REPORT NUMBER: SPNCAP-CAL-23-005

NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

FCA USA LLC
2023 Jeep Grand Cherokee 4xe
5 Door SUV

NHTSA No: M20230304

PREPARED BY:
CALSPAN CORPORATION
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December 18, 2023

FINAL REPORT

PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NRM-110
1200 NEW JERSEY AVE SE
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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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7. Author(s) Alex Rudniski, Test Engineer Vanessa Hansen , Operations Manager	***8. Performing Organization Report No.*** CAL-DOT-2023-005
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
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15. Supplementary Notes

16. Abstract

A 55/28, (61.90kph / 38.5 mph), 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2023 Jeep Grand Cherokee 4xe 5 Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 24, 2023.

The impact velocity of the Moving Deformable Barrier (MDB) was 62.11 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 232 mm located at level 2. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC36)		1000	60.041
Total Abdominal Force	N	2500	580.128
Pubic Symphysis Force	N	6000	671.436
Lower Spine (T12) Resultant Acceleration	G	82*	16.882
Maximum Thorax Rib Deflection	mm	44	16.465

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC36)		1000	127.234
Lower Spine (T12) Resultant Acceleration	G	82	35.588
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2479.739
Maximum Abdominal Rib Deflection	mm	45*	27.959
Maximum Thorax Rib Deflection	mm	38*	12.789

**Proposed IARV*

The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.

17. Key Words	***18. Distribution Statement***
New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs	Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave. SE Washington, D.C. 20590

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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2023 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number 693JJ920D000016. The purpose of this test is to generate comparative side impact performance in a 2023 Jeep Grand Cherokee 4xe 5 Door SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated March 2020.

SECTION 2
SUMMARY OF TEST RESULTS

A 2023 Jeep Grand Cherokee 4xe 5 Door SUV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.11 km/h. The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by the Calspan Corporation's Transportation Test Operations Center in Buffalo, New York on February 24, 2023. Pre-test and post-test photographs of the test vehicle, the MDB and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated March 2020. The side impact event was documented by 9 high-speed and 2 real-time cameras. Camera locations are included in this report.

The Dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen forward, middle, and rear y-axis load cells
Lower spine (T12) tri-axial accelerometers
Public symphysis y-axis load cell

PASSENGER ATD (SID-IIs)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen upper rib and lower rib y-axis displacement potentiometers
Lower spine (T12) tri-axial accelerometers
Acetabulum and iliac wing y-axis load cells

Appendix B contains the vehicle and dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report. Appendix D of this report contains the test equipment and instrumentation calibration data.

DUMMY INJURY VALUES

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC36)		1000	60.041
Total Abdominal Force	N	2500	580.128
Pubic Symphysis Force	N	6000	671.436
Lower Spine (T12) Resultant Acceleration	G	82*	16.882
Maximum Thorax Rib Deflection	mm	44	16.465

Measurement Description	Passenger ATD (SID-IIs)		
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Head Injury Criteria (HIC36)		1000	127.234
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Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2479.739
Maximum Abdominal Rib Deflection	mm	45*	27.959
Maximum Thorax Rib Deflection	mm	38*	12.789

*Proposed IARV

SUPPLEMENTAL RESTRAINT INFORMATION

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

GENERAL COMMENTS:

1. P1 serial number – F033
2. P4 serial number – DG8012

Data Anomalies:

The following channel was questionable for:

- Left Front Sill Y Acceleration, Exceeded calibration range at 8 ms
- Left B-Pillar Lower Y Acceleration, Exceeded calibration range and saturated at 8.7 ms
- Left B-Pillar Middle Y Acceleration, Exceeded calibration range and saturated at 12.3 ms 19.4 ms
- Rear Floorpan Z Acceleration, Questionable data after 42 ms

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

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

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

Data Sheet No. 3 - Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 - Dummy Lateral Clearance Dimensions

Data Sheet No. 5 - Camera and Instrumentation Data

Data Sheet No. 6 - Test Vehicle Accelerometer Locations

Data Sheet No. 7- MDB Accelerometer Locations

Data Sheet No. 8 - Post-Test Observations

Data Sheet No. 9 - MDB Summary of Results

Data Sheet No. 10 - Test Vehicle Profile Measurements

Data Sheet No. 11 - Test Vehicle Exterior Crush Measurements

Data Sheet No. 12 - MDB Exterior Static Crush Measurements

Data Sheet No. 13 - Vehicle and MDB Damage Profile Distances

Data Sheet No. 14 - FMVSS No. 301 Static Rollover Results

Data Sheet No. 15 - Dummy / Vehicle Temperature and Humidity Stabilization Data

Data Sheet No. 305-1 - General Test and Parameter Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-2 - Pre-Impact Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-3 - Pre-Impact Electrical Isolation Measurements and Calculations for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-4 - Post-Impact Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-5 - Static Rollover Test Data for Indicant FMVSS No. 305 Testing

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Jeep Grand Cherokee 4xe 5 Door SUV
NHTSA No.: M20230304
Test Program: NCAP Side MDB Impact Test
Test Date: 02/24/2023

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20230304
Model Year	2023
Make	Jeep
Model	Grand Cherokee 4xe
Body Style	SUV
VIN	1C4RJYB69P8785800
Body Color	White
Odometer Reading (km/mi)	20 miles
Engine Displacement (L)	2.0
Type / No. Cylinders	I4
Engine Placement	Inline
Transmission Type	Automatic
Transmission Speeds	8-speed
Overdrive	Yes
Final Drive	4WD
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	N/A
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso / Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head / Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso / Pelvis Airbag	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Other Safety Restraint	N/A

Does owner's manual provide instructions to turn off automatic door locks? No

DATA FROM CERTIFICATION LABEL

Manufactured By	FCA USA LLC
Date of Manufacture	12-22
Vehicle Type	MPV

GVWR	3130
GVWR Front	1452
GVWR Rear	1724

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)				476	(A)
DSC x 68.0 kg				340	(B)
Cargo Weight (RCLW) (kg)				136	(A-B)

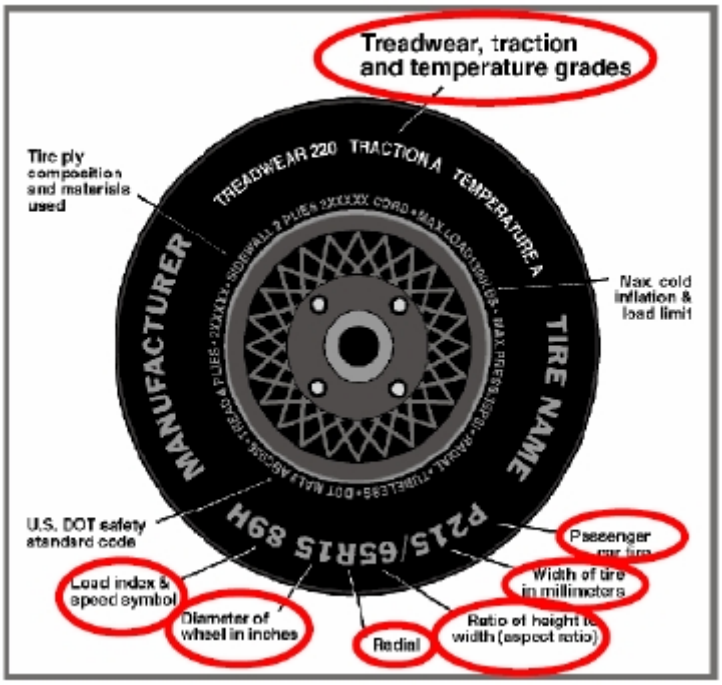
VEHICLE SEAT TYPE

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 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

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)	300	300
Cold Pressure (kPa)	270	290
Recommended Tire Size	265/50R20	265/50R20
Tire Size on Vehicle	265/50R20	265/50R20
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Dueller H/L	Dueller H/L
Treadwear	600	600
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1Nylon	2 Polyester, 2 Steel, 1Nylon
Load Index / Speed Symbol	107T	107T
Tire Material	Rubber	Rubber
DOT Safety Code Left	7XUM4014622	7XUM4014422
DOT Safety Code Right	7XUM4014422	7XUM4014622

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

Test Vehicle: 2023 Jeep Grand Cherokee 4xe 5 Door SUV
NHTSA No.: M20230304
Test Program: NCAP Side MDB Impact Test
Test Date: 02/24/2023

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	268	263	272	274
Tire Placard	kPa	270	270	290	290
Owner's Manual	kPa	270	270	290	290
As Tested	kPa	270	270	290	290

MDB TIRE SPECIFICATIONS

	Units	Requirements	LF	RF	LR	RR
Tire Size		P205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 ± 21	207	207	207	207

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	641	587		653	721		681	711	
Right	kg	650	580		678	661		658	674	
Ratio	%	52.5	47.5		49.1	50.9		49.2	50.8	
Totals	kg	1291	1167	2458	1331	1382	2713	1339	1385	2724

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	2458	(A)
Sum of Actual Weight of 1 ES2re and 1 P572 ATD (SID-IIs)	kg	127	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	136	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2721	(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	Fully Loaded	As Tested	Meets Rqmt***
LF	mm	924	929	Yes
RF	mm	930	931	Yes
RR	mm	938	938	Yes
LR	mm	935	931	Yes
Vehicle CG (Aft of Front Axle)	mm	1508	1511	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	18	10	

****The "As Tested" vehicle attitude measurements must be equal to or within ± 10mm of the "Fully Loaded" vehicle attitude measurements at each wheel well. Indicate "Yes" or "No" for "Meets Requirements".*

Test height adjustable suspension setting, if applicable: N/A

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

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	19
Spare Tire	28
Jack	3
Rear Speaker	3
Charger & Tool Kit	3
Ballast / Equipment Added	100

TEST SURFACE MARKINGS

	Distance from 63° Impact Location Line (mm)
Fore 25 mm target	920
Aft 25 mm target	922
Pre-Impact Angle Line	233

Parallel Track Target	X Location (mm)	Y Location (mm)
A	0	0
B	2955	1555
C	2955	3355
D	0	3000

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

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

SEAT POSITIONING

The driver's seat, front center seat (if applicable), and right front passenger's seat should be set to the mid-track, lowest, mid-angle position. The struck-side rear passenger's seat, rear center seat, and non-struck side rear passenger's seats should be set to the rear-most, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL(°)		
	Max	Min	Mid
Driver Seat	19.9	11.2	15.6
Front Passenger Seat	18.6	10.0	14.3
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	15.6	8	Max	44	47	52
			Mid	24	28	31
			Min	4	8	12
Front Passenger Seat	14.3	6	Max	43	46	50
			Mid	23	26	30
			Min	3	6	10
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 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

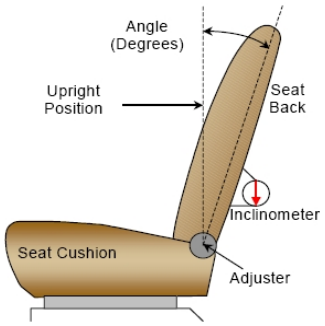
SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detents*
Driver Seat	250	Power	125	Power
Front Passenger Seat	250	Power	125	Power
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

**if applicable*

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. 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 seat back is positioned such that the dummy's head is level. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as 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	64.8	Power	5.0	Power
Front Passenger Seat	65.0	Power	5.0	Power
Front Center Seat*				
Struck Side Rear Seat w/ Seated Dummy	17.6	10 (0-9)	8.9	0
Non-Struck Side Rear Seat	17.6	10 (0-9)	8.9	0
Rear Center Seat*	17.6	10 (0-9)	8.9	0

**if applicable*

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

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. For this test zero is defined as the uppermost position.

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

HEAD RESTRAINT ADJUSTMENT

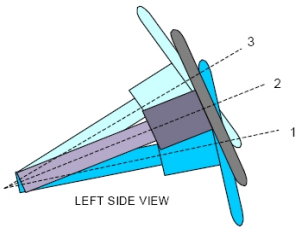
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

Seat	Total # of Positions	Placed in Position #
Driver Seat	4 (0-3)	Uppermost & Full Forward
Rear Seat	Fixed	Fixed

STEERING COLUMN ADJUSTMENT

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

	Degrees	Fore / Aft Position (mm)
Lowermost - Position No. 1	18.6	
Geometric center - Position No. 2	21.2	
Uppermost - Position No. 3	23.8	
Telescoping Steering Wheel Travel		72
Test Position	21.2	36

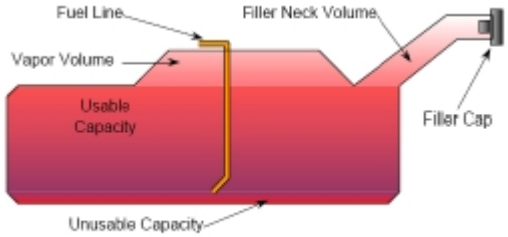


STEERING COLUMN ASSEMBLY

FUEL PUMP

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

The vehicle is a hybrid vehicle. The charge port is on the left front fender of the vehicle. The fuel filler neck is on the lefr rear quarter panel.



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

FUEL TANK CAPACITY

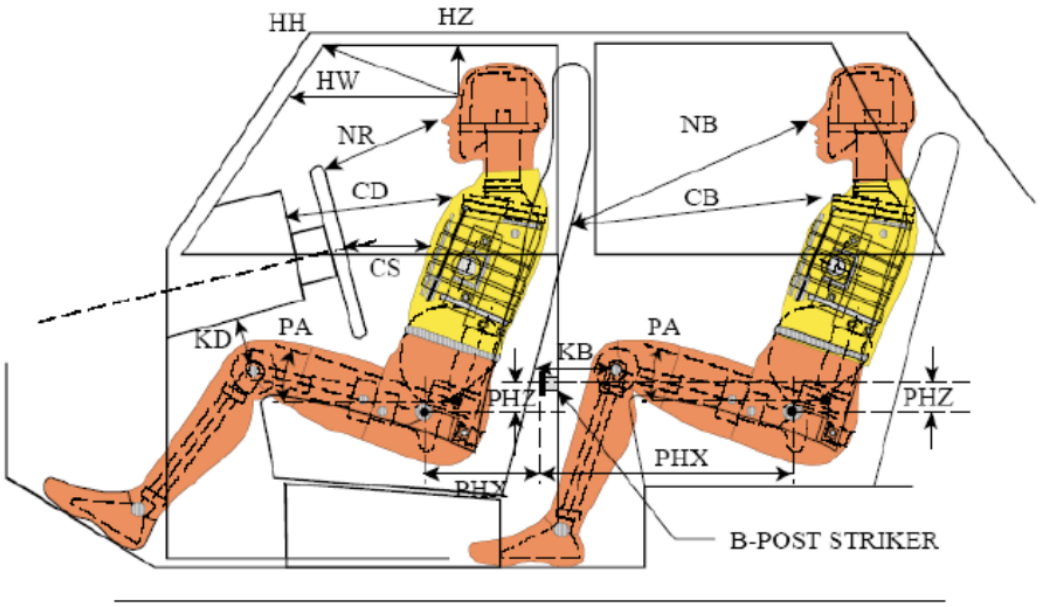
Description	Liters
Usable Capacity of “Standard Tank” (see Form No. 1)	71.9
Usable Capacity of “Optional Tank” (see Form No. 1)	N/A
Usable Capacity of “Standard Tank” (see Owner’s Manual)	71.9
Usable Capacity of “Optional Tank” (see Owner’s Manual)	N/A
93% of Usable Capacity	66.9
Actual Amount of Solvent Used in Test	66.9
1/3 of Usable Capacity	23.9

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** [ ] **N/A**

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION



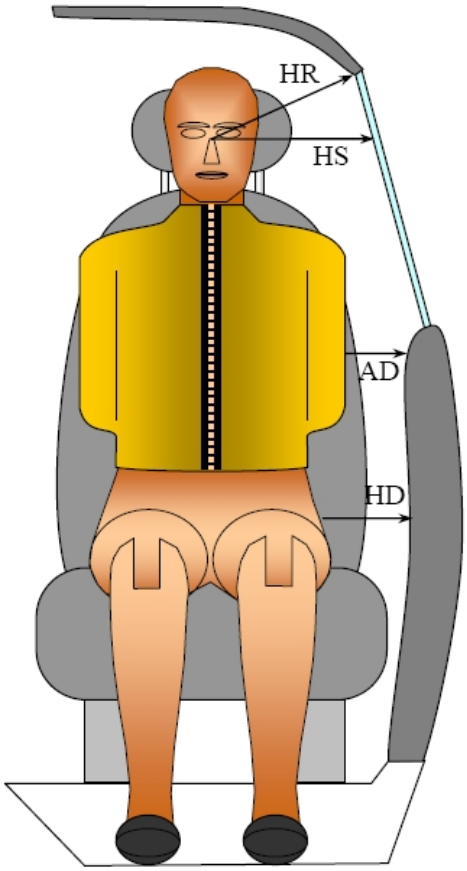
LEFT SIDE VIEW

NOTE: 2-DOOR VEHICLE SHOWN. REAR DUMMY PHX & PHZ MEASUREMENTS FOR A 4-DOOR VEHICLE WOULD USE THE C-POST STRIKER AS A REFERENCE POINT

Driver Code	Pass. Code	Description	Driver (Serial No. F033)		Left Rear Passenger (Serial No. DG8012)	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Header to Header	517			
HW		Header to Windshield	764			
HZ	HZ	Head to Roof Liner	196		270	
NR	NB	Nose to Rim/Seat Back	492		442	
CD	CB	Chest to Dash/Seat Back	661		453	
CS		Chest to Steering Wheel	424			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	225	27.3	275	18.1
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	224	30.3	280	13.2
PAX°	PAX°	Pelvic Tilt Angle X		25.5		21.6
	PAY°	Pelvic Tilt Angle Y				0.2
PHX	PHX	Hip Point to Striker (X-Axis)	117		162	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	61		136	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023



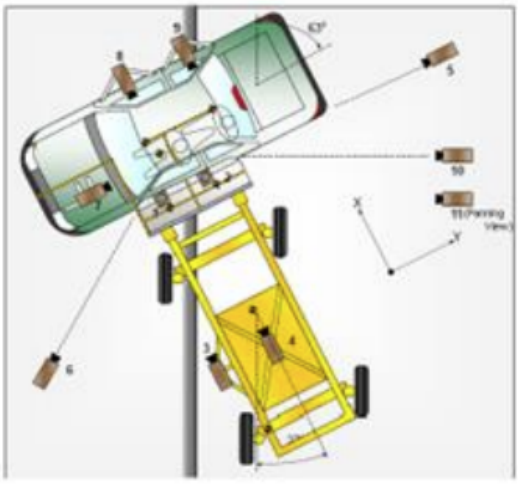
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver (Serial No. F033)	Left Rear Passenger (Serial No. DG8012)
HR	Head to Side Header	mm	225	278
HS	Head to Side Window	mm	345	370
AD	Arm to Door	mm	105	138
HD	Hip Point to Door	mm	180	162

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2023 Jeep Grand Cherokee 4xe 5 Door SUV
NHTSA No.: M20230304
Test Program: NCAP Side MDB Impact Test
Test Date: 02/24/2023



CAMERA LOCATIONS AND DATA

No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Overhead Overall	0	-259	-8444	12.5	1000
2	Overhead Close-up	0	0	-8374	28	1000
3	Left Impact Point (MDB)	-1470	0	-847	25	1000
4	Side Overall (MDB)	-1140	878	-1587	8	1000
5	Rear	-272	10004	-1402	24	1000
6	Left Front	-4010	-6781	-1438	24	1000
7	Driver Front (OB)				25	1000
8	Driver Side (OB)				12.5	1000
9	Passenger Side (OB)				12.5	1000
10	Real-time Left Rear				Zoom	30
11	Real-time In Run				Zoom	30

Notes: *Reference: Impact Point projected to Ground*
+X = To Front of MDB, +Y = To Right of MDB, +Z = Down
** All measurements accurate to ± 6 mm.*

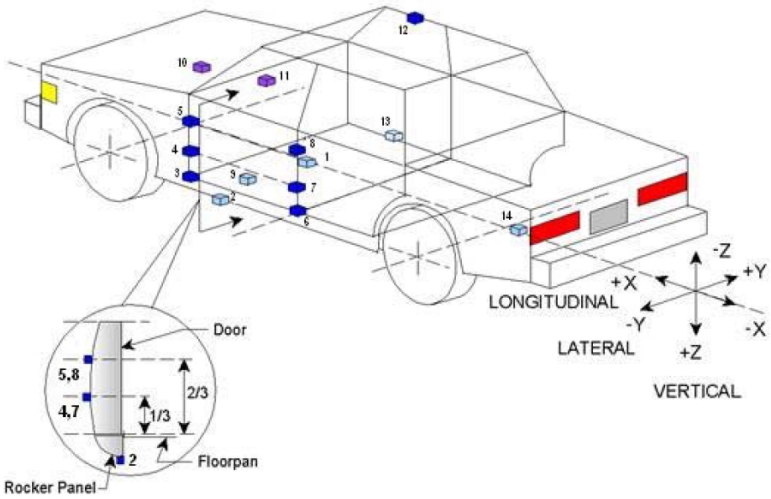
If applicable, explain why camera(s) did not operate as intended: All cameras operated as intended.

INSTRUMENTATION

Description	Number of Channels
Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	23
MDB Accelerometers	7
Total	62

DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023



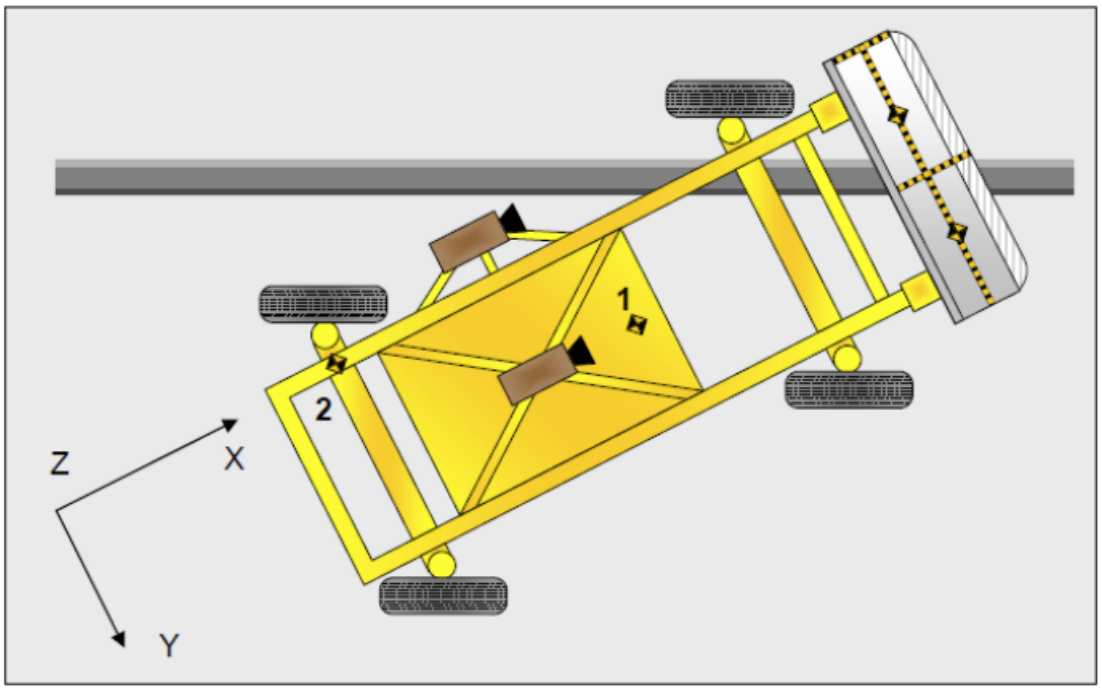
TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2425	-16	-158
2	Right Sill at Front Seat	2943	696	73
3	Right Sill at Rear Seat	1995	655	74
4	Left Sill at Front Door	2947	-699	75
5	Left Sill at Rear Door	1984	-659	75
6	A-Post Lower	3277	-669	66
7	A-Post Middle	3381	-672	-145
8	B-Post Lower	2242	-694	-327
9	B-Post Middle	2212	-694	-596
10	Front Seat Track	2489	-569	41
11	Rear Seat Structure	1809	-561	46
12	Rt. Rear Occ. Compartment	2066	360	115
13	Engine Block	3934	69	-426
14	Rear Above Axle	916	-3	45

Reference: X – Rear surface of vehicle (+ forward)
Y – Vehicle centerline (+ to right)
Z – Ground plane (+ down)

DATA SHEET NO. 7
MDB ACCELEROMETER LOCATIONS

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023



MDB ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	MDB CG	1859	0	-330
2	MDB Rear	386	-660	-660

Reference: *X – Face of MDB (+forward)*
Y – MDB centerline (+ to right)
Z – Ground plane (+down)

Width between left and right contact switches (mm): 1490

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2023 Jeep Grand Cherokee 4xe 5 Door SUV
NHTSA No.: M20230304
Test Program: NCAP Side MDB Impact Test
Test Date: 02/24/2023

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	None	None
Top of Head	Curtain Airbag	Curtain Airbag
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Curtain Airbag & Headrest	Curtain Airbag & Headrest
Left Shoulder	Curtain Airbag	Passenger Door
Upper Torso	Torso/Pelvis Airbag	Passenger Door
Lower Torso	Seatback & Torso/Pelvis Airbag	Passenger Door
Left Hip	Seatpan & Torso/Pelvis Airbag	Passenger Door
Left Knee	Driver Door	Passenger Door

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch/ Other*
	Front	Rear	Front	Rear	
Remained Closed and Operational	No	No	Yes	Yes	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or Hinge Systems Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Width of Opening at Striker (mm)	N/A	N/A	N/A	N/A	N/A

POST-TEST SEAT PERFORMANCE

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	No	No	No
Seat Disengagement from Floor Pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar, B-Pillar & C-Pillar Buckled
Sill Separation	None
Windshield Damage	None
Side Window Damage	None
Other Notable Effects	None

DATA SHEET NO. 8 … (CONTINUED)
POST-TEST OBSERVATIONS

Test Vehicle: 2023 Jeep Grand Cherokee 4xe 5 Door SUV
NHTSA No.: M20230304
Test Program: NCAP Side MDB Impact Test
Test Date: 02/24/2023

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2966
Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point)	mm		508
Actual Impact Point (Aft of Frontal Axle)	mm		499
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	+9
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	+1

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length Including Honeycomb Frame	4120
Wheelbase of Framework Carriage	2591
CG Location of Front Axle	1122

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	396	291.5	687.5
Right	kg	377.5	301	678.5
Ratio	%	56.6	43.4	100
Totals	kg	773.5	592.5	1366

SPEED AND ANGLE AT IMPACT DATA

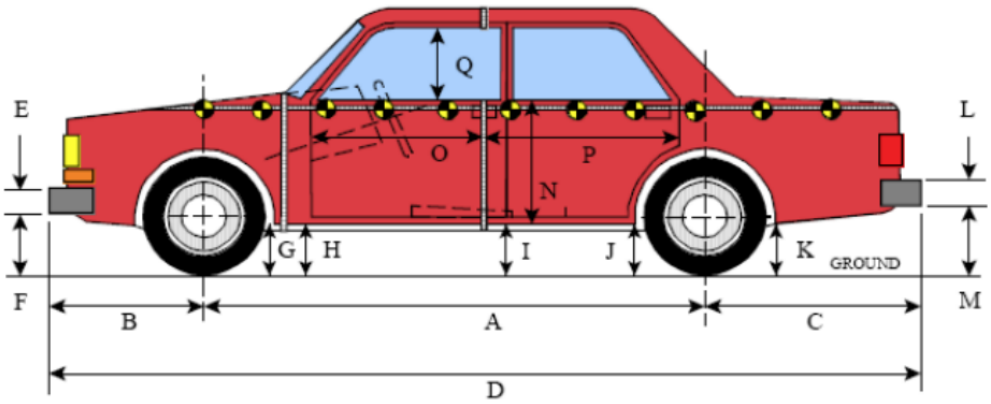
Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h		62.11
Trap No. 2 Velocity (Redundant)	km/h		61.99
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.0

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	0	Center	302
B	Top of Bumper	533	800	Left	208
C	Mid-Level	686	800	Left	209
D	Top of Stack	813	800	Left	219

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023



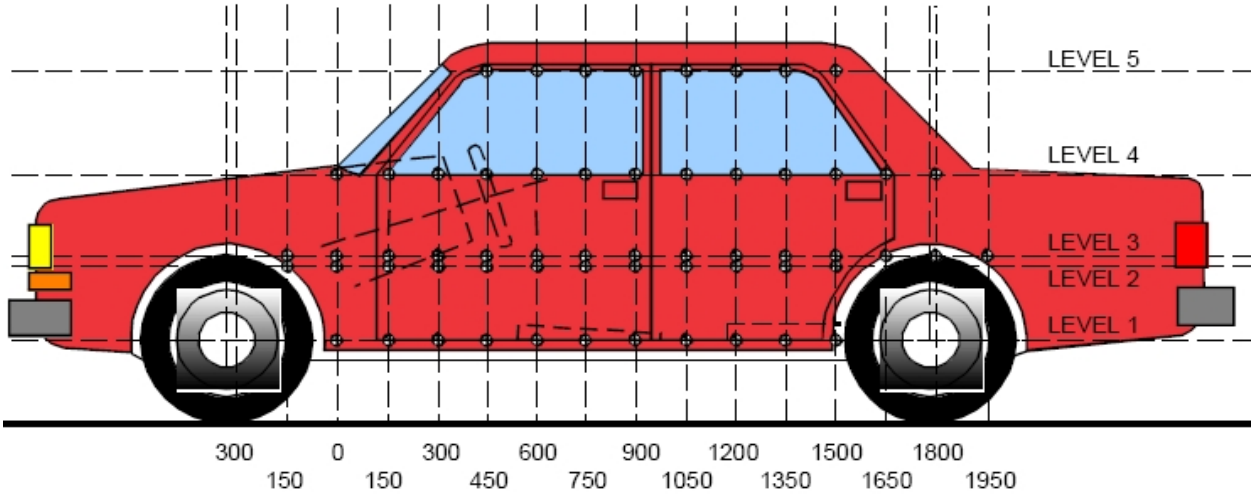
LEFT SIDE VIEW
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3mm

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code.	Measurement Description	Pre-Test	Post-Test	Change
A	Wheelbase	2966	2958	-8
B	Front Axle to FSOV	907	910	3
C	Rear Axle to RSOV	1043	1044	1
D2	Total Length at Centerline	4915	4912	-3
E	Front Bumper Thickness	100	100	0
F	Front Bumper Bottom to Ground	680	687	7
G	Sill Height at Front Wheel Well	260	251	-9
H	Sill Height at Front Door Leading Edge	269	263	-6
I	Sill Height at B Pillar	271	272	1
J1	Sill Height at Rear Wheel Well	263	261	-2
J2	Pinch Weld Height at Rear Wheel Well	293	295	2
K	Sill Height Aft of Rear Wheel Well	308	315	7
L	Rear Bumper Thickness	132	132	0
M	Rear Bumper Bottom to Ground	565	574	9
N	Sill Height to Bottom of Front Window Sill	936	923	-13
O	Front Door Leading Edge to Impact CL	700	699	-1
P	Rear Door Trailing Edge to Impact CL	1439	1412	-27
Q	Front Window Opening	447	449	2
R	Right Side Length	4811	4810	-1
S	Left Side Length	4813	4809	-4
T	Vehicle Width at B-Pillars	1899	1779	-120
U	Front Wheel Track Width	1661	1650	-11
V	Rear Wheel Track Width	1665	1655	-10

DATA SHEET NO.11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	419	46	1500
2	Occupant H-Point	mm	783	232	1650
3	Mid-Door	mm	839	219	1650
4	Window Sill	mm	1187	48	1350
5	Window Top	mm	1696	3	1950

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.11 … (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Jeep Grand Cherokee 4xe 5 Door SUV
NHTSA No.: M20230304
Test Program: NCAP Side MDB Impact Test
Test Date: 02/24/2023

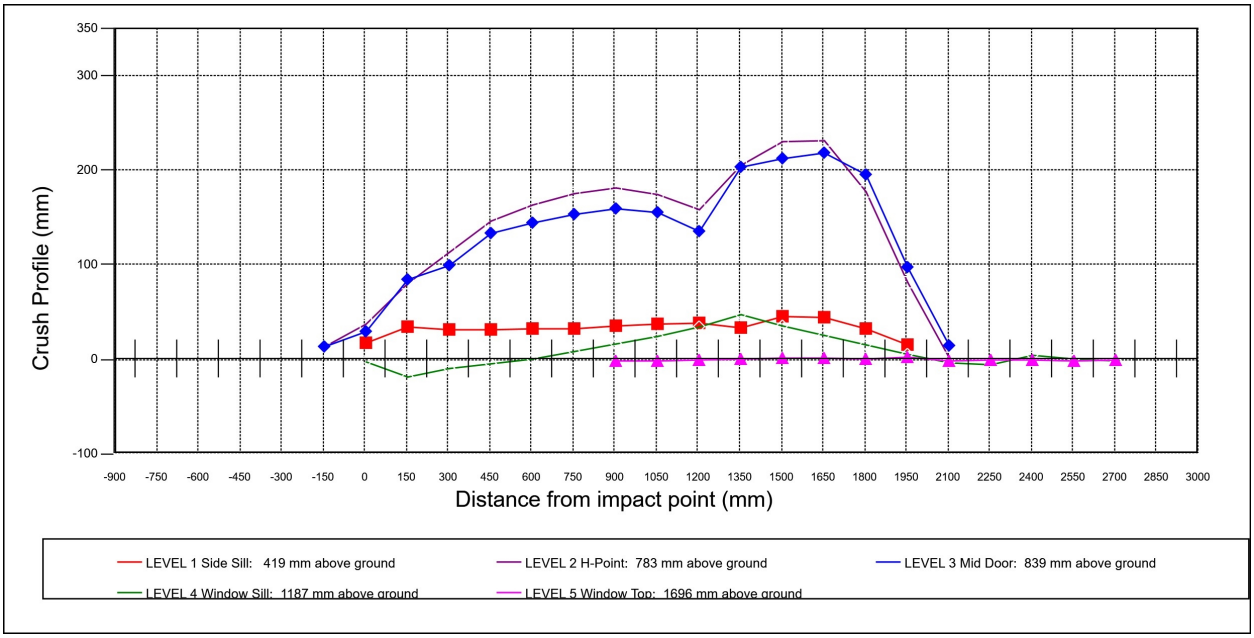
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test					Post-Test					Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300															
-150		975	976				961	962				14	14		
0	923	957	957	835		905	919	925	837		18	38	32	-2	
150	909	943	945	849		874	862	860	867		35	81	85	-18	
300	902	941	943	859		870	827	843	868		32	114	100	-9	
450	901	942	945	865		869	795	811	869		32	147	134	-4	
600	902	943	946	872		869	779	801	871		33	164	145	1	
750	903	944	947	879		870	768	793	870		33	176	154	9	
900	903	945	948	885	651	867	763	788	868	652	36	182	160	17	-1
1050	903	945	949	890	670	865	770	793	865	671	38	175	156	25	-1
1200	901	946	949	892	674	862	787	813	857	674	39	159	136	35	0
1350	900	944	947	894	676	866	738	743	846	675	34	206	204	48	1
1500	900	944	947	896	676	854	713	734	860	674	46	231	213	36	2
1650	903	945	947	898	675	858	713	728	872	673	45	232	219	26	2
1800	916	949	951	897	673	883	771	755	881	672	33	178	196	16	1
1950	935	963	963	896	671	919	881	865	890	668	16	82	98	6	3
2100		973	978	894	669		971	963	897	670		2	15	-3	-1
2250				891	663				896	663				-5	0
2400				885	657				880	657				5	0
2550				877	645				876	646				1	-1
2700				868	631				869	631				-1	0
2850															
3000															

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 test based on an estimated impact point.

DATA SHEET NO.11 … (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

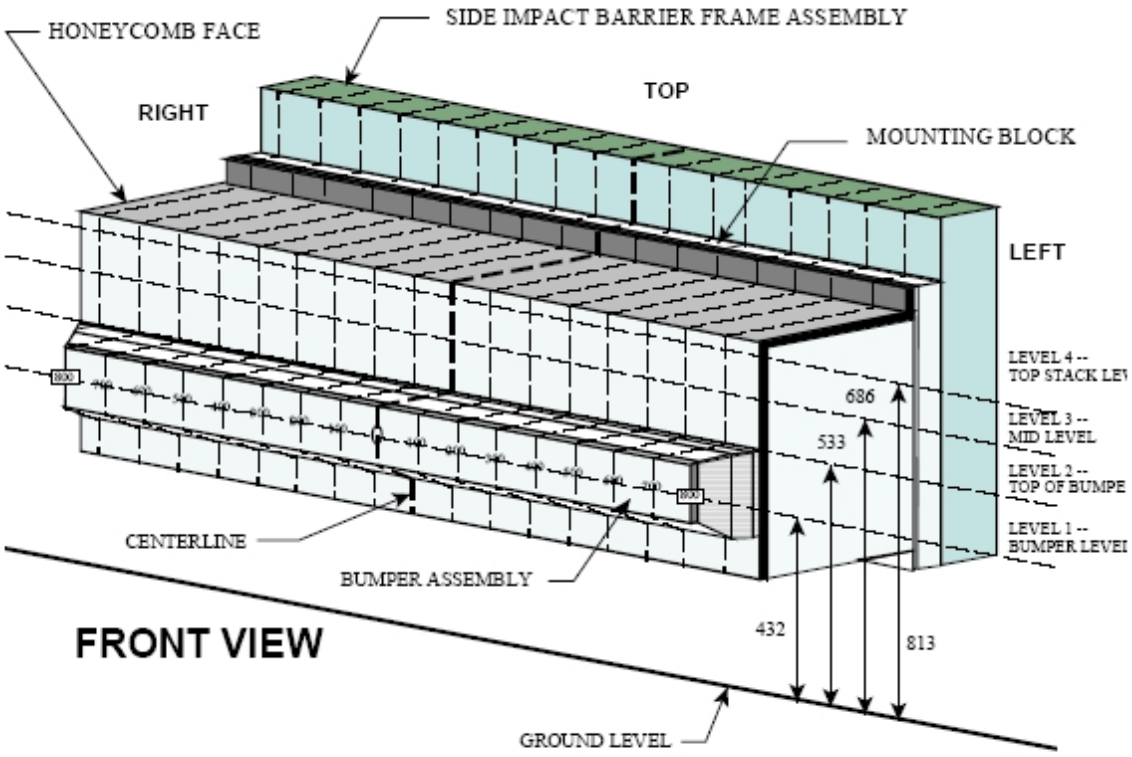
Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023



Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO.12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023



NOTE: Dimensions are shown in millimeters, mm

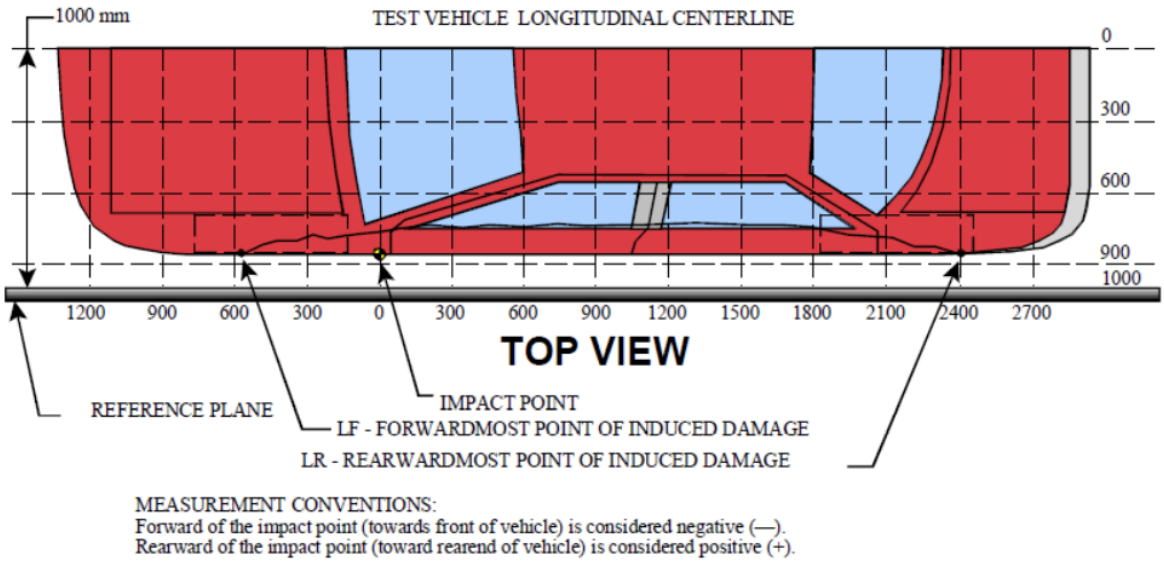
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
1	288	288	290	292	295	300	300	301	302	294	292	288	287	287	286	287	291
2	178	183	186	191	177	192	199	194	194	189	187	187	188	189	188	204	208
3	139	94	90	101	149	164	134	107	120	118	112	108	112	124	151	204	209
4	118	101	88	84	110	131	135	118	112	116	121	134	151	153	183	210	219

DATA SHEET NO.13
VEHICLE AND MDB DAMAGE PROFILE DISTANCE

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

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



MEASUREMENT CONVENTIONS:
Forward of the impact point (towards front of vehicle) is considered negative (—).
Rearward of the impact point (toward rearend of vehicle) is considered positive (+).

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-150	3	38	24	14
2	300	3	157	57	100
3	750	3	207	53	154
4	1200	3	187	51	136
5	1650	3	272	53	219
6	2100	3	37	22	15

MDB DAMAGE PROFILE DISTANCES

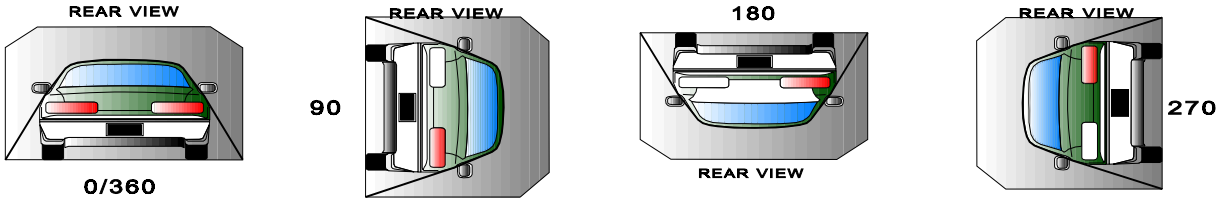
DPD	Distance From Center of MDB (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	800 mm left of center	1	214	505	-291
2	480 mm left of center	1	227	514	-287
3	160 mm leftt of center	1	221	514	-293
4	160 mm right of center	1	213	513	-300
5	480 mm right of center	1	220	513	-293
6	800 mm right of center	1	213	501	-288

DATA SHEET NO.14
FMVSS NO.301 STATIC ROLLOVER RESULTS

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023
Test Time:	2:09 PM	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°	66	300	366
90° to 180°	64	300	364
180° to 270°	66	300	366
270° to 360°	66	300	366

FMVSS 301 SPILLAGE TABLE

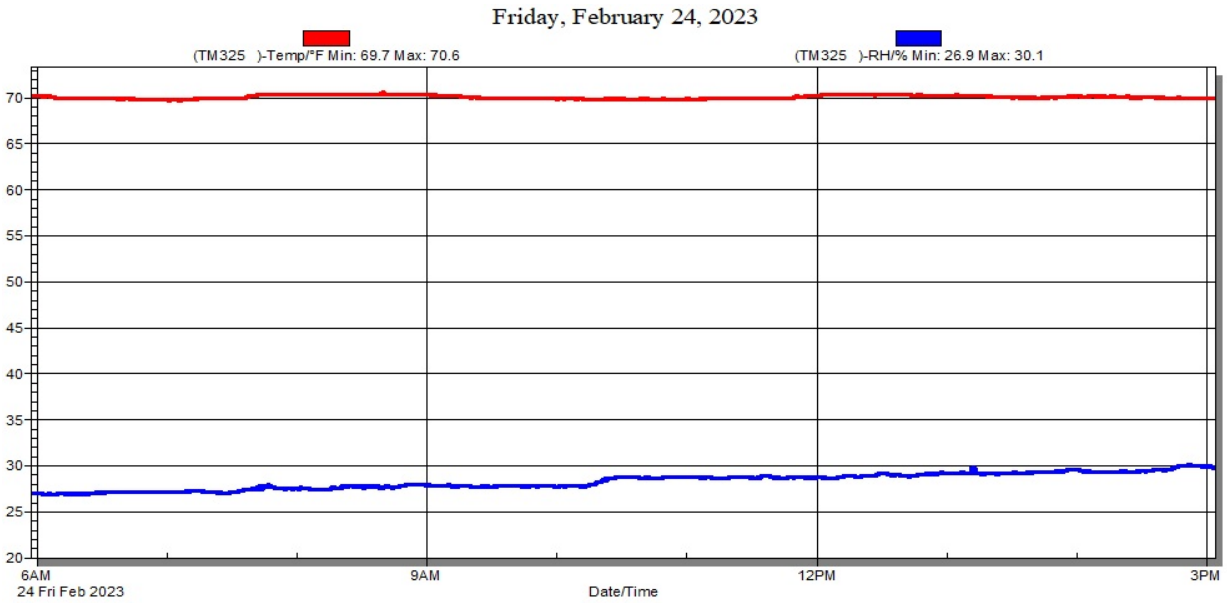
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 15
DUMMY / VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023



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

DATA SHEET NO. 305-1
GENERAL TEST AND VEHICLE PARAMETER DATA FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2023 Jeep Grand Cherokee 4xe 5 Door SUV
NHTSA No.: M20230304
Test Program: NCAP Side MDB Impact Test
Test Date: 02/24/2023

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Gasoline-Electric Hybrid
Propulsion Battery Type	NMC Lithium Ion Polymer
Nominal Voltage (Volts)	400
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Driver side rear trunk area
Auxiliary Battery Type	N/A

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	Organic solvent – carbonate based
Electrolyte Fluid Specific Gravity	1.2g/cm^3
Electrolyte Fluid Kinematic Viscosity (centistokes)	~3.52cP (@25ºC)
Electrolyte Fluid Color	Clear
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Ethylene-Glycol/Water mixture, Pink
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Outside Passenger Compartment

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
For all battery types: Voltage Range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	336.3
Maximum State of Charge	V	372
95% of Maximum	V	353.4
Test Voltage *	V	368
For batteries that are rechargeable ONLY by an energy source on the vehicle: Voltage range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	

* *For all battery types-No less than 95% of Maximum Operating Voltage; for batteries that are rechargeable ONLY by an energy source on the vehicle-maximum practicable state of charge within normal operating range.*

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

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

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

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	The Mopar test point adapter tool proveded included a ground lead along with positive and negative meter leads.
Details of Propulsion Battery Components	The propulsion battery is located under the rear passenger vehicle underbody.

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

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		58100115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		04/28/2022

NOTES:

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

PROPULSION BATTERY VOLTAGE, RESISTANCE & ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Measured Parameter	Symbol	Units	Value
Normal operating voltage range specified by the manufacturer	V_b	V	336.3-396.5
Propulsion Battery Voltage: (ready to drive position)	V_b	V	368.0
Propulsion Battery to Vehicle Chassis	V_1	V	65.0
Propulsion Battery to Vehicle Chassis	V_2	V	66.0
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	200,000
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	26.0
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	14.0
$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$	R_{i1}	Ω	604,615
$R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$	R_{i2}	Ω	1,474,459
Lesser value of R_{i1} and R_{i2}	R_i	Ω	604,615
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	1,643

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

NOTES:

- *The measurement shall be made with the propulsion battery connected to the vehicle propulsion system, and the vehicle in the "ready-to-drive" (propulsion motor(s) activated) position.*
- *If the voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.*
- *The known resistance Ro (in Ohms) should be approximately 500 times the nominal operating voltage of the vehicle (in volts) per SAE J1766*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*

DATA SHEET NO. 305-4
POST-IMPACT DATA FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		58100115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		04/28/2022

NOTES:

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

ELECTRICAL ISOLATION MEASUREMENTS & IMPACT CALCULATIONS

Parameter	Value	Units		Value		Value	
V_b =	0.150	V	Time:	0	Minutes	55	Seconds
V_1 =	0.390	V	Time:	1	Minutes	7	Seconds
V_2 =	0.490	V	Time:	1	Minutes	12	Seconds
R_o =	200,000	Ω					
V_1' =	0.100	V	Time:	1	Minutes	20	Seconds
V_2' =	0.100	Ω	Time:	1	Minutes	23	Seconds
R_{i1} =	1,308,718	Ω	Time:	1	Minutes	20	Seconds
R_{i2} =	1,400,816	Ω	Time:	1	Minutes	23	Seconds
R_i =	1,308,718	Ω/V	Time:	1	Minutes	20	Seconds
R_i/V_b =	8,724,787	Ω/V	Time:	1	Minutes	20	Seconds

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

NOTES:

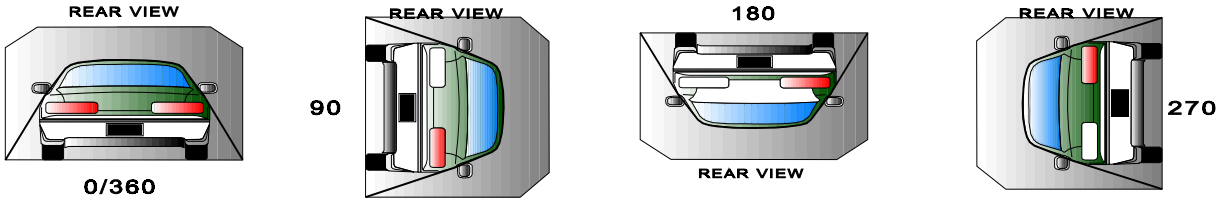
- *$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$, $R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$, R_i = Lesser value of R_{i1} and R_{i2}*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*
- *Minimum Electrical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

PROPULSION BATTERY SYSTEM COMPONENTS

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

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

Test Vehicle:	2023 Jeep Grand Cherokee 4xe 5 Door SUV	NHTSA No.:	M20230304
Test Program:	NCAP Side MDB Impact Test	Test Date:	02/24/2023



Rear View

DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Rollover Stage	Rotation Time (spec. 1 -3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	6	5	6	6	7
90° to 180°	1	4	5	6	4	7
180° to 270°	1	6	5	6	6	7
270° to 360°	1	6	5	6	6	7

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

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

** FMVSS 305 Requirements: Maximum allowable propulsion battery electrolyte spillage is **5.0 Liters***

Is the total spillage of propulsion battery electrolyte greater than 5.0 Liters?		Yes (Fail)	X	No
Is propulsion battery electrolyte spillage visible in the passenger compartment?		Yes (Fail)	X	No

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		58100115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		04/28/2022

NOTES:

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

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

Test Vehicle: 2023 Jeep Grand Cherokee 4xe 5 Door SUV
NHTSA No.: M20230304
Test Program: NCAP Side MDB Impact Test
Test Date: 02/24/2023

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units		Minutes	Seconds
V_b =	90°	0.01	V	Time:	1	11
	180°	0.01	V		8	45
	270°	0	V		15	2
	360°	0	V		21	18
V_1 =	90°	0.01	V	Time:	1	20
	180°	0.01	V		8	57
	270°	0.01	V		15	9
	360°	0.00	V		21	27
V_2 =	90°	0.01	V	Time:	1	24
	180°	0.01	V		9	1
	270°	0.01	V		15	14
	360°	0.00	V		21	31
V_1' =	90°	0.00	V	Time:	1	26
	180°	0.00	V		9	4
	270°	0.00	V		15	18
	360°	0.00	V		21	36
V_2' =	90°	0.00	Ω	Time:	1	28
	180°	0.00	Ω		9	6
	270°	0.00	Ω		15	21
	360°	0.00	Ω		21	39
R_{i1} =	90°	Zero Volts	Ω	Time:	1	26
	180°	Zero Volts	Ω		9	4
	270°	Zero Volts	Ω		15	18
	360°	Zero Volts	Ω		21	36
R_{i2} =	90°	Zero Volts	Ω	Time:	1	28
	180°	Zero Volts	Ω		9	6
	270°	Zero Volts	Ω		15	21
	360°	Zero Volts	Ω		21	39
R_i =	90°	Zero Volts	Ω/V	Time:	1	28
	180°	Zero Volts	Ω/V		9	6
	270°	Zero Volts	Ω/V		15	21
	360°	Zero Volts	Ω/V		21	28
R_i/V_b =	90°	Zero Volts	Ω/V	Time:	1	28
	180°	Zero Volts	Ω/V		9	6
	270°	Zero Volts	Ω/V		15	21
	360°	Zero Volts	Ω/V		21	39

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

APPENDIX A

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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 Side 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

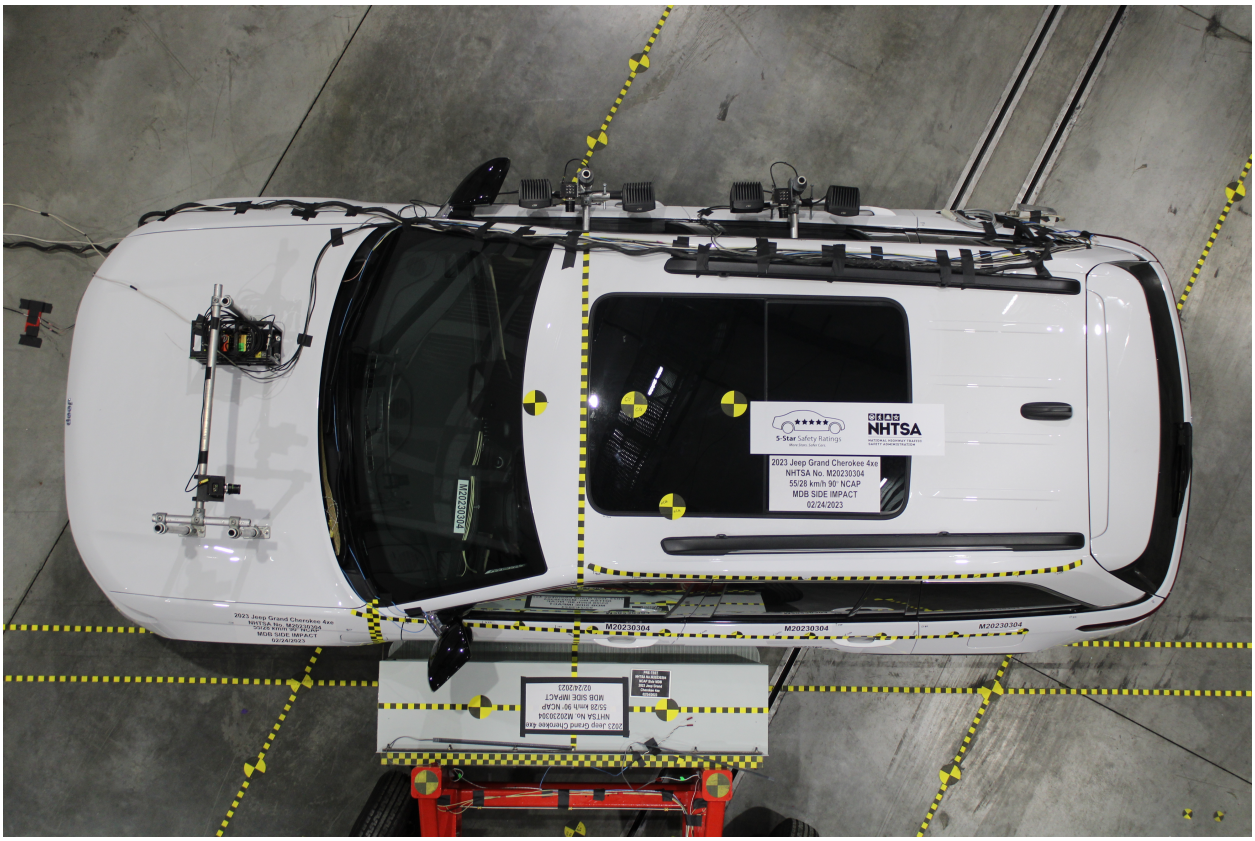


Figure A-15: Pre-Test Overhead View of Test Area

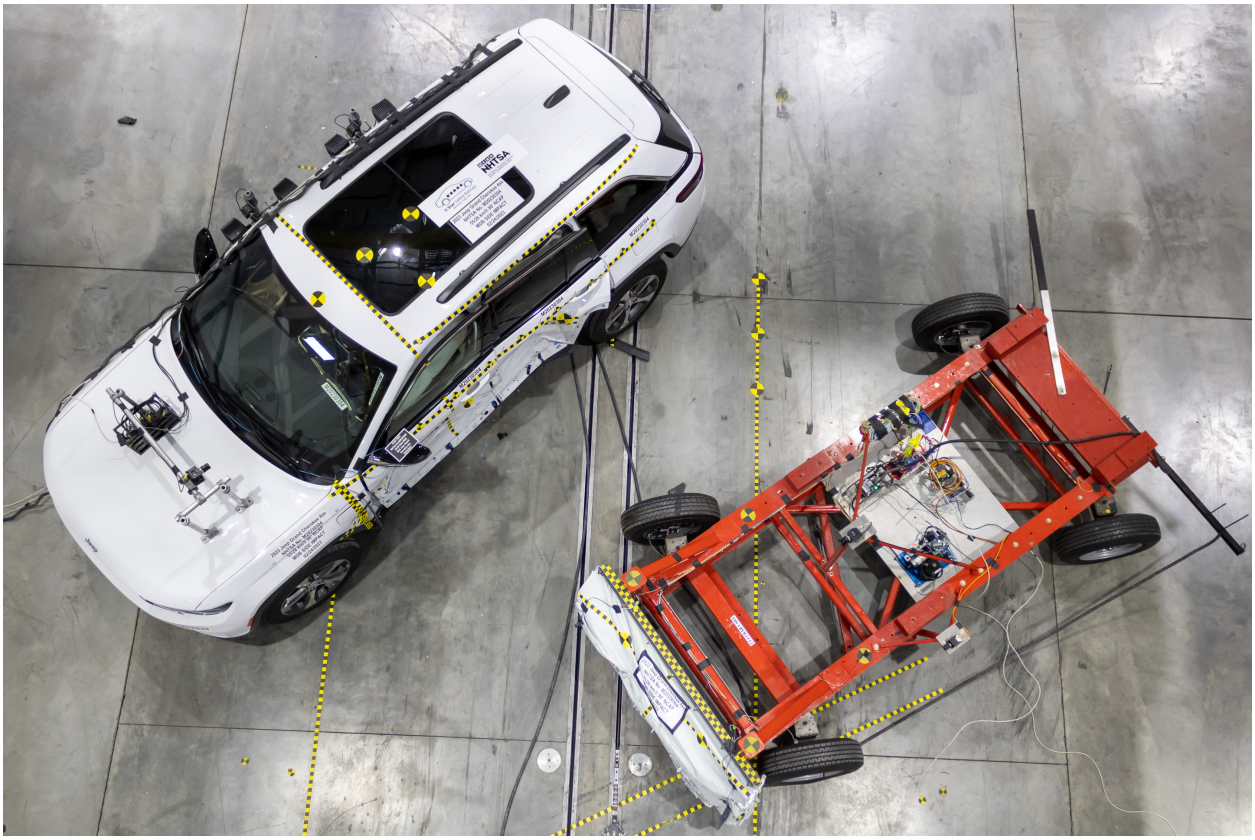


Figure A-16: Post-Test Overhead View of Test Area



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



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



Figure A-21: Pre-Test Left Front Door Latch Close-Up

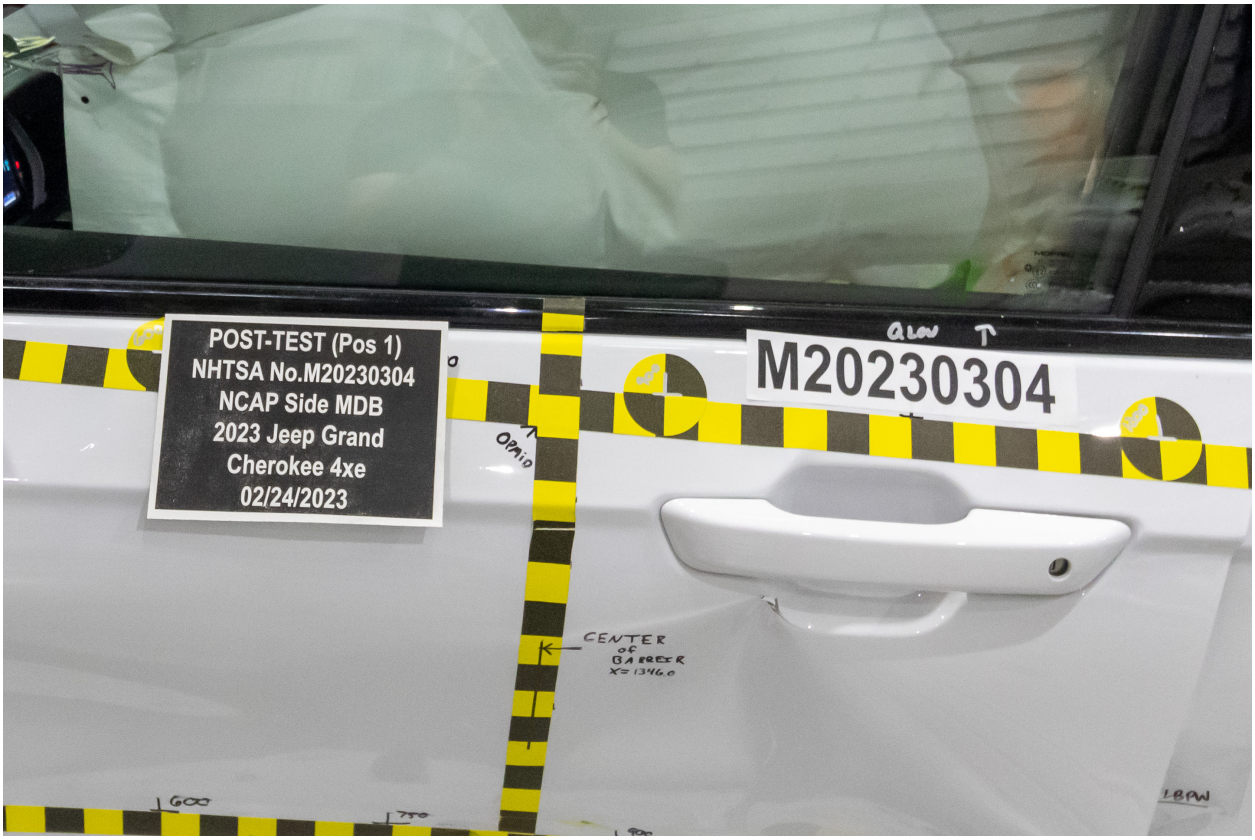


Figure A-22: Post-Test Left Front Door Latch Close-Up



Figure A-23: Pre-Test Left Rear Door Latch Close-Up



Figure A-24: Post-Test Left Rear Door Latch Close-Up



Figure A-25: Pre-Test Front Close-up View of Driver Dummy



Figure A-26: Post-Test Front Close-up View of Driver Dummy



Figure A-27: Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking



Figure A-28: Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View



Figure A-29: Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



Figure A-30: Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



Figure A-31: Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



Figure A-32: Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



Figure A-33: Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



Figure A-34: Pre-Test Placement of Driver Dummy's Feet



Figure A-35: Pre-Test View of Belt Anchorage for Driver Dummy



Figure A-36: Pre-Test Left Side View of Steering Wheel



Figure A-37: View of Disengaged Parking Brake



Figure A-38: Pre-Test View of Parking Brake

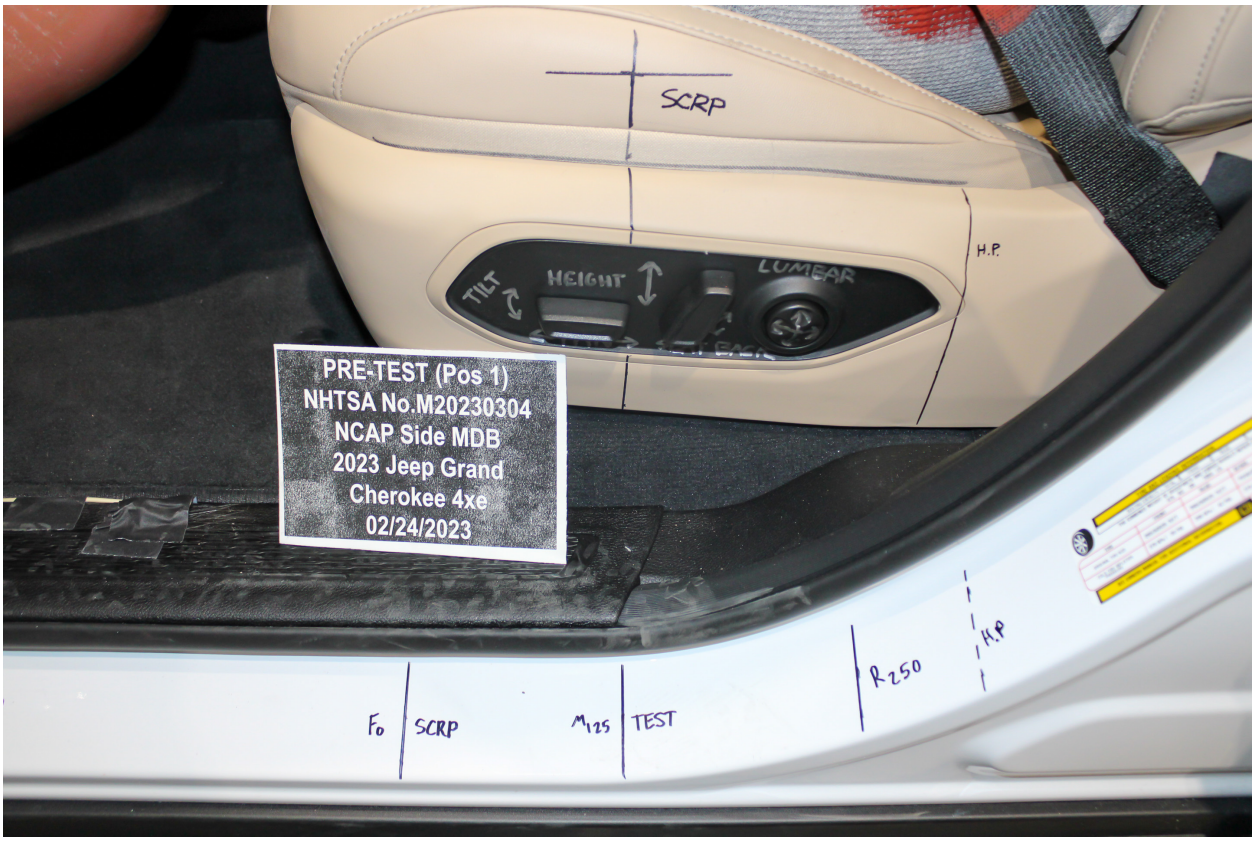


Figure A-39: Pre-Test Close-Up Left Side View of Driver Seat Track



Figure A-40: Pre-Test Close-Up Left Side View of Driver Seat Back



Figure A-41: Pre-Test Close-Up View of Driver Seat Back or Head Restraint



Figure A-42: Pre-Test Driver Dummy and Door Clearance View



Figure A-43: Post-Test Driver Dummy and Door Clearance View



Figure A-44: Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Figure A-45: Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Figure A-46: Pre-Test Driver Inner Door Panel View



Figure A-47: Post-Test Driver Inner Door Panel View



Figure A-48: Post-Test Driver Dummy Close-Up Head Contact with Vehicle View



Figure A-49: Post-Test Driver Dummy Close-Up Head Contact with Side Air bag View



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



Figure A-51: Post-Test Driver Dummy Close-Up Torso Contact with Side Air bag View



Figure A-52: Post-Test Driver Dummy Close-Up Pelvis Contact View



Figure A-53: Post-Test Driver Dummy Close-Up Pelvis Contact with Side Air bag View



Figure A-54: Post-Test Driver Dummy Close-Up Knee Contact View



Figure A-55: Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking



Figure A-56: Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Figure A-57: Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Figure A-58: Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning

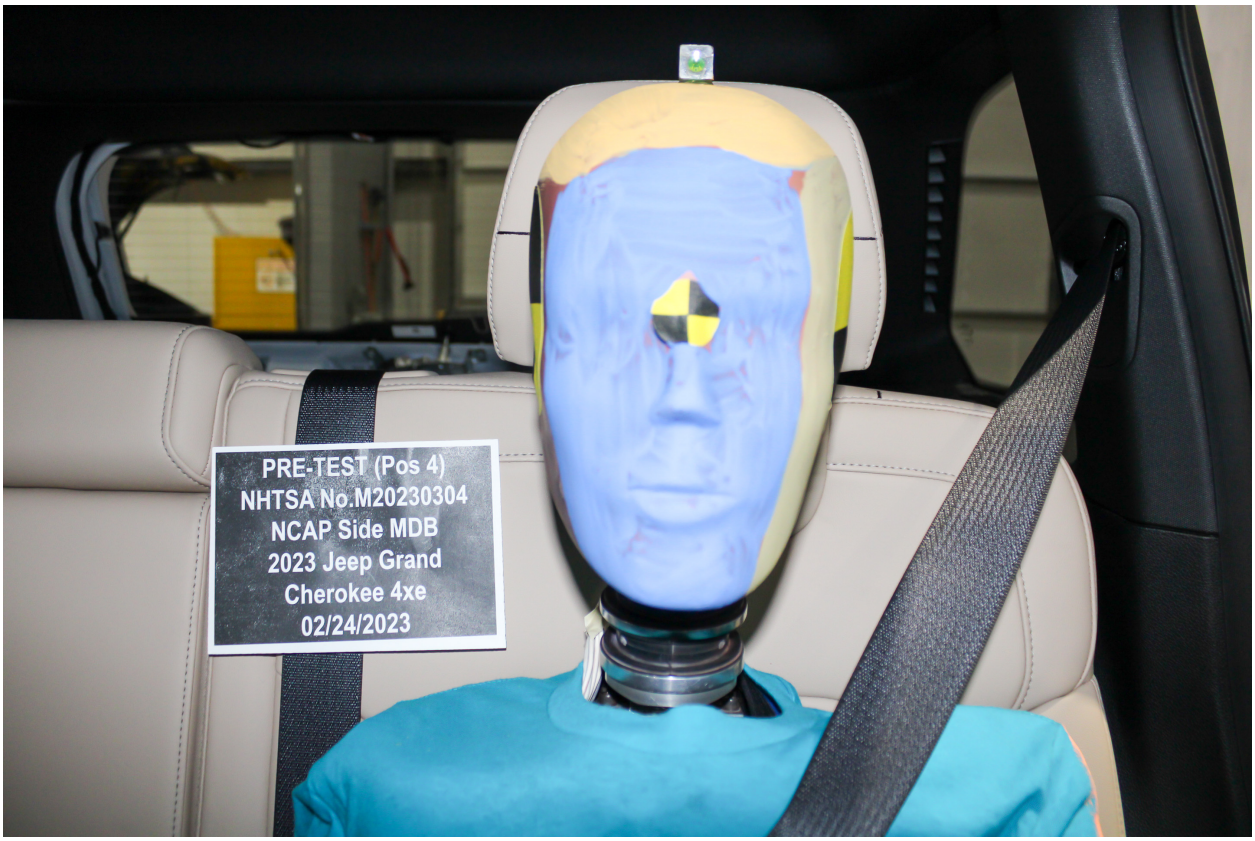


Figure A-59: Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



Figure A-60: Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



Figure A-61: Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

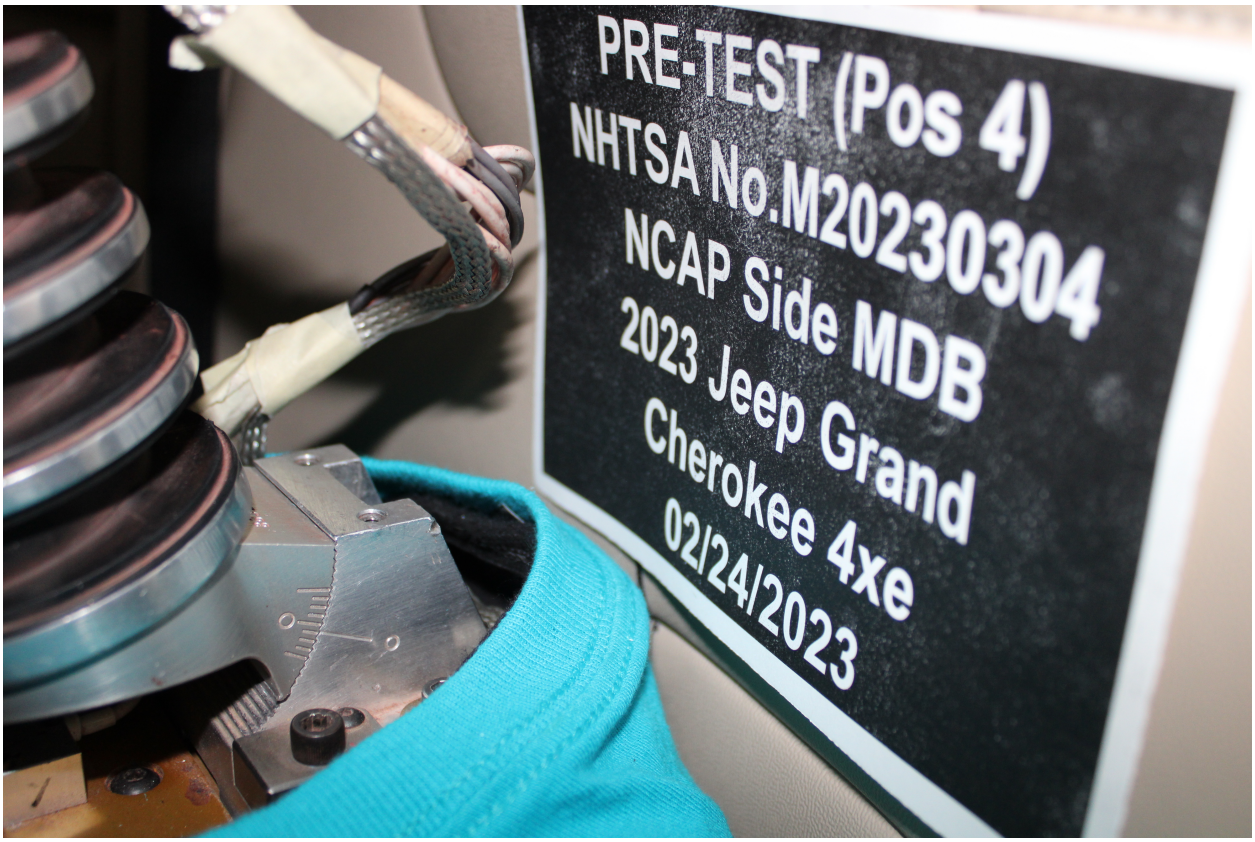


Figure A-62: Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket



Figure A-63: Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level



Figure A-64: Pre-Test Placement of Rear Passenger Dummy's Feet



Figure A-65: Pre-Test View of Belt Anchorage for Rear Passenger Dummy



Figure A-66: Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



Figure A-67: Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



Figure A-68: Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint



Figure A-69: Pre-Test Rear Passenger Dummy and Door Clearance View



Figure A-70: Post-Test Rear Passenger Dummy and Door Clearance View



Figure A-71: Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Figure A-72: Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Figure A-73: Pre-Test Rear Passenger Inner Door Panel View



Figure A-74: Post-Test Rear Passenger Inner Door Panel View Showing Rear Passenger Dummy Contact Locations



Figure A-75: Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View



Figure A-76: Post-Test Rear Passenger Dummy Close-Up Head Contact with Side Air bag View



Figure A-77: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View

Photo Not Applicable

Figure A-78: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Air bag View



Figure A-79: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact View

Photo Not Applicable

Figure A-80: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Air bag View



Figure A-81: Post-Test Rear Passenger Dummy Close-Up Knee Contact View



Figure A-82: Pre-Test Charging Port



Figure A-83: Post-Test Charging Port

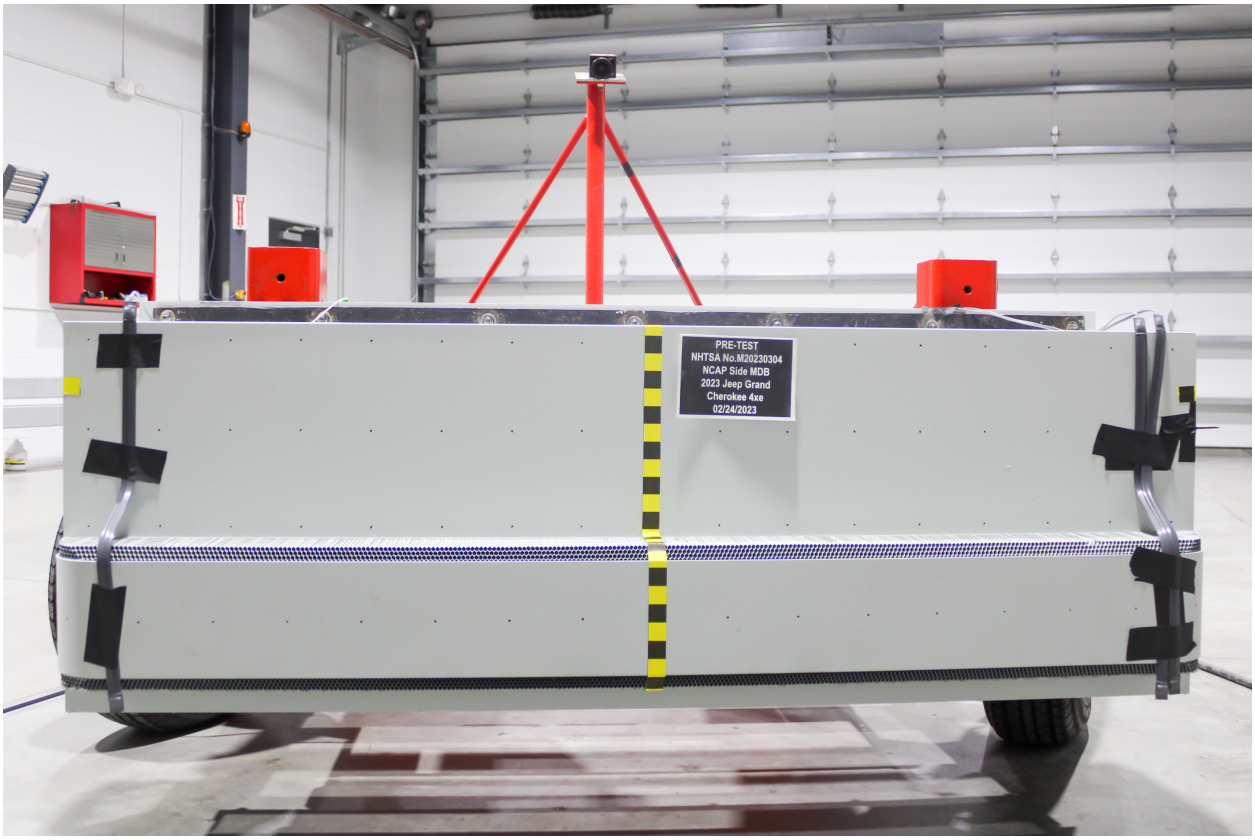


Figure A-84: Pre-Test Front View of MDB Impactor Face

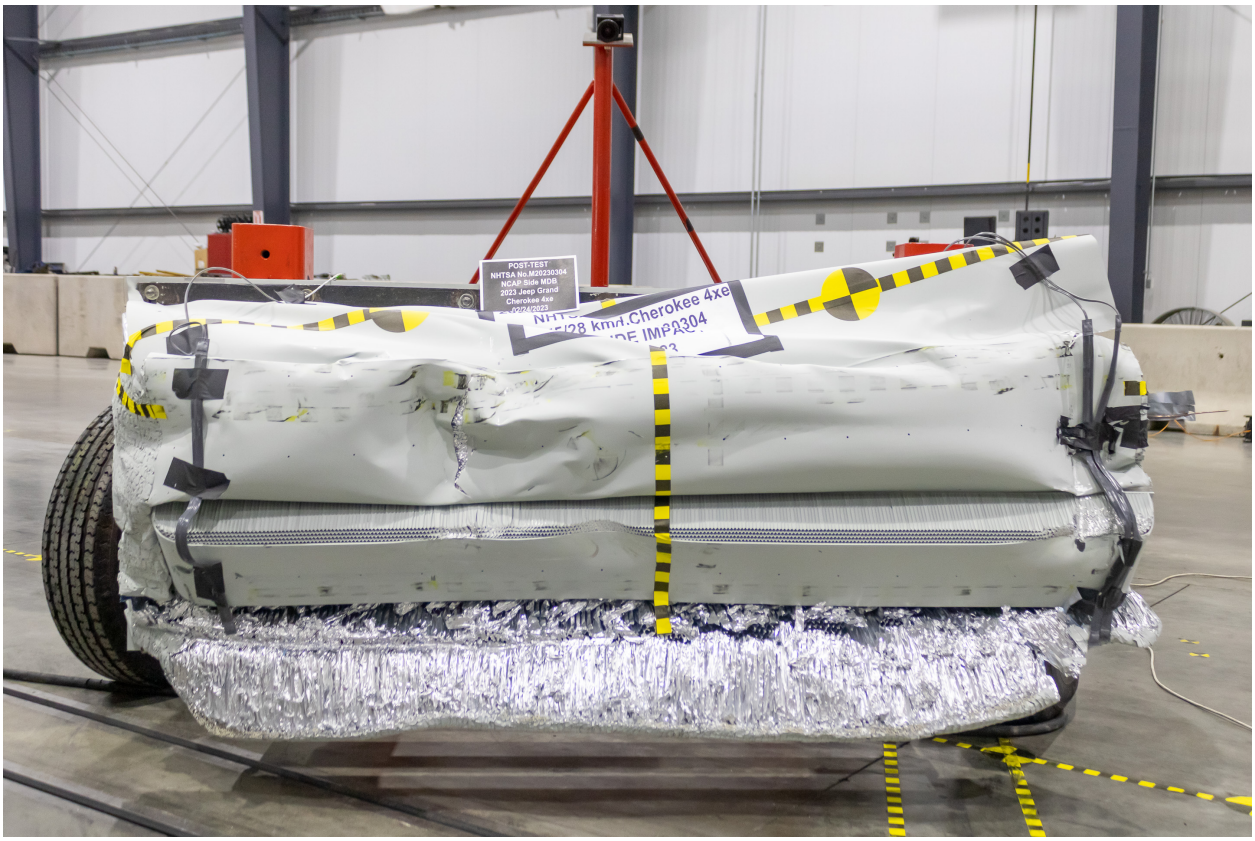


Figure A-85: Post-Test Front View of MDB Impactor Face



Figure A-86: Pre-Test Top View of MDB Impactor Face



Figure A-87: Post-Test Top View of MDB Impactor Face



Figure A-88: Pre-Test Left Side View of MDB Impactor Face



Figure A-89: Post-Test Left Side View of MDB Impactor Face



Figure A-90: Pre-Test Right Side View of MDB Impactor Face



Figure A-91: Post-Test Right Side View of MDB Impactor Face



Figure A-92: Close-Up View of Vehicle's Certification Label

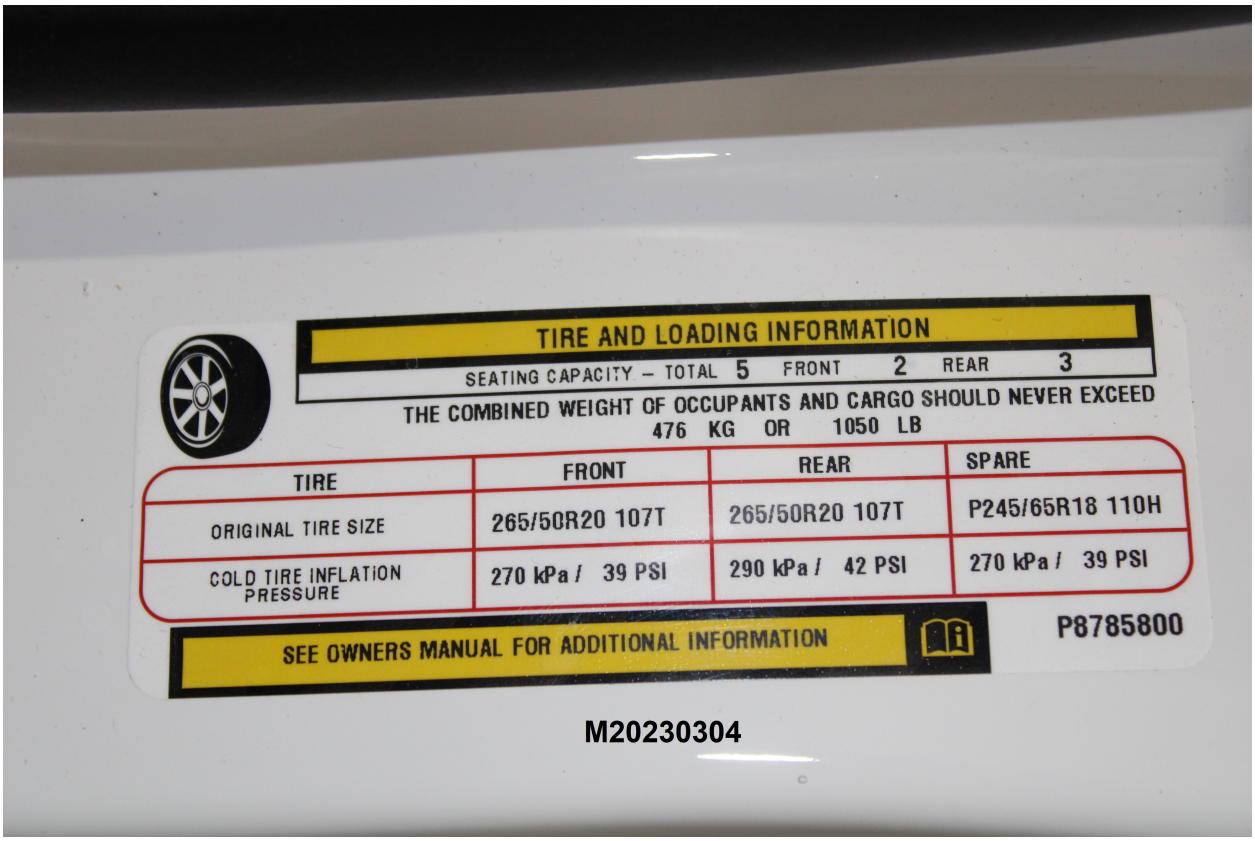


Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label

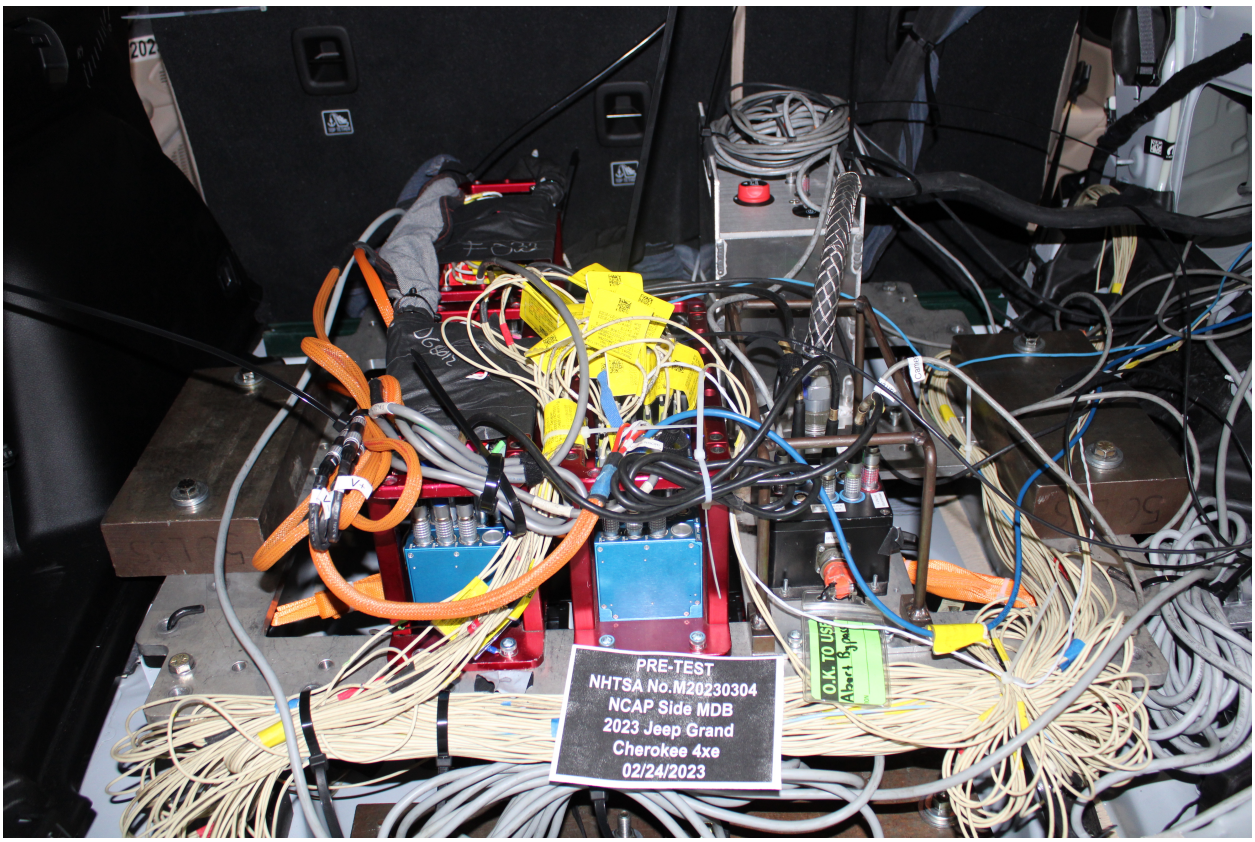


Figure A-94: Pre-Test Ballast View



Figure A-95: Post-Test Primary and Redundant Speed Trap Read-Out



Figure A-96: FMVSS No. 301 Static Rollover 0 Degrees

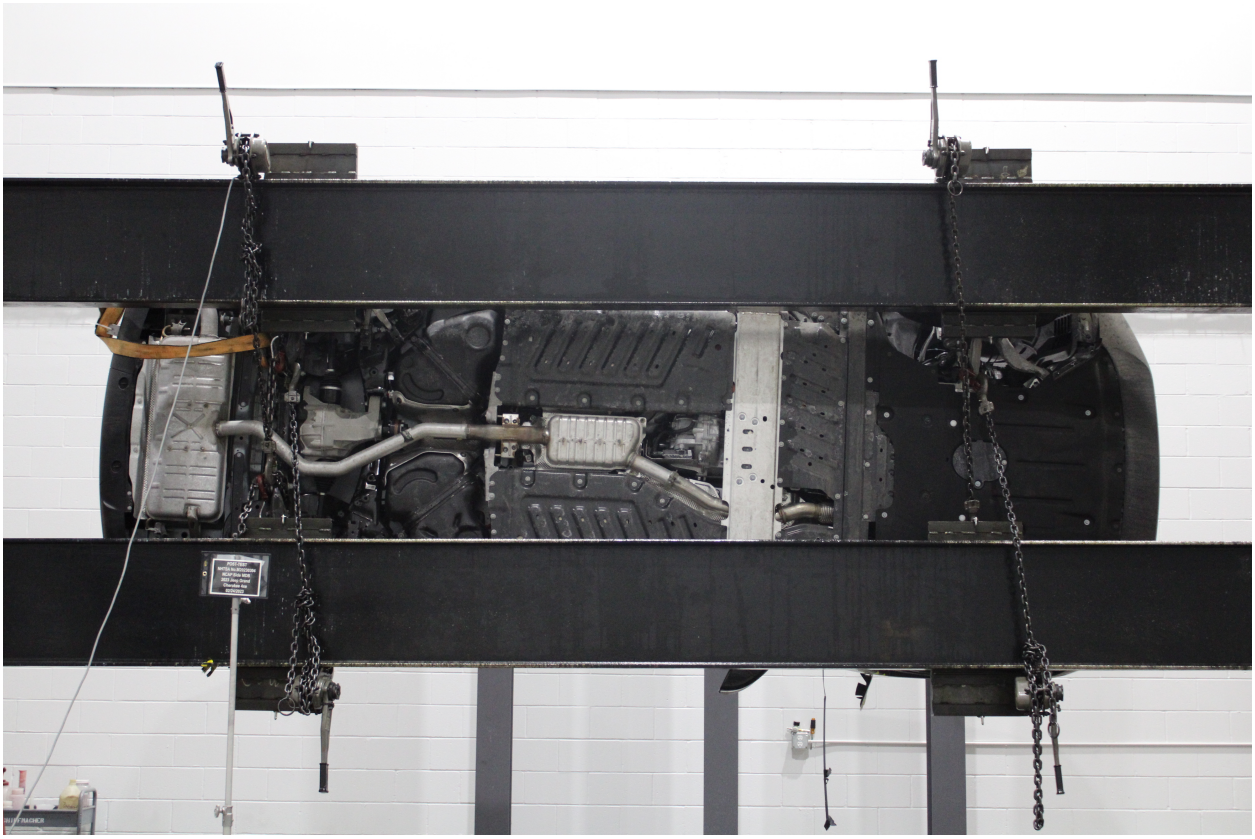


Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees

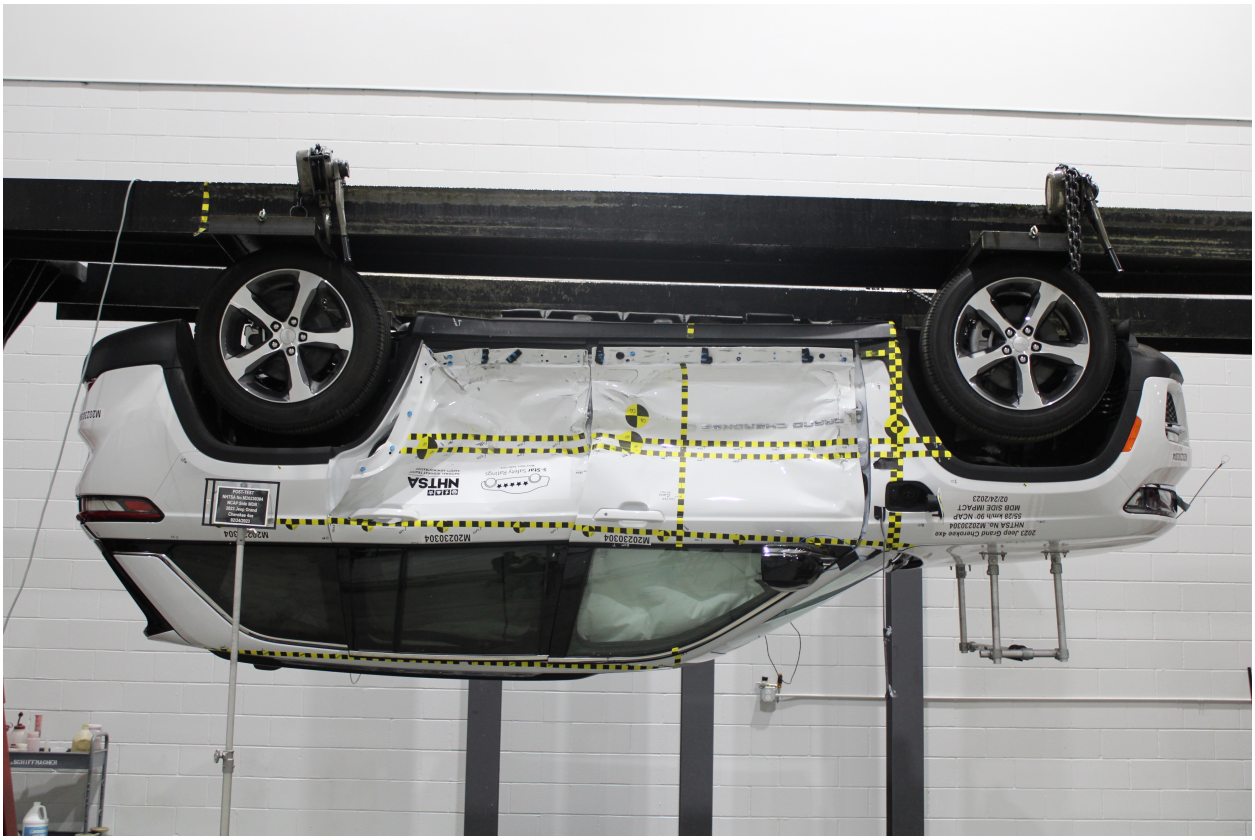


Figure A-98: FMVSS No. 301 Static Rollover 180 Degrees



Figure A-99: FMVSS No. 301 Static Rollover 270 Degrees



Figure A-100: FMVSS No. 301 Static Rollover 360 Degrees



Figure A-101: Impact Event

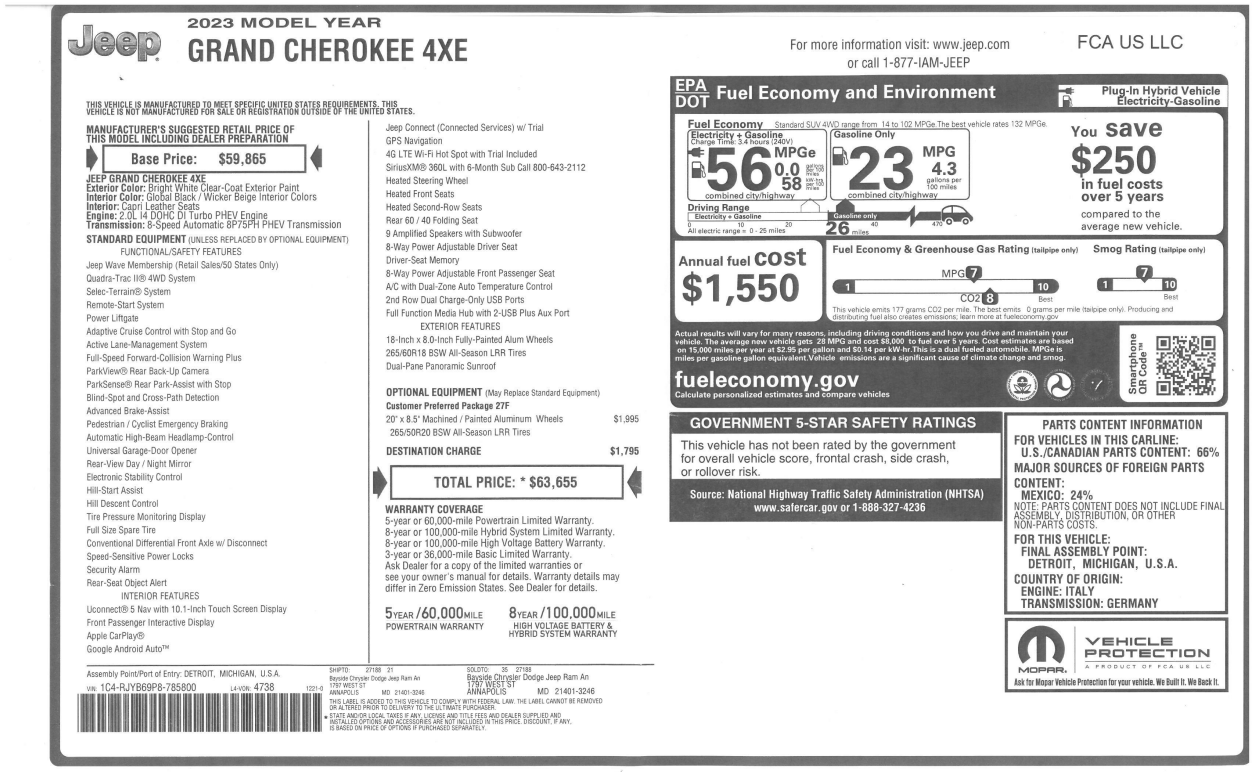


Figure A-102: Monroney Label

HEAD RESTRAINTS

Head restraints are designed to reduce the risk of injury by restricting head movement in the event of a rear impact. Head restraints should be adjusted so that the top of the head restraint is located above the top of your ear.

WARNING!

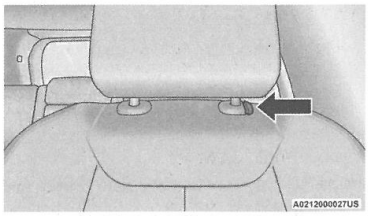
- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

Front Head Restraints

Your vehicle is equipped with front four-way driver and passenger head restraints.

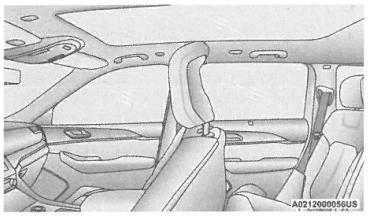
To raise the head restraint, pull upward on the head restraint. To lower the head restraint, push the adjustment button, located at the base of the head restraint, and push downward on the head restraint.

NOTE:
The head restraints should only be removed by qualified technicians, for service purposes only. If either of the head restraints require removal, see an authorized dealer.

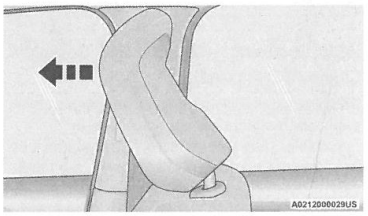


Head Restraint Adjustment Button

To adjust the head restraint forward, pull the top of the head restraint toward the front of the vehicle as desired and release. To adjust the head restraint rearward, pull the top of the head restraint to the forward most position and release. The head restraint will return to the rear most position.



Upright Position



Forward Adjustment

Figure A-103: Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

WARNING!

- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

Head Restraints — Second Row Captain's Chairs (If Equipped)

If the second row is equipped with captain's chairs, the head restraints are not adjustable or removable. They automatically fold forward when the seatback is folded, and do not return to their normal position when the seatback is raised. After returning the seatback to its upright position after a folding operation, raise the head restraint until it locks in place.

WARNING!

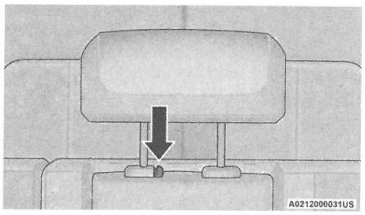
- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

Head Restraints — Second Row Bench (If Equipped)

If the second row is equipped with a bench seat, the head restraints on the outboard seats are not adjustable or removable. They automatically fold forward when the seatback is folded, and do not return to their normal position when the seatback is raised. After returning the seatback to its upright position after a folding operation, raise the head restraint until it locks in place.

The center head restraint has one adjustment position, and can be adjusted up or down when the seat is occupied. Pull up on the head restraint to raise it. To lower the head restraint, push the adjustment button located on the base of the head restraint, and push downward on the head restraint until it locks into place.

NOTE:
The center head restraint is not removable.



Center Seat Head Restraint Adjustment Button

NOTE:
For information on child restraint tethering, see ➪ page 269.

Figure A-104: Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



Figure 305-1: Auxiliary Power Module Warning Label

Photo Not Applicable

Figure 305-2: Power Inverter Warning Label



Figure 305-3 First Responder Warning Label



Figure 305-4: First Responder Warning Label Location

Photo Not Applicable

Figure 305-5: Other Vehicle Label(s) Related to Electrical Propulsion System



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



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

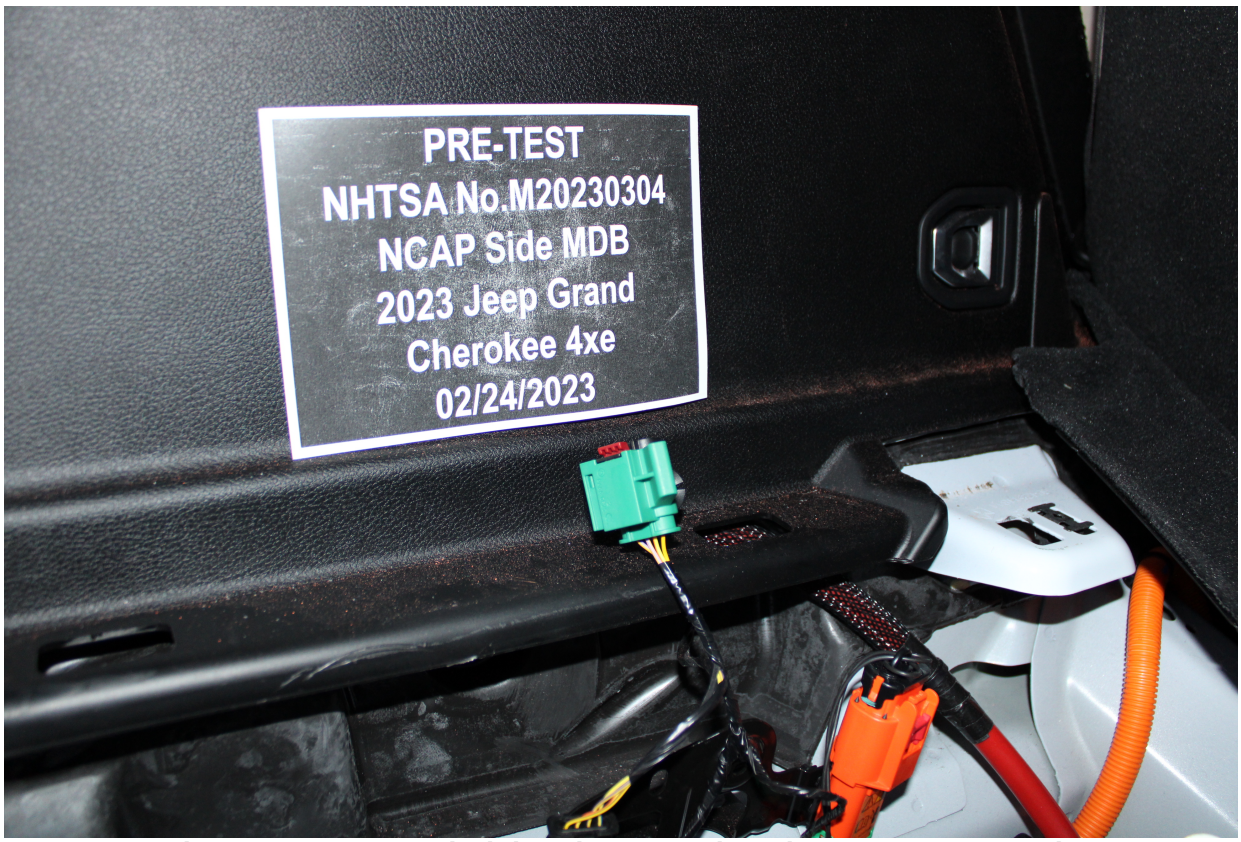


Figure 305-8: Manual High Voltage Service Disconnect Removed (Location where removed)

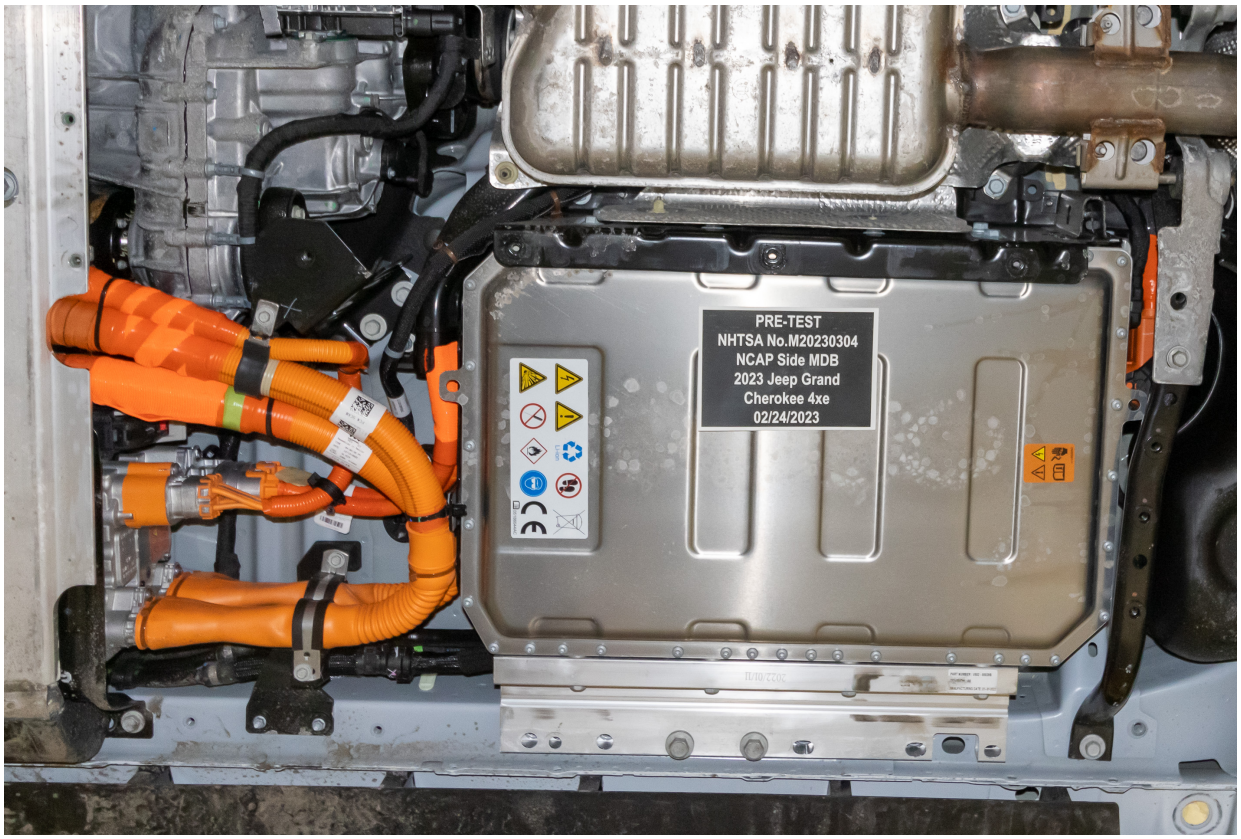


Figure 305-9: Pre-Impact View of Propulsion Battery



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

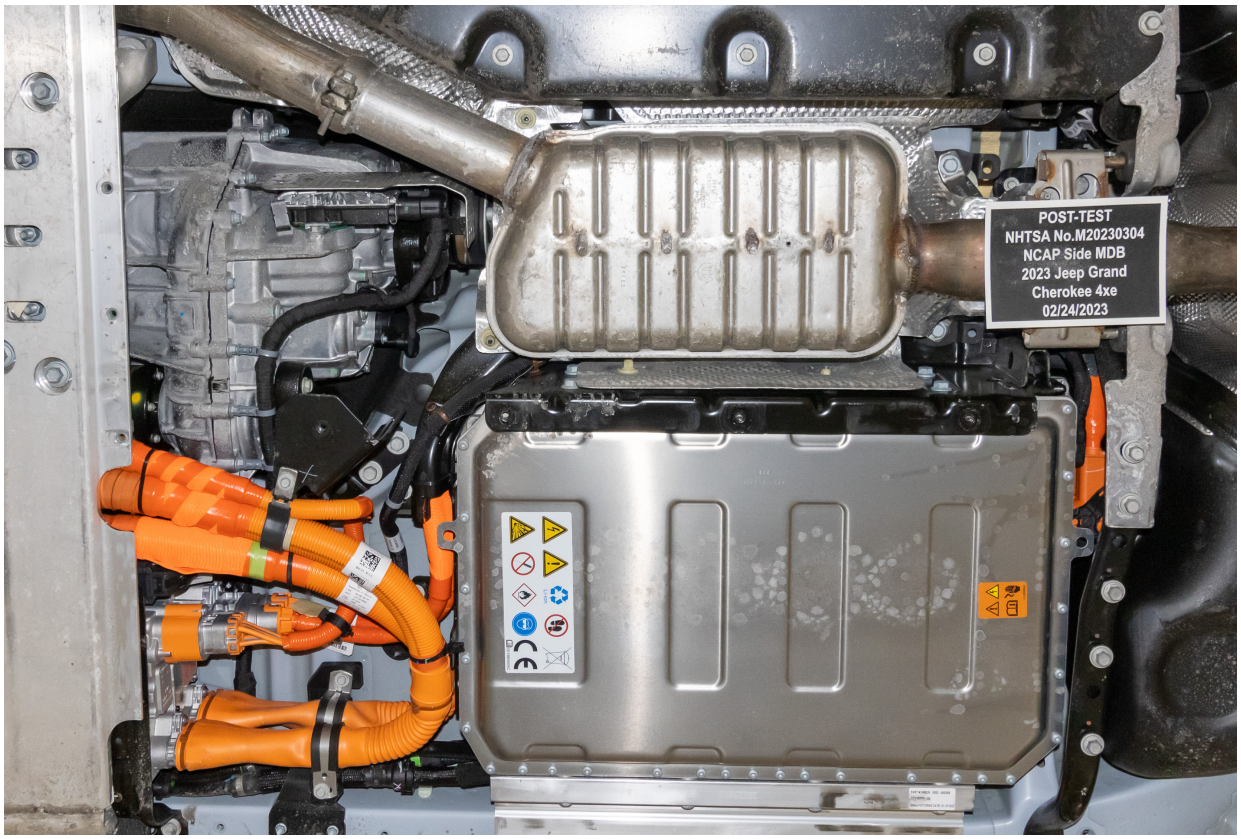


Figure 305-11: Post-Impact Rear View of Propulsion Battery (if any part of it is visible)

Photo Not Applicable

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

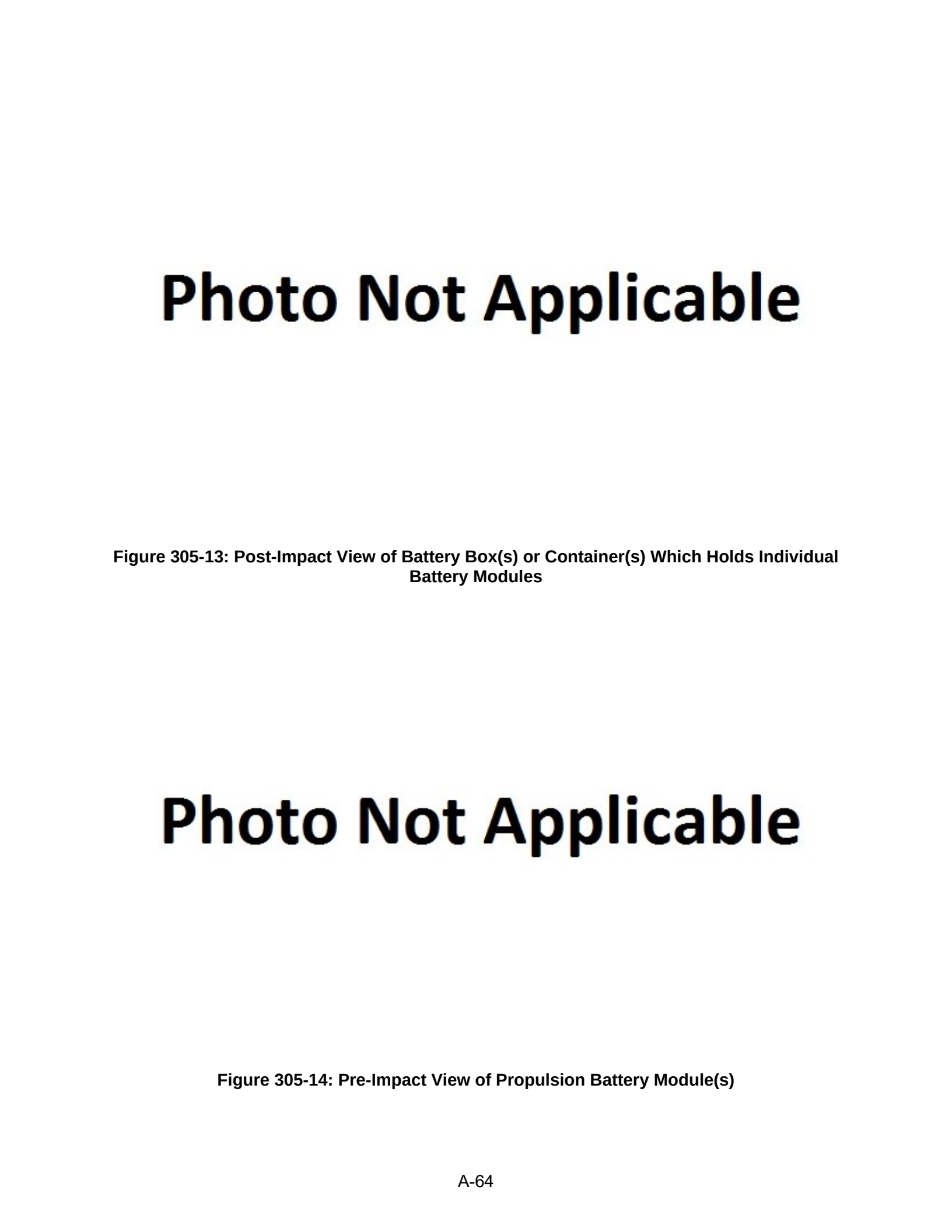


Figure 305-13: Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

Figure 305-14: Pre-Impact View of Propulsion Battery Module(s)

Photo Not Applicable

Figure 305-15: Post-Impact View of Propulsion Battery Module(s)

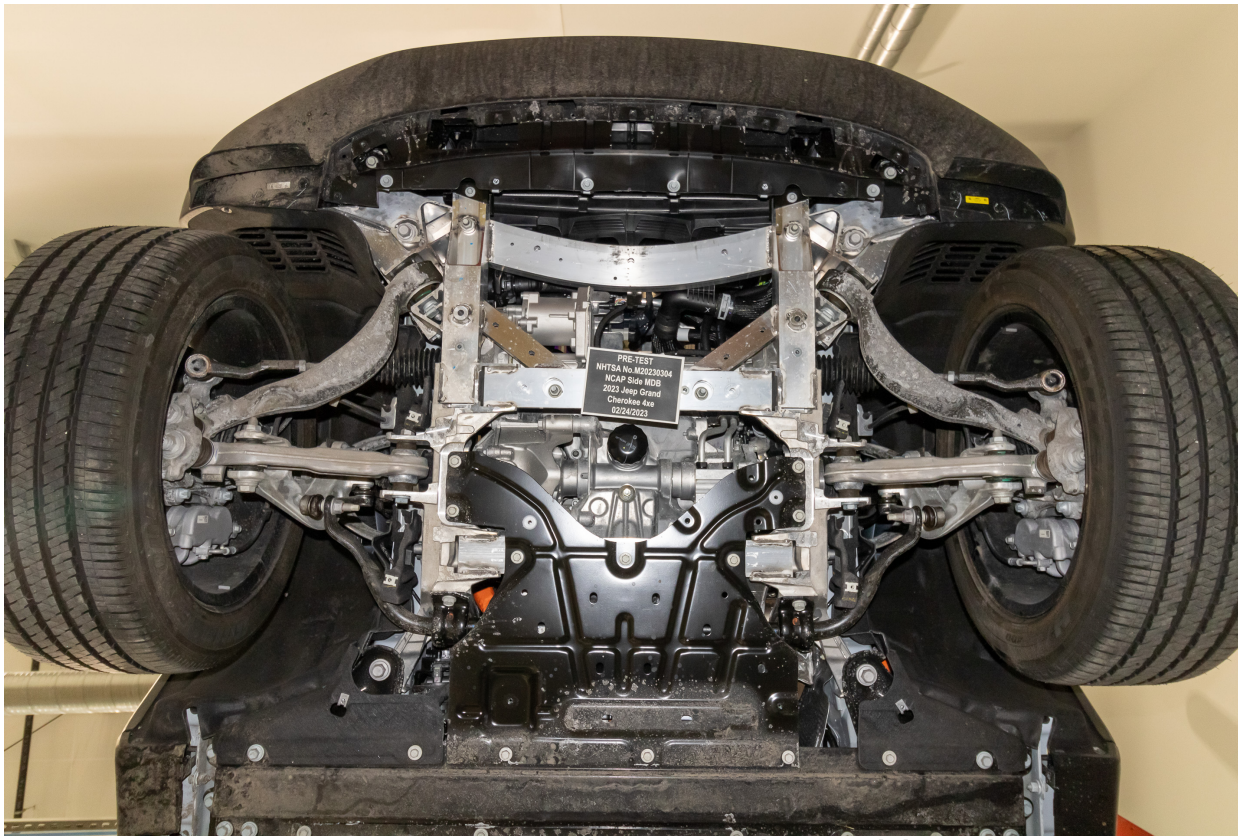


Figure 305-16: Pre-Impact View of Electric Propulsion Drive

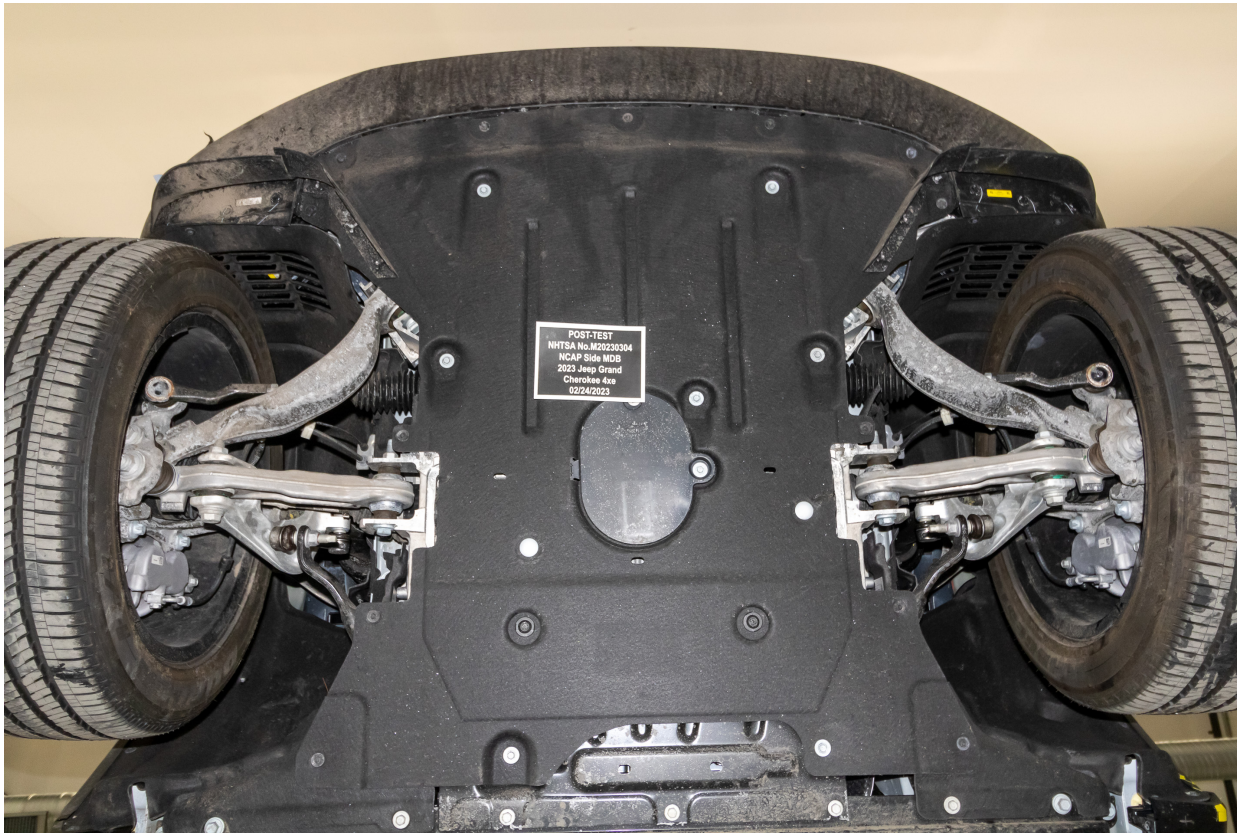


Figure 305-17: Post-Impact View of Electric Propulsion Drive

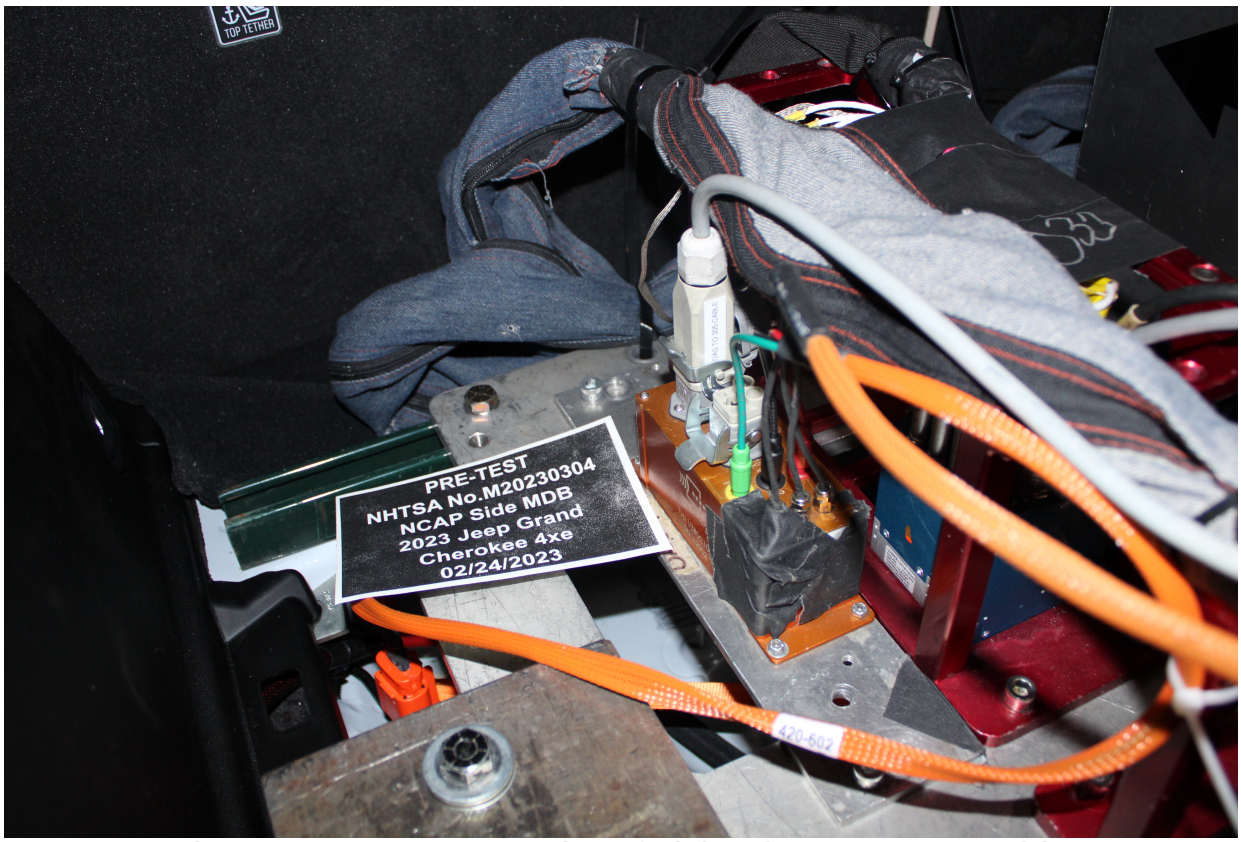


Figure 305-18: Pre-Impact View of High Voltage Interconnect(s)

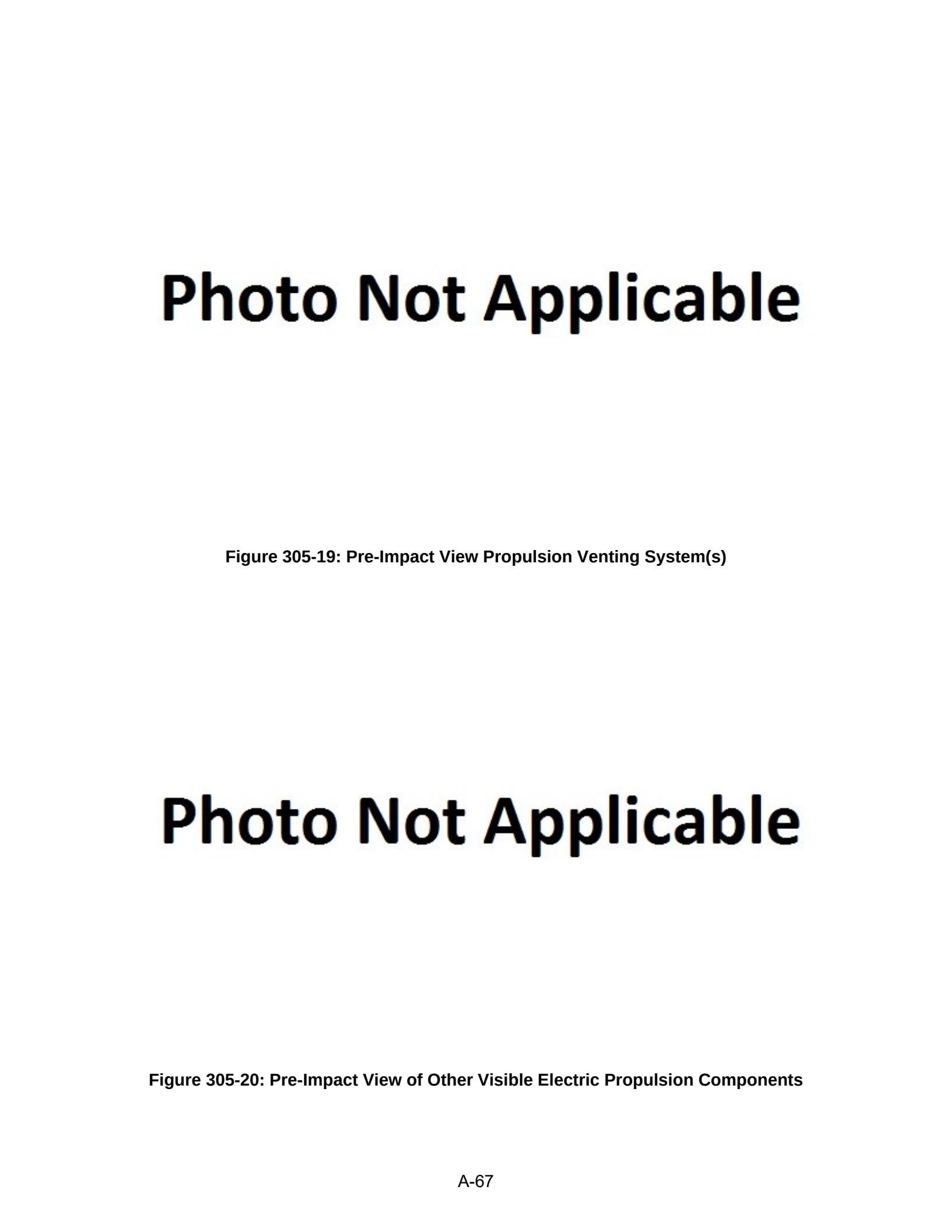


Figure 305-19: Pre-Impact View Propulsion Venting System(s)

Figure 305-20: Pre-Impact View of Other Visible Electric Propulsion Components

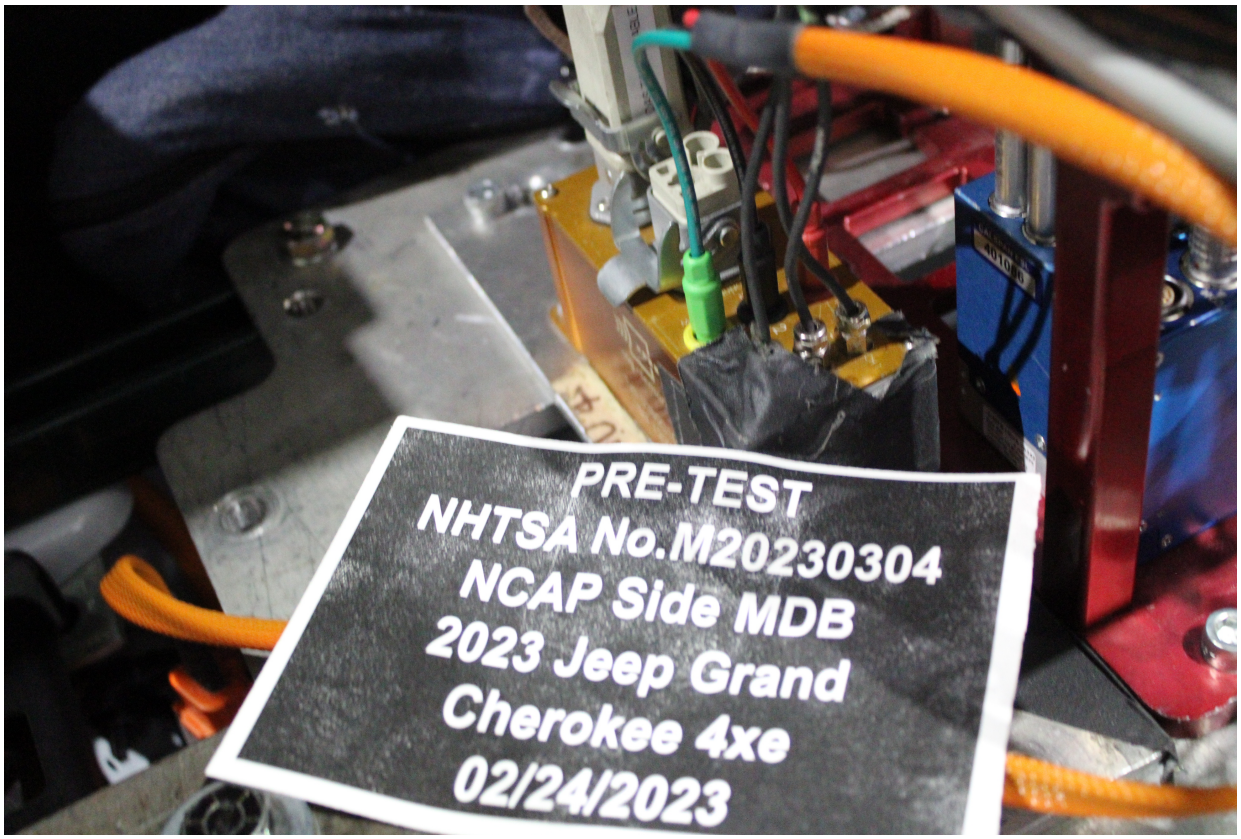


Figure 305-21: Pre-Impact View of Ground Lead Attached

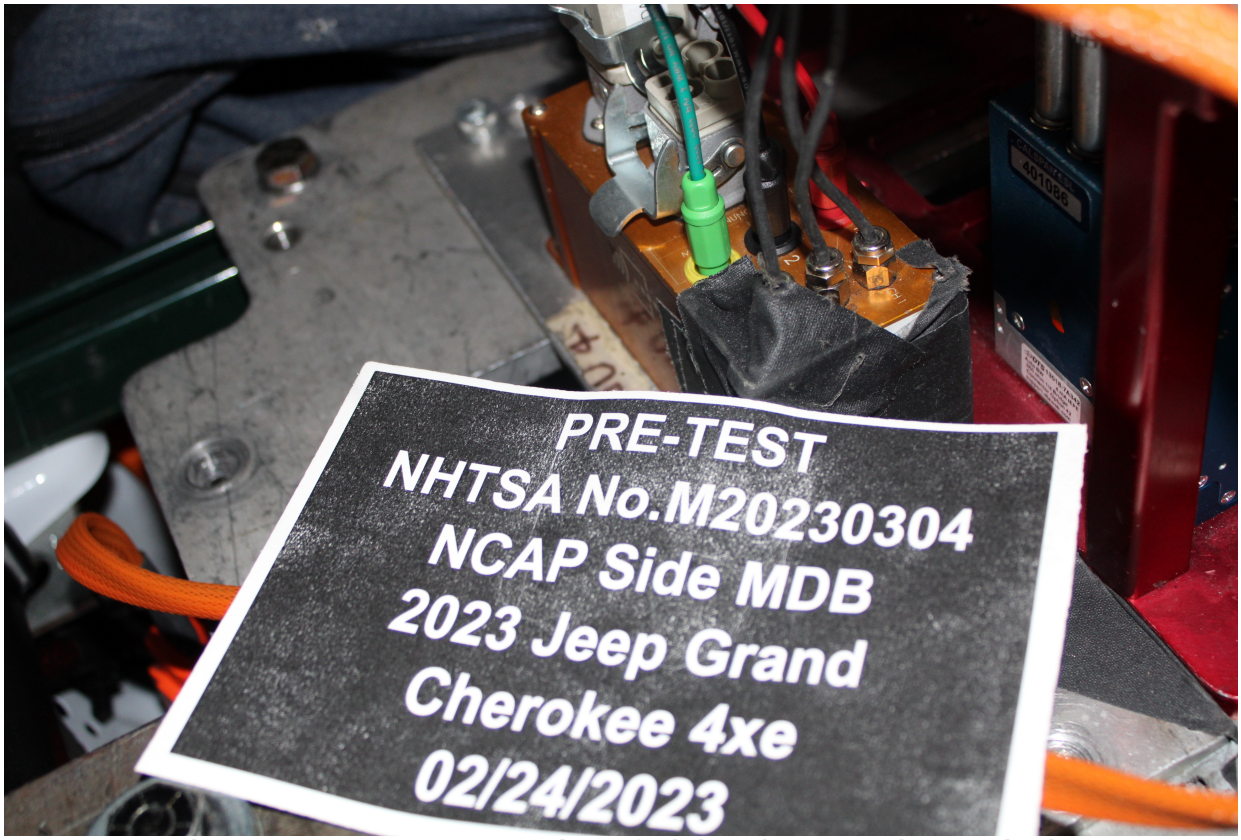


Figure 305-22: Pre-Impact View of High Voltage Leads Attached



Figure 305-23: Pre-Impact Close-Up View of High Voltage Leads Attached

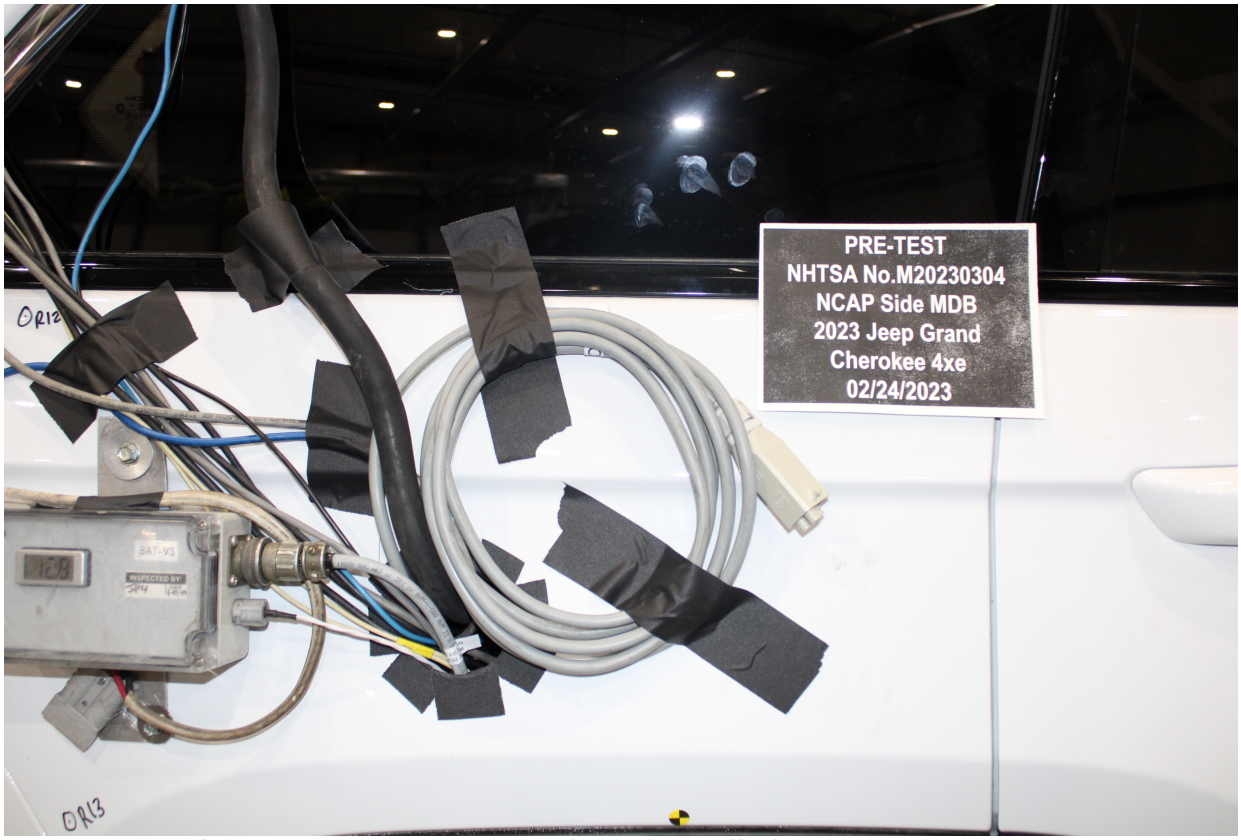


Figure 305-24: Pre-Impact View of Installed Test Interface Port



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

Figure 305-26: Pre-Impact View of Other Test Devices

Photo Not Applicable

Figure 305-27: Post-Impact View of Other Test Devices

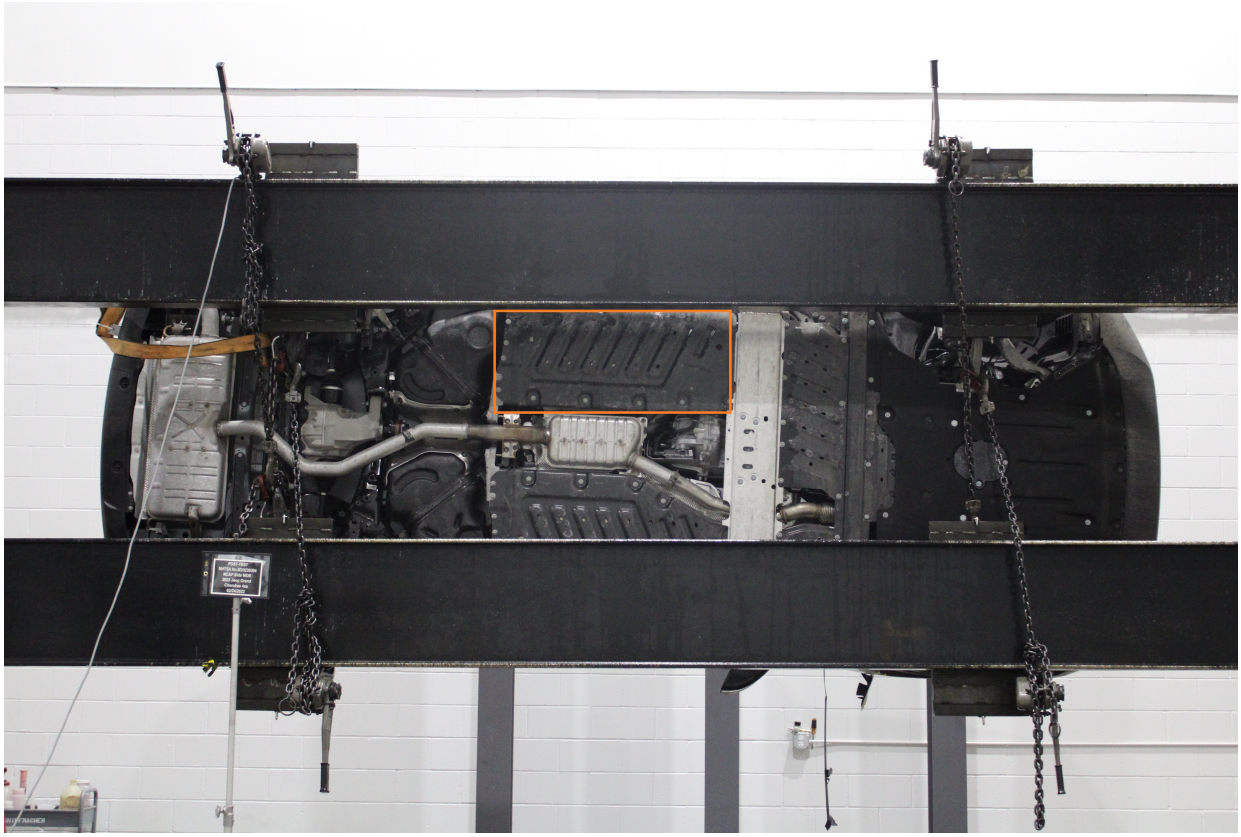


Figure 305-28: FMVSS No. 305 Static Rollover 90 Degrees

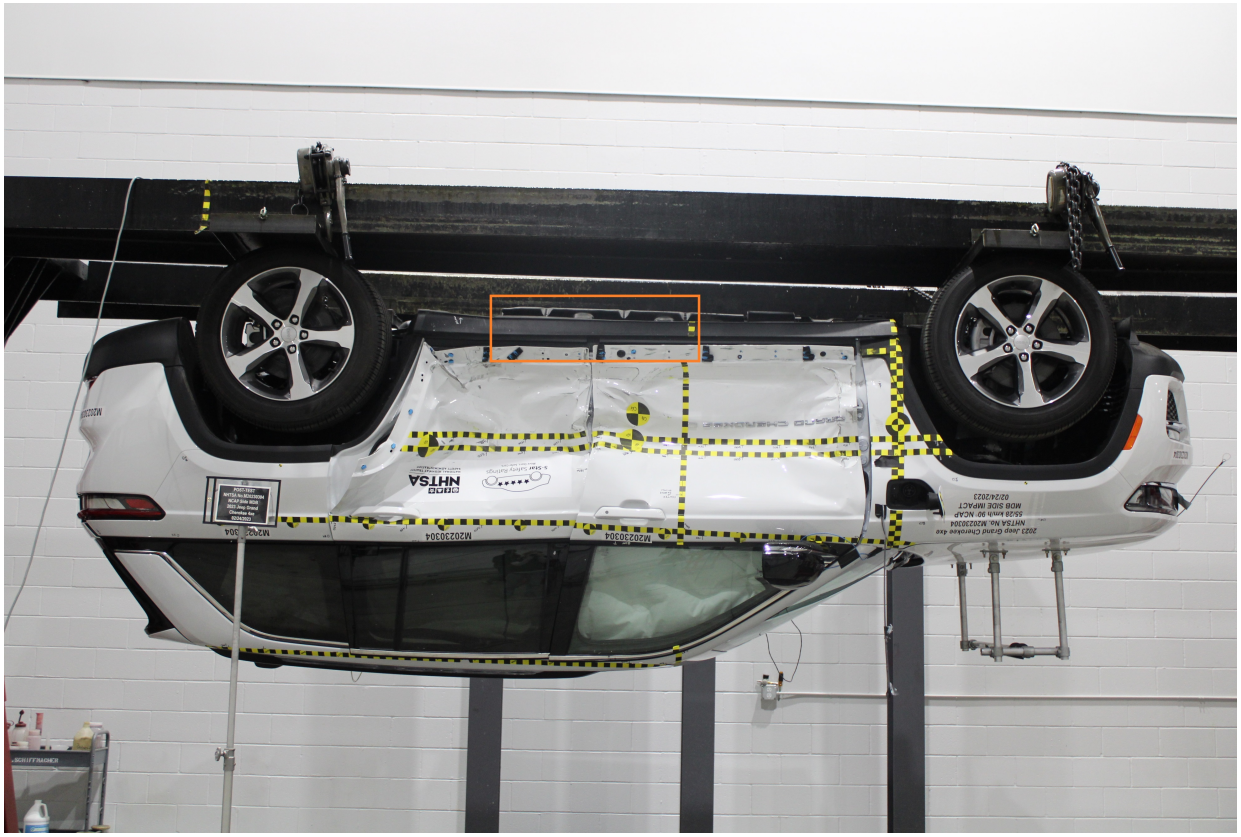


Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees



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



Figure 305-31: FMVSS No. 305 Static Rollover 360 Degrees



Figure 305-32: Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery



Figure 305-33: Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

Photo Not Applicable

Figure 305-34: Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)



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

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



Figure 305-37: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (Prior to static roll)

Figure 305-38: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (After static roll)

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots
Driver Dummy Instrumentation Plots

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Plot 19	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-9
Plot 20	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-9
Plot 21	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-10
Plot 22	Passenger Iliac Force on Impact Side (Y) vs. Time	B-10
Plot 23	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-10
Plot 24	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-10

The following additional dummy and vehicle response data can be obtained from the Research and Development section of the NHTSA website. The website can be found at www.NHTSA.gov

Additional Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

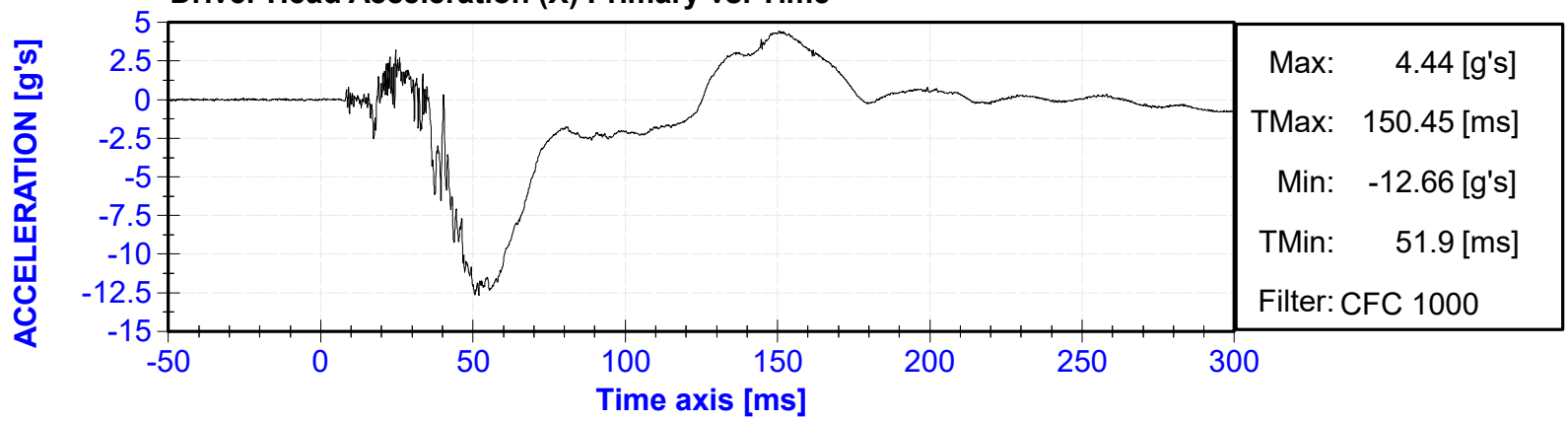
Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Structure Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

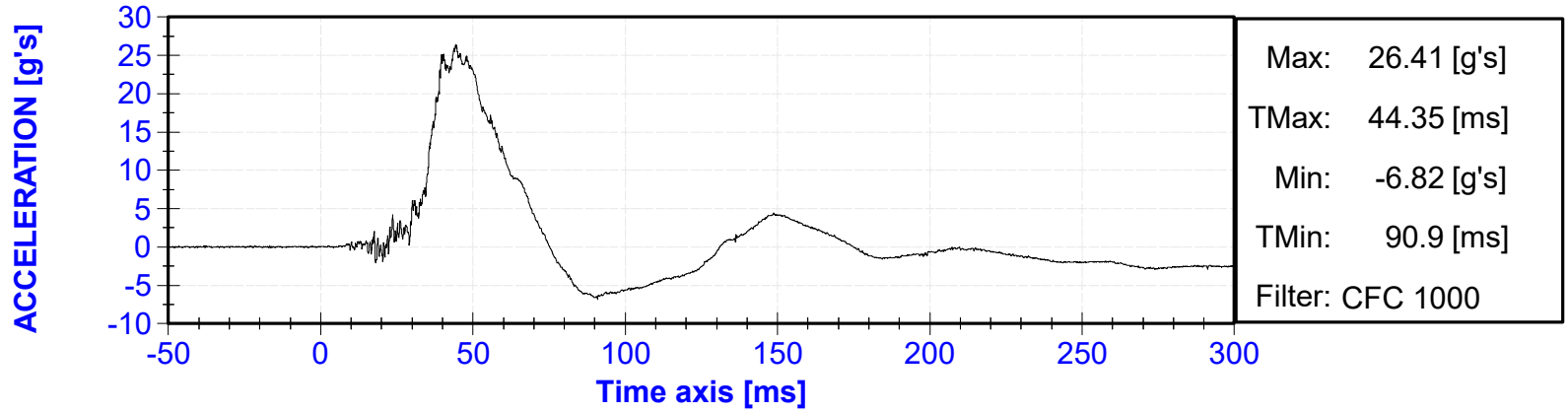
MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch

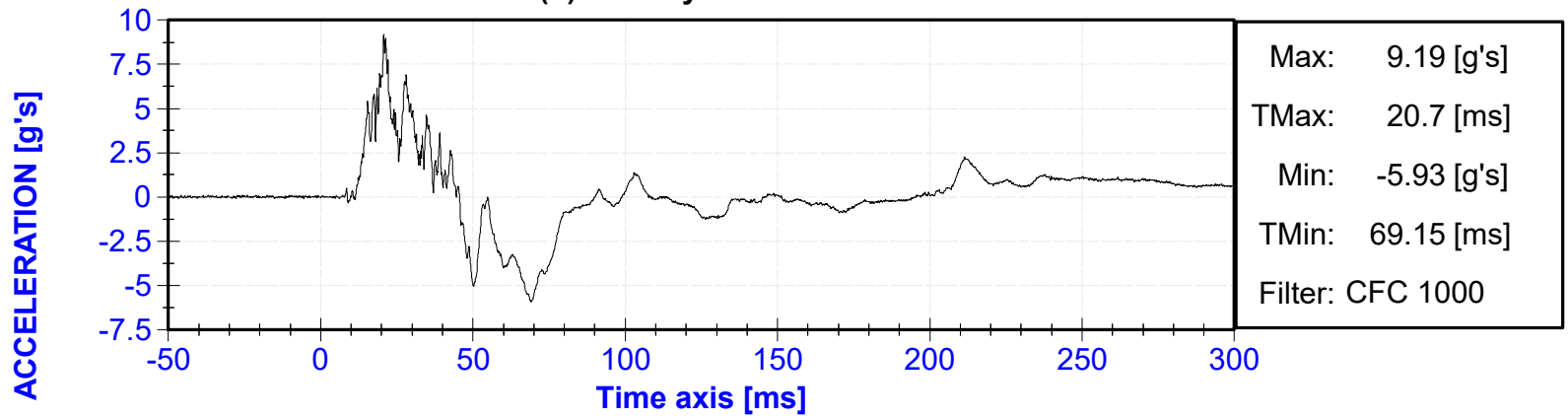
Driver Head Acceleration (X) Primary vs. Time



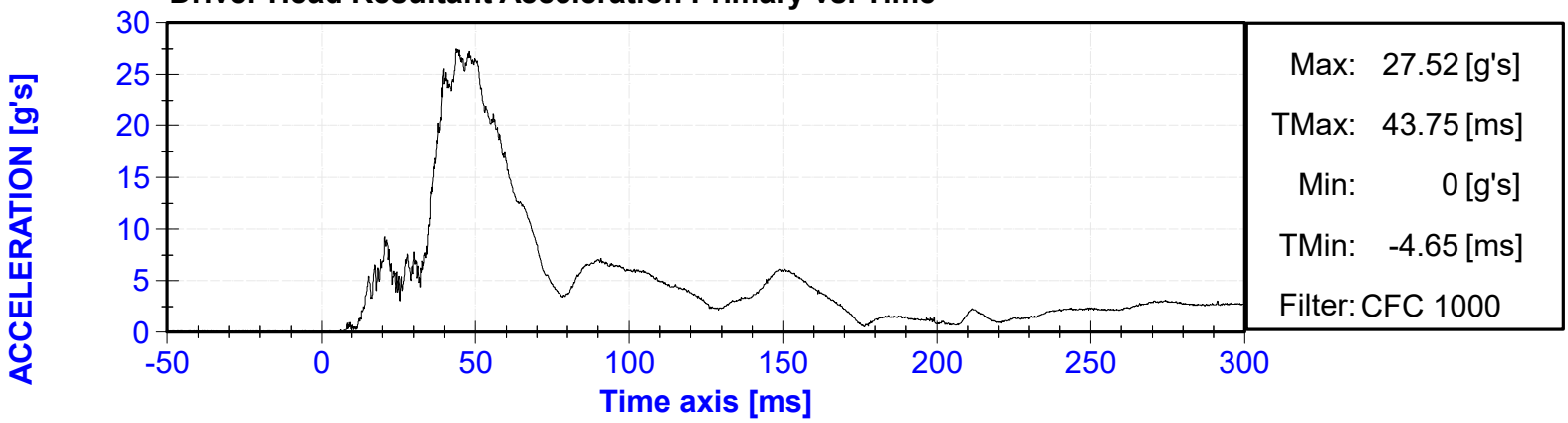
Driver Head Acceleration (Y) Primary vs. Time



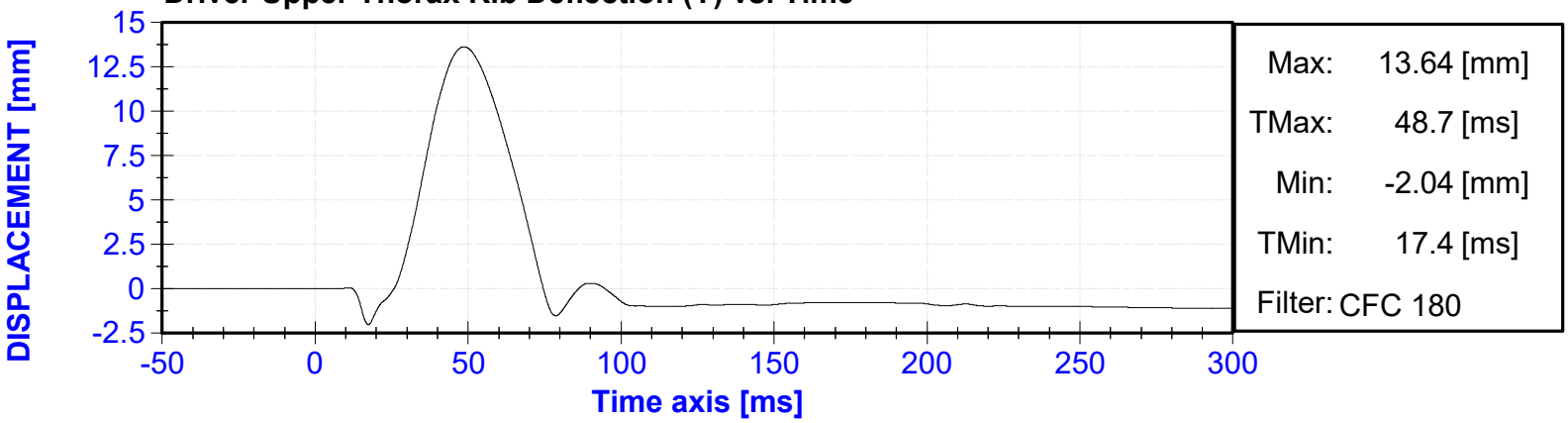
Driver Head Acceleration (Z) Primary vs. Time



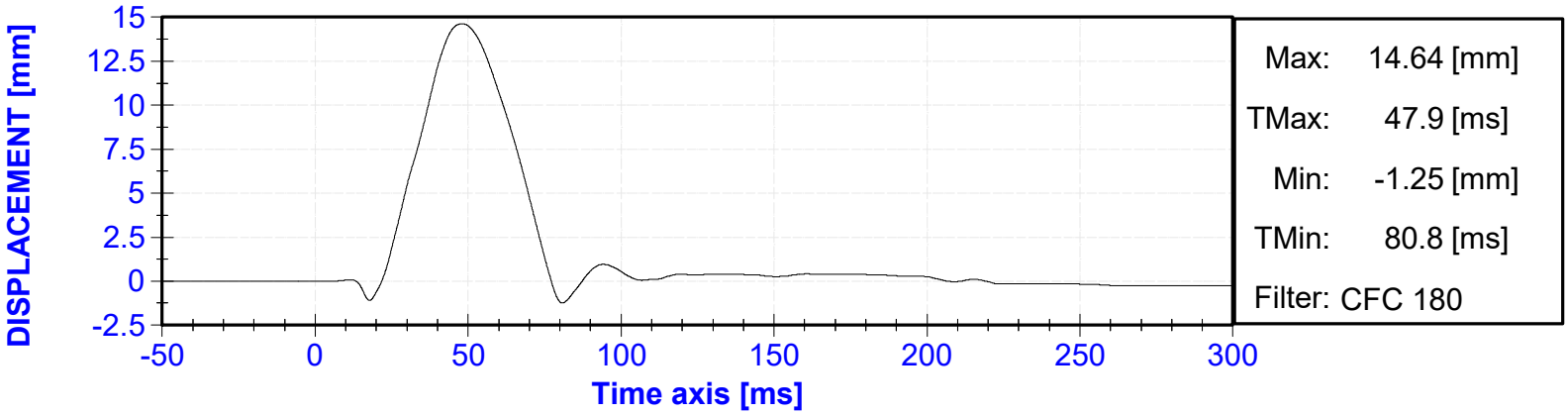
Driver Head Resultant Acceleration Primary vs. Time



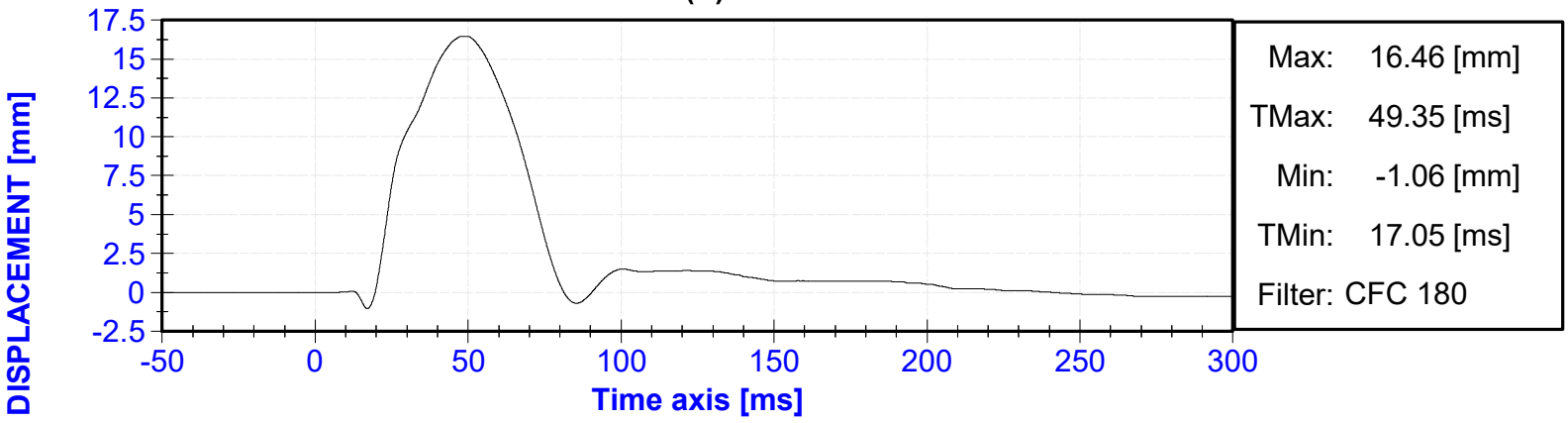
Driver Upper Thorax Rib Deflection (Y) vs. Time



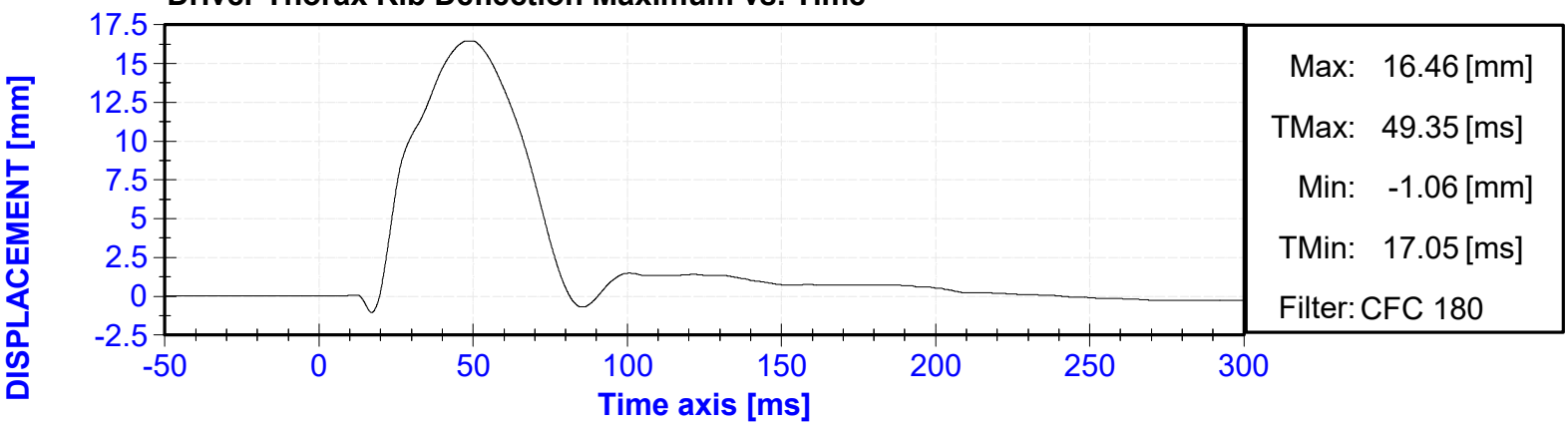
Driver Middle Thorax Rib Deflection (Y) vs. Time



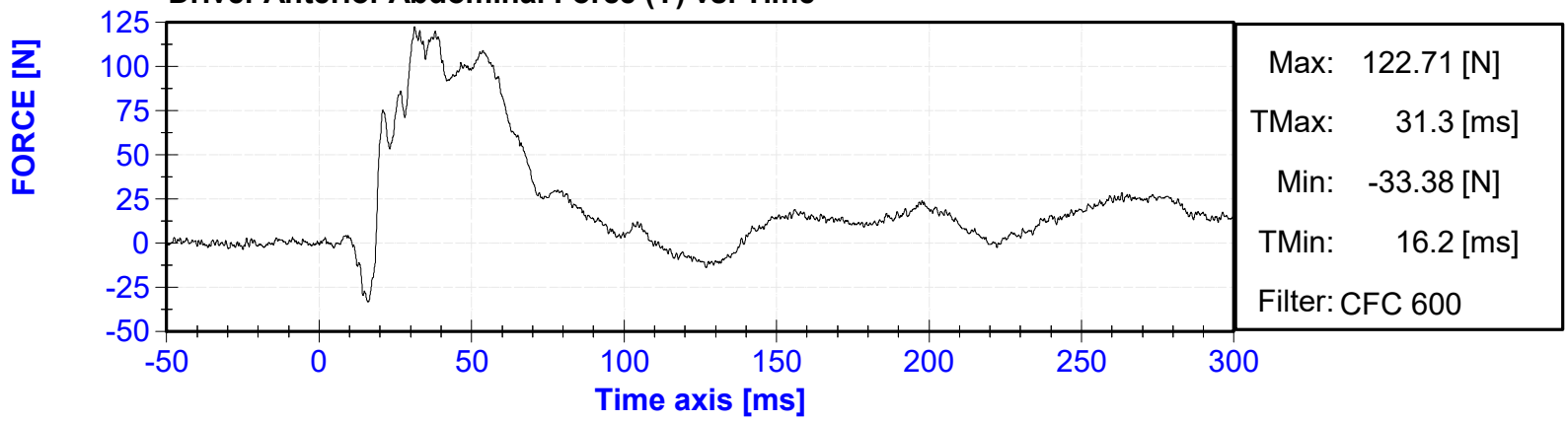
Driver Lower Thorax Rib Deflection (Y) vs. Time



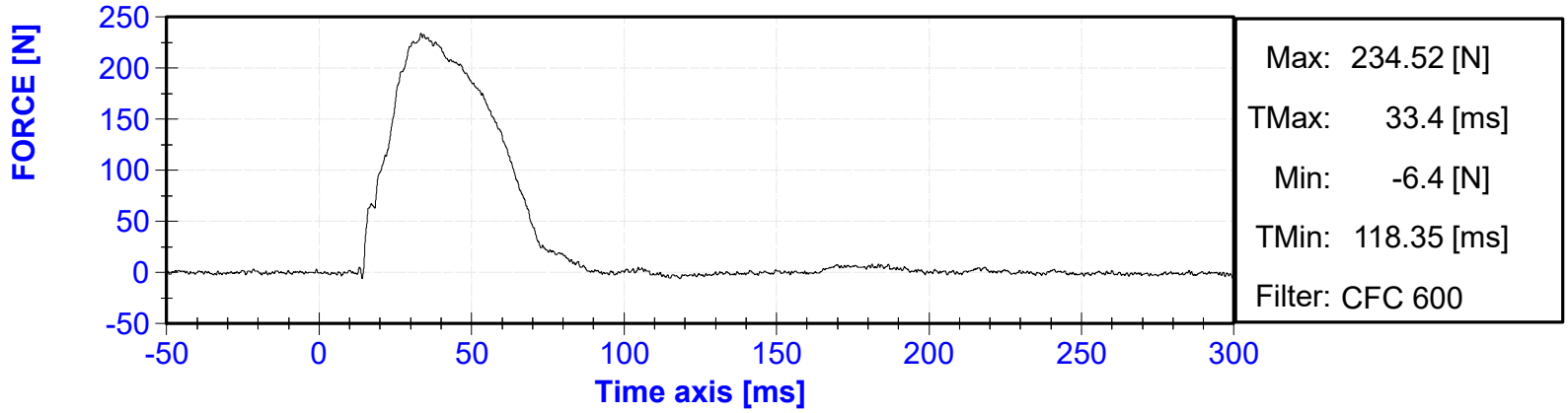
Driver Thorax Rib Deflection Maximum vs. Time



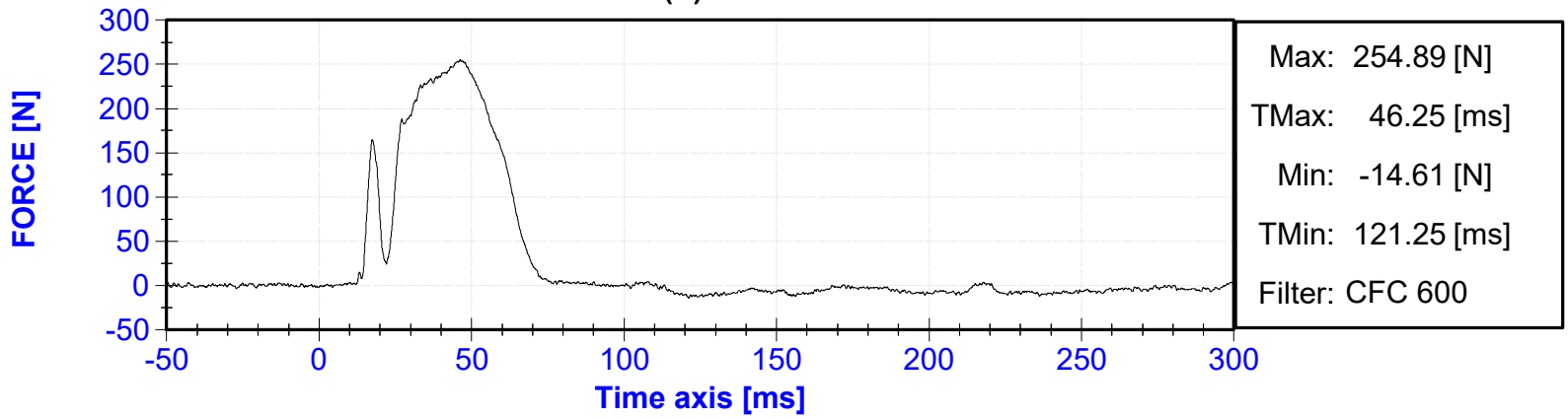
Driver Anterior Abdominal Force (Y) vs. Time



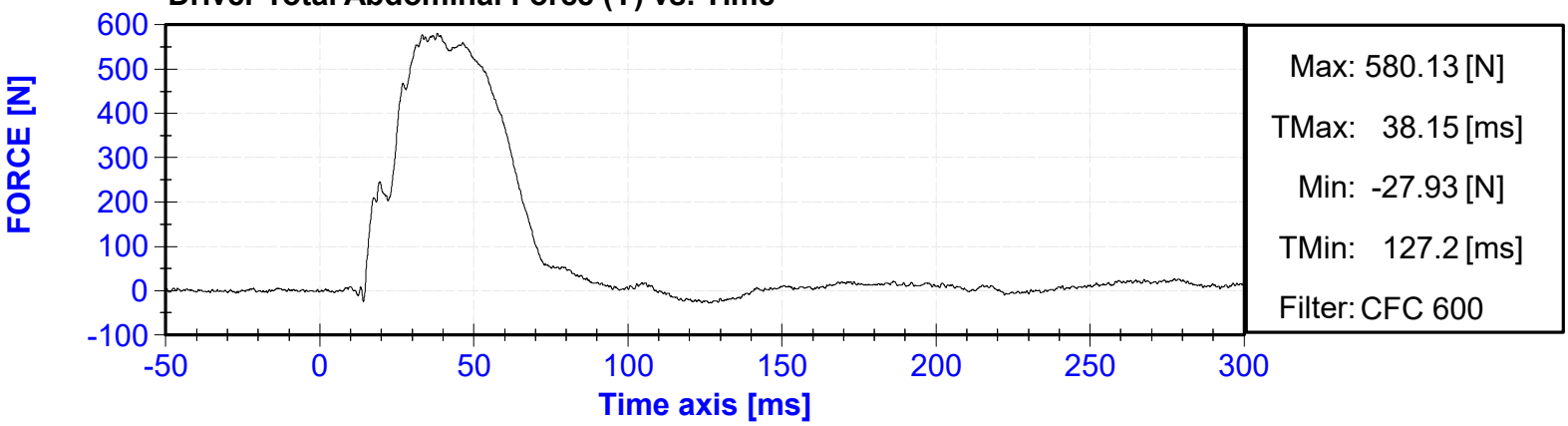
Driver Middle Abdominal Force (Y) vs. Time



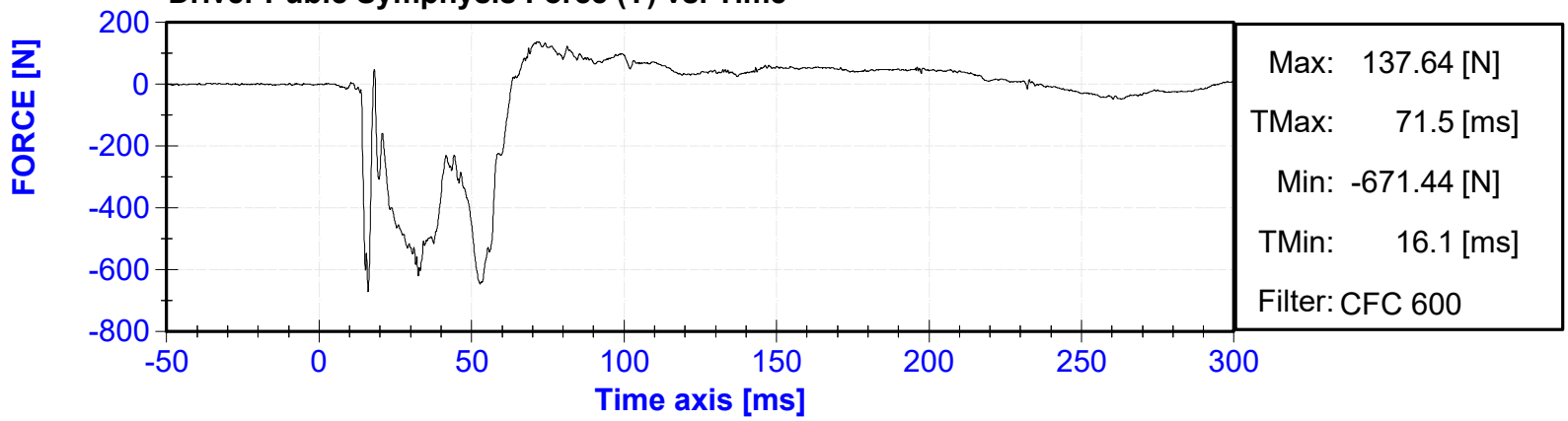
Driver Posterior Abdominal Force (Y) vs. Time



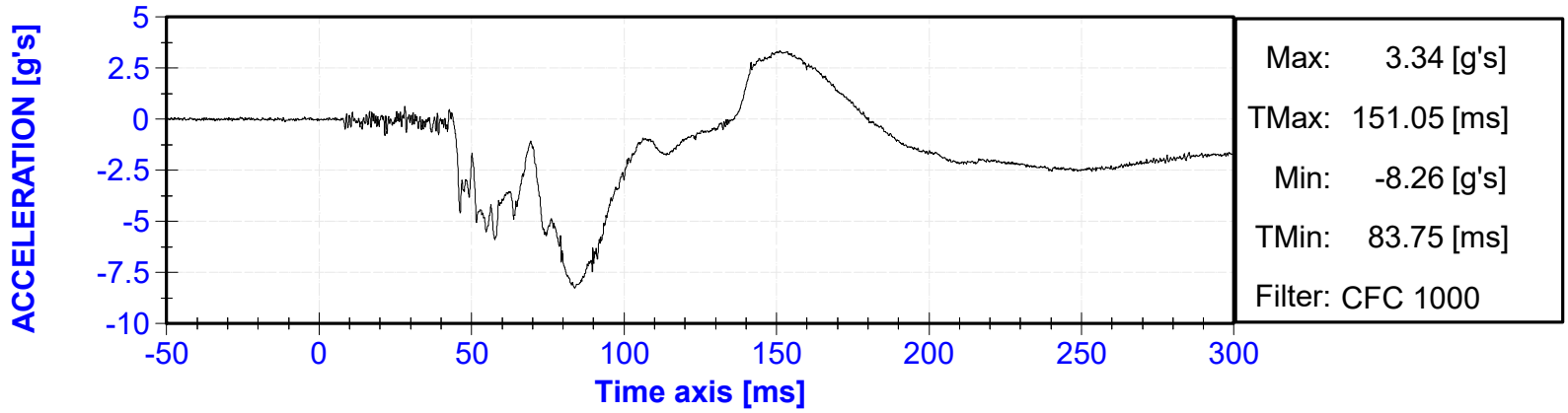
Driver Total Abdominal Force (Y) vs. Time



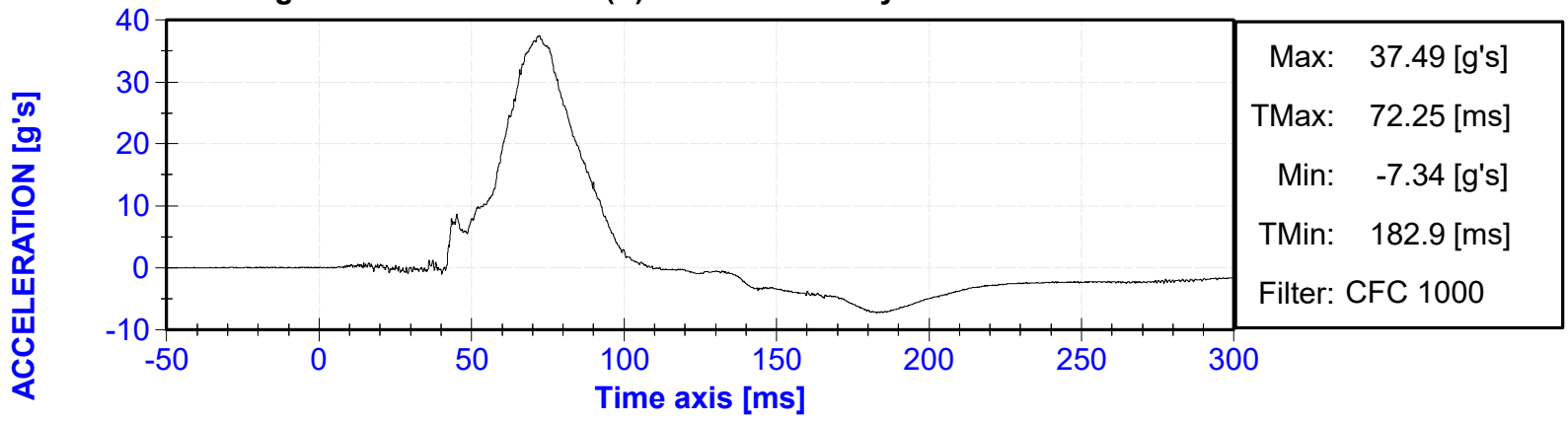
Driver Pubic Symphysis Force (Y) vs. Time



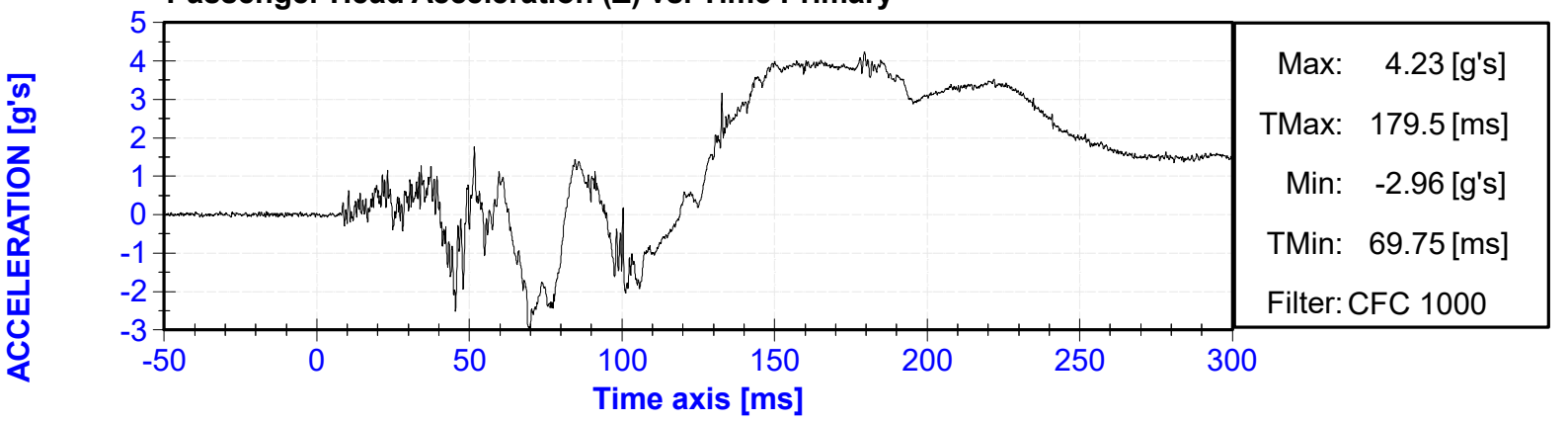
Passenger Head Acceleration (X) vs. Time Primary



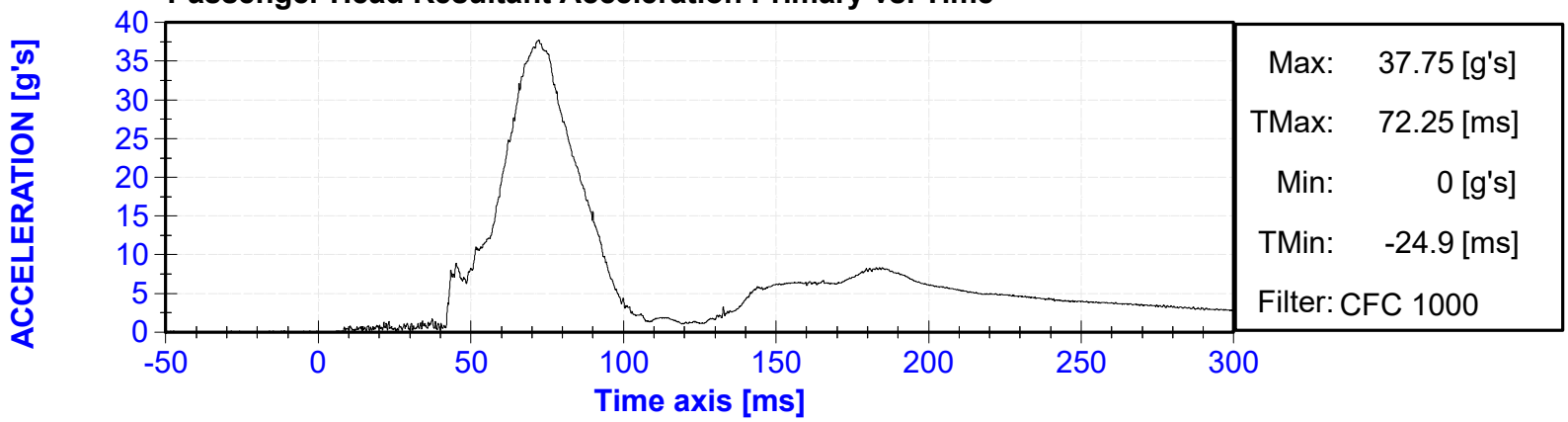
Passenger Head Acceleration (Y) vs. Time Primary



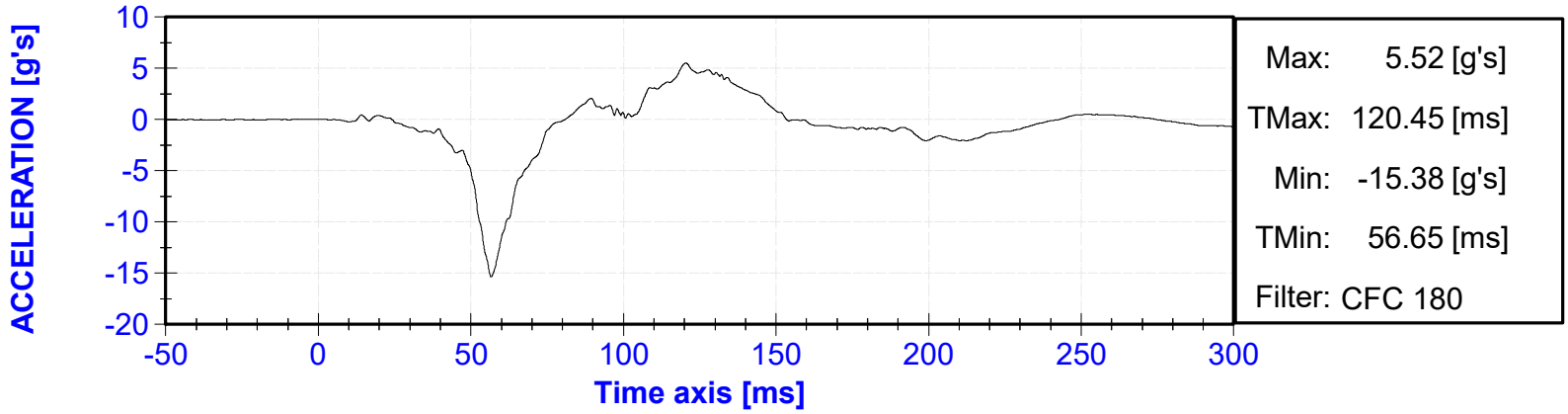
Passenger Head Acceleration (Z) vs. Time Primary



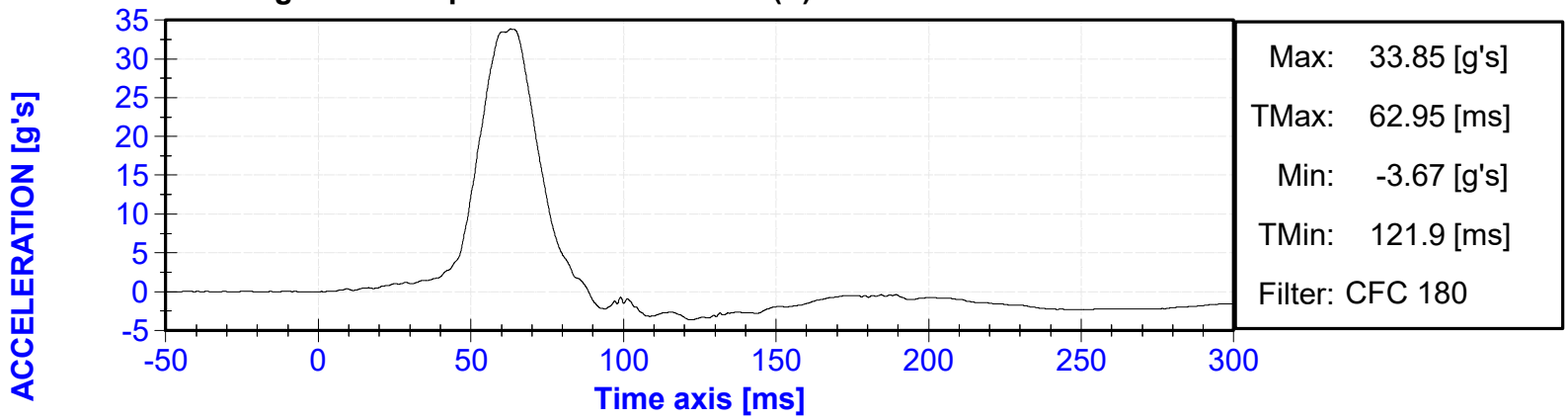
Passenger Head Resultant Acceleration Primary vs. Time



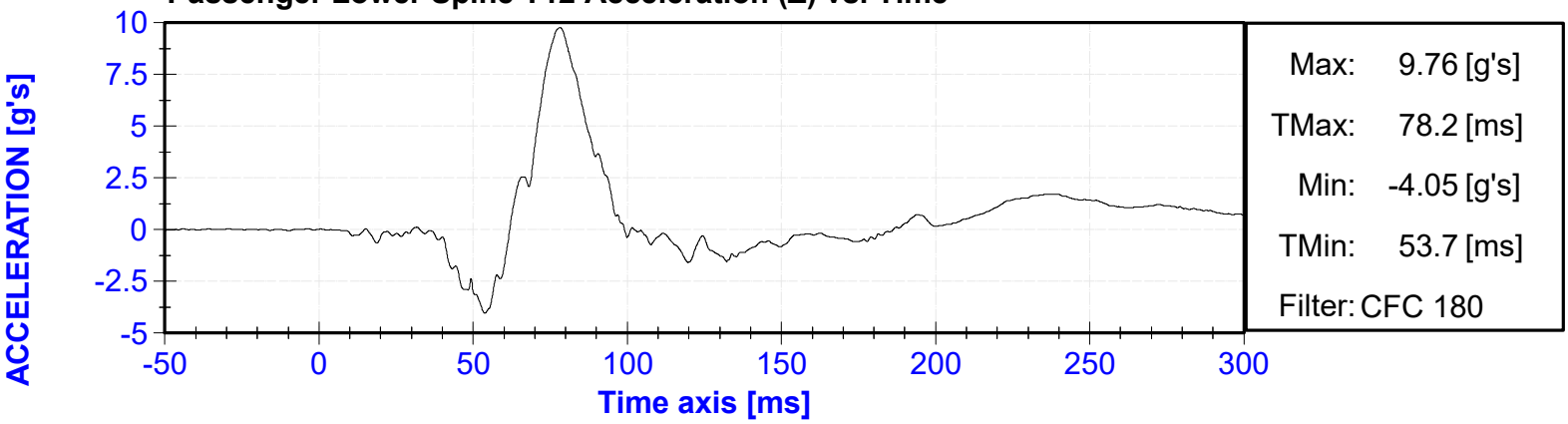
Passenger Lower Spine T12 Acceleration (X) vs. Time



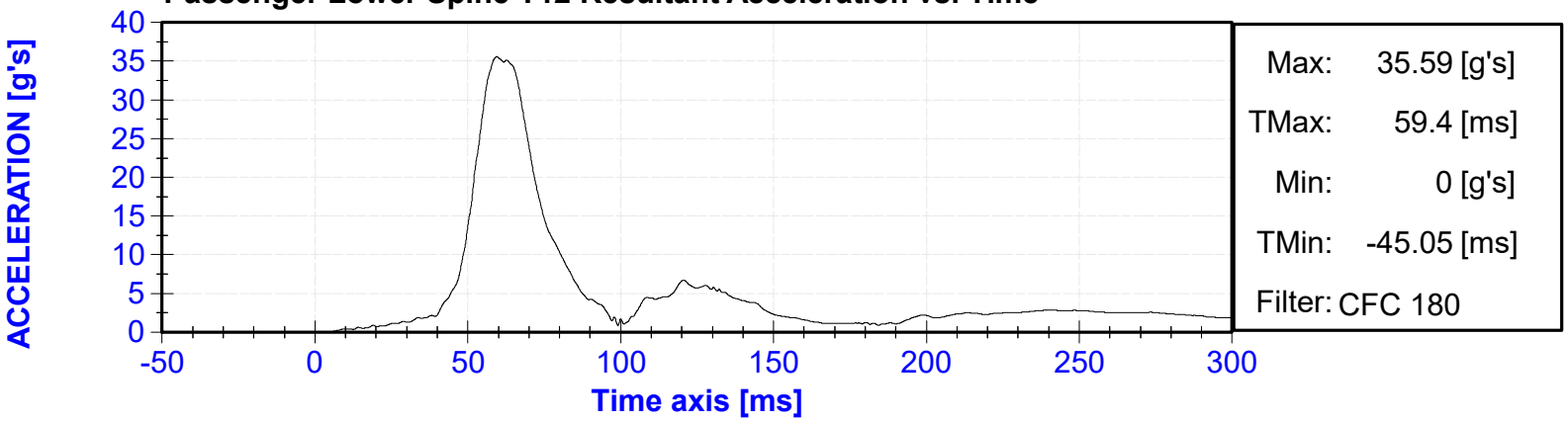
Passenger Lower Spine T12 Acceleration (Y) vs. Time



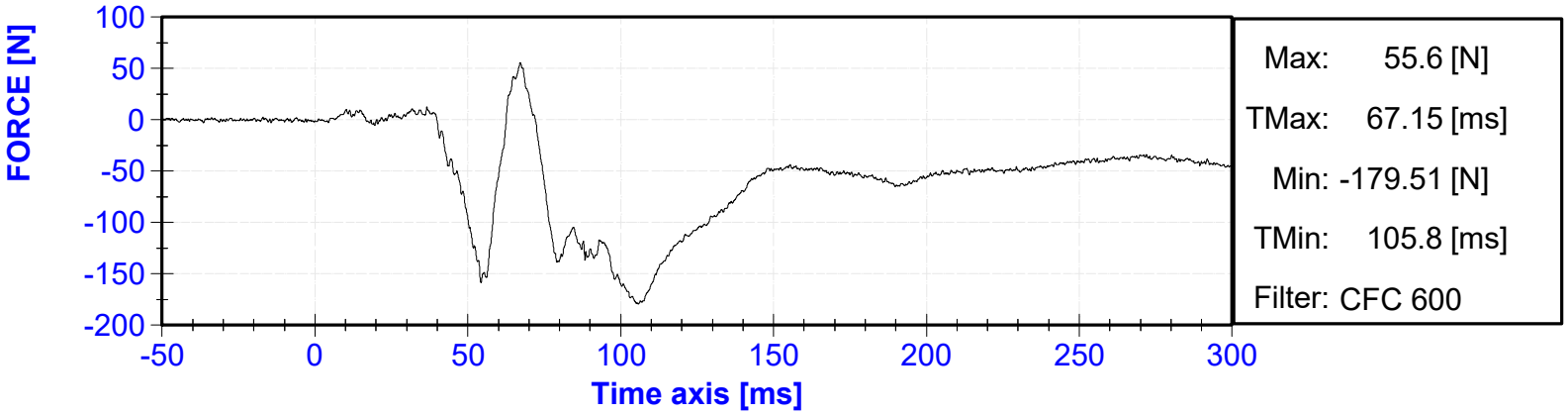
Passenger Lower Spine T12 Acceleration (Z) vs. Time



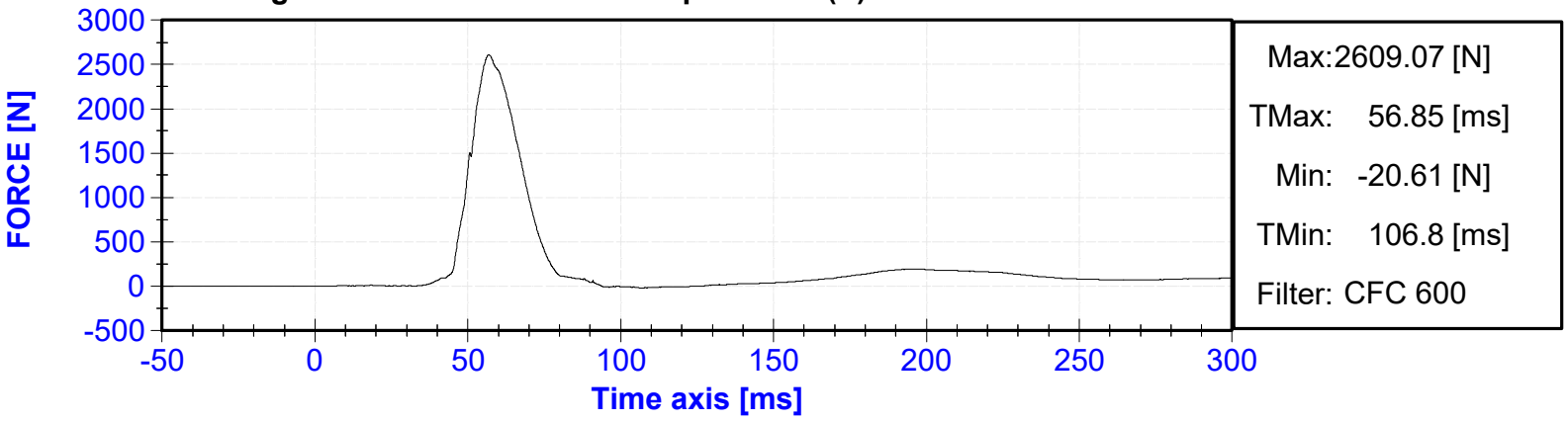
Passenger Lower Spine T12 Resultant Acceleration vs. Time



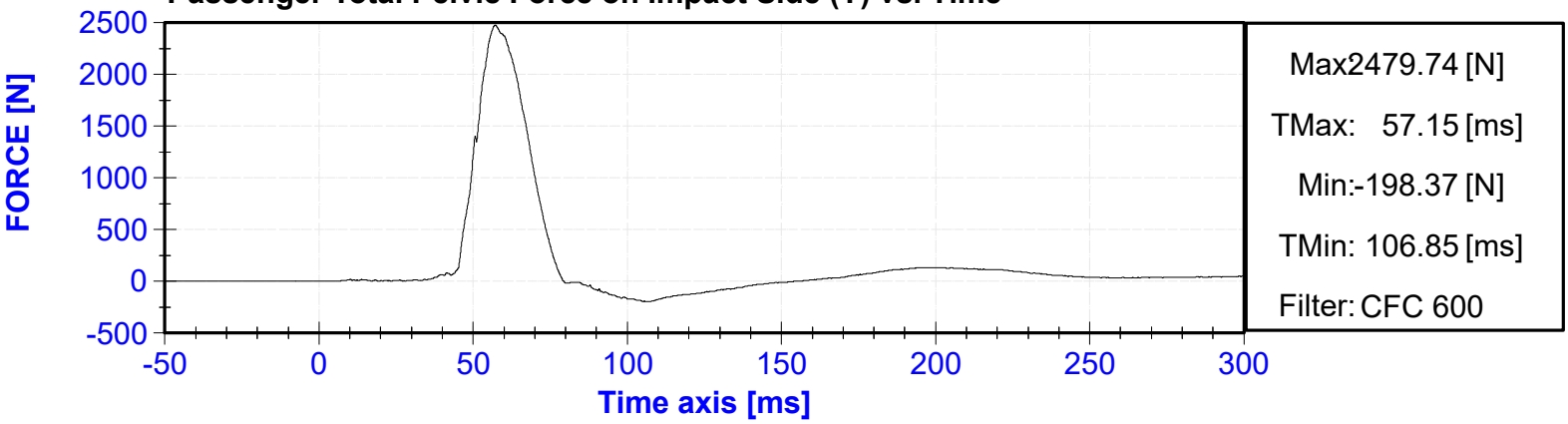
Passenger Iliac Force on Impact Side (Y) vs. Time



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



Passenger Total Pelvic Force on Impact Side (Y) vs. Time



APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

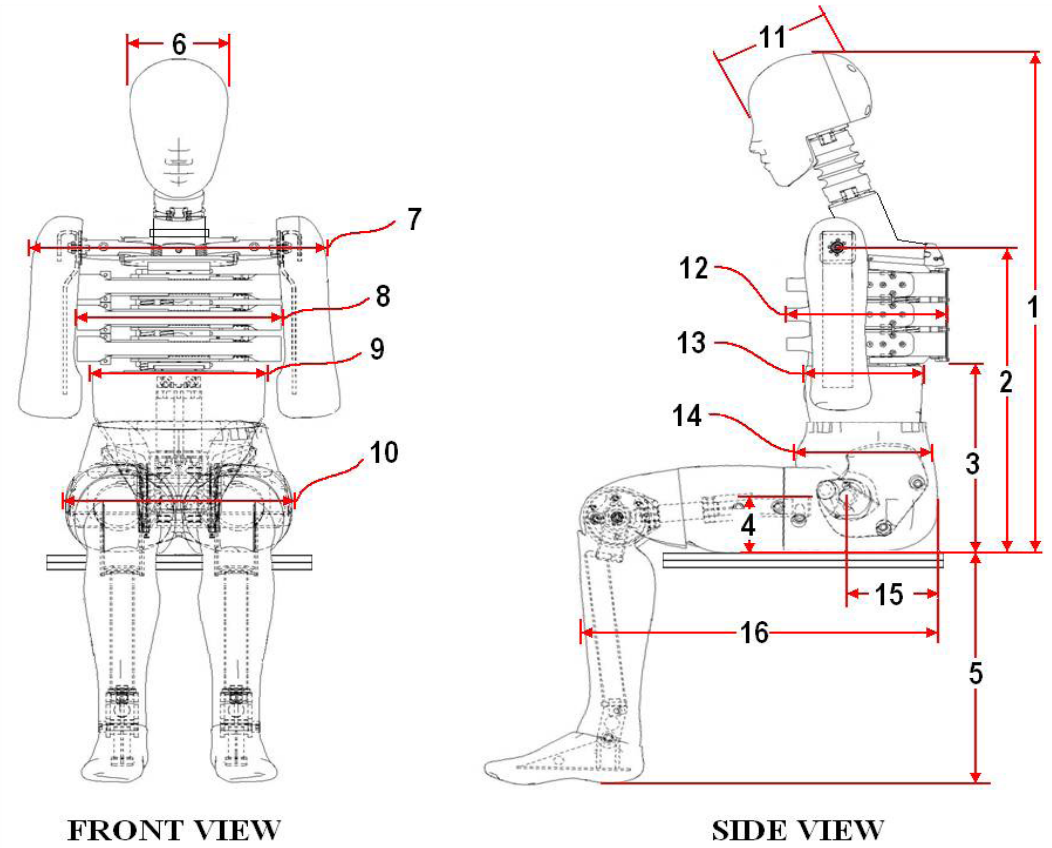
SERIAL NO:F033

(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - EuroSID-2re

Technician: K. Brogan Date: 02/17/2023

Dummy Serial Number: F033



FRONT VIEW SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	912	Pass
2	Seat to Shoulder Joint	558	572	567	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	353	Pass
4	Seat to Hip Joint (center of bolt)	97	103	99	Pass
5	Sole to Seat, Sitting	333	451	423	Pass
6	Head Width	152	158	157	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	328	Pass
9	Abdomen Width	273	287	281	Pass
10	Pelvis Lap Width	359	373	368	Pass
11	Head Depth	196	206	201	Pass
12	Thorax Depth	262	272	269	Pass
13	Abdomen Depth	194	204	202	Pass
14	Pelvis Depth	235	245	239	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	156	Pass
16	Back of Buttocks to Front Knee	597	615	612	Pass

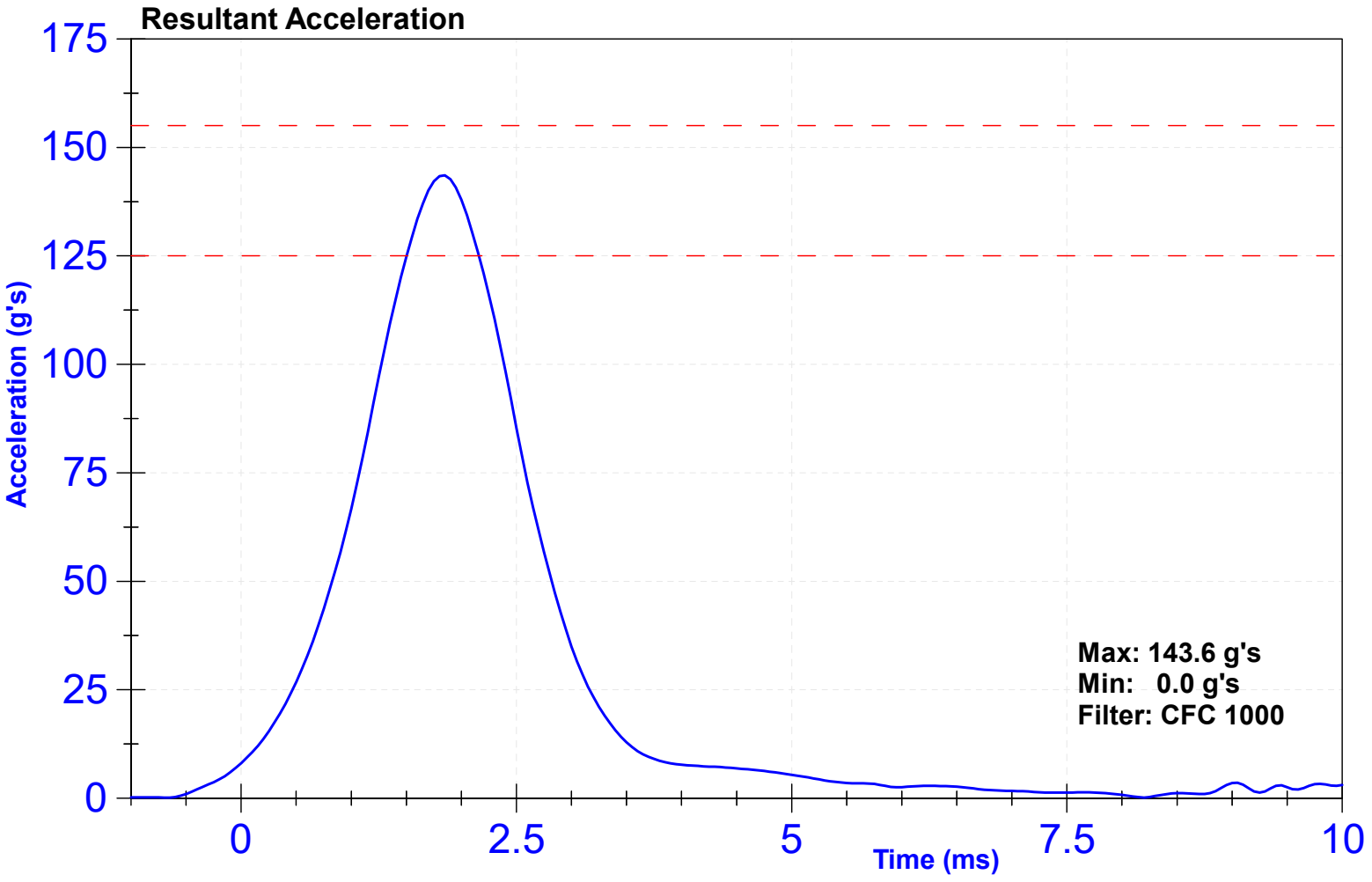
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

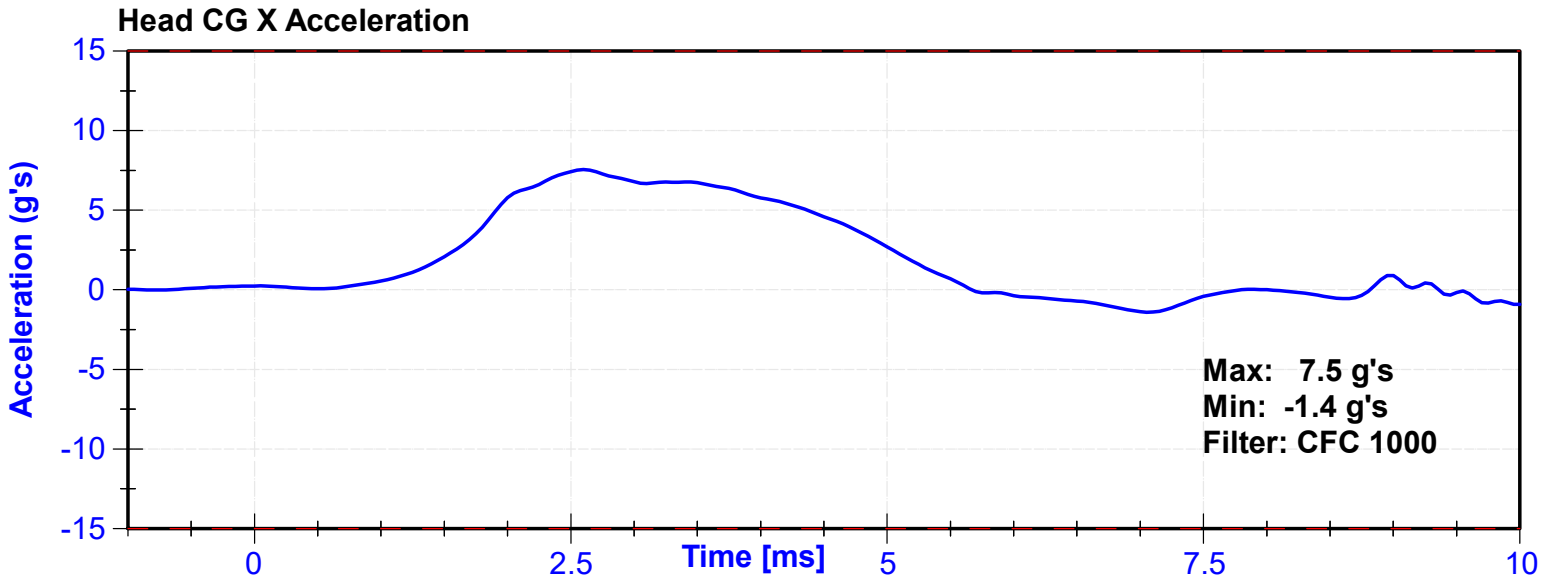
Results

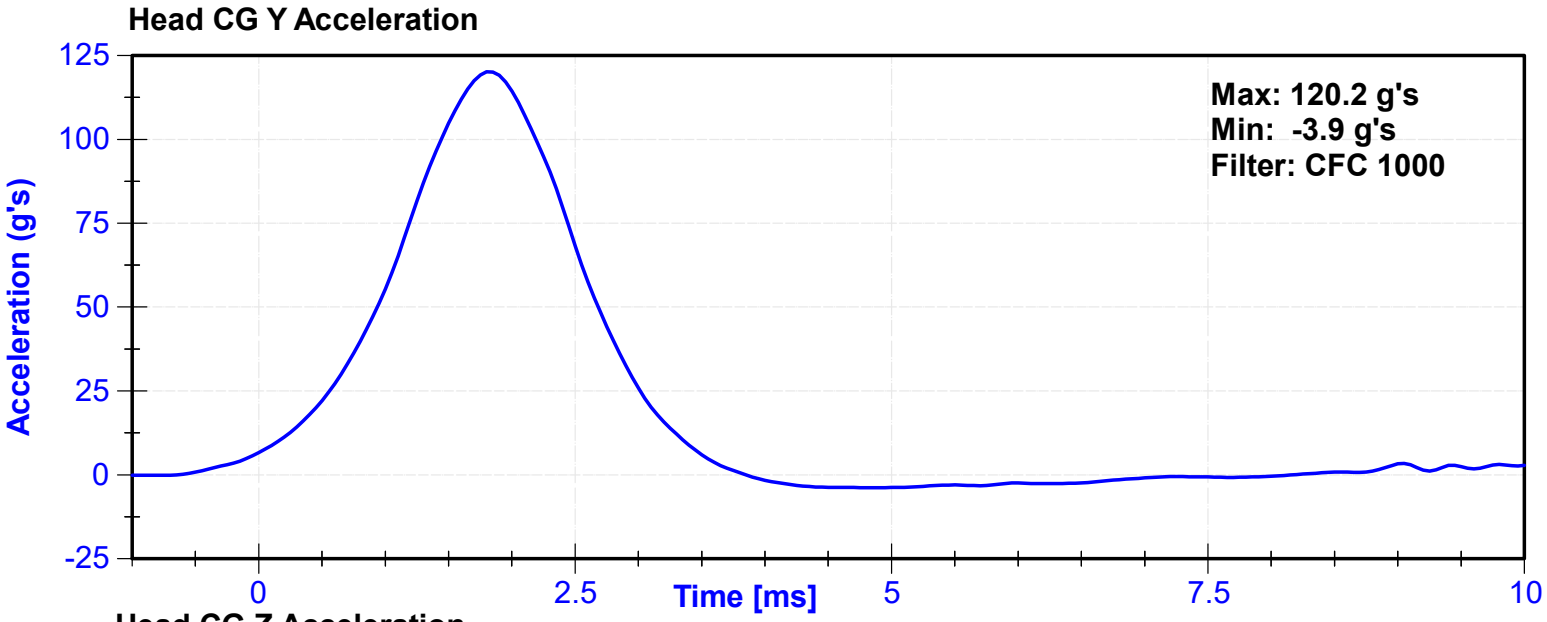
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	30,5	Pass
Resultant Acceleration	125	155	g's	143.6	Pass
Oscillation	0	15	%	2.82	Pass
Fore-Aft Acceleration	-15	15	g's	7.5	Pass

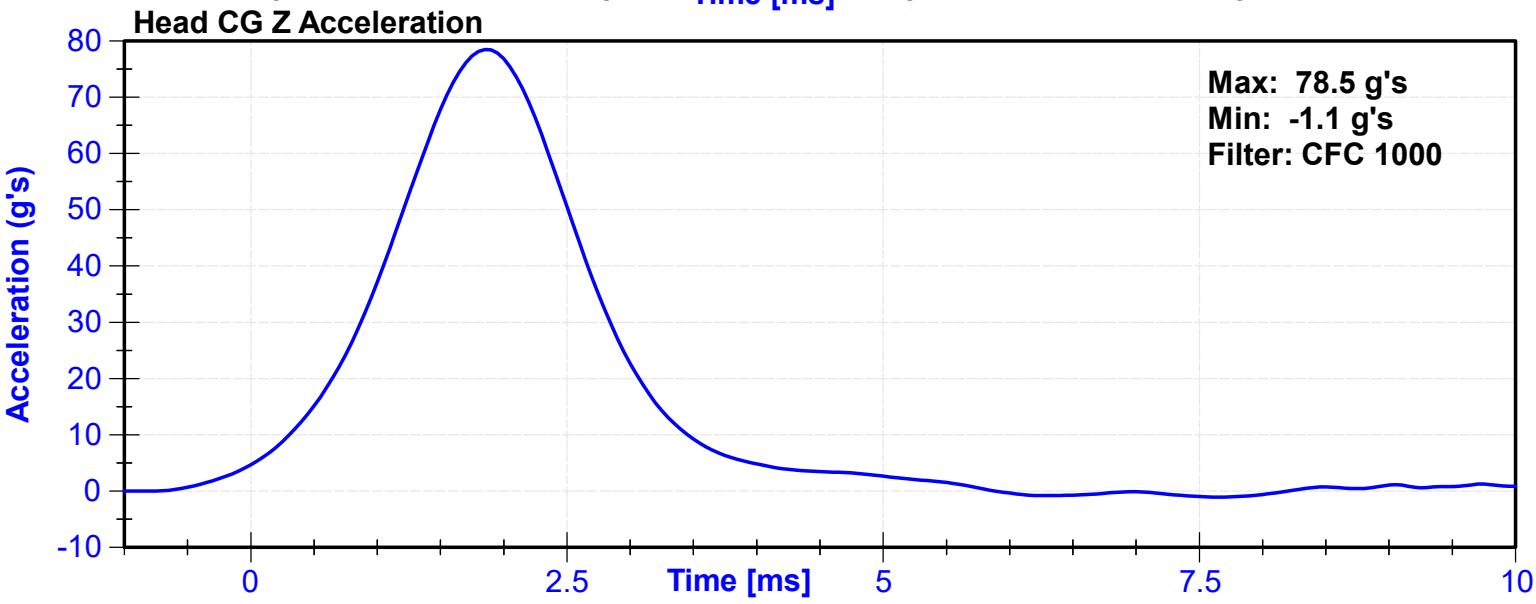
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P63861	1/17/2023	7/16/2023
Y Accelerometer	Endevco	P49216	1/17/2023	7/16/2023
Z Accelerometer	Endevco	P51303	1/17/2023	7/16/2023




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 7.5 g's
Min: -1.4 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 120.2 g's
Min: -3.9 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]
Max: 78.5 g's
Min: -1.1 g's
Filter: CFC 1000

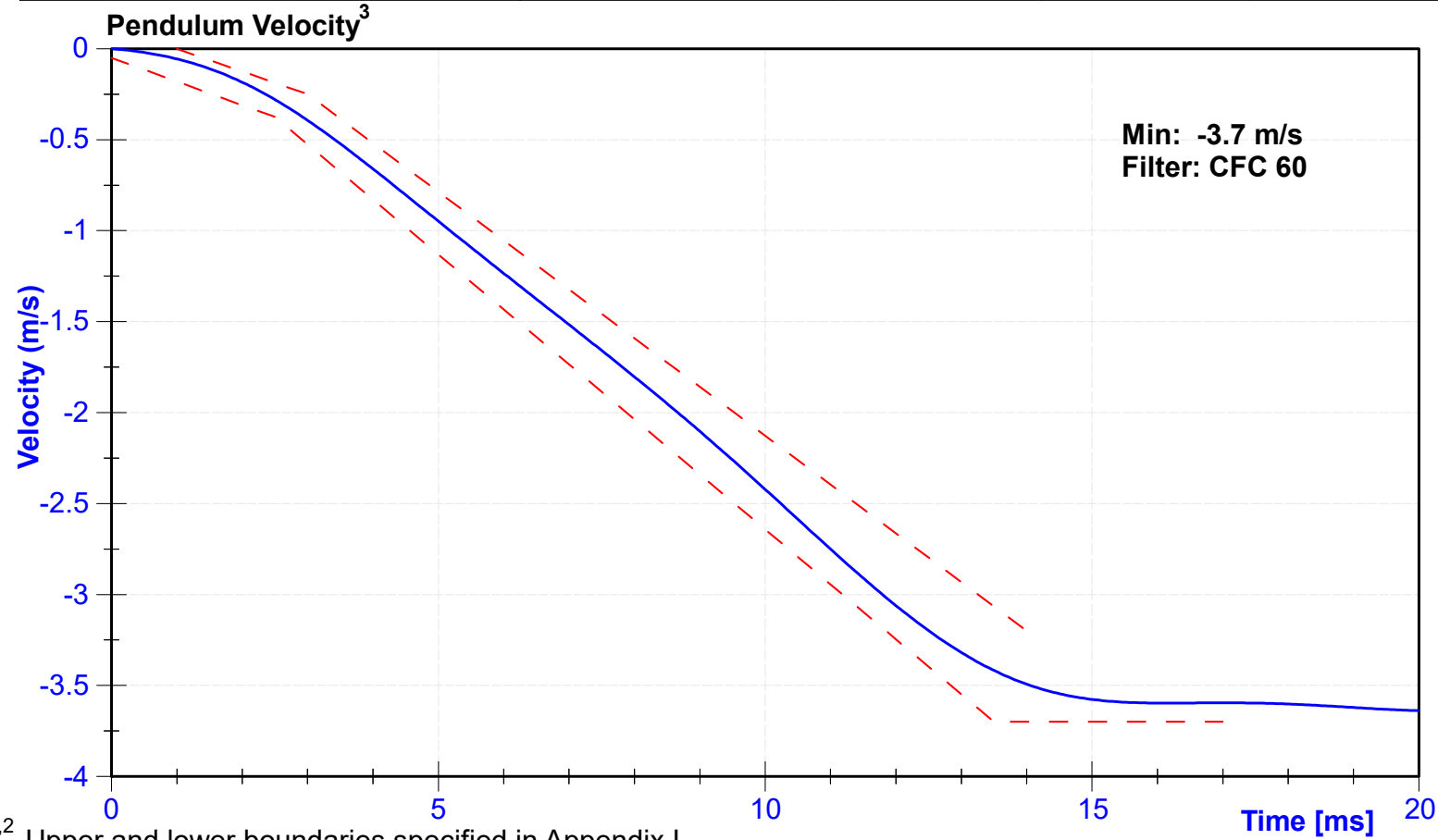
ATD Manufacturer	FTSS	Test Technician	D. Kroll
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

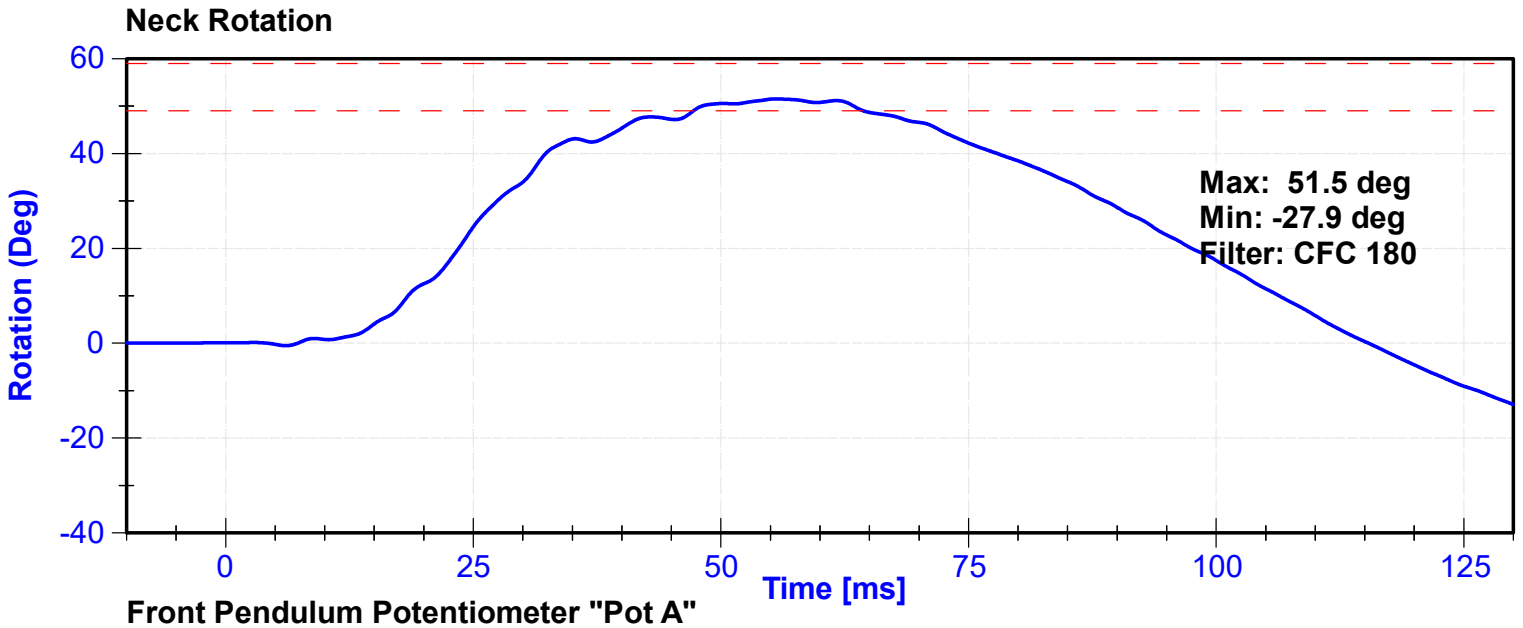
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	27.5	Pass
Velocity	3.3	3.5	m/s	3.38	Pass
Lateral Neck Rotation	49	59	deg	51.5	Pass
Time at Maximum Rotation	54	66	ms	55.5	Pass
Time of Rotation Decay from Maximum	53	88	ms	59.9	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

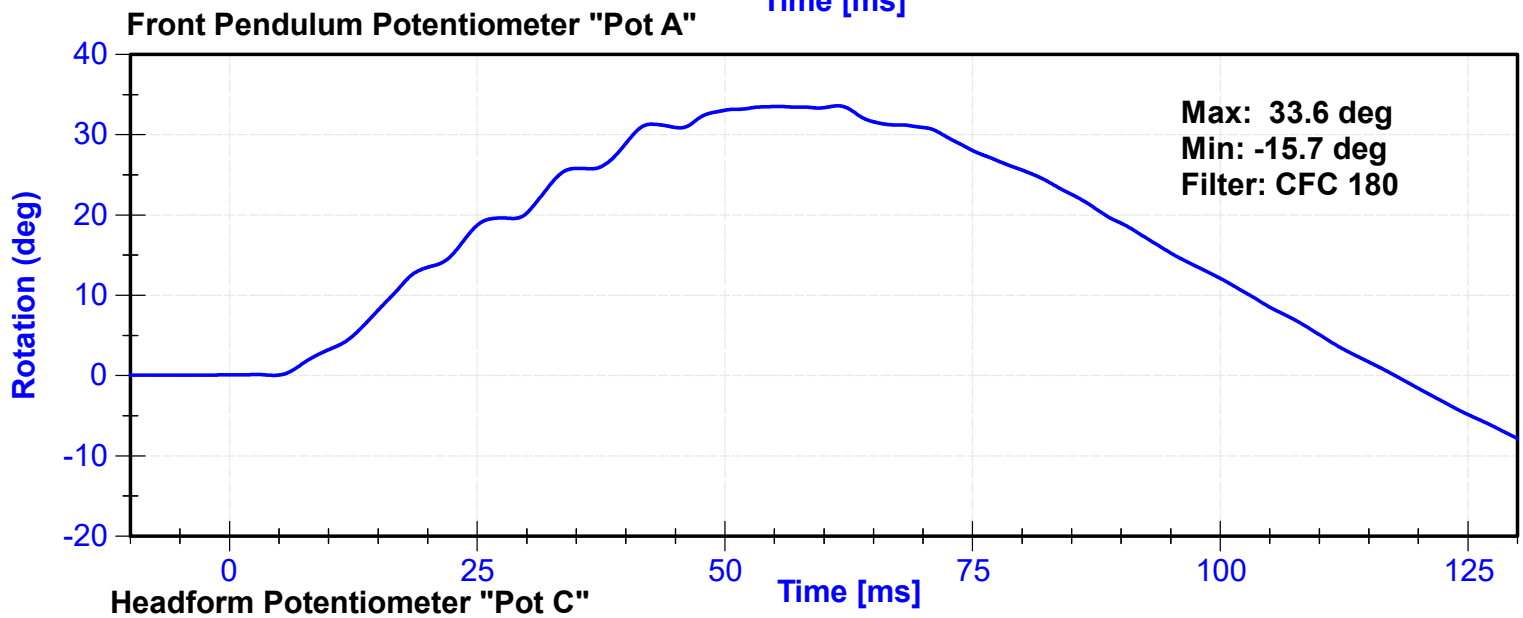
Transducer Calibrations

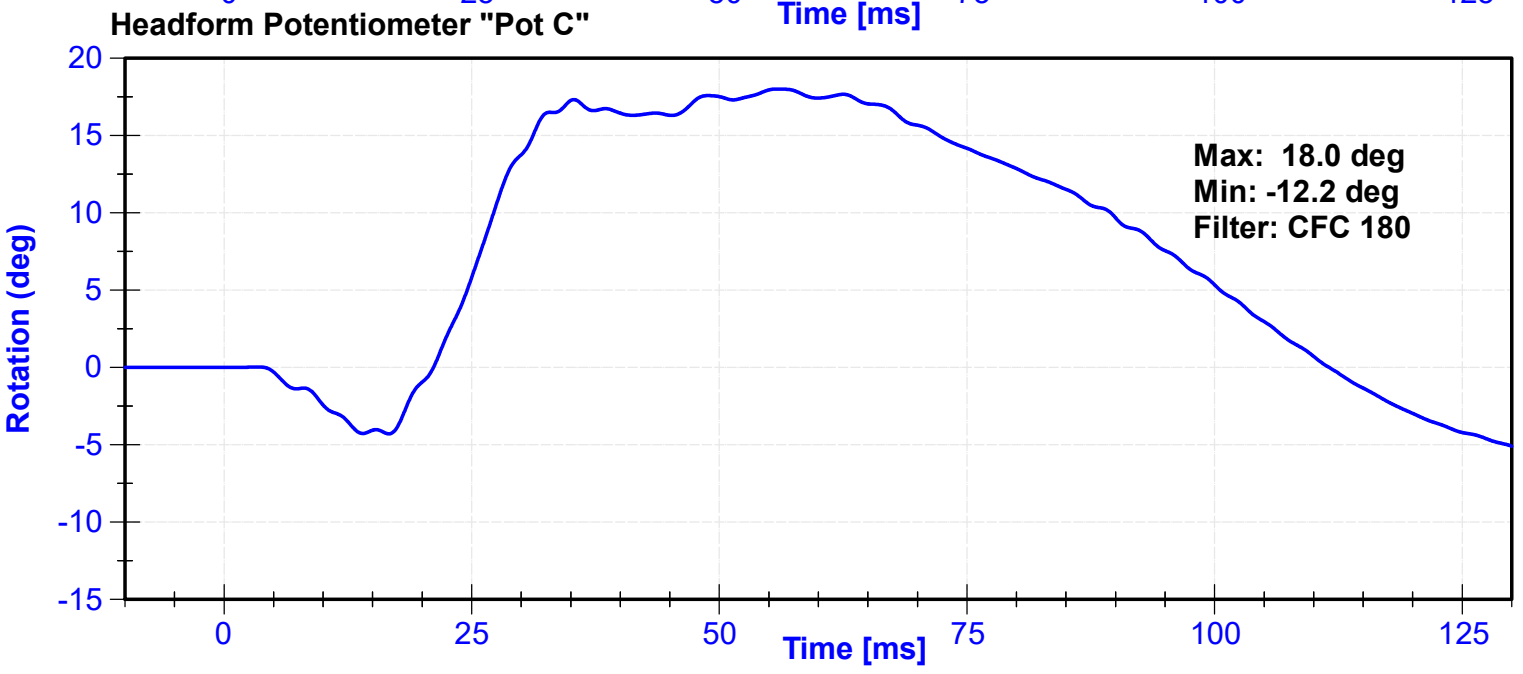
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/26/2022	10/26/2023
Front Pendulum Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Headform Potentiometer	Sfernice	095	10/5/2022	10/5/2023



[1,2] Upper and lower boundaries specified in Appendix I


Neck Rotation
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]
Max: 51.5 deg
Min: -27.9 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]
Max: 33.6 deg
Min: -15.7 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
20
15
10
5
0
-5
-10
-15
0
25
50
75
100
125
Time [ms]
Max: 18.0 deg
Min: -12.2 deg
Filter: CFC 180

Appendix I

[2] Upper Boundary Corridor		[1] Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.0	-0.25	2.5	-0.375
14.0	-3.20	13.5	-3.7
		17.0	-3.7

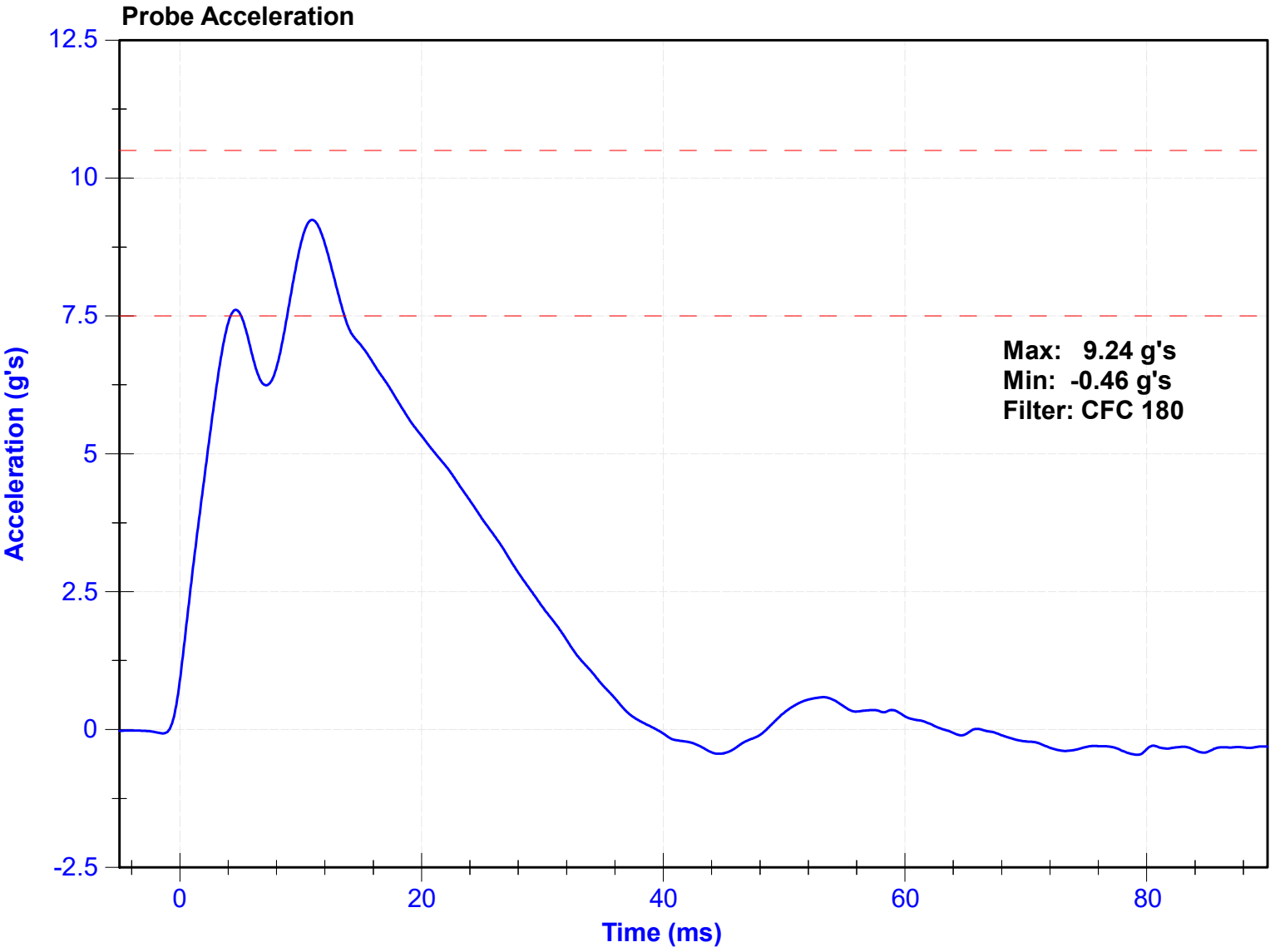
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	27.3	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	7.5	10.5	g's	9.24	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18546	11/19/2022	5/18/2023



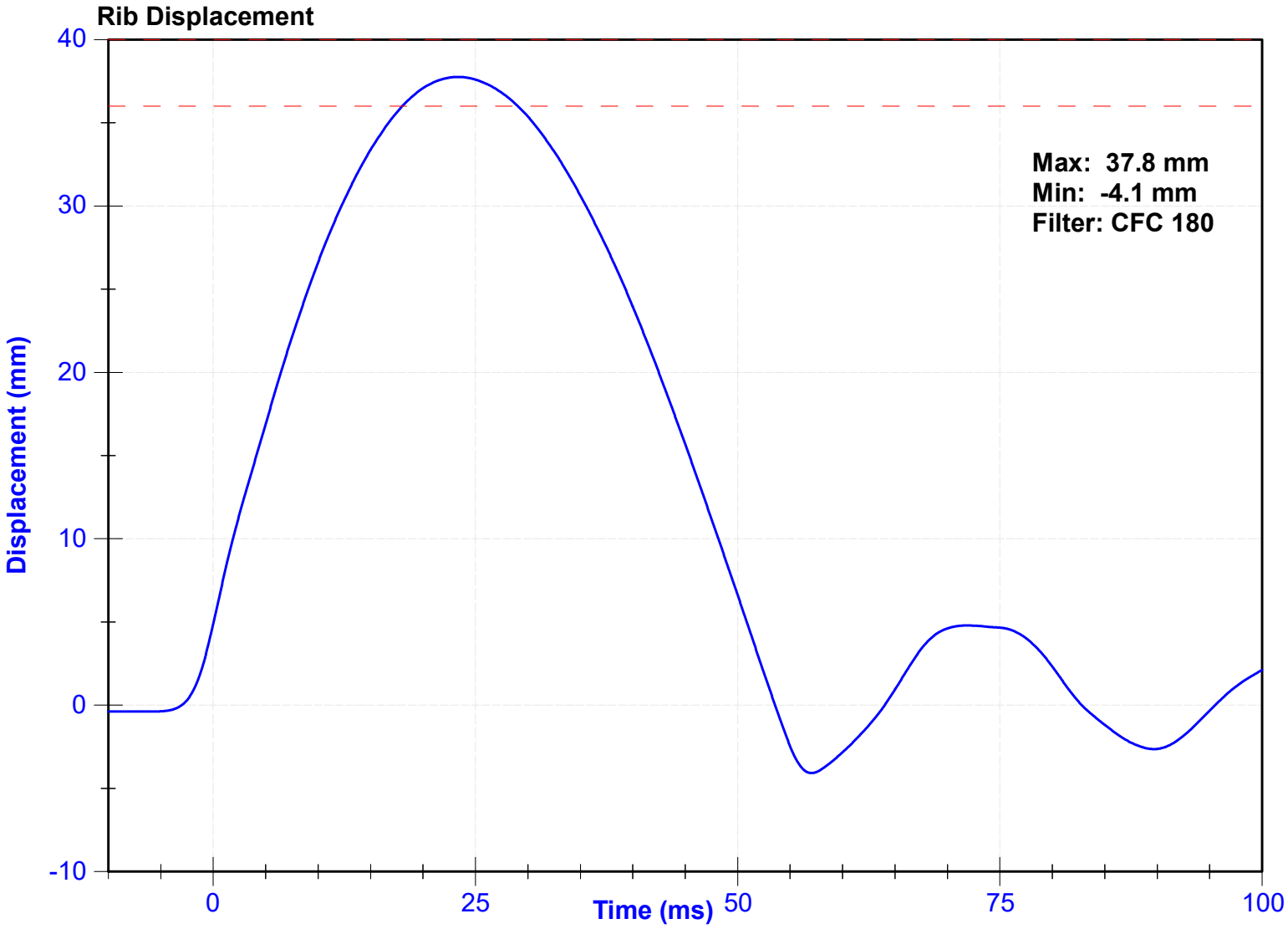
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	36	40	mm	37.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	1/17/2023	7/18/2023



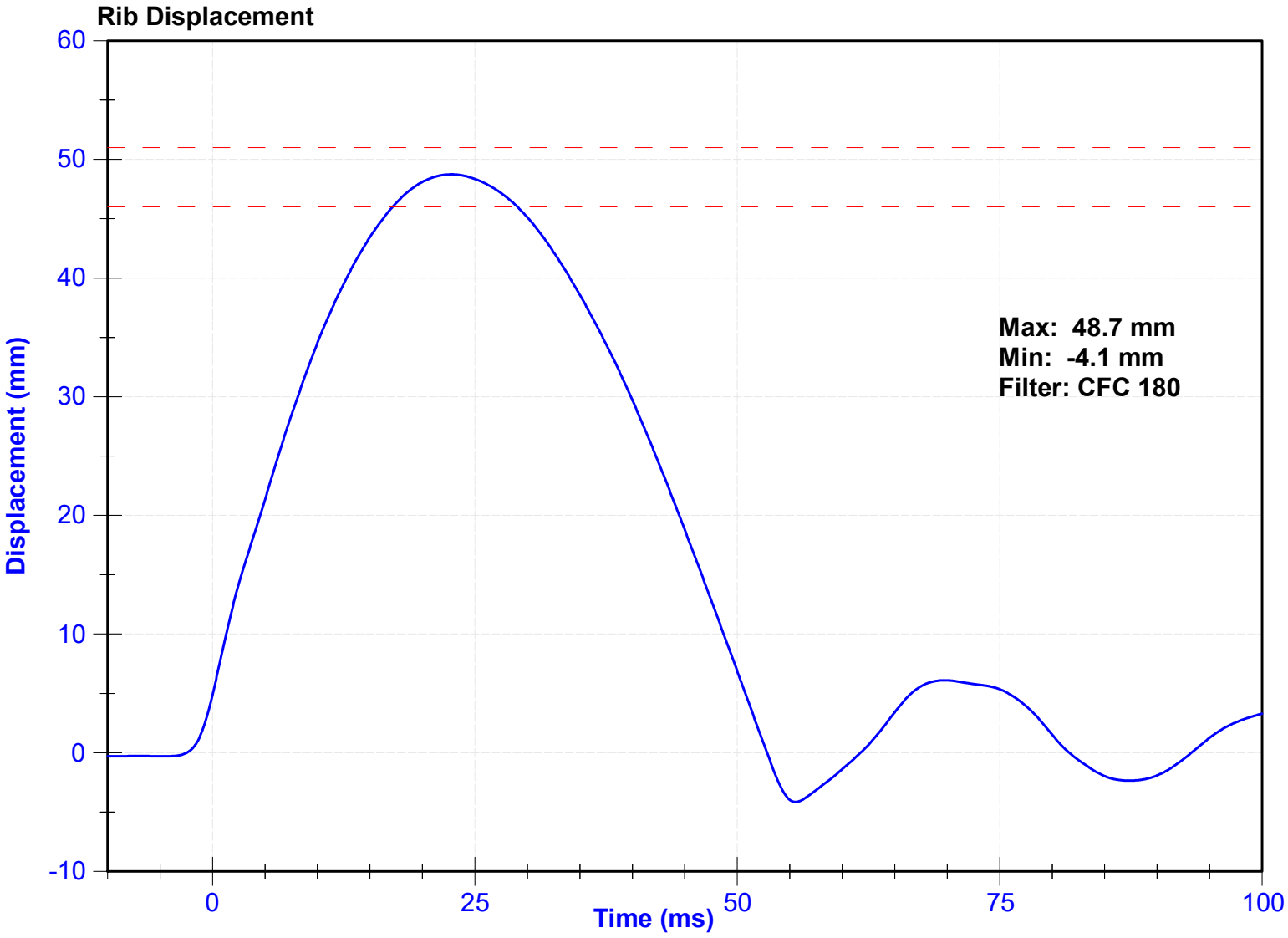
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	46	51	mm	48.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	1/17/2023	7/18/2023



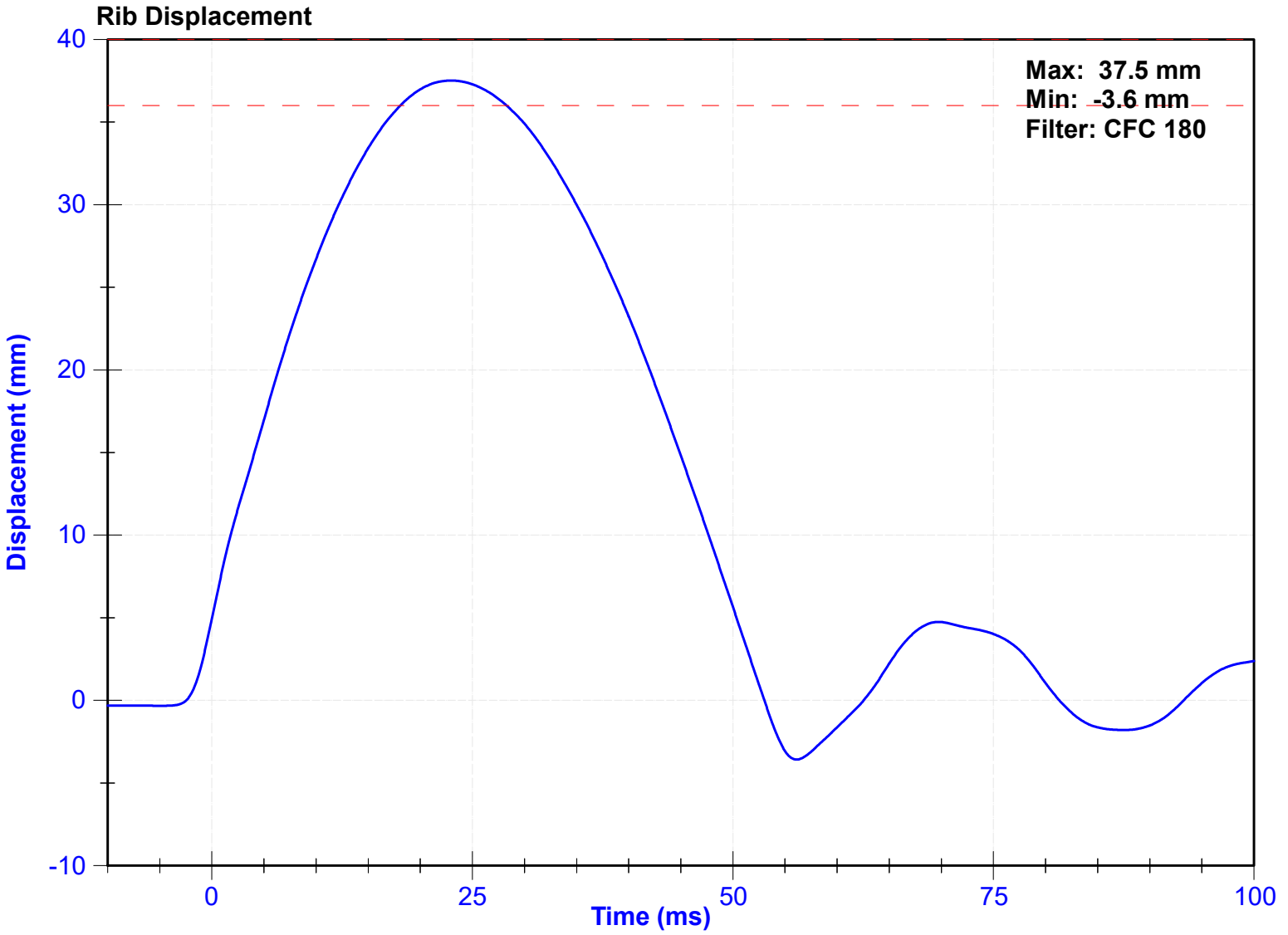
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	36	40	mm	37.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	1/17/2023	7/18/2023



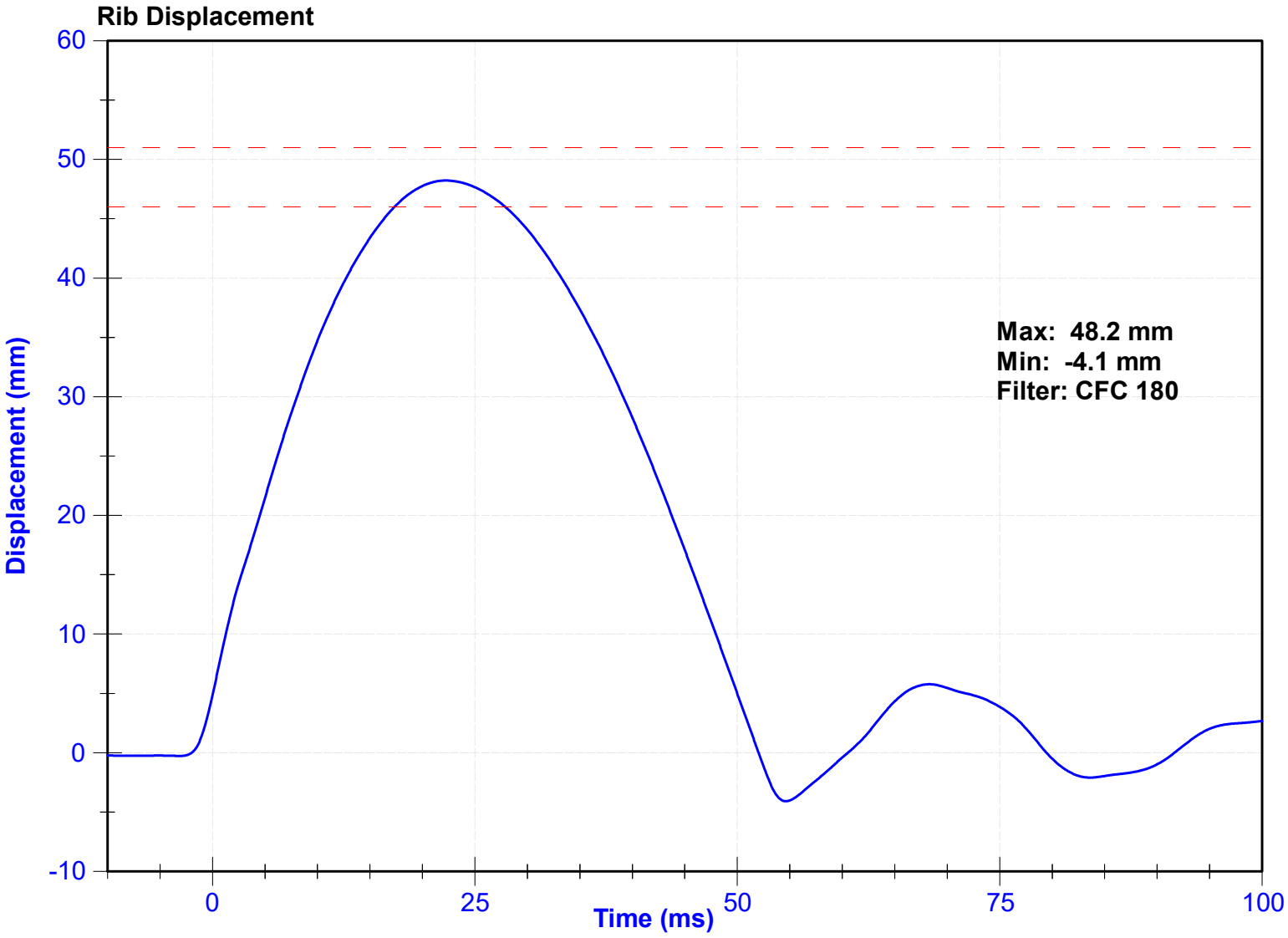
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	46	51	mm	48.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	1/17/2023	7/18/2023



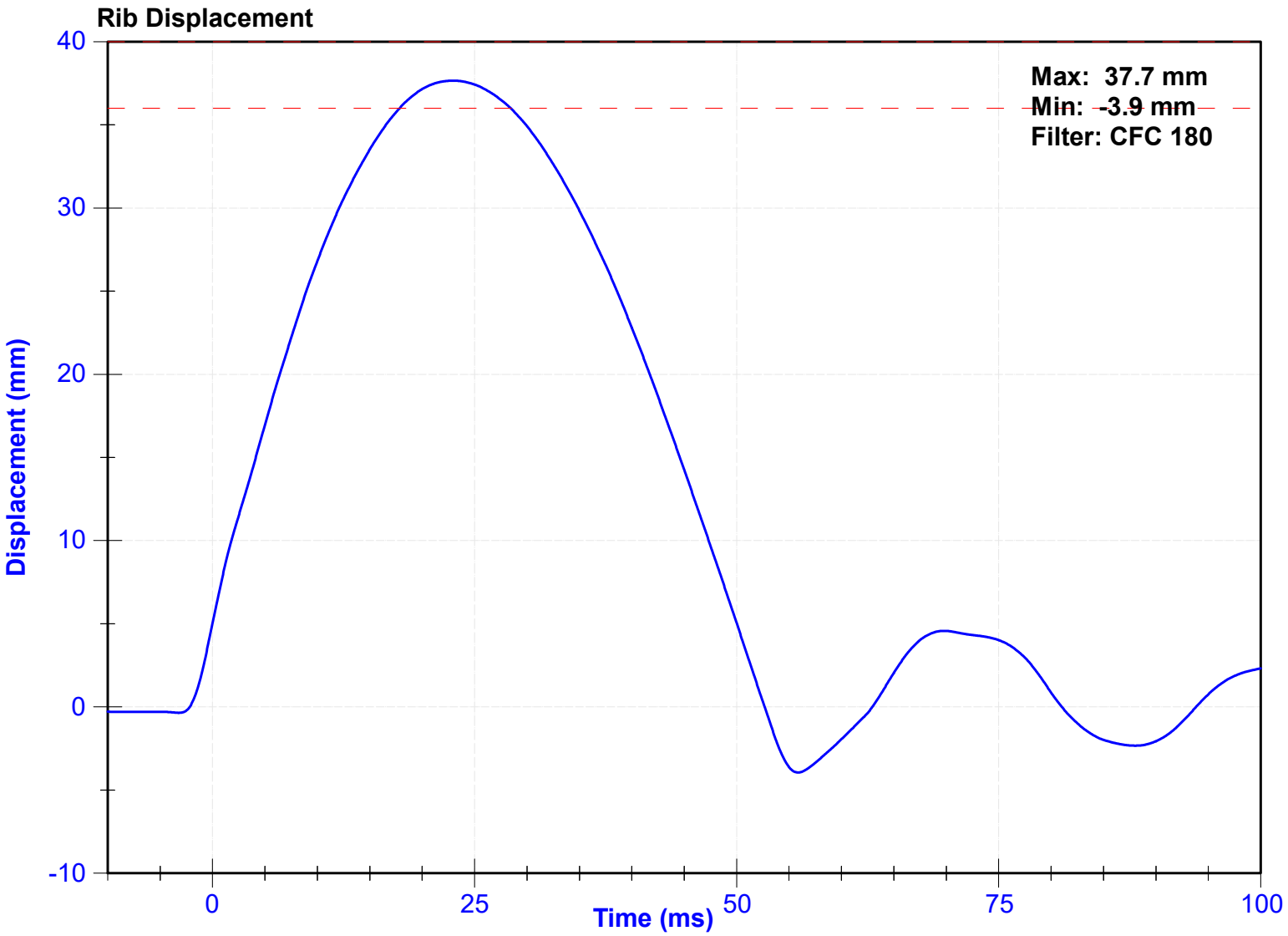
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	36	40	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	1/17/2023	7/18/2023



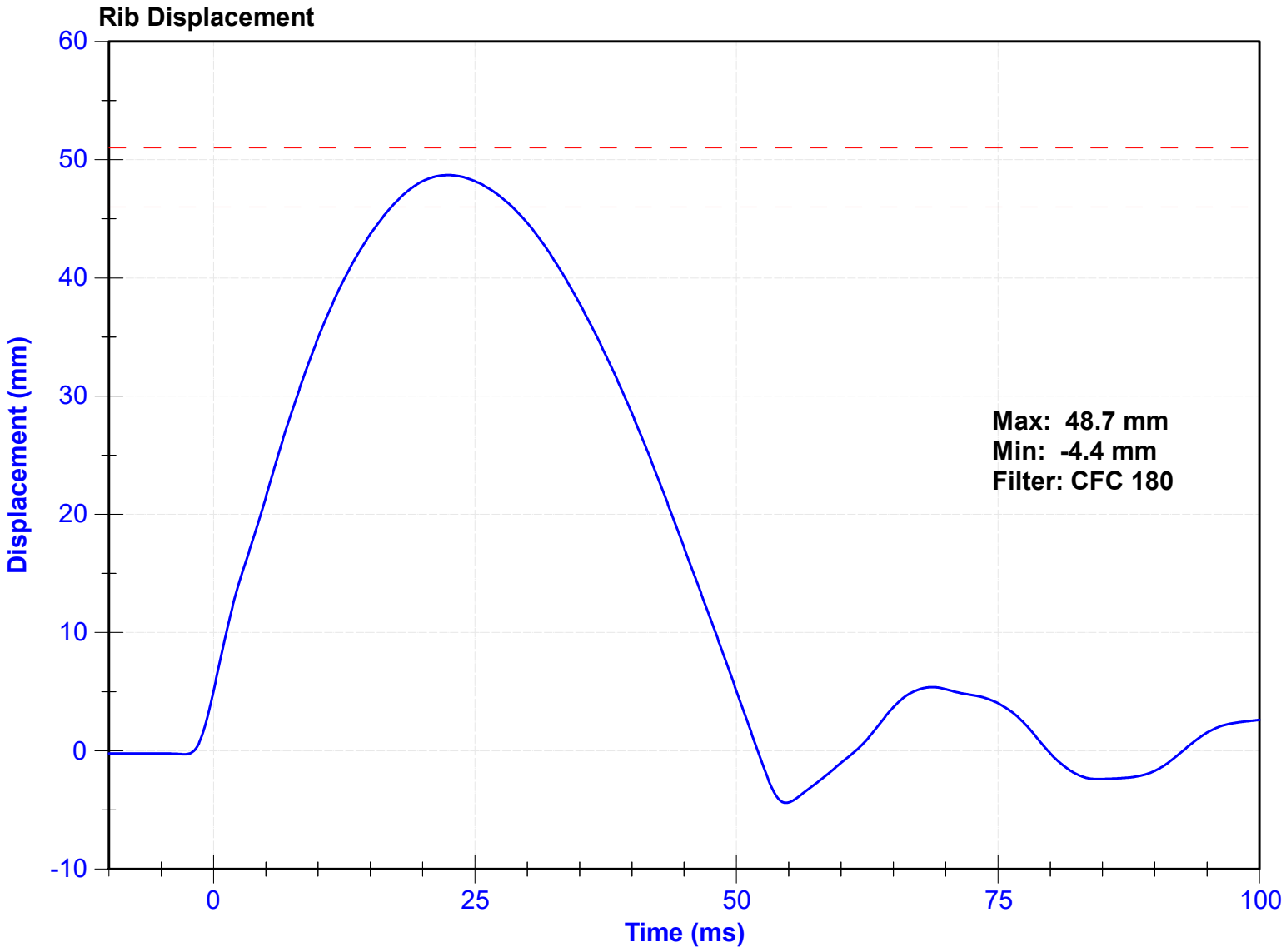
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	46	51	mm	48.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	1/17/2023	7/18/2023



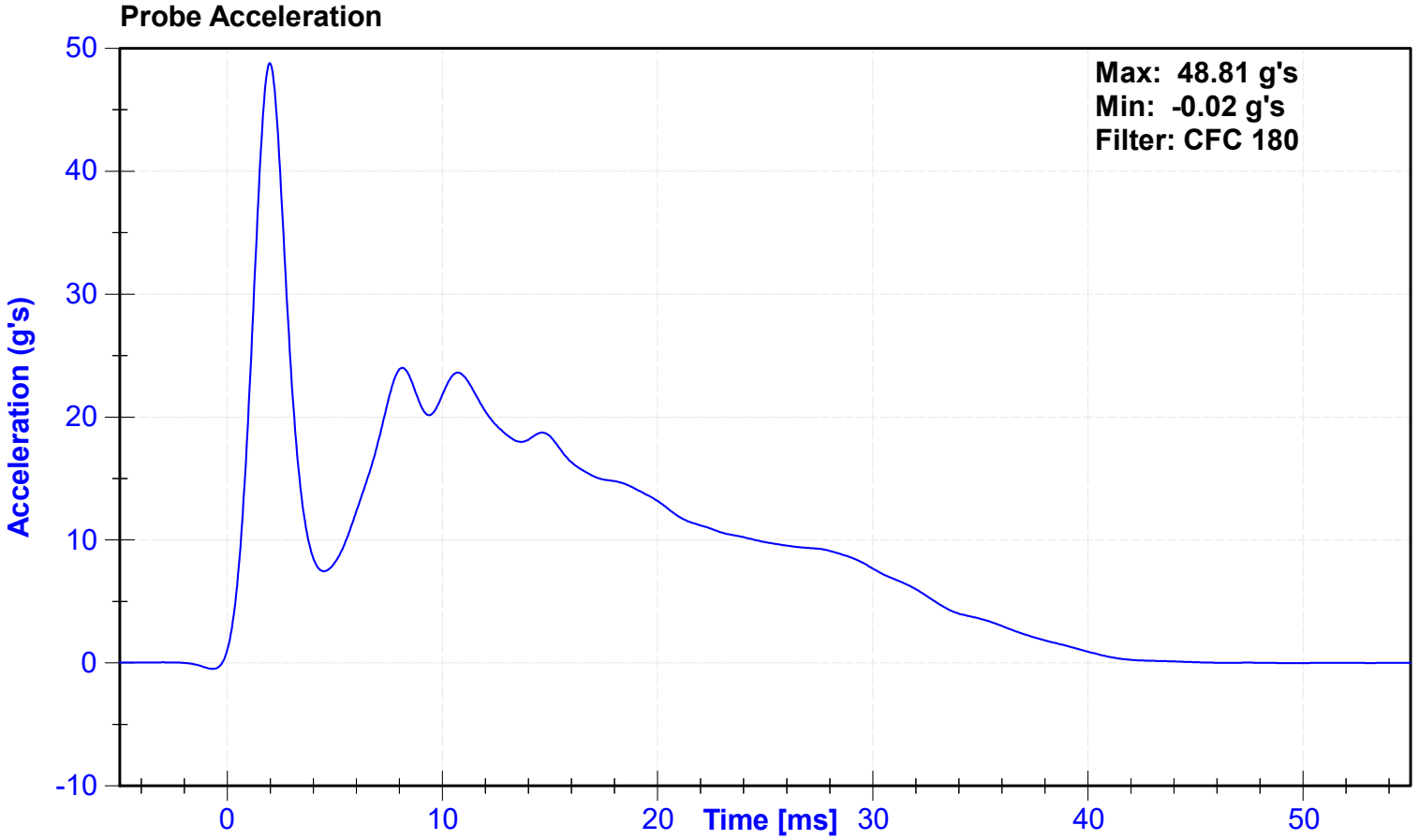
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

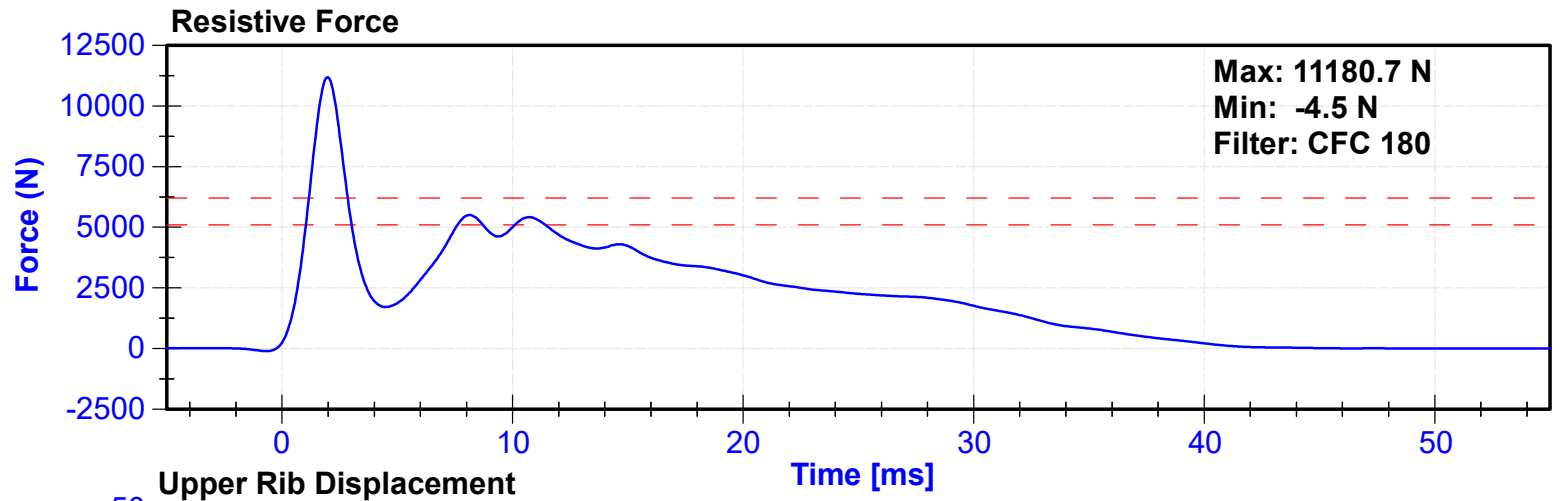
Results

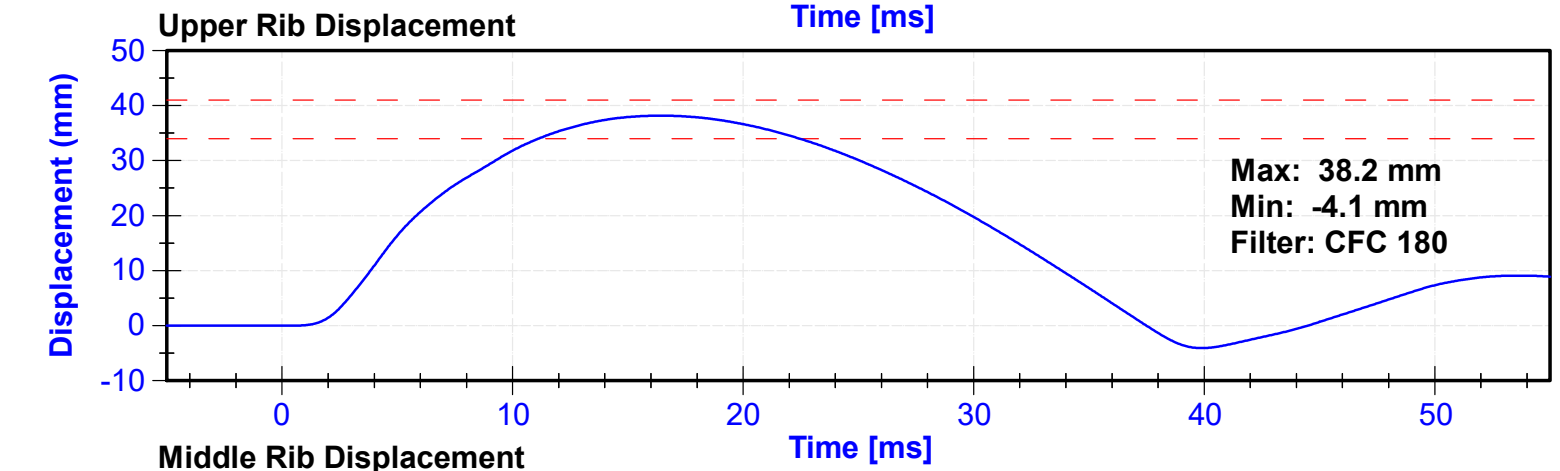
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	27.3	Pass
Velocity	5.4	5.6	m/s	5.52	Pass
Resistive Force after 6ms	5100	6200	N	5500.9	Pass
Upper Thorax Rib Deflection	34	41	mm	38.2	Pass
Mid Thorax Rib Deflection	37	45	mm	42.0	Pass
Lower Thorax Rib Deflection	37	44	mm	40.7	Pass

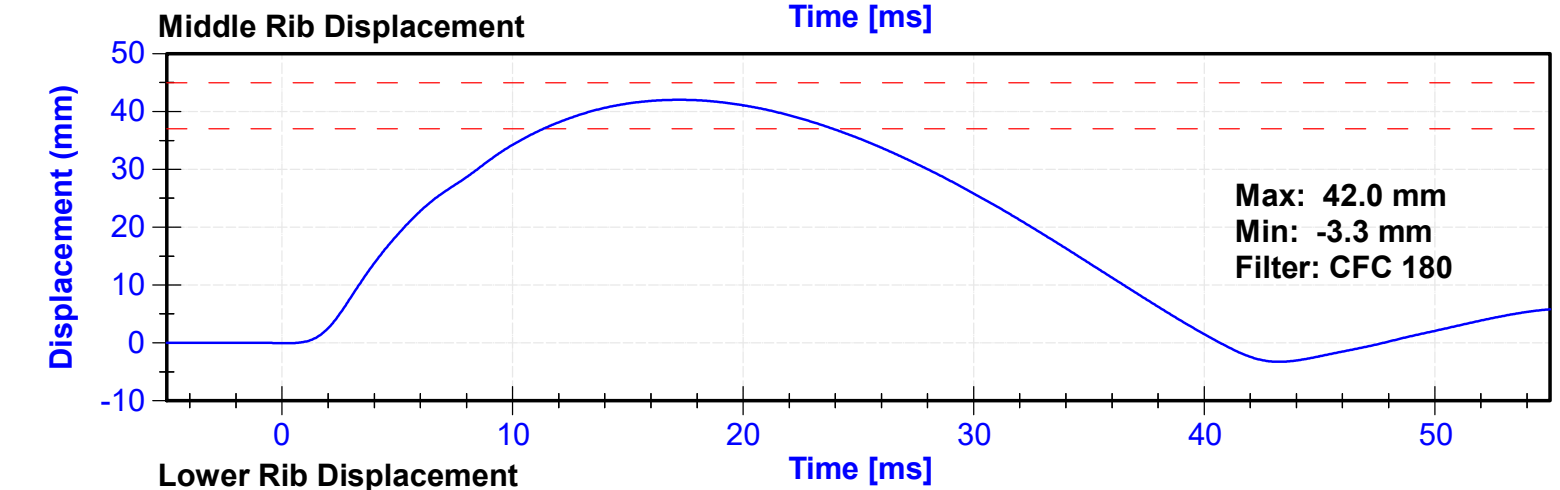
Transducer Calibrations

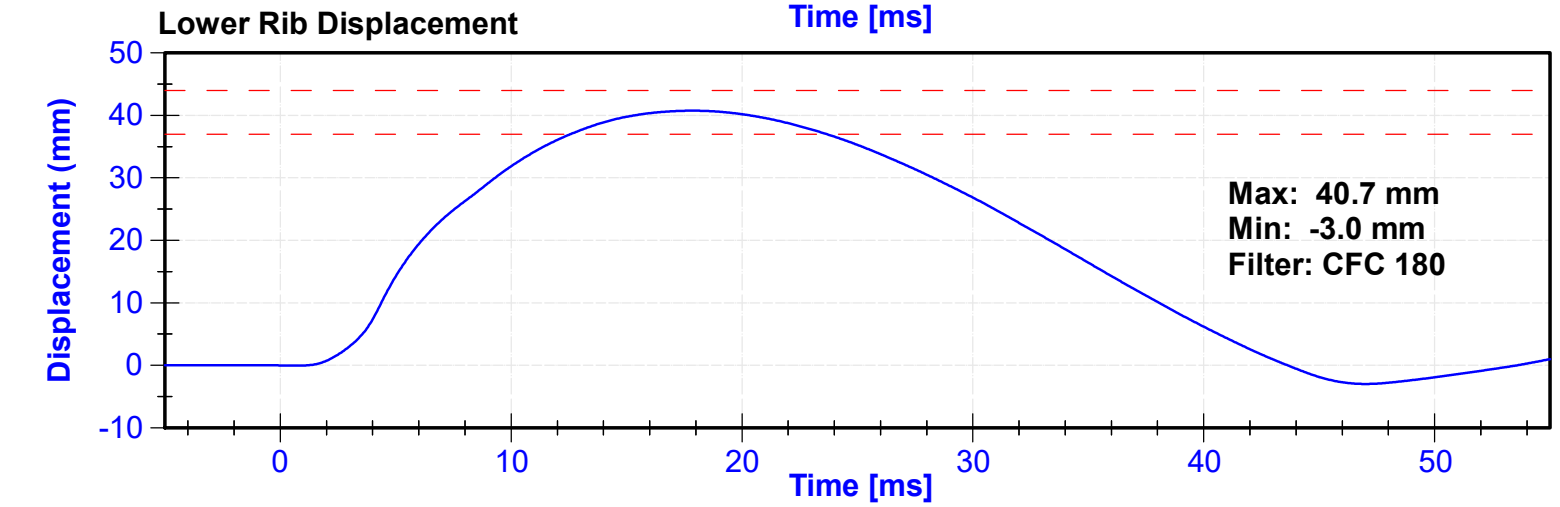
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Upper Thorax Rib Potentiometer	Honeywell	179GFE	1/17/2023	7/18/2023
Middle Thorax Rib Potentiometer	Honeywell	185GFE	1/17/2023	7/18/2023
Lower Thorax Rib Potentiometer	Honeywell	178GFE	1/17/2023	7/18/2023




Resistive Force
Force (N)
12500
10000
7500
5000
2500
0
-2500
0
10
20
30
40
50
Time [ms]
Max: 11180.7 N
Min: -4.5 N
Filter: CFC 180


Upper Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 38.2 mm
Min: -4.1 mm
Filter: CFC 180


Middle Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 42.0 mm
Min: -3.3 mm
Filter: CFC 180


Lower Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 40.7 mm
Min: -3.0 mm
Filter: CFC 180

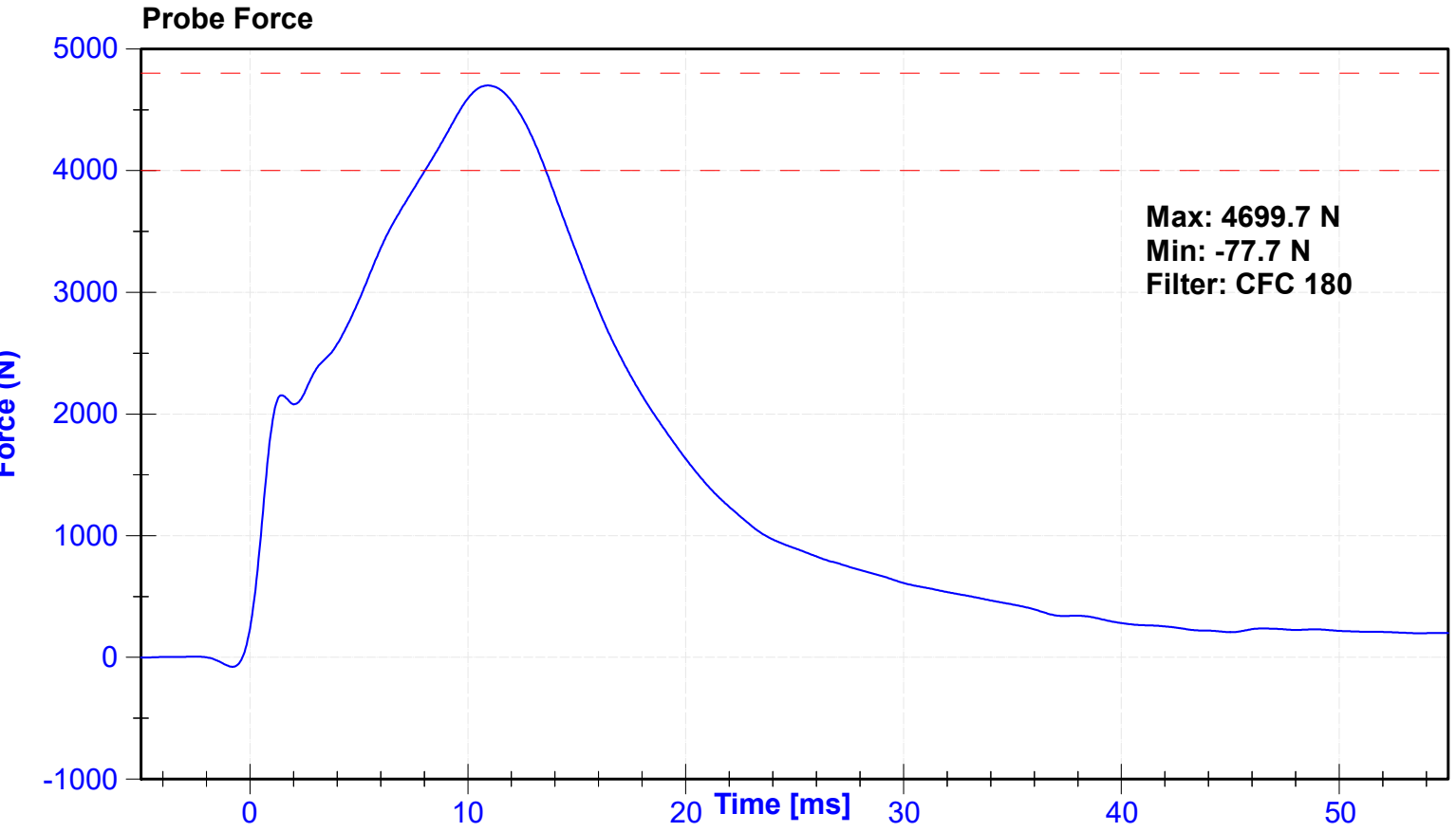
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

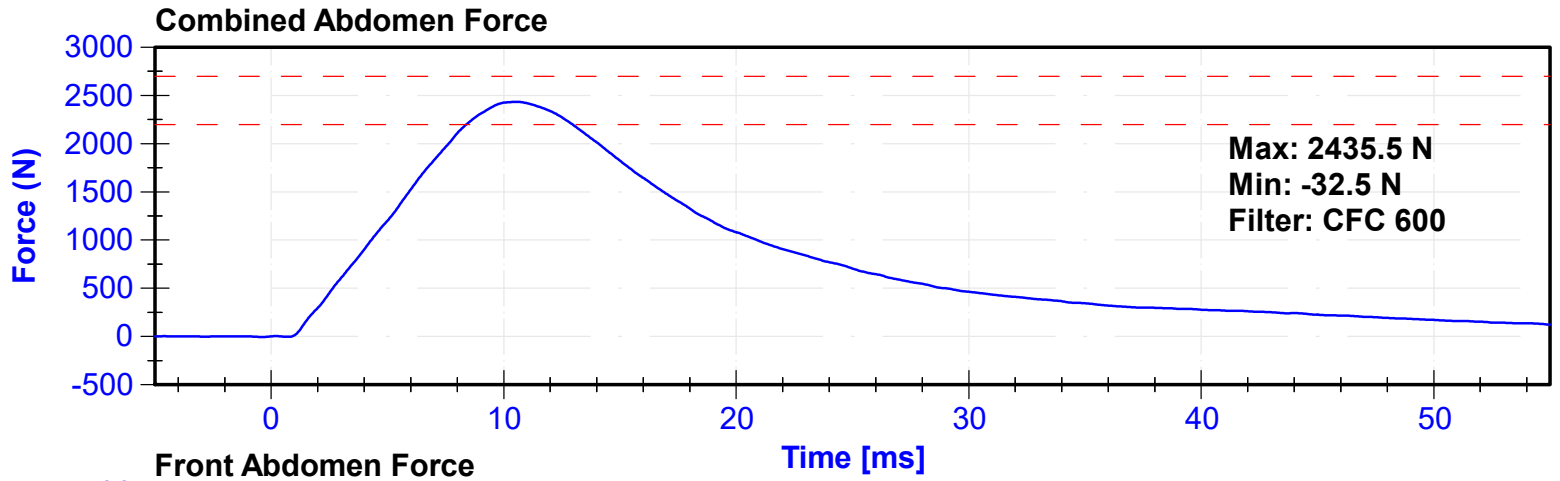
Results

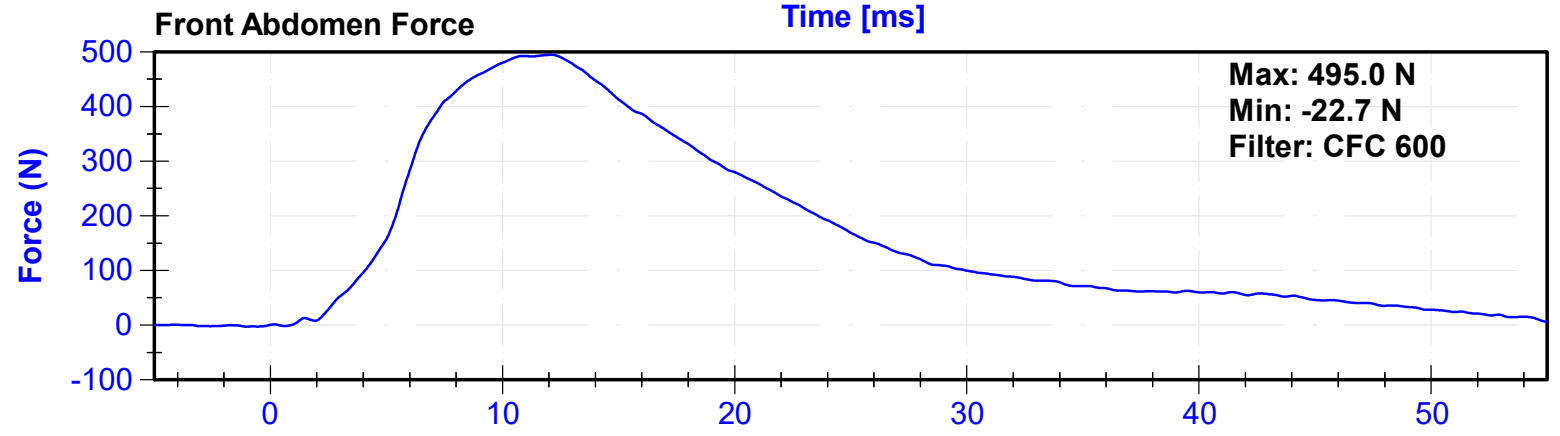
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	27.3	Pass
Velocity	3.9	4.1	m/s	4.01	Pass
Combined Abdomen Force	2200	2700	N	2435.5	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.55	Pass
Resistive Probe Force	4000	4800	N	4699.7	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.90	Pass

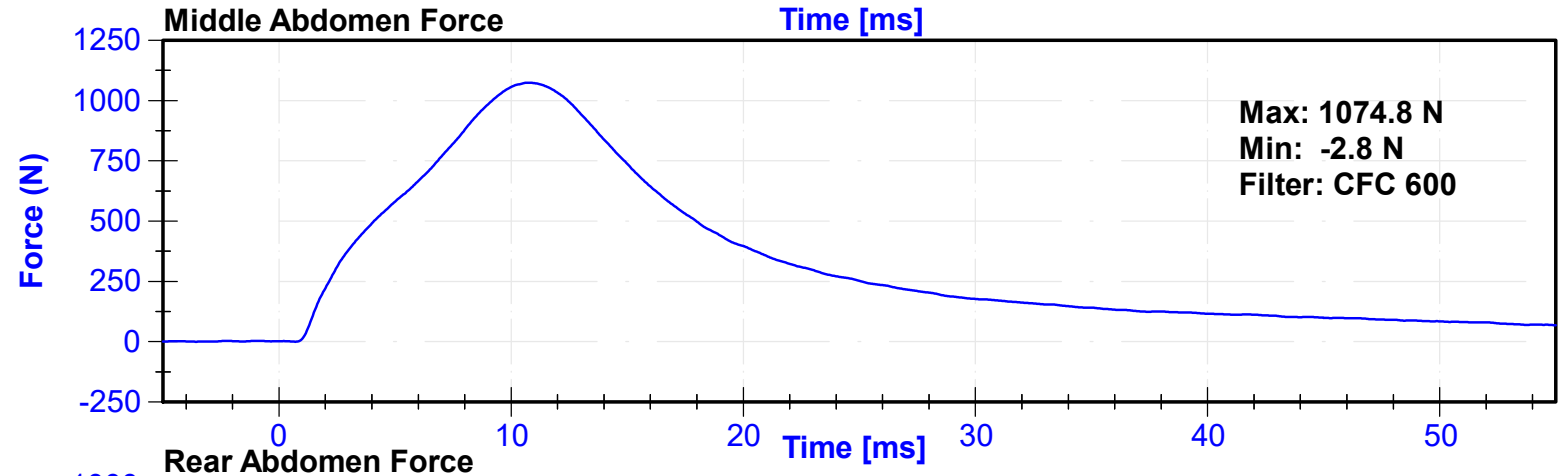
Transducer Calibrations

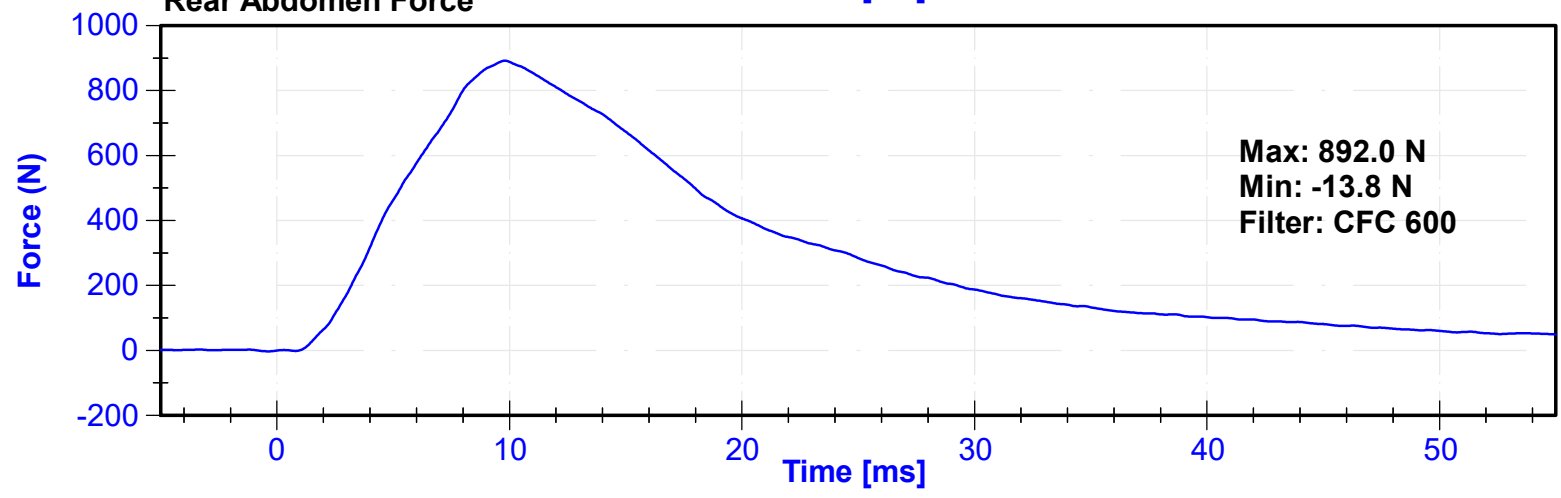
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Front Abdomen Load Cell	Denton	1509	8/12/2022	8/12/2023
Middle Abdomen Load Cell	Denton	1508	8/12/2022	8/12/2023
Rear Abdomen Load Cell	Denton	1507	8/12/2022	8/12/2023




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2435.5 N
Min: -32.5 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 495.0 N
Min: -22.7 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1074.8 N
Min: -2.8 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 892.0 N
Min: -13.8 N
Filter: CFC 600

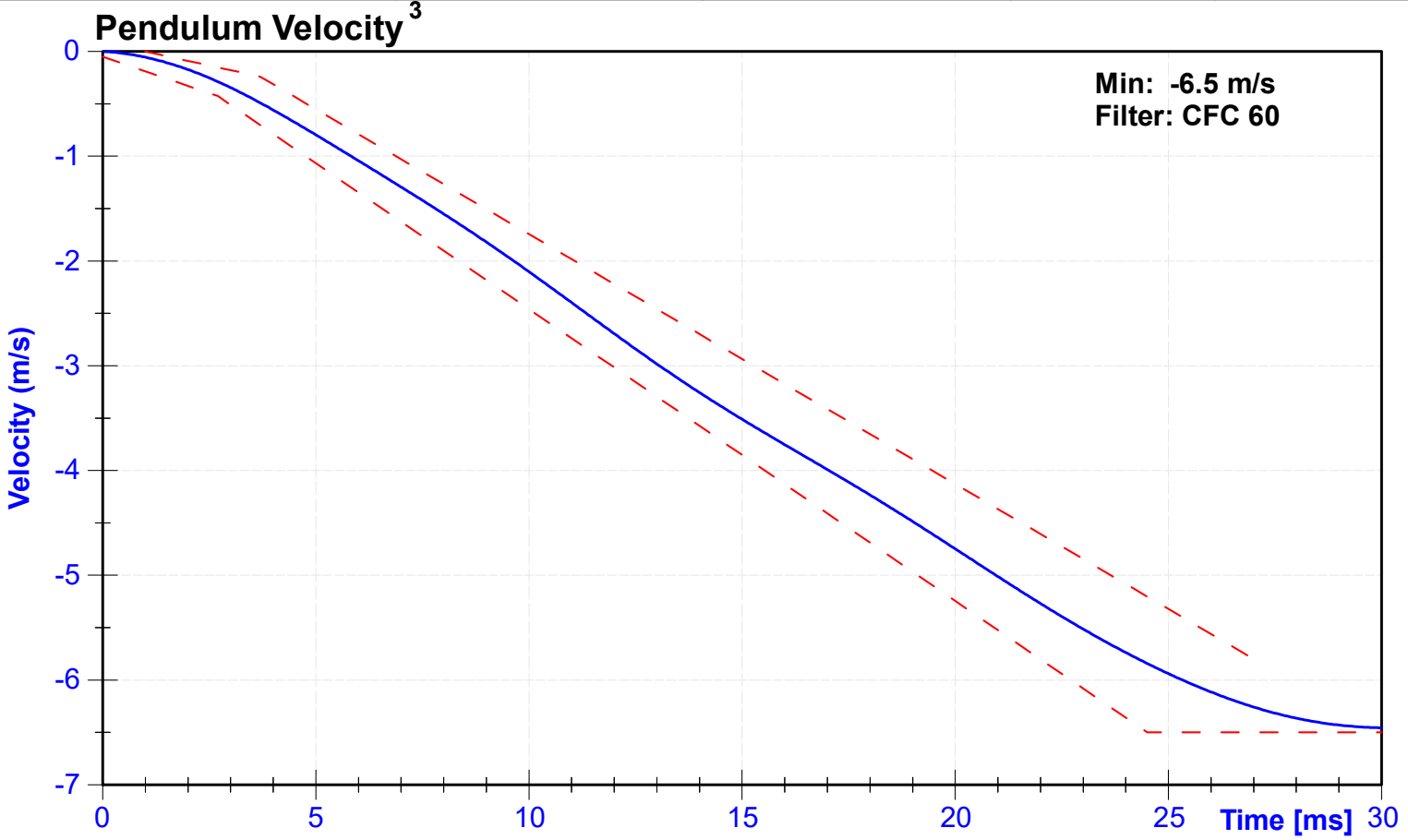
ATD Manufacturer	FTSS	Test Technician	D. Kroll
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

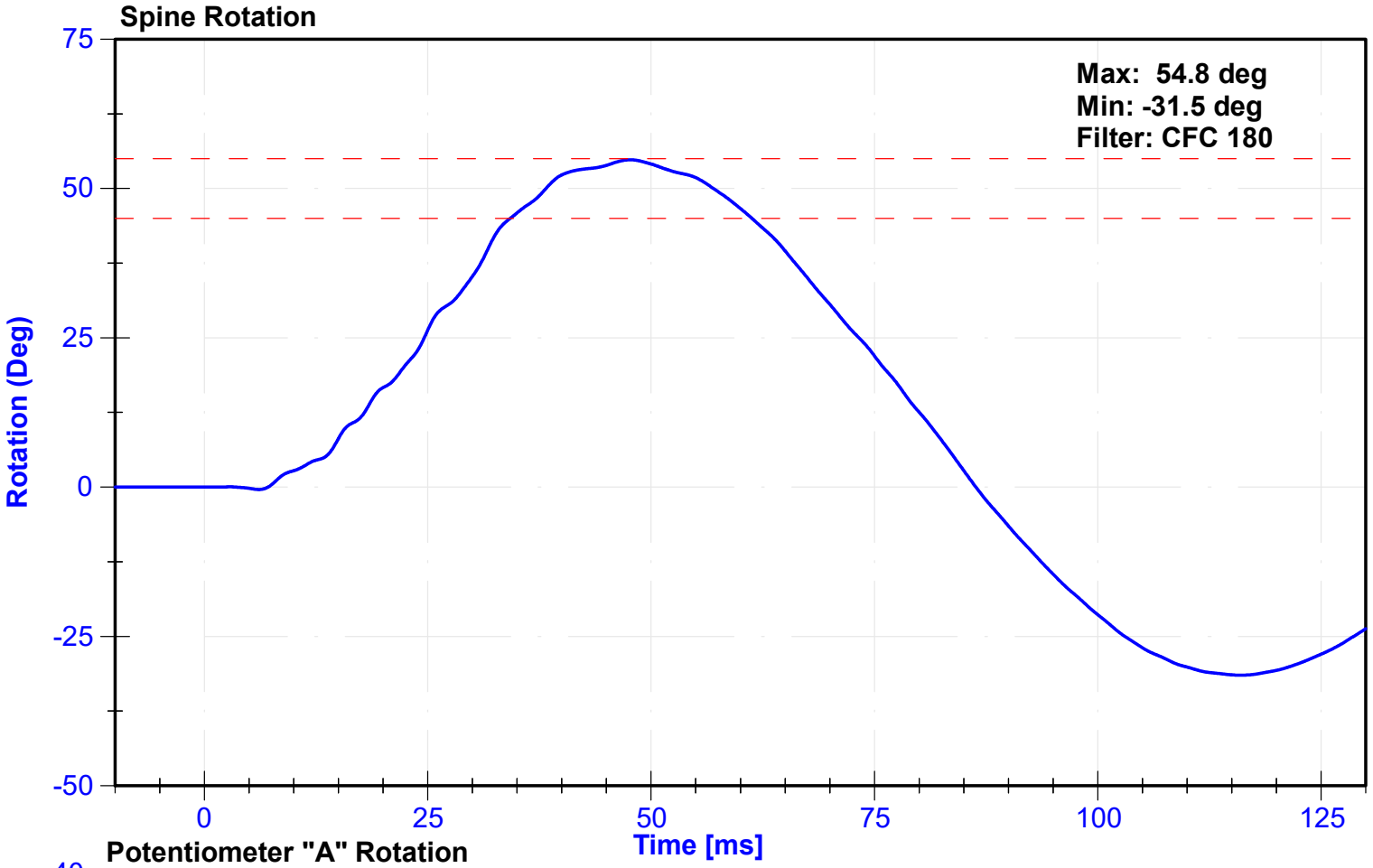
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	27.5	Pass
Velocity	5.95	6.15	m/s	6.044	Pass
Lateral Spine Rotation	45	55	deg	54.8	Pass
Time at Maximum Rotation	39	53	ms	47.7	Pass
Time of Decay to Zero Degrees	37	57	ms	38.7	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

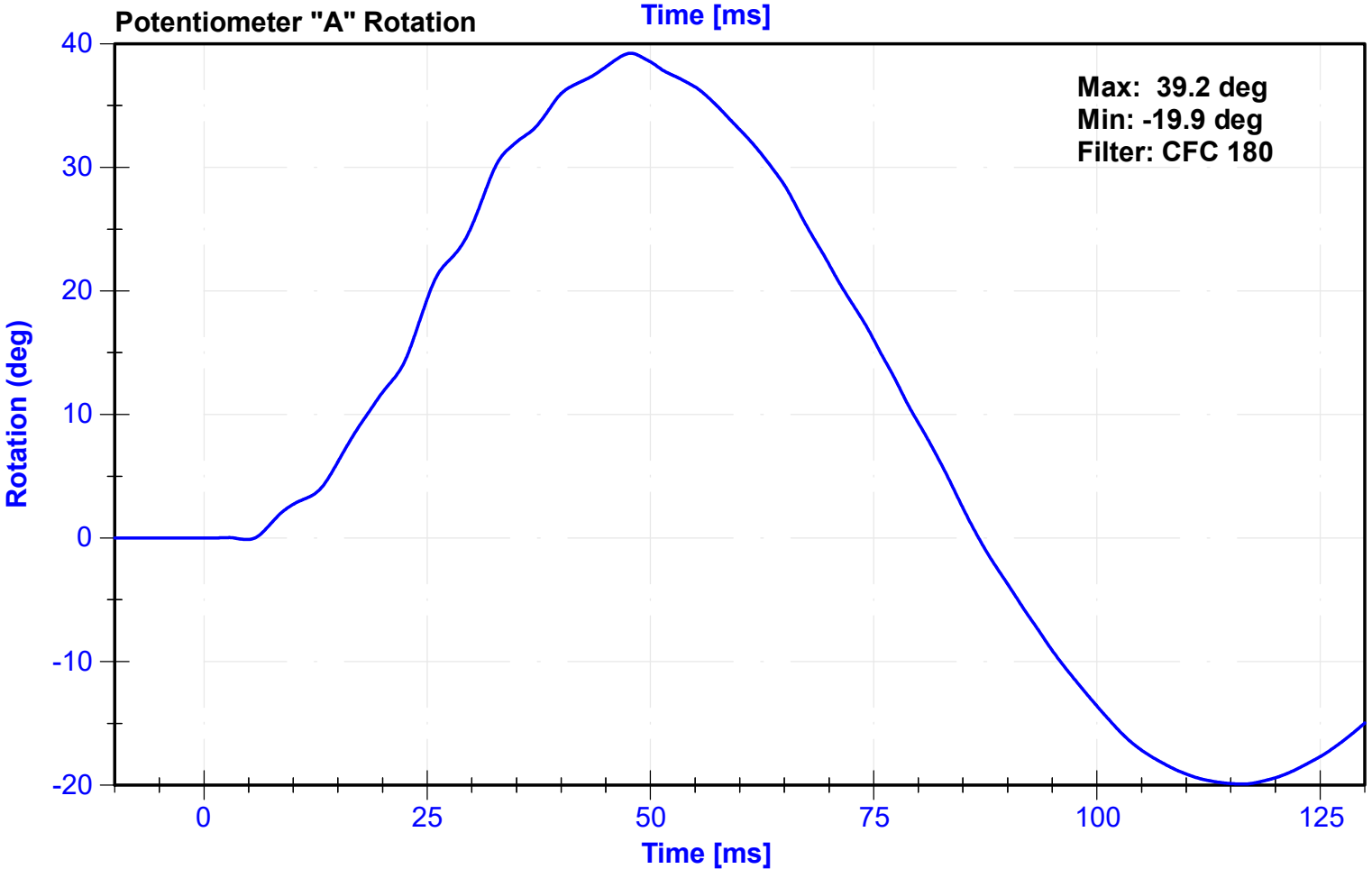
Transducer Calibrations

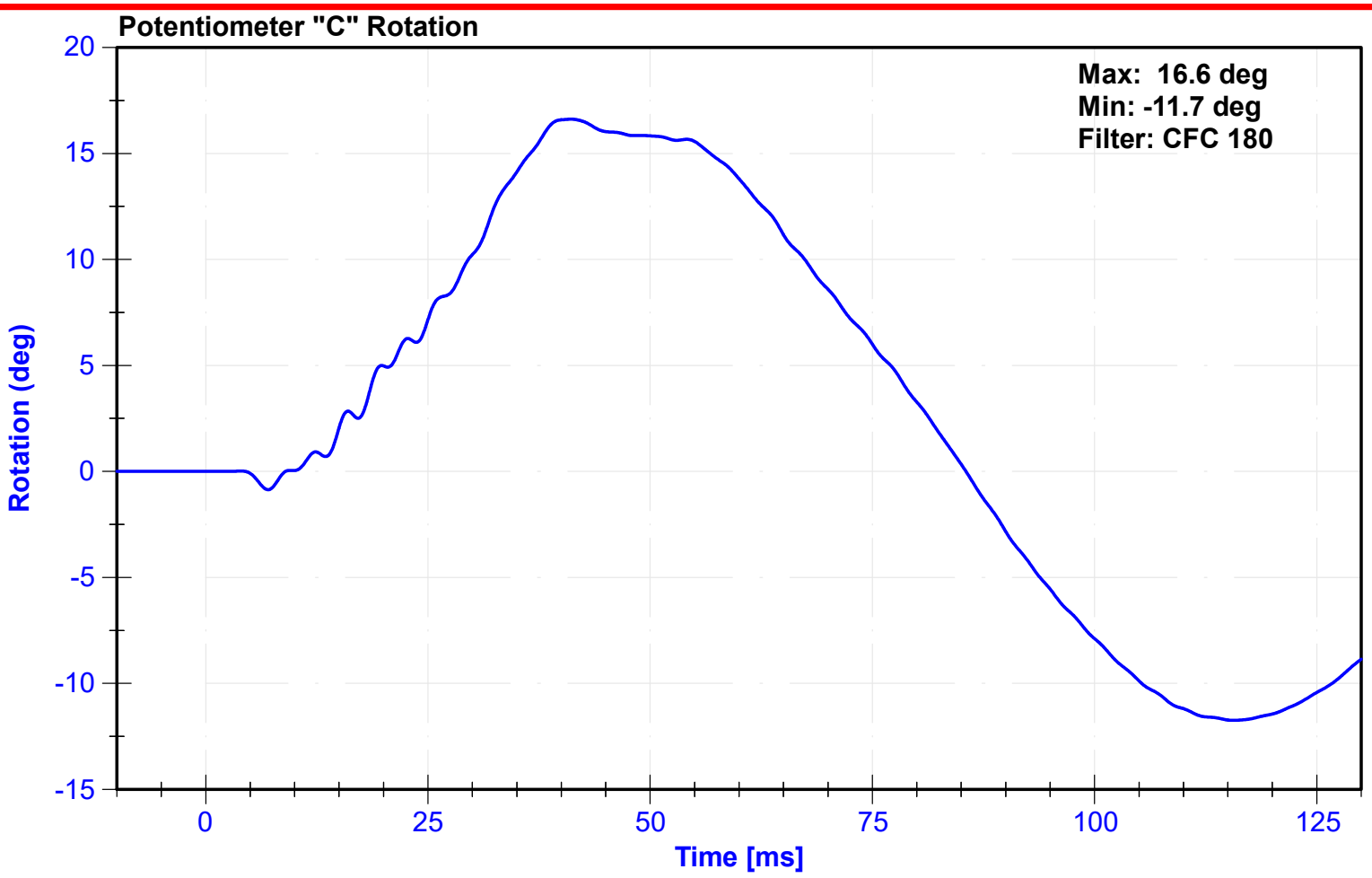
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/26/2022	10/26/2023
Pendulum "A" Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Condyle "B" Potentiometer	Sfernice	095	10/5/2022	10/5/2023



[1,2] Upper and lower boundaries specified in Appendix I


Spine Rotation
Max: 54.8 deg
Min: -31.5 deg
Filter: CFC 180
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 39.2 deg
Min: -19.9 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]



Appendix I

[2] Upper Boundary Corridor		[1] Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.7	-0.24	2.7	-0.425
27.0	-5.80	24.5	-6.5
		30.0	-6.5

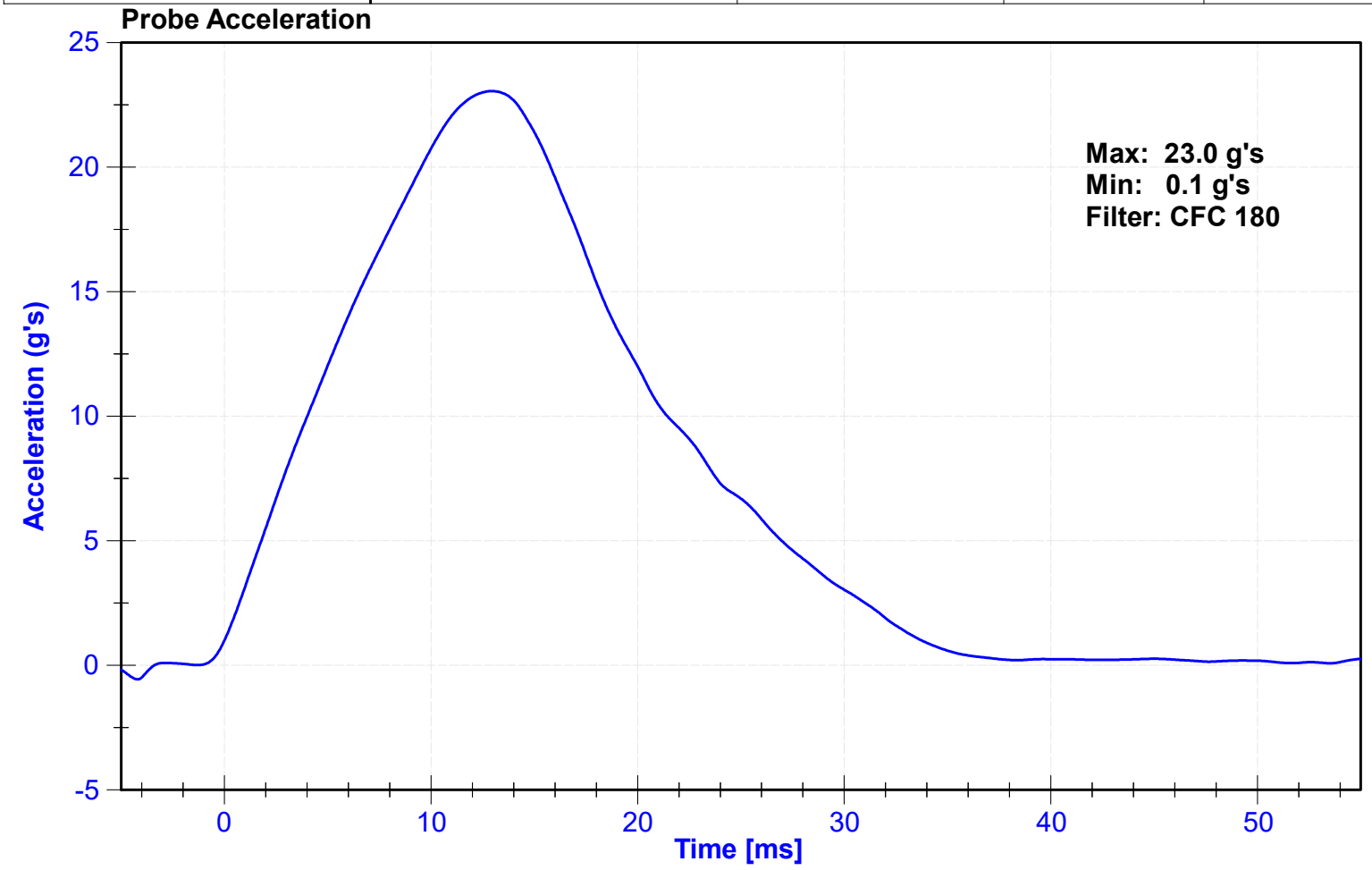
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

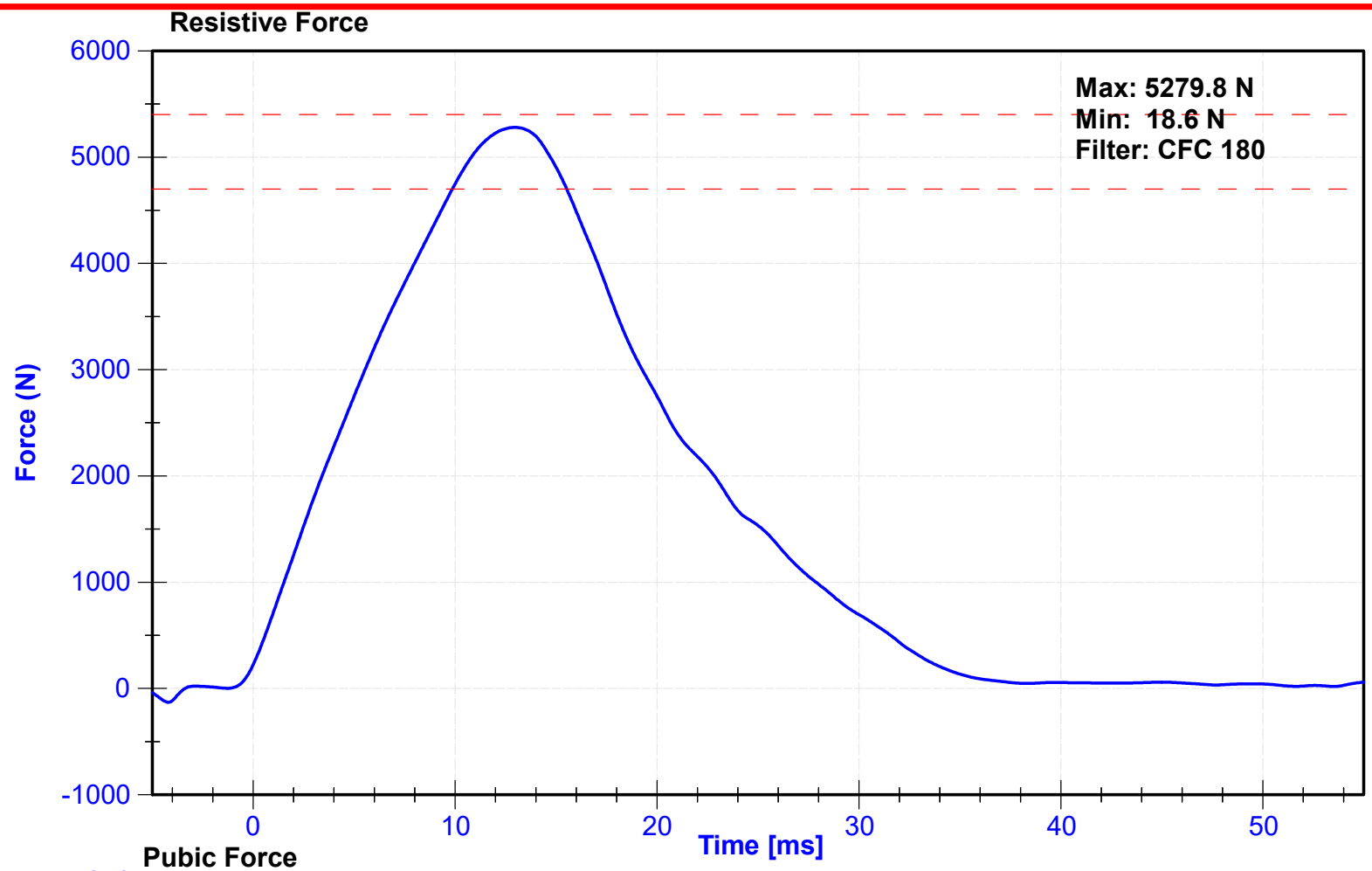
Results

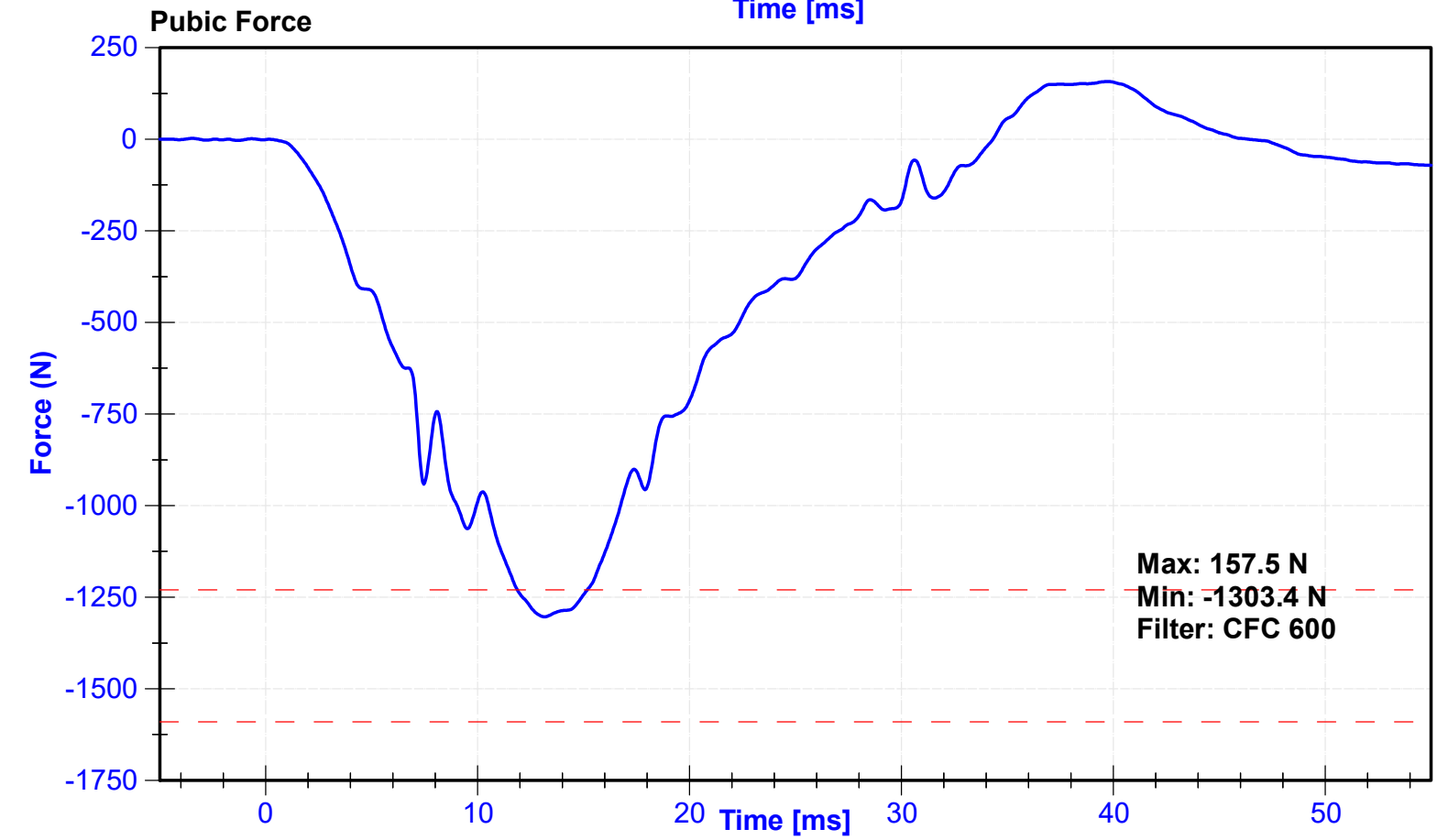
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	27.3	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Resistive Force	4700	5400	N	5279.8	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.95	Pass
Pubic Force	-1590	-1230	N	-1303.4	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.15	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Pubic Load Cell	Denton	459-FY	6/14/2022	6/14/2023




Resistive Force
Max: 5279.8 N
Min: 18.6 N
Filter: CFC 180
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]


Pubic Force
Max: 157.5 N
Min: -1303.4 N
Filter: CFC 600
Force (N)
250
0
-250
-500
-750
-1000
-1250
-1500
-1750
0
10
20
30
40
50
Time [ms]

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE – PASSENGER ATD

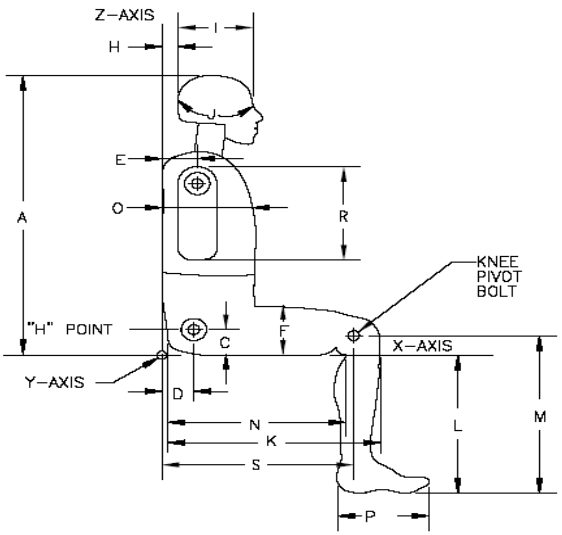
SERIAL NO:DG8012

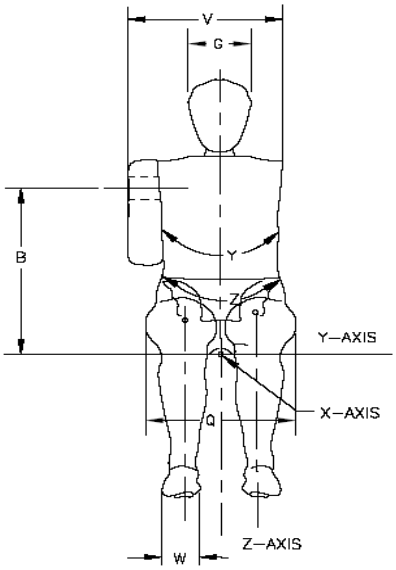
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Brogan Date: 02/16/2023

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	786	Pass
B	Shoulder Pivot Height	437	453	447	Pass
C	H-point Height	79	89	81	Pass
D	H-point from seatback	141	151	147	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	128	Pass
G	Head Breadth	140	148	143	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	182	Pass
J	Head Circumference	541	551	546	Pass
K	Buttock to Knee Length	514	540	528	Pass
L	Popliteal Height	343	369	359	Pass
M	Knee Pivot to floor height	392	409	402	Pass
N	Buttock Popliteal Length	416	442	433	Pass
O	Chest Depth w/o jacket	195	211	201	Pass
P	Foot Length	216	232	226	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	251	Pass
S	Knee Joint to seatback	477	493	487	Pass
V	Shoulder Width	341	357	351	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	873	Pass
Z	Waist Circumference	761	791	778	Pass

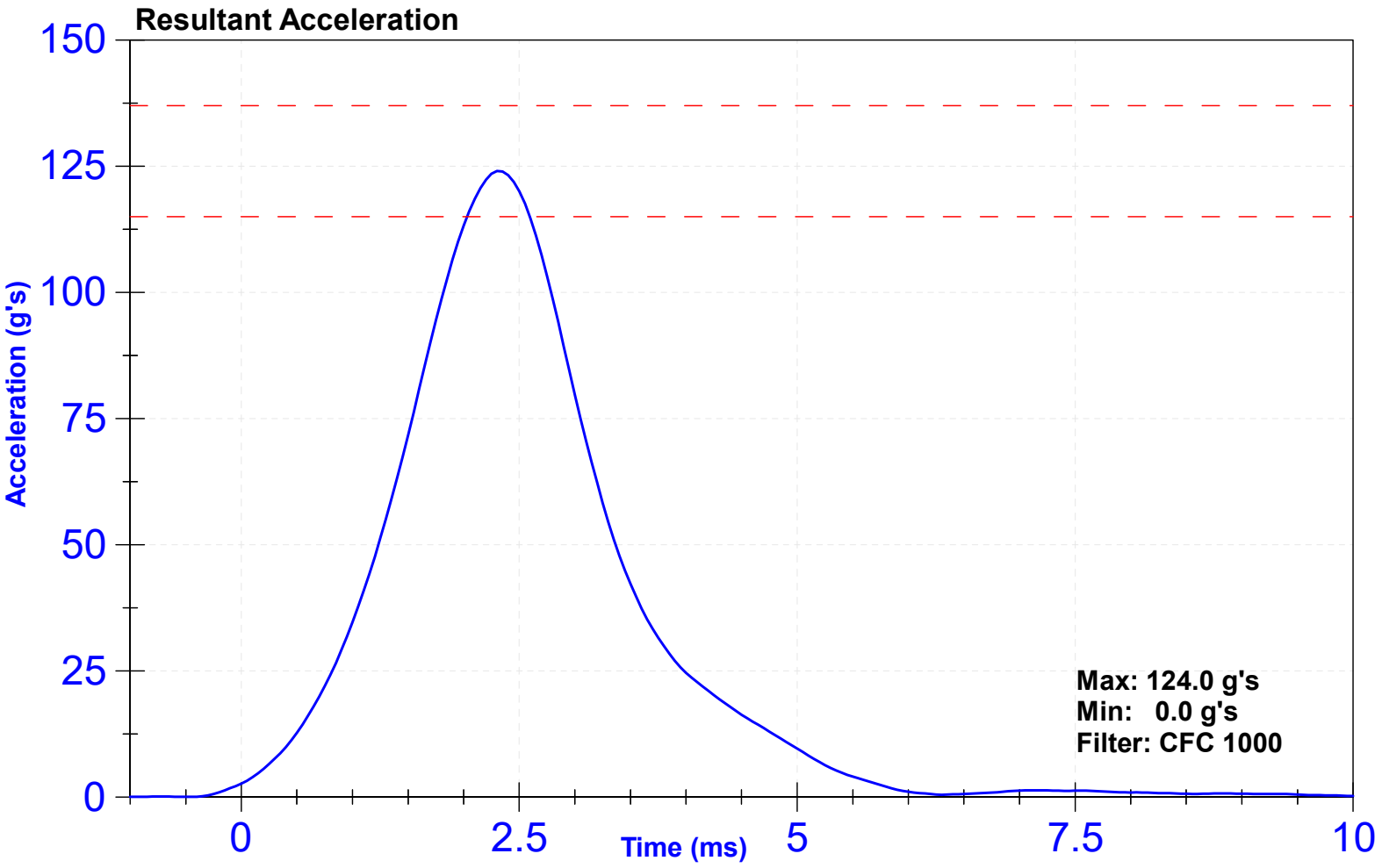
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

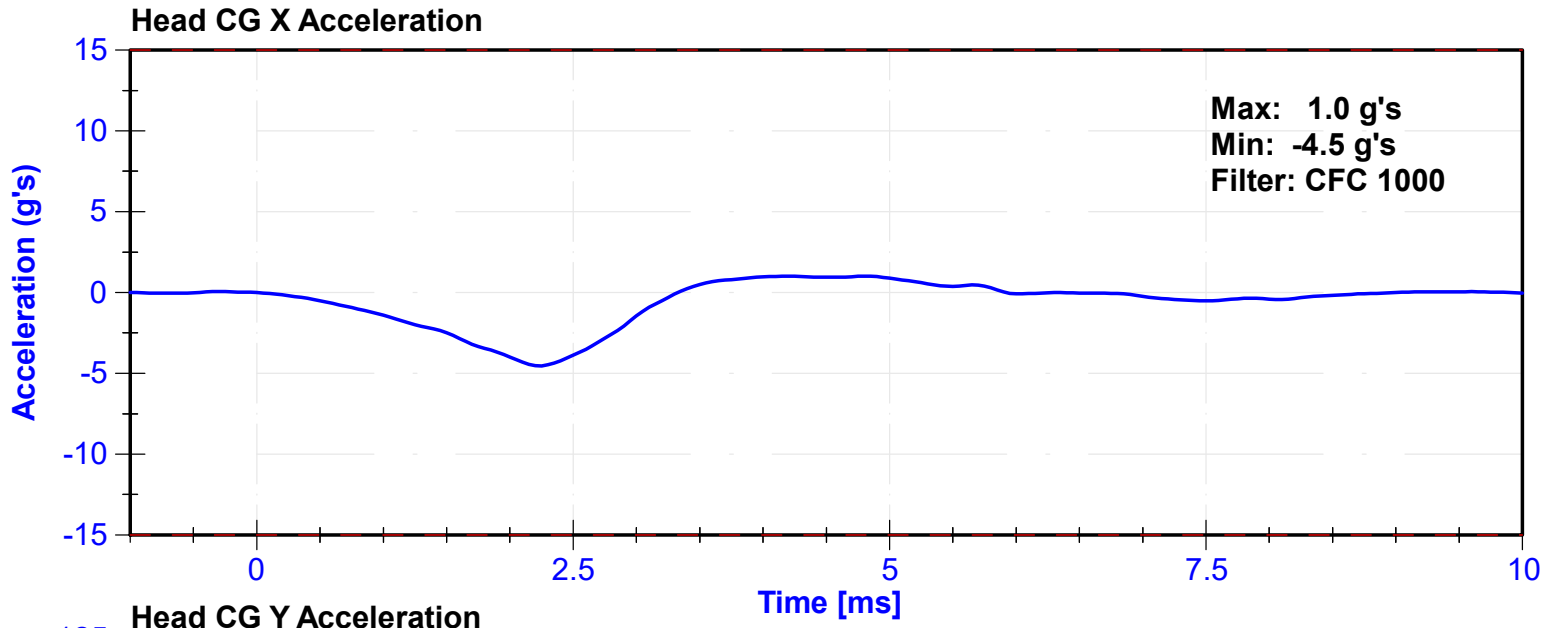
Results

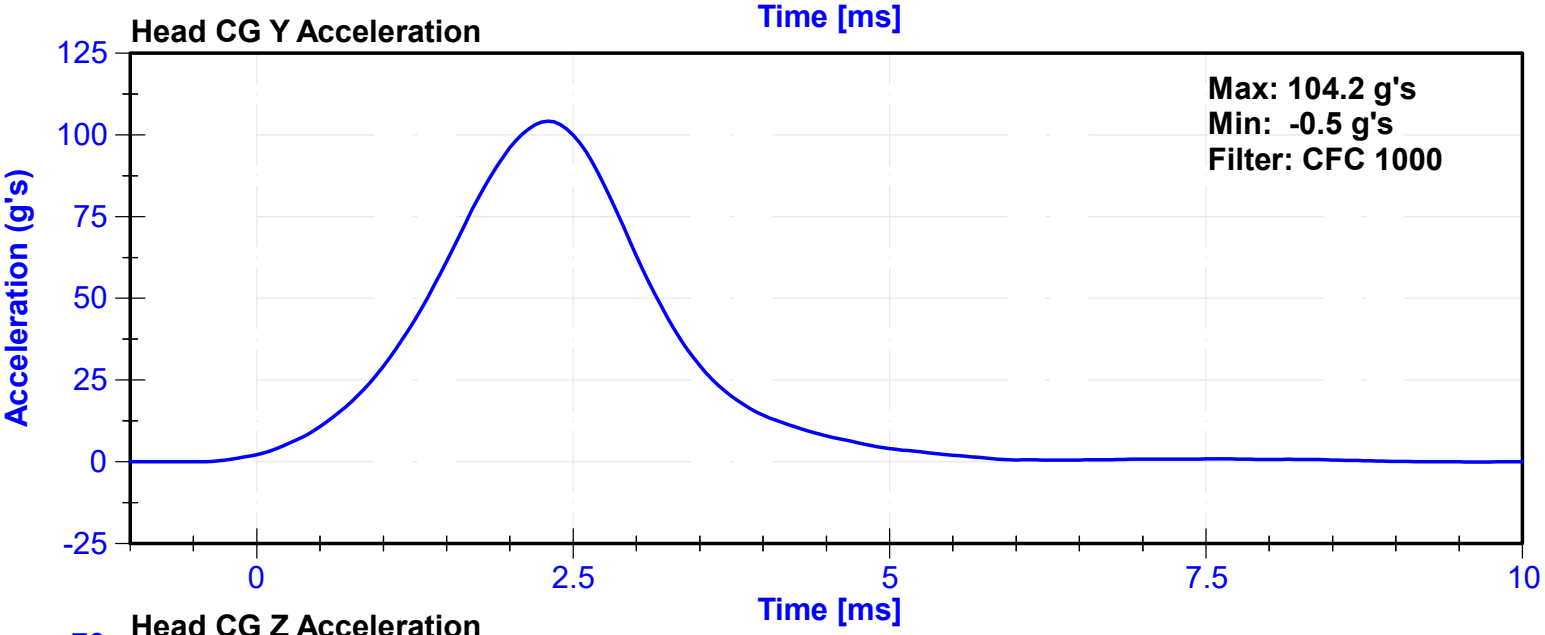
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	22.3	Pass
Resultant Acceleration	115	137	g's	124.0	Pass
Oscillation	0	15	%	1.0	Pass
Fore-Aft Acceleration	-15	15	g's	-4.5	Pass

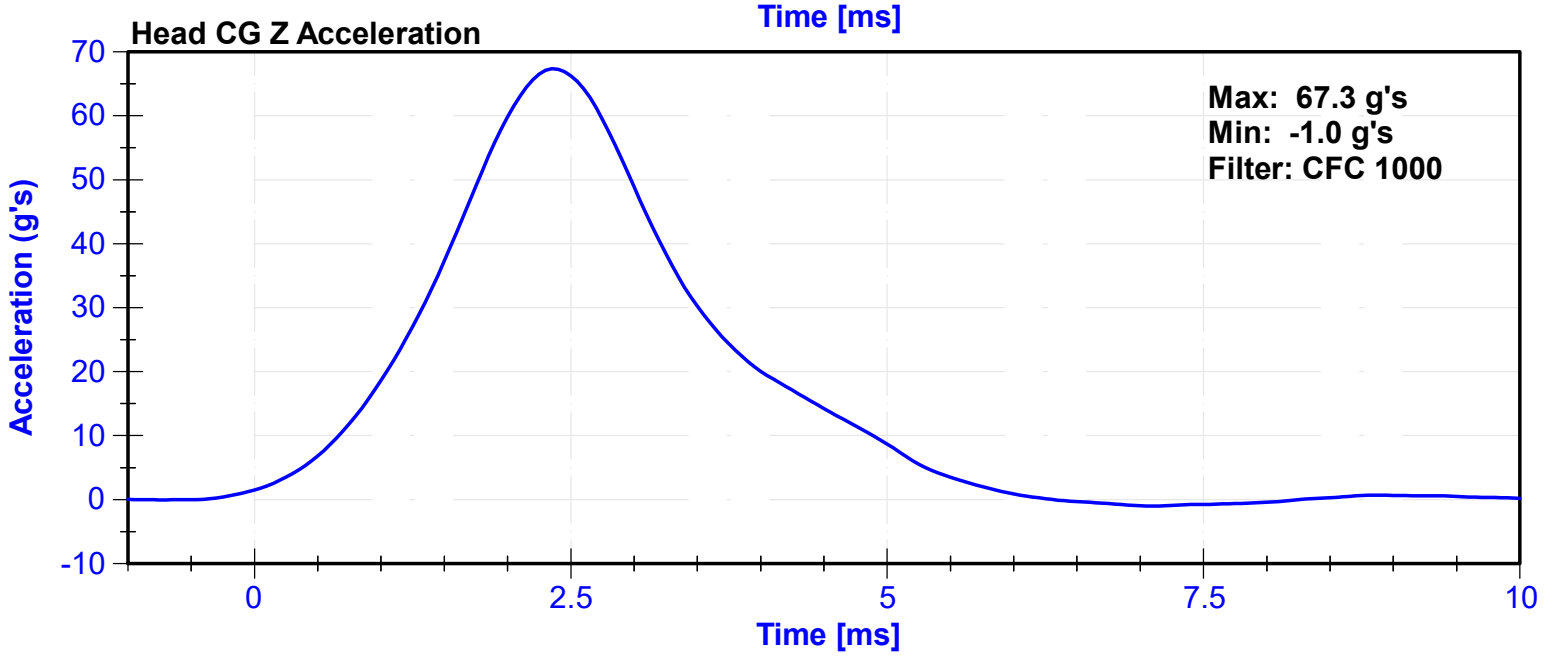
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P74788	12/12/2022	6/10/2023
Y Accelerometer	Endevco	P51668	12/12/2022	6/10/2023
Z Accelerometer	Endevco	P83319	12/12/2022	6/10/2023




Head CG X Acceleration
Max: 1.0 g's
Min: -4.5 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Y Acceleration
Max: 104.2 g's
Min: -0.5 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Z Acceleration
Max: 67.3 g's
Min: -1.0 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]

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

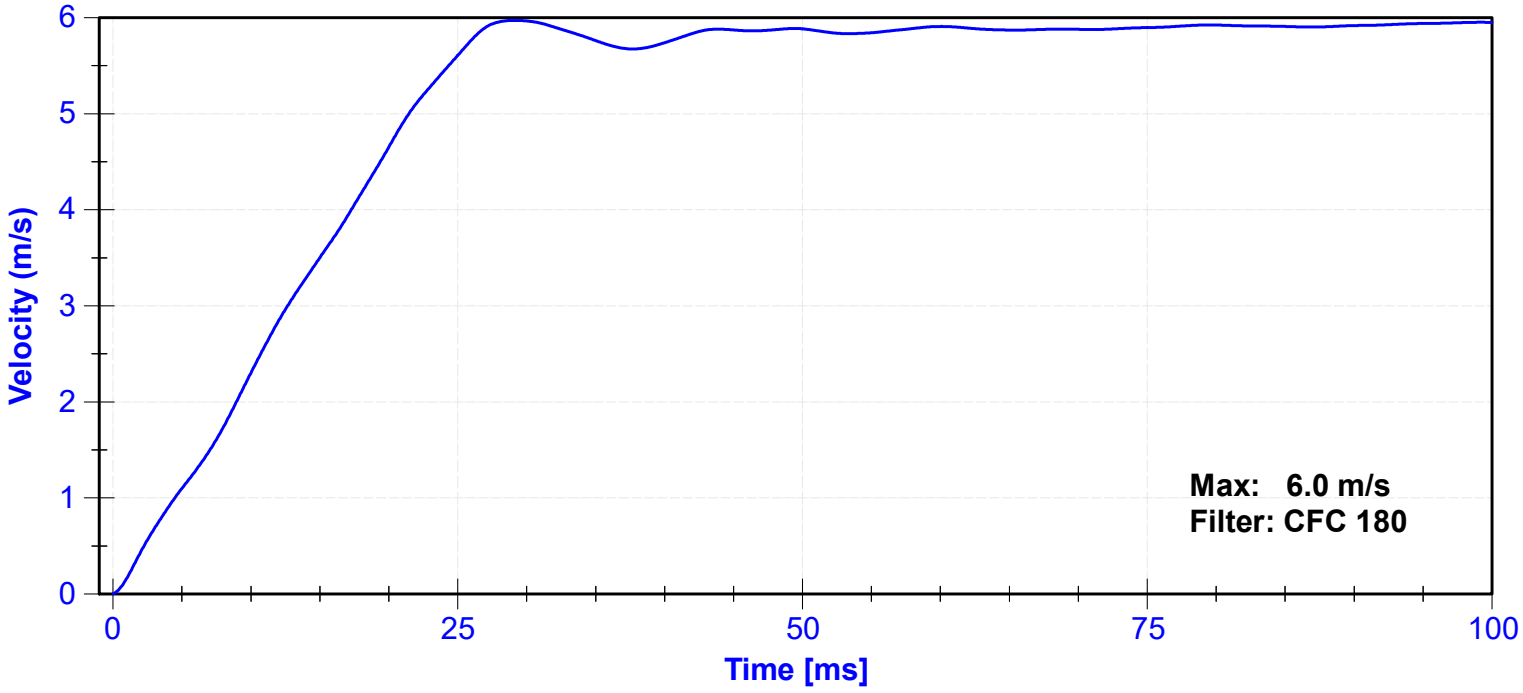
Results

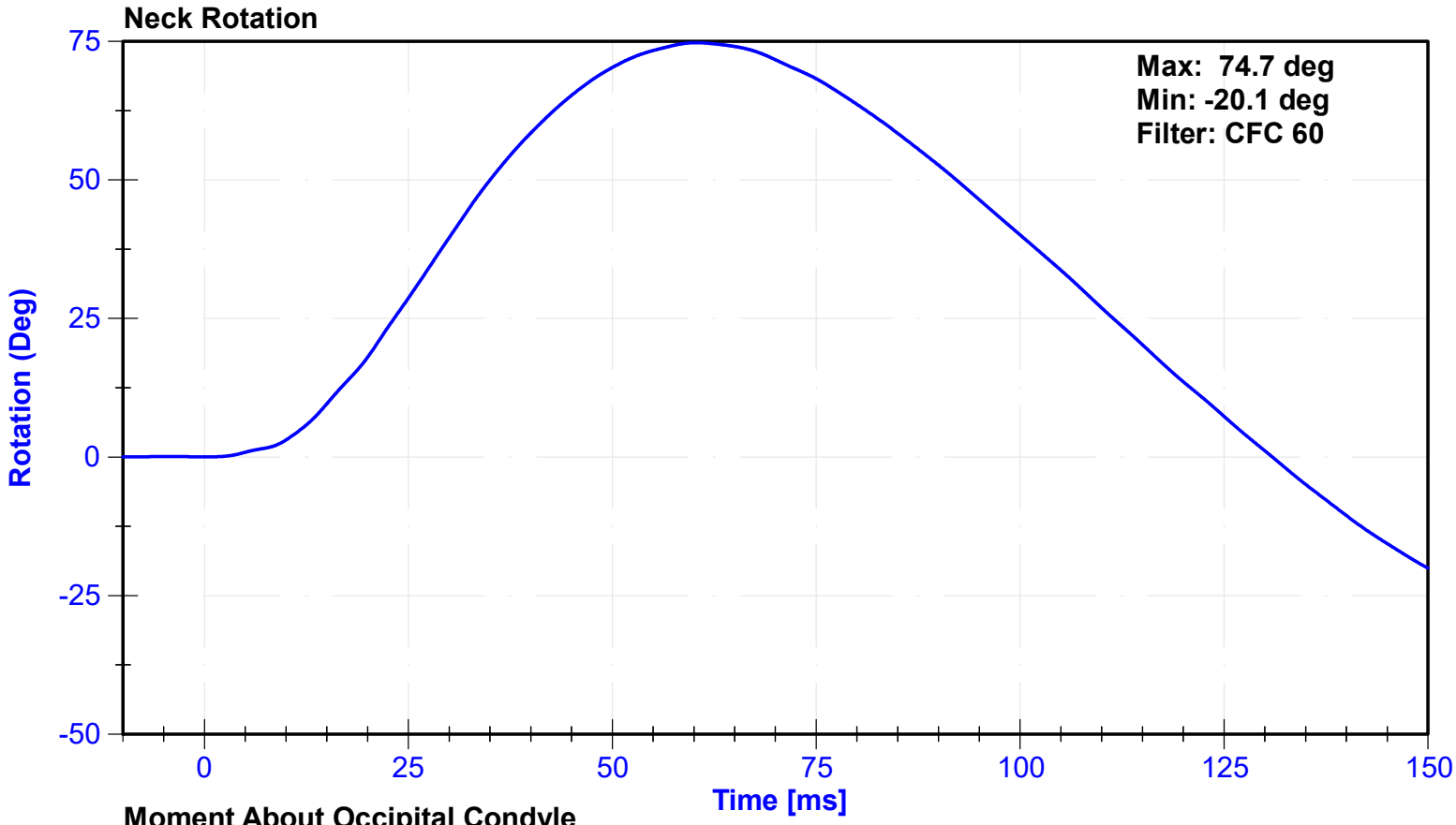
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	22.5	Pass
Velocity	5.51	5.63	m/s	5.530	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.30	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.50	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.65	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.61	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.97	Pass
Neck Rotation	71	81	deg	74.7	Pass
Time at Maximum Rotation	50	70	ms	60.3	Pass
Moment about the OC	36	44	Nm	43.2	Pass
Moment Decay to 0 Nm	102	126	ms	111.9	Pass

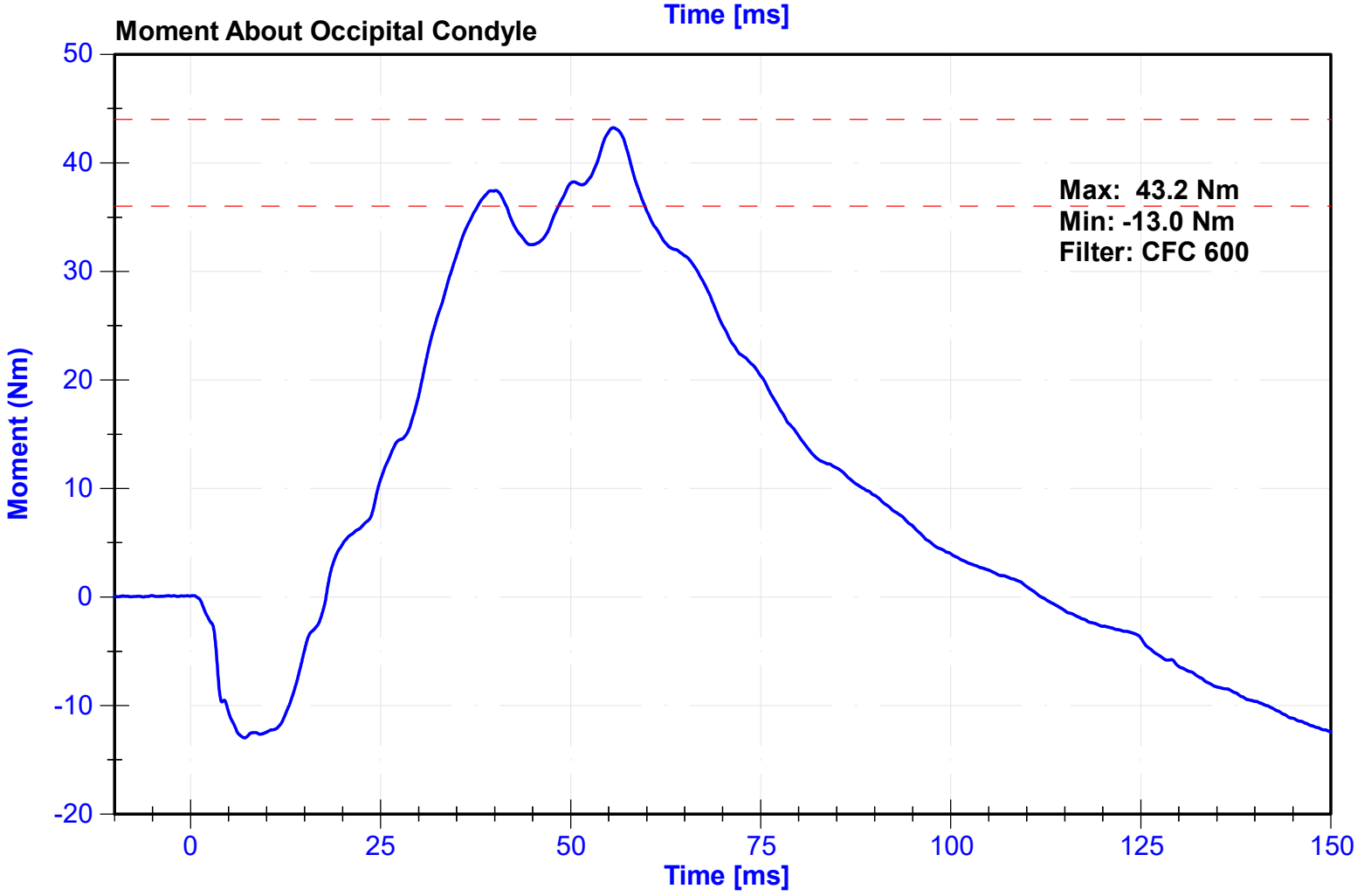
Transducer Calibrations

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: 74.7 deg
Min: -20.1 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: 43.2 Nm
Min: -13.0 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

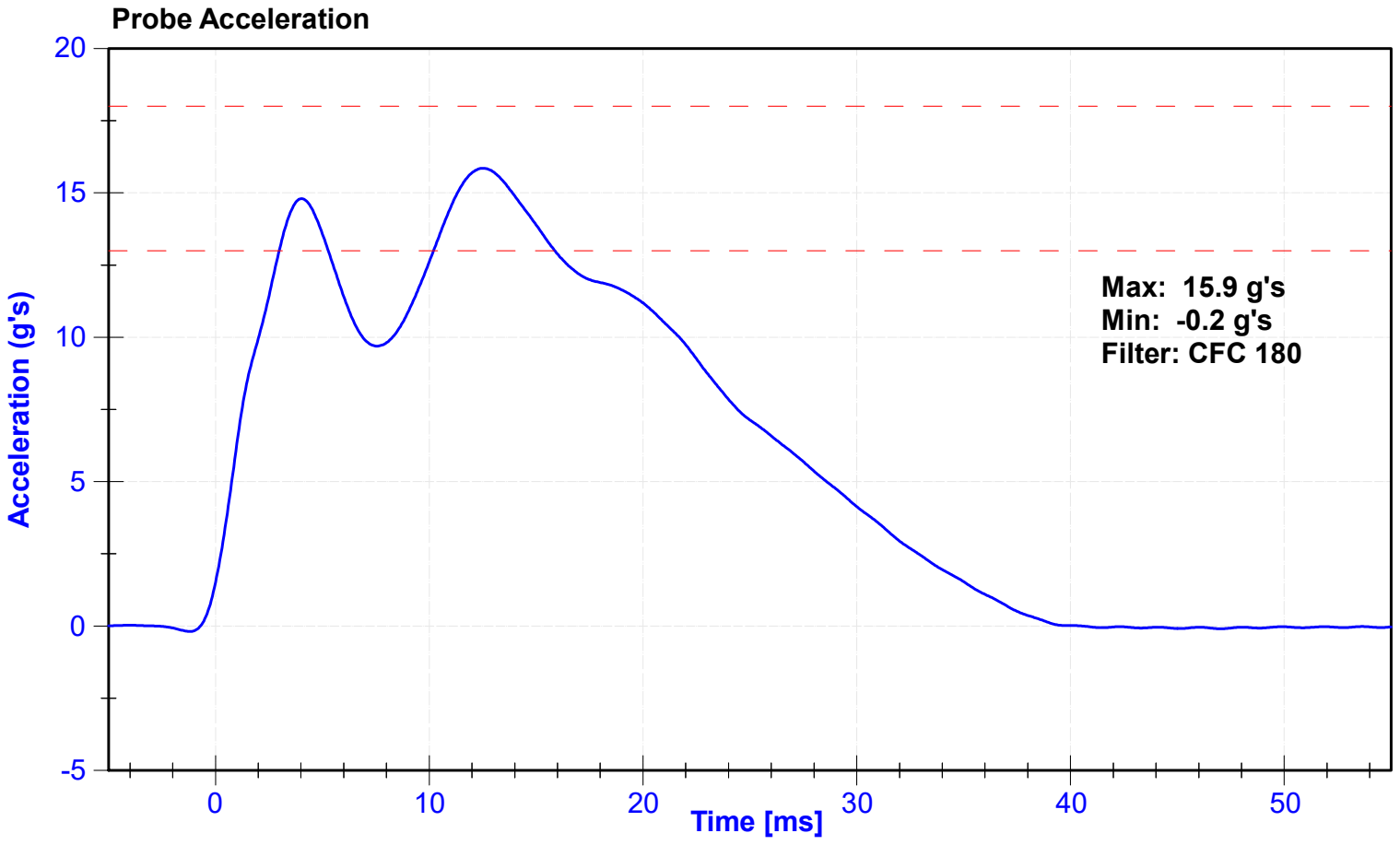
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

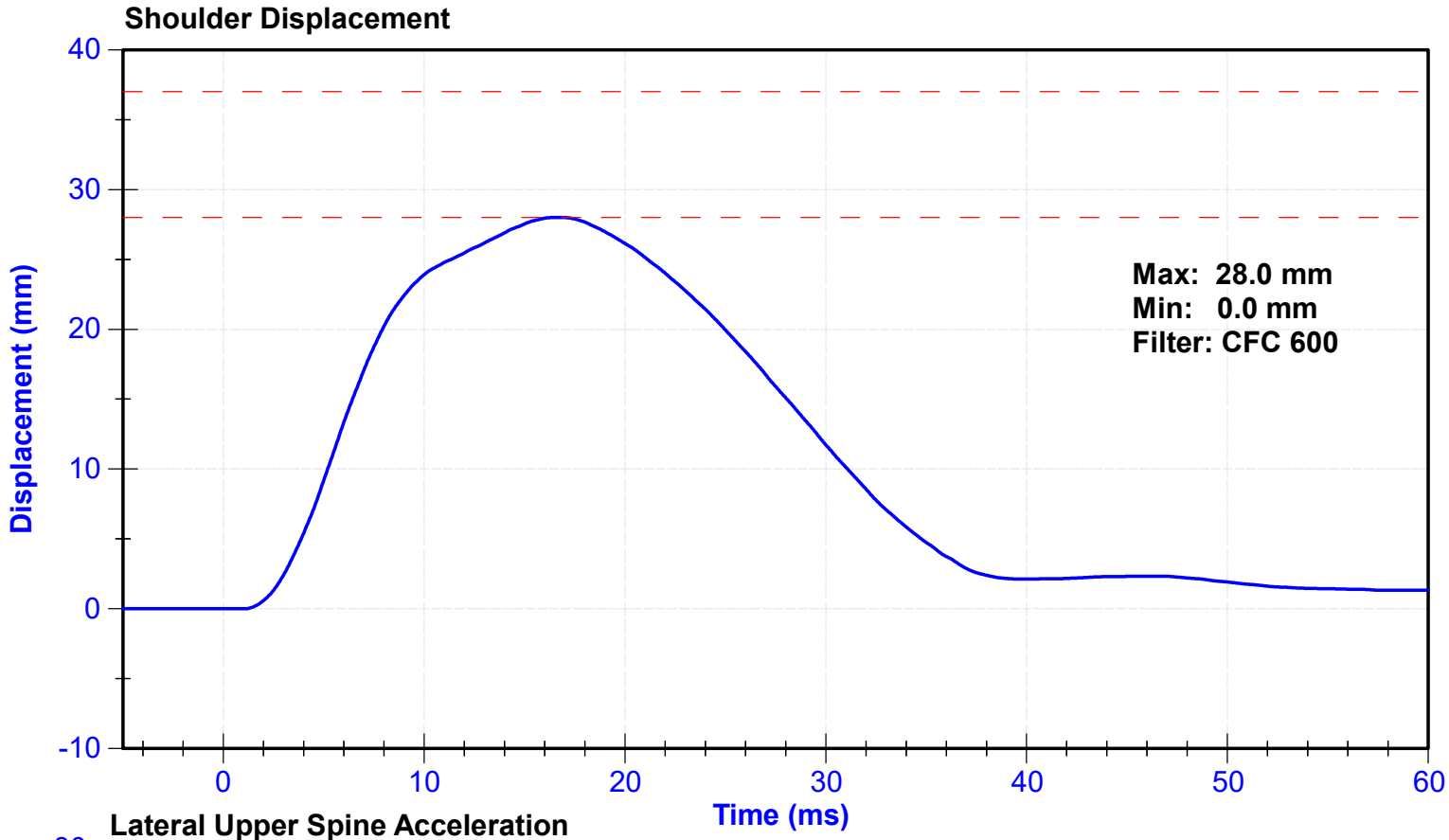
Results

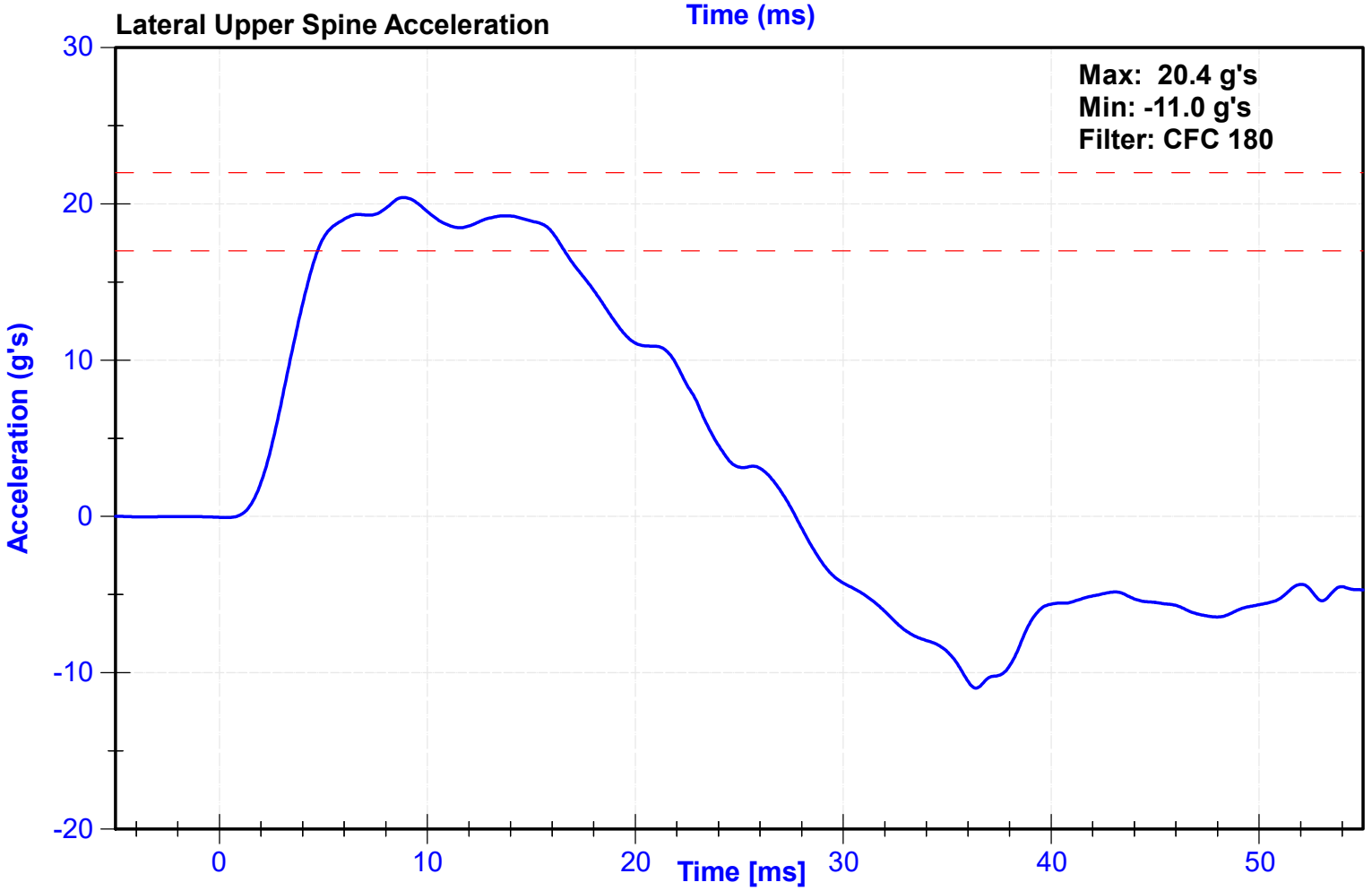
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	26.5	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	13	18	g's	15.9	Pass
Shoulder Deflection	28	37	mm	28.0	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Shoulder Potentiometer	Servo	1274GFE	12/13/2022	6/13/2023
Upper Spine Y Accelerometer	Endevco	P64148	12/12/2022	6/10/2023




Shoulder Displacement
Displacement (mm)
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time (ms)
Max: 28.0 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 20.4 g's
Min: -11.0 g's
Filter: CFC 180

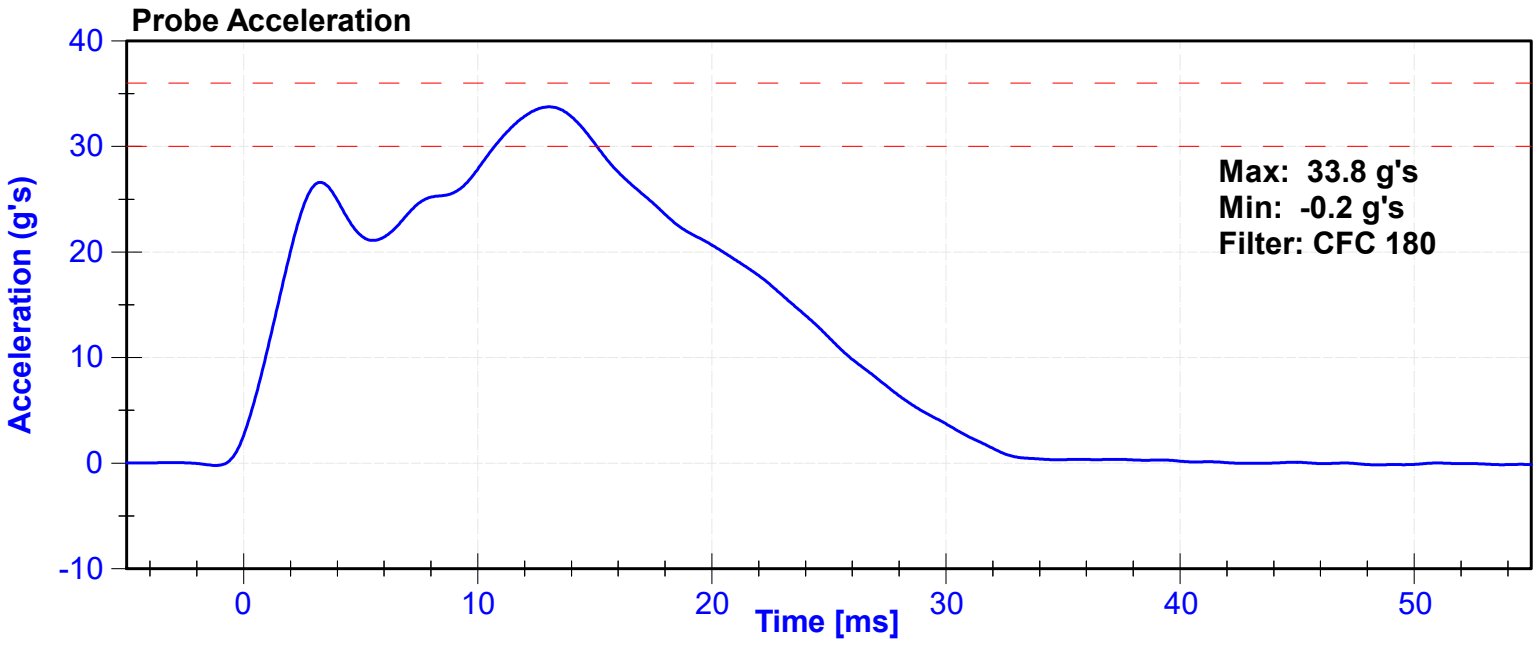
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

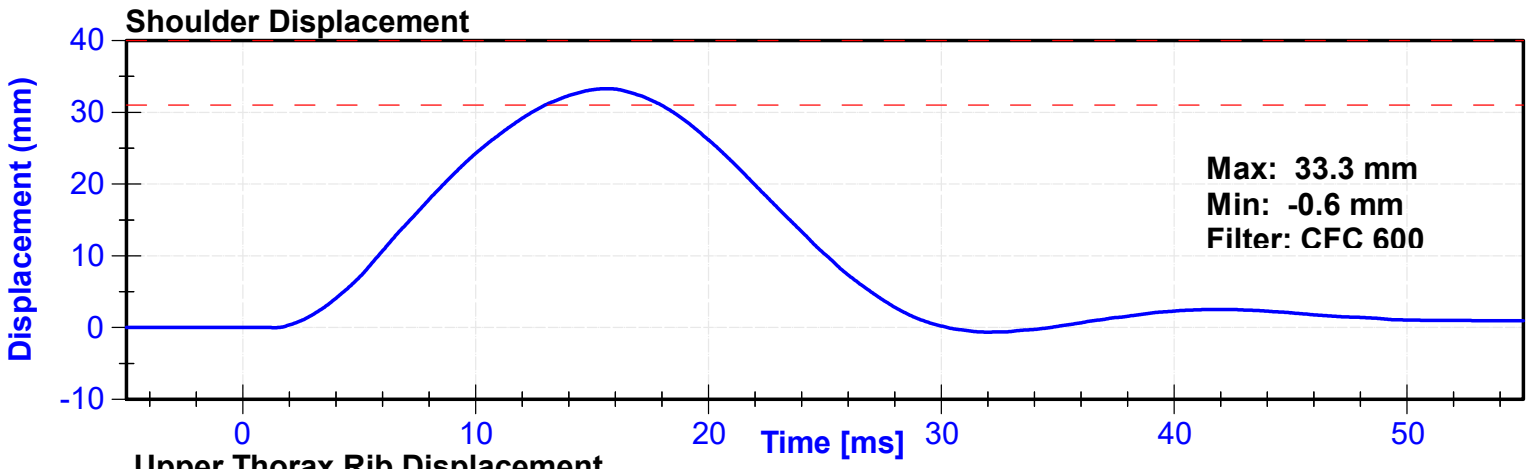
Results

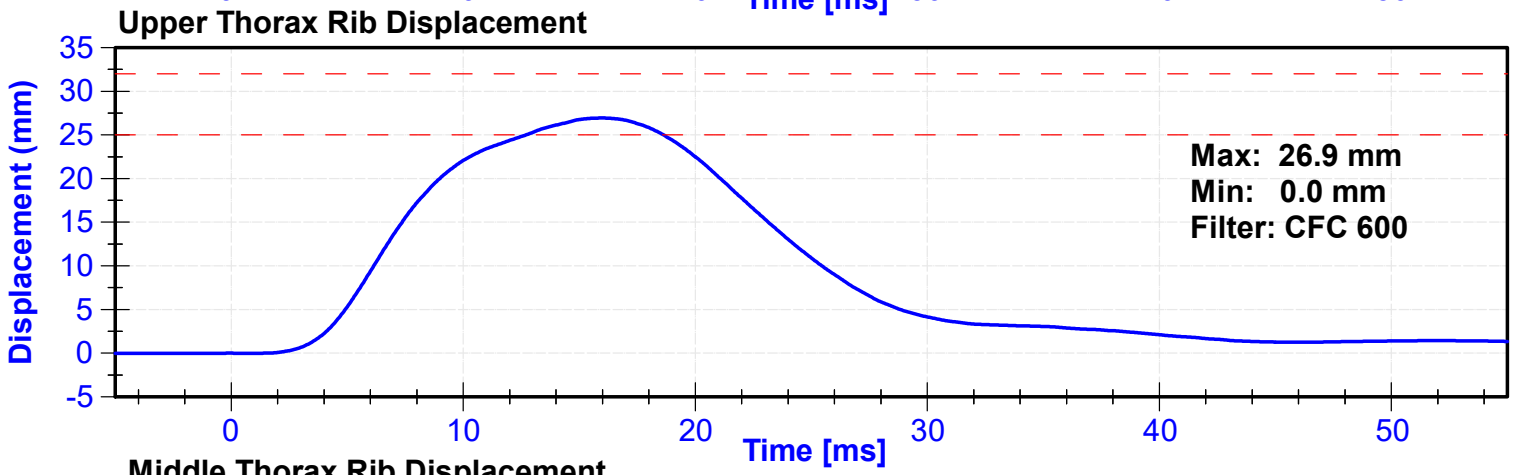
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	26.5	Pass
Velocity	6.6	6.8	m/s	6.70	Pass
Probe Acceleration after 5 ms	30	36	g's	33.8	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.4	Pass
Lateral Lower Spine Acceleration	29	37	g's	34.6	Pass
Shoulder Deflection	31	40	mm	33.3	Pass
Upper Thorax Rib Deflection	25	32	mm	26.9	Pass
Mid Thorax Rib Deflection	30	36	mm	30.4	Pass
Lower Thorax Rib Deflection	32	38	mm	32.4	Pass

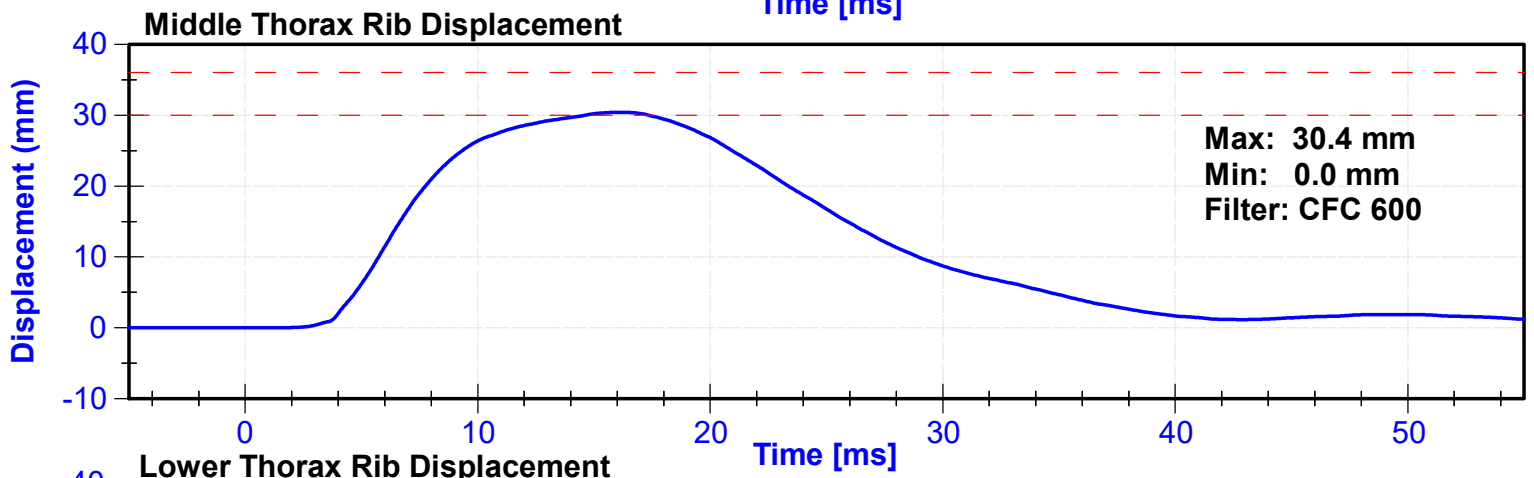
Transducer Calibrations

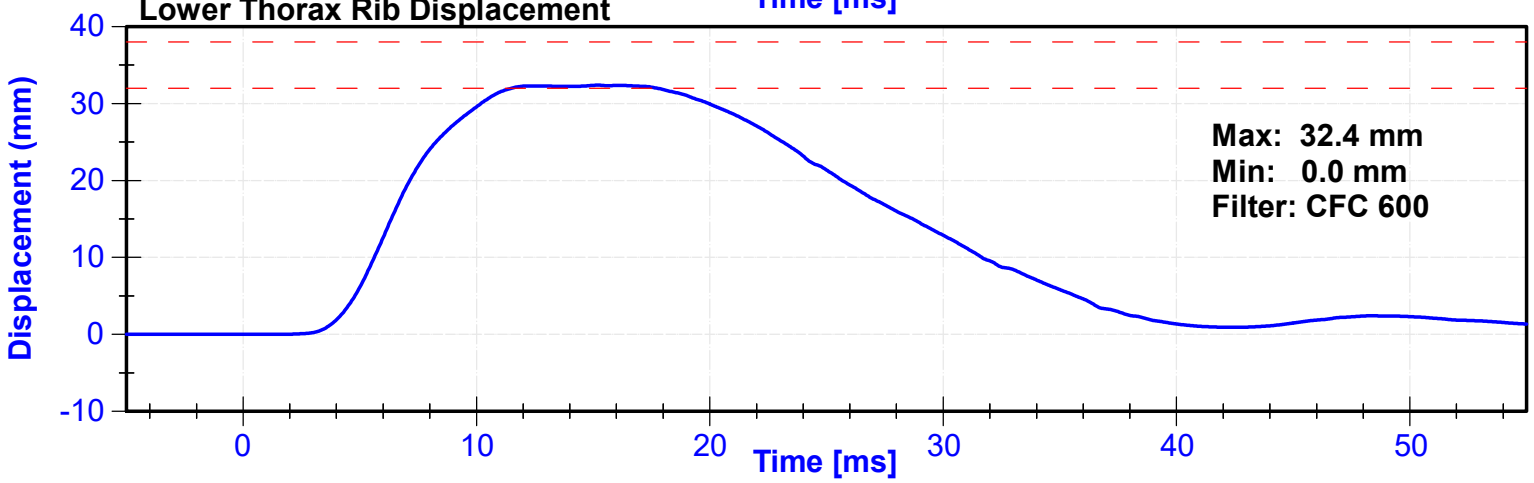
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Upper Spine T1 Y Accelerometer	Endevco	P64148	12/12/2022	6/10/2023
Upper Spine T12 Y Accelerometer	Endevco	P51327	12/12/2022	6/10/2023
Shoulder Potentiometer	Servo	1274GFE	12/13/2022	6/13/2023
Upper Thorax Rib Potentiometer	Servo	1199GFE	12/13/2022	6/13/2023
Middle Thorax Rib Potentiometer	Servo	1246GFE	12/13/2022	6/13/2023
Lower Thorax Rib Potentiometer	Servo	011GFE	12/13/2022	6/13/2023

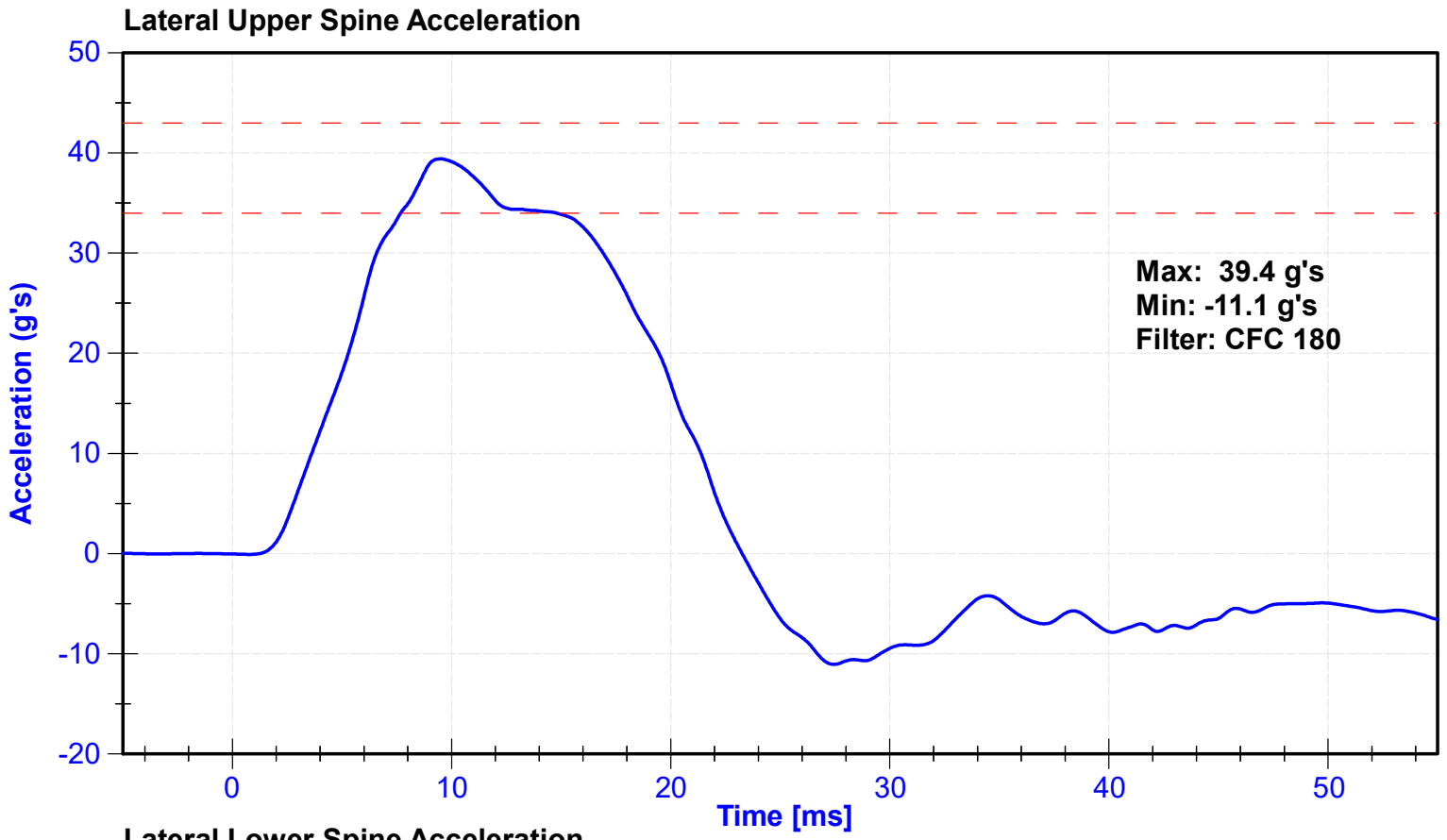


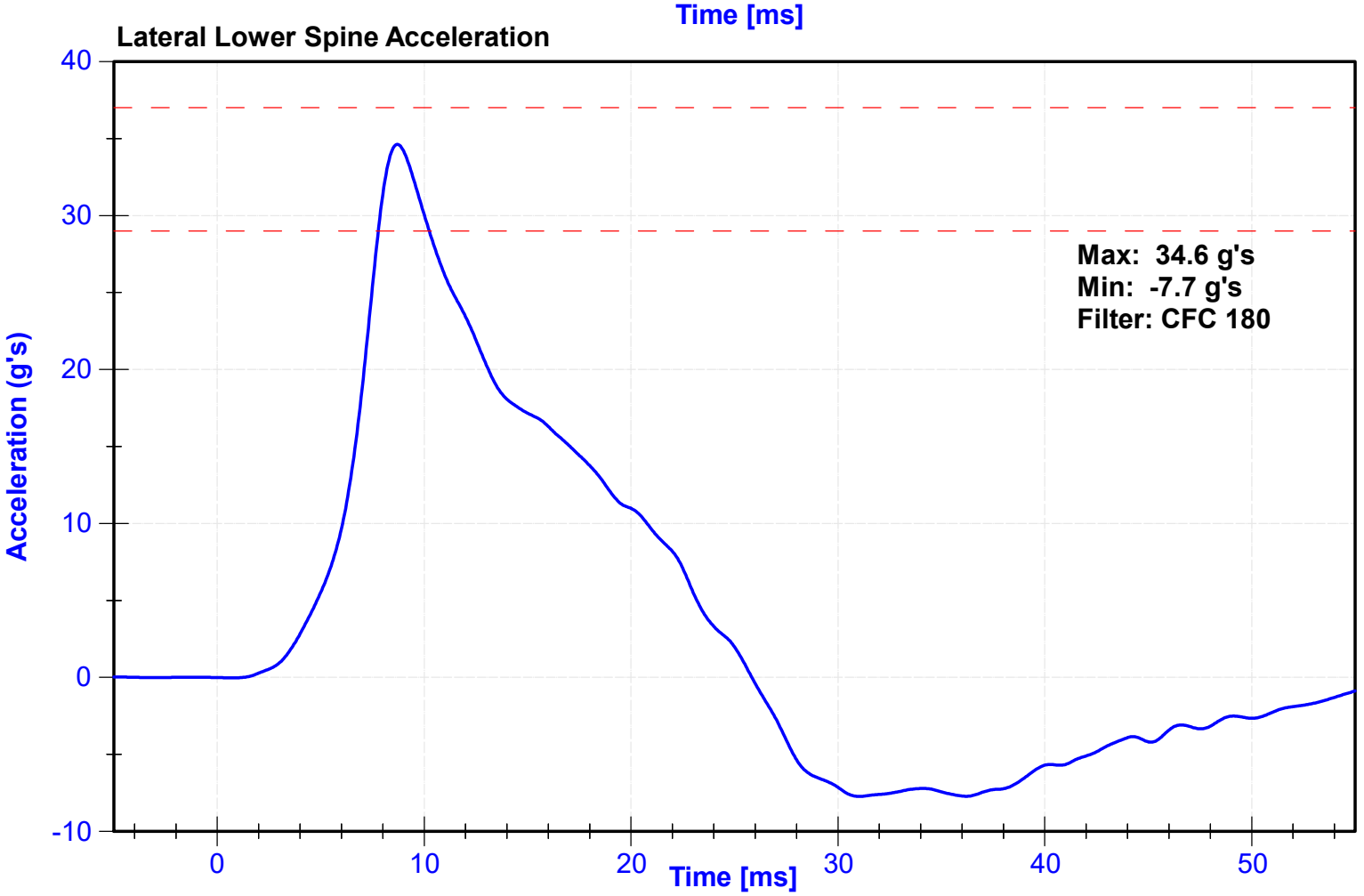

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 33.3 mm
Min: -0.6 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 26.9 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 30.4 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.4 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 39.4 g's
Min: -11.1 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 34.6 g's
Min: -7.7 g's
Filter: CFC 180

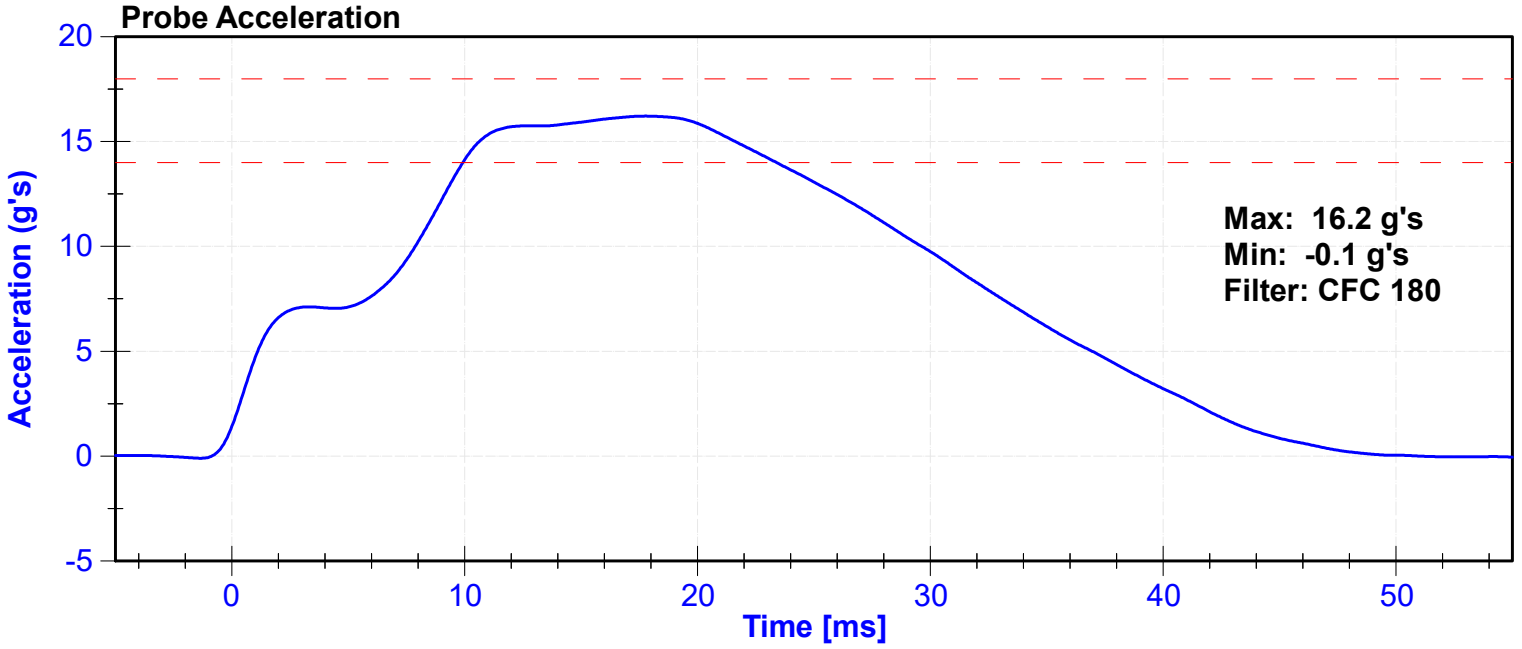
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

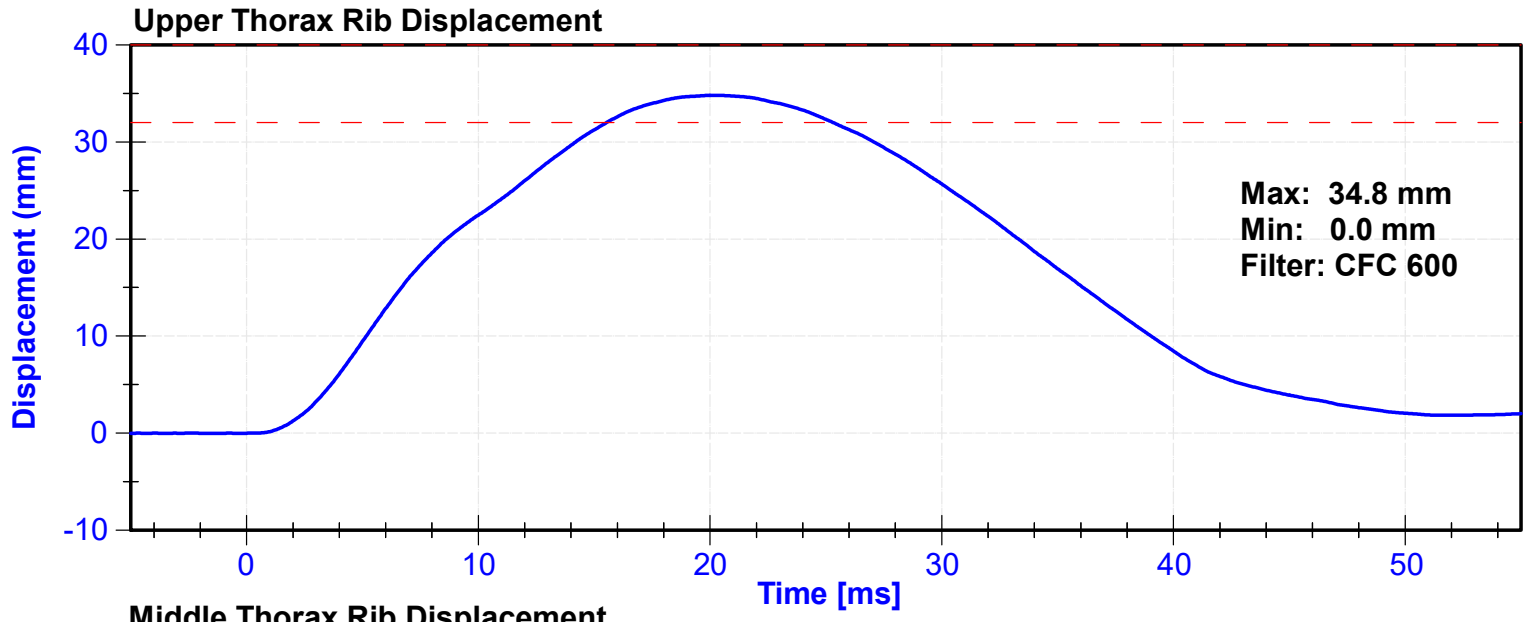
Results

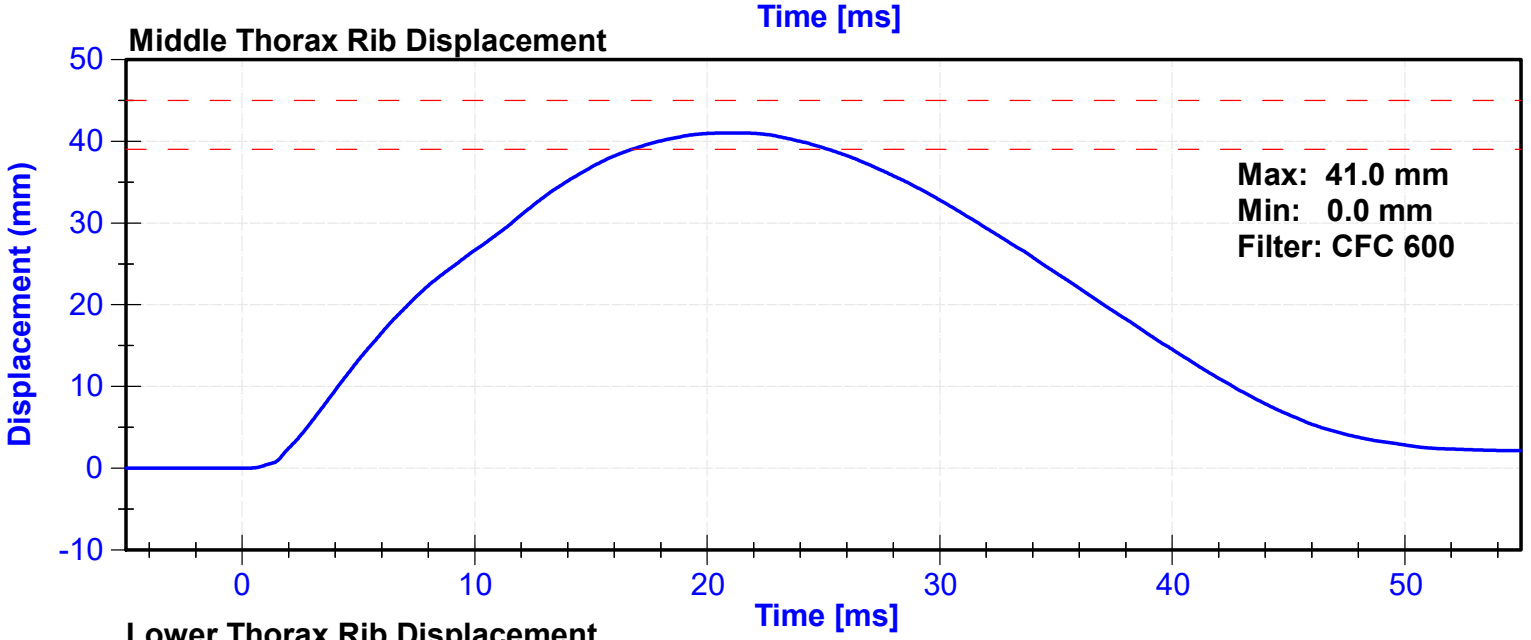
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	26.5	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	14	18	g's	16.2	Pass
Lateral Upper Spine Acceleration	13	17	g's	16.2	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.8	Pass
Upper Thorax Rib Deflection	32	40	mm	34.8	Pass
Middle Thorax Rib Deflection	39	45	mm	41.0	Pass
Lower Thorax Rib Deflection	35	43	mm	39.9	Pass

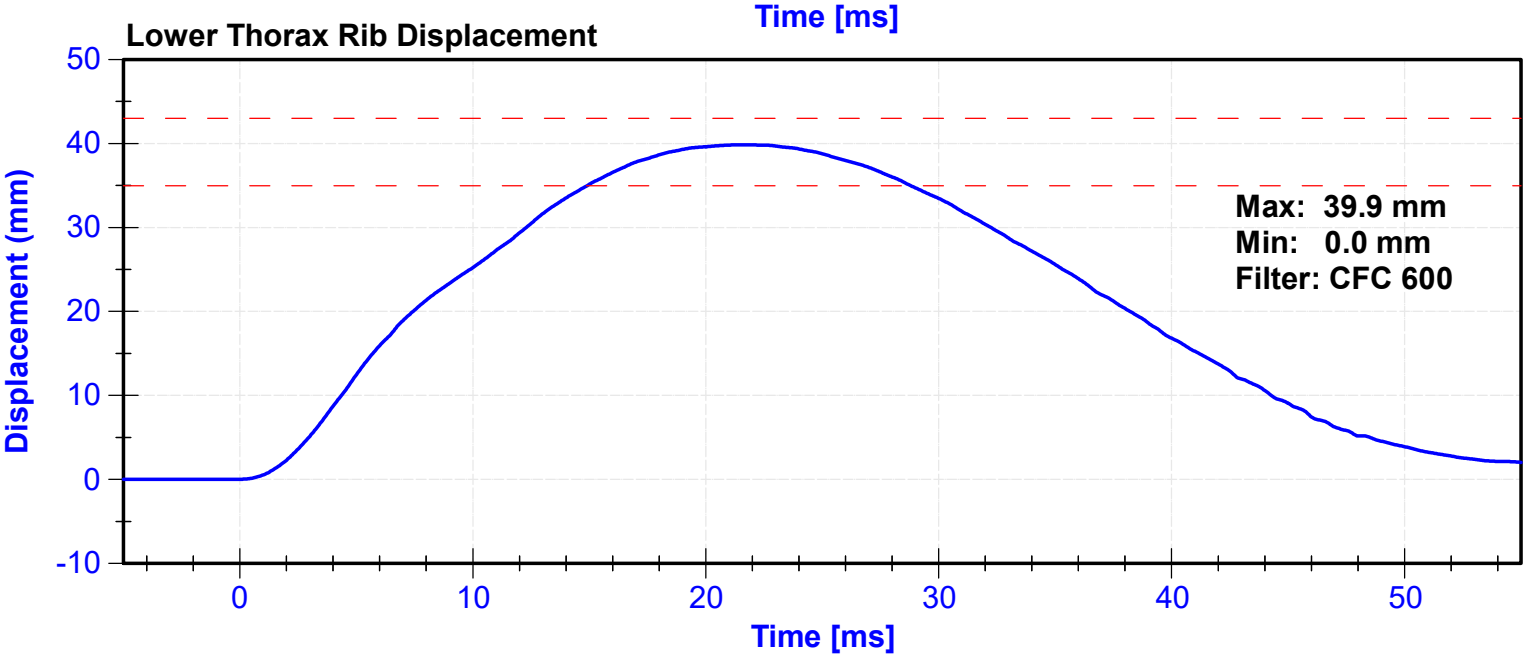
Transducer Calibrations

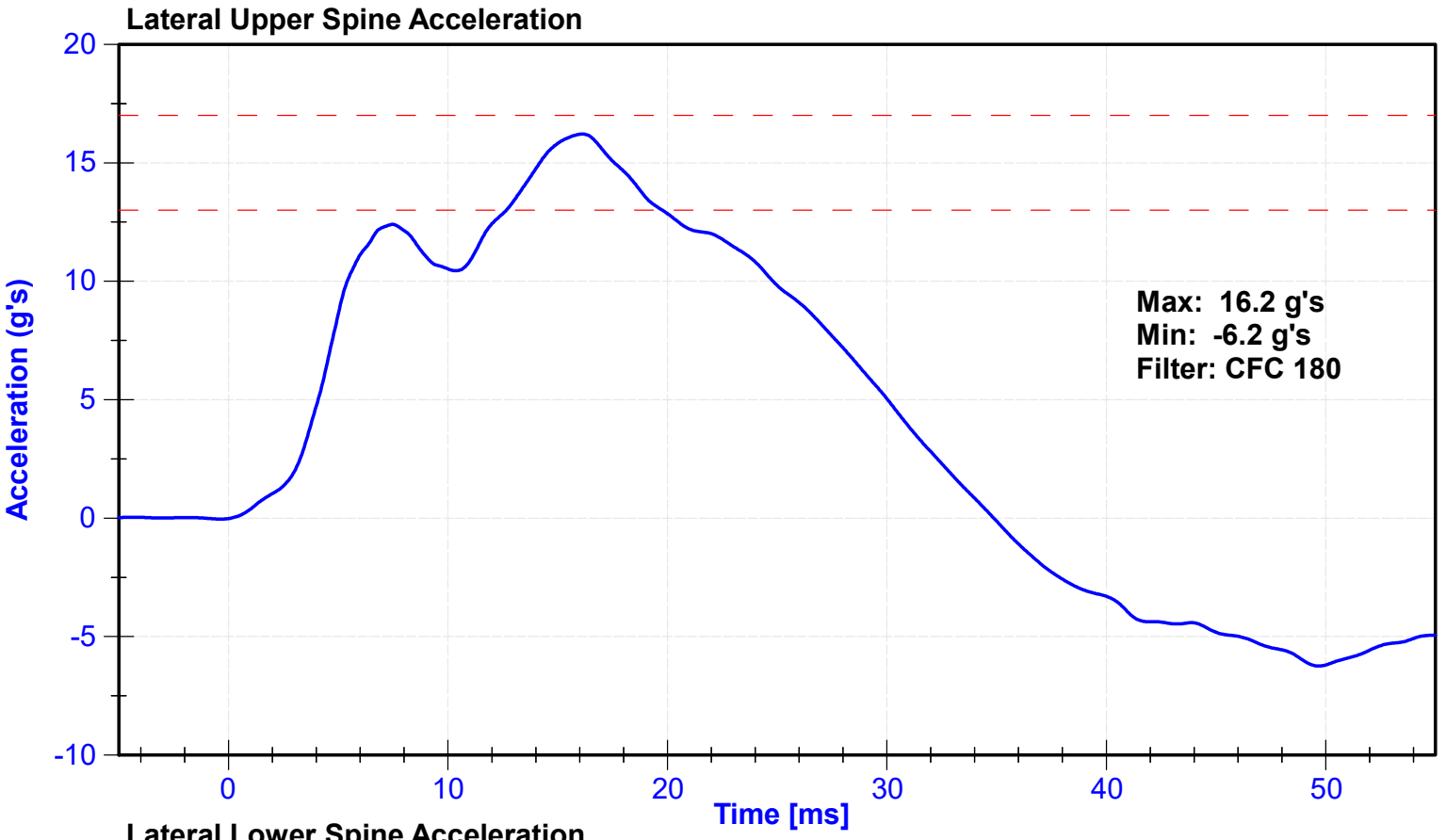
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Upper Spine Y Accelerometer	Endevco	P64148	12/12/2022	6/10/2023
Lower Spine Y Accelerometer	Endevco	P51327	12/12/2022	6/10/2023
Upper Thorax Rib Potentiometer	Servo	1199GFE	12/13/2022	6/13/2023
Middle Thorax Rib Potentiometer	Servo	1246GFE	12/13/2022	6/13/2023
Lower Thorax Rib Potentiometer	Servo	011GFE	12/13/2022	6/13/2023

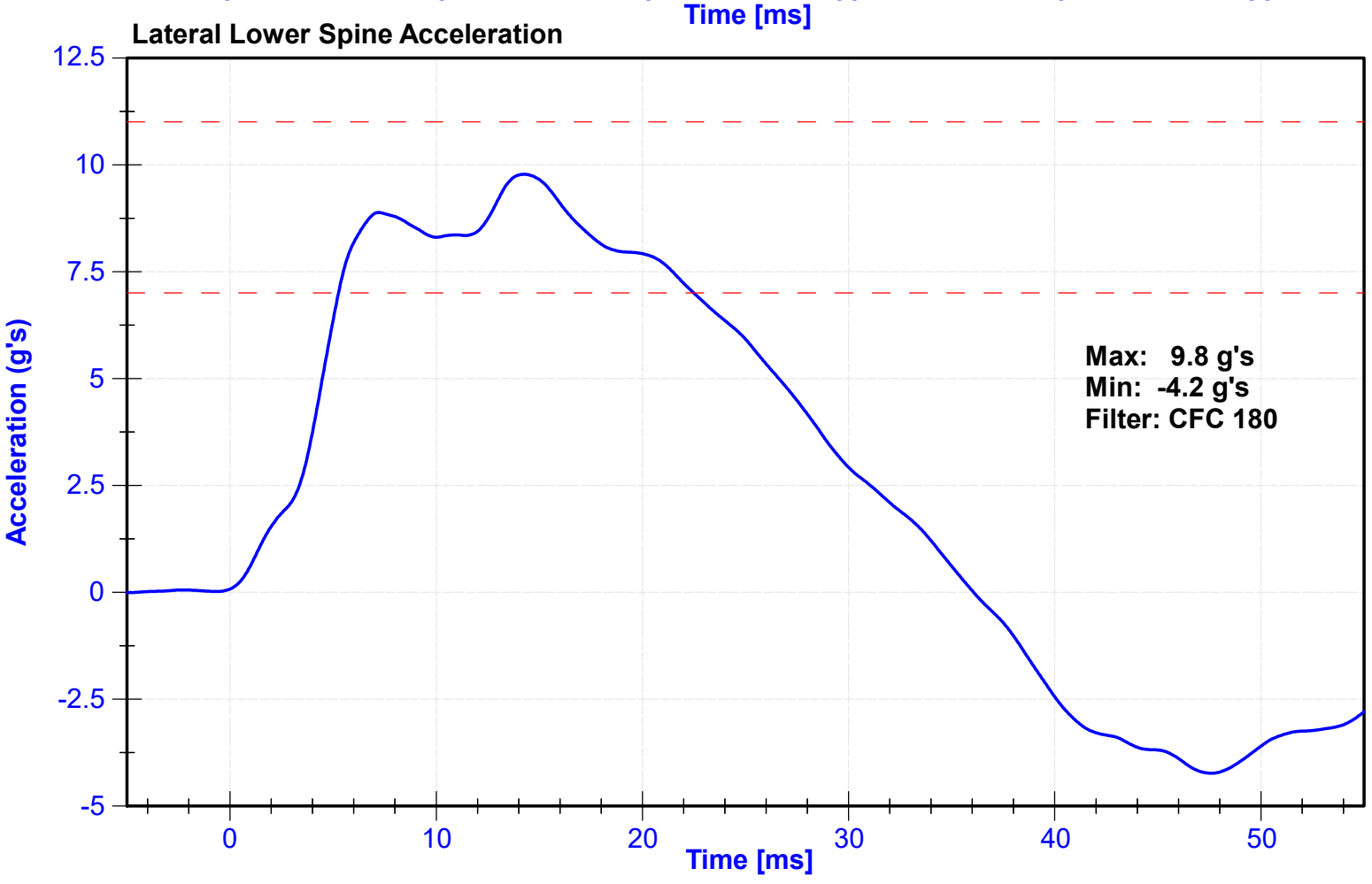



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 34.8 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.0 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 39.9 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 16.2 g's
Min: -6.2 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 9.8 g's
Min: -4.2 g's
Filter: CFC 180

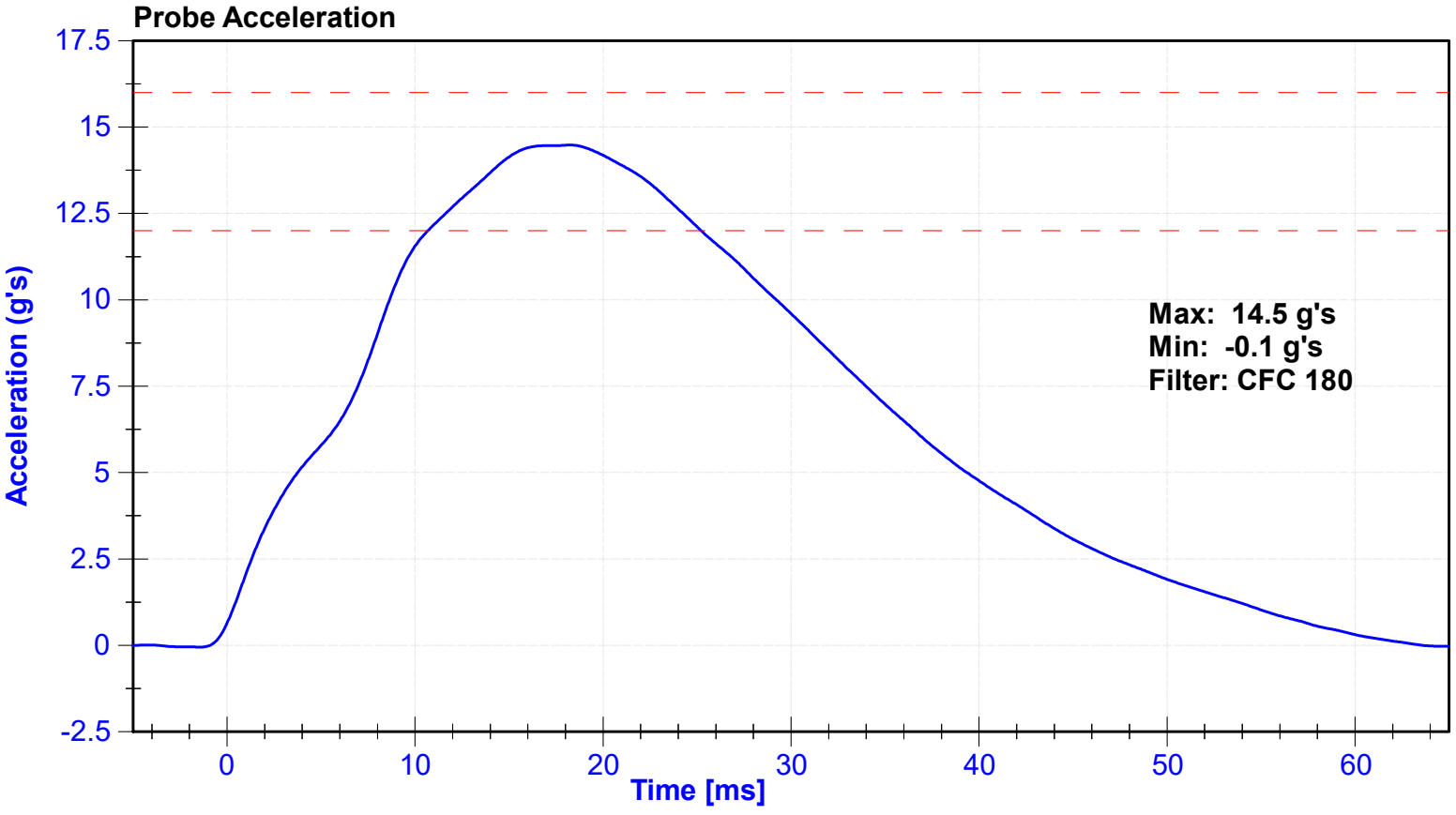
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

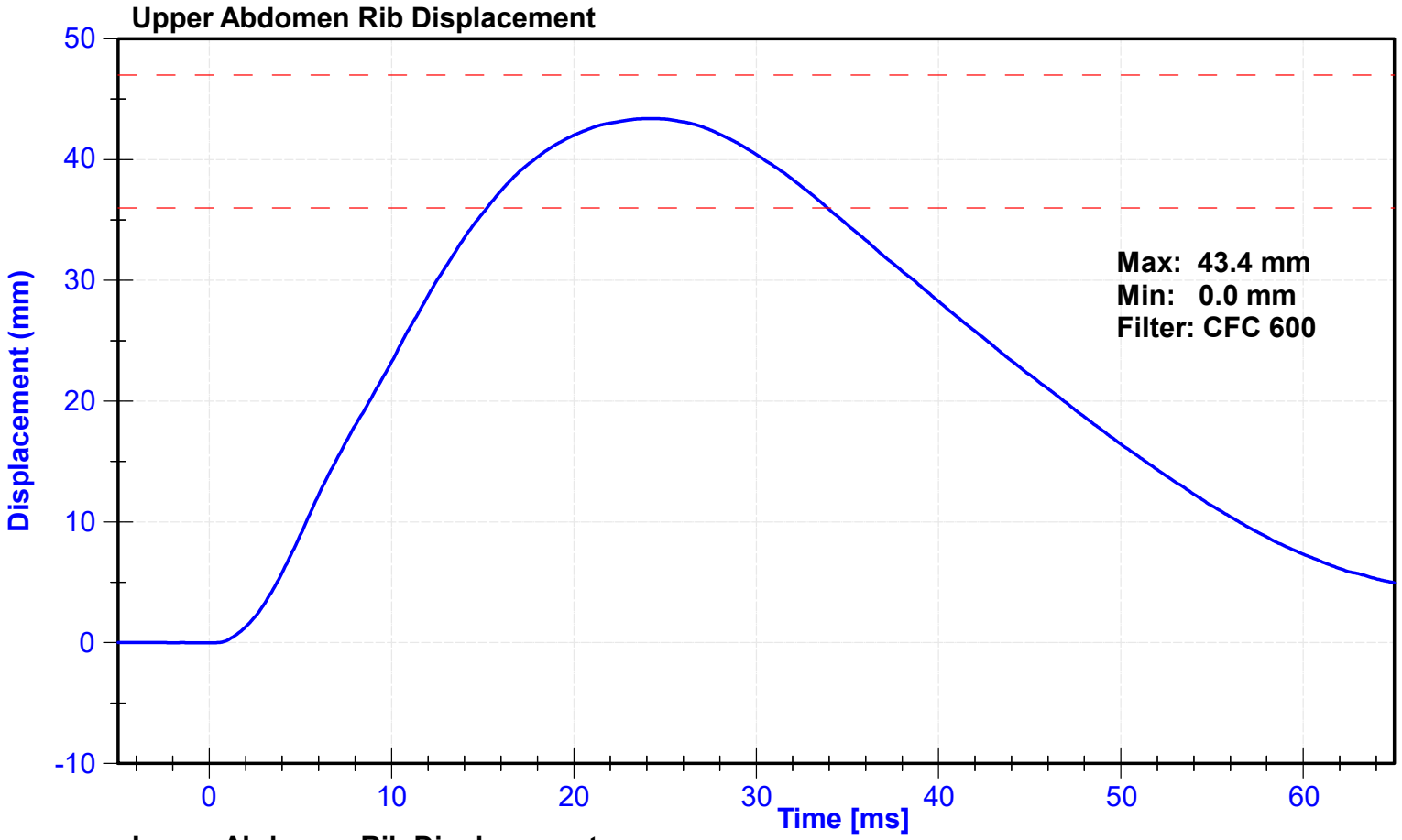
Results

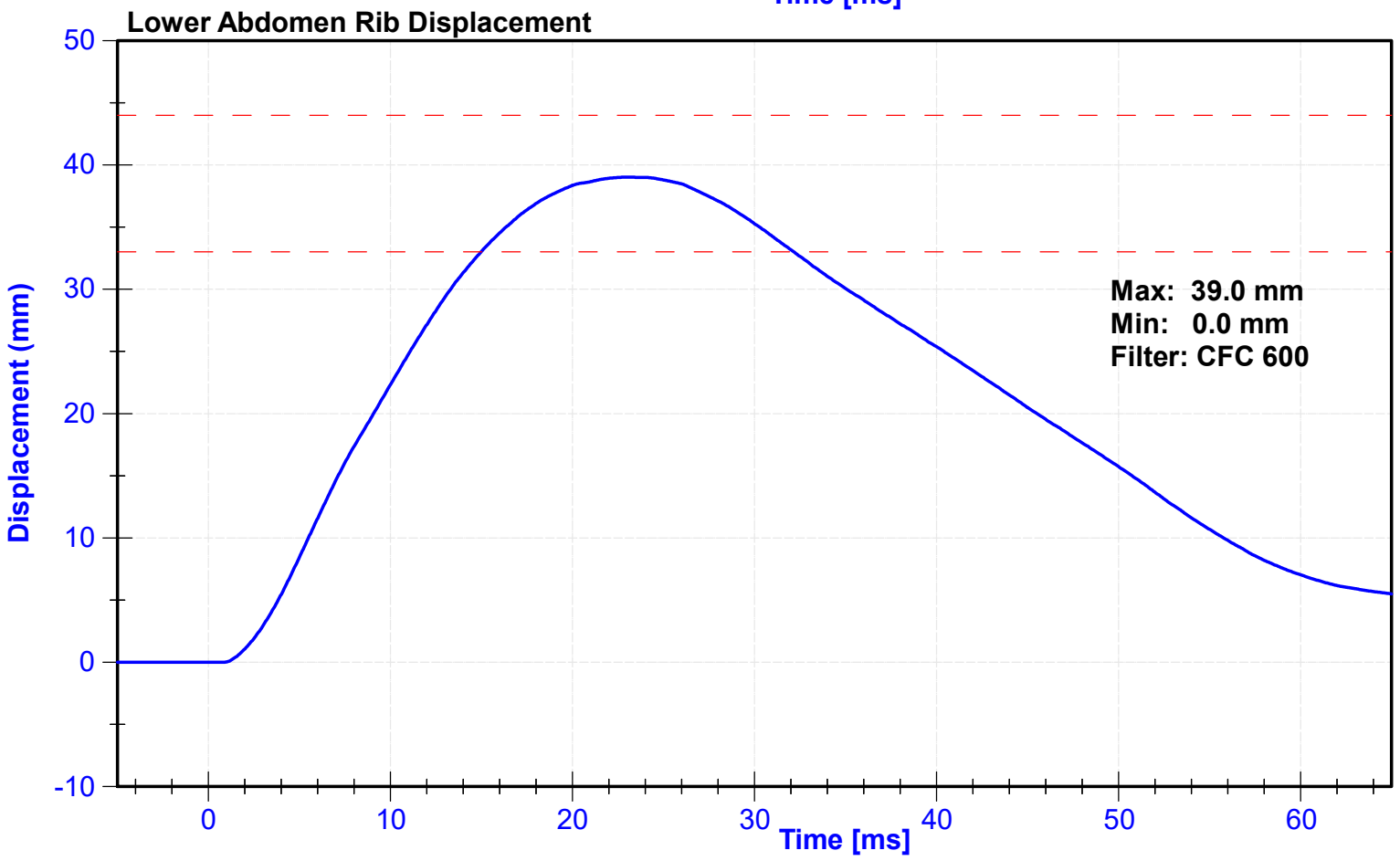
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	26.5	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	12	16	g's	14.5	Pass
Lateral Lower Spine Acceleration	9	14	g's	11.0	Pass
Upper Abdomen Rib Deflection	36	47	mm	43.4	Pass
Lower Abdomen Rib Deflection	33	44	mm	39.0	Pass

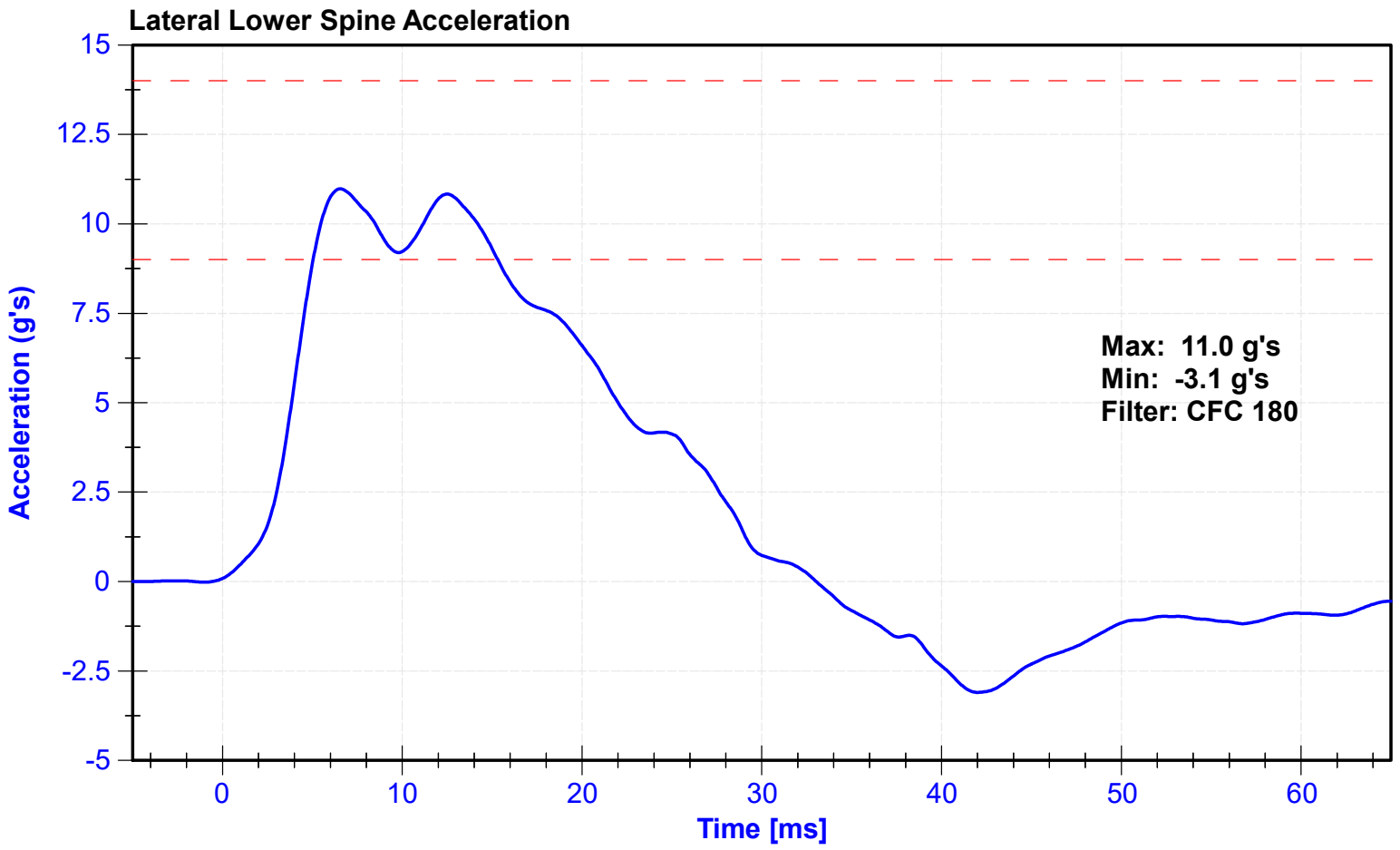
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Lower Spine Y Accelerometer	Endevco	P51327	12/12/2022	6/10/2023
Upper Abdomen Rib Potentiometer	Servo	008GFE	12/13/2022	6/13/2023
Lower Abdomen Rib Potentiometer	Servo	041 GFE	12/13/2022	6/13/2023




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 43.4 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: 39.0 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: 11.0 g's
Min: -3.1 g's
Filter: CFC 180

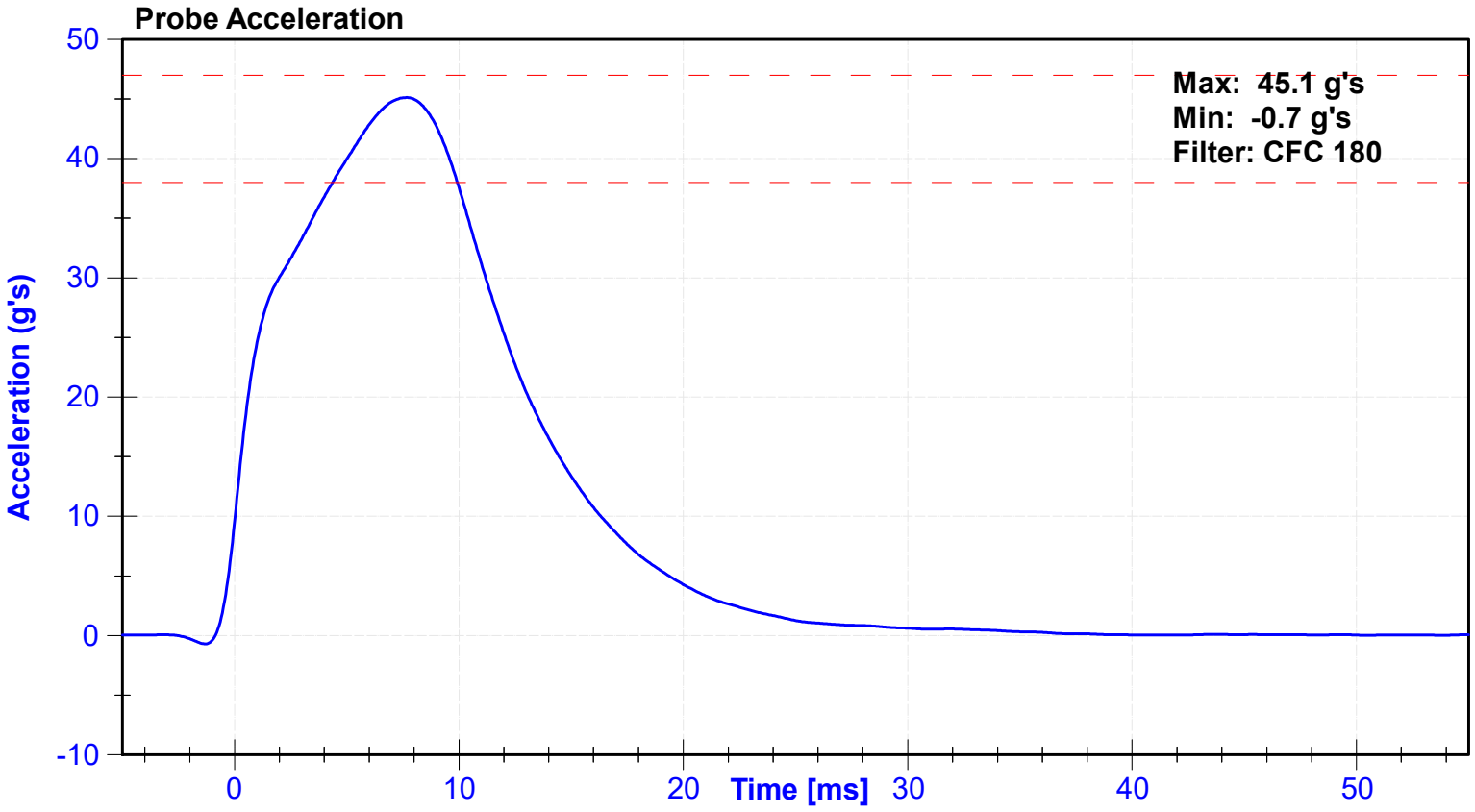
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

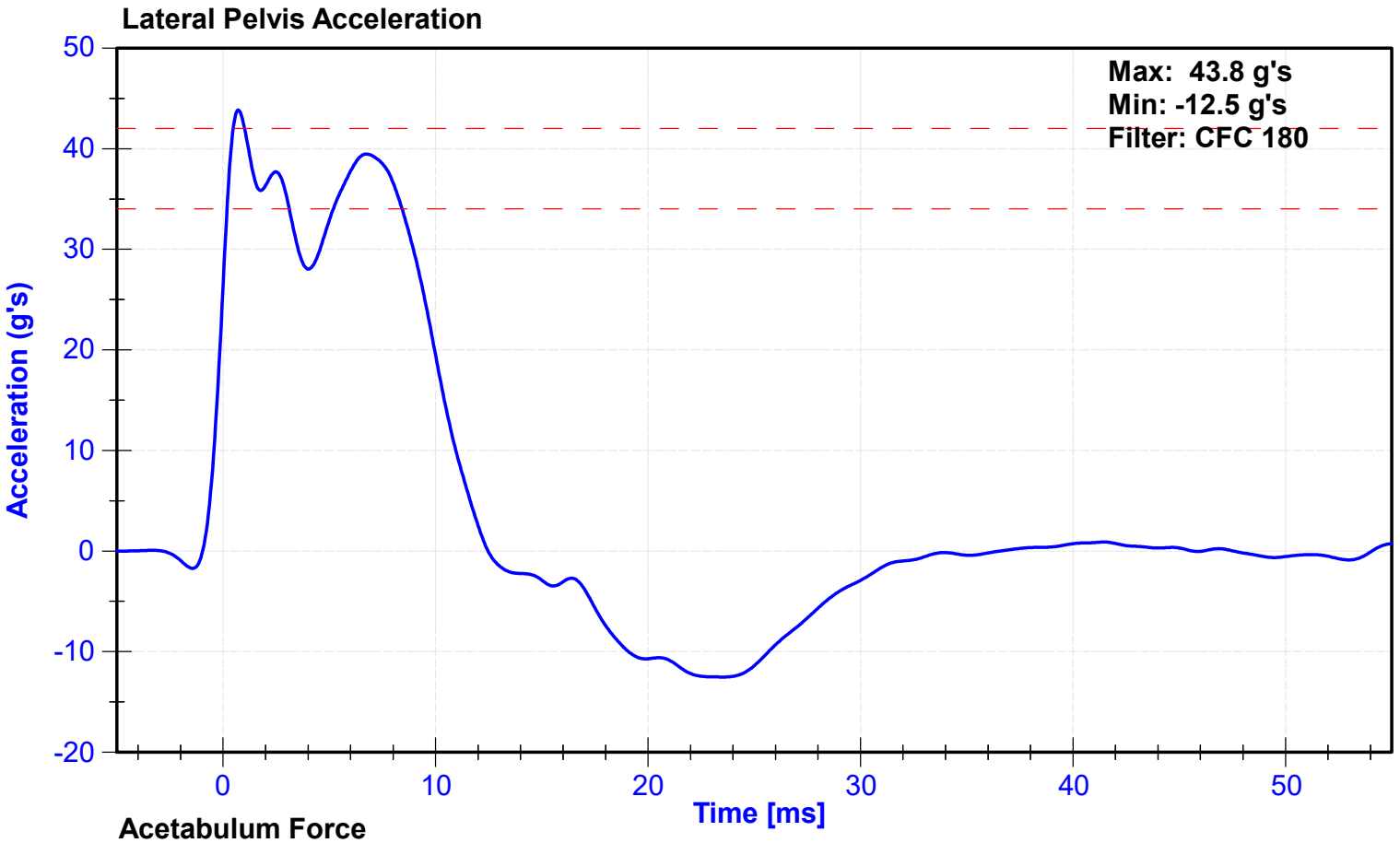
Results

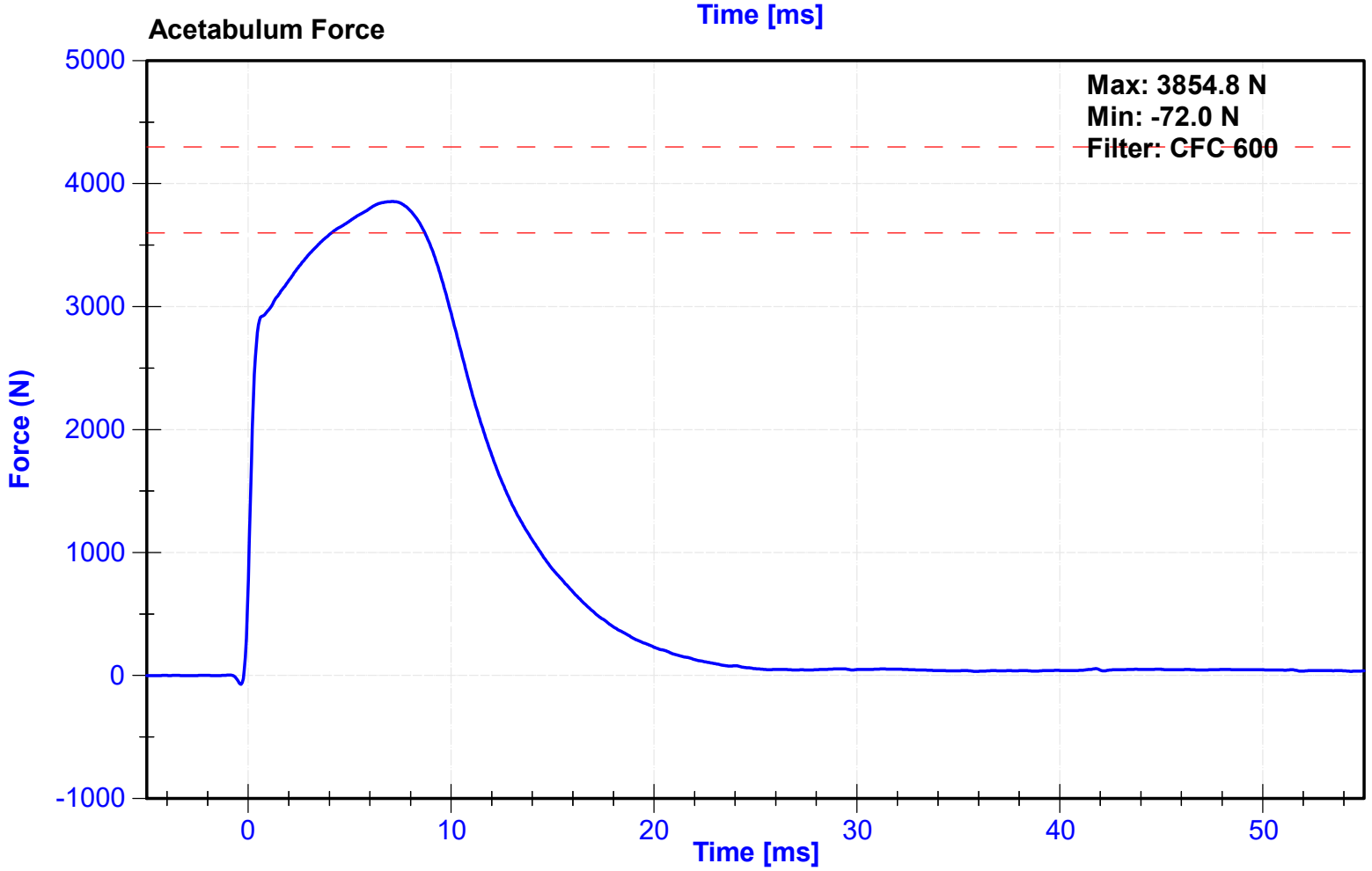
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	26.5	Pass
Velocity	6.6	6.8	m/s	6.63	Pass
Probe Acceleration	38	47	g's	45.1	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	39.5	Pass
Acetabulum Force	3600	4300	N	3854.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Pelvis Y Accelerometer	Endevco	P51875	12/12/2022	6/10/2023
Acetabulum Load Cell	Denton	276-FY	8/11/2022	8/11/2023
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A




Lateral Pelvis Acceleration
Max: 43.8 g's
Min: -12.5 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: 3854.8 N
Min: -72.0 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

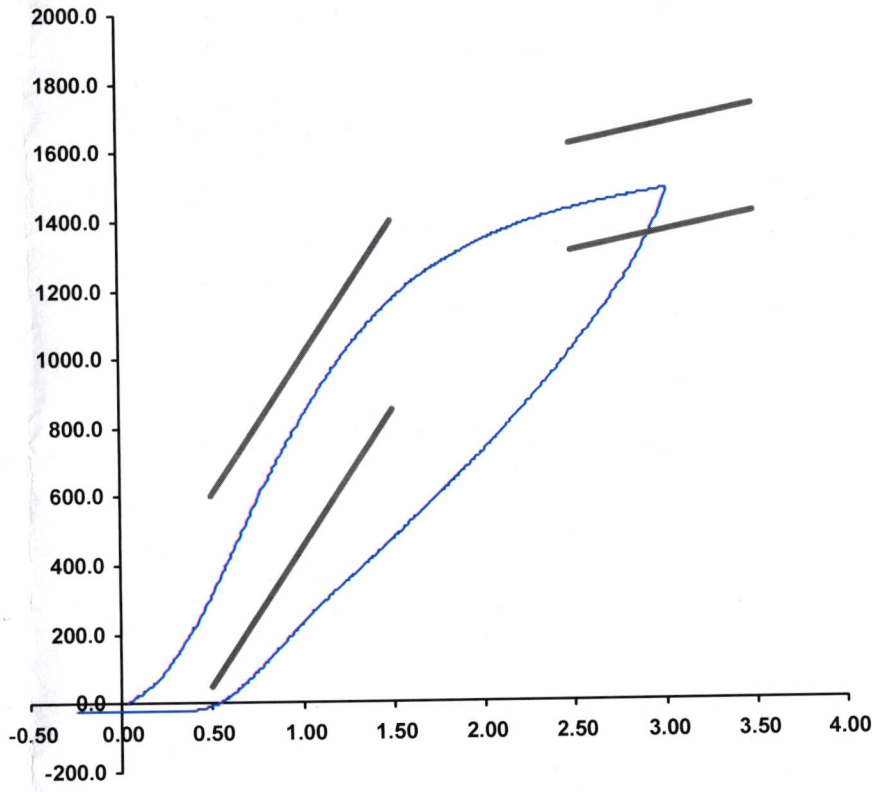
Cert
2/16/23

SID-IIs Pelvis Plug Certification Test

Plug S/N 15237
Test Number 17988
Report Number 18037
Test Date 3/10/2021 1:04:53 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	321	50	600
Force @ 1.5 mm (N)	1,171	850	1,400
Force @ 2.5 mm (N)	1,431	1,306	1,618
Force @ 3.0 mm (N)	1,484	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 10-Mar-21
SACO Research

By : DC Date : 3/10/2021

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

Test prepared 2/16/23

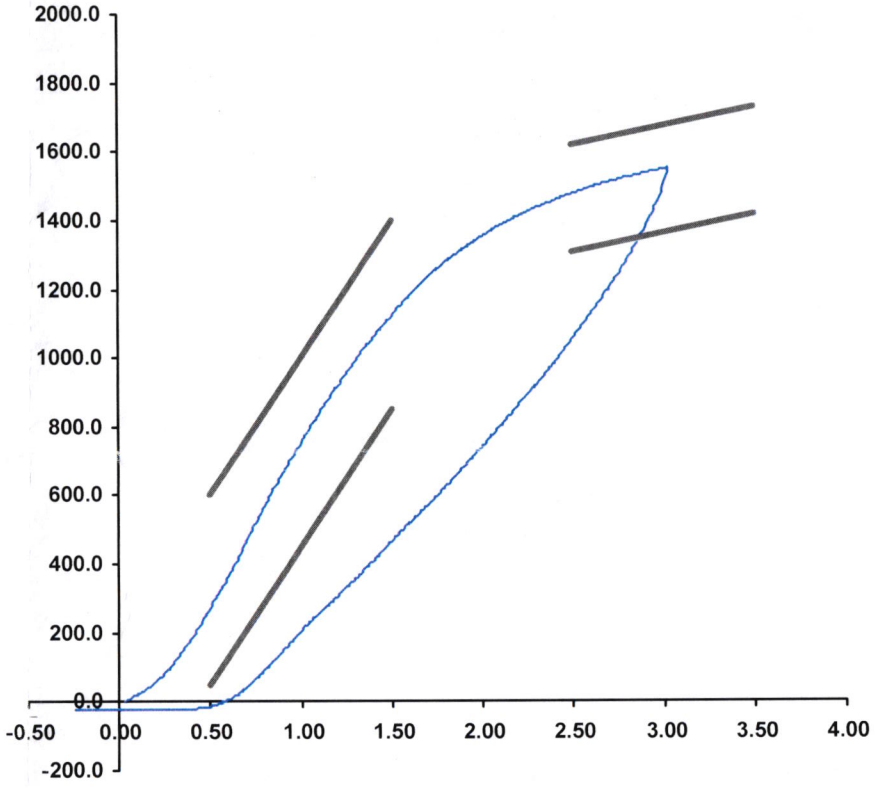
IMPACT

SID-IIs Pelvis Plug Certification Test

Plug S/N 15461
Test Number 20180
Report Number 20234
Test Date 9/22/2021 7:54:43 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	280	50	600
Force @ 1.5 mm (N)	1,129	850	1,400
Force @ 2.5 mm (N)	1,481	1,306	1,618
Force @ 3.0 mm (N)	1,550	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 22-Sep-21
SACO Research

By : DC Date : 9/22/2021

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

SACO RESEARCH

Test prepared 2/16/23

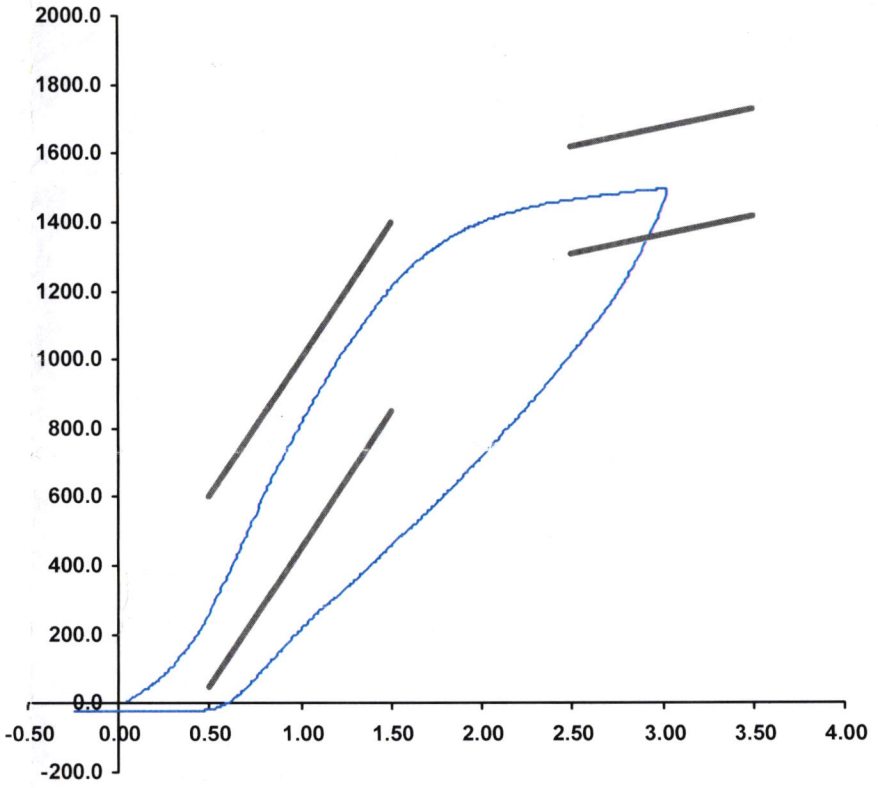
NON-IMPACT

SID-IIs Pelvis Plug Certification Test

Plug S/N 15454
Test Number 20115
Report Number 20169
Test Date 9/9/2021 10:53:34 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	267	50	600
Force @ 1.5 mm (N)	1,215	850	1,400
Force @ 2.5 mm (N)	1,465	1,306	1,618
Force @ 3.0 mm (N)	1,497	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

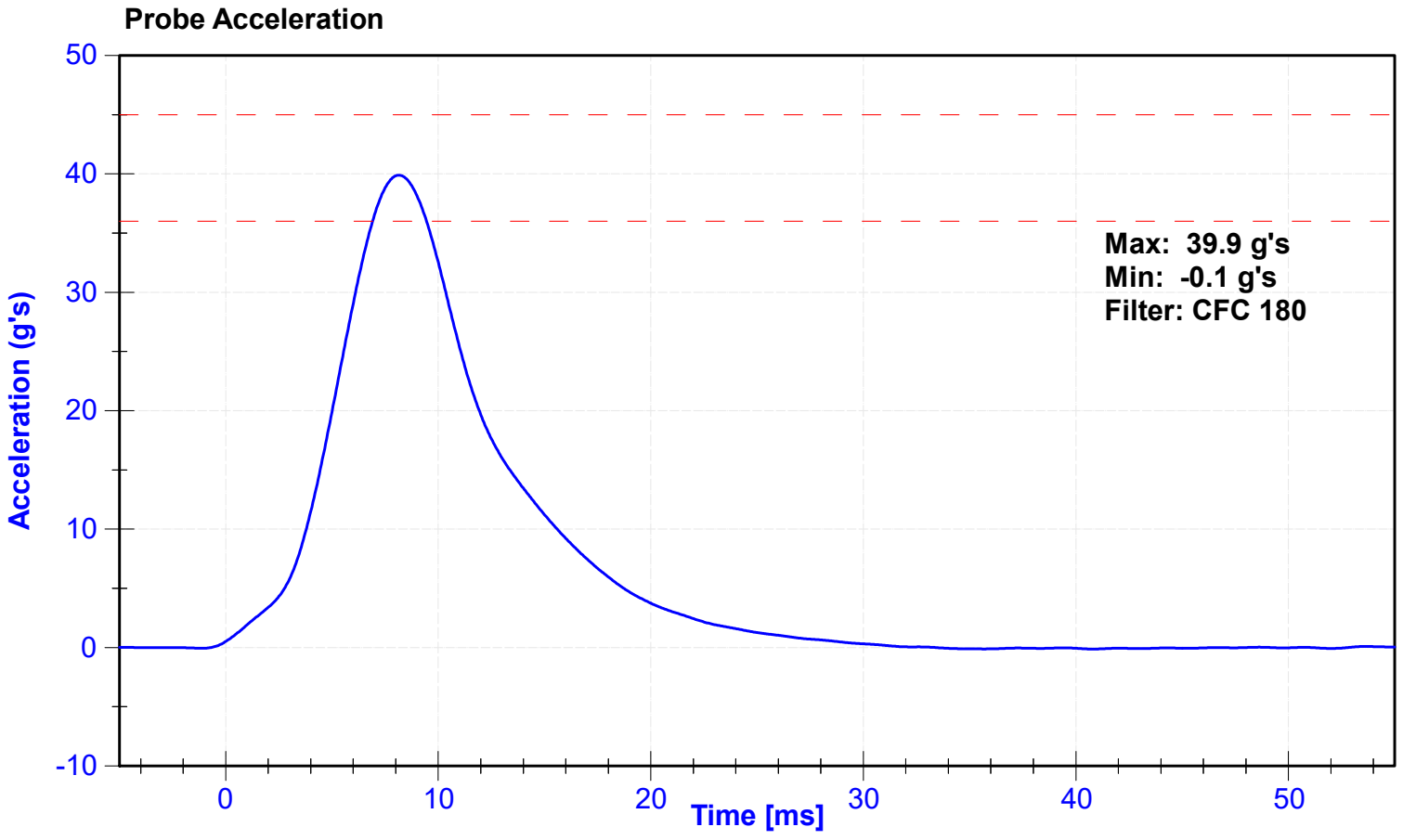
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

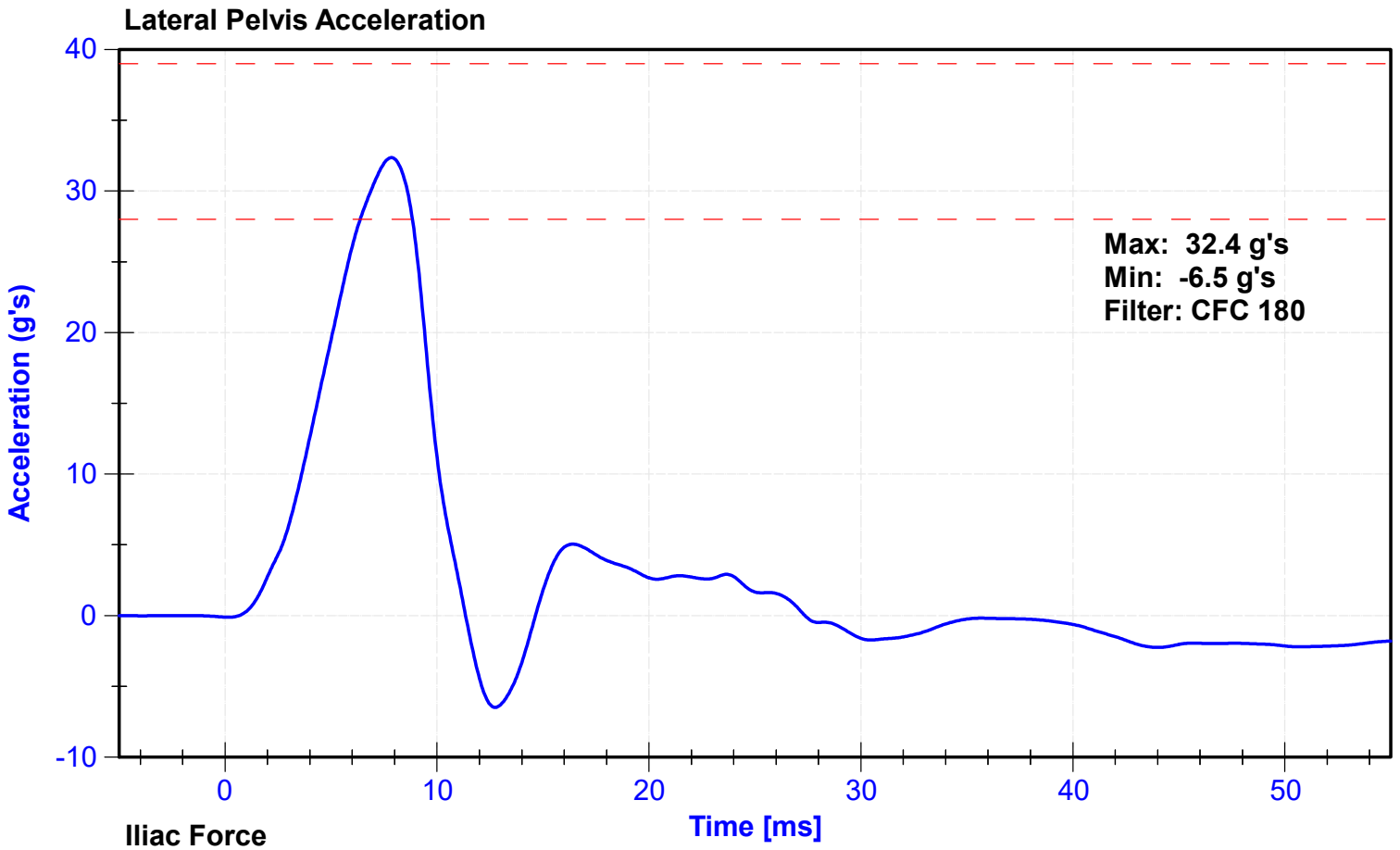
Results

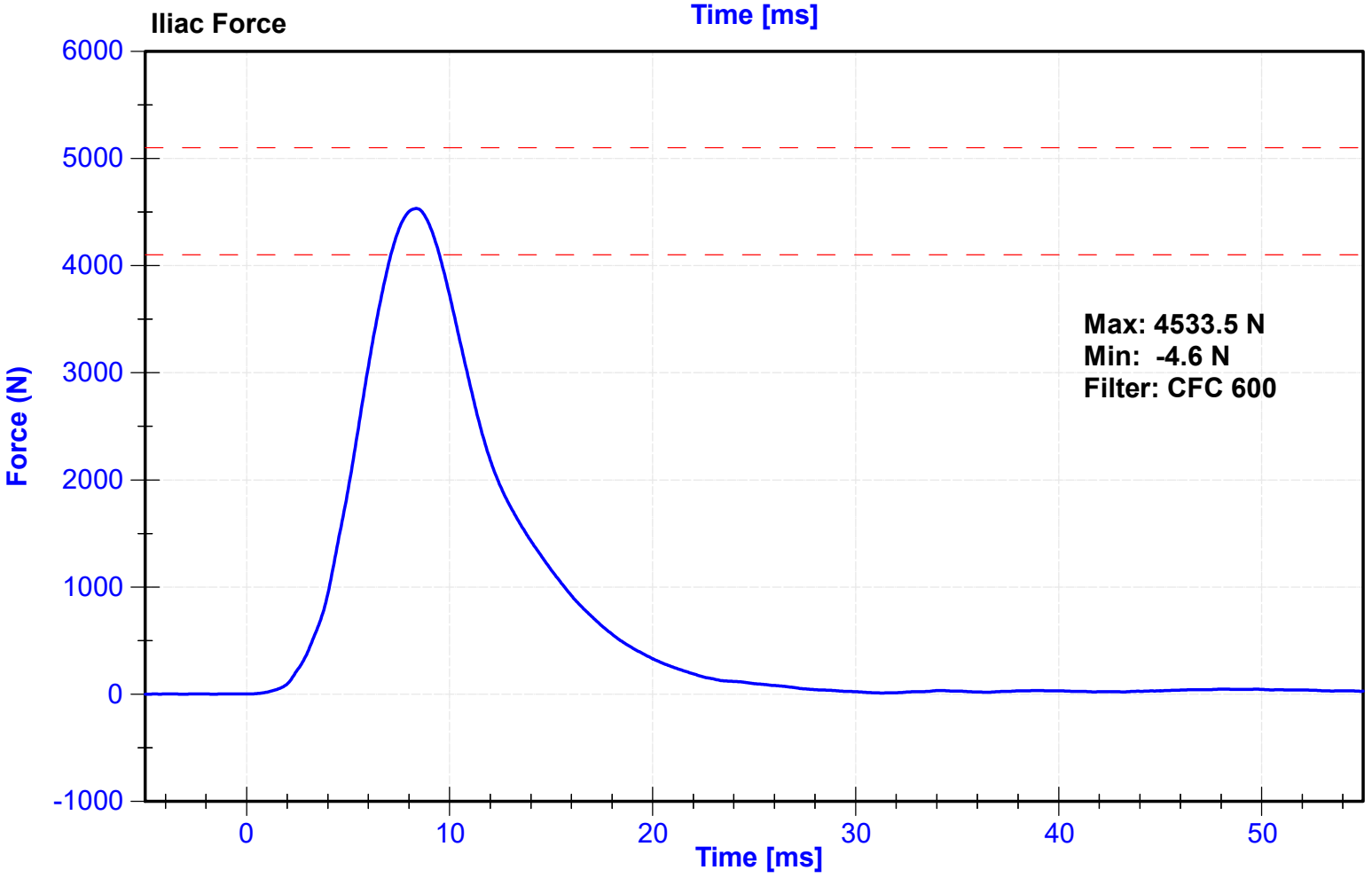
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	26.5	Pass
Velocity	4.2	4.4	m/s	4.20	Pass
Probe Acceleration	36	45	g's	39.9	Pass
Lateral Pelvis Acceleration	28	39	g's	32.4	Pass
Iliac Force	4100	5100	N	4533.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Pelvis Y Accelerometer	Endevco	P51875	12/12/2022	6/10/2023
Iliac Load Cell	Denton	290-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: 32.4 g's
Min: -6.5 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: 4533.5 N
Min: -4.6 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

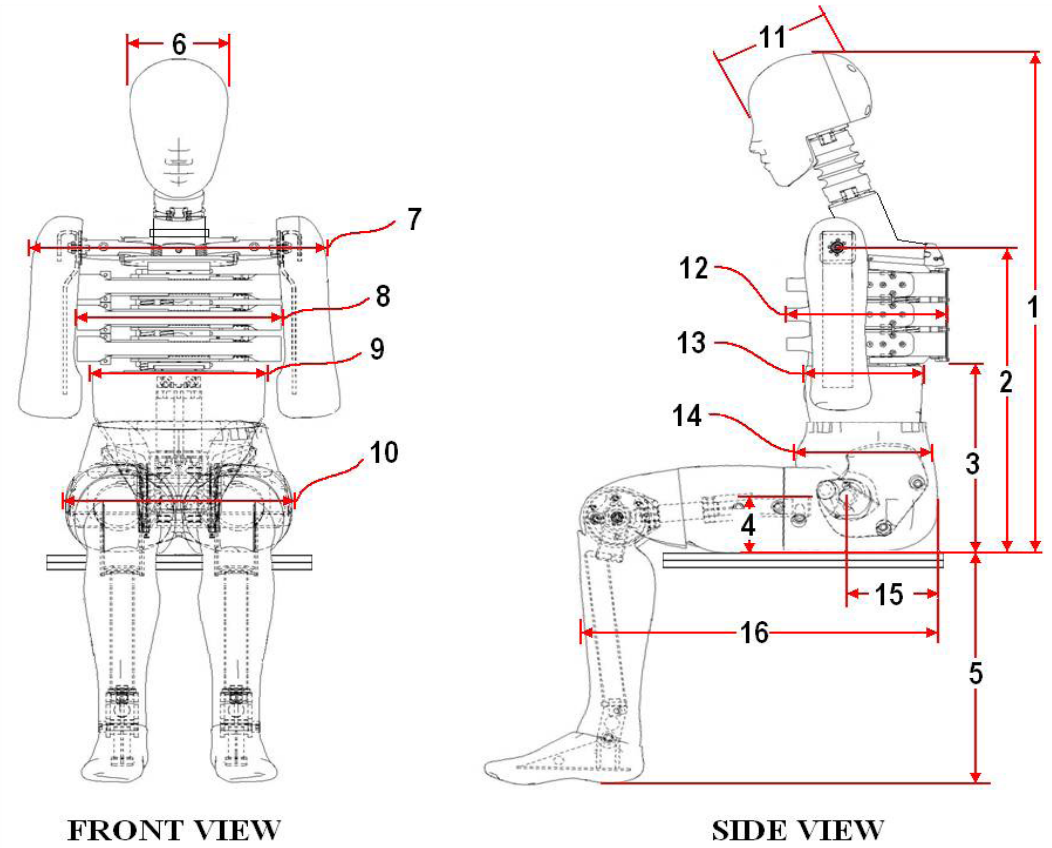
SERIAL NO:F033

(CONFIGURED FOR LEFT SIDE It

External Measurements - EuroSID-2re

Technician: K. Brogan Date: 02/27/2023

Dummy Serial Number: F033



FRONT VIEW SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	913	Pass
2	Seat to Shoulder Joint	558	572	567	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	354	Pass
4	Seat to Hip Joint (center of bolt)	97	103	99	Pass
5	Sole to Seat, Sitting	333	451	422	Pass
6	Head Width	152	158	157	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	329	Pass
9	Abdomen Width	273	287	281	Pass
10	Pelvis Lap Width	359	373	369	Pass
11	Head Depth	196	206	201	Pass
12	Thorax Depth	262	272	268	Pass
13	Abdomen Depth	194	204	202	Pass
14	Pelvis Depth	235	245	240	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	156	Pass
16	Back of Buttocks to Front Knee	597	615	610	Pass

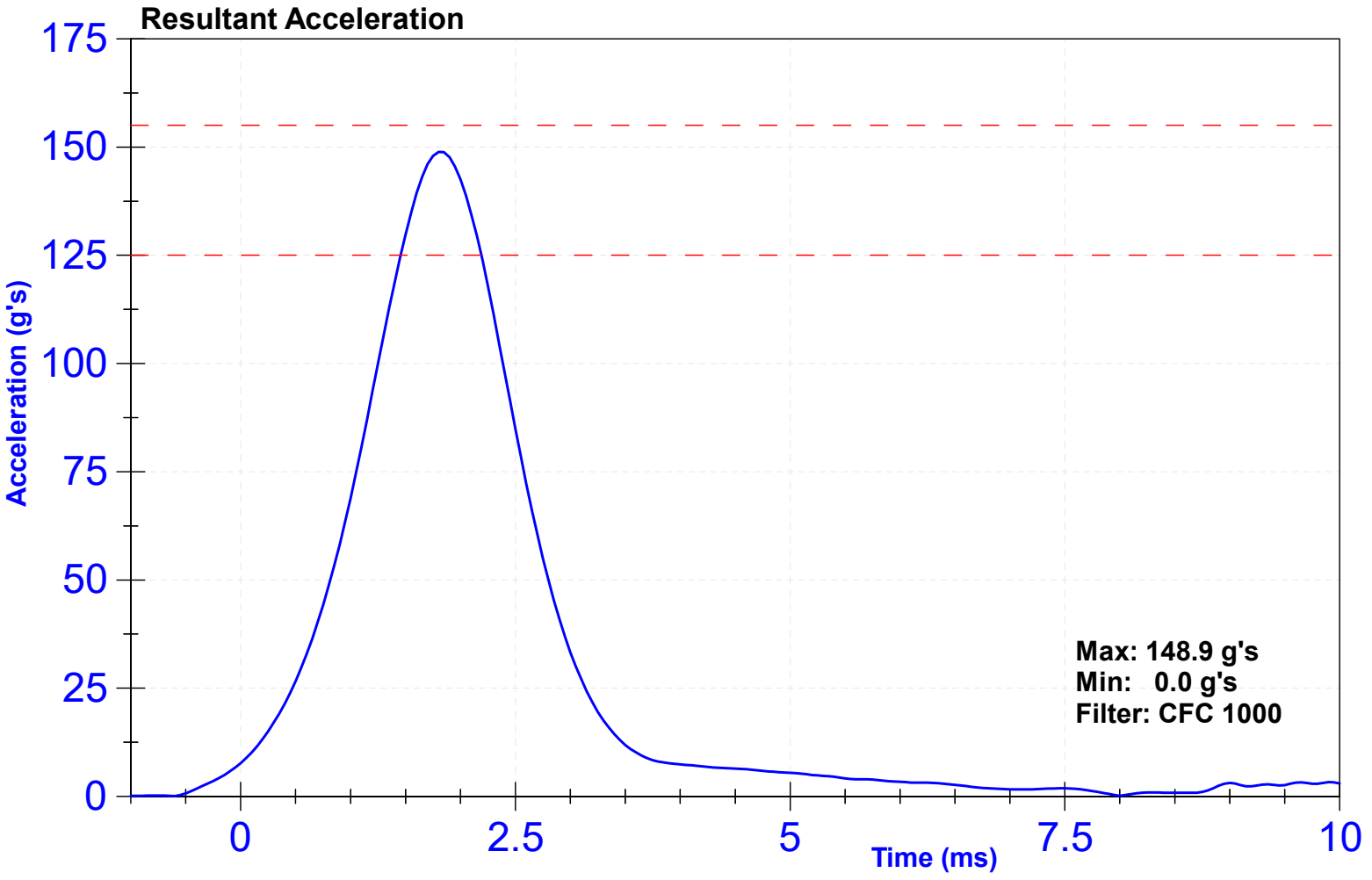
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

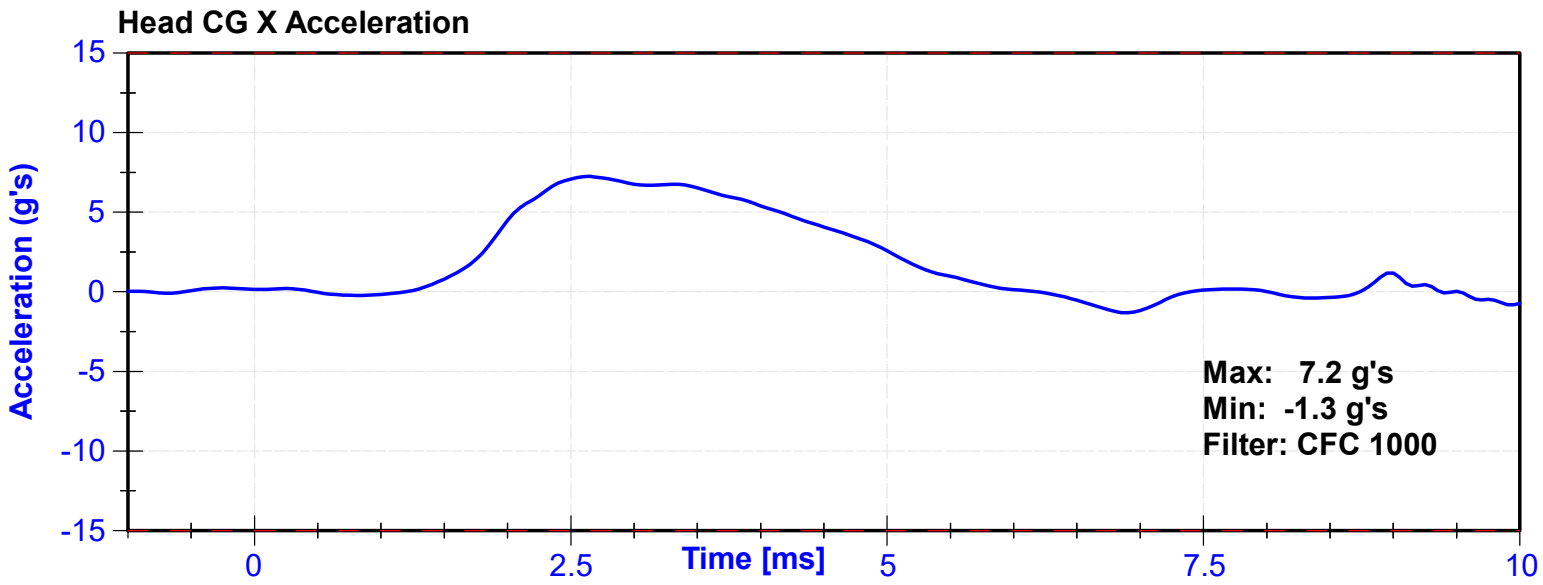
Results

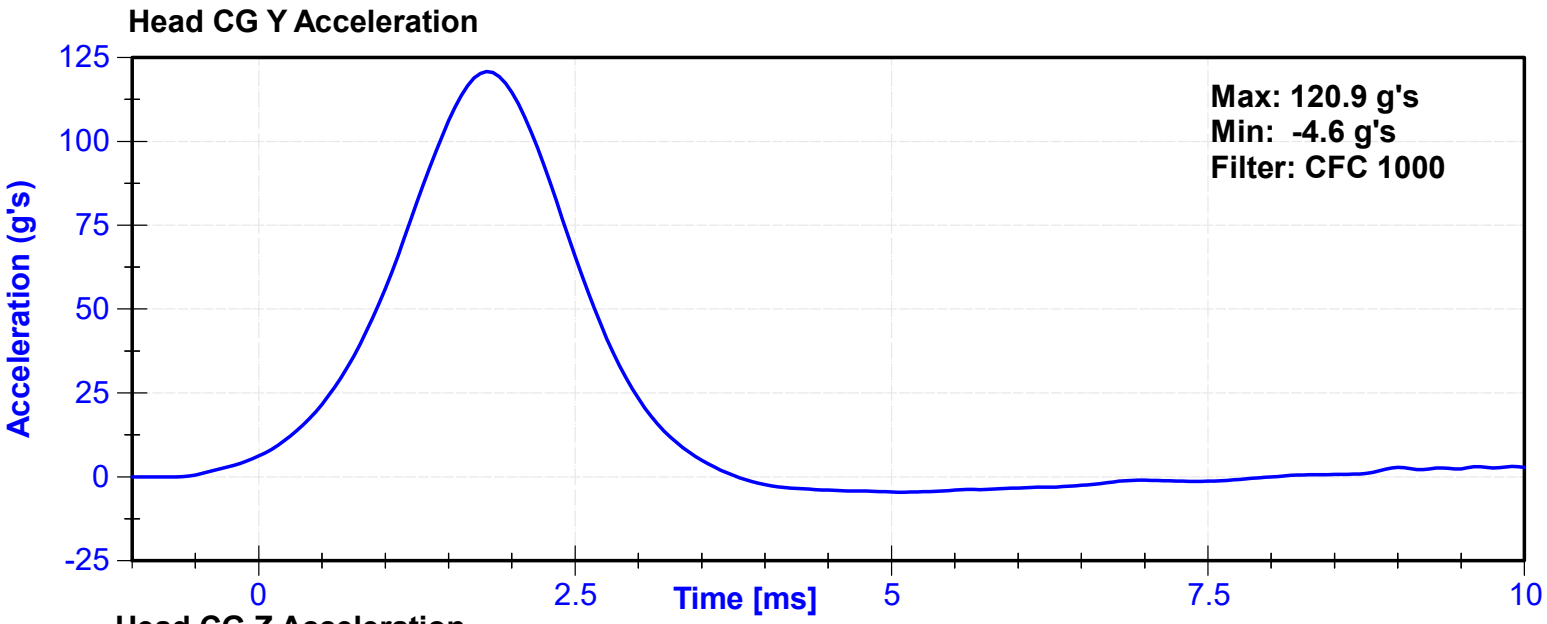
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	30.5	Pass
Resultant Acceleration	125	155	g's	148.9	Pass
Oscillation	0	15	%	2.20	Pass
Fore-Aft Acceleration	-15	15	g's	7.2	Pass

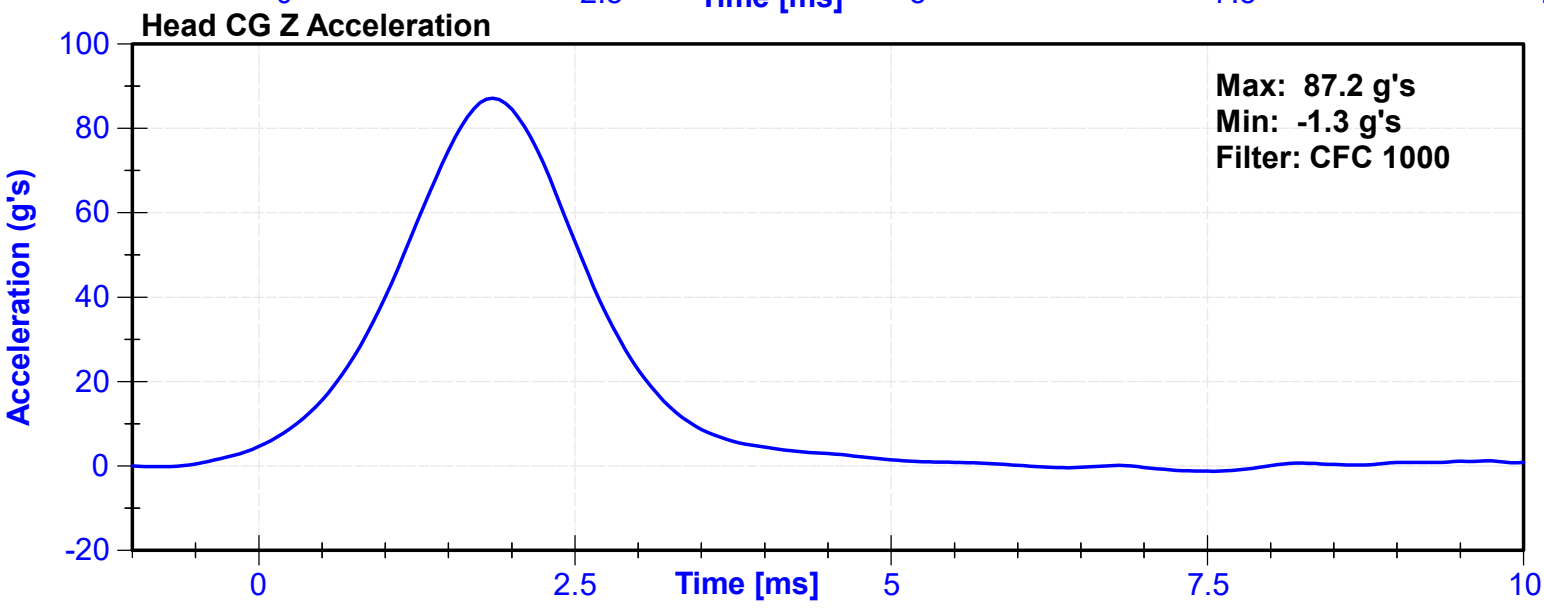
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P63861	1/17/2023	7/16/2023
Y Accelerometer	Endevco	P49216	1/17/2023	7/16/2023
Z Accelerometer	Endevco	P51303	1/17/2023	7/16/2023




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 7.2 g's
Min: -1.3 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 120.9 g's
Min: -4.6 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]
Max: 87.2 g's
Min: -1.3 g's
Filter: CFC 1000

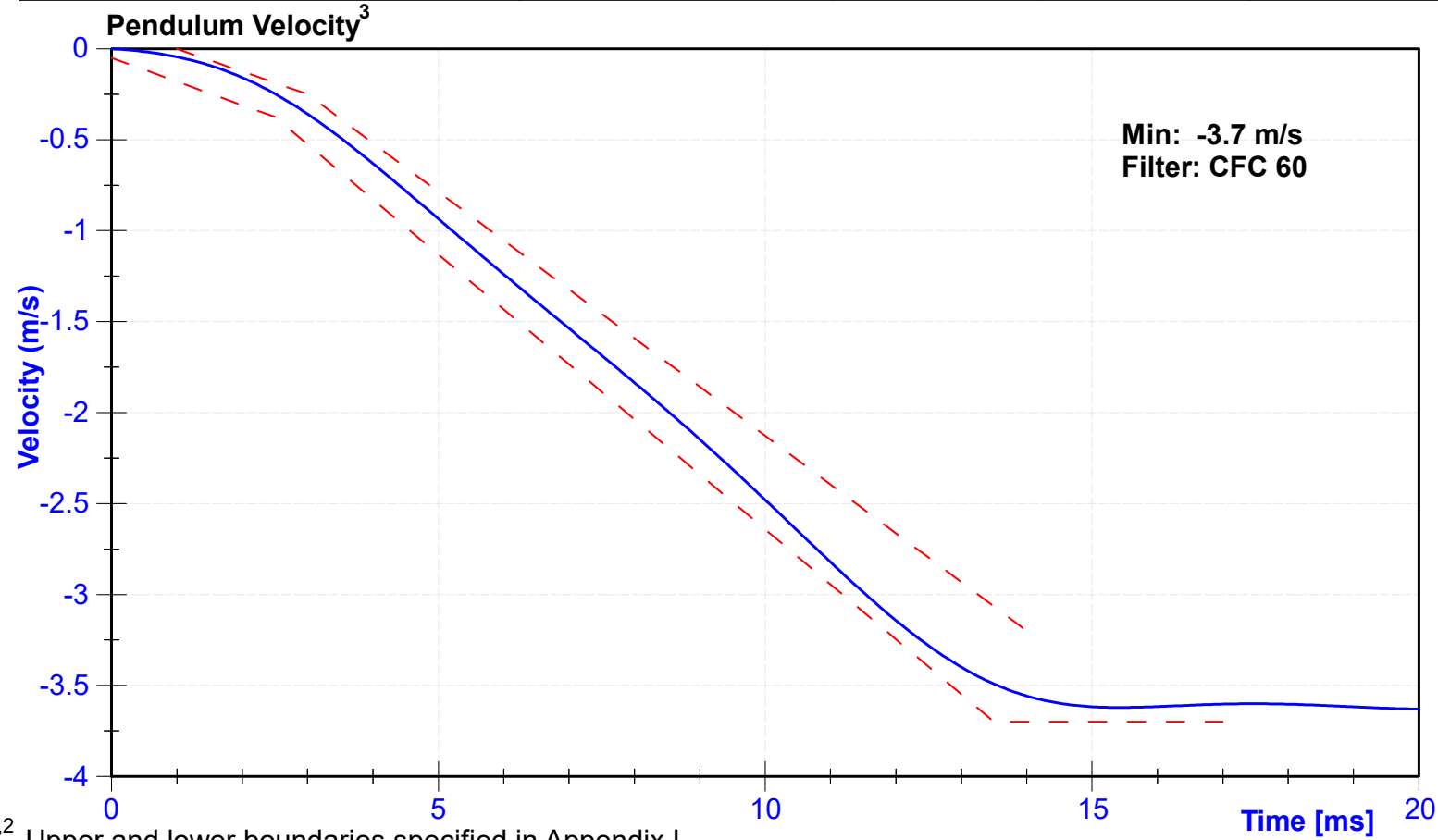
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

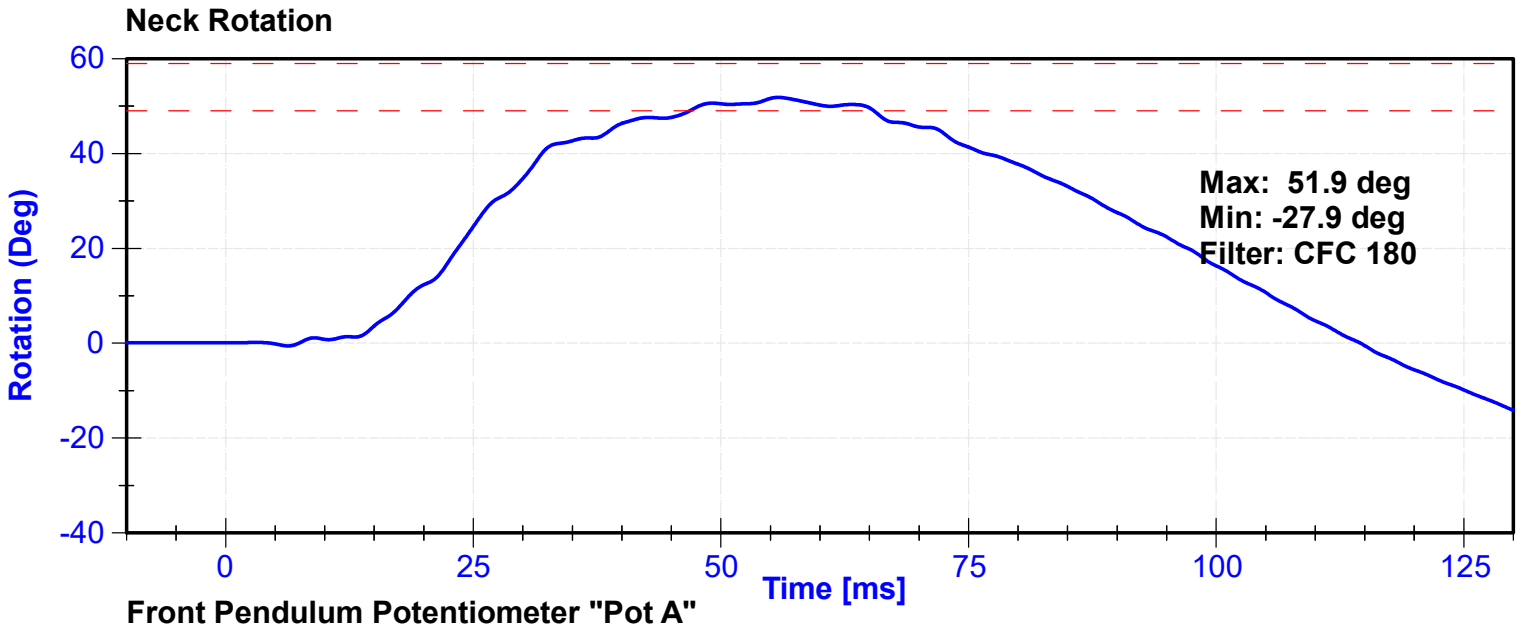
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	20.2	Pass
Velocity	3.3	3.5	m/s	3.42	Pass
Lateral Neck Rotation	49	59	deg	51.9	Pass
Time at Maximum Rotation	54	66	ms	55.8	Pass
Time of Rotation Decay from Maximum	53	88	ms	58.8	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

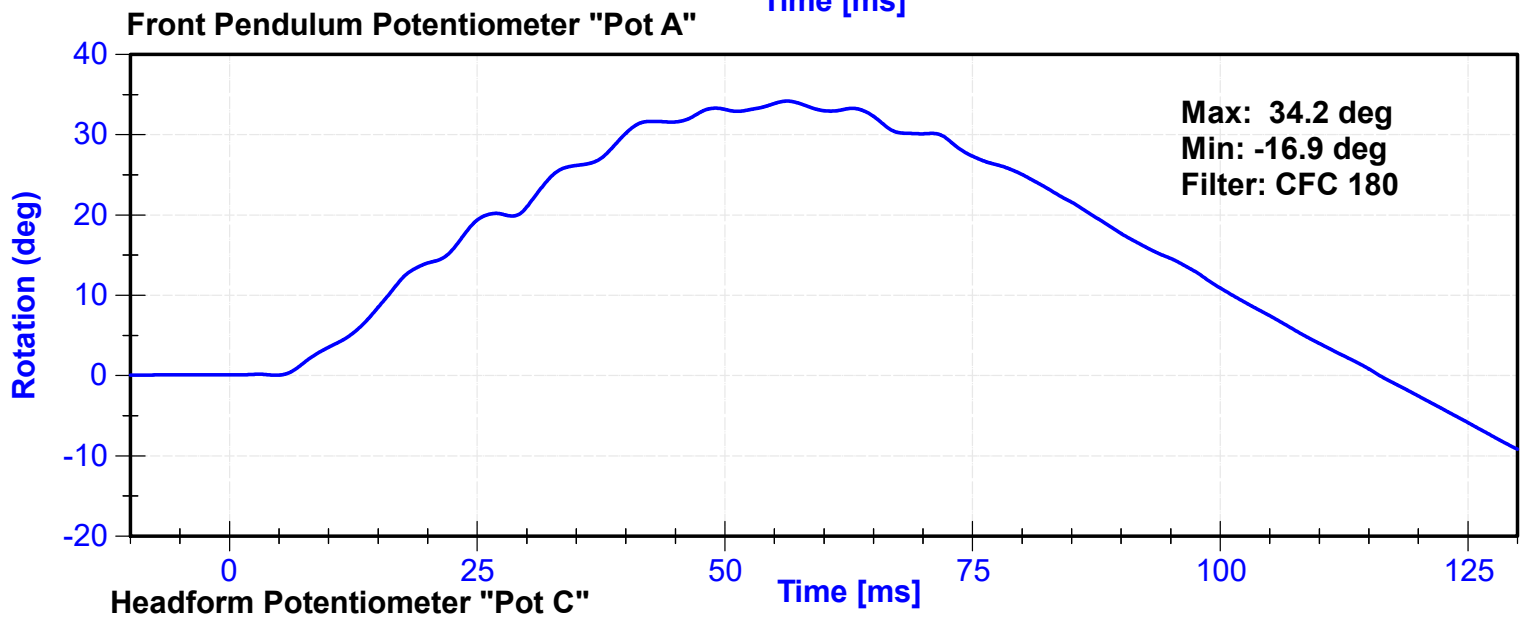
Transducer Calibrations

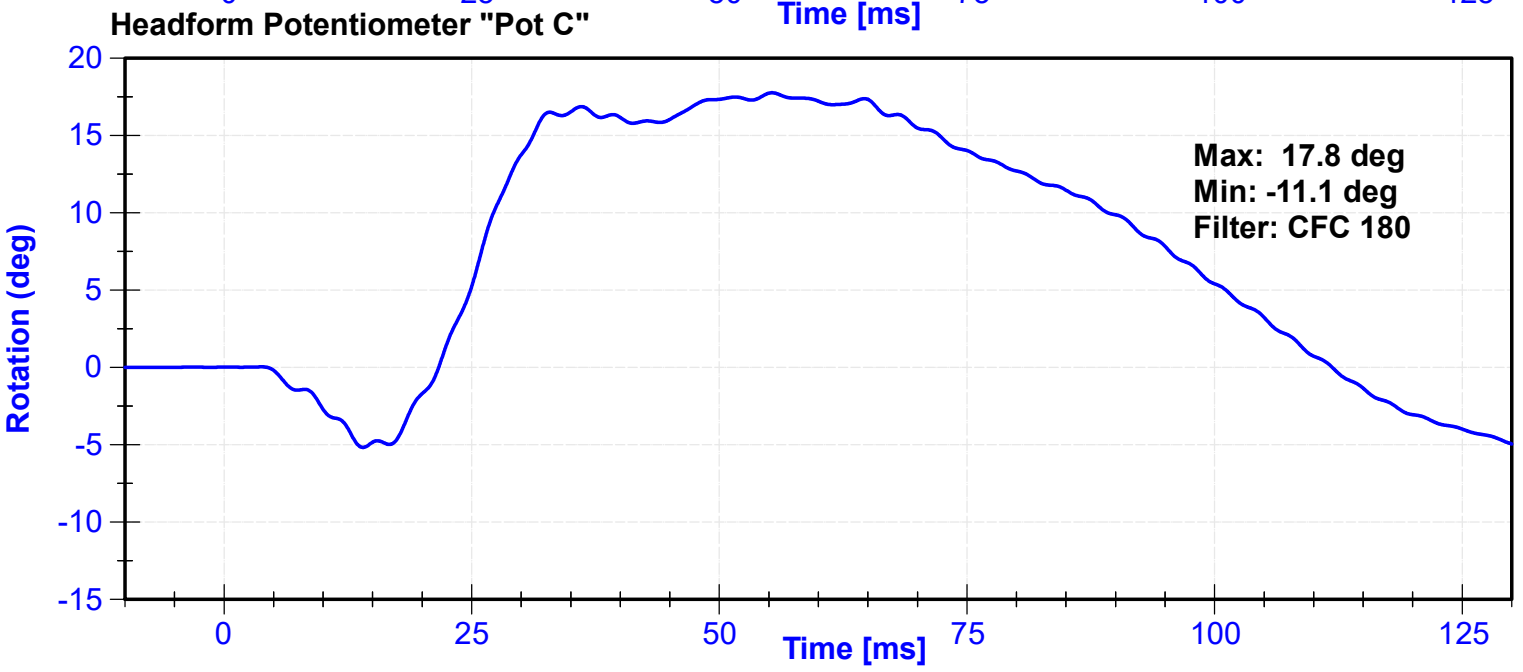
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/26/2022	10/26/2023
Front Pendulum Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Headform Potentiometer	Sfernice	095	10/5/2022	10/5/2023



[1,2] Upper and lower boundaries specified in Appendix I


Neck Rotation
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]
Max: 51.9 deg
Min: -27.9 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]
Max: 34.2 deg
Min: -16.9 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
20
15
10
5
0
-5
-10
-15
0
25
50
75
100
125
Time [ms]
Max: 17.8 deg
Min: -11.1 deg
Filter: CFC 180

Appendix I

[2] Upper Boundary Corridor		[1] Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.0	-0.25	2.5	-0.375
14.0	-3.20	13.5	-3.7
		17.0	-3.7

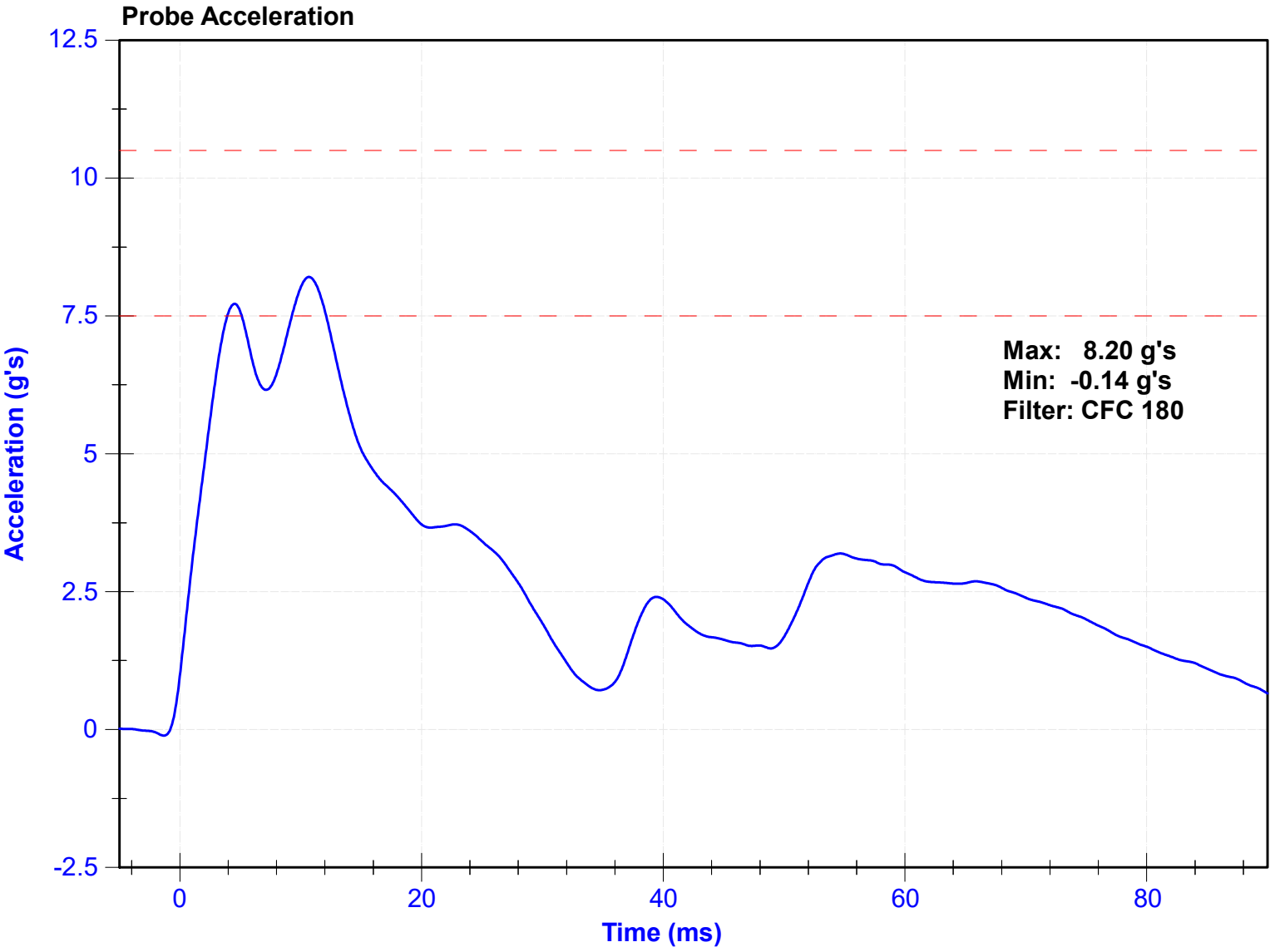
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	21	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	7.5	10.5	g's	8.20	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18546	11/19/2022	5/18/2023



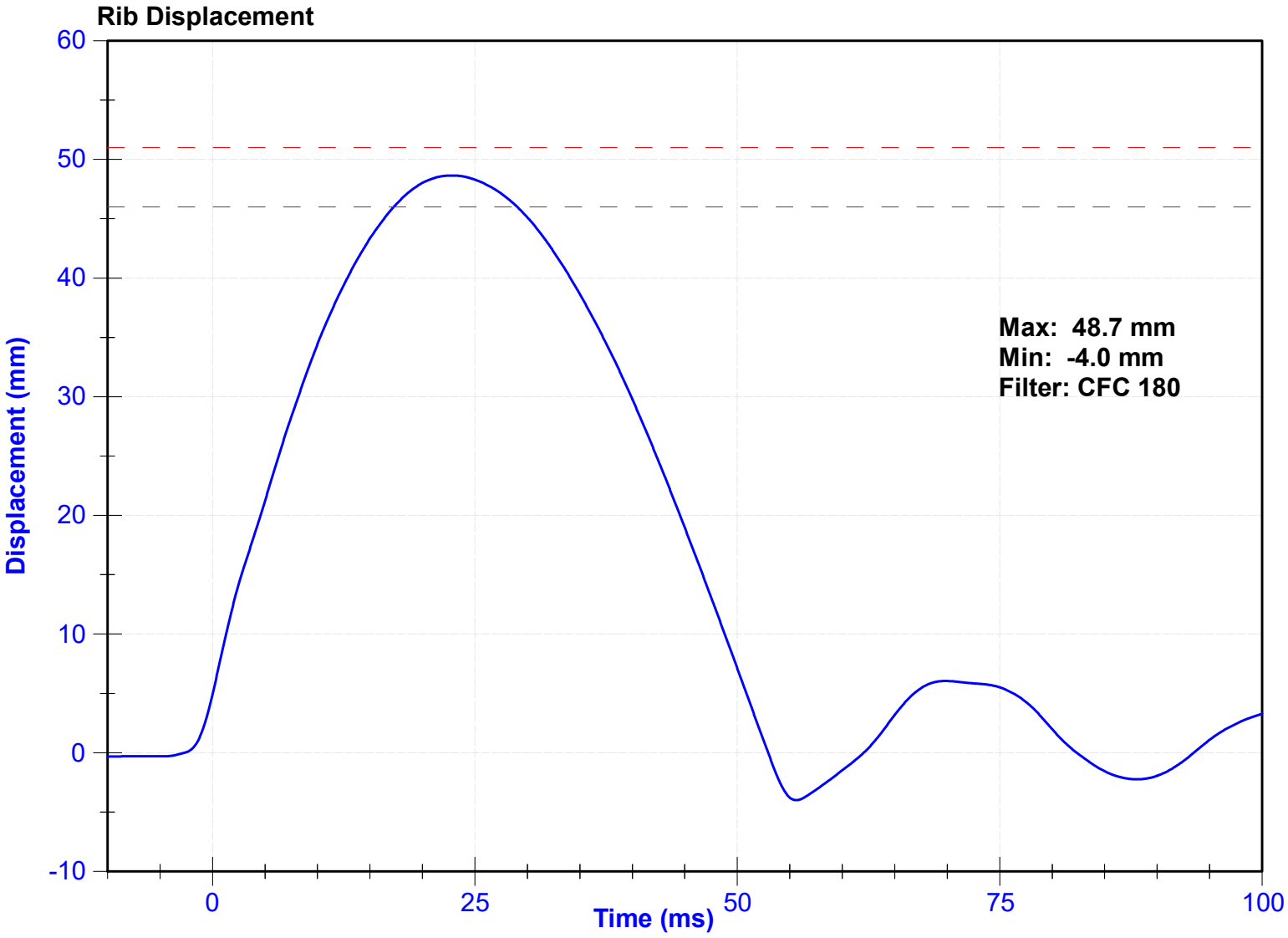
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	46	51	mm	48.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	1/17/2023	7/18/2023



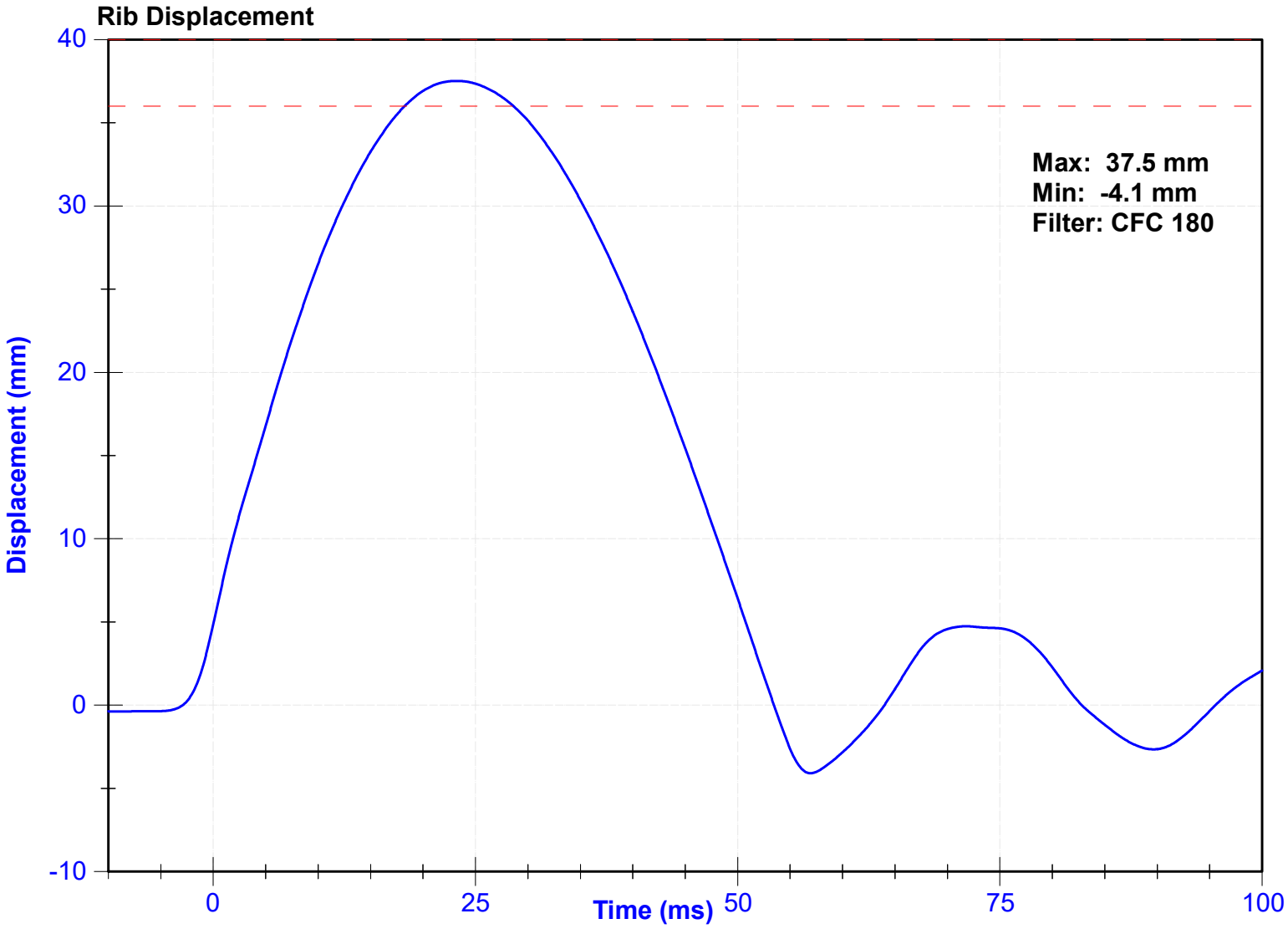
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	36	40	mm	37.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	1/17/2023	7/18/2023



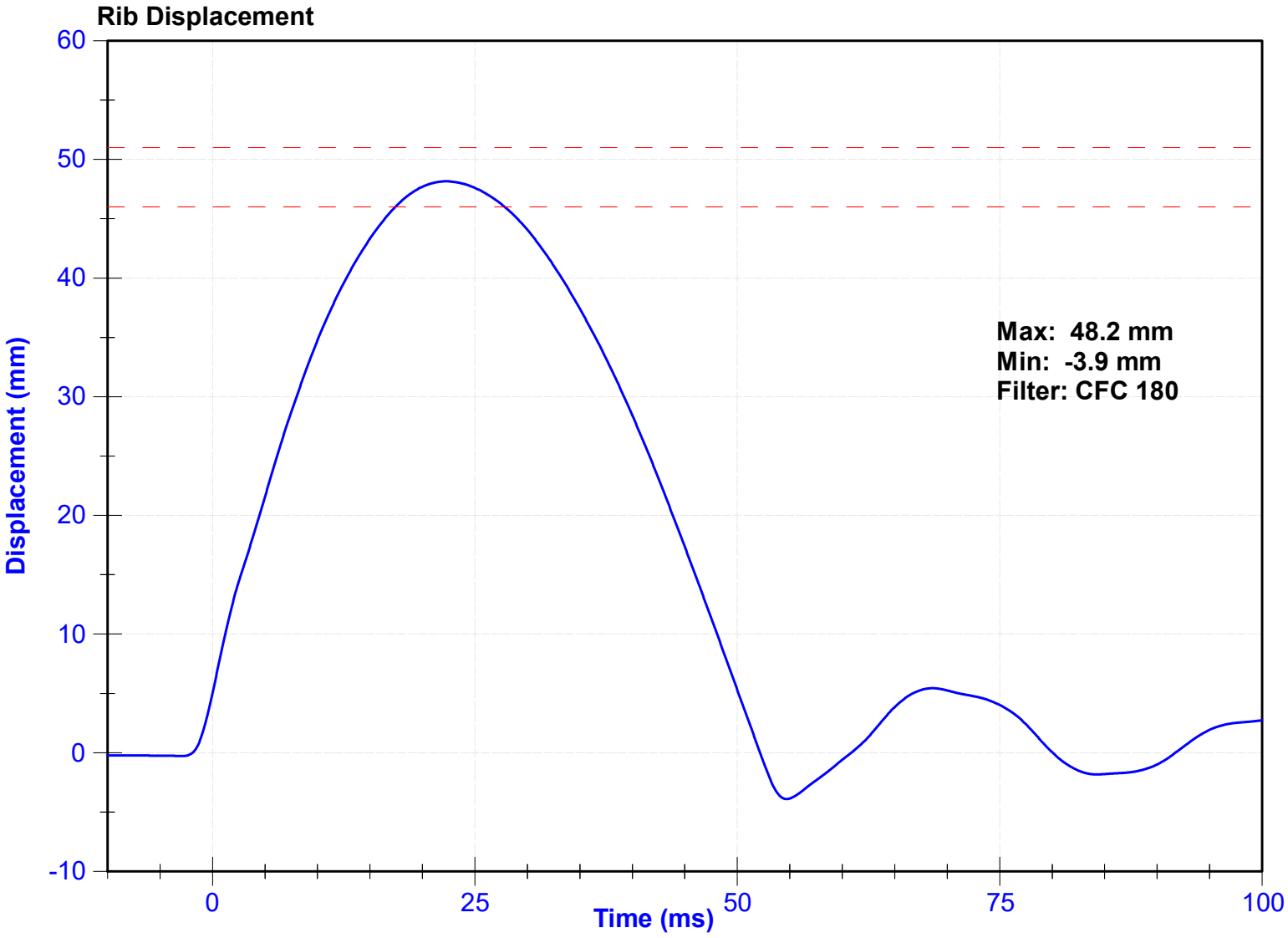
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	46	51	mm	48.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	1/17/2023	7/18/2023



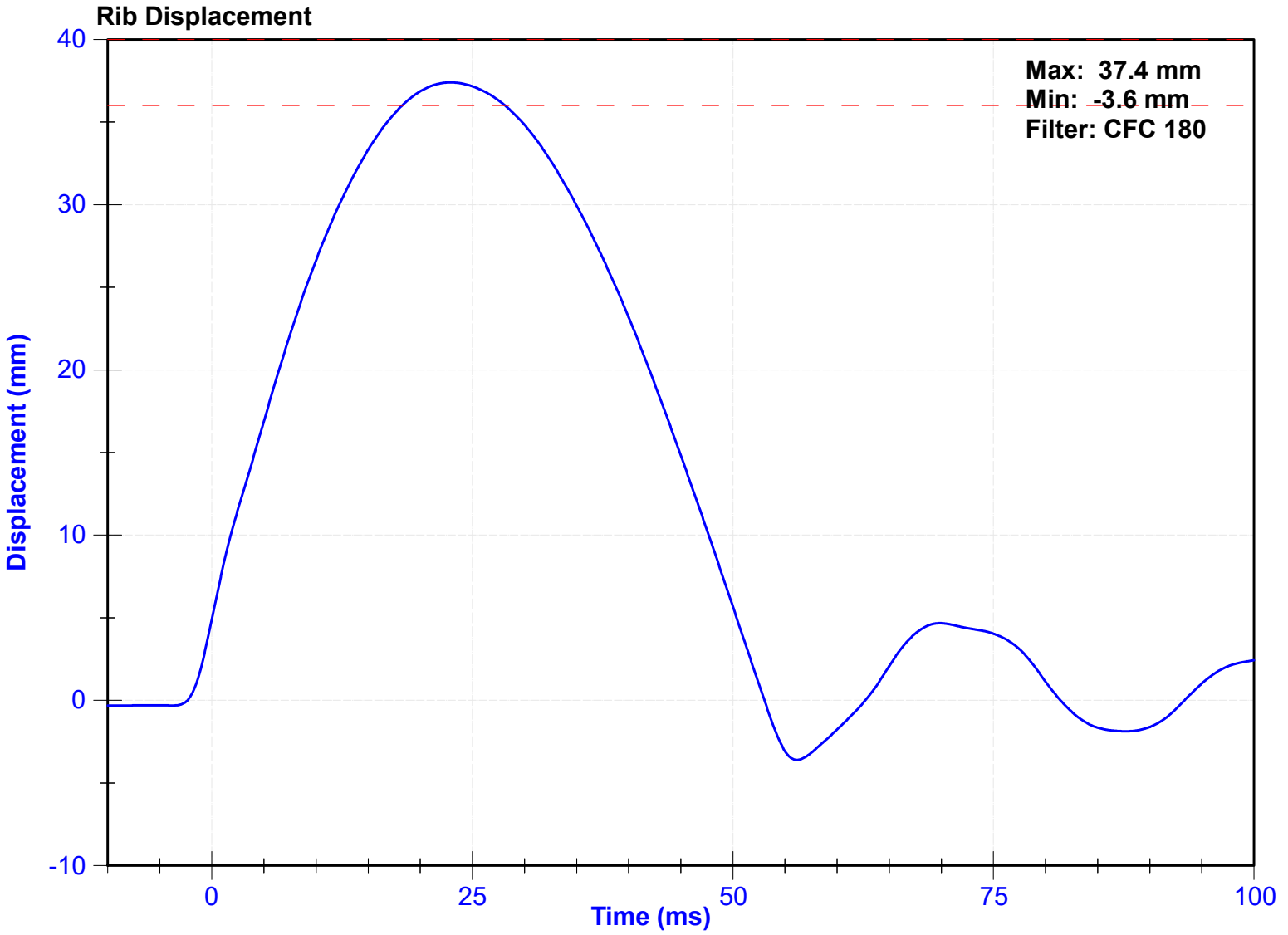
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	36	40	mm	37.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	1/17/2023	7/18/2023



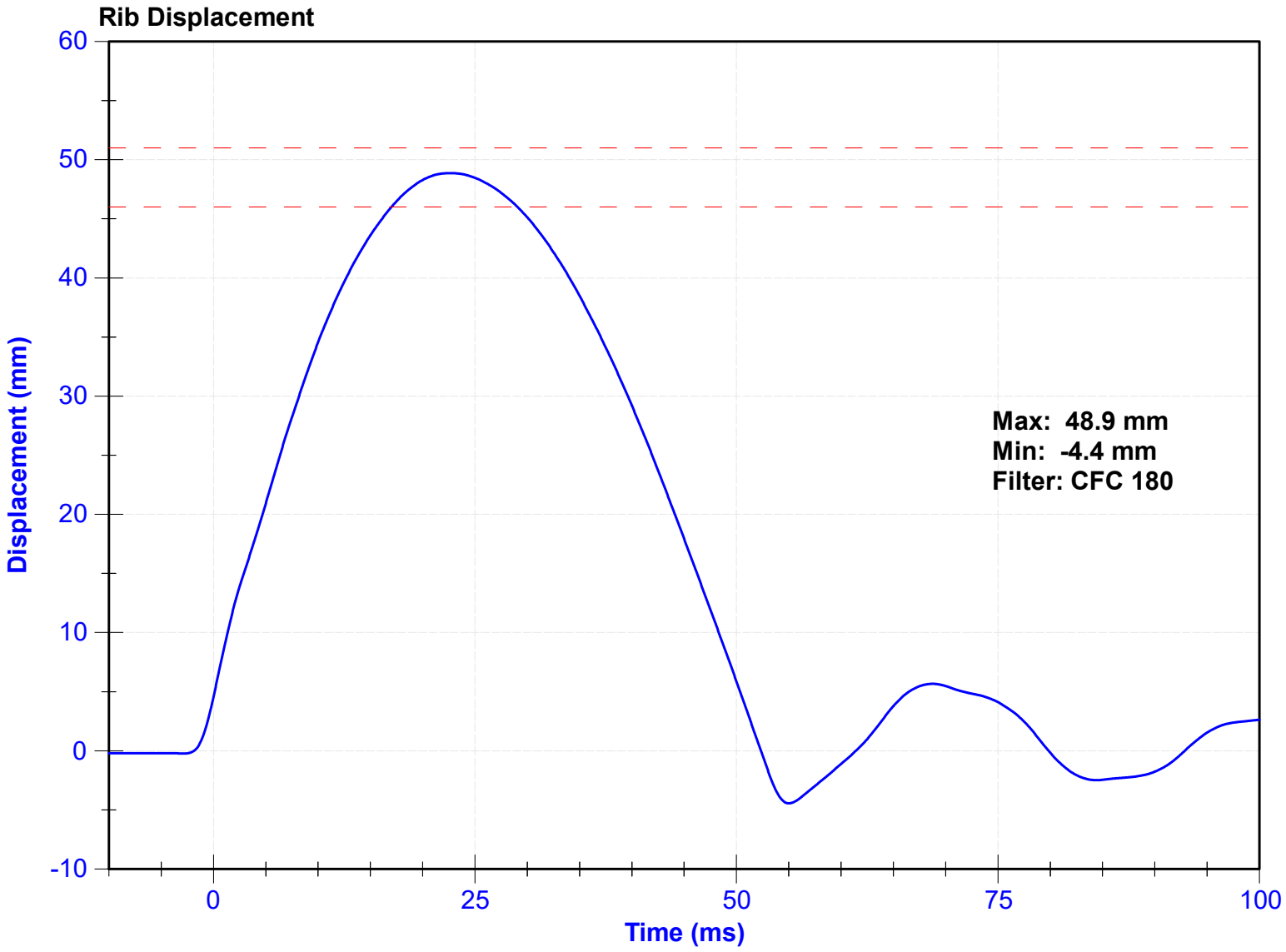
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	46	51	mm	48.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	1/17/2023	7/18/2023



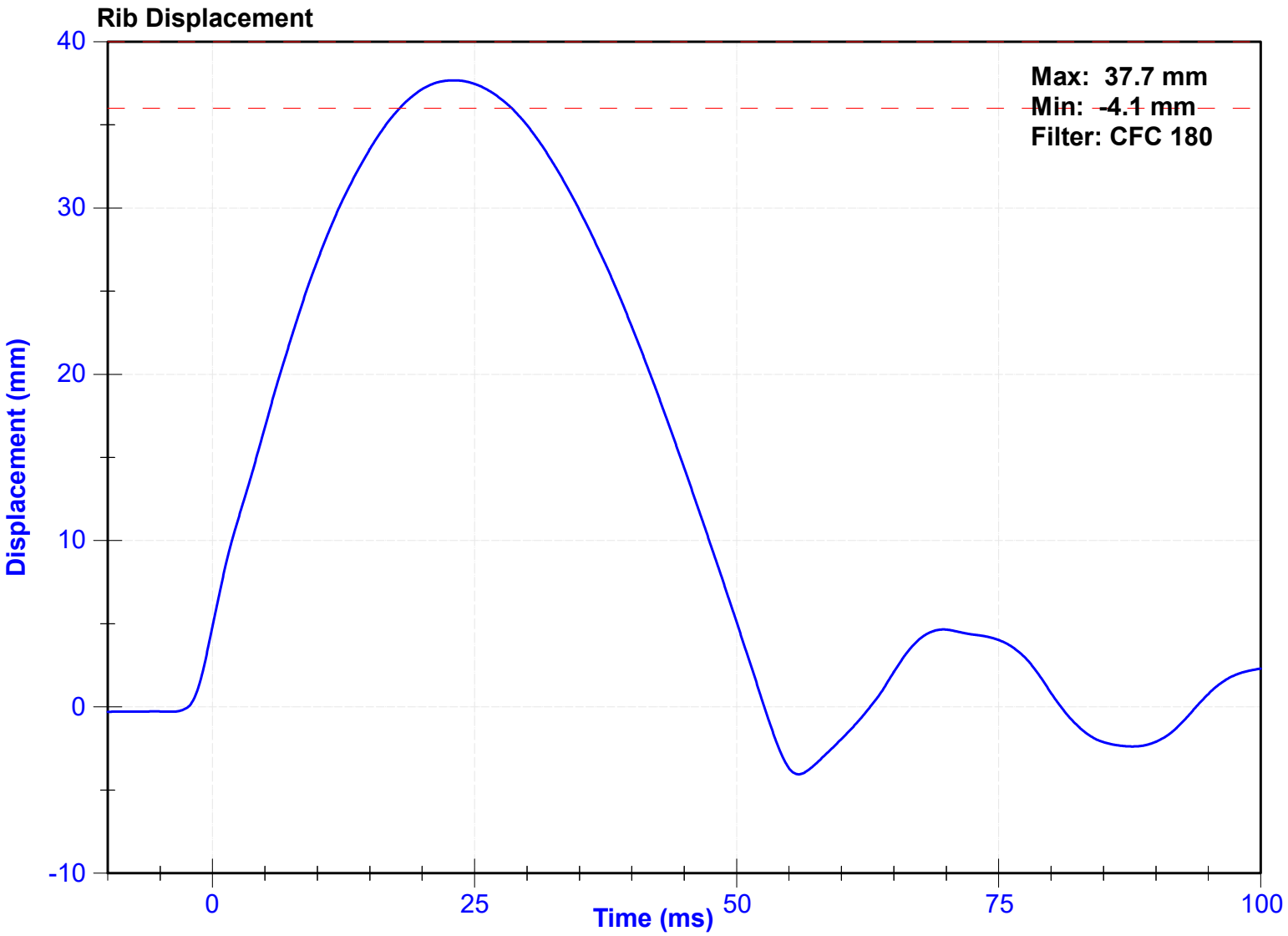
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	36	40	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	1/17/2023	7/18/2023



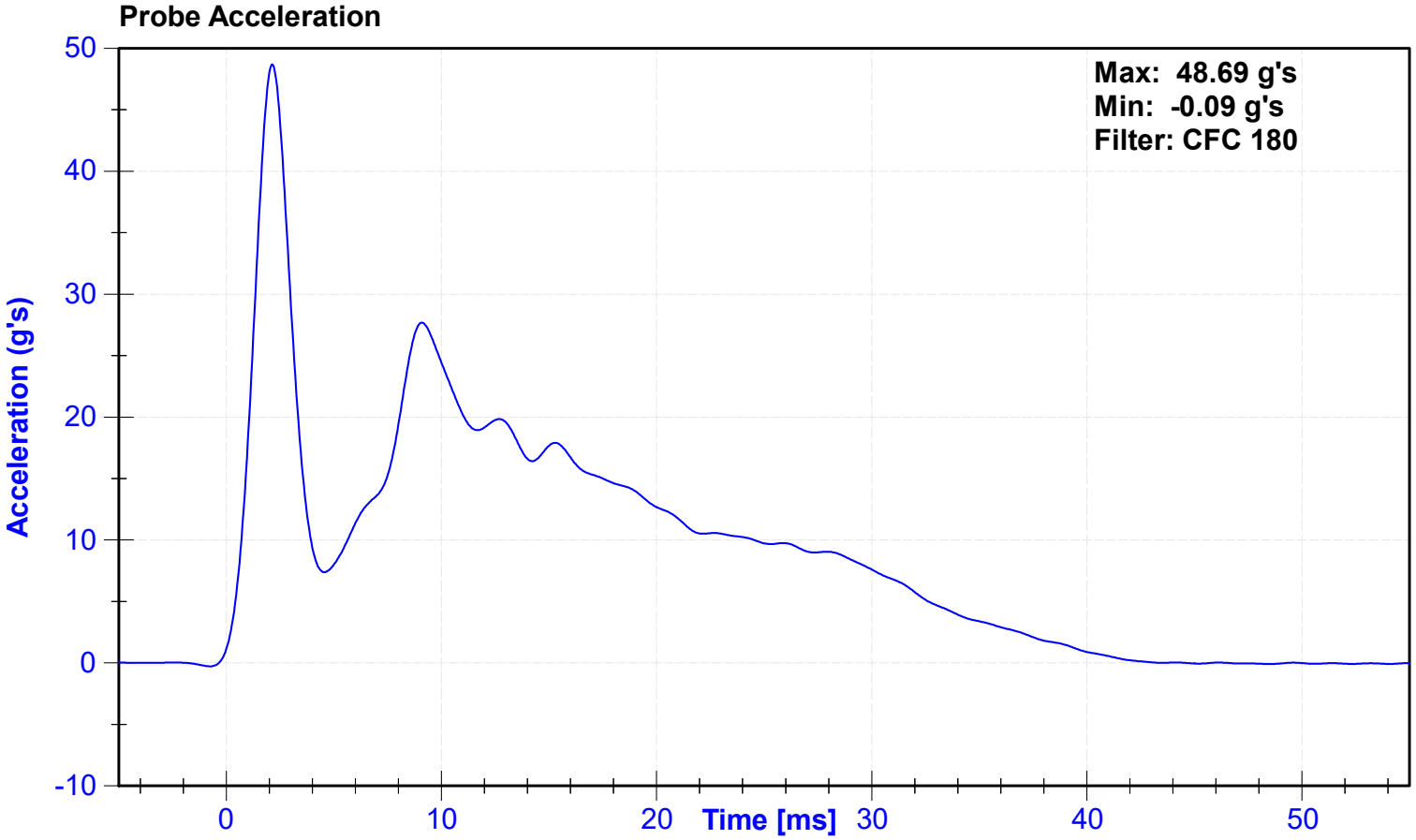
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

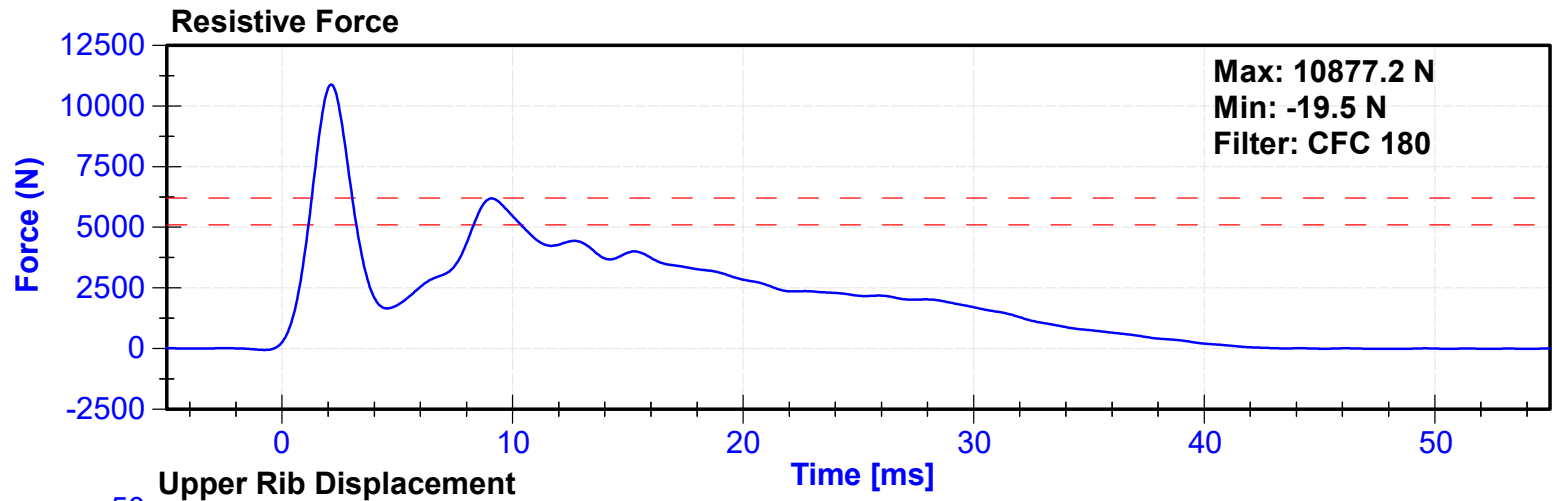
Results

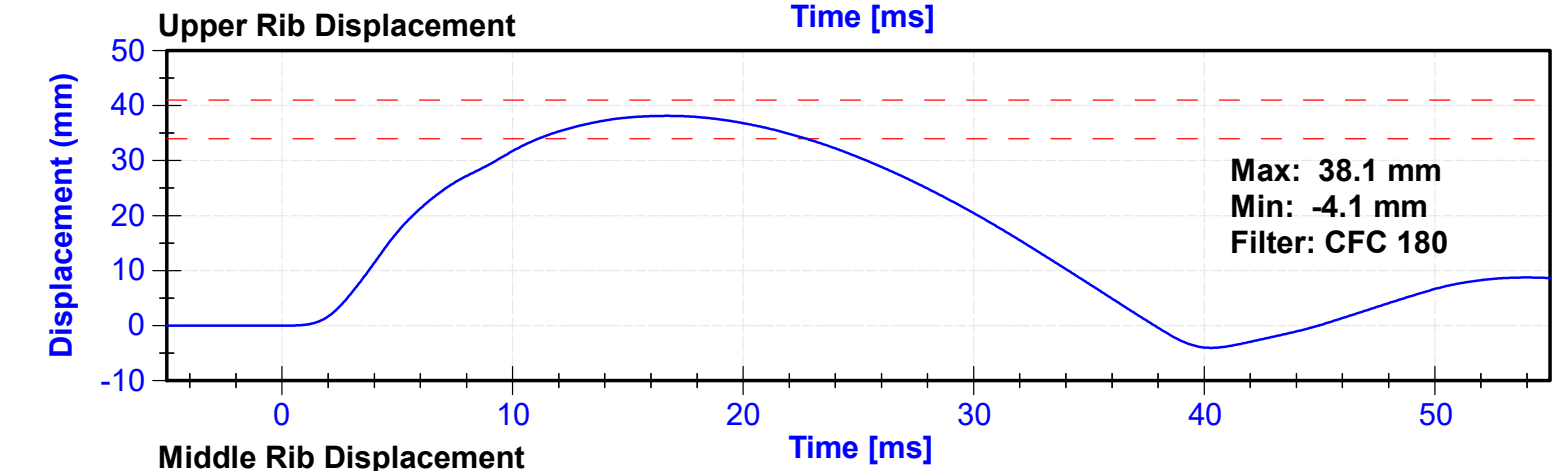
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	21	Pass
Velocity	5.4	5.6	m/s	5.52	Pass
Resistive Force after 6ms	5100	6200	N	6185.9	Pass
Upper Thorax Rib Deflection	34	41	mm	38.1	Pass
Mid Thorax Rib Deflection	37	45	mm	40.6	Pass
Lower Thorax Rib Deflection	37	44	mm	39.3	Pass

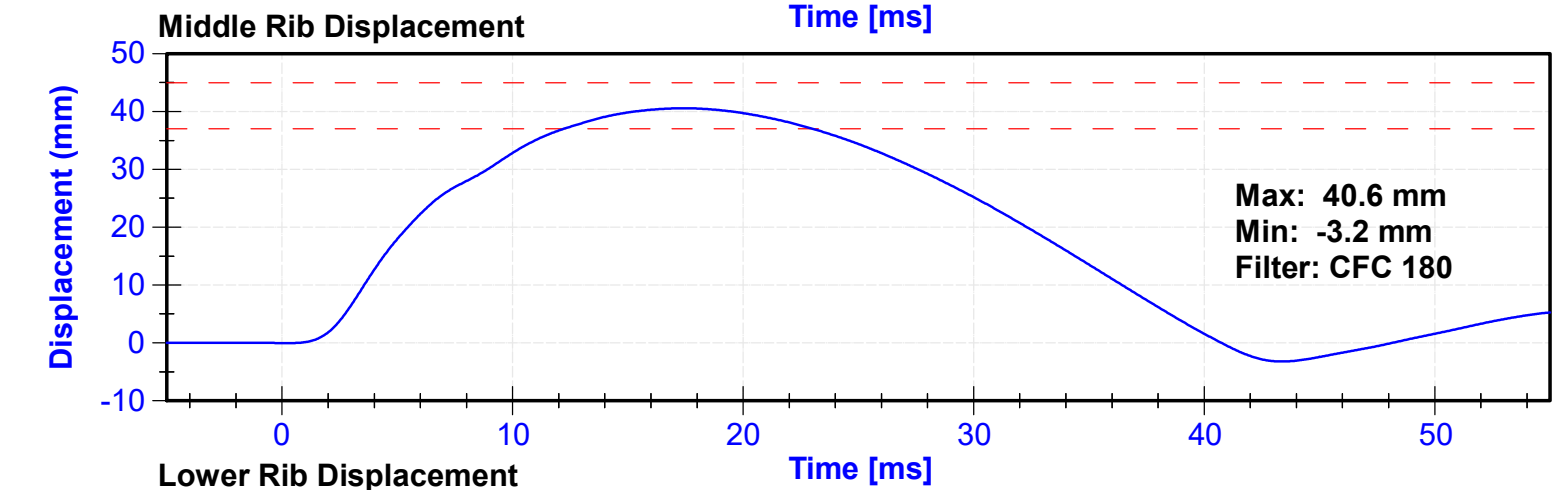
Transducer Calibrations

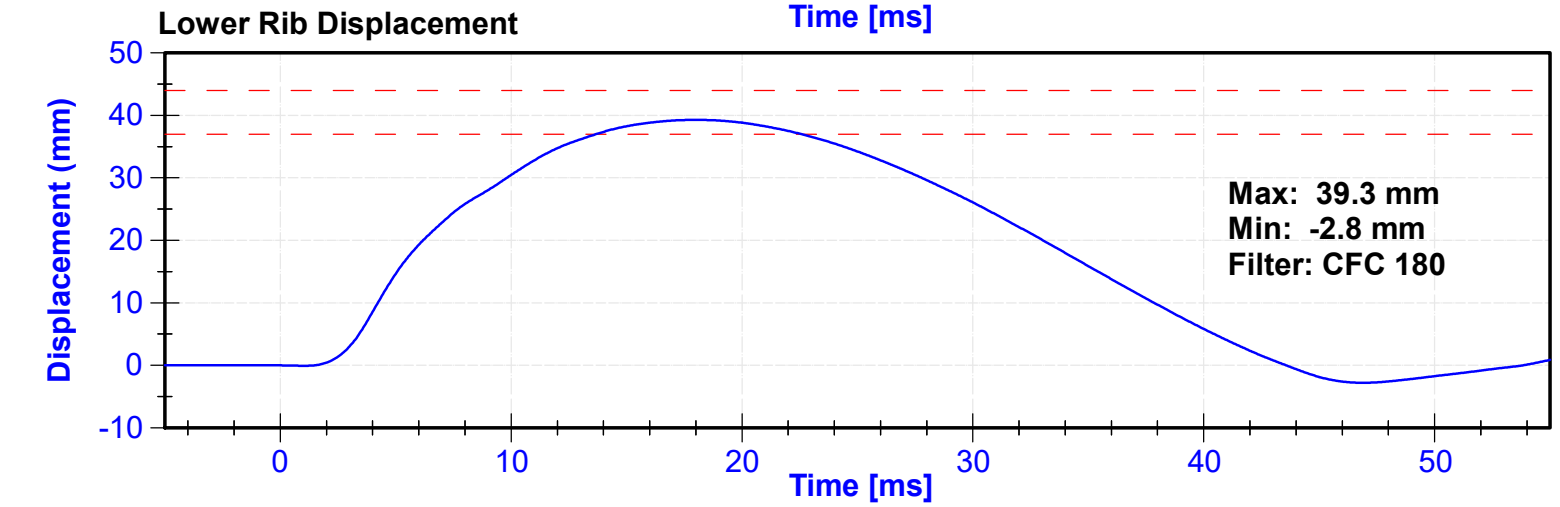
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Upper Thorax Rib Potentiometer	Honeywell	179GFE	1/17/2023	7/18/2023
Middle Thorax Rib Potentiometer	Honeywell	185GFE	1/17/2023	7/18/2023
Lower Thorax Rib Potentiometer	Honeywell	178GFE	1/17/2023	7/18/2023




Resistive Force
Max: 10877.2 N
Min: -19.5 N
Filter: CFC 180
Force (N)
12500
10000
7500
5000
2500
0
-2500
0
10
20
30
40
50
Time [ms]


Upper Rib Displacement
Max: 38.1 mm
Min: -4.1 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Middle Rib Displacement
Max: 40.6 mm
Min: -3.2 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Lower Rib Displacement
Max: 39.3 mm
Min: -2.8 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]

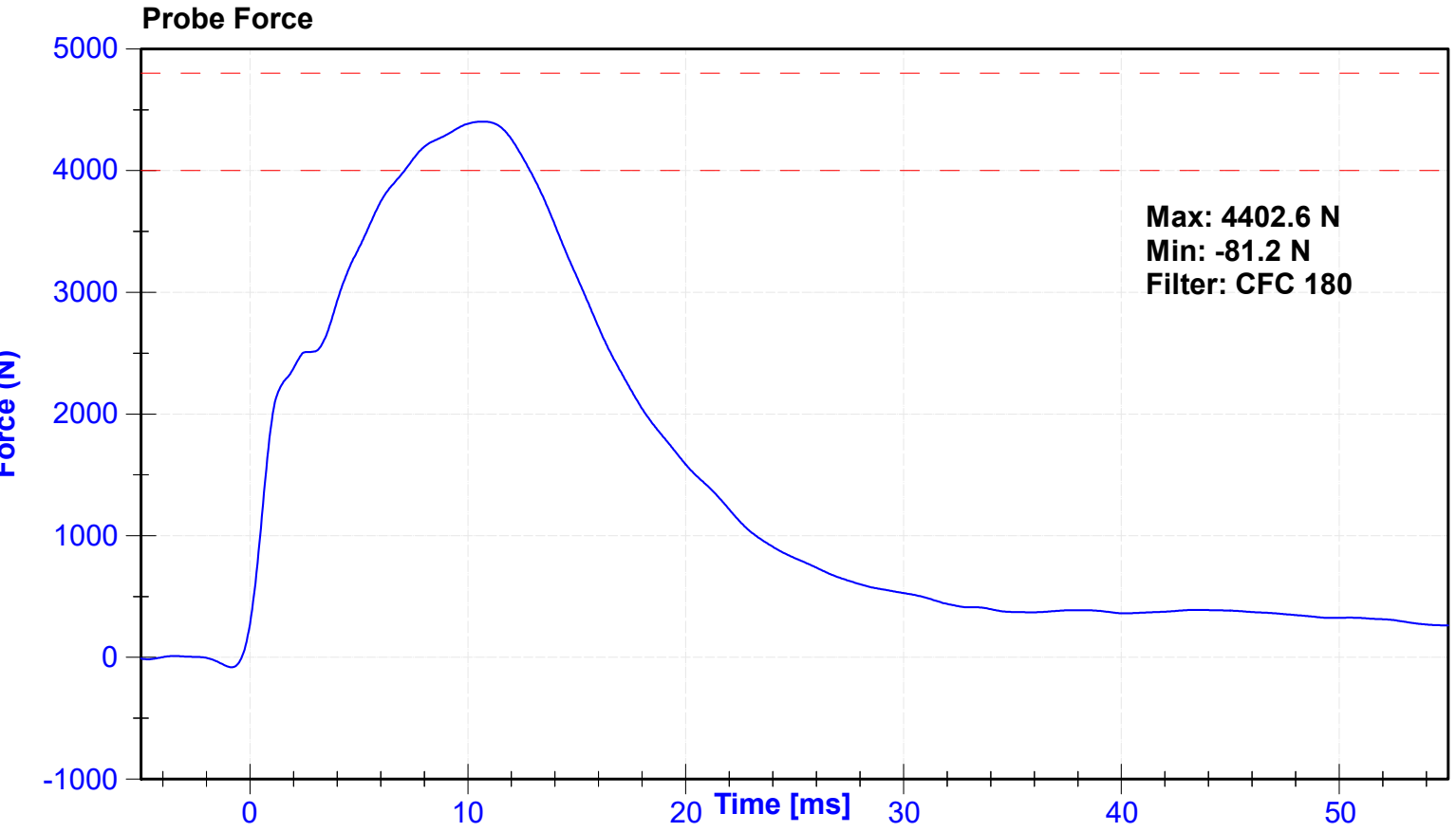
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

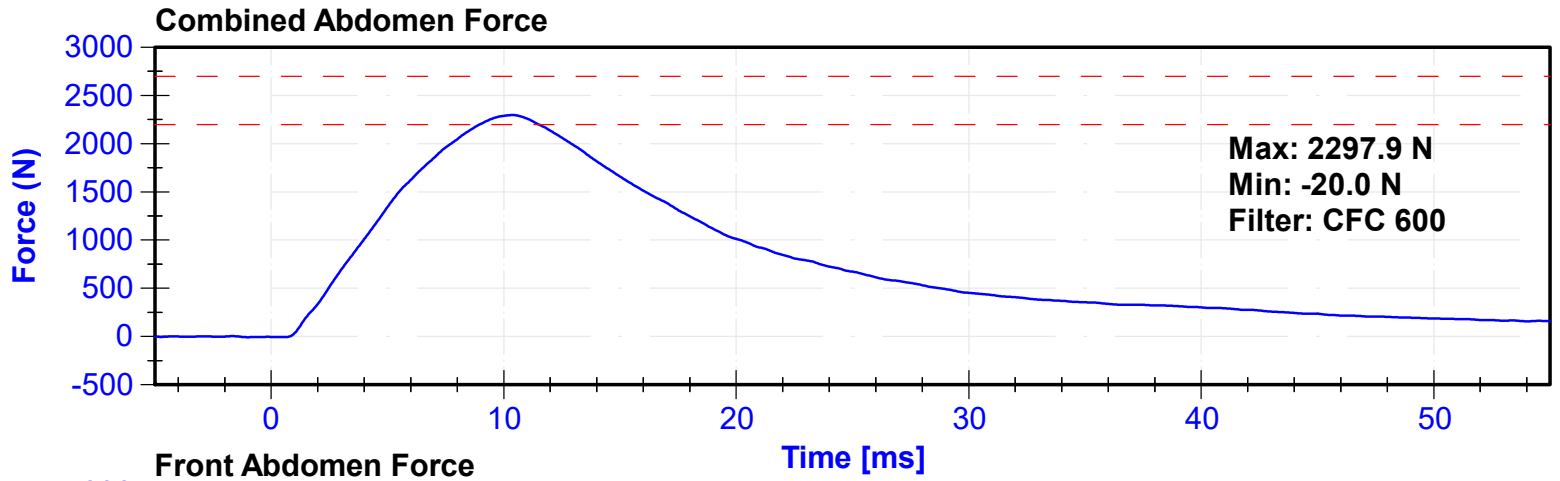
Results

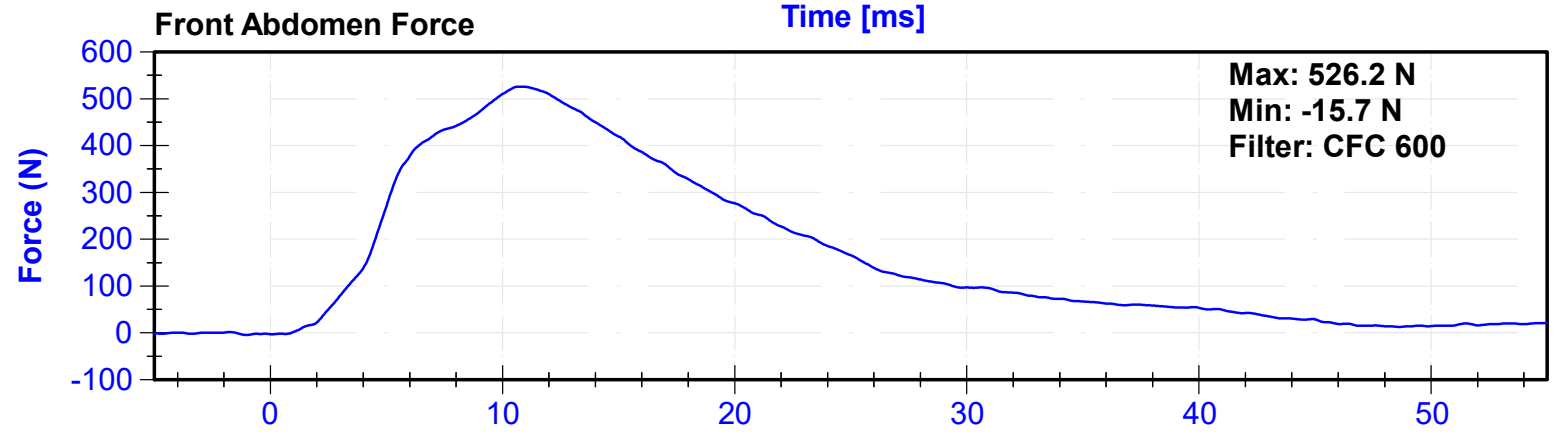
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	21	Pass
Velocity	3.9	4.1	m/s	3.96	Pass
Combined Abdomen Force	2200	2700	N	2297.9	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.40	Pass
Resistive Probe Force	4000	4800	N	4402.6	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.70	Pass

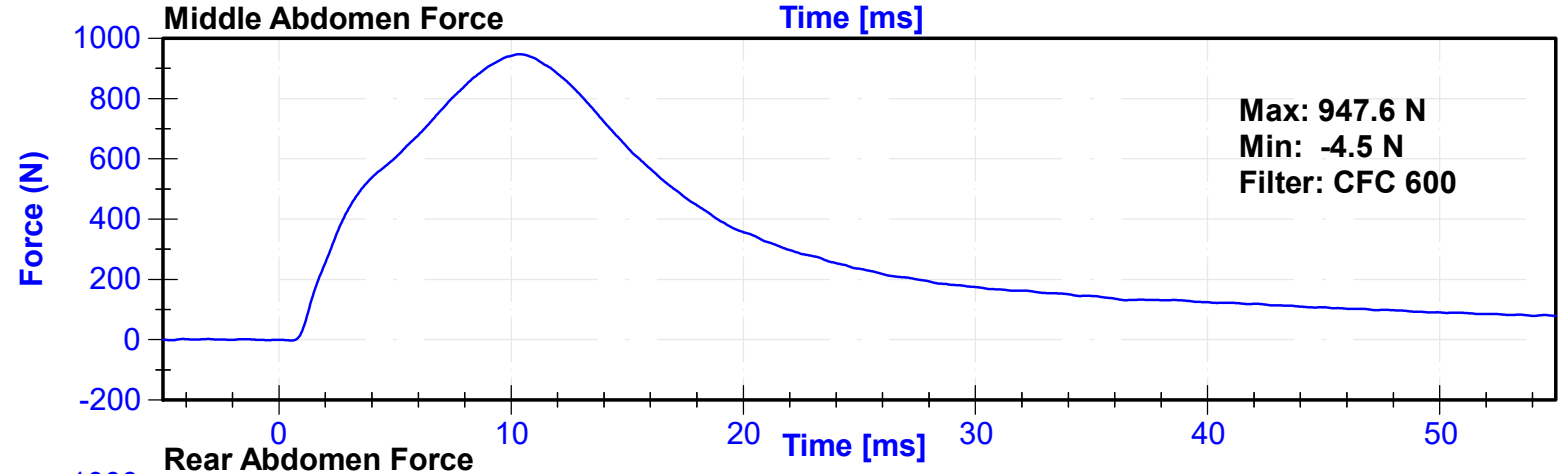
Transducer Calibrations

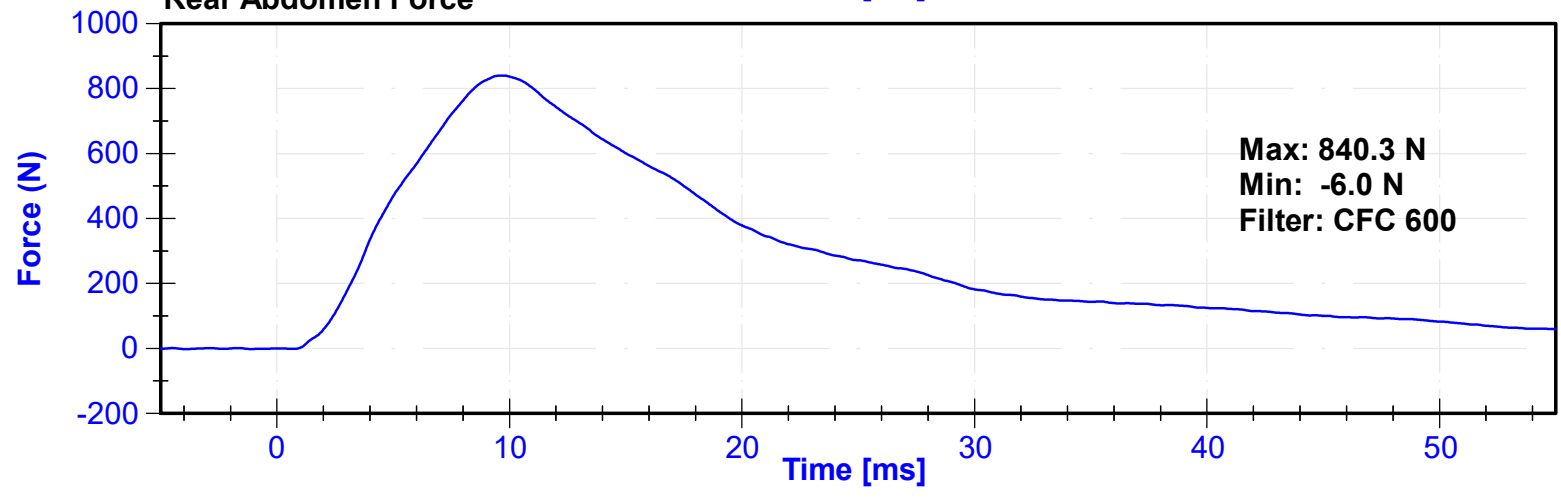
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Front Abdomen Load Cell	Denton	1509	8/12/2022	8/12/2023
Middle Abdomen Load Cell	Denton	1508	8/12/2022	8/12/2023
Rear Abdomen Load Cell	Denton	1507	8/12/2022	8/12/2023




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2297.9 N
Min: -20.0 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 526.2 N
Min: -15.7 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 947.6 N
Min: -4.5 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 840.3 N
Min: -6.0 N
Filter: CFC 600

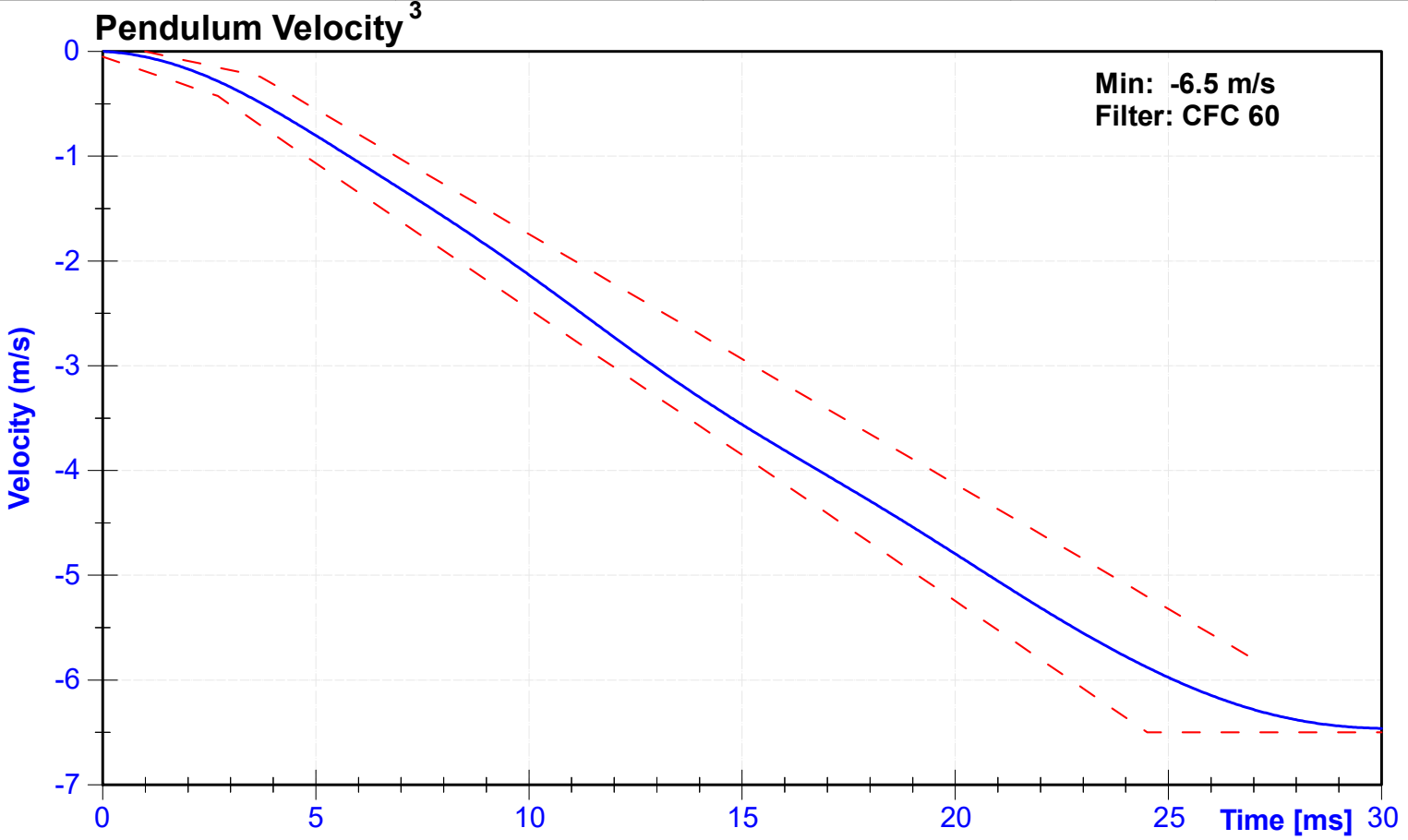
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

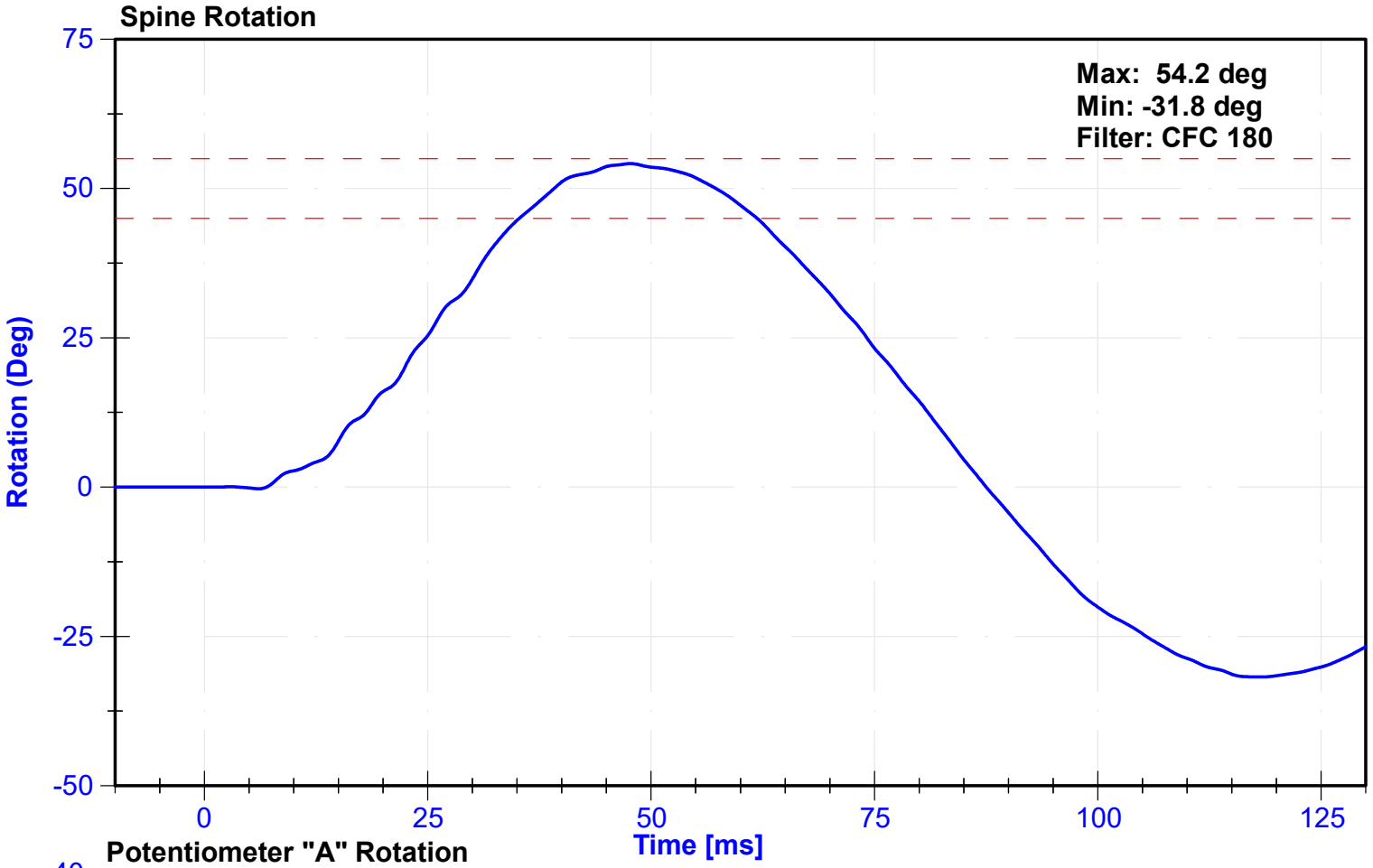
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	20.2	Pass
Velocity	5.95	6.15	m/s	6.046	Pass
Lateral Spine Rotation	45	55	deg	54.2	Pass
Time at Maximum Rotation	39	53	ms	47.7	Pass
Time of Decay to Zero Degrees	37	57	ms	39.9	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

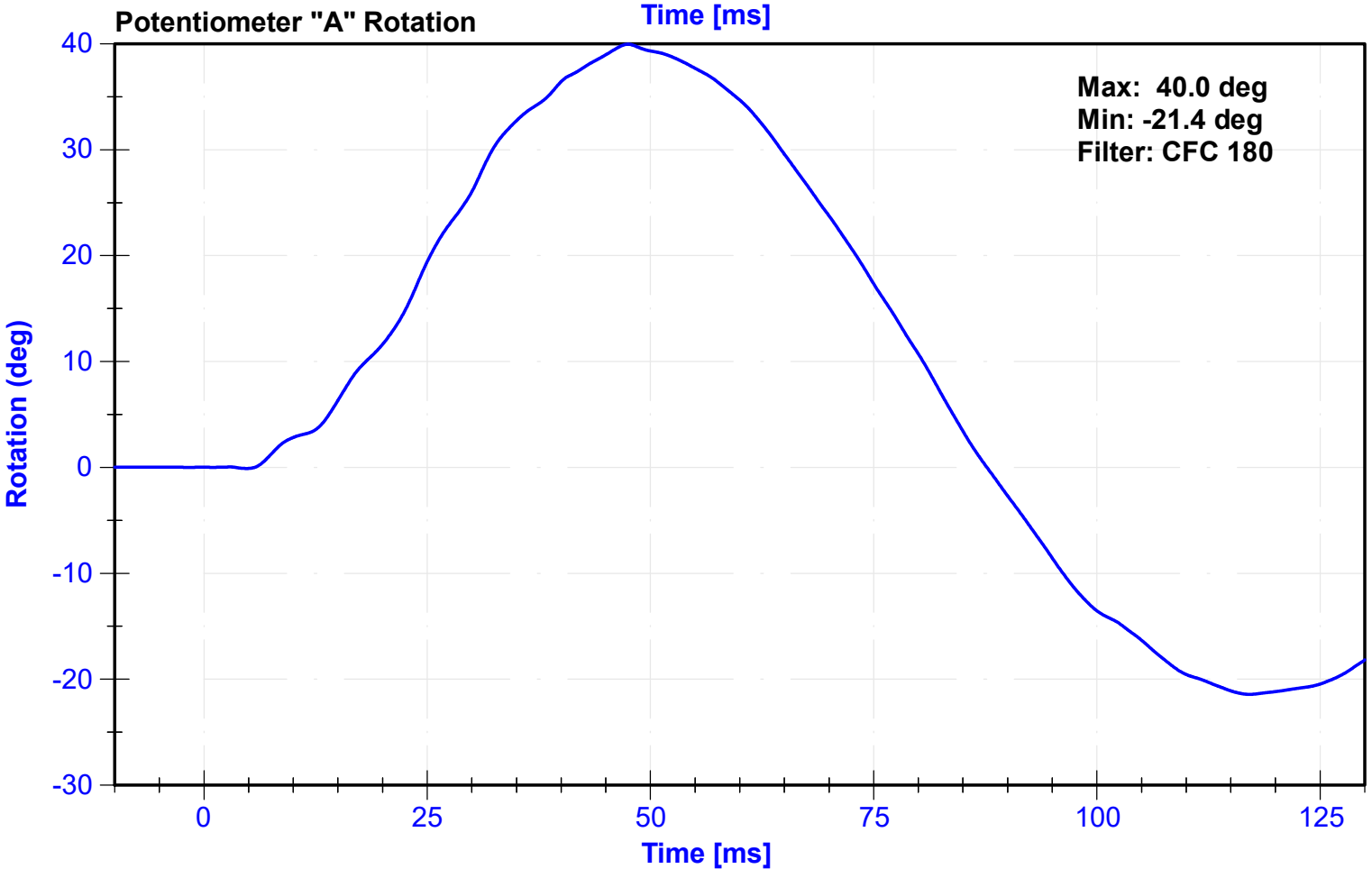
Transducer Calibrations

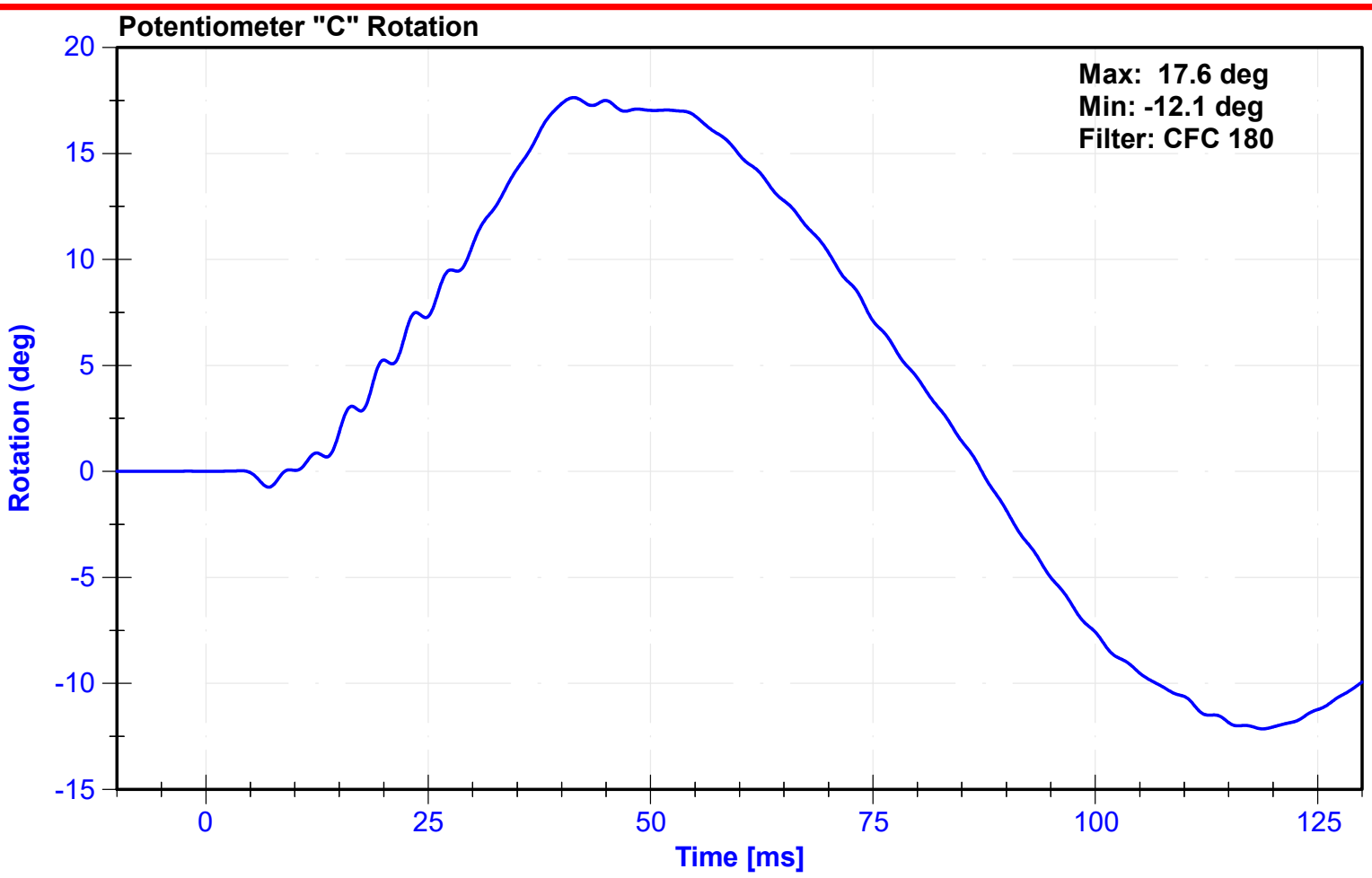
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/26/2022	10/26/2023
Pendulum "A" Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Condyle "B" Potentiometer	Sfernice	095	10/5/2022	10/5/2023



[1,2] Upper and lower boundaries specified in Appendix I


Spine Rotation
Max: 54.2 deg
Min: -31.8 deg
Filter: CFC 180
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 40.0 deg
Min: -21.4 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
-30
0
25
50
75
100
125
Time [ms]



Appendix I

[2] Upper Boundary Corridor		[1] Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.7	-0.24	2.7	-0.425
27.0	-5.80	24.5	-6.5
		30.0	-6.5

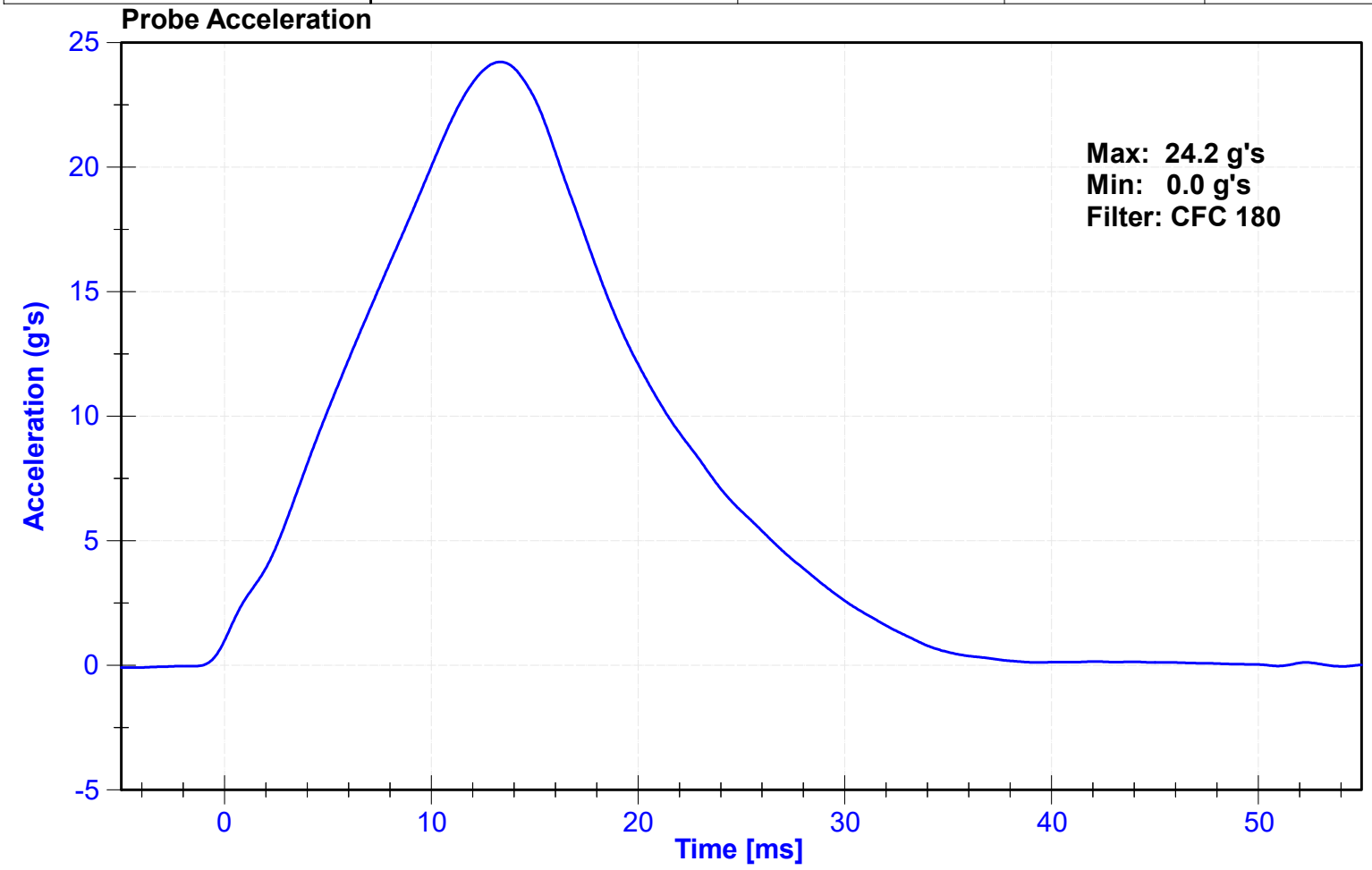
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

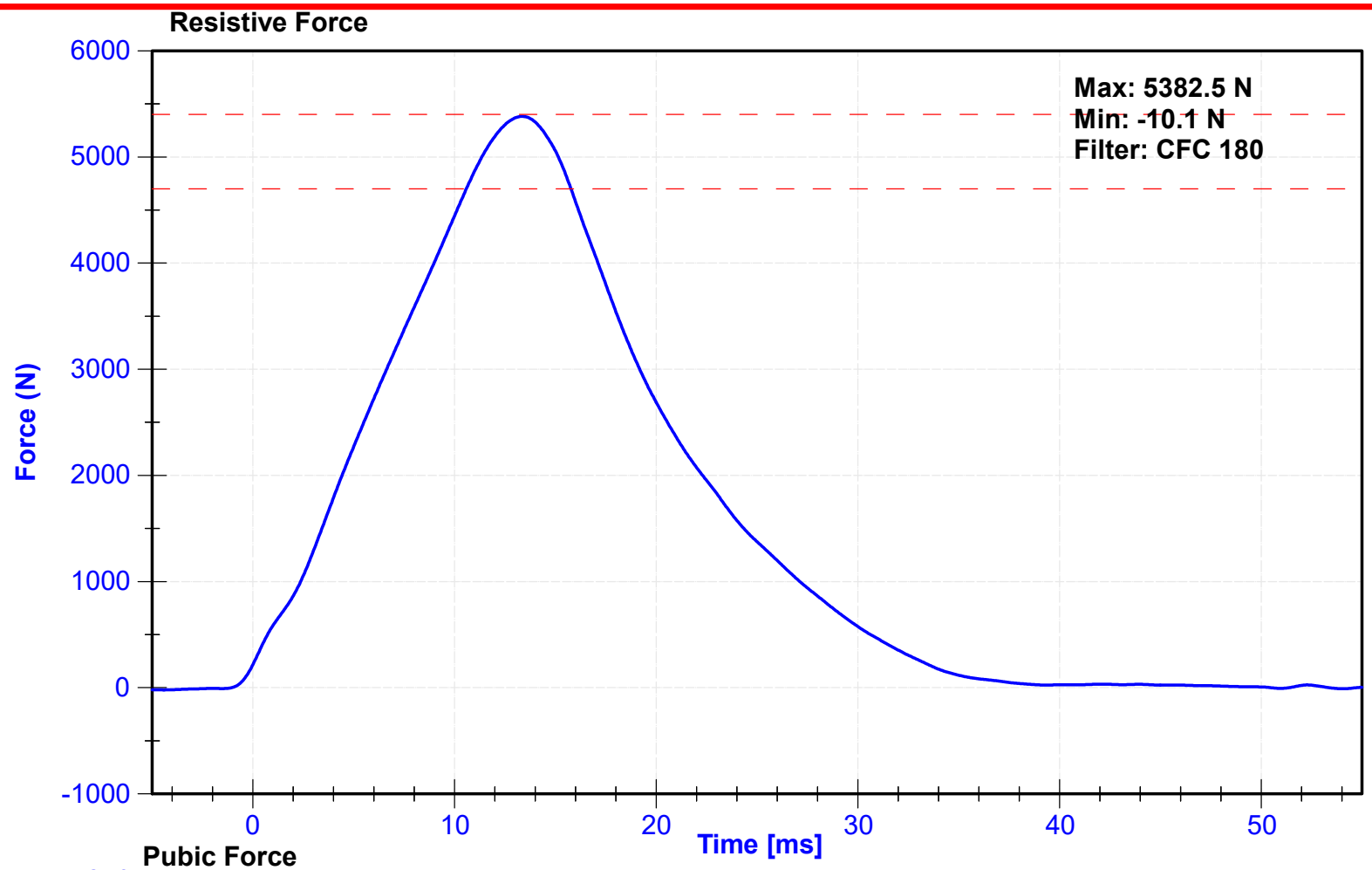
Results

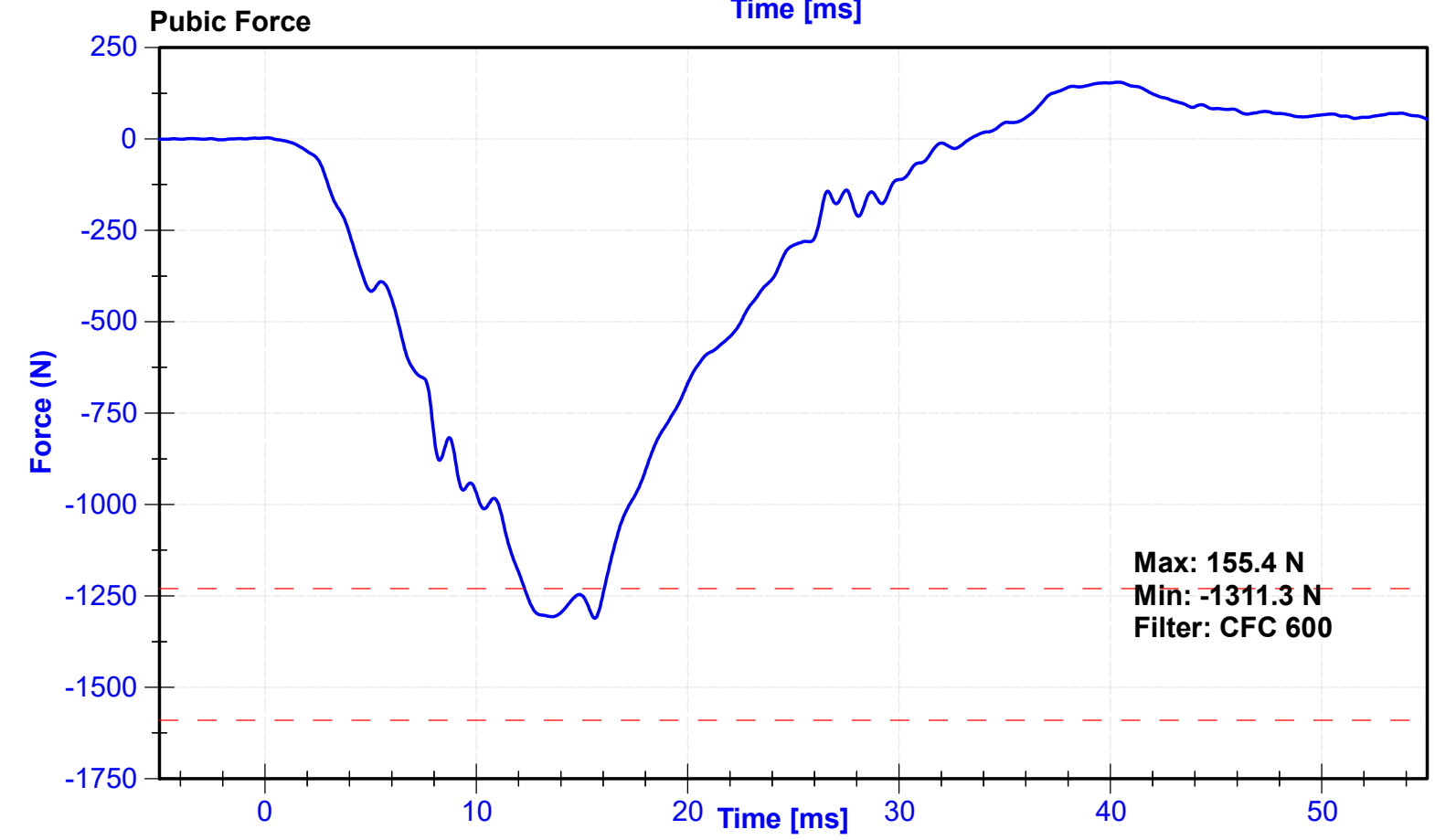
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	21	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Resistive Force	4700	5400	N	5382.5	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.35	Pass
Pubic Force	-1590	-1230	N	-1311.3	Pass
Time at Peak Pubic Force	12.2	17.0	ms	15.60	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Pubic Load Cell	Denton	459-FY	6/14/2022	6/14/2023




Resistive Force
Max: 5382.5 N
Min: -10.1 N
Filter: CFC 180
Force (N)
Time [ms]
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50


Pubic Force
Max: 155.4 N
Min: -1311.3 N
Filter: CFC 600
Force (N)
Time [ms]
250
0
-250
-500
-750
-1000
-1250
-1500
-1750
0
10
20
30
40
50

CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE – PASSENGER ATD

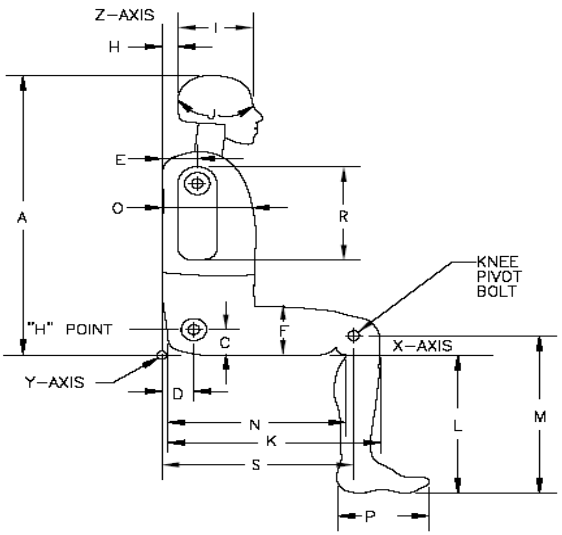
SERIAL NO:DG8012

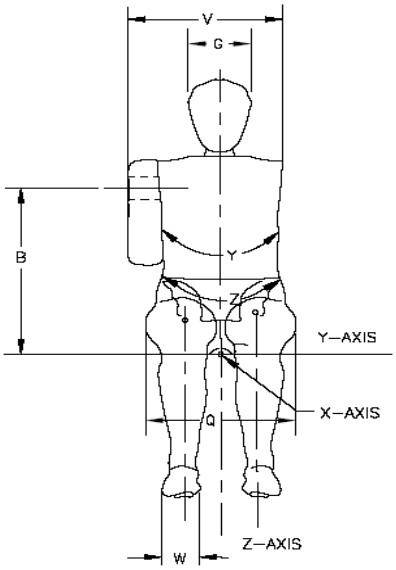
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Brogan Date: 03/01/2023

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	783	Pass
B	Shoulder Pivot Height	437	453	447	Pass
C	H-point Height	79	89	82	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	127	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	182	Pass
J	Head Circumference	541	551	546	Pass
K	Buttock to Knee Length	514	540	528	Pass
L	Popliteal Height	343	369	359	Pass
M	Knee Pivot to floor height	392	409	401	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	200	Pass
P	Foot Length	216	232	226	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	251	Pass
S	Knee Joint to seatback	477	493	487	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	872	Pass
Z	Waist Circumference	761	791	777	Pass

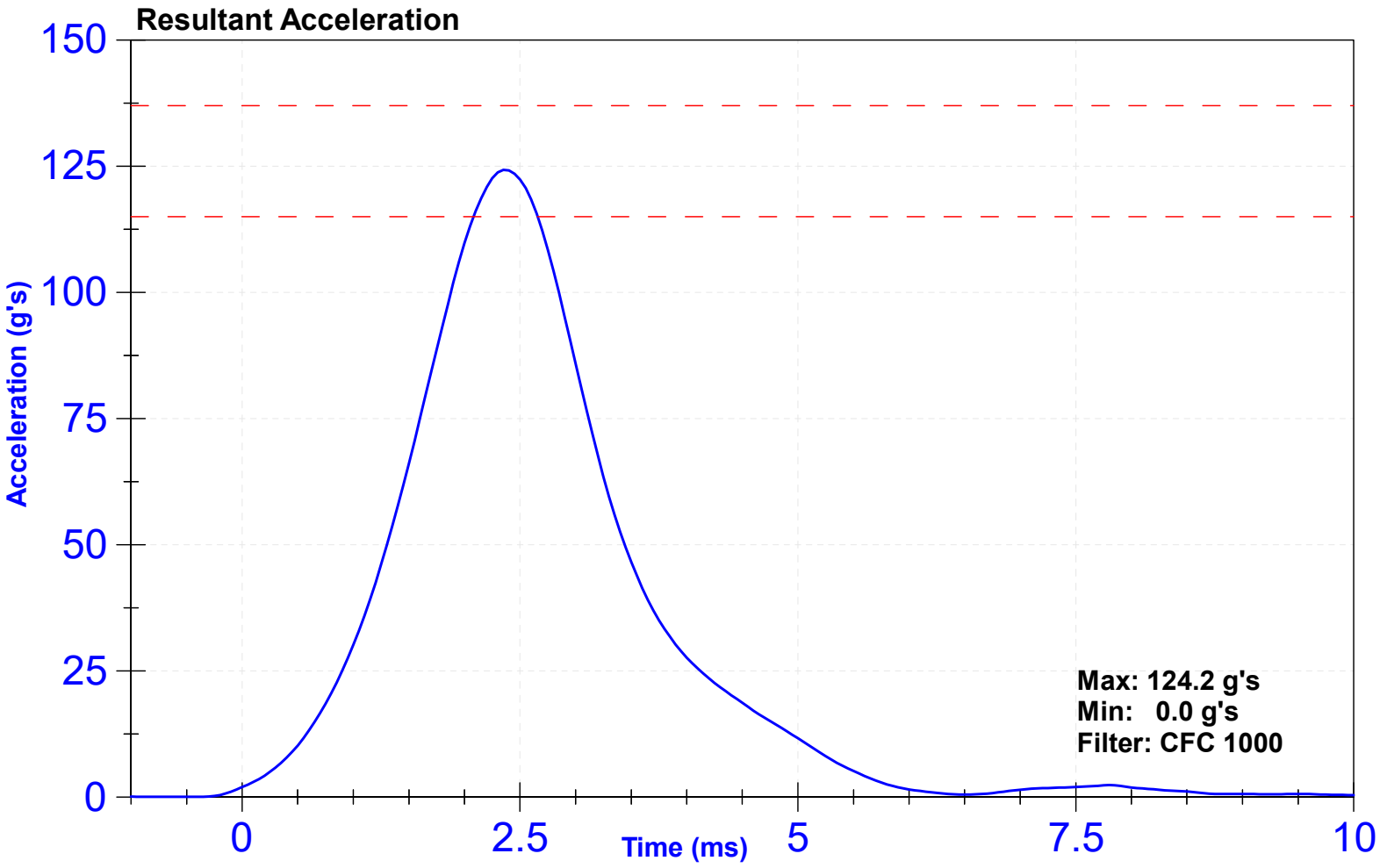
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

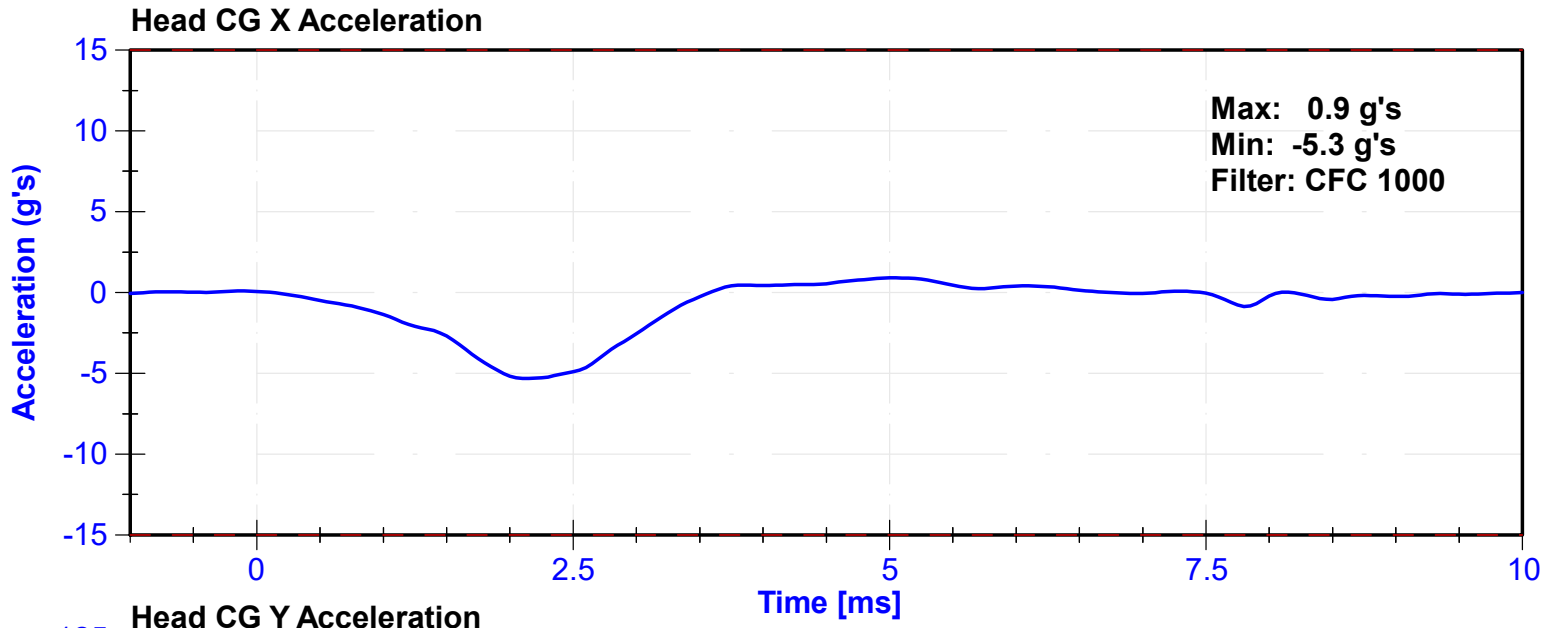
Results

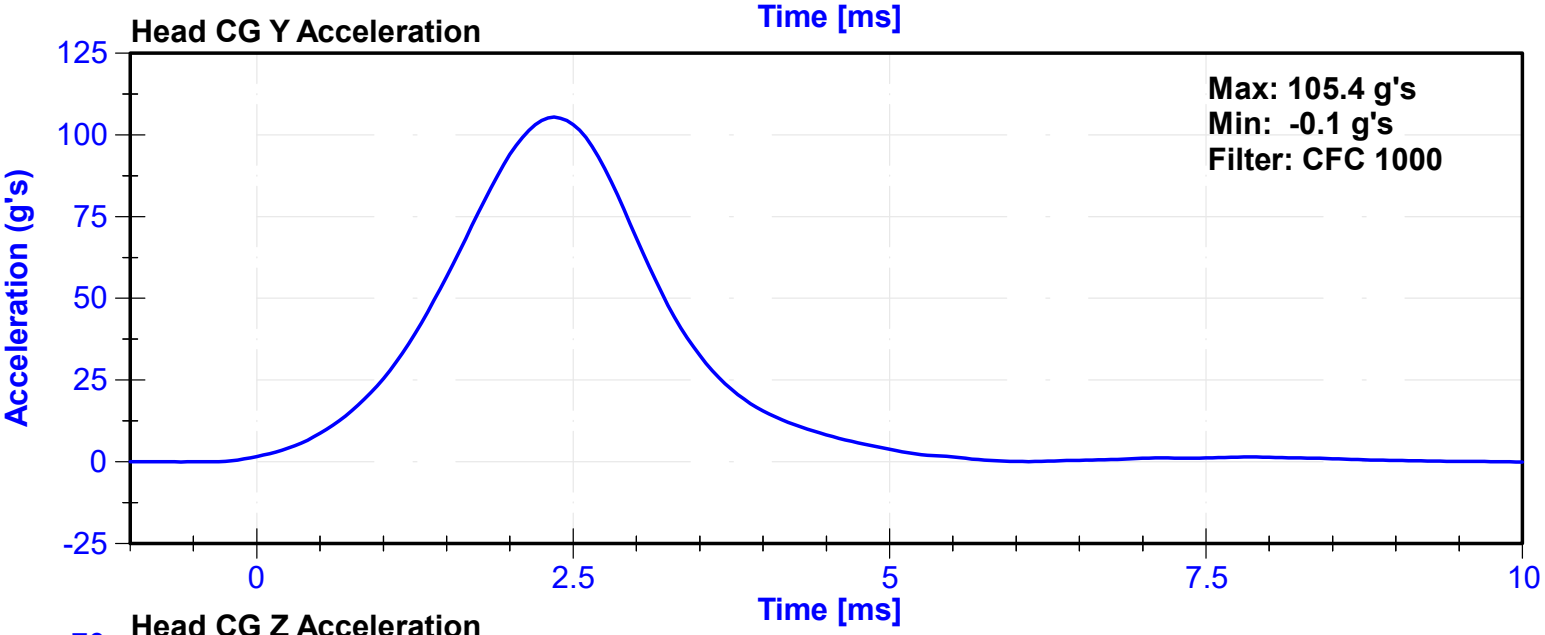
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	25.5	Pass
Resultant Acceleration	115	137	g's	124.2	Pass
Oscillation	0	15	%	1.8	Pass
Fore-Aft Acceleration	-15	15	g's	-5.3	Pass

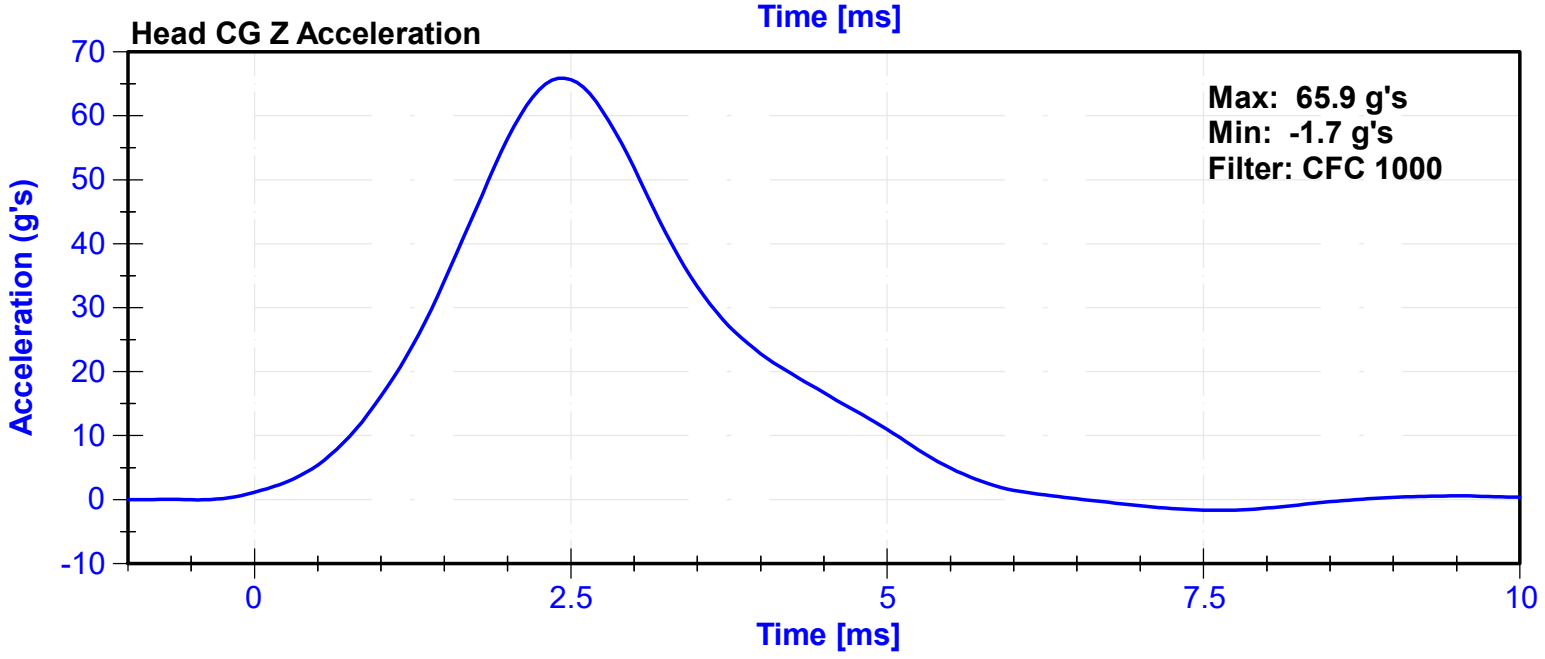
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P74788	12/12/2022	6/10/2023
Y Accelerometer	Endevco	P51668	12/12/2022	6/10/2023
Z Accelerometer	Endevco	P83319	12/12/2022	6/10/2023




Head CG X Acceleration
Max: 0.9 g's
Min: -5.3 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Y Acceleration
Max: 105.4 g's
Min: -0.1 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Z Acceleration
Max: 65.9 g's
Min: -1.7 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]

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

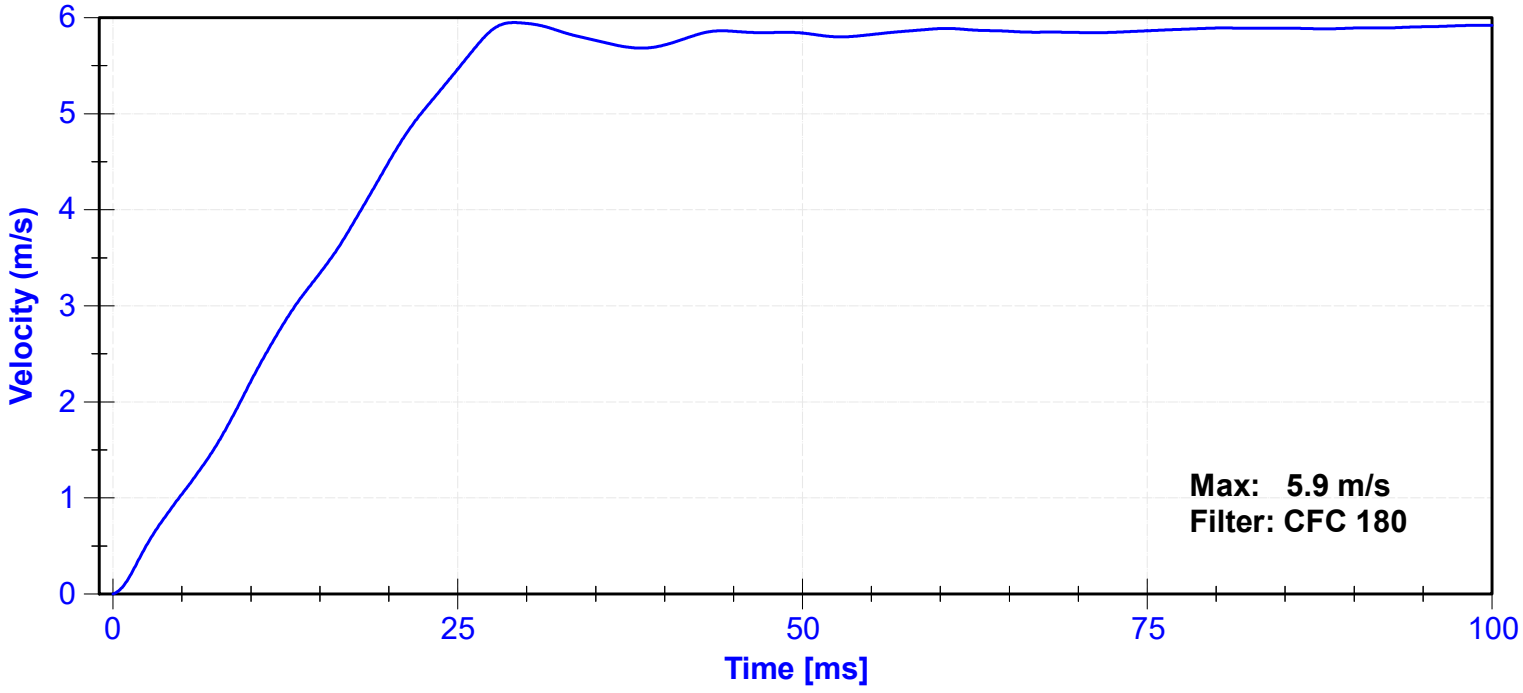
Results

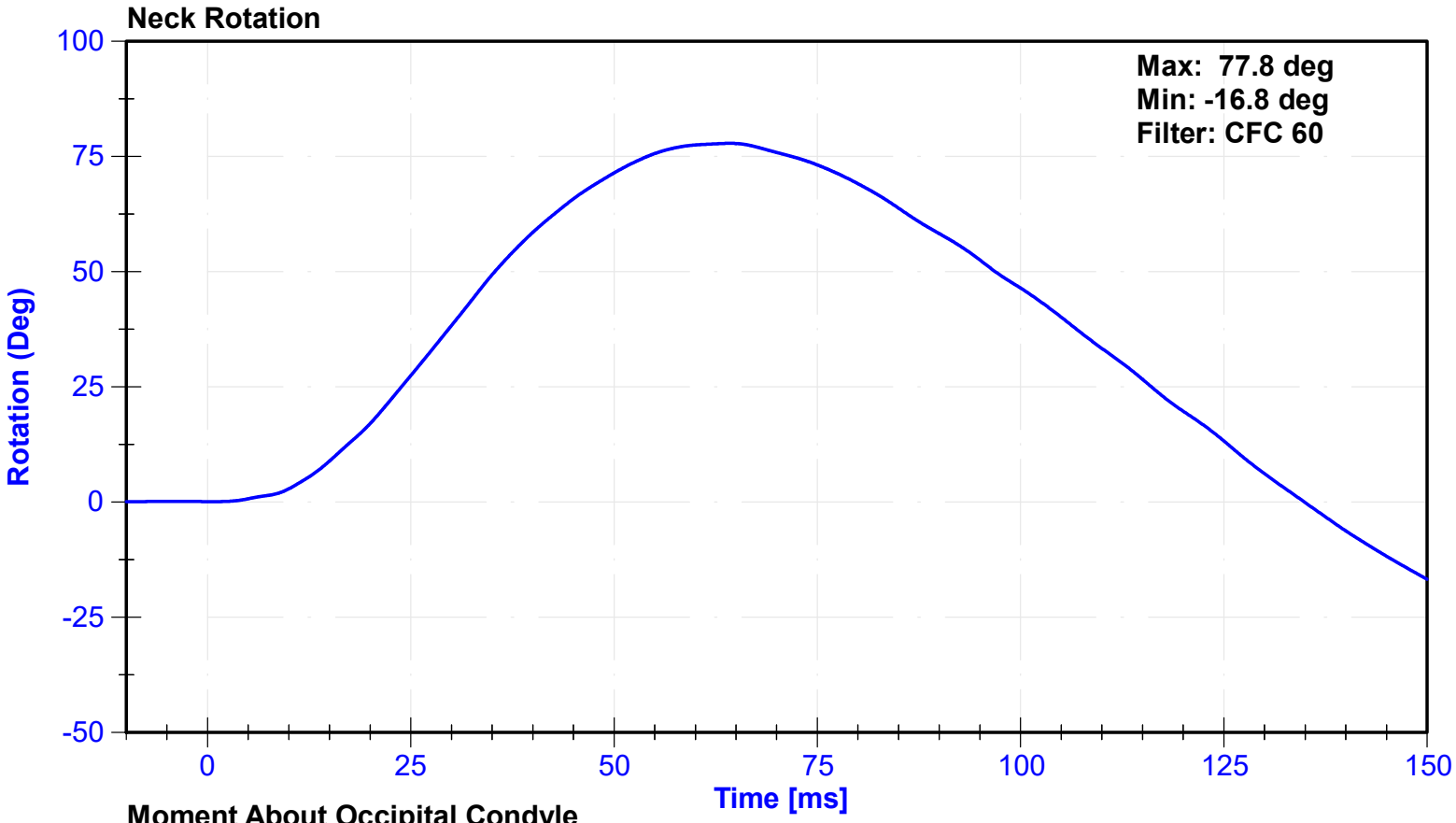
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	25.5	Pass
Velocity	5.51	5.63	m/s	5.567	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.22	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.34	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.50	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.46	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.95	Pass
Neck Rotation	71	81	deg	77.8	Pass
Time at Maximum Rotation	50	70	ms	64.3	Pass
Moment about the OC	36	44	Nm	43.2	Pass
Moment Decay to 0 Nm	102	126	ms	117.3	Pass

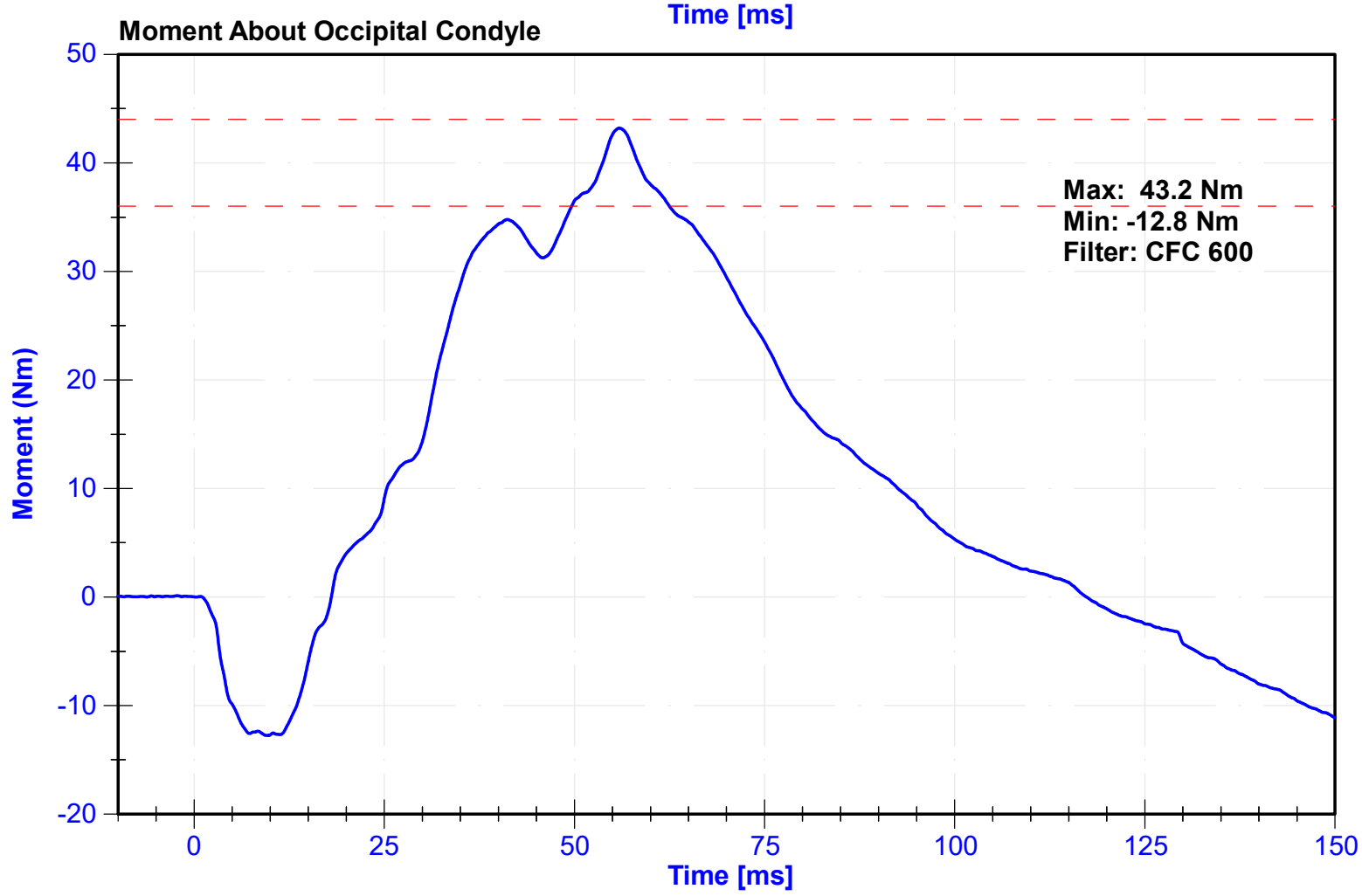
Transducer Calibrations

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

Pendulum Impulse




Neck Rotation
Max: 77.8 deg
Min: -16.8 deg
Filter: CFC 60
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 43.2 Nm
Min: -12.8 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

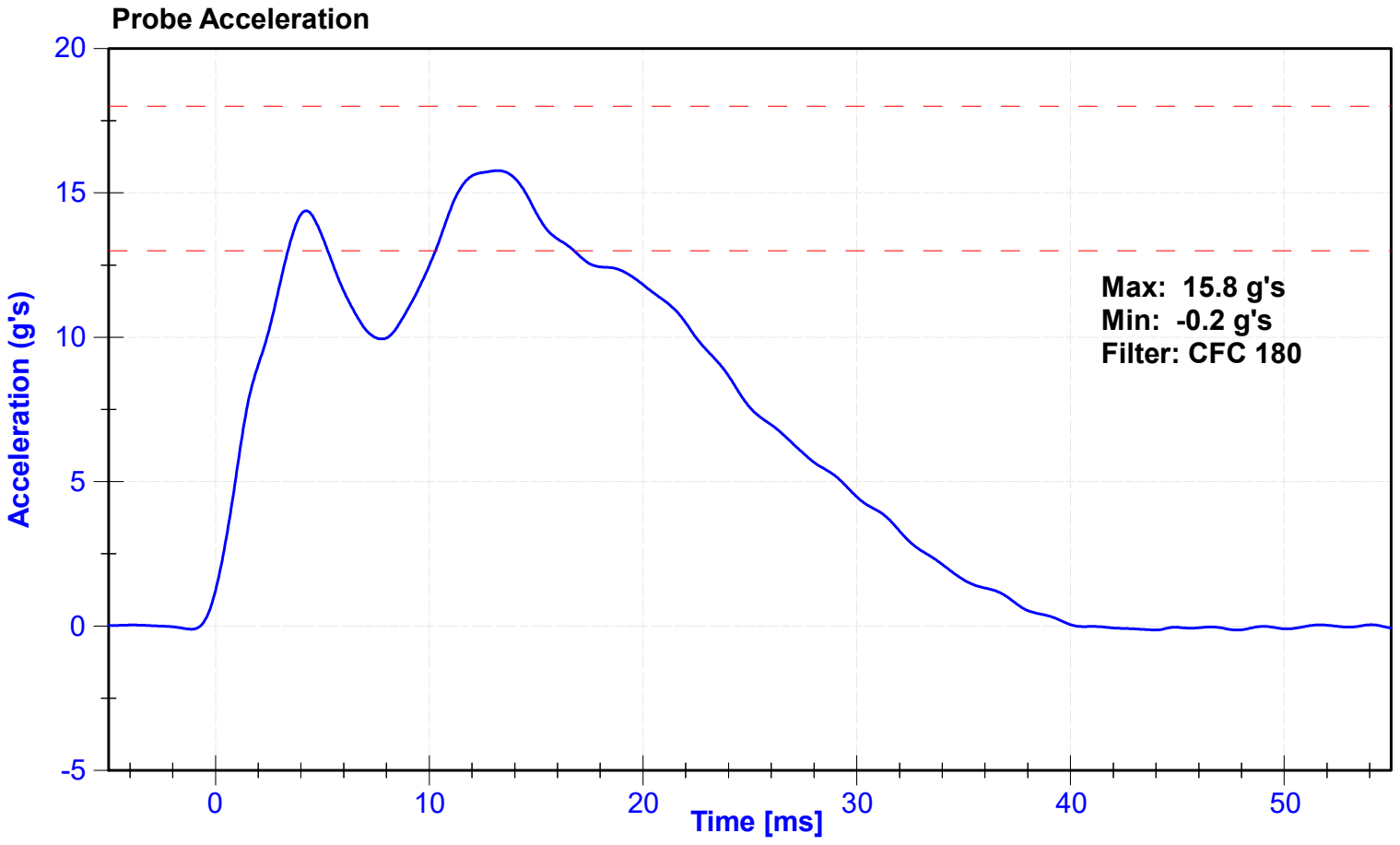
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

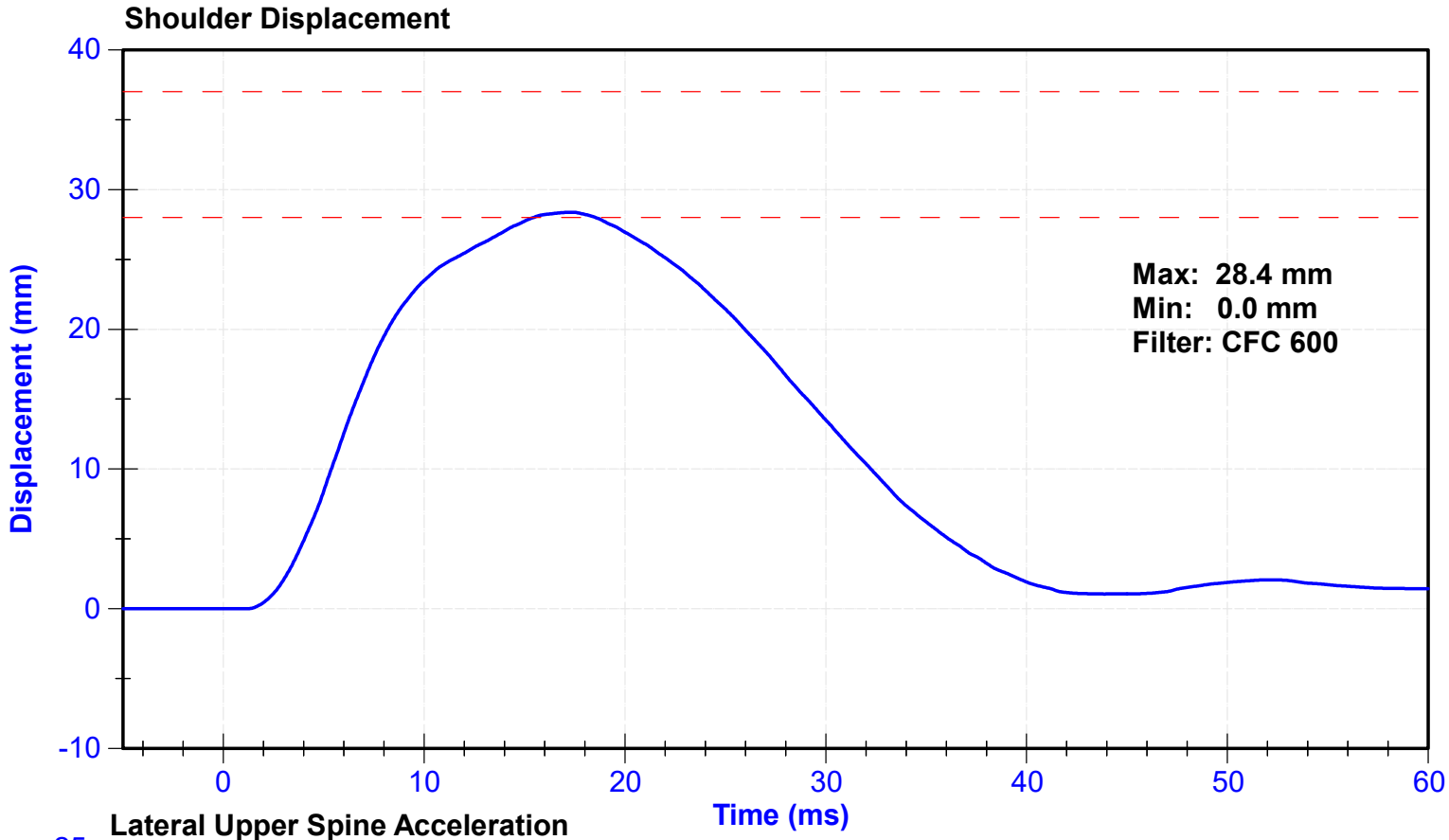
Results

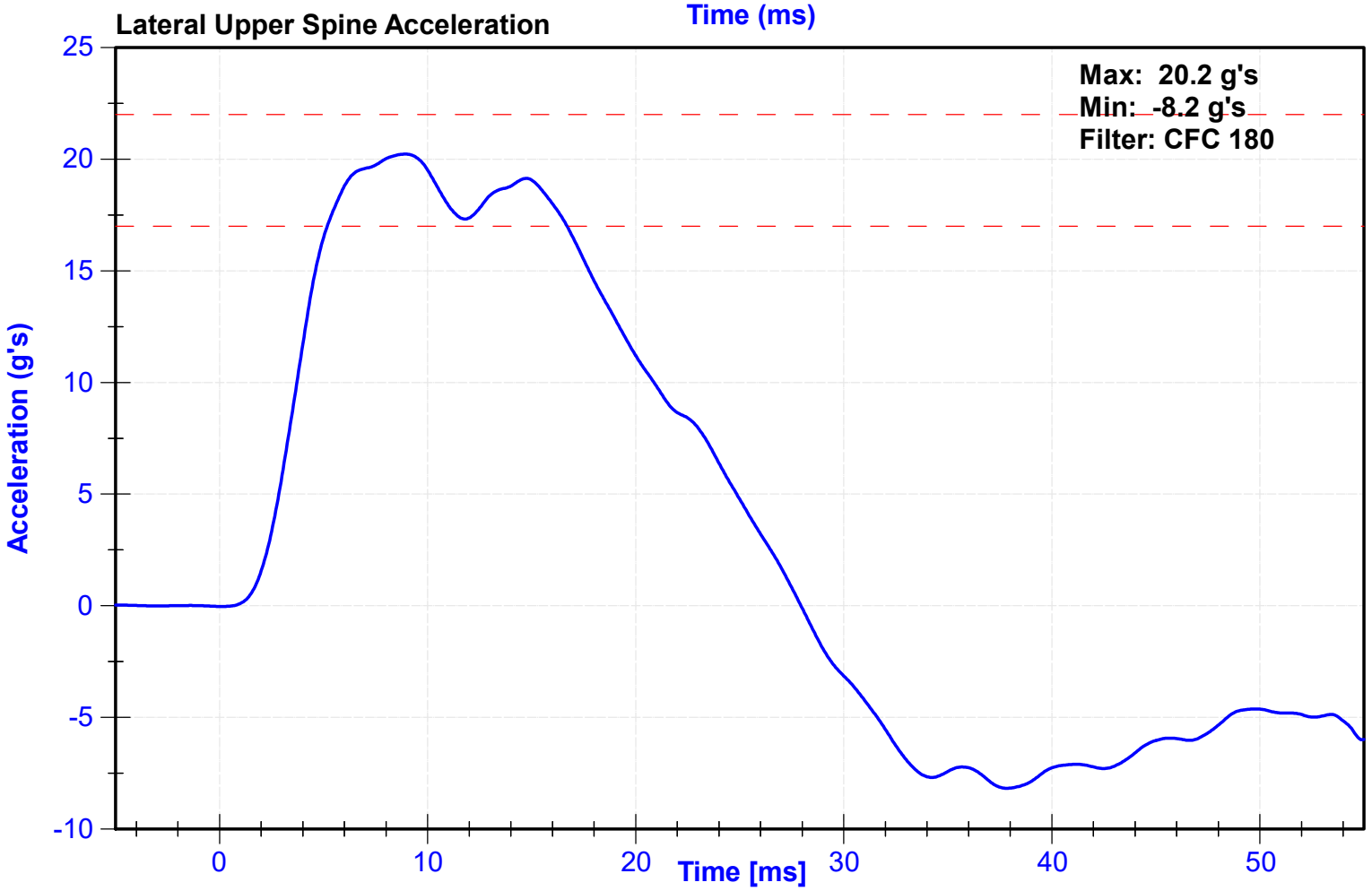
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.4	Pass
Humidity	10	70	%	22.3	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	13	18	g's	15.8	Pass
Shoulder Deflection	28	37	mm	28.4	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Shoulder Potentiometer	Servo	1274GFE	12/13/2022	6/13/2023
Upper Spine Y Accelerometer	Endevco	P64148	12/12/2022	6/10/2023




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 28.4 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 20.2 g's
Min: -8.2 g's
Filter: CFC 180

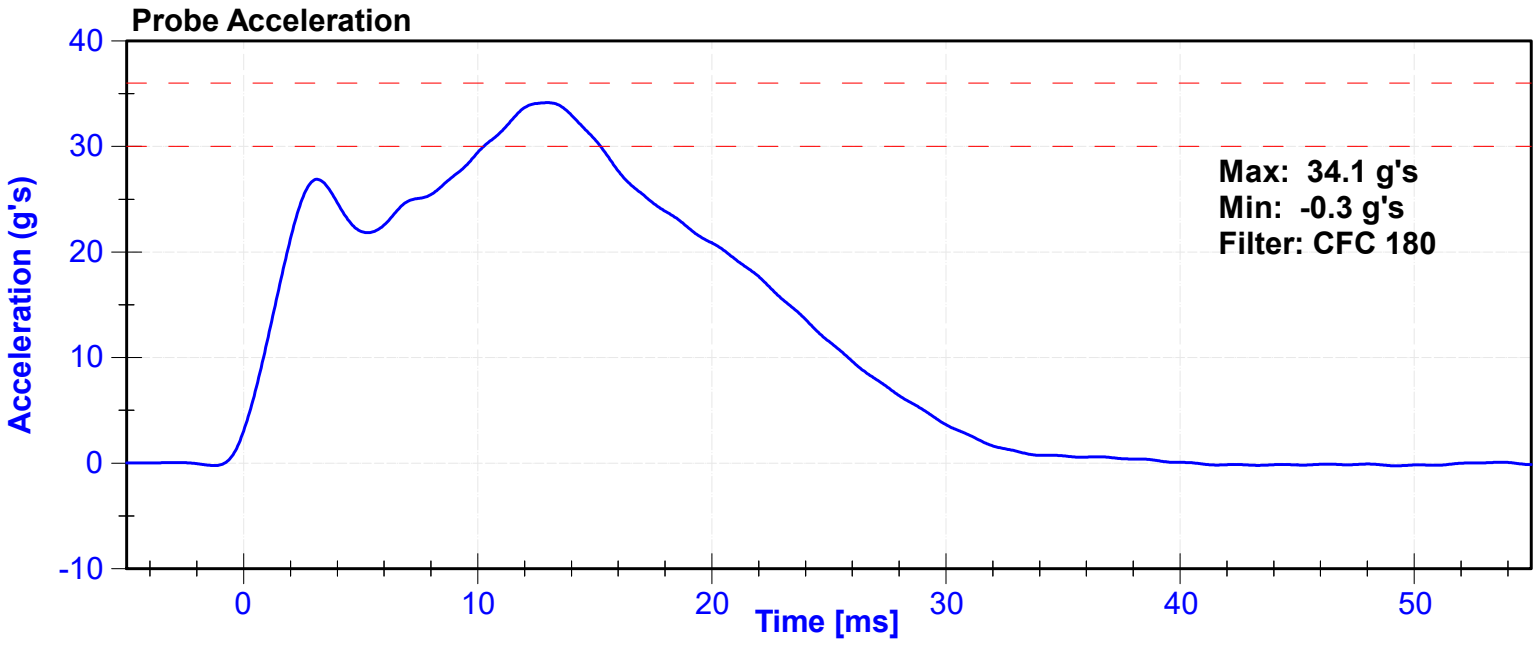
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

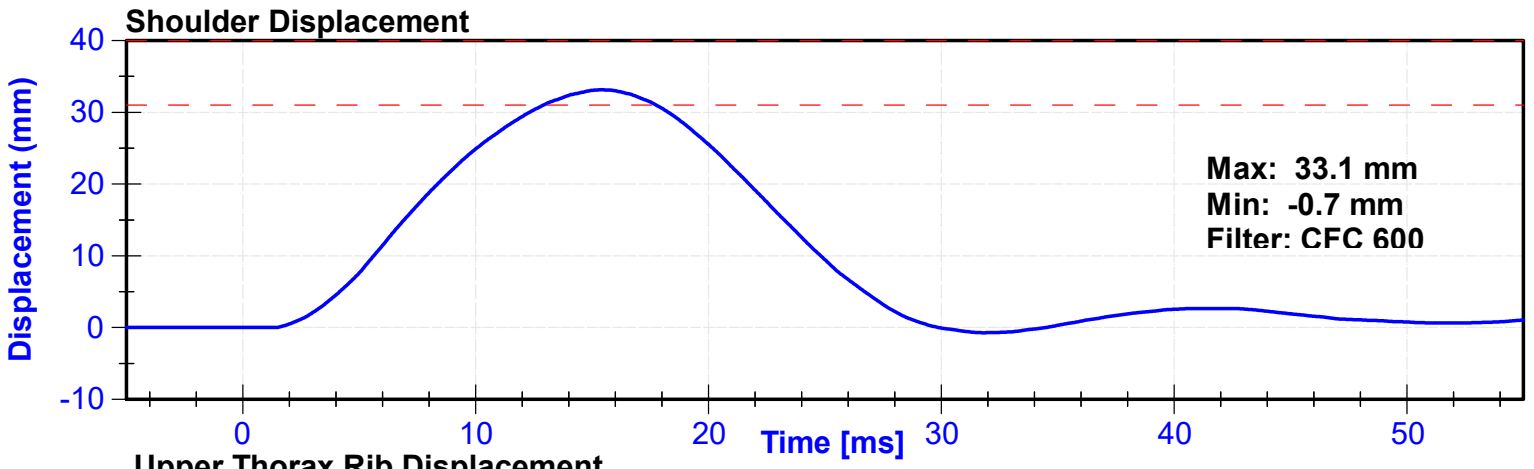
Results

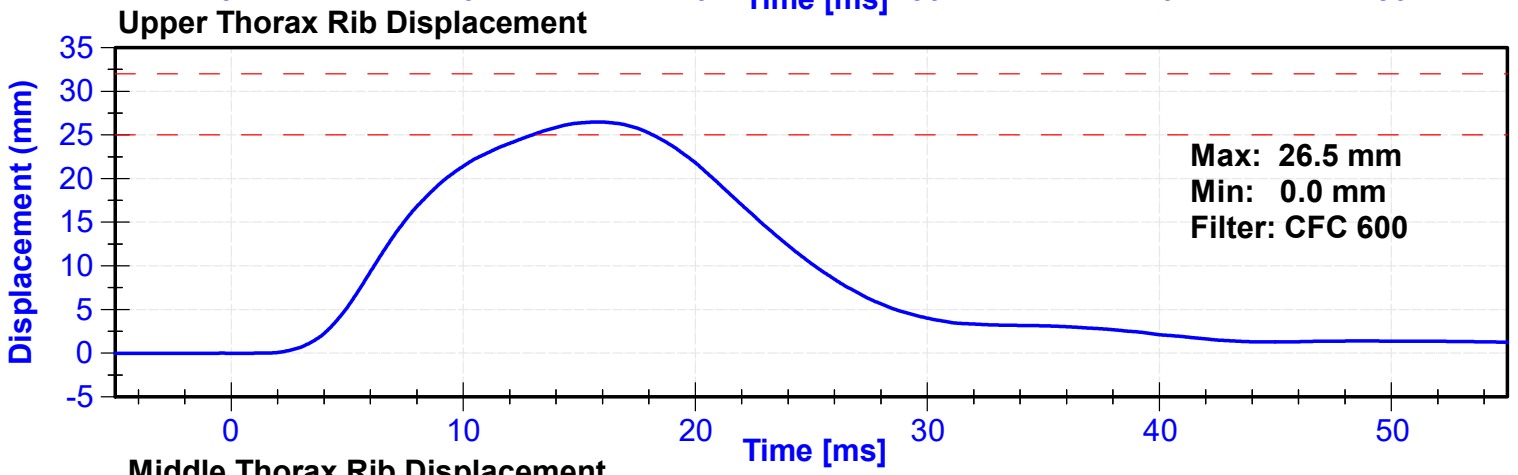
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.4	Pass
Humidity	10	70	%	22.3	Pass
Velocity	6.6	6.8	m/s	6.72	Pass
Probe Acceleration after 5 ms	30	36	g's	34.1	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.0	Pass
Lateral Lower Spine Acceleration	29	37	g's	34.4	Pass
Shoulder Deflection	31	40	mm	33.1	Pass
Upper Thorax Rib Deflection	25	32	mm	26.5	Pass
Mid Thorax Rib Deflection	30	36	mm	30.8	Pass
Lower Thorax Rib Deflection	32	38	mm	33.2	Pass

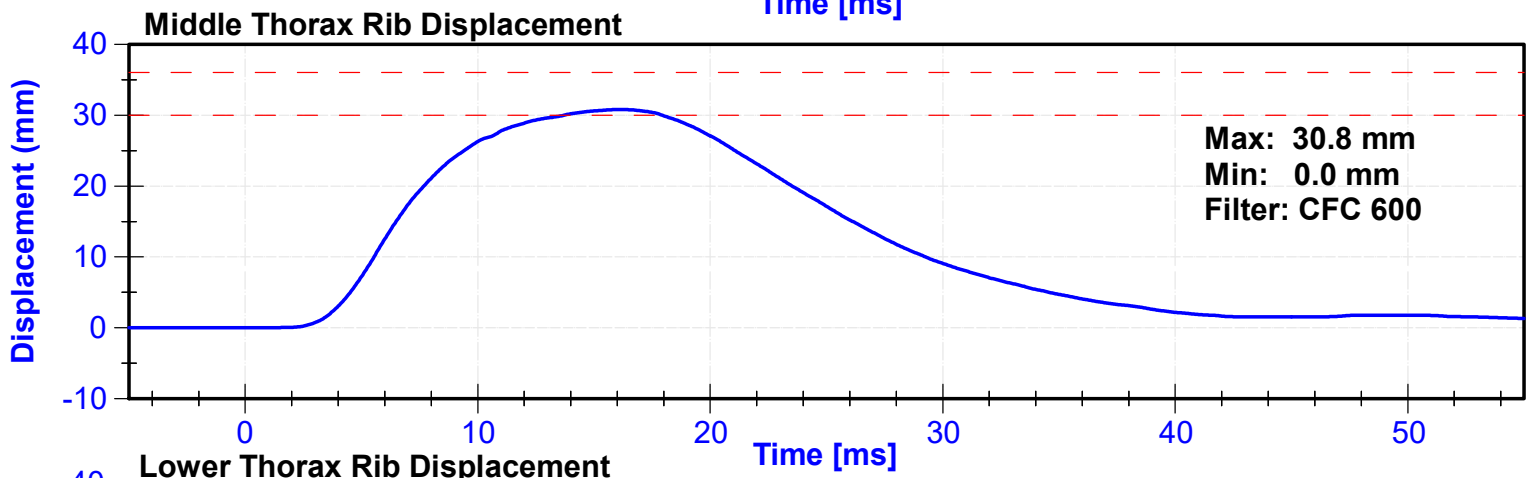
Transducer Calibrations

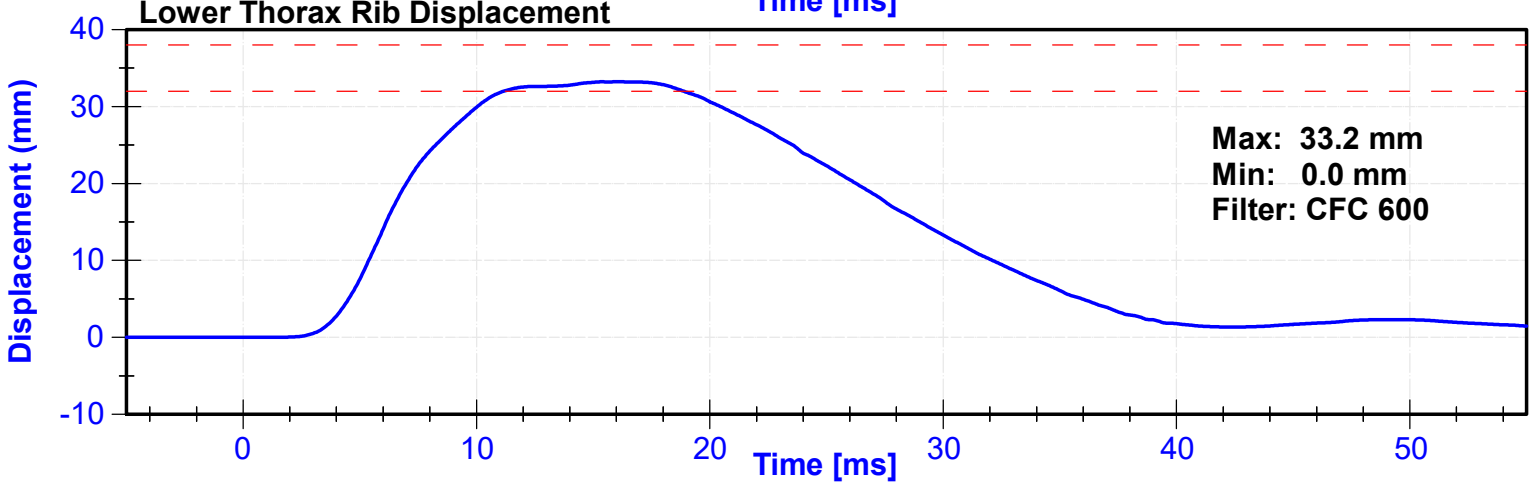
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Upper Spine T1 Y Accelerometer	Endevco	P64148	12/12/2022	6/10/2023
Upper Spine T12 Y Accelerometer	Endevco	P51327	12/12/2022	6/10/2023
Shoulder Potentiometer	Servo	1274GFE	12/13/2022	6/13/2023
Upper Thorax Rib Potentiometer	Servo	1199GFE	12/13/2022	6/13/2023
Middle Thorax Rib Potentiometer	Servo	1246GFE	12/13/2022	6/13/2023
Lower Thorax Rib Potentiometer	Servo	011GFE	12/13/2022	6/13/2023

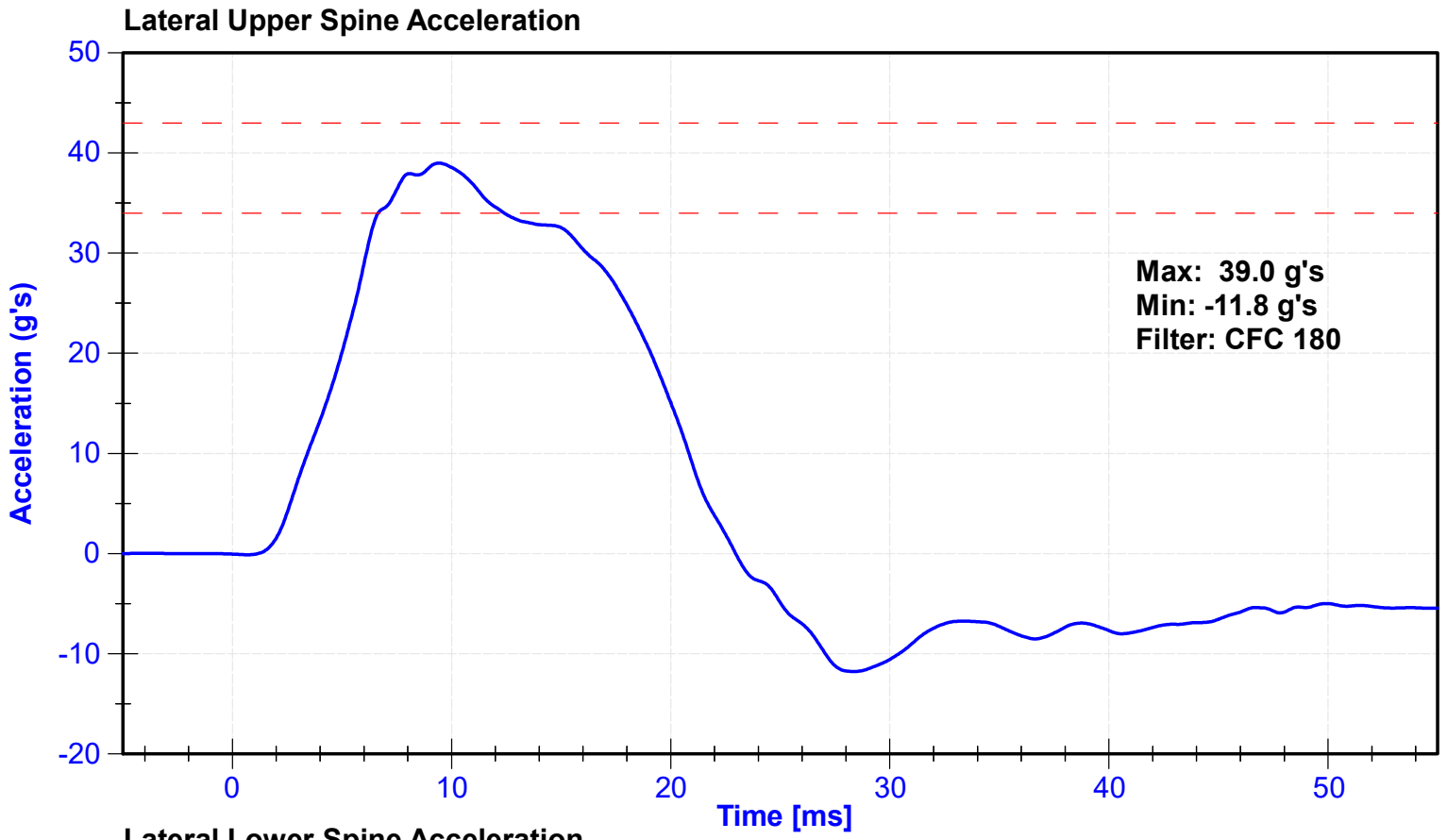


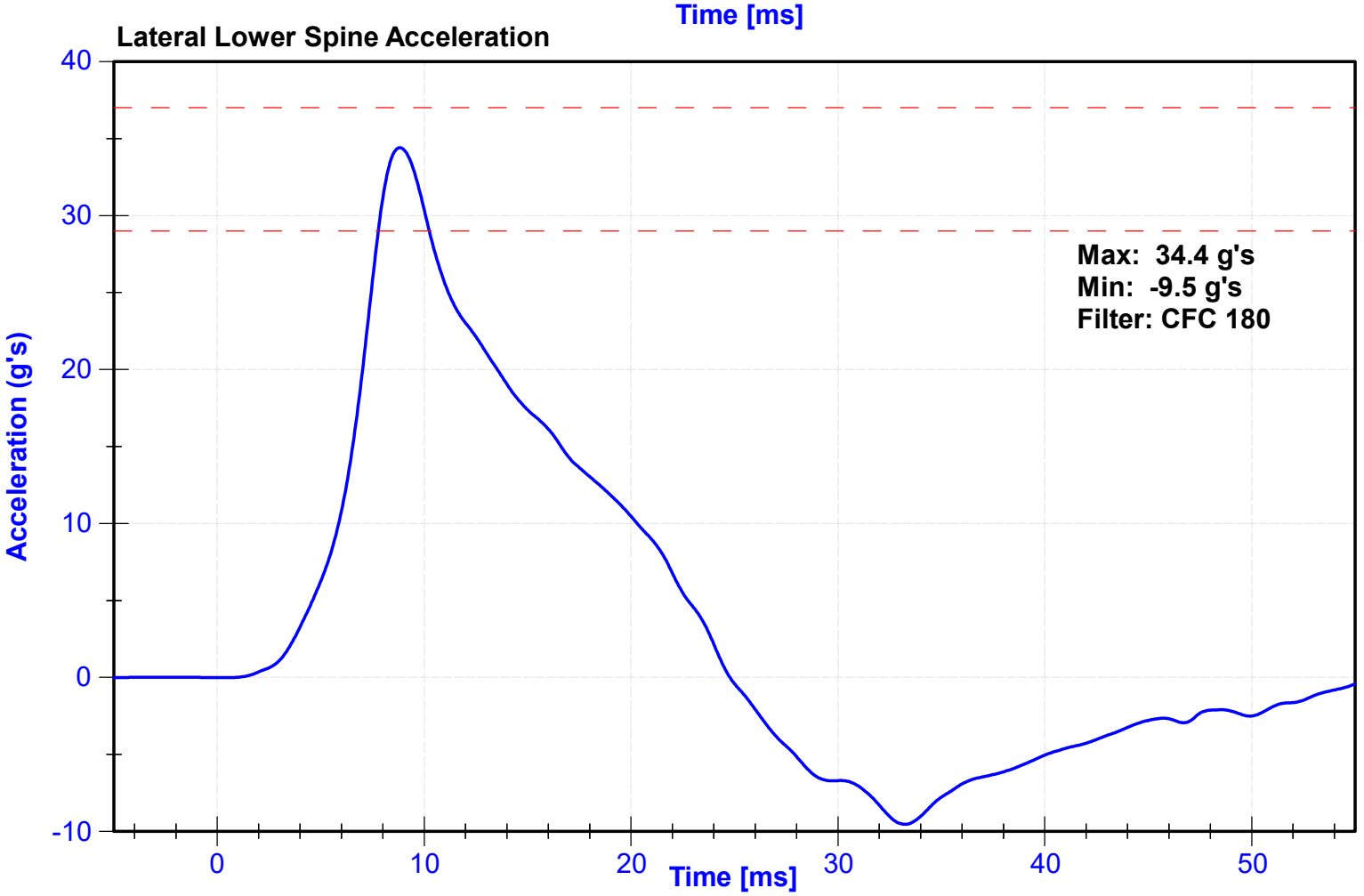

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 33.1 mm
Min: -0.7 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 26.5 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 30.8 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.2 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: 39.0 g's
Min: -11.8 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: 34.4 g's
Min: -9.5 g's
Filter: CFC 180

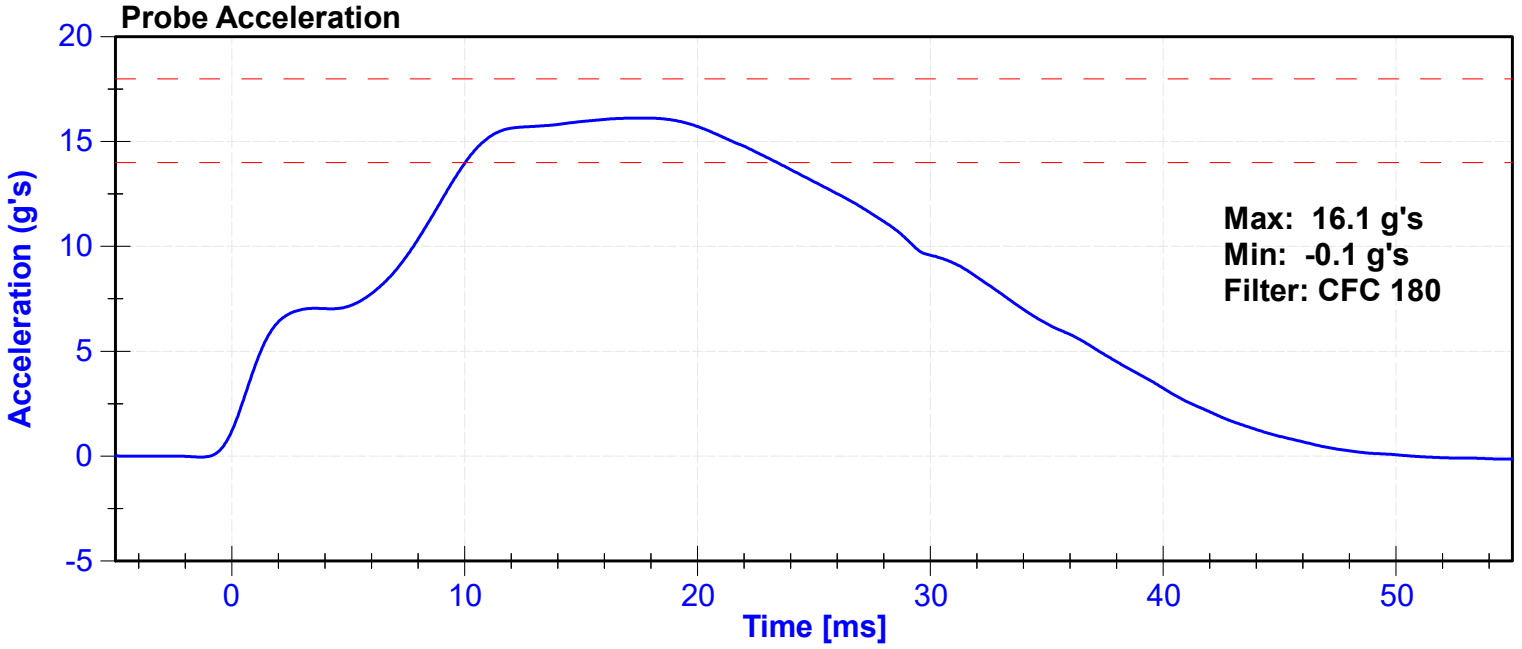
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

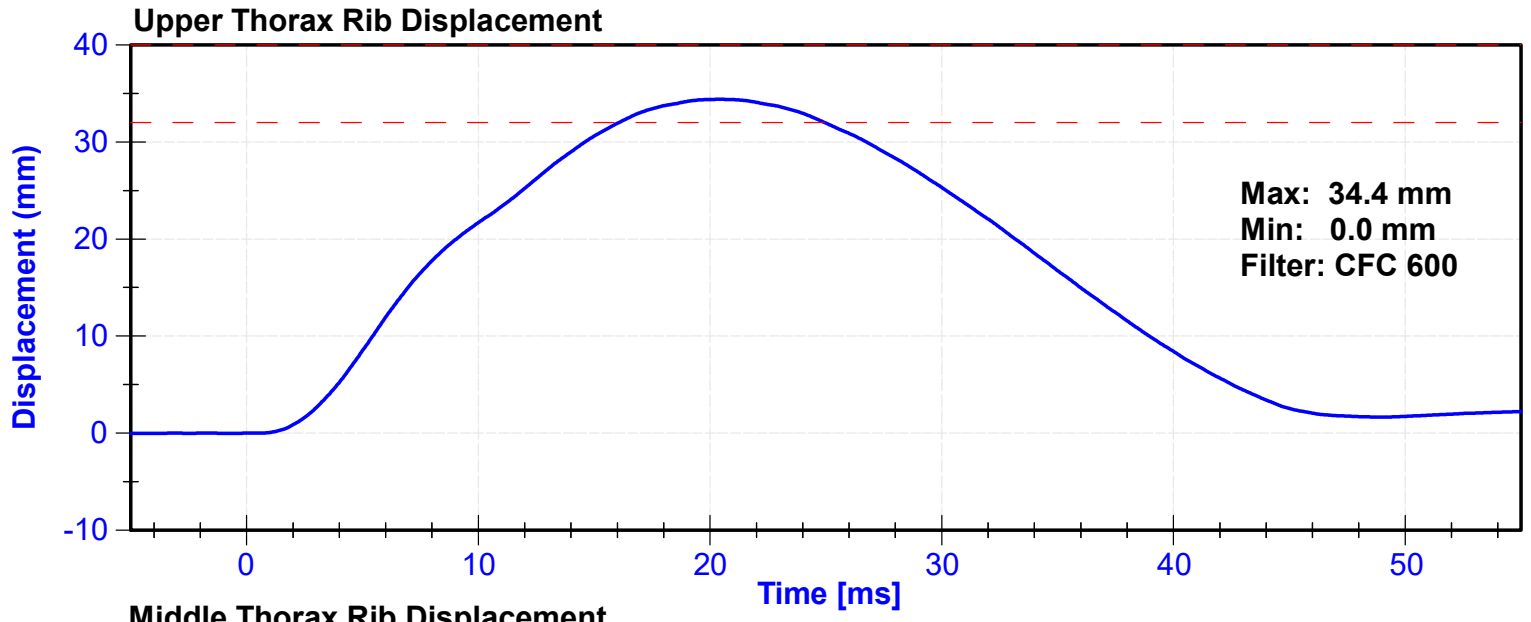
Results

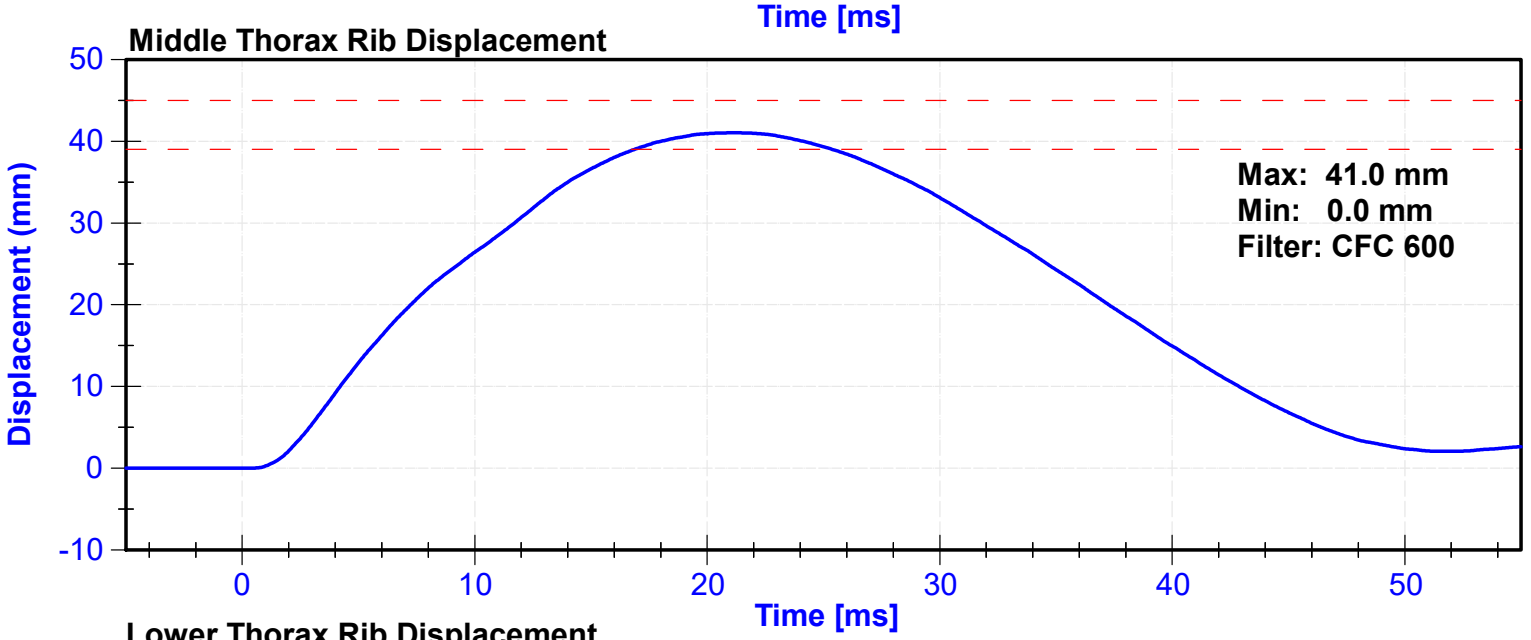
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.4	Pass
Humidity	10	70	%	22.3	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	14	18	g's	16.1	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.5	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.6	Pass
Upper Thorax Rib Deflection	32	40	mm	34.4	Pass
Middle Thorax Rib Deflection	39	45	mm	41.0	Pass
Lower Thorax Rib Deflection	35	43	mm	40.0	Pass

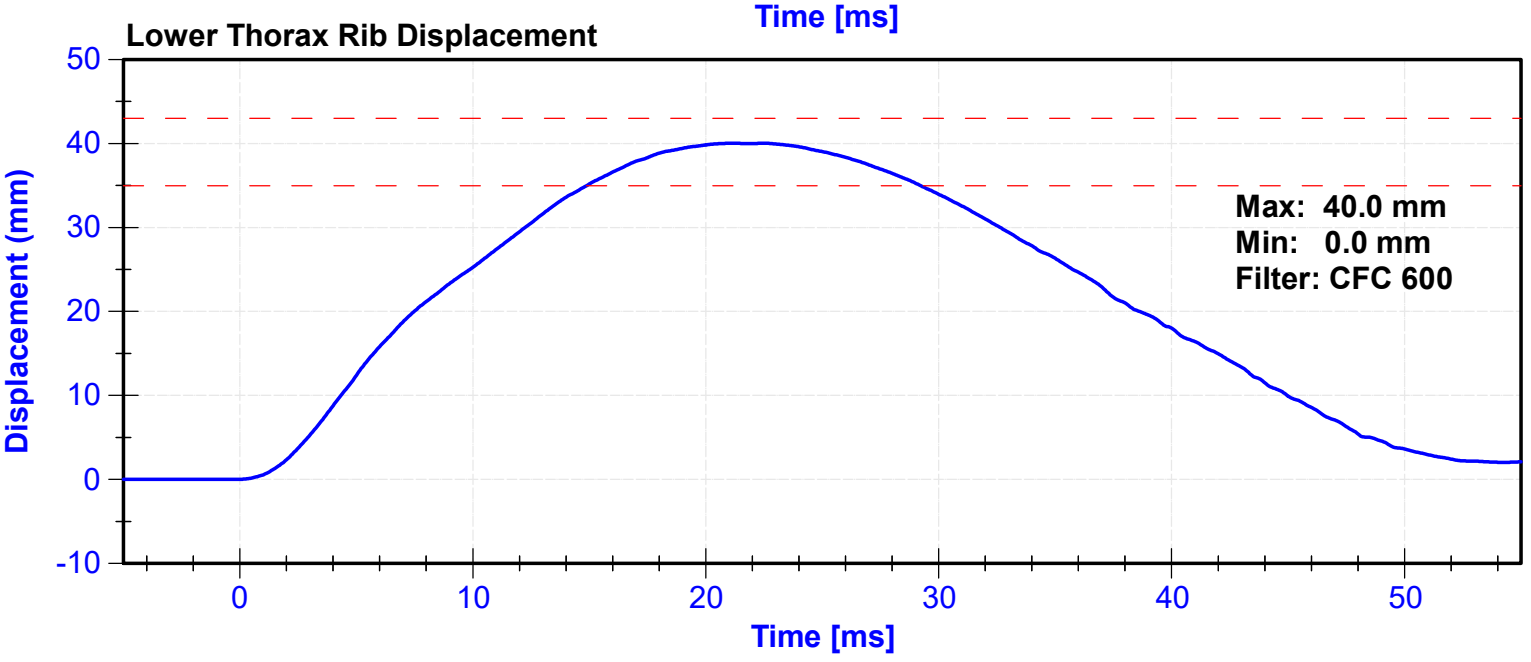
Transducer Calibrations

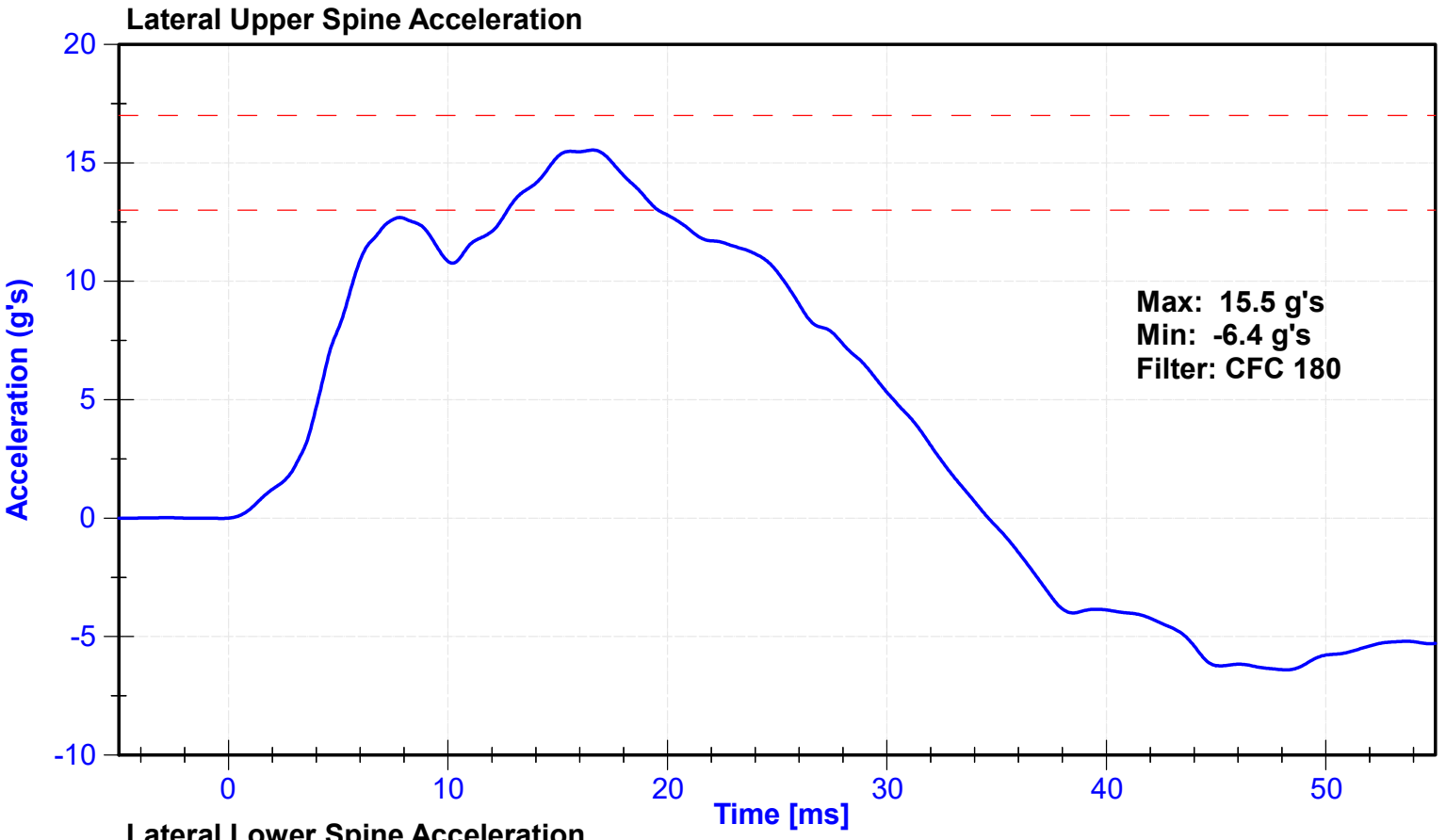
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Upper Spine Y Accelerometer	Endevco	P64148	12/12/2022	6/10/2023
Lower Spine Y Accelerometer	Endevco	P51327	12/12/2022	6/10/2023
Upper Thorax Rib Potentiometer	Servo	1199GFE	12/13/2022	6/13/2023
Middle Thorax Rib Potentiometer	Servo	1246GFE	12/13/2022	6/13/2023
Lower Thorax Rib Potentiometer	Servo	011GFE	12/13/2022	6/13/2023

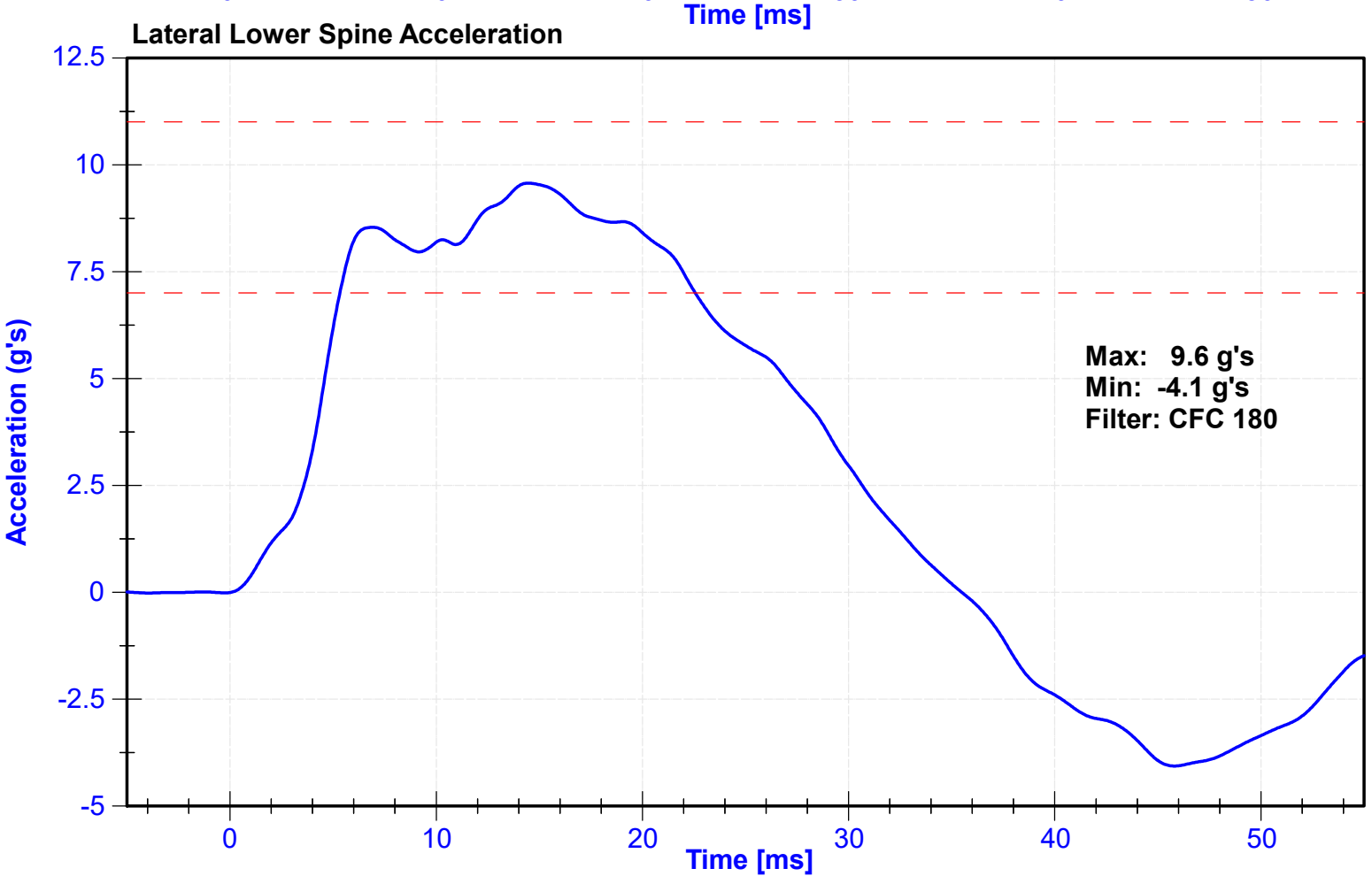



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 34.4 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.0 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.0 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 15.5 g's
Min: -6.4 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 9.6 g's
Min: -4.1 g's
Filter: CFC 180

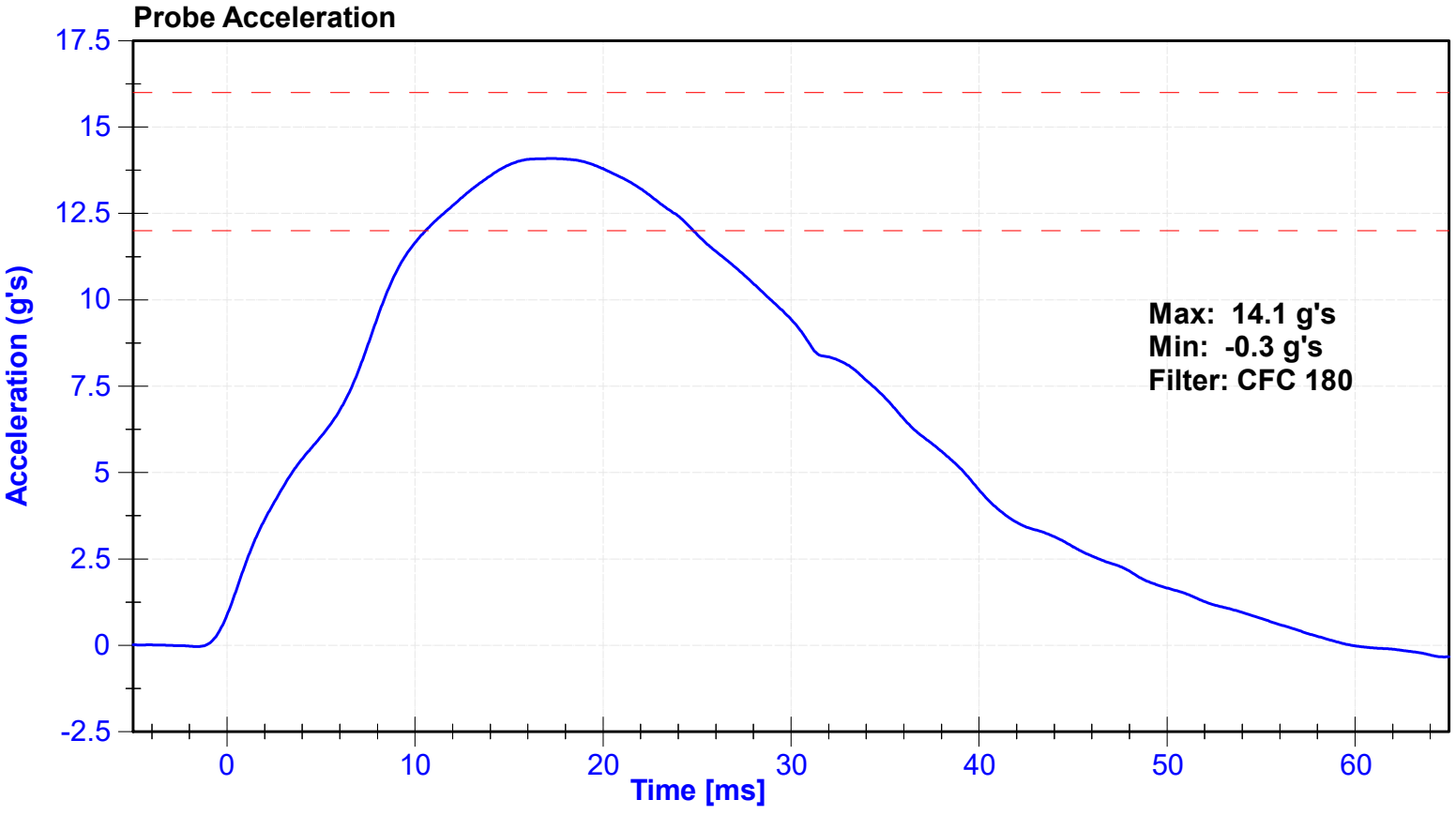
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

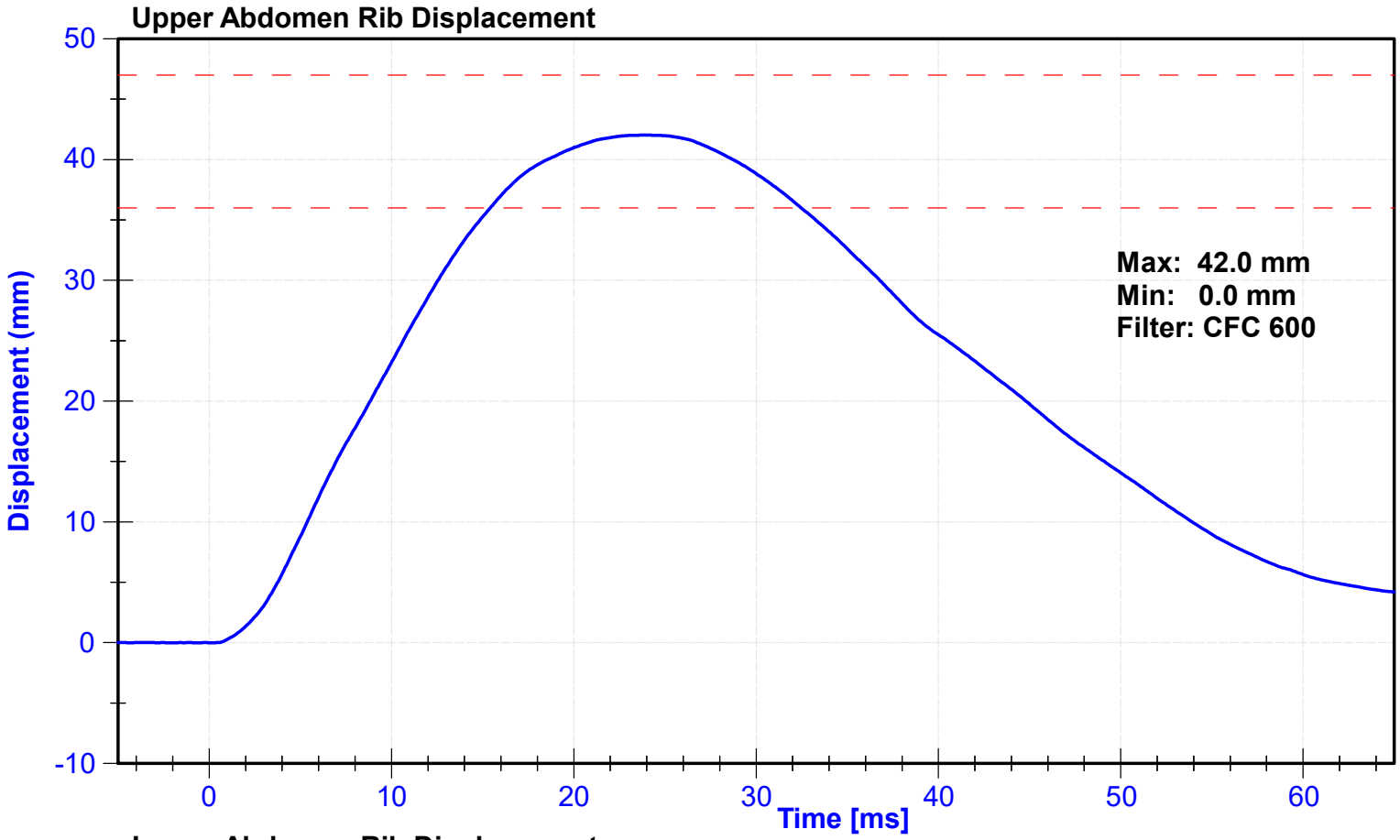
Results

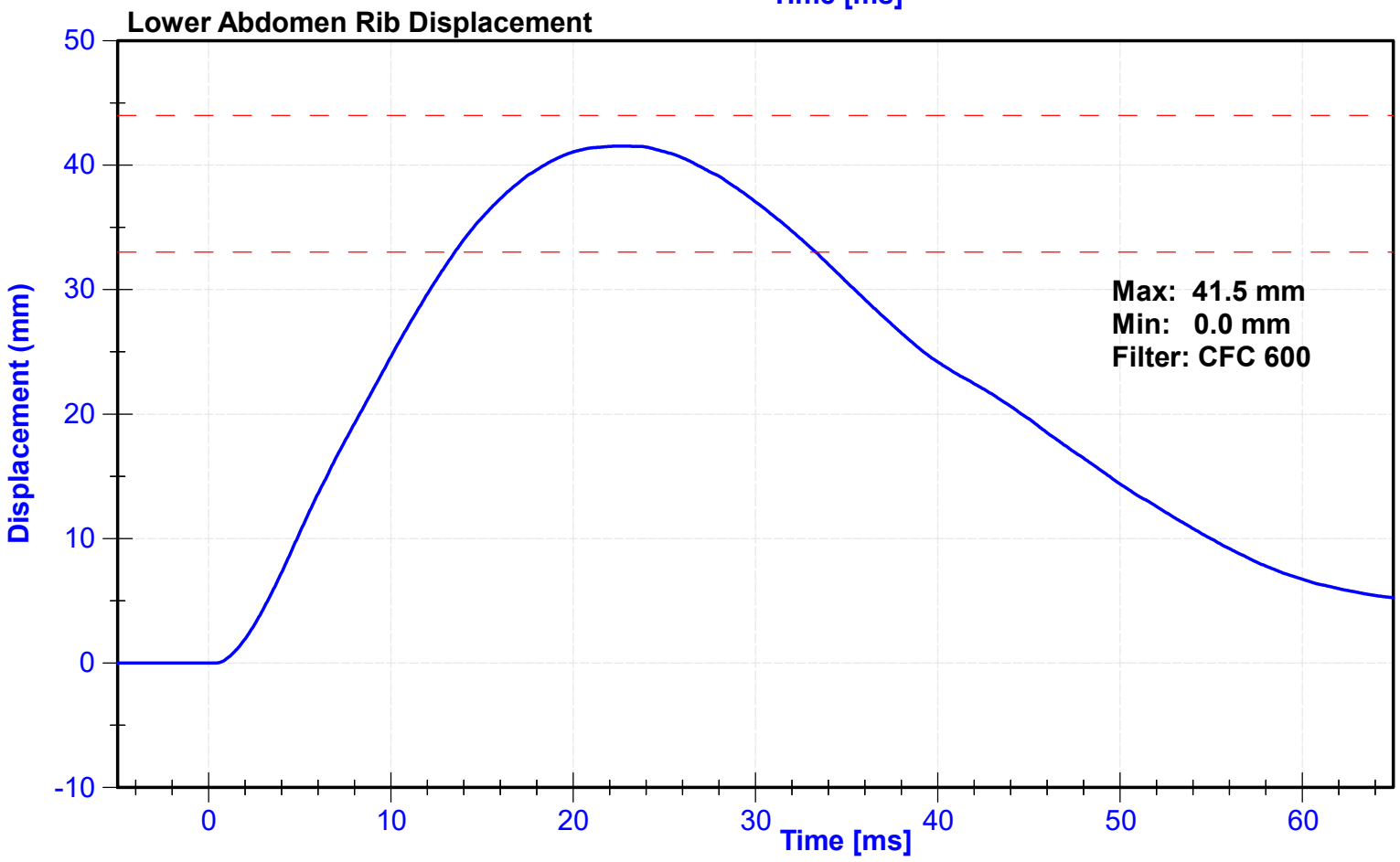
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.4	Pass
Humidity	10	70	%	22.3	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	12	16	g's	14.1	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.3	Pass
Upper Abdomen Rib Deflection	36	47	mm	42.0	Pass
Lower Abdomen Rib Deflection	33	44	mm	41.5	Pass

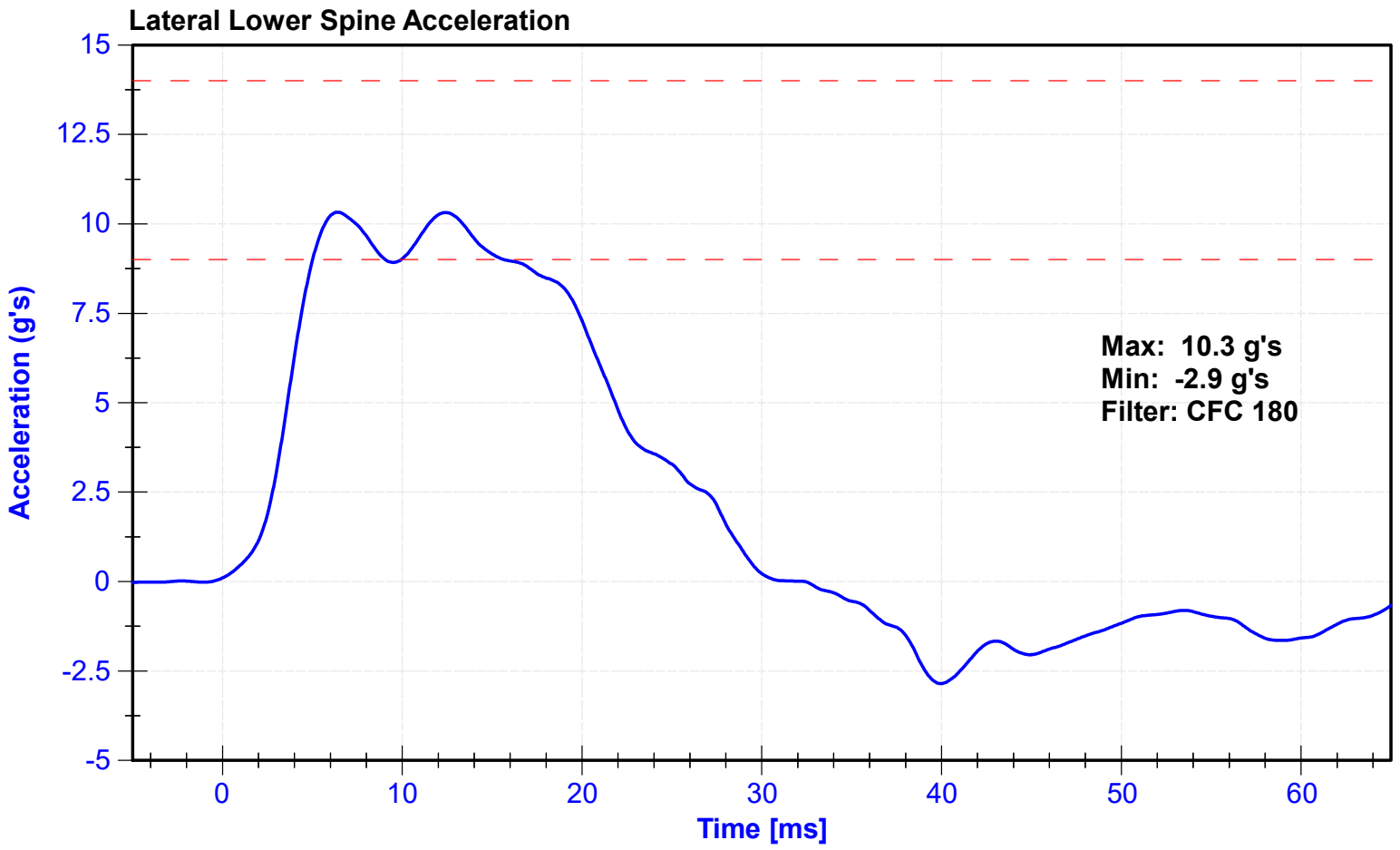
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18546	11/19/2022	5/18/2023
Lower Spine Y Accelerometer	Endevco	P51327	12/12/2022	6/10/2023
Upper Abdomen Rib Potentiometer	Servo	008GFE	12/13/2022	6/13/2023
Lower Abdomen Rib Potentiometer	Servo	041 GFE	12/13/2022	6/13/2023




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 42.0 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: 41.5 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: 10.3 g's
Min: -2.9 g's
Filter: CFC 180

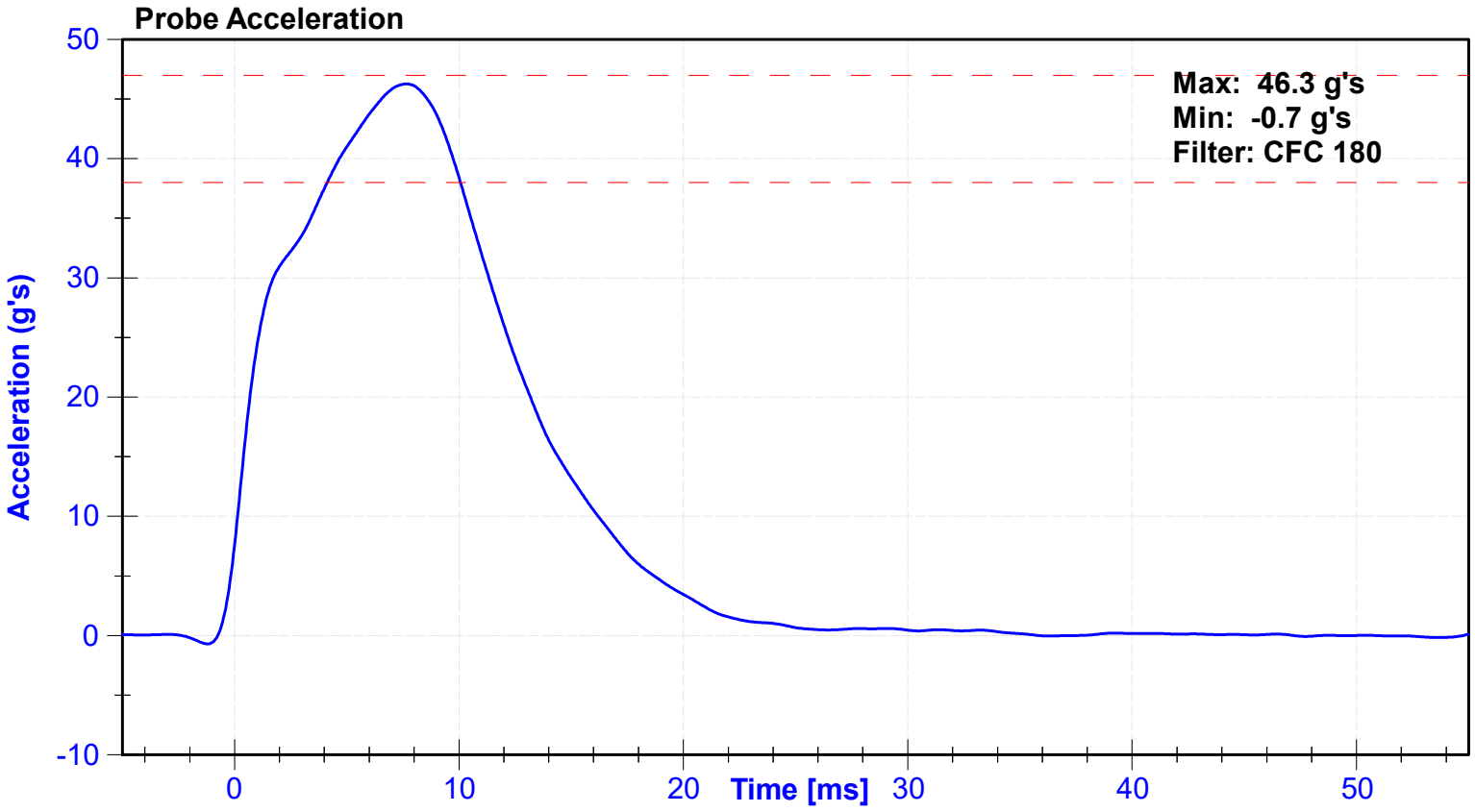
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

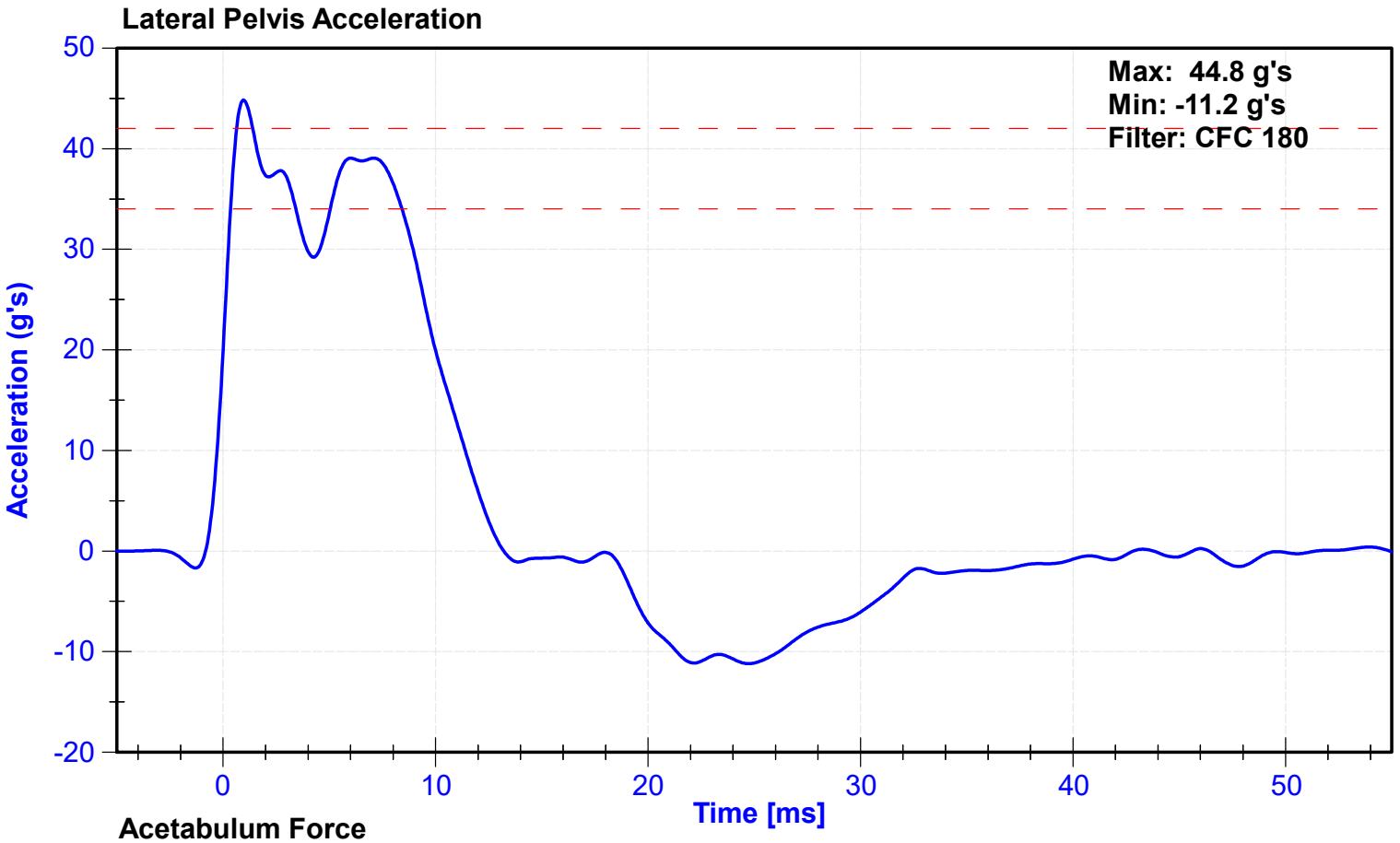
Results

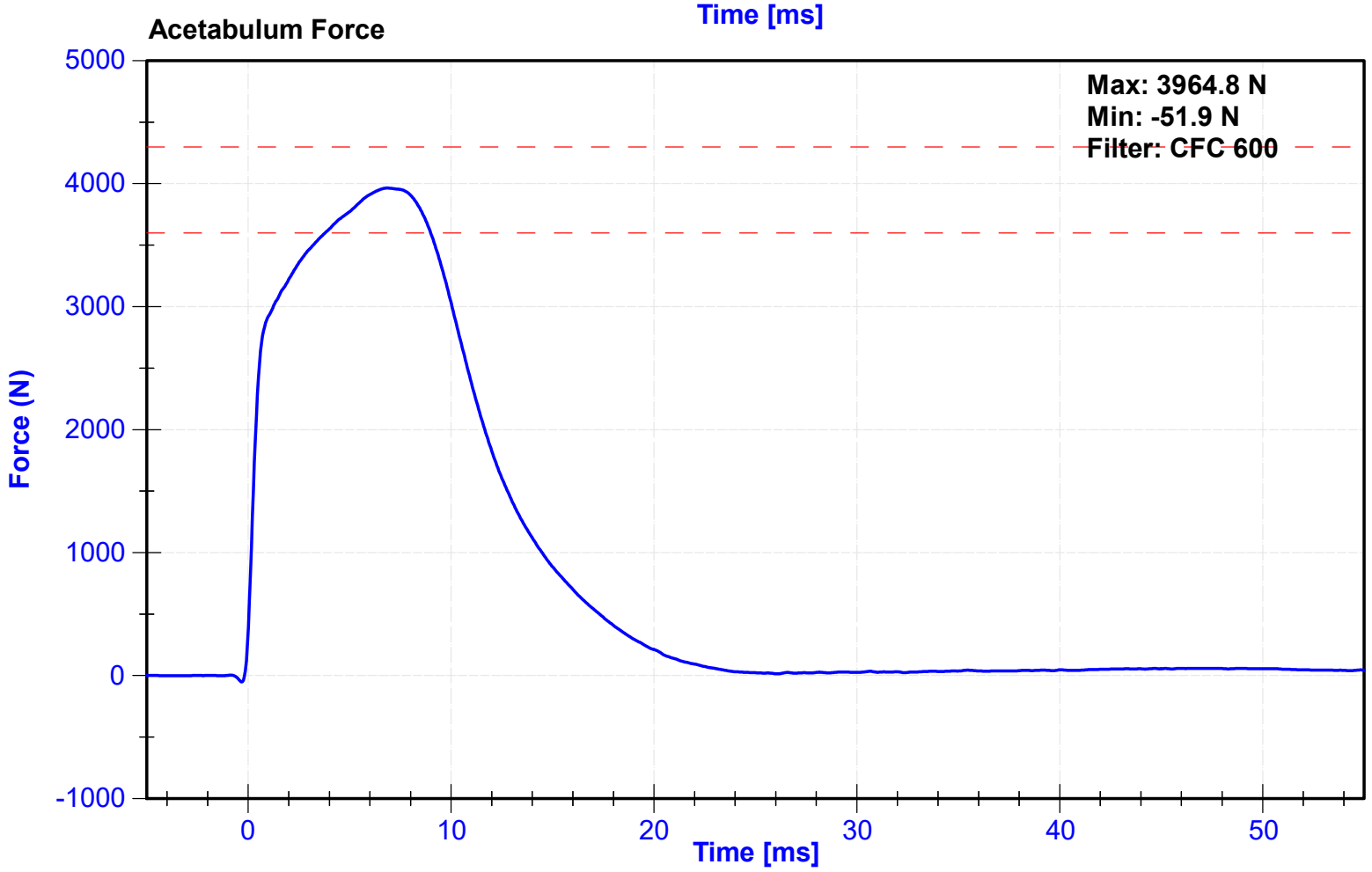
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.4	Pass
Humidity	10	70	%	22.3	Pass
Velocity	6.6	6.8	m/s	6.73	Pass
Probe Acceleration	38	47	g's	46.3	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	39.1	Pass
Acetabulum Force	3600	4300	N	3964.8	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	P51875	12/12/2022	6/10/2023
Acetabulum Load Cell	Denton	276-FY	8/11/2022	8/11/2023
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A




Lateral Pelvis Acceleration
Max: 44.8 g's
Min: -11.2 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: 3964.8 N
Min: -51.9 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

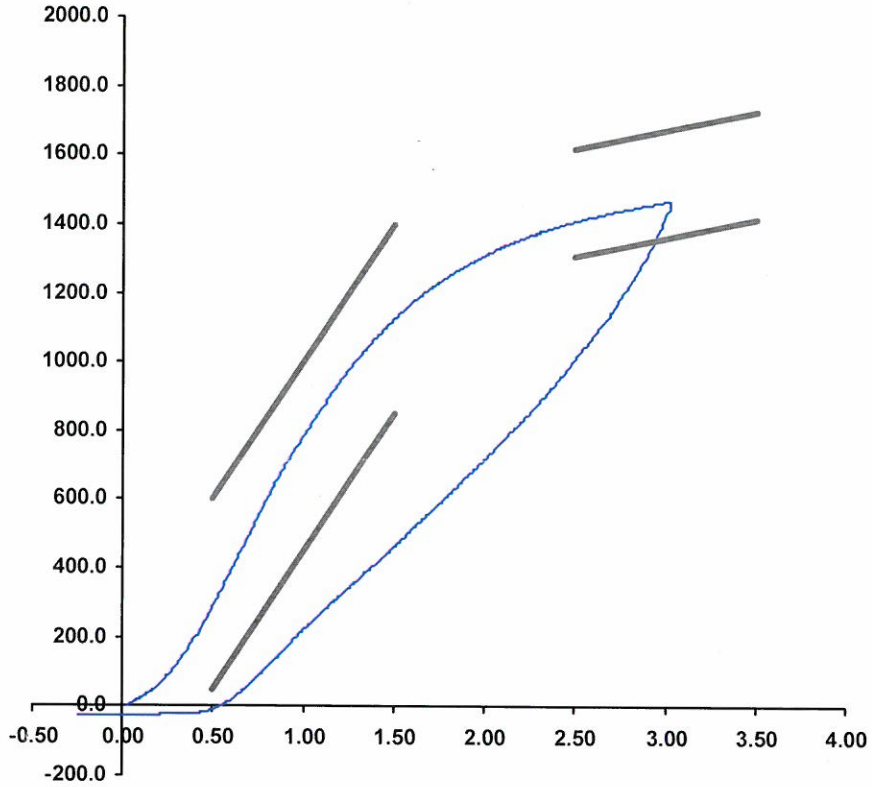
CERT DG8012 3/1/2023

SID-IIs Pelvis Plug Certification Test

Force (-N) vs Extension (-mm)

Plug S/N 15223
Test Number 17974
Report Number 18023
Test Date 3/10/2021 12:37:55 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	290	50	600
Force @ 1.5 mm (N)	1,127	850	1,400
Force @ 2.5 mm (N)	1,410	1,306	1,618
Force @ 3.0 mm (N)	1,468	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 10-Mar-21
SACO Research

By : DL Date : 3/10/2021

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

SACO RESEARCH

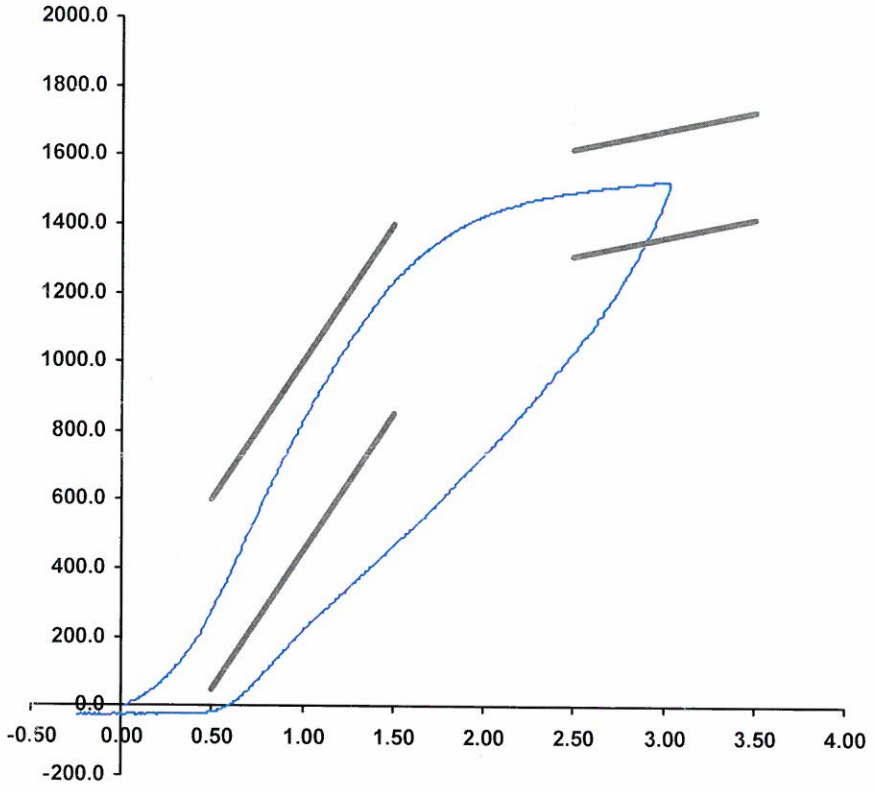
Impact
DG 8012 3/1/2023

SID-IIs Pelvis Plug Certification Test

Plug S/N 15452
Test Number 20113
Report Number 20167
Test Date 9/9/2021 10:51:21 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	287	50	600
Force @ 1.5 mm (N)	1,237	850	1,400
Force @ 2.5 mm (N)	1,494	1,306	1,618
Force @ 3.0 mm (N)	1,528	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

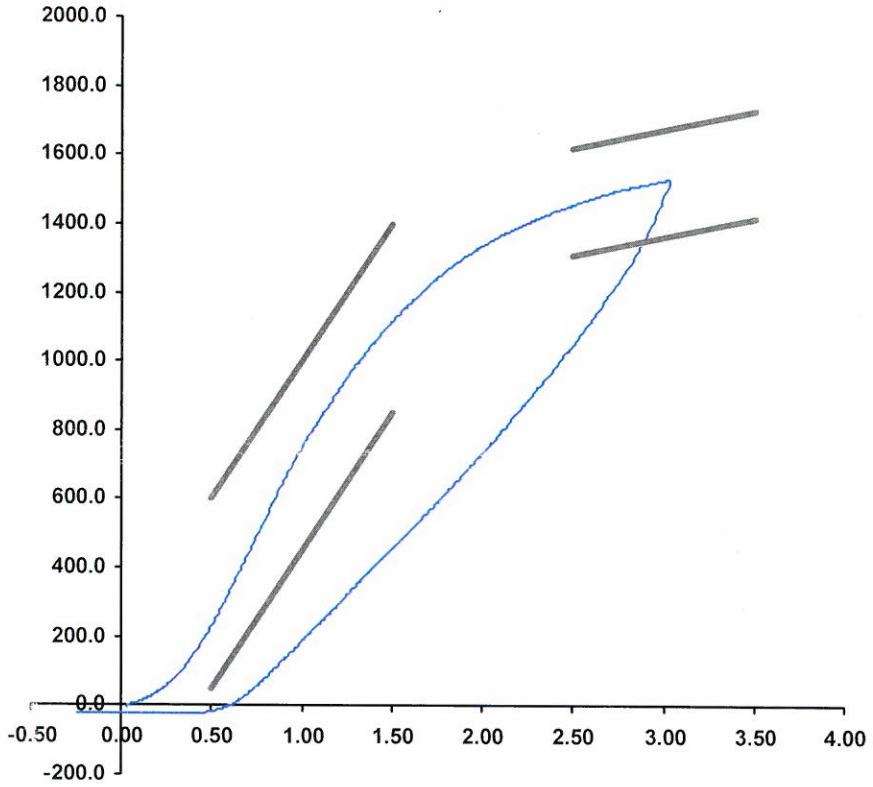
Non Impact
DG8012 3/1/2023

SID-IIs Pelvis Plug Certification Test

Plug S/N 15465
Test Number 20184
Report Number 20238
Test Date 9/22/2021 8:01:26 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	239	50	600
Force @ 1.5 mm (N)	1,118	850	1,400
Force @ 2.5 mm (N)	1,459	1,306	1,618
Force @ 3.0 mm (N)	1,529	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 22-Sep-21
SACO Research

By : DC Date : 9/22/2021

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

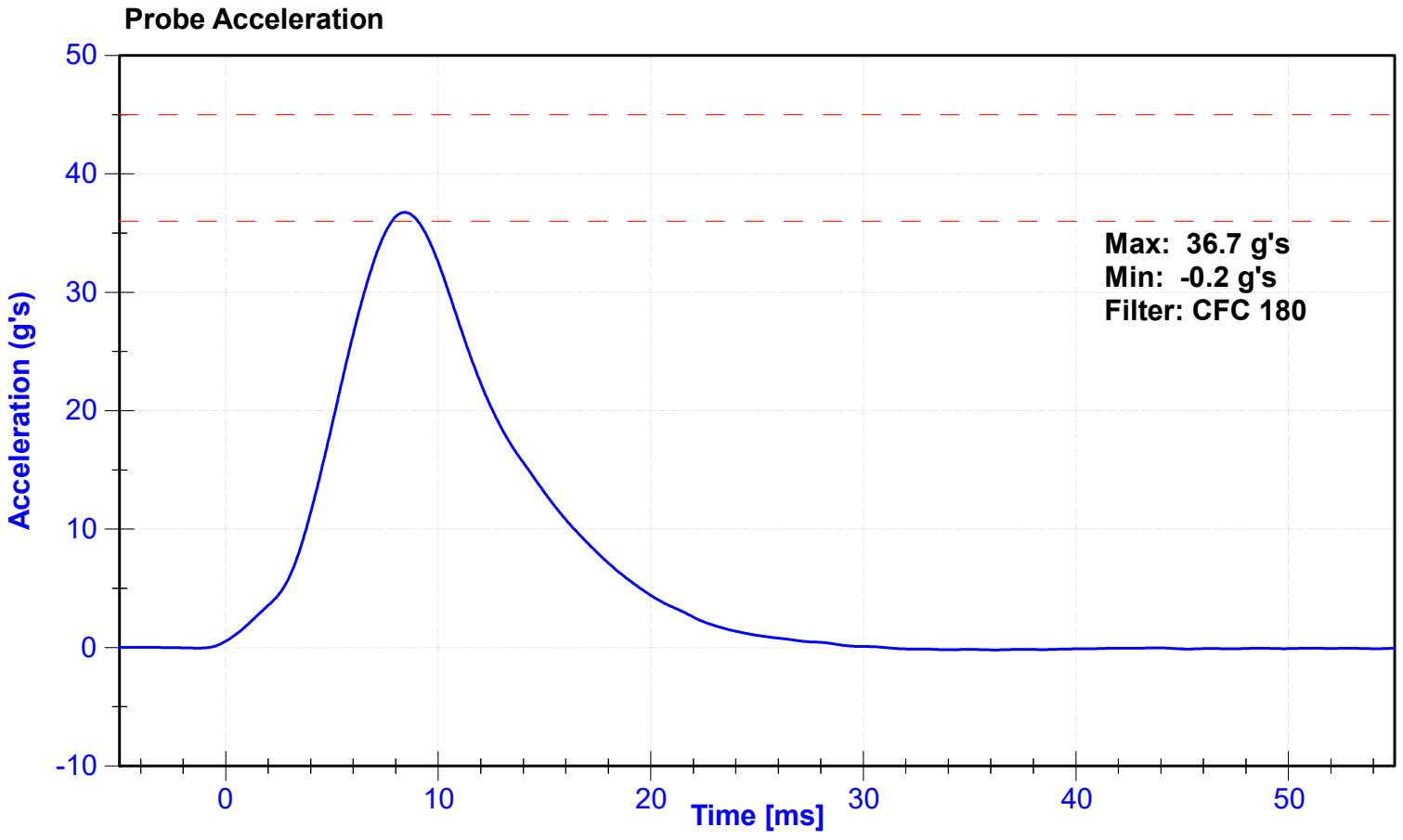
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

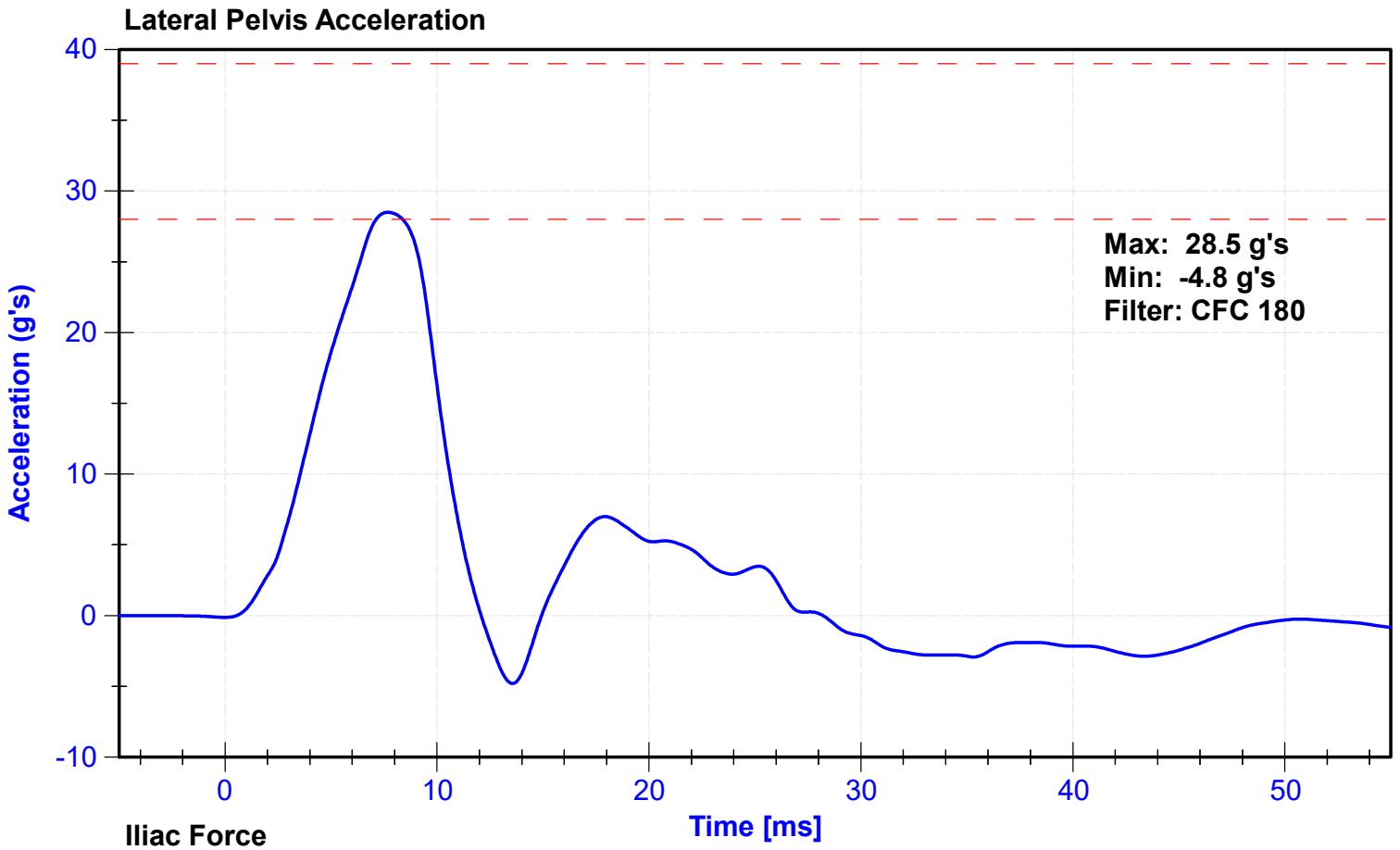
Results

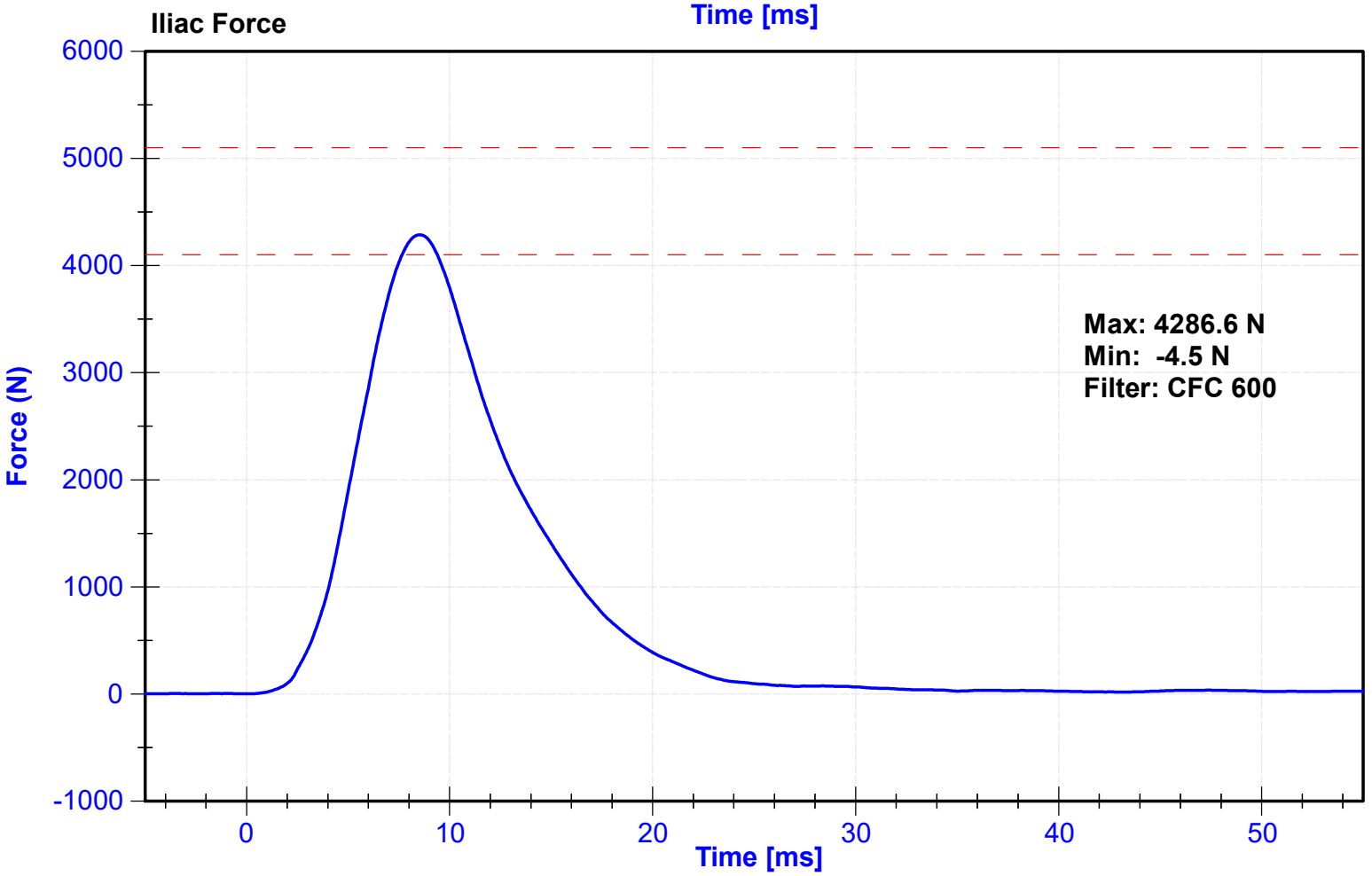
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.4	Pass
Humidity	10	70	%	22.3	Pass
Velocity	4.2	4.4	m/s	4.21	Pass
Probe Acceleration	36	45	g's	36.7	Pass
Lateral Pelvis Acceleration	28	39	g's	28.5	Pass
Iliac Force	4100	5100	N	4286.6	Pass

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	P51875	12/12/2022	6/10/2023
Iliac Load Cell	Denton	290-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: 28.5 g's
Min: -4.8 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: 4286.6 N
Min: -4.5 N
Filter: CFC 600

APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N _F033__		
			Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers	Primary	X	P63861	Endevco	1/17/2023
		Y	P49216	Endevco	1/17/2023
		Z	P51303	Endevco	1/17/2023
	Redundant	X	P58868	Endevco	1/17/2023
		Y	P59020	Endevco	1/12/2023
		Z	P52132	Endevco	1/17/2023
Thorax Rib Displacement Potentiometers	Upper	Y	179GFE	Honeywell	1/17/2023
	Middle	Y	185GFE	Honeywell	1/17/2023
	Lower	Y	178GFE	Honeywell	1/17/2023
Abdomen Load Cells	Forward	Y	1509	Denton	8/12/2022
	Middle	Y	1508	Denton	8/12/2022
	Rear	Y	1507	Denton	8/12/2022
Lower Spine Accelerometers (T12)		X	P51740	Endevco	1/17/2023
		Y	T21243	Endevco	1/18/2023
		Z	P52033	Endevco	1/17/2023
Pubic Symphysis Load Cell		Y	459-FY	Denton	6/14/2022

TABLE 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N __DG8012__		
				Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers		Primary	X	P74788	Endevco	12/12/2022
			Y	P51668	Endevco	12/12/2022
			Z	P83319	Endevco	12/12/2022
		Redundant	X	P80334	Endevco	12/12/2022
			Y	P52155	Endevco	12/12/2022
			Z	P83322	Endevco	12/12/2022
Displacement Potentiometers	Thoracic Rib	Upper	Y	1199GFE	Servo	12/13/2022
		Middle	Y	1246GFE	Servo	12/13/2022
		Lower	Y	011GFE	Servo	12/13/2022
	Abdominal Rib	Upper	Y	008GFE	Servo	12/13/2022
		Lower	Y	041 GFE	Servo	12/13/2022
Lower Spine Accelerometers (T12)			X	P71272	Endevco	12/12/2022
			Y	P51327	Endevco	12/12/2022
			Z	P52067	Endevco	12/12/2022
Acetabulum Load Cell			Y	276-FY	Denton	8/11/2022
Iliac Wing Load Cell			Y	290-FY	Denton	8/11/2022
Pelvis Plug (struck side)				15461	SACO	9/22/2021
Pelvis Plug (non-struck side)				15454	SACO	9/9/2021

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	A255841	Measurement Specialties	1/27/2023
	Vehicle Center of Gravity	Y	A335453	Measurement Specialties	1/27/2023
	Vehicle Center of Gravity	Z	A400764	Measurement Specialties	1/27/2023
2	Right Sill at Front Seat	X	A373215	Measurement Specialties	2/2/2023
	Right Sill at Front Seat	Y	G22183	Endevco	9/19/2022
	Right Sill at Front Seat	Z	A413575	Measurement Specialties	2/2/2023
3	Right Sill at Rear Seat	X	A431248	Measurement Specialties	2/2/2023
	Right Sill at Rear Seat	Y	A431350	Measurement Specialties	2/2/2023
	Right Sill at Rear Seat	Z	A431254	Measurement Specialties	2/2/2023
4	Left Sill at Front Door	Y	G22645	Endevco	11/24/2022
5	Left Sill at Rear Door	Y	A373228	Measurement Specialties	2/2/2023
6	Left A-Post Lower	Y	A370963	Measurement Specialties	2/2/2023
7	Left A-Post Middle	Y	A399985	Measurement Specialties	2/2/2023
8	Left B-Post Lower	Y	G22571	Endevco	10/22/2022
9	Left B-Post Middle	Y	G22594	Endevco	10/22/2022
10	Front Seat Track	Y	G22610	Endevco	11/2/2022
11	Rear Seat Track or Structure	Y	G22413	Endevco	10/9/2022
12	Right Rear Occ. Compartment	Y	G22403	Endevco	10/8/2022
13	Engine Block	X	A405553	Measurement Specialties	1/19/2023
	Engine Block	Y	A427995	Measurement Specialties	1/19/2023
14	Rear Floorpan Above Axle	X	G16876	Endevco	11/21/2022
	Rear Floorpan Above Axle	Y	A413611	Measurement Specialties	11/16/2022
	Rear Floorpan Above Axle	Z	G22422	Endevco	10/9/2022

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	A398663	Measurement Specialties	11/15/2022
MDB Center of Gravity	Y	A413569	Measurement Specialties	11/15/2022
MDB Center of Gravity	Z	A413574	Measurement Specialties	11/15/2022
Left Frame at Rear Axle Centerline	X	A255878	Measurement Specialties	11/15/2022
Left Frame at Rear Axle Centerline	Y	A350971	Measurement Specialties	11/15/2022