REPORT NUMBER: 214P-CAL-23-006

NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST

Mazda Motor Manufacturing de Mexico S.A. DE C.V.
2023 Mazda Mazda3
4 Door Sedan

NHTSA No: O20235402

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

June 8, 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

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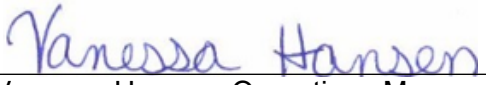
Prepared by:  Date: June 8, 2023
Quinn Porzio, Test Engineer

Approved by:  Date: June 8, 2023
Vanessa Hansen, Operations Manager

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Pole Testing of a 2023 Mazda Mazda3 4 Door Sedan NHTSA No.: O20235402	***5. Report Date*** June 8, 2023 ***6. Performing Organization Code*** CAL
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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 June 1, 2023 - June 8, 2023 ***14. Sponsoring Agency Code*** NRM-110

15. Supplementary Notes

16. Abstract

A 32.20 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject 2023 Mazda Mazda3 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 June 1, 2023.

The impact velocity of the vehicle was 32.21 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 310 mm located at level 1. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (SID-IIs) (Serial No.300)		
	Units	Threshold	Result
Head Injury Criteria (HIC36)		1000	169.541
Resultant Lower Spine Acceleration	G	82	38.239
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3352.917
Maximum Thoracic Rib Deflection	mm	38	22.152
Maximum Abdominal Rib Deflection	mm	45*	21.739

17. Key Words New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs	***18. Distribution Statement*** Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, 1200 New Jersey Ave. 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 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 Mazda Mazda3 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 Mazda Mazda3 4 Door Sedan. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.21 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on June 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	169.541
Resultant Lower Spine Acceleration	G	82	38.239
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3352.917
Maximum Thoracic Rib Deflection	mm	38	22.152
Maximum Abdominal Rib Deflection	mm	45*	21.739

*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 Airbag	Yes	Yes	Yes	Yes
Side Airbag 2 - Torso Airbag	No	N/A	No	N/A
Side Airbag 3 - Torso/Pelvis Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

GENERAL COMMENTS:

1. P1 serial number - 300

Data Anomalies:

- Left Sill A-Pillar Y Acceleration, Exceeded calibration range at 48.9 ms
- Front Seat Track Y Acceleration, Questionable data throughout

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 Mazda Mazda3 4 Door Sedan | NHTSA No.: O20235402
Test Program: NCAP Side Pole Impact Test | Test Date: 06/01/2023

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20235402
Model Year	2023
Make	Mazda
Model	Mazda 3
Body Style	Four Door Sedan
VIN	3MZBPBDM8PM350333
Body Color	Jet Black Mica
Odometer Reading (km/mi)	22 Miles
Engine Displacement (L)	2.5
Type / No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6-speed
Overdrive	Yes
Final Drive	All Wheel Drive
Roof Rack	No
Sunroof / T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks (ADL)	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	-
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso / Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head / Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso / Pelvis Airbag	Yes
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Rear Pass. Load Limiter	Yes
Other Safety Restraint	-

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Mazda Motor Manufacturing de Mexico S.A. DE C.V.
Date of Manufacture	11/22
Vehicle Type	Passenger Car

GVWR	1923
GVWR Front	1045
GVWR Rear	888

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)				385	(A)
DSC x 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				44.8	(A-B)

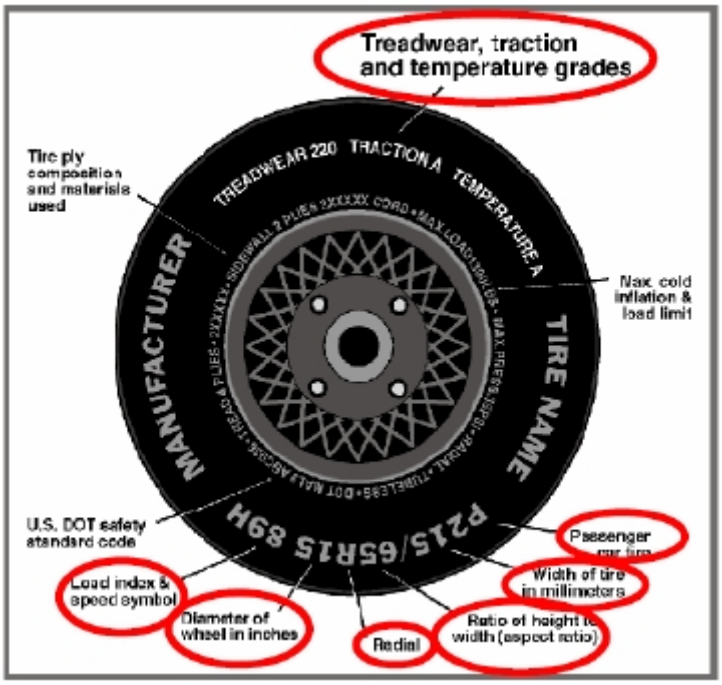
VEHICLE SEAT TYPE

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 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023

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)	250	250
Recommended Tire Size	215/45R18	215/45R18
Tire Size on Vehicle	215/45R18	215/45R18
Tire Manufacturer	Toyo	Toyo
Tire Model	Proxes A40	Proxes A40
Treadwear	300	300
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	89V	89V
Tire Material	Rubber	Rubber
DOT Safety Code Left	N3X09VY0822	N3X09VY0922
DOT Safety Code Right	N3X09VY1222	N3X09VY0422

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

Test Vehicle: 2023 Mazda Mazda3 4 Door Sedan NHTSA No.: O20235402
Test Program: NCAP Side Pole Impact Test Test Date: 06/01/2023

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	248	296	250	246
Tire Placard	kPa	250	250	250	250
Owner's Manual	kPa	250	250	250	250
As Tested	kPa	250	250	250	250

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Rear	Total	Total	Front	Rear	Total
Left	kg	468.0	288.0		484.0	321.0		489.0	327.0	
Right	kg	439.0	303.0		457.0	325.0		440.5	335.5	
Ratio	%	60.5	39.5		59.3	40.7		58.4	41.6	
Totals	kg	907.0	591.0	1498.0	941.0	646.0	1587.0	929.5	662.5	1592.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1498	(A)
Actual Weight of 1 P572V (SID-IIs) ATD Used	kg	50	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	44.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1592.8	(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)? [X] **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	+ 0.20	+0.15	- 0.05	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg	- 0.25	-0.25	-0.05	Yes
Front Bumper-Line Angle (left-to-right)**	Deg	- 0.20	-0.20	- 0.25	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg	+ 0.15	+0.20	+ 0.20	Yes
Vehicle CG (Aft of Front Axle)	mm	1074	1108	1133	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	-7	-11	-20	

* 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:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	11
Spare Tire	11
Jack	2
Ballast / Equipment Added	8

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

TEST SURFACE MARKING

	Distance from 75° Impact Location Line (mm)
Fore 25 mm target	591
Aft 25 mm target	593

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

Test Vehicle:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023

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	18.8	11.0	14.9
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) (º)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	14.9	53	Max	53	66	78
			Mid	28	40	53
			Min	2	15	28
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

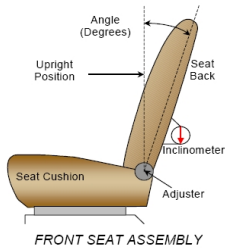
Test Vehicle:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	254	Powered	0	Powered
Front Passenger Seat	255	33 (0-32)	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.



FRONT SEAT ASSEMBLY

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/Seated Dummy	61.9	Powered	- 3.0	Powered
Front Passenger Seat	58.3	31 (0-30)	- 0.5	1
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	4 (0-3)	0

HEAD RESTRAINT ADJUSTMENT

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

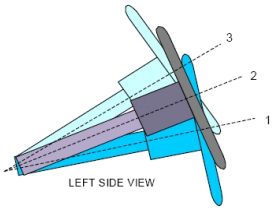
Seat	Total # of Positions	Placed in Position #
Driver Seat	4 (0-3)	Lowermost

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

Test Vehicle:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023

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.



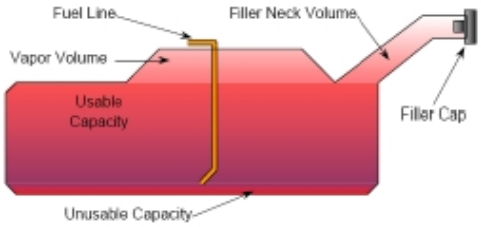
STEERING COLUMN ASSEMBLY

	Degrees	Fore / Aft Position (mm)
Lowermost - Position No. 1	19.9	
Geometric center - Position No. 2	22.4	
Uppermost - Position No. 3	24.8	
Telescoping Steering Wheel Travel		68
Test Position	22.4	34

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.



VEHICLE FUEL TANK ASSEMBLY

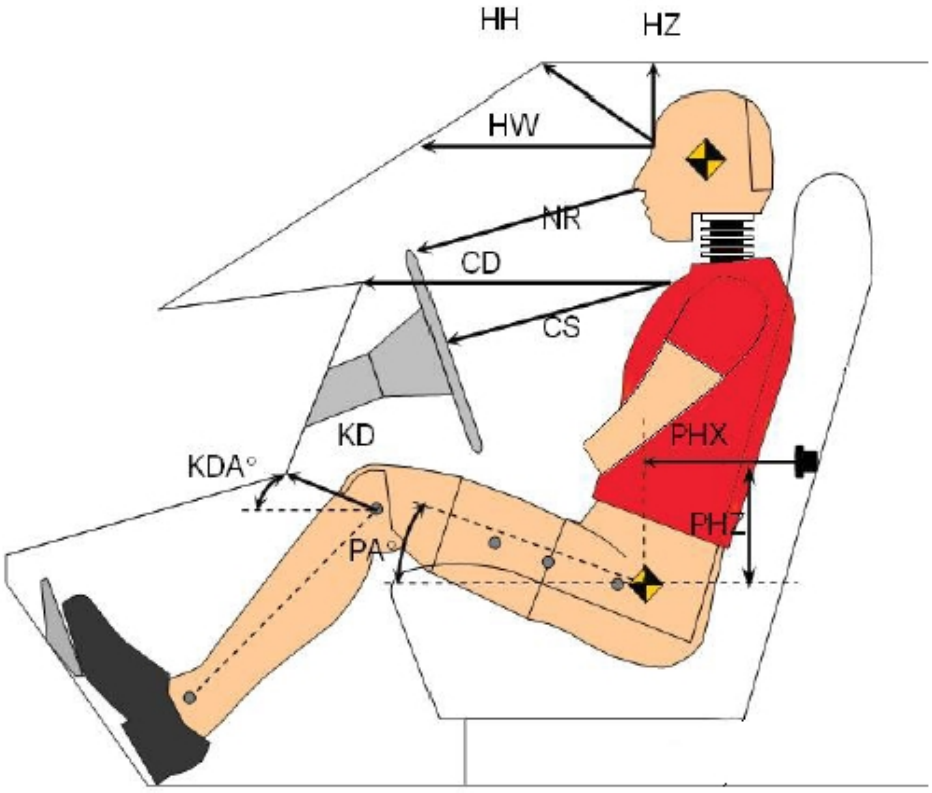
FUEL TANK CAPACITY

Description		Liters
Usable Capacity of “Standard Tank”	- see Form No. 1	48.0
Usable Capacity of “Optional Tank”	- see Form No. 1	N/A
Usable Capacity of “Standard Tank”	- see Owner’s Manual	48.0
Usable Capacity of “Optional Tank”	- see Owner’s Manual	N/A
93% of Usable Capacity		44.64
Actual Amount of Solvent Used in Test		44.6
1/3 of Usable Capacity		16.0

Is the Actual Amount of Solvent Used in the test equal to 93% ±1% of the Usable Capacity stated in Form No. 1? [X] Yes [ ] No

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023



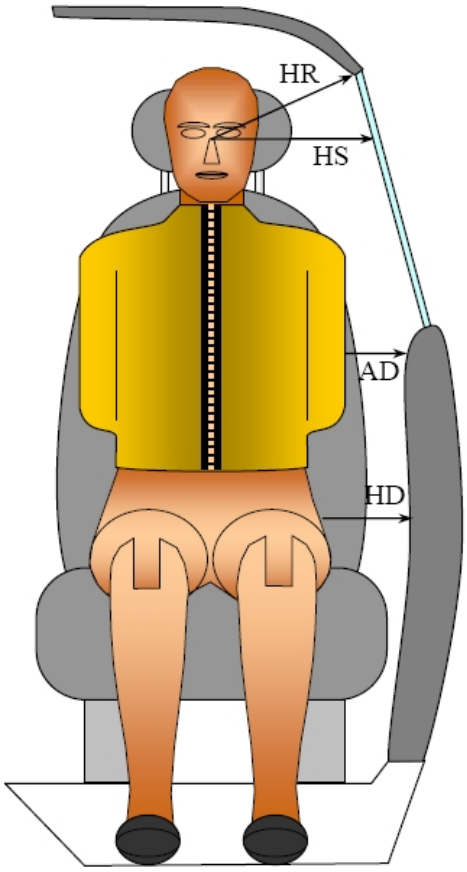
Left Side View

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver (Serial No. 300)	
		Length (mm)	Angle (°)
HH	Head to Header	230	
HW	Head to Windshield	559	
HZ	Head to Roof Liner	171	
NR	Nose to Rim/Dash	220	
CD	Chest to Dash	400	
CS	Chest to Steering Wheel	161	
KD(L) / KDA(L)◦	Left Knee to Dash	124	28.8
KD(R) / KDA(R)◦	Right Knee to Dash	125	27.0
PAX◦	Pelvic Tilt Angle (X-Axis)		20.2
PAY◦	Pelvic Tilt Angle (Y-Axis)		0.3
PHX	Hip Point to Striker (X-Axis)	322	
PHZ	Hip Point to Striker (Z-Axis)	168	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023



FRONT VIEW OF DUMMY

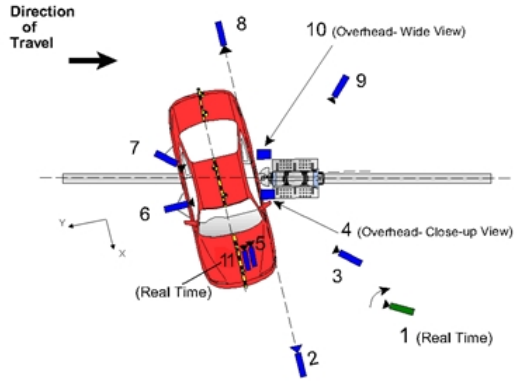
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver – Length (Serial No. 300)
HR	Head to Side Header	mm	226
HS	Head to Side Window	mm	353
AD	Arm to Door	mm	141
HD	H-Point to Door	mm	250

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2023 Mazda Mazda3 4 Door Sedan NHTSA No.: O20235402

Test Program: NCAP Side Pole Impact Test Test Date: 06/01/2023



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	30
2	Front ground level - impact view	-198	7485	-1439	24	1000
3	Impact side 45º - forward pole view	1270	-4555	-1402	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	0	-8648	-1641	24	1000
9	Impact side 45º - rearward pole view	4217	-3592	-1452	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 75º angle to the rigid pole.*

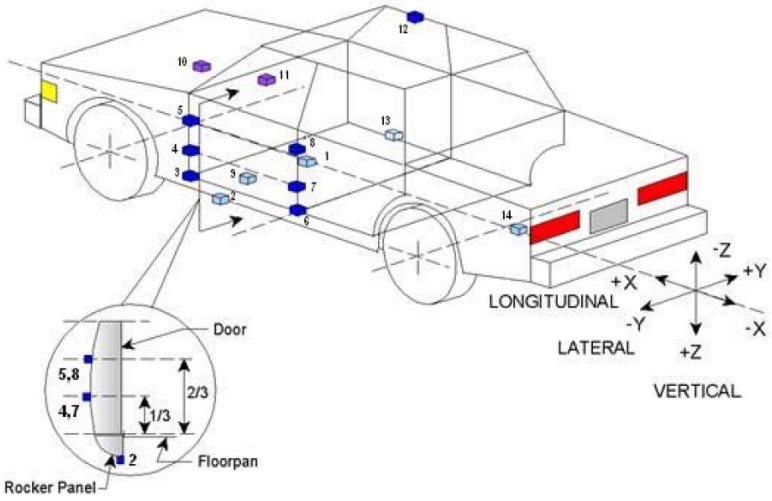
If applicable, explain why camera(s) did not operate as intended: All cameras operated as intended.

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 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2082	-2	269
2	Left Floor Sill	2771	-680	345
3	A-Pillar Sill	3198	-606	349
4	A-Pillar Low	3269	-612	184
5	A-Pillar Mid	3032	-639	-296
6	B-Pillar Sill	2101	-689	328
7	B-Pillar Low	2174	-688	75
8	B-Pillar Mid	2095	-656	-258
9	Driver Seat Track	2377	-550	390
10	Engine Top	3811	267	-137
11	Firewall	3467	197	-38
12	Right Roof	2178	612	-705
13	Right Floor Sill	2814	673	355
14	Rear Floor Pan	913	-36	273

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 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023

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: 2023 Mazda Mazda3 4 Door Sedan
NHTSA No.: O20235402
Test Program: NCAP Side Pole Impact Test
Test Date: 06/01/2023

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 & Head Rest
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:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-PIllar and C-Pillar buckled
Sill Separation	345 mm at rear pinch weld and 185 mm on pinch weld at impact location
Windshield Damage	Cracked throughout and separated along A-Pillar
Side Window Damage	Driver window shattered on impact
Other Notable Effects	Sunroof separated from its track on the left side

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 Airbag	Yes	Yes	Yes	Yes
Side Airbag 2 - Torso Airbag	No	N/A	No	N/A
Side Airbag 3 - Torso/Pelvis Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

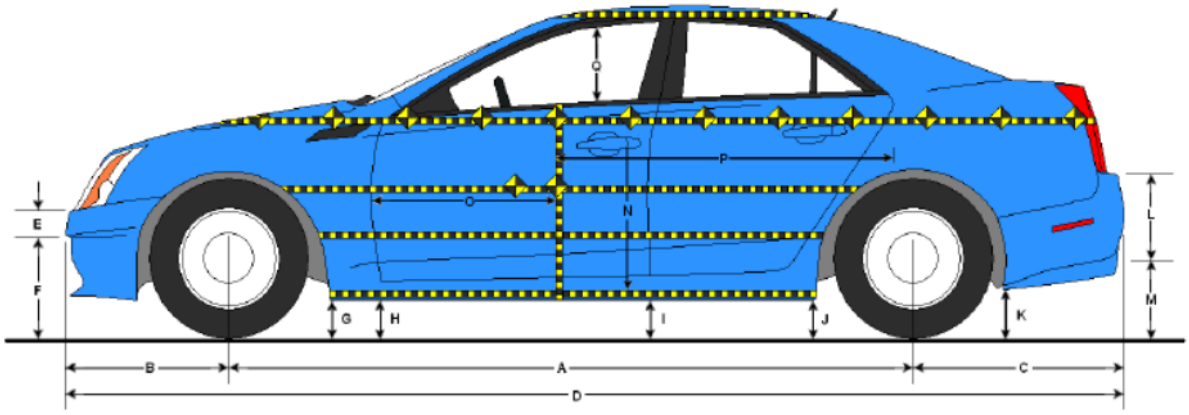
VEHICLE SPEED, VEHICLE ANGLE AT IMPACT AND IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vertical Impact Ref Line - Aft of Front Axle, Intended Impact Pt	mm		1153
Actual Impact Point - Aft of Front Axle	mm		1156
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	32.21
Trap No. 2 Velocity - Redundant	kph	31.4 to 33.0	32.13

*Of Intended Impact Point

DATA SHEET NO. 9
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023



LEFT SIDE VIEW

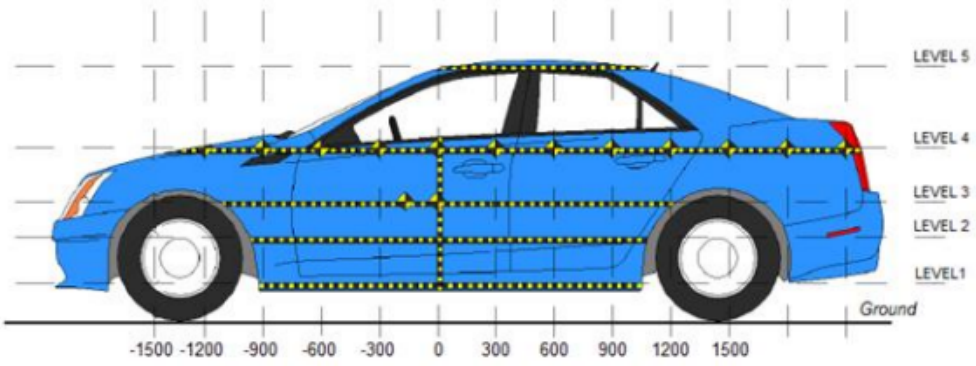
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

No.	Measurement Description	Pre-Test	Post-Test	Change
A	Vehicle Wheelbase	2723	2716	-7
B	Front Axle to FSOV	922	874	-48
C	Rear Axle to RSOV	1018	1072	54
D	Total Length at Centerline	4662	4662	0
E	Front Bumper Thickness	120	120	0
F	Front Bumper Bottom to Ground	389	393	4
G	Sill Height at Front Wheel Well	156	169	13
H	Sill Height at Front Door Leading Edge	163	172	9
I	Sill Height at B Pillar	169	200	31
J1	Sill Height at Rear Wheel Well	170	196	26
J2	Pinch Weld Height at Rear Wheel Well	159	161	2
K	Sill Height Aft of Rear Wheel Well	225	237	12
L	Rear Bumper Thickness	162	162	0
M	Rear Bumper Bottom to Ground	442	453	11
N	Sill Height to Bottom of Front Window Sill	714	728	14
O	Front Door Leading Edge to Impact CL	617	556	-61
P	Rear Door Trailing Edge to Impact CL	1418	1349	-69
Q	Front Window Opening	309	305	-4
R	Right Side Length	4527	4518	-9
S	Left Side Length	4527	4476	-51
T	Vehicle Width at B-Pillars	1800	1674	-126
U	Front Wheel Track Width	1566	1570	4
V	Rear Wheel Track Width	1570	1571	1

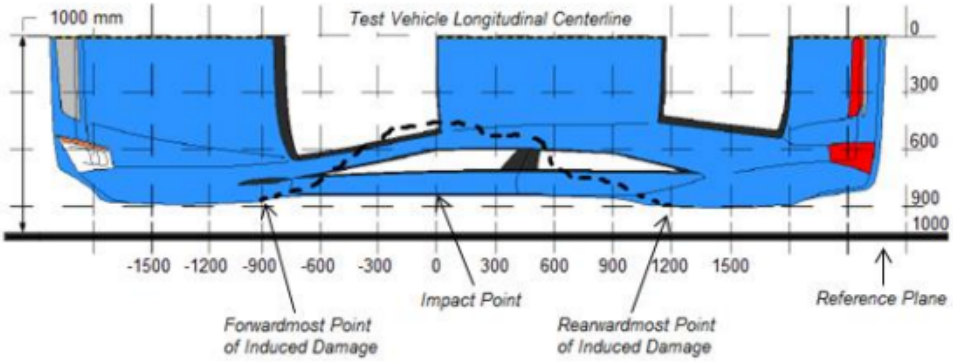
* All measurements in mm with tolerance of ± 3mm

DATA SHEET NO.10
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023



Left Side View



Overhead View

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	317	310	0
2	Driver H-Point	mm	543	307	0
3	Mid-Door	mm	648	302	0
4	Window Sill	mm	948	263	0
5	Window Top	mm	1384	53	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 Mazda Mazda3 4 Door Sedan NHTSA No.: O20235402
Test Program: NCAP Side Pole Impact Test Test Date: 06/01/2023

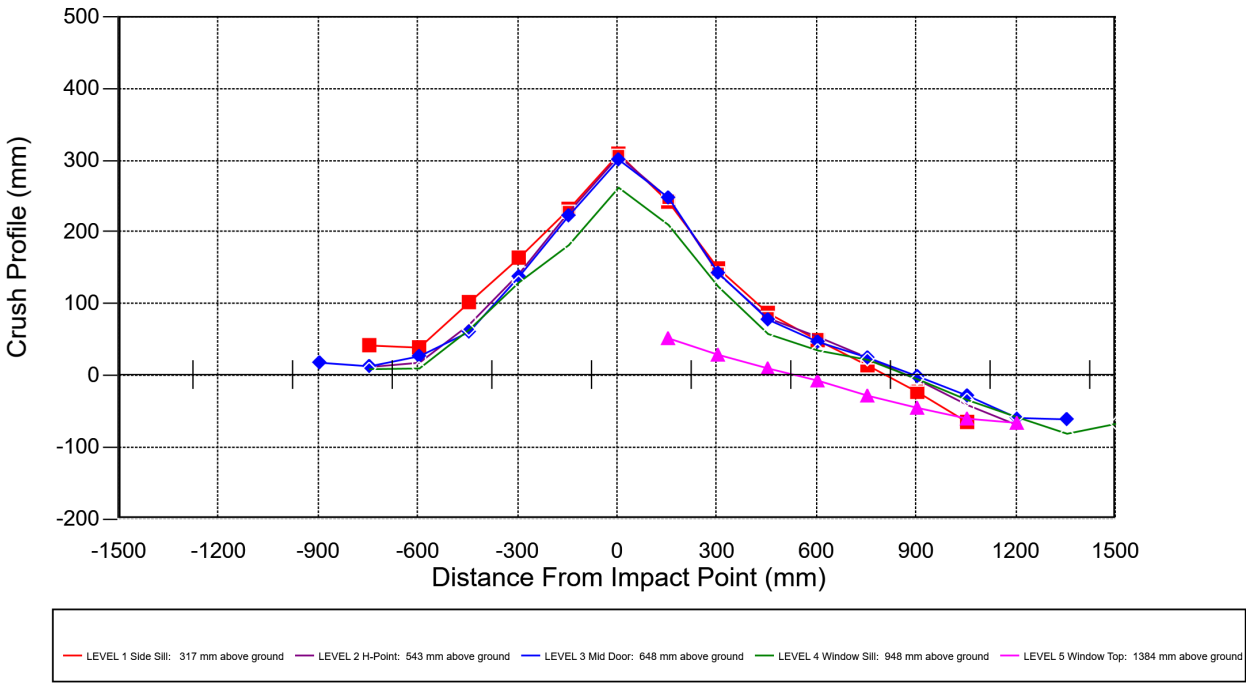
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	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			902					883					19		
-750	880	898	894	793		837	885	880	783		43	13	14	10	
-600	880	889	887	805		840	870	859	794		40	19	28	11	
-450	881	883	882	814		778	811	820	749		103	72	62	65	
-300	882	880	880	851		717	737	741	720		165	143	139	131	
-150	882	879	878	834		649	650	654	651		233	229	224	183	
0	881	880	878	839		571	573	576	576		310	307	302	263	
150	880	881	879	842	608	637	633	630	631	555	243	248	249	211	53
300	879	882	880	843	617	729	739	736	718	587	150	143	144	125	30
450	877	884	881	843	617	789	803	802	784	606	88	81	79	59	11
600	874	885	881	841	614	824	830	833	805	620	50	55	48	36	-6
750	872	887	883	837	609	857	861	857	814	636	15	26	26	23	-27
900	872	890	886	833	603	894	895	886	837	647	-22	-5	0	-4	-44
1050	873	896	891	830	593	937	936	918	863	652	-64	-40	-27	-33	-59
1200		902	903	829	568		970	961	886	633		-68	-58	-57	-65
1350			900	829				960	909				-60	-80	
1500				830					896					-66	

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 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023

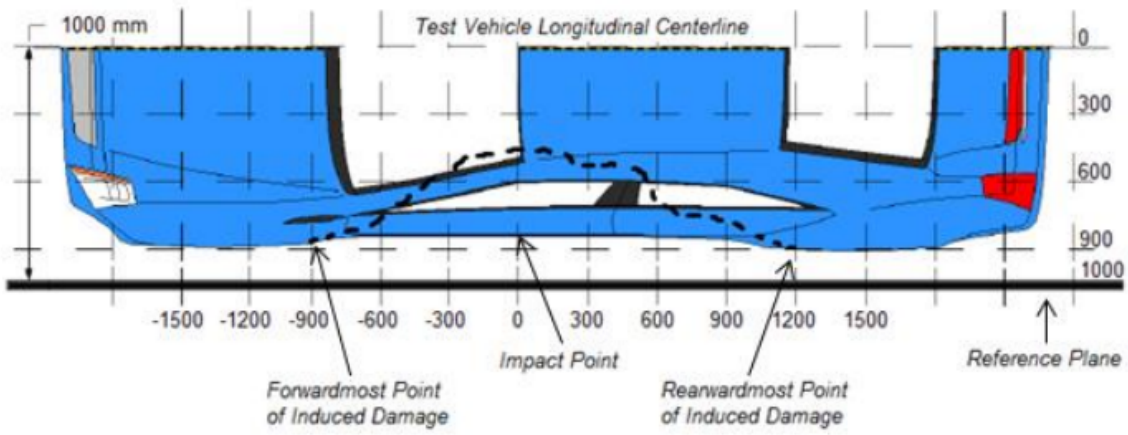


Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO.11
VEHICLE DAMAGE PROFILE DISTANCE

Test Vehicle:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023

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



Overhead View

VEHICLE DAMAGE PROFILE DISTANCES

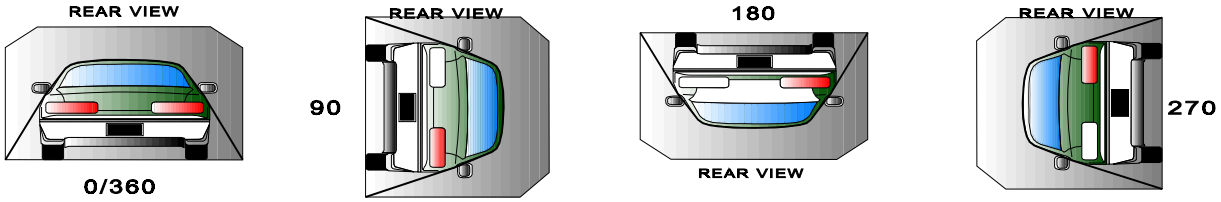
DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-900	3	117	98	19
2	-450	3	180	118	62
3	0	3	424	122	302
4	450	3	198	119	79
5	900	3	114	114	0
6	1350	3	40	100	-60

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

Test Vehicle:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023
Test Time:	9:06 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°	70	300	370
90° to 180°	65	300	365
180° to 270°	62	300	362
270° to 360°	68	300	368

FMVSS 301 SPILLAGE TABLE

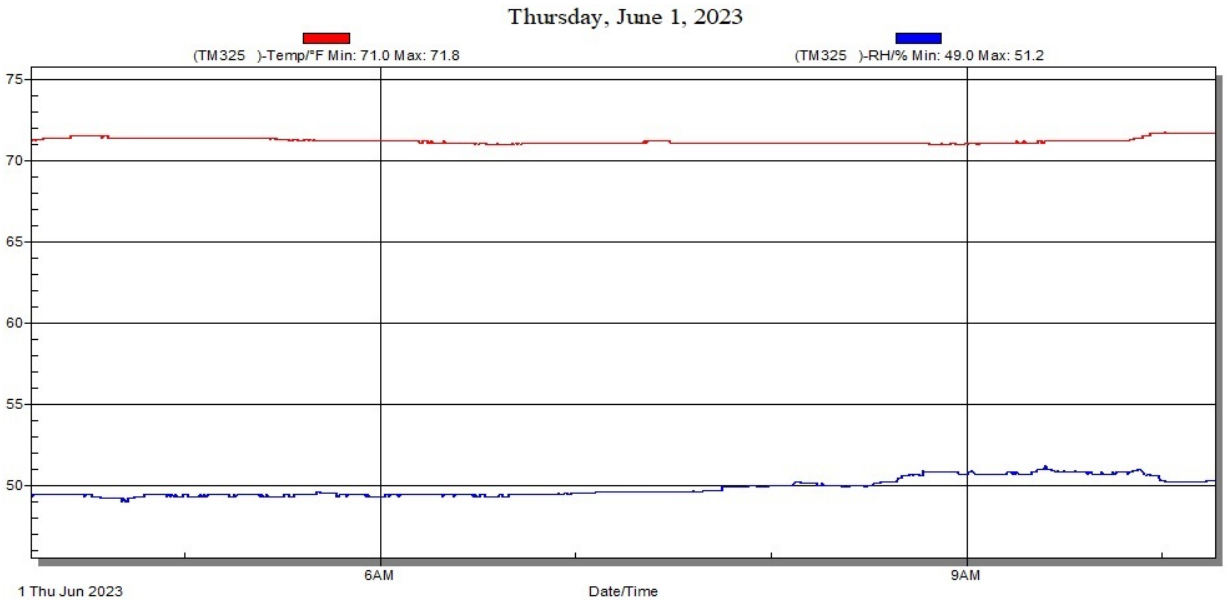
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0.0	0.0	0.0	
90° to 180°	0.0	0.0	0.0	
180° to 270°	0.0	0.0	0.0	
270° to 360°	0.0	0.0	0.0	

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	No Spillage Occurred
90° to 180°	No Spillage Occurred
180° to 270°	No Spillage Occurred
270° to 360°	No Spillage Occurred

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

Test Vehicle:	2023 Mazda Mazda3 4 Door Sedan	NHTSA No.:	O20235402
Test Program:	NCAP Side Pole Impact Test	Test Date:	06/01/2023



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

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Figure A-1: As Delivered Right Front ¾ View of Test Vehicle

Figure A-2: As Delivered Left Rear ¾ View of Test Vehicle

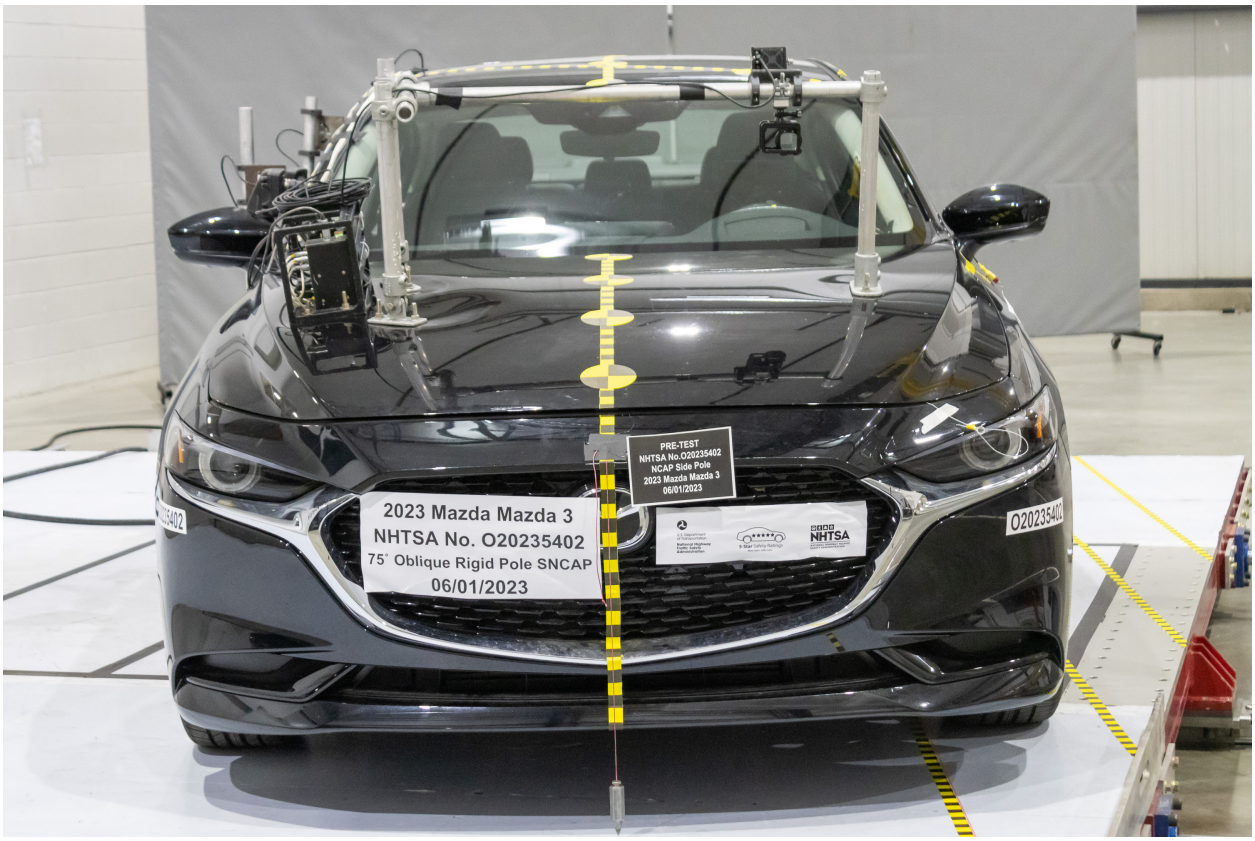


Figure A-3: Pre-Test Frontal View of Test Vehicle

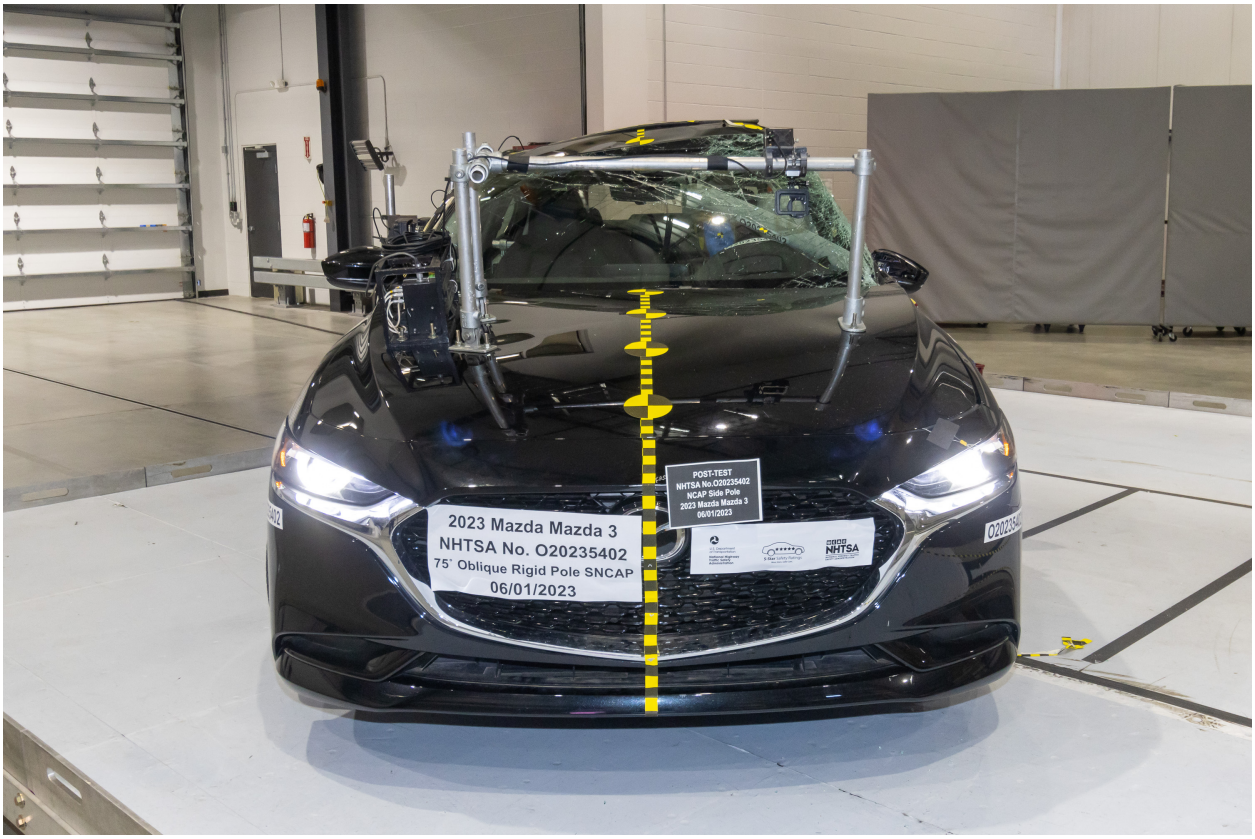


Figure A-4: Post-Test Frontal View of Test Vehicle

Figure A-5: Pre-Test Left Front ¾ View of Test Vehicle

Figure A-6: Post-Test Left Front ¾ View of Test Vehicle

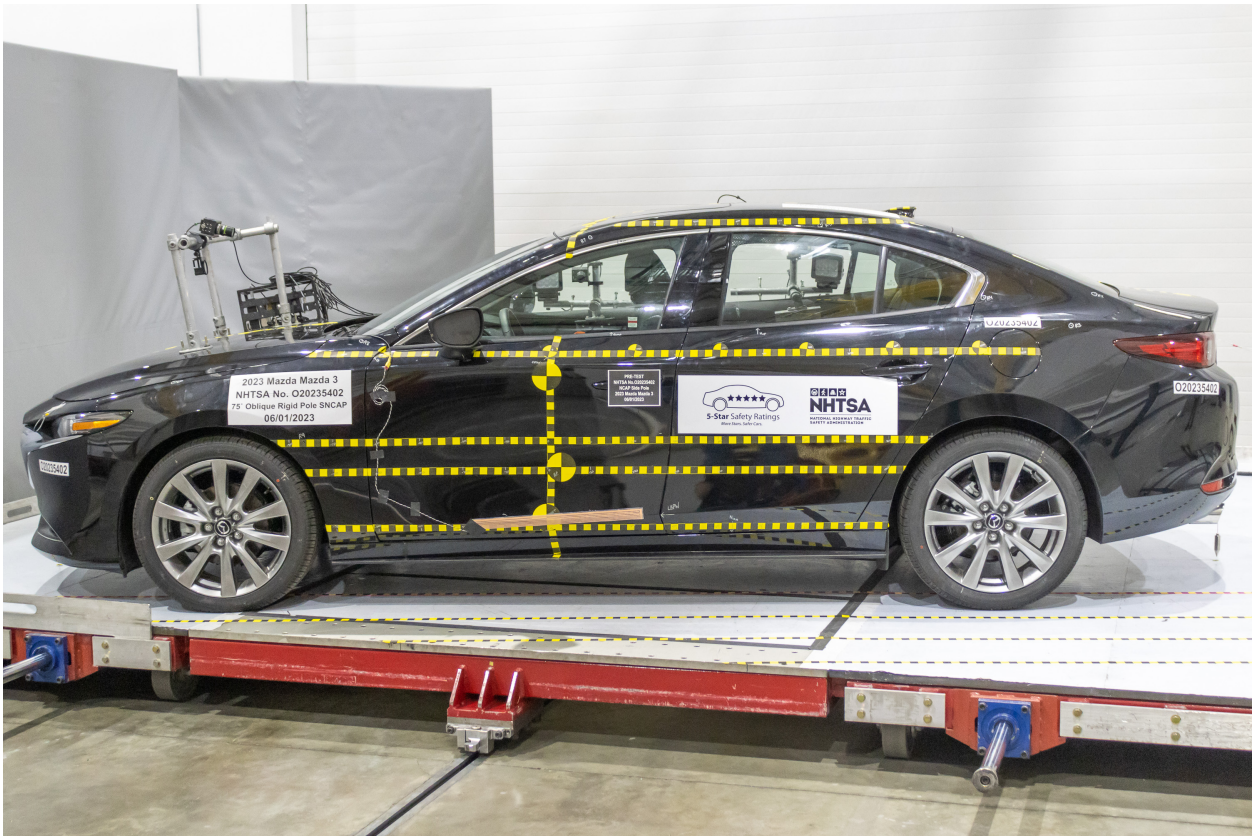


Figure A-7: Pre-Test Left Side View of Test Vehicle

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

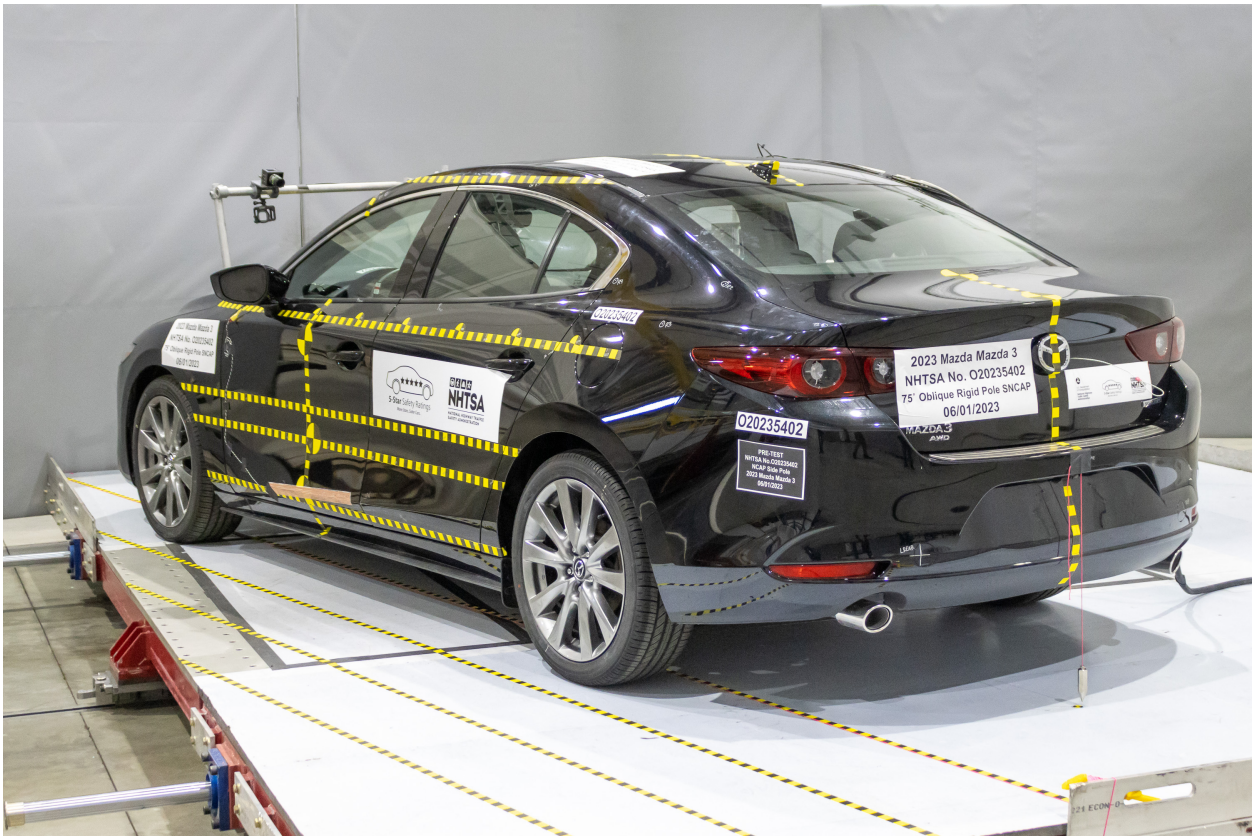


Figure A-9: Pre-Test Left Rear ¾ View of Test Vehicle

Figure A-10: Post-Test Left Rear ¾ View of Test Vehicle

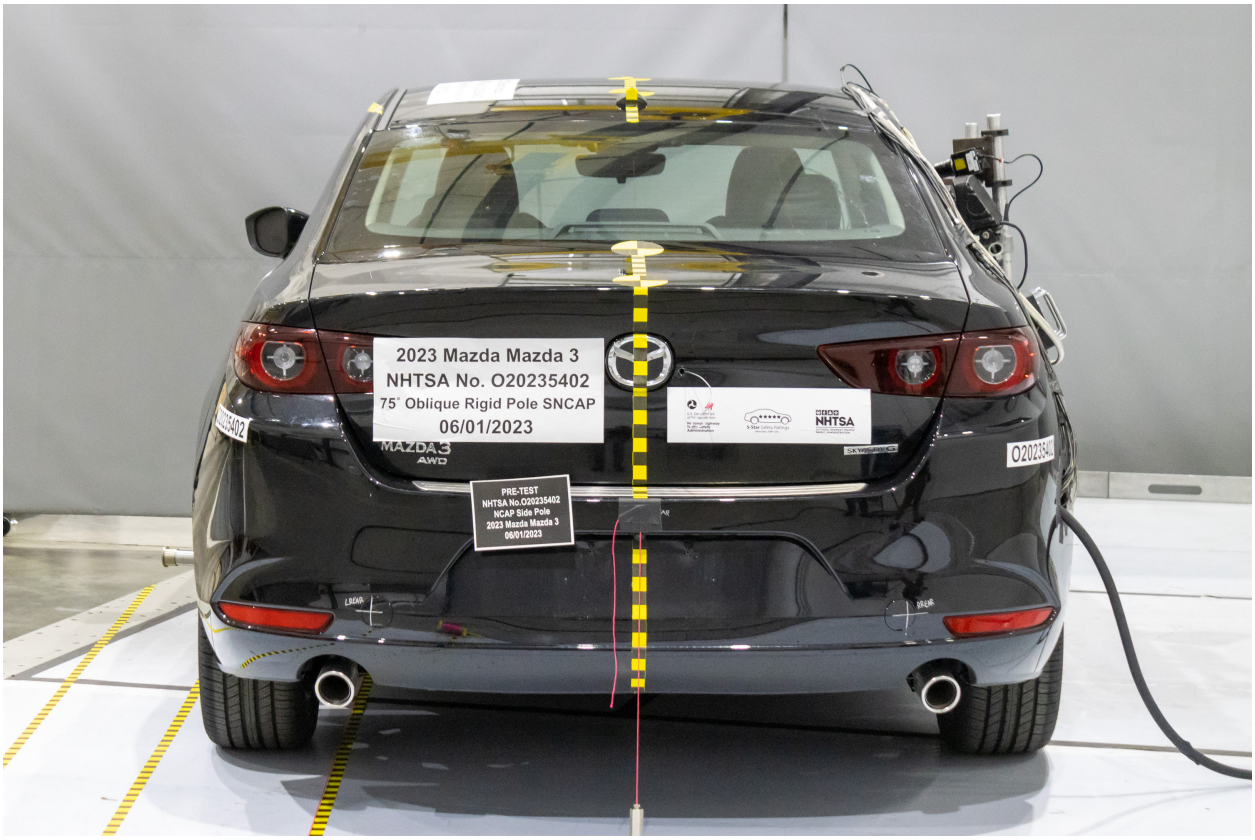


Figure A-11: Pre-Test Rear View of Test Vehicle

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

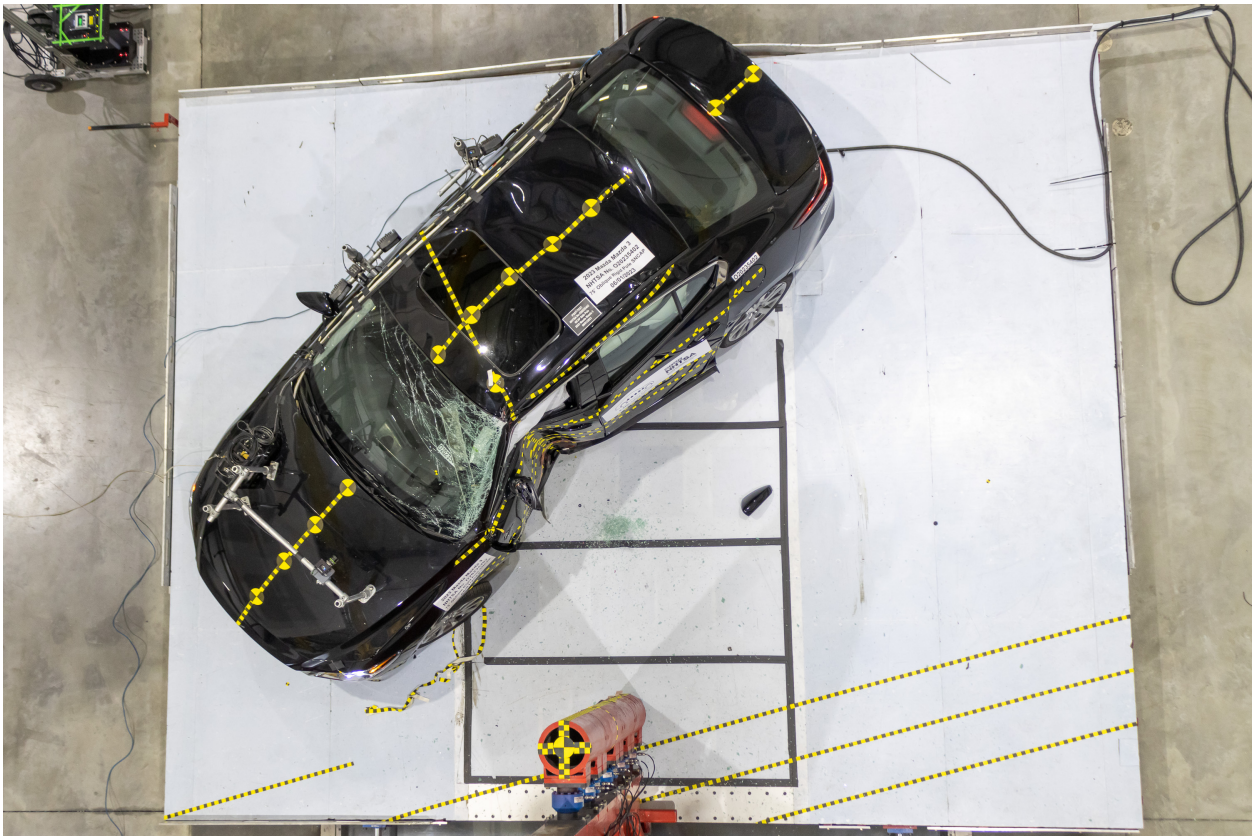


Figure A-16: Post-Test Overhead View of Test Area

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

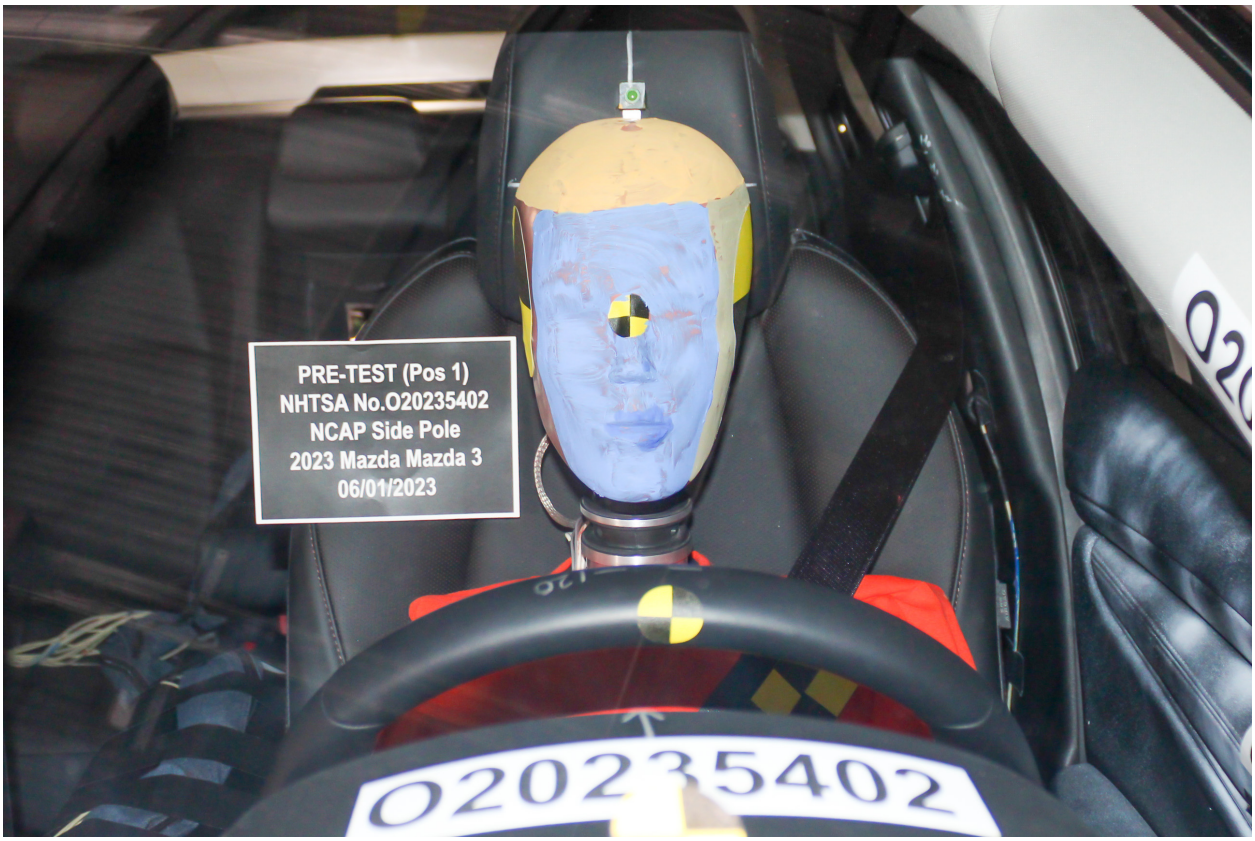


Figure A-21: Pre-Test Front Close-Up View of Dummy Head and Chest

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

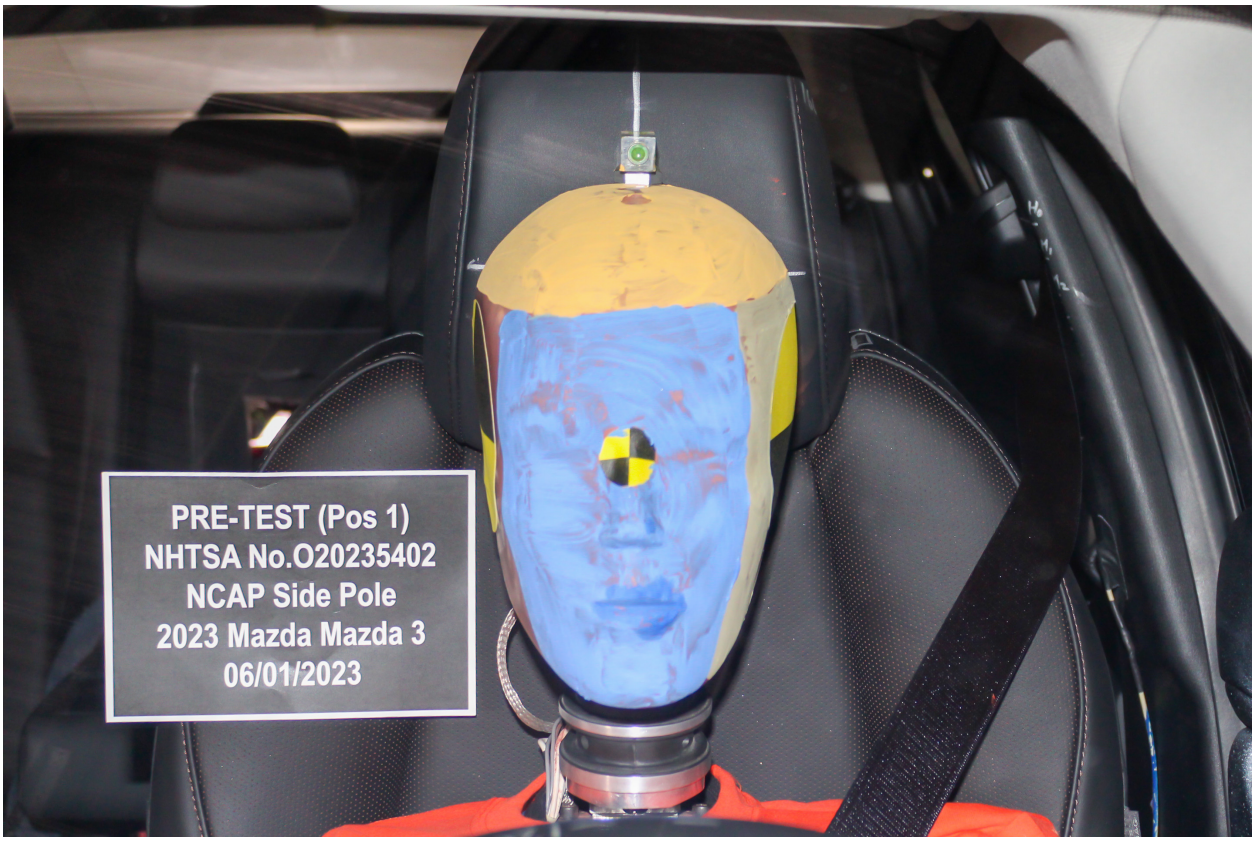


Figure A-27: Pre-Test Frontal Close-Up View of Dummy Head / Shoulders in Relation to Head Restraint

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

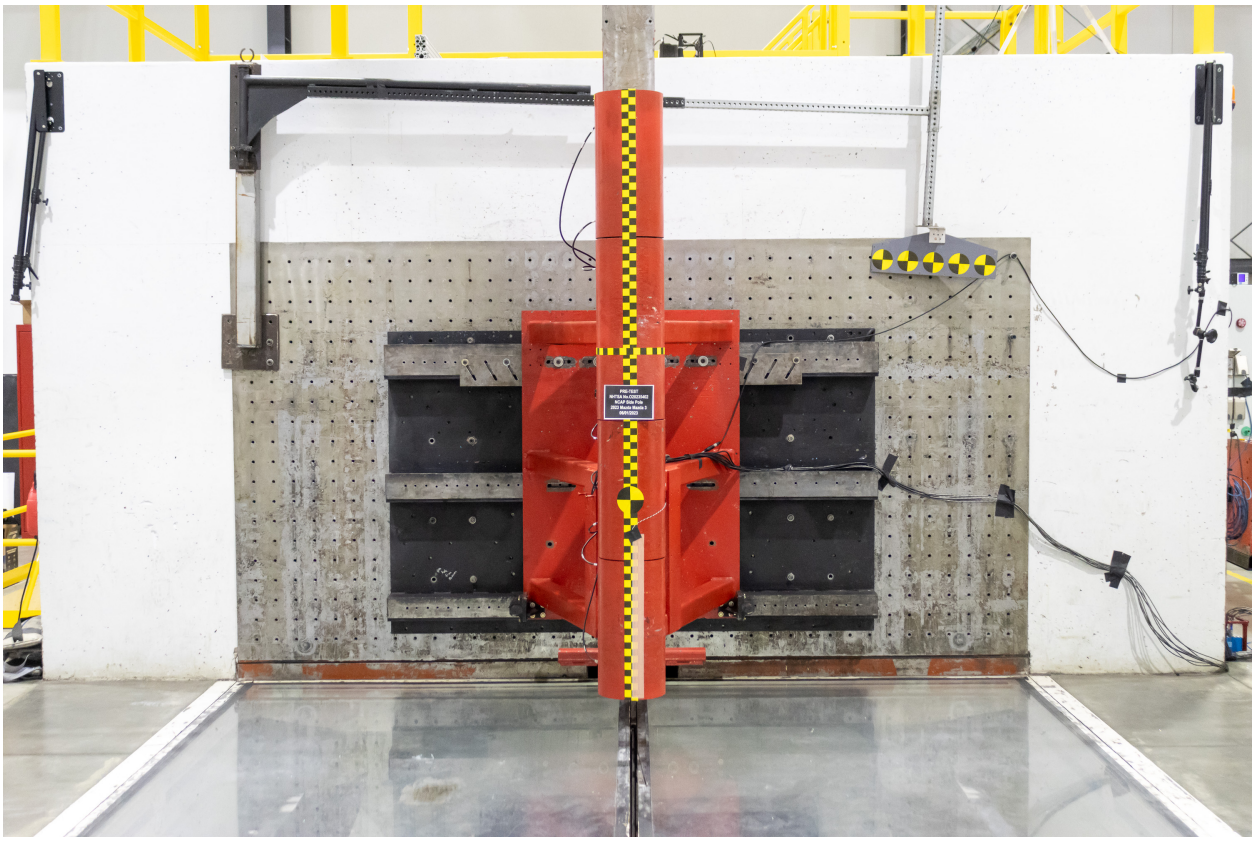


Figure A-59: Pre-Test Pole Barrier Front View

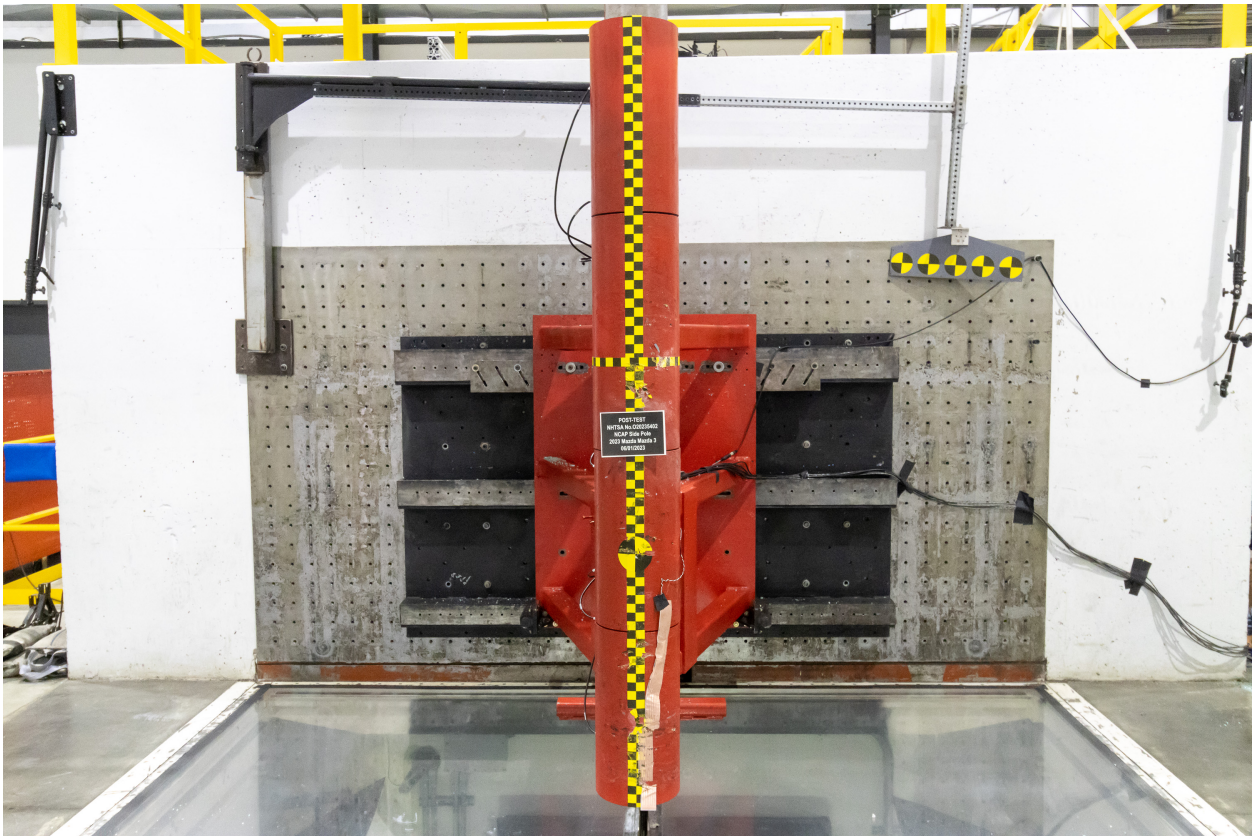


Figure A-60: Post-Test Pole Barrier Front View

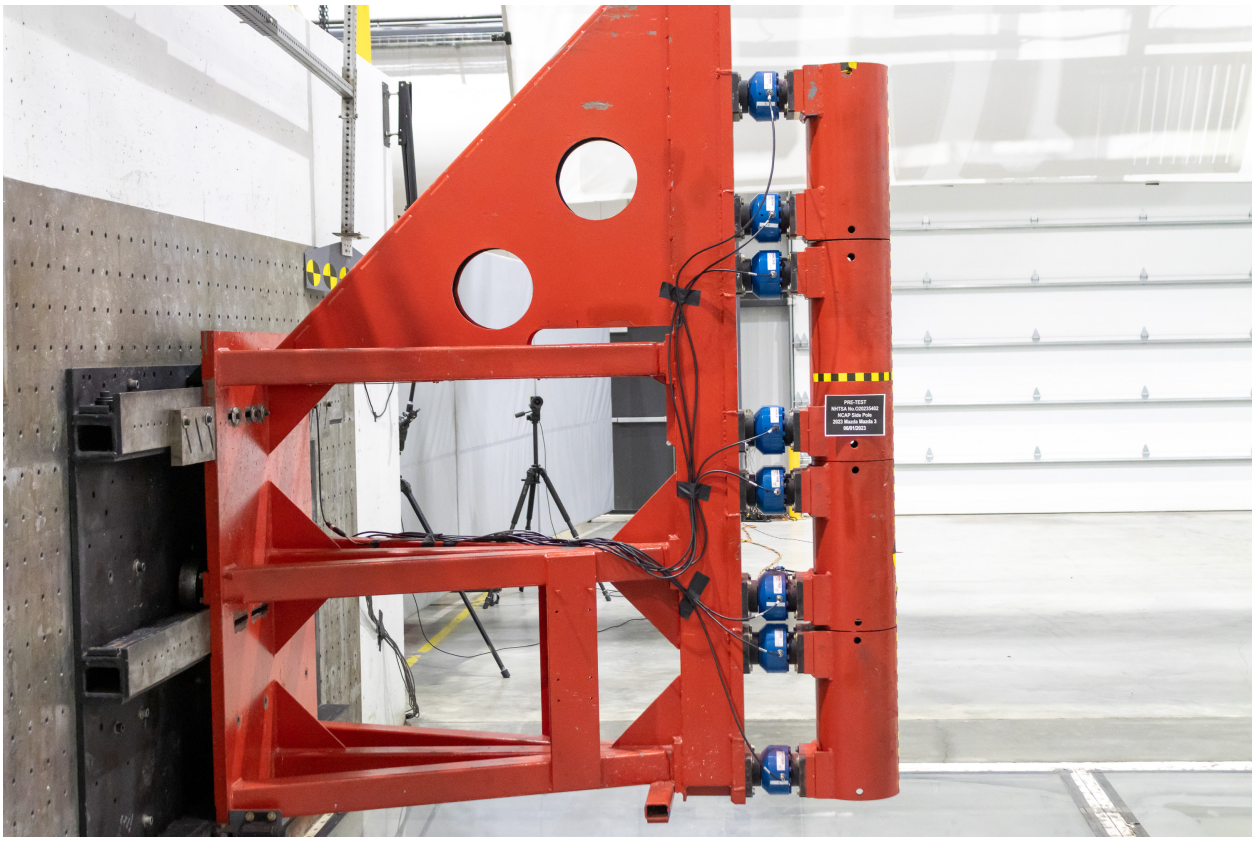


Figure A-61: Pre-Test Pole Barrier Side View

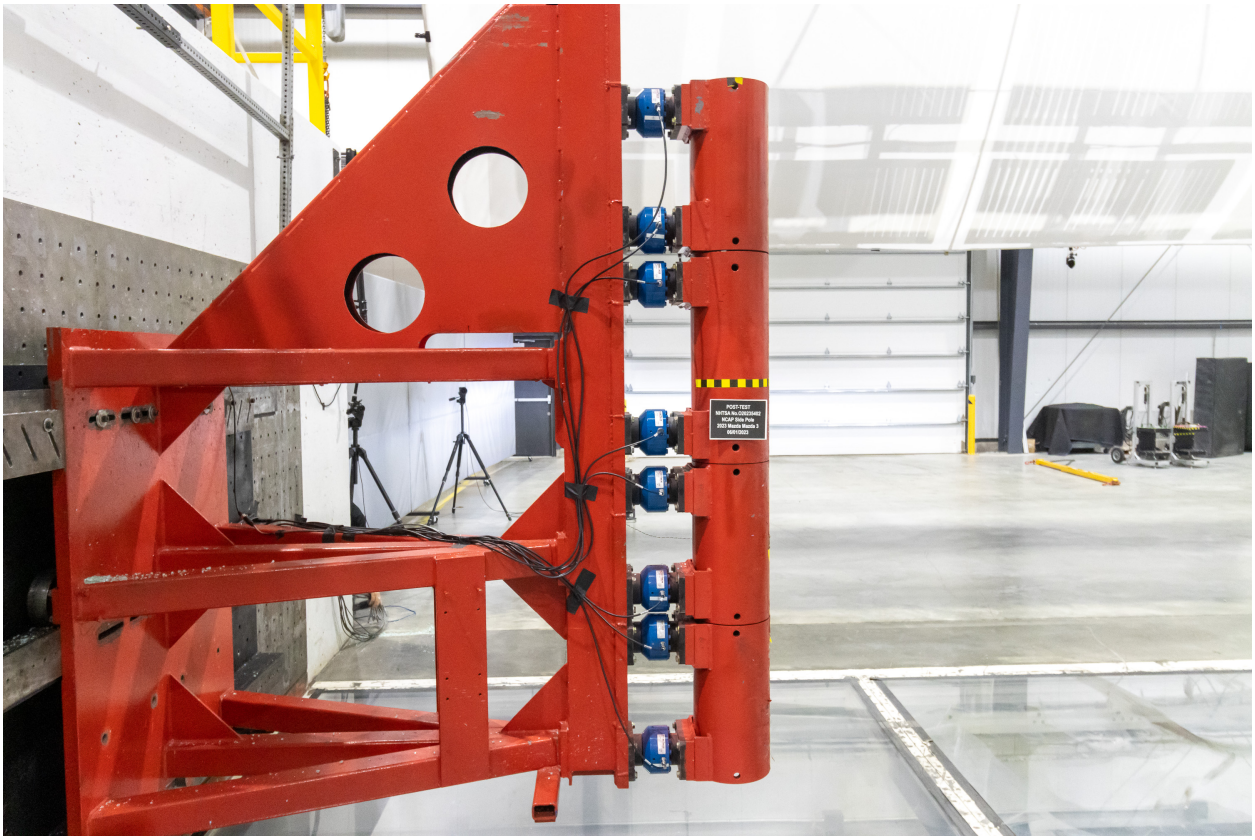


Figure A-62: Post-Test Pole Barrier Side View

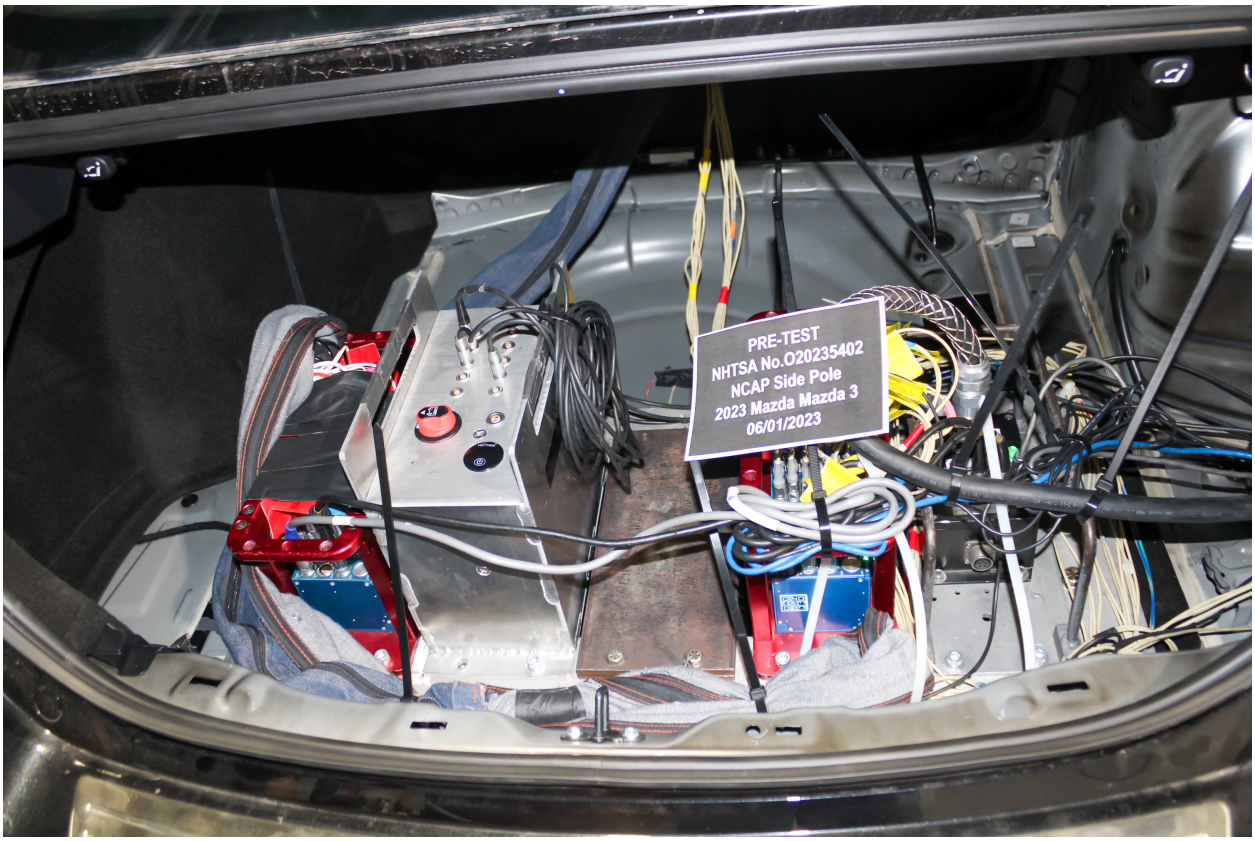


Figure A-63: Pre-Test Ballast View

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

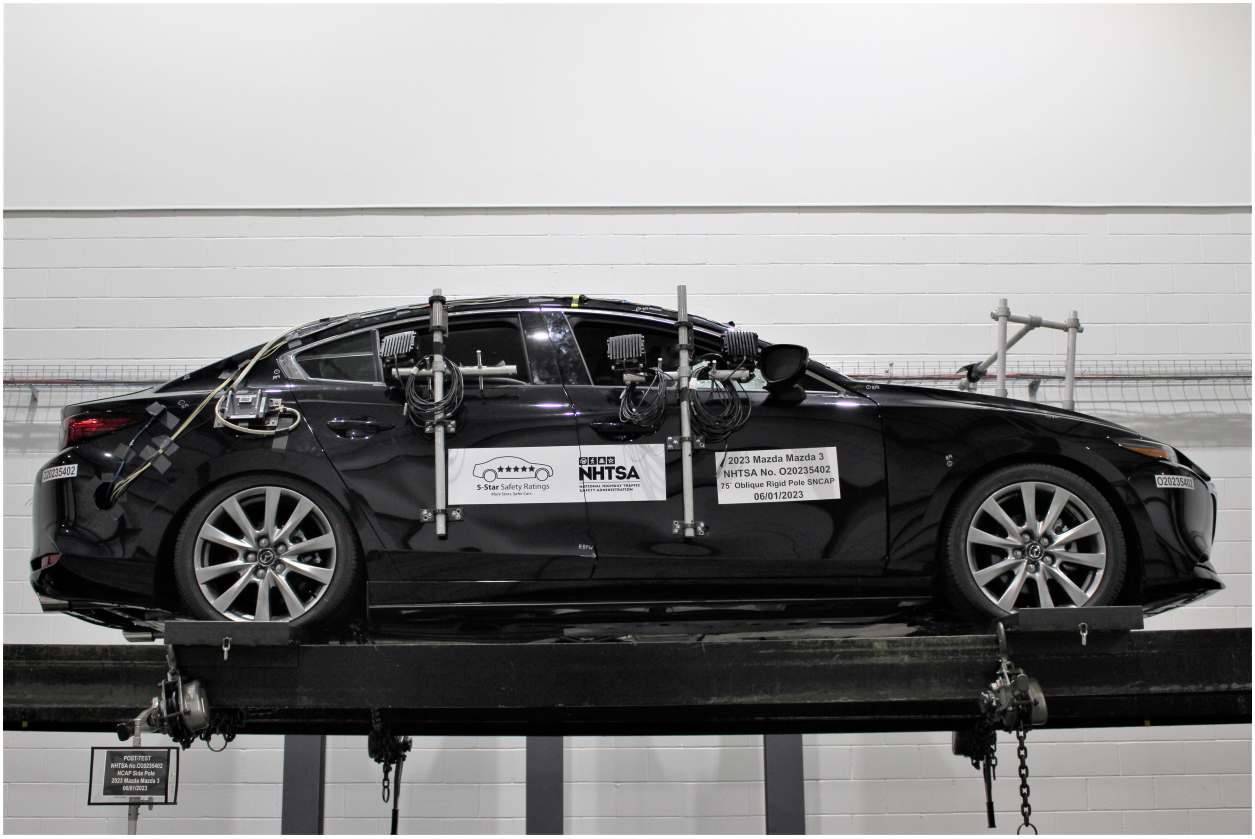


Figure A-65: FMVSS No. 301 Static Rollover 0 Degrees

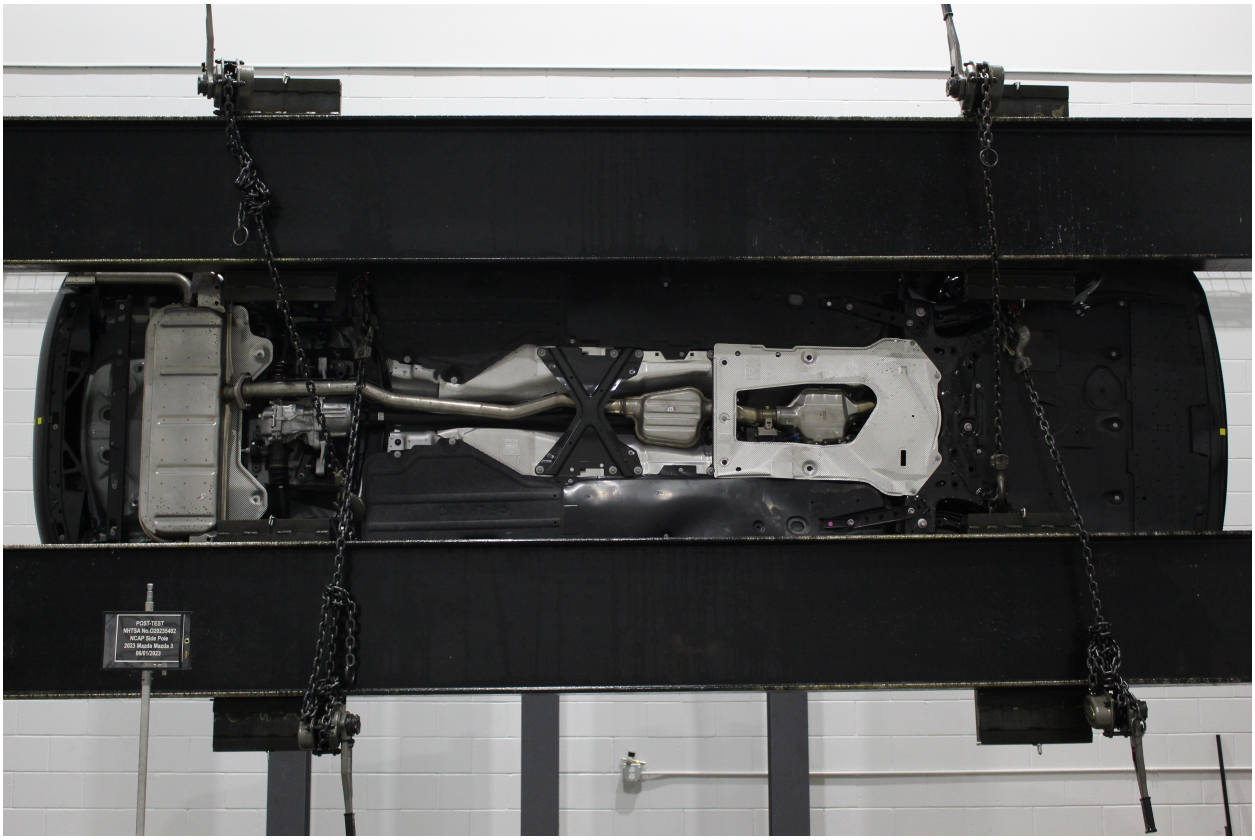


Figure A-66: FMVSS No. 301 Static Rollover 90 Degrees

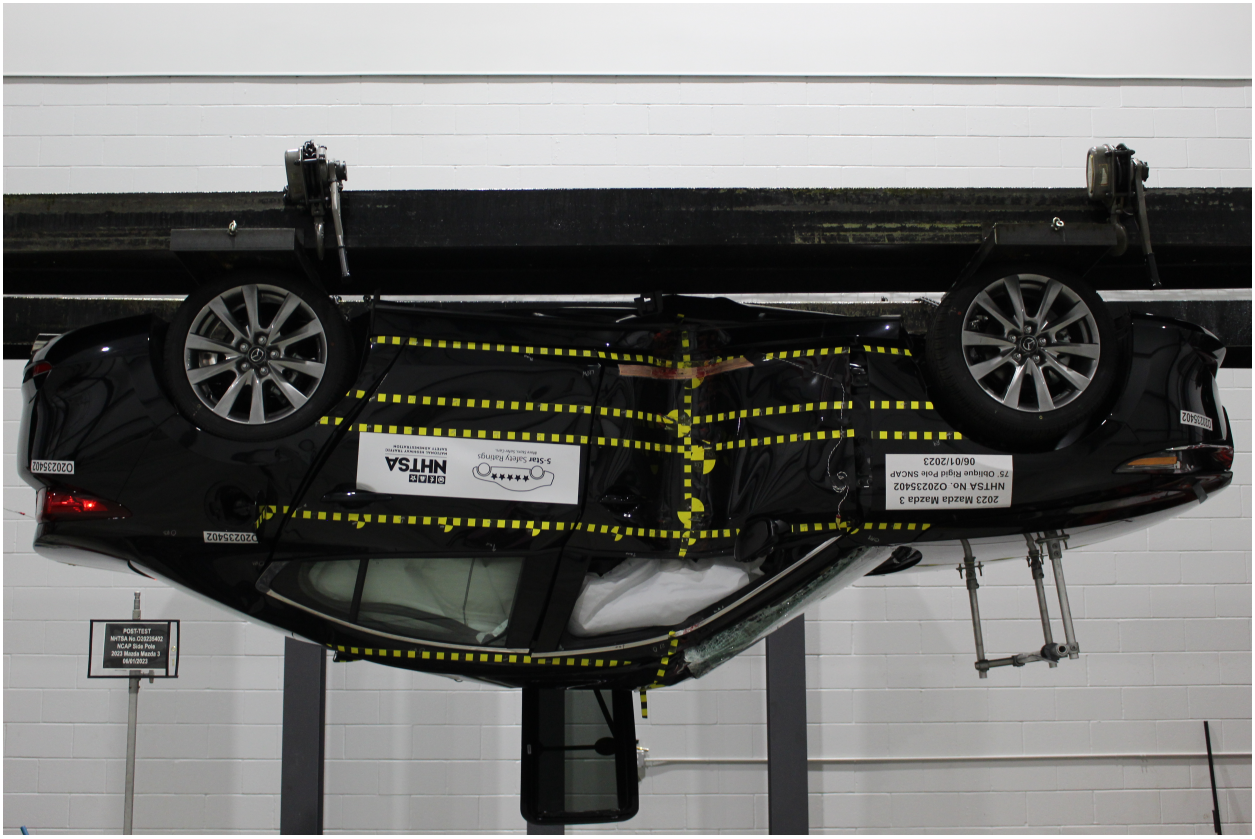


Figure A-67: FMVSS No. 301 Static Rollover 180 Degrees

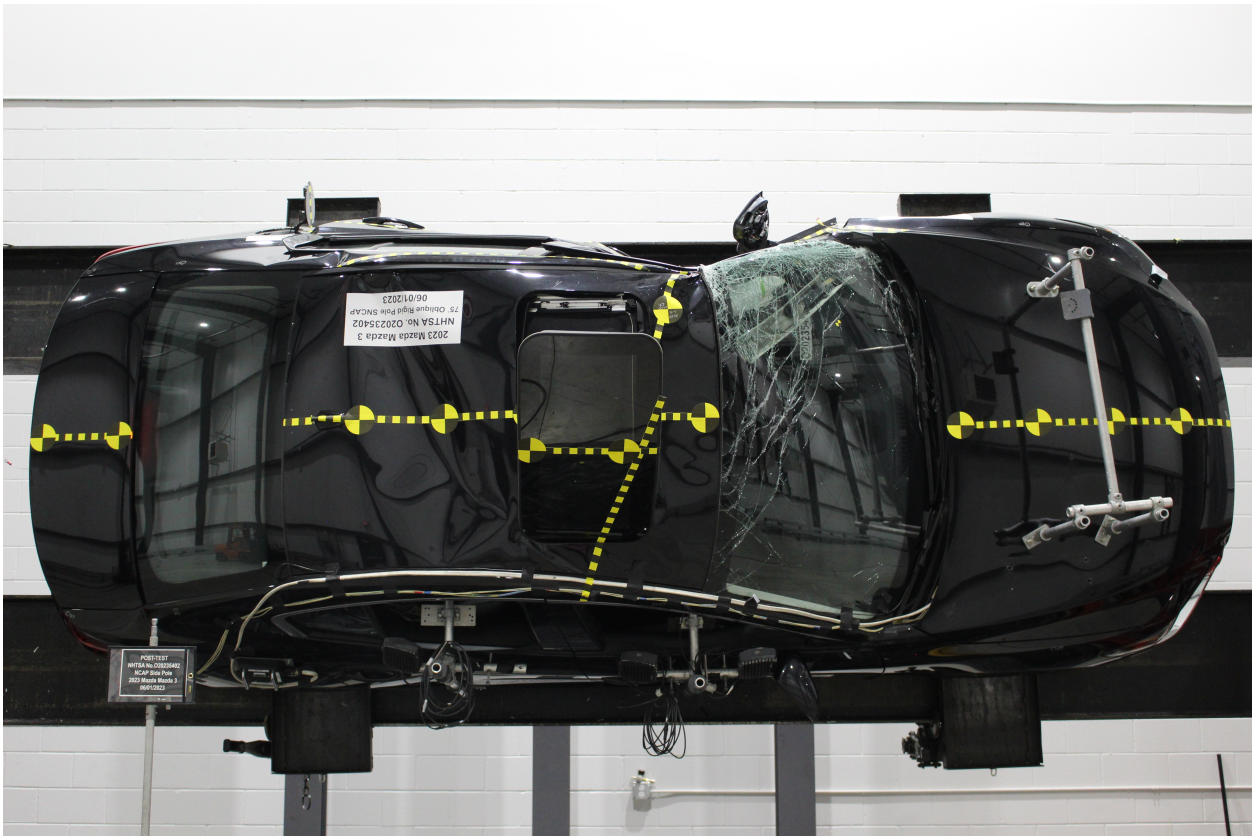


Figure A-68: FMVSS No. 301 Static Rollover 270 Degrees

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

Figure A-70: Impact Event

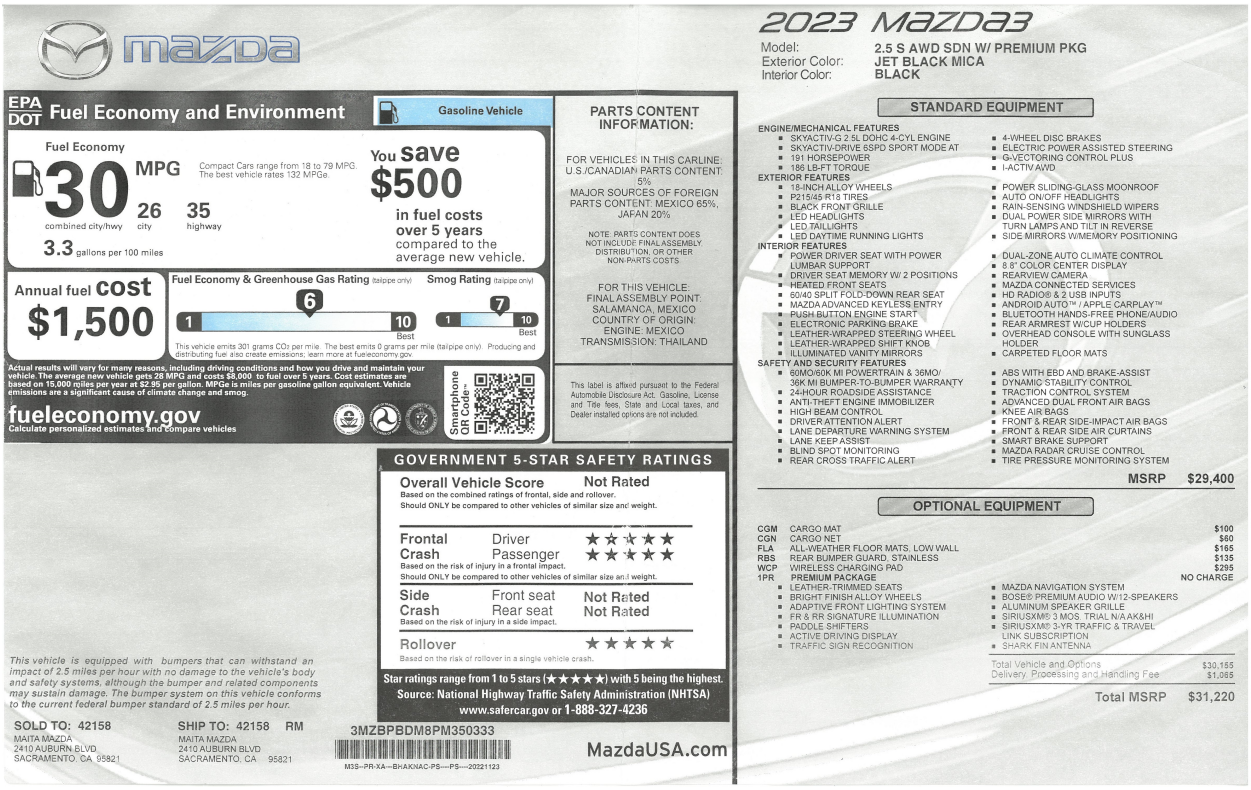


Figure A-71: Monroney Label

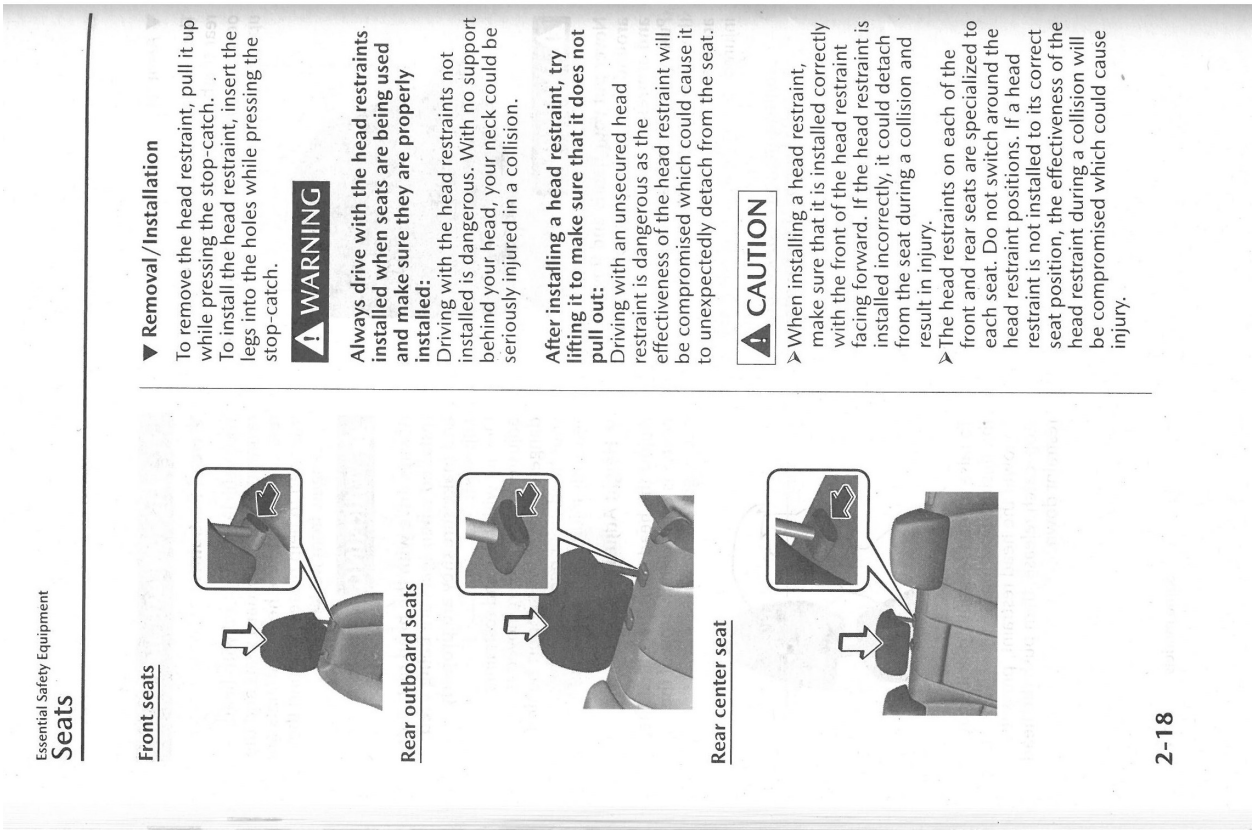


Figure A-72: Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

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

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots
Driver Dummy Instrumentation Plots

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

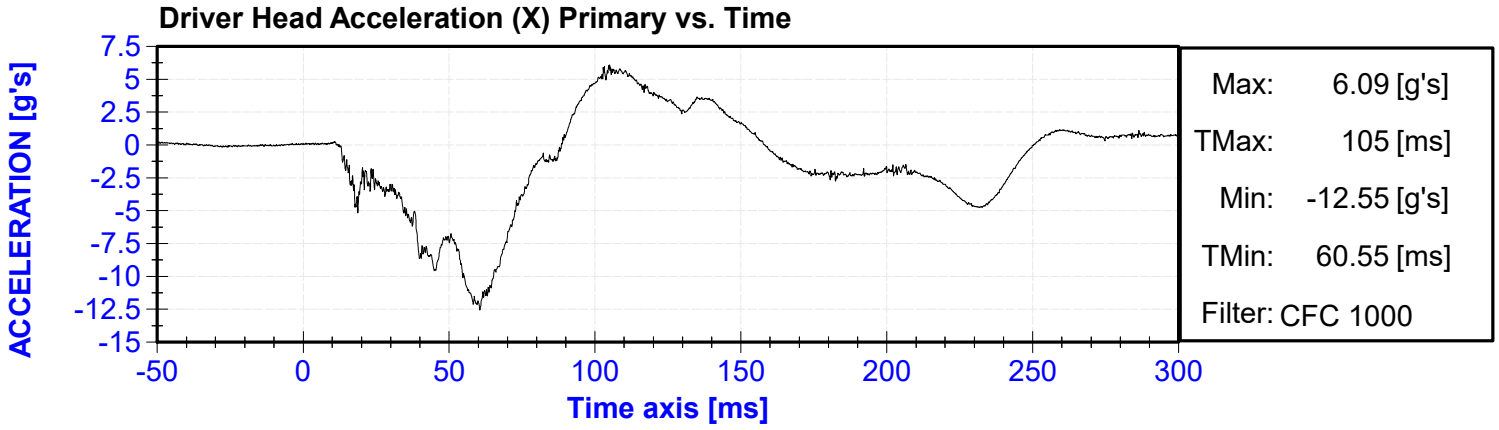
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Driver Upper Thorax Rib Deflection (Y)
Driver Middle Thorax Rib Deflection (Y)
Driver Lower Thorax Rib Deflection (Y)
Driver Upper Abdomen Rib Deflection (Y)
Driver Lower Abdomen Rib Deflection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

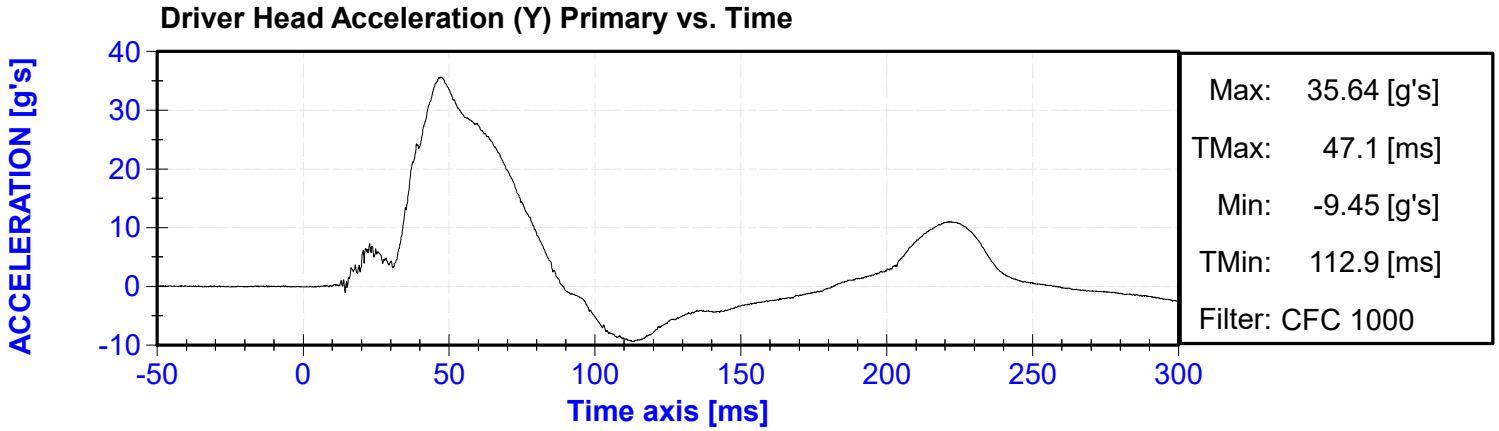
Vehicle Instrumentation Data

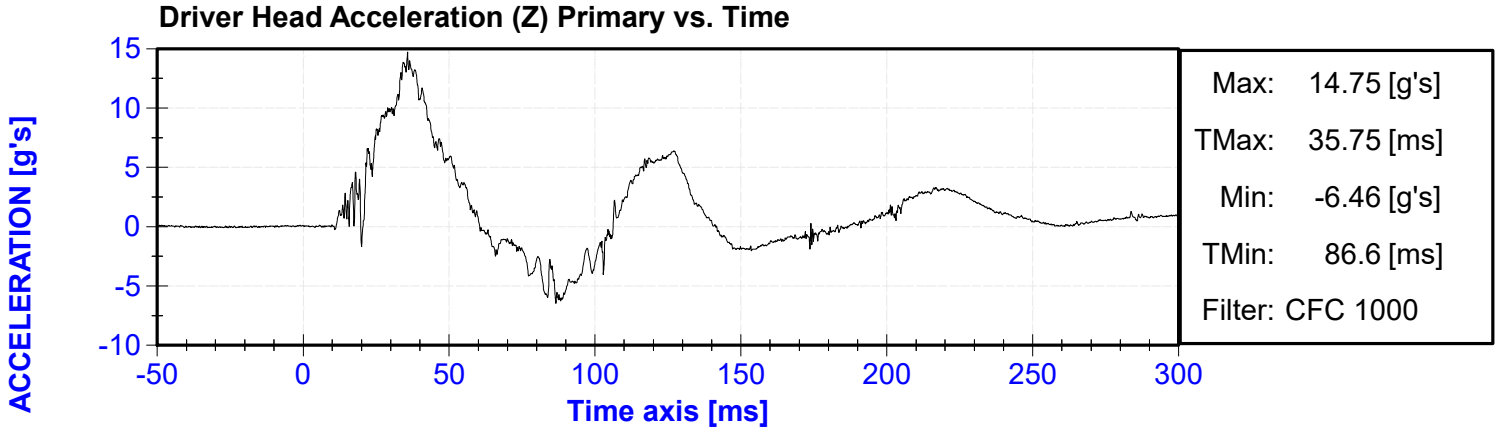
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration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

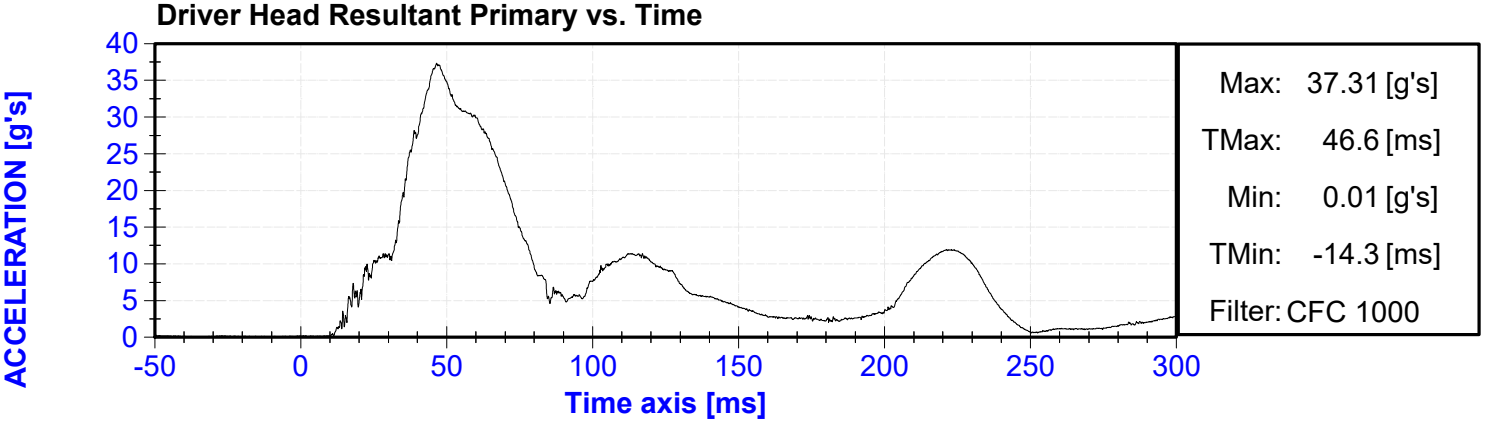
Pole Instrumentation Data

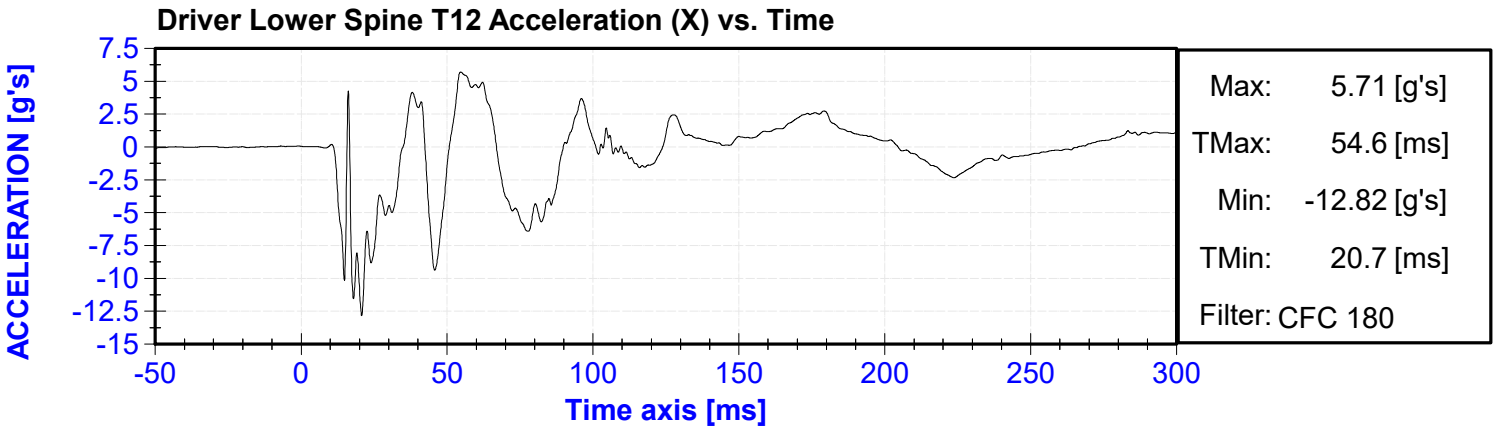
Load Cell Pole Barrier #1 Force (Y)
Load Cell Pole Barrier #2 Force (Y)
Load Cell Pole Barrier #3 Force (Y)
Load Cell Pole Barrier #4 Force (Y)
Load Cell Pole Barrier #5 Force (Y)
Load Cell Pole Barrier #6 Force (Y)
Load Cell Pole Barrier #7 Force (Y)
Load Cell Pole Barrier #8 Force (Y)

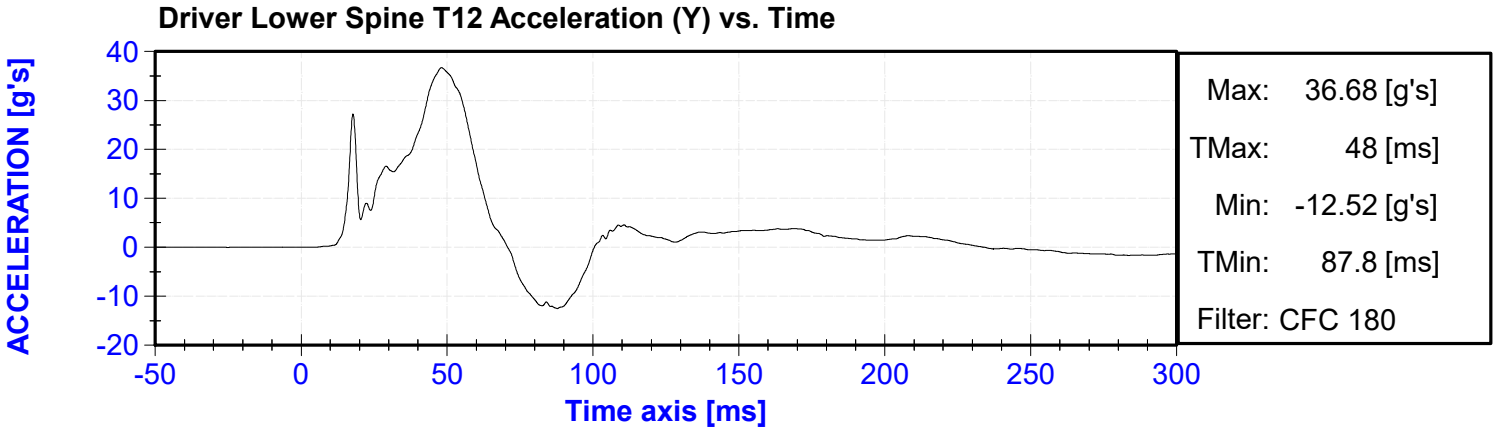

Driver Head Acceleration (X) Primary vs. Time
ACCELERATION [g's]
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 6.09 [g's]
TMax: 105 [ms]
Min: -12.55 [g's]
TMin: 60.55 [ms]
Filter: CFC 1000

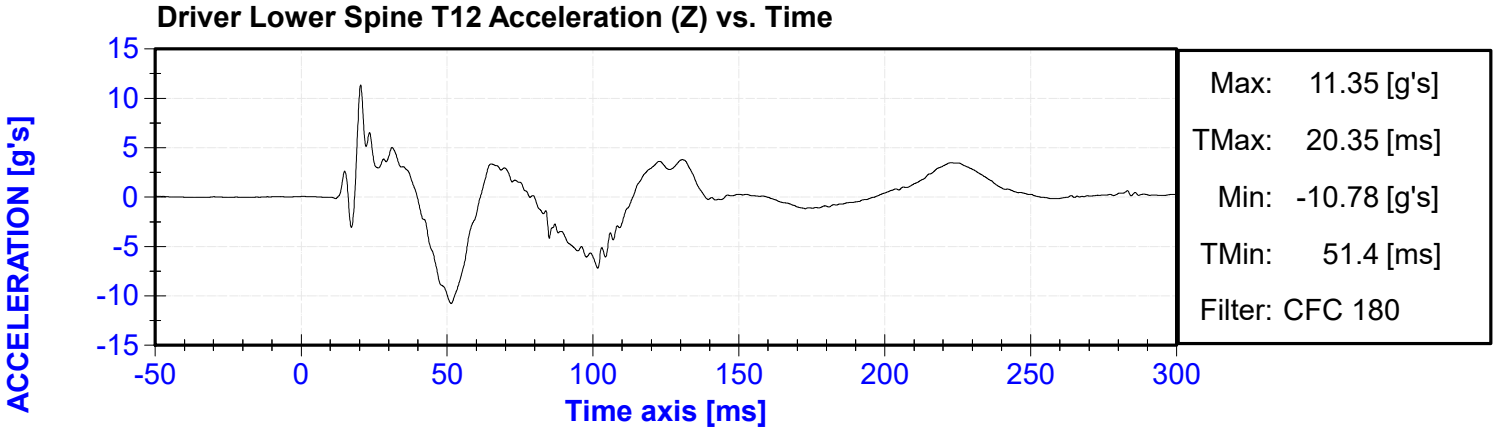

Driver Head Acceleration (Y) Primary vs. Time
ACCELERATION [g's]
40
30
20
10
0
-10
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 35.64 [g's]
TMax: 47.1 [ms]
Min: -9.45 [g's]
TMin: 112.9 [ms]
Filter: CFC 1000

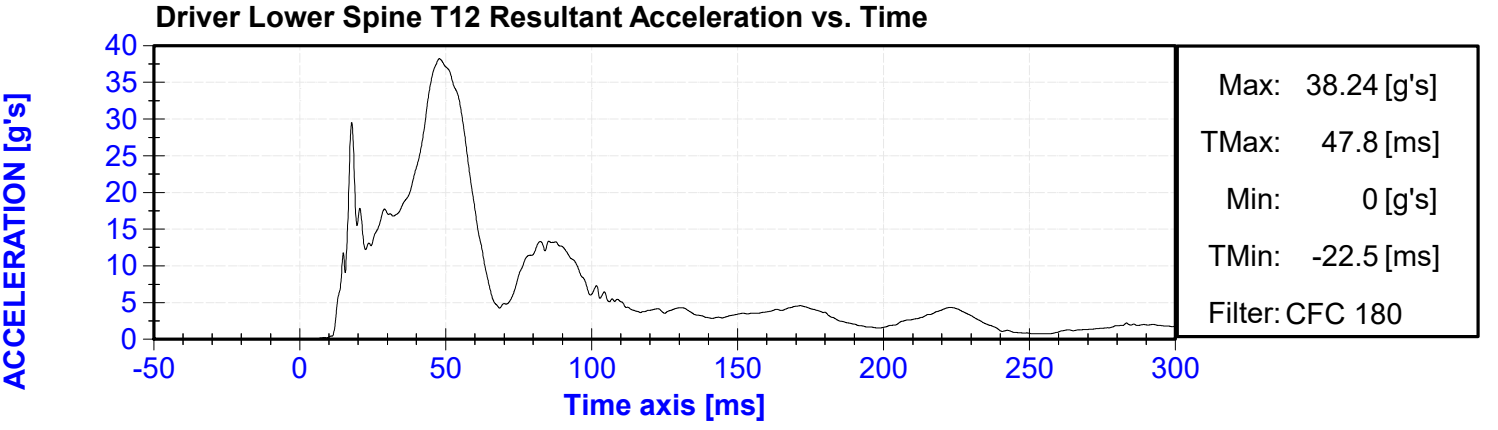

Driver Head Acceleration (Z) Primary vs. Time
ACCELERATION [g's]
15
10
5
0
-5
-10
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 14.75 [g's]
TMax: 35.75 [ms]
Min: -6.46 [g's]
TMin: 86.6 [ms]
Filter: CFC 1000


Driver Head Resultant Primary vs. Time
ACCELERATION [g's]
40
35
30
25
20
15
10
5
0
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 37.31 [g's]
TMax: 46.6 [ms]
Min: 0.01 [g's]
TMin: -14.3 [ms]
Filter: CFC 1000

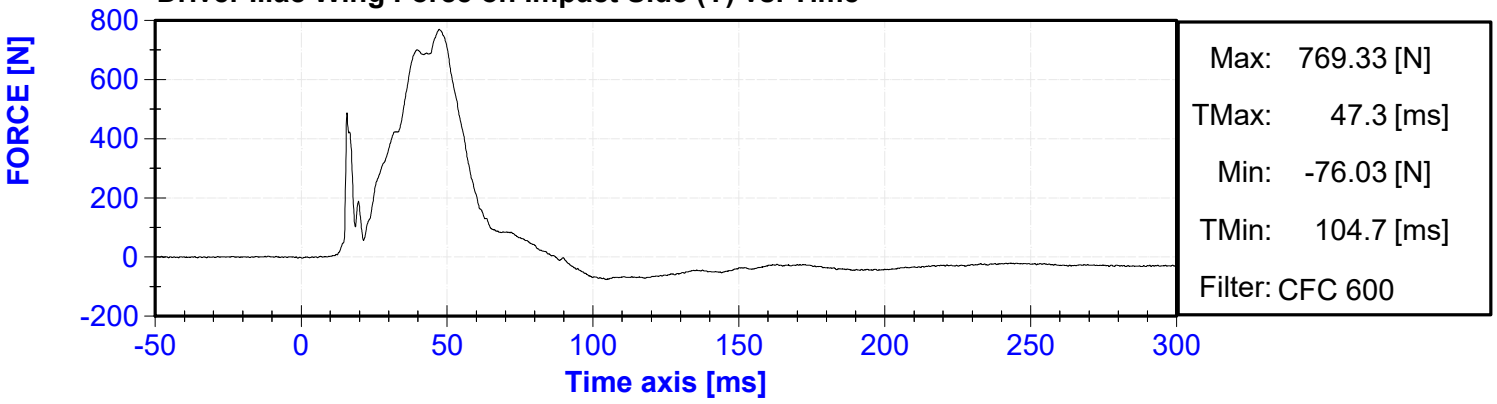

Driver Lower Spine T12 Acceleration (X) vs. Time
ACCELERATION [g's]
Time axis [ms]
Max: 5.71 [g's]
TMax: 54.6 [ms]
Min: -12.82 [g's]
TMin: 20.7 [ms]
Filter: CFC 180


Driver Lower Spine T12 Acceleration (Y) vs. Time
ACCELERATION [g's]
Time axis [ms]
Max: 36.68 [g's]
TMax: 48 [ms]
Min: -12.52 [g's]
TMin: 87.8 [ms]
Filter: CFC 180

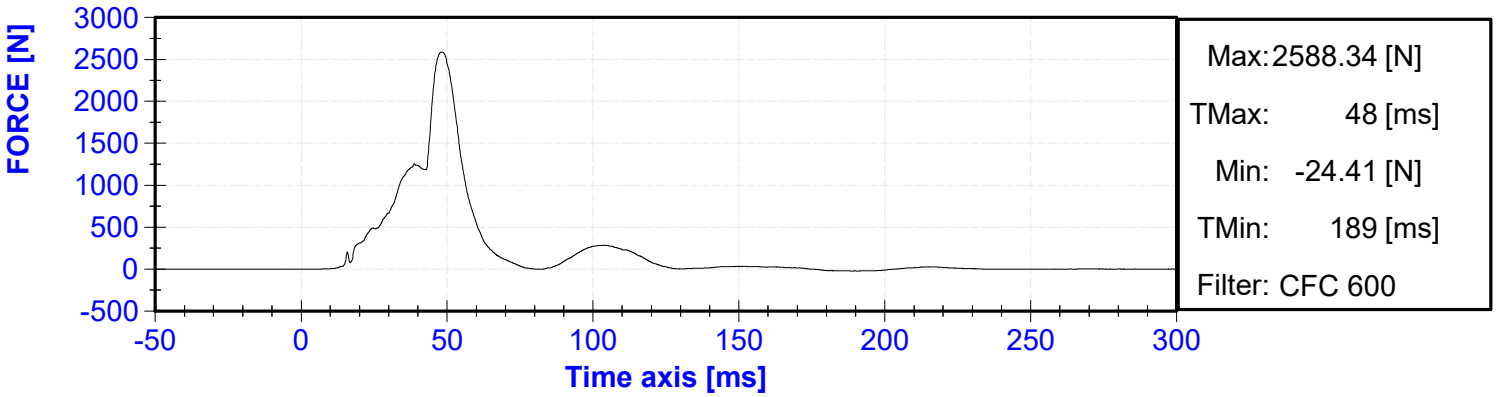

Driver Lower Spine T12 Acceleration (Z) vs. Time
ACCELERATION [g's]
Time axis [ms]
Max: 11.35 [g's]
TMax: 20.35 [ms]
Min: -10.78 [g's]
TMin: 51.4 [ms]
Filter: CFC 180


Driver Lower Spine T12 Resultant Acceleration vs. Time
ACCELERATION [g's]
Time axis [ms]
Max: 38.24 [g's]
TMax: 47.8 [ms]
Min: 0 [g's]
TMin: -22.5 [ms]
Filter: CFC 180

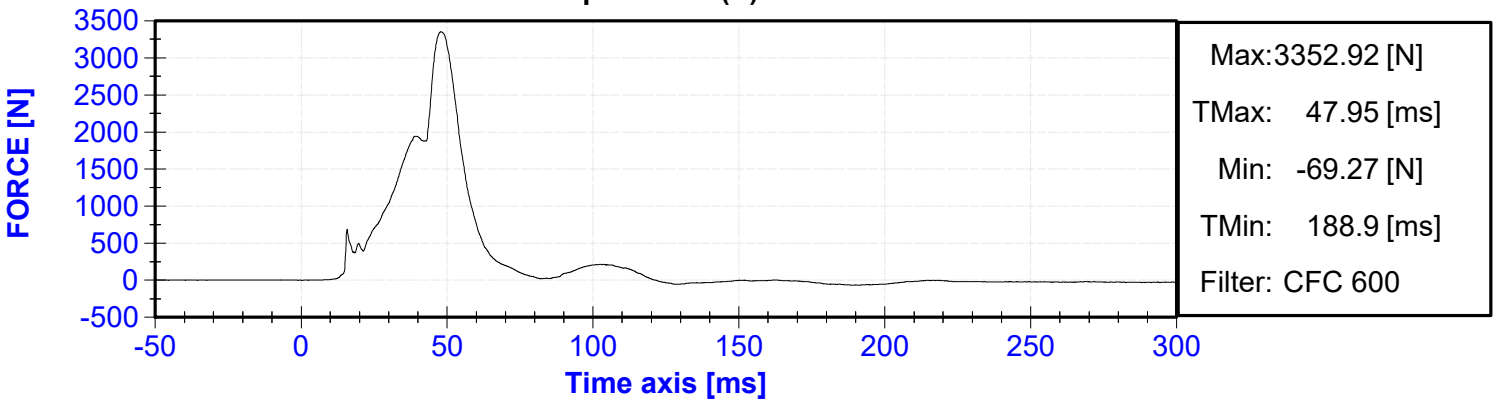
Driver Iliac Wing Force on Impact Side (Y) vs. Time



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

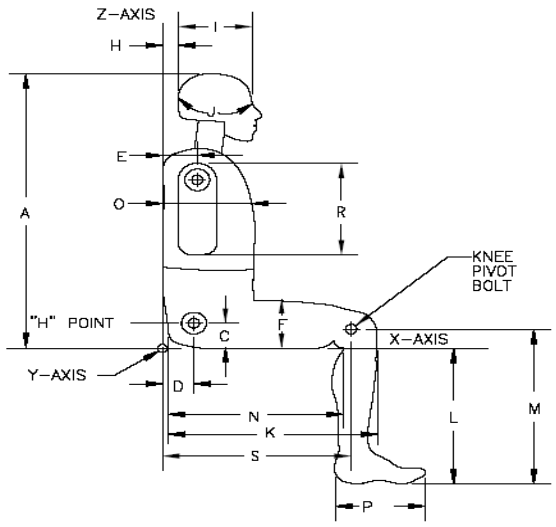
SERIAL NO:300

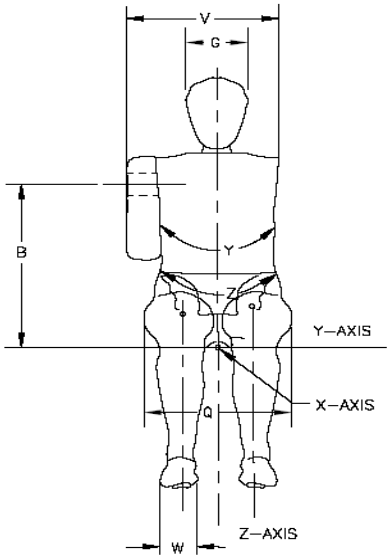
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Brogan Date: 04/21/2023

Dummy Serial Number: 300





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	781	Pass
B	Shoulder Pivot Height	437	453	444	Pass
C	H-point Height	79	89	84	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	101	Pass
F	Thigh Clearance	119	135	122	Pass
G	Head Breadth	140	148	145	Pass
H	Head Back from Backline	40	46	42	Pass
I	Head Depth	178	188	182	Pass
J	Head Circumference	541	551	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	403	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	199	Pass
P	Foot Length	216	232	221	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	251	Pass
S	Knee Joint to seatback	477	493	486	Pass
V	Shoulder Width	341	357	351	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	876	Pass
Z	Waist Circumference	761	791	776	Pass

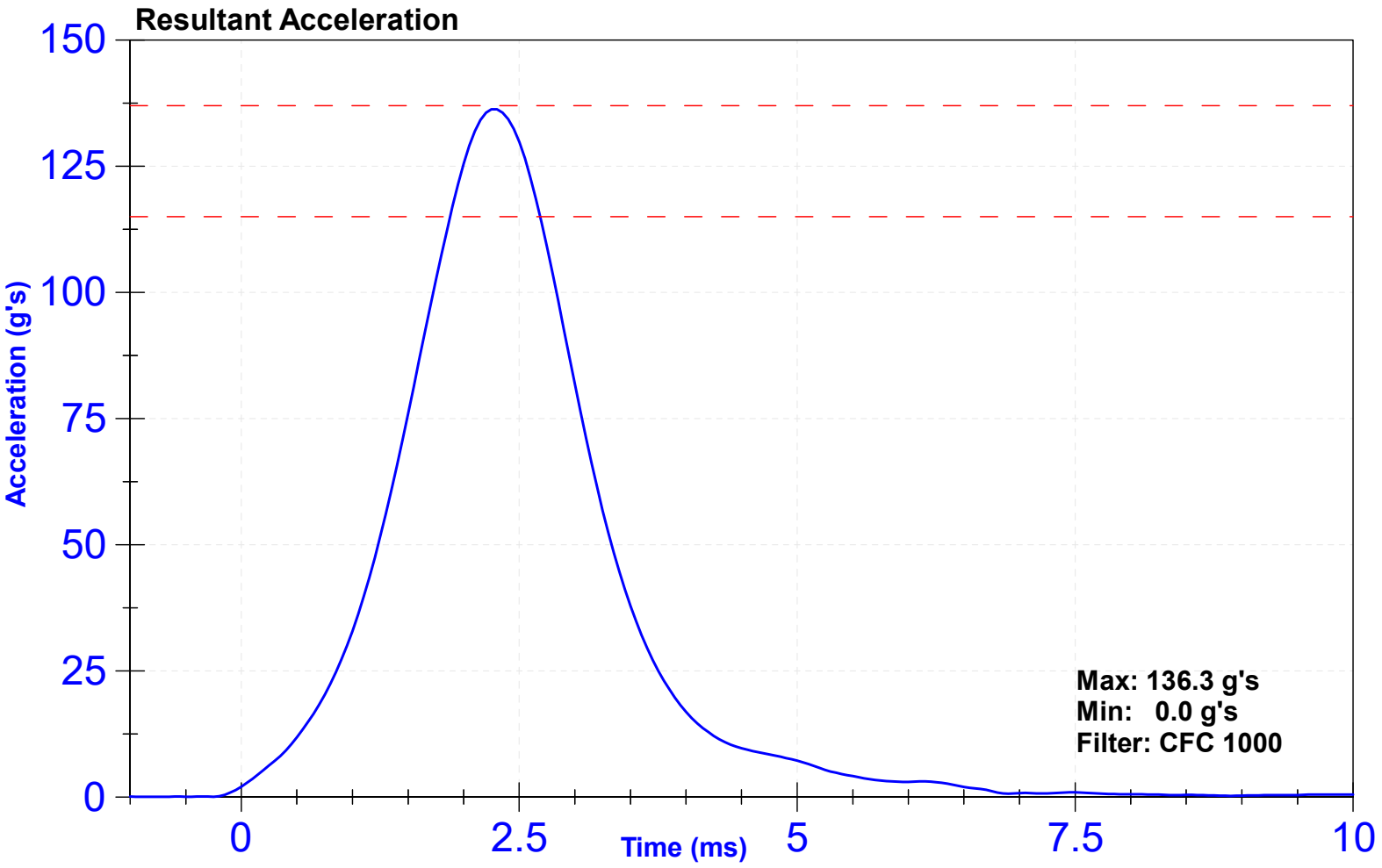
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	300	Laboratory Supervisor	K. Brogan

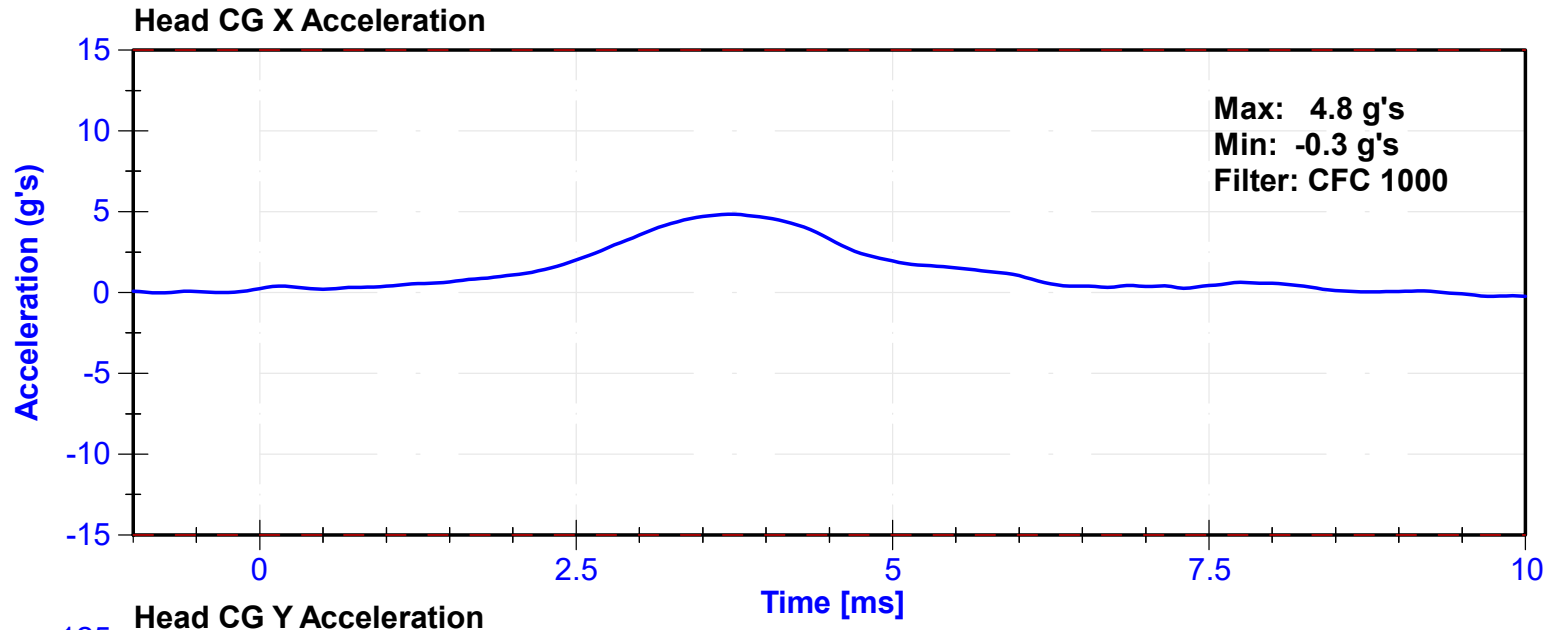
Results

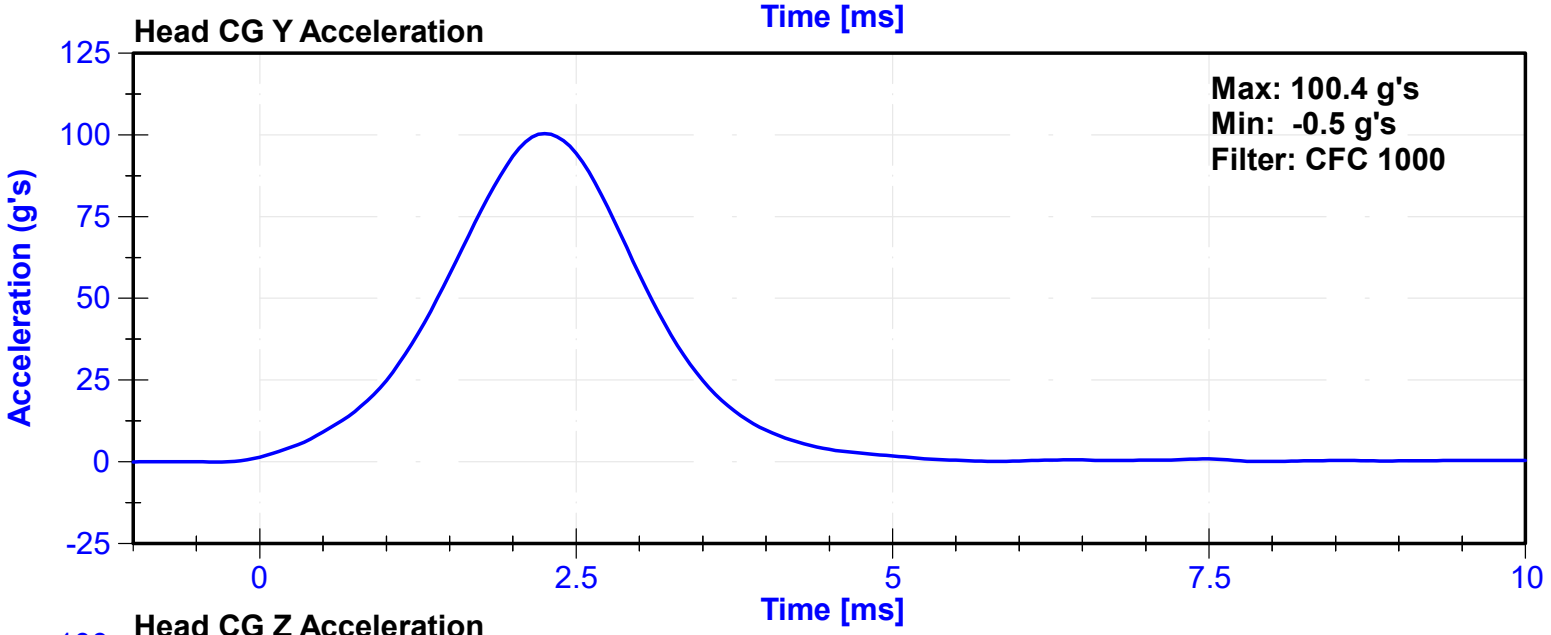
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	27	Pass
Resultant Acceleration	115	137	g's	136.3	Pass
Oscillation	0	15	%	2.2	Pass
Fore-Aft Acceleration	-15	15	g's	4.8	Pass

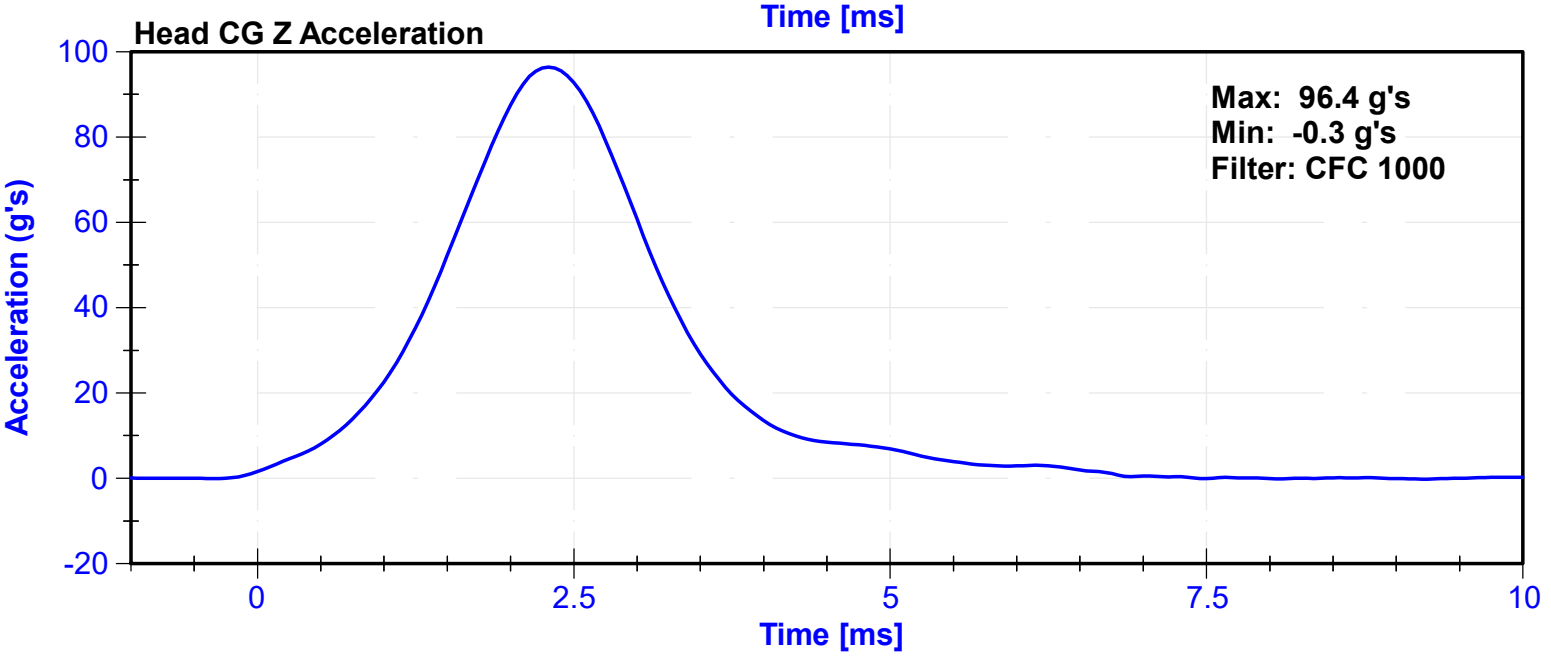
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P59018	4/4/2023	10/1/2023
Y Accelerometer	Endevco	P79189	4/4/2023	10/1/2023
Z Accelerometer	Endevco	P79587	4/4/2023	10/1/2023




Head CG X Acceleration
Max: 4.8 g's
Min: -0.3 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 100.4 g's
Min: -0.5 g's
Filter: CFC 1000
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 96.4 g's
Min: -0.3 g's
Filter: CFC 1000
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]

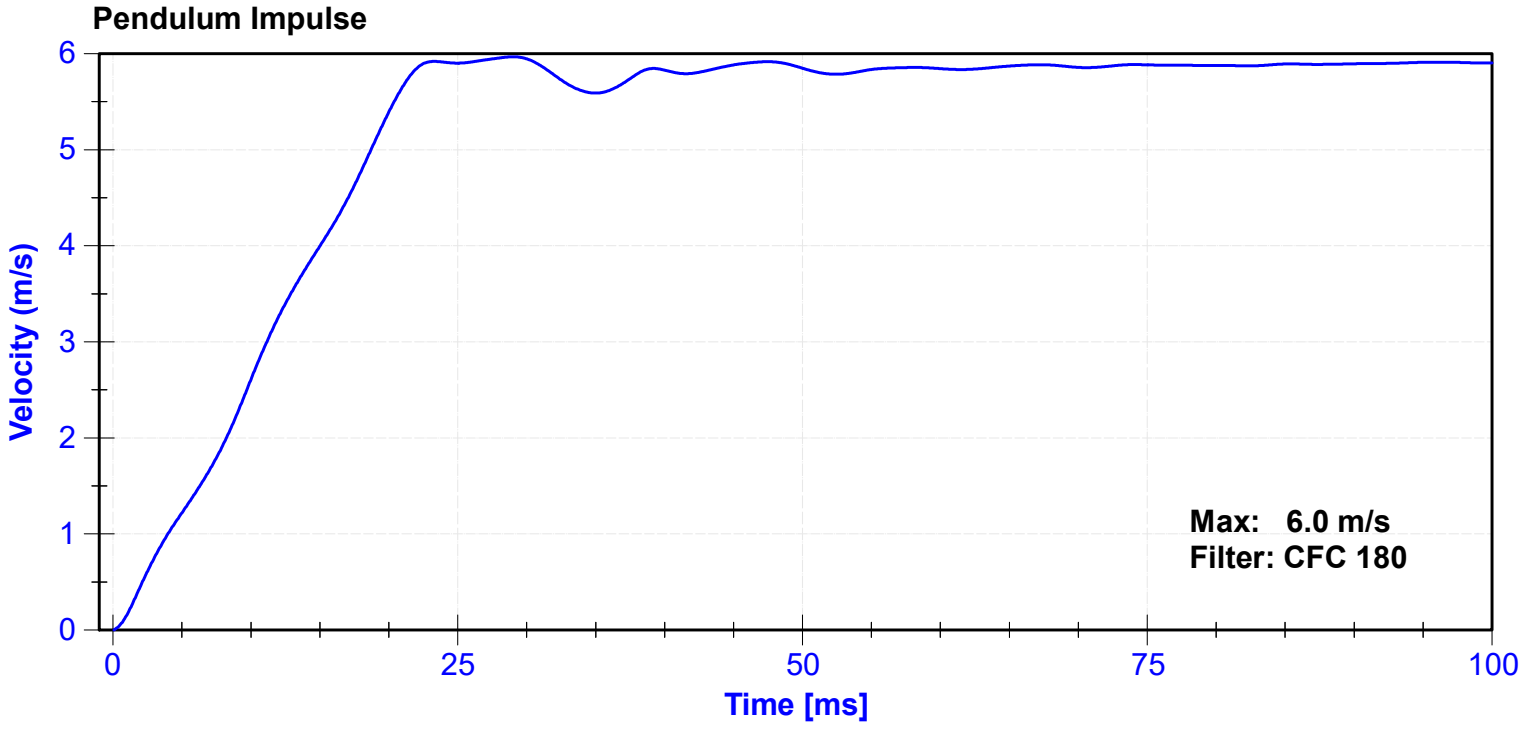
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

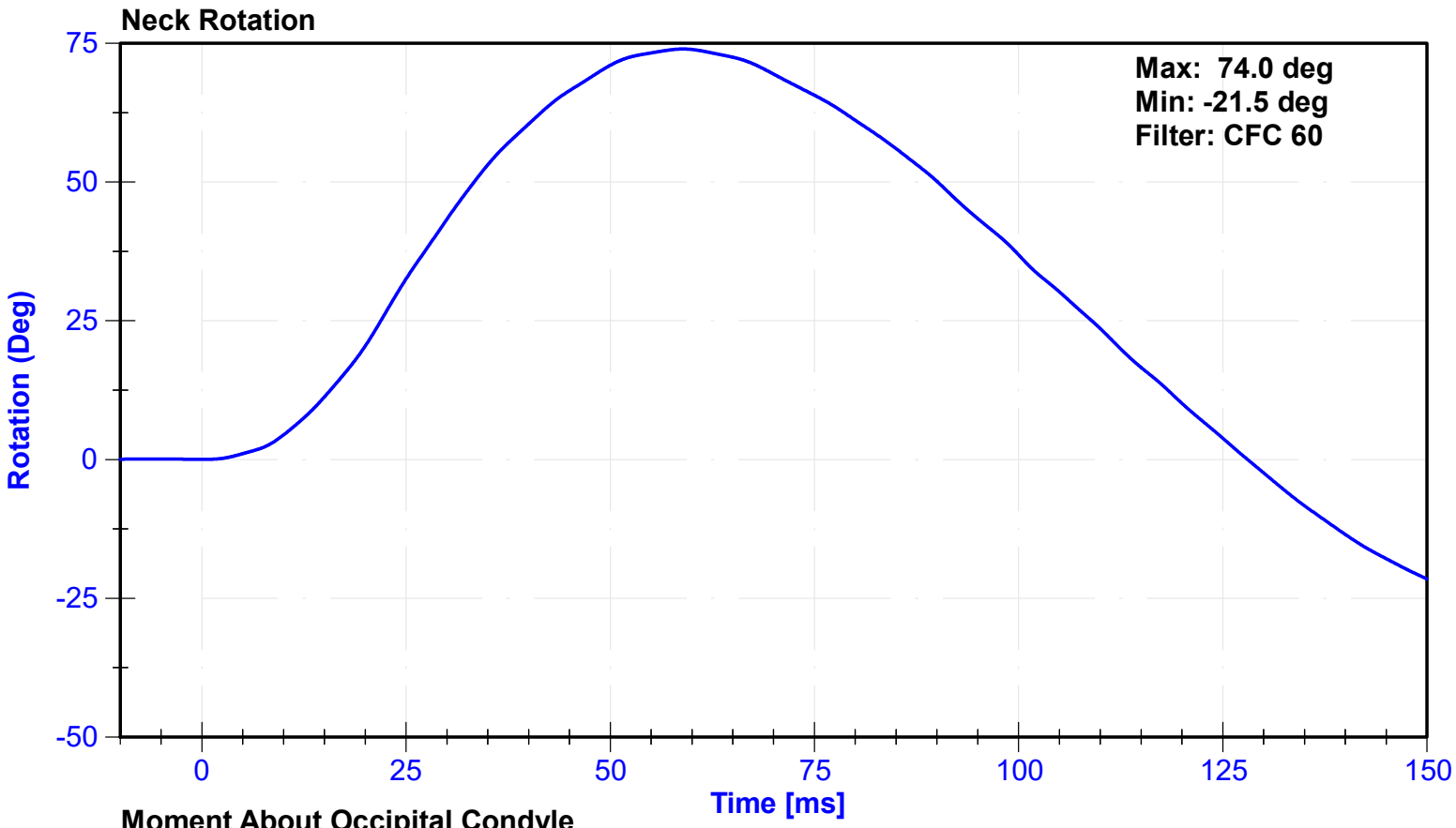
Results

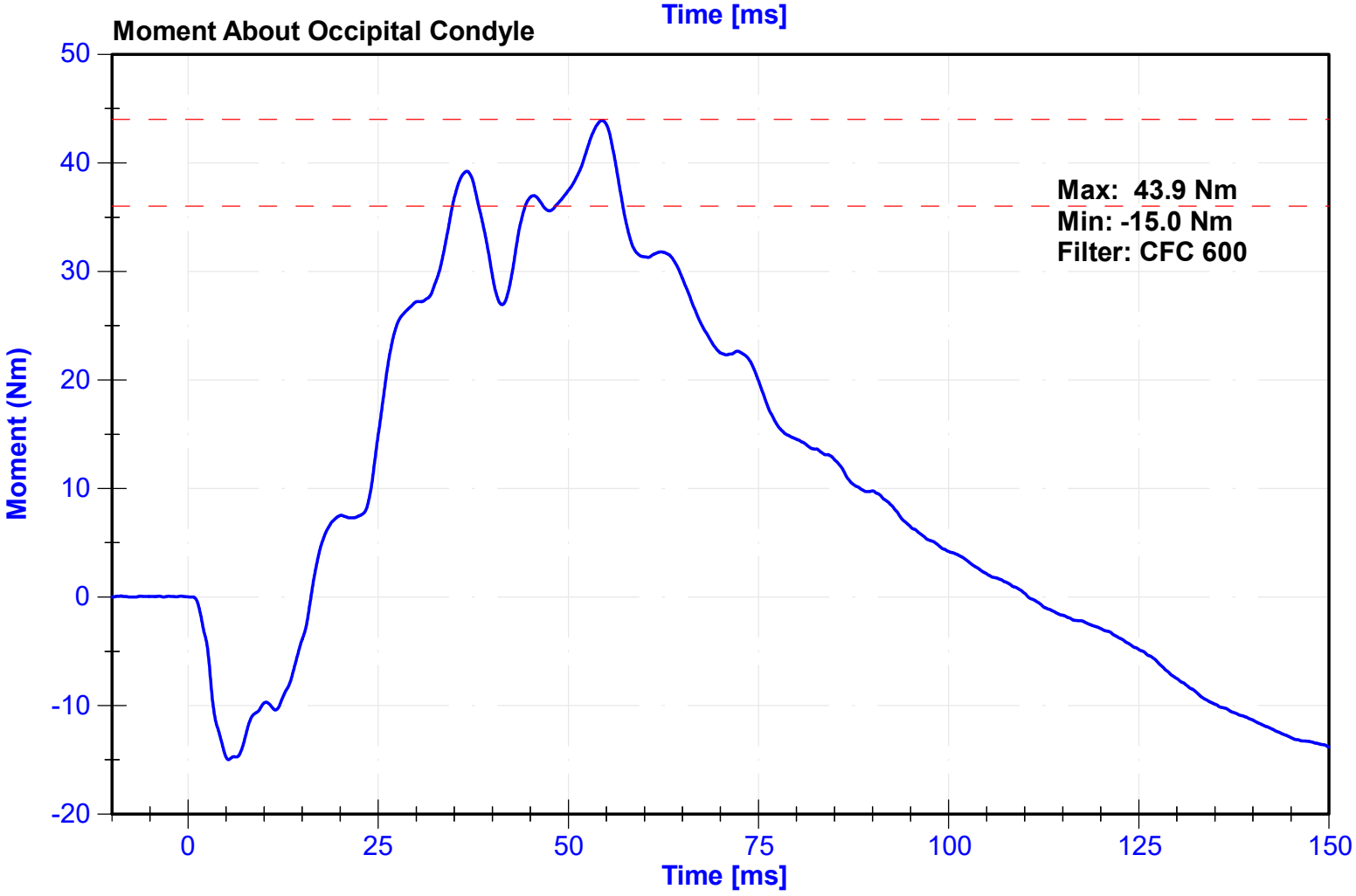
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.4	Pass
Humidity	10	70	%	30.2	Pass
Velocity	5.51	5.63	m/s	5.594	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.61	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	4.00	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	5.39	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.90	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.97	Pass
Neck Rotation	71	81	deg	74.0	Pass
Time at Maximum Rotation	50	70	ms	58.9	Pass
Moment about the OC	36	44	Nm	43.9	Pass
Moment Decay to 0 Nm	102	126	ms	110.4	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




Neck Rotation
Max: 74.0 deg
Min: -21.5 deg
Filter: CFC 60
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 43.9 Nm
Min: -15.0 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

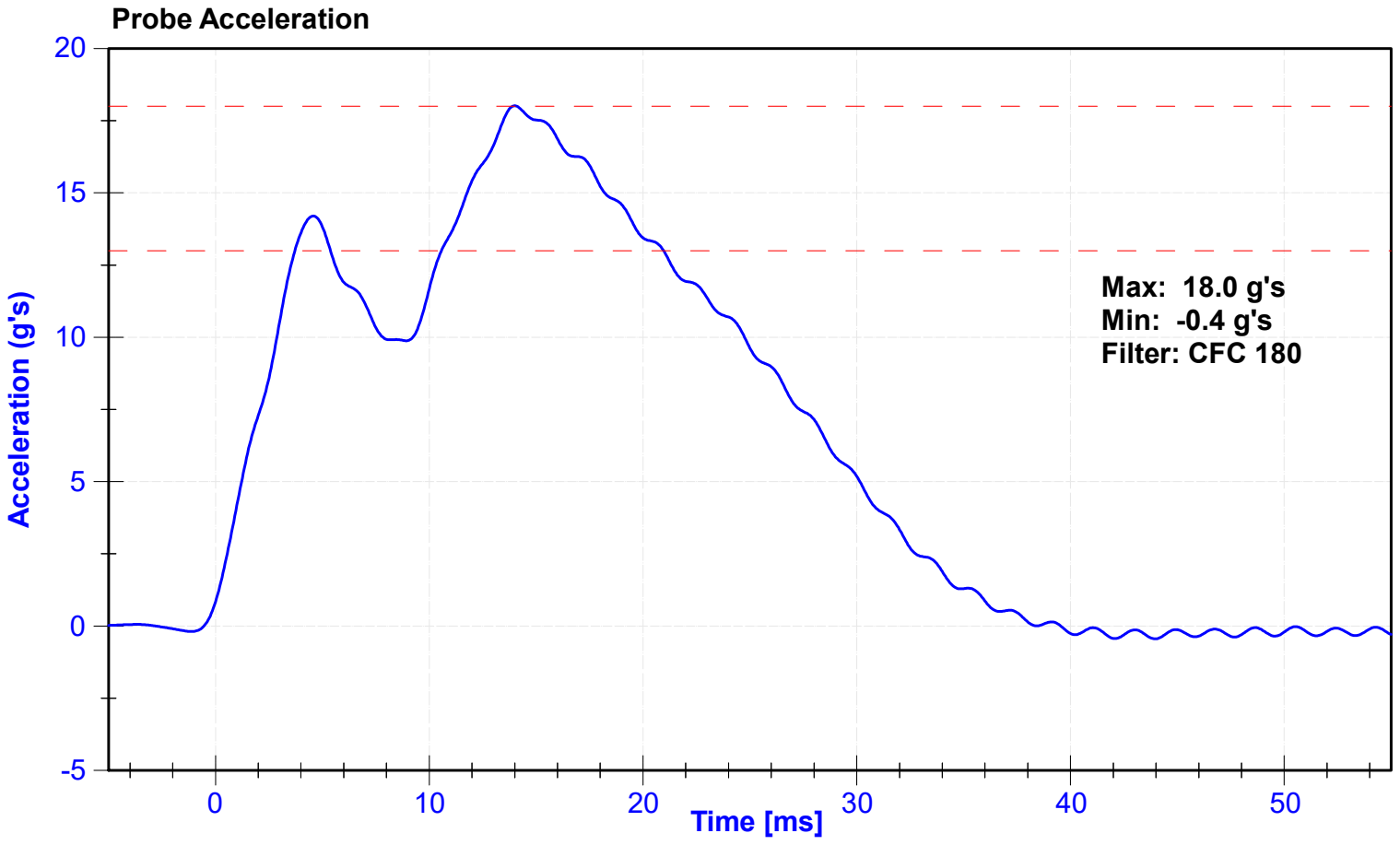
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

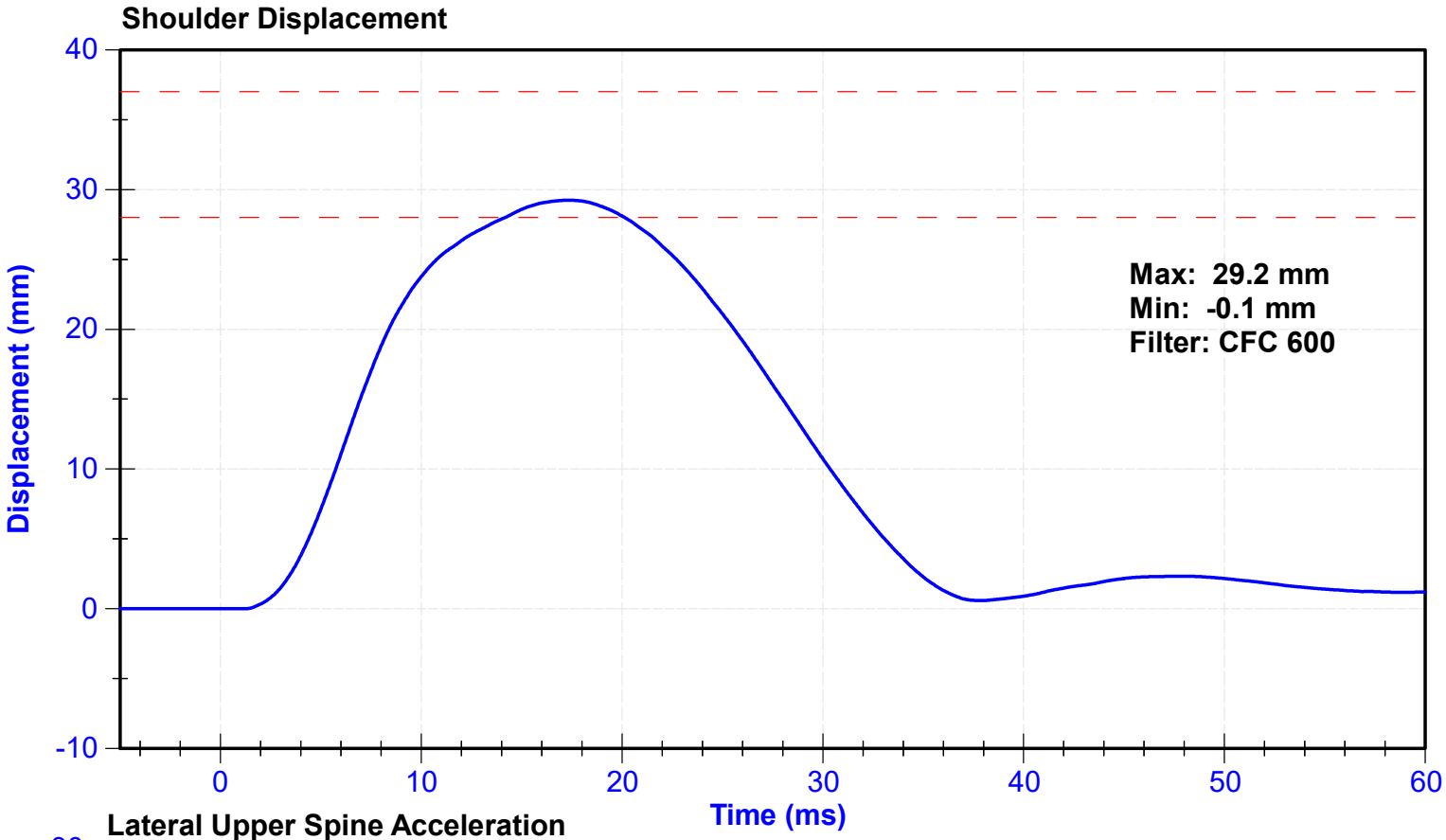
Results

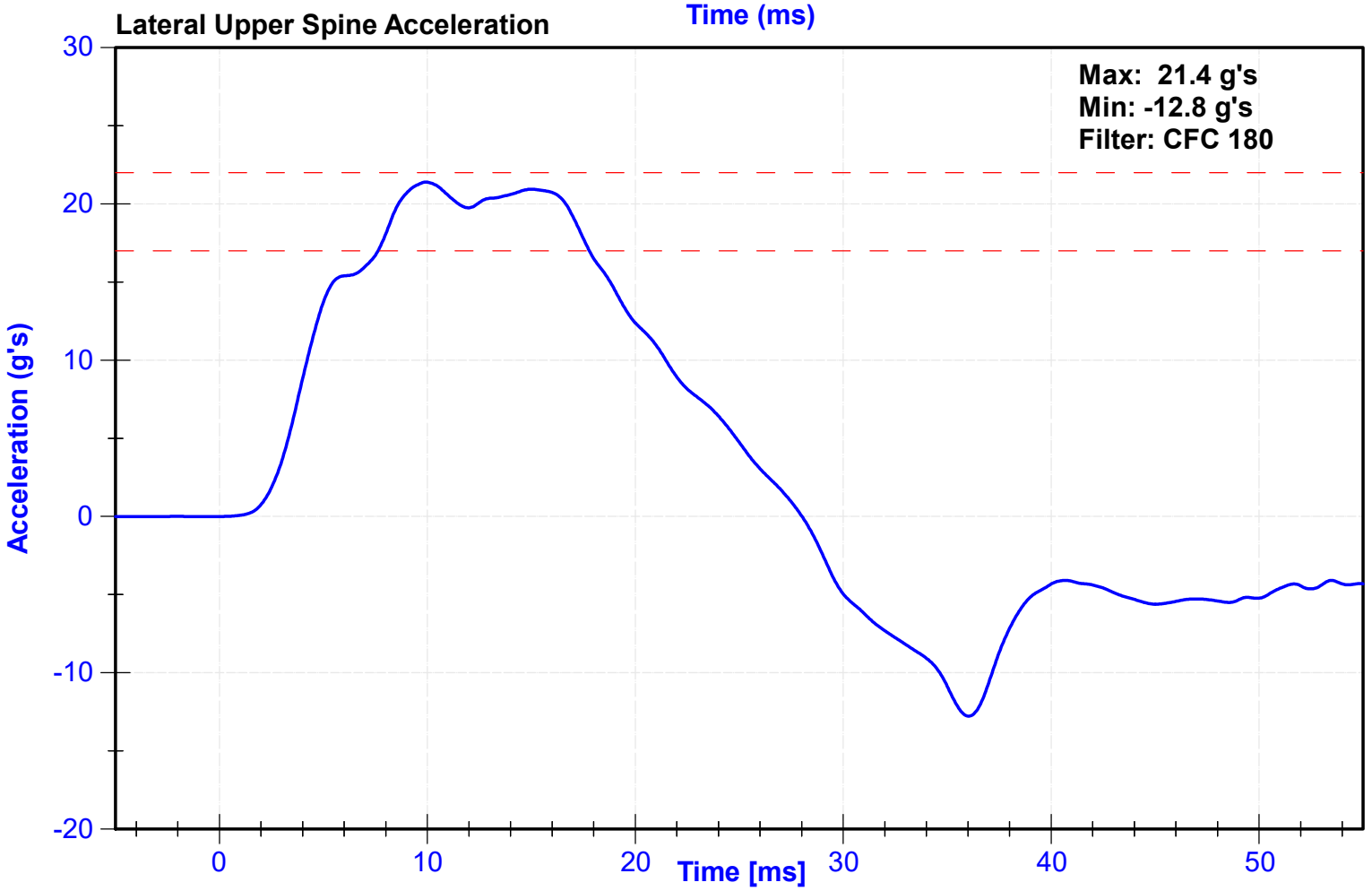
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	35	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	13	18	g's	18.0	Pass
Shoulder Deflection	28	37	mm	29.2	Pass
Lateral Upper Spine Acceleration	17	22	g's	21.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Shoulder Potentiometer	Servo	053GFE	4/10/2023	10/9/2023
Upper Spine Y Accelerometer	Endevco	T20880	4/4/2023	10/1/2023




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 29.2 mm
Min: -0.1 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 21.4 g's
Min: -12.8 g's
Filter: CFC 180

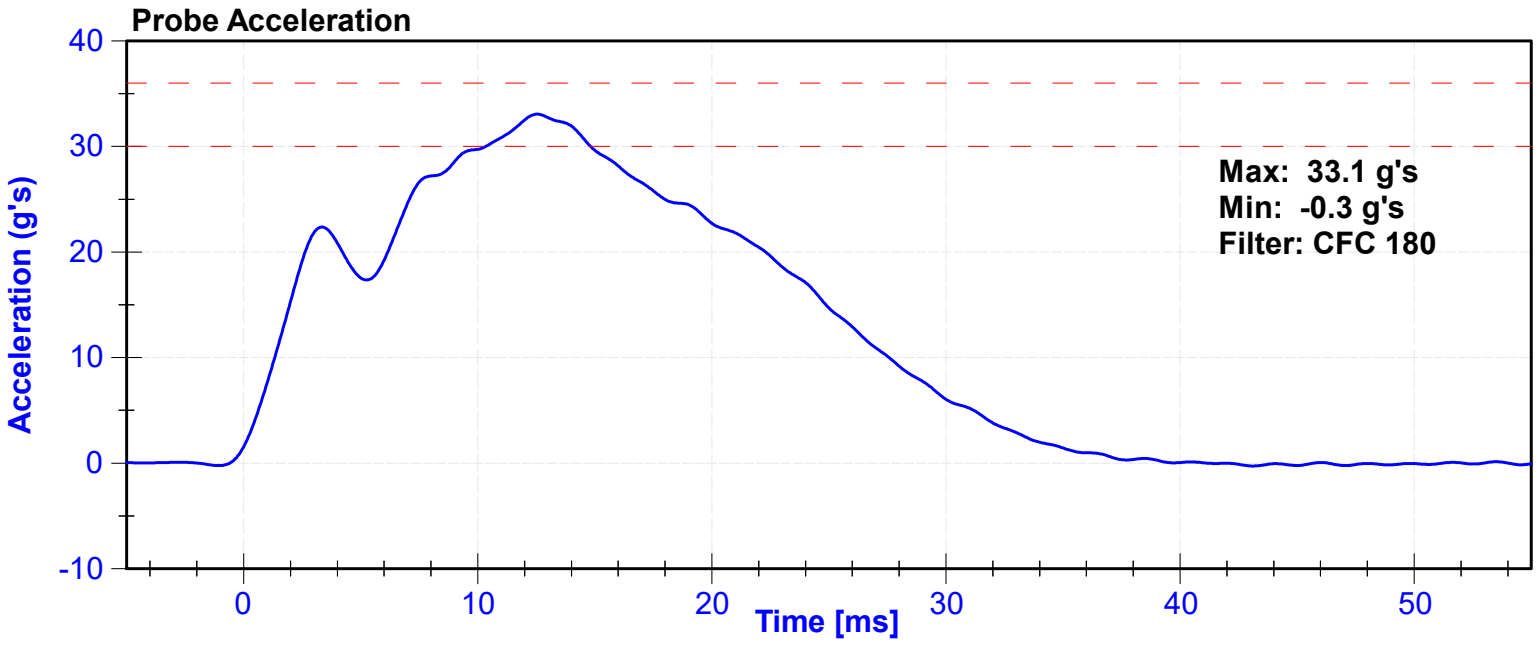
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

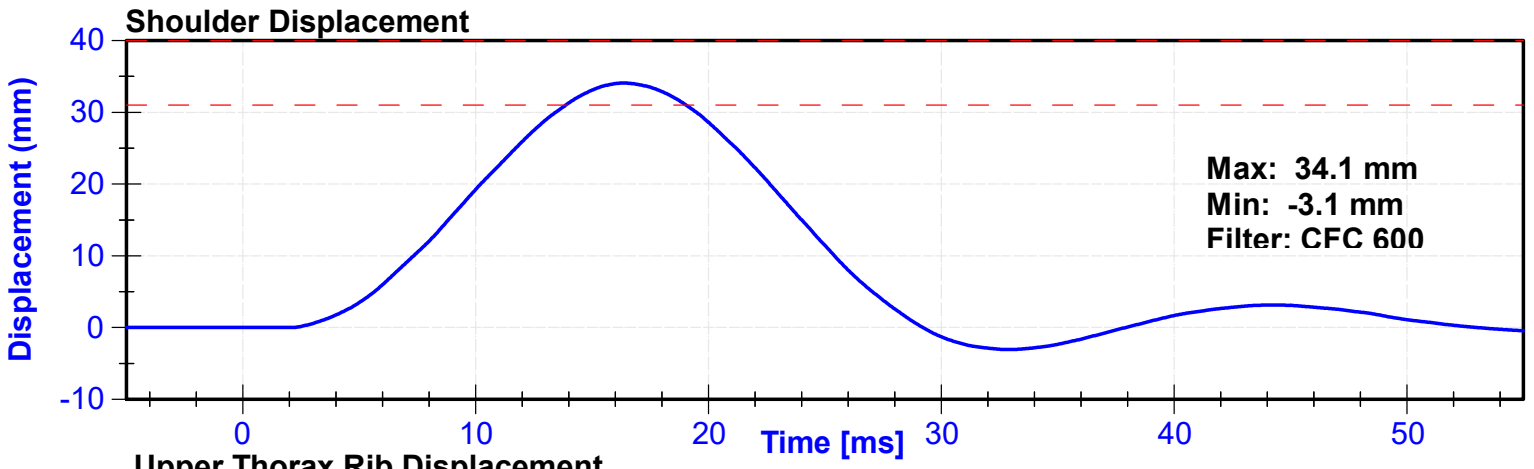
Results

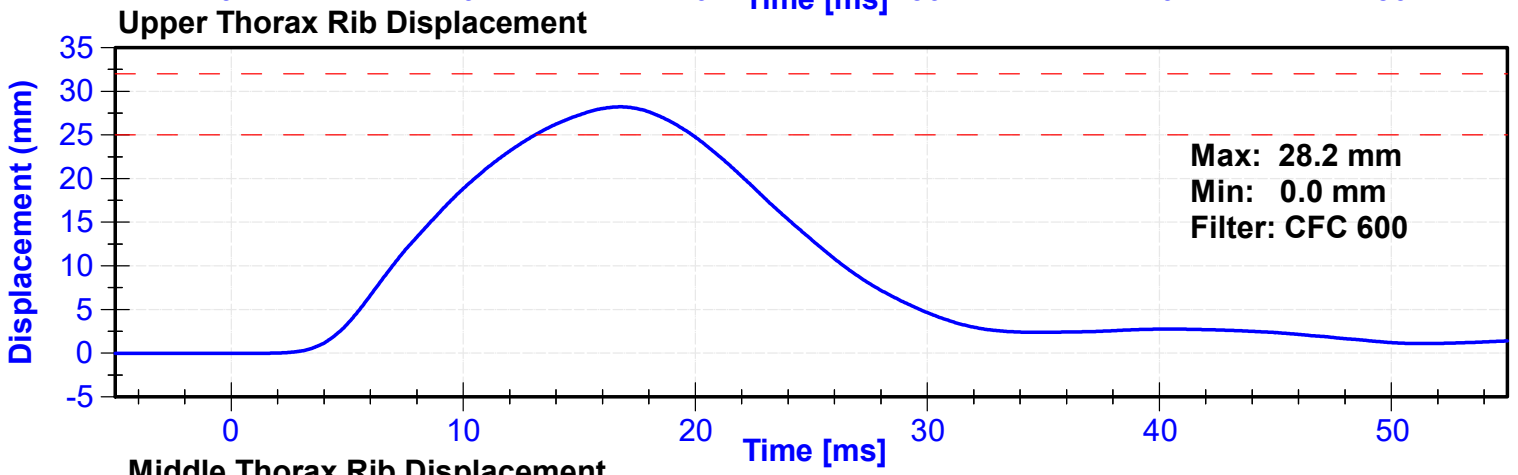
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	35	Pass
Velocity	6.6	6.8	m/s	6.76	Pass
Probe Acceleration after 5 ms	30	36	g's	33.1	Pass
Lateral Upper Spine Acceleration	34	43	g's	36.3	Pass
Lateral Lower Spine Acceleration	29	37	g's	29.9	Pass
Shoulder Deflection	31	40	mm	34.1	Pass
Upper Thorax Rib Deflection	25	32	mm	28.2	Pass
Mid Thorax Rib Deflection	30	36	mm	33.8	Pass
Lower Thorax Rib Deflection	32	38	mm	36.8	Pass

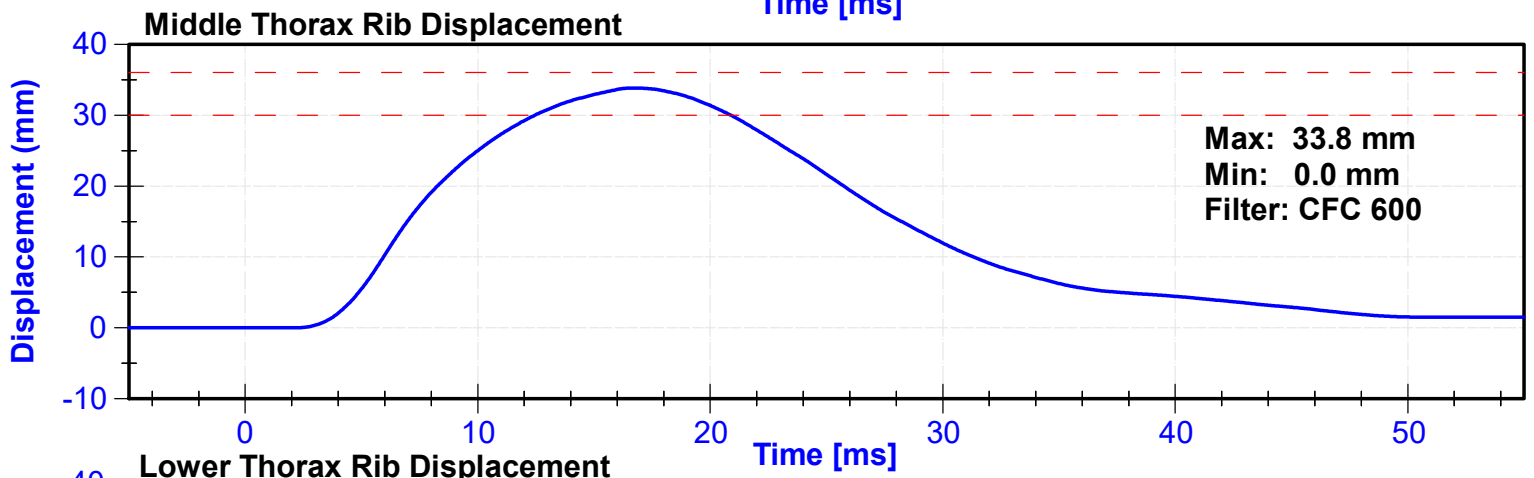
Transducer Calibrations

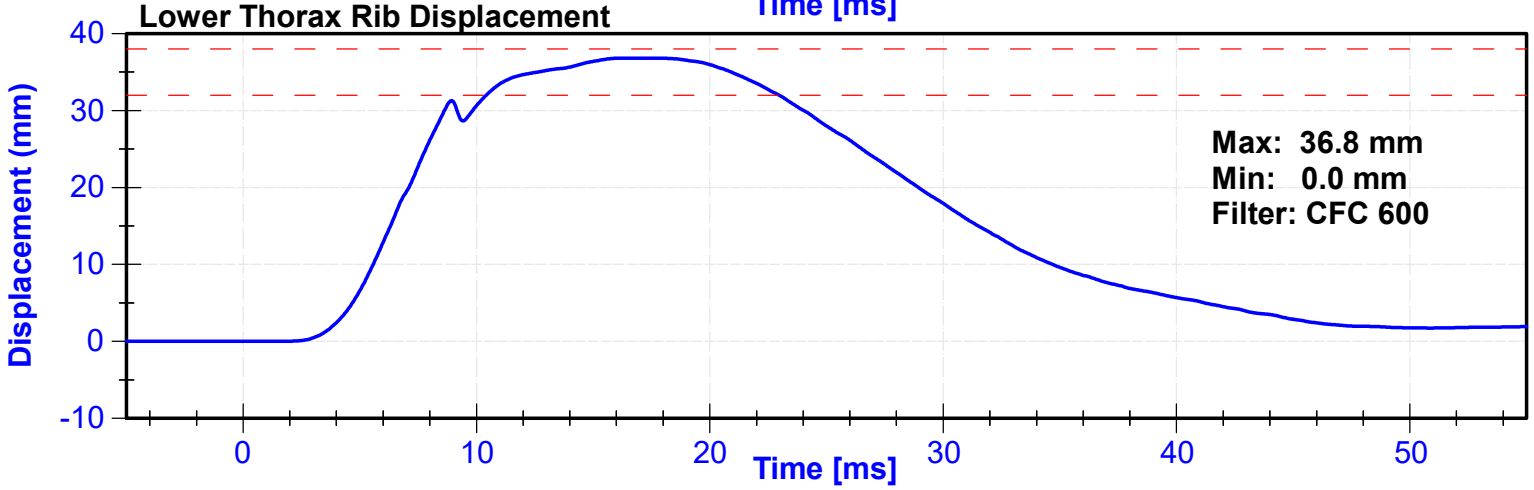
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Upper Spine T1 Y Accelerometer	Endevco	T20880	4/4/2023	10/1/2023
Upper Spine T12 Y Accelerometer	Endevco	P52071	4/4/2023	10/1/2023
Shoulder Potentiometer	Servo	053GFE	4/10/2023	10/9/2023
Upper Thorax Rib Potentiometer	Servo	2316GFE	4/10/2023	10/9/2023
Middle Thorax Rib Potentiometer	Servo	040GFE	4/10/2023	10/9/2023
Lower Thorax Rib Potentiometer	Servo	1156GFE	4/10/2023	10/9/2023

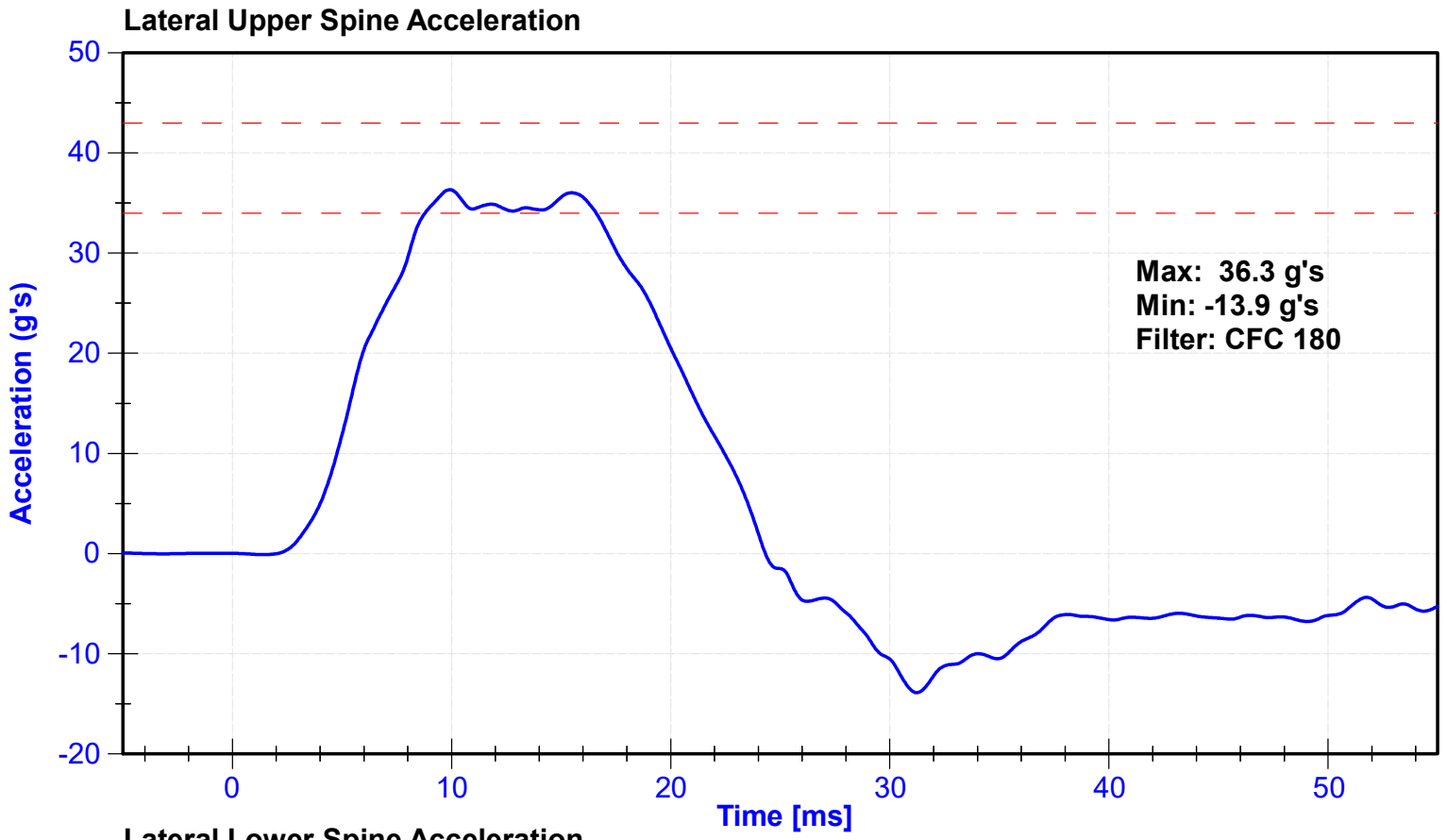


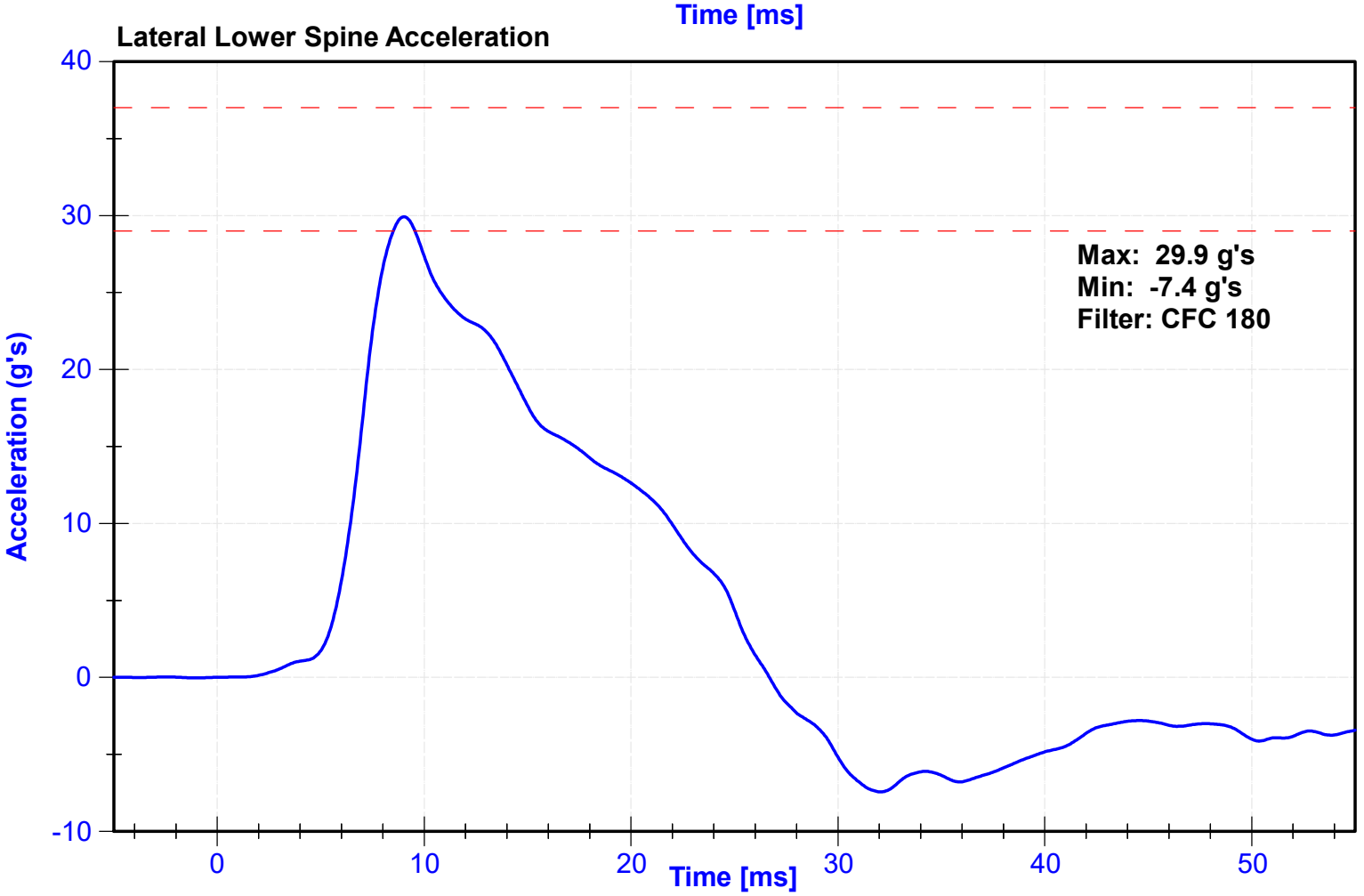

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 34.1 mm
Min: -3.1 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 28.2 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.8 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 36.8 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 36.3 g's
Min: -13.9 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 29.9 g's
Min: -7.4 g's
Filter: CFC 180

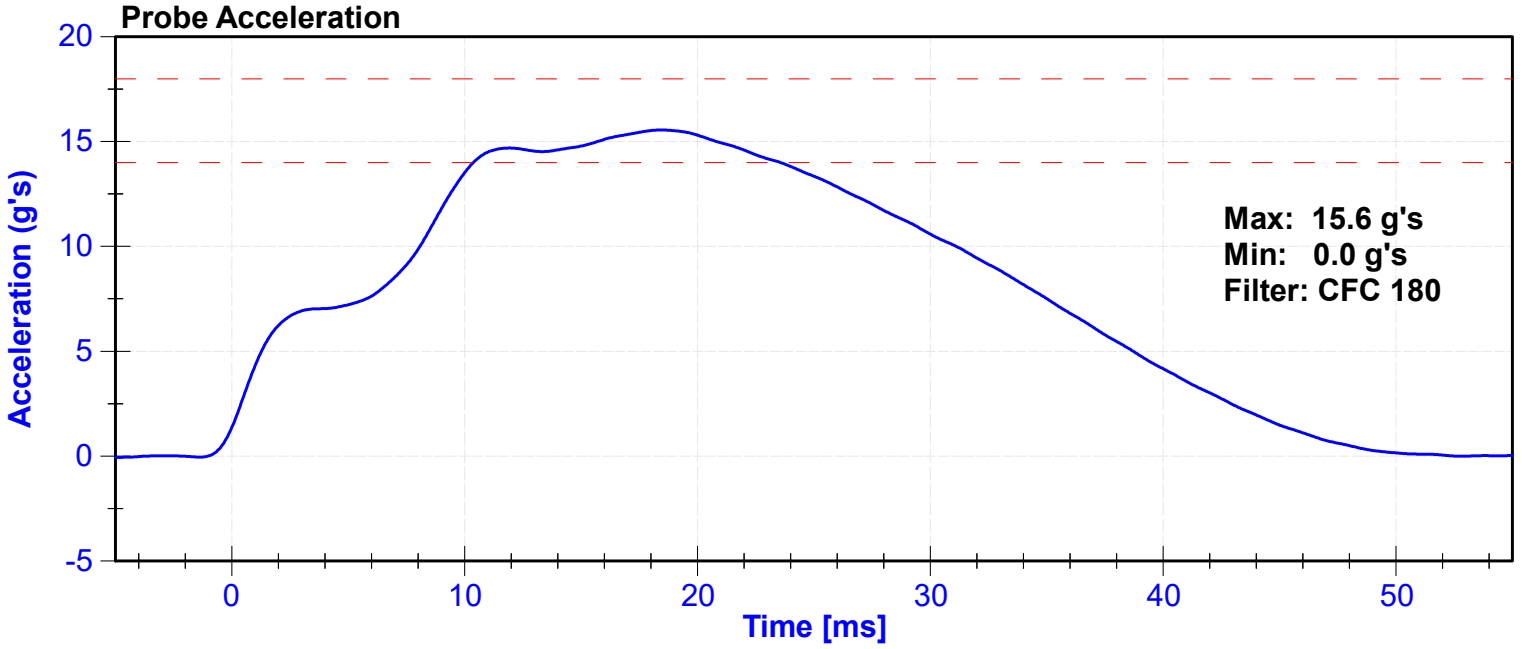
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

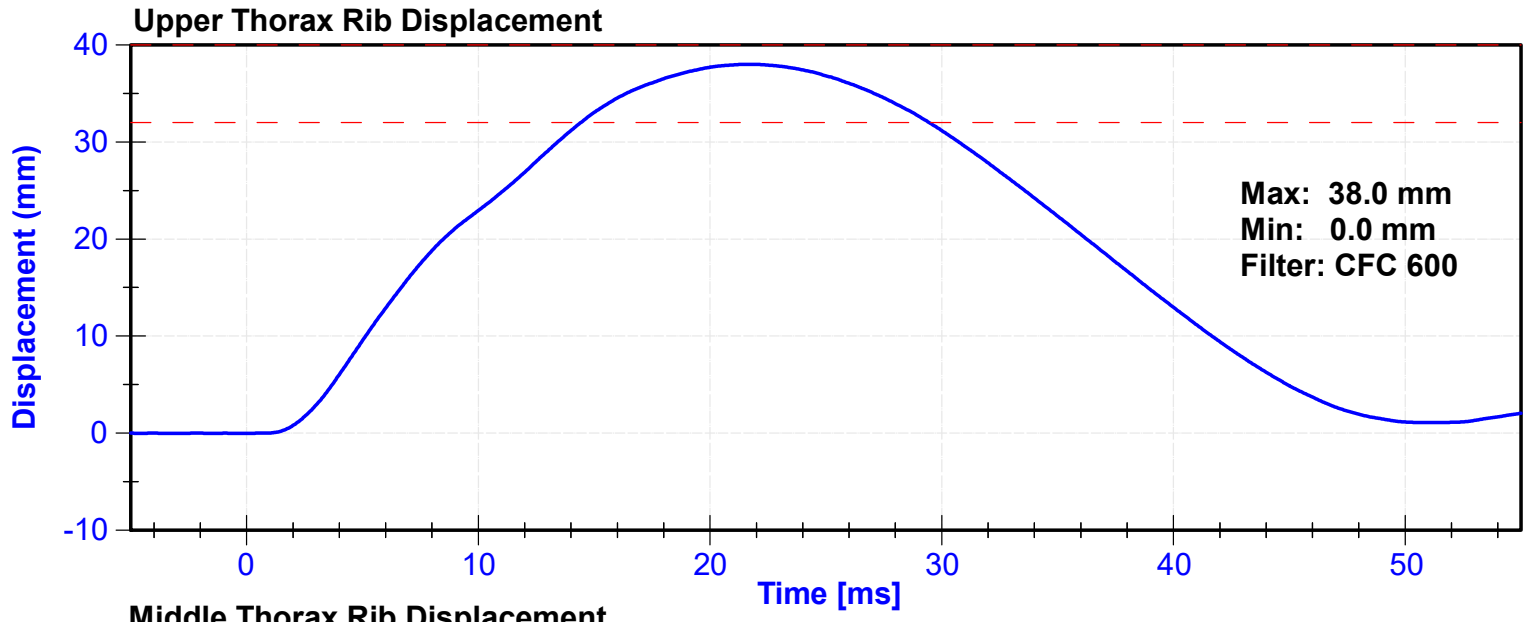
Results

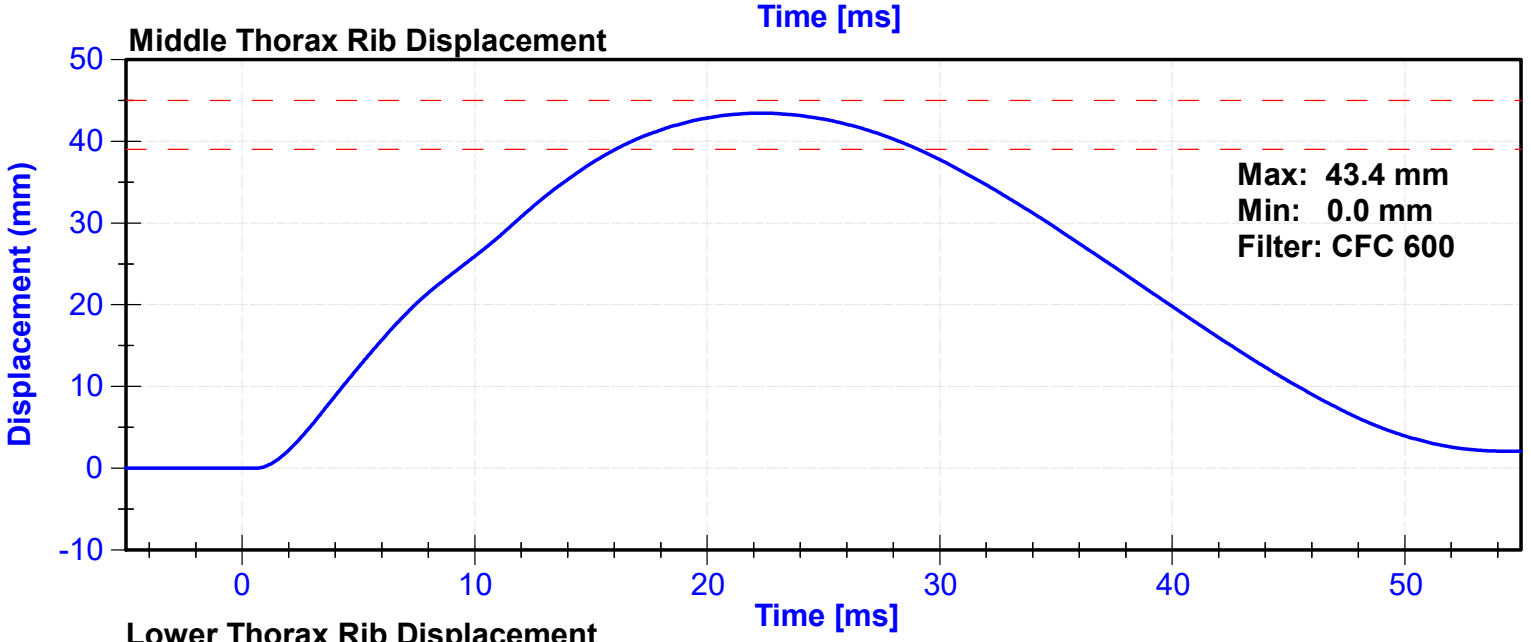
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	35	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	14	18	g's	15.6	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.8	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.0	Pass
Upper Thorax Rib Deflection	32	40	mm	38.0	Pass
Middle Thorax Rib Deflection	39	45	mm	43.4	Pass
Lower Thorax Rib Deflection	35	43	mm	40.5	Pass

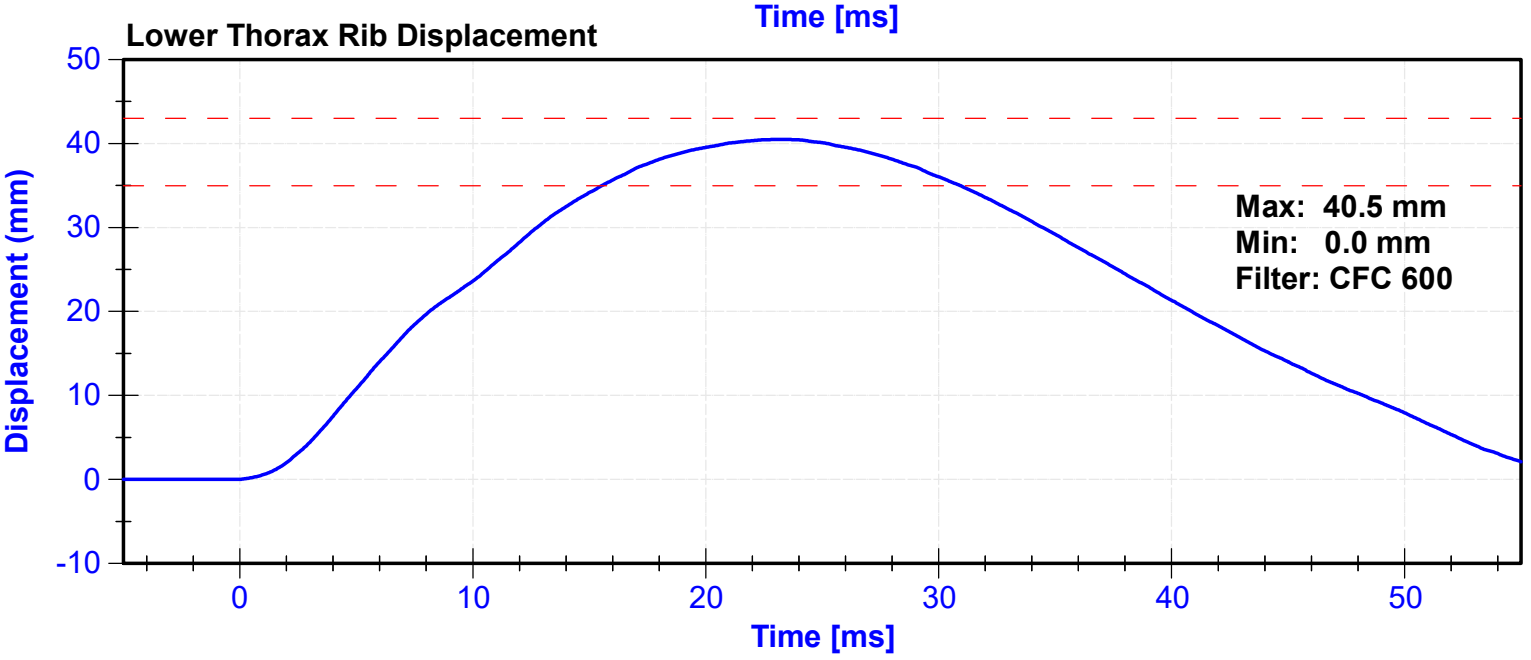
Transducer Calibrations

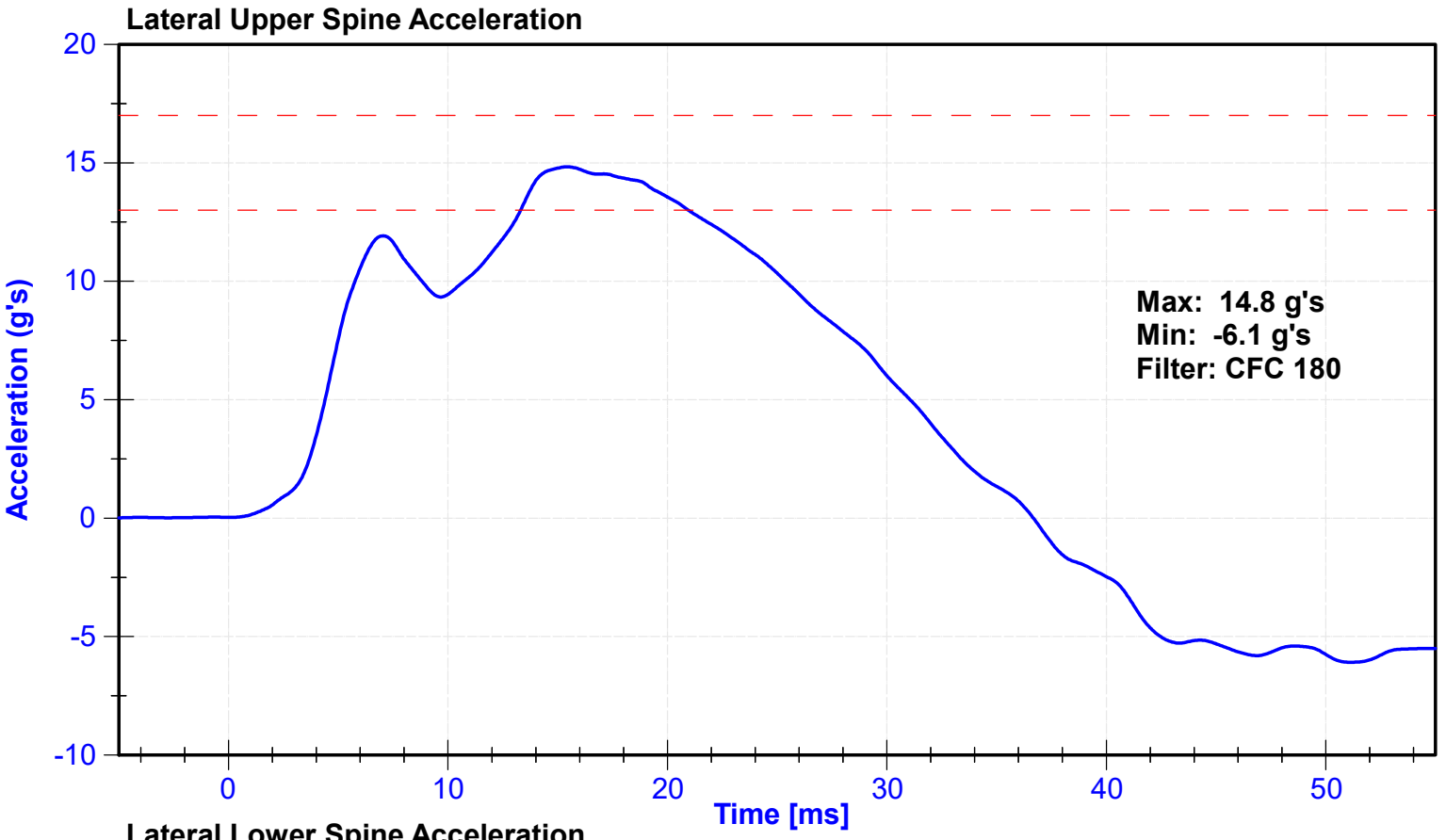
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Upper Spine Y Accelerometer	Endevco	T20880	4/4/2023	10/1/2023
Lower Spine Y Accelerometer	Endevco	P52071	4/4/2023	10/1/2023
Upper Thorax Rib Potentiometer	Servo	2316GFE	4/10/2023	10/9/2023
Middle Thorax Rib Potentiometer	Servo	040GFE	4/10/2023	10/9/2023
Lower Thorax Rib Potentiometer	Servo	1156GFE	4/10/2023	10/9/2023

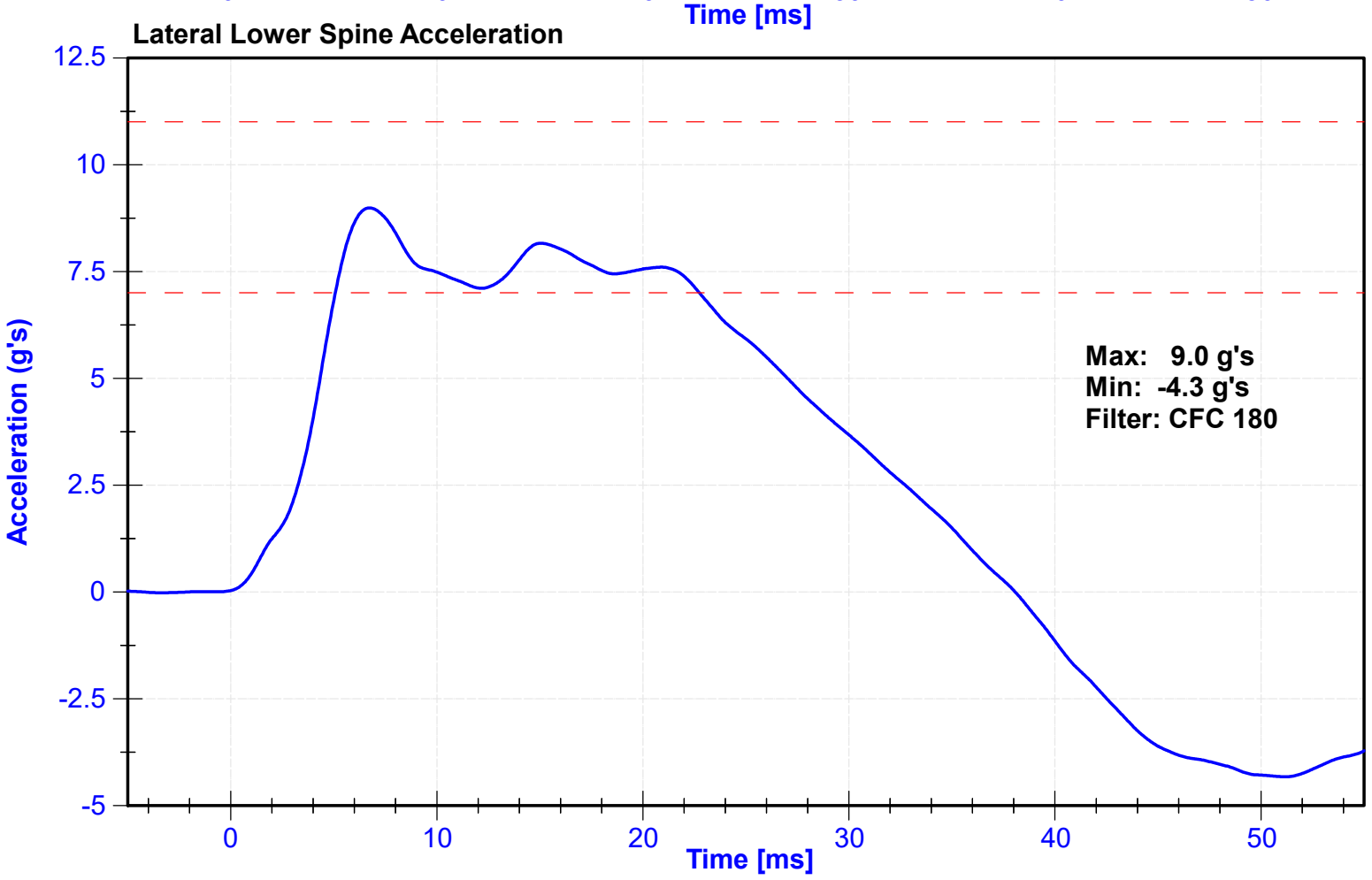



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.0 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 43.4 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.5 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]
Max: 14.8 g's
Min: -6.1 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
Time [ms]
Max: 9.0 g's
Min: -4.3 g's
Filter: CFC 180

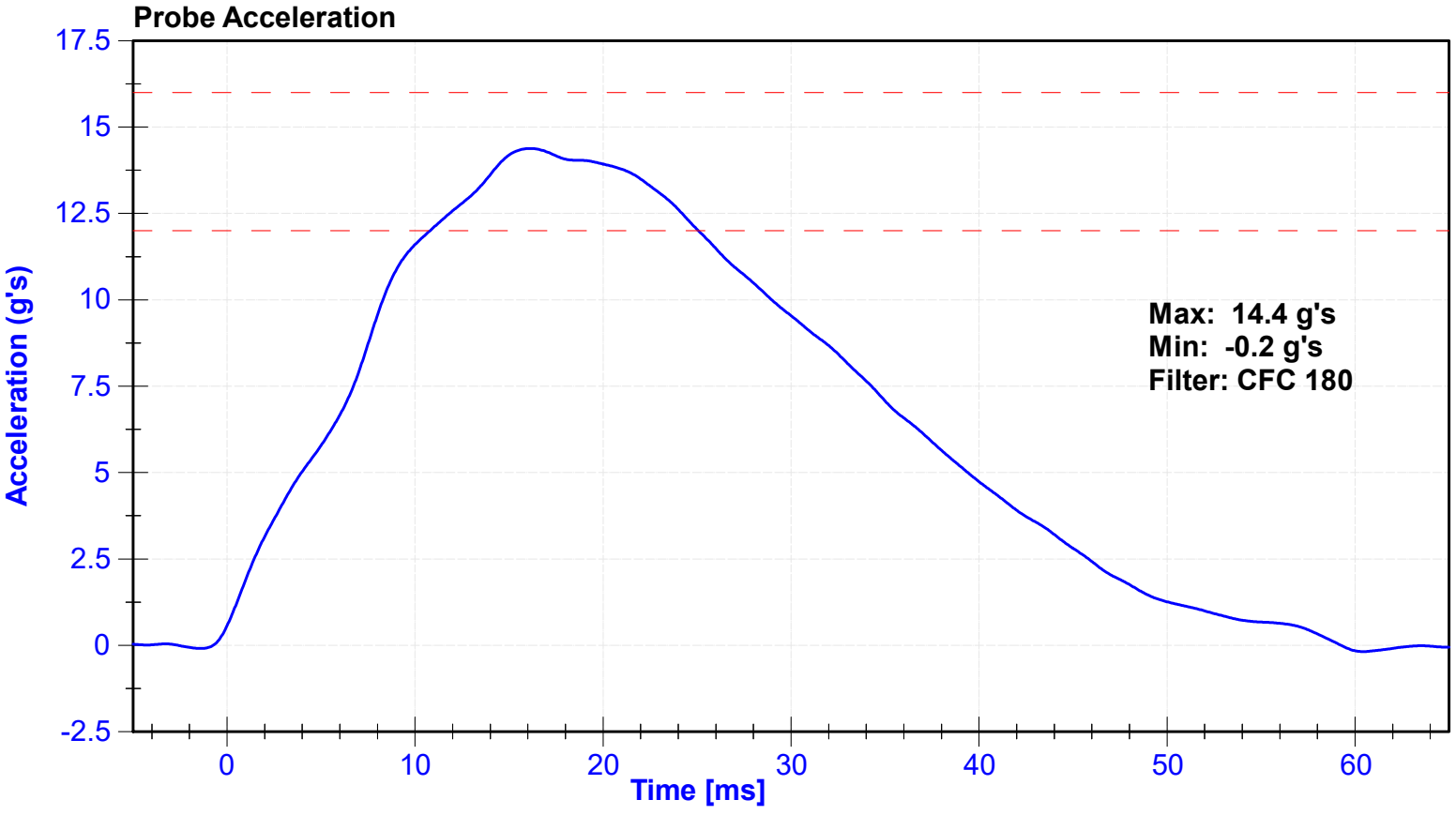
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

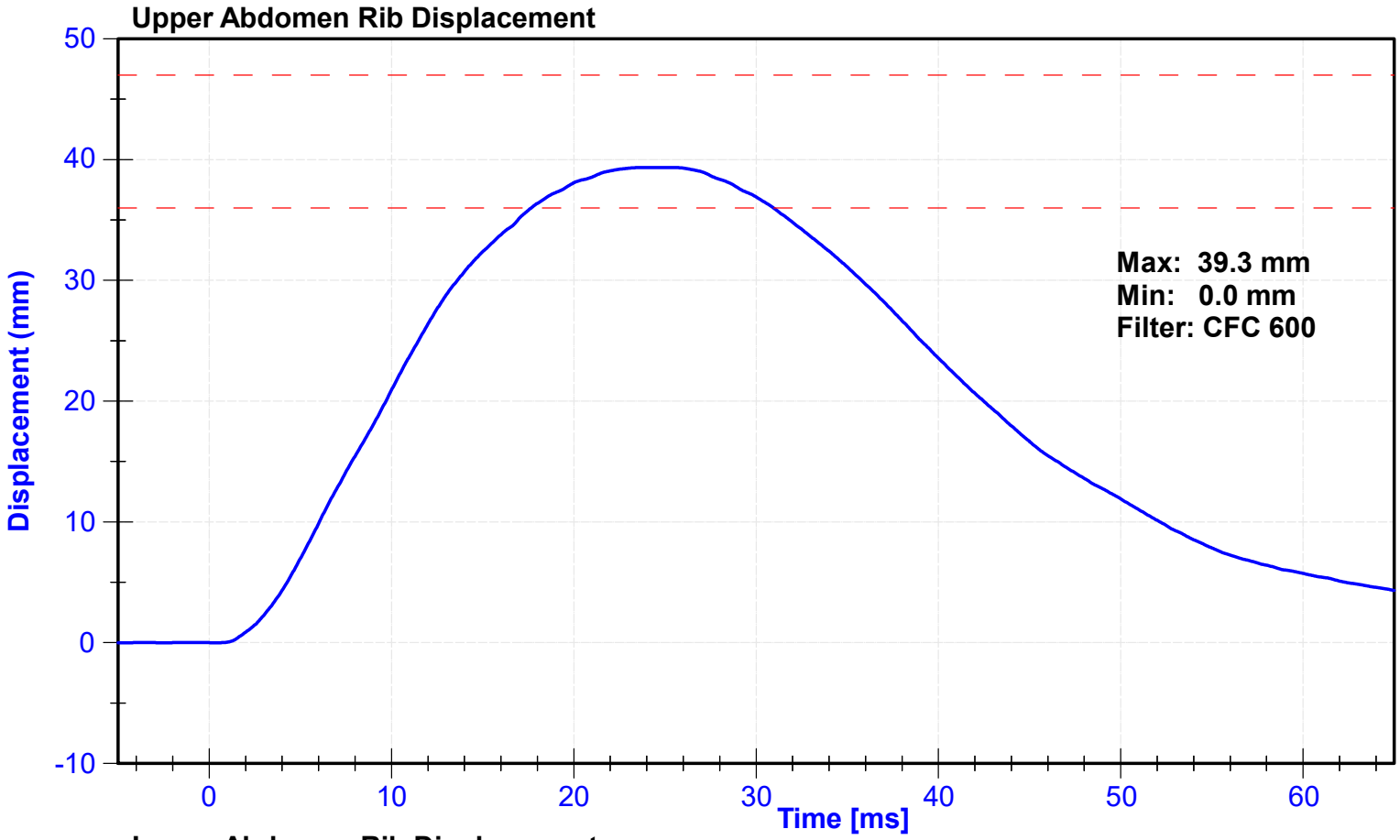
Results

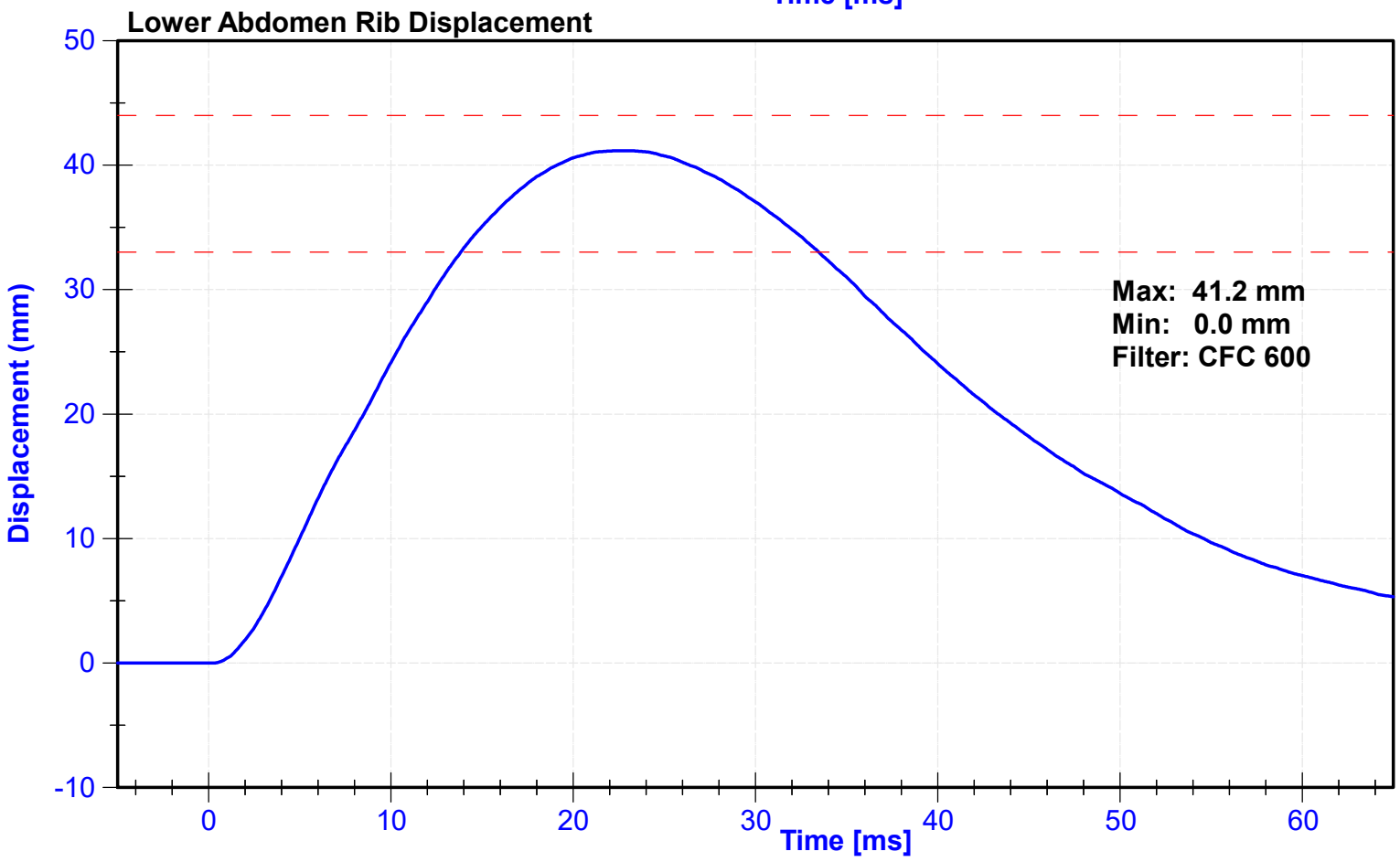
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	35	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	12	16	g's	14.4	Pass
Lateral Lower Spine Acceleration	9	14	g's	11.8	Pass
Upper Abdomen Rib Deflection	36	47	mm	39.3	Pass
Lower Abdomen Rib Deflection	33	44	mm	41.2	Pass

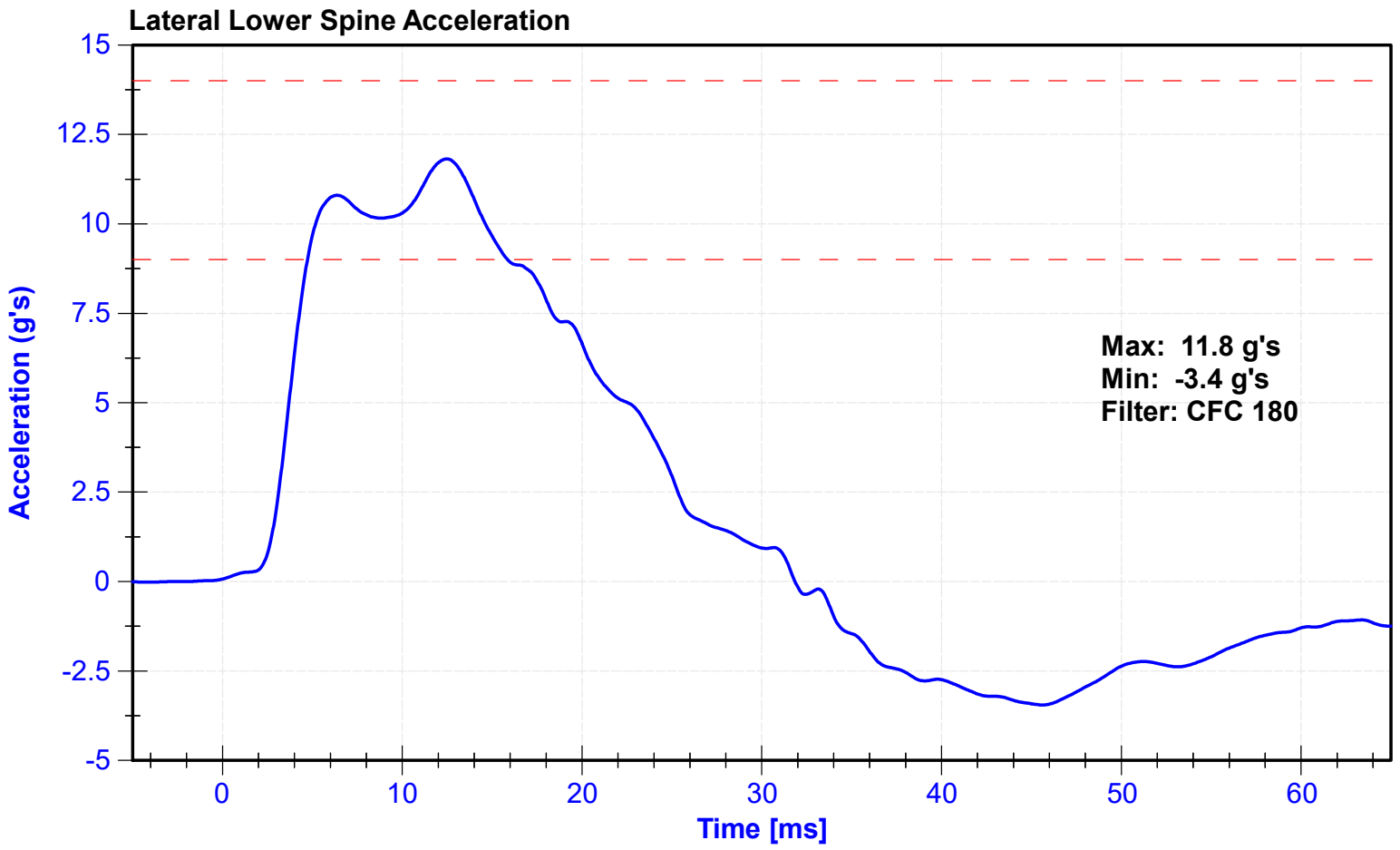
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Lower Spine Y Accelerometer	Endevco	P52071	4/4/2023	10/1/2023
Upper Abdomen Rib Potentiometer	Servo	307GFE	4/10/2023	10/9/2023
Lower Abdomen Rib Potentiometer	Servo	308GFE	4/10/2023	10/9/2023




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 39.3 mm
Min: 0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 41.2 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
60
Time [ms]
Max: 11.8 g's
Min: -3.4 g's
Filter: CFC 180

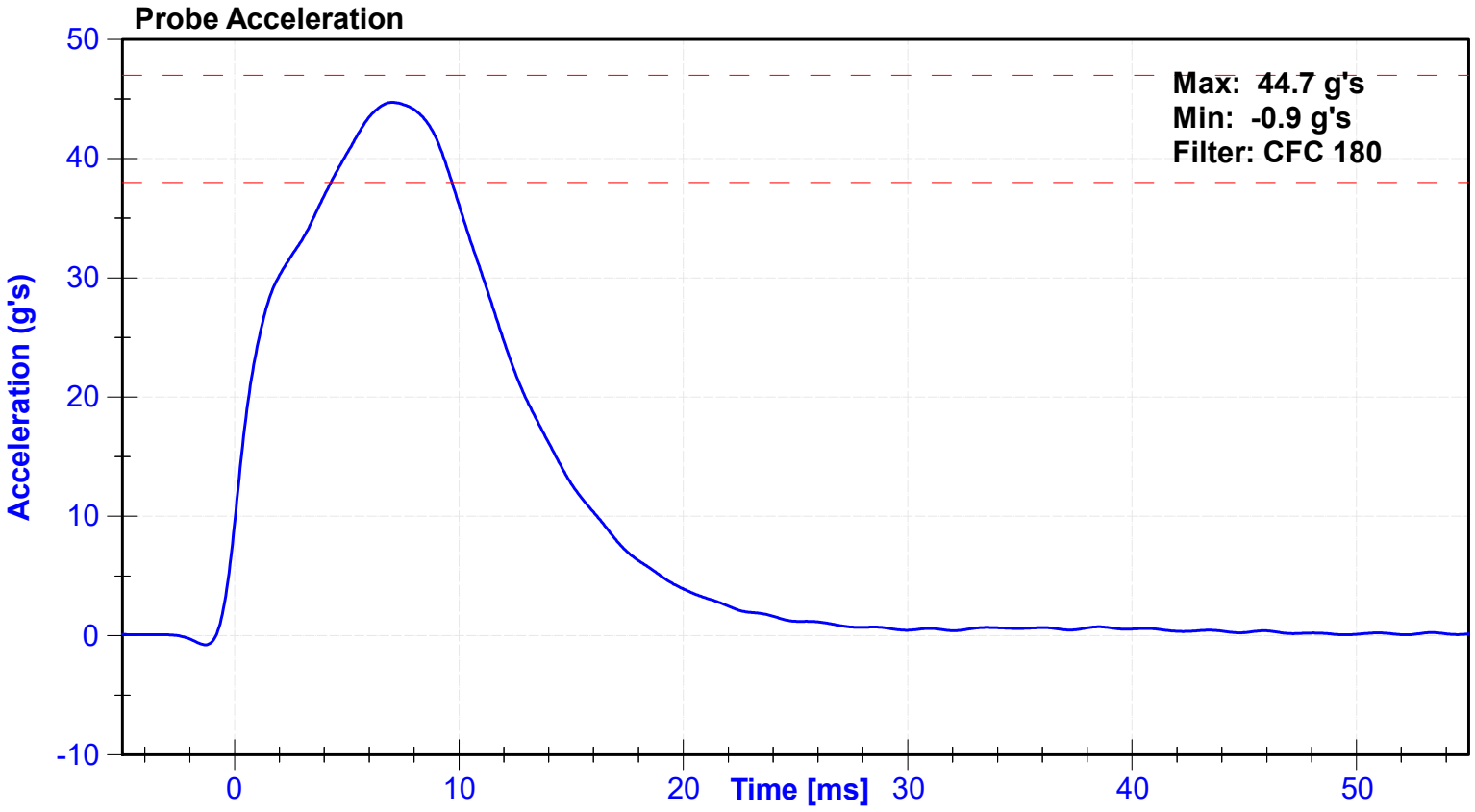
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

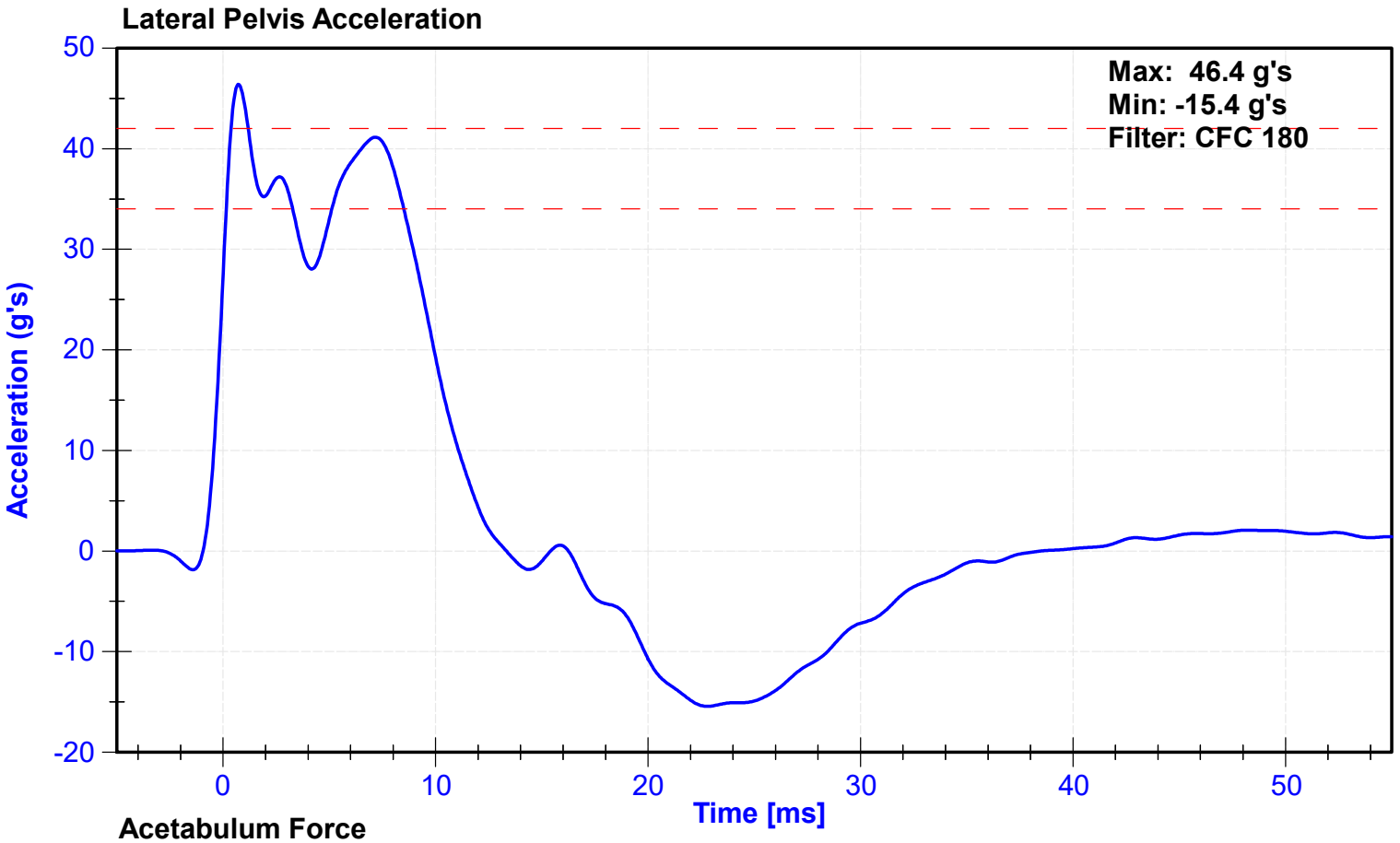
Results

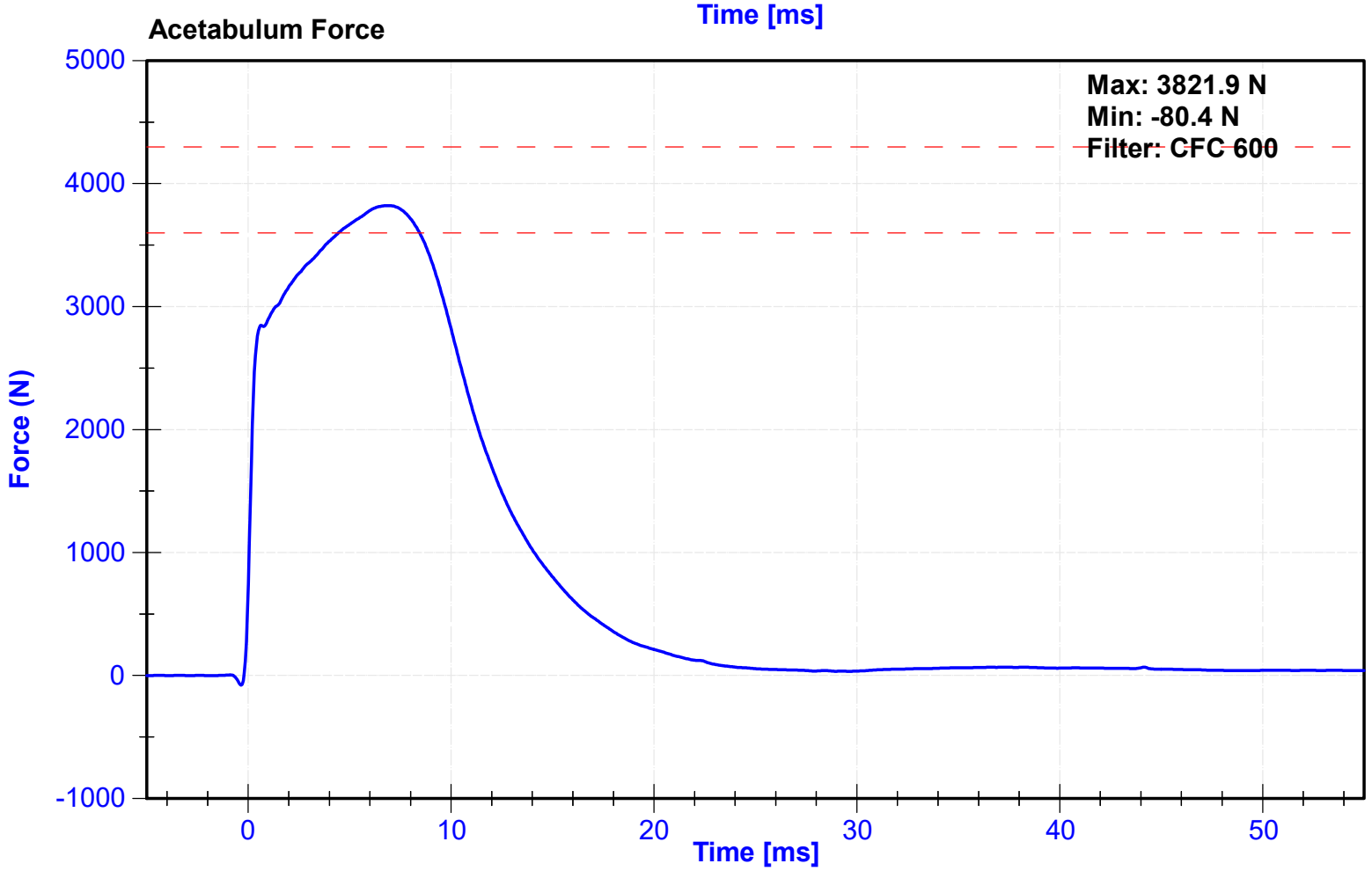
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	35	Pass
Velocity	6.6	6.8	m/s	6.77	Pass
Probe Acceleration	38	47	g's	44.7	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.1	Pass
Acetabulum Force	3600	4300	N	3821.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Pelvis Y Accelerometer	Endevco	P51731	4/4/2023	10/1/2023
Acetabulum Load Cell	Denton	267-FY	8/11/2022	8/11/2023
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A




Lateral Pelvis Acceleration
Max: 46.4 g's
Min: -15.4 g's
Filter: CFC 180
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]


Acetabulum Force
Max: 3821.9 N
Min: -80.4 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

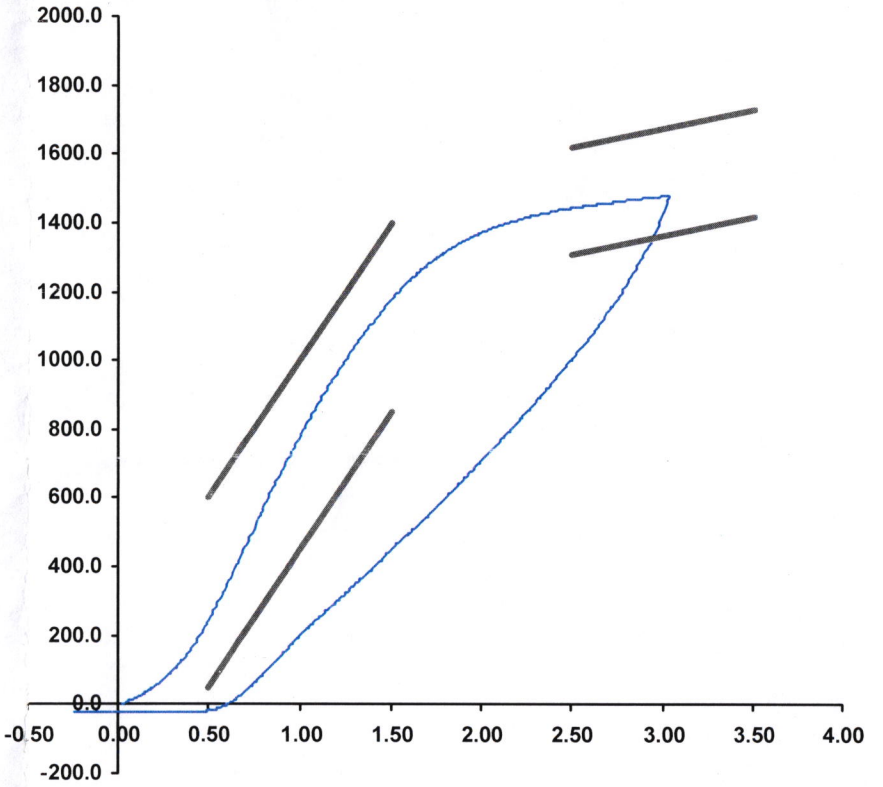
Plug S/N 15435
Test Number 20096
Report Number 20150
Test Date 9/9/2021 10:16:59 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	253	50	600
Force @ 1.5 mm (N)	1,181	850	1,400
Force @ 2.5 mm (N)	1,444	1,306	1,618
Force @ 3.0 mm (N)	1,479	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

SACO RESEARCH

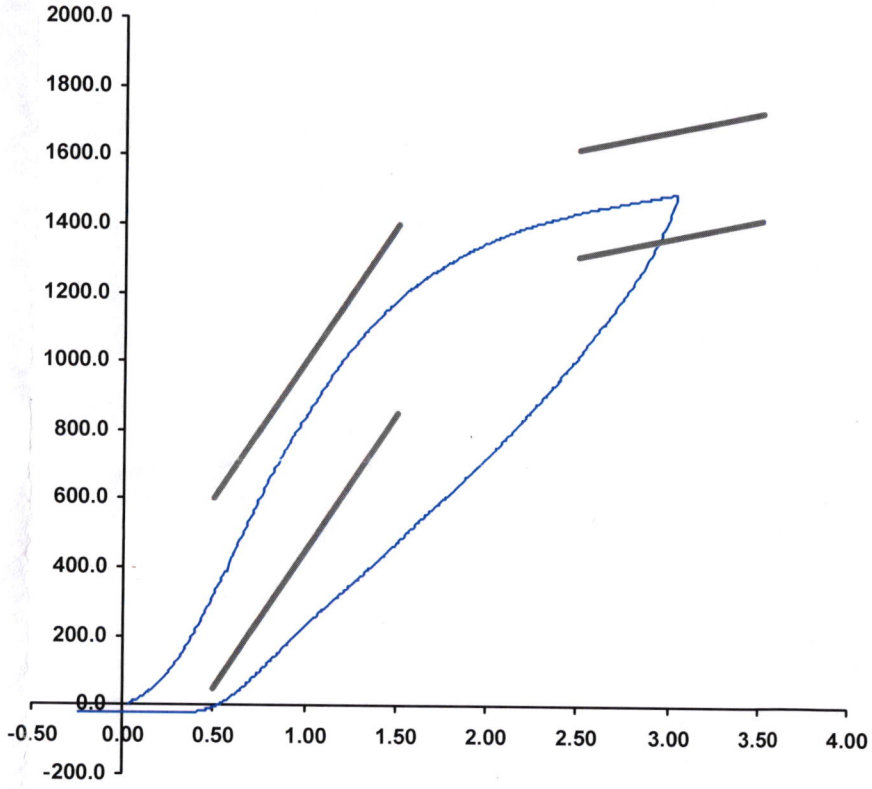
IMPACT

SID-IIs Pelvis Plug Certification Test

Plug S/N 15132
Test Number 17844
Report Number 17893
Test Date 3/5/2021 10:16:28 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	327	50	600
Force @ 1.5 mm (N)	1,180	850	1,400
Force @ 2.5 mm (N)	1,437	1,306	1,618
Force @ 3.0 mm (N)	1,489	1,361	1,673

Force (-N) vs Extension (-mm)



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 05-Mar-21
SACO Research

By : DC Date : 3/5/2021

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

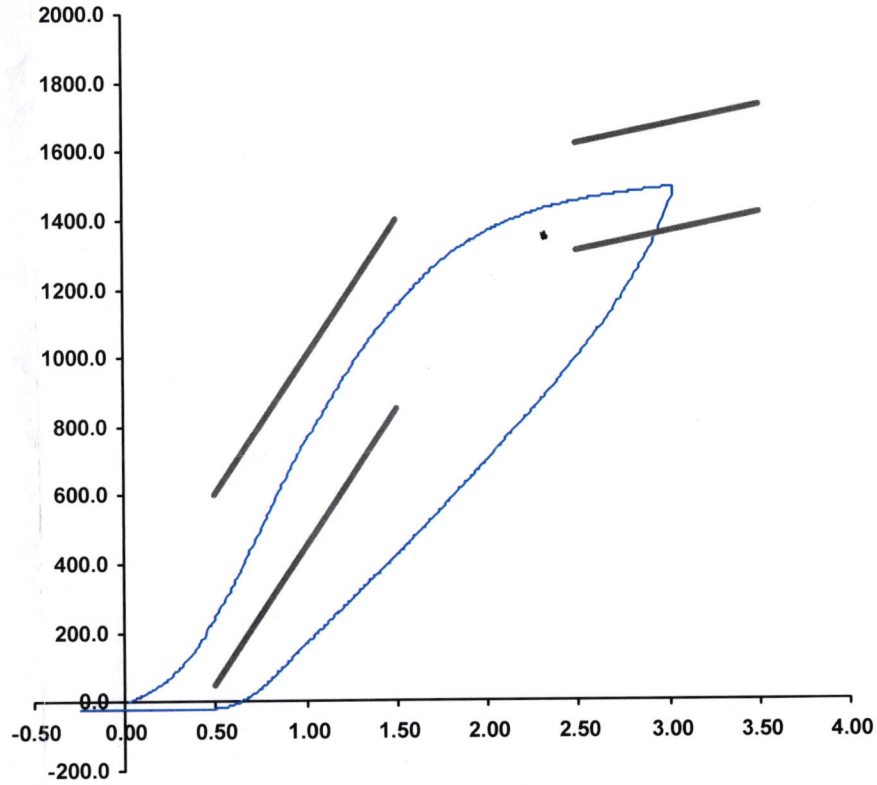
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test NON-IMPACT

Force (-N) vs Extension (-mm)

Plug S/N 15342
Test Number 19689
Report Number 19741
Test Date 7/20/2021 12:15:22 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	256	50	600
Force @ 1.5 mm (N)	1,149	850	1,400
Force @ 2.5 mm (N)	1,454	1,306	1,618
Force @ 3.0 mm (N)	1,492	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-Jul-21
SACO Research

By : DC Date : 7/20/2021

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

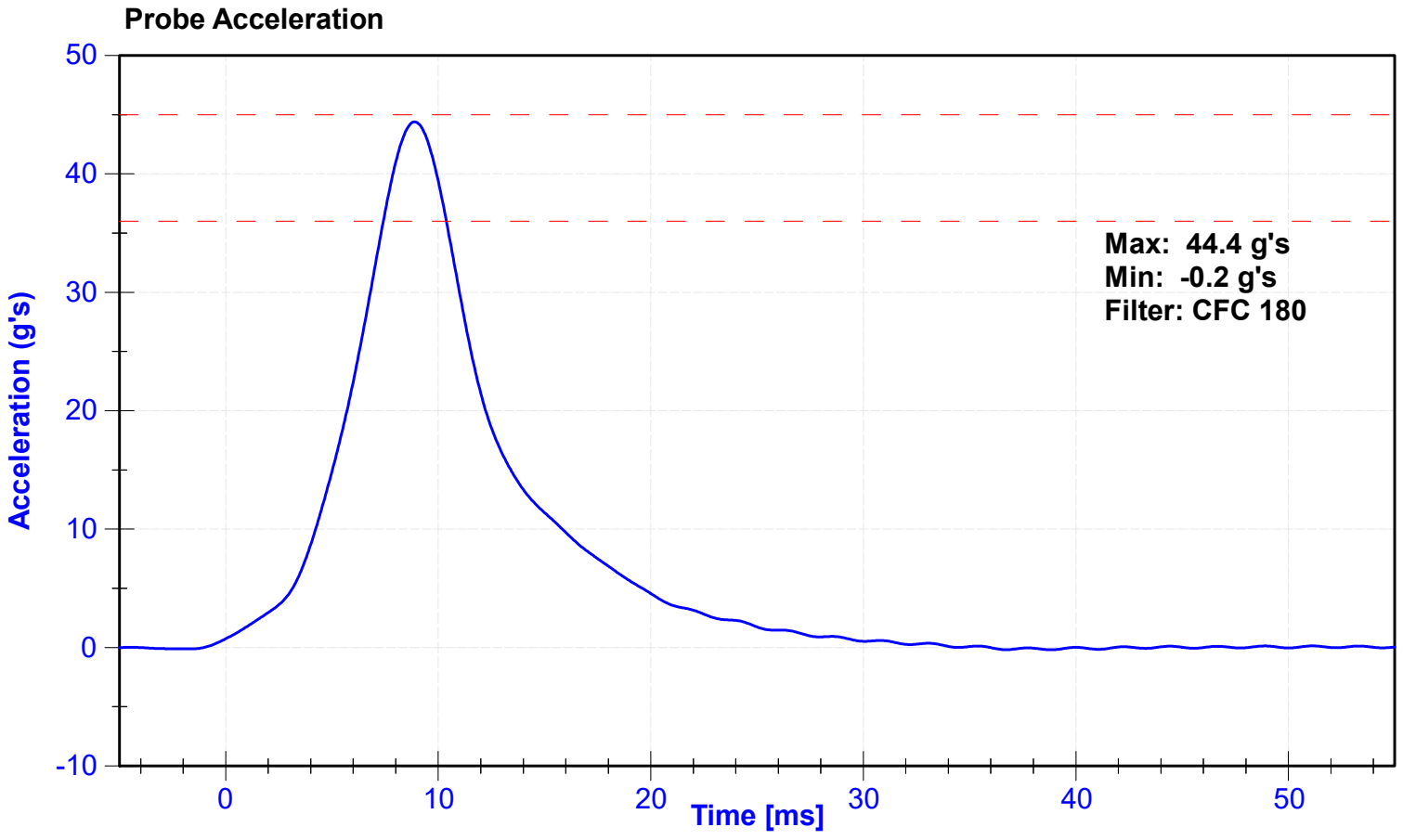
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

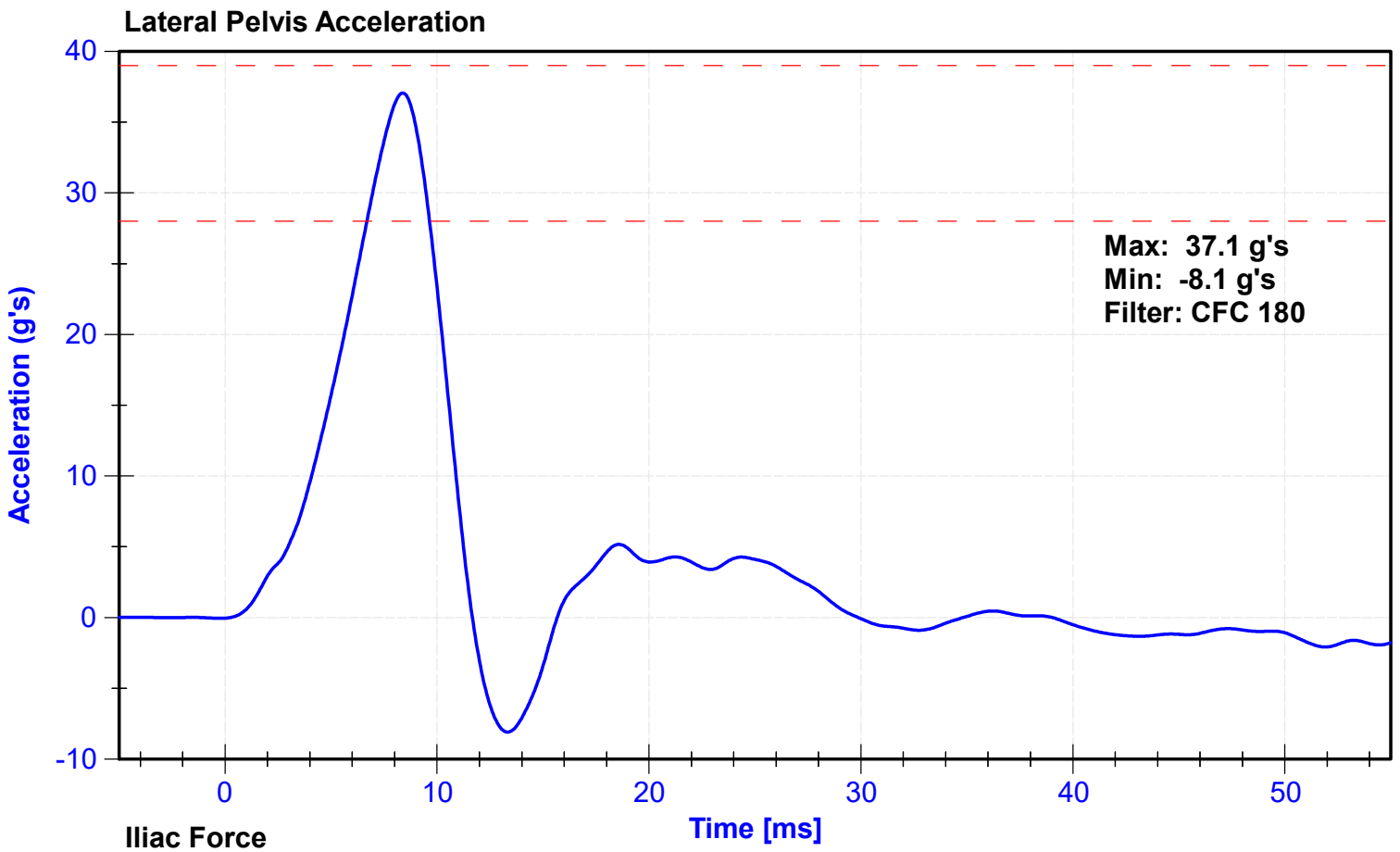
Results

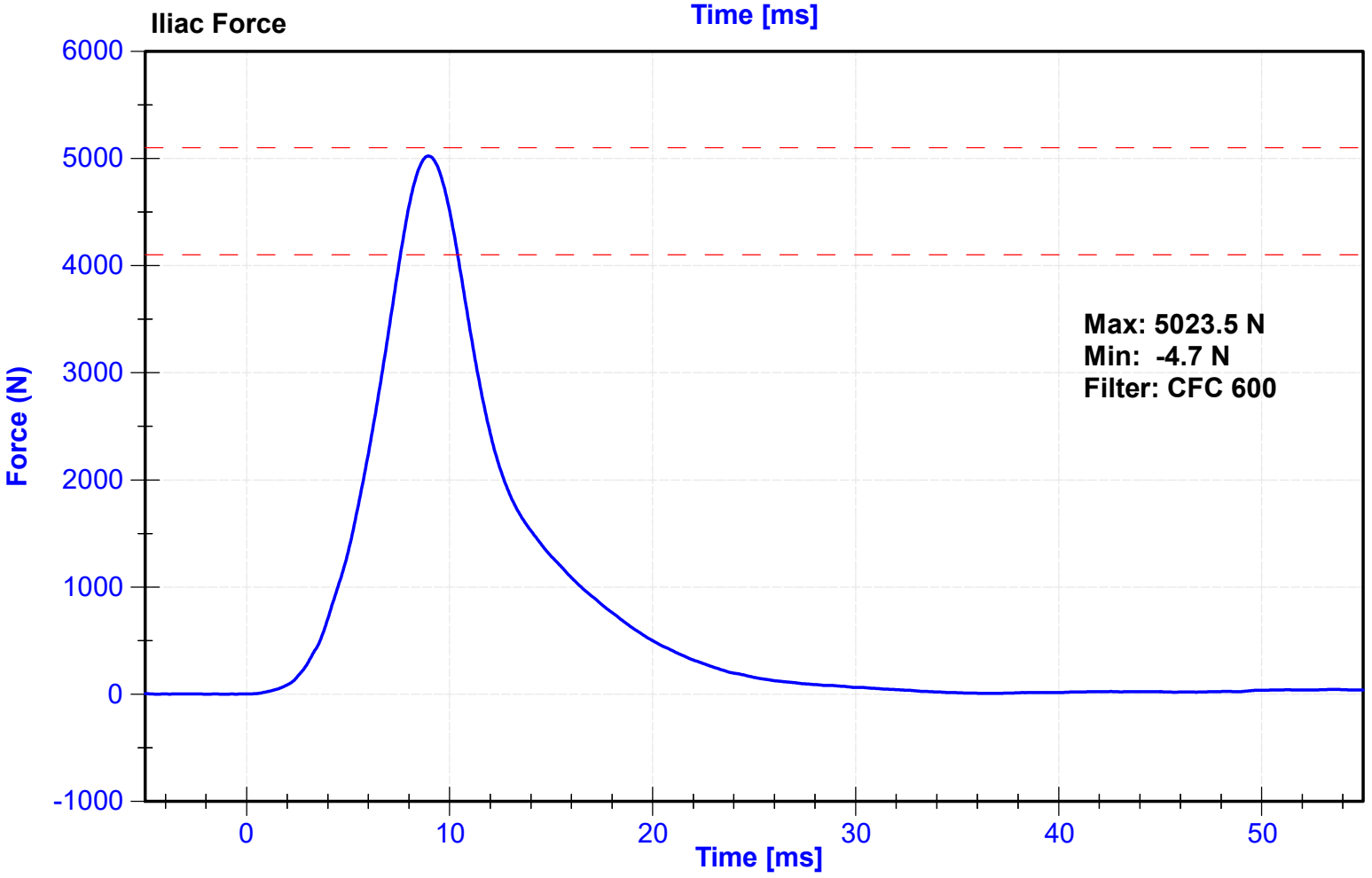
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	35	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	36	45	g's	44.4	Pass
Lateral Pelvis Acceleration	28	39	g's	37.1	Pass
Iliac Force	4100	5100	N	5023.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Pelvis Y Accelerometer	Endevco	P51731	4/4/2023	10/1/2023
Iliac Load Cell	Denton	280-FY	8/11/2022	8/11/2023




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 37.1 g's
Min: -8.1 g's
Filter: CFC 180


Iliac Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 5023.5 N
Min: -4.7 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

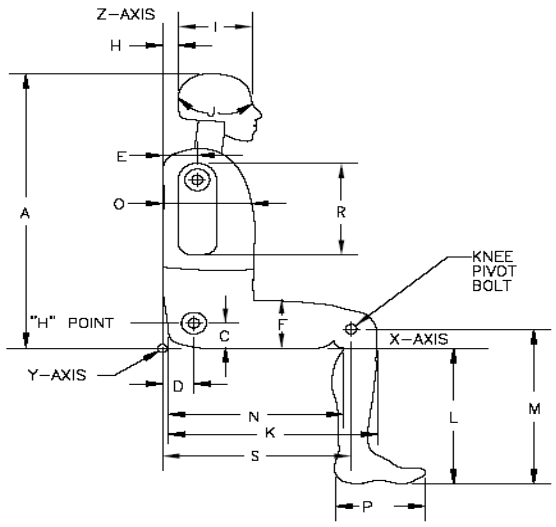
SERIAL NO:300

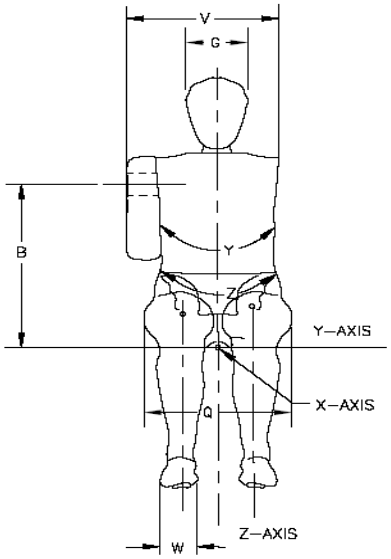
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Brogan Date: 06/02/2023

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	101	Pass
F	Thigh Clearance	119	135	123	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	42	Pass
I	Head Depth	178	188	181	Pass
J	Head Circumference	541	551	547	Pass
K	Buttock to Knee Length	514	540	529	Pass
L	Popliteal Height	343	369	353	Pass
M	Knee Pivot to floor height	392	409	403	Pass
N	Buttock Popliteal Length	416	442	430	Pass
O	Chest Depth w/o jacket	195	211	199	Pass
P	Foot Length	216	232	221	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	252	Pass
S	Knee Joint to seatback	477	493	486	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	876	Pass
Z	Waist Circumference	761	791	773	Pass

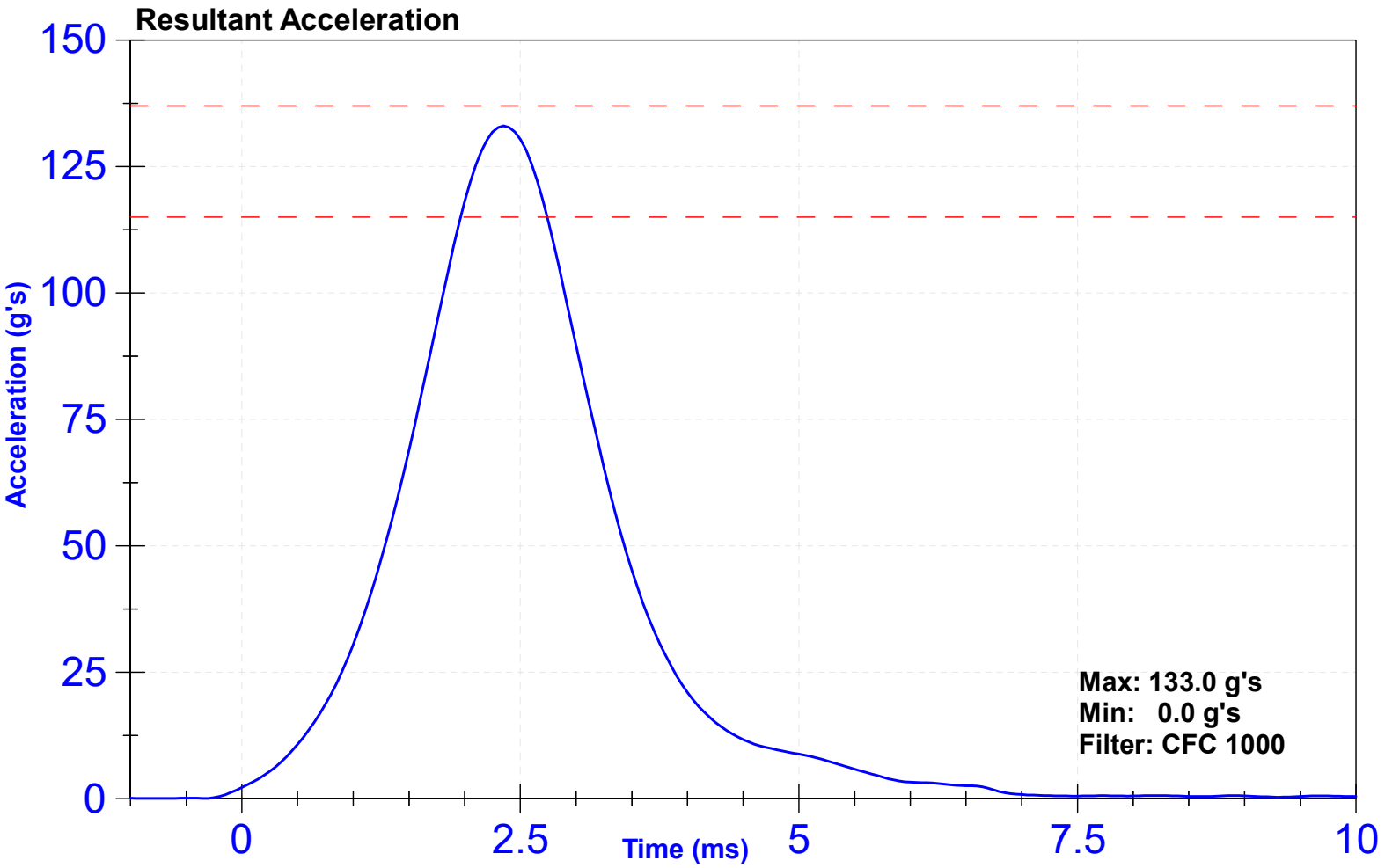
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

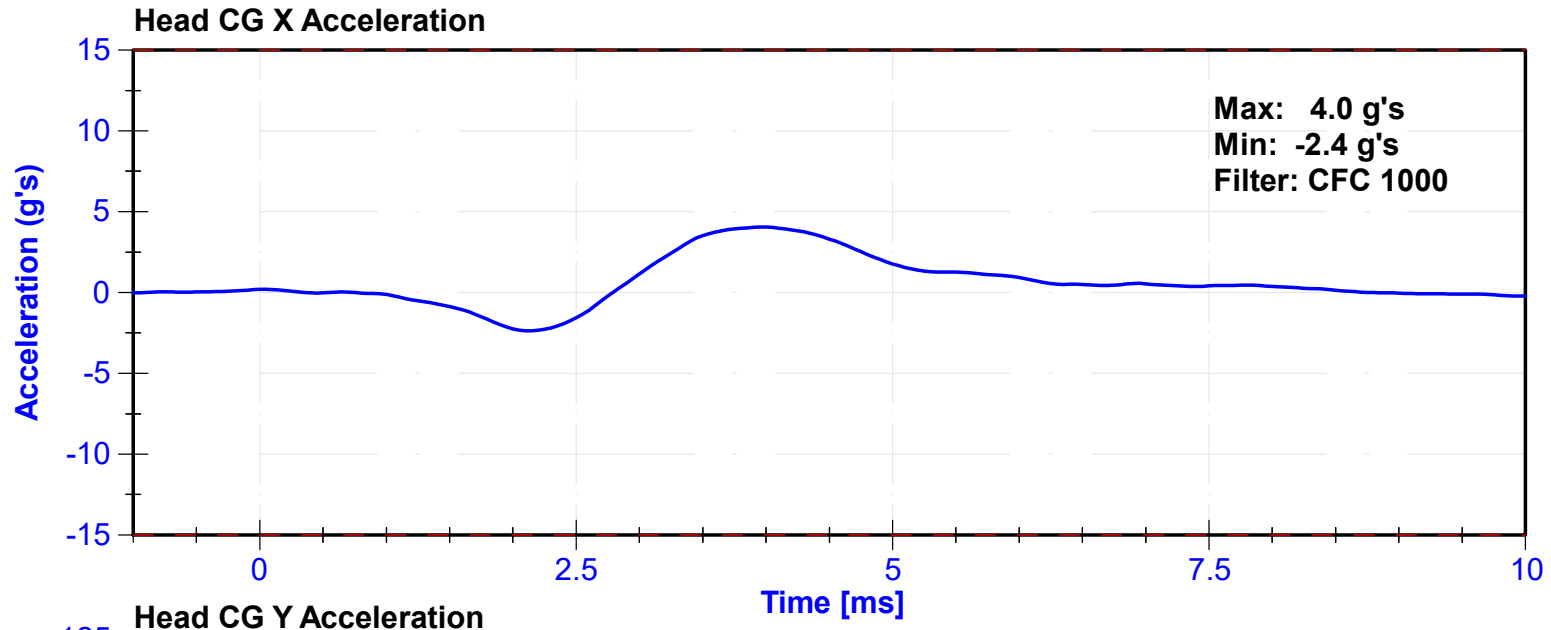
Results

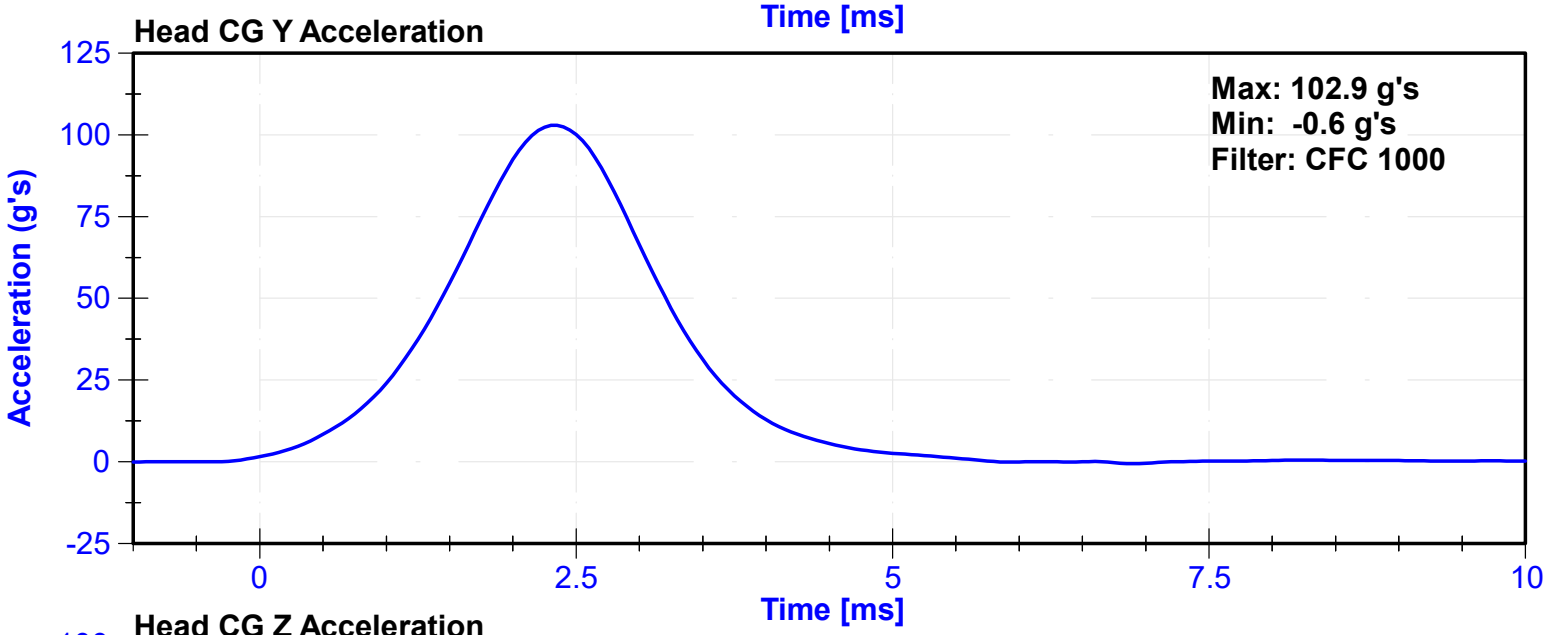
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	35.6	Pass
Resultant Acceleration	115	137	g's	133.0	Pass
Oscillation	0	15	%	0.4	Pass
Fore-Aft Acceleration	-15	15	g's	4.0	Pass

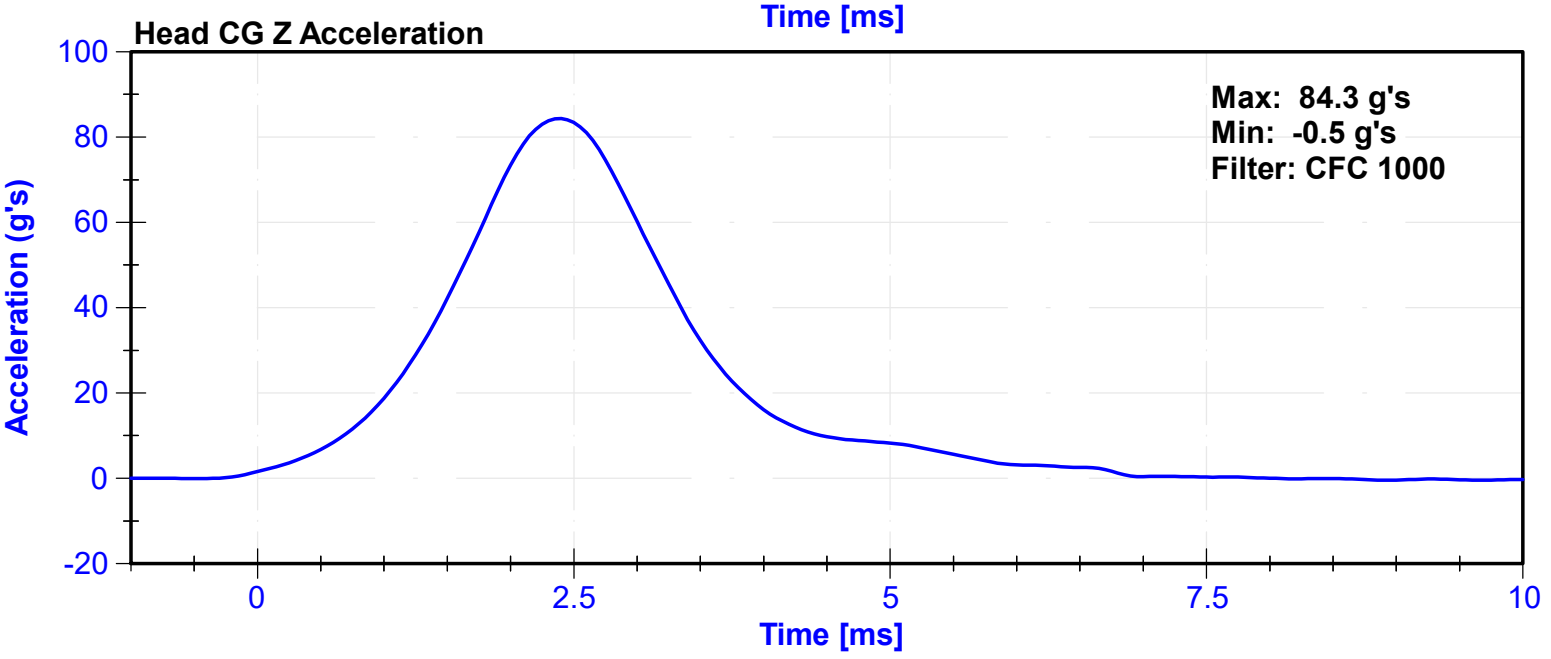
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P59018	4/4/2023	10/1/2023
Y Accelerometer	Endevco	P79189	4/4/2023	10/1/2023
Z Accelerometer	Endevco	P79587	4/4/2023	10/1/2023




Head CG X Acceleration
Max: 4.0 g's
Min: -2.4 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 102.9 g's
Min: -0.6 g's
Filter: CFC 1000
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 84.3 g's
Min: -0.5 g's
Filter: CFC 1000
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]

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

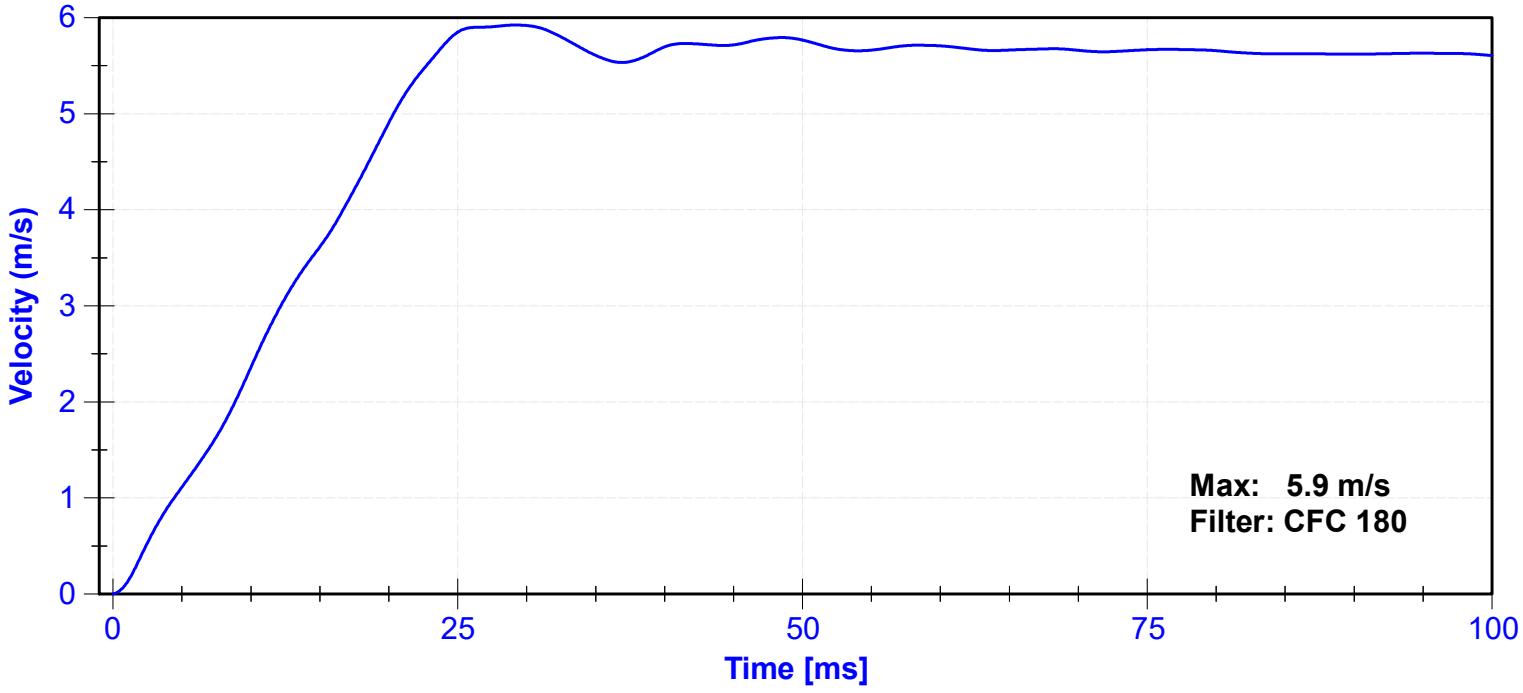
Results

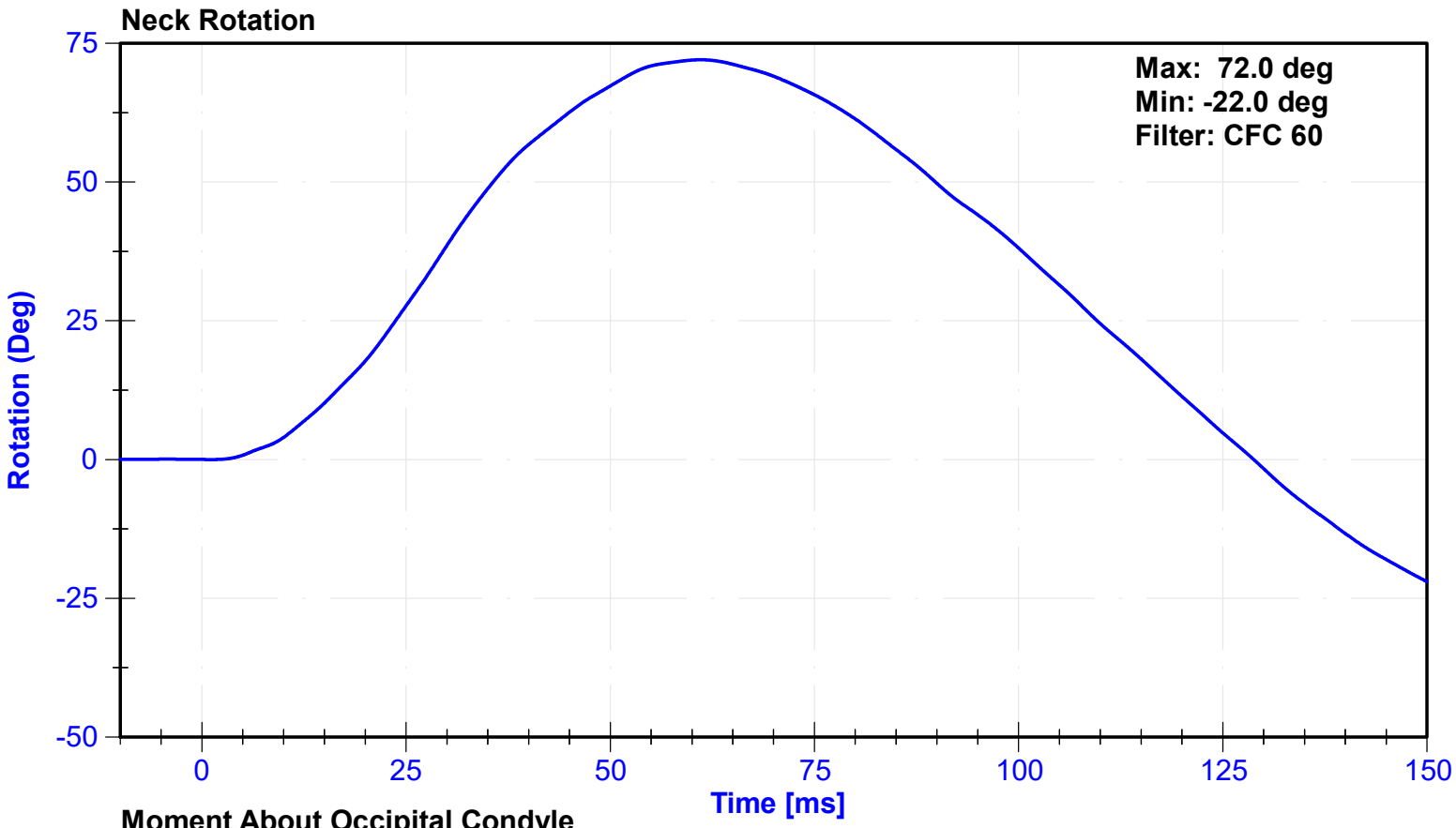
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	50.2	Pass
Velocity	5.51	5.63	m/s	5.587	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.36	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.61	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.91	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.85	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.92	Pass
Neck Rotation	71	81	deg	72.0	Pass
Time at Maximum Rotation	50	70	ms	61.1	Pass
Moment about the OC	36	44	Nm	44.0	Pass
Moment Decay to 0 Nm	102	126	ms	112.8	Pass

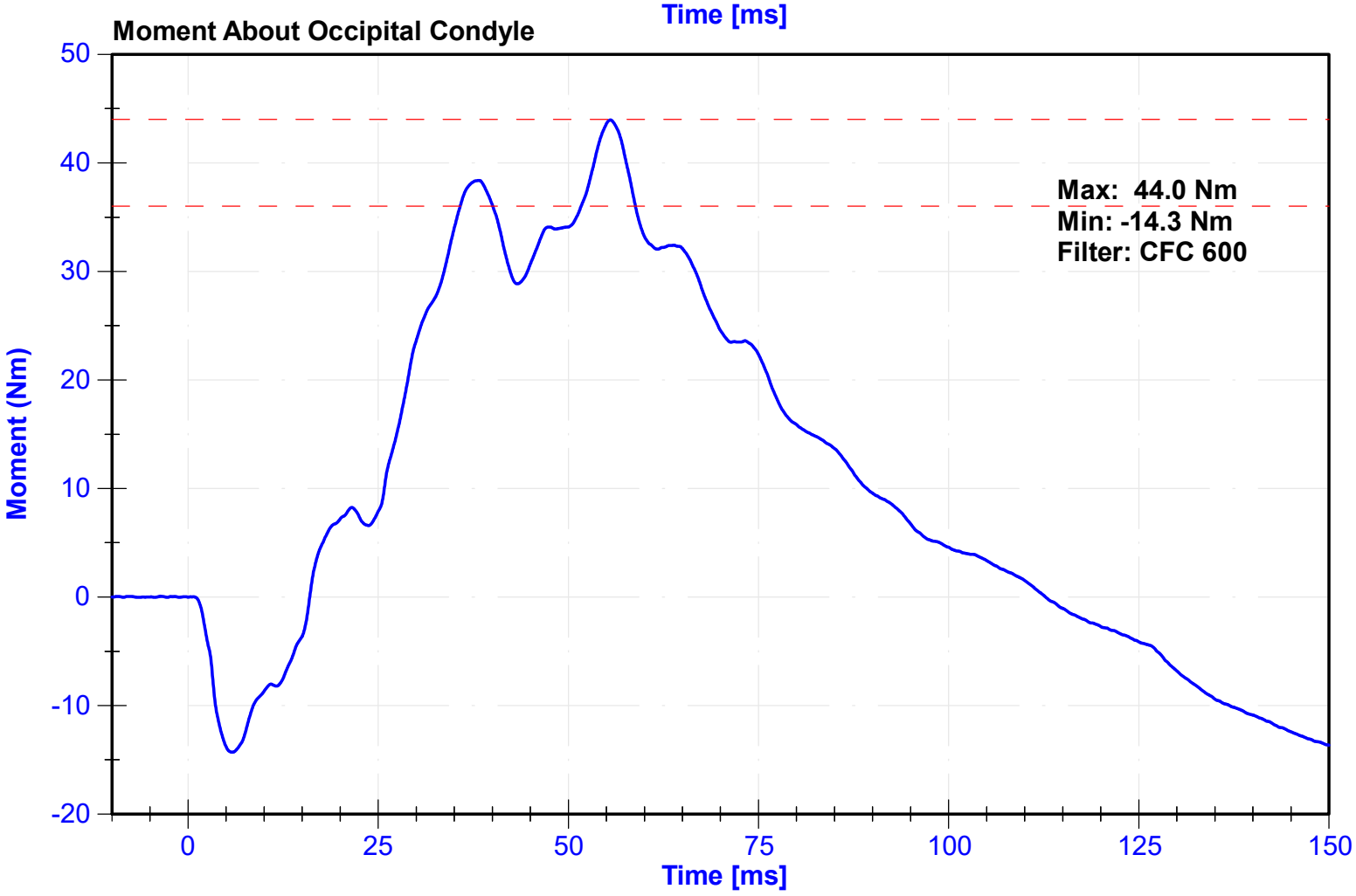
Transducer Calibrations

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

Pendulum Impulse




Neck Rotation
Max: 72.0 deg
Min: -22.0 deg
Filter: CFC 60
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 44.0 Nm
Min: -14.3 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

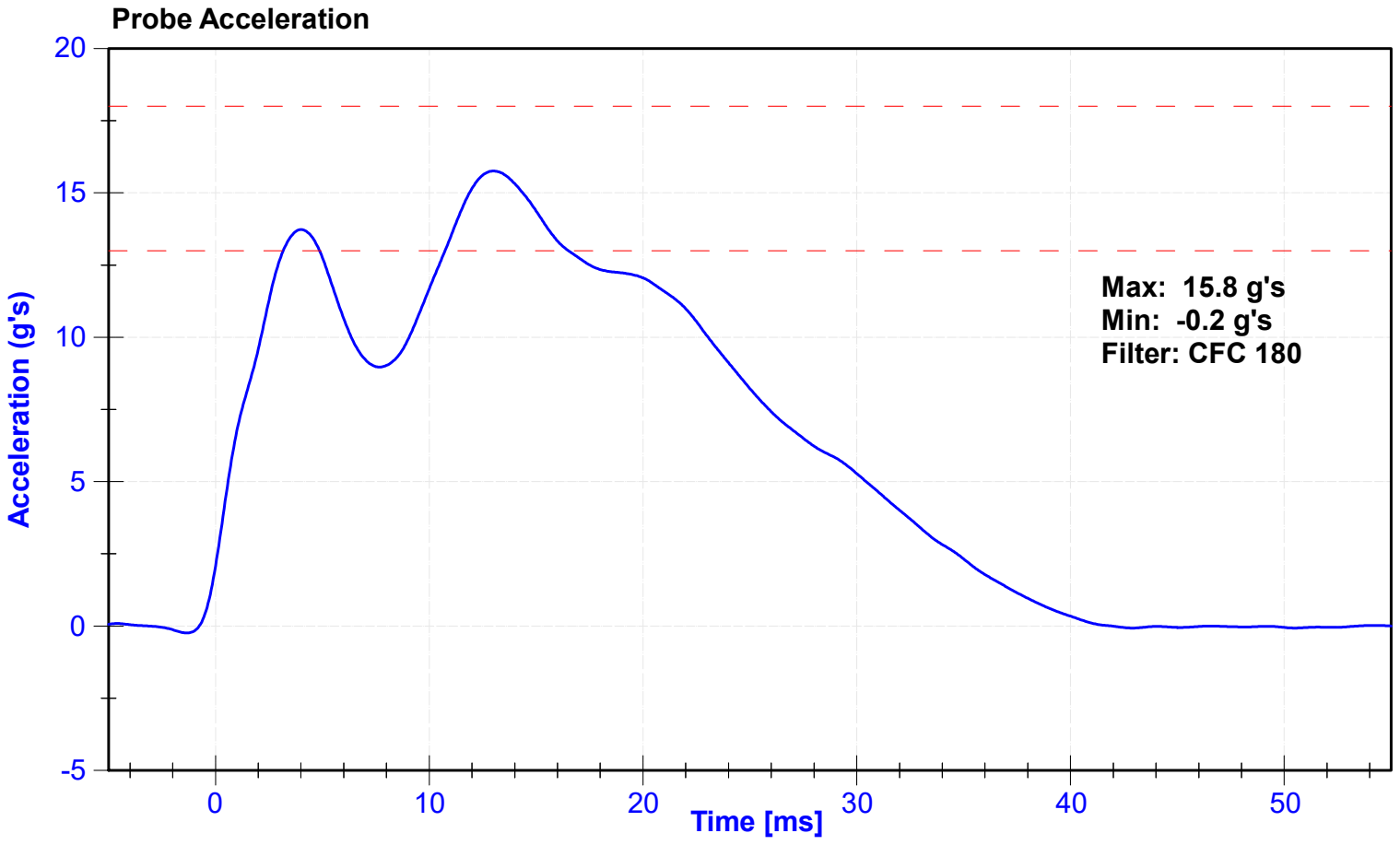
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

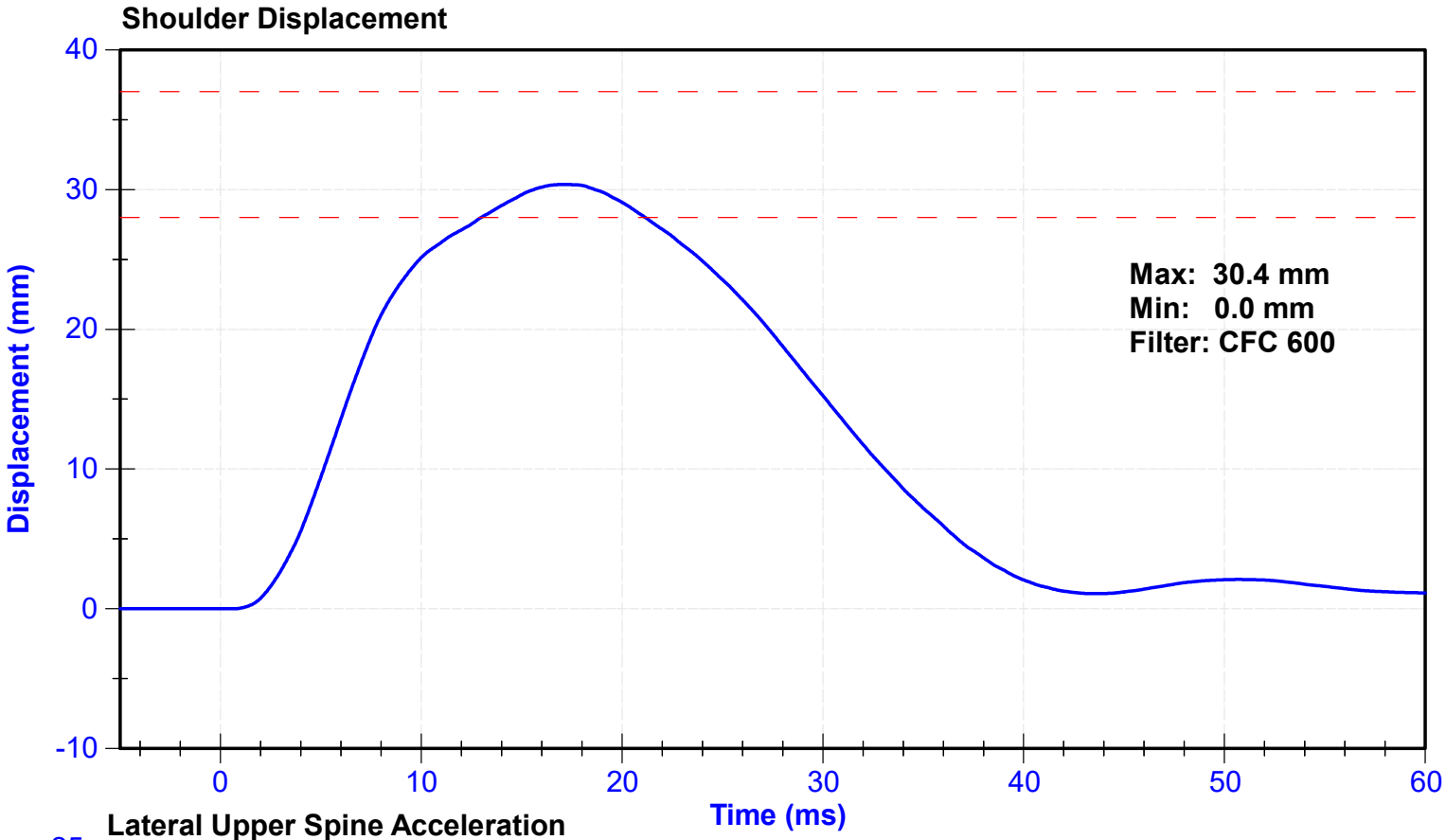
Results

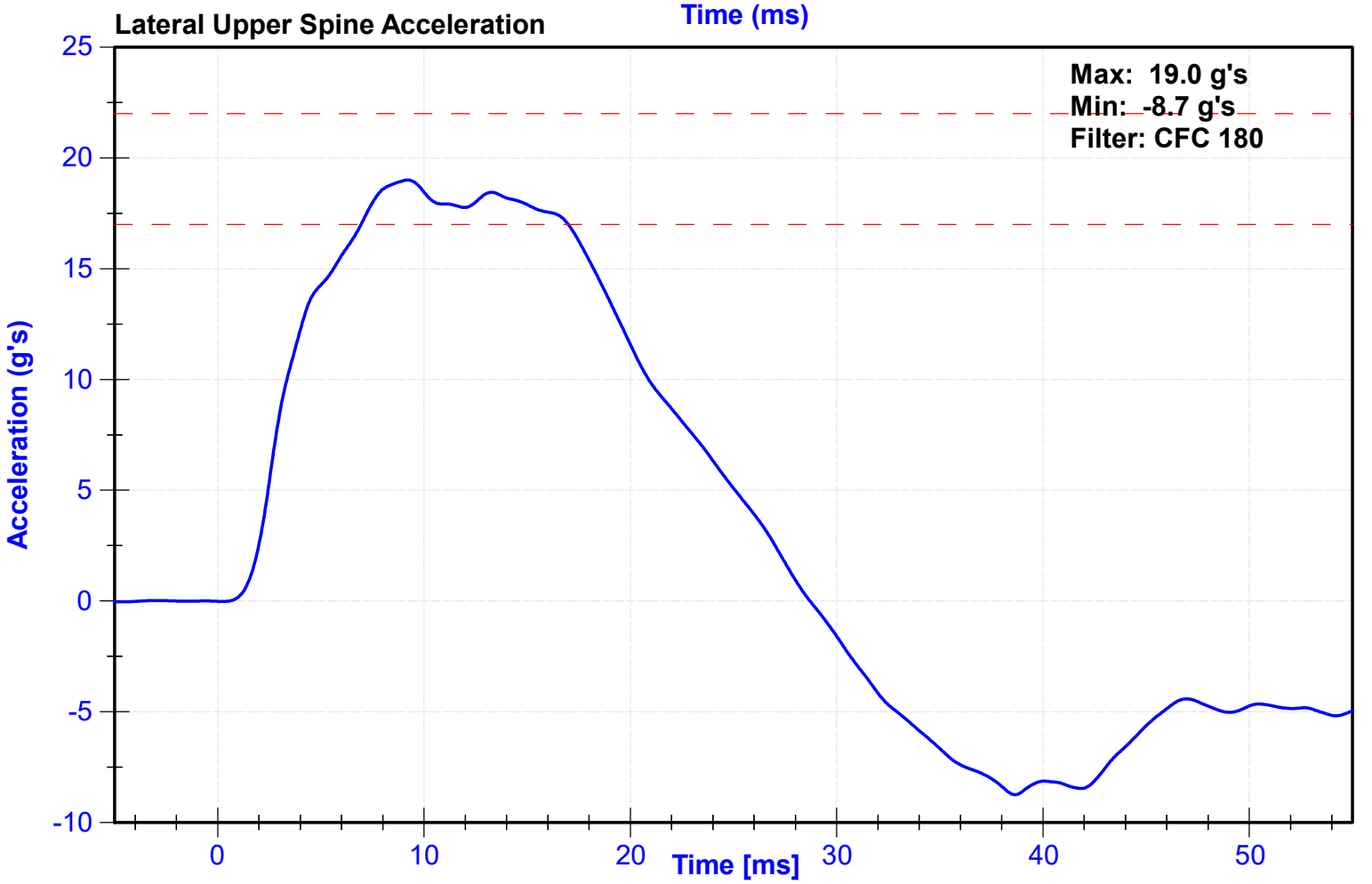
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	50.2	Pass
Velocity	4.2	4.4	m/s	4.30	Pass
Probe Acceleration	13	18	g's	15.8	Pass
Shoulder Deflection	28	37	mm	30.4	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Shoulder Potentiometer	Servo	053GFE	4/10/2023	10/9/2023
Upper Spine Y Accelerometer	Endevco	T20880	4/4/2023	10/1/2023




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 30.4 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 19.0 g's
Min: -8.7 g's
Filter: CFC 180

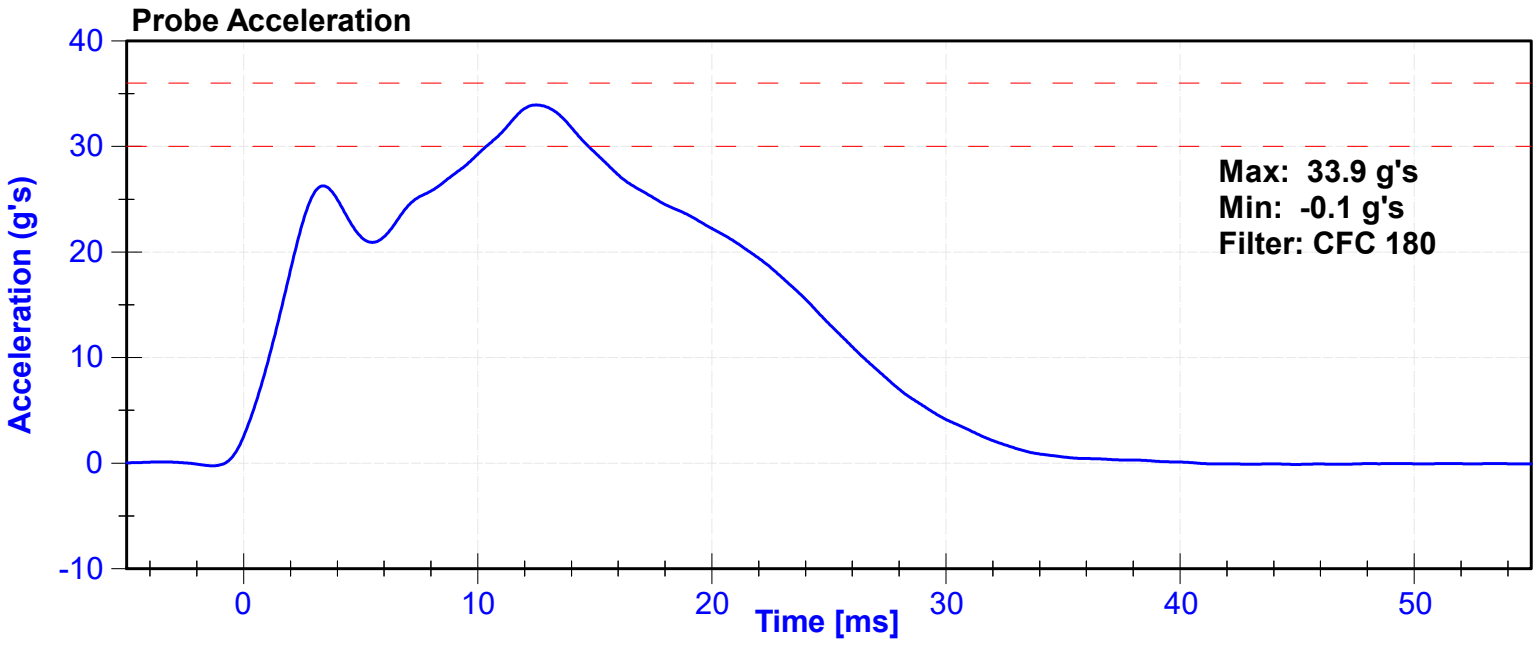
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

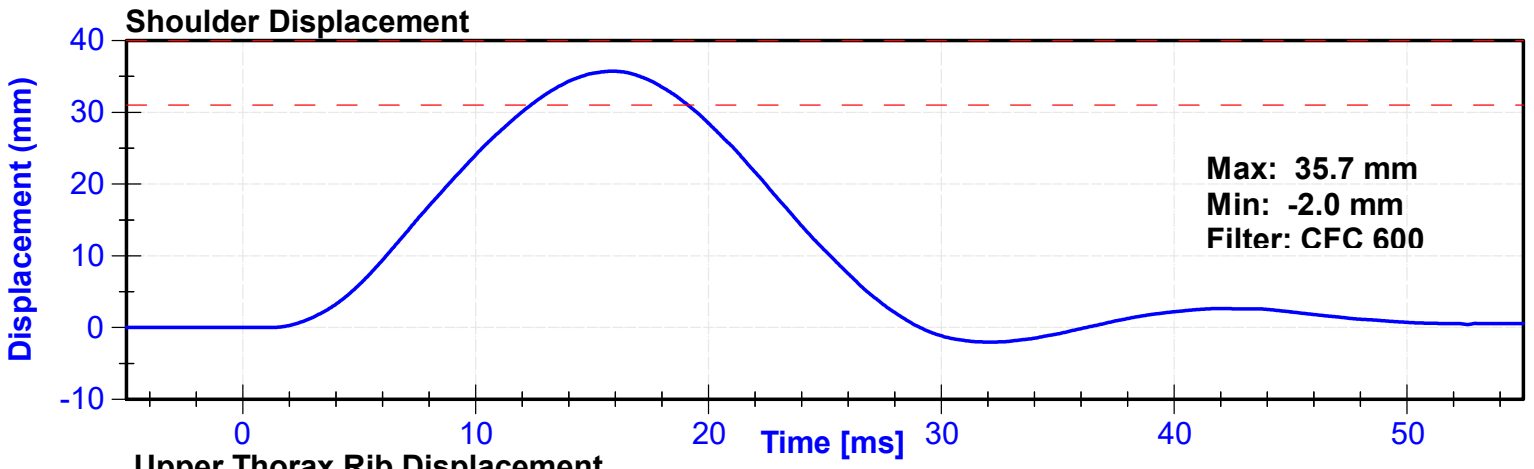
Results

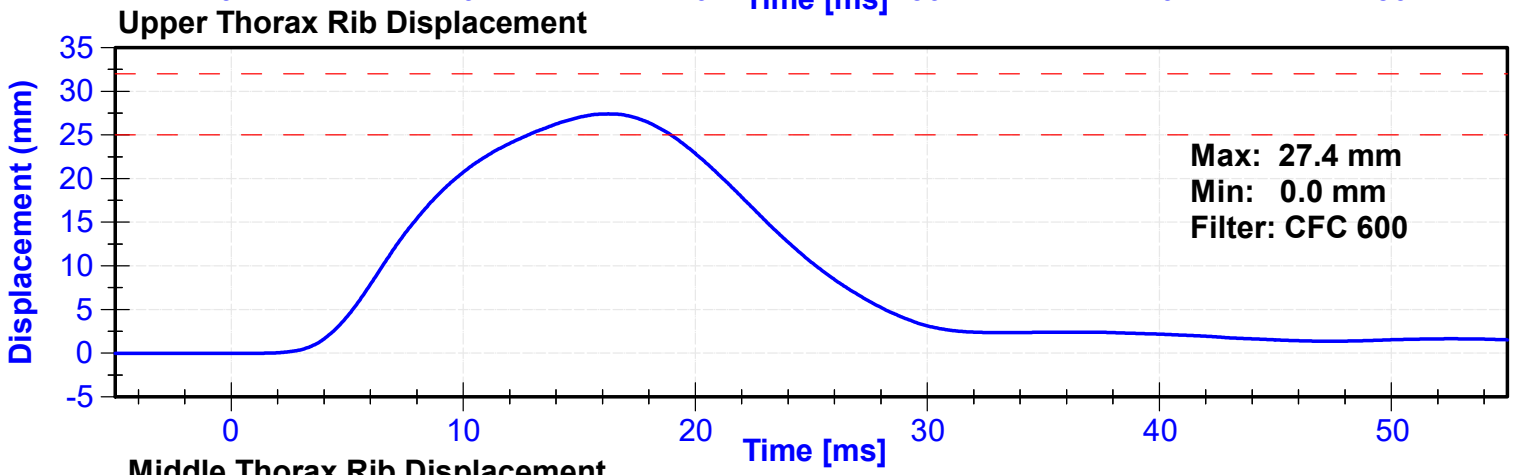
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	50.2	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration after 5 ms	30	36	g's	33.9	Pass
Lateral Upper Spine Acceleration	34	43	g's	36.0	Pass
Lateral Lower Spine Acceleration	29	37	g's	34.3	Pass
Shoulder Deflection	31	40	mm	35.7	Pass
Upper Thorax Rib Deflection	25	32	mm	27.4	Pass
Mid Thorax Rib Deflection	30	36	mm	32.0	Pass
Lower Thorax Rib Deflection	32	38	mm	33.8	Pass

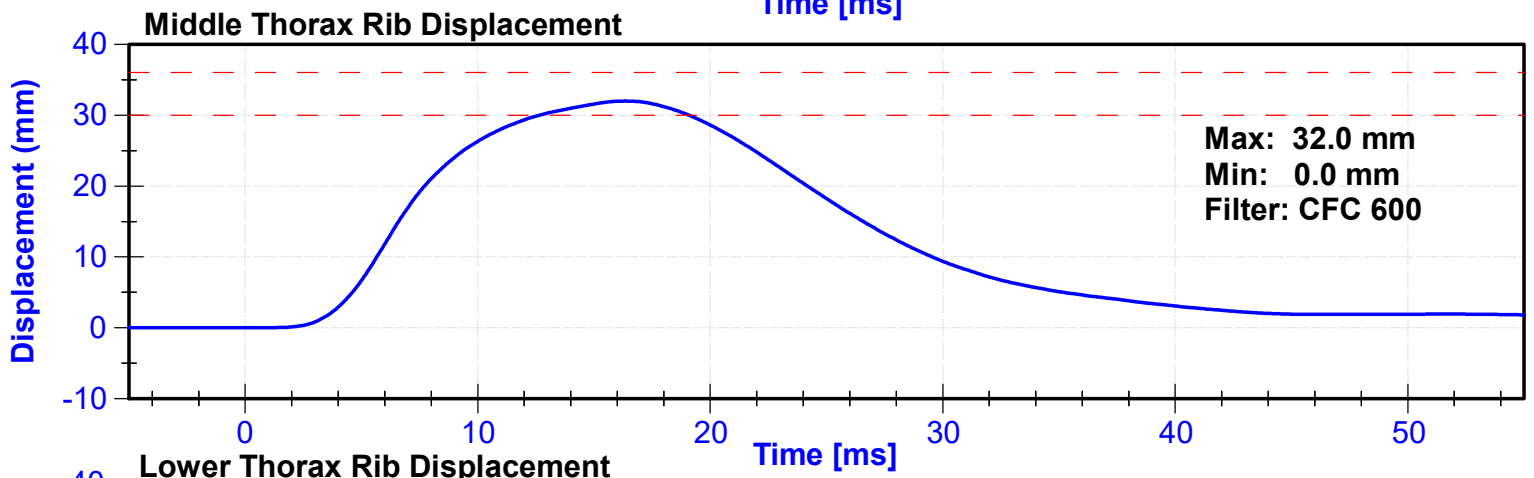
Transducer Calibrations

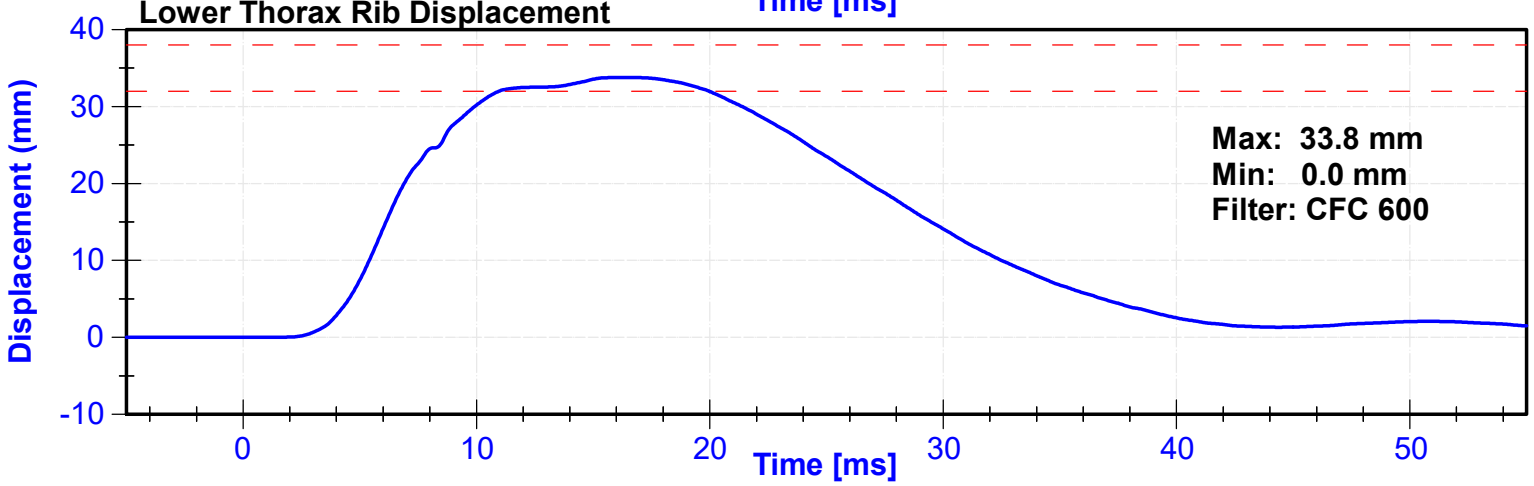
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Upper Spine T1 Y Accelerometer	Endevco	T20880	4/4/2023	10/1/2023
Upper Spine T12 Y Accelerometer	Endevco	P52071	4/4/2023	10/1/2023
Shoulder Potentiometer	Servo	053GFE	4/10/2023	10/9/2023
Upper Thorax Rib Potentiometer	Servo	2316GFE	4/10/2023	10/9/2023
Middle Thorax Rib Potentiometer	Servo	040GFE	4/10/2023	10/9/2023
Lower Thorax Rib Potentiometer	Servo	1156GFE	4/10/2023	10/9/2023

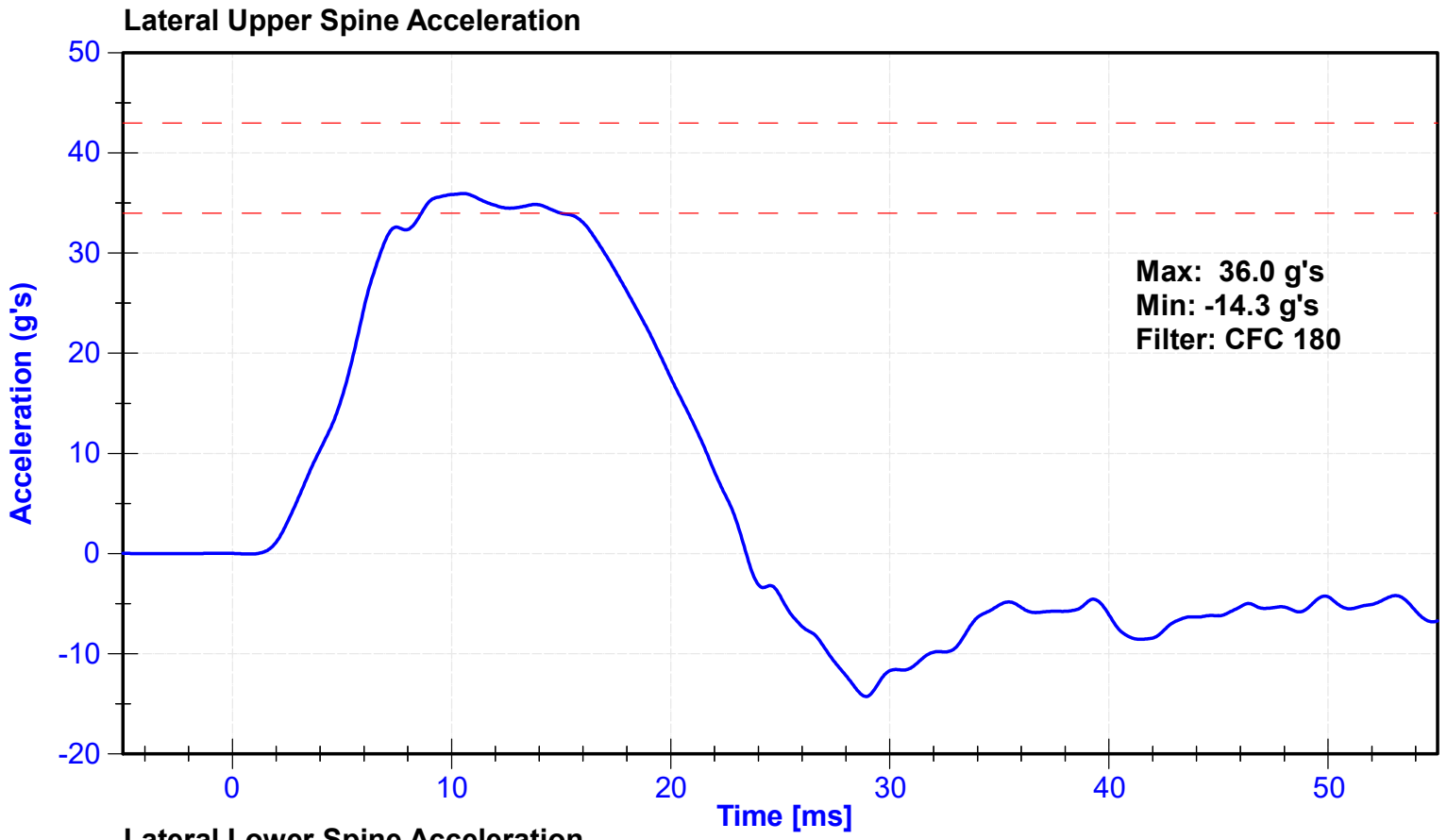


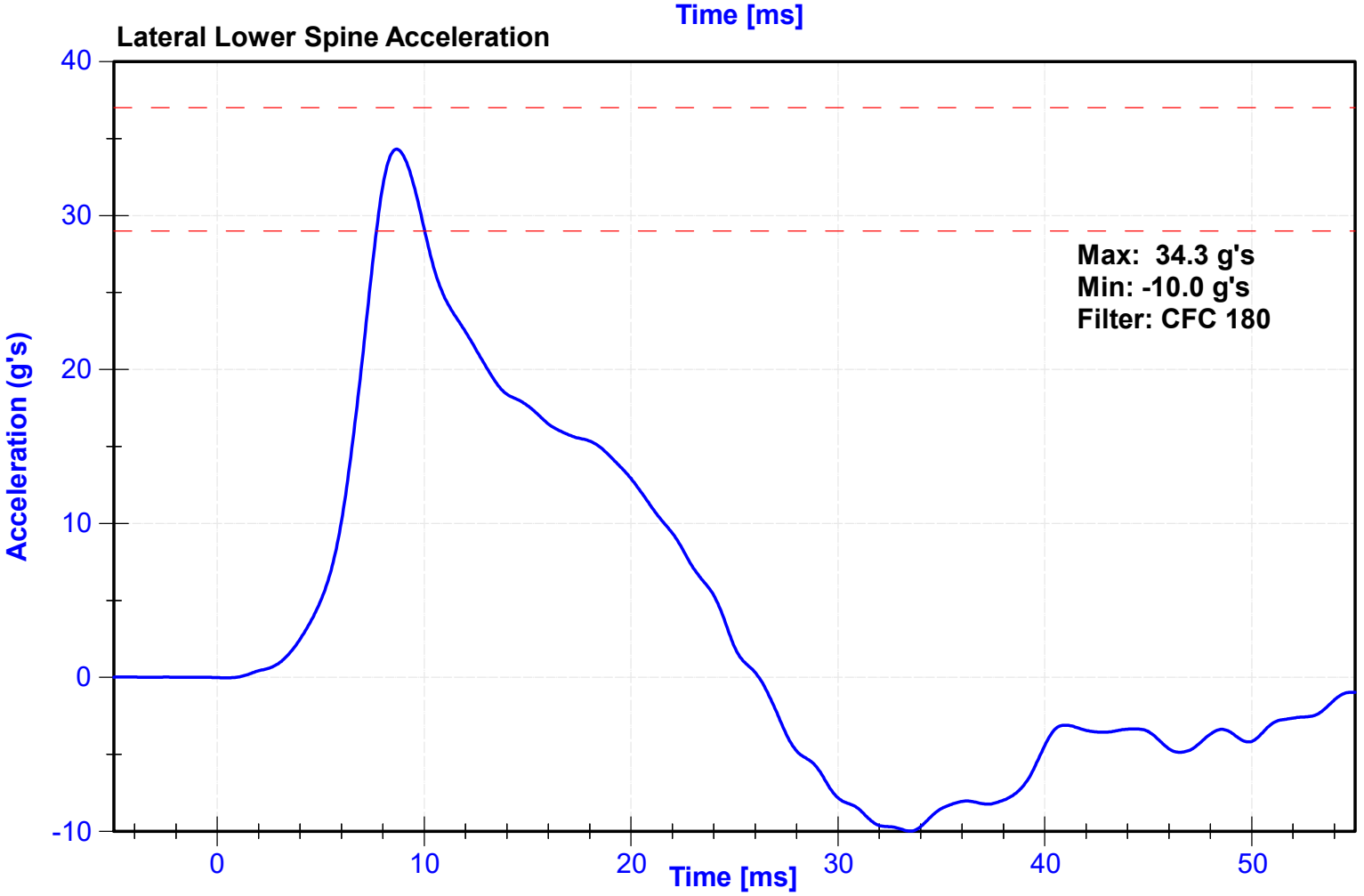

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 35.7 mm
Min: -2.0 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 27.4 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.0 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.8 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 36.0 g's
Min: -14.3 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 34.3 g's
Min: -10.0 g's
Filter: CFC 180

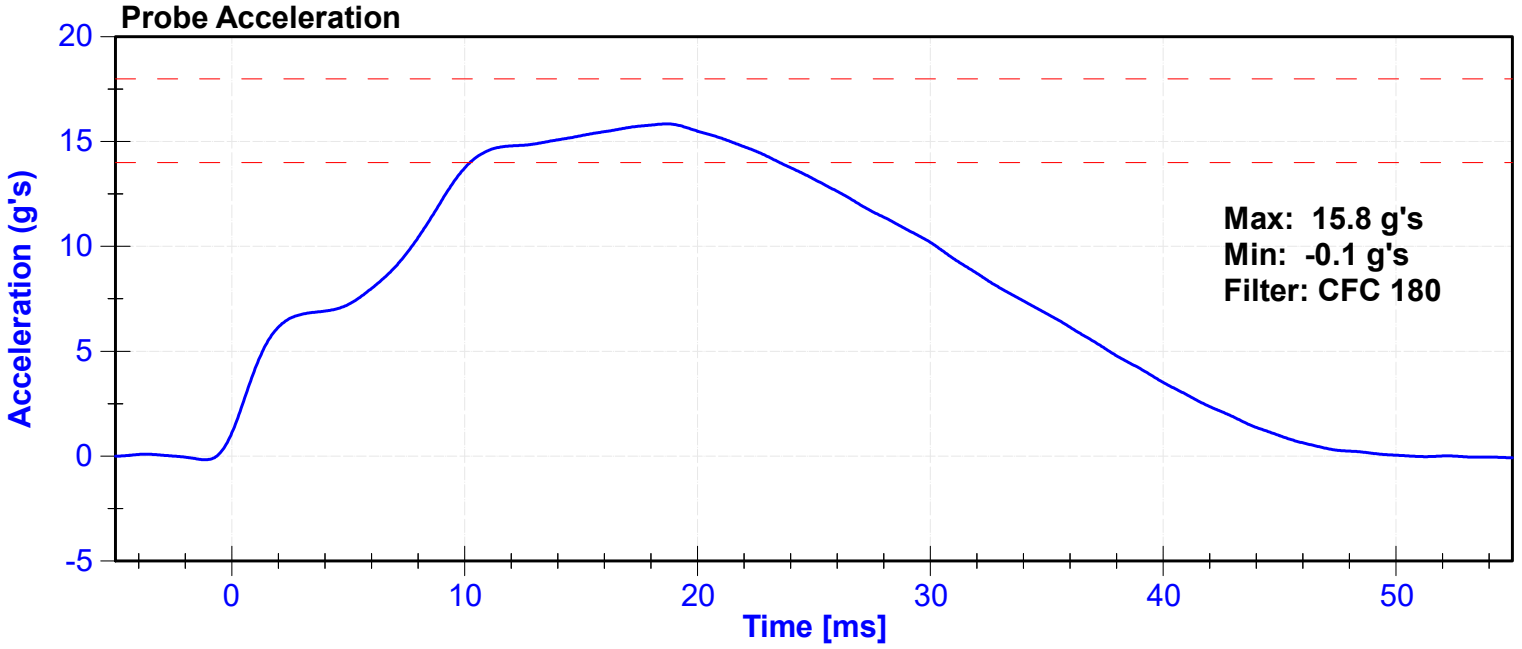
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

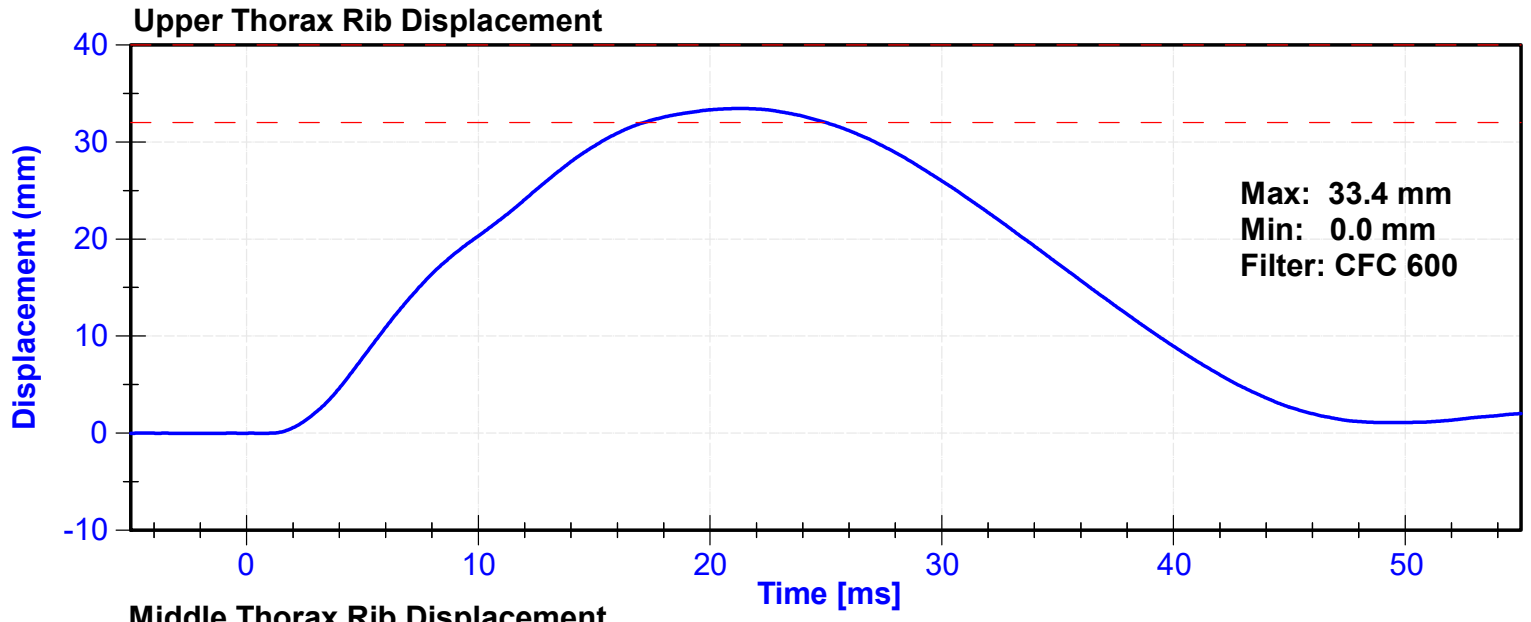
Results

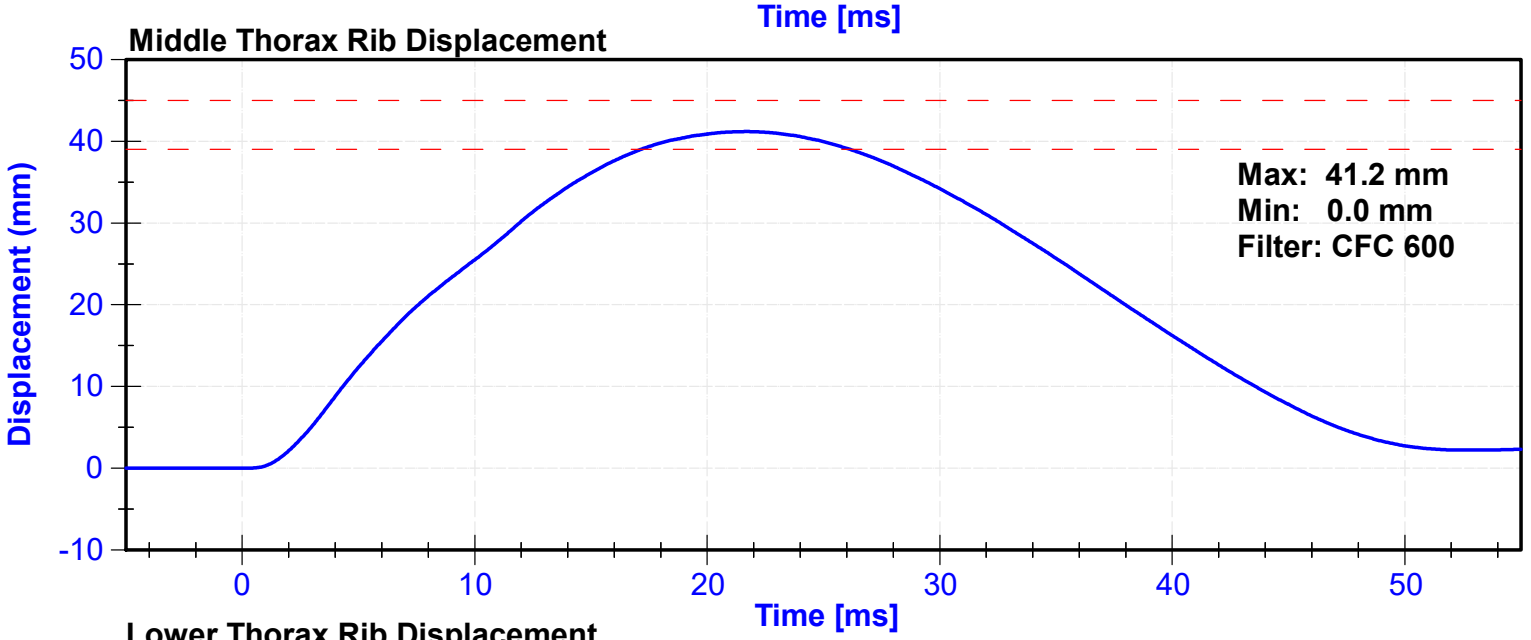
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	50.2	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	14	18	g's	15.8	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.4	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.6	Pass
Upper Thorax Rib Deflection	32	40	mm	33.4	Pass
Middle Thorax Rib Deflection	39	45	mm	41.2	Pass
Lower Thorax Rib Deflection	35	43	mm	40.3	Pass

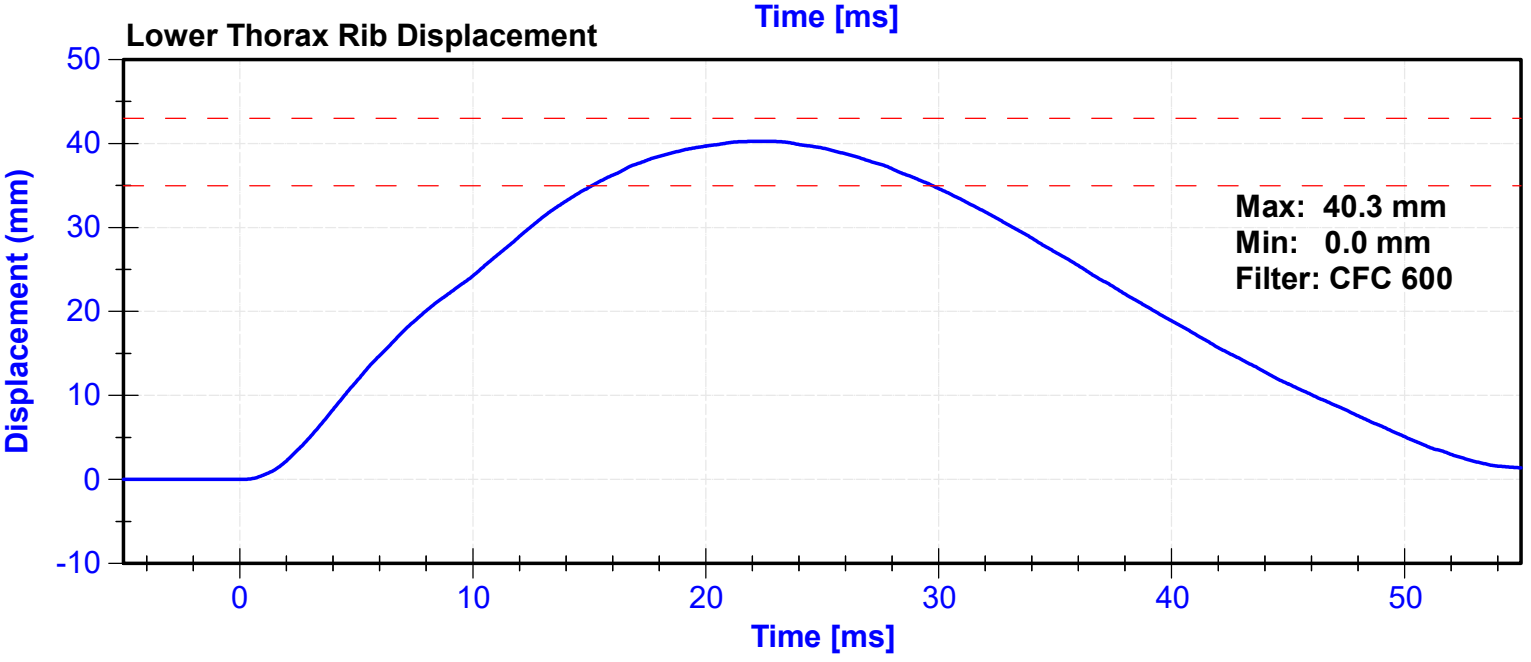
Transducer Calibrations

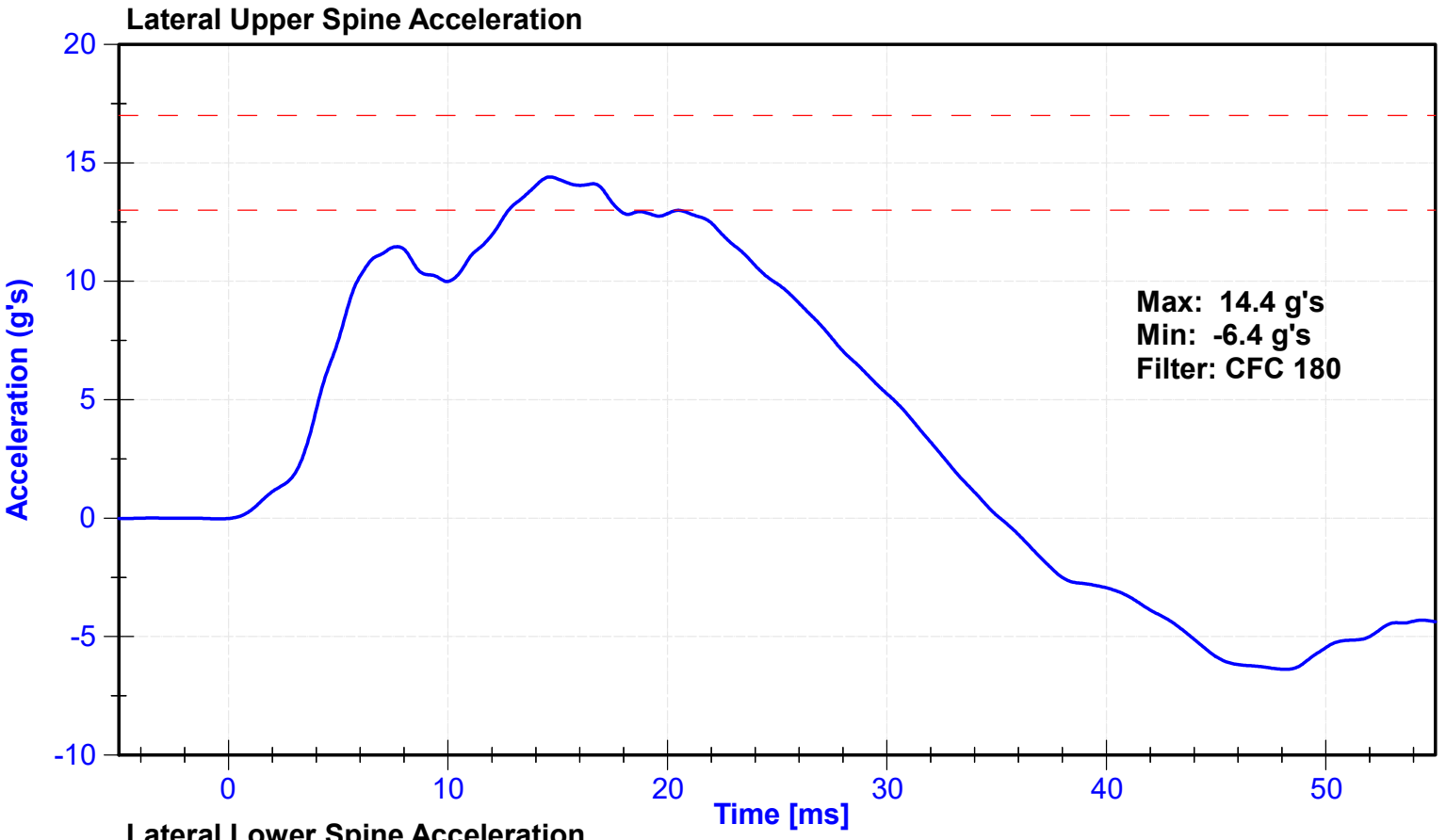
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Upper Spine Y Accelerometer	Endevco	T20880	4/4/2023	10/1/2023
Lower Spine Y Accelerometer	Endevco	P52071	4/4/2023	10/1/2023
Upper Thorax Rib Potentiometer	Servo	2316GFE	4/10/2023	10/9/2023
Middle Thorax Rib Potentiometer	Servo	040GFE	4/10/2023	10/9/2023
Lower Thorax Rib Potentiometer	Servo	1156GFE	4/10/2023	10/9/2023

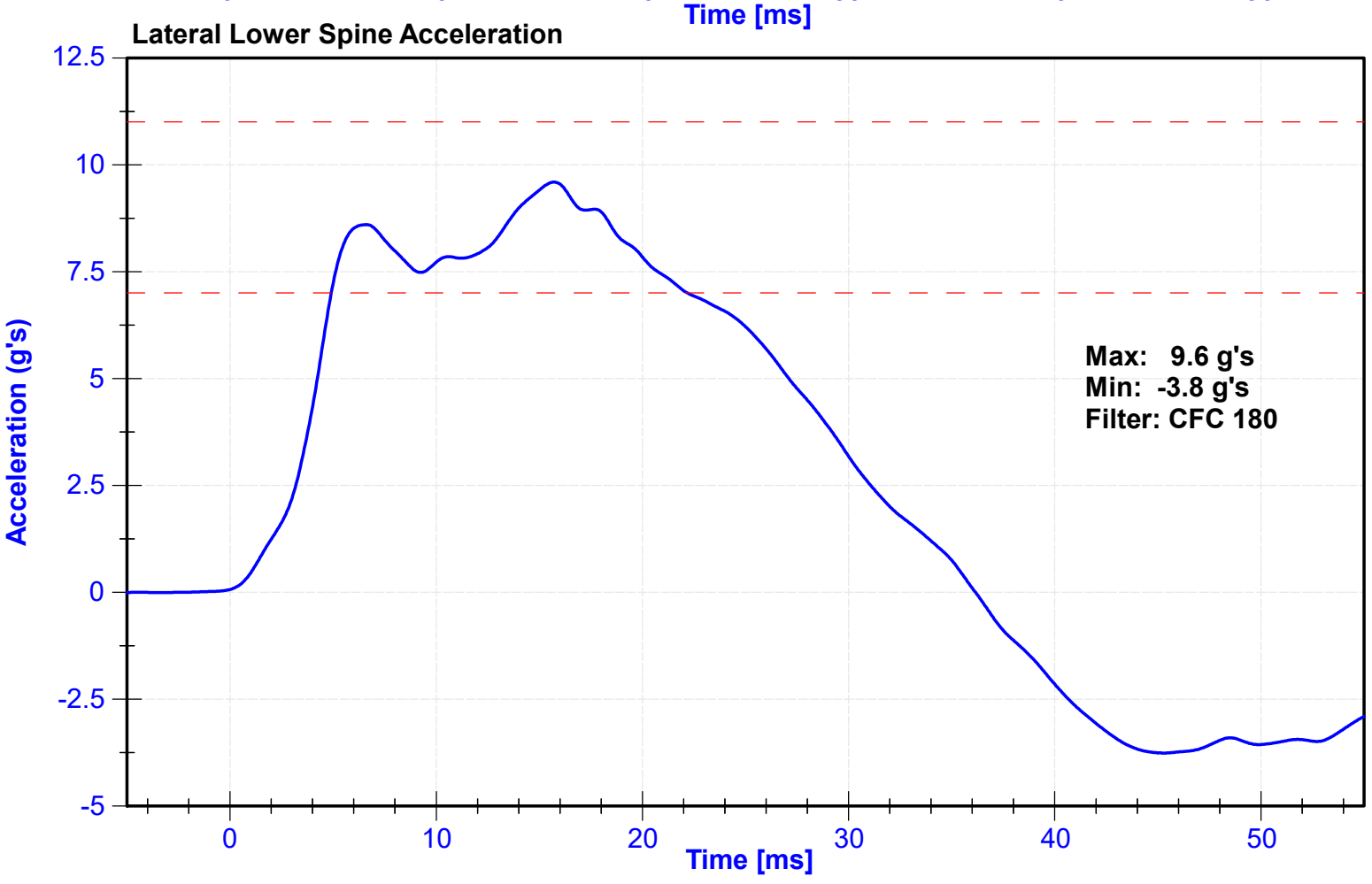



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.4 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.2 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.3 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]
Max: 14.4 g's
Min: -6.4 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
Time [ms]
Max: 9.6 g's
Min: -3.8 g's
Filter: CFC 180

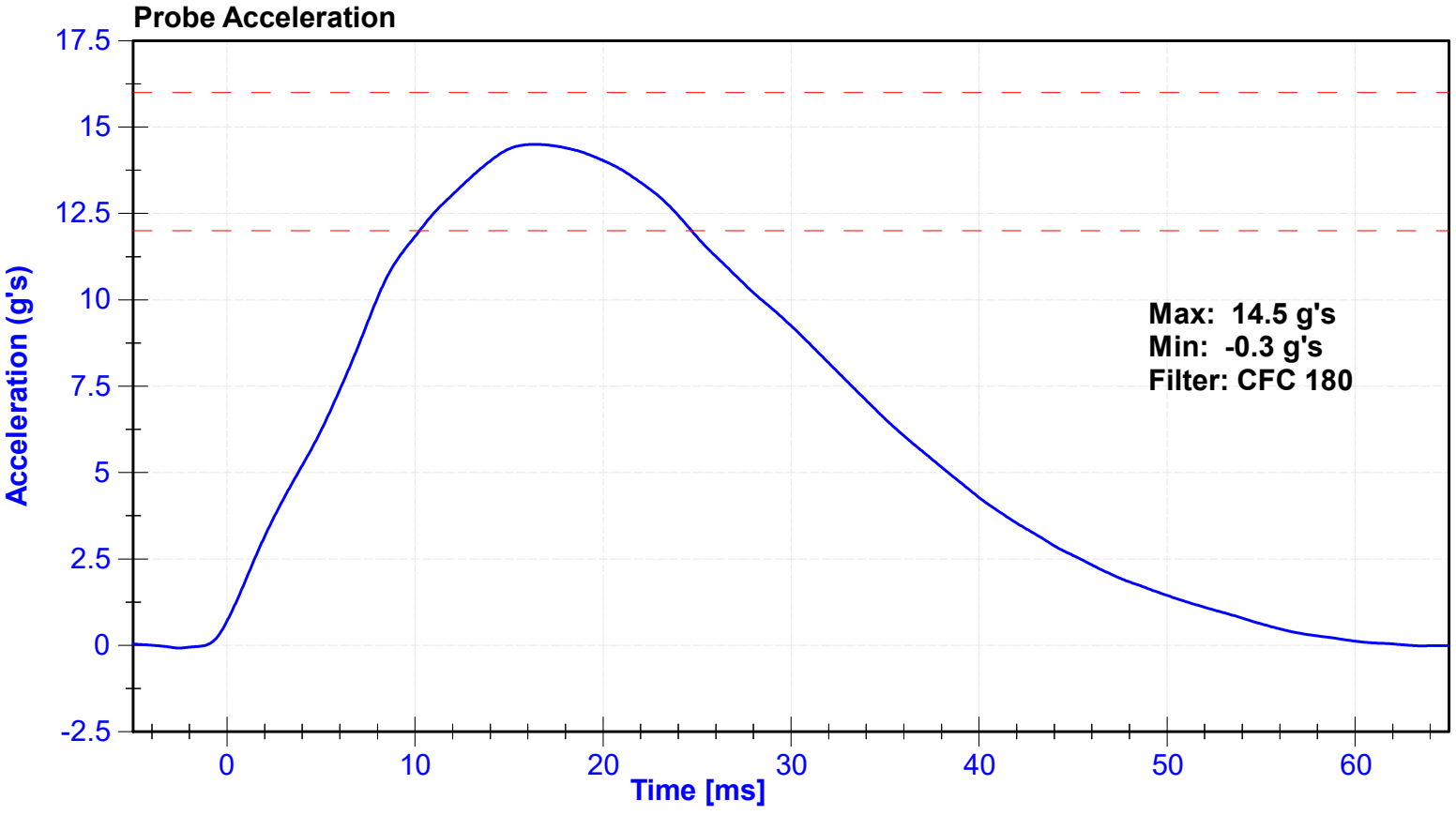
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

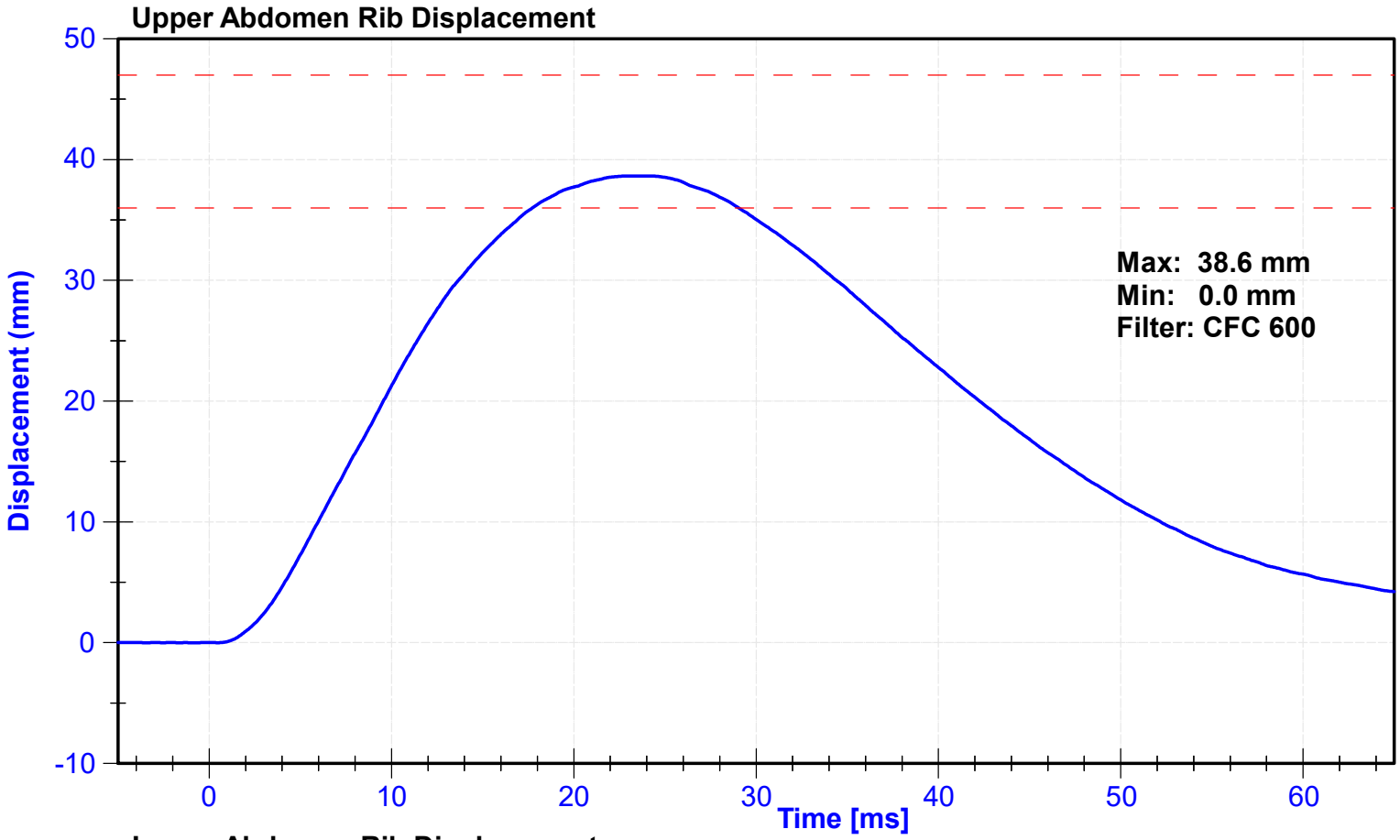
Results

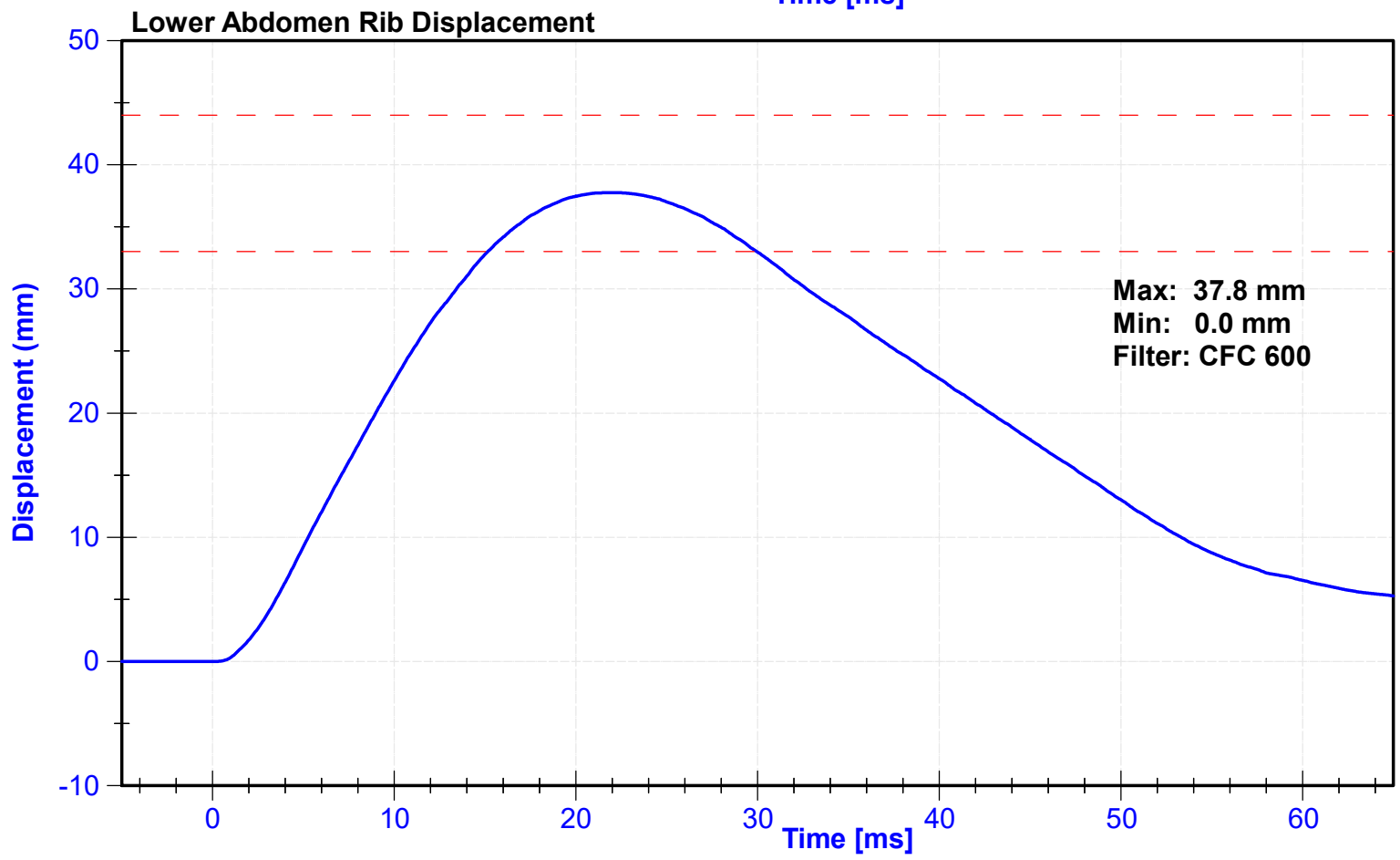
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	50.2	Pass
Velocity	4.2	4.4	m/s	4.30	Pass
Probe Acceleration	12	16	g's	14.5	Pass
Lateral Lower Spine Acceleration	9	14	g's	11.4	Pass
Upper Abdomen Rib Deflection	36	47	mm	38.6	Pass
Lower Abdomen Rib Deflection	33	44	mm	37.8	Pass

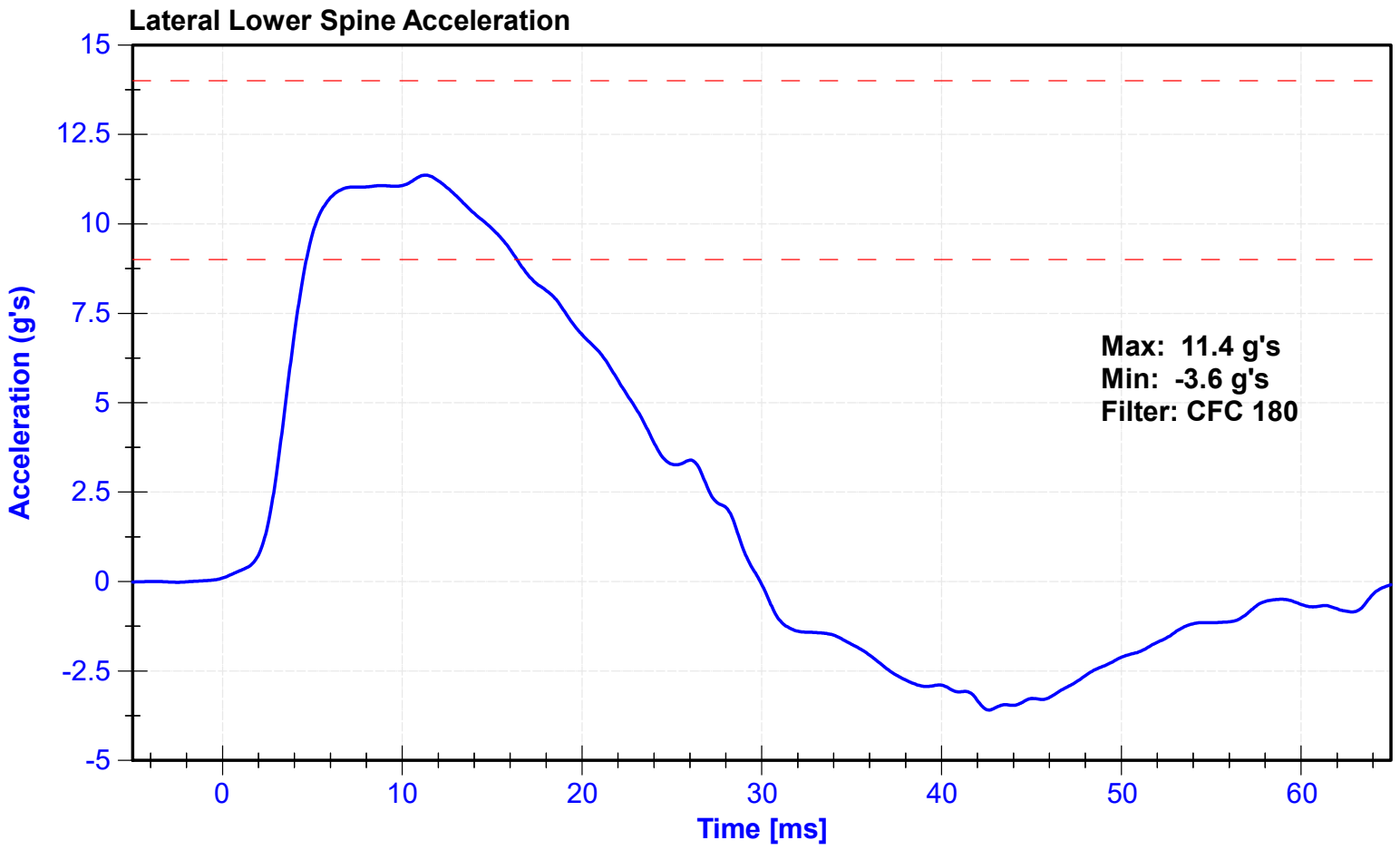
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Lower Spine Y Accelerometer	Endevco	P52071	4/4/2023	10/1/2023
Upper Abdomen Rib Potentiometer	Servo	307GFE	4/10/2023	10/9/2023
Lower Abdomen Rib Potentiometer	Servo	308GFE	4/10/2023	10/9/2023




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 38.6 mm
Min: 0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 37.8 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
60
Time [ms]
Max: 11.4 g's
Min: -3.6 g's
Filter: CFC 180

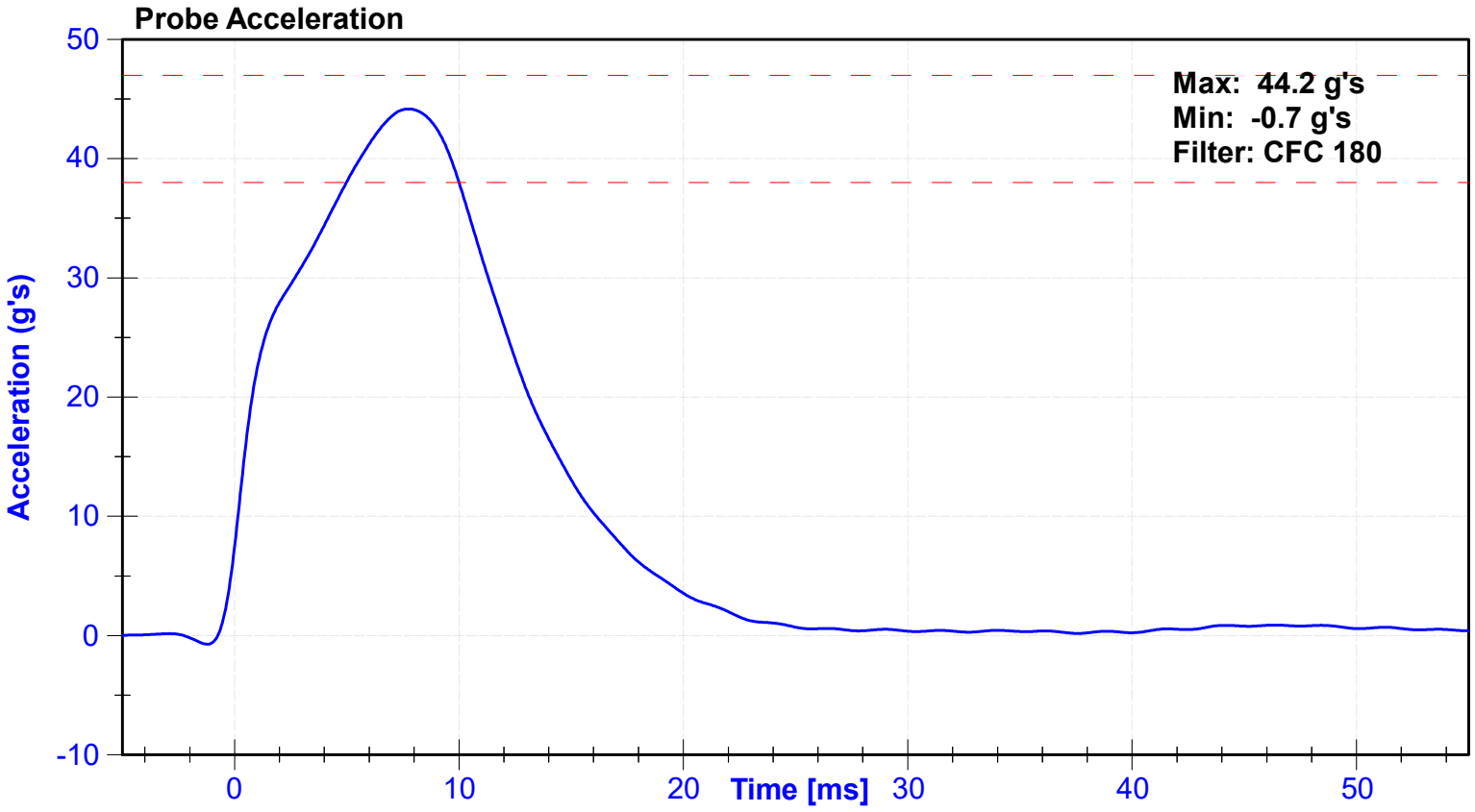
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

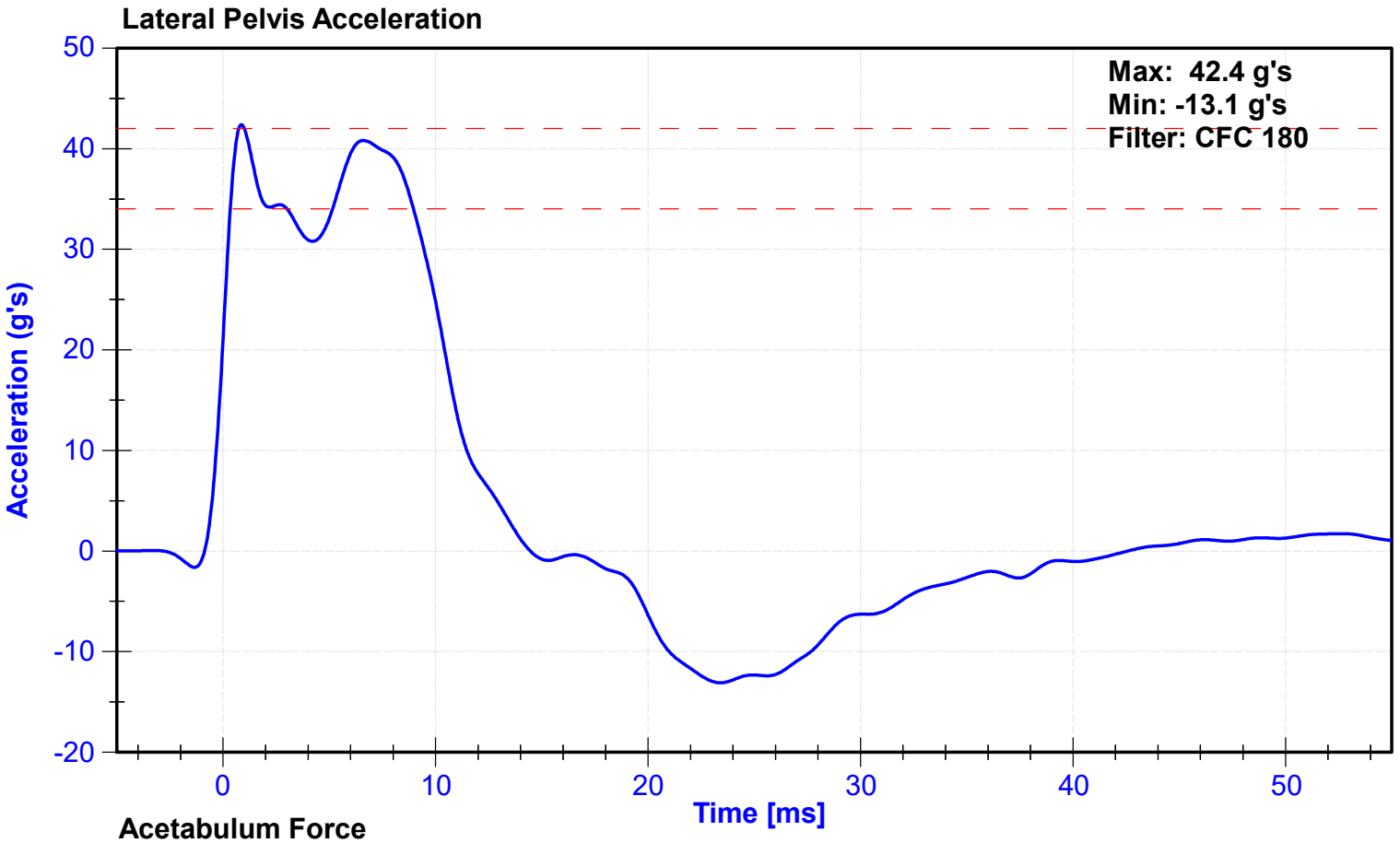
Results

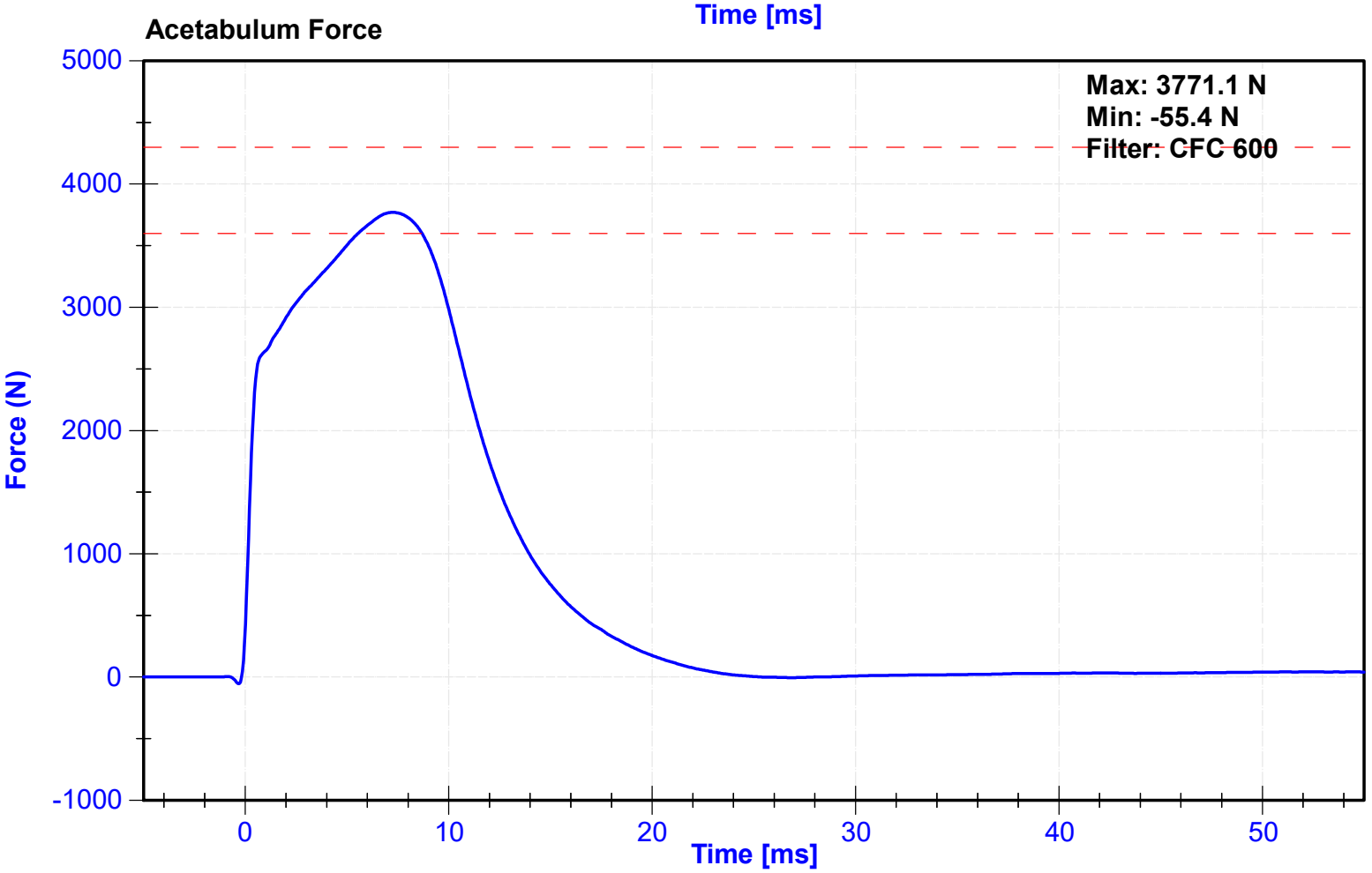
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	50.2	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration	38	47	g's	44.2	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	40.8	Pass
Acetabulum Force	3600	4300	N	3771.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Pelvis Y Accelerometer	Endevco	P51731	4/4/2023	10/1/2023
Acetabulum Load Cell	Denton	267-FY	8/11/2022	8/11/2023
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A




Lateral Pelvis Acceleration
Max: 42.4 g's
Min: -13.1 g's
Filter: CFC 180
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]


Acetabulum Force
Max: 3771.1 N
Min: -55.4 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

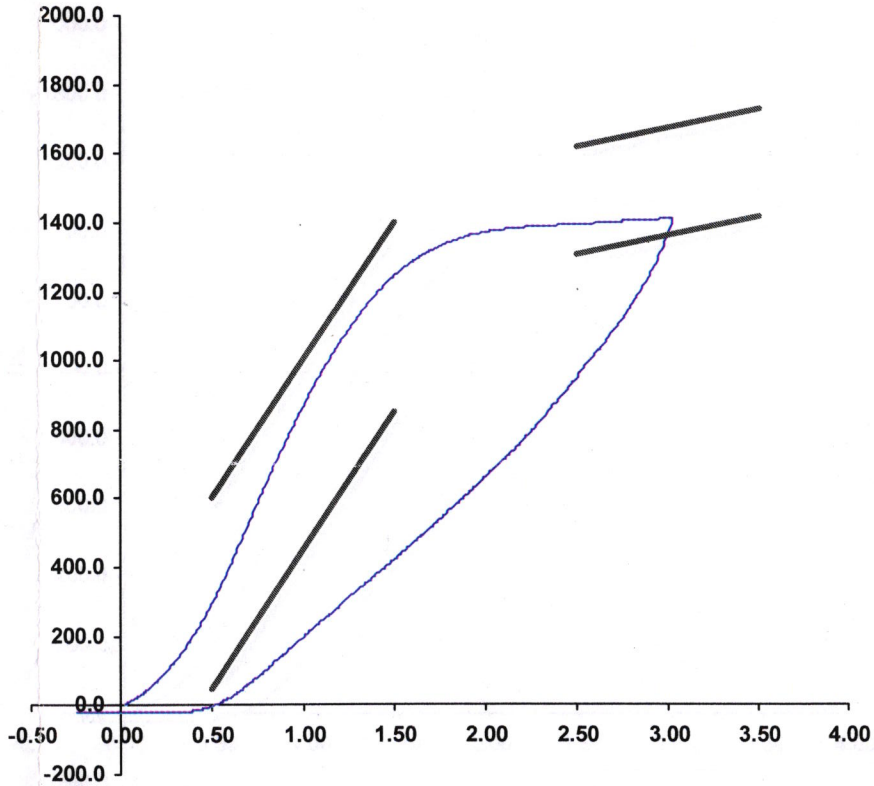
CERT
300 6/2/2023

SID-IIs Pelvis Plug Certification Test

Plug S/N 14213
Test Number 14353
Report Number 14397
Test Date 7/3/2020 9:00:57 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	305.61	50.00	600.00
Force @ 1.5 mm (N)	1,246.71	850.00	1,400.00
Force @ 2.5 mm (N)	1,393.47	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,409.34	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS 1000

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

Notes:

Operator

Part Number 180-4450

Template No 107 03-Jul-20
SACO Research

By : DC Date : 7/3/2020

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

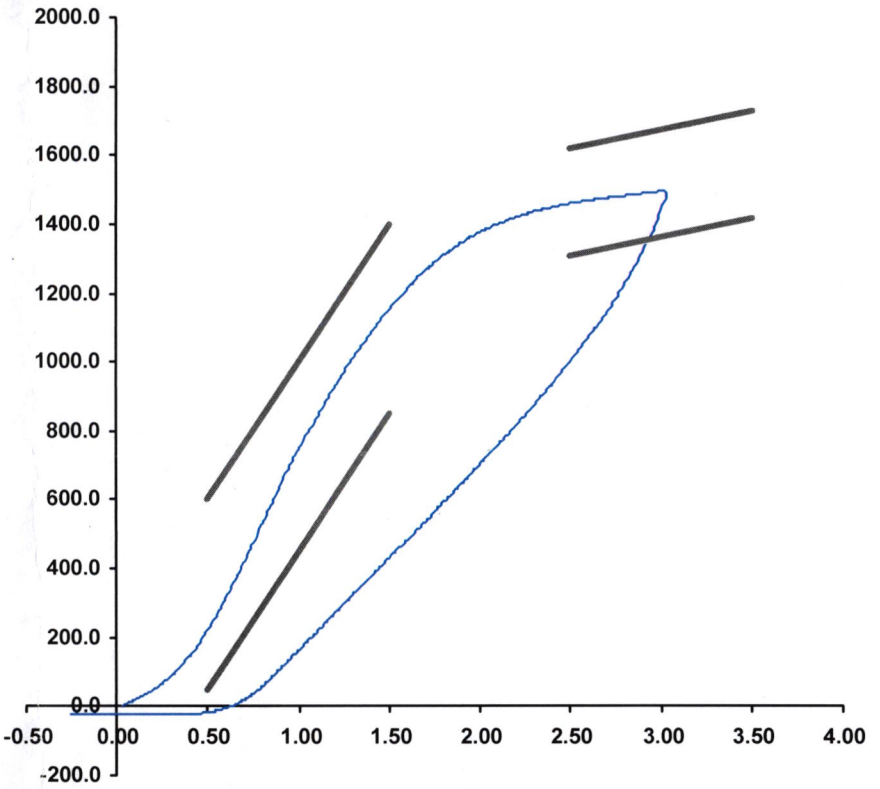
Crash
300 6/2/2023

SID-IIs Pelvis Plug Certification Test

Plug S/N 15344
Test Number 19691
Report Number 19743
Test Date 7/20/2021 12:18:48 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	227	50	600
Force @ 1.5 mm (N)	1,153	850	1,400
Force @ 2.5 mm (N)	1,462	1,306	1,618
Force @ 3.0 mm (N)	1,496	1,361	1,673

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS) 1000

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

Notes:

Operator

Part Number 180-4450

Template No 107 20-Jul-21
SACO Research

By : DC Date : 7/20/2021

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

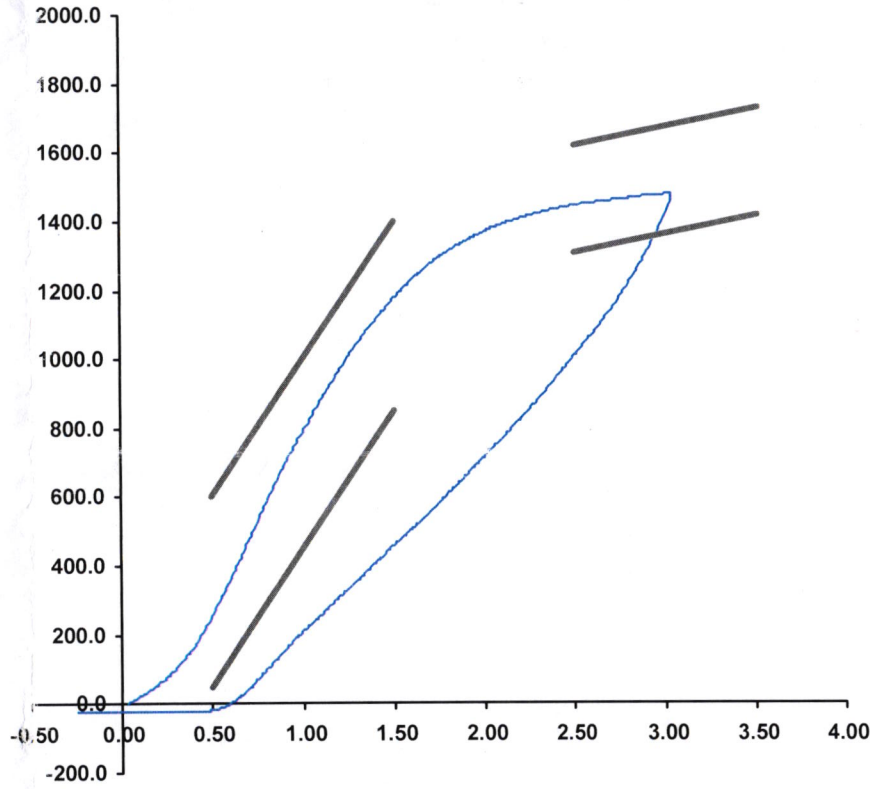
NON-IMPACT
300 6/2/2023

SID-IIs Pelvis Plug Certification Test

Plug S/N 15429
Test Number 20090
Report Number 20144
Test Date 9/9/2021 10:05:41 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	264	50	600
Force @ 1.5 mm (N)	1,178	850	1,400
Force @ 2.5 mm (N)	1,445	1,306	1,618
Force @ 3.0 mm (N)	1,478	1,361	1,673

Force (-N) vs Extension (-mm)



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

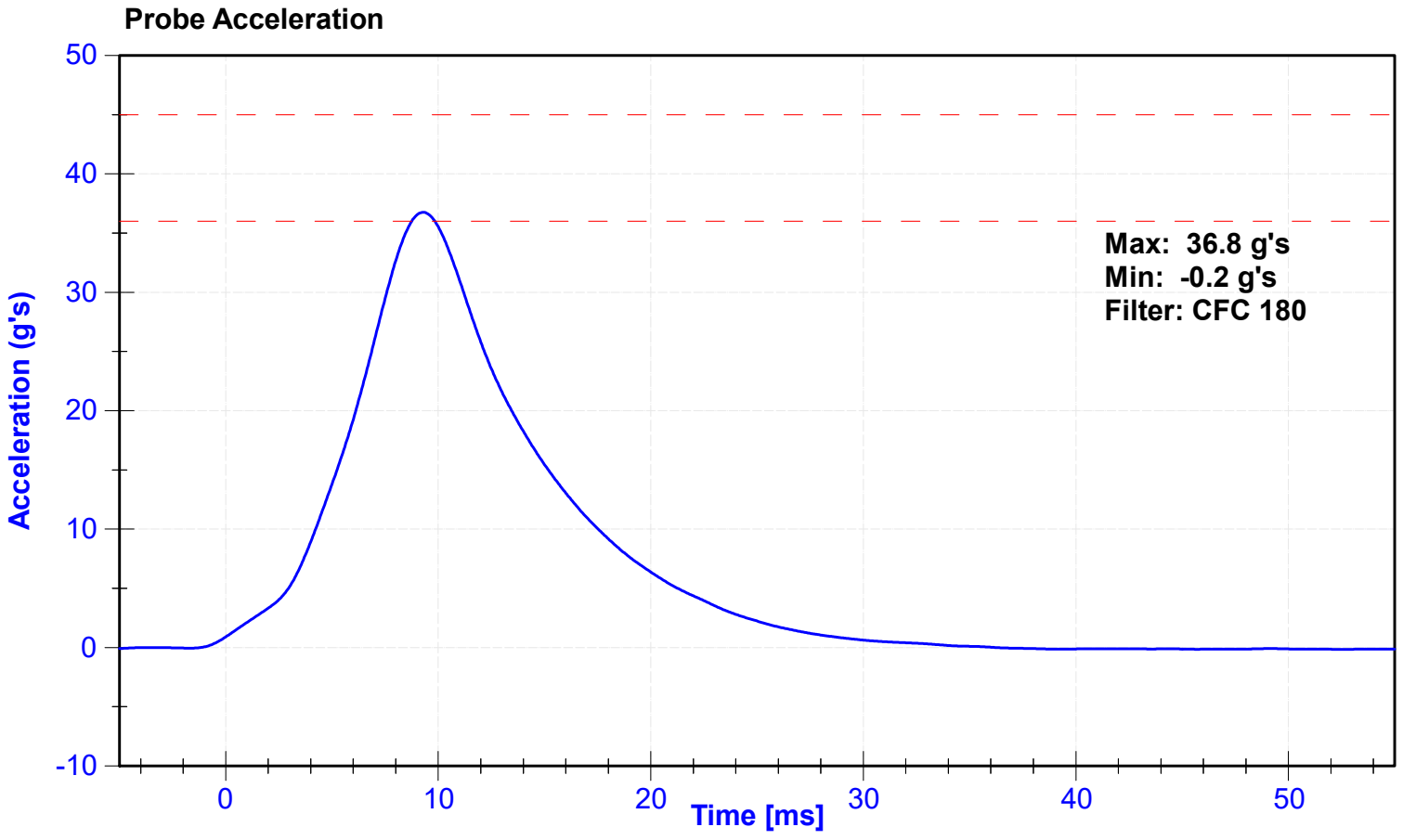
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	300	Laboratory Supervisor	C. Mantell

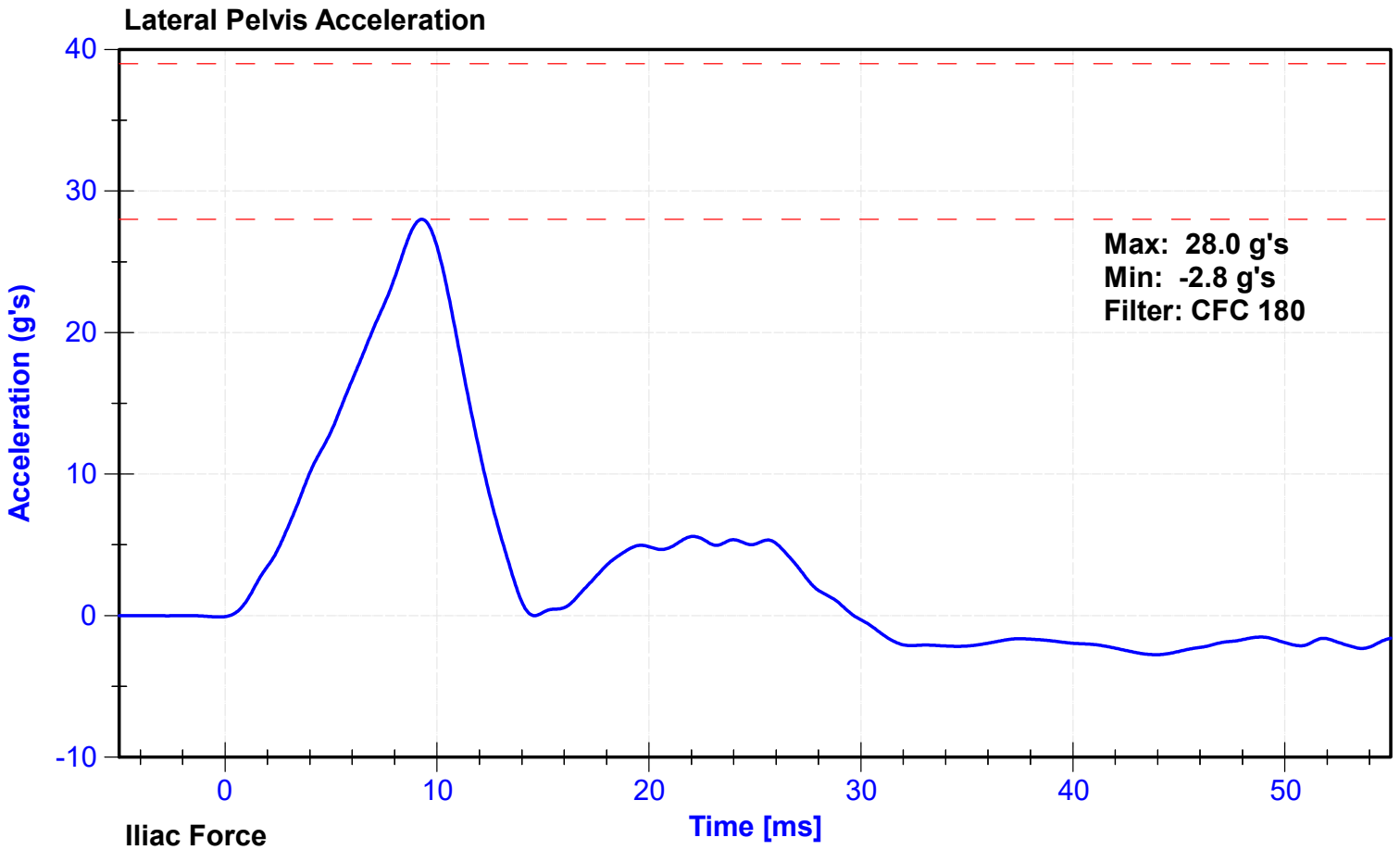
Results

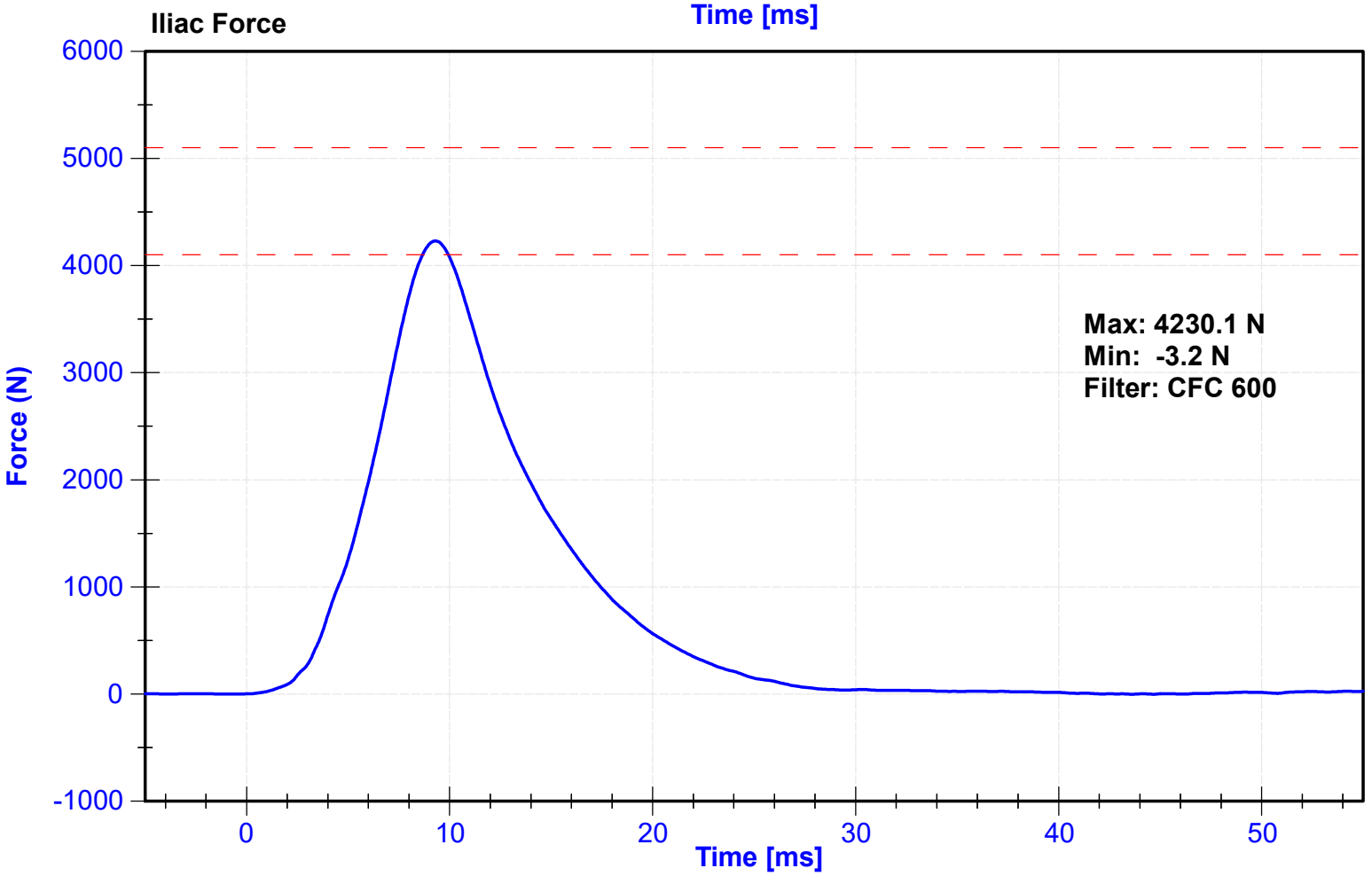
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	50.2	Pass
Velocity	4.2	4.4	m/s	4.30	Pass
Probe Acceleration	36	45	g's	36.8	Pass
Lateral Pelvis Acceleration	28	39	g's	28.0	Pass
Iliac Force	4100	5100	N	4230.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Pelvis Y Accelerometer	Endevco	P51731	4/4/2023	10/1/2023
Iliac Load Cell	Denton	280-FY	8/11/2022	8/11/2023




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 28.0 g's
Min: -2.8 g's
Filter: CFC 180


Iliac Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4230.1 N
Min: -3.2 N
Filter: CFC 600

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	4/4/2023
			Y	P79189	Endevco	4/4/2023
			Z	P79587	Endevco	4/4/2023
Head Accelerometers - Redundant			X	P68057	Endevco	4/4/2023
			Y	P58986	Endevco	4/4/2023
			Z	P52025	Endevco	4/4/2023
Displacement Potentiometer	Shoulder		Y			
	Thoracic Rib	Upper	Y	2316GFE	Servo	4/10/2023
		Middle	Y	040GFE	Servo	4/10/2023
		Lower	Y	1156GFE	Servo	4/10/2023
	Abdominal Rib	Upper	Y	307GFE	Servo	4/10/2023
		Lower	Y	308GFE	Servo	4/10/2023
Lower Spine Accelerometers (T12)			X	P64003	Endevco	4/4/2023
			Y	P52071	Endevco	4/4/2023
			Z	P17283	Endevco	4/4/2023
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)				15132	SACO	3/5/2021
Pelvis Plug (Non-Struck Side)				15342	SACO	7/20/2021

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	A280407	Measurement Specialties	5/20/2023
Vehicle Center of Gravity	Y	A372805	Measurement Specialties	5/20/2023
Vehicle Center of Gravity	Z	A372812	Measurement Specialties	5/20/2023
Left Floor Sill	Y	A428004	Measurement Specialties	5/23/2023
A-Pillar Sill	Y	A315892	Measurement Specialties	3/6/2023
A-Pillar Low	Y	A428034	Measurement Specialties	5/23/2023
A-Pillar Mid	Y	A431199	Measurement Specialties	3/6/2023
B-Pillar Sill	Y	A370944	Measurement Specialties	3/6/2023
B-Pillar Low	Y	A374256	Measurement Specialties	3/22/2023
B-Pillar Mid	Y	A398653	Measurement Specialties	3/21/2023
Driver Seat	Y	A413573	Measurement Specialties	4/7/2023
Engine Top	X	A315714	Measurement Specialties	5/3/2023
Engine Top	Y	A373201	Measurement Specialties	5/3/2023
Firewall	Y	A405591	Measurement Specialties	1/24/2023
Right Roof	Y	A280020	Measurement Specialties	1/20/2023
Right Floor Sill	Y	A374346	Measurement Specialties	3/6/2023
Rear Floorpan	X	A255837	Measurement Specialties	5/20/2023
Rear Floorpan	Y	A374217	Measurement Specialties	5/20/2023

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-1281288-F0	Interface	3/17/2023
Load Cell 6	1220AF-1281285-F0	Interface	3/17/2023
Load Cell 7	1220AF-1117035-F0	Interface	7/19/2022
Load Cell 8	1220AF-1117011-F0	Interface	7/19/2022