REPORT NUMBER: SINCAP-CAL-24-005

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

KIA Corporation
2024 KIA Sportage Hybrid
5 Door SUV

NHTSA No: O20244216

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

October 21, 2024

FINAL REPORT

PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NRM-110
1200 NEW JERSEY AVE SE
WASHINGTON, D.C. 20590

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number 693JJ920D000016.

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Prepared by: Alexander Rudniski
Alexander Rudniski, Test Engineer

Date: October 21, 2024

Approved by: Matthew Pronko
Matthew Pronko, Test Engineer

Date: October 21, 2024

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

1. *Report No.*	*2. Government Accession No.*	*3. Recipient's Catalog No.*
SINCAP-CAL-24-005		

4. Title and Subtitle	*5. Report Date*
Final Report of New Car Assessment Program Side Impact MDB Testing & FMVSS 305 Indicant Testing of a 2024 KIA Sportage Hybrid 5 Door SUV NHTSA No.: O20244216	October 21, 2024
	6. Performing Organization Code CAL
7. Author(s) Alexander Rudniski, Test Engineer Matthew Pronko, Test Engineer	*8. Performing Organization Report No.* CAL-DOT-2024-005
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225	*10. Work Unit No.*
	11. Contract or Grant No. 693JJ920D000016
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave., SE Washington, D.C. 20590	*13. Type of Report and Period Covered:* Final Test Report March 13, 2024 - October 21, 2024
	14. Sponsoring Agency Code NRM-110

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 2024 KIA Sportage Hybrid 5 Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on March 13, 2024.

The impact velocity of the Moving Deformable Barrier (MDB) was 62.09 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 189 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	69.702
Maximum Thorax Rib Deflection	mm	44	22.805
Total Abdominal Force	N	2500	719.710
Pubic Symphysis Force	N	6000	1096.533
Lower Spine (T12) Resultant Acceleration	G	82*	24.396

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC36)		1000	81.833
Maximum Thorax Rib Deflection	mm	38*	18.065
Lower Spine (T12) Resultant Acceleration	G	82	47.181
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2585.066
Maximum Abdominal Rib Deflection	mm	45*	33.156

**Proposed IARV*

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

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

19. Security Class. (of this report)	*20. Security Class. (of this page)*	*21. No. of Pages*	*22. Price*
UNCLASSIFIED	UNCLASSIFIED	222	

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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2024 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 2024 KIA Sportage Hybrid 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 2024 KIA Sportage Hybrid 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 62.09 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 March 13, 2024. 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	69.702
Maximum Thorax Rib Deflection	mm	44	22.805
Total Abdominal Force	N	2500	719.710
Pubic Symphysis Force	N	6000	1096.533
Lower Spine (T12) Resultant Acceleration	G	82*	24.396

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC36)		1000	81.833
Maximum Thorax Rib Deflection	mm	38*	18.065
Lower Spine (T12) Resultant Acceleration	G	82	47.181
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2585.066
Maximum Abdominal Rib Deflection	mm	45*	33.156

*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	No	N/A		
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 - Torso/Pelvis Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other	N/A	N/A	N/A	N/A

GENERAL COMMENTS:

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

Data Anomalies:

The following channel was questionable for:

- Left A-Pillar Lower Y Acceleration, Exceeded calibration range at 40.3 ms
- Left B-Pillar Lower Y Acceleration, Exceeded calibration range at 11.5 ms 18.6 ms
- Left B-Pillar Middle Y Acceleration, Exceeded calibration range at 11.4 ms

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

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

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

Data Sheet No. 3 - Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 - Dummy Lateral Clearance Dimensions

Data Sheet No. 5 - Camera and Instrumentation Data

Data Sheet No. 6 - Test Vehicle Accelerometer Locations

Data Sheet No. 7- MDB Accelerometer Locations

Data Sheet No. 8 - Post-Test Observations

Data Sheet No. 9 - MDB Summary of Results

Data Sheet No. 10 - Test Vehicle Profile Measurements

Data Sheet No. 11 - Test Vehicle Exterior Crush Measurements

Data Sheet No. 12 - MDB Exterior Static Crush Measurements

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

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

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

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

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

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

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

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

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20244216
Model Year	2024
Make	KIA
Model	Sportage
Body Style	SUV
VIN	KNDPU3DG0R7119585
Body Color	Fusion Black
Odometer Reading (km/mi)	595 mi
Engine Displacement (L)	1.6 Hybrid Powertrain
Type / No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6-Speed
Overdrive	Yes
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
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	No
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head / Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso / Pelvis Airbag	Yes
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Rear Pass. Load Limiter	Yes
Other Safety Restraint	N/A

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

DATA FROM CERTIFICATION LABEL

Manufactured By	KIA Corporation
Date of Manufacture	10/23
Vehicle Type	MPV

GVWR (KG)	2155
GVWR Front (KG)	1260
GVWR Rear (KG)	1200

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	0	5	
Vehicle Capacity Weight (VCW) (kg)				420	(A)
DSC x 68.04 kg				320	(B)
Cargo Weight (RCLW) (kg)				80	(A-B)

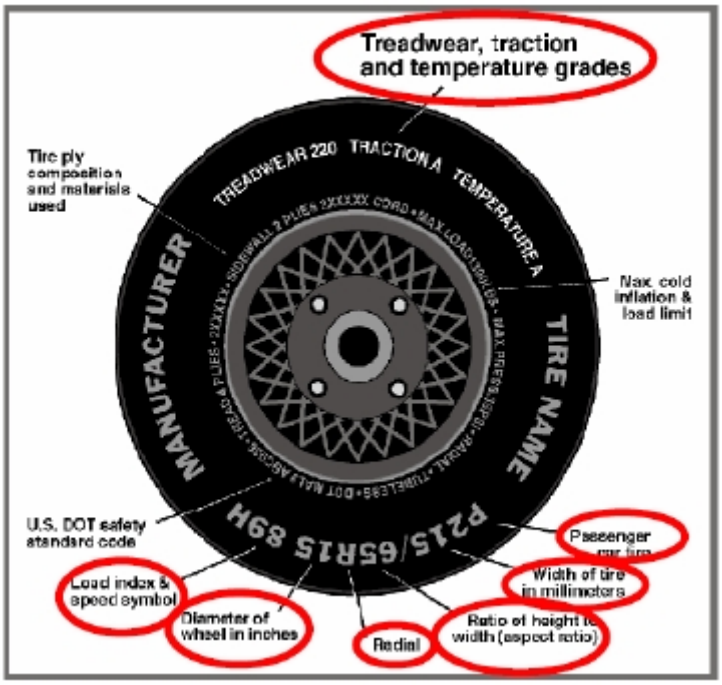
VEHICLE SEAT TYPE

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

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

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

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



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	235/65R17	235/65R17
Tire Size on Vehicle	235/65R17	235/65R17
Tire Manufacturer	Nexen	Nexen
Tire Model	Roadian GTX	Roadian GTX
Treadwear	600	600
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index / Speed Symbol	104H	104H
Tire Material	Rubber	Rubber
DOT Safety Code Left	1UA9YBMHL4123	1UA9YDMLR4123
DOT Safety Code Right	1UA9YDMCL4123	1UA9YDMCL4123

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

Test Vehicle: 2024 KIA Sportage Hybrid 5 Door SUV | NHTSA No.: O20244216
Test Program: NCAP Side MDB Impact Test | Test Date: 03/13/2024

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	251	249	246	253
Tire Placard	kPa	240	240	240	240
Owner's Manual	kPa	240	240	240	240
As Tested	kPa	240	240	240	240

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	494	325		540	403		542	411	
Right	kg	498	305		502	376		505	372	
Ratio	%	61.2	38.8		57.2	42.8		57.2	42.8	
Totals	kg	992	630	1622	1042	779	1821	1047	783	1830

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1622	(A)
Sum of Actual Weight of 1 ES2re and 1 P572 ATD (SID-IIs)	kg	127	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	80	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1829	(A+B+C)

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

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

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Rqmt***
LF	mm	844	836	Yes
RF	mm	850	841	Yes
RR	mm	861	857	Yes
LR	mm	852	848	Yes
Vehicle CG (Aft of Front Axle)	mm	1179	1179	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	34	29	

****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:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	6
Plastic Trim	3
Tire Mobility Kit	2
Tail Light	1
Ballast / Equipment Added	19.4

TEST SURFACE MARKINGS

	Distance from 63° Impact Location Line (mm)
Fore 25 mm target	910
Aft 25 mm target	908
Pre-Impact Angle Line	230

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:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

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	15.1	11.8	13.5
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (º)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	13.5	17	Max	-	-	-
			Mid	-	-	-
			Min	11	17	22
Front Passenger Seat	Fixed	Fixed	Max			
			Mid			
			Min			
Front Center Seat*			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max			
			Mid			
			Min			
Non-Struck Side Rear Seat	Fixed	Fixed	Max			
			Mid			
			Min			
Rear Center Seat*	Fixed	Fixed	Max			
			Mid			
			Min			

**If applicable*

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

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

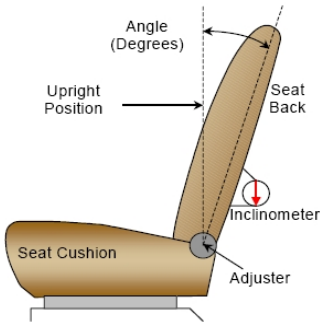
SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detents*
Driver Seat	240.5	38 (0-37)	123.5	19
Front Passenger Seat	240.5	38 (0-37)	123.5	19
Front Center Seat				
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed	Fixed

**if applicable*

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. The front center and front passenger's seat backs are positioned in a similar manner as the driver's seat back. The struck side rear seat back is positioned such that the dummy's head is level. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck-side rear seat back.



FRONT SEAT ASSEMBLY

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/ Seated Dummy	38.5	31 (0-30)	-6.8	7
Front Passenger Seat	39.6	31 (0-30)	-5.9	7
Front Center Seat*				
Struck Side Rear Seat w/ Seated Dummy	29.8	15 (0-14)	2.45	0
Non-Struck Side Rear Seat	30.3	15 (0-14)	2.0	0
Rear Center Seat*	30.3	15 (0-14)	2.0	0

**if applicable*

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

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

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

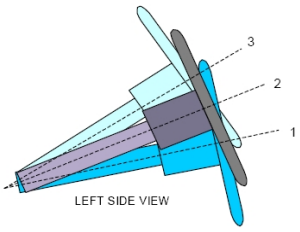
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

Seat	Total # of Positions	Placed in Position #
Driver Seat	6 (0-5)	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	22.9	
Geometric center - Position No. 2	25.4	
Uppermost - Position No. 3	27.9	
Telescoping Steering Wheel Travel		55
Test Position	25.4	27.5

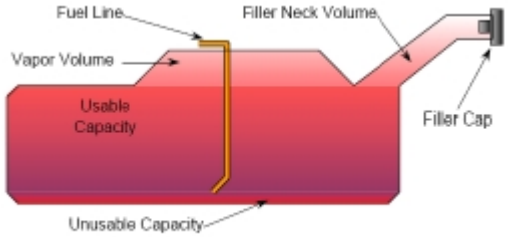


STEERING COLUMN ASSEMBLY

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 Form1 for more information.



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

FUEL TANK CAPACITY

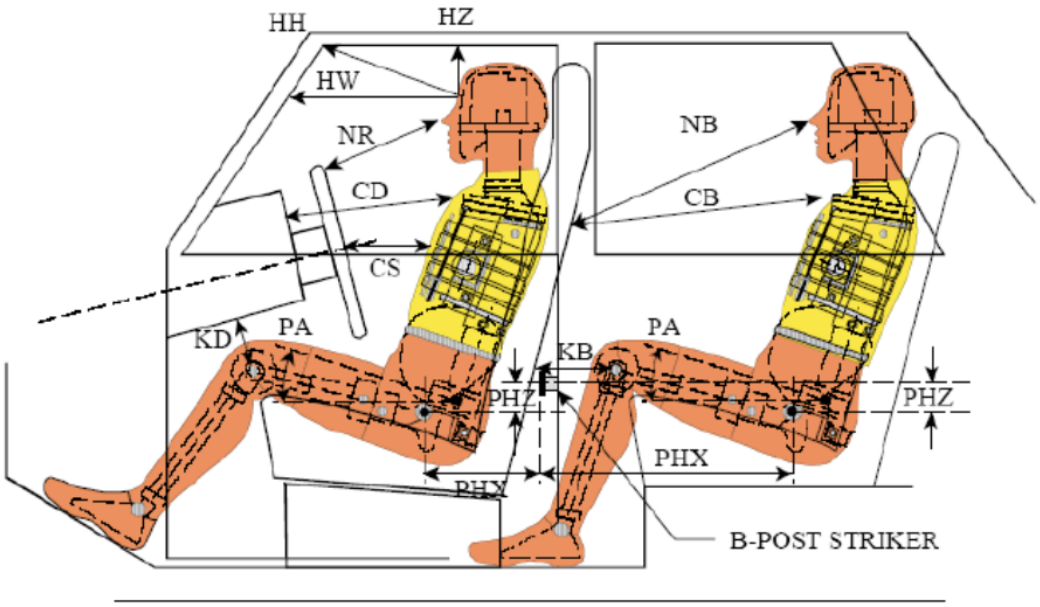
Description	Liters
Usable Capacity of “Standard Tank” (see Form No. 1)	52
Usable Capacity of “Optional Tank” (see Form No. 1)	N/A
Usable Capacity of “Standard Tank” (see Owner’s Manual)	52
Usable Capacity of “Optional Tank” (see Owner’s Manual)	N/A
93% of Usable Capacity	48.36
Actual Amount of Solvent Used in Test	48.36
1/3 of Usable Capacity	17.3

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

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION



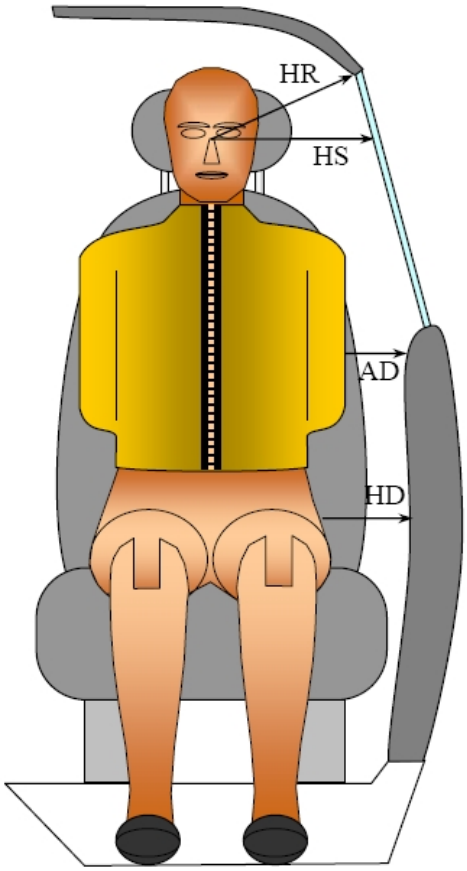
LEFT SIDE VIEW

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	362			
HW		Header to Windshield	604			
HZ	HZ	Head to Roof Liner	177		307	
NR	NB	Nose to Rim/Seat Back	438		545	
CD	CB	Chest to Dash/Seat Back	648		545	
CS		Chest to Steering Wheel	361			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	173	27.0	309	21.3
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	160	19.6	302	19.35
PAX°	PAX°	Pelvic Tilt Angle X		19.9		21.25
	PAY°	Pelvic Tilt Angle Y				0.2
PHX	PHX	Hip Point to Striker (X-Axis)	174		268	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	243		258	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024



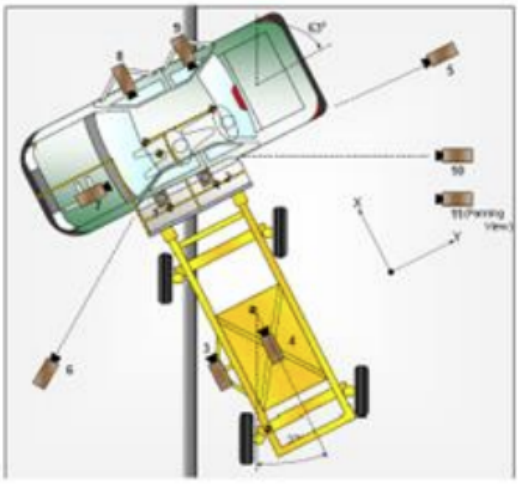
FRONT VIEW OF DUMMY

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	210	273
HS	Head to Side Window	mm	345	375
AD	Arm to Door	mm	108	177
HD	Hip Point to Door	mm	160	172

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2024 KIA Sportage Hybrid 5 Door SUV
NHTSA No.: O20244216
Test Program: NCAP Side MDB Impact Test
Test Date: 03/13/2024



CAMERA LOCATIONS AND DATA

No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Overhead Overall	0	-211	-9220	16	1000
2	Overhead Close-up	0	0	-9220	24	1000
3	Left Impact Point (MDB)	-1470	0	-847	25	1000
4	Side Overall (MDB)	-1140	878	-1587	8	1000
5	Rear	-8334	311	-1468	28	1000
6	Left Front	-2967	-2234	-1488	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.*

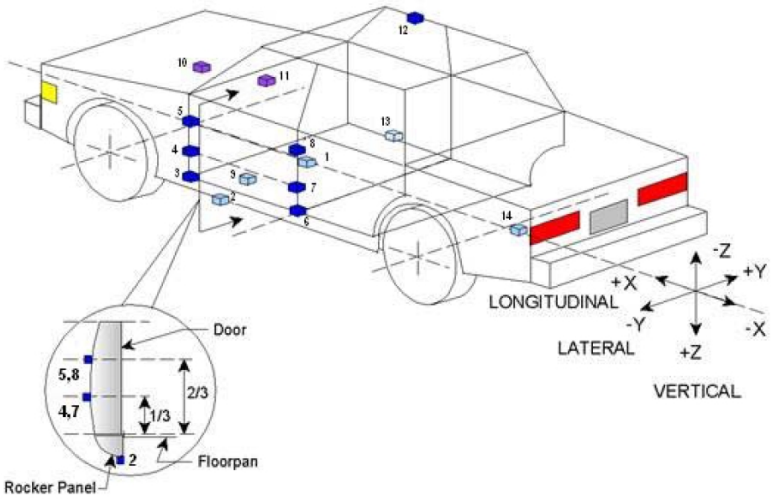
If applicable, explain why camera(s) did not operate as intended: All cameras operated as intended.

INSTRUMENTATION

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

DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024



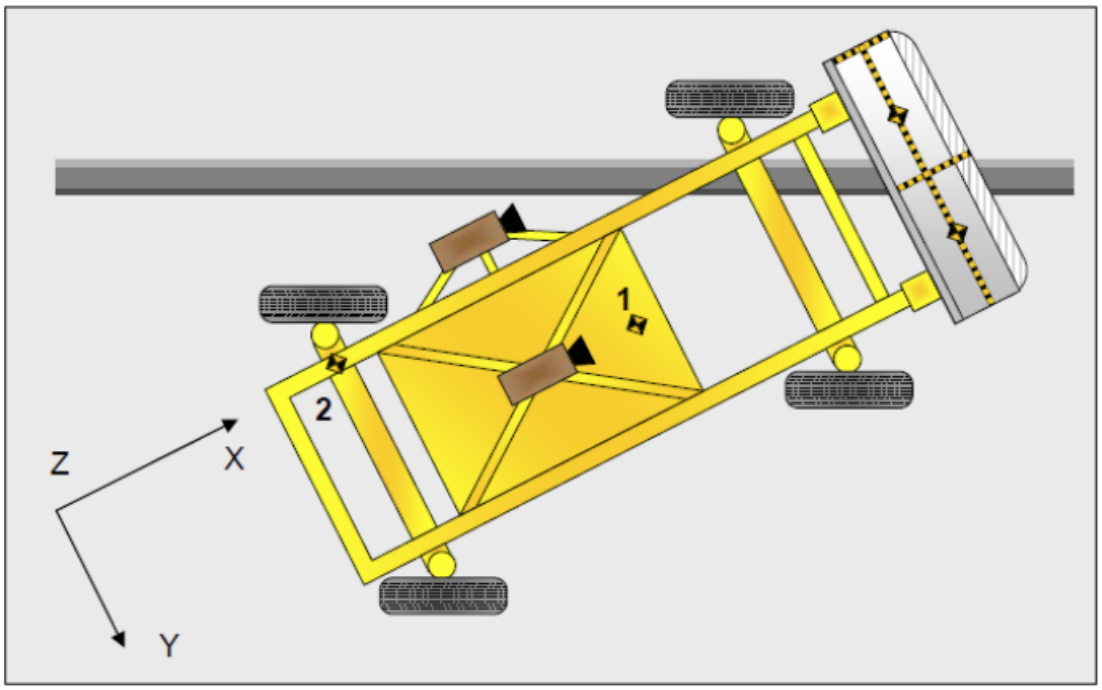
TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2825	-4	-336
2	Right Sill at Front Seat	2816	666	81
3	Right Sill at Rear Seat	1930	666	68
4	Left Sill at Front Door	2820	-666	78
5	Left Sill at Rear Door	1926	-666	69
6	A-Post Lower	3235	-647	-158
7	A-Post Middle	3166	-655	-640
8	B-Post Lower	2196	-685	-343
9	B-Post Middle	2145	-657	-650
10	Front Seat Track	2496	-569	32
11	Rear Seat Structure	1847	-304	-54
12	Rt. Rear Occ. Compartment	1988	417	154
13	Engine Block	3909	205	-424
14	Rear Above Axle	1043	5	2

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:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024



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: 2024 KIA Sportage Hybrid 5 Door SUV
NHTSA No.: O20244216
Test Program: NCAP Side MDB Impact Test
Test Date: 03/13/2024

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag
Top of Head	Side Header	Curtain Airbag
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Curtain Airbag, Side Header, Headrest	Curtain Airbag, Seat Back, Headrest
Left Shoulder	Torso/Pelvis Airbag	Torso/Pelvis Airbag, Seat Back
Upper Torso	Torso/Pelvis Airbag, Seat Back	Torso/Pelvis Airbag, Seat Back
Lower Torso	Torso/Pelvis Airbag, Seat Back	Torso/Pelvis Airbag, Seat Back
Left Hip	Torso/Pelvis Airbag, Seat Pan	Torso/Pelvis Airbag, Seat Pan
Left Knee	Door Trim	Door Trim

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 & C-Pillar Buckled
Sill Separation	None
Windshield Damage	None
Side Window Damage	None
Other Notable Effects	None

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

Test Vehicle: 2024 KIA Sportage Hybrid 5 Door SUV NHTSA No.: O20244216
Test Program: NCAP Side MDB Impact Test Test Date: 03/13/2024

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2756
Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point)	mm		438
Actual Impact Point (Aft of Frontal Axle)	mm		441
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	-3
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	+1

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

MDB SPECIFICATIONS

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

MDB WEIGHTS

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

SPEED AND ANGLE AT IMPACT DATA

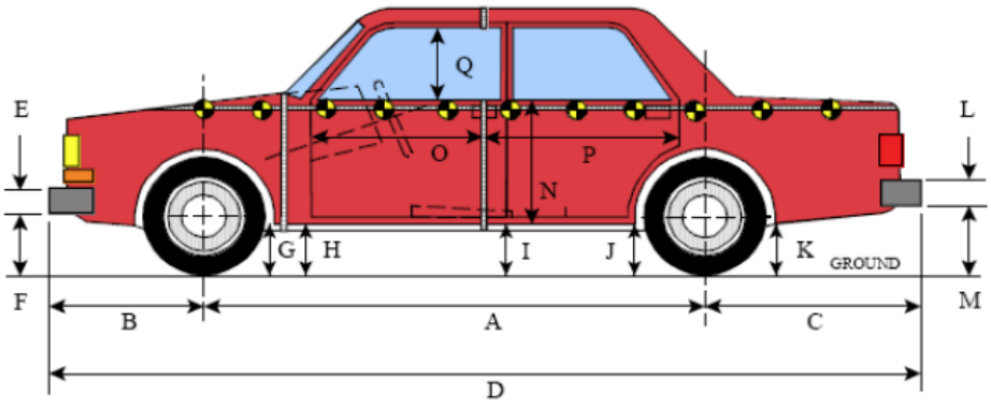
Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h		62.09
Trap No. 2 Velocity (Redundant)	km/h		62.12
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed angle to MDB Forward Line of Motion	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	243
B	Top of Bumper	533	700	Left	170
C	Mid-Level	686	800	Left	141
D	Top of Stack	813	800	Left	169

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024



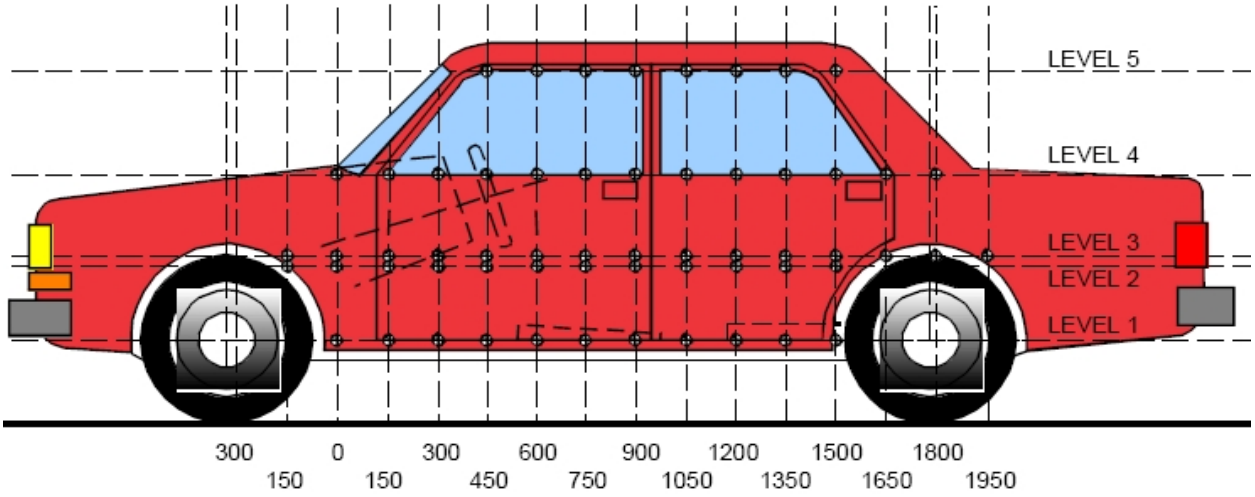
LEFT SIDE VIEW
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3mm

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code.	Measurement Description	Pre-Test	Post-Test	Change
A	Wheelbase	2756	2764	8
B	Front Axle to FSOV	903	903	0
C	Rear Axle to RSOV	1002	994	-8
D2	Total Length at Centerline	4662	4661	-1
E	Front Bumper Thickness	145	145	0
F	Front Bumper Bottom to Ground	471	468	-3
G	Sill Height at Front Wheel Well	245	245	0
H	Sill Height at Front Door Leading Edge	247	241	-6
I	Sill Height at B Pillar	250	240	-10
J1	Sill Height at Rear Wheel Well	266	251	-15
J2	Pinch Weld Height at Rear Wheel Well	242	225	-17
K	Sill Height Aft of Rear Wheel Well	276	268	-8
L	Rear Bumper Thickness	534	534	0
M	Rear Bumper Bottom to Ground	543	543	0
N	Sill Height to Bottom of Front Window Sill	908	864	-44
O	Front Door Leading Edge to Impact CL	728	727	-1
P	Rear Door Trailing Edge to Impact CL	1392	1369	-23
Q	Front Window Opening	383	387	4
R	Right Side Length	4573	4573	0
S	Left Side Length	4573	4572	-1
T	Vehicle Width at B-Pillars	1838	1722	-116
U	Front Wheel Track Width	1626	1611	-15
V	Rear Wheel Track Width	1628	1632	4

DATA SHEET NO.11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024



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	360	75	1650
2	Occupant H-Point	mm	686	184	1650
3	Mid-Door	mm	747	189	1650
4	Window Sill	mm	1108	35	1350
5	Window Top	mm	1579	4	1350

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: 2024 KIA Sportage Hybrid 5 Door SUV NHTSA No.: O20244216
Test Program: NCAP Side MDB Impact Test Test Date: 03/13/2024

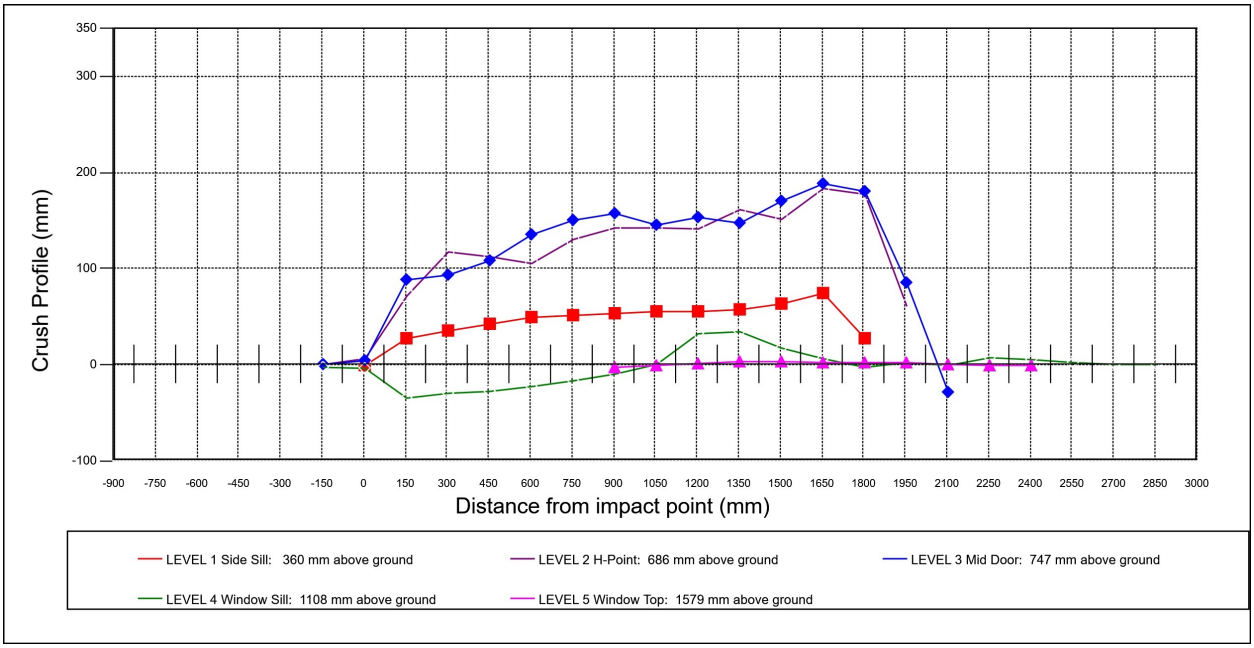
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test					Post-Test					Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300															
-150		932	926	790			931	925	792			1	1	-2	
0	898	917	917	802		898	910	908	805		0	7	9	-3	
150	893	901	902	811		865	829	813	845		28	72	89	-34	
300	892	897	902	817		856	779	808	846		36	118	94	-29	
450	891	899	903	824		848	786	794	851		43	113	109	-27	
600	892	900	905	832		842	794	769	854		50	106	136	-22	
750	894	902	906	838		842	771	755	854		52	131	151	-16	
900	898	902	906	844	623	844	759	748	853	625	54	143	158	-9	-2
1050	901	902	906	847	629	845	759	760	846	629	56	143	146	1	0
1200	902	900	904	850	629	846	758	750	817	627	56	142	154	33	2
1350	900	901	902	849	628	842	739	754	814	624	58	162	148	35	4
1500	899	907	902	849	625	835	755	731	831	621	64	152	171	18	4
1650	897	917	911	844	620	822	733	722	837	617	75	184	189	7	3
1800	898	929	925	843	616	870	751	744	845	613	28	178	181	-2	3
1950		931	933	856	608		869	847	853	605		62	86	3	3
2100			934	872	599			962	872	598			-28	0	1
2250				879	585				871	585				8	0
2400				877	563				871	563				6	0
2550				866					863					3	
2700				851					850					1	
2850				829					828					1	
3000															

NOTE: *Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition.*
Vehicle measurements forward of the vertical impact reference line are negative.
The crush profile grid is established prior to test based on an estimated impact point.

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

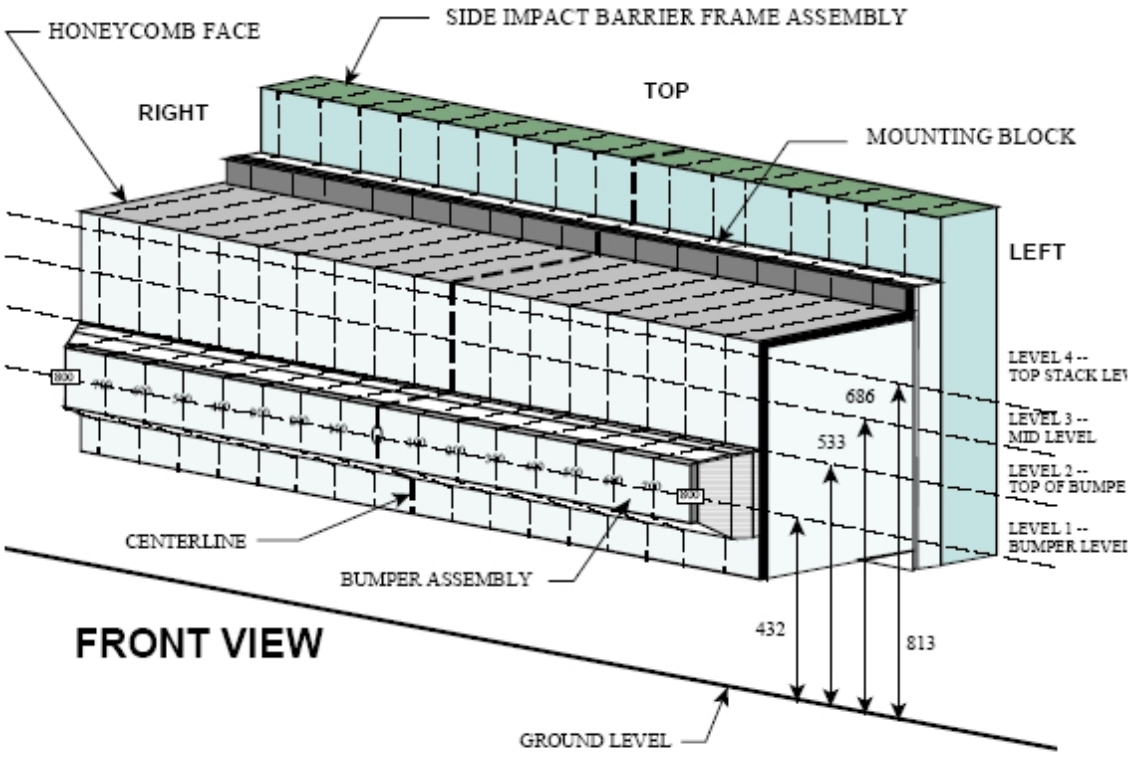
Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024



Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO.12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024



NOTE: Dimensions are shown in millimeters, mm

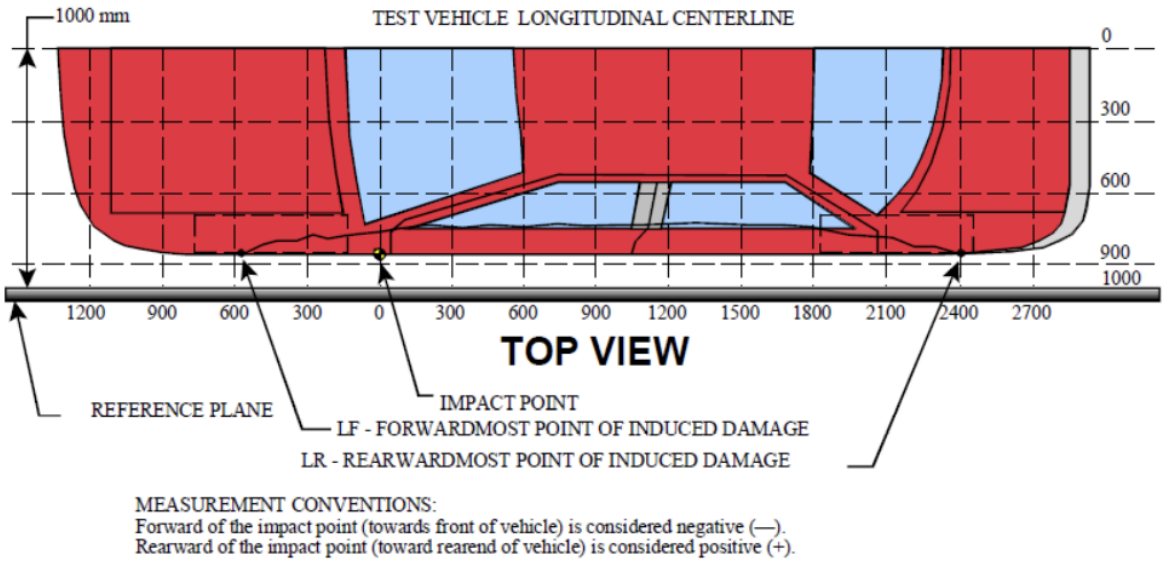
DEFORMABLE BARRIER STATIC CRUSH

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	224	226	224	226	228	230	232	231	231	228	228	229	232	234	236	239	243
2	129	133	135	134	134	135	135	132	130	126	127	129	132	135	138	143	170
3	74	68	75	62	57	66	65	66	56	56	61	70	74	78	87	100	141
4	68	60	56	50	55	66	82	76	63	70	77	89	101	106	124	144	169

DATA SHEET NO.13
VEHICLE AND MDB DAMAGE PROFILE DISTANCE

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

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	75	74	1
2	300	3	192	98	94
3	750	3	245	94	151
4	1200	3	250	96	154
5	1650	3	278	89	189
6	2100	3	38	66	-28

MDB DAMAGE PROFILE DISTANCES

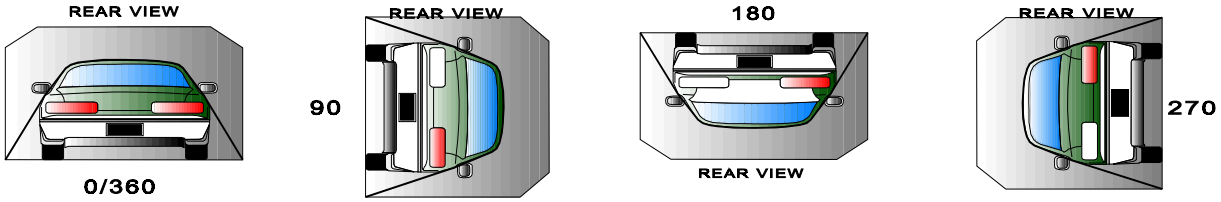
DPD	Distance From Center of MDB (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	800 mm left of center	1	262	505	-243
2	480 mm left of center	1	280	514	-234
3	160 mm left of center	1	286	514	-228
4	160 mm right of center	1	282	513	-232
5	480 mm right of center	1	287	513	-226
6	800 mm right of center	1	277	501	-224

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

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024
Test Time:	1:24PM	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



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

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

FMVSS 301 SPILLAGE TABLE

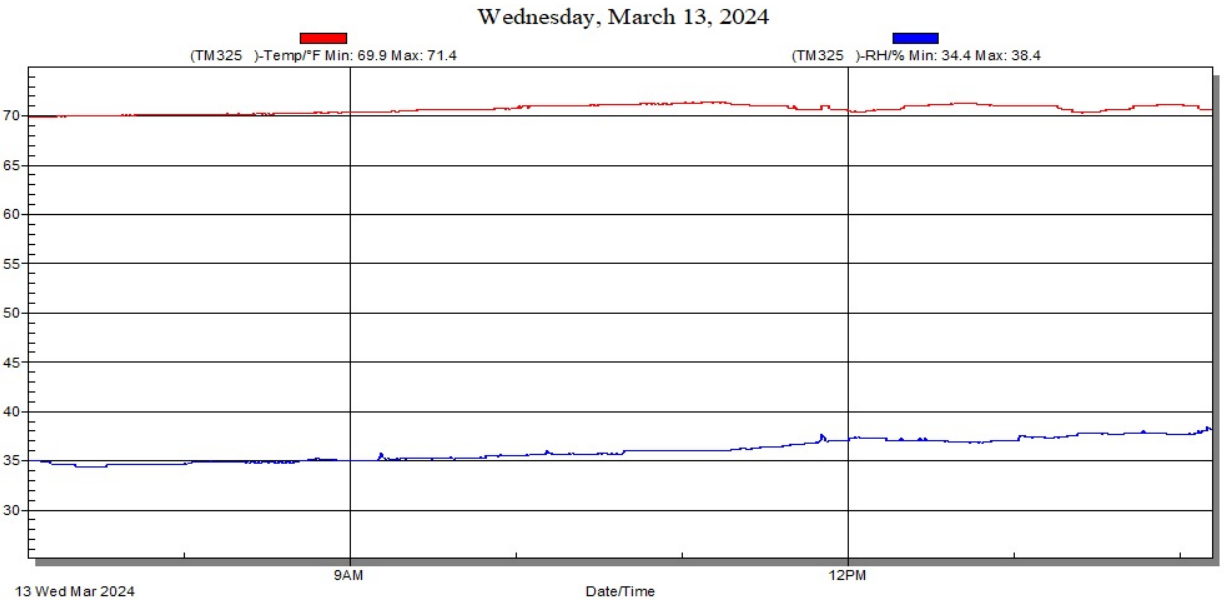
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

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:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024



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

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

Test Vehicle: 2024 KIA Sportage Hybrid 5 Door SUV NHTSA No.: O20244216
Test Program: NCAP Side MDB Impact Test Test Date: 03/13/2024

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Gas-Electric Hybrid
Propulsion Battery Type	Lithium-ion Polymer
Nominal Voltage (Volts)	270
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Under 2nd row seat
Auxiliary Battery Type	Lithium-ion Battery

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	Liquid
Electrolyte Fluid Specific Gravity	1.225g/cm3
Electrolyte Fluid Kinematic Viscosity (centistokes)	0.65cp
Electrolyte Fluid Color	Clear
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Unapplied (Air-cooled type)
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Inside

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
For all battery types: Voltage Range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	
For batteries that are rechargeable ONLY by an energy source on the vehicle: Voltage range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	180
Maximum State of Charge	V	309.6
95% of Maximum	V	294.12
Test Voltage *	V	262

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

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

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

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

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	The ground point is located under the second row seat and is connected to the vehicle chassis.
Details of Propulsion Battery Components	The high voltage battery is located under the second row split bench seat.

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

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		51800115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		06/20/2023

NOTES:

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

PROPULSION BATTERY VOLTAGE, RESISTANCE & ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Measured Parameter	Symbol	Units	Value
Normal operating voltage range specified by the manufacturer	V_b	V	180-309.6
Propulsion Battery Voltage: (ready to drive position)	V_b	V	262.0
Propulsion Battery to Vehicle Chassis	V_1	V	186.0
Propulsion Battery to Vehicle Chassis	V_2	V	187.0
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	150,600
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	25.6
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	25.8
$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$	R_{i1}	Ω	1,892,279
$R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$	R_{i2}	Ω	1,876,884
Lesser value of R_{i1} and R_{i2}	R_i	Ω	1,876,884
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	7,164

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

NOTES:

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

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

Test Vehicle:	2024 KIA Sportage Hybrid 5 Door SUV	NHTSA No.:	O20244216
Test Program:	NCAP Side MDB Impact Test	Test Date:	03/13/2024

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		51800115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		06/20/2023

NOTES:

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

ELECTRICAL ISOLATION MEASUREMENTS & IMPACT CALCULATIONS

Parameter	Value	Units		Value		Value	
V_b =	0.2	V	Time:	1	Minutes	40	Seconds
V_1 =	3.3	V	Time:	1	Minutes	46	Seconds
V_2 =	2.8	V	Time:	1	Minutes	49	Seconds
R_o =	150,600	Ω					
V_1' =	0.1	V	Time:	1	Minutes	58	Seconds
V_2' =	0.1	V	Time:	1	Minutes	56	Seconds
R_{i1} =	8,908,218	Ω	Time:	1	Minutes	58	Seconds
R_{i2} =	8,858,507	Ω	Time:	1	Minutes	58	Seconds
R_i =	8,858,507	Ω/V	Time:	1	Minutes	58	Seconds
R_i/V_b =	44,292,535	Ω/V	Time:	2	Minutes	13	Seconds

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

NOTES:

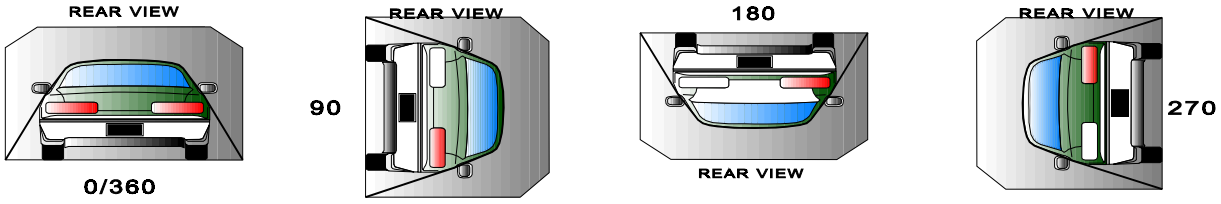
- *$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$, $R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$, R_i = Lesser value of R_{i1} and R_{i2}*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*
- *Minimum Electrical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

PROPULSION BATTERY SYSTEM COMPONENTS

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

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

Test Vehicle: 2024 KIA Sportage Hybrid 5 Door SUV
NHTSA No.: O20244216
Test Program: NCAP Side MDB Impact Test
Test Date: 03/13/2024



Rear View

DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Rollover Stage	Rotation Time (spec. 1 -3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	8	5	6	8	7
90° to 180°	1	8	5	6	8	7
180° to 270°	1	3	5	6	3	7
270° to 360°	1	9	5	6	9	7

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

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

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

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

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		51800115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		06/20/2023

NOTES:

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

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

Test Vehicle: 2024 KIA Sportage Hybrid 5 Door SUV NHTSA No.: O20244216
Test Program: NCAP Side MDB Impact Test Test Date: 03/13/2024

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units	R_o= 150,600 Ω	Minutes	Seconds
V_b =	90°	0.0	V	Time:	1	4
	180°	0.0	V		10	33
	270°	0.0	V		16	14
	360°	0.0	V		23	12
V_1 =	90°	0.0	V	Time:	1	14
	180°	0.0	V		10	42
	270°	0.0	V		16	25
	360°	0.0	V		23	20
V_2 =	90°	0.0	V	Time:	1	25
	180°	0.0	V		10	50
	270°	0.0	V		16	31
	360°	0.0	V		23	25
V_1' =	90°	0.0	V	Time:	1	29
	180°	0.0	V		10	55
	270°	0.0	V		16	36
	360°	0.0	V		23	30
V_2' =	90°	0.0	V	Time:	1	35
	180°	0.0	V		11	0
	270°	0.0	V		16	41
	360°	0.0	V		23	34
R_{i1} =	90°	Zero Volts	Ω	Time:	1	29
	180°	Zero Volts	Ω		10	55
	270°	Zero Volts	Ω		16	36
	360°	Zero Volts	Ω		23	30
R_{i2} =	90°	Zero Volts	Ω	Time:	1	35
	180°	Zero Volts	Ω		11	0
	270°	Zero Volts	Ω		16	41
	360°	Zero Volts	Ω		23	34
R_i =	90°	Zero Volts	Ω/V	Time:	1	35
	180°	Zero Volts	Ω/V		11	0
	270°	Zero Volts	Ω/V		16	41
	360°	Zero Volts	Ω/V		23	34
R_i/V_b =	90°	Zero Volts	Ω/V	Time:	1	35
	180°	Zero Volts	Ω/V		11	0
	270°	Zero Volts	Ω/V		16	41
	360°	Zero Volts	Ω/V		23	34

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

APPENDIX A

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



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



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



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



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



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



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



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



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



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



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

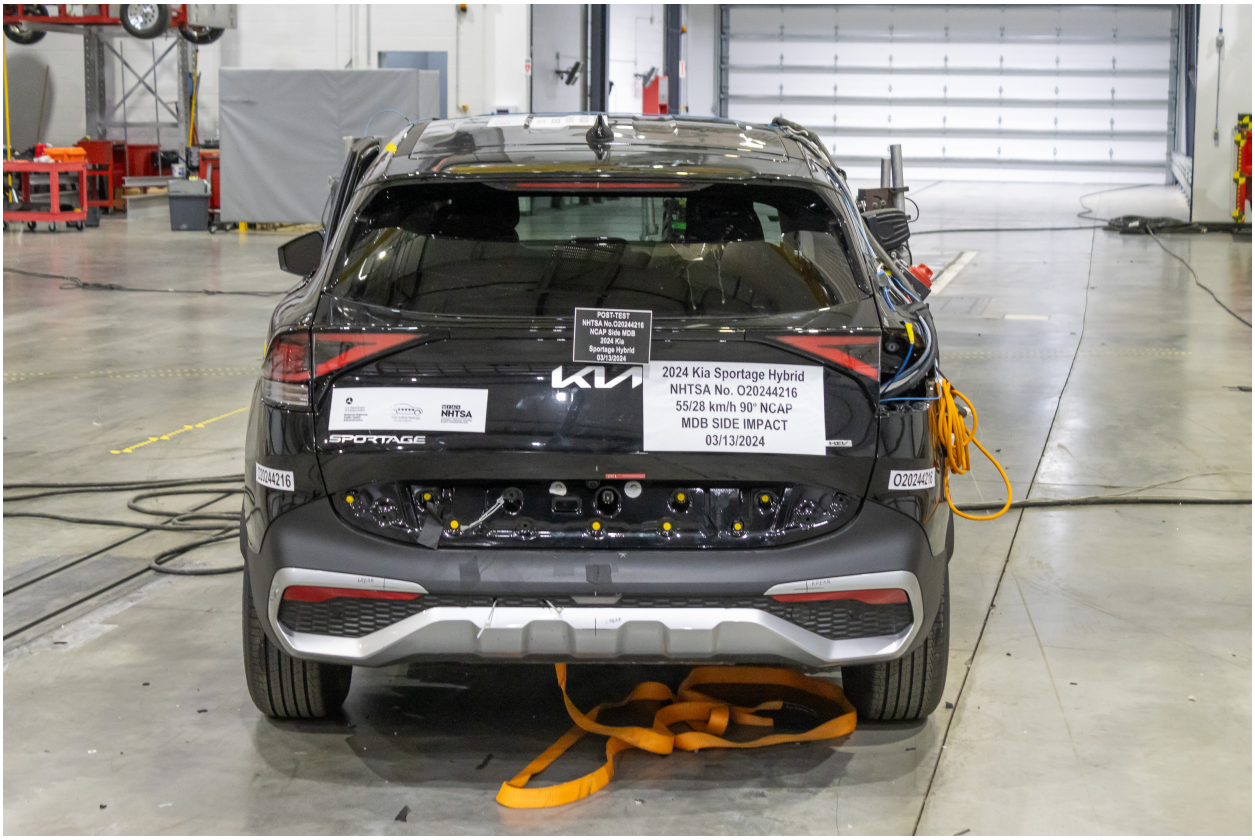


Figure A-12: Post-Test Rear Side View of Test Vehicle



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



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



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

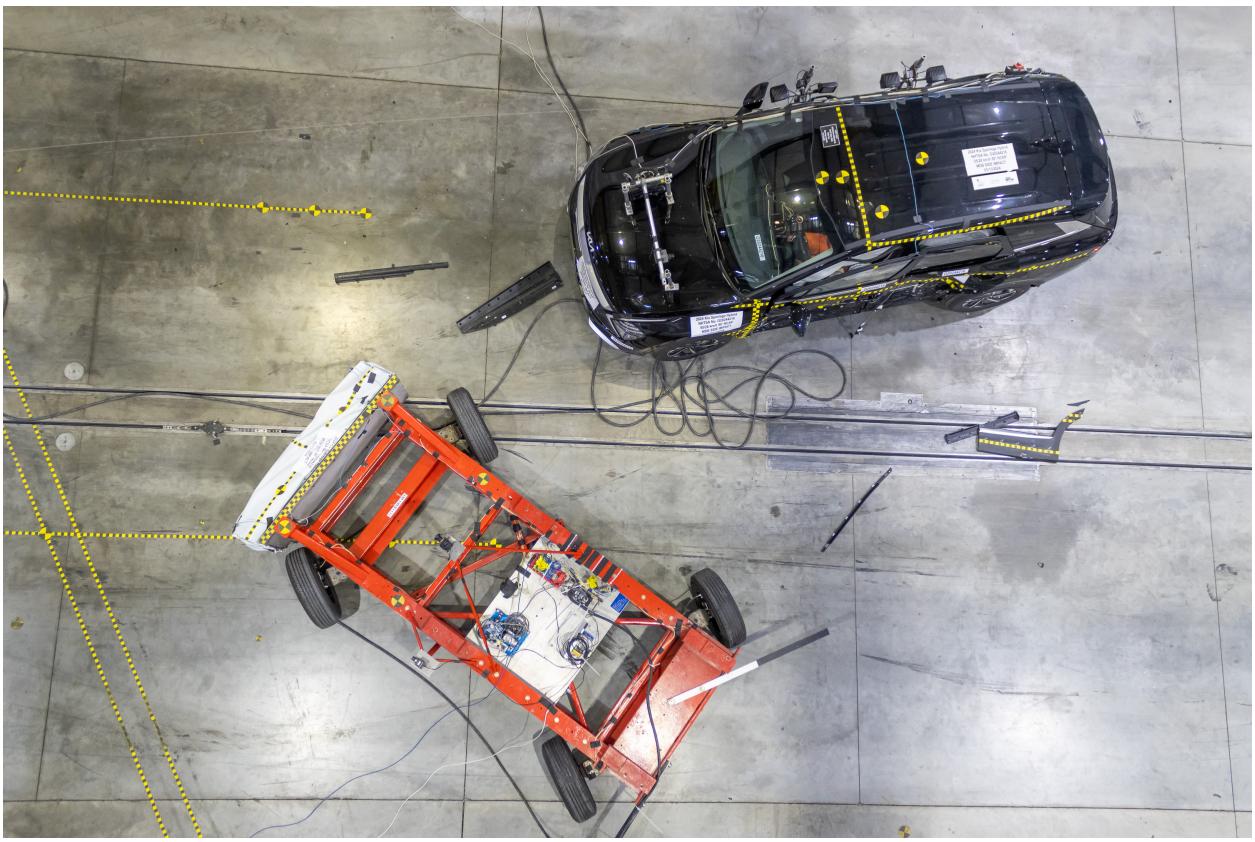


Figure A-16: Post-Test Overhead View of Test Area



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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

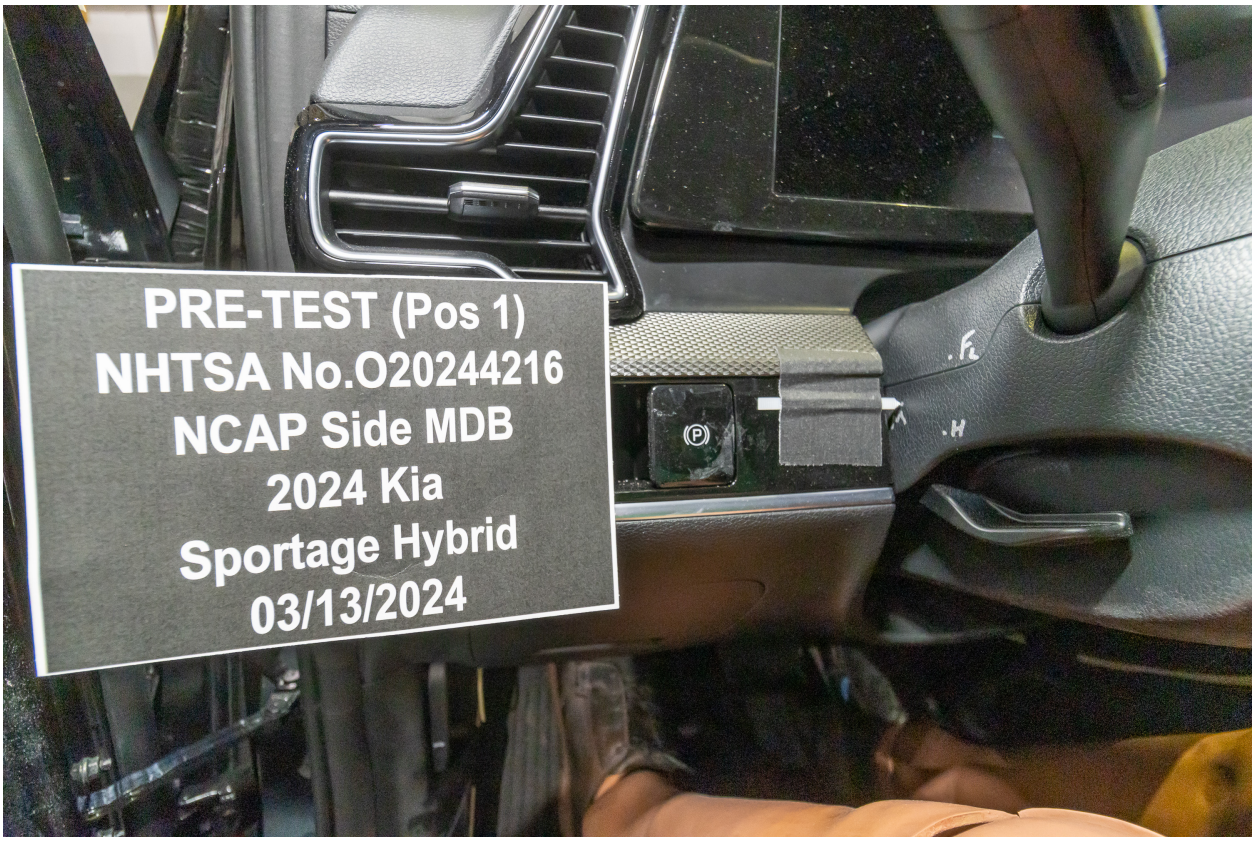


Figure A-37: View of Disengaged Parking Brake



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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

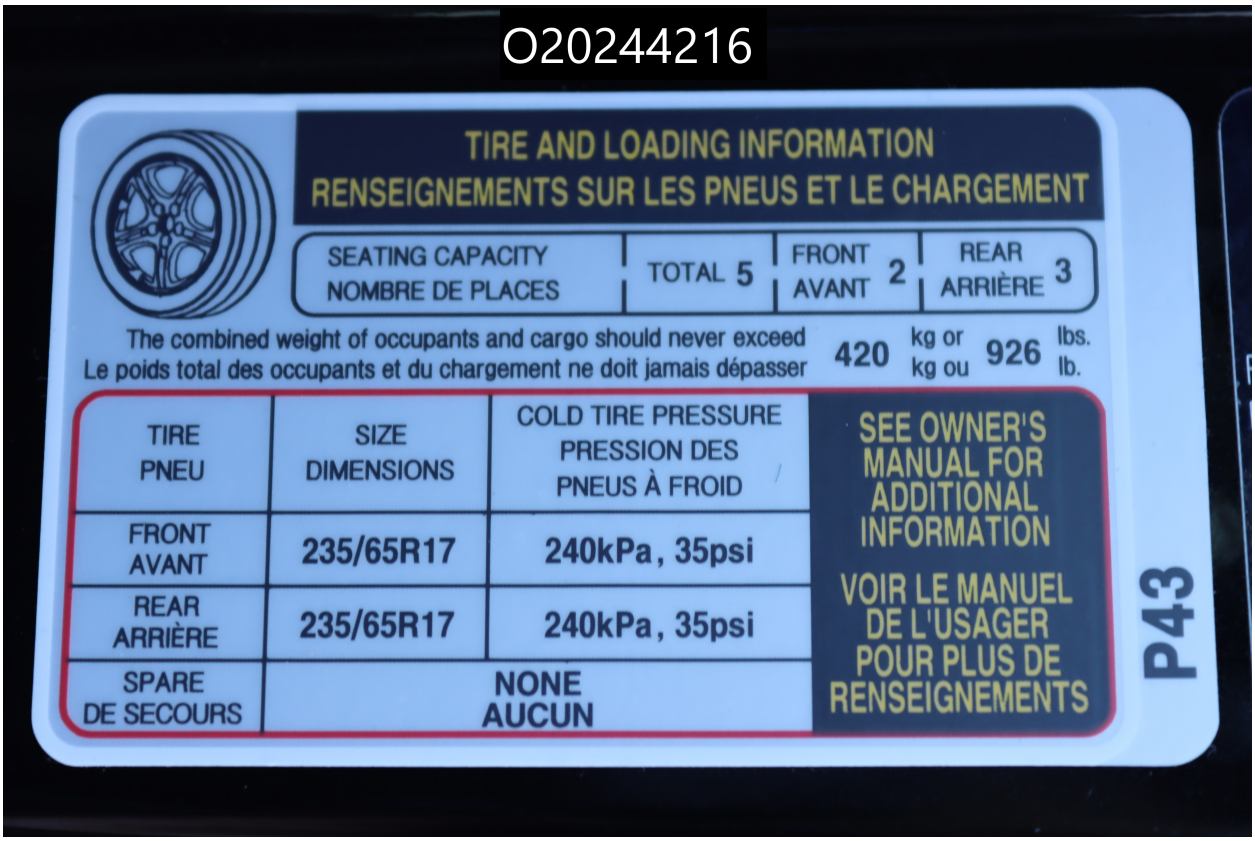


Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label

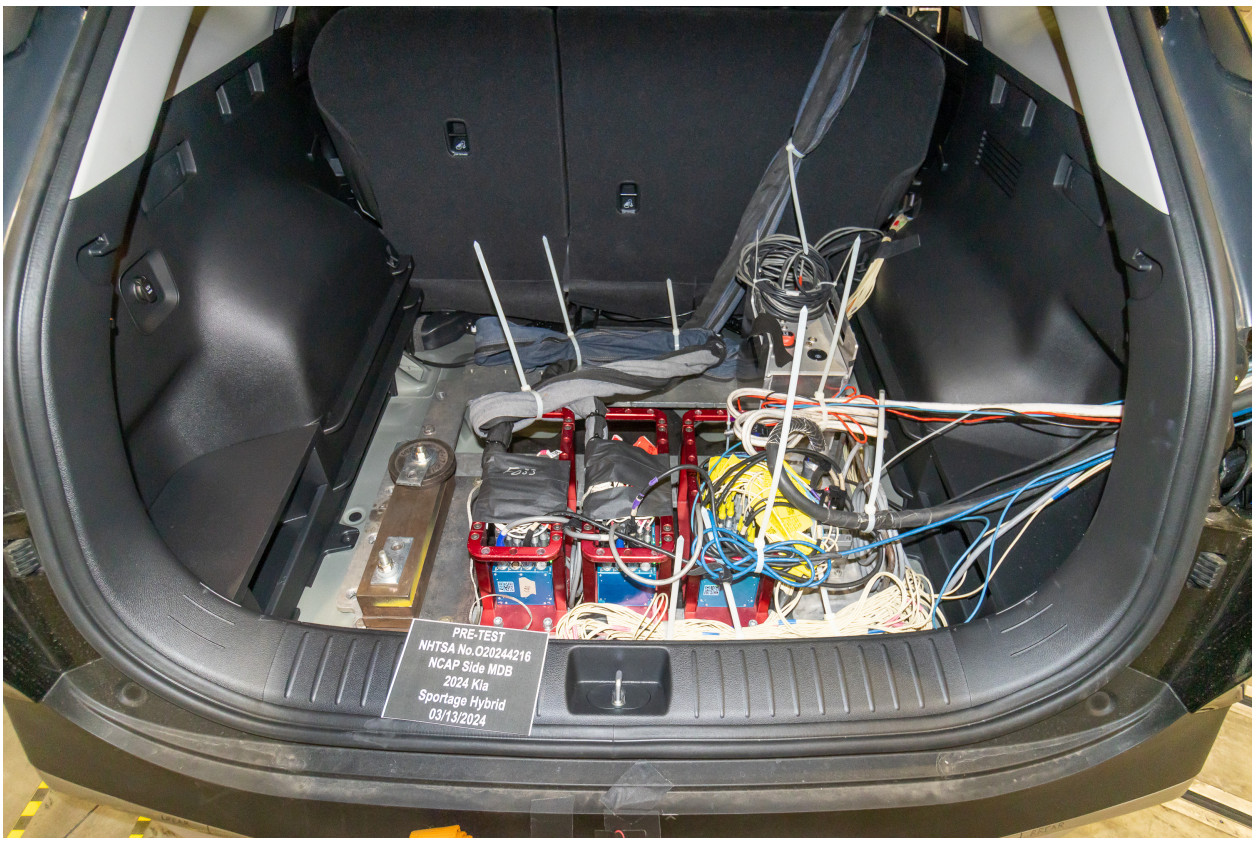


Figure A-94: Pre-Test Ballast View



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



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

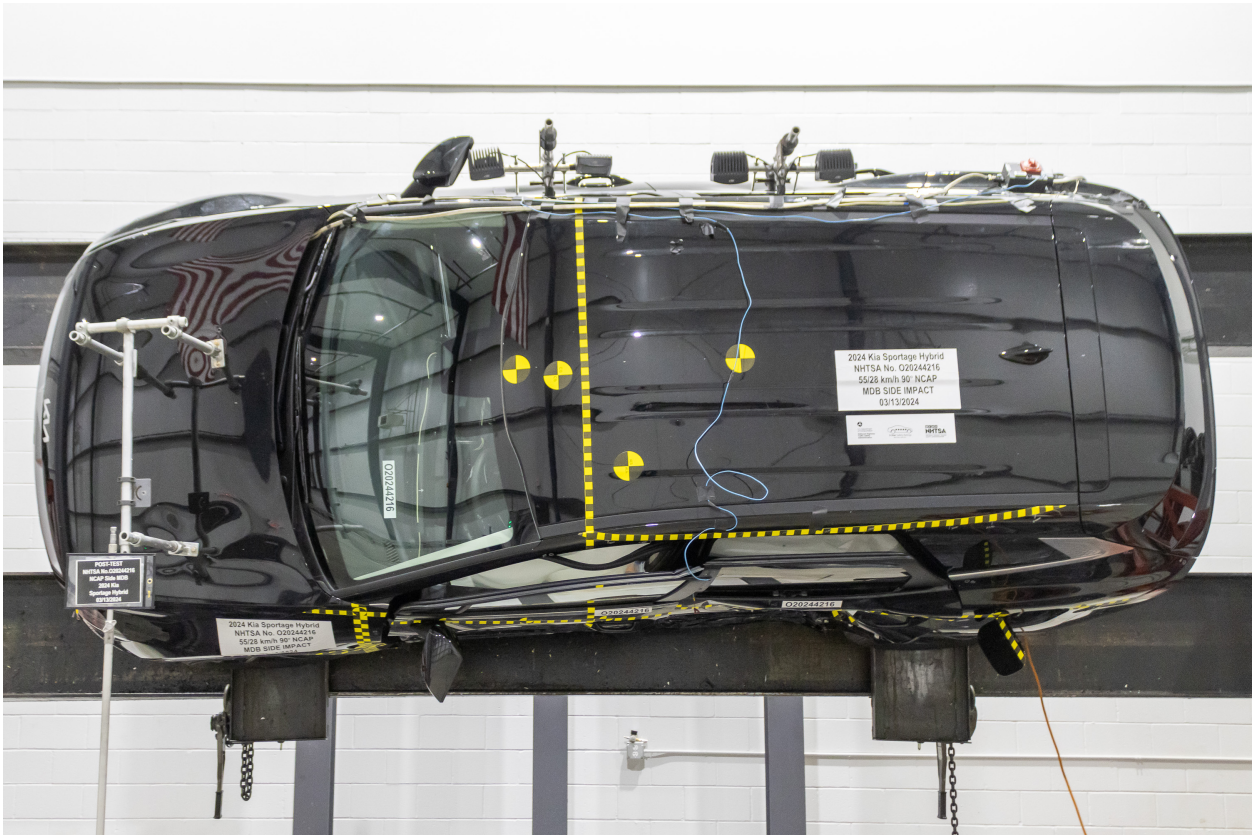


Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees

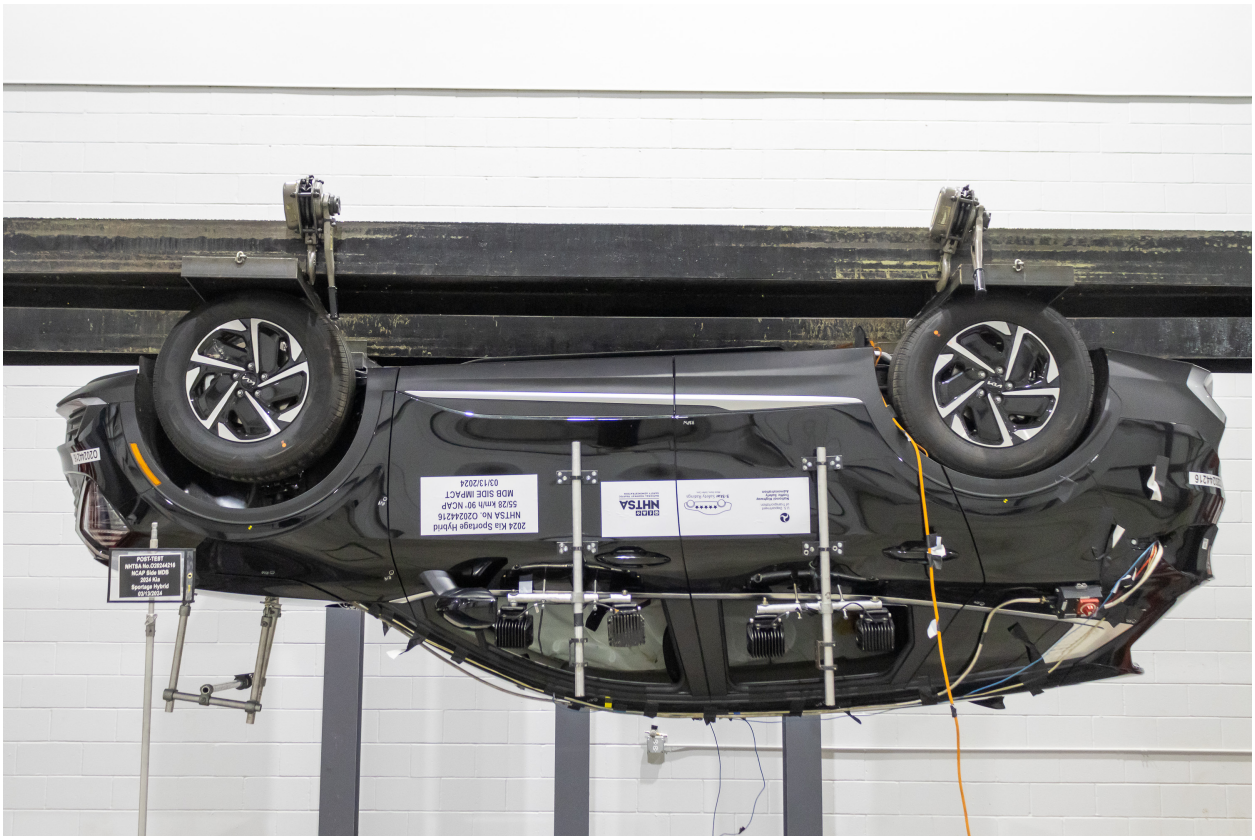


Figure A-98: FMVSS No. 301 Static Rollover 180 Degrees

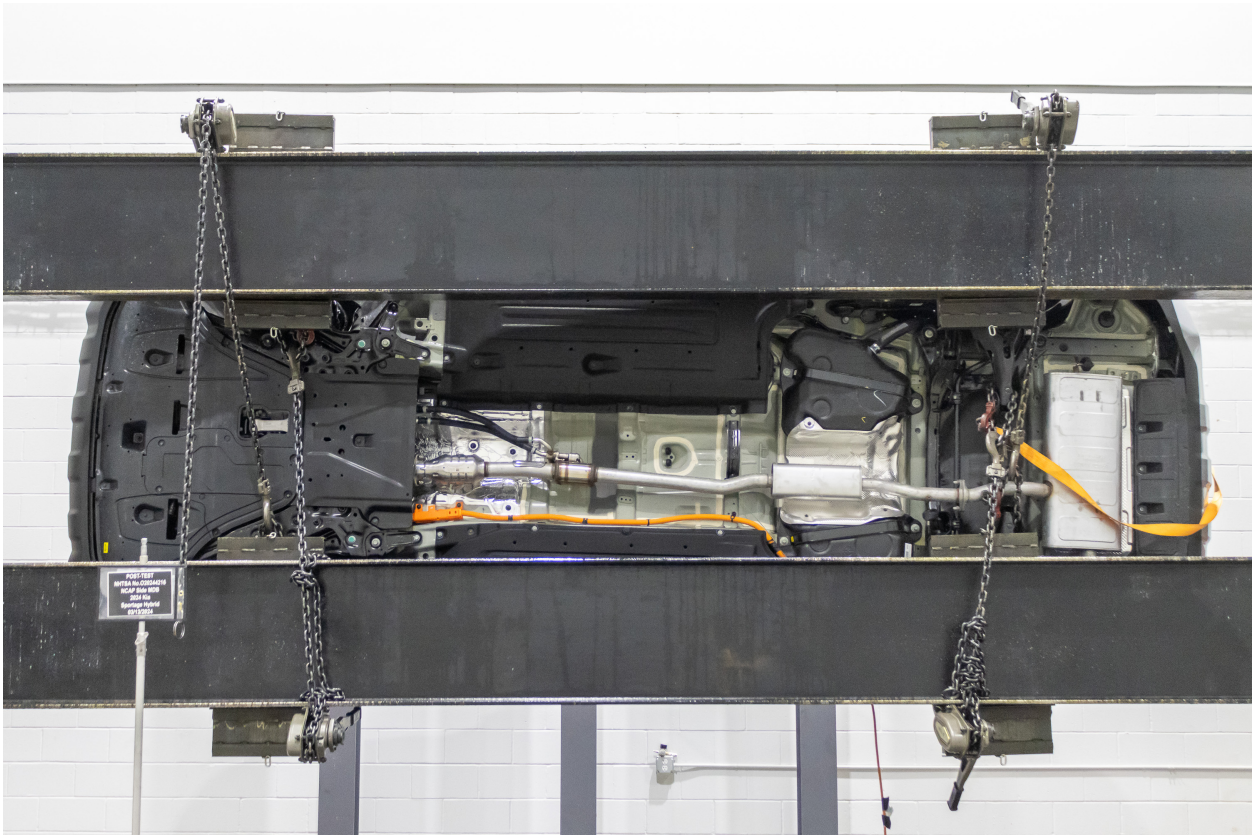


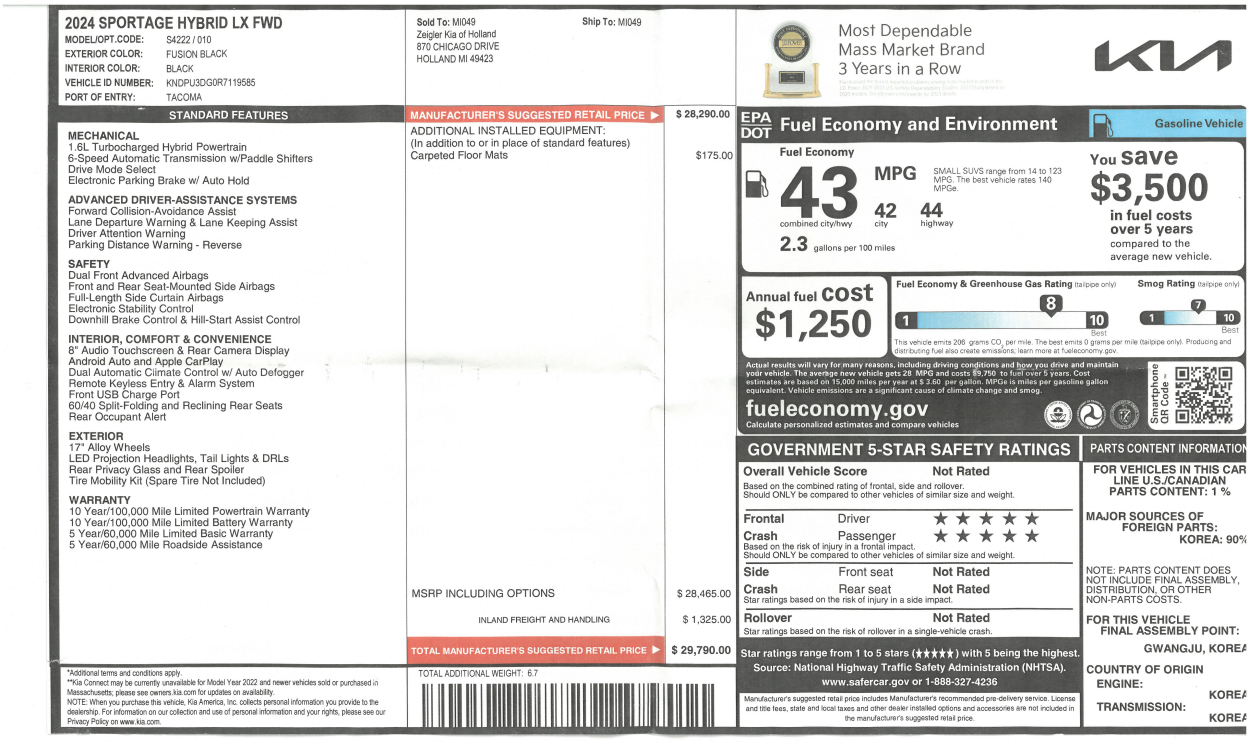
Figure A-99: FMVSS No. 301 Static Rollover 270 Degrees



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



Figure A-101: Impact Event



2024 SPORTAGE HYBRID LX FWD

MODEL/OPT.CODE: S4222 / 010
EXTERIOR COLOR: FUSION BLACK
INTERIOR COLOR: BLACK
VEHICLE ID NUMBER: KNDPU3DG0R7119585
PORT OF ENTRY: TACOMA

Sold To: MI049
Zeigler Kia of Holland
870 CHICAGO DRIVE
HOLLAND MI 49423

Ship To: MI049

Most Dependable Mass Market Brand 3 Years in a Row

KIA

STANDARD FEATURES

MECHANICAL
1.6L Turbocharged Hybrid Powertrain
6-Speed Automatic Transmission w/Paddle Shifters
Drive Mode Select
Electronic Parking Brake w/ Auto Hold

ADVANCED DRIVER-ASSISTANCE SYSTEMS
Forward Collision-Avoidance Assist
Lane Departure Warning & Lane Keeping Assist
Driver Attention Warning
Parking Distance Warning - Reverse

SAFETY
Dual Front Advanced Airbags
Front and Rear Seat-Mounted Side Airbags
Full-Length Side Curtain Airbags
Electronic Stability Control
Downhill Brake Control & Hill-Start Assist Control

INTERIOR, COMFORT & CONVENIENCE
8" Audio Touchscreen & Rear Camera Display
Android Auto and Apple CarPlay
Dual Automatic Climate Control w/ Auto Defogger
Remote Keyless Entry & Alarm System
Front USB Charge Port
60/40 Split-Folding and Reclining Rear Seats
Rear Occupant Alert

EXTERIOR
17" Alloy Wheels
LED Projection Headlights, Tail Lights & DRLs
Rear Privacy Glass and Rear Spoiler
Tire Mobility Kit (Spare Tire Not Included)

WARRANTY
10 Year/100,000 Mile Limited Powertrain Warranty
10 Year/100,000 Mile Limited Battery Warranty
5 Year/60,000 Mile Limited Basic Warranty
5 Year/60,000 Mile Roadside Assistance

MANUFACTURER'S SUGGESTED RETAIL PRICE ▶	$ 28,290.00
ADDITIONAL INSTALLED EQUIPMENT: (In addition to or in place of standard features) Carpeted Floor Mats	$175.00
MSRP INCLUDING OPTIONS	$ 28,465.00
INLAND FREIGHT AND HANDLING	$ 1,325.00
TOTAL MANUFACTURER'S SUGGESTED RETAIL PRICE ▶	$ 29,790.00

*Additional terms and conditions apply.
**Kia Connect may be currently unavailable for Model Year 2022 and newer vehicles sold or purchased in Massachusetts; please see owners.kia.com for updates on availability.
NOTE: When you purchase this vehicle, Kia America, Inc. collects personal information you provide to the dealership. For information on our collection and use of personal information and your rights, please see our Privacy Policy on www.kia.com.

TOTAL ADDITIONAL WEIGHT: 6.7

EPA DOT Fuel Economy and Environment — Gasoline Vehicle

Fuel Economy: **43** combined city/hwy MPG — 42 city, 44 highway
2.3 gallons per 100 miles

SMALL SUVS range from 14 to 123 MPG. The best vehicle rates 140 MPGe.

You save **$3,500** in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost **$1,250**

Fuel Economy & Greenhouse Gas Rating (tailpipe only): 8 (1 – 10, Best)
Smog Rating (tailpipe only): 7 (1 – 10, Best)

This vehicle emits 206 grams CO_2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at fueleconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 28 MPG and costs $9,750 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $ 3.60 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone link Code

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score		Not Rated
Based on the combined rating of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.		
Frontal Crash	Driver	★★★★★
	Passenger	★★★★★
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
Side Crash	Front seat	Not Rated
	Rear seat	Not Rated
Star ratings based on the risk of injury in a side impact.		
Rollover		Not Rated
Star ratings based on the risk of rollover in a single-vehicle crash.		

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

Manufacturer's suggested retail price includes Manufacturer's recommended pre-delivery service. License and title fees, state and local taxes and other dealer installed options and accessories are not included in the manufacturer's suggested retail price.

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CAR LINE U.S./CANADIAN PARTS CONTENT: 1 %

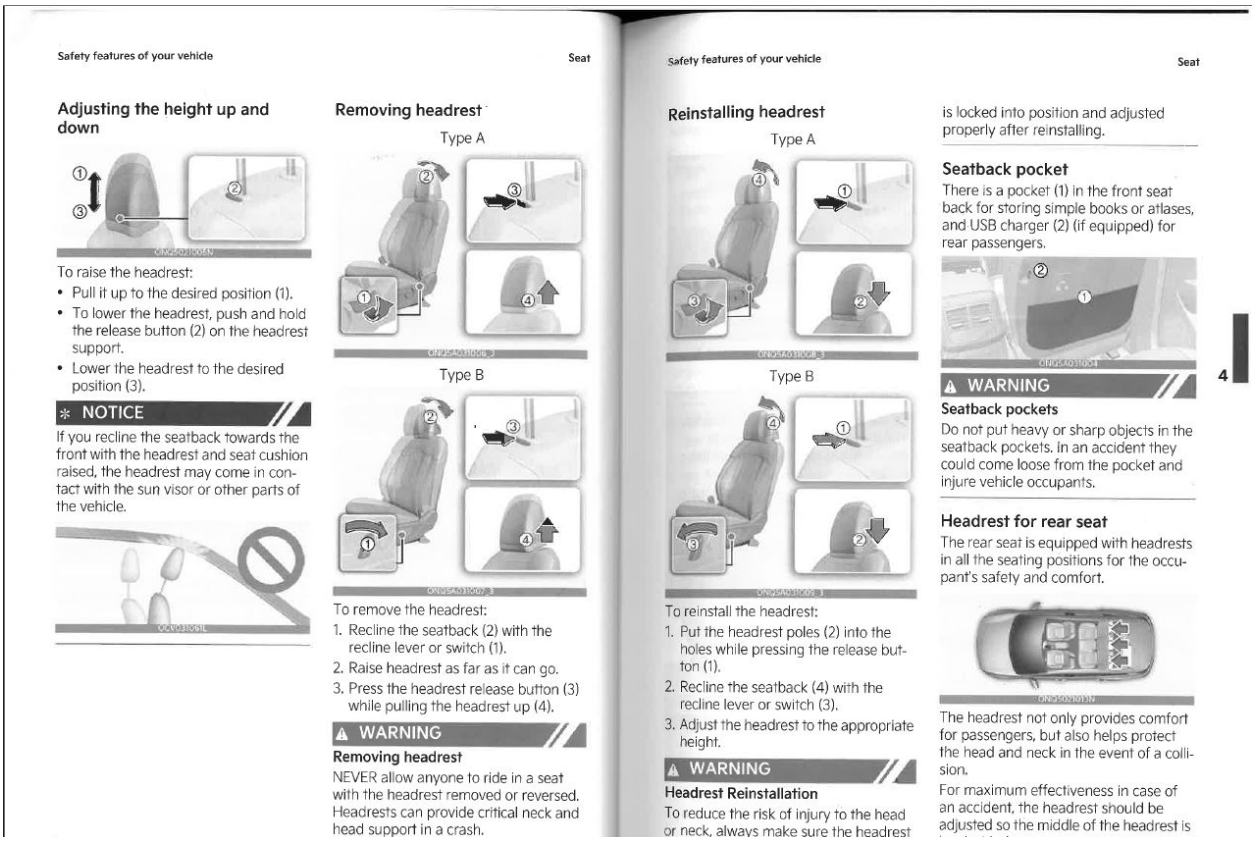
MAJOR SOURCES OF FOREIGN PARTS: KOREA: 90%

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

FOR THIS VEHICLE FINAL ASSEMBLY POINT: GWANGJU, KOREA

COUNTRY OF ORIGIN
ENGINE: KOREA
TRANSMISSION: KOREA

Figure A-102: Monroney Label



Safety features of your vehicle

Seat

Adjusting the height up and down

To raise the headrest:

- Pull it up to the desired position (1).
- To lower the headrest, push and hold the release button (2) on the headrest support.
- Lower the headrest to the desired position (3).

NOTICE

If you recline the seatback towards the front with the headrest and seat cushion raised, the headrest may come in contact with the sun visor or other parts of the vehicle.

Removing headrest

Type A

Type B

To remove the headrest:

1. Recline the seatback (2) with the recline lever or switch (1).
2. Raise headrest as far as it can go.
3. Press the headrest release button (3) while pulling the headrest up (4).

WARNING

Removing headrest

NEVER allow anyone to ride in a seat with the headrest removed or reversed. Headrests can provide critical neck and head support in a crash.

Safety features of your vehicle

Seat

Reinstalling headrest

Type A

Type B

To reinstall the headrest:

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

WARNING

Headrest Reinstallation

To reduce the risk of injury to the head or neck, always make sure the headrest is locked into position and adjusted properly after reinstalling.

Seatback pocket

There is a pocket (1) in the front seat back for storing simple books or atlases, and USB charger (2) (if equipped) for rear passengers.

WARNING

Seatback pockets

Do not put heavy or sharp objects in the seatback pockets. In an accident they could come loose from the pocket and injure vehicle occupants.

Headrest for rear seat

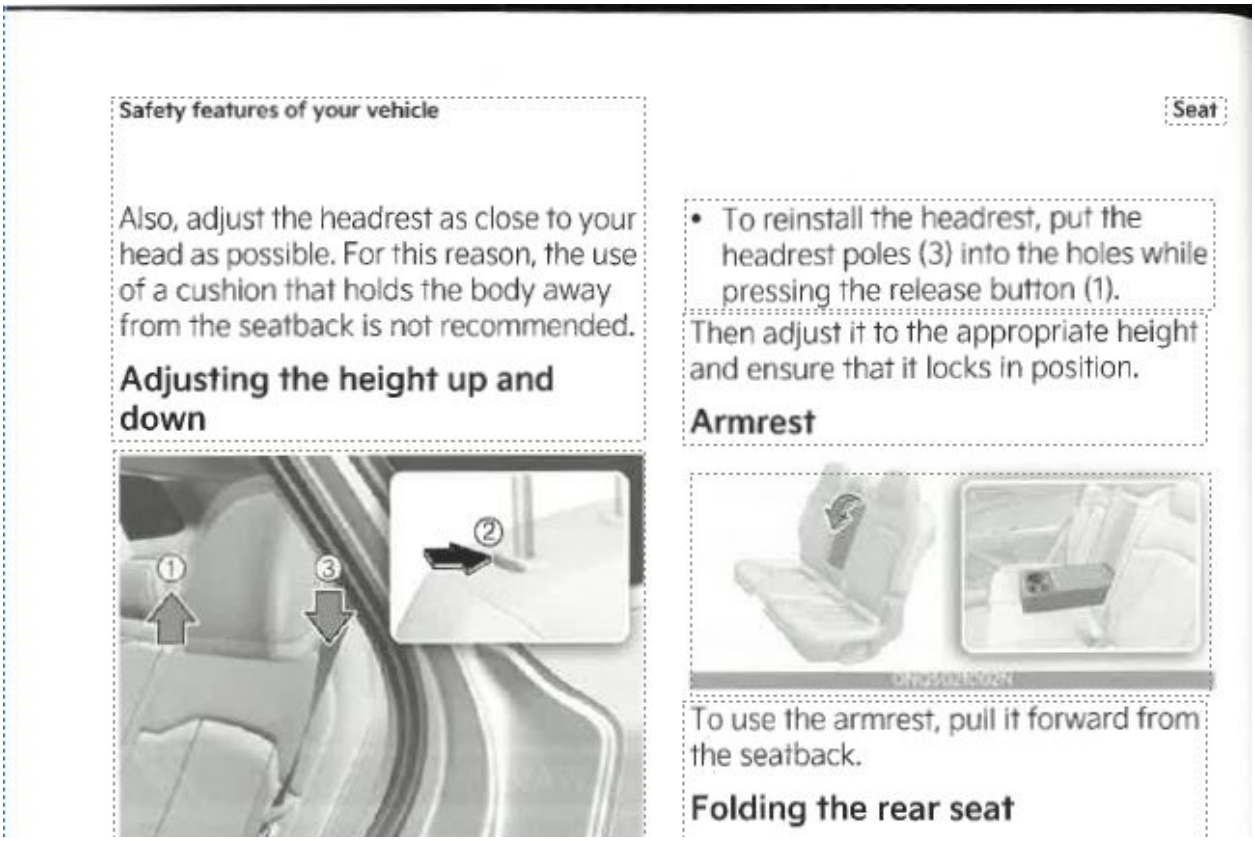
The rear seat is equipped with headrests in all the seating positions for the occupant's safety and comfort.

The headrest not only provides comfort for passengers, but also helps protect the head and neck in the event of a collision.

For maximum effectiveness in case of an accident, the headrest should be adjusted so the middle of the headrest is

4

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



Safety features of your vehicle

Seat

Also, adjust the headrest as close to your head as possible. For this reason, the use of a cushion that holds the body away from the seatback is not recommended.

Adjusting the height up and down

- To reinstall the headrest, put the headrest poles (3) into the holes while pressing the release button (1).

Then adjust it to the appropriate height and ensure that it locks in position.

Armrest

To use the armrest, pull it forward from the seatback.

Folding the rear seat

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



Figure 305-1: Auxiliary Power Module Warning Label



Figure 305-2: Power Inverter Warning Label

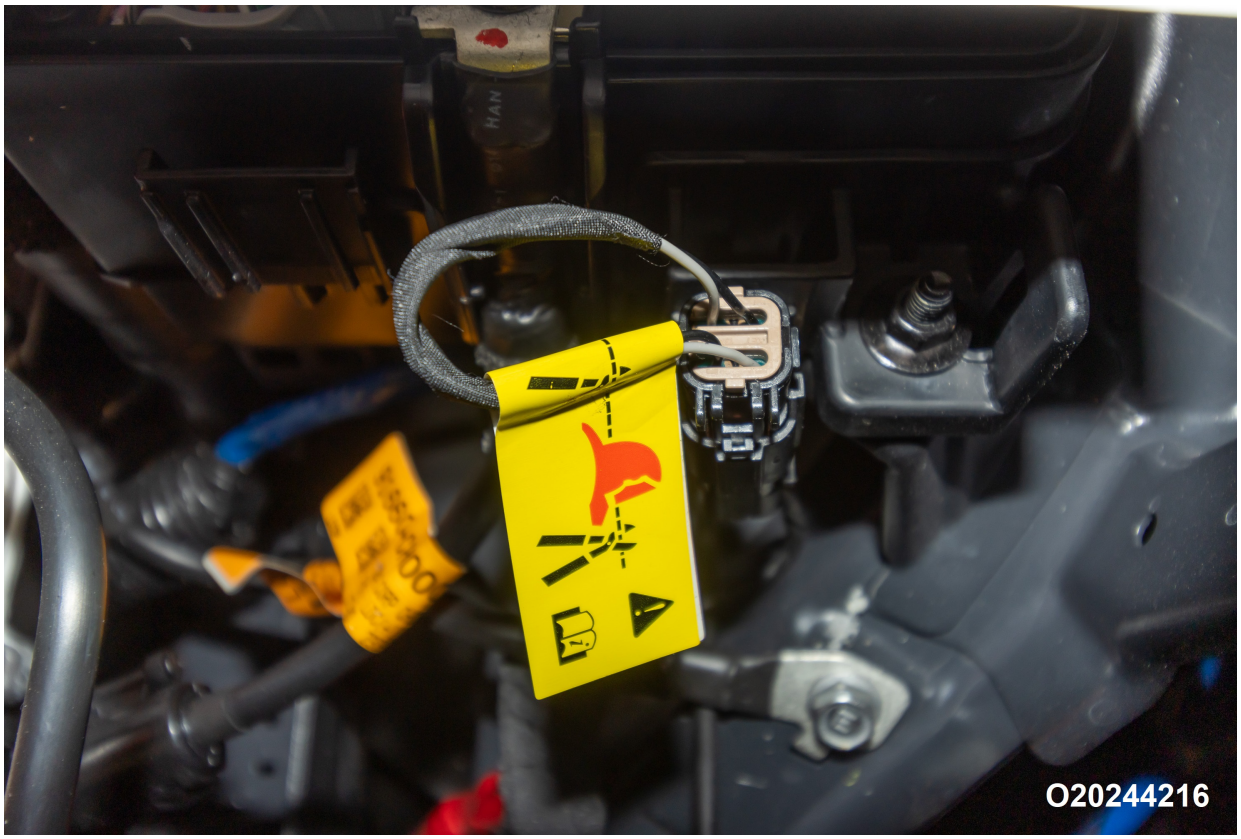


Figure 305-3 First Responder Warning Label



Figure 305-4: First Responder Warning Label Location

Photo Not Applicable

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



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



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



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



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



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



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

Photo Not Applicable

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



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

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

Photo Not Applicable

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

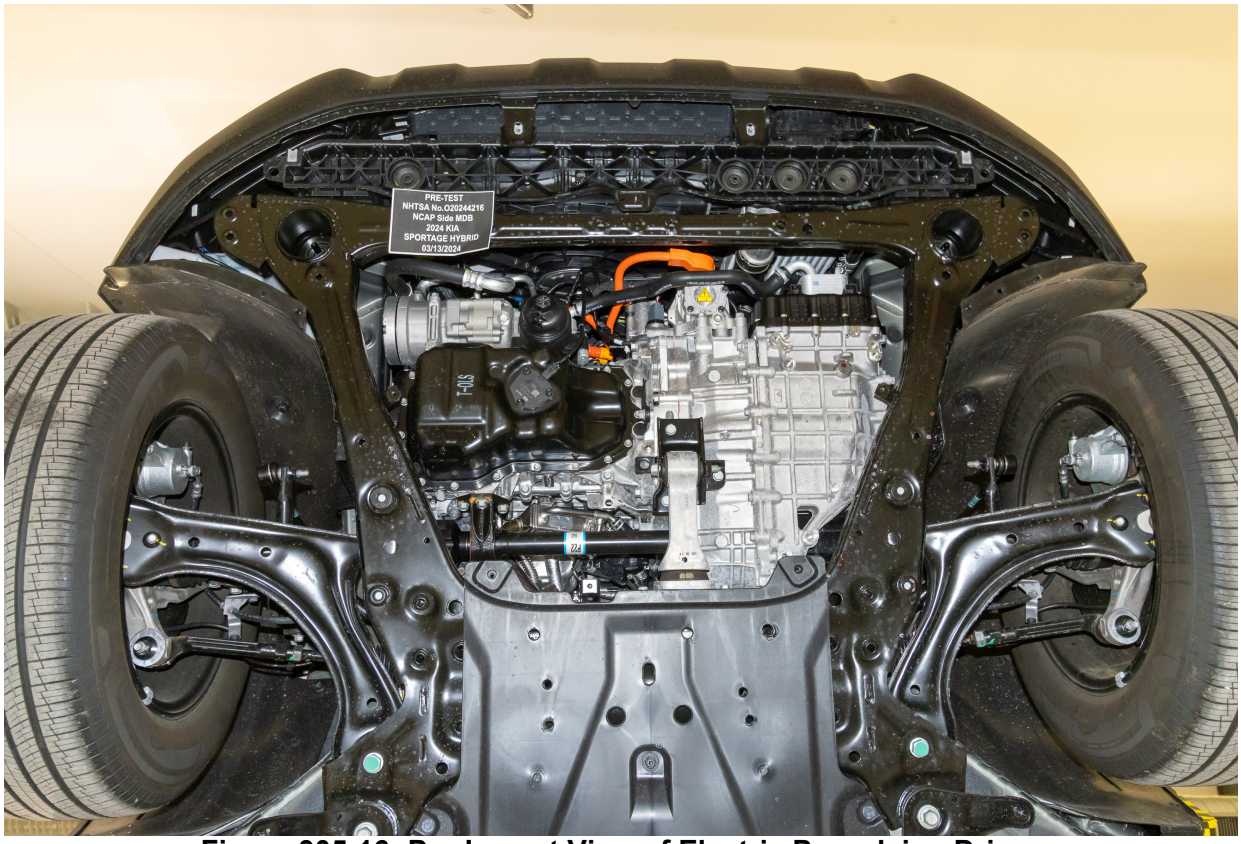


Figure 305-16: Pre-Impact View of Electric Propulsion Drive



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

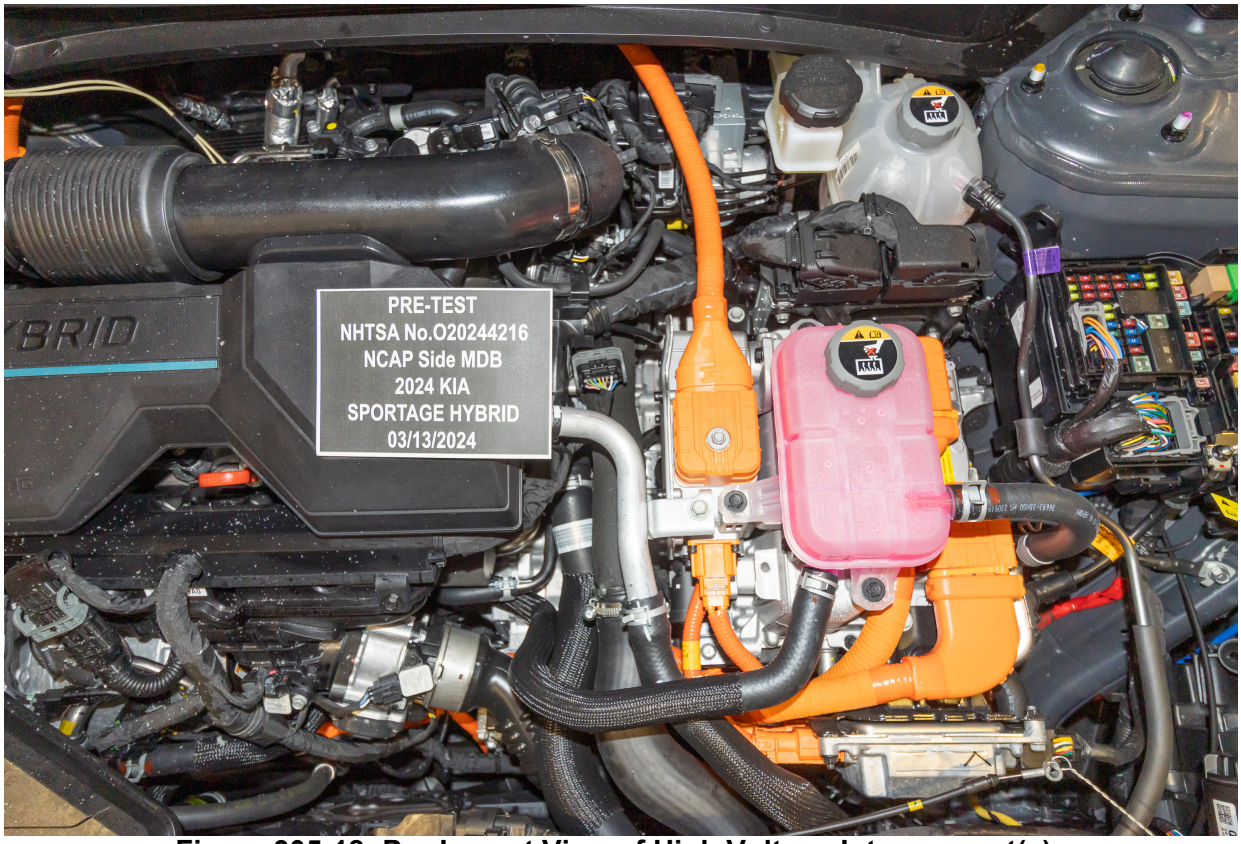


Figure 305-18: Pre-Impact View of High Voltage Interconnect(s)



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

Photo Not Applicable

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



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

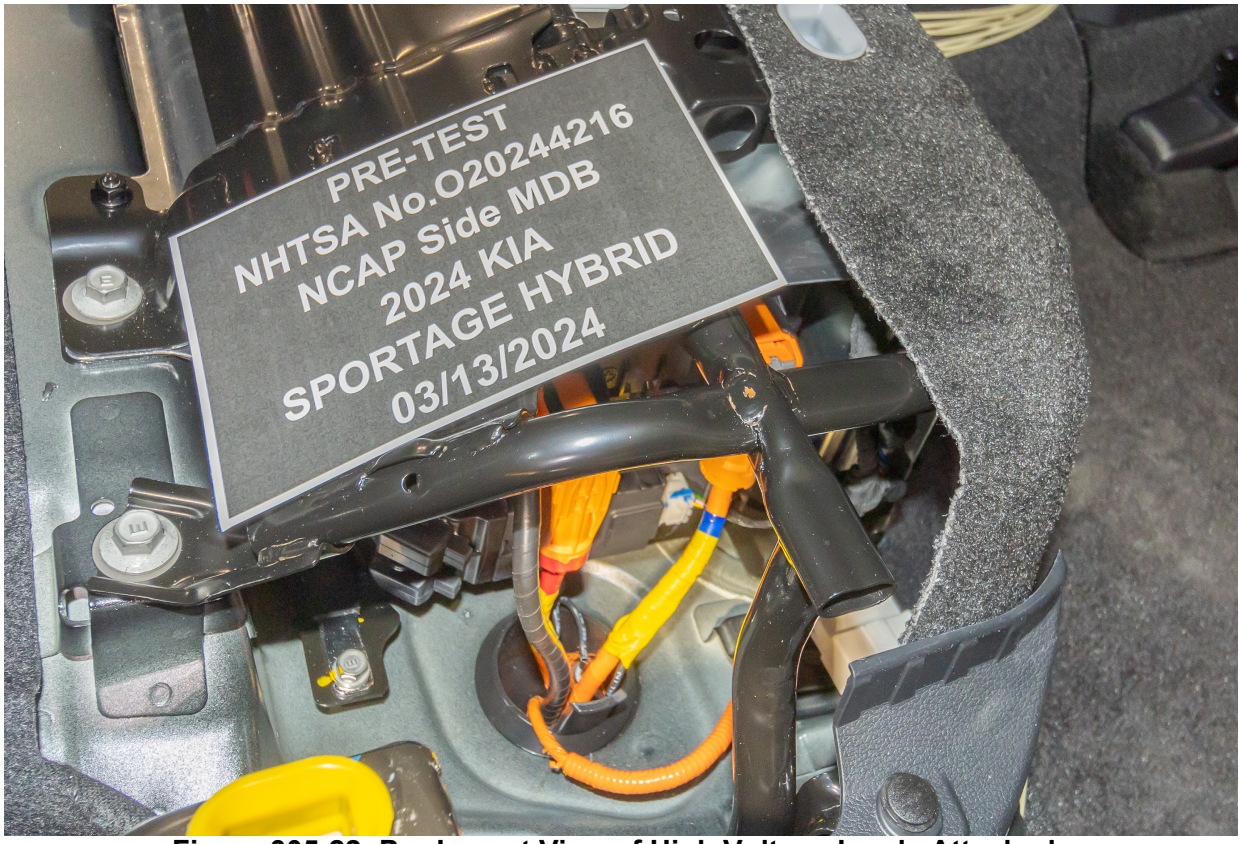


Figure 305-22: Pre-Impact View of High Voltage Leads Attached



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

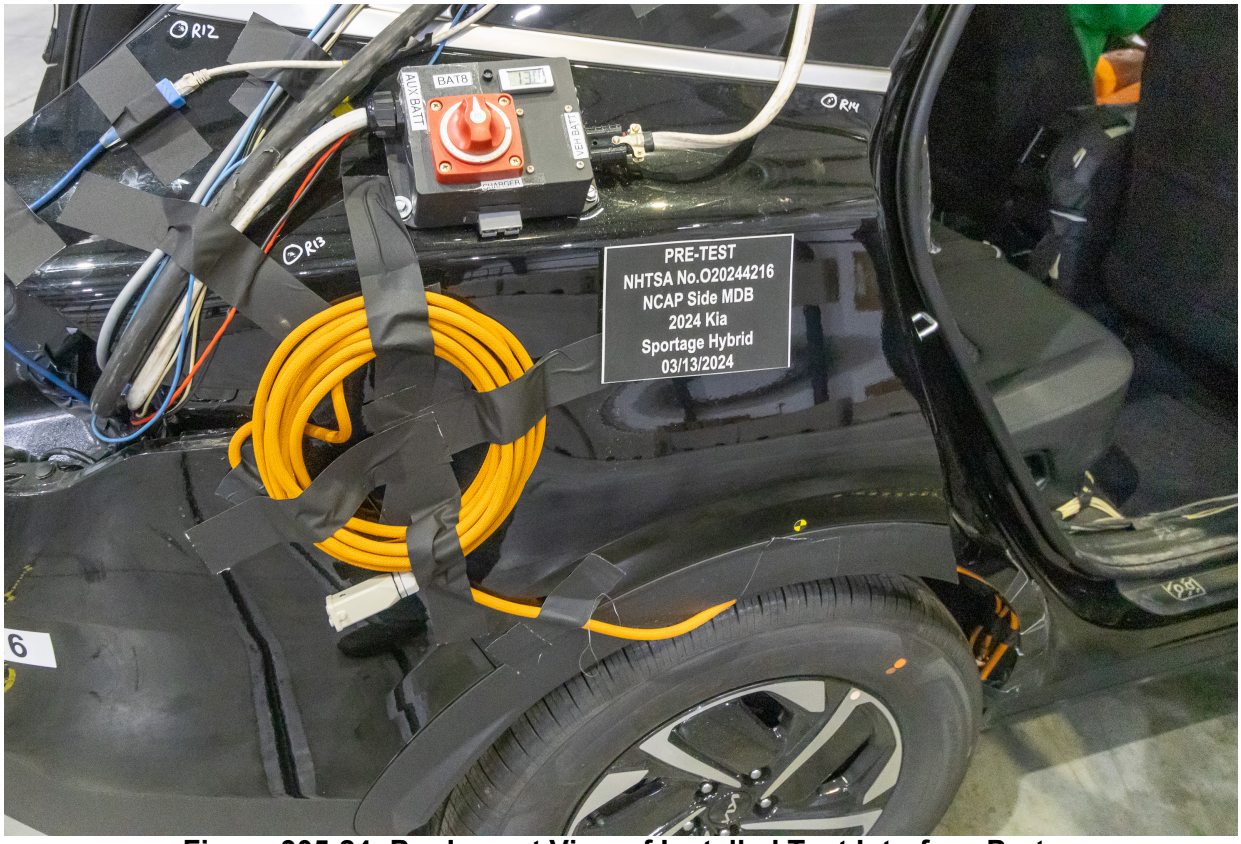


Figure 305-24: Pre-Impact View of Installed Test Interface Port



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

Photo Not Applicable

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

Photo Not Applicable

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



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

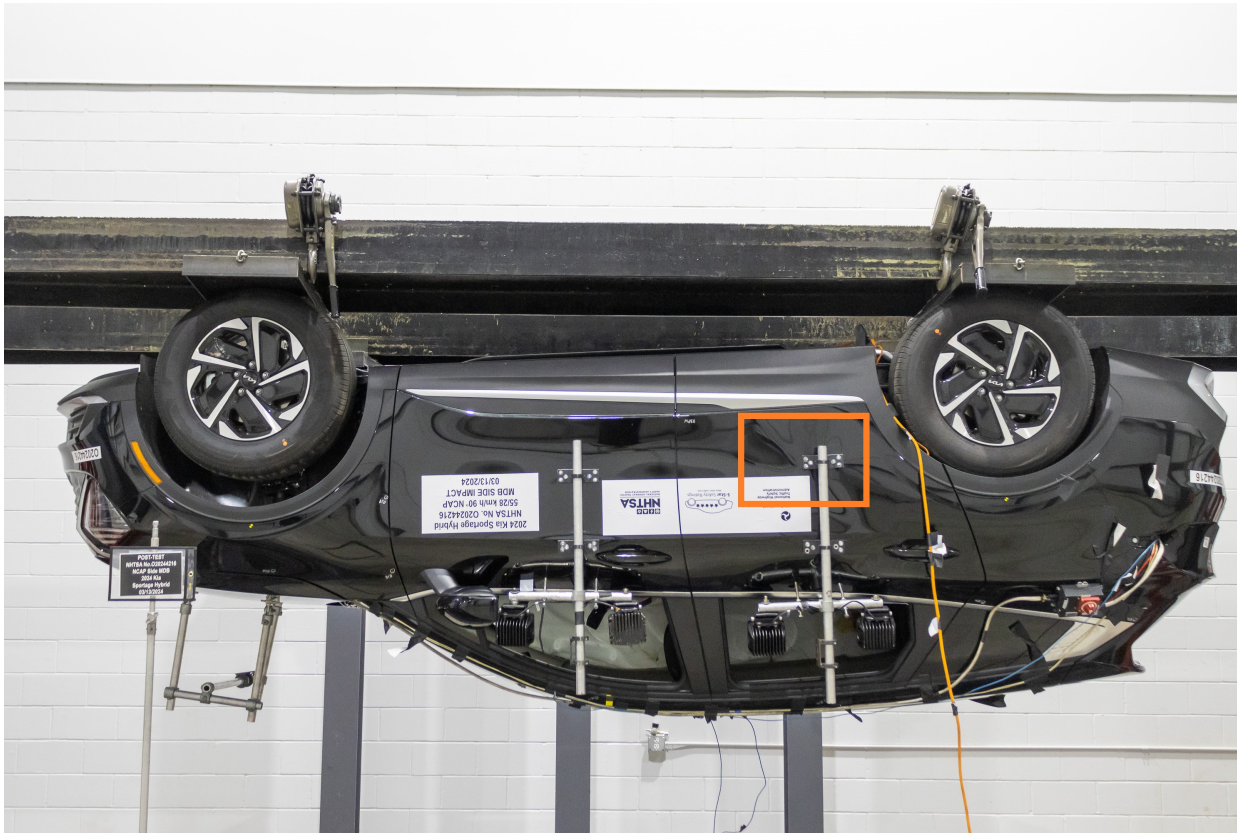


Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees

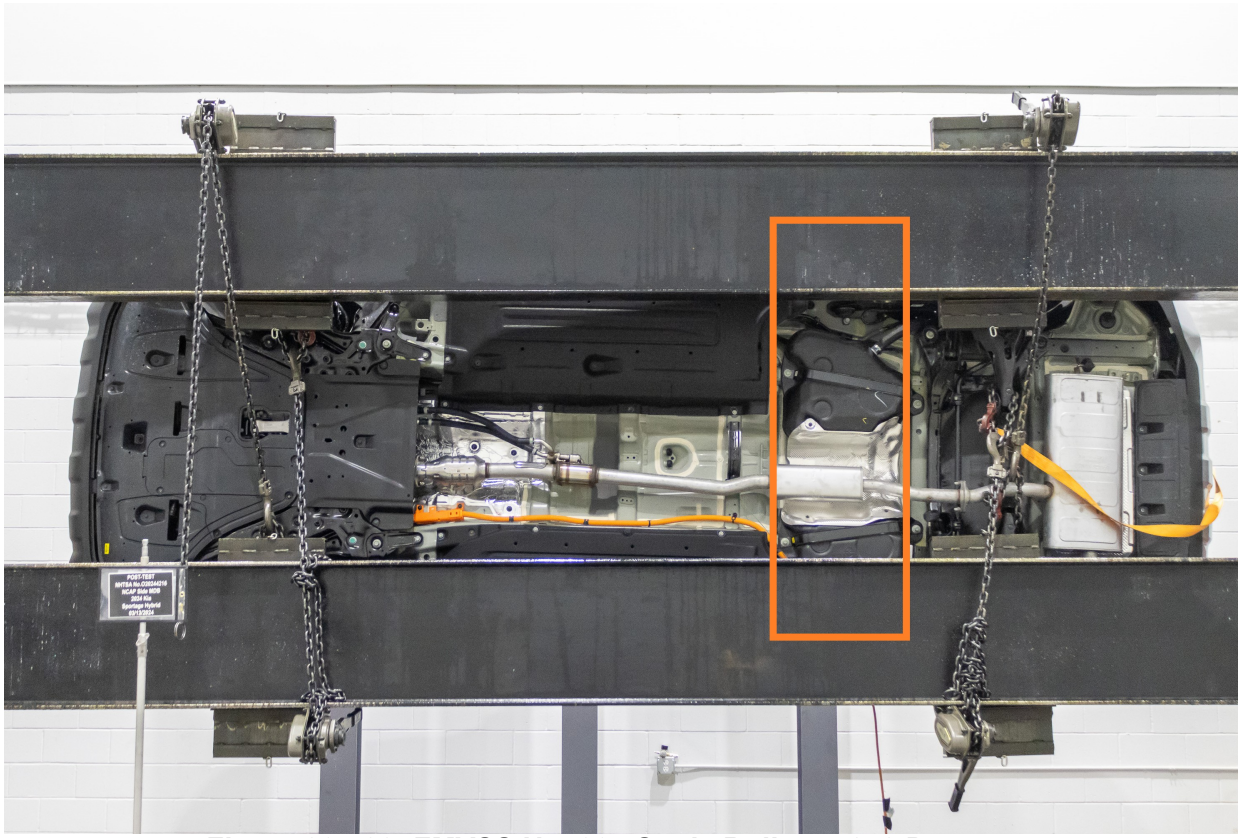


Figure 305-30: FMVSS No. 305 Static Rollover 270 Degrees



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



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



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

Photo Not Applicable

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



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

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



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

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

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA TRACES

Table of Data Plots
Driver Dummy Instrumentation Plots

Fig.	Description	Page
Plot 1	Driver Head Acceleration (X) Primary vs. Time	B-5
Plot 2	Driver Head Acceleration (Y) Primary vs. Time	B-5
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
Plot 8	Driver Thorax Rib Deflection Maximum vs. Time	B-6
Plot 9	Driver Anterior Abdominal Force (Y) vs. Time	B-7
Plot 10	Driver Middle Abdominal Force (Y) vs. Time	B-7
Plot 11	Driver Posterior Abdominal Force (Y) vs. Time	B-7
Plot 12	Driver Total Abdominal Force (Y) vs. Time	B-7
Plot 13	Driver Pubic Symphysis Force (Y) vs. Time	B-8
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Plot 16	Passenger Head Acceleration (Z) vs. Time Primary	B-8
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Plot 20	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-9
Plot 21	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-10
Plot 22	Passenger Iliac Force on Impact Side (Y) vs. Time	B-10
Plot 23	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-10
Plot 24	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-10

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

Additional Driver & Passenger Dummy Instrumentation Data

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

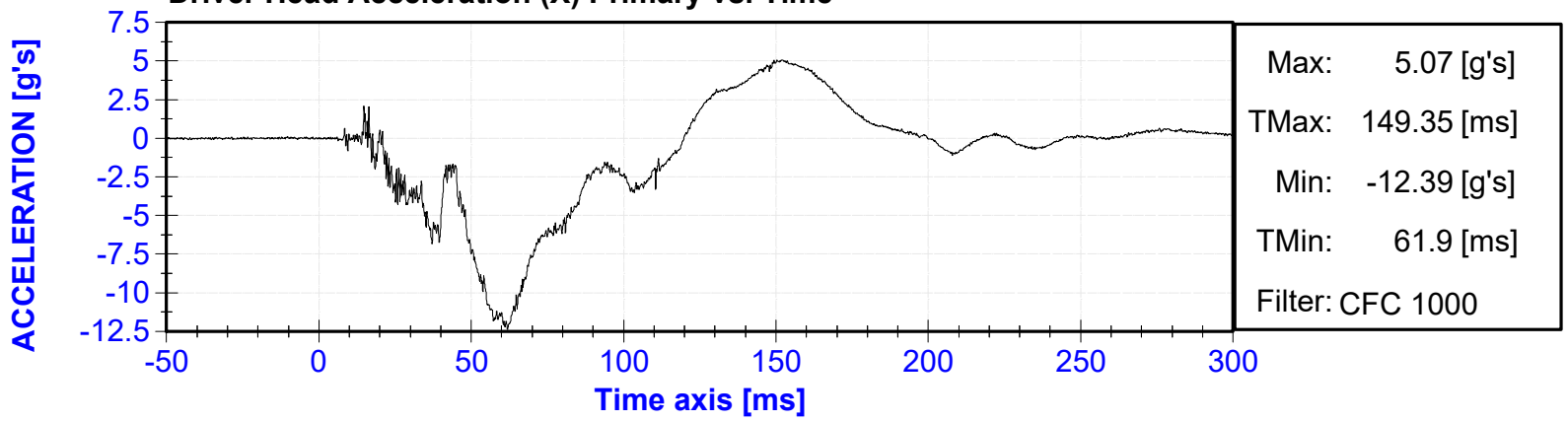
Vehicle Instrumentation Data

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

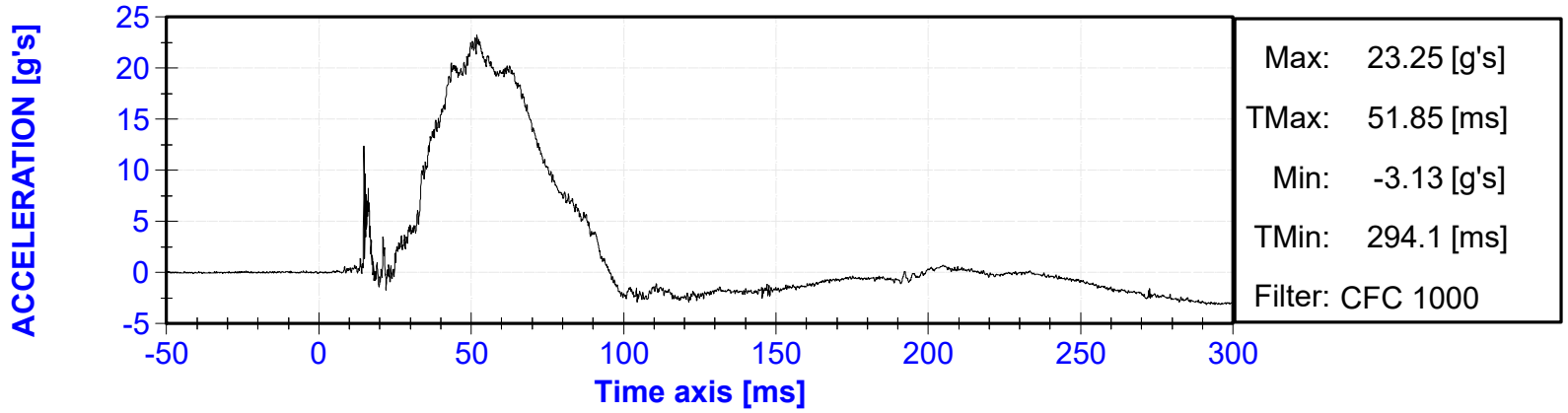
MDB Instrumentation Data

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

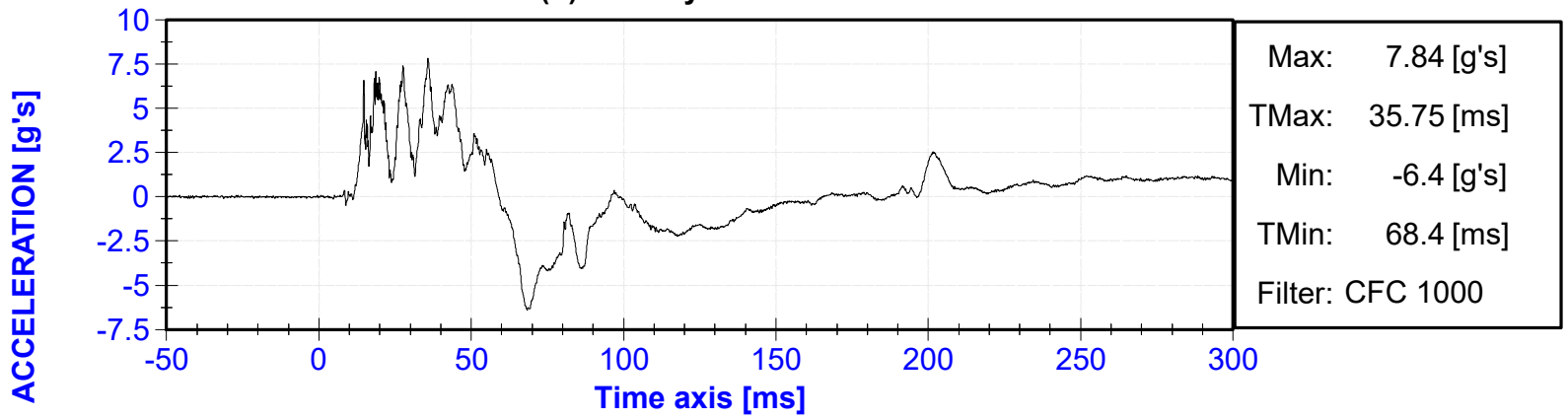
Driver Head Acceleration (X) Primary vs. Time



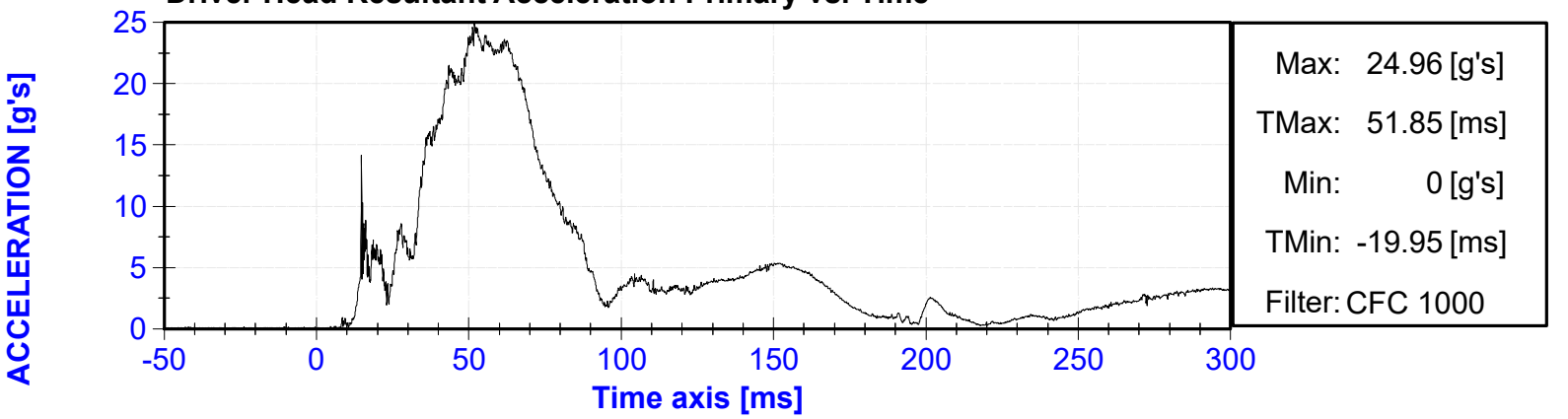
Driver Head Acceleration (Y) Primary vs. Time



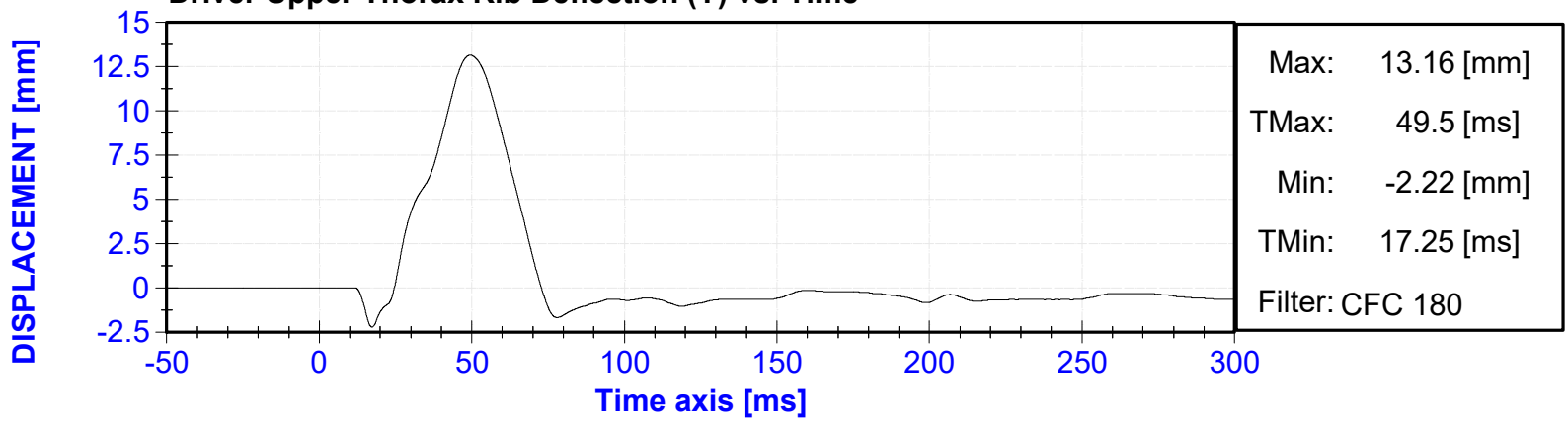
Driver Head Acceleration (Z) Primary vs. Time



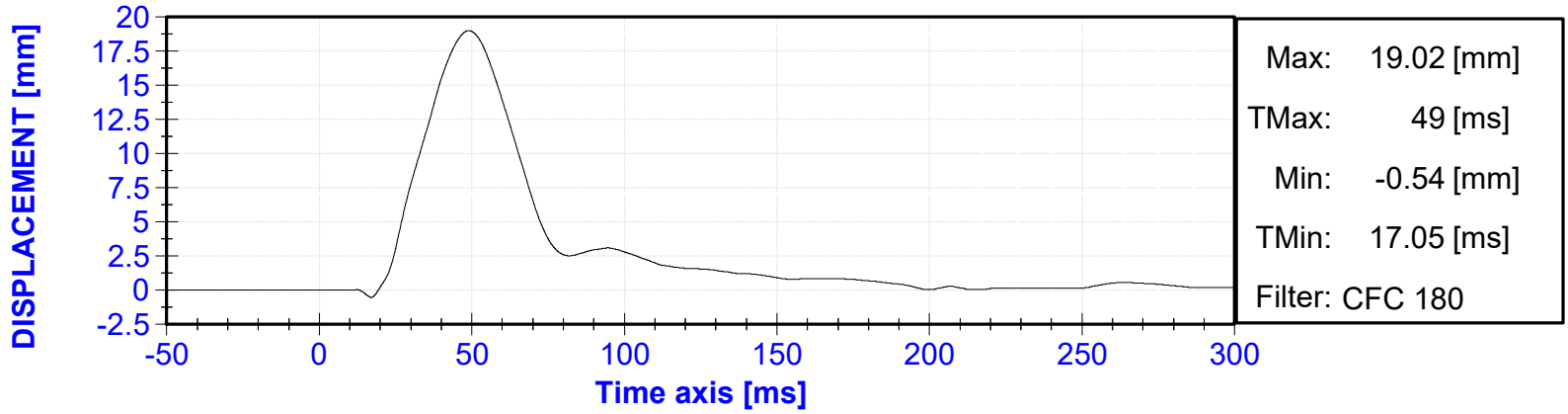
Driver Head Resultant Acceleration Primary vs. Time



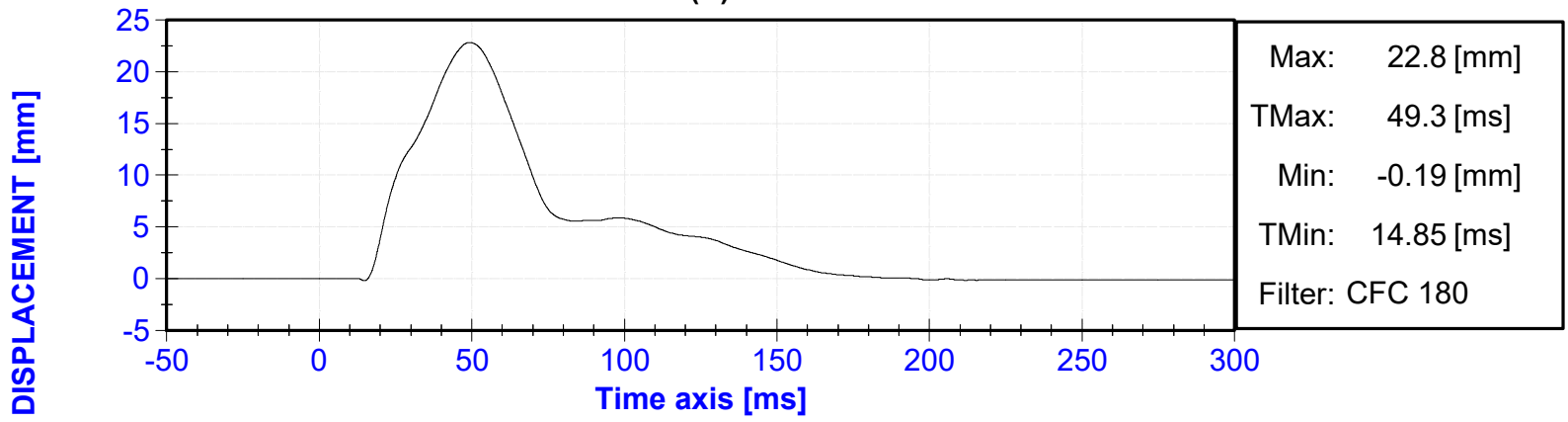
Driver Upper Thorax Rib Deflection (Y) vs. Time



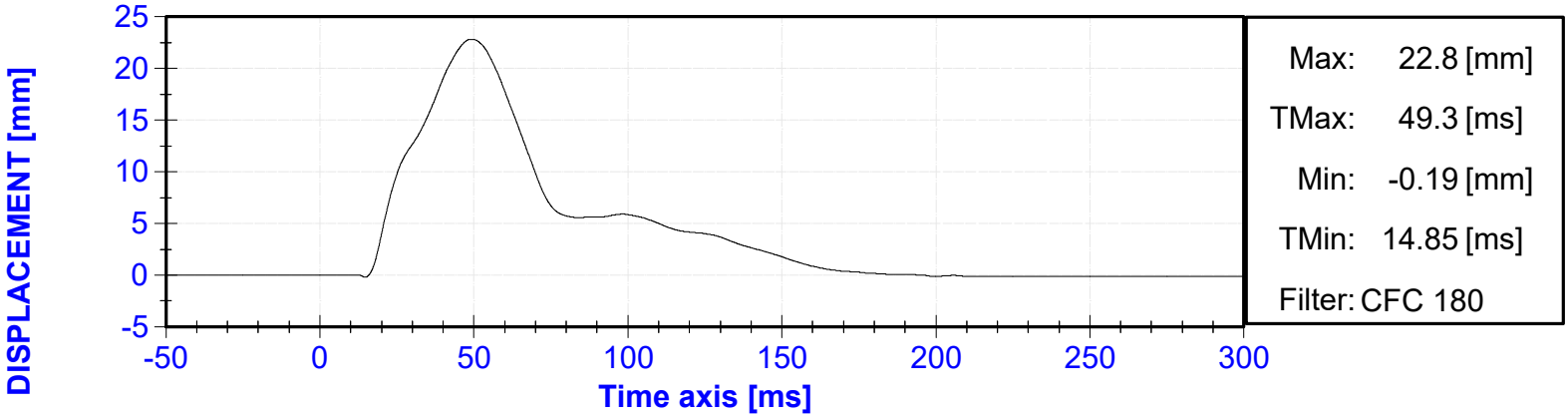
Driver Middle Thorax Rib Deflection (Y) vs. Time



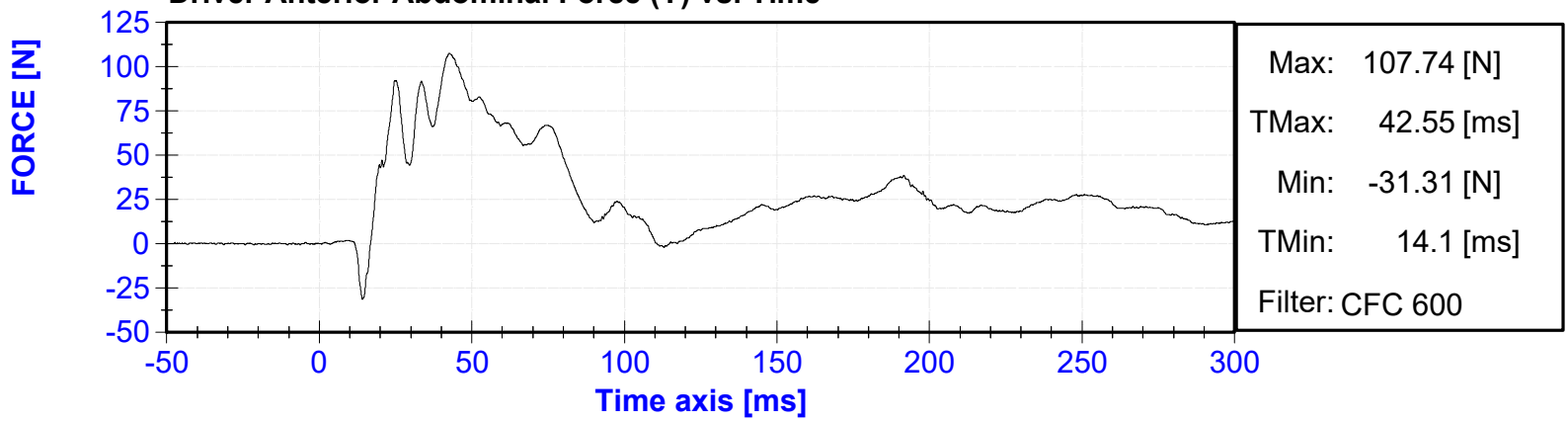
Driver Lower Thorax Rib Deflection (Y) vs. Time



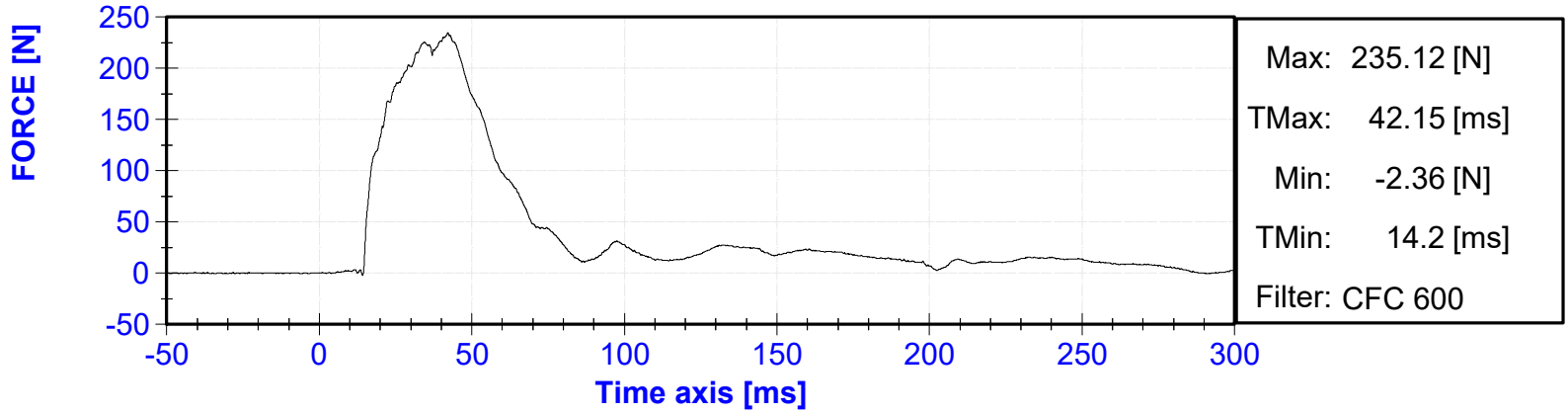
Driver Thorax Rib Deflection Maximum vs. Time



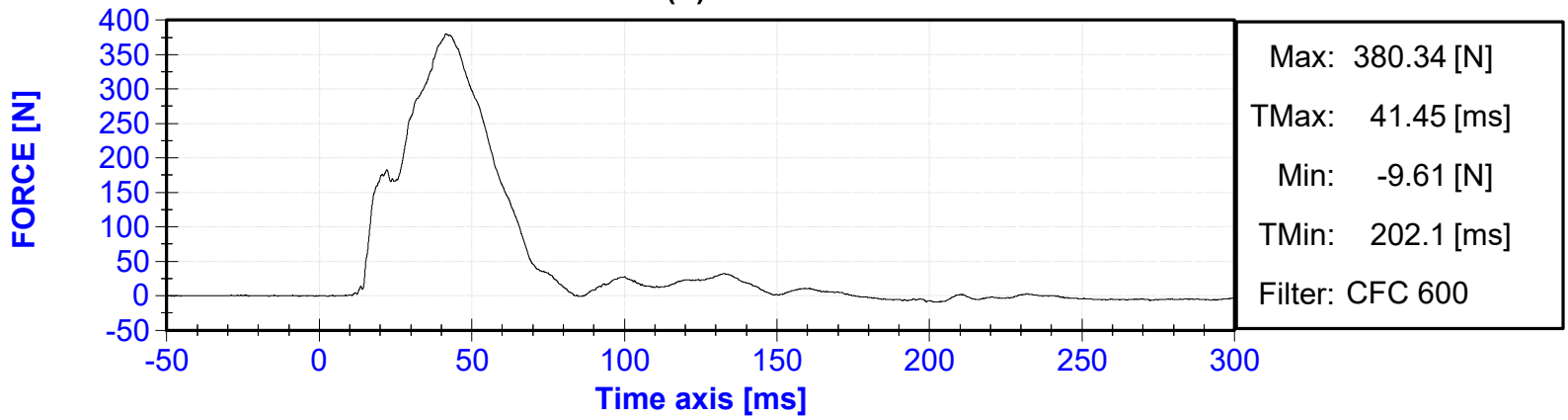
Driver Anterior Abdominal Force (Y) vs. Time



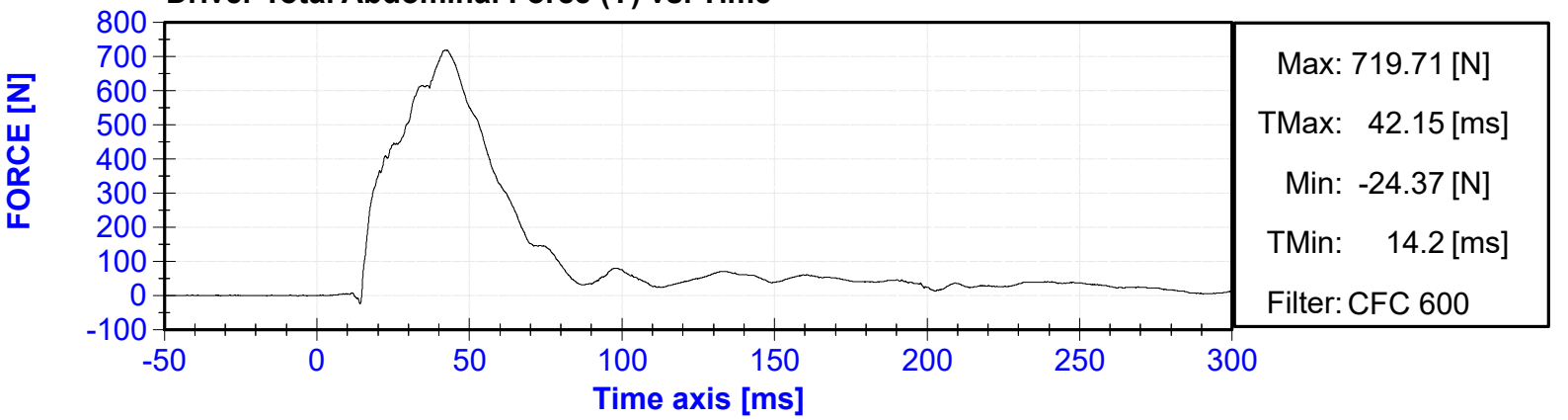
Driver Middle Abdominal Force (Y) vs. Time



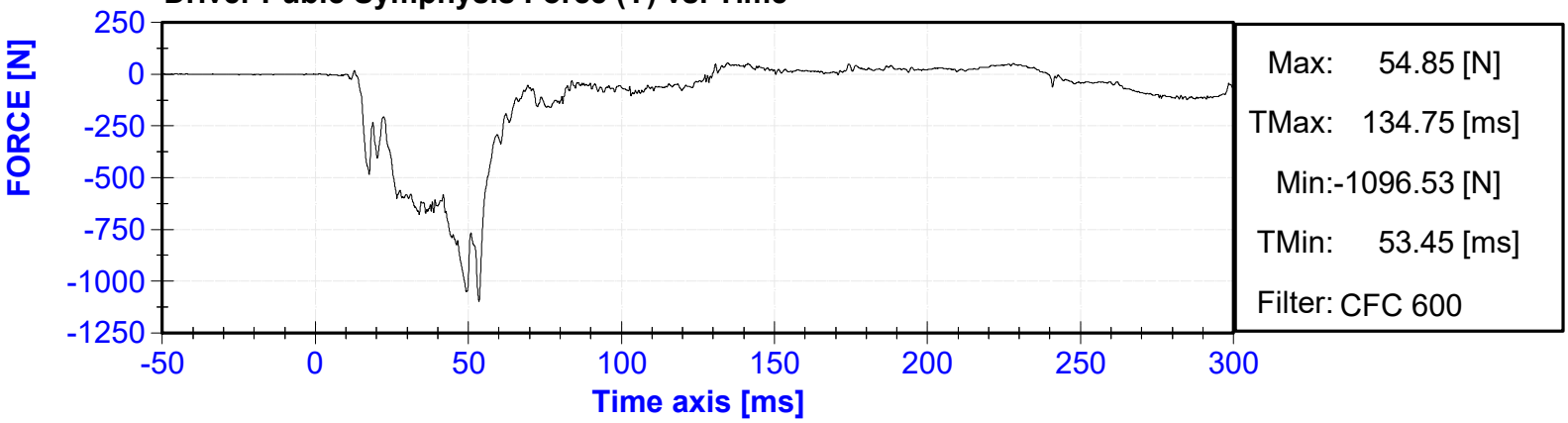
Driver Posterior Abdominal Force (Y) vs. Time



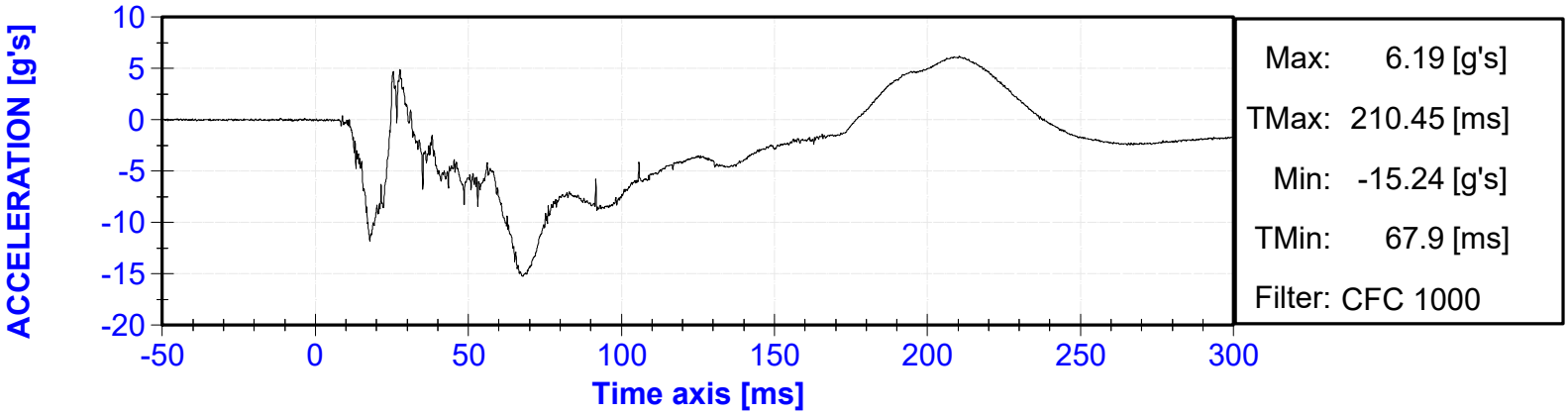
Driver Total Abdominal Force (Y) vs. Time



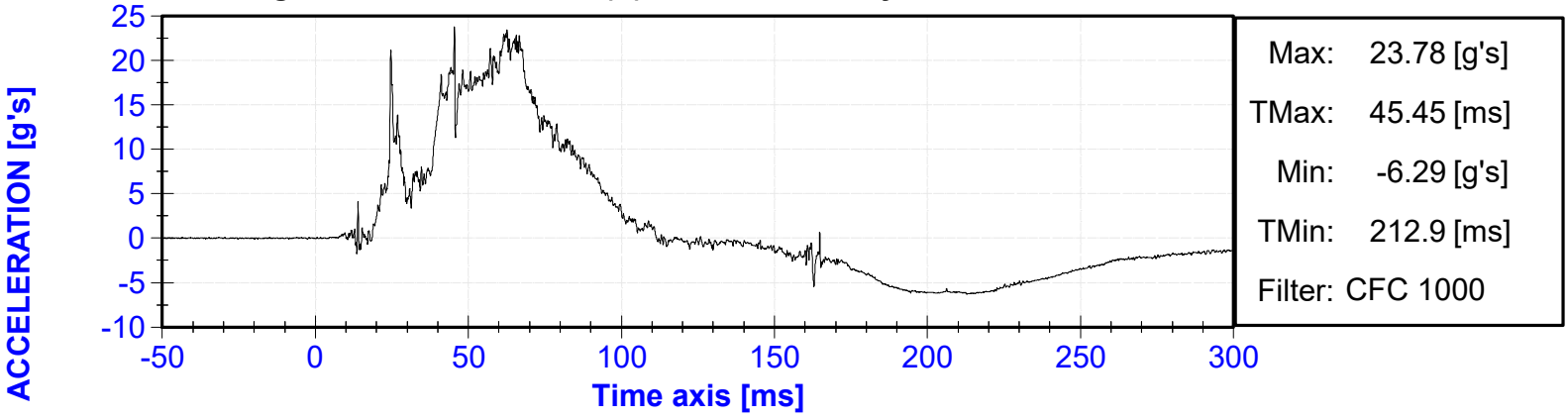
Driver Pubic Symphysis Force (Y) vs. Time



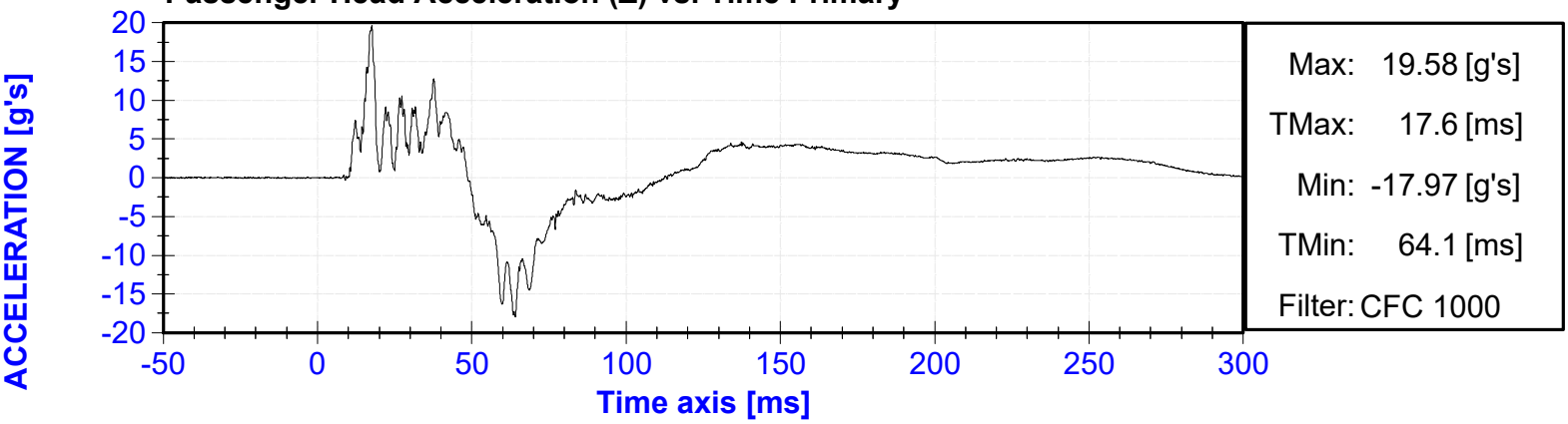
Passenger Head Acceleration (X) vs. Time Primary



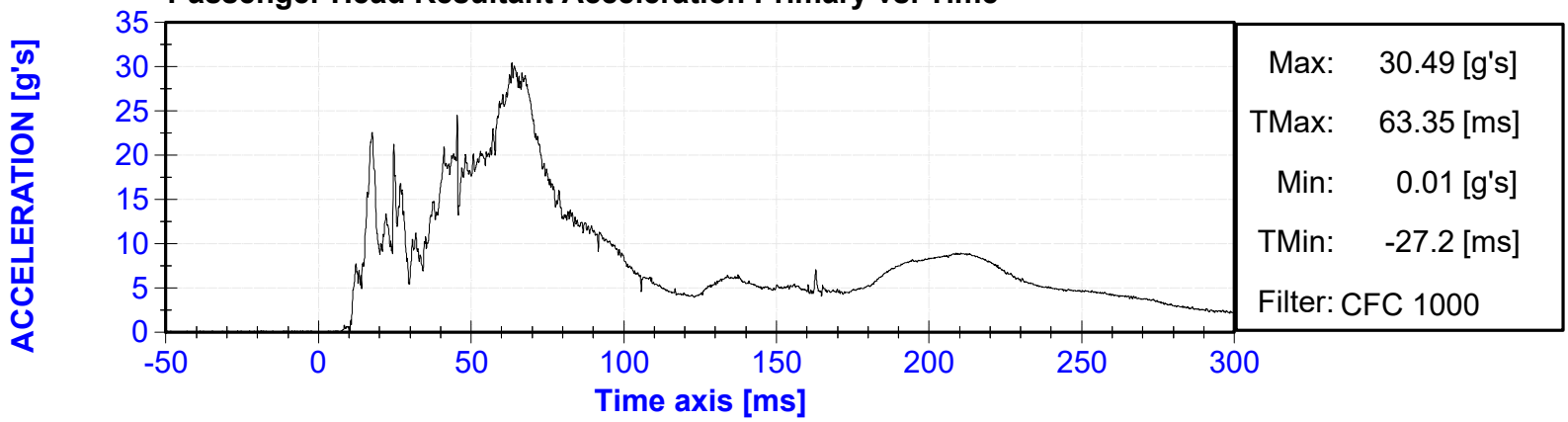
Passenger Head Acceleration (Y) vs. Time Primary



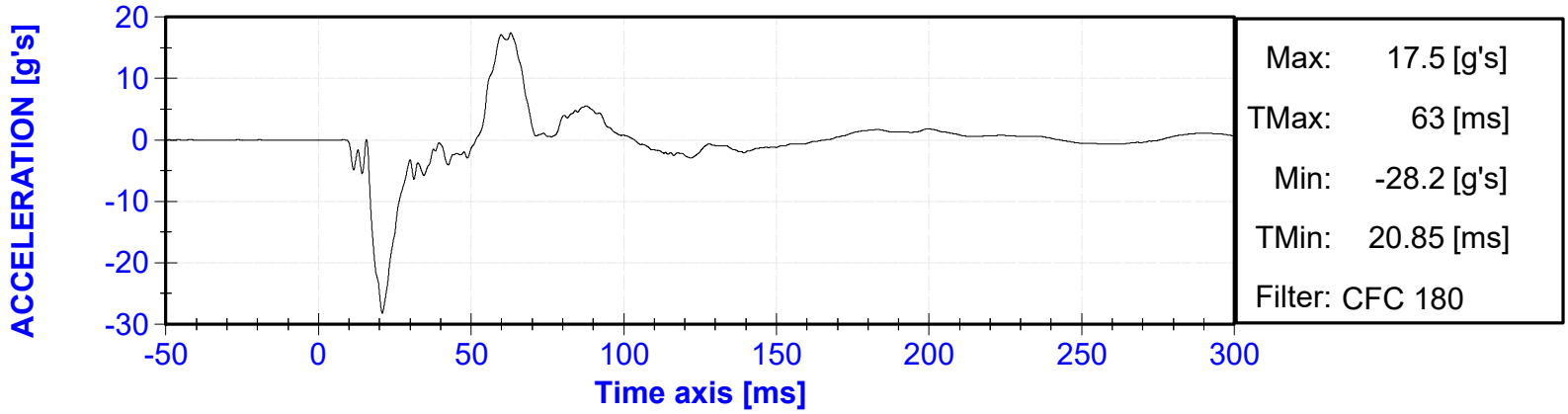
Passenger Head Acceleration (Z) vs. Time Primary



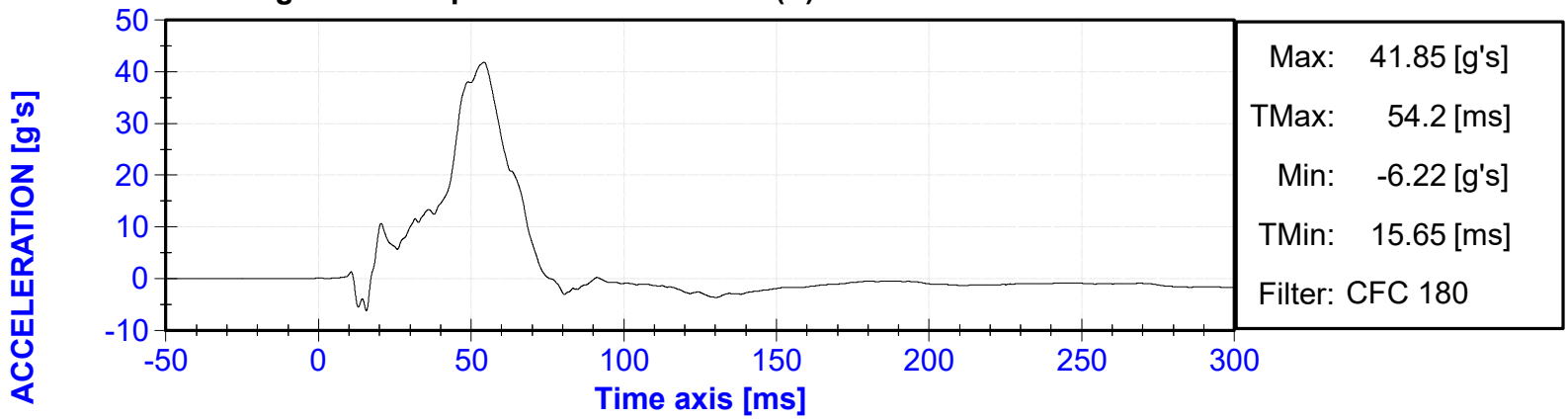
Passenger Head Resultant Acceleration Primary vs. Time



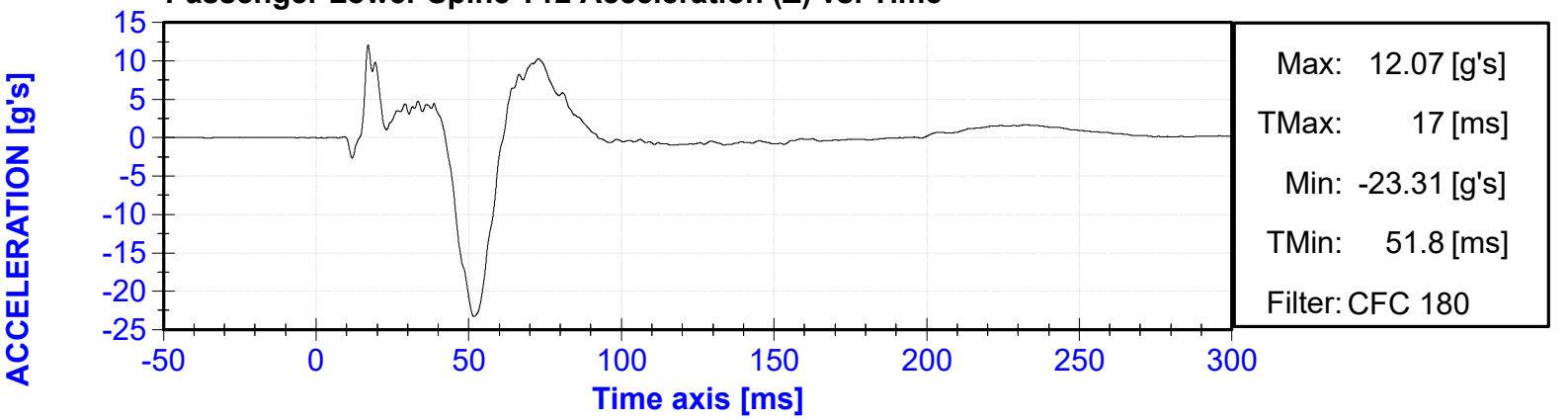
Passenger Lower Spine T12 Acceleration (X) vs. Time



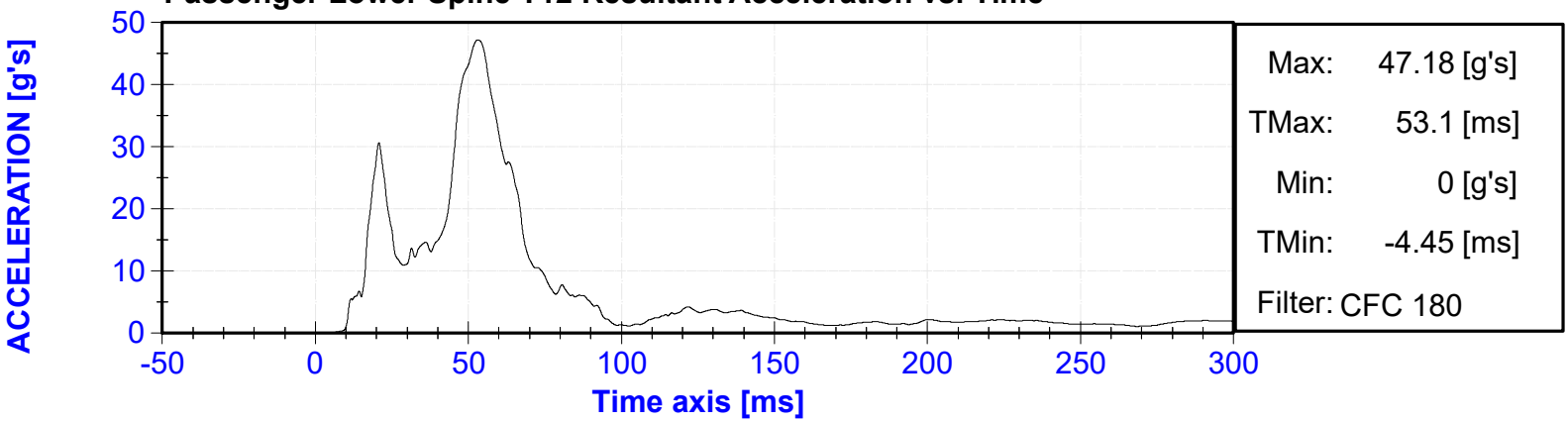
Passenger Lower Spine T12 Acceleration (Y) vs. Time



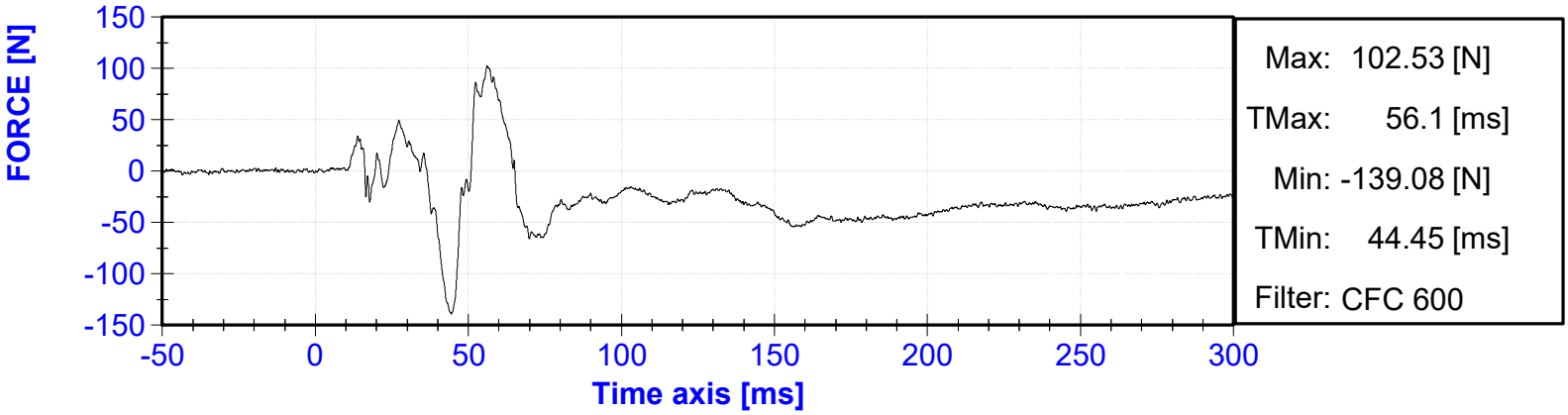
Passenger Lower Spine T12 Acceleration (Z) vs. Time



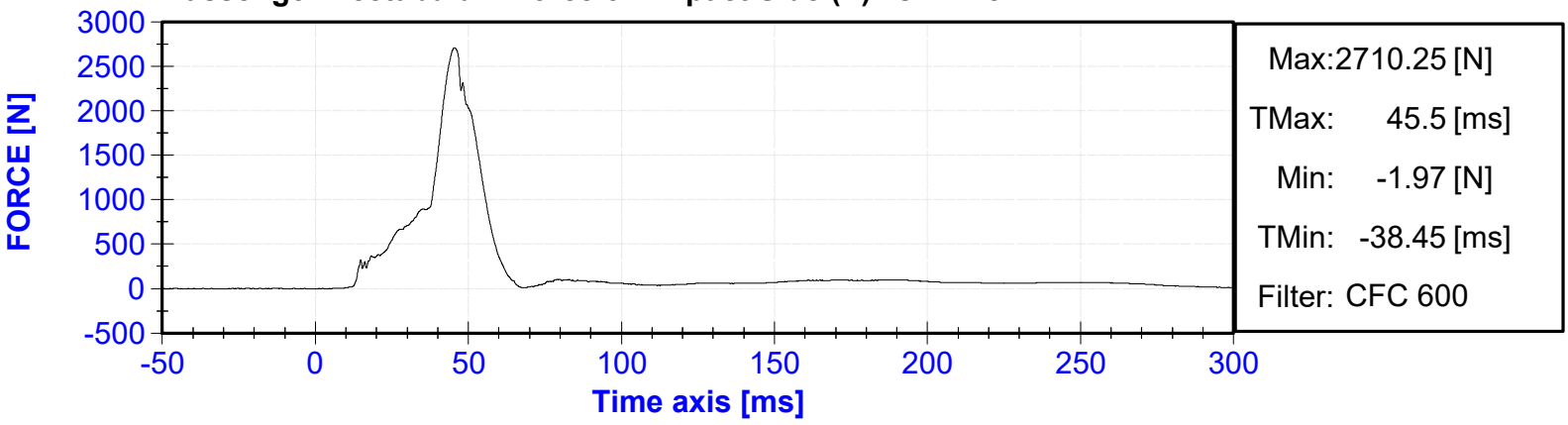
Passenger Lower Spine T12 Resultant Acceleration vs. Time



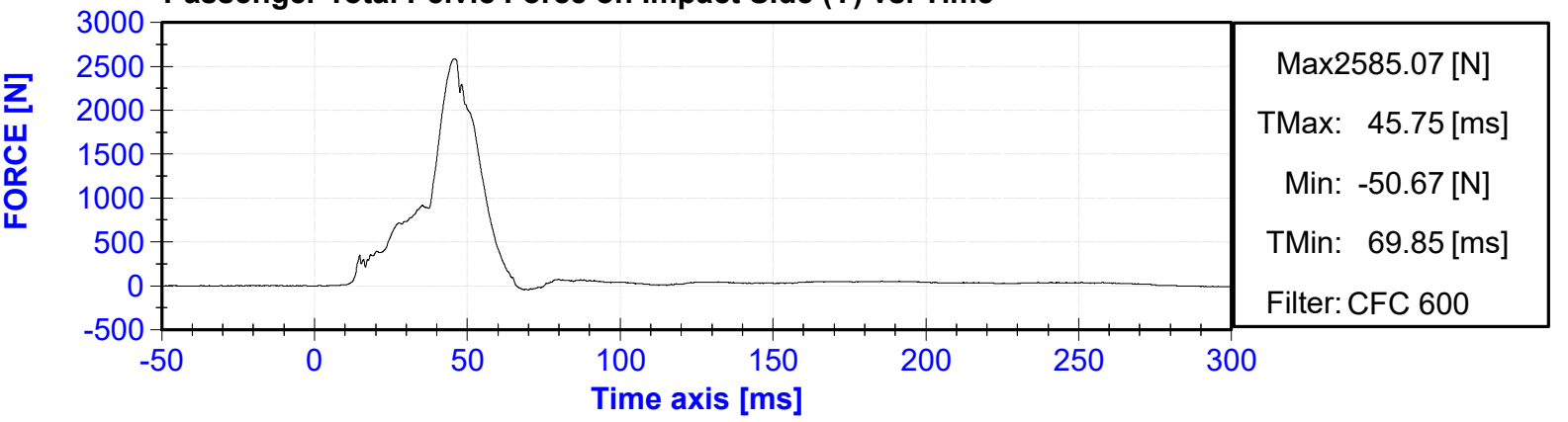
Passenger Iliac Force on Impact Side (Y) vs. Time



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



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



APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

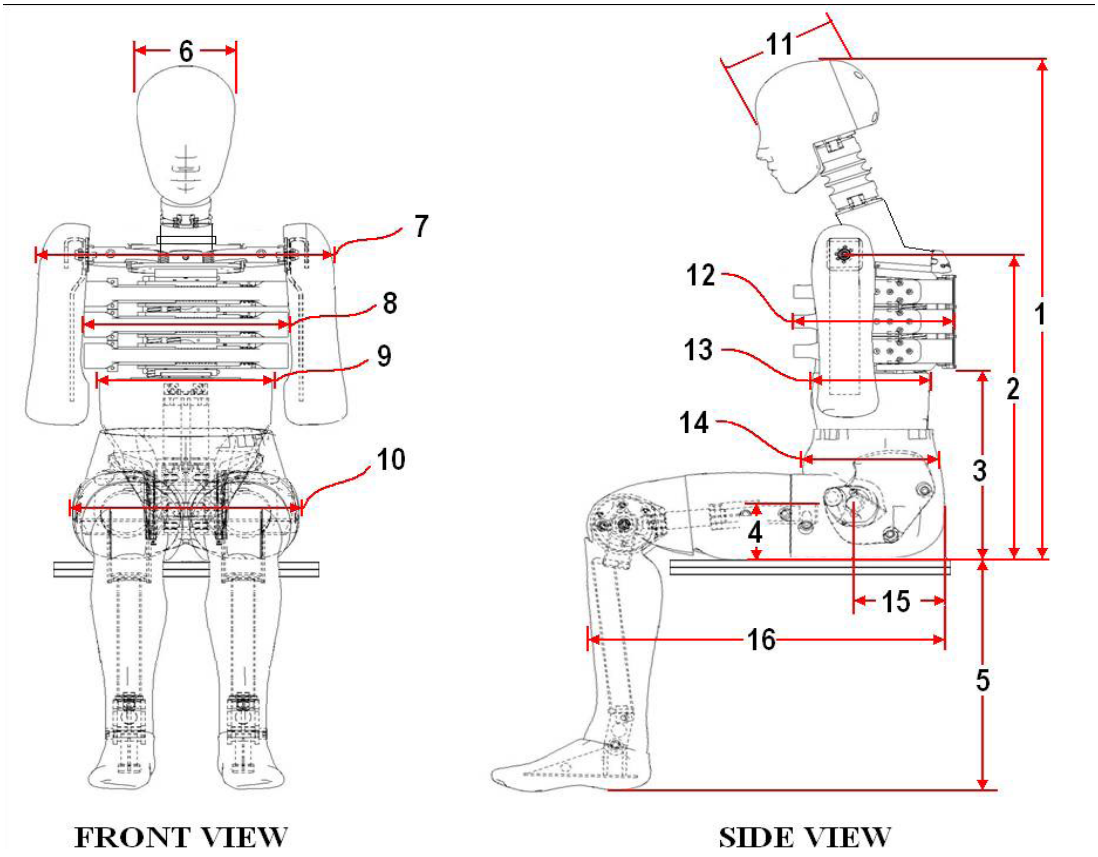
SERIAL NO:F033

(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - EuroSID-2re

Technician: T. Roseman Date: 2/22/2024

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	353	Pass
4	Seat to Hip Joint (center of bolt)	97	103	99	Pass
5	Sole to Seat, Sitting	333	451	429	Pass
6	Head Width	152	158	156	Pass
7	Shoulder/Arm Width	461	479	472	Pass
8	Thorax Width	322	332	330	Pass
9	Abdomen Width	273	287	282	Pass
10	Pelvis Lap Width	359	373	370	Pass
11	Head Depth	196	206	201	Pass
12	Thorax Depth	262	272	269	Pass
13	Abdomen Depth	194	204	201	Pass
14	Pelvis Depth	235	245	241	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	155	Pass
16	Back of Buttocks to Front Knee	597	615	611	Pass

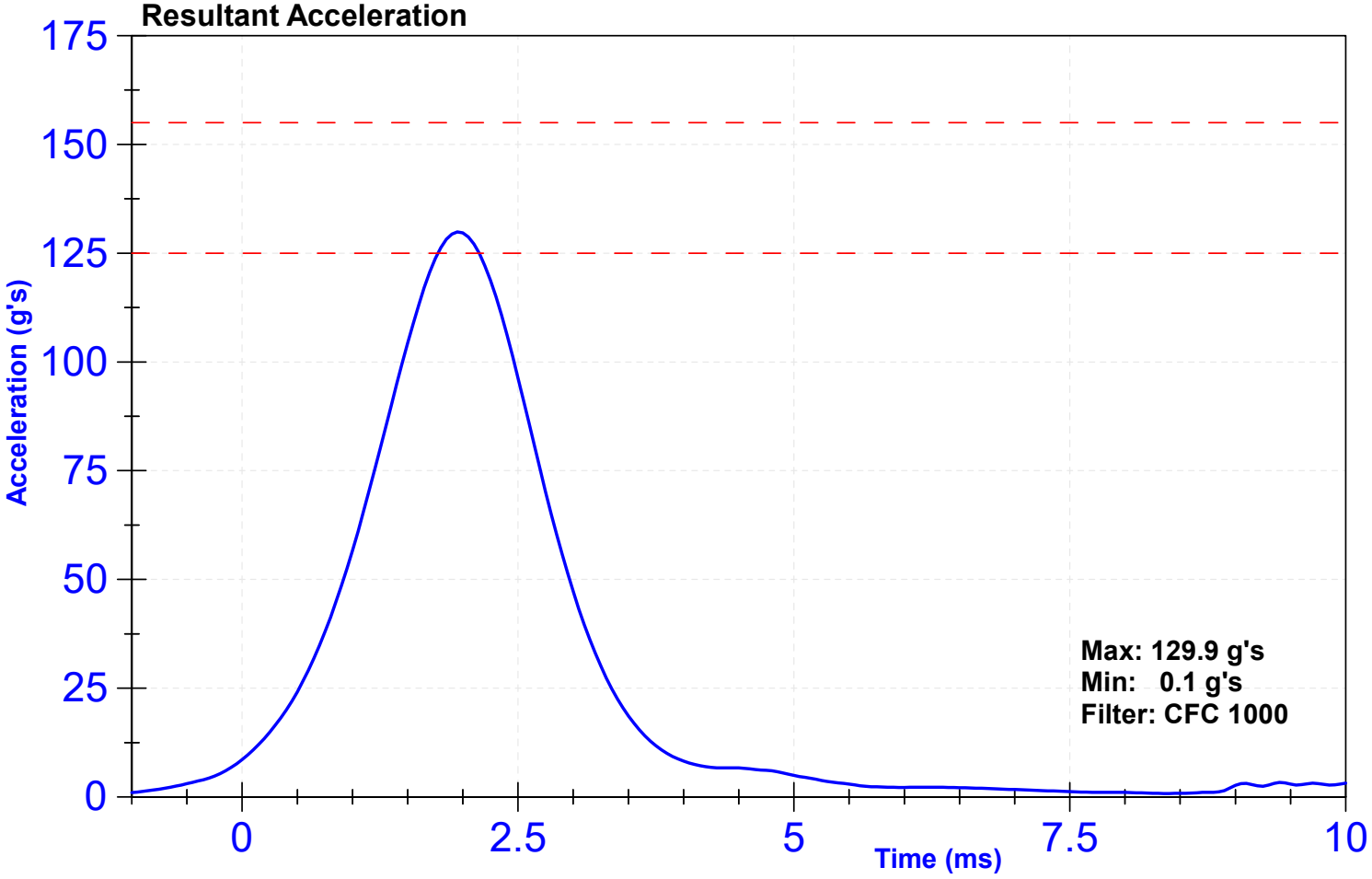
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

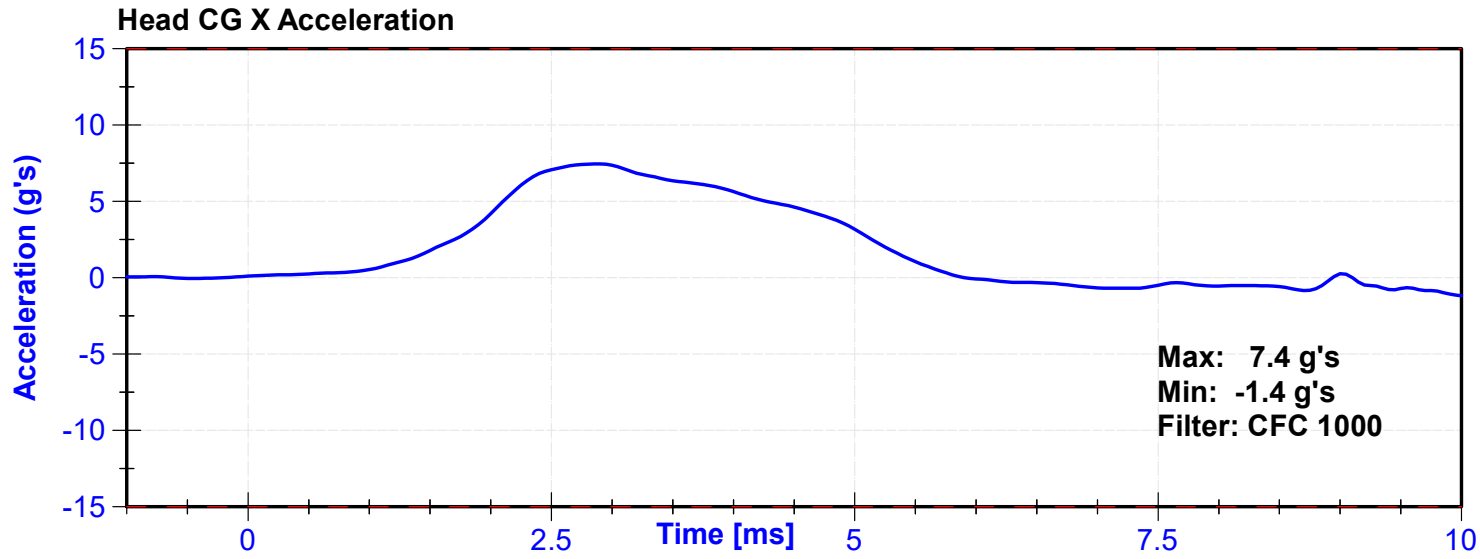
Results

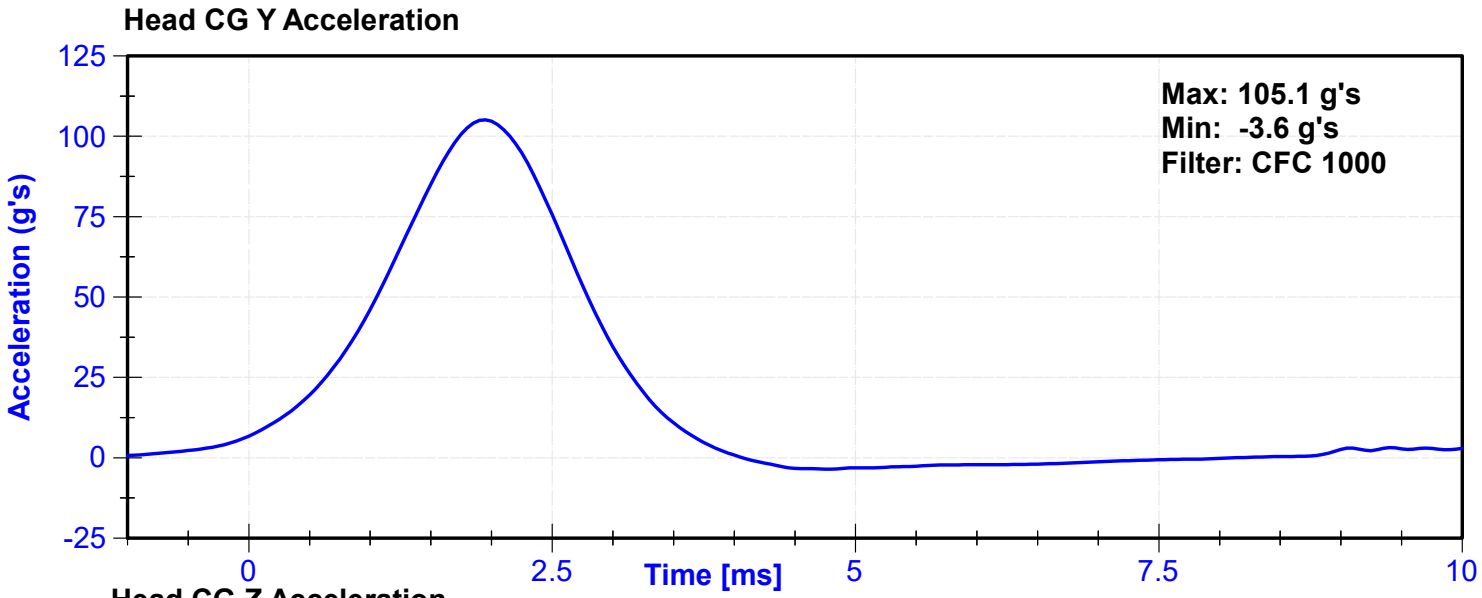
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18	Pass
Resultant Acceleration	125	155	g's	129.9	Pass
Oscillation	0	15	%	5.13	Pass
Fore-Aft Acceleration	-15	15	g's	7.4	Pass

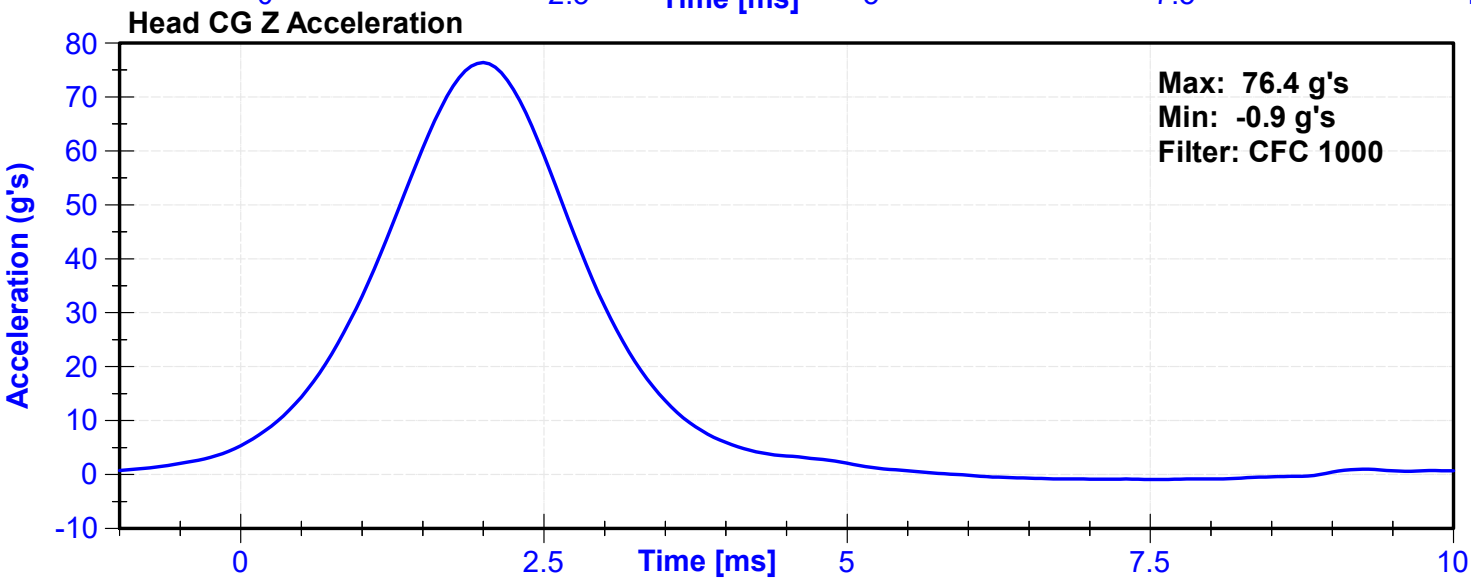
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P63861	11/16/2023	5/14/2024
Y Accelerometer	Endevco	P49216	11/16/2023	5/14/2024
Z Accelerometer	Endevco	P51303	11/16/2023	5/14/2024




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
Time [ms]
5
7.5
10
Max: 7.4 g's
Min: -1.4 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
Time [ms]
5
7.5
10
Max: 105.1 g's
Min: -3.6 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
Time [ms]
5
7.5
10
Max: 76.4 g's
Min: -0.9 g's
Filter: CFC 1000

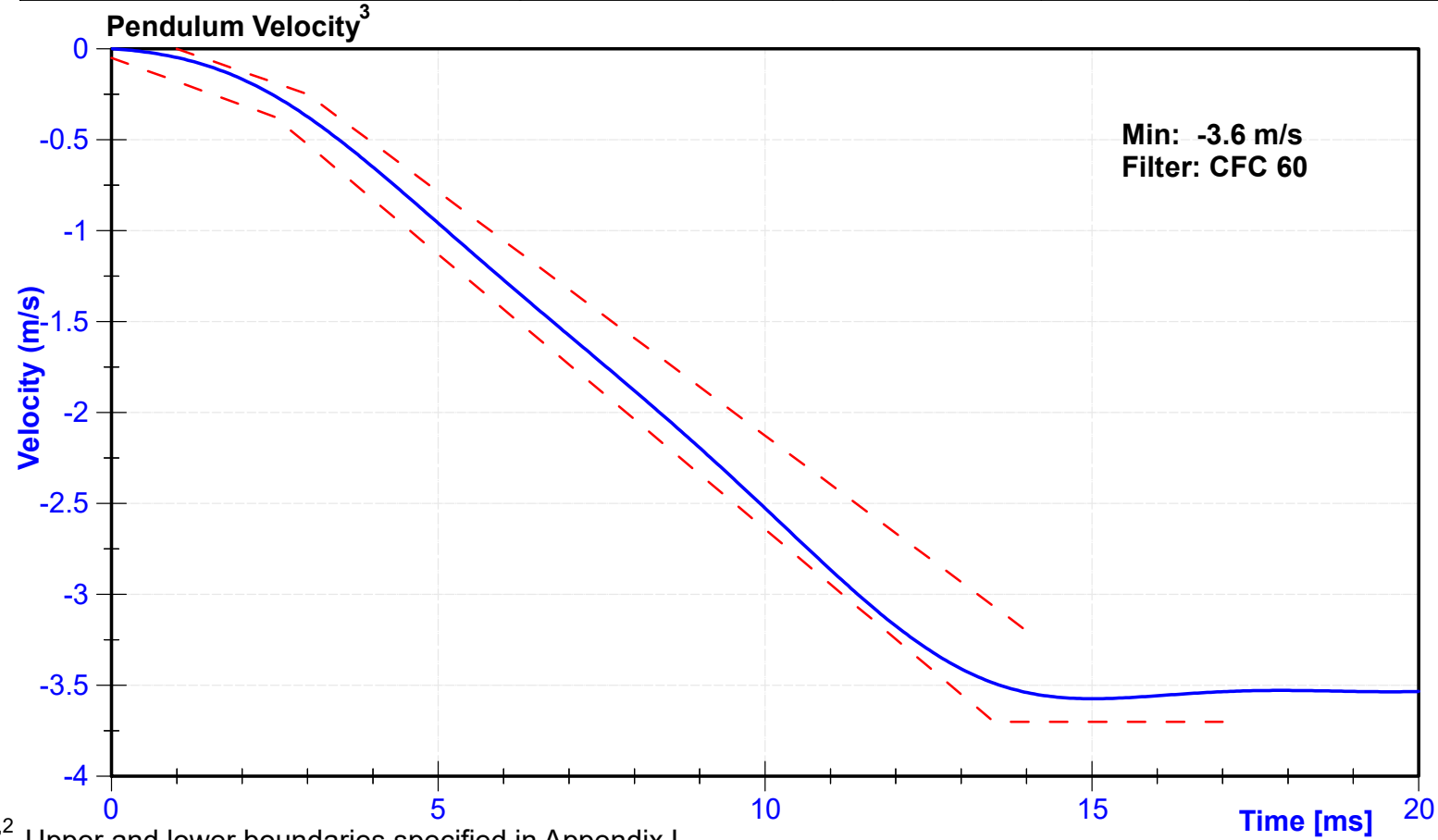
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

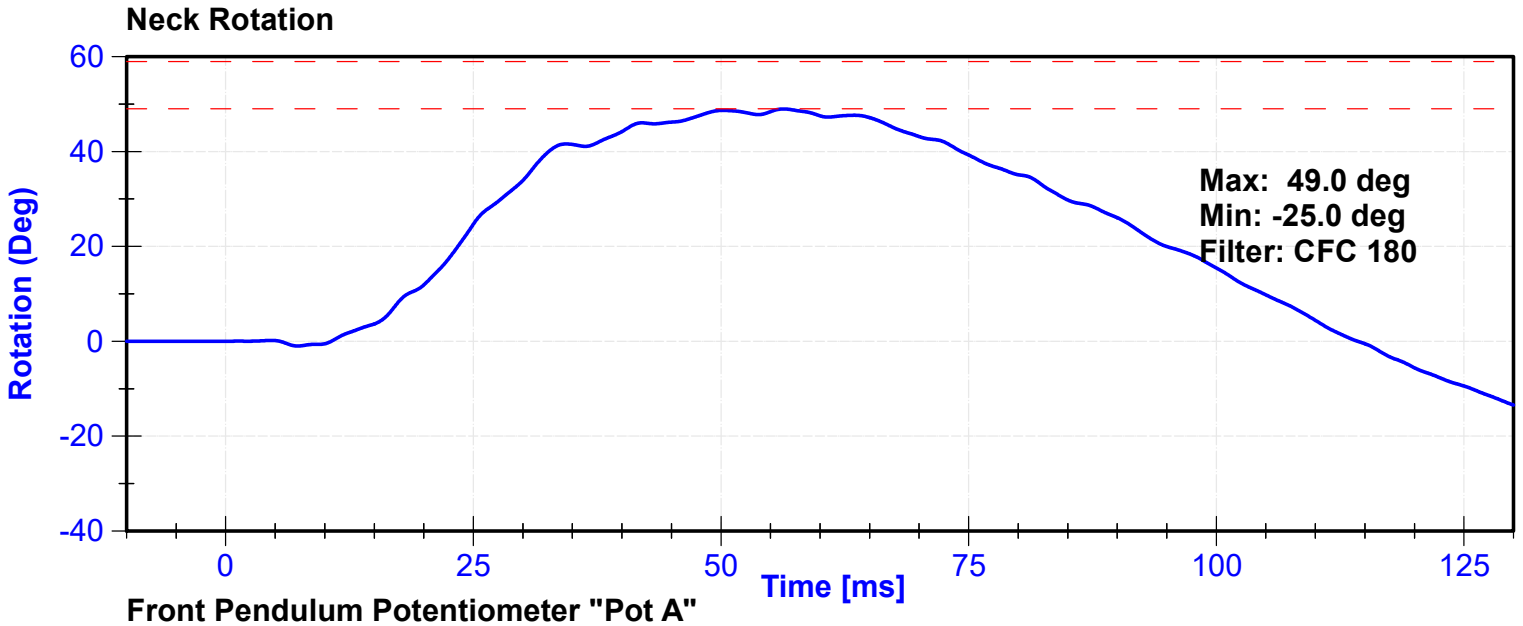
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	29	Pass
Velocity	3.3	3.5	m/s	3.37	Pass
Lateral Neck Rotation	49	59	deg	49.0	Pass
Time at Maximum Rotation	54	66	ms	56.3	Pass
Time of Rotation Decay from Maximum	53	88	ms	58.0	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

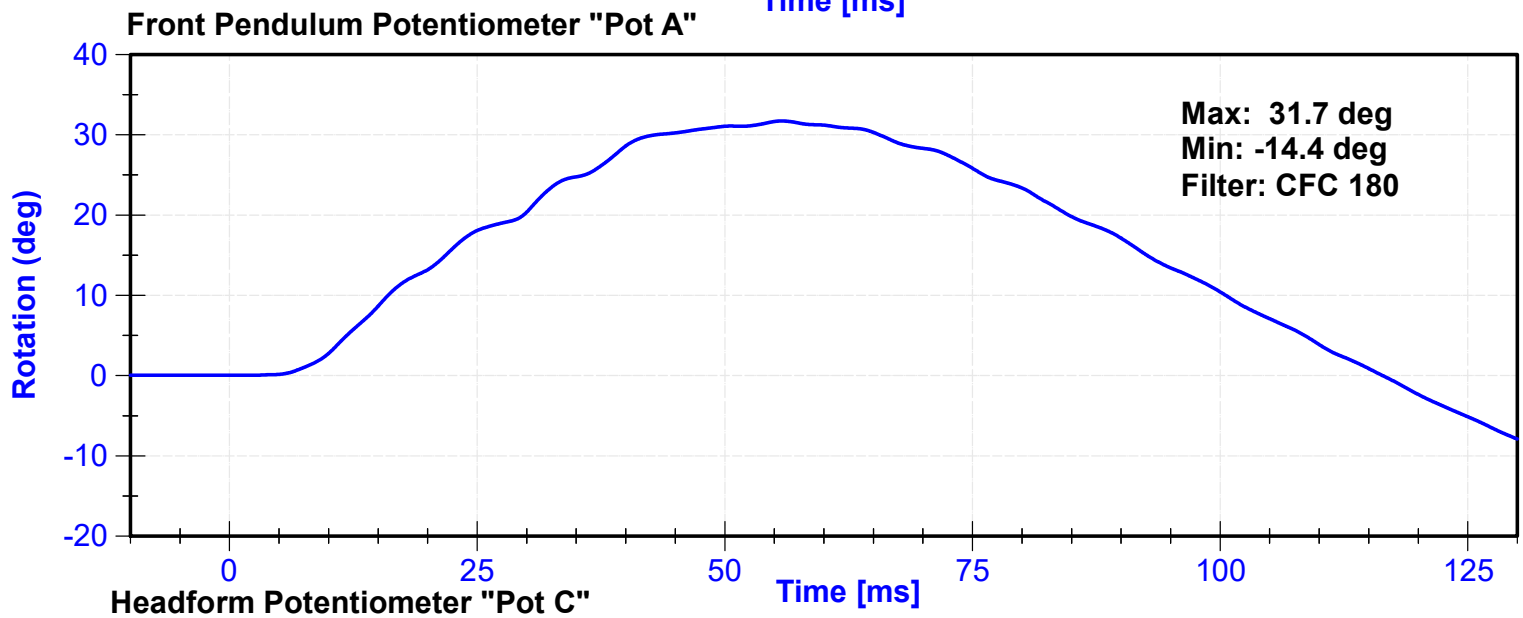
Transducer Calibrations

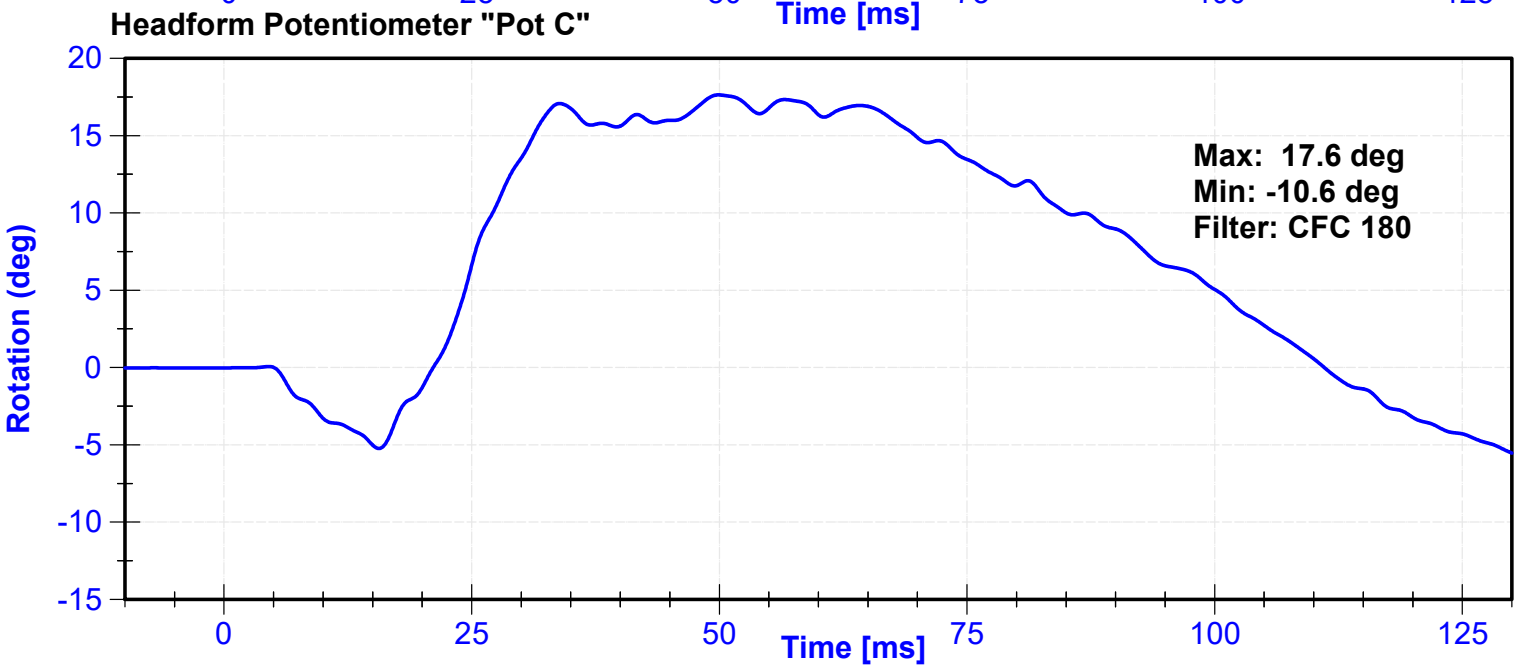
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/31/2023	4/28/2024
Front Pendulum Potentiometer	Sfernice	2247	12/5/2023	12/4/2024
Headform Potentiometer	Sfernice	095	9/29/2023	9/28/2024



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


Neck Rotation
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]
Max: 49.0 deg
Min: -25.0 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: 31.7 deg
Min: -14.4 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
20
15
10
5
0
-5
-10
-15
0
25
50
75
100
125
Time [ms]
Max: 17.6 deg
Min: -10.6 deg
Filter: CFC 180

Appendix I

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

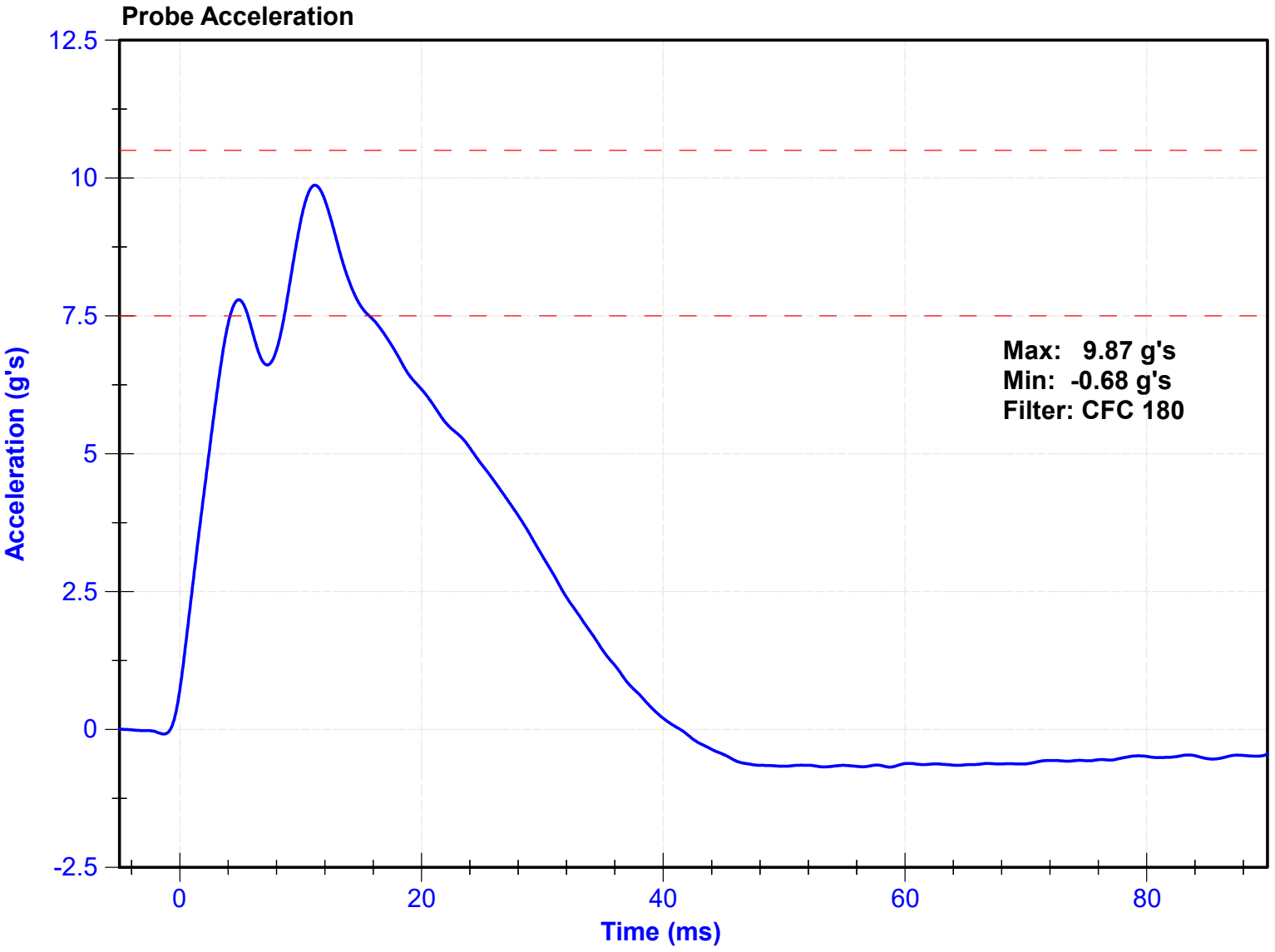
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.39	Pass
Probe Acceleration	7.5	10.5	g's	9.87	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024



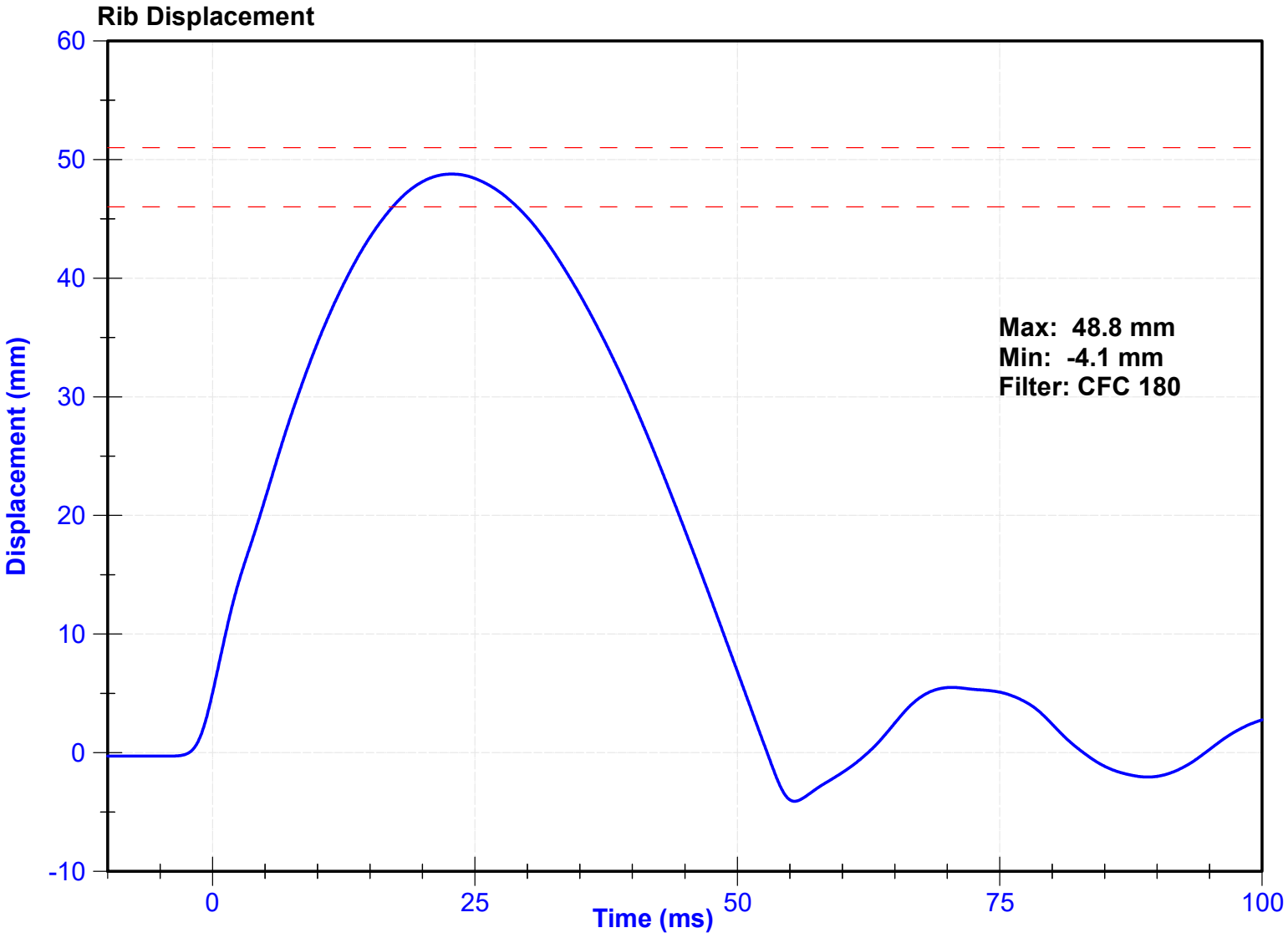
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	46	51	mm	48.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	11/17/2023	5/17/2024



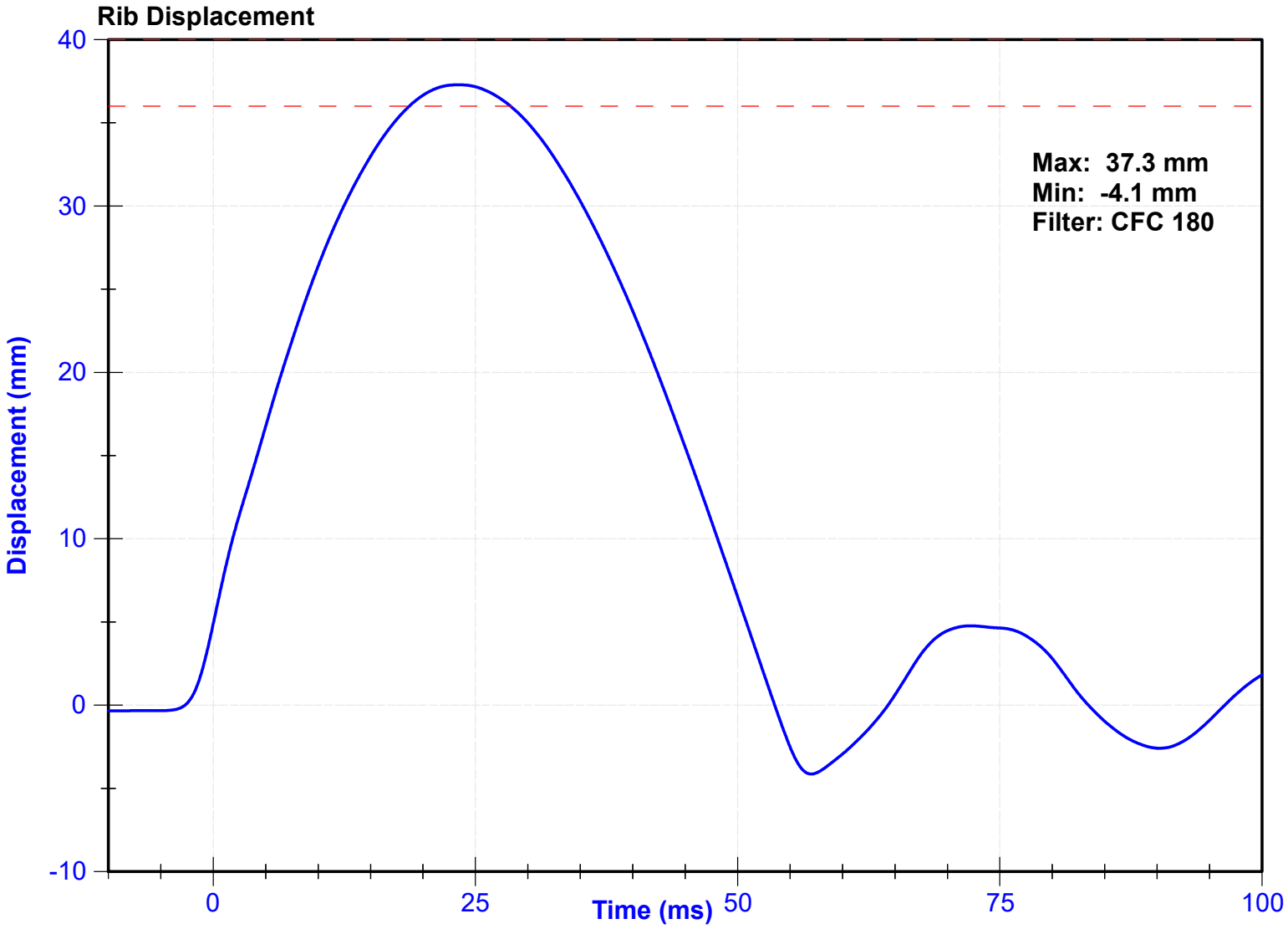
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	36	40	mm	37.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	11/17/2023	5/17/2024



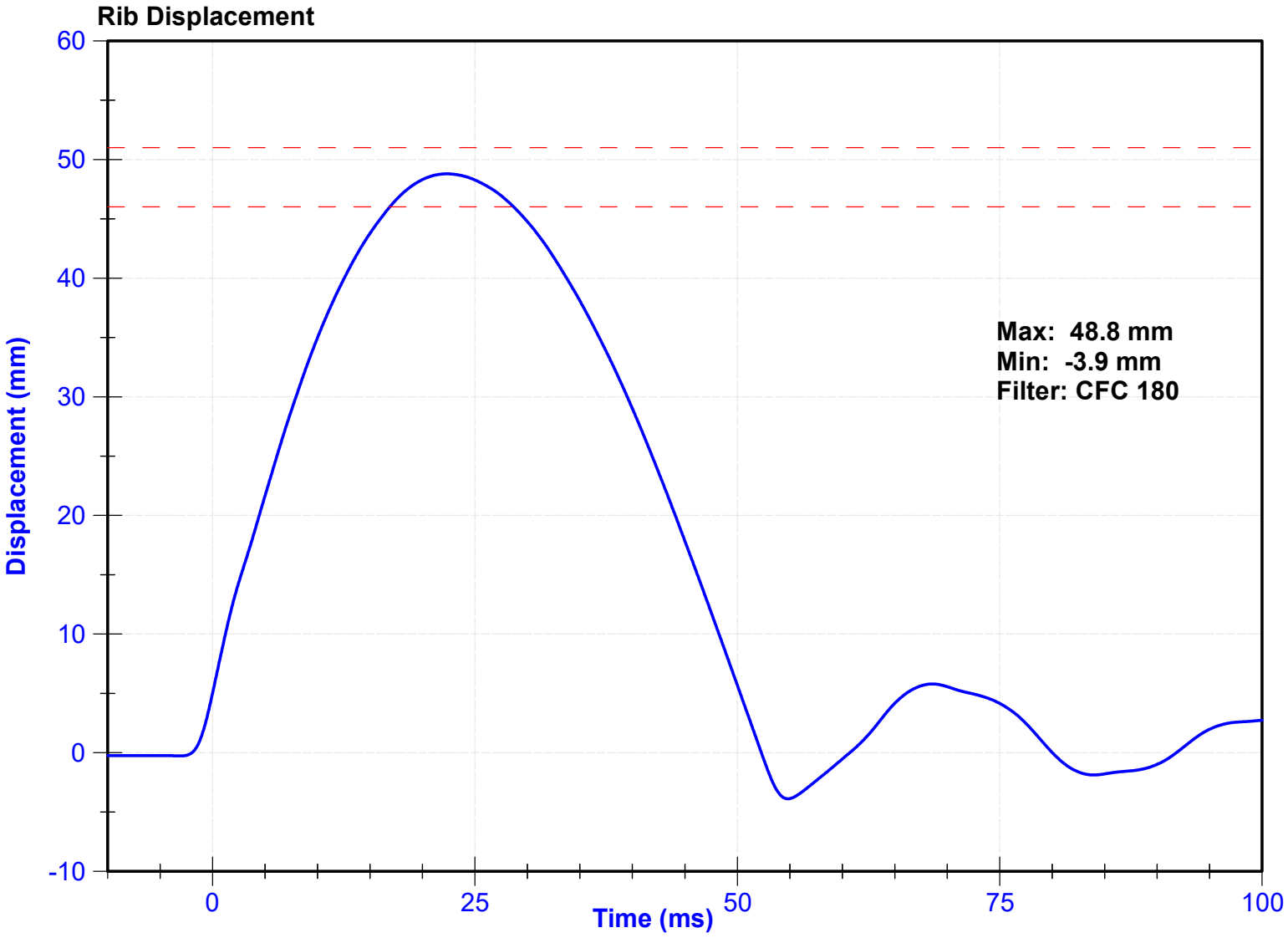
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	46	51	mm	48.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	11/17/2023	5/17/2024



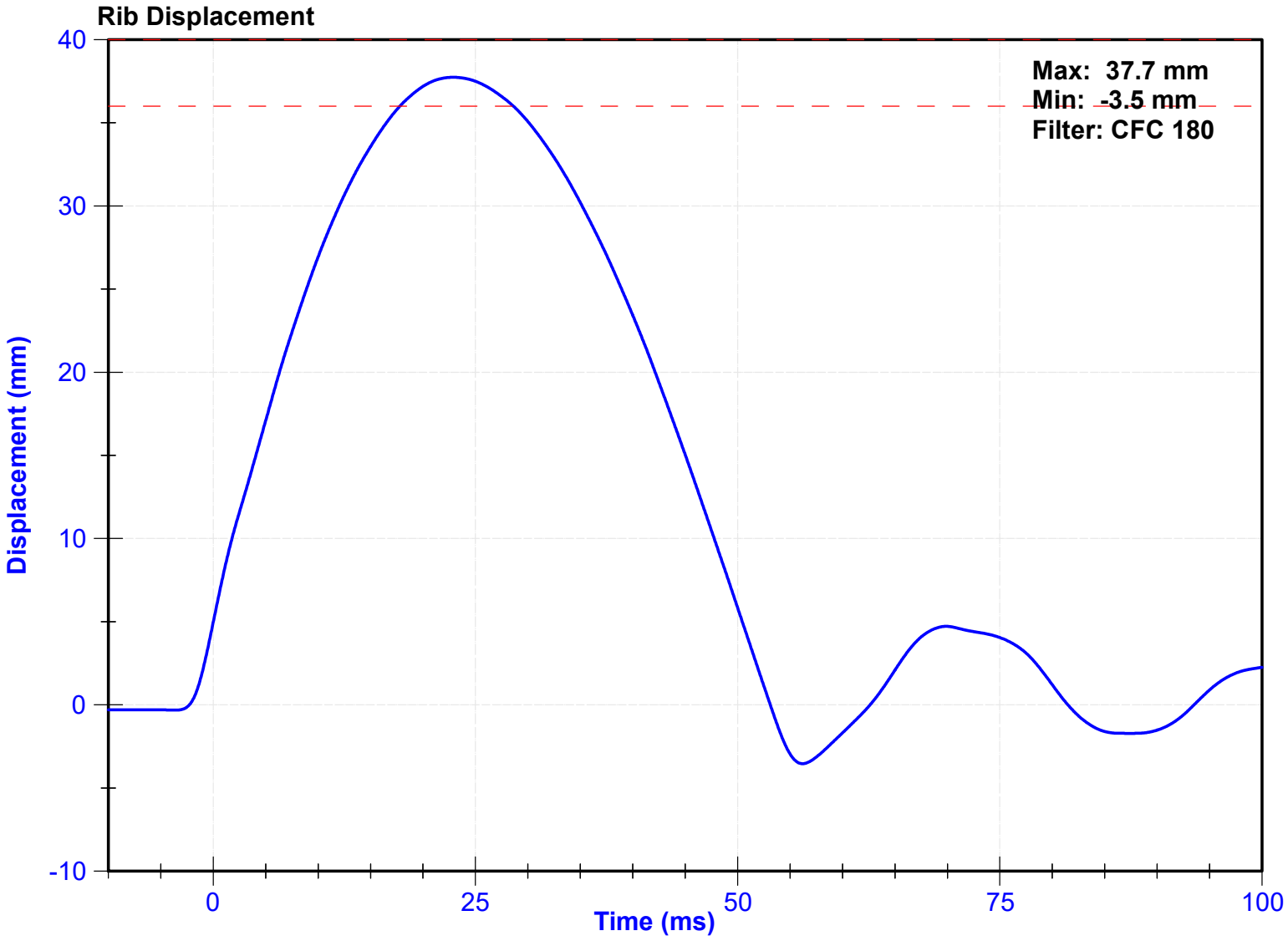
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	36	40	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	11/17/2023	5/17/2024



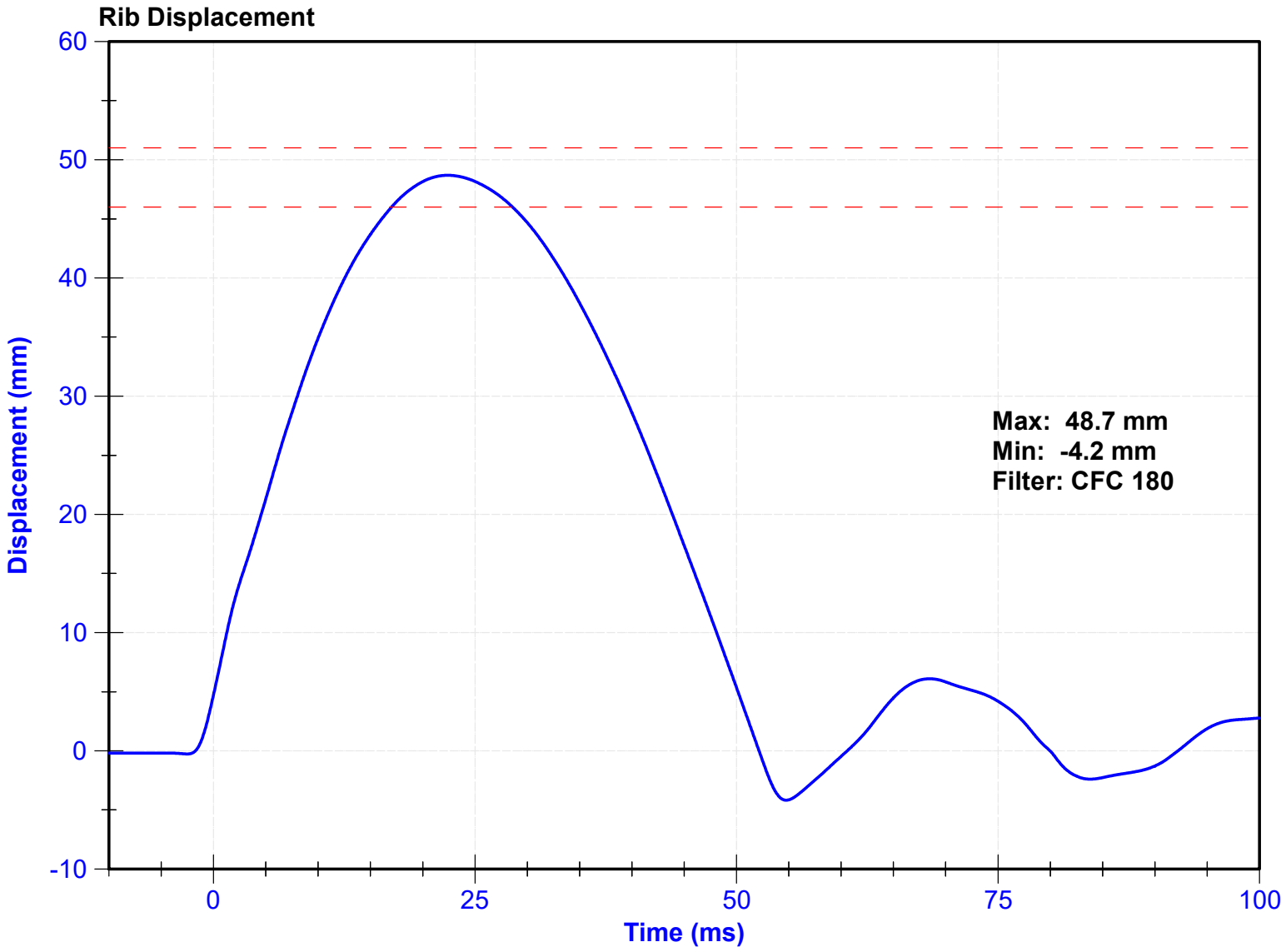
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	46	51	mm	48.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	11/17/2023	5/17/2024



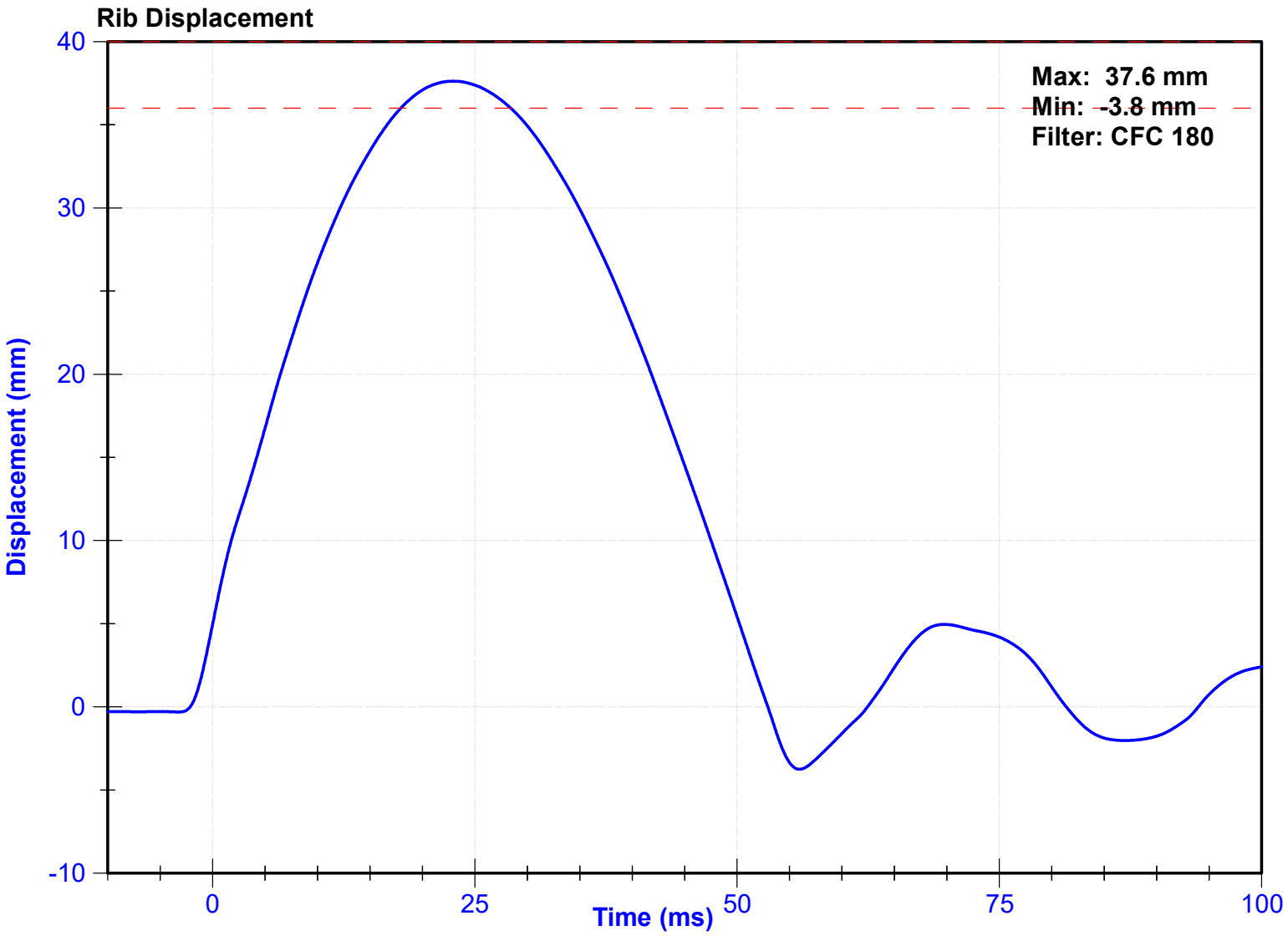
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	36	40	mm	37.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	11/17/2023	5/17/2024



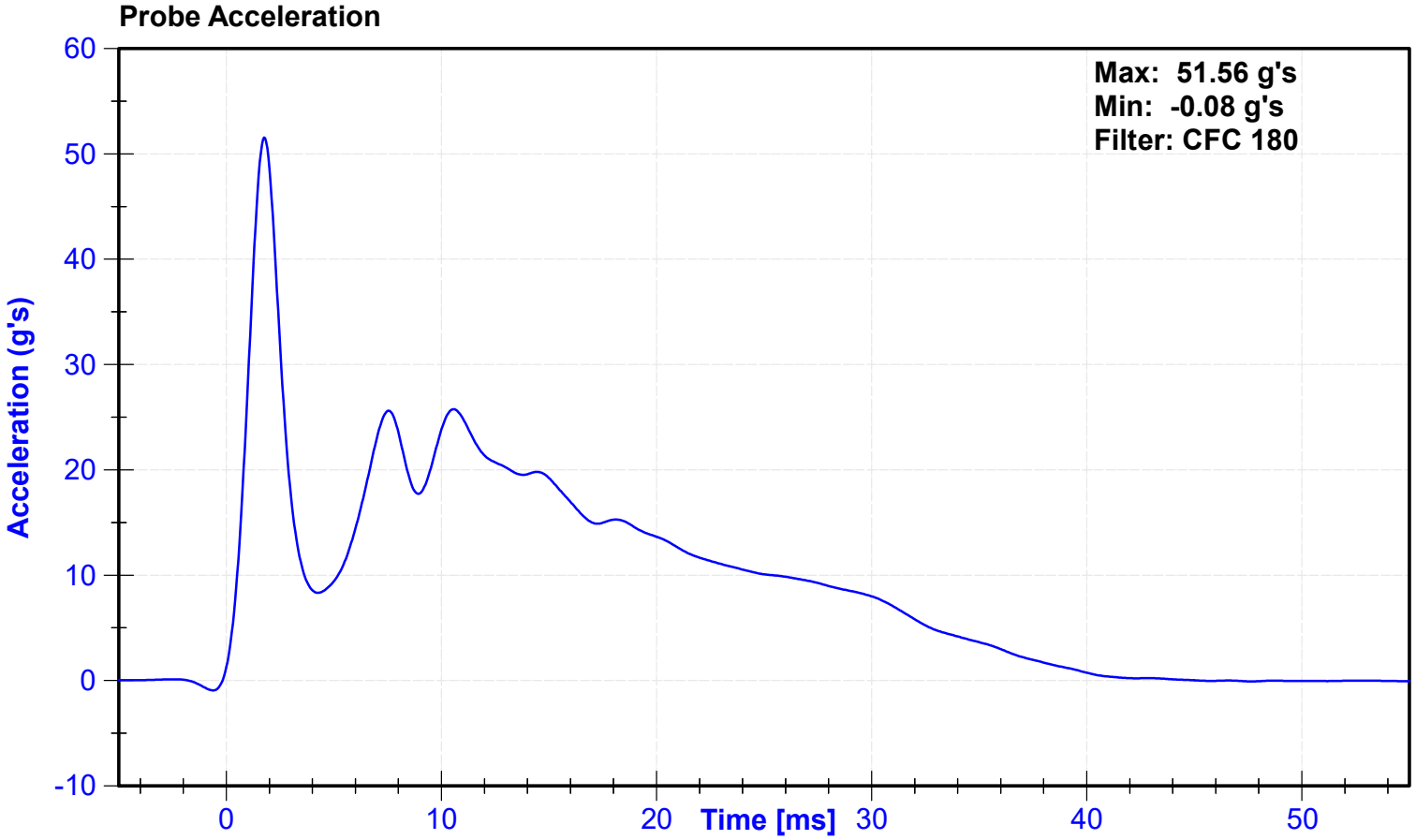
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

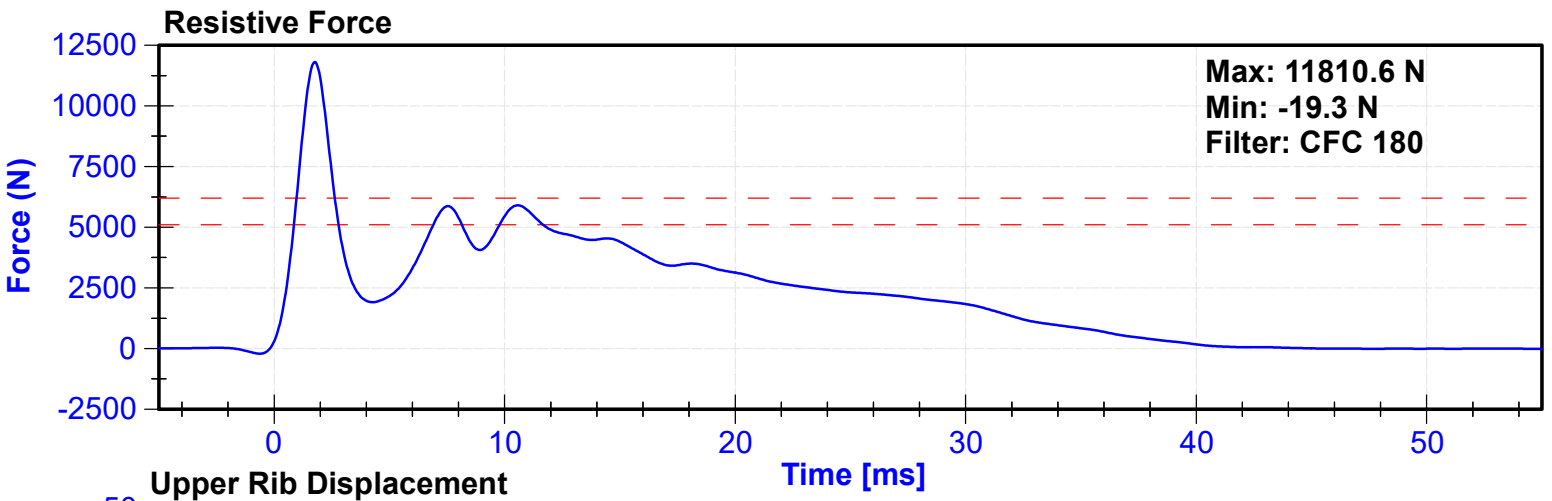
Results

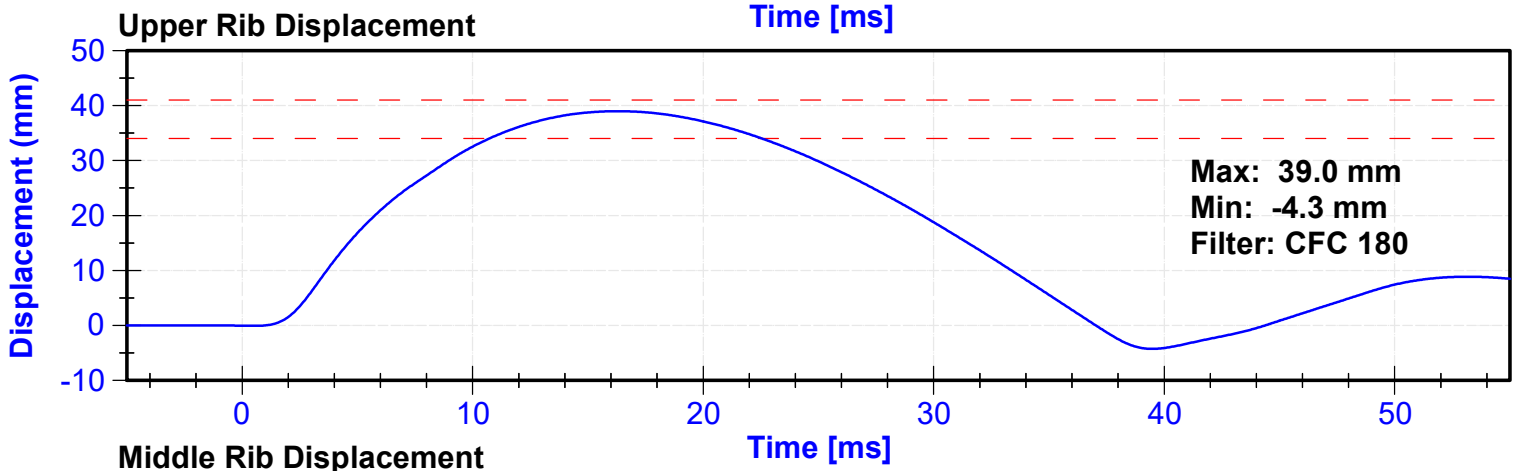
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	27	Pass
Velocity	5.4	5.6	m/s	5.58	Pass
Resistive Force after 6ms	5100	6200	N	5900.9	Pass
Upper Thorax Rib Deflection	34	41	mm	39.0	Pass
Mid Thorax Rib Deflection	37	45	mm	42.6	Pass
Lower Thorax Rib Deflection	37	44	mm	41.3	Pass

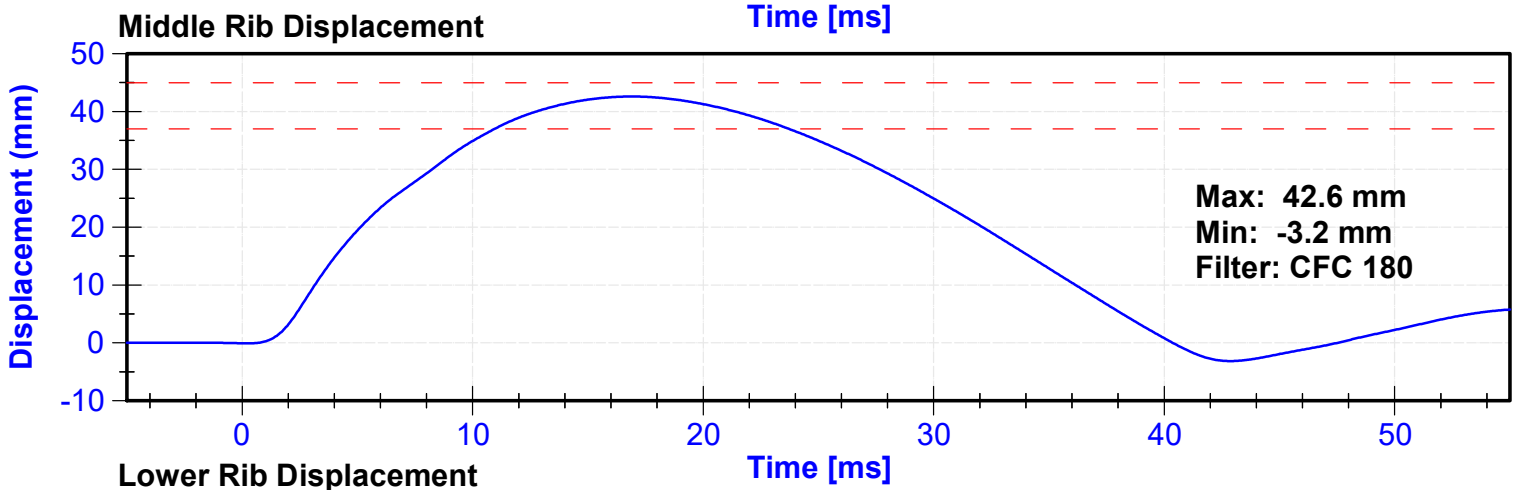
Transducer Calibrations

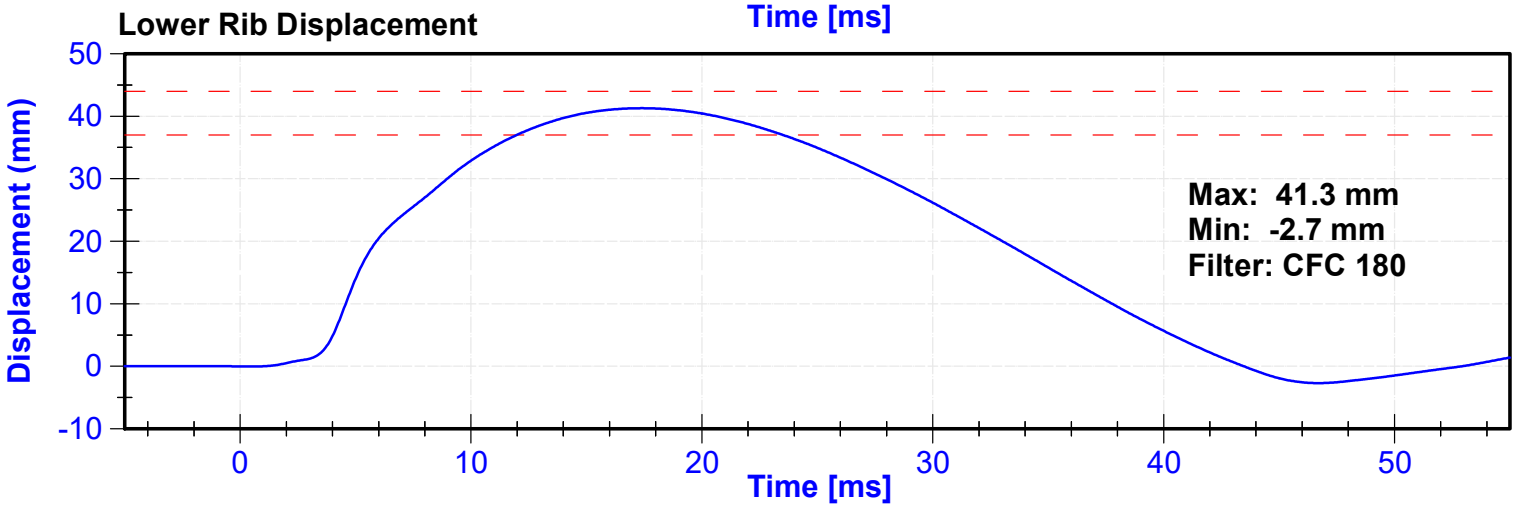
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Thorax Rib Potentiometer	Honeywell	179GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Honeywell	185GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Honeywell	178GFE	11/17/2023	5/17/2024




Resistive Force
Max: 11810.6 N
Min: -19.3 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: 39.0 mm
Min: -4.3 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: 42.6 mm
Min: -3.2 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Lower Rib Displacement
Max: 41.3 mm
Min: -2.7 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]

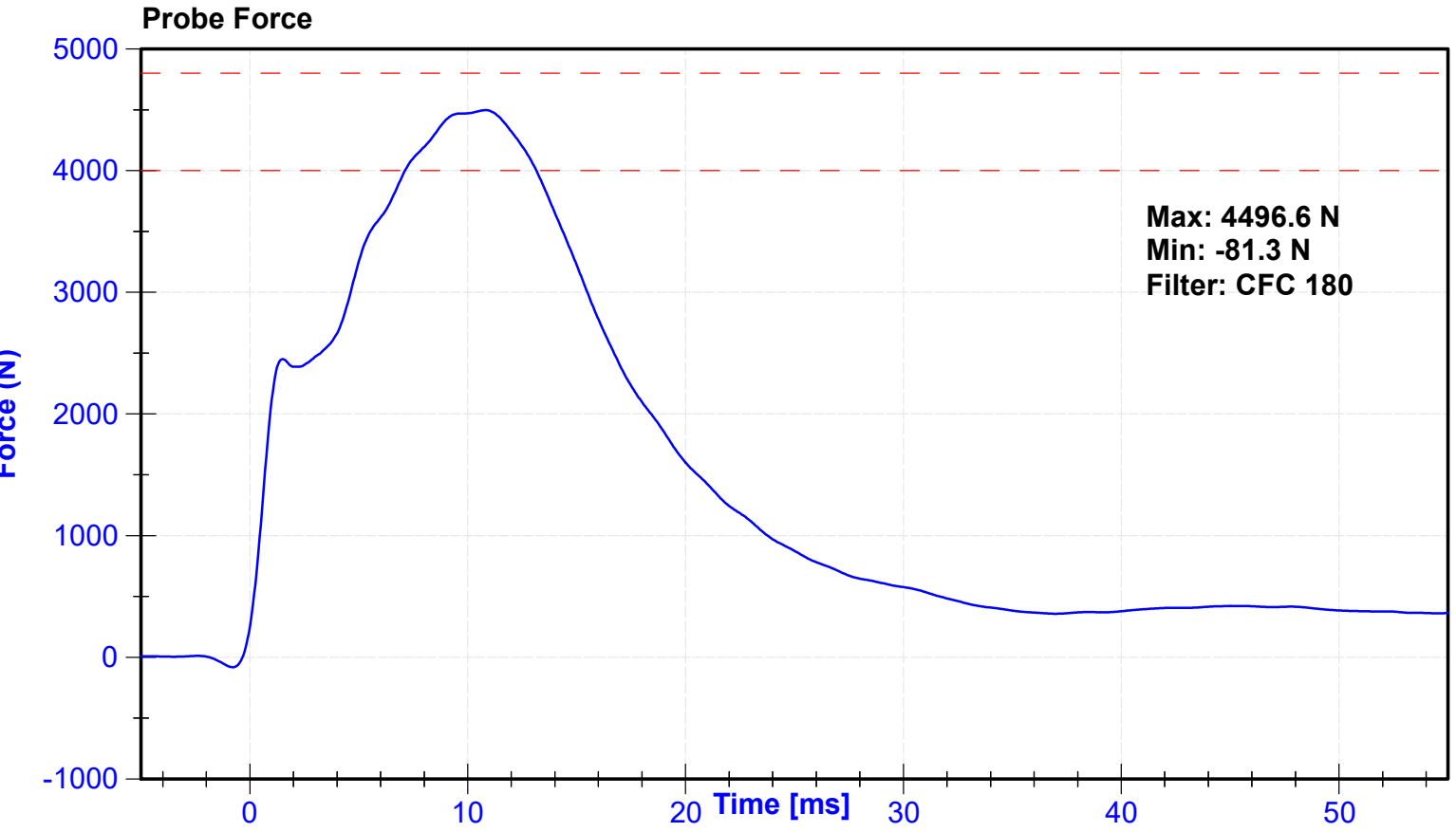
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

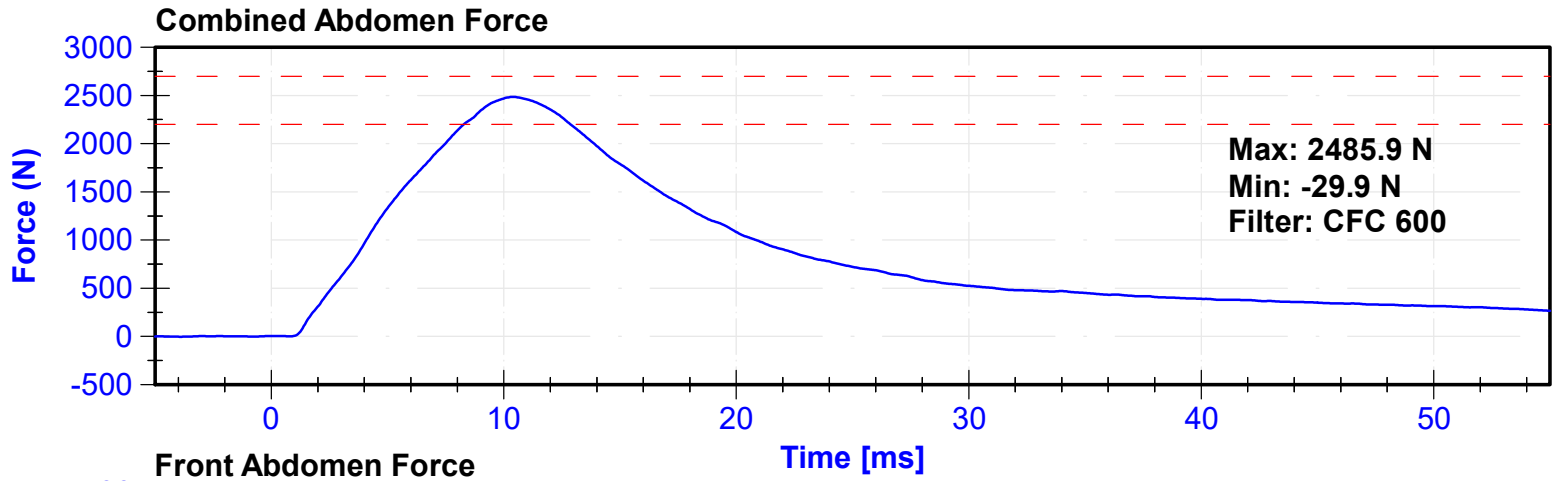
Results

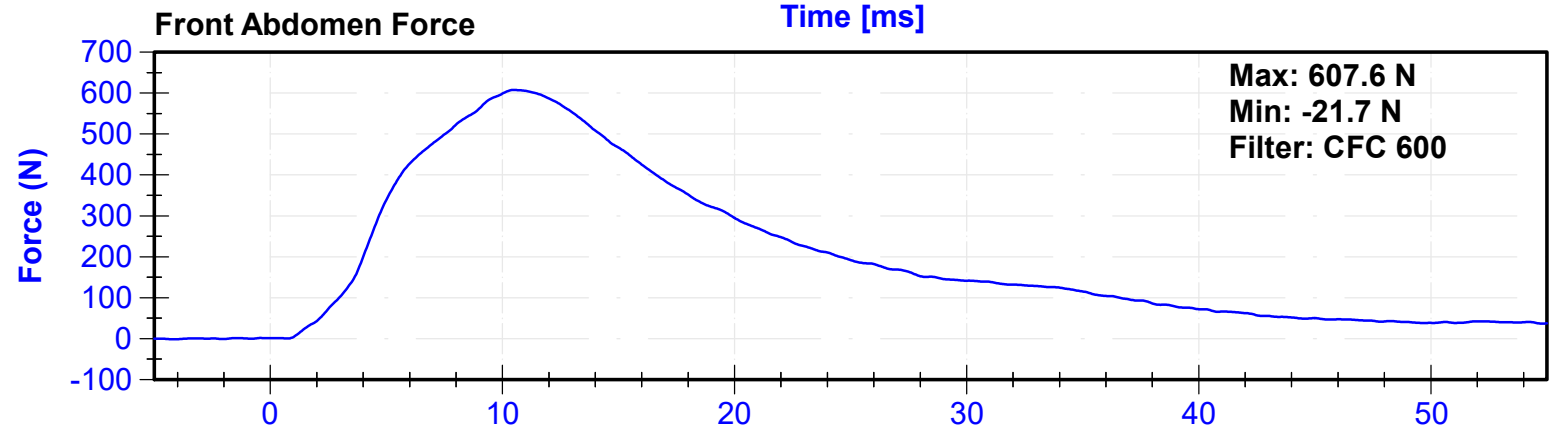
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	27	Pass
Velocity	3.9	4.1	m/s	4.03	Pass
Combined Abdomen Force	2200	2700	N	2485.9	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.40	Pass
Resistive Probe Force	4000	4800	N	4496.6	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.80	Pass

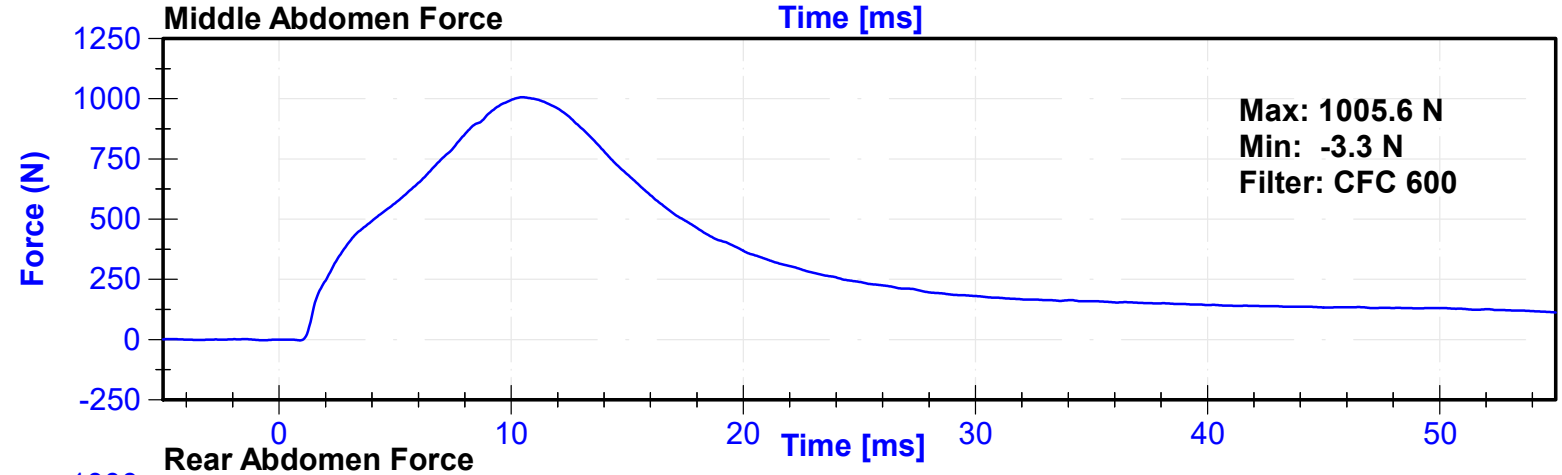
Transducer Calibrations

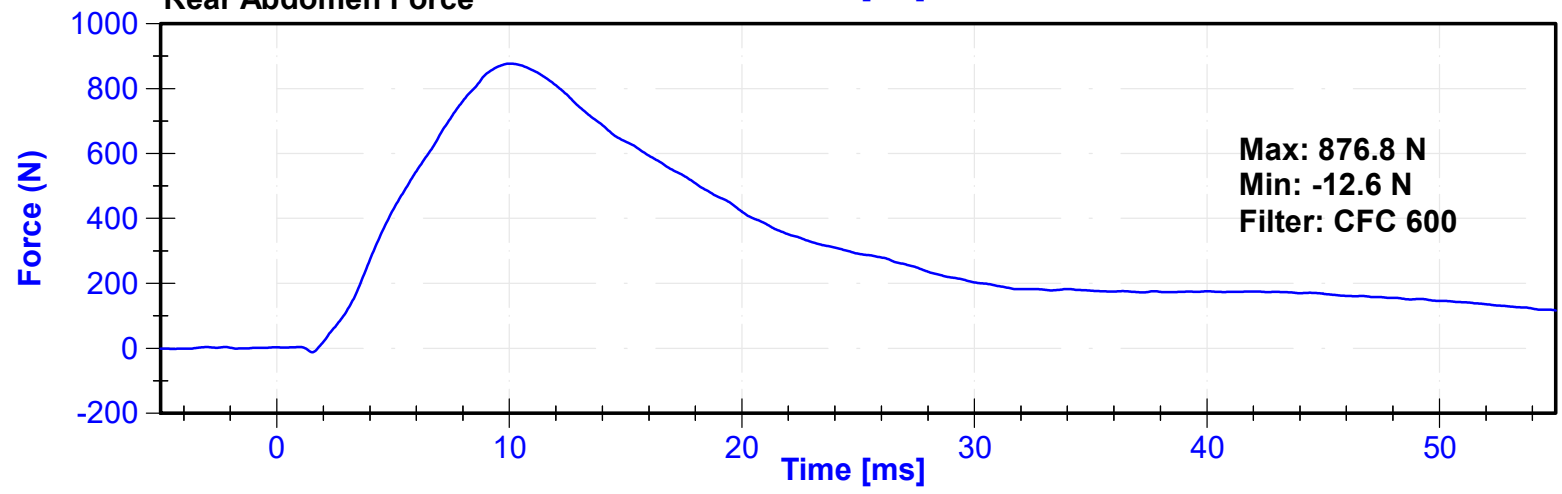
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Front Abdomen Load Cell	Denton	DM5846	5/18/2023	5/17/2024
Middle Abdomen Load Cell	Denton	1529	5/18/2023	5/17/2024
Rear Abdomen Load Cell	Denton	1533	5/18/2023	5/17/2024




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2485.9 N
Min: -29.9 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 607.6 N
Min: -21.7 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1005.6 N
Min: -3.3 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 876.8 N
Min: -12.6 N
Filter: CFC 600

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

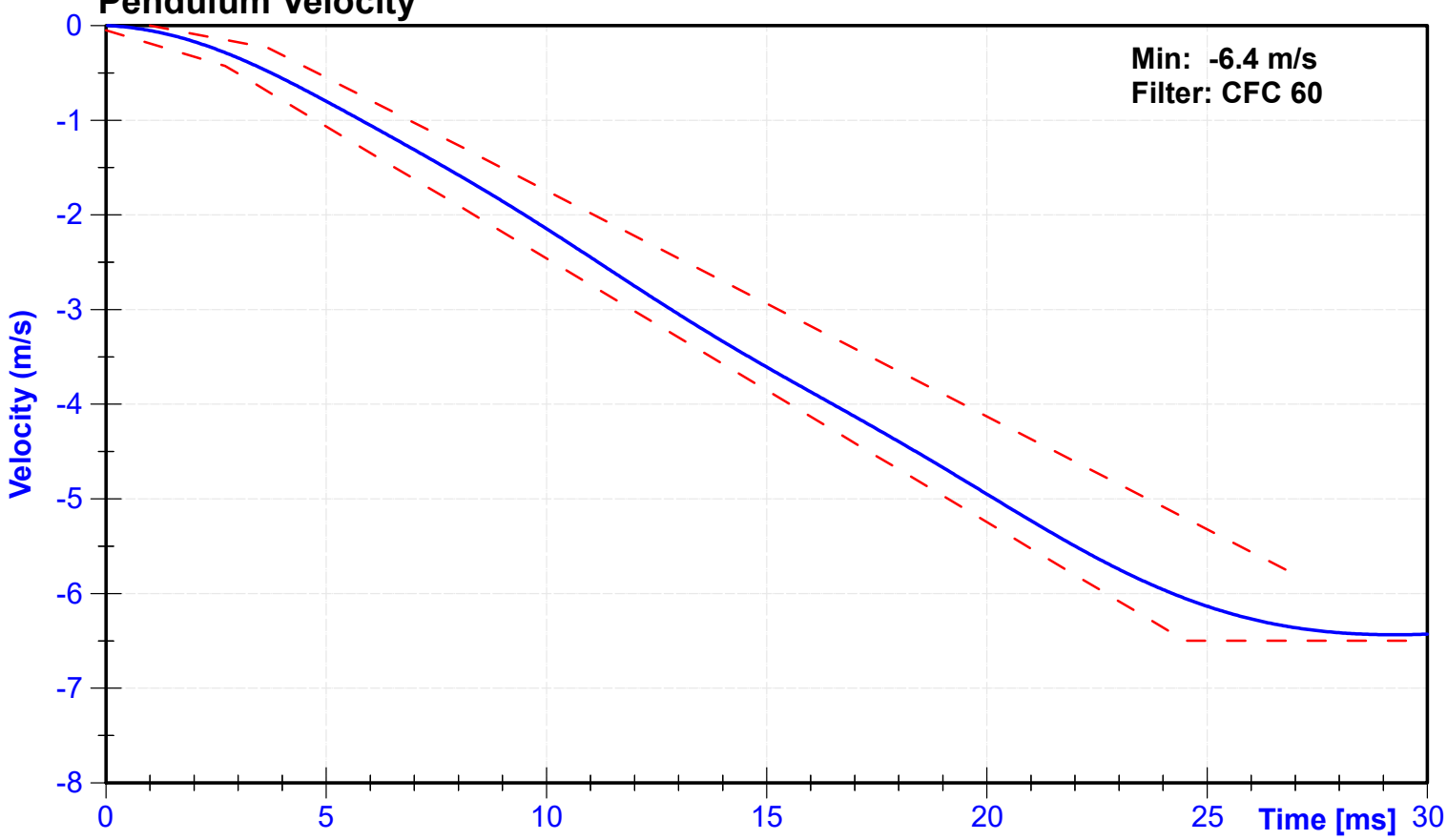
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	29	Pass
Velocity	5.95	6.15	m/s	6.042	Pass
Lateral Spine Rotation	45	55	deg	54.1	Pass
Time at Maximum Rotation	39	53	ms	45.1	Pass
Time of Decay to Zero Degrees	37	57	ms	38.9	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

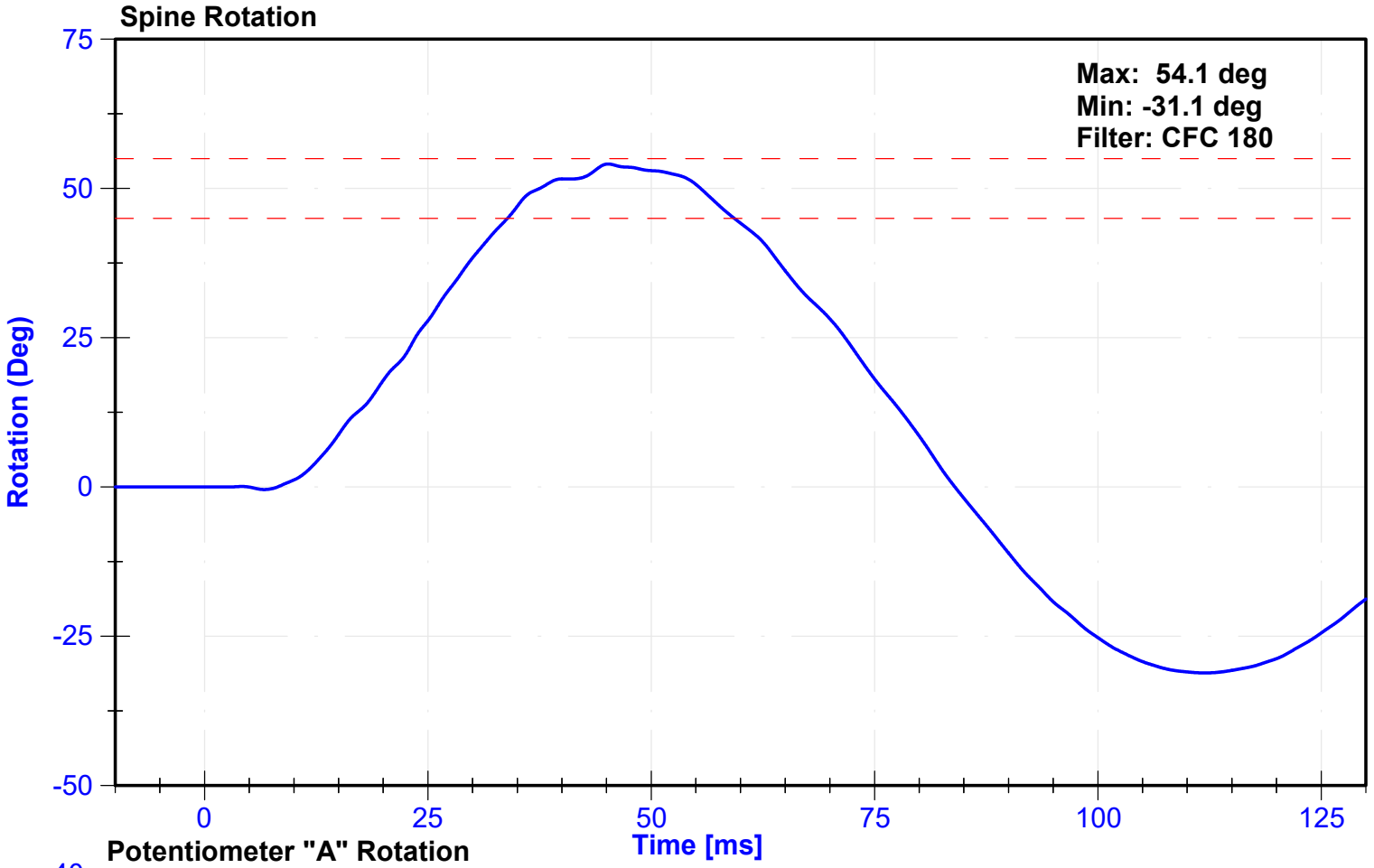
Transducer Calibrations

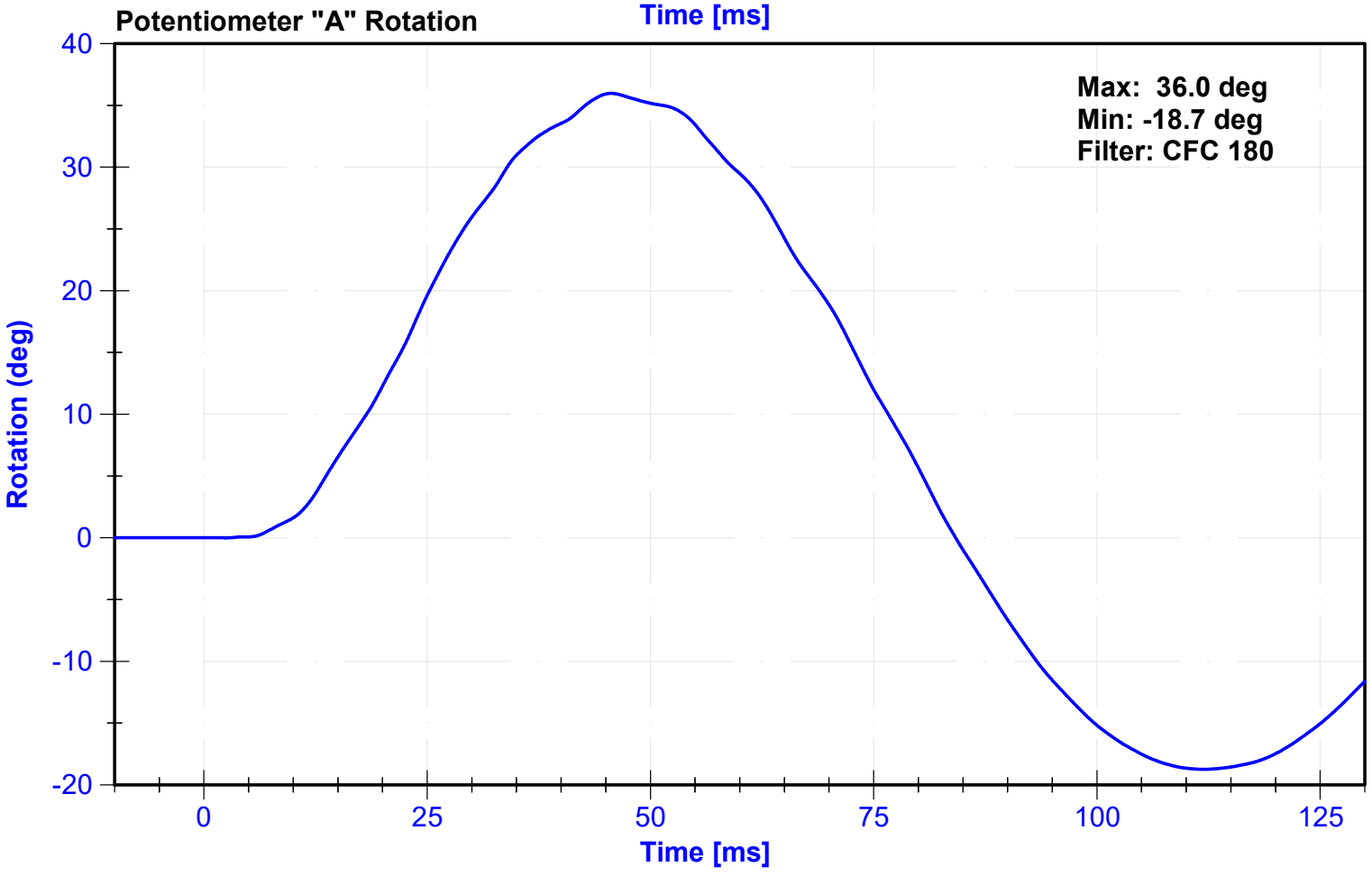
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/31/2023	4/28/2024
Pendulum "A" Potentiometer	Sfernice	2247	12/5/2023	12/4/2024
Condyle "B" Potentiometer	Sfernice	095	9/29/2023	9/28/2024

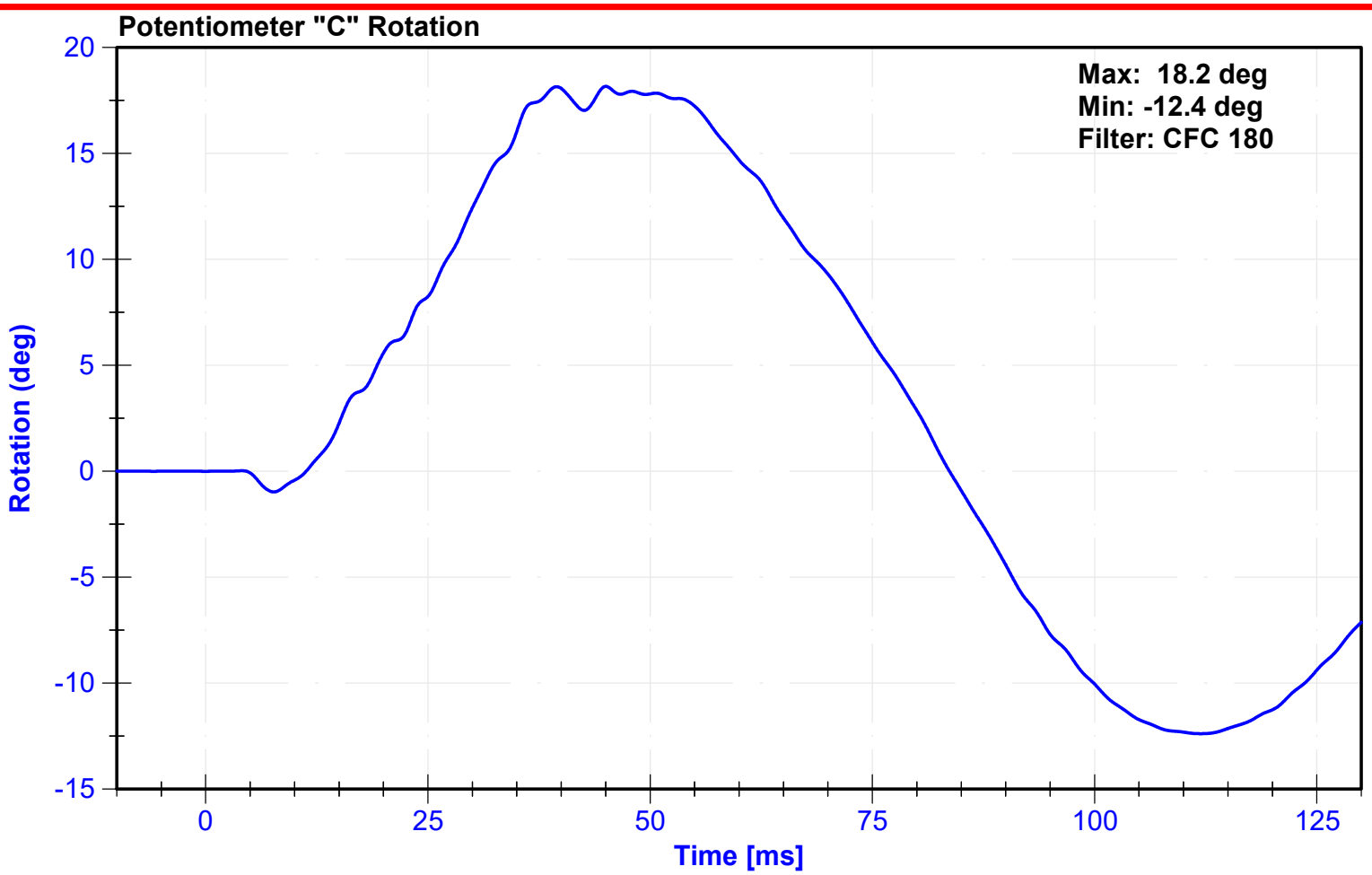
Pendulum Velocity[3]



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


Spine Rotation
Max: 54.1 deg
Min: -31.1 deg
Filter: CFC 180
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 36.0 deg
Min: -18.7 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

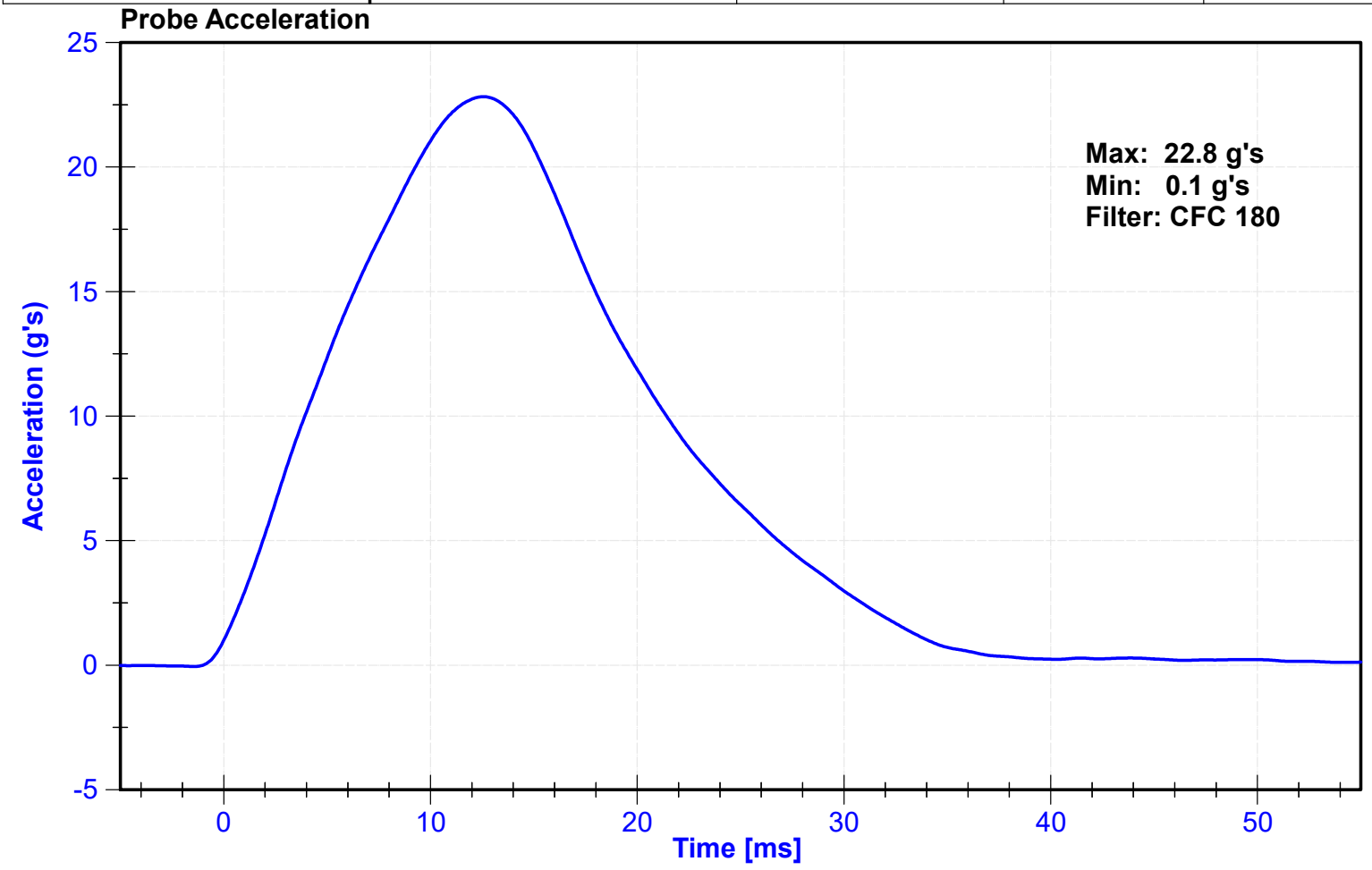
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

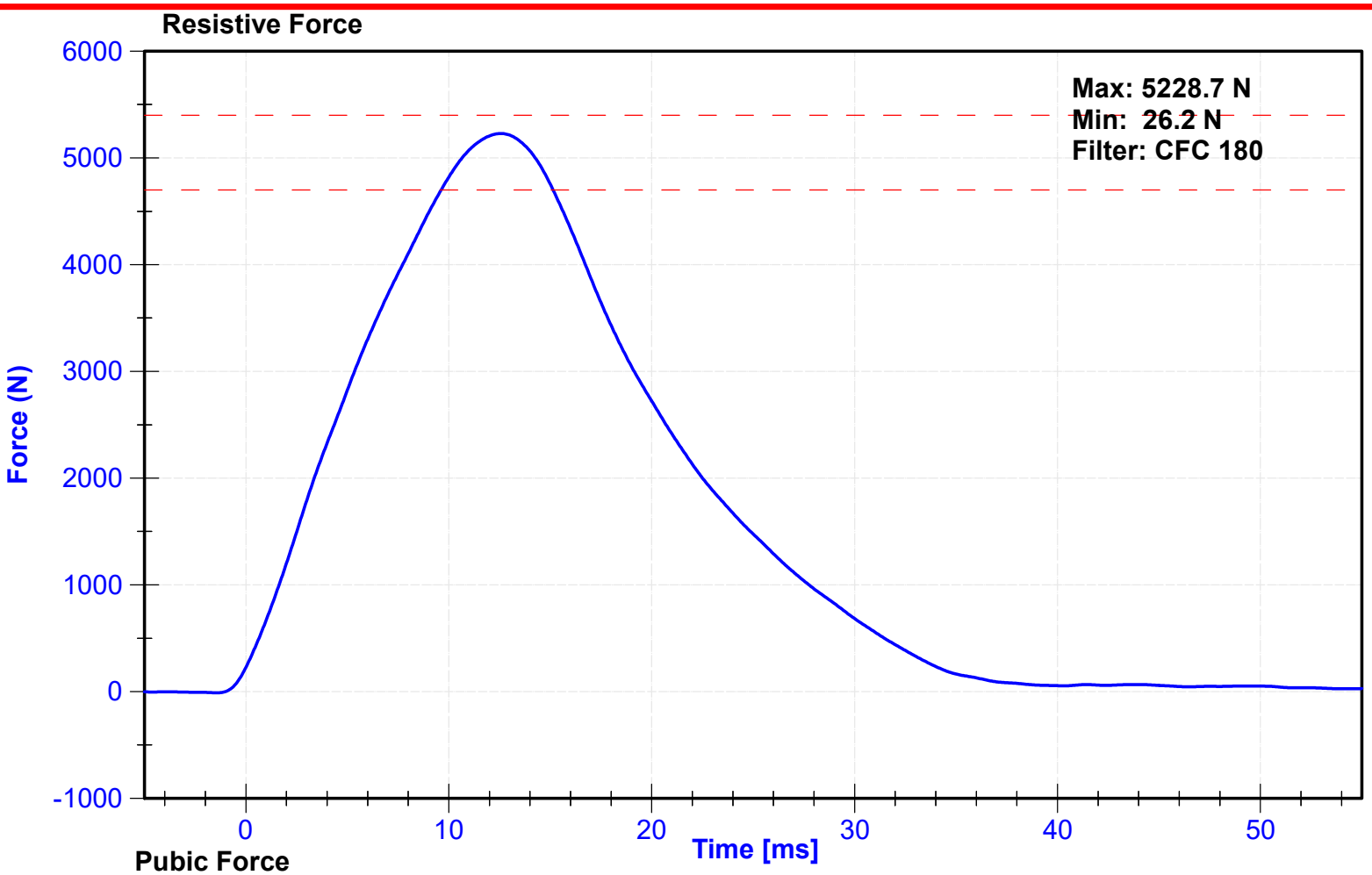
Results

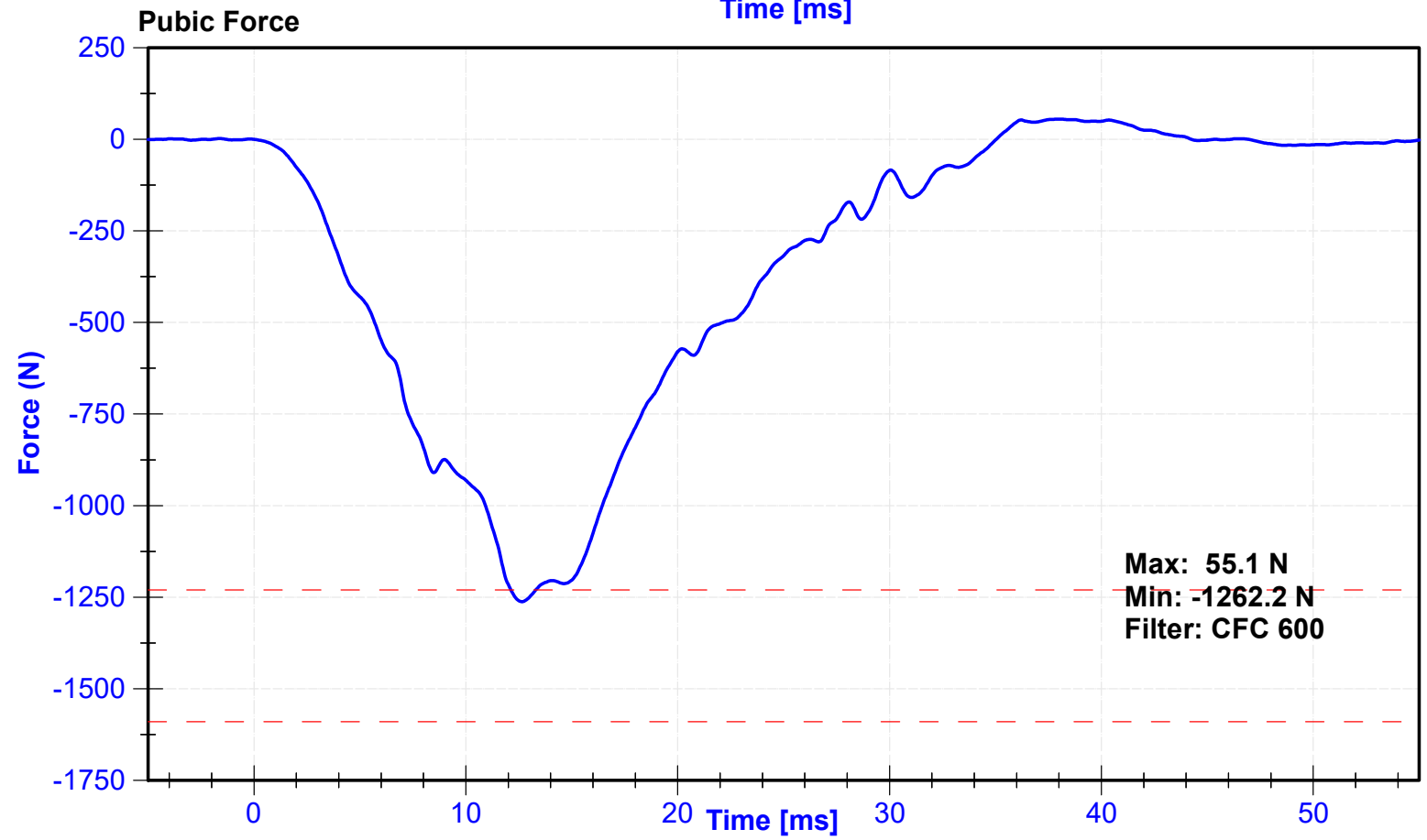
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Resistive Force	4700	5400	N	5228.7	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.55	Pass
Pubic Force	-1590	-1230	N	-1262.2	Pass
Time at Peak Pubic Force	12.2	17.0	ms	12.65	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pubic Load Cell	Denton	459-FY	6/20/2023	6/19/2024




Resistive Force
Max: 5228.7 N
Min: 26.2 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: 55.1 N
Min: -1262.2 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

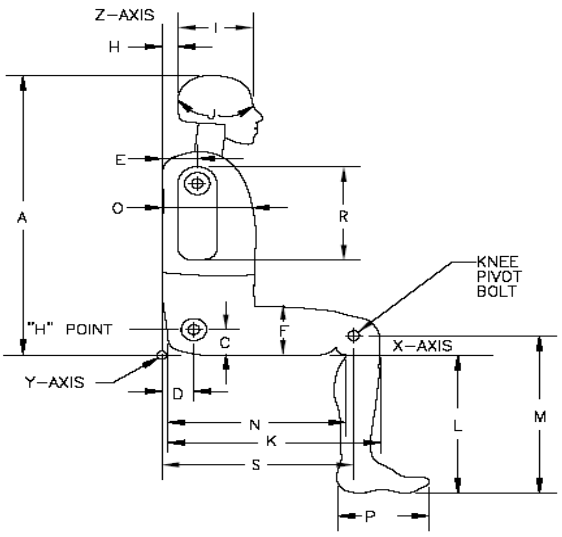
SERIAL NO:DG8012

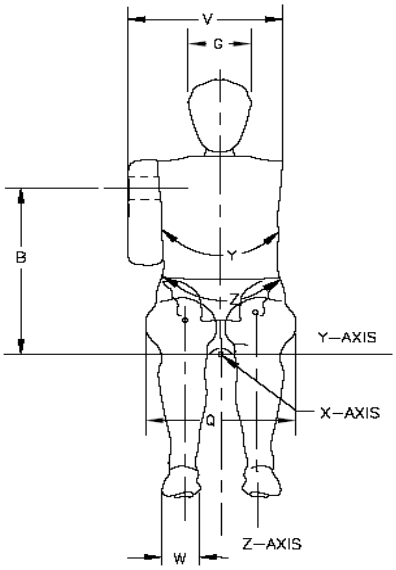
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: T. Roseman Date: 02/22/2024

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	783	Pass
B	Shoulder Pivot Height	437	453	447	Pass
C	H-point Height	79	89	84	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	104	Pass
F	Thigh Clearance	119	135	129	Pass
G	Head Breadth	140	148	143	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	545	Pass
K	Buttock to Knee Length	514	540	530	Pass
L	Popliteal Height	343	369	363	Pass
M	Knee Pivot to floor height	392	409	399	Pass
N	Buttock Popliteal Length	416	442	438	Pass
O	Chest Depth w/o jacket	195	211	204	Pass
P	Foot Length	216	232	220	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	255	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	353	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	869	Pass
Z	Waist Circumference	761	791	780	Pass

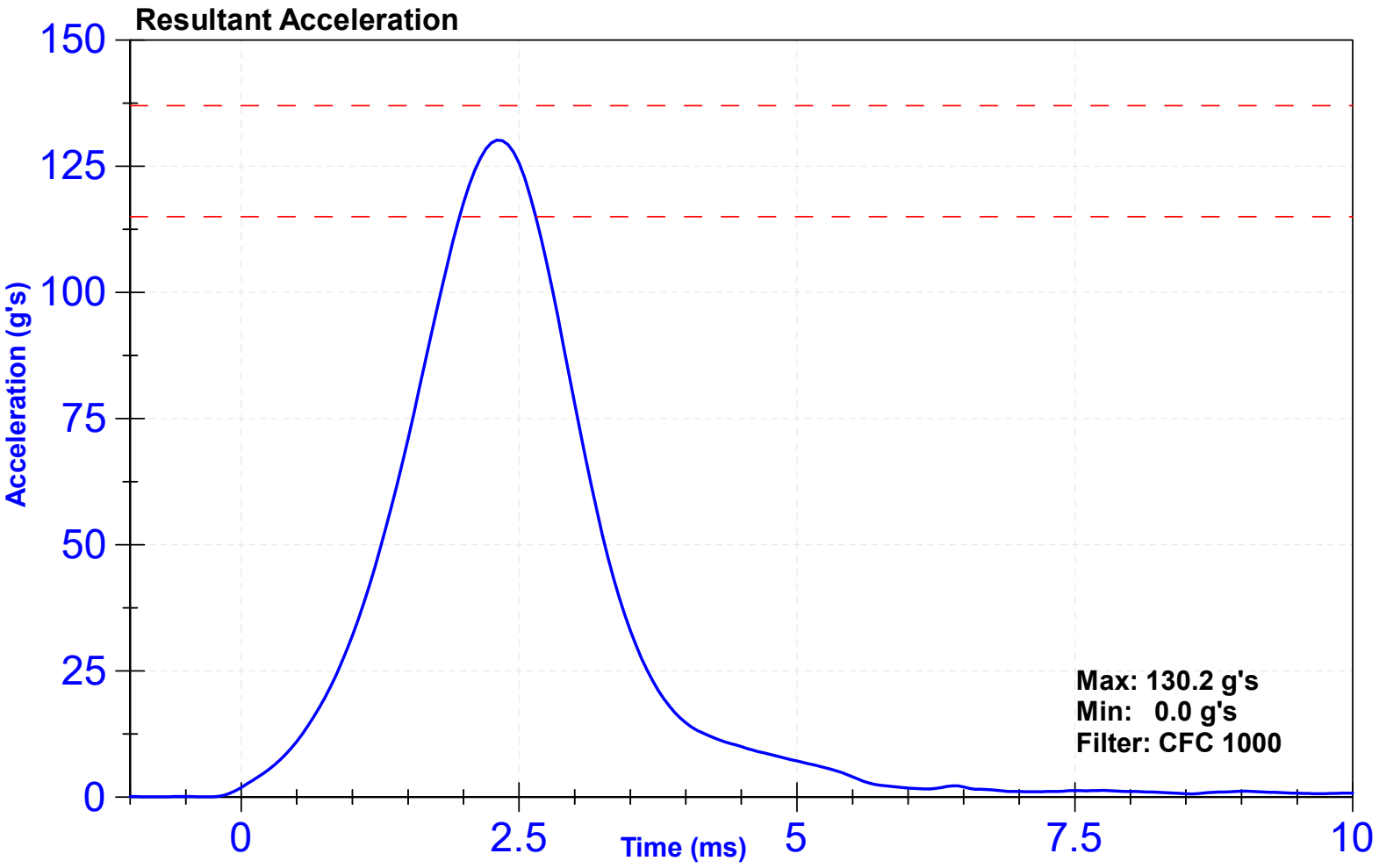
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

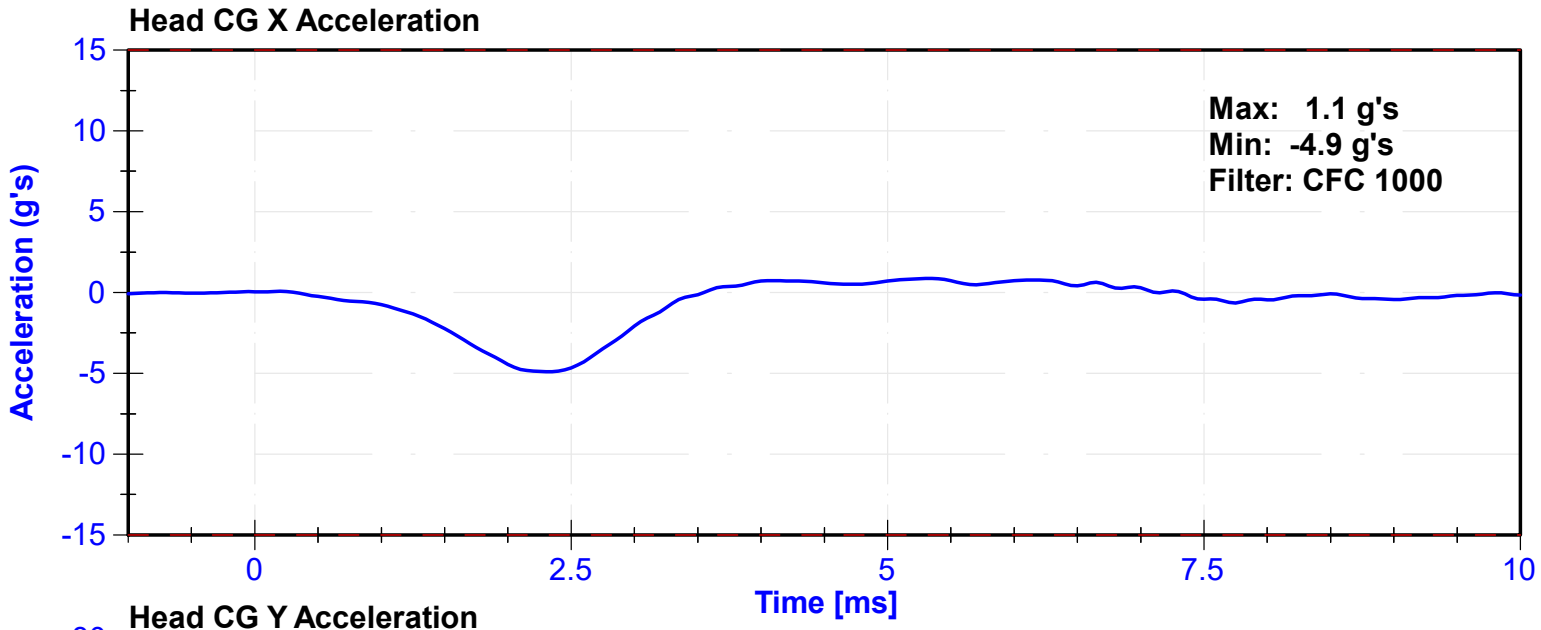
Results

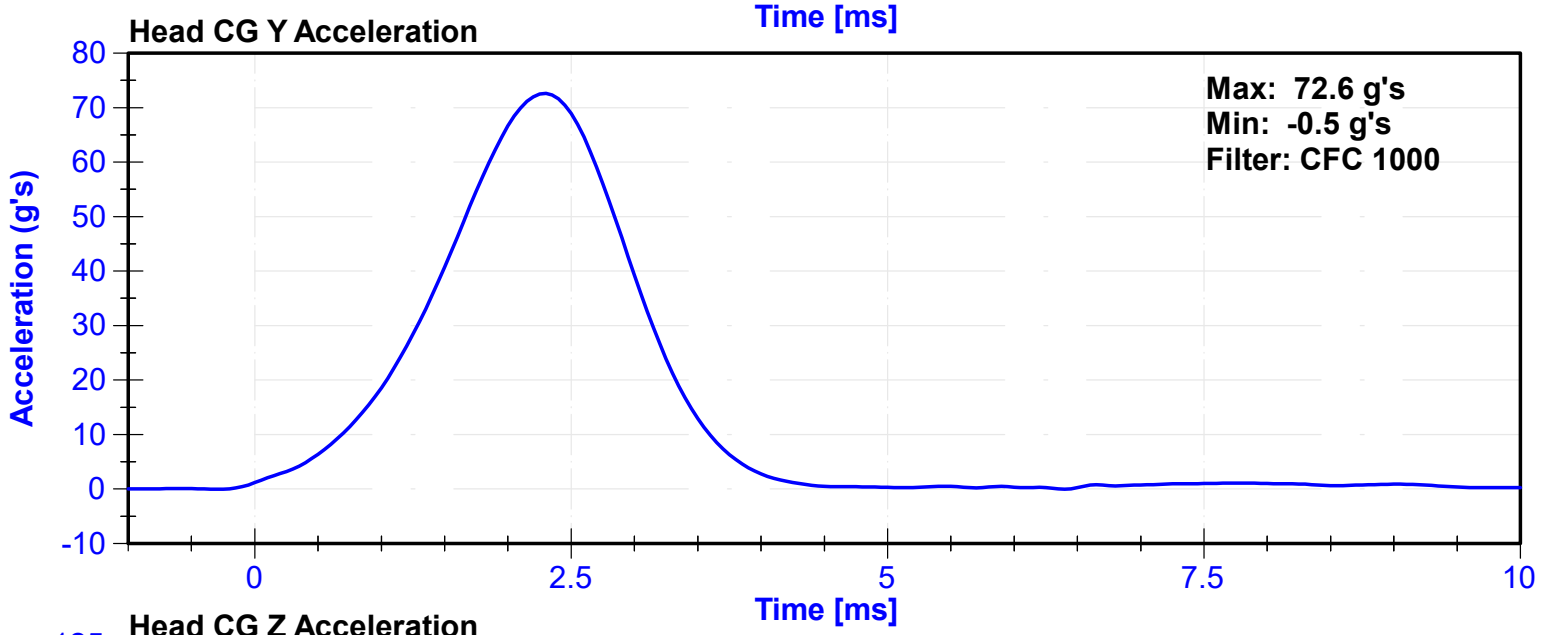
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21	Pass
Humidity	10	70	%	24	Pass
Resultant Acceleration	115	137	g's	130.2	Pass
Oscillation	0	15	%	1.7	Pass
Fore-Aft Acceleration	-15	15	g's	-4.9	Pass

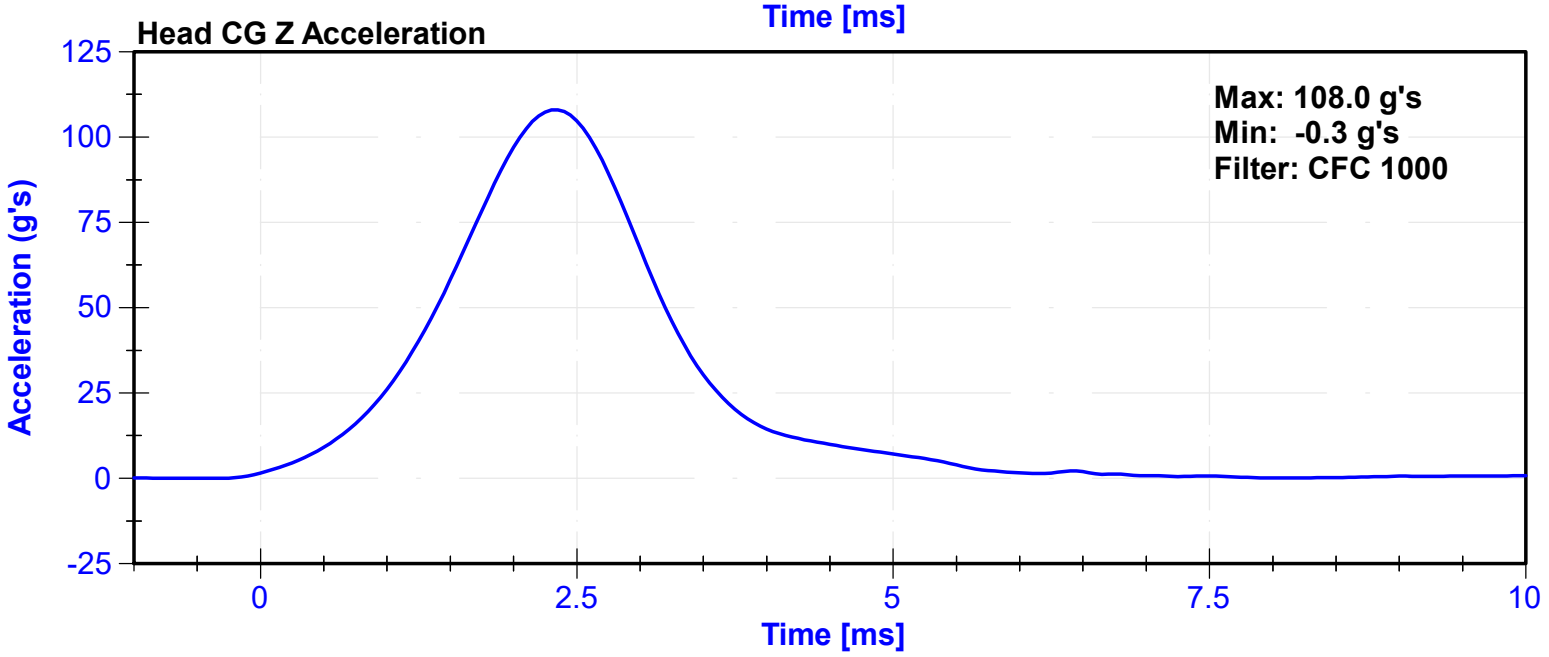
Transducer Calibrations

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




Head CG X Acceleration
Max: 1.1 g's
Min: -4.9 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: 72.6 g's
Min: -0.5 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]


Head CG Z Acceleration
Max: 108.0 g's
Min: -0.3 g's
Filter: CFC 1000
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]

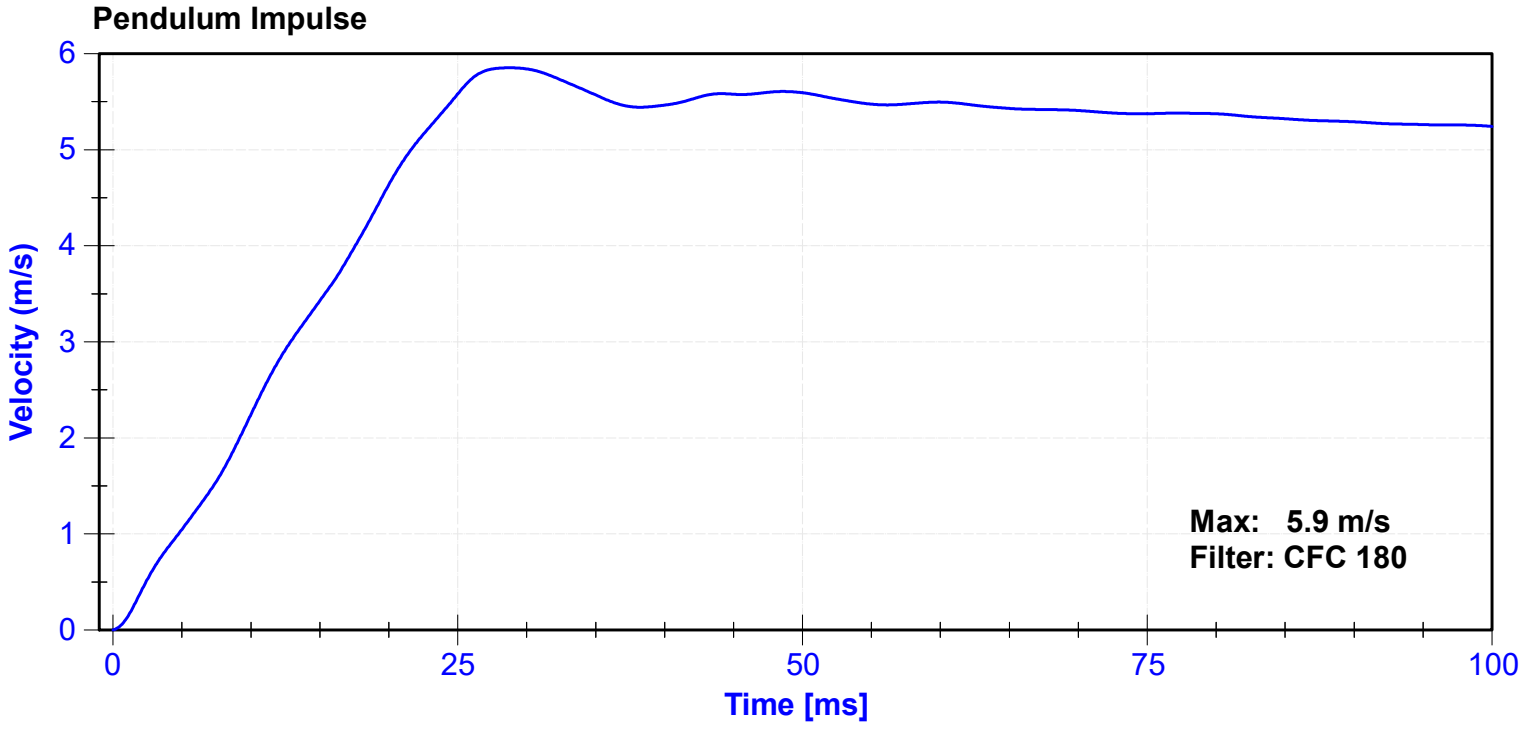
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

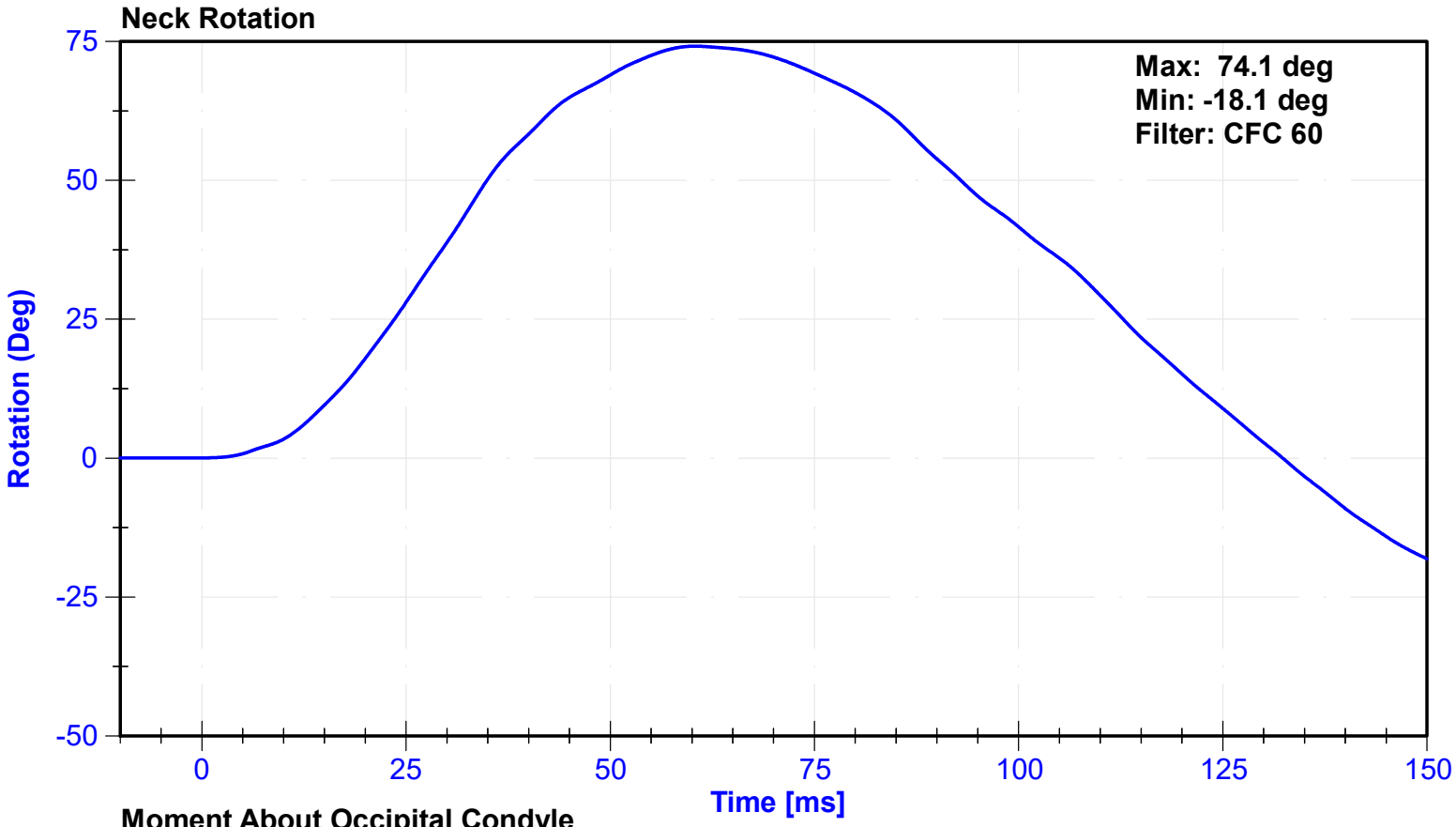
Results

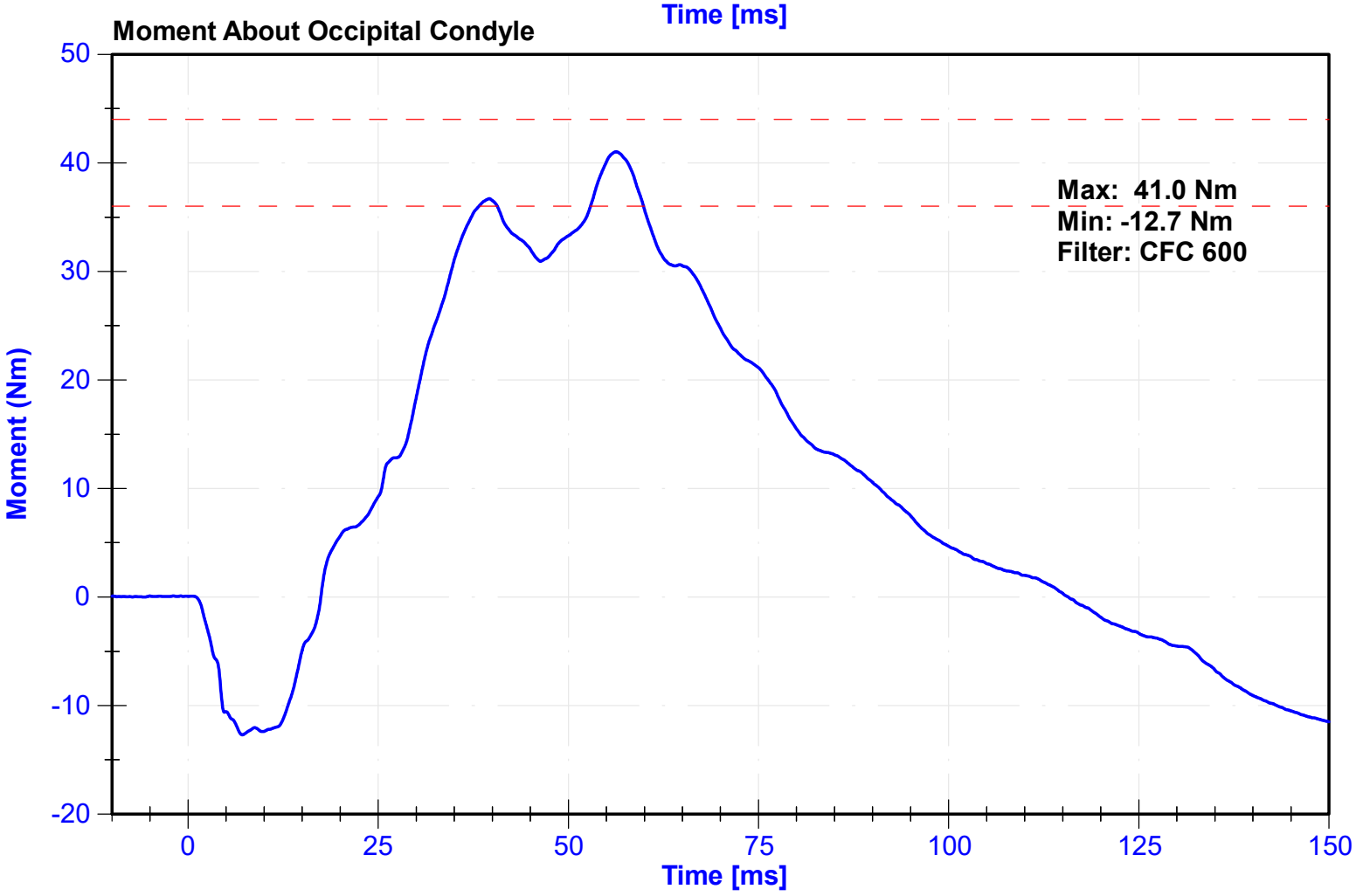
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21	Pass
Humidity	10	70	%	30	Pass
Velocity	5.51	5.63	m/s	5.532	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.24	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.43	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.64	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	5.85	Pass
Neck Rotation	71	81	deg	74.1	Pass
Time at Maximum Rotation	50	70	ms	60.4	Pass
Moment about the OC	36	44	Nm	41.0	Pass
Moment Decay to 0 Nm	102	126	ms	115.8	Pass

Transducer Calibrations

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




Neck Rotation
Max: 74.1 deg
Min: -18.1 deg
Filter: CFC 60
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 41.0 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]

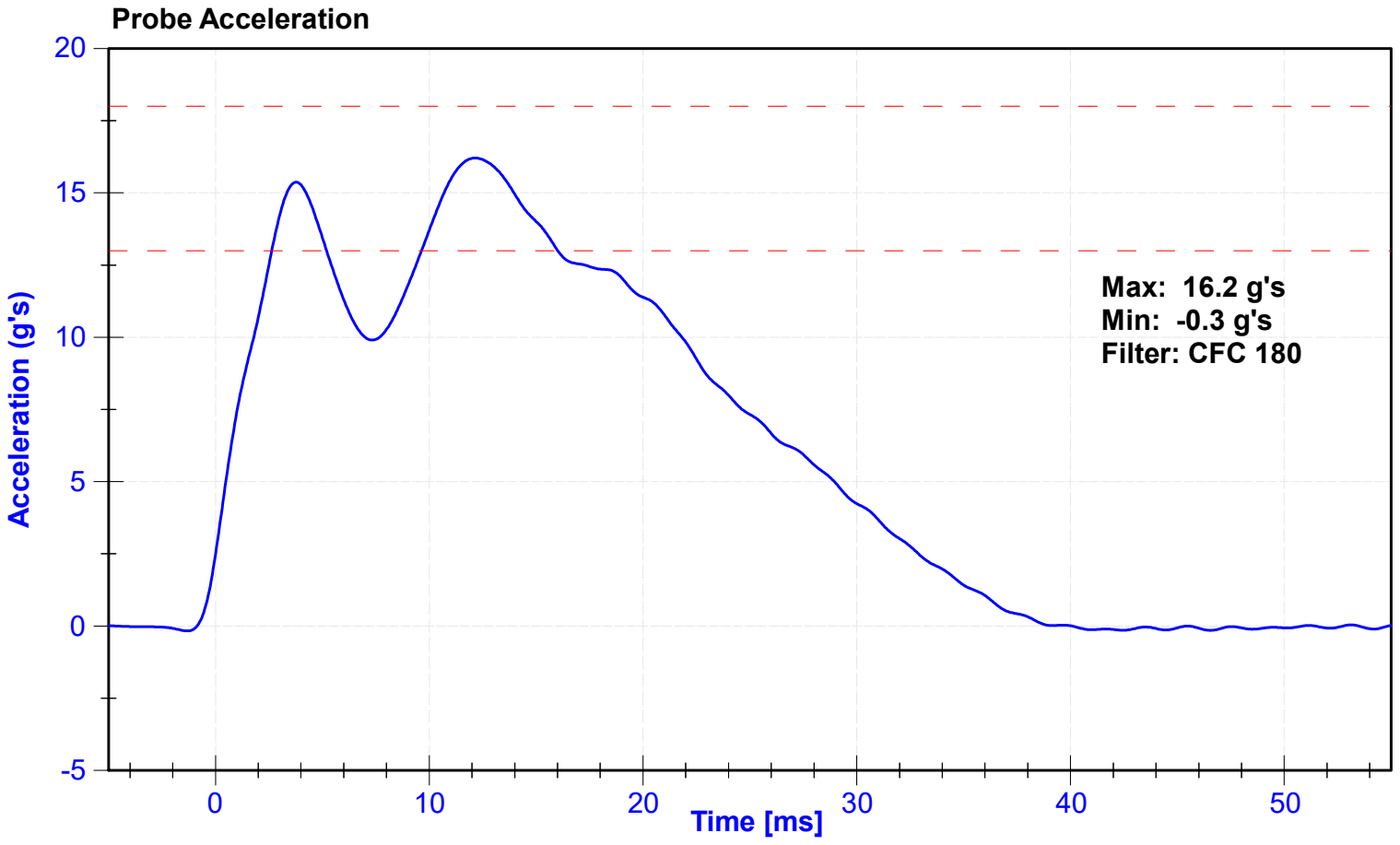
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

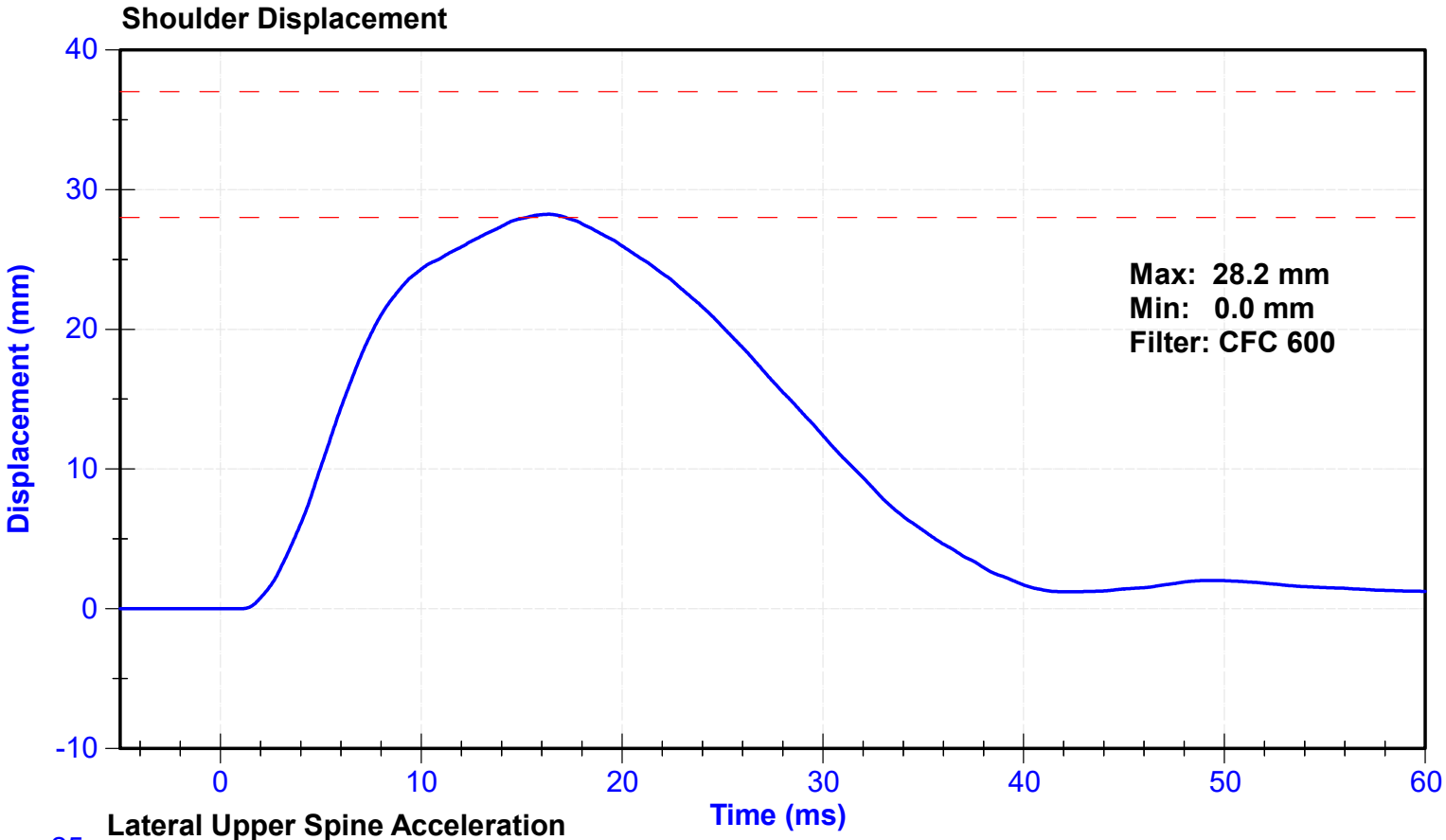
Results

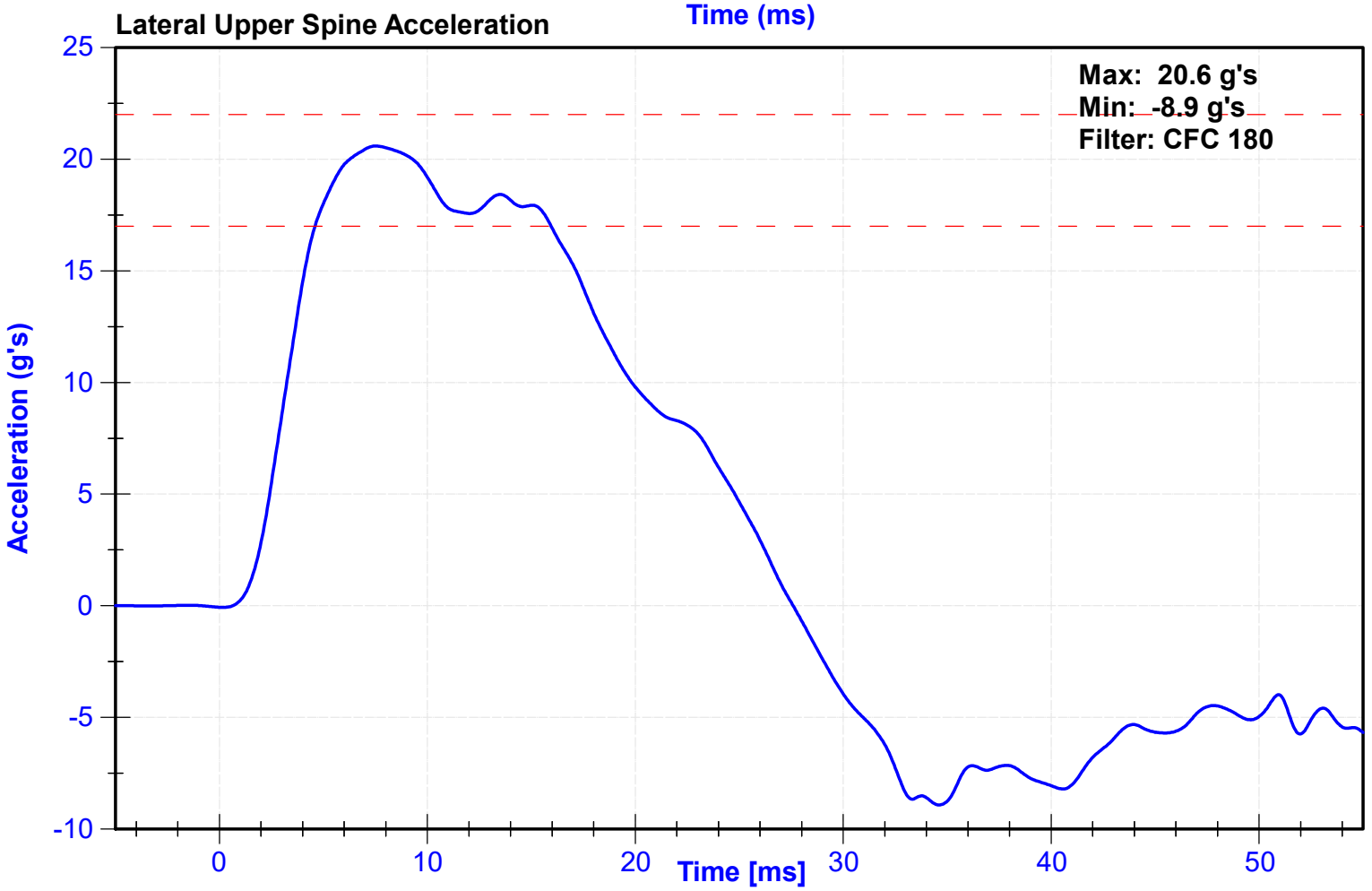
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.30	Pass
Probe Acceleration	13	18	g's	16.2	Pass
Shoulder Deflection	28	37	mm	28.2	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 28.2 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 20.6 g's
Min: -8.9 g's
Filter: CFC 180

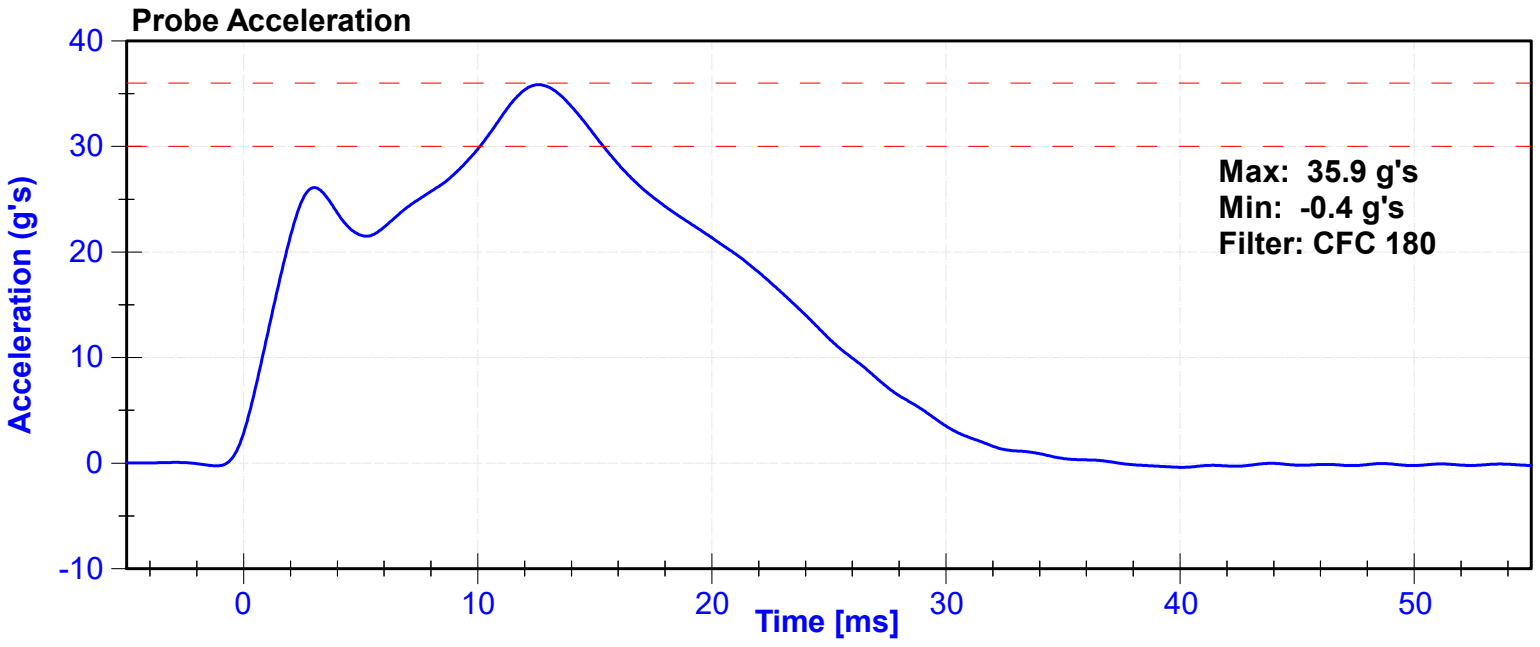
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

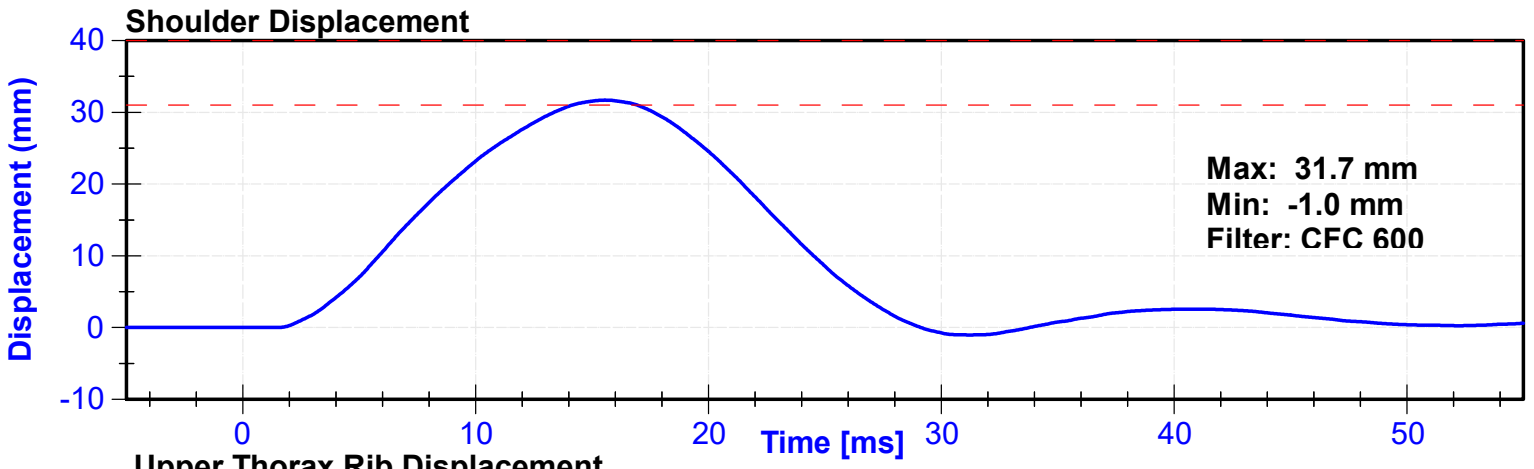
Results

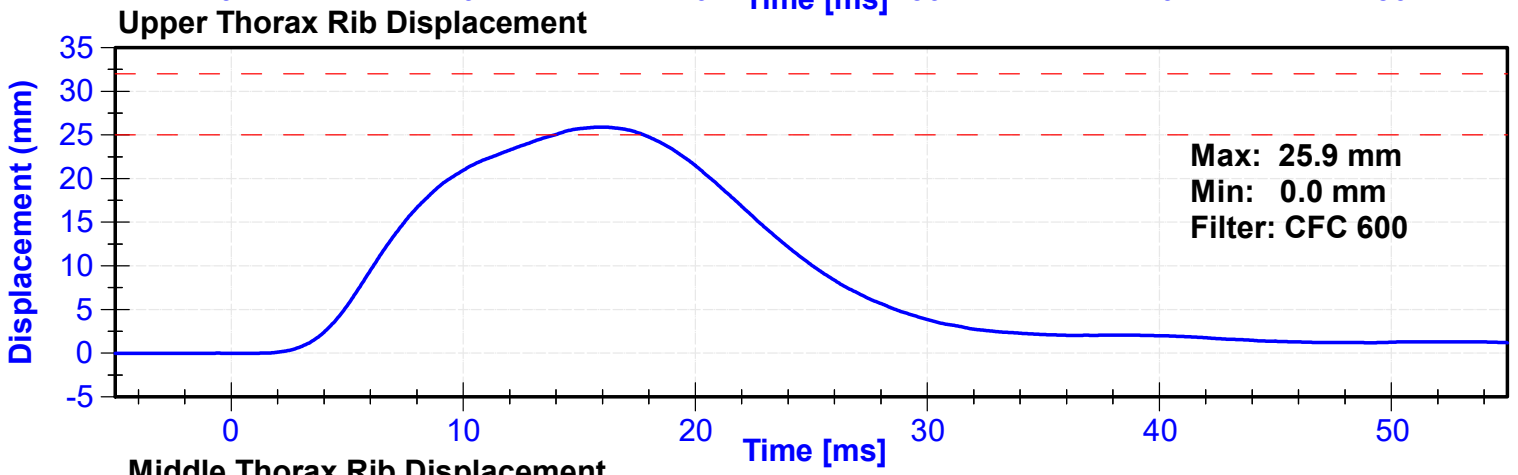
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	6.6	6.8	m/s	6.69	Pass
Probe Acceleration after 5 ms	30	36	g's	35.9	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.9	Pass
Lateral Lower Spine Acceleration	29	37	g's	34.4	Pass
Shoulder Deflection	31	40	mm	31.7	Pass
Upper Thorax Rib Deflection	25	32	mm	25.9	Pass
Mid Thorax Rib Deflection	30	36	mm	30.3	Pass
Lower Thorax Rib Deflection	32	38	mm	33.3	Pass

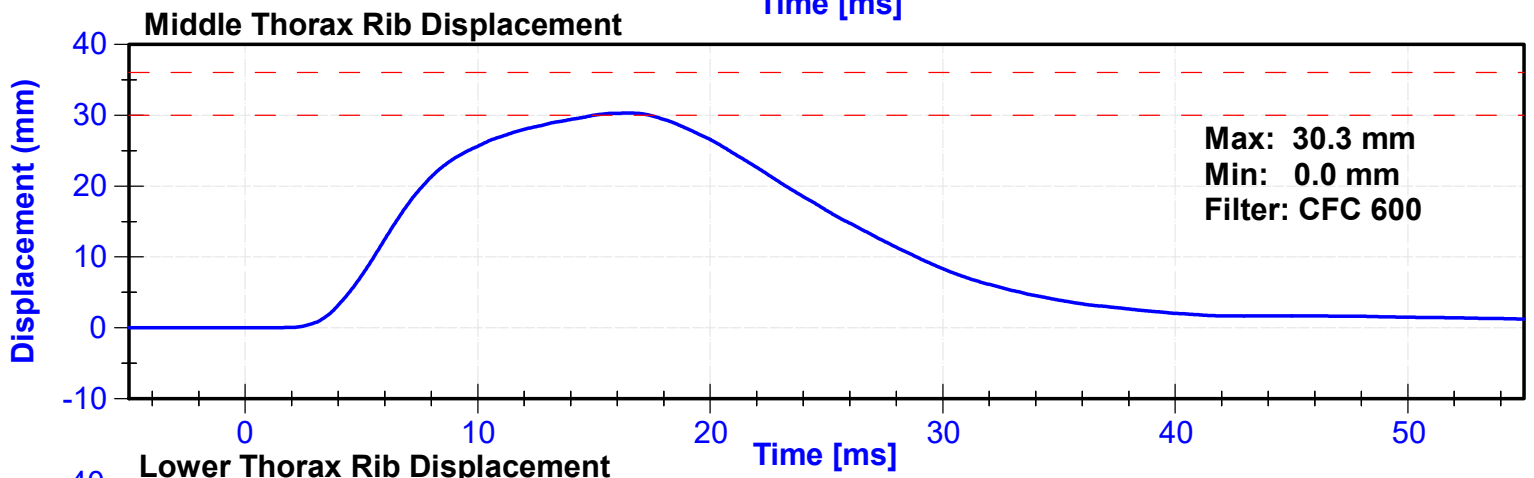
Transducer Calibrations

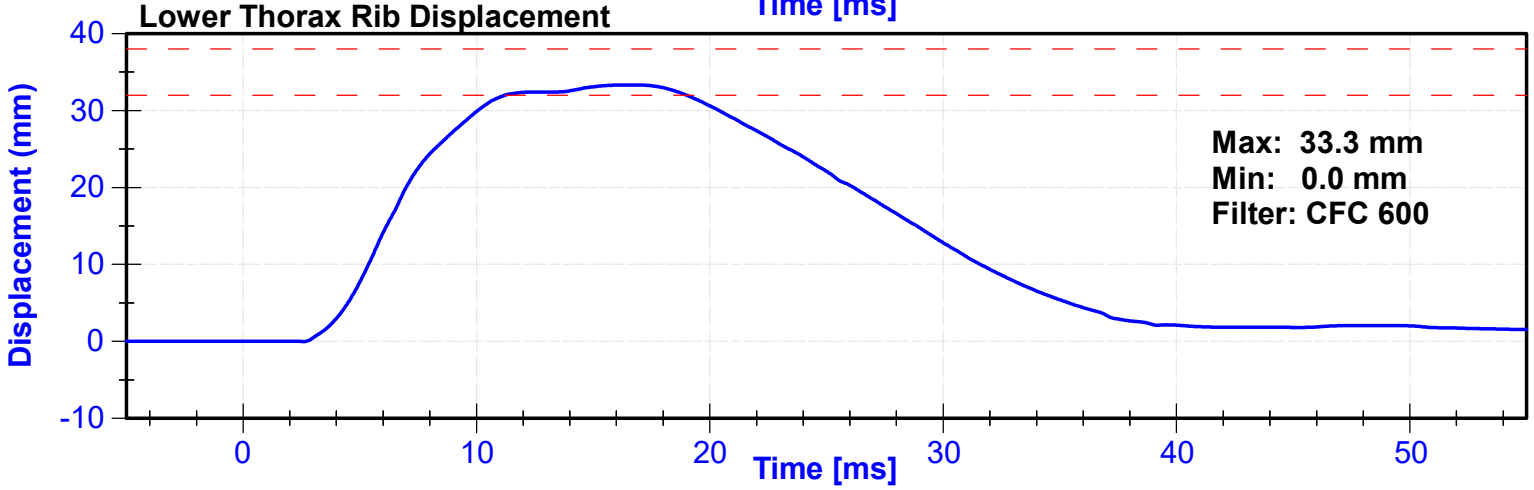
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Spine T1 Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Upper Spine T12 Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	11/17/2023	5/17/2024

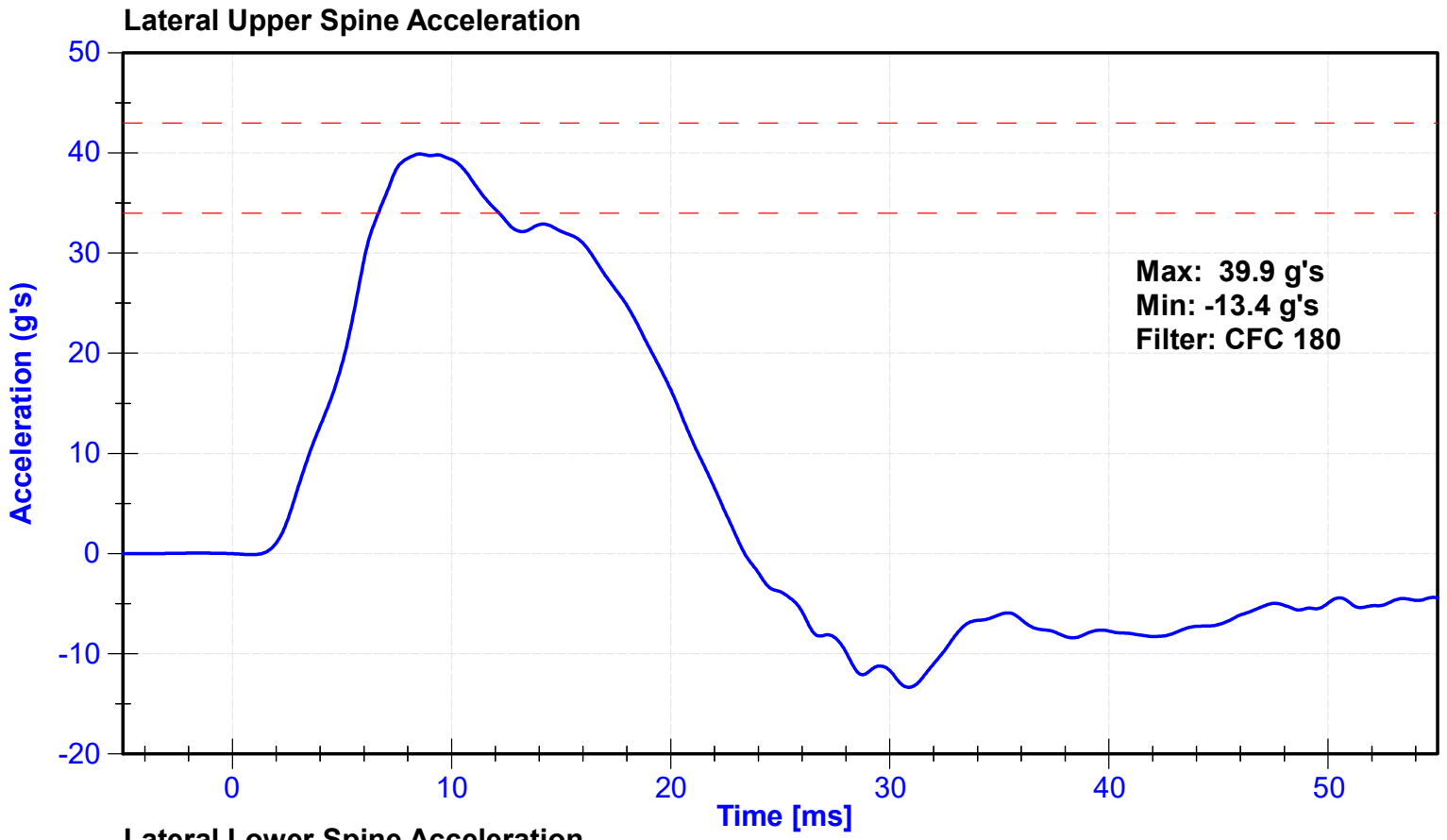


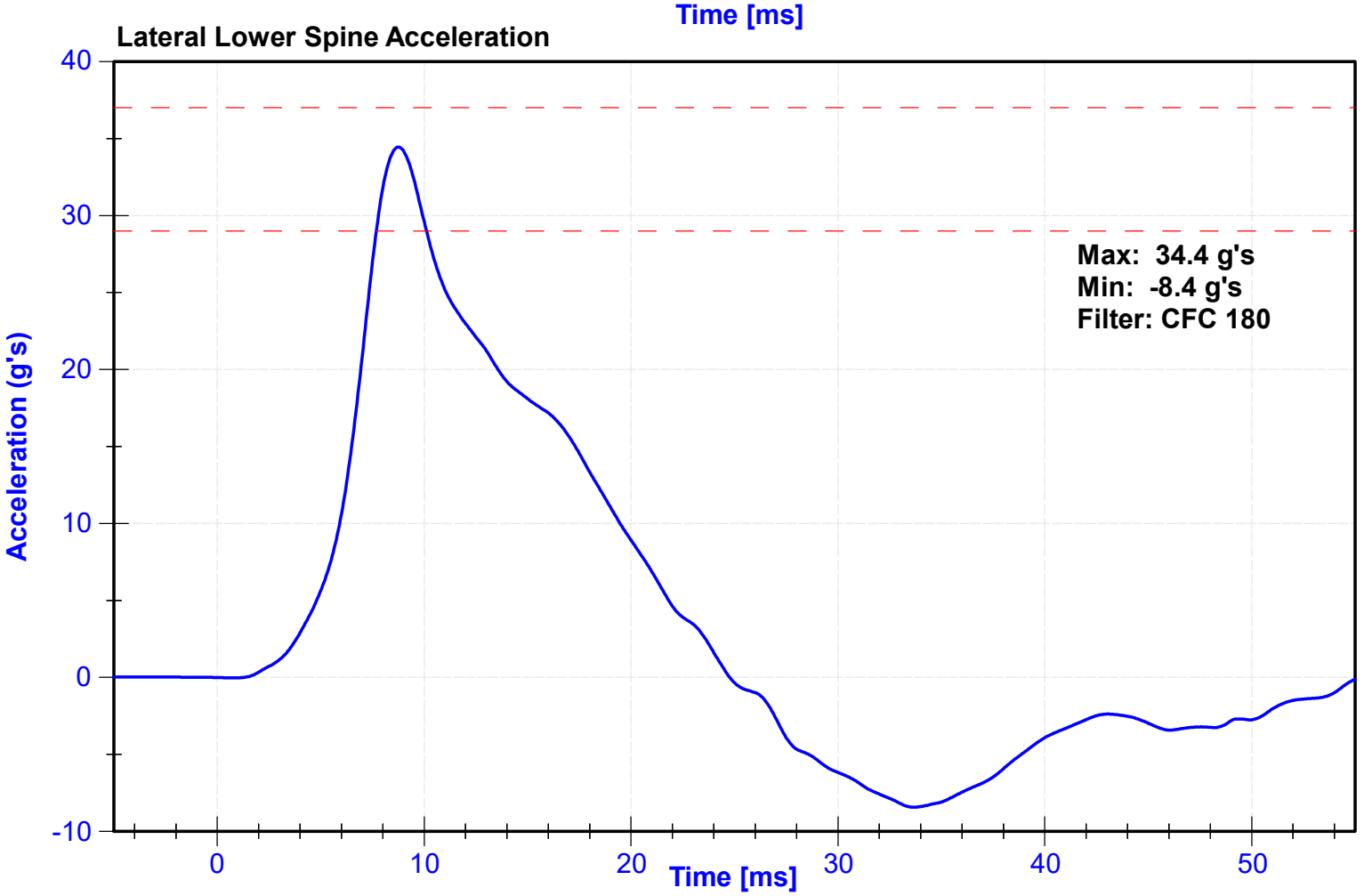

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 31.7 mm
Min: -1.0 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 25.9 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 30.3 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.3 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 39.9 g's
Min: -13.4 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 34.4 g's
Min: -8.4 g's
Filter: CFC 180

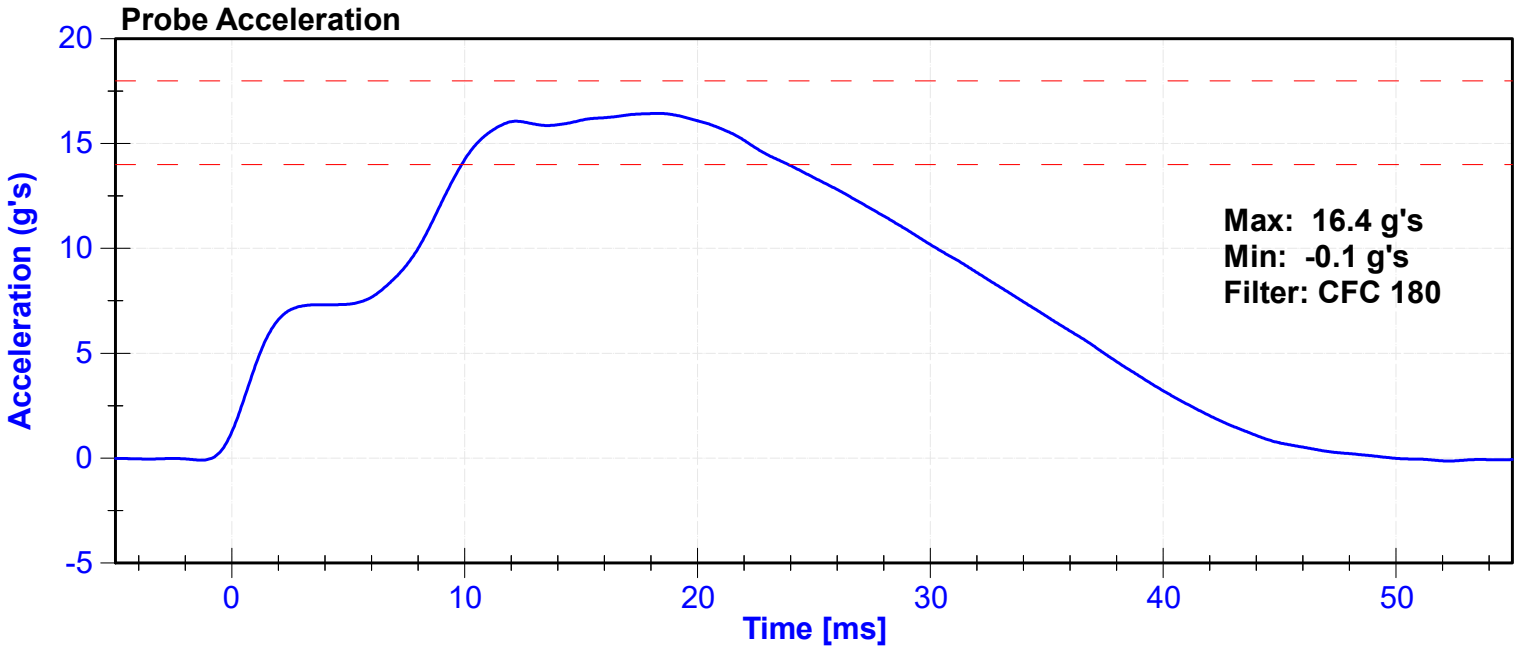
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

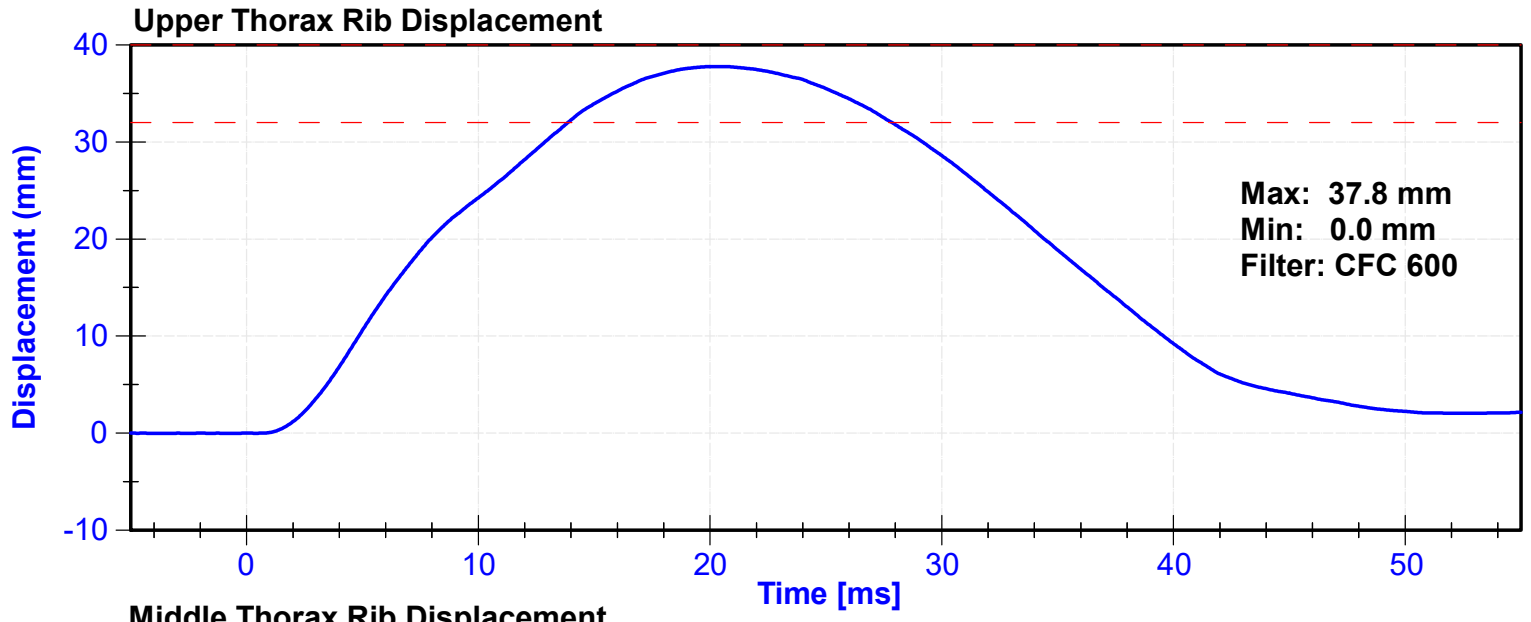
Results

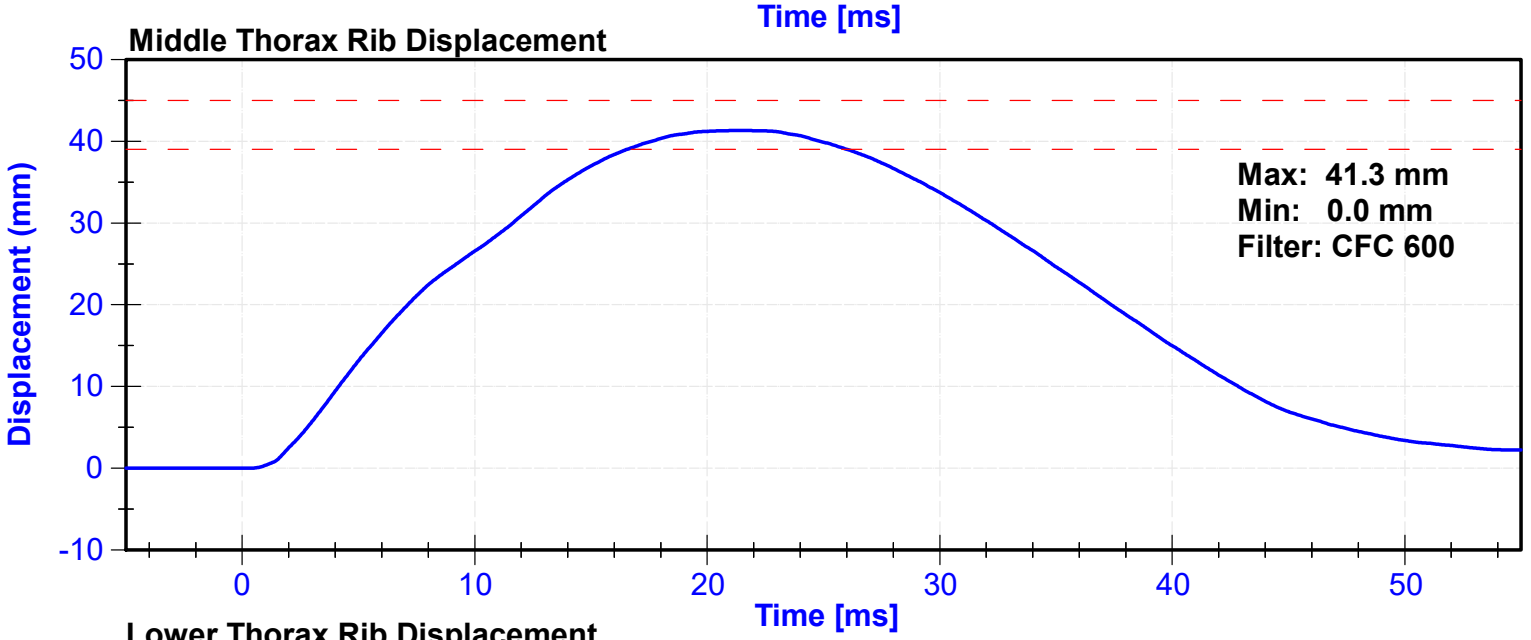
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	14	18	g's	16.4	Pass
Lateral Upper Spine Acceleration	13	17	g's	16.5	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.1	Pass
Upper Thorax Rib Deflection	32	40	mm	37.8	Pass
Middle Thorax Rib Deflection	39	45	mm	41.3	Pass
Lower Thorax Rib Deflection	35	43	mm	37.8	Pass

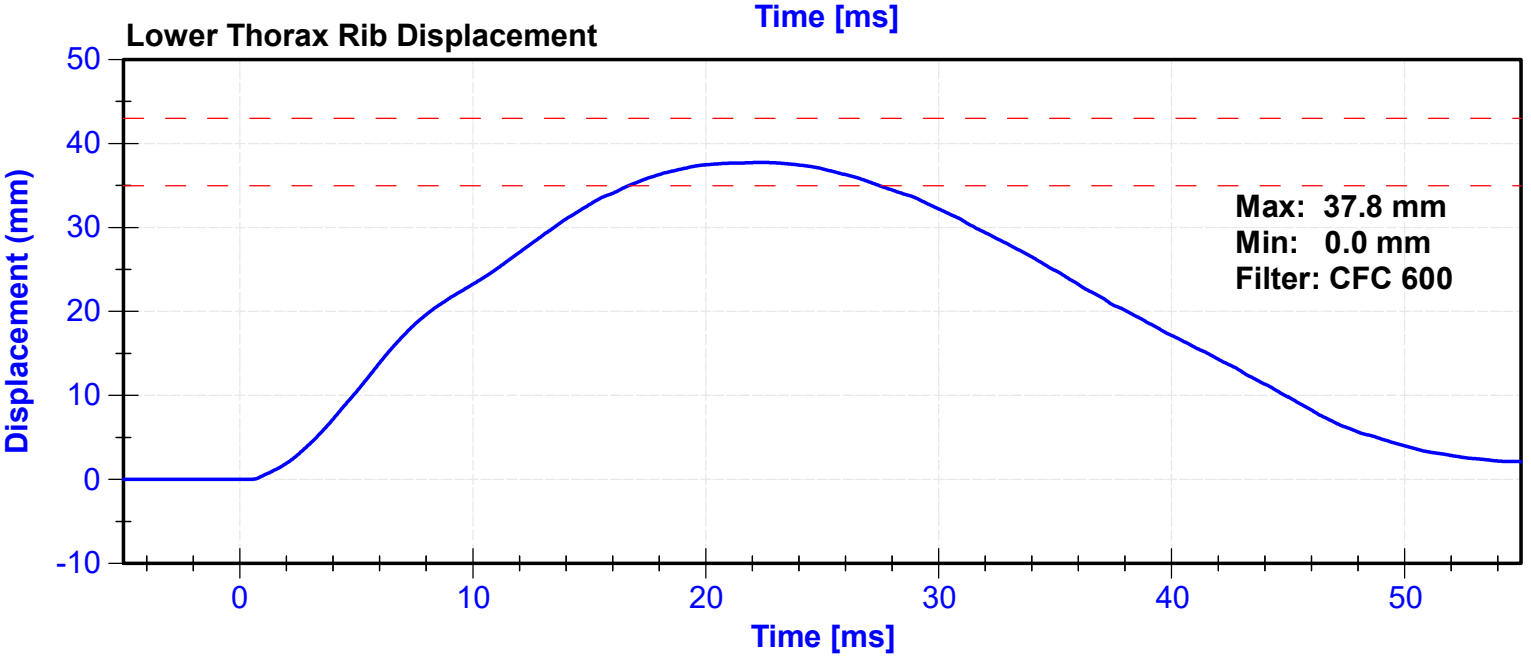
Transducer Calibrations

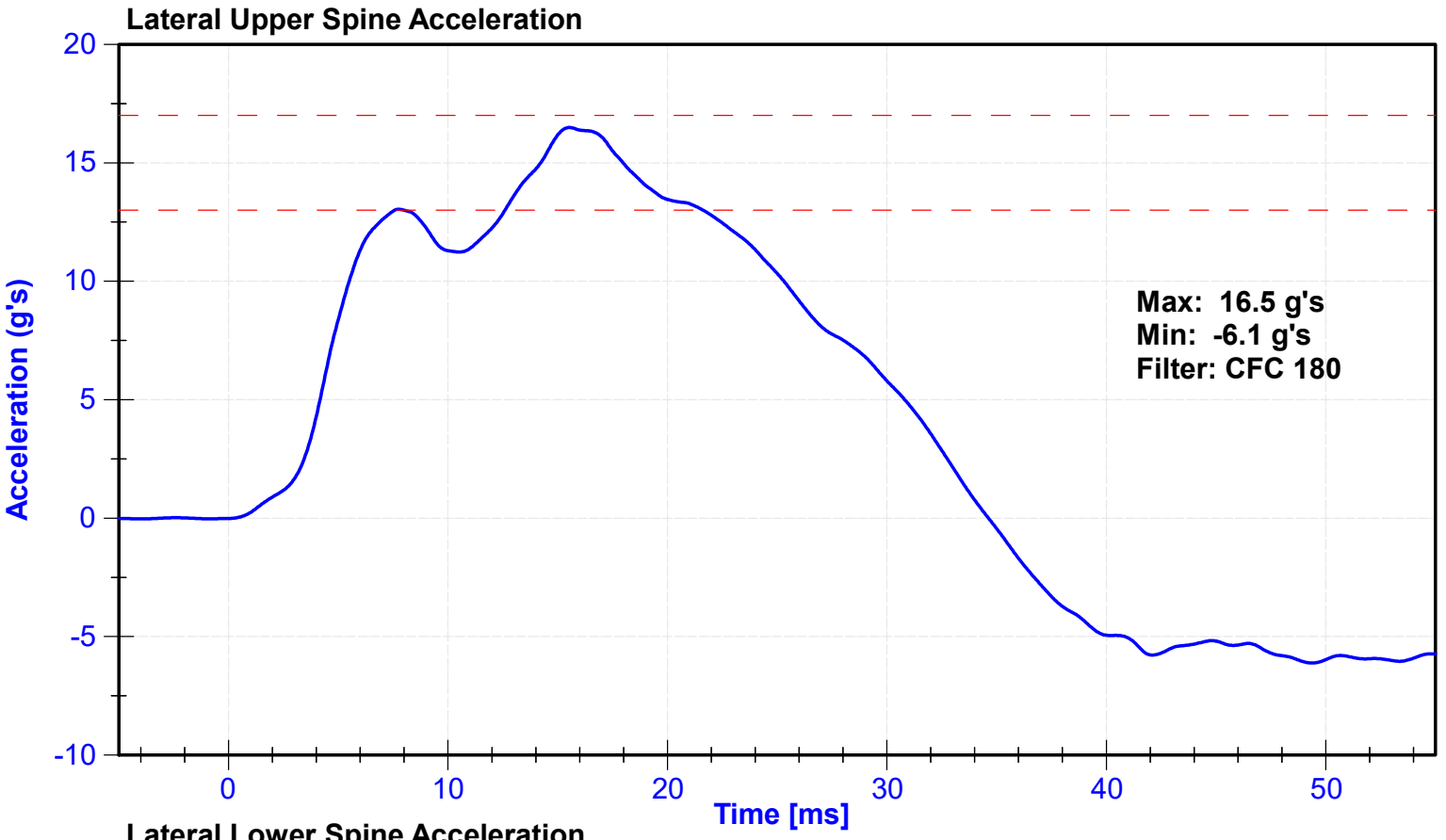
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Servo	1246GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Servo	011GFE	11/17/2023	5/17/2024

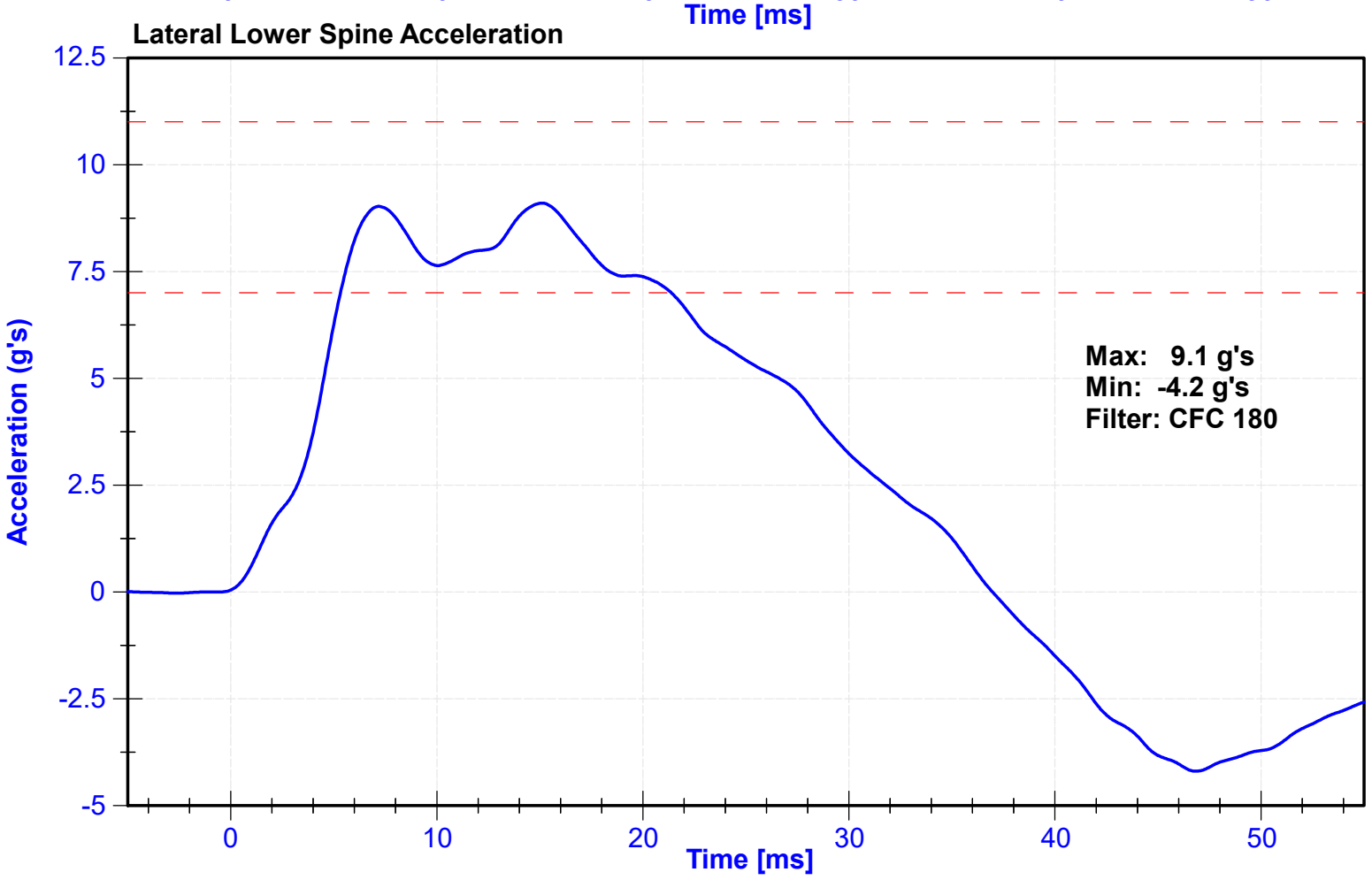



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.8 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.3 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.8 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: 16.5 g's
Min: -6.1 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
Time [ms]
Max: 9.1 g's
Min: -4.2 g's
Filter: CFC 180

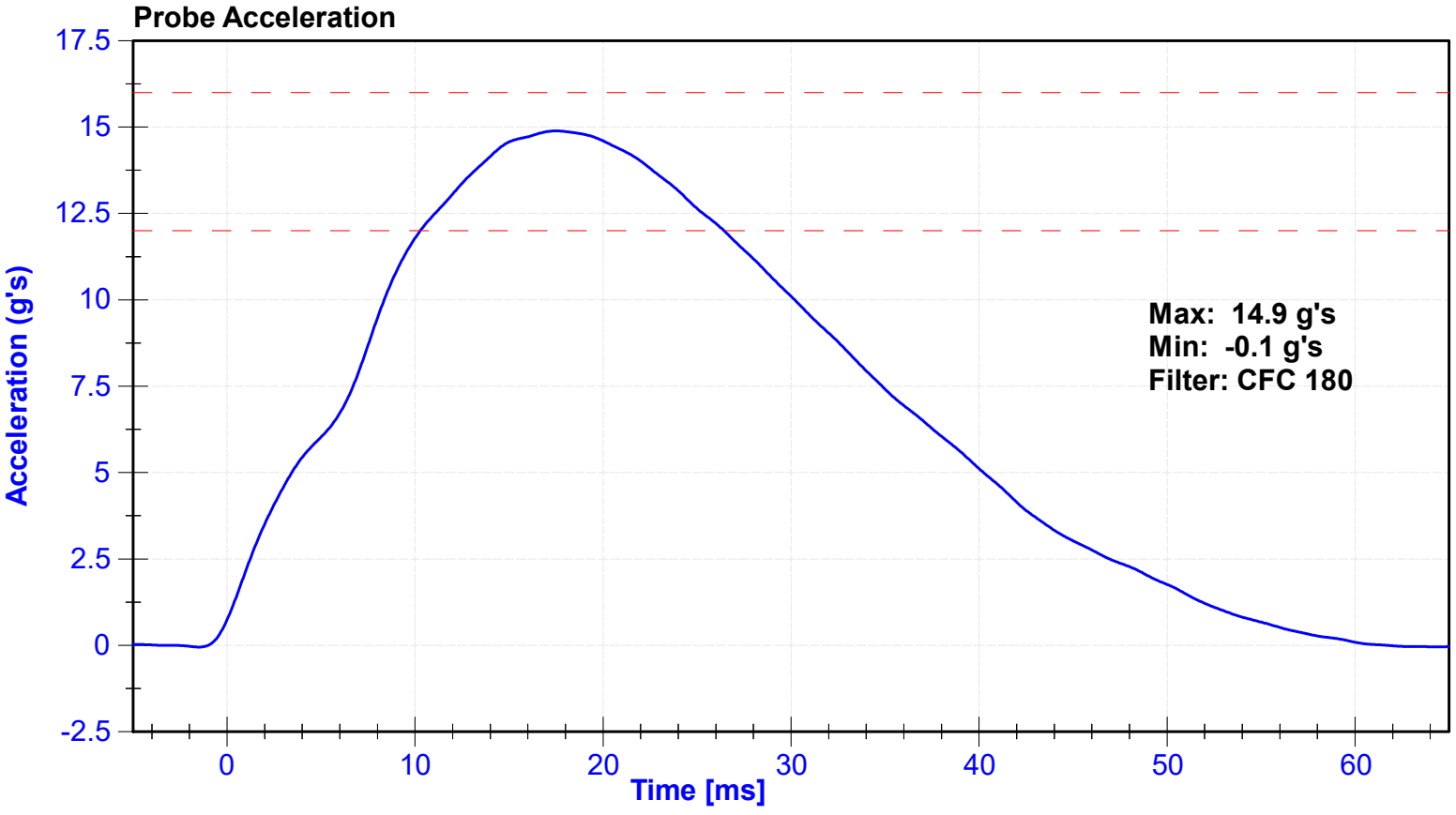
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

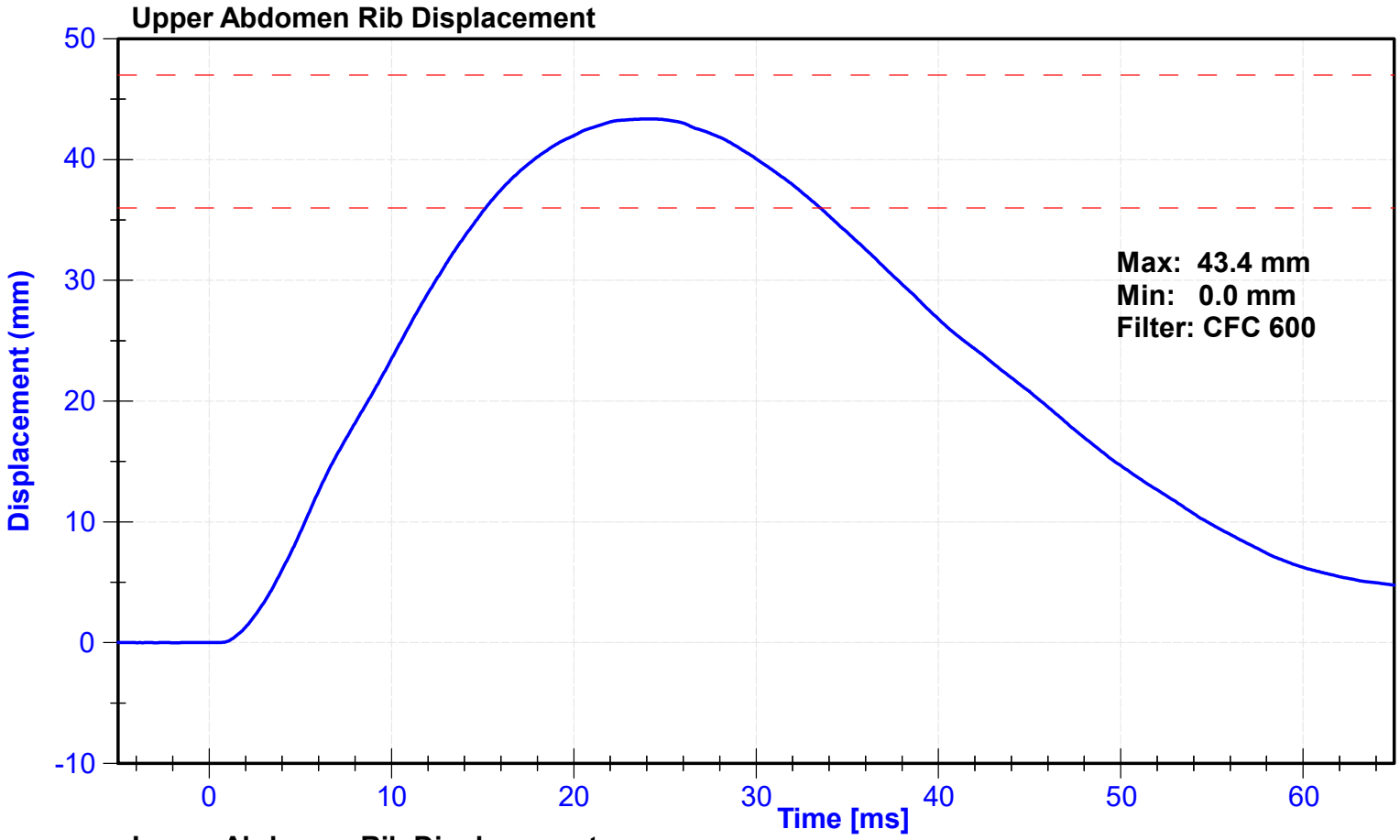
Results

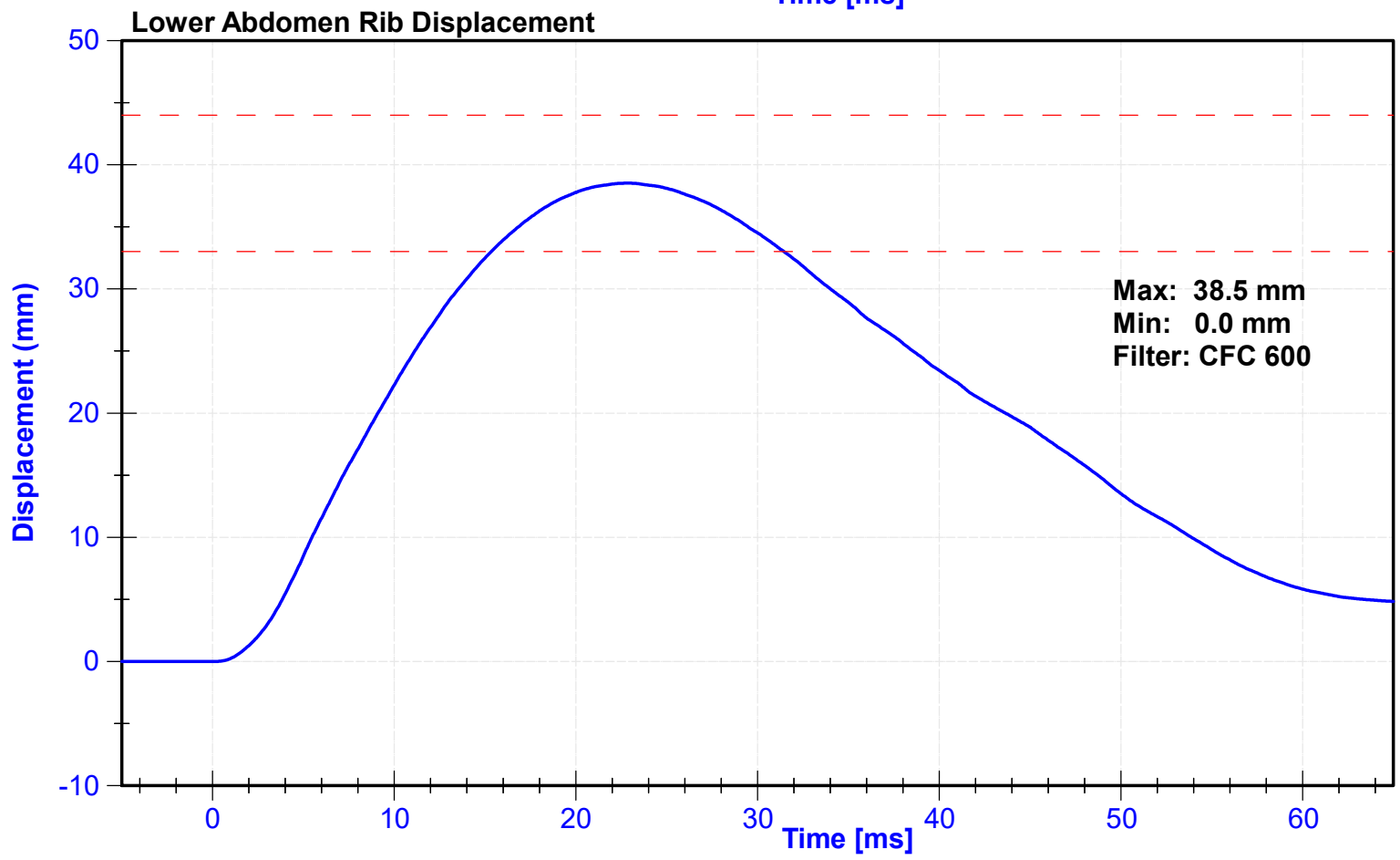
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	12	16	g's	14.9	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.6	Pass
Upper Abdomen Rib Deflection	36	47	mm	43.4	Pass
Lower Abdomen Rib Deflection	33	44	mm	38.5	Pass

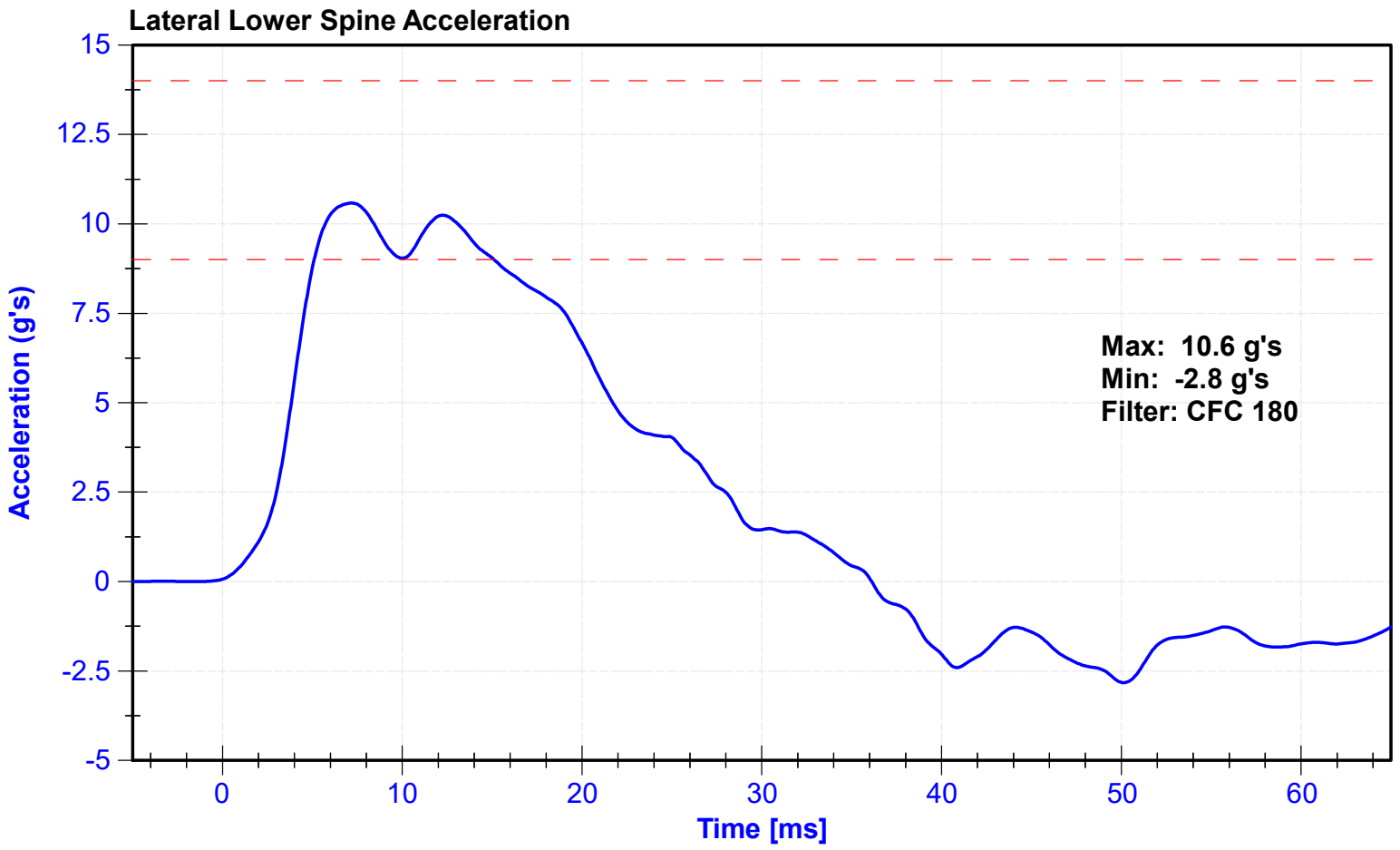
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Abdomen Rib Potentiometer	Servo	008GFE	11/17/2023	5/17/2024
Lower Abdomen Rib Potentiometer		046		




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 43.4 mm
Min: 0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 38.5 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
60
Time [ms]
Max: 10.6 g's
Min: -2.8 g's
Filter: CFC 180

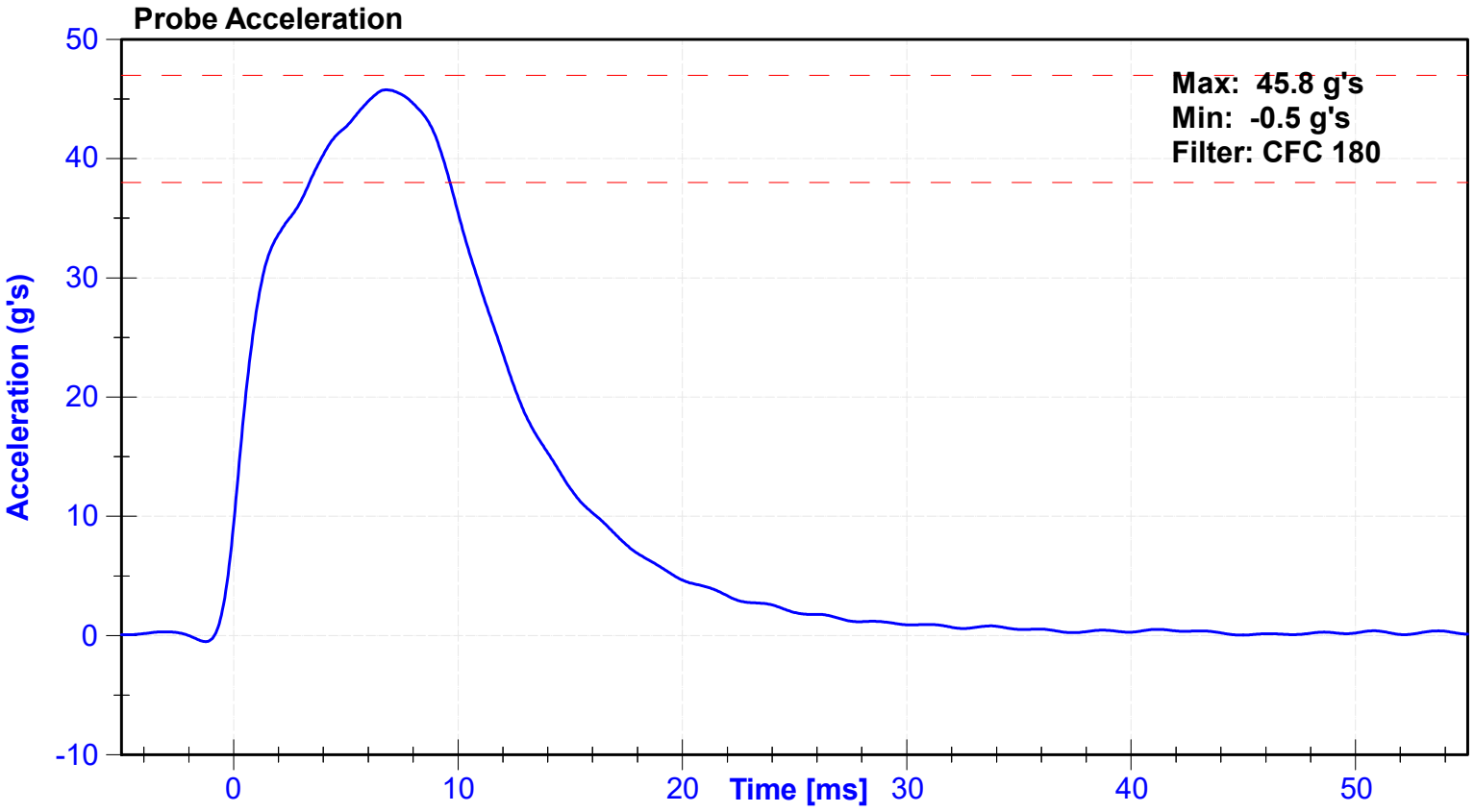
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

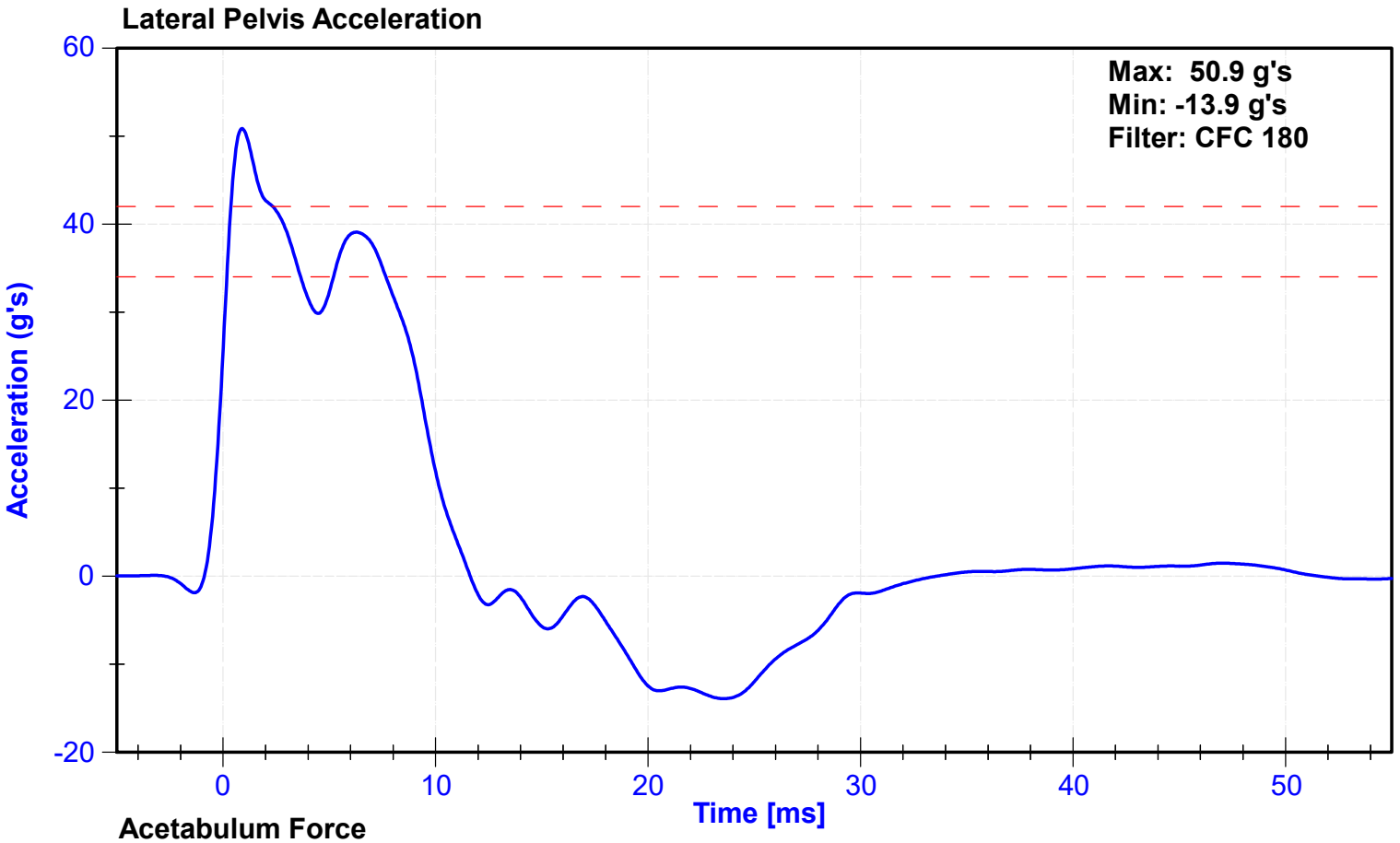
Results

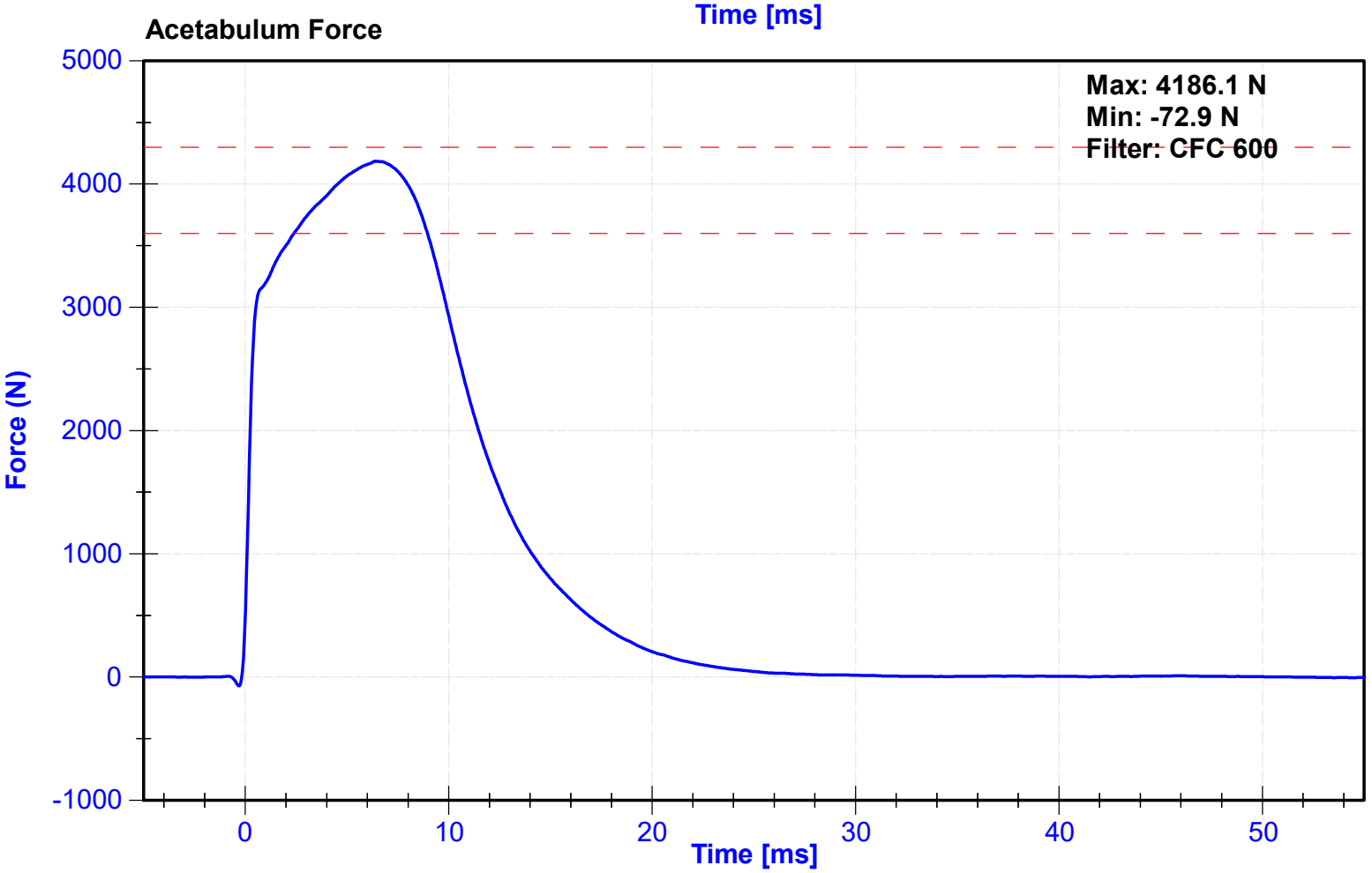
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	6.6	6.8	m/s	6.69	Pass
Probe Acceleration	38	47	g's	45.8	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	39.1	Pass
Acetabulum Force	3600	4300	N	4186.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pelvis Y Accelerometer	Endevco	P50078	11/16/2023	5/14/2024
Acetabulum Load Cell	Denton	270-FY	9/11/2023	9/10/2024
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A




Lateral Pelvis Acceleration
Max: 50.9 g's
Min: -13.9 g's
Filter: CFC 180
Acceleration (g's)
60
40
20
0
-20
0
10
20
30
40
50
Time [ms]


Acetabulum Force
Max: 4186.1 N
Min: -72.9 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

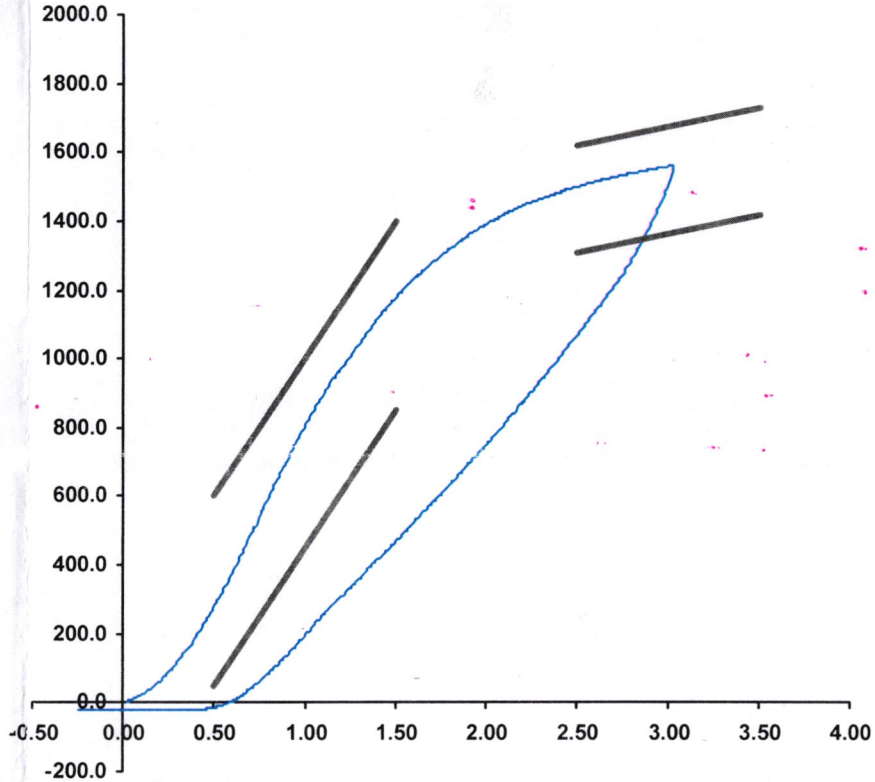
DG8012
Cert
2-23-24

SID-IIs Pelvis Plug Certification Test

Plug S/N 16347
Test Number 22914
Report Number 22971
Test Date 5/20/2022 12:43:51 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	282	50	600
Force @ 1.5 mm (N)	1,181	850	1,400
Force @ 2.5 mm (N)	1,499	1,306	1,618
Force @ 3.0 mm (N)	1,559	1,361	1,673

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 20-May-22
SACO Research

By : DC Date : 5/20/22

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

SACO RESEARCH

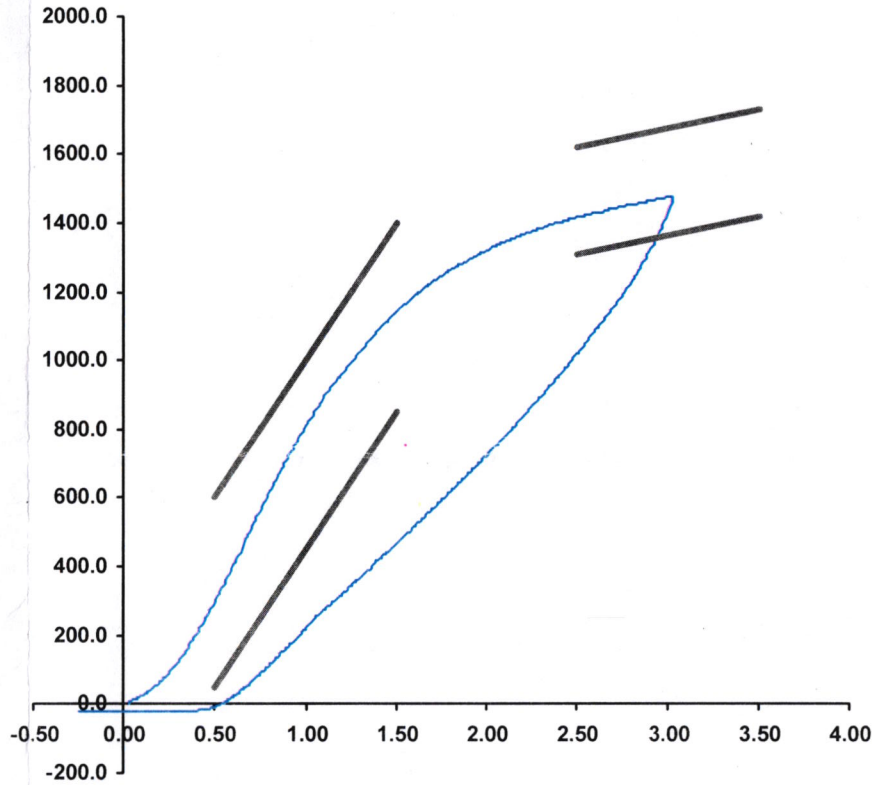
DG8012
IMPACT
2-23-24

SID-IIs Pelvis Plug Certification Test

Plug S/N 16424
Test Number 22993
Report Number 23051
Test Date 5/23/2022 10:46:51 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	295	50	600
Force @ 1.5 mm (N)	1,142	850	1,400
Force @ 2.5 mm (N)	1,415	1,306	1,618
Force @ 3.0 mm (N)	1,474	1,361	1,673

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 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

SACO RESEARCH

DG8012

NON-IMPACT

2-23-24

SID-IIs Pelvis Plug Certification Test

Plug S/N 16421

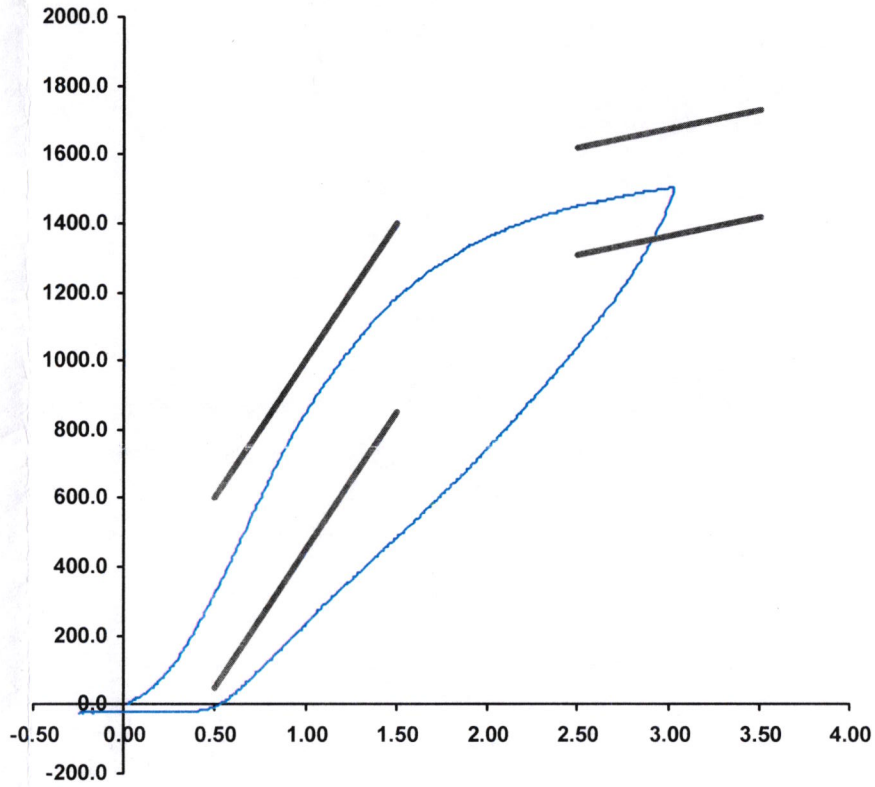
Test Number 22990

Report Number 23048

Test Date 5/23/2022 10:31:44 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	322	50	600
Force @ 1.5 mm (N)	1,183	850	1,400
Force @ 2.5 mm (N)	1,449	1,306	1,618
Force @ 3.0 mm (N)	1,501	1,361	1,673

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542

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

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:

Operator

Part Number 180-4450

Template No 107 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

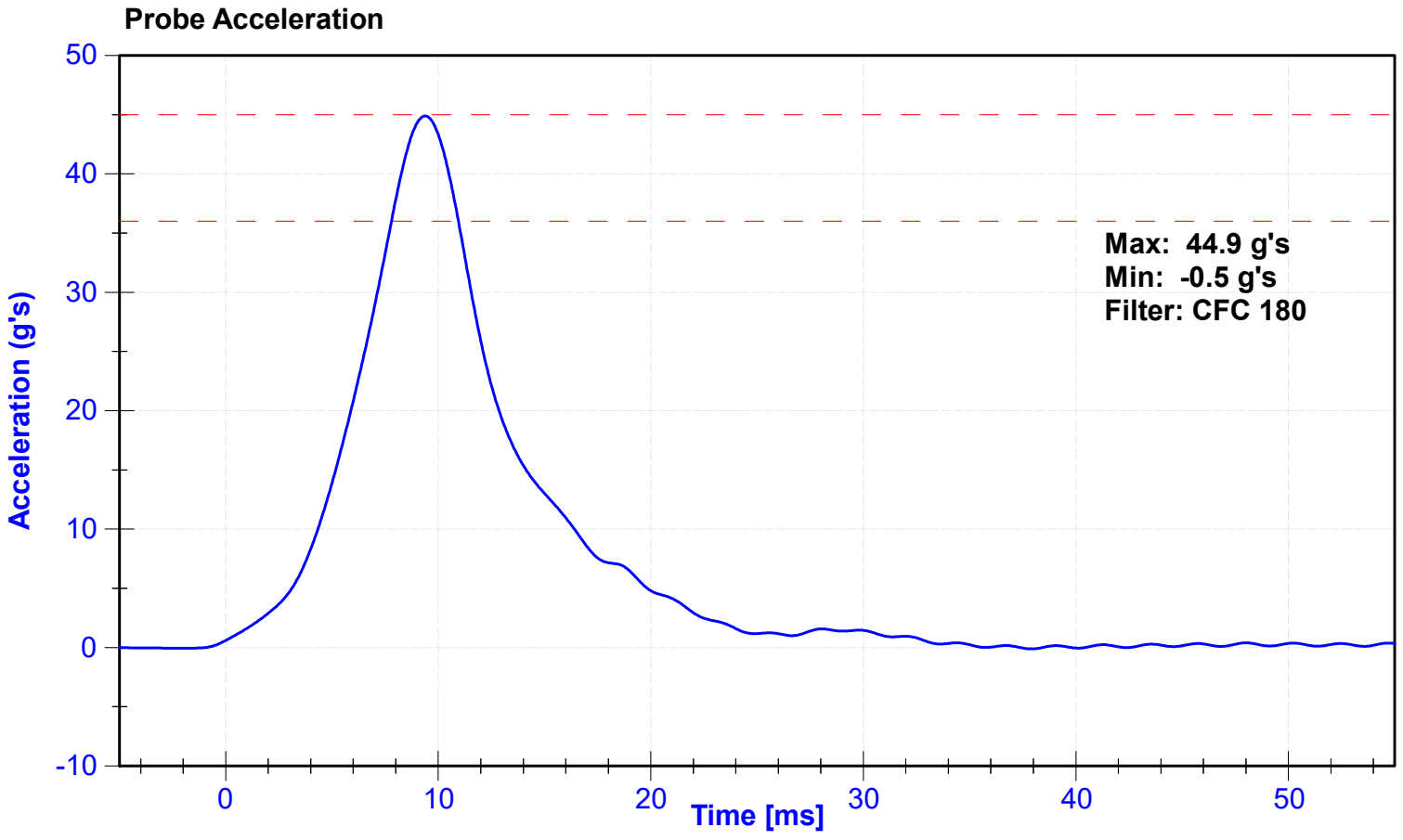
ATD Manufacturer	FTSS	Test Technician	J. Kinderman
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

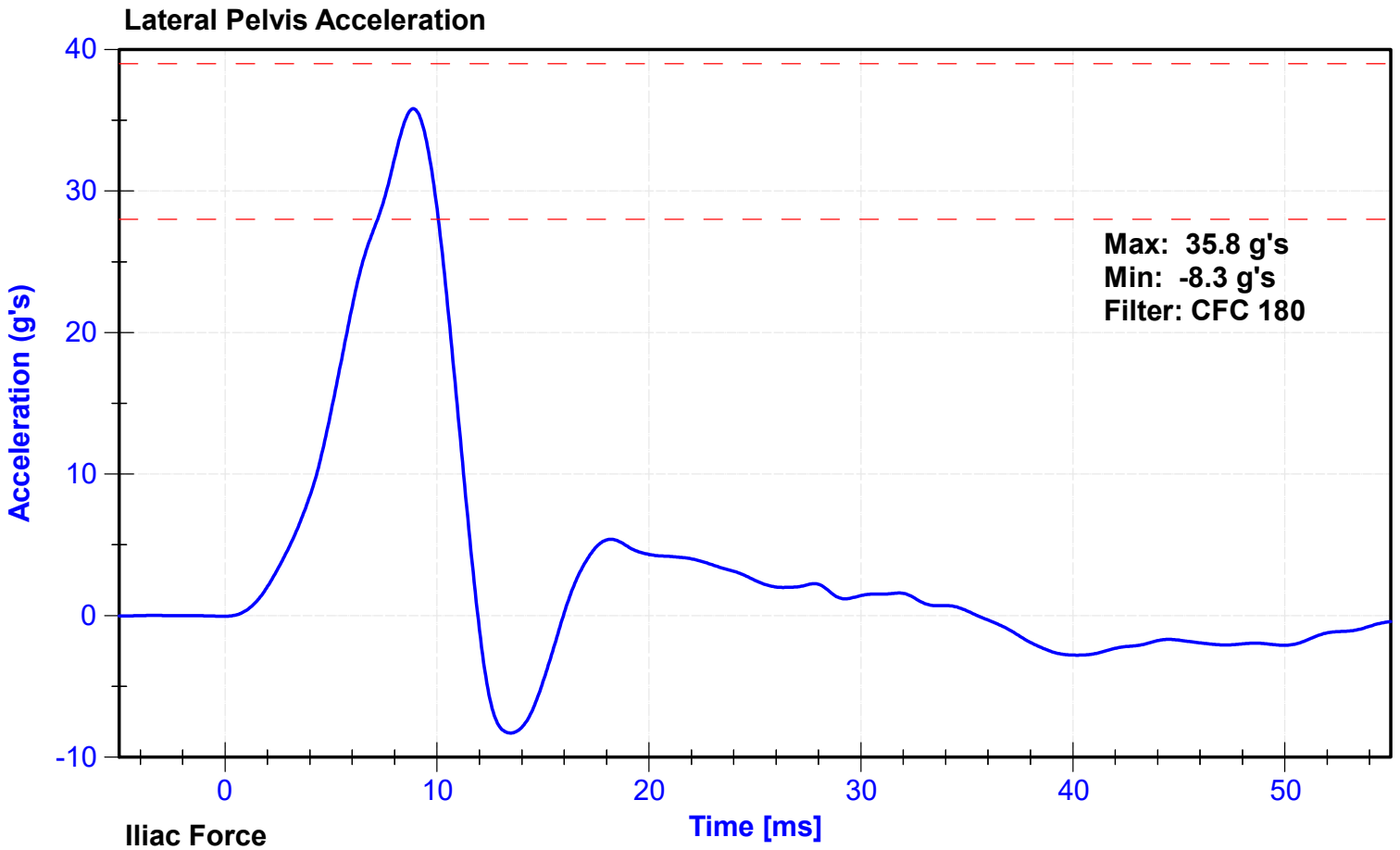
Results

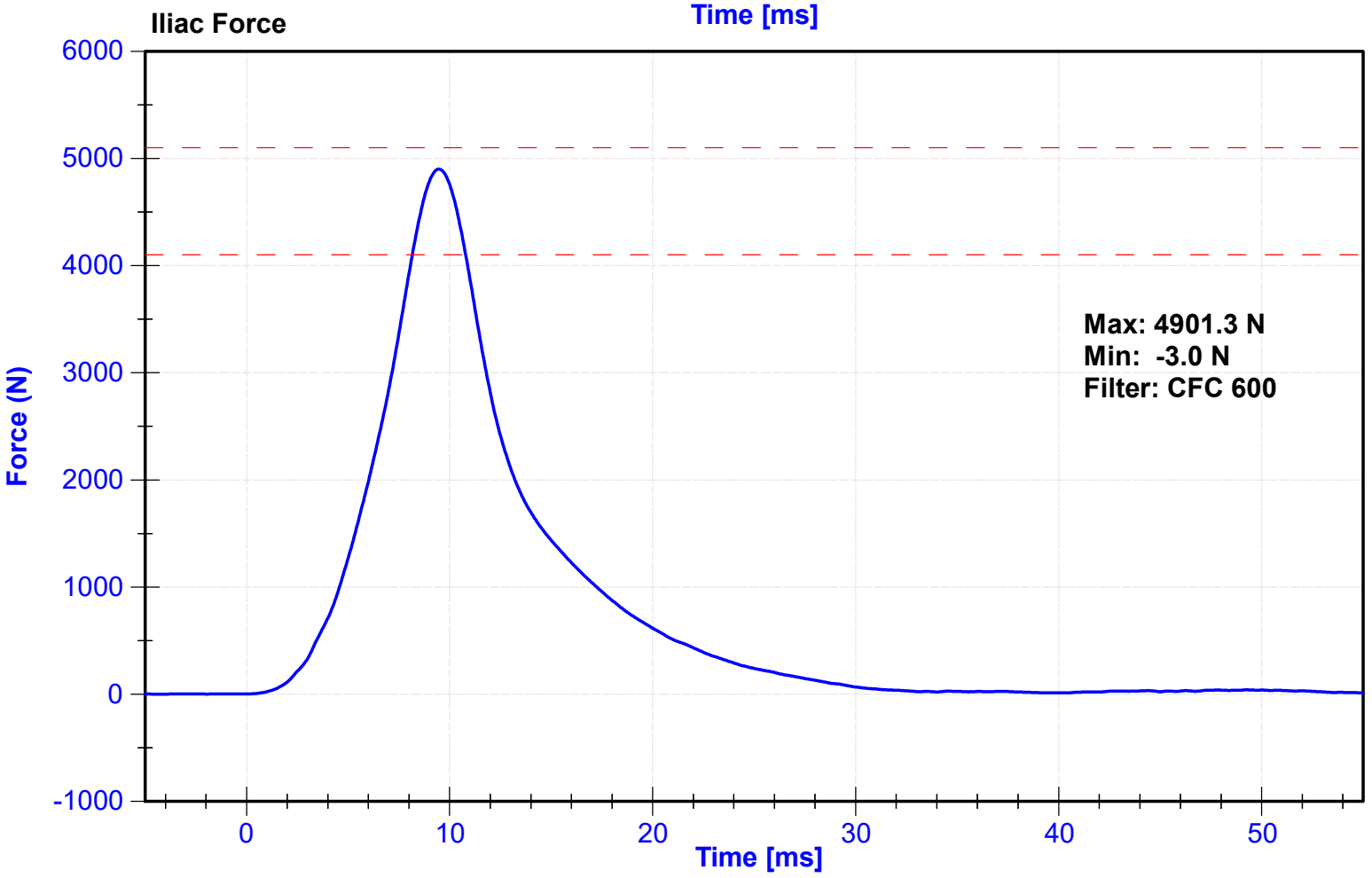
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	36	45	g's	44.9	Pass
Lateral Pelvis Acceleration	28	39	g's	35.8	Pass
Iliac Force	4100	5100	N	4901.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pelvis Y Accelerometer	Endevco	P50078	11/16/2023	5/14/2024
Iliac Load Cell	Denton	280-FY	9/11/2023	9/10/2024




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 35.8 g's
Min: -8.3 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: 4901.3 N
Min: -3.0 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

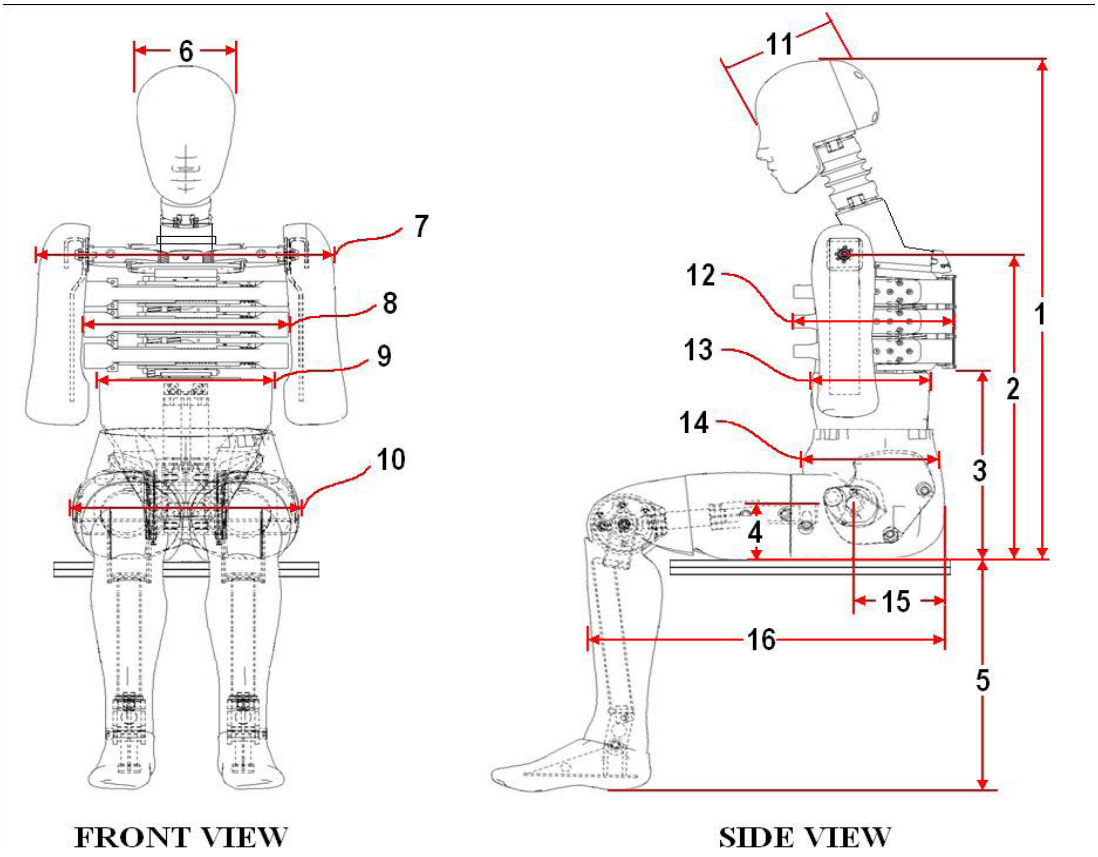
SERIAL NO:F033

(CONFIGURED FOR LEFT SIDE It

External Measurements - EuroSID-2re

Technician: K. Brogan Date: 3/14/2024

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	429	Pass
6	Head Width	152	158	156	Pass
7	Shoulder/Arm Width	461	479	472	Pass
8	Thorax Width	322	332	330	Pass
9	Abdomen Width	273	287	282	Pass
10	Pelvis Lap Width	359	373	370	Pass
11	Head Depth	196	206	200	Pass
12	Thorax Depth	262	272	269	Pass
13	Abdomen Depth	194	204	201	Pass
14	Pelvis Depth	235	245	241	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	155	Pass
16	Back of Buttocks to Front Knee	597	615	611	Pass

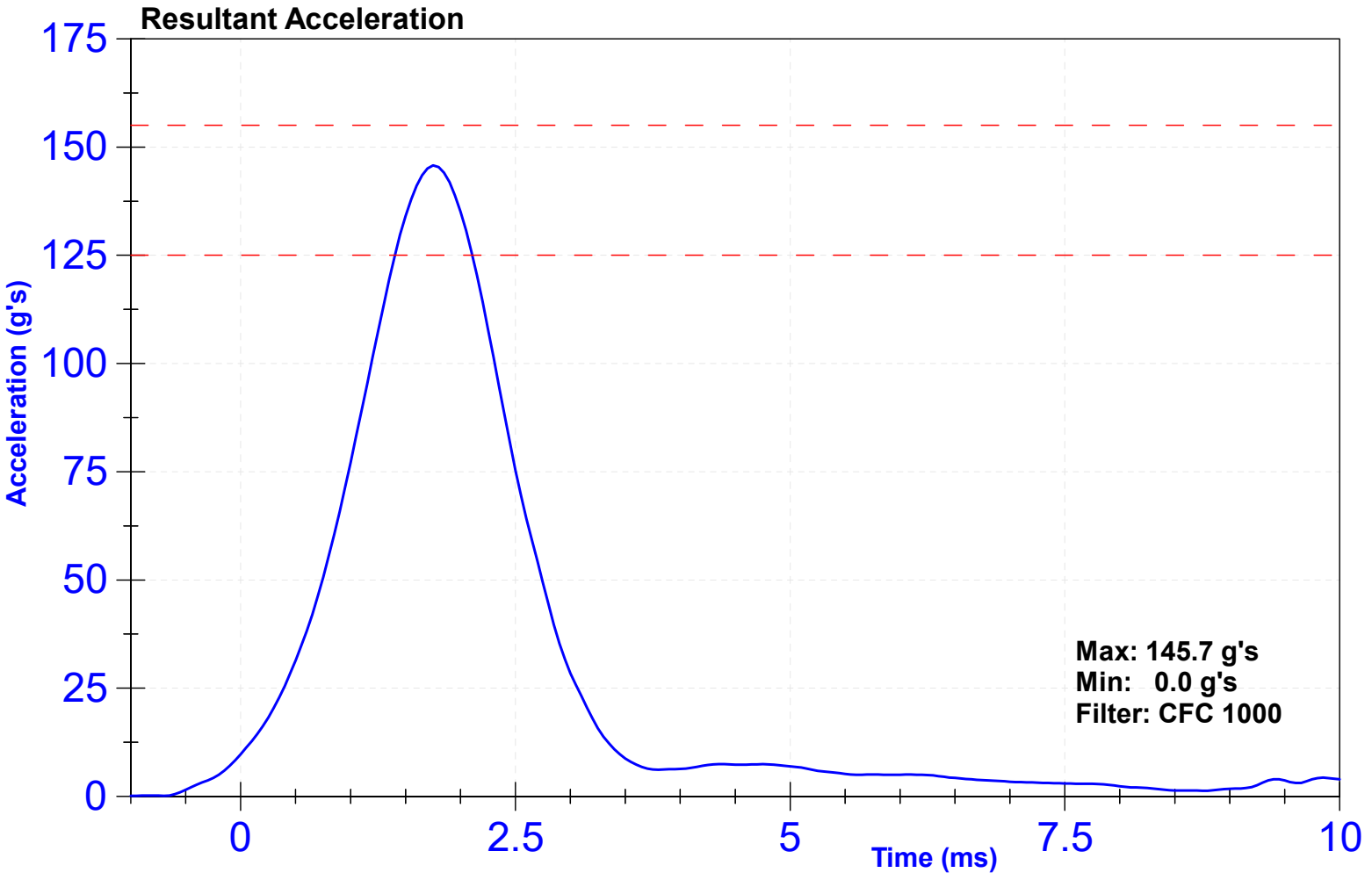
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

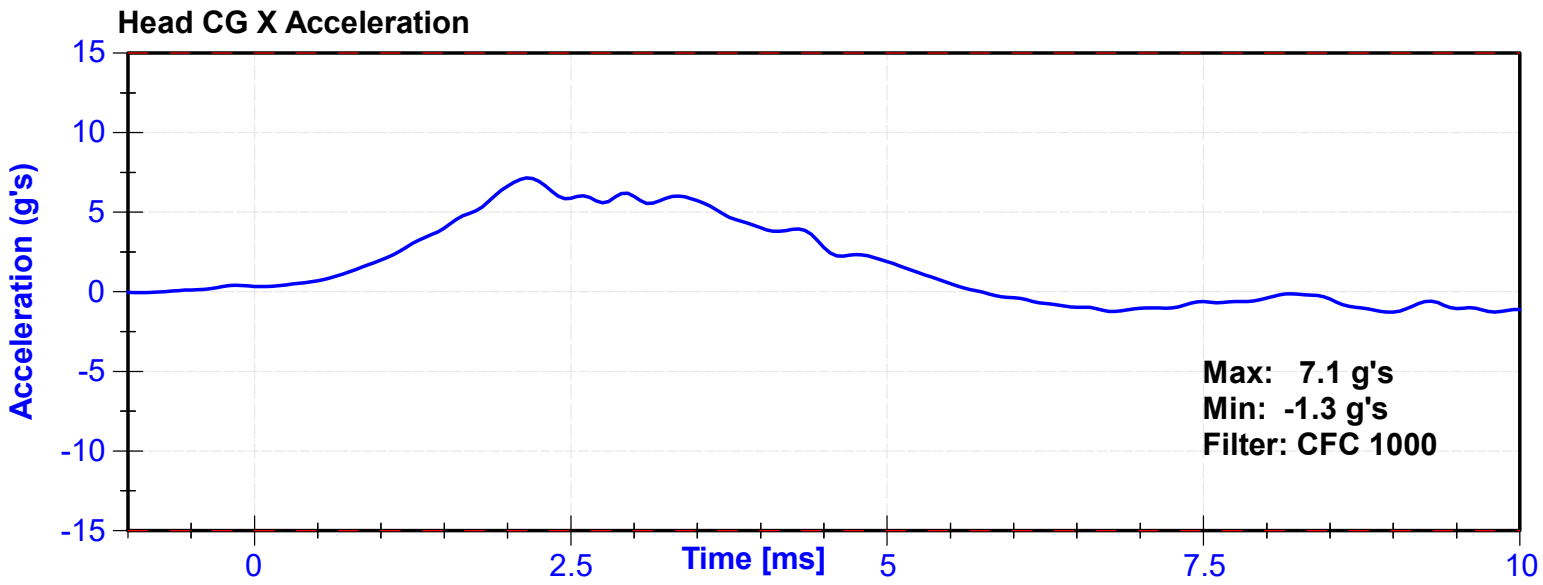
Results

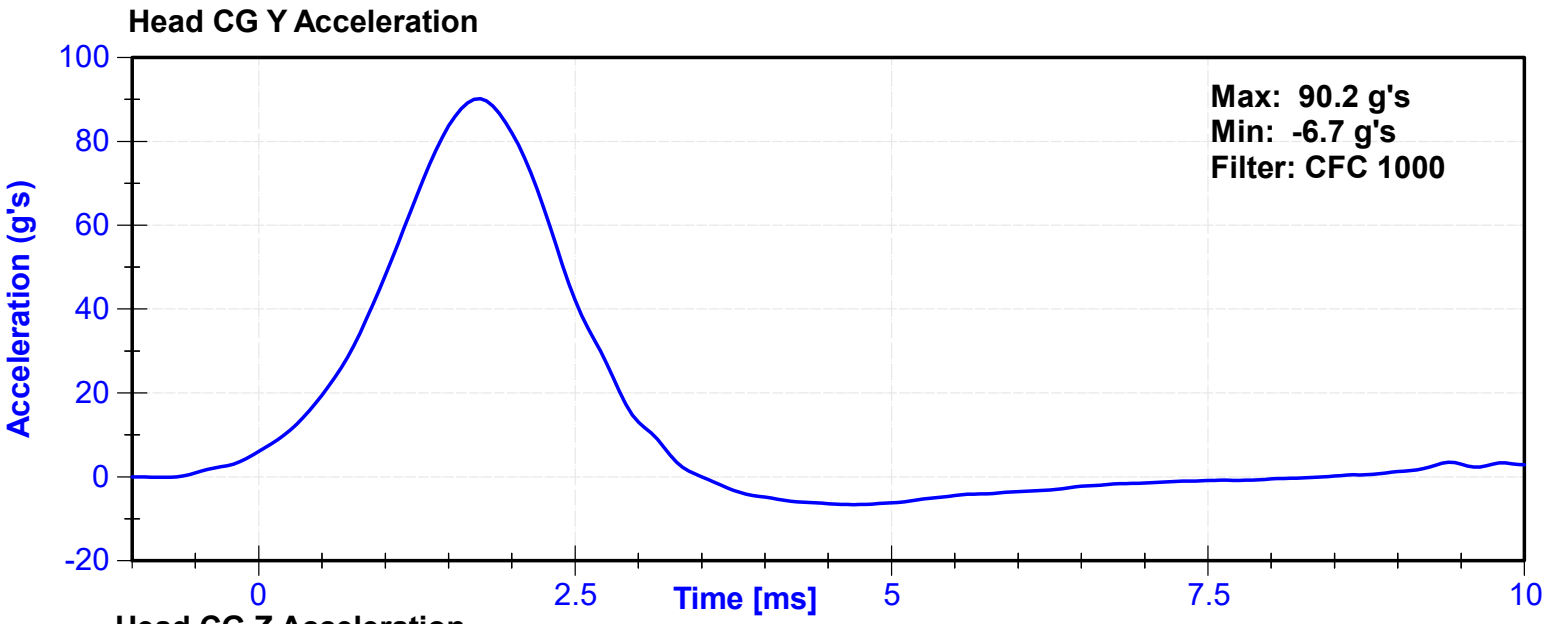
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18	Pass
Resultant Acceleration	125	155	g's	145.7	Pass
Oscillation	0	15	%	5.11	Pass
Fore-Aft Acceleration	-15	15	g's	7.1	Pass

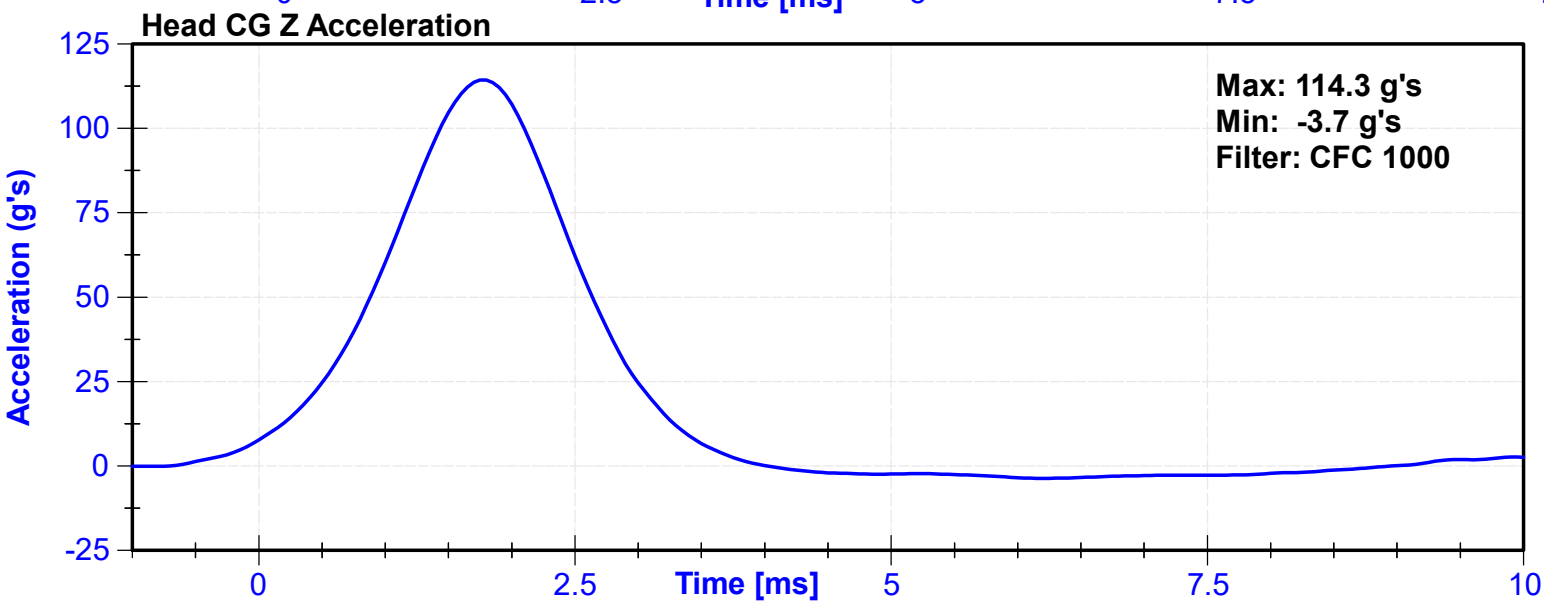
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P63861	11/16/2023	5/14/2024
Y Accelerometer	Endevco	P49216	11/16/2023	5/14/2024
Z Accelerometer	Endevco	P51303	11/16/2023	5/14/2024




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 7.1 g's
Min: -1.3 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]
Max: 90.2 g's
Min: -6.7 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 114.3 g's
Min: -3.7 g's
Filter: CFC 1000

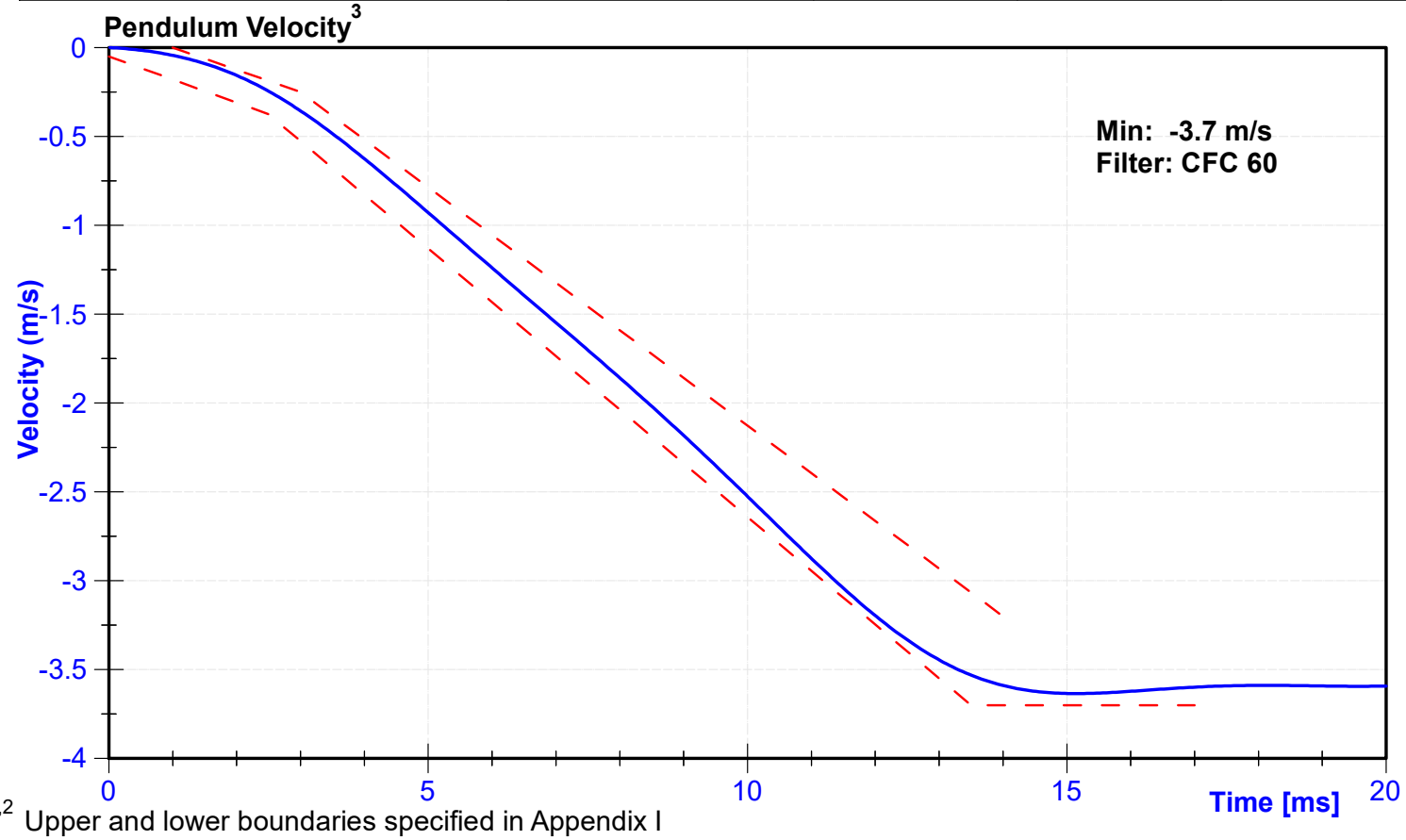
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

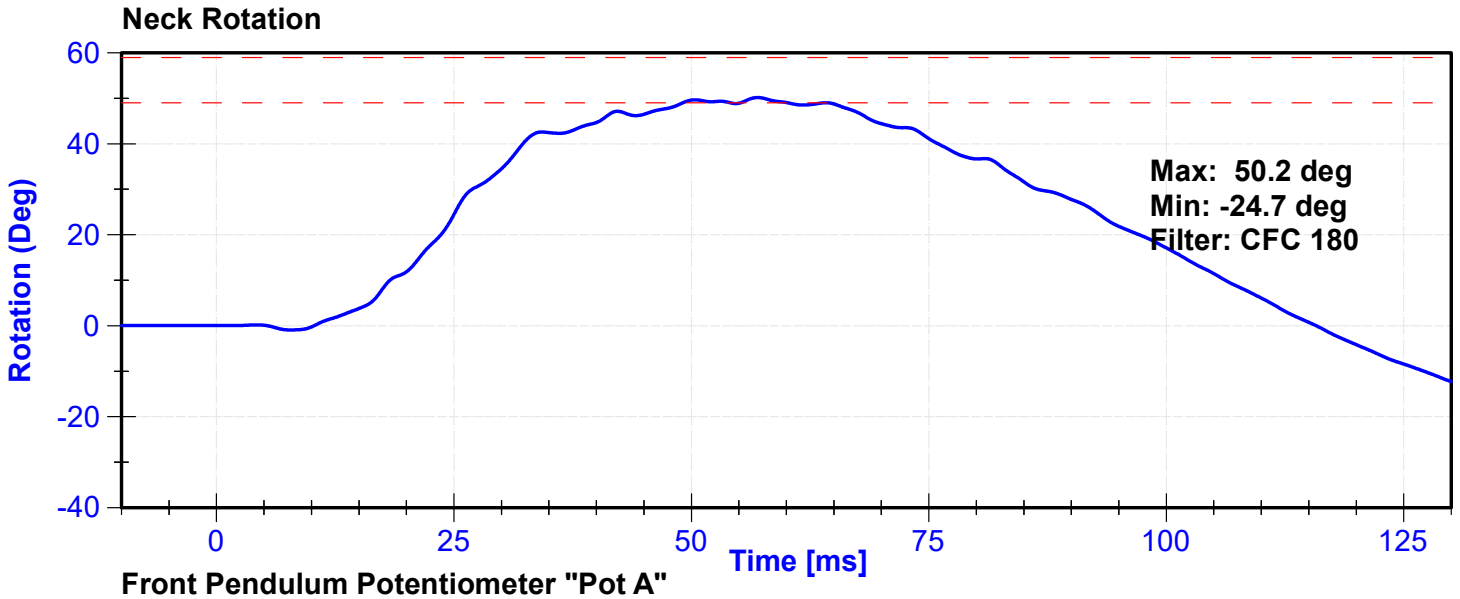
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	37	Pass
Velocity	3.3	3.5	m/s	3.41	Pass
Lateral Neck Rotation	49	59	deg	50.2	Pass
Time at Maximum Rotation	54	66	ms	57.0	Pass
Time of Rotation Decay from Maximum	53	88	ms	58.8	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

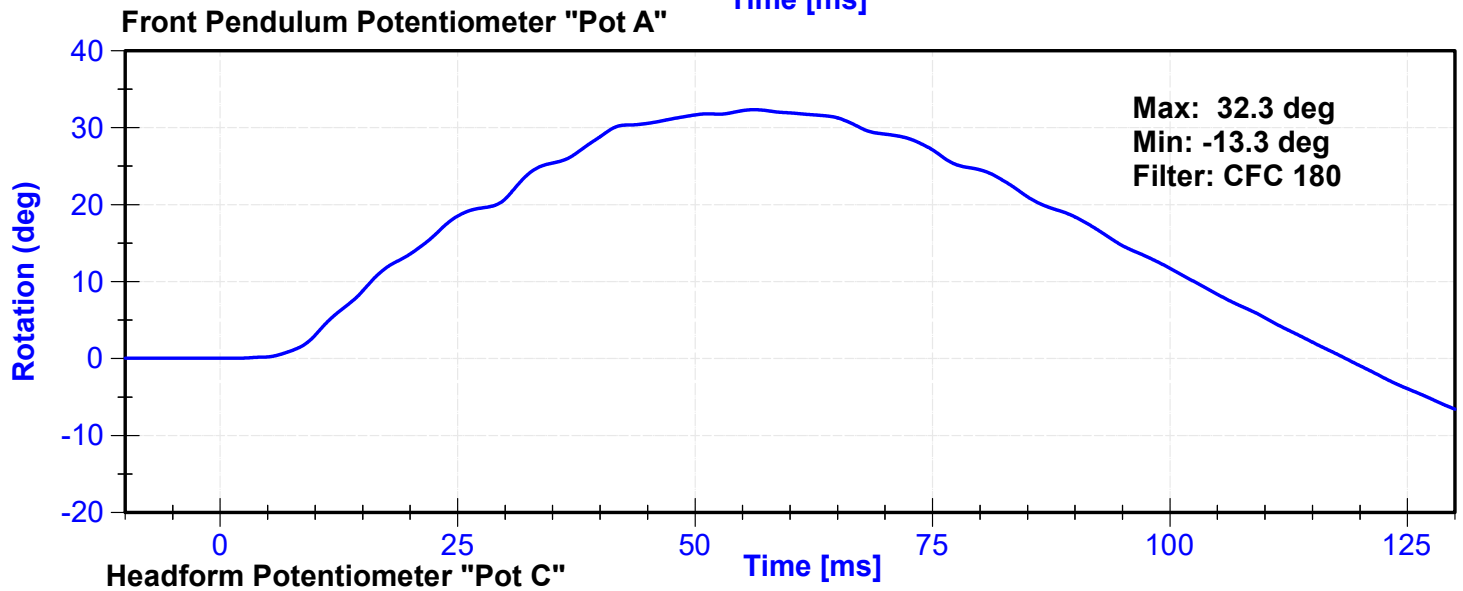
Transducer Calibrations

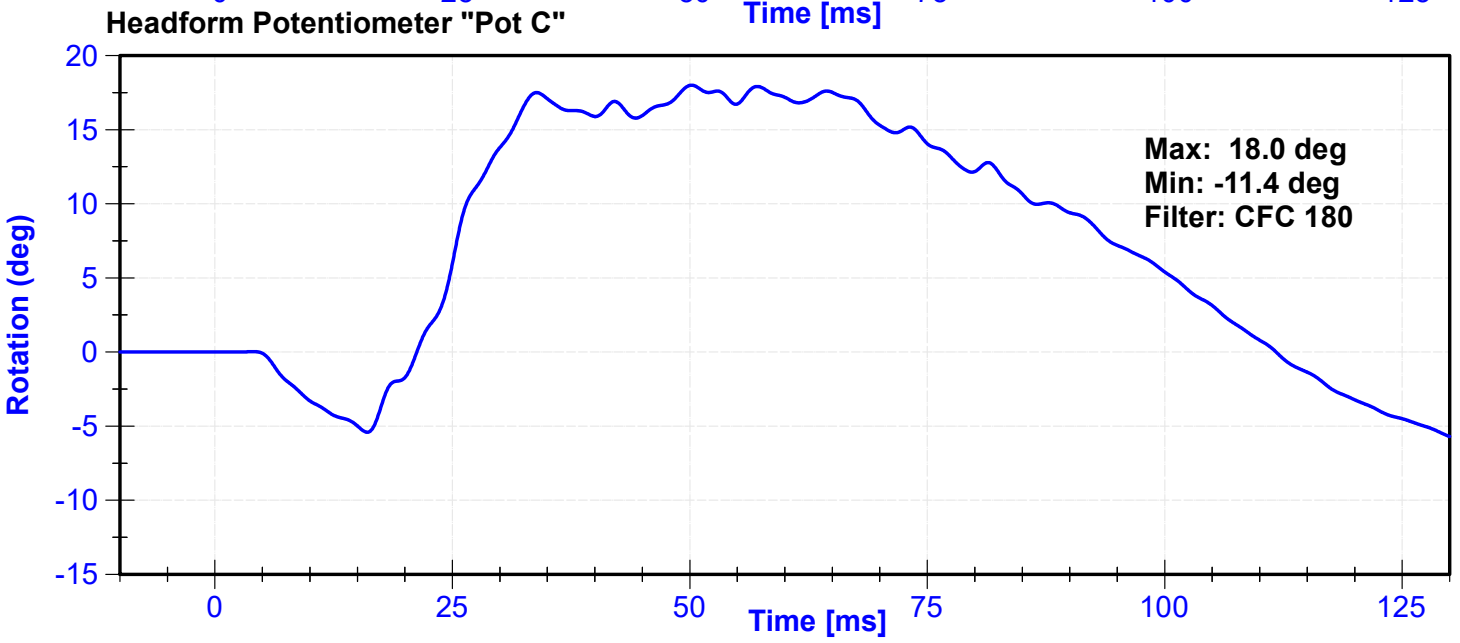
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/31/2023	4/28/2024
Front Pendulum Potentiometer	Sfernice	2247	12/5/2023	12/4/2024
Headform Potentiometer	Sfernice	095	9/29/2023	9/28/2024



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


Neck Rotation
Rotation (Deg)
Time [ms]
Max: 50.2 deg
Min: -24.7 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 32.3 deg
Min: -13.3 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 18.0 deg
Min: -11.4 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

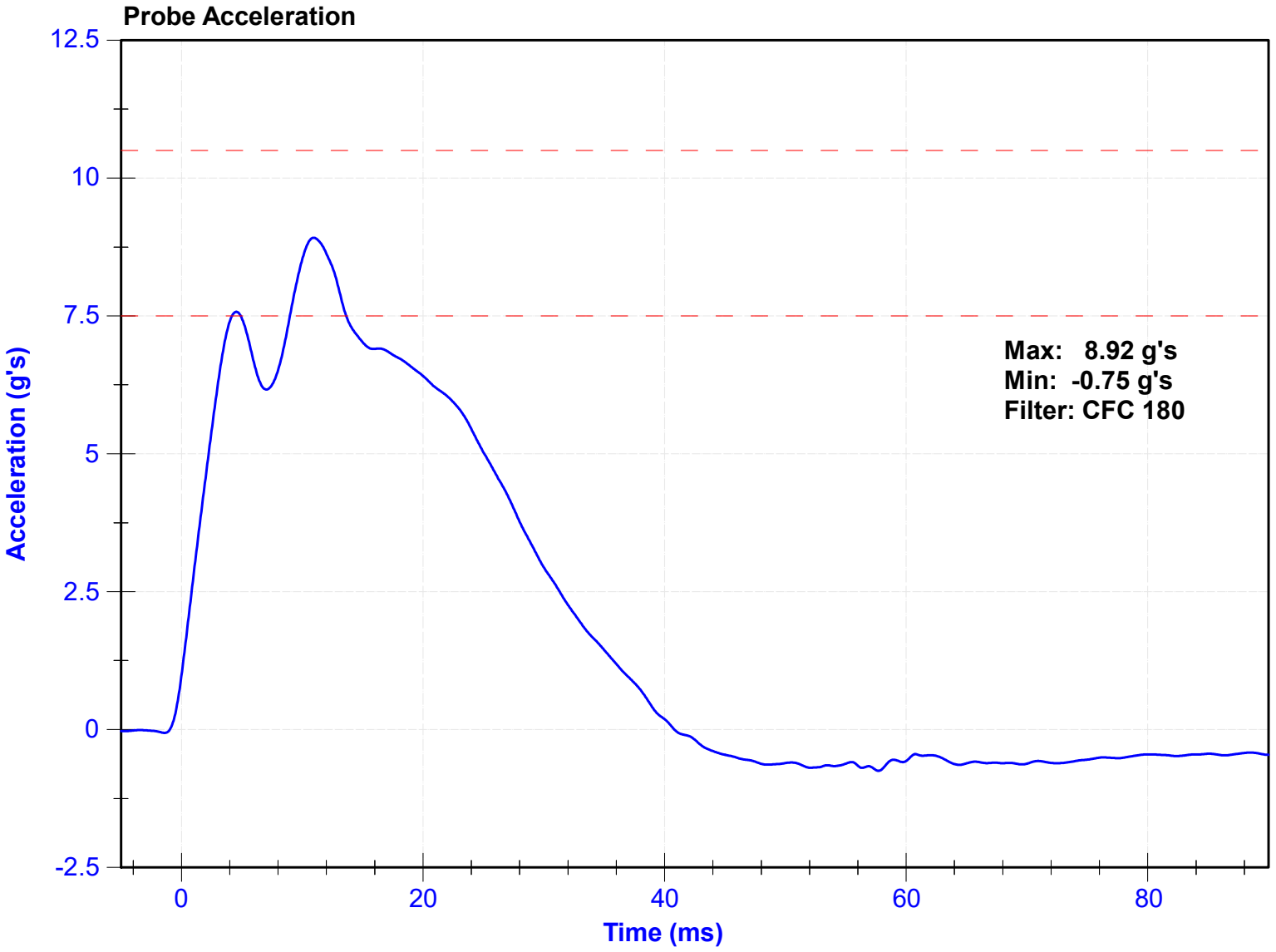
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	7.5	10.5	g's	8.92	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024



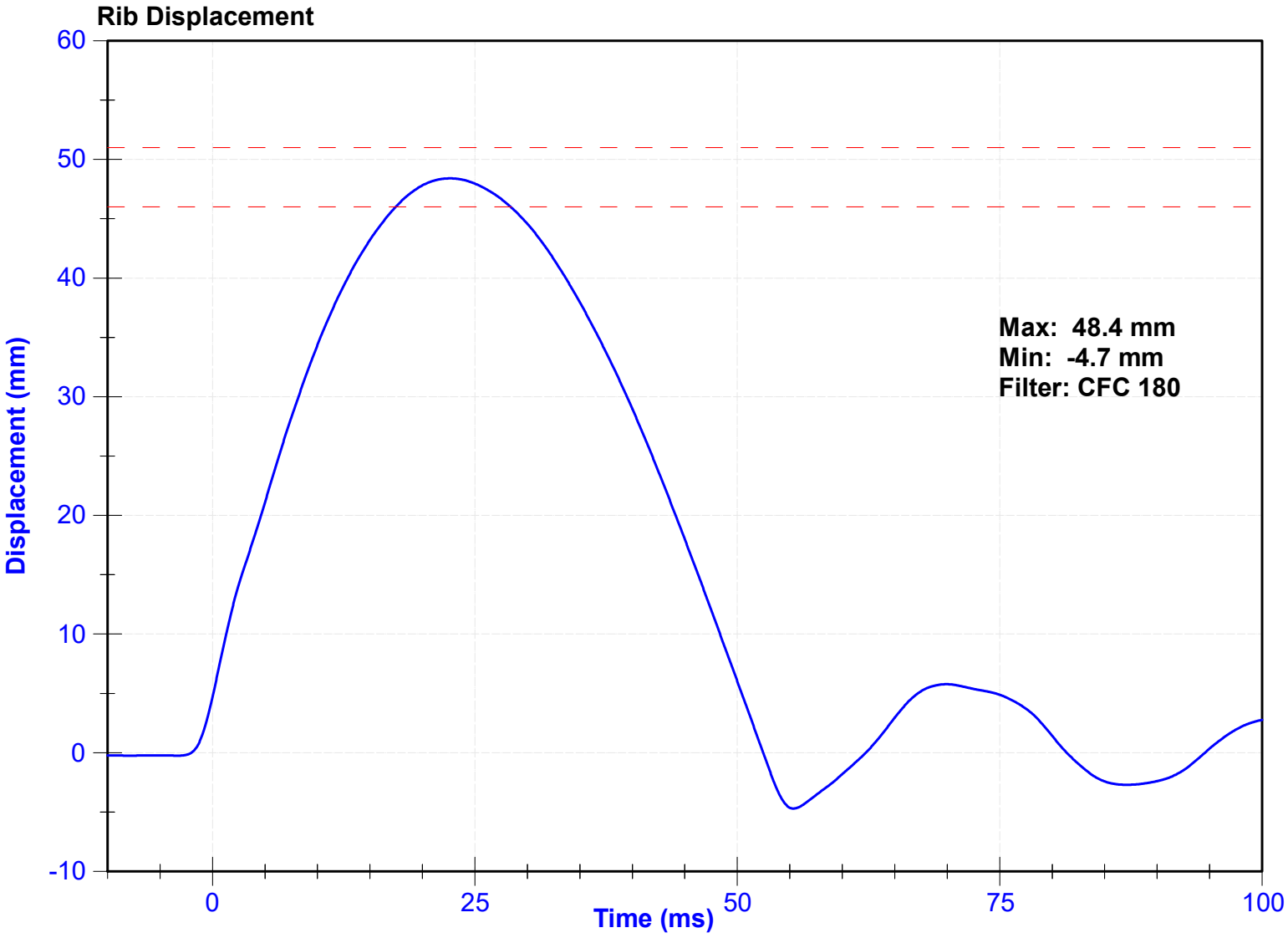
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	46	51	mm	48.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	11/17/2023	5/17/2024



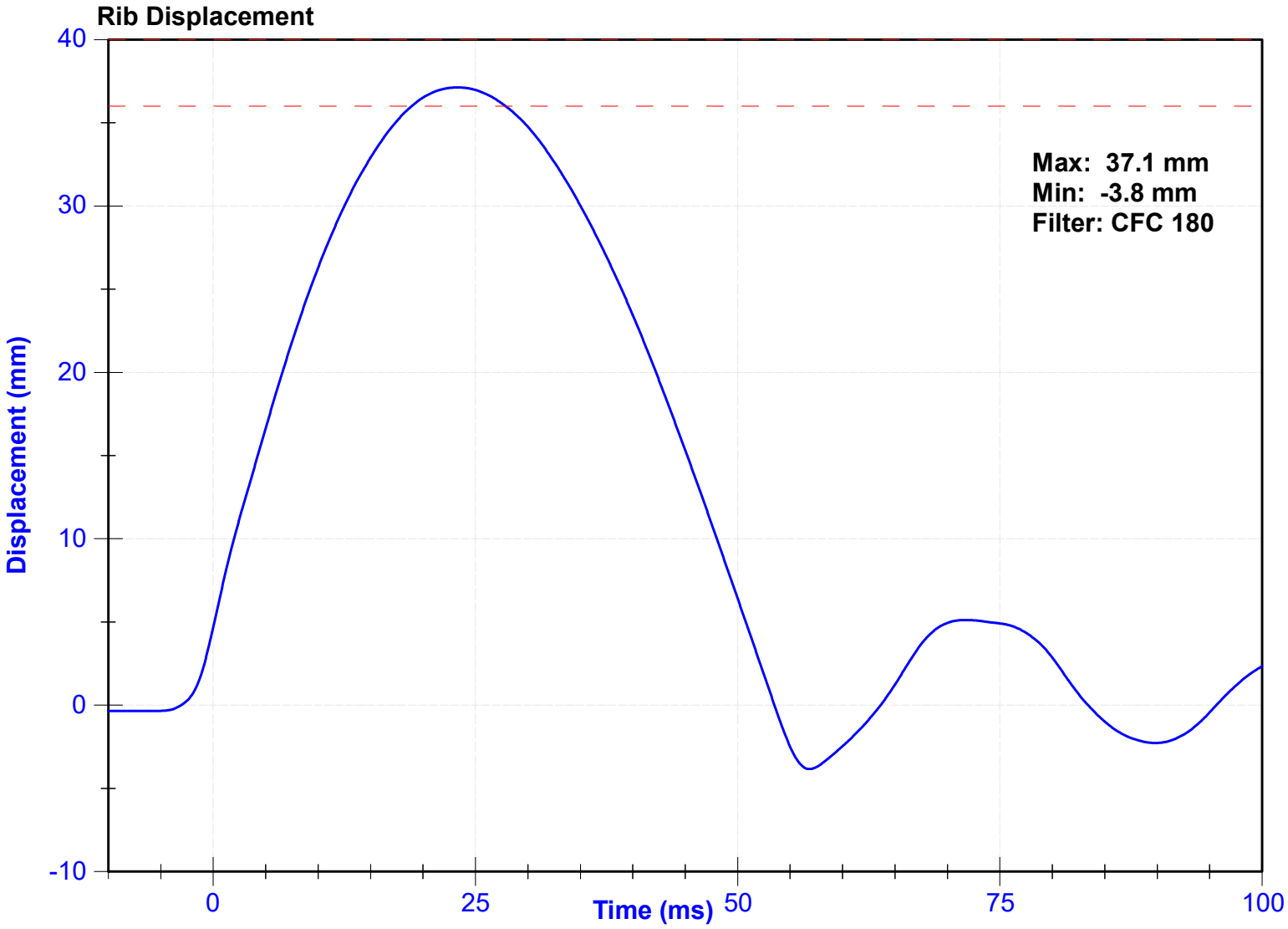
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	36	40	mm	37.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	179GFE	11/17/2023	5/17/2024



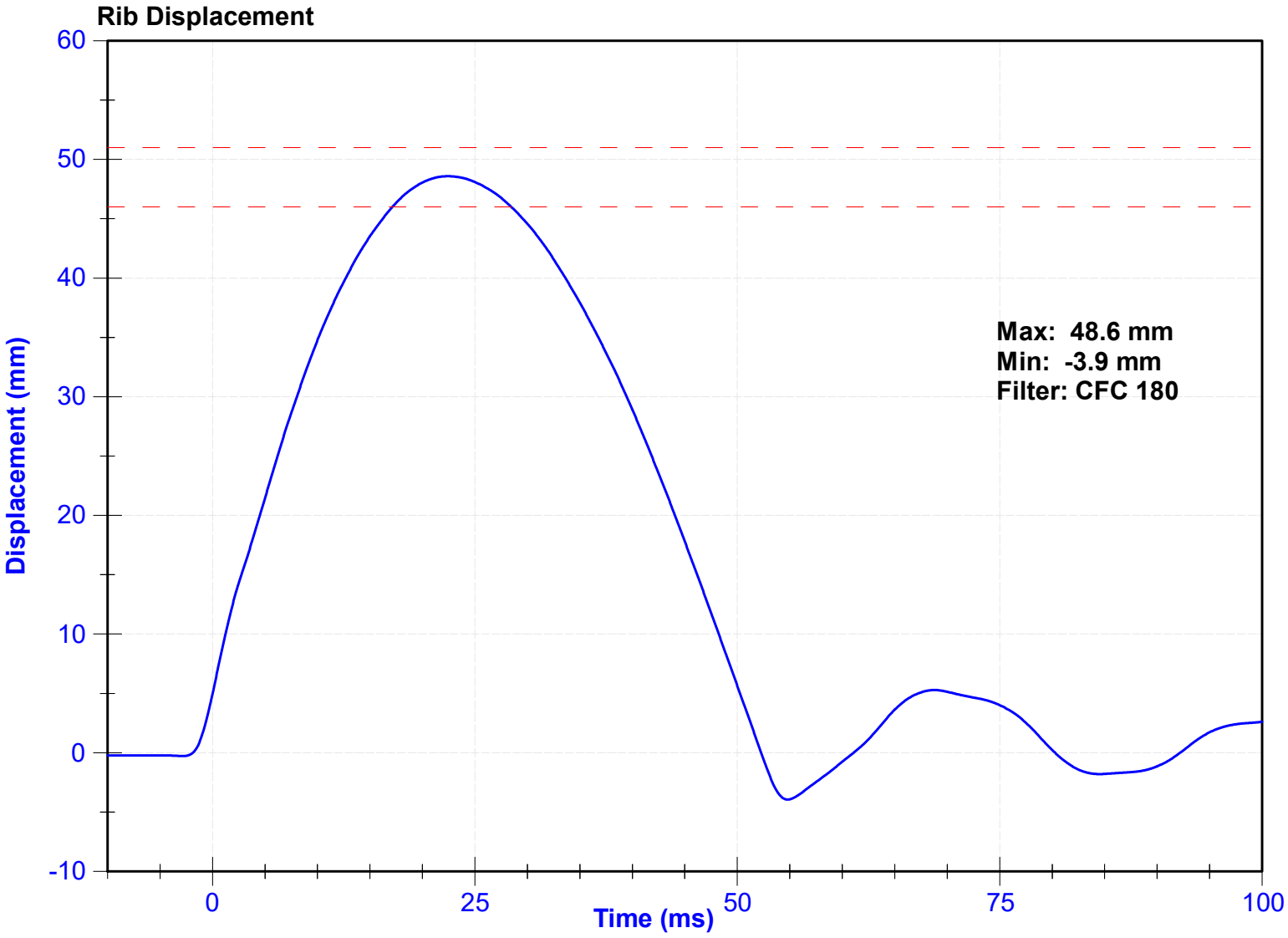
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	46	51	mm	48.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	11/17/2023	5/17/2024



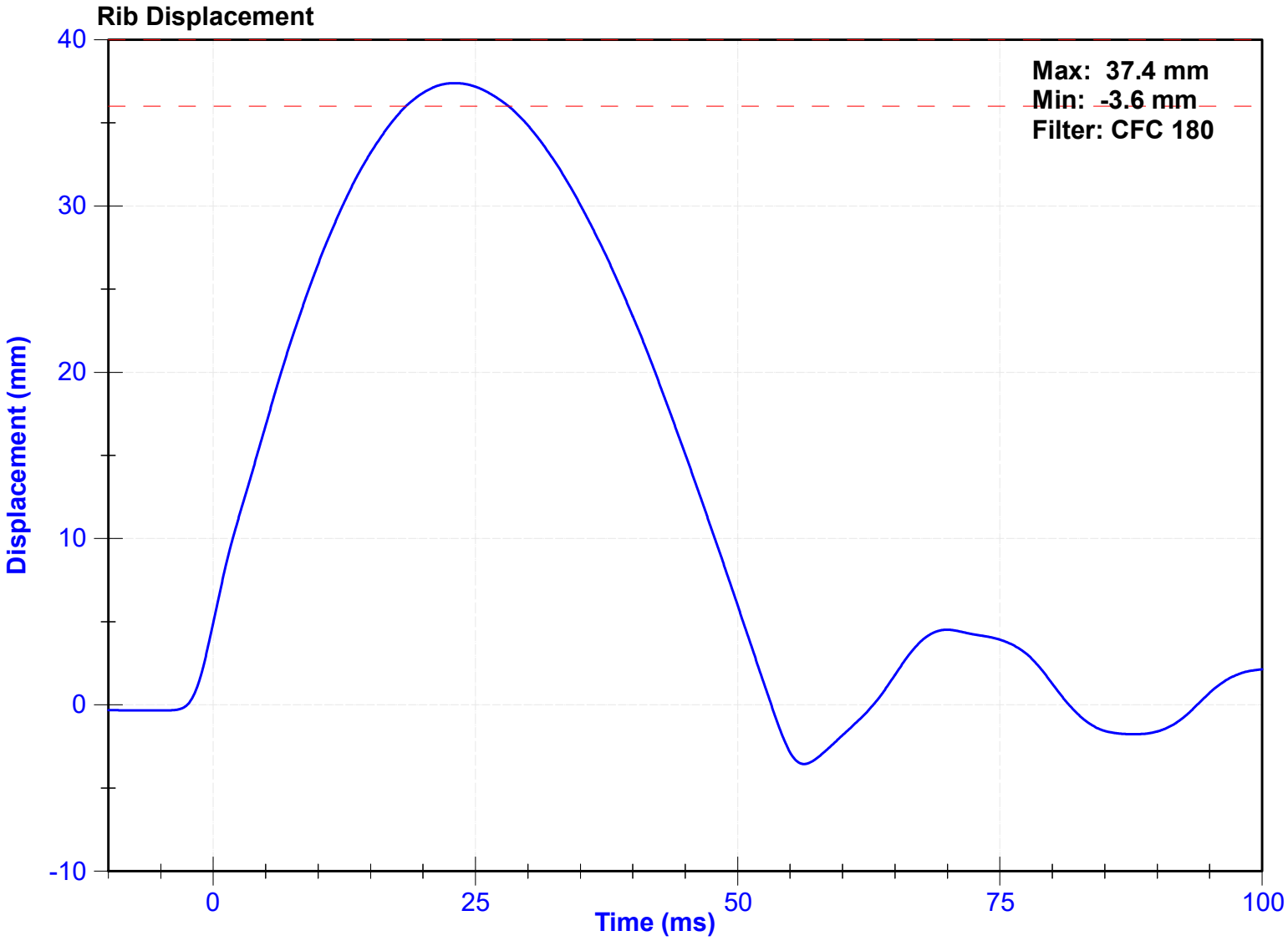
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	36	40	mm	37.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	185GFE	11/17/2023	5/17/2024



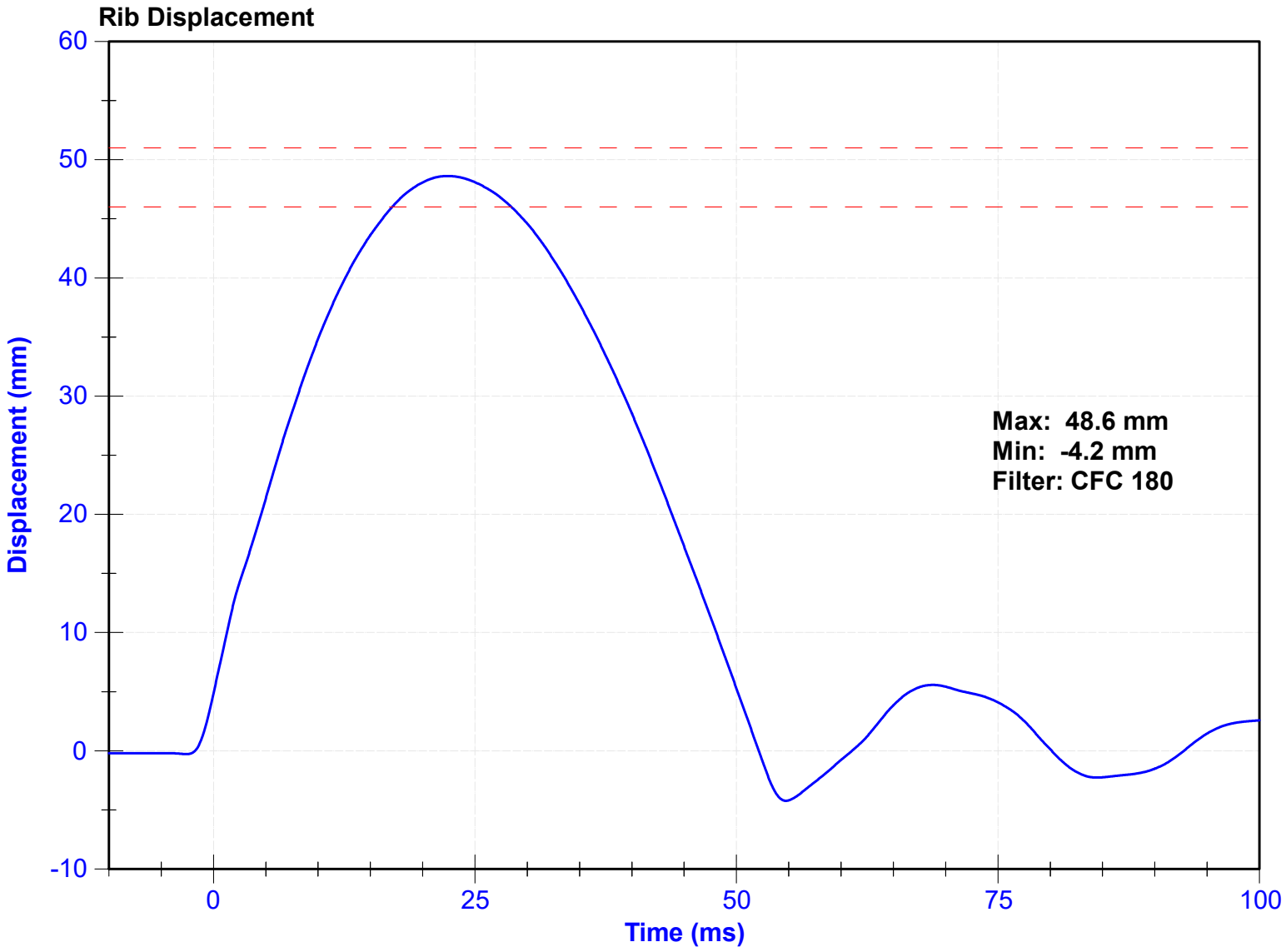
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	46	51	mm	48.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	11/17/2023	5/17/2024



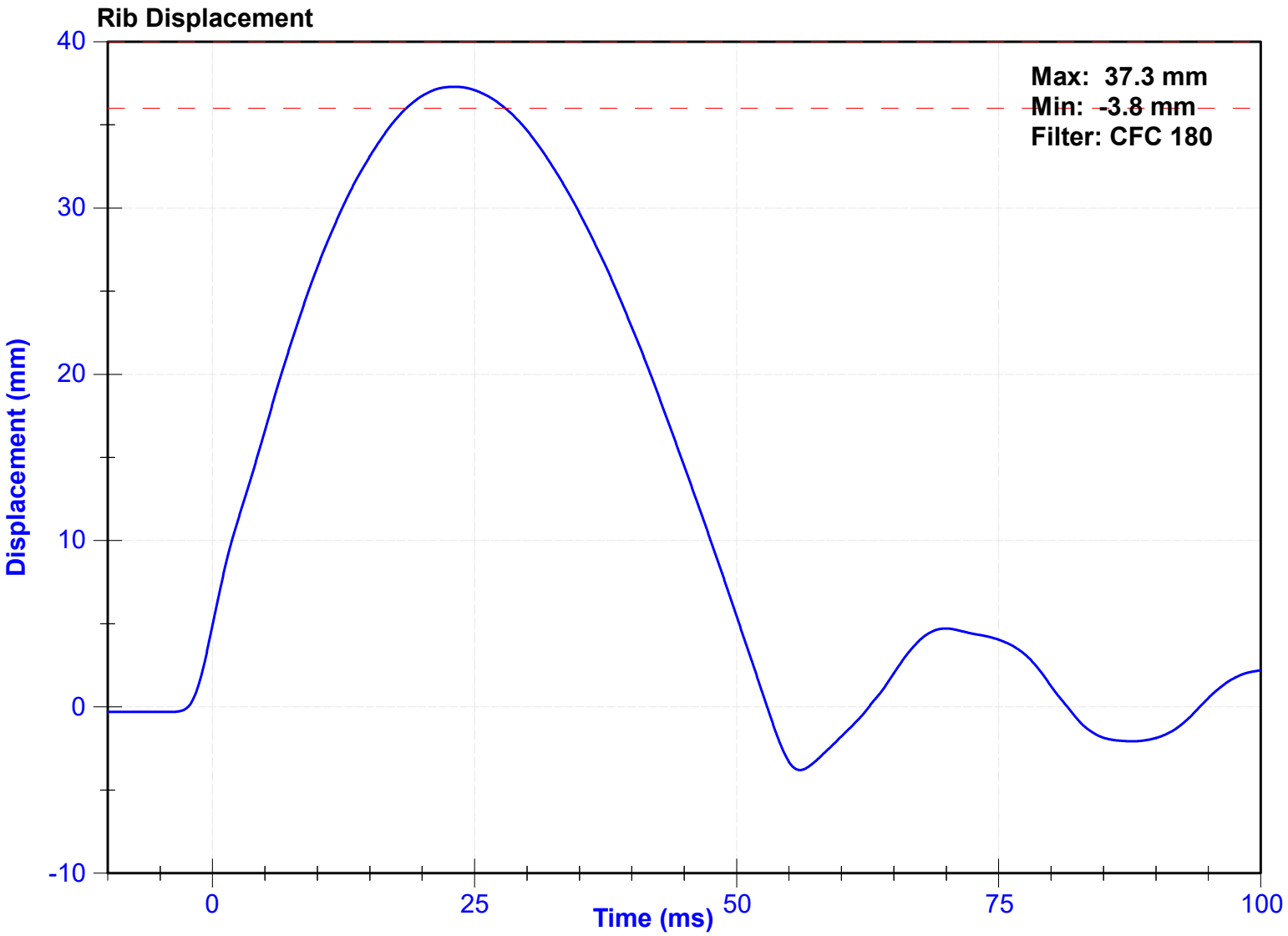
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C.Mantel

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	18.0	Pass
Rib Displacement	36	40	mm	37.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	178GFE	11/17/2023	5/17/2024



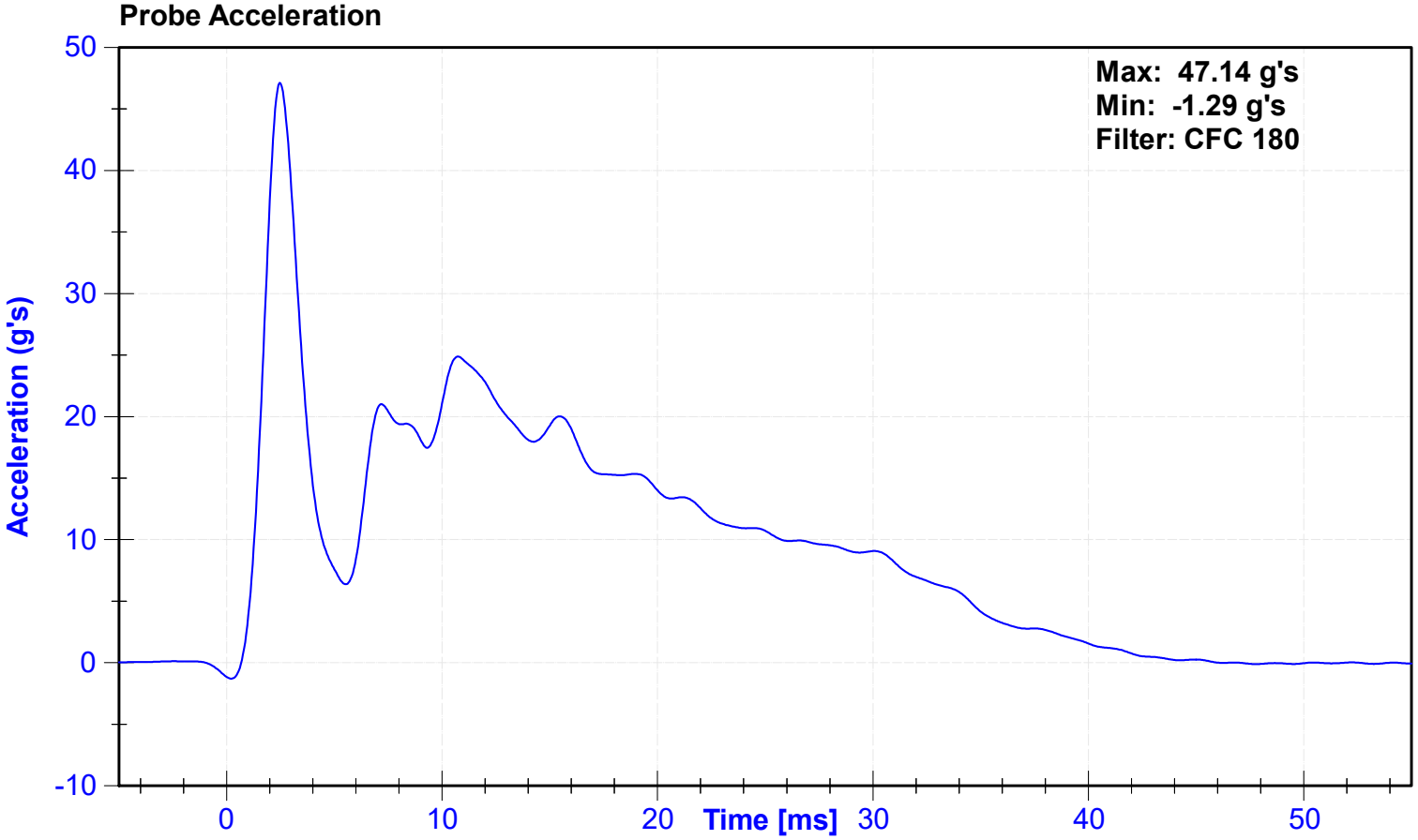
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

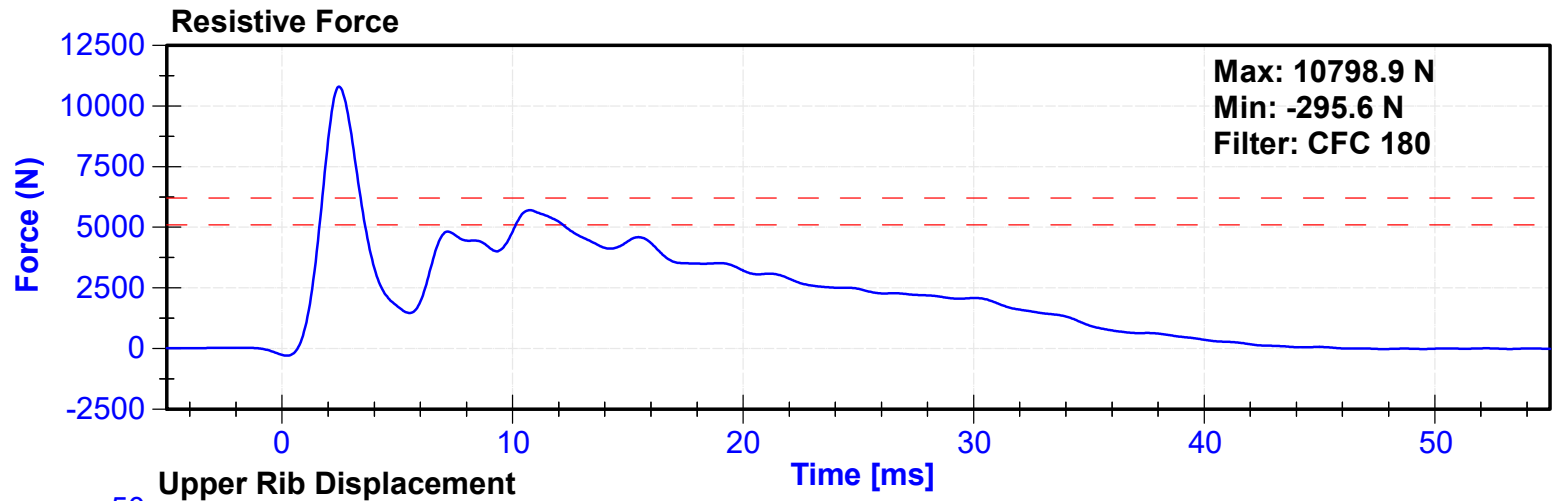
Results

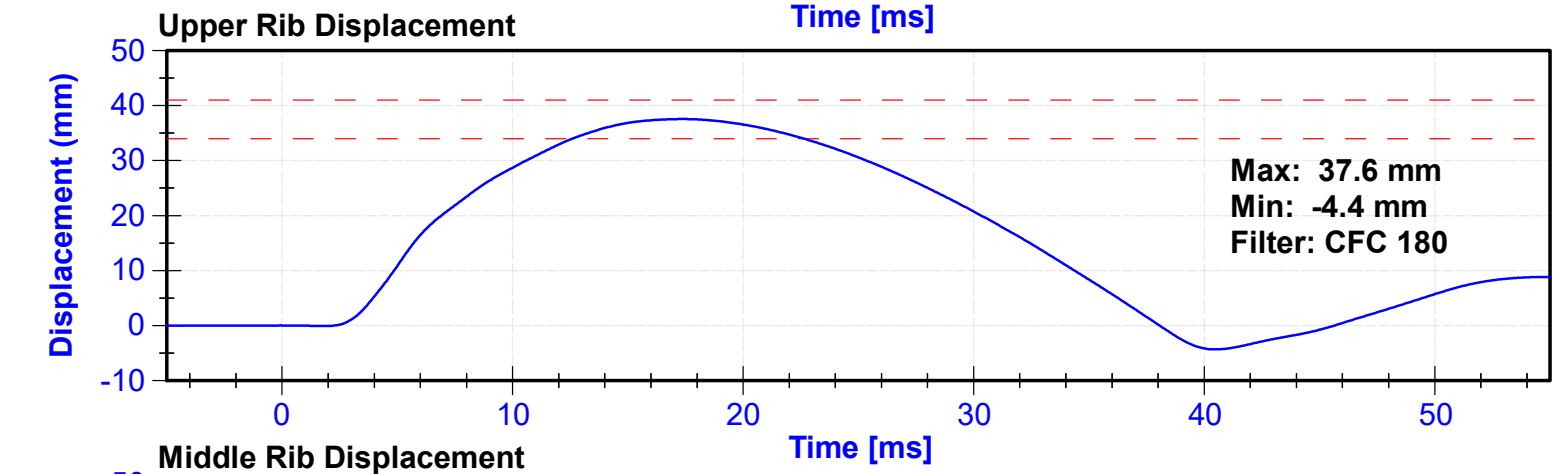
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	27	Pass
Velocity	5.4	5.6	m/s	5.49	Pass
Resistive Force after 6ms	5100	6200	N	5702.5	Pass
Upper Thorax Rib Deflection	34	41	mm	37.6	Pass
Mid Thorax Rib Deflection	37	45	mm	42.6	Pass
Lower Thorax Rib Deflection	37	44	mm	42.1	Pass

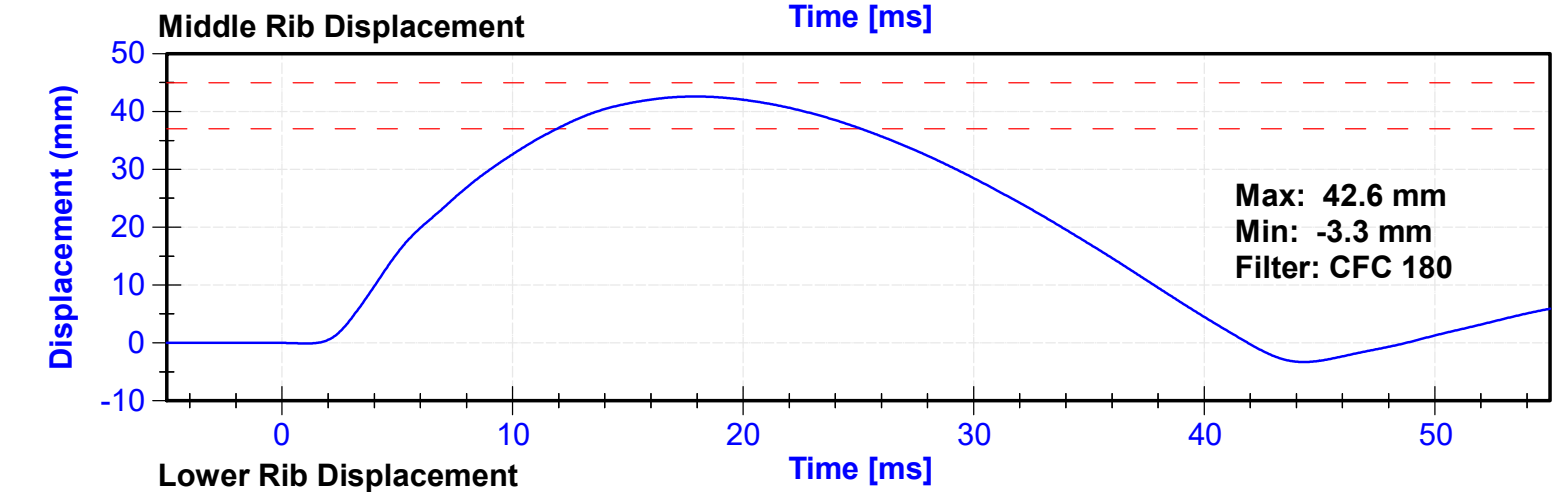
Transducer Calibrations

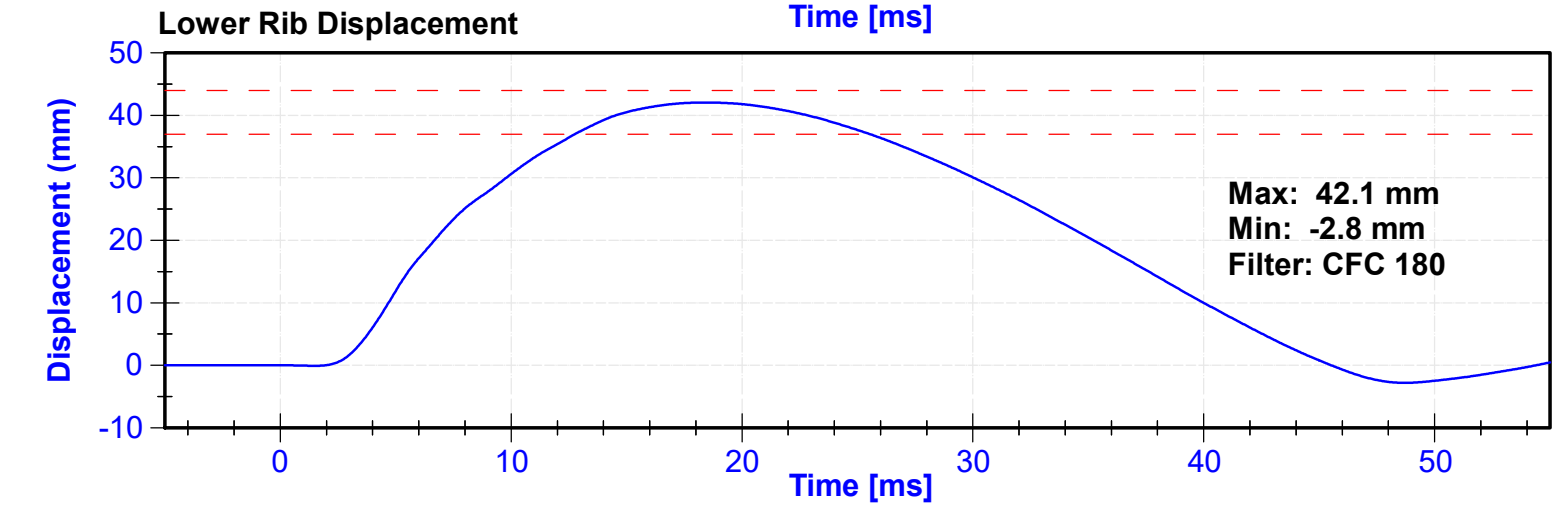
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Thorax Rib Potentiometer	Honeywell	179GFE	11/17/2023	5/17/2024
Middle Thorax Rib Potentiometer	Honeywell	185GFE	11/17/2023	5/17/2024
Lower Thorax Rib Potentiometer	Honeywell	178GFE	11/17/2023	5/17/2024




Resistive Force
Max: 10798.9 N
Min: -295.6 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: 37.6 mm
Min: -4.4 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: 42.6 mm
Min: -3.3 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: 42.1 mm
Min: -2.8 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]

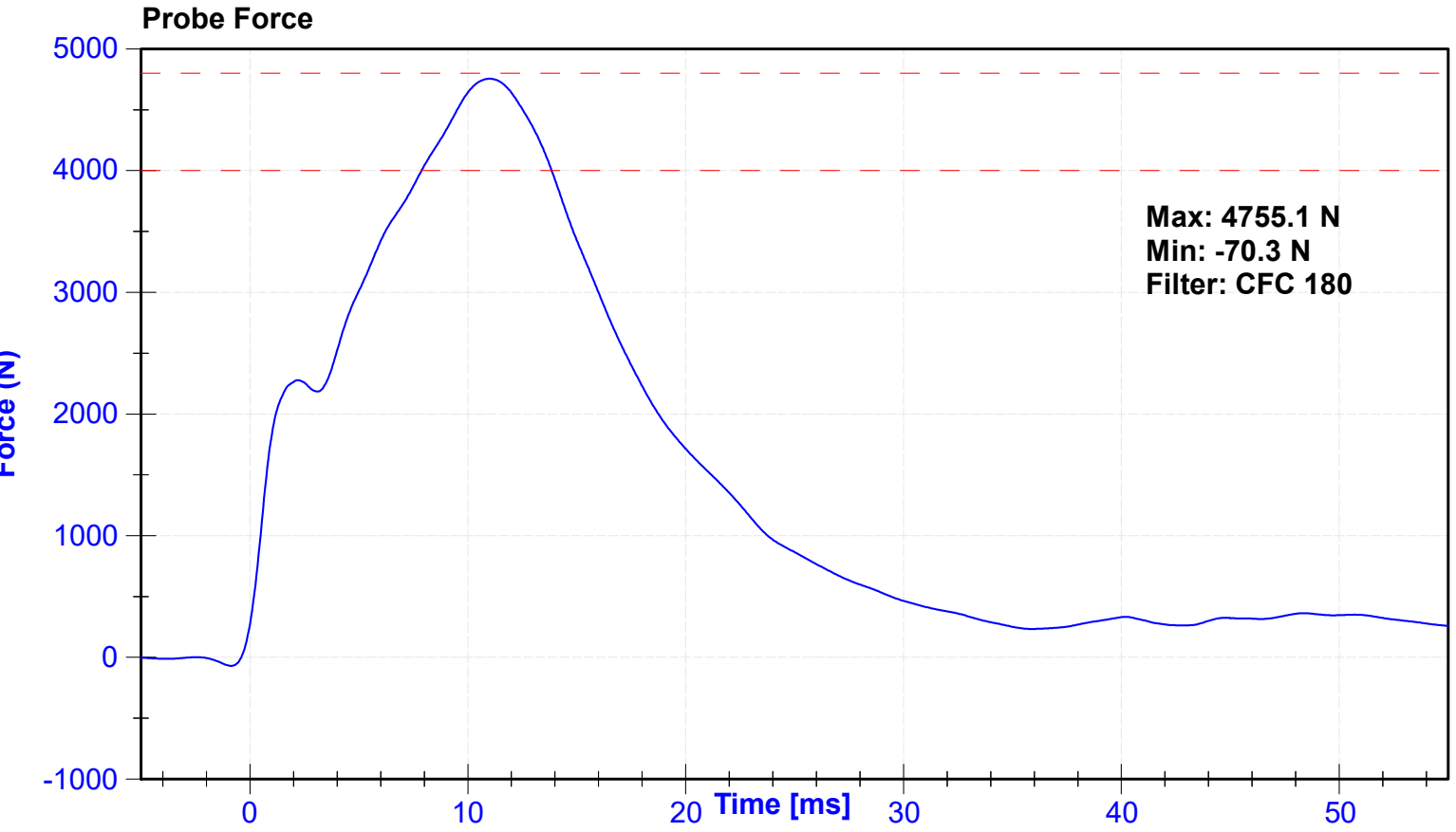
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

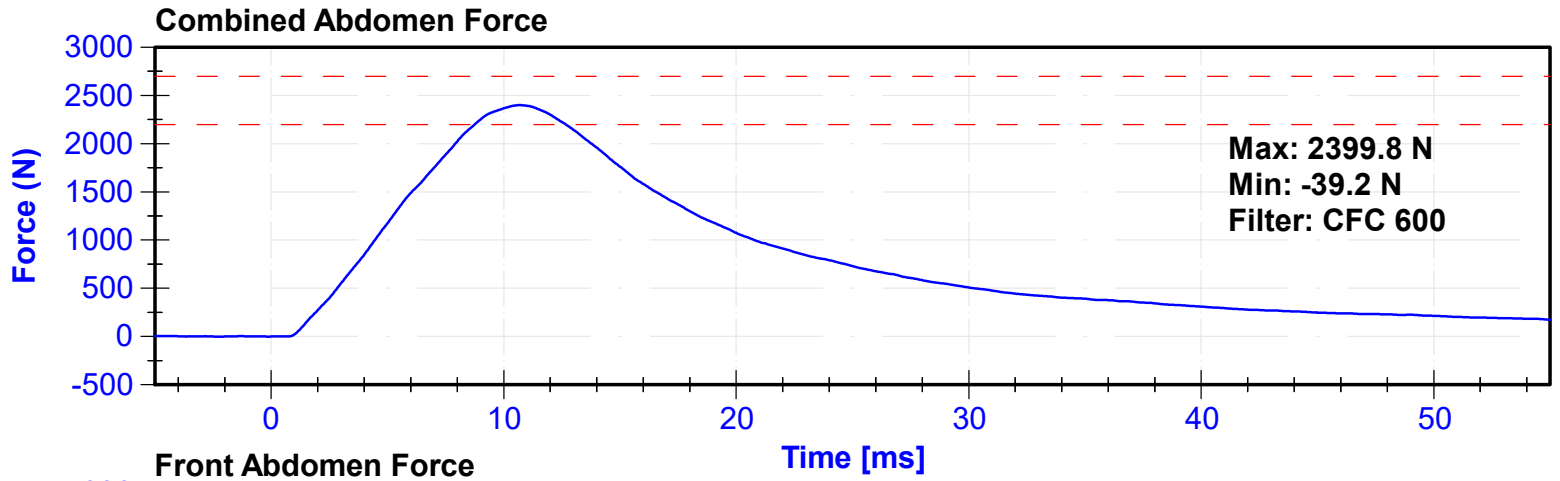
Results

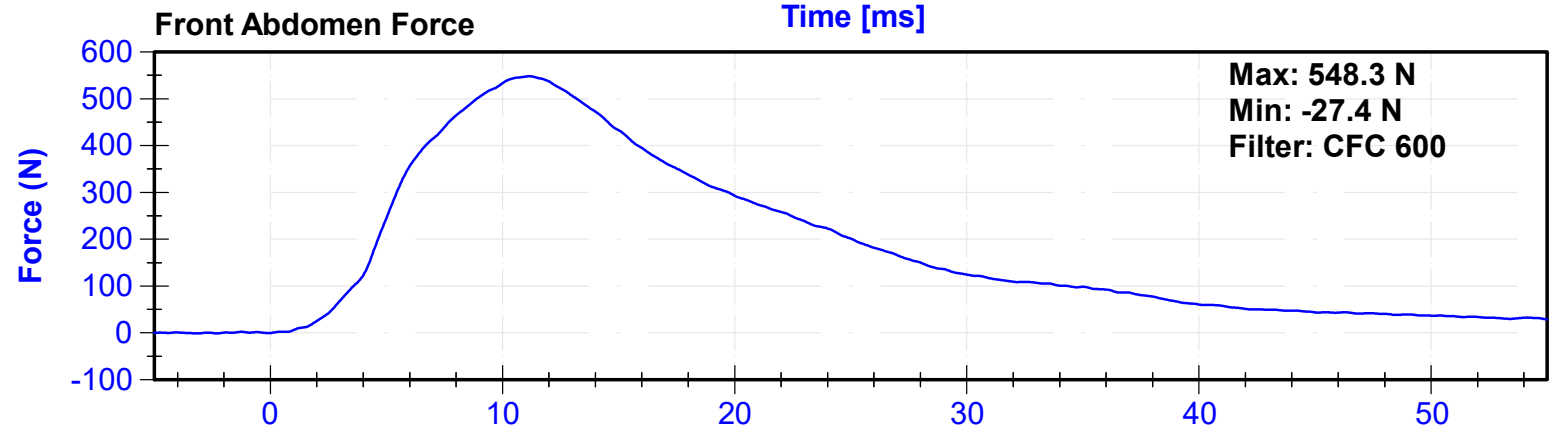
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	27	Pass
Velocity	3.9	4.1	m/s	3.99	Pass
Combined Abdomen Force	2200	2700	N	2399.8	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.65	Pass
Resistive Probe Force	4000	4800	N	4755.1	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.00	Pass

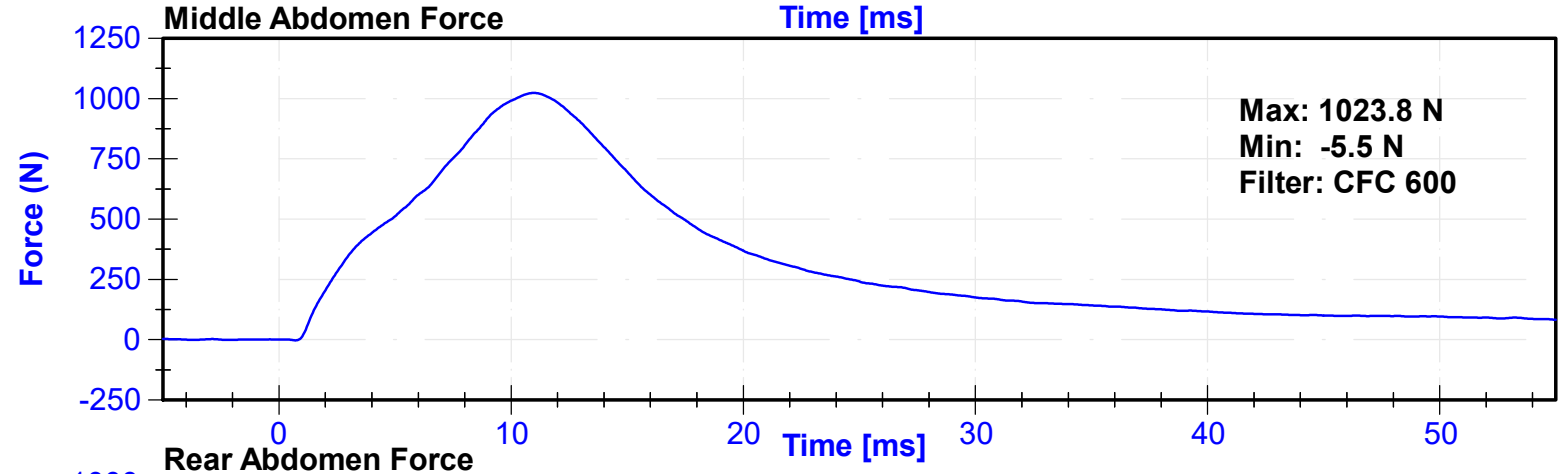
Transducer Calibrations

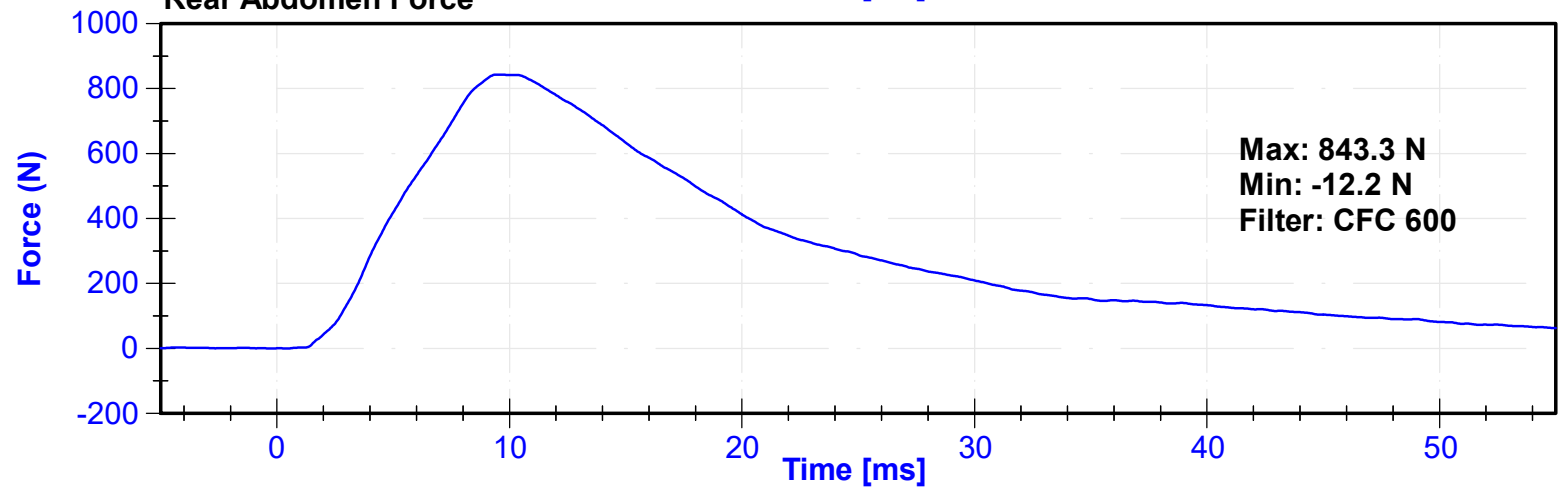
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Front Abdomen Load Cell	Denton	DM5846	5/18/2023	5/17/2024
Middle Abdomen Load Cell	Denton	1529	5/18/2023	5/17/2024
Rear Abdomen Load Cell	Denton	1533	5/18/2023	5/17/2024




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2399.8 N
Min: -39.2 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 548.3 N
Min: -27.4 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1023.8 N
Min: -5.5 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 843.3 N
Min: -12.2 N
Filter: CFC 600

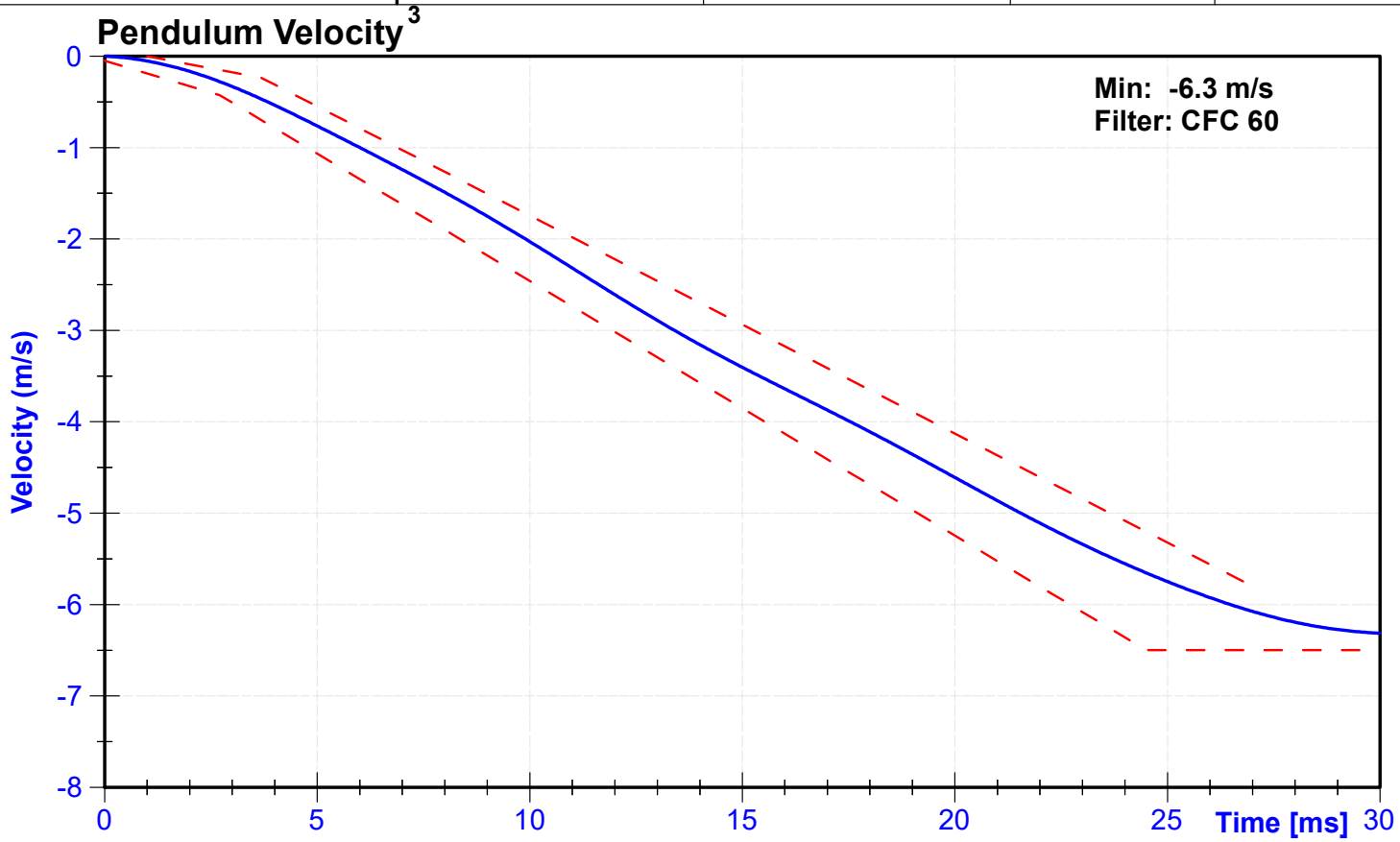
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

Results

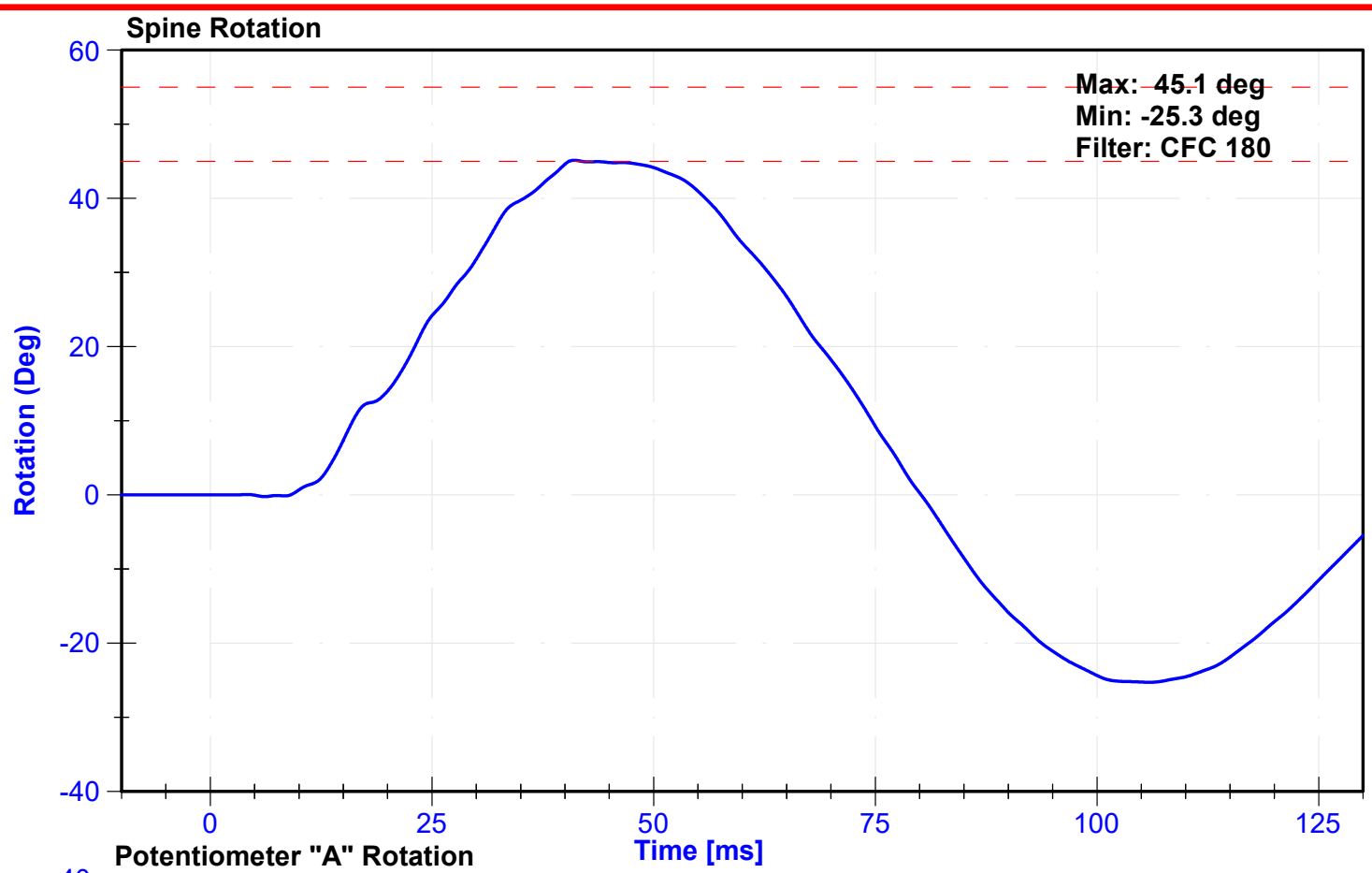
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	37	Pass
Velocity	5.95	6.15	m/s	6.051	Pass
Lateral Spine Rotation	45	55	deg	45.1	Pass
Time at Maximum Rotation	39	53	ms	41.0	Pass
Time of Decay to Zero Degrees	37	57	ms	39.2	Pass
Pendulum Velocity Overall Corridor	Lower Boundary[1]	Upper Boundary[2]	m/s	See Plot[3]	Pass

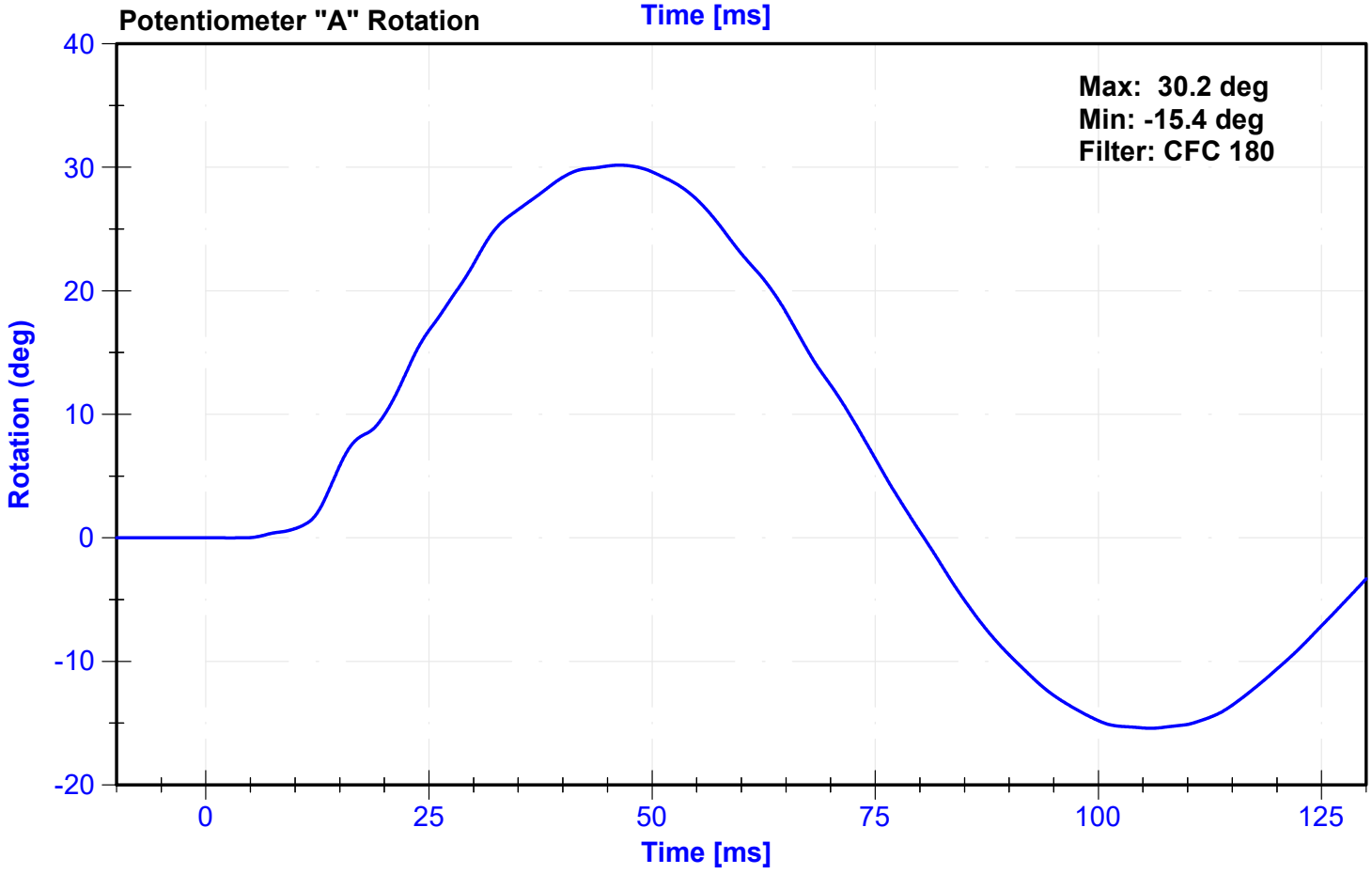
Transducer Calibrations

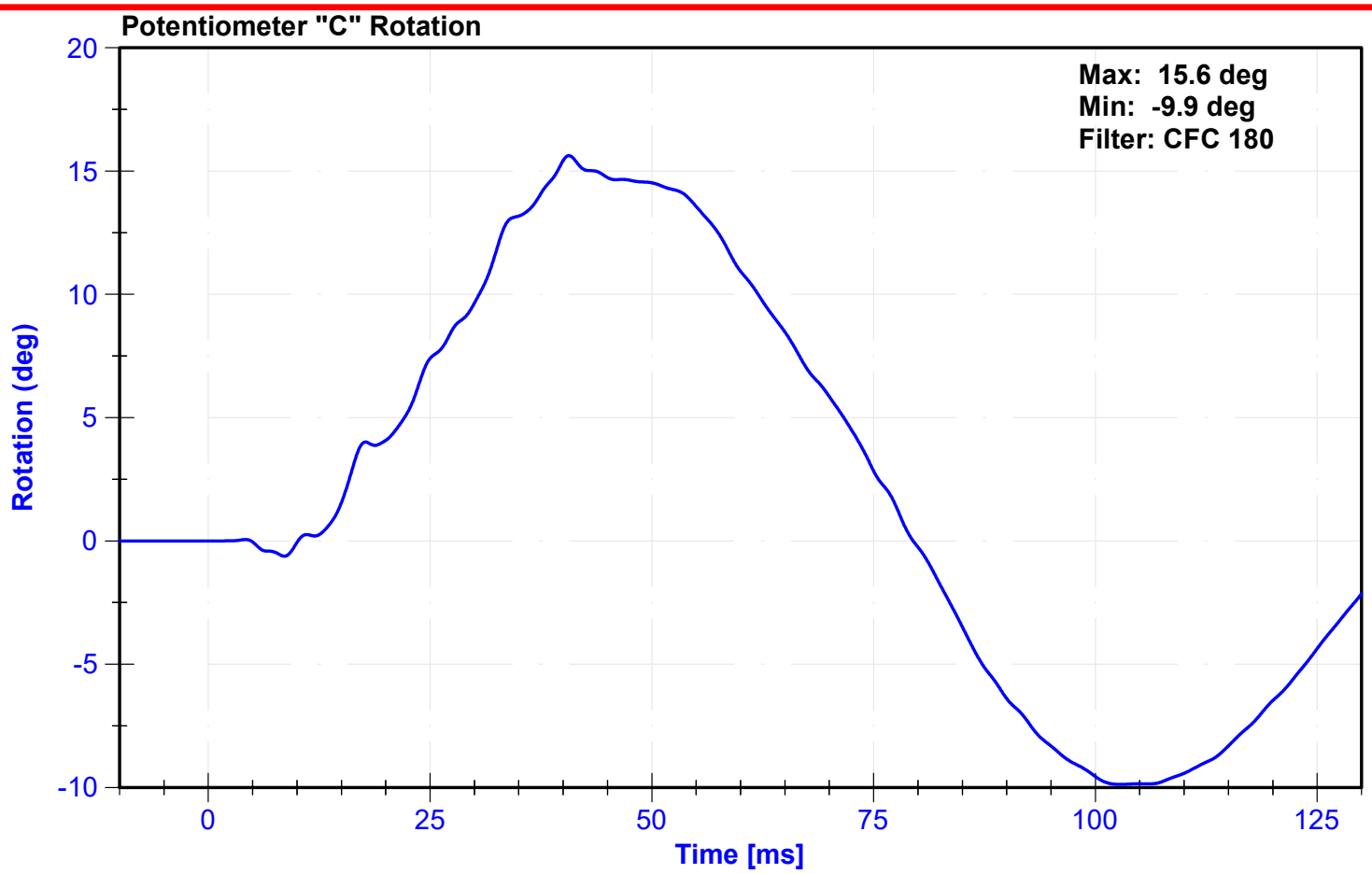
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/31/2023	4/28/2024
Pendulum "A" Potentiometer	Sfernice	2247	12/5/2023	12/4/2024
Condyle "B" Potentiometer	Sfernice	095	9/29/2023	9/28/2024



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


Spine Rotation
Max: 45.1 deg
Min: -25.3 deg
Filter: CFC 180
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 30.2 deg
Min: -15.4 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

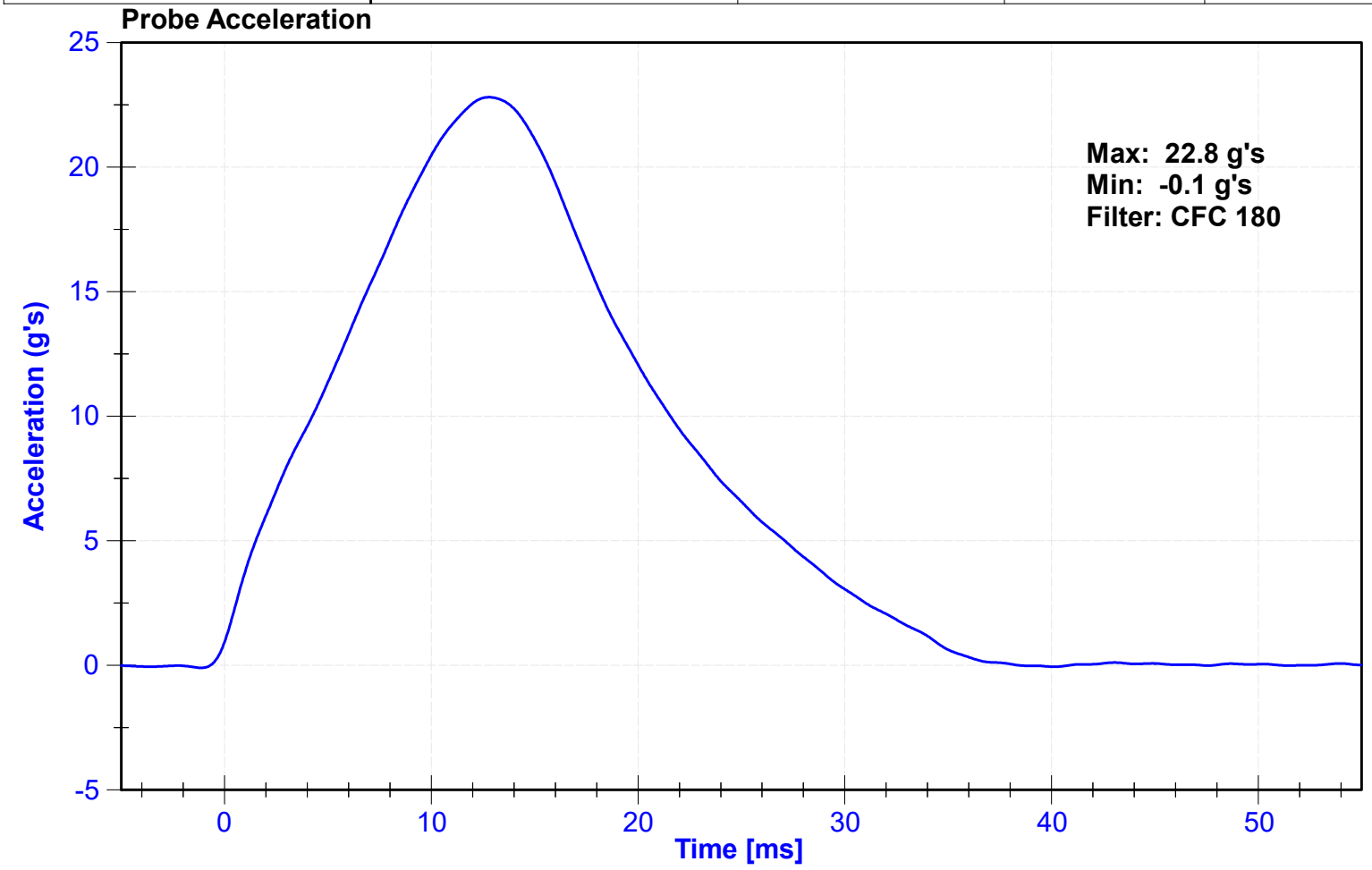
ATD Manufacturer	FTSS	Test Technician	J.Kinderman
ATD Serial Number	F033	Laboratory Supervisor	C. Mantell

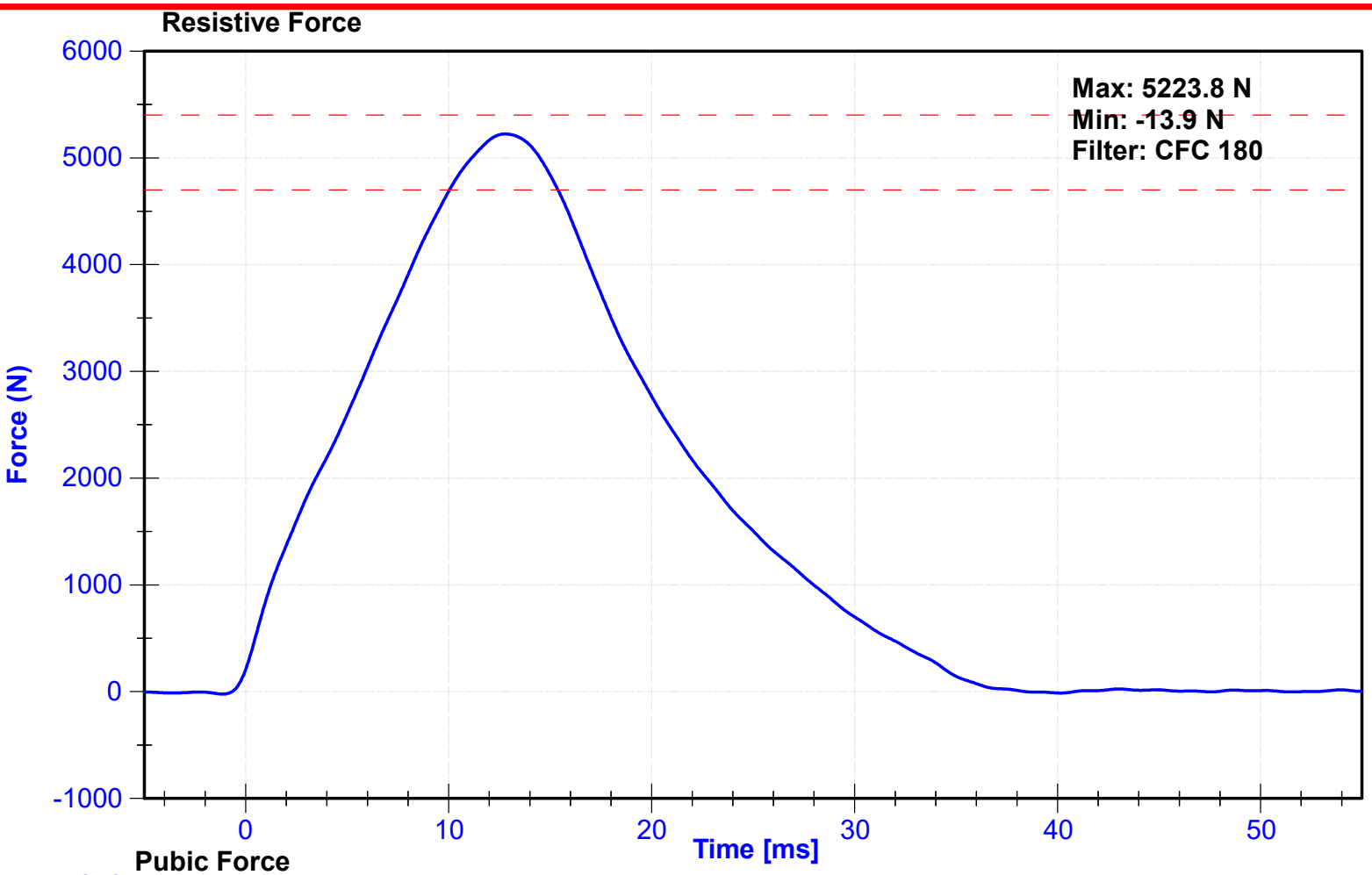
Results

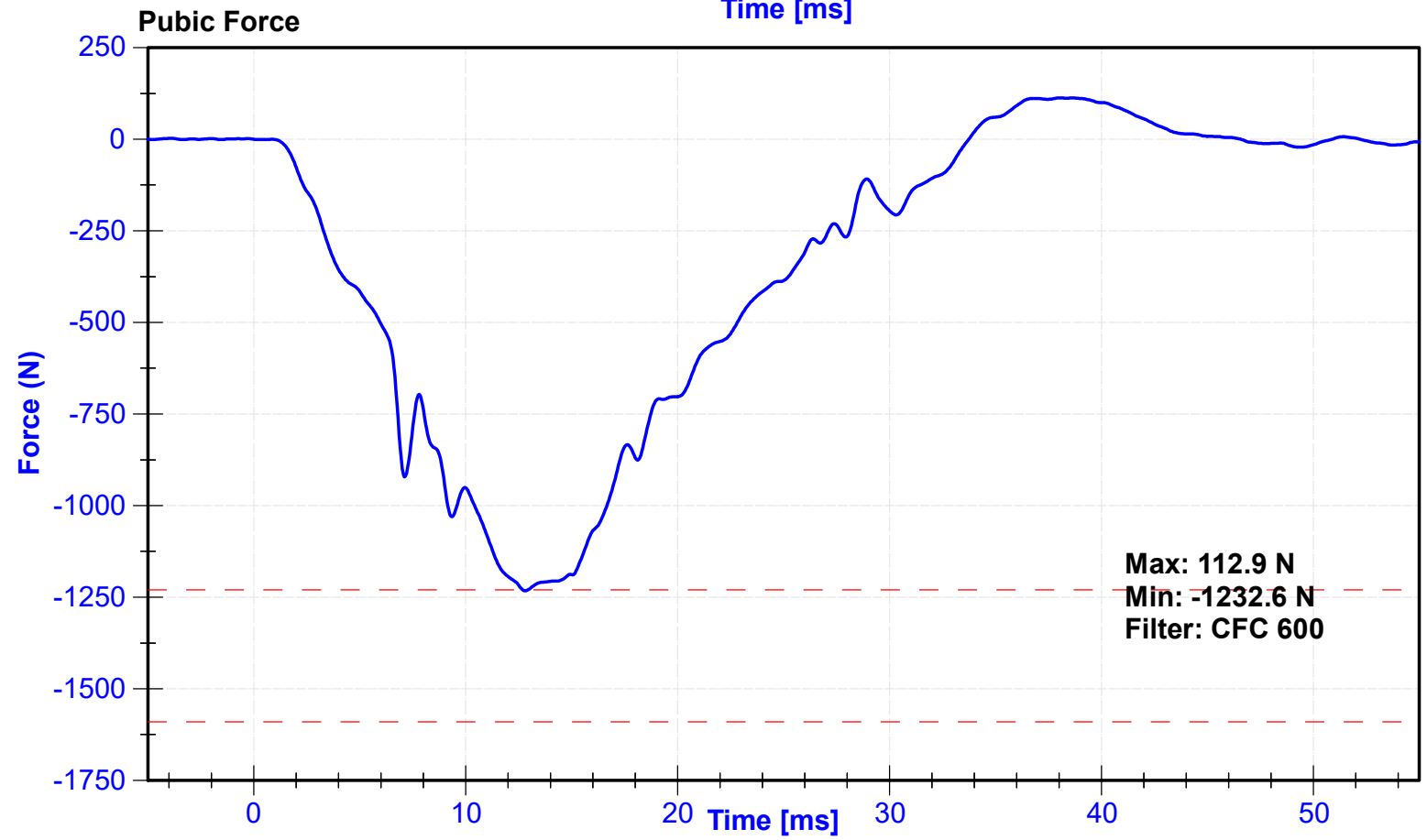
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Resistive Force	4700	5400	N	5223.8	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.80	Pass
Pubic Force	-1590	-1230	N	-1232.6	Pass
Time at Peak Pubic Force	12.2	17.0	ms	12.80	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pubic Load Cell	Denton	459-FY	6/20/2023	6/19/2024




Resistive Force
Max: 5223.8 N
Min: -13.9 N
Filter: CFC 180
Force (N)
Time [ms]
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50


Pubic Force
Max: 112.9 N
Min: -1232.6 N
Filter: CFC 600
Force (N)
Time [ms]
250
0
-250
-500
-750
-1000
-1250
-1500
-1750
0
10
20
30
40
50

CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE – PASSENGER ATD

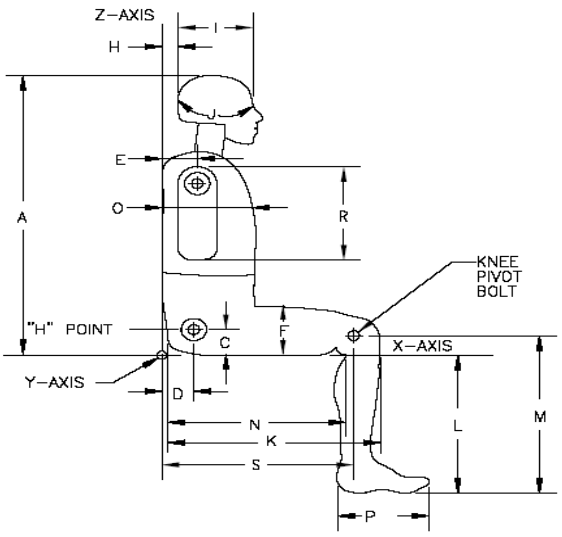
SERIAL NO:DG8012

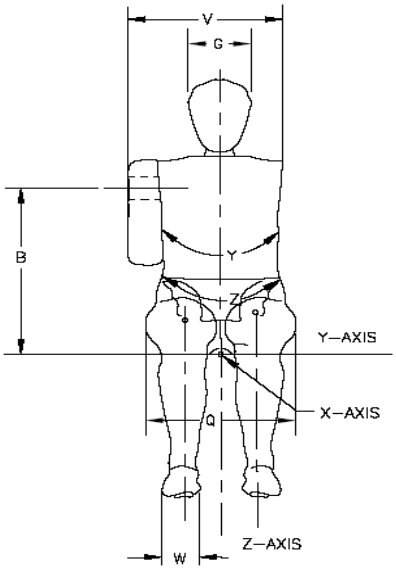
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Brogan Date: 03/15/2024

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	84	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	105	Pass
F	Thigh Clearance	119	135	129	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	546	Pass
K	Buttock to Knee Length	514	540	530	Pass
L	Popliteal Height	343	369	362	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	438	Pass
O	Chest Depth w/o jacket	195	211	204	Pass
P	Foot Length	216	232	220	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	354	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	869	Pass
Z	Waist Circumference	761	791	781	Pass

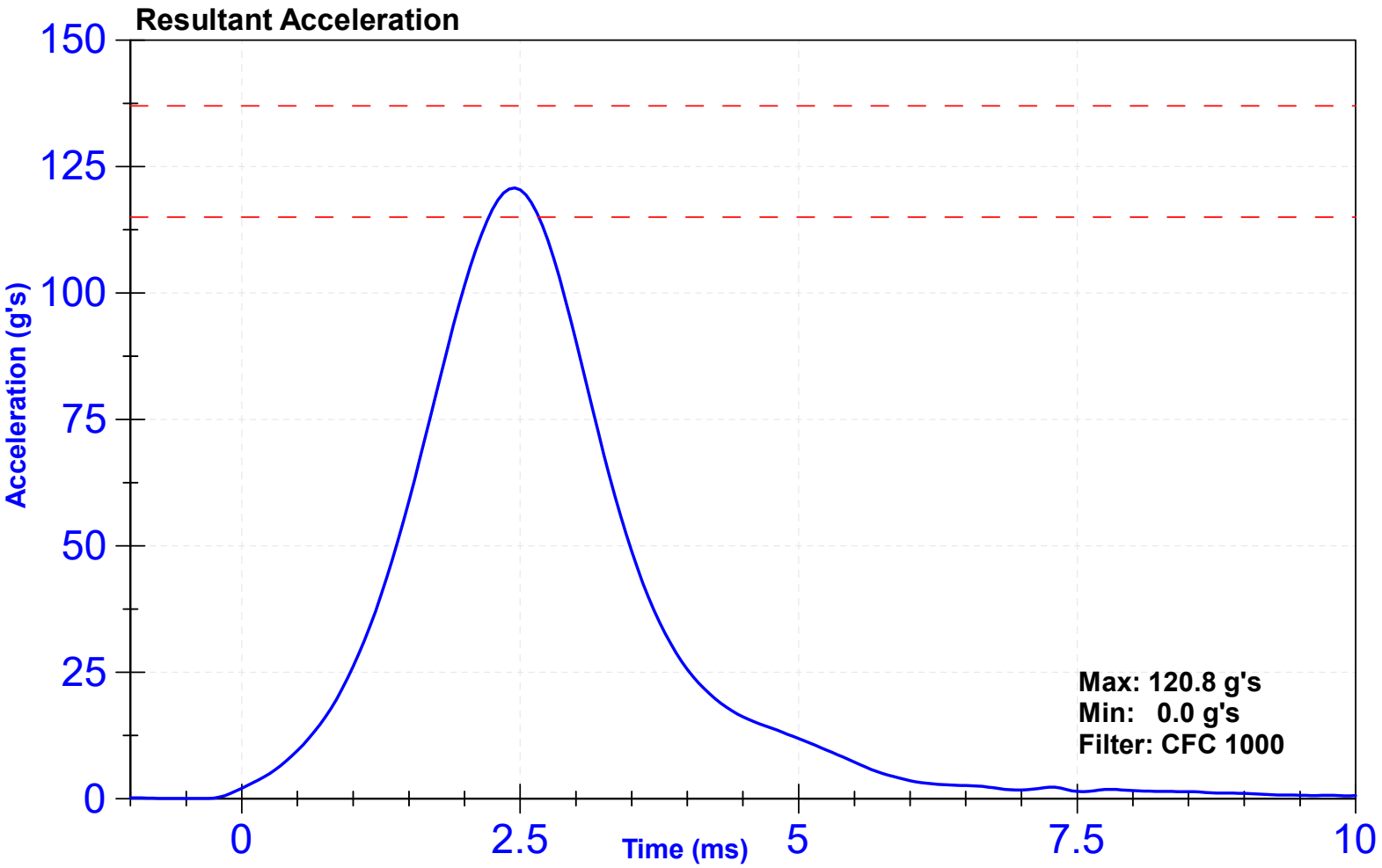
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

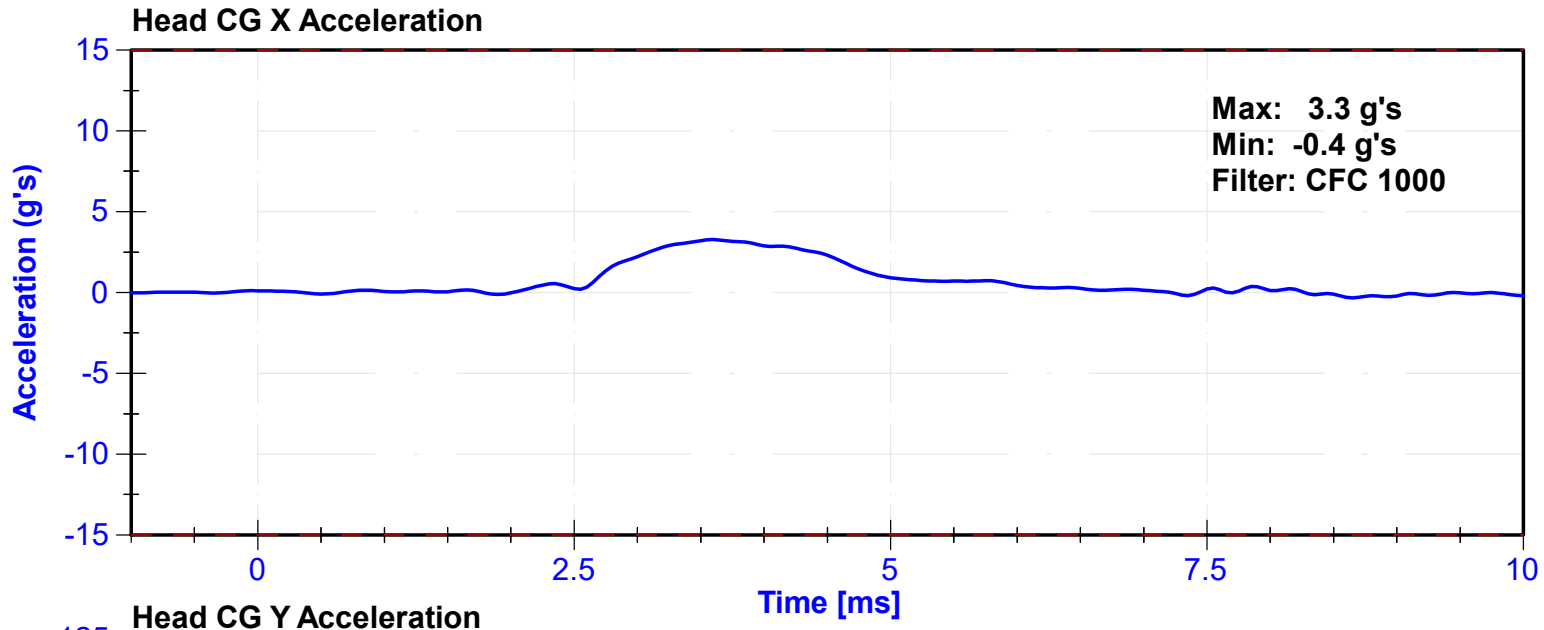
Results

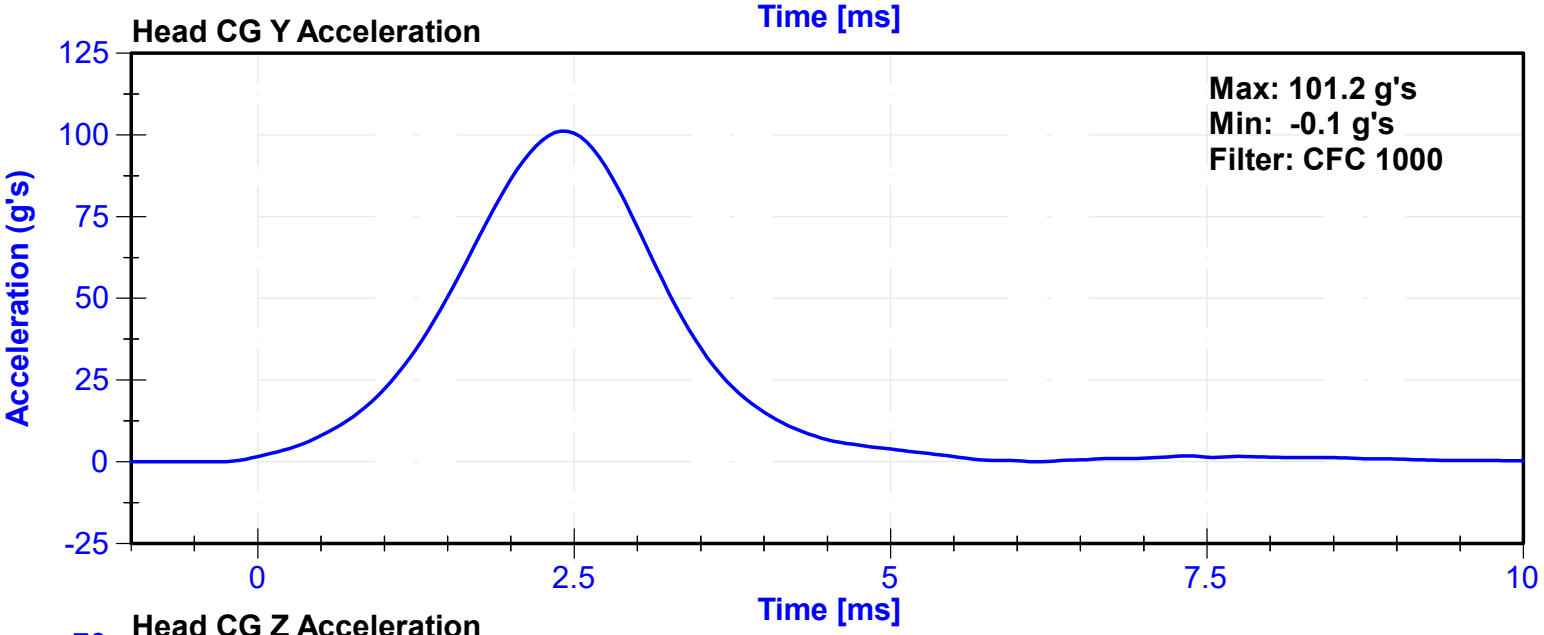
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21	Pass
Humidity	10	70	%	29	Pass
Resultant Acceleration	115	137	g's	120.8	Pass
Oscillation	0	15	%	1.8	Pass
Fore-Aft Acceleration	-15	15	g's	3.3	Pass

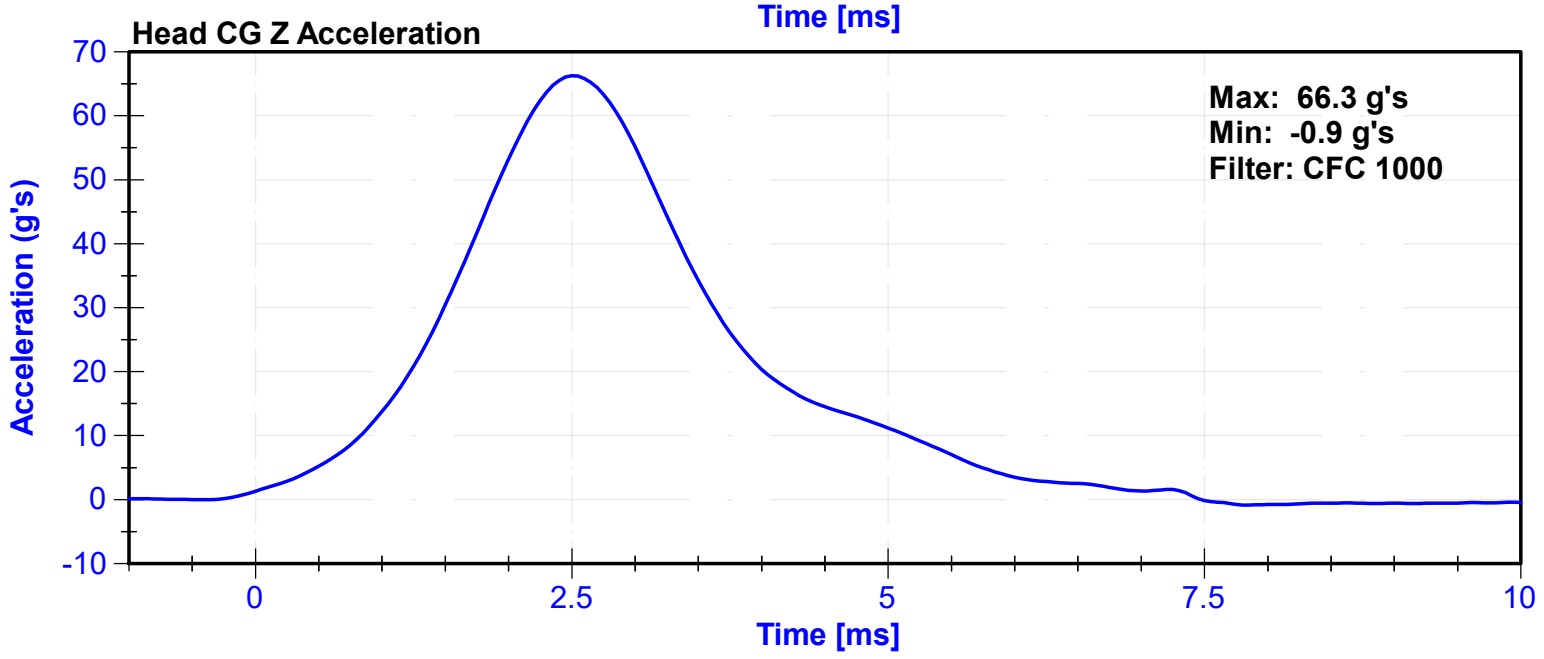
Transducer Calibrations

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




Head CG X Acceleration
Max: 3.3 g's
Min: -0.4 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Y Acceleration
Max: 101.2 g's
Min: -0.1 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Z Acceleration
Max: 66.3 g's
Min: -0.9 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]

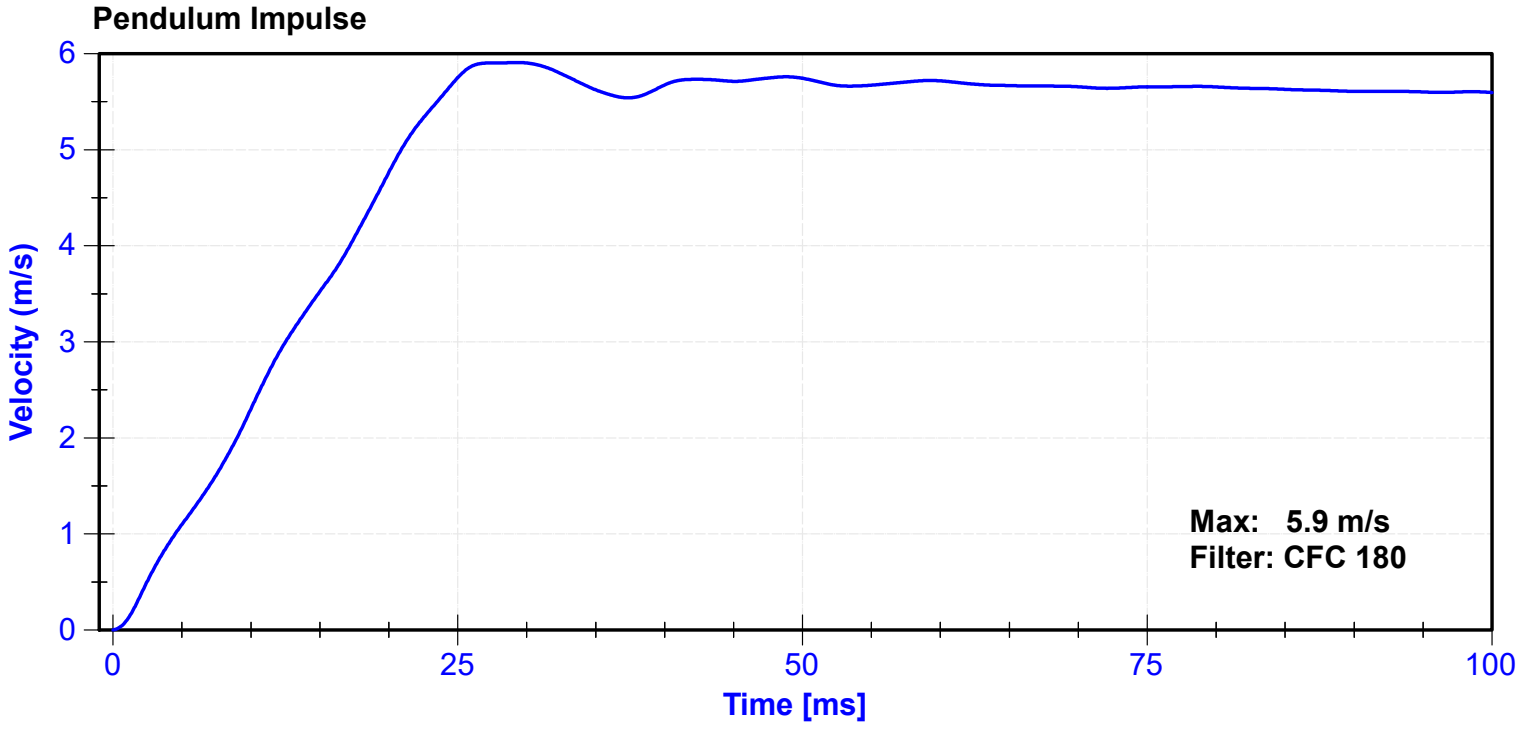
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

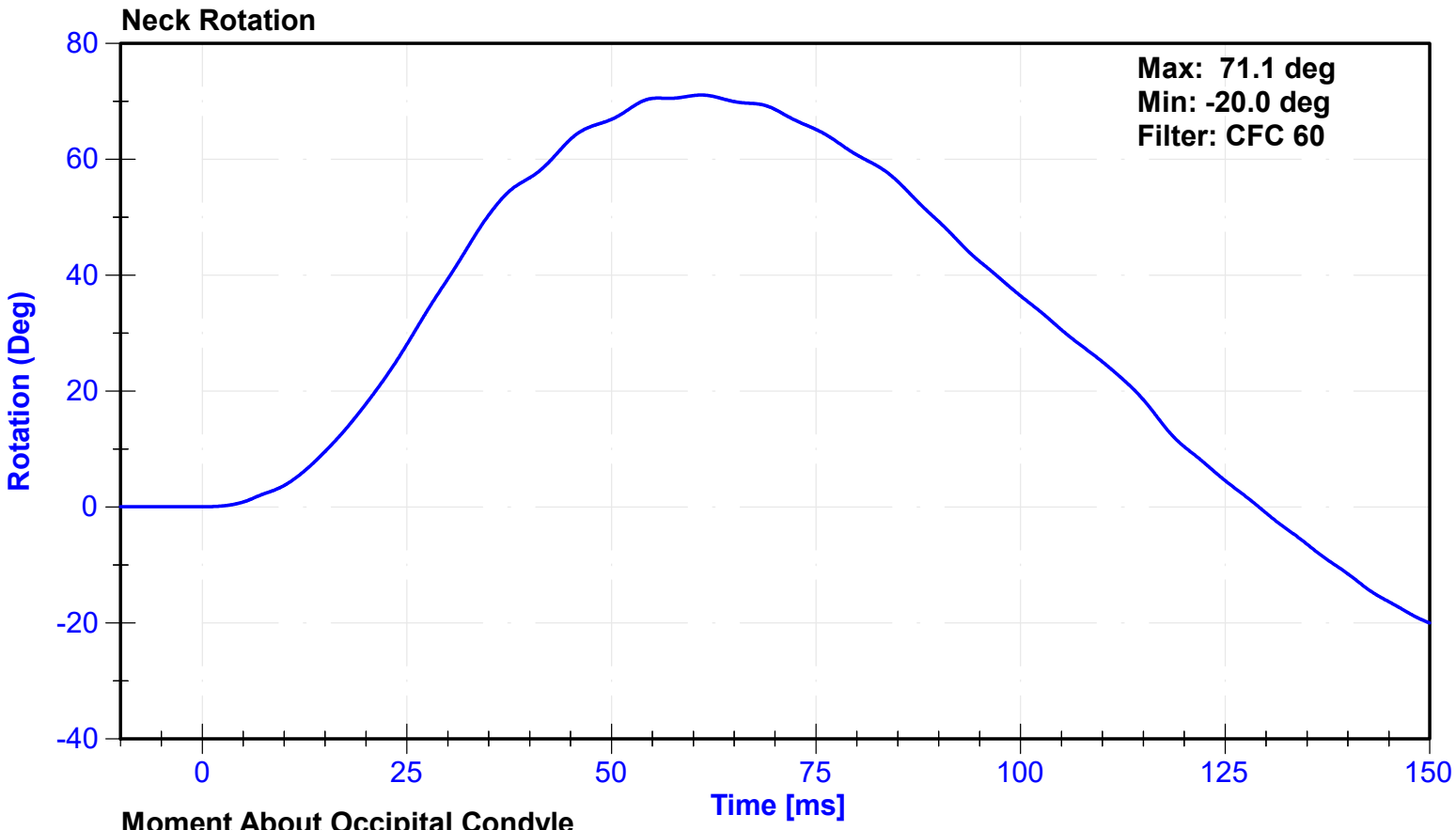
Results

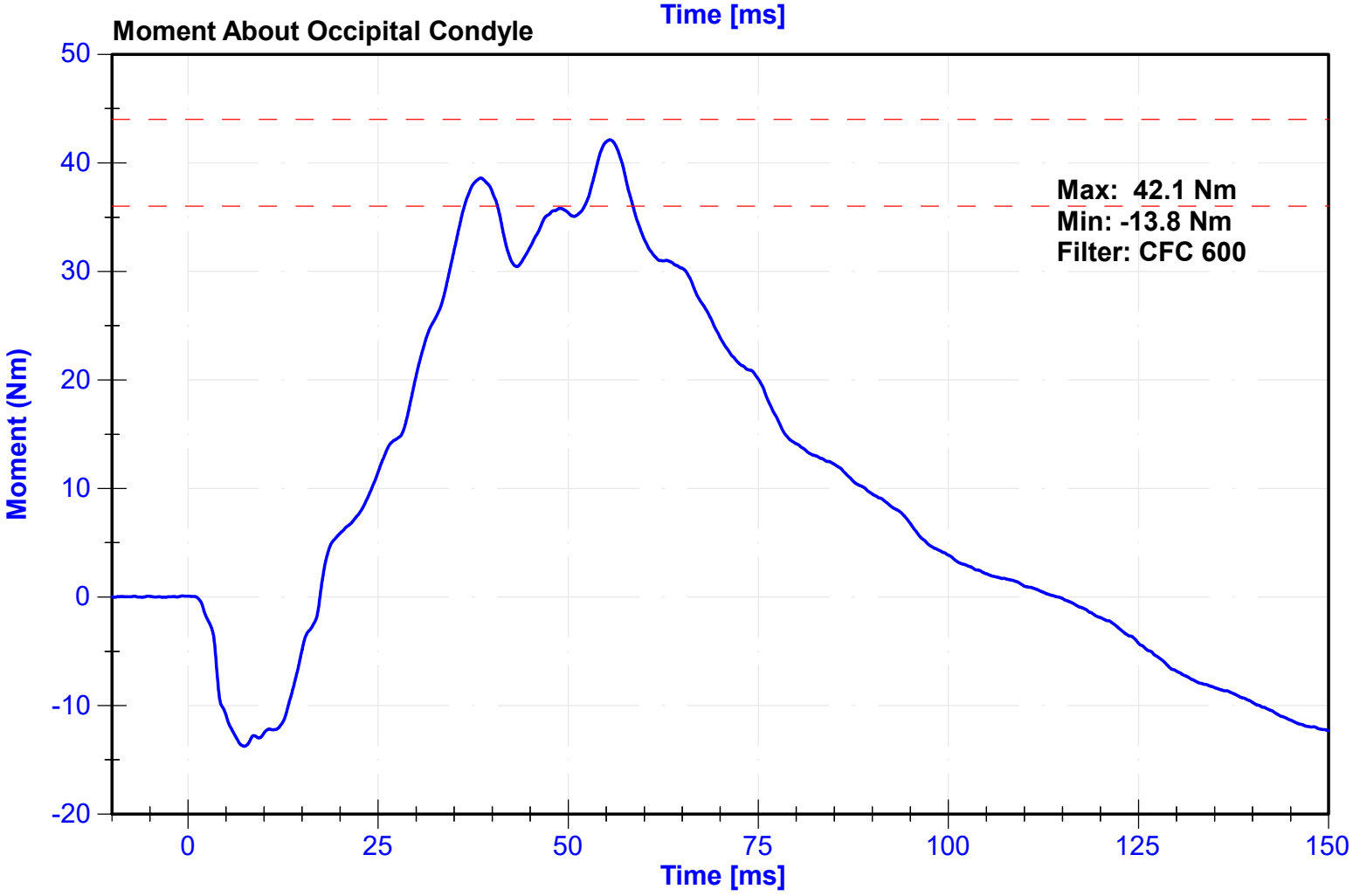
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21	Pass
Humidity	10	70	%	30	Pass
Velocity	5.51	5.63	m/s	5.550	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.30	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.53	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.76	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.75	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.91	Pass
Neck Rotation	71	81	deg	71.1	Pass
Time at Maximum Rotation	50	70	ms	61.0	Pass
Moment about the OC	36	44	Nm	42.1	Pass
Moment Decay to 0 Nm	102	126	ms	114.5	Pass

Transducer Calibrations

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




Neck Rotation
Max: 71.1 deg
Min: -20.0 deg
Filter: CFC 60
Rotation (Deg)
80
60
40
20
0
-20
-40
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 42.1 Nm
Min: -13.8 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

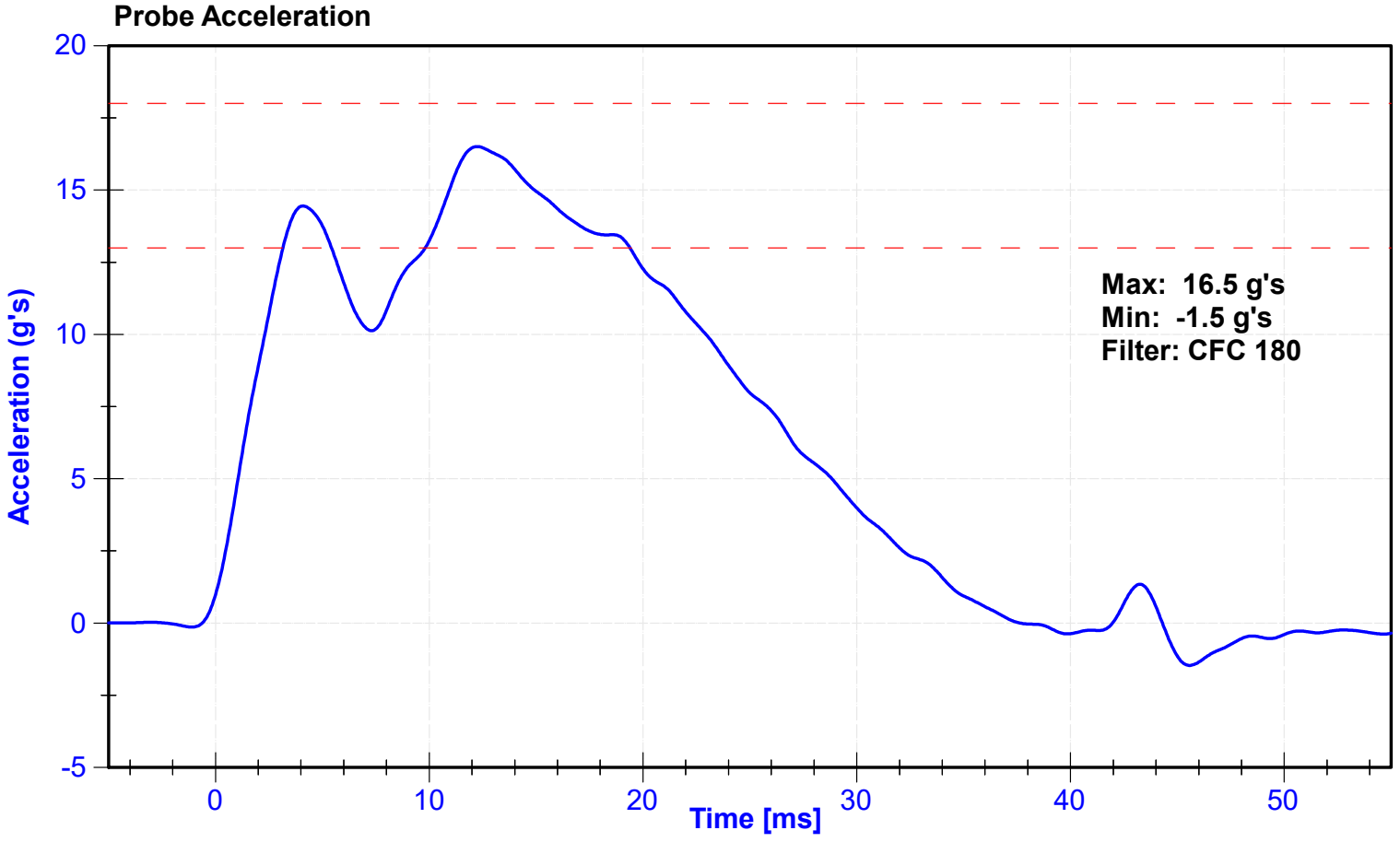
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

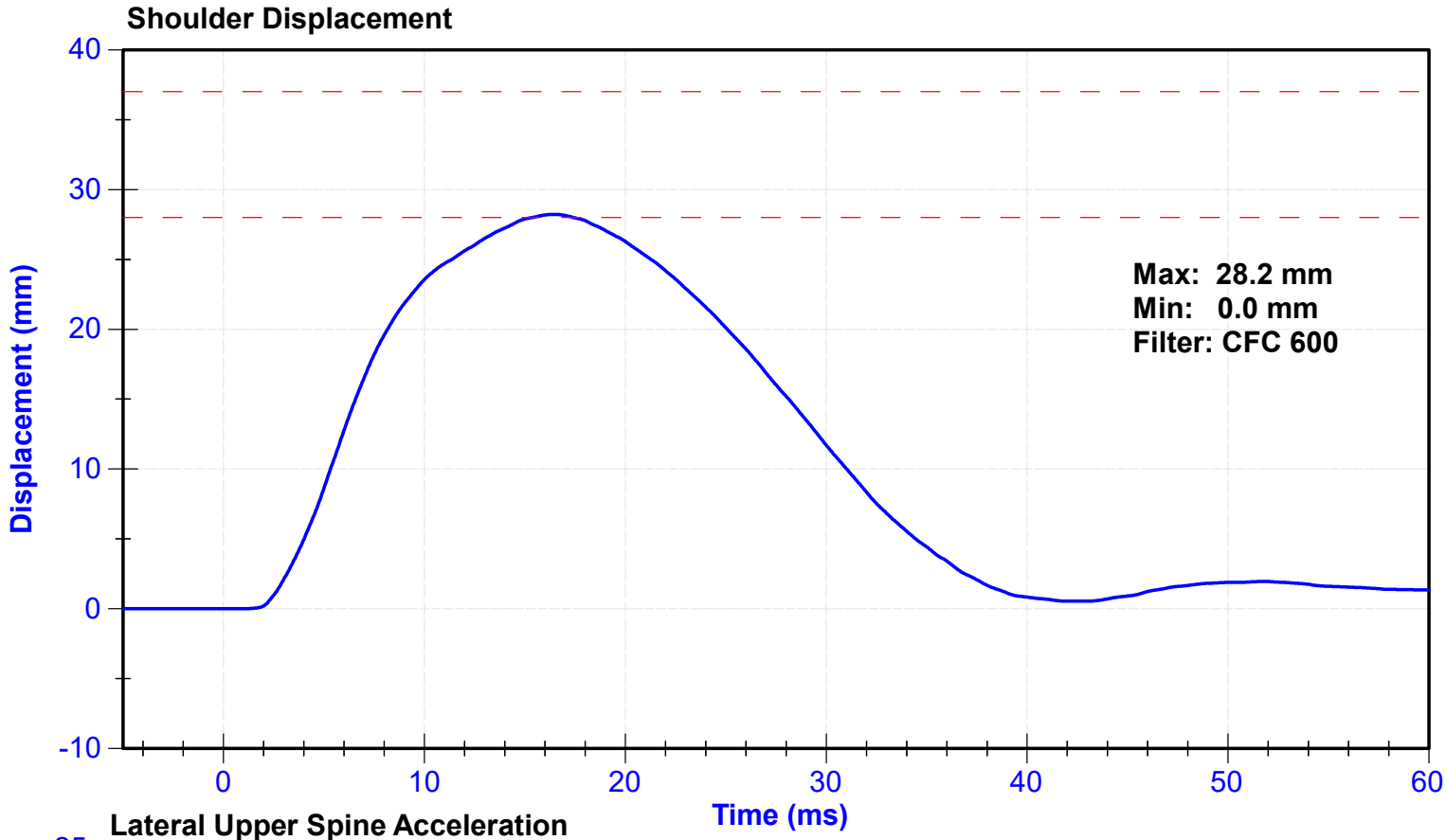
Results

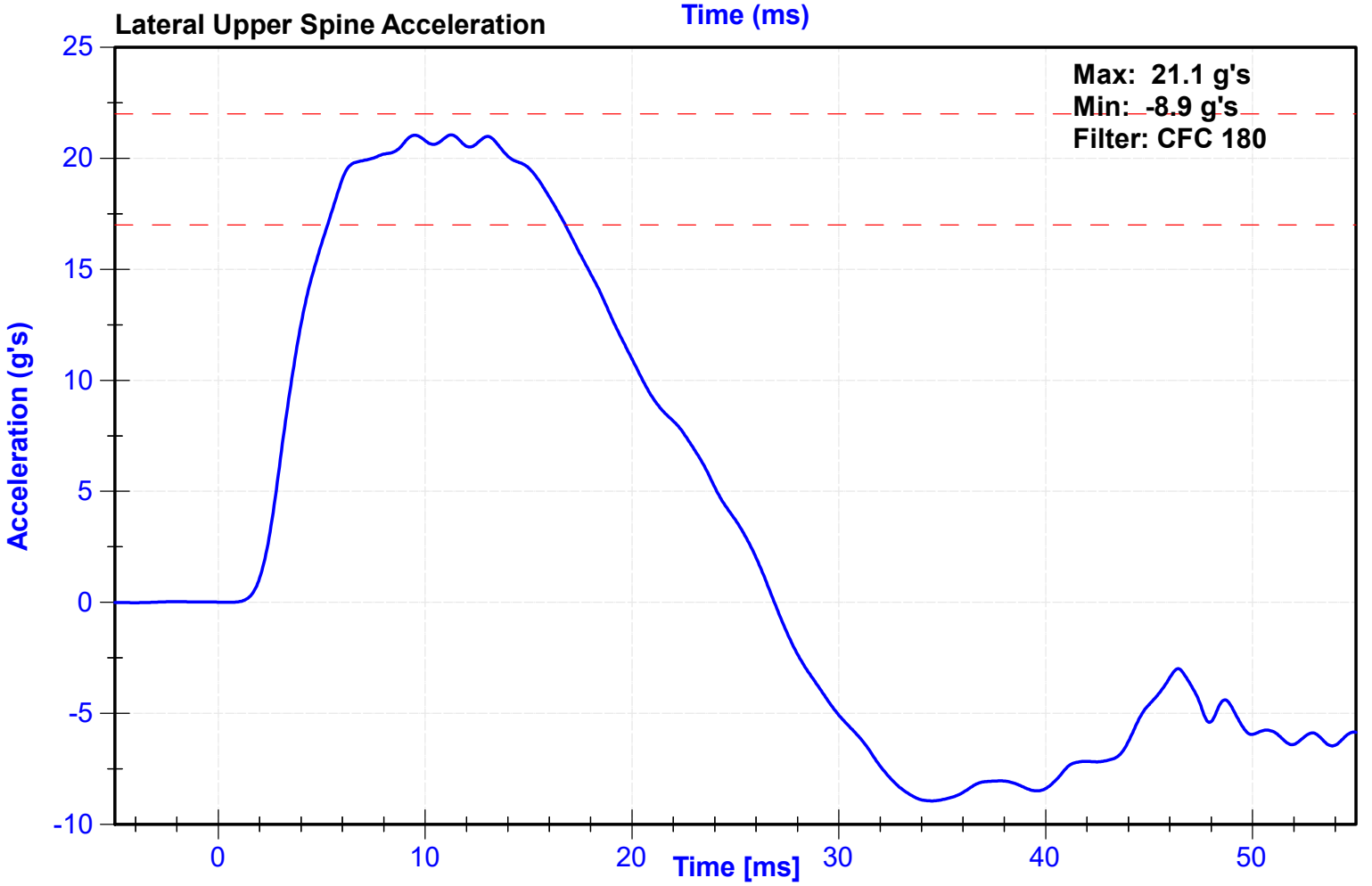
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	34	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	13	18	g's	16.5	Pass
Shoulder Deflection	28	37	mm	28.2	Pass
Lateral Upper Spine Acceleration	17	22	g's	21.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Shoulder Potentiometer	Servo	1274GFE	11/17/2023	5/17/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024




Shoulder Displacement
Displacement (mm)
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time (ms)
Max: 28.2 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: 21.1 g's
Min: -8.9 g's
Filter: CFC 180

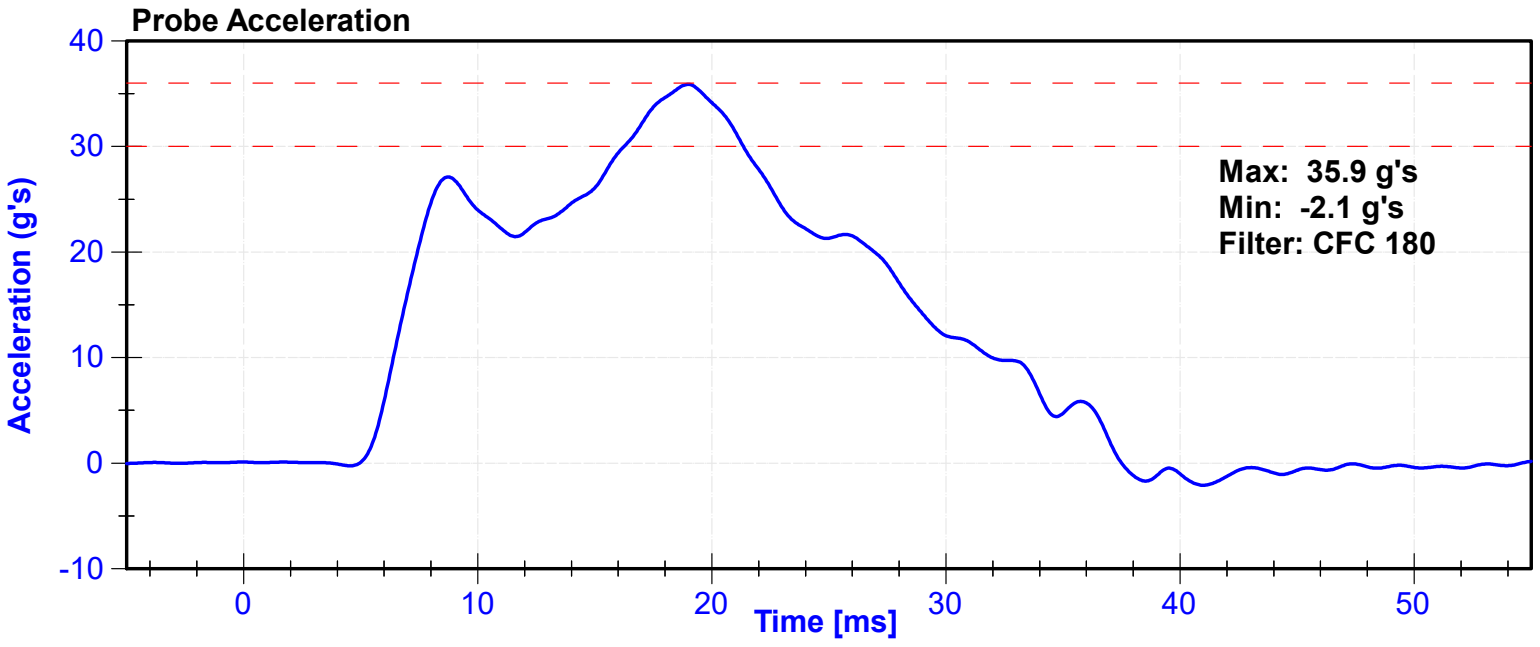
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

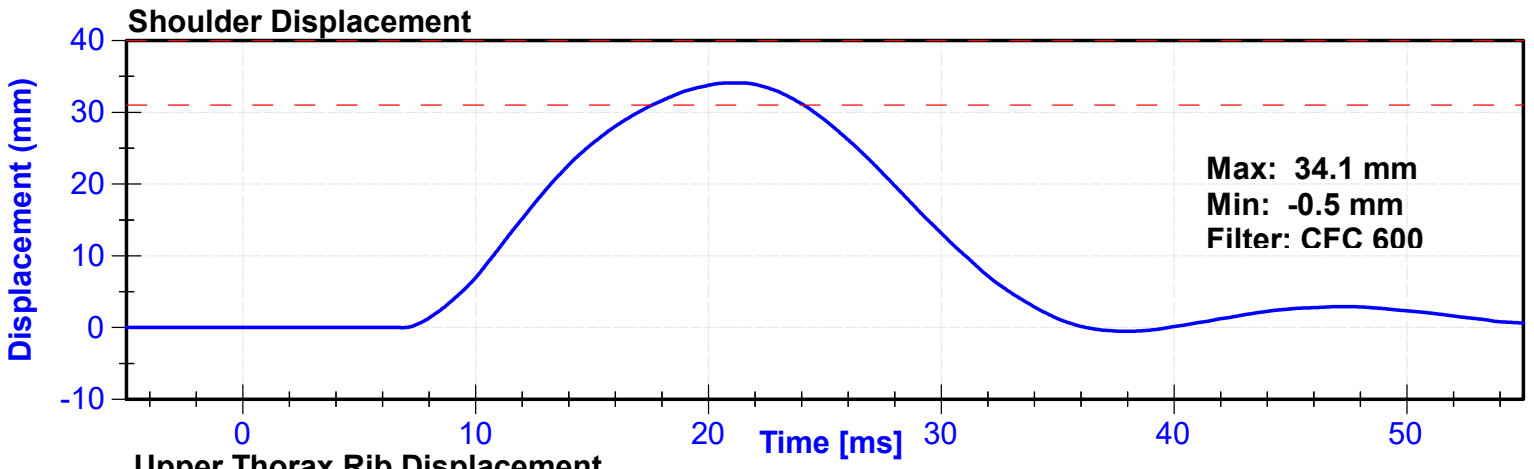
Results

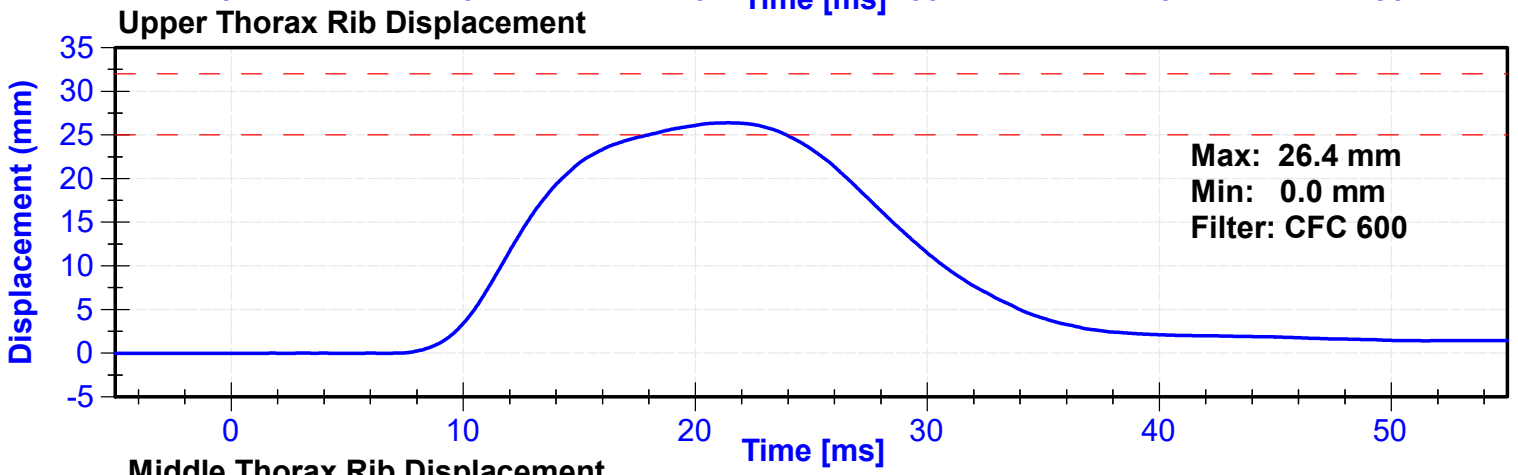
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	34	Pass
Velocity	6.6	6.8	m/s	6.64	Pass
Probe Acceleration after 5 ms	30	36	g's	35.9	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.9	Pass
Lateral Lower Spine Acceleration	29	37	g's	35.0	Pass
Shoulder Deflection	31	40	mm	34.1	Pass
Upper Thorax Rib Deflection	25	32	mm	26.4	Pass
Mid Thorax Rib Deflection	30	36	mm	30.2	Pass
Lower Thorax Rib Deflection	32	38	mm	32.1	Pass

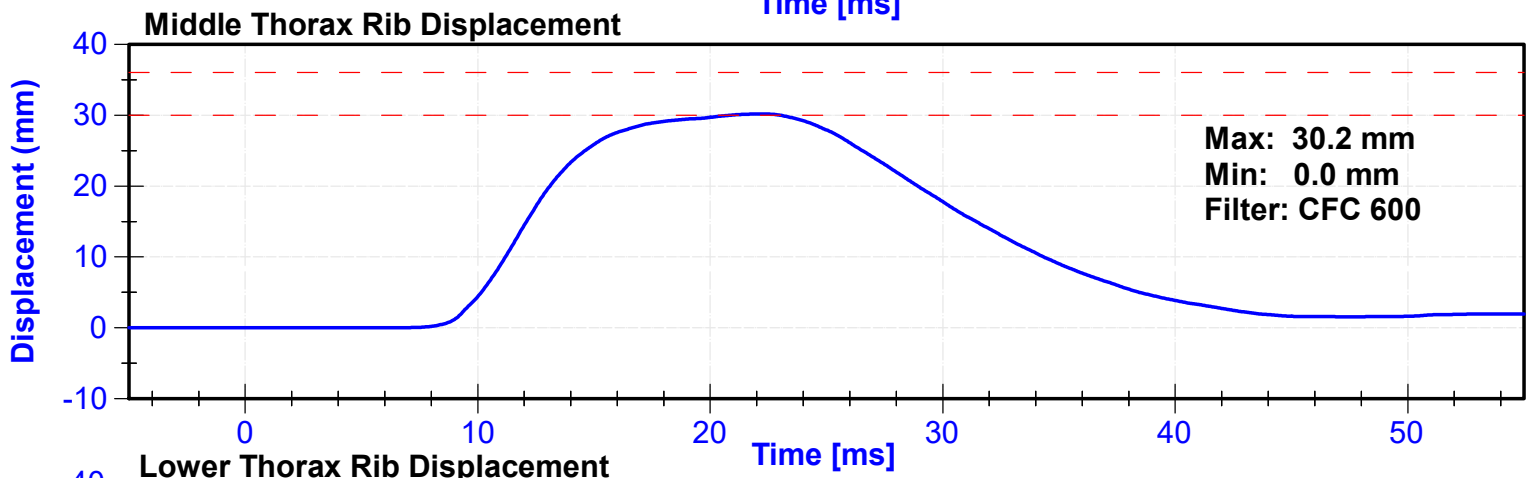
Transducer Calibrations

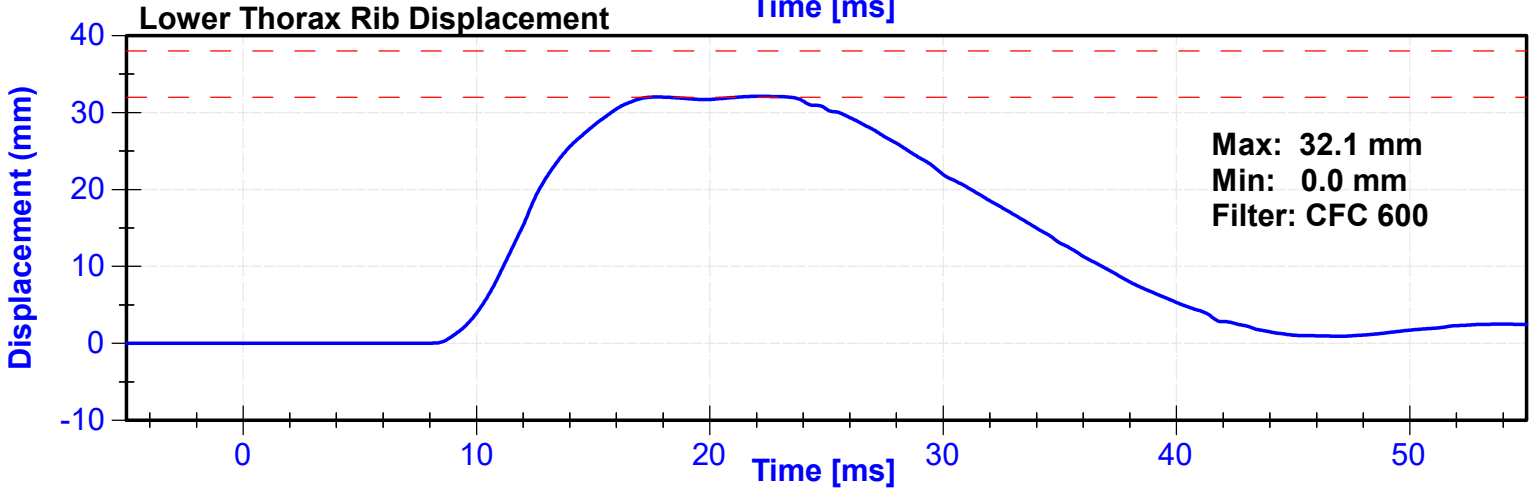
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Upper Spine T1 Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Upper Spine T12 Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Shoulder Potentiometer	Servo	1274GFE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

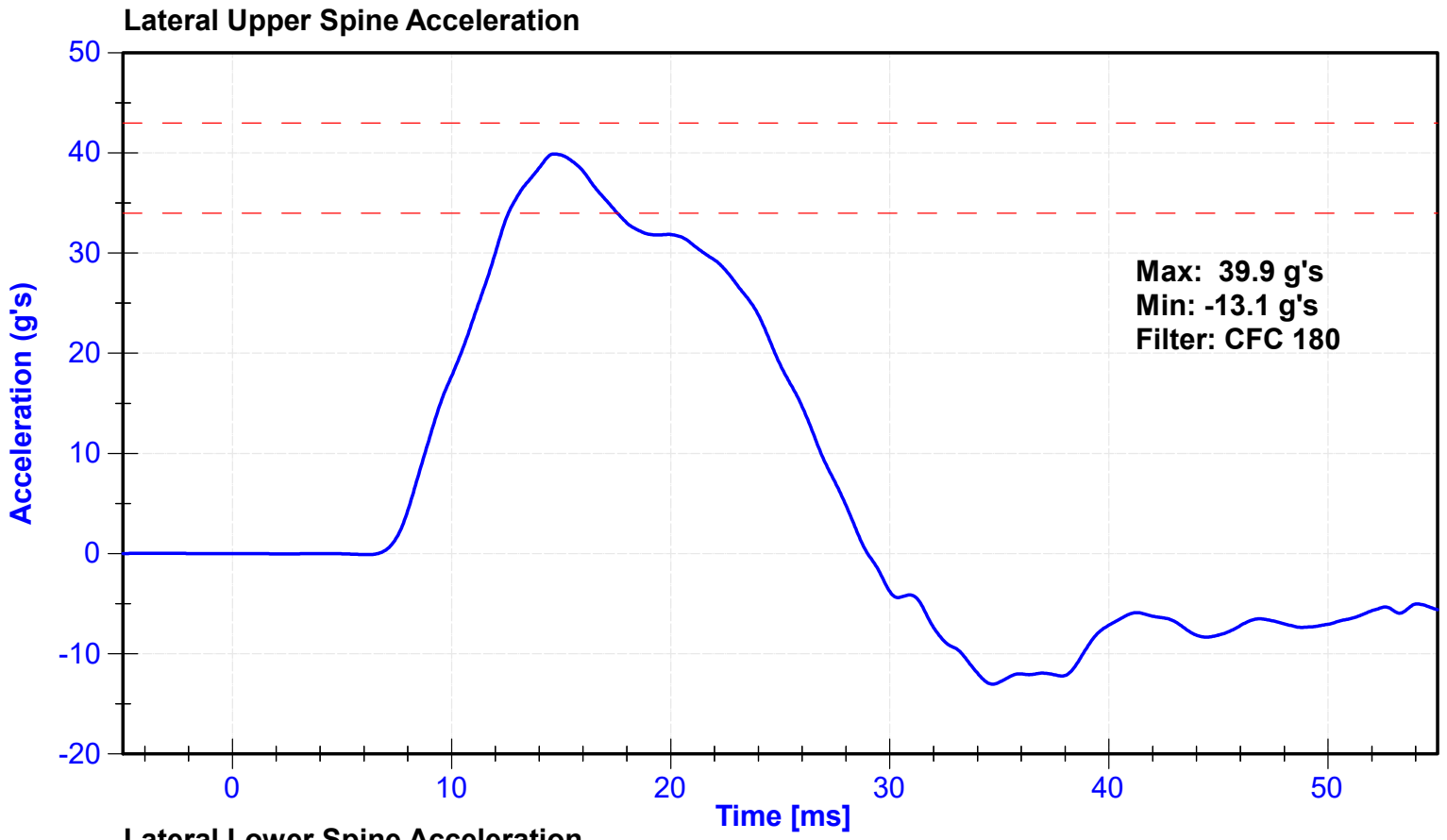


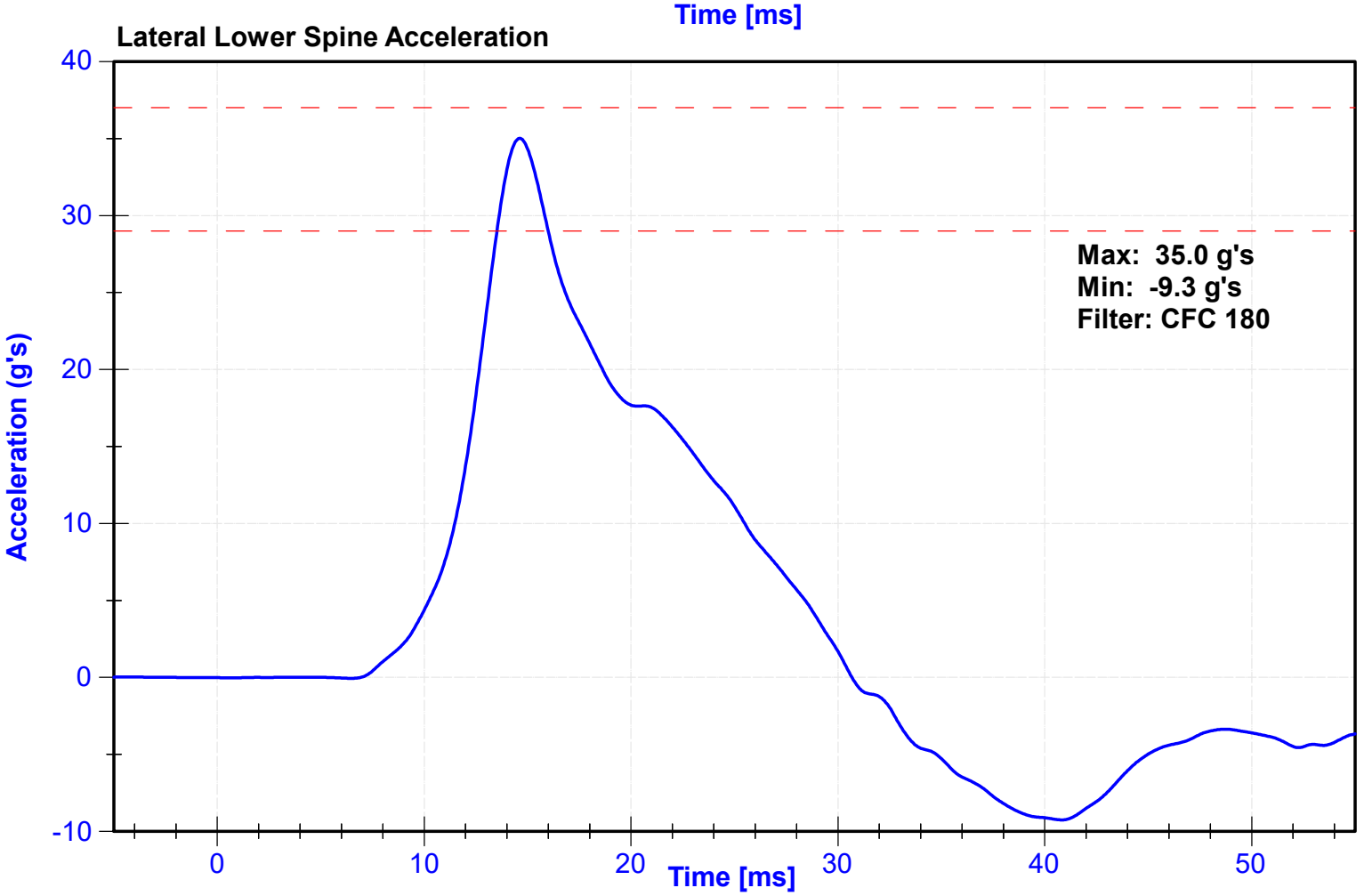

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 34.1 mm
Min: -0.5 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 26.4 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 30.2 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.1 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: 39.9 g's
Min: -13.1 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: 35.0 g's
Min: -9.3 g's
Filter: CFC 180

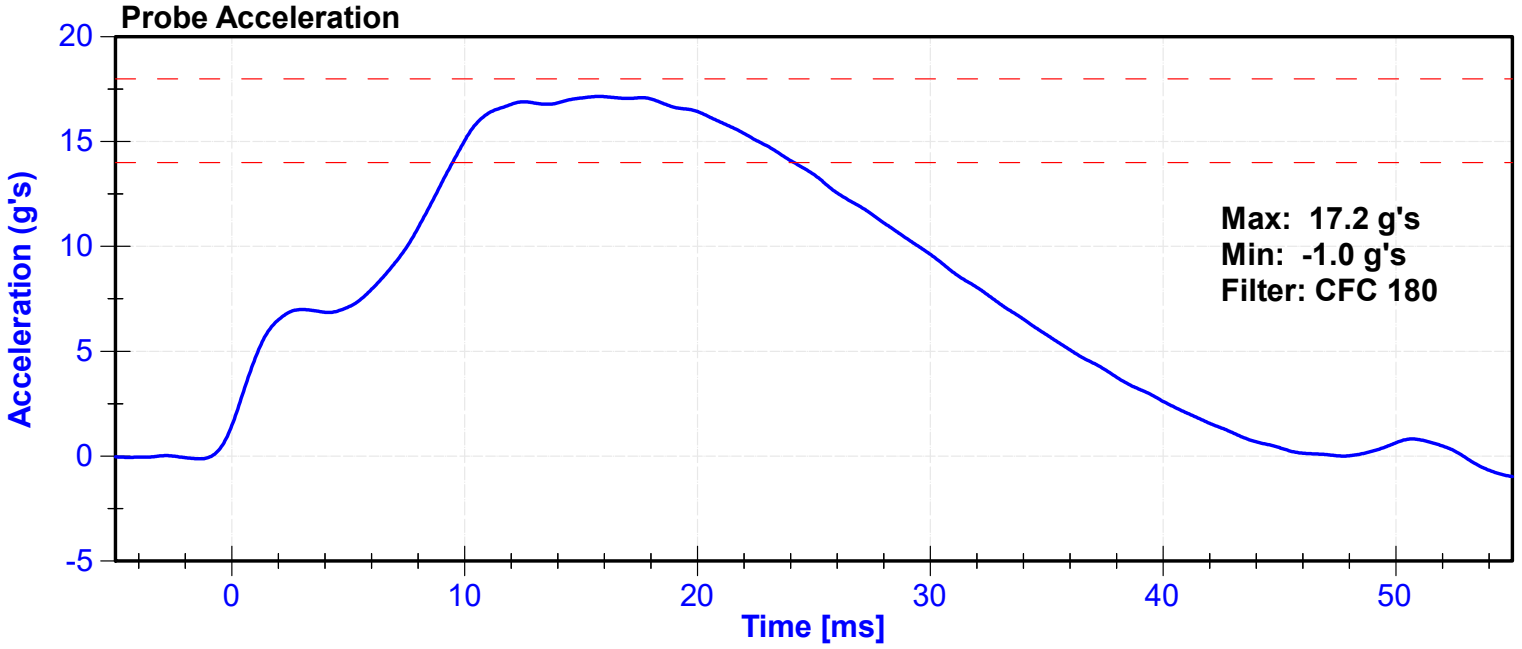
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

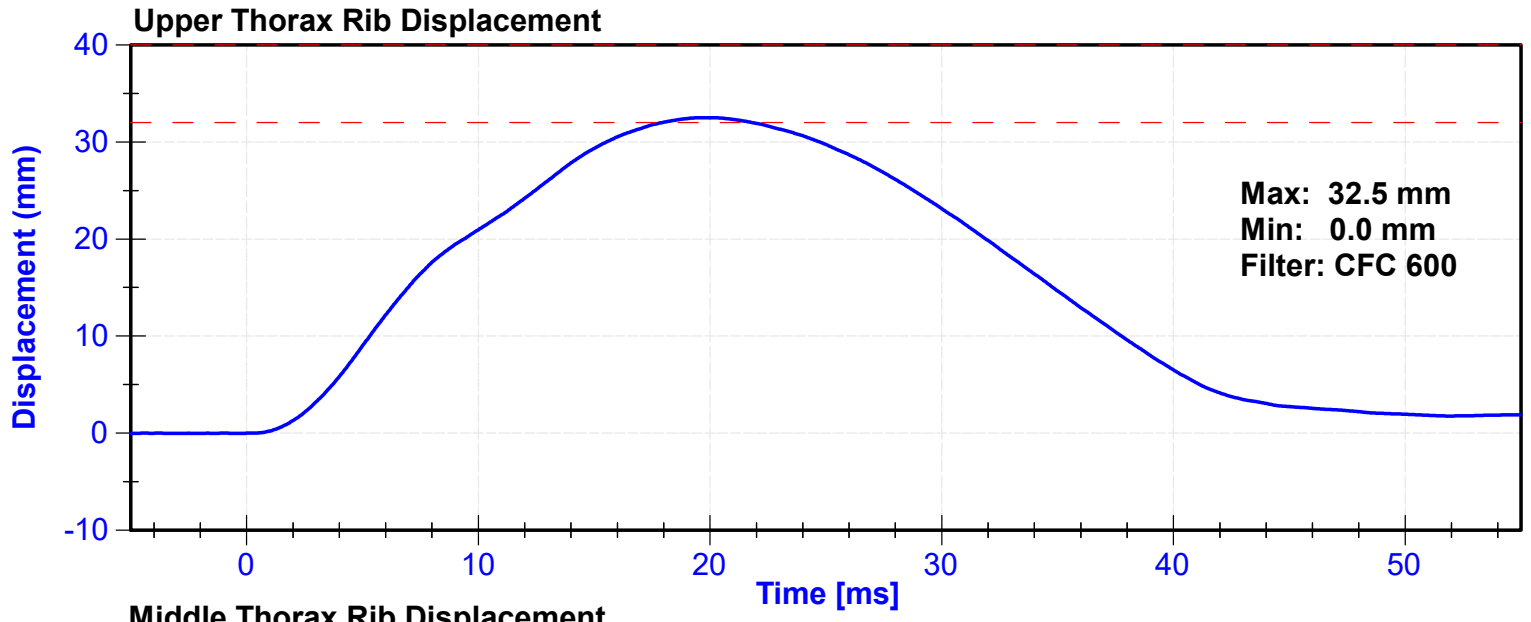
Results

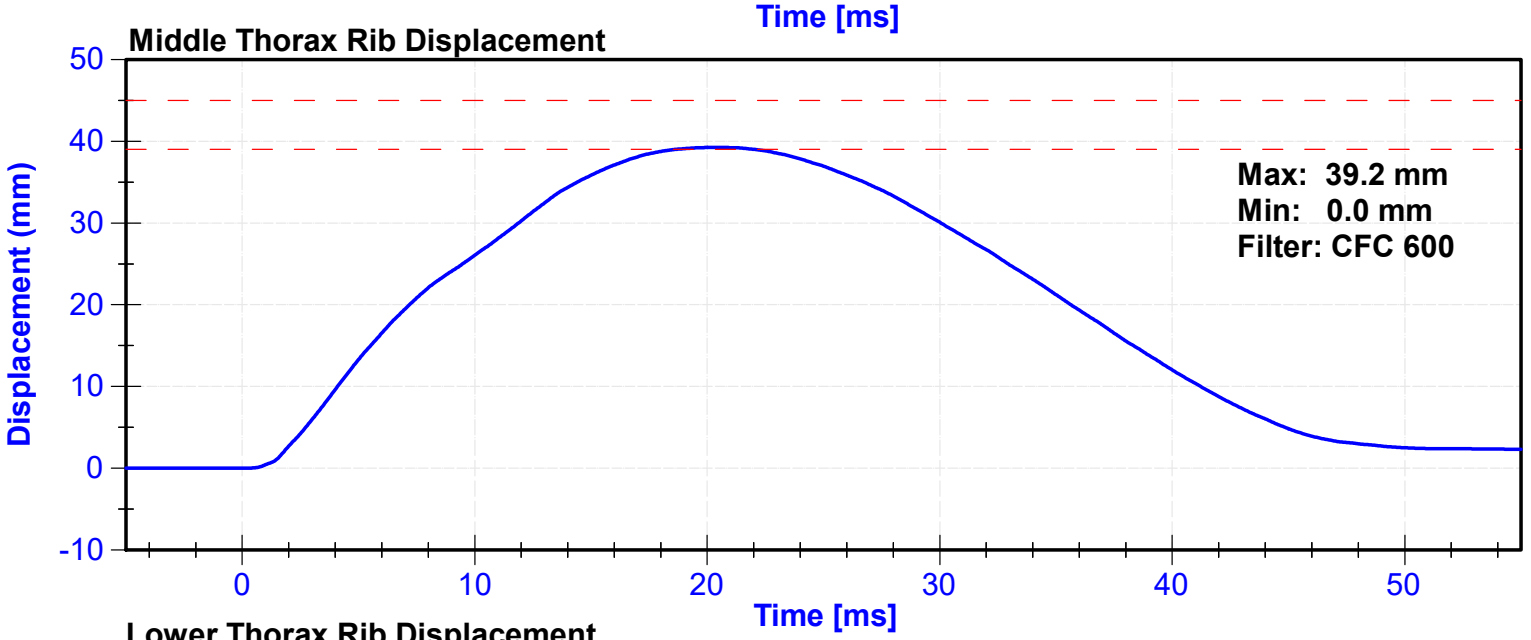
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	34	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	14	18	g's	17.2	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.7	Pass
Lateral Lower Spine Acceleration	7	11	g's	11.0	Pass
Upper Thorax Rib Deflection	32	40	mm	32.5	Pass
Middle Thorax Rib Deflection	39	45	mm	39.2	Pass
Lower Thorax Rib Deflection	35	43	mm	38.2	Pass

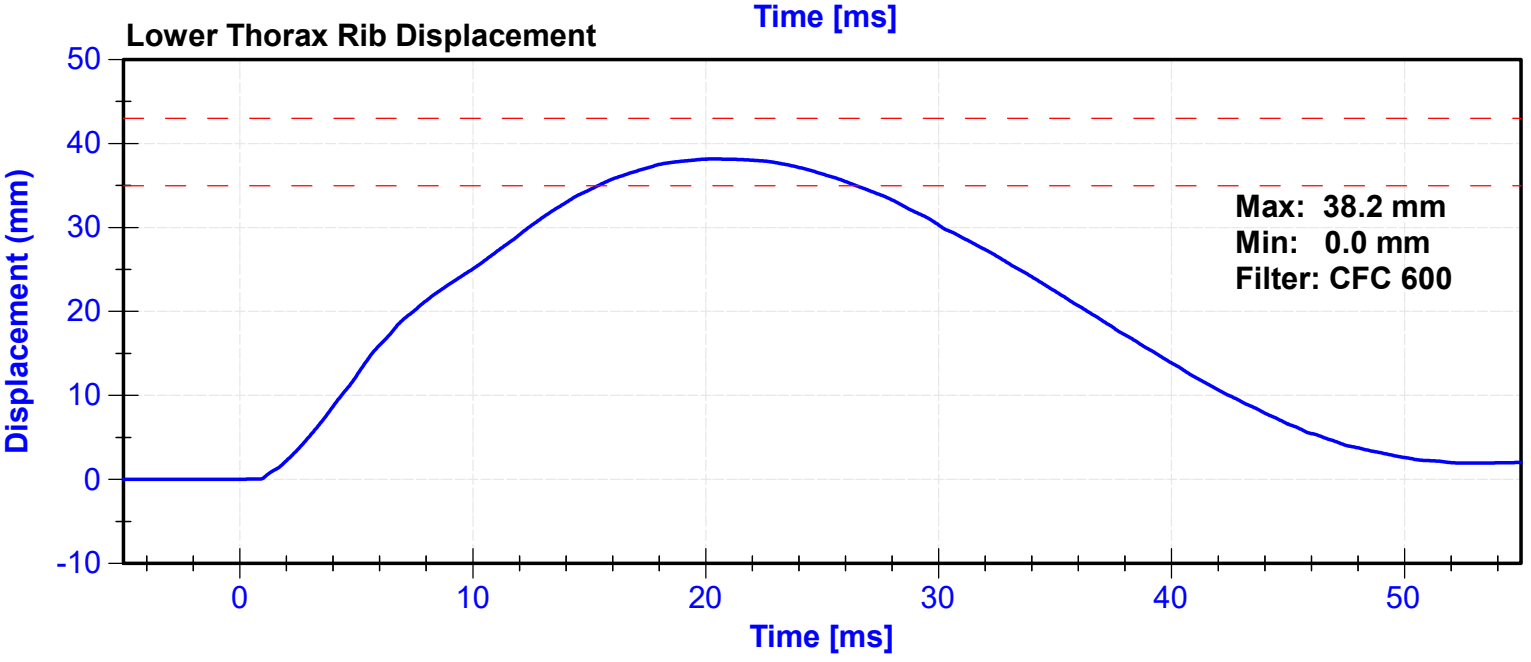
Transducer Calibrations

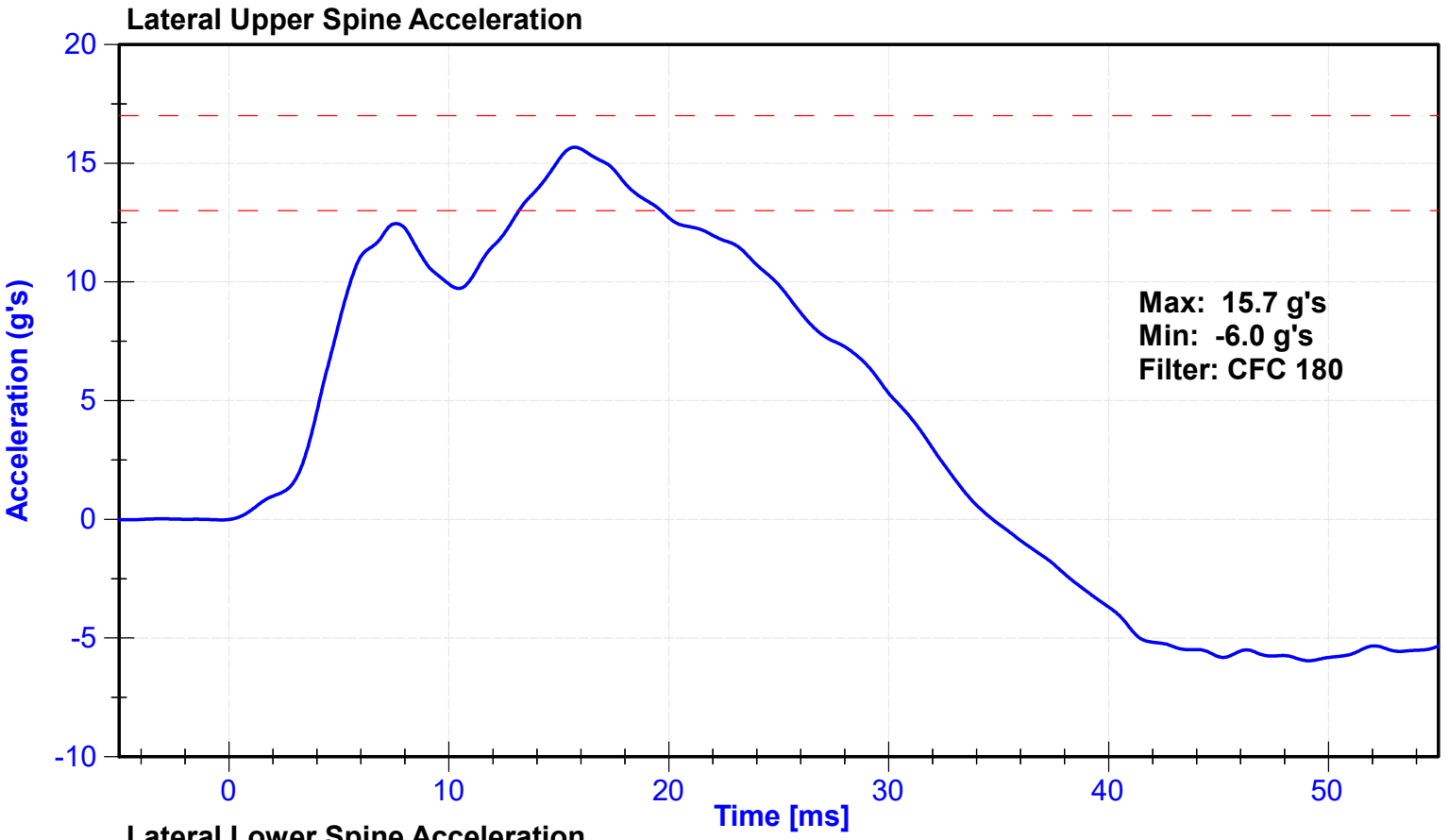
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Upper Spine Y Accelerometer	Endevco	P64148	11/16/2023	5/14/2024
Lower Spine Y Accelerometer	Endevco	P51327	11/16/2023	5/14/2024
Upper Thorax Rib Potentiometer	Servo	1199GFE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

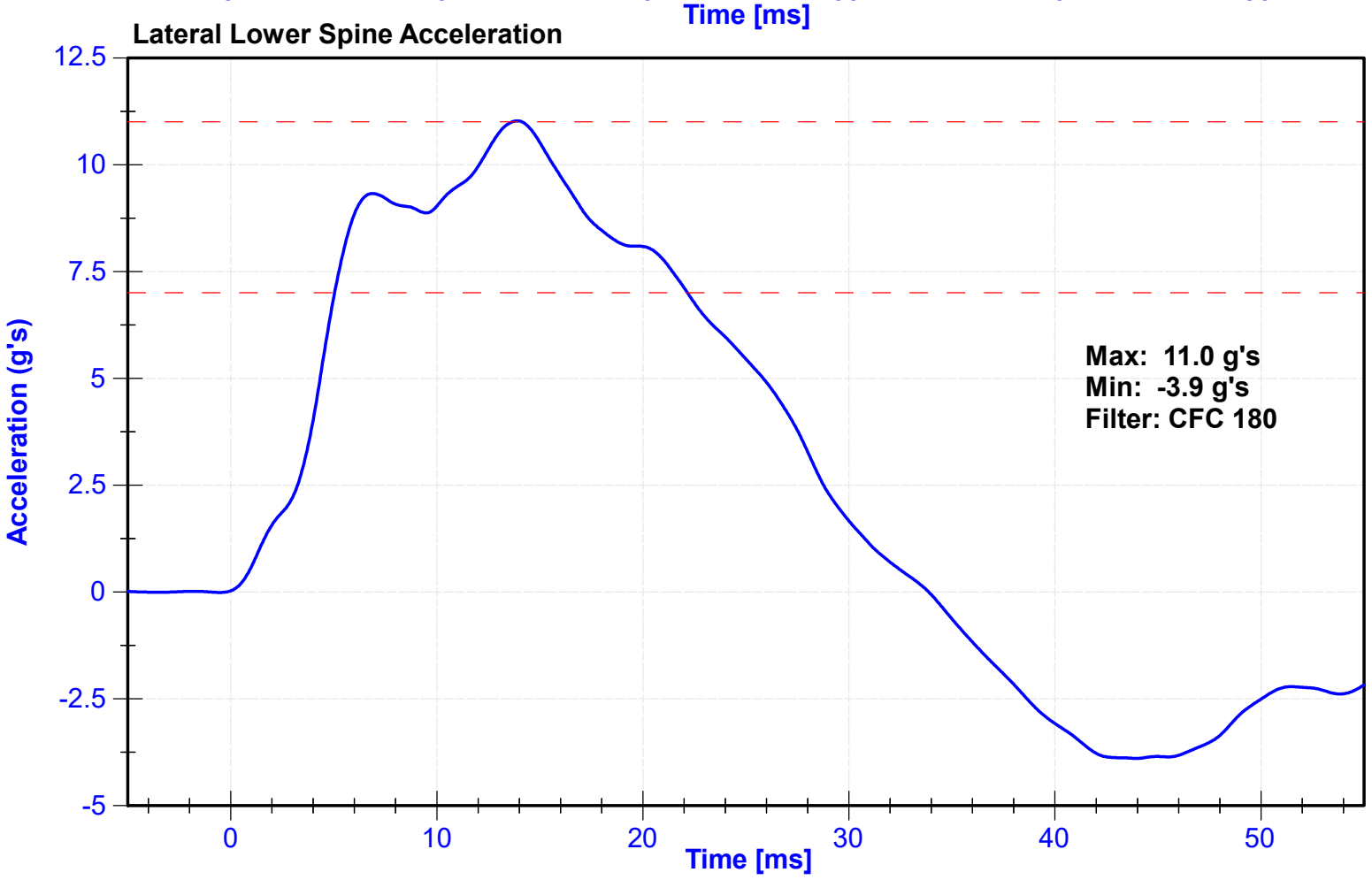



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.5 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 39.2 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.2 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: 15.7 g's
Min: -6.0 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: 11.0 g's
Min: -3.9 g's
Filter: CFC 180

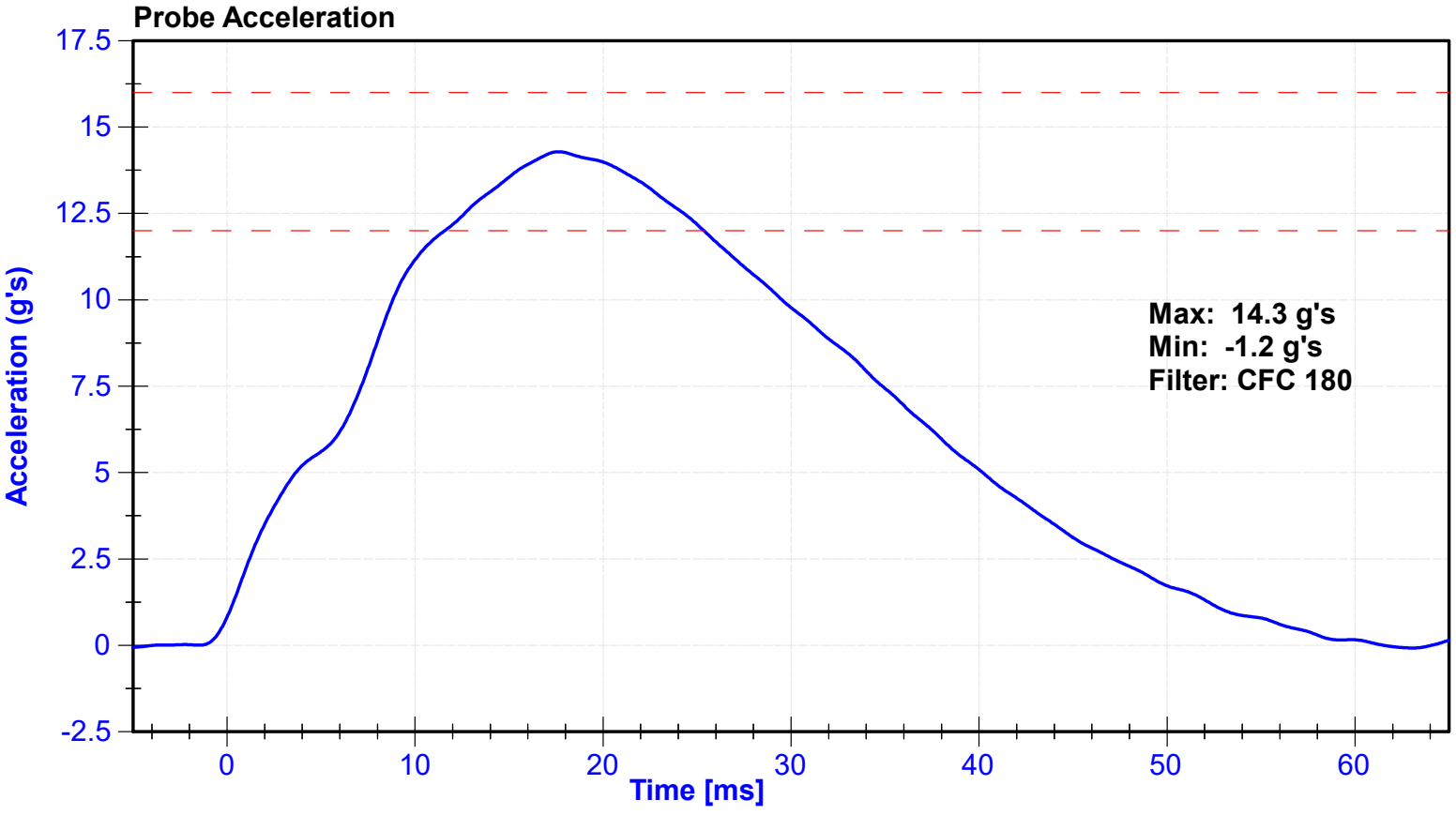
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

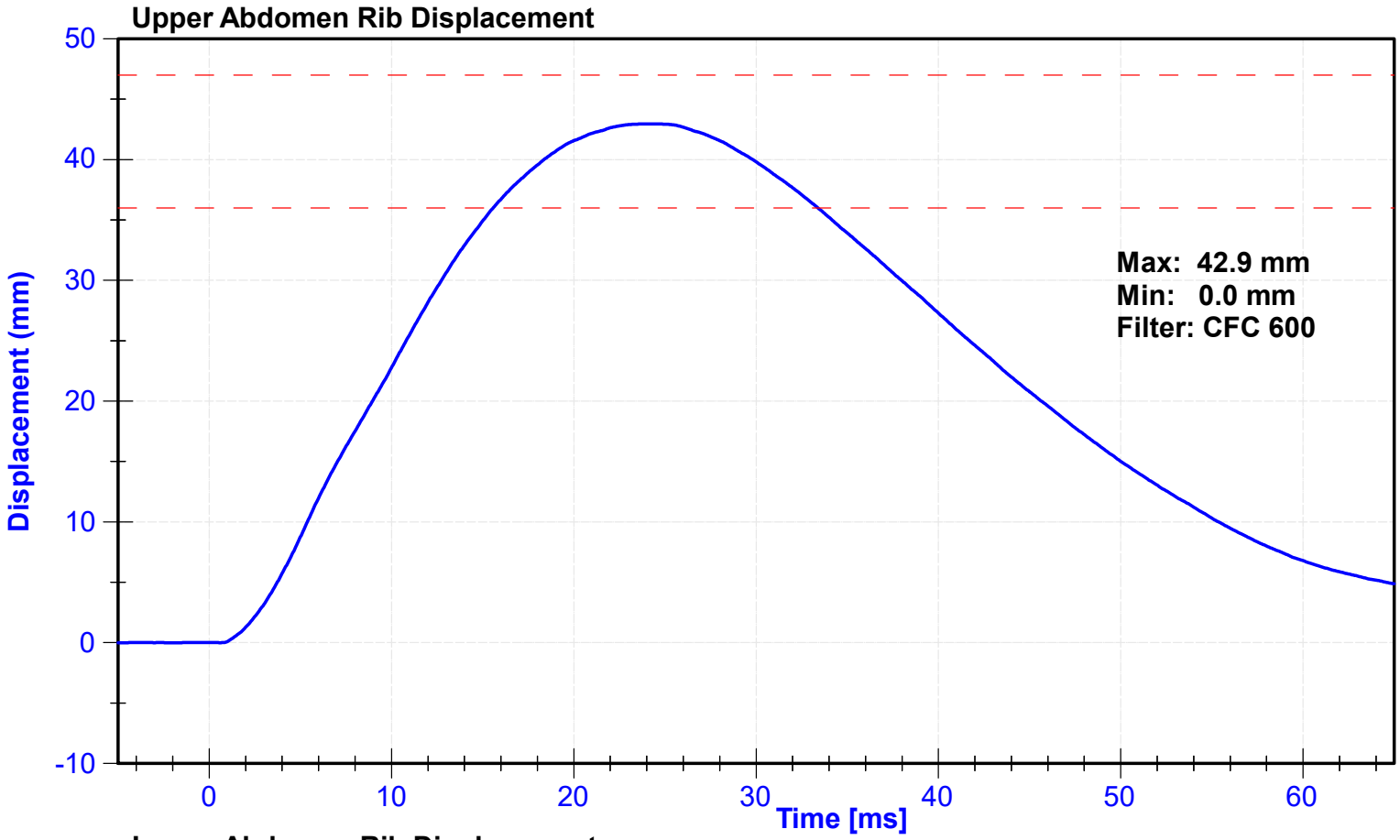
Results

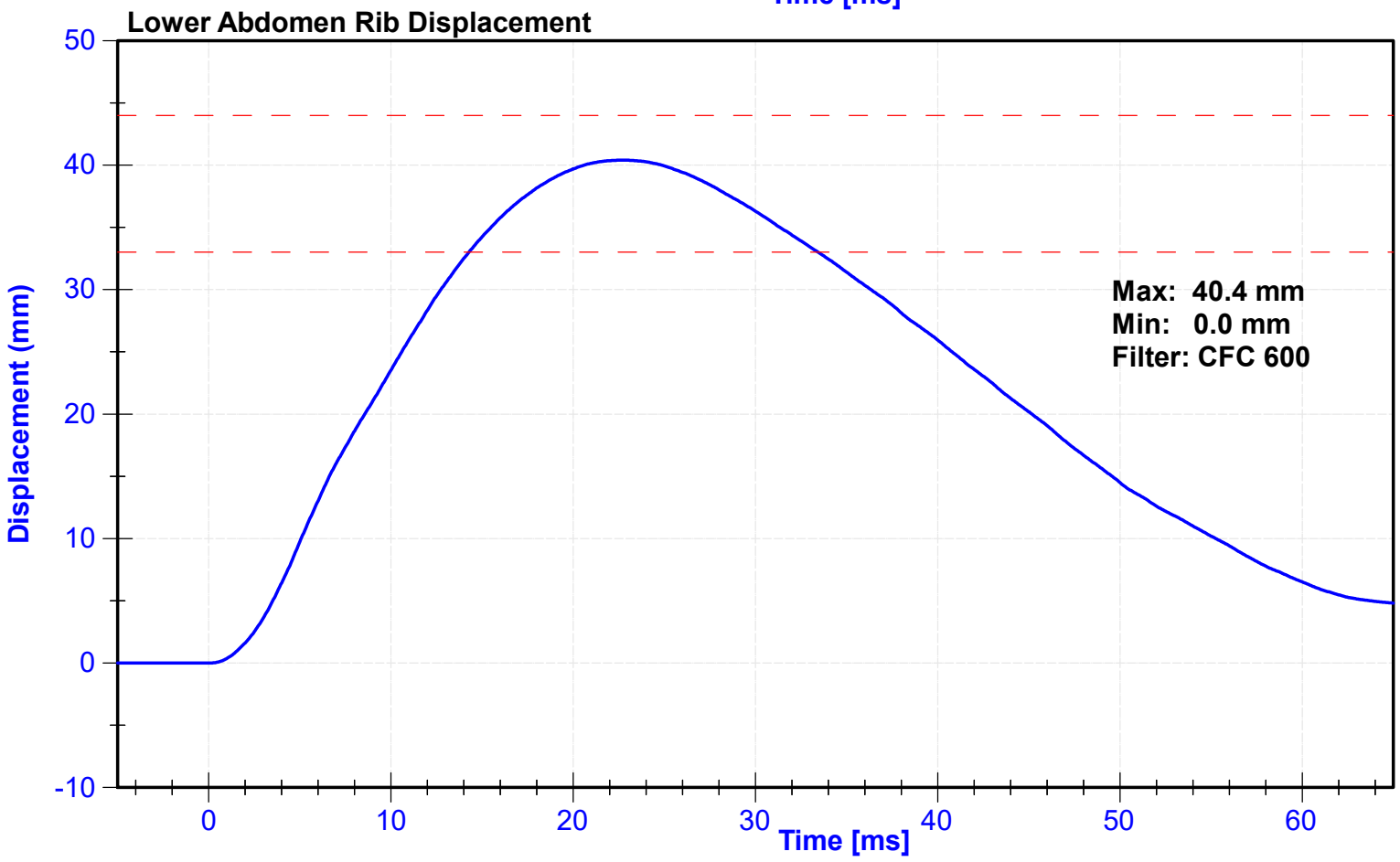
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	34	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	12	16	g's	14.3	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.7	Pass
Upper Abdomen Rib Deflection	36	47	mm	42.9	Pass
Lower Abdomen Rib Deflection	33	44	mm	40.4	Pass

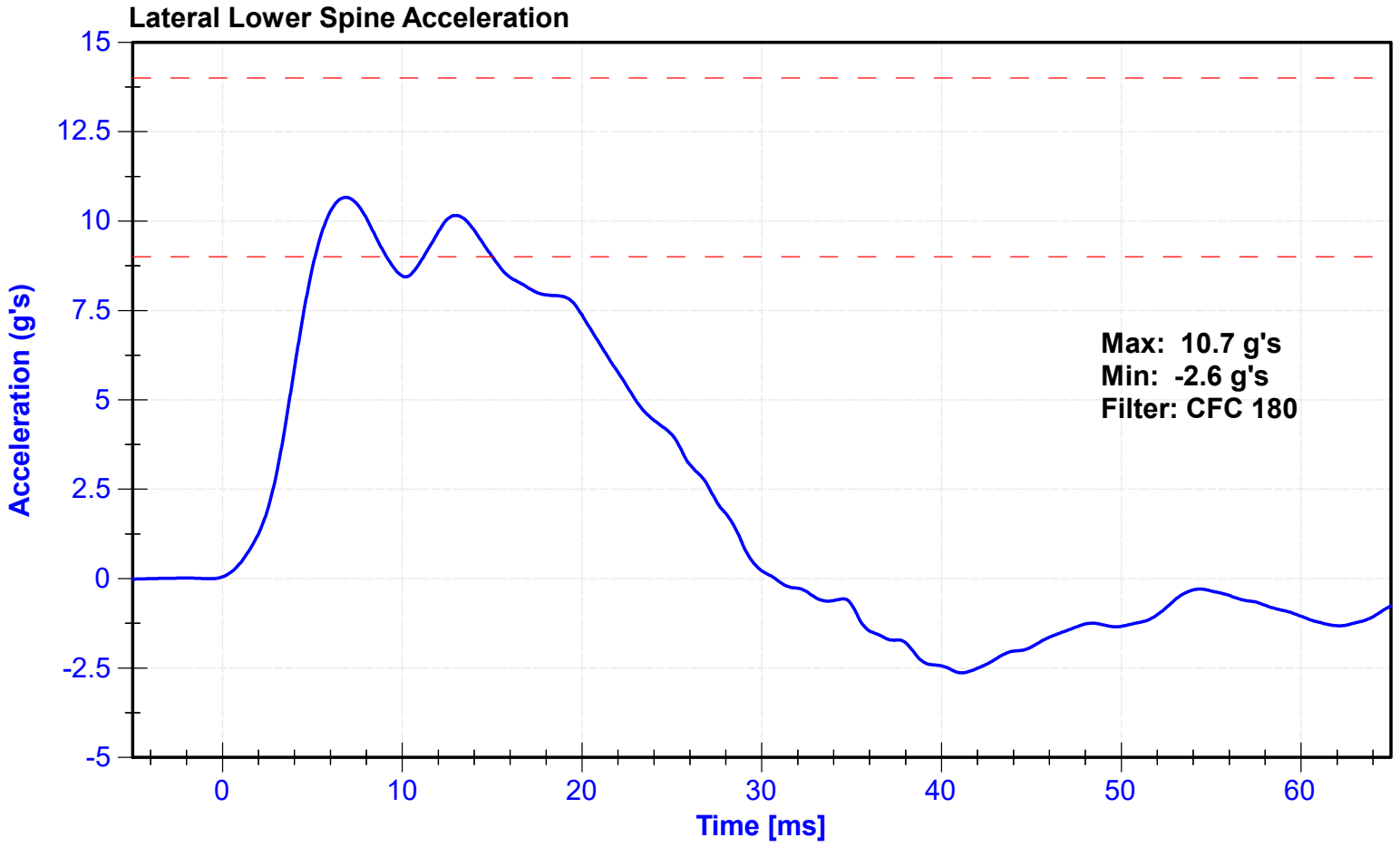
Transducer Calibrations

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




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 42.9 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: 40.4 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
60
Time [ms]
Max: 10.7 g's
Min: -2.6 g's
Filter: CFC 180

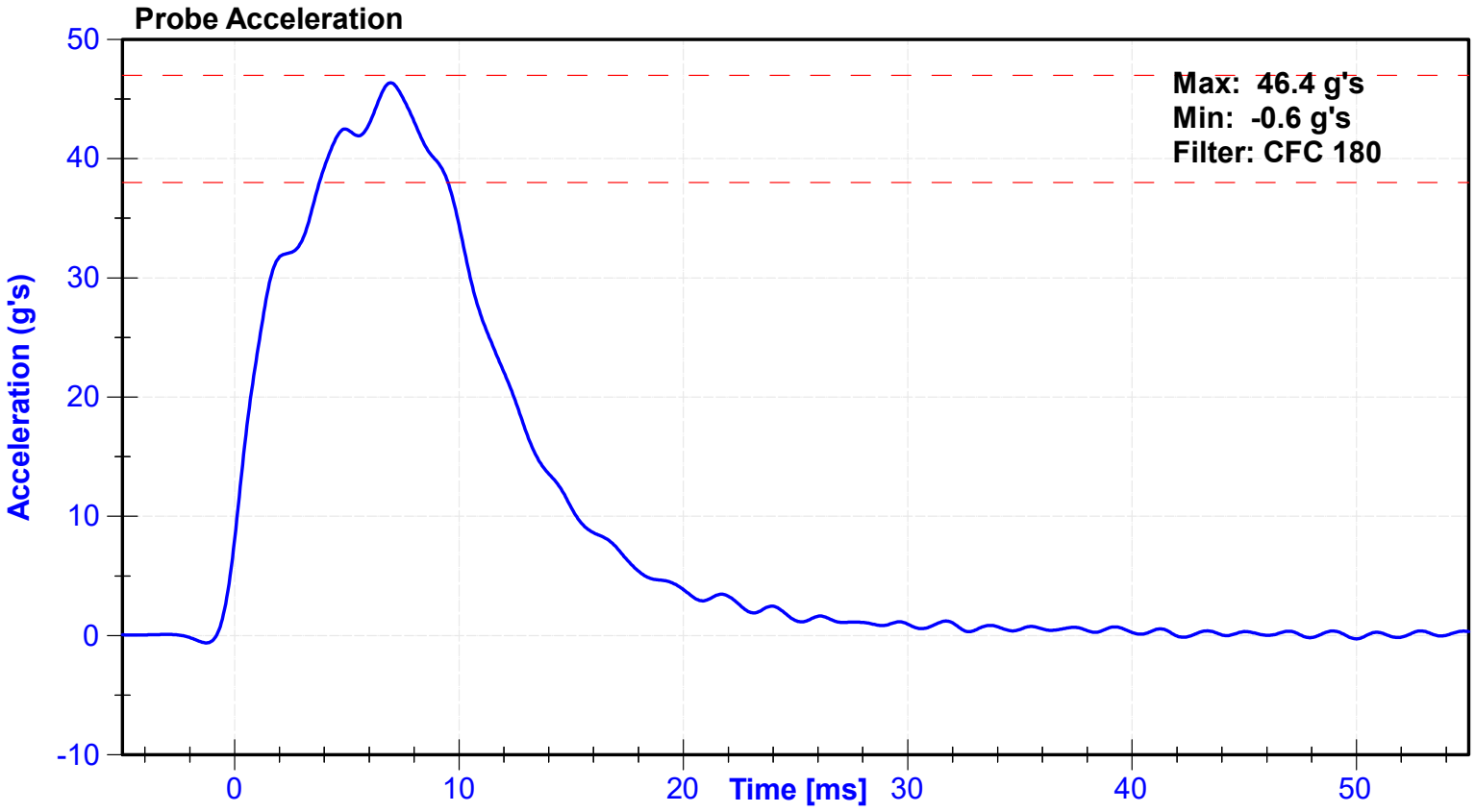
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

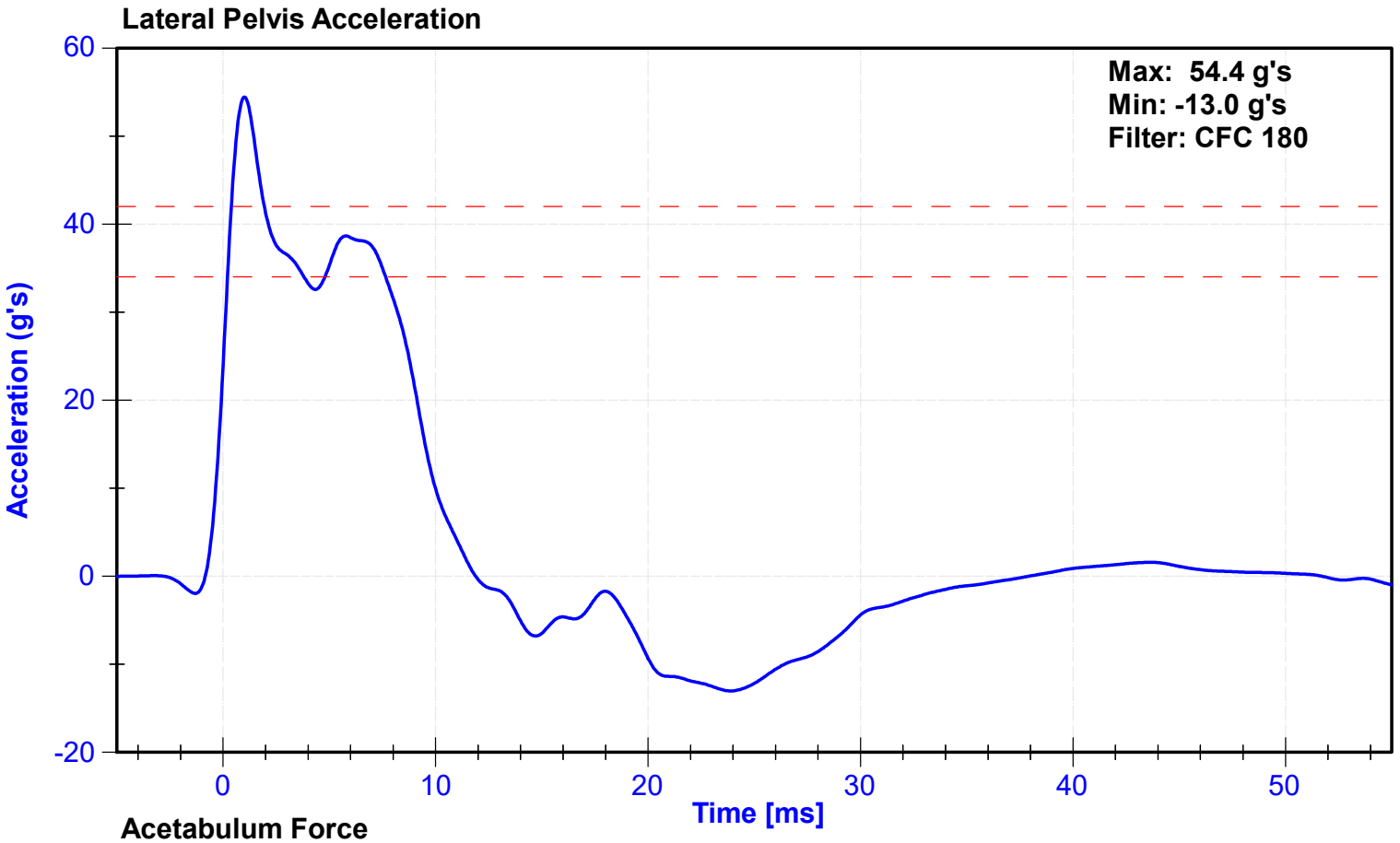
Results

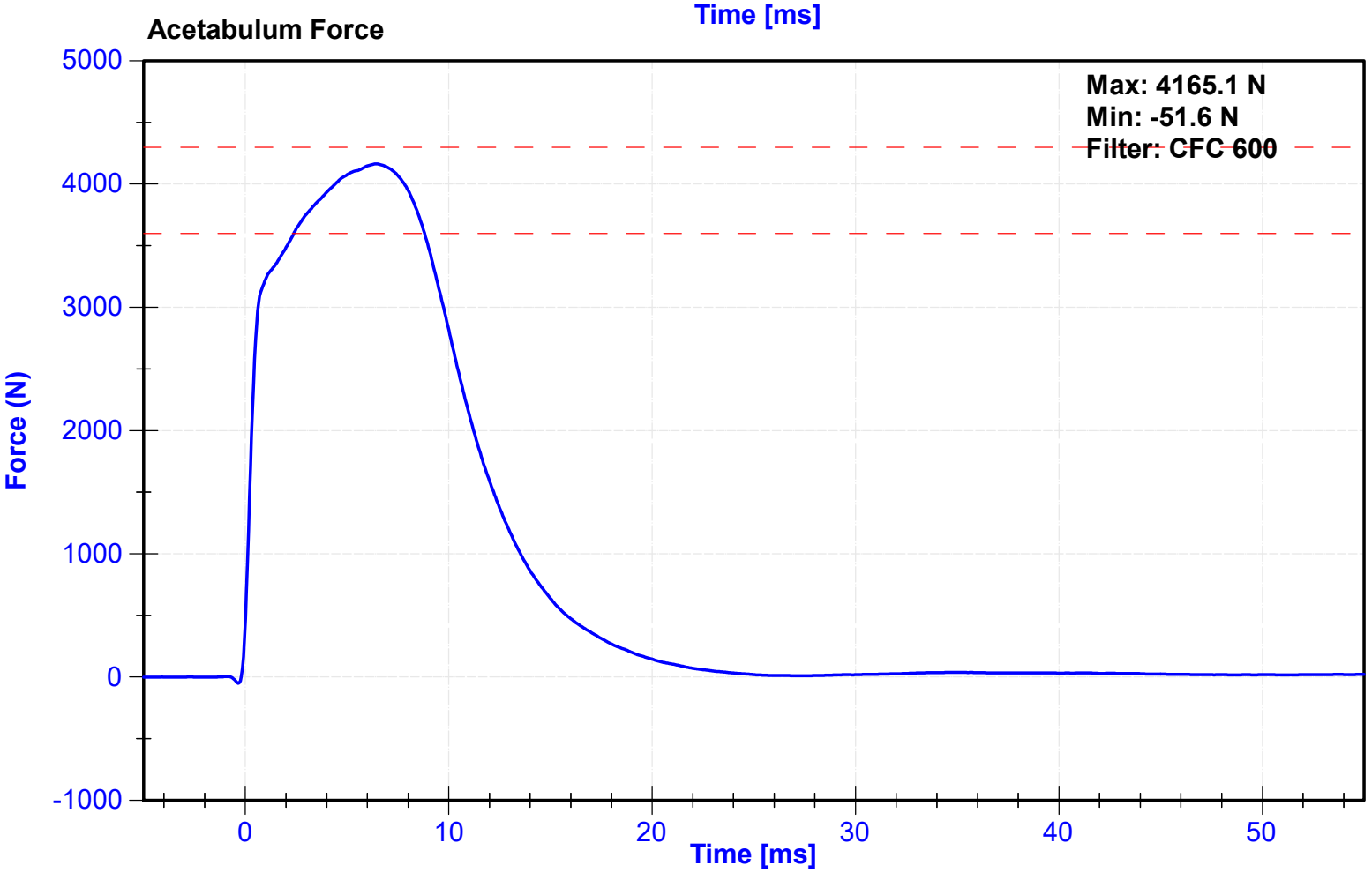
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	34	Pass
Velocity	6.6	6.8	m/s	6.64	Pass
Probe Acceleration	38	47	g's	46.4	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	38.5	Pass
Acetabulum Force	3600	4300	N	4165.1	Pass

Transducer Calibrations

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




Lateral Pelvis Acceleration
Max: 54.4 g's
Min: -13.0 g's
Filter: CFC 180
Acceleration (g's)
60
40
20
0
-20
0
10
20
30
40
50
Time [ms]


Acetabulum Force
Max: 4165.1 N
Min: -51.6 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

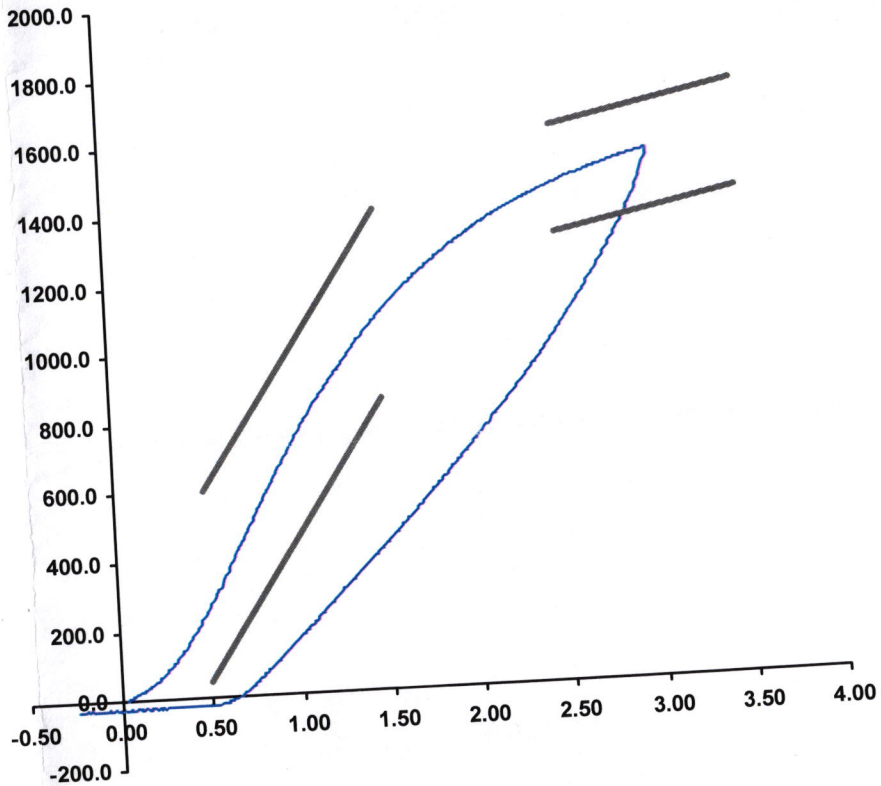
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 16479
Test Number 23262
Report Number 23319
Test Date 7/14/2022 12:05:22 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	258	50	600
Force @ 1.5 mm (N)	1,092	850	1,400
Force @ 2.5 mm (N)	1,450	1,306	1,618
Force @ 3.0 mm (N)	1,535	1,361	1,673

Force (-N) vs Extension (-mm)



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

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

Notes:
Cert Plug 03-15-2024

Operator

Part Number 180-4450

Template No 107 14-Jul-22
SACO Research

By : DC Date : 7/14/2022

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

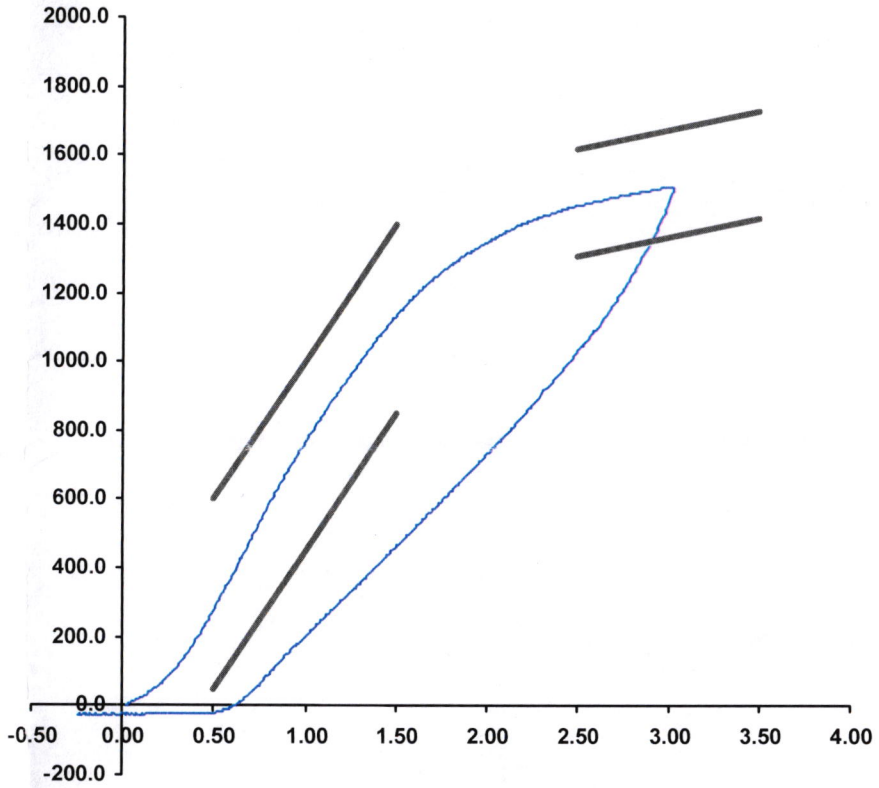
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 15791
Test Number 20691
Report Number 20745
Test Date 10/15/2021 8:34:16 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	283	50	600
Force @ 1.5 mm (N)	1,140	850	1,400
Force @ 2.5 mm (N)	1,456	1,306	1,618
Force @ 3.0 mm (N)	1,510	1,361	1,673

Force (-N) vs Extension (-mm)



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

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

Notes: IMPACT

Operator

Part Number 180-4450

Template No 107 15-Oct-21
SACO Research

By : DC Date : 10/15/21

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

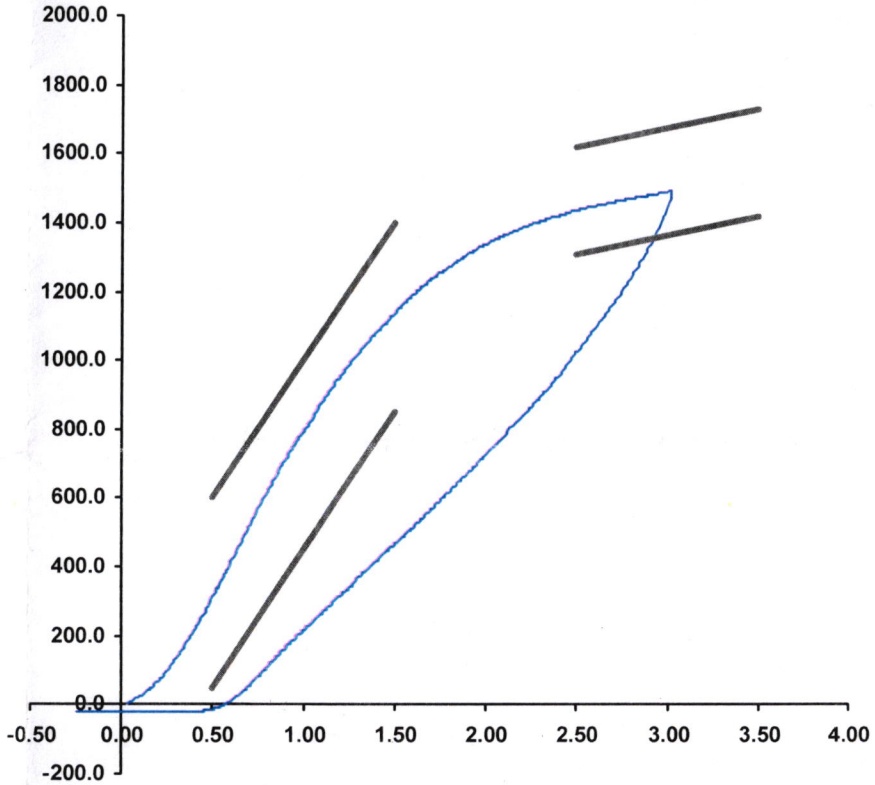
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 16623
Test Number 23389
Report Number 23446
Test Date 7/20/2022 11:50:37 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	320	50	600
Force @ 1.5 mm (N)	1,139	850	1,400
Force @ 2.5 mm (N)	1,435	1,306	1,618
Force @ 3.0 mm (N)	1,488	1,361	1,673

Force (-N) vs Extension (-mm)



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

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

Notes: NON IMPACT

Operator

Part Number 180-4450

Template No 107 20-Jul-22
SACO Research

By : DC Date : 7/20/22

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

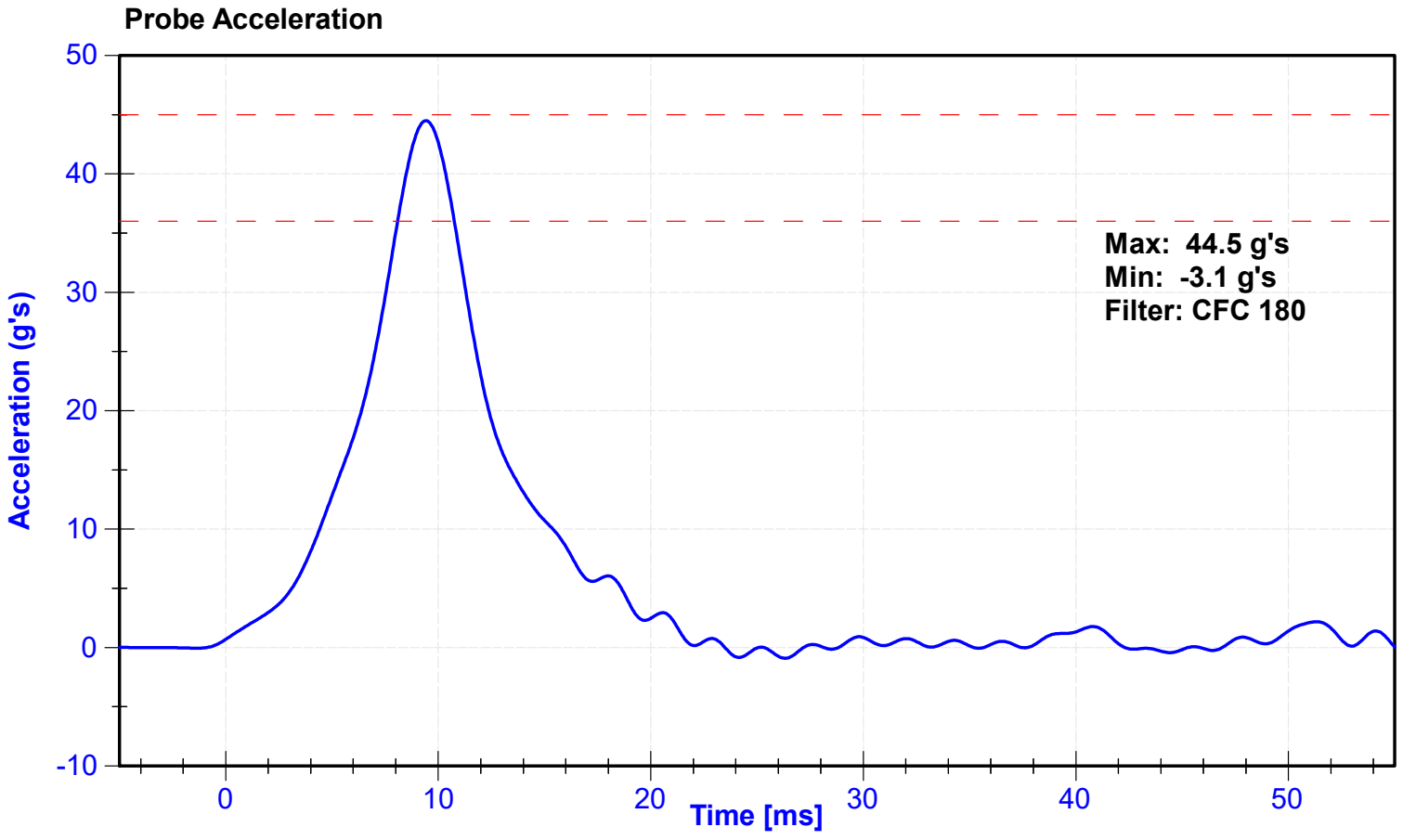
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	DG8012	Laboratory Supervisor	C. Mantell

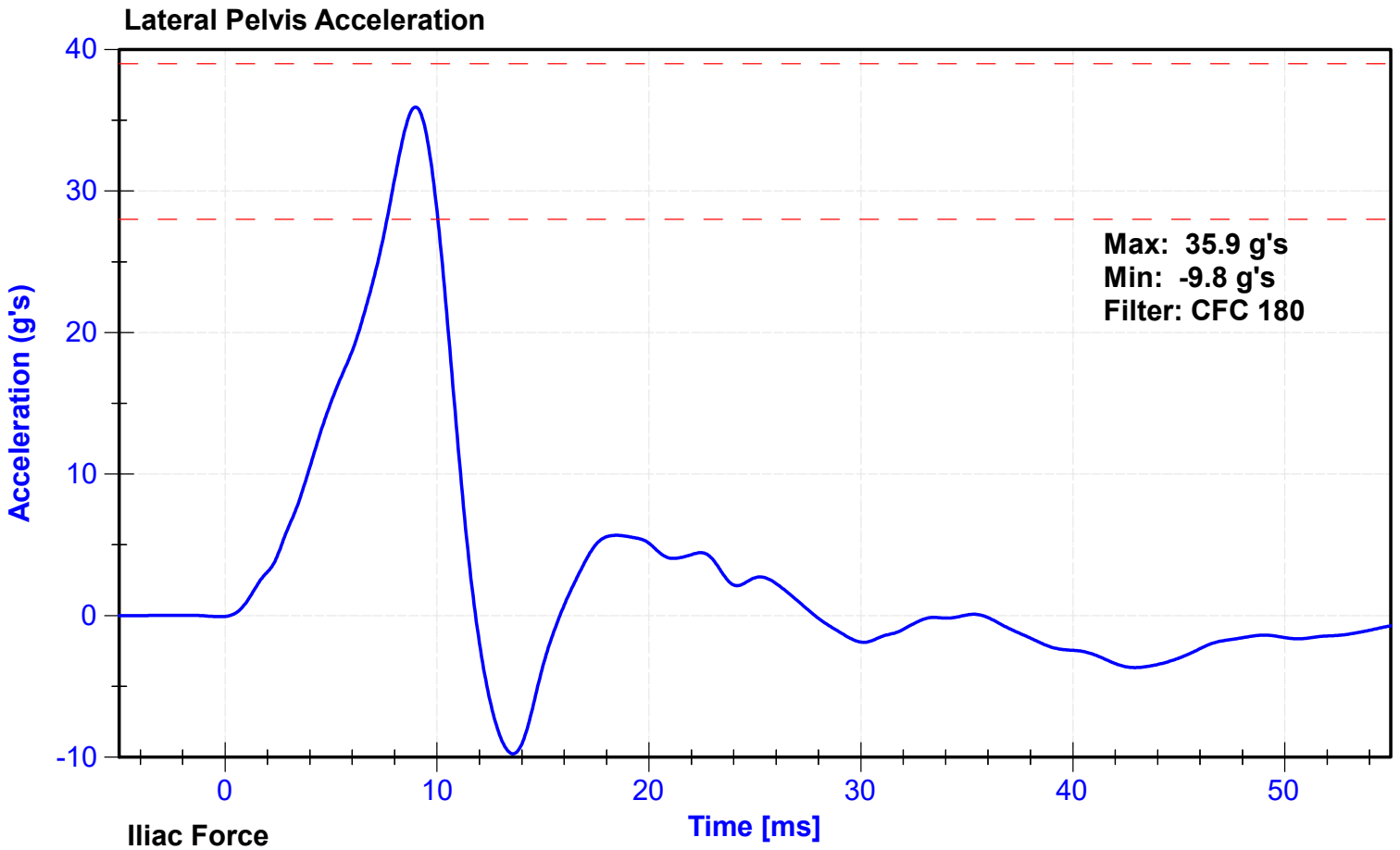
Results

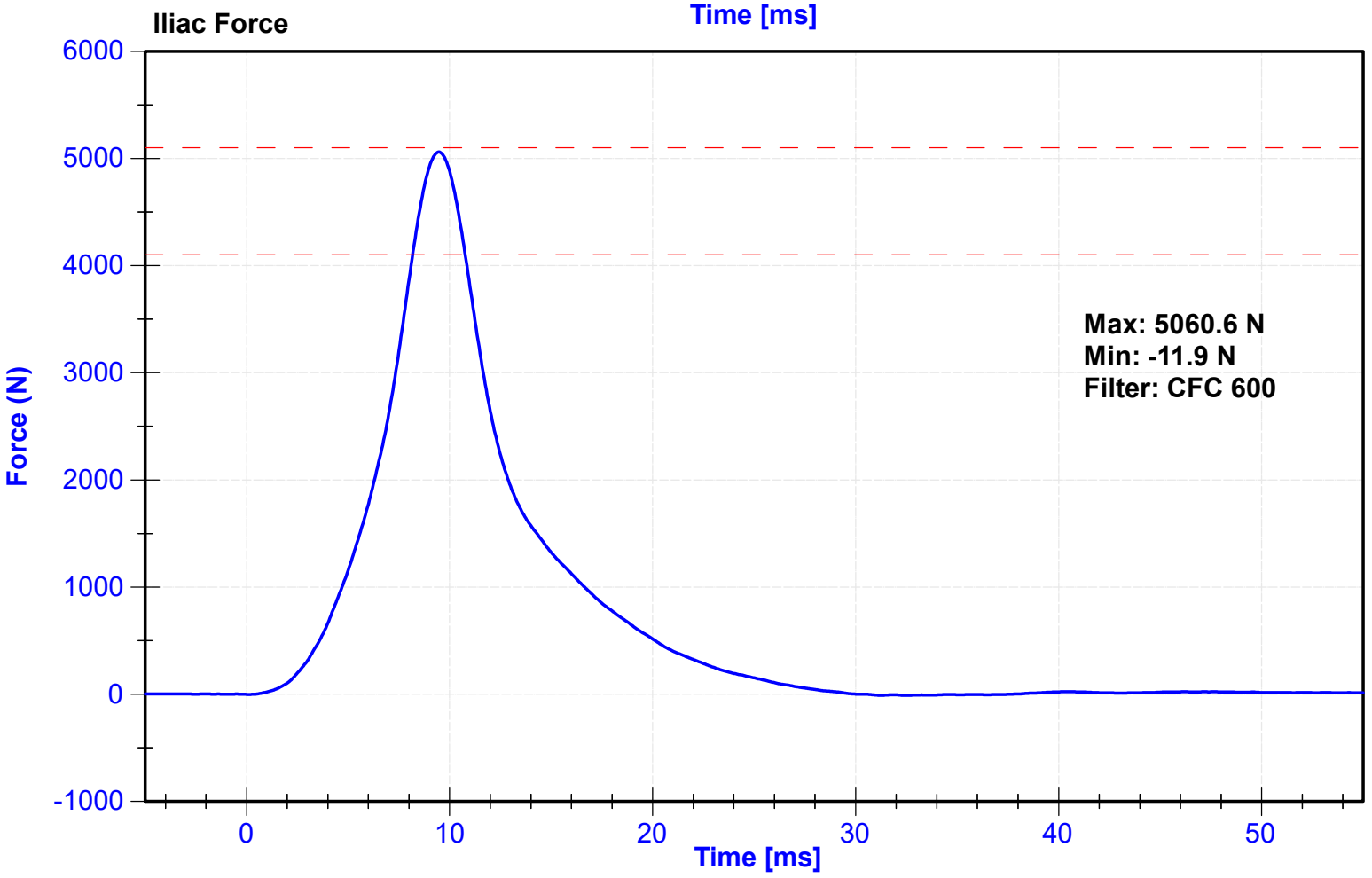
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	34	Pass
Velocity	4.2	4.4	m/s	4.25	Pass
Probe Acceleration	36	45	g's	44.5	Pass
Lateral Pelvis Acceleration	28	39	g's	35.9	Pass
Iliac Force	4100	5100	N	5060.6	Pass

Transducer Calibrations

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




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 35.9 g's
Min: -9.8 g's
Filter: CFC 180


Iliac Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 5060.6 N
Min: -11.9 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	11/16/2023
		Y	P49216	Endevco	11/16/2023
		Z	P51303	Endevco	11/16/2023
	Redundant	X	P58868	Endevco	11/16/2023
		Y	P59020	Endevco	11/16/2023
		Z	P52132	Endevco	11/16/2023
Thorax Rib Displacement Potentiometers	Upper	Y	179GFE	Honeywell	11/17/2023
	Middle	Y	185GFE	Honeywell	11/17/2023
	Lower	Y	178GFE	Honeywell	11/17/2023
Abdomen Load Cells	Forward	Y	DM5846	Denton	05/18/2023
	Middle	Y	1529	Denton	05/18/2023
	Rear	Y	1533	Denton	05/24/2023
Lower Spine Accelerometers (T12)		X	P58997	Endevco	11/16/2023
		Y	T31029	Endevco	01/24/2024
		Z	P52033	Endevco	11/16/2023
Pubic Symphysis Load Cell		Y	459-FY	Denton	06/20/2023

TABLE 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N __DG8012__		
				Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers		Primary	X	P74788	Endevco	11/16/2023
			Y	P51668	Endevco	11/16/2023
			Z	P83319	Endevco	11/16/2023
		Redundant	X	P80334	Endevco	11/16/2023
			Y	P52155	Endevco	11/16/2023
			Z	P83322	Endevco	11/16/2023
Displacement Potentiometers	Thoracic Rib	Upper	Y	1199GFE	Servo	11/17/2023
		Middle	Y	1246GFE	Servo	11/17/2023
		Lower	Y	011GFE	Servo	11/17/2023
	Abdominal Rib	Upper	Y	008GFE	Servo	11/17/2023
		Lower	Y	046GFE	Servo	11/17/2023
Lower Spine Accelerometers (T12)			X	P71272	Endevco	11/16/2023
			Y	P51327	Endevco	11/16/2023
			Z	P52067	Endevco	11/16/2023
Acetabulum Load Cell			Y	270-FY	Denton	09/11/2023
Iliac Wing Load Cell			Y	280-FY	Denton	09/11/2023
Pelvis Plug (struck side)				16424	SACO	05/23/2022
Pelvis Plug (non-struck side)				16421	SACO	05/23/2022

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	G22578	Endevco	09/26/2023
	Vehicle Center of Gravity	Y	G22675	Endevco	09/26/2023
	Vehicle Center of Gravity	Z	G23427	Endevco	09/26/2023
2	Right Sill at Front Seat	X	A315085	Measurement Specialties	10/06/2023
	Right Sill at Front Seat	Y	A315181	Measurement Specialties	10/06/2023
	Right Sill at Front Seat	Z	A315931	Measurement Specialties	10/06/2023
3	Right Sill at Rear Seat	X	A431232	Measurement Specialties	10/24/2023
	Right Sill at Rear Seat	Y	A431233	Measurement Specialties	10/24/2023
	Right Sill at Rear Seat	Z	A431240	Measurement Specialties	10/24/2023
4	Left Sill at Front Door	Y	G24335	Endevco	11/10/2023
5	Left Sill at Rear Door	Y	G24986	Endevco	01/09/2024
6	Left A-Post Lower	Y	G24587	Endevco	11/30/2023
7	Left A-Post Middle	Y	G24588	Endevco	11/30/2023
8	Left B-Post Lower	Y	G24306	Endevco	11/09/2023
9	Left B-Post Middle	Y	G24614	Endevco	11/29/2023
10	Front Seat Track	Y	G24988	Endevco	01/09/2024
11	Rear Seat Track or Structure	Y	G24590	Endevco	11/30/2023
12	Right Rear Occ. Compartment	Y	G24954	Endevco	01/10/2024
13	Engine Block	X	G22391	Endevco	01/26/2024
	Engine Block	Y	G22599	Endevco	01/26/2024
14	Rear Floorpan Above Axle	X	G23693	Endevco	11/29/2023
	Rear Floorpan Above Axle	Y	G23695	Endevco	11/29/2023
	Rear Floorpan Above Axle	Z	G23699	Endevco	11/29/2023

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	A315905	Measurement Specialties	02/16/2024
MDB Center of Gravity	Y	A315970	Measurement Specialties	02/16/2024
MDB Center of Gravity	Z	A335459	Measurement Specialties	02/16/2024
Left Frame at Rear Axle Centerline	X	G23642	Endevco	02/05/2024
Left Frame at Rear Axle Centerline	Y	G23646	Endevco	02/05/2024