

REPORT NUMBER: SPNCAP-CAL-23-001

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

**GENERAL MOTORS LLC
2023 Chevrolet Malibu
4 Door Sedan**

NHTSA No: M20230103

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



December 12, 2023

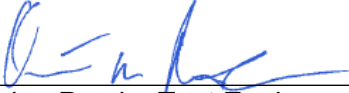
FINAL REPORT

**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 Administration, in response to Contract Number 693JJ920D000016.

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof.

If trade or manufacturers' names or products are mentioned it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by:  Date: December 12, 2023
Quinn Porzio, Test Engineer

Approved by:  Date: December 12, 2023
Matthew Pronko, Test Engineer

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. SPNCAP-CAL-23-001		2. Government Accession No.		3. Recipient's Catalog No.																												
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Pole Testing of a 2023 Chevrolet Malibu 4 Door Sedan NHTSA No.: M20230103				5. Report Date December 12, 2023																												
				6. Performing Organization Code CAL																												
7. Author(s) Quinn Porzio, Test Engineer Matthew Pronko, Test Engineer				8. Performing Organization Report No. CAL-DOT-2023-001																												
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225				10. Work Unit No.																												
				11. Contract or Grant No. 693JJ920D000016																												
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards 1200 New Jersey Ave., SE Washington, D.C. 20590				13. Type of Report and Period Covered: Final Test Report February 9, 2023 - December 12, 2023																												
				14. Sponsoring Agency Code NRM-100																												
15. Supplementary Notes																																
16. Abstract A 32.20 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject 2023 Chevrolet Malibu 4 Door Sedan in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 9, 2023. The impact velocity of the vehicle was 32.03 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 358 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.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>395.714</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>G</td> <td>82</td> <td>31.832</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>2202.711</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38</td> <td>15.024</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td>mm</td> <td>45*</td> <td>15.891</td> </tr> </tbody> </table> The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.						Measurement Description	Driver ATD (SID-IIs) (Serial No.300)			Units	Threshold	Result	Head Injury Criteria (HIC36)		1000	395.714	Resultant Lower Spine Acceleration	G	82	31.832	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2202.711	Maximum Thoracic Rib Deflection	mm	38	15.024	Maximum Abdominal Rib Deflection	mm	45*	15.891
Measurement Description	Driver ATD (SID-IIs) (Serial No.300)																															
	Units	Threshold	Result																													
Head Injury Criteria (HIC36)		1000	395.714																													
Resultant Lower Spine Acceleration	G	82	31.832																													
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2202.711																													
Maximum Thoracic Rib Deflection	mm	38	15.024																													
Maximum Abdominal Rib Deflection	mm	45*	15.891																													
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																												
19. Security Class. (of this report) UNCLASSIFIED		20. Security Class. (of this page) UNCLASSIFIED		21. No. of Pages 126	22. Price																											

Form DOT F1700.7 (8-72)

TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1	Test Purpose and Procedure	1-1
2	Summary of Test Results	2-1
3	Occupant and Vehicle Information	3-1
 <u>Data Sheet</u>		 <u>Page</u>
1	General Test and Vehicle Parameter Data	3-2
2	Seat, Seat Belt, Steering Wheel Adjustment and Fuel Systems Data	3-6
3	Dummy Longitudinal Clearance Dimensions	3-9
4	Dummy Lateral Clearance Dimensions	3-10
5	Camera and instrumentation Data	3-11
6	Vehicle Accelerometer Data	3-12
7	Rigid Pole Load Cell Data	3-13
8	Post-Test Observations	3-14
9	Test Vehicle Profile Measurements	3-16
10	Test Vehicle Exterior Crush Measurements	3-17
11	Vehicle Damage Profile Distances	3-20
12	FMVSS No. 301 Static Rollover Results	3-21
13	Dummy / Vehicle Temperature and Humidity Stabilization Data	3-22
 <u>Appendix</u>		 <u>Page</u>
A	Photographs	A-1
B	Vehicle and Dummy Response Data Plots	B-1
C	Dummy Configuration and Performance Verification Data	C-1
D	Test Equipment and Instrumentation Calibration Data	D-1

SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY 2023 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 2023 Chevrolet Malibu 4 Door Sedan. 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 2023 Chevrolet Malibu 4 Door Sedan. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.03 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 9, 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	395.714
Resultant Lower Spine Acceleration	G	82	31.832
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2202.711
Maximum Thoracic Rib Deflection	mm	38	15.024
Maximum Abdominal Rib Deflection	mm	45*	15.891

*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	No	N/A
Seat Belt Load Limiter	Yes	Yes	No	N/A
Other	N/A	N/A	N/A	N/A

GENERAL COMMENTS:

1. P1 serial number - 300

Data Anomalies:

- Left Front Sill Y Acceleration, Exceeded calibration range at 43.5 ms
- Left Lower A-Pillar Y Acceleration, Exceeded calibration range at 60.9 ms
- Load Cell Pole Barrier #3 Fy, Exceeded calibration range at 119 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: 2023 Chevrolet Malibu 4 Door Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
Test Date: 02/09/2023

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20230103	Traction Control System (TCS)	Yes
Model Year	2023	Auto-Leveling System	No
Make	Chevrolet	Automatic Door Locks (ADL)	Yes
Model	Malibu	Power Window Auto-Reverse	Yes
Body Style	Four Door Sedan	Other Optional Feature	N/A
VIN	1G1ZD5ST9PF127071	Driver Front Airbag	Yes
Body Color	Sterling Gray Metallic	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	7 miles	Driver Head/Torso Airbag	No
Engine Displacement (L)	1.5	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	Yes
Transmission Speeds	CVT	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	GENERAL MOTORS LLC	GVWR	1847
Date of Manufacture	10/22	GVWR Front	960
Vehicle Type	Passenger Car	GVWR Rear	887

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)				408	(A)
DSC x 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				67.8	(A-B)

VEHICLE SEAT TYPE

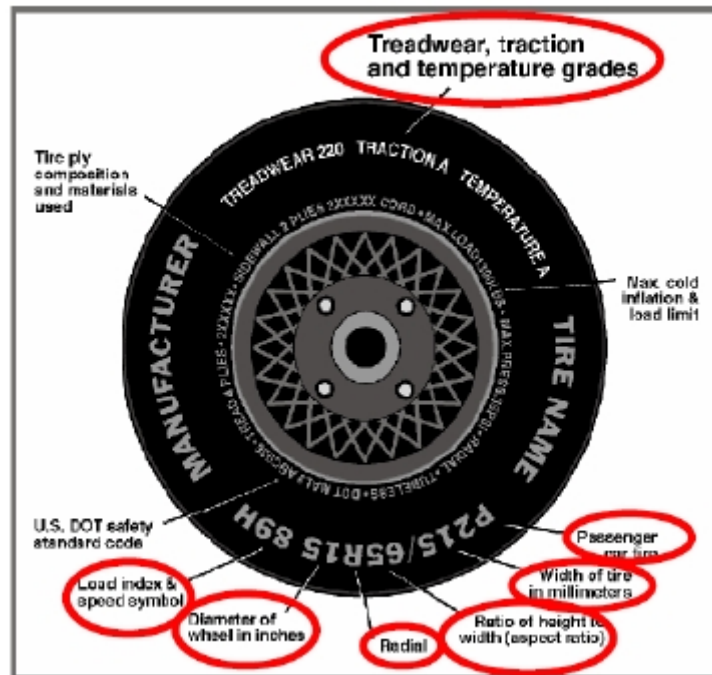
Seating Location	Type Of Seat Pan				Type Of Seat Back		
	Bucket	Bench	Split Bench	Contour	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front	X						X
Rear or Second Row Seat			X		X		
Third Row seat	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
 Test Date: 02/09/2023

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)	230	230
Recommended Tire Size	225/55R17	225/55R17
Tire Size on Vehicle	225/55R17	225/55R17
Tire Manufacturer	Hankook	Hankook
Tire Model	Kinergy GT	Kinergy GT
Treadwear	450	450
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Steel, 2 Polyester, 1 Nylon	2 Steel, 2 Polyester, 1 Nylon
Load Index / Speed Symbol	95H	95H
Tire Material	Rubber	Rubber
DOT Safety Code Left	5MEM1BH1322	5MEM1BH1322
DOT Safety Code Right	5MEM1BH1322	5MEM1BH1322

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

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
 Test Date: 02/09/2023

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	230	230	230	230
Tire Placard	kPa	230	230	230	230
Owner's Manual	kPa	230	230	230	230
As Tested	kPa	230	230	230	230

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Rear	Total	Total	Front	Rear	Total
Left	kg	430.0	305.5		441.0	338.0		453.0	357.0	
Right	kg	443.0	255.5		458.0	308.0		433.5	312.5	
Ratio	%	60.9	39.1		58.2	41.8		57.0	43.0	
Totals	kg	873.0	561.0	1434.0	899.0	646.0	1545.0	886.5	669.5	1556.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1434	(A)
Actual Weight of 1 P572V (SID-IIs) ATD Used	kg	50	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	67.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1551.8	(A+B+C)

Does the measured As Test Vehicle Weight lie within the required weight range (i.e. Calculated

Test Vehicle Target Weight – 4.5 kg to – 9 kg)?



Yes



No

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	As Delivered	As Tested	Fully Loaded	Meets Rqmt***
Driver Door Sill Angle (front-to-rear)*	Deg	+0.15	-0.05	-0.05	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg	-0.80	-0.50	+0.30	Yes
Front Bumper-Line Angle (left-to-right)**	Deg	-0.50	-0.60	-0.60	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg	-0.10	+0.05	+0.35	Yes
Vehicle CG (Aft of Front Axle)	mm	1107	1183	1217	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	21	7	33	

* 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: <u>2023 Chevrolet Malibu 4 Door Sedan</u>	NHTSA No.: <u>M20230103</u>
Test Program: <u>NCAP Side Pole Impact Test</u>	Test Date: <u>02/09/2023</u>

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	5
Spare Tire	12
Jack	3
Passenger Rear Window	3
Ballast / Equipment Added	27.6

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

TEST SURFACE MARKING

	Distance from 75° Impact Location Line (mm)
Fore 25 mm target	986
Aft 25 mm target	987

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

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan

NHTSA No.: M20230103

Test Program: NCAP Side Pole Impact Test

Test Date: 02/09/2023

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	19.8	11.6	15.6
Front Passenger Seat	18.2	14.1	16.2
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	15.6	51	Max	63	72	81
			Mid	33	42	51
			Min	2	11	20
Front Passenger Seat	16.2	33	Max	N/A	N/A	N/A
			Mid	N/A	N/A	N/A
			Min	15	24	33
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: 2023 Chevrolet Malibu 4 Door Sedan

NHTSA No.: M20230103

Test Program: NCAP Side Pole Impact Test

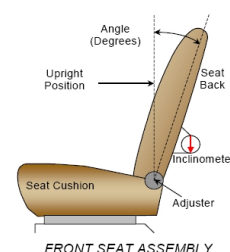
Test Date: 02/09/2023

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	260	Power	0	Power
Front Passenger Seat	240	25 (0-24)	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	64.9	Power	25.1	Power
Front Passenger Seat	67.0	21 (0-20)	25.3	4
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 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	Fixed	Fixed

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	9 (0-8)	8 - Lowermost

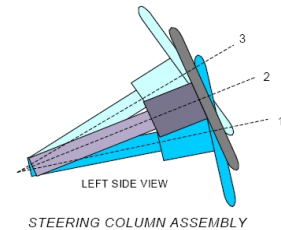
DATA SHEET NO. 2 ... (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
 Test Date: 02/09/2023

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.

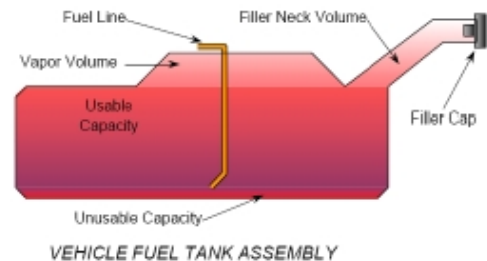


	Degrees	Fore / Aft Position (mm)
Lowermost - Position No. 1	20.0	
Geometric center - Position No. 2	22.3	
Uppermost - Position No. 3	24.5	
Telescoping Steering Wheel Travel		65
Test Position	22.3	32.5

FUEL PUMP

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

The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the right 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	59.8
Usable Capacity of "Optional Tank" - see Form No. 1	
Usable Capacity of "Standard Tank" - see Owner's Manual	59.8
Usable Capacity of "Optional Tank" - see Owner's Manual	
93% of Usable Capacity	55.6
Actual Amount of Solvent Used in Test	55.6
1/3 of Usable Capacity	19.9

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

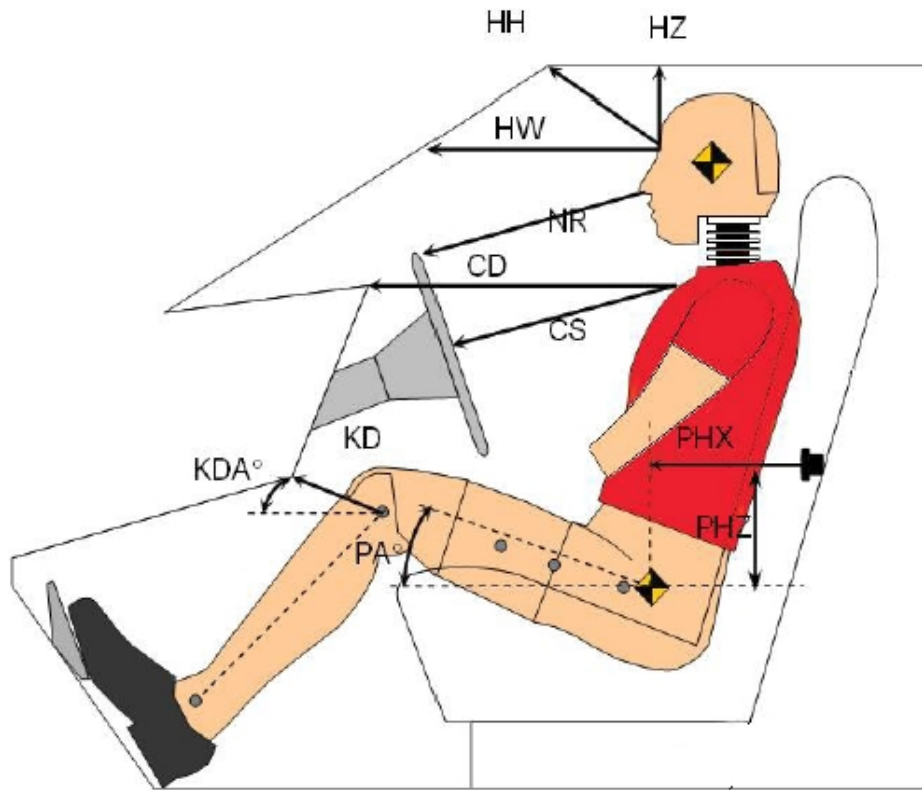


No

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
 Test Date: 02/09/2023



Left Side View

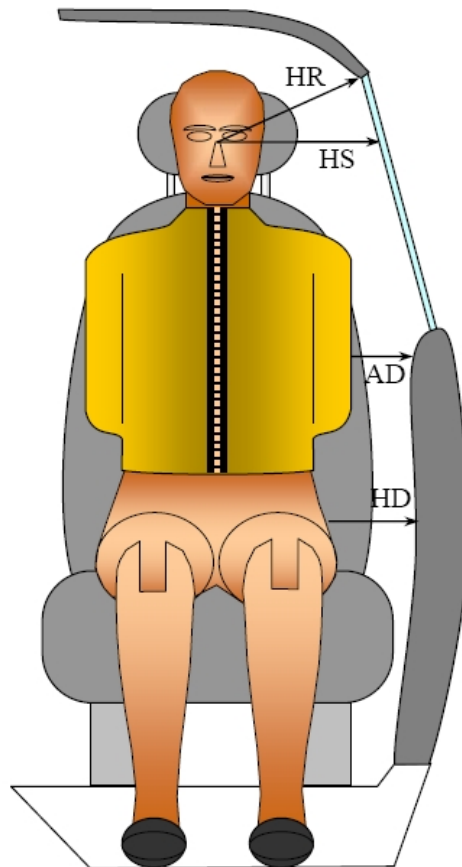
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver (Serial No. 300)	
		Length (mm)	Angle (°)
HH	Head to Header	192	
HW	Head to Windshield	643	
HZ	Head to Roof Liner	260	
NR	Nose to Rim	268	
CD	Chest to Dash	416	
CS	Chest to Steering Wheel	220	
KD(L) / KDA(L)°	Left Knee to Dash	141	25.1
KD(R) / KDA(R)°	Right Knee to Dash	138	42.4
PAX°	Pelvic Tilt Angle (X-Axis)		19.6
PAY°	Pelvic Tilt Angle (Y-Axis)		0.2
PHX	Hip Point to Striker (X-Axis)	316	
PHZ	Hip Point to Striker (Z-Axis)	143	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
Test Date: 02/09/2023



FRONT VIEW OF DUMMY

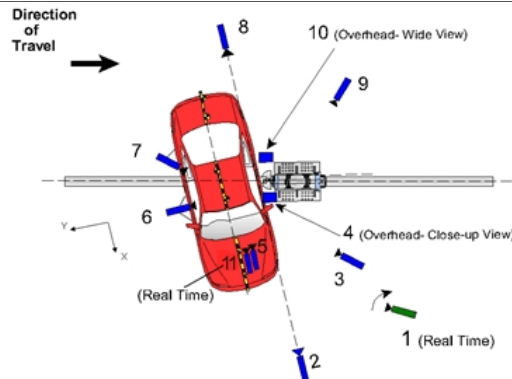
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver – Length (Serial No. 300)
HR	Head to Side Header	mm	241
HS	Head to Side Window	mm	381
AD	Arm to Door	mm	185
HD	H-Point to Door	mm	156

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
Test Date: 02/09/2023



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	30
2	Front ground level - impact view	220	8001	-1330	24	1000
3	Impact side 45° - forward pole view	1405	4724	-1426	28	1000
4	Overhead Close-up view of impact	0	0	-9200	24	1000
5	Onboard - dummy front view				25	1000
6	Onboard - dummy side view				12.5	1000
7	Onboard - dummy rear oblique view				12.5	1000
8	Rear ground level - impact view	3998	-4926	-1374	24	1000
9	Impact side 45° - rearward pole view	-379	-8073	-1467	28	1000
10	Overhead wide - view of impact	0	0	-9200	12.5	1000
11	Real-time (24 - 30 fps) - dummy front view				Zoom	30

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.

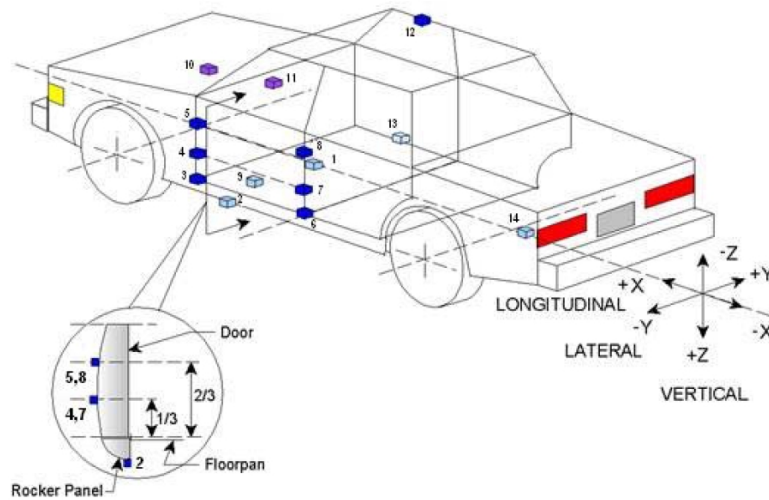
INSTRUMENTATION

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: 2023 Chevrolet Malibu 4 Door Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
Test Date: 02/09/2023



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2710	-2	-156
2	Left Floor Sill	3020	-697	117
3	A-Pillar Sill	3328	-660	100
4	A-Pillar Low	3372	-679	-76
5	A-Pillar Mid	3363	-659	-522
6	B-Pillar Sill	2233	-689	105
7	B-Pillar Low	2342	-692	-87
8	B-Pillar Mid	2285	-671	-450
9	Driver Seat Track	2531	-561	159
10	Engine Top	4279	122	-319
11	Firewall	3813	123	-362
12	Right Roof	2373	594	-977
13	Right Floor Sill	3023	701	108
14	Rear Floor Pan	754	-41	124

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: 2023 Chevrolet Malibu 4 Door Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
Test Date: 02/09/2023

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: 2023 Chevrolet Malibu 4 Door Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
Test Date: 02/09/2023

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver Seat Dummy (SID-IIs)
Face	Curtain Airbag
Top of Head	Curtain Airbag & Head Restraint
Left Side of Head	Curtain Airbag
Back of Head	Curtain Airbag, Side Header, Head Restraint & Seatback
Left Shoulder	Torso/Pelvis Airbag & Seatback
Upper Torso	Seatback & Torso/Pelvis Airbag
Lower Torso	Seatback & Torso/Pelvis Airbag
Left Hip	Seat Pan, Torso/Pelvis Airbag & Driver Door
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)	N/A	N/A	N/A	N/A	N/A

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: 2023 Chevrolet Malibu 4 Door Sedan

NHTSA No.: M20230103

Test Program: NCAP Side Pole Impact Test

Test Date: 02/09/2023

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar & B-Pillar Buckled
Sill Separation	167mm of total separation; 32mm by impact point, 80mm by B-Pillar, & 55mm located by middle of rear door sill
Windshield Damage	Cracked throughout with separation along A-Pillar
Side Window Damage	Shattered during impact event
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	No	N/A
Seat Belt Load Limiter	Yes	Yes	No	N/A
Other	N/A	N/A	N/A	N/A

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

Measured Parameter	Units	Tolerance	Value
Vertical Impact Ref Line - Aft of Front Axle, Intended Impact Pt	mm		1186
Actual Impact Point - Aft of Front Axle	mm		1187
Horizontal Offset (+ forward / - rearward)	mm	+/- 38*	-1
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	32.03
Trap No. 2 Velocity - Redundant	kph	31.4 to 33.0	32.06

*Of Intended Impact Point

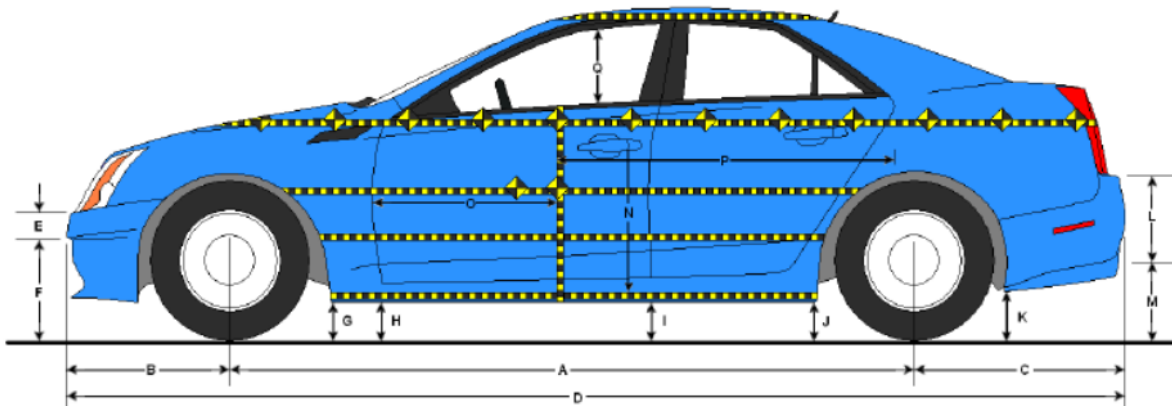
DATA SHEET NO. 9
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan

NHTSA No.: M20230103

Test Program: NCAP Side Pole Impact Test

Test Date: 02/09/2023



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

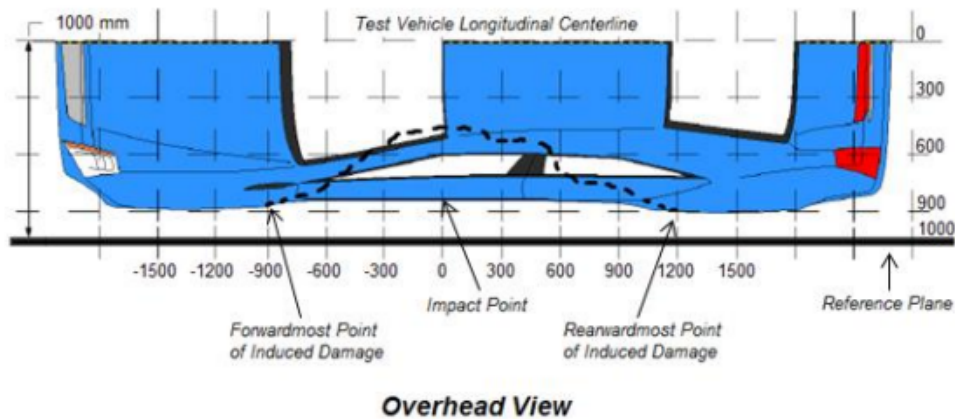
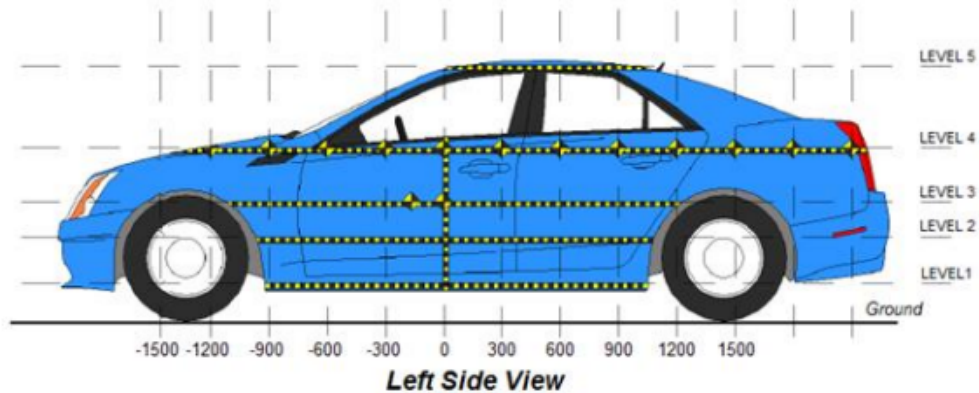
No.	Measurement Description	Pre-Test	Post-Test	Change
A	Vehicle Wheelbase	2829	2751	-78
B	Front Axle to FSOV	974	1003	29
C	Rear Axle to RSOV	1132	1132	0
D	Total Length at Centerline	4934	4886	-48
E	Front Bumper Thickness	100	100	0
F	Front Bumper Bottom to Ground	398	444	46
G	Sill Height at Front Wheel Well	167	157	-10
H	Sill Height at Front Door Leading Edge	177	167	-10
I	Sill Height at B Pillar	188	189	1
J1	Sill Height at Rear Wheel Well	188	206	18
J2	Pinch Weld Height at Rear Wheel Well	162	185	23
K	Sill Height Aft of Rear Wheel Well	240	254	14
L	Rear Bumper Thickness	170	171	1
M	Rear Bumper Bottom to Ground	446	435	-11
N	Sill Height to Bottom of Front Window Sill	735	738	3
O	Front Door Leading Edge to Impact CL	706	605	-101
P	Rear Door Trailing Edge to Impact CL	1521	1444	-77
Q	Front Window Opening	341	339	-2
R	Right Side Length	4784	4775	-9
S	Left Side Length	4784	4707	-77
T	Vehicle Width at B-Pillars	1834	1733	-101
U	Front Wheel Track width	1590	1580	-10
V	Rear Wheel Track Width	1602	1606	4

* All measurements in mm with tolerance of ± 3 mm

DATA SHEET NO.10
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
 Test Date: 02/09/2023



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	212	316	0
2	Driver H-Point	mm	541	354	0
3	Mid-Door	mm	616	358	0
4	Window Sill	mm	913	321	0
5	Window Top	mm	1383	116	150

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

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

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
 Test Date: 02/09/2023

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

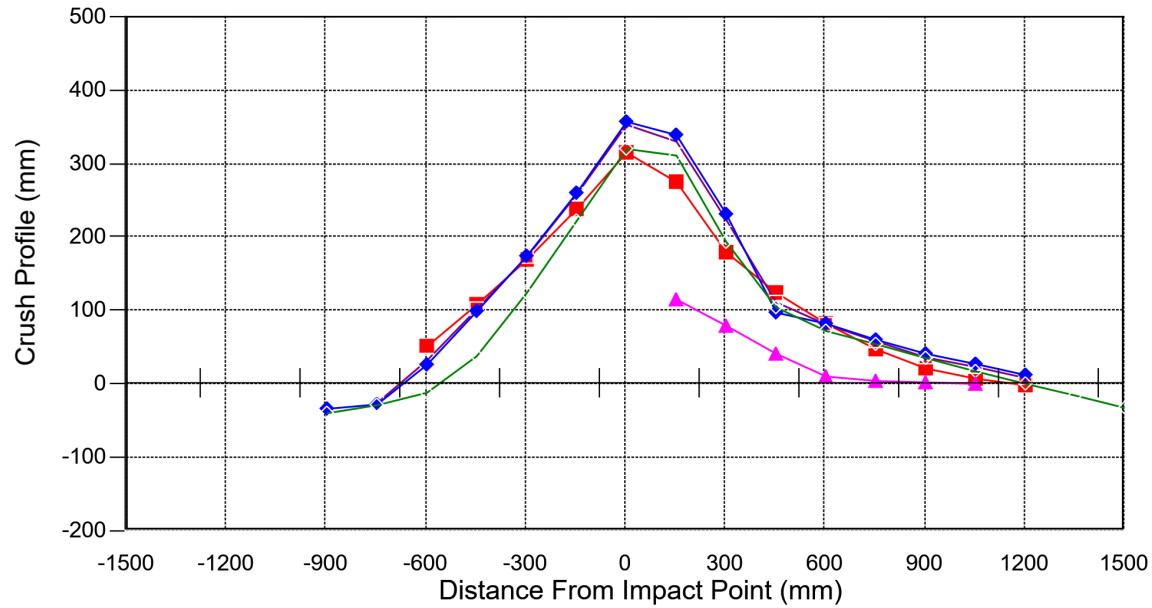
	Pre-Test					Post-Test					Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500															
-1350															
-1200															
-1050															
-900			927	815				960	854				-33	-39	
-750		922	924	830			947	951	858			-25	-27	-28	
-600	875	916	923	842		823	883	896	853		52	33	27	-11	
-450	873	914	917	854		764	811	817	815		109	103	100	39	
-300	872	912	916	864		702	738	741	739		170	174	175	125	
-150	871	912	916	871		632	653	655	648		239	259	261	223	
0	869	912	916	875		553	558	558	554		316	354	358	321	
150	867	911	916	878	641	591	580	576	566	525	276	331	340	312	116
300	865	911	916	878	645	685	687	684	684	565	180	224	232	194	80
450	864	911	915	876	644	739	799	817	771	602	125	112	98	105	42
600	862	908	912	872	642	779	826	829	799	631	83	82	83	73	11
750	863	908	912	870	638	815	849	851	815	633	48	59	61	55	5
900	864	909	913	868	630	842	872	871	832	627	22	37	42	36	3
1050	867	912	915	867	608	859	888	887	849	607	8	24	28	18	1
1200	873	915	918	892		874	906	905	891		-1	9	13	1	
1350				891					906					-15	
1500				864					896					-32	

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: 2023 Chevrolet Malibu 4 Door Sedan
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
 Test Date: 02/09/2023



— LEVEL 1 Side Sill: 212 mm above ground — LEVEL 2 H-Point: 541 mm above ground — LEVEL 3 Mid Door: 616 mm above ground — LEVEL 4 Window Sill: 913 mm above ground
 — LEVEL 5 Window Top: 1383 mm above ground

Vehicle Exterior Crush Measurements - Visual Representation

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

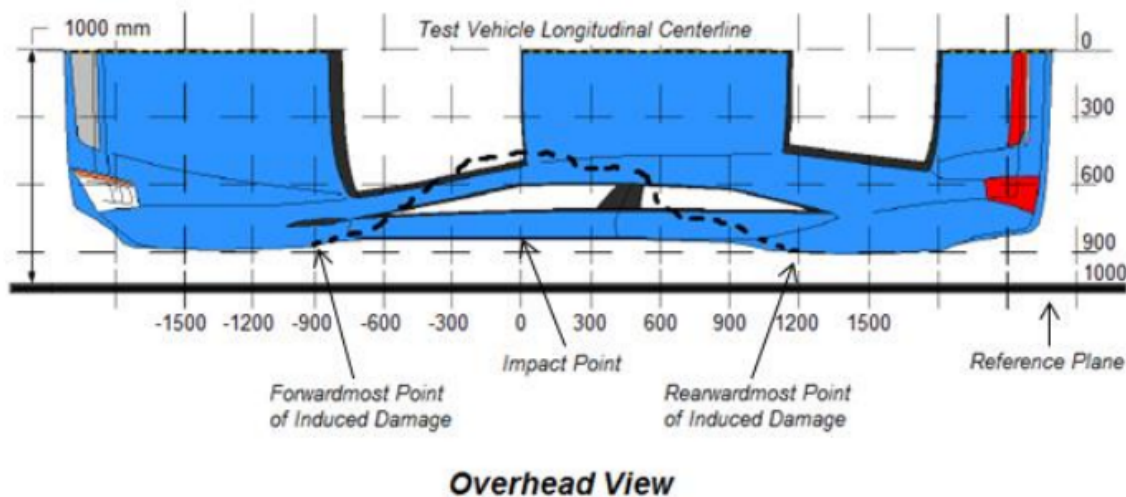
Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan

NHTSA No.: M20230103

Test Program: NCAP Side Pole Impact Test

Test Date: 02/09/2023

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	-900	3	40	73	-33
2	-480	3	167	82	85
3	-60	3	403	84	319
4	360	3	263	84	179
5	780	3	145	88	57
6	1200	3	95	82	13

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

Test Vehicle: 2023 Chevrolet Malibu 4 Door Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
Test Date: 02/09/2023

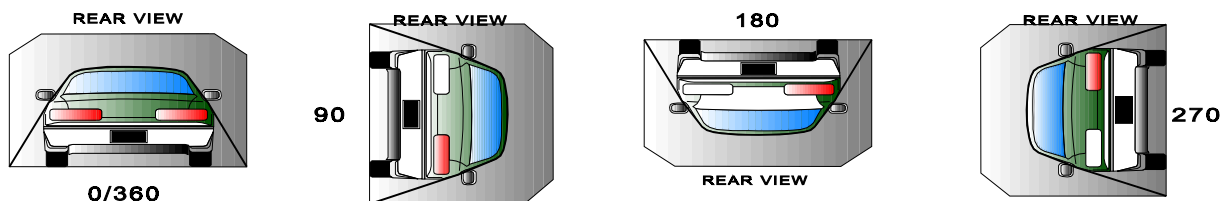
Test Time: 9:32 AM

Temperature: 21.0 °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°	68	300	368
90° to 180°	67	300	367
180° to 270°	61	300	361
270° to 360°	70	300	370

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	

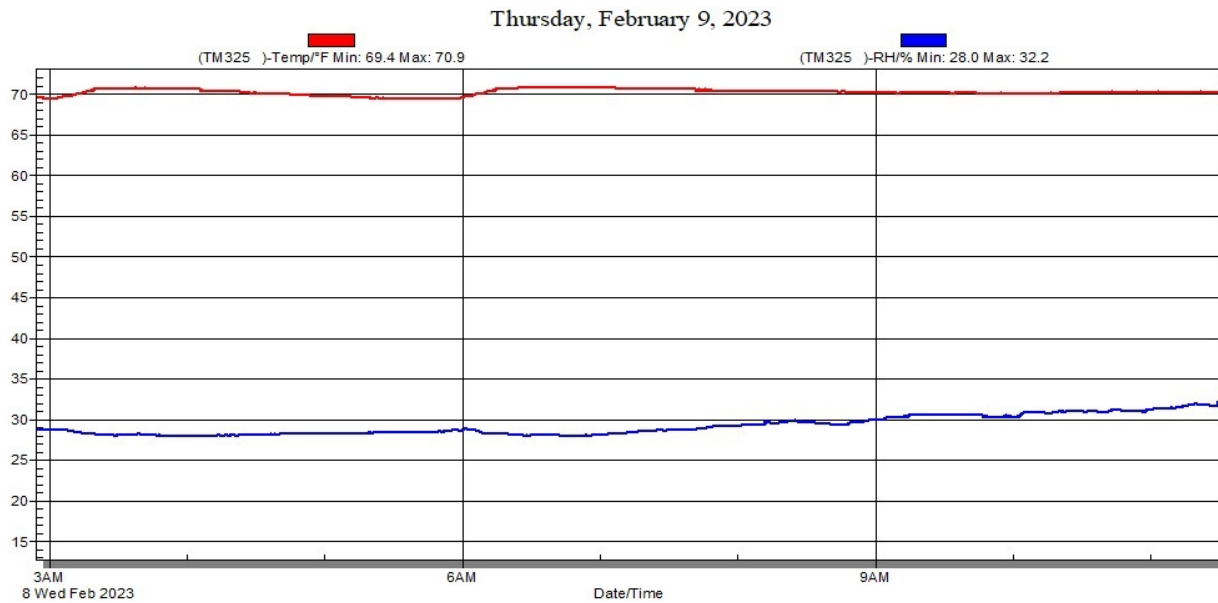
SOLVENT SPILLAGE LOCATION TABLE

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: 2023 Chevrolet Malibu 4 Door Sedan
Test Program: NCAP Side Pole Impact Test

NHTSA No.: M20230103
Test Date: 02/09/2023



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

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Fig.	Description	Page
1	As Delivered Right Front $\frac{3}{4}$ View of Test Vehicle	A-4
2	As Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle	A-4
3	Pre-Test Frontal View of Test Vehicle	A-5
4	Post-Test Frontal View of Test Vehicle	A-5
5	Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle	A-6
6	Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle	A-6
7	Pre-Test Left Side View of Test Vehicle	A-7
8	Post-Test Left Side View of Test Vehicle	A-7
9	Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle	A-8
10	Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle	A-8
11	Pre-Test Rear View of Test Vehicle	A-9
12	Post-Test Rear View of Test Vehicle	A-9
13	Pre-Test Right Side View of Test Vehicle	A-10
14	Post-Test Right Side View of Test Vehicle	A-10
15	Pre-Test Overhead View of Test Area	A-11
16	Post-Test Overhead View of Test Area	A-11
17	Pre-Test Left Side View of Pole Positioned Against Side of Vehicle	A-12
18	Pre-Test Right Side View of Pole Positioned Against Side of Vehicle	A-12
19	Pre-Test Close-Up View of Impact Point Target	A-13
20	Post-Test Close-Up View of Impact Point Target Showing Impact Location	A-13
21	Pre-Test Front Close-Up View of Dummy Head and Chest	A-14
22	Post-Test Front Close-Up View of Dummy	A-14
23	Pre-Test Left Side View of Dummy Showing Belt and Chalking	A-15
24	Pre-Test Left Side View of Dummy Shoulder and Door Top View	A-15
25	Post-Test Left Side View of Dummy Shoulder and Door Top View	A-16
26	Pre-Test Frontal View of Seat Back Prior to Dummy Positioning	A-16
27	Pre-Test Frontal Close-Up View of Dummy Head / Shoulders in Relation to Head Restraint	A-17
28	Pre-Test Frontal View of Seat Pan Prior to Dummy Positioning	A-17
29	Pre-Test Overhead View of Dummy Thighs on Seat Pan	A-18
30	Pre-Test Left Side View of Dummy's Neck Showing Position of Adjustable Neck Bracket	A-18
31	Pre-Test Left Side View of Dummy's Head Showing Dummy's Head is Level	A-19
32	Pre-Test Placement of Dummy's Feet	A-19
33	Pre-Test View of Belt Anchorage for Dummy	A-20
34	Pre-Test Left Side View of Steering Wheel	A-20
35	Pre-Test View of Disengaged Parking Brake	A-21

Fig.	Description	Page
36	Pre-Test View of Parking Brake	A-21
37	Pre-Test Close-Up Left Side View of Driver Seat Track	A-22
38	Pre-Test Close-Up Left Side View of Driver Seat Back	A-22
39	Pre-Test Close-Up View of Driver Seat Back or Head Restraint	A-23
40	Pre-Test Dummy and Door Clearance View	A-23
41	Post-Test Dummy and Door Clearance View	A-24
42	Pre-Test Right Side View of Dummy and Front Seat of Occupant Compartment	A-24
43	Post-Test Right Side View of Dummy and Front Seat of Occupant Compartment	A-25
44	Pre-Test Inner Door Panel View	A-25
45	Post-Test Inner Door Panel View Showing Dummy Contact Location	A-26
46	Post-Test Dummy Close-Up Head Contact with Vehicle Interior View	A-26
47	Post-Test Dummy Close-Up Head Contact with Side Airbag View	A-27
48	Post-Test Dummy Close-Up Torso Contact with Vehicle Interior View	A-27
49	Post-Test Dummy Close-Up Torso Contact with Side Airbag View	A-28
50	Post-Test Dummy Close-Up Pelvis Contact with Vehicle Interior View	A-28
51	Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View	A-29
52	Post-Test Dummy Close-Up Knee Contact with Vehicle Interior View	A-29
53	Pre-Test Right Side View of Dummy and Rear Seat of Occupant Compartment	A-30
54	Post-Test Inner Rear Passenger Torso Air Bag Deployment View	A-30
55	Pre-Test View of Fuel Filler Cap or Fuel Filler Neck	A-31
56	Post-Test View of Fuel Filler Cap or Fuel Filler Neck	A-31
57	Close-Up View of Vehicle's Certification Label	A-32
58	Close-Up View of Vehicle's Tire Information Placard or Label	A-32
59	Pre-Test Pole Barrier Front View	A-33
60	Post-Test Pole Barrier Front View	A-33
61	Pre-Test Pole Barrier Side View	A-34
62	Post-Test Pole Barrier Side View	A-34
63	Pre-Test Ballast View	A-35
64	Post-Test Primary and Redundant Speed Trap Read-Out	A-35
65	FMVSS No. 301 Static Rollover 0 Degrees	A-36
66	FMVSS No. 301 Static Rollover 90 Degrees	A-36
67	FMVSS No. 301 Static Rollover 180 Degrees	A-37
68	FMVSS No. 301 Static Rollover 270 Degrees	A-37
69	FMVSS No. 301 Static Rollover 360 Degrees	A-38
70	Impact Event	A-38
71	Monroney Label	A-39
72	Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	A-39
73	Post-Test View of Shattered Vehicle Inner Door Panel	A-41



M20230103

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



M20230103

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

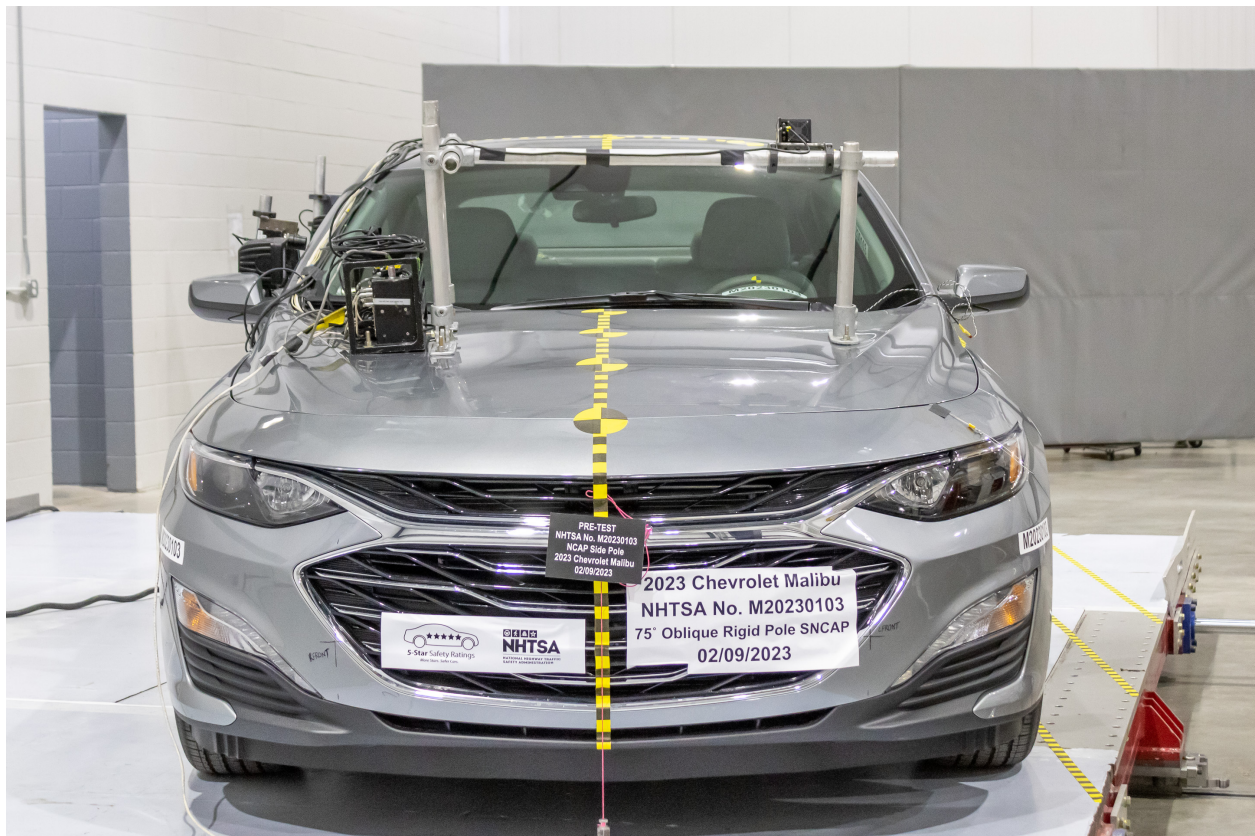


Figure A-3: Pre-Test Frontal View of Test Vehicle

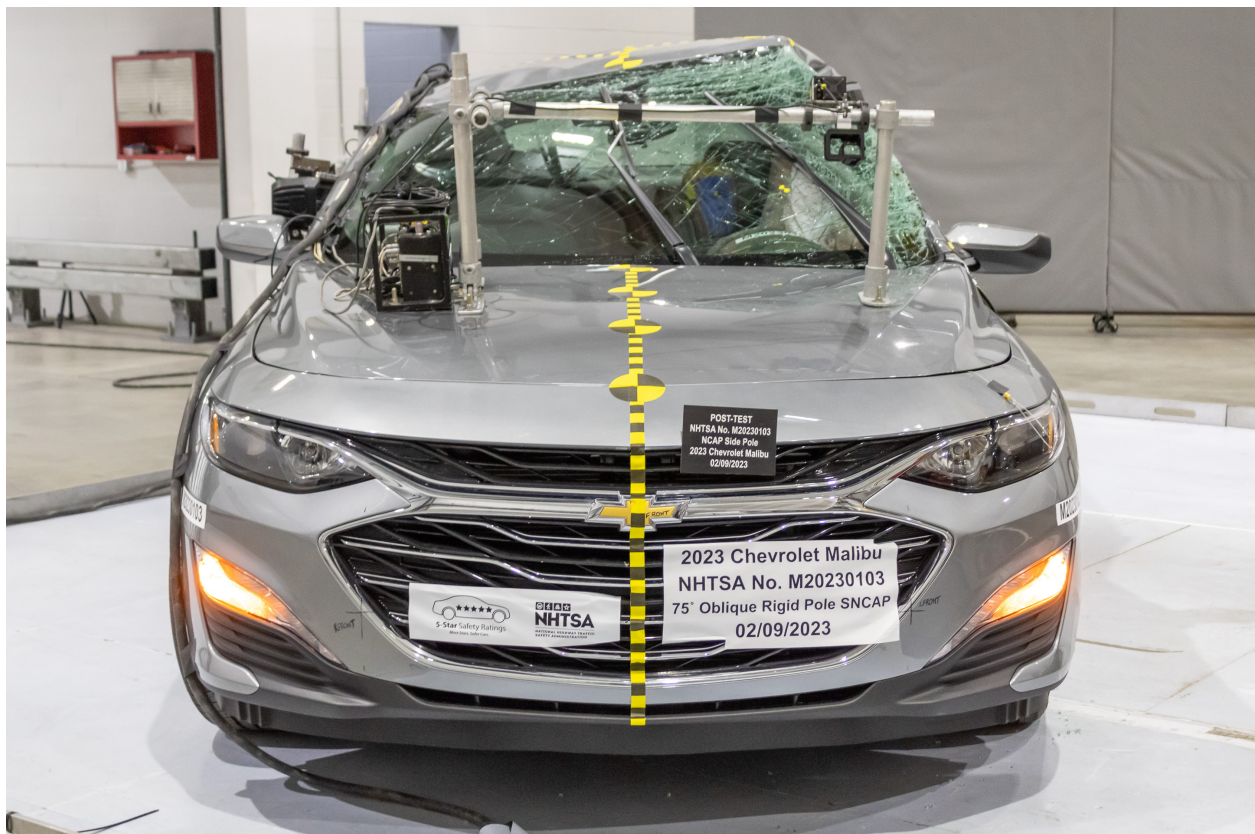


Figure A-4: Post-Test Frontal View of Test Vehicle



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

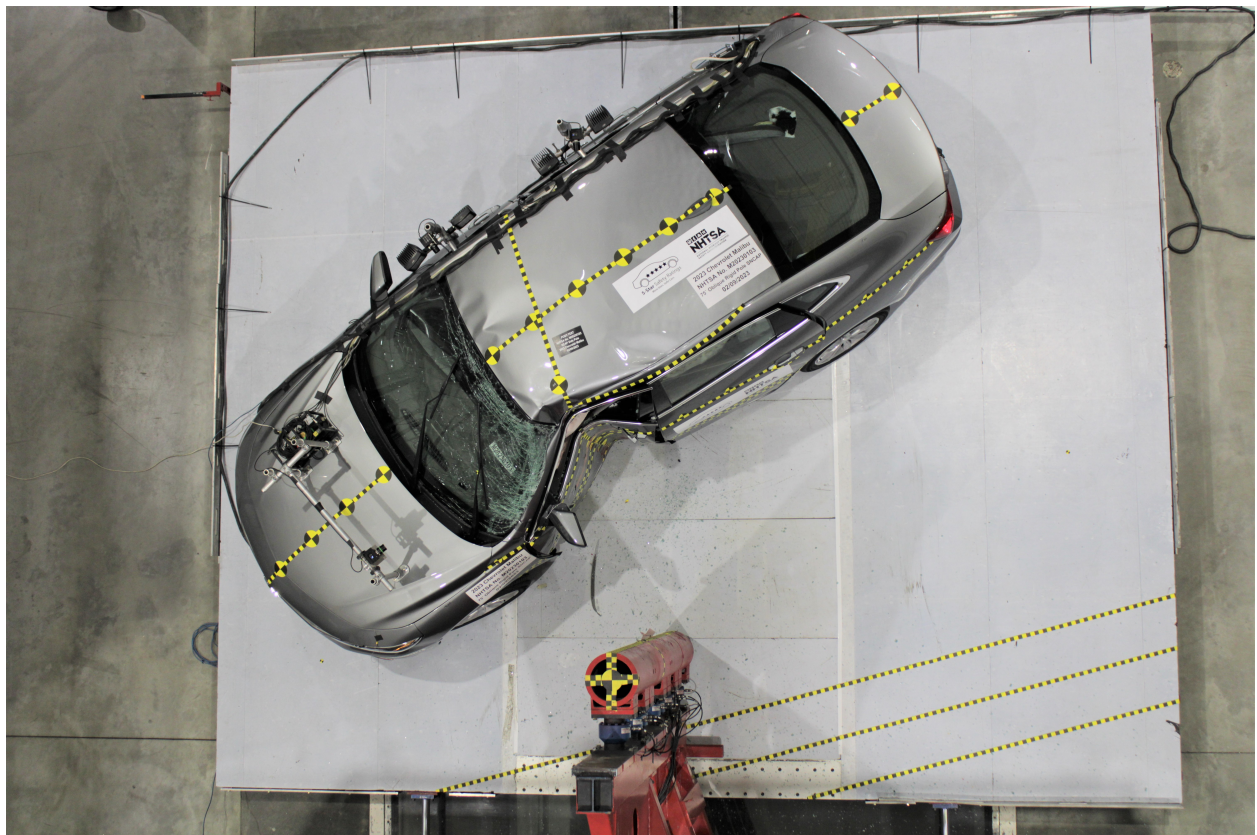


Figure A-16: Post-Test Overhead View of Test Area



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

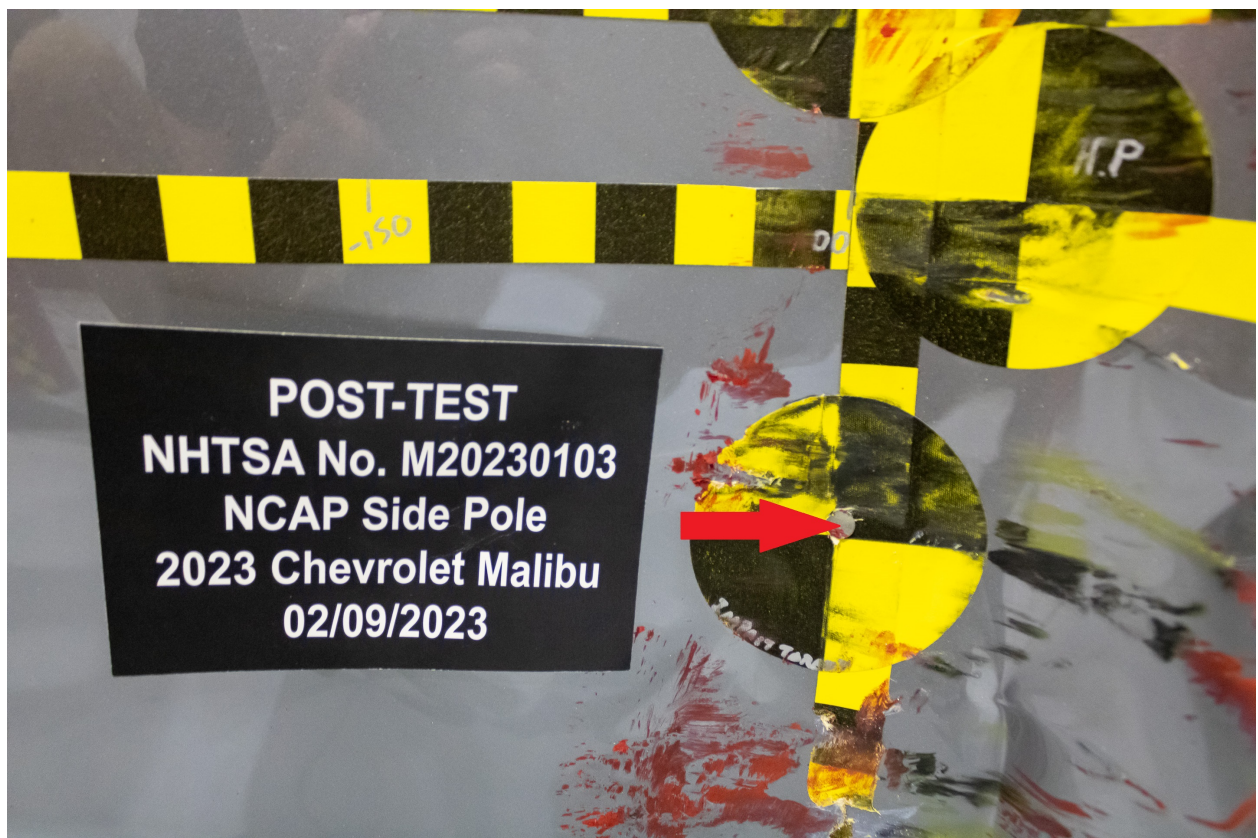


Figure A-20: Post-Test Close-Up View of Impact Point Target Showing Impact Location



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

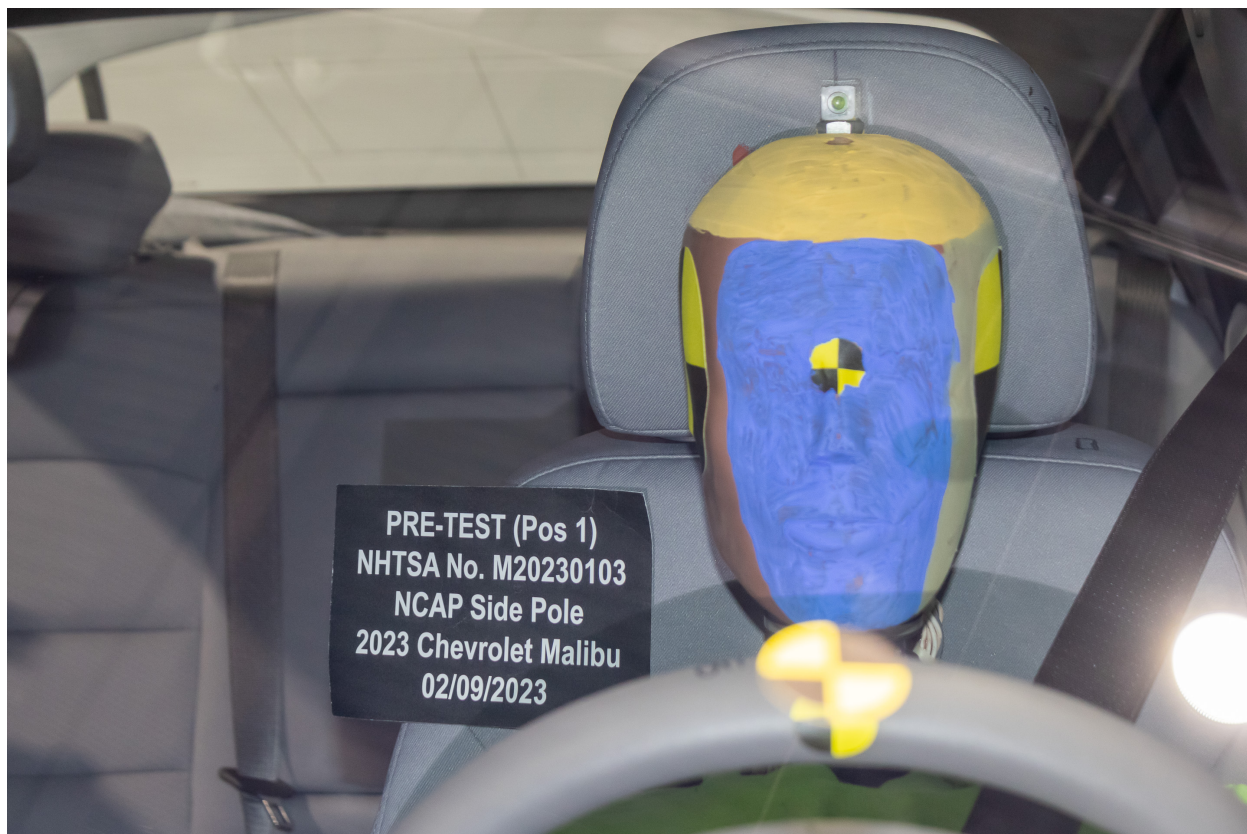


Figure A-27: Pre-Test Frontal Close-Up View of Dummy Head / Shoulders in Relation to Head Restraint



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

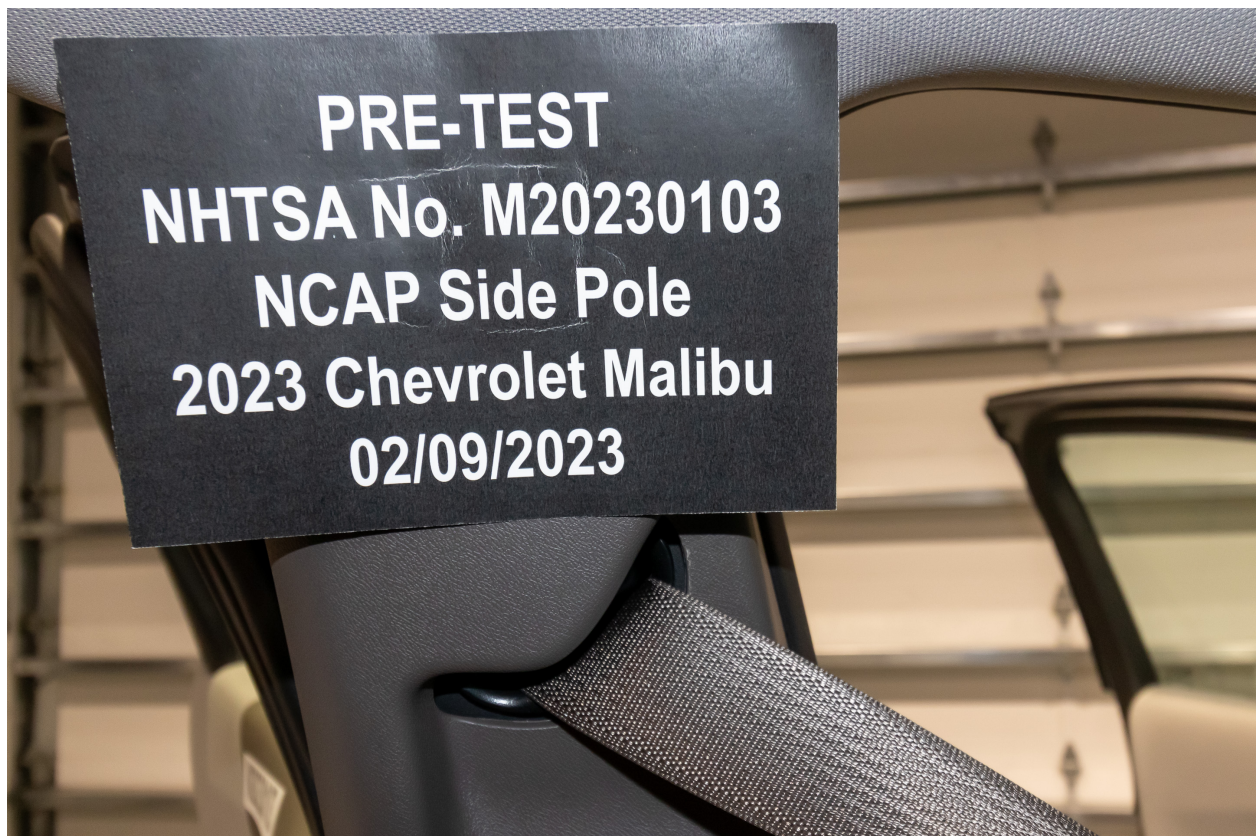


Figure A-33: Pre-Test View of Belt Anchorage for Dummy



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

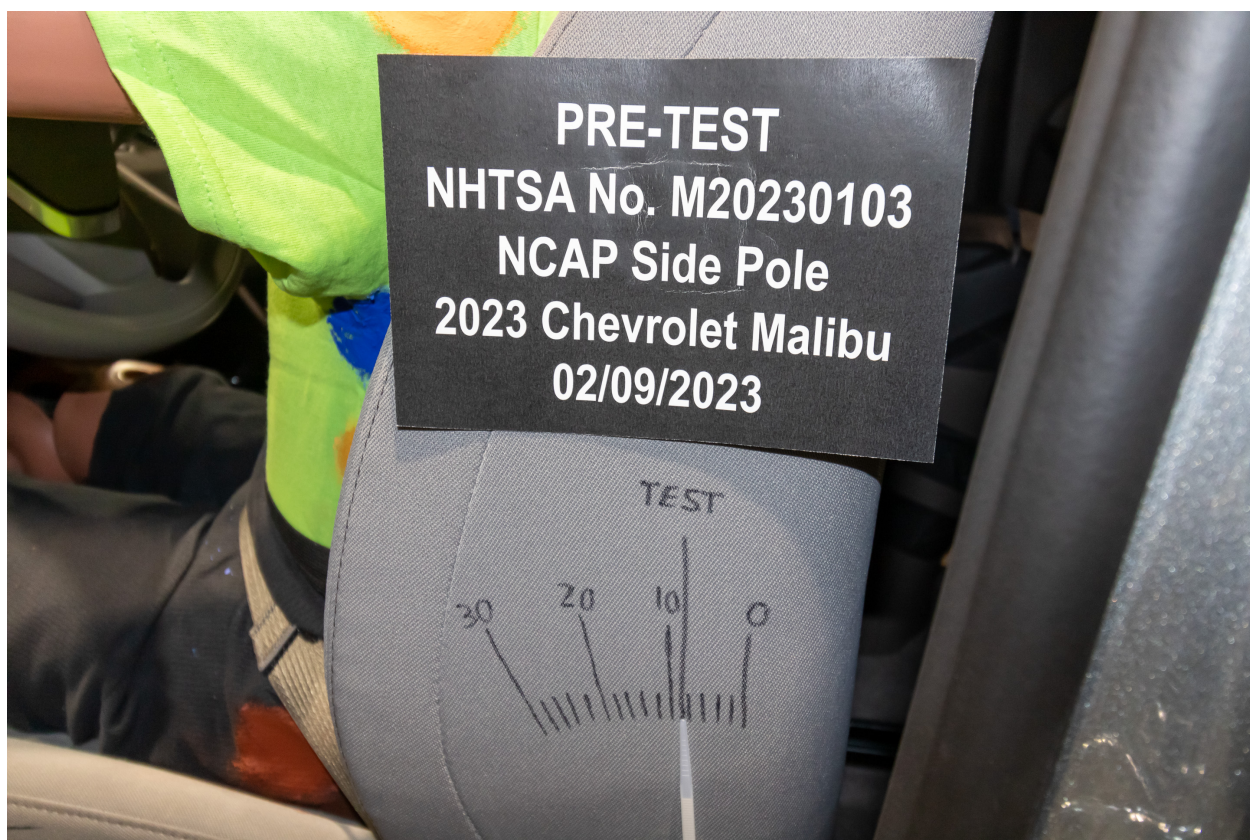


Figure A-38: Pre-Test Close-Up Left Side View of Driver Seat Back



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

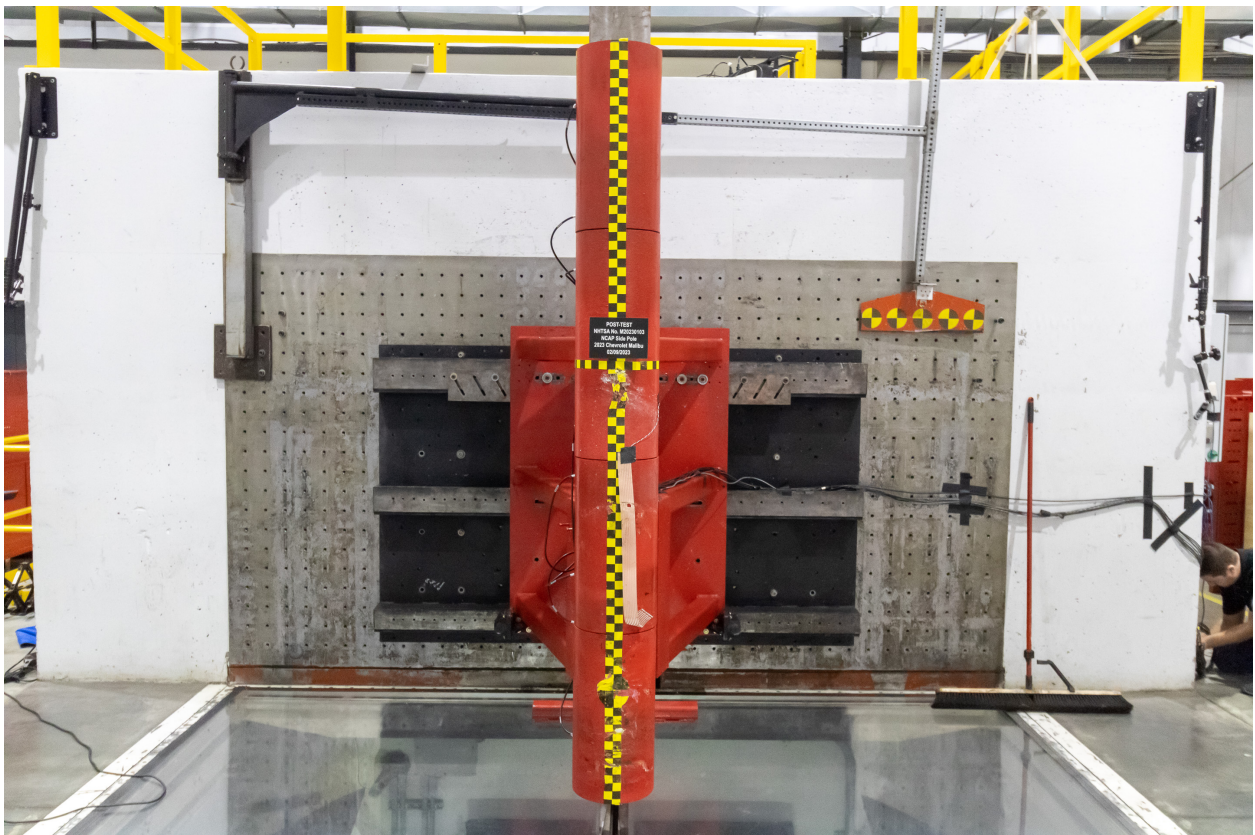


Figure A-60: Post-Test Pole Barrier Front View

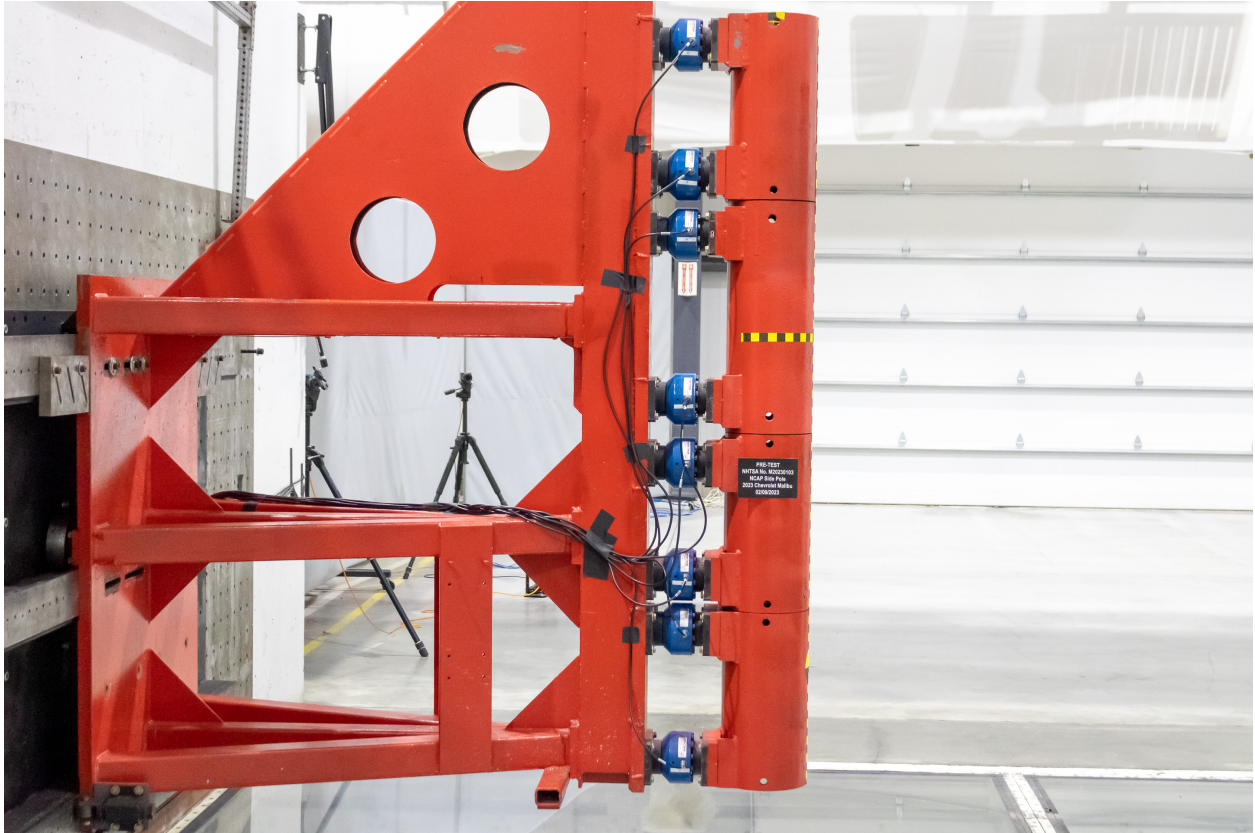


Figure A-61: Pre-Test Pole Barrier Side View

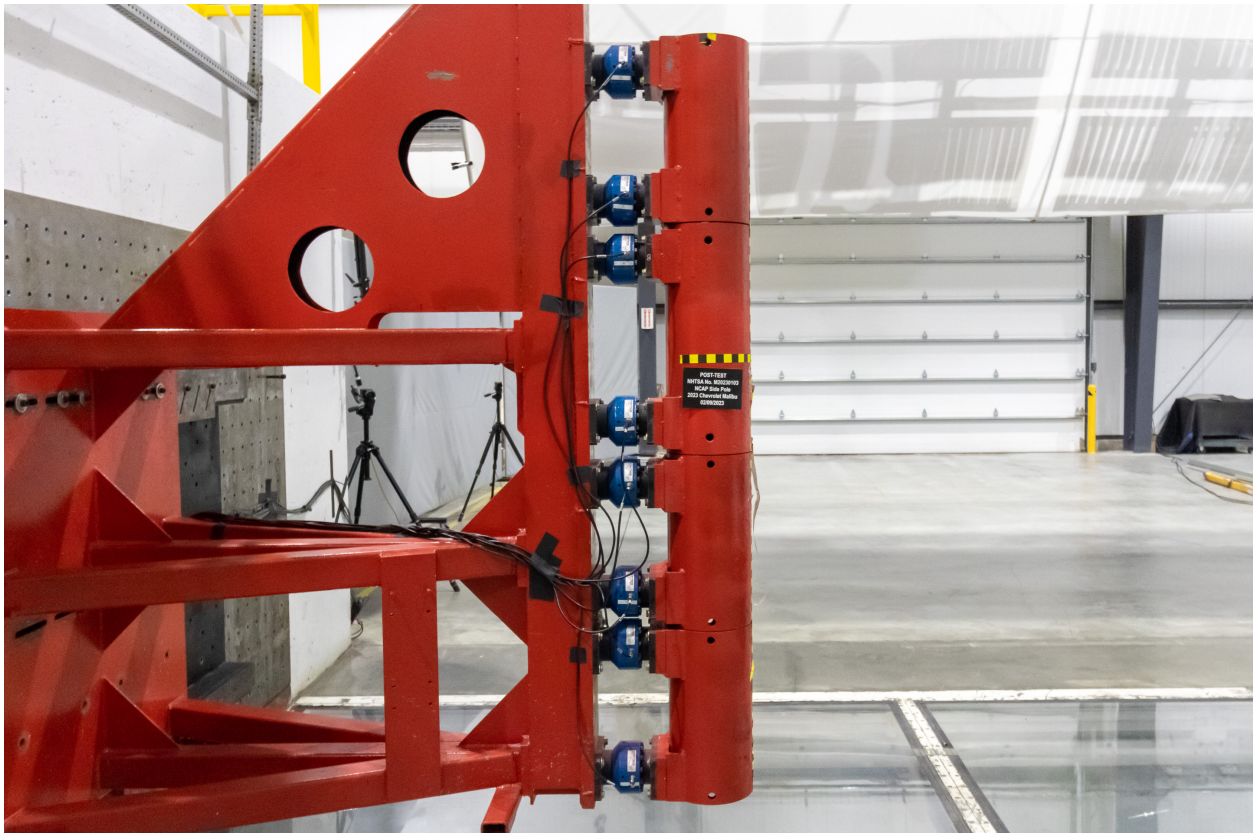


Figure A-62: Post-Test Pole Barrier Side View

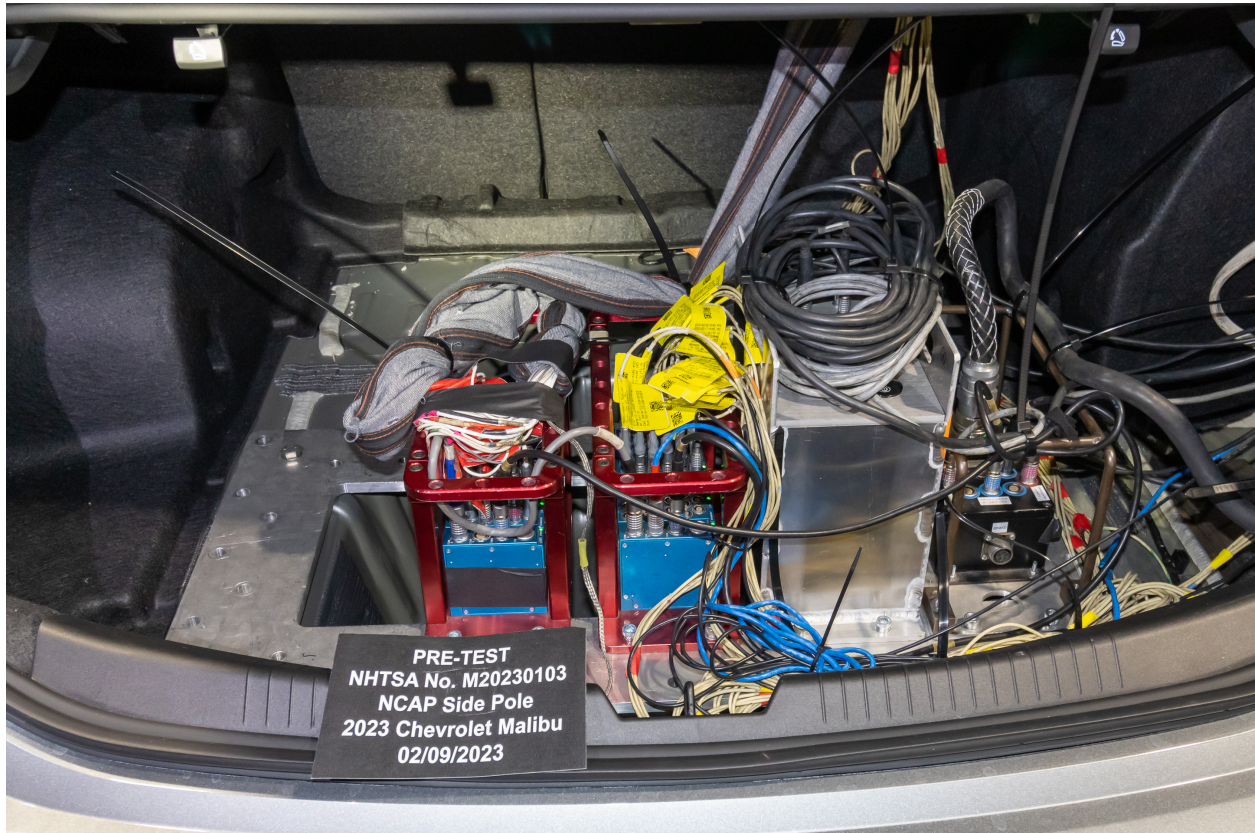


Figure A-63: Pre-Test Ballast View



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

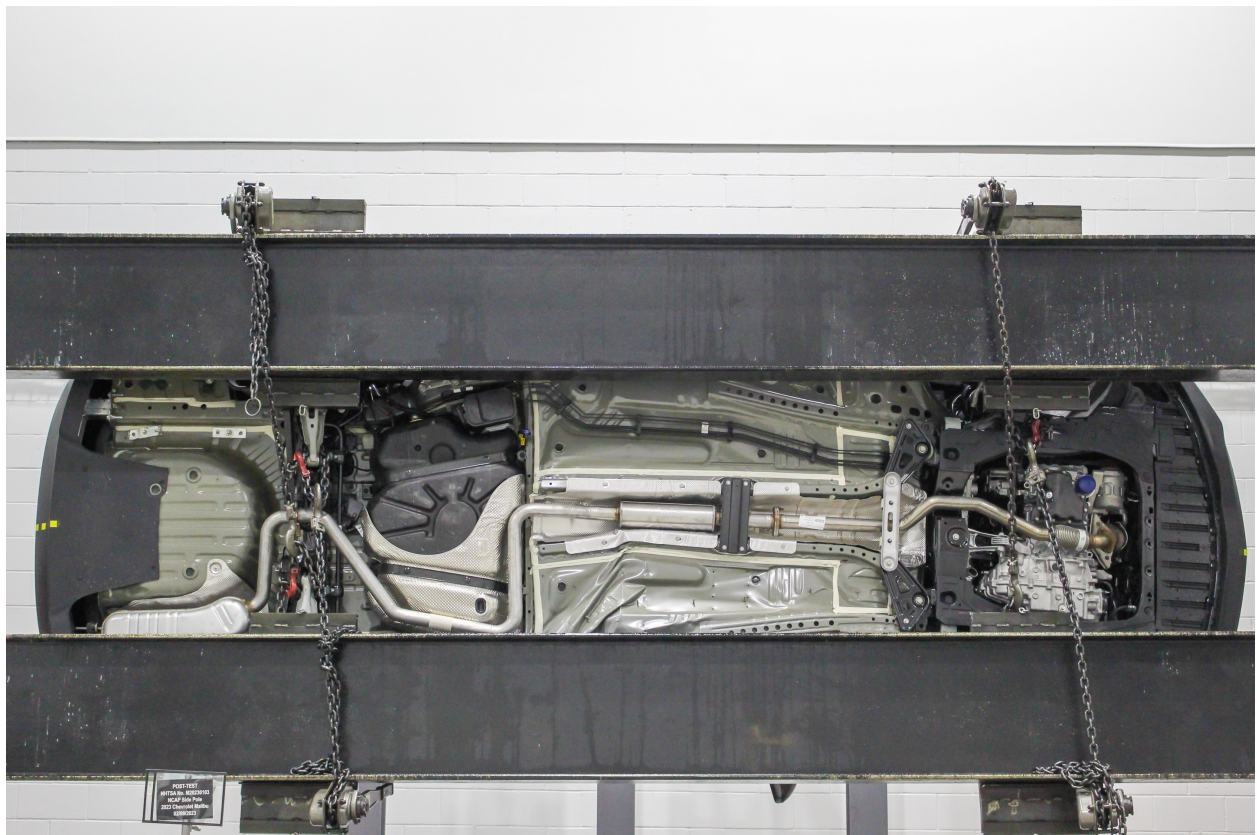


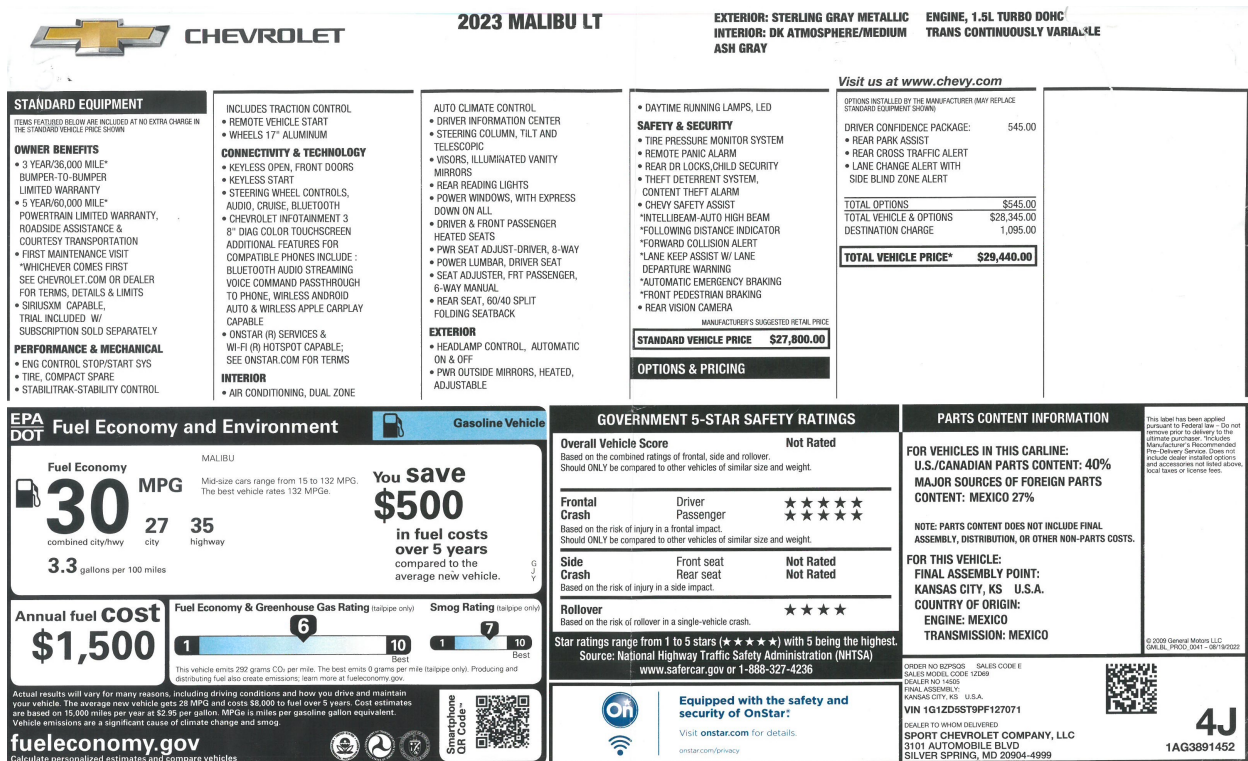
Figure A-68: FMVSS No. 301 Static Rollover 270 Degrees



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



Figure A-70: Impact Event



EPA DOT Fuel Economy and Environment

Fuel Economy

30 MPG

combined city/hwy

27 city

35 highway

3.3 gallons per 100 miles

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

Annual fuel cost \$1,500

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

6

Smog Rating (tailpipe only)

7

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 \$8,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.95 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov

Calculate personalized estimates and compare vehicles

Gasoline Vehicle

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score

Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash

Driver Passenger

★★★★★

★★★★★

Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.

Side Crash

Front seat Rear seat

★★★★★

Not Rated

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

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:

U.S./CANADIAN PARTS CONTENT: 40%

MAJOR SOURCES OF FOREIGN PARTS CONTENT: MEXICO 27%

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

FOR THIS VEHICLE:

FINAL ASSEMBLY POINT:

KANSAS CITY, KS U.S.A.

COUNTRY OF ORIGIN:

ENGINE: MEXICO

TRANSMISSION: MEXICO

ORDER NO. REPRODUCED SALES CODE E

SALES MODEL CODE 12089

DEALER NO. 14500

FINAL ASSEMBLY

KANSAS CITY, KS U.S.A.

VIN 1G11ZD55T9PF127071

DEALER TO WHOM DELIVERED

SPORT CHEVROLET COMPANY, LLC

3101 AUTOMOBILE BLVD

SILVER SPRING, MD 20904-4999

4J

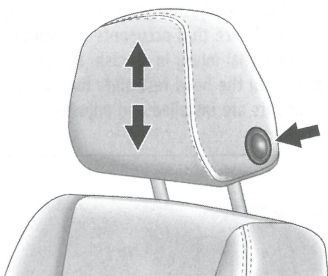
1AG391452

Figure A-71: Monroney Label

28 Seats and Restraints

Front Seat

The vehicle's front seats have adjustable head restraints in the outboard seating positions.



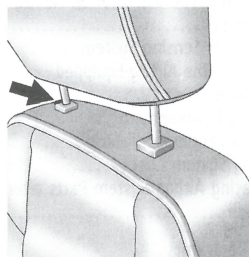
To raise or lower the head restraint, press the button located on the side of the head restraint and pull up or push the head restraint down and release the button.

Pull and push on the head restraint after the button is released to make sure that it is locked in place.

The front seat outboard head restraints are not removable.

Rear Seat

The vehicle's rear seats have adjustable head restraints in the outboard seating positions.



The height of the head restraint can be adjusted. Pull the head restraint up to raise it. Try to move the head restraint to make sure that it is locked in place.

To lower the head restraint, press the button, located on the top of the seatback, and push the head restraint down. Try to move the head restraint after the button is released to make sure that it is locked in place.

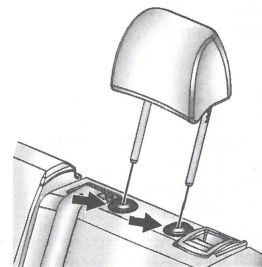
The rear seat outboard head restraints are not intended to be removed. If removal is required see your dealer for assistance with

removal. In the event of an emergency, the following can be used as removal and installation instructions. Store the removed head restraints in a secure place. Reinstall the head restraints before the seating position is occupied.

Head Restraint Removal and Reinstallation

To remove the head restraint:

1. Partially fold the seatback forward. See *Rear Seats* ⇨ 35 for additional information.



2. Press both buttons on the head restraint posts at the same time, and pull up on the head restraint.

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

Photo Not Applicable

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

APPENDIX B

VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots

Driver Dummy Instrumentation Plots

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

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)

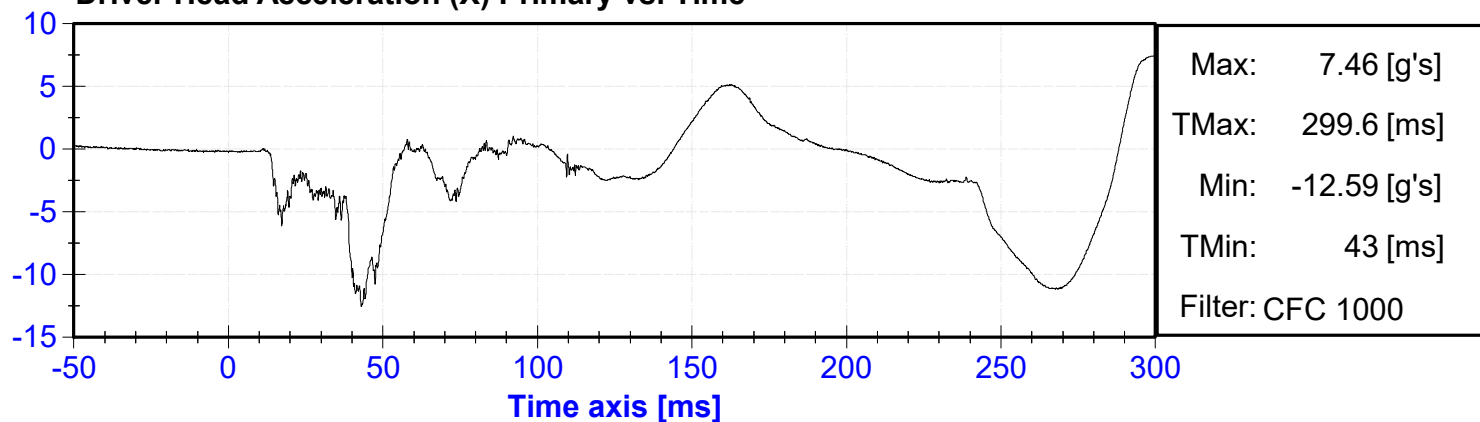
Vehicle Instrumentation Data

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)

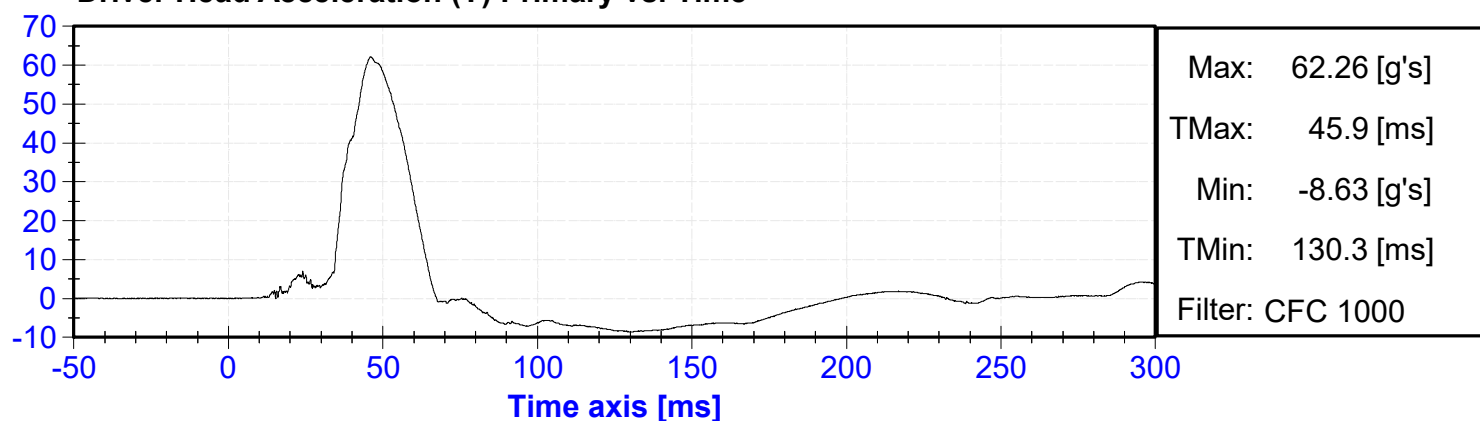
Pole Instrumentation Data

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)

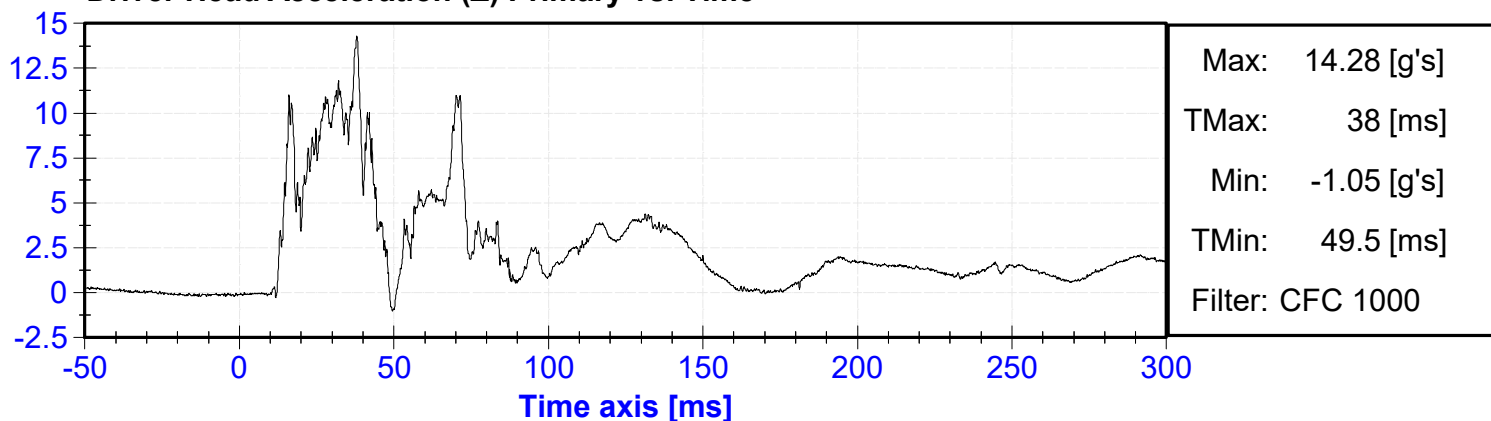
Driver Head Acceleration (X) Primary vs. Time



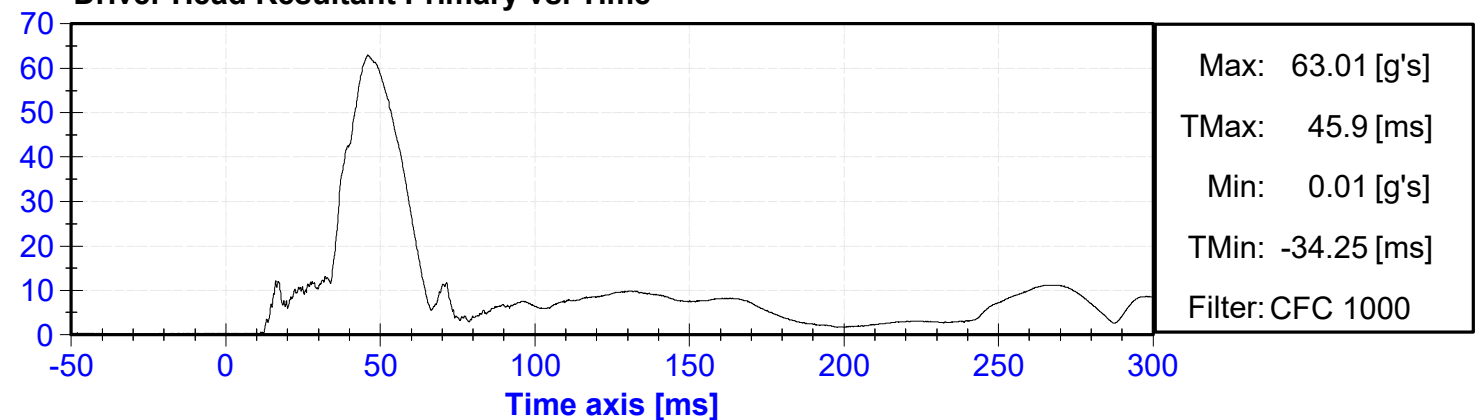
Driver Head Acceleration (Y) Primary vs. Time



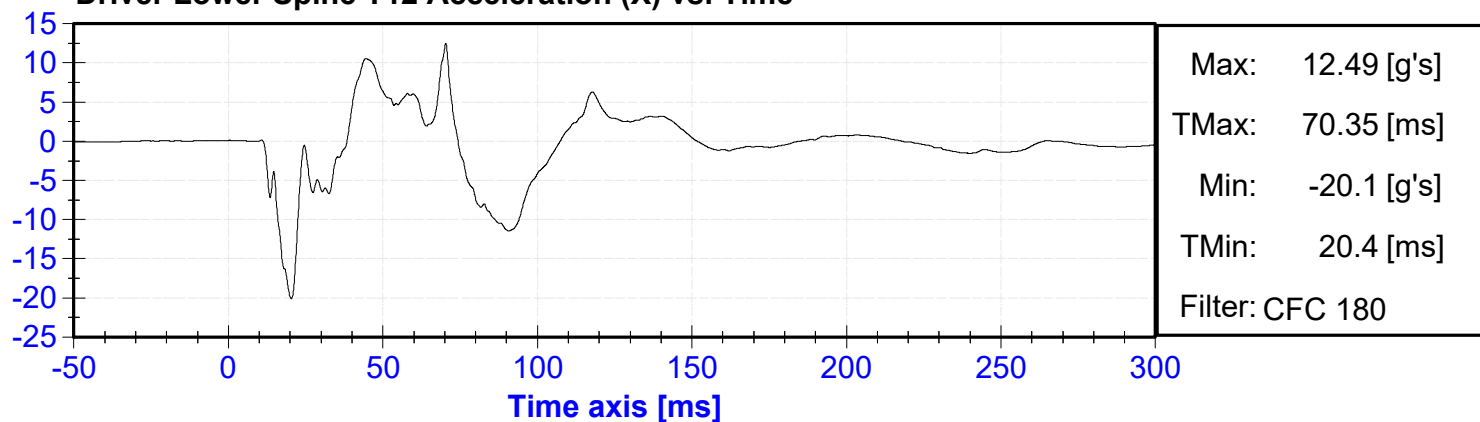
Driver Head Acceleration (Z) Primary vs. Time



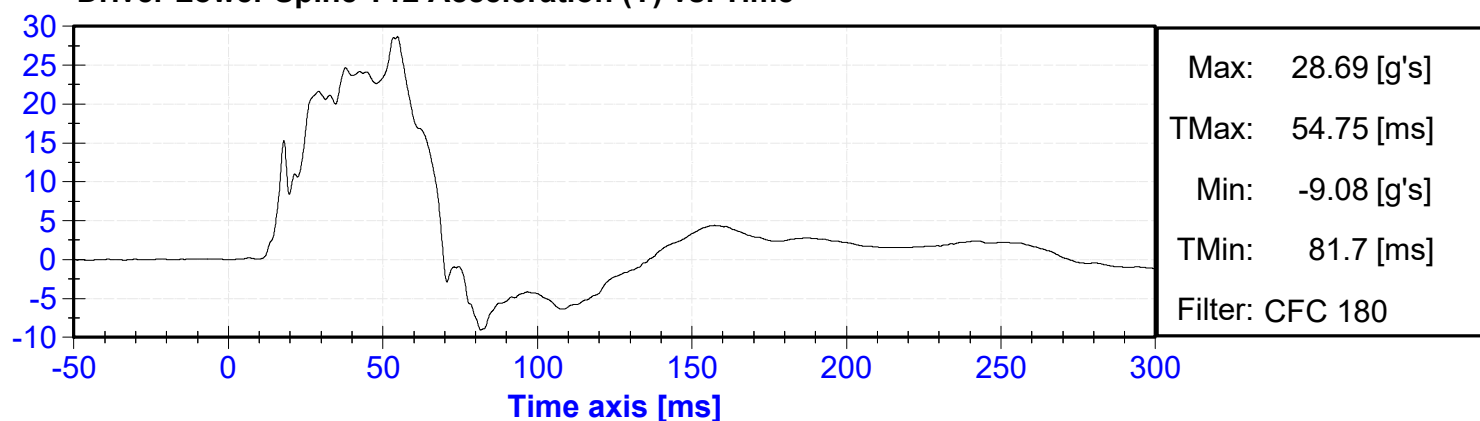
Driver Head Resultant Primary vs. Time



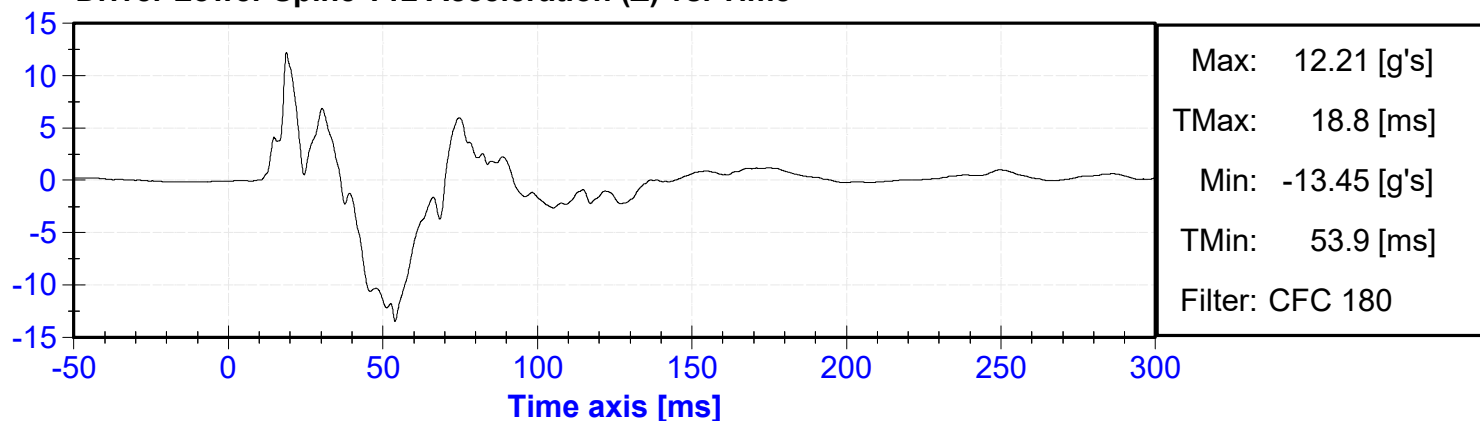
Driver Lower Spine T12 Acceleration (X) vs. Time



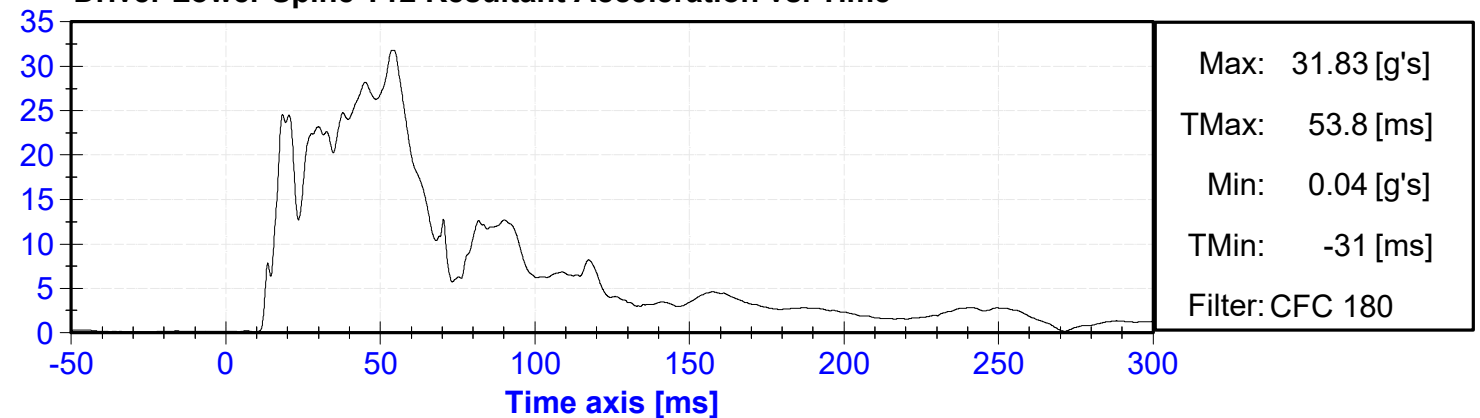
Driver Lower Spine T12 Acceleration (Y) vs. Time



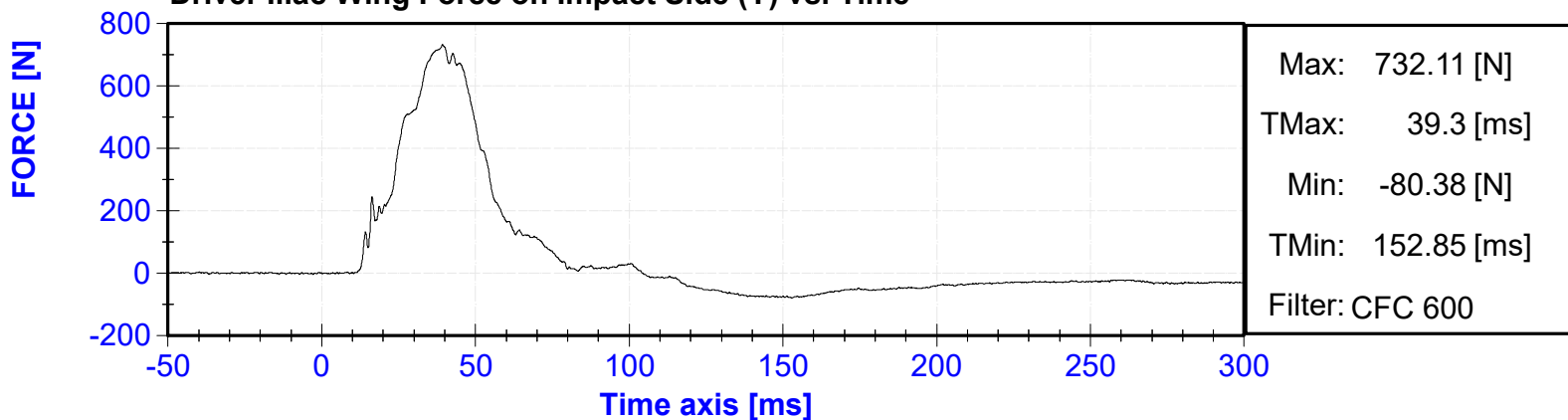
Driver Lower Spine T12 Acceleration (Z) vs. Time



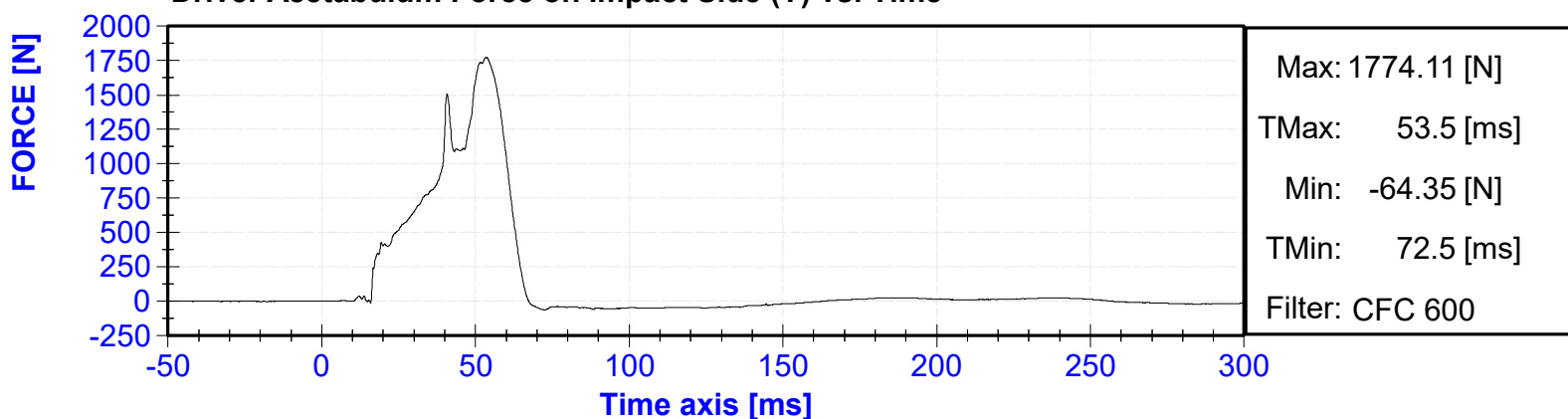
Driver Lower Spine T12 Resultant Acceleration vs. Time



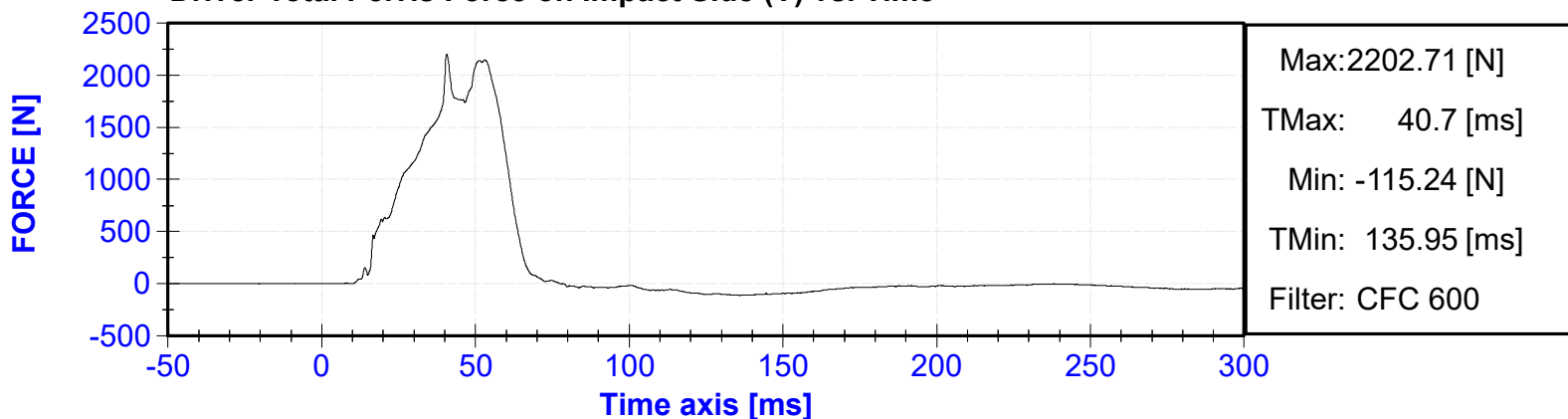
Driver Iliac Wing Force on Impact Side (Y) vs. Time



Driver Acetabulum Force on Impact Side (Y) vs. Time



Driver Total Pelvis Force on Impact Side (Y) vs. Time



APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

SERIAL NO:300

(CONFIGURED FOR LEFT SIDE IMPACT)

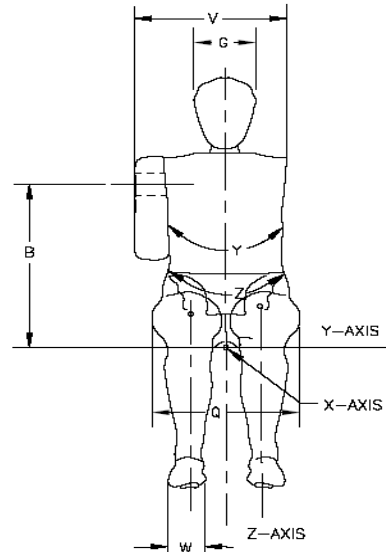
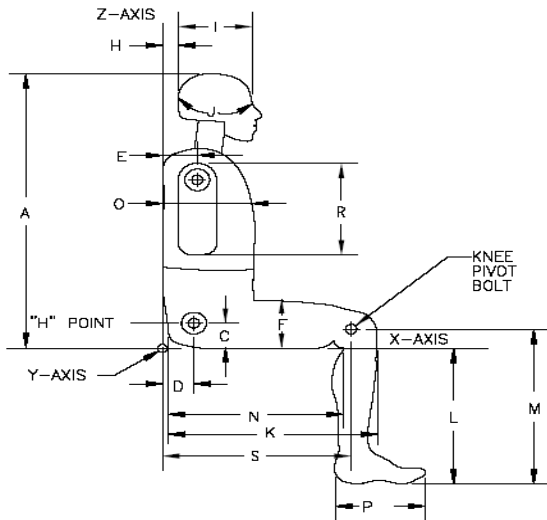


External Measurements - SID-IIs

Technician: K. Brogan

Date: 02/07/2023

Dummy Serial Number: 300



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	783	Pass
B	Shoulder Pivot Height	437	453	444	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	105	Pass
F	Thigh Clearance	119	135	122	Pass
G	Head Breadth	140	148	143	Pass
H	Head Back from Backline	40	46	42	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	547	Pass
K	Buttock to Knee Length	514	540	528	Pass
L	Popliteal Height	343	369	357	Pass
M	Knee Pivot to floor height	392	409	401	Pass
N	Buttock Popliteal Length	416	442	432	Pass
O	Chest Depth w/o jacket	195	211	200	Pass
P	Foot Length	216	232	223	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	317	Pass
R	Arm Length	249	259	253	Pass
S	Knee Joint to seatback	477	493	487	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	86	Pass
Y	Chest Circumference w/jacket	851	881	878	Pass
Z	Waist Circumference	761	791	775	Pass

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

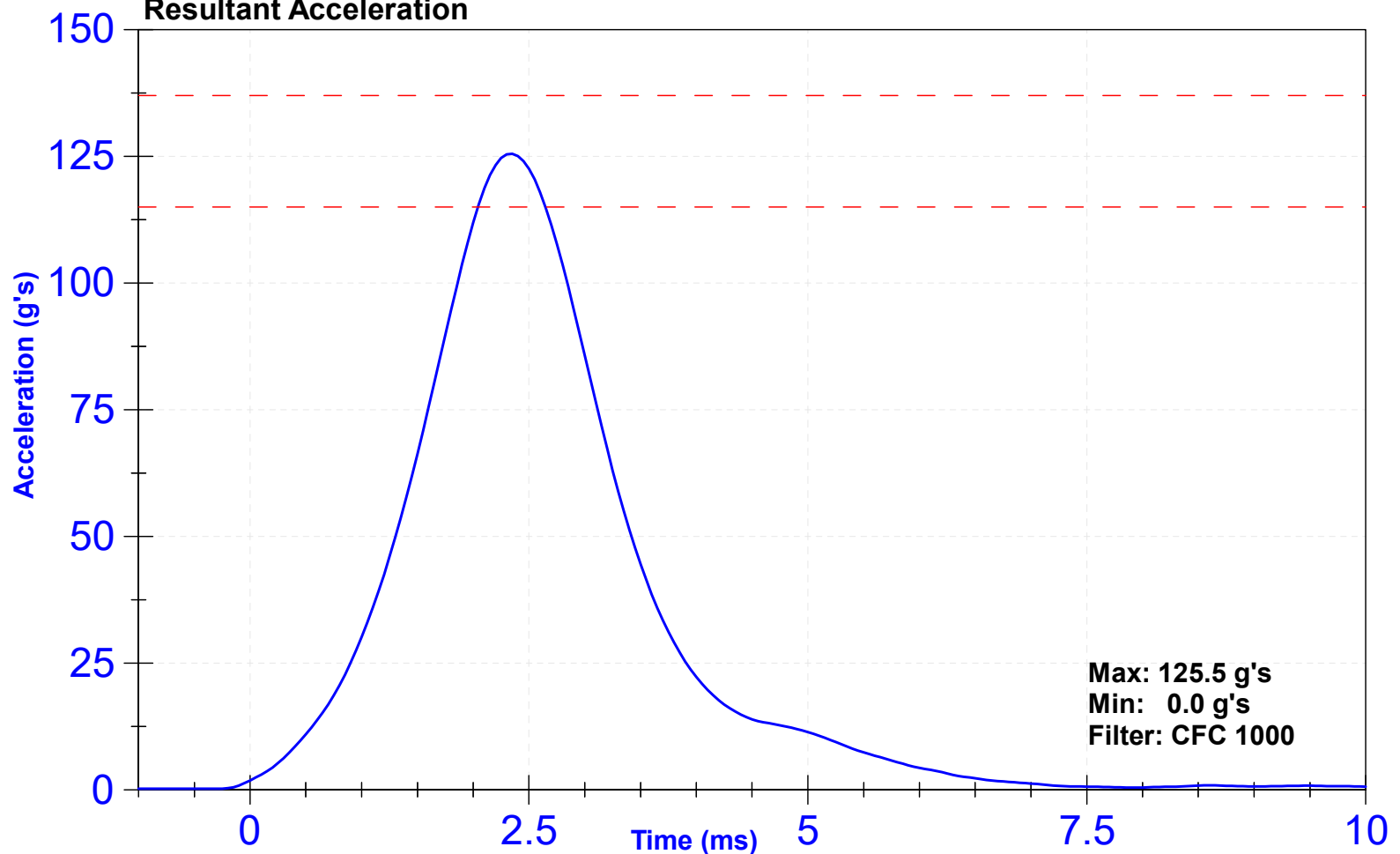
Results

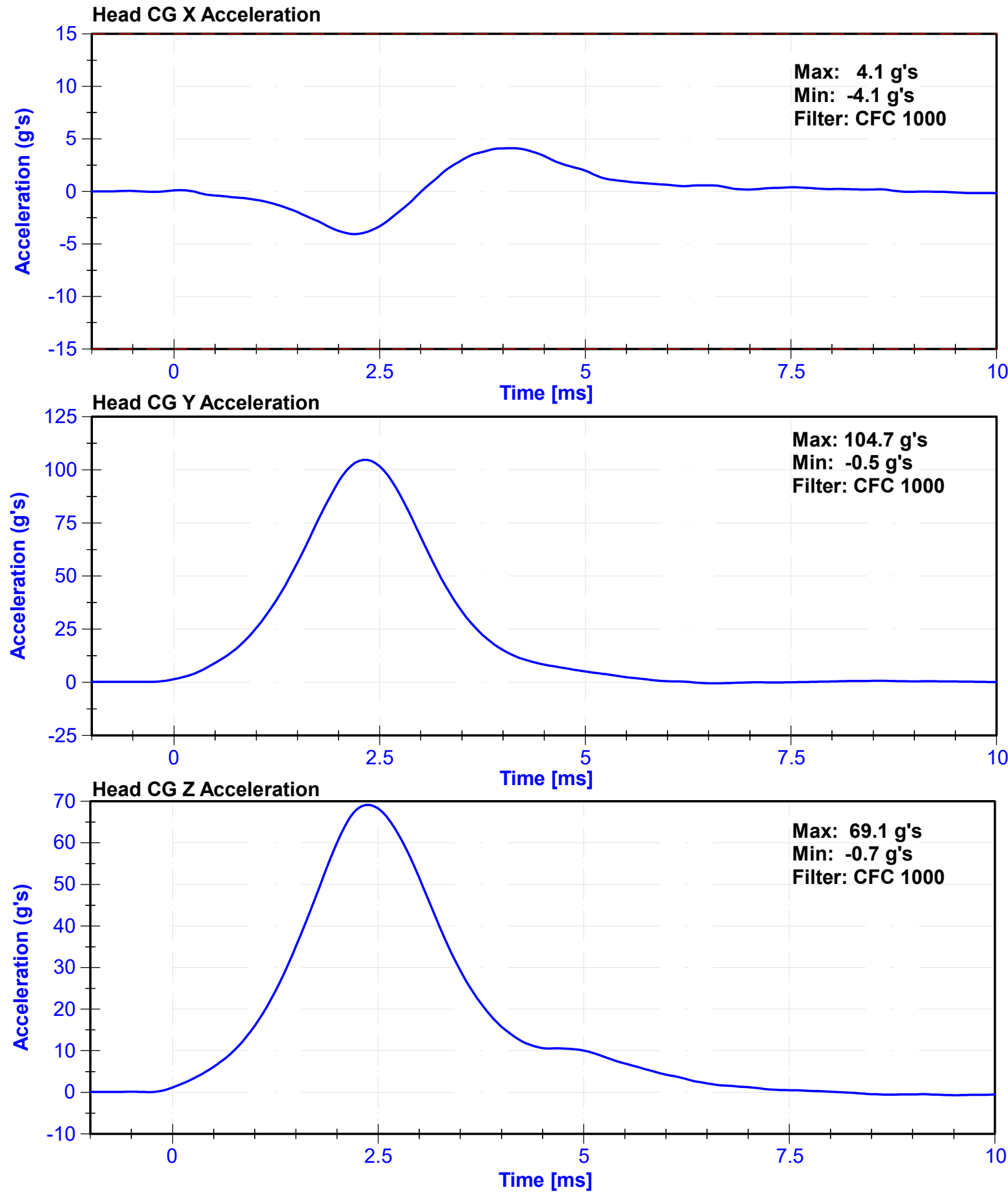
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	13.6	Pass
Resultant Acceleration	115	137	g's	125.5	Pass
Oscillation	0	15	%	0.7	Pass
Fore-Aft Acceleration	-15	15	g's	4.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P59018	10/3/2022	4/1/2023
Y Accelerometer	Endevco	P79189	10/3/2022	4/1/2023
Z Accelerometer	Endevco	P58777	10/3/2022	4/1/2023

Resultant Acceleration





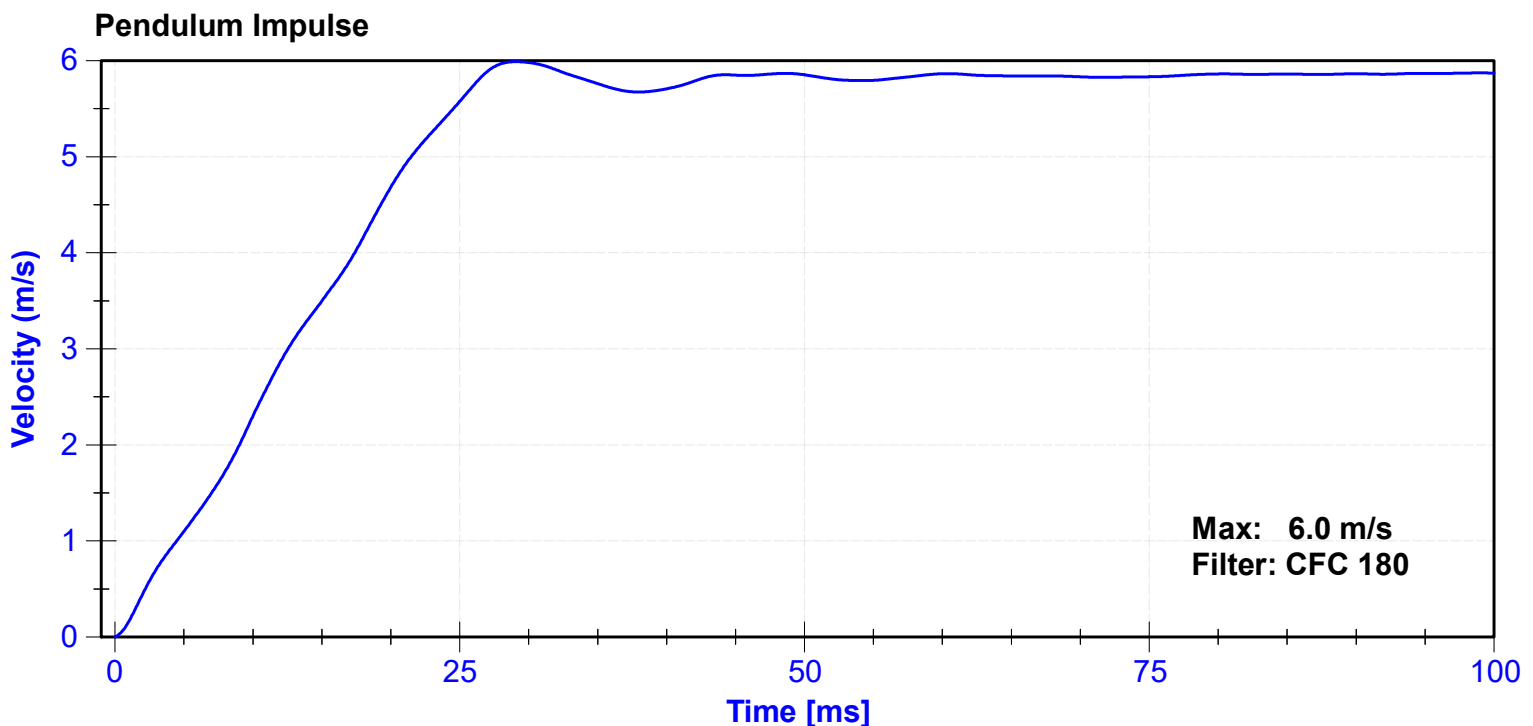
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

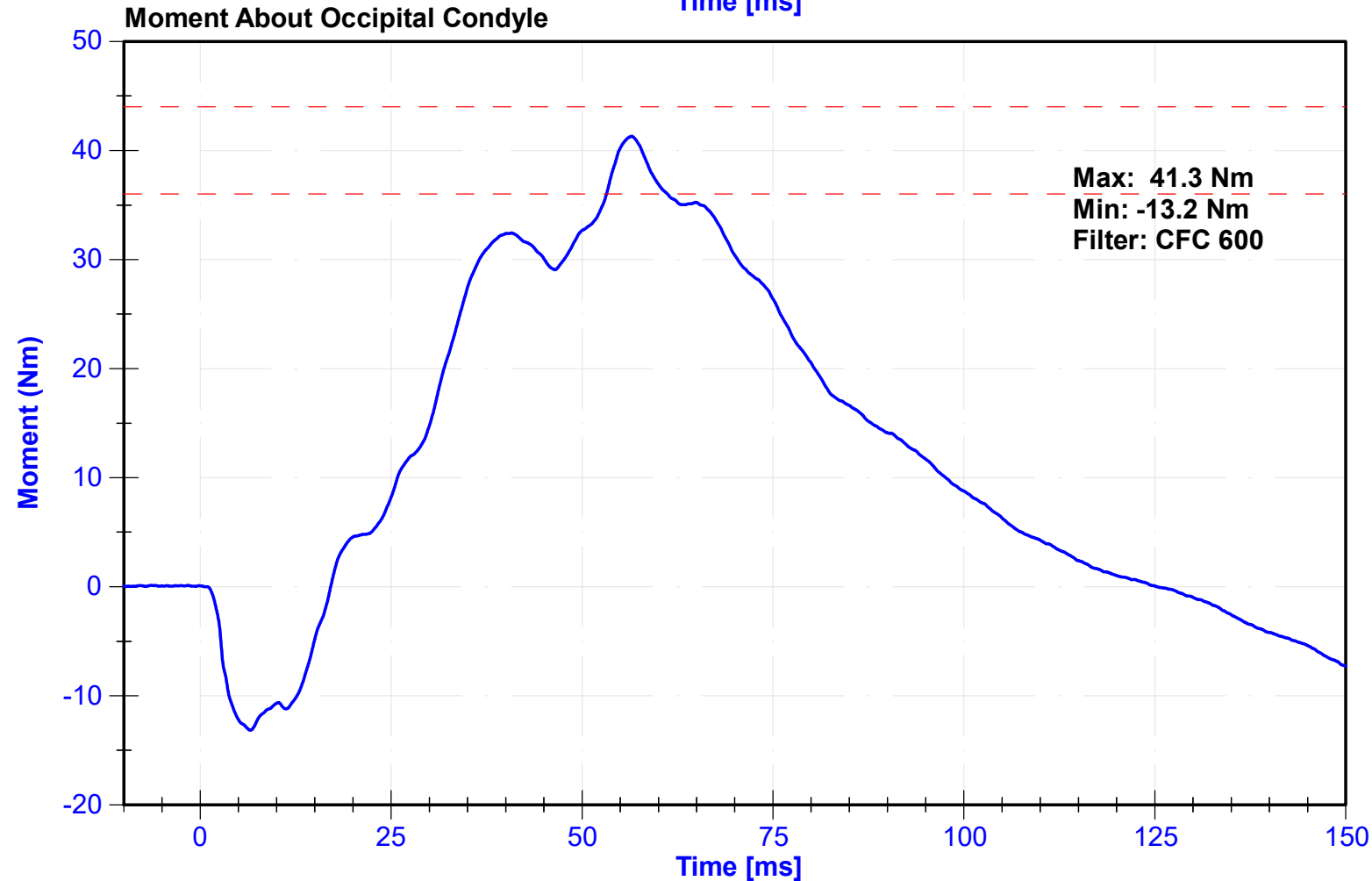
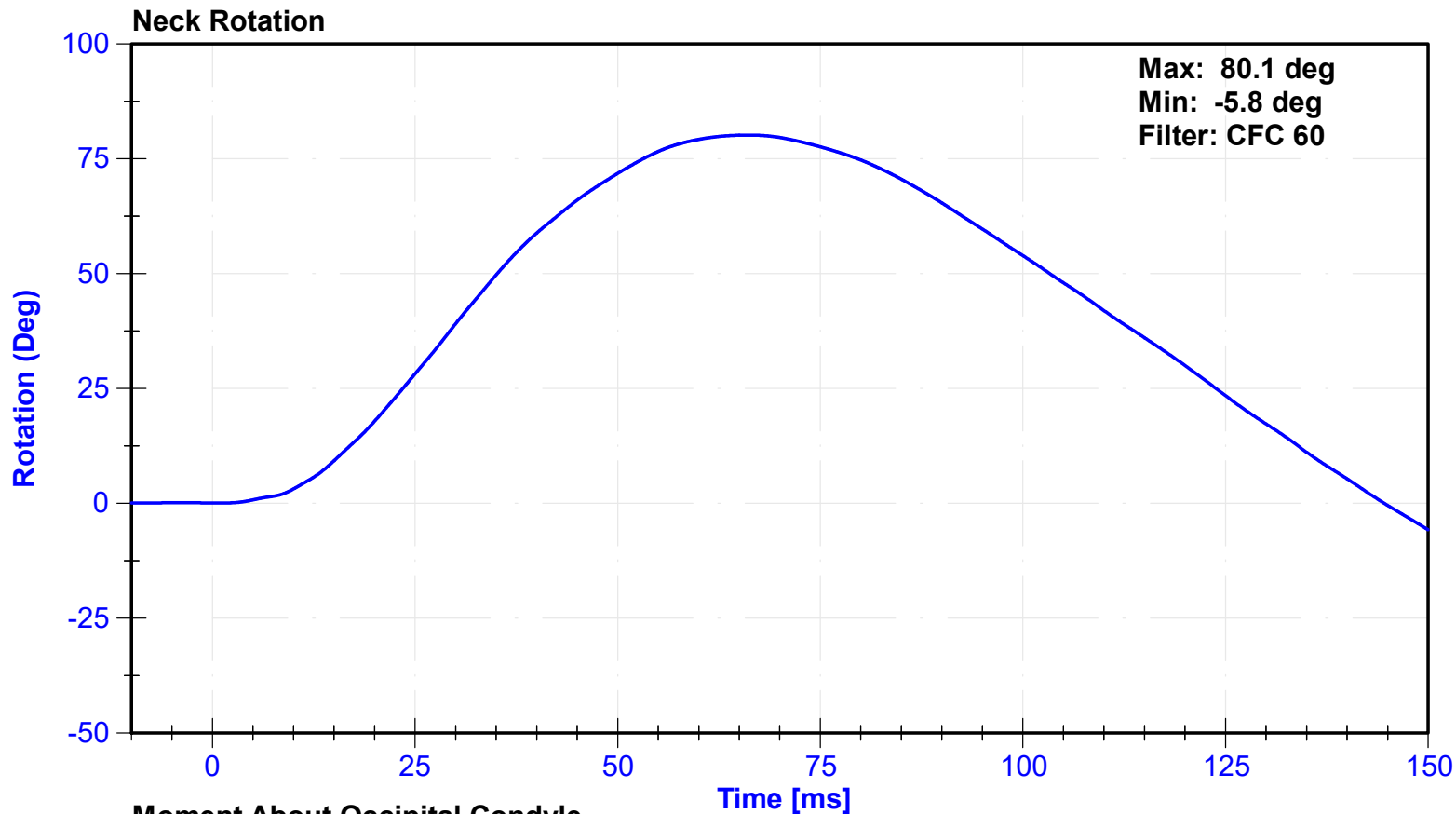
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	19.5	Pass
Velocity	5.51	5.63	m/s	5.593	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.30	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.50	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.68	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.58	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.99	Pass
Neck Rotation	71	81	deg	80.1	Pass
Time at Maximum Rotation	50	70	ms	66.1	Pass
Moment about the OC	36	44	Nm	41.3	Pass
Moment Decay to 0 Nm	102	126	ms	125.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	10/26/2022	10/26/2023
Pendulum Potentiometer	Servo	4961	11/11/2022	11/11/2023
Condyle Potentiometer	Servo	DS185	11/11/2022	11/11/2023
Upper Neck Load Cell	Humanetics	1716A_1872-FY	6/13/2022	6/13/2023





ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

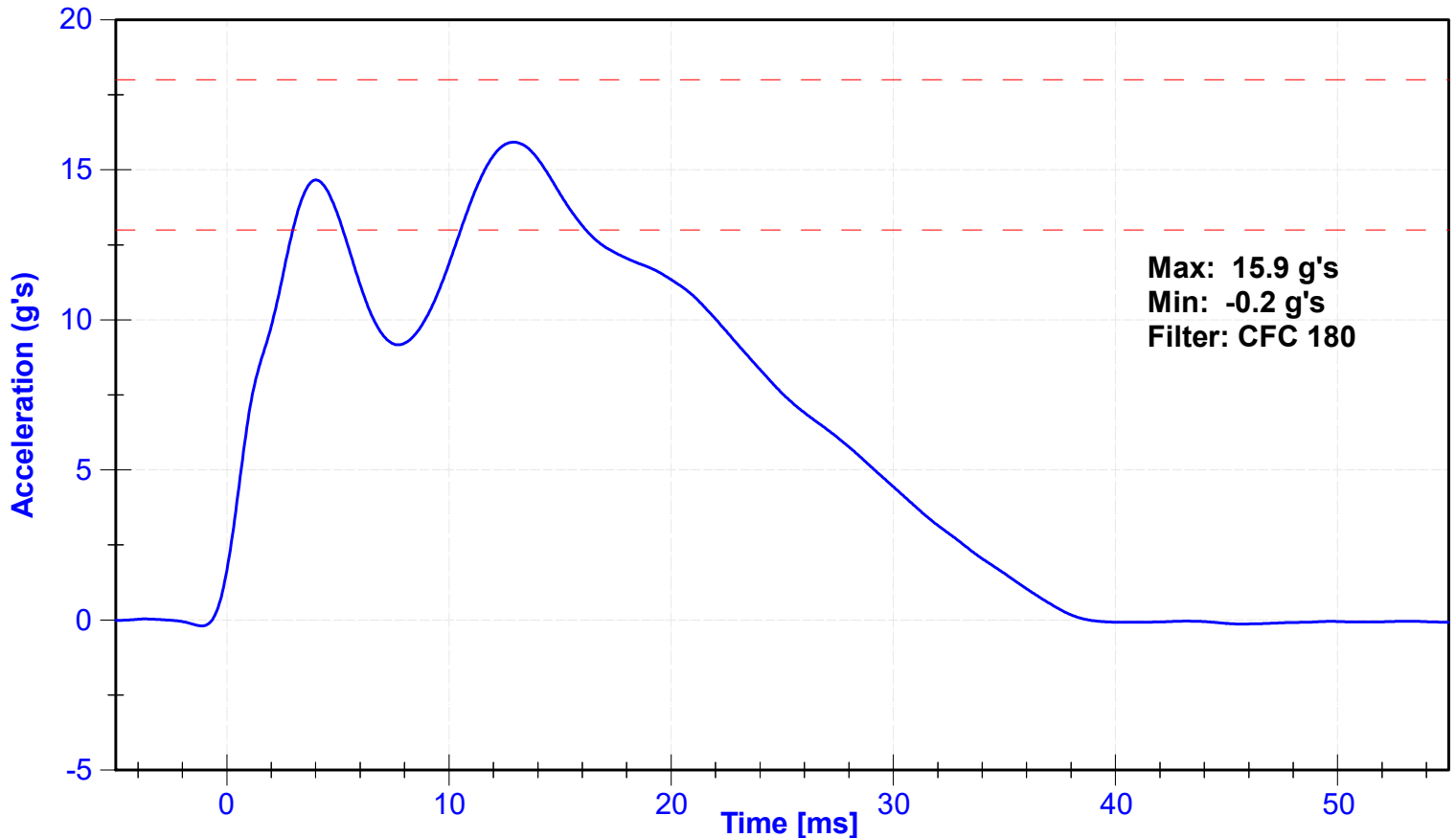
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	19.4	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	13	18	g's	15.9	Pass
Shoulder Deflection	28	37	mm	28.7	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.7	Pass

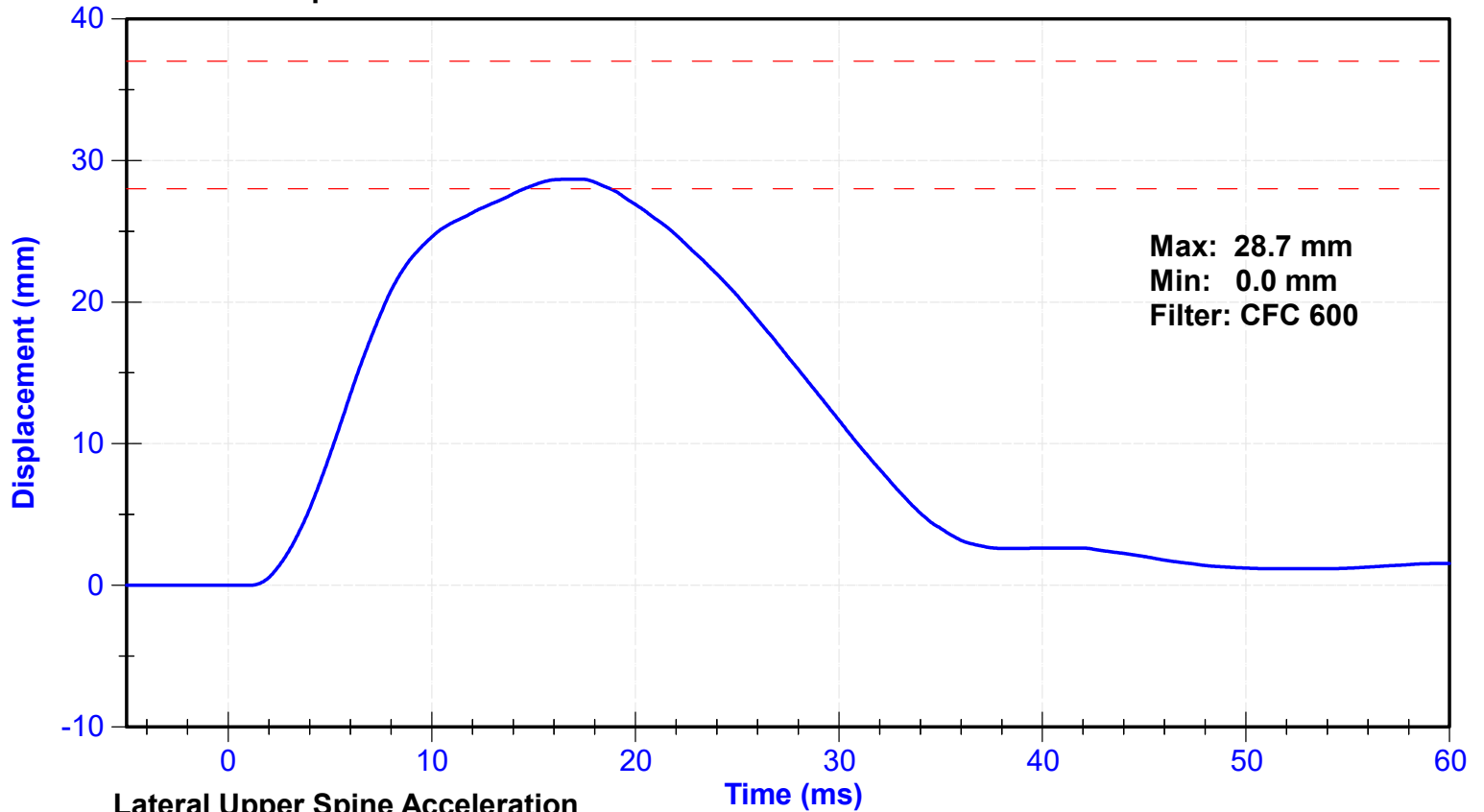
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Shoulder Potentiometer	Servo	053GFE	10/4/2022	4/4/2023
Upper Spine Y Accelerometer	Endevco	T20880	10/3/2022	4/1/2023

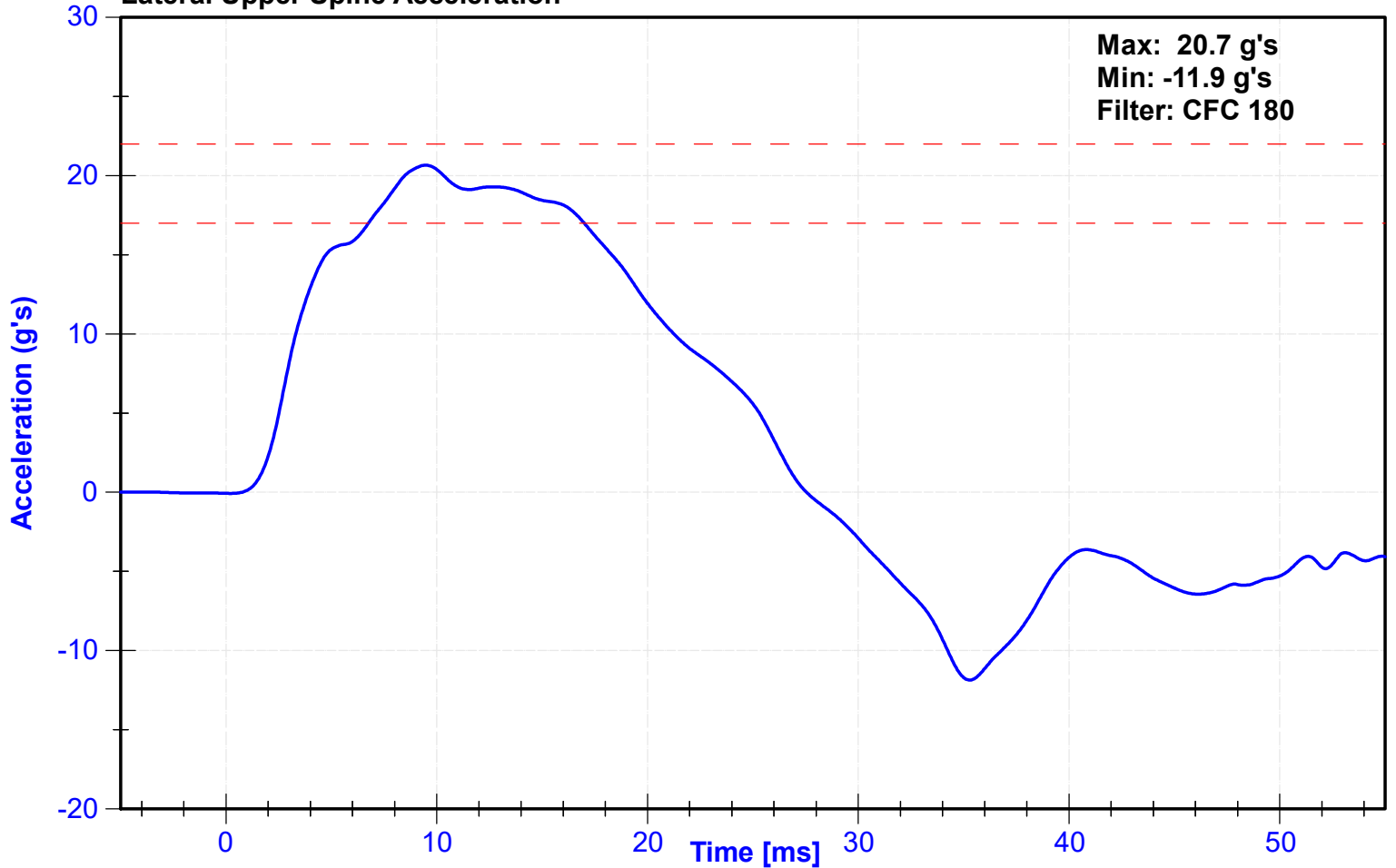
Probe Acceleration



Shoulder Displacement



Lateral Upper Spine Acceleration



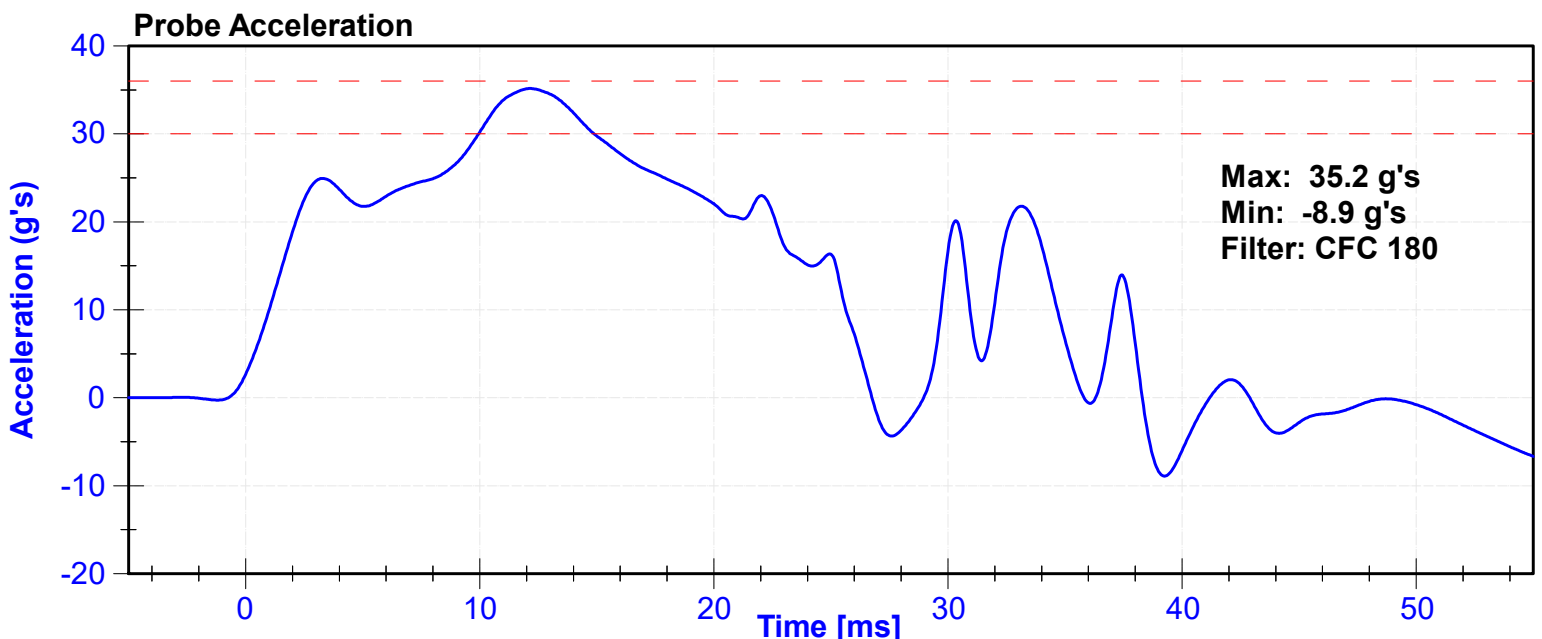
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

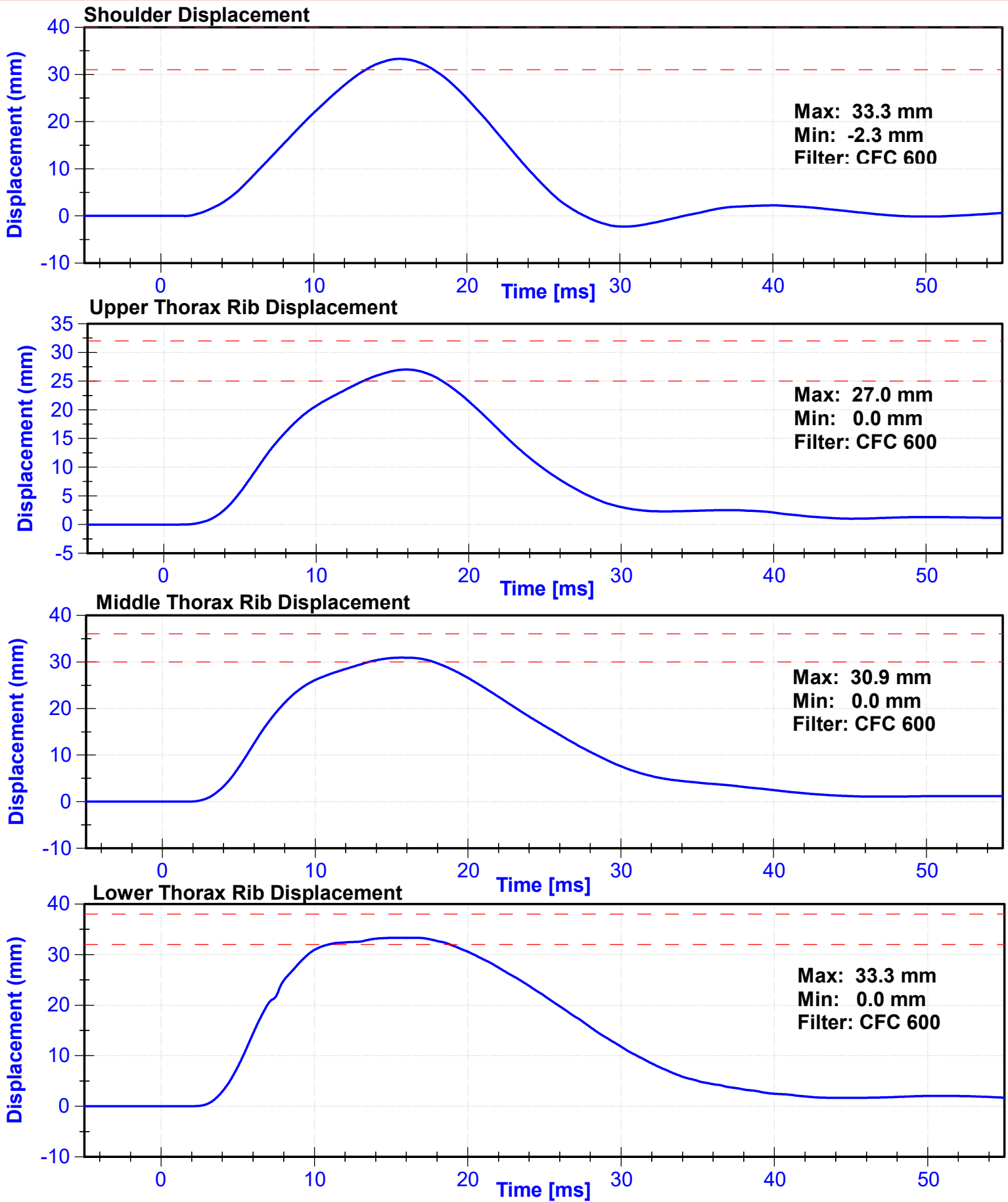
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	19.4	Pass
Velocity	6.6	6.8	m/s	6.75	Pass
Probe Acceleration after 5 ms	30	36	g's	35.2	Pass
Lateral Upper Spine Acceleration	34	43	g's	38.3	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.8	Pass
Shoulder Deflection	31	40	mm	33.3	Pass
Upper Thorax Rib Deflection	25	32	mm	27.0	Pass
Mid Thorax Rib Deflection	30	36	mm	30.9	Pass
Lower Thorax Rib Deflection	32	38	mm	33.3	Pass

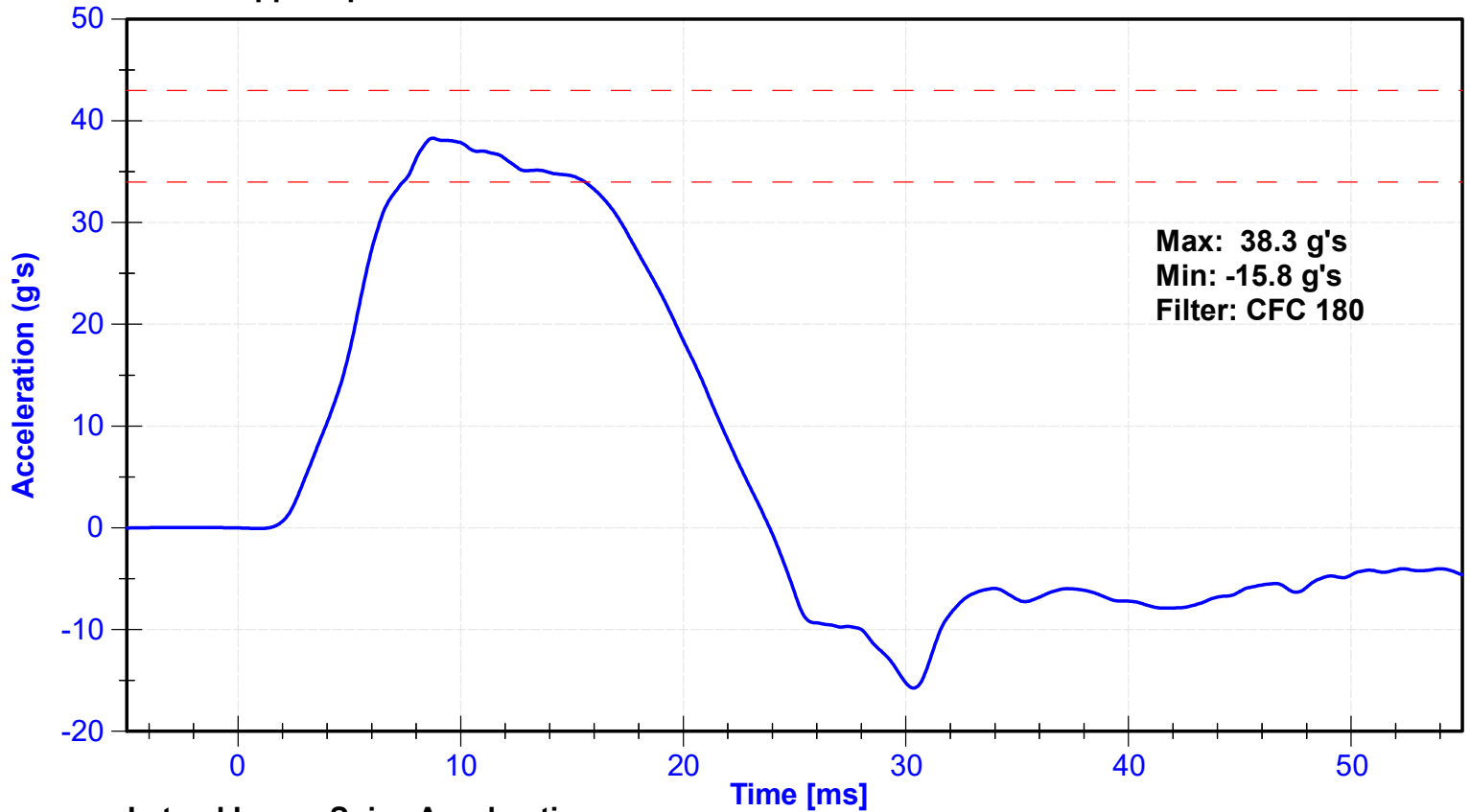
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Upper Spine T1 Y Accelerometer	Endevco	T20880	10/3/2022	4/1/2023
Upper Spine T12 Y Accelerometer	Endevco	P52071	10/3/2022	4/1/2023
Shoulder Potentiometer	Servo	053GFE	10/4/2022	4/4/2023
Upper Thorax Rib Potentiometer	Servo	2316GFE	10/4/2022	4/4/2023
Middle Thorax Rib Potentiometer	Servo	040GFE	10/4/2022	4/4/2023
Lower Thorax Rib Potentiometer	Servo	1156GFE	10/4/2022	4/4/2023

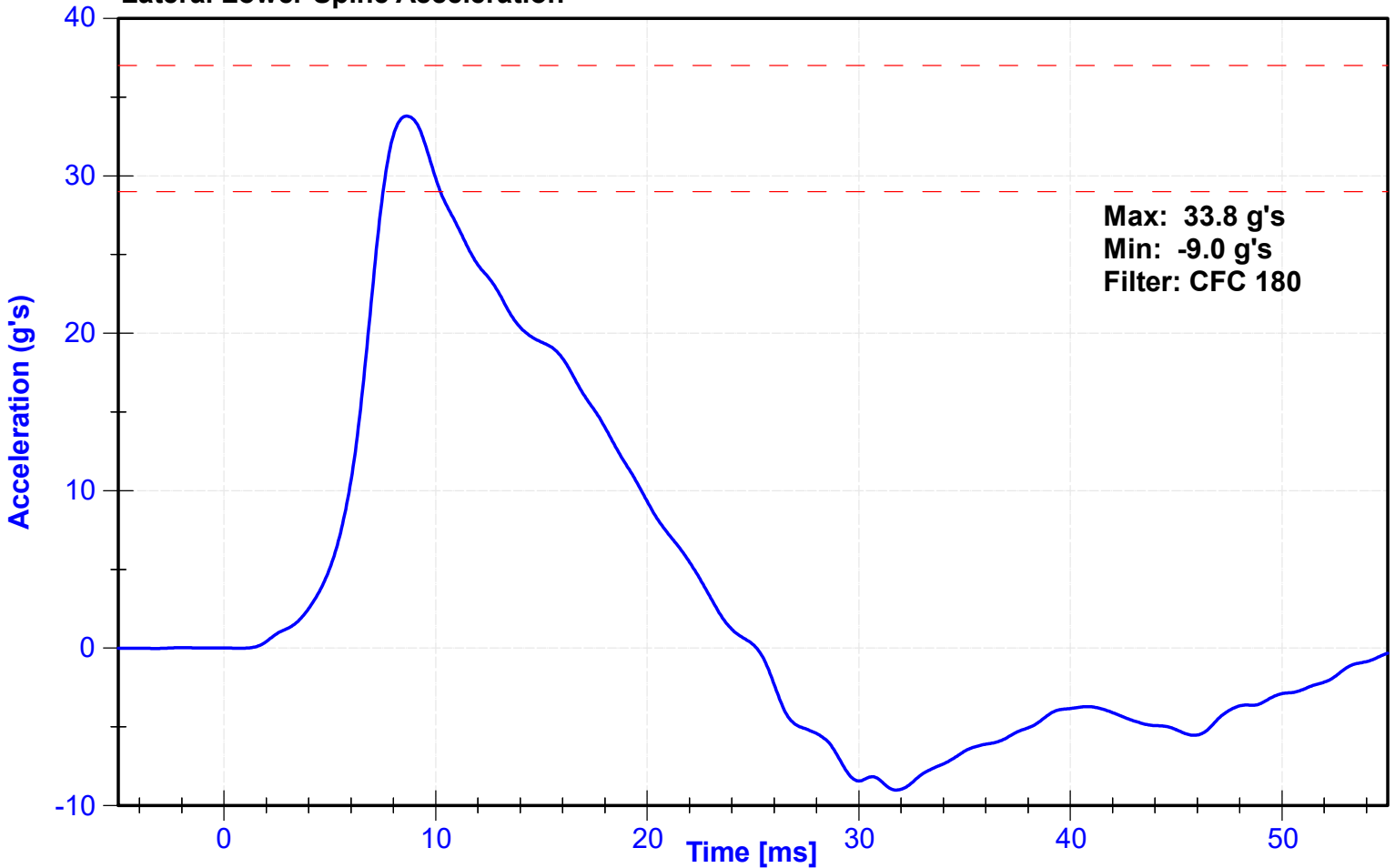




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



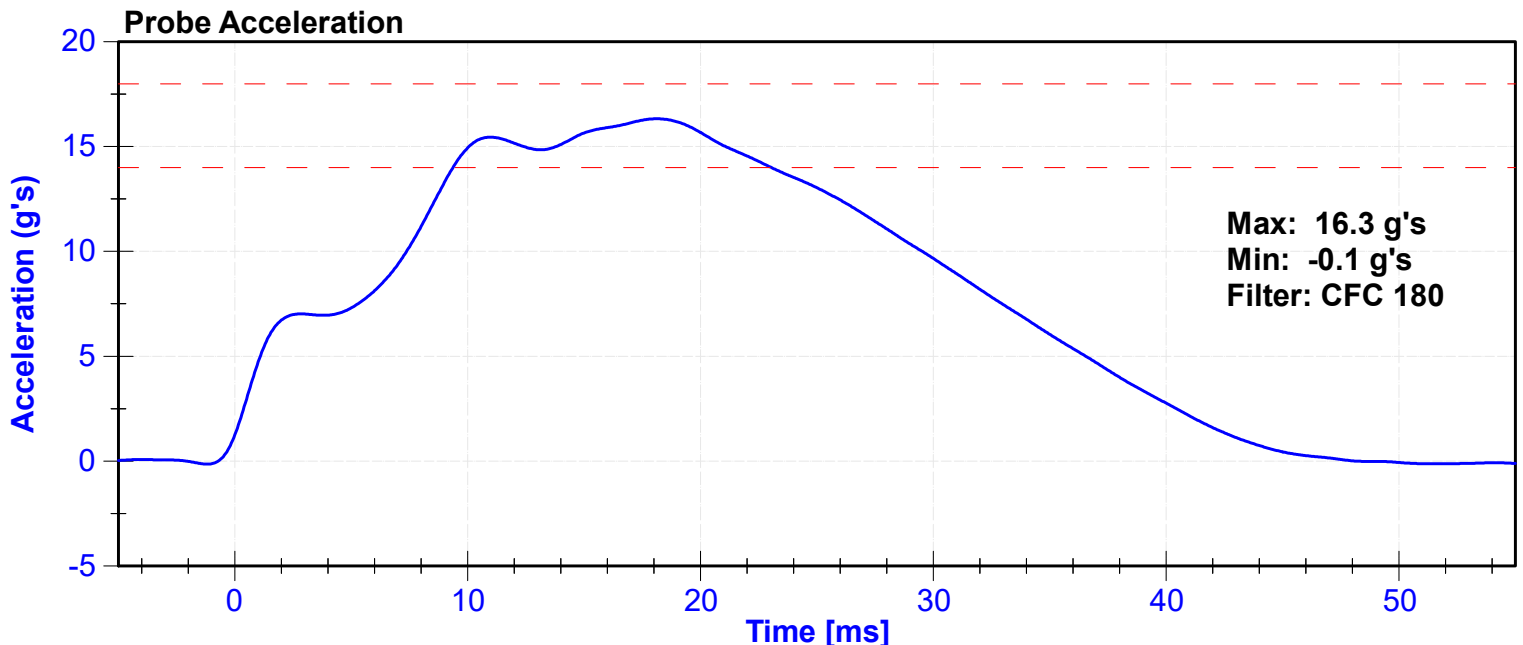
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

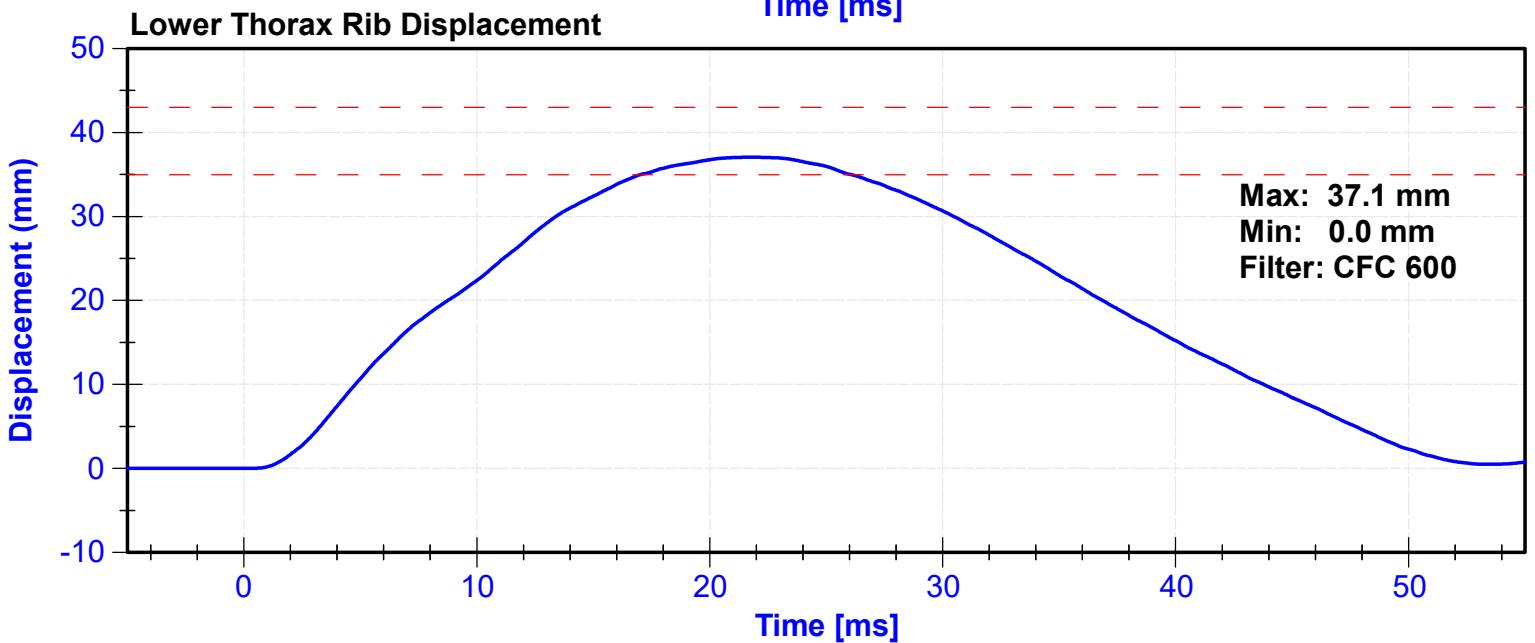
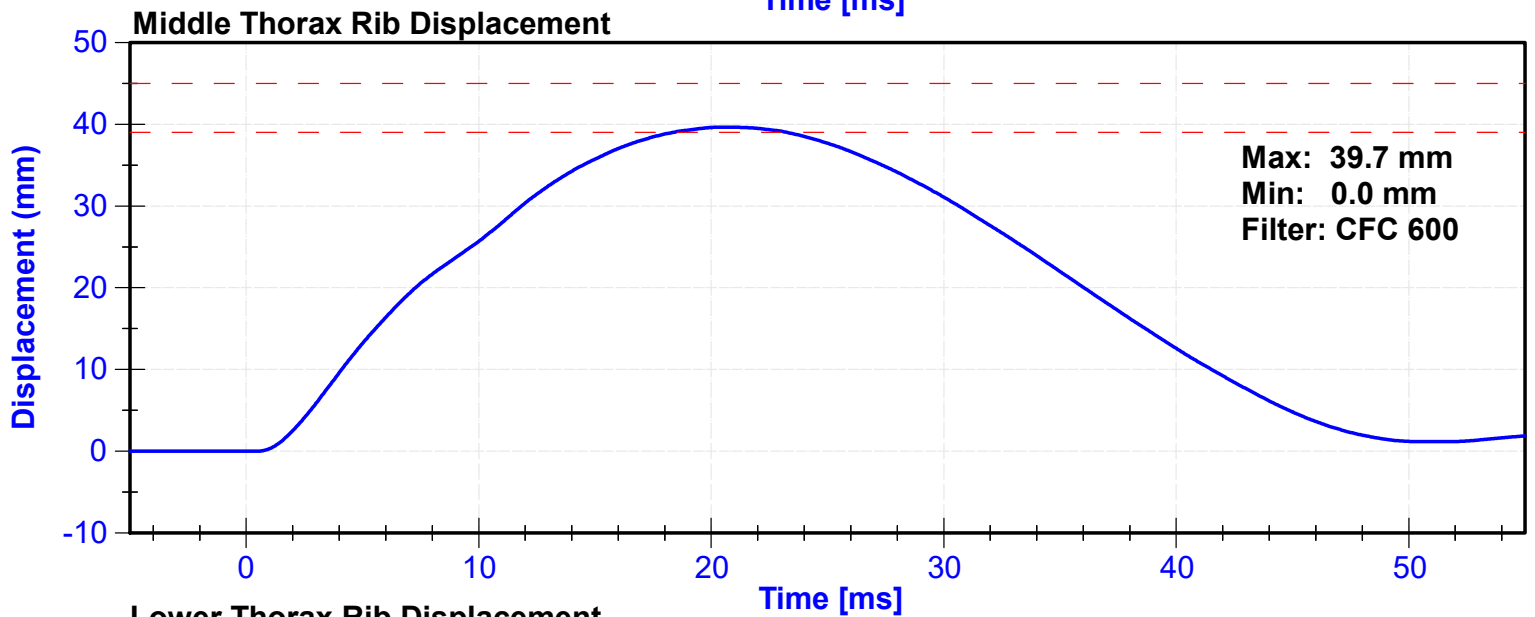
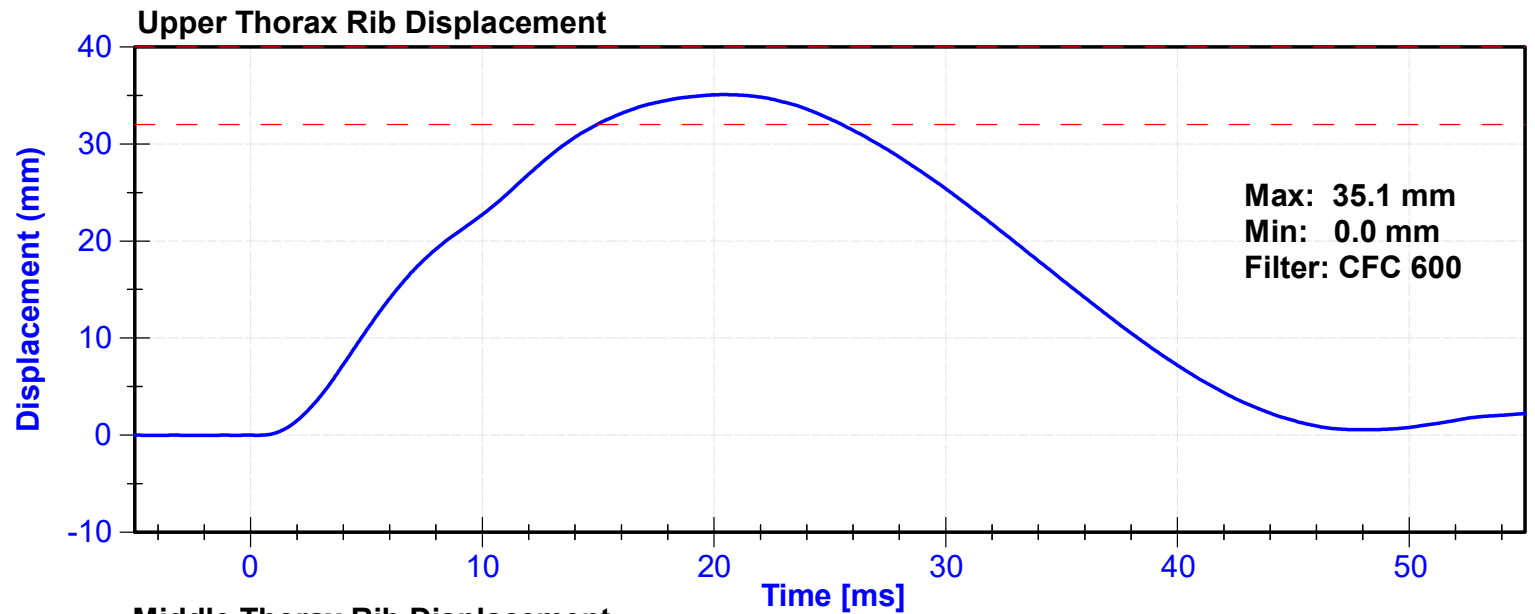
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	19.4	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	14	18	g's	16.3	Pass
Lateral Upper Spine Acceleration	13	17	g's	16.0	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.8	Pass
Upper Thorax Rib Deflection	32	40	mm	35.1	Pass
Middle Thorax Rib Deflection	39	45	mm	39.7	Pass
Lower Thorax Rib Deflection	35	43	mm	37.1	Pass

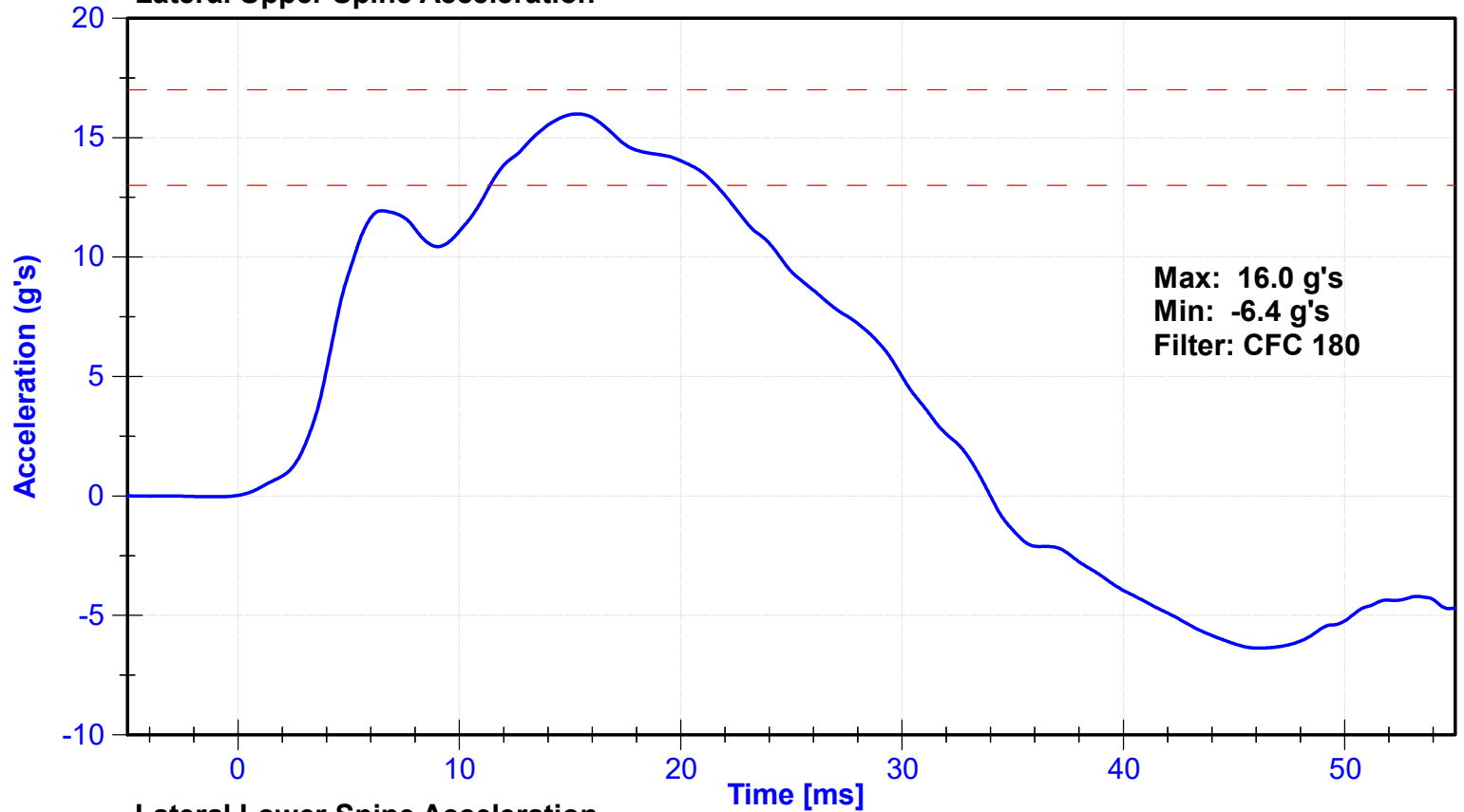
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Upper Spine Y Accelerometer	Endevco	T20880	10/3/2022	4/1/2023
Lower Spine Y Accelerometer	Endevco	P52071	10/3/2022	4/1/2023
Upper Thorax Rib Potentiometer	Servo	2316GFE	10/4/2022	4/4/2023
Middle Thorax Rib Potentiometer	Servo	040GFE	10/4/2022	4/4/2023
Lower Thorax Rib Potentiometer	Servo	1156GFE	10/4/2022	4/4/2023

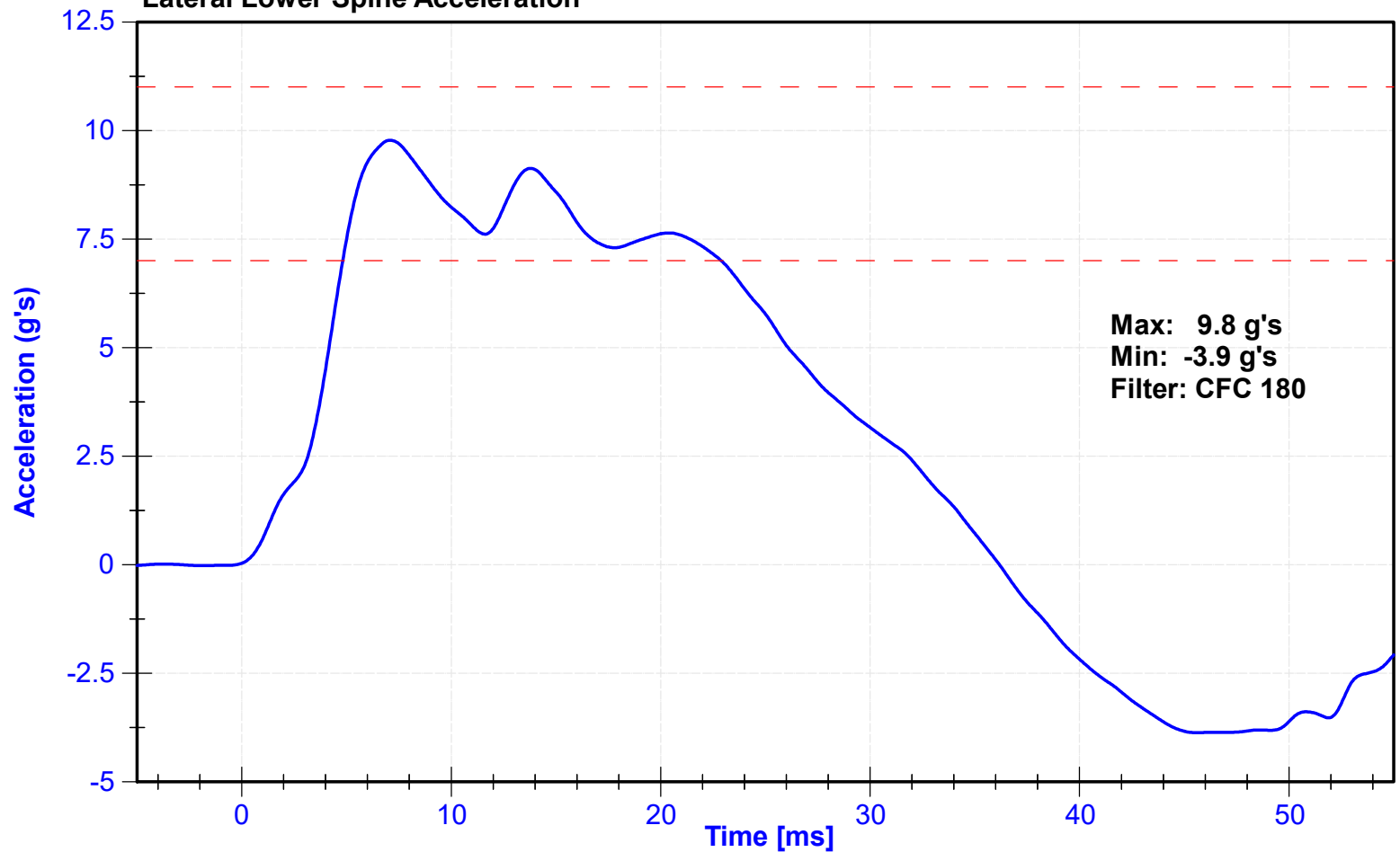




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

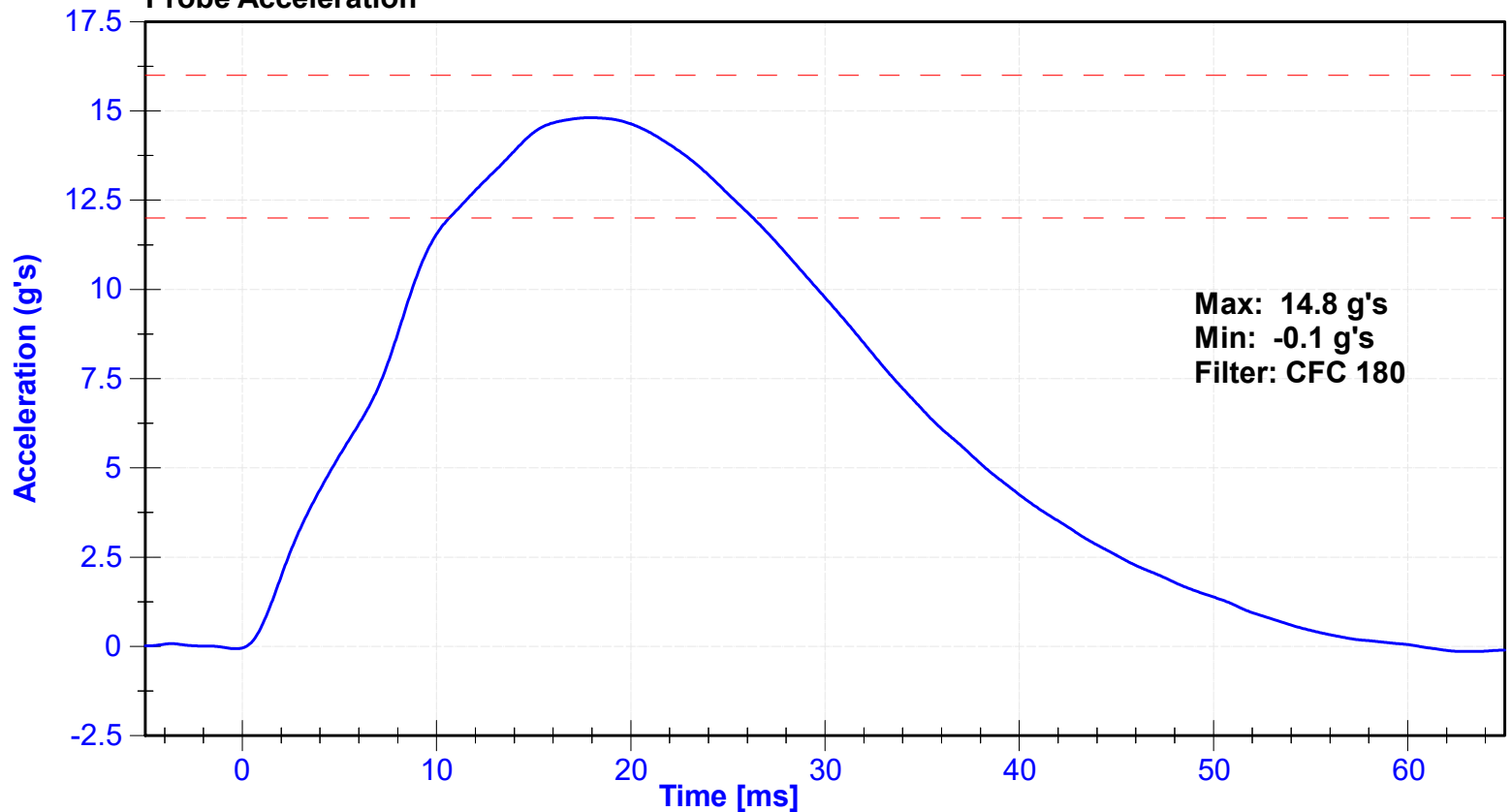
Results

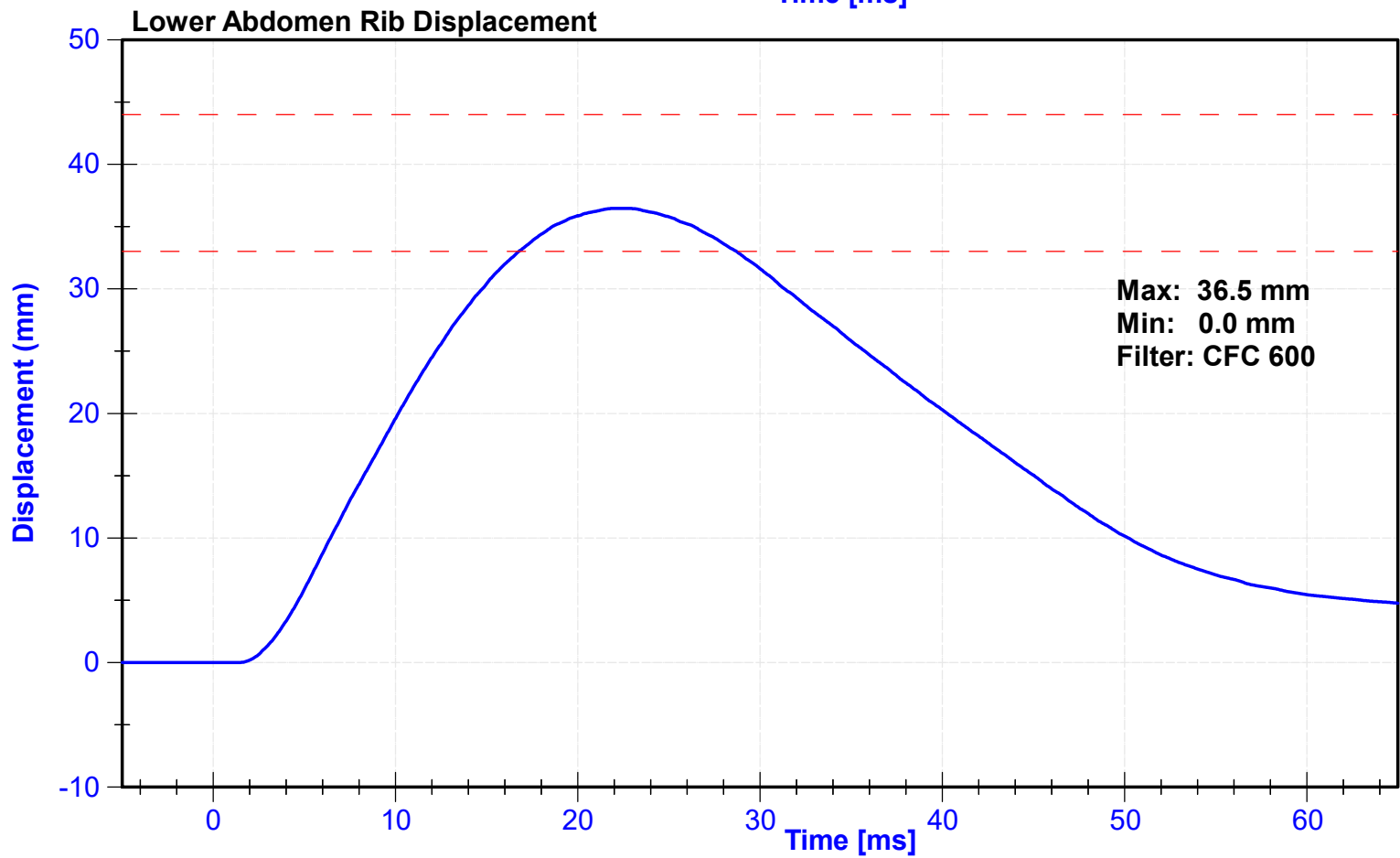
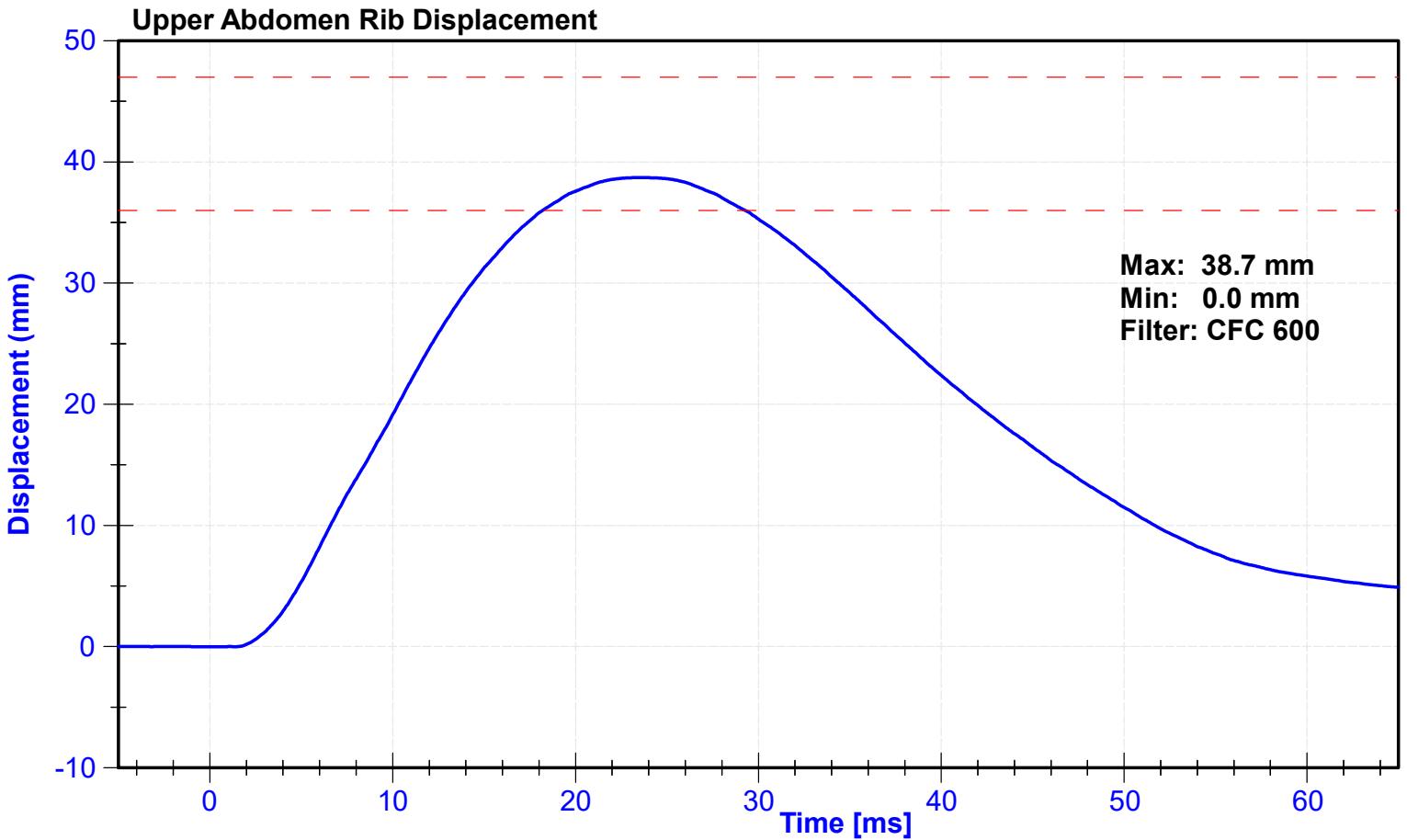
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	19.4	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	12	16	g's	14.8	Pass
Lateral Lower Spine Acceleration	9	14	g's	12.5	Pass
Upper Abdomen Rib Deflection	36	47	mm	38.7	Pass
Lower Abdomen Rib Deflection	33	44	mm	36.5	Pass

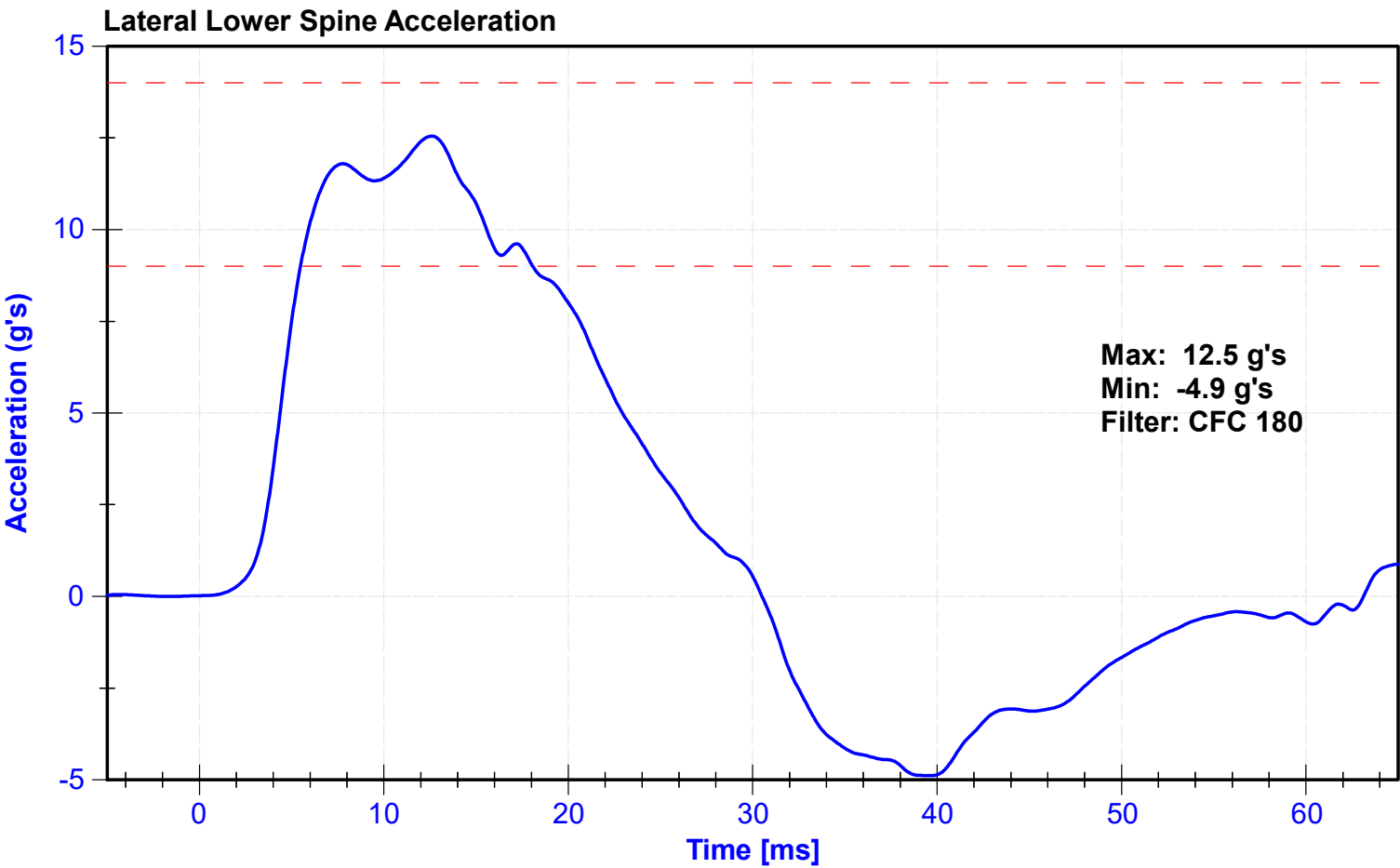
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Lower Spine Y Accelerometer	Endevco	P52071	10/3/2022	4/1/2023
Upper Abdomen Rib Potentiometer	Servo	307GFE	10/4/2022	4/4/2023
Lower Abdomen Rib Potentiometer	Servo	308GFE	10/4/2022	4/4/2023

Probe Acceleration







ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

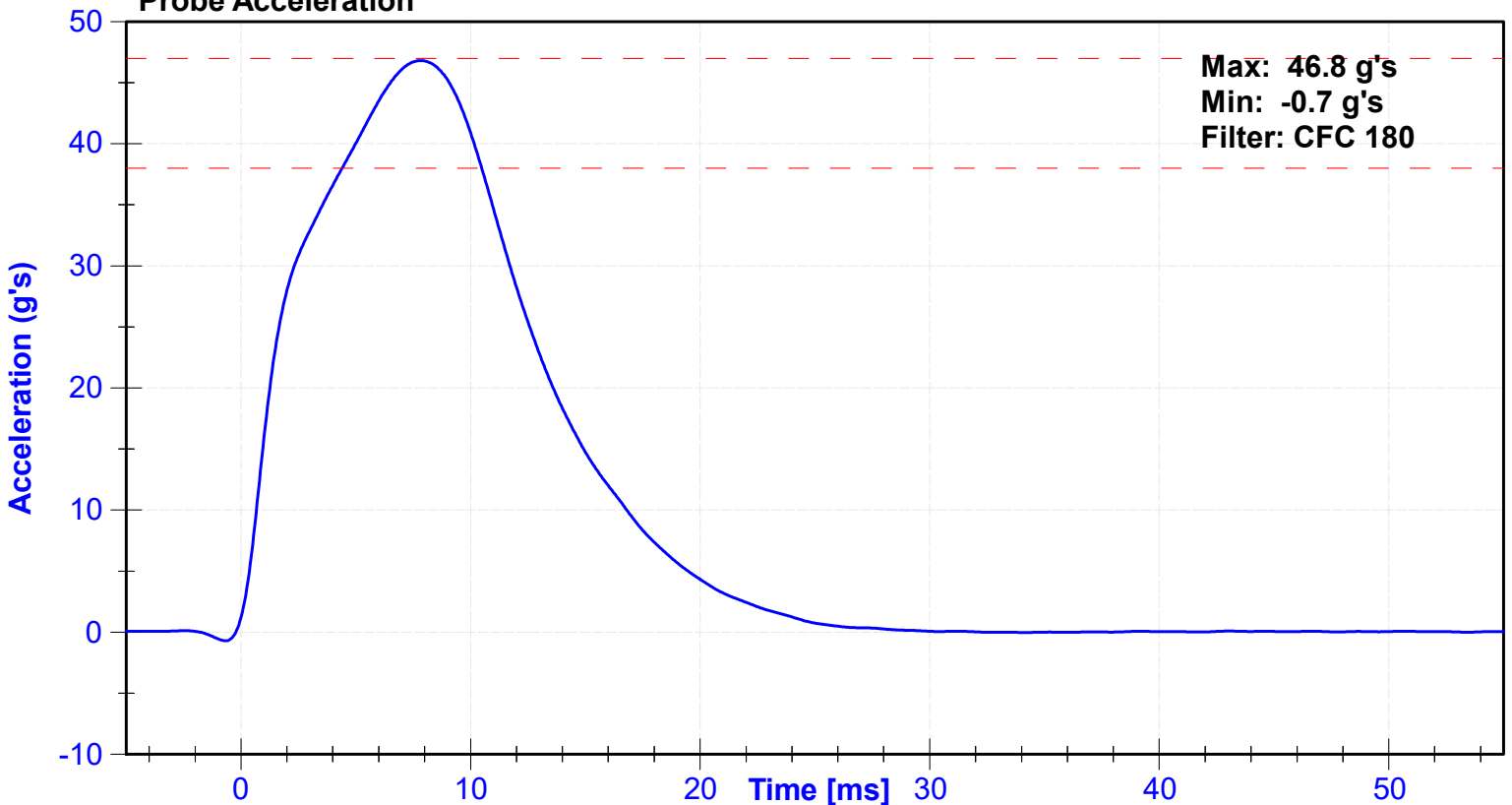
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	19.4	Pass
Velocity	6.6	6.8	m/s	6.75	Pass
Probe Acceleration	38	47	g's	46.8	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.5	Pass
Acetabulum Force	3600	4300	N	3962.7	Pass

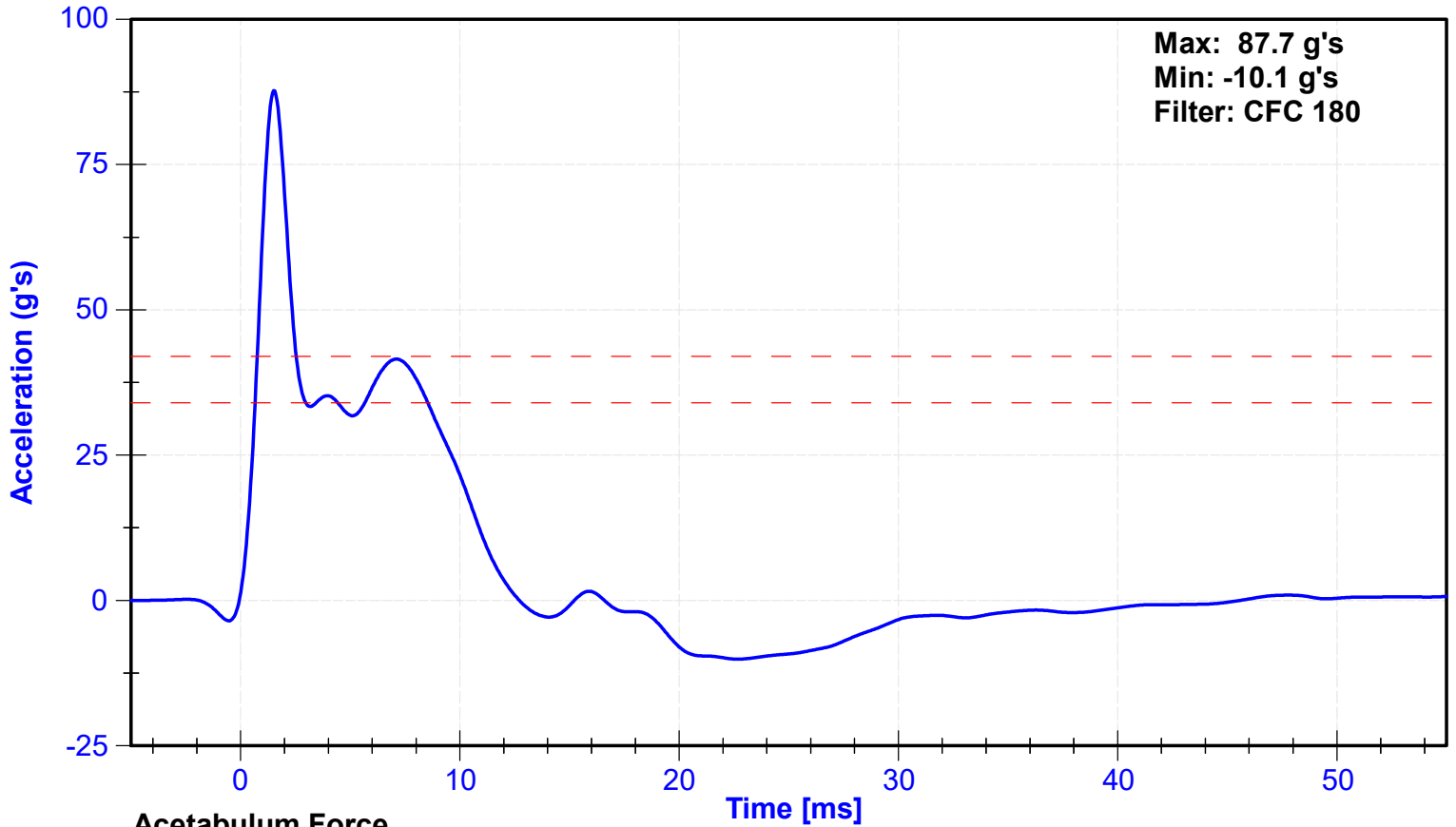
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Pelvis Y Accelerometer	Endevco	P51731	10/3/2022	4/1/2023
Acetabulum Load Cell	Denton	267-FY	8/11/2022	8/11/2023
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A

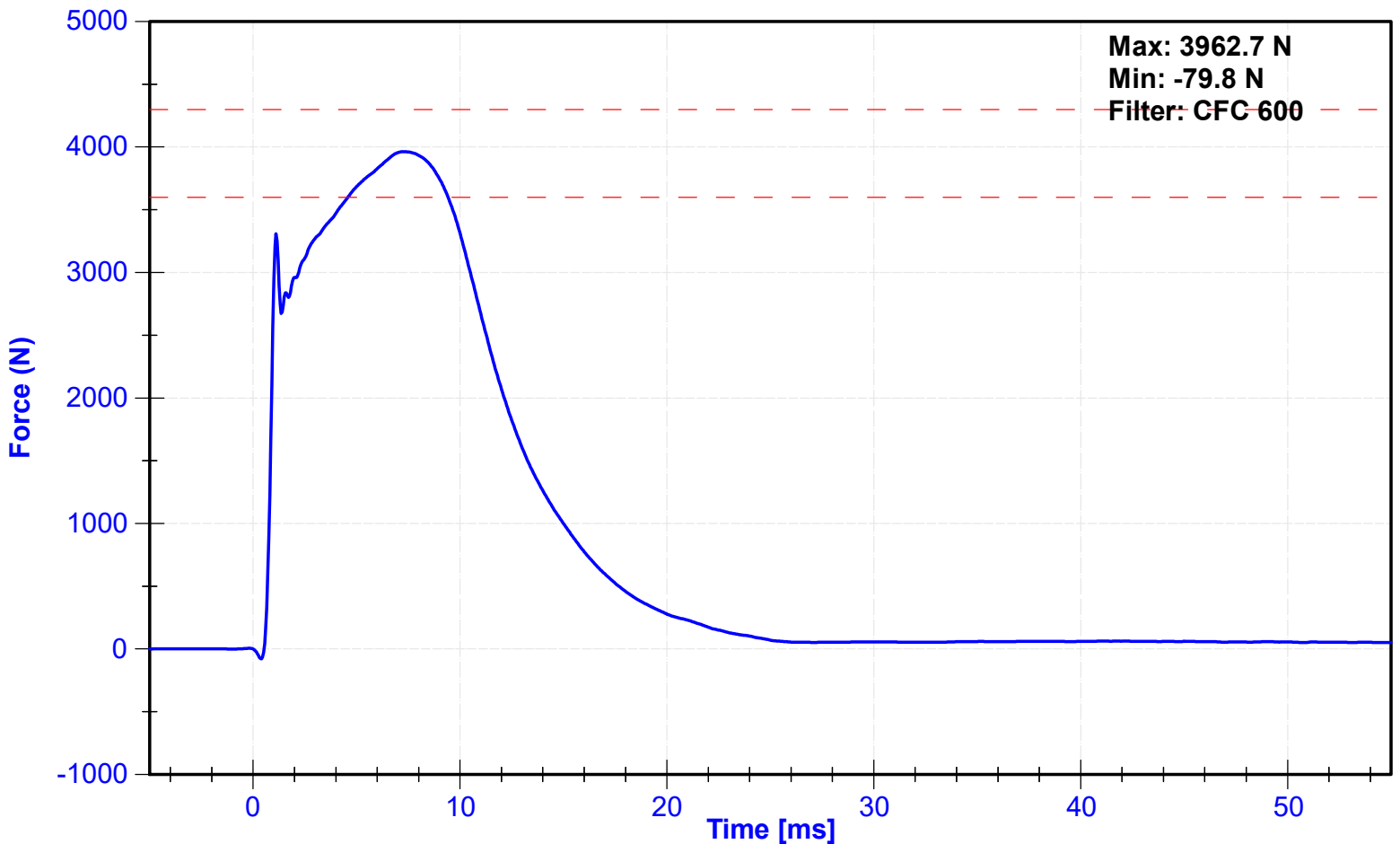
Probe Acceleration



Lateral Pelvis Acceleration



Acetabulum Force





SID-IIs Pelvis Plug Certification Test

Plug S/N 15362

Test Number 19709

Report Number 19761

Test Date 7/20/2021 12:53:15 PM

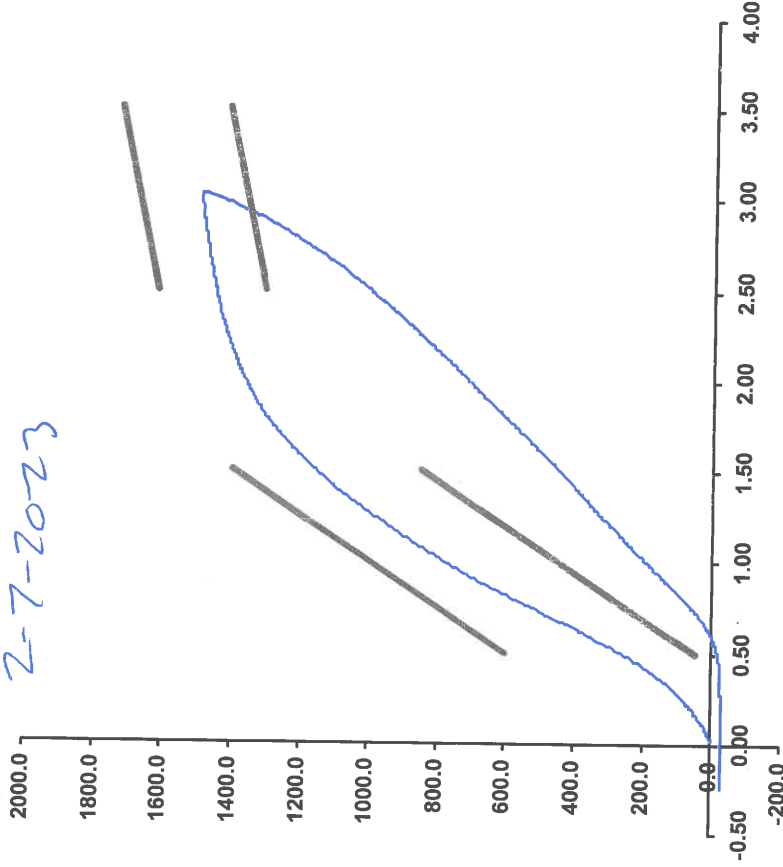
Test Results		Spec Min	Spec Max
Force @ 0.5 mm (N)	268	50	600
Force @ 1.5 mm (N)	1,159	850	1,400
Force @ 2.5 mm (N)	1,454	1,306	1,618
Force @ 3.0 mm (N)	1,498	1,361	1,673

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)

CRASH 300
2-7-2023



Operator

Part Number 180-4450

Template No 107 20-Jul-21

SACO Research

By: *DC* Date: *7/20/2021*

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



~~CLASH~~ 300 NON-IMPACT
2/7/2023

SID-IIs Pelvis Plug Certification Test

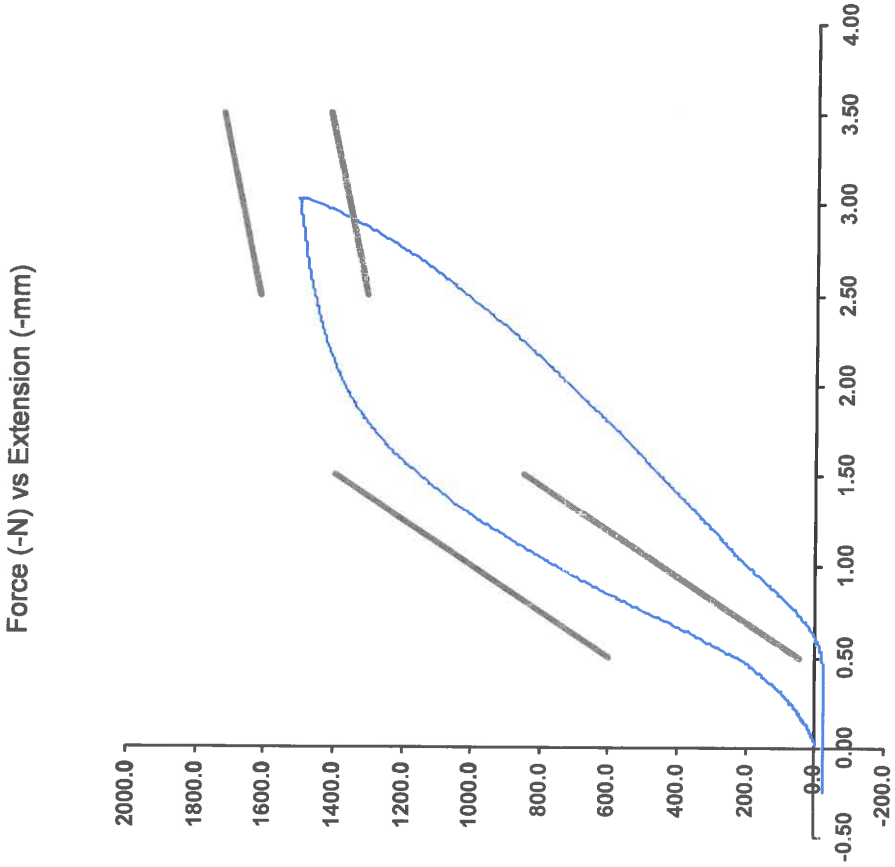
Plug S/N 15448
Test Number 20109
Report Number 20163

Test Date 9/9/2021 10:47:00 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
Preload Value (-N) 22.24
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator	Part Number 180-4450
Template No 107	09-Sep-21
SACO Research	

By: DC Date: 9/9/2021
SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



CERT 300 2/7/2023

SID-Its Pelvis Plug Certification Test

Plug S/N 15204

Test Number 17920

Report Number 17969

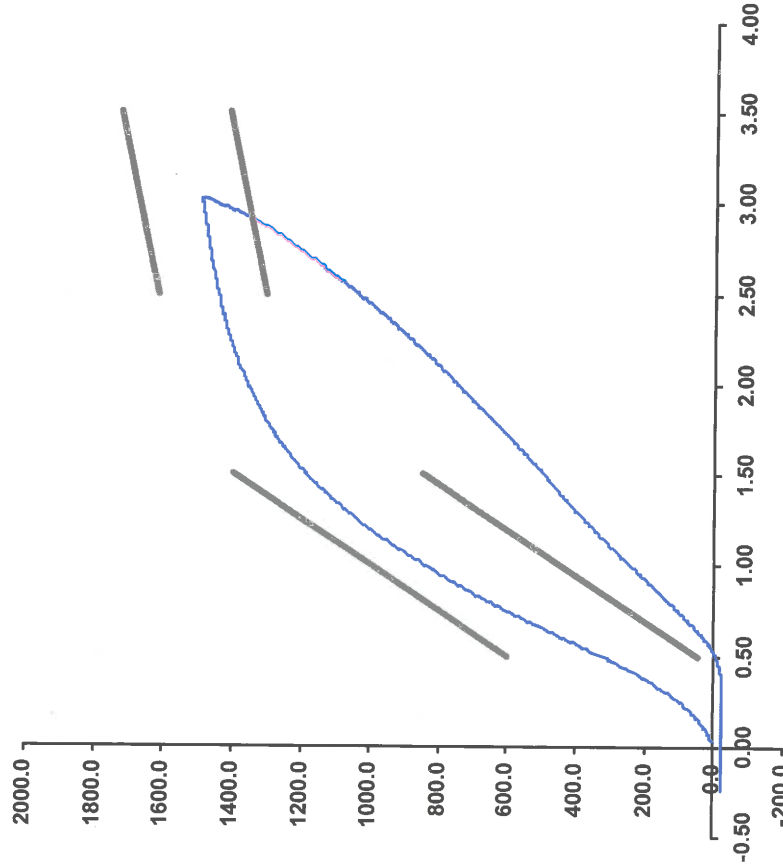
Test Date 3/8/2021 1:34:19 PM

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	327	600
Force @ 1.5 mm (N)	1,183	1,400
Force @ 2.5 mm (N)	1,446	1,618
Force @ 3.0 mm (N)	1,495	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	08-Mar-21
SACO Research	

By : DC Date : 3/8/2021
SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

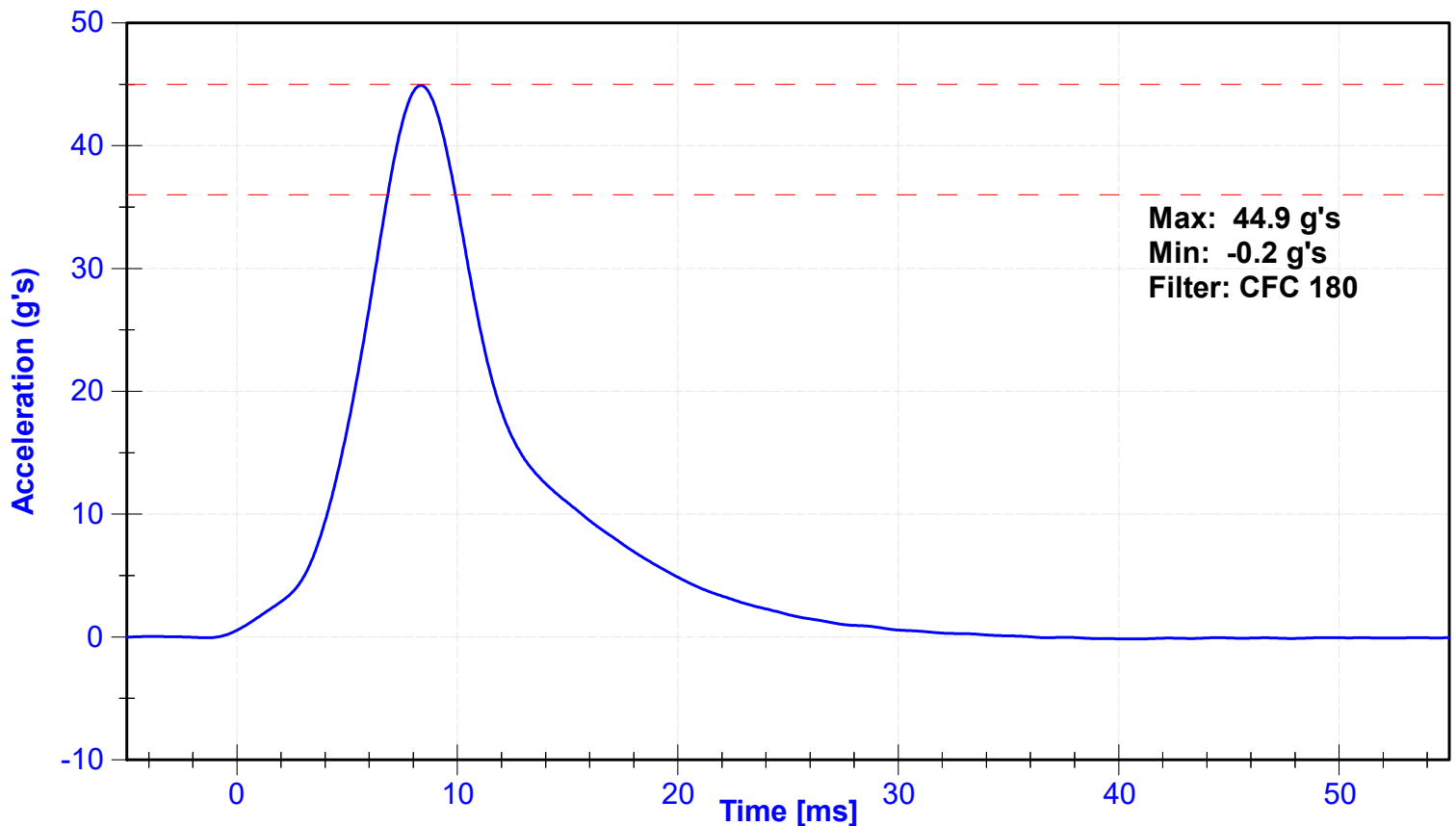
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	19.4	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	36	45	g's	44.9	Pass
Lateral Pelvis Acceleration	28	39	g's	38.5	Pass
Iliac Force	4100	5100	N	5047.7	Pass

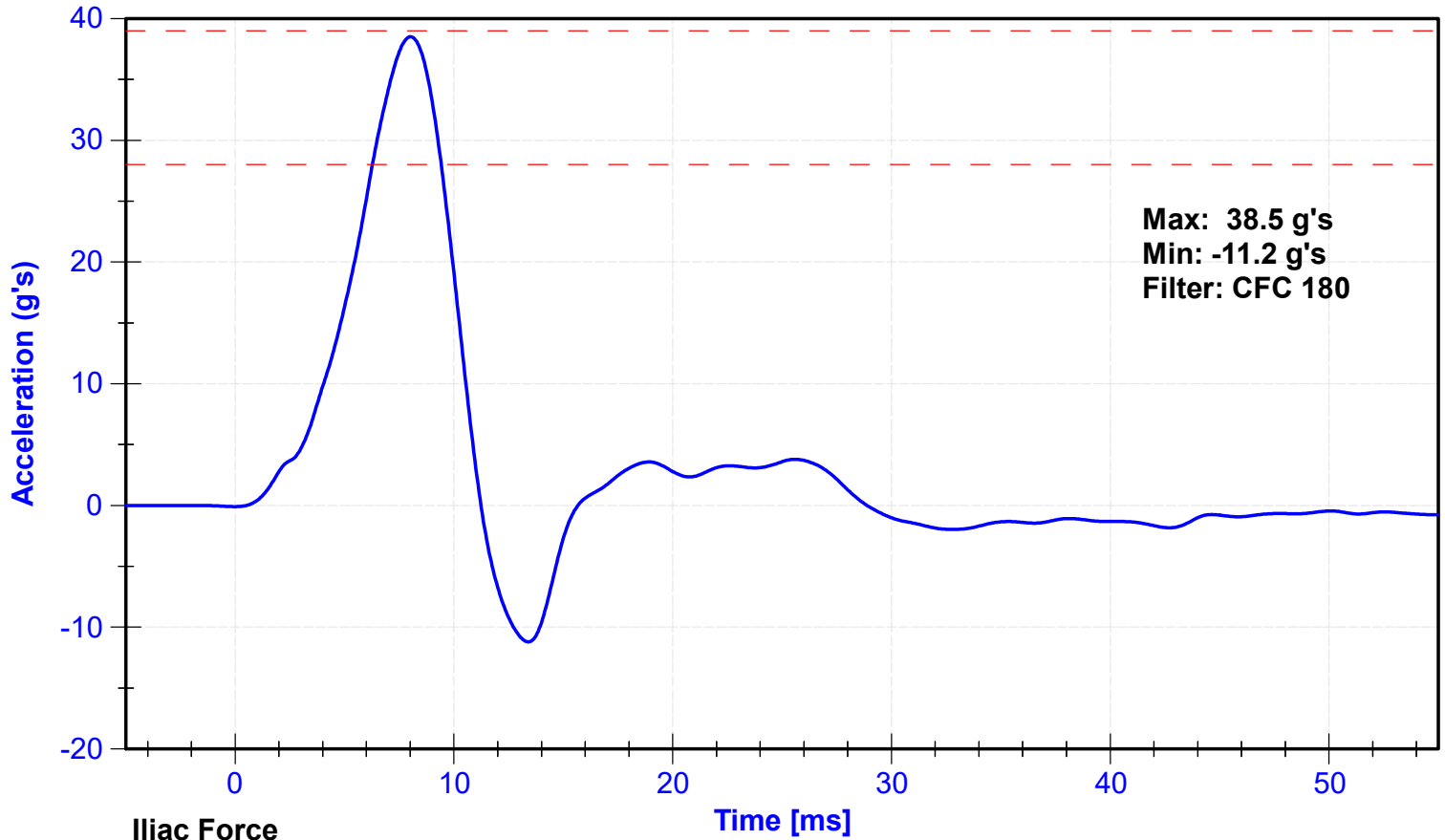
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Pelvis Y Accelerometer	Endevco	P51731	10/3/2022	4/1/2023
Iliac Load Cell	Denton	280-FY	8/11/2022	8/11/2023

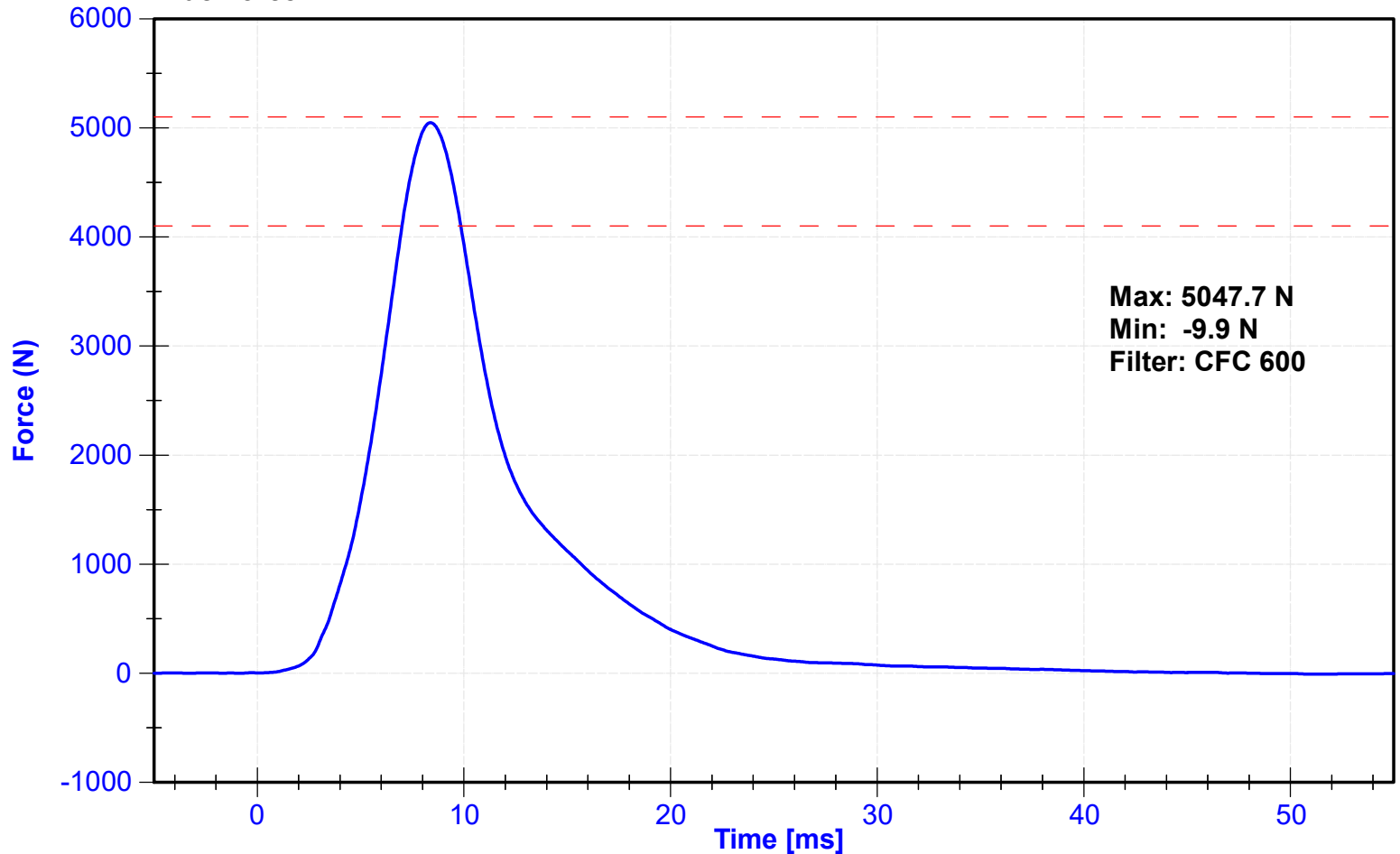
Probe Acceleration



Lateral Pelvis Acceleration



Iliac Force



CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

SERIAL NO:300

(CONFIGURED FOR LEFT SIDE IMPACT)

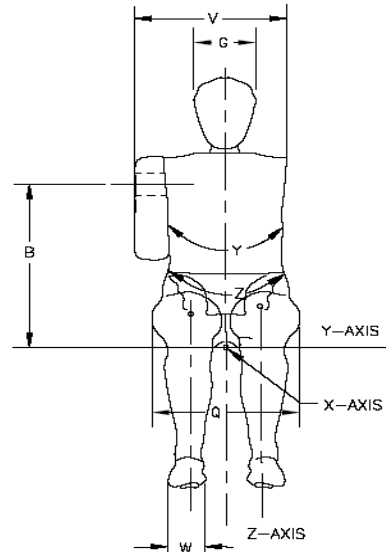
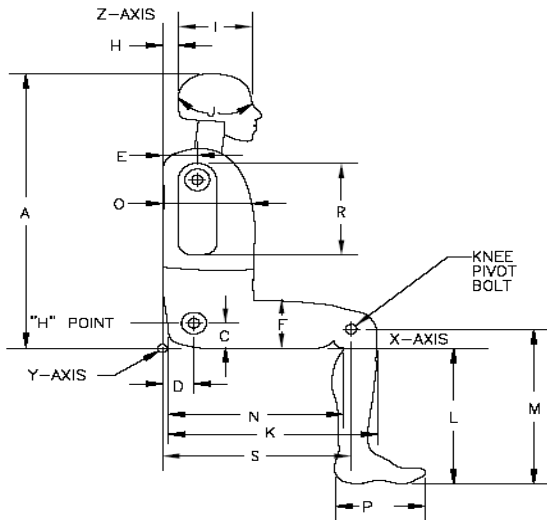


External Measurements - SID-IIs

Technician: K. Brogan

Date: 02/13/2023

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	444	Pass
C	H-point Height	79	89	84	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	122	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	42	Pass
I	Head Depth	178	188	184	Pass
J	Head Circumference	541	551	547	Pass
K	Buttock to Knee Length	514	540	529	Pass
L	Popliteal Height	343	369	357	Pass
M	Knee Pivot to floor height	392	409	402	Pass
N	Buttock Popliteal Length	416	442	432	Pass
O	Chest Depth w/o jacket	195	211	200	Pass
P	Foot Length	216	232	223	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	253	Pass
S	Knee Joint to seatback	477	493	488	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	878	Pass
Z	Waist Circumference	761	791	777	Pass

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

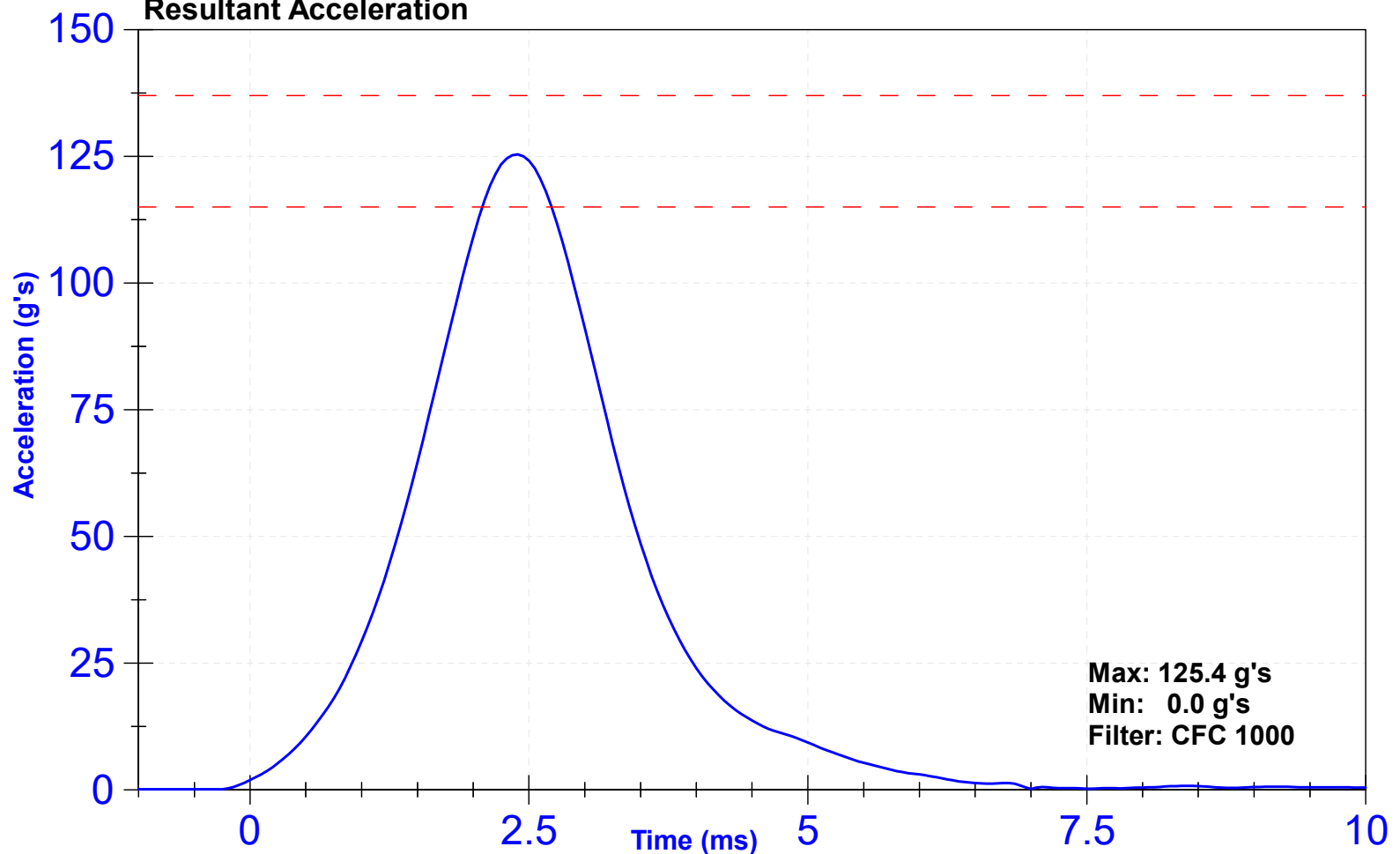
Results

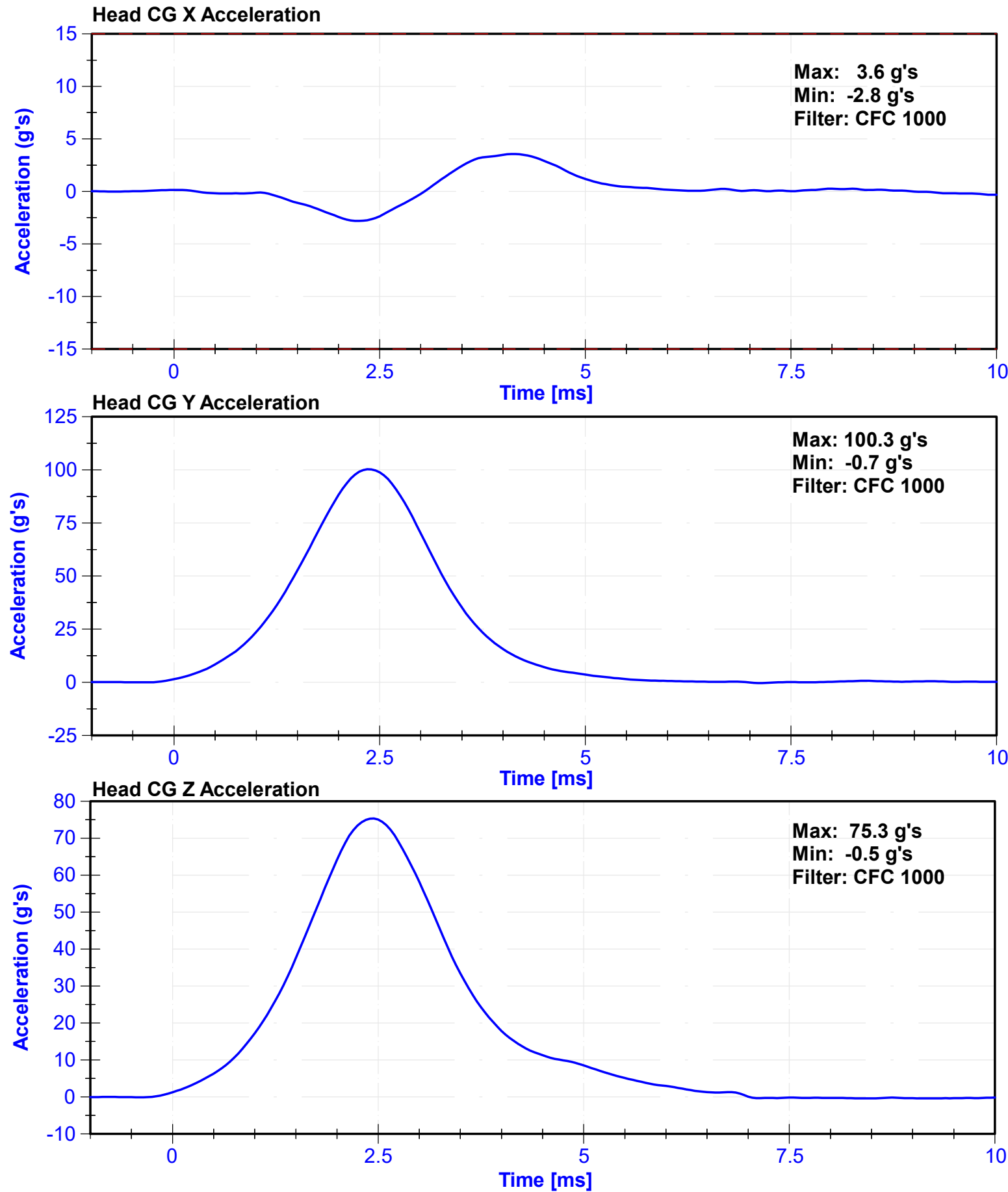
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	22.5	Pass
Resultant Acceleration	115	137	g's	125.4	Pass
Oscillation	0	15	%	1.0	Pass
Fore-Aft Acceleration	-15	15	g's	3.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P59018	10/3/2022	4/1/2023
Y Accelerometer	Endevco	P79189	10/3/2022	4/1/2023
Z Accelerometer	Endevco	P58777	10/3/2022	4/1/2023

Resultant Acceleration





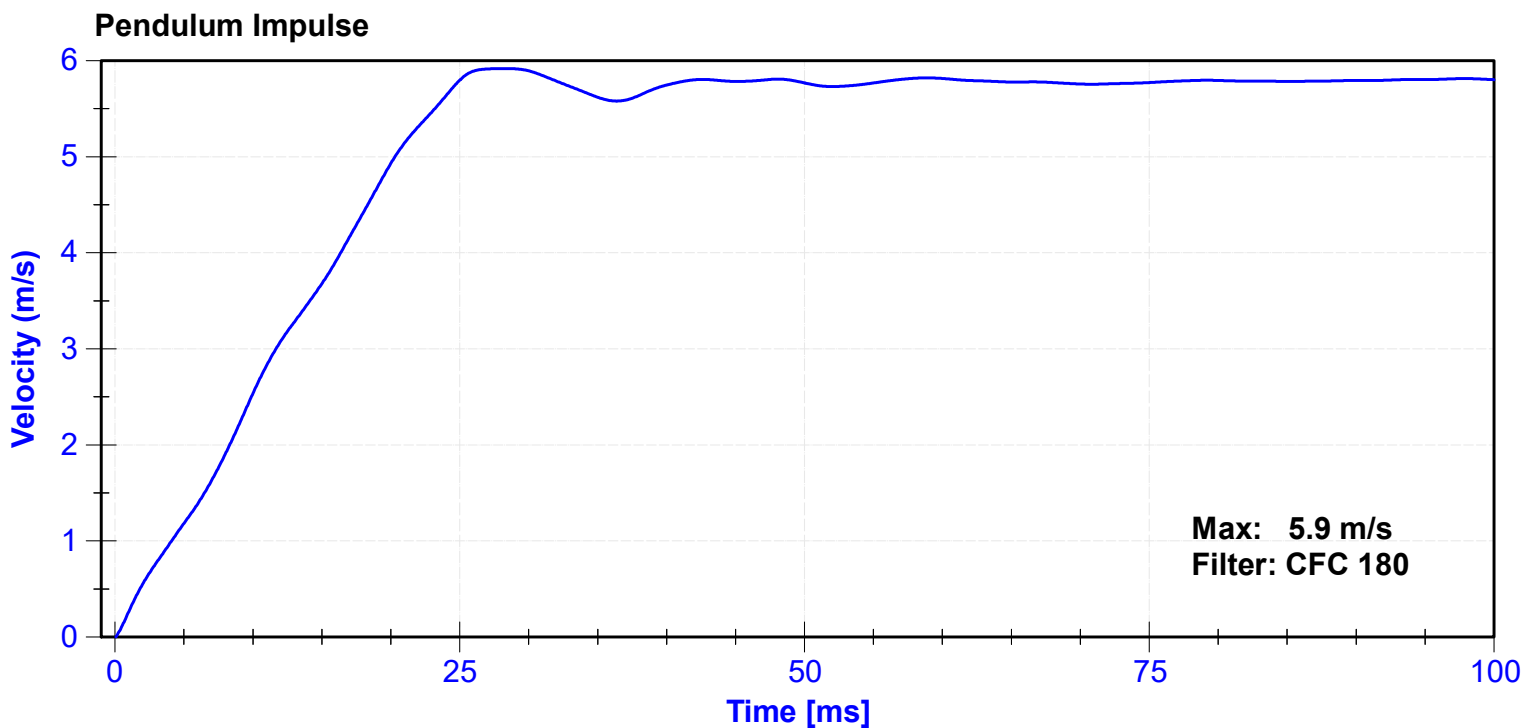
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

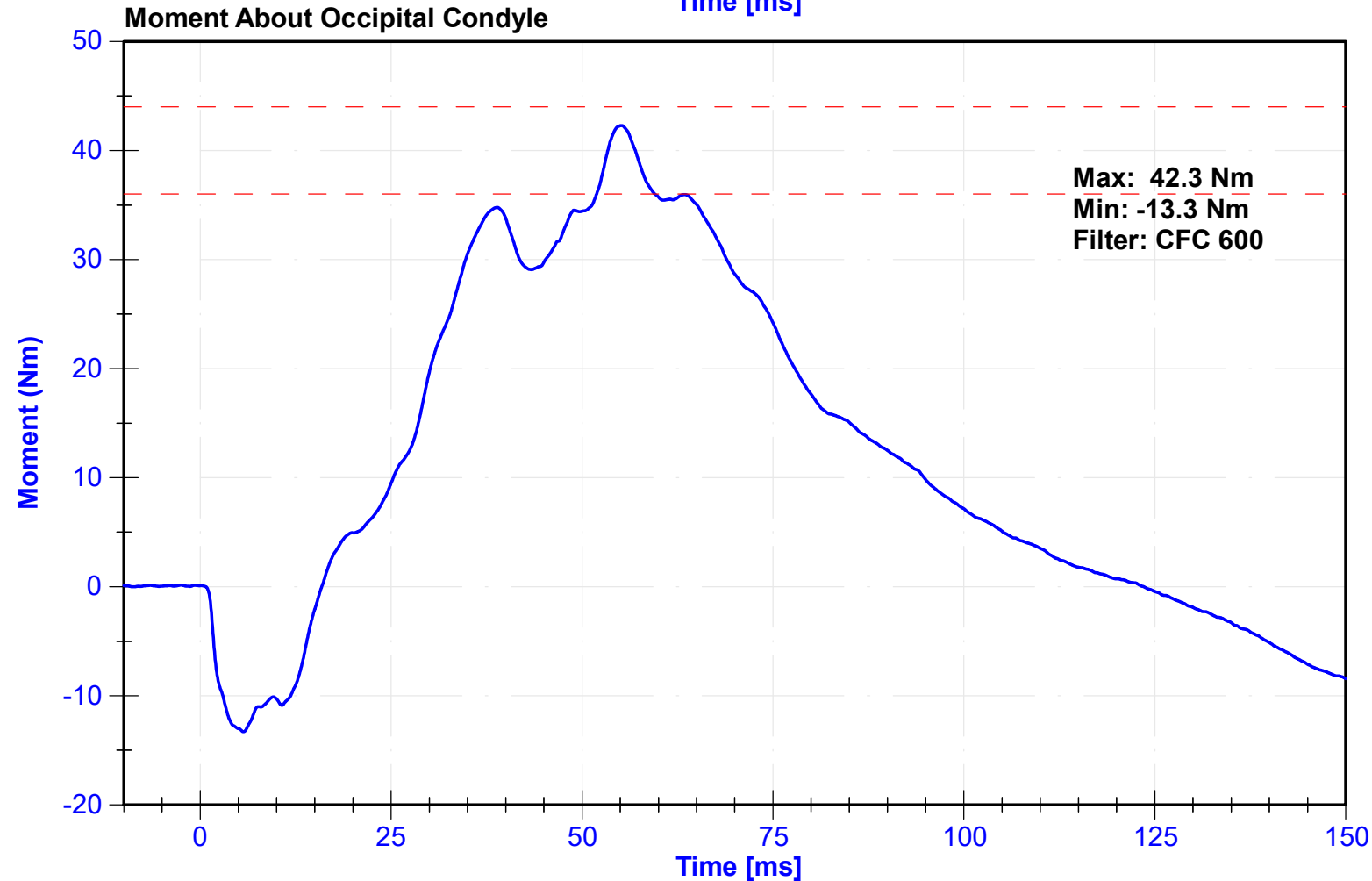
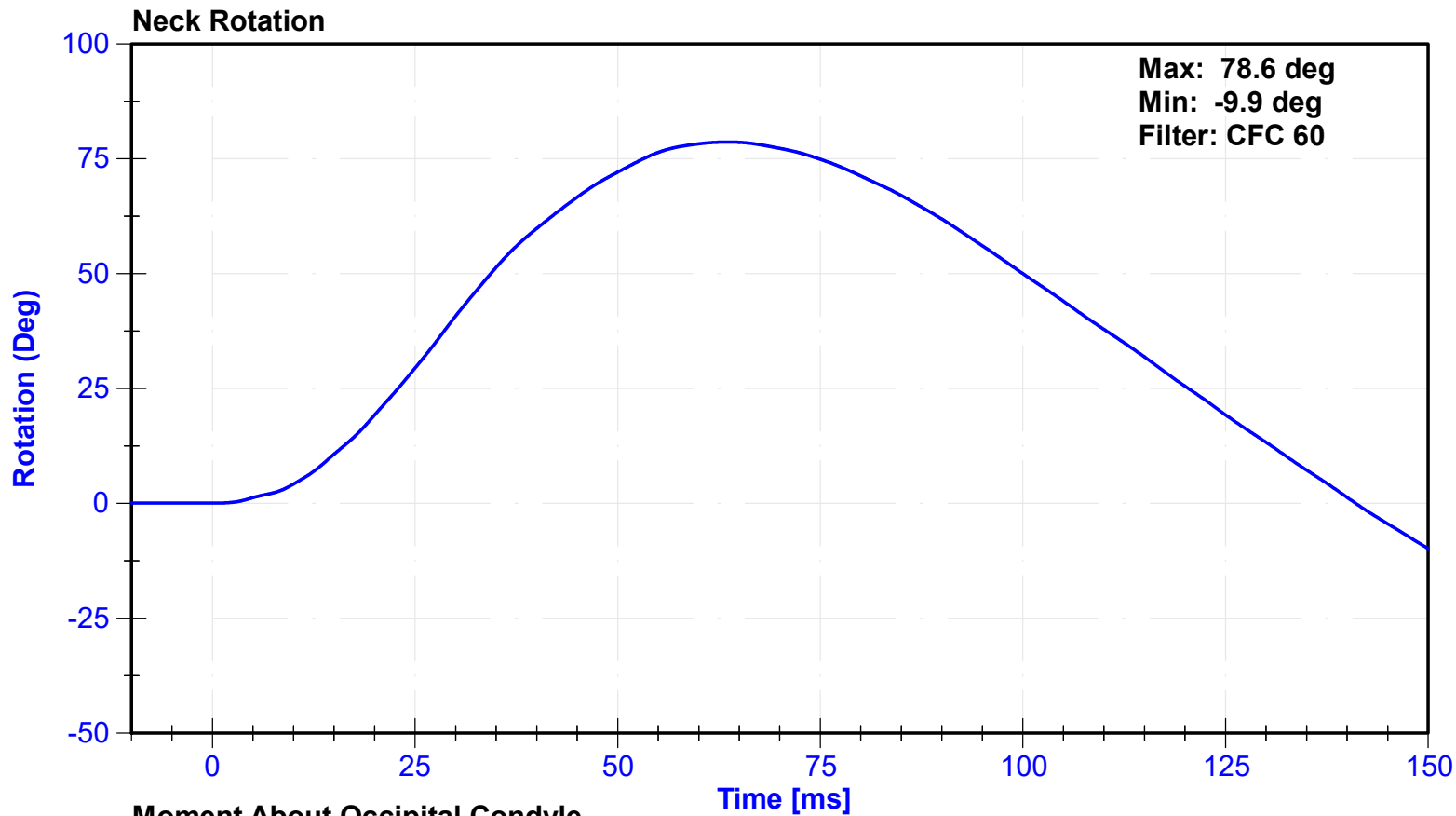
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	19.5	Pass
Velocity	5.51	5.63	m/s	5.593	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.54	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.68	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.93	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.80	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.92	Pass
Neck Rotation	71	81	deg	78.6	Pass
Time at Maximum Rotation	50	70	ms	63.6	Pass
Moment about the OC	36	44	Nm	42.3	Pass
Moment Decay to 0 Nm	102	126	ms	123.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	10/26/2022	10/26/2023
Pendulum Potentiometer	Servo	4961	11/11/2022	11/11/2023
Condyle Potentiometer	Servo	DS185	11/11/2022	11/11/2023
Upper Neck Load Cell	Humanetics	1716A_1872-FY	6/13/2022	6/13/2023





ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

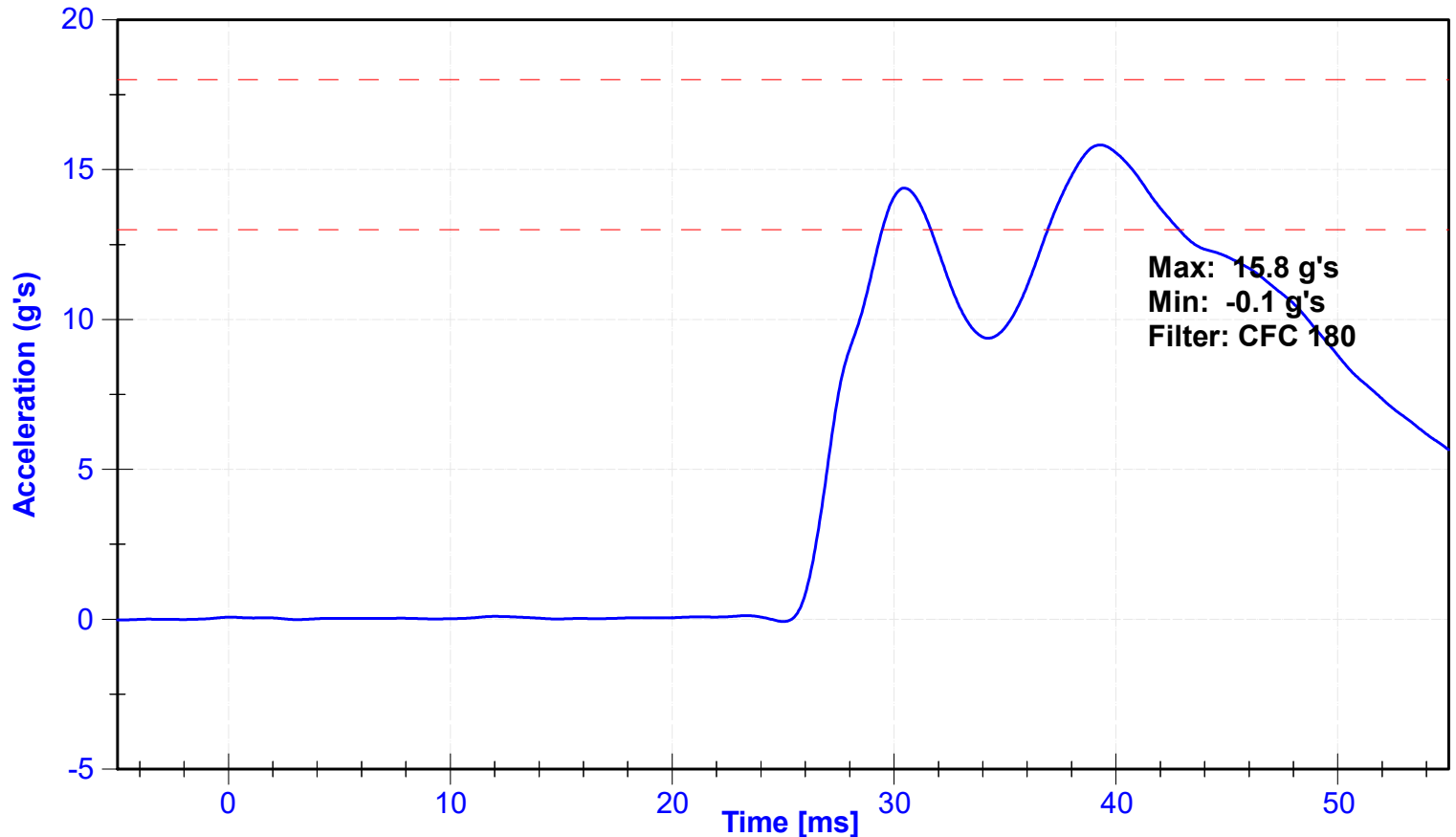
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	19.5	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	13	18	g's	15.8	Pass
Shoulder Deflection	28	37	mm	28.7	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.6	Pass

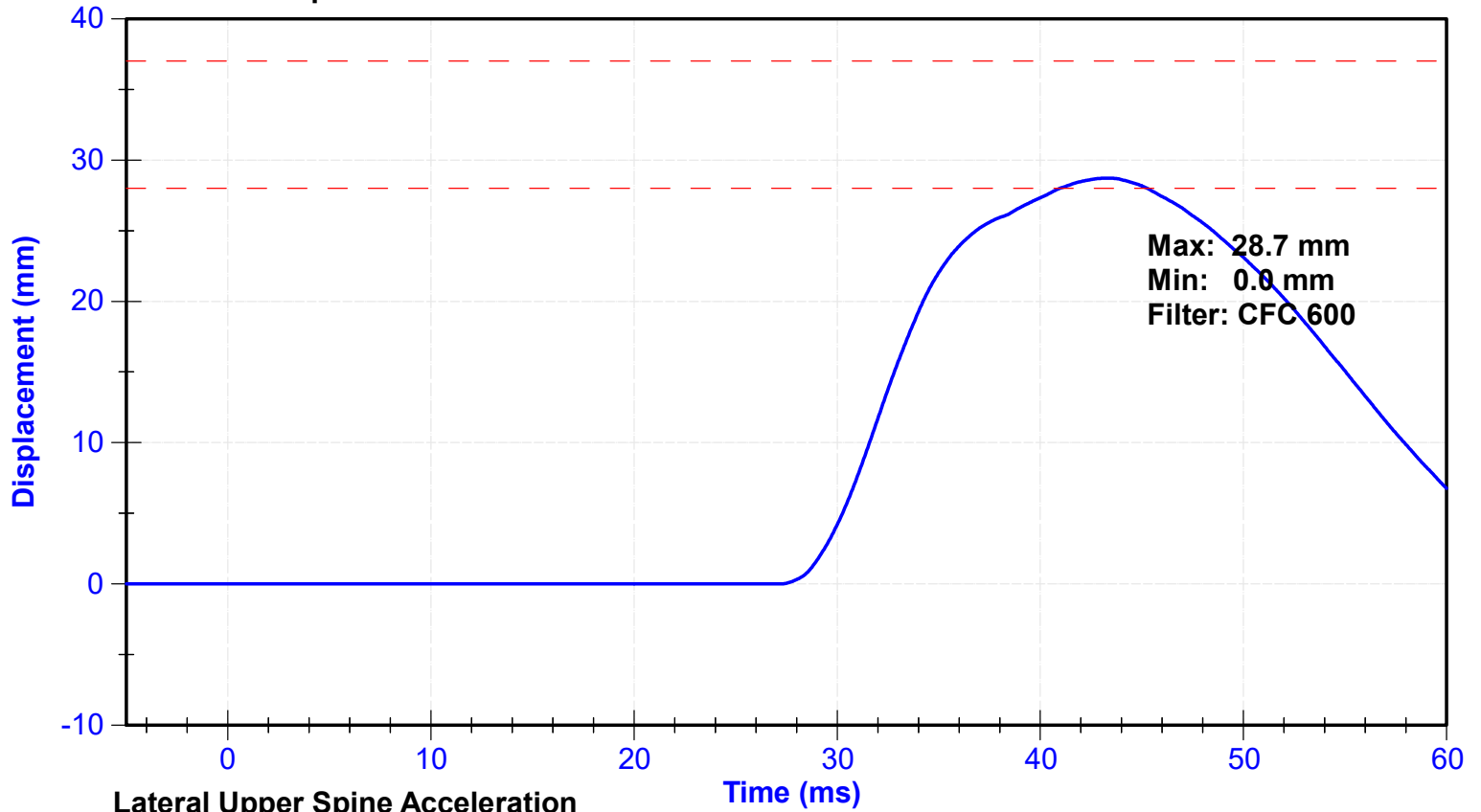
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Shoulder Potentiometer	Servo	053GFE	10/4/2022	4/4/2023
Upper Spine Y Accelerometer	Endevco	T20880	10/3/2022	4/1/2023

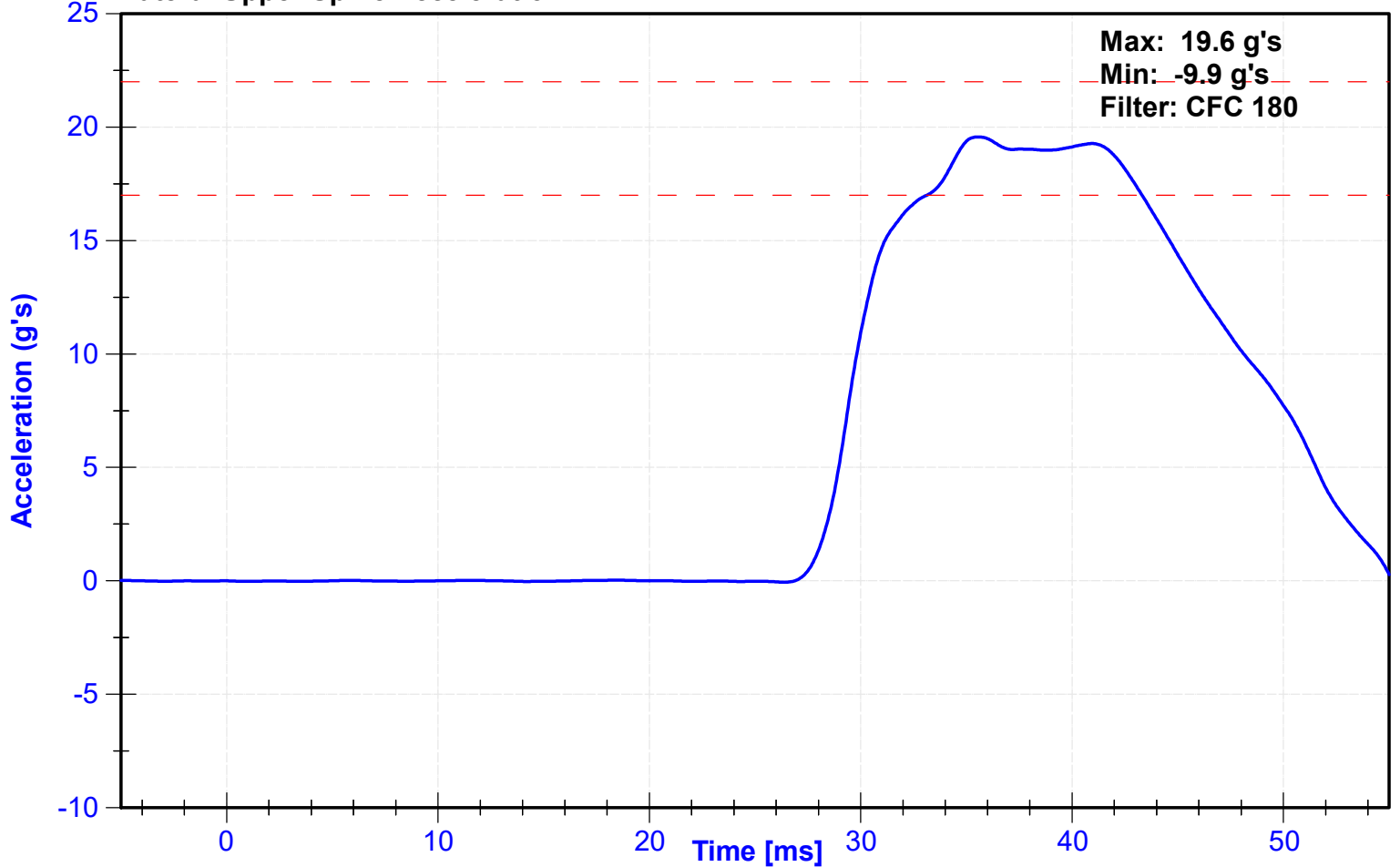
Probe Acceleration



Shoulder Displacement



Lateral Upper Spine Acceleration



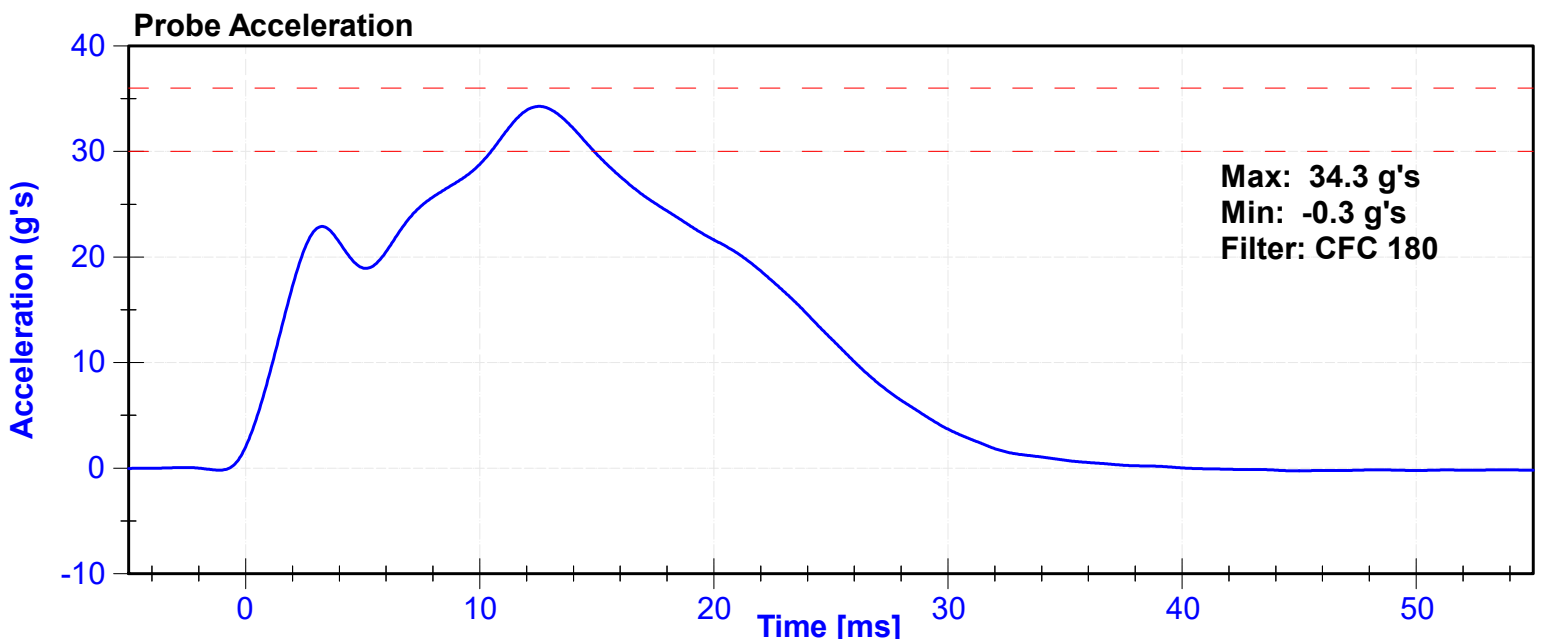
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

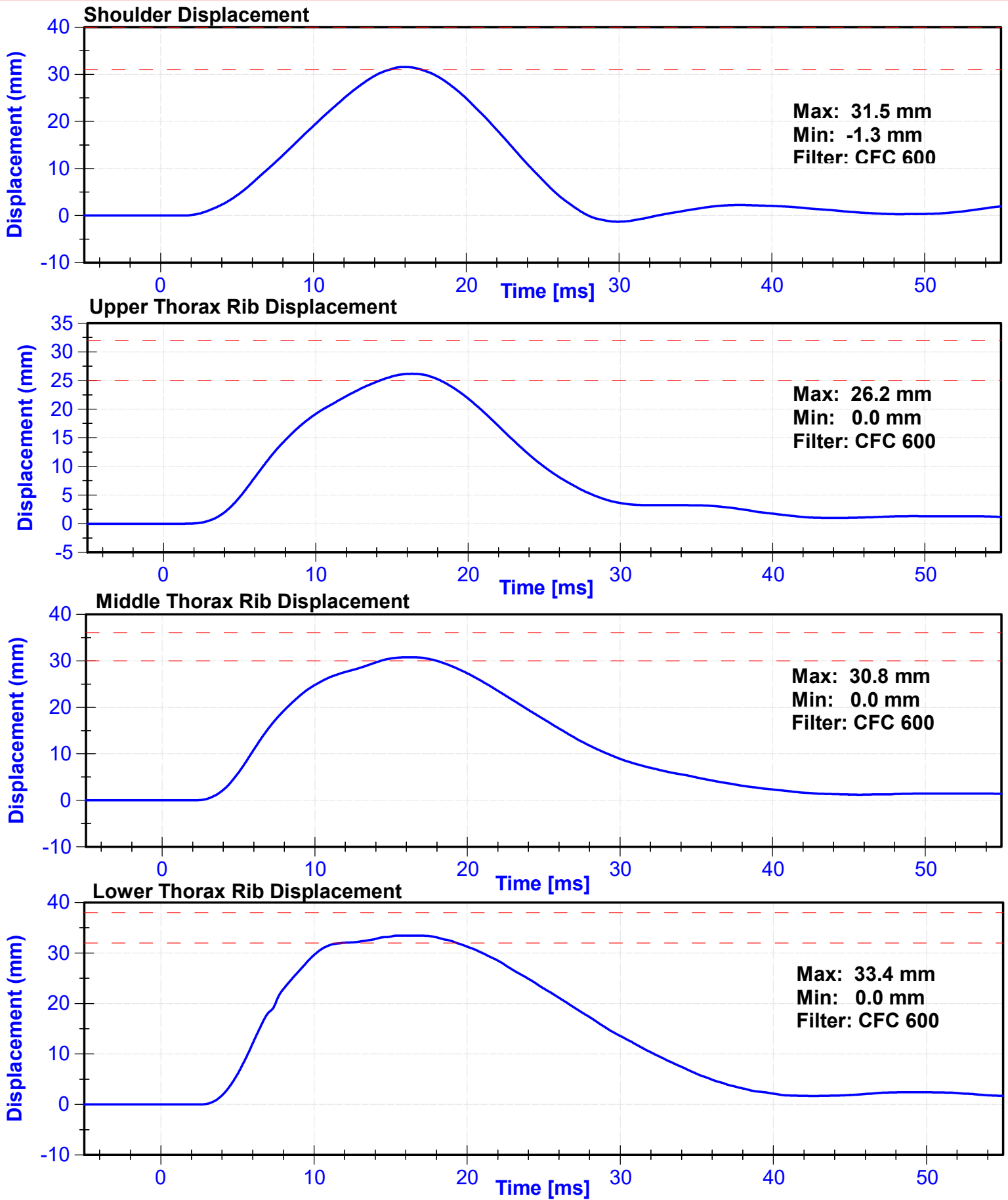
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	19.5	Pass
Velocity	6.6	6.8	m/s	6.67	Pass
Probe Acceleration after 5 ms	30	36	g's	34.3	Pass
Lateral Upper Spine Acceleration	34	43	g's	37.1	Pass
Lateral Lower Spine Acceleration	29	37	g's	32.9	Pass
Shoulder Deflection	31	40	mm	31.5	Pass
Upper Thorax Rib Deflection	25	32	mm	26.2	Pass
Mid Thorax Rib Deflection	30	36	mm	30.8	Pass
Lower Thorax Rib Deflection	32	38	mm	33.4	Pass

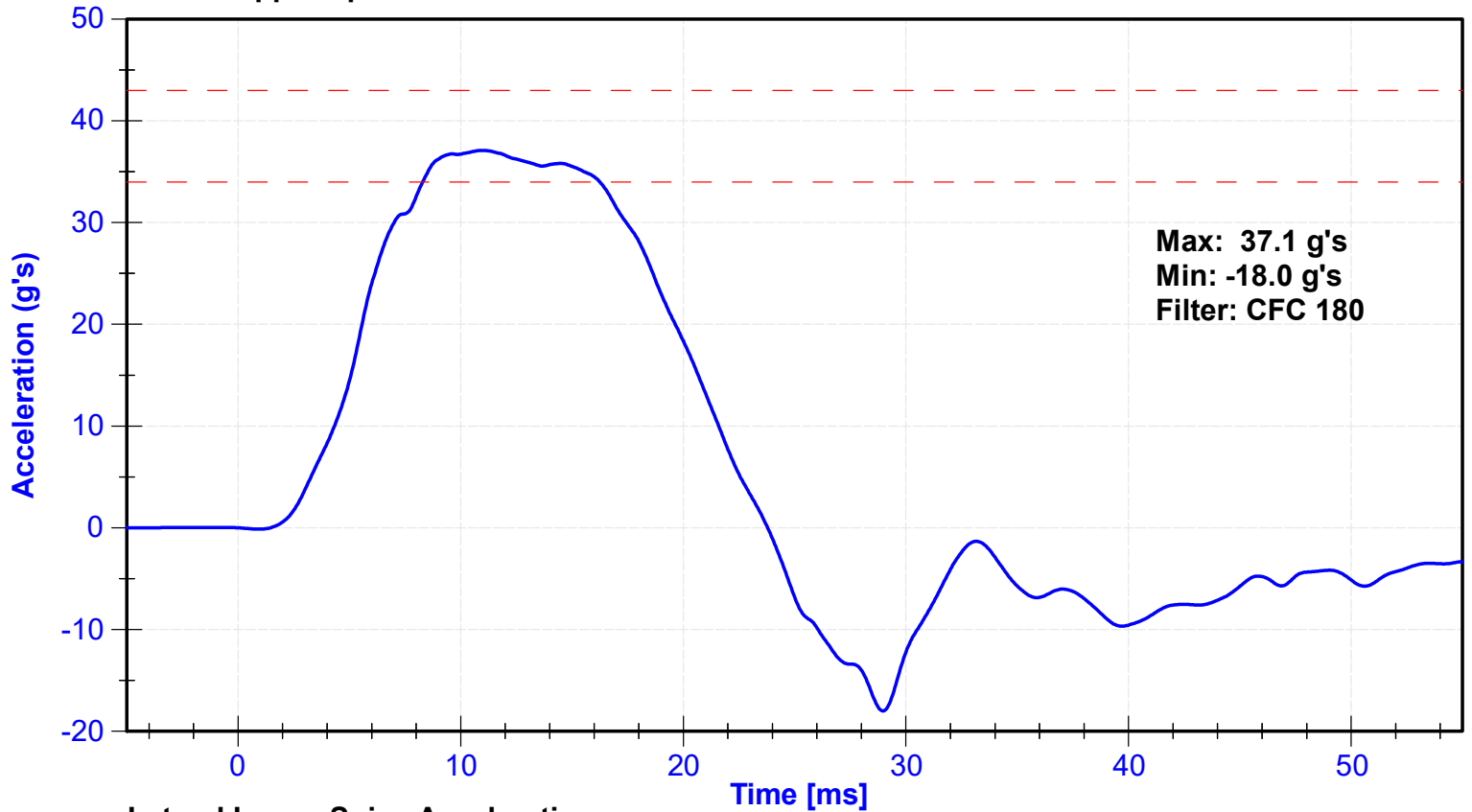
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Upper Spine T1 Y Accelerometer	Endevco	T20880	10/3/2022	4/1/2023
Upper Spine T12 Y Accelerometer	Endevco	P52071	10/3/2022	4/1/2023
Shoulder Potentiometer	Servo	053GFE	10/4/2022	4/4/2023
Upper Thorax Rib Potentiometer	Servo	2316GFE	10/4/2022	4/4/2023
Middle Thorax Rib Potentiometer	Servo	040GFE	10/4/2022	4/4/2023
Lower Thorax Rib Potentiometer	Servo	1156GFE	10/4/2022	4/4/2023

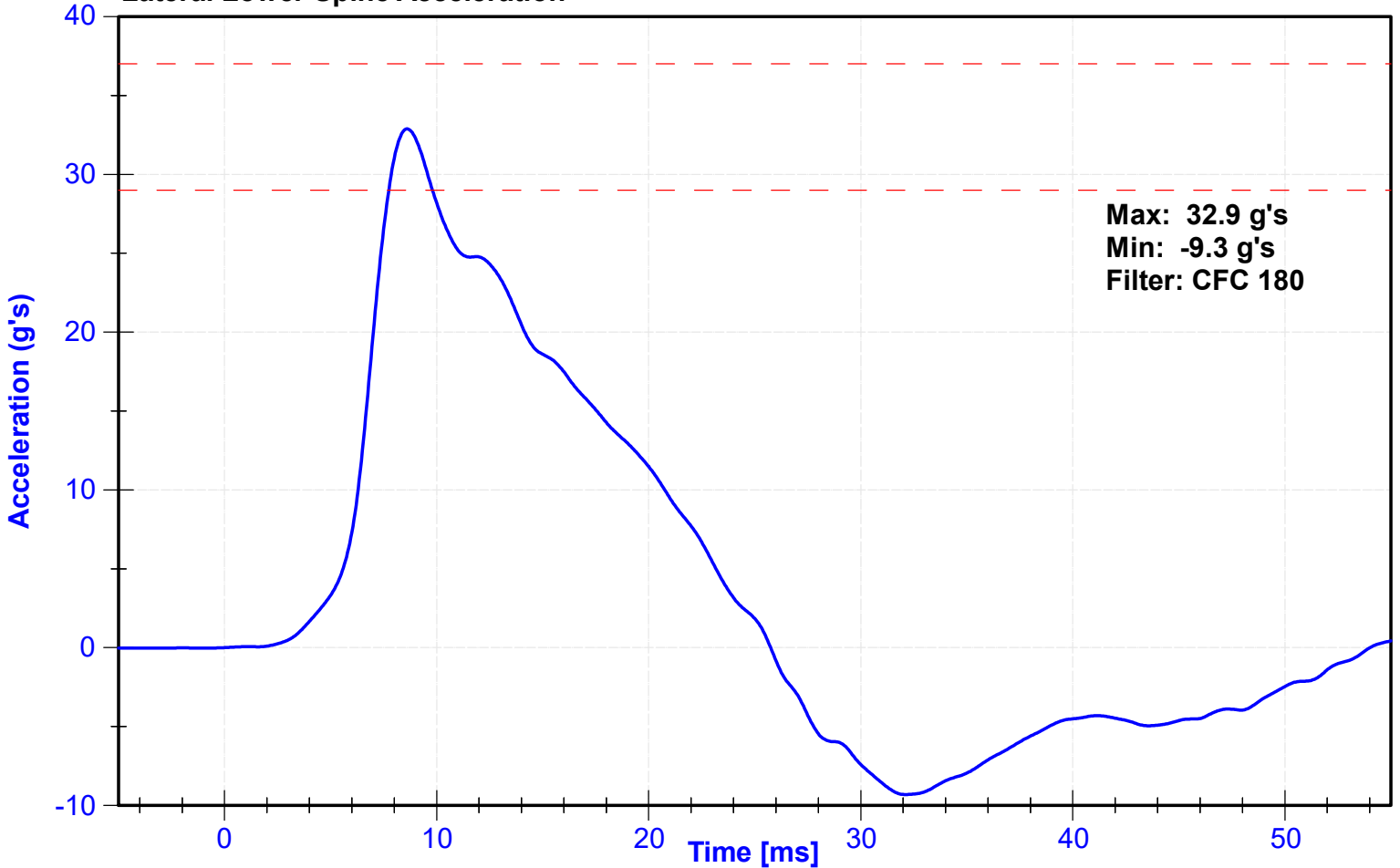




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



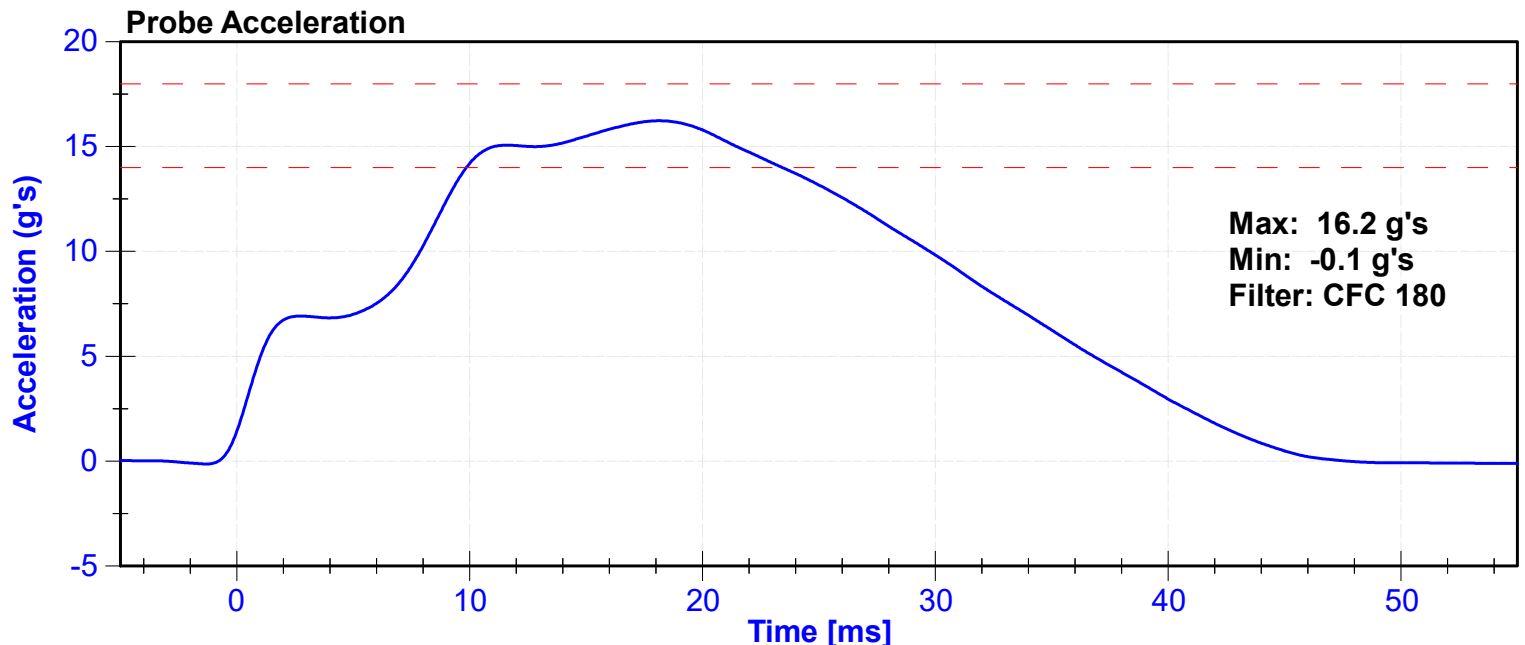
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

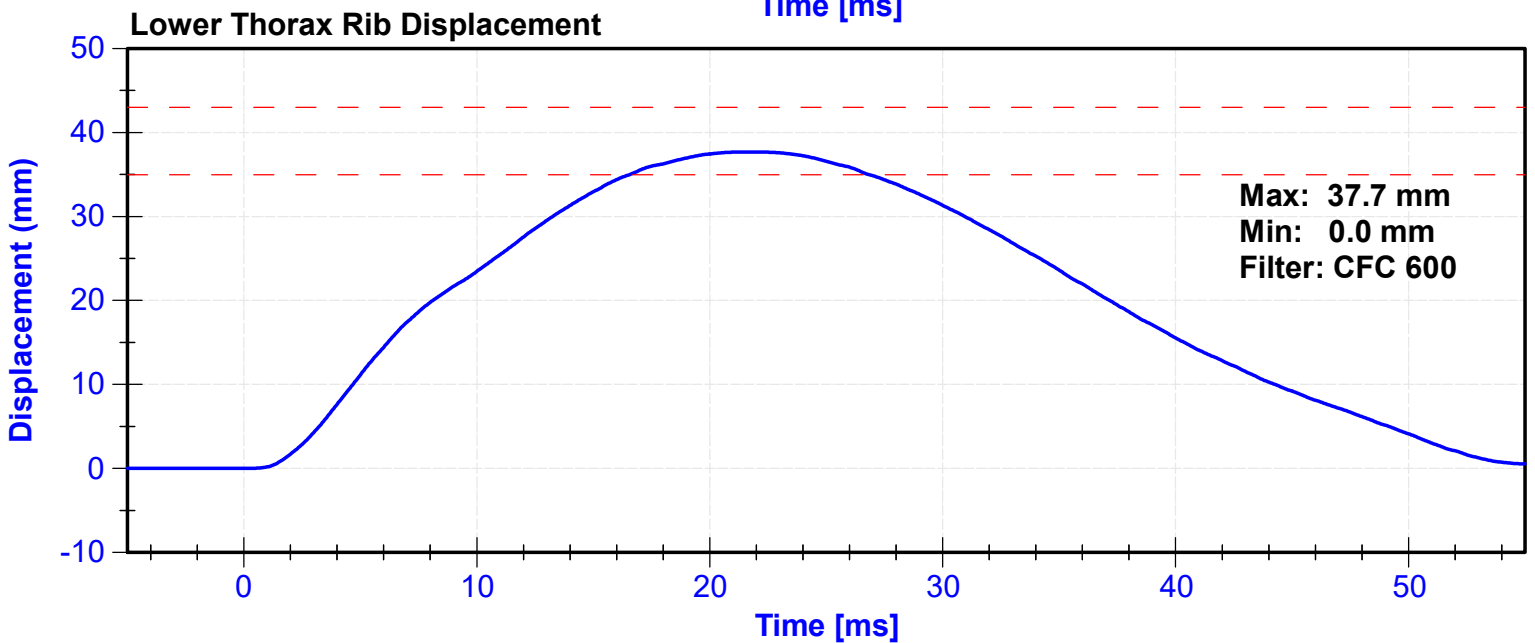
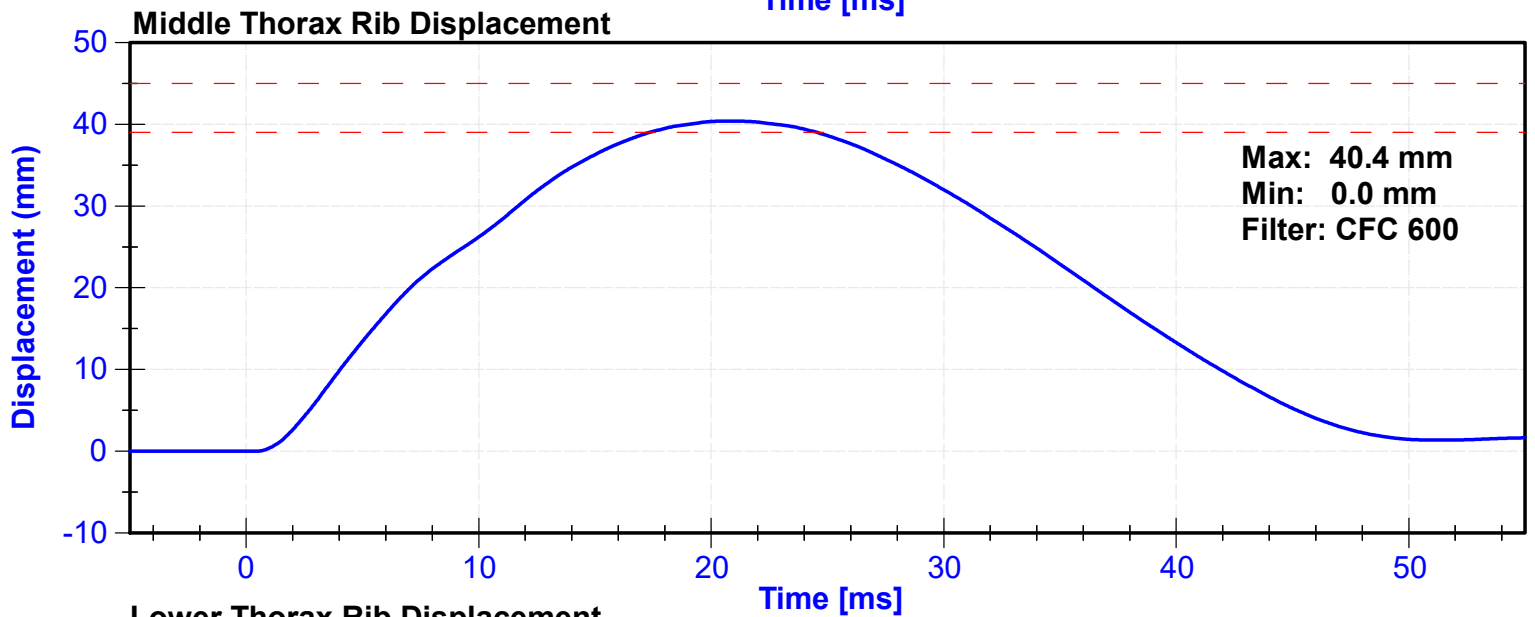
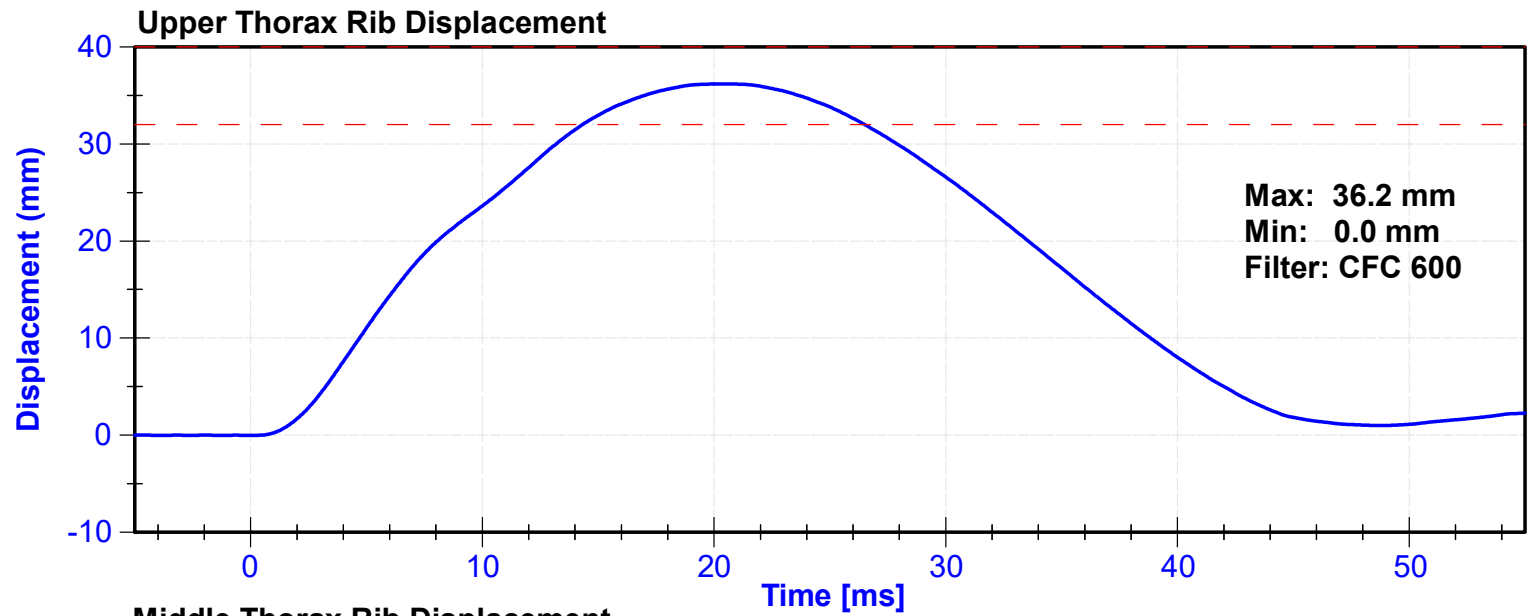
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	19.5	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	14	18	g's	16.2	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.8	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.5	Pass
Upper Thorax Rib Deflection	32	40	mm	36.2	Pass
Middle Thorax Rib Deflection	39	45	mm	40.4	Pass
Lower Thorax Rib Deflection	35	43	mm	37.7	Pass

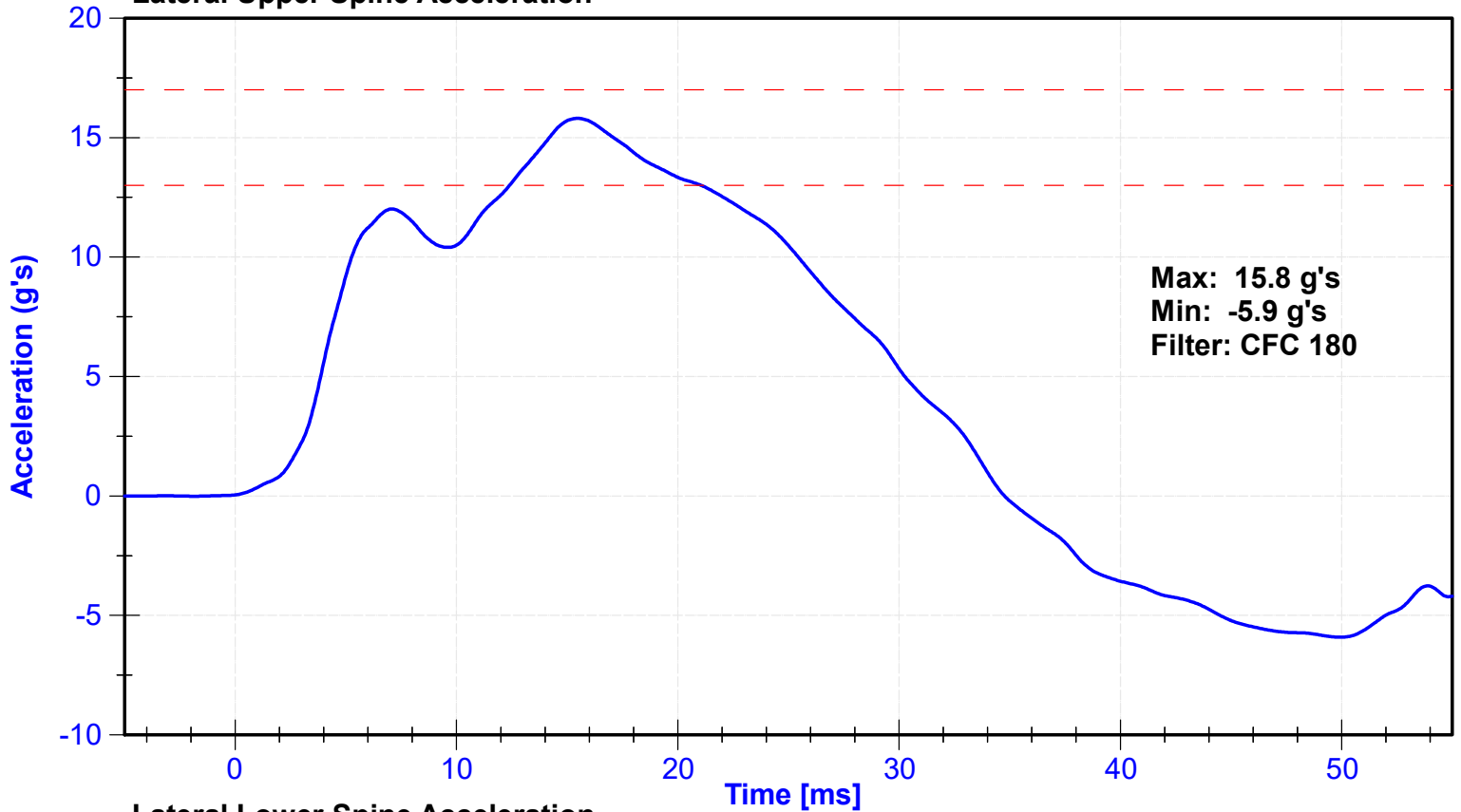
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Upper Spine Y Accelerometer	Endevco	T20880	10/3/2022	4/1/2023
Lower Spine Y Accelerometer	Endevco	P52071	10/3/2022	4/1/2023
Upper Thorax Rib Potentiometer	Servo	2316GFE	10/4/2022	4/4/2023
Middle Thorax Rib Potentiometer	Servo	040GFE	10/4/2022	4/4/2023
Lower Thorax Rib Potentiometer	Servo	1156GFE	10/4/2022	4/4/2023

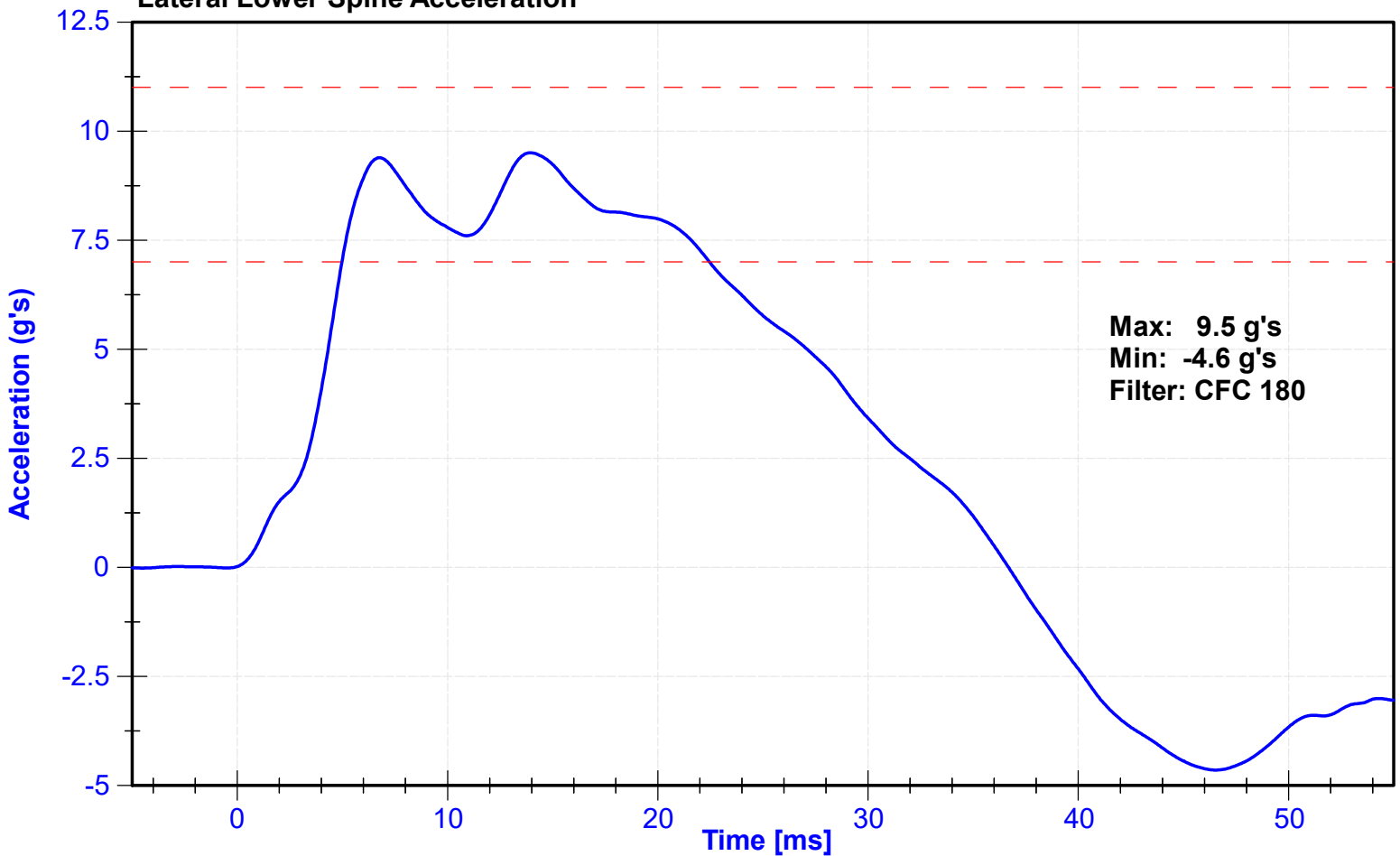




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

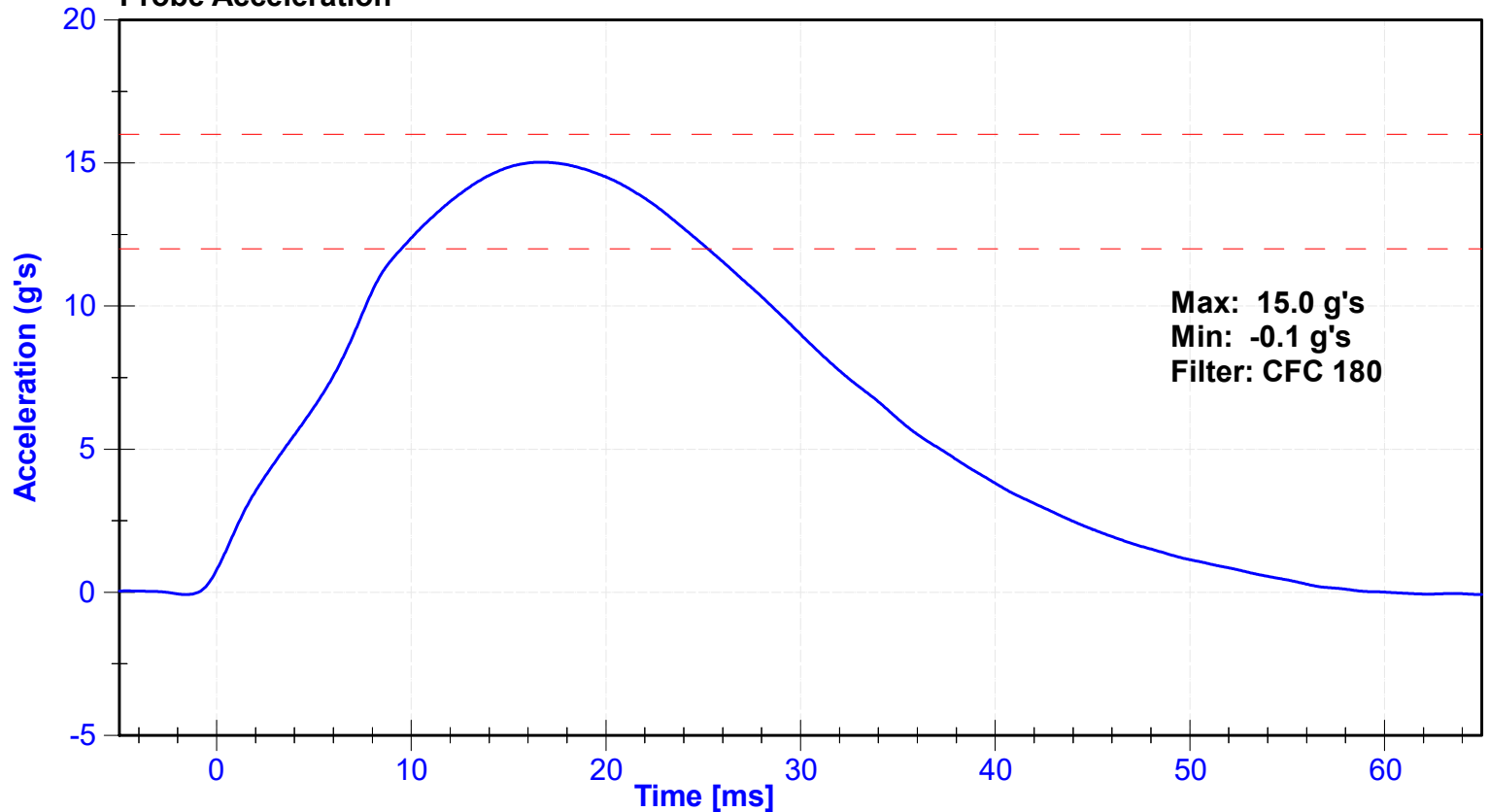
Results

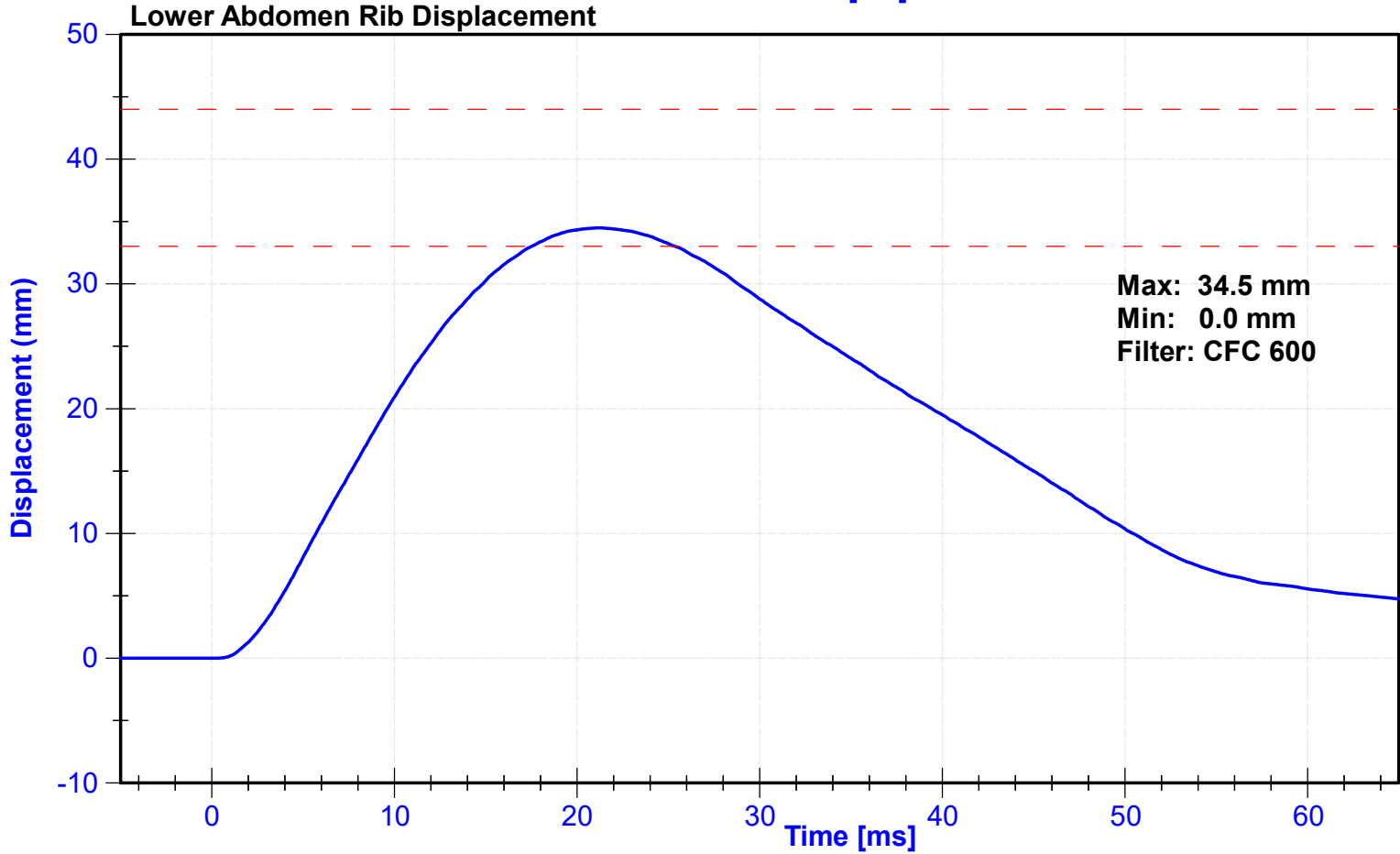
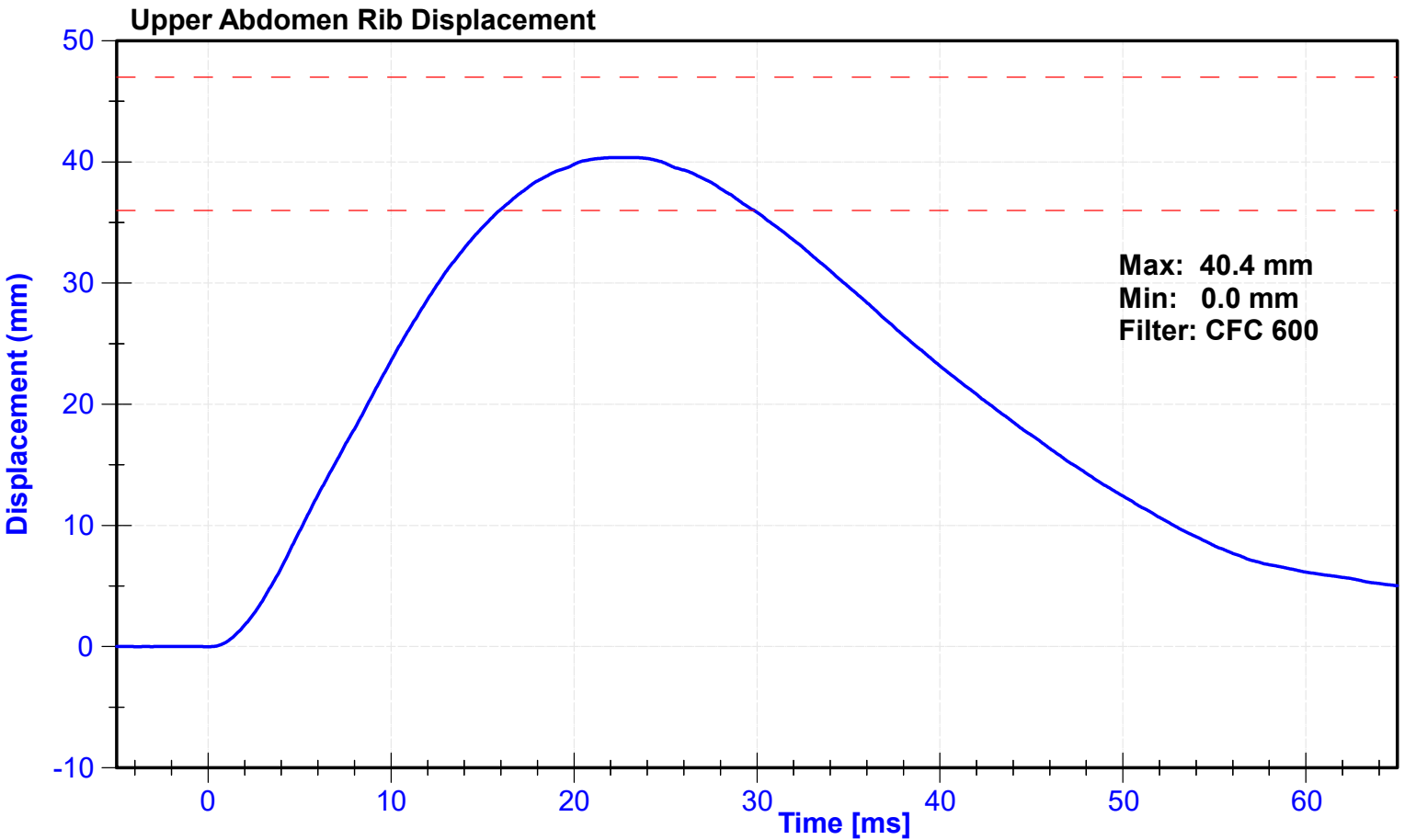
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	19.5	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	12	16	g's	15.0	Pass
Lateral Lower Spine Acceleration	9	14	g's	12.1	Pass
Upper Abdomen Rib Deflection	36	47	mm	40.4	Pass
Lower Abdomen Rib Deflection	33	44	mm	34.5	Pass

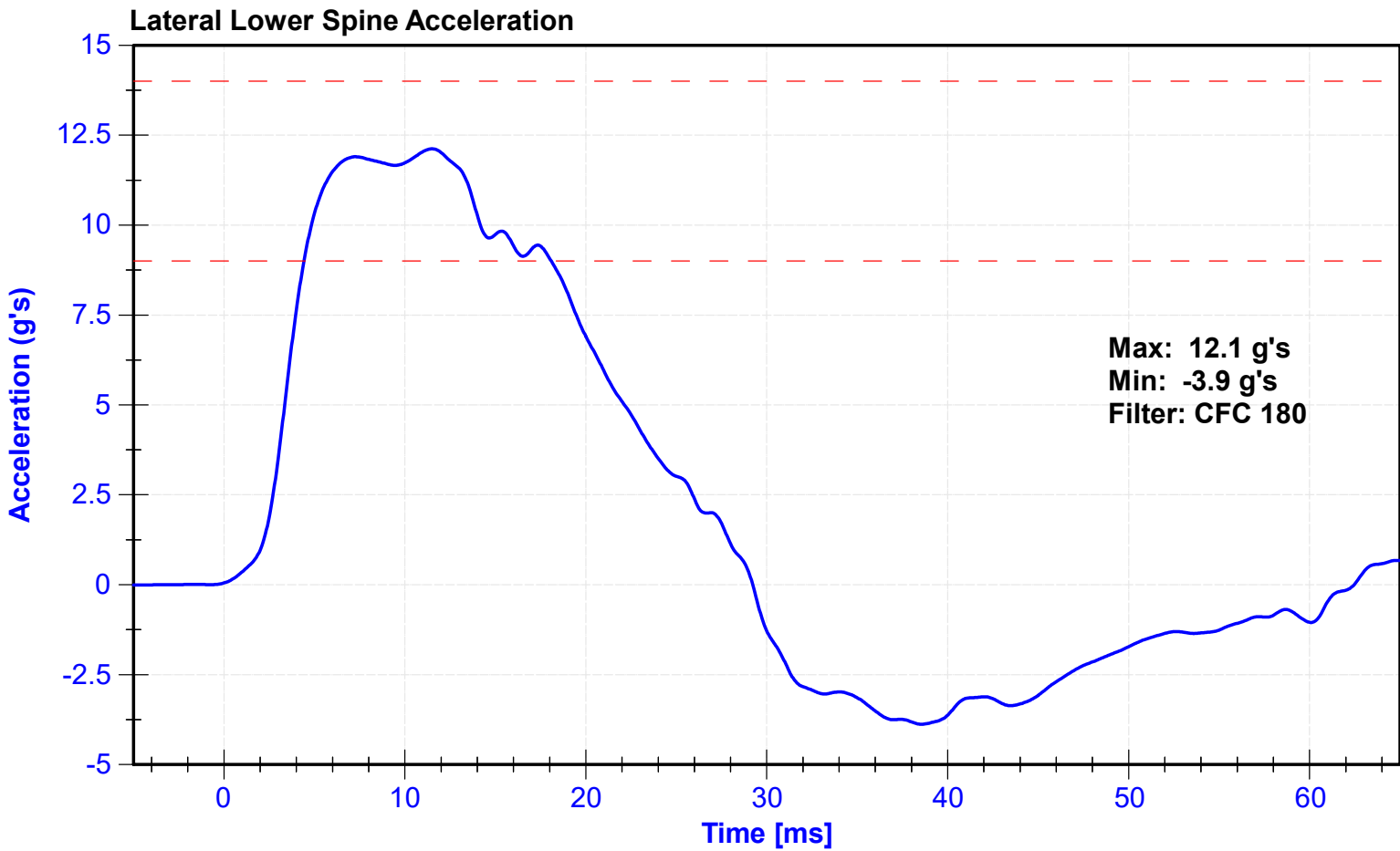
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Lower Spine Y Accelerometer	Endevco	P52071	10/3/2022	4/1/2023
Upper Abdomen Rib Potentiometer	Servo	307GFE	10/4/2022	4/4/2023
Lower Abdomen Rib Potentiometer	Servo	308GFE	10/4/2022	4/4/2023

Probe Acceleration







ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

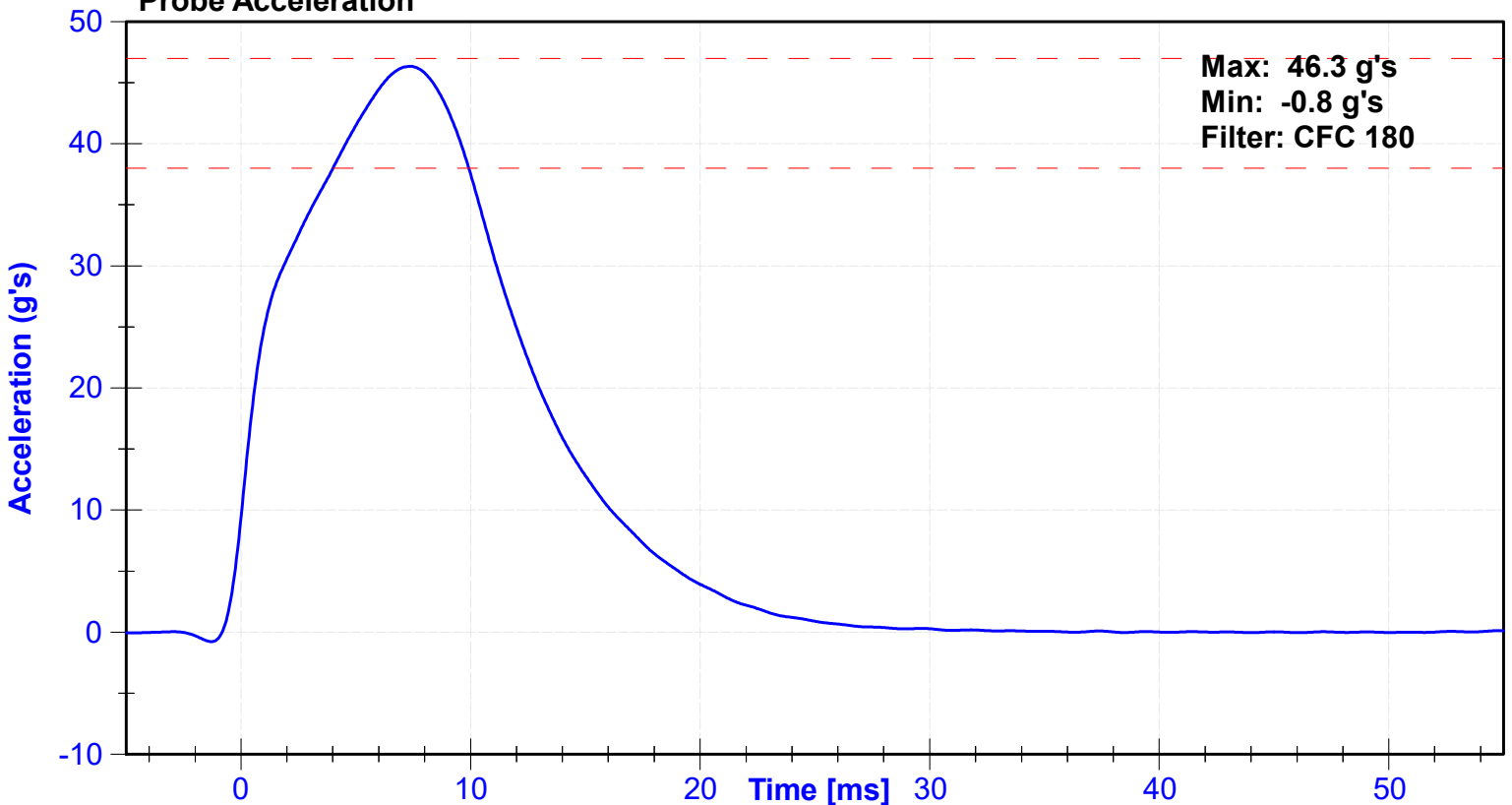
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	19.5	Pass
Velocity	6.6	6.8	m/s	6.74	Pass
Probe Acceleration	38	47	g's	46.3	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	40.9	Pass
Acetabulum Force	3600	4300	N	3978.1	Pass

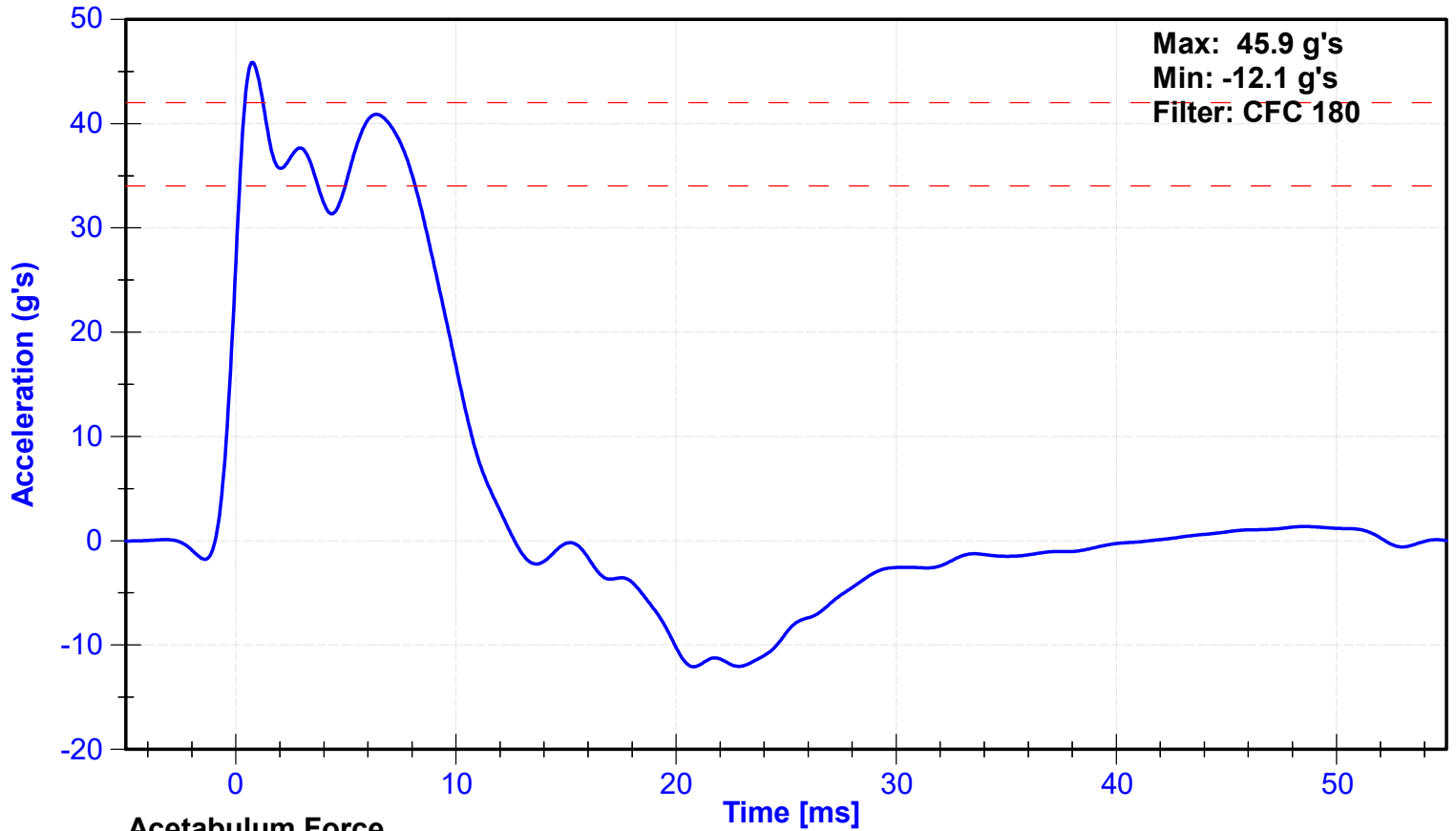
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Pelvis Y Accelerometer	Endevco	P51731	10/3/2022	4/1/2023
Acetabulum Load Cell	Denton	267-FY	8/11/2022	8/11/2023
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A

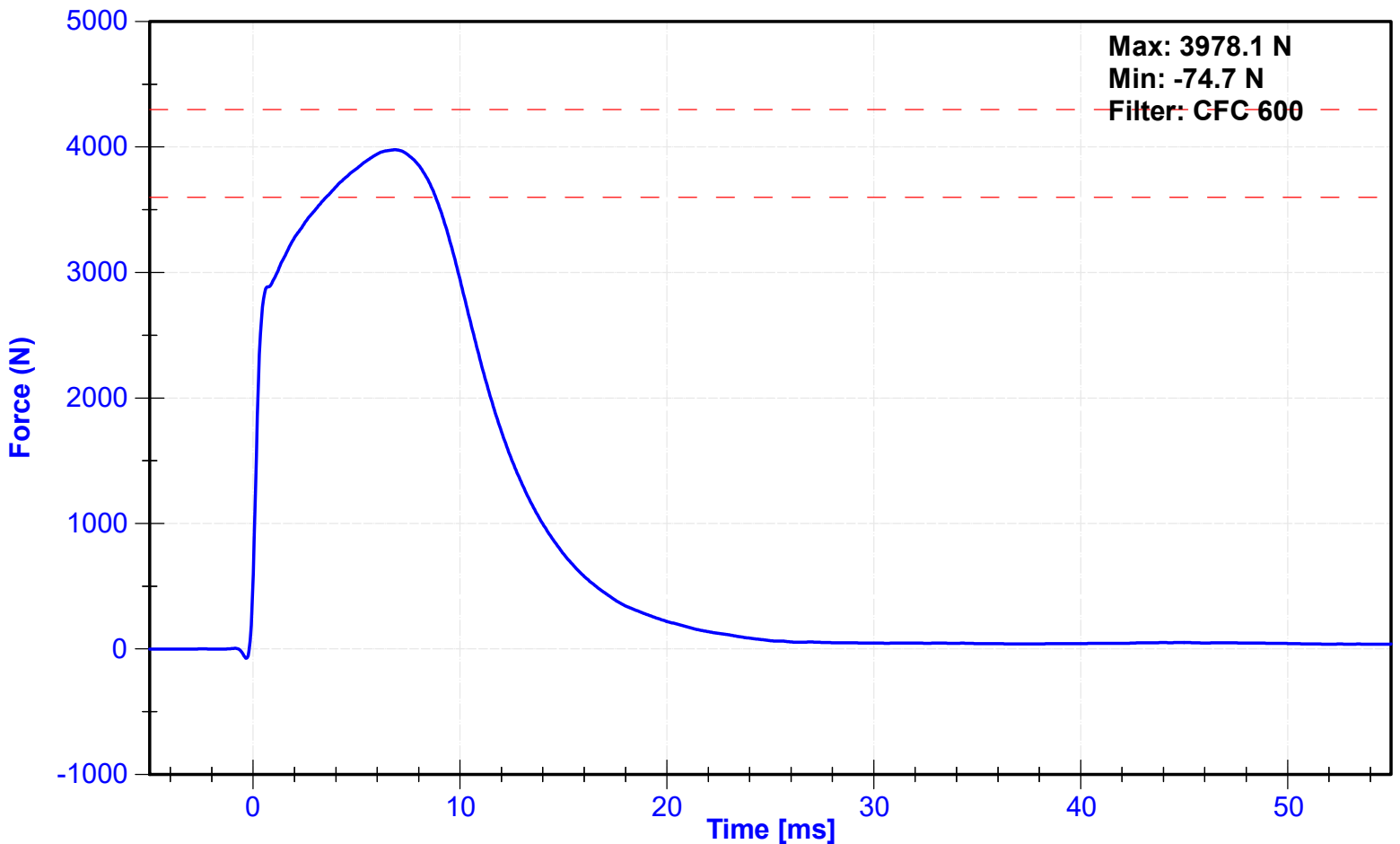
Probe Acceleration



Lateral Pelvis Acceleration



Acetabulum Force





cert 2/14/23

SID-Its Pelvis Plug Certification Test

Plug S/N 16173

Test Number 21237

Report Number 21291

Test Date 11/3/2021 8:51:24 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

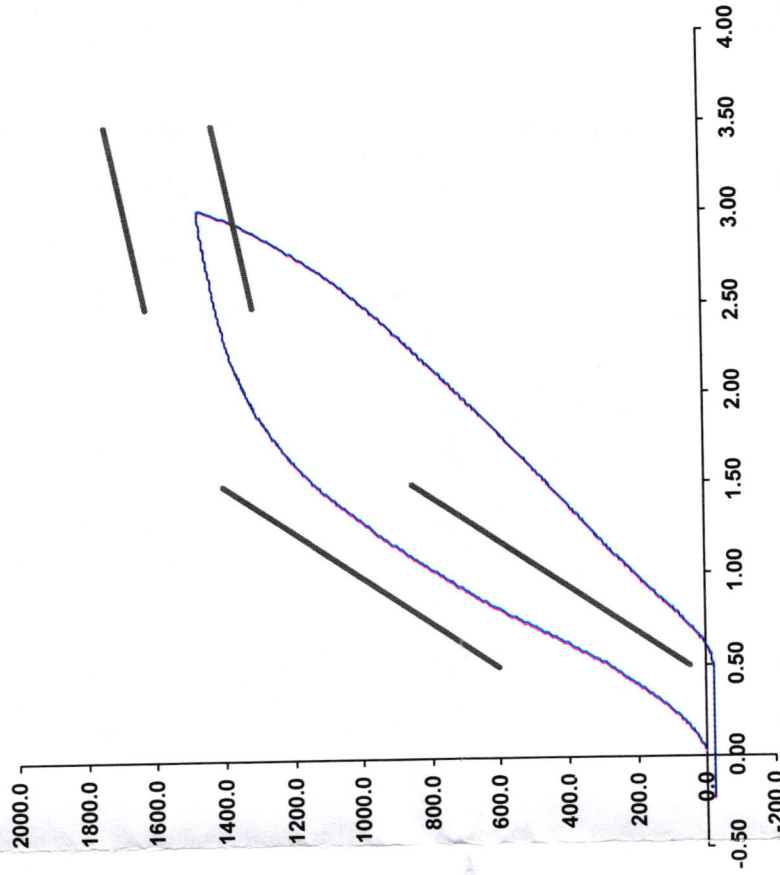
Load Cell S/N (FI360947), Units (LBS) 1000

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 03-Nov-21

SACO Research

By : Date : 11/3/21

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



Tapia et

SID-IIs Pelvis Plug Certification Test

Plug S/N 15228

Test Number 17979

Report Number 18028

Test Date 3/10/2021 12:46:39 PM

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	320	600
Force @ 1.5 mm (N)	1,195	1,400
Force @ 2.5 mm (N)	1,466	1,618
Force @ 3.0 mm (N)	1,516	1,673

Testing Machine STM-20 5965542

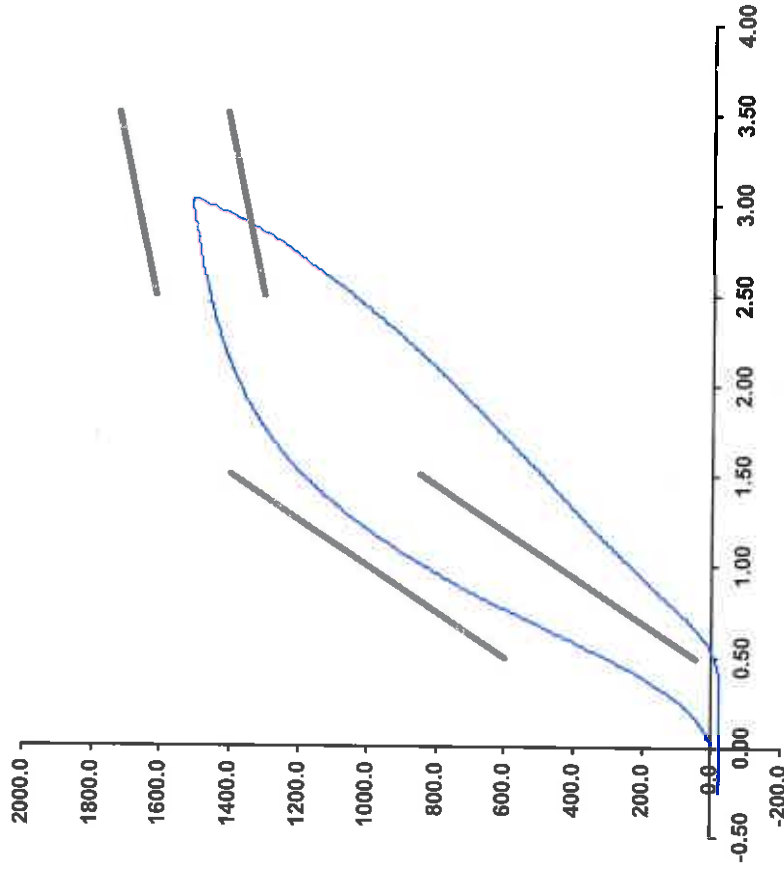
Load Cell S/N (F1360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 10-Mar-21

SACO Research

By: *DC* Date: 3/10/2021

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



Non-Impact

SID-Ils Pelvis Plug Certification Test

Plug S/N 15430

Test Number 20091

Report Number 20145

Test Date 9/9/2021 10:07:28 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

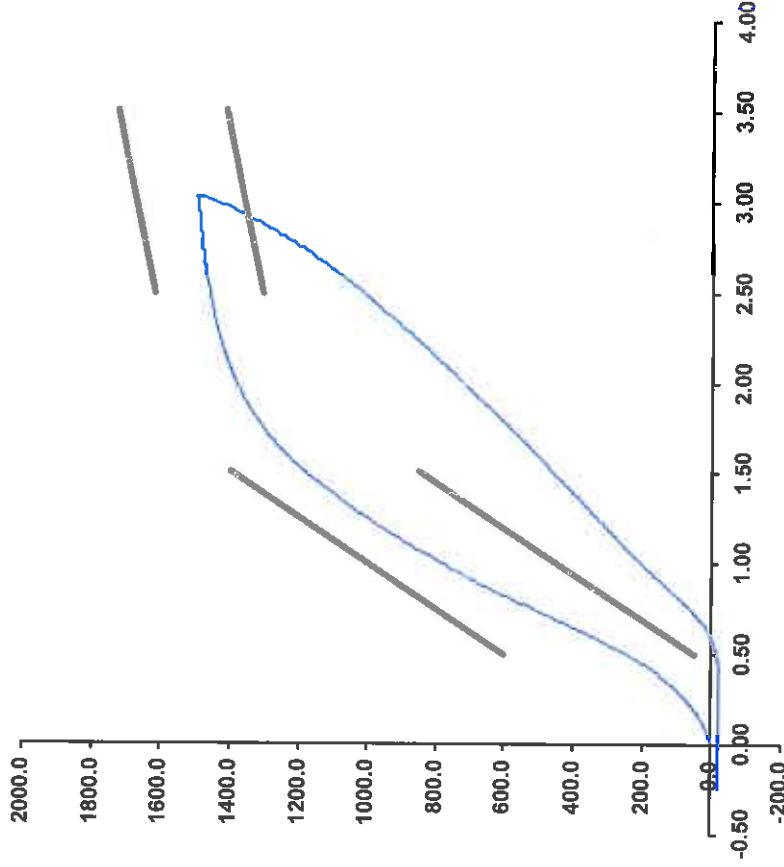
Preload Value (-N) 22.24

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 09-Sep-21

SACO Research

By: DC Date: 9/9/2021

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

ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

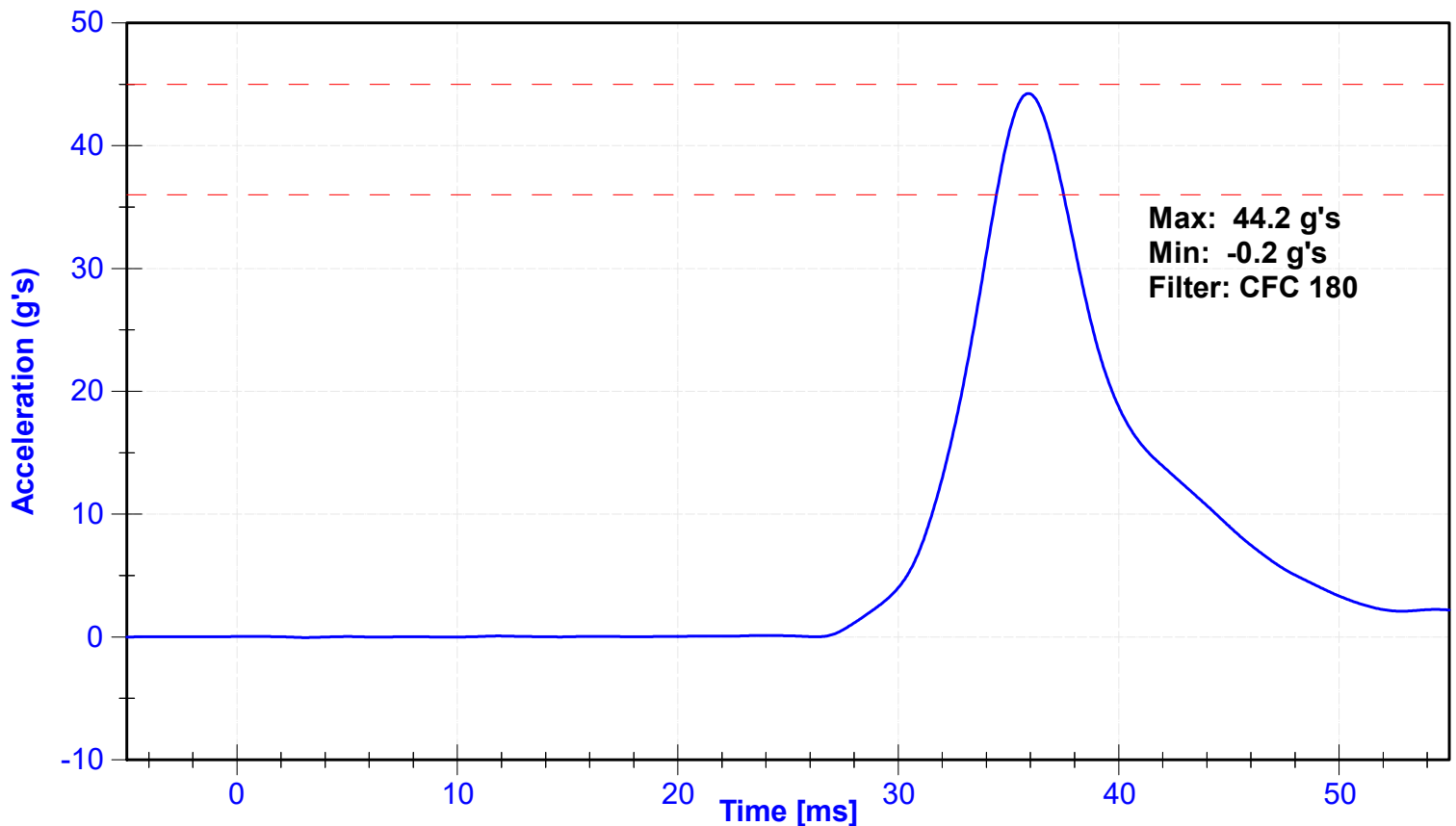
Results

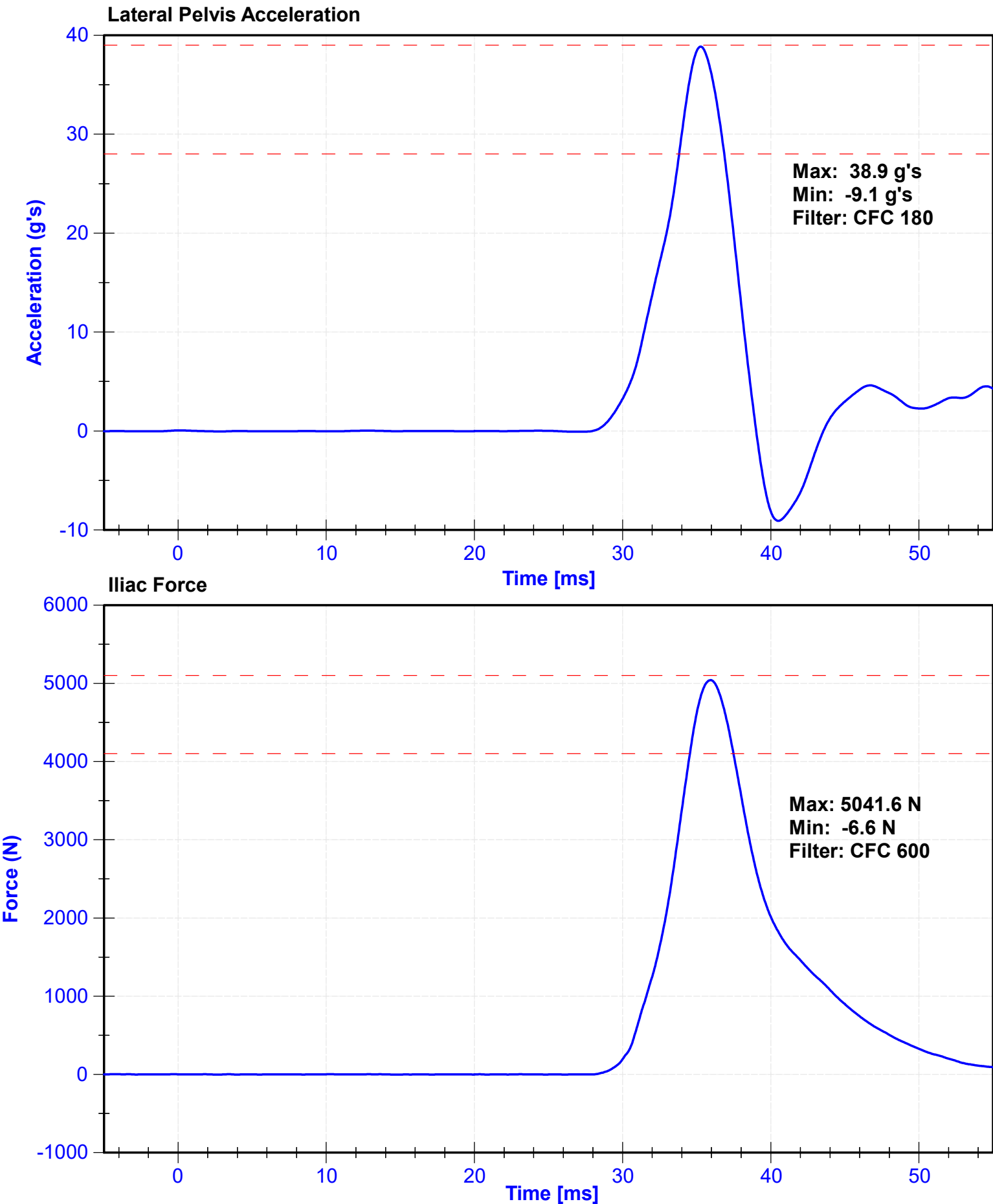
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	19.5	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	36	45	g's	44.2	Pass
Lateral Pelvis Acceleration	28	39	g's	38.9	Pass
Iliac Force	4100	5100	N	5041.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Pelvis Y Accelerometer	Endevco	P51731	10/3/2022	4/1/2023
Iliac Load Cell	Denton	280-FY	8/11/2022	8/11/2023

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	10/3/2022
			Y	P79189	Endevco	10/3/2022
			Z	P58777	Endevco	10/3/2022
Head Accelerometers - Redundant			X	P68057	Endevco	10/3/2022
			Y	P58986	Endevco	10/3/2022
			Z	P52025	Endevco	10/3/2022
Displacement Potentiometer	Shoulder		Y			
	Thoracic Rib	Upper	Y	2316GFE	Servo	10/4/2022
		Middle	Y	040GFE	Servo	10/4/2022
		Lower	Y	1156GFE	Servo	10/4/2022
	Abdominal Rib	Upper	Y	307GFE	Servo	10/4/2022
		Lower	Y	308GFE	Servo	10/4/2022
Lower Spine Accelerometers (T12)			X	P64003	Endevco	10/3/2022
			Y	P52071	Endevco	10/3/2022
			Z	P17283	Endevco	10/3/2022
Acetabulum Load Cell			Y	267-FY	Denton	8/11/2022
Lilac Wing Load Cell			Y	280-FY	Denton	8/11/2022
Pelvis Plug (Struck Side)				15362	SACO	7/20/2021
Pelvis Plug (Non-Struck Side)				15448	SACO	9/9/2021

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	A315794	Measurement Specialties	11/29/2022
Vehicle Center of Gravity	Y	A315852	Measurement Specialties	11/29/2022
Vehicle Center of Gravity	Z	A315895	Measurement Specialties	11/29/2022
Left Floor Sill	Y	A315862	Measurement Specialties	11/29/2022
A-Pillar Sill	Y	A374373	Measurement Specialties	11/16/2022
A-Pillar Low	Y	A352356	Measurement Specialties	11/16/2022
A-Pillar Mid	Y	A279976	Measurement Specialties	11/16/2022
B-Pillar Sill	Y	A315916	Measurement Specialties	11/29/2022
B-Pillar Low	Y	A282672	Measurement Specialties	11/29/2022
B-Pillar Mid	Y	A284286	Measurement Specialties	11/29/2022
Driver Seat	Y	A274261	Measurement Specialties	10/10/2022
Engine Top	X	A335428	Measurement Specialties	1/19/2023
Engine Top	Y	A373221	Measurement Specialties	1/19/2023
Firewall	Y	A301874	Measurement Specialties	11/29/2022
Right Roof	Y	A350943	Measurement Specialties	12/28/2022
Right Floor Sill	Y	A370927	Measurement Specialties	11/29/2022
Rear Floorpan	X	A290948	Measurement Specialties	1/3/2023
Rear Floorpan	Y	A335471	Measurement Specialties	1/3/2023

Table 3 – Pole Instrumentation

Pole Instrumentation	Serial Number	Manufacturer	Calibration Date
Load Cell 1	1220AF-1117006-F0	Interface	7/19/2022
Load Cell 2	1220AF-1117006-F0	Interface	7/19/2022
Load Cell 3	1220AF-1117025-F0	Interface	7/19/2022
Load Cell 4	1220AF-1130989-F0	Interface	7/19/2022
Load Cell 5	1220AF-1117017-F0	Interface	7/19/2022
Load Cell 6	1220AF-1117019-F0	Interface	7/19/2022
Load Cell 7	1220AF-1117035-F0	Interface	7/19/2022
Load Cell 8	1220AF-1117011-F0	Interface	7/19/2022