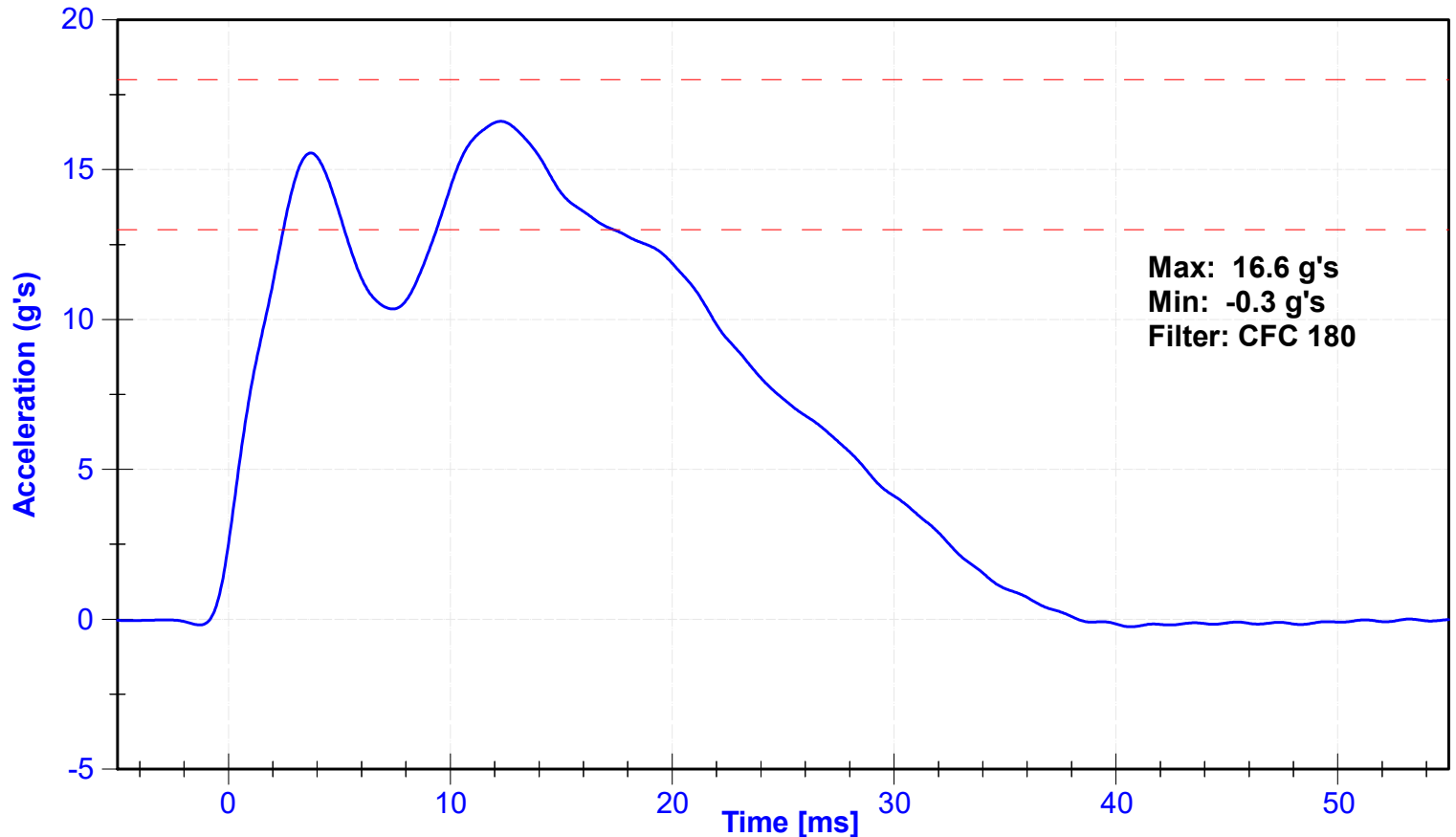
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	13	18	g's	16.6	Pass
Shoulder Deflection	28	37	mm	28.0	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.6	Pass

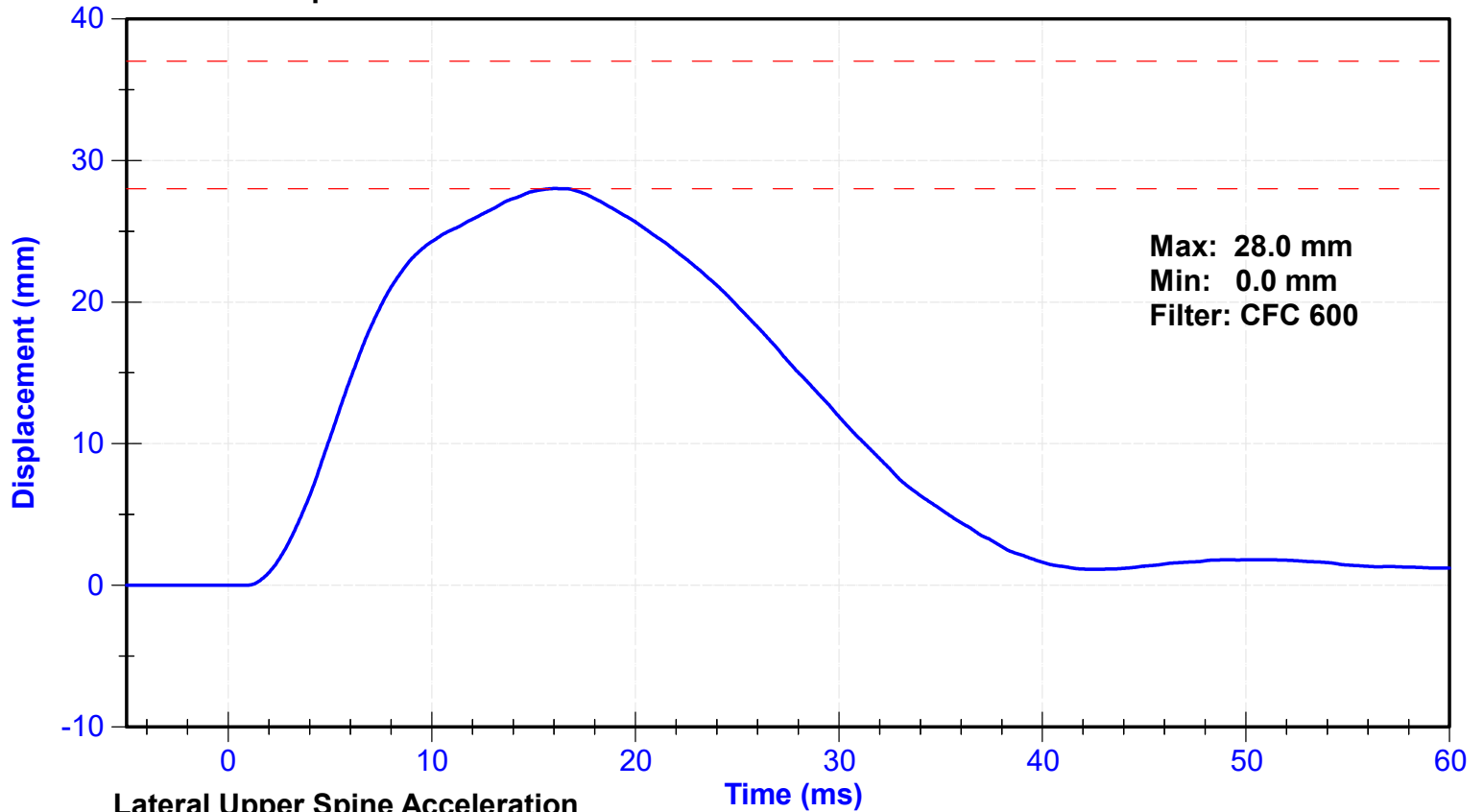
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	5/18/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024

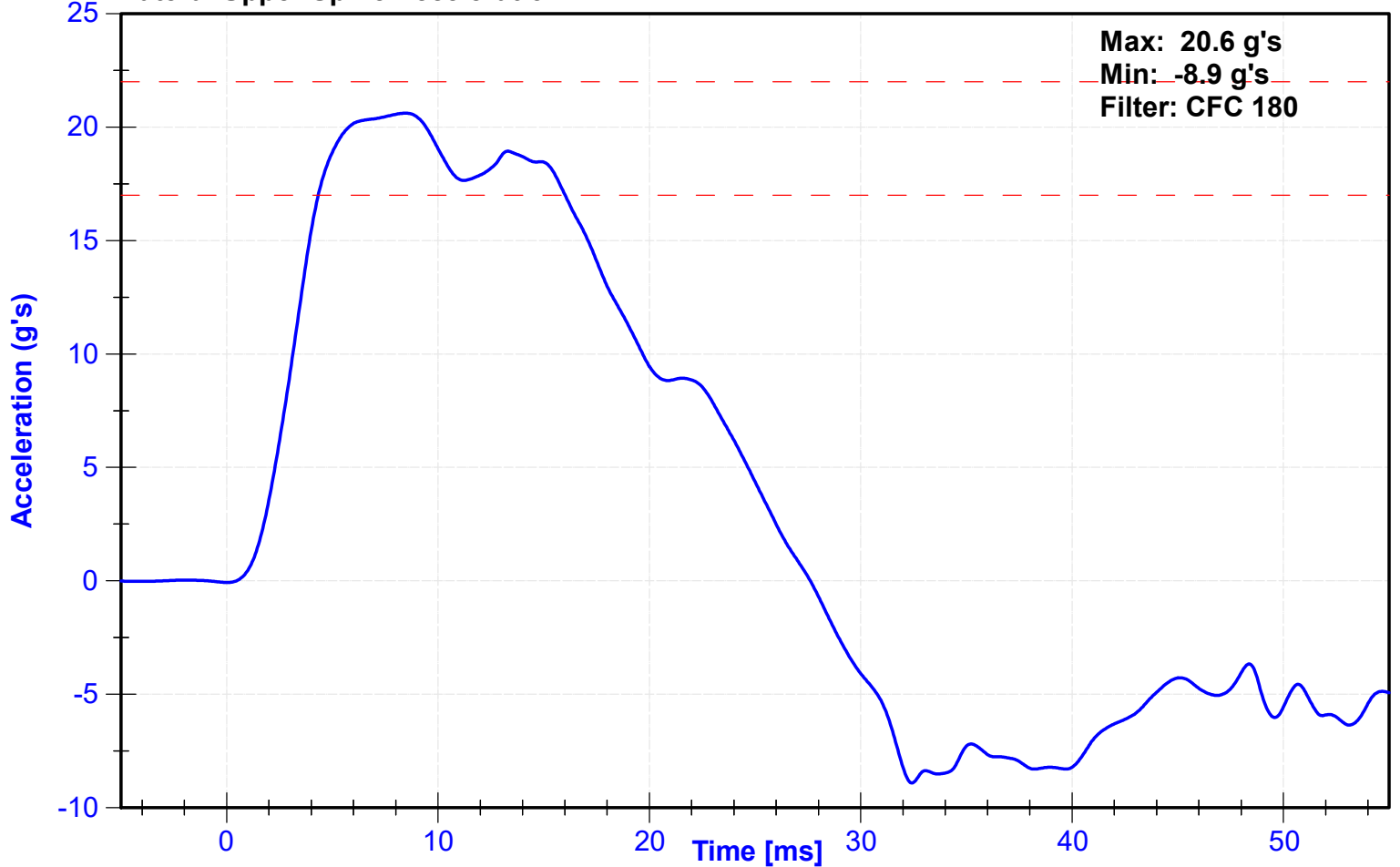
Probe Acceleration



Shoulder Displacement



Lateral Upper Spine Acceleration



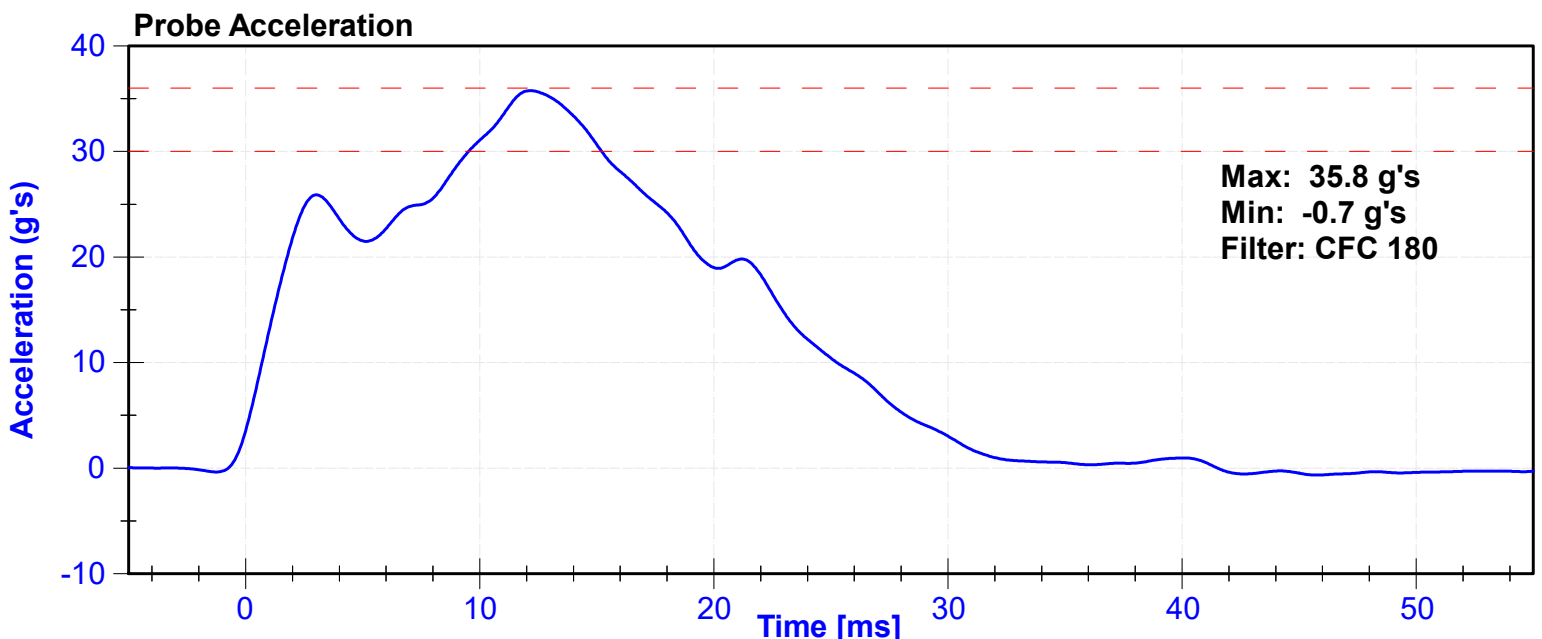
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

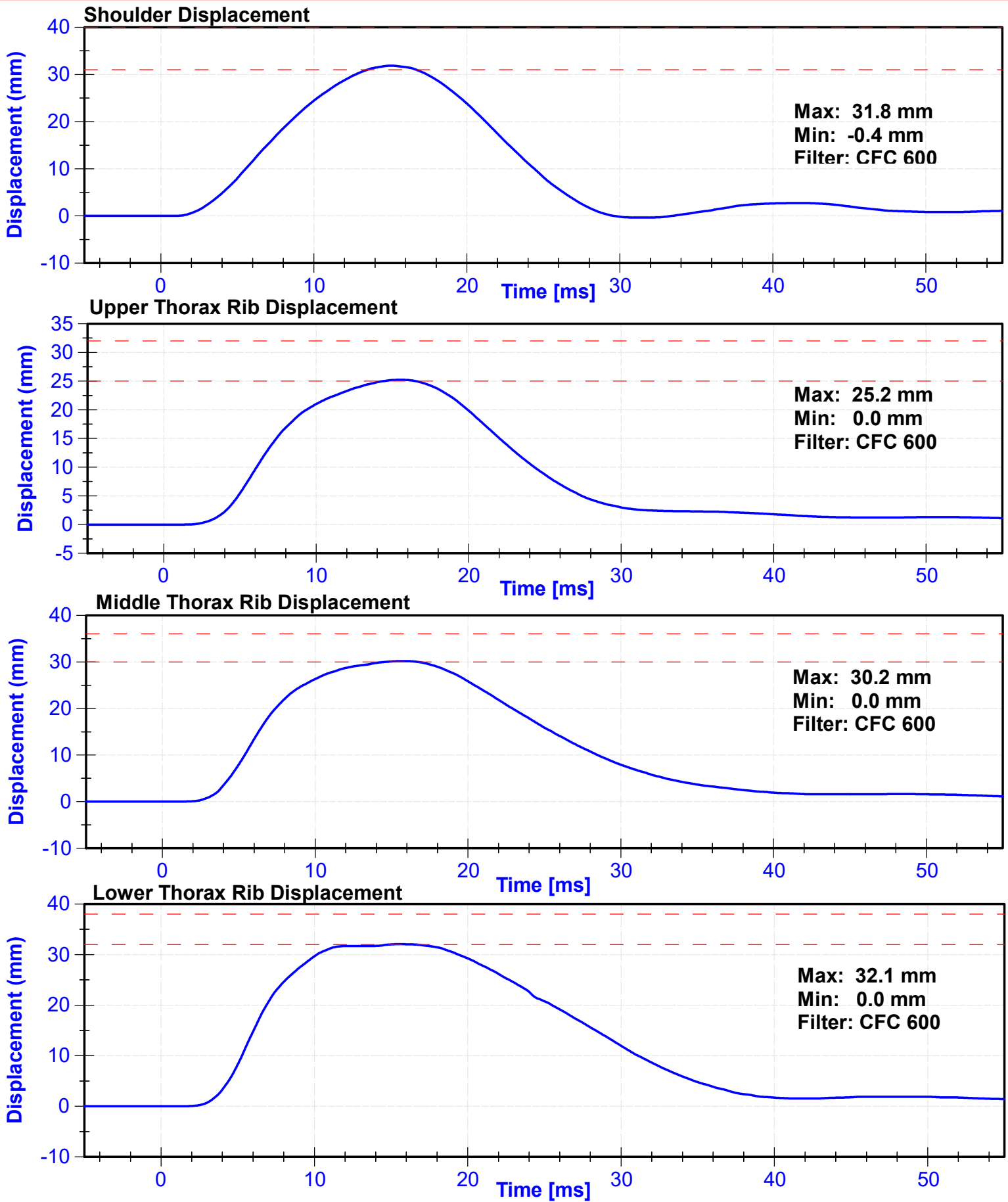
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	6.6	6.8	m/s	6.68	Pass
Probe Acceleration after 5 ms	30	36	g's	35.8	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.9	Pass
Lateral Lower Spine Acceleration	29	37	g's	34.2	Pass
Shoulder Deflection	31	40	mm	31.8	Pass
Upper Thorax Rib Deflection	25	32	mm	25.2	Pass
Mid Thorax Rib Deflection	30	36	mm	30.2	Pass
Lower Thorax Rib Deflection	32	38	mm	32.1	Pass

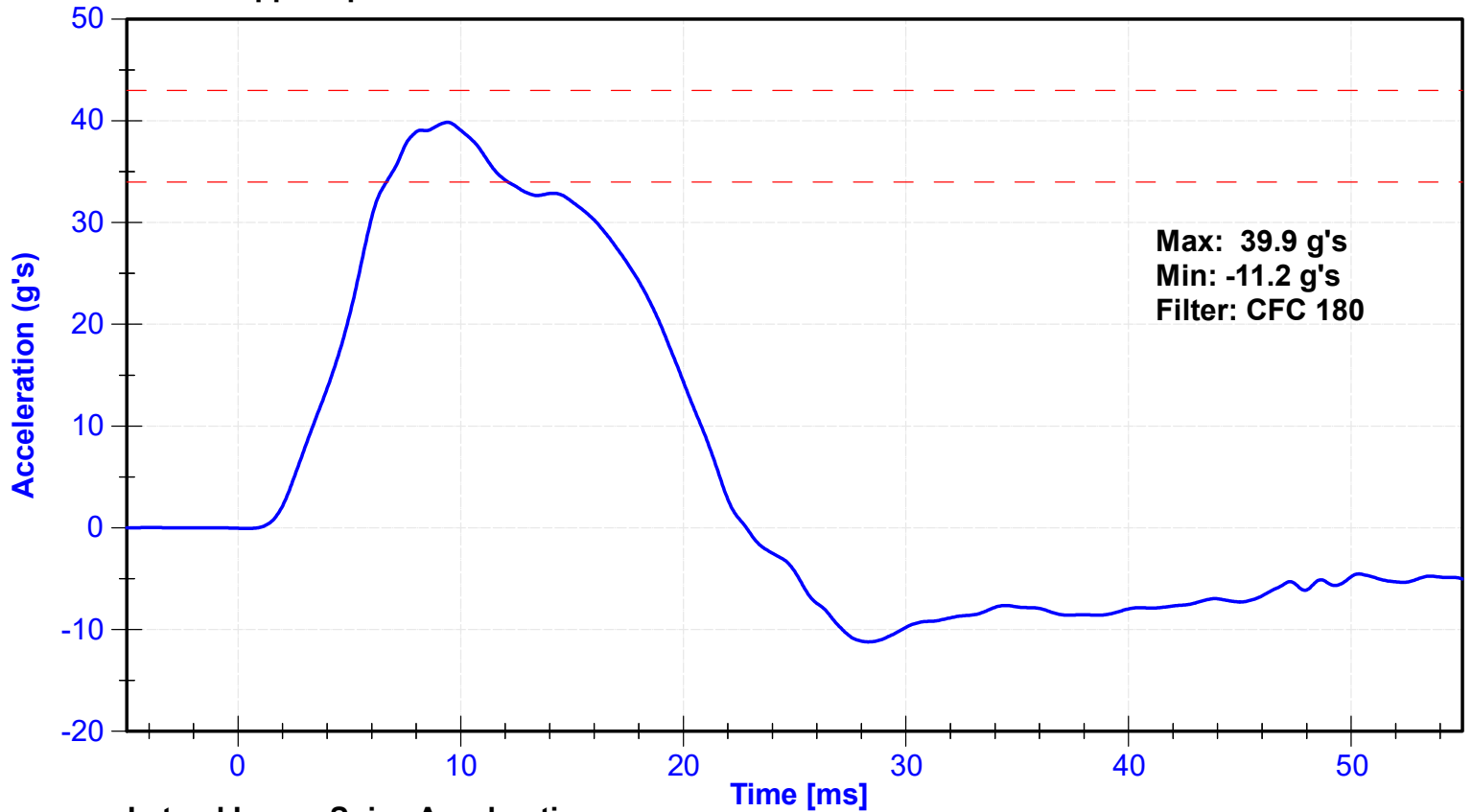
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Upper Spine T1 Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Upper Spine T12 Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	11/17/2023	5/17/2024

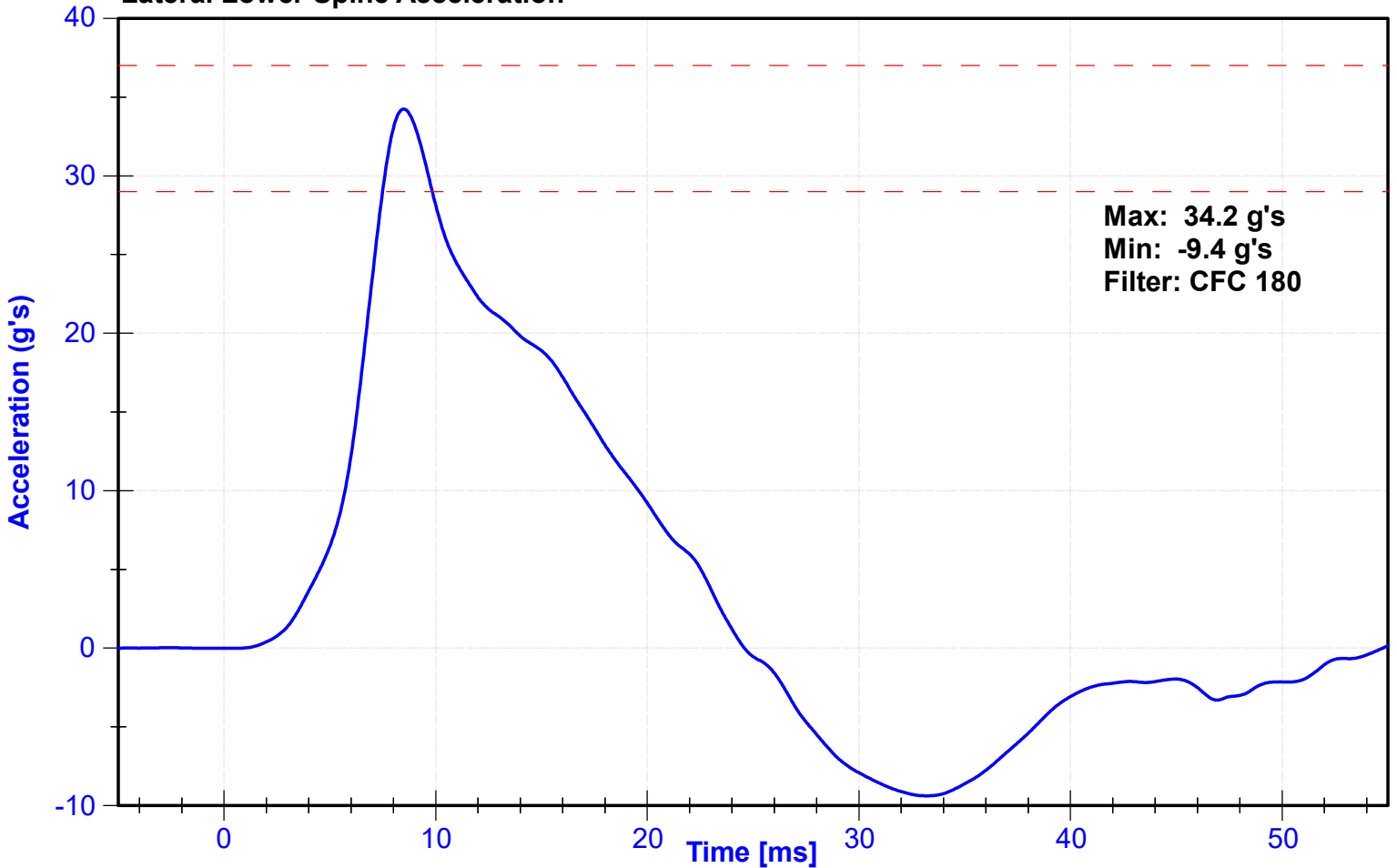




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



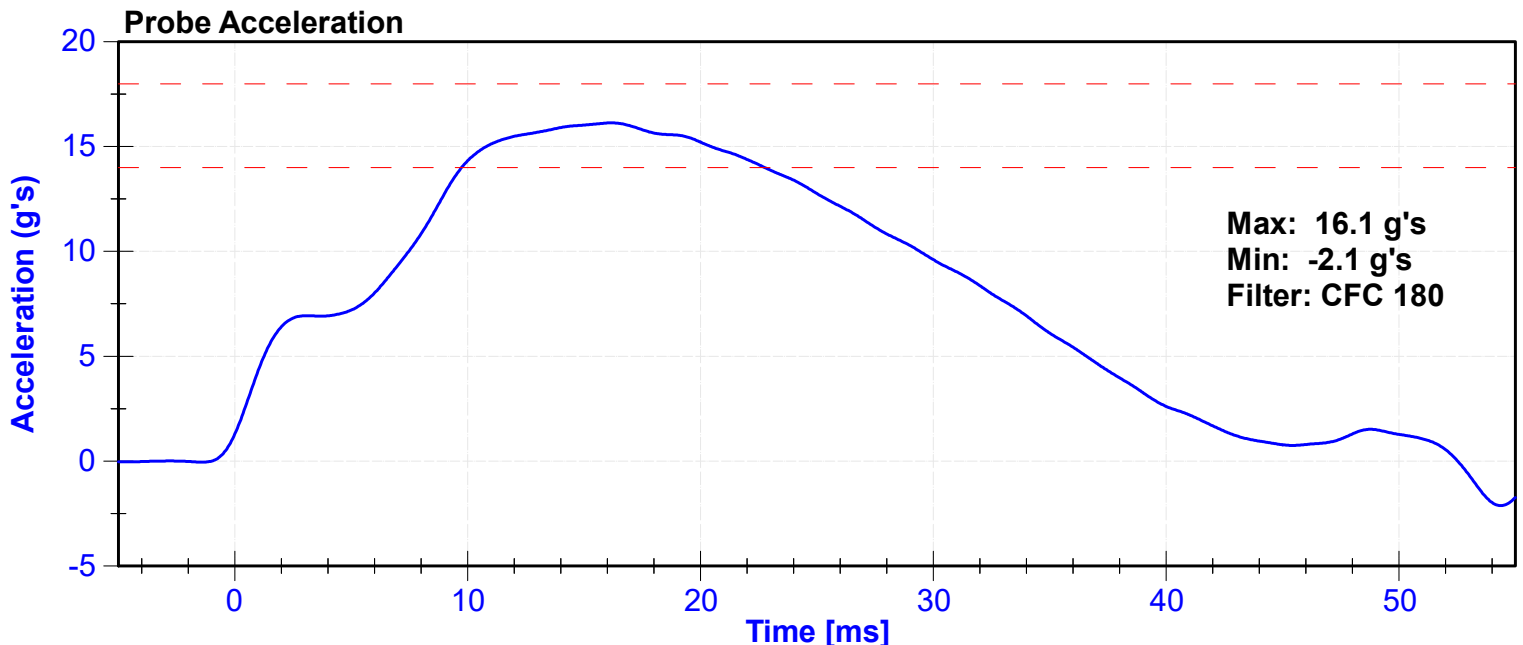
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

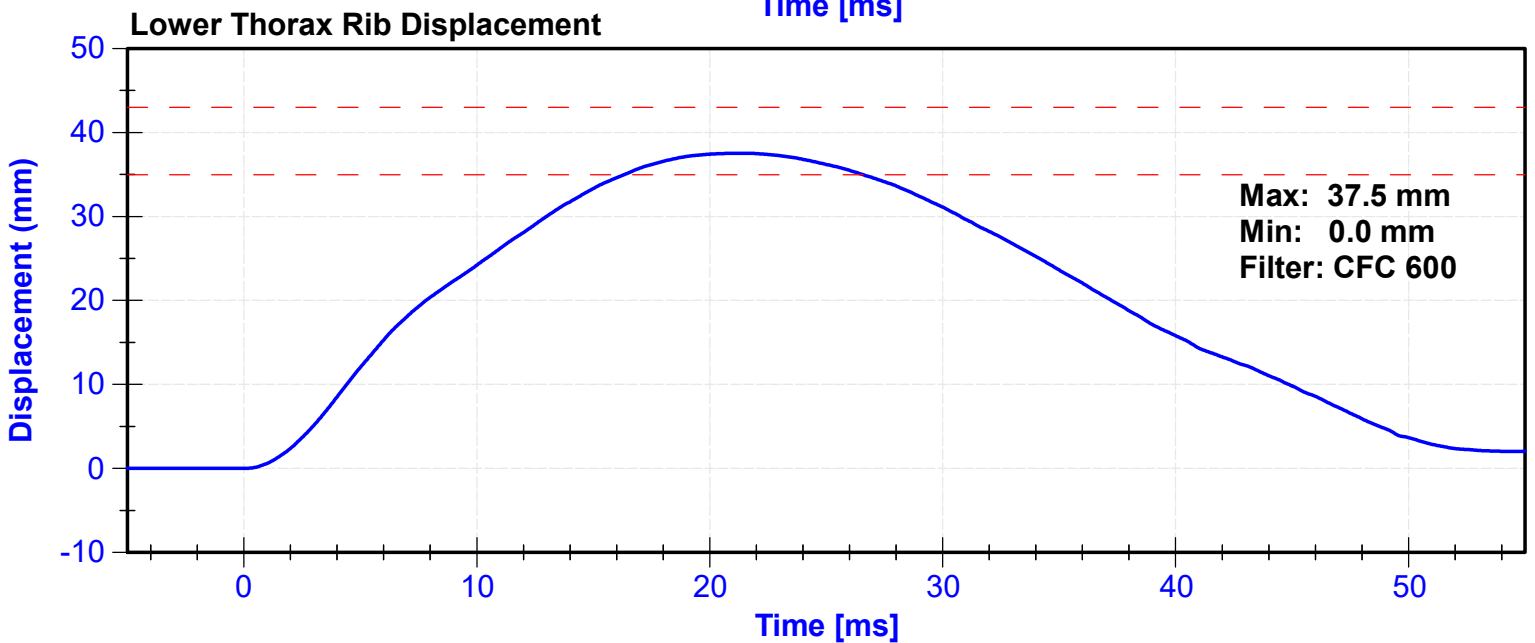
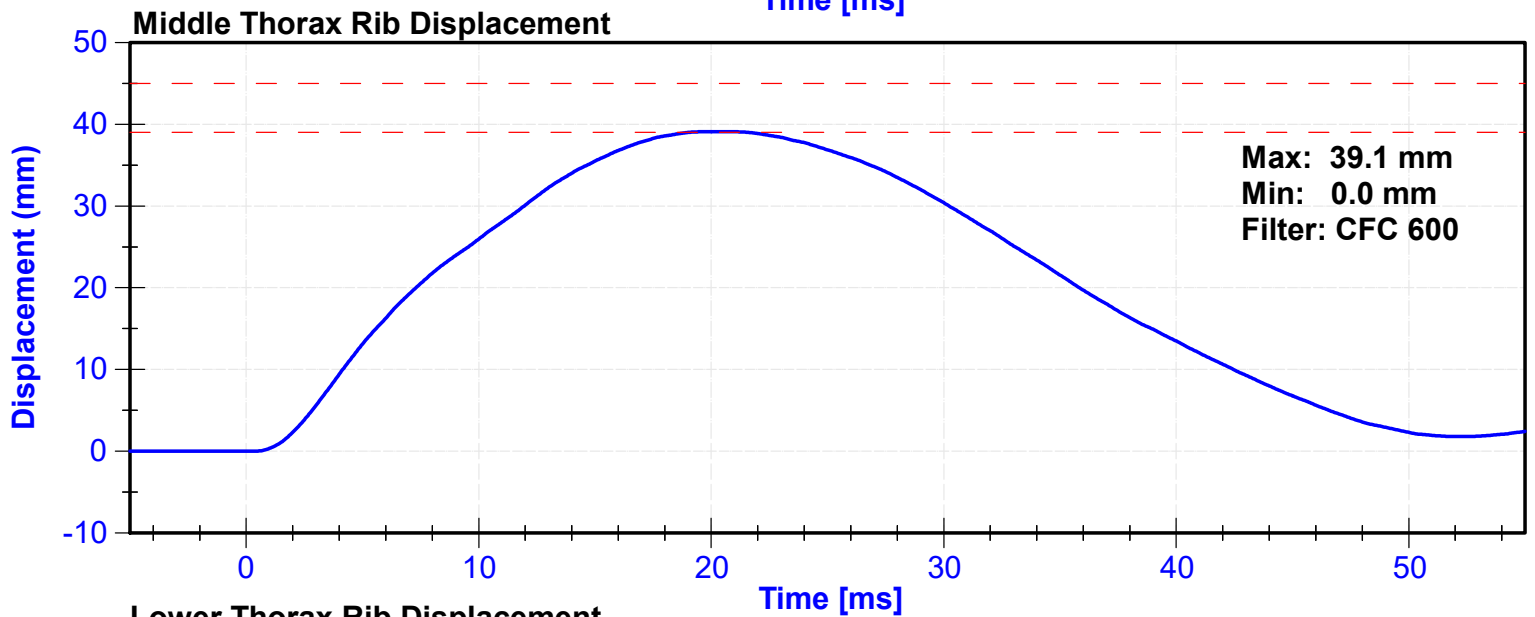
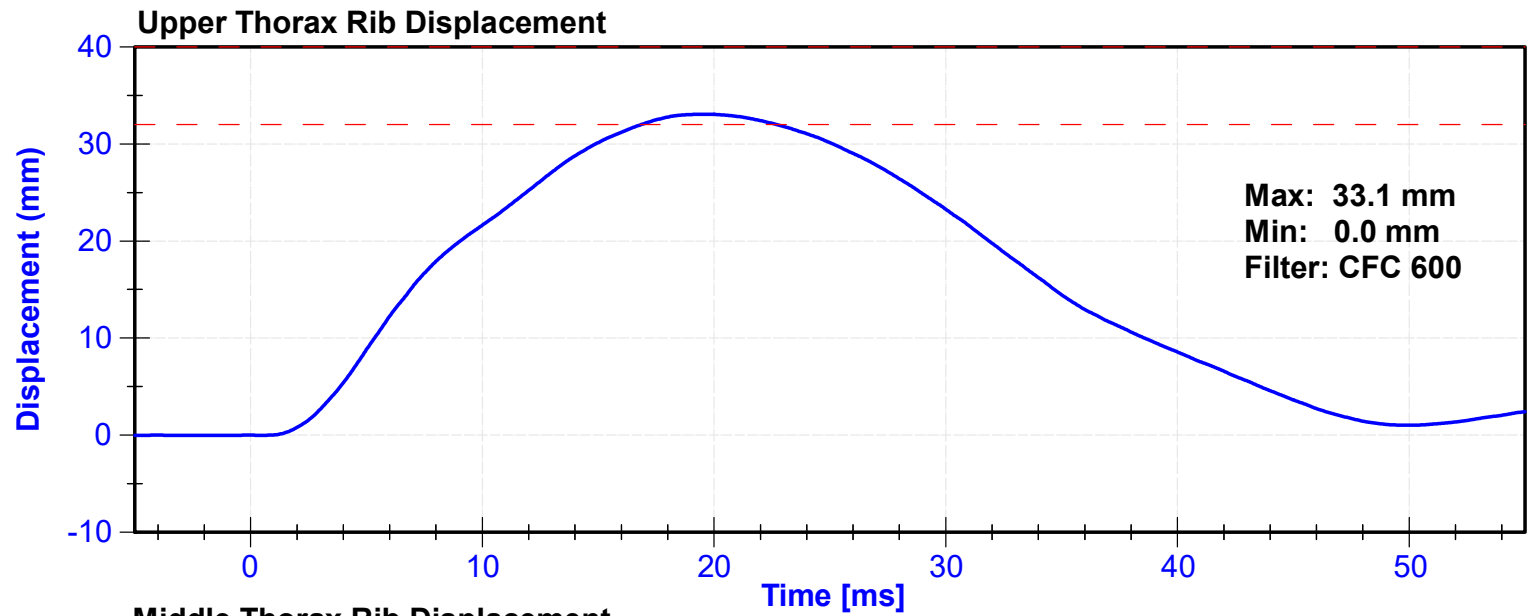
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	14	18	g's	16.1	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.5	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.5	Pass
Upper Thorax Rib Deflection	32	40	mm	33.1	Pass
Middle Thorax Rib Deflection	39	45	mm	39.1	Pass
Lower Thorax Rib Deflection	35	43	mm	37.5	Pass

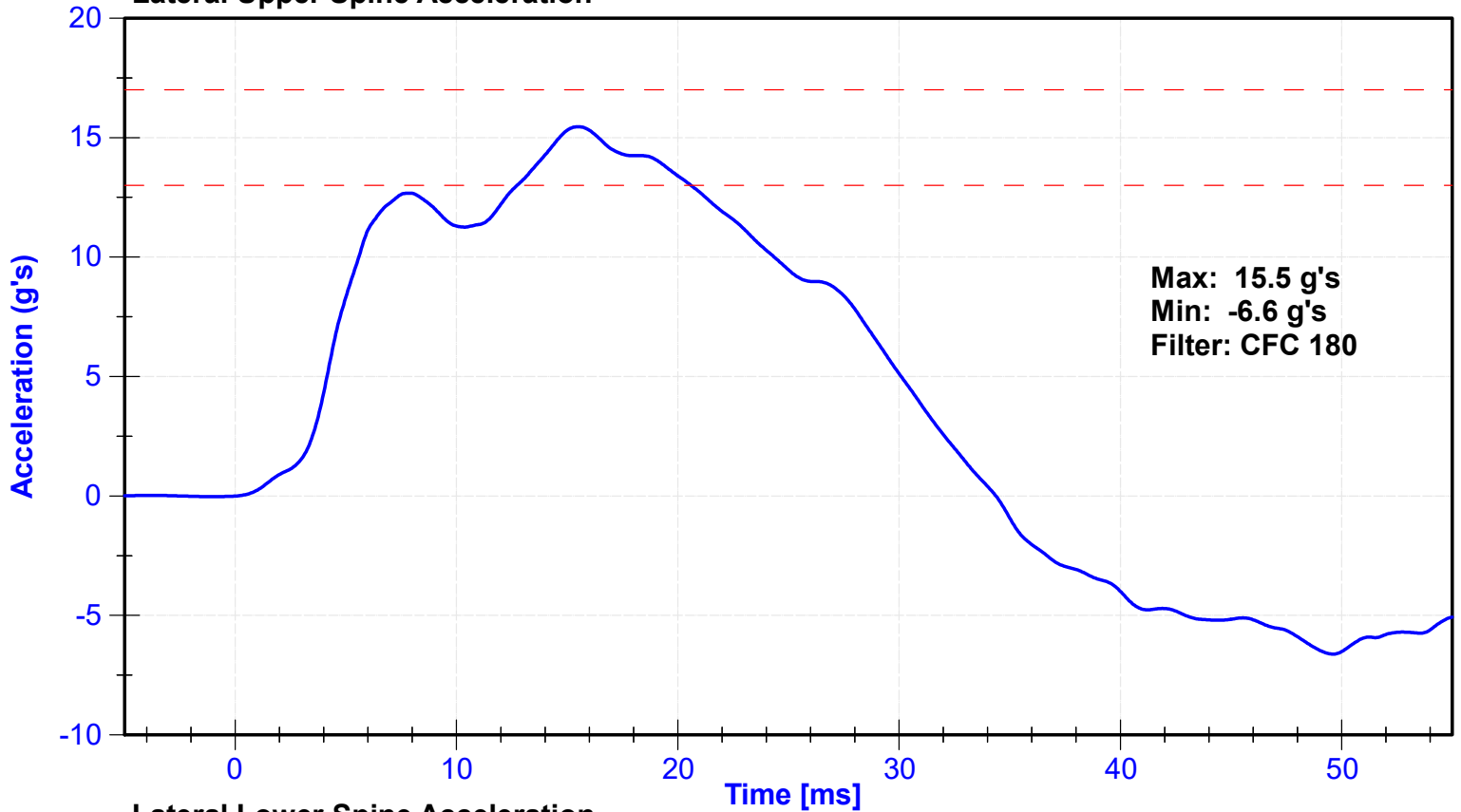
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	11/17/2023	5/17/2024

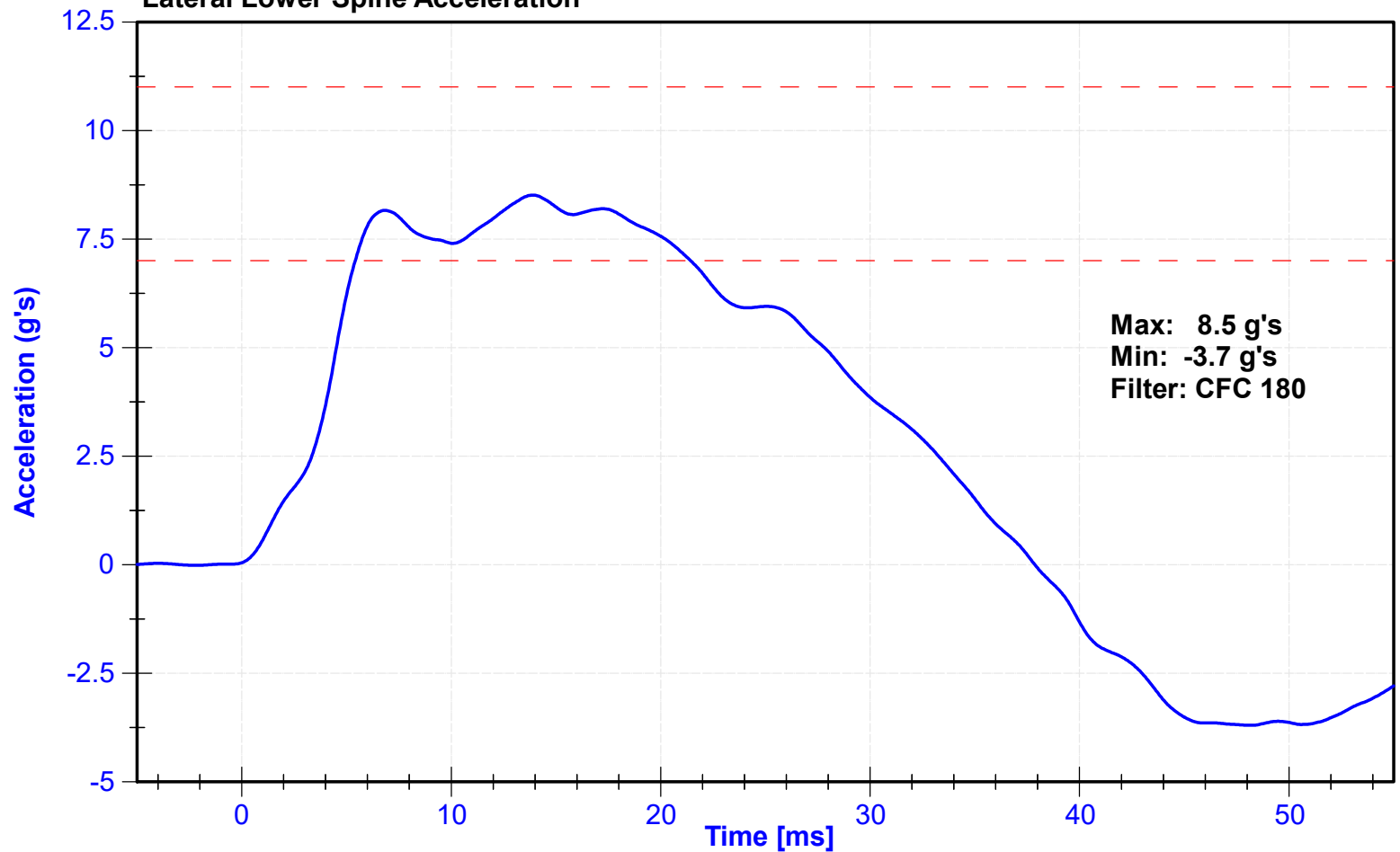




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



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

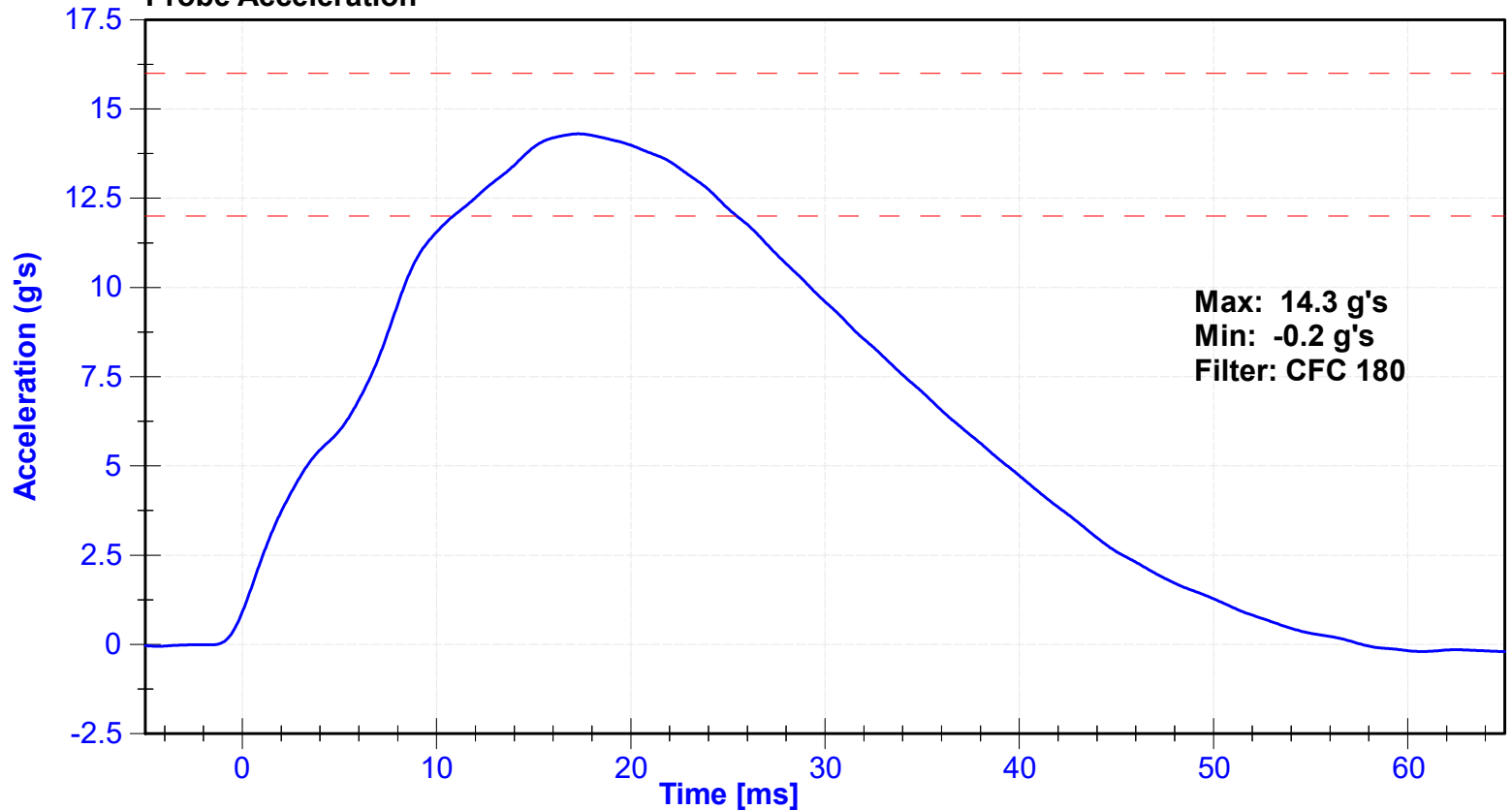
Results

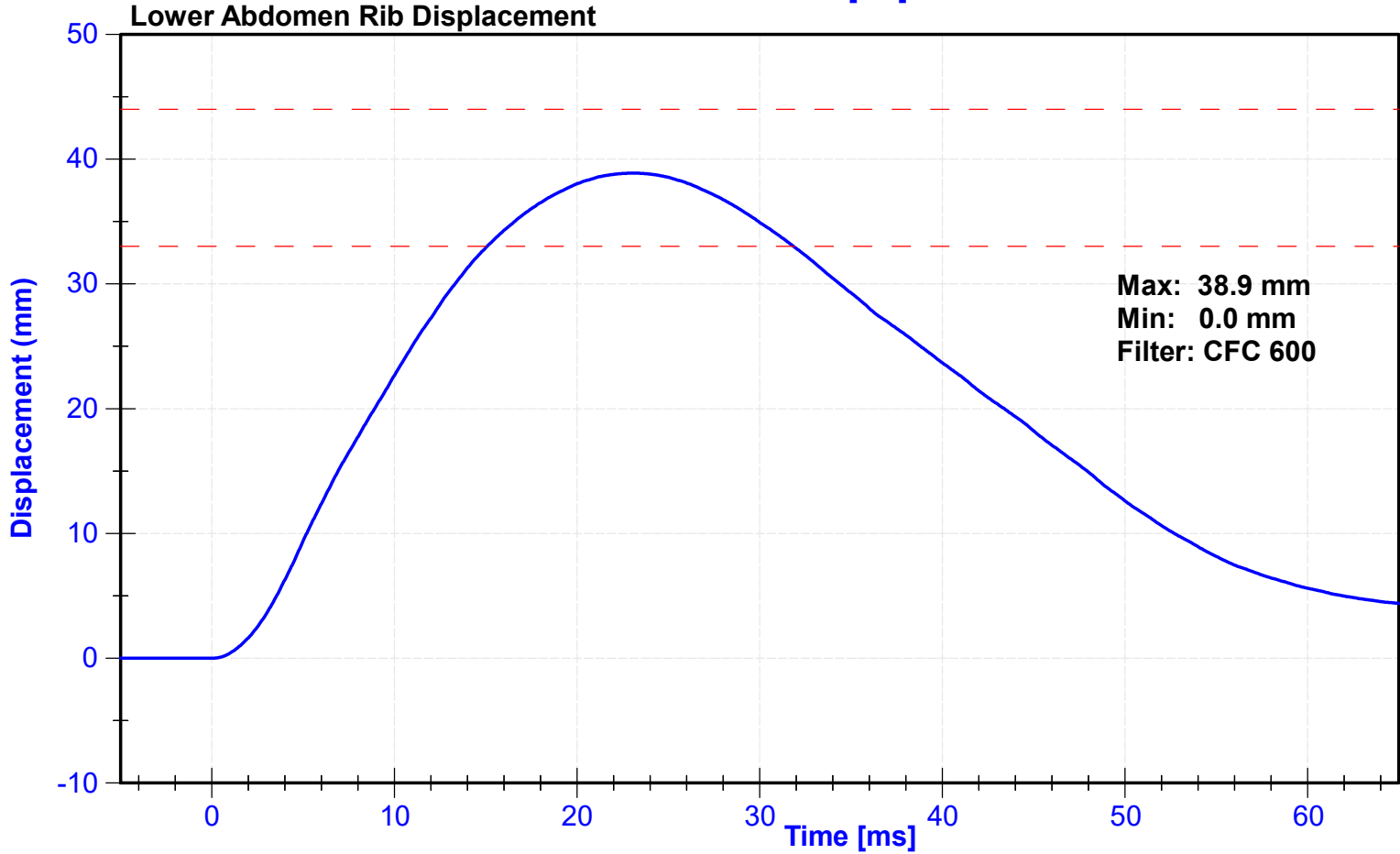
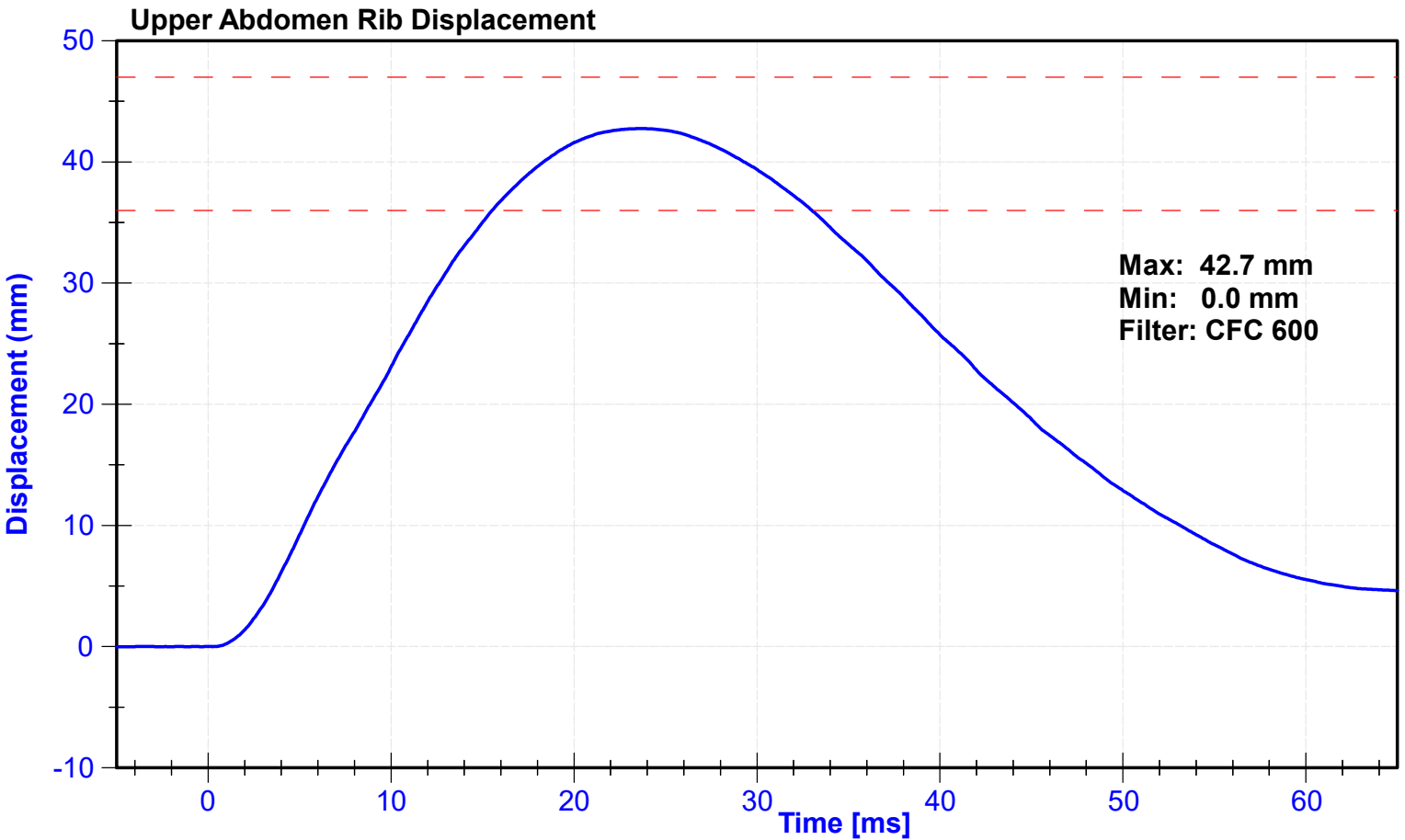
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	12	16	g's	14.3	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.8	Pass
Upper Abdomen Rib Deflection	36	47	mm	42.7	Pass
Lower Abdomen Rib Deflection	33	44	mm	38.9	Pass

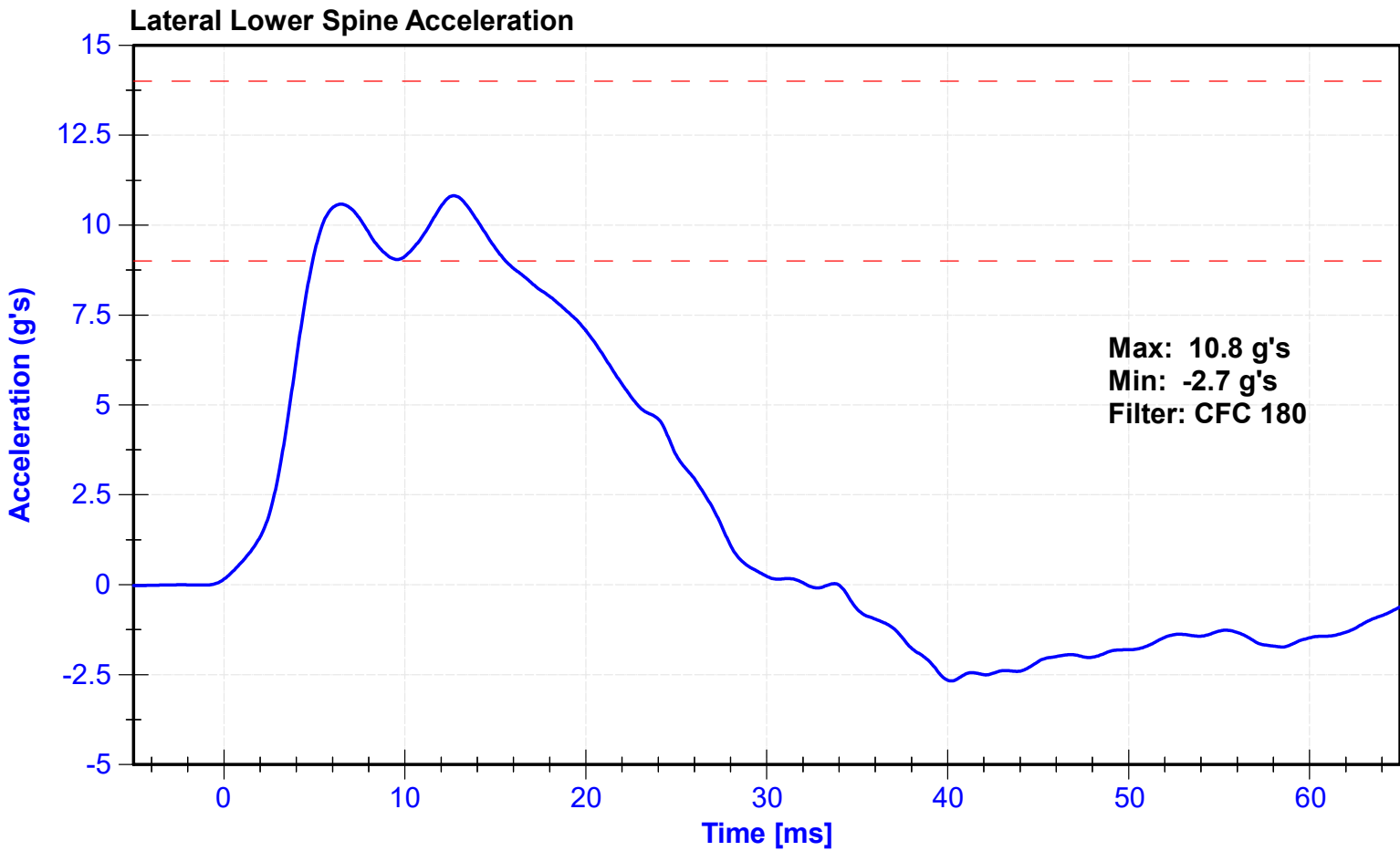
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Abdomen Rib Potentiometer	Servo	008GFE	11/17/2023	5/17/2024
Lower Abdomen Rib Potentiometer	Servo	046	11/17/2023	5/17/2024

Probe Acceleration







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

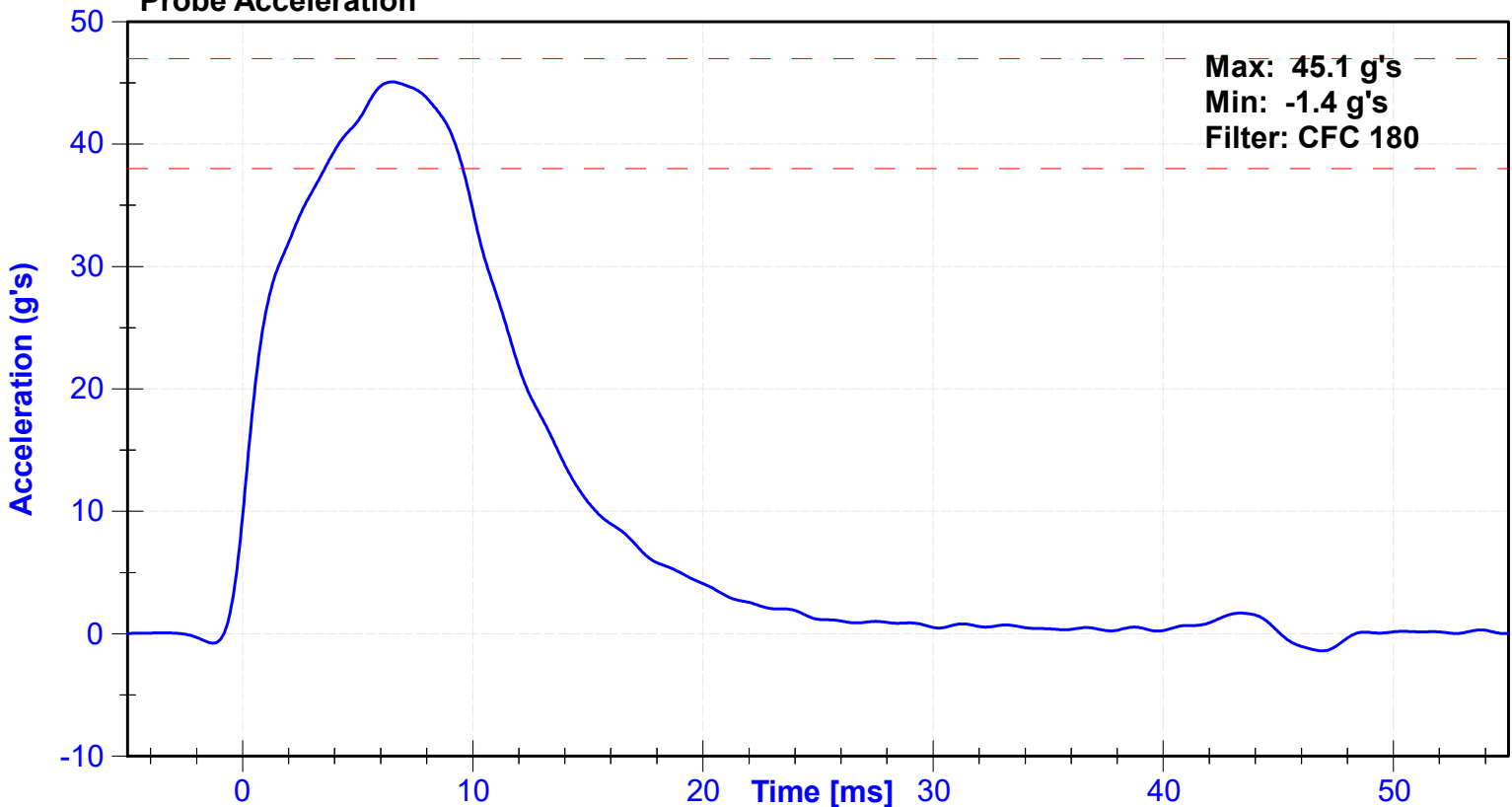
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	6.6	6.8	m/s	6.61	Pass
Probe Acceleration	38	47	g's	45.1	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	38.2	Pass
Acetabulum Force	3600	4300	N	4139.7	Pass

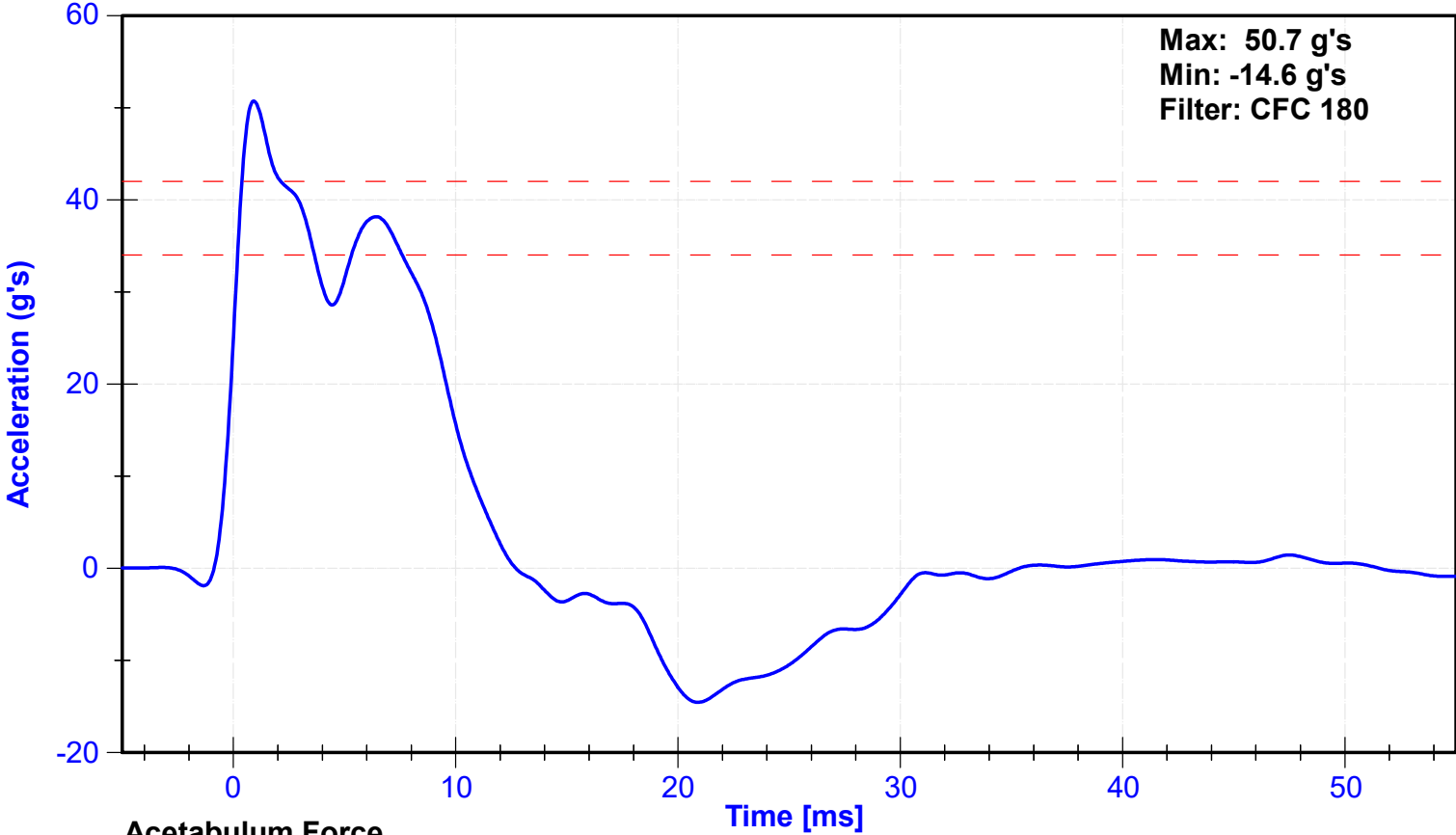
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Pelvis Y Accelerometer	Endevco	P50078	11/16/2023	5/14/2024
Acetabulum Load Cell	Denton	270-FY	9/11/2023	9/10/2024
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A

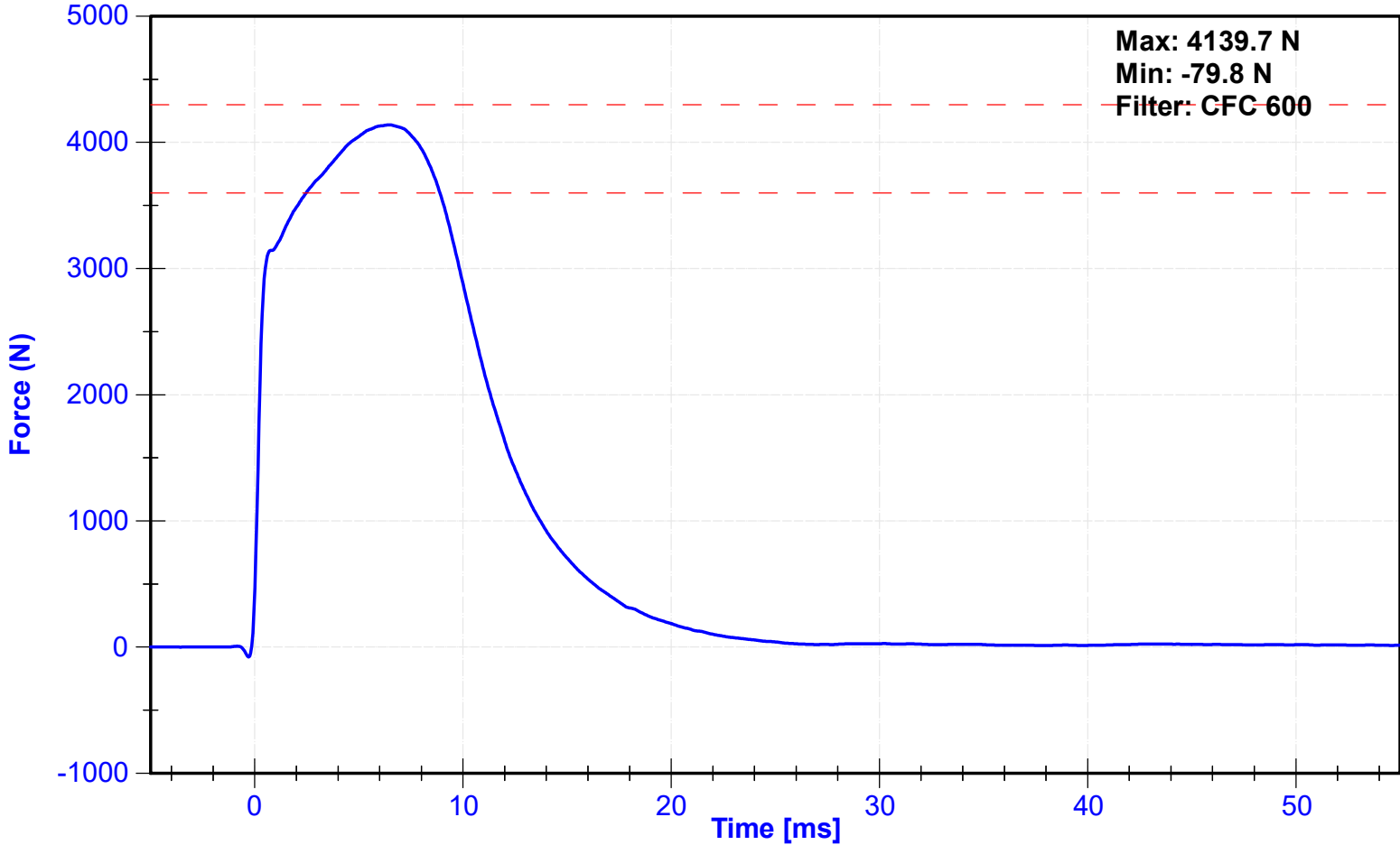
Probe Acceleration



Lateral Pelvis Acceleration



Acetabulum Force



SID-IIs Pelvis Plug Certification Test

Plug S/N 16390

Test Number 22957

Report Number 23015

Test Date 5/20/2022 3:55:58 PM

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

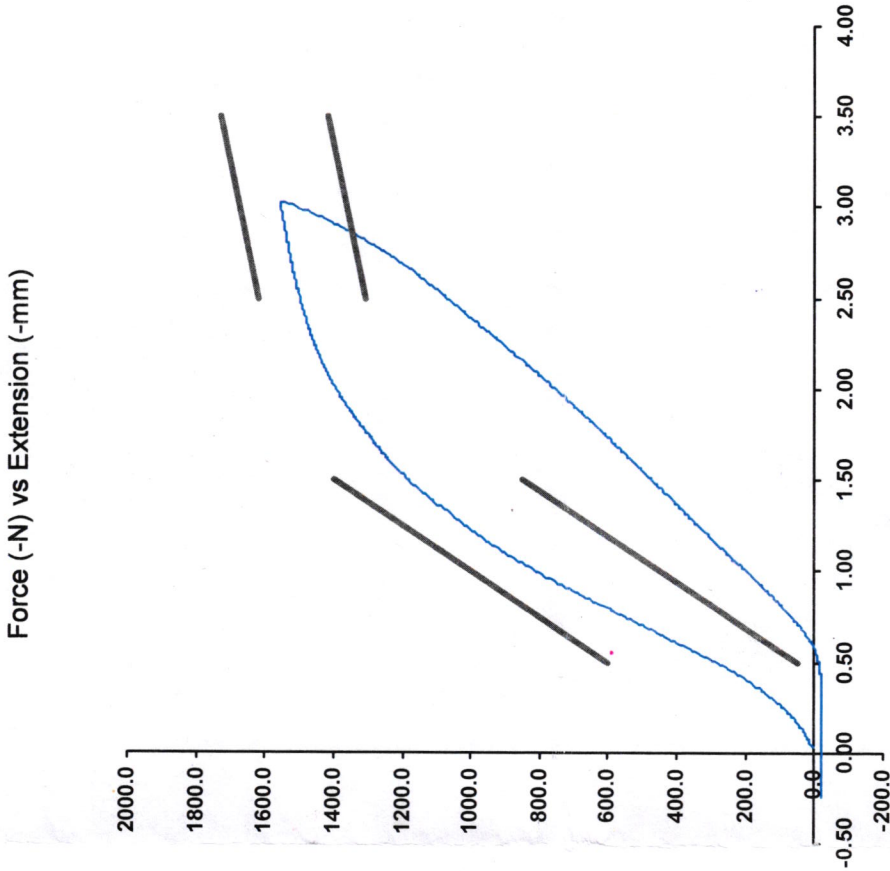
Testing Machine STM-20 5965542

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

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator

Part Number 180-4450

Template No 107 20-May-22

SACO Research

By: *DC* Date: *5/20/2022*

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



SID-IIs Pelvis Plug Certification Test

Plug S/N 16431 *CRASH* Non-Impact

Test Number 23000

Report Number 23058

Test Date 5/23/2022 11:02:13 AM

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	338	600
Force @ 1.5 mm (N)	1,180	1,400
Force @ 2.5 mm (N)	1,426	1,618
Force @ 3.0 mm (N)	1,476	1,673

Testing Machine STM-20 5965542

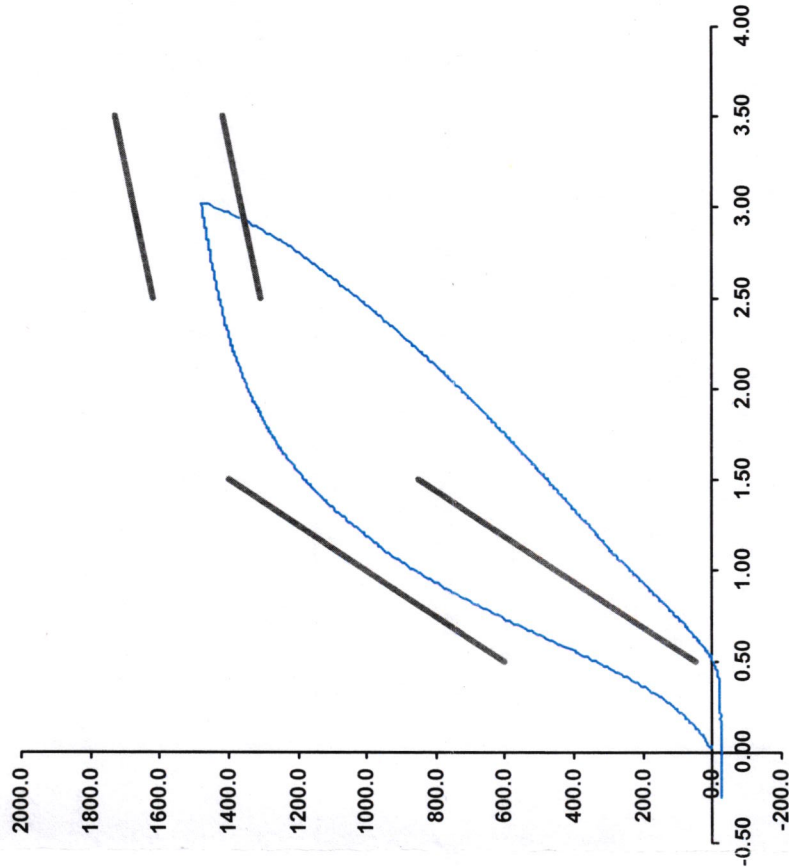
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 23-May-22

SACO Research

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

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



SID-ILs Pelvis Plug Certification Test

Plug S/N 16353 *CRASH*

Test Number 22920

Report Number 22977

Test Date 5/20/2022 1:07:00 PM

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

Testing Machine STM-20 5965542

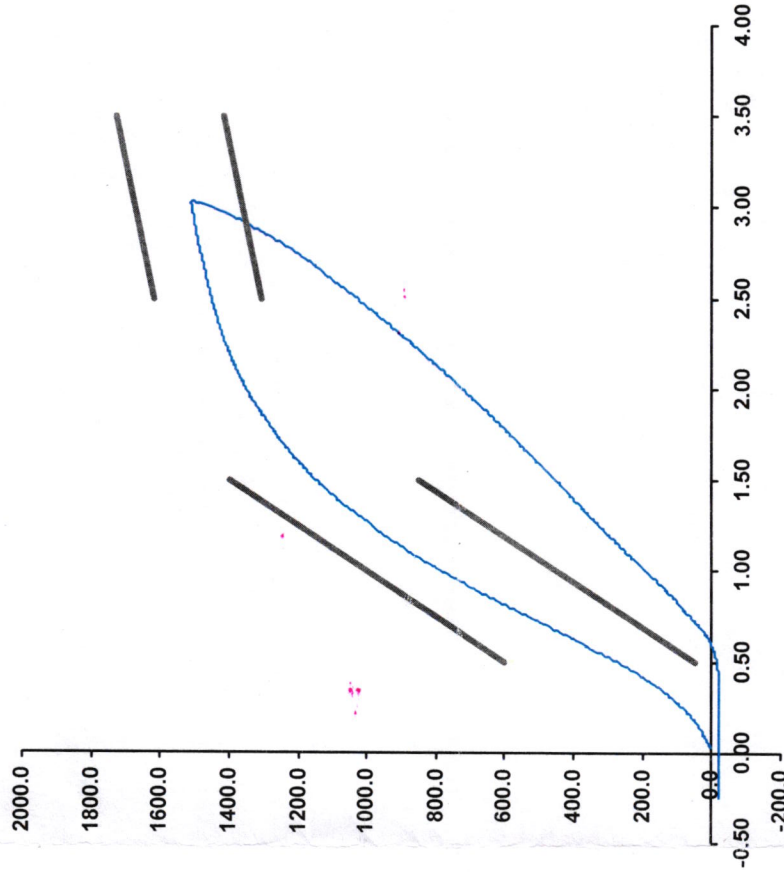
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 20-May-22

SACO Research

By: *RC* Date: *5/20/2022*

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

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

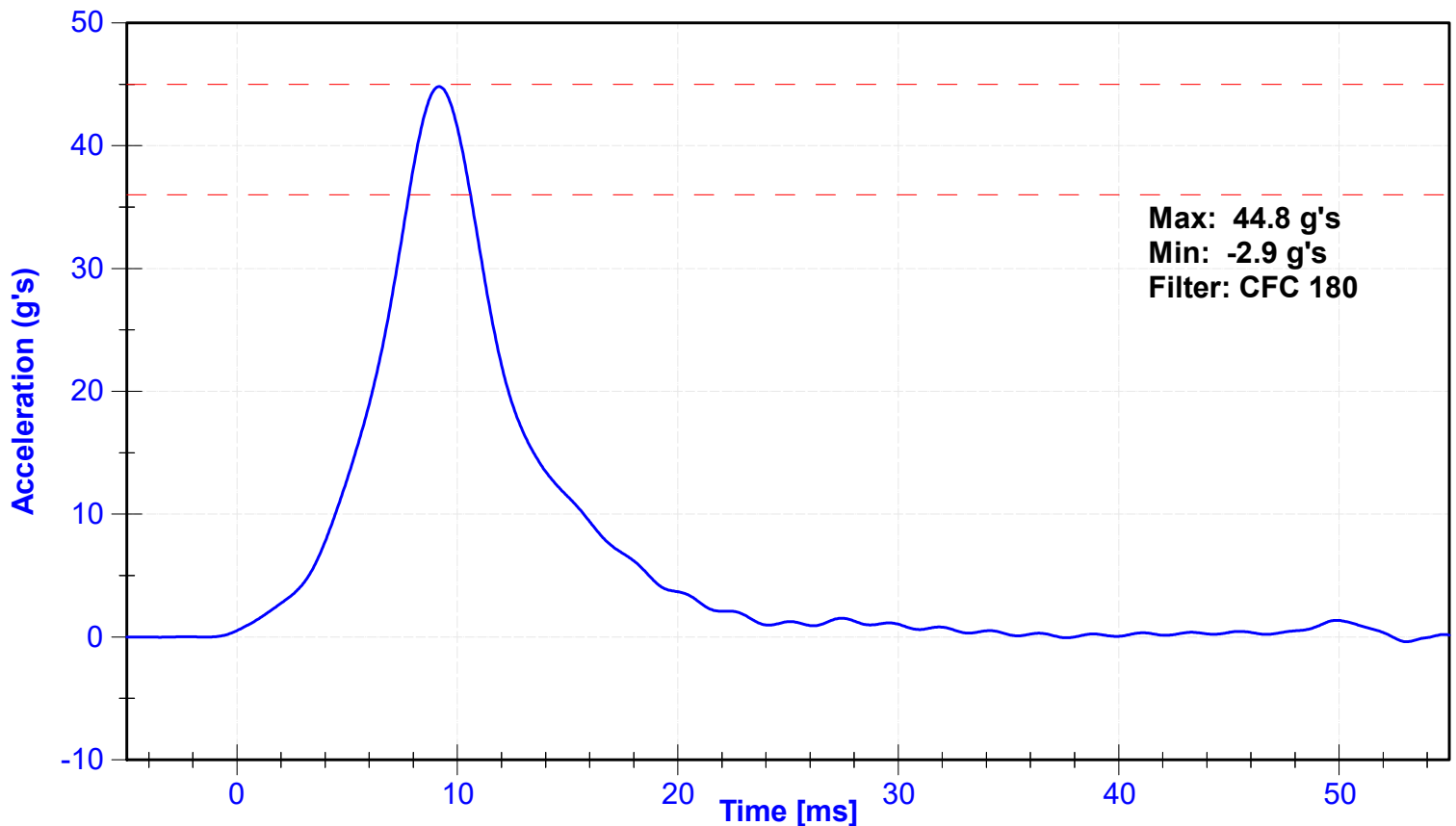
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	36	45	g's	44.8	Pass
Lateral Pelvis Acceleration	28	39	g's	36.5	Pass
Iliac Force	4100	5100	N	5090.3	Pass

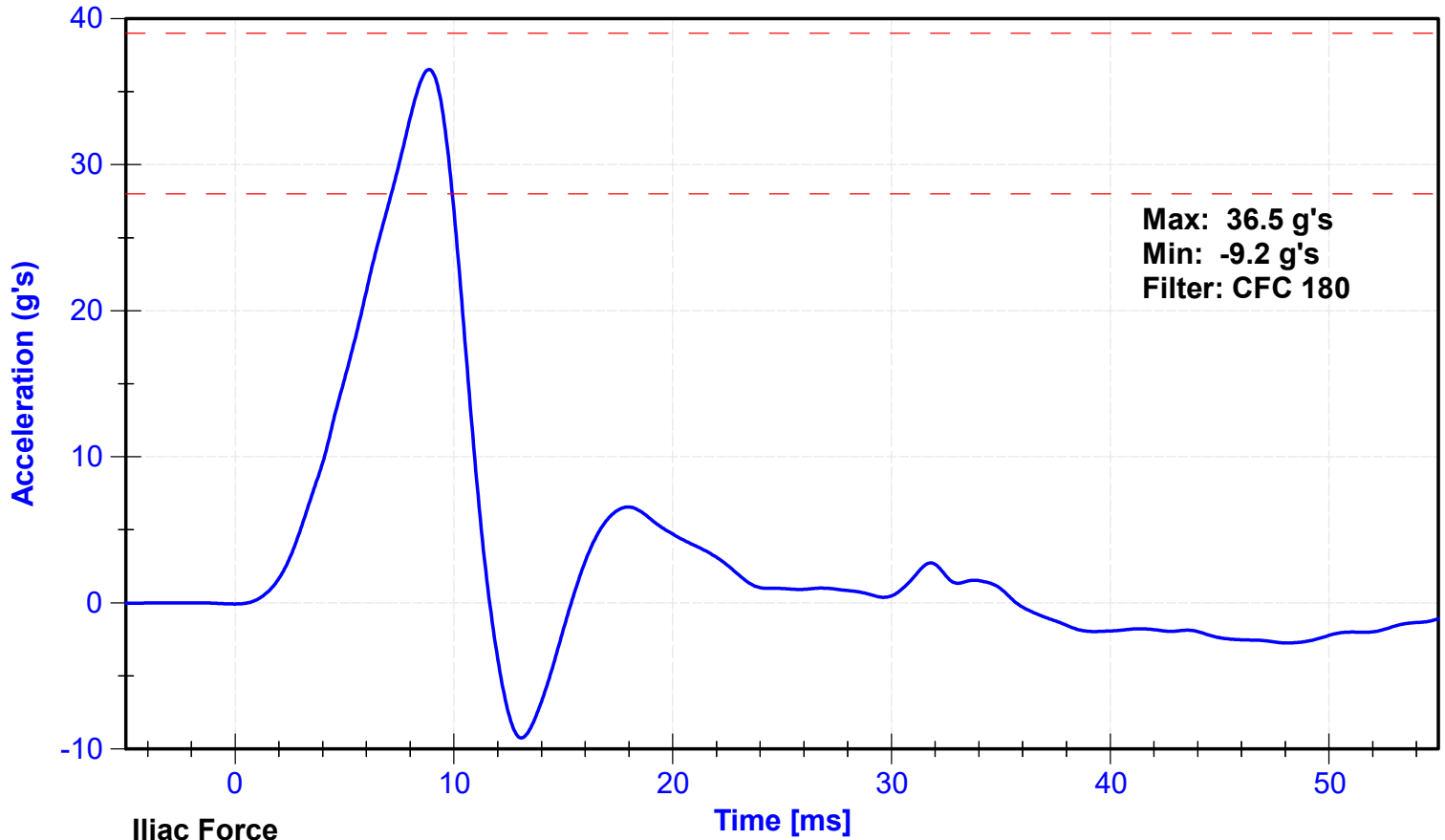
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Pelvis Y Accelerometer	Endevco	P50078	11/16/2023	5/14/2024
Iliac Load Cell	Denton	280-FY	9/11/2023	9/10/2024

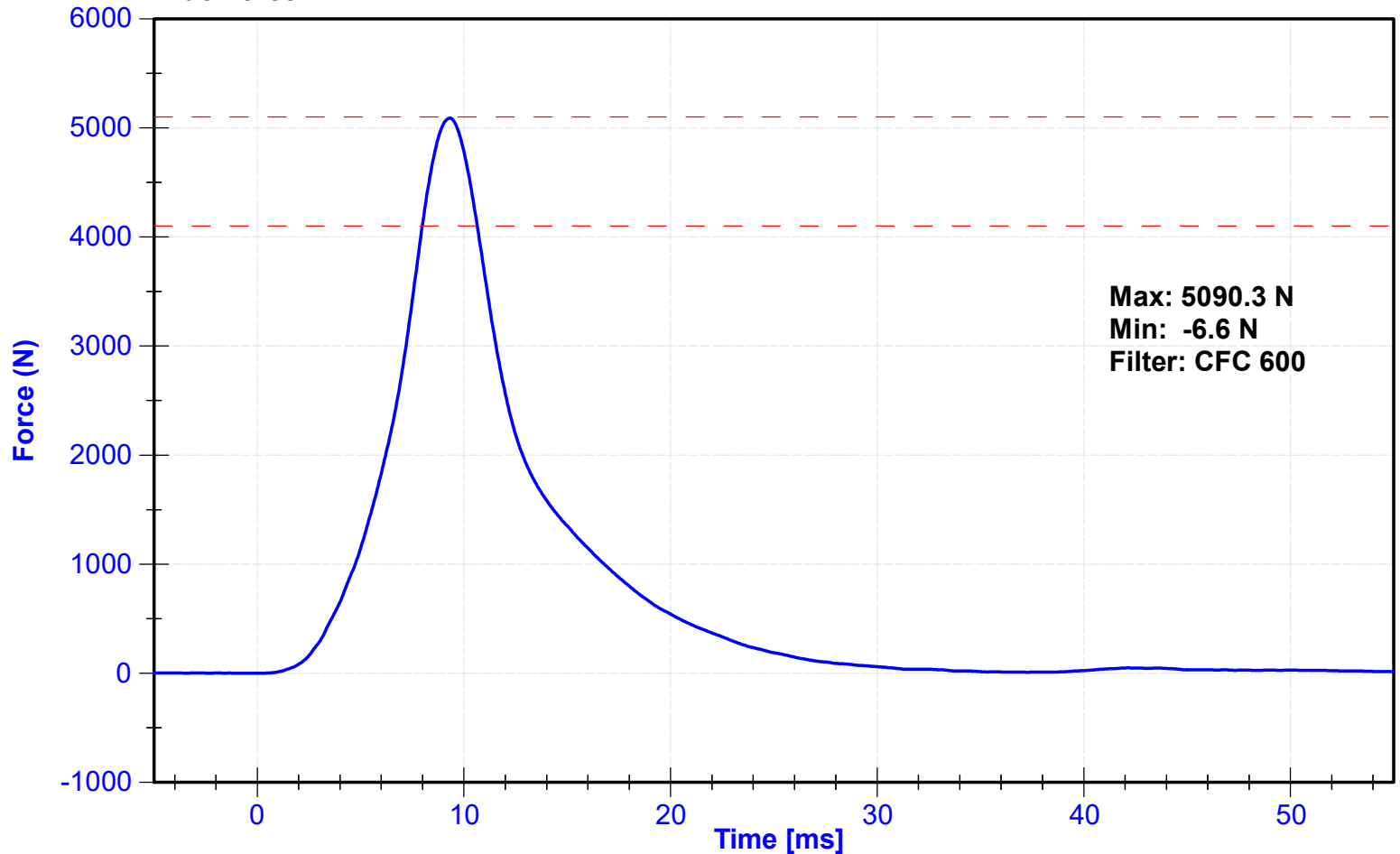
Probe Acceleration



Lateral Pelvis Acceleration



Iliac Force



CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

SERIAL NO:DG8012

(CONFIGURED FOR LEFT SIDE IMPACT)

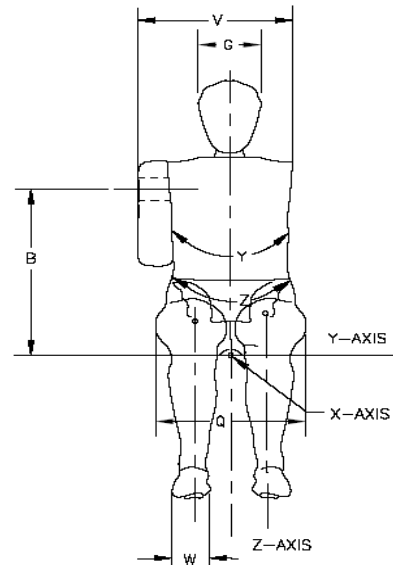
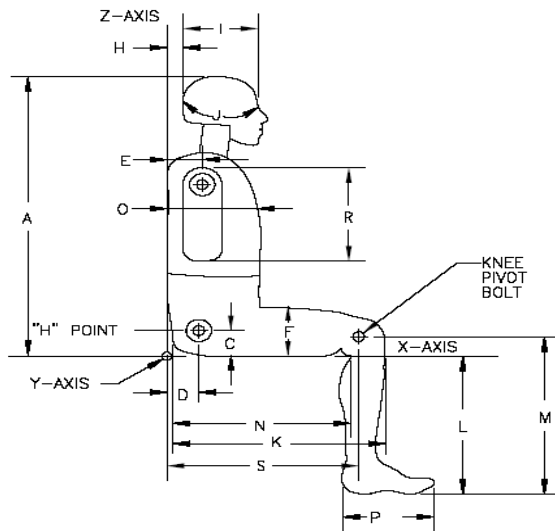


External Measurements - SID-IIs

Technician: **K. Brogan**

Date: **12/05/2023**

Dummy Serial Number: **DG8012**



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	781	Pass
B	Shoulder Pivot Height	437	453	447	Pass
C	H-point Height	79	89	83	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	104	Pass
F	Thigh Clearance	119	135	129	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	545	Pass
K	Buttock to Knee Length	514	540	530	Pass
L	Popliteal Height	343	369	361	Pass
M	Knee Pivot to floor height	392	409	399	Pass
N	Buttock Popliteal Length	416	442	437	Pass
O	Chest Depth w/o jacket	195	211	204	Pass
P	Foot Length	216	232	220	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	352	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	869	Pass
Z	Waist Circumference	761	791	779	Pass

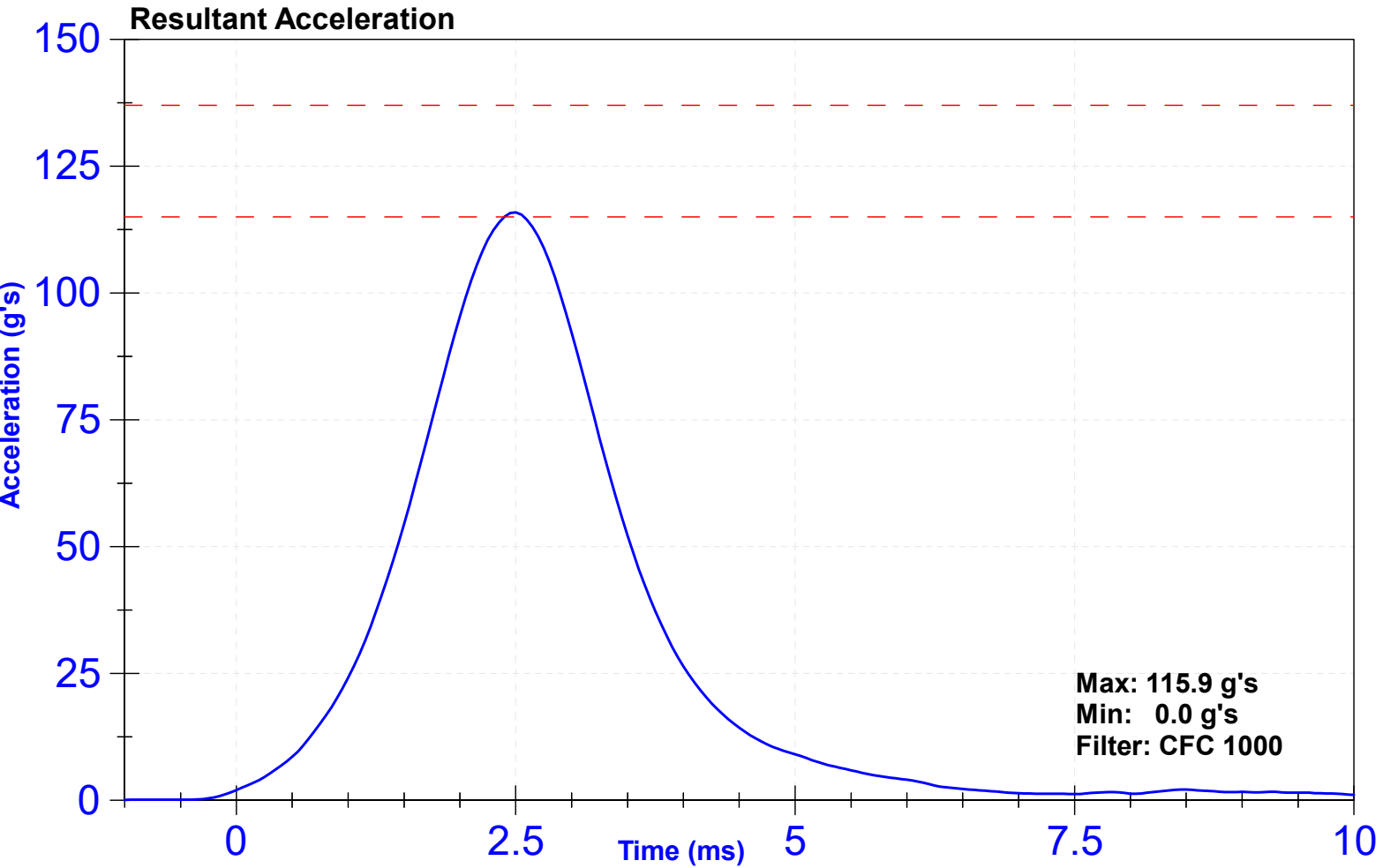
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

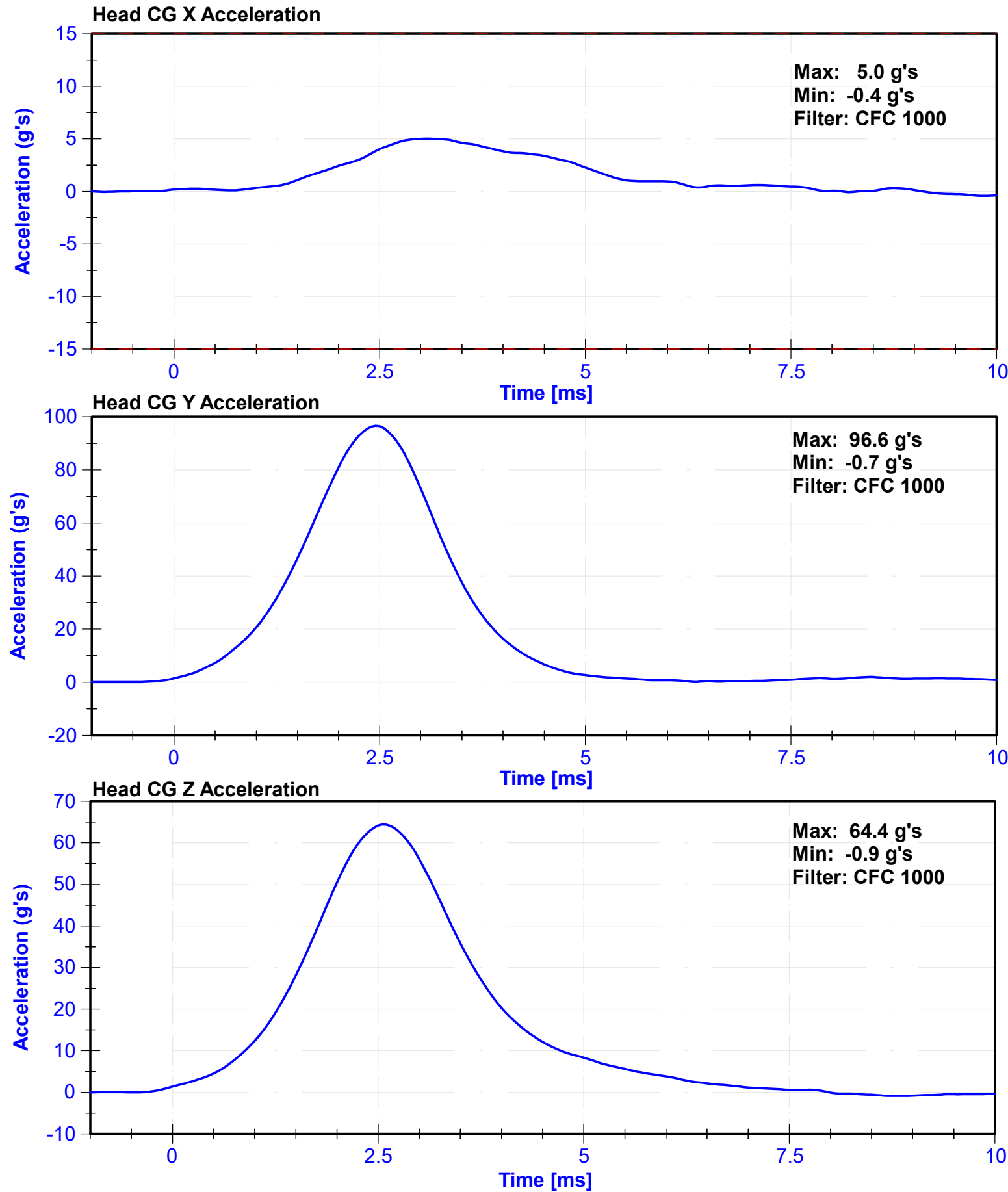
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	20	Pass
Resultant Acceleration	115	137	g's	115.9	Pass
Oscillation	0	15	%	1.8	Pass
Fore-Aft Acceleration	-15	15	g's	5.0	Pass

Transducer Calibrations

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





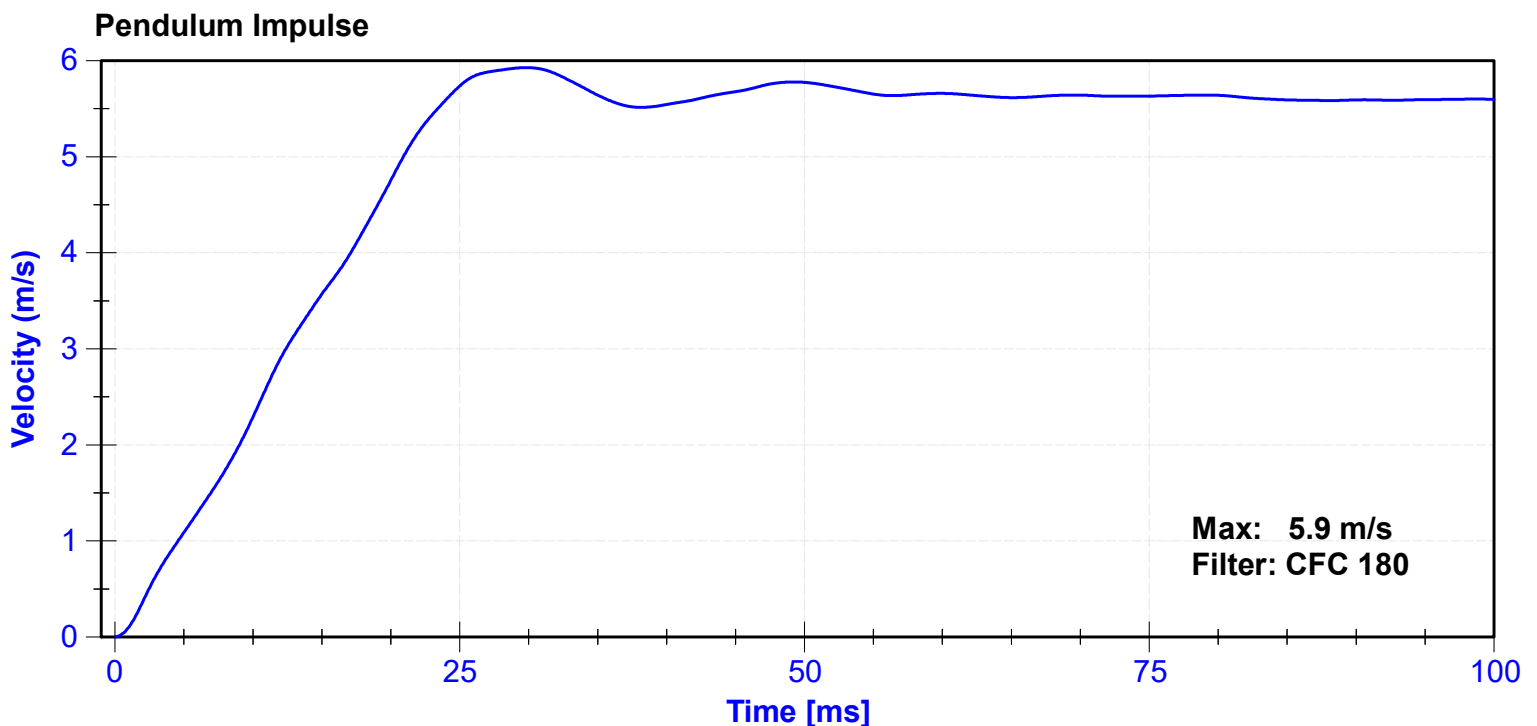
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

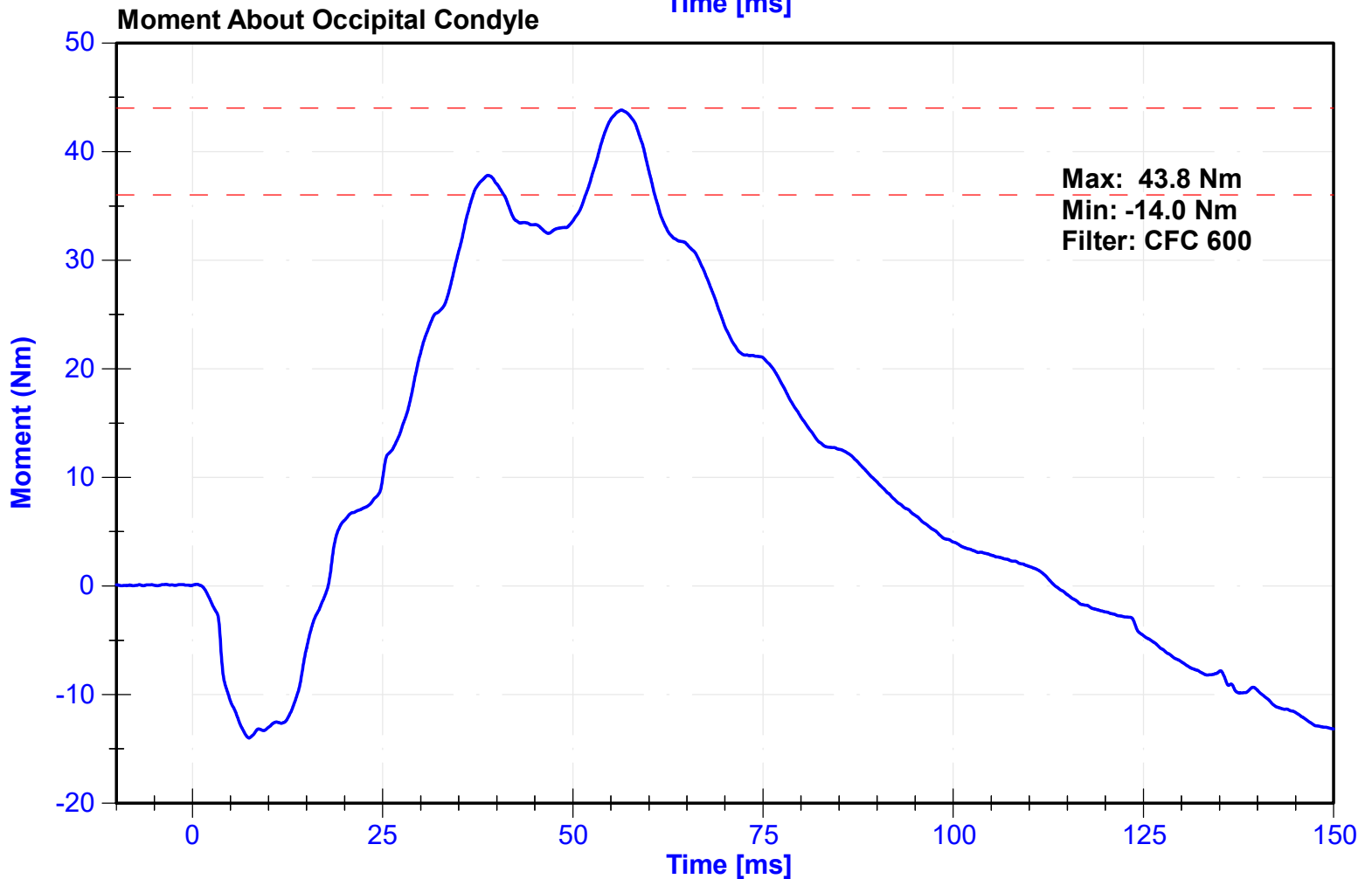
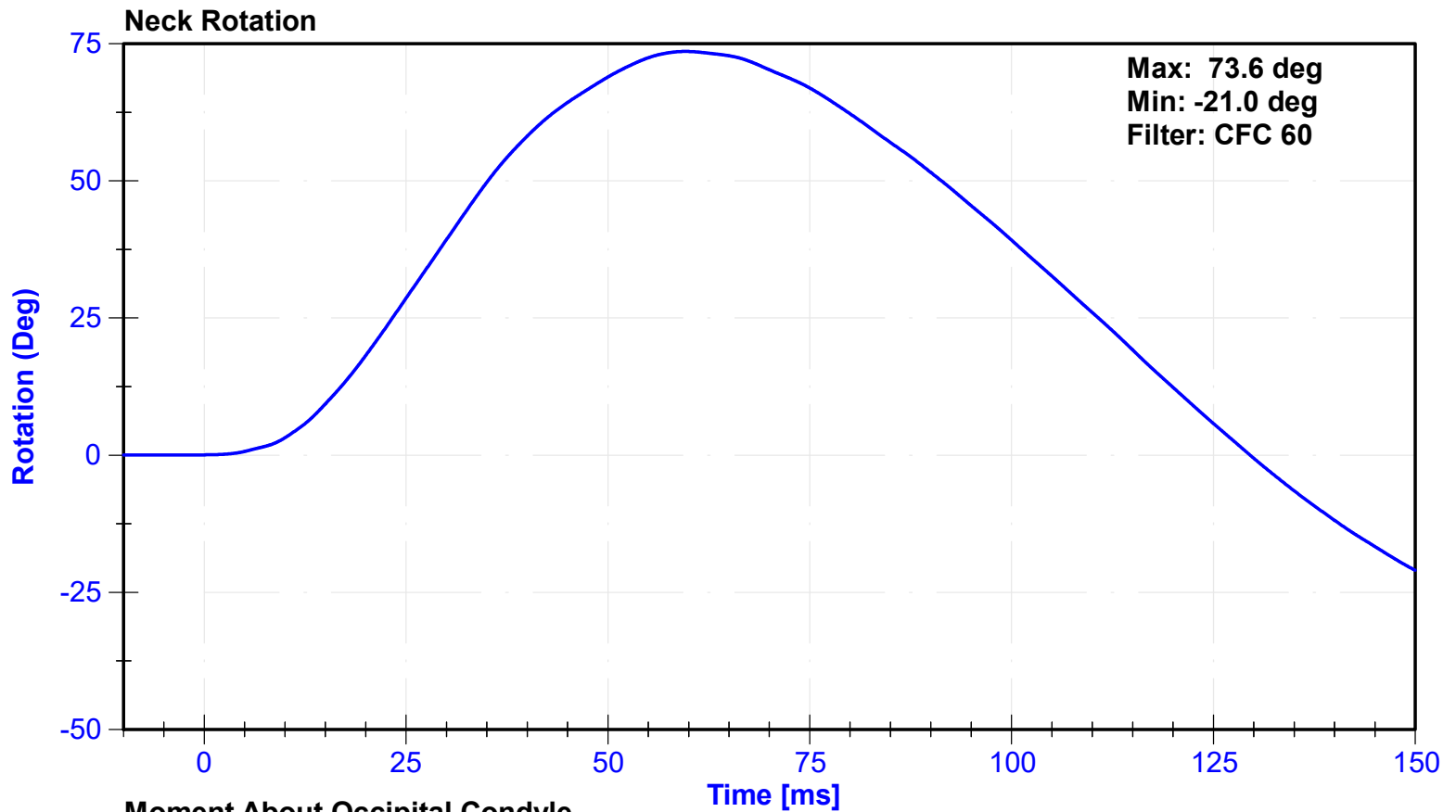
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	20	Pass
Velocity	5.51	5.63	m/s	5.526	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.29	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.57	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.75	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.74	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.93	Pass
Neck Rotation	71	81	deg	73.6	Pass
Time at Maximum Rotation	50	70	ms	59.6	Pass
Moment about the OC	36	44	Nm	43.8	Pass
Moment Decay to 0 Nm	102	126	ms	113.4	Pass

Transducer Calibrations

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





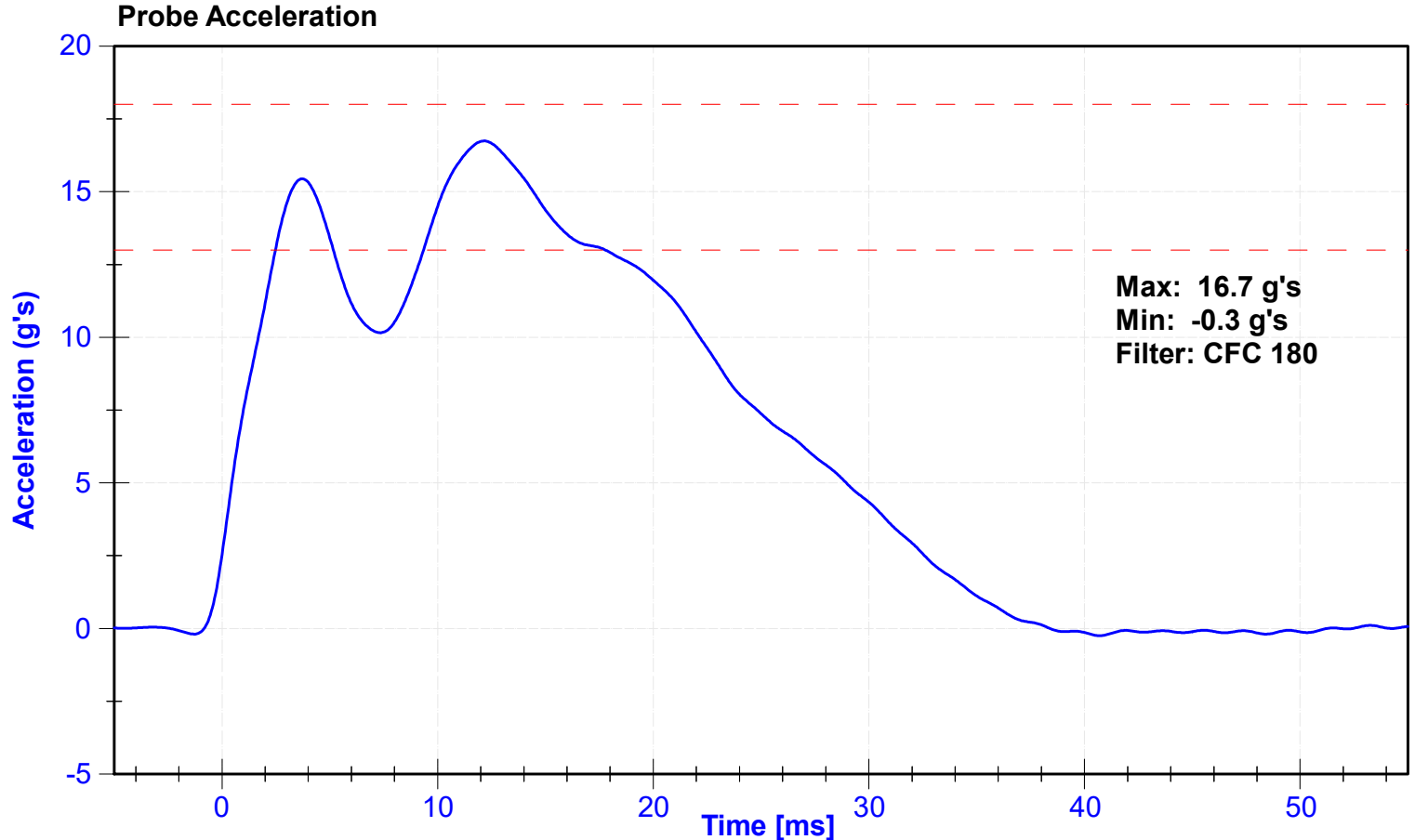
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

Results

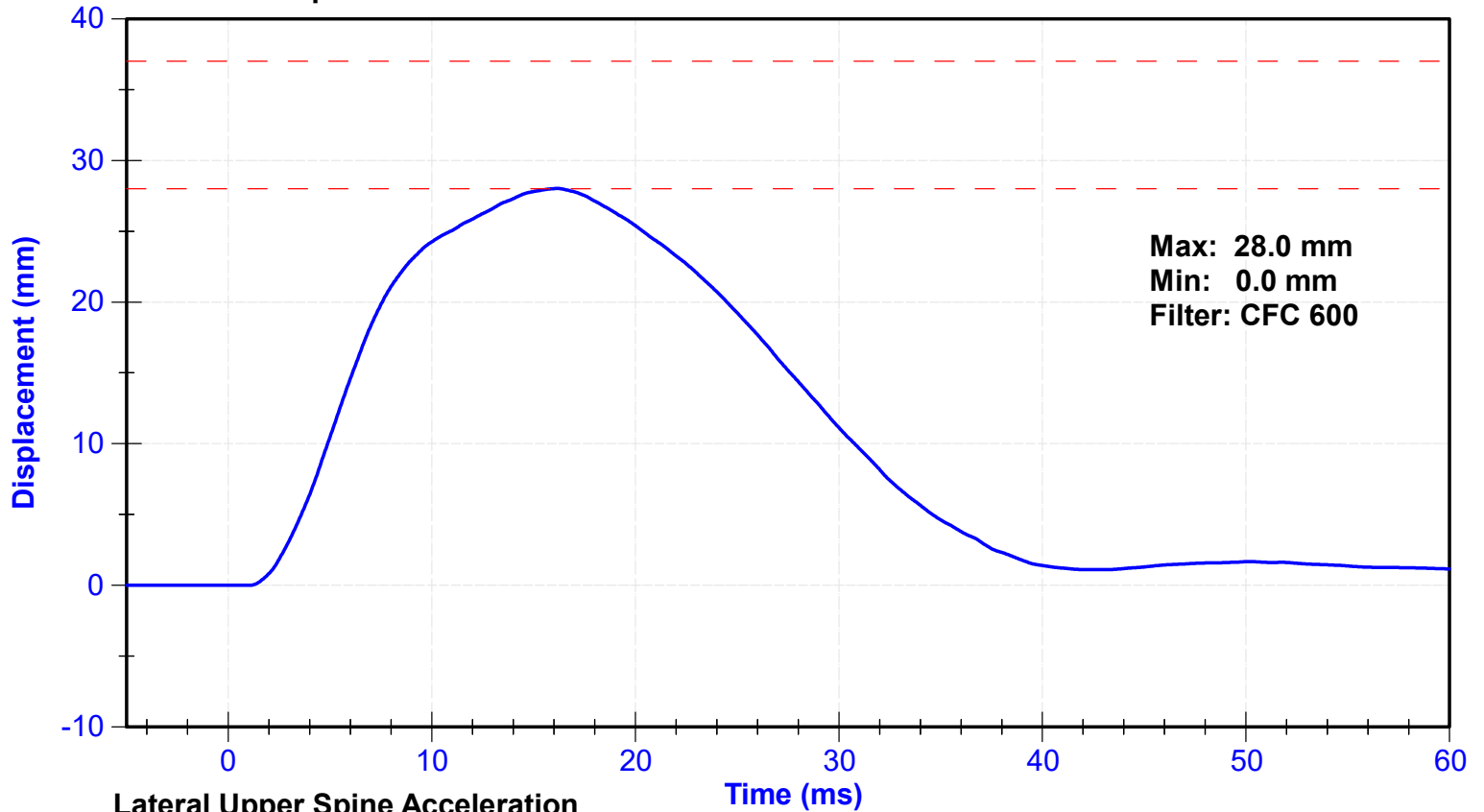
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	13	18	g's	16.7	Pass
Shoulder Deflection	28	37	mm	28.0	Pass
Lateral Upper Spine Acceleration	17	22	g's	21.5	Pass

Transducer Calibrations

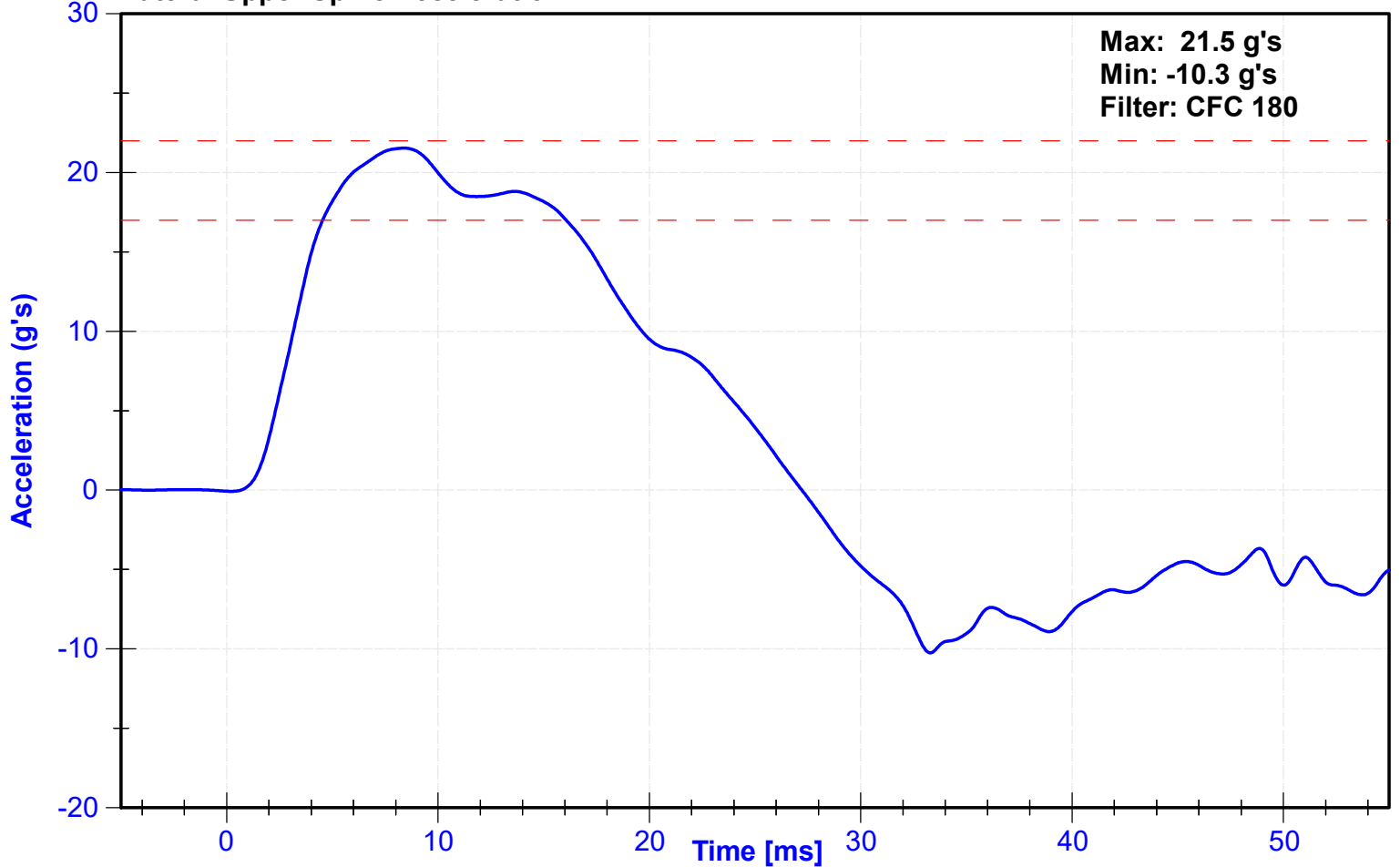
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	5/18/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024



Shoulder Displacement



Lateral Upper Spine Acceleration



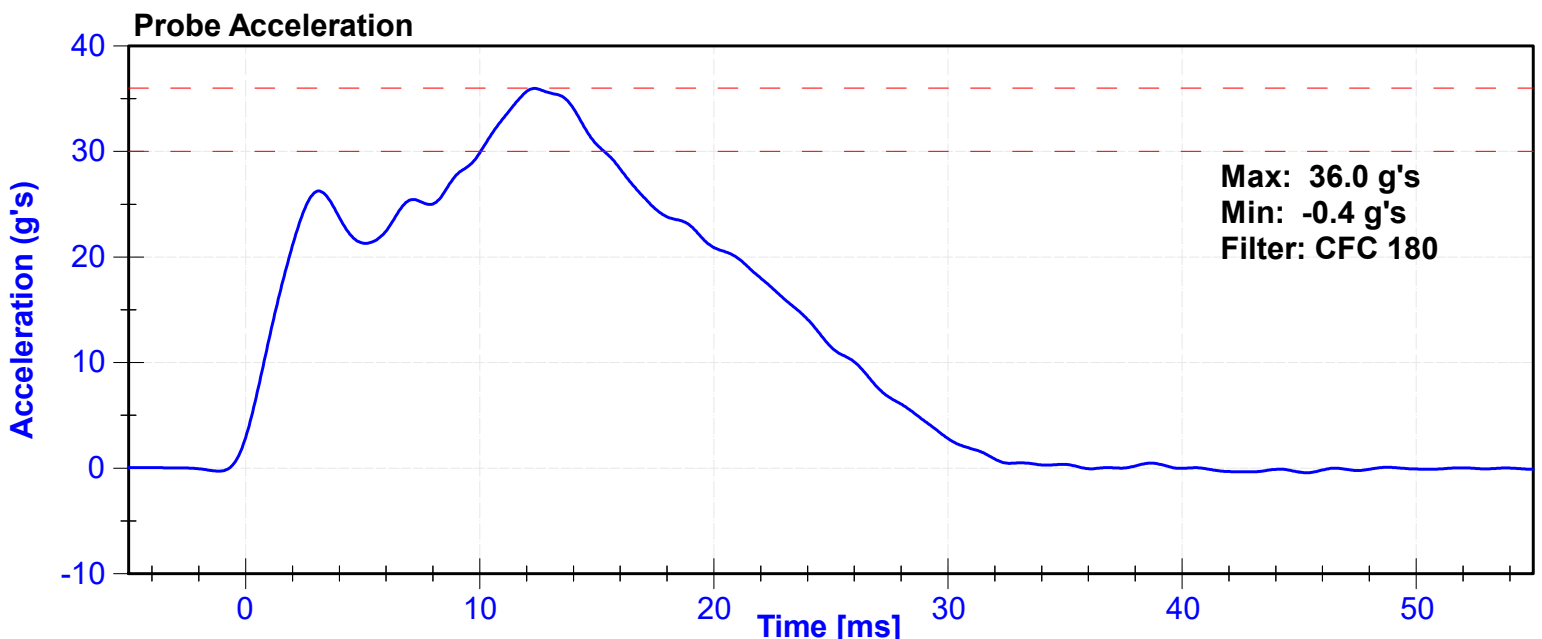
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

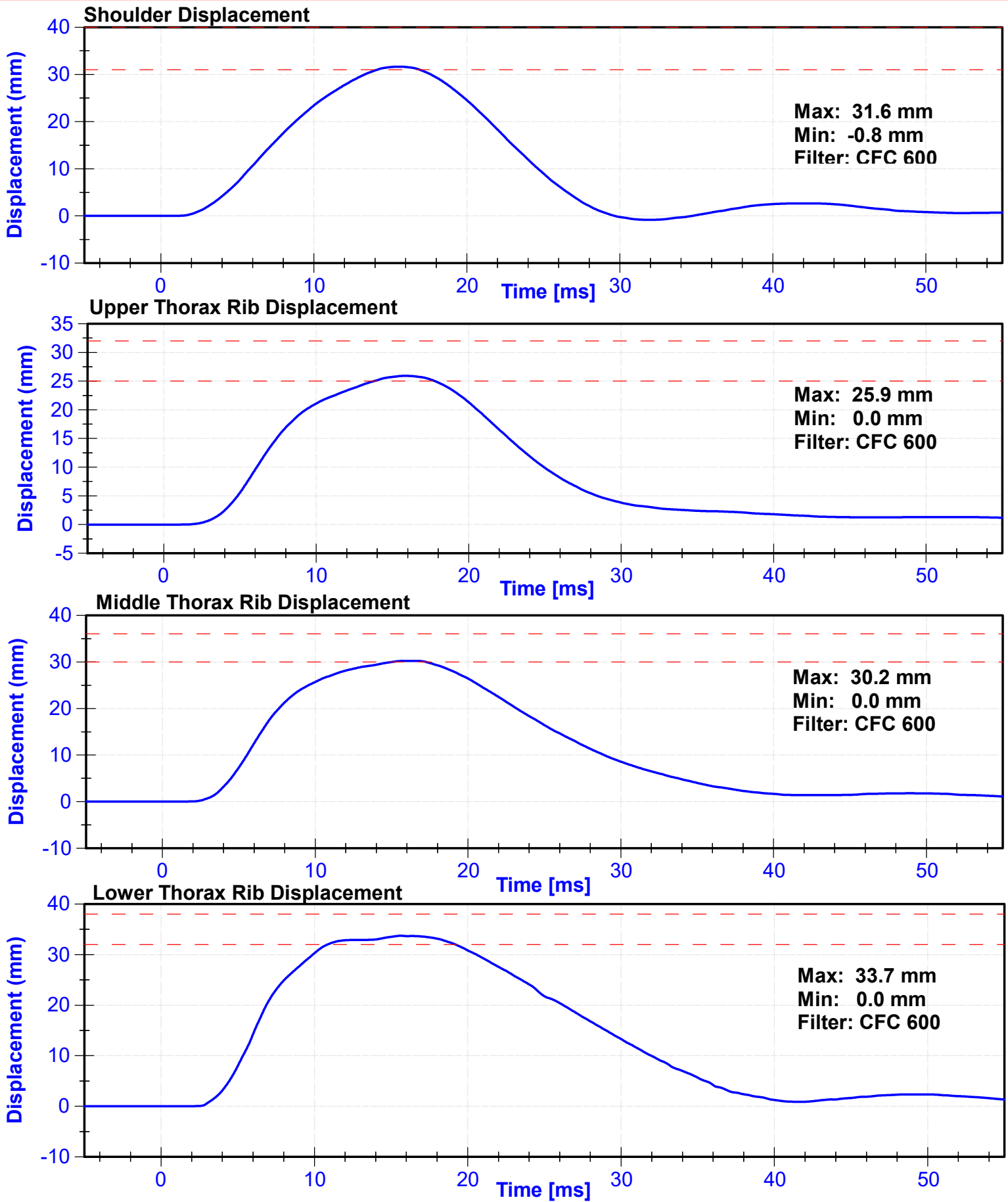
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration after 5 ms	30	36	g's	36.0	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.7	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.9	Pass
Shoulder Deflection	31	40	mm	31.6	Pass
Upper Thorax Rib Deflection	25	32	mm	25.9	Pass
Mid Thorax Rib Deflection	30	36	mm	30.2	Pass
Lower Thorax Rib Deflection	32	38	mm	33.7	Pass

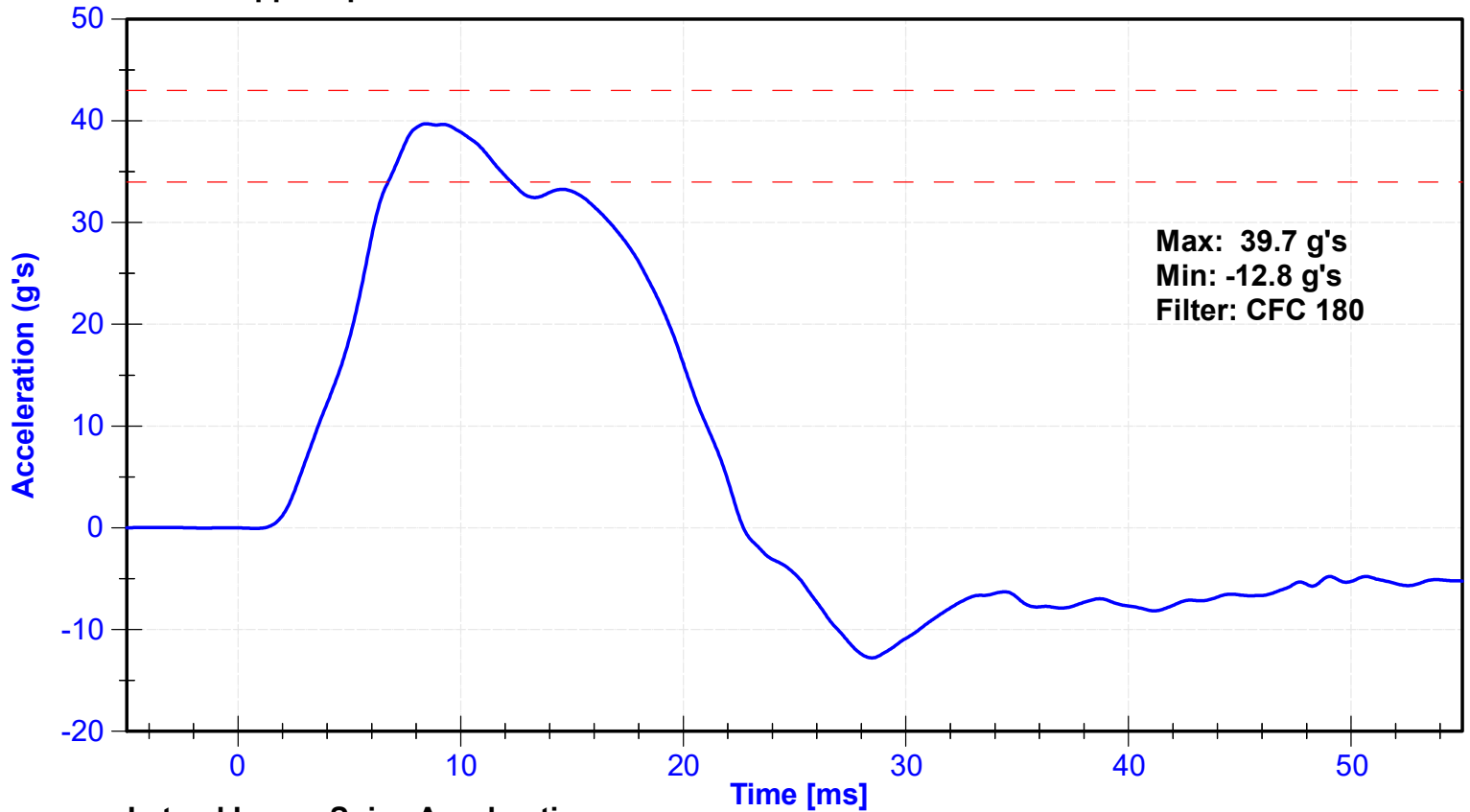
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	5/18/2024
Upper Spine T1 Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Upper Spine T12 Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	11/17/2023	5/17/2024

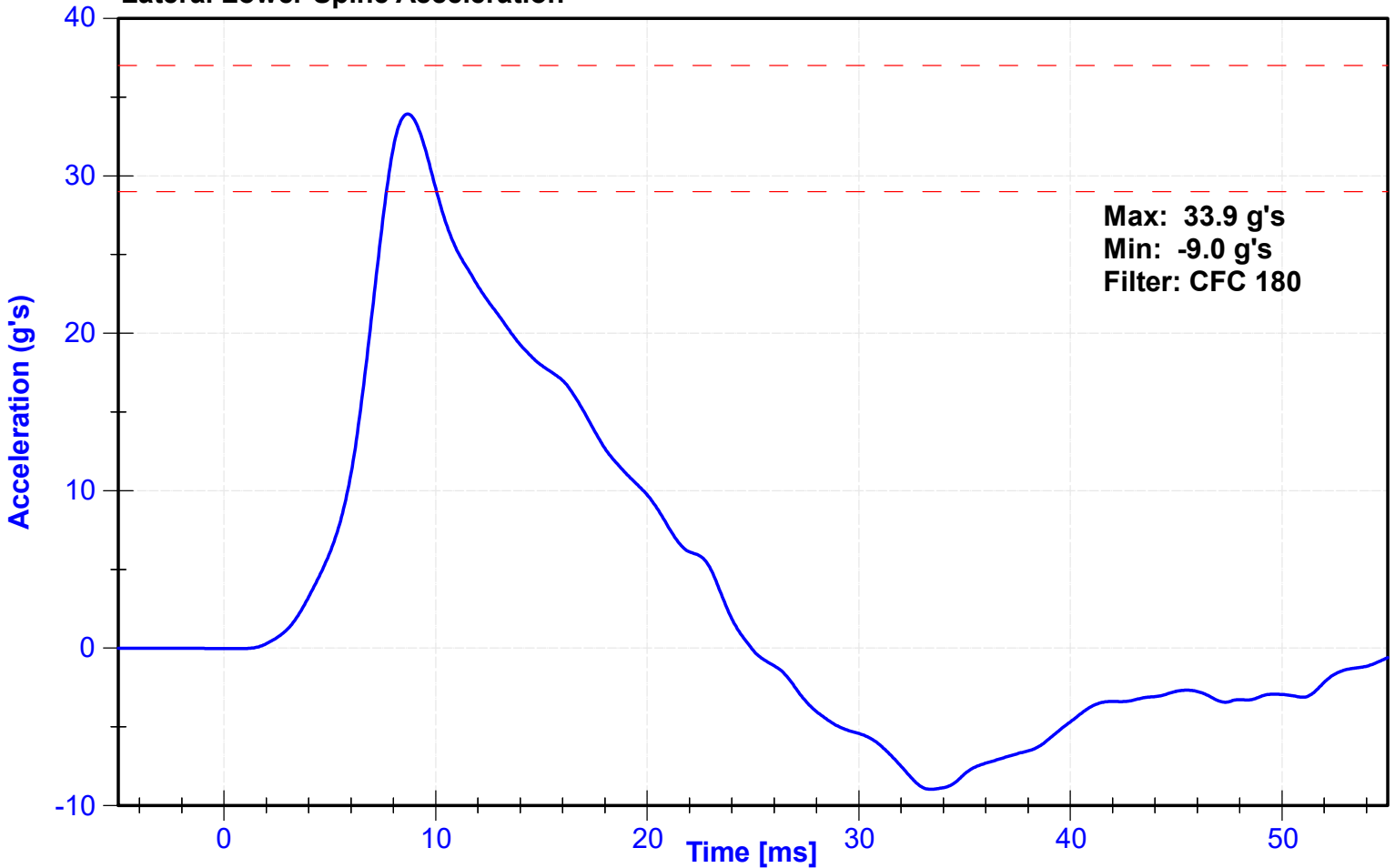




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



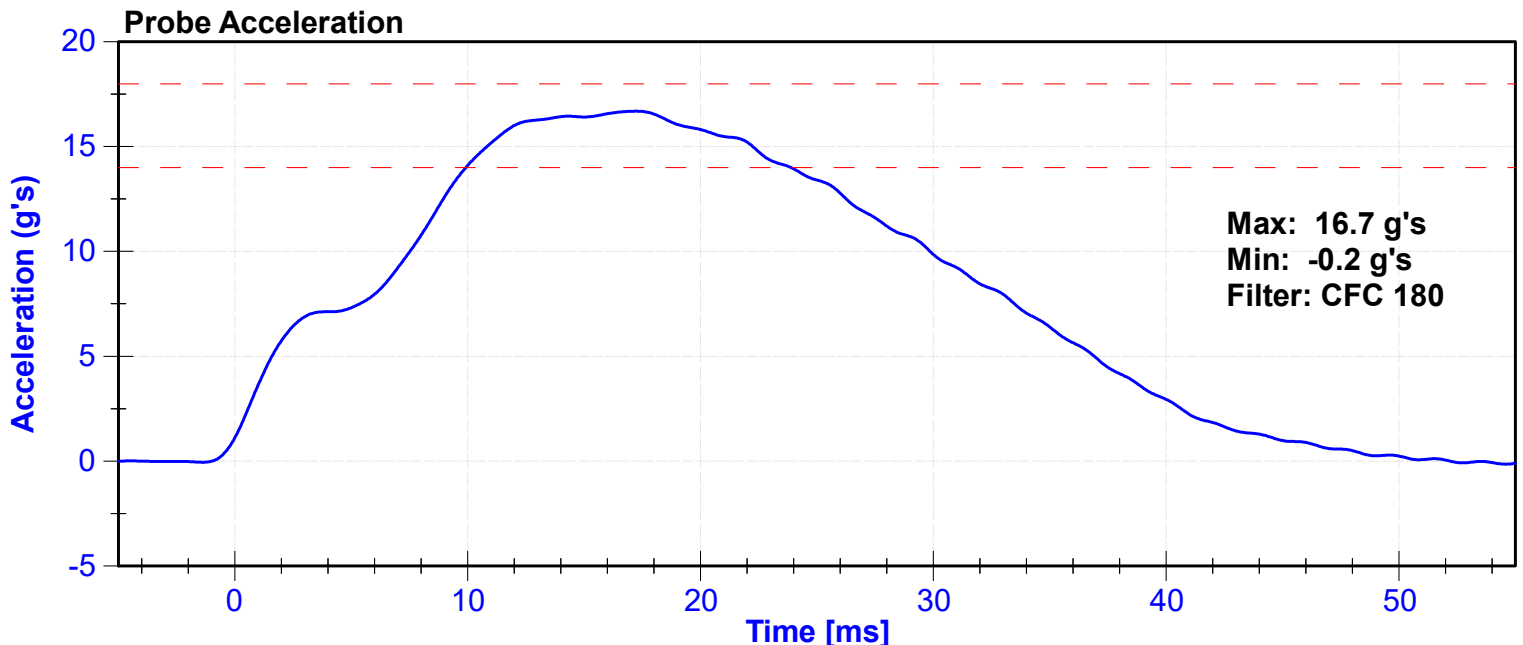
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

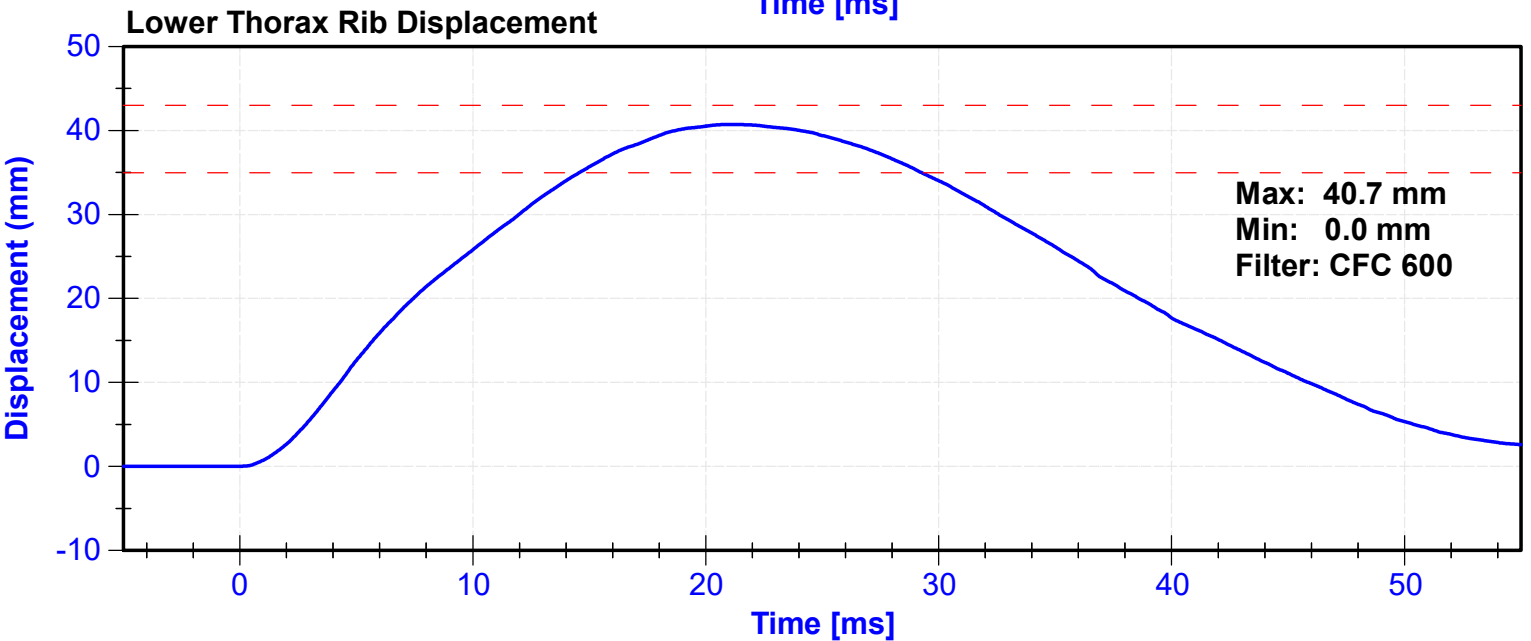
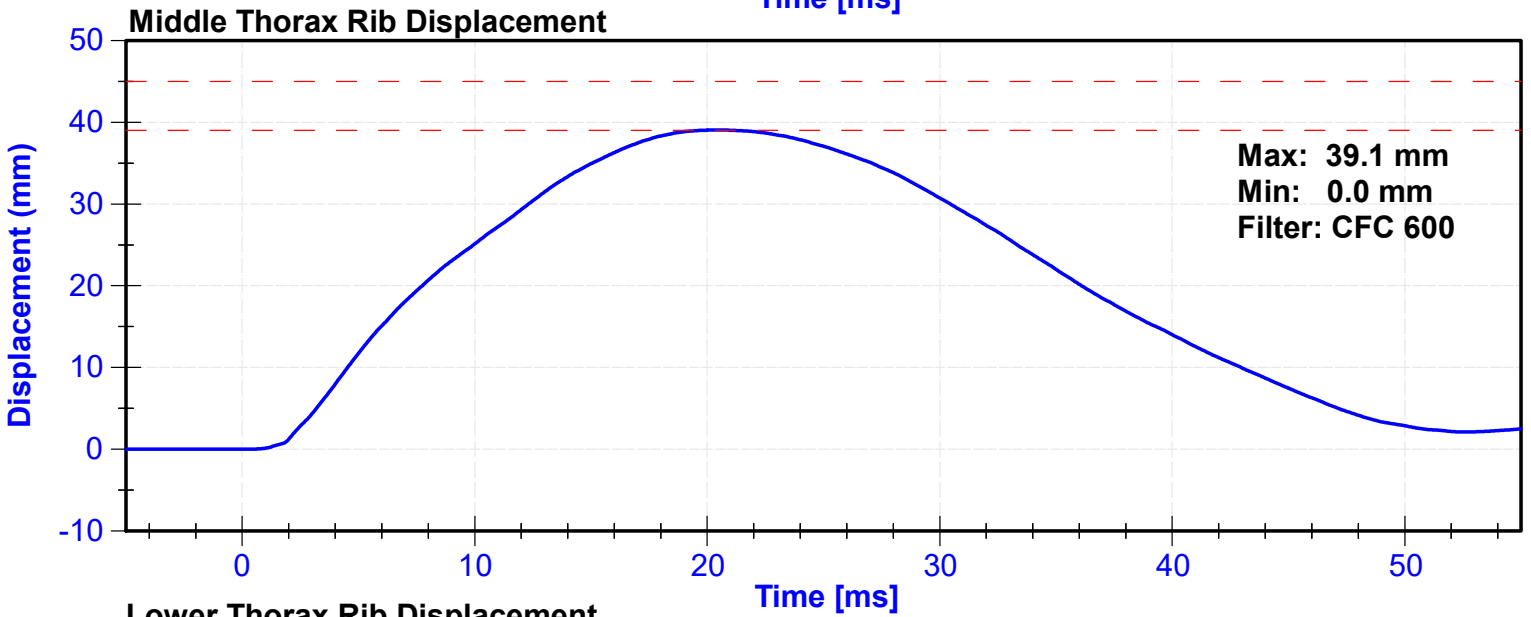
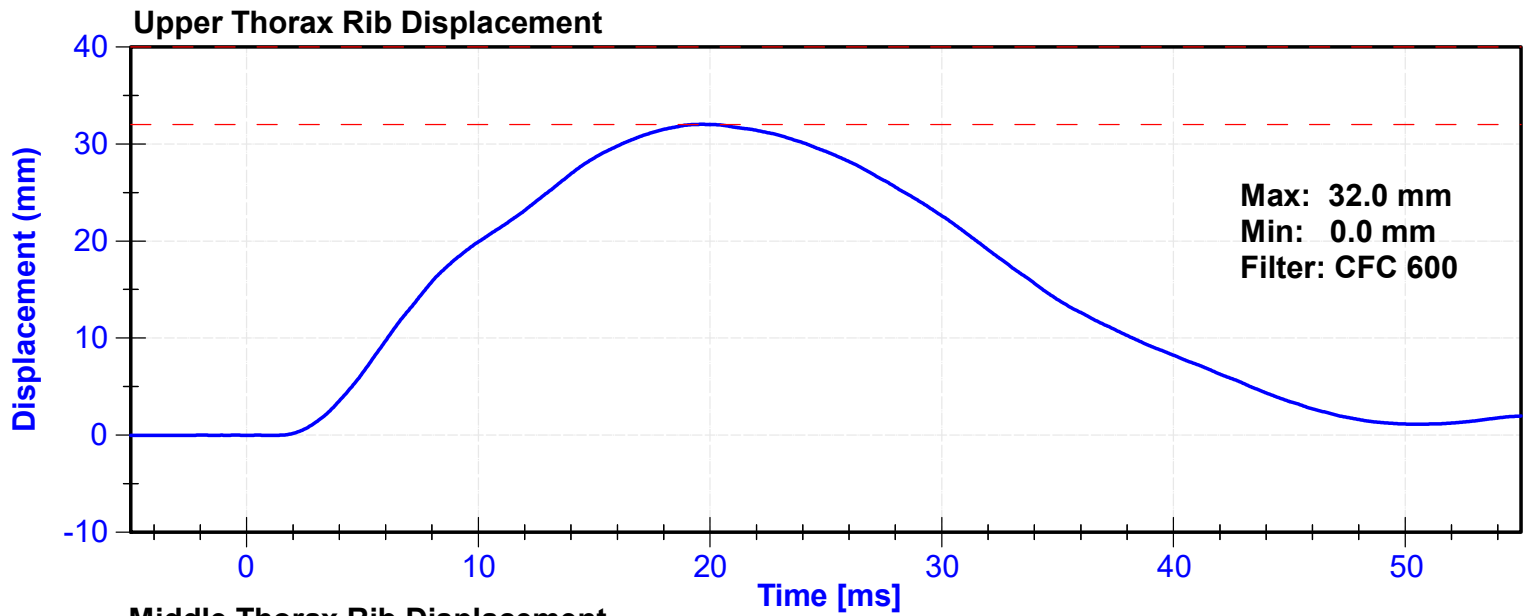
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	14	18	g's	16.7	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.7	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.7	Pass
Upper Thorax Rib Deflection	32	40	mm	32.0	Pass
Middle Thorax Rib Deflection	39	45	mm	39.1	Pass
Lower Thorax Rib Deflection	35	43	mm	40.7	Pass

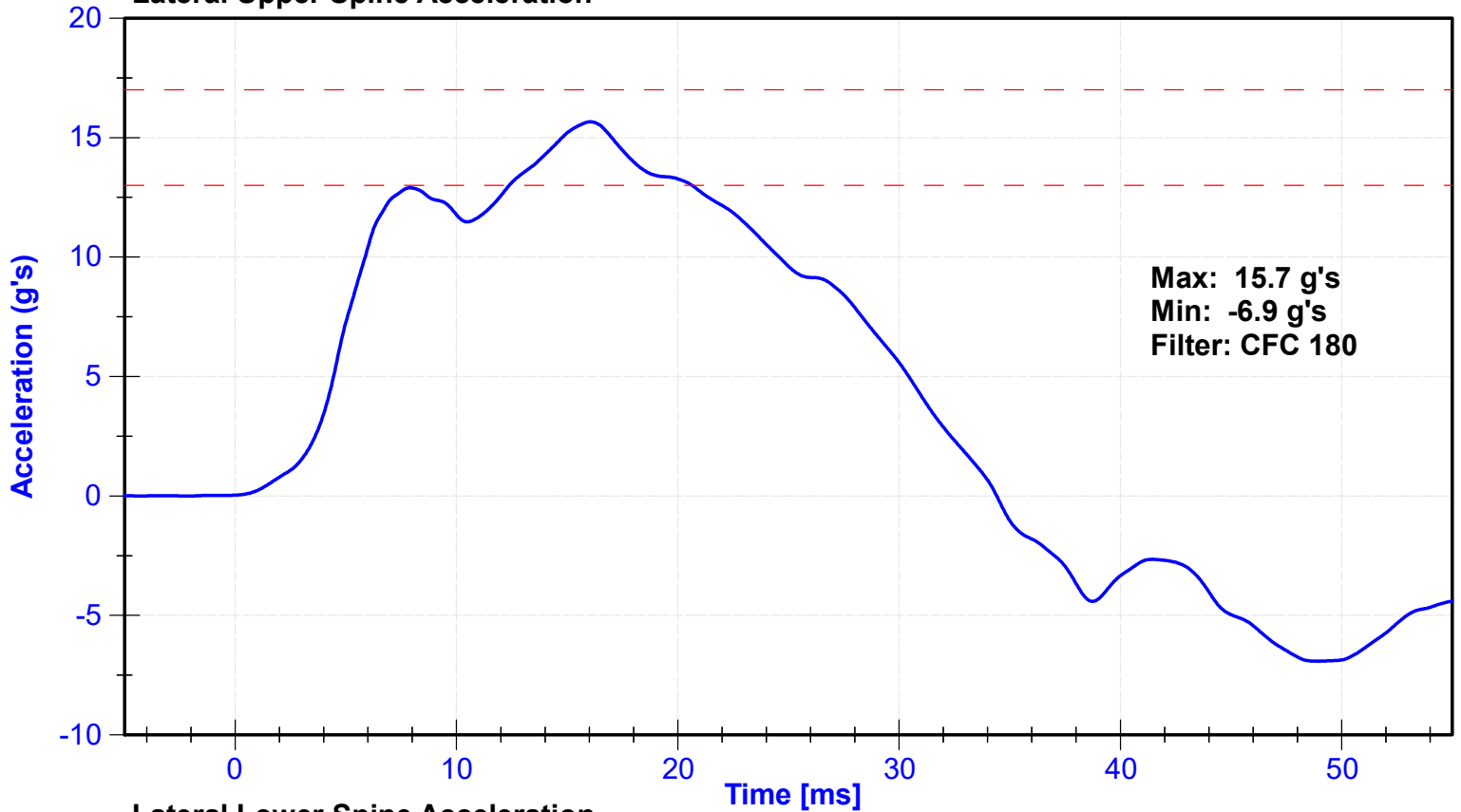
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	5/18/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	11/17/2023	5/17/2024

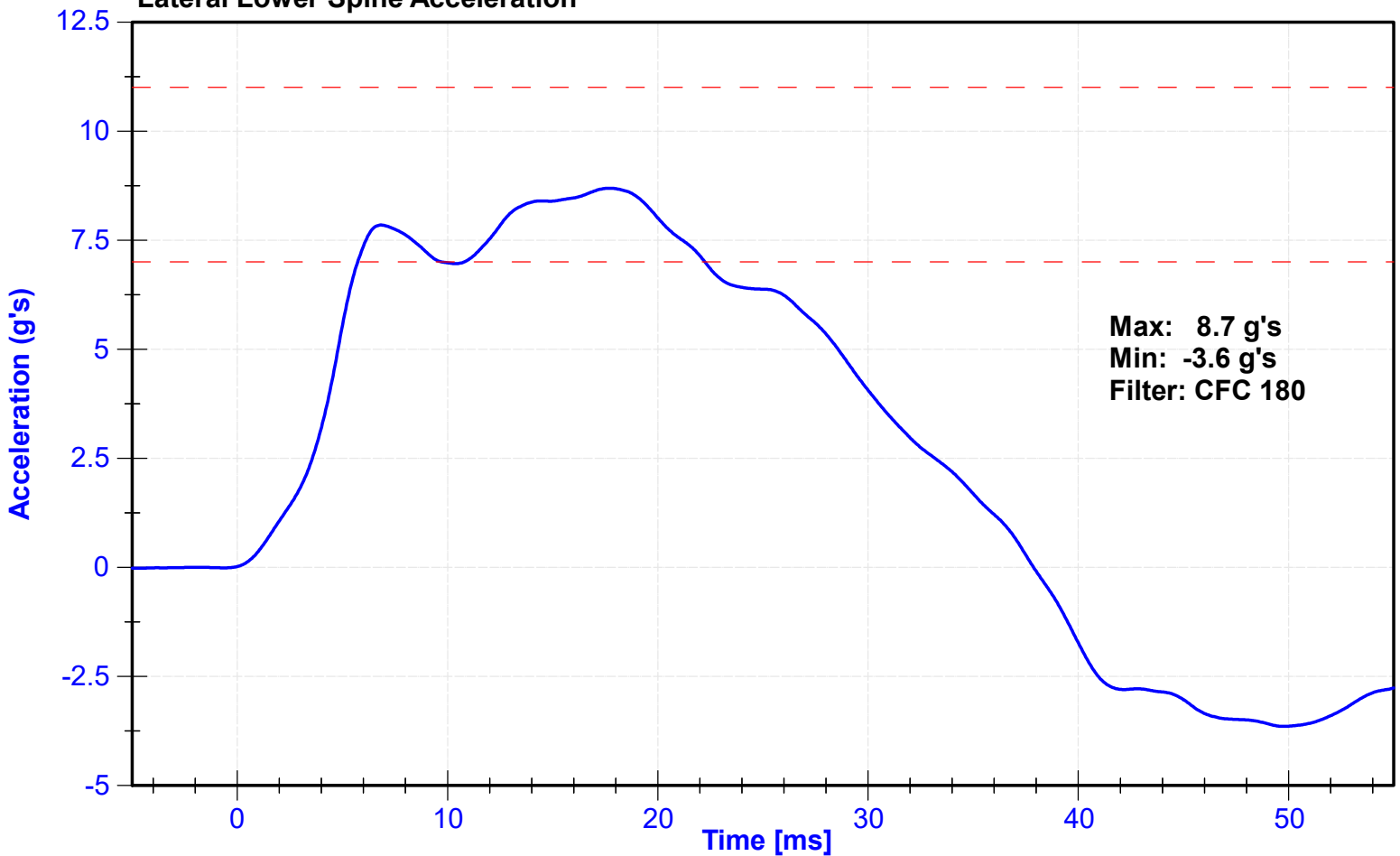




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



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

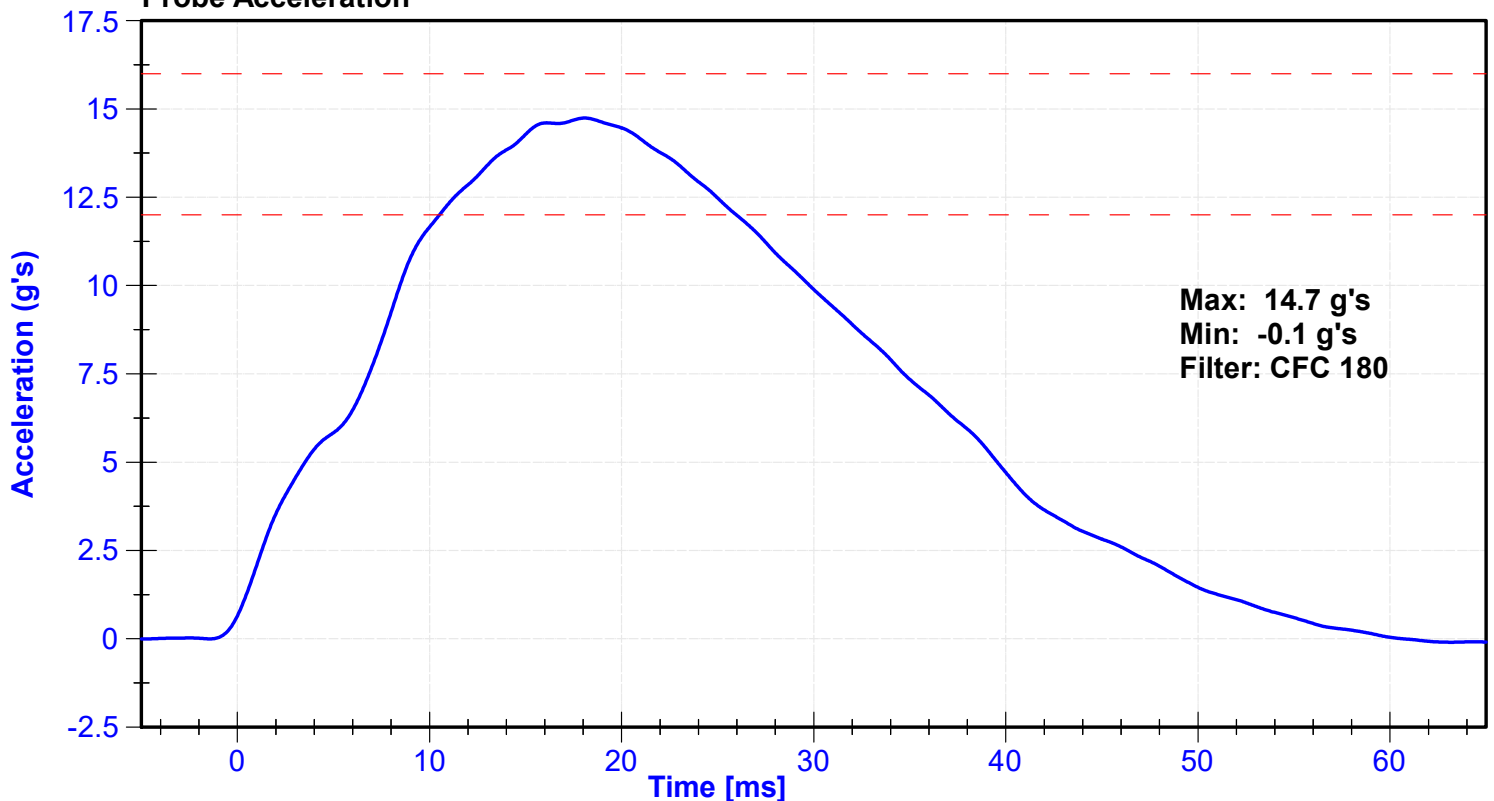
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	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	10.3	Pass
Upper Abdomen Rib Deflection	36	47	mm	42.1	Pass
Lower Abdomen Rib Deflection	33	44	mm	40.9	Pass

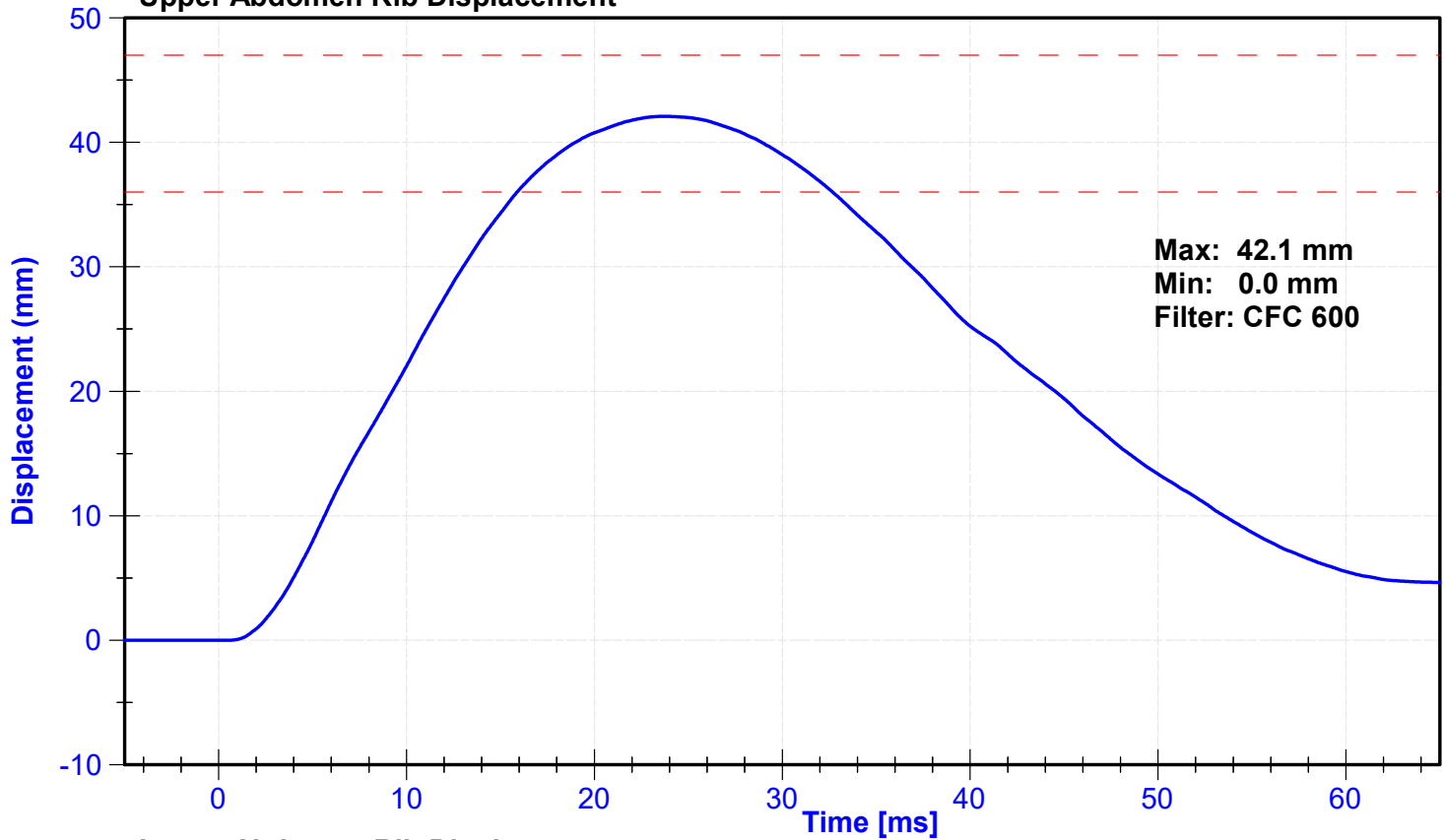
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	5/18/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Abdomen Rib Potentiometer	Servo	008GFE	11/17/2023	5/17/2024
Lower Abdomen Rib Potentiometer	Servo	046	11/17/2023	5/17/2024

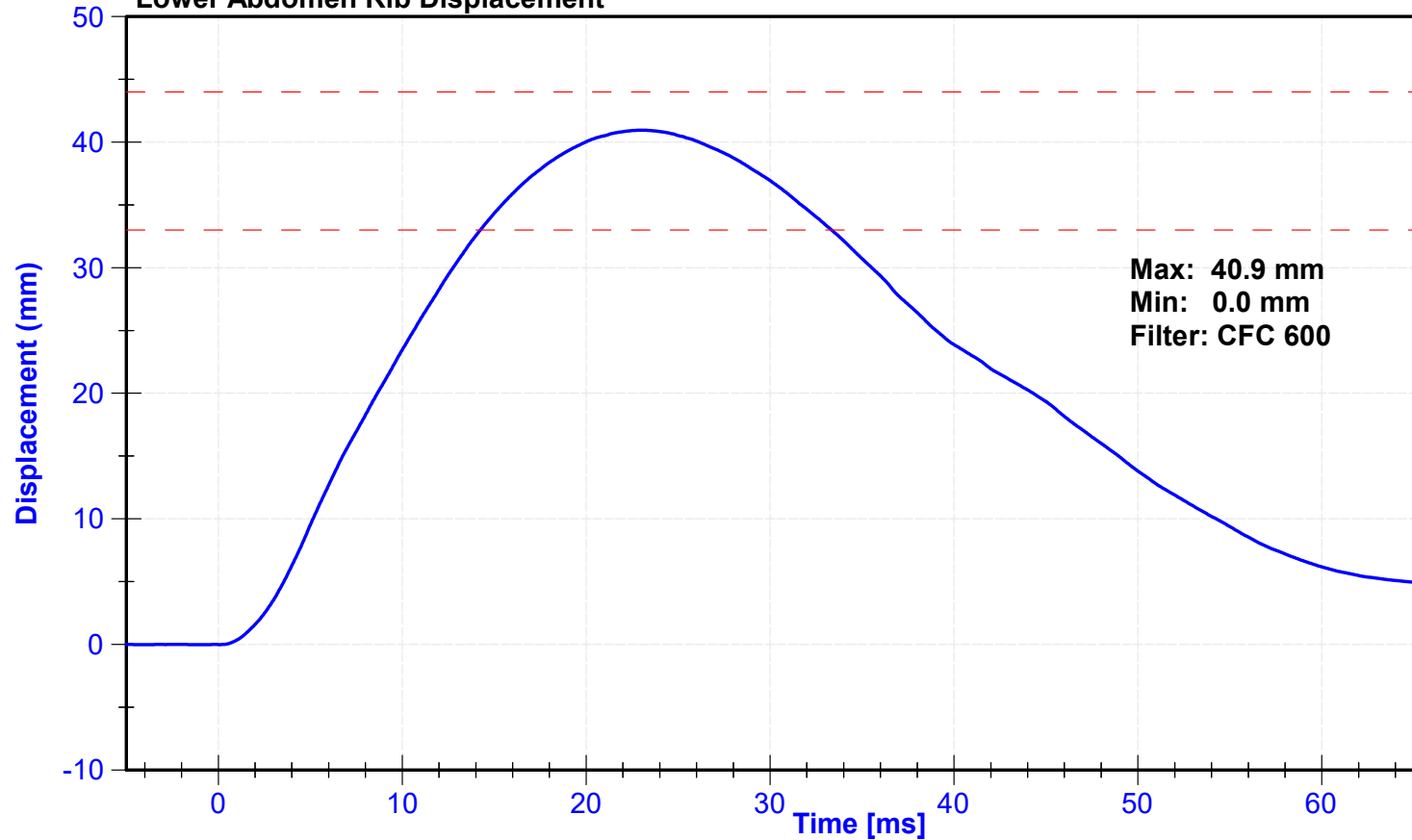
Probe Acceleration

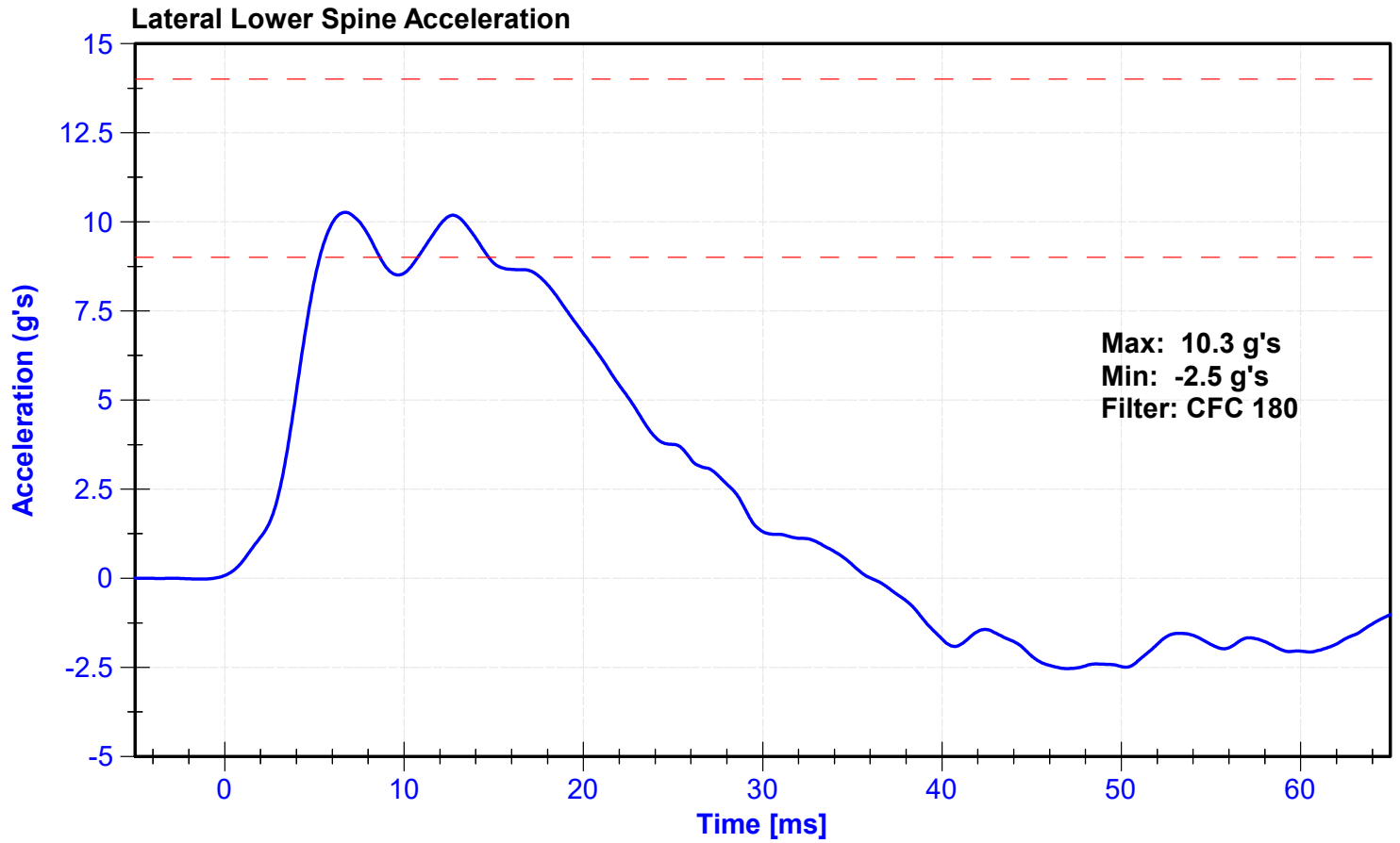


Upper Abdomen Rib Displacement



Lower Abdomen Rib Displacement





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

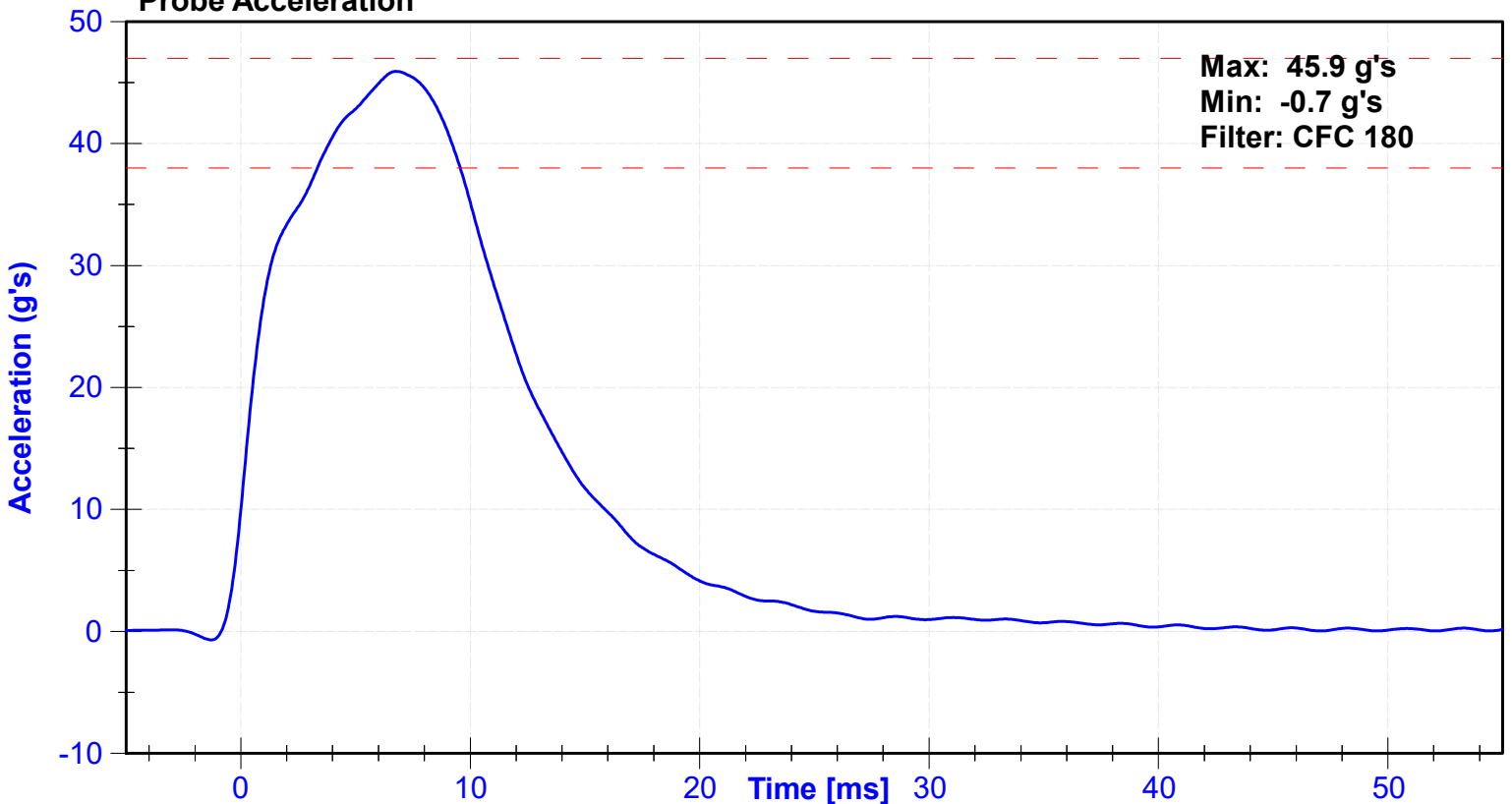
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	6.6	6.8	m/s	6.63	Pass
Probe Acceleration	38	47	g's	45.9	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	39.6	Pass
Acetabulum Force	3600	4300	N	4159.1	Pass

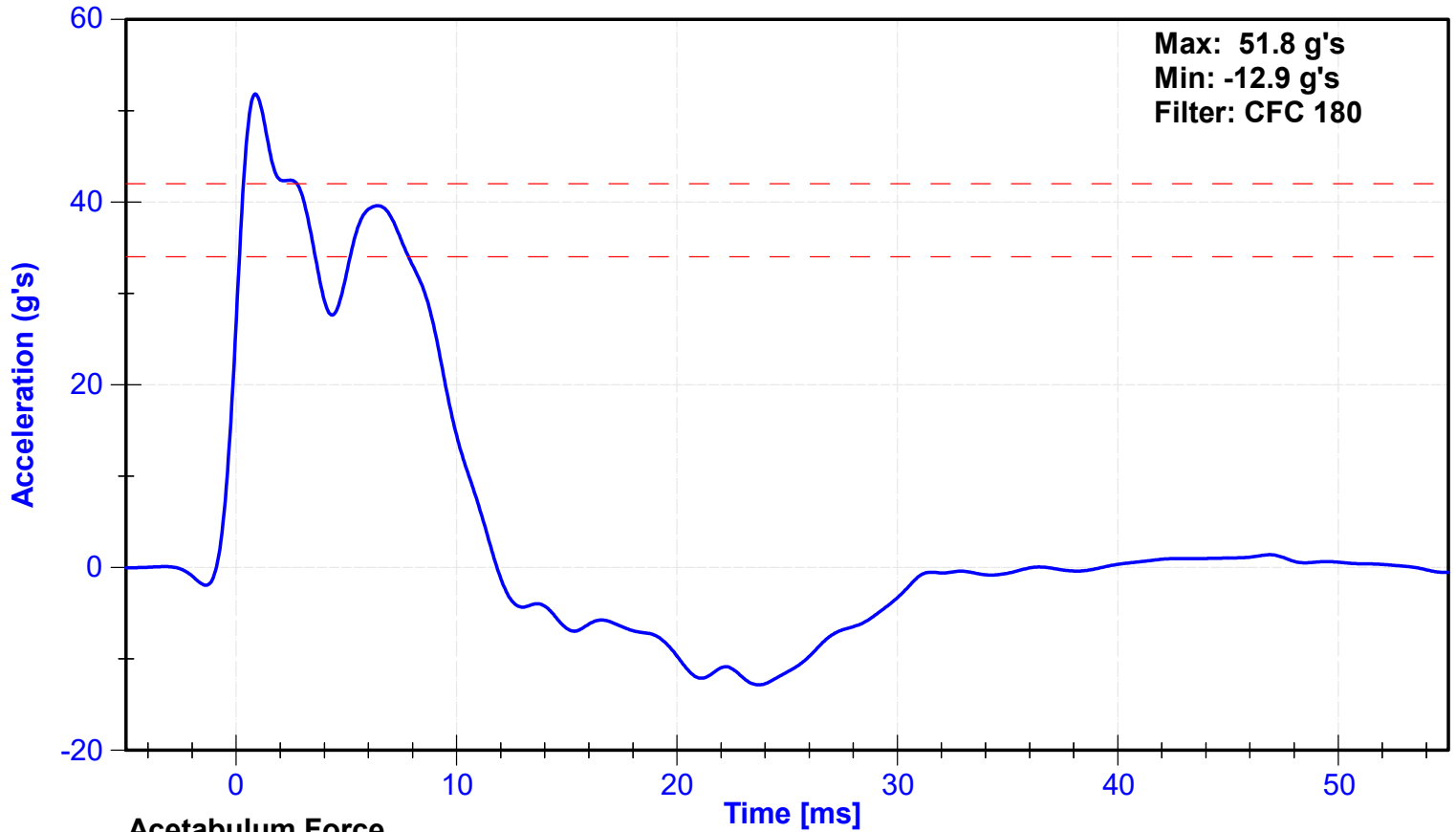
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	5/18/2024
Pelvis Y Accelerometer	Endevco	P50078	11/16/2023	5/14/2024
Acetabulum Load Cell	Denton	270-FY	9/11/2023	9/10/2024
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A

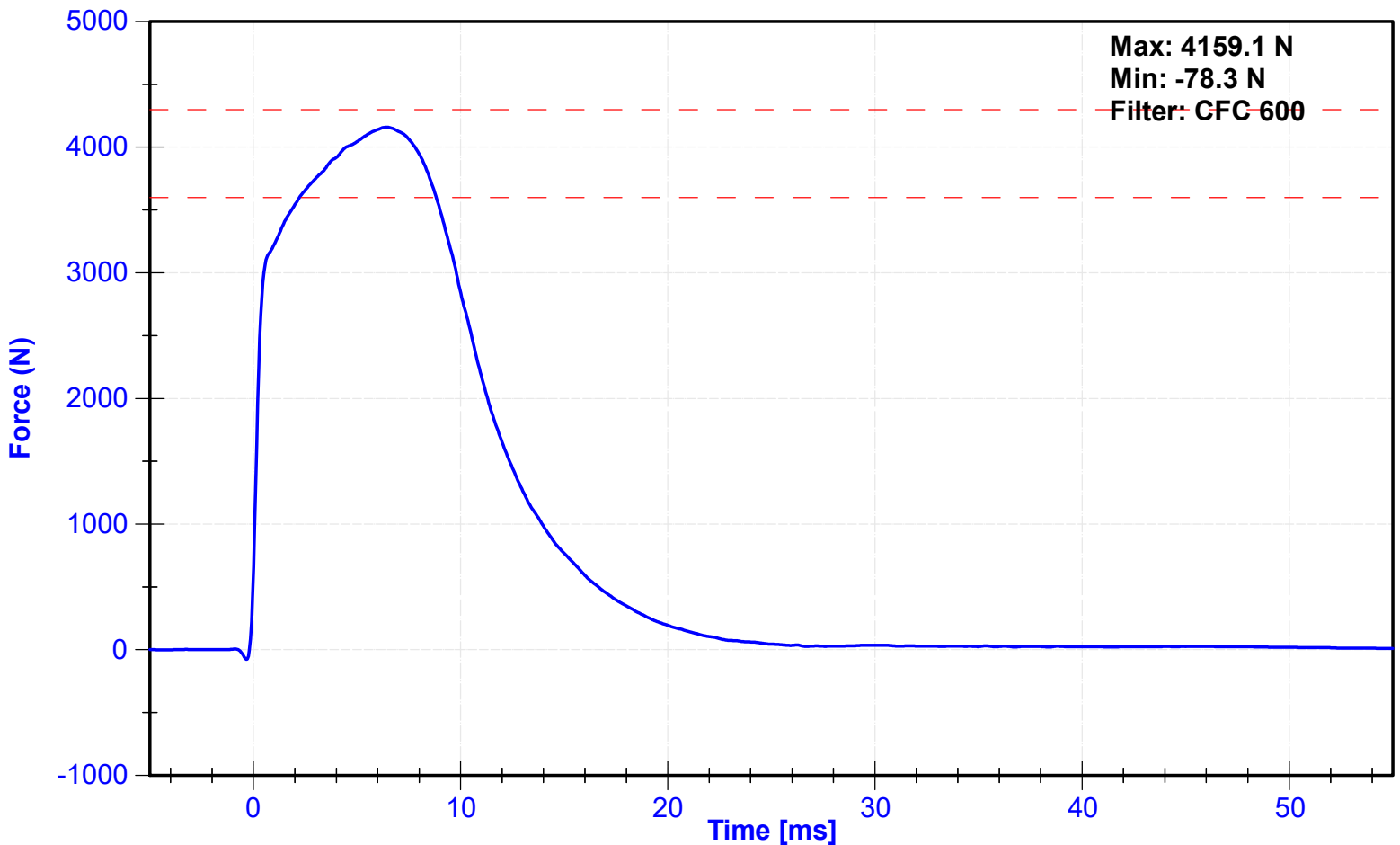
Probe Acceleration



Lateral Pelvis Acceleration



Acetabulum Force



1205-23



Certification
kit

SID-IIs Pelvis Plug Certification Test

Plug S/N 16542

Test Number 23326

Report Number 23383

Test Date 7/15/2022 9:07:34 AM

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

Testing Machine STM-20 5965542

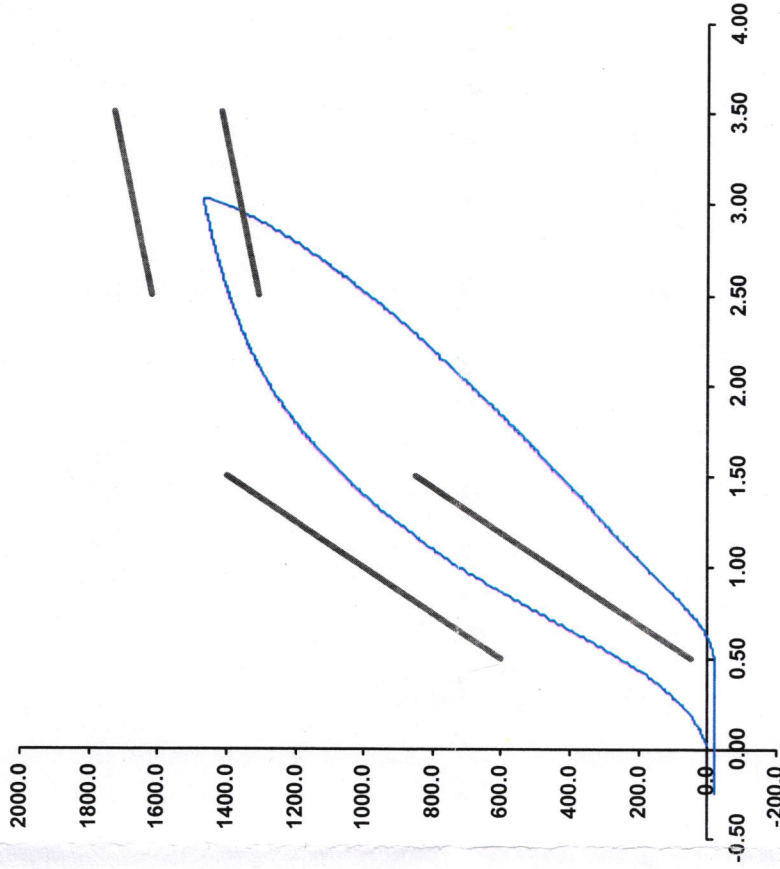
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 15-Jul-22

SACO Research

By: *SC*

Date: 7/15/22

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

SID-IIs Pelvis Plug Certification Test

Plug S/N 15802

Test Number 20702

Report Number 20756

Test Date 10/15/2021 8:57:25 AM

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

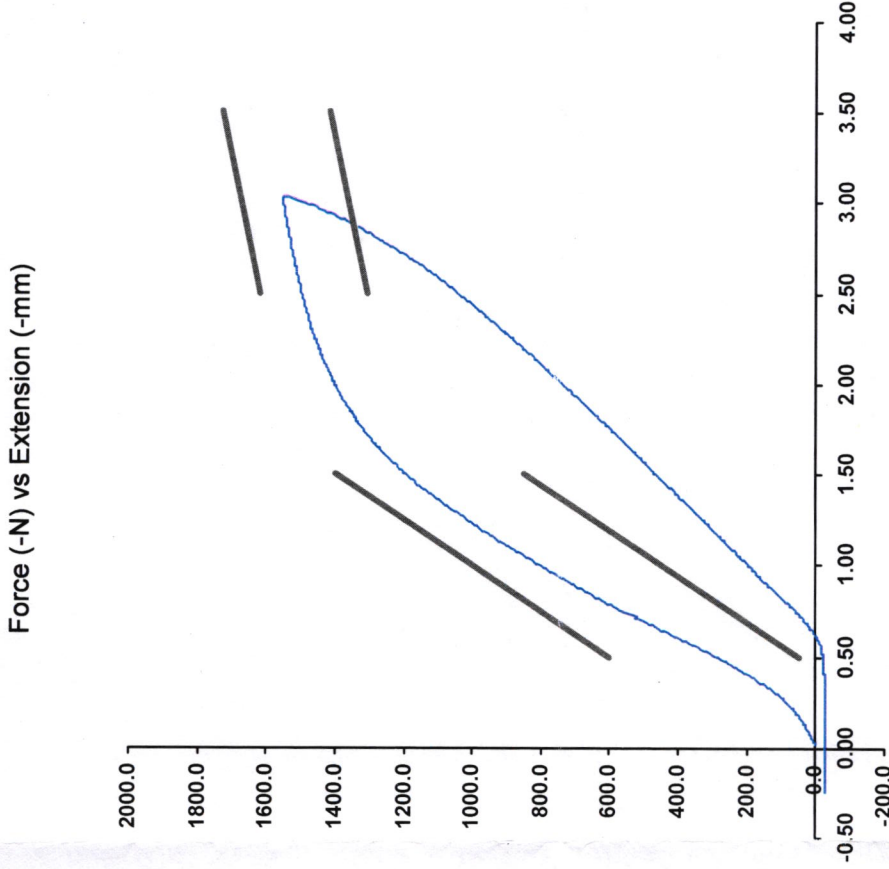
Testing Machine STM-20 5965542

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

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator

Part Number 180-4450

Template No 107 15-Oct-21

SACO Research

By: *DC* Date: 10/15/21

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



SID-IIs Pelvis Plug Certification Test

Plug S/N 16394

Test Number 22961

Report Number 23019

Test Date 5/20/2022 4:01:33 PM

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	301	600
Force @ 1.5 mm (N)	1,188	1,400
Force @ 2.5 mm (N)	1,491	1,618
Force @ 3.0 mm (N)	1,544	1,673

Testing Machine STM-20 5965542

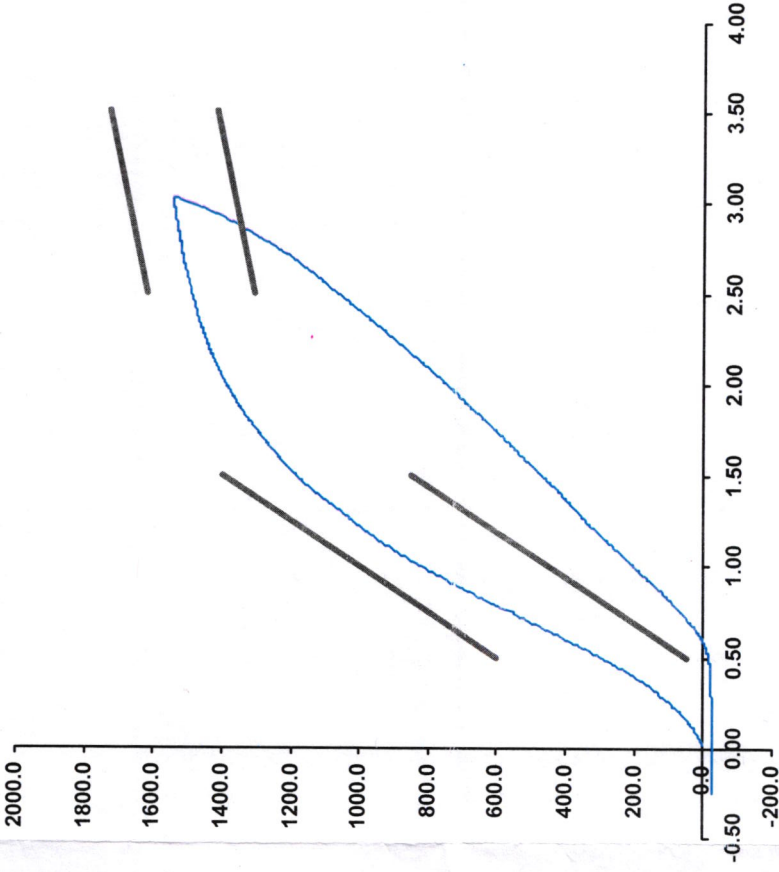
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 20-May-22

SACO Research

By: DC

Date : 5/20/2022

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

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

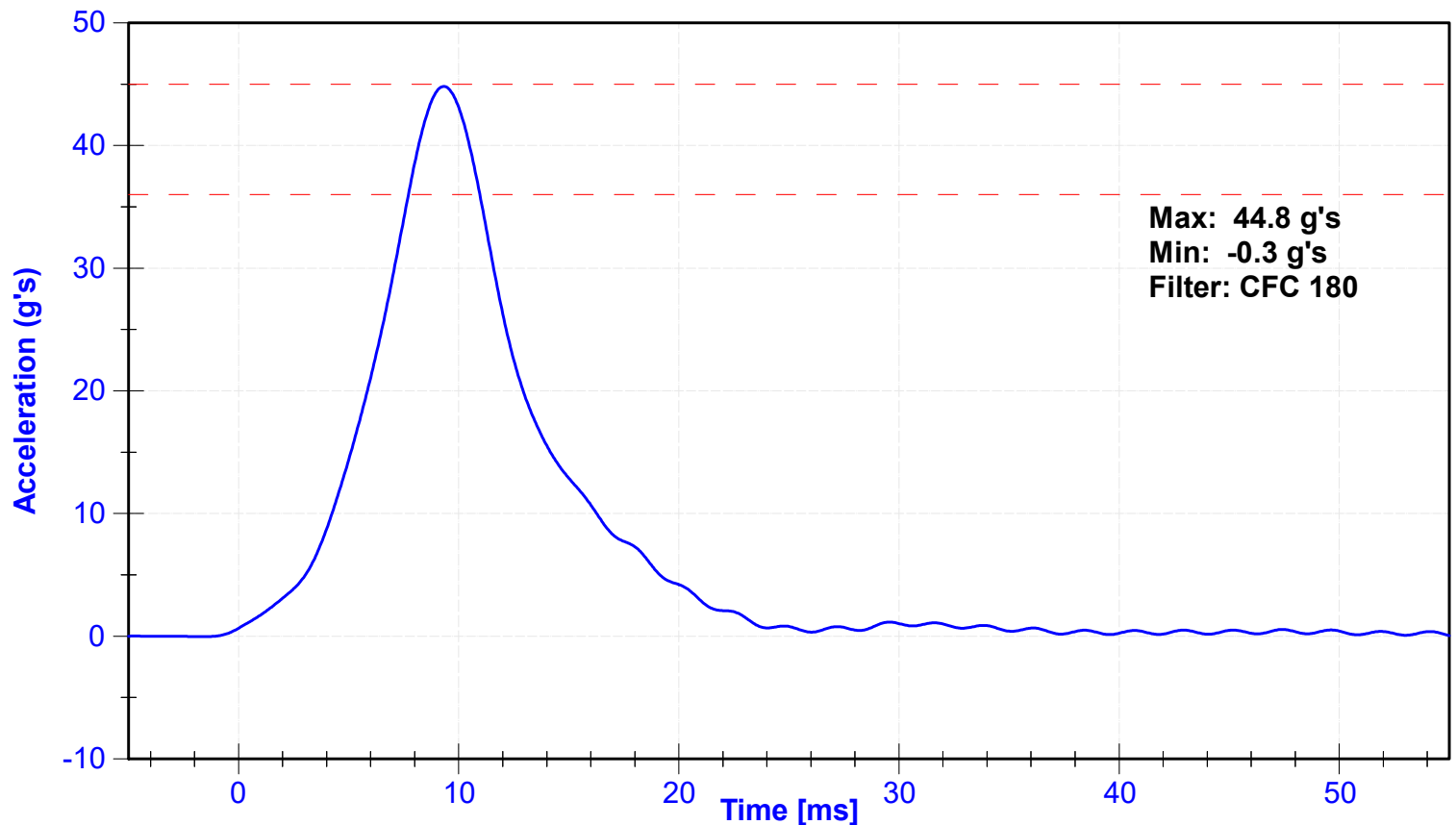
Results

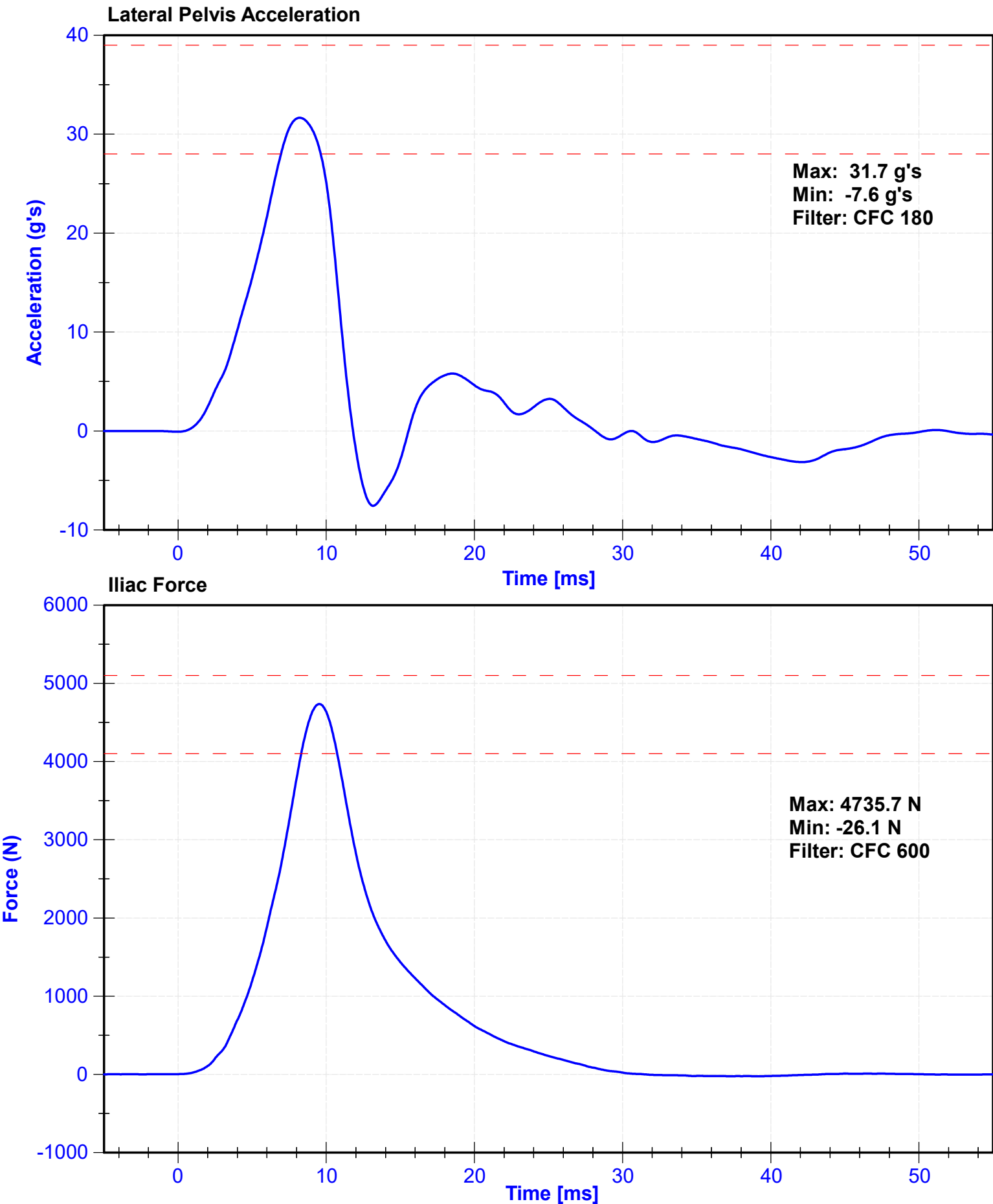
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.23	Pass
Probe Acceleration	36	45	g's	44.8	Pass
Lateral Pelvis Acceleration	28	39	g's	31.7	Pass
Iliac Force	4100	5100	N	4735.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	5/18/2024
Pelvis Y Accelerometer	Endevco	P50078	11/16/2023	5/14/2024
Iliac Load Cell	Denton	280-FY	9/11/2023	9/10/2024

Probe Acceleration





APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (SID-IIs)

			SID-IIs S/N: DG8012			
			Serial Number	Manufacturer	Calibration Date	
Head Accelerometers			X	P74788	Endevco	11/16/2023
			Y	P51668	Endevco	11/16/2023
			Z	P83319	Endevco	11/16/2023
Head Accelerometers - Redundant			X	P80334	Endevco	11/16/2023
			Y	P52155	Endevco	11/16/2023
			Z	P83322	Endevco	11/16/2023
Displacement Potentiometer	Shoulder		Y			
	Thoracic Rib	Upper	Y	1199GFE	Servo	11/17/2023
		Middle	Y	1246GFE	Servo	11/17/2023
		Lower	Y	011GFE	Servo	11/17/2023
	Abdominal Rib	Upper	Y	008GFE	Servo	11/17/2023
		Lower	Y	046	Servo	11/17/2023
Lower Spine Accelerometers (T12)			X	P71272	Endevco	11/16/2023
			Y	P51327	Endevco	11/16/2023
			Z	P52067	Endevco	11/16/2023
Acetabulum Load Cell			Y	270-FY	Denton	09/11/2023
Lilac Wing Load Cell			Y	280-FY	Denton	09/11/2023
Pelvis Plug (Struck Side)				16353	SACO	05/20/2023
Pelvis Plug (Non-Struck Side)				16431	SACO	05/23/2022

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	A350968	Measurement Specialties	07/26/2023
Vehicle Center of Gravity	Y	A350991	Measurement Specialties	07/26/2023
Vehicle Center of Gravity	Z	A372854	Measurement Specialties	07/26/2023
Left Floor Sill	Y	A399942	Measurement Specialties	09/16/2023
A-Pillar Sill	Y	A414758	Measurement Specialties	09/30/2023
A-Pillar Low	Y	G22108	Endevco	09/19/2023
A-Pillar Mid	Y	G21391	Endevco	08/14/2023
B-Pillar Sill	Y	A351009	Measurement Specialties	10/14/2023
B-Pillar Low	Y	A400032	Measurement Specialties	08/17/2023
B-Pillar Mid	Y	A280929	Measurement Specialties	10/16/2023
Driver Seat	Y	G23423	Endevco	10/12/2023
Engine Top	X	A282720	Measurement Specialties	06/26/2023
Engine Top	Y	A374300	Measurement Specialties	06/26/2023
Firewall	Y	A373223	Measurement Specialties	09/09/2023
Right Roof	Y	A398302	Measurement Specialties	09/23/2023
Right Floor Sill	Y	G22831	Endevco	08/14/2023
Rear Floorpan	X	A372822	Measurement Specialties	10/04/2023
Rear Floorpan	Y	A374357	Measurement Specialties	10/09/2023

Table 3 – Pole Instrumentation

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