REPORT NUMBER: SINCAP-CAL-23-011

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

Hyundai Motor Company
2023 Genesis GV70
5 Door SUV

NHTSA No: M20234205

PREPARED BY:
CALSPAN CORPORATION
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January 29, 2024

FINAL REPORT

PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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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

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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 Genesis GV70 5 Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP MDB 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 August 2, 2023.

The impact velocity of the Moving Deformable Barrier (MDB) was 62.16 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 200 mm located at level 3. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC36)		1000	77.812
Maximum Thorax Rib Deflection	mm	44	24.570
Total Abdominal Force	N	2500	895.202
Pubic Symphysis Force	N	6000	874.796
Lower Spine (T12) Resultant Acceleration	G	82*	24.630
Measurement Description	**Passenger ATD (SID-IIs)**		
	Units	**IARV**	**Result**
Head Injury Criteria (HIC36)		1000	127.180
Maximum Thorax Rib Deflection	mm	38*	12.485
Lower Spine (T12) Resultant Acceleration	G	82	49.121
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1830.371
Maximum Abdominal Rib Deflection	mm	45*	22.747

**Proposed IARV*

The two doors on the struck side of 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 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 Genesis GV70 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 Genesis GV70 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 62.16 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 August 2, 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	77.812
Maximum Thorax Rib Deflection	mm	44	24.570
Total Abdominal Force	N	2500	895.202
Pubic Symphysis Force	N	6000	874.796
Lower Spine (T12) Resultant Acceleration	G	82*	24.630

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC36)		1000	127.180
Maximum Thorax Rib Deflection	mm	38*	12.485
Lower Spine (T12) Resultant Acceleration	G	82	49.121
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1830.371
Maximum Abdominal Rib Deflection	mm	45*	22.747

**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
Seat Center Airbag	Yes	Yes	No	N/A

GENERAL COMMENTS:

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

Data Anomalies:

The following channel was questionable for:

- Left Rear Sill Y Acceleration, Exceeded calibration range at 36 ms
- Left B-Pillar Lower Y Acceleration, Exceeded calibration range at 13.1 ms 21.4 ms
- Left B-Pillar Middle Y Acceleration, Exceeded calibration range and saturated at 9.7 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. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Genesis GV70 5 Door SUV | NHTSA No.: M20234205
Test Program: NCAP Side MDB Impact Test | Test Date: 08/02/2023

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20234205
Model Year	2023
Make	Genesis
Model	GV70
Body Style	SUV
VIN	KMUMADTBXPU120407
Body Color	Capri Blue
Odometer Reading (km/mi)	249 Miles
Engine Displacement (L)	2.5 Liters
Type / No. Cylinders	I4
Engine Placement	Inline
Transmission Type	Automatic
Transmission Speeds	8 Speed
Overdrive	Yes
Final Drive	AWD
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 - Driver Seat Center Airbag	Yes

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company
Date of Manufacture	FEB/2023
Vehicle Type	MPV

GVWR	2495
GVWR Front	1245
GVWR Rear	1420

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)				462	(A)
DSC x 68.0 kg				340	(B)
Cargo Weight (RCLW) (kg)				122	(A-B)

VEHICLE SEAT TYPE

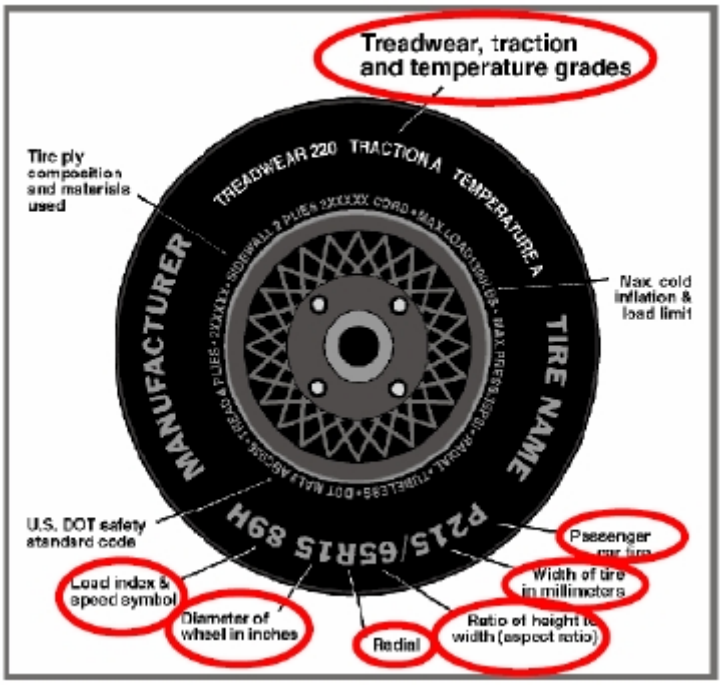
Seating Location	Type Of Seat Pan				Type Of Seat Back		
	Bucket	Bench	Split Bench	Contour	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front	X						X
Rear or Second Row Seat			X			X	
Third Row Seat	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023

VEHICLE TIRE INFORMATION

Collected for year, make, model, & VIN, all items circled in red, tire manufacturer and tire name



TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	340	340
Cold Pressure (kPa)	230	250
Recommended Tire Size	235/55R19	235/55R19
Tire Size on Vehicle	235/55R19	235/55R19
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy Tour A/S	Primacy Tour A/S
Treadwear	540	540
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 polyester	2 polyester
Tire Plies Body	2 polyester, 2 steel, 1 polyamide	2 polyester, 2 steel, 1 polyamide
Load Index / Speed Symbol	105W	105W
Tire Material	Rubber	Rubber
DOT Safety Code Left	0C8F04AX4822	0C8F04AX4822
DOT Safety Code Right	0C8F04AX4822	0C8F04AX4822

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

Test Vehicle: 2023 Genesis GV70 5 Door SUV | NHTSA No.: M20234205
Test Program: NCAP Side MDB Impact Test | Test Date: 08/02/2023

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	222	224	242	243
Tire Placard	kPa	230	230	250	250
Owner's Manual	kPa	230	230	250	250
As Tested	kPa	230	230	250	250

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	518	466		549	579		561	584	
Right	kg	499	479		517	560		498	568	
Ratio	%	51.8	48.2		48.3	51.7		47.9	52.1	
Totals	kg	1017	945	1962	1066	1139	2205	1059	1152	2211

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1962	(A)
Actual Weight of 2 P572V (ES-2re and SID-IIs) ATDs Used	kg	127	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	122	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2211	(A+B+C)

Does the measured As Test Vehicle Weight lie within the required weight range

(i.e. Calculated Test Vehicle Target Weight – 4.5 kg to – 9 kg)? [X] **Yes** [ ] **No**

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	As Tested	Fully Loaded	Meets Rqmt***
LF	mm	872	871	Yes
RF	mm	875	882	Yes
RR	mm	875	873	Yes
LR	mm	869	866	Yes
Vehicle CG (Aft of Front Axle)	mm	1485	1497	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	-19	-30	

****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 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	16
Spare Tire	16
Jack	4
Passenger Rear Window	3
Ballast / Equipment Added	93

TEST SURFACE MARKINGS

	Distance from 63° Impact Location Line (mm)
Fore 25 mm target	935
Aft 25 mm target	934
Pre-Impact Angle Line	235

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 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023

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	20.1	11.2	15.6
Front Passenger Seat	19.4	11.2	15.3
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	7	Max	65	73	80
			Mid	33	40	48
			Min	1	7	15
Front Passenger Seat	15.3	7	Max	61	70	75
			Mid	31	38	44
			Min	1	7	13
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 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023

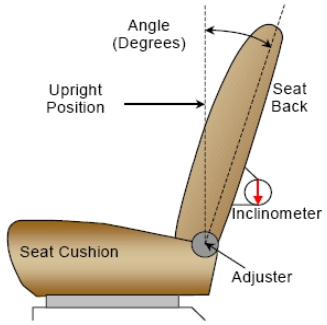
SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	257	Powered	128.5	Powered
Front Passenger Seat	248	Powered	124	Powered
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	42.7	Powered	-1.35	Powered
Front Passenger Seat	41.9	Powered	-1.35	Powered
Front Center Seat				
Struck Side Rear Seat	27.45	13 (0-12)	10.1	0
Non-Struck Side Rear Seat	27.45	13 (0-12)	10.1	0
Rear Center Seat	27.45	13 (0-12)	10.1	0

**if applicable*

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

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023

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

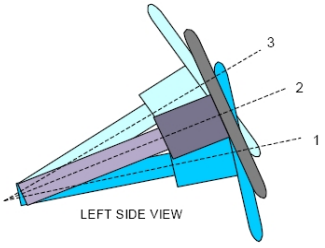
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

Seat	Total # of Positions	Placed in Position #
Driver Seat	5 (0-4)	Uppermost
Rear Seat	3 (0-2)	Lowermost

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	21.7	
Geometric center - Position No. 2	23.9	
Uppermost - Position No. 3	26.1	
Telescoping Steering Wheel Travel		63
Test Position	23.9	31.5

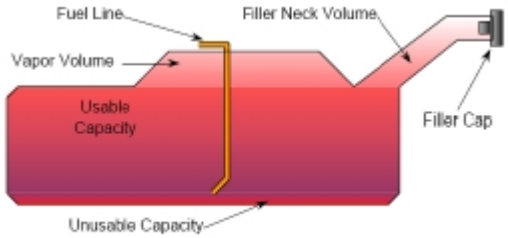


STEERING COLUMN ASSEMBLY

FUEL PUMP

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

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



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023

FUEL TANK CAPACITY

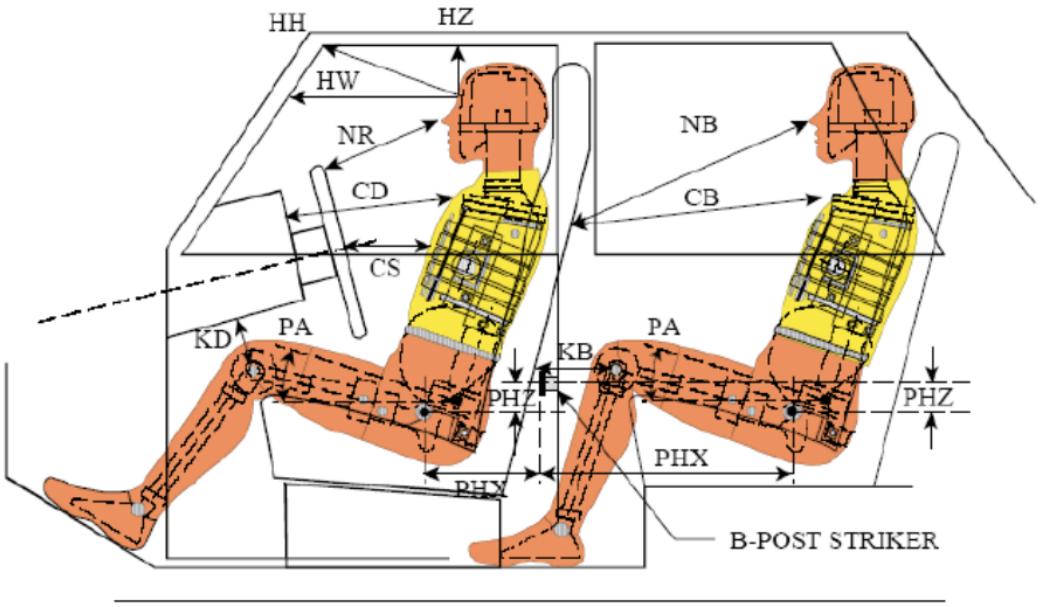
Description	Liters
Usable Capacity of “Standard Tank” (see Form No. 1)	66
Usable Capacity of “Optional Tank” (see Form No. 1)	N/A
Usable Capacity of “Standard Tank” (see Owner’s Manual)	66
Usable Capacity of “Optional Tank” (see Owner’s Manual)	N/A
93% of Usable Capacity	61.4
Actual Amount of Solvent Used in Test	61.4
1/3 of Usable Capacity	22

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

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION



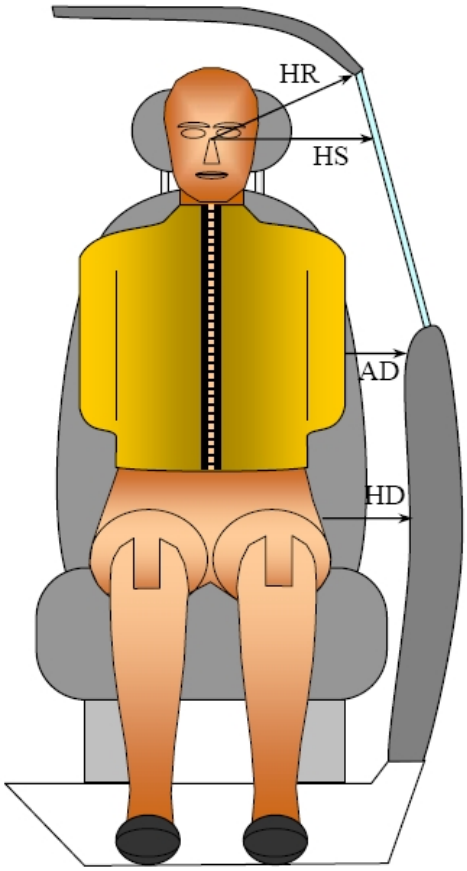
LEFT SIDE VIEW

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	415			
HW		Header to Windshield	682			
HZ	HZ	Head to Roof Liner	182		301	
NR	NB	Nose to Rim/Seat Back	460		471	
CD	CB	Chest to Dash/Seat Back	625		455	
CS		Chest to Steering Wheel	375			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	224	35.5	229	16.1
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	215	34.0	227	15.7
PAX°	PAX°	Pelvic Tilt Angle X		21.7		20.8
	PAY°	Pelvic Tilt Angle Y				0.1
PHX	PHX	Hip Point to Striker (X-Axis)	129		294	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	208		277	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023



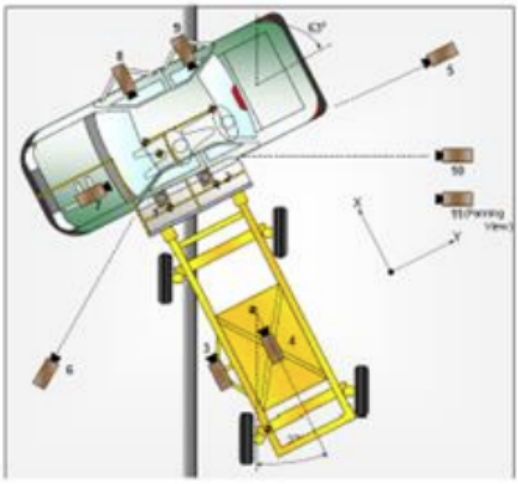
FRONT VIEW OF DUMMY

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	222	262
HS	Head to Side Window	mm	356	387
AD	Arm to Door	mm	119	166
HD	Hip Point to Door	mm	170	185

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2023 Genesis GV70 5 Door SUV
NHTSA No.: M20234205
Test Program: NCAP Side MDB Impact Test
Test Date: 08/02/2023



CAMERA LOCATIONS AND DATA

No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Overhead Overall	0	0	-8125	12.5	1000
2	Overhead Close-up	0	0	-8125	28	1000
3	Left Impact Point (MDB)	-1470	0	-847	25	1000
4	Side Overall (MDB)	-1140	878	-1587	8	1000
5	Rear	0	9257	-1391	28	1000
6	Left Front	-2669	-5452	-1357	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	60
11	Real-time In Run				Zoom	60

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.*

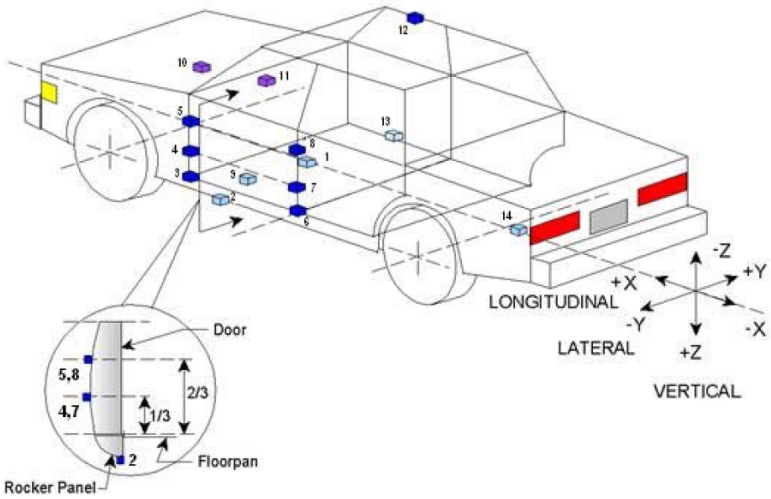
If applicable, explain why camera(s) did not operate as intended: All cameras operated as intended.

INSTRUMENTATION

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 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023



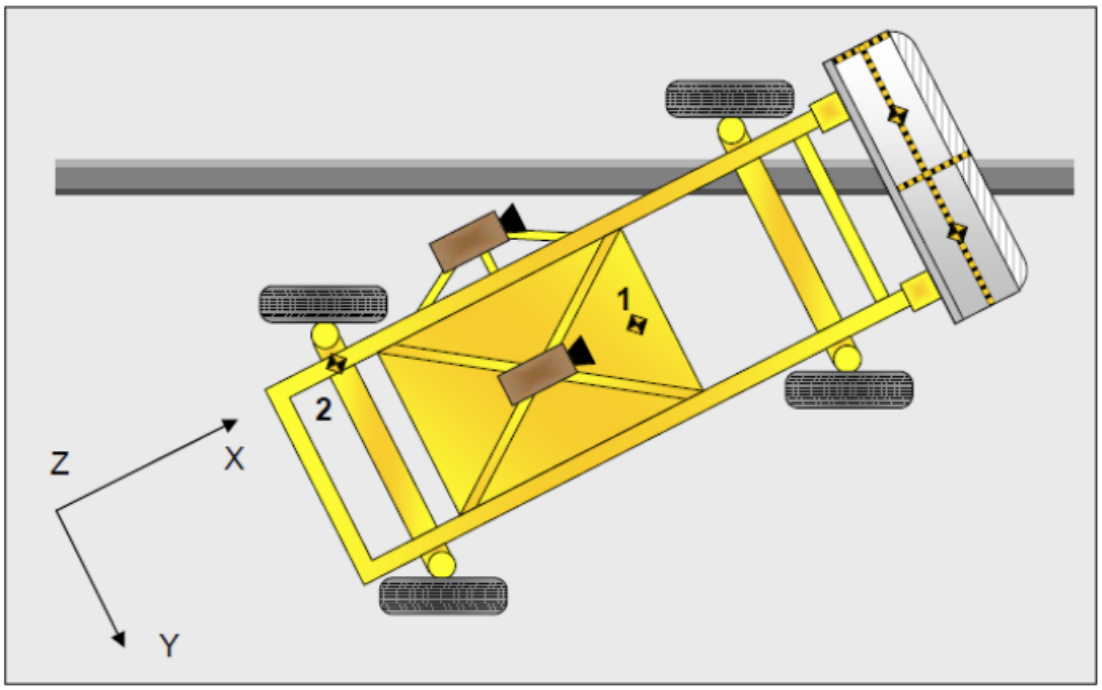
TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2105	-6	-3
2	Right Sill at Front Seat	2743	691	89
3	Right Sill at Rear Seat	1930	688	82
4	Left Sill at Front Door	2898	-691	83
5	Left Sill at Rear Door	1926	-687	87
6	A-Post Lower	3223	-657	-159
7	A-Post Middle	3094	-690	-631
8	B-Post Lower	2143	-708	-169
9	B-Post Middle	2085	-696	-583
10	Front Seat Track	2366	-597	62
11	Rear Seat Structure	1832	-414	80
12	Rt. Rear Occ. Compartment	2060	408	186
13	Engine Block	3813	-121	-454
14	Rear Above Axle	1127	-17	-88

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 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023



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): 1485

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2023 Genesis GV70 5 Door SUV | NHTSA No.: M20234205
Test Program: NCAP Side MDB Impact Test | Test Date: 08/02/2023

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	None	Curtain Airbag
Top of Head	Side Header	Curtain Airbag
Left Side of Head	Curtain Airbag & Side Header	Curtain Airbag
Back of Head	Curtain Airbag, Side Header & Headrest	Curtain Airbag, Headrest & Rear Center Headrest
Left Shoulder	Curtain Airbag & Torso/Pelvis Airbag	Passenger Door & Curtain Airbag
Upper Torso	Seatback & Torso/Pelvis Airbag	Passenger Door
Lower Torso	Seatback & Torso/Pelvis Airbag	Passenger Door
Left Hip	Seat Pan, Buckle Anchorage & Torso/Pelvis Airbag	Seat Pan & Door Trim
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)	0	0	0	0	0

POST-TEST SEAT PERFORMANCE

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar & B-Pillar Buckled
Sill Separation	None
Windshield Damage	None
Side Window Damage	Rear Passenger Window shattered during impact event
Other Notable Effects	Driver Seatback moved rearward after event

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

Test Vehicle: 2023 Genesis GV70 5 Door SUV NHTSA No.: M20234205
Test Program: NCAP Side MDB Impact Test Test Date: 08/02/2023

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
Seat Center Airbag	Yes	Yes	No	N/A

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2875
Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point)	mm		497
Actual Impact Point (Aft of Frontal Axle)	mm		497
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	0
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	-4

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023

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

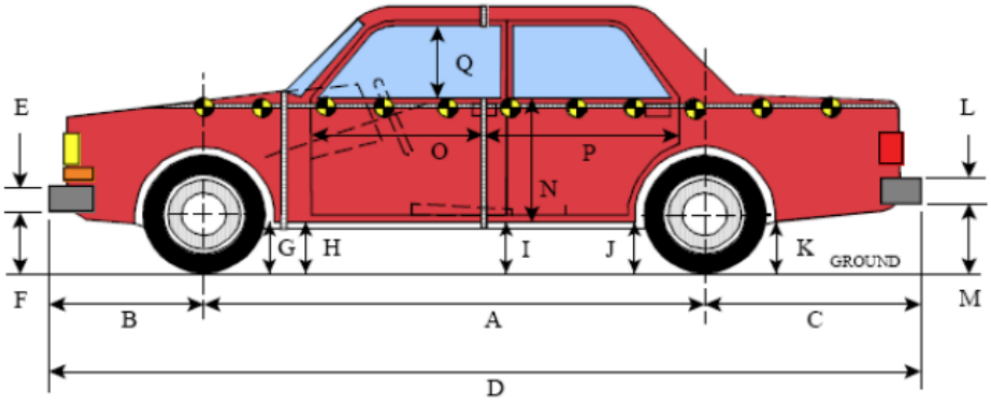
Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.10 to 62.70	62.16
Trap No. 2 Velocity (Redundant)	km/h	61.10 to 62.70	62.18
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed angle 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	800	Left	242
B	Top of Bumper	533	800	Left	162
C	Mid-Level	686	800	Left	174
D	Top of Stack	813	800	Left	220

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023



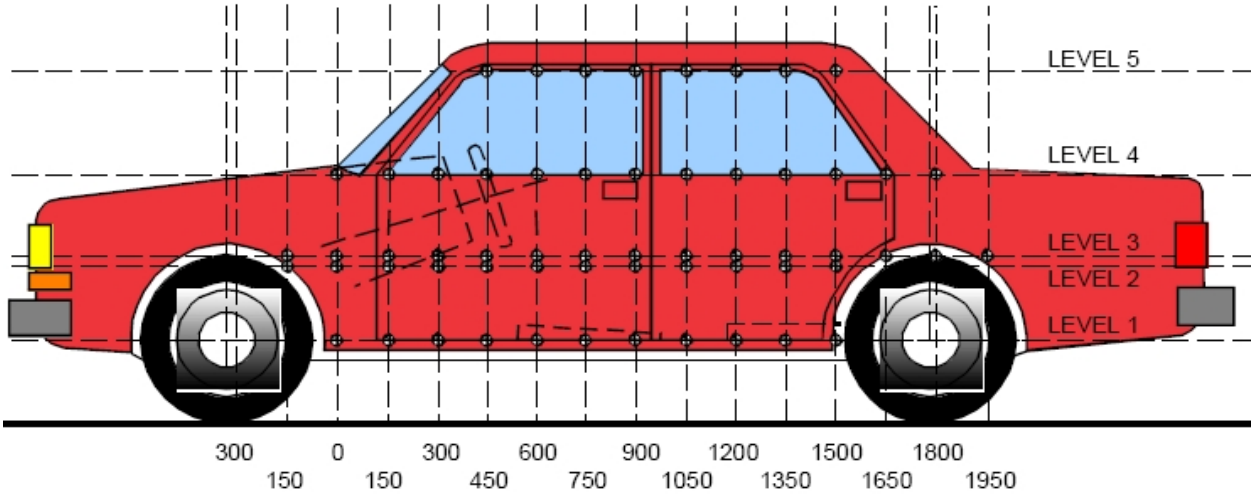
LEFT SIDE VIEW
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3mm

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code.	Measurement Description	Pre-Test	Post-Test	Change
A	Wheelbase	2875	2876	1
B	Front Axle to FSOV	838	839	1
C	Rear Axle to RSOV	997	996	-1
D	Total Length at Centerline	4710	4711	1
E	Front Bumper Thickness	154	154	0
F	Front Bumper Bottom to Ground	495	504	9
G	Sill Height at Front Wheel Well	235	211	-24
H	Sill Height at Front Door Leading Edge	210	213	3
I	Sill Height at B Pillar	212	215	3
J1	Sill Height at Rear Wheel Well	210	210	0
J2	Pinch Weld Height at Rear Wheel Well	205	202	-3
K	Sill Height Aft of Rear Wheel Well	258	260	2
L	Rear Bumper Thickness	145	145	0
M	Rear Bumper Bottom to Ground	455	459	4
N	Sill Height to Bottom of Front Window Sill	832	745	-87
O	Front Door Leading Edge to Impact CL	659	652	-7
P	Rear Door Trailing Edge to Impact CL	1484	1441	-43
Q	Front Window Opening	467	480	13
R	Right Side Length	4633	4636	3
S	Left Side Length	4633	4636	3
T	Maximum Vehicle Width	1891	1733	-158
U	Front Wheel Track Width	1645	1630	-15
V	Rear Wheel Track Width	1660	1656	-4

DATA SHEET NO.11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023



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	306	24	300
2	Driver H-Point	mm	645	181	1350
3	Mid-Door	mm	692	200	1350
4	Window Sill	mm	1068	80	1650
5	Window Top	mm	1564	4	1500

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 Genesis GV70 5 Door SUV NHTSA No.: M20234205
Test Program: NCAP Side MDB Impact Test Test Date: 08/02/2023

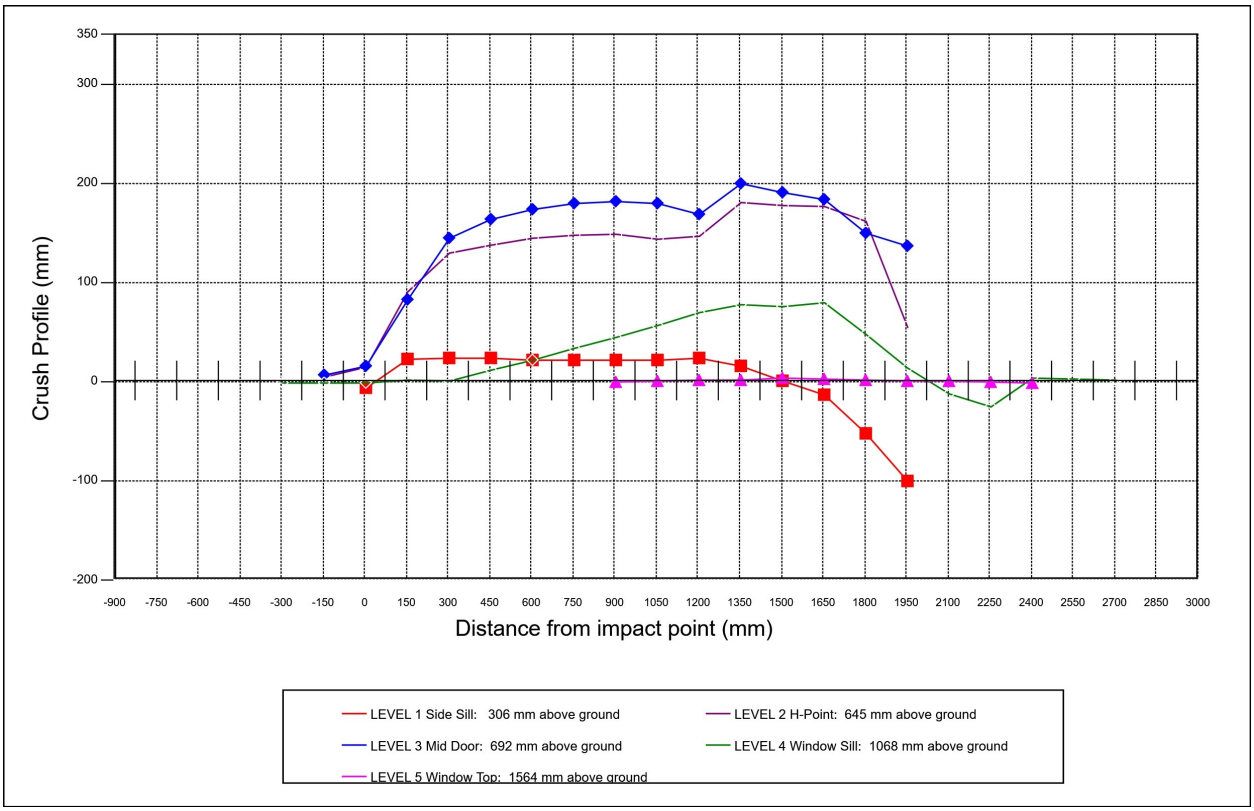
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	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				792					793					-1	
-150		954	955	812			949	948	813			5	7	-1	
0	913	945	945	831		919	930	930	832		-6	15	15	-1	
150	916	934	937	842		893	843	854	840		23	91	83	2	
300	915	929	935	853		891	799	790	852		24	130	145	1	
450	913	929	935	863		889	791	771	851		24	138	164	12	
600	910	930	936	869		888	785	762	847		22	145	174	22	
750	907	931	936	875		885	783	756	841		22	148	180	34	
900	904	932	937	879	605	882	783	755	834	605	22	149	182	45	0
1050	901	932	937	881	629	879	788	757	824	628	22	144	180	57	1
1200	899	931	936	881	639	875	784	767	811	637	24	147	169	70	2
1350	893	930	933	880	639	877	749	733	802	637	16	181	200	78	2
1500	889	929	931	877	636	888	751	740	801	632	1	178	191	76	4
1650	889	931	933	874	631	902	754	749	794	628	-13	177	184	80	3
1800	896	942	942	872	623	948	780	792	824	621	-52	162	150	48	2
1950	908	954	959	876	612	1008	899	822	862	611	-100	55	137	14	1
2100				881	597				893	596				-12	1
2250				882	564				907	564				-25	0
2400				881	536				877	537				4	-1
2550				873					870					3	
2700				859					857					2	
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 the test based on an estimated impact point. The final distance from impact is determined after the final dummy positioning and the pole is aligned with the center of gravity of the dummy's head.*

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

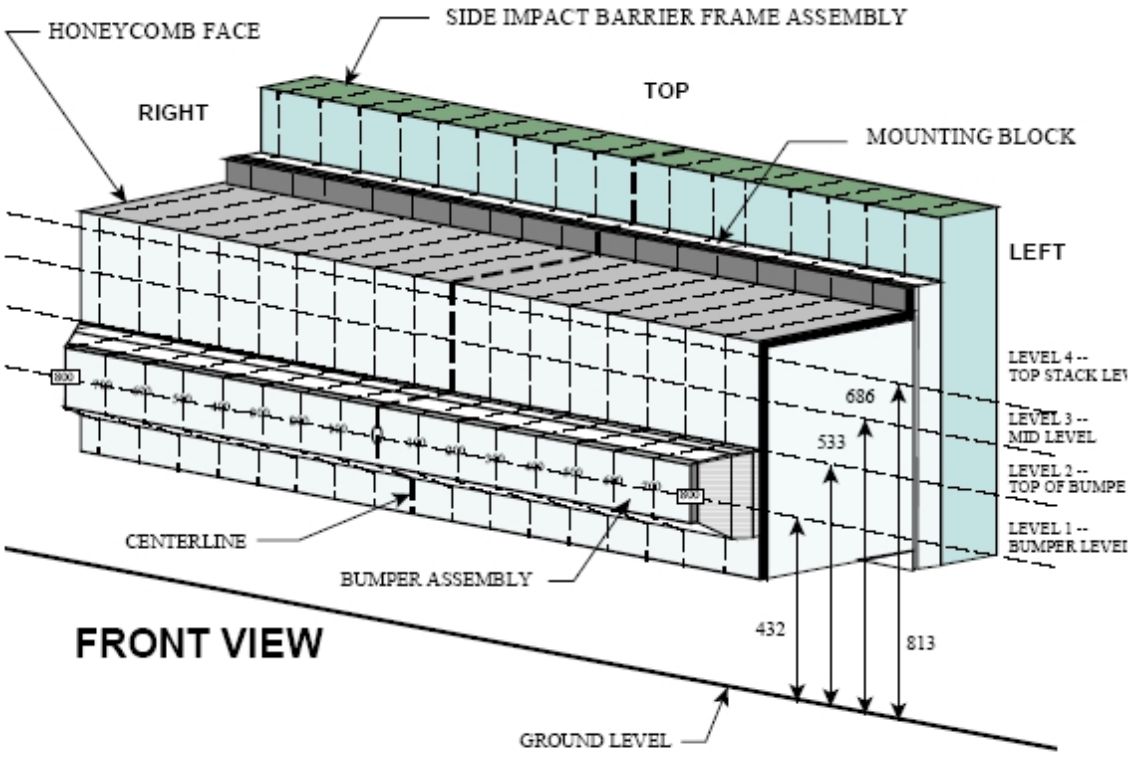
Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023



Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO.12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023



NOTE: Dimensions are shown in millimeters, mm

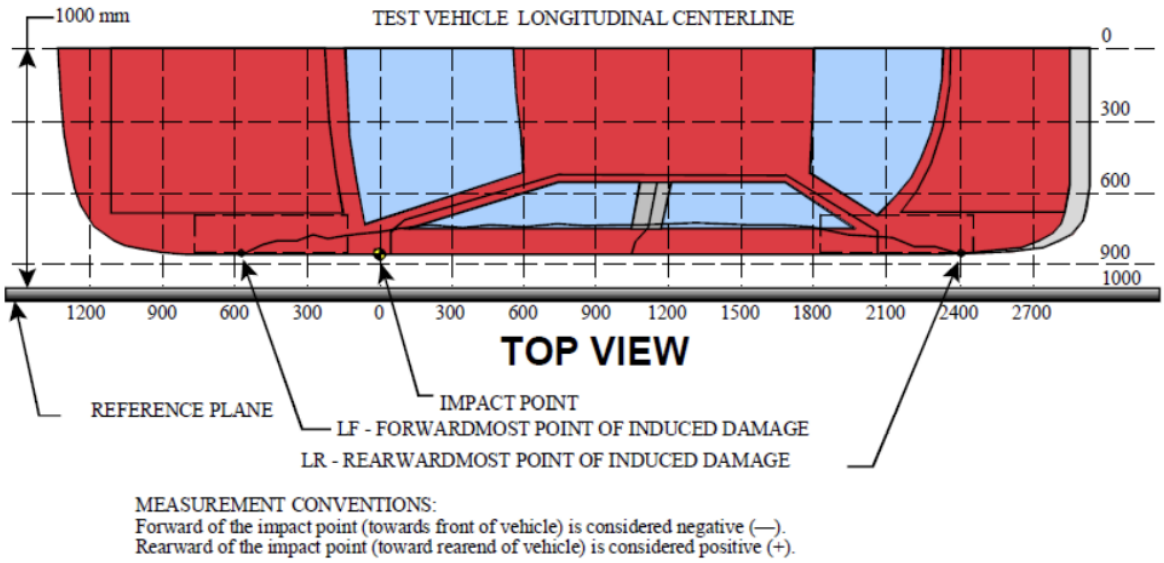
DEFORMABLE BARRIER STATIC CRUSH

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	231	235	236	236	238	238	236	235	229	227	228	228	229	229	231	240	242
2	113	116	117	119	121	126	120	117	116	115	117	119	121	123	126	139	162
3	100	73	58	52	57	82	83	64	56	49	48	52	60	73	94	134	174
4	91	61	36	34	61	59	74	60	59	65	77	91	100	106	127	179	220

DATA SHEET NO.13
VEHICLE AND MDB DAMAGE PROFILE DISTANCE

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023

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	52	45	7
2	270	3	197	65	132
3	690	3	242	64	178
4	1110	3	239	63	176
5	1530	3	258	69	189
6	1950	3	178	41	137

MDB DAMAGE PROFILE DISTANCES

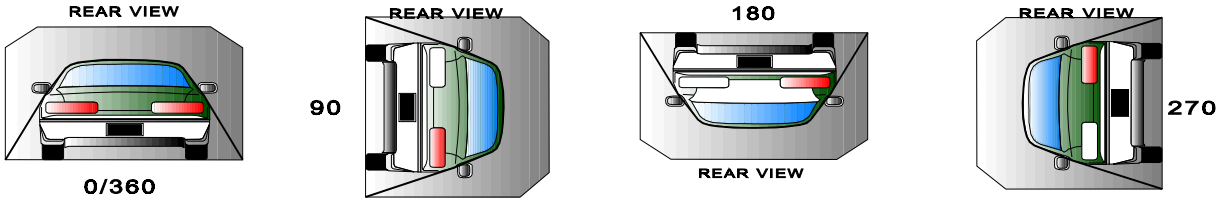
DPD	Distance From Center of MDB	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	800 mm left of center	1	263	505	-242
2	480 mm left of center	1	285	514	-229
3	160 mm left of center	1	286	514	-228
4	160 mm right of center	1	278	513	-235
5	480 mm right of center	1	277	513	-236
6	800 mm right of center	1	270	501	-231

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

Test Vehicle:	2023 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023
Test Time:	11:03 AM	Temperature:	21 °C

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

D. Spillage Detail: No Spillage Occurred



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	69	300	369
90° to 180°	68	300	368
180° to 270°	63	300	363
270° to 360°	68	300	368

FMVSS 301 SPILLAGE TABLE

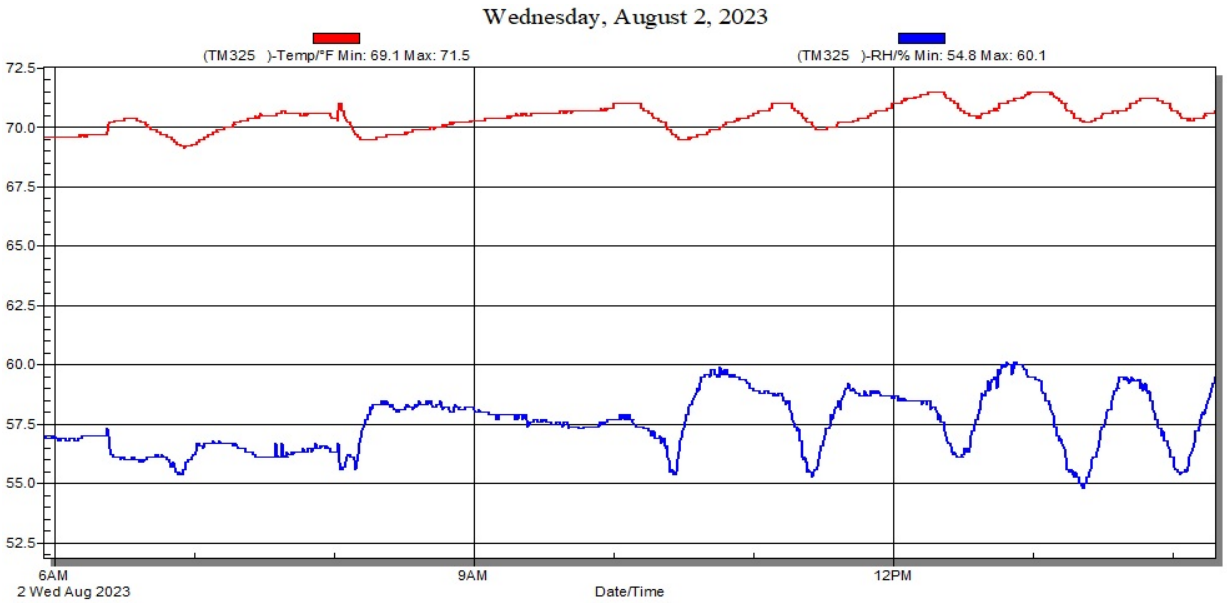
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

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 Genesis GV70 5 Door SUV	NHTSA No.:	M20234205
Test Program:	NCAP Side MDB Impact Test	Test Date:	08/02/2023



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

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 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

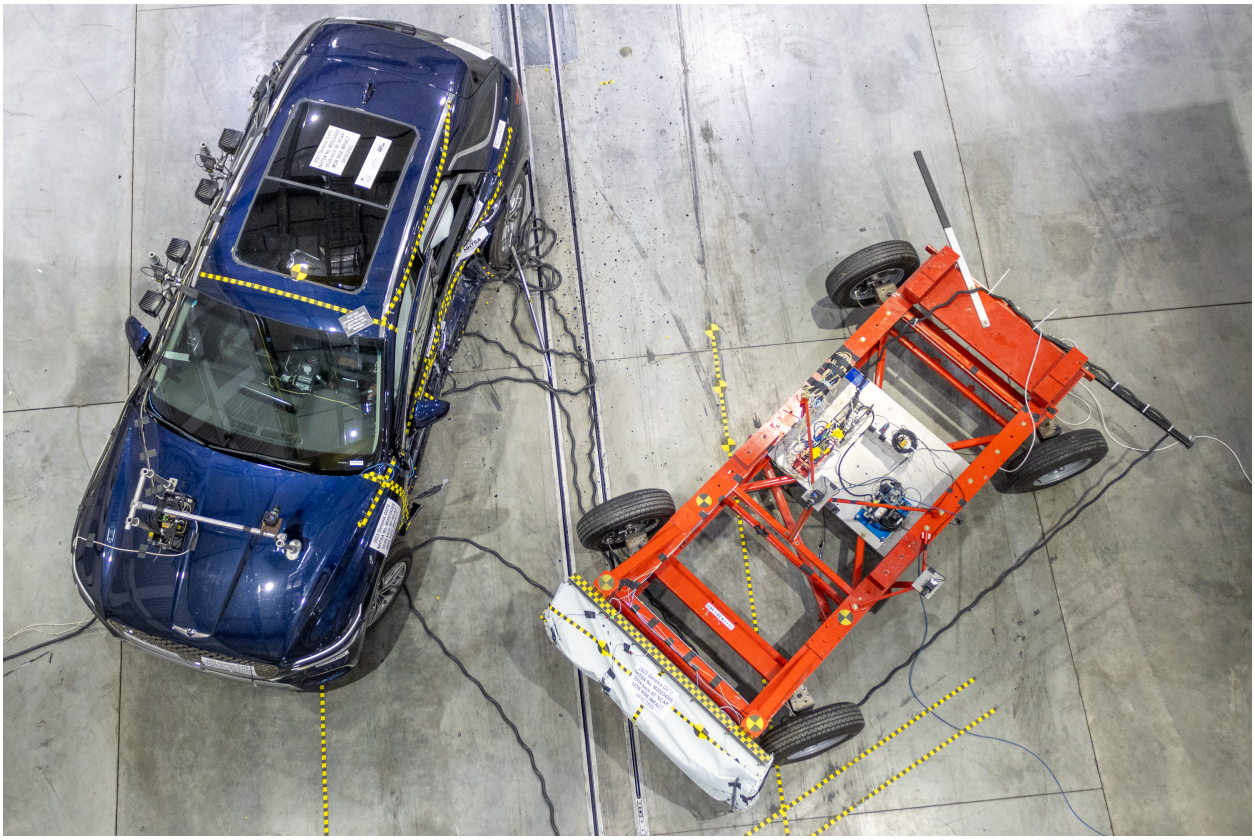

Figure A-16: Post-Test Overhead View of Test Area



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

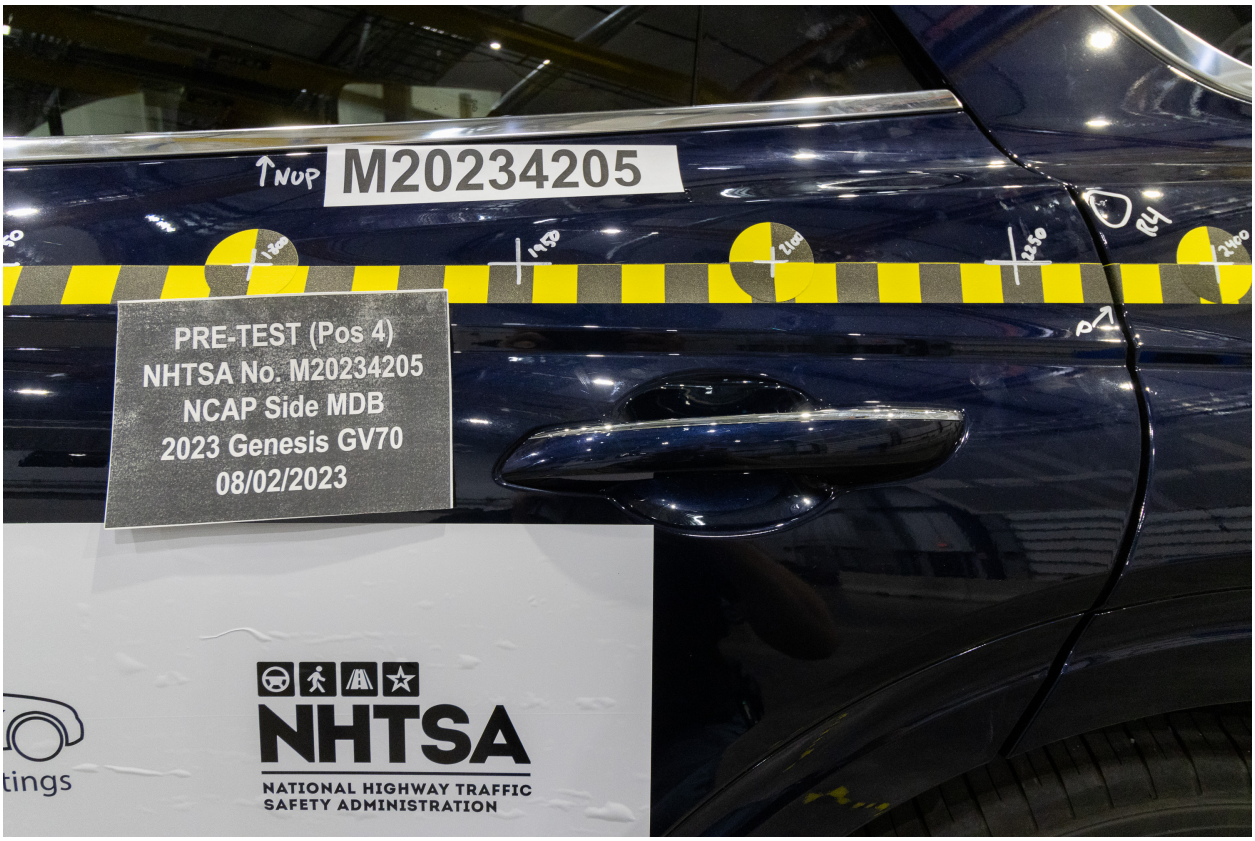

Figure A-23: Pre-Test Left Rear Door Latch Close-Up



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

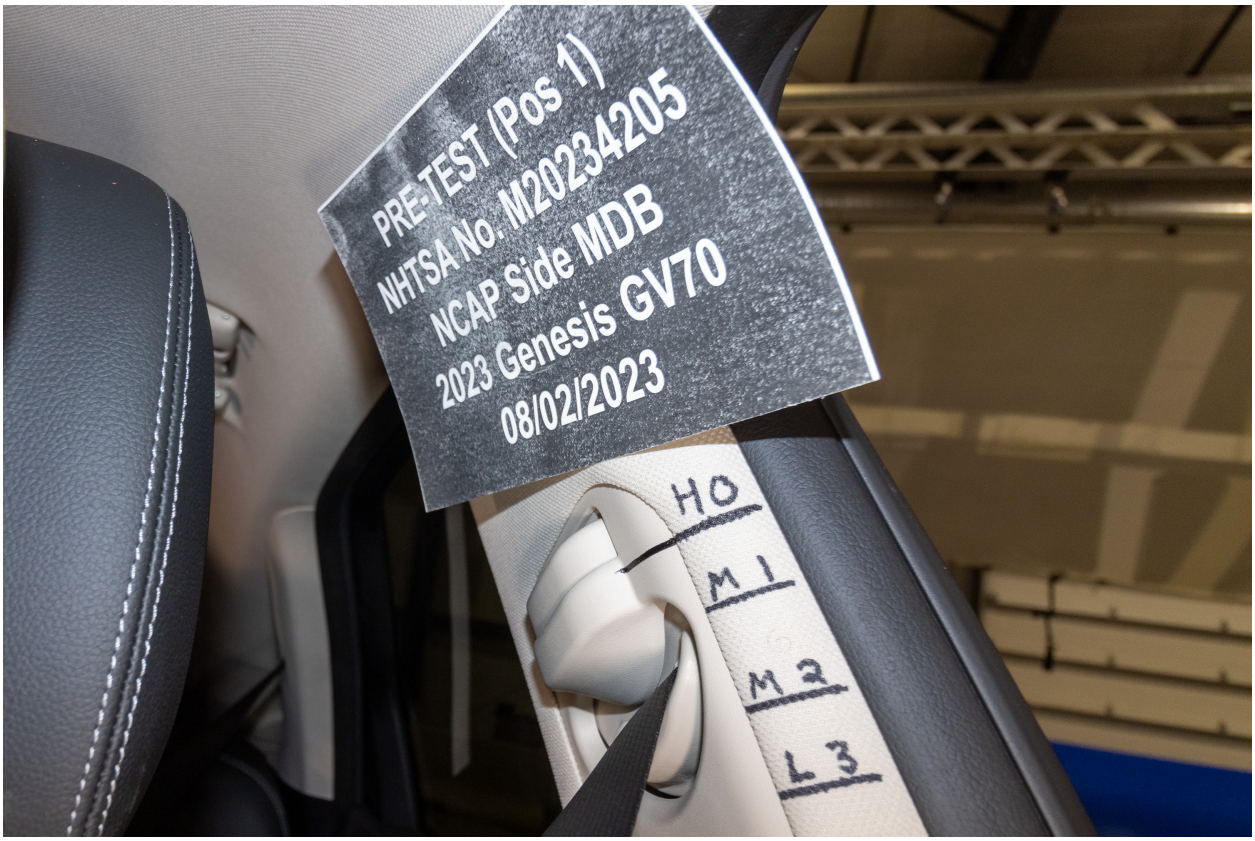

Figure A-35: Pre-Test View of Belt Anchorage for Driver Dummy



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

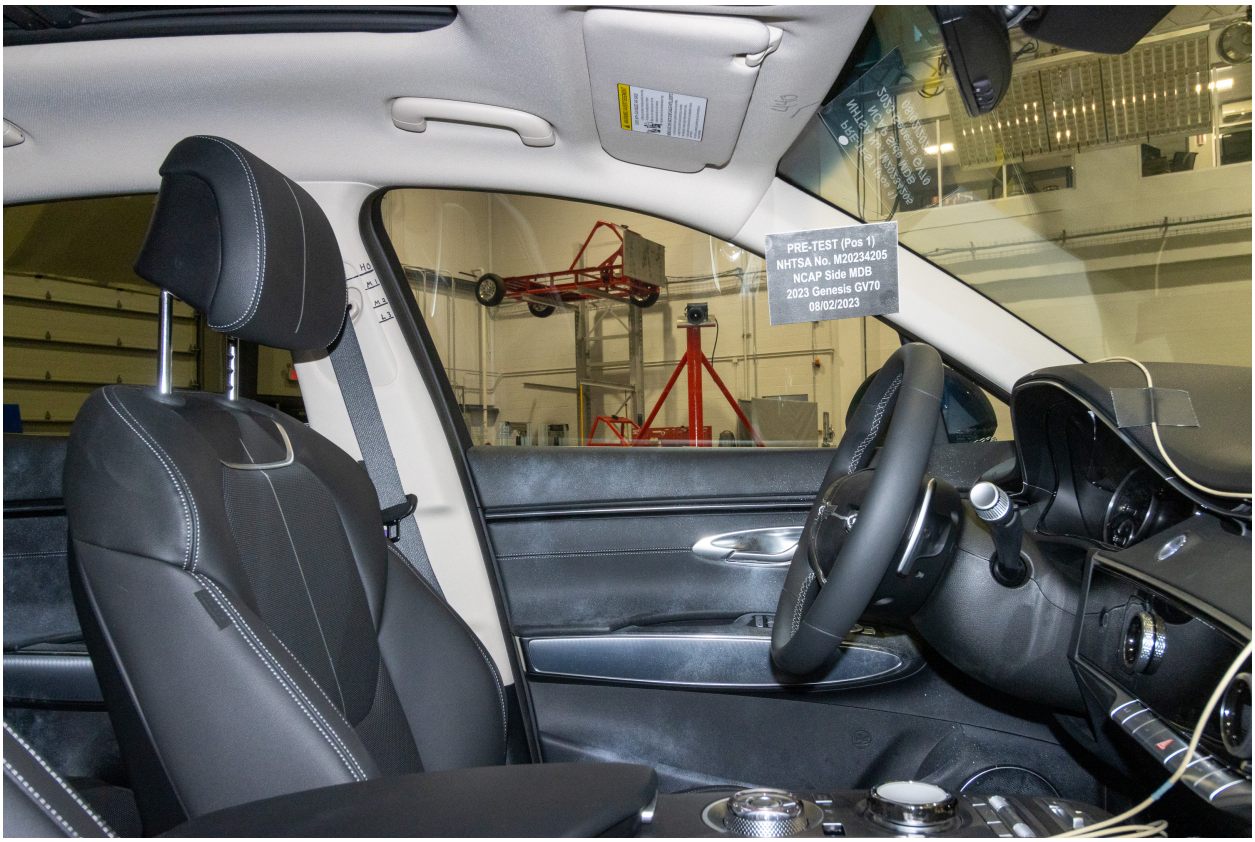

Figure A-46: Pre-Test Driver Inner Door Panel View



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

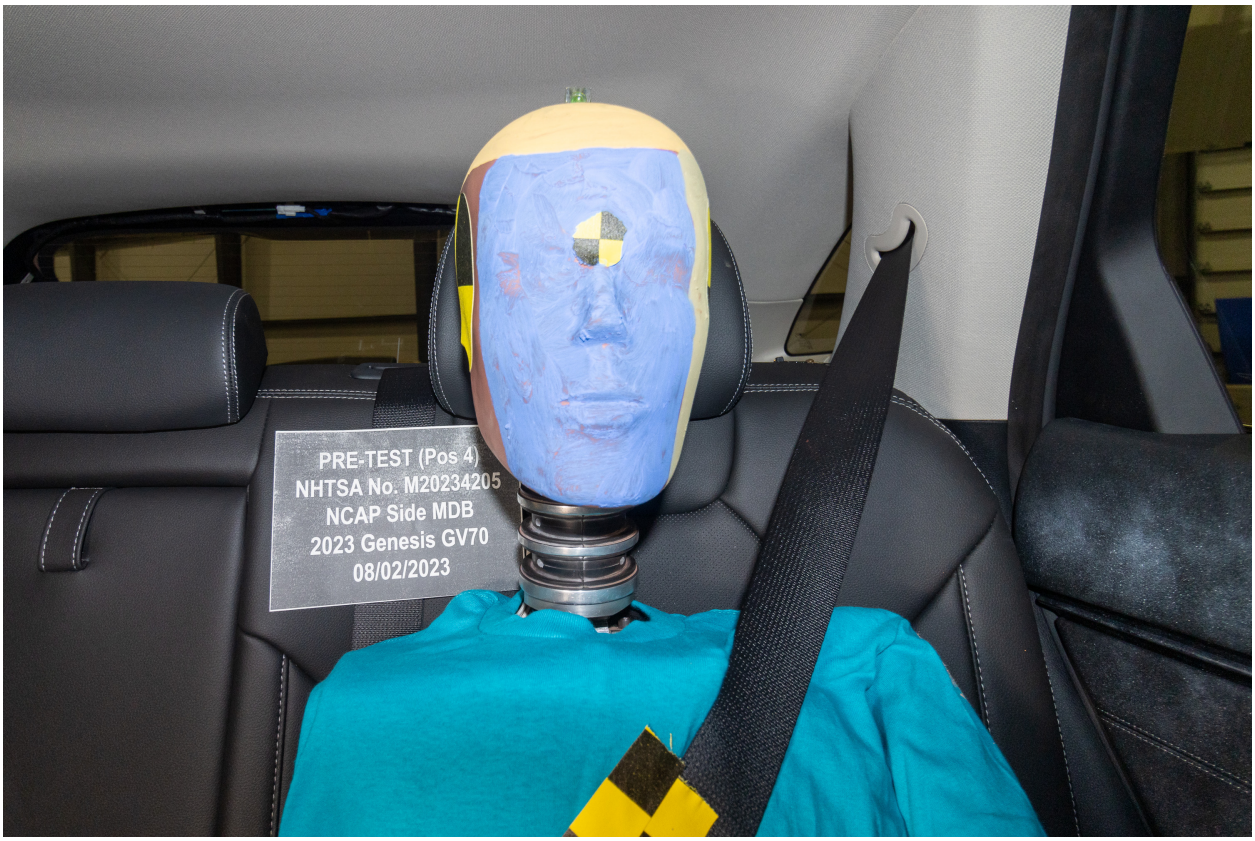

Figure A-59: Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



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 View of Fuel Filler Cap or Fuel Filler Neck



Figure A-83: Post-Test View of Fuel Filler Cap or Fuel Filler Neck

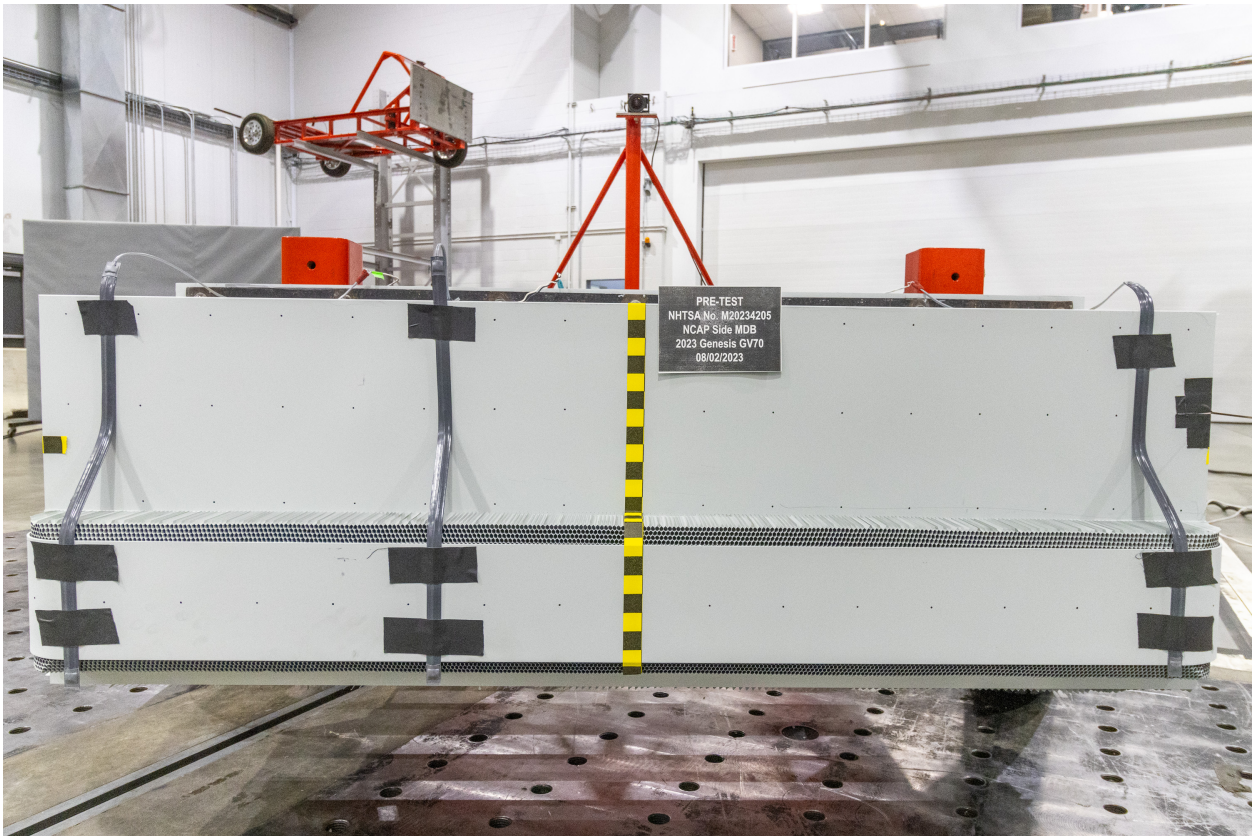

Figure A-84: Pre-Test Front View of MDB Impactor Face



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

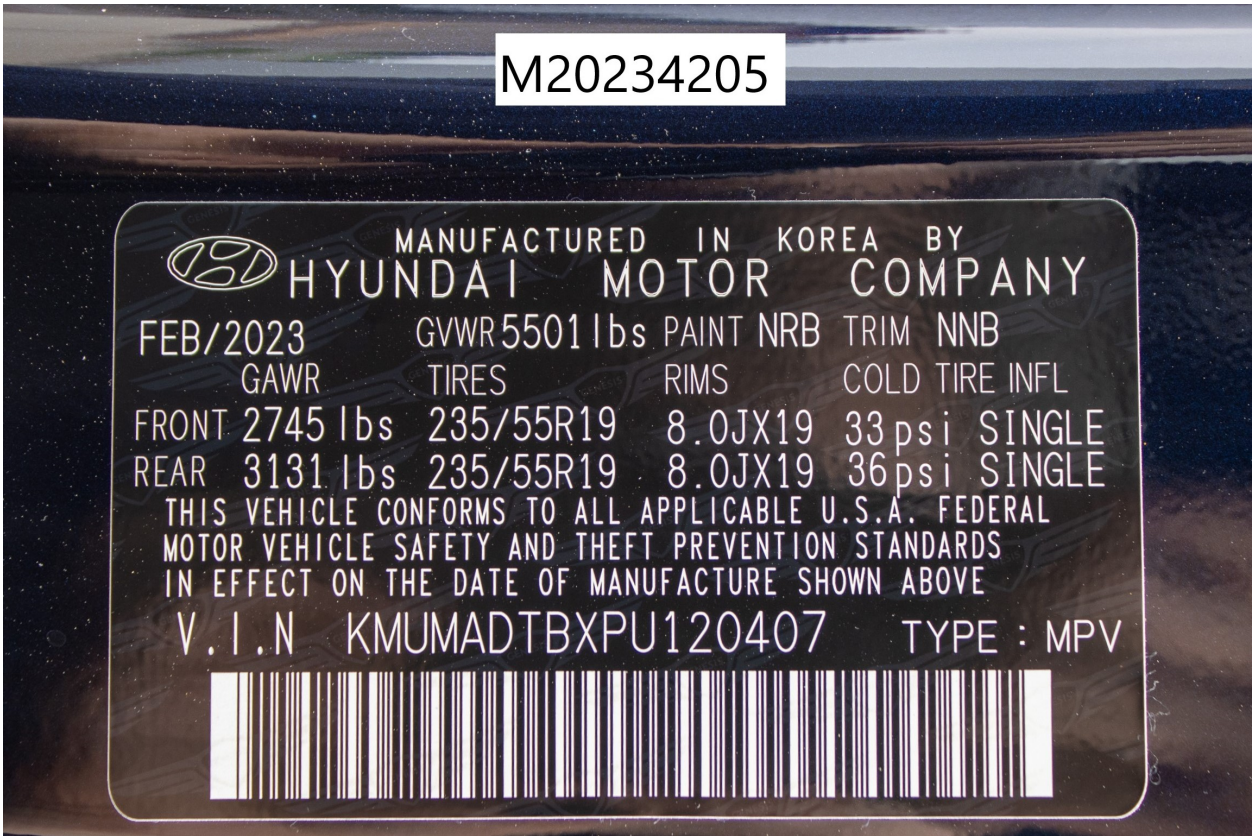

Figure A-92: Close-Up View of Vehicle's Certification Label

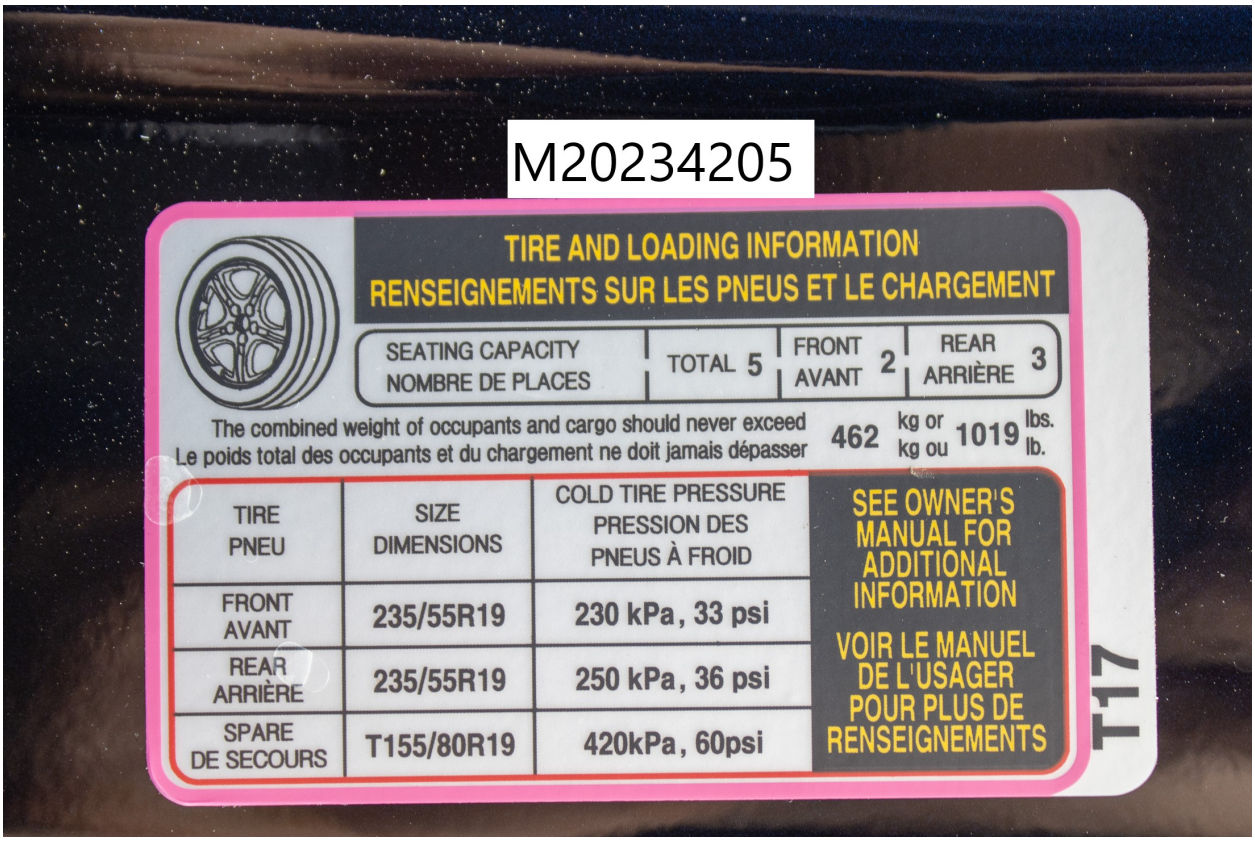

Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label



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

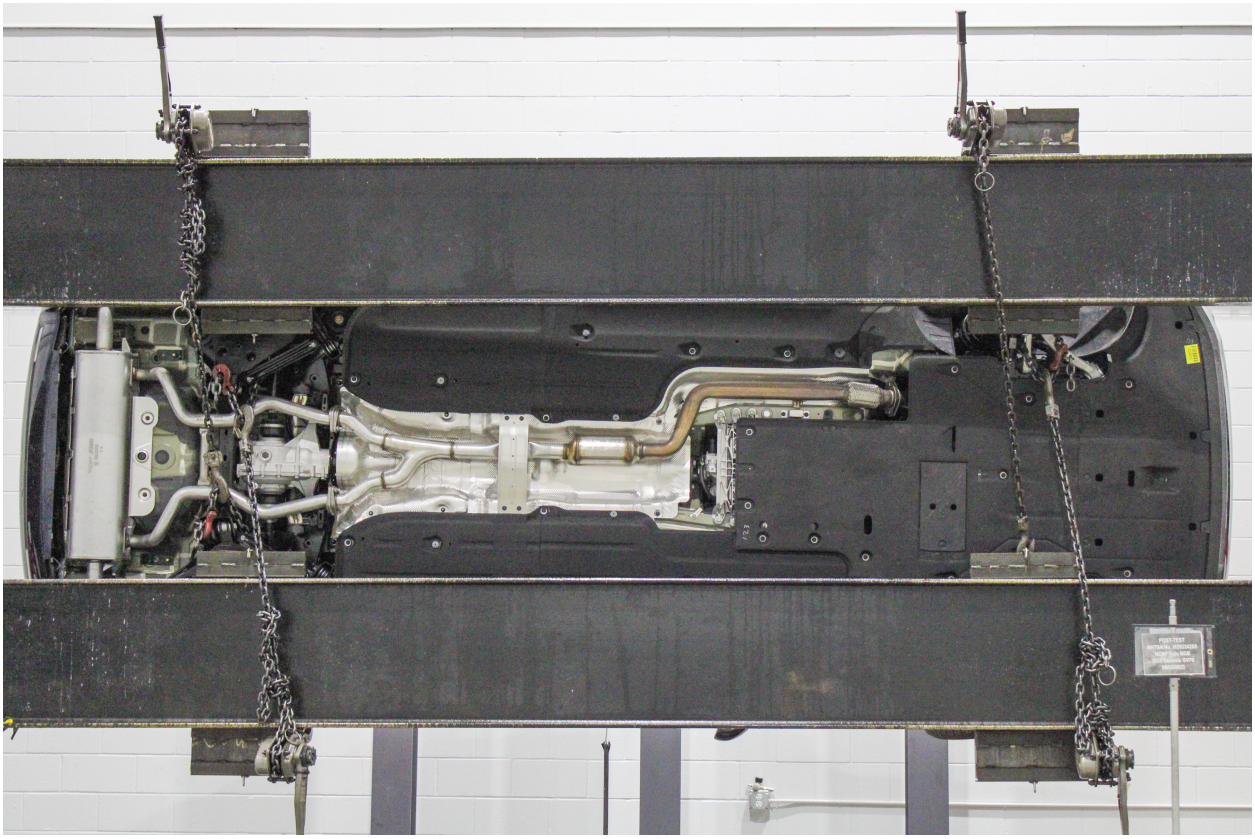

Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees

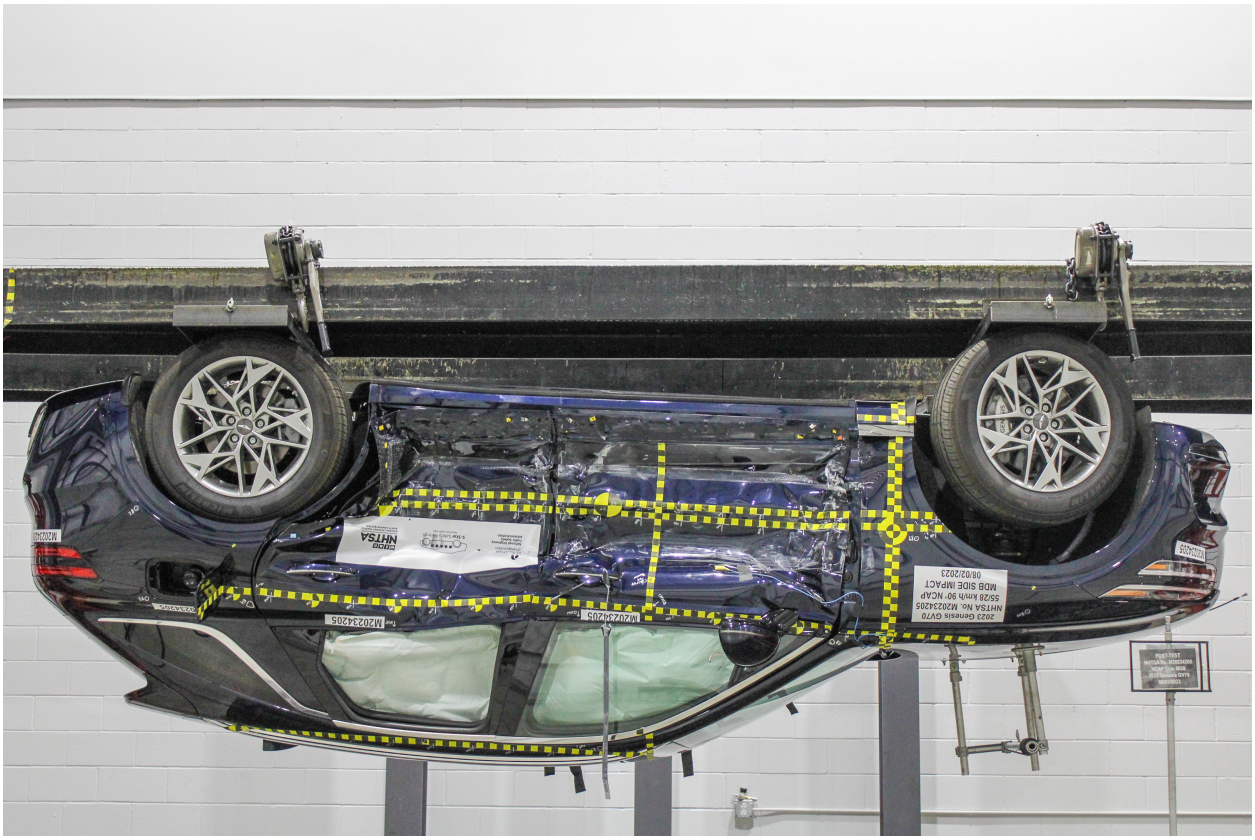

Figure A-98: FMVSS No. 301 Static Rollover 180 Degrees

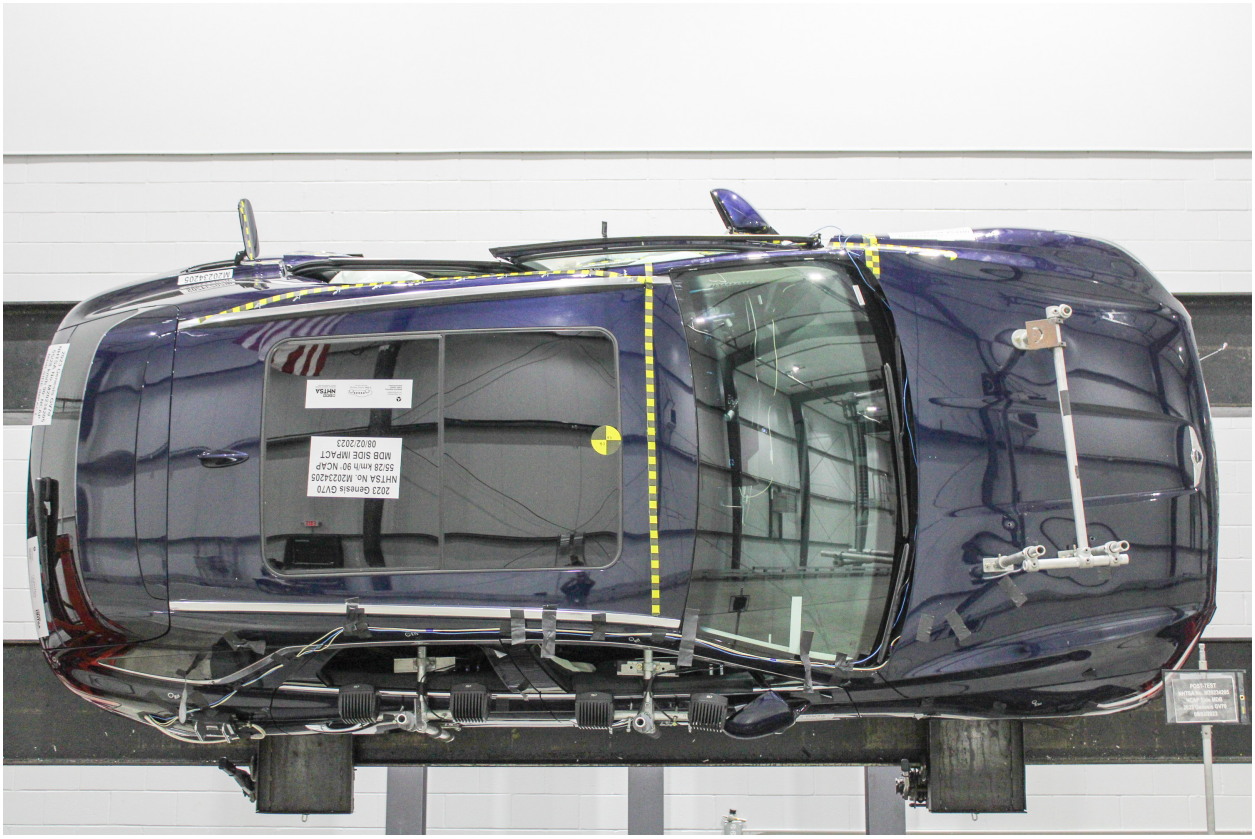

Figure A-99: FMVSS No. 301 Static Rollover 270 Degrees



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

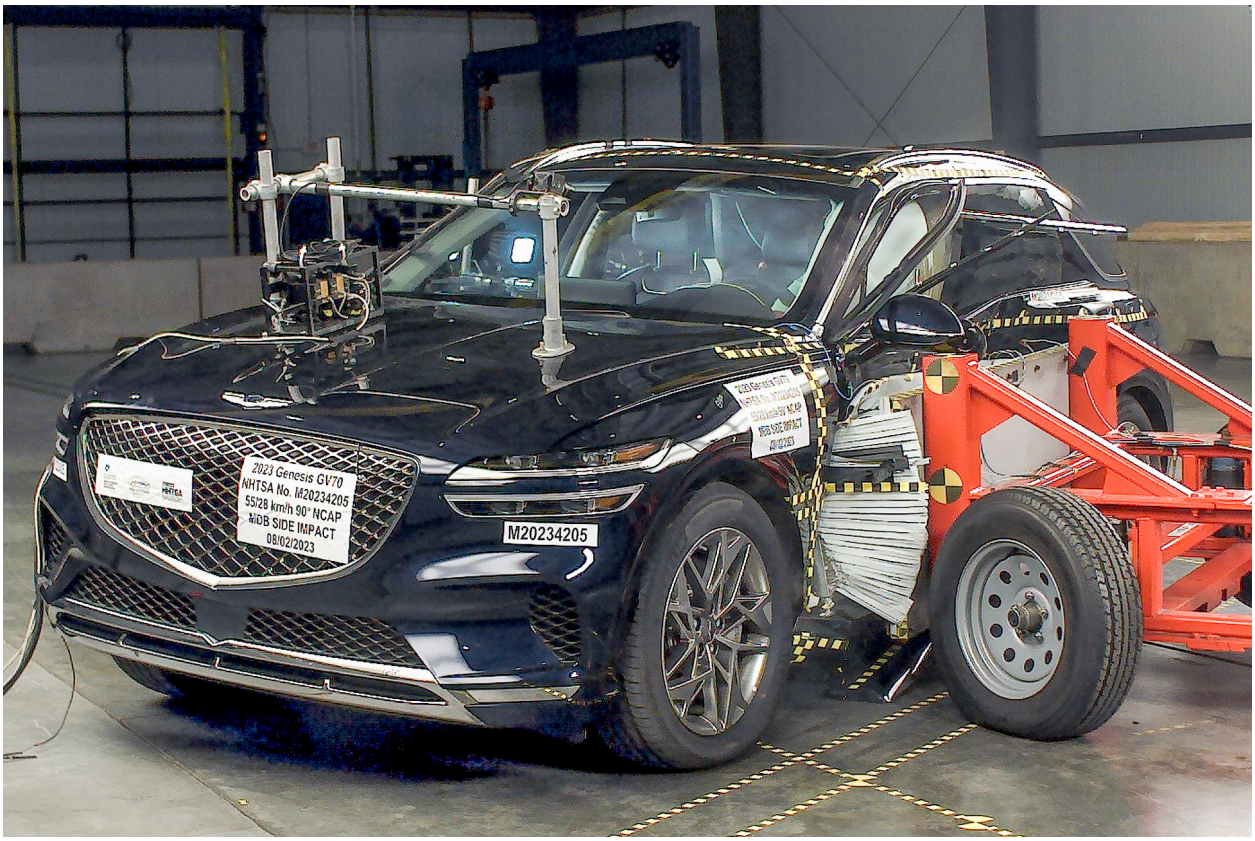

Figure A-101: Impact Event

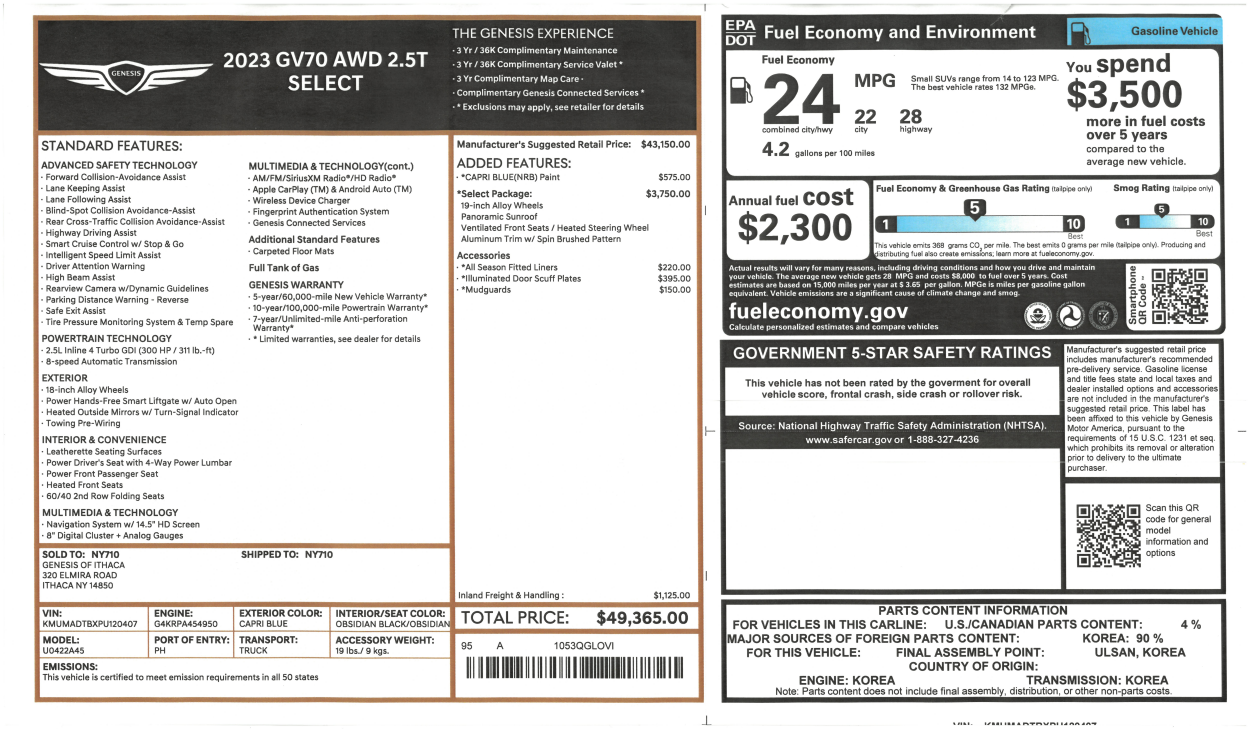

Figure A-102: Monroney Label

03

Front seat headrests

OJK030064L

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

OJK039009

Adjusting the height up and down

To raise the headrest:

1. Pull it up to the desired position (1).

To lower the headrest:

1. Push and hold the release button (2) on the headrest support.
2. Lower the headrest to the desired position (3).

WARNING

OTL035061

When sitting on the rear seat, do not adjust the height of the headrest to the lowest position.

CAUTION

When there is no occupant in the rear seats, adjust the height of the headrest to the lowest position. The rear seat headrest can reduce the visibility of the rear area.

NOTICE

To prevent damage, NEVER hit or pull on the headrests.

3-17

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

03

Rear seat headrests

OJK030074

The rear seats are equipped with headrests in all the seating positions for the passenger's safety and comfort.

OJK030073

Adjusting the height up and down

To raise the headrest:

1. Pull it up to the desired position (1).

To lower the headrest:

1. Push and hold the release button (2) on the headrest support.
2. Lower the headrest to the desired position (3).

OJK039012

To reinstall the headrest :

1. Recline the seatback.
2. Put the headrest poles (2) into the holes while pressing the release button (1).
3. Adjust the headrest to the appropriate height.
4. Recline the seatback (4) with the seatback angle switch (3).

WARNING

Always make sure the headrest locks into position after reinstalling and adjusting it properly.

3-19

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

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots
Driver Dummy Instrumentation Plots

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Plot 3	Driver Head Acceleration (Z) Primary vs. Time	B-5
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Plot 6	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-6
Plot 7	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-6
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Plot 14	Passenger Head Acceleration (X) vs. Time Primary	B-8
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Plot 16	Passenger Head Acceleration (Z) vs. Time Primary	B-8
Plot 17	Passenger Head Resultant Acceleration Primary vs. Time	B-9
Plot 18	Passenger Lower Spine T12 Acceleration (X) vs. Time	B-9
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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

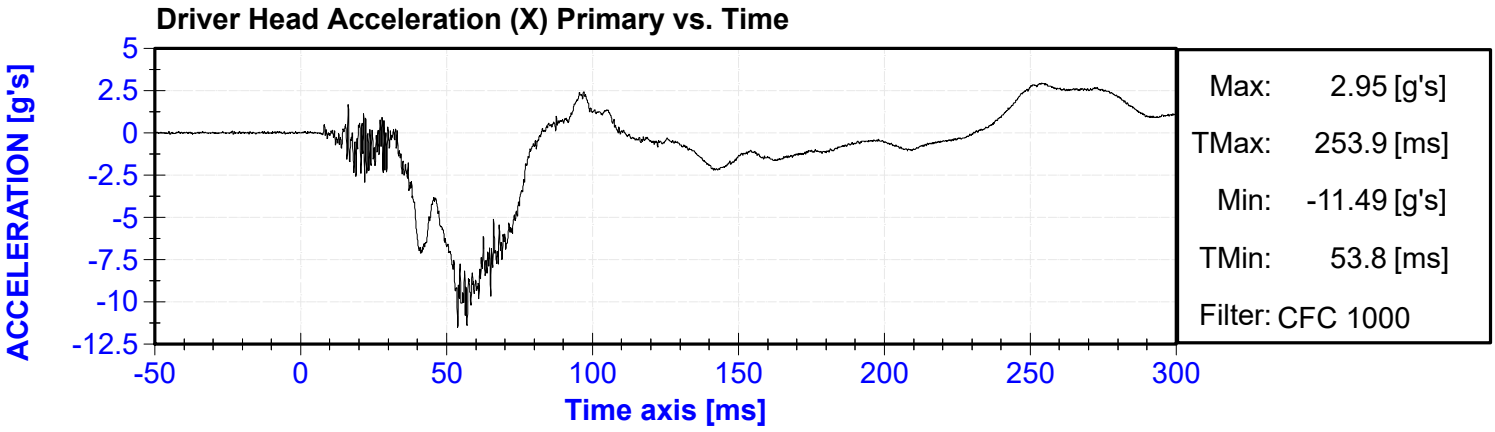
Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower 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
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Min: -11.49 [g's]
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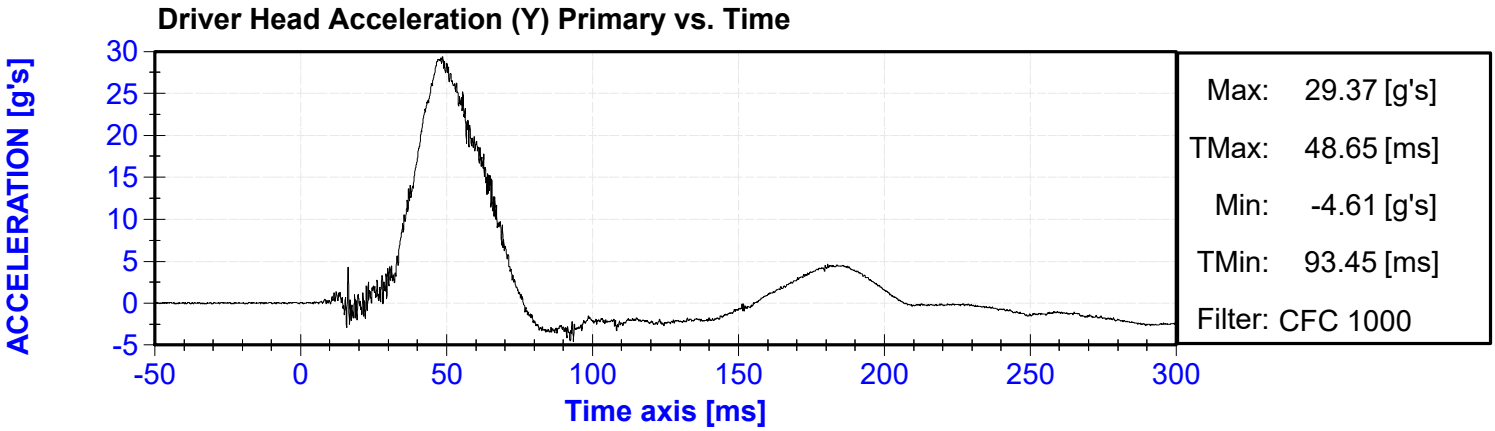
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Time axis [ms]
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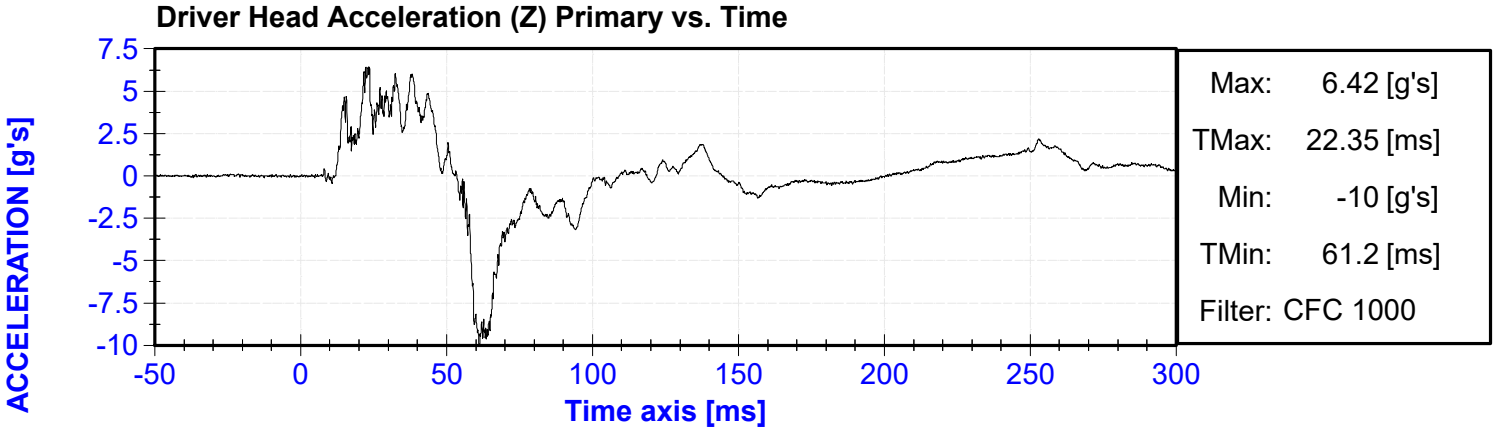
Driver Head Acceleration (Z) Primary vs. Time
ACCELERATION [g's]
Time axis [ms]
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TMax: 22.35 [ms]
Min: -10 [g's]
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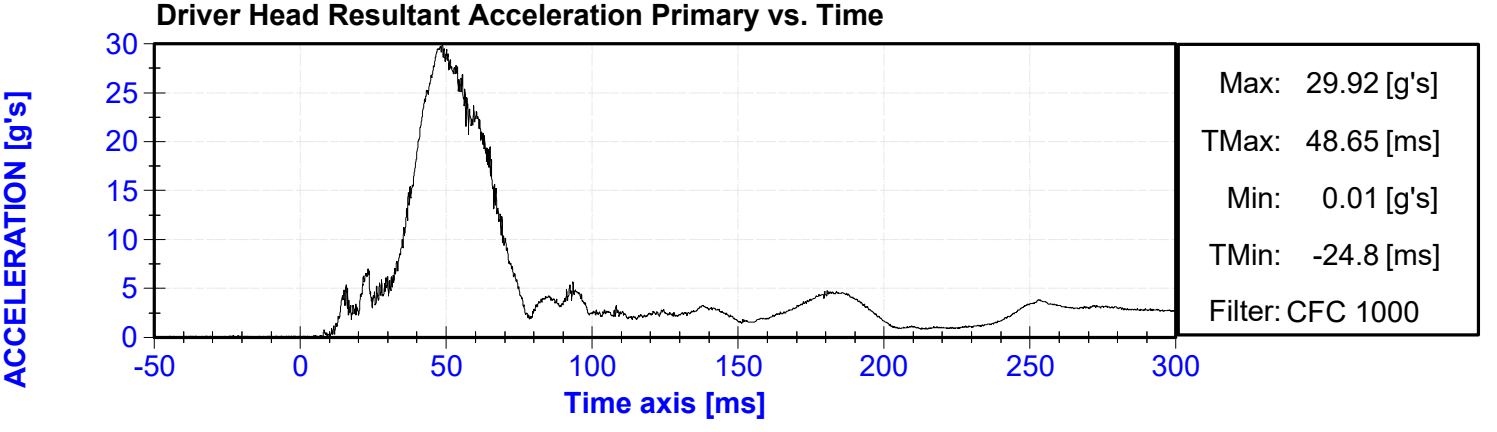
Driver Head Resultant Acceleration Primary vs. Time
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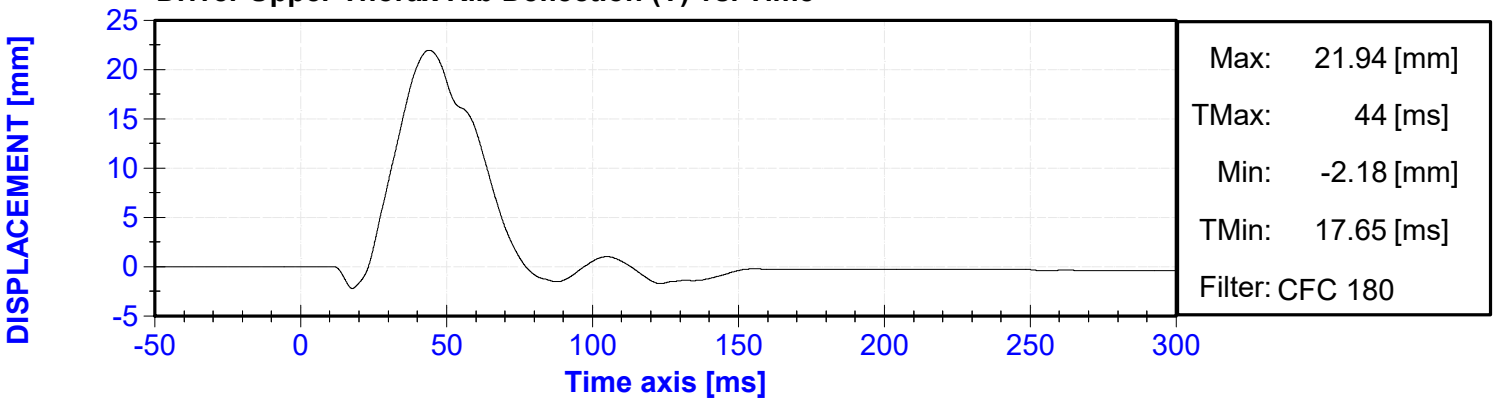
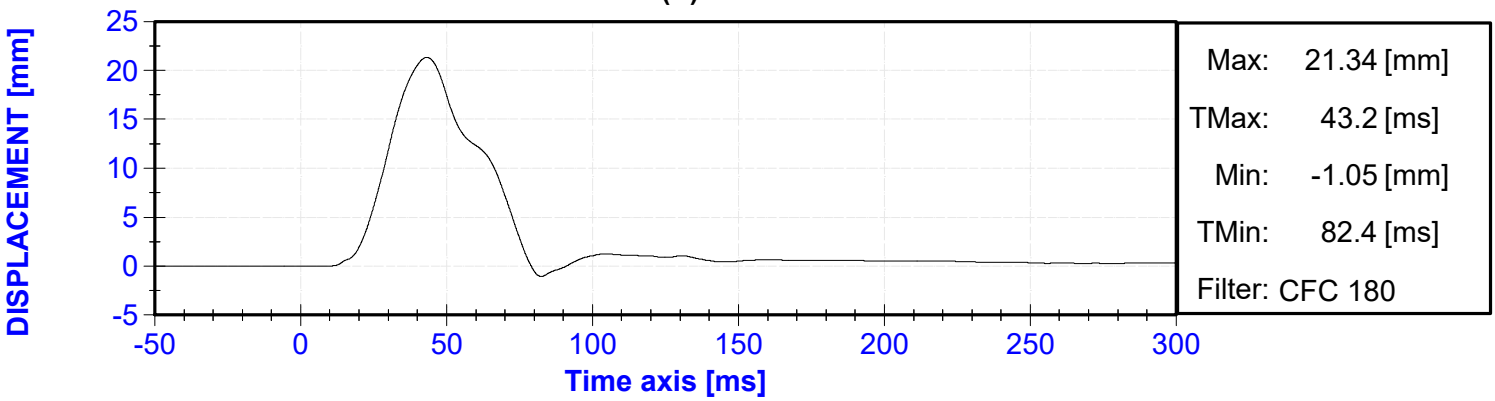
Time axis [ms]
Max: 29.92 [g's]
TMax: 48.65 [ms]
Min: 0.01 [g's]
TMin: -24.8 [ms]
Filter: CFC 1000

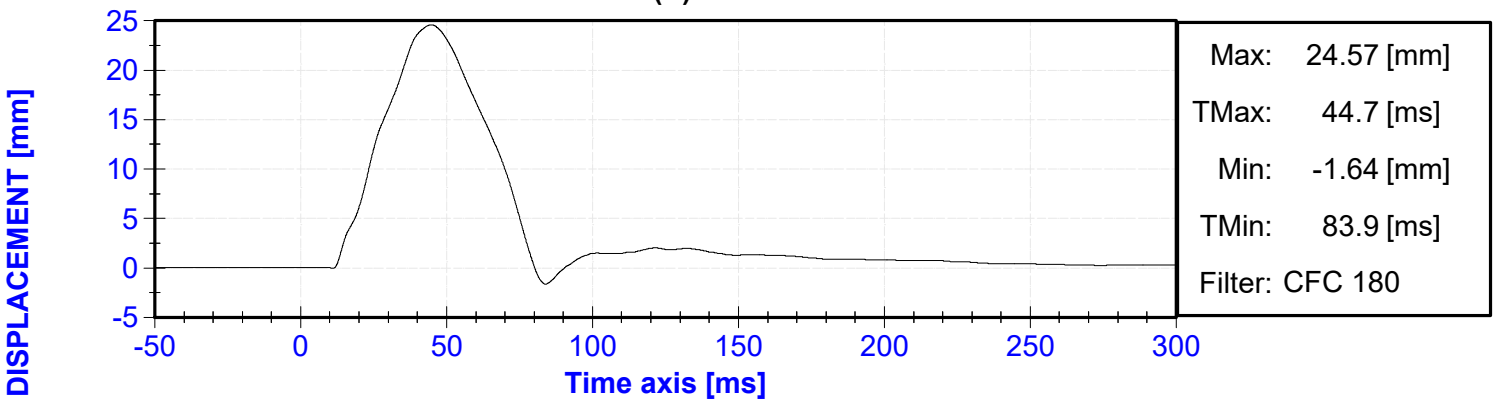
Driver Upper Thorax Rib Deflection (Y) vs. Time



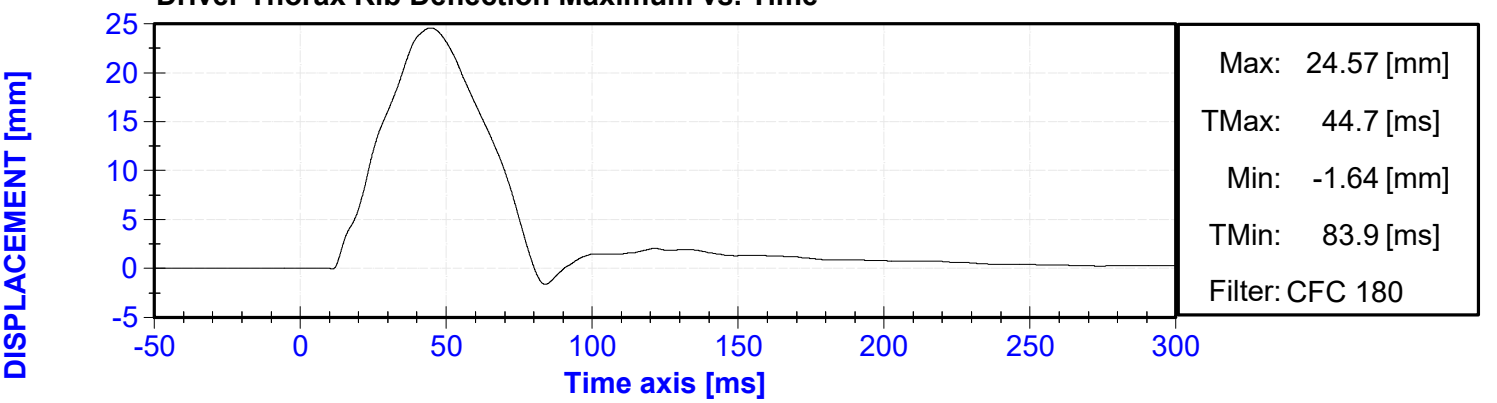
Driver Middle Thorax Rib Deflection (Y) vs. Time



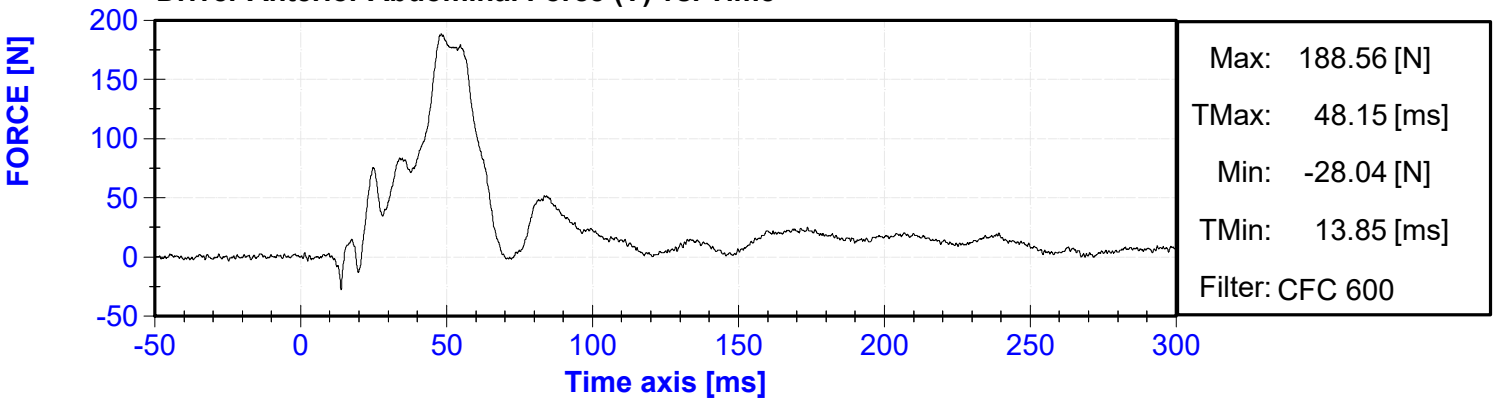
Driver Lower Thorax Rib Deflection (Y) vs. Time



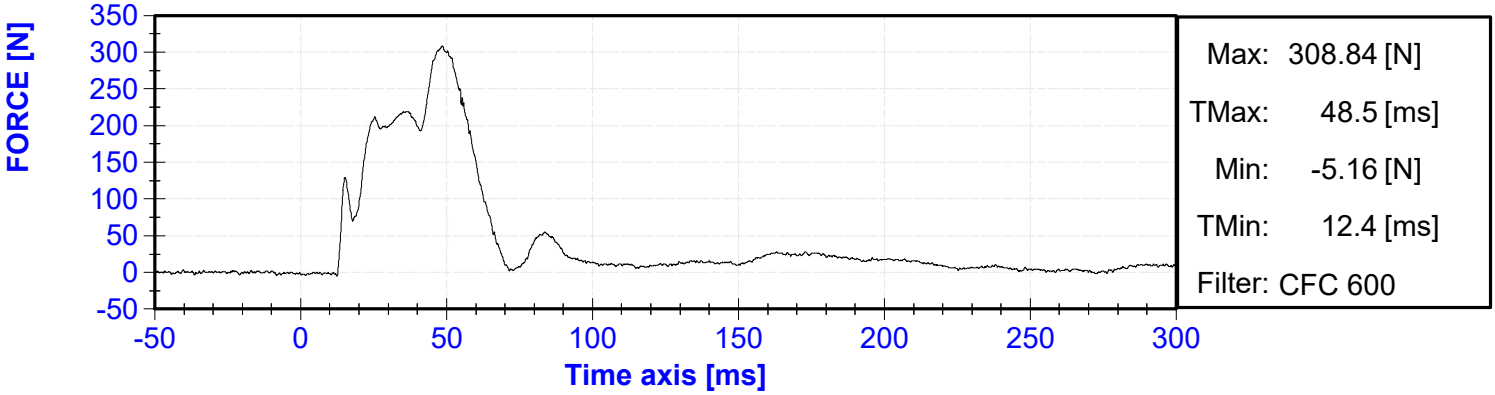
Driver Thorax Rib Deflection Maximum vs. Time



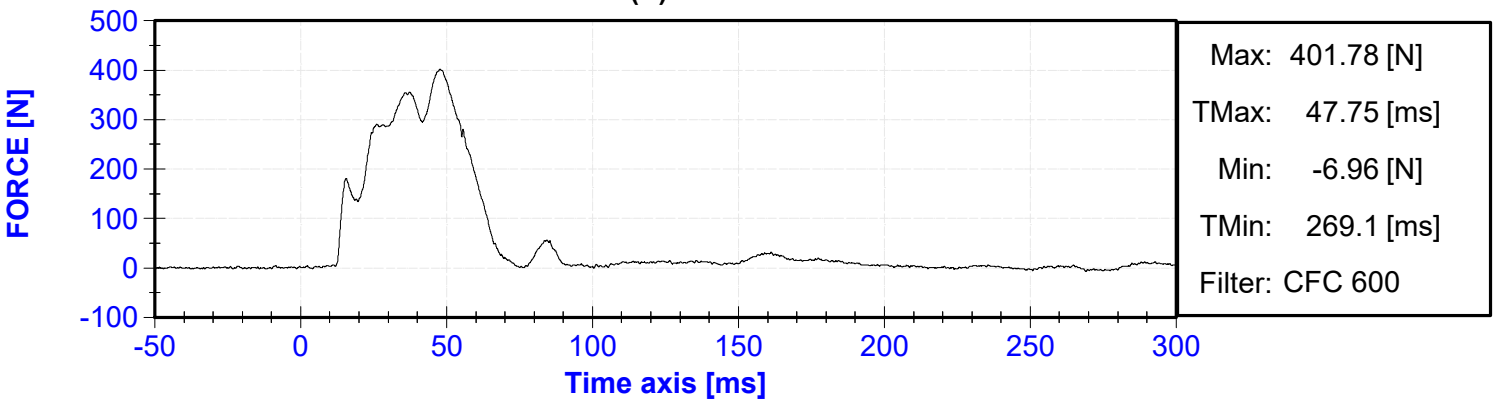
Driver Anterior Abdominal Force (Y) vs. Time



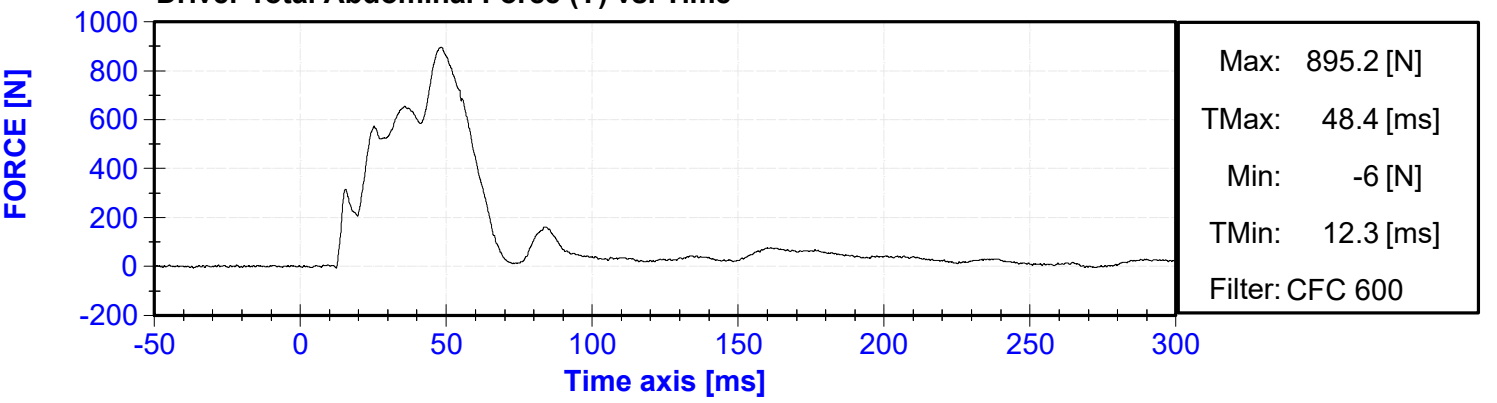
Driver Middle Abdominal Force (Y) vs. Time

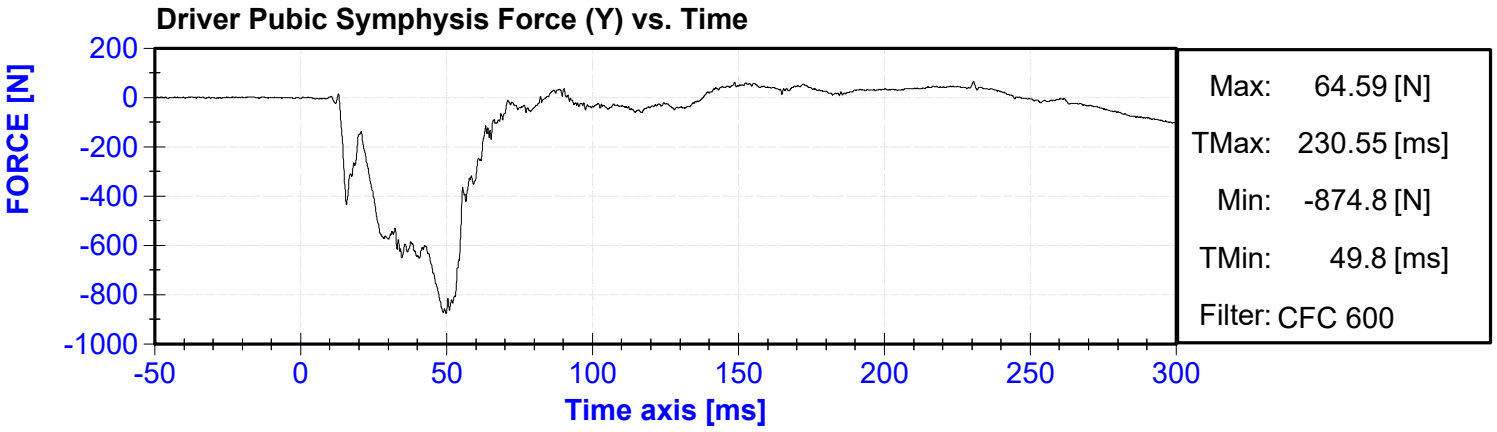


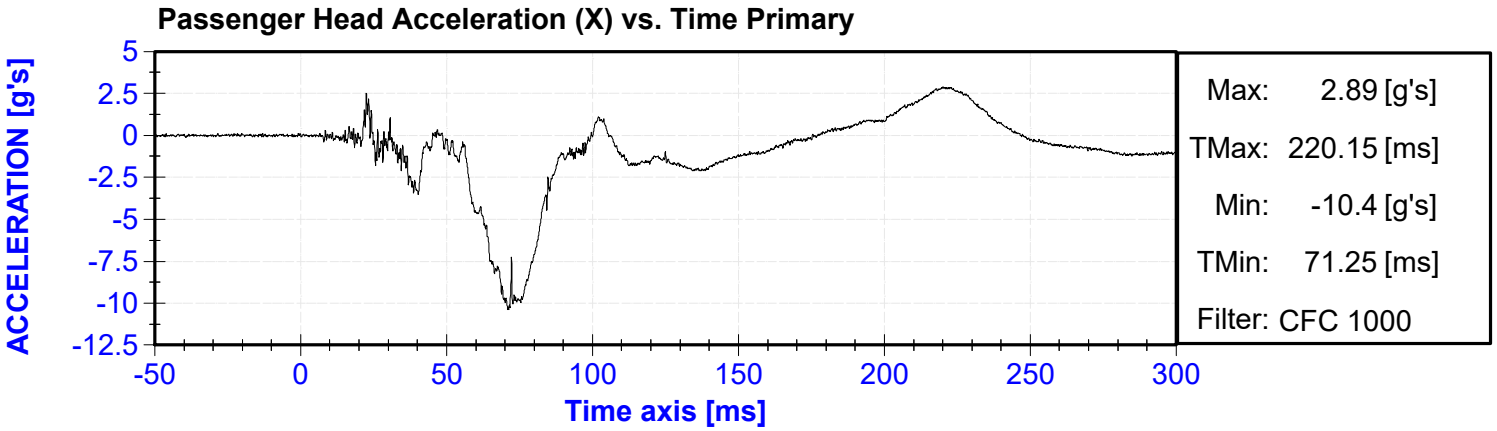
Driver Posterior Abdominal Force (Y) vs. Time

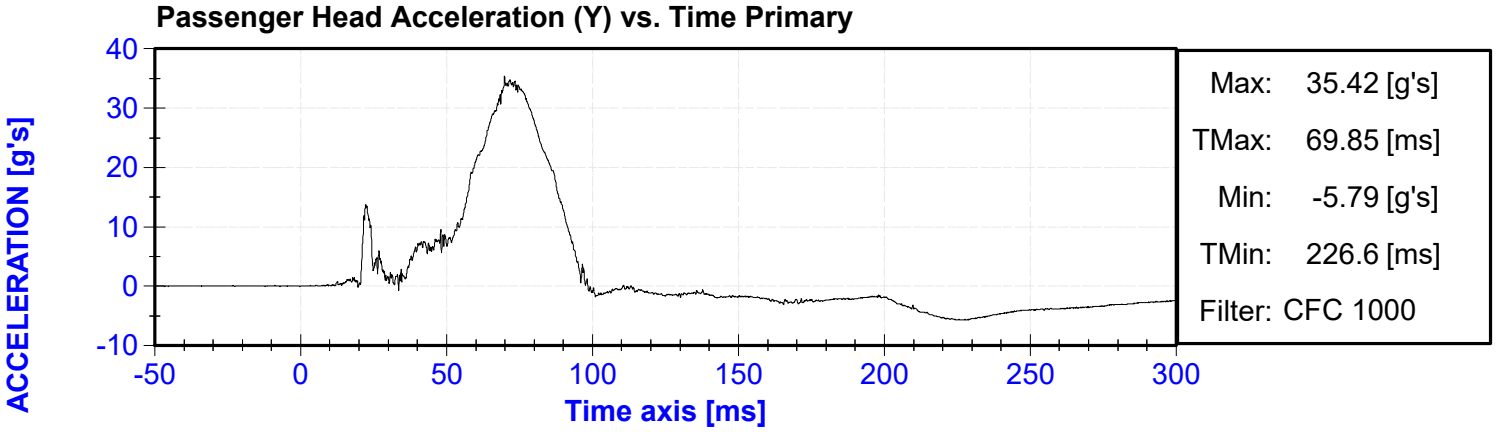


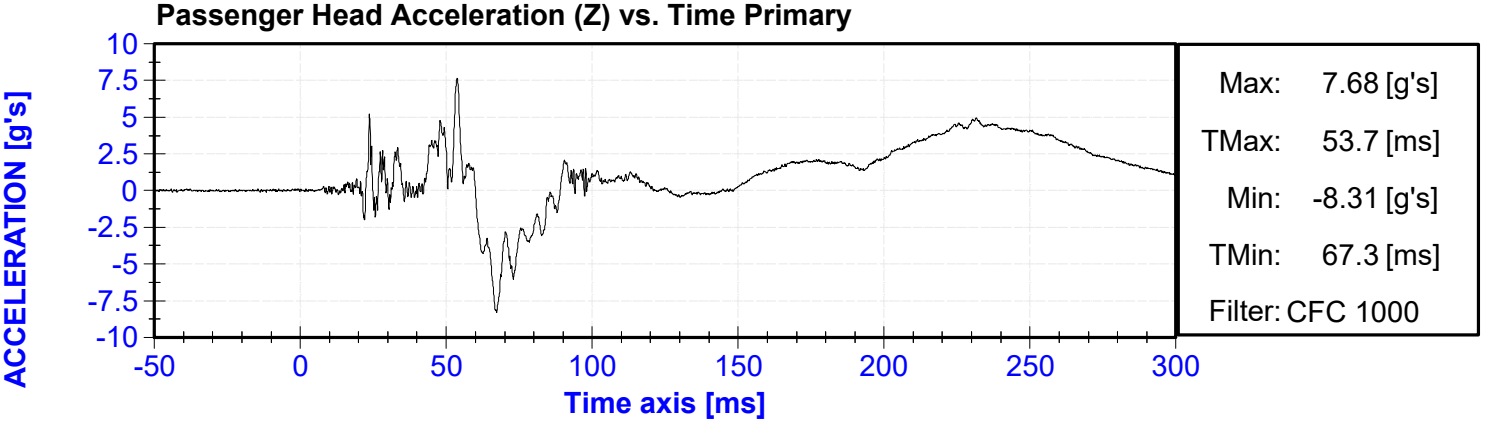
Driver Total Abdominal Force (Y) vs. Time



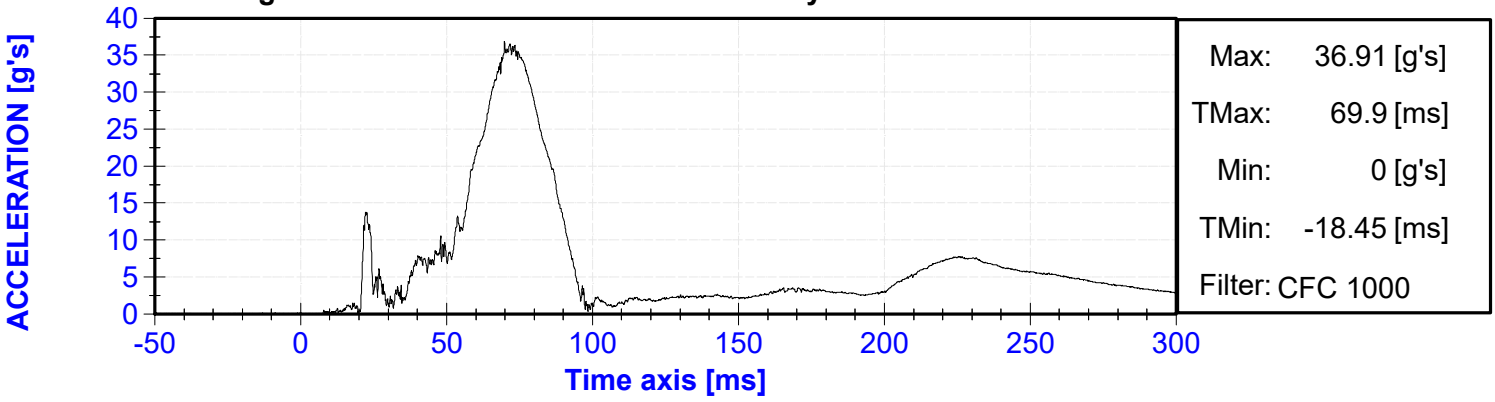

Driver Pubic Symphysis Force (Y) vs. Time
FORCE [N]
200
0
-200
-400
-600
-800
-1000
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 64.59 [N]
TMax: 230.55 [ms]
Min: -874.8 [N]
TMin: 49.8 [ms]
Filter: CFC 600


Passenger Head Acceleration (X) vs. Time Primary
ACCELERATION [g's]
5
2.5
0
-2.5
-5
-7.5
-10
-12.5
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 2.89 [g's]
TMax: 220.15 [ms]
Min: -10.4 [g's]
TMin: 71.25 [ms]
Filter: CFC 1000

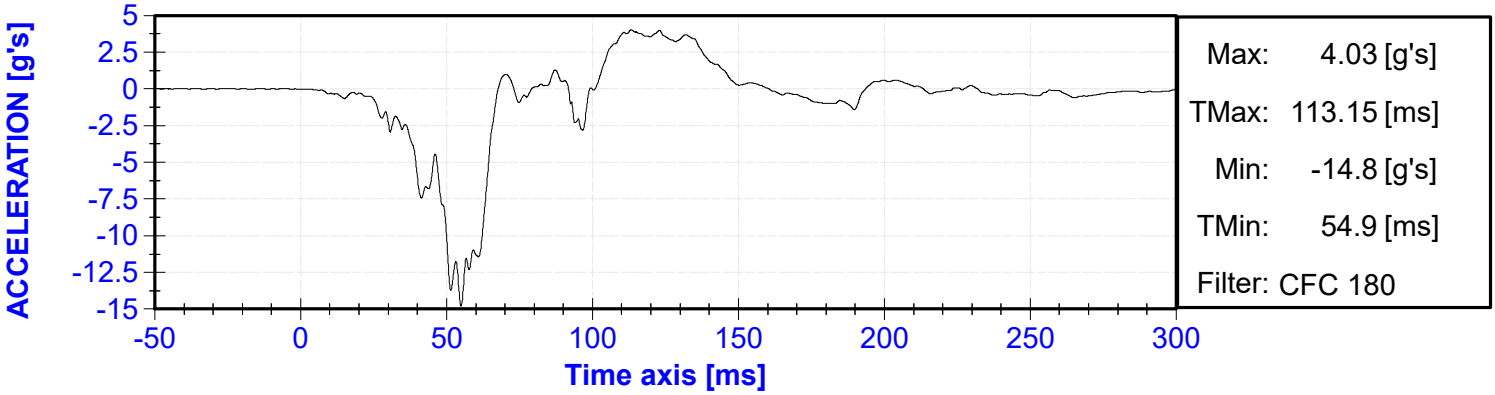

Passenger Head Acceleration (Y) vs. Time Primary
ACCELERATION [g's]
40
30
20
10
0
-10
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 35.42 [g's]
TMax: 69.85 [ms]
Min: -5.79 [g's]
TMin: 226.6 [ms]
Filter: CFC 1000


Passenger Head Acceleration (Z) vs. Time Primary
ACCELERATION [g's]
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 7.68 [g's]
TMax: 53.7 [ms]
Min: -8.31 [g's]
TMin: 67.3 [ms]
Filter: CFC 1000

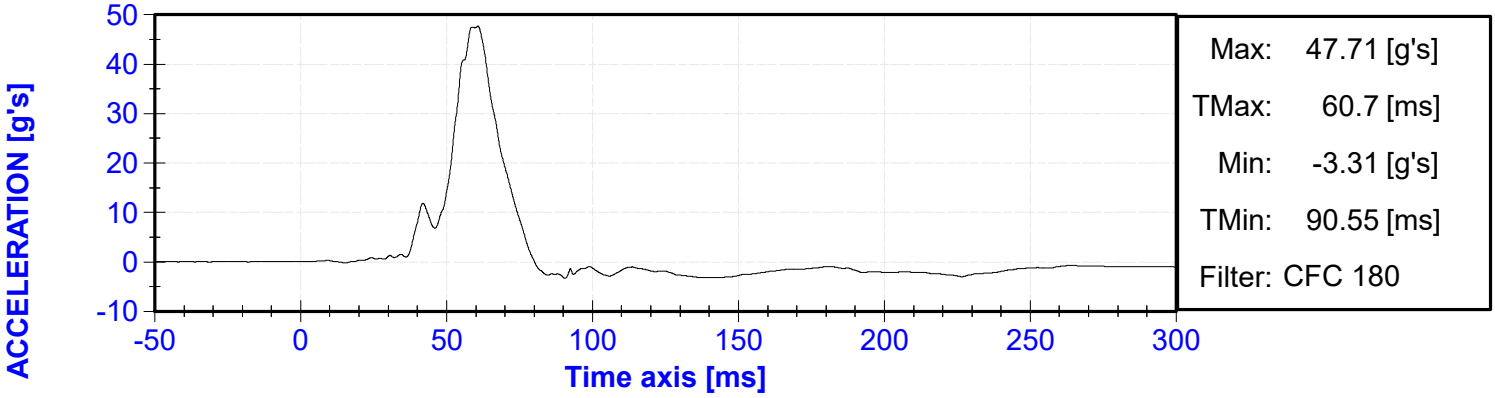
Passenger Head Resultant Acceleration Primary vs. Time



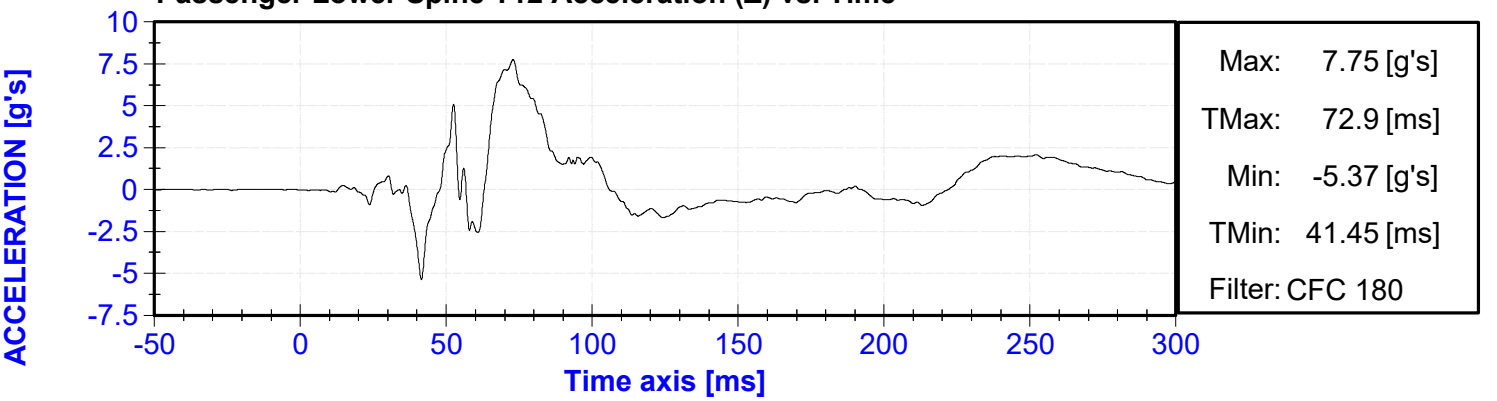
Passenger Lower Spine T12 Acceleration (X) vs. Time



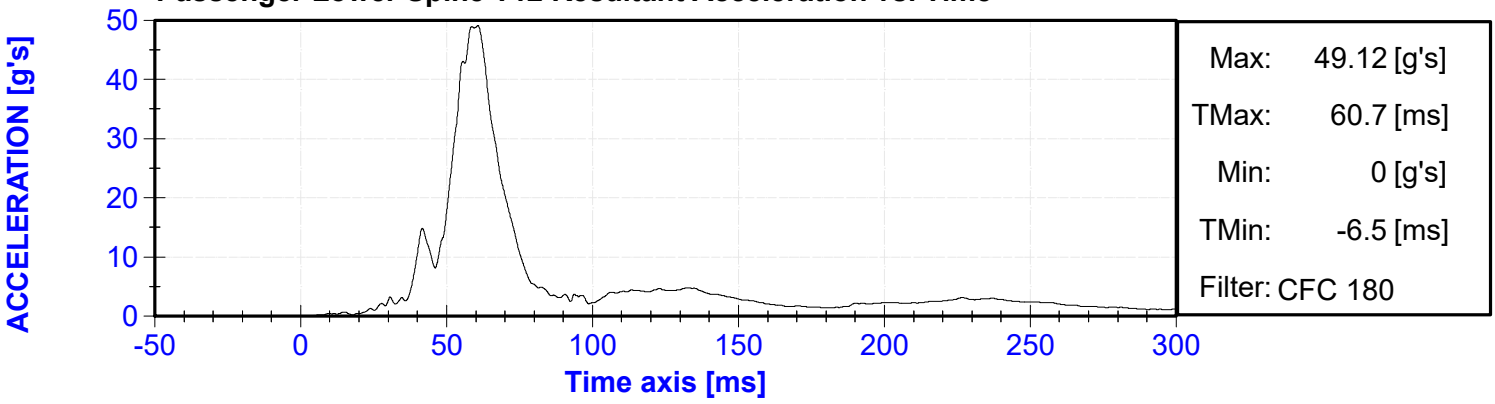
Passenger Lower Spine T12 Acceleration (Y) vs. Time



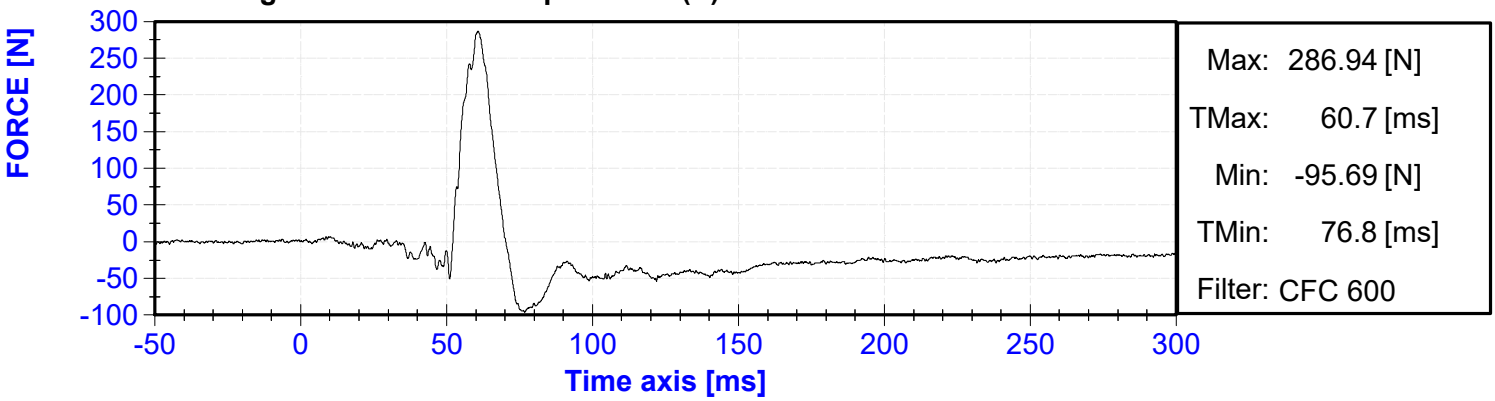
Passenger Lower Spine T12 Acceleration (Z) vs. Time



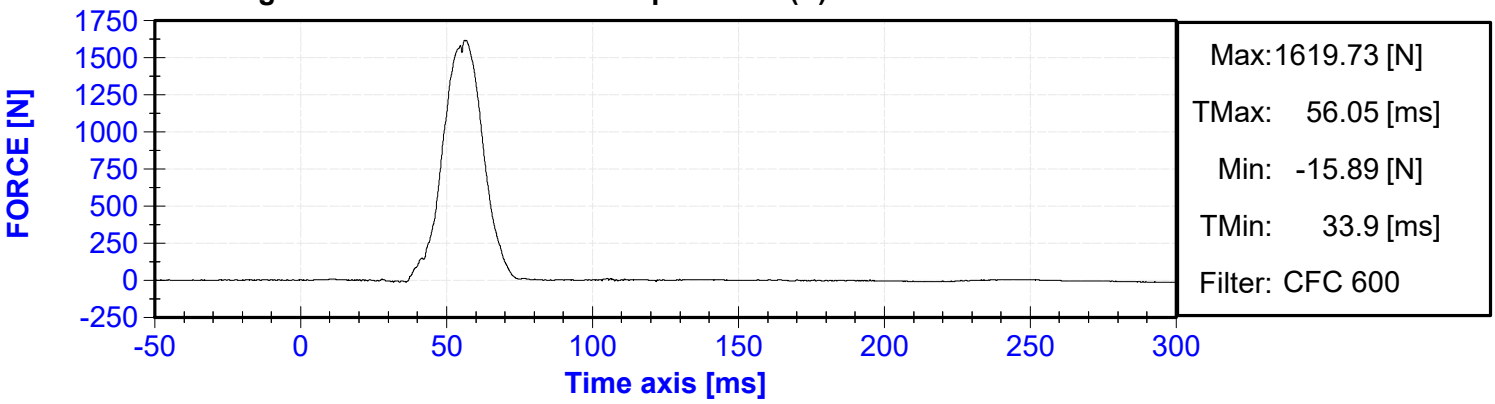
Passenger Lower Spine T12 Resultant Acceleration vs. Time



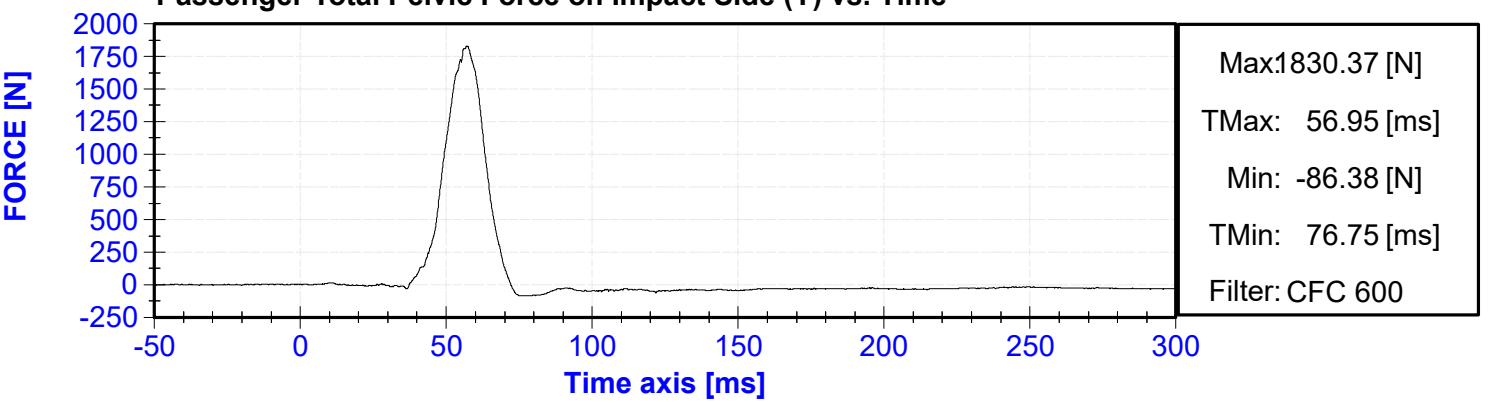
Passenger Iliac Force on Impact Side (Y) vs. Time



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



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



APPENDIX C

DUMMY PERFORMANCE CALIBRATION TEST DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

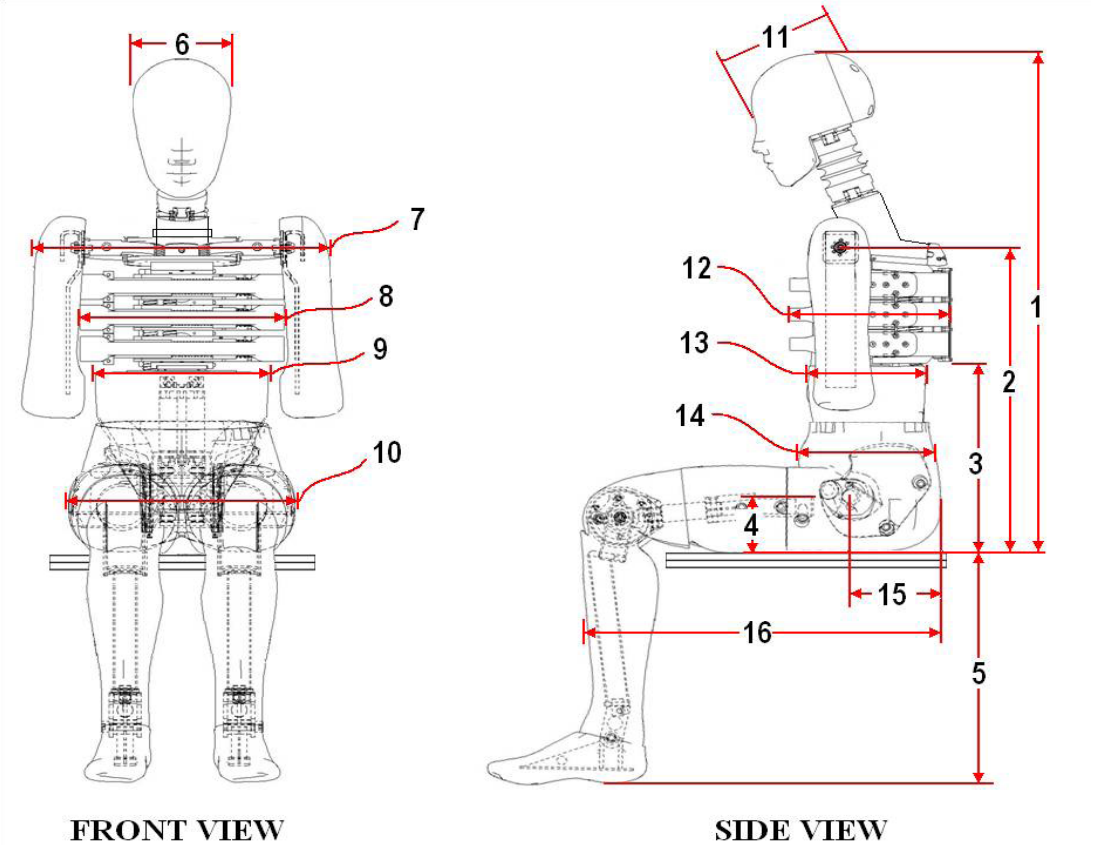
SERIAL NO:F033

(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - EuroSID-2re

Technician: K. Brogan Date: 07/17/2023

Dummy Serial Number: F033



FRONT VIEW SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	915	Pass
2	Seat to Shoulder Joint	558	572	567	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	352	Pass
4	Seat to Hip Joint (center of bolt)	97	103	99	Pass
5	Sole to Seat, Sitting	333	451	424	Pass
6	Head Width	152	158	157	Pass
7	Shoulder/Arm Width	461	479	472	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	266	Pass
13	Abdomen Depth	194	204	200	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

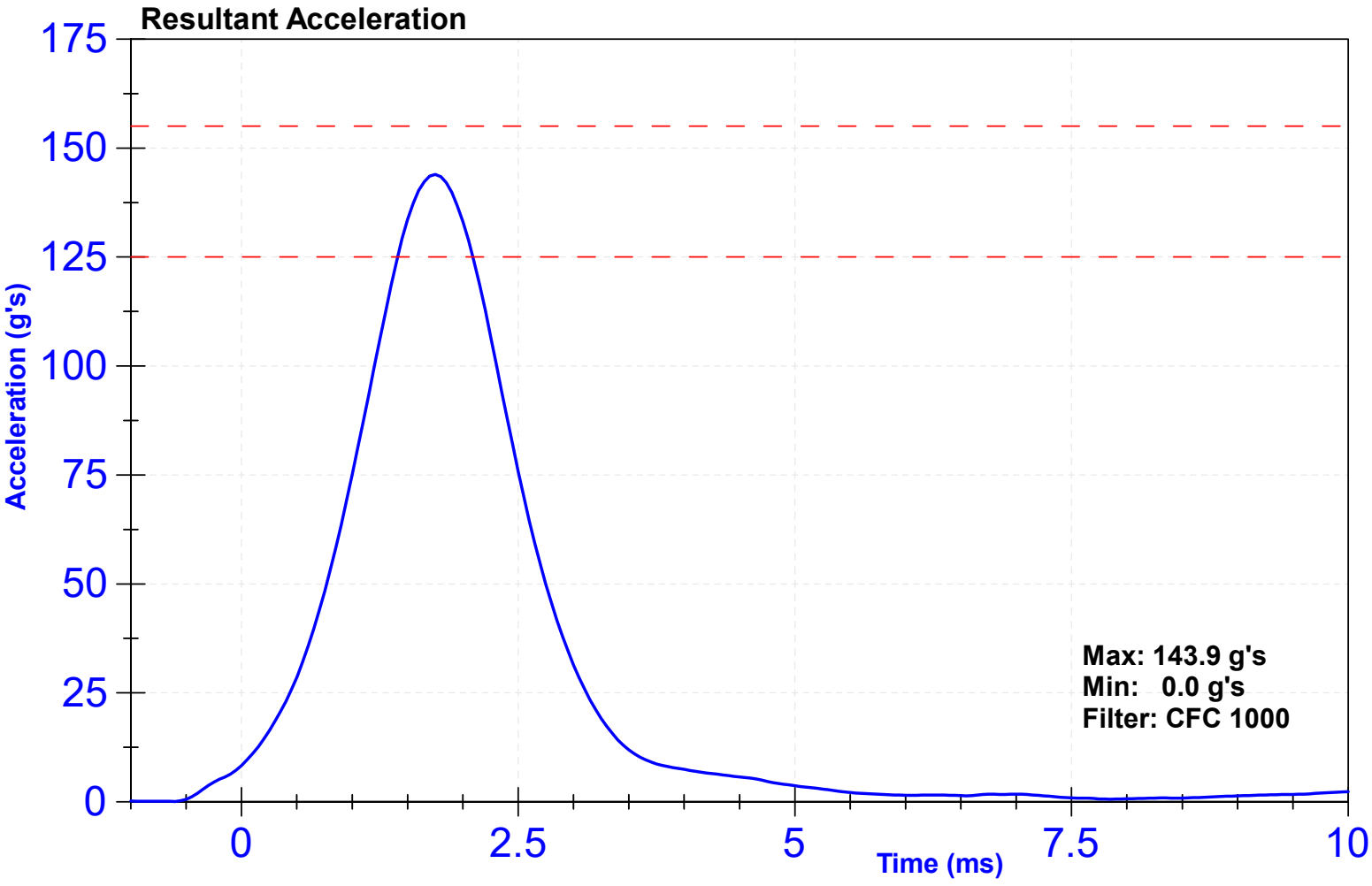
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

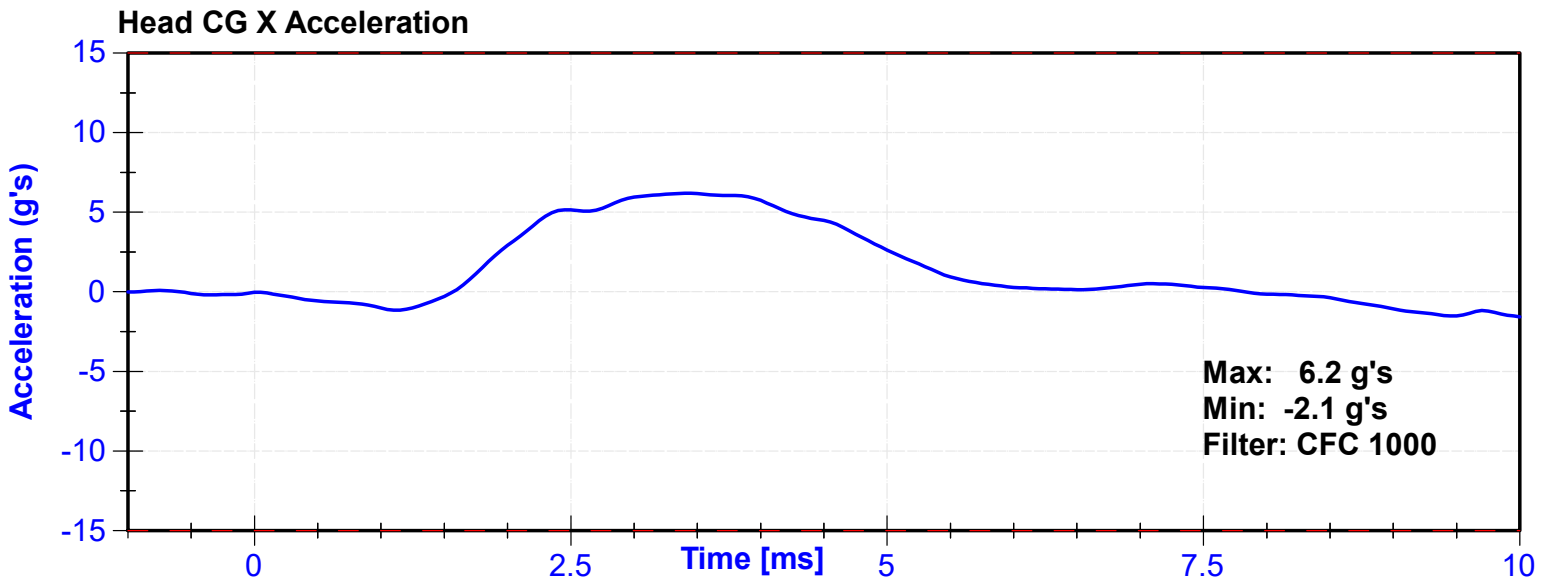
Results

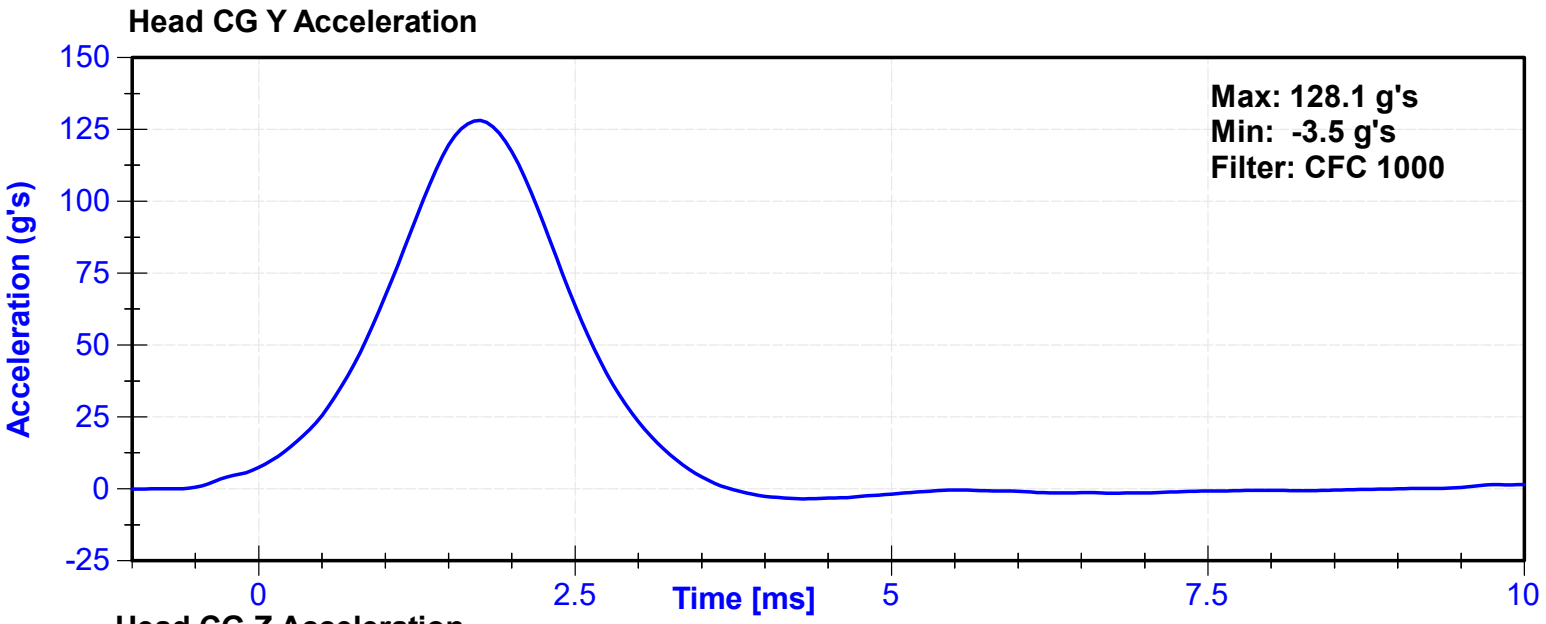
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22.1	Pass
Humidity	10	70	%	54.3	Pass
Resultant Acceleration	125	155	g's	143.9	Pass
Oscillation	0	15	%	2.41	Pass
Fore-Aft Acceleration	-15	15	g's	6.2	Pass

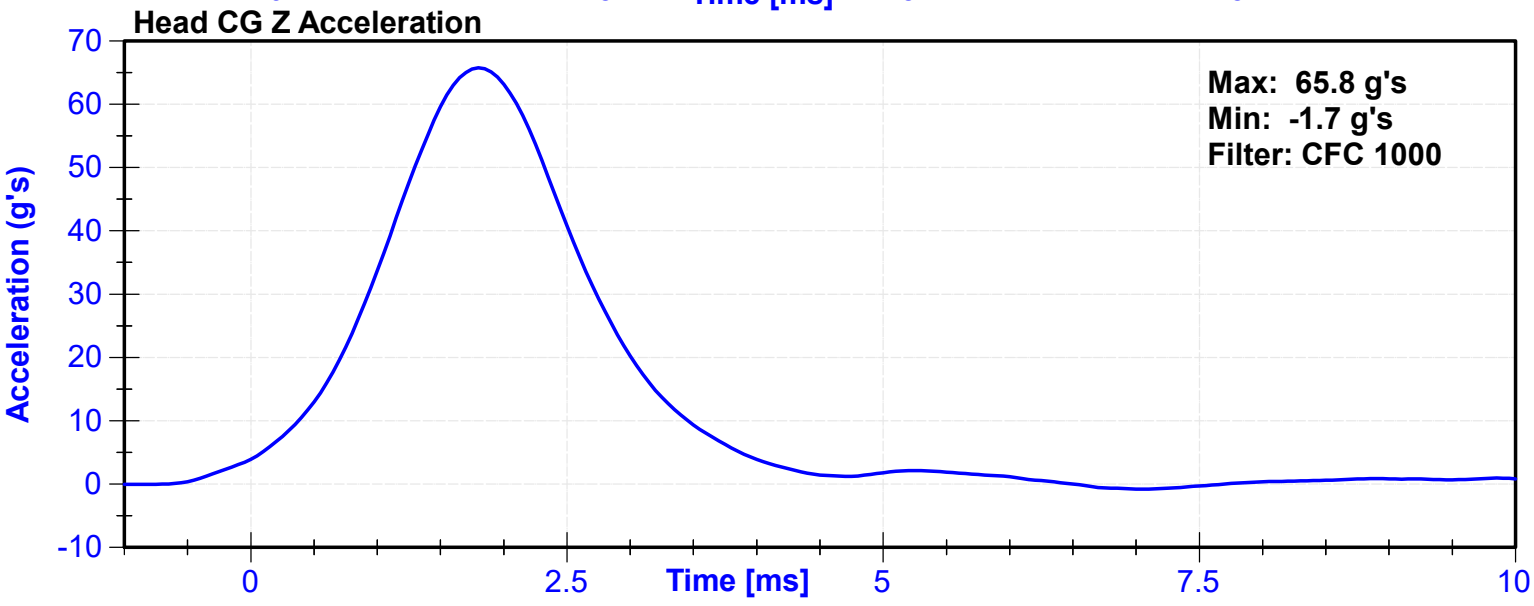
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P63861	6/20/2023	12/17/2023
Y Accelerometer	Endevco	P49216	6/20/2023	12/17/2023
Z Accelerometer	Endevco	P51303	6/19/2023	12/16/2023




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
Time [ms]
5
7.5
10
Max: 6.2 g's
Min: -2.1 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
Time [ms]
5
7.5
10
Max: 128.1 g's
Min: -3.5 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
70
60
50
40
30
20
10
0
-10
0
2.5
Time [ms]
5
7.5
10
Max: 65.8 g's
Min: -1.7 g's
Filter: CFC 1000

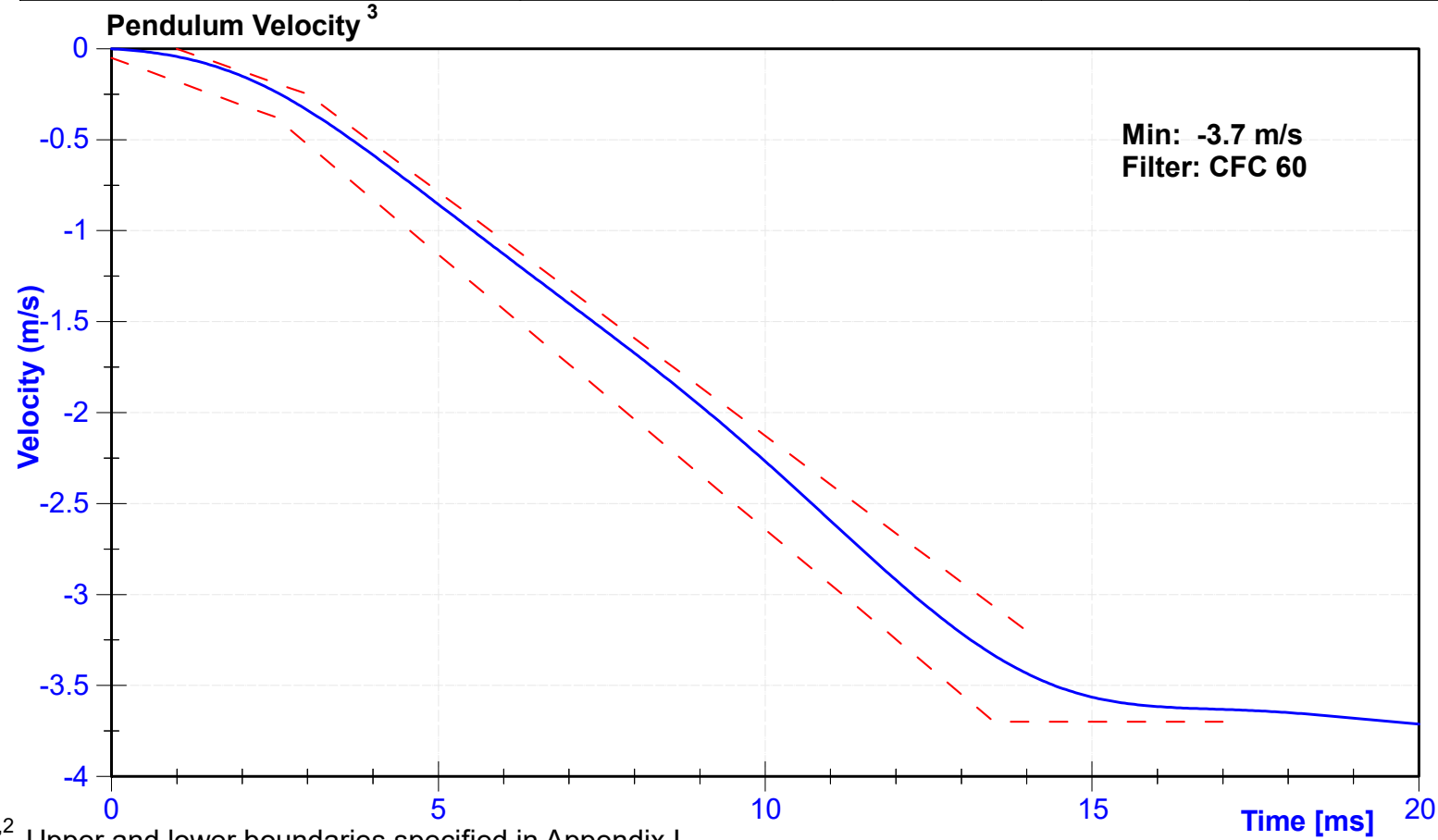
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

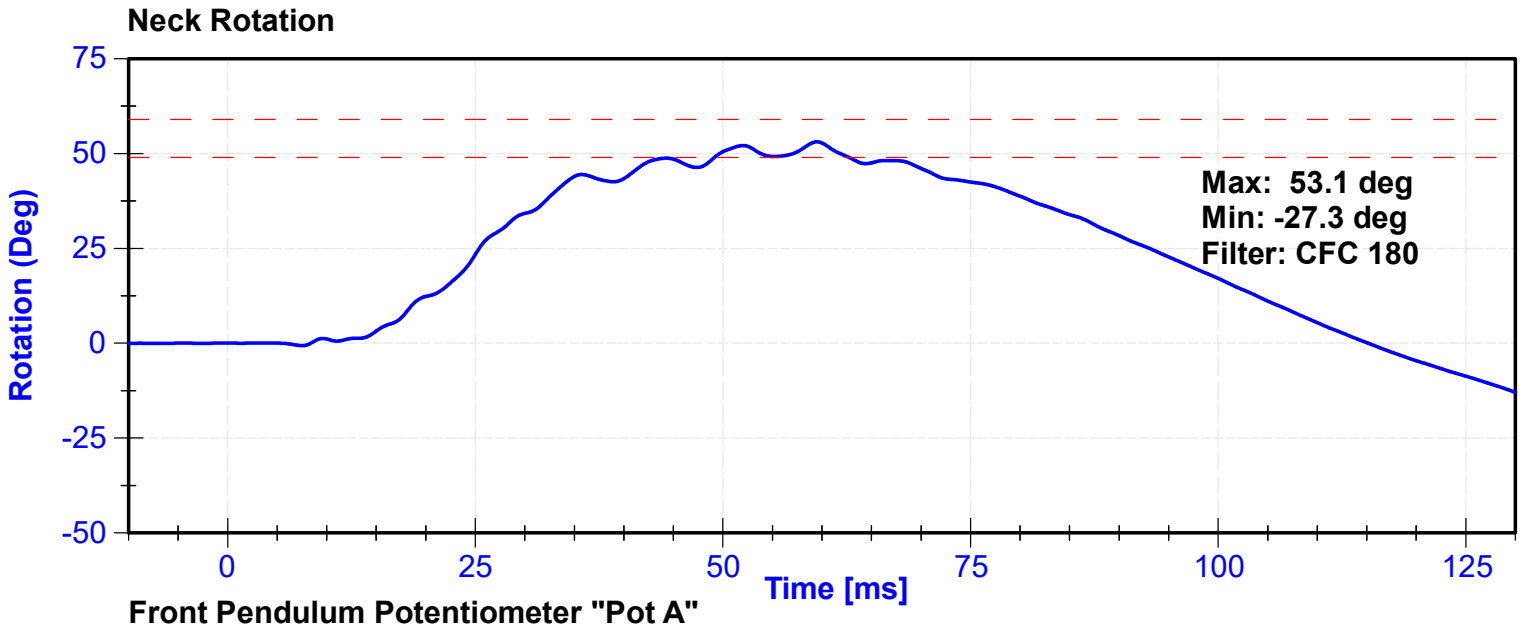
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	54.3	Pass
Velocity	3.3	3.5	m/s	3.48	Pass
Lateral Neck Rotation	49	59	deg	53.1	Pass
Time at Maximum Rotation	54	66	ms	59.5	Pass
Time of Rotation Decay from Maximum	53	88	ms	55.7	Pass
Pendulum Velocity Overall Corridor	Lower Boundary [1]	Upper Boundary [2]	m/s	See Plot [3]	Pass

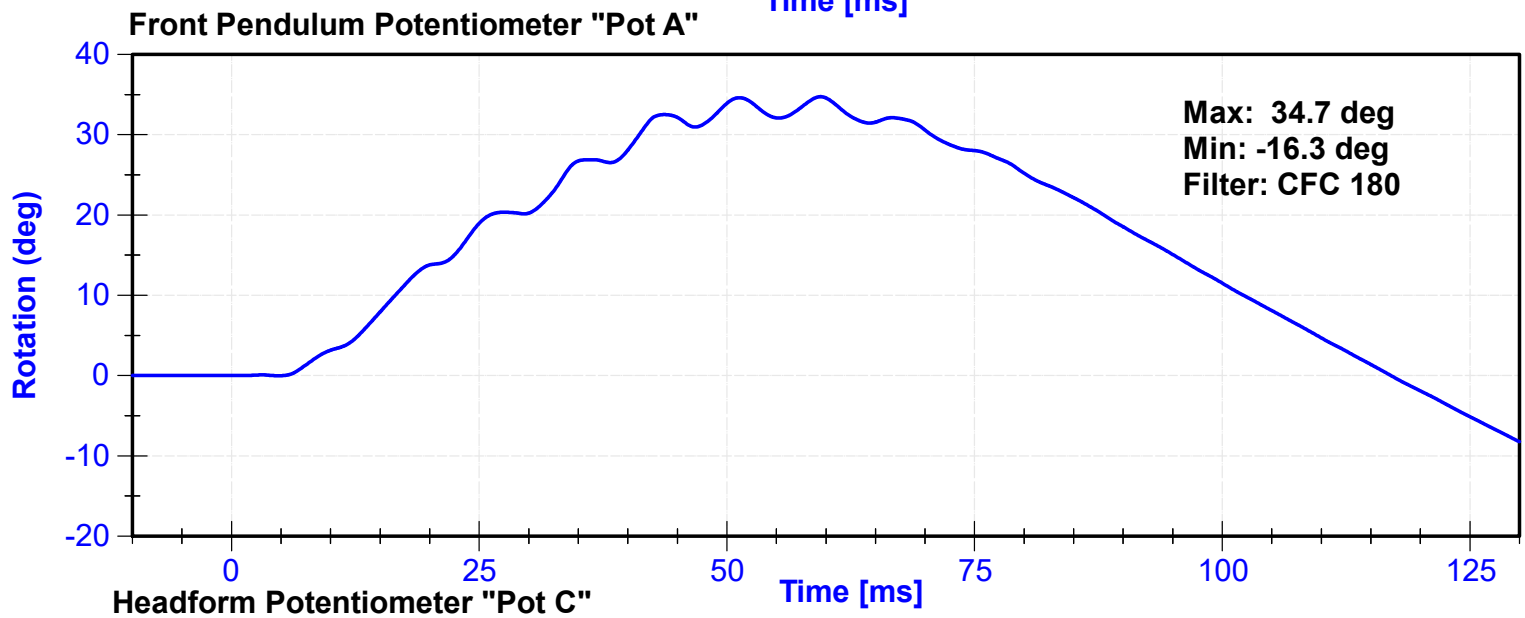
Transducer Calibrations

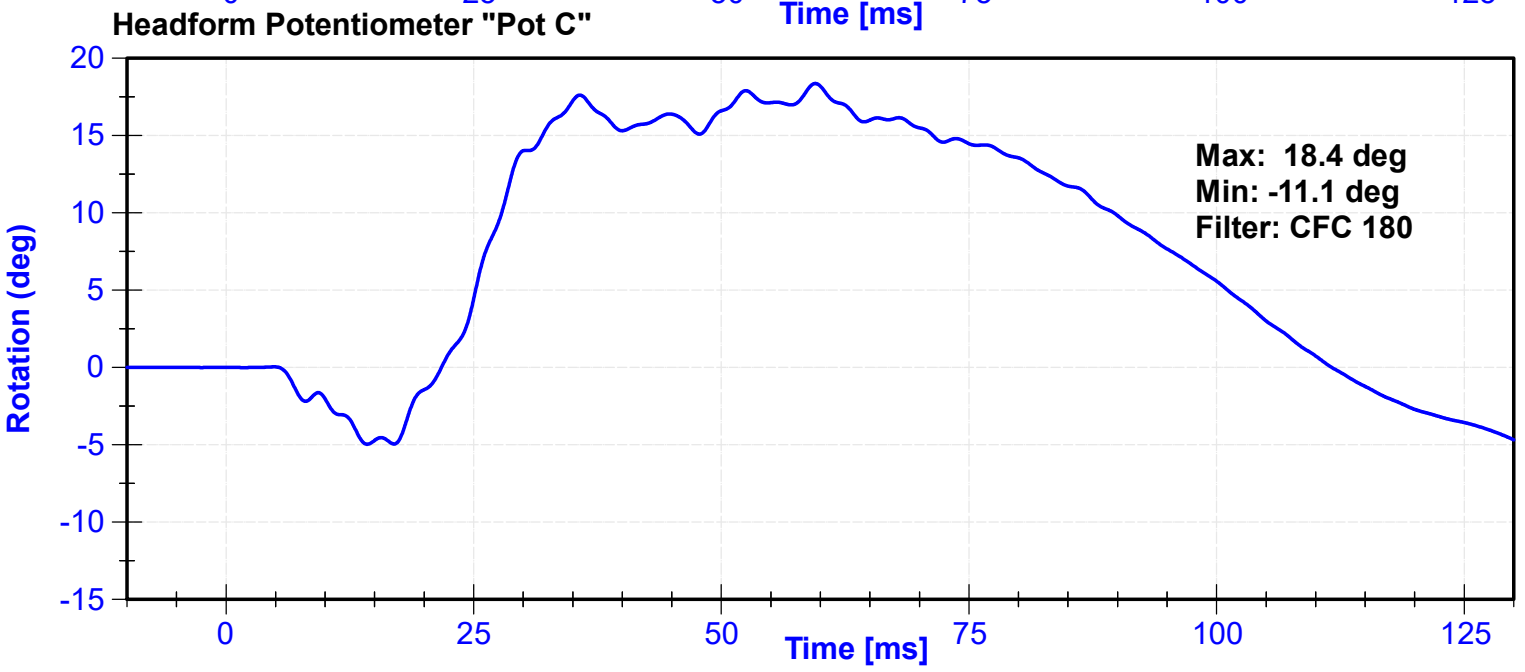
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	10/31/2022	10/31/2023
Front Pendulum Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Headform Potentiometer	Sfernice	095	10/5/2022	10/5/2023



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


Neck Rotation
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
Time [ms]
Max: 53.1 deg
Min: -27.3 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: 34.7 deg
Min: -16.3 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: 18.4 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

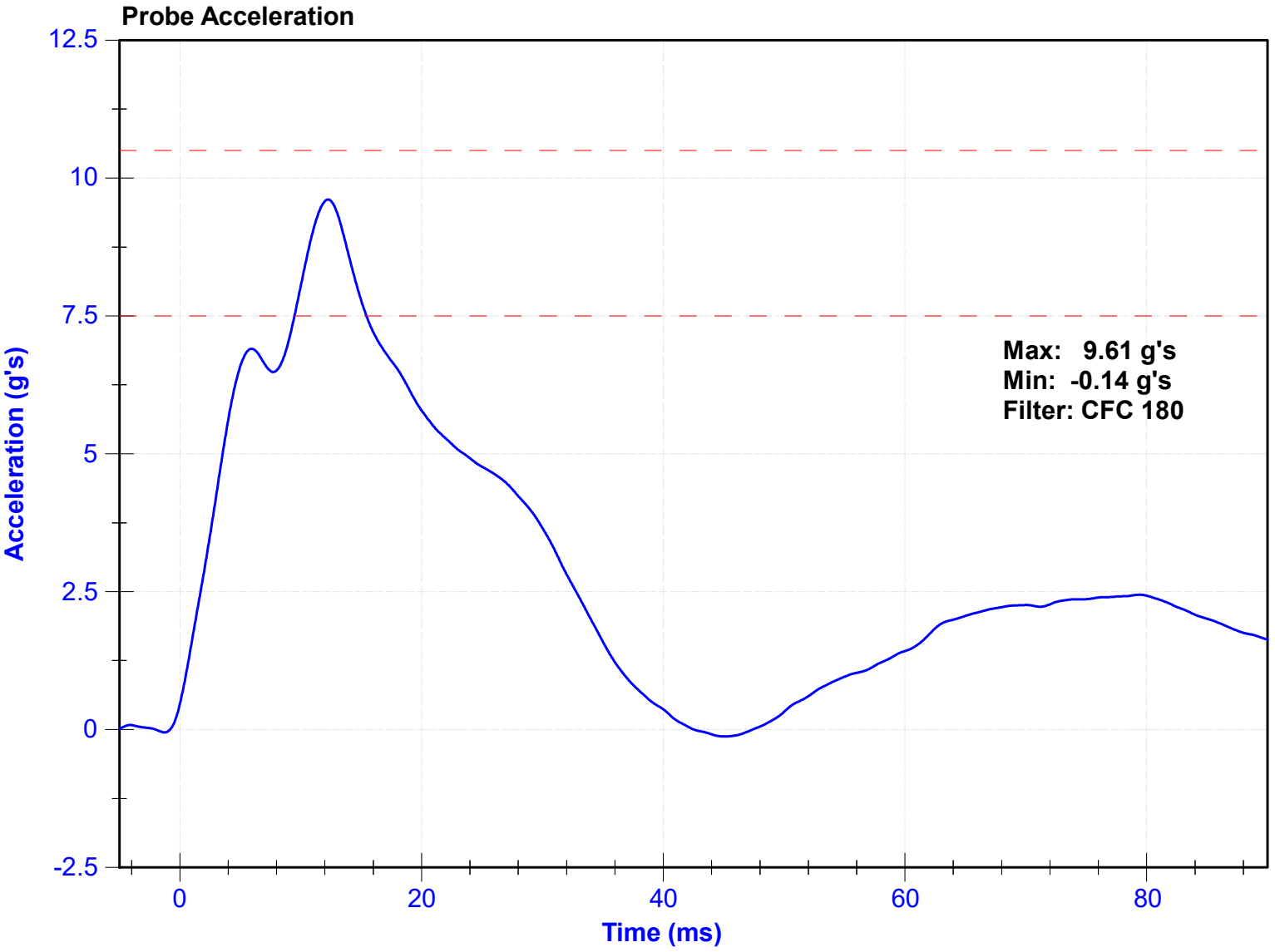
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	49.4	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	7.5	10.5	g's	9.61	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2022	10/25/2023



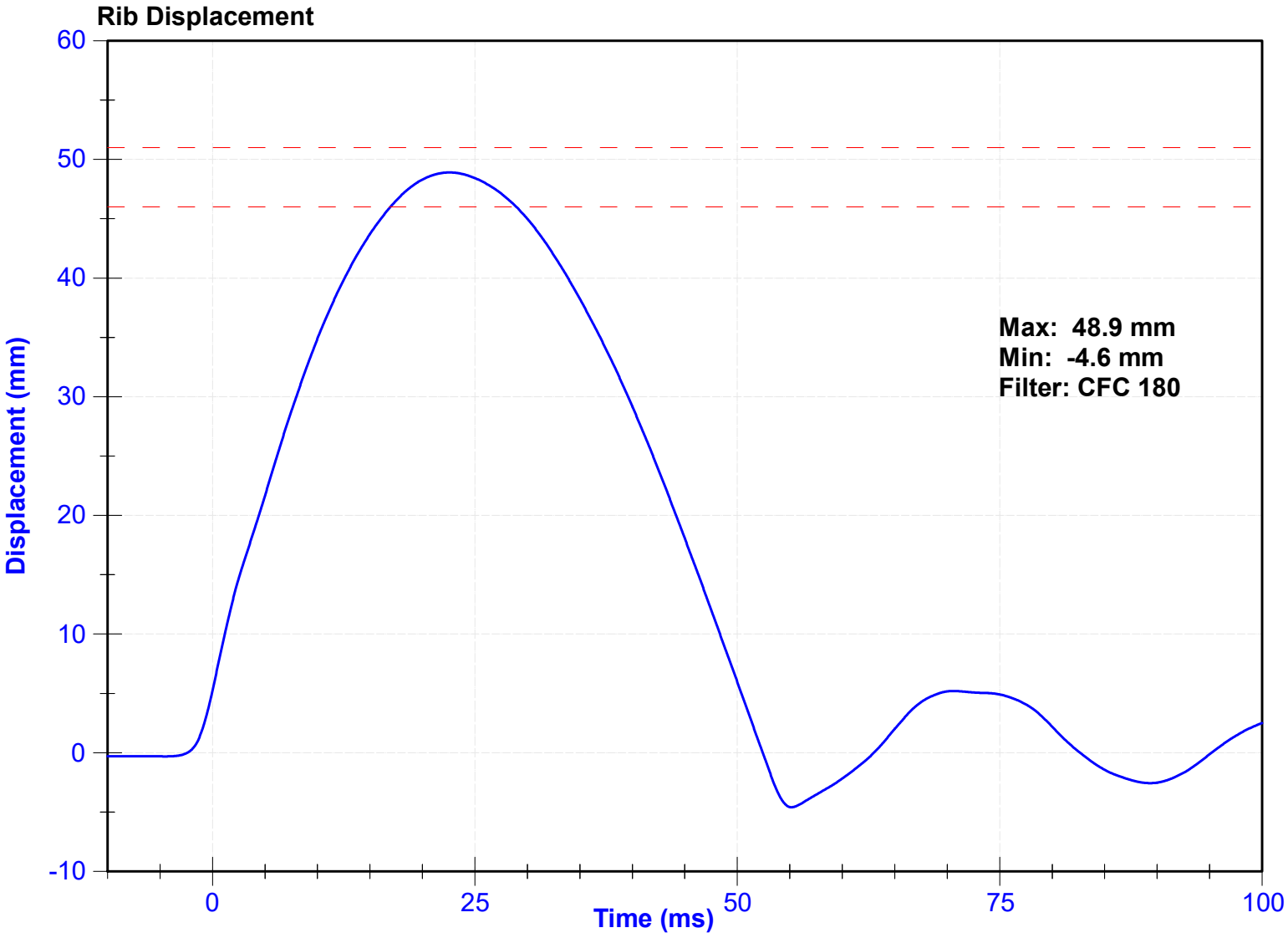
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	46	51	mm	48.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	6/20/2023	12/19/2023



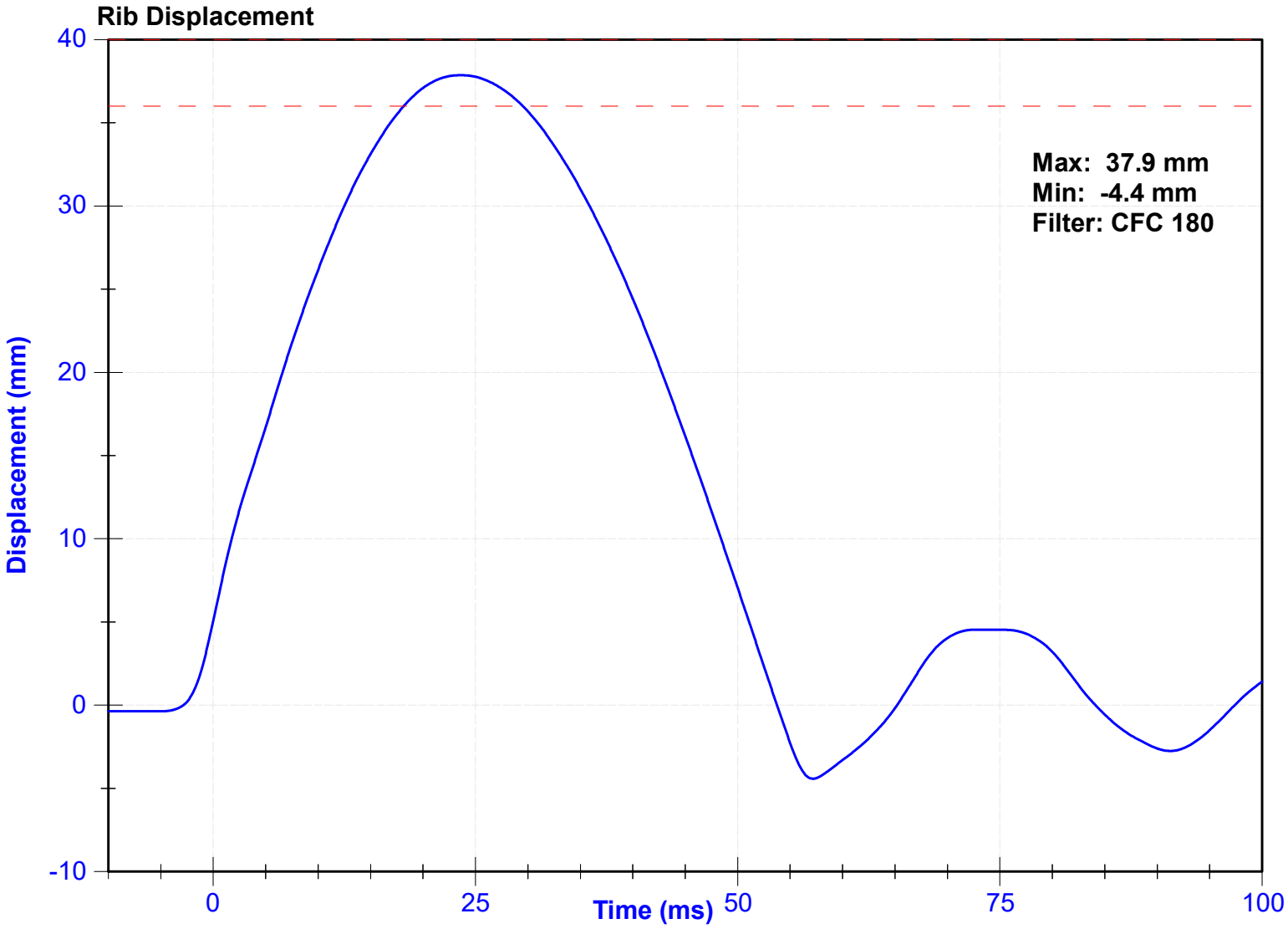
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	36	40	mm	37.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	6/20/2023	12/19/2023



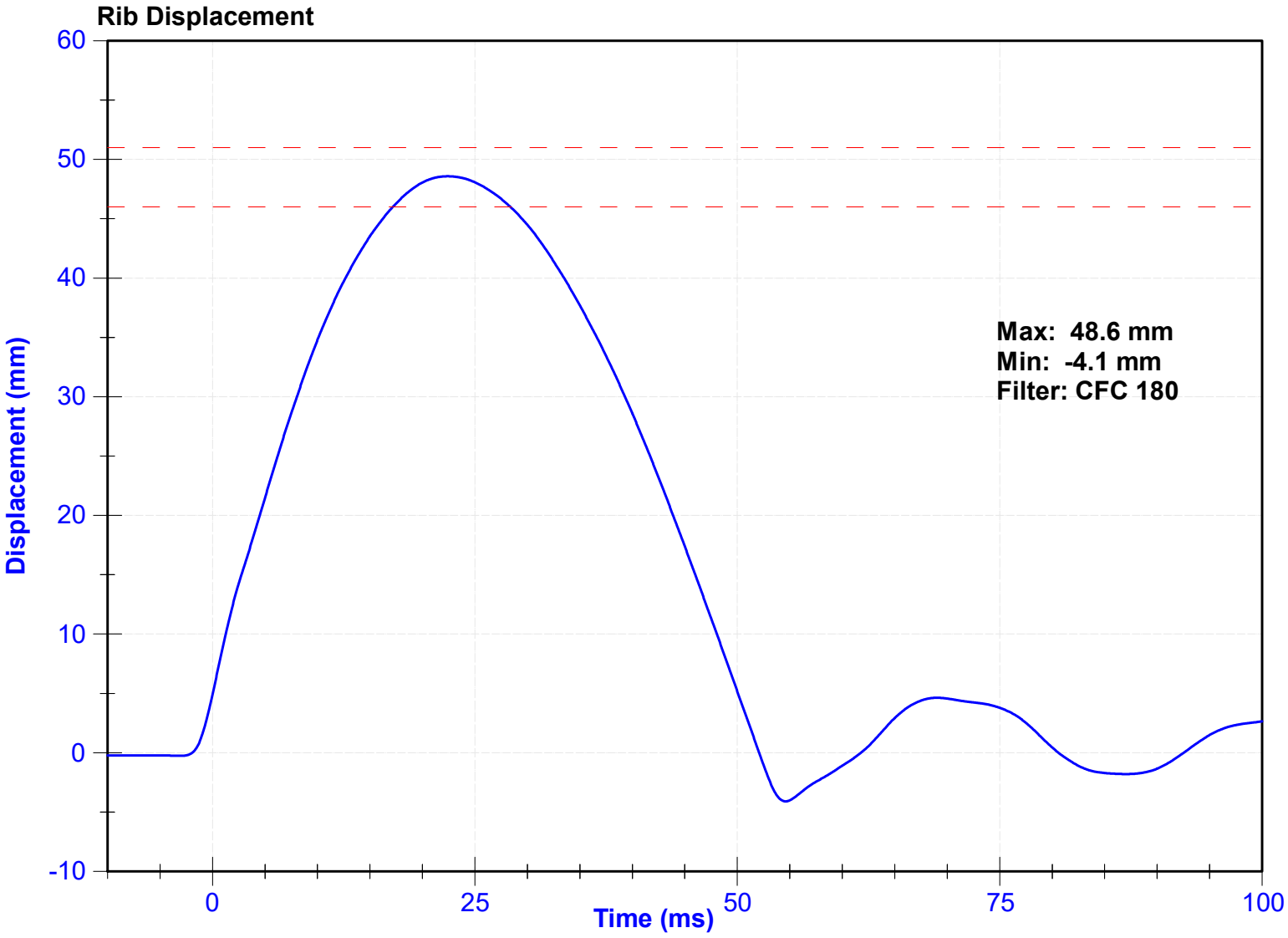
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	46	51	mm	48.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	6/20/2023	12/19/2023



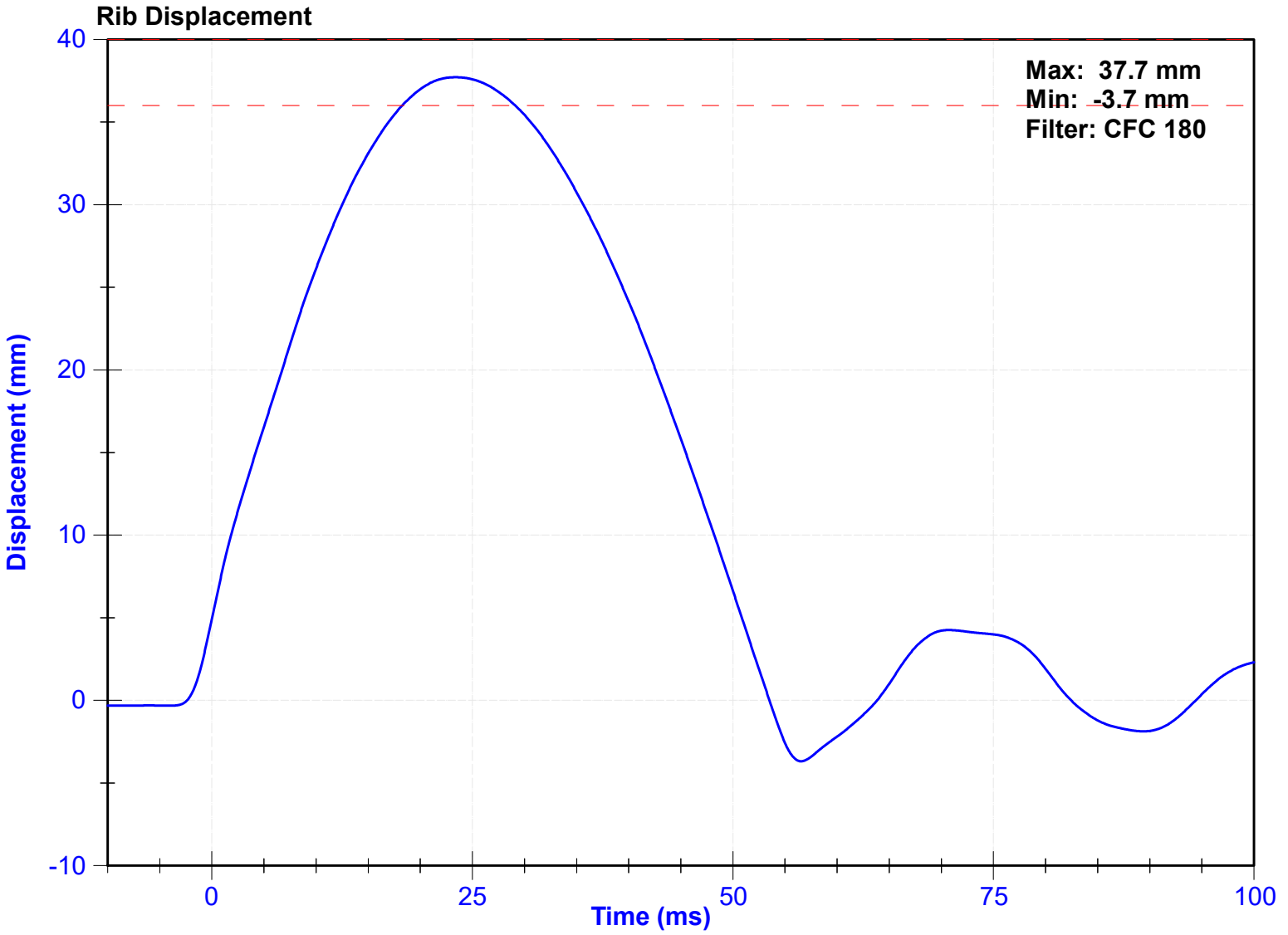
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	36	40	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	6/20/2023	12/19/2023



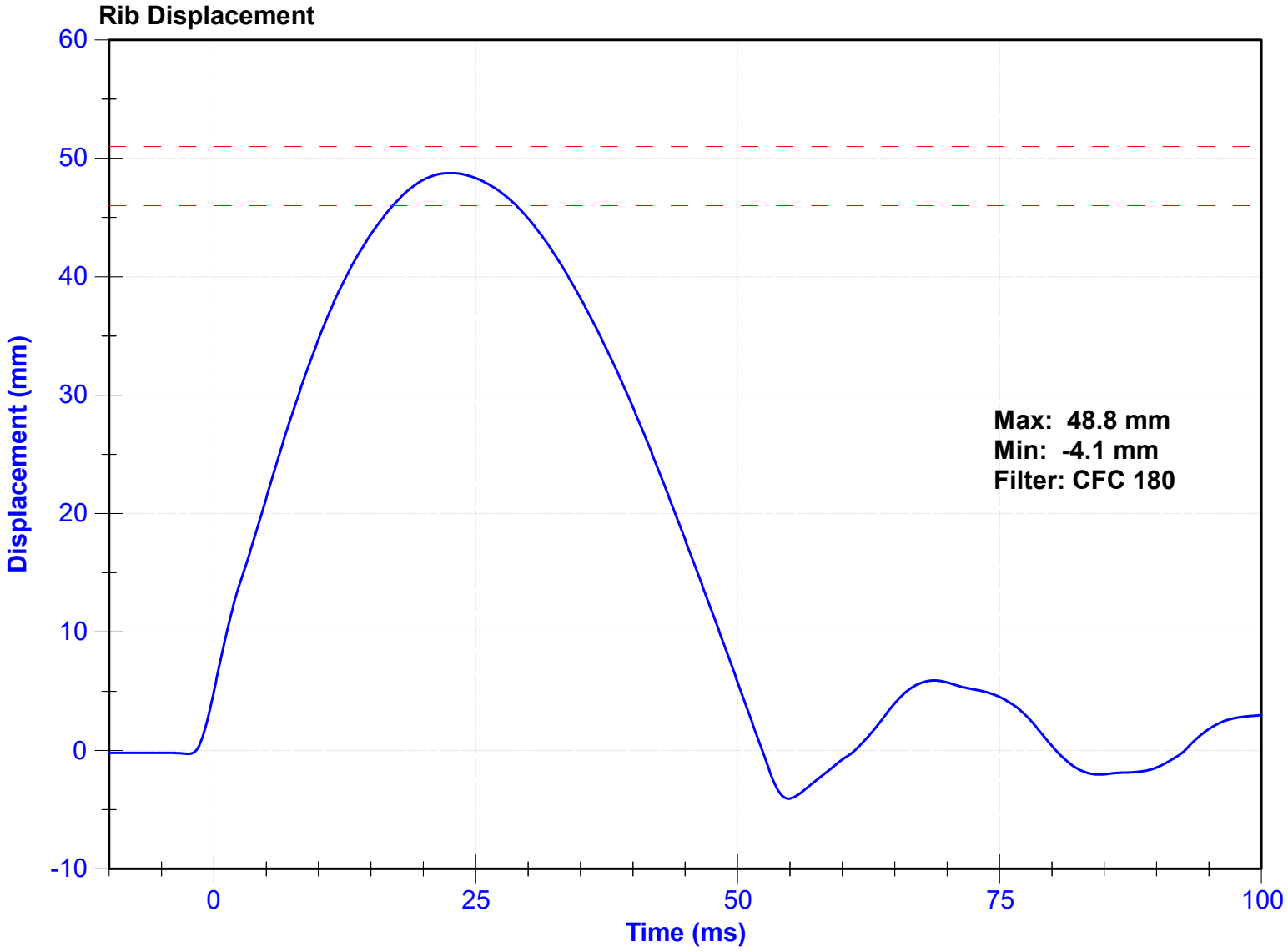
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	46	51	mm	48.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	6/20/2023	12/19/2023



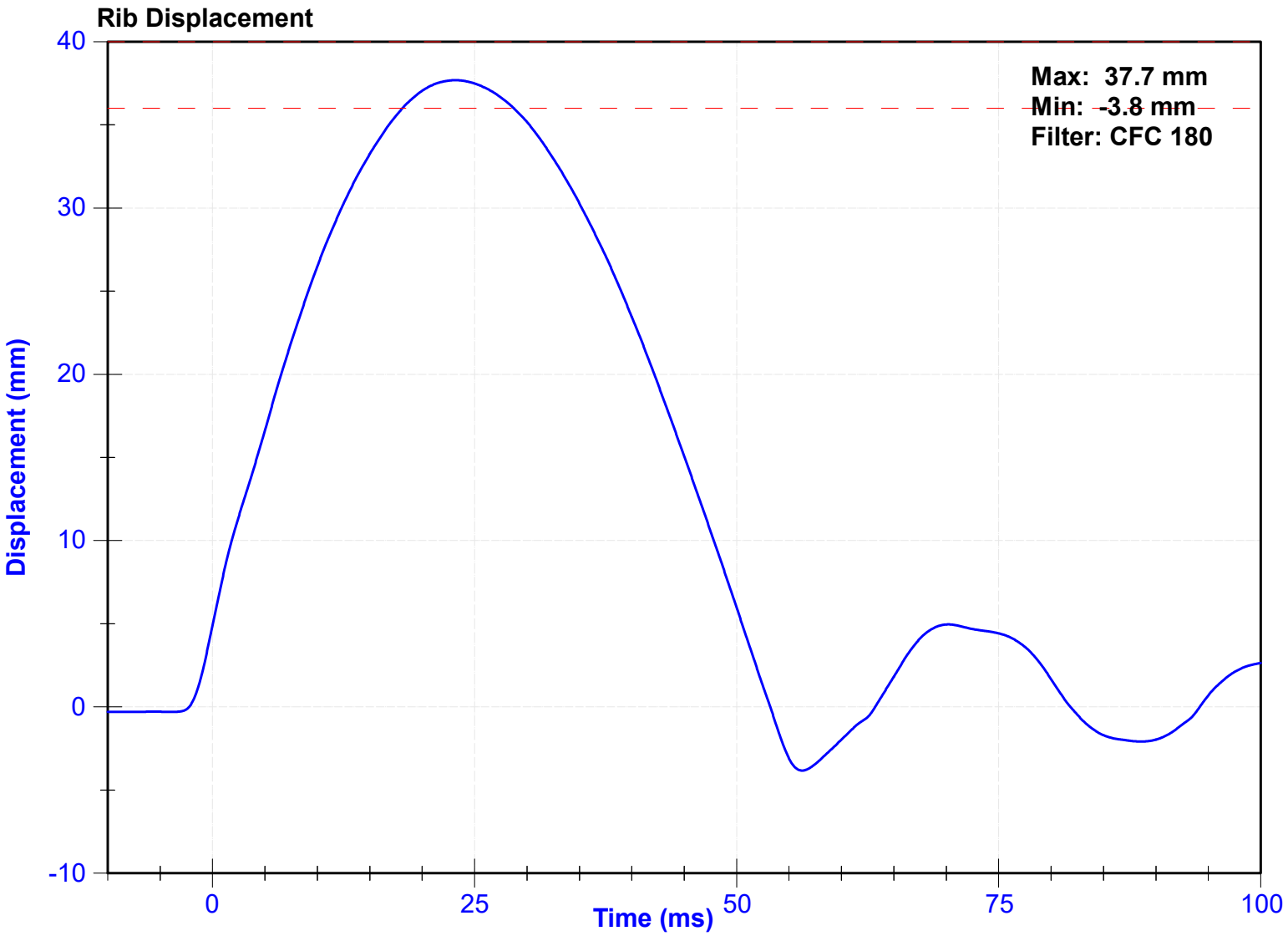
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	36	40	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	6/20/2023	12/19/2023



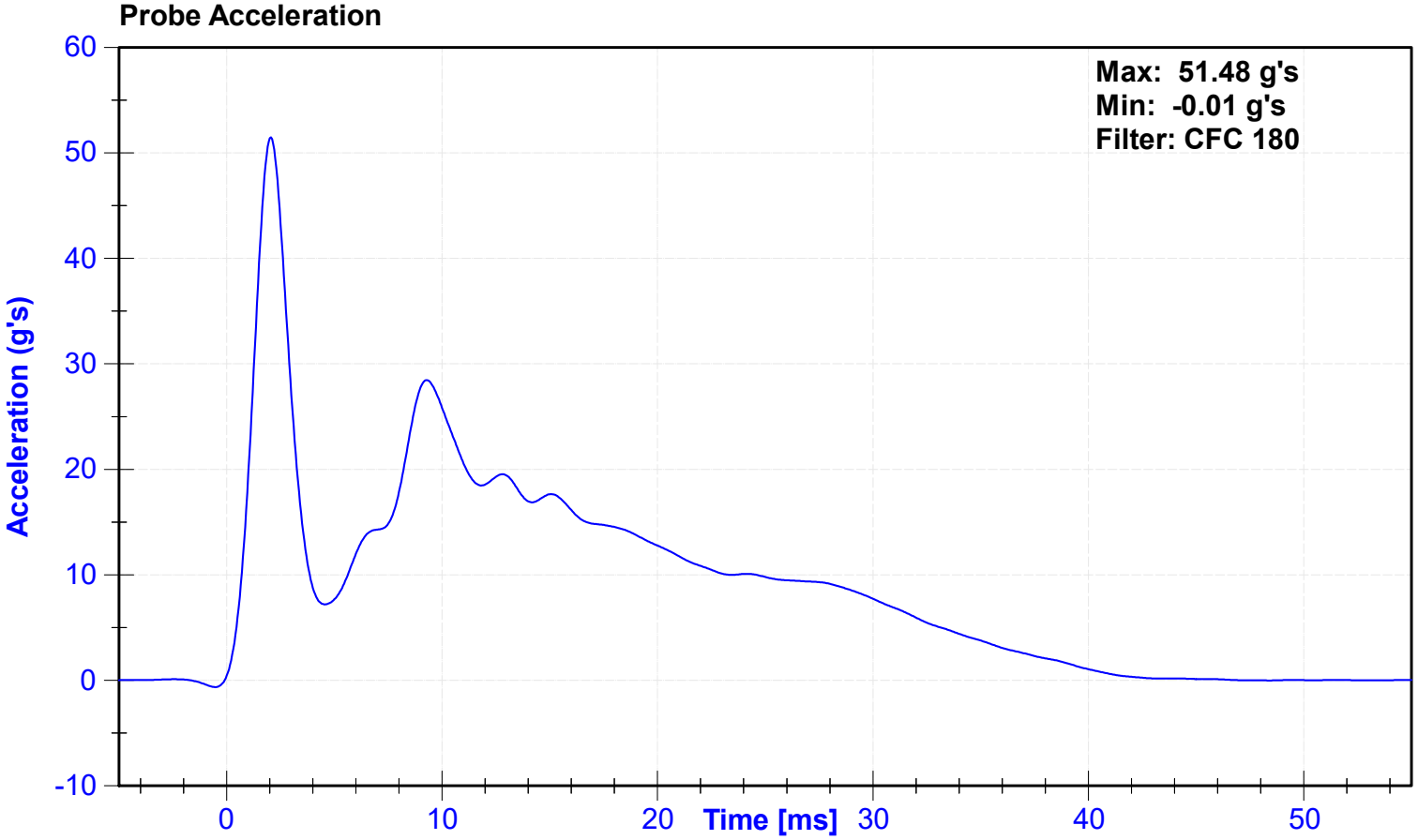
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

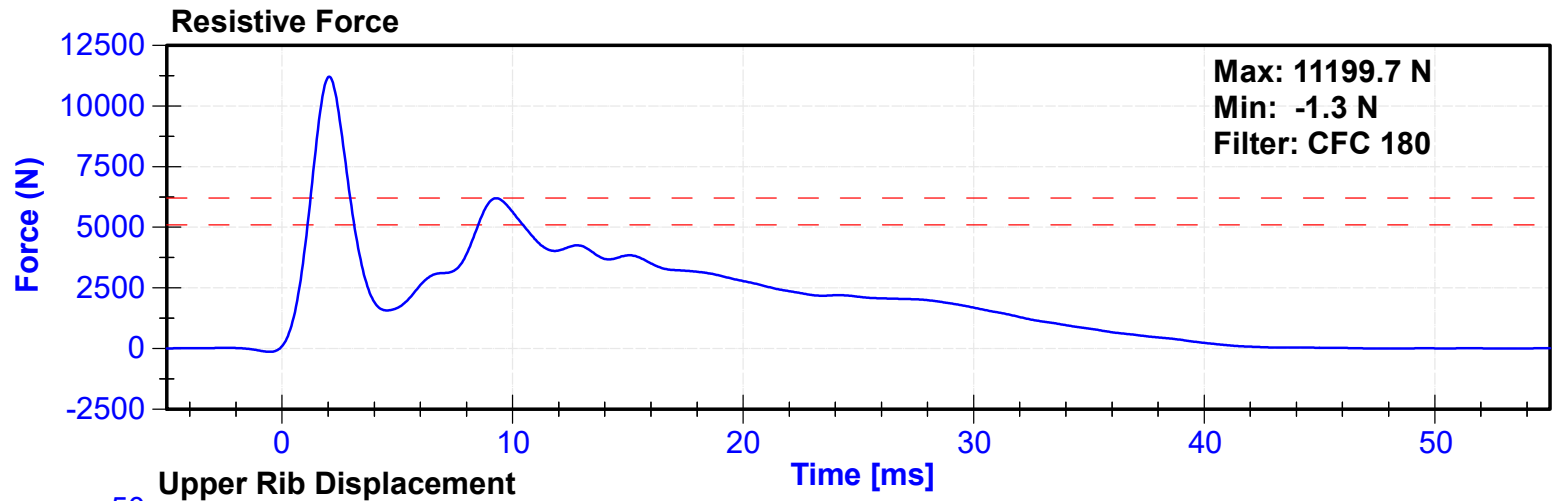
Results

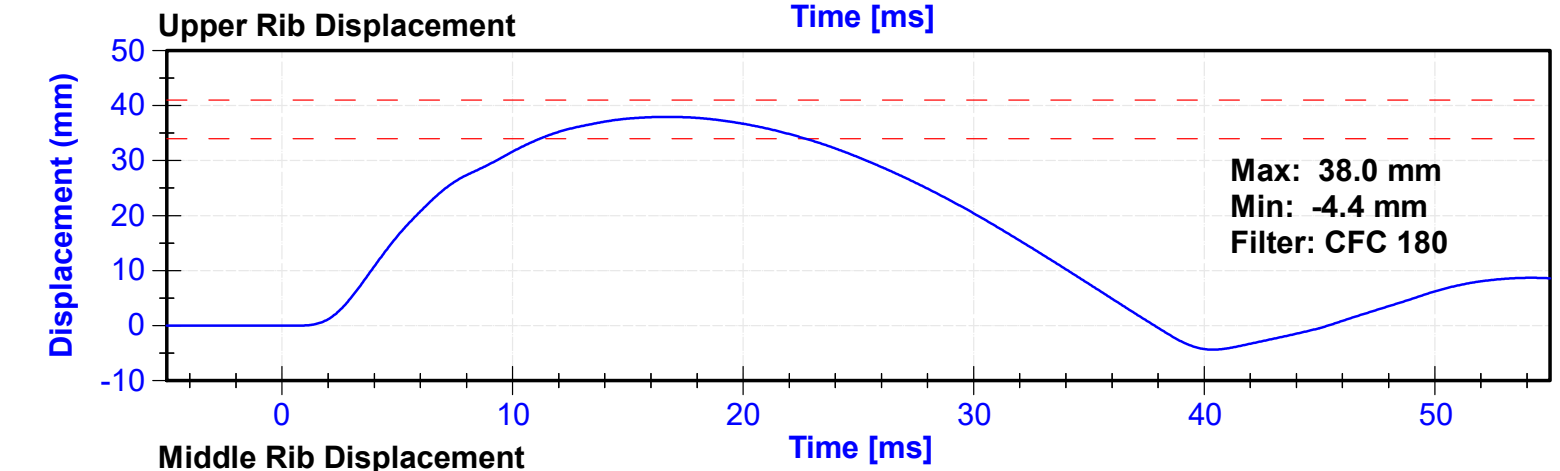
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	49.4	Pass
Velocity	5.4	5.6	m/s	5.54	Pass
Resistive Force after 6ms	5100	6200	N	6194.3	Pass
Upper Thorax Rib Deflection	34	41	mm	38.0	Pass
Mid Thorax Rib Deflection	37	45	mm	40.5	Pass
Lower Thorax Rib Deflection	37	44	mm	39.9	Pass

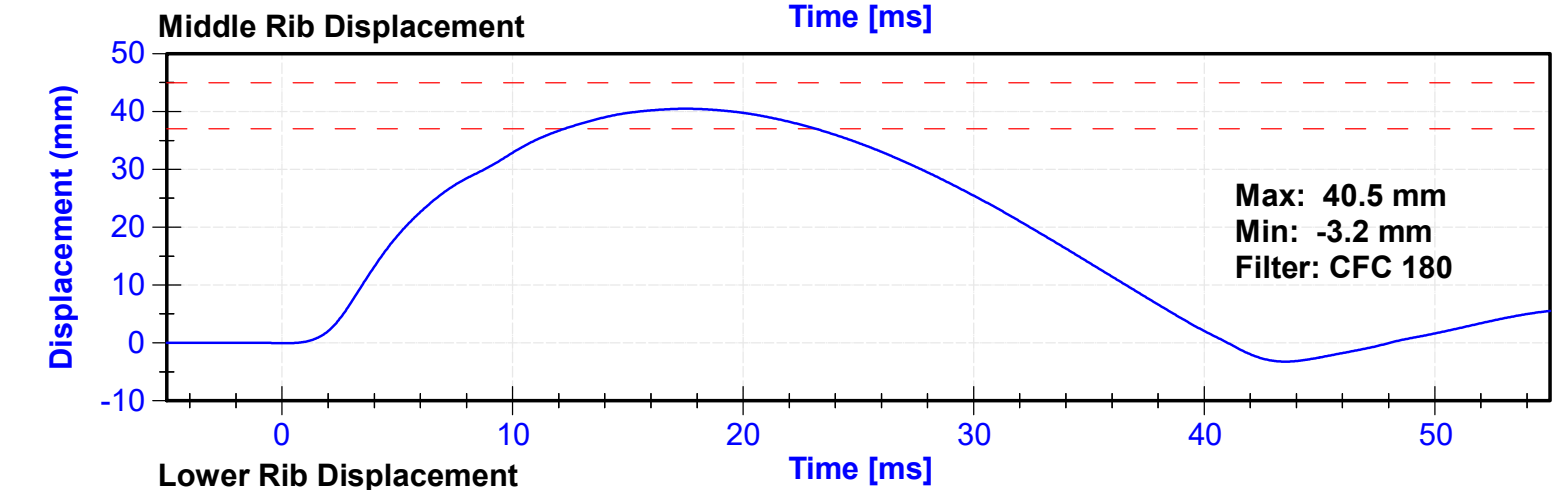
Transducer Calibrations

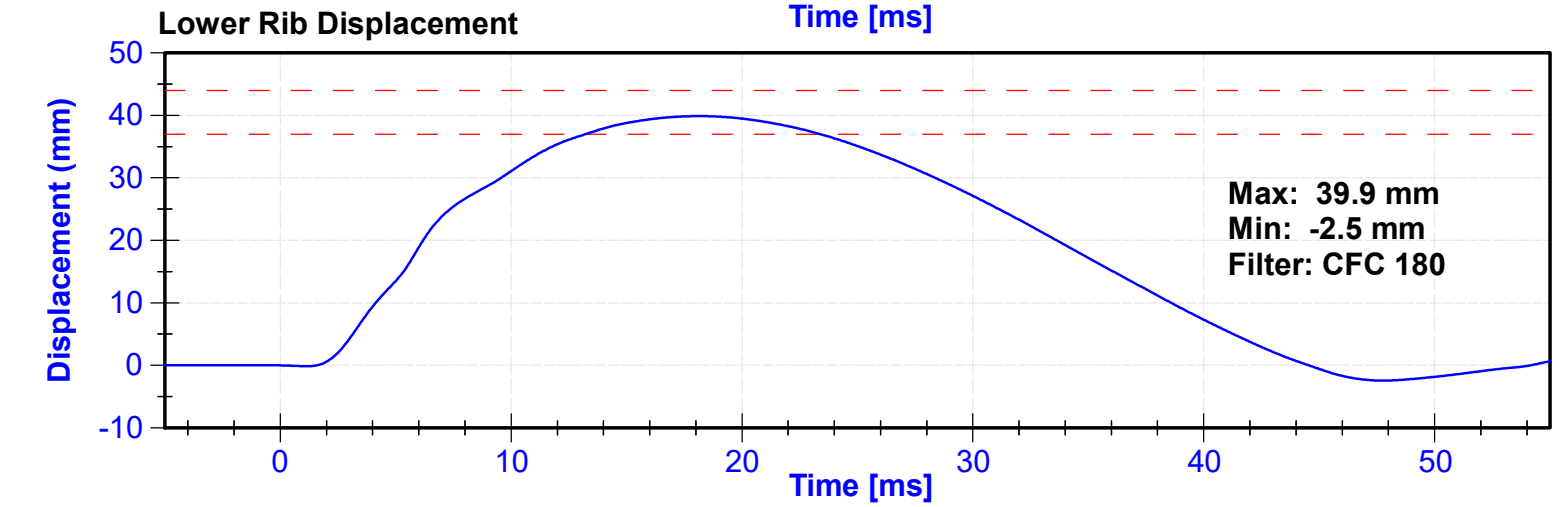
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Upper Thorax Rib Potentiometer	Honeywell	179GFE	6/20/2023	12/19/2023
Middle Thorax Rib Potentiometer	Honeywell	185GFE	6/20/2023	12/19/2023
Lower Thorax Rib Potentiometer	Honeywell	178GFE	6/20/2023	12/19/2023




Resistive Force
Force (N)
12500
10000
7500
5000
2500
0
-2500
0
10
20
30
40
50
Time [ms]
Max: 11199.7 N
Min: -1.3 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: 38.0 mm
Min: -4.4 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: 40.5 mm
Min: -3.2 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: 39.9 mm
Min: -2.5 mm
Filter: CFC 180

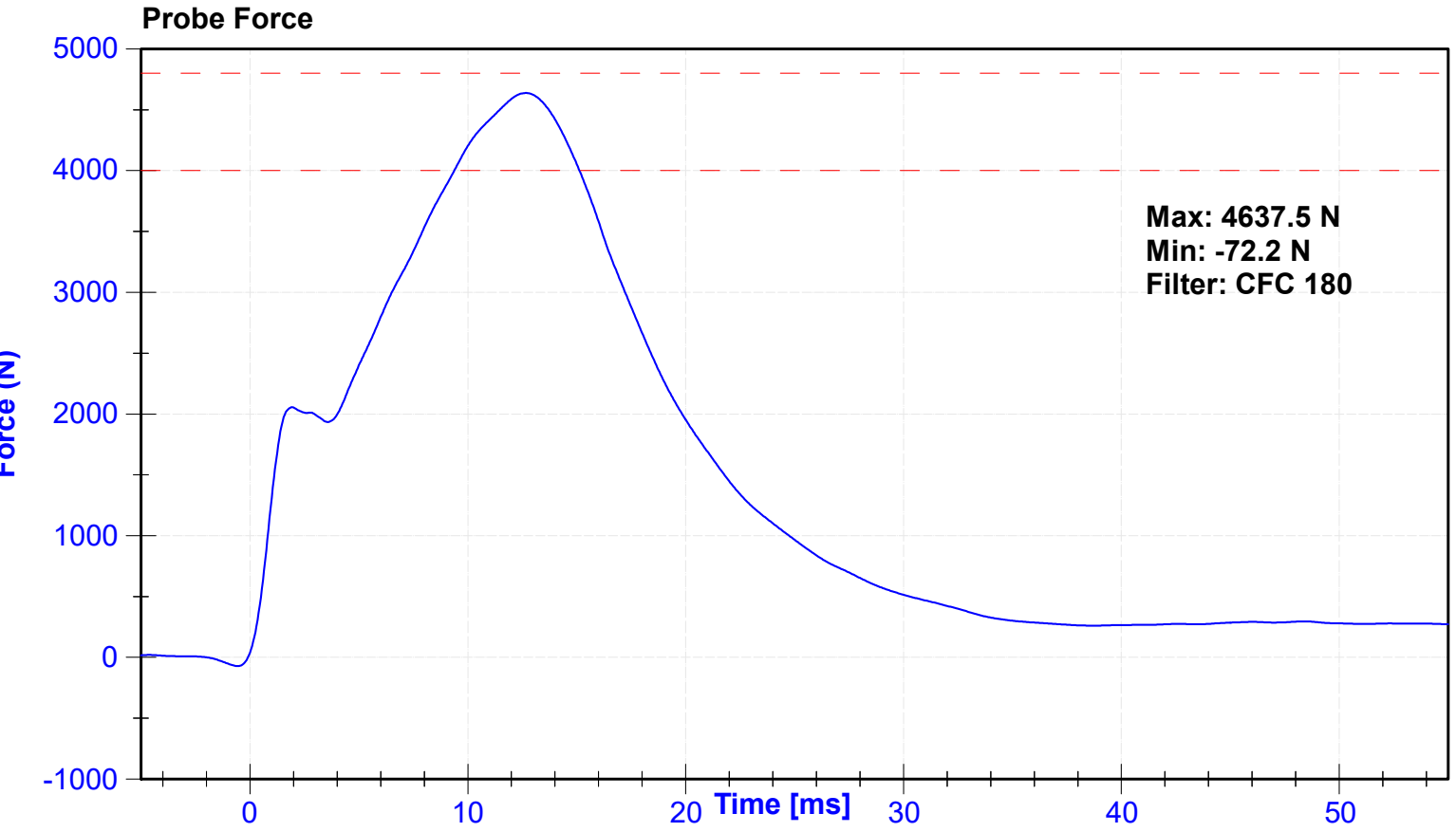
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

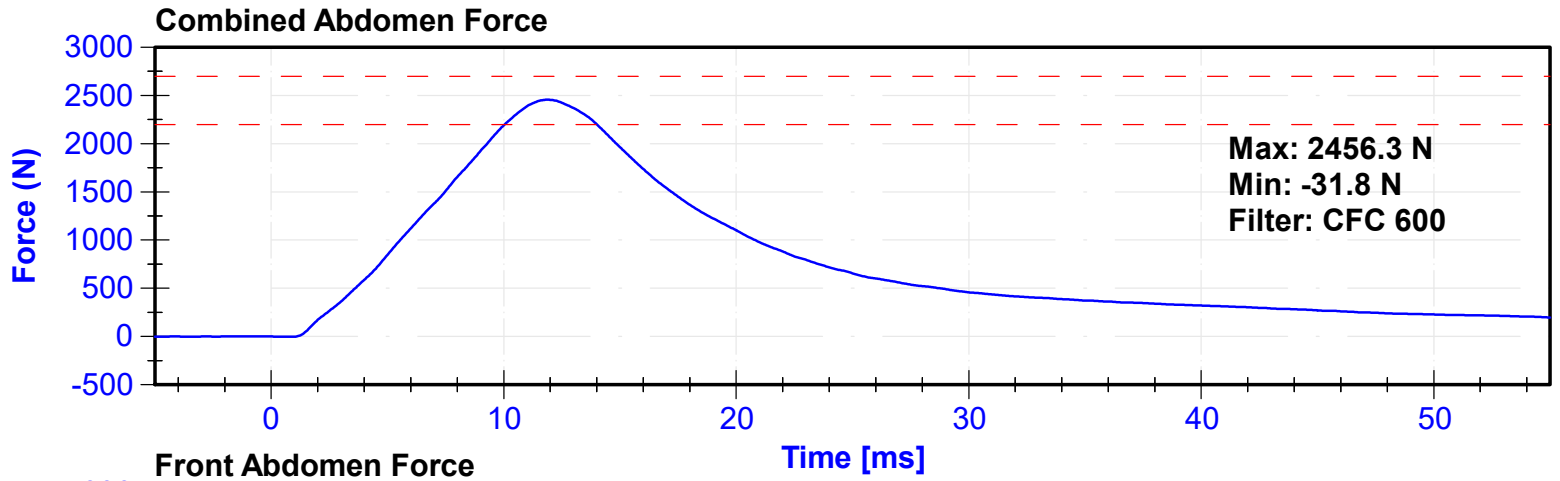
Results

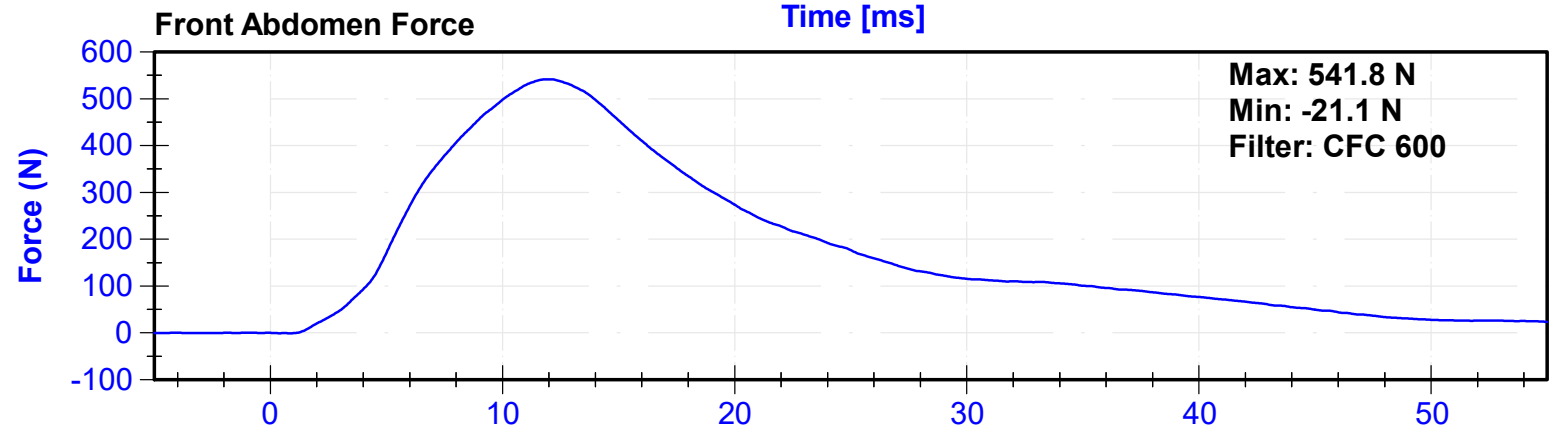
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	49.4	Pass
Velocity	3.9	4.1	m/s	4.04	Pass
Combined Abdomen Force	2200	2700	N	2456.3	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.85	Pass
Resistive Probe Force	4000	4800	N	4637.5	Pass
Time at Peak Resistive Force	10.6	13.0	ms	12.65	Pass

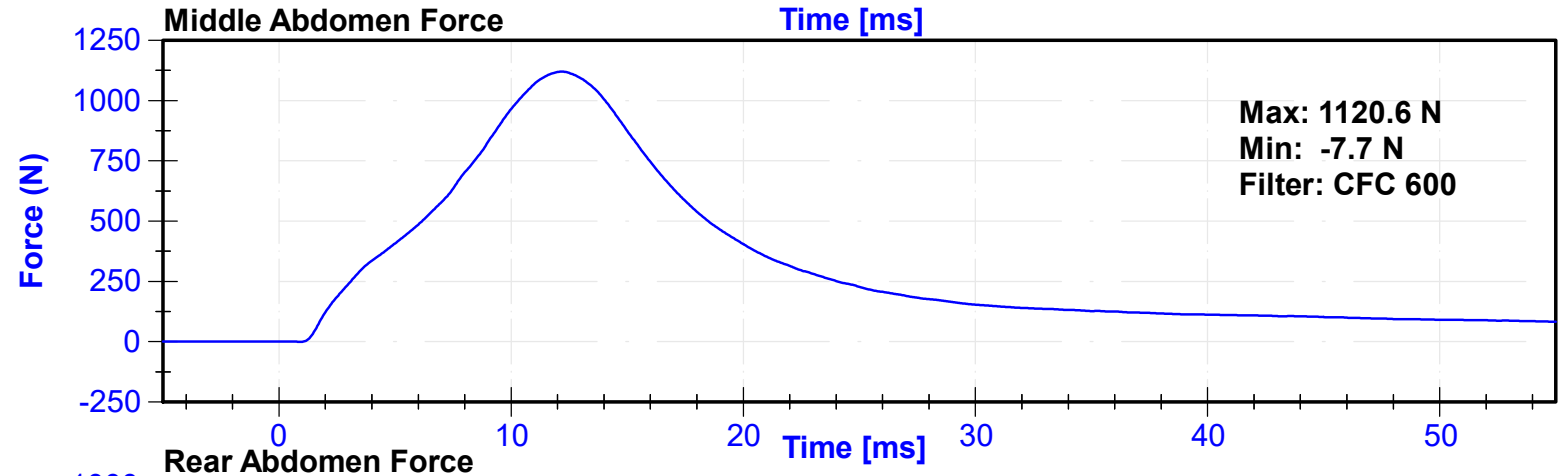
Transducer Calibrations

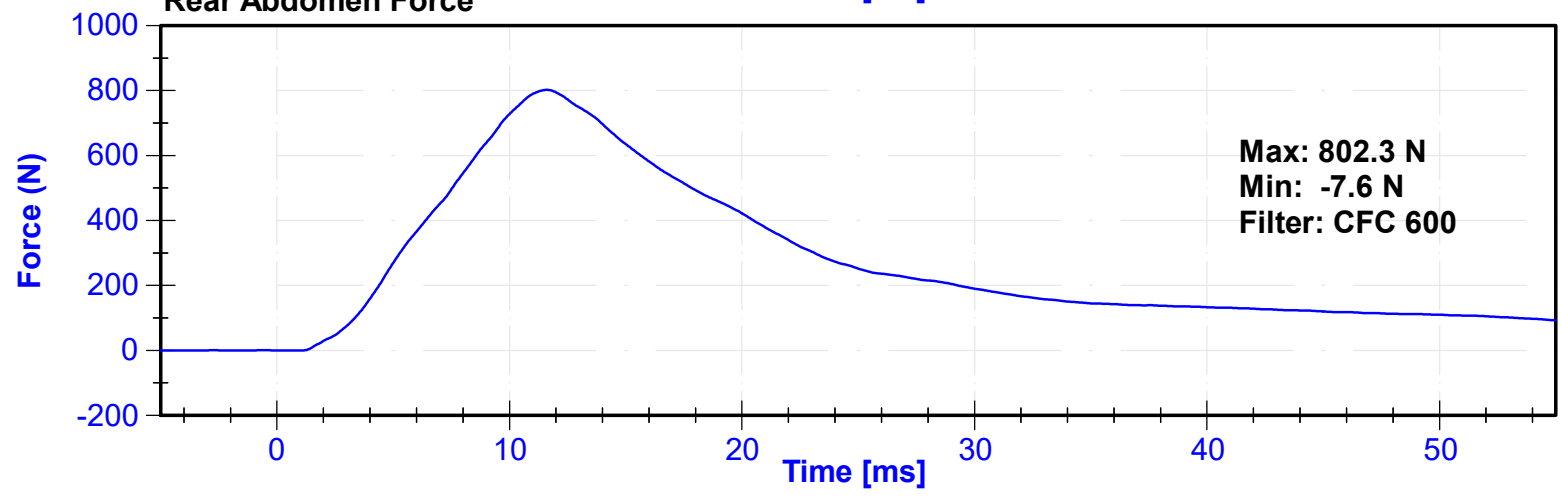
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Front Abdomen Load Cell	Denton	DM5846	5/18/2023	5/17/2024
Middle Abdomen Load Cell	Denton	1529	5/18/2023	5/17/2024
Rear Abdomen Load Cell	Denton	1533	5/18/2023	5/17/2024




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2456.3 N
Min: -31.8 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 541.8 N
Min: -21.1 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1120.6 N
Min: -7.7 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 802.3 N
Min: -7.6 N
Filter: CFC 600

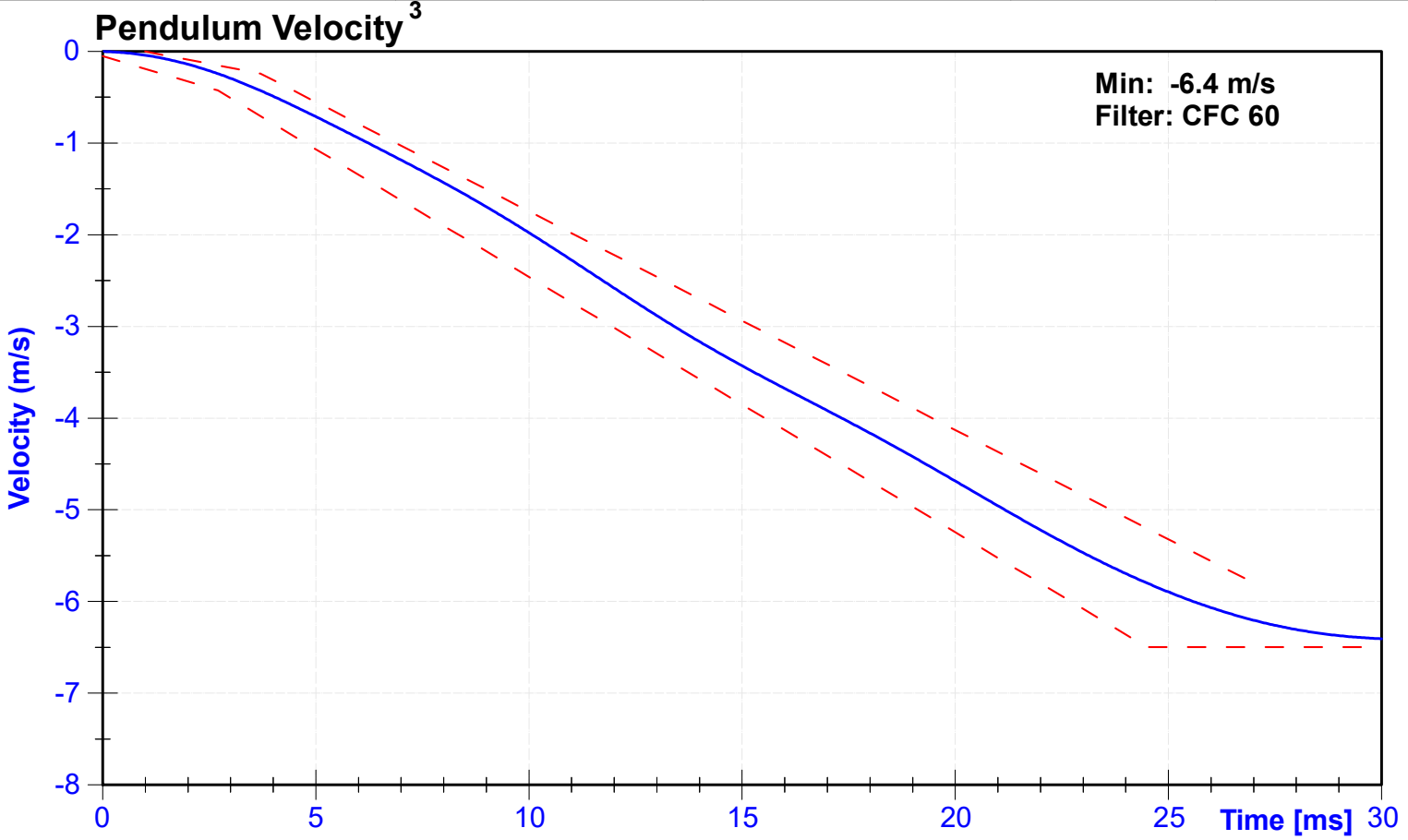
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

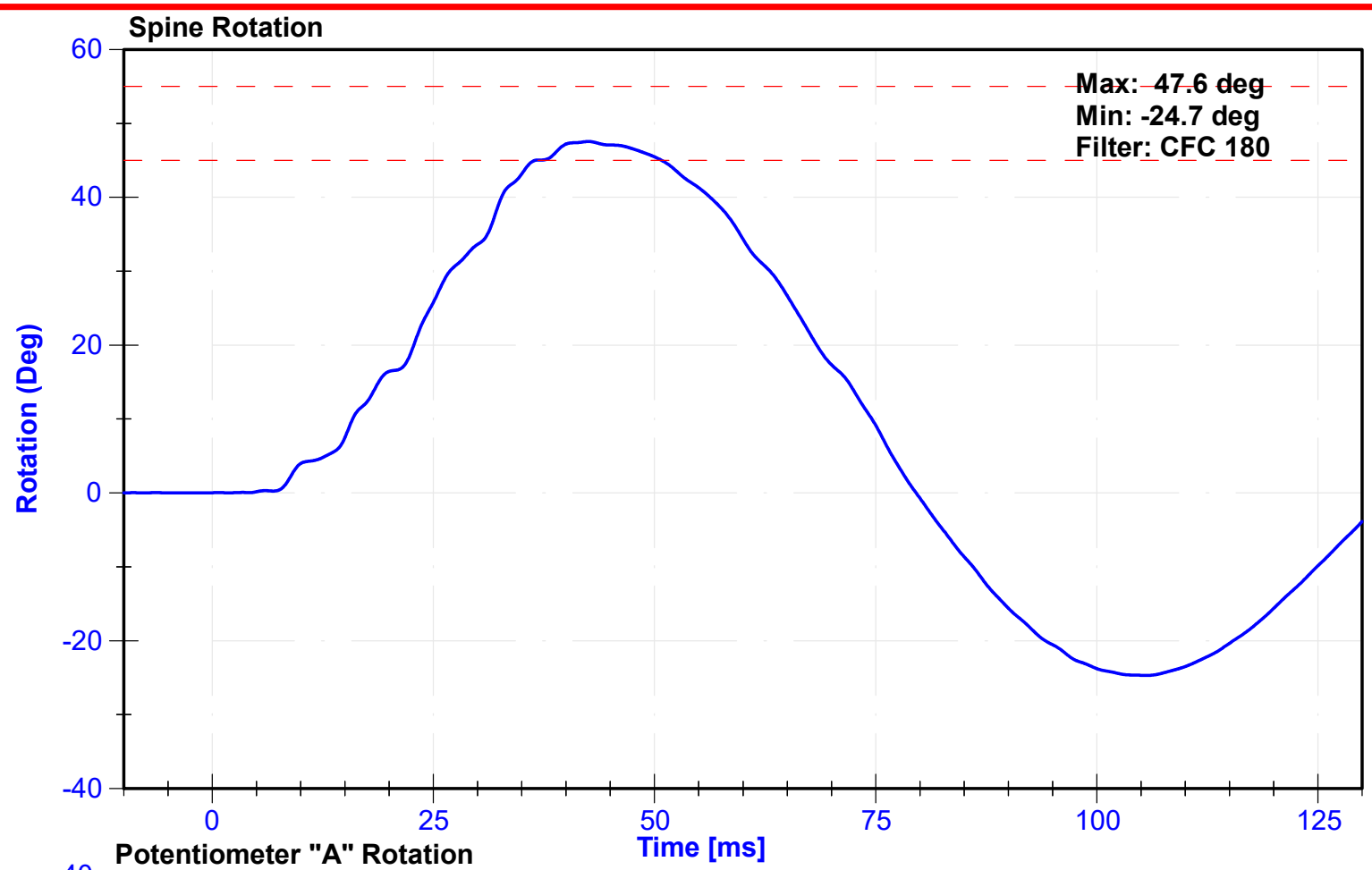
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	54.3	Pass
Velocity	5.95	6.15	m/s	6.101	Pass
Lateral Spine Rotation	45	55	deg	47.6	Pass
Time at Maximum Rotation	39	53	ms	42.5	Pass
Time of Decay to Zero Degrees	37	57	ms	37.1	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

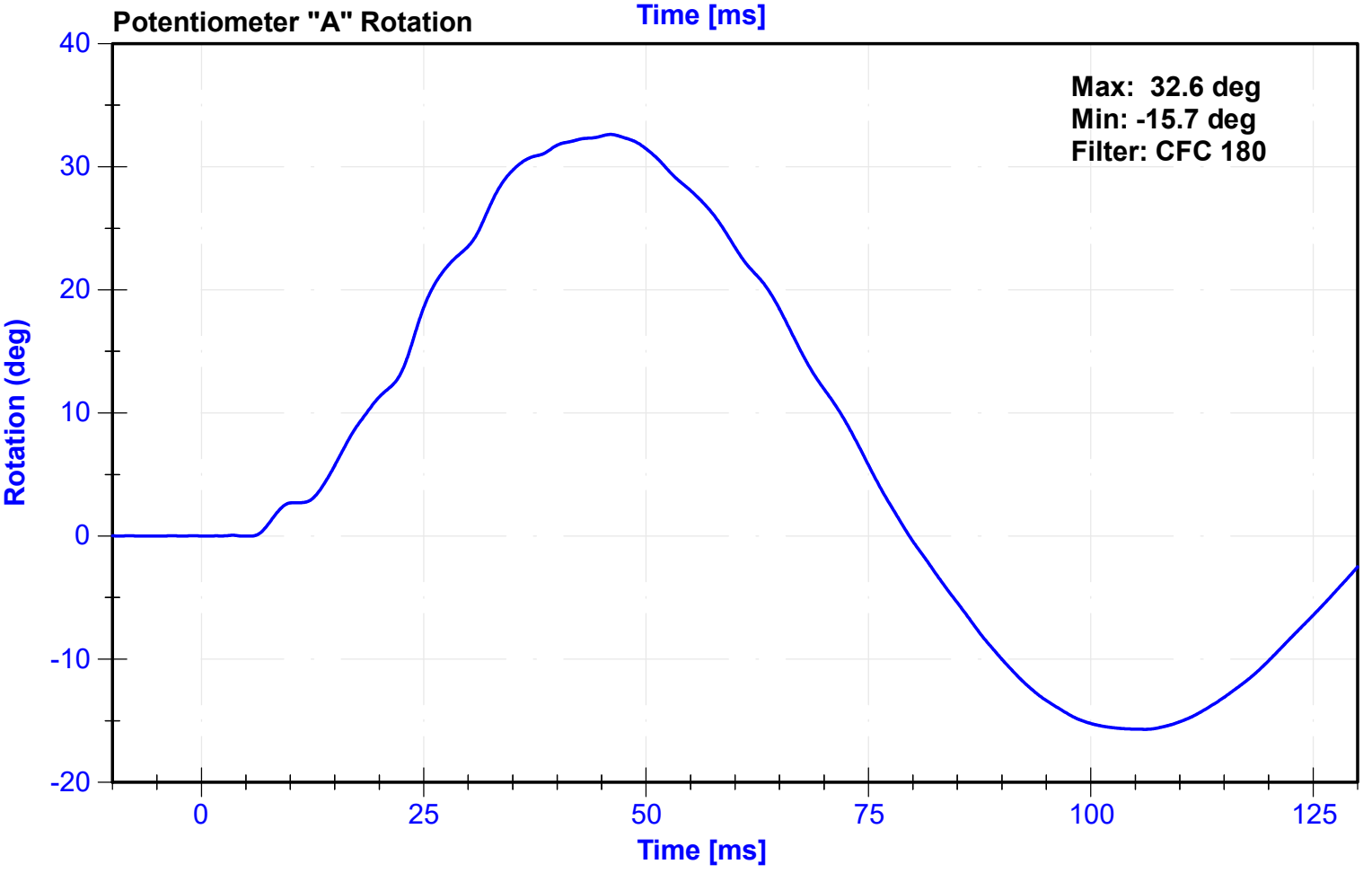
Transducer Calibrations

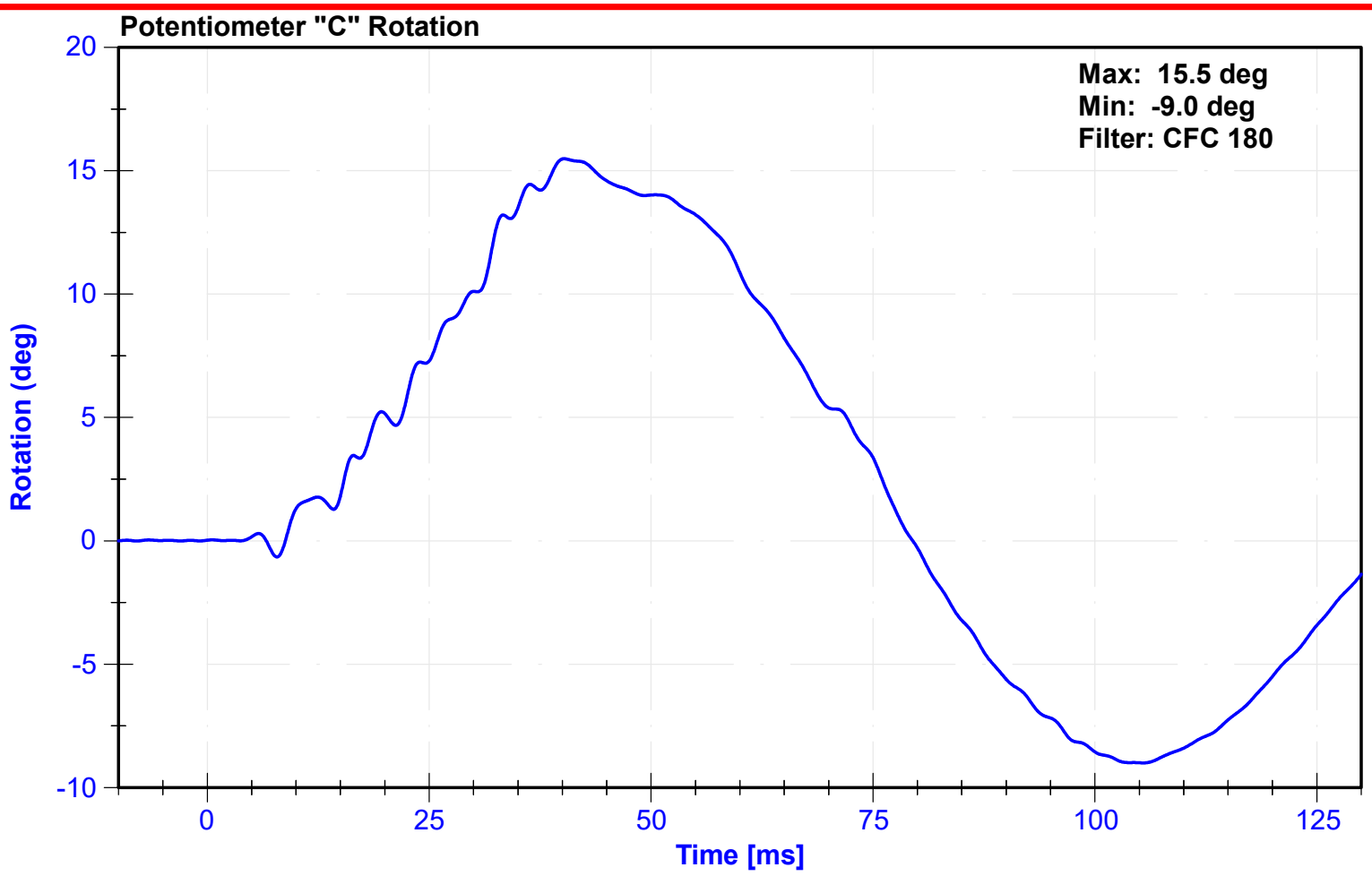
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	10/31/2022	10/31/2023
Pendulum "A" Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Condyle "B" Potentiometer	Sfernice	095	10/5/2022	10/5/2023



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


Spine Rotation
Max: 47.6 deg
Min: -24.7 deg
Filter: CFC 180
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 32.6 deg
Min: -15.7 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

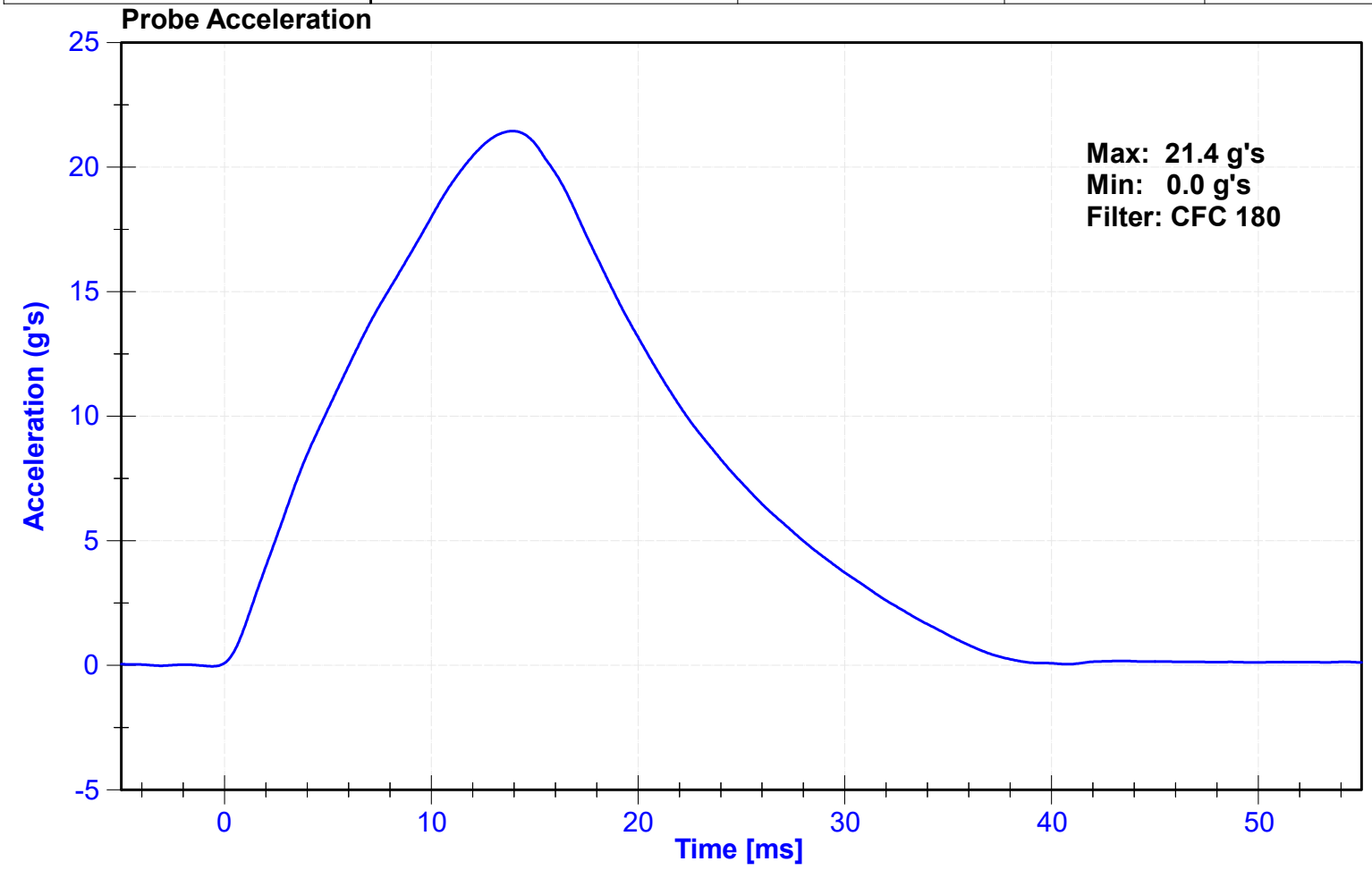
ATD Manufacturer	FTSS	Test Technician	Z.Schneider
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

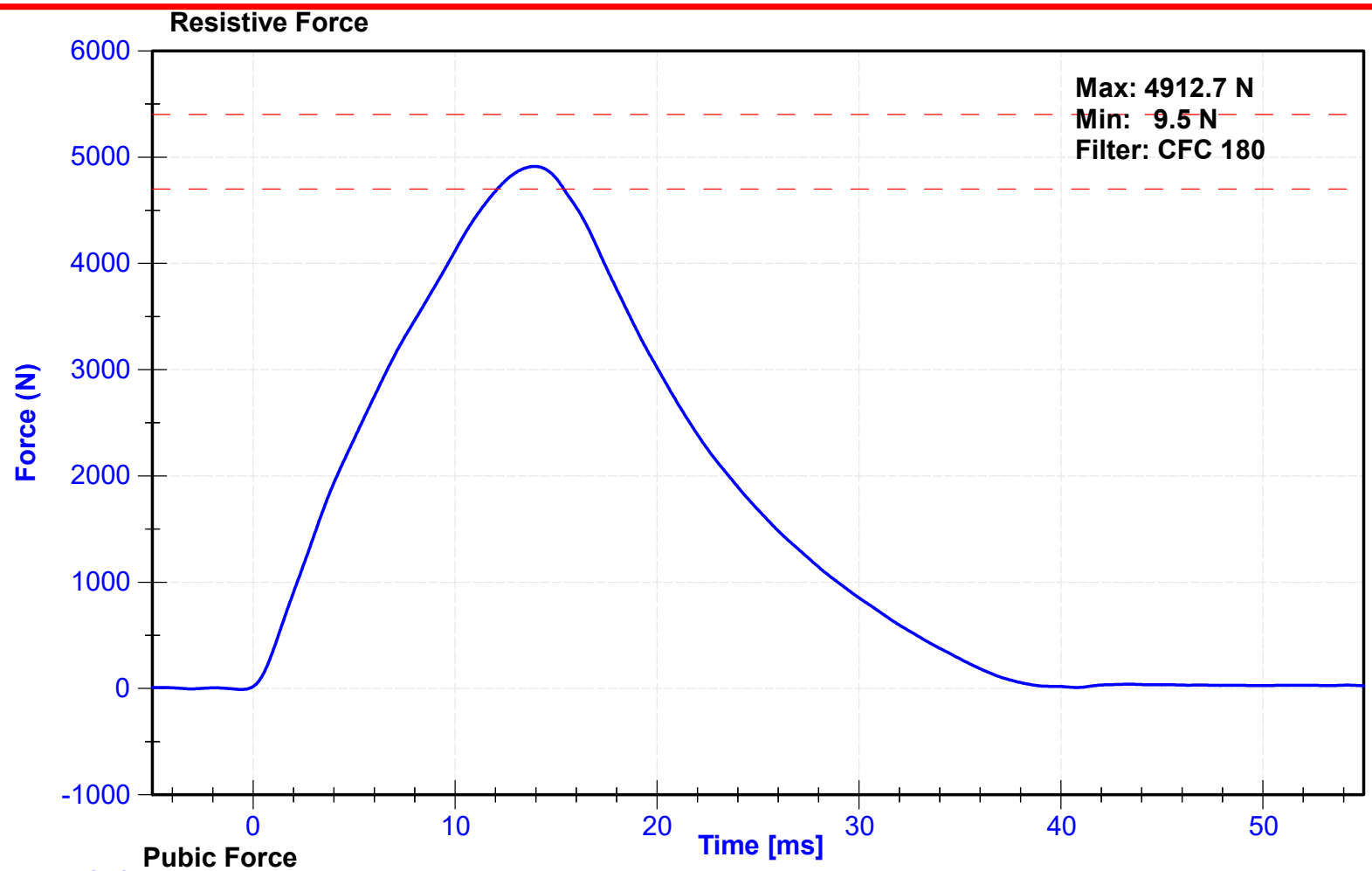
Results

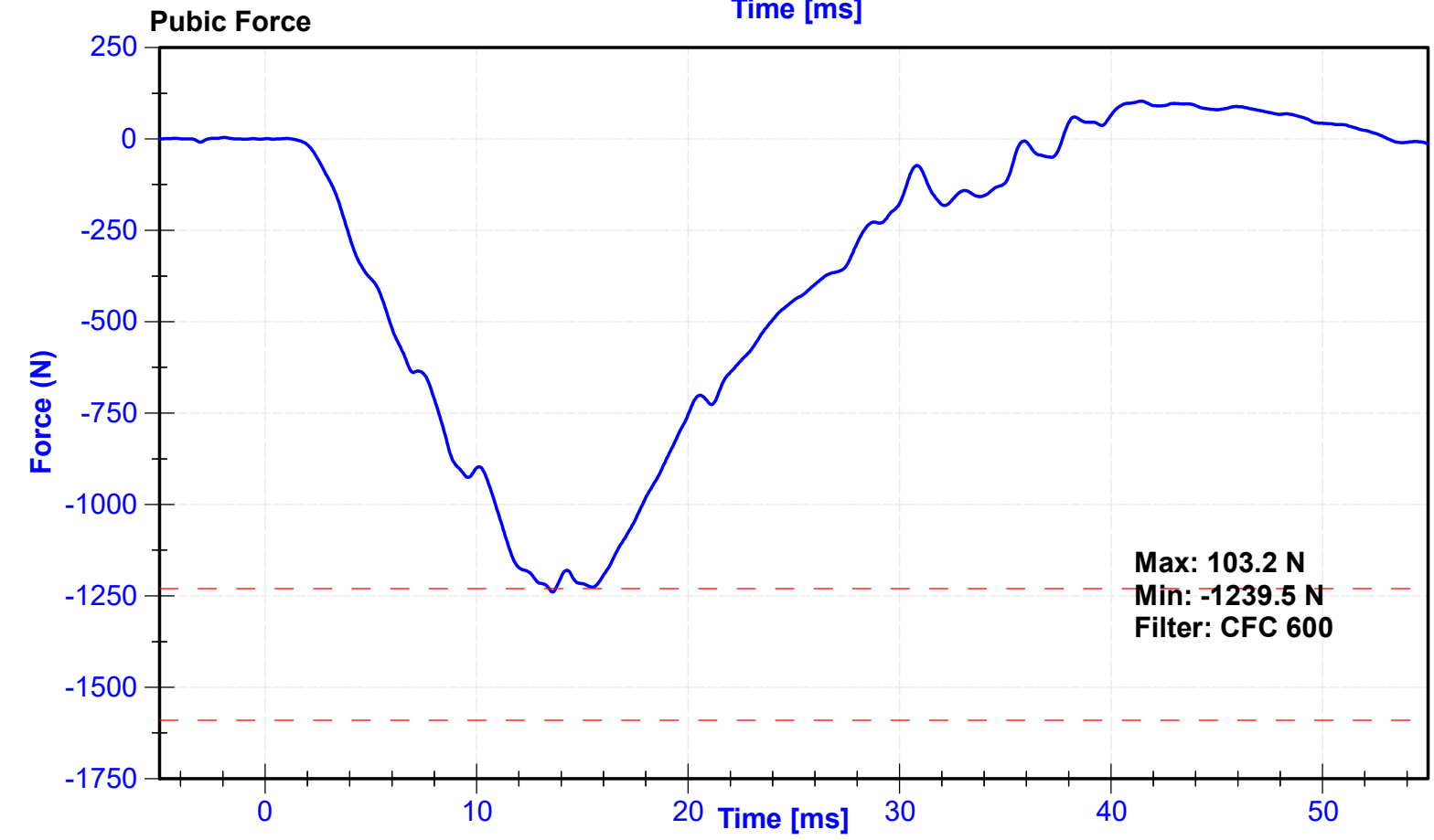
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	49.4	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Resistive Force	4700	5400	N	4912.7	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.90	Pass
Pubic Force	-1590	-1230	N	-1239.5	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.60	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Pubic Load Cell	Denton	459-FY	6/20/2023	6/19/2024




Resistive Force
Max: 4912.7 N
Min: 9.5 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: 103.2 N
Min: -1239.5 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

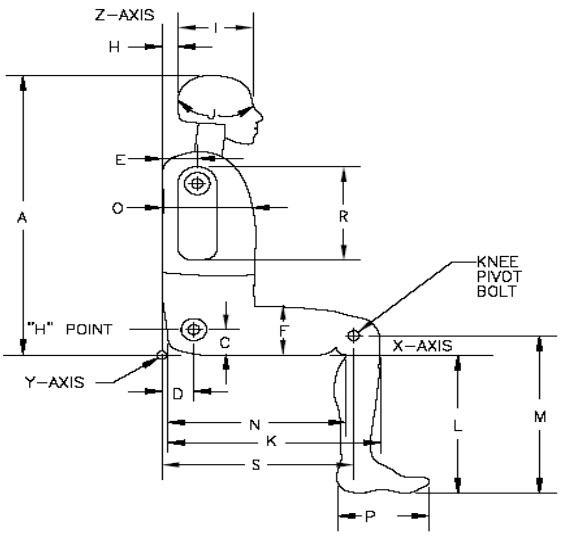
SERIAL NO:DG8012

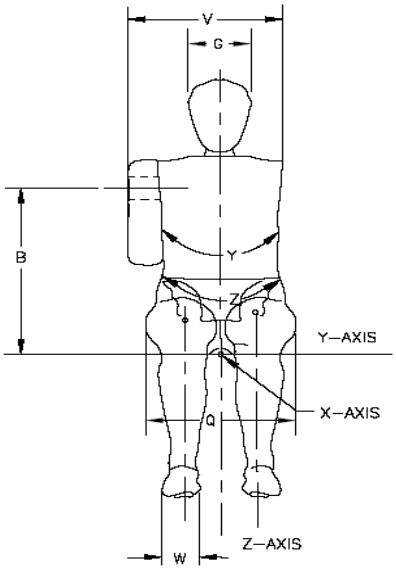
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Brogan Date: 07/17/2023

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	780	Pass
B	Shoulder Pivot Height	437	453	447	Pass
C	H-point Height	79	89	82	Pass
D	H-point from seatback	141	151	143	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	127	Pass
G	Head Breadth	140	148	142	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	182	Pass
J	Head Circumference	541	551	543	Pass
K	Buttock to Knee Length	514	540	528	Pass
L	Popliteal Height	343	369	360	Pass
M	Knee Pivot to floor height	392	409	399	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	200	Pass
P	Foot Length	216	232	220	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	252	Pass
S	Knee Joint to seatback	477	493	482	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	869	Pass
Z	Waist Circumference	761	791	778	Pass

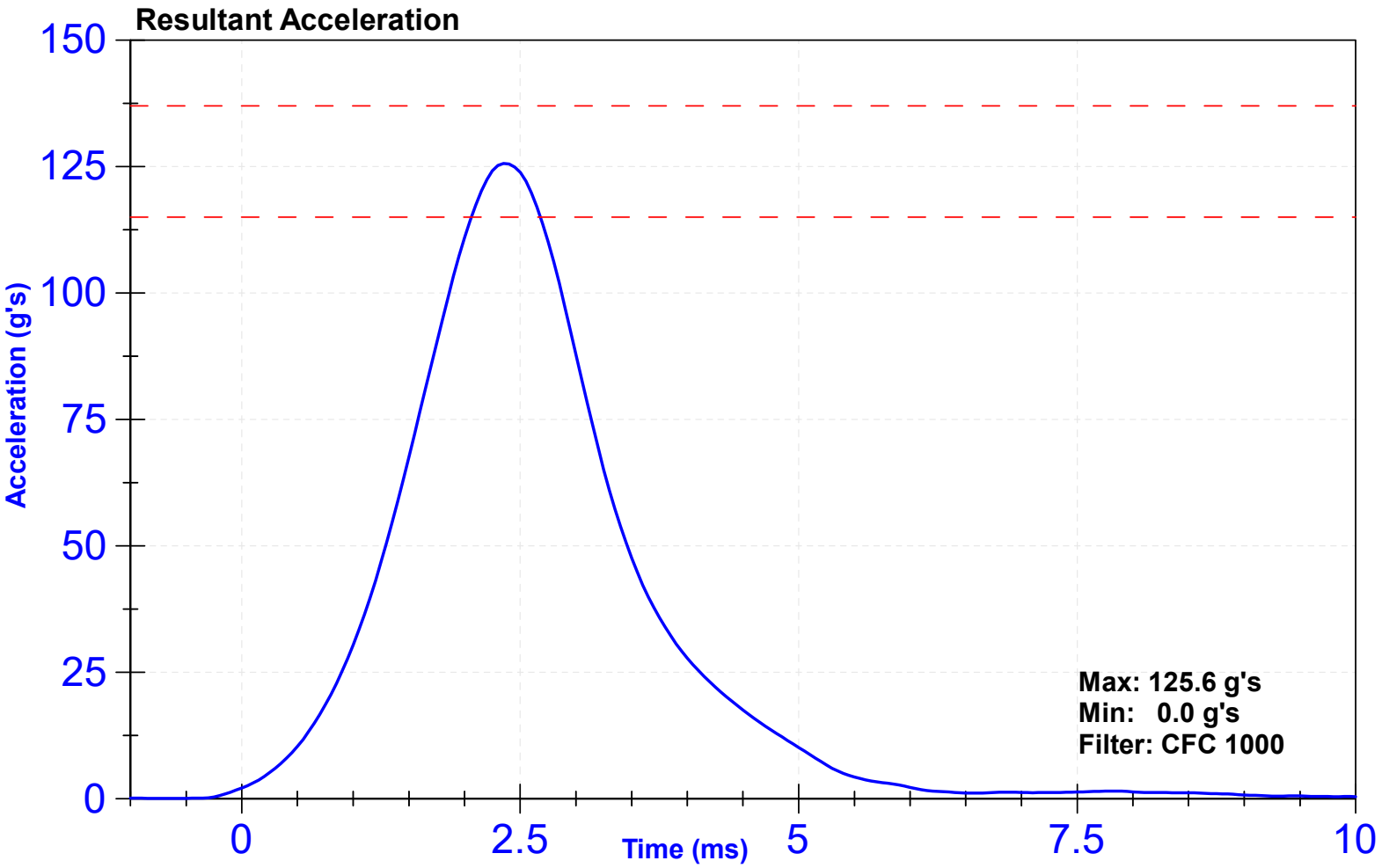
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

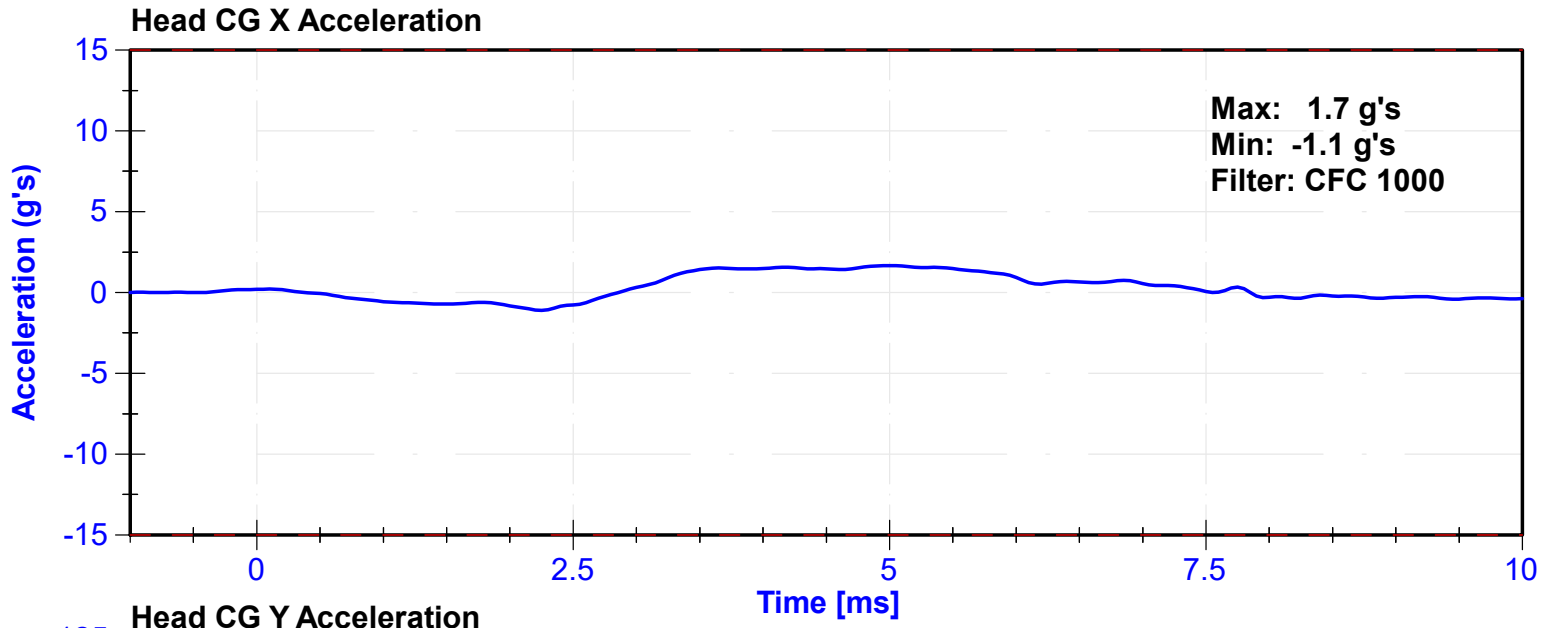
Results

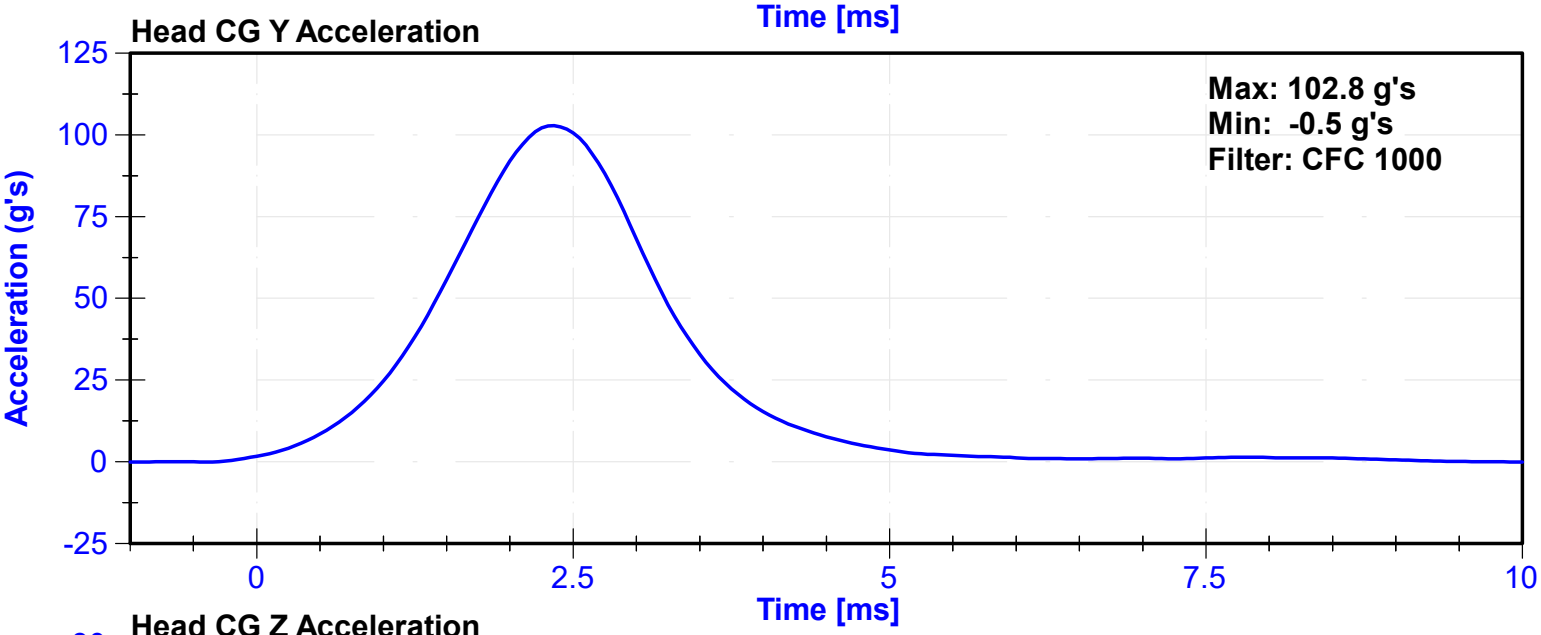
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.1	Pass
Humidity	10	70	%	61	Pass
Resultant Acceleration	115	137	g's	125.6	Pass
Oscillation	0	15	%	1.1	Pass
Fore-Aft Acceleration	-15	15	g's	1.7	Pass

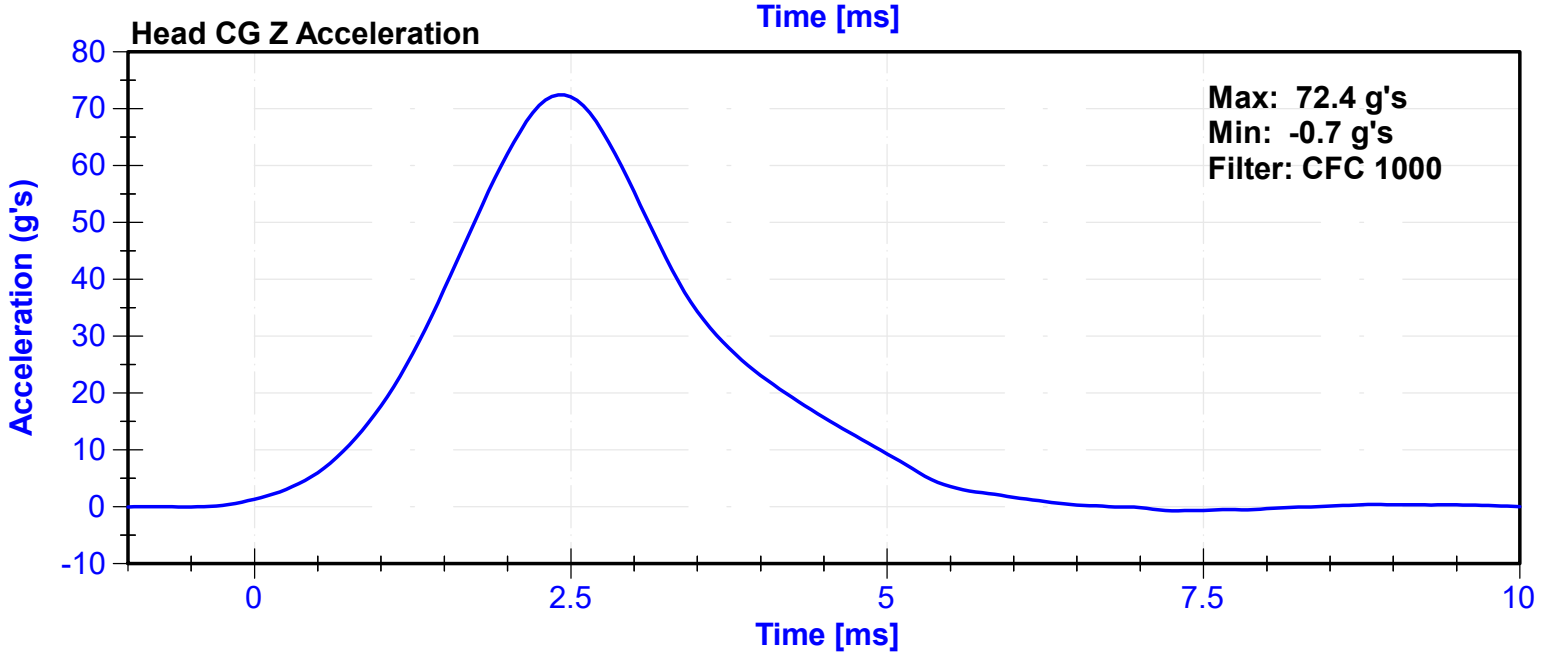
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P74788	7/5/2023	1/1/2024
Y Accelerometer	Endevco	P51668	7/5/2023	1/1/2024
Z Accelerometer	Endevco	P83319	7/5/2023	1/1/2024




Head CG X Acceleration
Max: 1.7 g's
Min: -1.1 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 102.8 g's
Min: -0.5 g's
Filter: CFC 1000
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 72.4 g's
Min: -0.7 g's
Filter: CFC 1000
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]

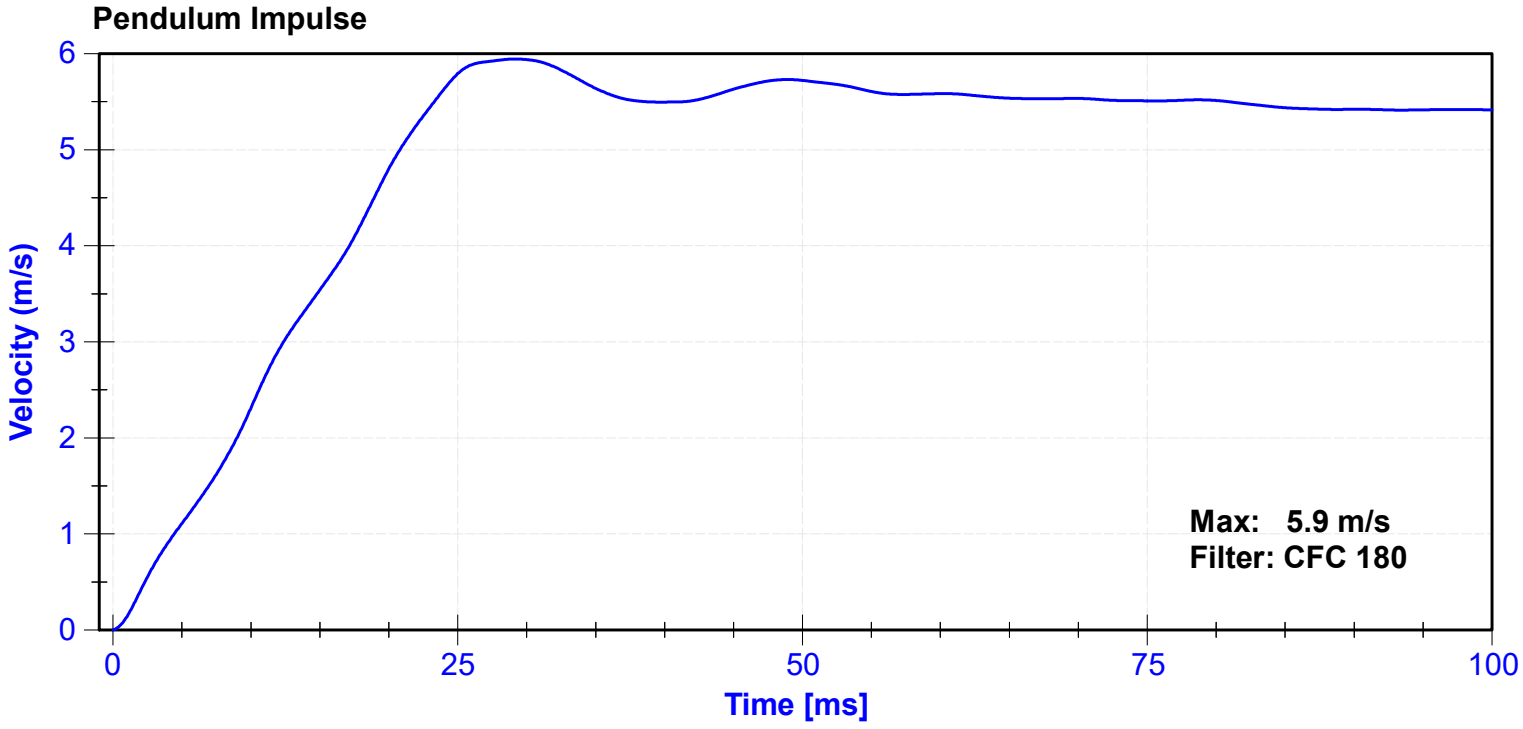
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

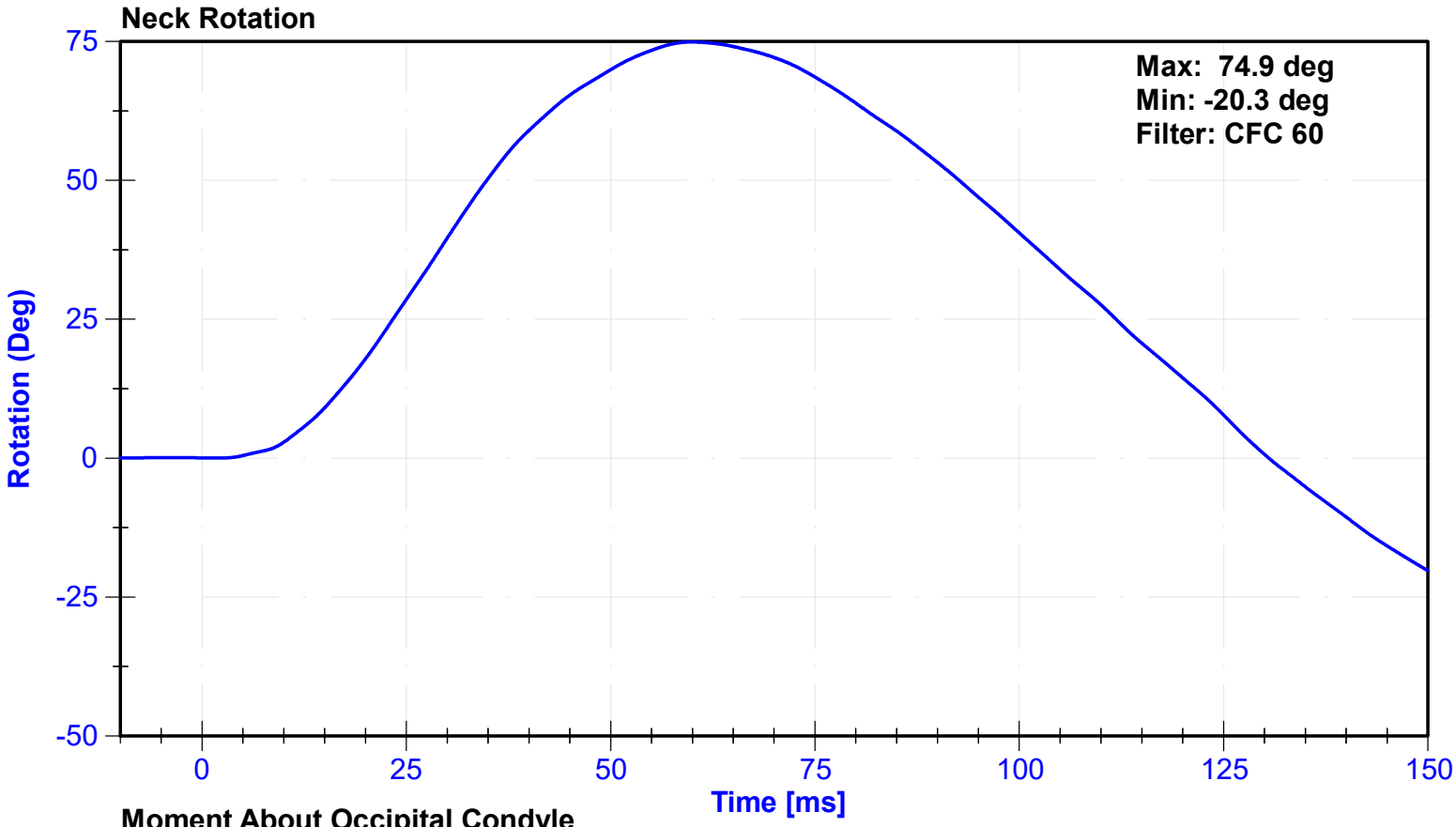
Results

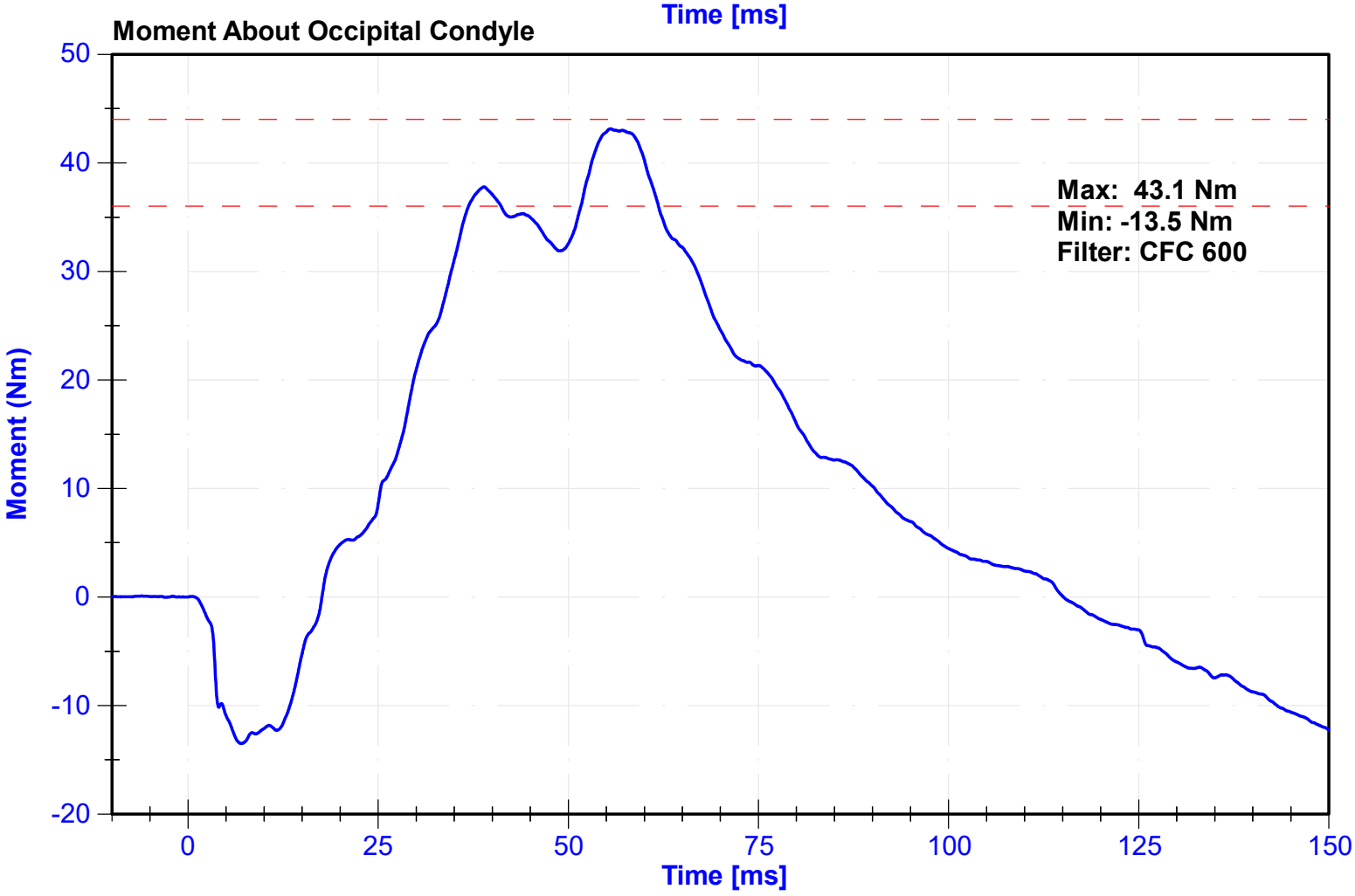
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.9	Pass
Humidity	10	70	%	61	Pass
Velocity	5.51	5.63	m/s	5.566	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.31	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.54	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.80	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.79	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.94	Pass
Neck Rotation	71	81	deg	74.9	Pass
Time at Maximum Rotation	50	70	ms	59.9	Pass
Moment about the OC	36	44	Nm	43.1	Pass
Moment Decay to 0 Nm	102	126	ms	115.1	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	Denton	1716ATF_2184-FY	5/18/2023	5/17/2024




Neck Rotation
Max: 74.9 deg
Min: -20.3 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: 43.1 Nm
Min: -13.5 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

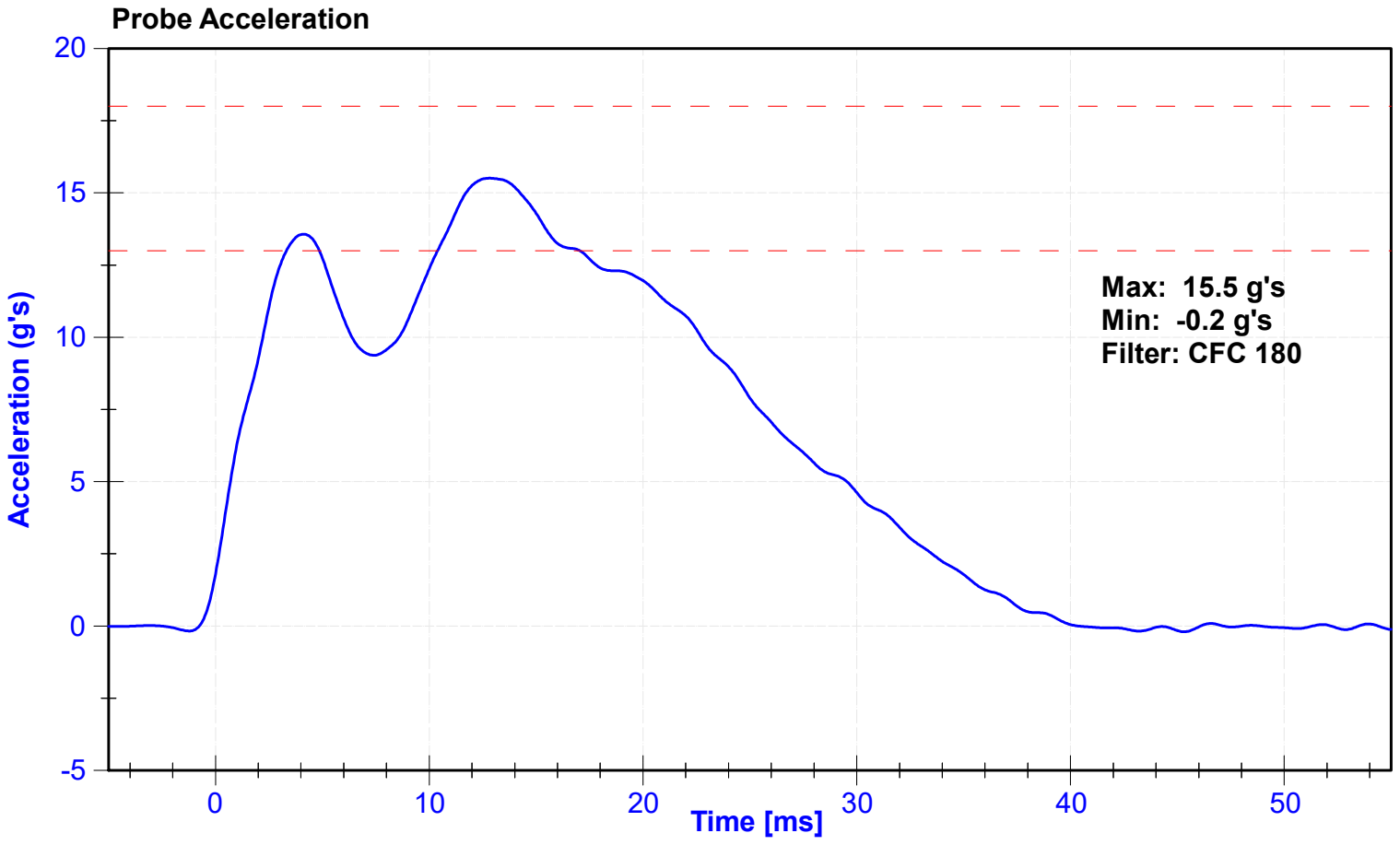
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

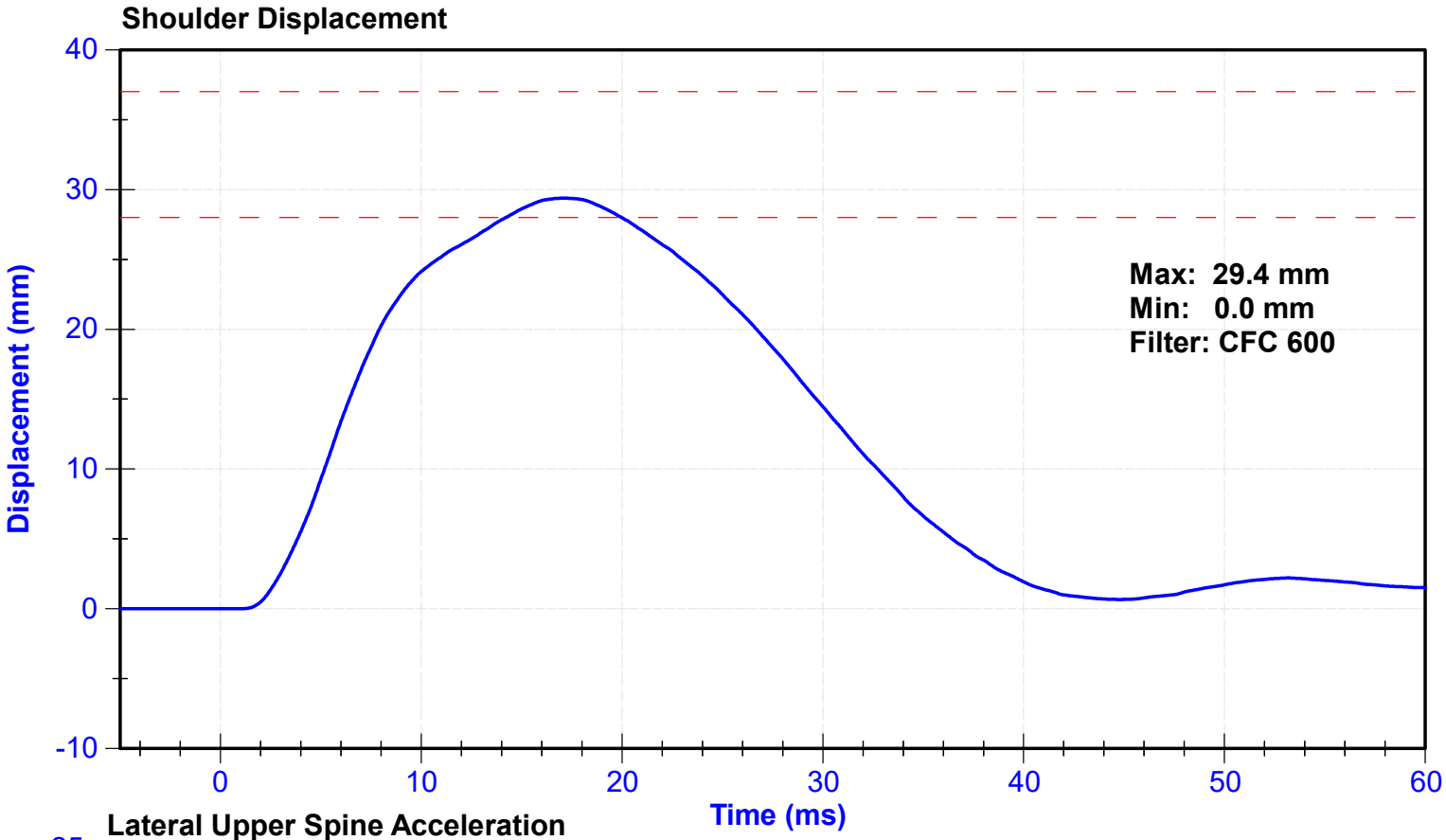
Results

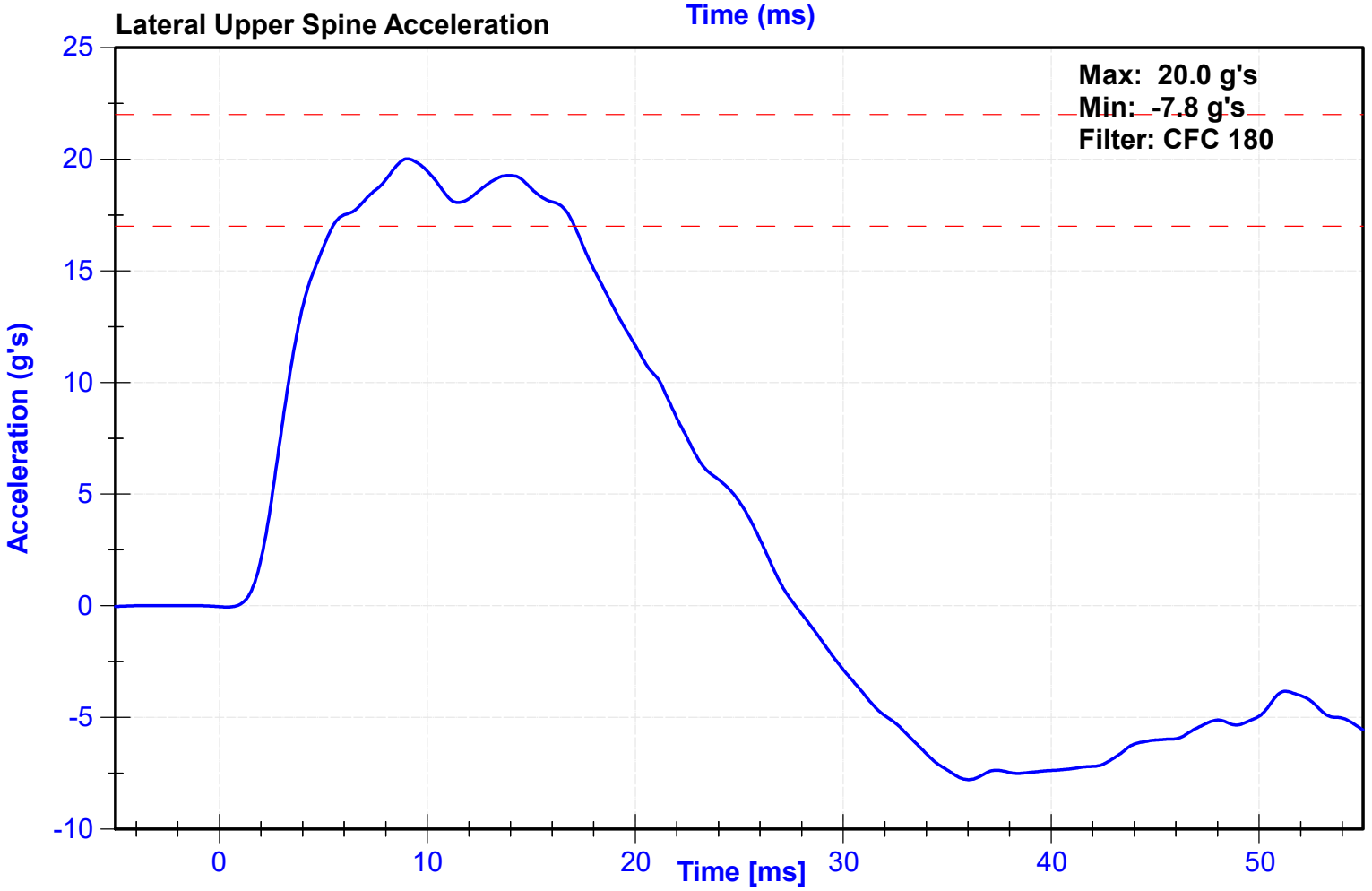
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.9	Pass
Humidity	10	70	%	61	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	13	18	g's	15.5	Pass
Shoulder Deflection	28	37	mm	29.4	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Shoulder Potentiometer	Servo	1274GFE	7/5/2023	1/3/2024
Upper Spine Y Accelerometer	Endevco	P64148	6/30/2023	12/27/2023




Shoulder Displacement
Displacement (mm)
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time (ms)
Max: 29.4 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]
Max: 20.0 g's
Min: -7.8 g's
Filter: CFC 180

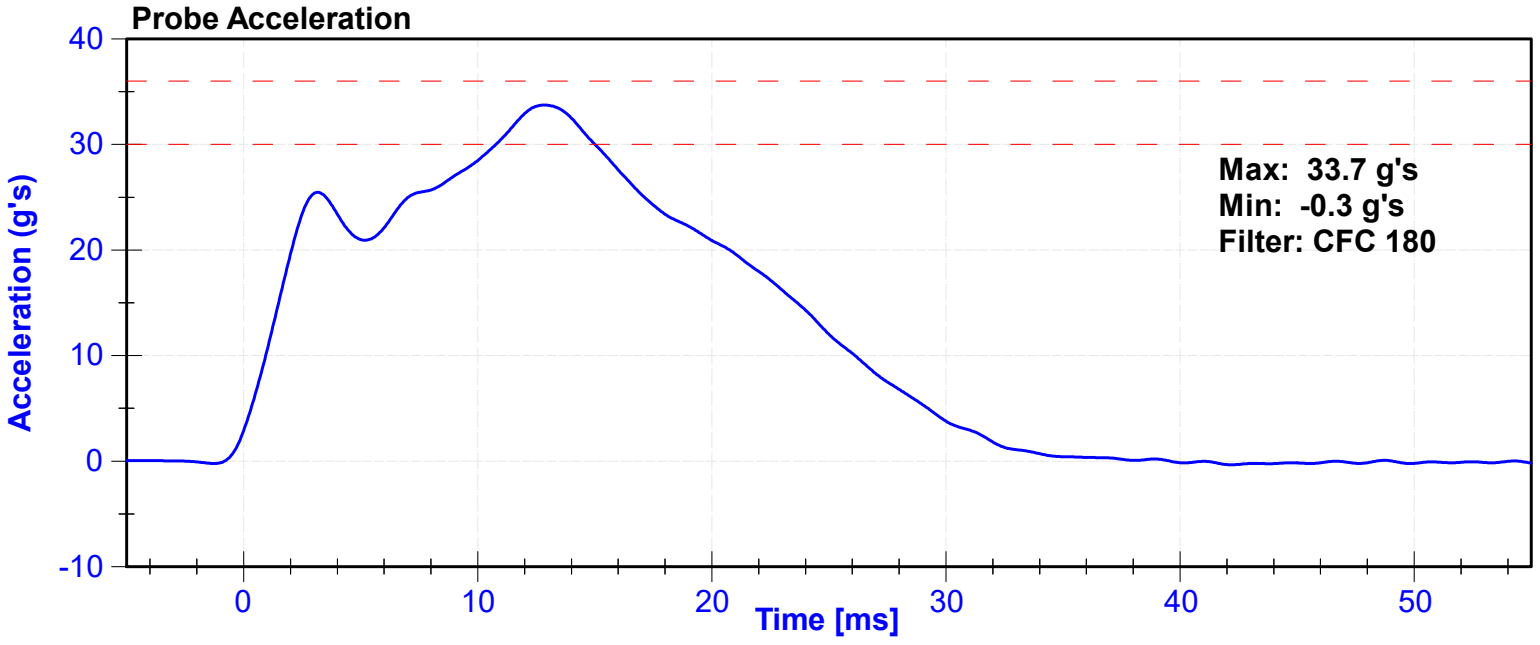
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

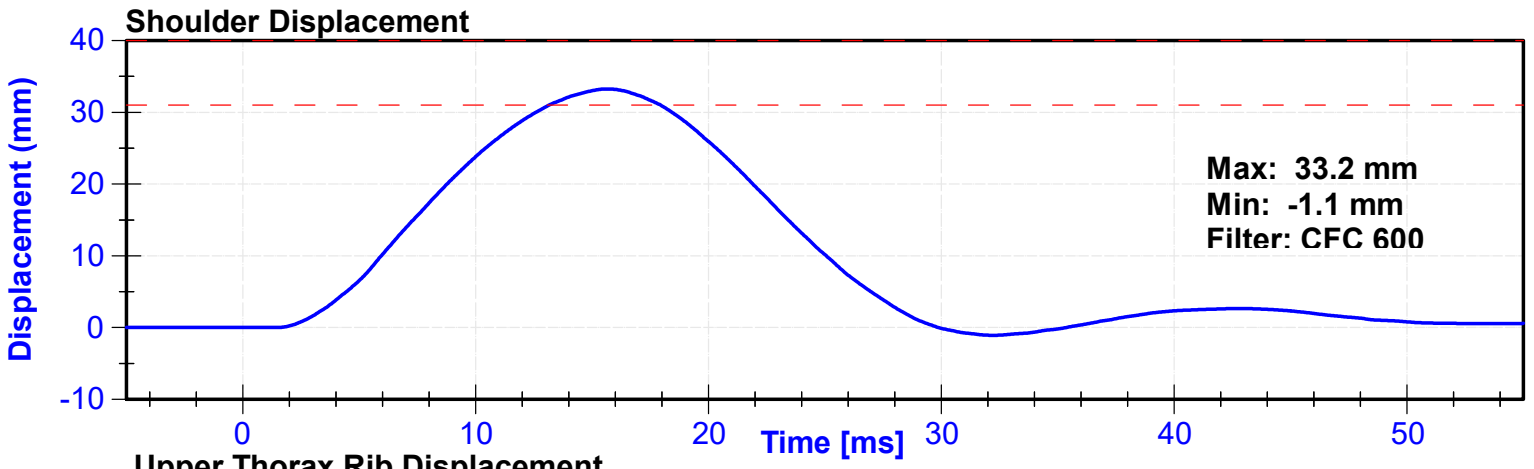
Results

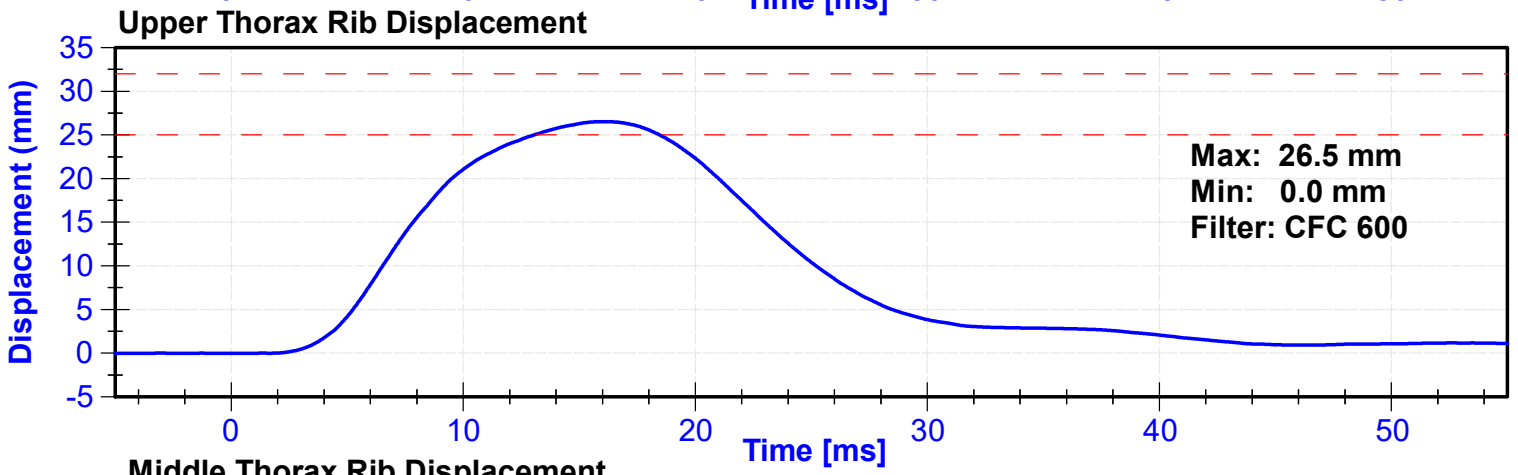
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.9	Pass
Humidity	10	70	%	61	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration after 5 ms	30	36	g's	33.7	Pass
Lateral Upper Spine Acceleration	34	43	g's	40.1	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.2	Pass
Shoulder Deflection	31	40	mm	33.2	Pass
Upper Thorax Rib Deflection	25	32	mm	26.5	Pass
Mid Thorax Rib Deflection	30	36	mm	31.1	Pass
Lower Thorax Rib Deflection	32	38	mm	33.9	Pass

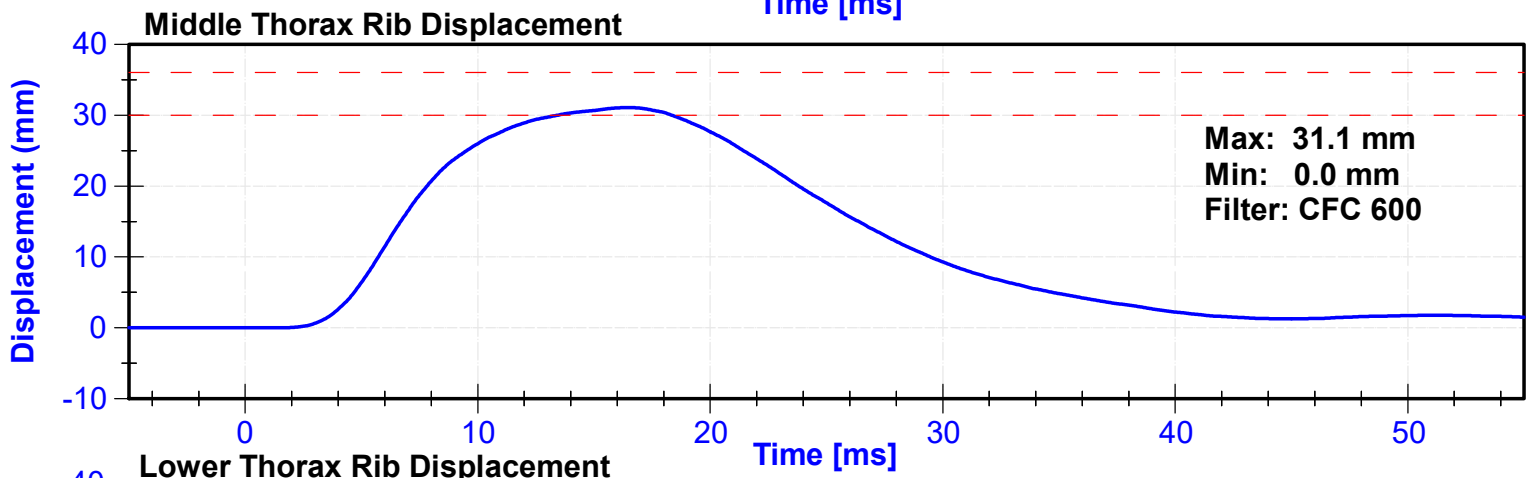
Transducer Calibrations

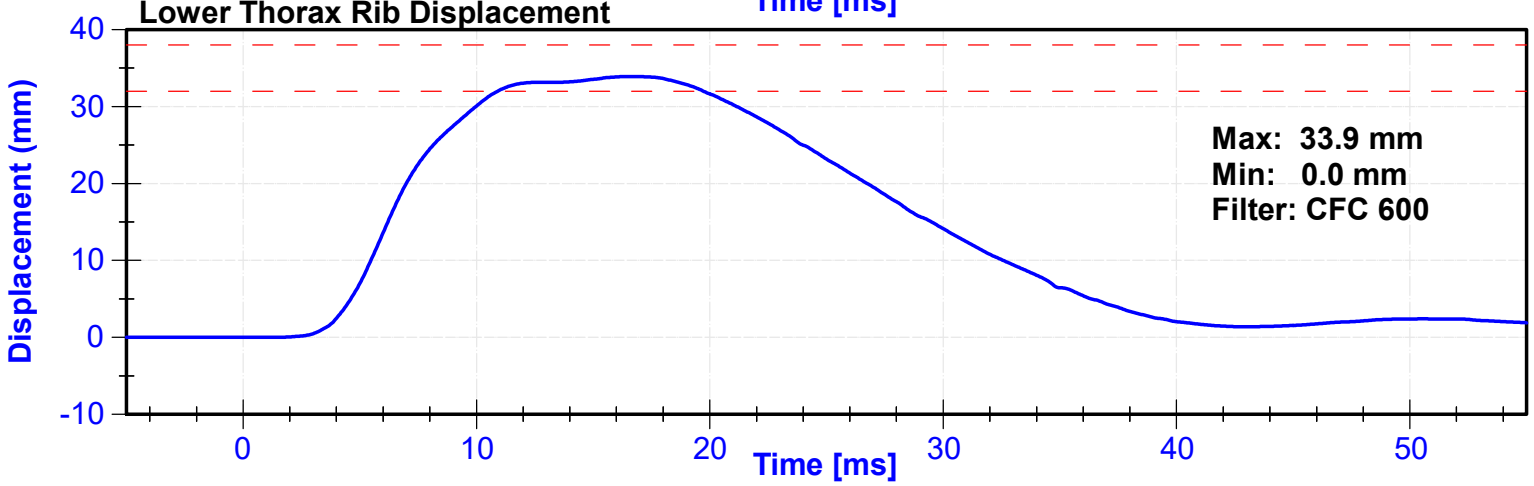
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Upper Spine T1 Y Accelerometer	Endevco	P64148	6/30/2023	12/27/2023
Upper Spine T12 Y Accelerometer	Endevco	P51327	6/30/2023	12/27/2023
Shoulder Potentiometer	Servo	1274GFE	7/5/2023	1/3/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	7/5/2023	1/3/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	7/5/2023	1/3/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	7/5/2023	1/3/2024

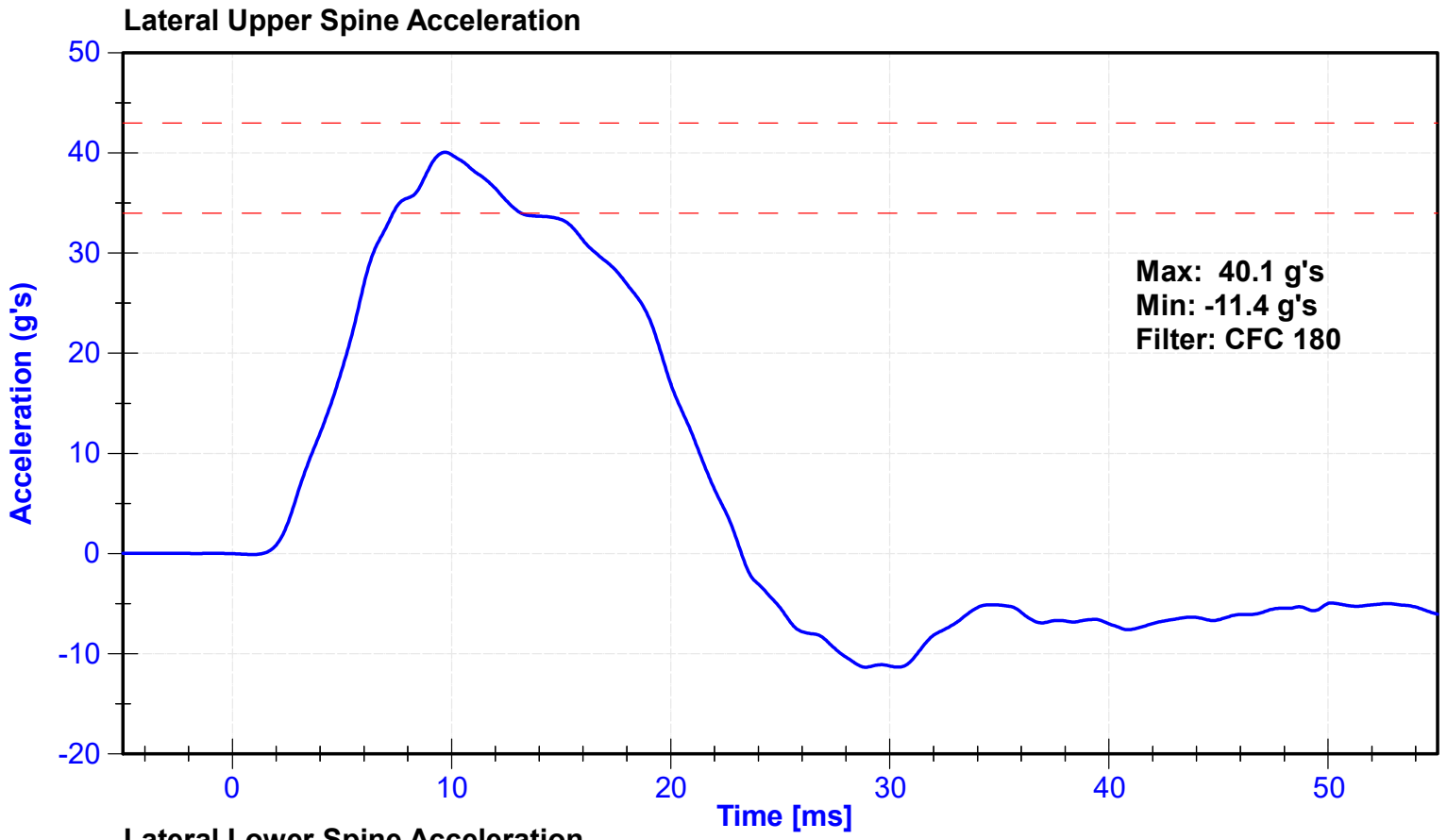


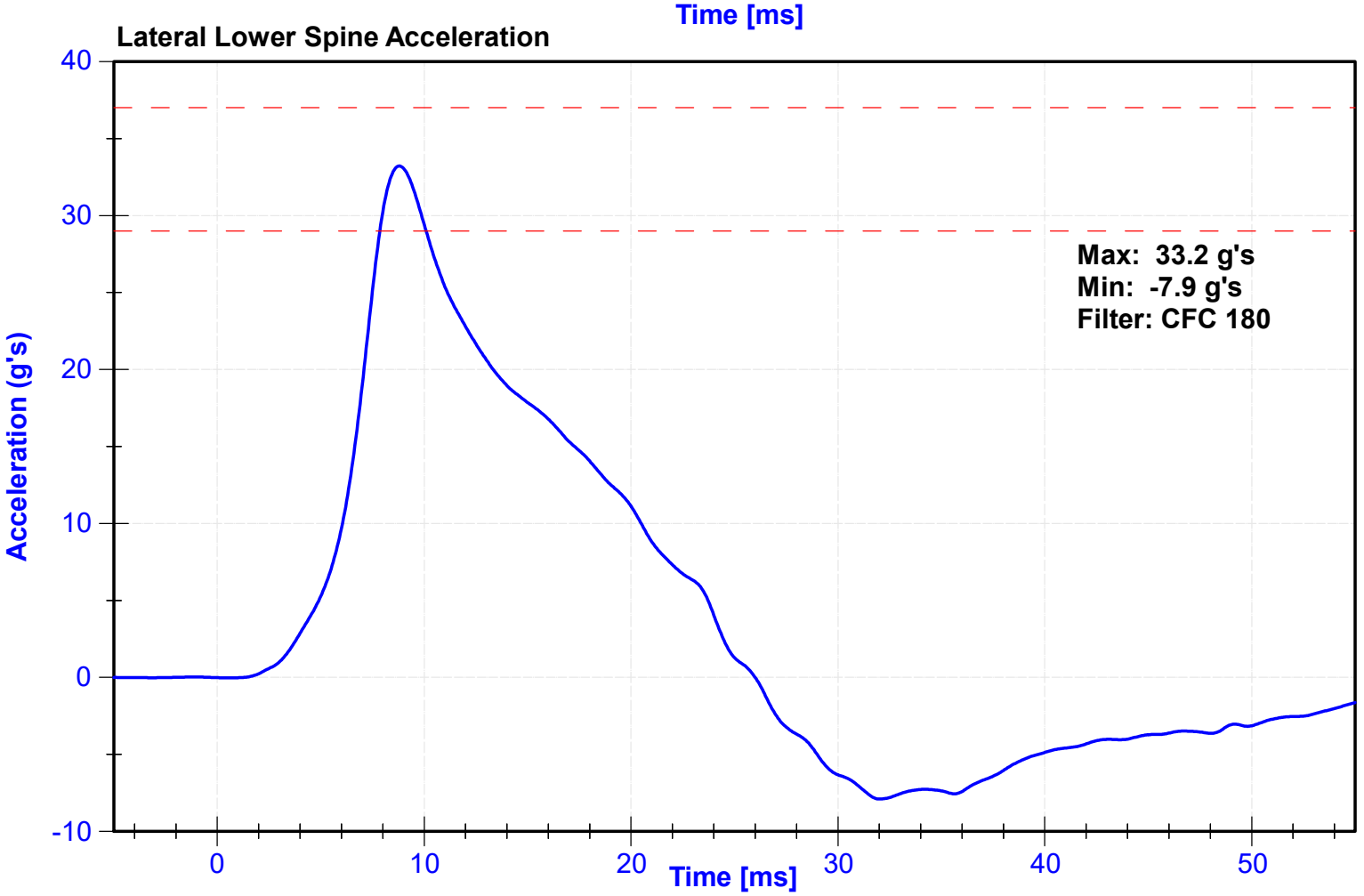

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 33.2 mm
Min: -1.1 mm
Filter: CFC 600


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: 31.1 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.9 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: 40.1 g's
Min: -11.4 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: 33.2 g's
Min: -7.9 g's
Filter: CFC 180

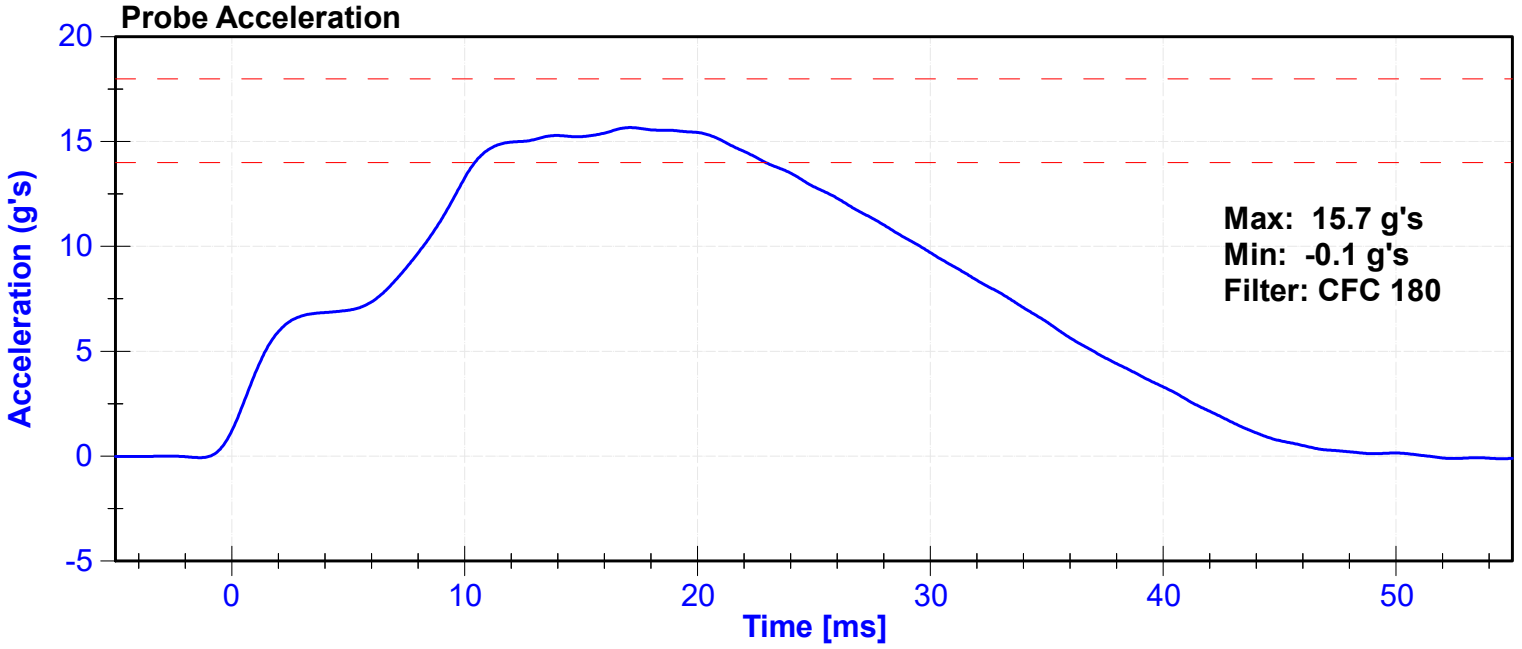
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

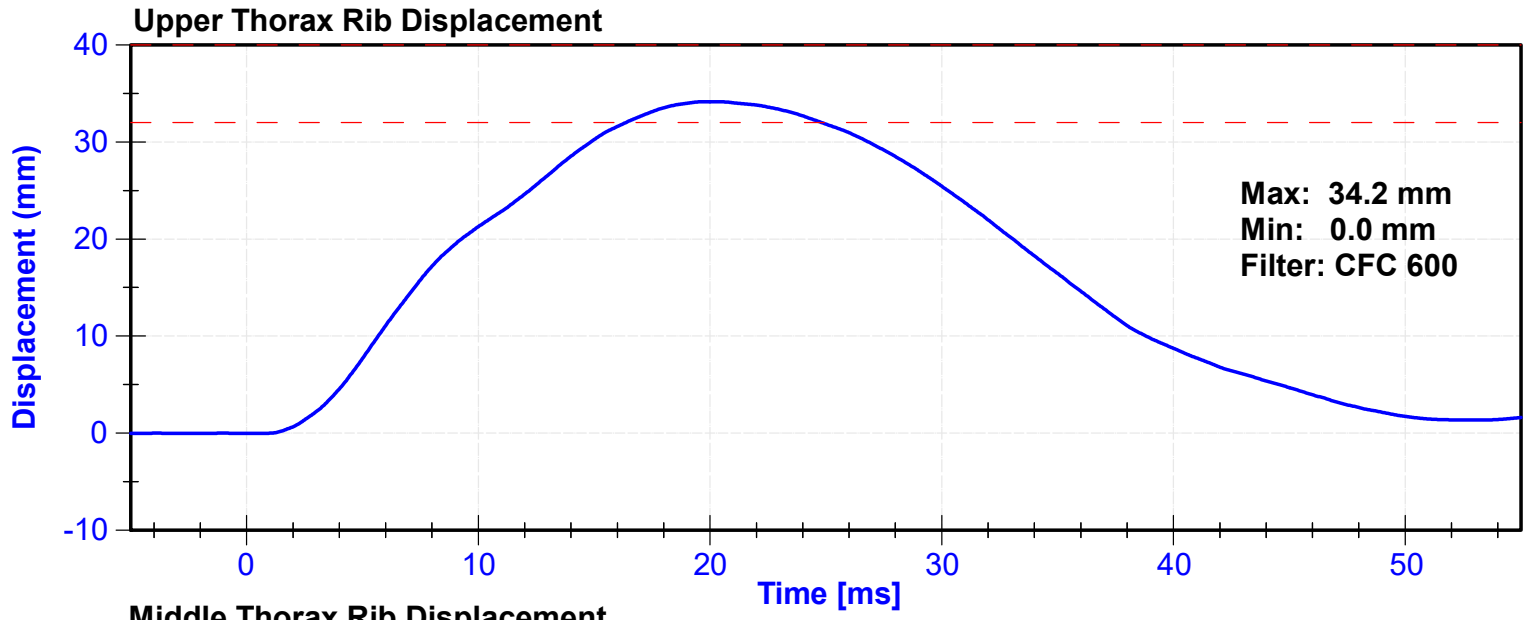
Results

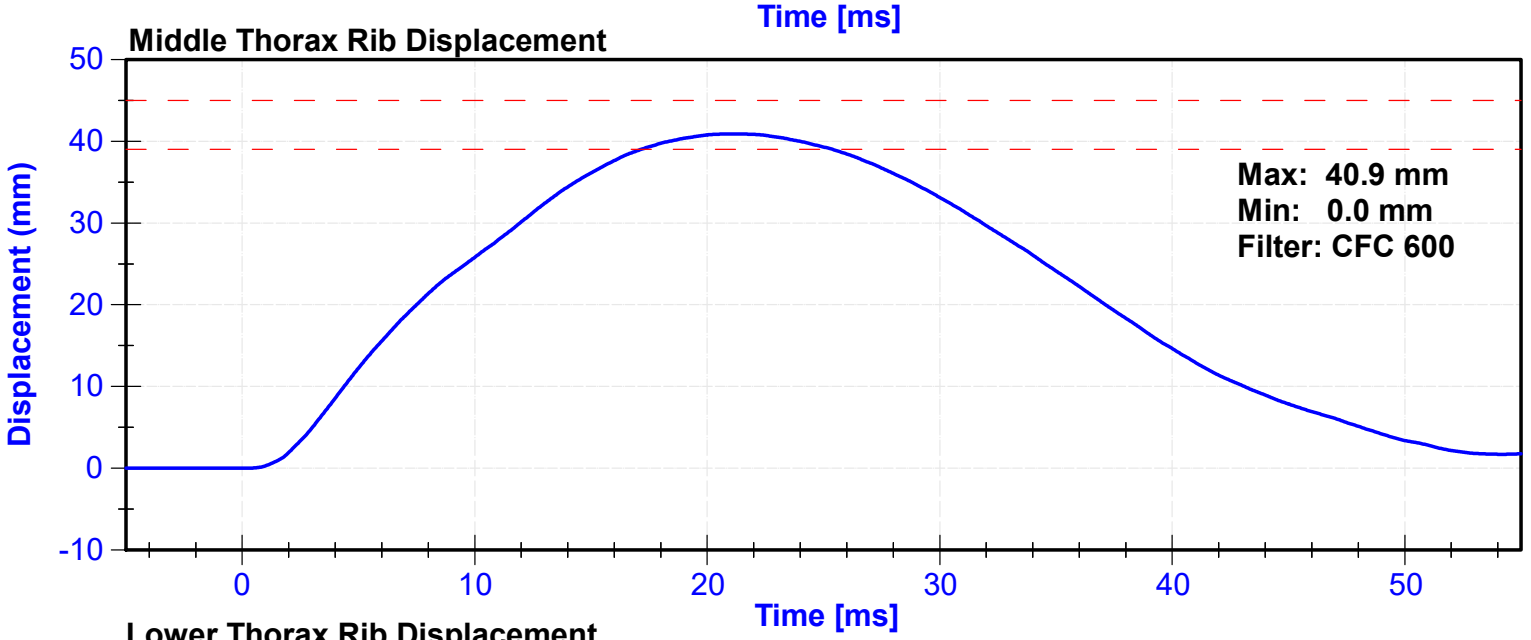
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.9	Pass
Humidity	10	70	%	61	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	14	18	g's	15.7	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.8	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.1	Pass
Upper Thorax Rib Deflection	32	40	mm	34.2	Pass
Middle Thorax Rib Deflection	39	45	mm	40.9	Pass
Lower Thorax Rib Deflection	35	43	mm	40.6	Pass

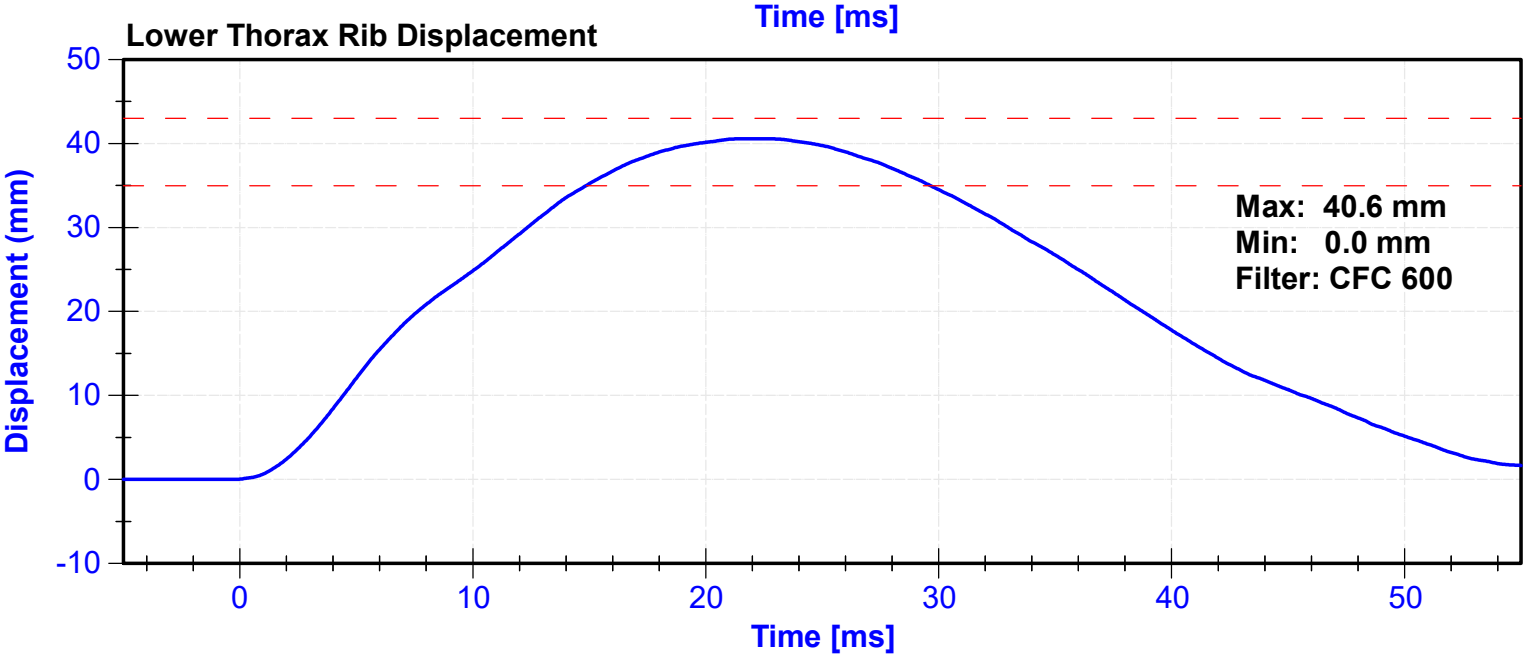
Transducer Calibrations

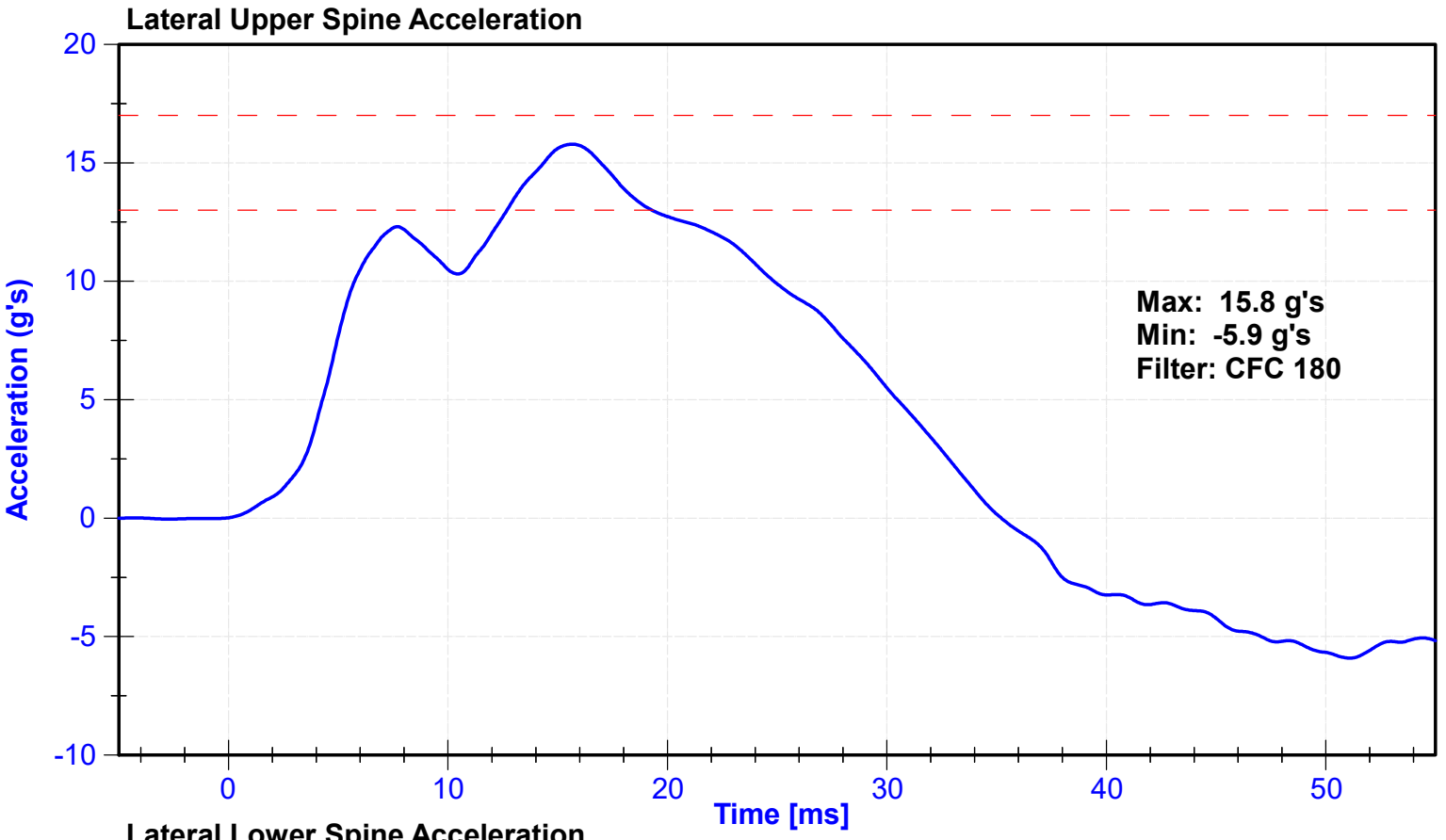
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Upper Spine Y Accelerometer	Endevco	P64148	6/30/2023	12/27/2023
Lower Spine Y Accelerometer	Endevco	P51327	6/30/2023	12/27/2023
Upper Thorax Rib Potentiometer	Servo	1199GFE	7/5/2023	1/3/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	7/5/2023	1/3/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	7/5/2023	1/3/2024

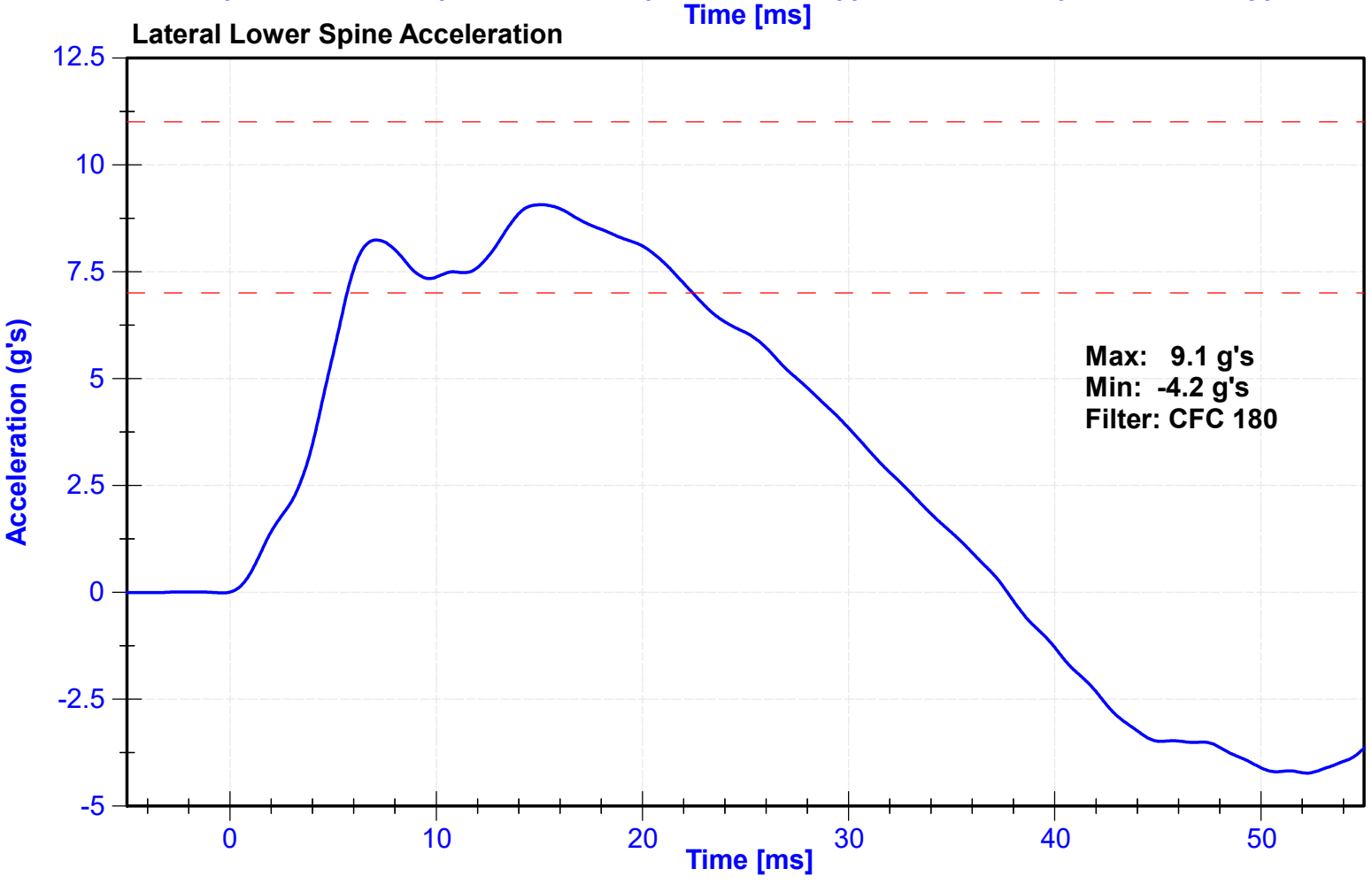



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 34.2 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.9 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.6 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 15.8 g's
Min: -5.9 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 9.1 g's
Min: -4.2 g's
Filter: CFC 180

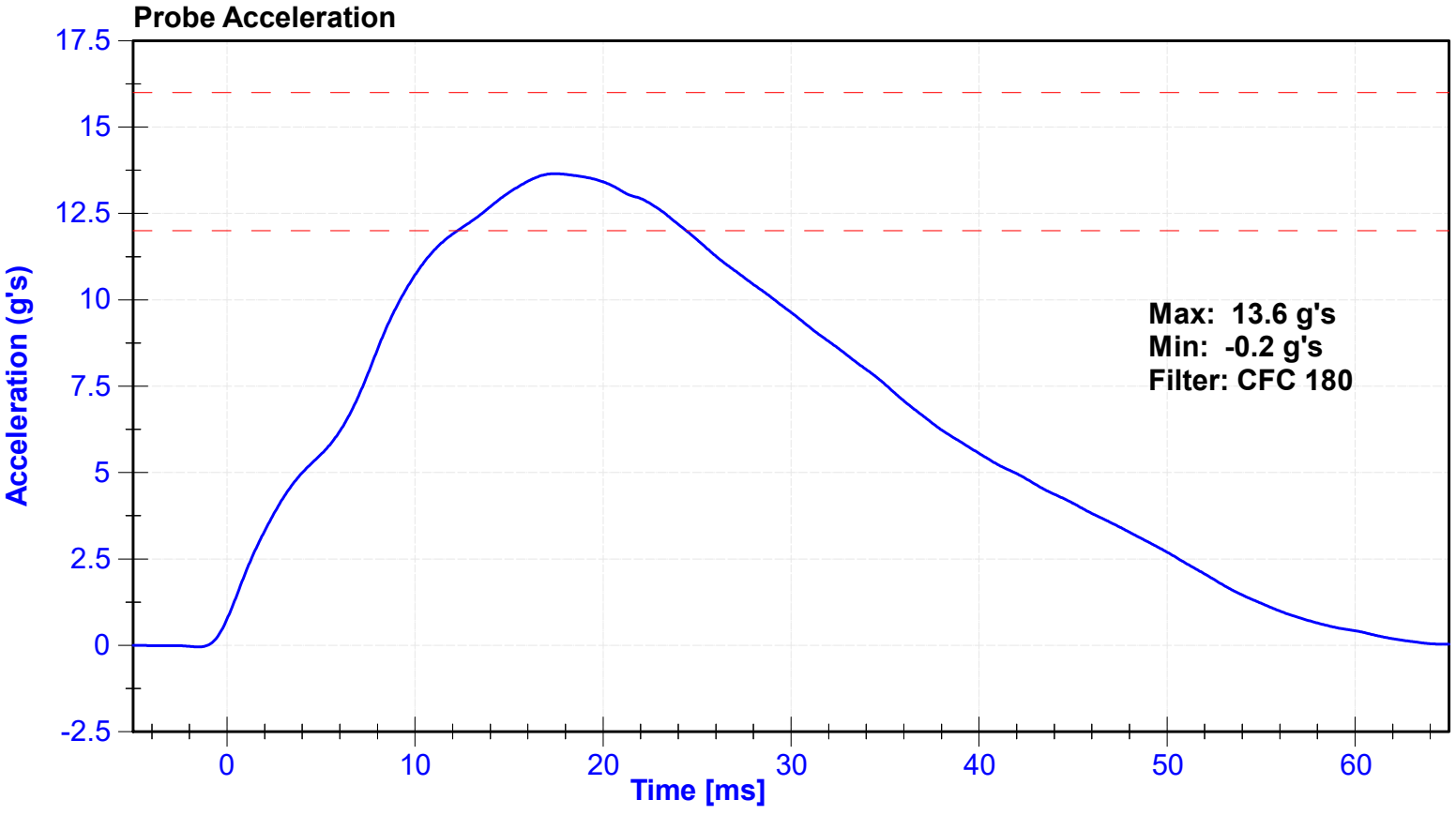
ATD Manufacturer	FTSS	Test Technician	J. Miller
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

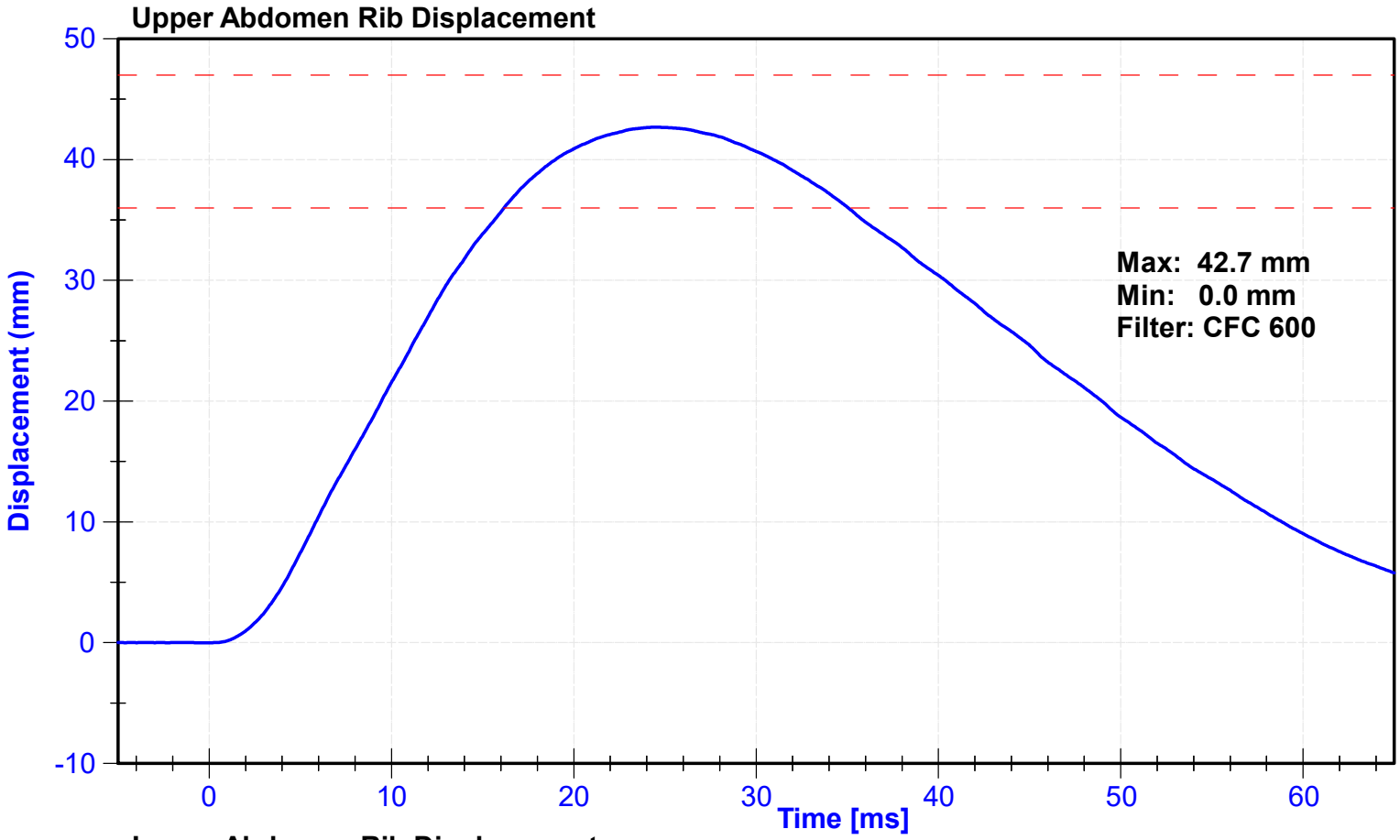
Results

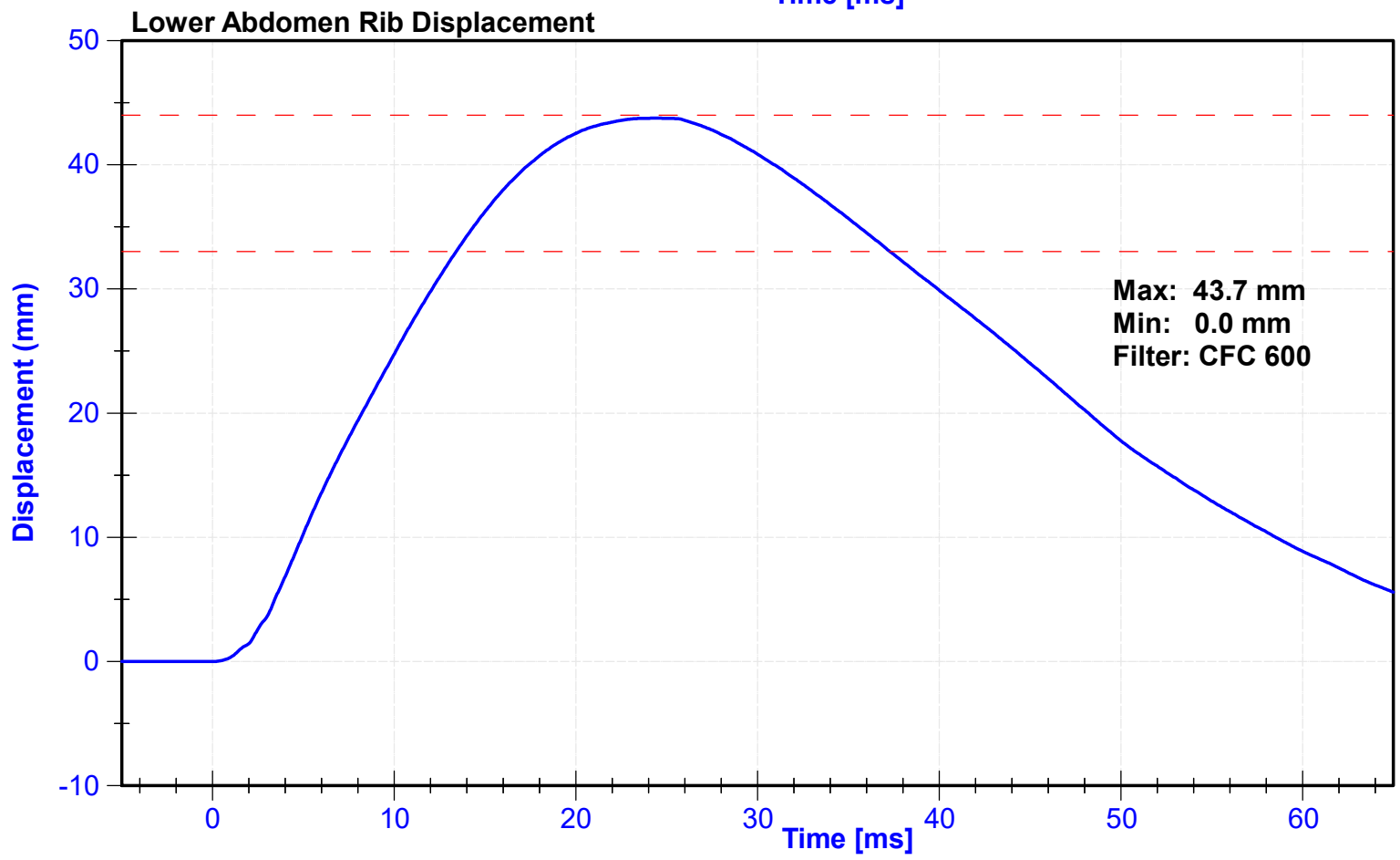
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	62	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	12	16	g's	13.6	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.8	Pass
Upper Abdomen Rib Deflection	36	47	mm	42.7	Pass
Lower Abdomen Rib Deflection	33	44	mm	43.7	Pass

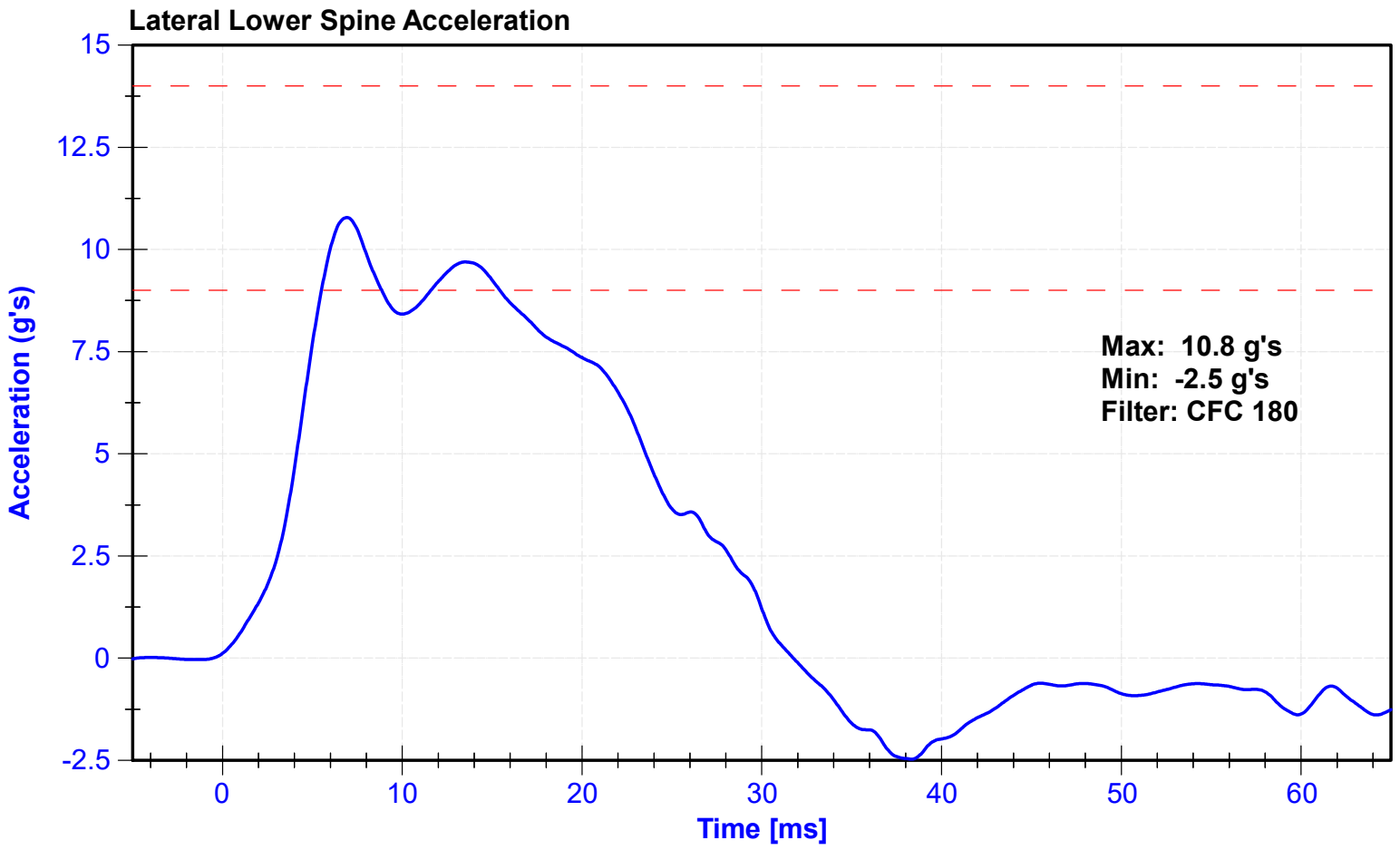
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Lower Spine Y Accelerometer	Endevco	P51327	6/30/2023	12/27/2023
Upper Abdomen Rib Potentiometer	Servo	008GFE	7/5/2023	1/3/2024
Lower Abdomen Rib Potentiometer	Servo	041 GFE	7/5/2023	1/3/2024




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 42.7 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: 43.7 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
0
10
20
30
40
50
60
Time [ms]
Max: 10.8 g's
Min: -2.5 g's
Filter: CFC 180

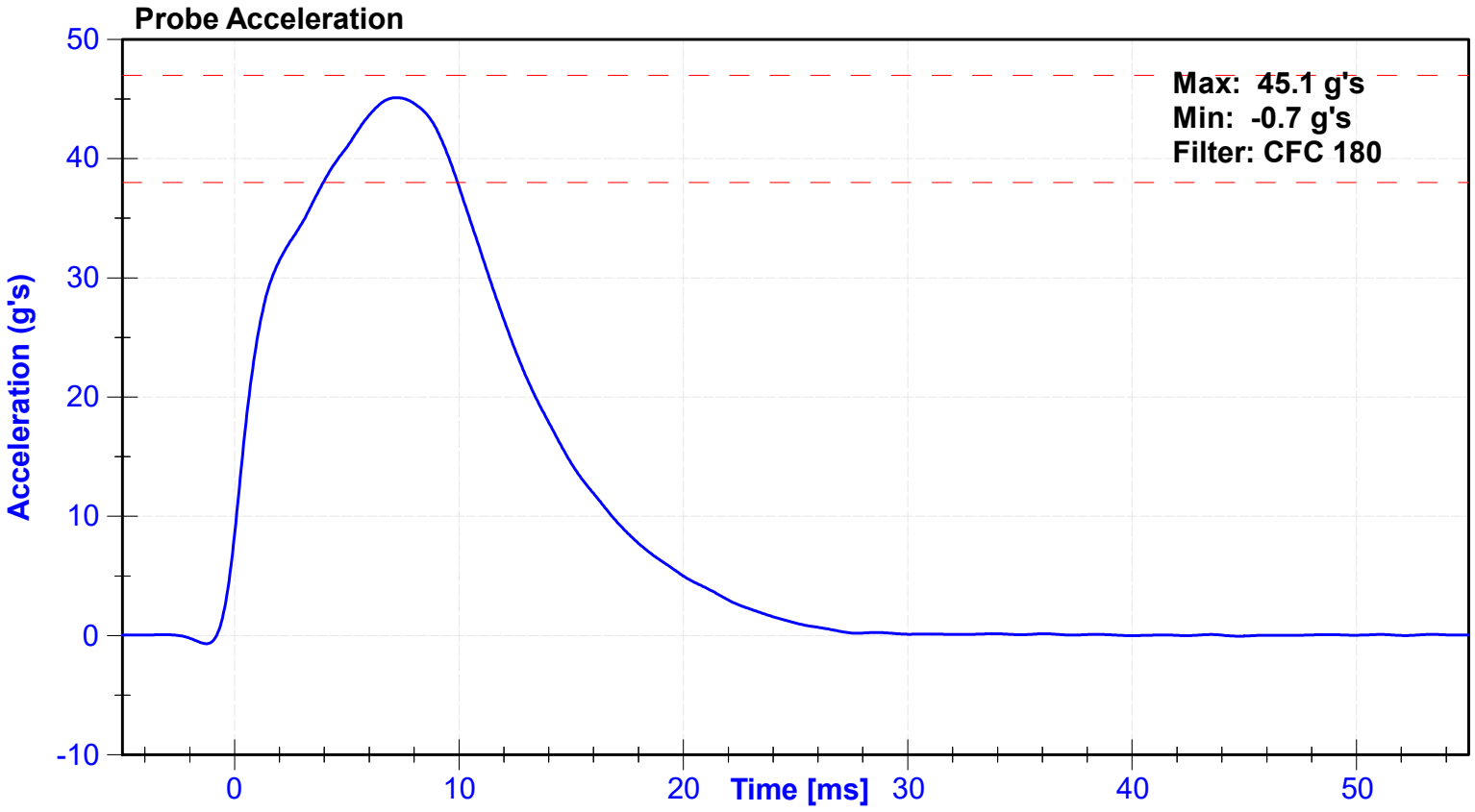
ATD Manufacturer	FTSS	Test Technician	J. Miller
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

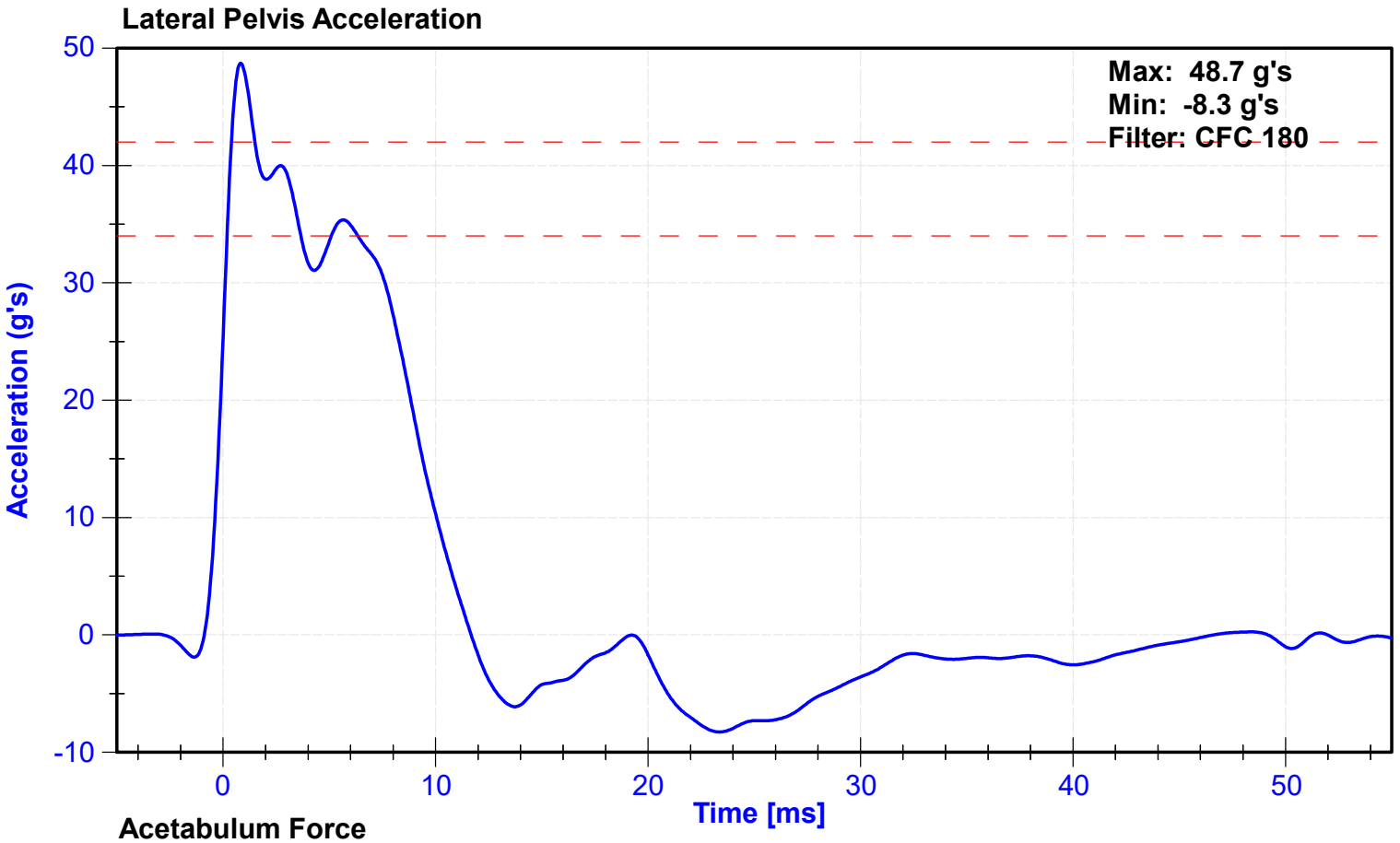
Results

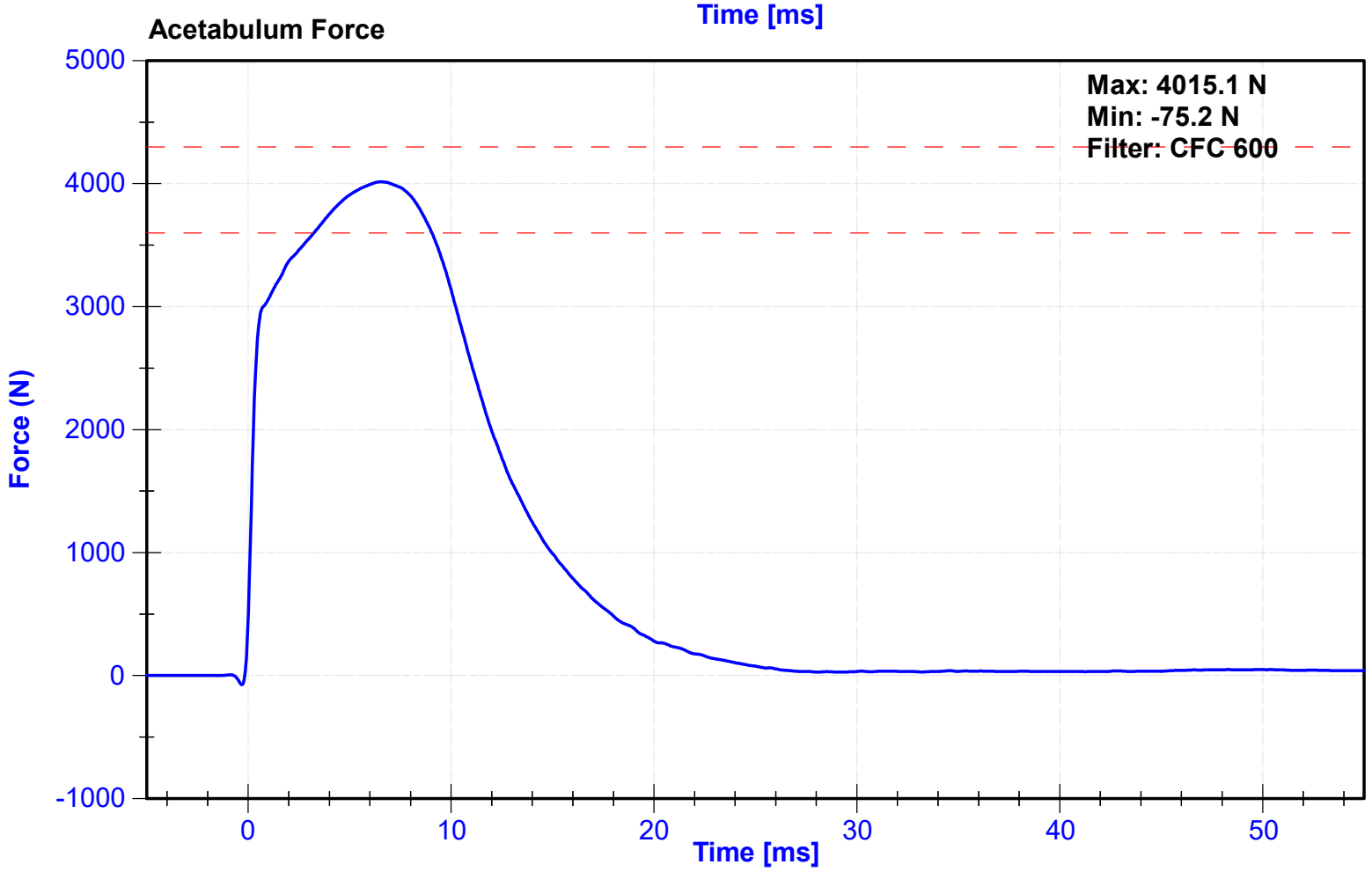
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	65	Pass
Velocity	6.6	6.8	m/s	6.66	Pass
Probe Acceleration	38	47	g's	45.1	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	34.9	Pass
Acetabulum Force	3600	4300	N	4015.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Pelvis Y Accelerometer	Endevco	P51875	6/30/2023	12/27/2023
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: 48.7 g's
Min: -8.3 g's
Filter: CFC 180
Acceleration (g's)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Acetabulum Force
Max: 4015.1 N
Min: -75.2 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 16321 CERT 7-28-23
Test Number 22887
Report Number 22944
Test Date 5/20/2022 11:09:08 AM

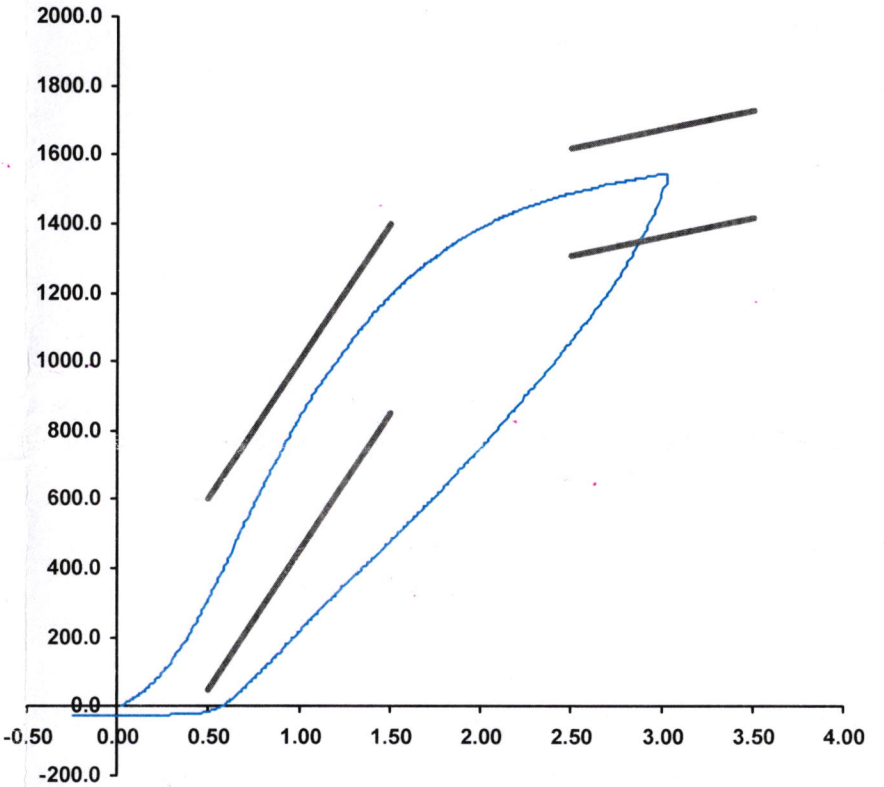
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	318	50	600
Force @ 1.5 mm (N)	1,192	850	1,400
Force @ 2.5 mm (N)	1,488	1,306	1,618
Force @ 3.0 mm (N)	1,545	1,361	1,673

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

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

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 20-May-22
SACO Research

By : DC Date : 5/20/2022

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

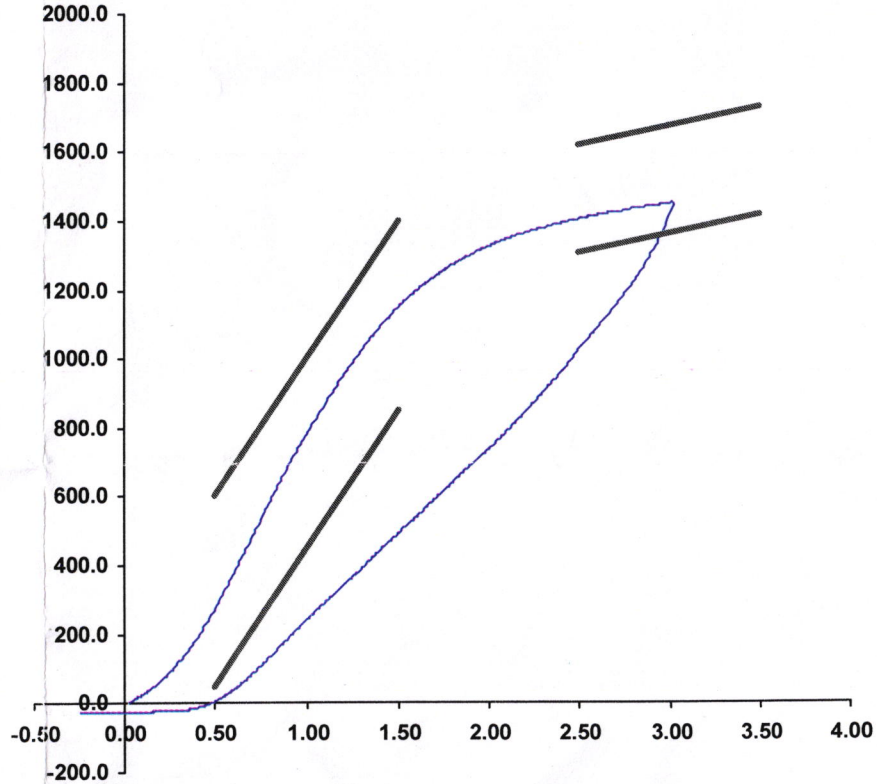
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 14243 CRASH 7/14/23
Test Number 14384
Report Number 14428
Test Date 7/3/2020 9:46:39 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	283.56	50.00	600.00
Force @ 1.5 mm (N)	1,150.02	850.00	1,400.00
Force @ 2.5 mm (N)	1,402.92	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,447.64	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 03-Jul-20
SACO Research

By : DC Date : 7/3/2020

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

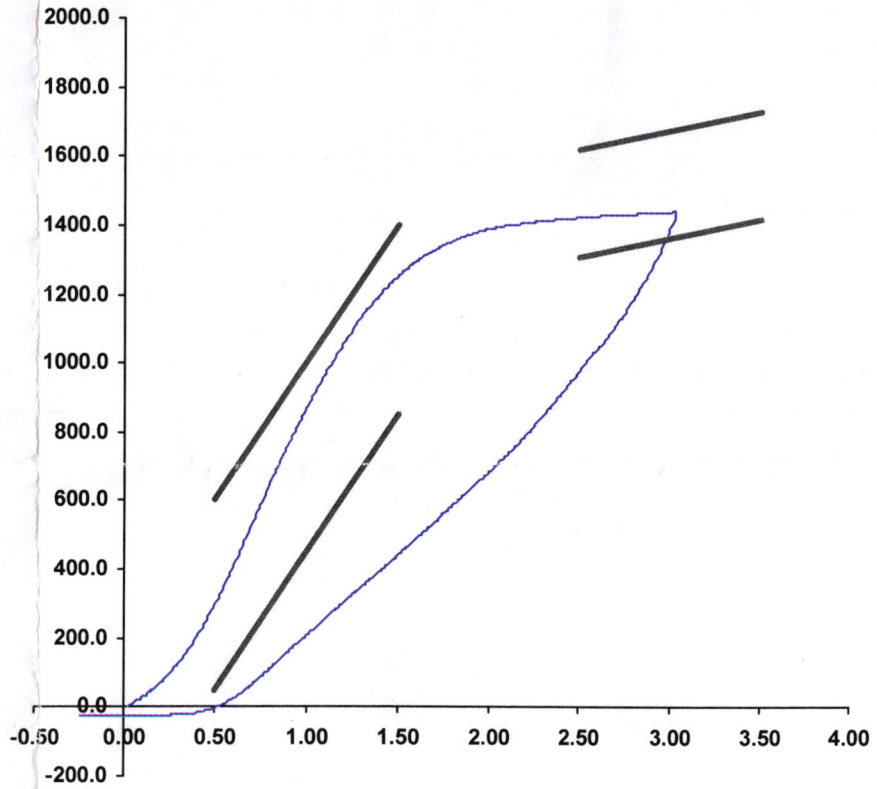
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 14229 NON IMPACT 7-14-23
Test Number 14369
Report Number 14413
Test Date 7/3/2020 9:21:27 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	308.56	50.00	600.00
Force @ 1.5 mm (N)	1,252.79	850.00	1,400.00
Force @ 2.5 mm (N)	1,420.47	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,436.47	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 03-Jul-20
SACO Research

By : DC Date : 7/3/2020

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

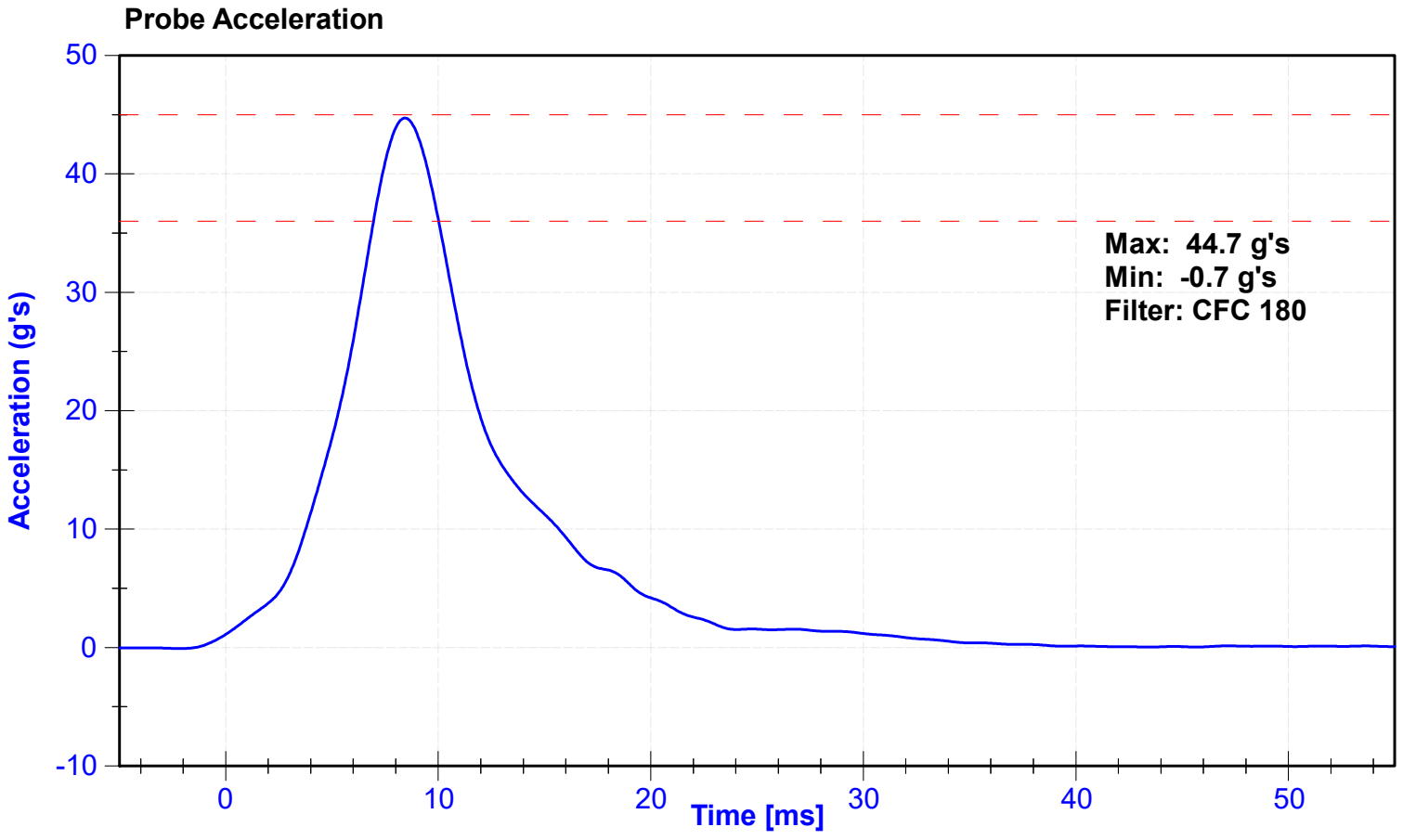
ATD Manufacturer	FTSS	Test Technician	J. Miller
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

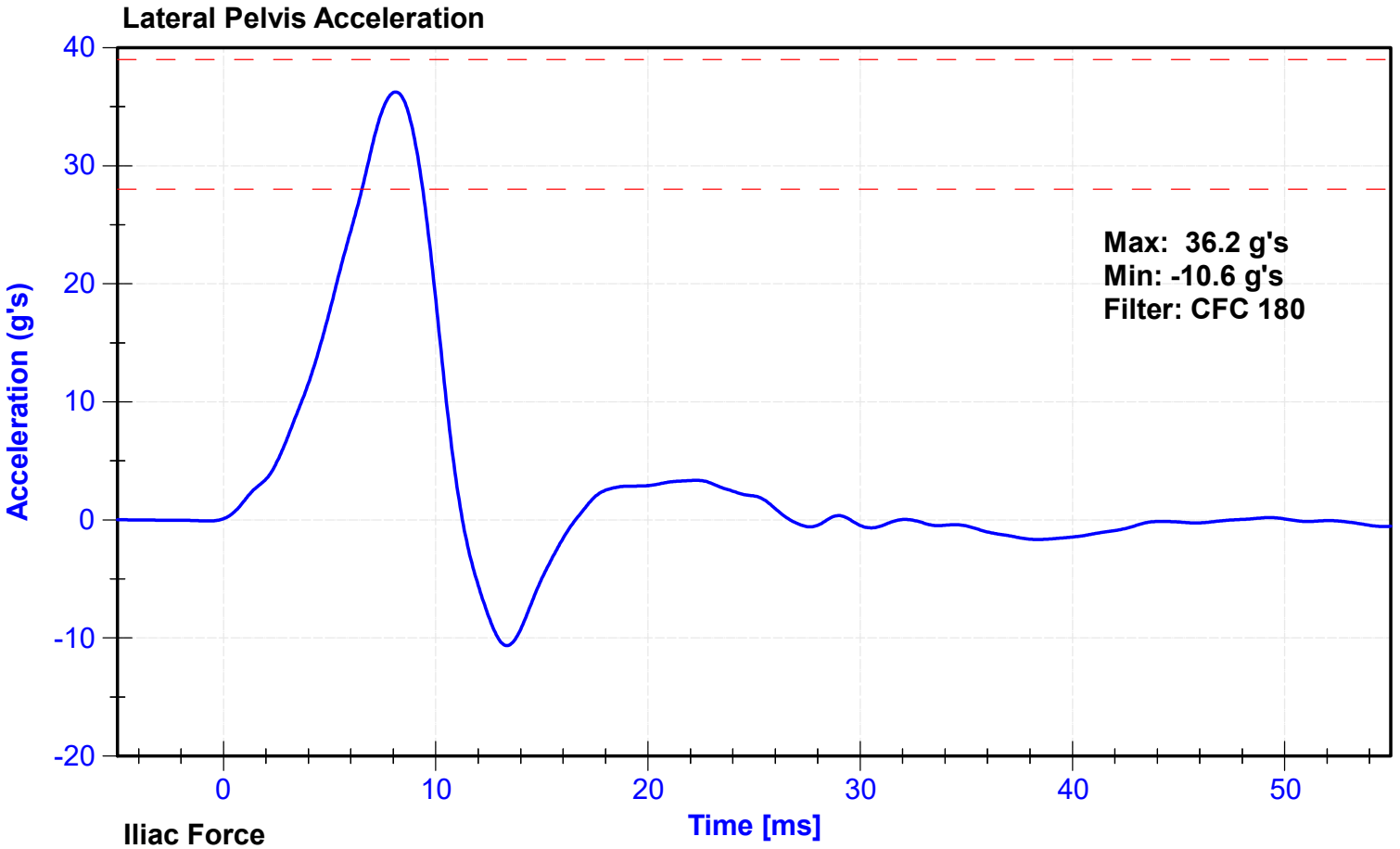
Results

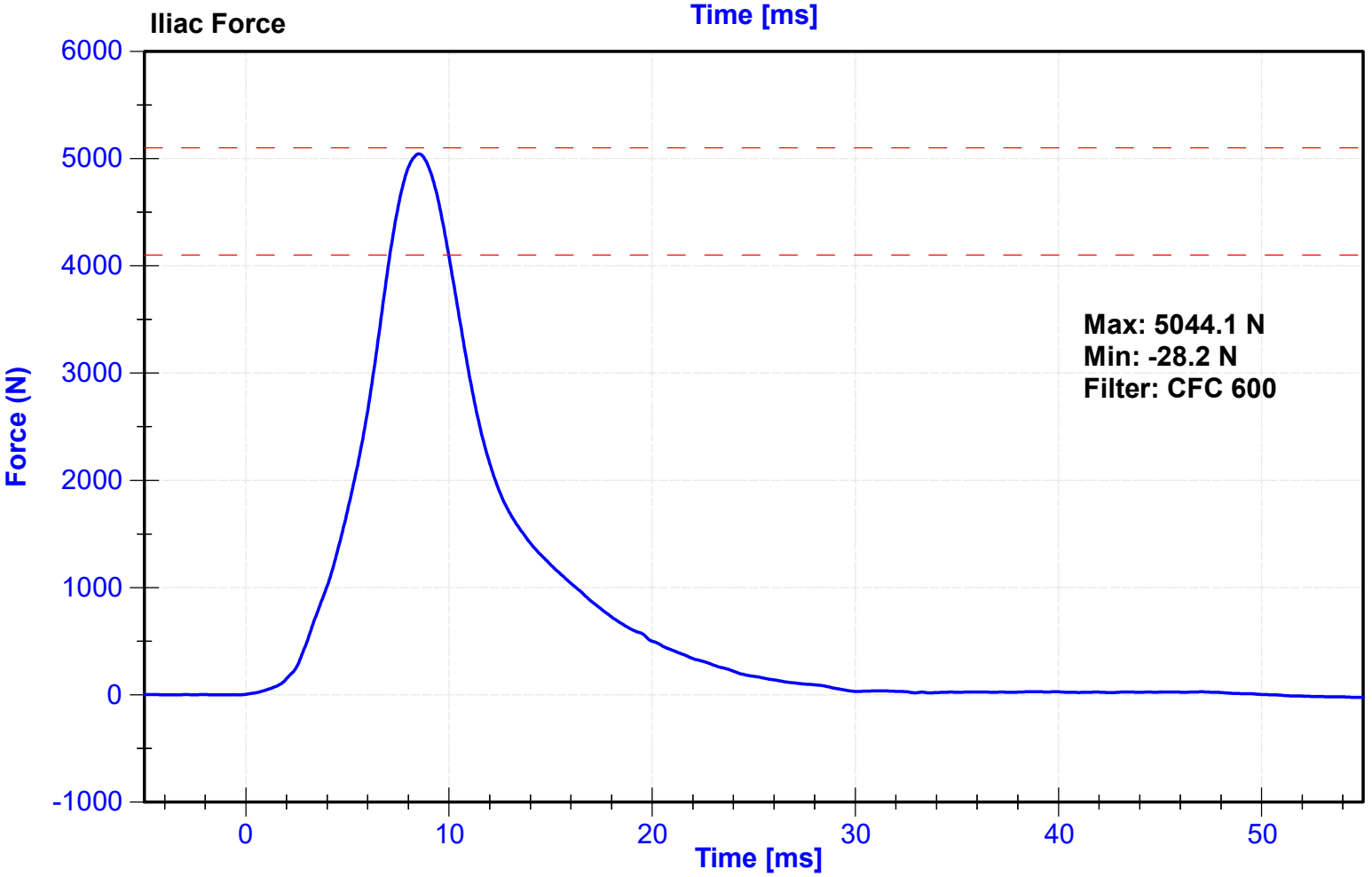
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	65	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	36	45	g's	44.7	Pass
Lateral Pelvis Acceleration	28	39	g's	36.2	Pass
Iliac Force	4100	5100	N	5044.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Pelvis Y Accelerometer	Endevco	P51875	6/30/2023	12/27/2023
Iliac Load Cell	Denton	290-FY	8/11/2022	8/11/2023




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 36.2 g's
Min: -10.6 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: 5044.1 N
Min: -28.2 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

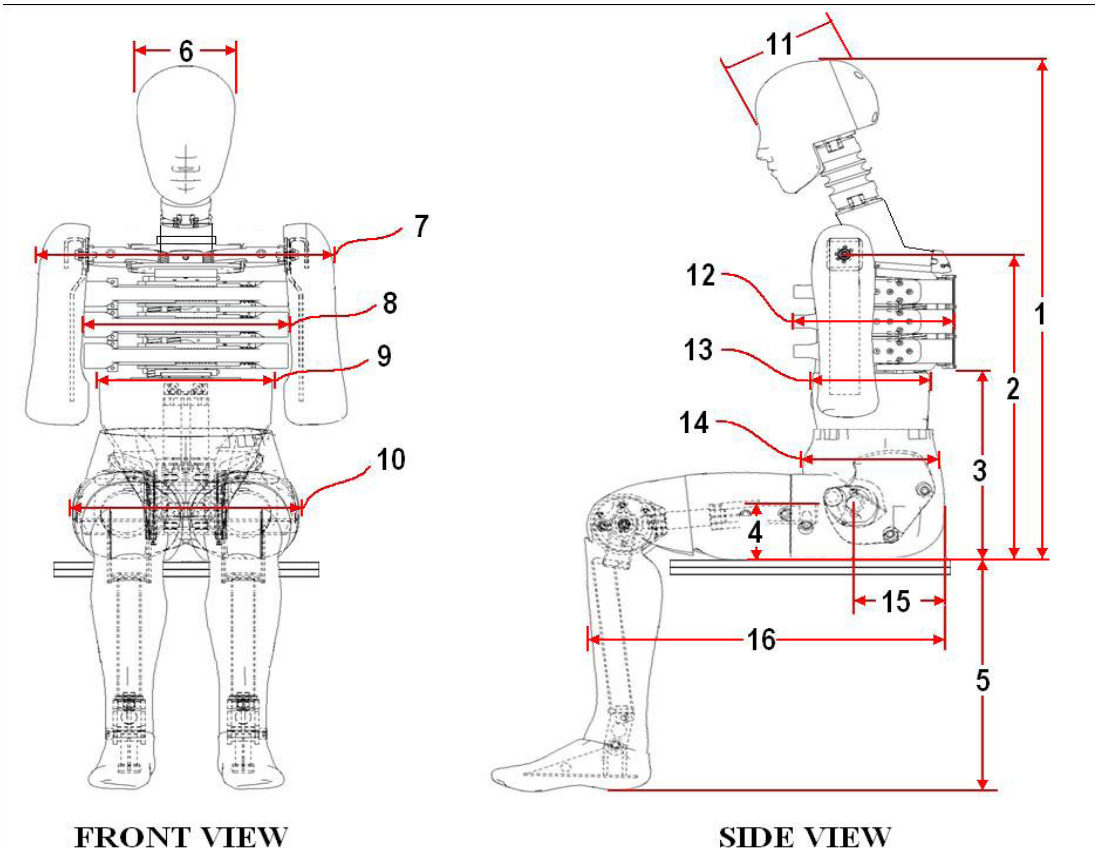
SERIAL NO:F033

(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - EuroSID-2re

Technician: K. Brogan Date: 08/04/2023

Dummy Serial Number: F033



FRONT VIEW SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	914	Pass
2	Seat to Shoulder Joint	558	572	567	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	351	Pass
4	Seat to Hip Joint (center of bolt)	97	103	99	Pass
5	Sole to Seat, Sitting	333	451	424	Pass
6	Head Width	152	158	156	Pass
7	Shoulder/Arm Width	461	479	472	Pass
8	Thorax Width	322	332	329	Pass
9	Abdomen Width	273	287	280	Pass
10	Pelvis Lap Width	359	373	369	Pass
11	Head Depth	196	206	201	Pass
12	Thorax Depth	262	272	266	Pass
13	Abdomen Depth	194	204	201	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	609	Pass

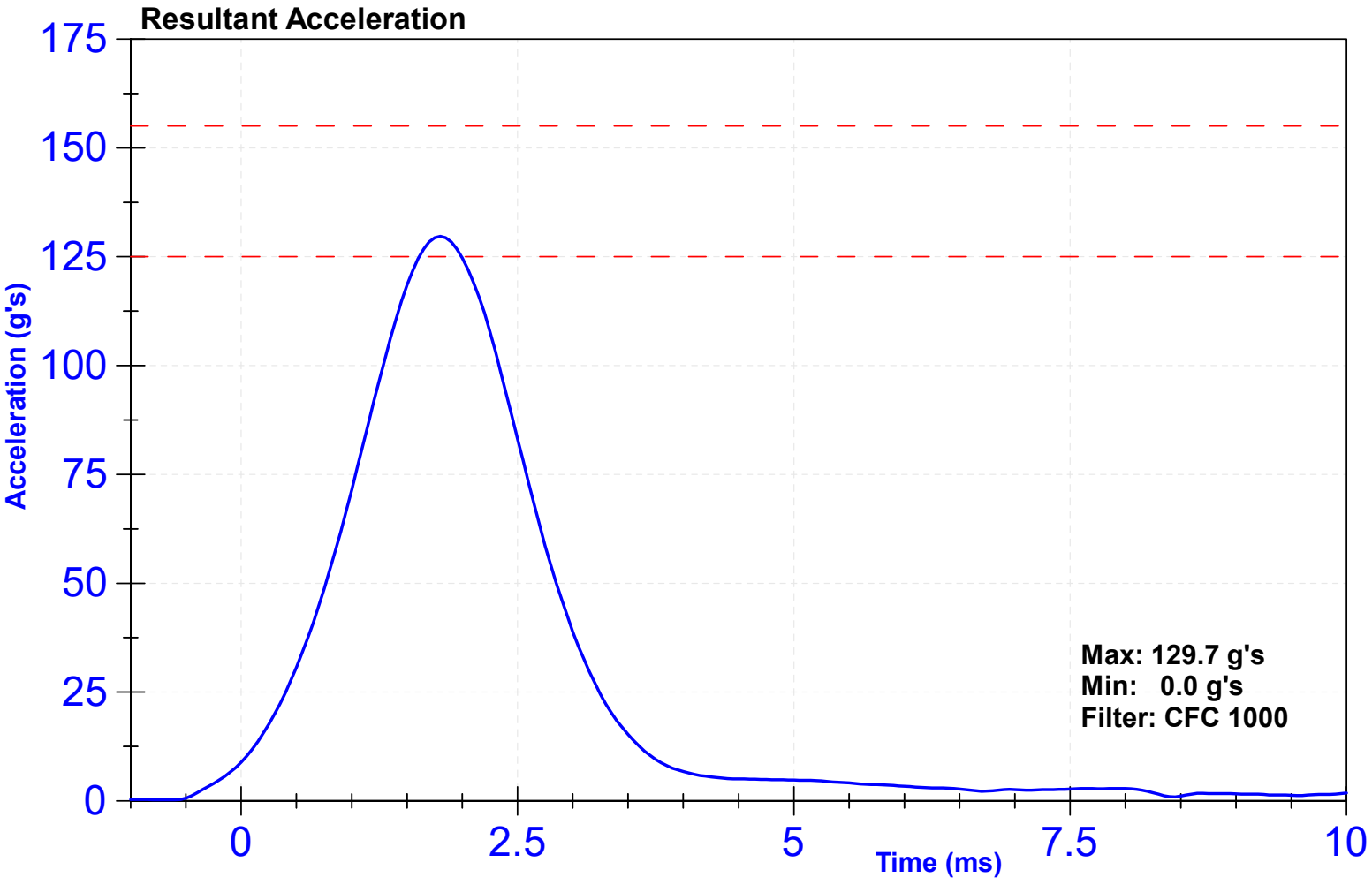
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

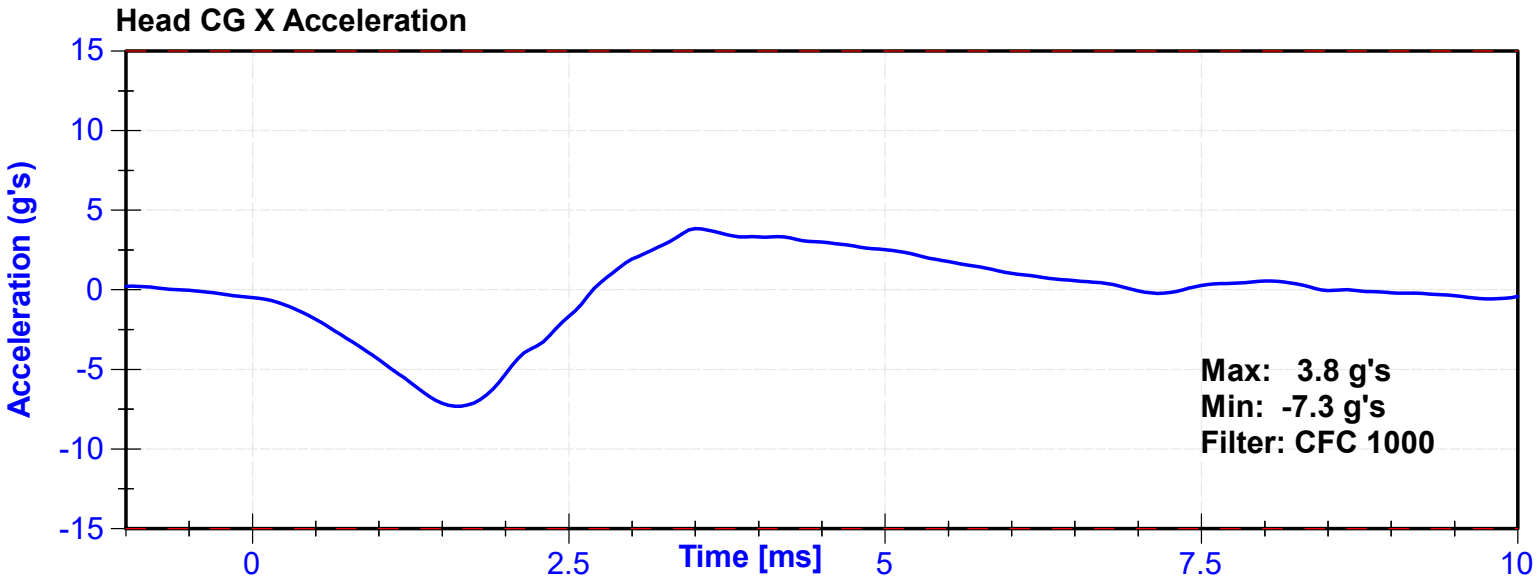
Results

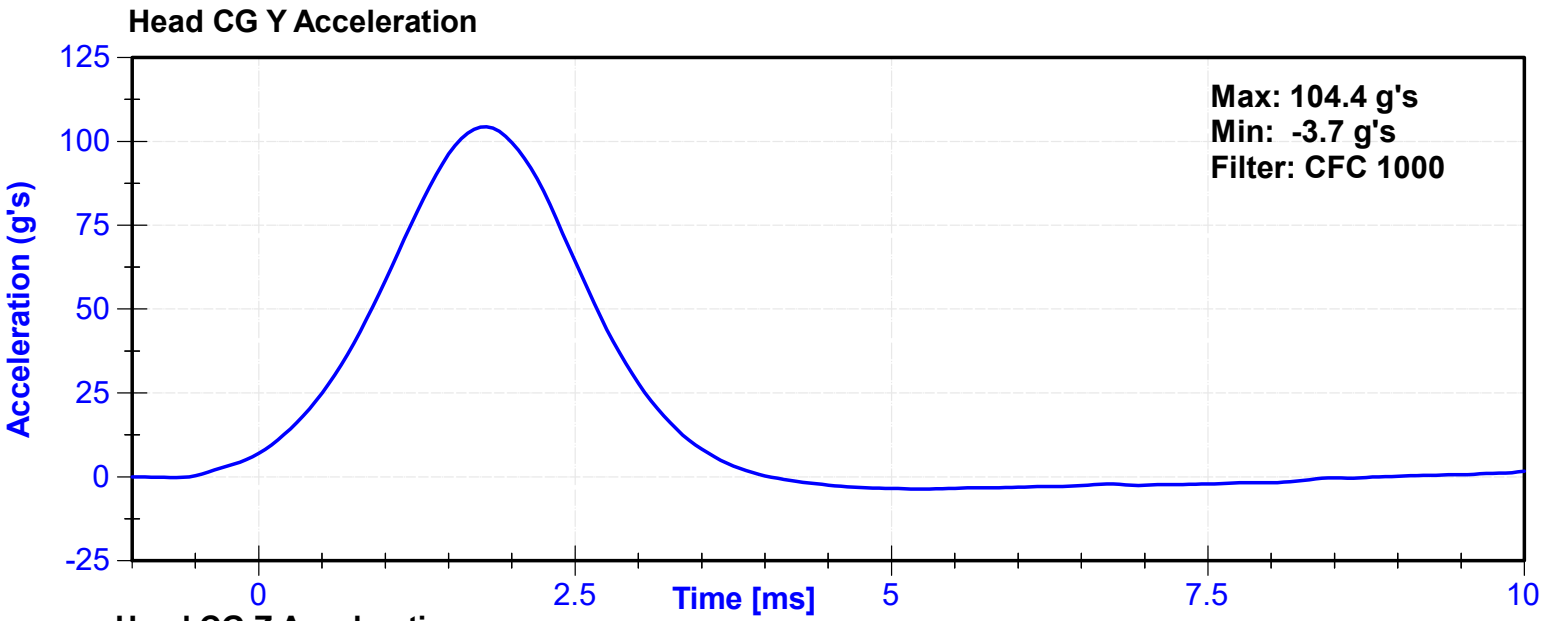
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	48	Pass
Resultant Acceleration	125	155	g's	129.7	Pass
Oscillation	0	15	%	2.75	Pass
Fore-Aft Acceleration	-15	15	g's	-7.3	Pass

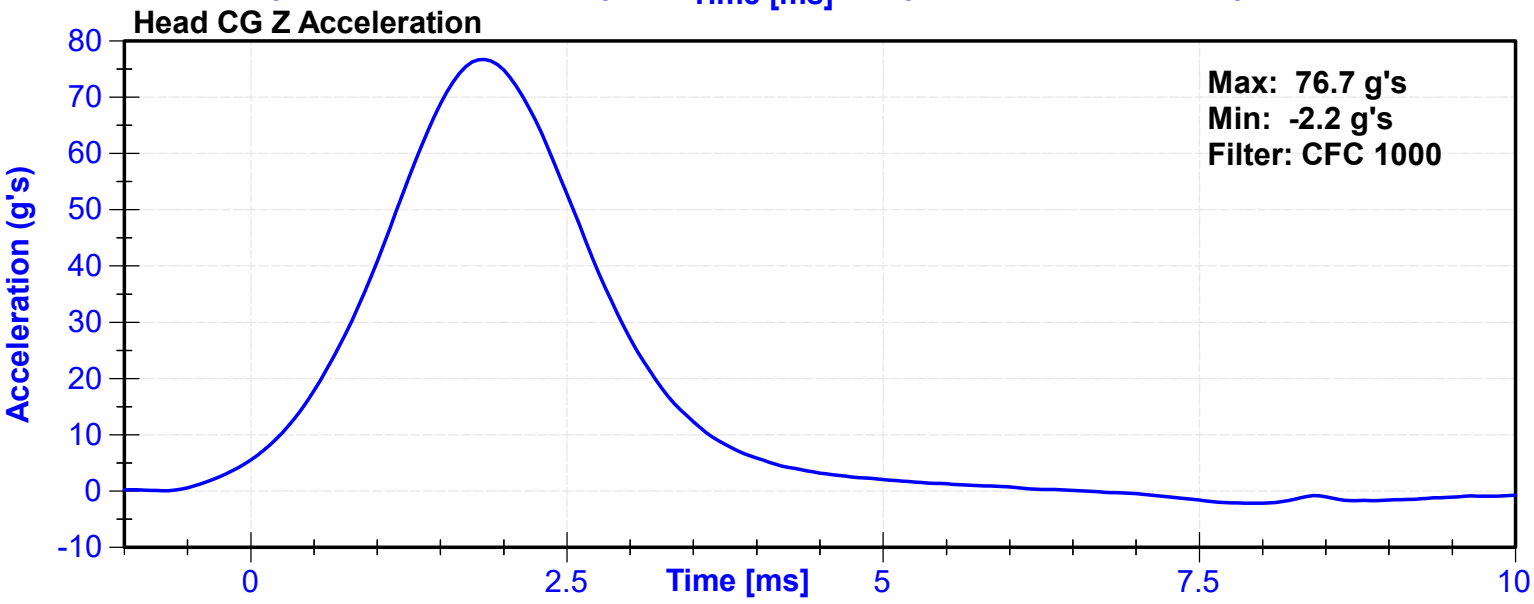
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P63861	6/20/2023	12/17/2023
Y Accelerometer	Endevco	P49216	6/20/2023	12/17/2023
Z Accelerometer	Endevco	P51303	6/19/2023	12/16/2023




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 3.8 g's
Min: -7.3 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: 104.4 g's
Min: -3.7 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: 76.7 g's
Min: -2.2 g's
Filter: CFC 1000

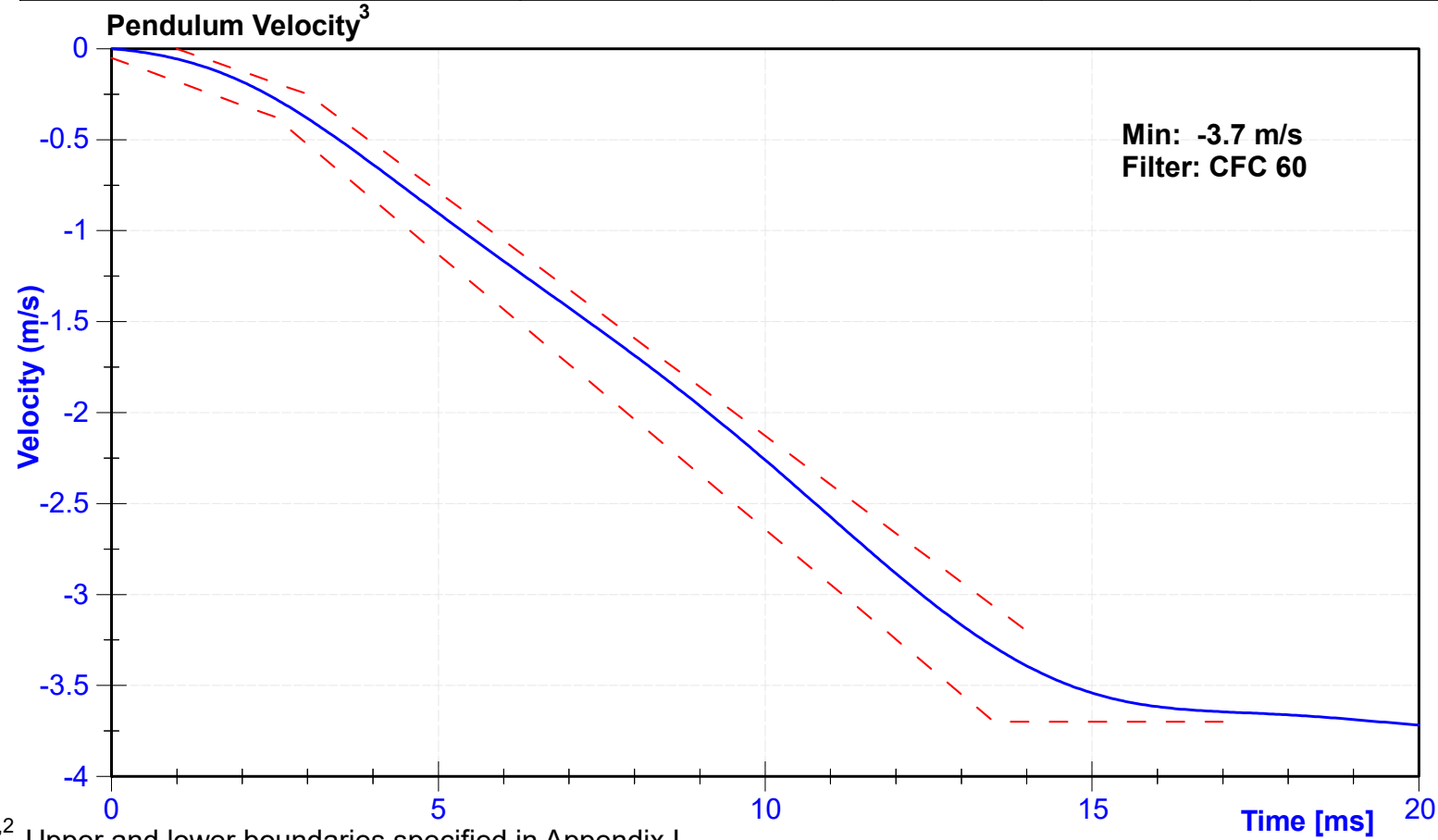
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

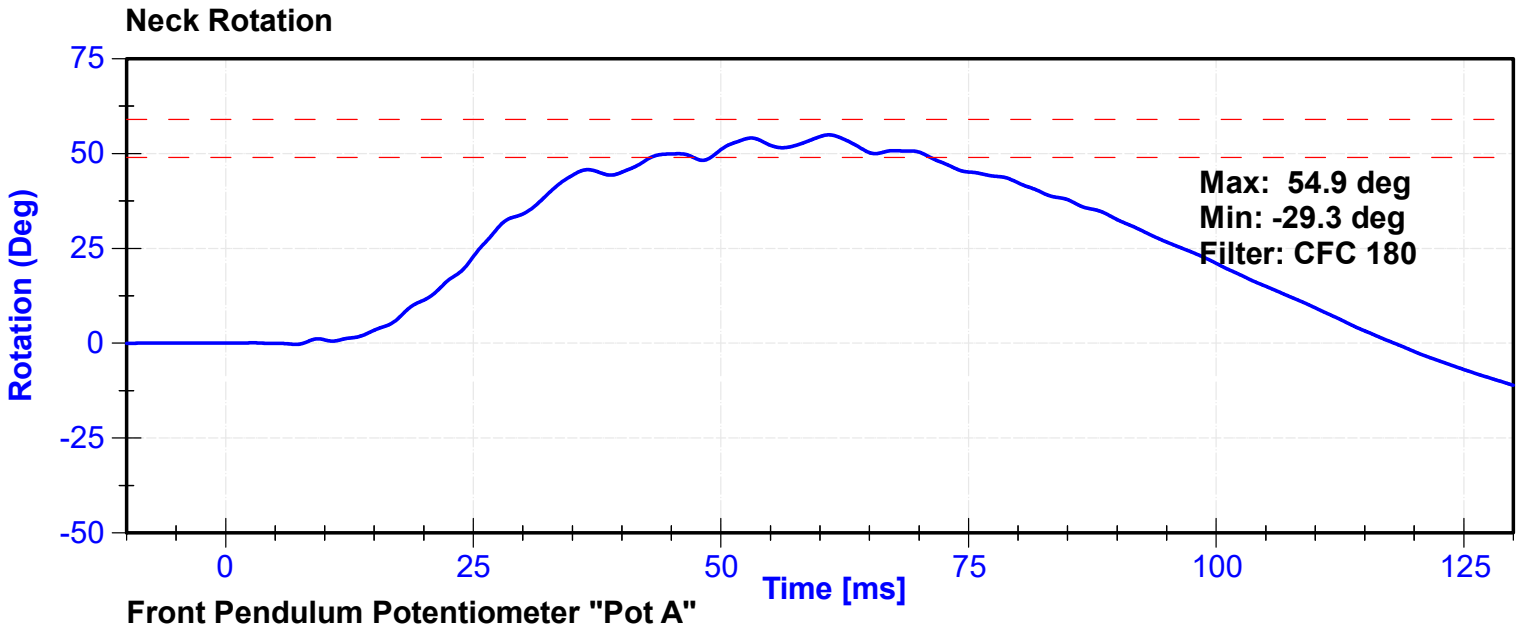
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	55	Pass
Velocity	3.3	3.5	m/s	3.43	Pass
Lateral Neck Rotation	49	59	deg	54.9	Pass
Time at Maximum Rotation	54	66	ms	60.9	Pass
Time of Rotation Decay from Maximum	53	88	ms	57.1	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

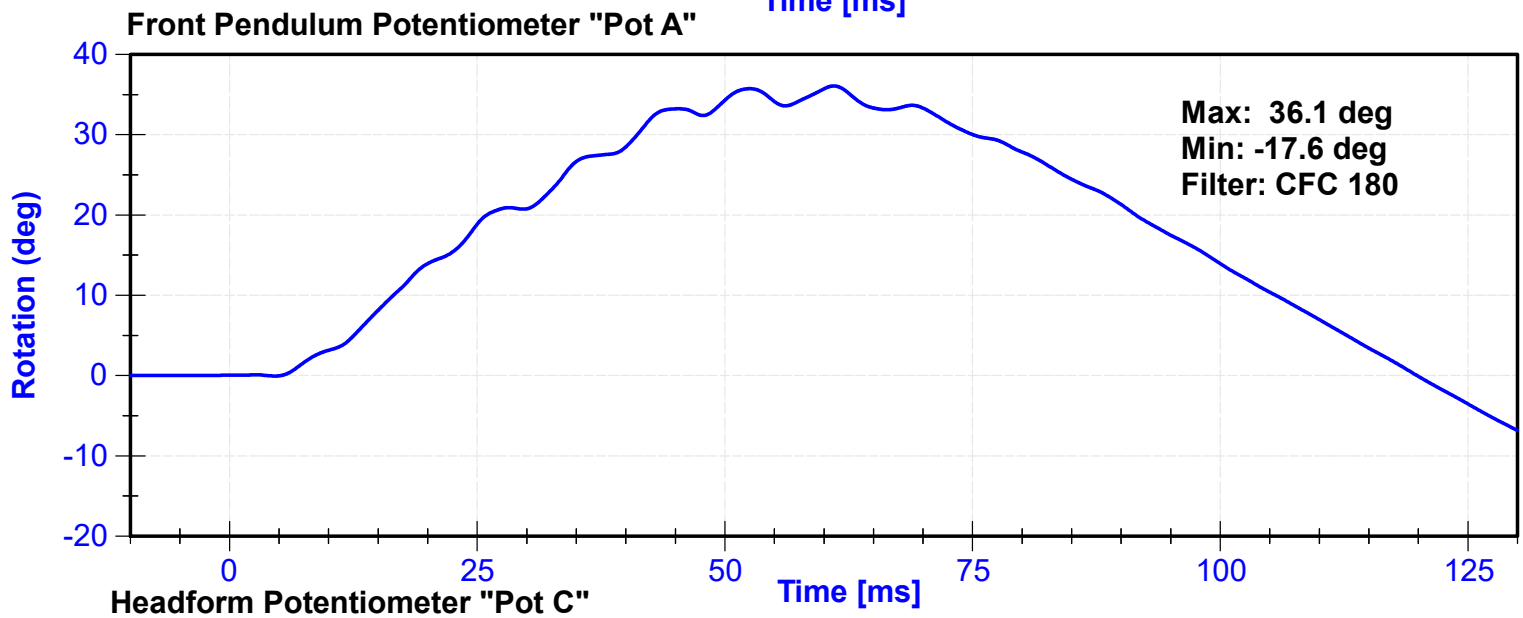
Transducer Calibrations

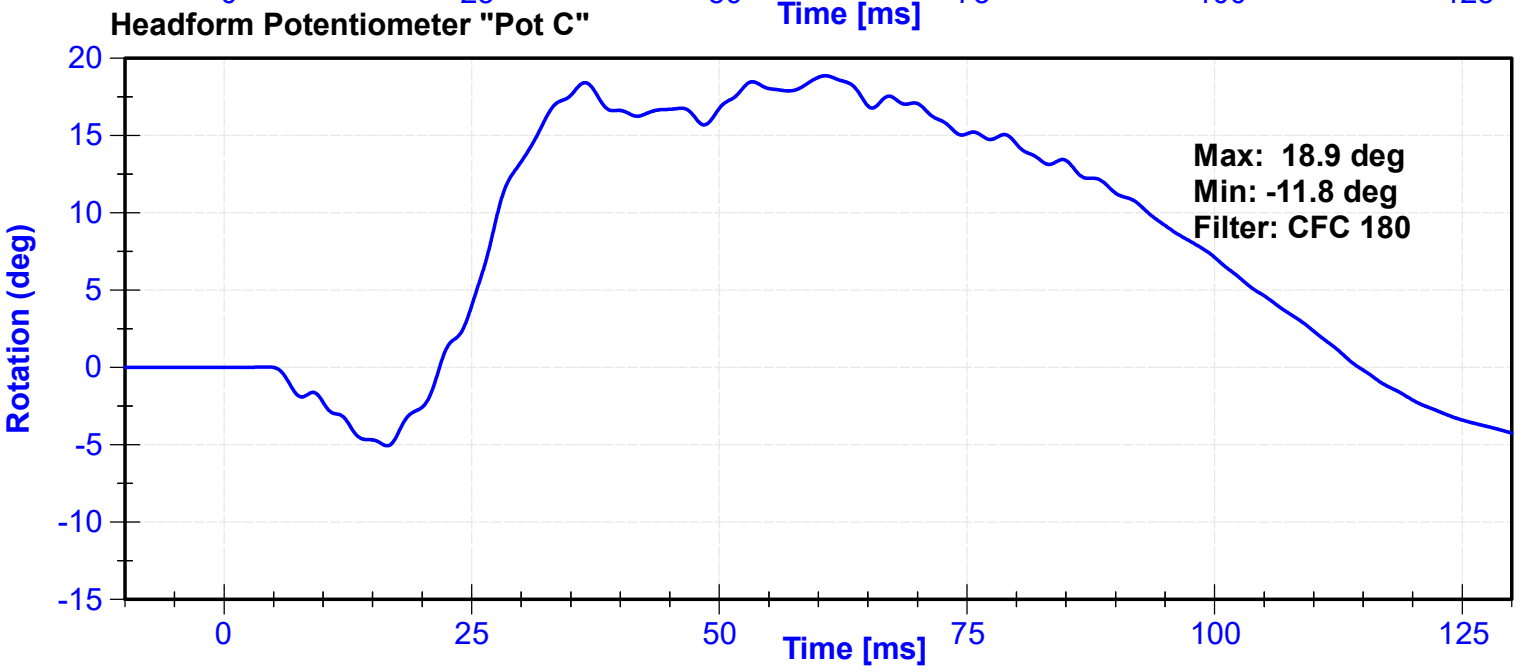
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/26/2022	10/26/2023
Front Pendulum Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Headform Potentiometer	Sfernice	095	10/5/2022	10/5/2023



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


Neck Rotation
Rotation (Deg)
Time [ms]
Max: 54.9 deg
Min: -29.3 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 36.1 deg
Min: -17.6 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 18.9 deg
Min: -11.8 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

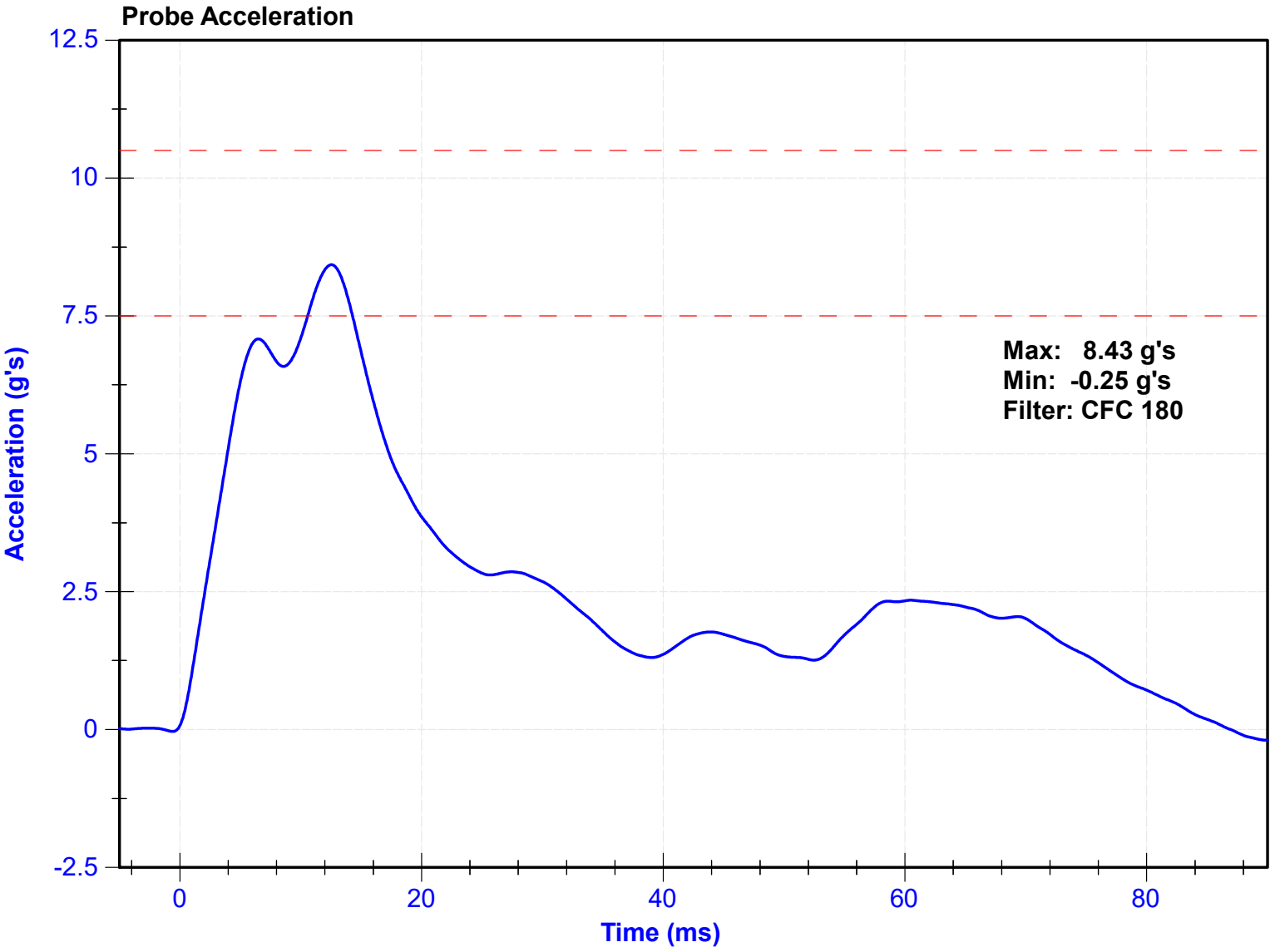
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	59.4	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	7.5	10.5	g's	8.43	Pass

Transducer Calibrations

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



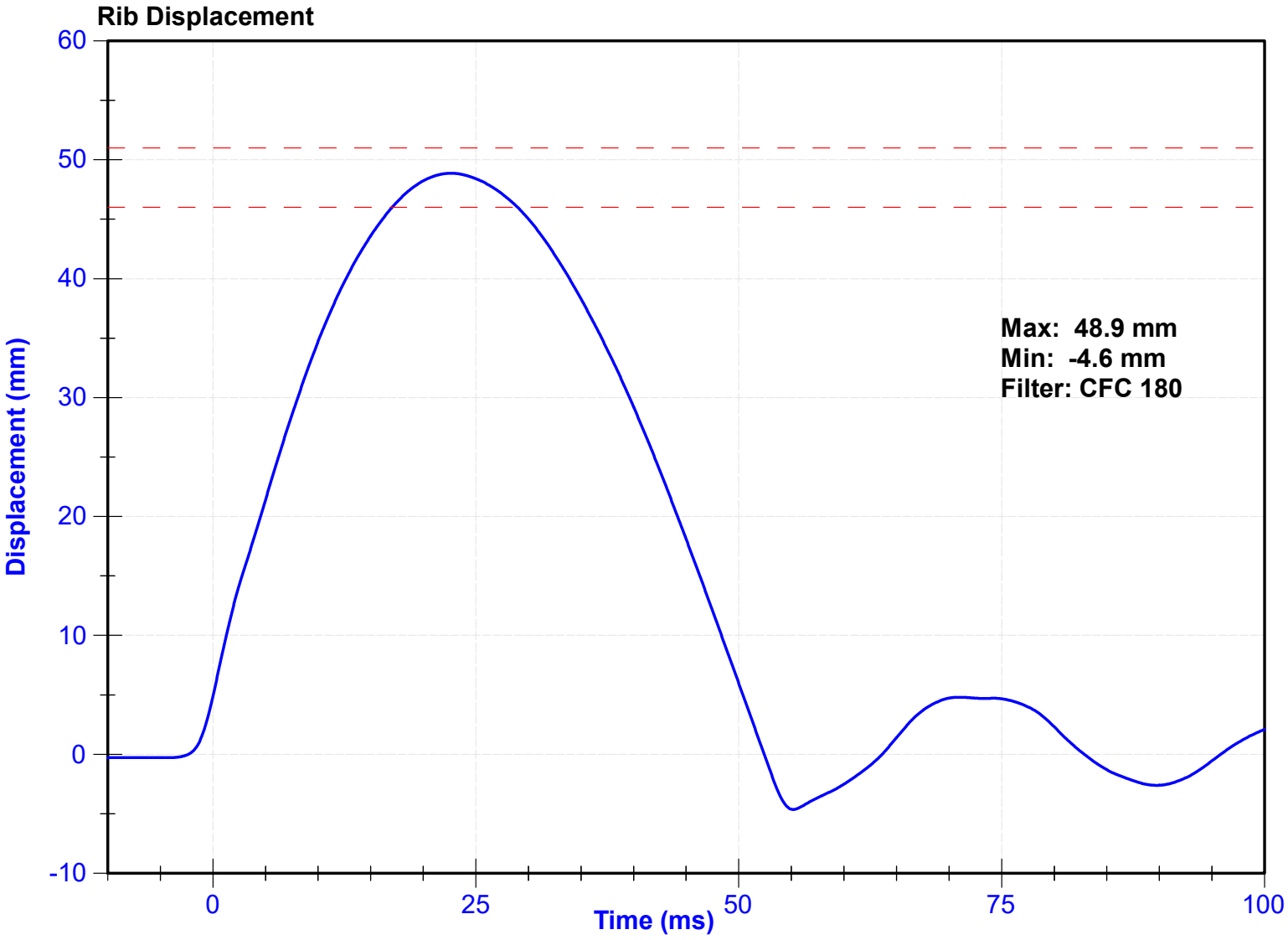
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	48	Pass
Rib Displacement	46	51	mm	48.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	6/20/2023	12/19/2023



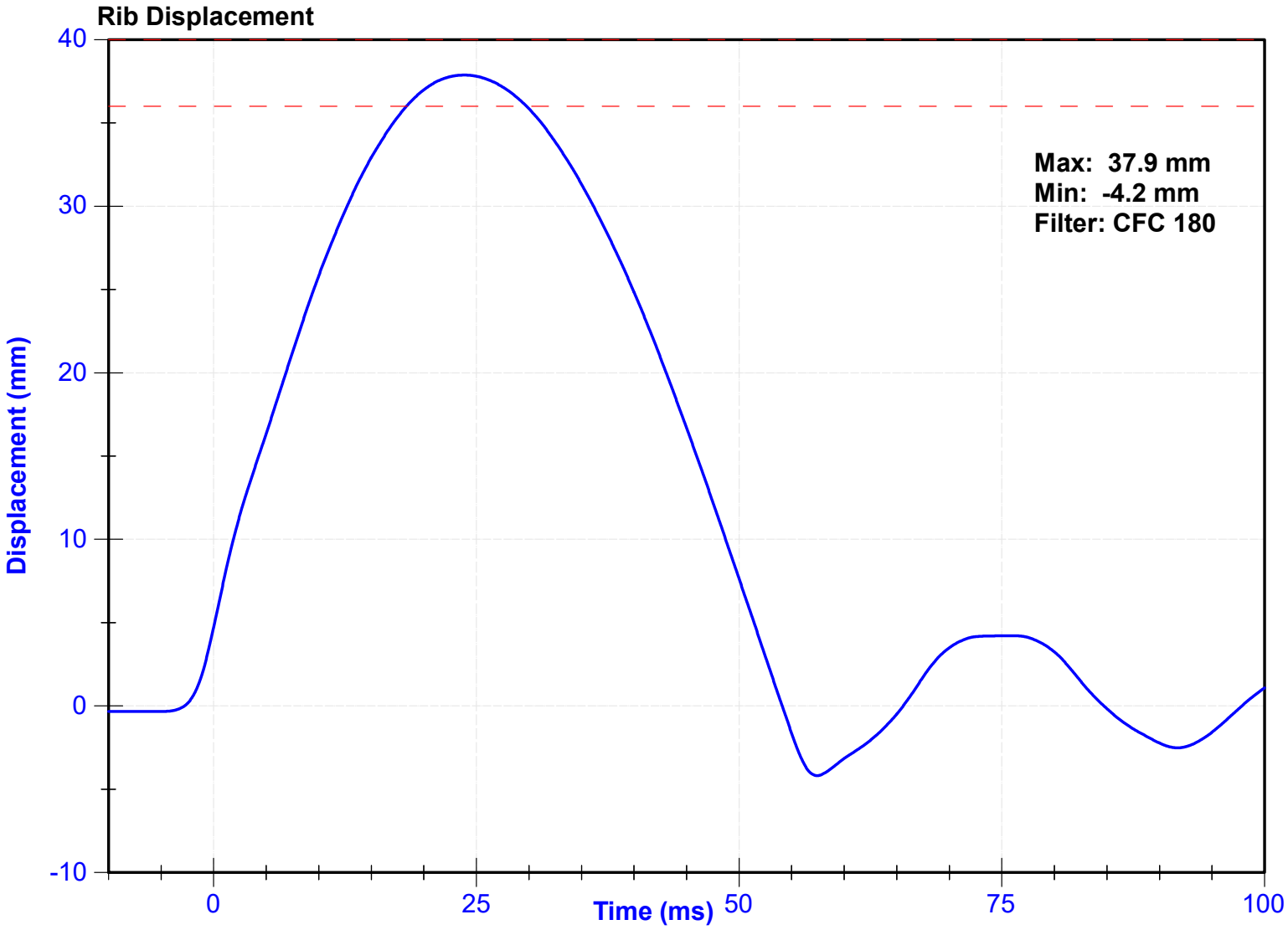
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	48	Pass
Rib Displacement	36	40	mm	37.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	6/20/2023	12/19/2023



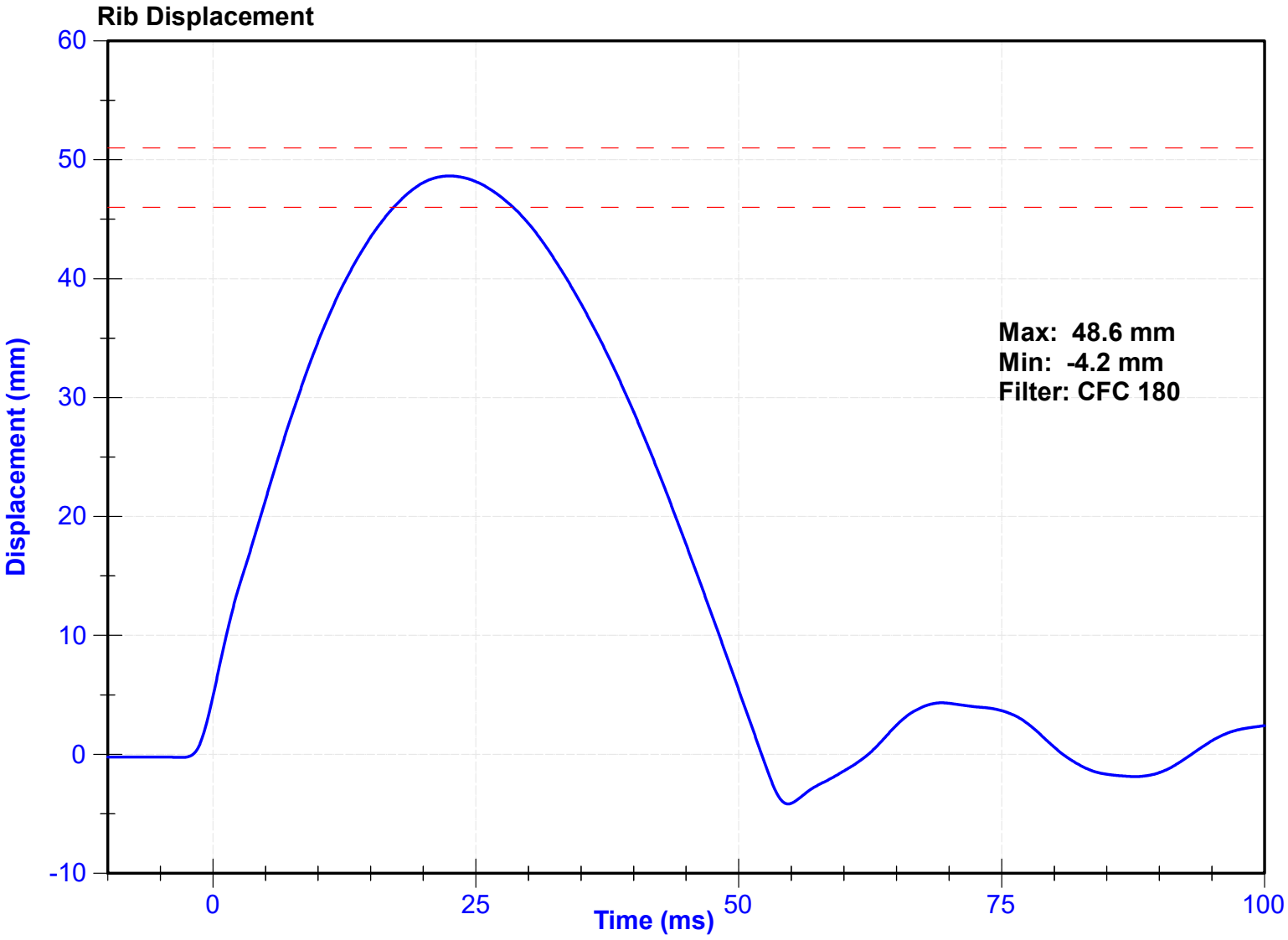
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	48	Pass
Rib Displacement	46	51	mm	48.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	6/20/2023	12/19/2023



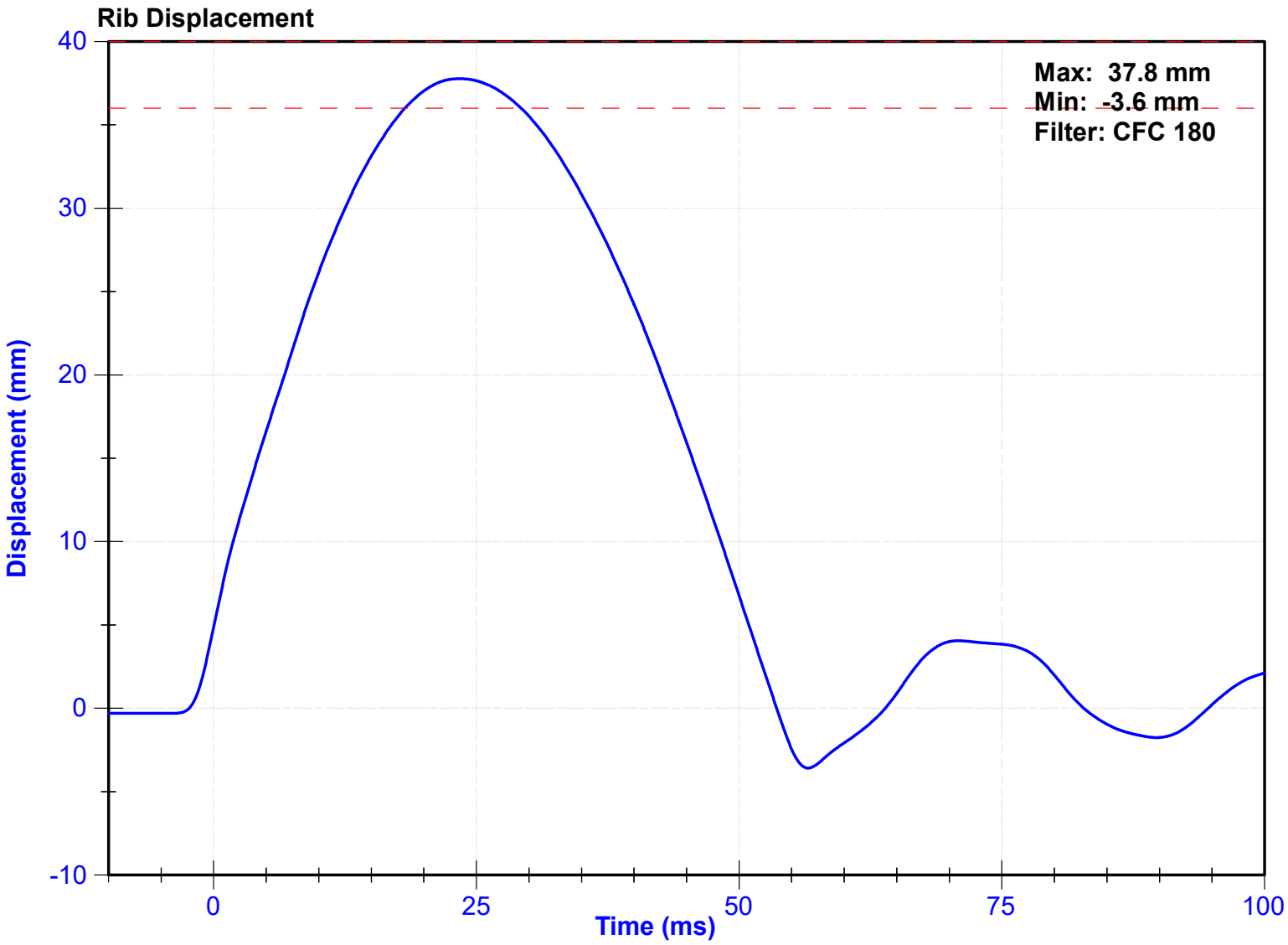
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	48	Pass
Rib Displacement	36	40	mm	37.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	6/20/2023	12/19/2023



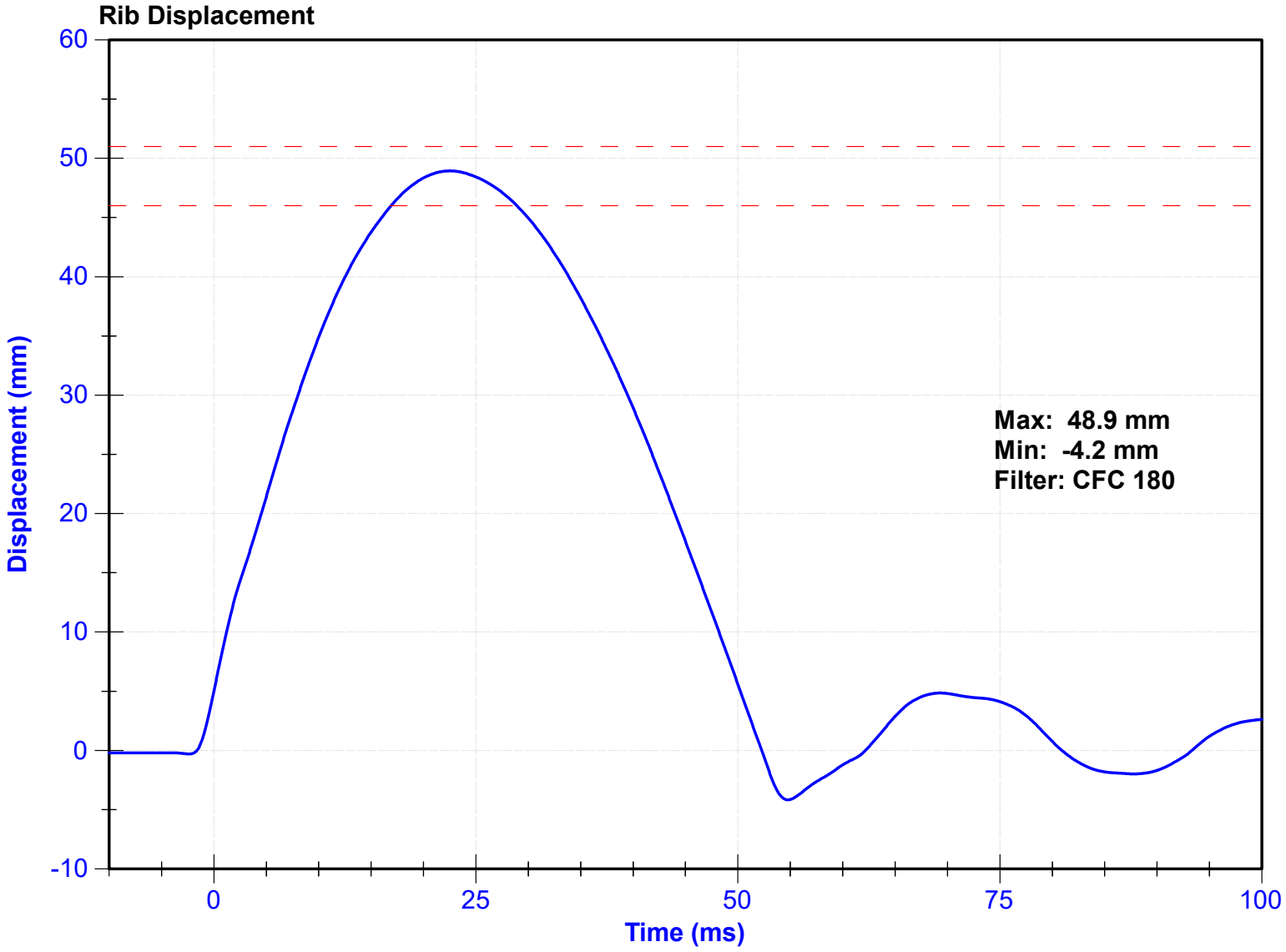
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	48	Pass
Rib Displacement	46	51	mm	48.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	6/20/2023	12/19/2023



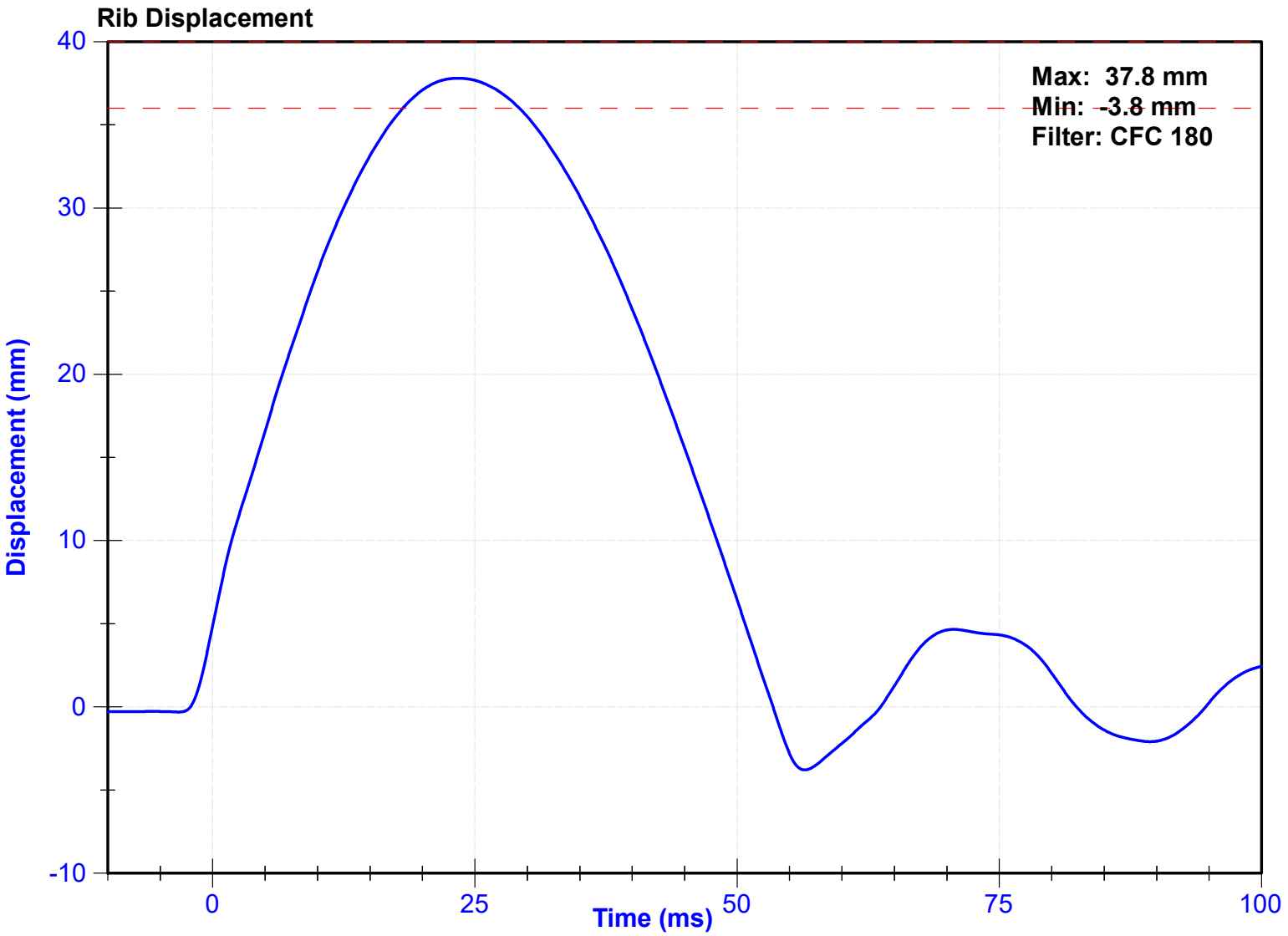
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	48	Pass
Rib Displacement	36	40	mm	37.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	6/20/2023	12/19/2023



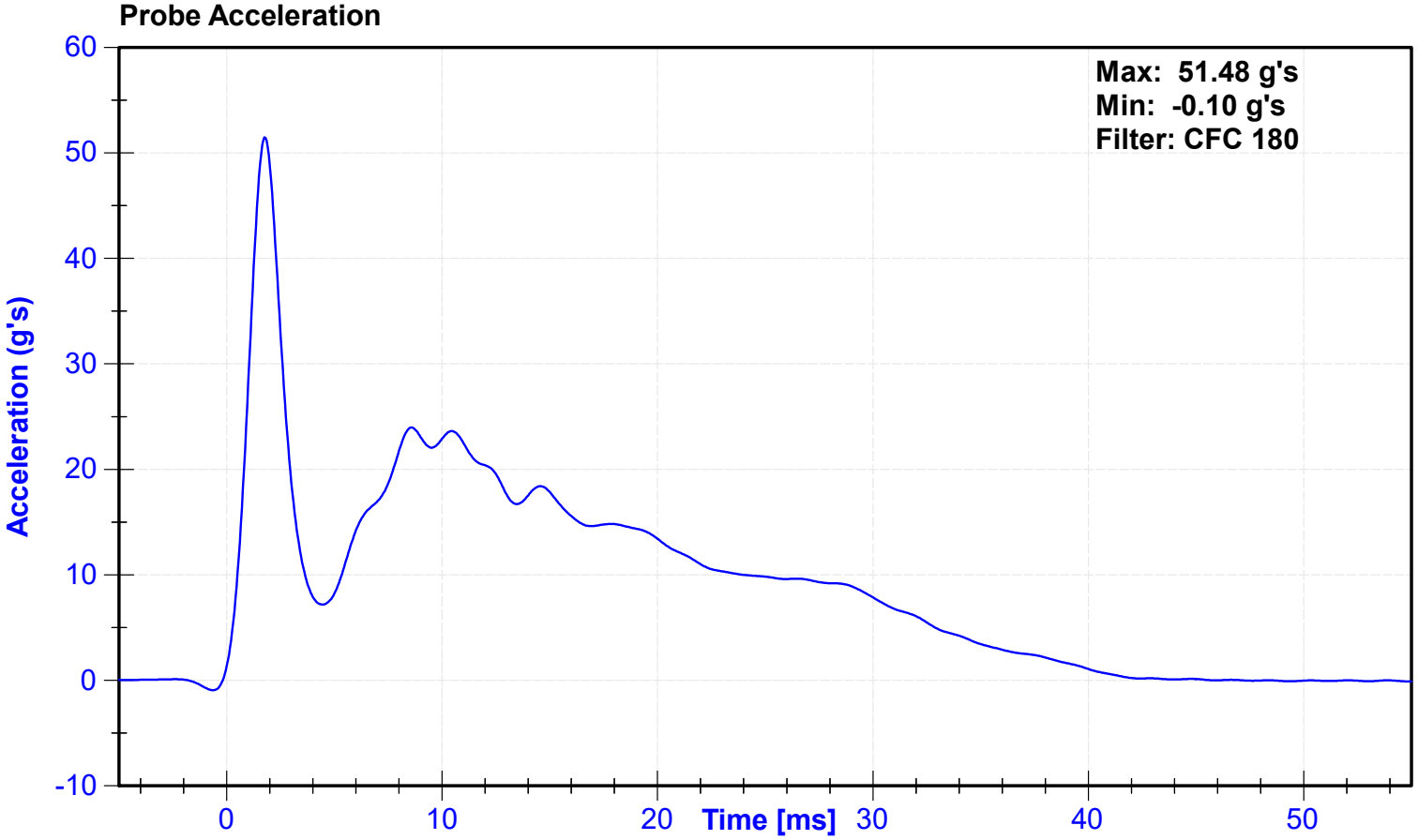
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

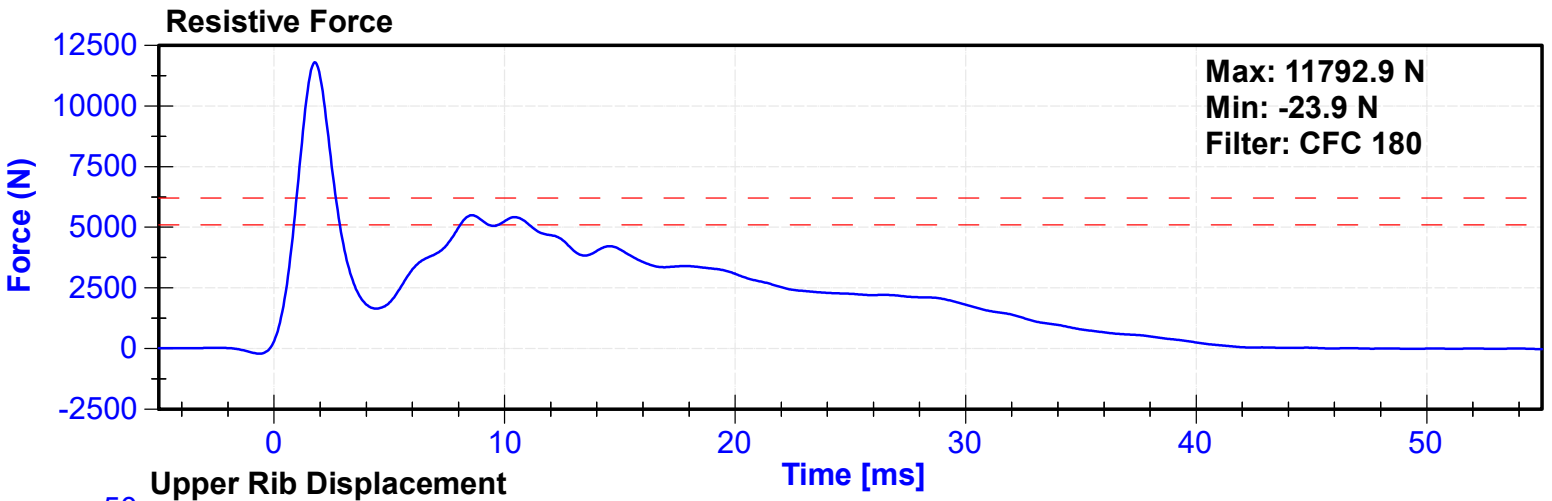
Results

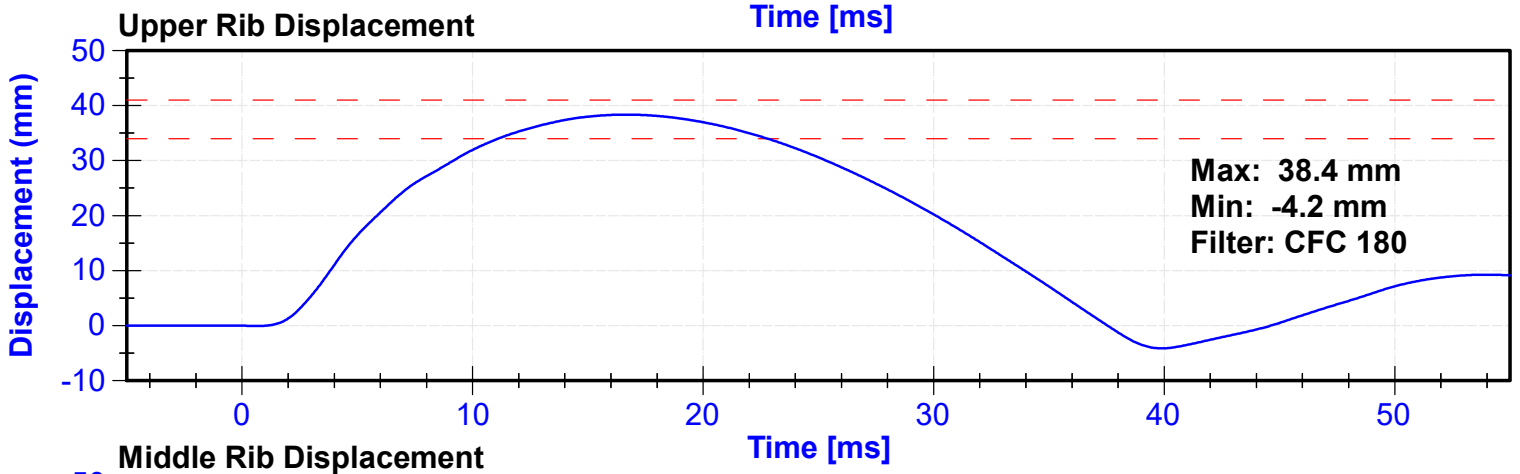
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	59.4	Pass
Velocity	5.4	5.6	m/s	5.53	Pass
Resistive Force after 6ms	5100	6200	N	5492.5	Pass
Upper Thorax Rib Deflection	34	41	mm	38.4	Pass
Mid Thorax Rib Deflection	37	45	mm	41.5	Pass
Lower Thorax Rib Deflection	37	44	mm	40.7	Pass

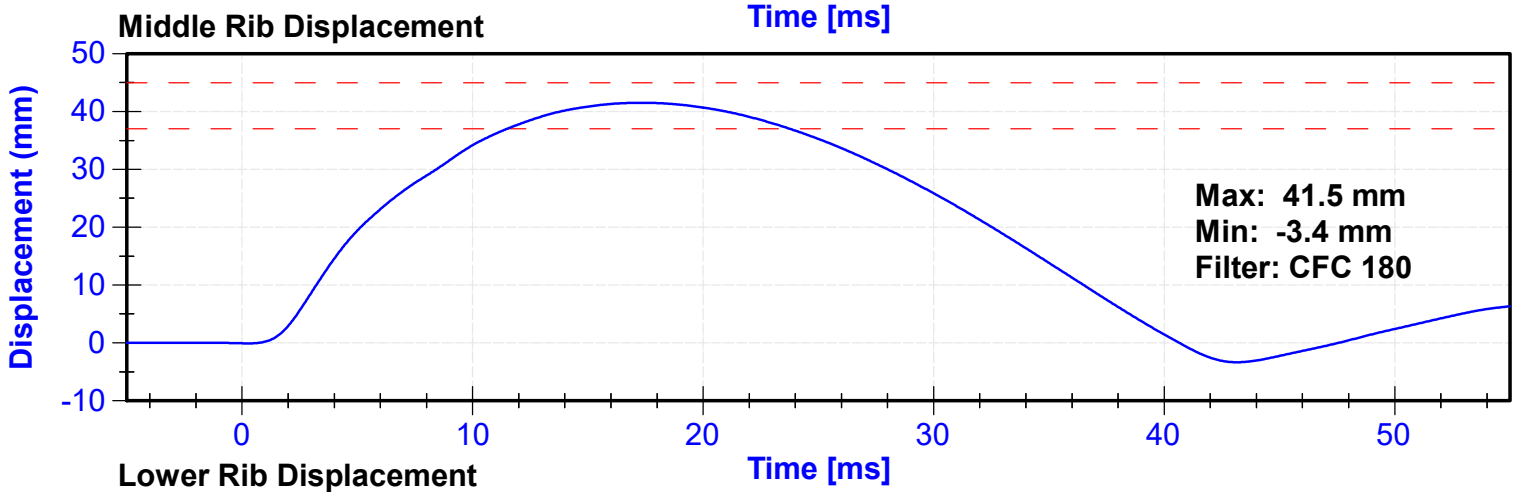
Transducer Calibrations

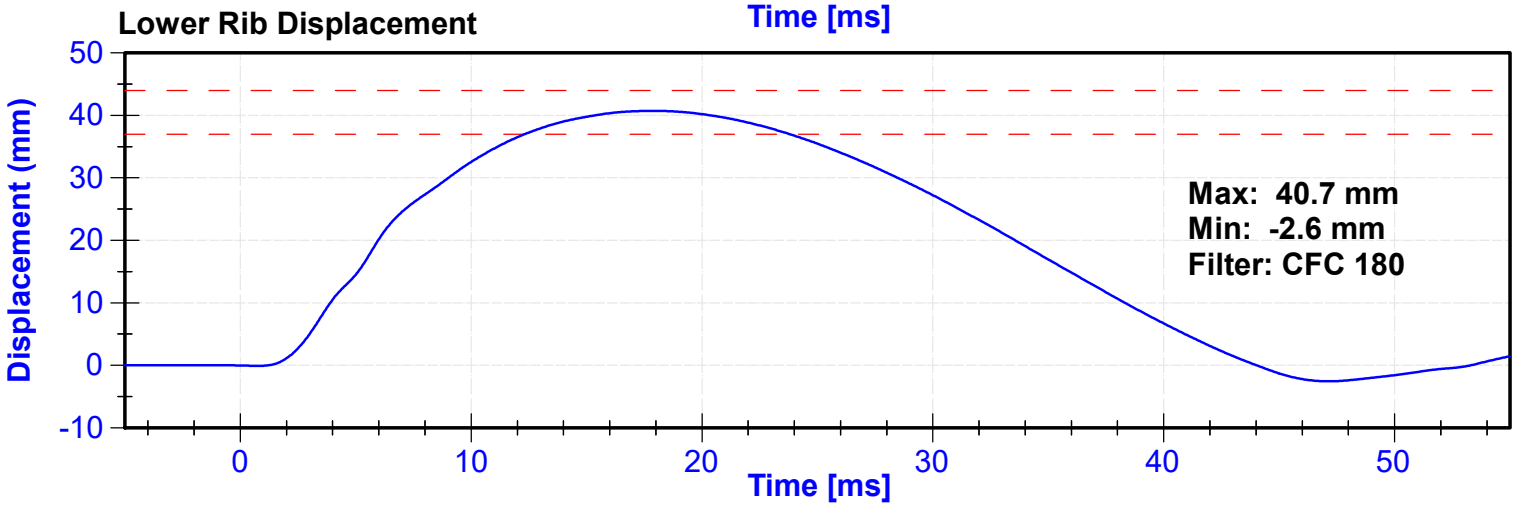
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Upper Thorax Rib Potentiometer	Honeywell	179GFE	6/20/2023	12/19/2023
Middle Thorax Rib Potentiometer	Honeywell	185GFE	6/20/2023	12/19/2023
Lower Thorax Rib Potentiometer	Honeywell	178GFE	6/20/2023	12/19/2023




Resistive Force
Max: 11792.9 N
Min: -23.9 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: 38.4 mm
Min: -4.2 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: 41.5 mm
Min: -3.4 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: 40.7 mm
Min: -2.6 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]

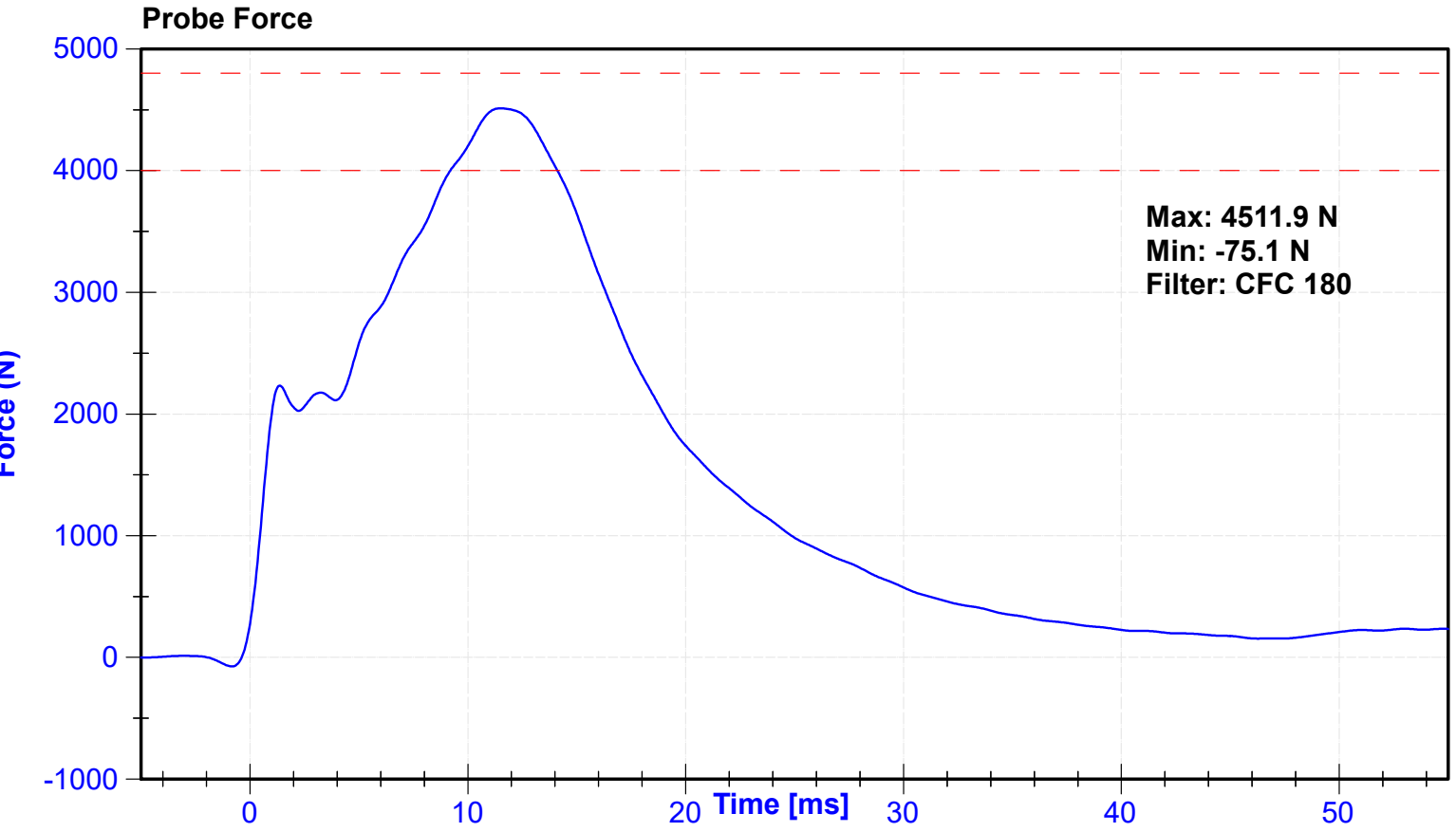
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

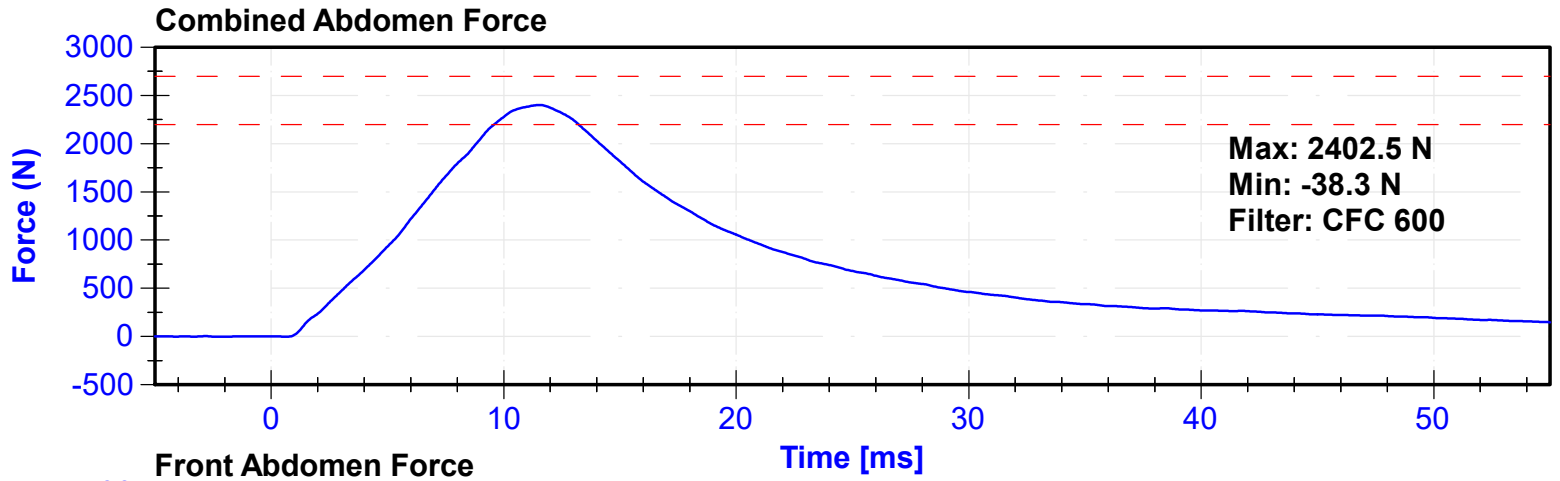
Results

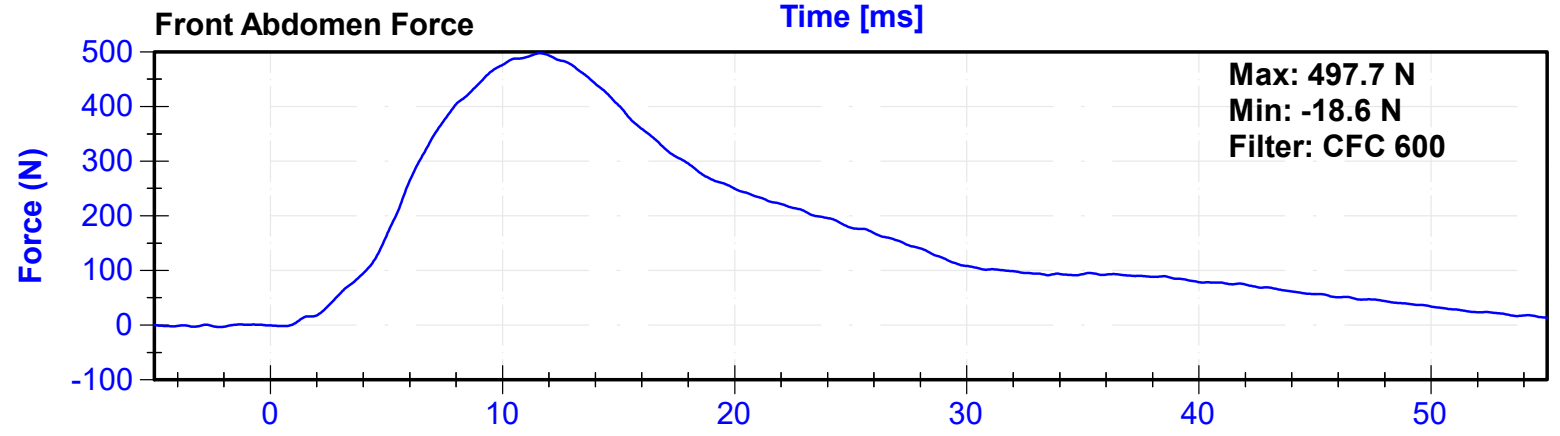
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	59.4	Pass
Velocity	3.9	4.1	m/s	4.01	Pass
Combined Abdomen Force	2200	2700	N	2402.5	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.50	Pass
Resistive Probe Force	4000	4800	N	4511.9	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.50	Pass

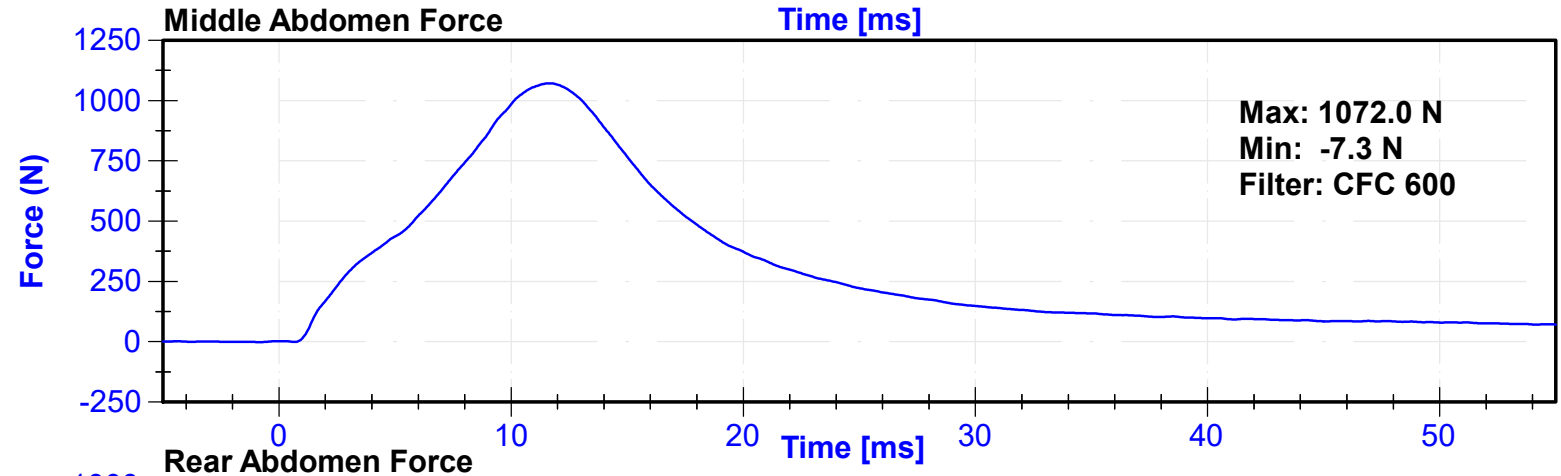
Transducer Calibrations

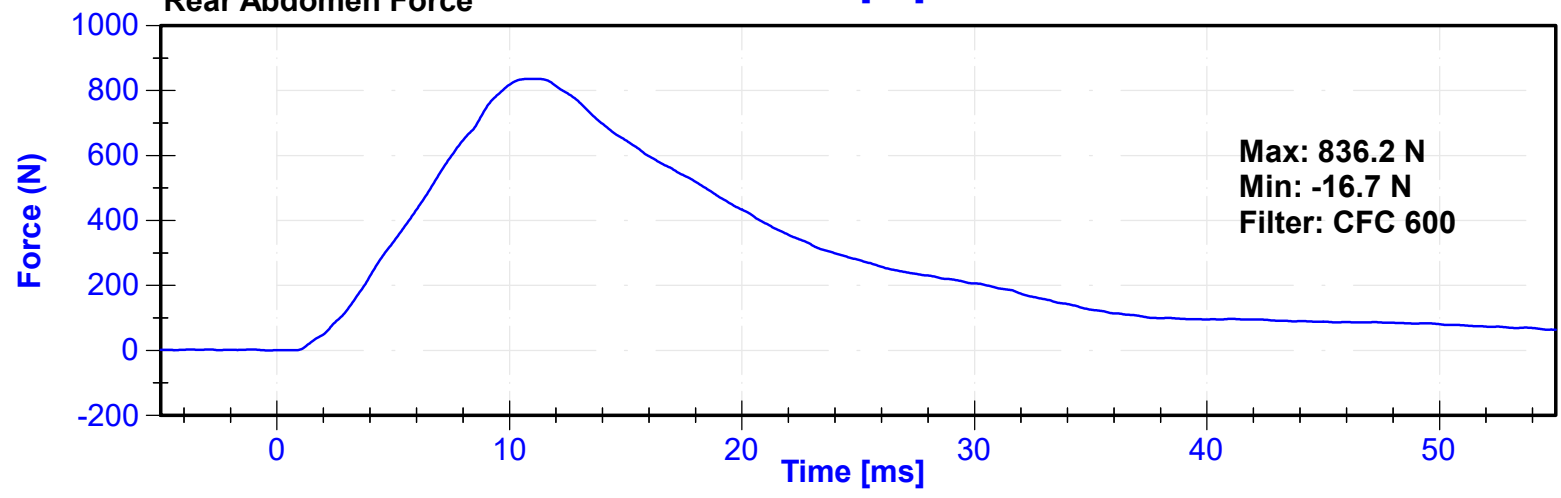
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Front Abdomen Load Cell	Denton	DM5846	5/18/2023	5/17/2024
Middle Abdomen Load Cell	Denton	1529	5/18/2023	5/17/2024
Rear Abdomen Load Cell	Denton	1533	5/18/2023	5/17/2024




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2402.5 N
Min: -38.3 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 497.7 N
Min: -18.6 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1072.0 N
Min: -7.3 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 836.2 N
Min: -16.7 N
Filter: CFC 600

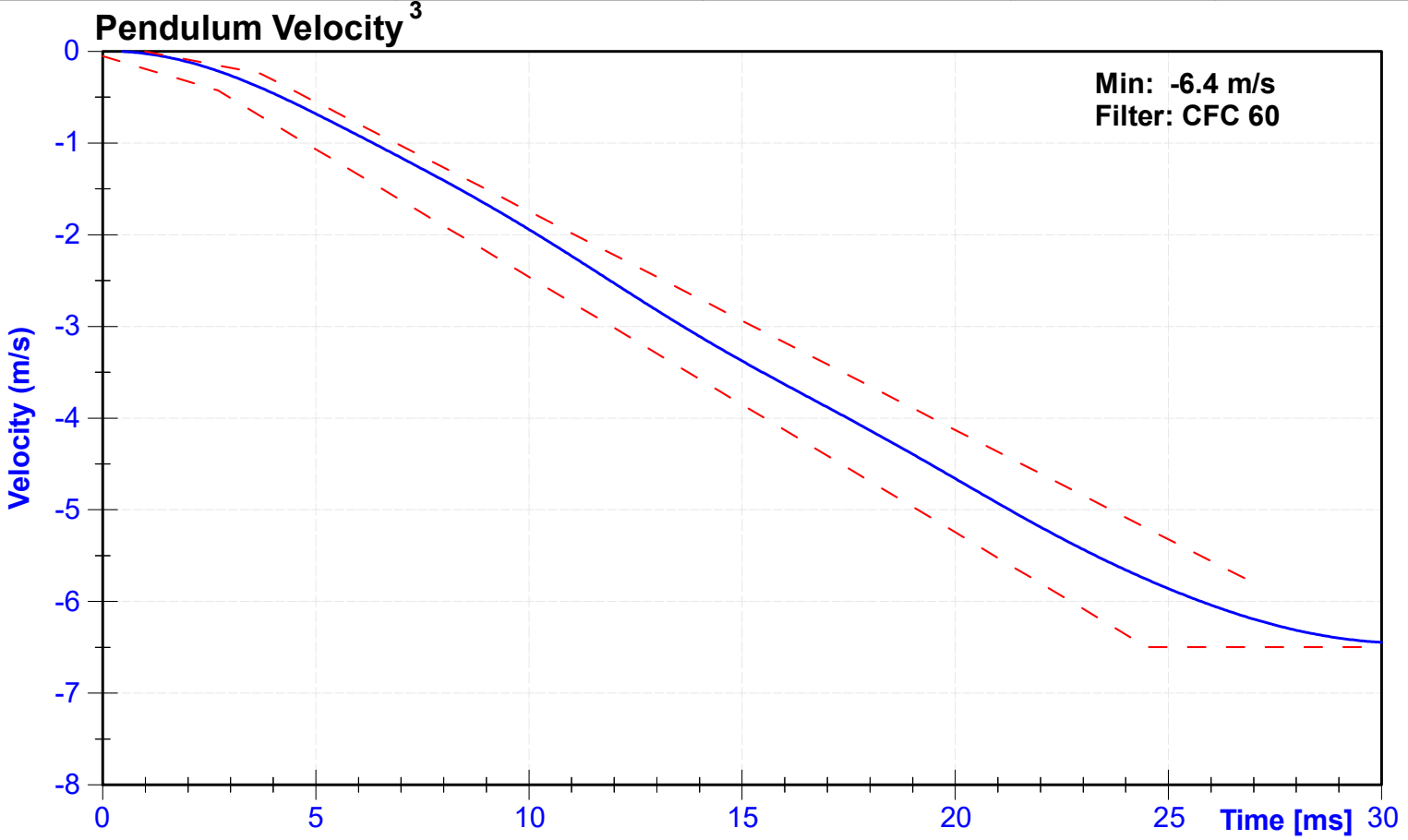
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

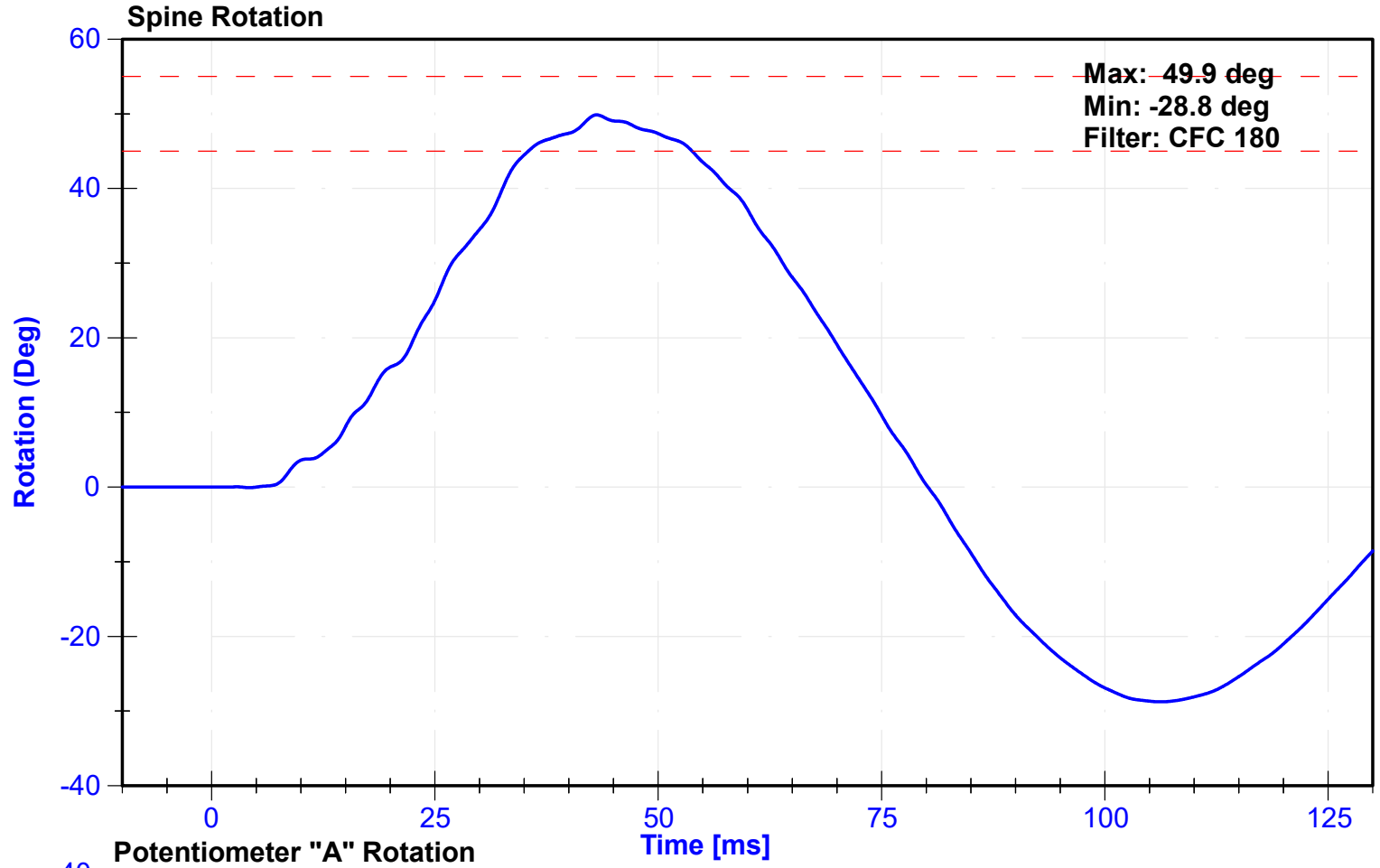
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	55	Pass
Velocity	5.95	6.15	m/s	6.054	Pass
Lateral Spine Rotation	45	55	deg	49.9	Pass
Time at Maximum Rotation	39	53	ms	43.1	Pass
Time of Decay to Zero Degrees	37	57	ms	37.1	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

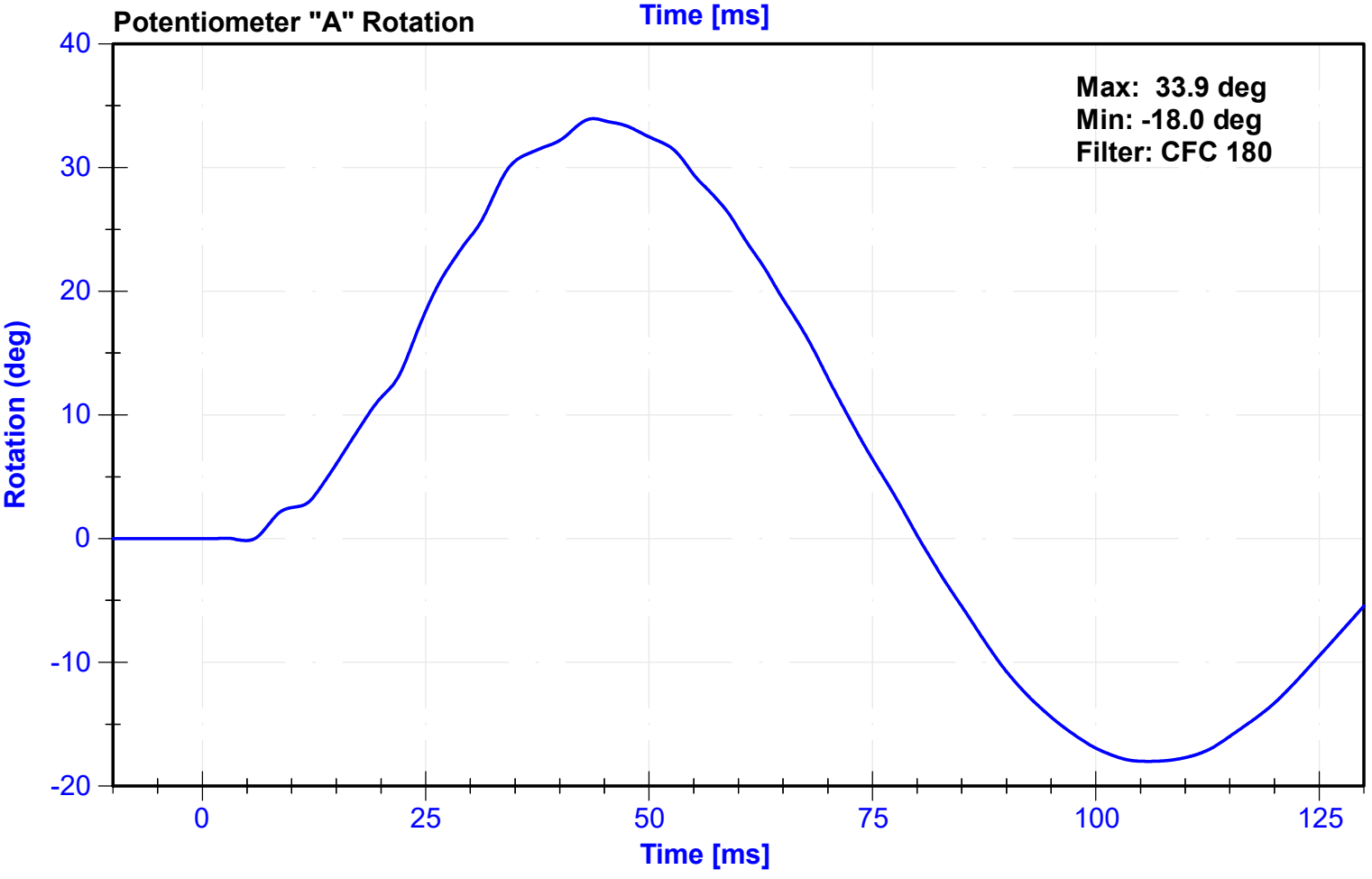
Transducer Calibrations

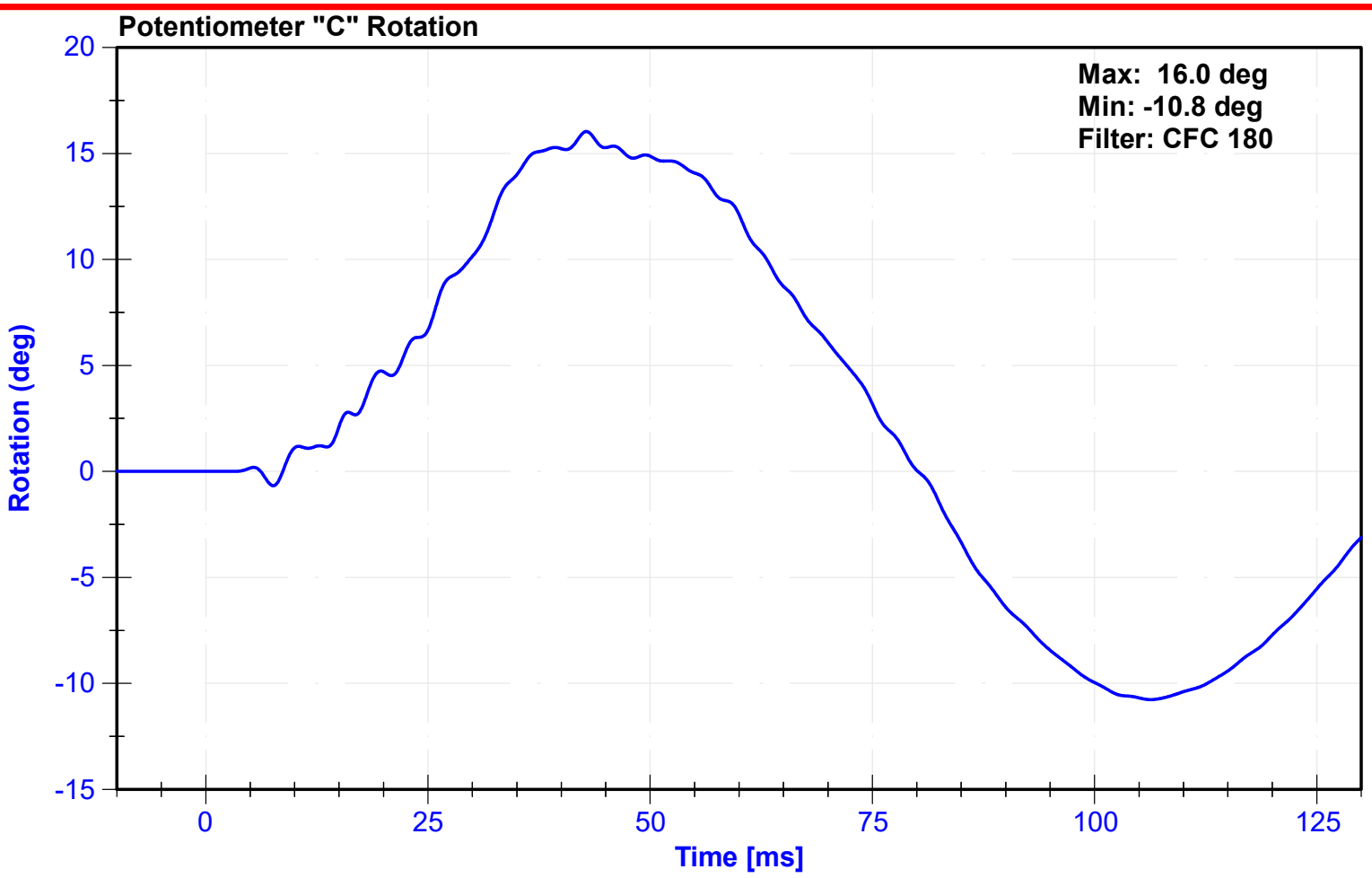
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/26/2022	10/26/2023
Pendulum "A" Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Condyle "B" Potentiometer	Sfernice	095	10/5/2022	10/5/2023



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


Spine Rotation
Max: 49.9 deg
Min: -28.8 deg
Filter: CFC 180
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 33.9 deg
Min: -18.0 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

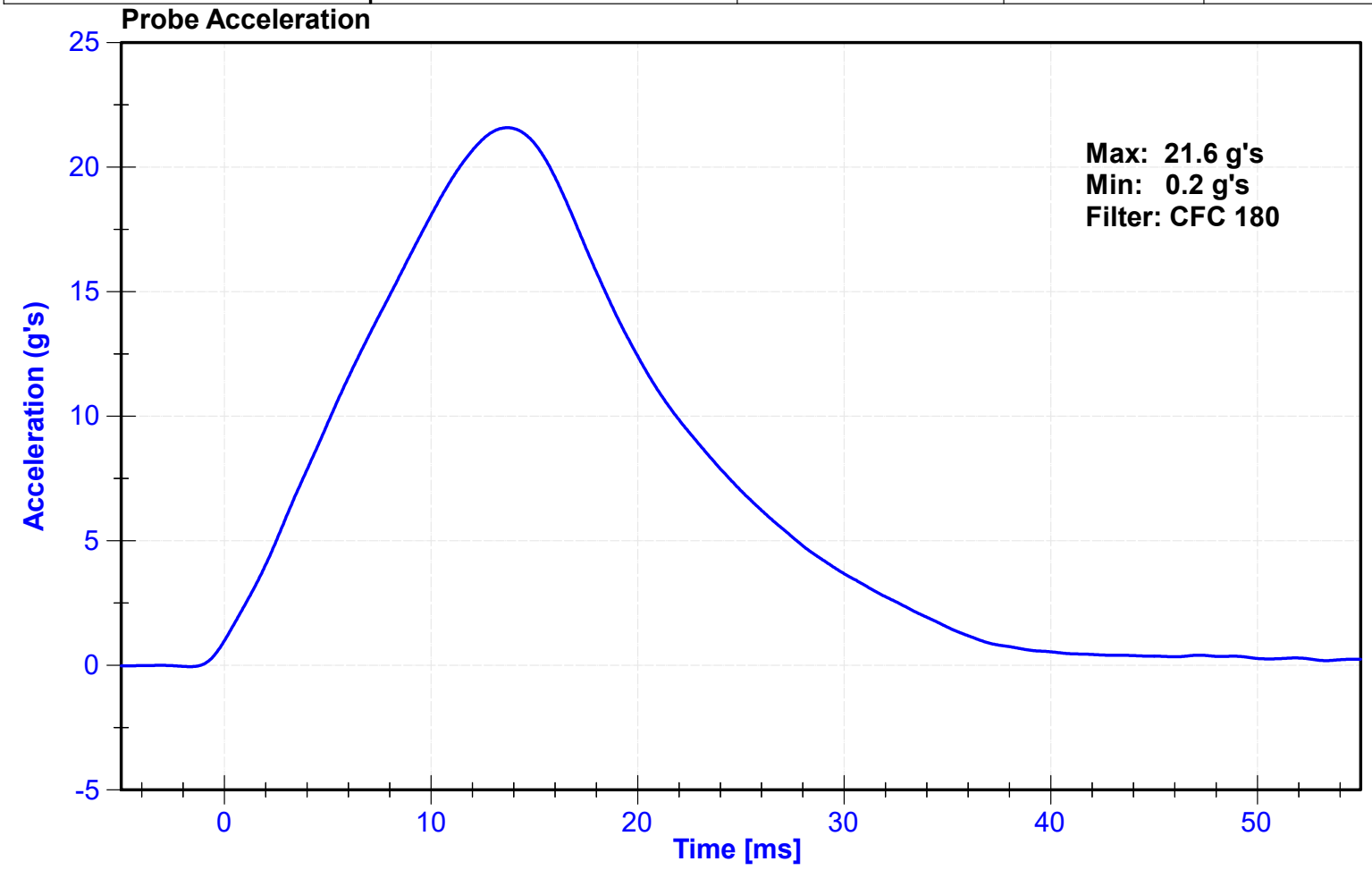
ATD Manufacturer	FTSS	Test Technician	O.Vail
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

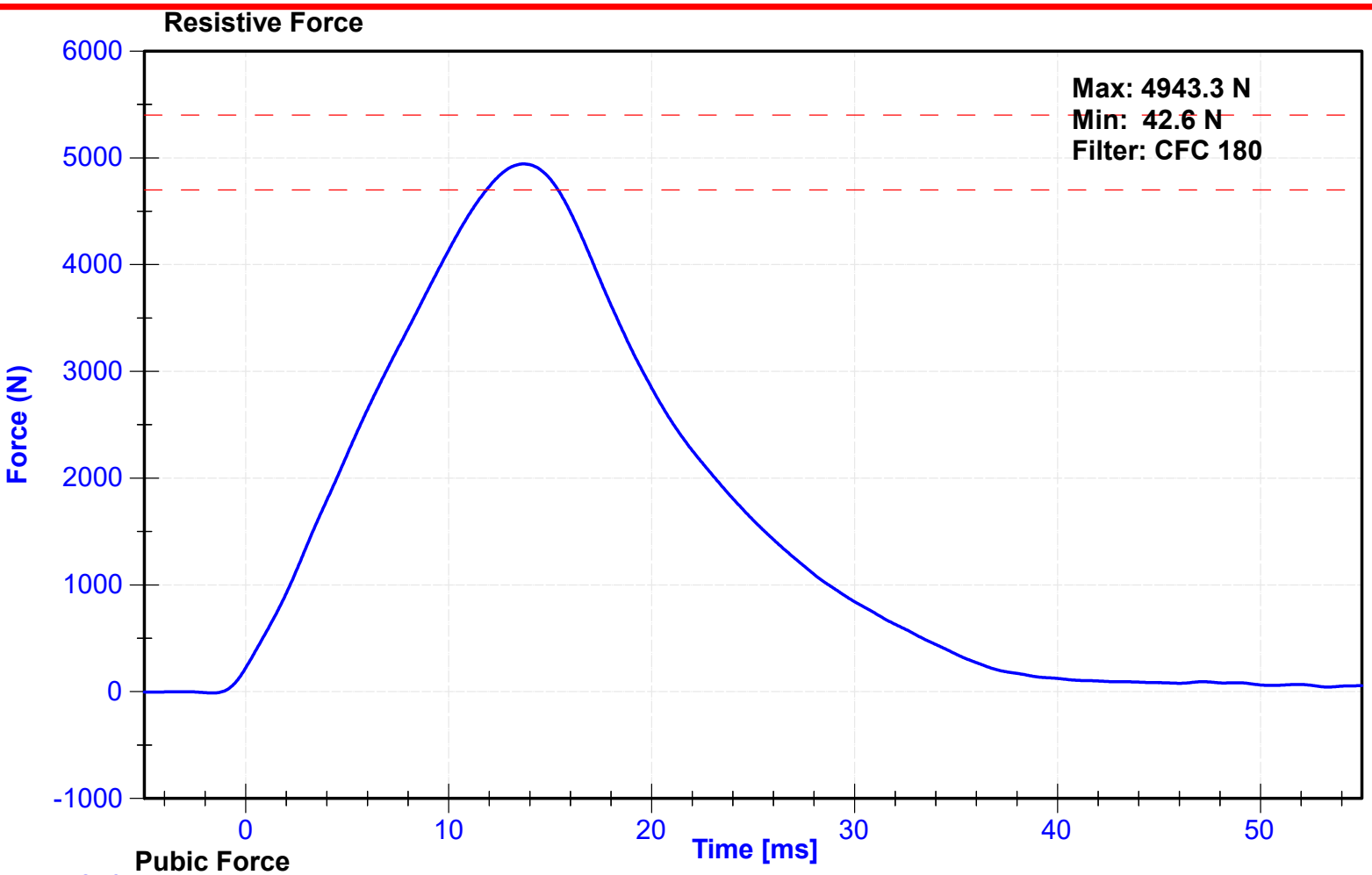
Results

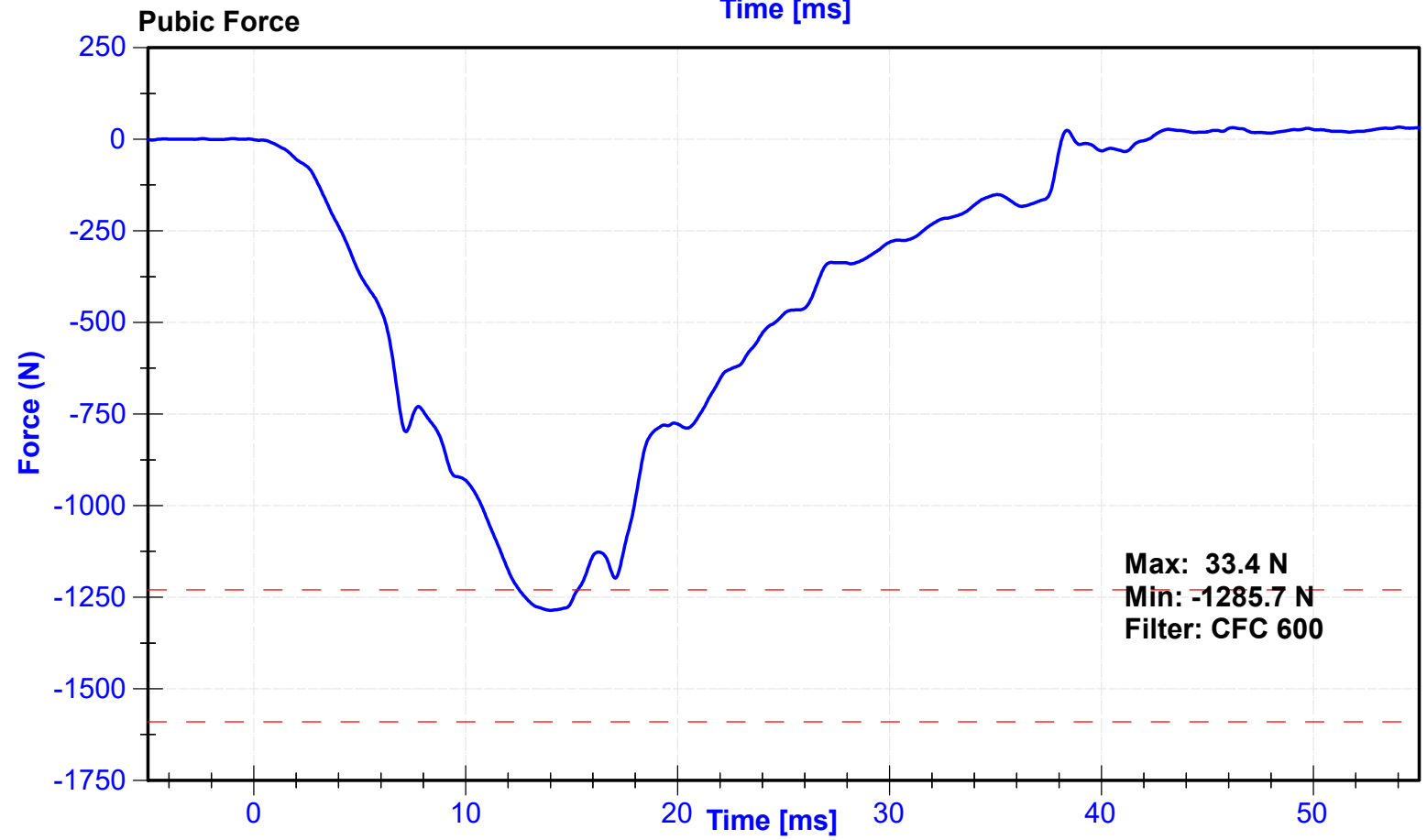
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	59.4	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Resistive Force	4700	5400	N	4943.3	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.70	Pass
Pubic Force	-1590	-1230	N	-1285.7	Pass
Time at Peak Pubic Force	12.2	17.0	ms	14.00	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Pubic Load Cell	Denton	459-FY	6/20/2023	6/19/2024




Resistive Force
Max: 4943.3 N
Min: 42.6 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: 33.4 N
Min: -1285.7 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

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE – PASSENGER ATD

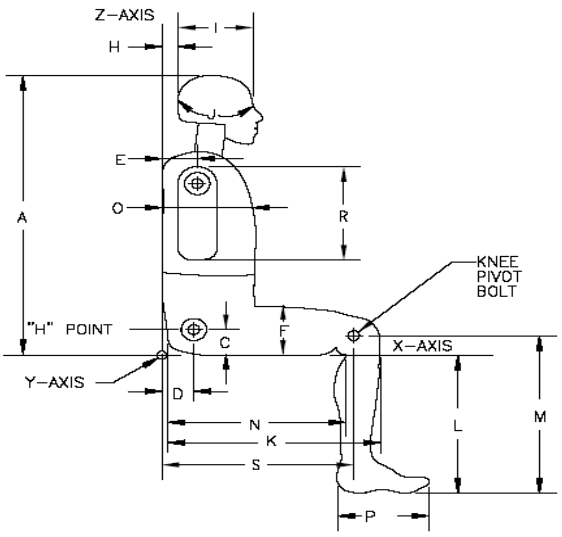
SERIAL NO:DG8012

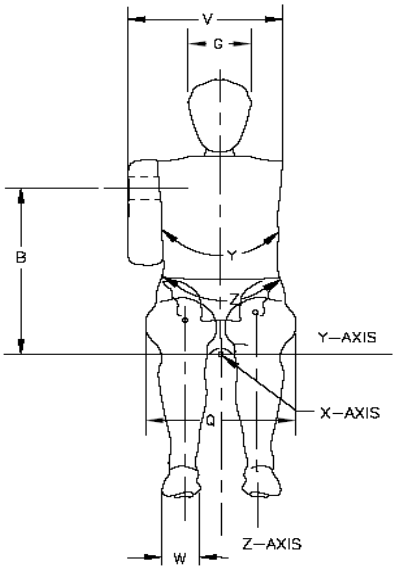
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Brogan Date: 08/07/2023

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	781	Pass
B	Shoulder Pivot Height	437	453	447	Pass
C	H-point Height	79	89	82	Pass
D	H-point from seatback	141	151	144	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	127	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	544	Pass
K	Buttock to Knee Length	514	540	528	Pass
L	Popliteal Height	343	369	360	Pass
M	Knee Pivot to floor height	392	409	399	Pass
N	Buttock Popliteal Length	416	442	432	Pass
O	Chest Depth w/o jacket	195	211	200	Pass
P	Foot Length	216	232	220	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	482	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	868	Pass
Z	Waist Circumference	761	791	778	Pass

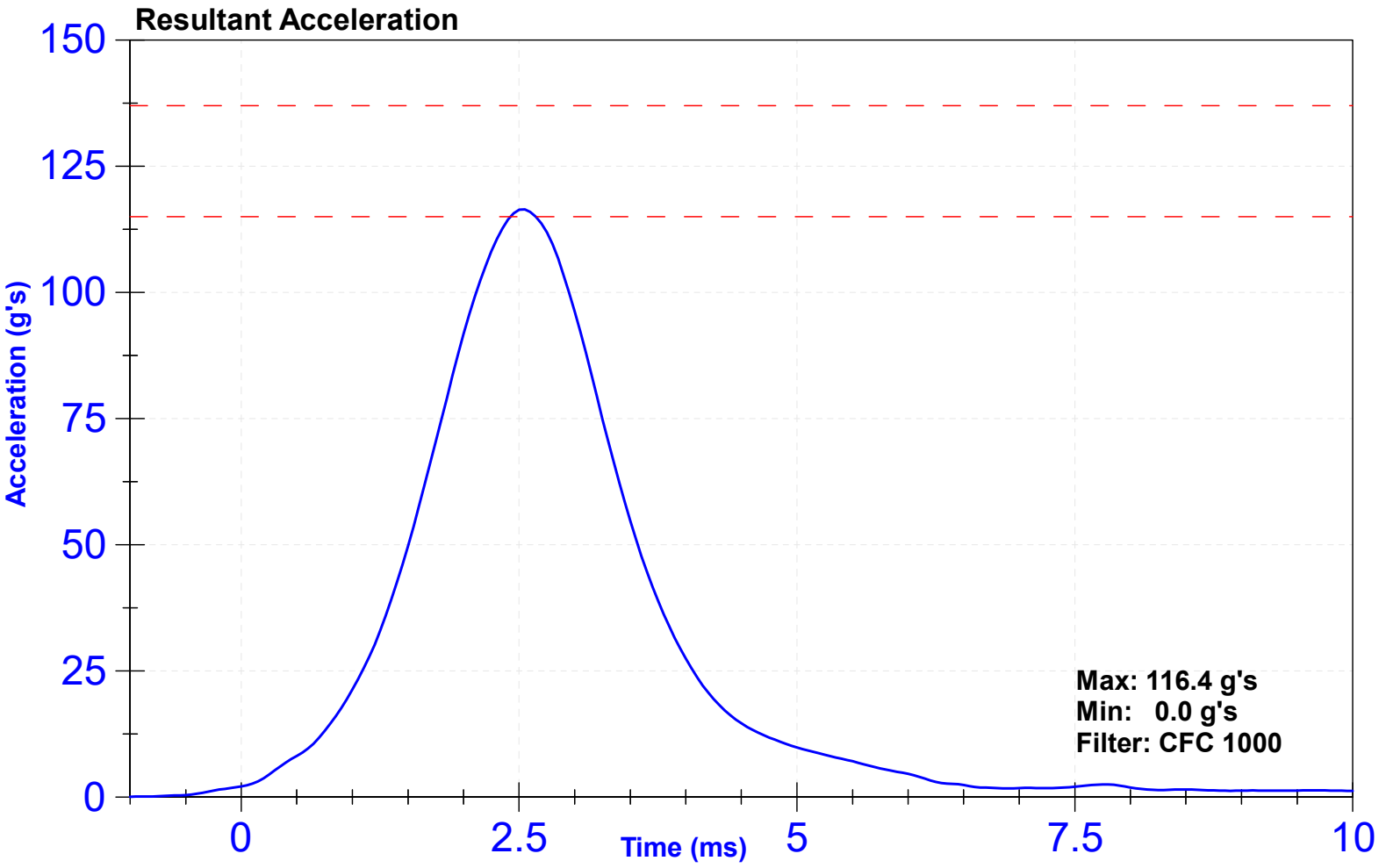
ATD Manufacturer	FTSS	Test Technician	J.Miller
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

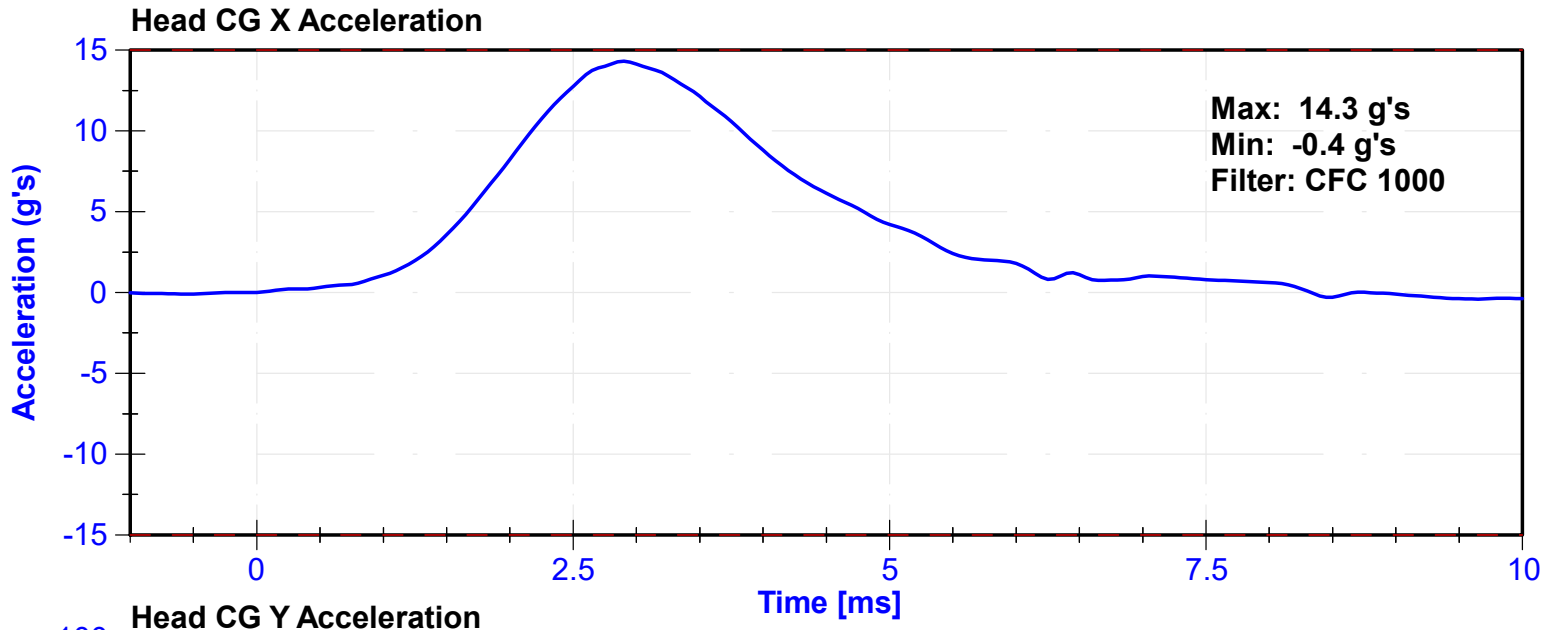
Results

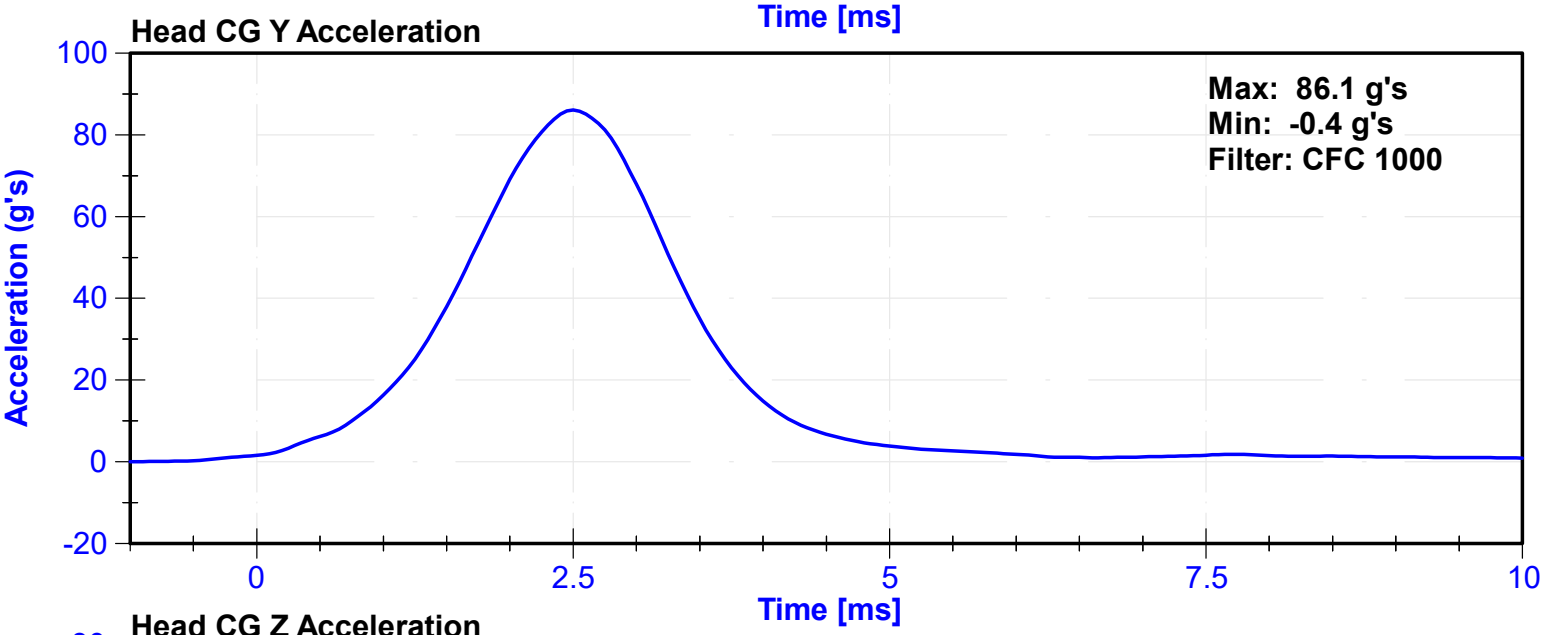
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	67	Pass
Resultant Acceleration	115	137	g's	116.4	Pass
Oscillation	0	15	%	2.1	Pass
Fore-Aft Acceleration	-15	15	g's	14.3	Pass

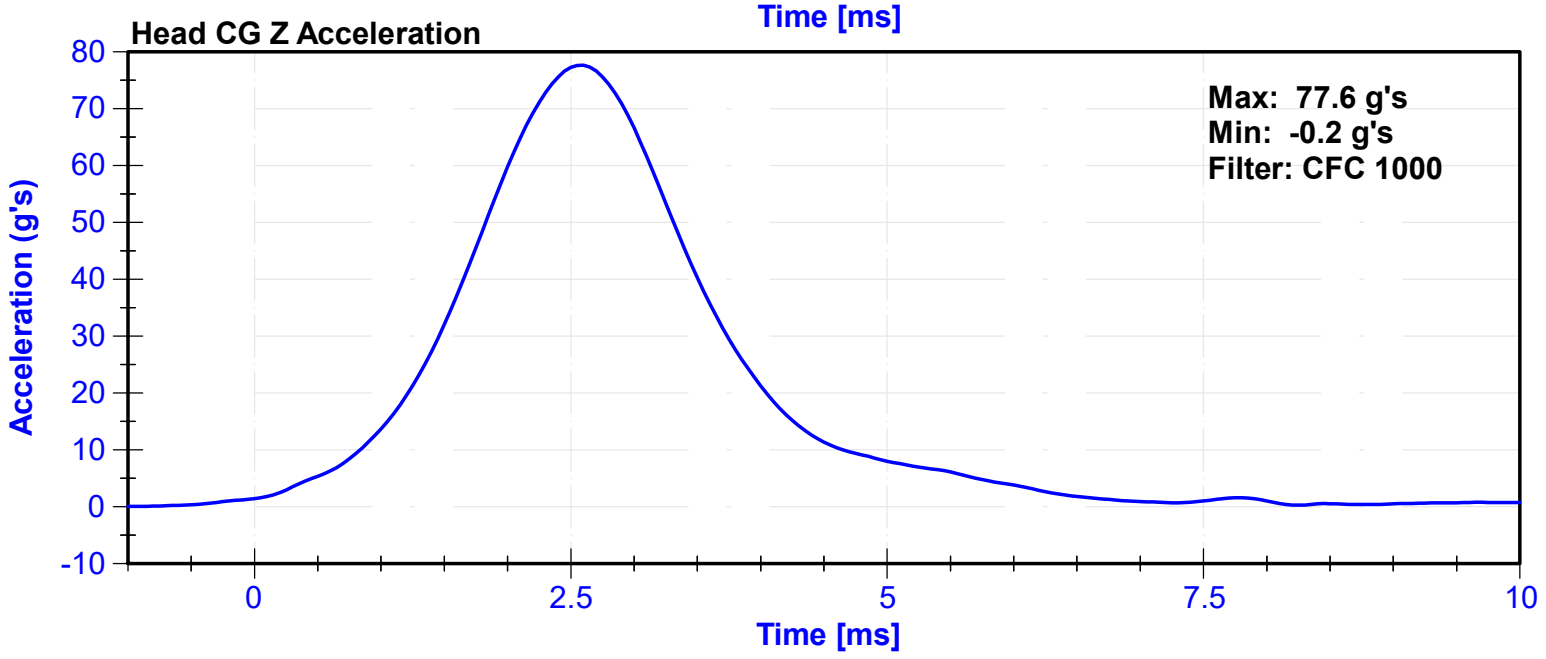
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P74788	7/5/2023	1/1/2024
Y Accelerometer	Endevco	P51668	7/5/2023	1/1/2024
Z Accelerometer	Endevco	P83319	7/5/2023	1/1/2024




Head CG X Acceleration
Max: 14.3 g's
Min: -0.4 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Y Acceleration
Max: 86.1 g's
Min: -0.4 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Z Acceleration
Max: 77.6 g's
Min: -0.2 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]

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

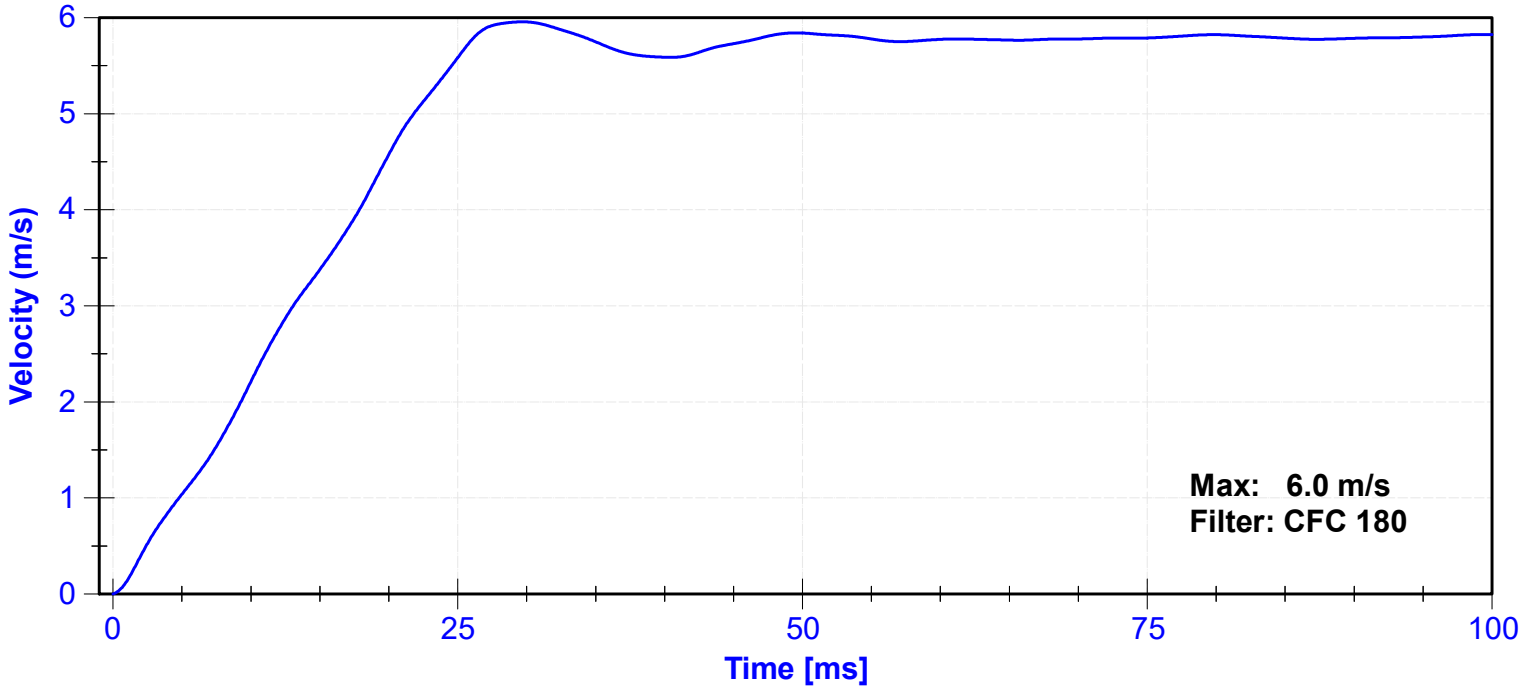
Results

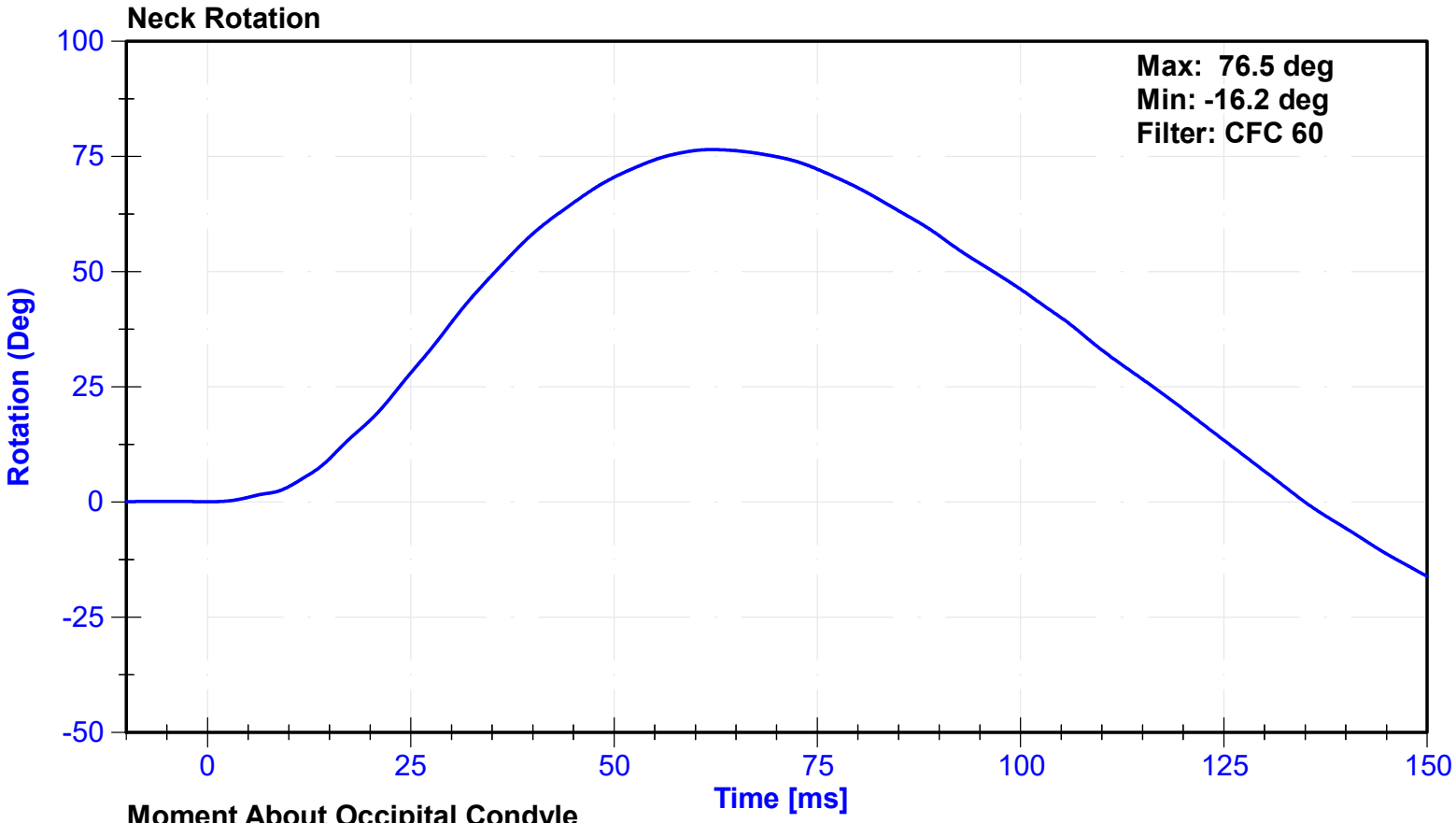
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.9	Pass
Humidity	10	70	%	56	Pass
Velocity	5.51	5.63	m/s	5.531	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.21	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.38	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.58	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.58	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.96	Pass
Neck Rotation	71	81	deg	76.5	Pass
Time at Maximum Rotation	50	70	ms	62.0	Pass
Moment about the OC	36	44	Nm	40.8	Pass
Moment Decay to 0 Nm	102	126	ms	118.0	Pass

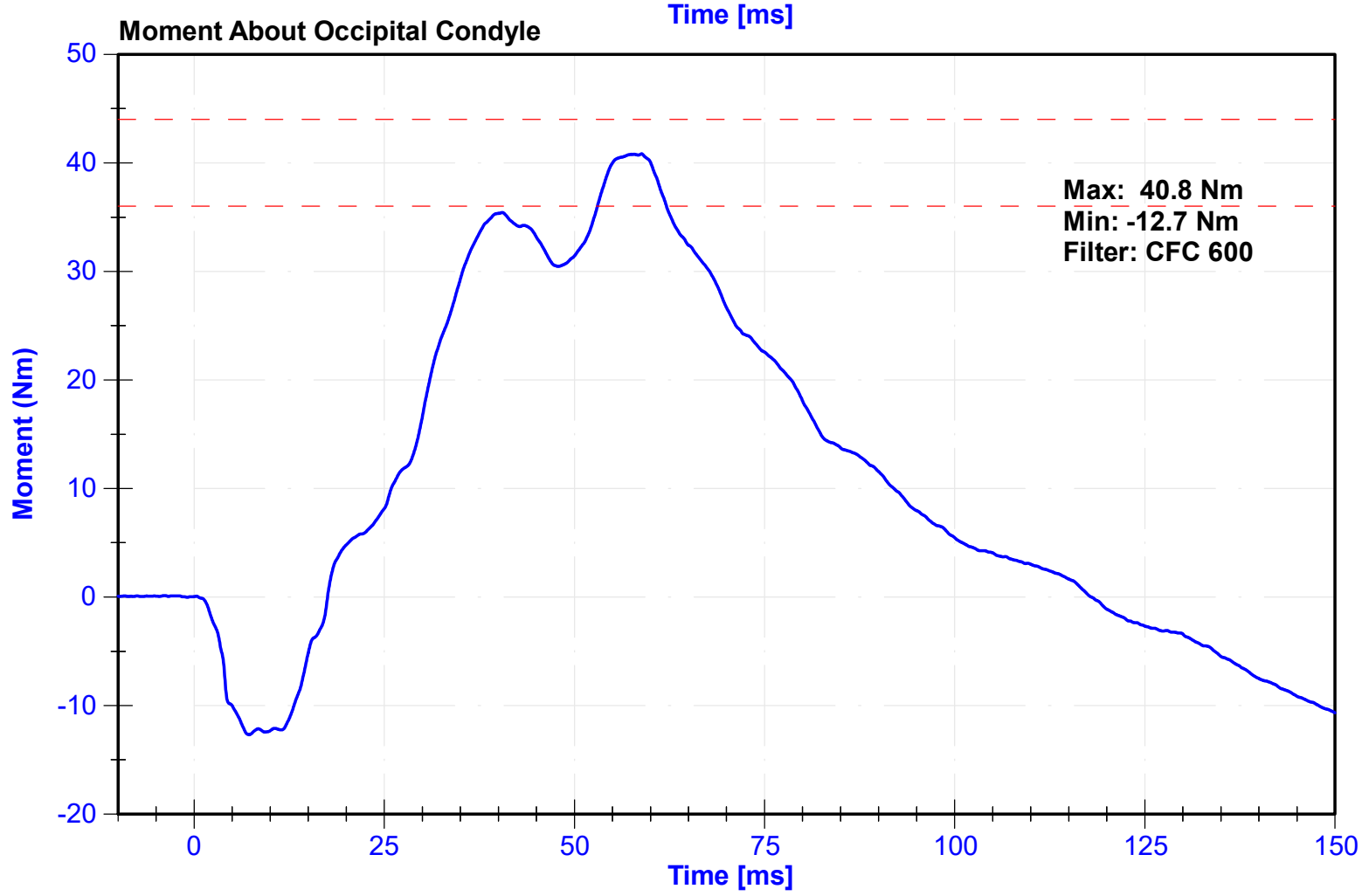
Transducer Calibrations

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	Denton	1716ATF_2184-FY	5/18/2023	5/17/2024

Pendulum Impulse




Neck Rotation
Max: 76.5 deg
Min: -16.2 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: 40.8 Nm
Min: -12.7 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

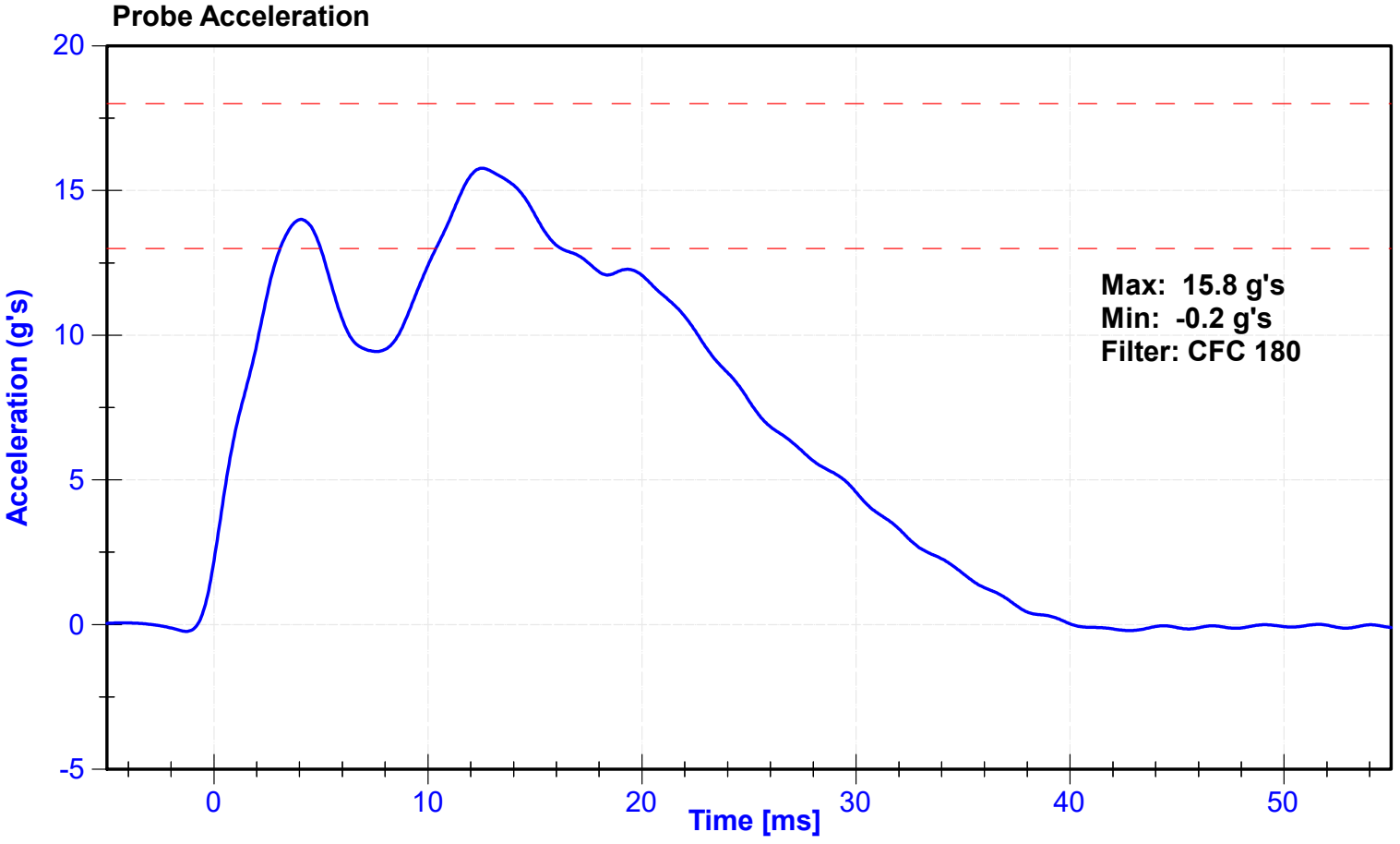
ATD Manufacturer	FTSS	Test Technician	J. Miller
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

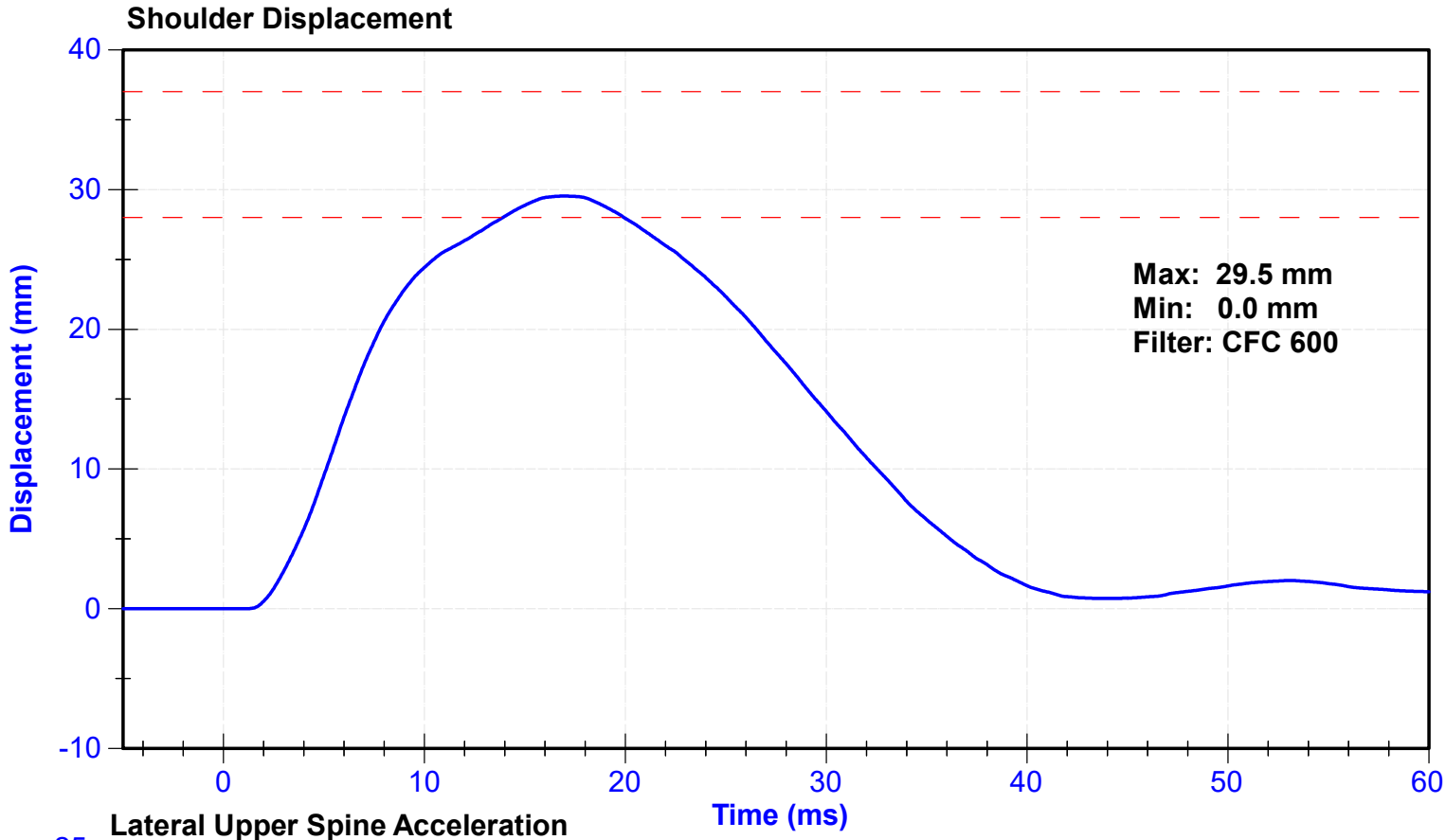
Results

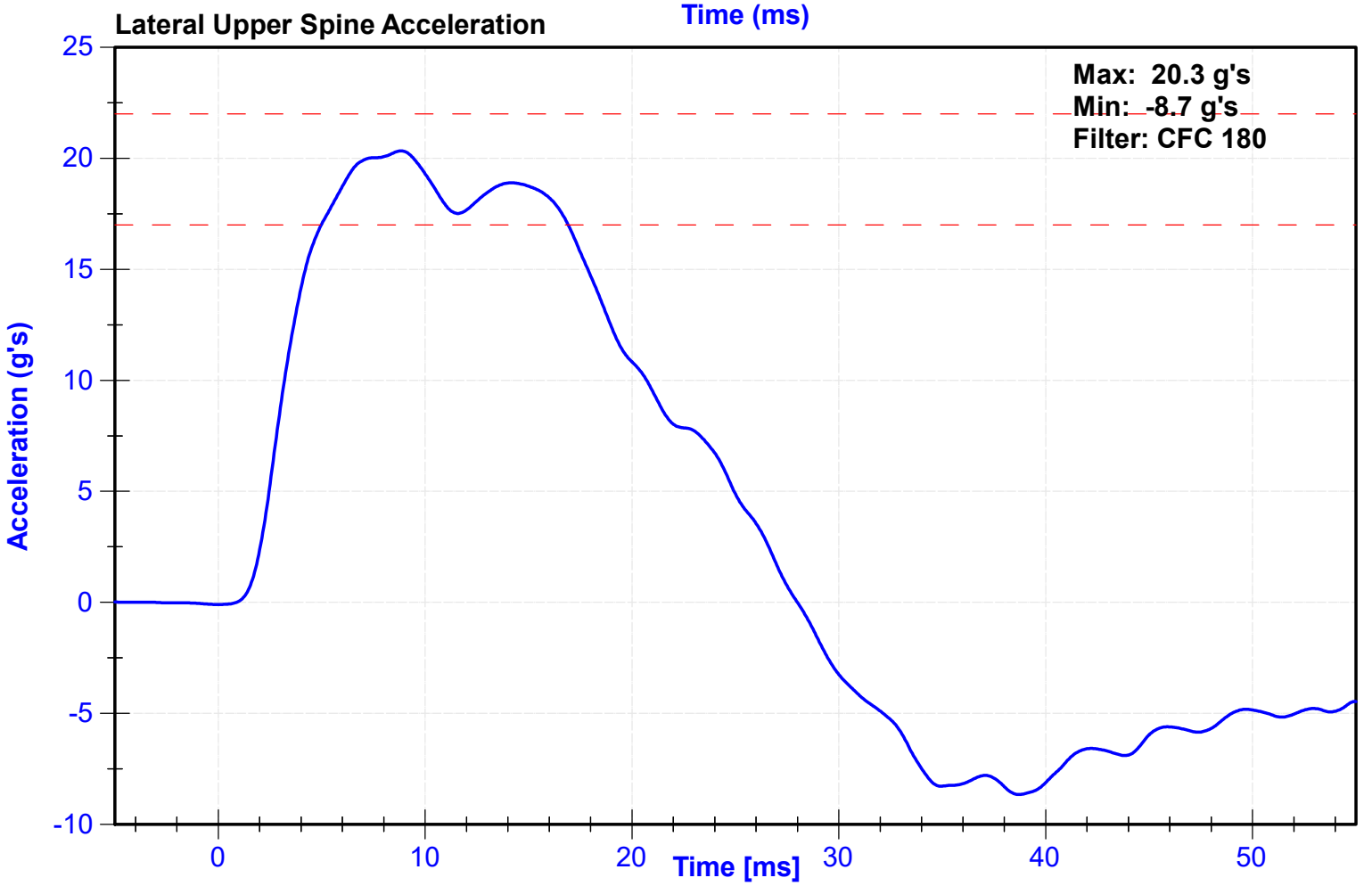
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	62	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	13	18	g's	15.8	Pass
Shoulder Deflection	28	37	mm	29.5	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Shoulder Potentiometer	Servo	1274GFE	7/5/2023	1/3/2024
Upper Spine Y Accelerometer	Endevco	P64148	6/30/2023	12/27/2023




Shoulder Displacement
Displacement (mm)
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time (ms)
Max: 29.5 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]
Max: 20.3 g's
Min: -8.7 g's
Filter: CFC 180

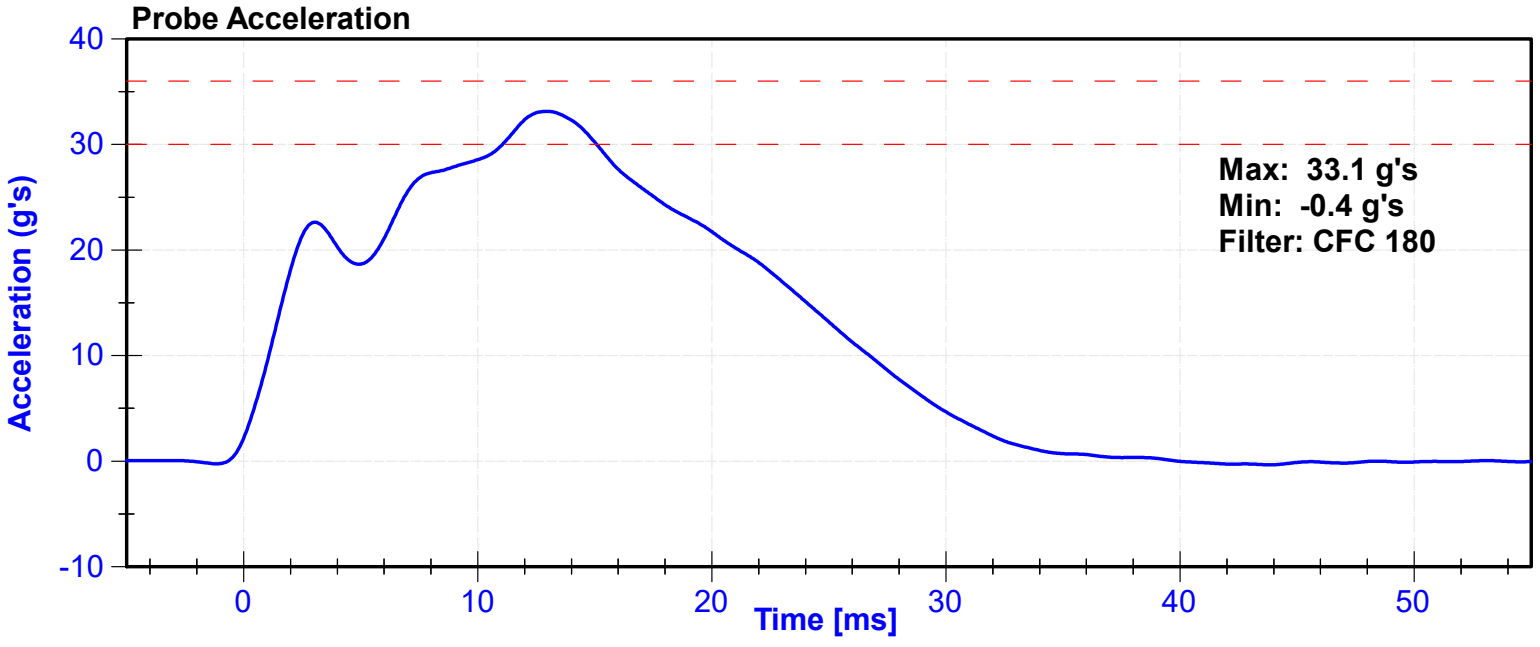
ATD Manufacturer	FTSS	Test Technician	J. Miller
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

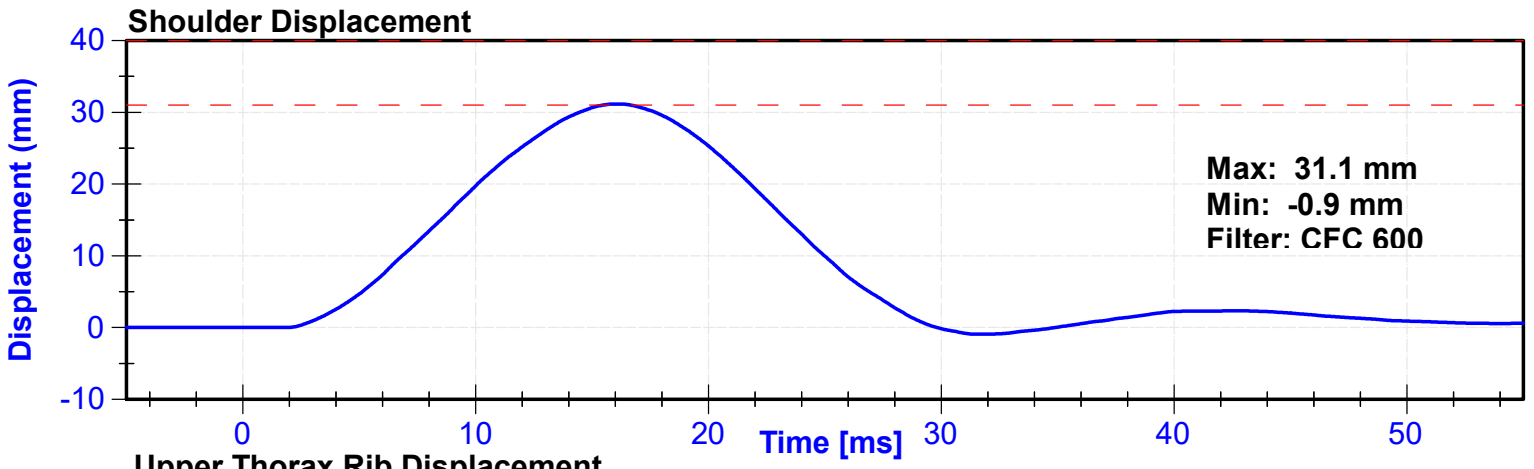
Results

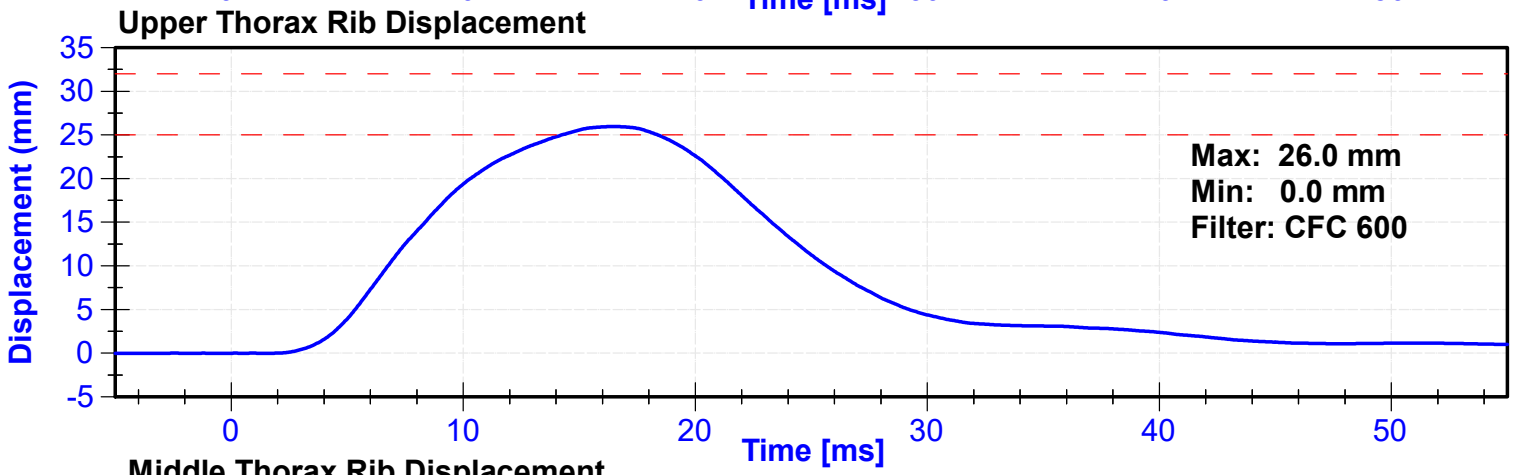
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	62	Pass
Velocity	6.6	6.8	m/s	6.70	Pass
Probe Acceleration after 5 ms	30	36	g's	33.1	Pass
Lateral Upper Spine Acceleration	34	43	g's	38.2	Pass
Lateral Lower Spine Acceleration	29	37	g's	34.6	Pass
Shoulder Deflection	31	40	mm	31.1	Pass
Upper Thorax Rib Deflection	25	32	mm	26.0	Pass
Mid Thorax Rib Deflection	30	36	mm	31.4	Pass
Lower Thorax Rib Deflection	32	38	mm	35.1	Pass

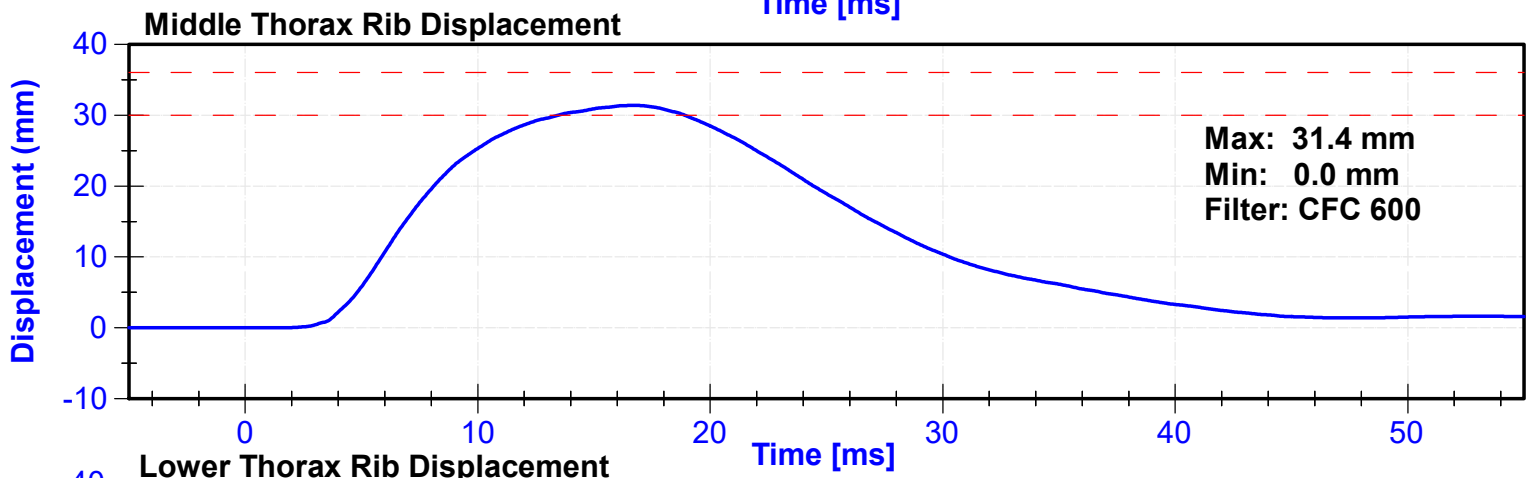
Transducer Calibrations

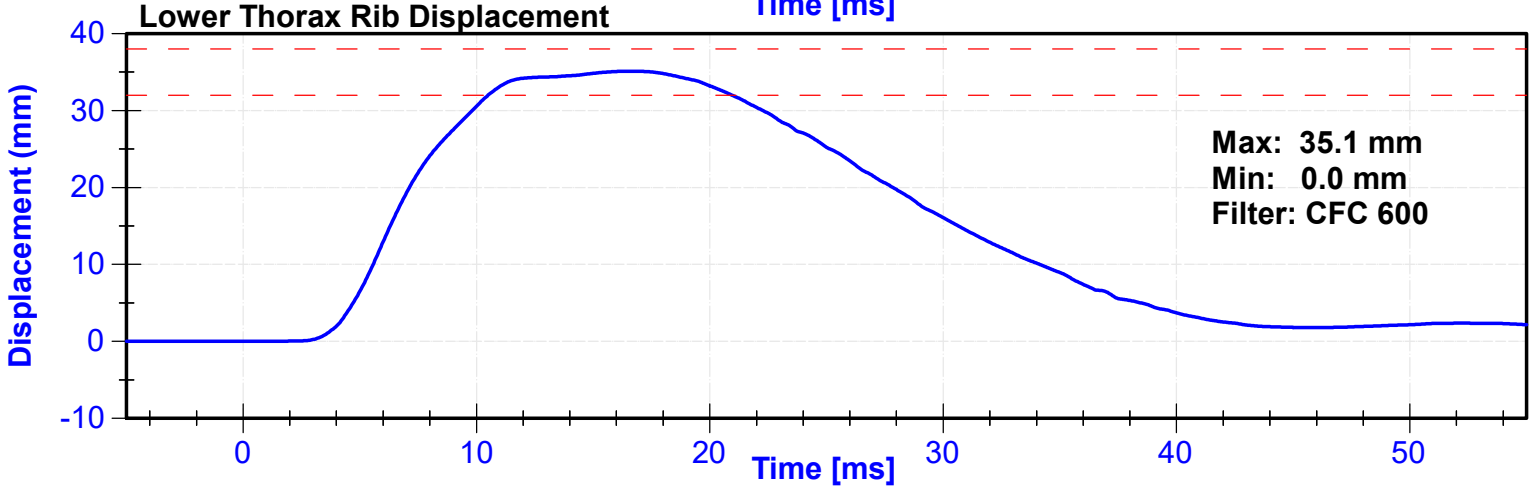
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Upper Spine T1 Y Accelerometer	Endevco	P64148	6/30/2023	12/27/2023
Upper Spine T12 Y Accelerometer	Endevco	P51327	6/30/2023	12/27/2023
Shoulder Potentiometer	Servo	1274GFE	7/5/2023	1/3/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	7/5/2023	1/3/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	7/5/2023	1/3/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	7/5/2023	1/3/2024

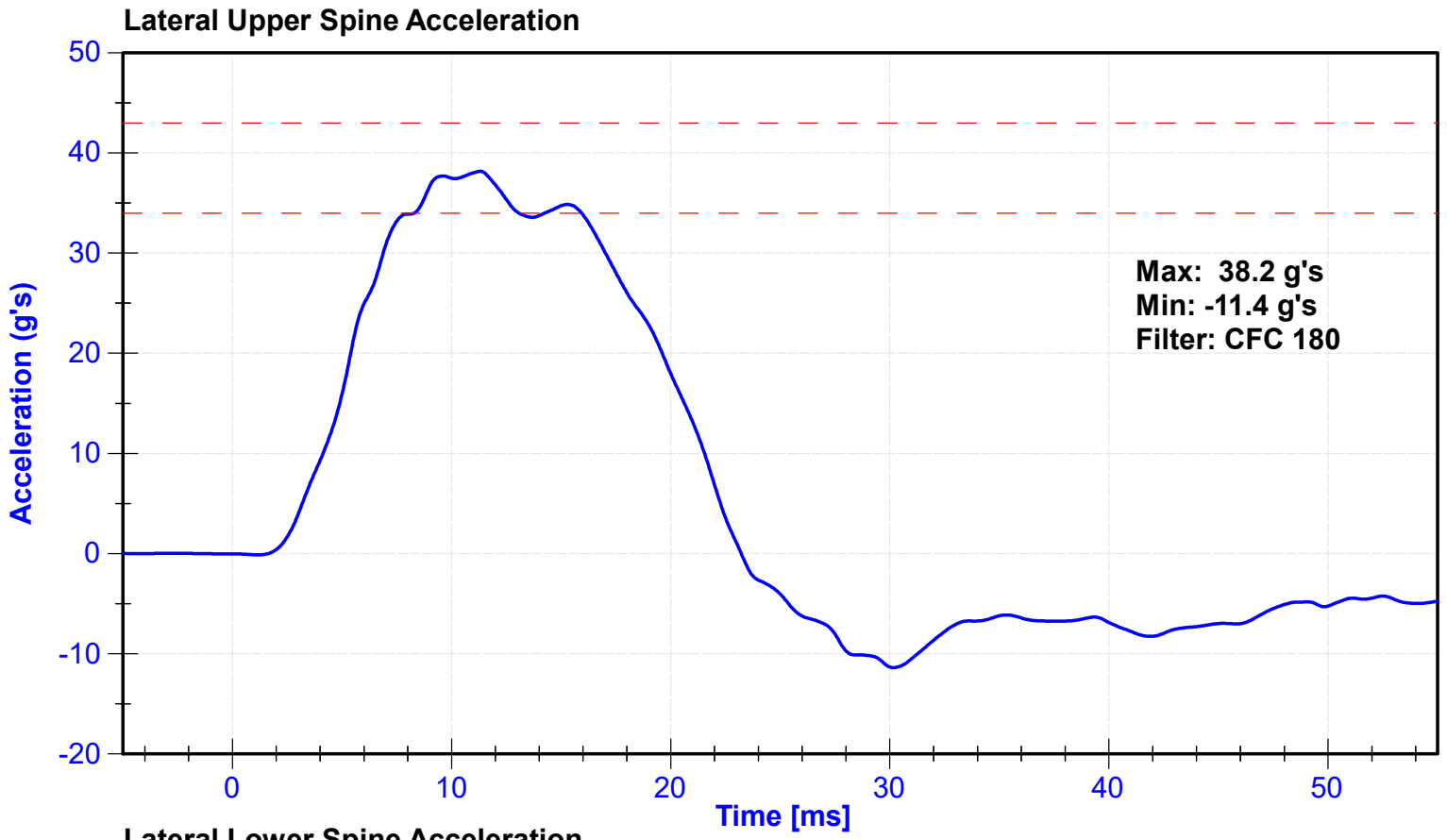


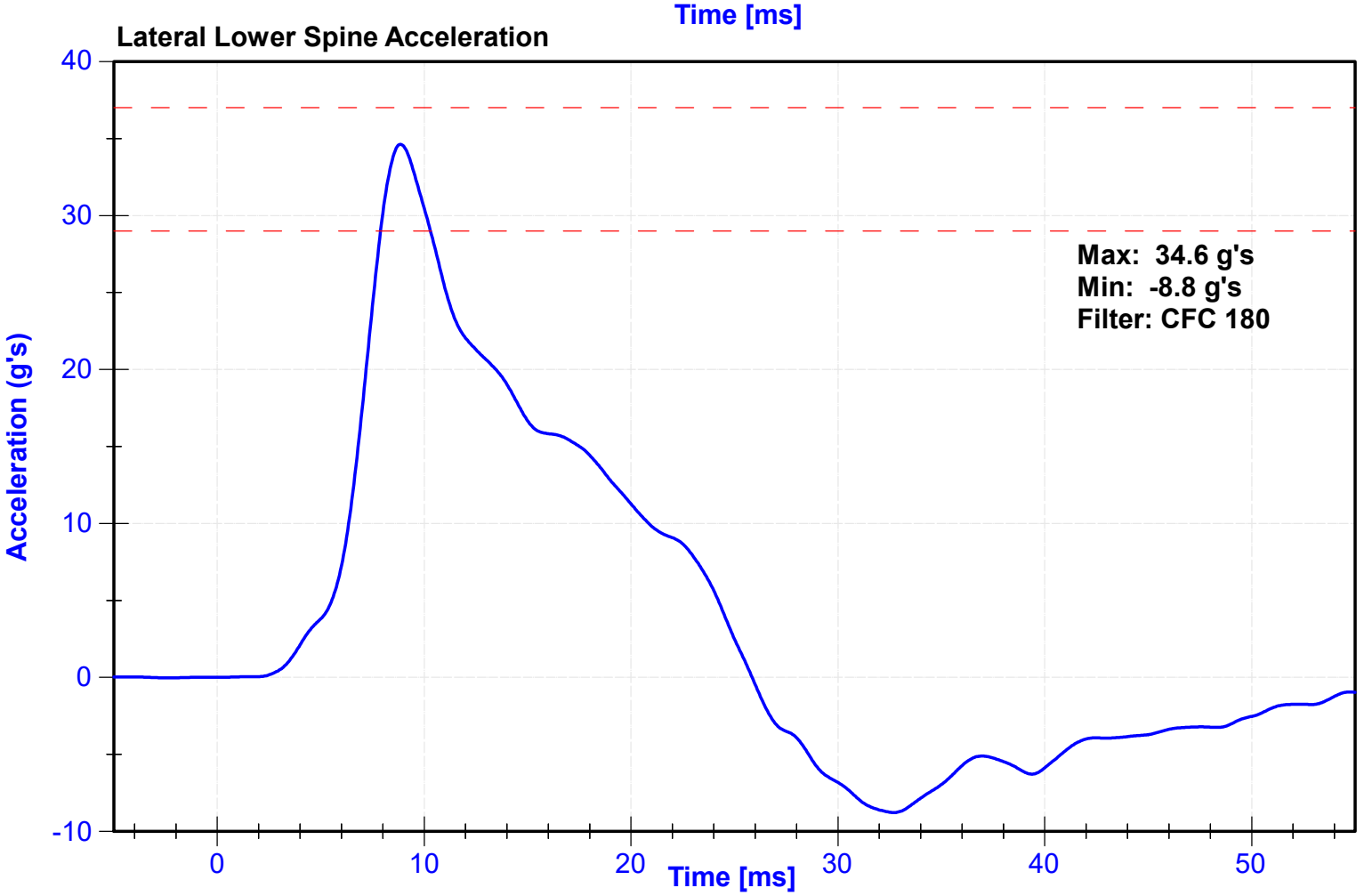

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 31.1 mm
Min: -0.9 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 26.0 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 31.4 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 35.1 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: 38.2 g's
Min: -11.4 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: 34.6 g's
Min: -8.8 g's
Filter: CFC 180

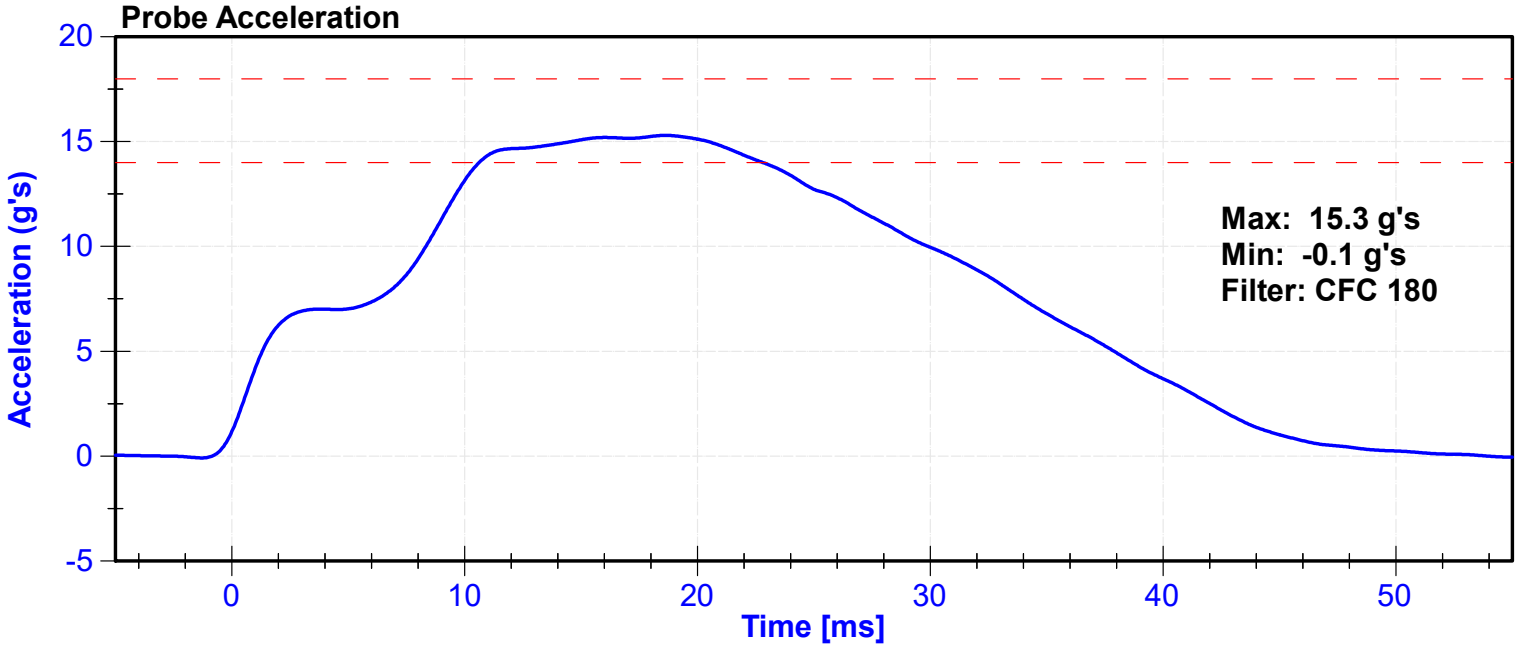
ATD Manufacturer	FTSS	Test Technician	J. Miller
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

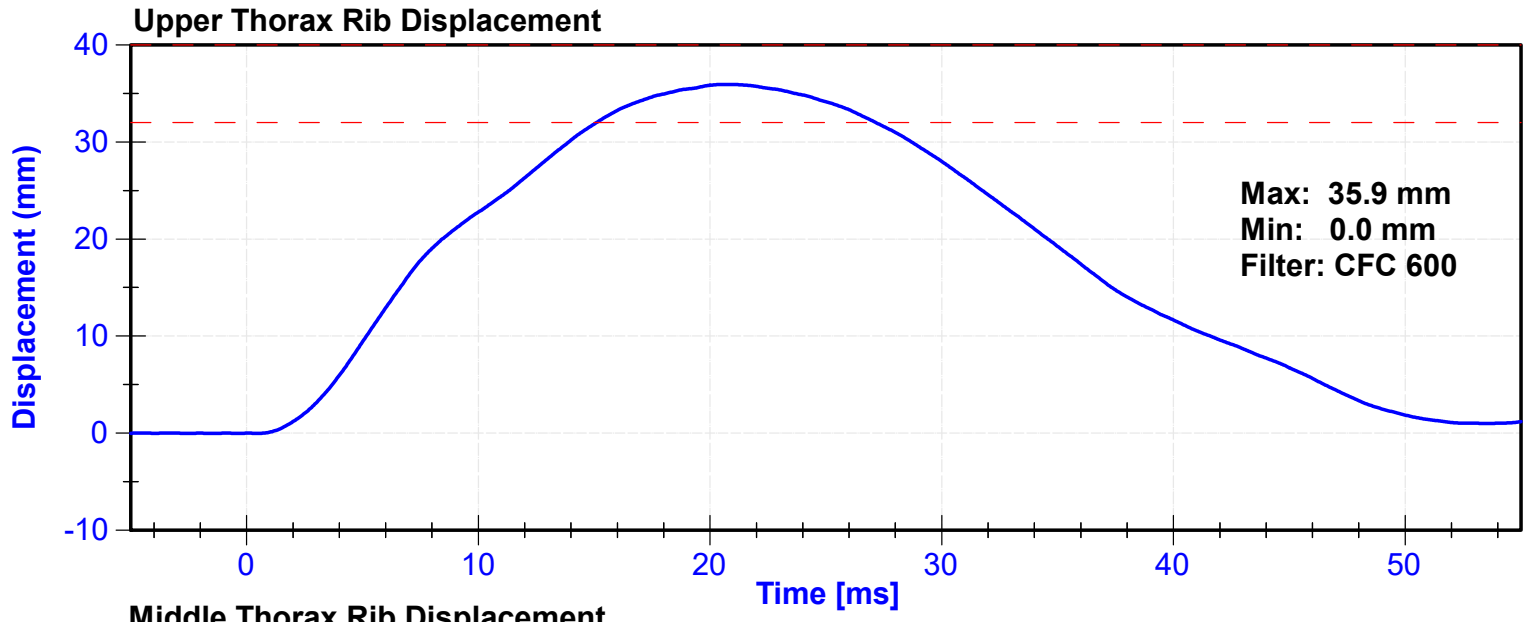
Results

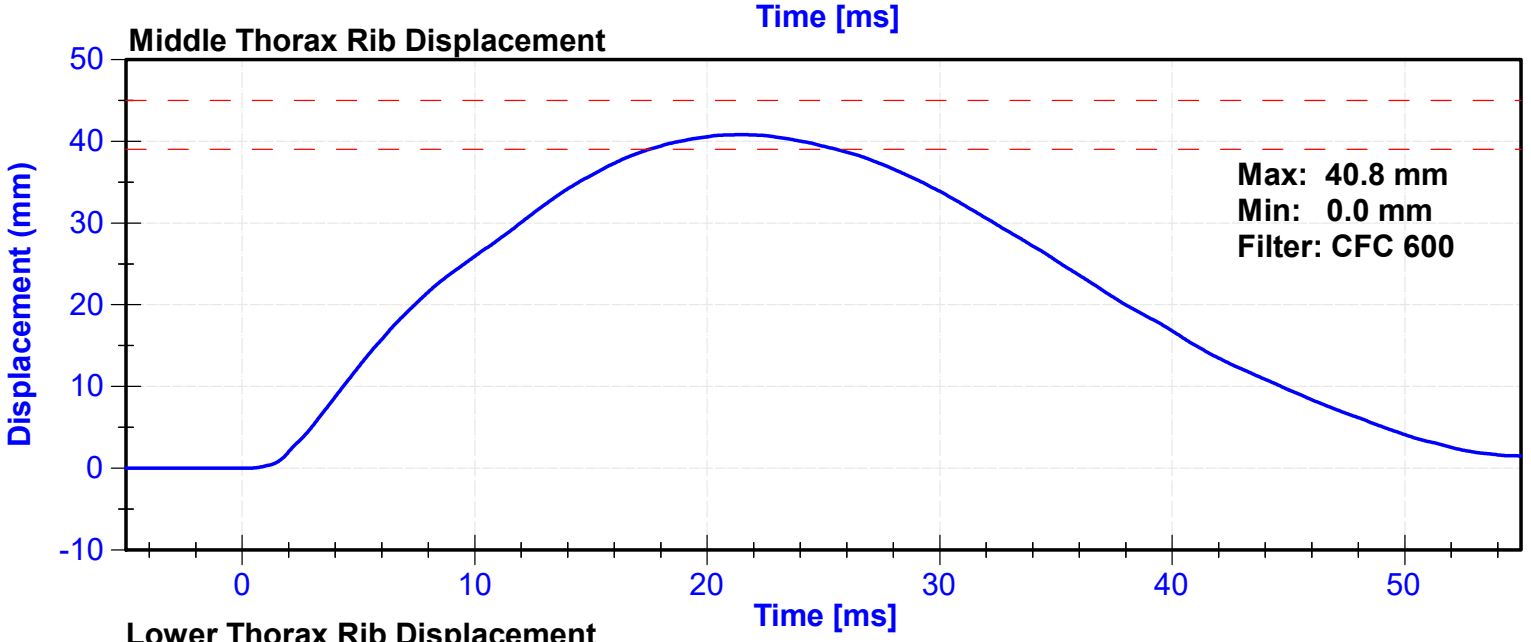
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	65	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	14	18	g's	15.3	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.5	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.5	Pass
Upper Thorax Rib Deflection	32	40	mm	35.9	Pass
Middle Thorax Rib Deflection	39	45	mm	40.8	Pass
Lower Thorax Rib Deflection	35	43	mm	38.6	Pass

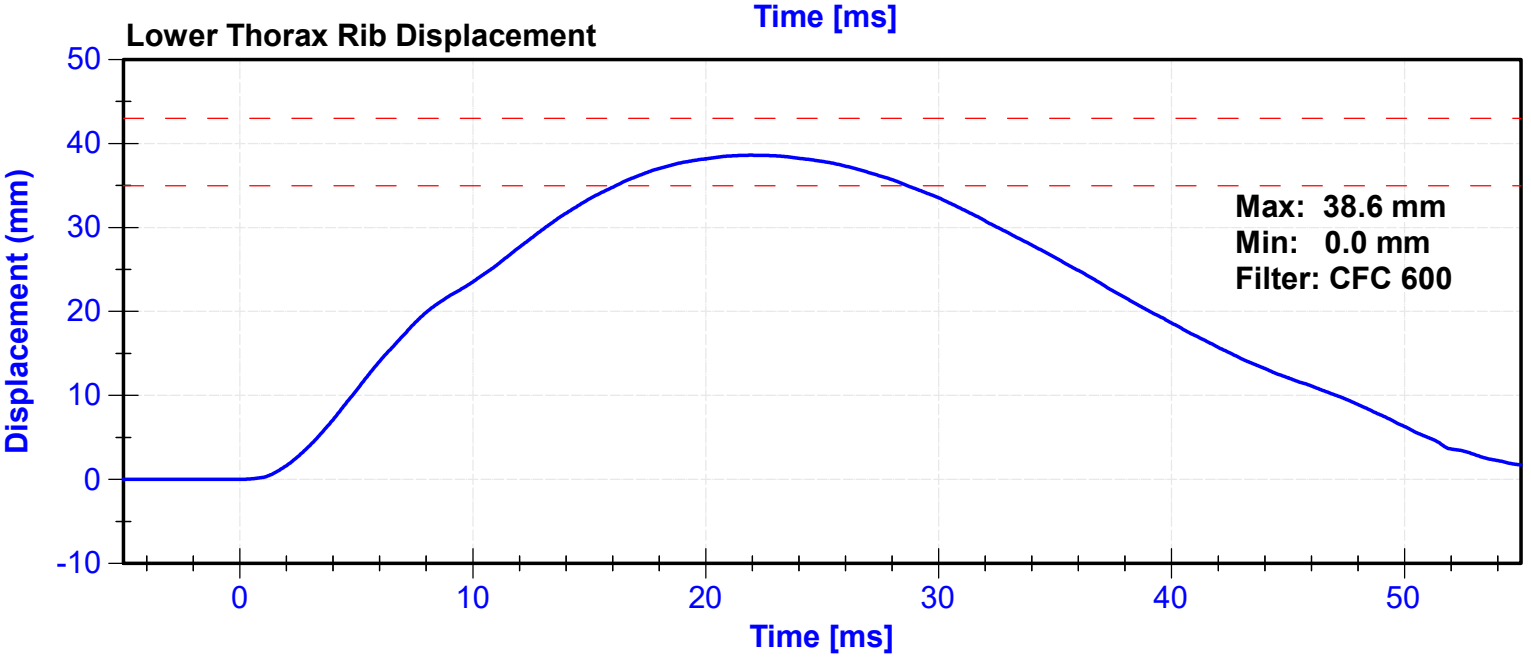
Transducer Calibrations

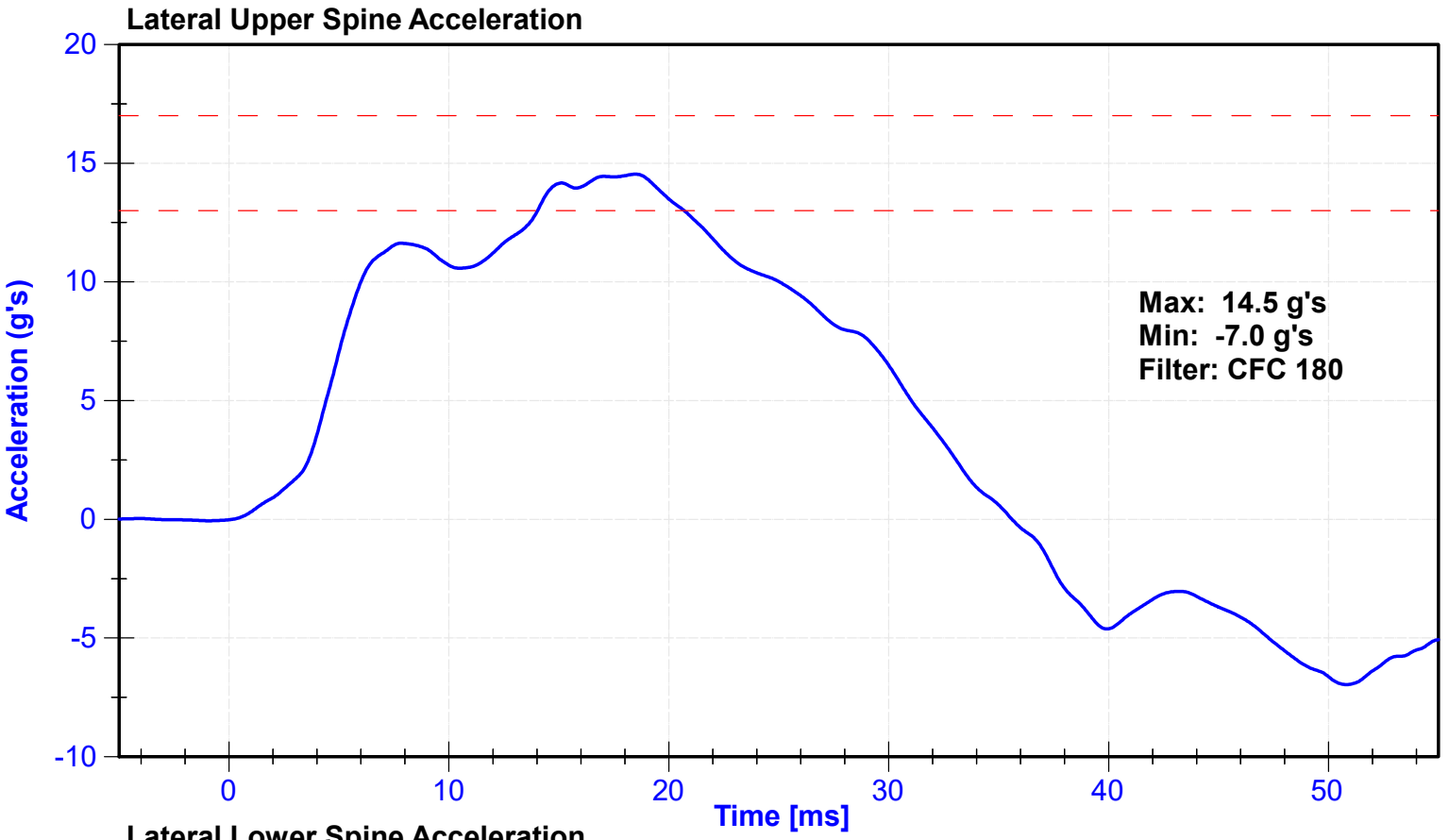
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Upper Spine Y Accelerometer	Endevco	P64148	6/30/2023	12/27/2023
Lower Spine Y Accelerometer	Endevco	P51327	6/30/2023	12/27/2023
Upper Thorax Rib Potentiometer	Servo	1199GFE	7/5/2023	1/3/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	7/5/2023	1/3/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	7/5/2023	1/3/2024

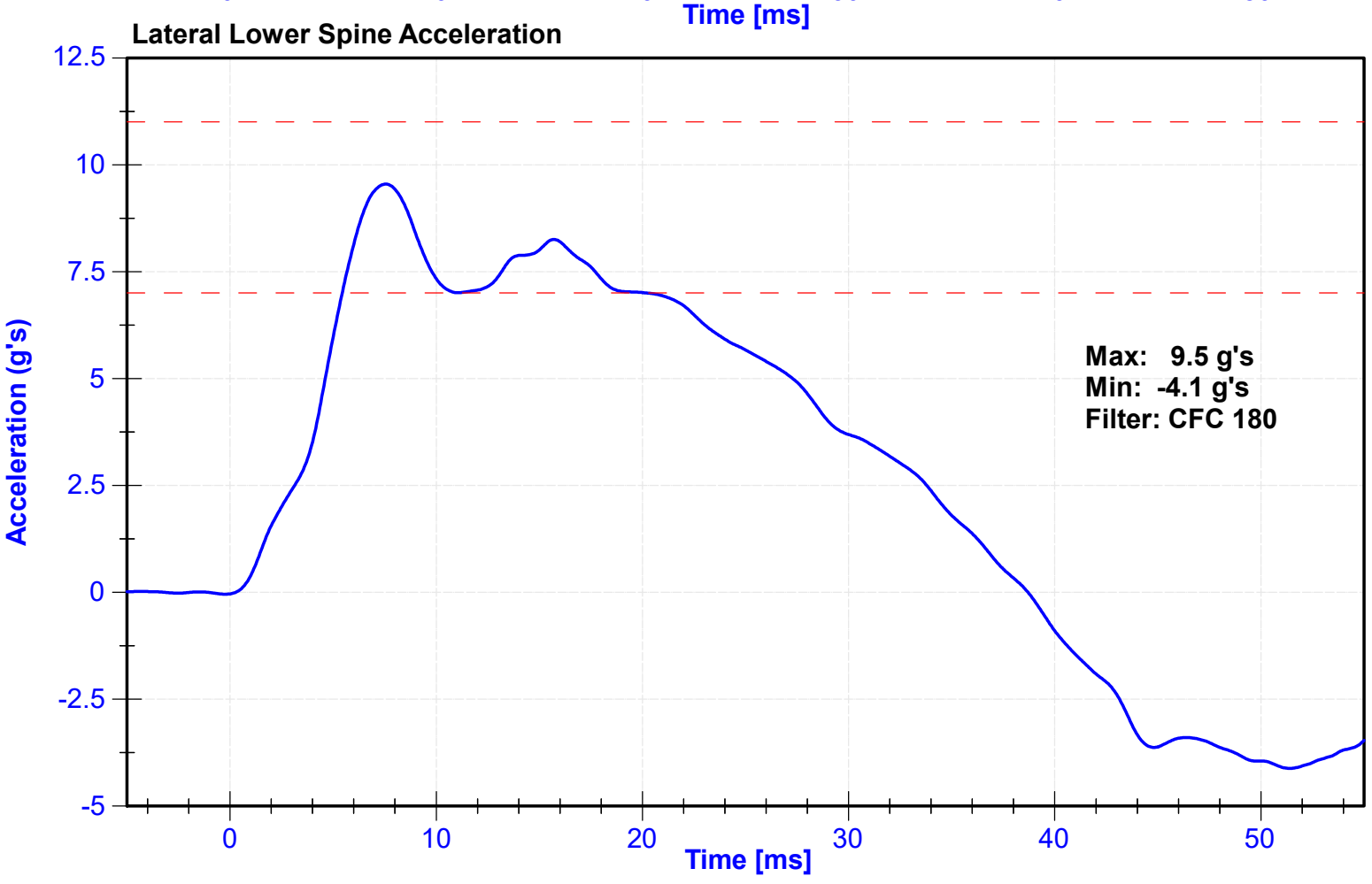



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 35.9 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.8 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.6 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]
Max: 14.5 g's
Min: -7.0 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
Time [ms]
Max: 9.5 g's
Min: -4.1 g's
Filter: CFC 180

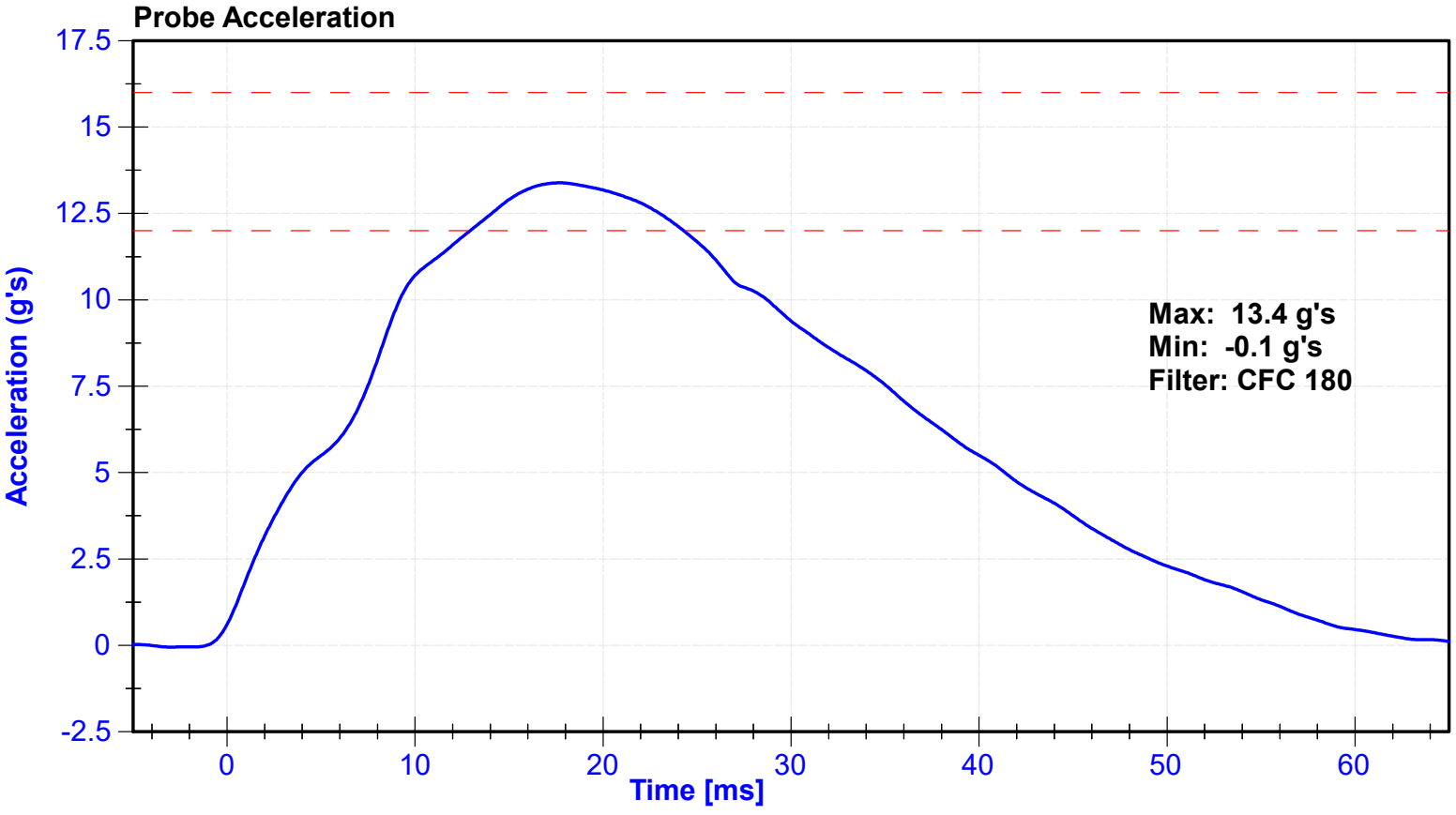
ATD Manufacturer	FTSS	Test Technician	J. Miller
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

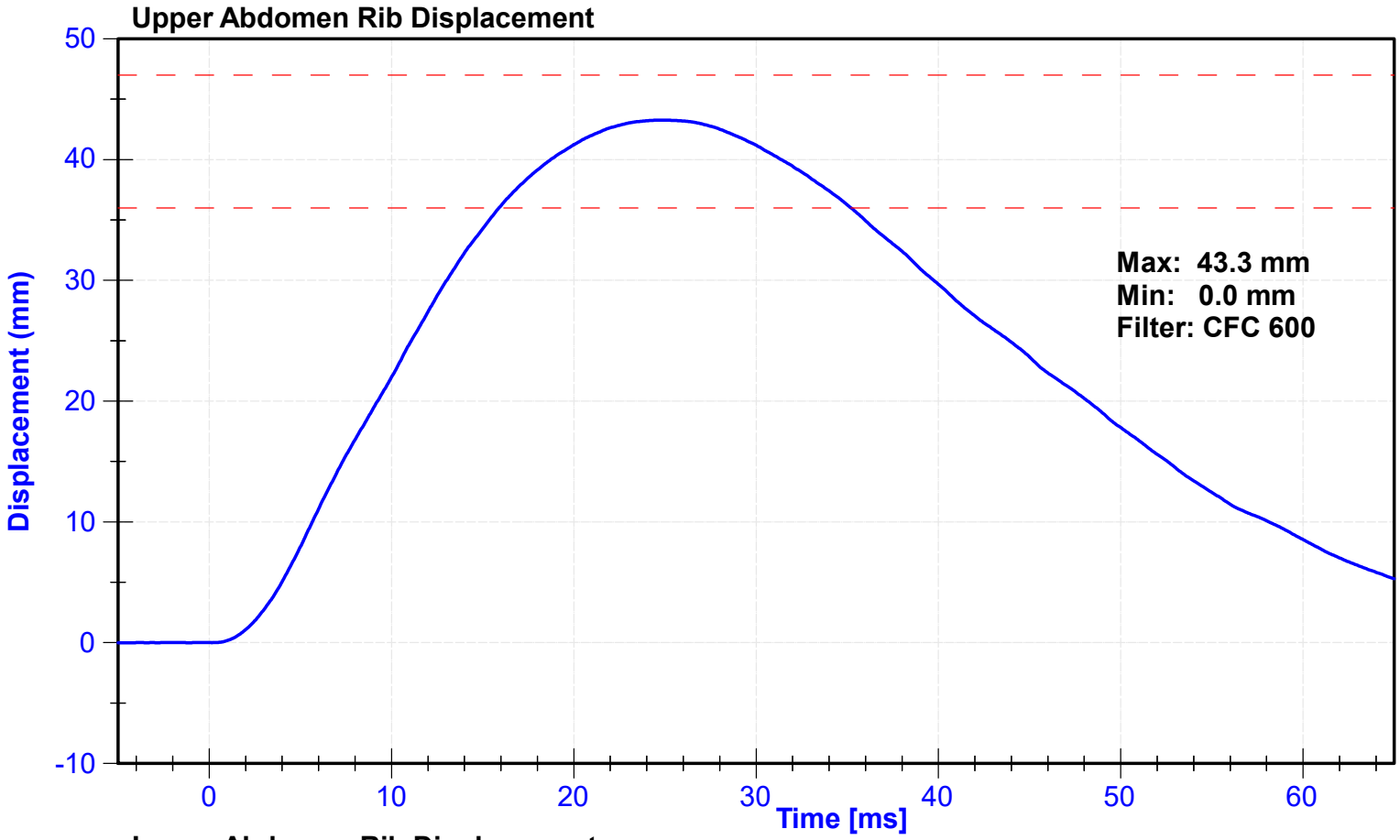
Results

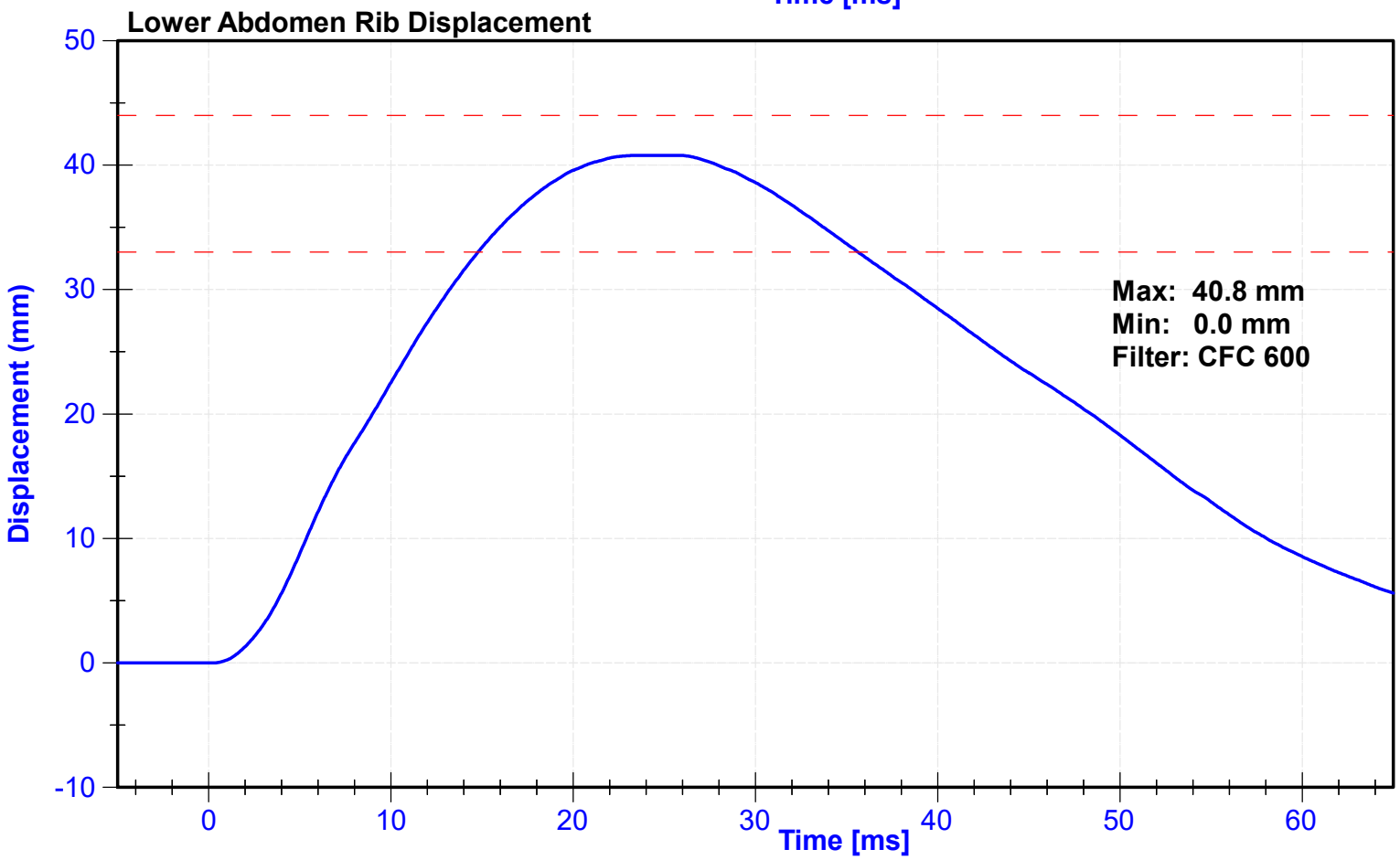
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	65	Pass
Velocity	4.2	4.4	m/s	4.24	Pass
Probe Acceleration	12	16	g's	13.4	Pass
Lateral Lower Spine Acceleration	9	14	g's	12.0	Pass
Upper Abdomen Rib Deflection	36	47	mm	43.3	Pass
Lower Abdomen Rib Deflection	33	44	mm	40.8	Pass

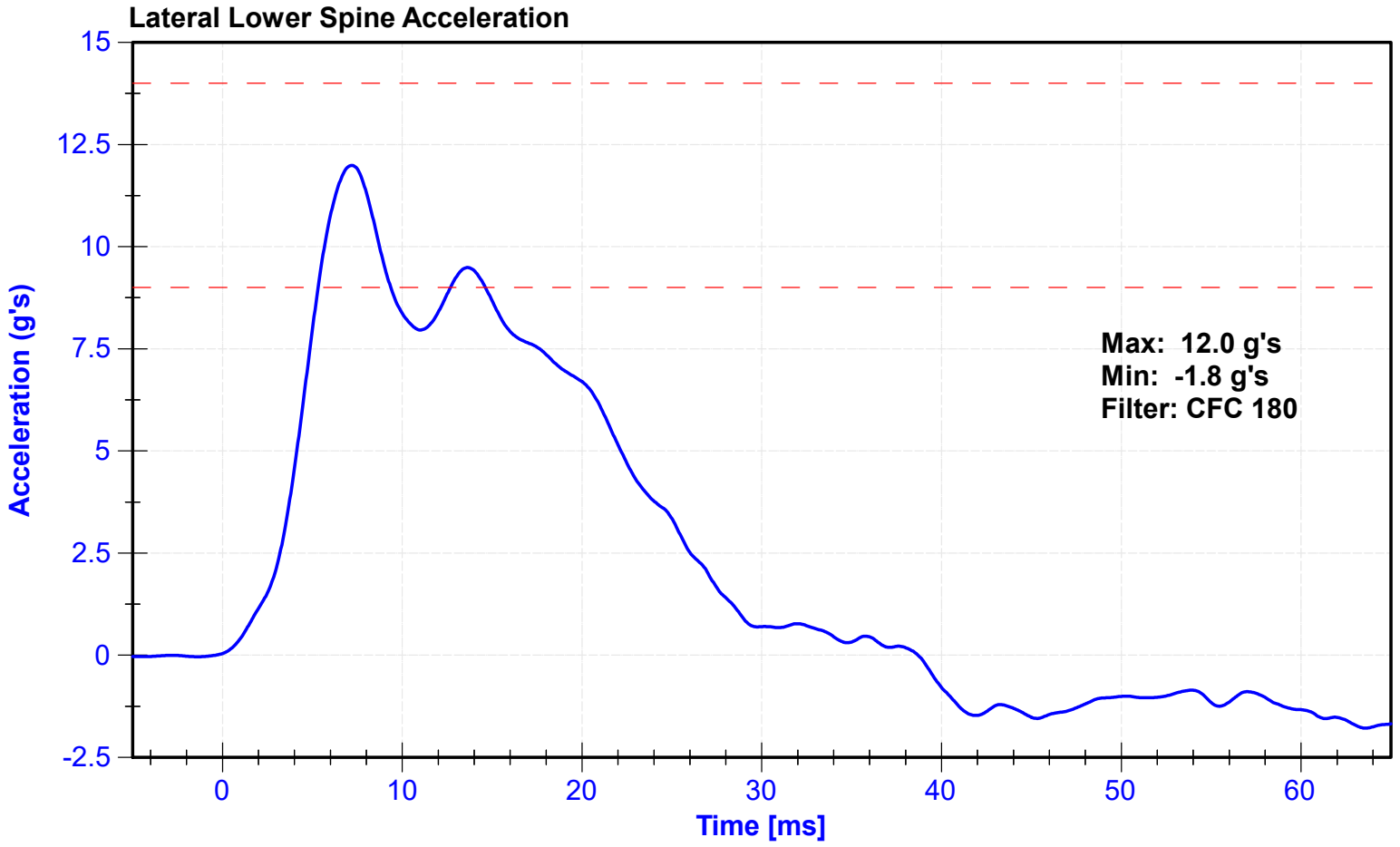
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Lower Spine Y Accelerometer	Endevco	P51327	6/30/2023	12/27/2023
Upper Abdomen Rib Potentiometer	Servo	008GFE	7/5/2023	1/3/2024
Lower Abdomen Rib Potentiometer	Servo	041 GFE	7/5/2023	1/3/2024




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 43.3 mm
Min: 0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 40.8 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
0
10
20
30
40
50
60
Time [ms]
Max: 12.0 g's
Min: -1.8 g's
Filter: CFC 180

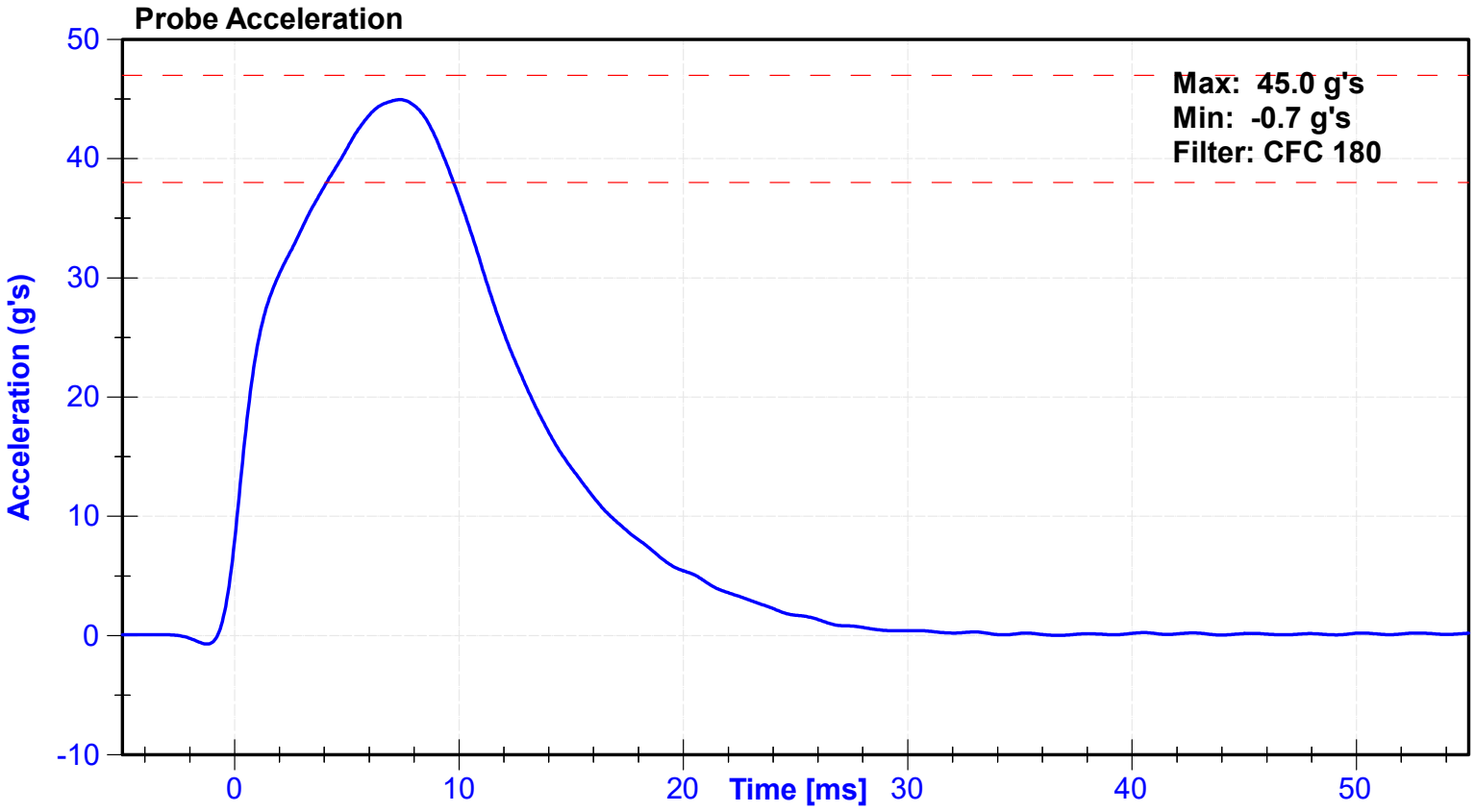
ATD Manufacturer	FTSS	Test Technician	J. Miller
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

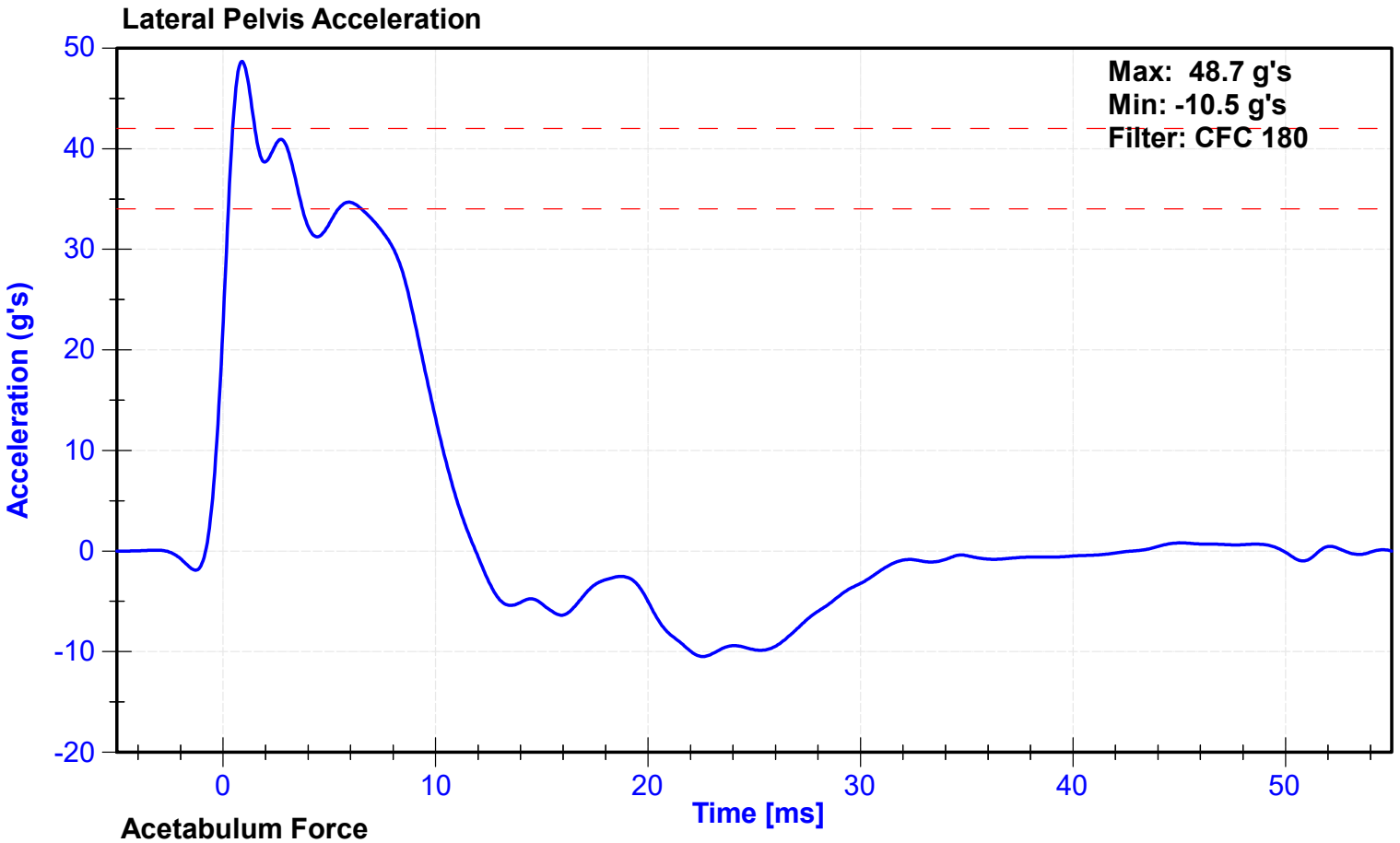
Results

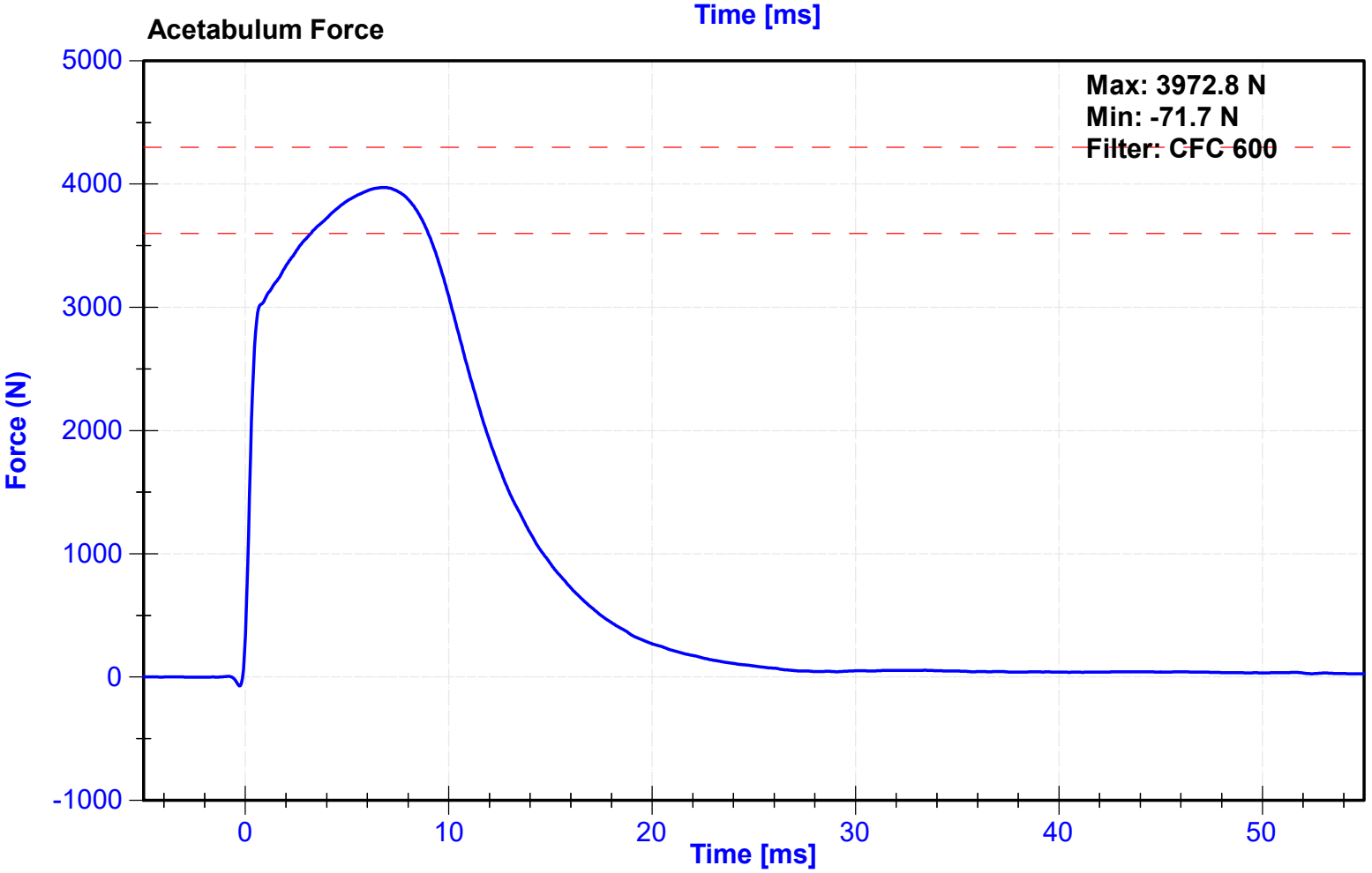
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	63	Pass
Velocity	6.6	6.8	m/s	6.65	Pass
Probe Acceleration	38	47	g's	45.0	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	34.7	Pass
Acetabulum Force	3600	4300	N	3972.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Pelvis Y Accelerometer	Endevco	P51875	6/30/2023	12/27/2023
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: 48.7 g's
Min: -10.5 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: 3972.8 N
Min: -71.7 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 16306 CERT 8-7-23
Test Number 22872
Report Number 22929
Test Date 5/20/2022 10:39:39 AM

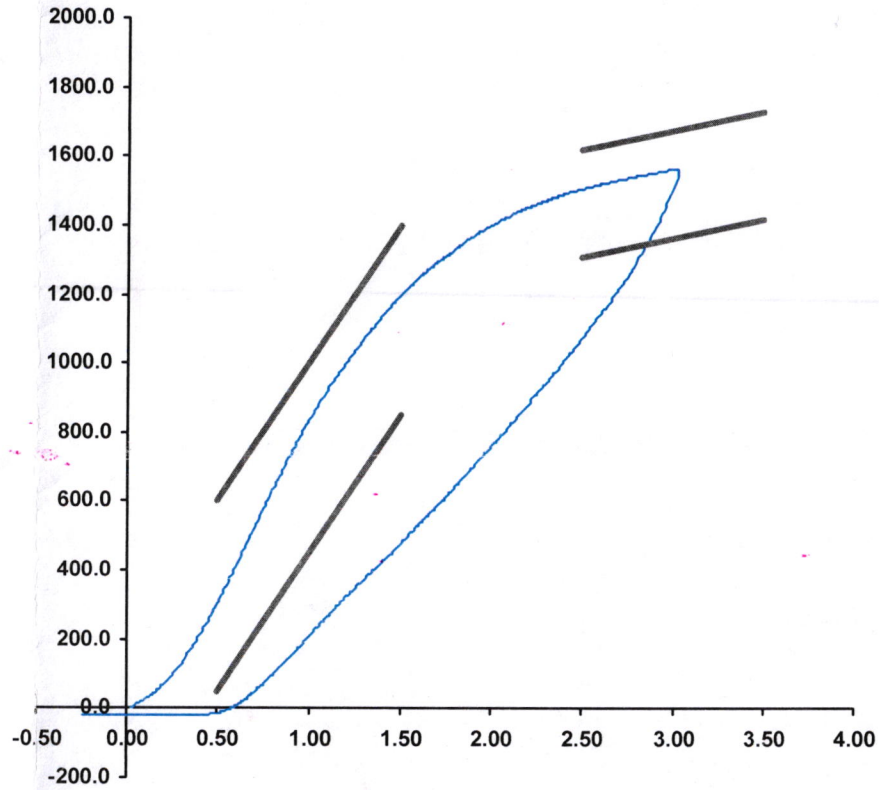
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	309	50	600
Force @ 1.5 mm (N)	1,205	850	1,400
Force @ 2.5 mm (N)	1,505	1,306	1,618
Force @ 3.0 mm (N)	1,561	1,361	1,673

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

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

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 20-May-22
SACO Research

By : DC Date : 5/20/2022

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

SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 16353 CRASH

Test Number 22920

Report Number 22977

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

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	276	50	600
Force @ 1.5 mm (N)	1,151	850	1,400
Force @ 2.5 mm (N)	1,453	1,306	1,618
Force @ 3.0 mm (N)	1,511	1,361	1,673

Testing Machine STM-20 5965542

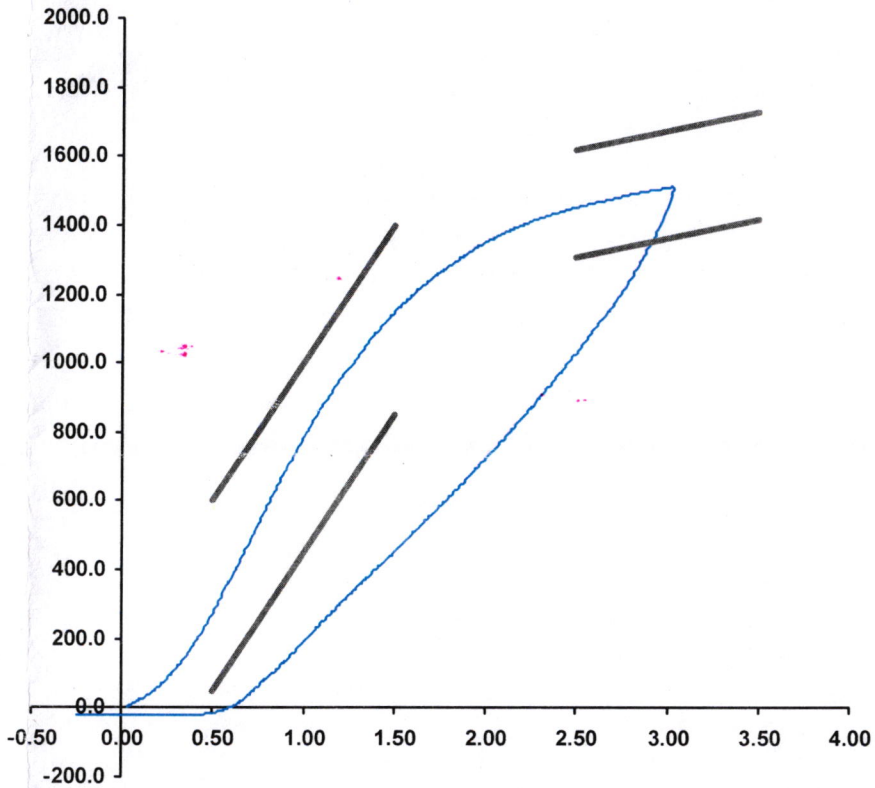
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 20-May-22

SACO Research

By : DC Date : 5/20/2022

SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Non-Impact DG8012

Plug S/N 16431 CRASH

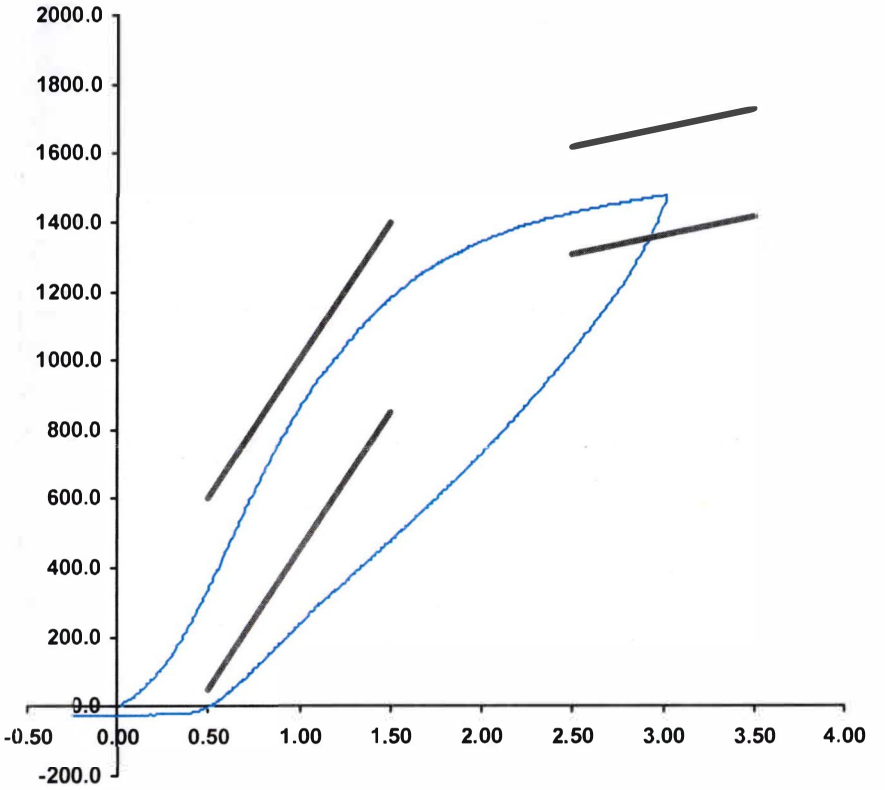
Test Number 23000

Report Number 23058

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

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	338	50	600
Force @ 1.5 mm (N)	1,180	850	1,400
Force @ 2.5 mm (N)	1,426	1,306	1,618
Force @ 3.0 mm (N)	1,476	1,361	1,673

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542

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

0.092

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 23-May-22

SACO Research

By : DC Date : 5/23/2022

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

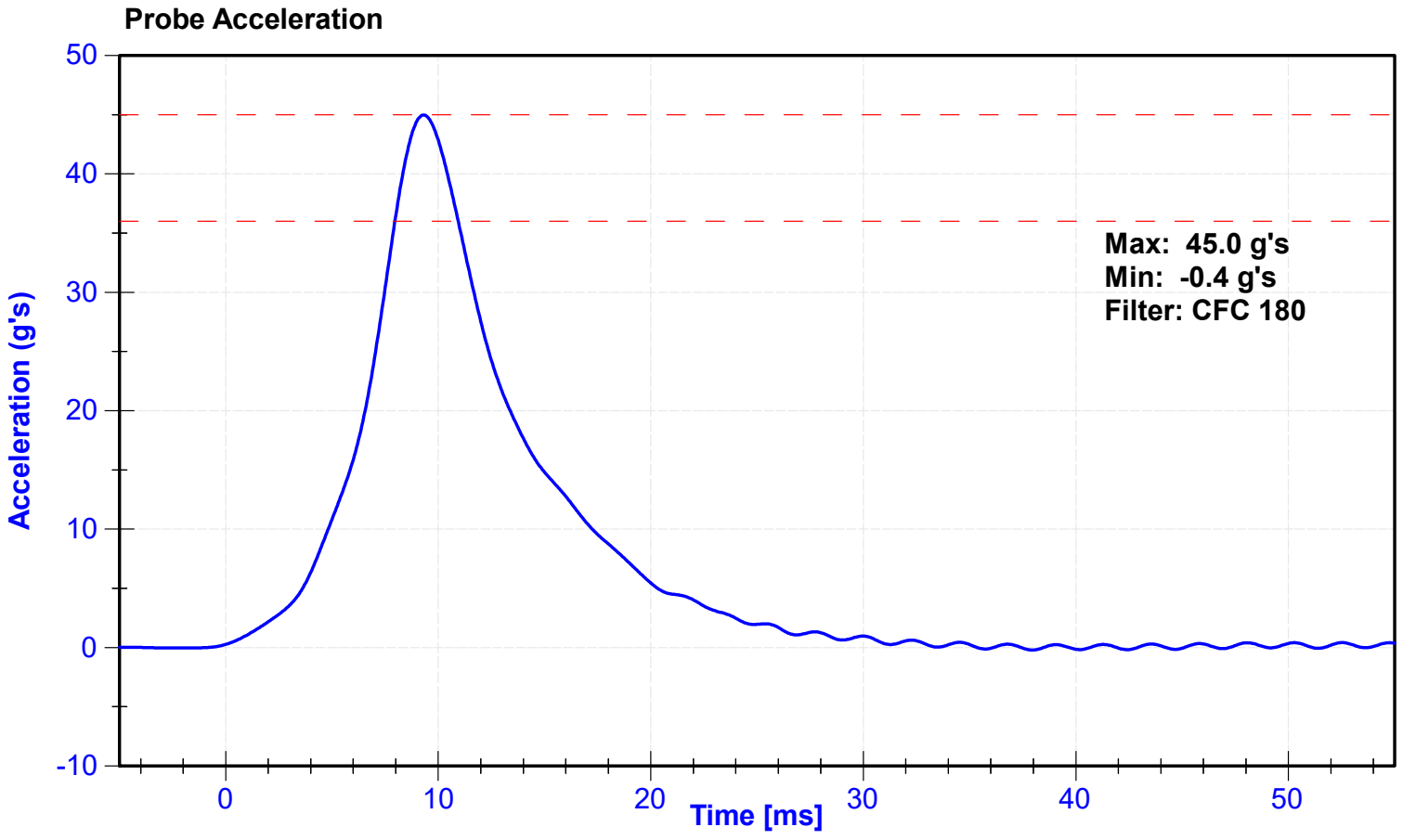
ATD Manufacturer	FTSS	Test Technician	J. Miller
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

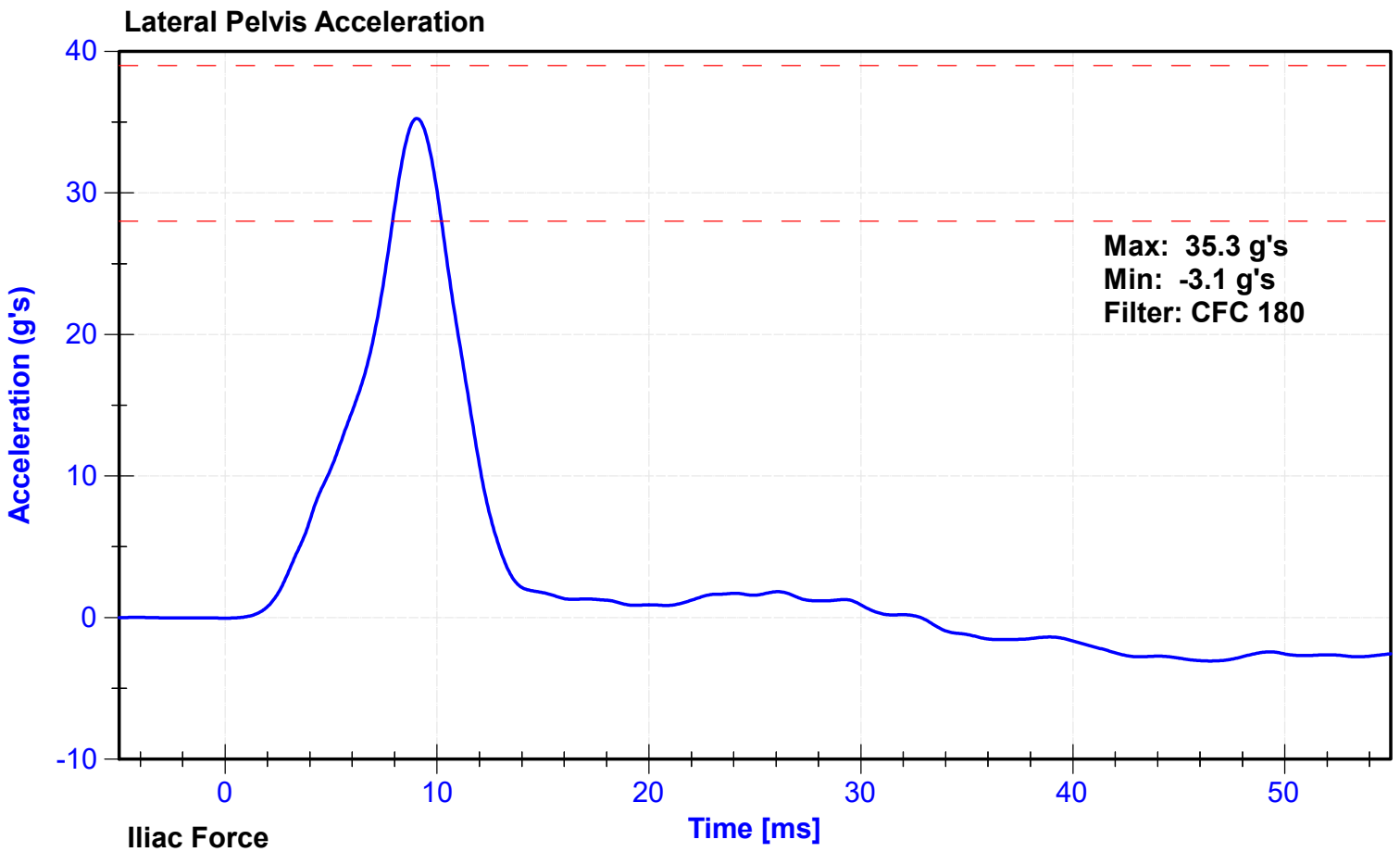
Results

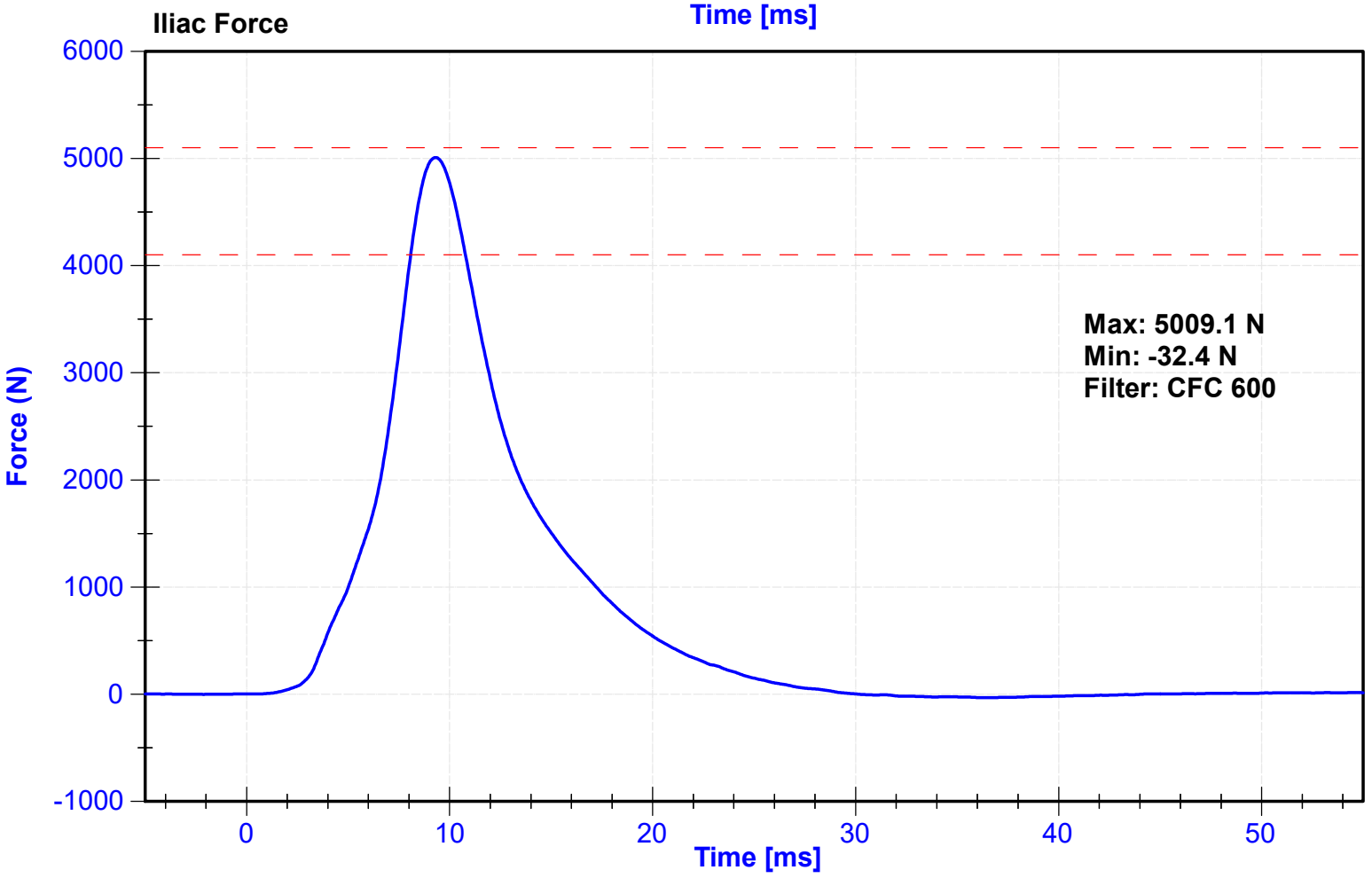
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	64	Pass
Velocity	4.2	4.4	m/s	4.25	Pass
Probe Acceleration	36	45	g's	45.0	Pass
Lateral Pelvis Acceleration	28	39	g's	35.3	Pass
Iliac Force	4100	5100	N	5009.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18546	11/19/2022	11/18/2023
Pelvis Y Accelerometer	Endevco	P51875	6/30/2023	12/27/2023
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: 35.3 g's
Min: -3.1 g's
Filter: CFC 180


Iliac Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 5009.1 N
Min: -32.4 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	6/20/2023
		Y	P49216	Endevco	6/20/2023
		Z	P51303	Endevco	6/19/2023
	Redundant	X	P58868	Endevco	6/20/2023
		Y	P59020	Endevco	6/20/2023
		Z	P52132	Endevco	6/19/2023
Thorax Rib Displacement Potentiometers	Upper	Y	179GFE	Honeywell	6/20/2023
	Middle	Y	185GFE	Honeywell	6/20/2023
	Lower	Y	178GFE	Honeywell	6/20/2023
Abdomen Load Cells	Forward	Y	DM5846	Denton	5/18/2023
	Middle	Y	1529	Denton	5/18/2023
	Rear	Y	1533	Denton	5/24/2023
Lower Spine Accelerometers (T12)		X	P58997	Endevco	7/6/2023
		Y	T21243	Endevco	6/19/2023
		Z	P52033	Endevco	6/19/2023
Pubic Symphysis Load Cell		Y	459-FY	Denton	6/20/2023

TABLE 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N DG8012		
				Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers		Primary	X	P74788	Endevco	7/5/2023
			Y	P51668	Endevco	7/5/2023
			Z	P83319	Endevco	7/5/2023
		Redundant	X	P80334	Endevco	6/30/2023
			Y	P52155	Endevco	7/5/2023
			Z	P83322	Endevco	7/5/2023
Displacement Potentiometers	Thoracic Rib	Upper	Y	1199GFE	Servo	7/5/2023
		Middle	Y	1246GFE	Servo	7/5/2023
		Lower	Y	011GFE	Servo	7/5/2023
	Abdominal Rib	Upper	Y	008GFE	Servo	7/5/2023
		Lower	Y	041 GFE	Servo	7/5/2023
Lower Spine Accelerometers (T12)			X	P71272	Endevco	6/30/2023
			Y	P51327	Endevco	6/30/2023
			Z	P52067	Endevco	6/30/2023
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)				14243	SACO	7/3/2020
Pelvis Plug (non-struck side)				14229	SACO	7/3/2020

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	A398326	Measurement Specialties	6/6/2023
	Vehicle Center of Gravity	Y	A413605	Measurement Specialties	6/6/2023
	Vehicle Center of Gravity	Z	A413610	Measurement Specialties	6/6/2023
2	Right Sill at Front Seat	X	A372814	Measurement Specialties	3/9/2023
	Right Sill at Front Seat	Y	A372816	Measurement Specialties	3/8/2023
	Right Sill at Front Seat	Z	A372818	Measurement Specialties	3/9/2023
3	Right Sill at Rear Seat	X	A399940	Measurement Specialties	6/28/2023
	Right Sill at Rear Seat	Y	A399946	Measurement Specialties	6/28/2023
	Right Sill at Rear Seat	Z	A431363	Measurement Specialties	6/28/2023
4	Left Sill at Front Door	Y	A283621	Measurement Specialties	7/5/2023
5	Left Sill at Rear Door	Y	A284066	Measurement Specialties	7/5/2023
6	Left A-Post Lower	Y	G22900	Endevco	2/25/2023
7	Left A-Post Middle	Y	A405621	Measurement Specialties	3/6/2023
8	Left B-Post Lower	Y	G22689	Endevco	6/21/2023
9	Left B-Post Middle	Y	G22707	Endevco	6/21/2023
10	Front Seat Track	Y	A280891	Measurement Specialties	5/30/2023
11	Rear Seat Track or Structure	Y	G23670	Endevco	4/28/2023
12	Right Rear Occ. Compartment	Y	G23415	Endevco	4/24/2023
13	Engine Block	X	G23439	Endevco	4/25/2023
	Engine Block	Y	G23662	Endevco	4/28/2023
14	Rear Floorpan Above Axle	X	A335440	Measurement Specialties	6/21/2023
	Rear Floorpan Above Axle	Y	A398297	Measurement Specialties	3/21/2023
	Rear Floorpan Above Axle	Z	G22203	Endevco	3/23/2023

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	A352316	Measurement Specialties	5/10/2023
MDB Center of Gravity	Y	A400754	Measurement Specialties	5/10/2023
MDB Center of Gravity	Z	A405578	Measurement Specialties	5/10/2023
Left Frame at Rear Axle Centerline	X	A255875	Measurement Specialties	5/10/2023
Left Frame at Rear Axle Centerline	Y	A398655	Measurement Specialties	5/10/2023