

**REPORT NUMBER: 214D-CAL-25-001**

**SAFETY COMPLIANCE TESTING FOR FMVSS 214  
SIDE IMPACT PROTECTION**

**Hyundai Motor Company  
2025 Hyundai Elantra Hybrid  
4 Door Sedan**

**NHTSA No: C20254203**

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



**January 3, 2025**

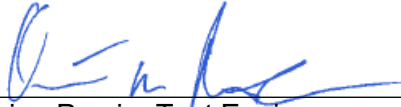
**FINAL REPORT**

**PREPARED FOR:  
U. S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
ENFORCEMENT  
OFFICE OF VEHICLE SAFETY COMPLIANCE  
1200 NEW JERSEY AVE. S.E.  
WEST Bldg. (NEF-240)  
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 693JJ923D000043.

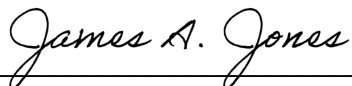
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Prepared by:  Date: January 3, 2025  
Quinn Porzio, Test Engineer

Approved by:  Date: January 3, 2025  
Vanessa Hansen, Operations Manager

**FINAL REPORT ACCEPTANCE BY OVSC:**

  
Accepted by

Date: 1/6/2025

## TECHNICAL REPORT DOCUMENTATION PAGE

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<b>4. Title and Subtitle</b> Final Report of 214P Compliance Test Side Impact Protection Testing of 2025 Hyundai Elantra Hybrid 4 Door Sedan NHTSA No.: C20254203		<b>5. Report Date</b> January 3, 2025																																											
		<b>6. Performing Organization Code</b> CAL																																											
<b>7. Author(s)</b> Quinn Porzio, Test Engineer Vanessa Hansen, Operations Manager		<b>8. Performing Organization Report No.</b> CAL-DOT-2025-001																																											
<b>9. Performing Organization Name and Address</b> Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225		<b>10. Work Unit No.</b>																																											
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<b>12. Sponsoring Agency Name and Address</b> U.S. Department of Transportation National Highway Traffic Safety Administration Enforcement Office of Vehicle Safety Compliance 1200 New Jersey Ave., SE, Room W43-304 Washington, D.C. 20590		<b>13. Type of Report and Period Covered:</b> Final Test Report November 27, 2024 - January 3, 2025																																											
		<b>14. Sponsoring Agency Code</b> NEF-240																																											
<b>15. Supplementary Notes</b>																																													
<b>16. Abstract</b> A 48/24 kph 90° Impact (Moving Deformable Barrier) Compliance Tests was conducted on the subject 2025 Hyundai Elantra Hybrid 4 Door Sedan in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-214D-09 for the determination of FMVSS No. 214 Side Impact Protection compliance. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on November 27, 2024.  The impact velocity of the Moving Deformable Barrier (MDB) was 53.10 kph, and the ambient temperature at the struck (driver side) of the target vehicle at the time of impact was 21°C. The target vehicle post-test maximum crush was 133 mm located at level 2. The test vehicle's occupant performance data is as follows:																																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 50%;">Measurement Description</th> <th colspan="3" style="background-color: #d3d3d3;">Driver ATD (ES-2re)</th> </tr> <tr> <th style="background-color: #d3d3d3;">Units</th> <th style="background-color: #d3d3d3;">IARV</th> <th style="background-color: #d3d3d3;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC36)</td> <td></td> <td style="text-align: center;">1000</td> <td style="text-align: center;">79.883</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">44</td> <td style="text-align: center;">29.071</td> </tr> <tr> <td>Total Abdominal Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">2500</td> <td style="text-align: center;">876.567</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">6000</td> <td style="text-align: center;">-1525.097</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 50%;">Measurement Description</th> <th colspan="3" style="background-color: #d3d3d3;">Passenger ATD (SID-IIs)</th> </tr> <tr> <th style="background-color: #d3d3d3;">Units</th> <th style="background-color: #d3d3d3;">IARV</th> <th style="background-color: #d3d3d3;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC36)</td> <td></td> <td style="text-align: center;">1000</td> <td style="text-align: center;">143.555</td> </tr> <tr> <td>Lower Spine Resultant Acceleration</td> <td style="text-align: center;">G</td> <td style="text-align: center;">82</td> <td style="text-align: center;">49.679</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td style="text-align: center;">N</td> <td style="text-align: center;">5525</td> <td style="text-align: center;">1310.730</td> </tr> </tbody> </table>				Measurement Description	Driver ATD (ES-2re)			Units	IARV	Result	Head Injury Criteria (HIC36)		1000	79.883	Maximum Thoracic Rib Deflection	mm	44	29.071	Total Abdominal Force	N	2500	876.567	Pubic Symphysis Force	N	6000	-1525.097	Measurement Description	Passenger ATD (SID-IIs)			Units	IARV	Result	Head Injury Criteria (HIC36)		1000	143.555	Lower Spine Resultant Acceleration	G	82	49.679	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1310.730
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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.																																													
<b>17. Key Words</b> Compliance Testing Side Impact Protection MDB ES-2re SID-IIs		<b>18. Distribution Statement</b> Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services (TIS) Room E12-100 East Bldg. 1200 New Jersey Ave. Washington, D.C. 20590 Telephone No. (202) 366-2588																																											
<b>19. Security Class. (of this report)</b> UNCLASSIFIED	<b>20. Security Class. (of this page)</b> UNCLASSIFIED	<b>21. No. of Pages</b> 175	<b>22. Price</b>																																										

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## SECTION 1

### PURPOSE AND SUMMARY OF TEST

#### PURPOSE

This moving deformable barrier side impact test was conducted as part of the MY 2024 214 Side Impact Protection Compliance Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. 693JJ923D000043. The purpose of this test was to evaluate side impact protection in a 2025 Hyundai Elantra Hybrid 4 Door Sedan. The side impact test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure, TP-214D-09 dated September 2012.

#### SUMMARY

A 2025 Hyundai Elantra Hybrid 4 Door Sedan was impacted on the left 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 53.10 kph. 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 November 27<sup>th</sup>, 2024. Pre-test and post-test photographs of the test vehicle, the MDB and the dummies are included in this report.

Test dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OVSC Test Procedure, dated September, 2012. The side impact event was documented by 9 cameras. Camera location and other pertinent information are included in this report.

The ES2re male dummy was instrumented with triaxial accelerometer packs located in the head, three rib displacement transducers located in the chest, three load cells located in the abdomen and a load cell located in the pubic symphysis.

The SID-II's female dummy was instrumented with triaxial accelerometer packs located in the head and the spine and load cells located in the pubic symphysis and acetabulum. A summary of each dummy's configuration and performance verification test data has been included in the report along with the dummy response traces.

Injury readings for the dummies were recorded as follows:

**INJURY READINGS**

<b>ES-2re Injury Criteria</b>	<b>Units</b>	<b>Max. Allowable IARV</b>	<b>Measured Value</b>	<b>Pass/Fail</b>
Head Injury Criteria (HIC36)		1000	79.883	Pass
Upper Rib Deflection	mm	44	17.344	Pass
Mid Rib Deflection	mm	44	23.338	Pass
Lower Rib Deflection	mm	44	29.071	Pass
Abdominal Load (front)	N		173.022	
Abdominal Load (mid)	N		297.024	
Abdominal Load (rear)	N		411.333	
Total Abdominal Force	N	2500	876.567	Pass
Pubic Symphysis Force	N	6000	-1525.097	Pass

**INJURY READINGS**

<b>SIDIs Injury Criteria</b>	<b>Units</b>	<b>Max. Allowable IARV</b>	<b>Measured Value</b>	<b>Pass/Fail</b>
Head Injury Criteria (HIC36)		1000	143.555	Pass
Lower Spine Resultant Acceleration	G	82	49.679	Pass
Acetabulum Force	N		1152.997	
Iliac Force	N		273.119	
Sum of Acetabular and Iliac	N	5525	1426.116	Pass

## SECTION 2

### OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

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**DATA SHEET NO. 1  
TEST VEHICLE INFORMATION AND OPTIONS**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024

**TEST VEHICLE INFORMATION AND OPTIONS**

Make	Hyundai
Model	Elantra Hybrid
Body Style	Four Door Sedan
VIN	KMHLM4DJXSU122688
Body Color	Fluid Metal
Engine Displacement (L)	1.6
Type / No. Cylinders	14
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6-Speed
Overdrive	Yes
Final Drive	Front Wheel Drive
Odometer Reading	13 mi

Anti-Lock Brakes (ABS)	Yes
All-Wheel Drive (AWD)	No
Traction Control System (TCS)	Yes
Electric Stability Control (ECS)	Yes
Curtain Airbags	Yes
Torso Airbags – Front Seats	Yes
Torso Airbags – Rear Seats	Yes
Combination/Head Torso Bag	No
Pelvic Airbag – Front Seats	No
Pelvis Airbag – Rear Seats	No
Knee Airbag – Driver	No
Knee Airbag – Front Passenger	No
Seat Belt Pretensioners – Front Seats	Yes
Seat Belt Pretensioners – Rear Seats	Yes
Seat Belt Load Limiter – Front Seats	Yes
Seat Belt Load Limiter – Rear Seats	Yes
Tire Pressure Monitoring System (TPMS)	Yes
Tilt Steering Wheel	Yes
Automatic Door Locks (ADL)	Yes
Power Window Auto-reverse	Yes
Power Seats	No

**DATA FROM CERTIFICATION LABEL**

Manufactured By	Hyundai Motor Company
Date of Manufacture	JUL/2024
Vehicle Type	Passenger Car

GVWR (kg)	1850
GAWR Front (kg)	1050
GAWR Rear (kg)	880

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

Measured Parameter	Front	Rear	Third	Total
Type of Seats (Bench or Bucket)	Bucket	Bench	N/A	
Designated Seating Capacity (DSC)	2	3	N/A	5
Capacity Weight (VCW) (kg)				385



**DATA SHEET NO. 2  
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024

**TIRE PRESSURES**

	Units	LF	RF	LR	RR
As Delivered	kPa	201	212	208	206
Tire Placard	kPa	230	230	230	230

**TEST VEHICLE AXLE WEIGHTS**

	Units	As Delivered (UVW)			Fully Loaded			As Tested		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	419	279		465	351		470	337	
Right	kg	421	253		424	306		427	307	
Ratio	%	61.2	38.8		57.5	42.5		58.2	41.8	
Totals	kg	840	532	1372	889	657	1546	897	644	1541

**TARGET TEST WEIGHT (TVTW) CALCULATION**

Measured Parameter	Units	Value	
As Delivered Weight (UVW)	kg	1372	(A)
Weight of 2 P572 ATDs	kg	131	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	44.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1547.8	(A+B+C)

**TEST VEHICLE ATTITUDES AND CG**

Wheel Opening Location	Distance (grd to ref. point above wheel opening in mm)		Difference (mm)	Meets Requirement***
	Fully Loaded	As Tested		
Left Front	666	660	6	Yes
Right Front	677	671	6	Yes
Left Rear	686	677	9	Yes
Right Rear	699	689	10	Yes

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

**MDB IMPACT POINT DATA**

Measured Parameter	Distance (mm)	Met Requirement
Test Vehicle Wheelbase	2721	Yes
Target Vertical Impact Reference Line Aft of Front Axle	420	Yes
Actual Impact Point Location (fore-aft, above - below)	414	Yes

Note: Fore or above the target impact point is positive (+). Aft or below the target impact point is negative (-)

**WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW**

Component Description	Weight (kg)
Trunk carpeting	4
Rear Passenger Window	2
Compressor	1
Tail light	2
Ballast (if any)	0

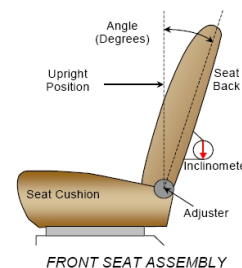
**DATA SHEET NO. 3  
SEAT AND SEAT BELT ANCHORAGE ADJUSTMENT DATA**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024

**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.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat	58.0	35 (0-34)	1.9	7
Front Passenger Seat	57.4	35 (0-34)	1.4	7
Rear Passenger Seat	Fixed	Fixed	Fixed	Fixed

\*Measured on seat back per Form 1

**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 passengers' seats should be set to the rear-most, lowest, mid-angle position

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	16.9	17.7	Max	-	-	-
			Mid	8.7	17.7	30.3
			Min	-	-	-
Front Passenger Seat	FIXED	FIXED	Max			
			Mid			
			Min			

**SEAT FORE / AFT POSITION**

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	259	41 (0-40)	129.5	20
Front Passenger Seat	259	41 (0-40)	129.5	20
Rear Passenger Seat	Fixed	Fixed	Fixed	Fixed

**SEAT BELT ANCHORAGE ADJUSTMENT**

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

**HEAD RESTRAINT ADJUSTMENT**

Seat	Total # of Positions	Placed in Position #
Driver Seat	6 (0-5)	Uppermost
Rear Passenger Seat	Fixed	Fixed

**DATA SHEET NO. 4**  
**FUEL SYSTEMS AND STEERING WHEEL POSITION DATA**

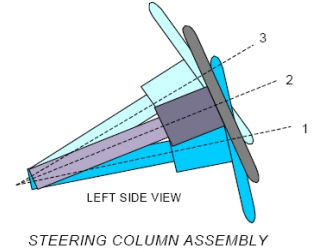
Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
Test Facility: Calspan

NHTSA No.: C20254203  
Test Date: 11/27/2024

**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.*

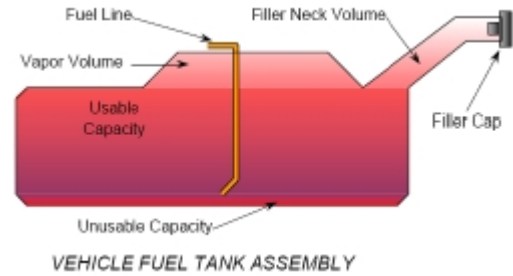
	Degrees	Fore / Aft Position (mm)
Lowermost - Position No. 1	19.8	
Geometric center - Position No. 2	22.35	
Uppermost - Position No. 3	24.9	
Telescoping Steering Wheel Travel		50
Test Position	22.35	25



**FUEL PUMP**

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

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



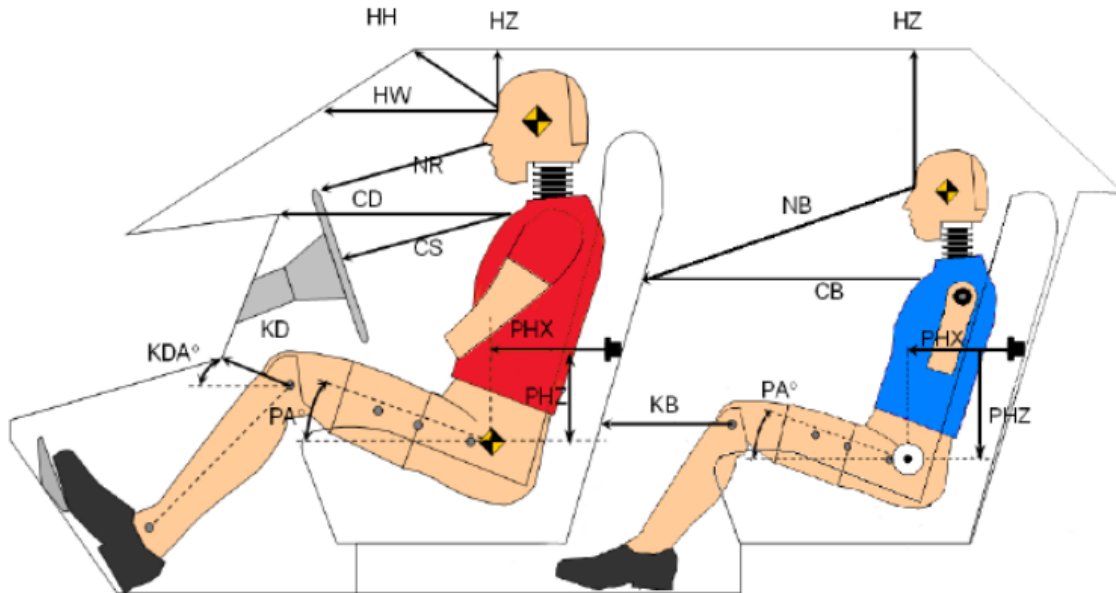
**FUEL TANK CAPACITY**

Description	Liters
Usable Capacity of - Form No.1	42
Usable Capacity of - Owner's Manual	42
92 - 94% of Usable Capacity	38.64 - 39.48
Actual Amount of Solvent Used in Test	39.06

**DATA SHEET NO. 5**  
**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
Test Facility: Calspan

NHTSA No.: C20254203  
Test Date: 11/27/2024



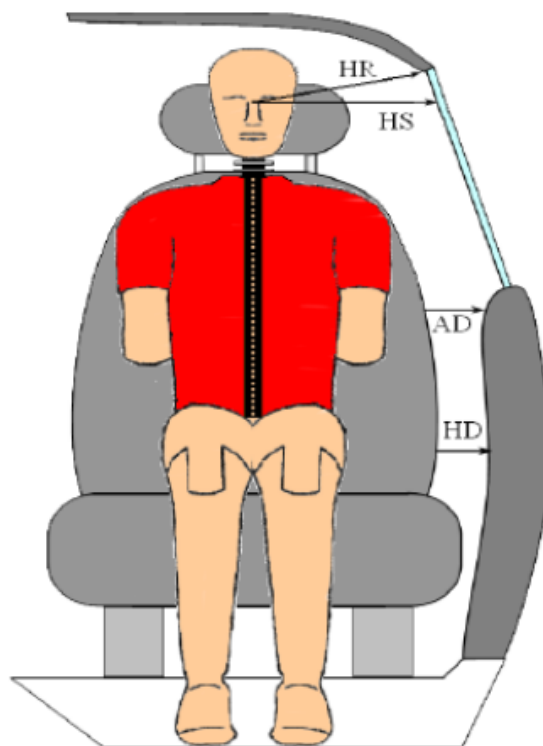
**DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION**

Code	Pass. Code	Description	ES2-re		SID-IIs	
			Length (mm)	Angle	Length (mm)	Angle
HH		Head to Header	397			
HW		Head to Windshield	624			
HZ	HZ	Head to Roof Liner	169		262	
NR	NB	Nose to Rim\Seatback	457		588	
CD	CB	Chest to Dash\Seatback	608		580	
CS		Chest to Steering Wheel	412			
KD(L) / KDA(L)°	KB(L) / KBA(L)°	Left Knee to Dash	243	42.5	292	19.65
KD(R) / KDA(R)°	KB(R) / KBA(R)°	Right Knee to Dash	201	28.2	285	25.35
PAX°	PAX°	Pelvic Tilt Angle (X-Axis)		21.8		24.65
PAY°	PAY°	Pelvic Tilt Angle (Y-Axis)		1.9		0.3
PHX	PHZ	Hip Point to Striker (X-Axis)	169		247	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	275		271	

**DATA SHEET NO. 6  
DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024



*FRONT VIEW OF DUMMY*

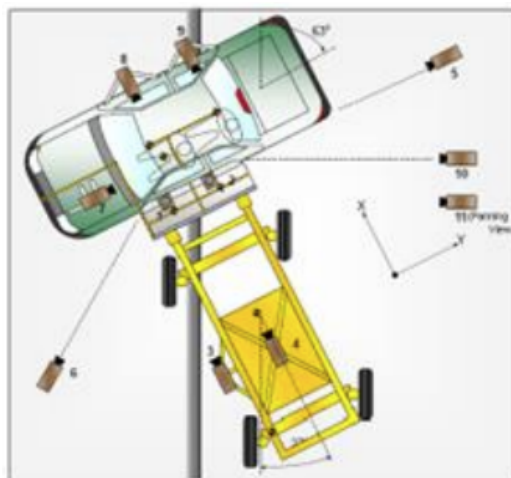
**DUMMY LATERAL CLEARANCE DIMENSION INFORMATION**

Code	Measurement Description	Units	Front Occupant	Rear Occupant
HR	Head to Side Header	mm	193	239
HS	Head to Side Window	mm	336	371
AD	Arm to Door	mm	92	155
HD	Hip Point to Door	mm	151	165

**DATA SHEET NO. 7  
LOCATION OF CAMERAS**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024



**CAMERA LOCATIONS AND DATA**

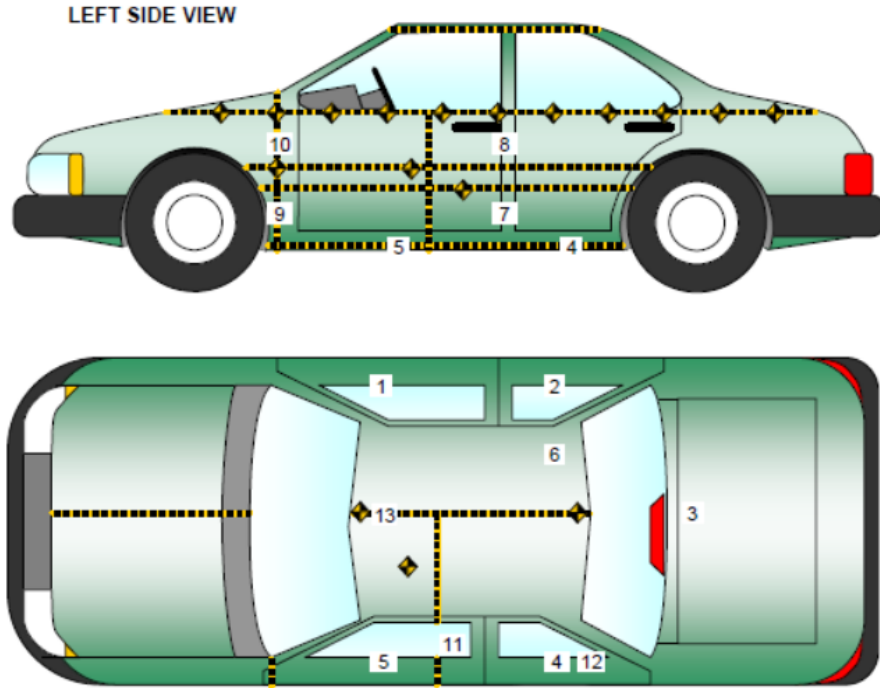
No.	Camera View	Location (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	0	0	-8128	12.5	1000
2	Overhead Close-up	0	0	-8128	28	1000
3	Impact Point Close-up				25	1000
4	Centerline of Impact (MDB)				8	1000
5	Right Side View	0	8043	-1447	28	1000
6	Left Side View	-2651	-5973	-1546	24	1000
7	Front Seat Occupant-Frontal View (OB)				25	1000
8	Front Seat Occupant-Side View (OB)				12.5	1000
9	Rear Passenger-Side View (OB)				12.5	1000
10	Real-time Coverage				Zoom	30

Notes: Reference: Impact Point projected to Ground  
 +X = To Front of MDB, +Y = To Right of MDB, +Z = Down

**DATA SHEET NO. 8**  
**TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
Test Facility: Calspan

NHTSA No.: C20254203  
Test Date: 11/27/2024



**TEST VEHICLE ACCELEROMETER LOCATIONS**

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Left (or Rt.) Sill at Front Seat	2871	670	64
2	Left (or Rt.) Sill at Rear Seat	1952	675	39
3	Rear Floorpan Above Axle	1158	11	-136
4	Left (or Rt.) Sill at Front Door	1956	-673	37
5	Left (or Rt.) Sill at Rear Door	2881	-674	64
6	Left (or Rt.) Rear Occ. Compartment	2111	434	156
7	Left (or Rt.) B-Post Lower	2223	-679	-253
8	Left (or Rt.) B-Post Middle	2175	-669	-490
9	Left (or Rt.) A-Post Lower	3316	-641	-162
10	Left (or Rt.) A-Post Middle	3192	-668	-583
11	Front Seat Track	2492	-561	99
12	Rear Seat Track or Structure	1913	-267	53
13	Vehicle CG	2484	-9	-233

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

**DATA SHEET NO. 9**  
**TEST VEHICLE ACCELEROMETER DATA SUMMARY**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

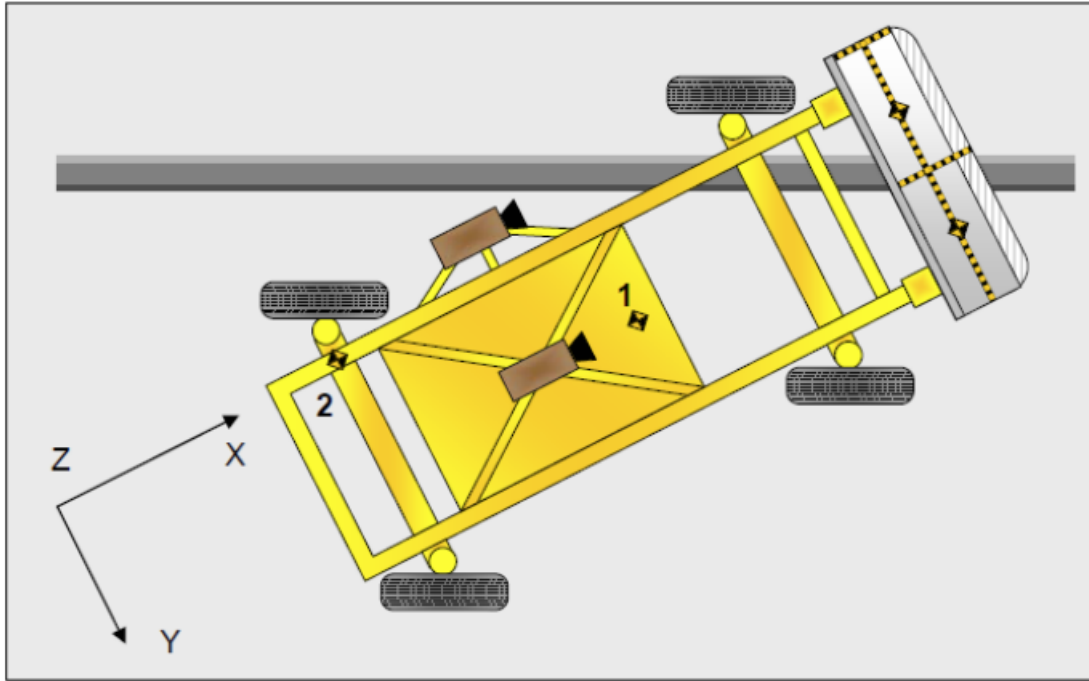
NHTSA No.: C20254203  
 Test Date: 11/27/2024

Loc. No	Description	Axes	Units	Peak Values (g's)			
				Max	Time (ms)	Min	Time (ms)
1	Left (or Rt.) Sill at Front Seat	X	g	4.16	44.80	-7.16	15.80
	Left (or Rt.) Sill at Front Seat	Y	g	25.03	15.35	-3.37	69.95
	Left (or Rt.) Sill at Front Seat	Z	g	11.02	21.70	-13.87	8.80
	Left (or Rt.) Sill at Front Seat Resultant	N/A	g	26.54	7.20	0.04	-33.15
2	Left (or Rt.) Sill at Rear Seat	X	g	3.87	46.65	-7.72	10.45
	Left (or Rt.) Sill at Rear Seat	Y	g	33.06	8.05	-4.23	86.15
	Left (or Rt.) Sill at Rear Seat	Z	g	8.89	10.40	-19.30	14.25
	Left (or Rt.) Sill at Rear Seat Resultant	N/A	g	33.29	8.10	0.00	-28.65
3	Rear Floor Pan Above Axle	X	g	2.52	46.80	-9.13	10.15
	Rear Floor Pan Above Axle	Y	g	25.51	29.85	-2.87	86.95
	Rear Floor Pan Above Axle	Z	g	8.57	32.50	-6.07	14.80
	Rear Floor Pan Above Axle Resultant	N/A	g	26.10	30.05	0.02	-3.65
4	Left (or Rt.) Sill at Rear Door	Y	g	93.38	4.80	-36.12	9.45
5	Left (or Rt.) Sill at Front Door	Y	g	98.70	4.50	-121.80	10.60
6	Left (or Rt.) Rear Occ. Compartment	Y	g	26.57	5.80	-3.11	85.75
7	Left (or Rt.) B-Post Lower	Y	g	185.98	13.25	-149.08	9.70
8	Left (or Rt.) B-Post Middle	Y	g	154.16	4.45	-113.03	22.30
9	Left (or Rt.) A-Post Lower	Y	g	104.05	3.30	-41.07	6.55
10	Left (or Rt.) A-Post Middle	Y	g	35.10	37.85	-29.31	26.25
11	Front Seat Track	Y	g	32.65	3.90	-1.81	132.85
12	Rear Seat Track or Structure	Y	g	26.03	29.60	-2.93	86.10
13	Vehicle CG	X	g	7.09	55.55	-8.59	16.40
	Vehicle CG	Y	g	34.34	17.75	-20.72	86.05
	Vehicle CG	Z	g	12.30	32.85	-18.21	78.20
	Vehicle CG Resultant	N/A	g	35.06	17.65	0.00	-33.40

**DATA SHEET NO. 10**  
**MDB ACCELEROMETER LOCATIONS DATA SUMMARY**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024



**MDB ACCELEROMETER LOCATIONS**

Loc No.	Description	Axes	Units	Peak Values (g's)			
				Max	Time (ms)	Min	Time (ms)
1	MDB CG	X	g	1.5	78.15	-20.74	30.75
		Y	g	1.28	78.40	-8.20	27.75
		Z	g	11.38	35.40	-11.19	30.80
		Resultant		24.34	30.70	0.06	-30.50
2	MDB Rear	Y	g	2.14	148.70	-23.99	29.40
		Z	g	3.17	25.20	-4.77	56.65

**DATA SHEET NO. 11  
MDB SUMMARY OF RESULTS**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024

**MDB SPECIFICATIONS**

Measurement Description	Requirement	Value
Overall Width of Framework Carriage	1241- 1261	1250
Overall Length Including Honeycomb Frame	4140 - 3990	4120
Wheelbase of Framework Carriage	2566 -2616	2600
CG Location of Front Axle		1120
MDB Front Axle Weight		764
MDB Rear Axle Weight		594
MDB Total Weight	1356.5 - 1365.5	1358

**SPEED AND ANGLE AT IMPACT DATA**

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	52.1 to 53.7	53.10
Trap No. 2 Velocity (Redundant)	km/h	52.1 to 53.7	53.26
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0

**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	146
B	Top of Bumper	533	800	Left	113
C	Mid-Level	686	800	Left	112
D	Top of Stack	813	800	Left	94

**IMPACT POINT LOCATION DATA**

Measured Parameter	Units	Tolerance	Value
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	+6
Vertical Offset (- down / + up)	mm	+/- 20 of Intended Impact Point	-17

**DATA SHEET NO. 12**  
**DUMMY INJURY RESPONSE DATA**  
**(Subpart U, ES-2re)**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan NHTSA No.: C20254203  
 Test Facility: Calspan Test Date: 11/27/2024

**Dummy Serial No. D037**

Description	Axes	Positive Direction		Negative Direction	
		MAX	TIME (ms)	MAX	TIME (ms)
<b>HEAD ACCELERATION (g)</b>					
Longitudinal	X	12.61	14.50	-20.66	25.15
Lateral	Y	30.23	24.50	-5.71	254.70
Vertical	Z	13.35	19.70	-8.82	56.20
Resultant	N/A	35.37	24.90		
HIC36 (t1, t2)	N/A	79.88		t1 = 19.55	t2 = 55.55
<b>THORAX DEFLECTION (mm)</b>					
Upper Rib	Y	17.34	49.30	-7.98	21.00
Middle Rib	Y	23.34	47.90	-3.76	23.60
Lower Rib	Y	29.07	46.70	-0.62	285.65
<b>ABDOMINAL FORCES (N)</b>					
Front	Y	173.02	36.10	-19.33	12.65
Middle	Y	297.02	43.70	-15.53	11.05
Rear	Y	411.33	43.35	-8.04	103.65
SUM	N/A	876.57	44.20		
<b>PELVIS FORCES (N)</b>					
Pubic Symphysis	Y	71.25	123.10	-1525.10	45.80

Reference: Positive Direction    -    Longitudinal                    (X) = forward  
                                                  -    Lateral                                (Y) = to right  
                                                  -    Vertical                                (Z) = down

**DATA SHEET NO. 13  
DUMMY INJURY RESPONSE DATA  
(Subpart V, SIDIs)**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan NHTSA No.: C20254203  
 Test Facility: Calspan Test Date: 11/27/2024

**Dummy Serial No. 224**

Description	Axes	Positive Direction		Negative Direction	
		MAX	TIME (ms)	MAX	TIME (ms)
<b>HEAD ACCELERATION (g)</b>					
Longitudinal	X	6.63	186.10	-7.84	51.80
Lateral	Y	37.58	42.35	-10.52	187.90
Vertical	Z	7.14	32.80	-5.94	61.40
Resultant	N/A	37.77	42.30		
HIC36 (t1, t2)	N/A	143.56		t1 = 28.30	t2 = 64.30
<b>LOWER SPINE (g)</b>					
Longitudinal	X	4.96	105.95	-15.86	18.35
Lateral	Y	46.34	47.35	-4.71	108.80
Vertical	Z	5.49	17.70	-17.83	46.90
Resultant	N/A	49.68	47.35	0.00	-38.20
<b>PELVIS FORCES (N)</b>					
Acetabular	Y	1153.00	45.60	-63.94	65.55
Iliac	Y	273.12	50.20	-104.97	83.80

Reference: Positive Direction - Longitudinal (X) = forward  
 - Lateral (Y) = to right  
 - Vertical (Z) = down

**DATA SHEET NO. 14  
POST-TEST OBSERVATIONS**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024

**TEST DUMMY INFORMATION AND CONTACT POINTS**

Dummy Body Part	Front Occupant	Rear Occupant
Head Contact	Header, Curtain Airbag & Headrest	Curtain, Rear Middle Headrest & Seat
Upper Torso Contact	Seatback & Torso/Pelvis Airbag	Seatback
Lower Torso Contact	Seatback	Seatback
Left Knee Contact	Door Trim	Door Trim
Right Knee Contact	Left Knee	Left Knee

**POST-TEST DOOR PERFORMANCE**

Description	Front	Rear
Left Side Doors	Jammed Shut	Jammed Shut
Right Side Doors	Closed and Operational	Closed and Operational
Hatch and Other Doors		Closed and Operational
Seat Movement	None	None
Seatback Failure	None	None

\*Note: Description for door opening must be specific with the following three categories: Remained closed and operational, opened/unlatched during the crash, or jammed shut. Sometimes the door is jammed and unlatched. If the door cannot be opened, then note the door as jammed shut. If open, measurement must be taken for the width of the door opening (mm).

**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

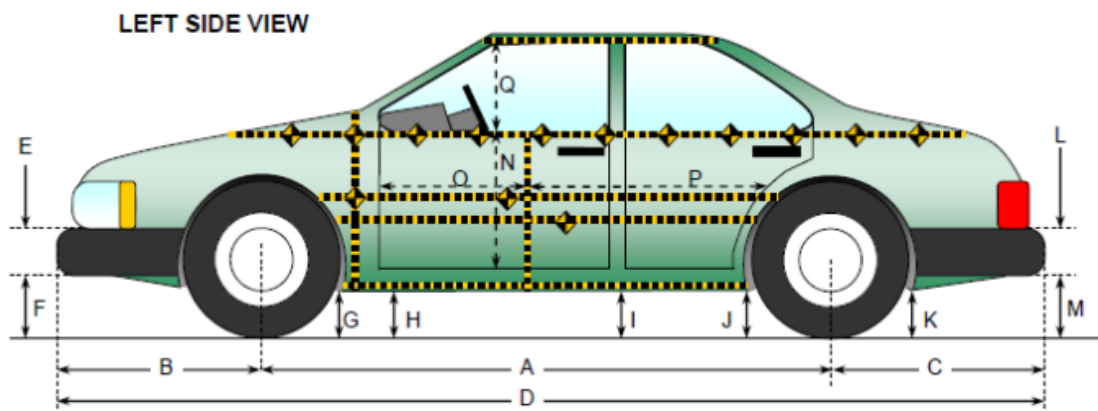
**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

Restraint Type	Front Occupant		Rear Occupant	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	No		
Side Torso/Pelvis Airbag	Yes	Yes	Yes	Yes
Head Airbag	No	N/A	No	N/A
Curtain Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Other				

**DATA SHEET NO. 15**  
**TEST VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
Test Facility: Calspan

NHTSA No.: C20254203  
Test Date: 11/27/2024



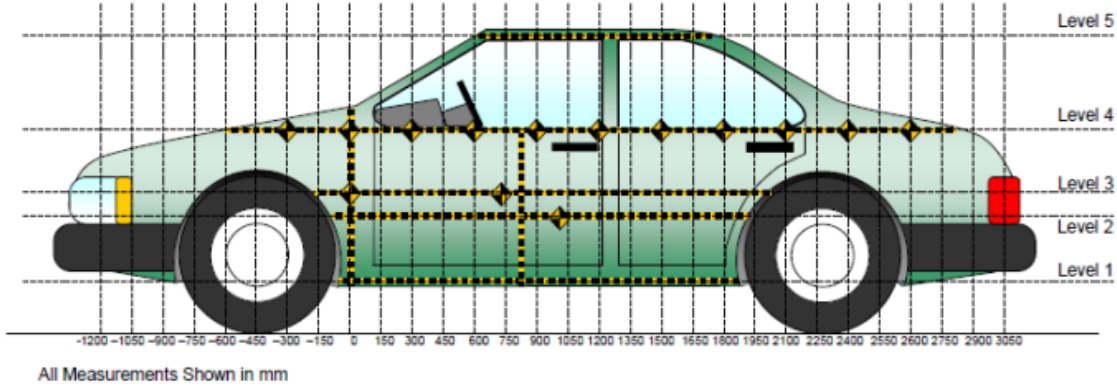
**VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION**

Code.	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2721	2718	-2
B	Front Axle to FSOV	923	922	-1
C	Rear Axle to RSOV	1069	1068	-1
D2	Total Vehicle Length at Centerline	4711	4709	-3
E	Front Bumper Thickness	75	75	0
F	Front Bumper Bottom to Ground	392	398	6
G	Sill Height at Front Wheel Well	168	167	-1
H	Sill Height at Front Door Leading Edge	175	190	15
I	Sill Height at B Pillar	180	175	-5
J1	Sill Height at Rear Wheel Well	16	152	136
J2	Pinch Weld Height at Rear Wheel Well	178	172	-6
K	Sill Height Aft of Rear Wheel Well	183	181	-2
L	Rear Bumper Thickness	90	90	0
M	Rear Bumper Bottom to Ground	386	390	4
N	Sill Height to Window Bottom of Front Window Sill	689	659	-30
O	Front Door Leading Edge to Impact CL	773	772	-1
P	Rear Door Trailing Edge to Impact CL	1382	1367	-15
Q	Front Window Opening	380	380	0
R	Right Side Length	4614	4615	1
S	Left Side Length	4615	4611	-4
T	Vehicle Width at B-Pillars	1795	1722	-73

**DATA SHEET NO.16  
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024



**MAXIMUM EXTERIOR CRUSH MEASUREMENTS**

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	307	91	300
2	Occupant H-Point	mm	483	133	450
3	Mid-Door	mm	630	112	1500
4	Window Sill	mm	888	98	1500
5	Window Top	mm	1343	7	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.17  
VEHICLE EXTERIOR CRUSH PROFILES**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024

**EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL**

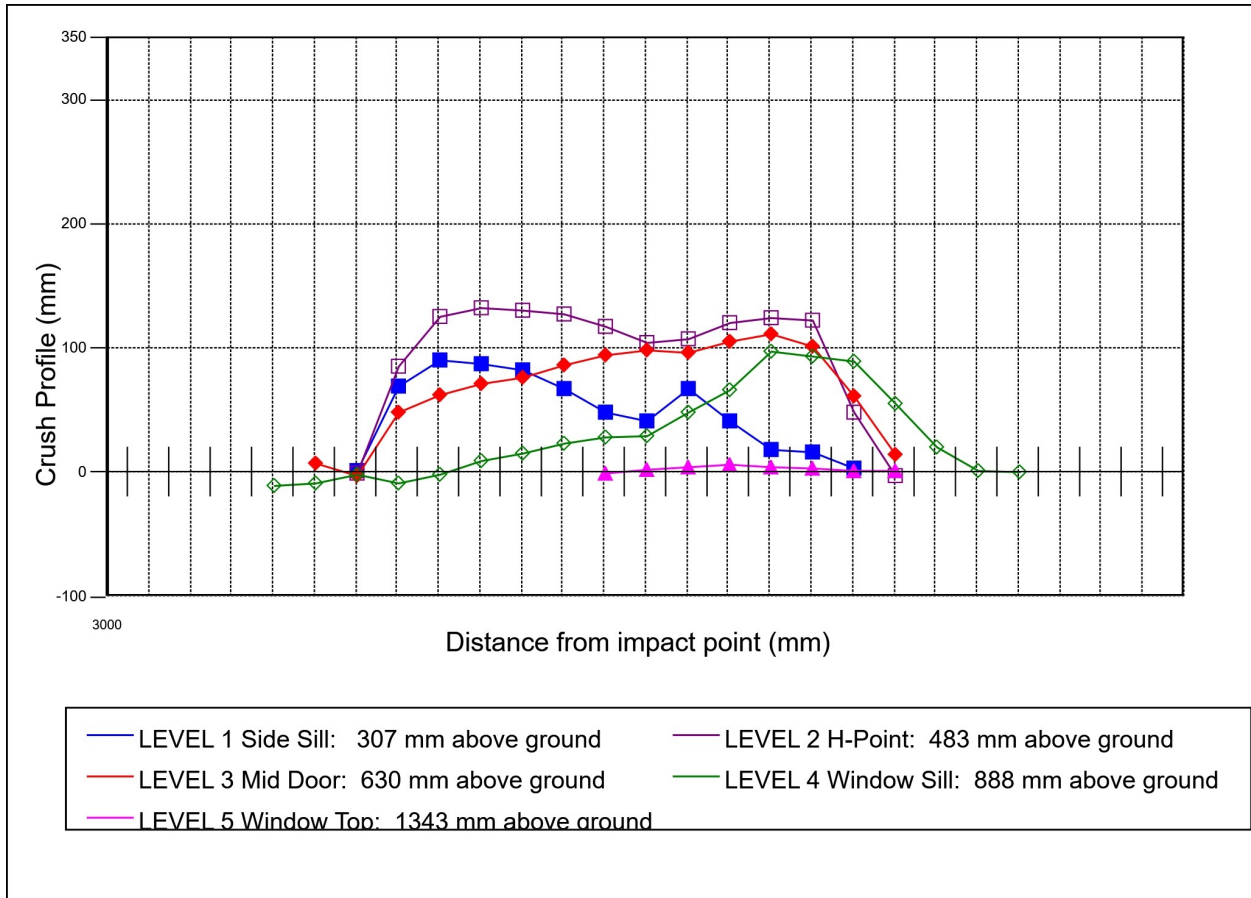
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300				767					777					-10	
-150			909	797				901	805				8	-8	
0	897	907	907	821		895	907	908	822		2	0	-1	-1	
150	889	902	903	829		819	816	854	837		70	86	49	-8	
300	887	900	900	840		796	774	837	841		91	126	63	-1	
450	882	899	898	848		794	766	826	838		88	133	72	10	
600	877	897	895	856		794	766	818	840		83	131	77	16	
750	873	895	893	861		805	767	806	837		68	128	87	24	
900	870	893	894	865	632	821	775	799	836	632	49	118	95	29	0
1050	867	892	897	868	633	825	787	798	838	630	42	105	99	30	3
1200	864	890	898	871	630	796	782	801	822	625	68	108	97	49	5
1350	861	889	900	872	627	819	768	794	805	620	42	121	106	67	7
1500	852	892	901	873	622	833	767	789	775	617	19	125	112	98	5
1650	855	895	903	873	613	838	772	801	779	609	17	123	102	94	4
1800	871	900	904	871	598	867	851	842	781	596	4	49	62	90	2
1950		902	907	867	556		904	892	811	554		-2	15	56	2
2100				863					842					21	
2250				859					857					2	
2400				849					848					1	
2550															
2700															
2850															
3000															

**NOTE:** Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point. The final distance from impact is determined after the final dummy positioning and the pole is aligned with the center of gravity of the dummy's head.

**DATA SHEET NO.17**  
**TEST VEHICLE EXTERIOR CRUSH PROFILES (CONTINUED)**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024

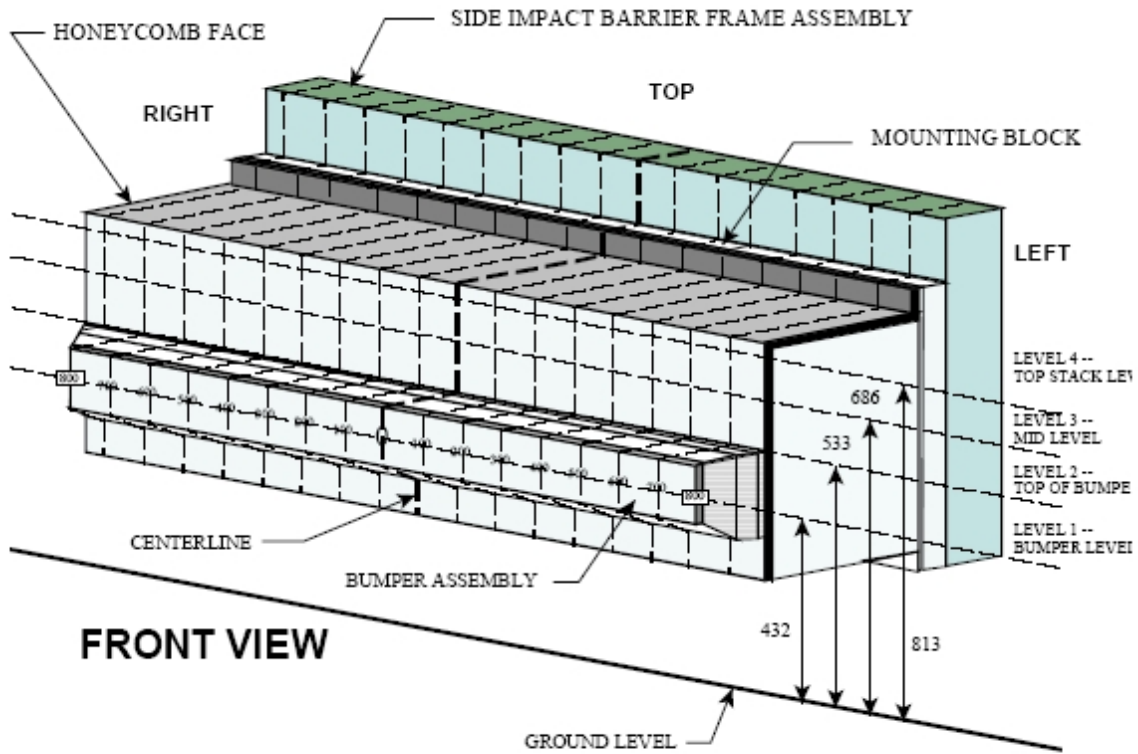


**Vehicle Exterior Crush Measurements - Visual Representation**

**DATA SHEET NO.18  
EXTERIOR STATIC CRUSH FOR IMPACT FACE**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
 Test Facility: Calspan

NHTSA No.: C20254203  
 Test Date: 11/27/2024



NOTE: Dimensions are shown in millimeters, mm

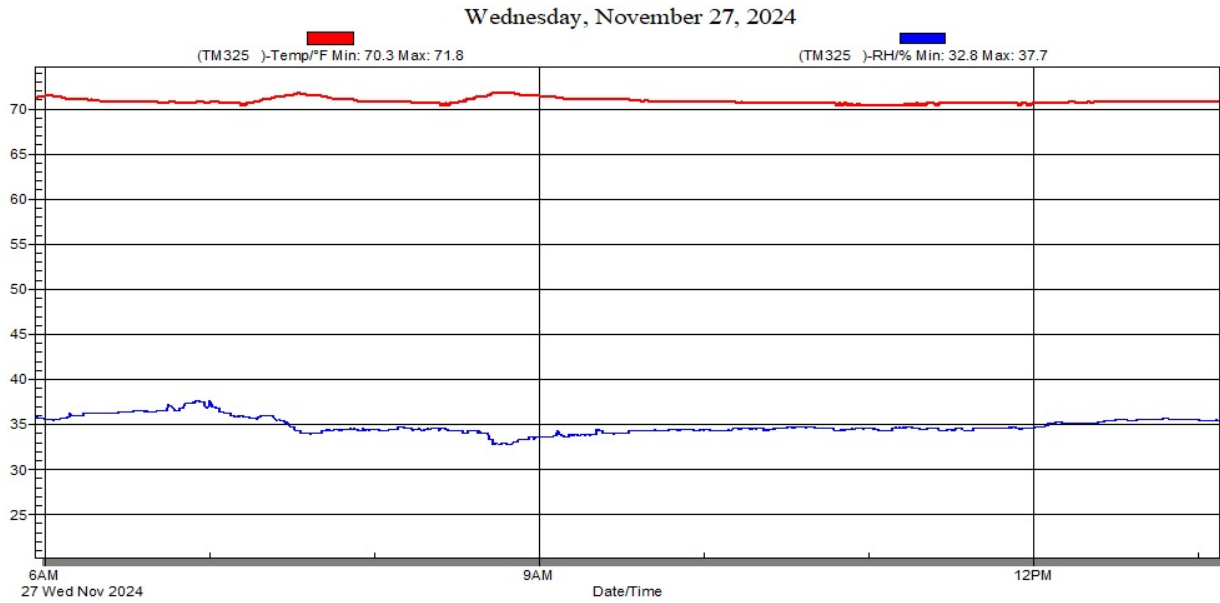
**DEFORMABLE BARRIER STATIC CRUSH**

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
1	114	114	120	124	128	142	132	132	116	132	132	142	128	124	120	114	114
2	91	94	94	97	100	104	104	96	89	96	104	104	100	97	94	94	91
3	34	18	16	20	32	52	46	25	17	25	46	52	32	20	16	18	34
4	11	-1	0	11	31	64	67	47	32	47	67	64	31	11	0	-1	11

**DATA SHEET NO. 19**  
**DUMMY / VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA**

Test Vehicle: 2025 Hyundai Elantra Hybrid 4 Door Sedan  
Test Facility: Calspan

NHTSA No.: C20254203  
Test Date: 11/27/2024



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

**APPENDIX I**  
**PHOTOGRAPHS**

## TABLE OF PHOTOGRAPHS

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2	Post-Test Frontal View of Test Vehicle	I-3
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30	Close-up View of Vehicle’s Tire Placard	I-17



**Figure A-1: Pre-Test Frontal View of Test Vehicle**



**Figure A-2: Post-Test Frontal View of Test Vehicle**



**Figure A-3: Pre-Test Rear View of Test Vehicle**



**Figure A-4: Post-Test Rear View of Test Vehicle**



**Figure A-5: Pre-Test Impacted Side View of Test Vehicle**



**Figure A-6: Post-Test Impacted Side View of Test Vehicle**



**Figure A-7: Pre-Test Frontal View of Impactor Face**



**Figure A-8: Post-Test Frontal View of Impactor Face**



**Figure A-9: Pre-Test Left Side View of Impactor Face**



**Figure A-10: Post-Test Left Side View of Impactor Face**



Figure A-11: Pre-Test Right Side View of Impactor Face



Figure A-12: Post-Test Right Side View of Impactor Face



**Figure A-13: Pre-Test Top View of Impactor Face**



**Figure A-14: Post-Test Top View of Impactor Face**



**Figure A-15: Pre-Test Overhead View of MDB Positioned Against Impact Side of Test Vehicle at Impact Location**



**Figure A-16: Post-Test Overhead View of the MDB and Test Vehicle**



Figure A-17: Pre-Test Front ES2-re in Final Seating Position (Door Open)



Figure A-18: Pre-Test Front ES2-re in Final Seating Position (Door Closed)



**Figure A-19: Pre-Test Front ES2-re - Opposite Side View**



**Figure A-20: Post-Test Front ES2-re - Opposite Side View**



**Figure A-21: Pre-Test Rear SID in Final Seating Position (Door Open)**



**Figure A-22: Pre-Test Rear SID in Final Seating Position (Door Closed)**



**Figure A-23: Pre-Test Rear SID - Opposite Side View**



**Figure A-24: Post-Test Rear SID - Opposite Side View**



Figure A-25: T (0) - Impact Event



Figure A-26: Post-Test Close-up View of Impact Point Target

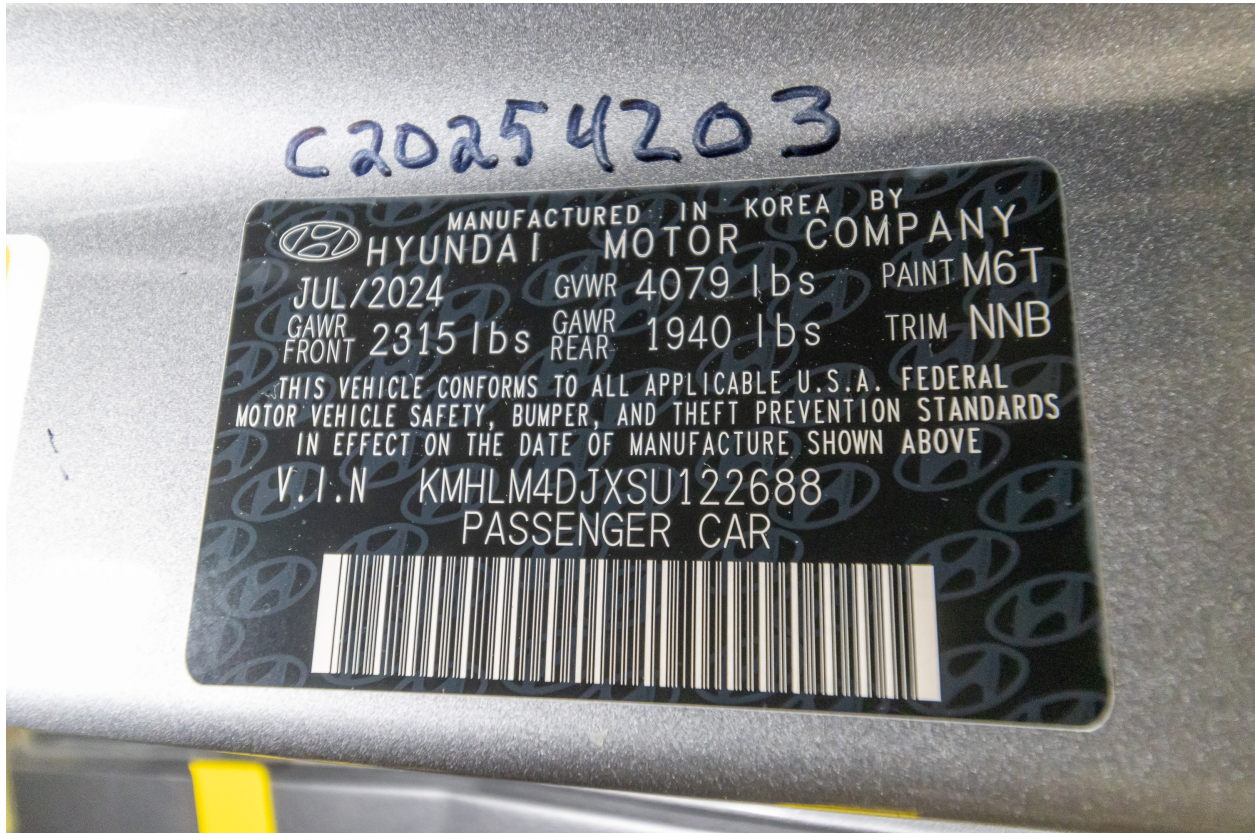


Figure A-27: Close-up View of Vehicle's Certification Label



Figure A-28: Post-Test Front Seat Occupant Area Showing Head & Torso Contact Regions



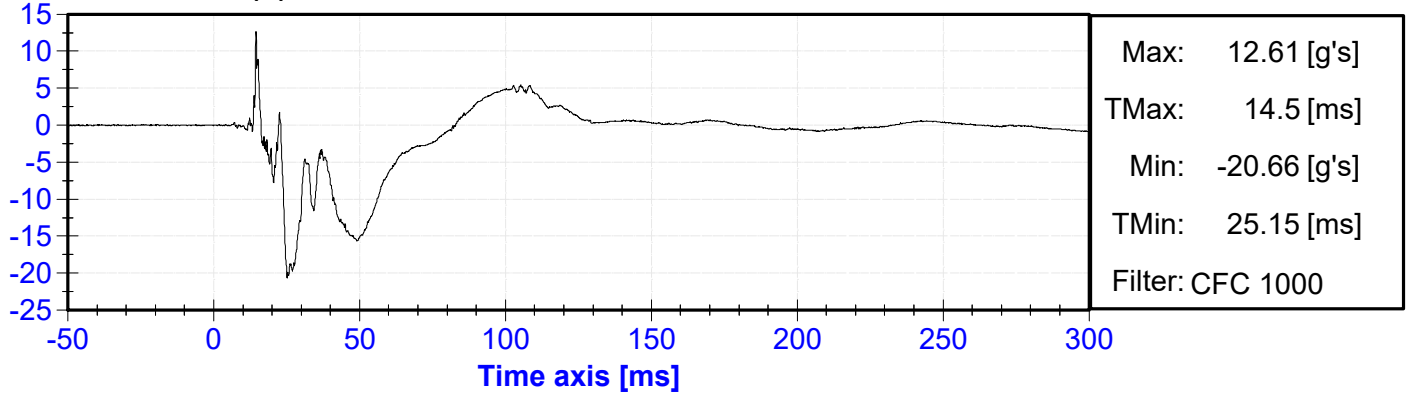
**APPENDIX II**  
**ES-2re DUMMY RESPONSE DATA TRACES**

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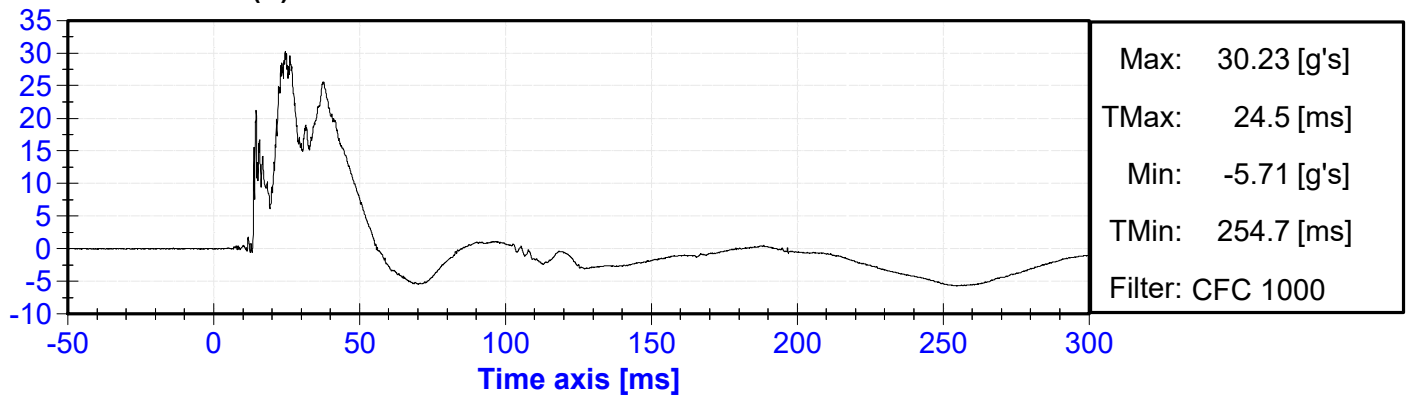
ACCELERATION [g's]

ES-2re Head (X) Acceleration vs. Time



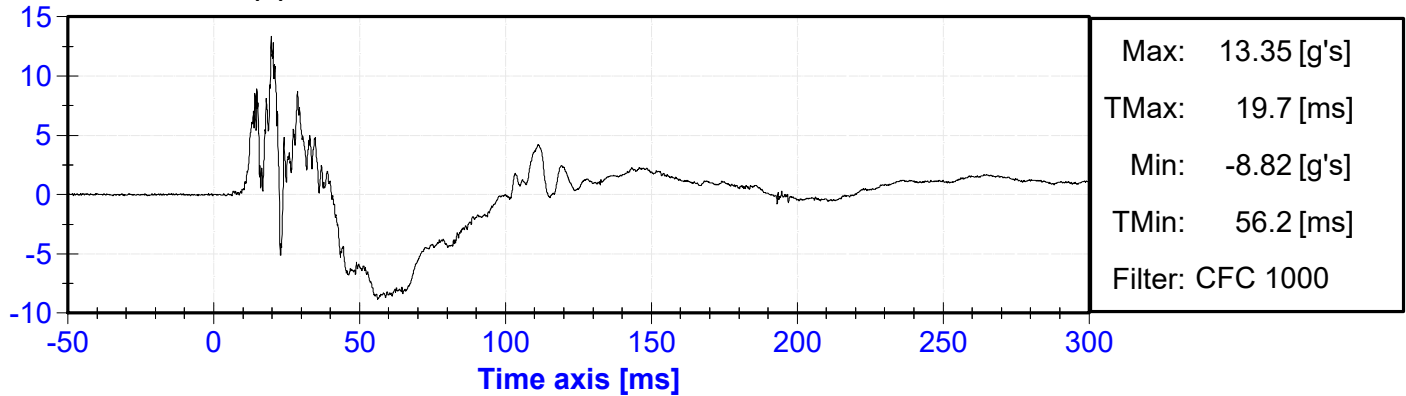
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ES-2re Head (Y) Acceleration vs. Time



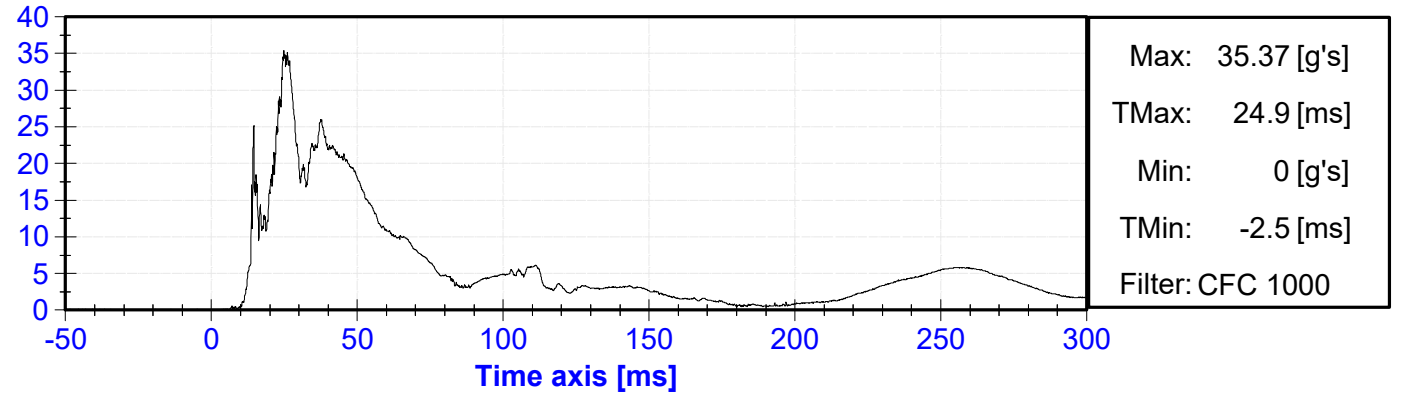
ACCELERATION [g's]

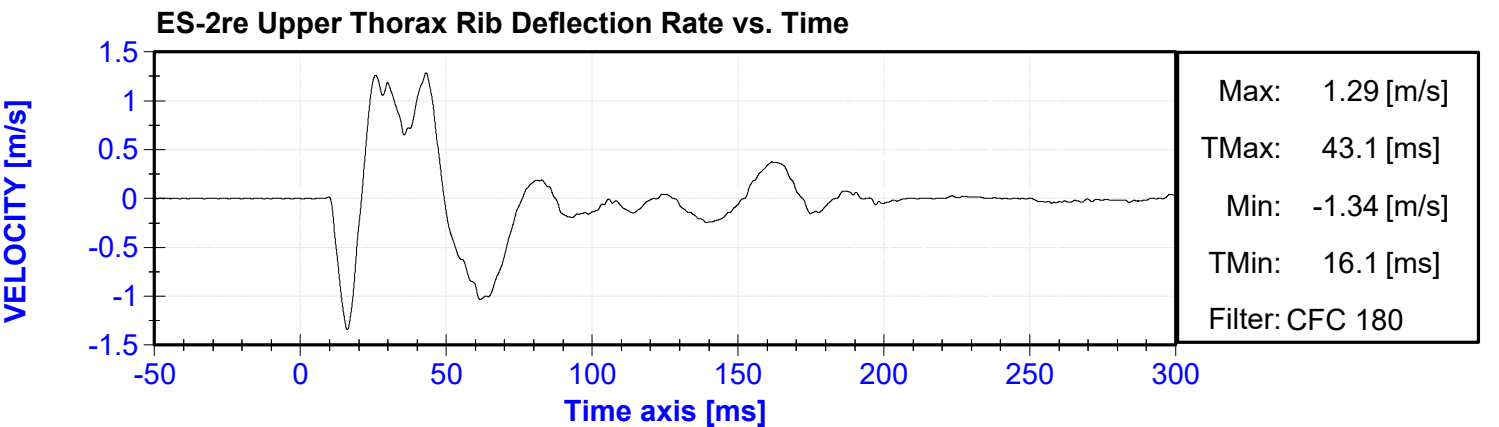
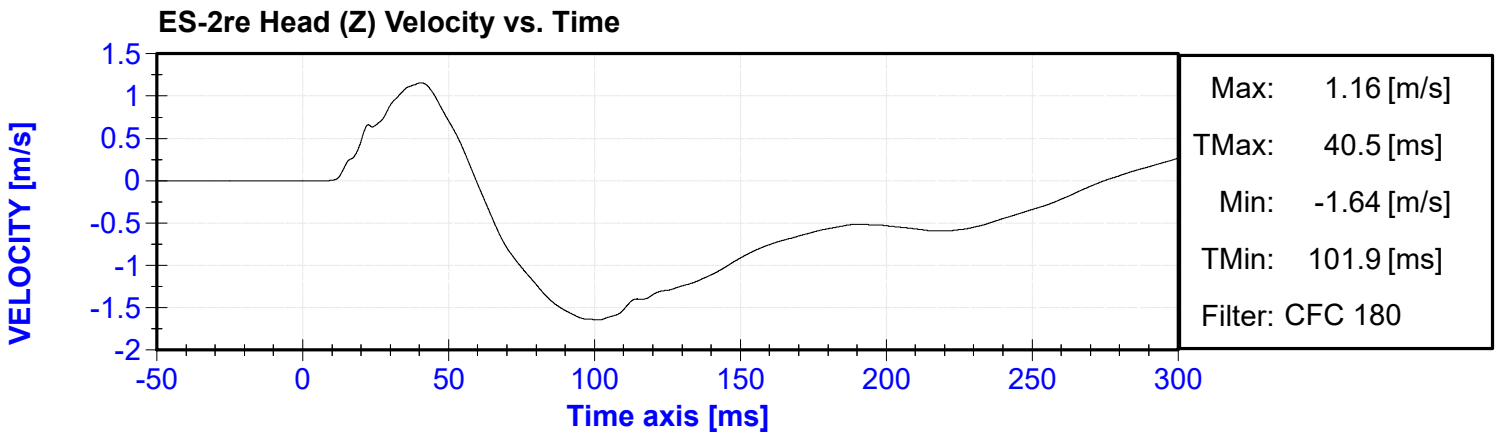
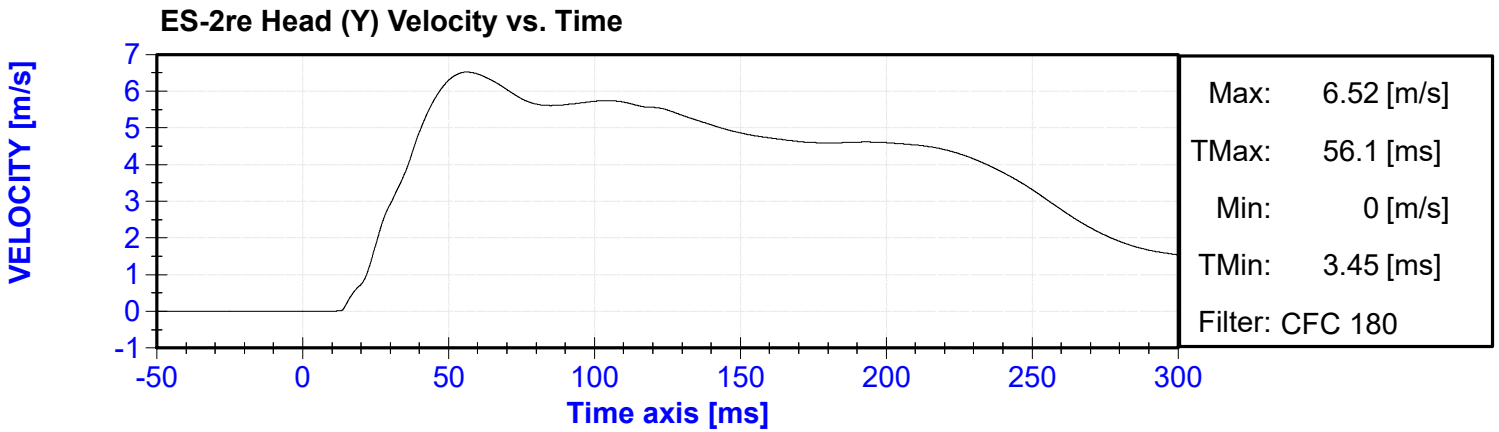
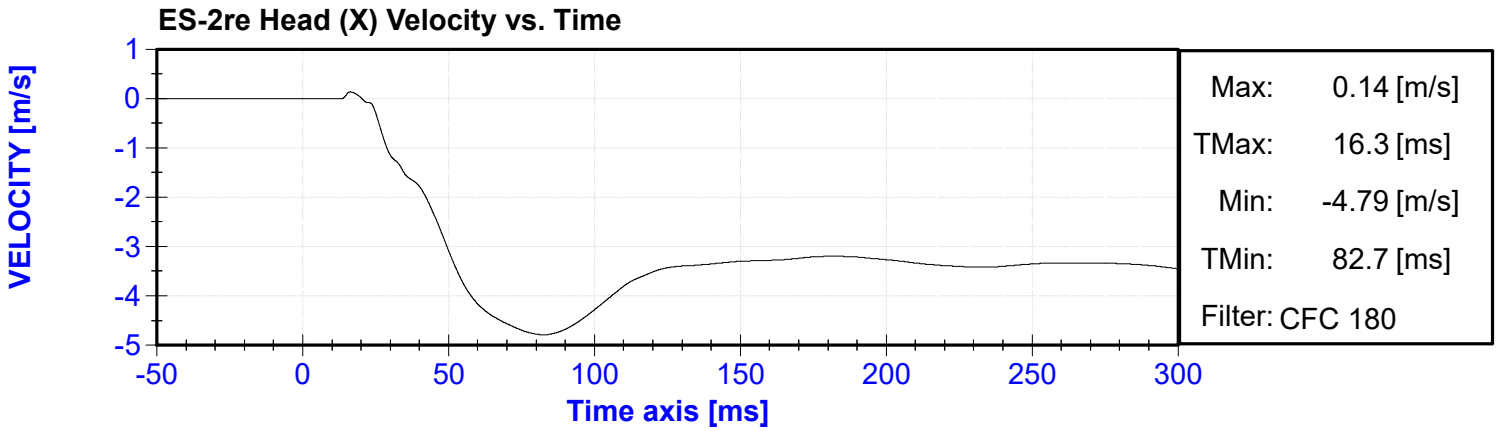
ES-2re Head (Z) Acceleration vs. Time

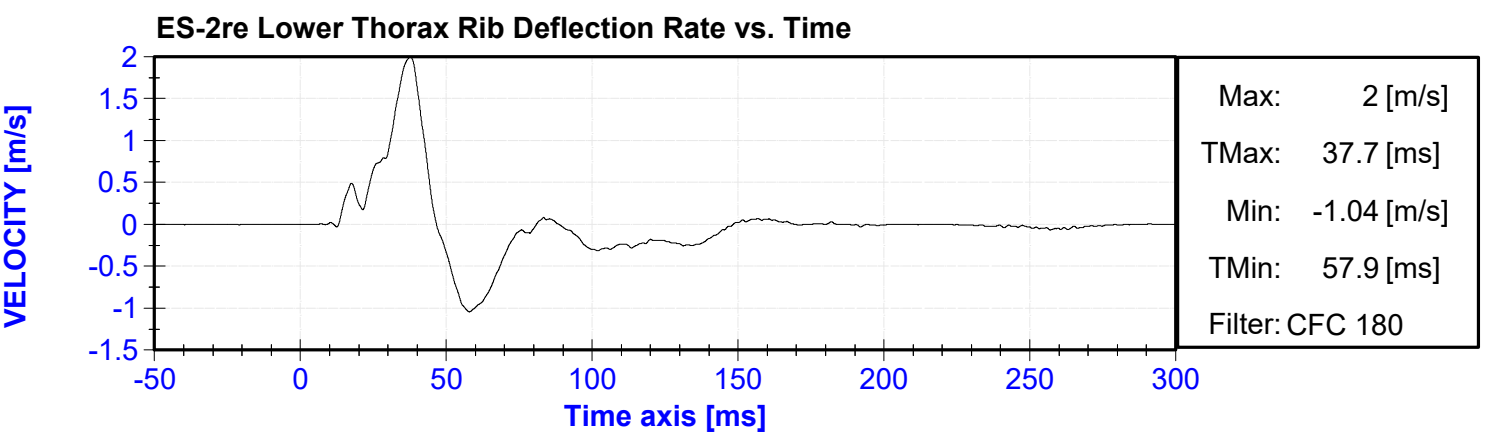
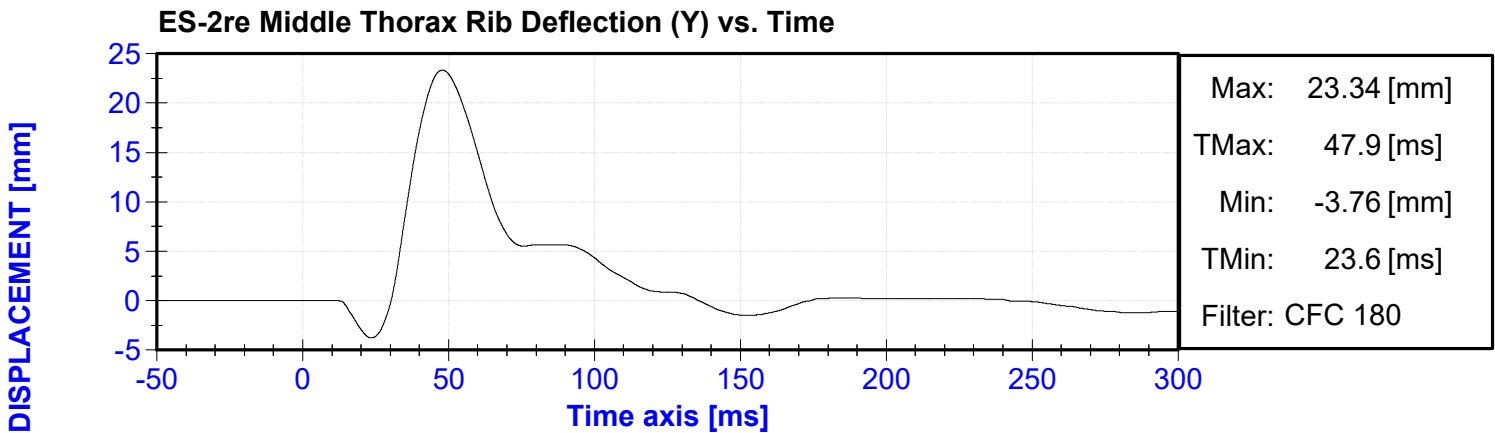
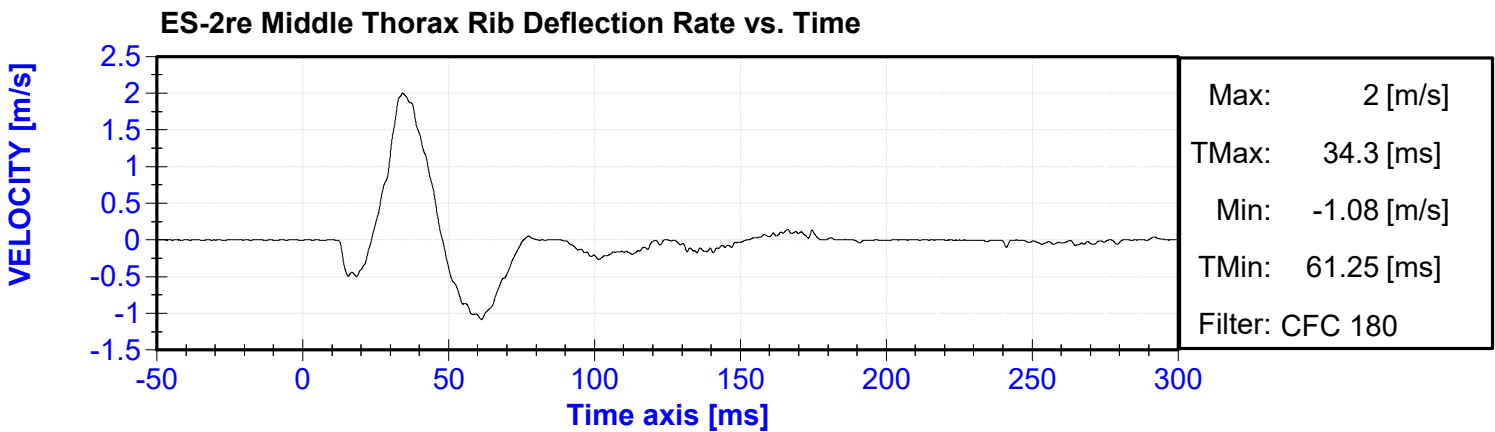
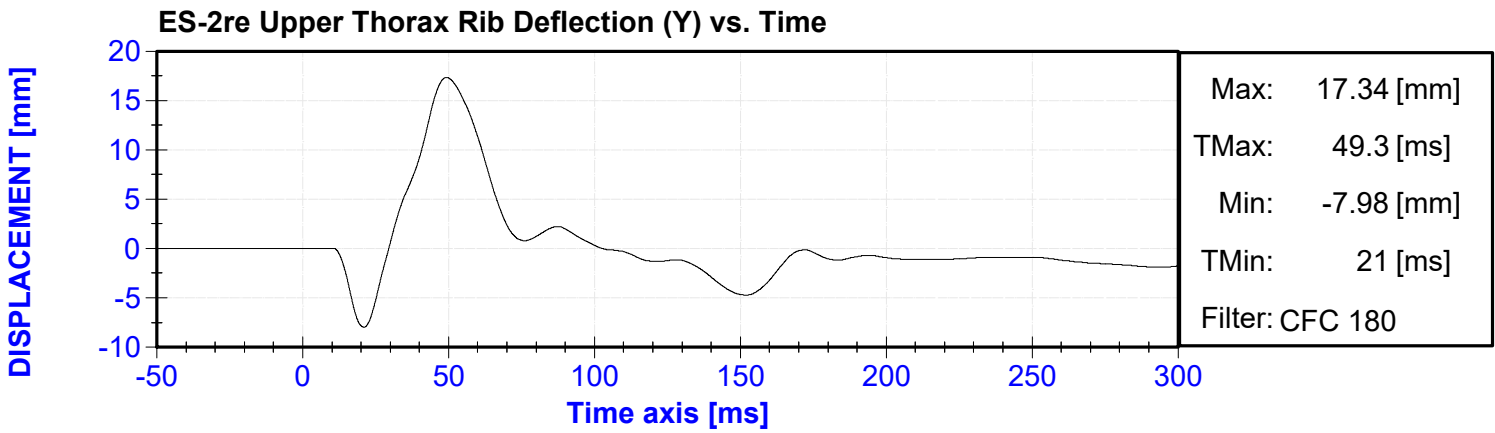


ACCELERATION [g's]

ES-2re Head Resultant Acceleration vs. Time

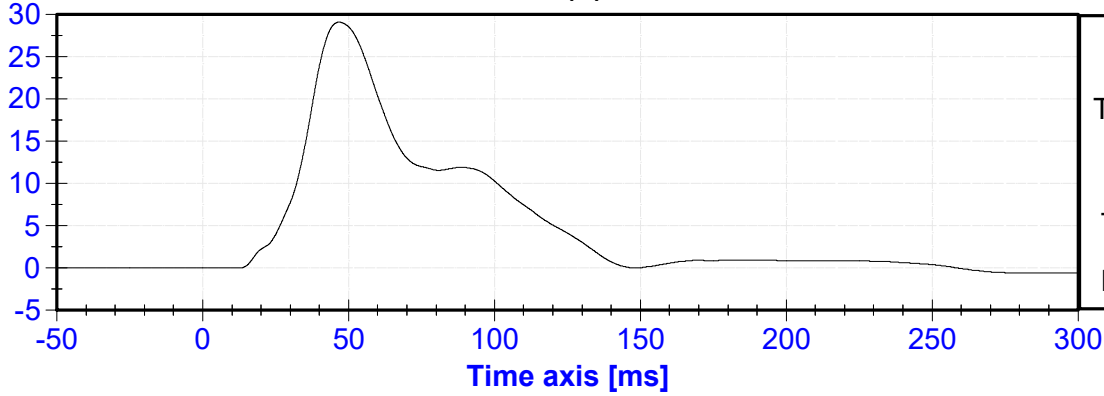






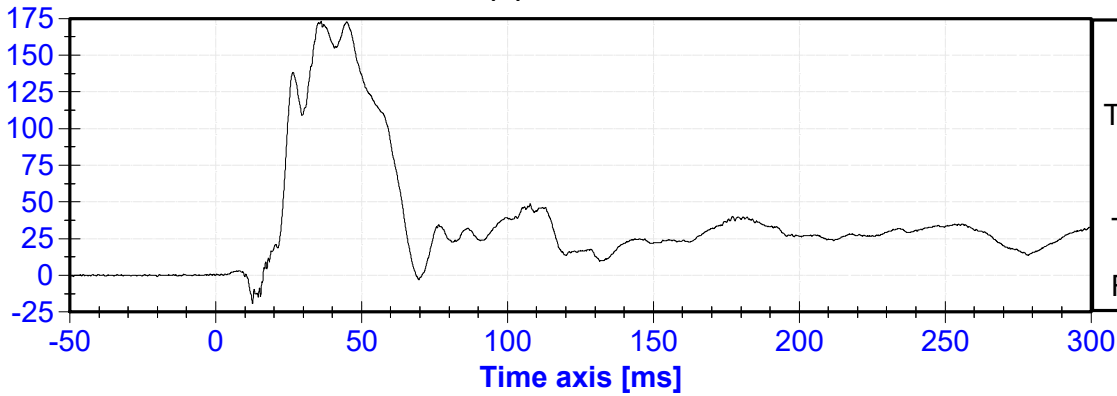
ES-2re Lower Thorax Rib Deflection (Y) vs. Time

DISPLACEMENT [mm]



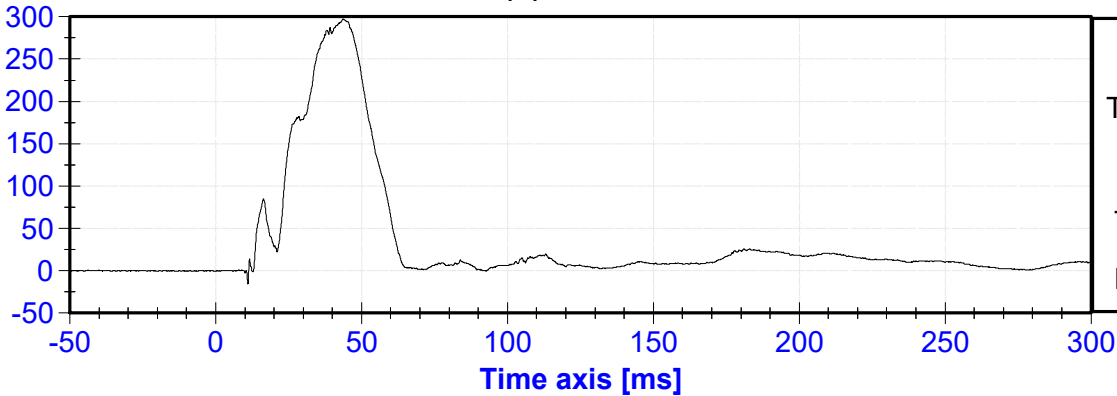
ES-2re Front Abdomen Force (Y) vs. Time

FORCE [N]



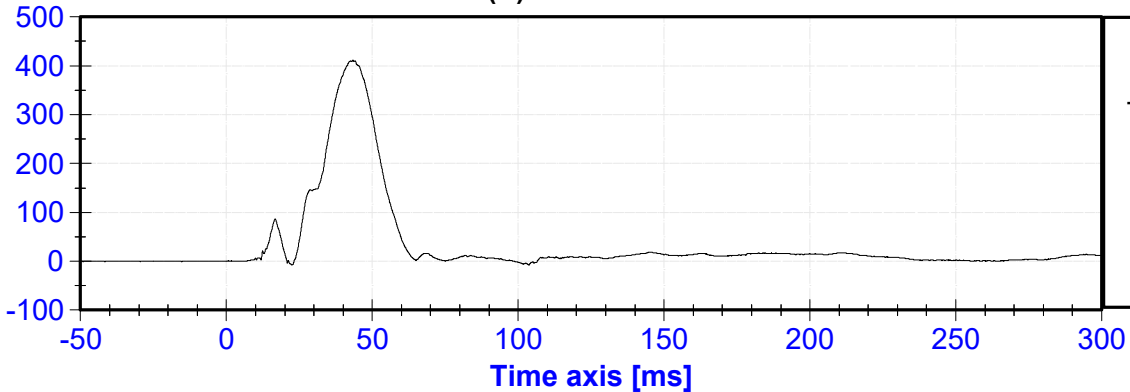
ES-2re Middle Abdomen Force (Y) vs. Time

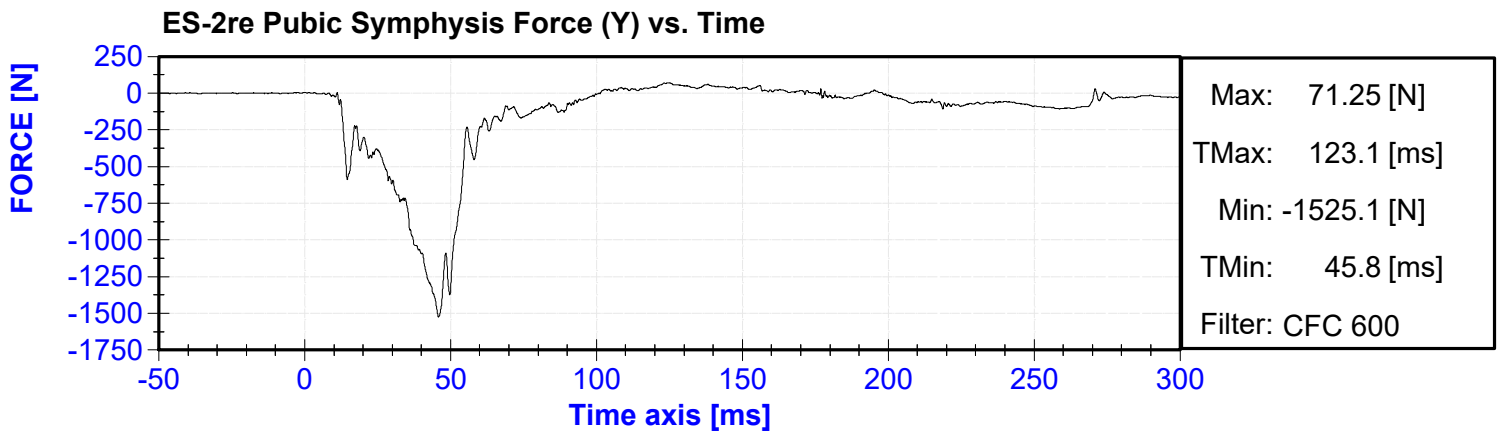
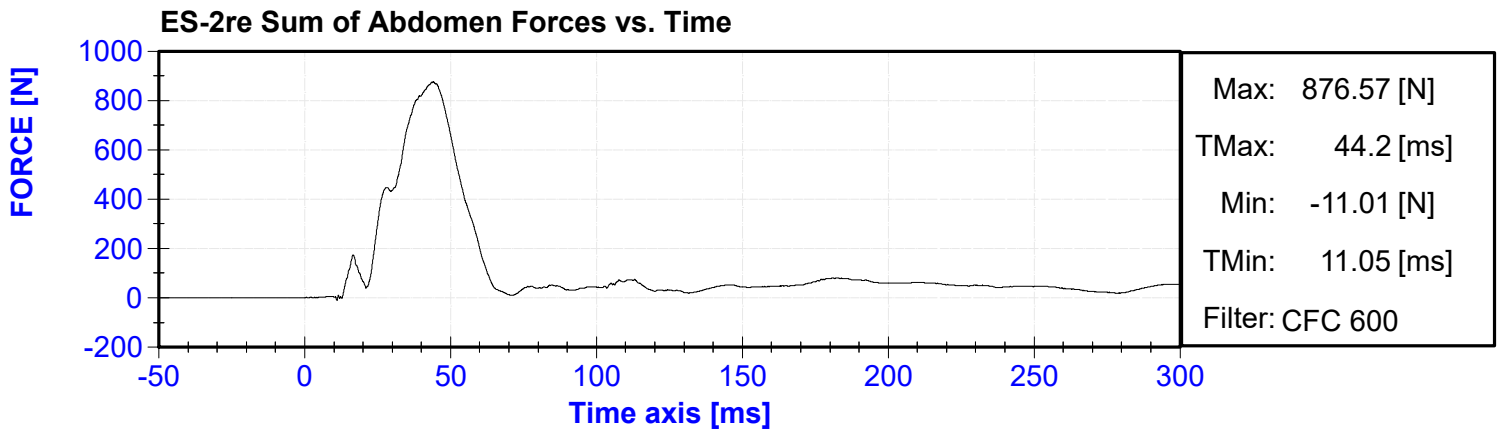
FORCE [N]



ES-2re Rear Abdomen Force (Y) vs. Time

FORCE [N]





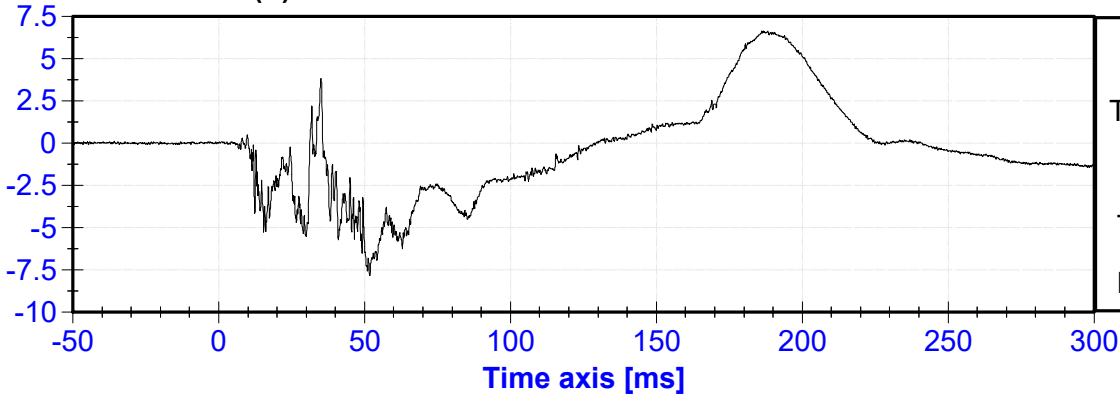
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**SID-II's DUMMY RESPONSE DATA TRACES**

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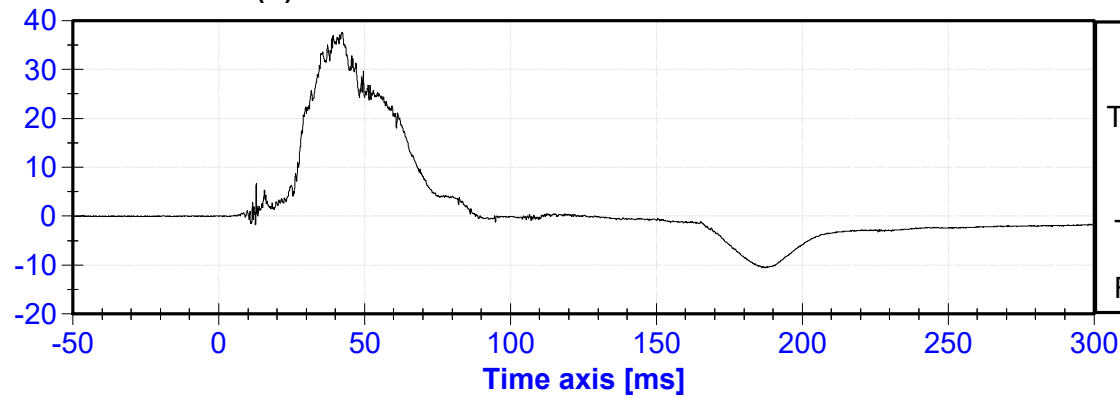
ACCELERATION [g's]

SID-IIs Head (X) Acceleration vs. Time



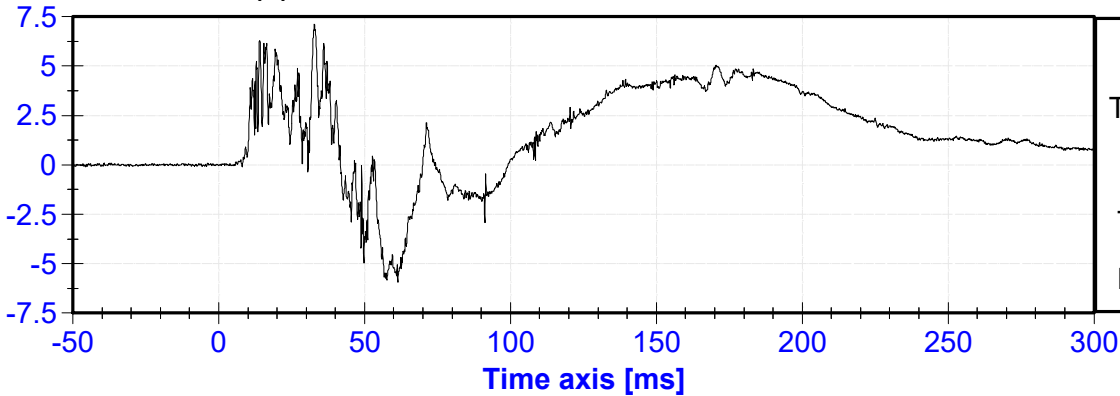
ACCELERATION [g's]

SID-IIs Head (Y) Acceleration vs. Time



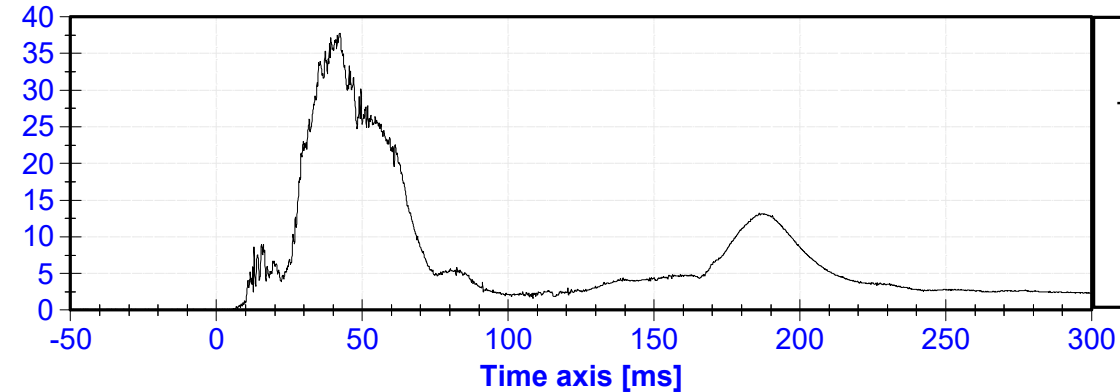
ACCELERATION [g's]

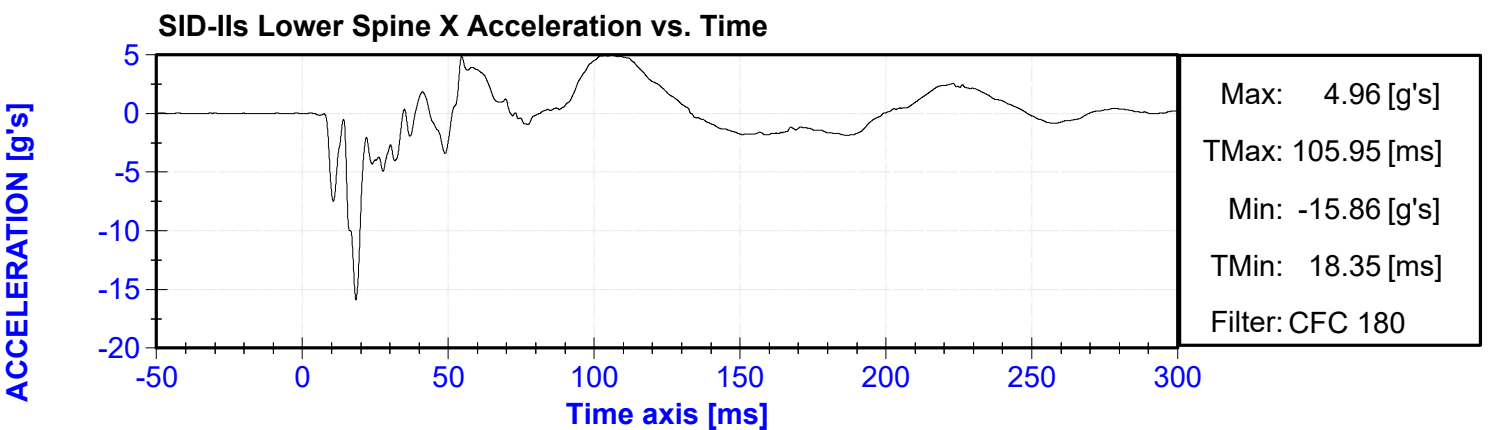
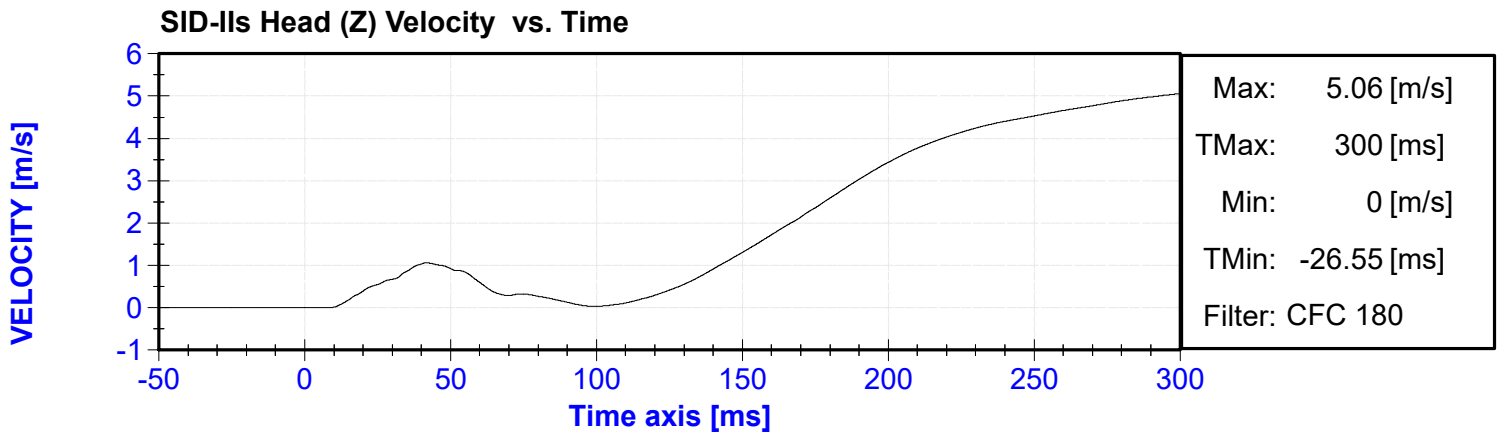
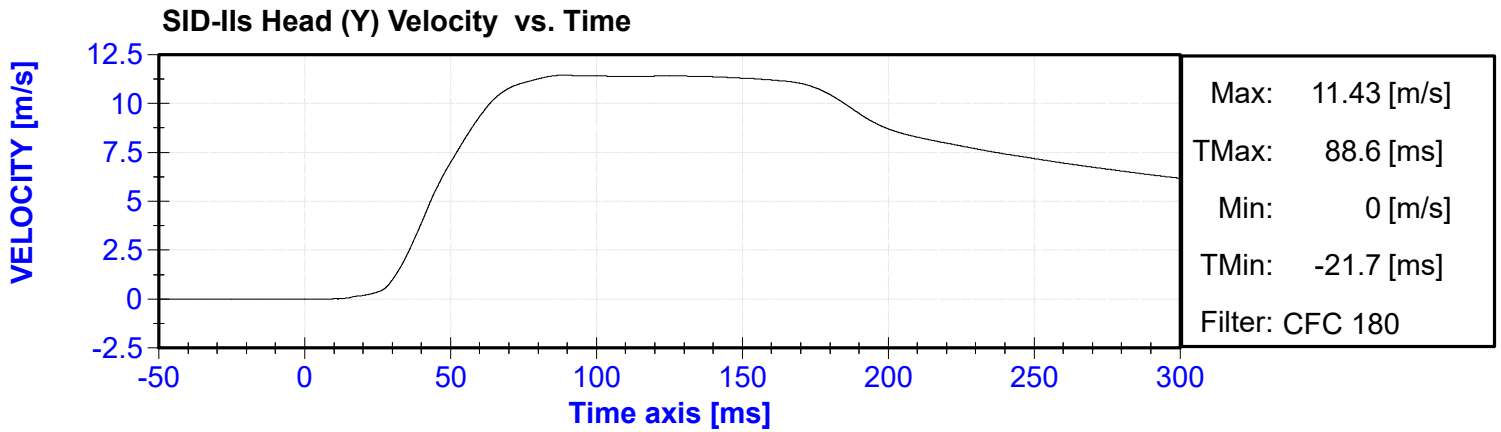
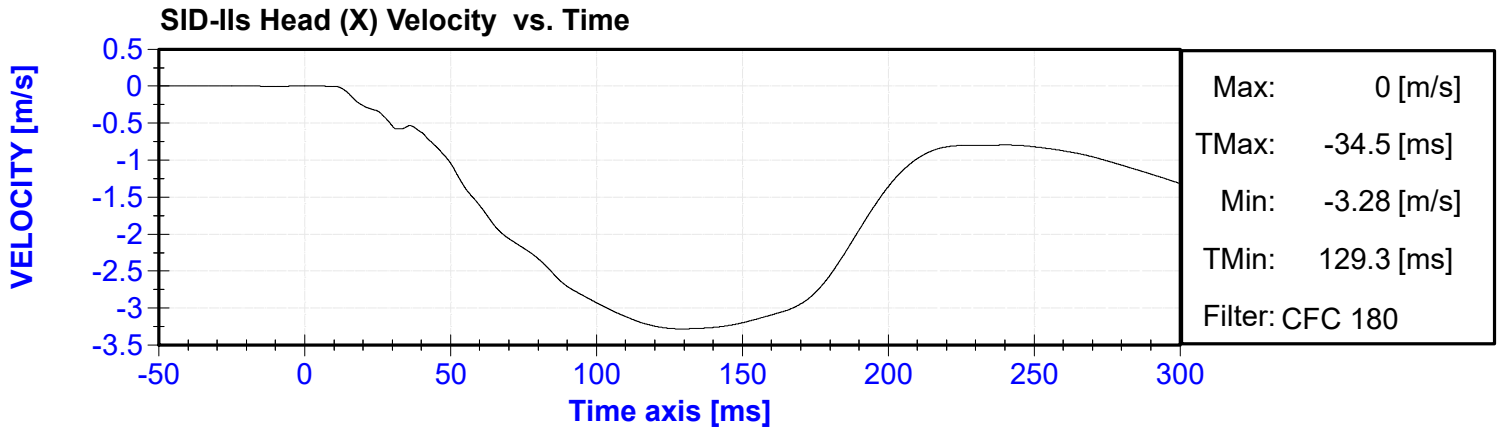
SID-IIs Head (Z) Acceleration vs. Time

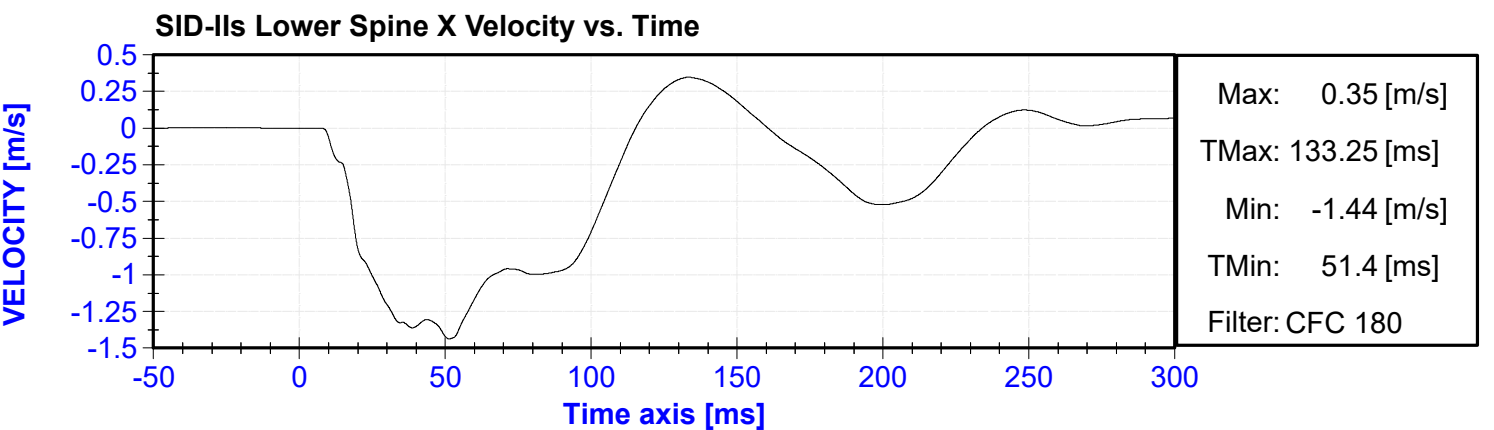
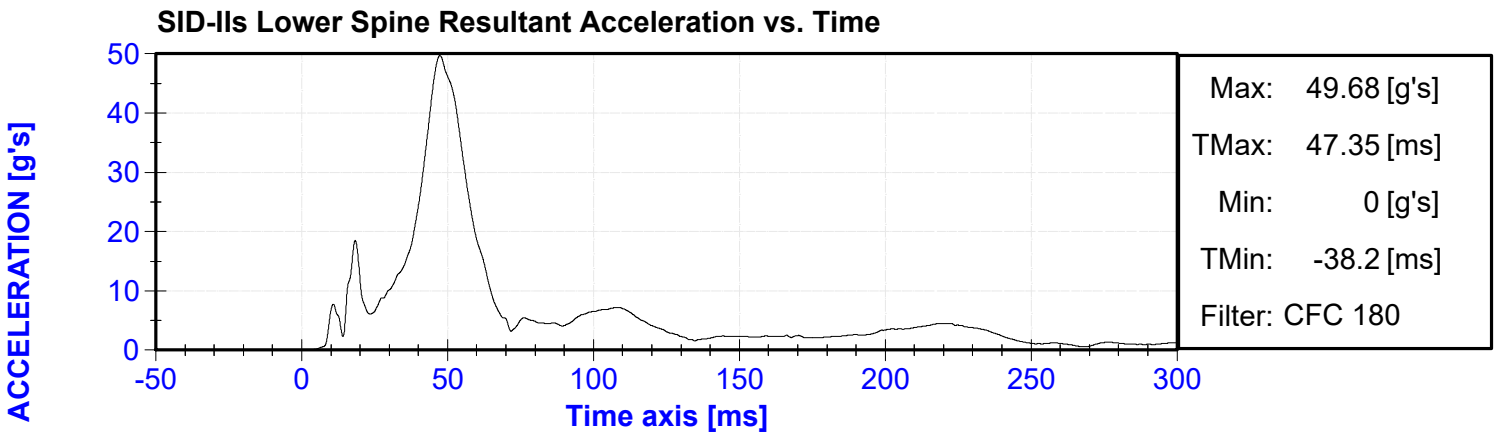
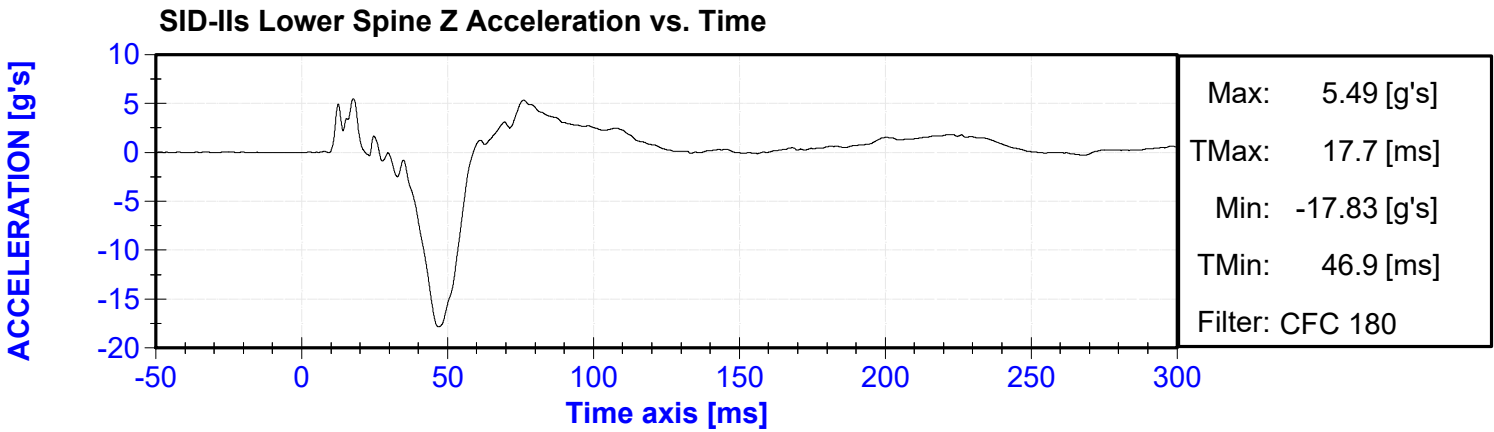
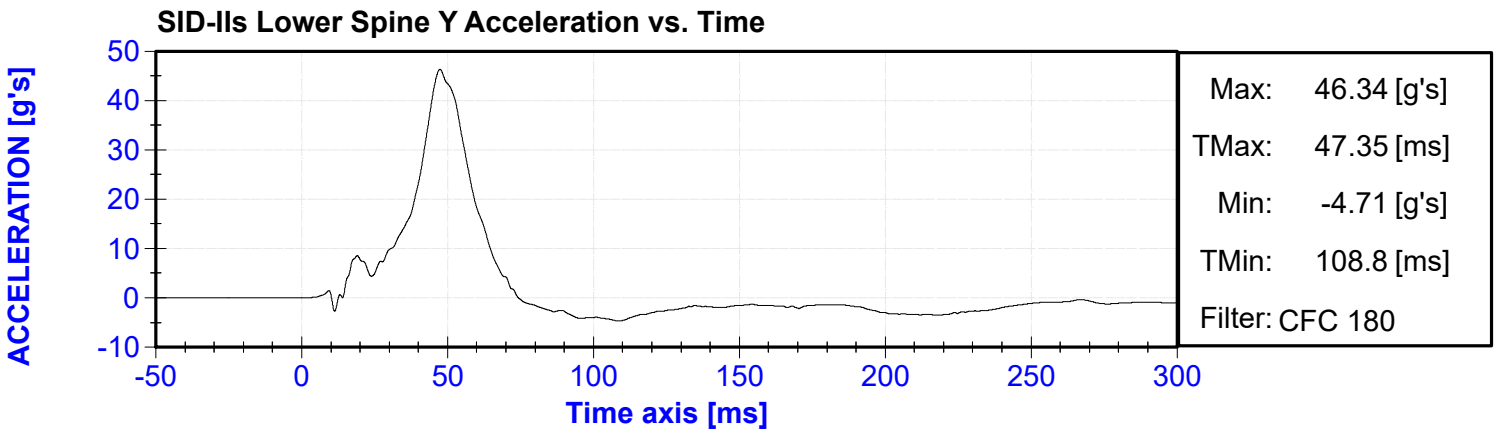


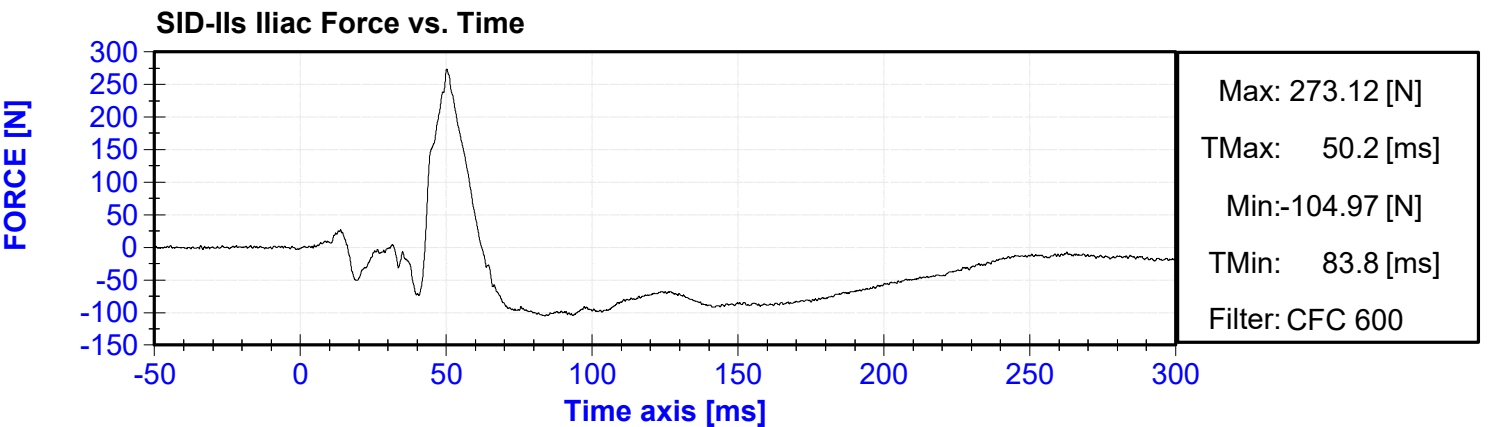
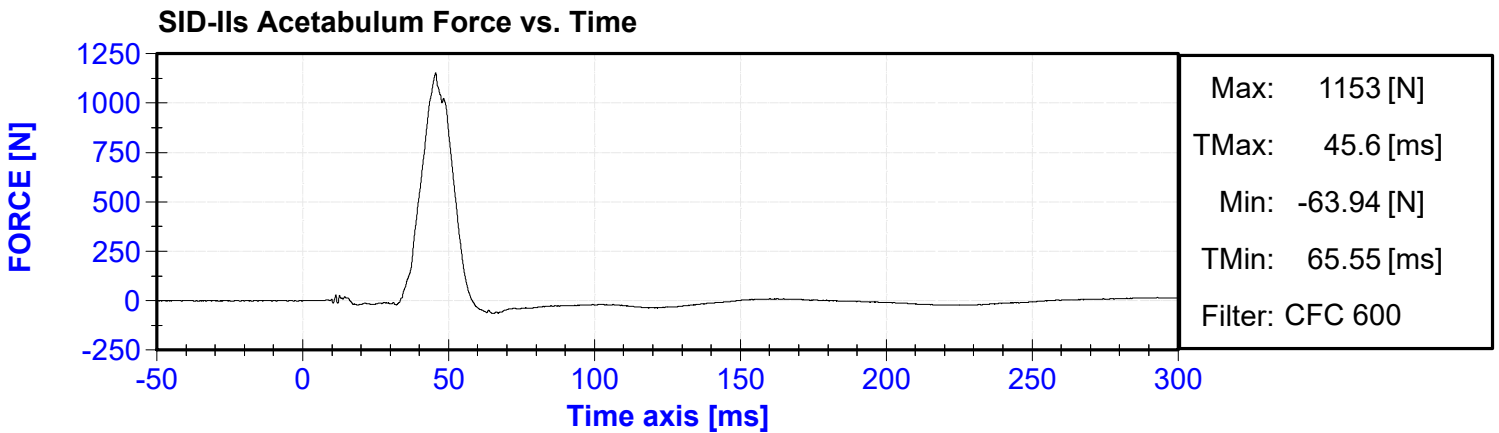
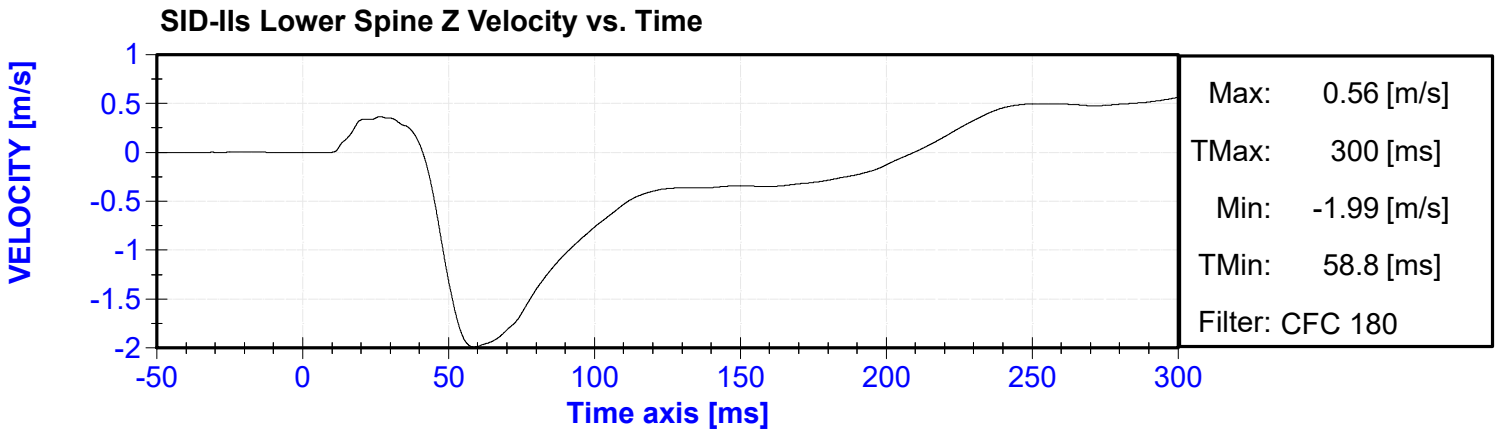
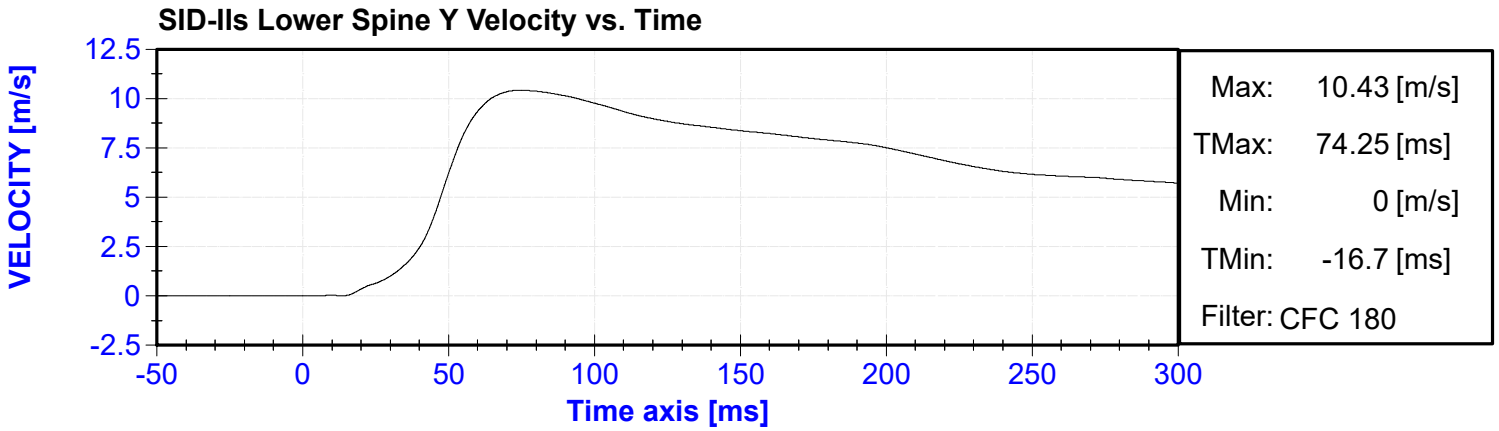
ACCELERATION [g's]

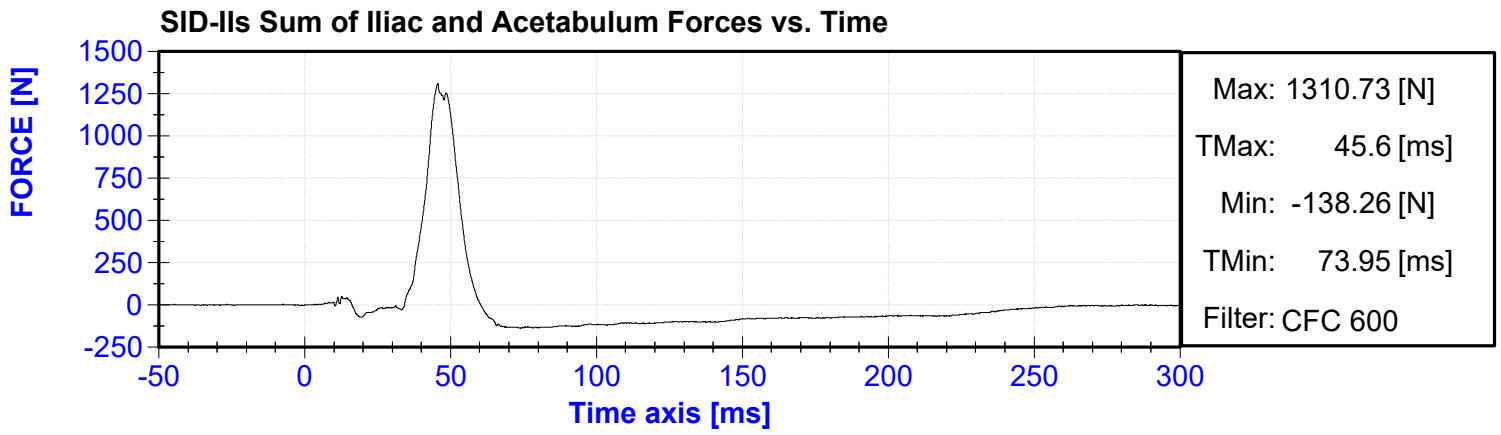
SID-IIs Head Resultant Acceleration vs. Time









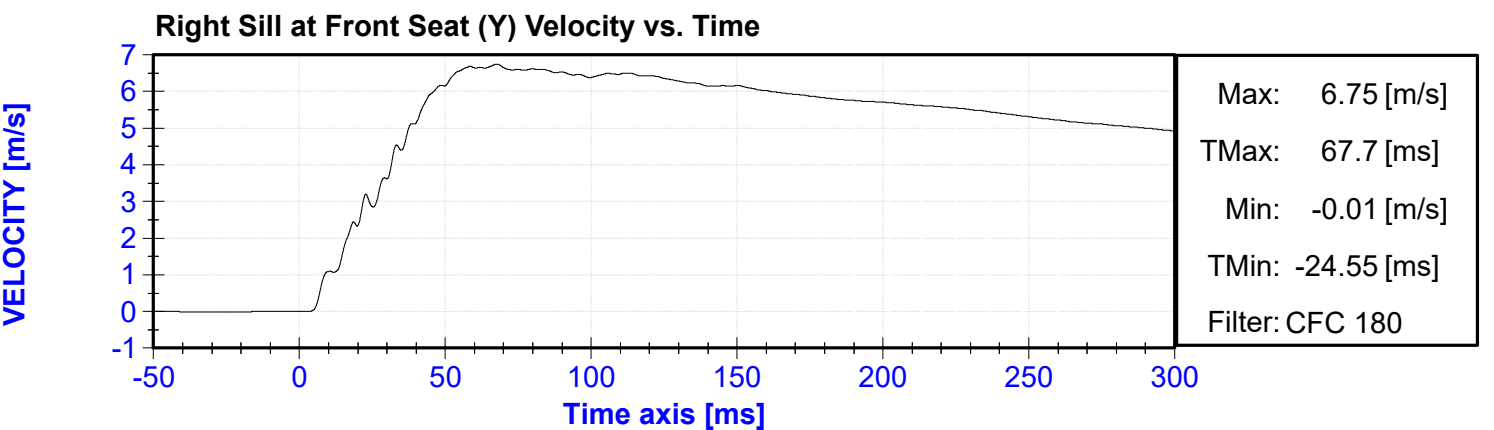
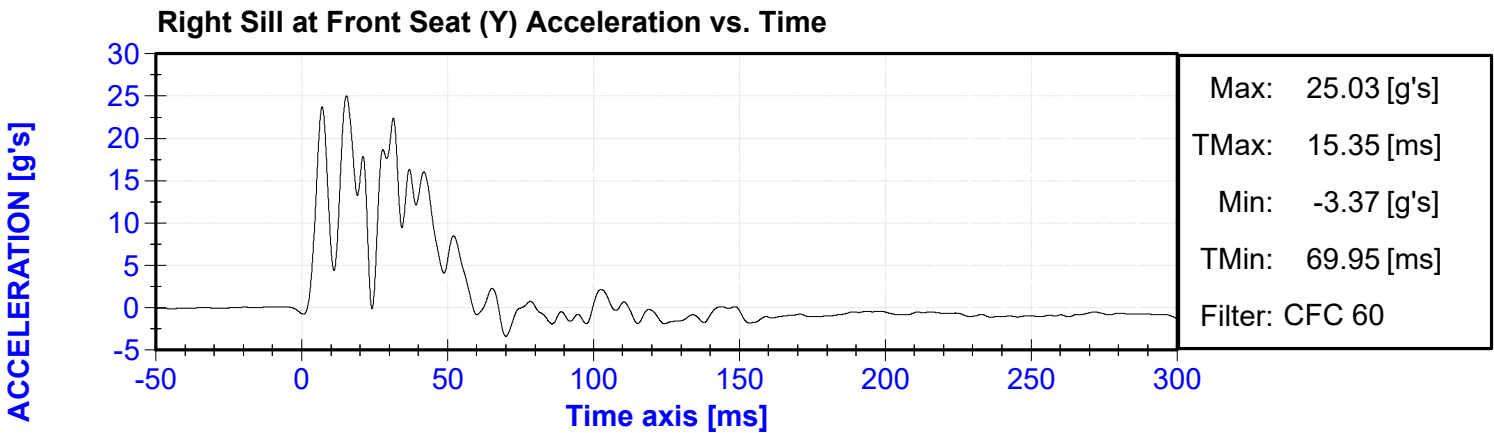
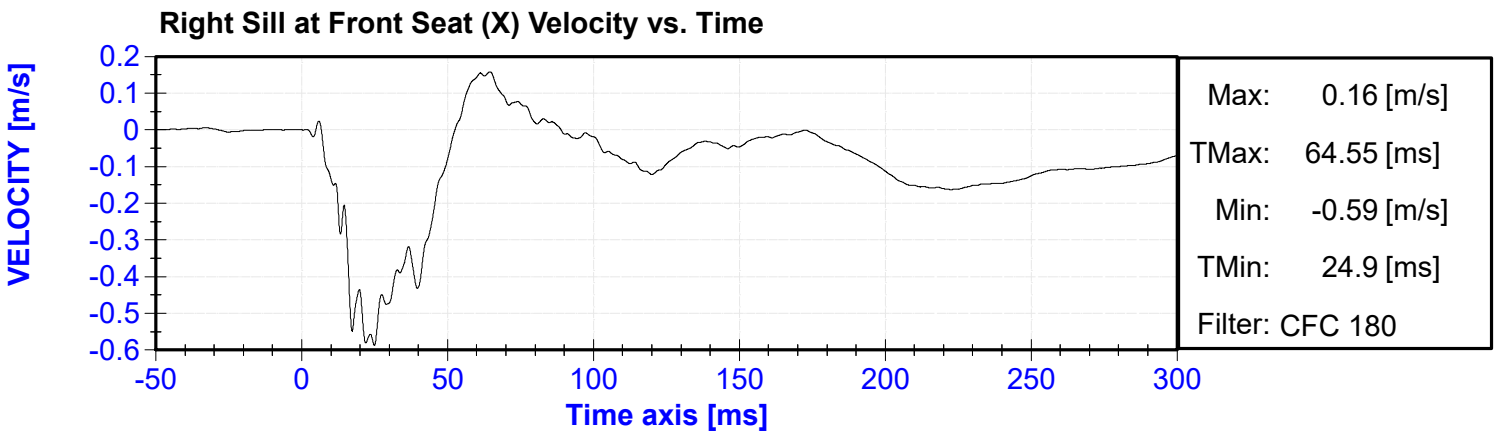
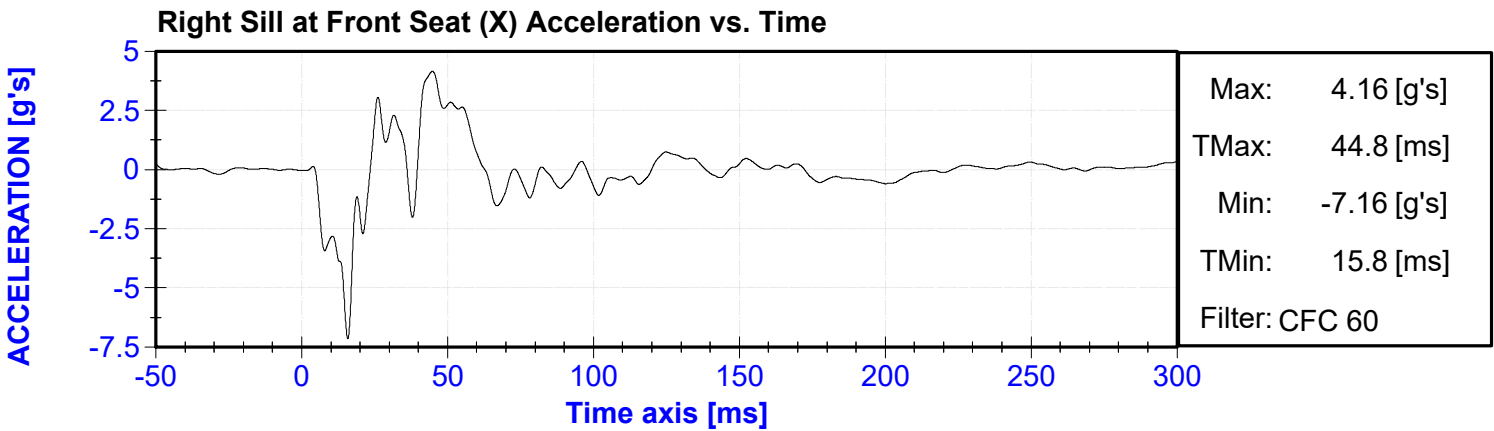


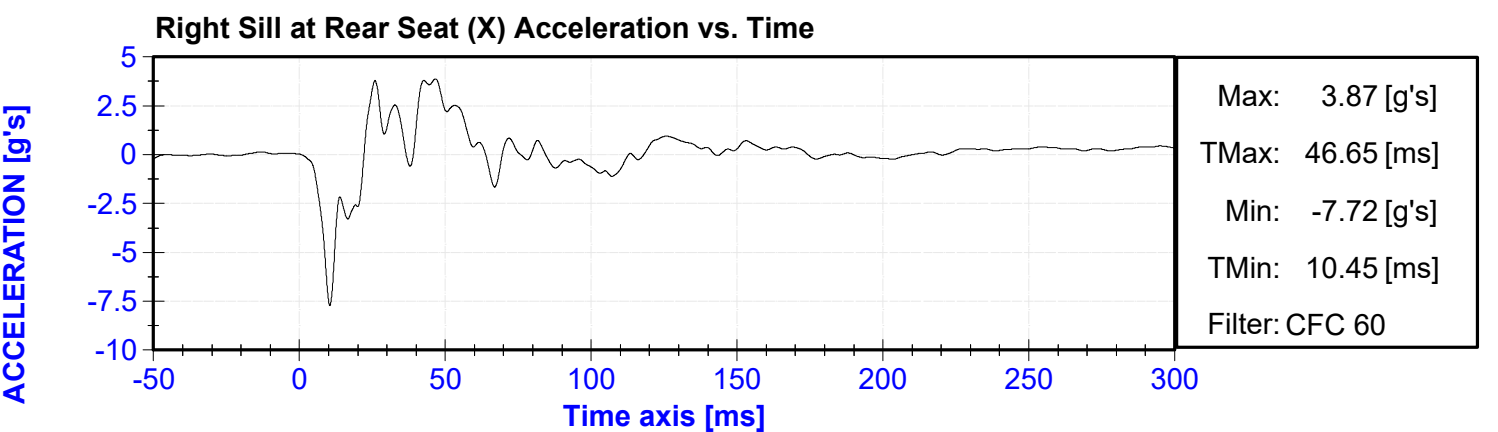
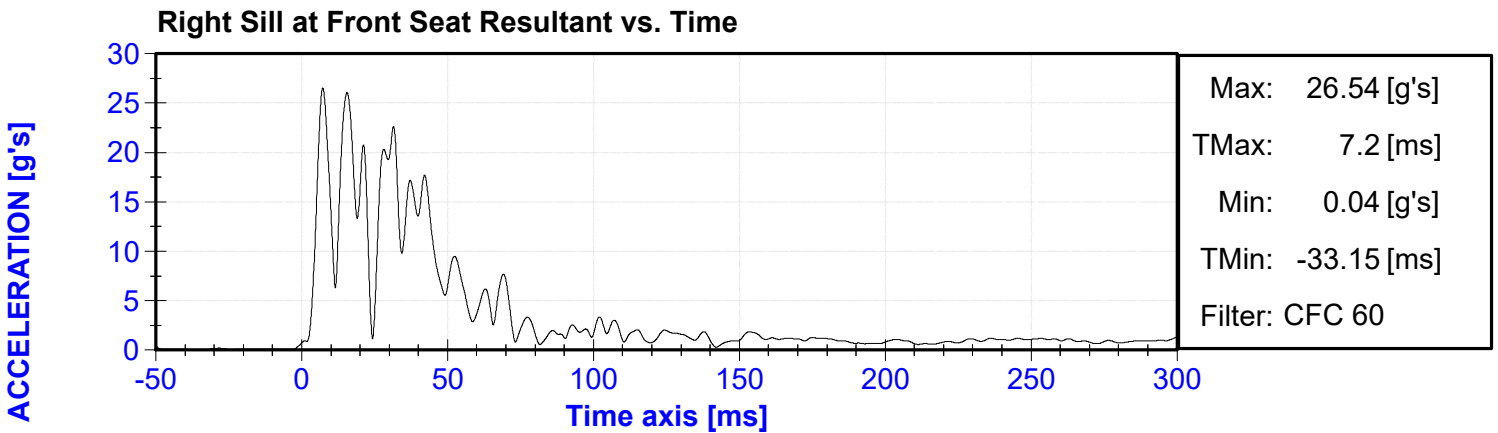
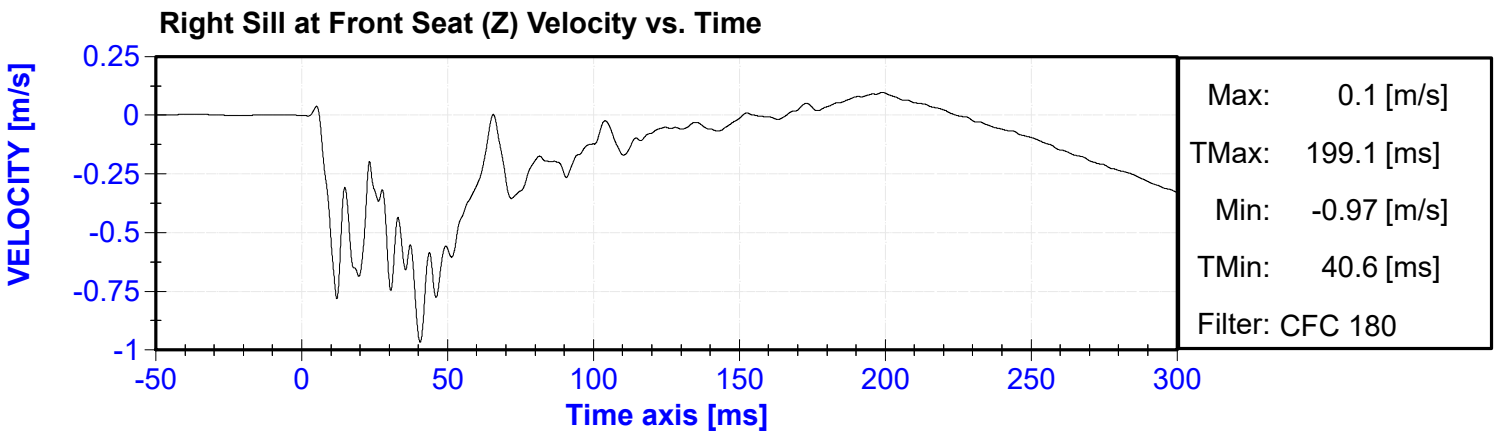
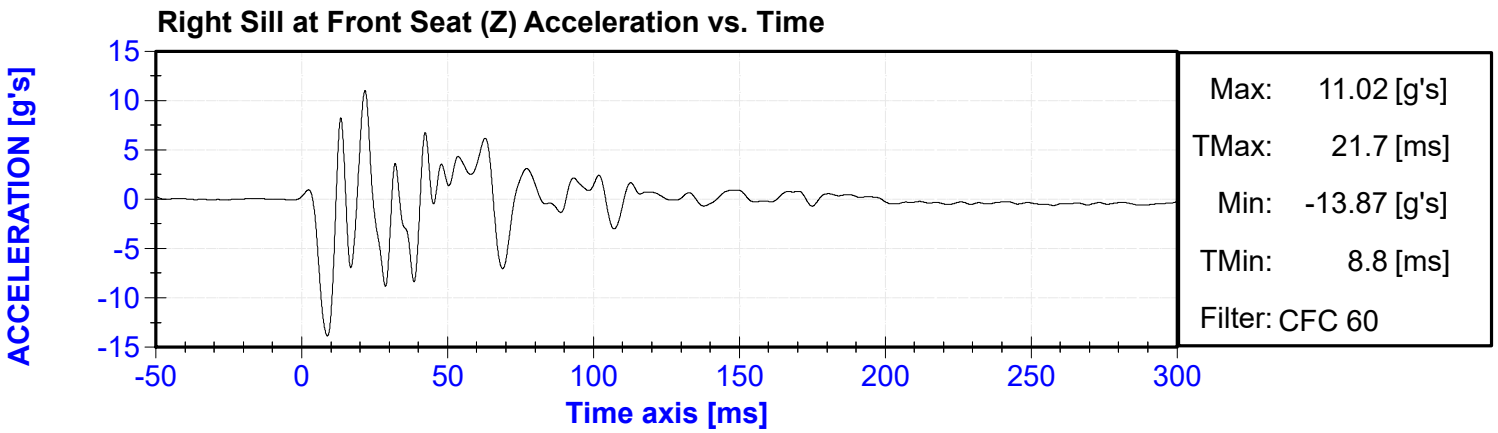
**APPENDIX IV  
VEHICLE AND MDB ACCELEROMETER RESPONSE  
DATA**

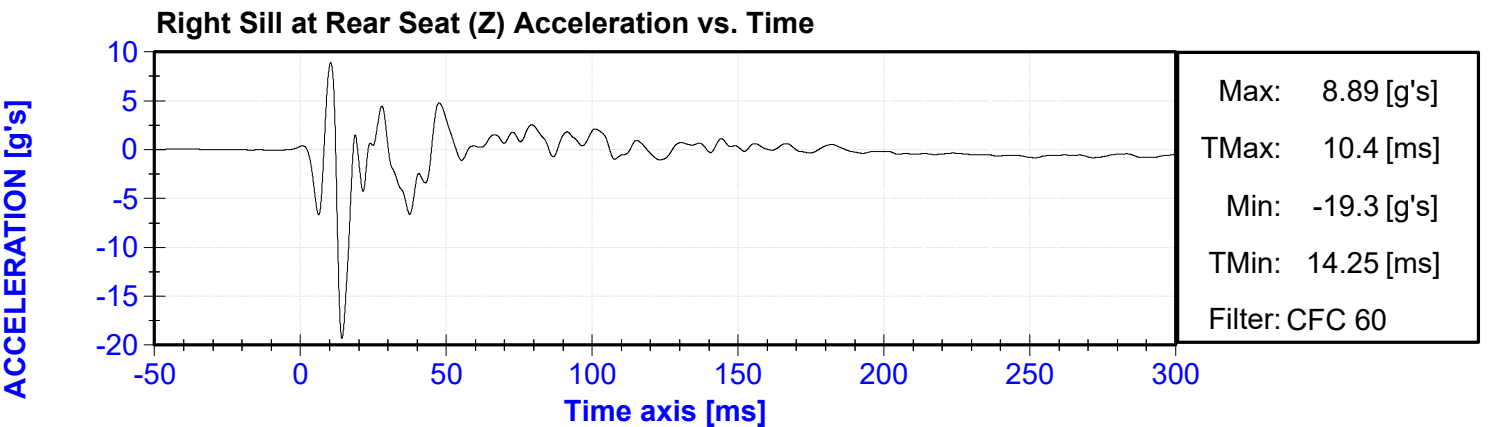
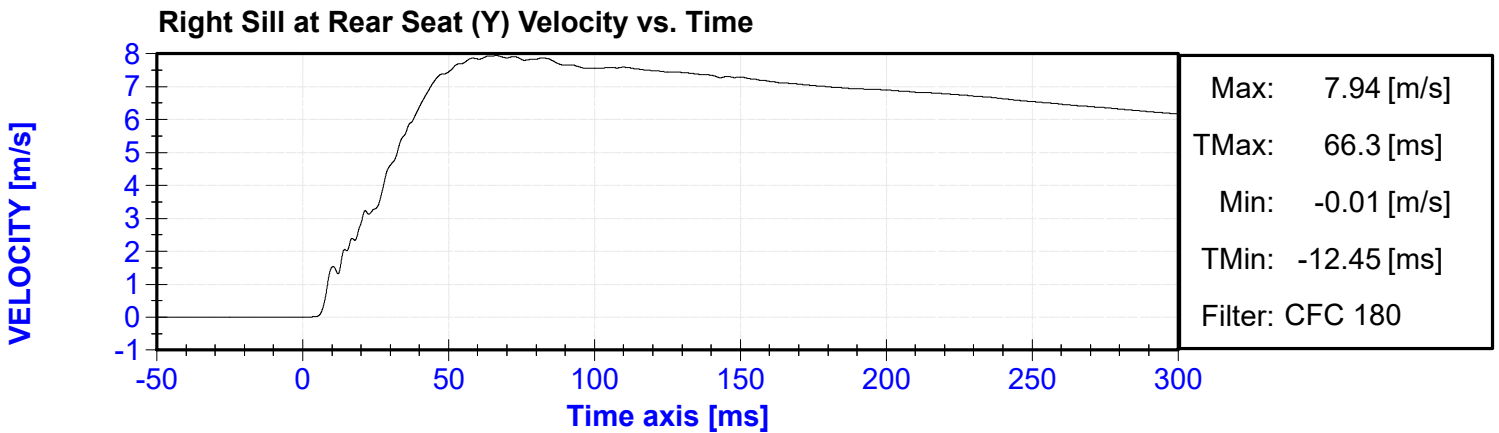
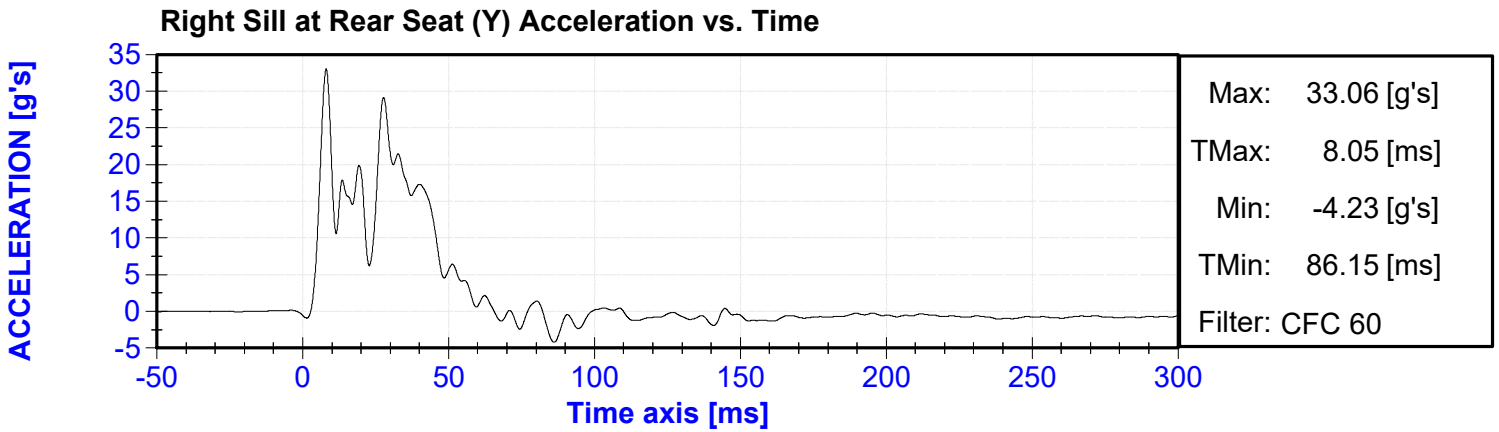
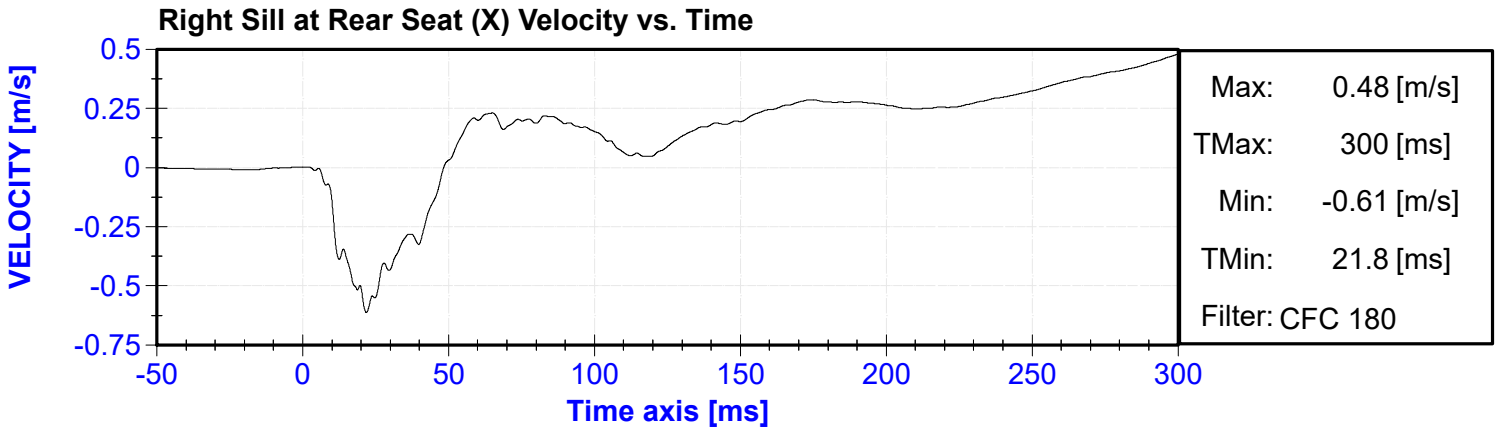
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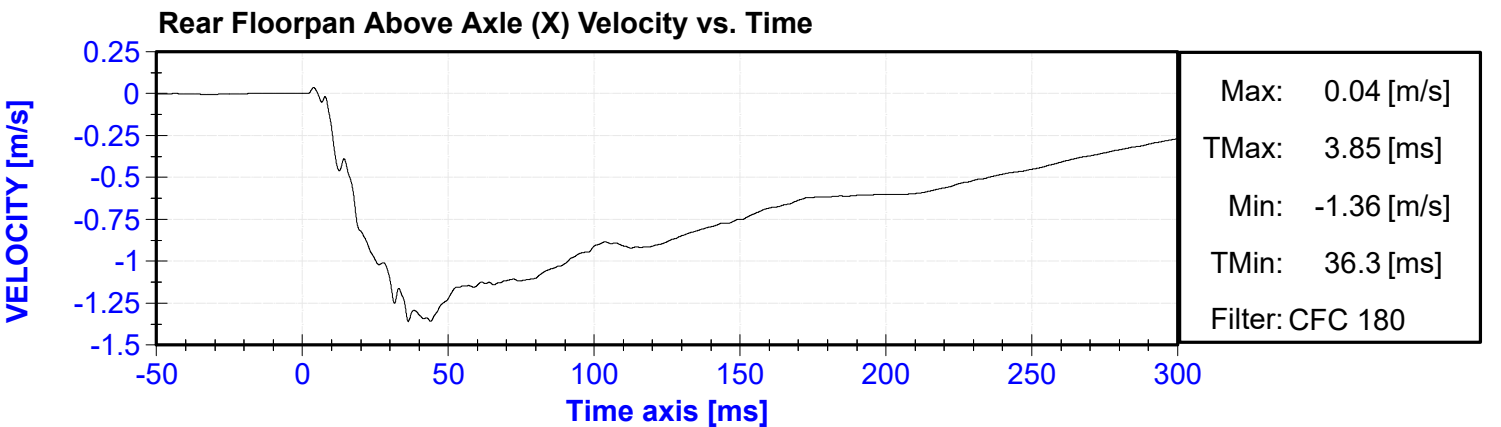
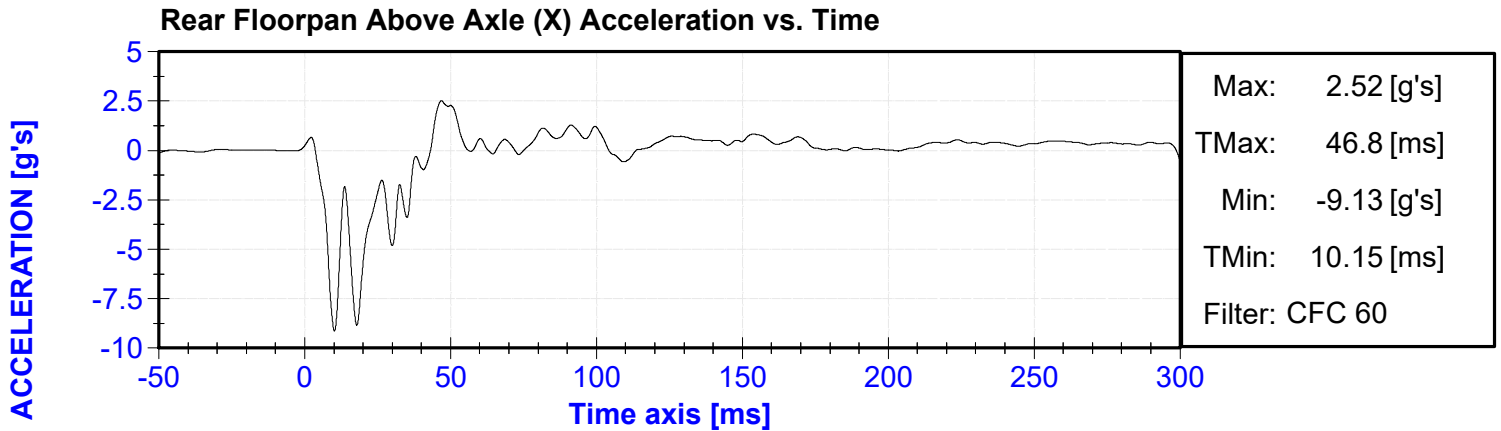
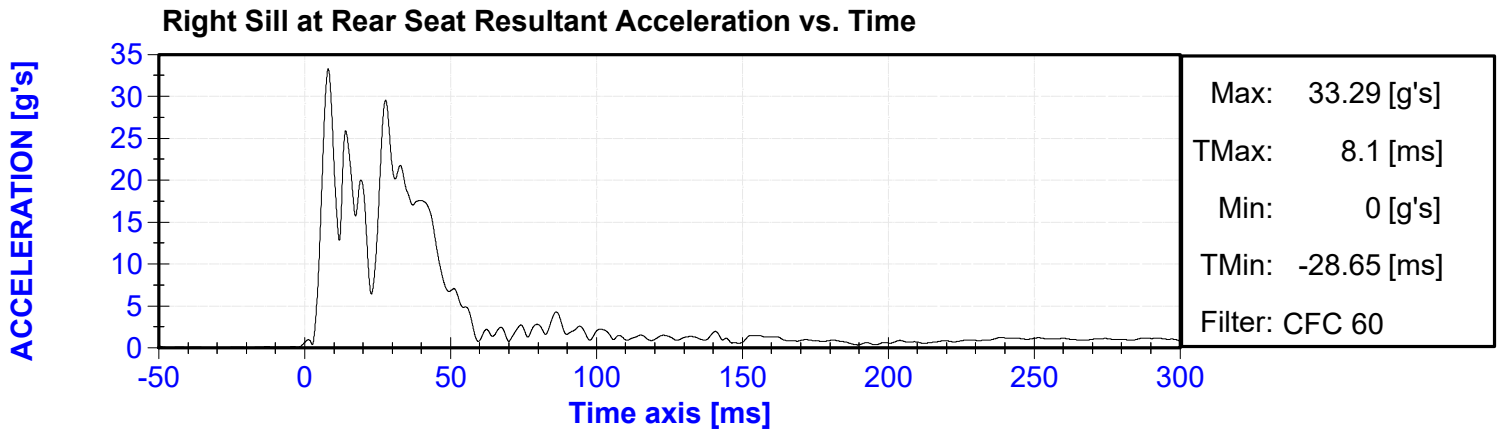
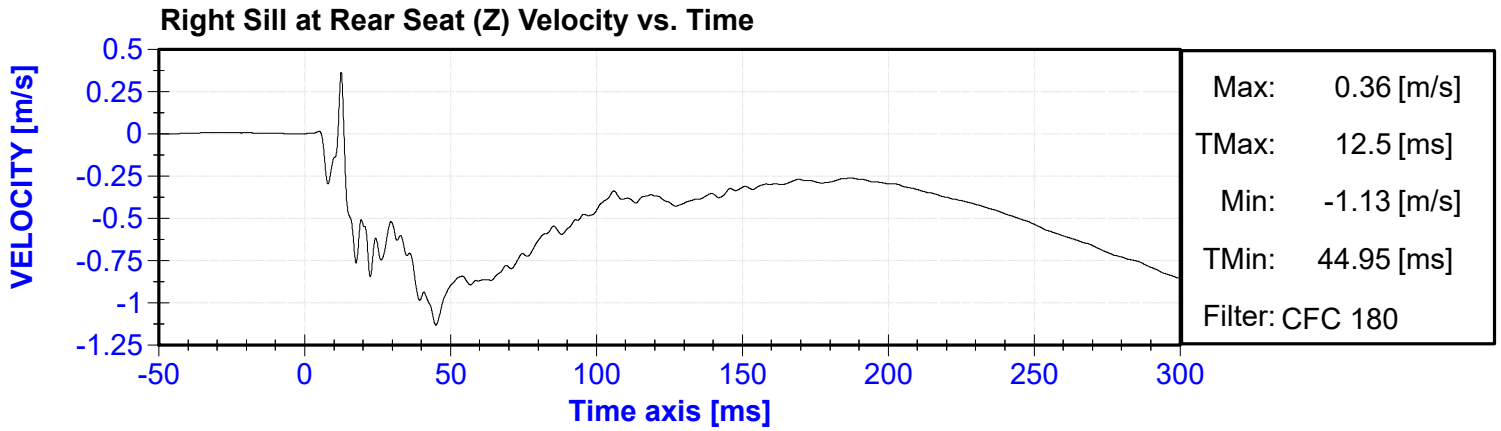
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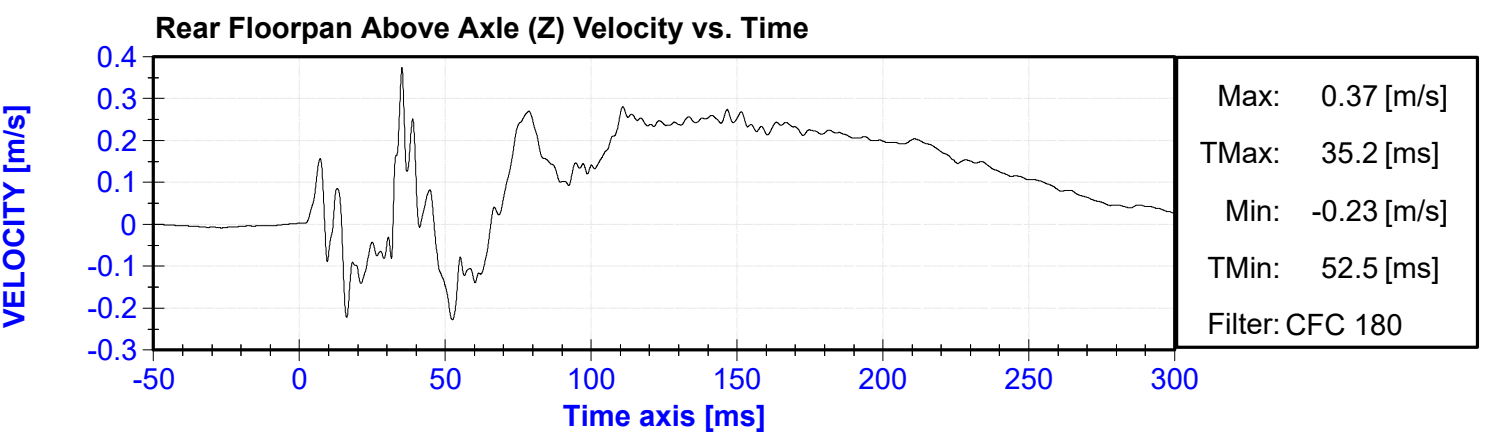
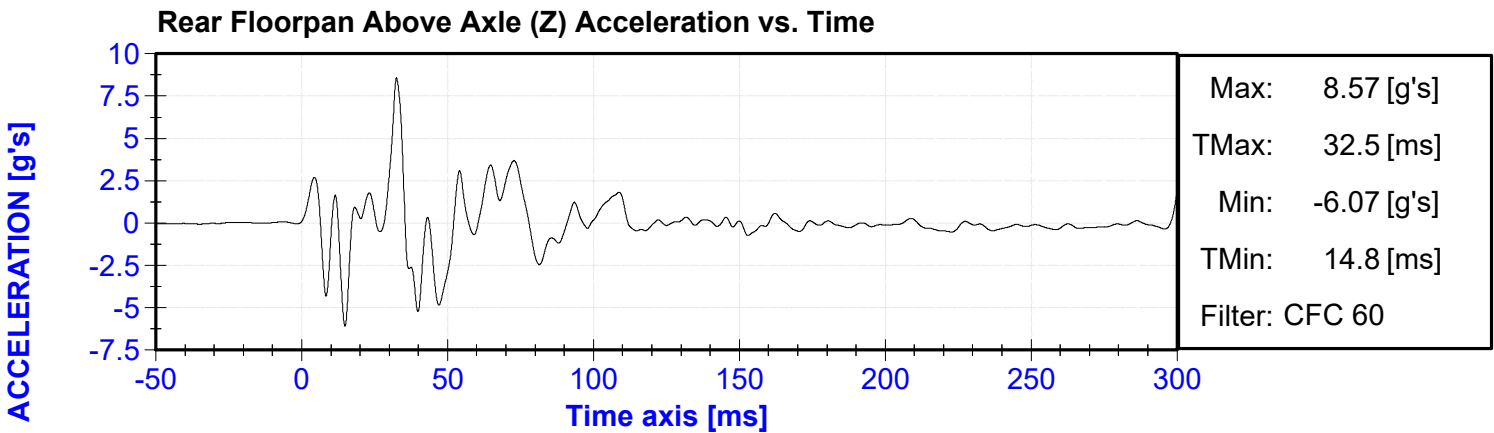
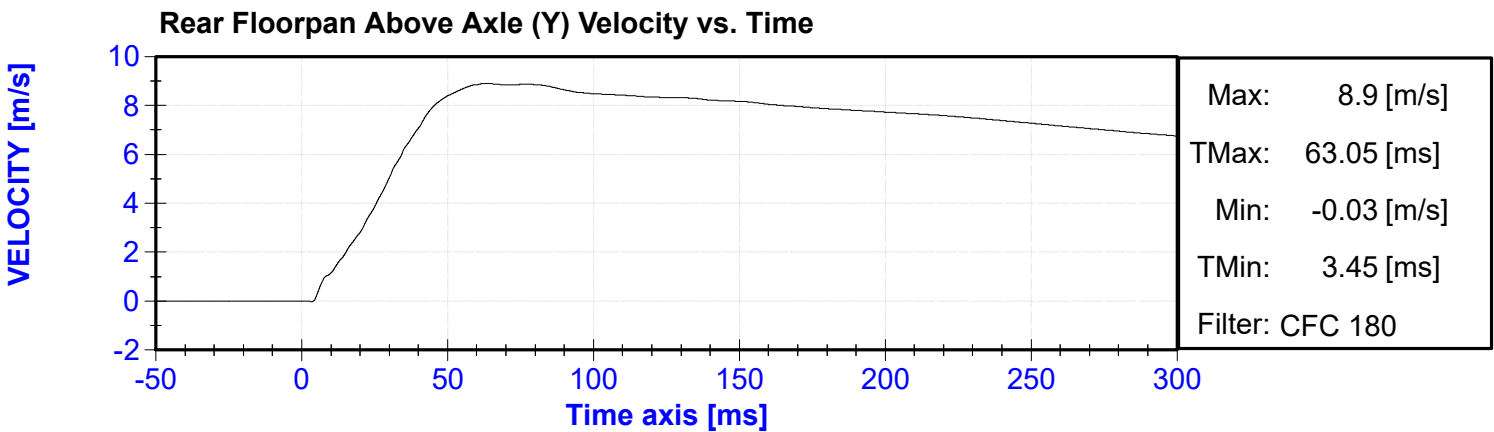
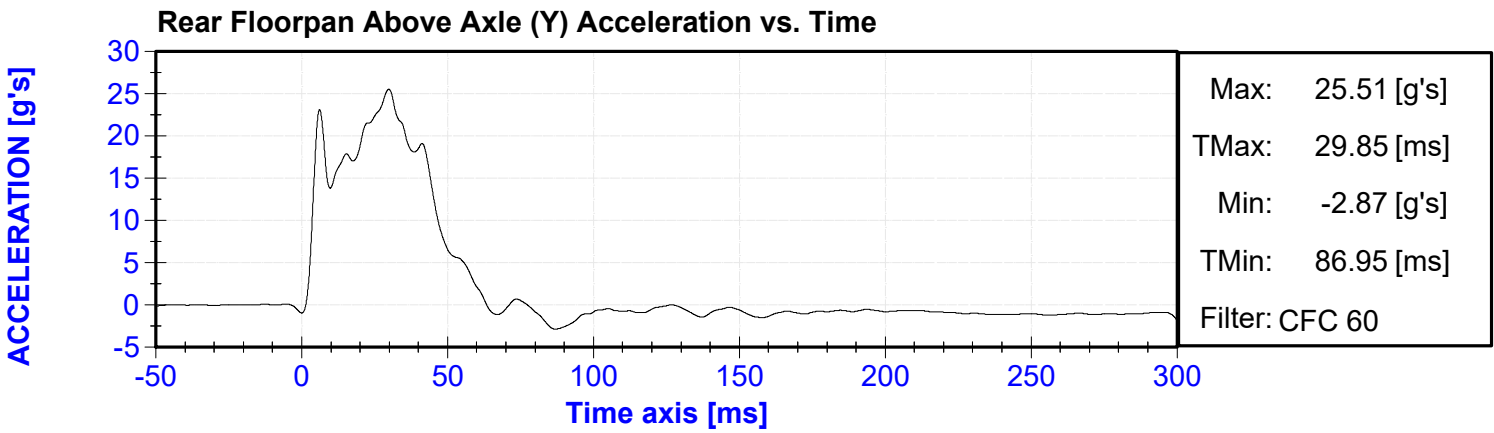
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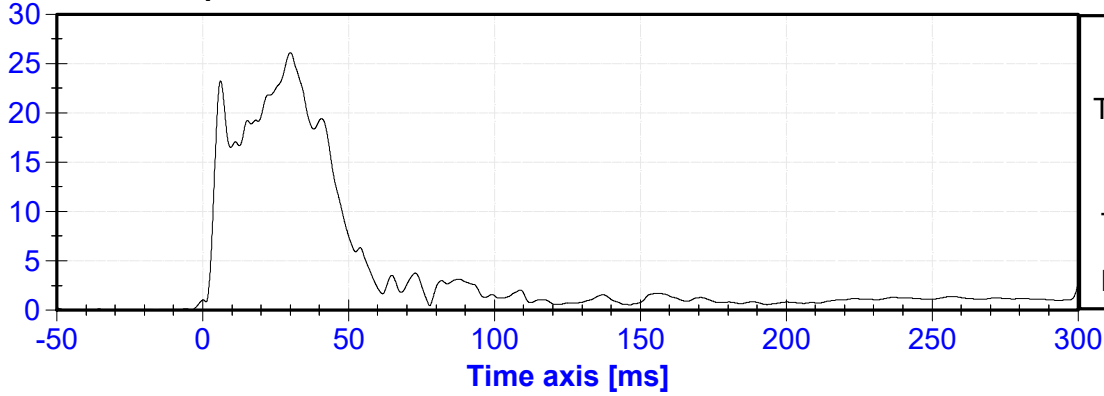






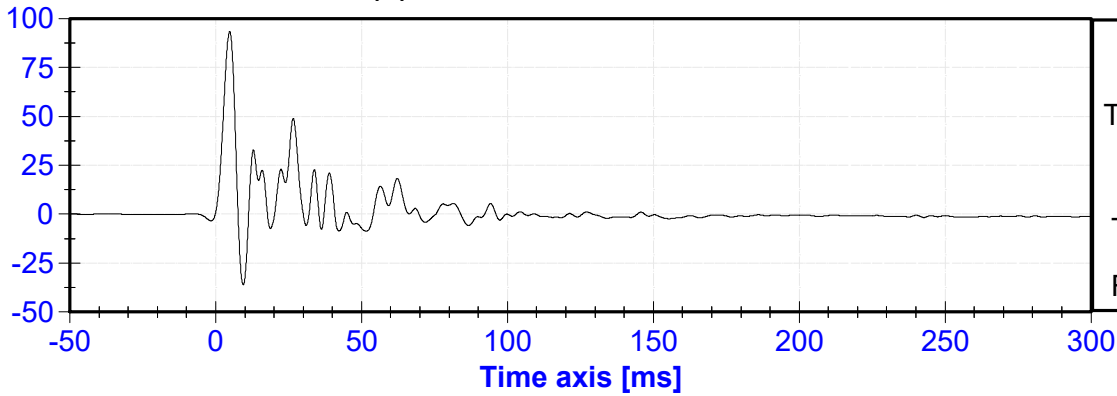
Rear Floorpan Above Axle Resultant Acceleration vs. Time

ACCELERATION [g's]



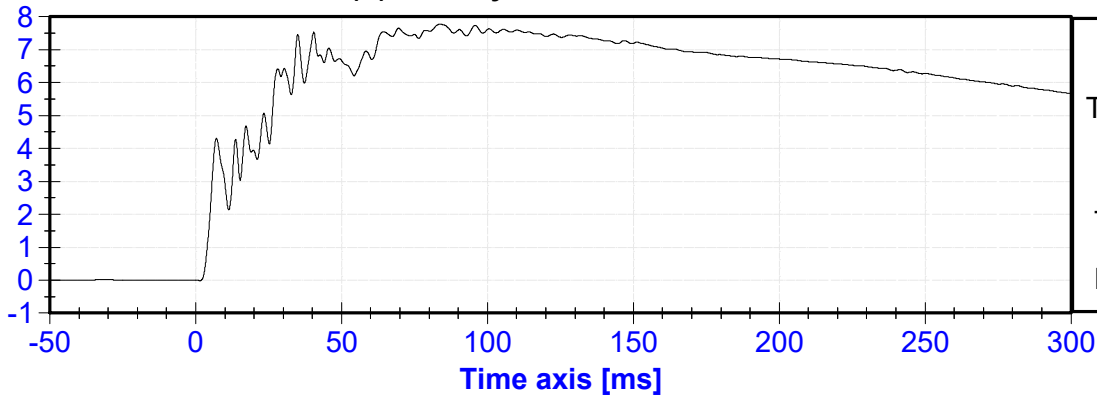
Left Sill at Rear Door (Y) Acceleration vs. Time

ACCELERATION [g's]



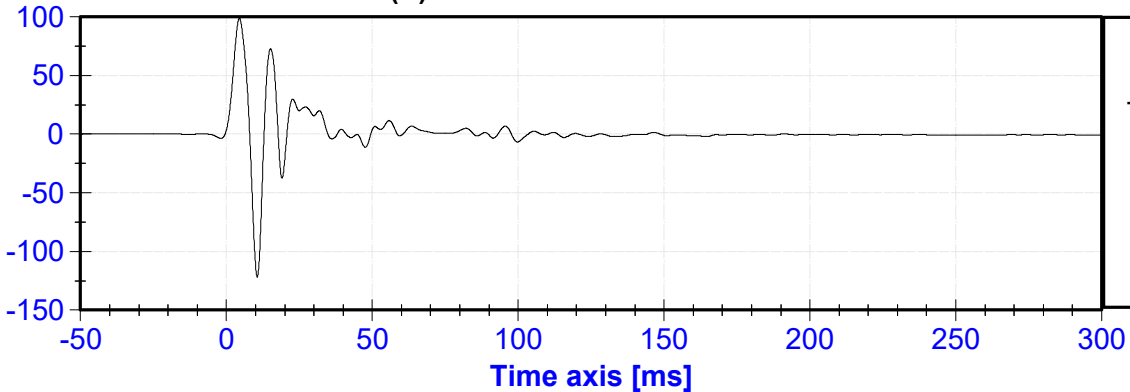
Left Sill at Rear Door (Y) Velocity vs. Time

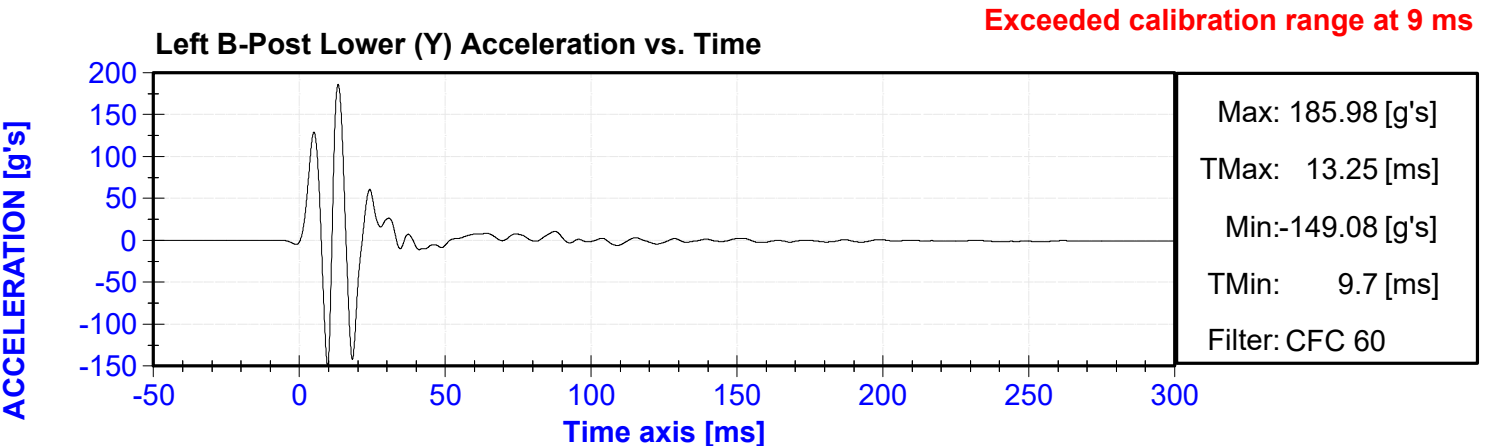
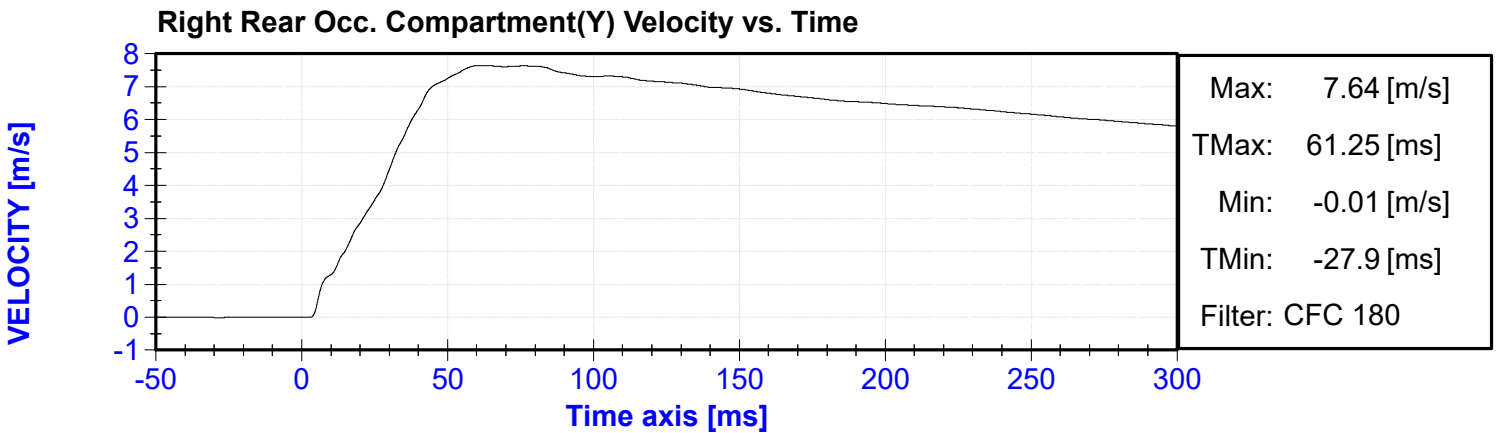
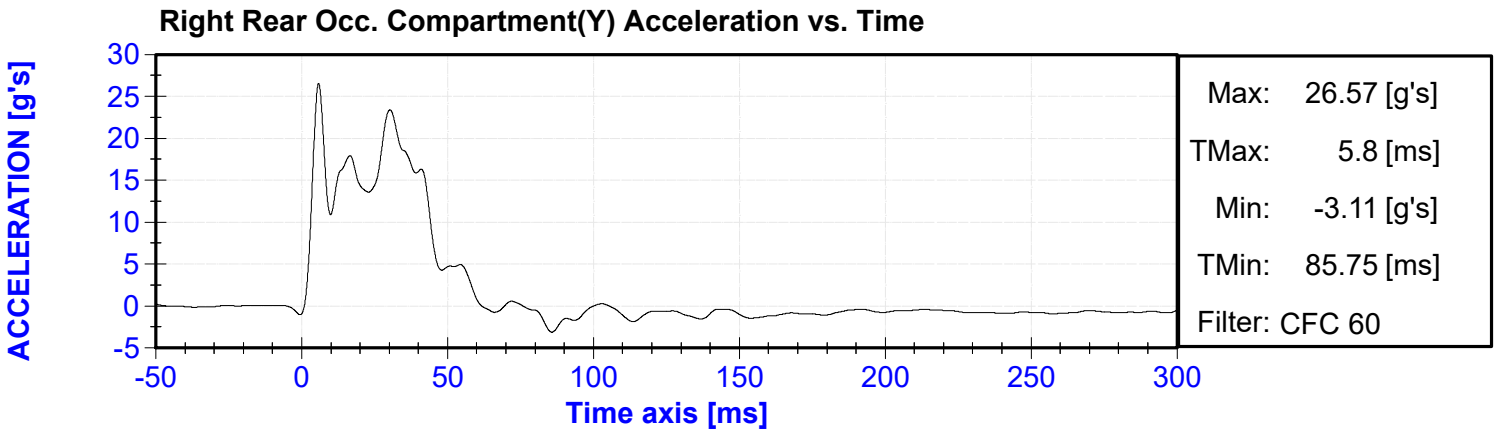
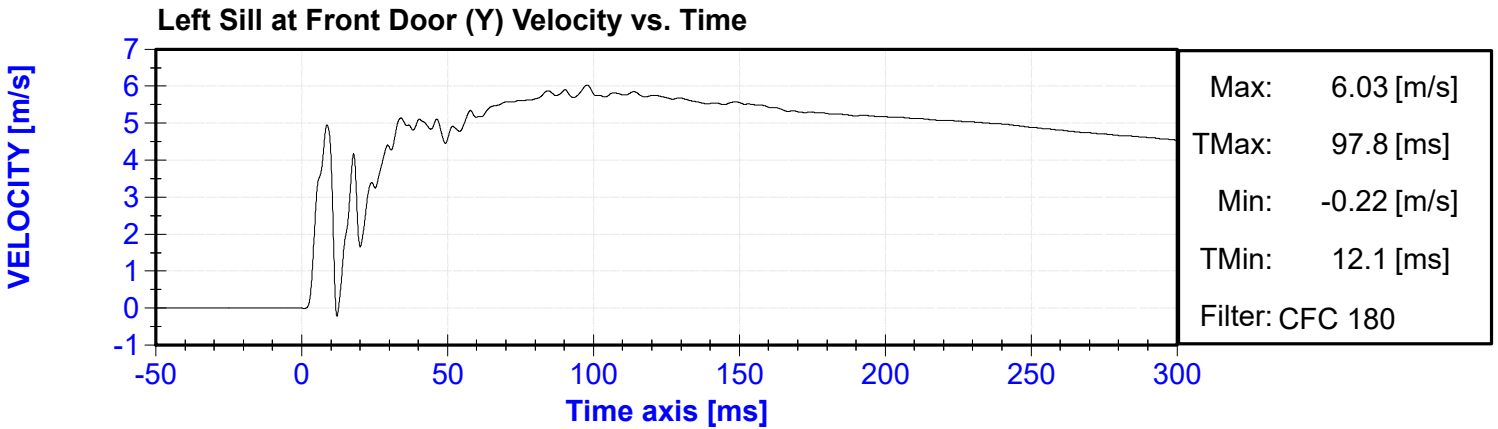
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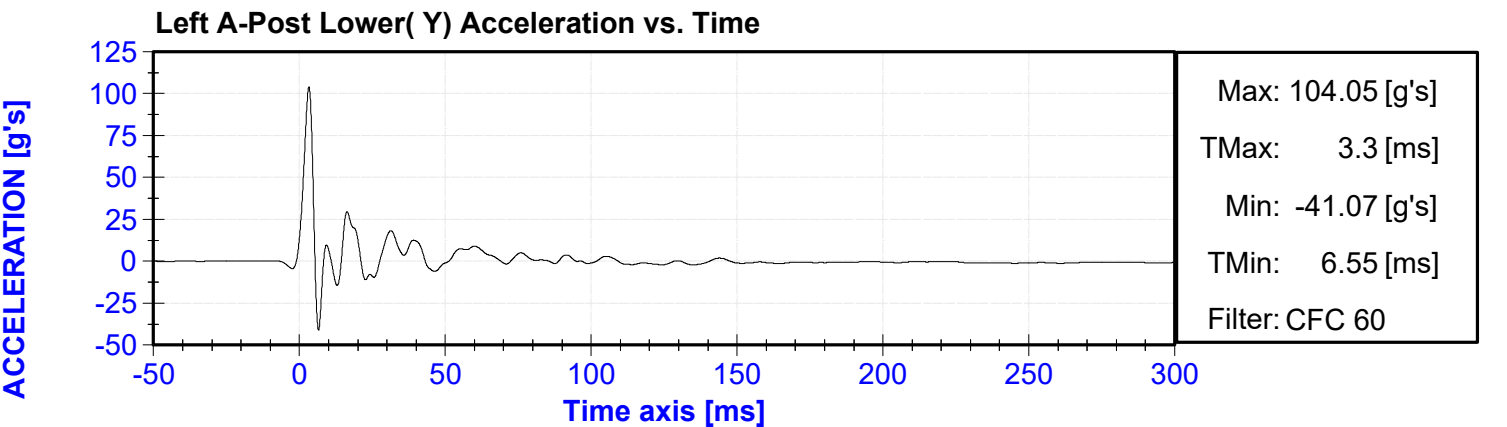
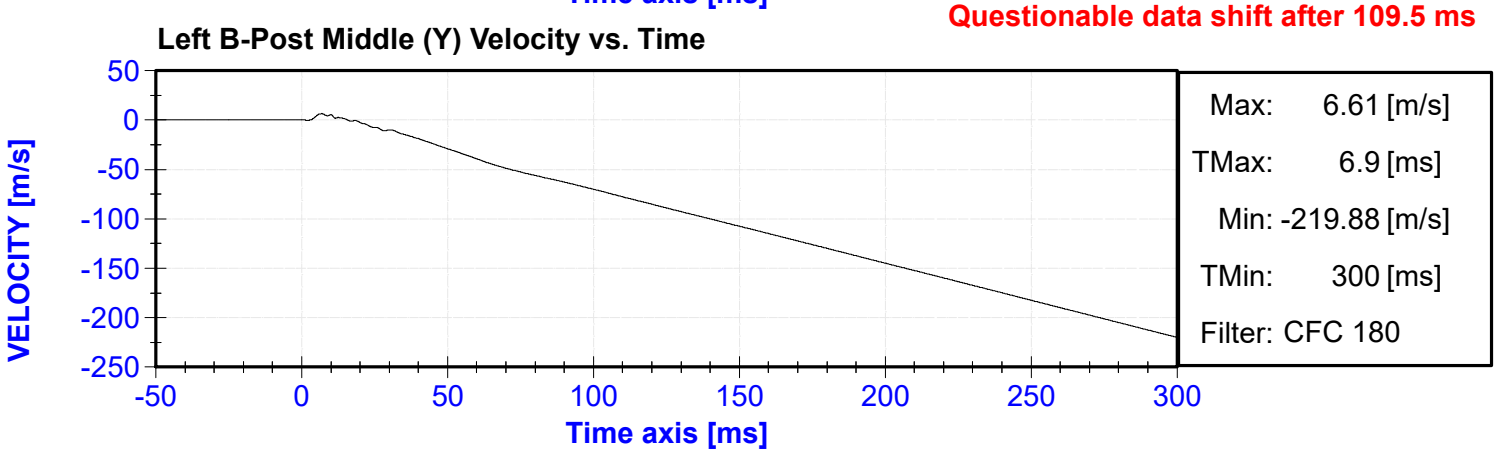
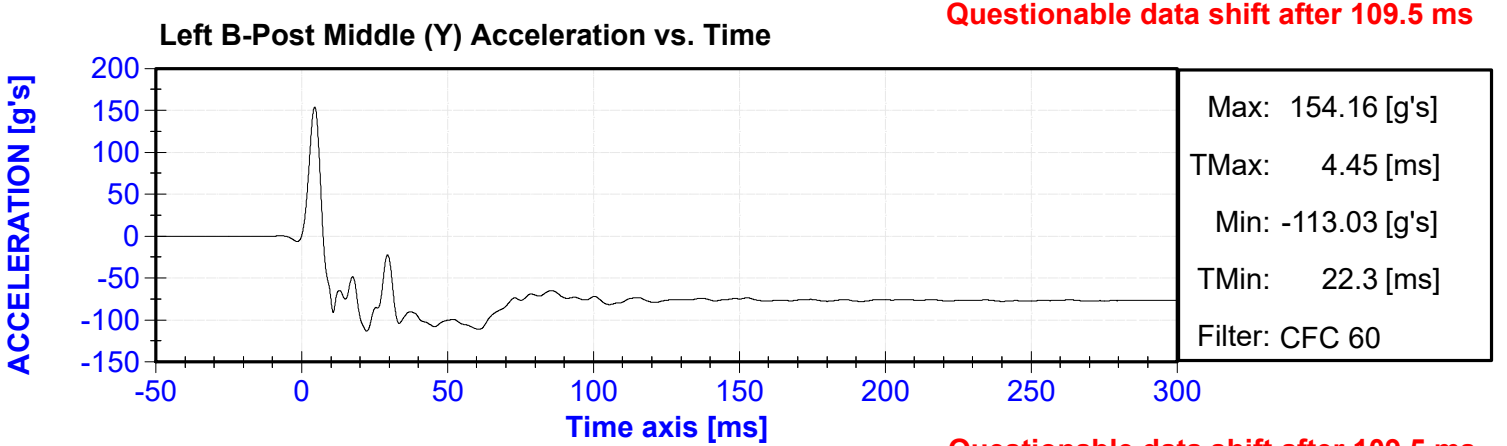
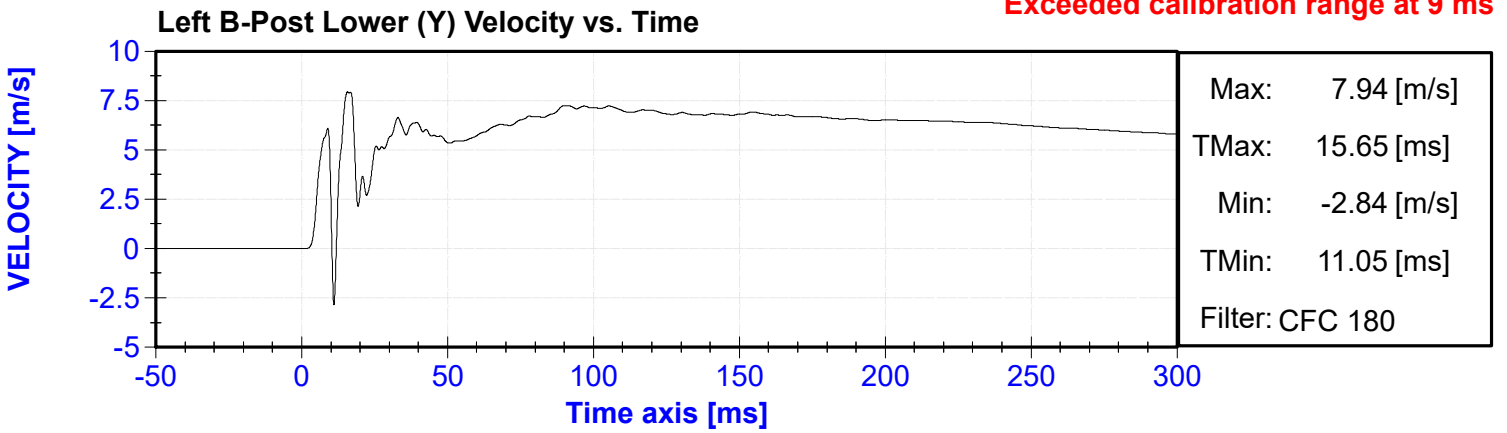


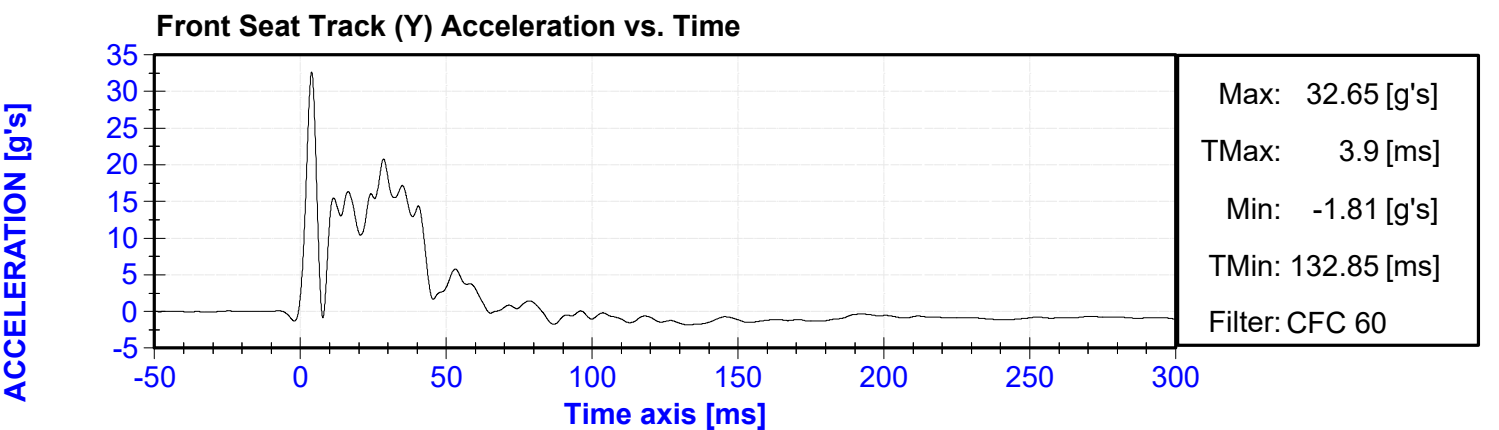
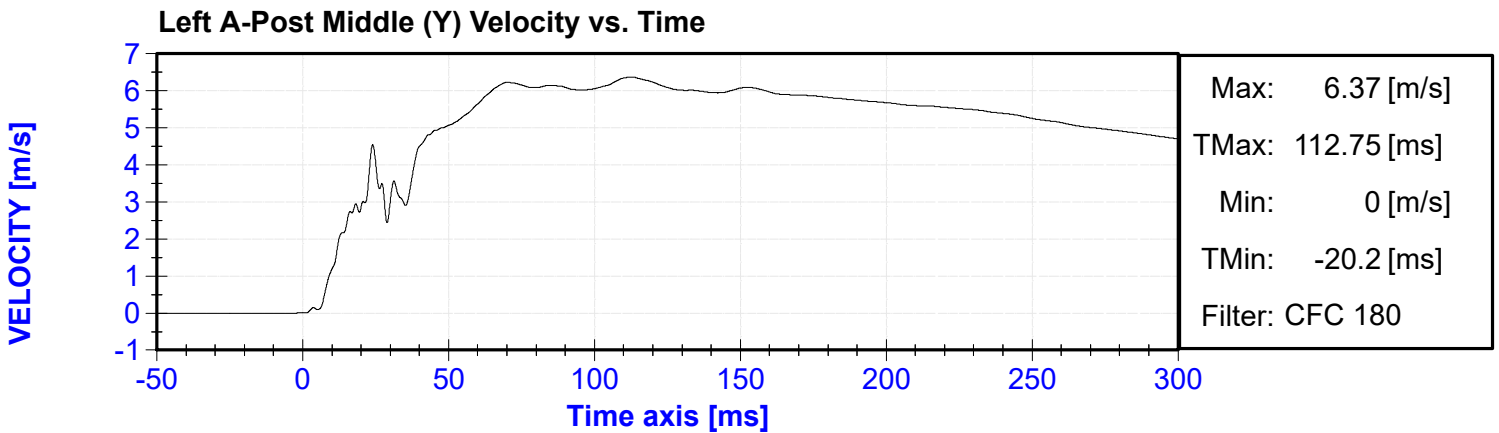
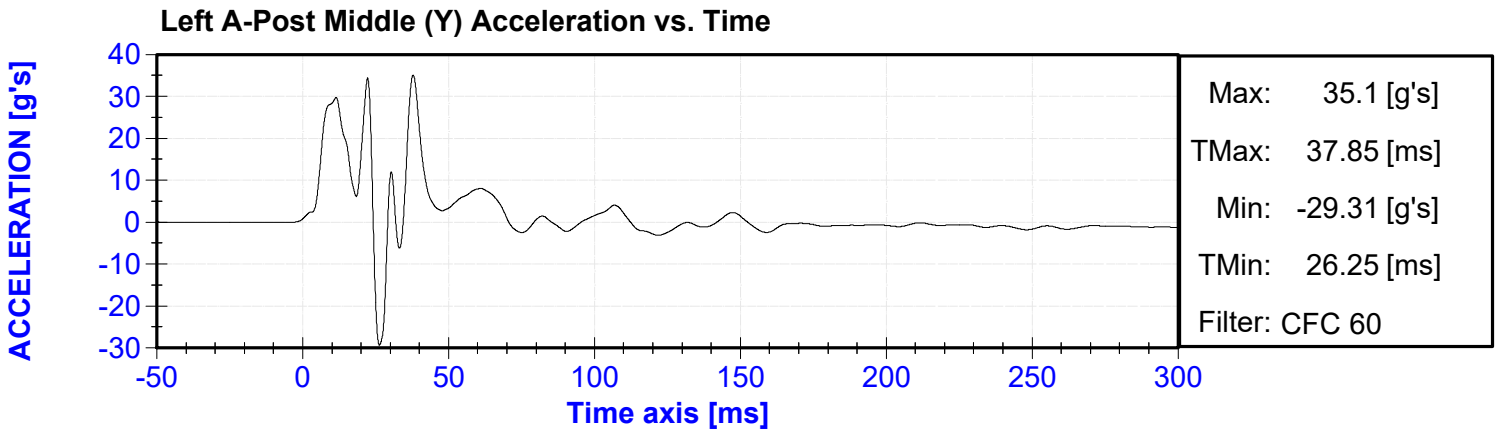
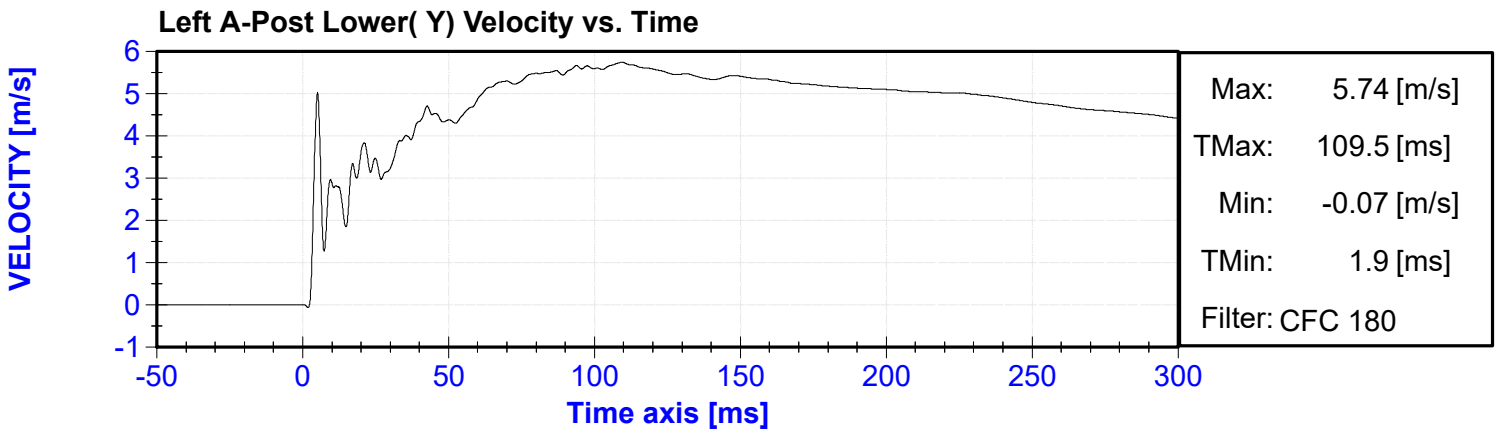
Left Sill at Front Door (Y) Acceleration vs. Time.

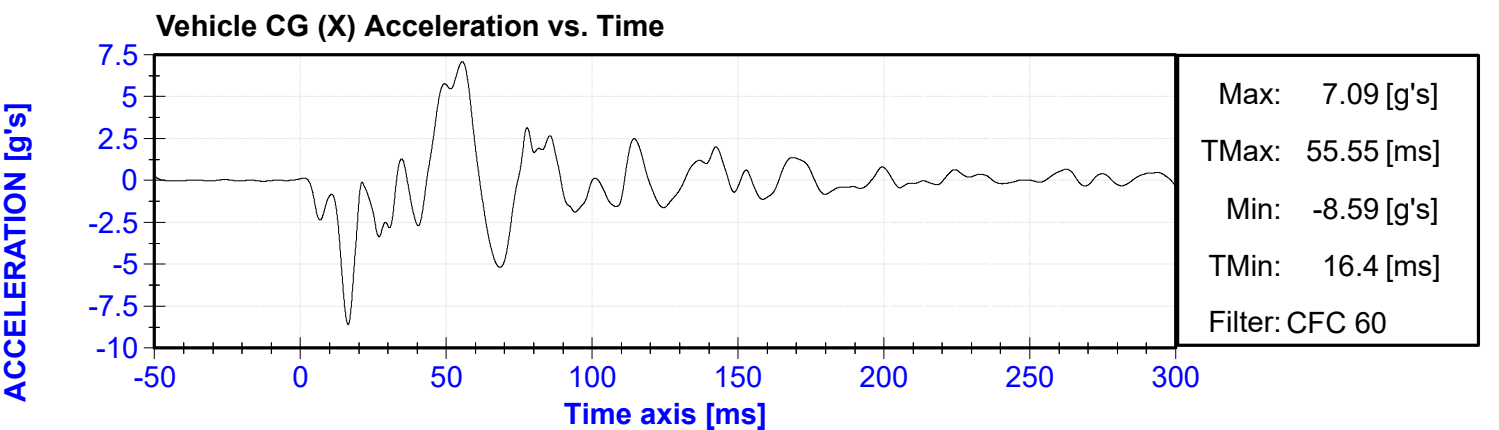
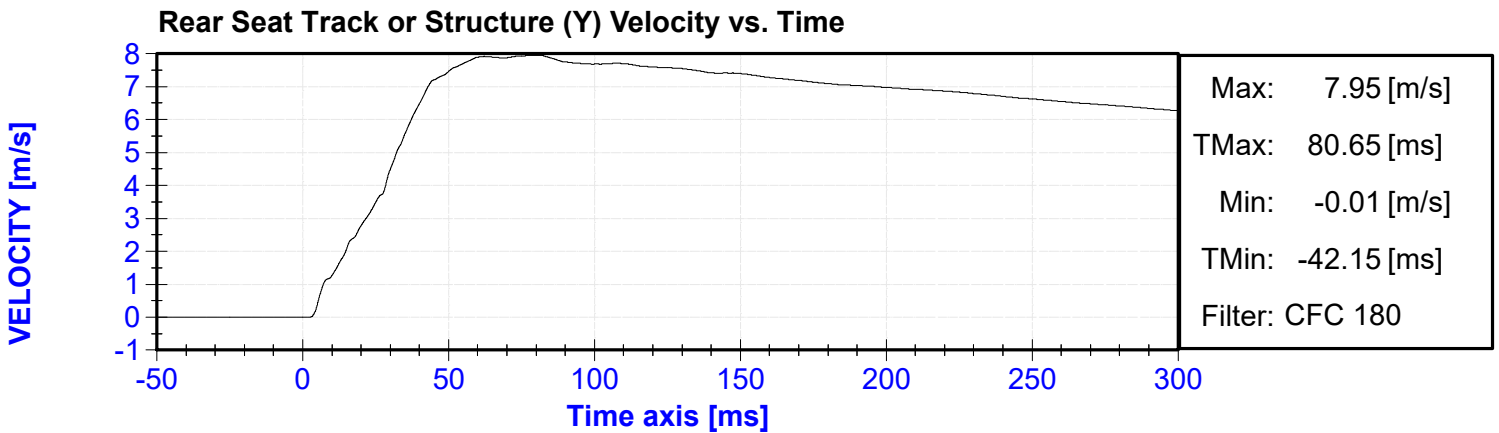
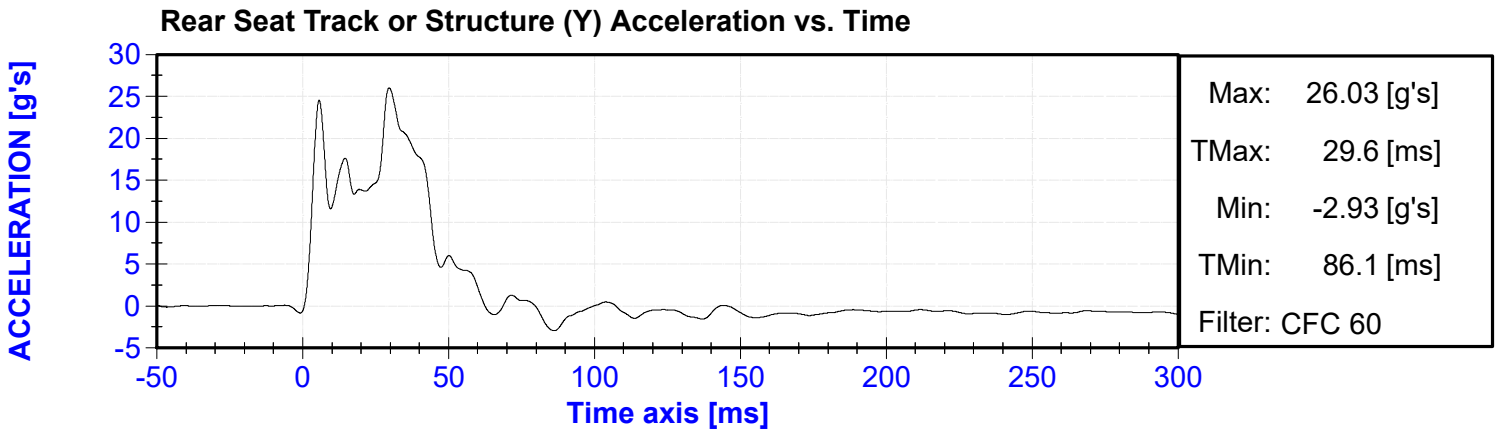
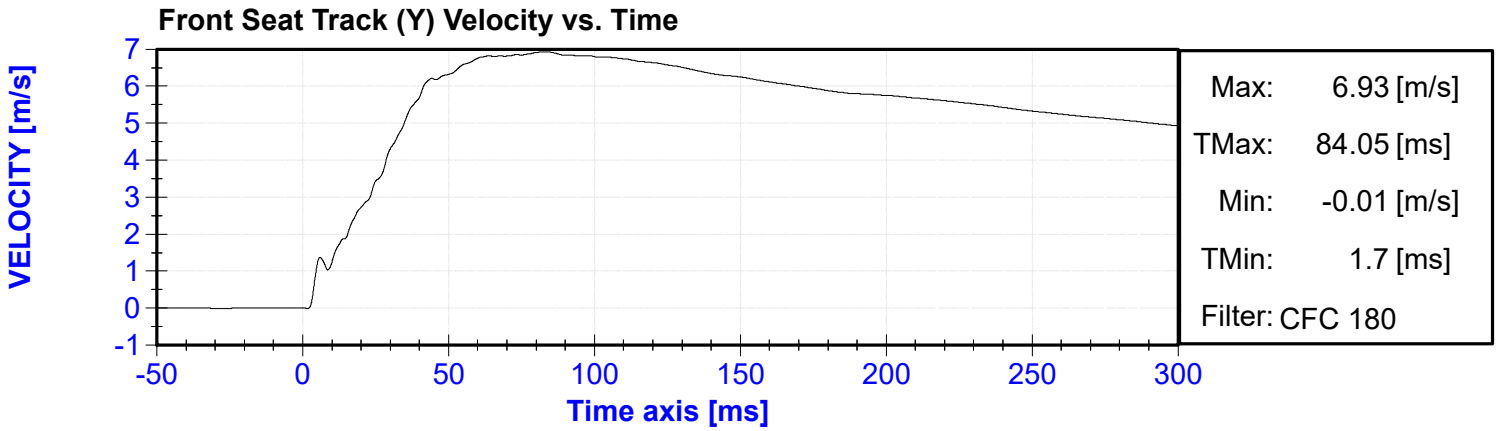
ACCELERATION [g's]

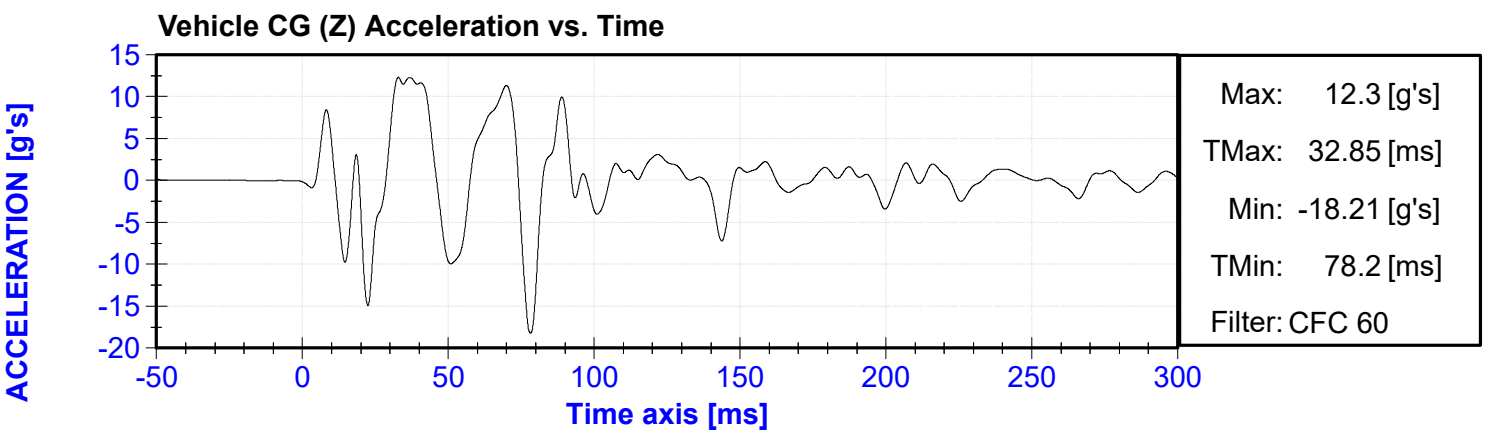
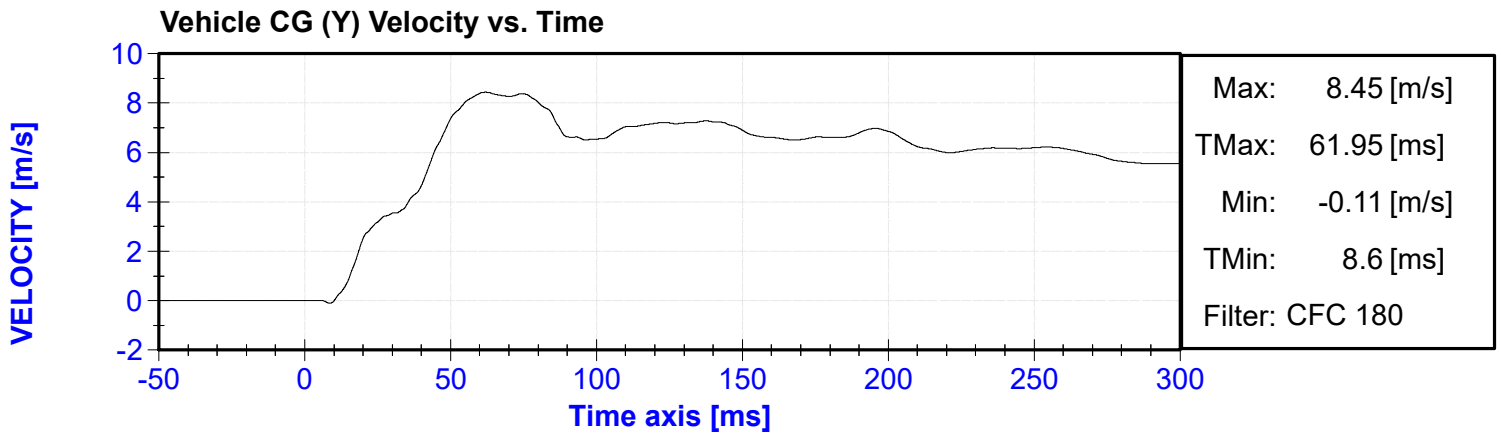
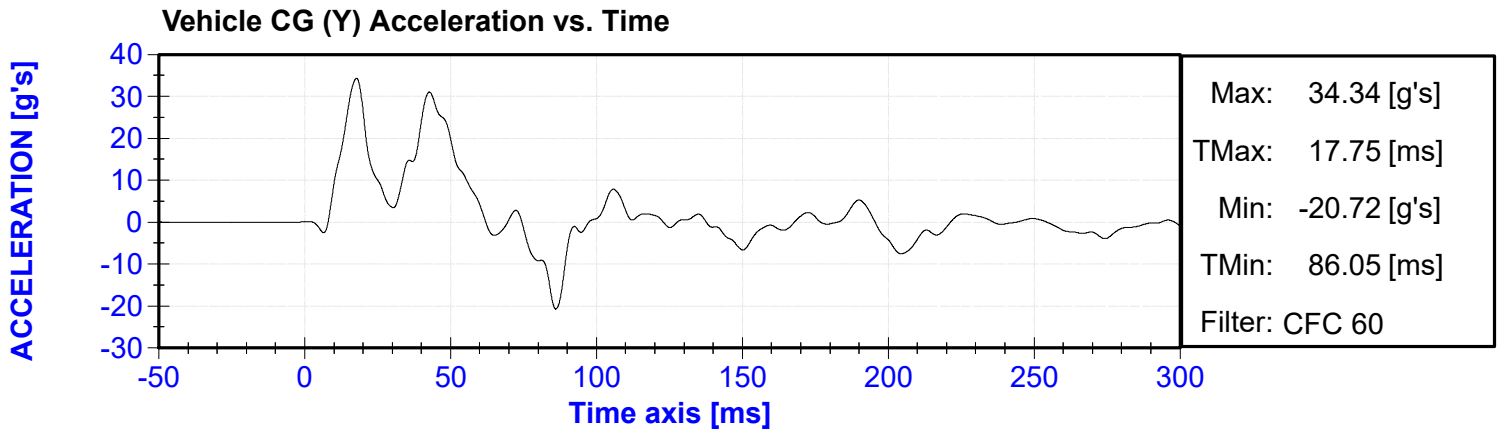
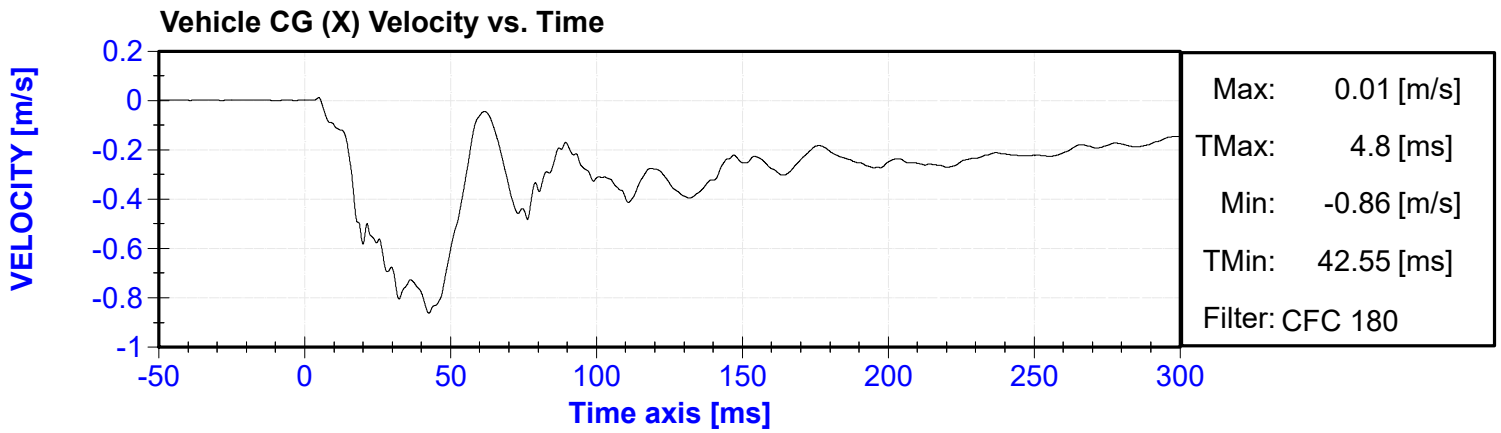


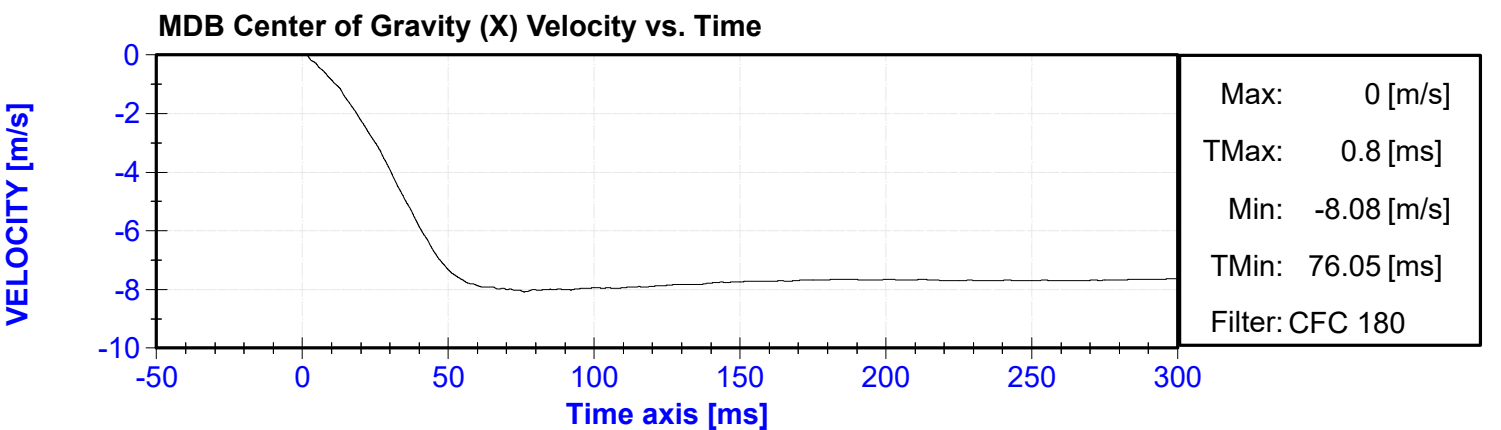
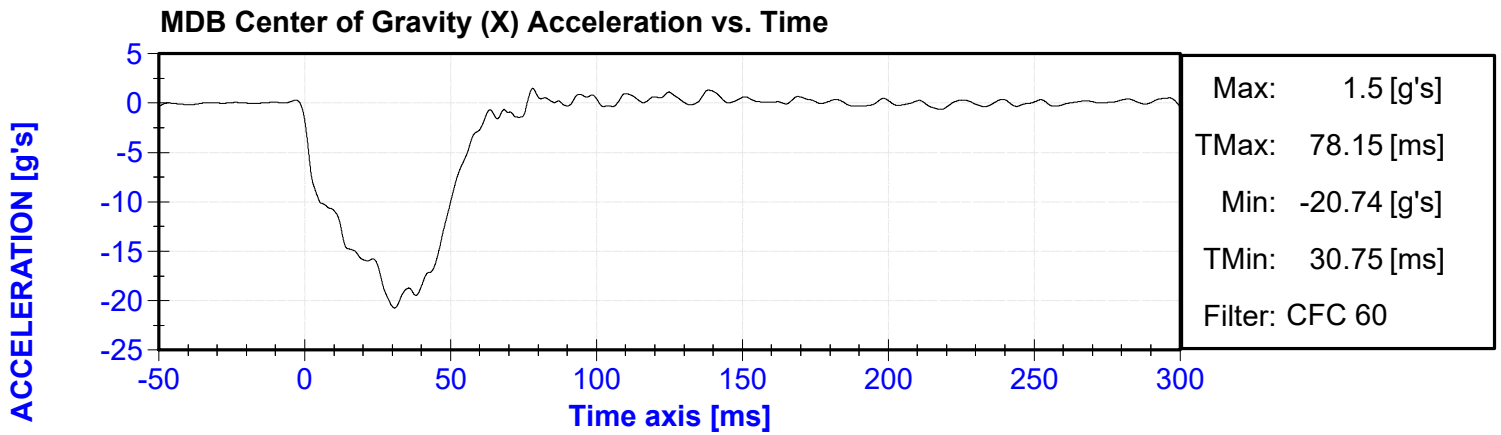
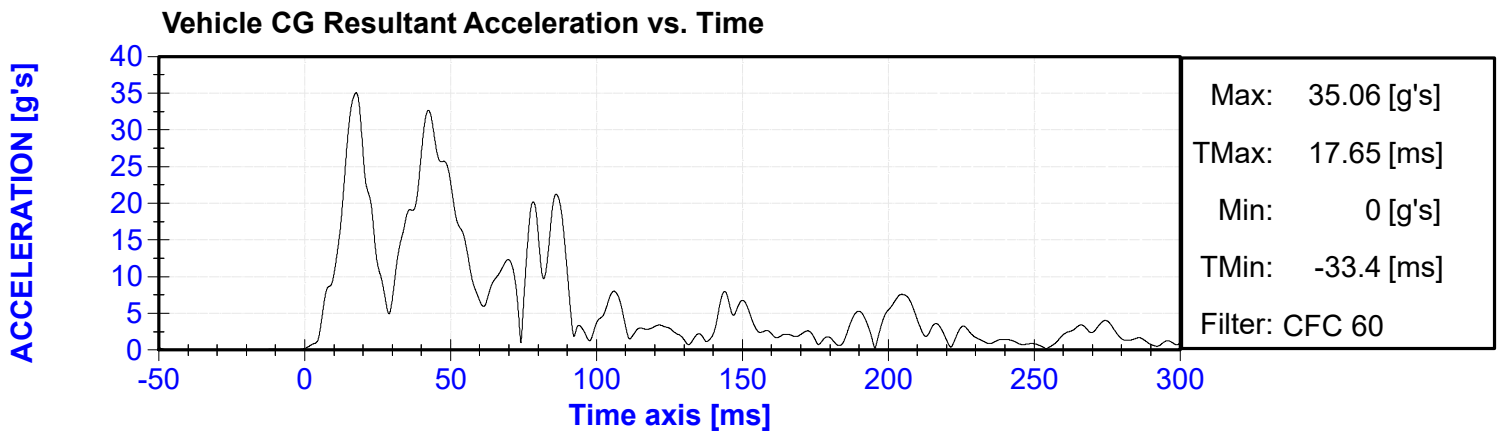
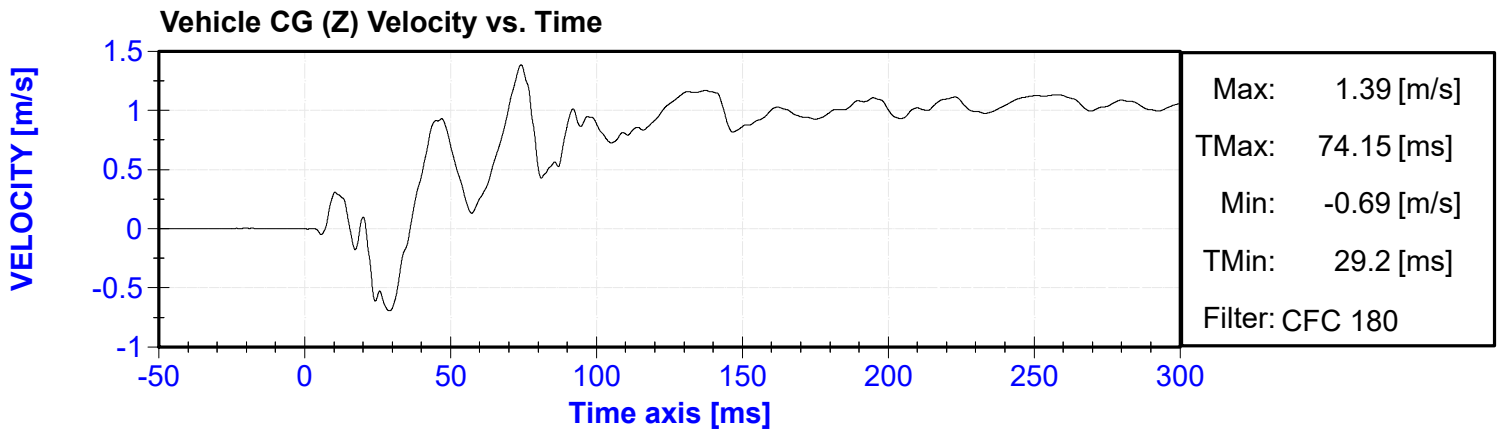


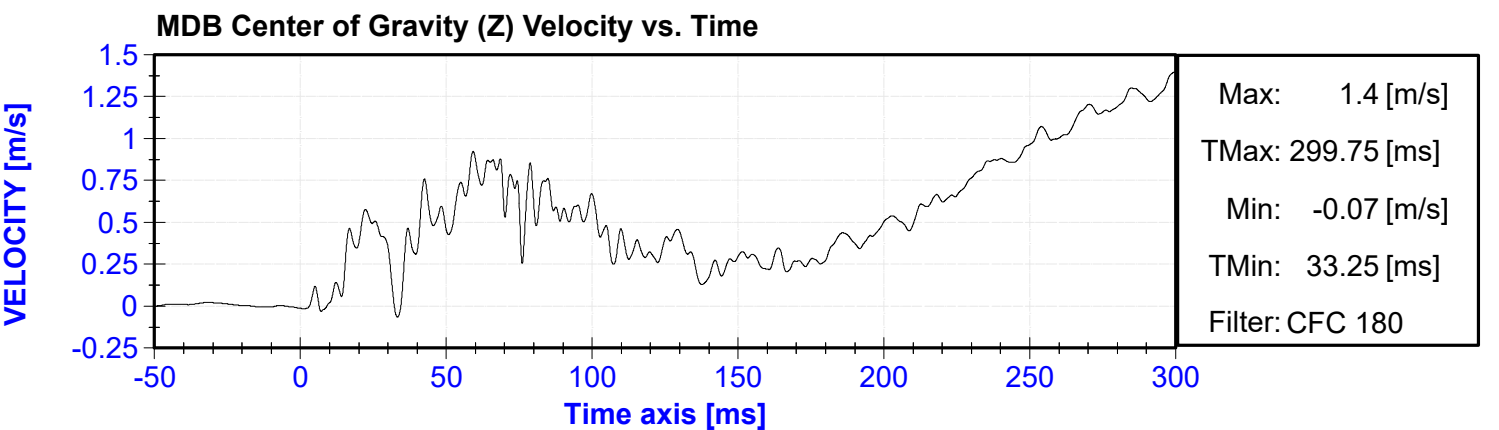
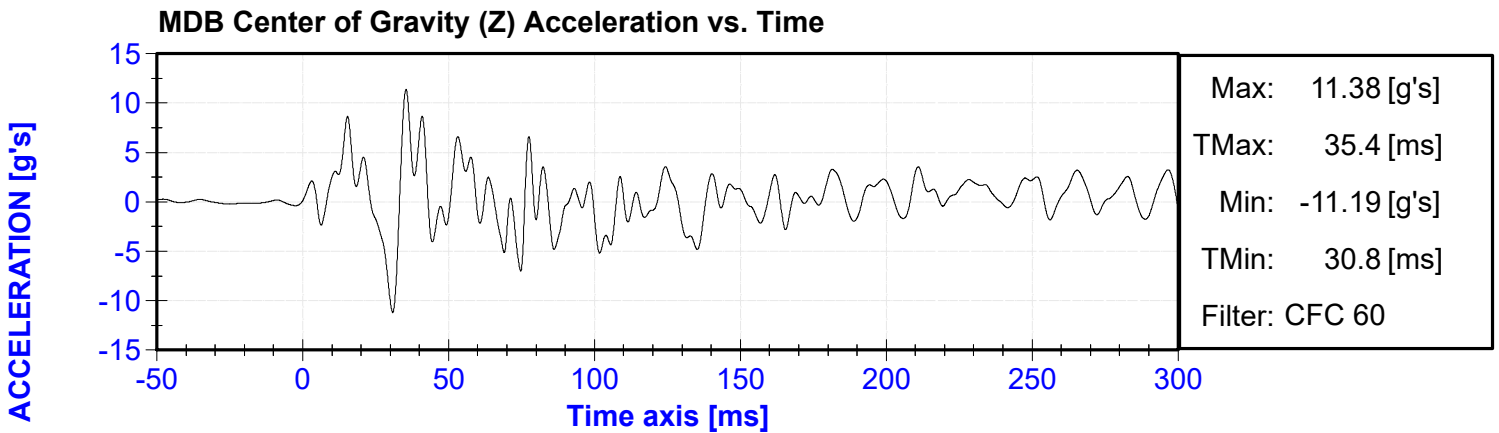
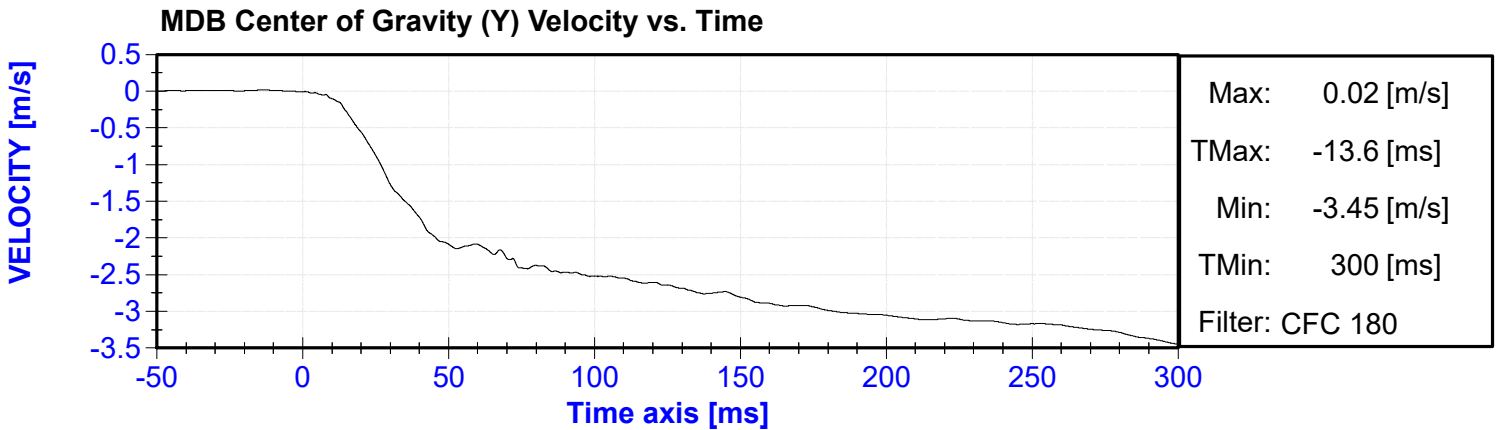
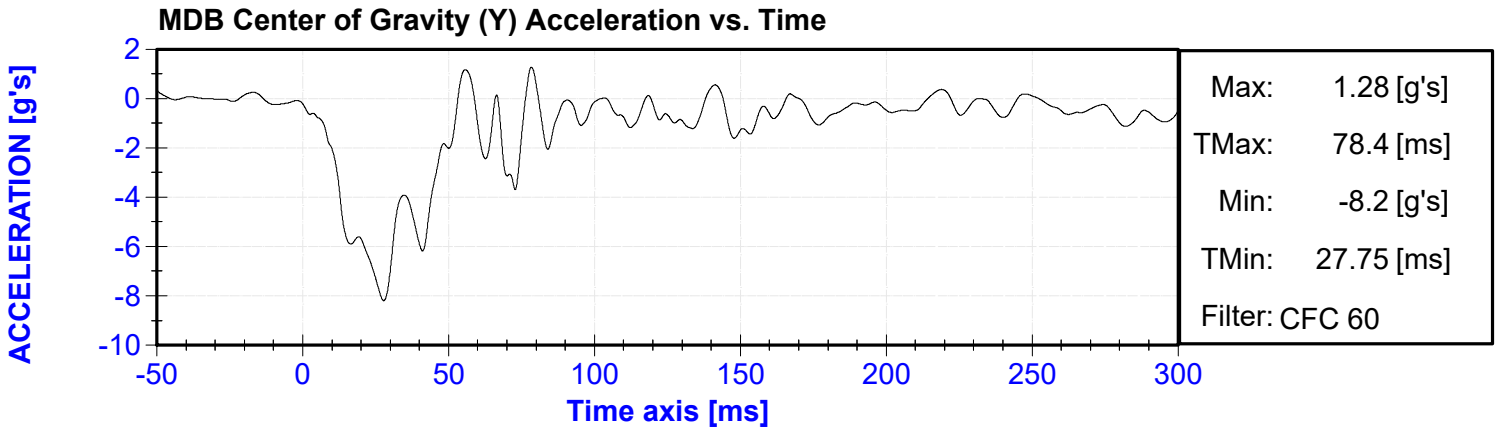


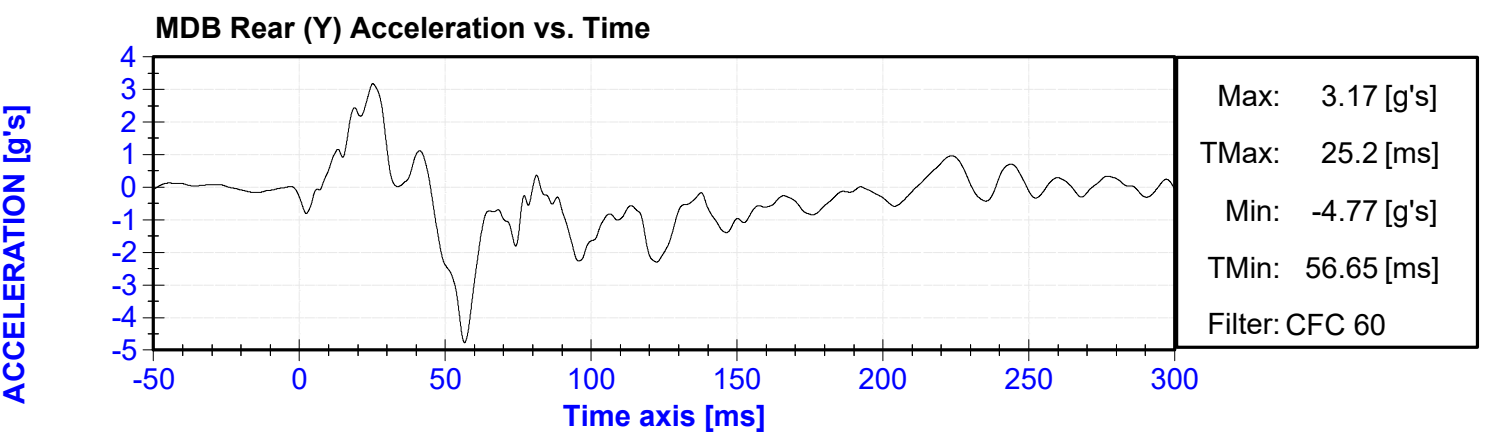
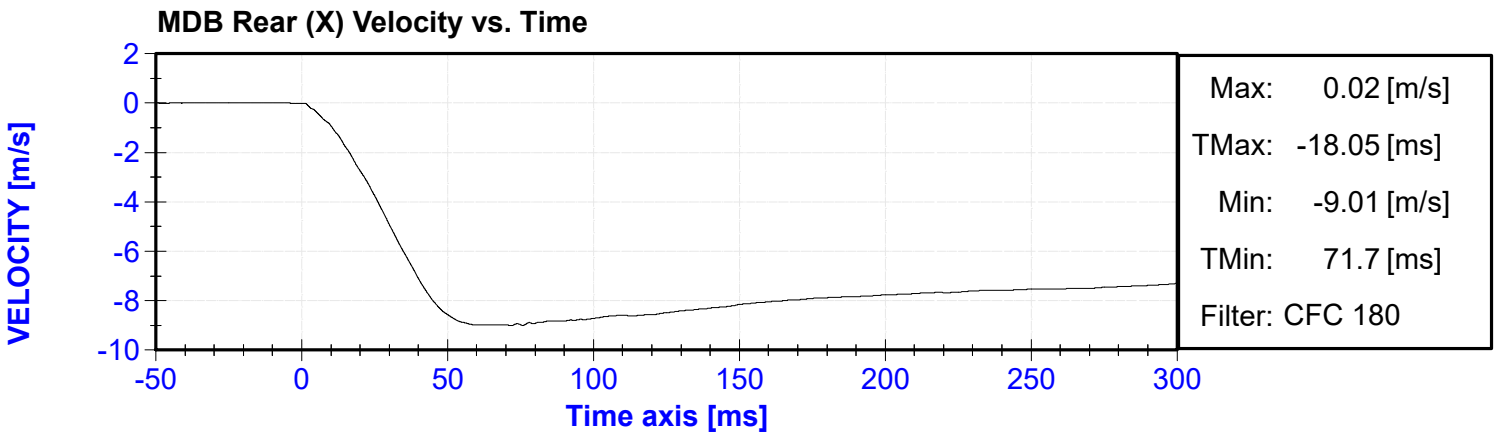
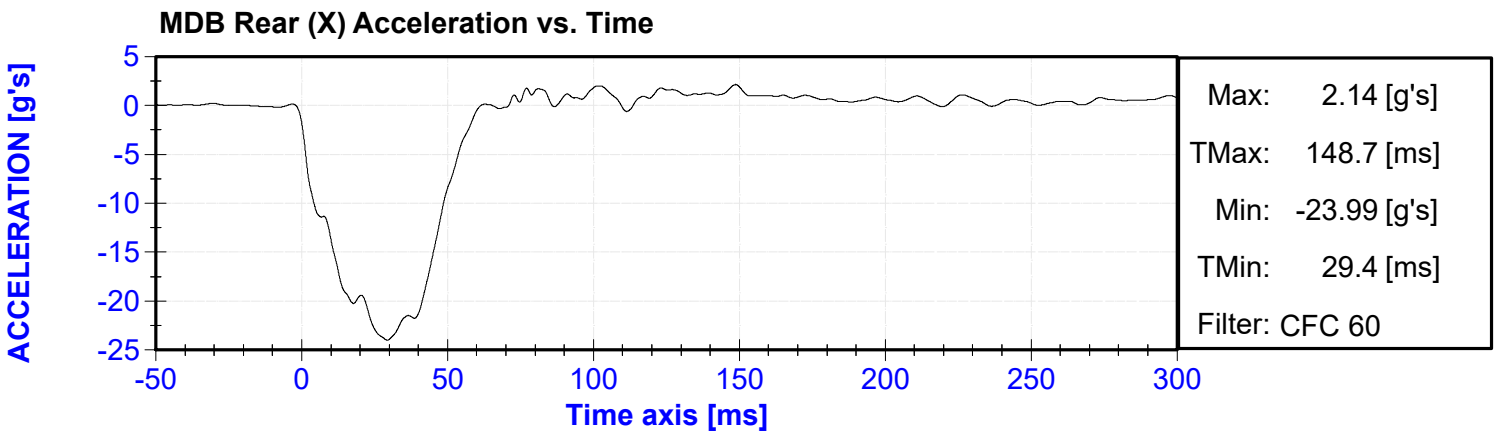
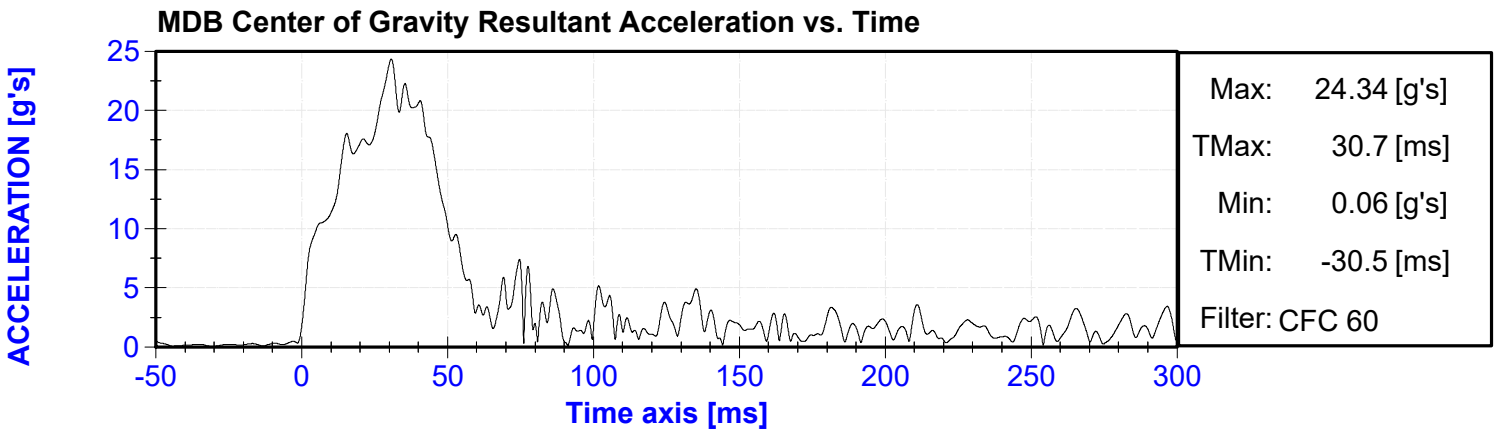


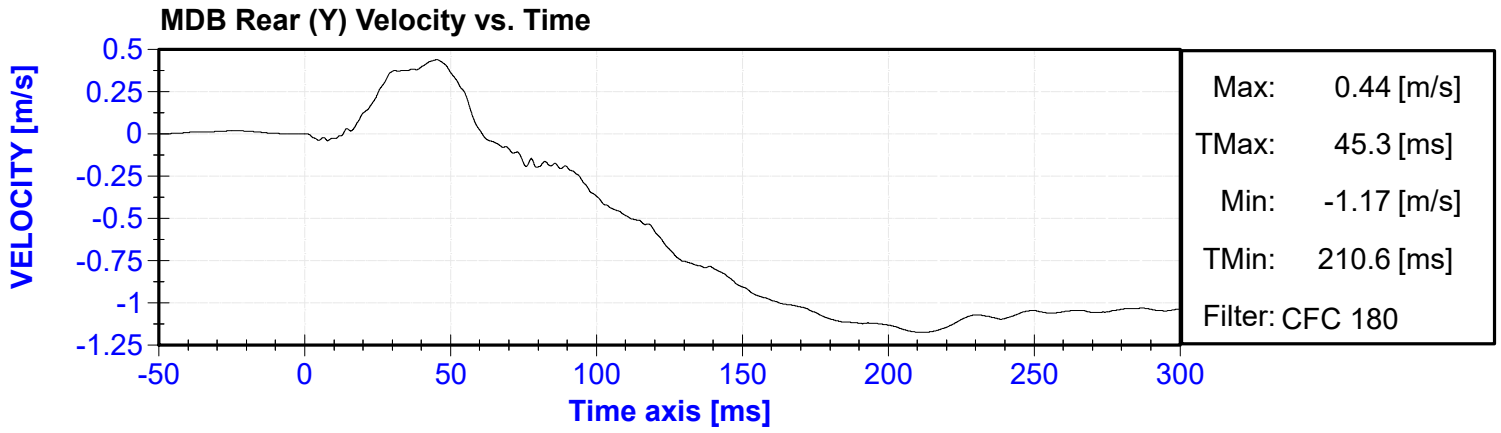












**APPENDIX V**

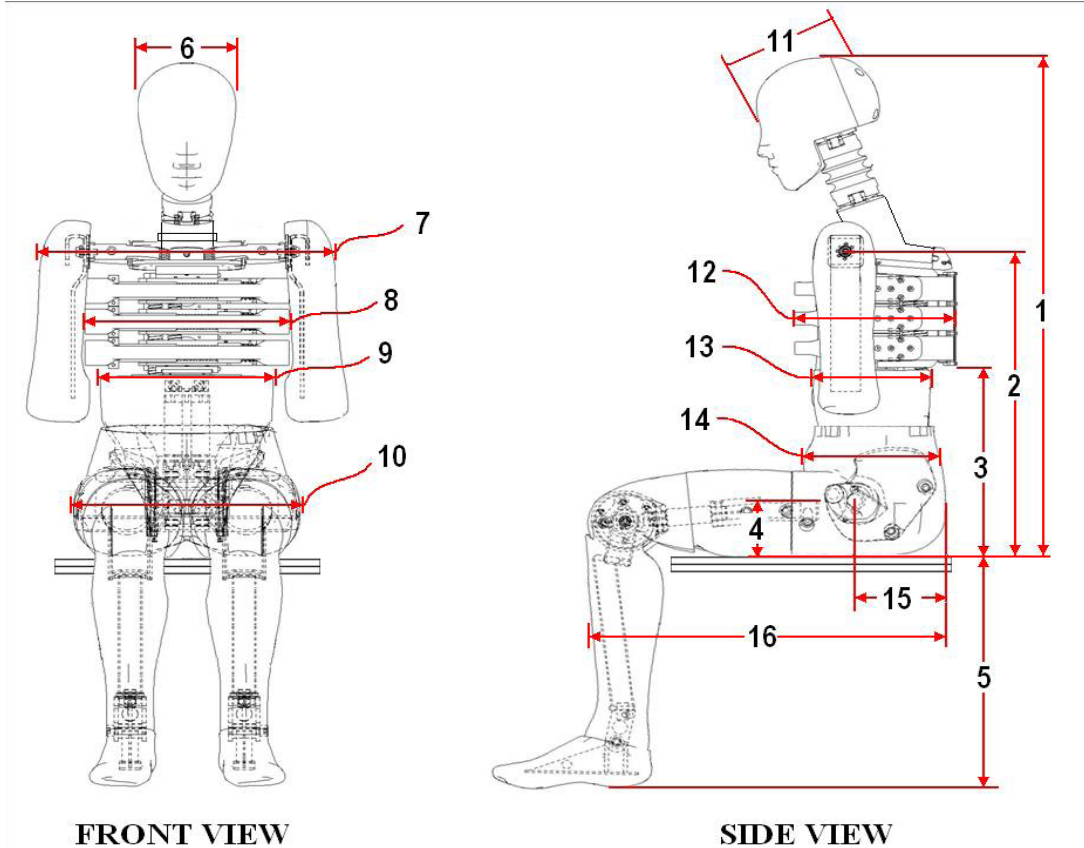
**PRE-TEST  
ES-2re PERFORMANCE CALIBRATION TEST DATA**

External Measurements - EuroSID-2re

Technician: J. Rios

Date: 11/16/2024

Dummy Serial Number: D037



Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	915	Pass
2	Seat to Shoulder Joint	558	572	565	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	349	Pass
4	Seat to Hip Joint (center of bolt)	97	103	100	Pass
5	Sole to Seat, Sitting	333	451	446	Pass
6	Head Width	152	158	153	Pass
7	Shoulder/Arm Width	461	479	474	Pass
8	Thorax Width	322	332	324	Pass
9	Abdomen Width	273	287	281	Pass
10	Pelvis Lap Width	359	373	372	Pass
11	Head Depth	196	206	197	Pass
12	Thorax Depth	262	272	264	Pass
13	Abdomen Depth	194	204	200	Pass
14	Pelvis Depth	235	245	239	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	154	Pass
16	Back of Buttocks to Front Knee	597	615	603	Pass

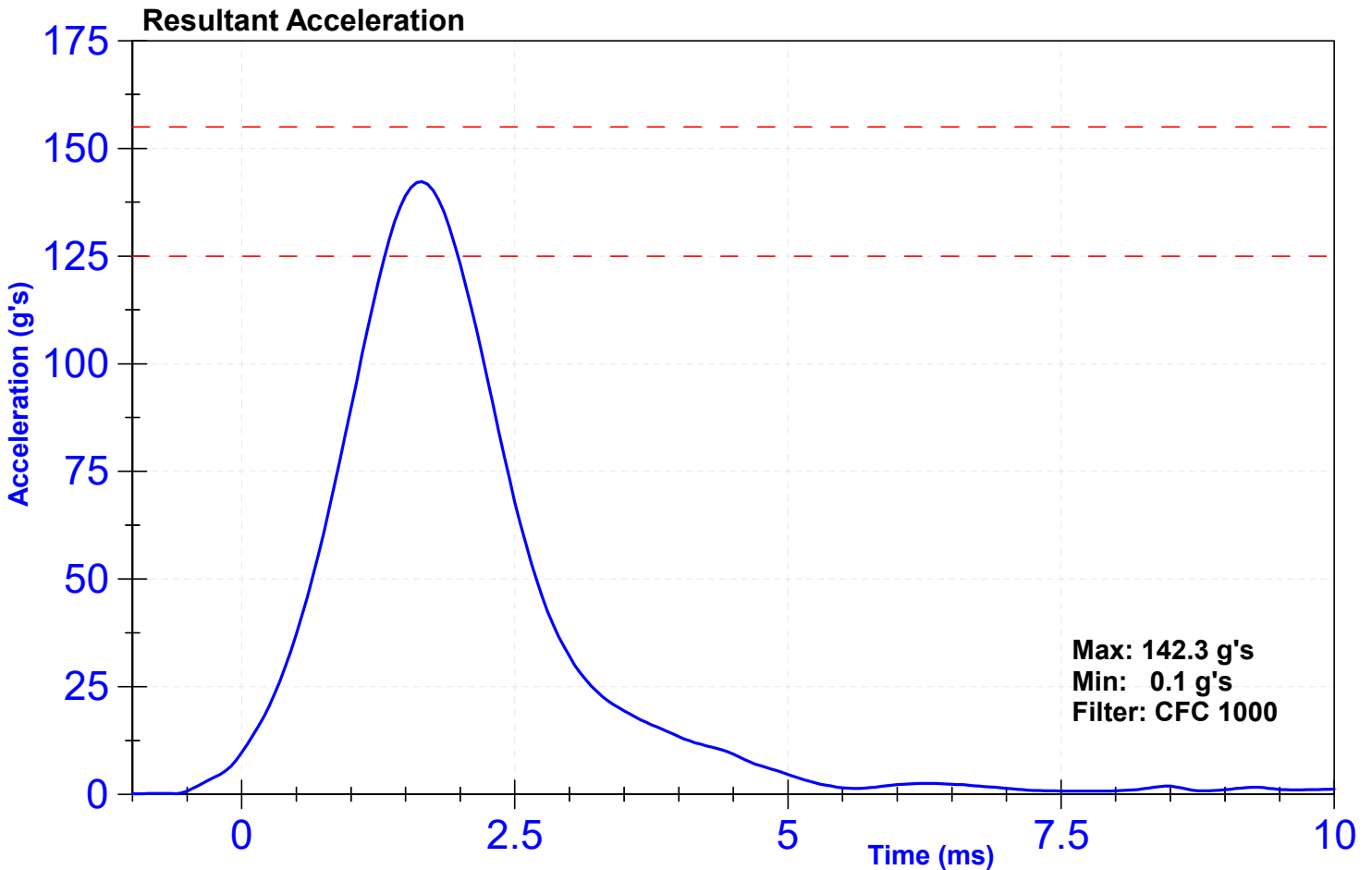
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

**Results**

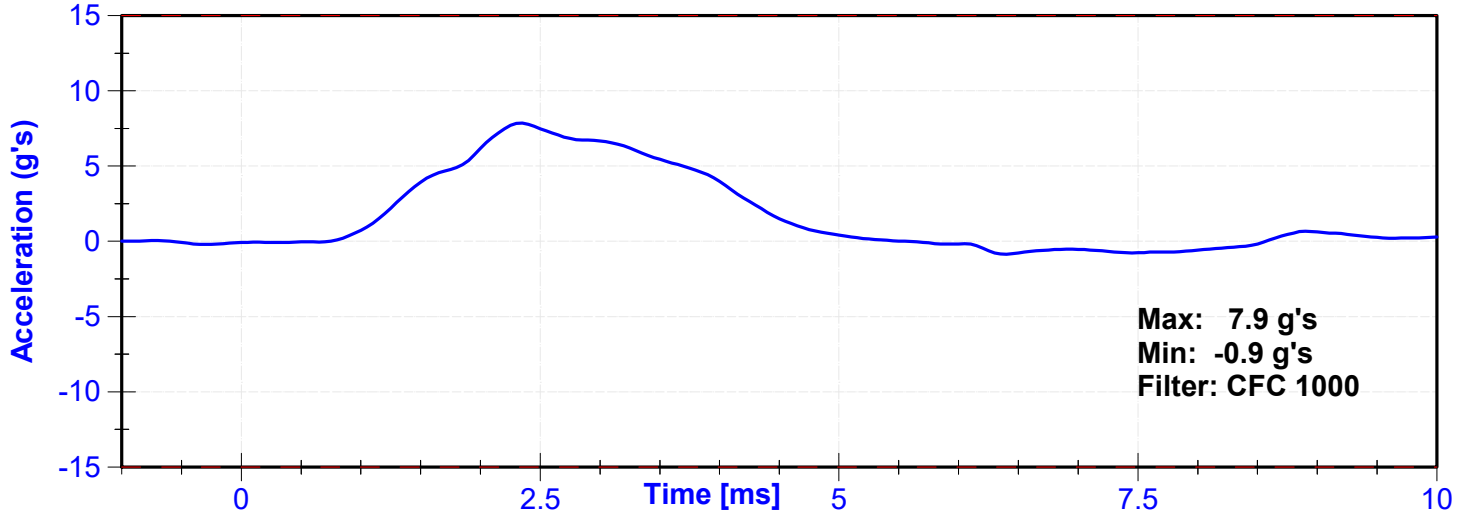
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	29	Pass
Resultant Acceleration	125	155	g's	142.3	Pass
Oscillation	0	15	%	1.77	Pass
Fore-Aft Acceleration	-15	15	g's	7.9	Pass

**Transducer Calibrations**

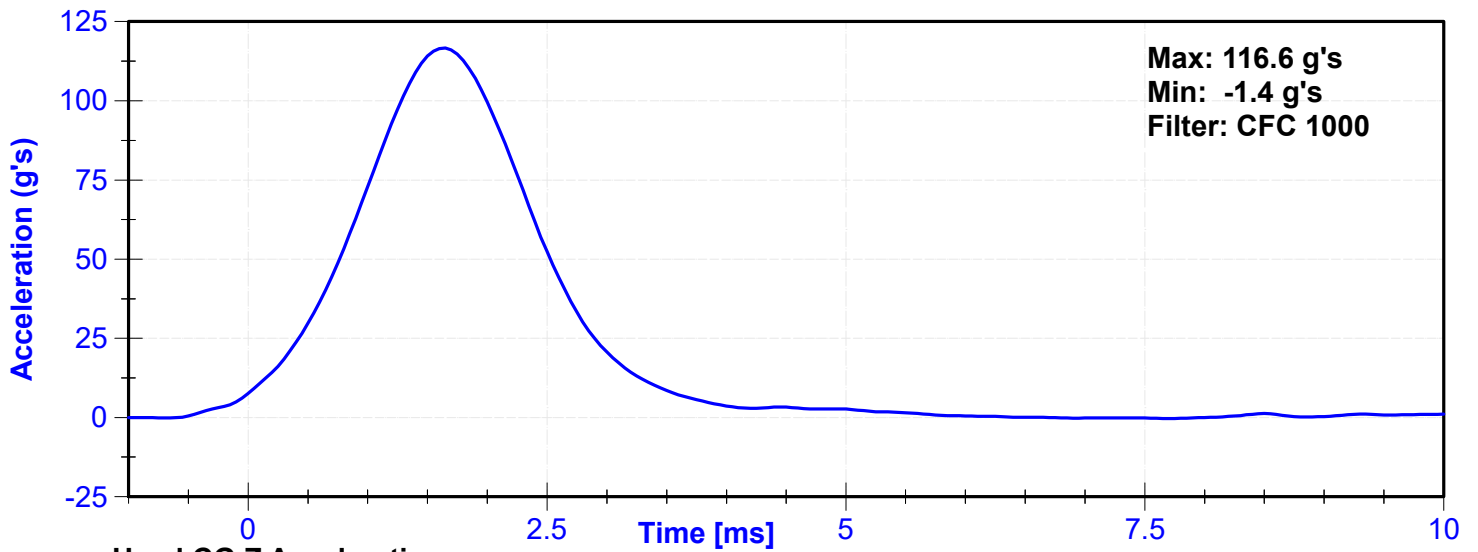
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	T21724	10/8/2024	4/6/2025
Y Accelerometer	Endevco	T22281	10/8/2024	4/6/2025
Z Accelerometer	Endevco	T26050	10/8/2024	4/6/2025



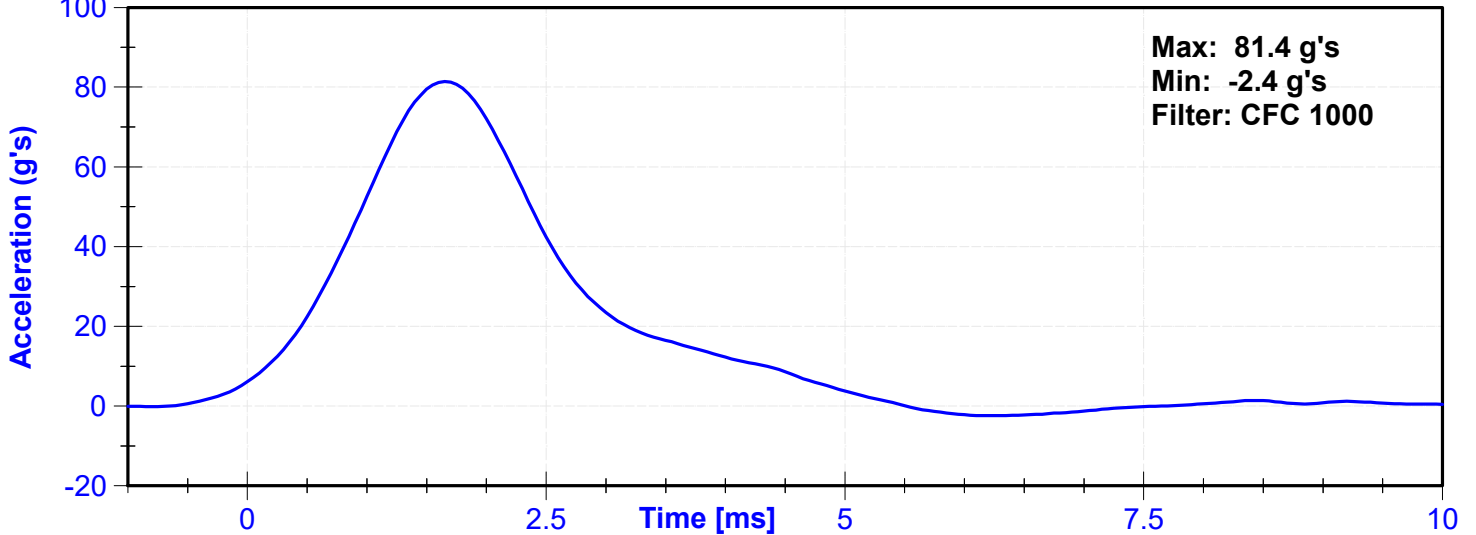
Head CG X Acceleration



Head CG Y Acceleration



Head CG Z Acceleration



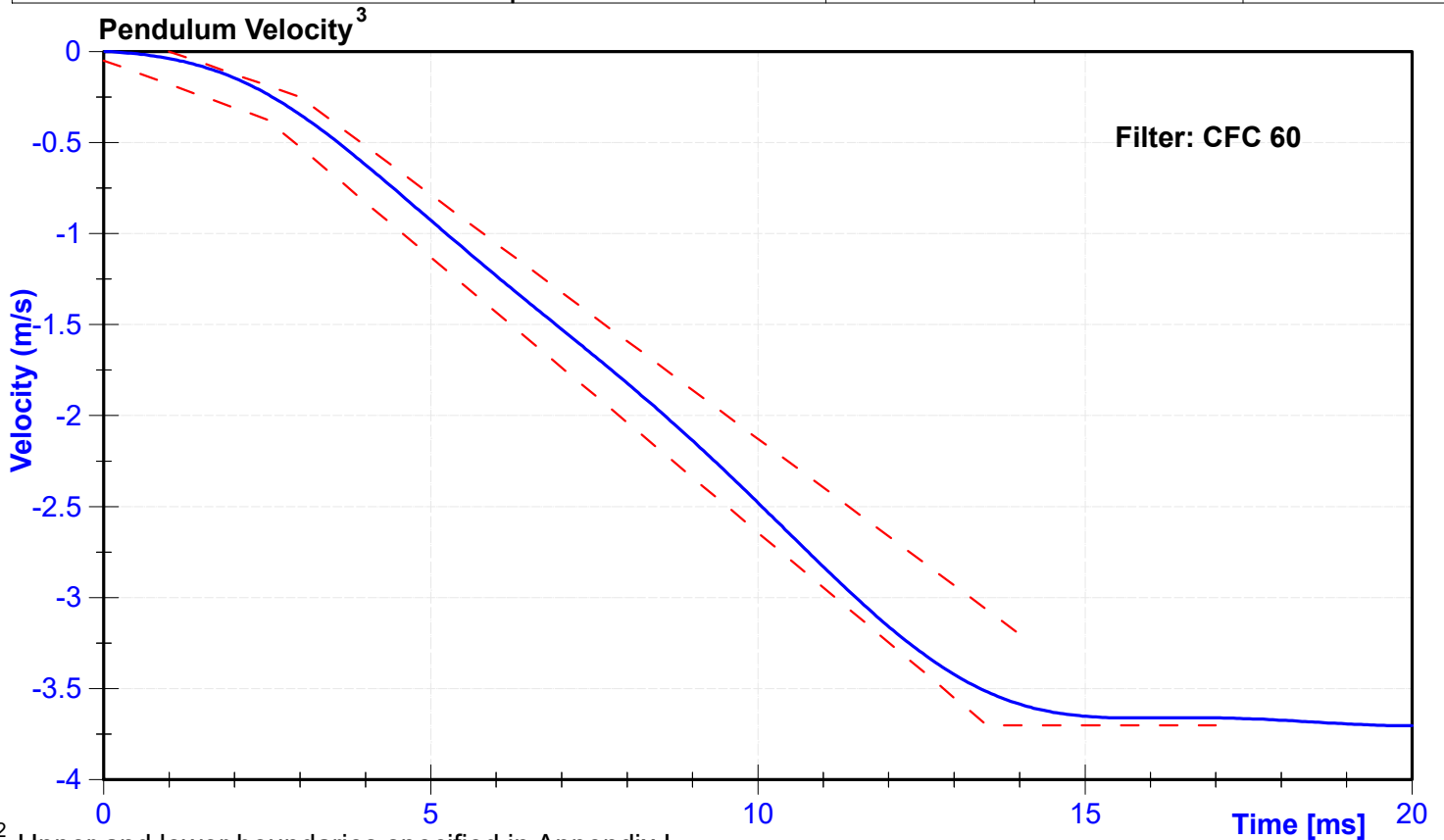
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

**Results**

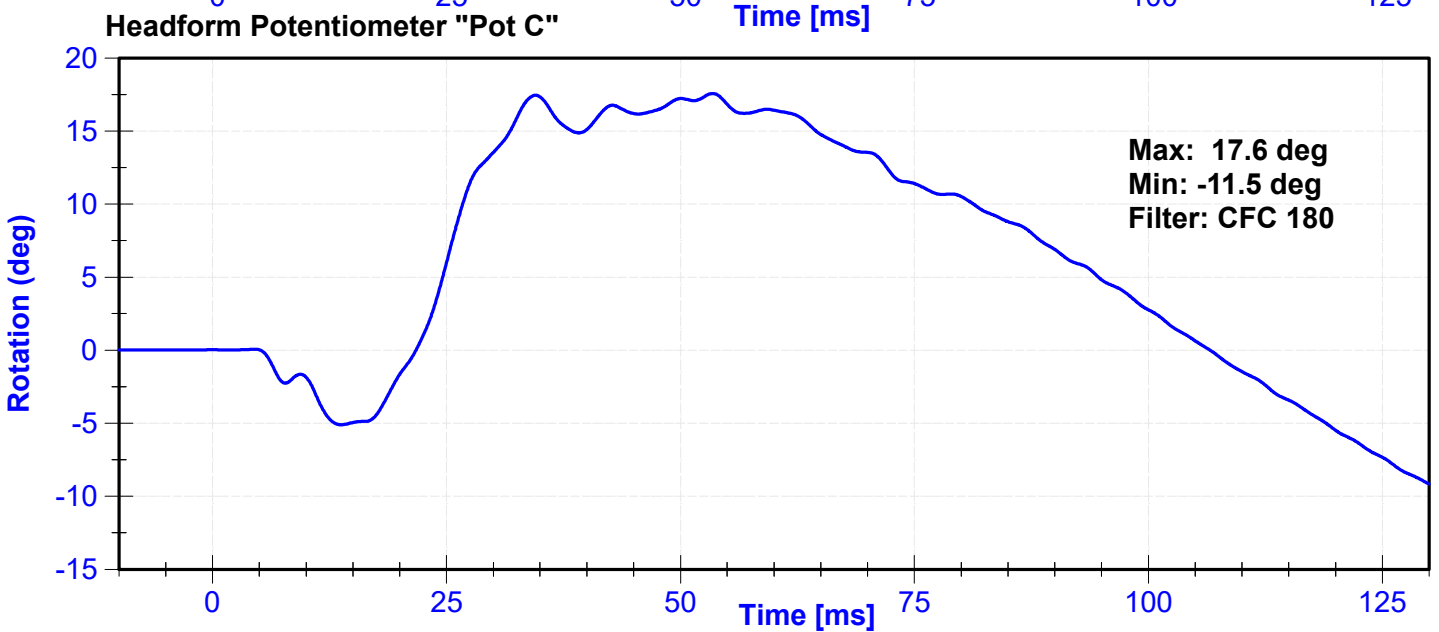
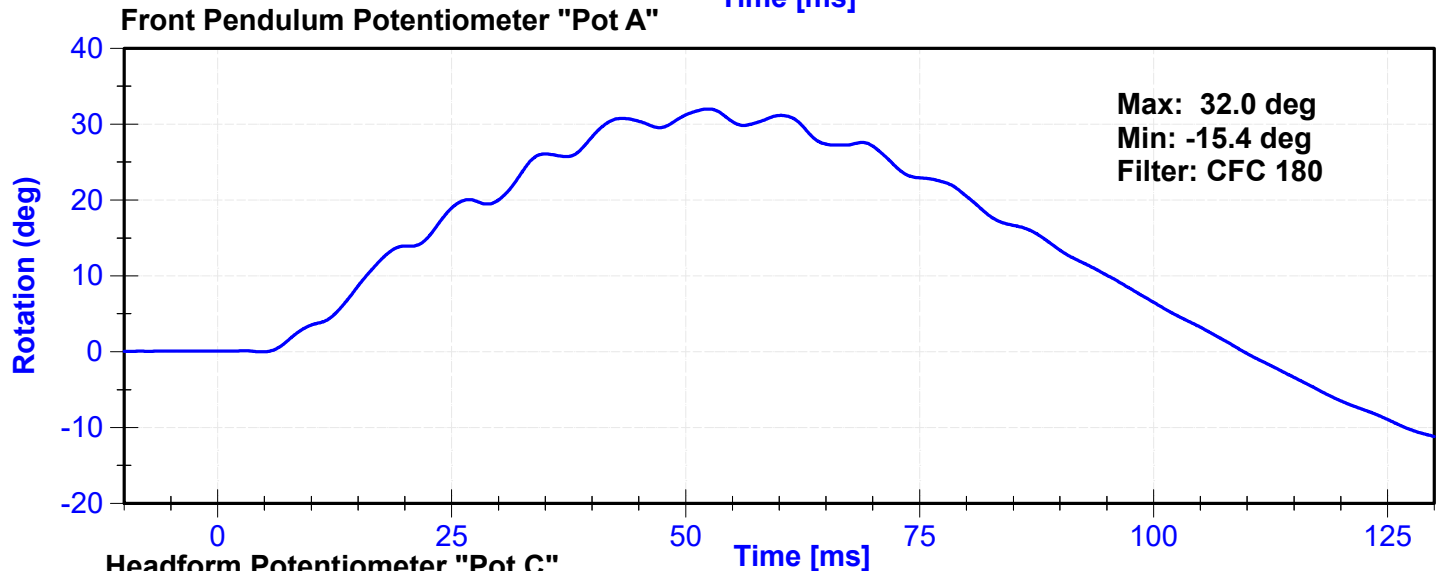
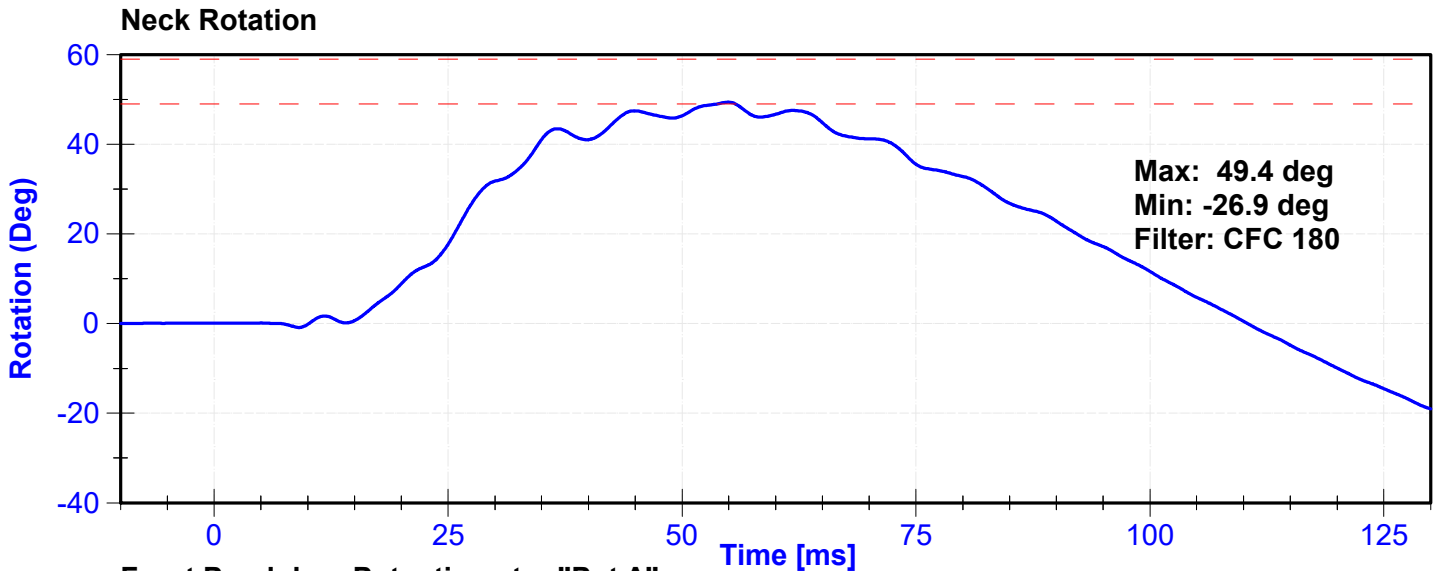
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	3.3	3.5	m/s	3.50	Pass
Lateral Neck Rotation	49	59	deg	49.4	Pass
Time at Maximum Rotation	54	66	ms	54.9	Pass
Time of Rotation Decay from Maximum	53	88	ms	55.5	Pass
Pendulum Velocity Overall Corridor	Lower Boundary <sup>1</sup>	Upper Boundary <sup>2</sup>	m/s	See Plot <sup>3</sup>	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	11/1/2024	11/1/2025
Front Pendulum Potentiometer	Sfernice	2247	9/13/2024	9/13/2025
Headform Potentiometer	Sfernice	095	9/13/2024	9/13/2025



<sup>1,2</sup> Upper and lower boundaries specified in Appendix I



## Appendix I

<sup>2</sup> Upper Boundary Corridor		<sup>1</sup> 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	Denton	Test Technician	K. Konieczny
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

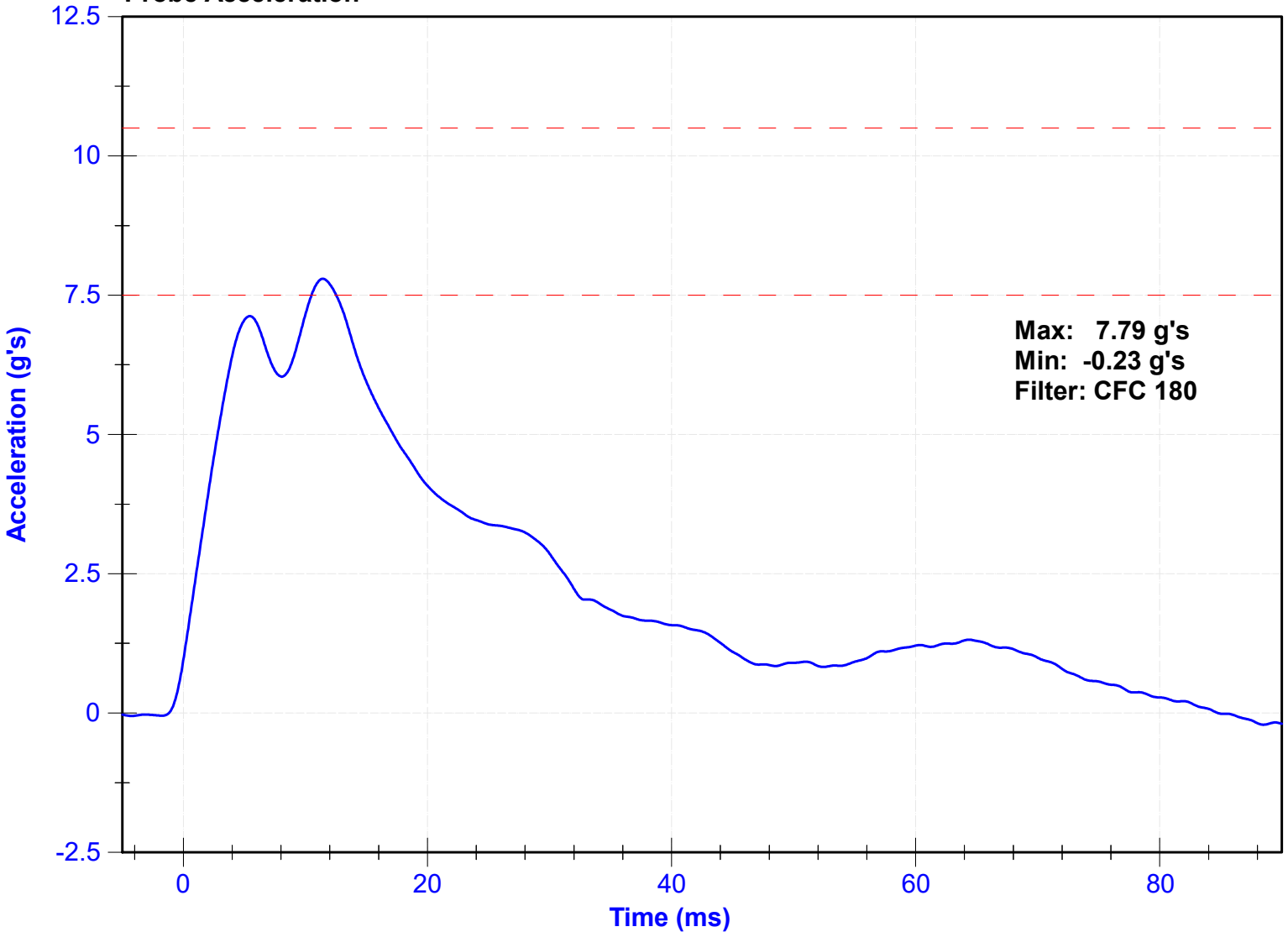
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	34	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	7.5	10.5	g's	7.79	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18599	9/13/2024	3/12/2025

**Probe Acceleration**



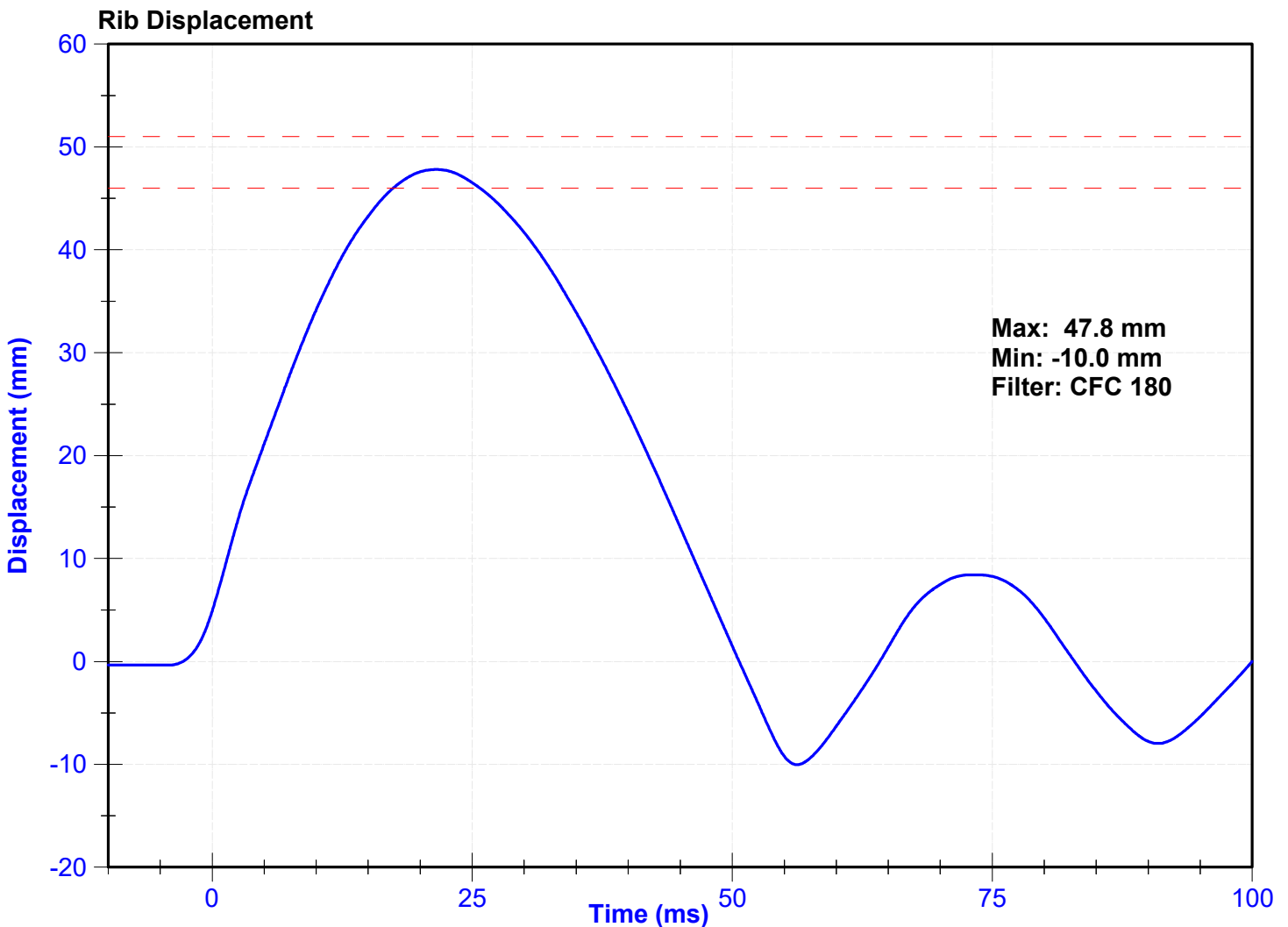
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	27	Pass
Rib Displacement	46	51	mm	47.8	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025



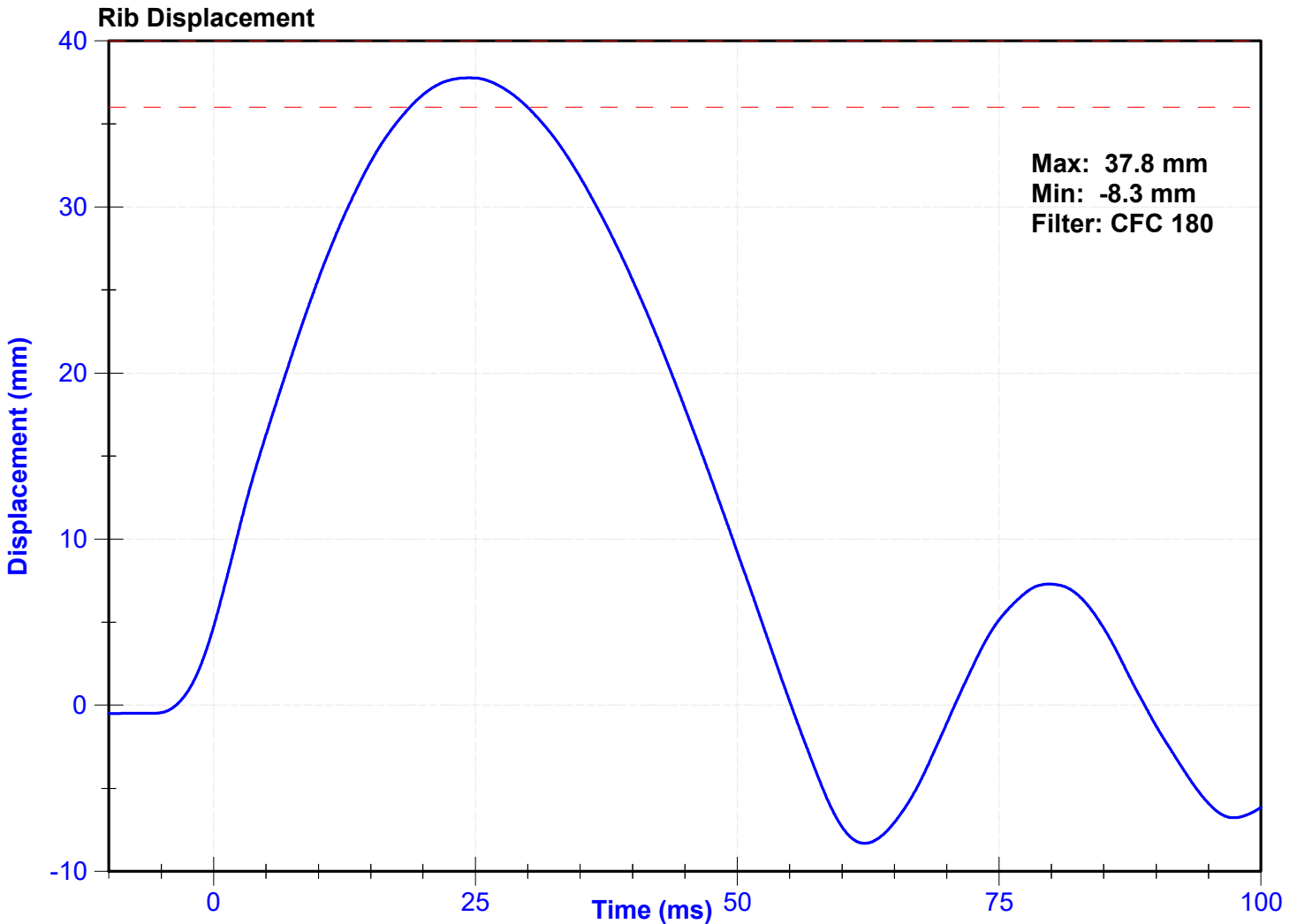
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	27	Pass
Rib Displacement	36	40	mm	37.8	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025



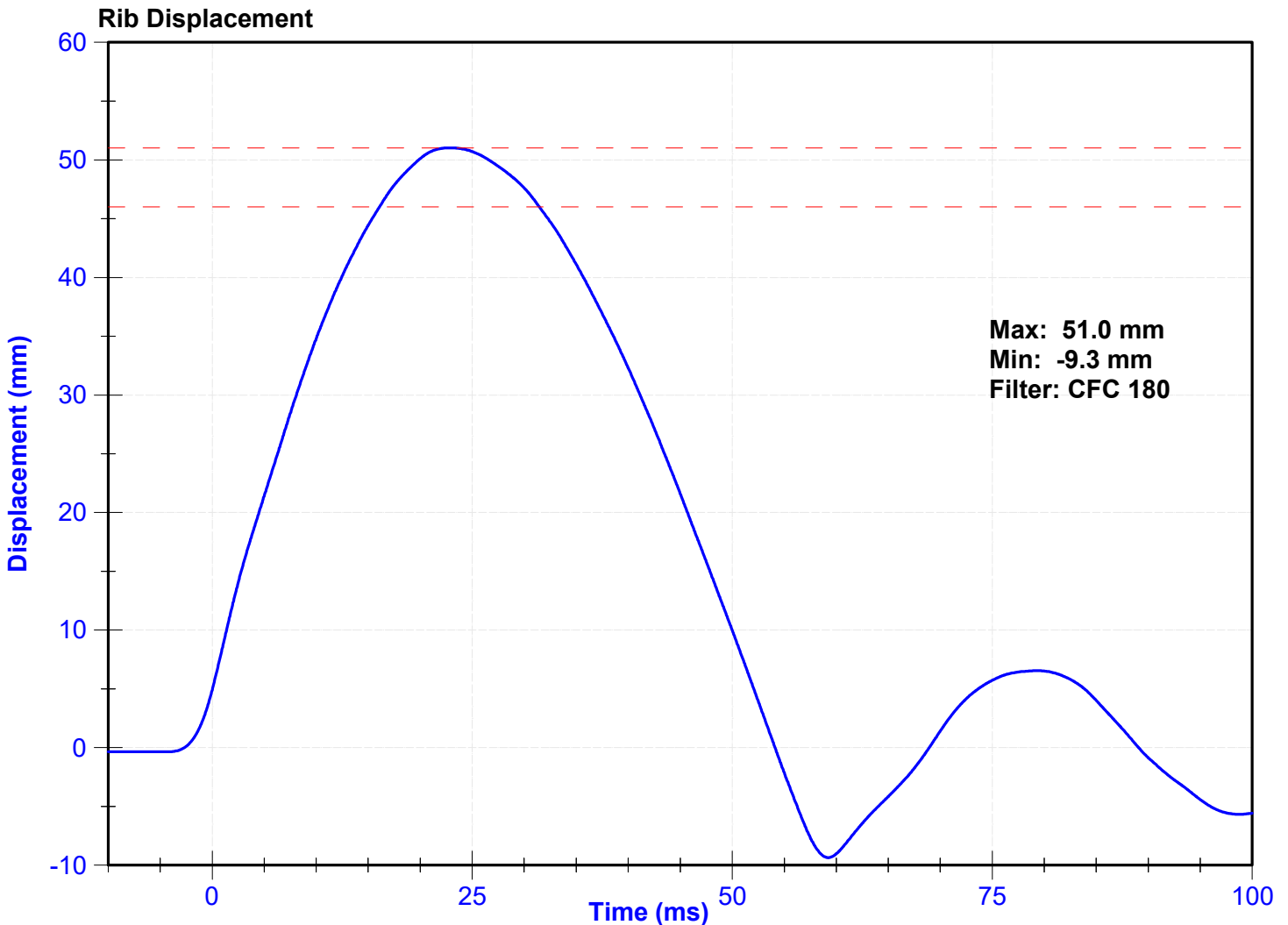
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	27	Pass
Rib Displacement	46	51	mm	51.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025



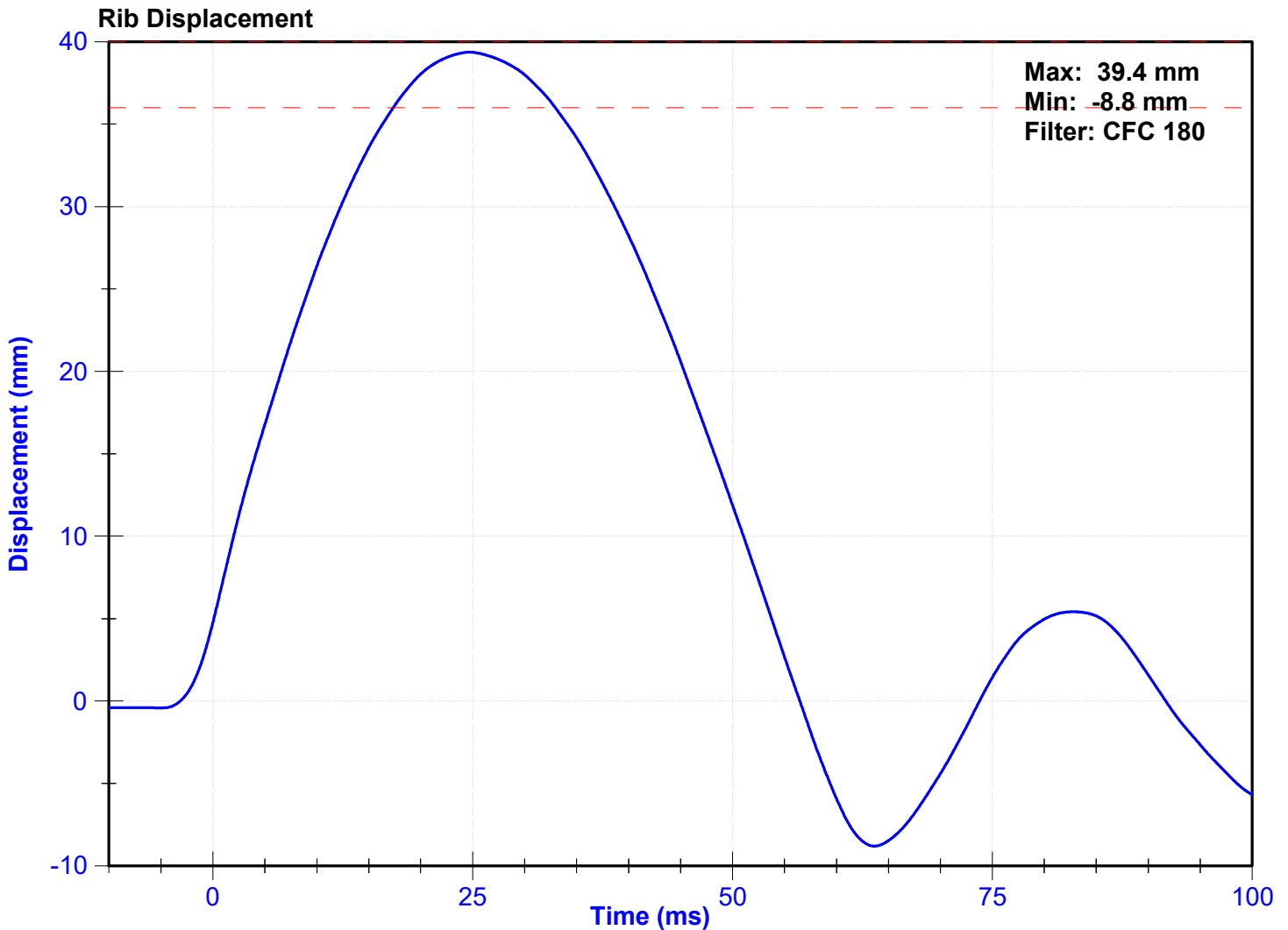
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	27	Pass
Rib Displacement	36	40	mm	39.4	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025



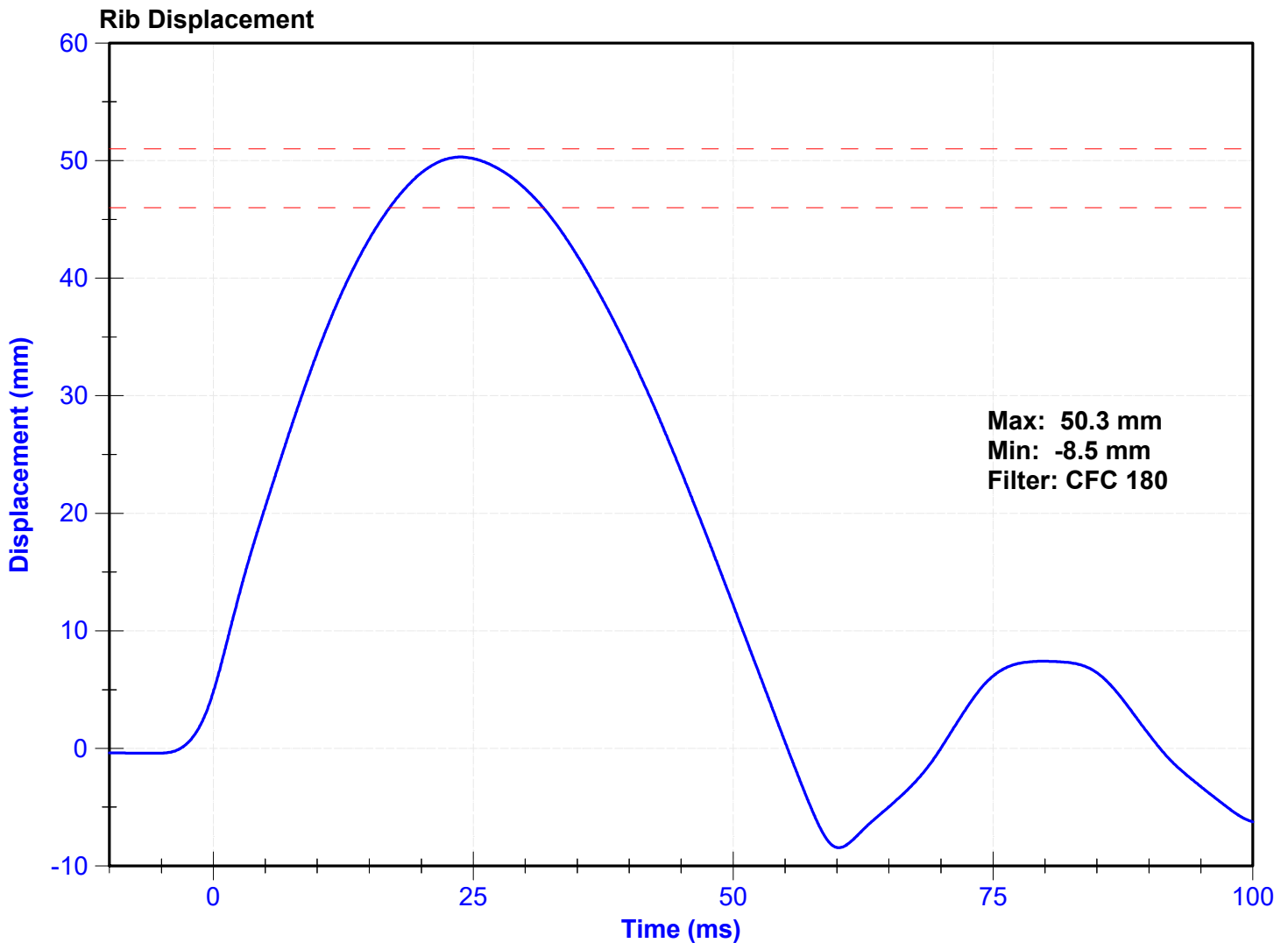
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	27	Pass
Rib Displacement	46	51	mm	50.3	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025



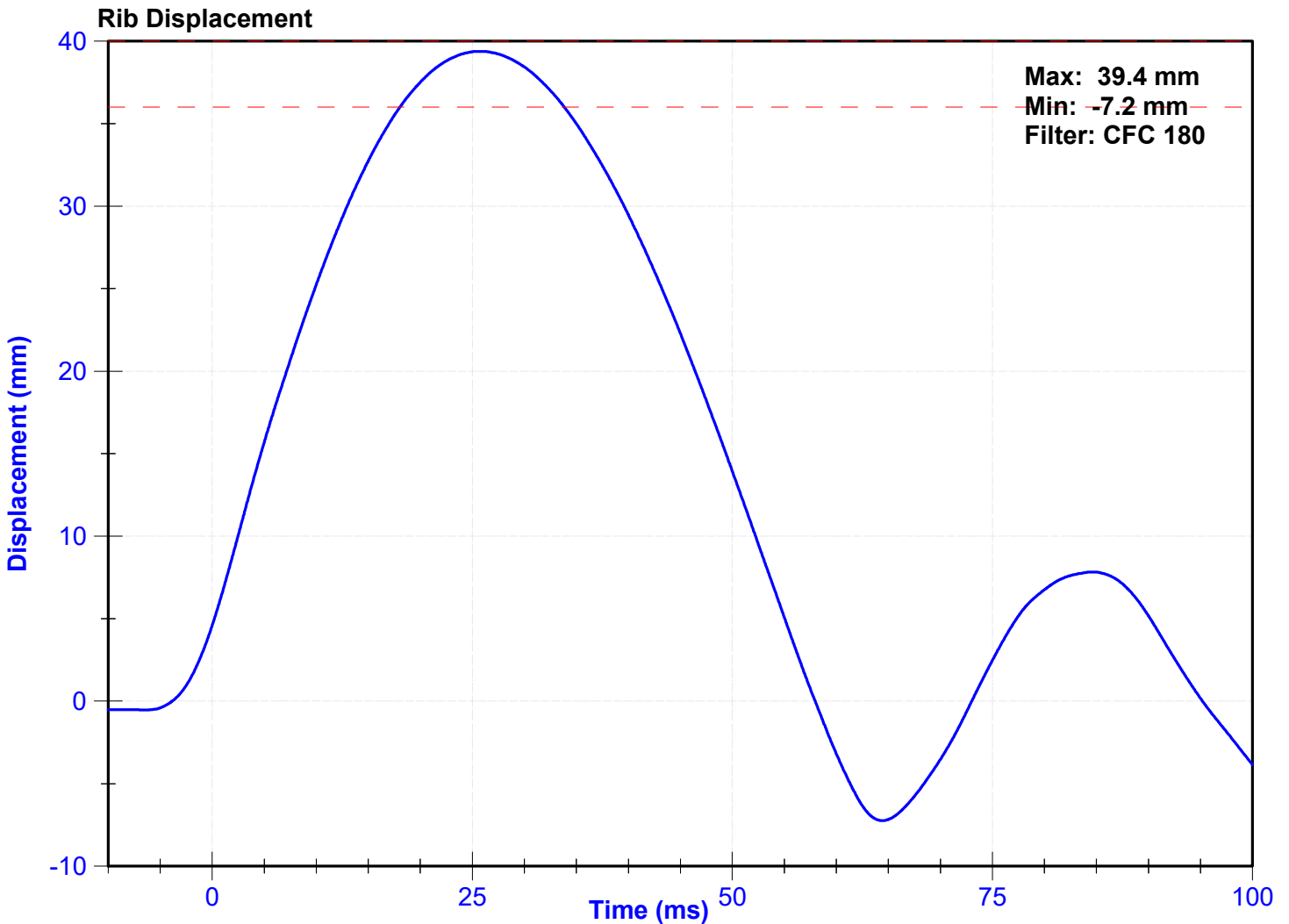
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	27	Pass
Rib Displacement	36	40	mm	39.4	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025



ATD Manufacturer	Denton	Test Technician	K. Konieczny
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

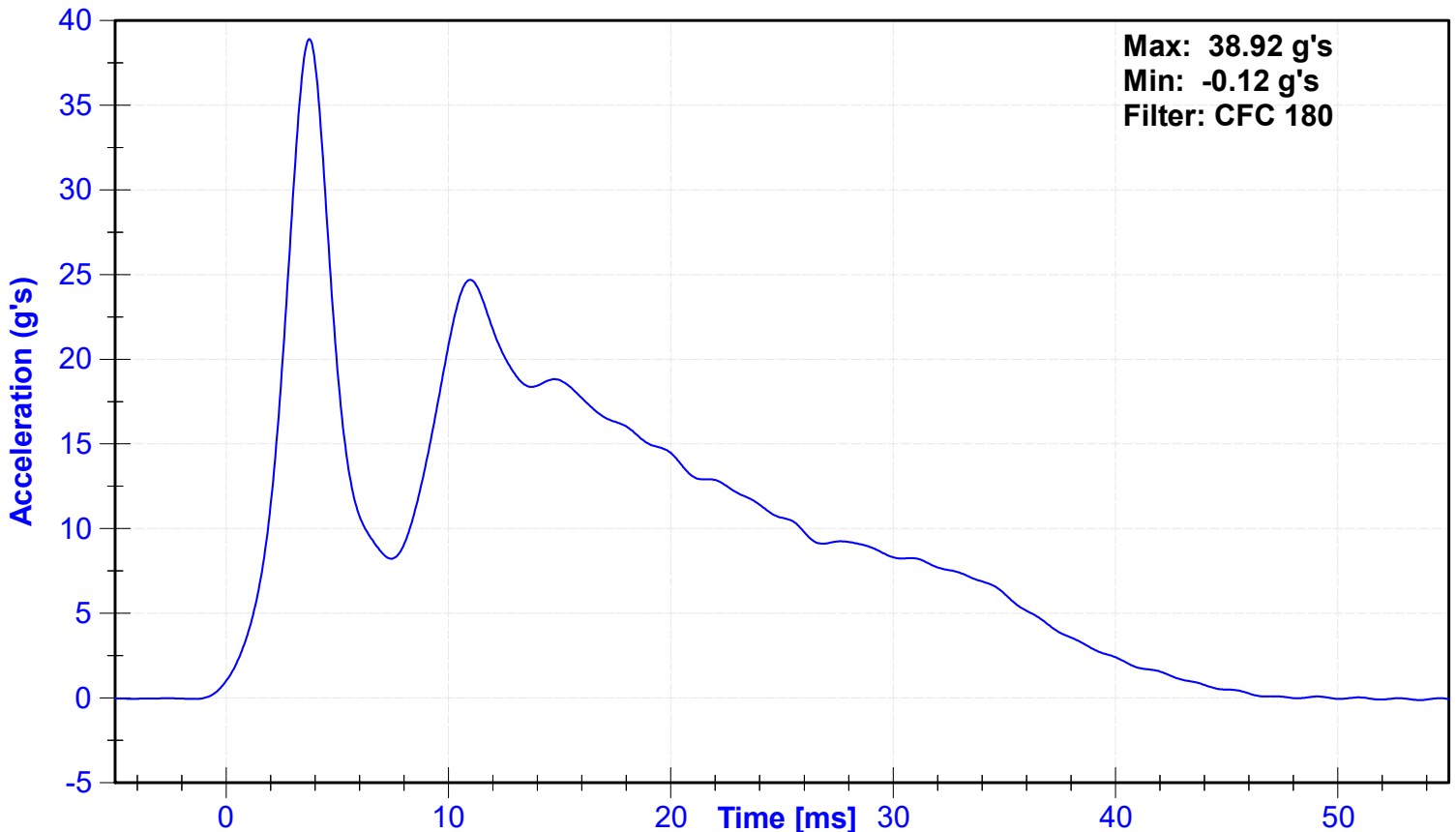
**Results**

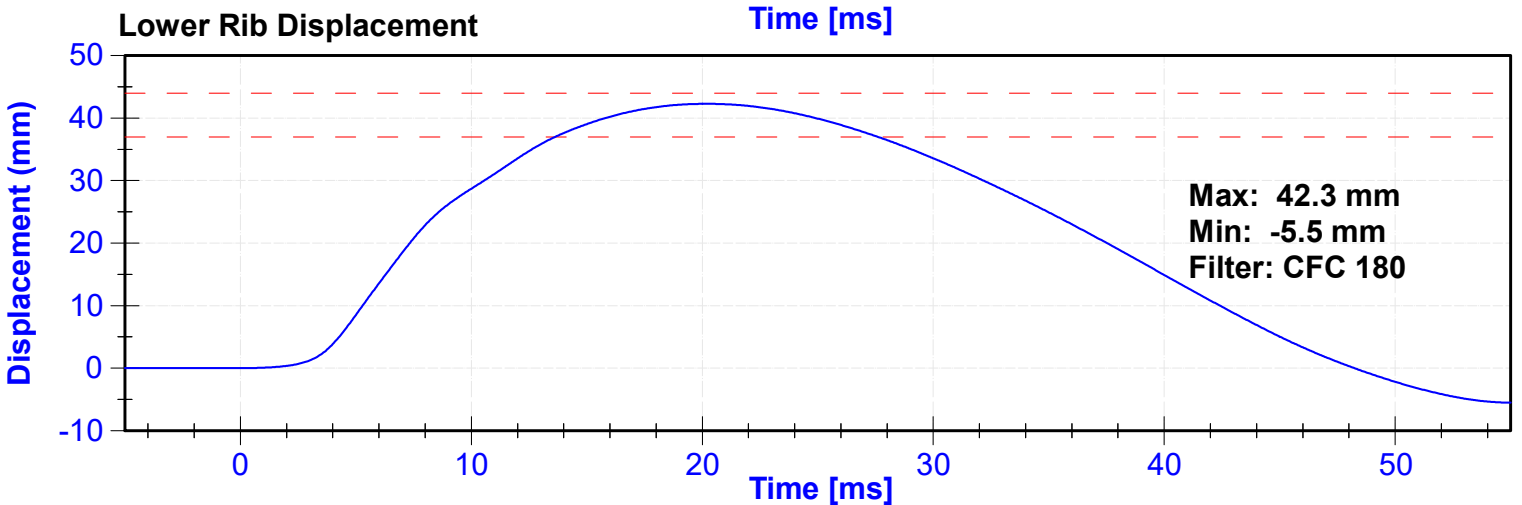
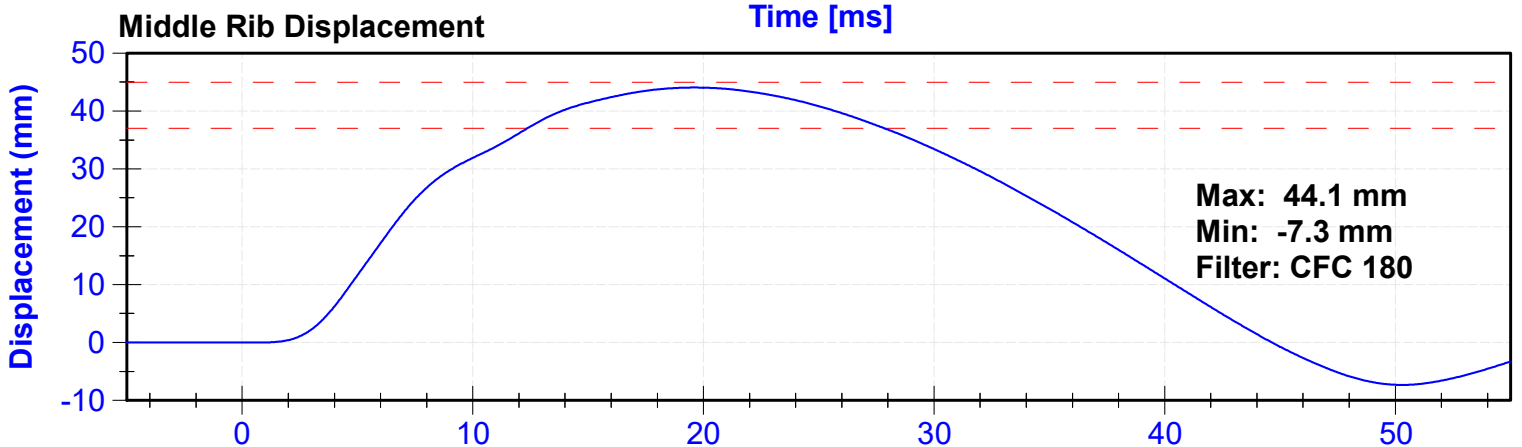
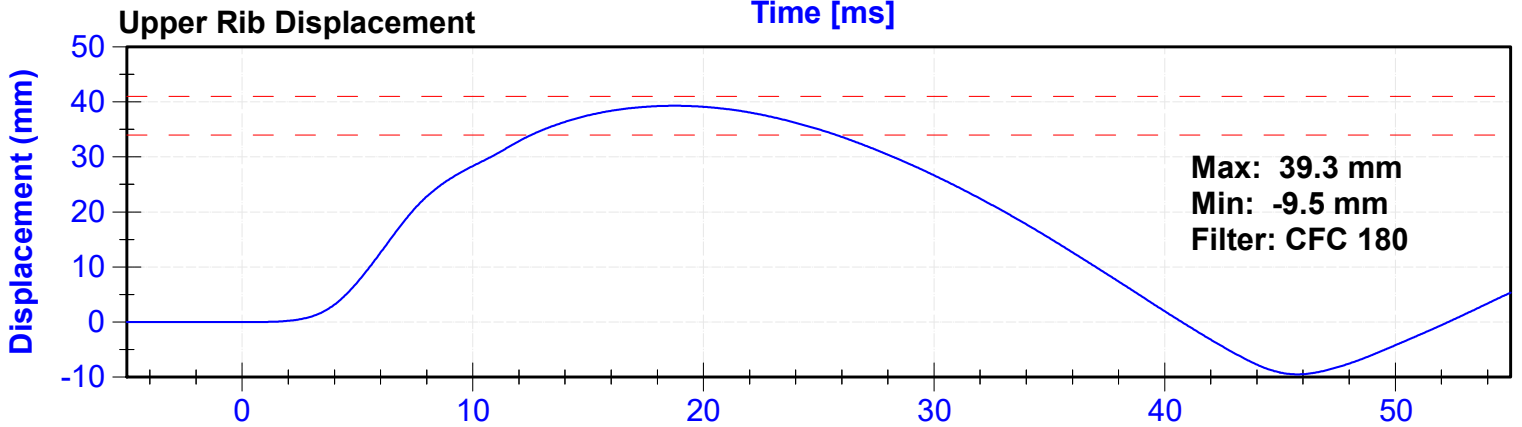
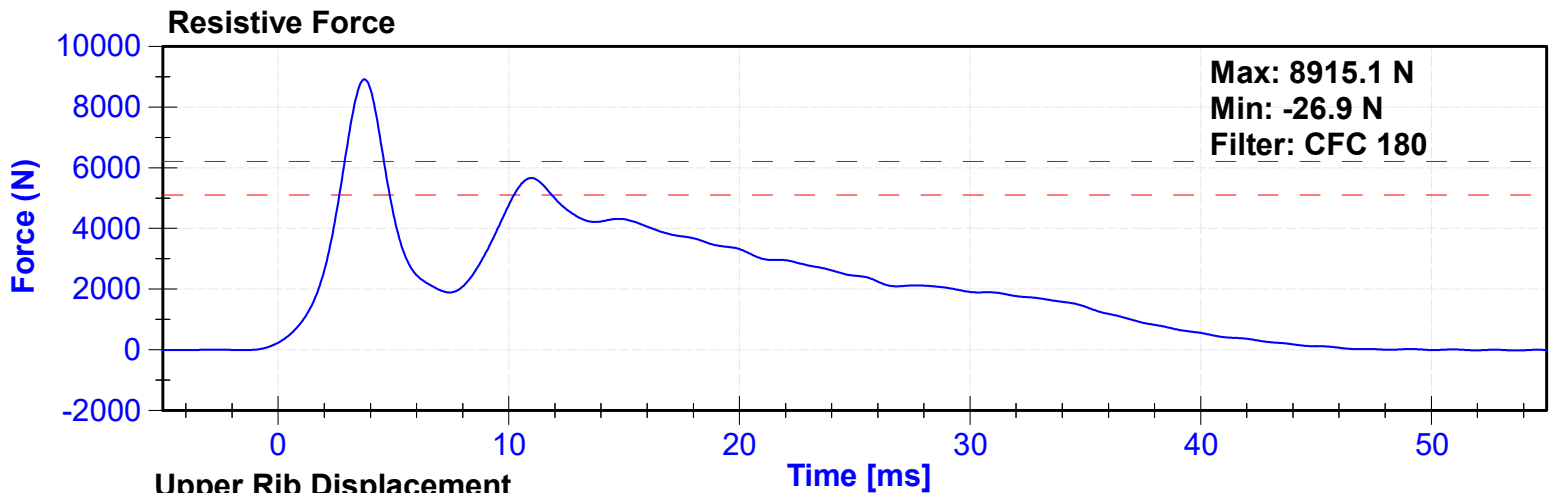
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	34	Pass
Velocity	5.4	5.6	m/s	5.52	Pass
Resistive Force after 6ms	5100	6200	N	5658.2	Pass
Upper Thorax Rib Deflection	34	41	mm	39.3	Pass
Mid Thorax Rib Deflection	37	45	mm	44.1	Pass
Lower Thorax Rib Deflection	37	44	mm	42.3	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18599	9/13/2024	3/12/2025
Upper Thorax Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025
Lower Thorax Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025

**Probe Acceleration**





ATD Manufacturer	Denton	Test Technician	K. Konieczny
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

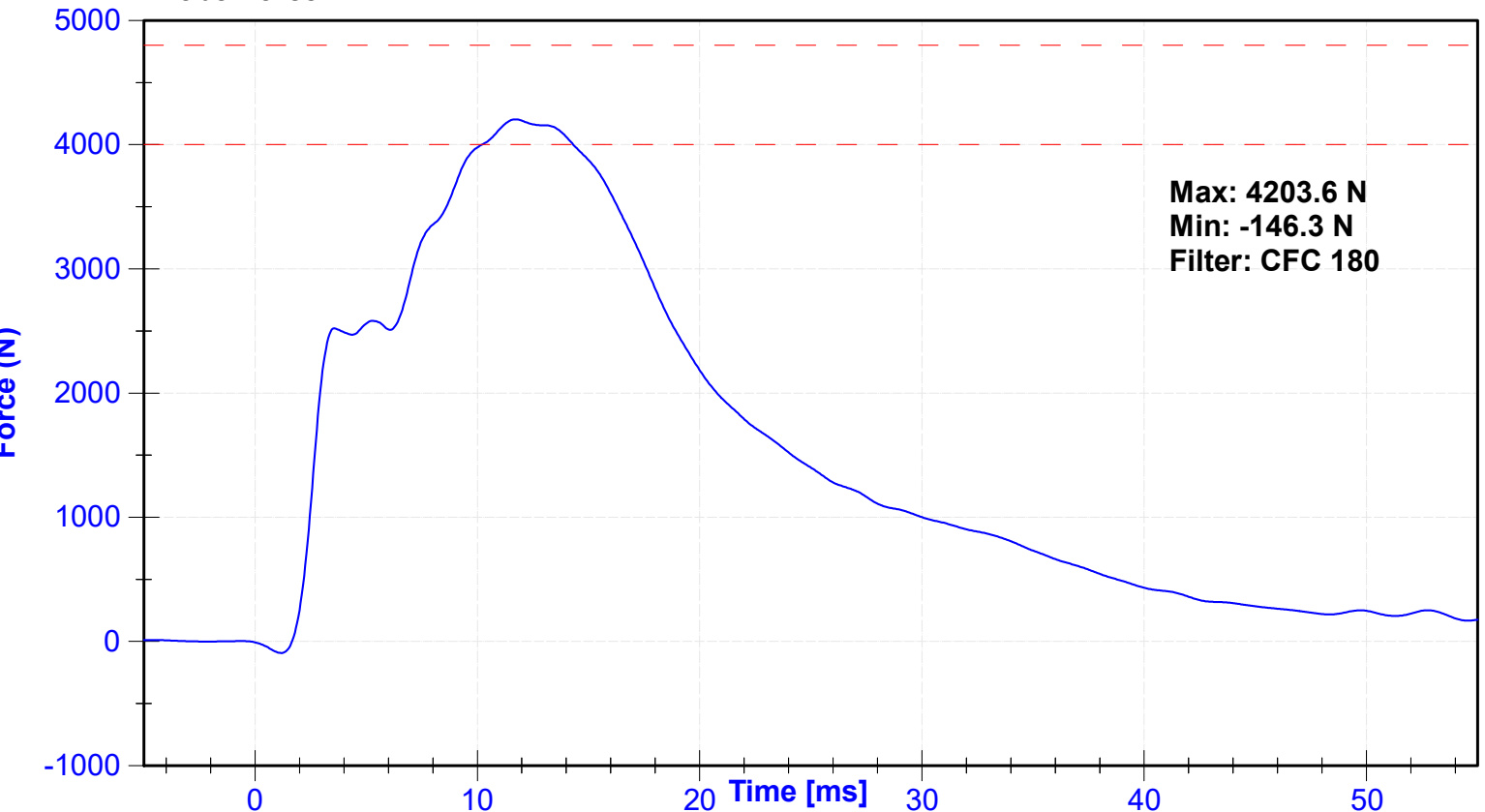
**Results**

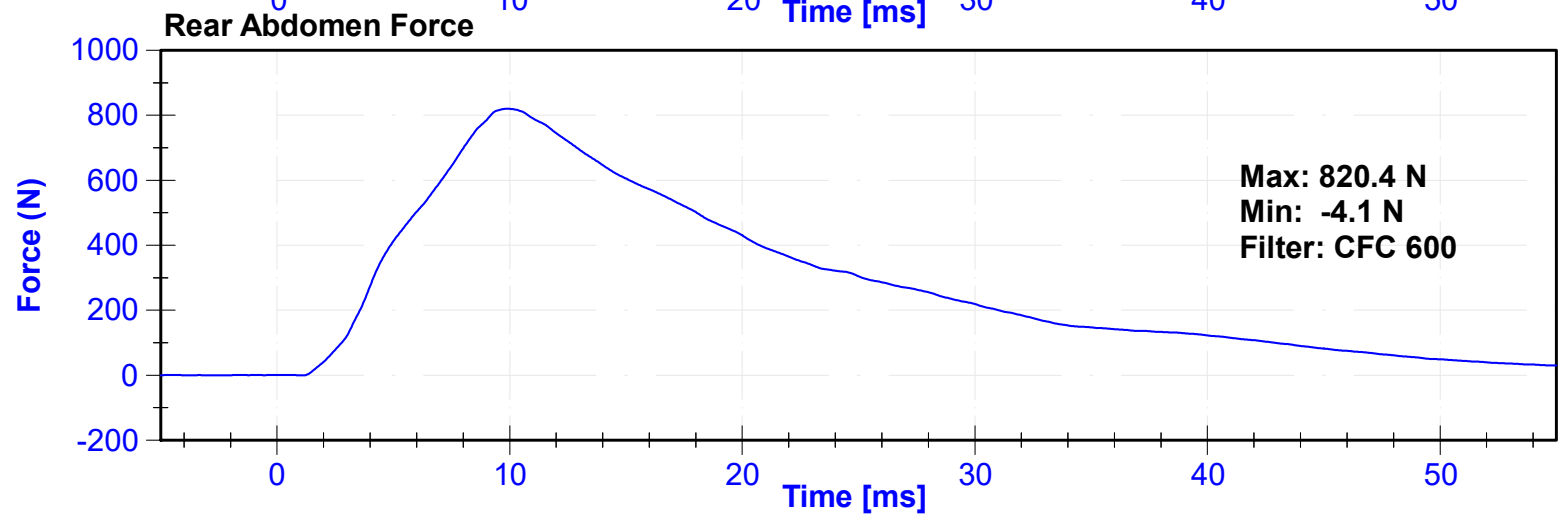
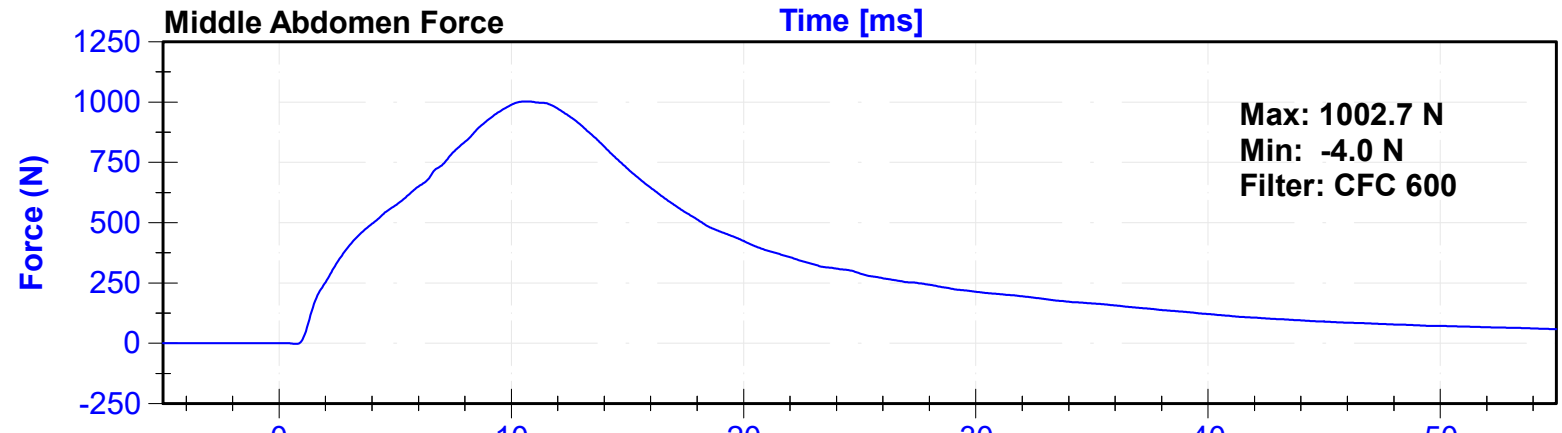
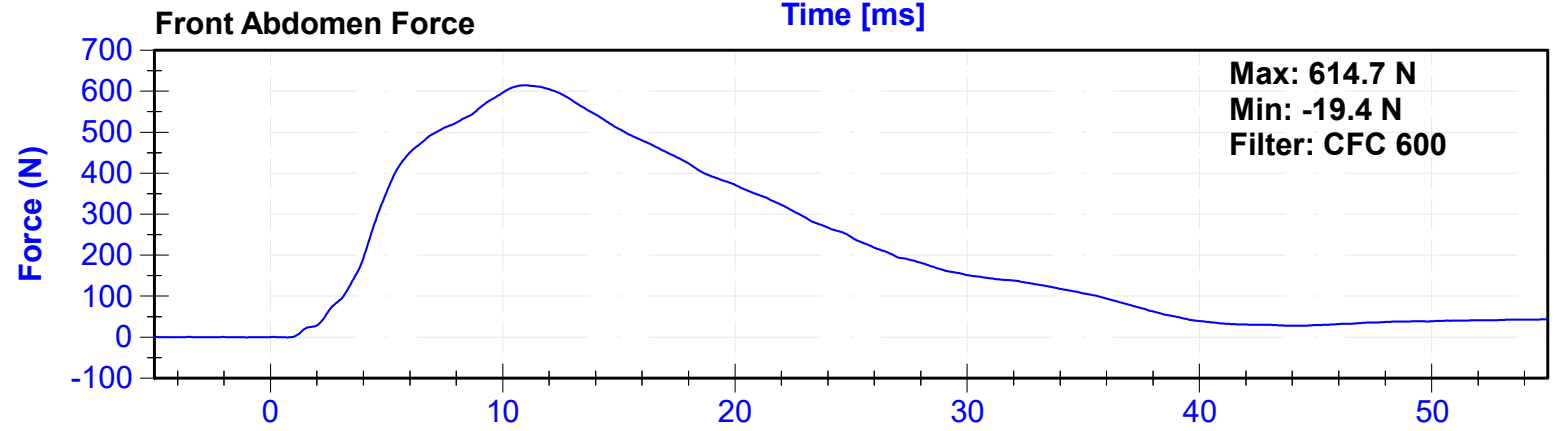
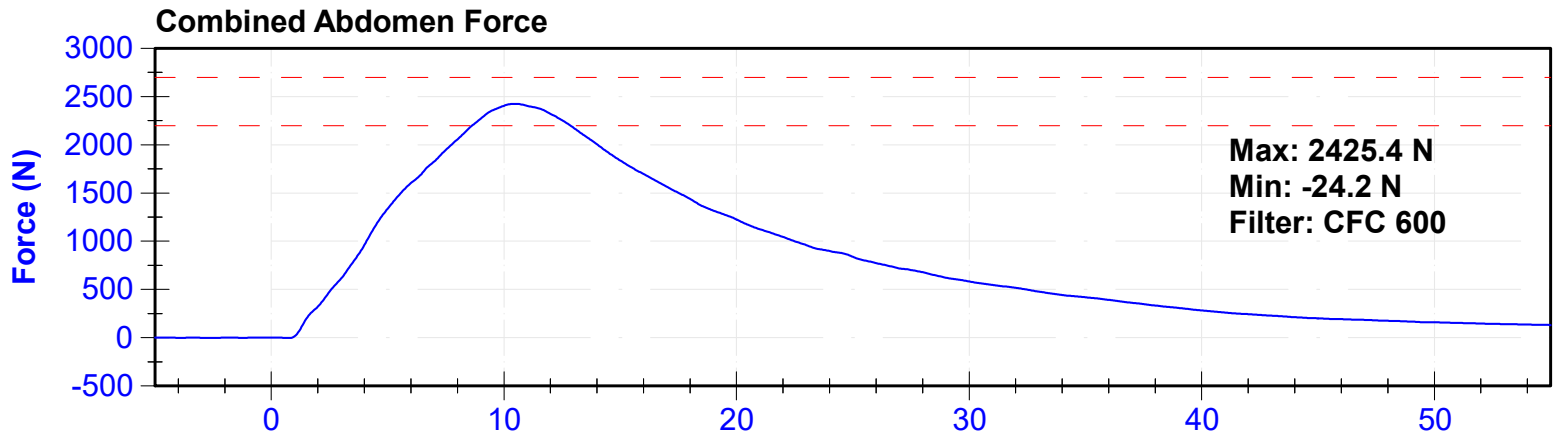
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	34	Pass
Velocity	3.9	4.1	m/s	4.02	Pass
Combined Abdomen Force	2200	2700	N	2425.4	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.45	Pass
Resistive Probe Force	4000	4800	N	4203.6	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.72	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18599	9/13/2024	3/12/2025
Front Abdomen Load Cell	Denton	1512	9/16/2024	9/16/2025
Middle Abdomen Load Cell	Denton	1526	9/16/2024	9/16/2025
Rear Abdomen Load Cell	Denton	1516	9/16/2024	9/16/2025

**Probe Force**





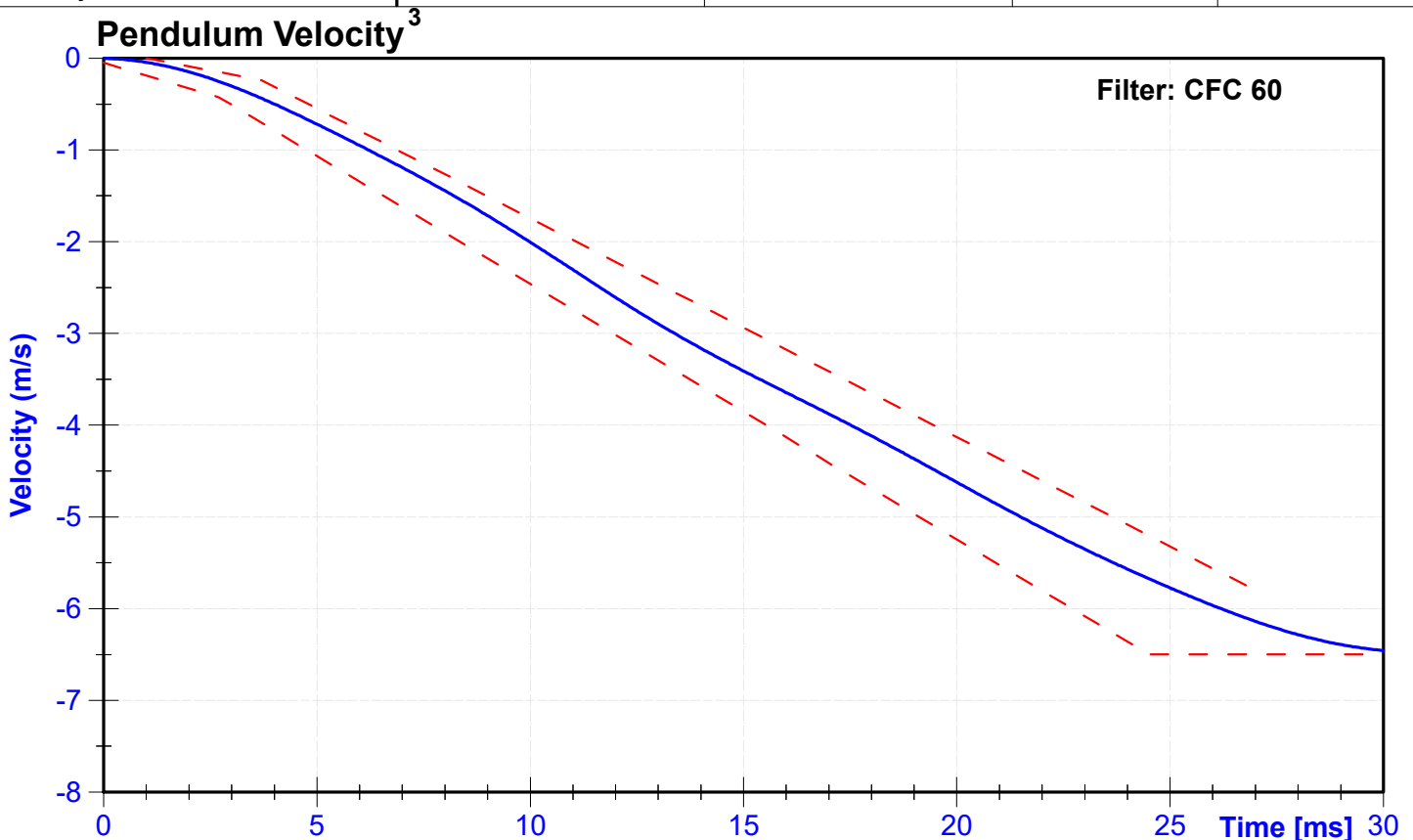
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

**Results**

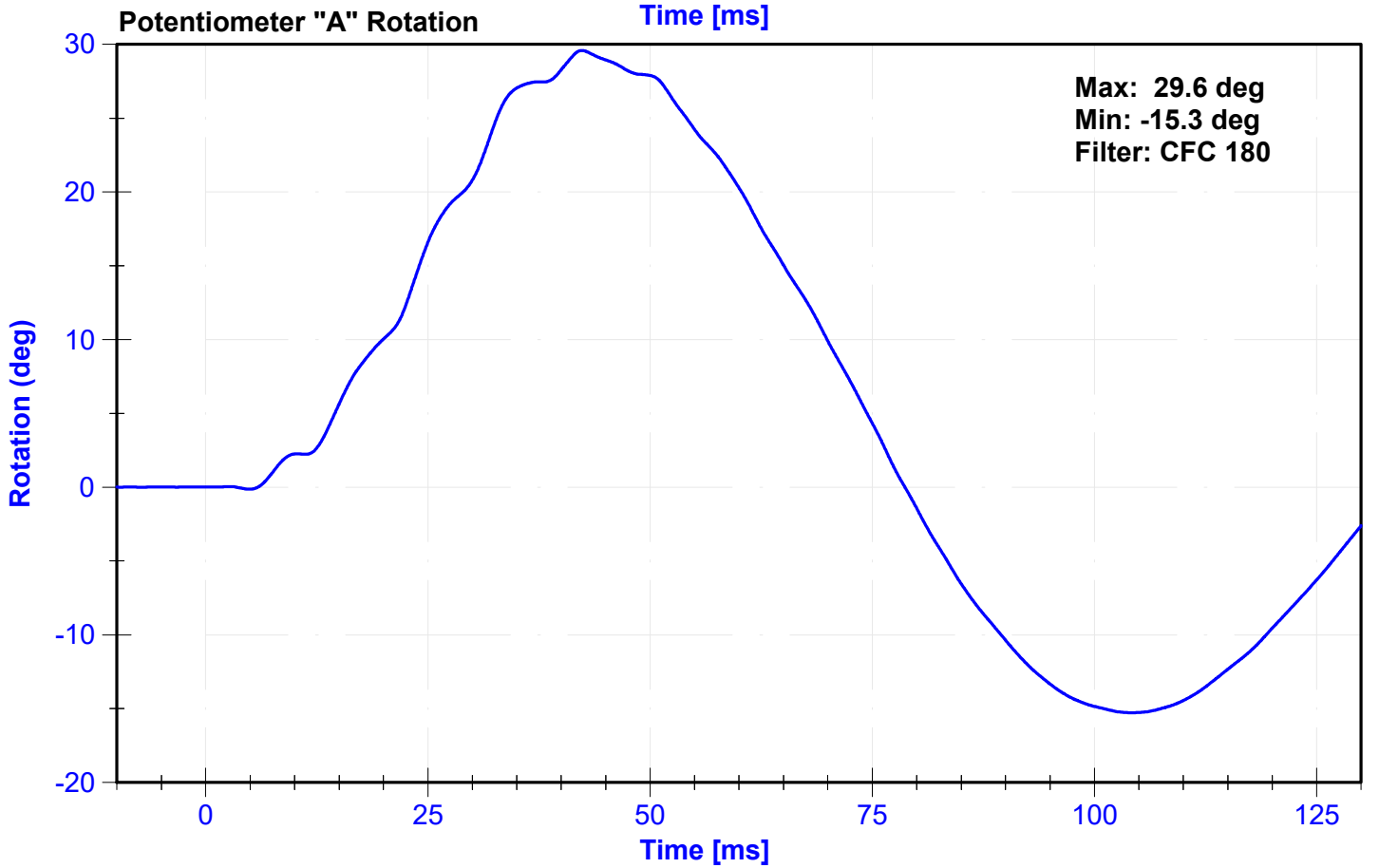
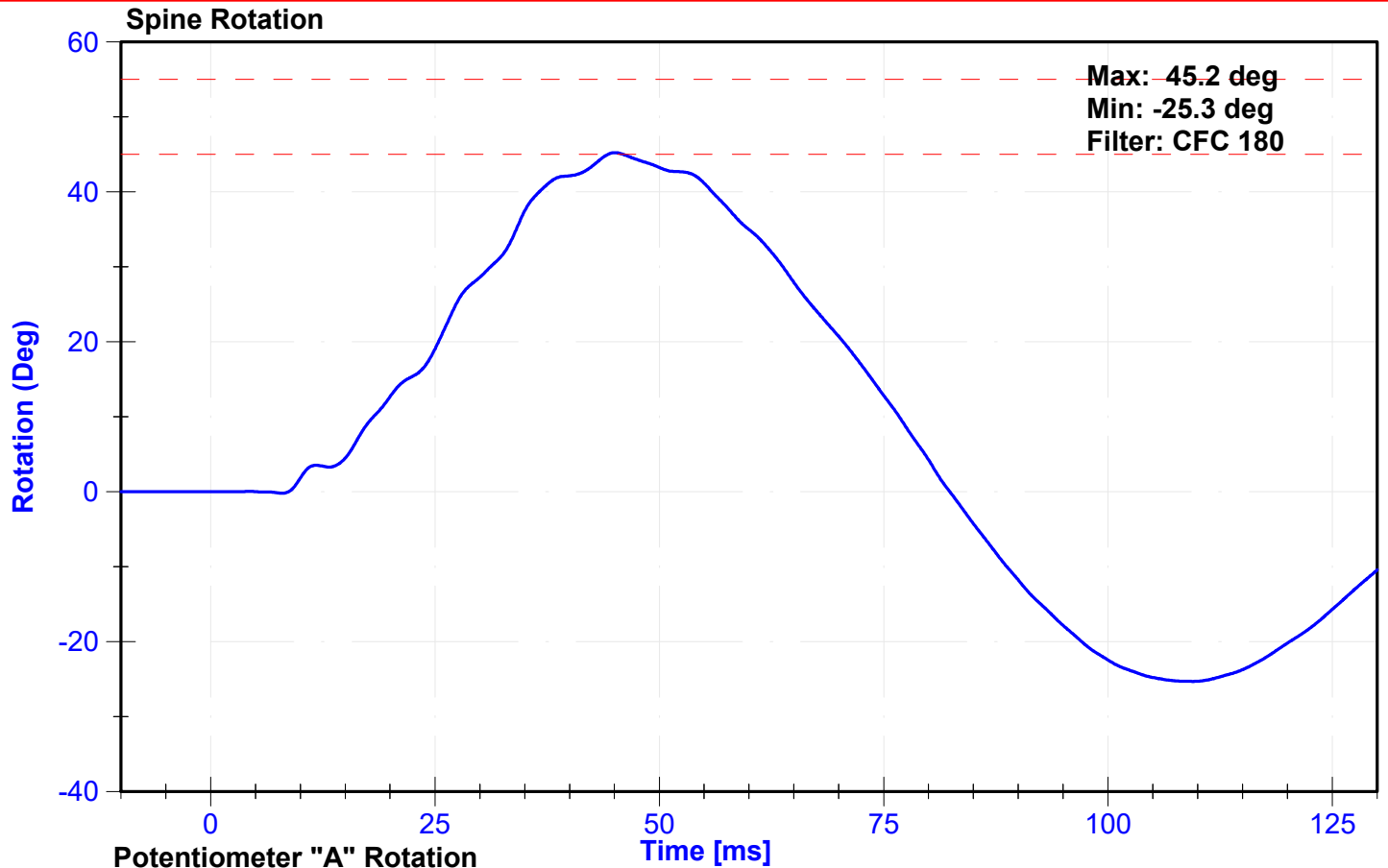
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	30	Pass
Velocity	5.95	6.15	m/s	6.094	Pass
Lateral Spine Rotation	45	55	deg	45.2	Pass
Time at Maximum Rotation	39	53	ms	45.1	Pass
Time of Decay to Zero Degrees	37	57	ms	37.3	Pass
Pendulum Velocity Overall Corridor	Lower Boundary <sup>1</sup>	Upper Boundary <sup>2</sup>	m/s	See Plot <sup>3</sup>	Pass

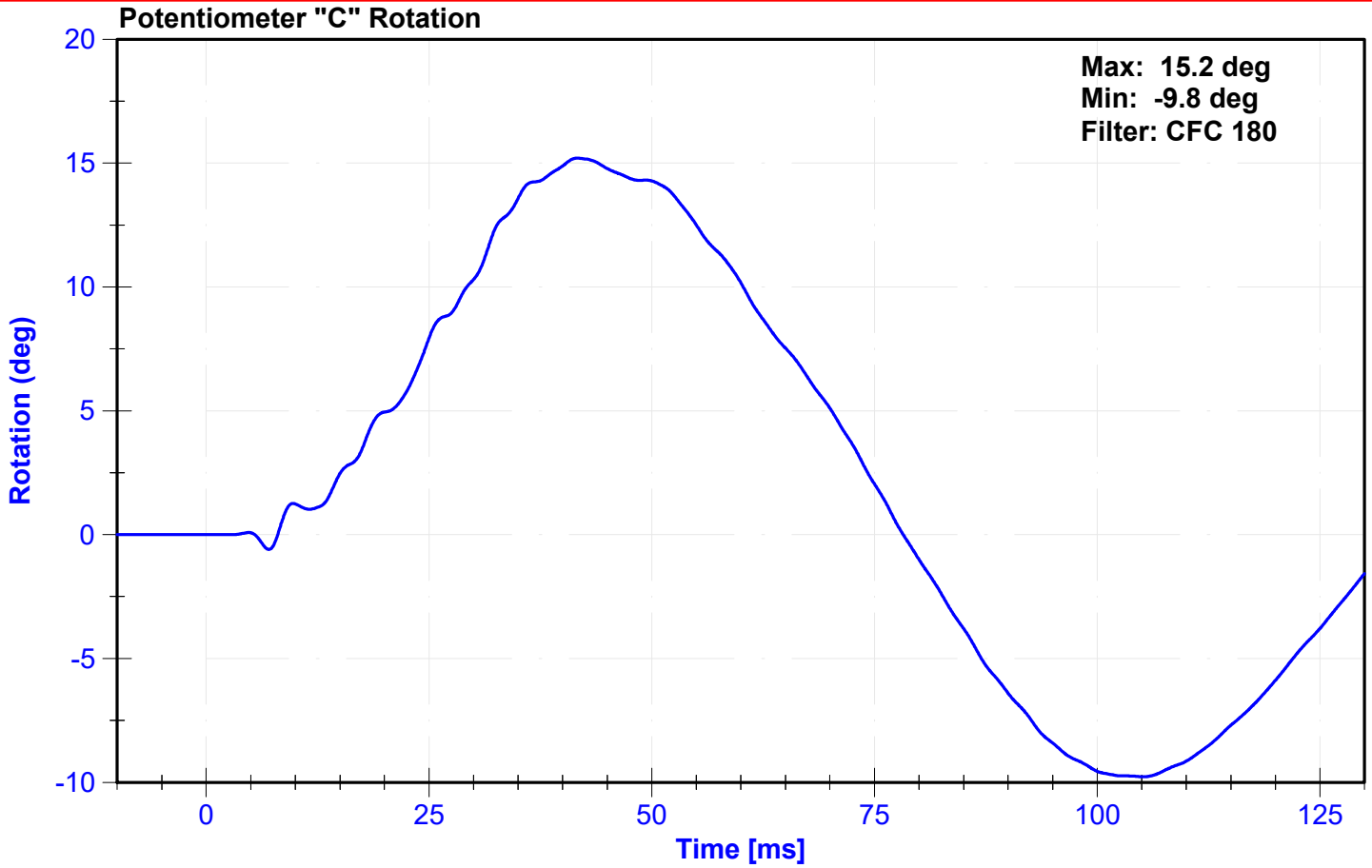
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	11/1/2024	11/1/2025
Pendulum "A" Potentiometer	Sfernice	2247	9/13/2024	9/13/2025
Condyle "B" Potentiometer	Sfernice	095	9/13/2024	9/13/2025



<sup>1,2</sup> Upper and lower boundaries specified in Appendix I





### Appendix I

<sup>2</sup> Upper Boundary Corridor		<sup>1</sup> 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

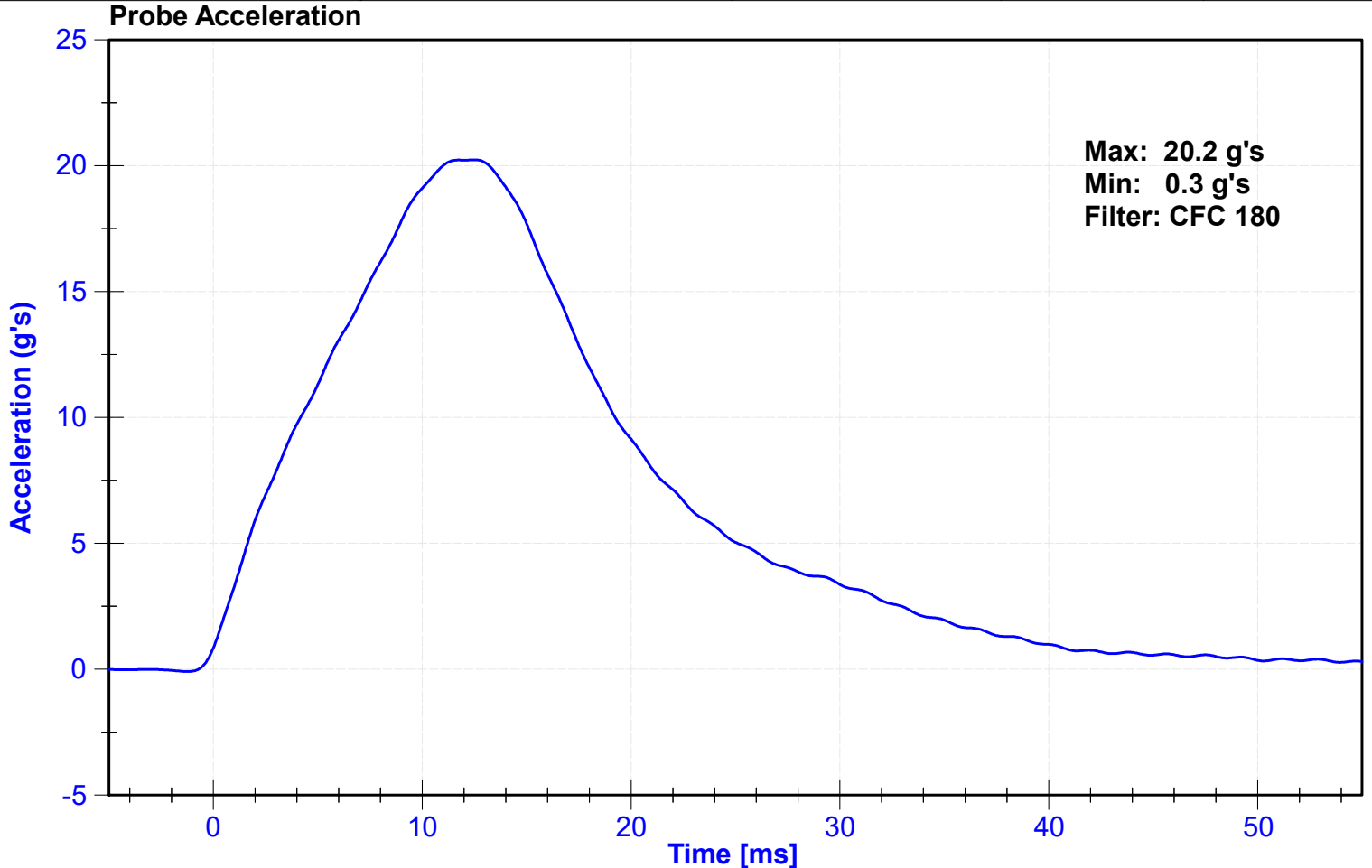
ATD Manufacturer	Denton	Test Technician	K. Konieczny
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

**Results**

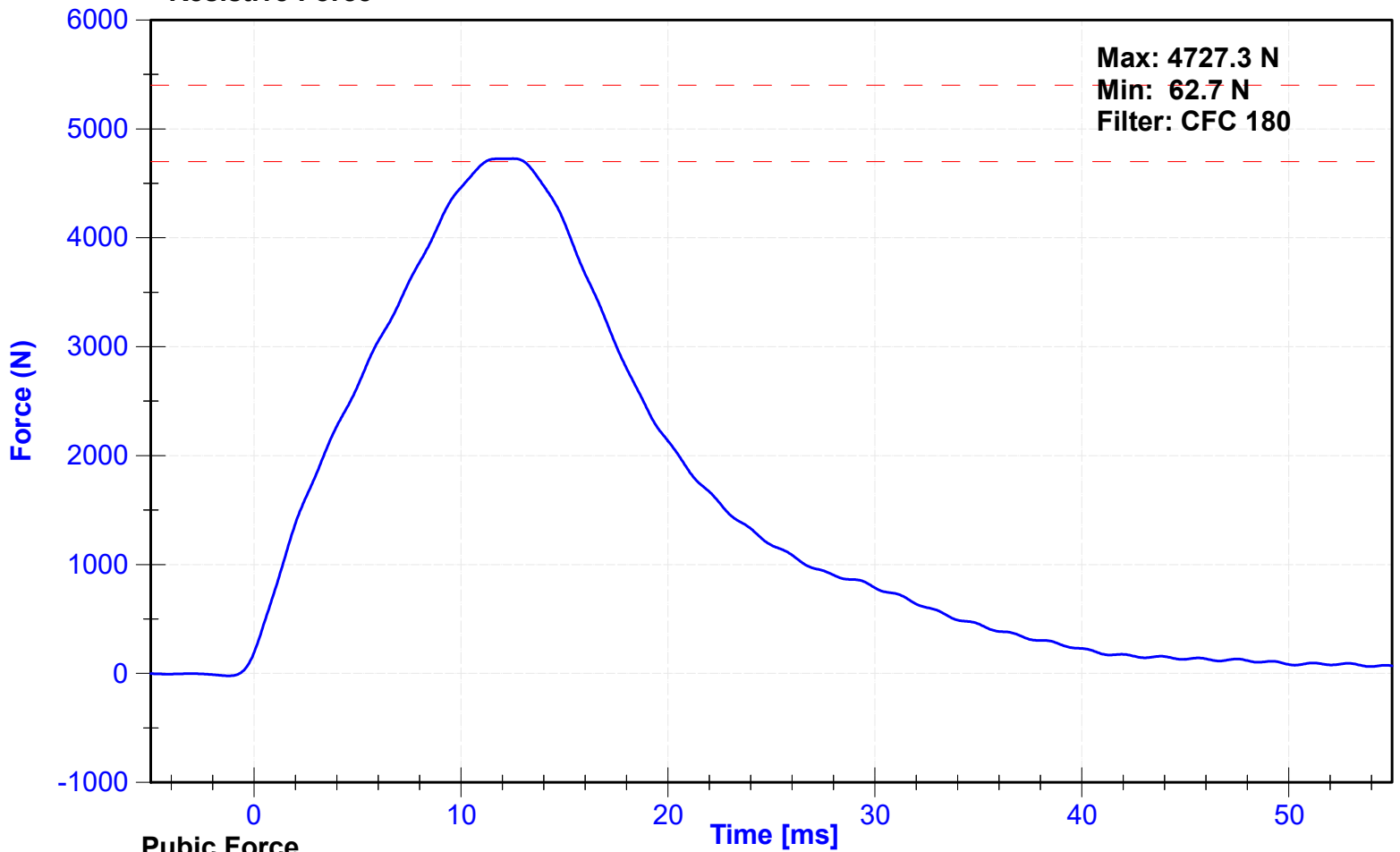
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	34	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Resistive Force	4700	5400	N	4727.3	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.50	Pass
Pubic Force	-1590	-1230	N	-1370.8	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.24	Pass

**Transducer Calibrations**

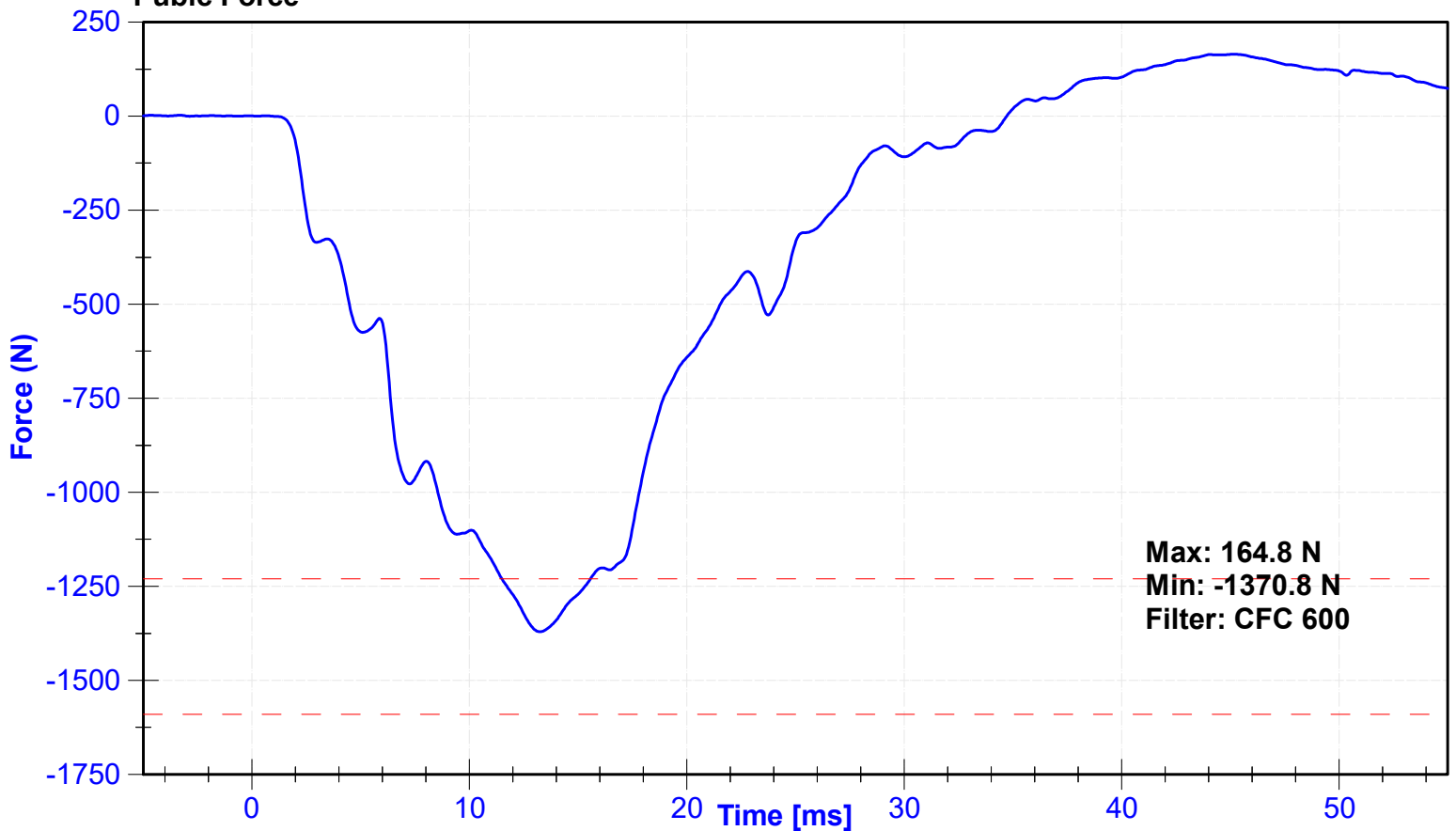
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18599	9/13/2024	3/12/2025
Pubic Load Cell	Denton	464-FY	9/16/2024	9/16/2025



### Resistive Force



### Pubic Force



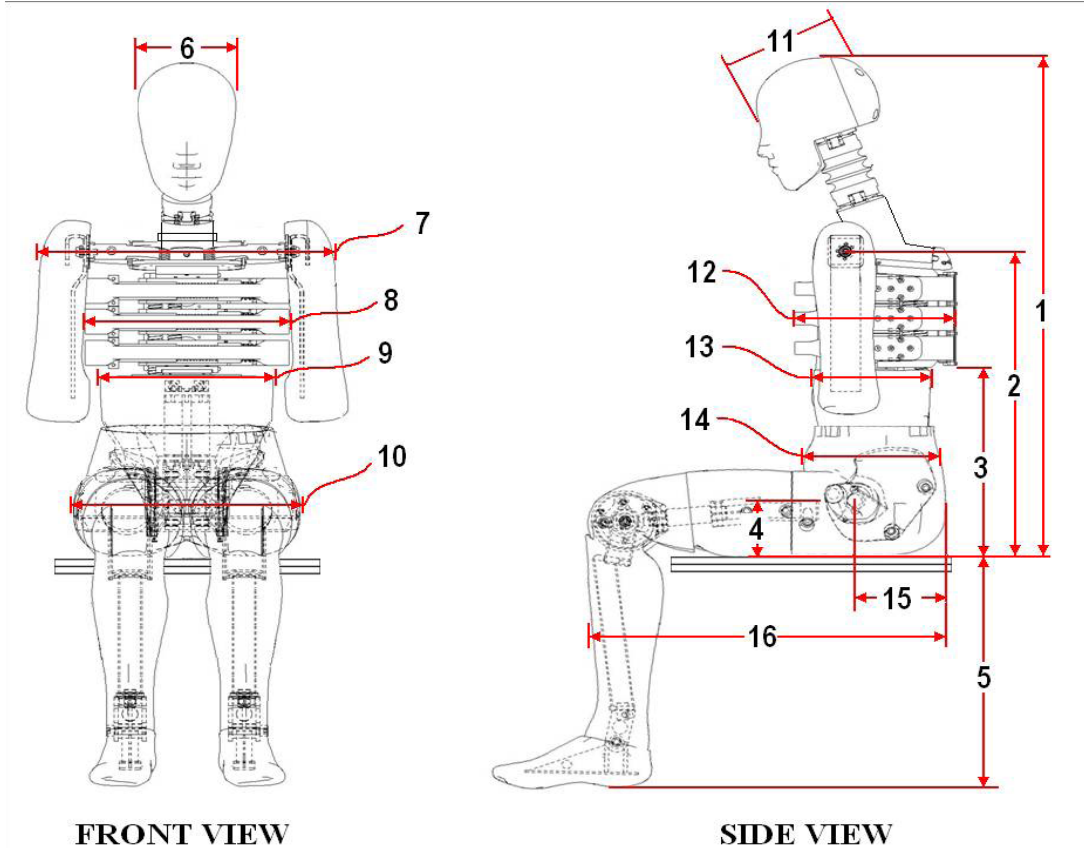
**POST-TEST  
ES-2re PERFORMANCE CALIBRATION TEST DATA**

External Measurements - EuroSID-2re

Technician: J. Rios

Date: 12/03/2024

Dummy Serial Number: D037



Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	907	Pass
2	Seat to Shoulder Joint	558	572	562	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	353	Pass
4	Seat to Hip Joint (center of bolt)	97	103	101	Pass
5	Sole to Seat, Sitting	333	451	434	Pass
6	Head Width	152	158	153	Pass
7	Shoulder/Arm Width	461	479	468	Pass
8	Thorax Width	322	332	330	Pass
9	Abdomen Width	273	287	282	Pass
10	Pelvis Lap Width	359	373	362	Pass
11	Head Depth	196	206	199	Pass
12	Thorax Depth	262	272	270	Pass
13	Abdomen Depth	194	204	197	Pass
14	Pelvis Depth	235	245	239	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	155	Pass
16	Back of Buttocks to Front Knee	597	615	604	Pass

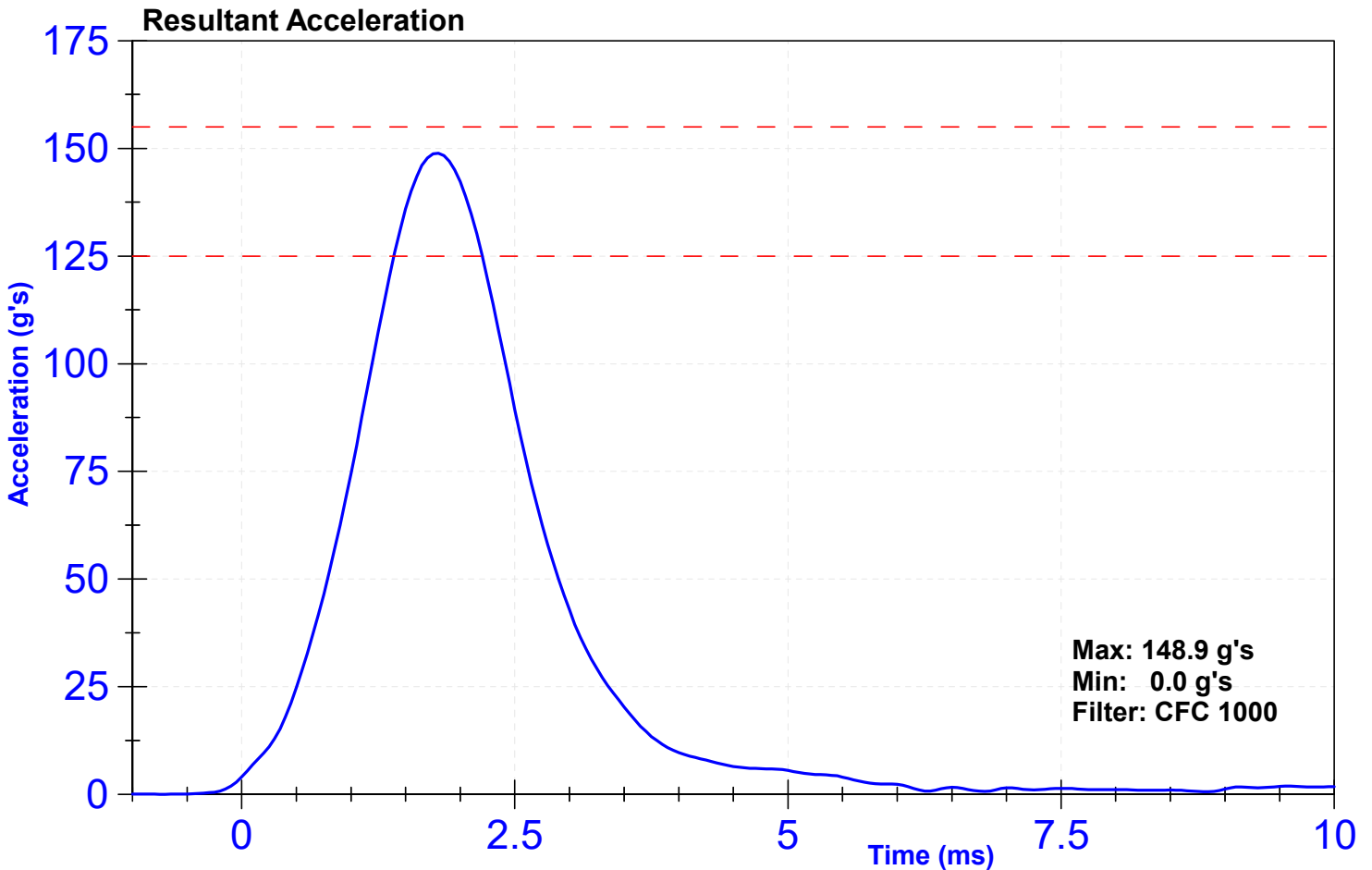
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

**Results**

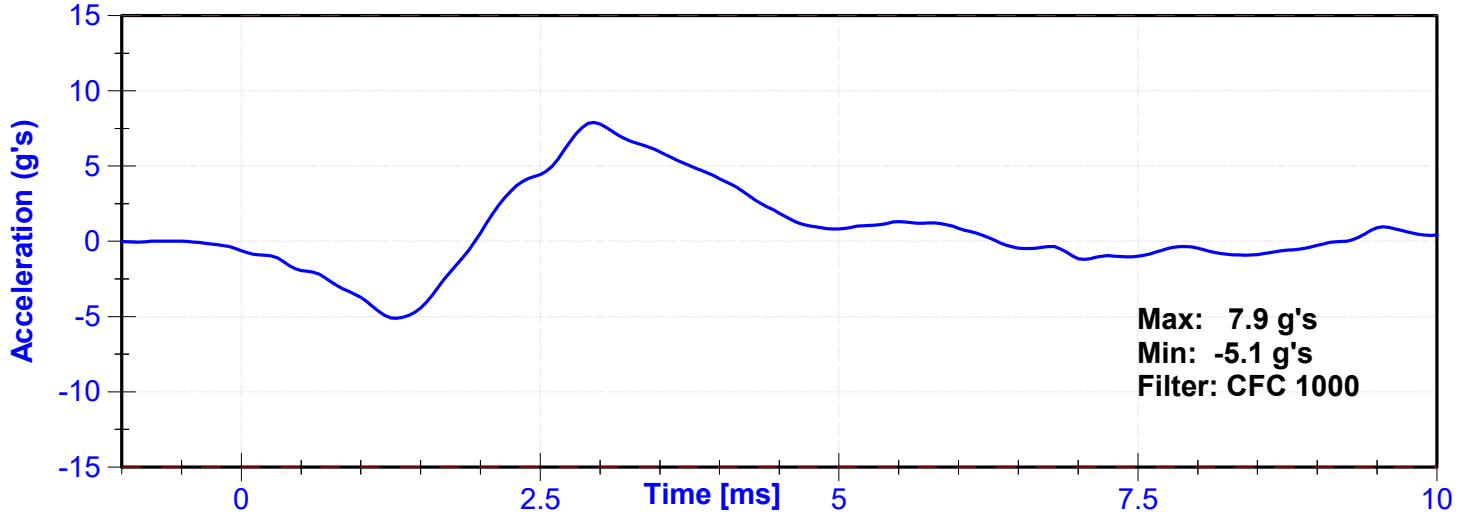
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	25	Pass
Resultant Acceleration	125	155	g's	148.9	Pass
Oscillation	0	15	%	1.61	Pass
Fore-Aft Acceleration	-15	15	g's	7.9	Pass

**Transducer Calibrations**

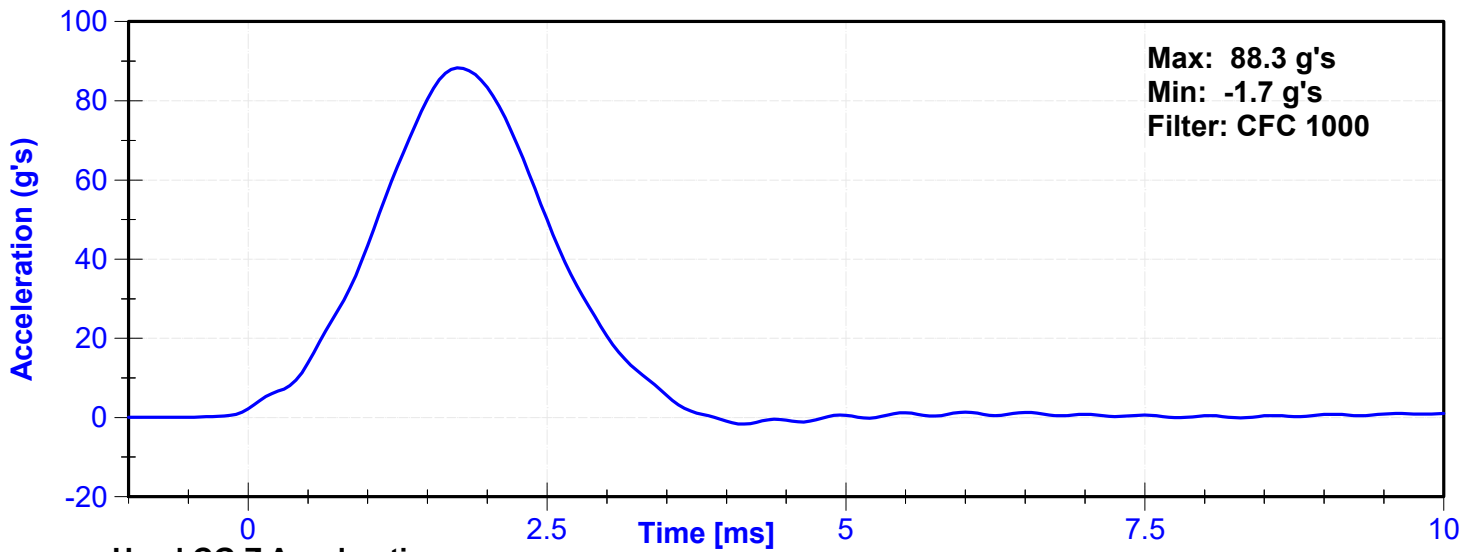
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	T21724	10/8/2024	4/6/2025
Y Accelerometer	Endevco	T22281	10/8/2024	4/6/2025
Z Accelerometer	Endevco	T26050	10/8/2024	4/6/2025



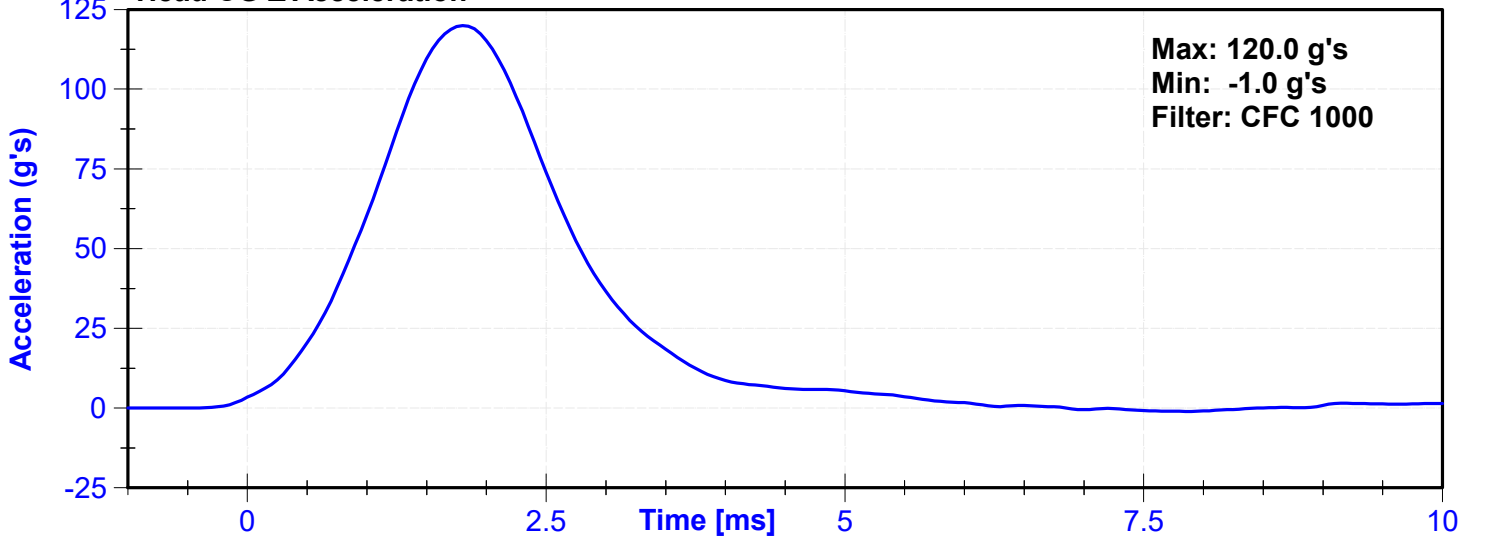
Head CG X Acceleration



Head CG Y Acceleration



Head CG Z Acceleration



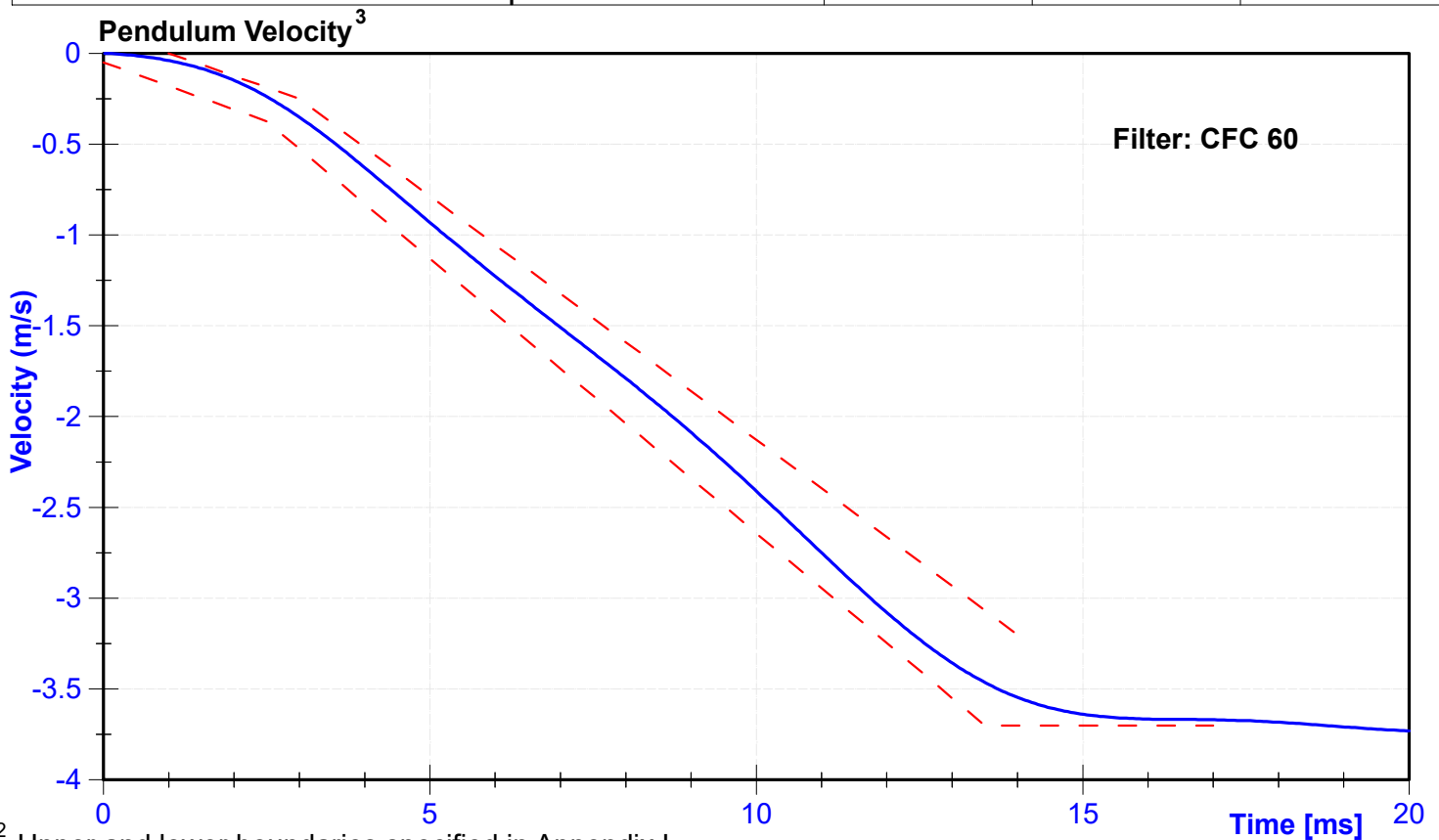
ATD Manufacturer	Humanetics	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

**Results**

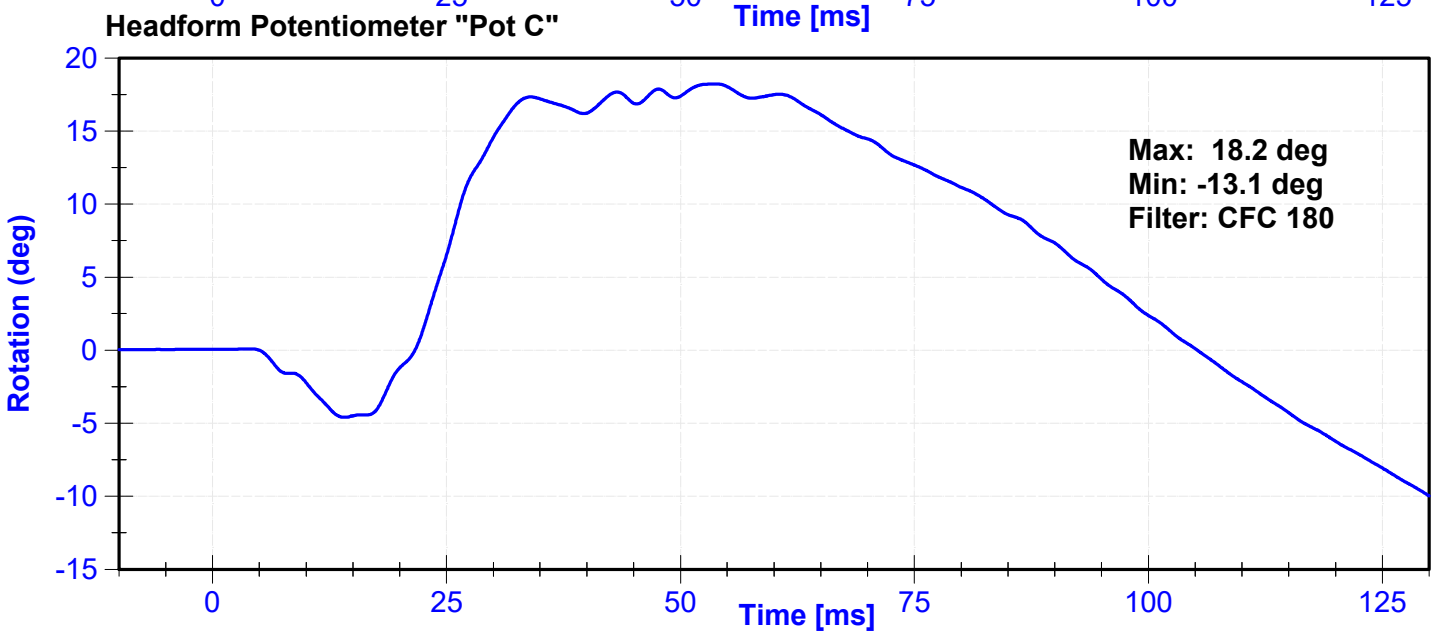
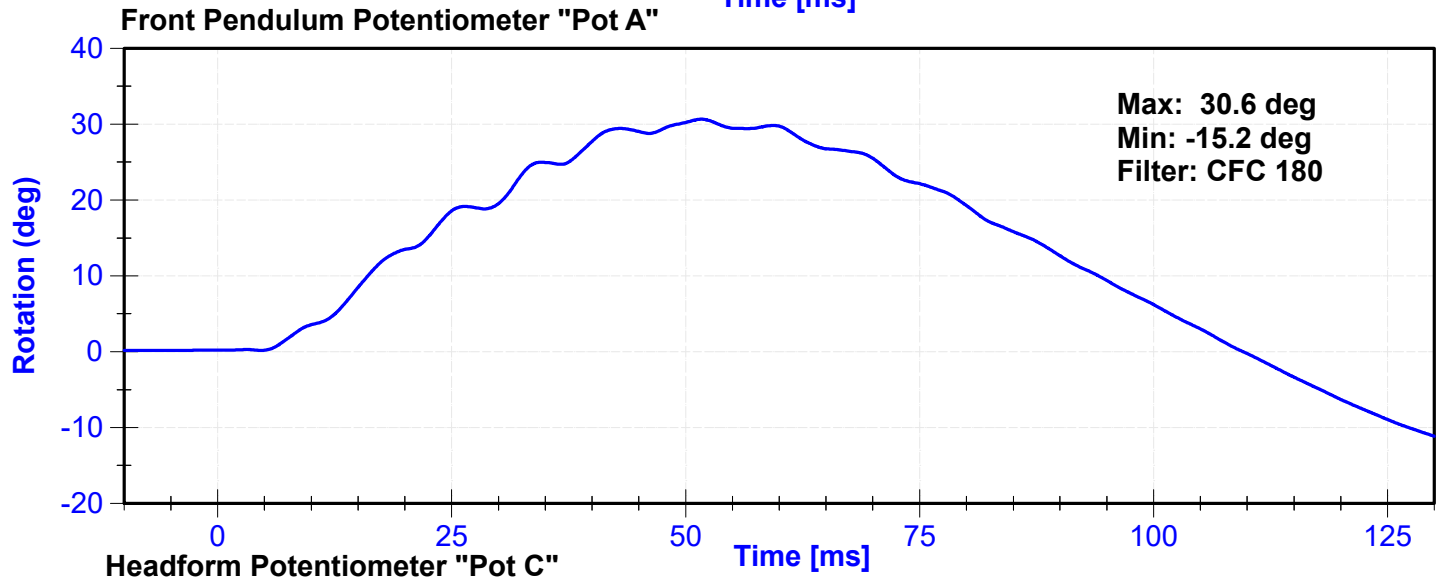
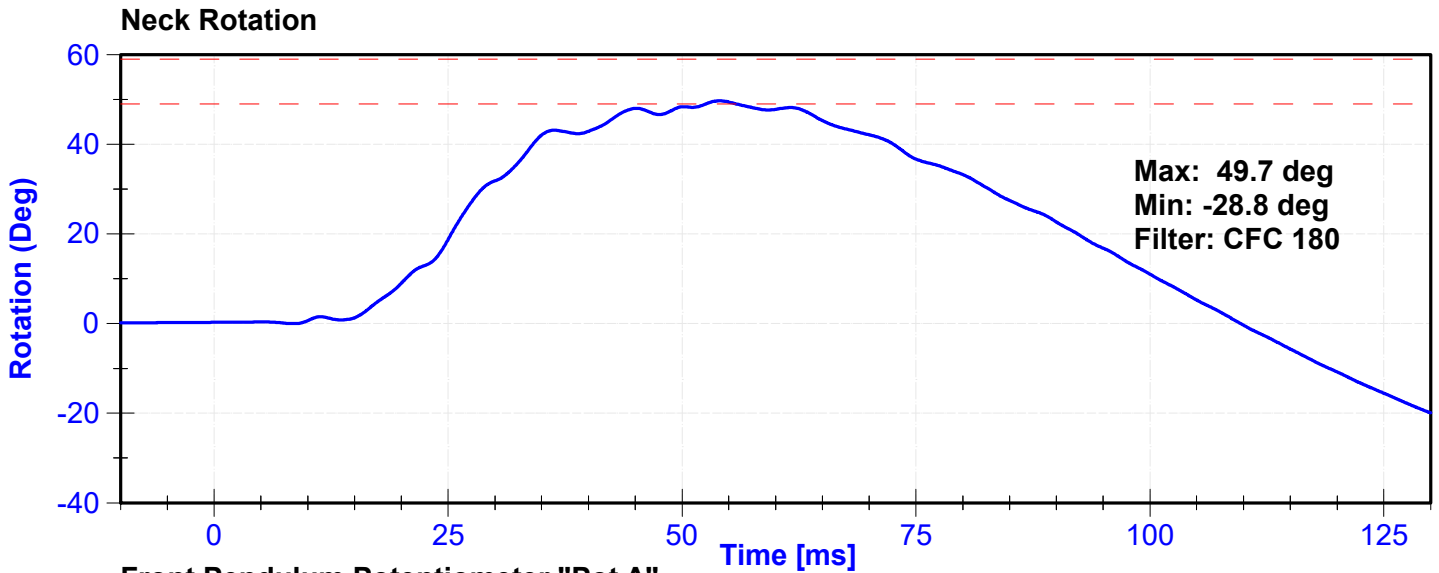
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	25	Pass
Velocity	3.3	3.5	m/s	3.47	Pass
Lateral Neck Rotation	49	59	deg	49.7	Pass
Time at Maximum Rotation	54	66	ms	54.1	Pass
Time of Rotation Decay from Maximum	53	88	ms	55.7	Pass
Pendulum Velocity Overall Corridor	Lower Boundary <sup>1</sup>	Upper Boundary <sup>2</sup>	m/s	See Plot <sup>3</sup>	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	11/1/2024	11/1/2025
Front Pendulum Potentiometer	Sfernice	2247	9/13/2024	9/13/2025
Headform Potentiometer	Sfernice	095	9/13/2024	9/13/2025



<sup>1,2</sup> Upper and lower boundaries specified in Appendix I



## Appendix I

<sup>2</sup> Upper Boundary Corridor		<sup>1</sup> 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

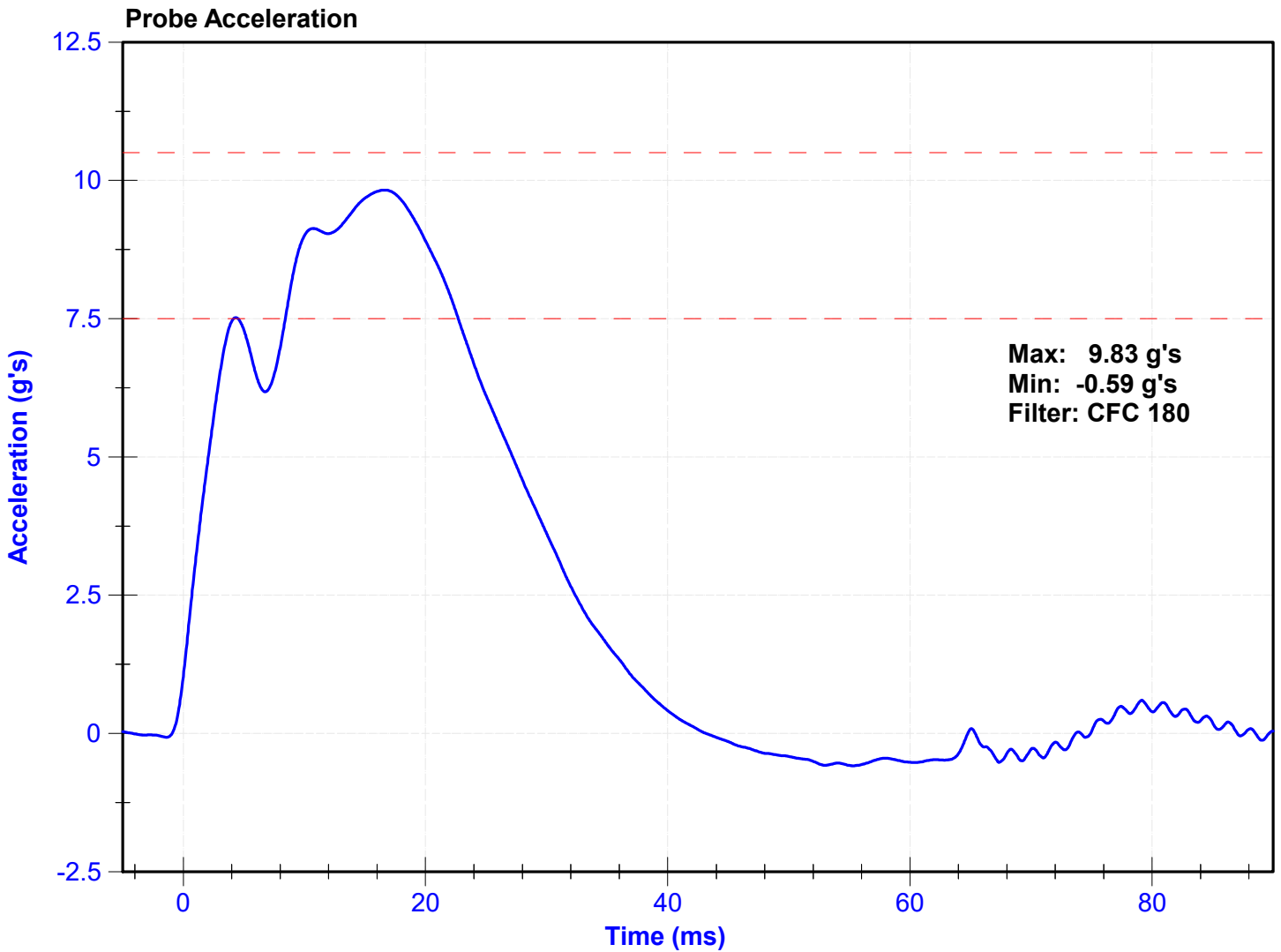
ATD Manufacturer	Denton	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	28	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	7.5	10.5	g's	9.83	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18566	11/26/2024	5/25/2025



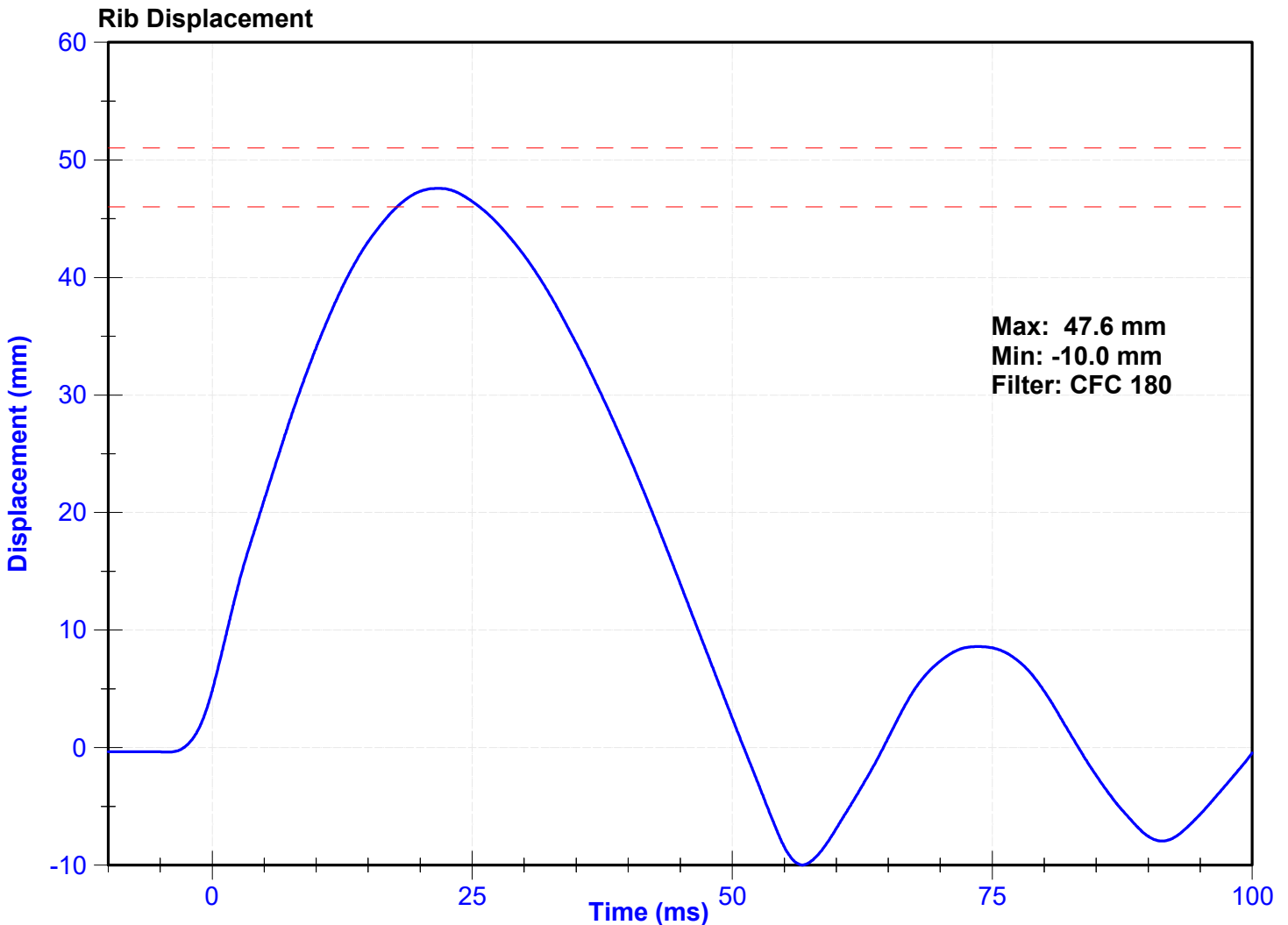
ATD Manufacturer	Denton	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	22	Pass
Rib Displacement	46	51	mm	47.6	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025



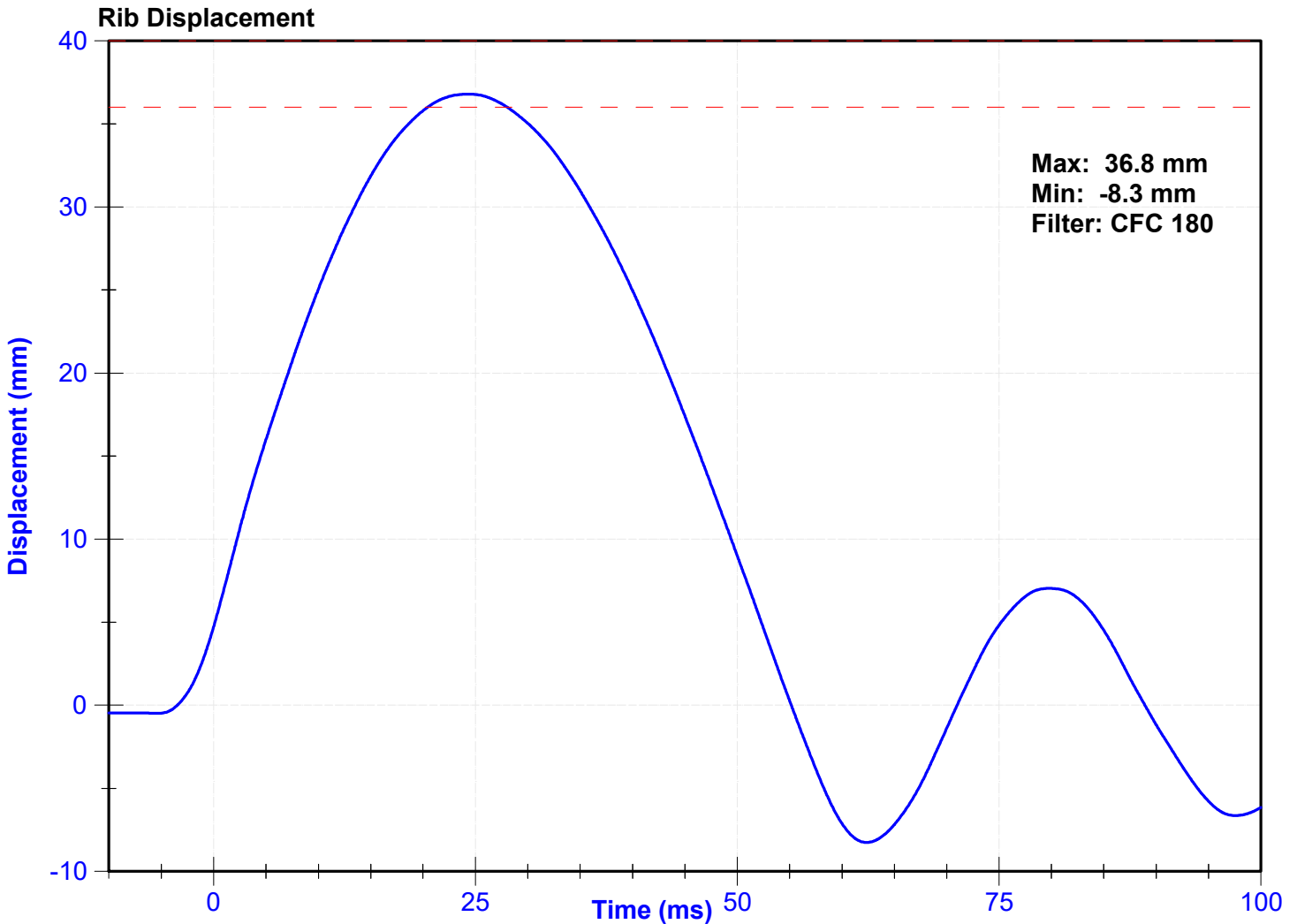
ATD Manufacturer	Denton	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	22	Pass
Rib Displacement	36	40	mm	36.8	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025



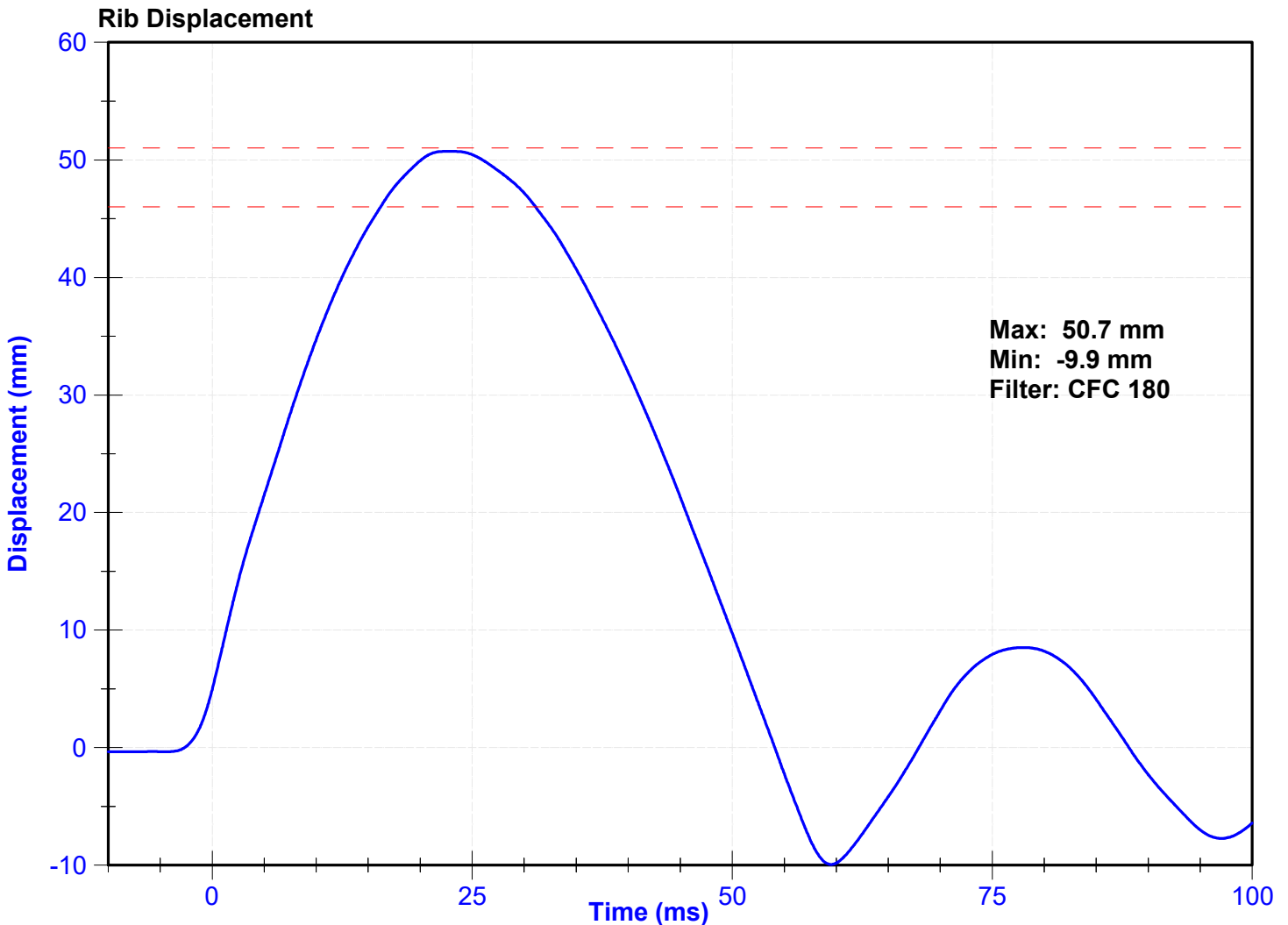
ATD Manufacturer	Denton	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	22	Pass
Rib Displacement	46	51	mm	50.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025



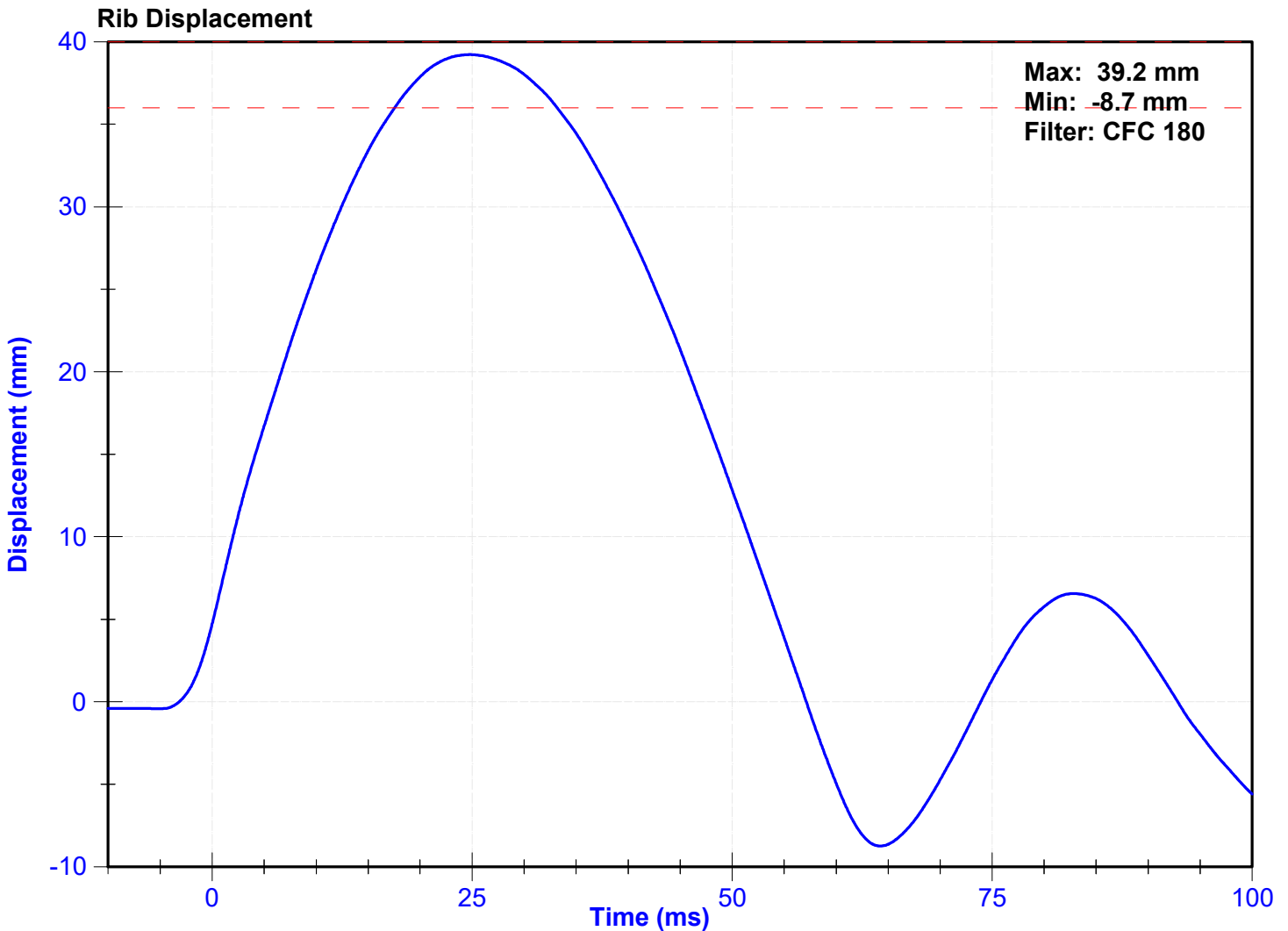
ATD Manufacturer	Denton	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	22	Pass
Rib Displacement	36	40	mm	39.2	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025



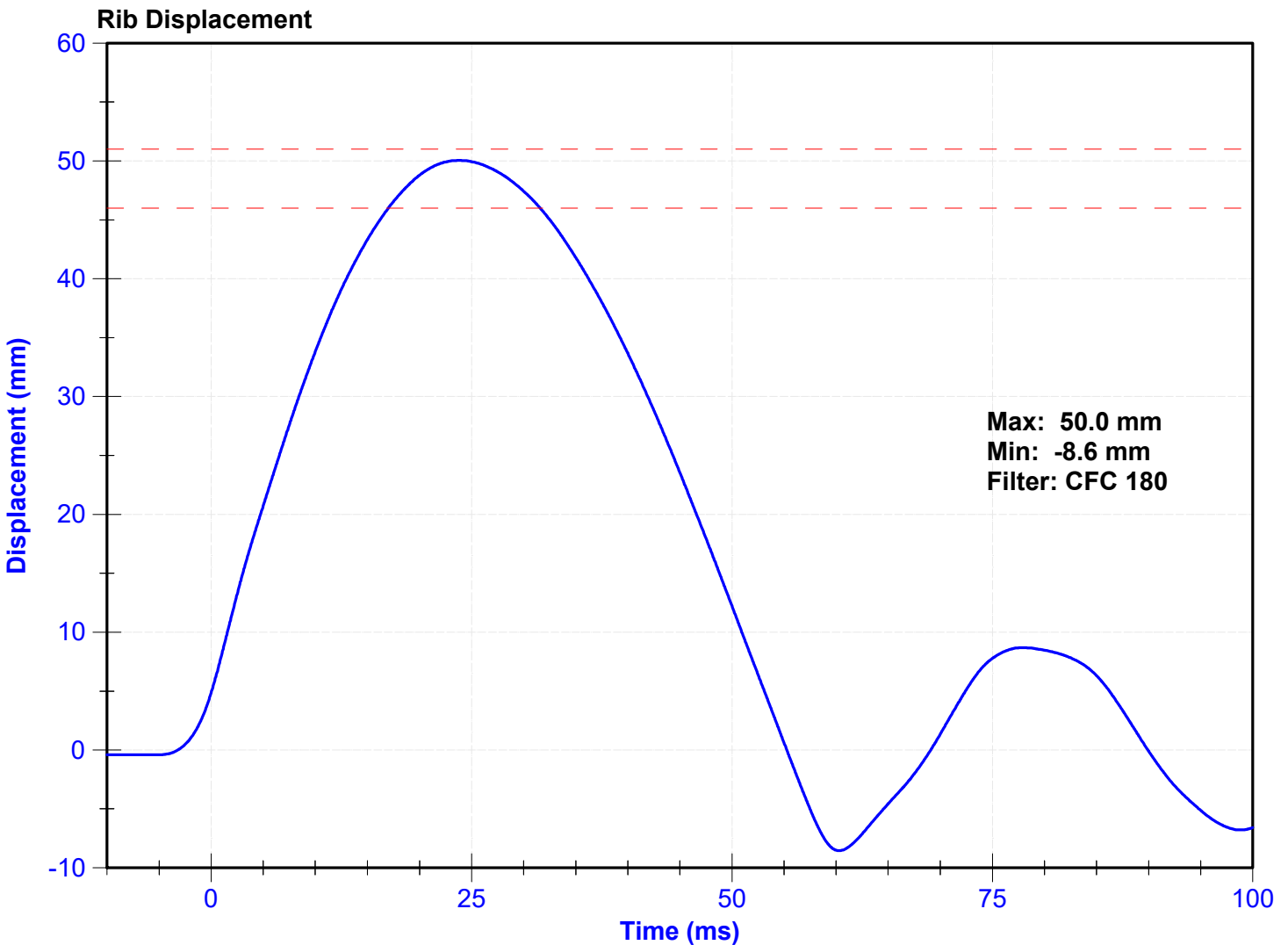
ATD Manufacturer	Denton	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	22	Pass
Rib Displacement	46	51	mm	50.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025



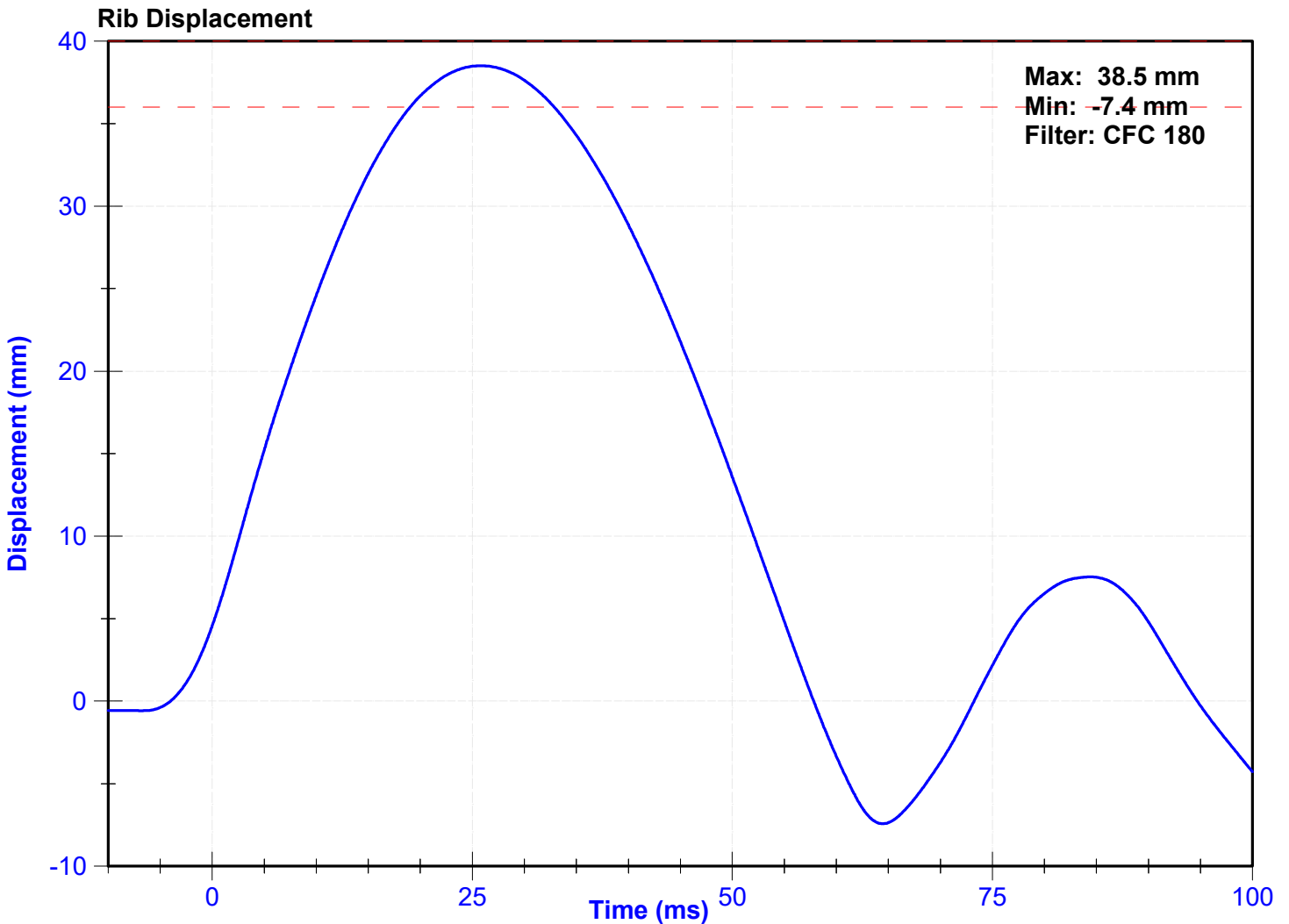
ATD Manufacturer	Denton	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	22	Pass
Rib Displacement	36	40	mm	38.5	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025



ATD Manufacturer	Denton	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

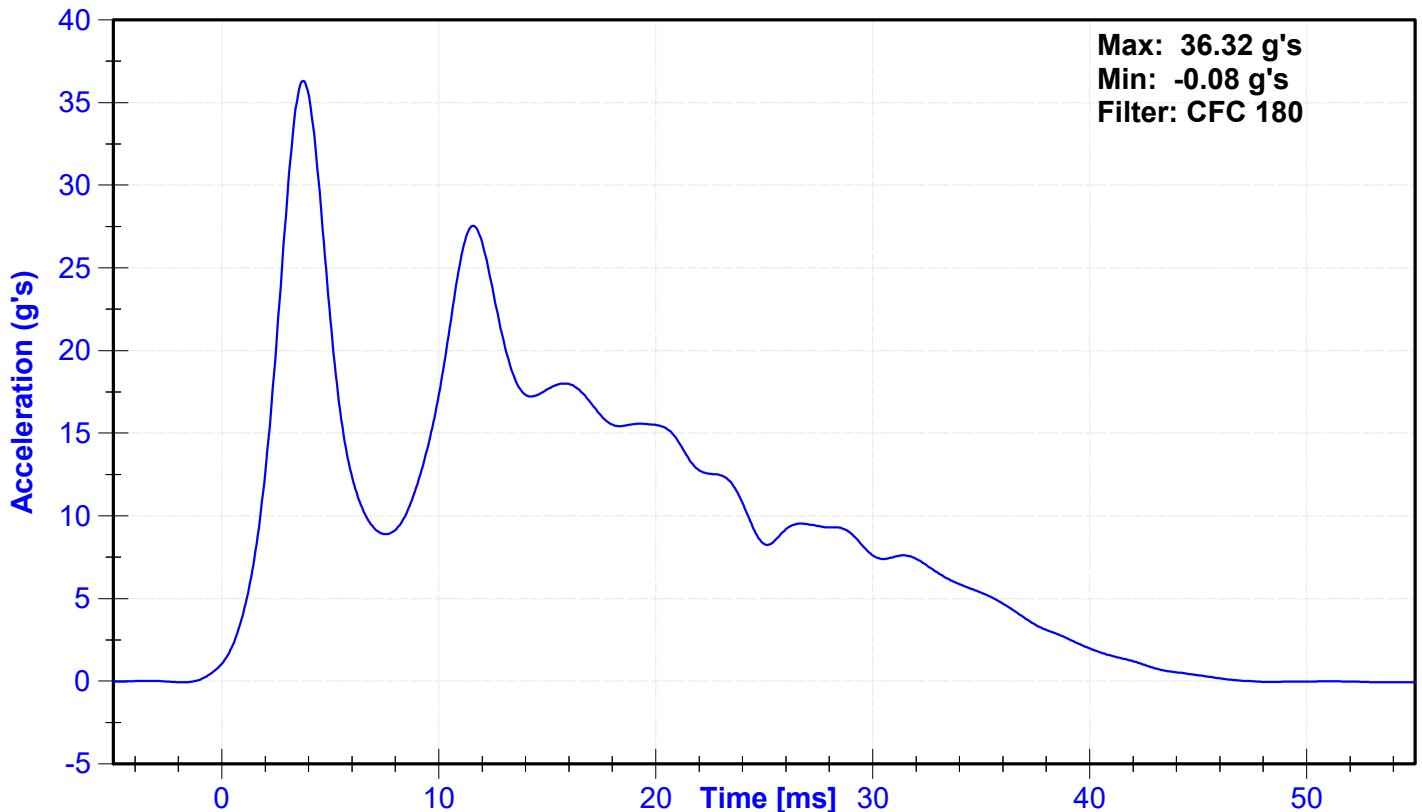
**Results**

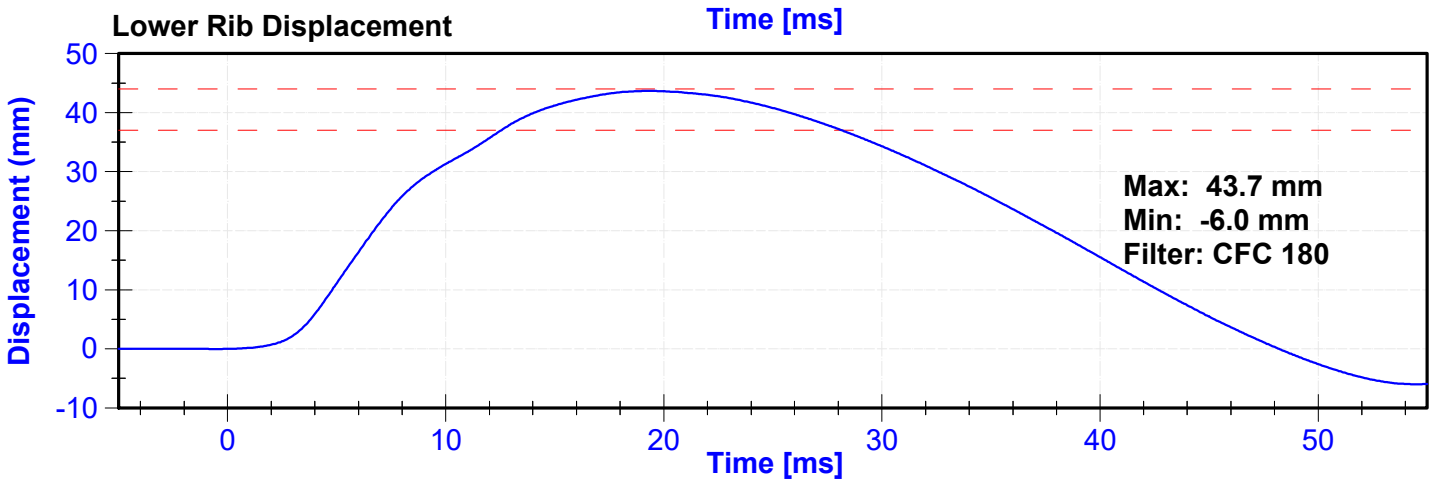
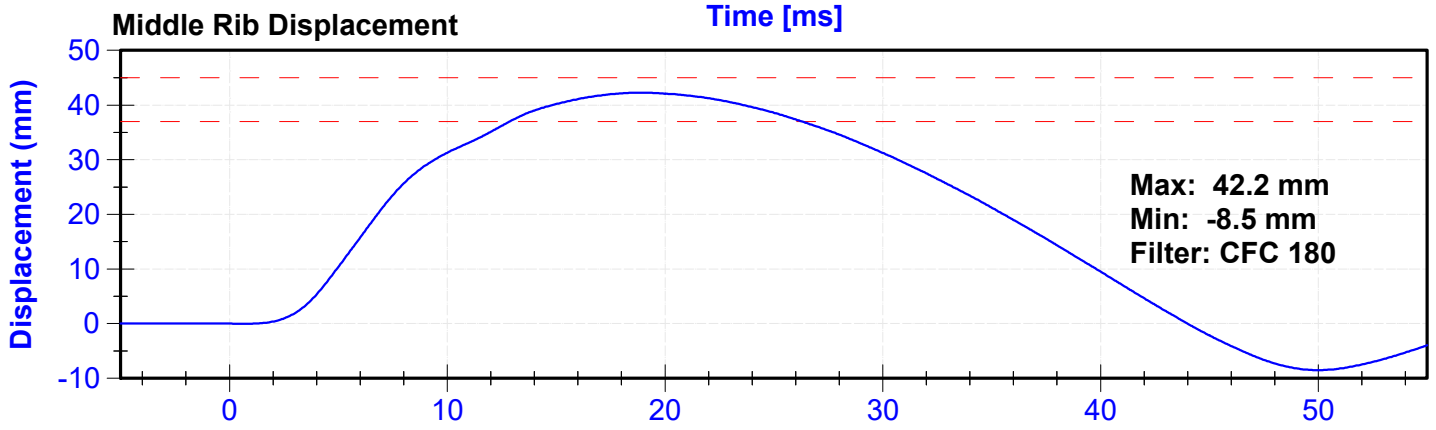
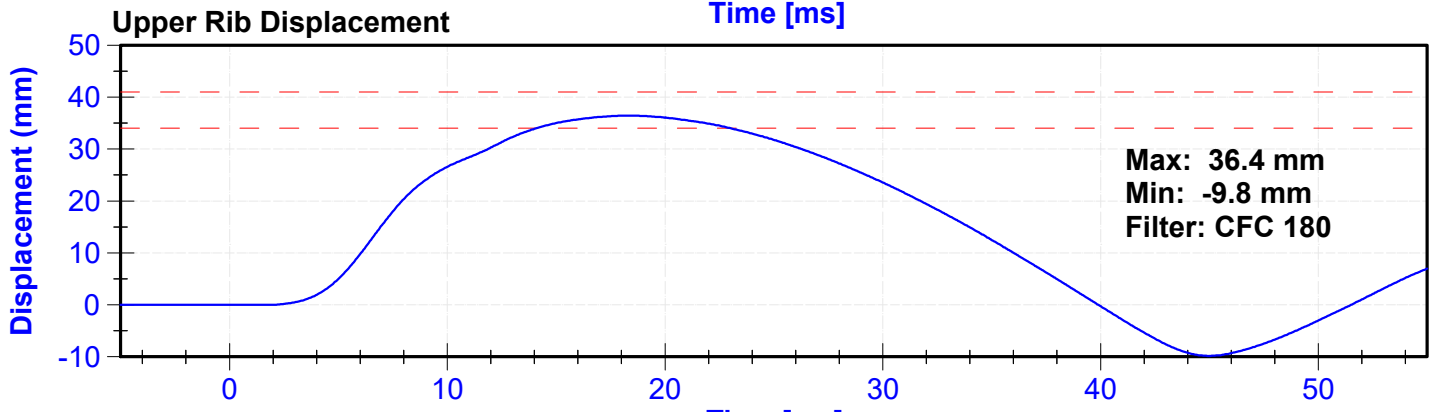
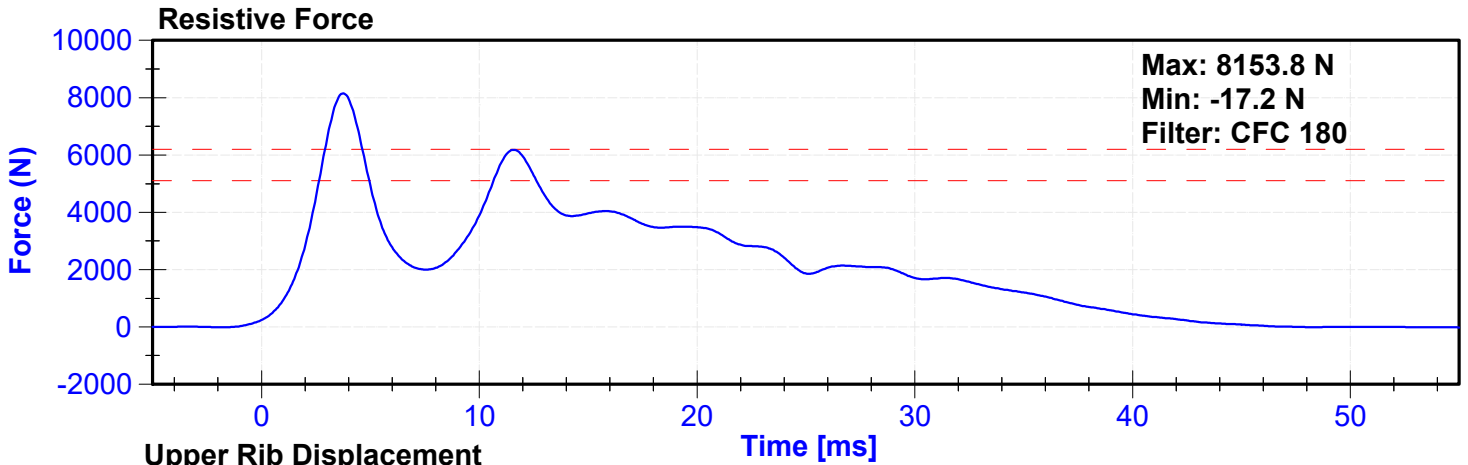
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	28	Pass
Velocity	5.4	5.6	m/s	5.54	Pass
Resistive Force after 6ms	5100	6200	N	6183.5	Pass
Upper Thorax Rib Deflection	34	41	mm	36.4	Pass
Mid Thorax Rib Deflection	37	45	mm	42.2	Pass
Lower Thorax Rib Deflection	37	44	mm	43.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Upper Thorax Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025
Lower Thorax Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025

**Probe Acceleration**





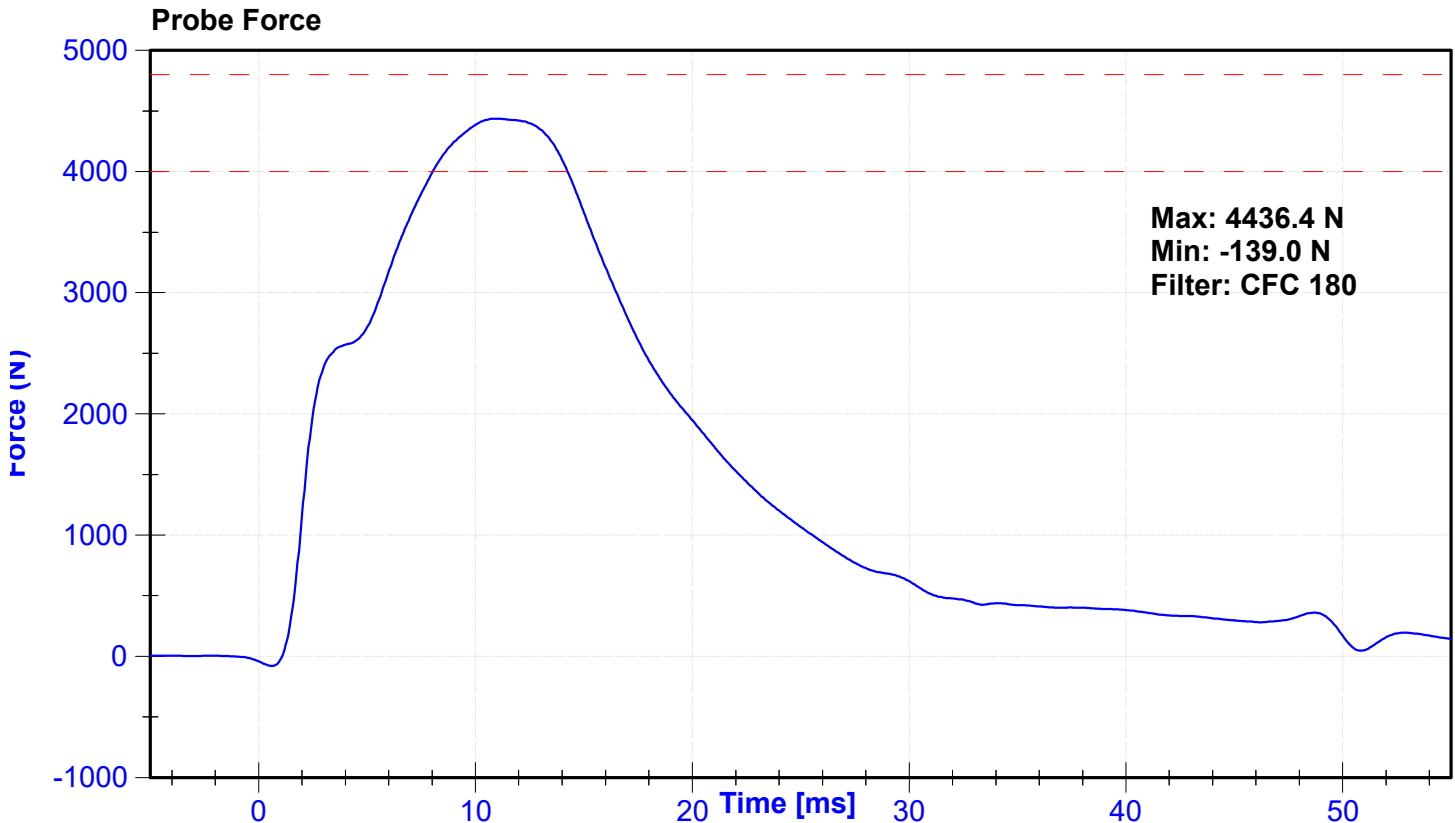
ATD Manufacturer	Denton	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

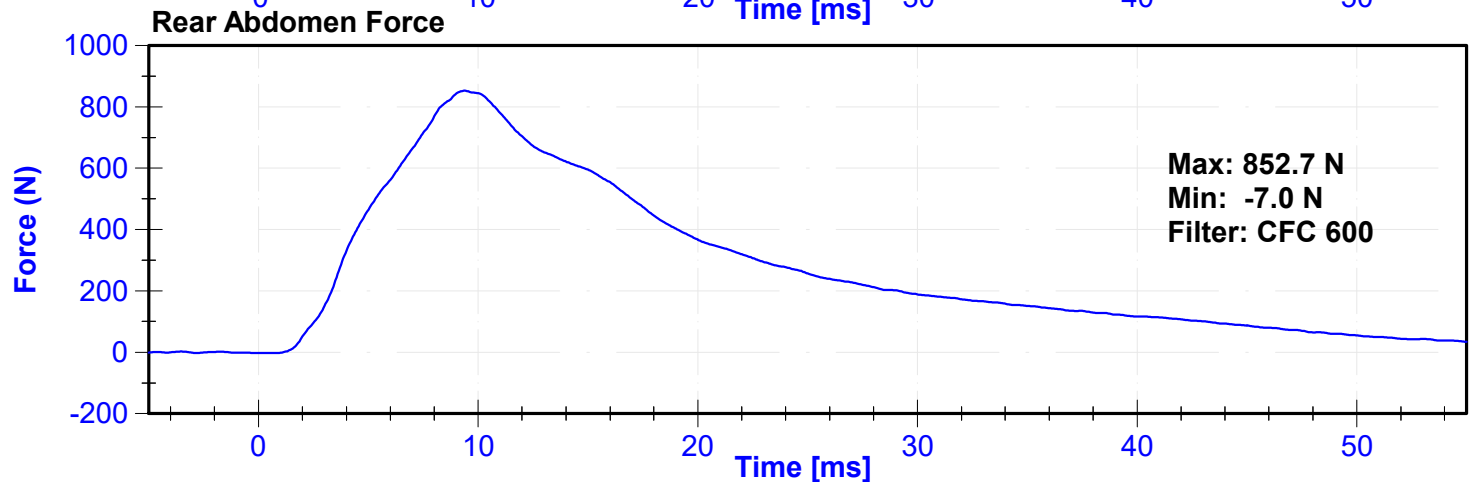
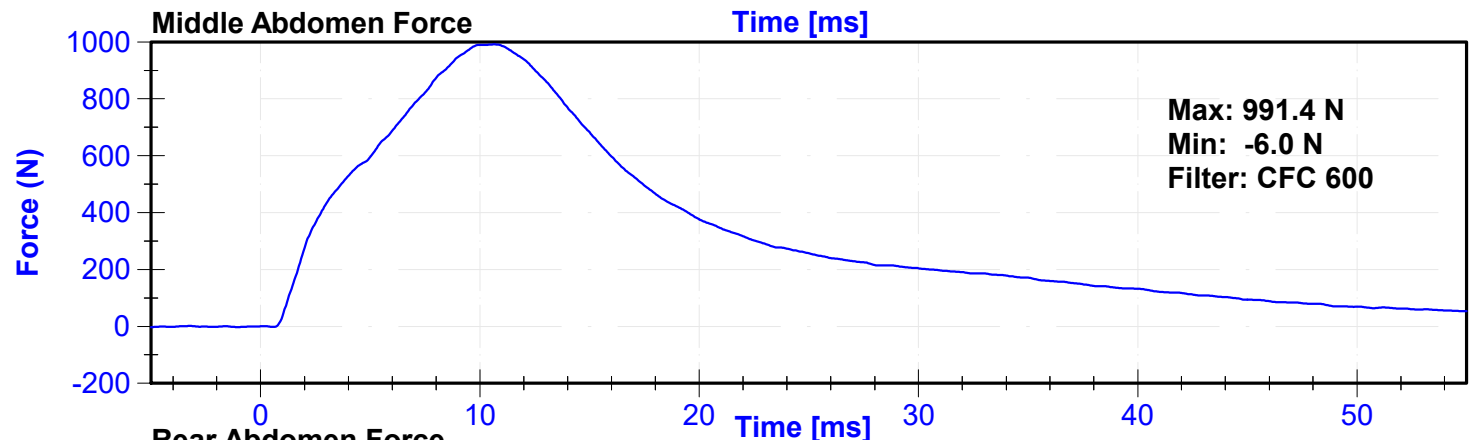
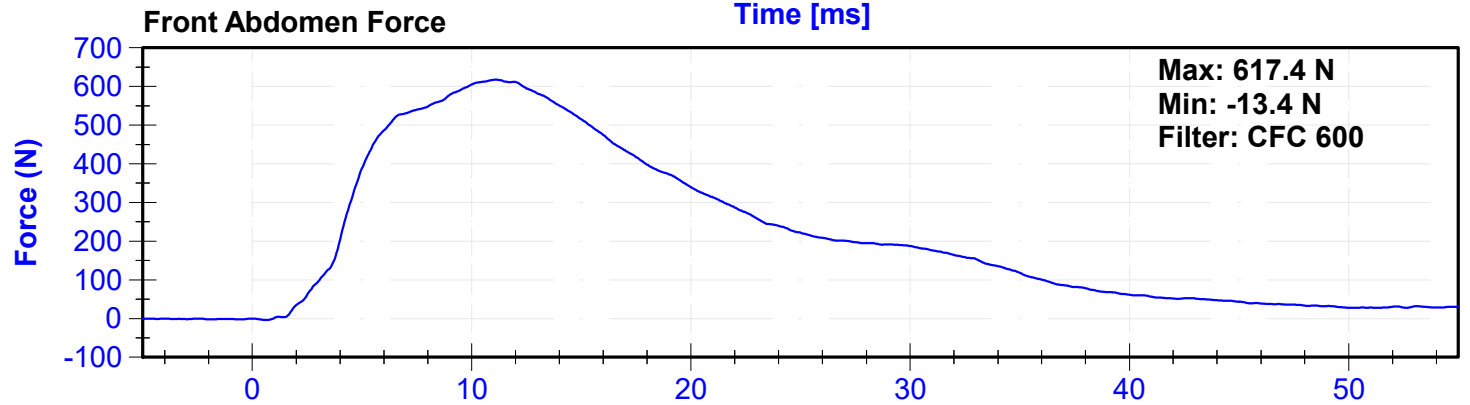
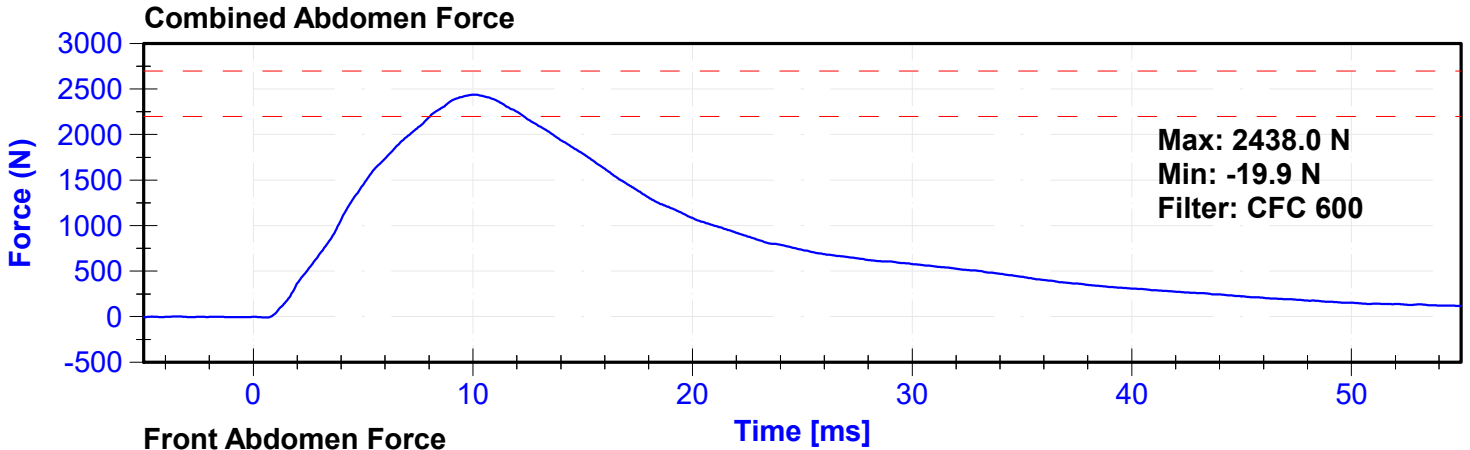
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	28	Pass
Velocity	3.9	4.1	m/s	4.02	Pass
Combined Abdomen Force	2200	2700	N	2438.0	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.05	Pass
Resistive Probe Force	4000	4800	N	4436.4	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.90	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Front Abdomen Load Cell	Denton	1512	9/16/2024	9/16/2025
Middle Abdomen Load Cell	Denton	1526	9/16/2024	9/16/2025
Rear Abdomen Load Cell	Denton	1516	9/16/2024	9/16/2025





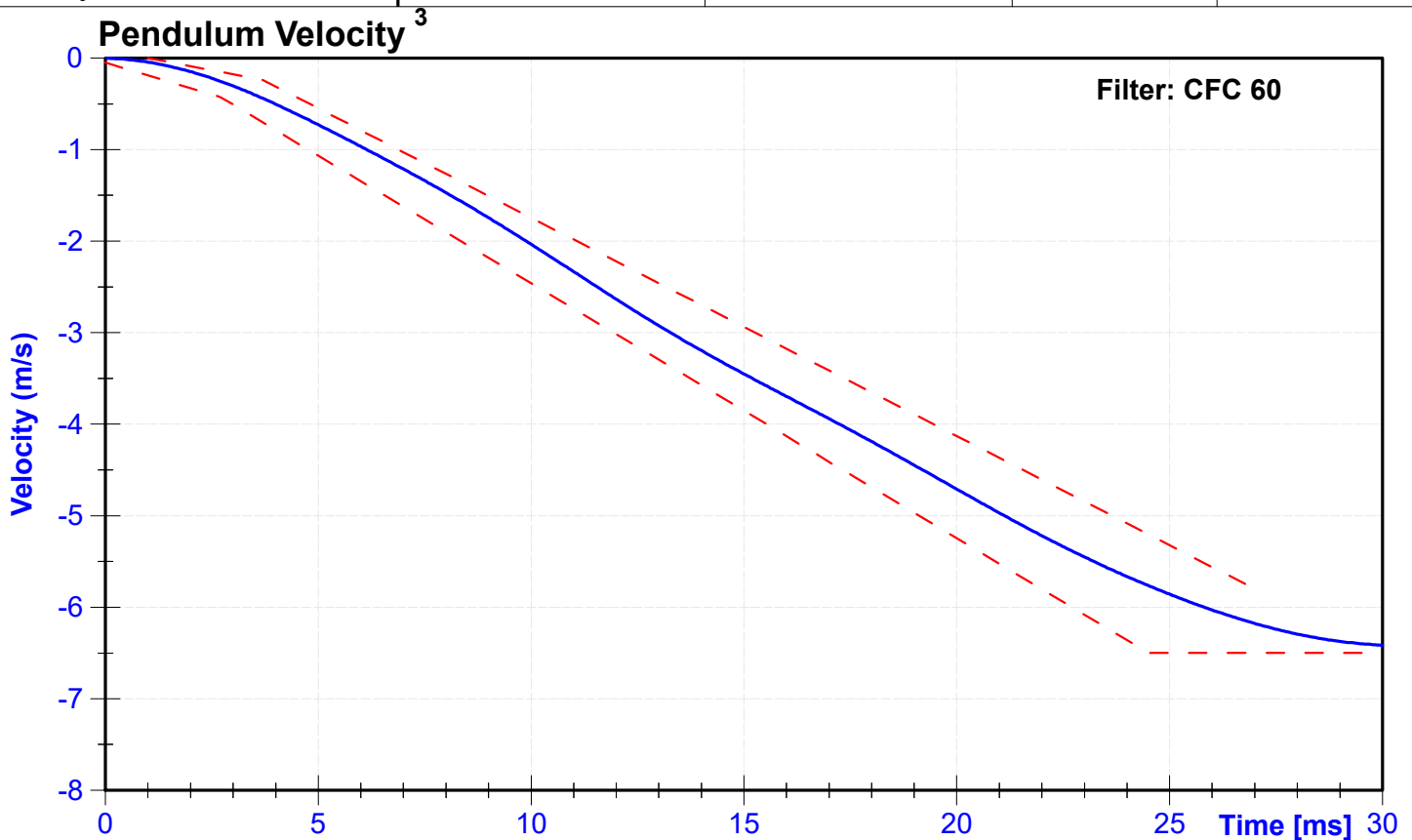
ATD Manufacturer	Humanetics	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

**Results**

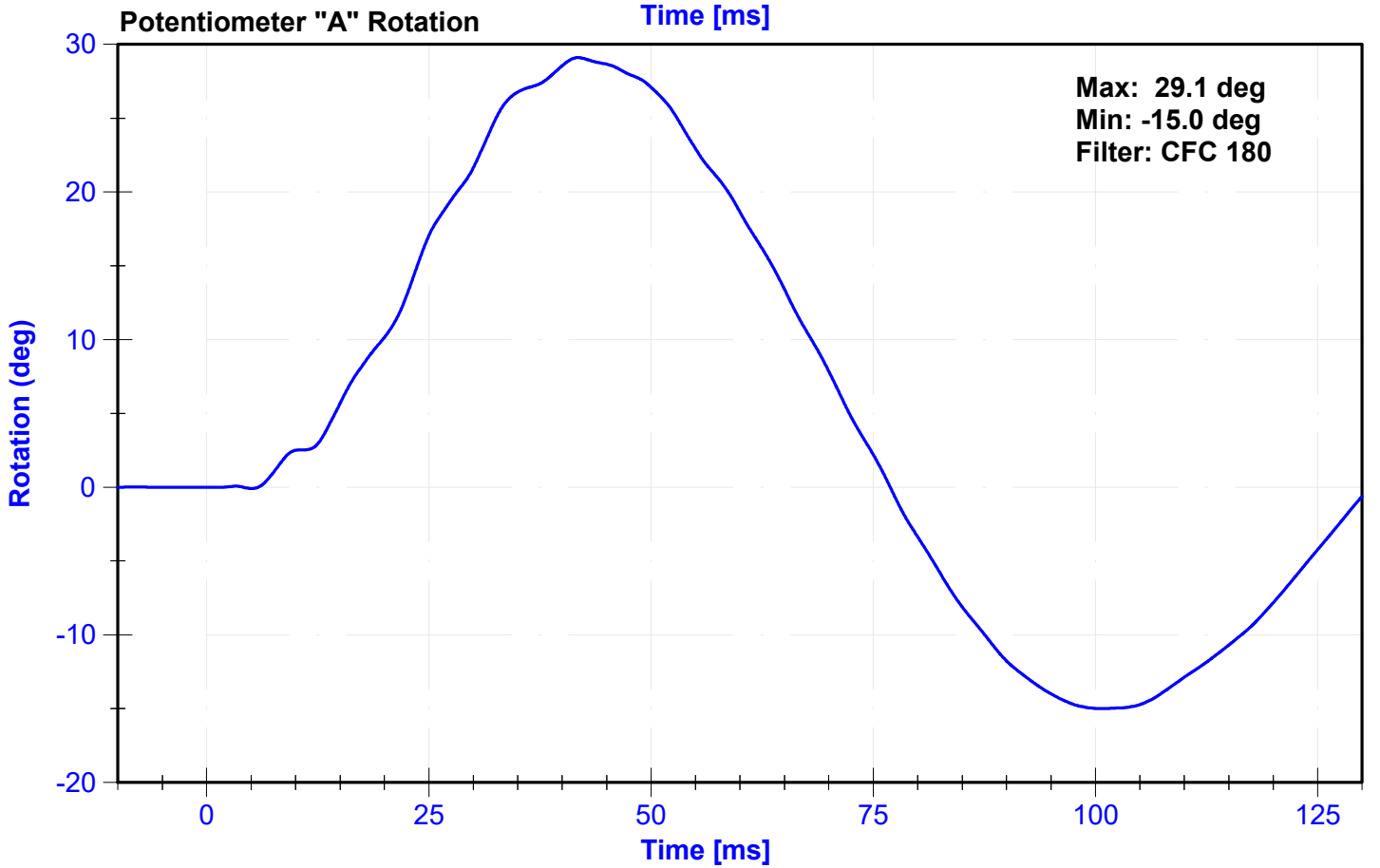
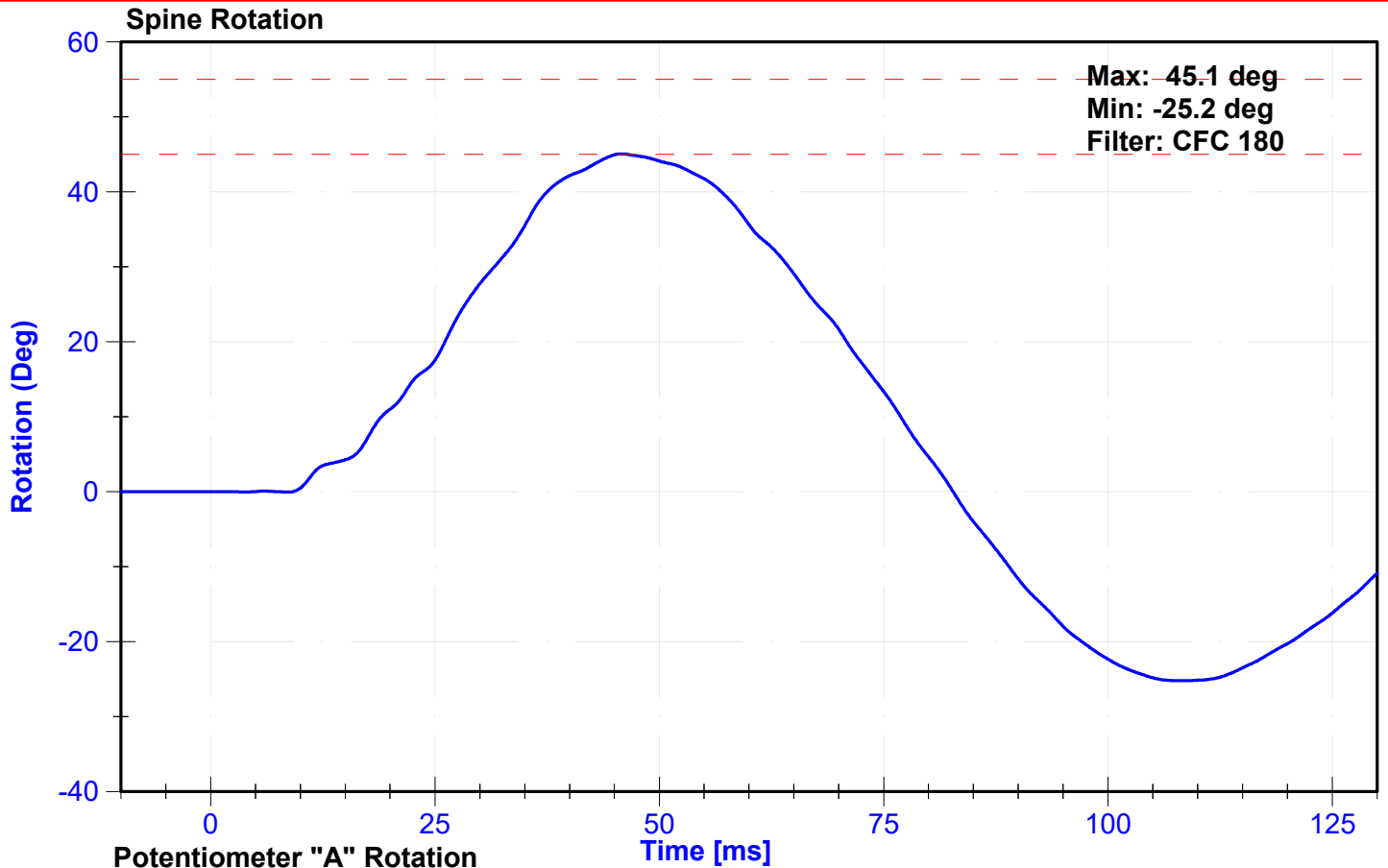
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	25	Pass
Velocity	5.95	6.15	m/s	6.146	Pass
Lateral Spine Rotation	45	55	deg	45.1	Pass
Time at Maximum Rotation	39	53	ms	45.8	Pass
Time of Decay to Zero Degrees	37	57	ms	37.0	Pass
Pendulum Velocity Overall Corridor	Lower Boundary <sup>1</sup>	Upper Boundary <sup>2</sup>	m/s	See Plot <sup>3</sup>	Pass

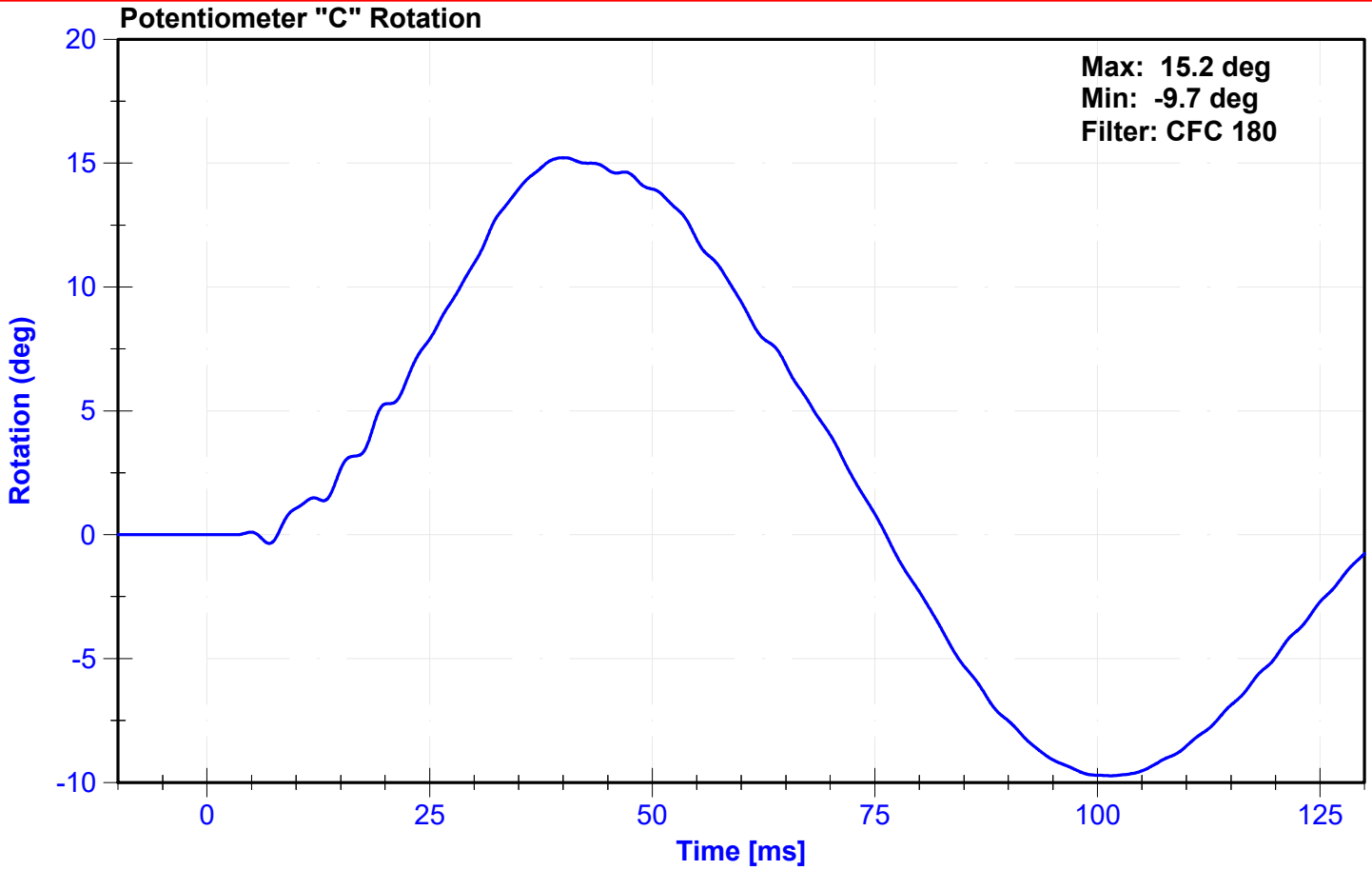
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	11/1/2024	11/1/2025
Pendulum "A" Potentiometer	Sfernice	2247	9/13/2024	9/13/2025
Condyle "B" Potentiometer	Sfernice	095	9/13/2024	9/13/2025



<sup>1,2</sup> Upper and lower boundaries specified in Appendix I





### Appendix I

<sup>2</sup> Upper Boundary Corridor		<sup>1</sup> 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

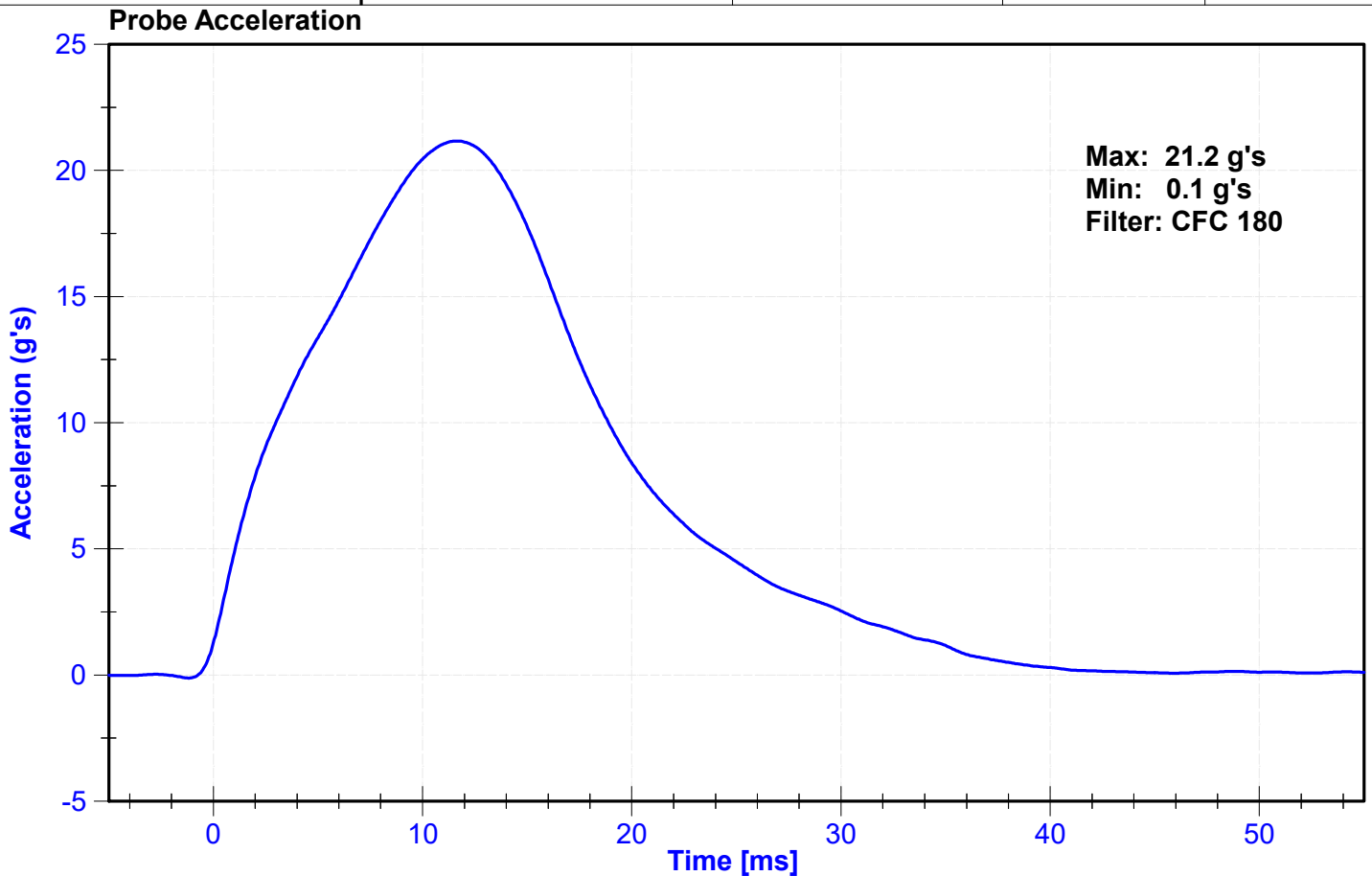
ATD Manufacturer	Denton	Test Technician	E. Andruczyk
ATD Serial Number	D037	Laboratory Supervisor	J. Kinderman

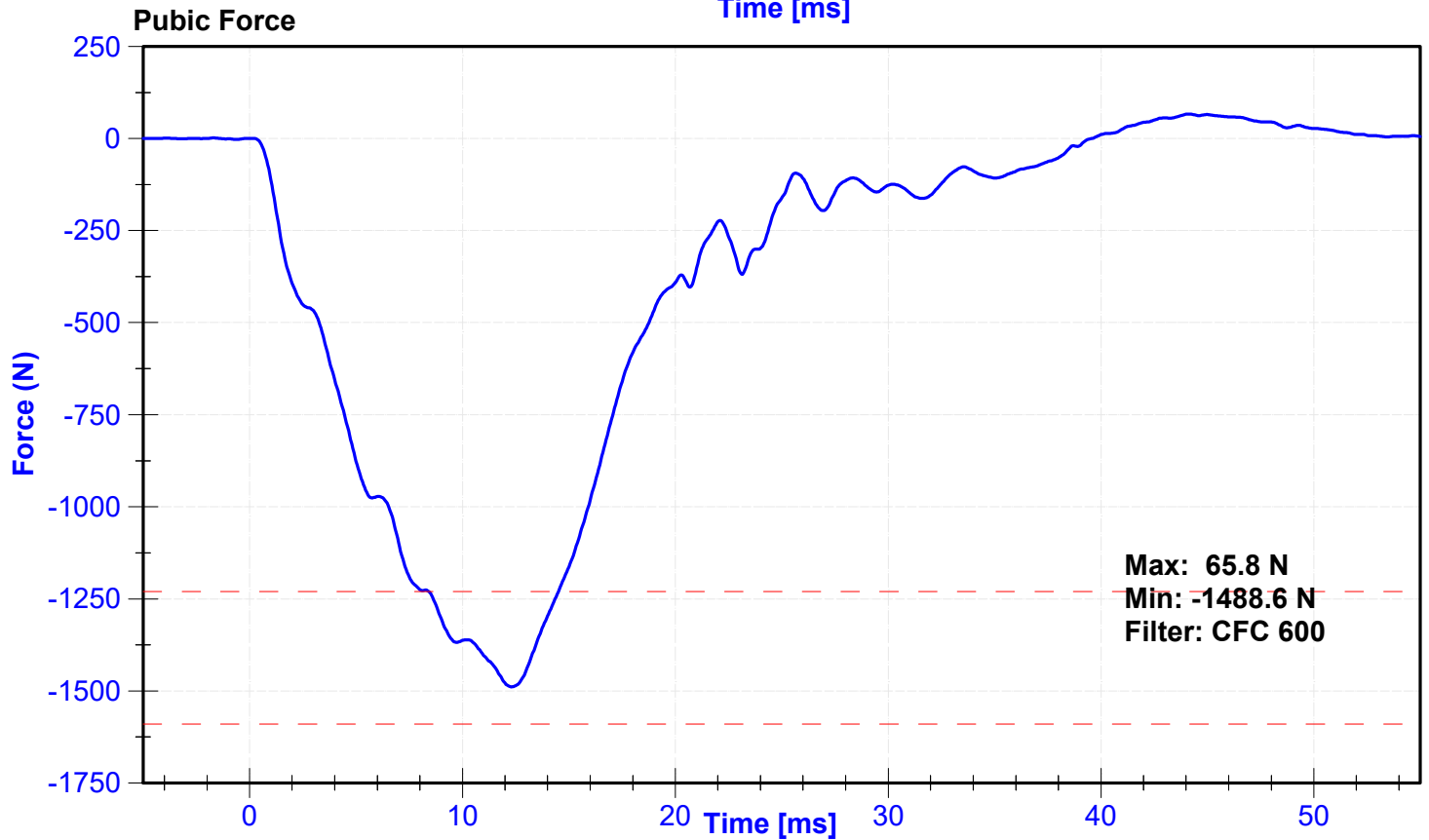
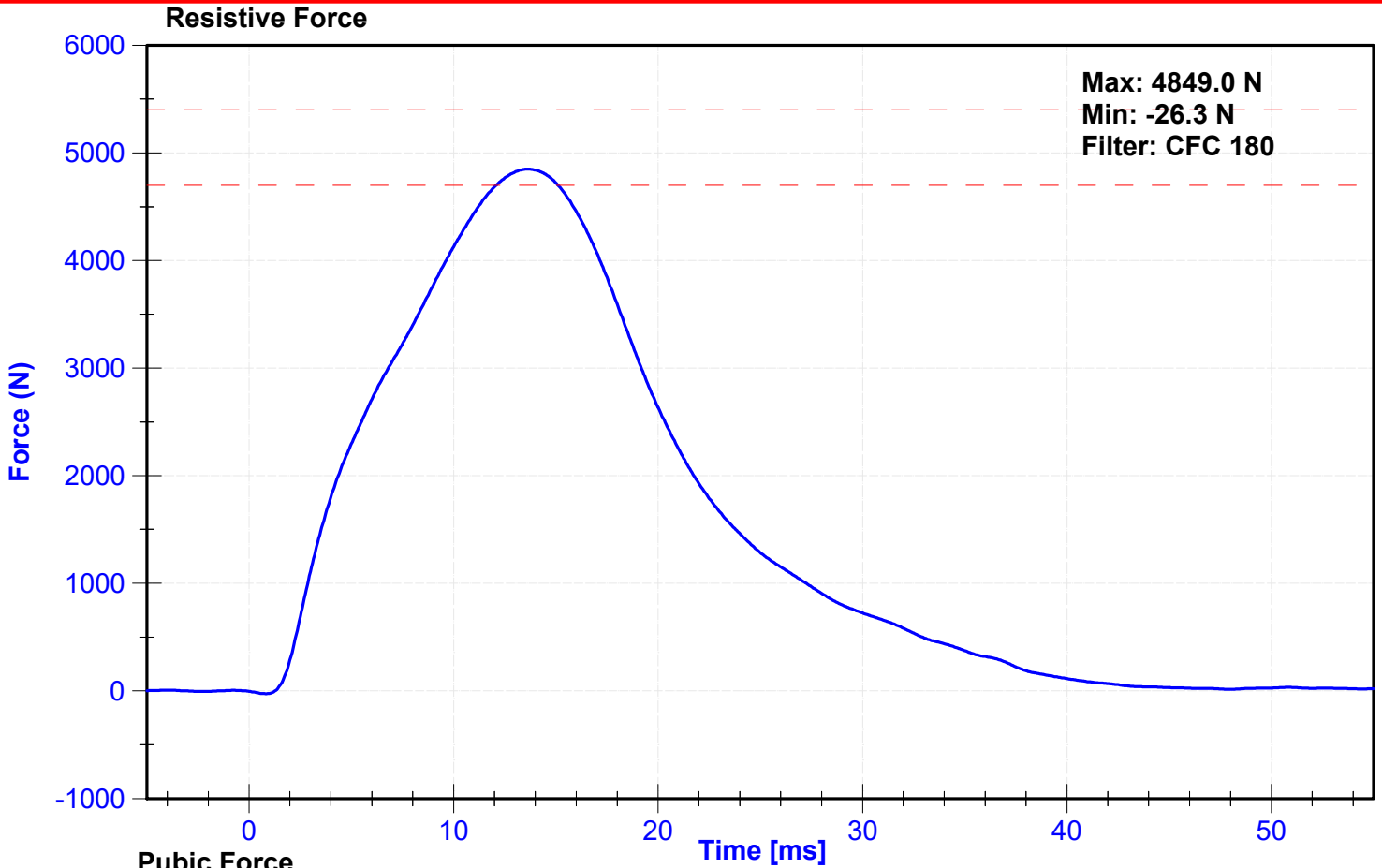
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	28	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Resistive Force	4700	5400	N	4849.0	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.65	Pass
Pubic Force	-1590	-1230	N	-1488.6	Pass
Time at Peak Pubic Force	12.2	17.0	ms	12.30	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Pubic Load Cell	Denton	464-FY	9/16/2024	9/16/2025





**APPENDIX VI**  
**SID-Its PERFORMANCE CALIBRATION TEST DATA**

**PRE-TEST  
SID-IIs PERFORMANCE CALIBRATION TEST DATA**

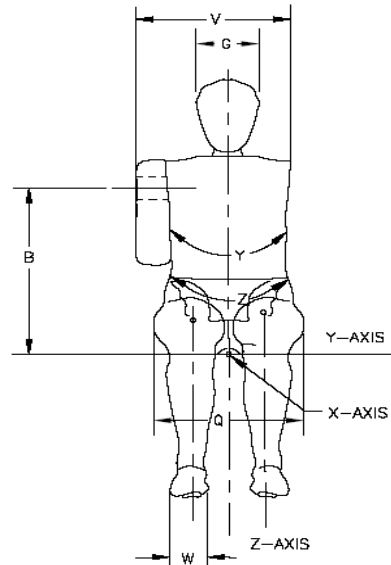
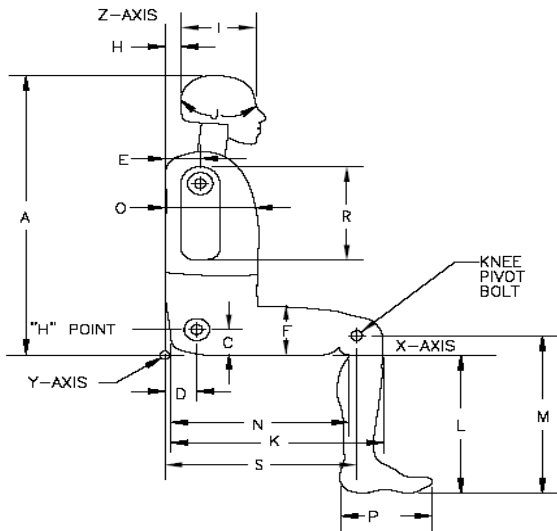


External Measurements - SID-IIs

Technician: J. Rios

Date: 10/23/2024

Dummy Serial Number: 224



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	785	Pass
B	Shoulder Pivot Height	437	453	444	Pass
C	H-point Height	79	89	82	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	98	Pass
F	Thigh Clearance	119	135	121	Pass
G	Head Breadth	140	148	142	Pass
H	Head Back from Backline	40	46	45	Pass
I	Head Depth	178	188	185	Pass
J	Head Circumference	541	551	544	Pass
K	Buttock to Knee Length	514	540	530	Pass
L	Popliteal Height	343	369	355	Pass
M	Knee Pivot to floor height	392	409	404	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	205	Pass
P	Foot Length	216	232	222	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	253	Pass
S	Knee Joint to seatback	477	493	489	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	84	Pass
Y	Chest Circumference w/jacket	851	881	871	Pass
Z	Waist Circumference	761	791	773	Pass

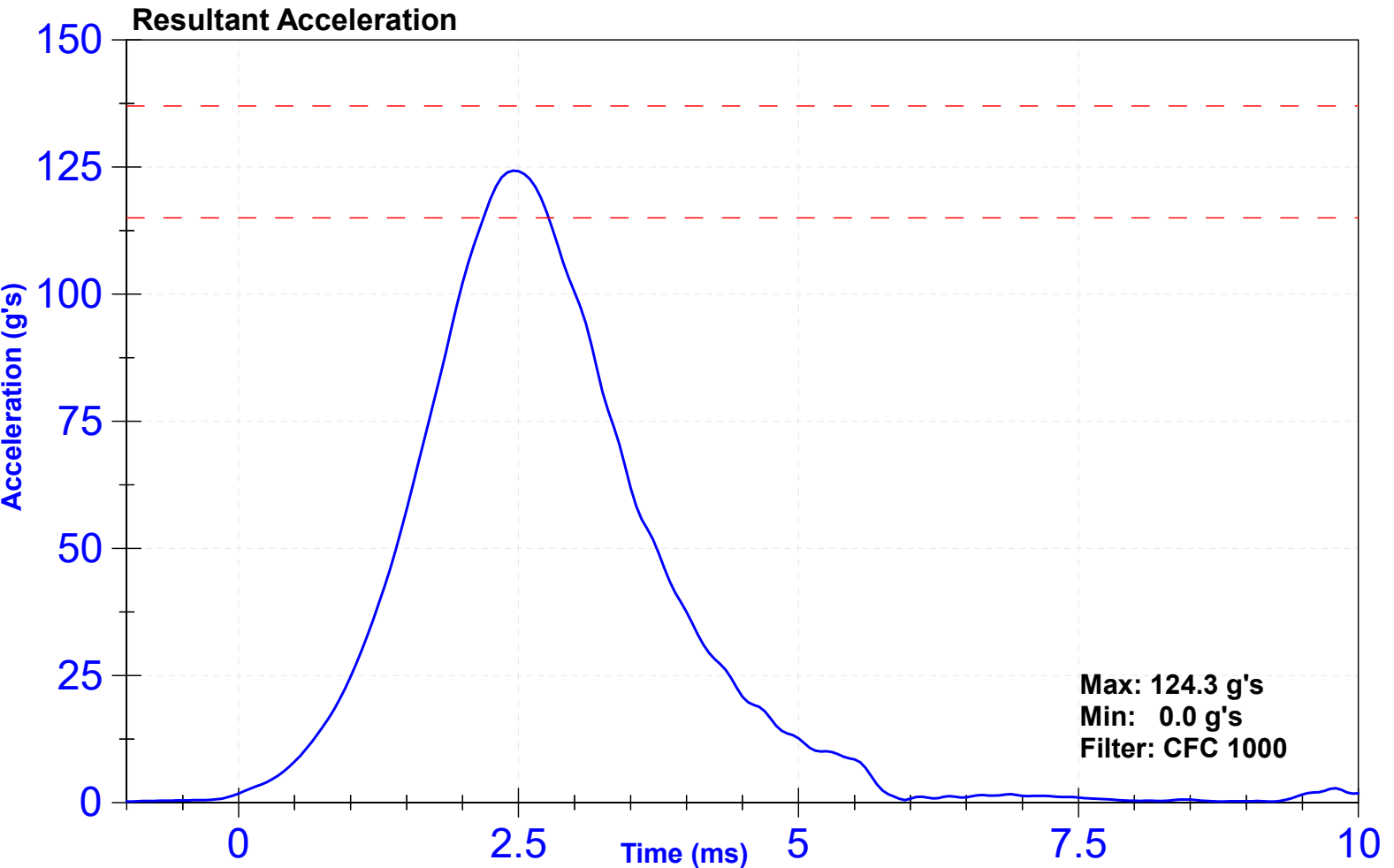
ATD Manufacturer	FTSS	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

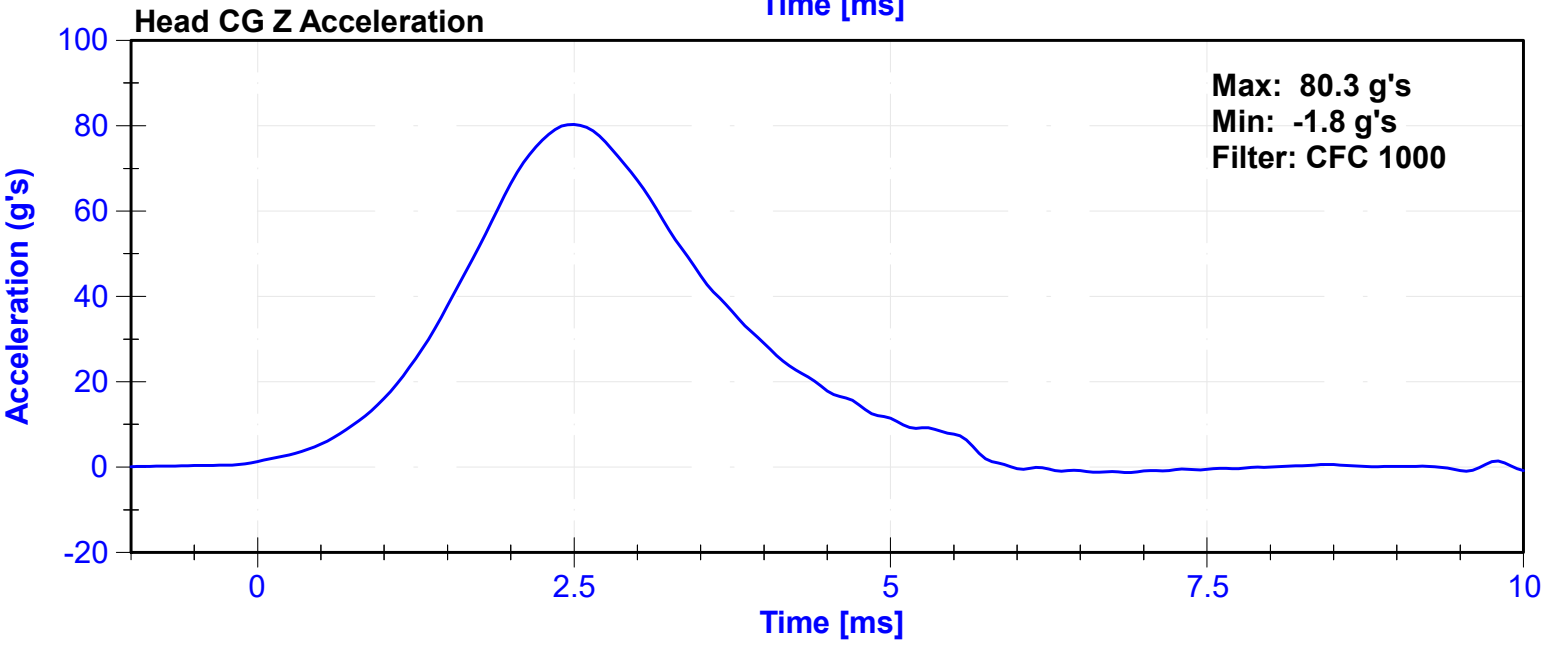
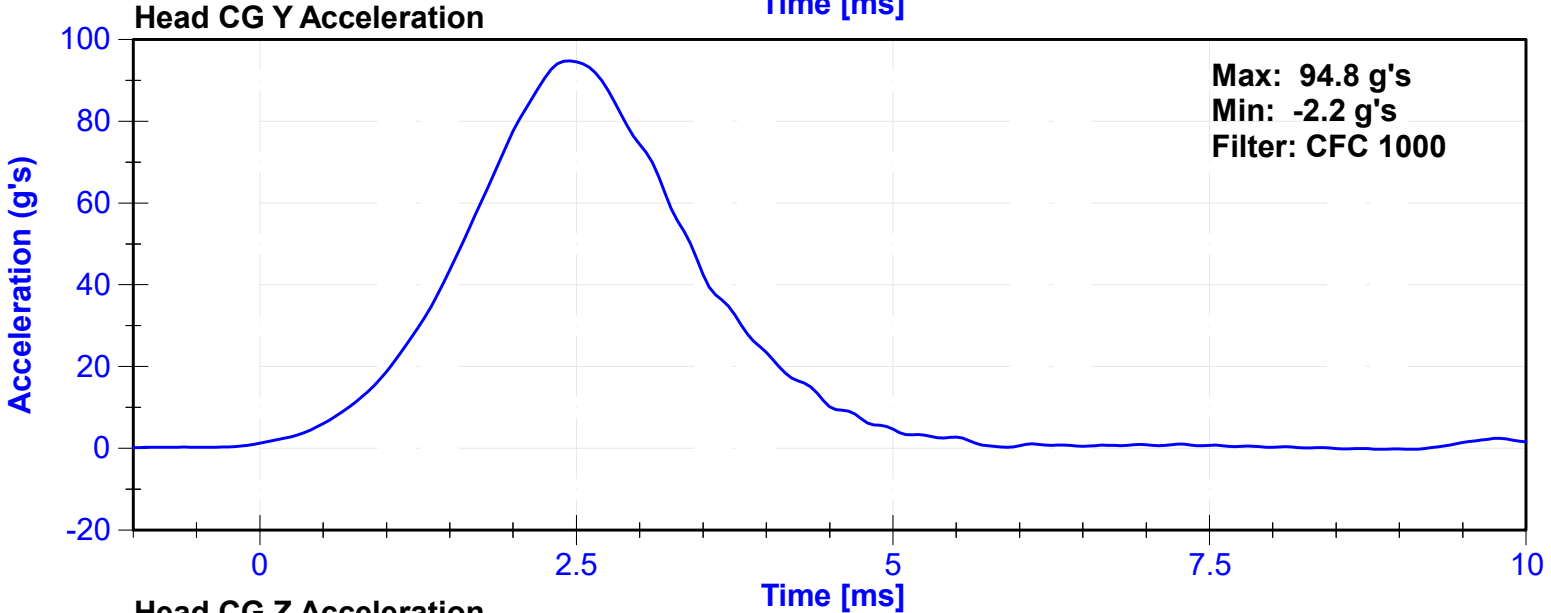
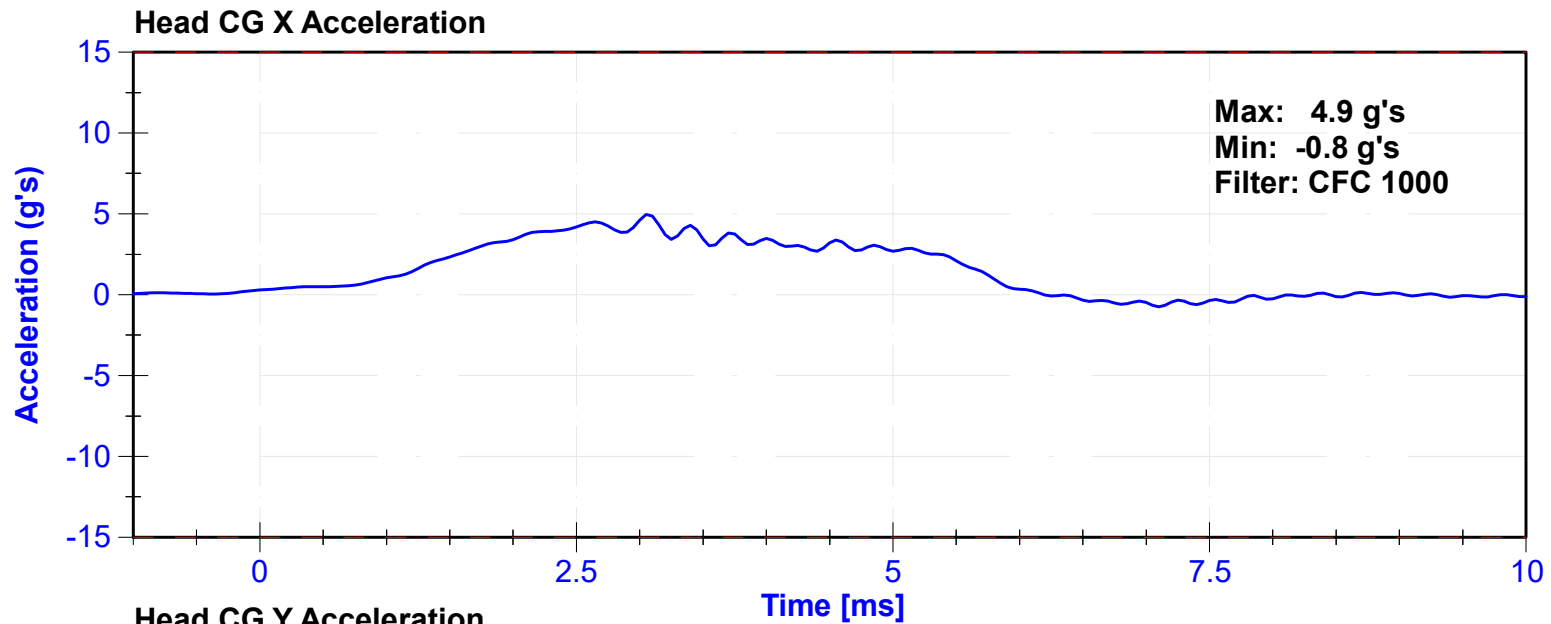
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	40	Pass
Resultant Acceleration	115	137	g's	124.3	Pass
Oscillation	0	15	%	8.1	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	P51884	10/8/2024	4/6/2025
Y Accelerometer	Endevco	P73161	10/8/2024	4/6/2025
Z Accelerometer	Endevco	P79588	10/8/2024	4/6/2025





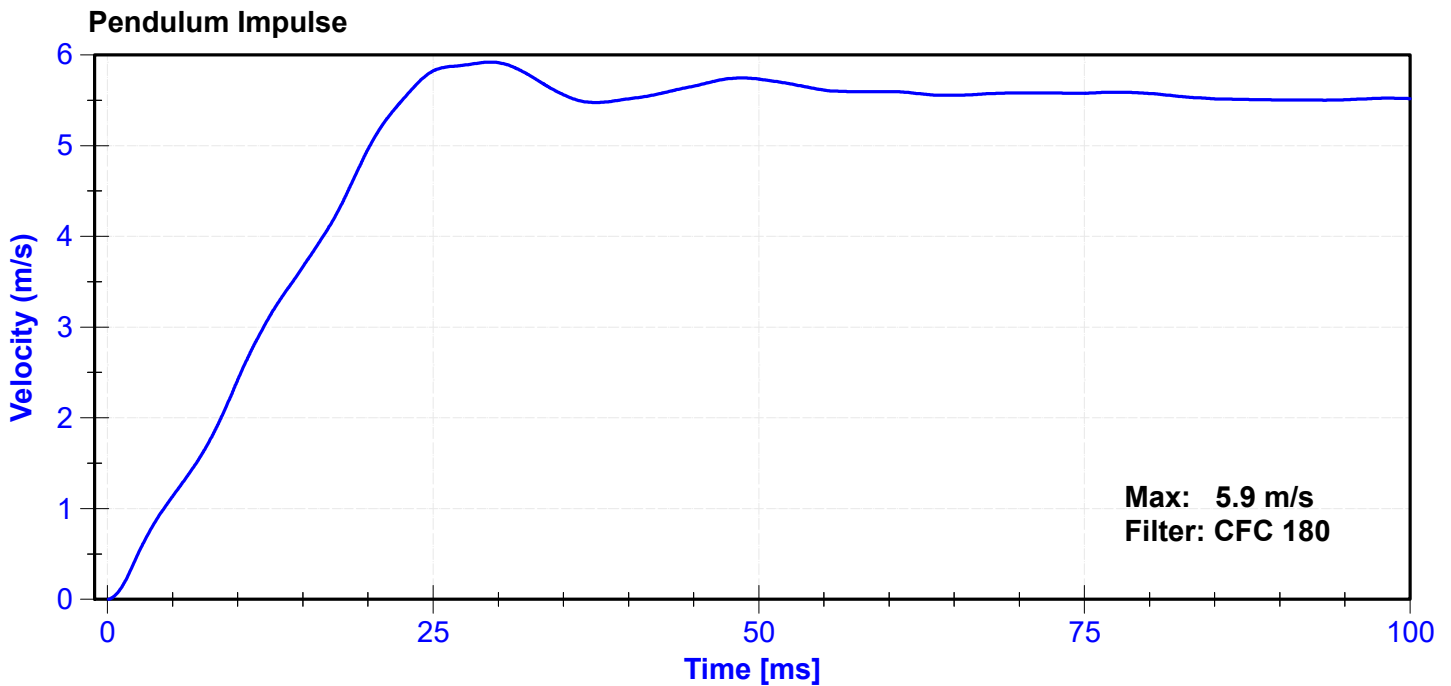
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

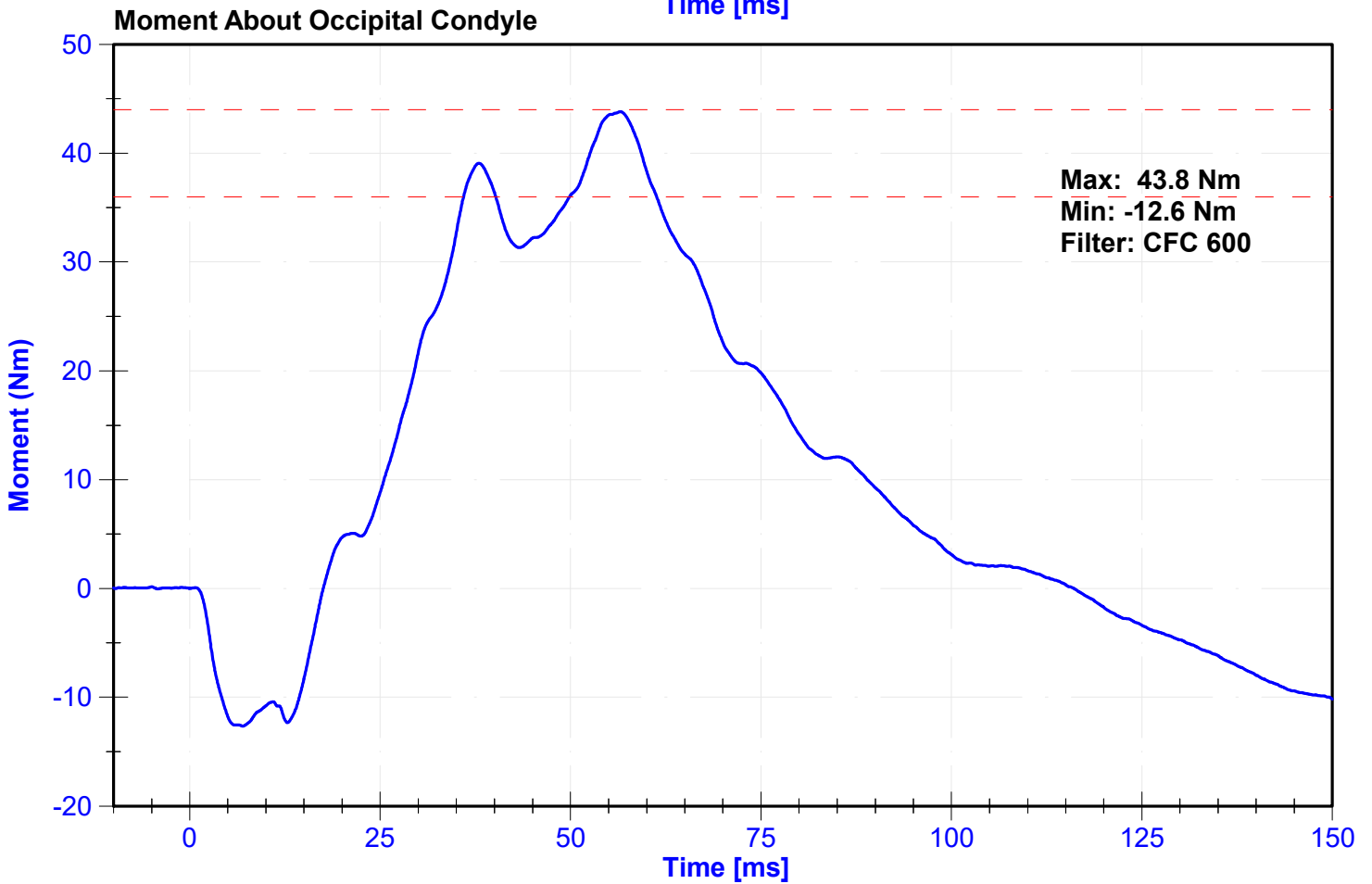
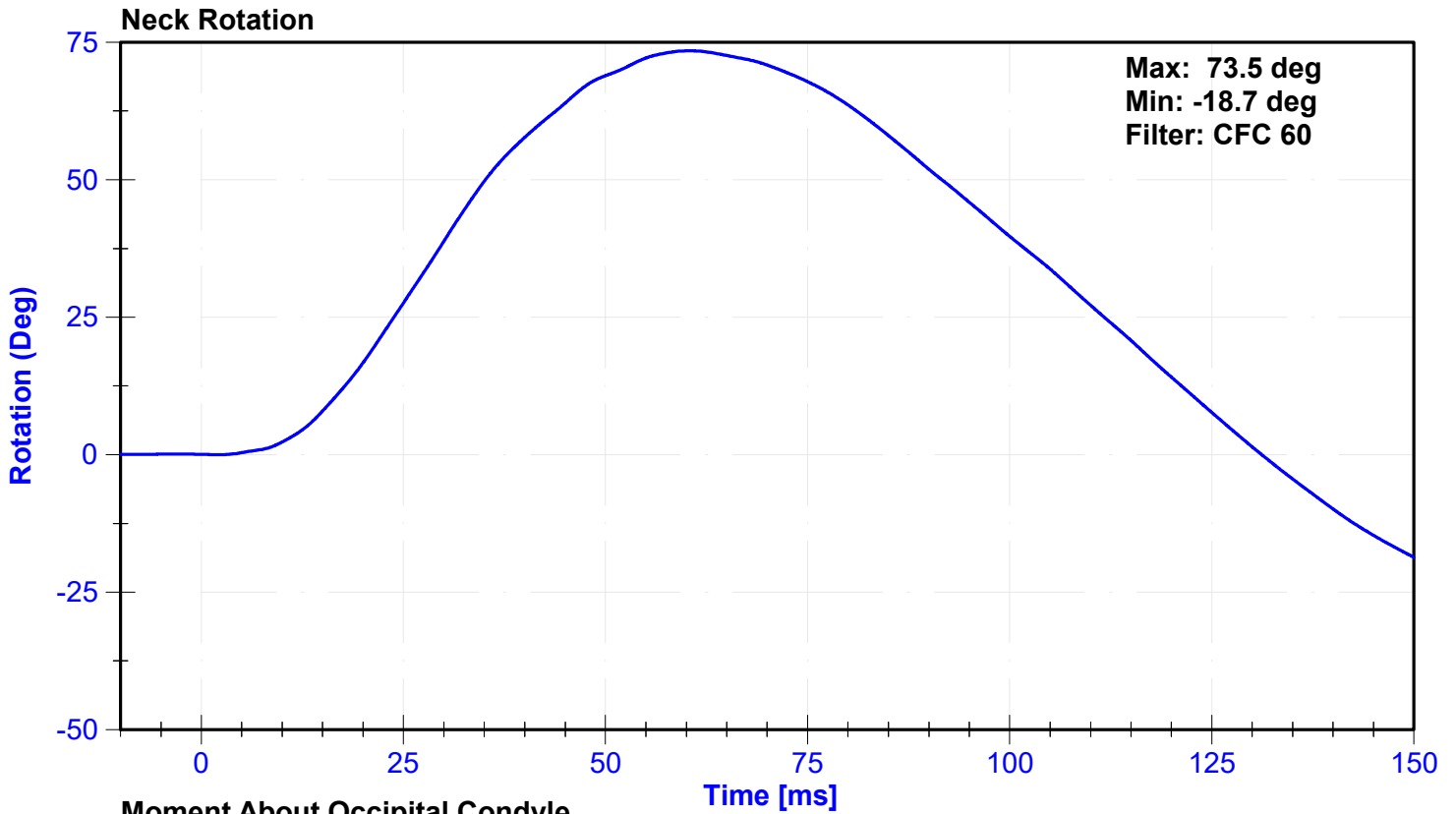
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	35	Pass
Velocity	5.51	5.63	m/s	5.557	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.42	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.67	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.96	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.82	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.92	Pass
Neck Rotation	71	81	deg	73.5	Pass
Time at Maximum Rotation	50	70	ms	60.4	Pass
Moment about the OC	36	44	Nm	43.8	Pass
Moment Decay to 0 Nm	102	126	ms	116.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	4/29/2024	10/26/2024
Pendulum Potentiometer	Servo	4961	9/23/2024	9/23/2025
Condyle Potentiometer	Servo	DS185	9/23/2024	9/23/2025
Upper Neck Load Cell	Denton	1716A_2187-FY	12/5/2023	12/4/2024





ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

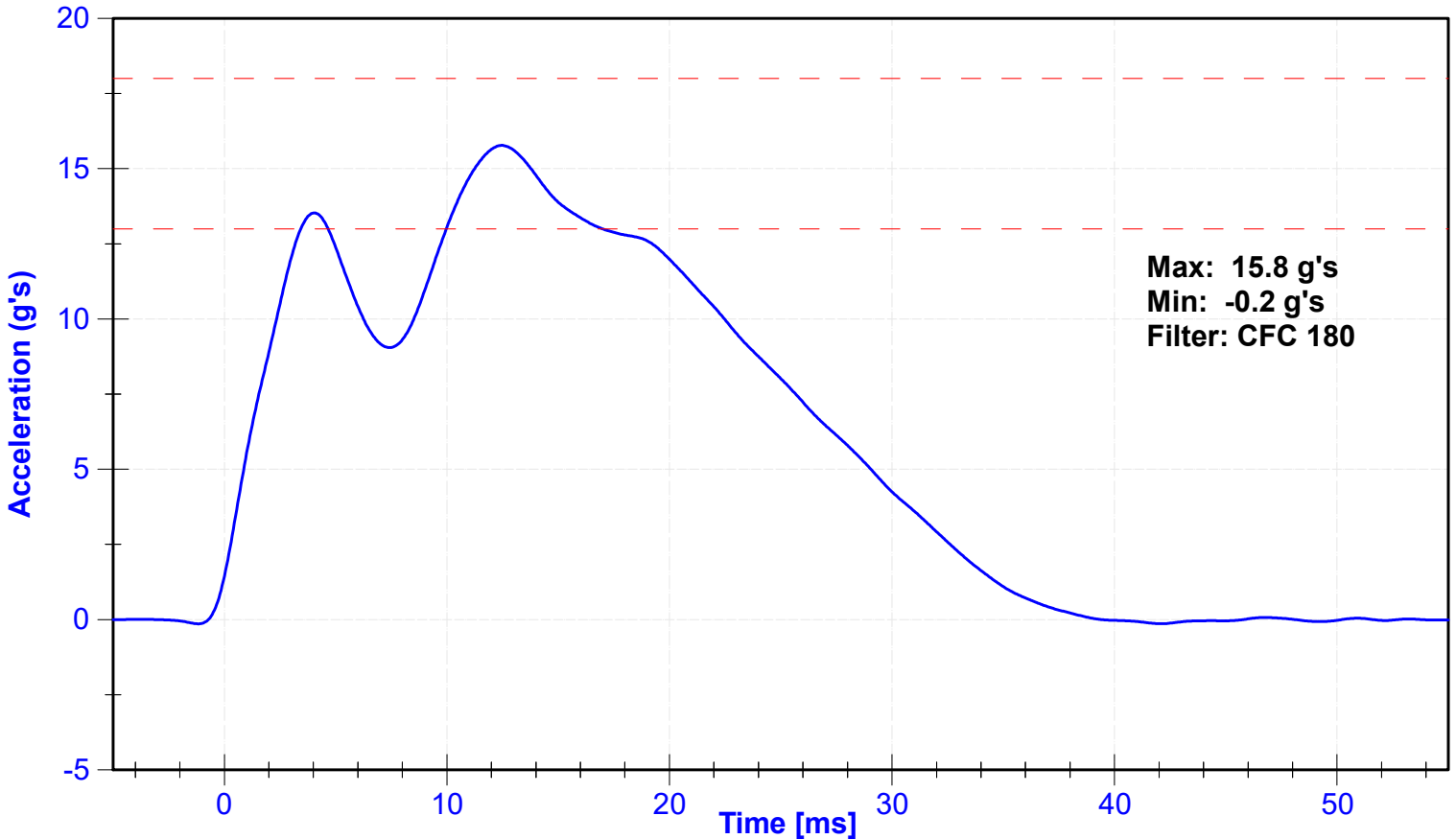
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	13	18	g's	15.8	Pass
Shoulder Deflection	28	37	mm	30.1	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.5	Pass

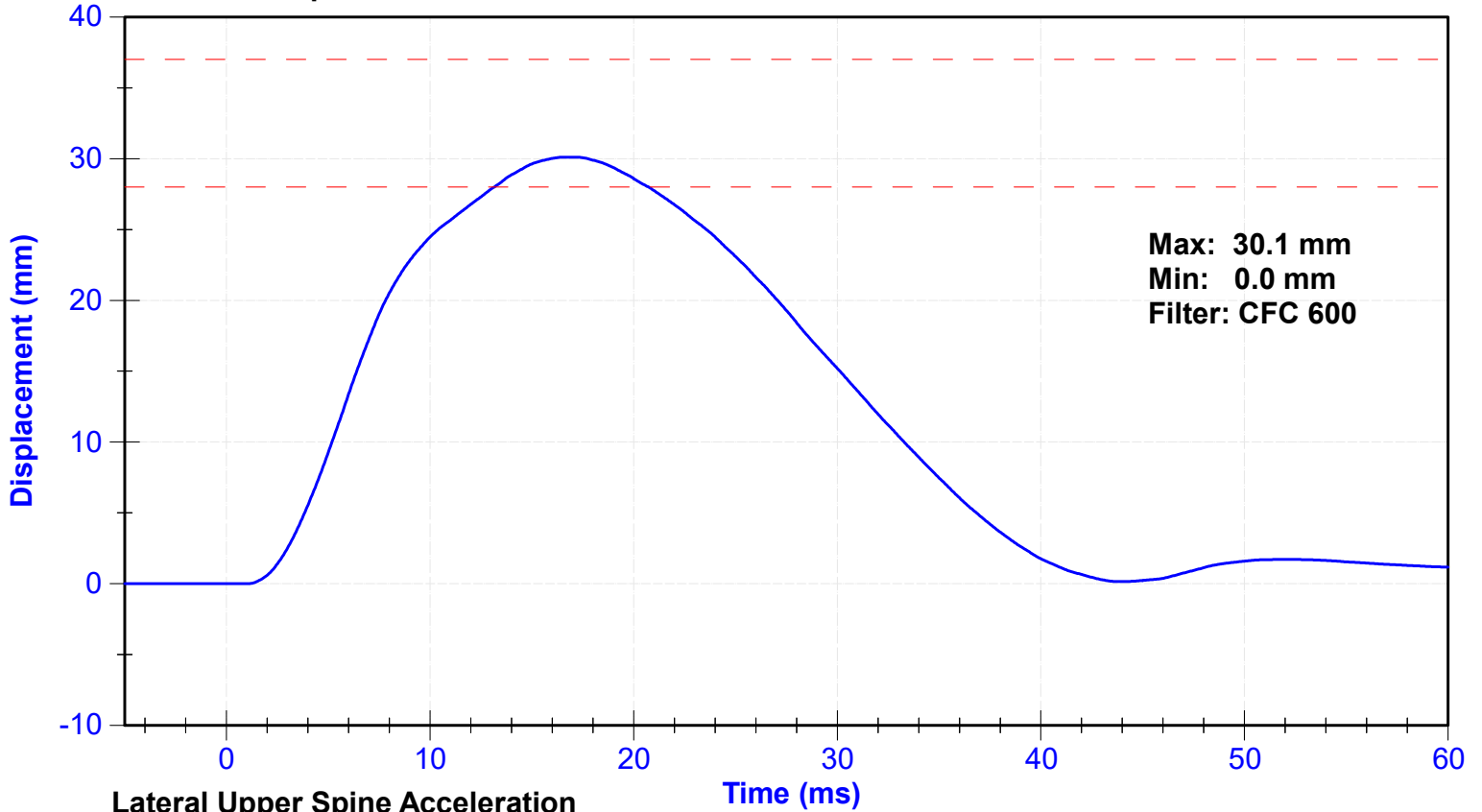
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Shoulder Potentiometer	Servo	829GFE	10/8/2024	4/8/2025
Upper Spine Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025

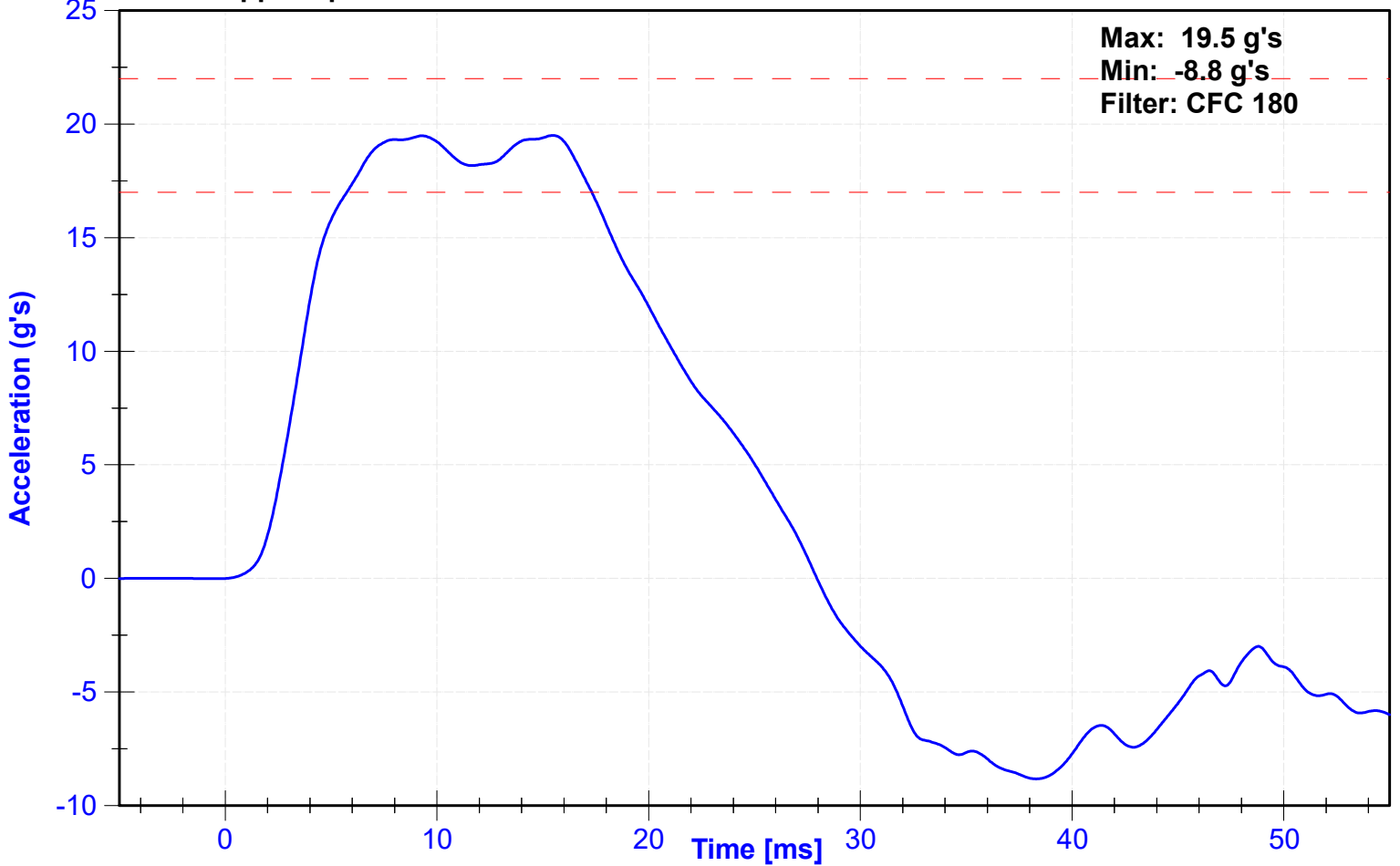
**Probe Acceleration**



### Shoulder Displacement



### Lateral Upper Spine Acceleration



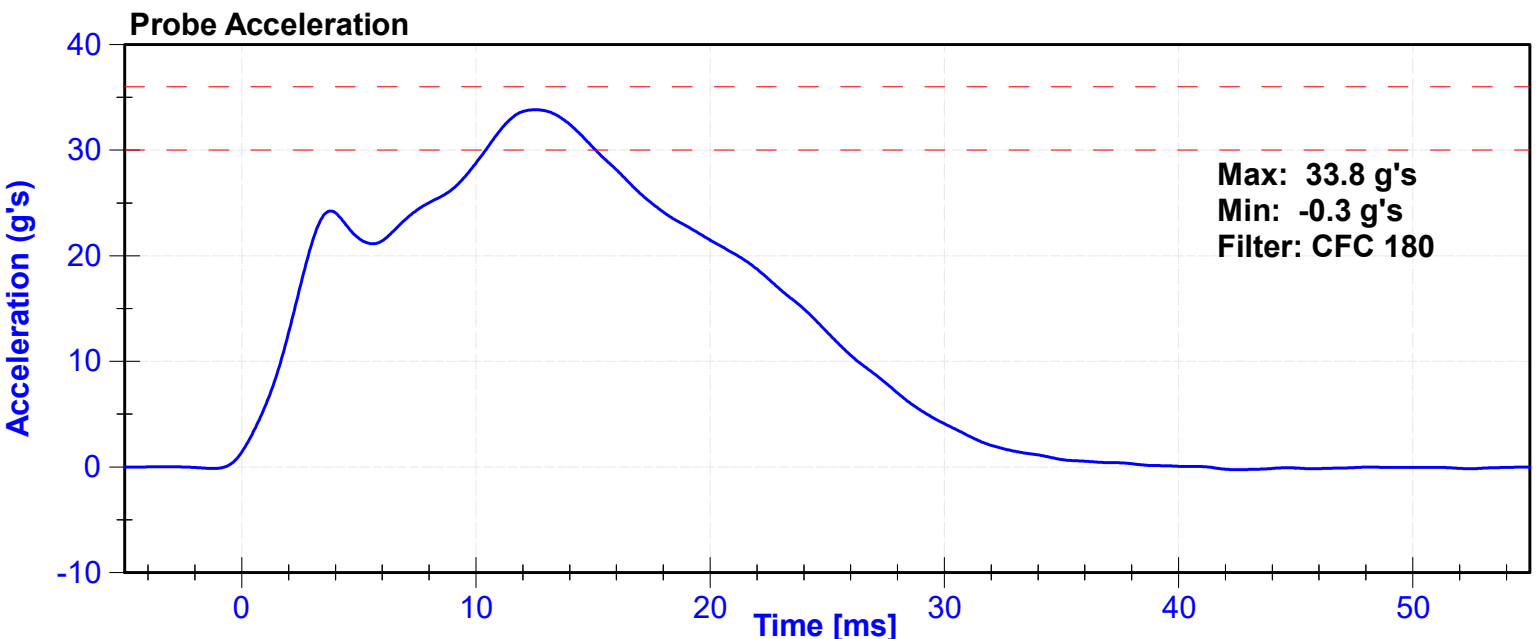
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

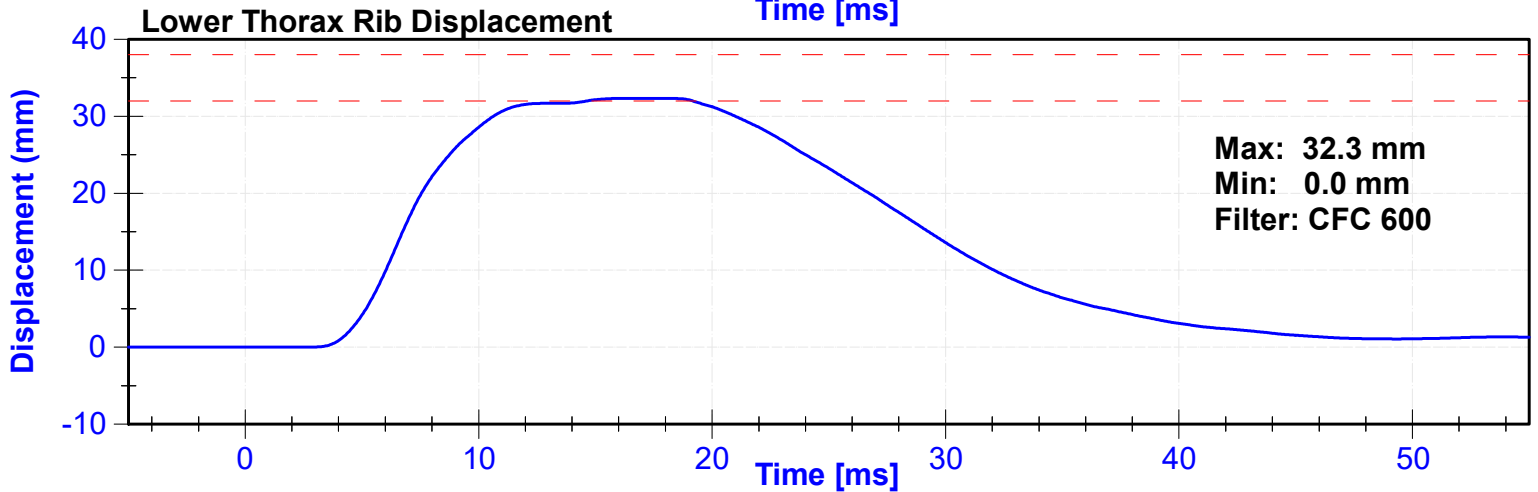
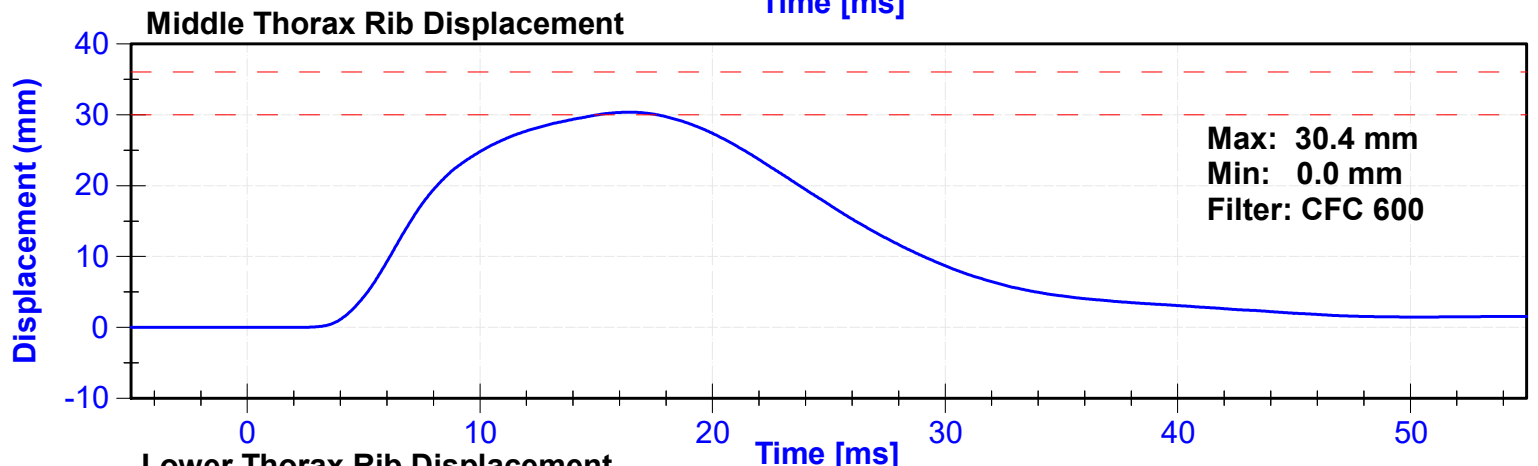
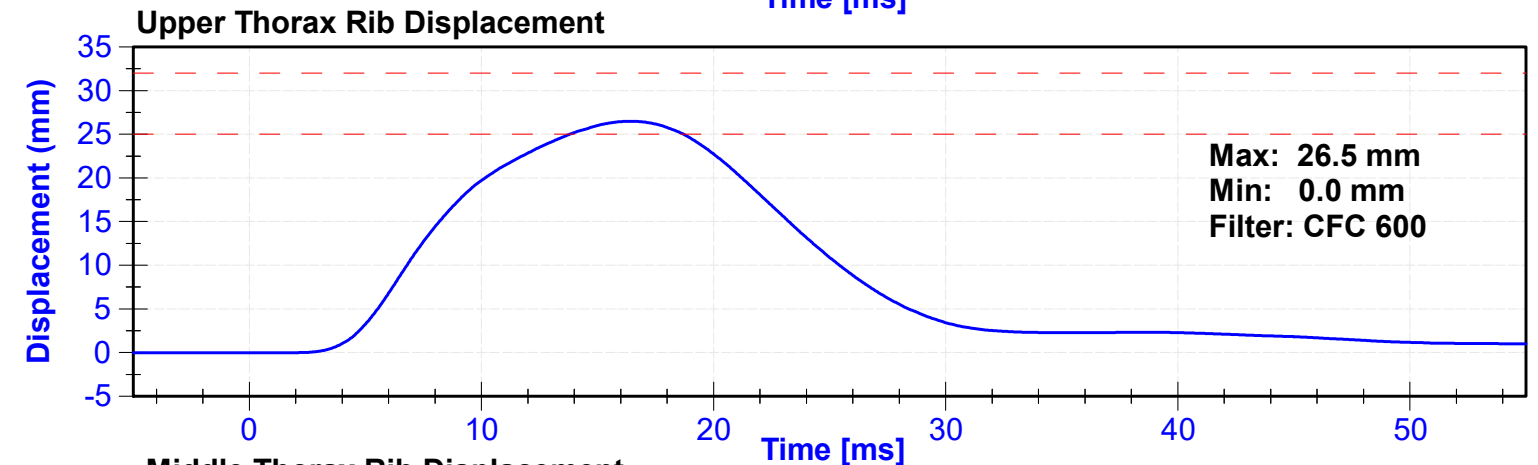
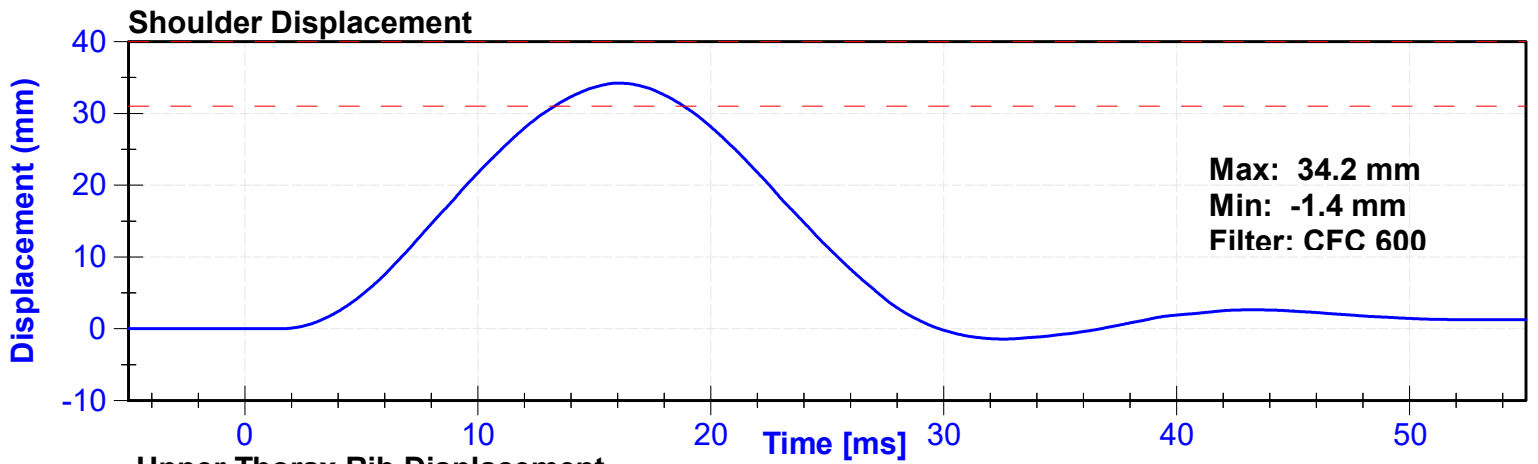
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	6.6	6.8	m/s	6.64	Pass
Probe Acceleration after 5 ms	30	36	g's	33.8	Pass
Lateral Upper Spine Acceleration	34	43	g's	38.0	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.0	Pass
Shoulder Deflection	31	40	mm	34.2	Pass
Upper Thorax Rib Deflection	25	32	mm	26.5	Pass
Mid Thorax Rib Deflection	30	36	mm	30.4	Pass
Lower Thorax Rib Deflection	32	38	mm	32.3	Pass

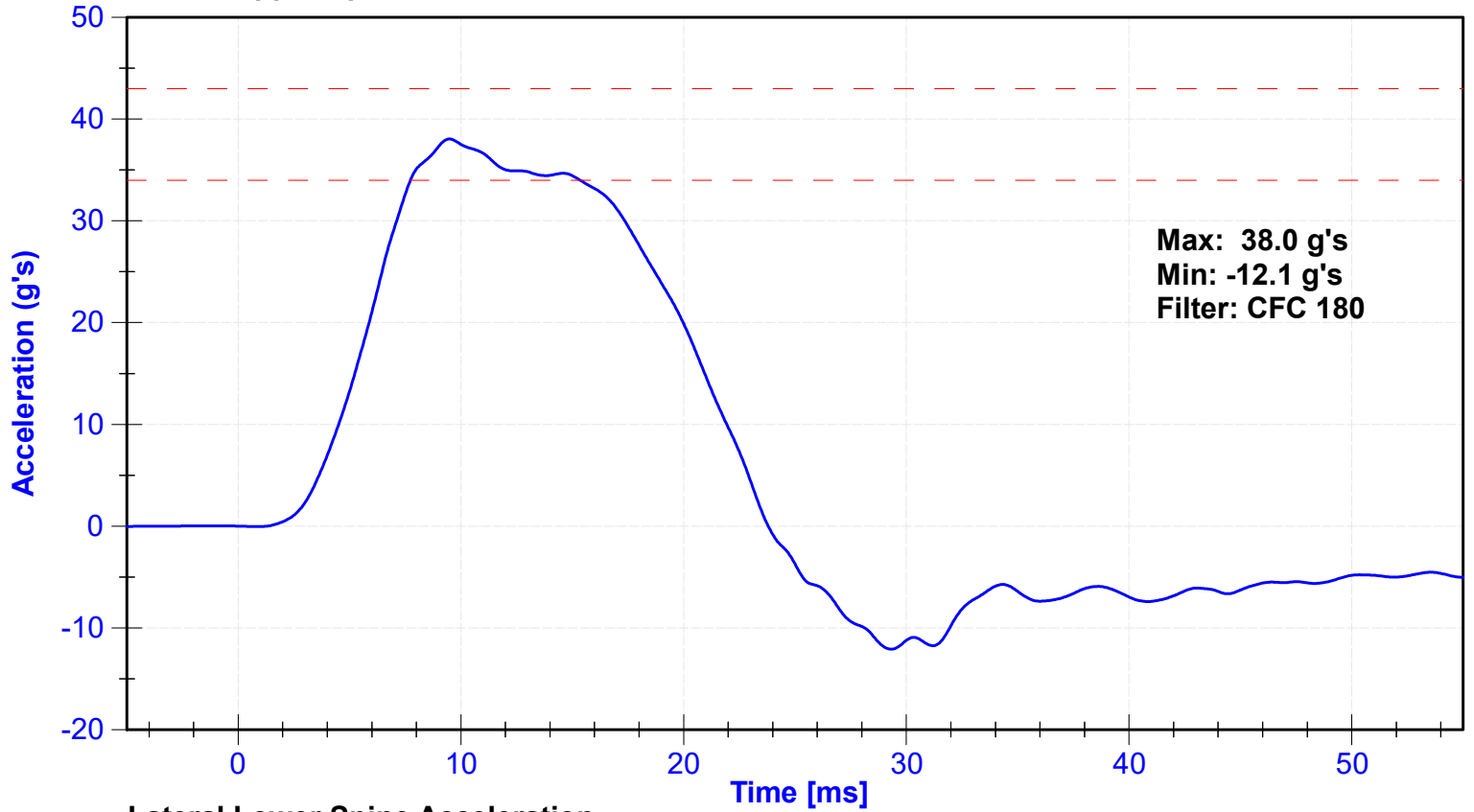
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Upper Spine T1 Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025
Upper Spine T12 Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Shoulder Potentiometer	Servo	829GFE	10/8/2024	4/8/2025
Upper Thorax Rib Potentiometer	Servo	DS-049GFE	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Servo	080GFE	10/9/2024	4/9/2025
Lower Thorax Rib Potentiometer	Servo	076GFE	10/8/2024	4/8/2025

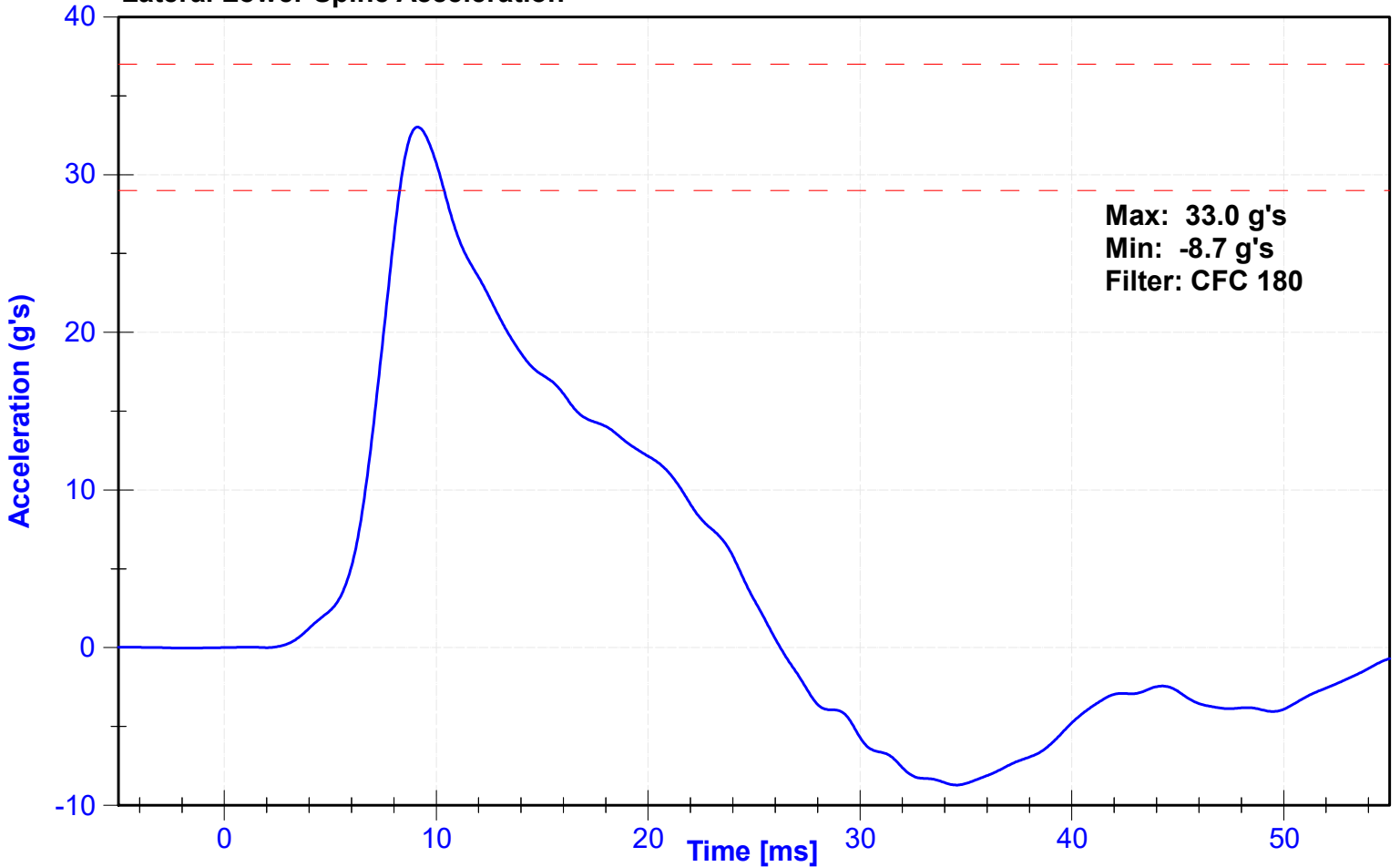




### Lateral Upper Spine Acceleration



### Lateral Lower Spine Acceleration



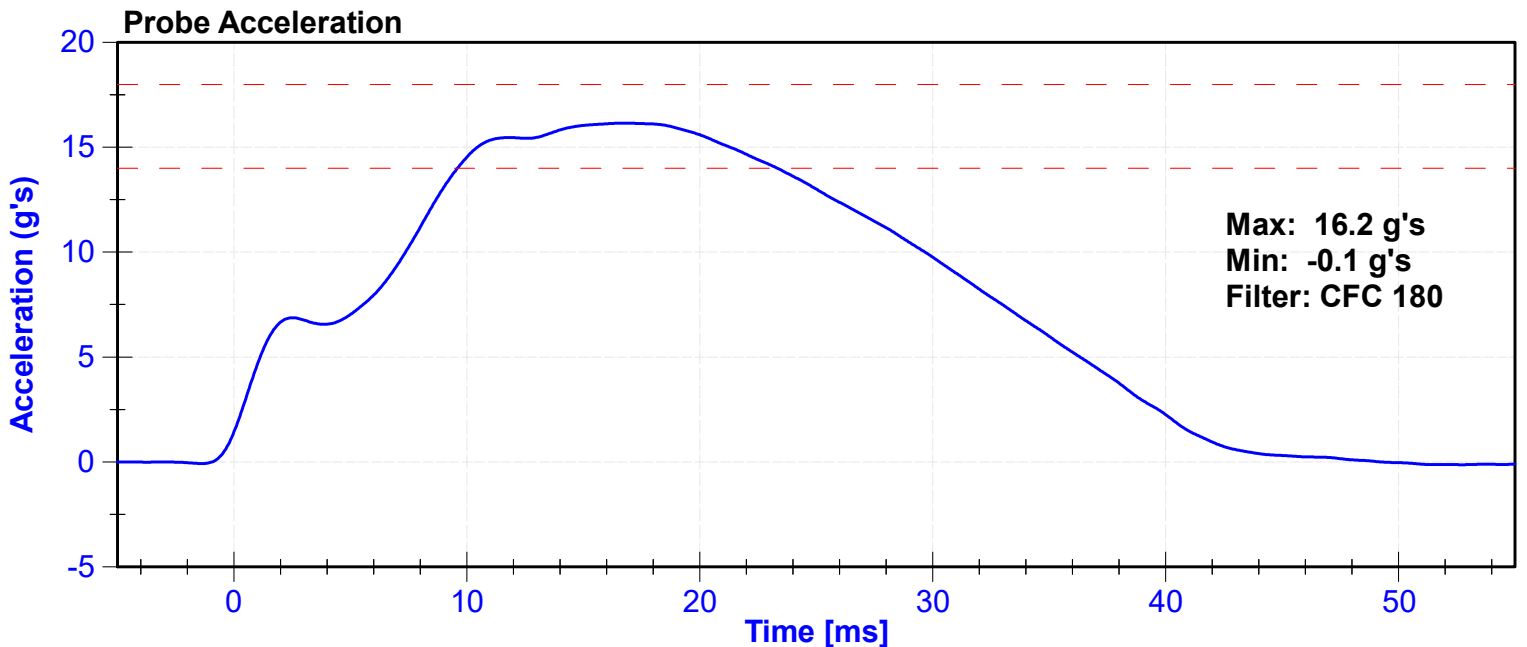
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

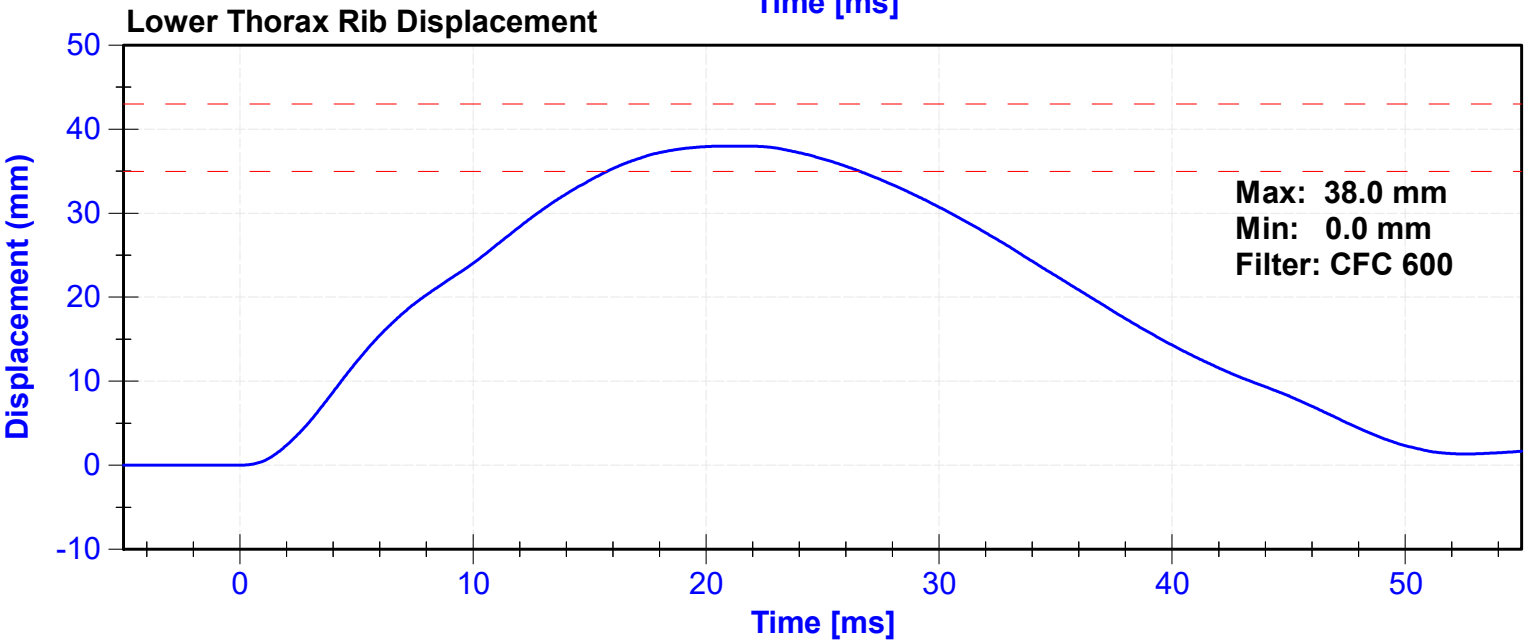
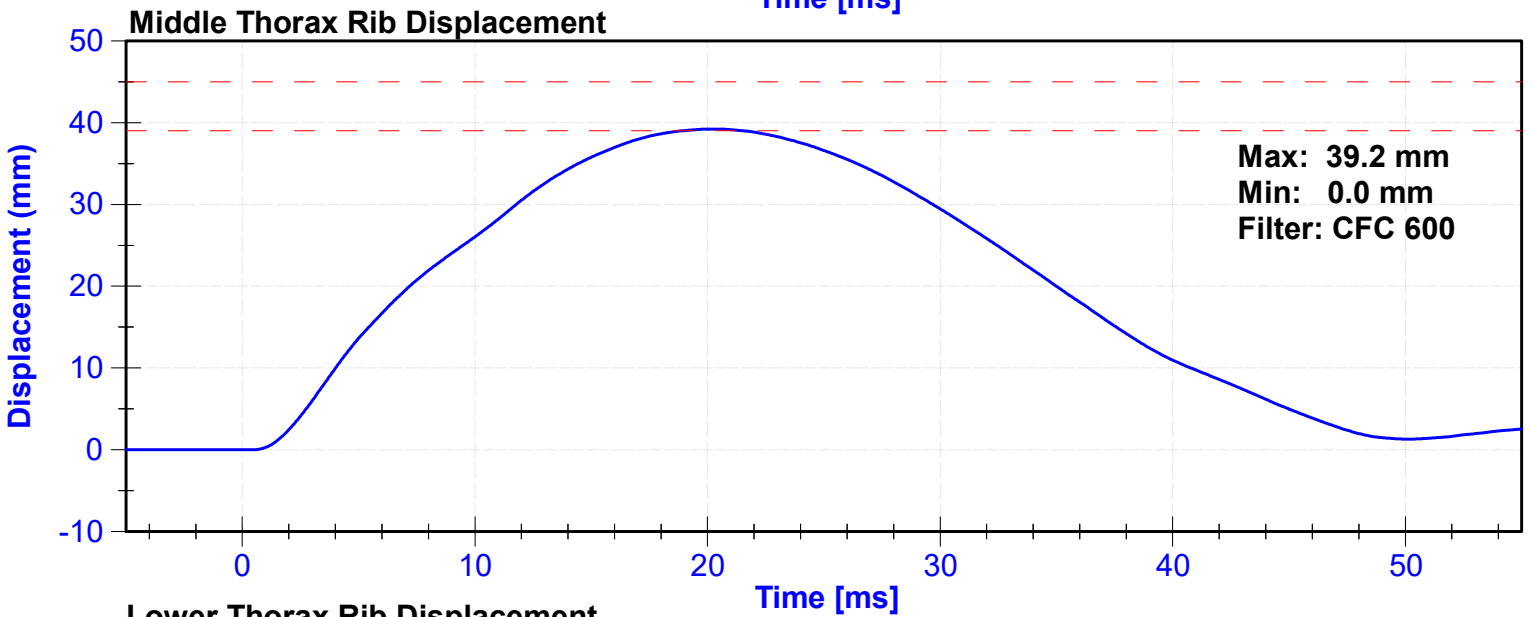
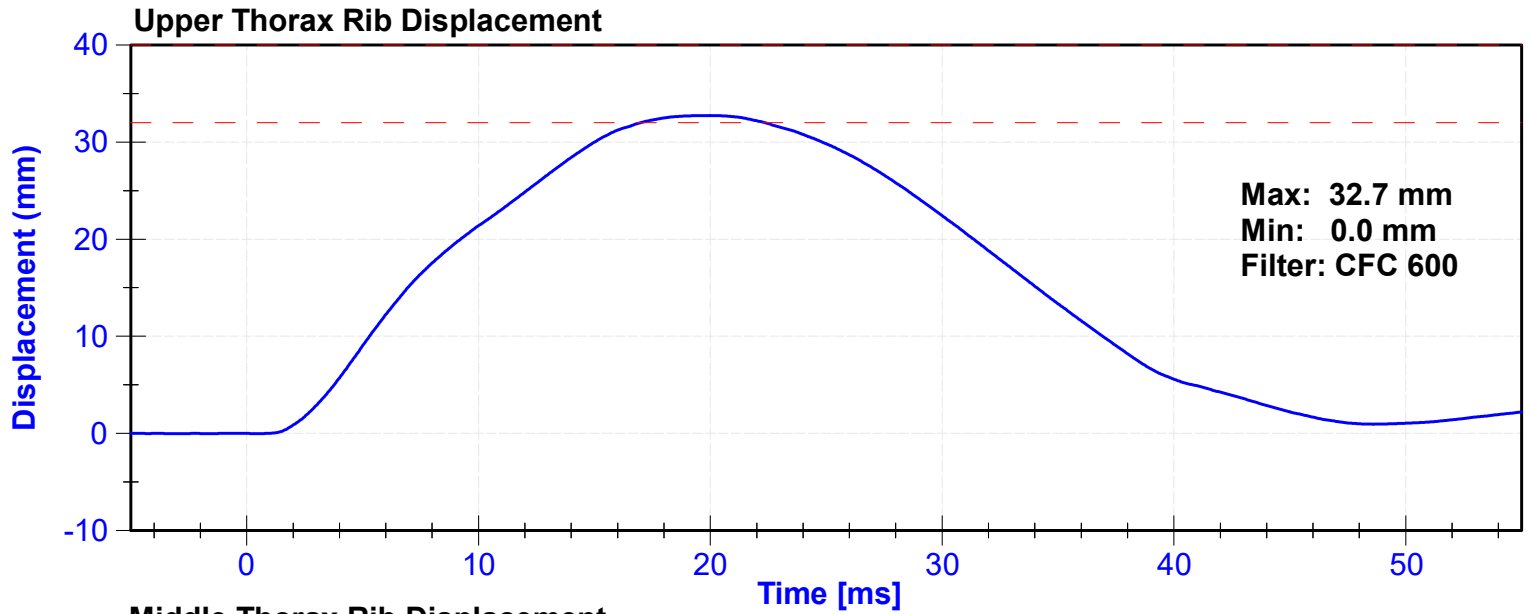
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	14	18	g's	16.2	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.3	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.3	Pass
Upper Thorax Rib Deflection	32	40	mm	32.7	Pass
Middle Thorax Rib Deflection	39	45	mm	39.2	Pass
Lower Thorax Rib Deflection	35	43	mm	38.0	Pass

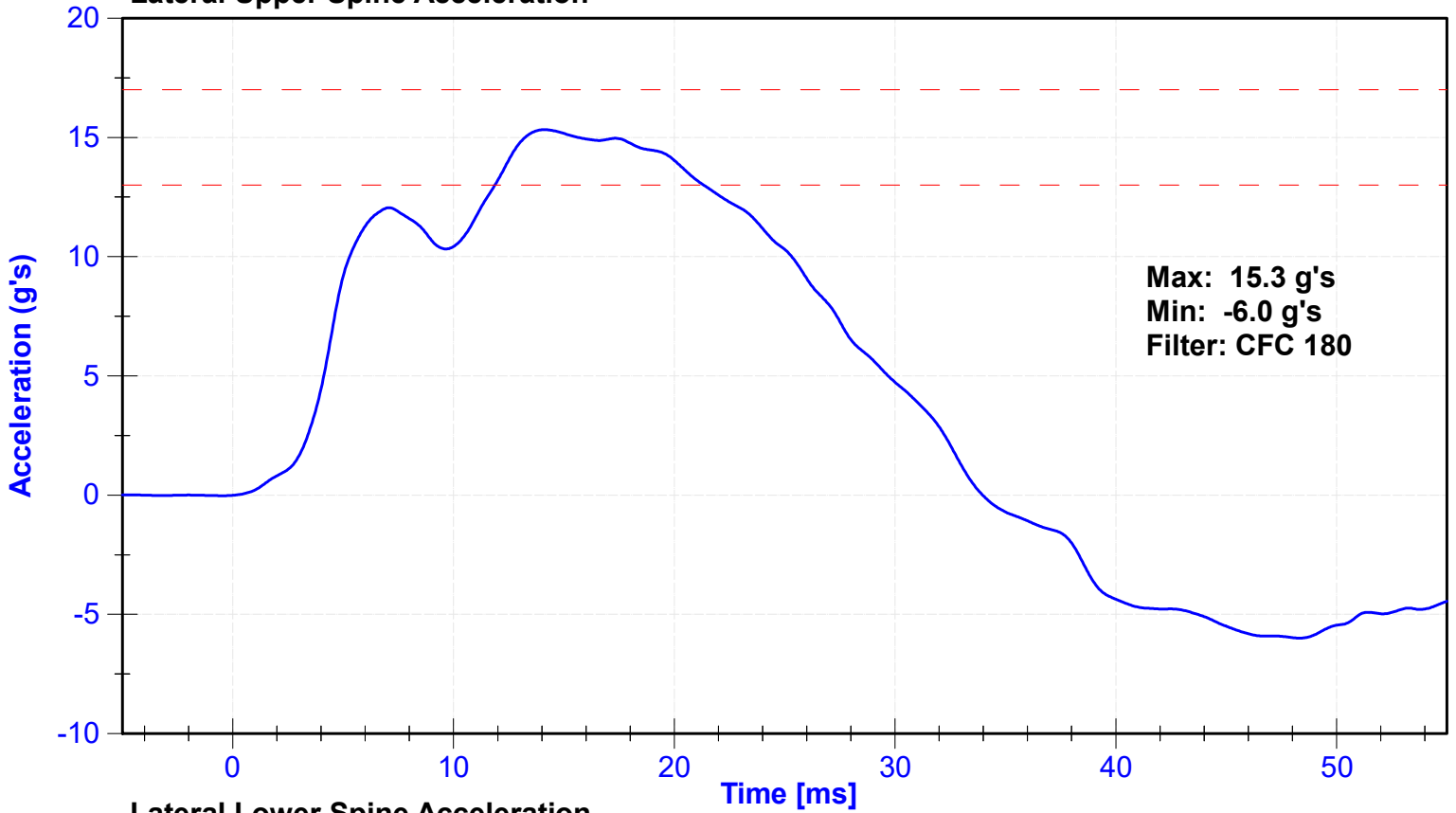
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Upper Spine Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025
Lower Spine Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Upper Thorax Rib Potentiometer	Servo	DS-049GFE	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Servo	080GFE	10/9/2024	4/9/2025
Lower Thorax Rib Potentiometer	Servo	076GFE	10/8/2024	4/8/2025

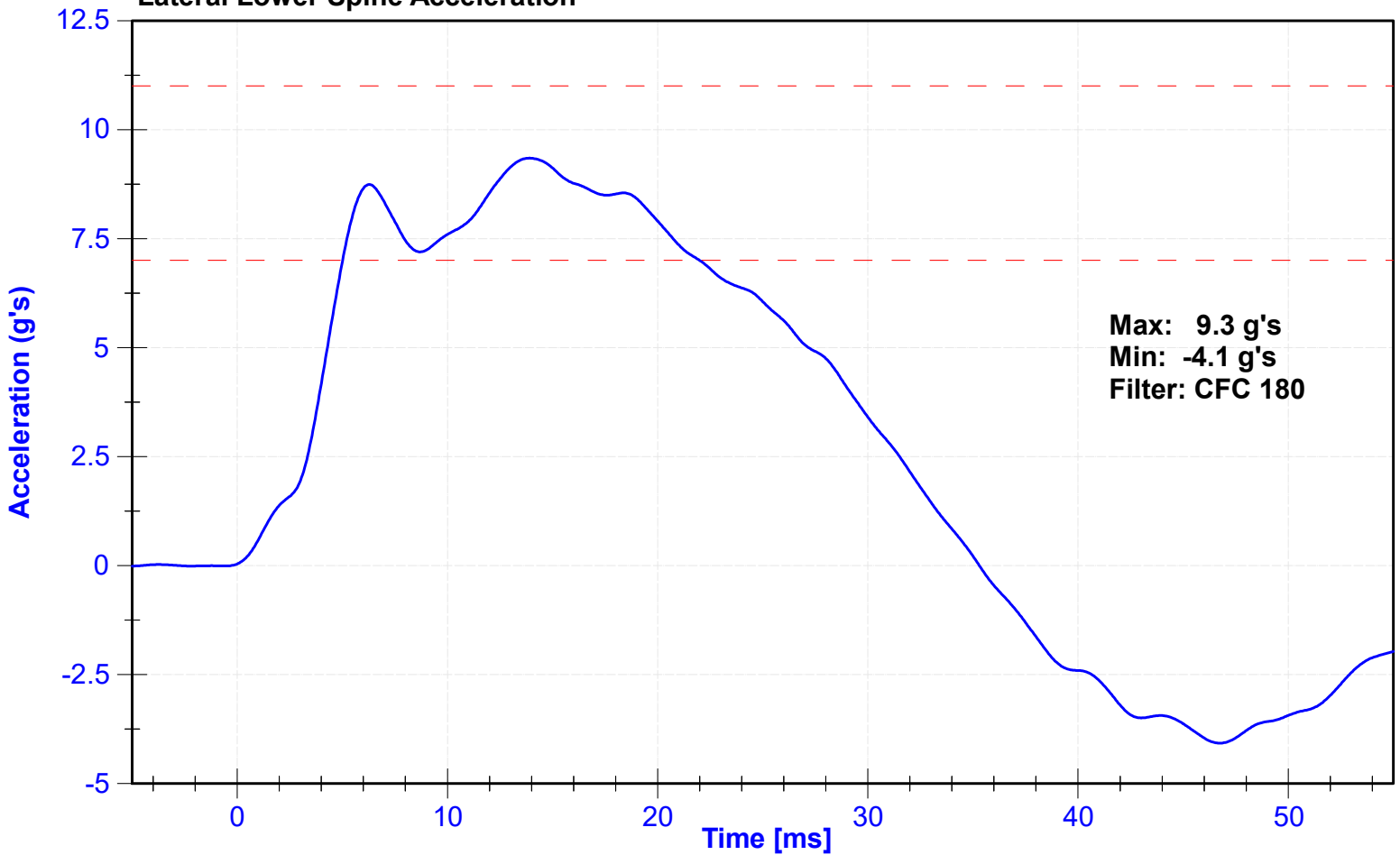




### Lateral Upper Spine Acceleration



### Lateral Lower Spine Acceleration



ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

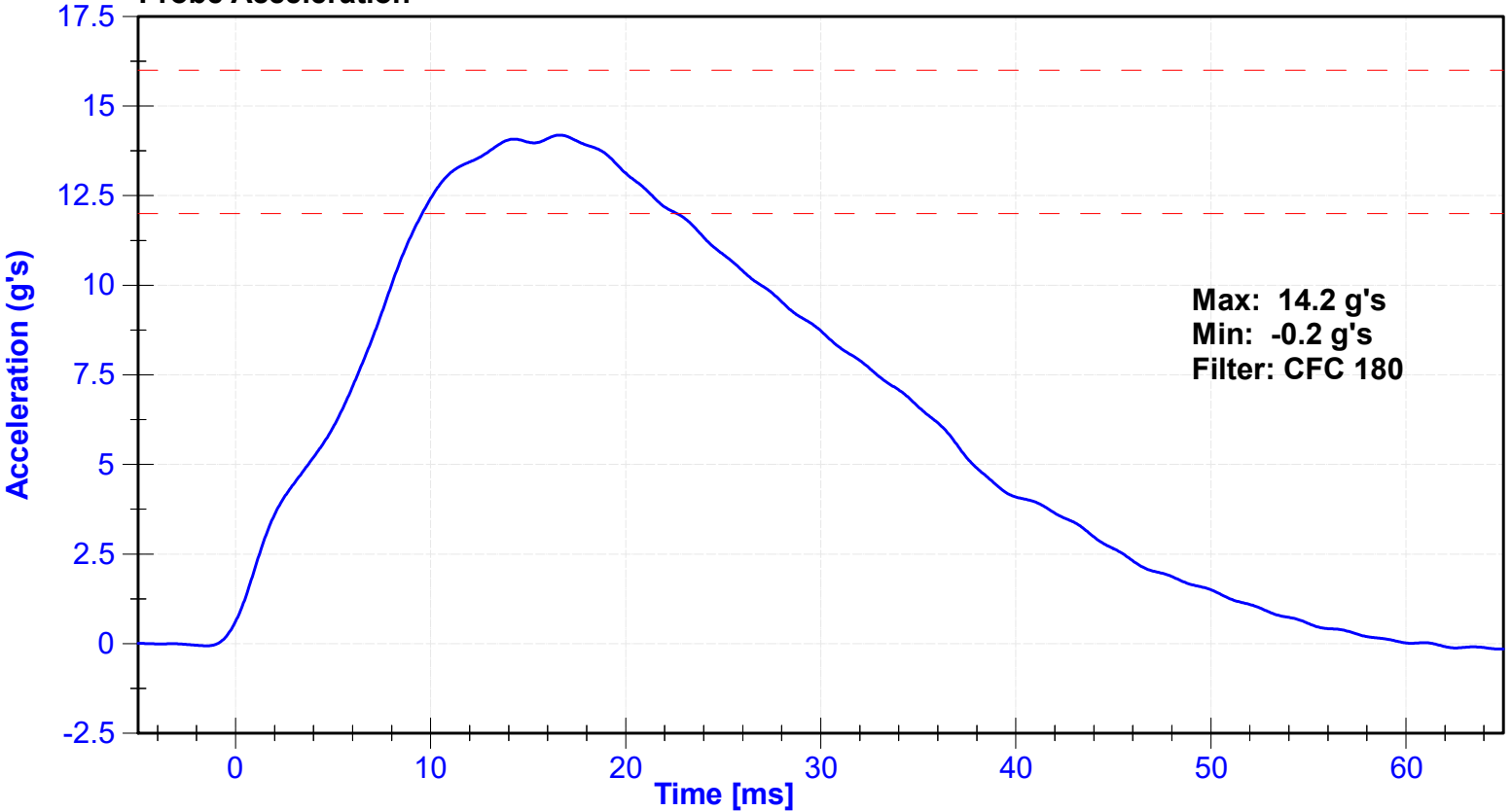
**Results**

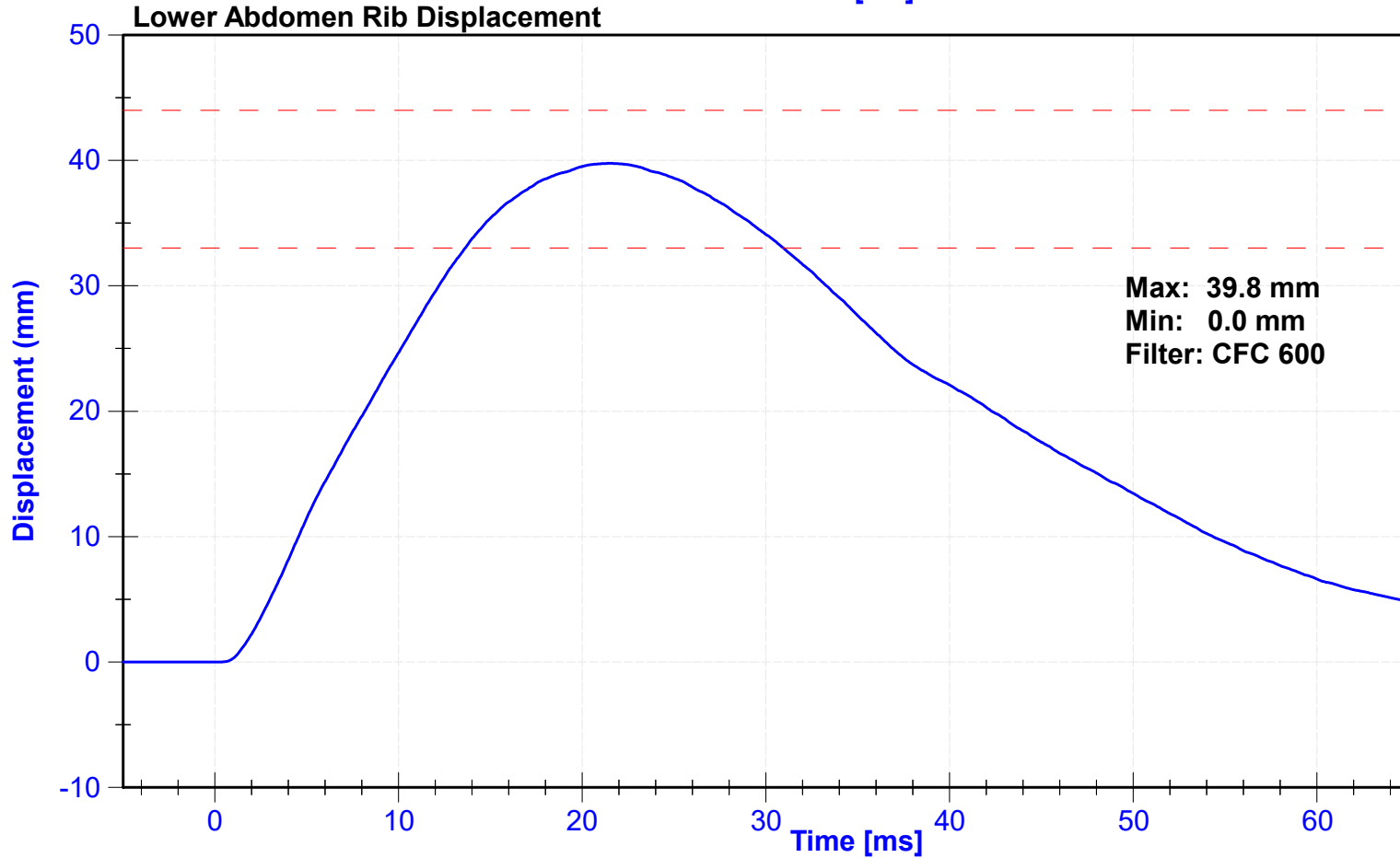
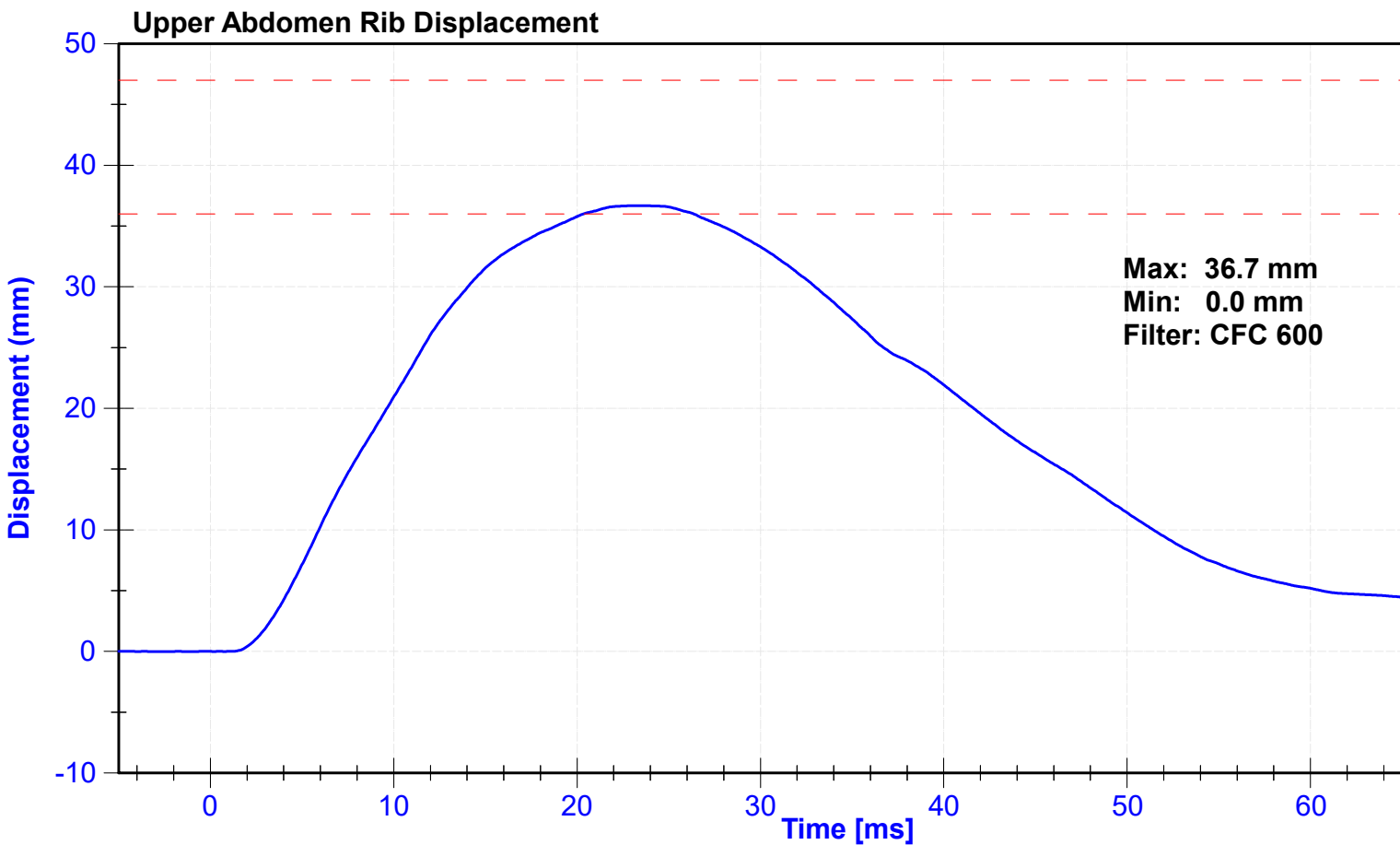
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	12	16	g's	14.2	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.3	Pass
Upper Abdomen Rib Deflection	36	47	mm	36.7	Pass
Lower Abdomen Rib Deflection	33	44	mm	39.8	Pass

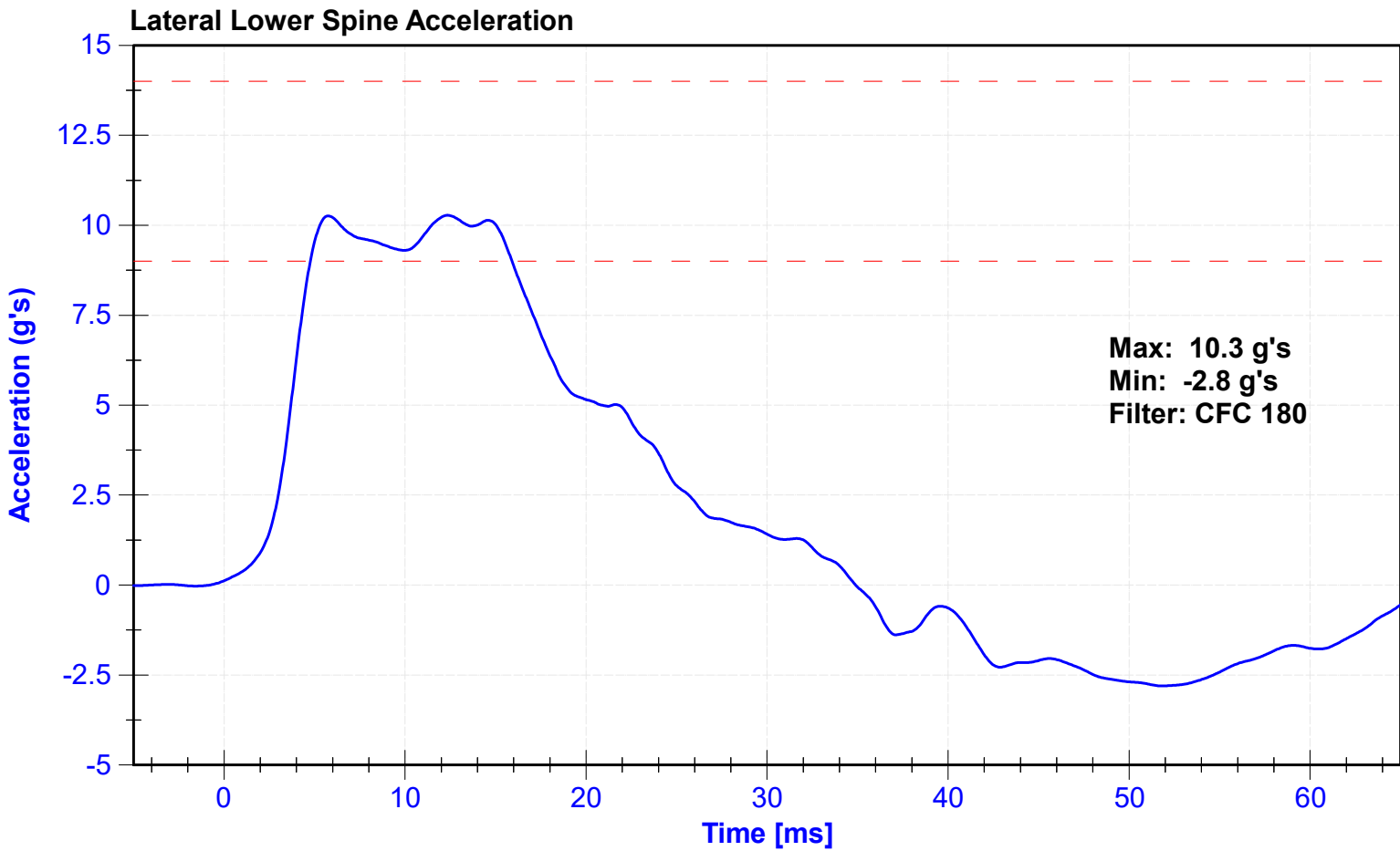
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Lower Spine Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Upper Abdomen Rib Potentiometer	Servo	DS-058GFE	10/8/2024	4/8/2025
Lower Abdomen Rib Potentiometer	Servo	1256GFE	10/8/2024	4/8/2025

**Probe Acceleration**







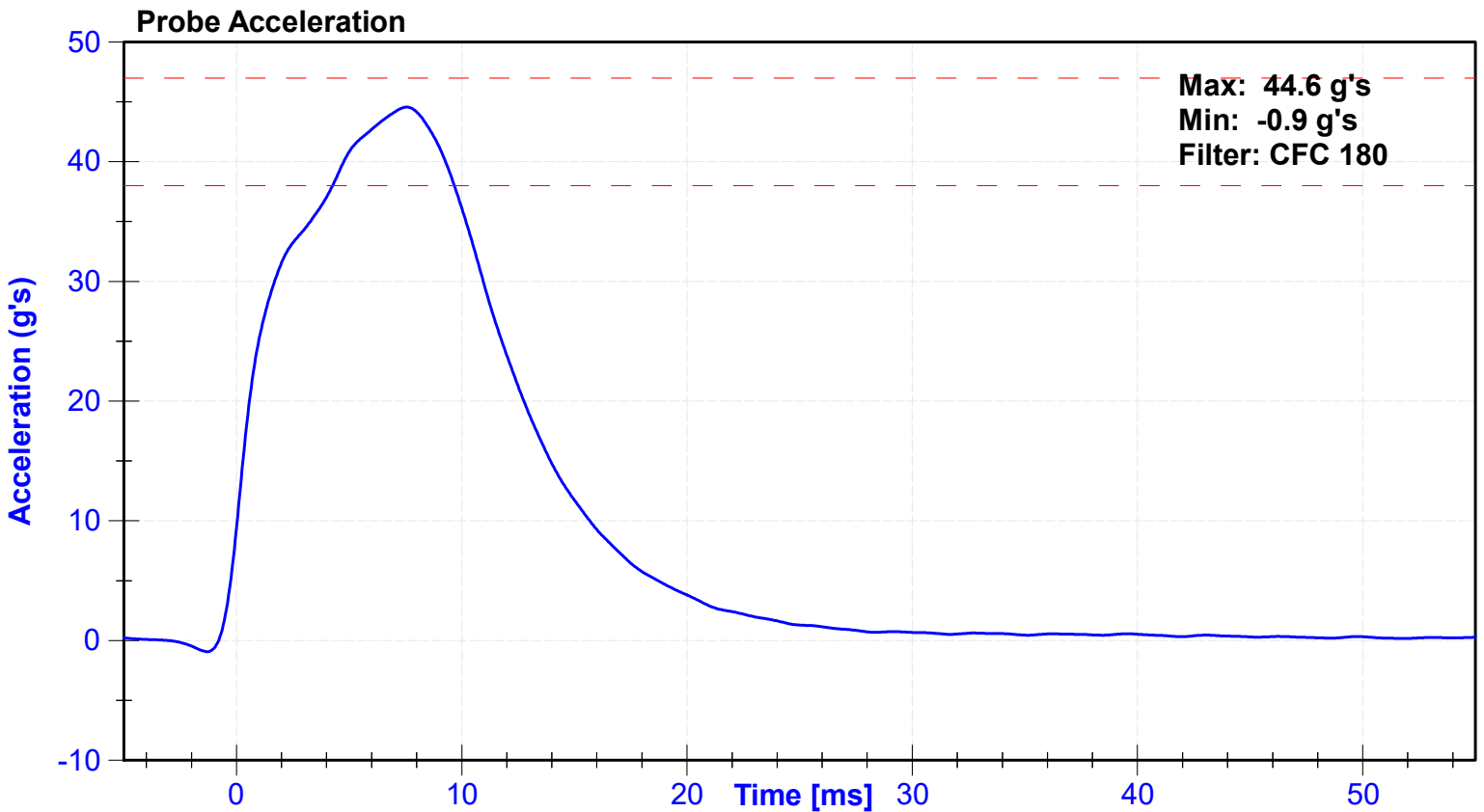
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

**Results**

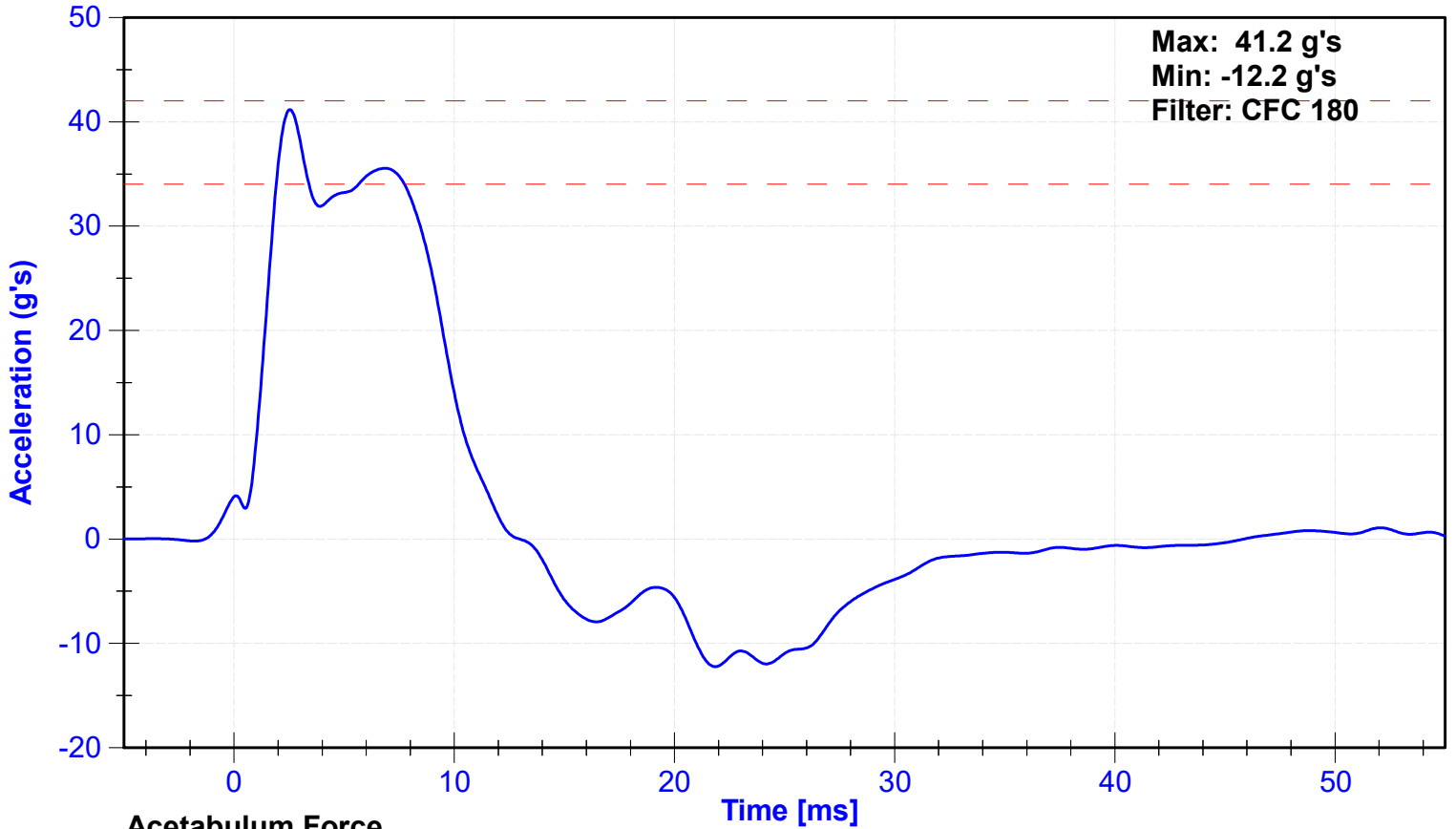
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	6.6	6.8	m/s	6.64	Pass
Probe Acceleration	38	47	g's	44.6	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	35.5	Pass
Acetabulum Force	3600	4300	N	4015.7	Pass

**Transducer Calibrations**

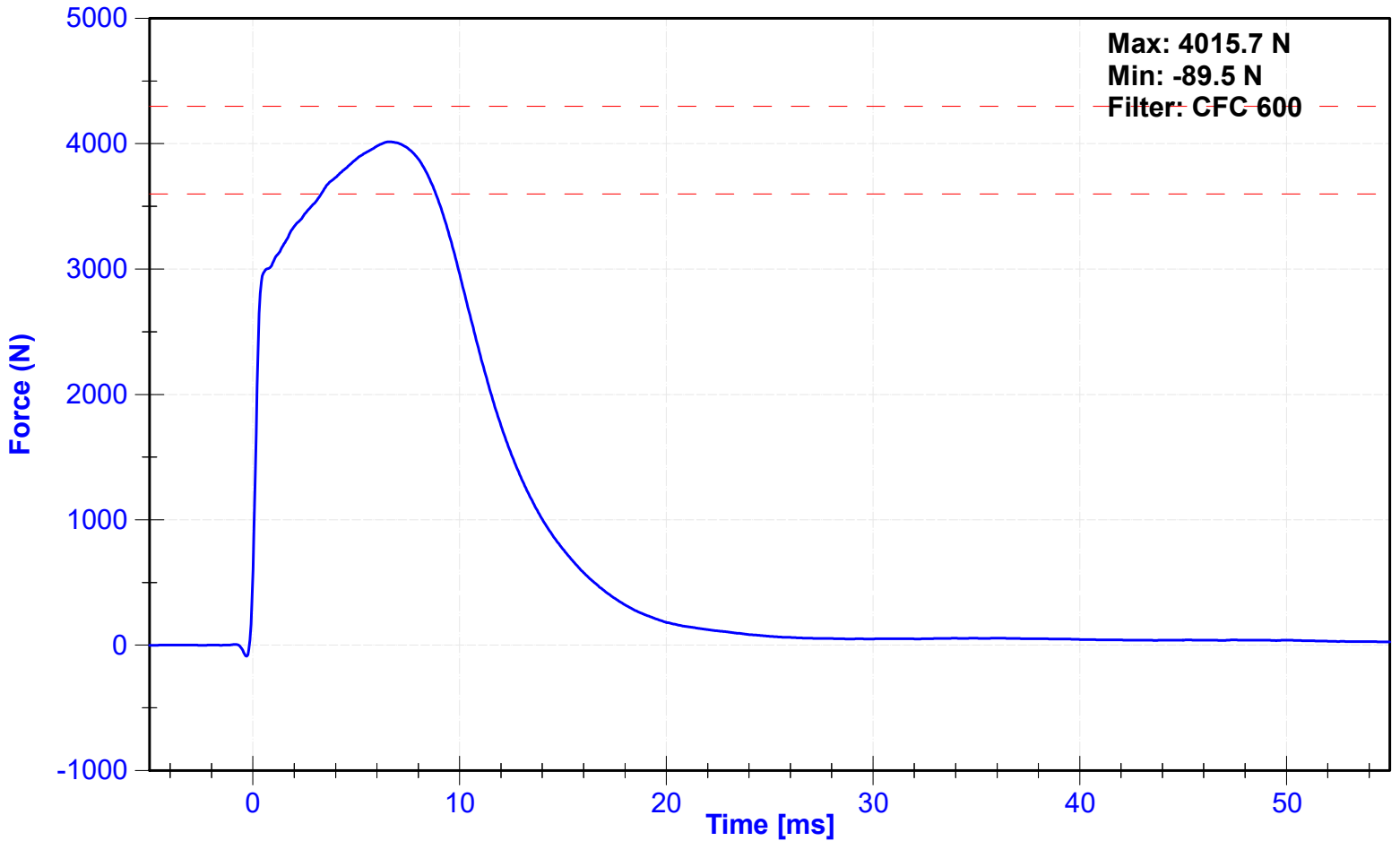
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Pelvis Y Accelerometer	Endevco	P63987	10/8/2024	4/6/2025
Acetabulum Load Cell	Denton	267-FY	9/16/2024	9/16/2025
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A



### Lateral Pelvis Acceleration



### Acetabulum Force





**SID-IIs Pelvis Plug Certification Test**

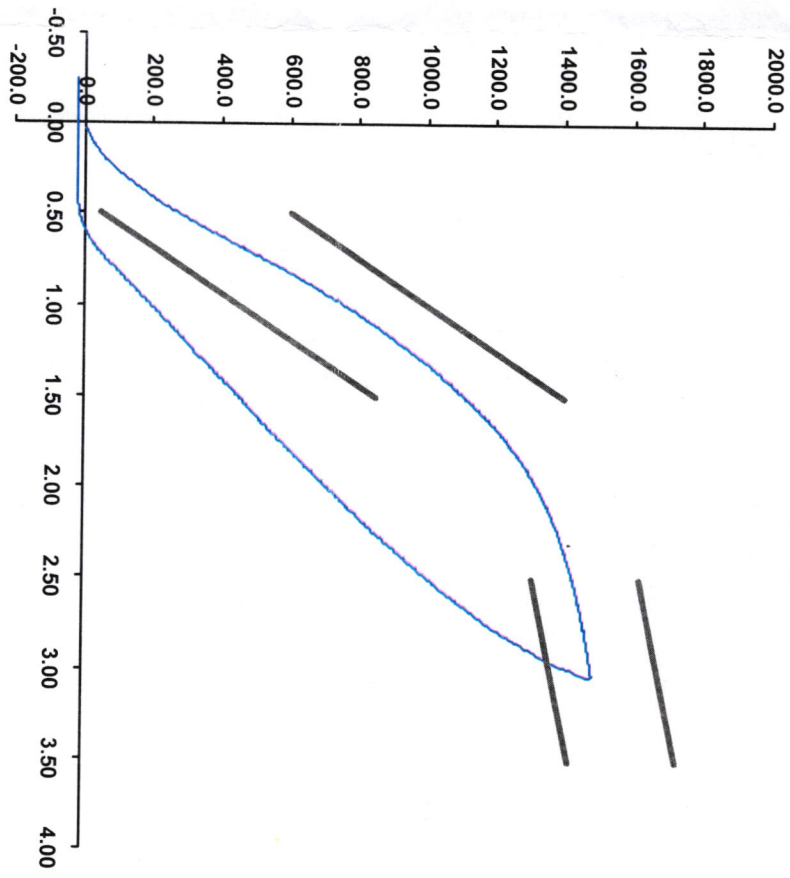
Plug S/N 16658  
 Test Number 23433  
 Report Number 23490  
 Test Date 7/21/2022 11:40:19 AM

CENT 10/23/24

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

Testing Machine STM-20 5965542  
 Load Cell S/N (F1360947), Units (LBS ) 1000  
 Crosshead Speed ( mm / min ) or Rate 12.7  
 Extension or Position Measured by XHD\_100 (XHD100)

Notes: 224



Force (-N) vs Extension (-mm)

Operator

Part Number 180-4450

Template No 107 21-Jul-22  
 SACO Research

By: DC Date: 7/21/22

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



Non Impact 10/23/24

### SID-IIs Pelvis Plug Certification Test

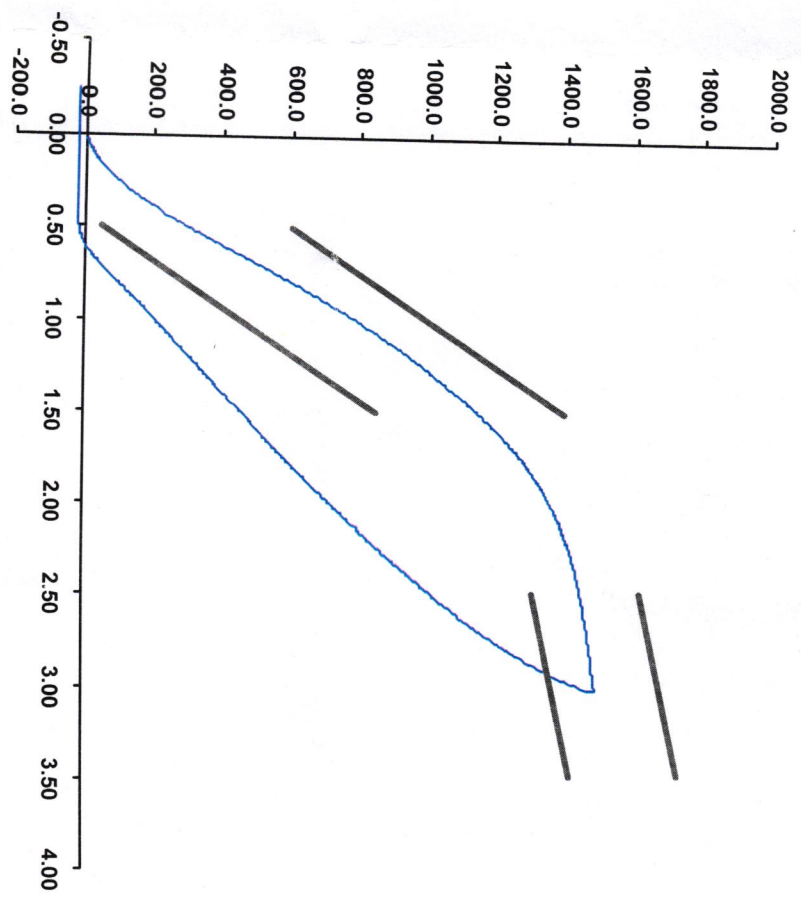
Plug S/N 16705  
Test Number 23505  
Report Number 23562  
Test Date 7/22/2022 11:28:58 AM

Force (-N) vs Extension (-mm)

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

Testing Machine STM-20 5965542  
 Load Cell S/N (F1360947), Units (LBS) 1000  
 Crosshead Speed (mm / min) or Rate 12.7  
 Extension or Position Measured by XHD\_100 (XHD100)

Notes: 224



Operator

Part Number 180-4450

Template No 107  
SACO Research 22-Jul-22

By: DC Date: 7/22/22

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



# SID-11s Pelvis Plug Certification Test

Plug S/N 16704  
Test Number 23504  
Report Number 23561  
Test Date 7/22/2022 11:27:45 AM

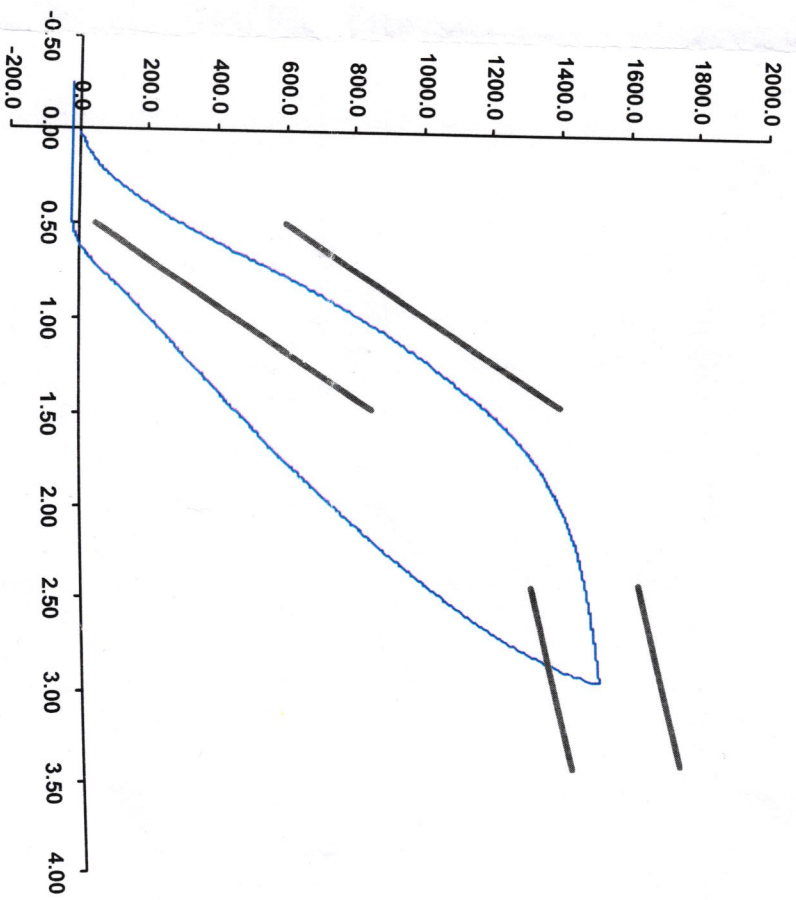
Impact 7/24/22

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

Testing Machine STM-20 5965542  
 Load Cell S/N (F1360947), Units (LBS) 1000  
 Crosshead Speed (mm / min ) or Rate 12.7  
 Extension or Position Measured by XHD\_100 (XHD100)

Notes: 224

Force (-N) vs Extension (-mm)



Operator  
Part Number 180-4450

Template No 107  
SACO Research 22-Jul-22

By: DC Date: 7/22/22

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

ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

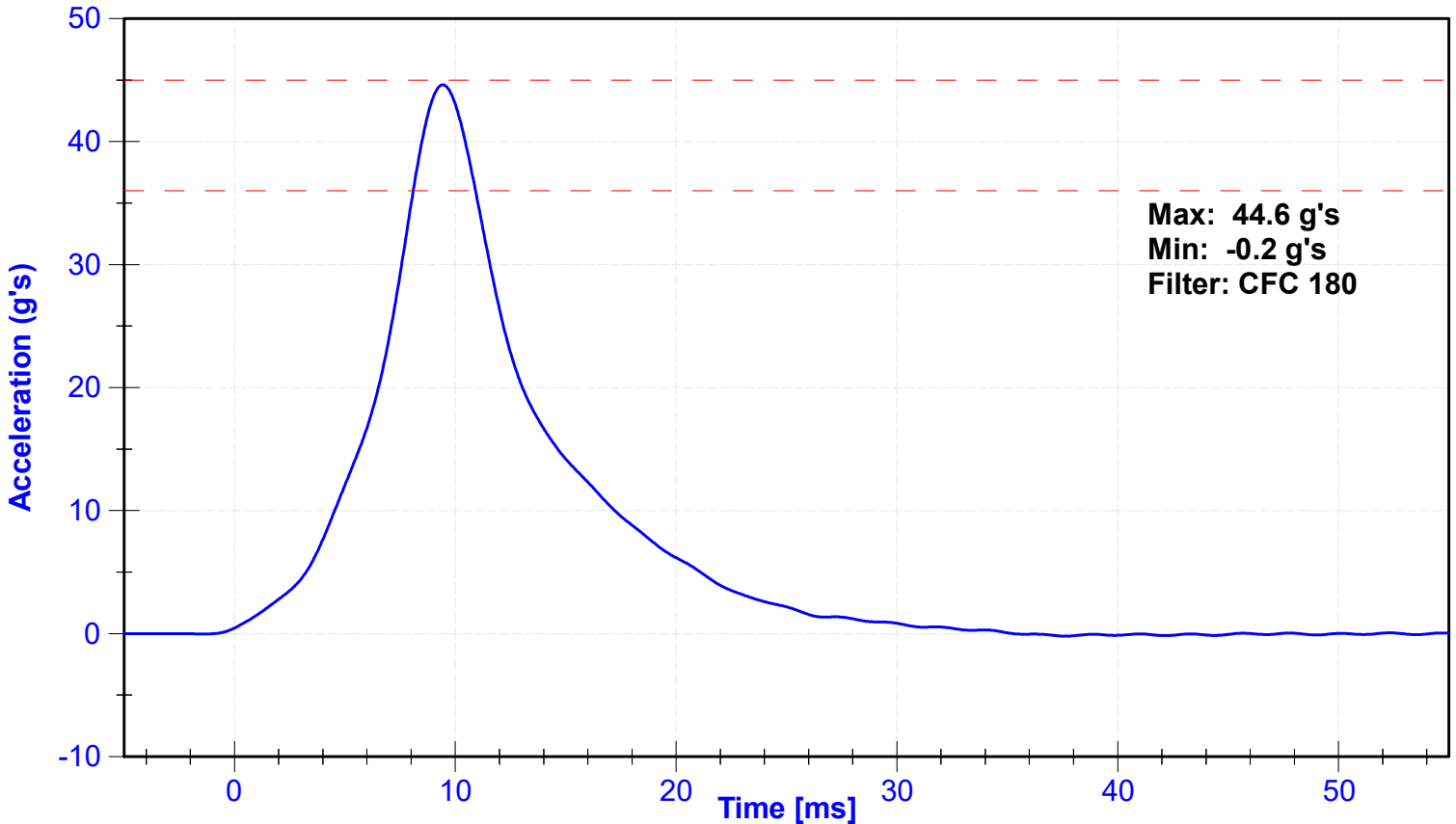
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	36	45	g's	44.6	Pass
Lateral Pelvis Acceleration	28	39	g's	35.4	Pass
Iliac Force	4100	5100	N	4853.0	Pass

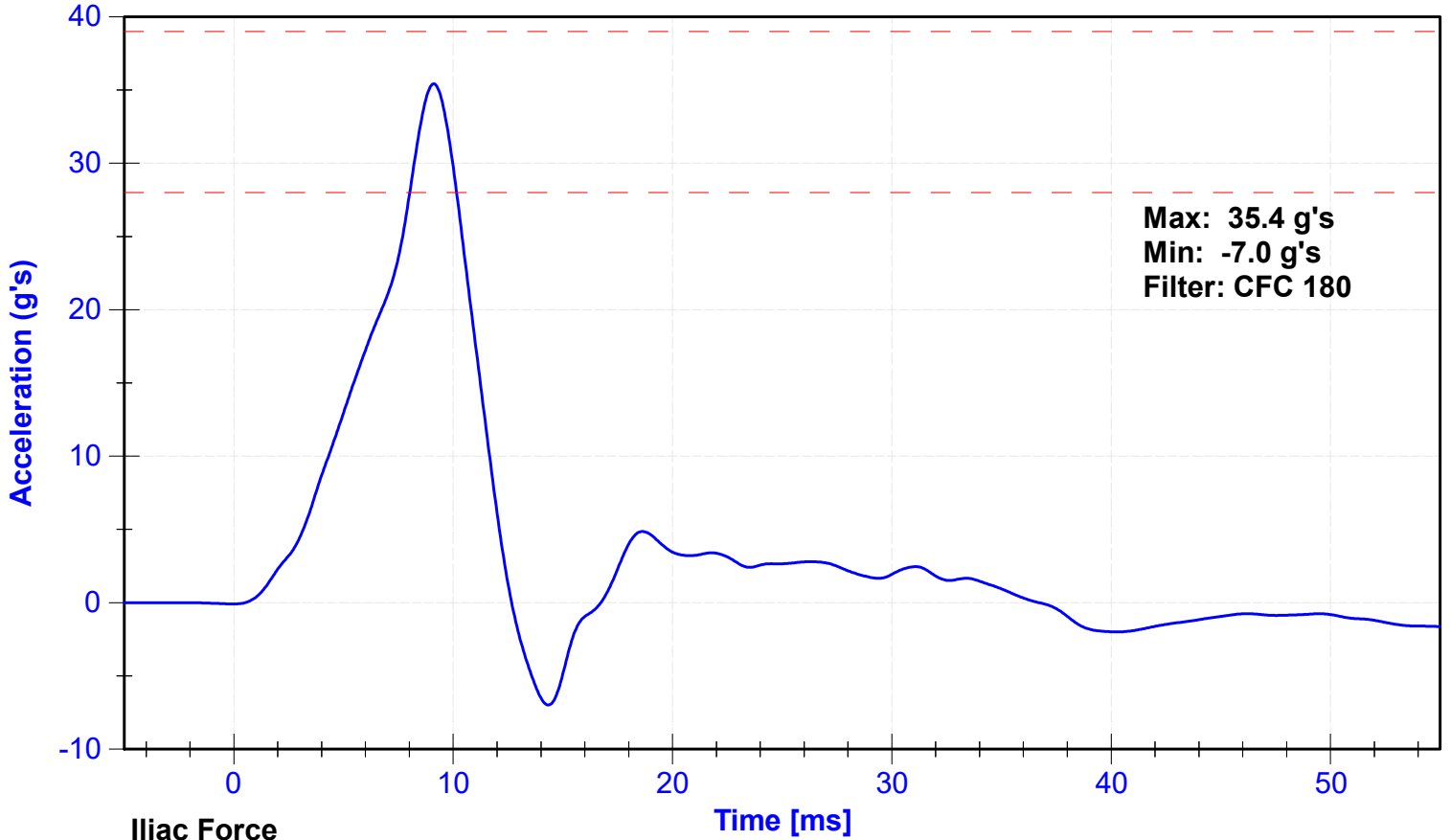
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Pelvis Y Accelerometer	Endevco	P63987	10/8/2024	4/6/2025
Iliac Load Cell	Denton	280-FY	9/16/2024	9/16/2025

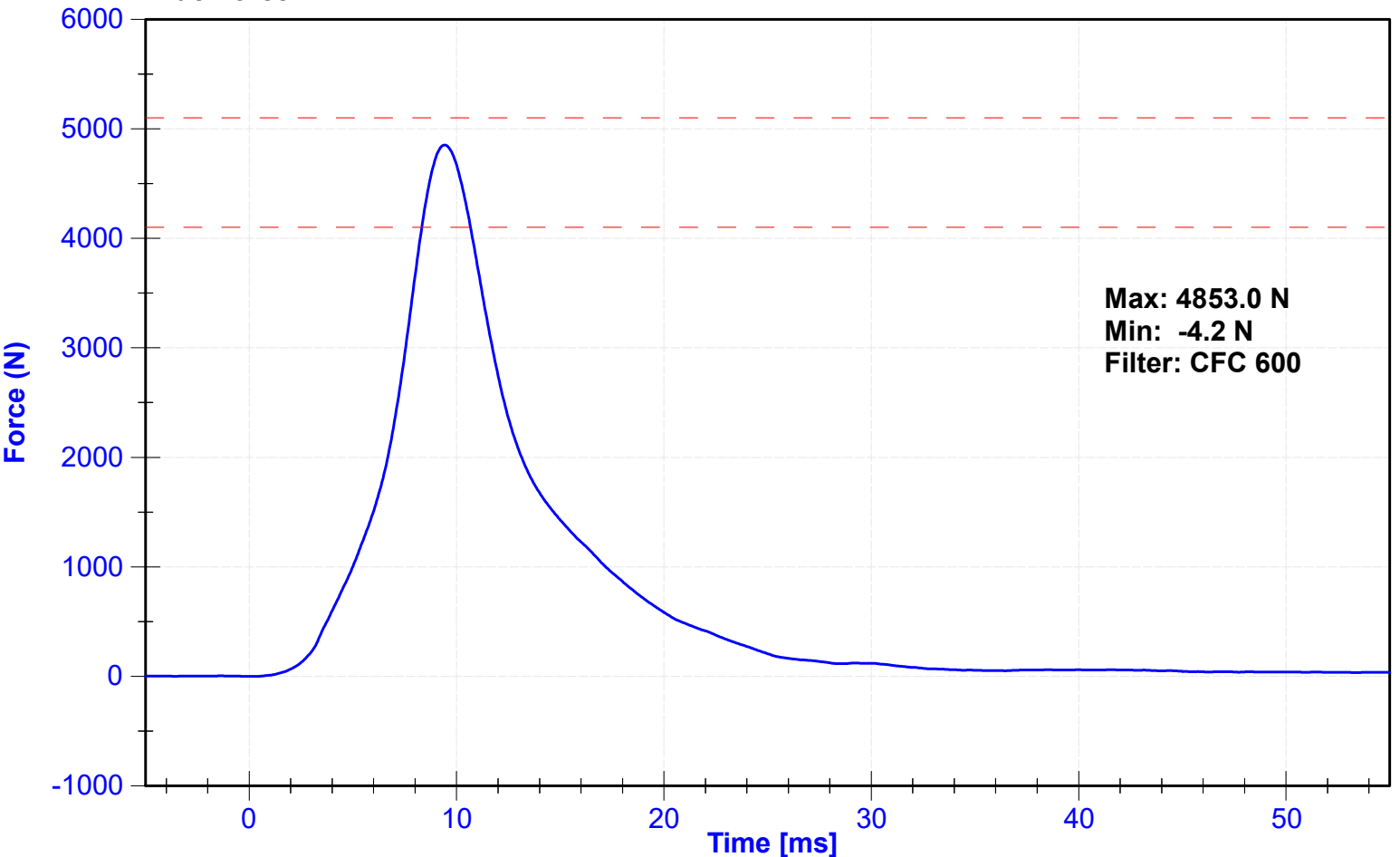
**Probe Acceleration**



### Lateral Pelvis Acceleration



### Iliac Force



**POST-TEST  
SID-IIs PERFORMANCE CALIBRATION TEST DATA**

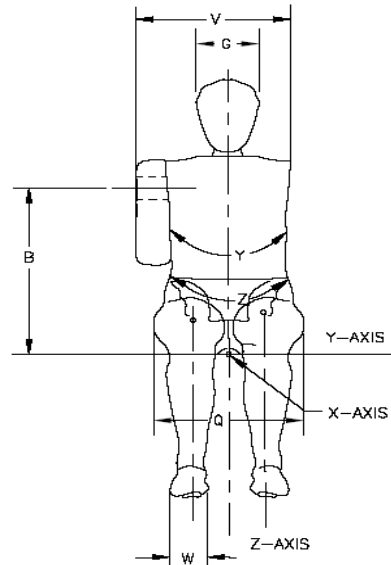
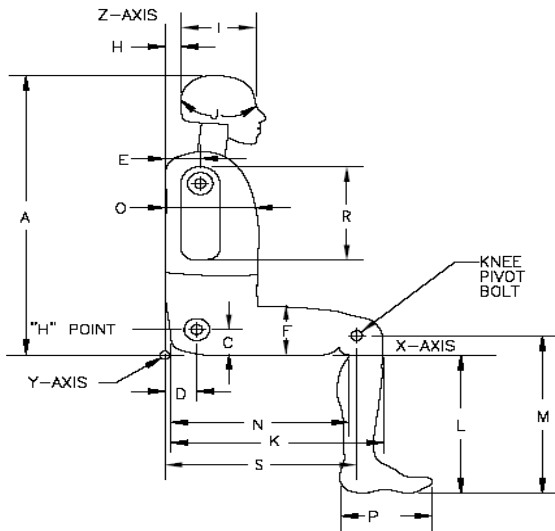


External Measurements - SID-IIs

Technician: J. Rios

Date: 12/06/2024

Dummy Serial Number: 224



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	781	Pass
B	Shoulder Pivot Height	437	453	448	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	98	Pass
F	Thigh Clearance	119	135	127	Pass
G	Head Breadth	140	148	142	Pass
H	Head Back from Backline	40	46	45	Pass
I	Head Depth	178	188	182	Pass
J	Head Circumference	541	551	544	Pass
K	Buttock to Knee Length	514	540	525	Pass
L	Popliteal Height	343	369	355	Pass
M	Knee Pivot to floor height	392	409	407	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	204	Pass
P	Foot Length	216	232	222	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	321	Pass
R	Arm Length	249	259	253	Pass
S	Knee Joint to seatback	477	493	484	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	84	Pass
Y	Chest Circumference w/jacket	851	881	874	Pass
Z	Waist Circumference	761	791	773	Pass

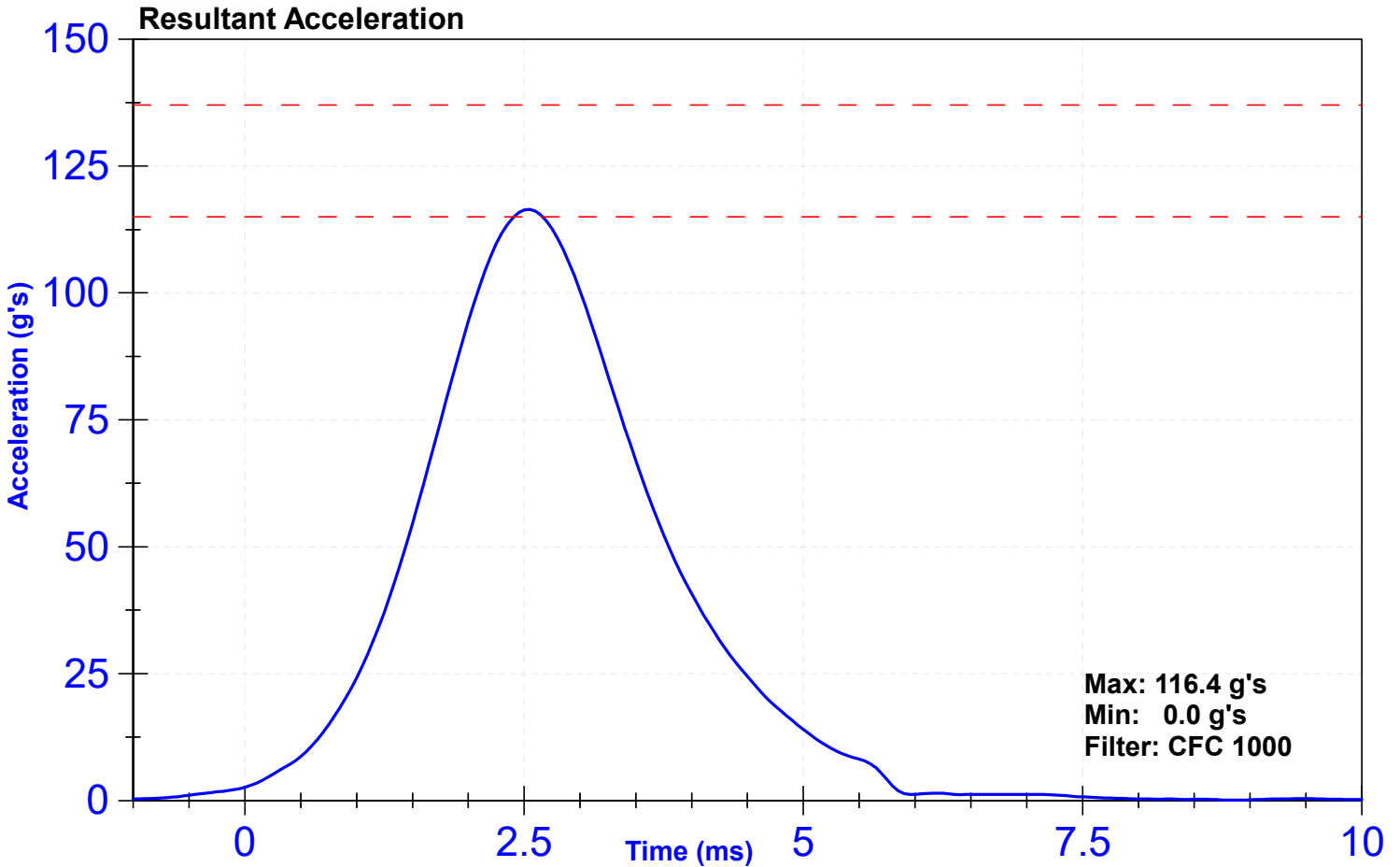
ATD Manufacturer	FTSS	Test Technician	E.Andruczyk
ATD Serial Number	224	Laboratory Supervisor	J.Kinderman

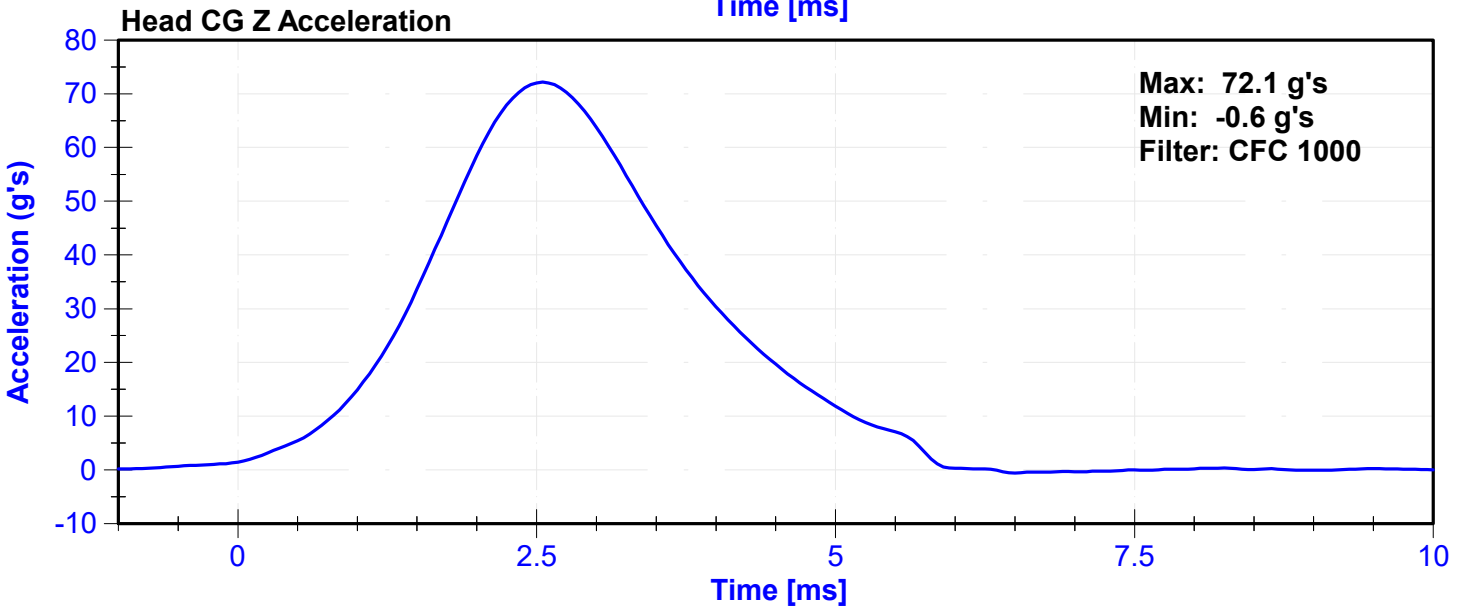
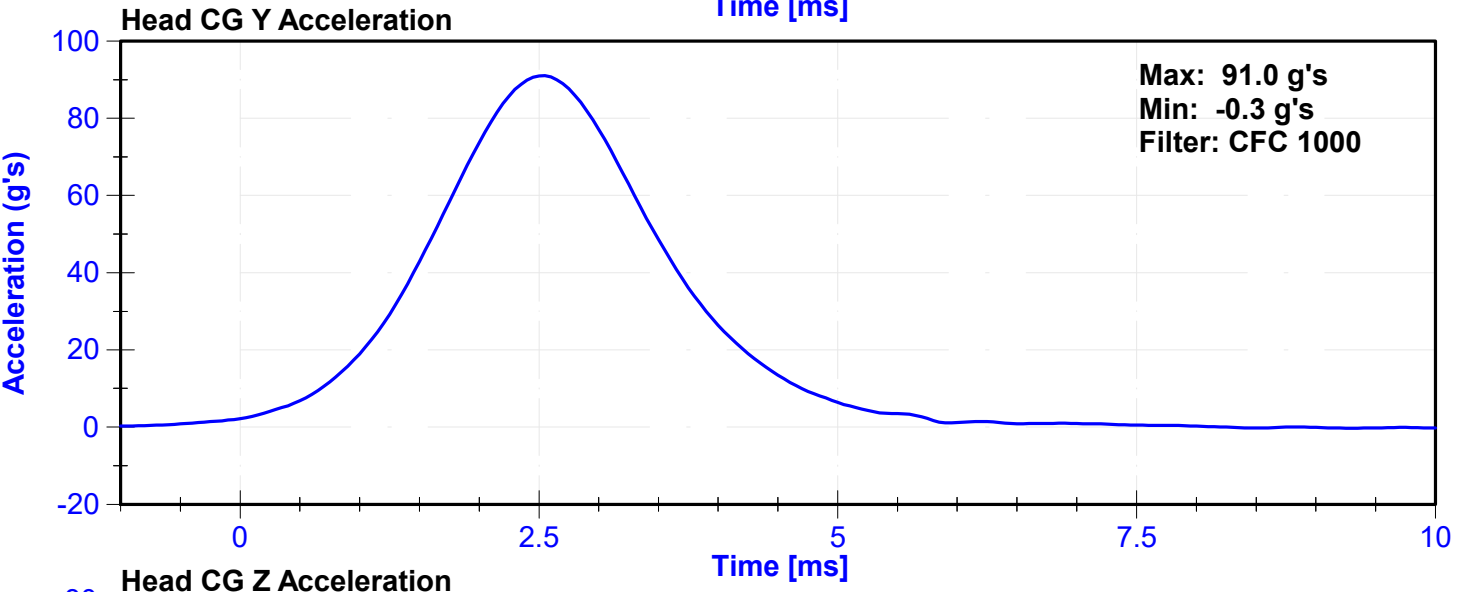
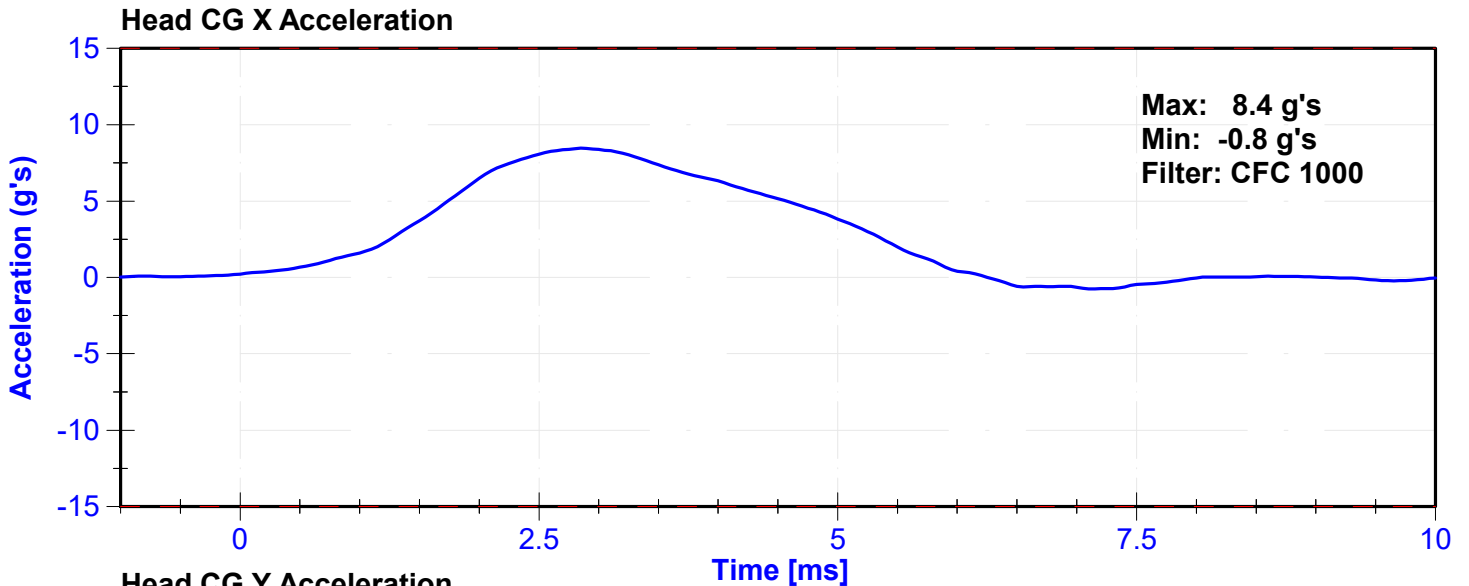
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	25	Pass
Resultant Acceleration	115	137	g's	116.4	Pass
Oscillation	0	15	%	1.2	Pass
Fore-Aft Acceleration	-15	15	g's	8.4	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P51884	10/8/2024	4/6/2025
Y Accelerometer	Endevco	P73161	10/8/2024	4/6/2025
Z Accelerometer	Endevco	P79588	10/8/2024	4/6/2025





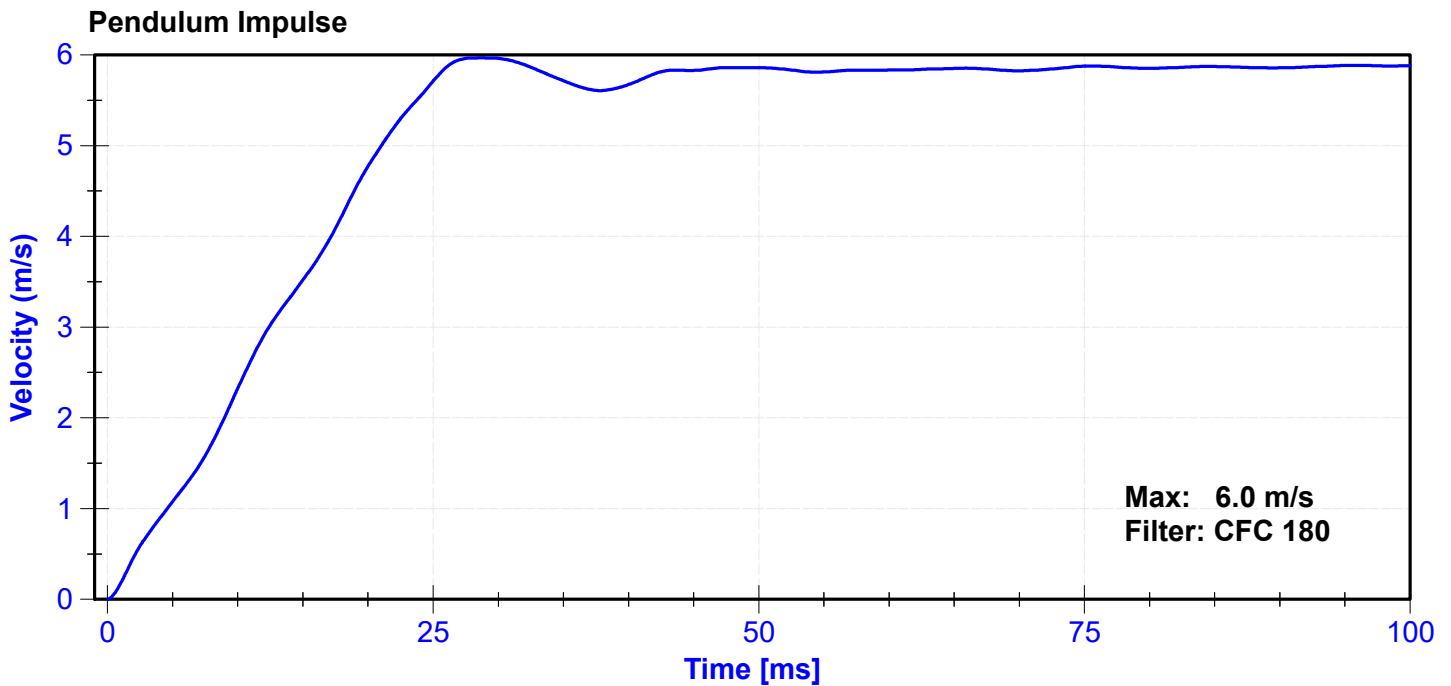
ATD Manufacturer	FTSS	Test Technician	E,Andruczyk
ATD Serial Number	224	Laboratory Supervisor	J. Kinderman

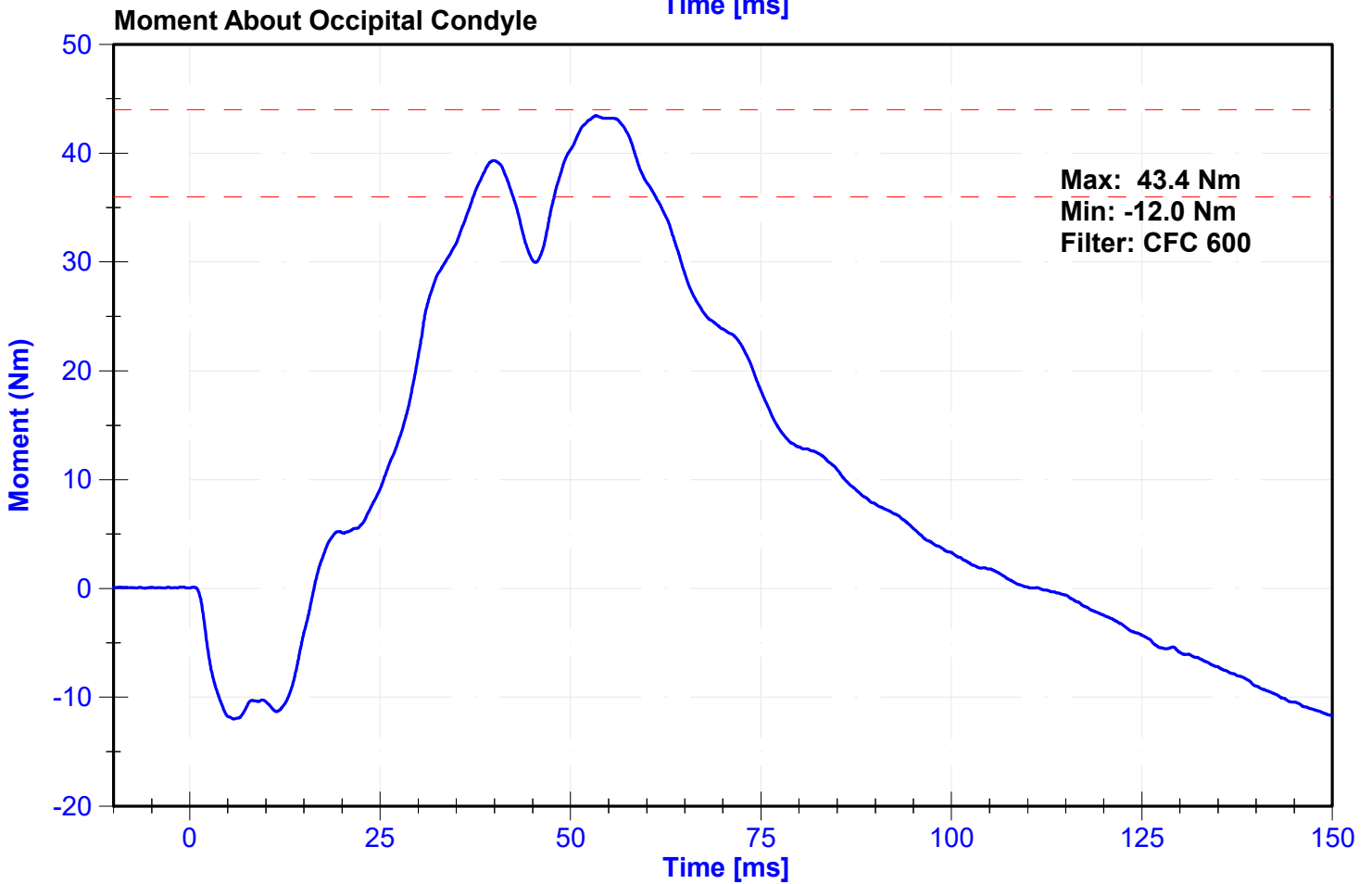
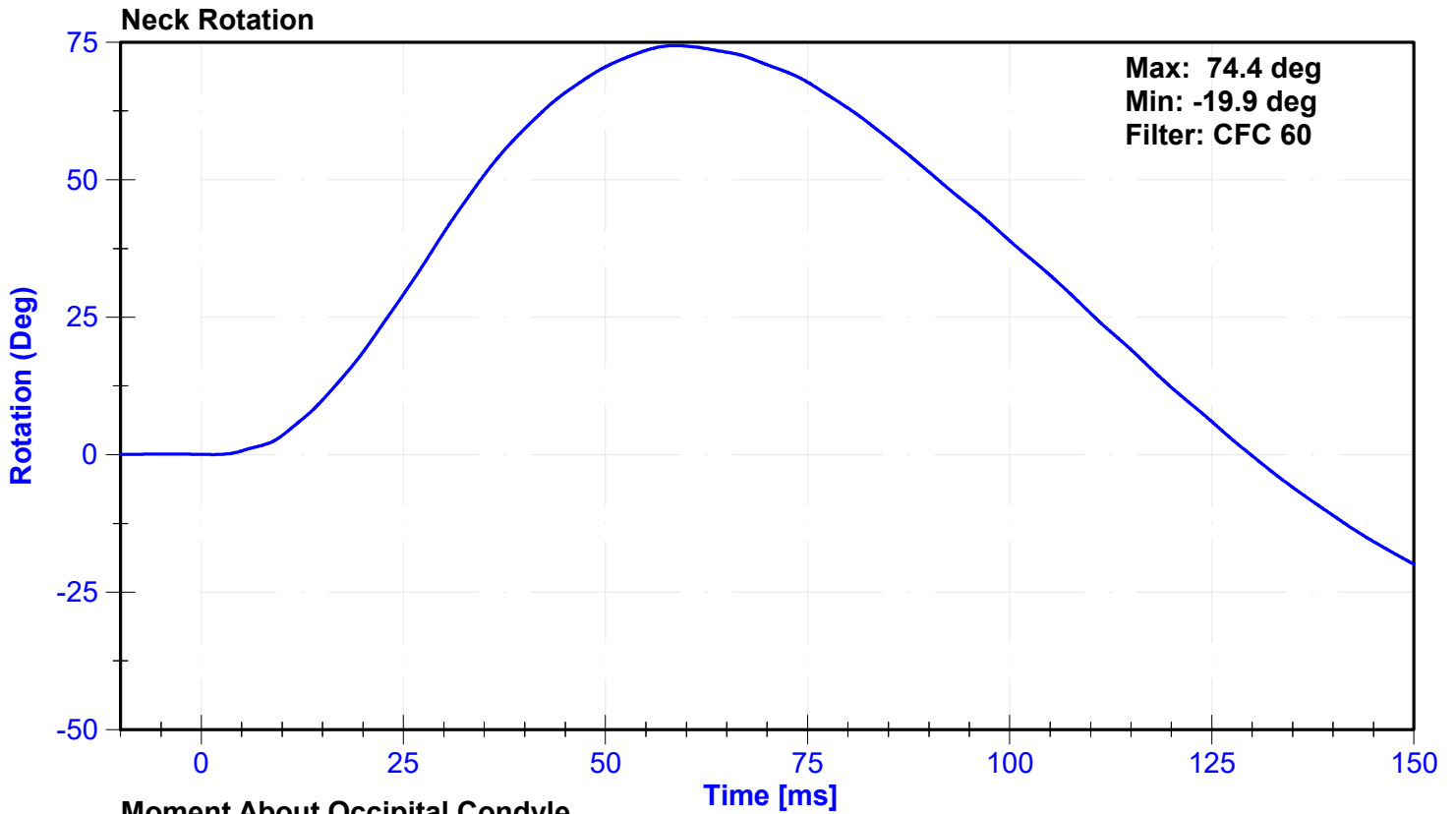
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	24	Pass
Velocity	5.51	5.63	m/s	5.597	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.33	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.52	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.77	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.71	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.97	Pass
Neck Rotation	71	81	deg	74.4	Pass
Time at Maximum Rotation	50	70	ms	58.6	Pass
Moment about the OC	36	44	Nm	43.4	Pass
Moment Decay to 0 Nm	102	126	ms	111.6	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	11/1/2024	11/1/2025
Pendulum Potentiometer	Servo	4961	9/23/2024	9/23/2025
Condyle Potentiometer	Servo	DS185	9/23/2024	9/23/2025
Upper Neck Load Cell	FTSS	IF-205_265-FY	9/26/2024	9/26/2025





ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	224	Laboratory Supervisor	J. Kinderman

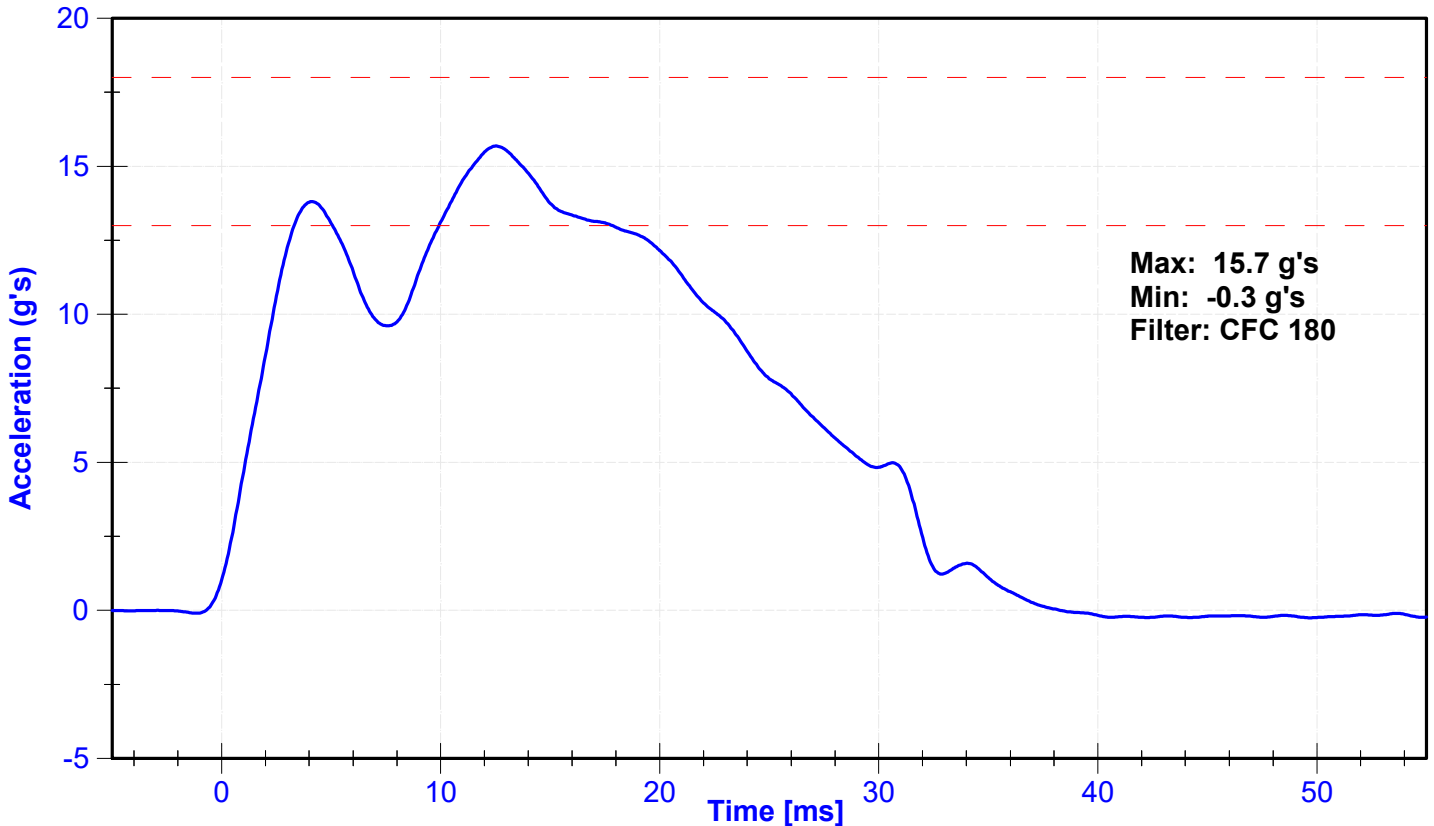
**Results**

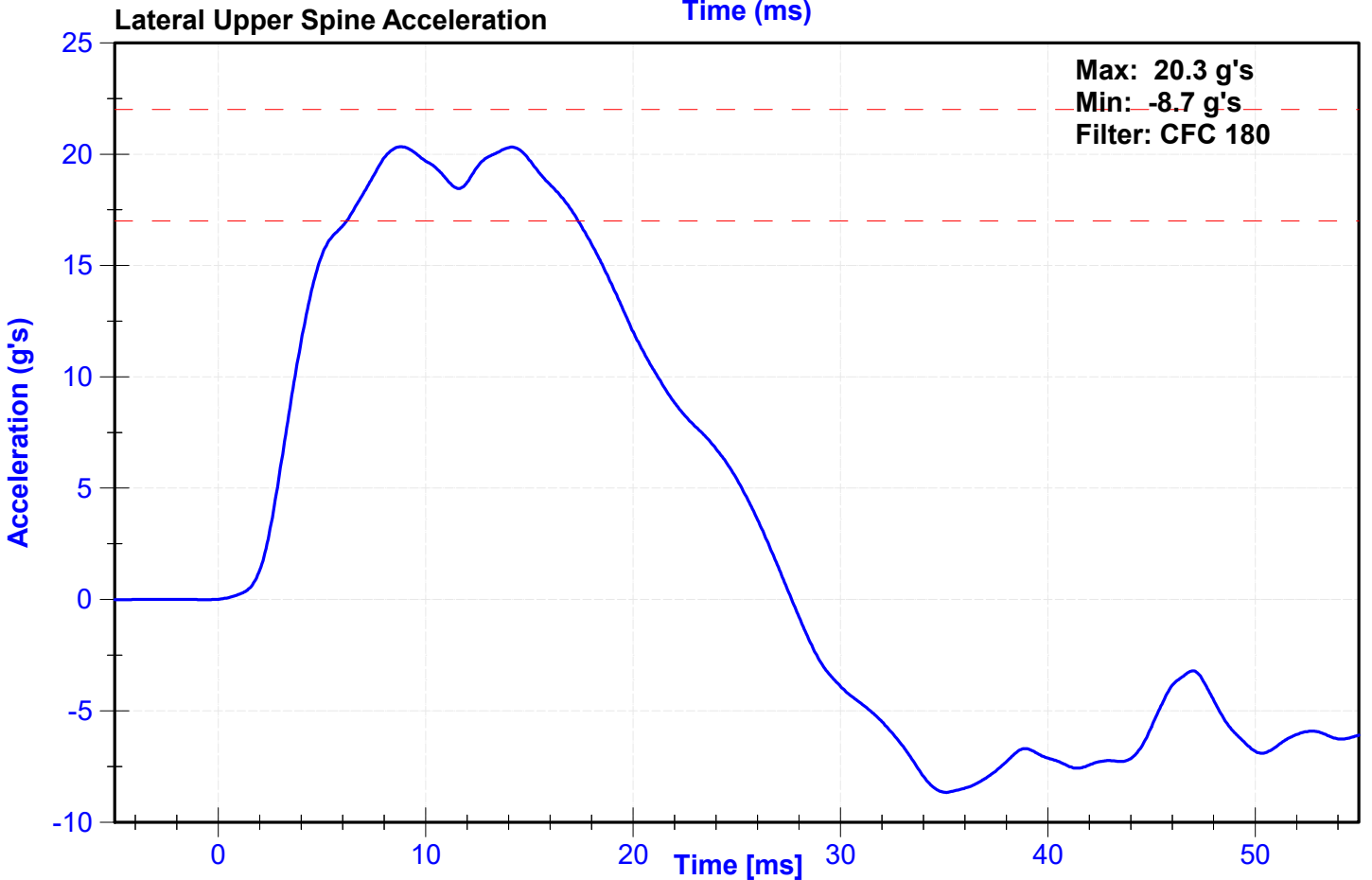
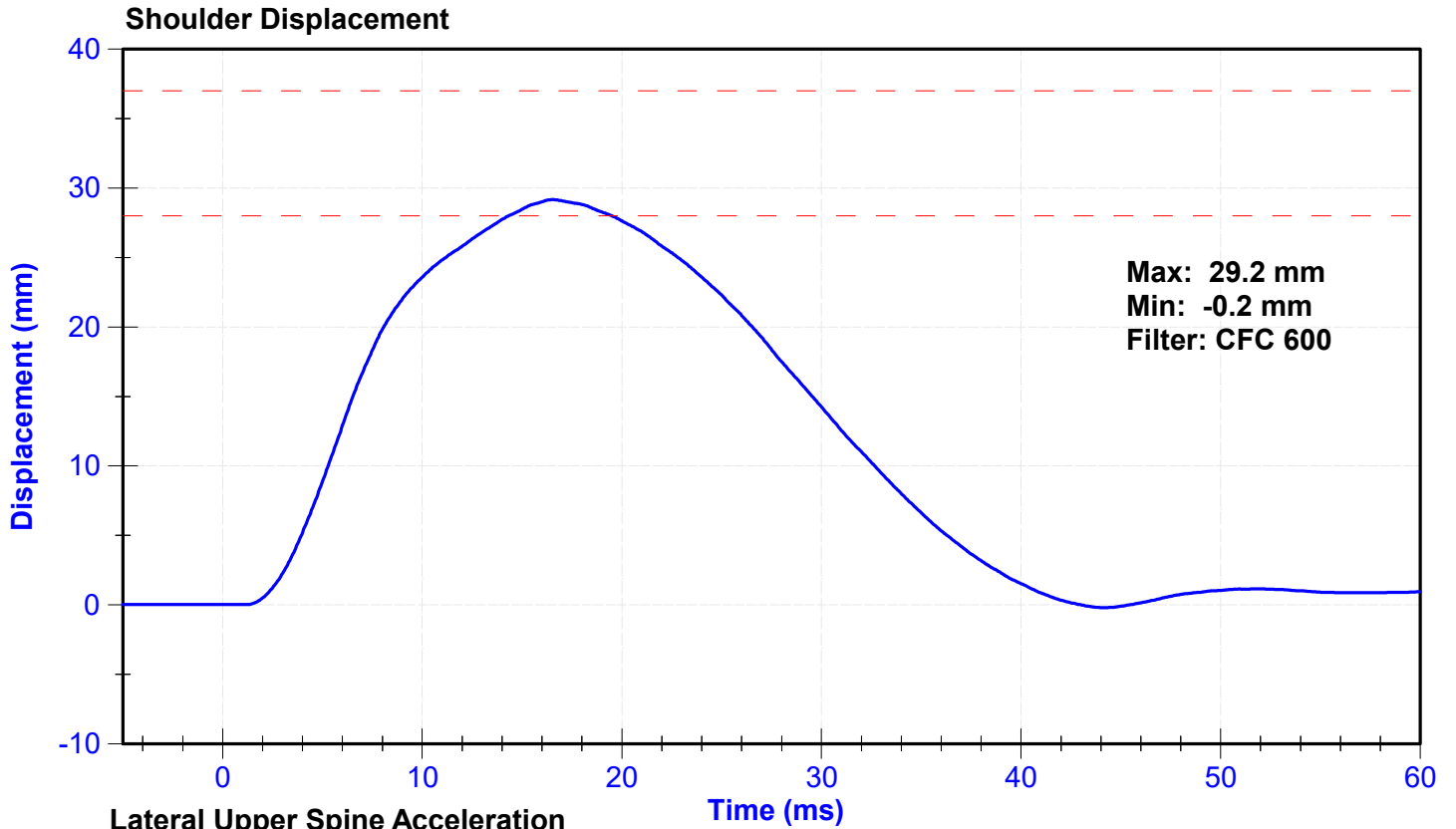
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	25	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	13	18	g's	15.7	Pass
Shoulder Deflection	28	37	mm	29.2	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.3	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Shoulder Potentiometer	Servo	829GFE	10/8/2024	4/8/2025
Upper Spine Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025

**Probe Acceleration**





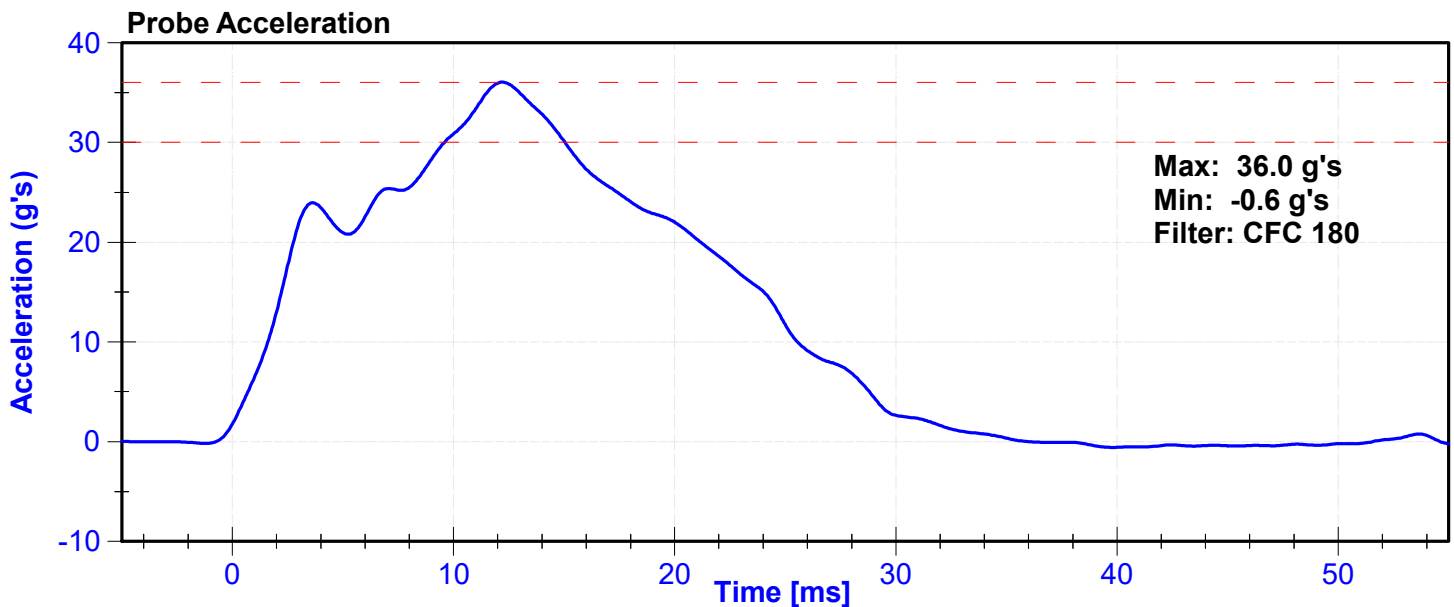
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	224	Laboratory Supervisor	J. Kinderman

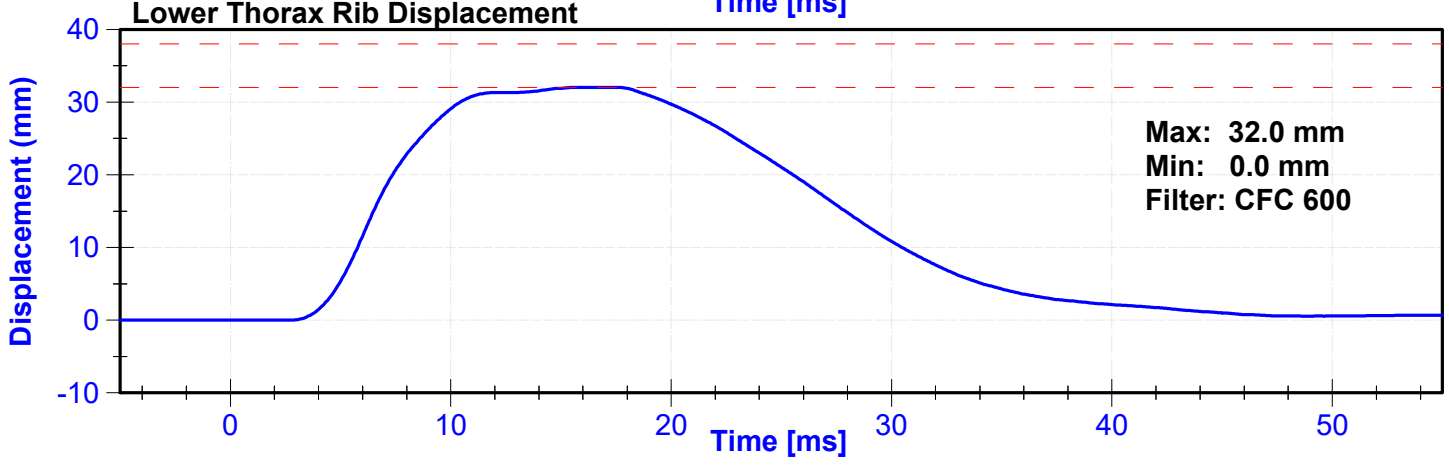
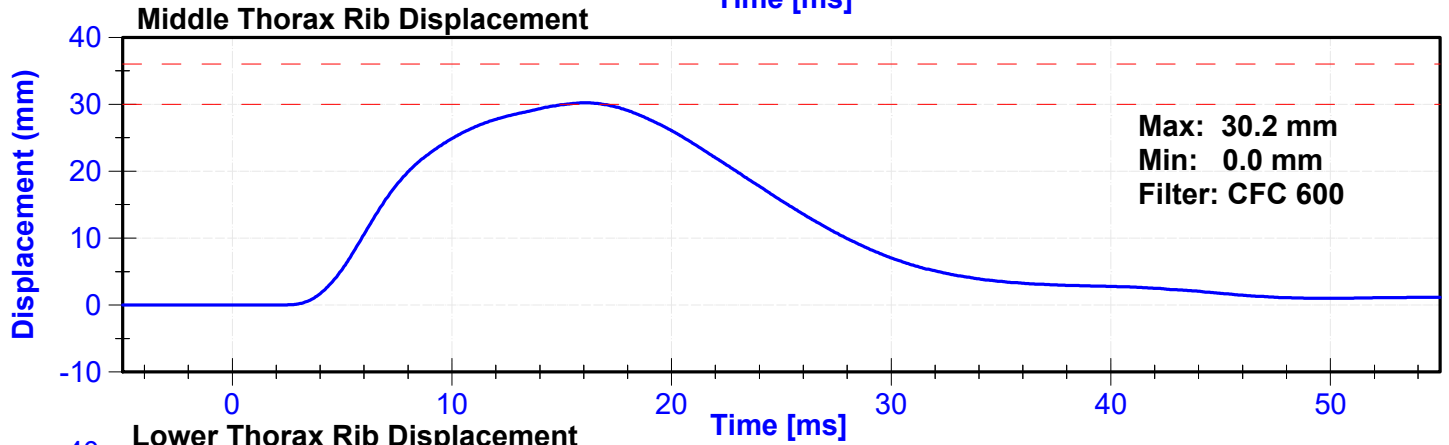
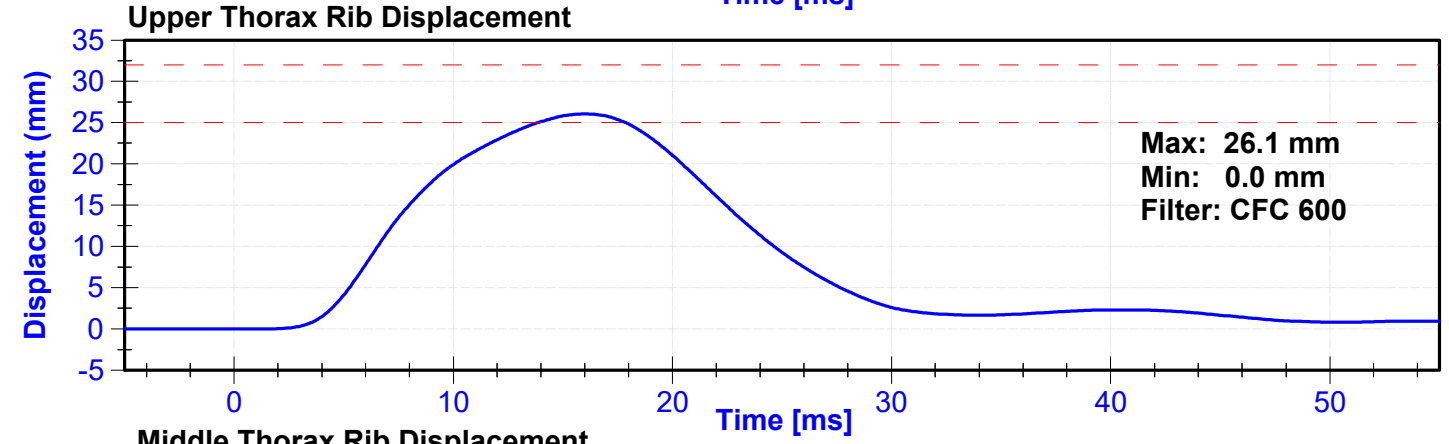
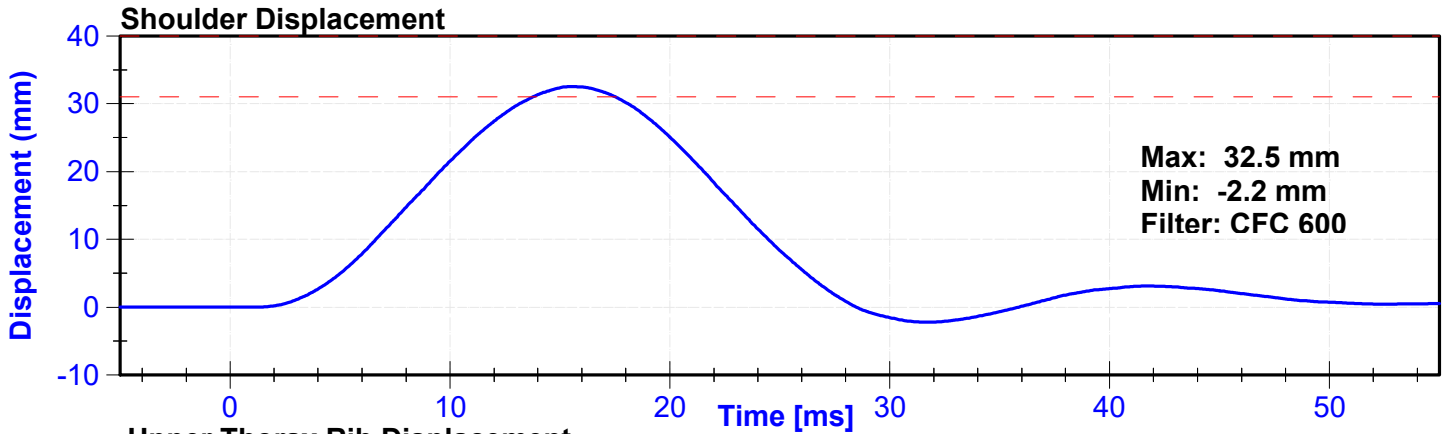
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	25	Pass
Velocity	6.6	6.8	m/s	6.68	Pass
Probe Acceleration after 5 ms	30	36	g's	36.0	Pass
Lateral Upper Spine Acceleration	34	43	g's	40.8	Pass
Lateral Lower Spine Acceleration	29	37	g's	34.2	Pass
Shoulder Deflection	31	40	mm	32.5	Pass
Upper Thorax Rib Deflection	25	32	mm	26.1	Pass
Mid Thorax Rib Deflection	30	36	mm	30.2	Pass
Lower Thorax Rib Deflection	32	38	mm	32.0	Pass

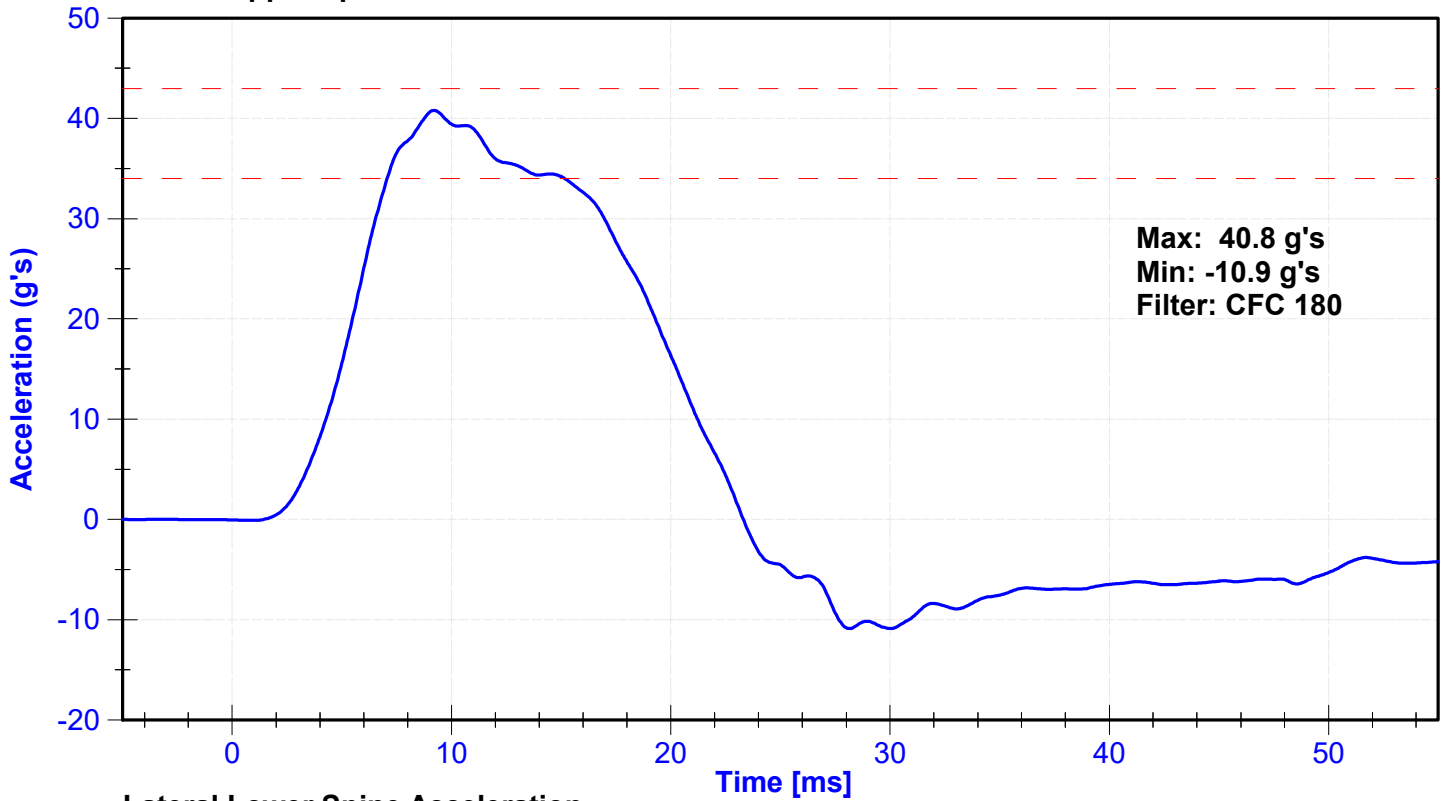
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Upper Spine T1 Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025
Upper Spine T12 Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Shoulder Potentiometer	Servo	829GFE	10/8/2024	4/8/2025
Upper Thorax Rib Potentiometer	Servo	DS-049GFE	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Servo	080GFE	10/9/2024	4/9/2025
Lower Thorax Rib Potentiometer	Servo	076GFE	10/8/2024	4/8/2025

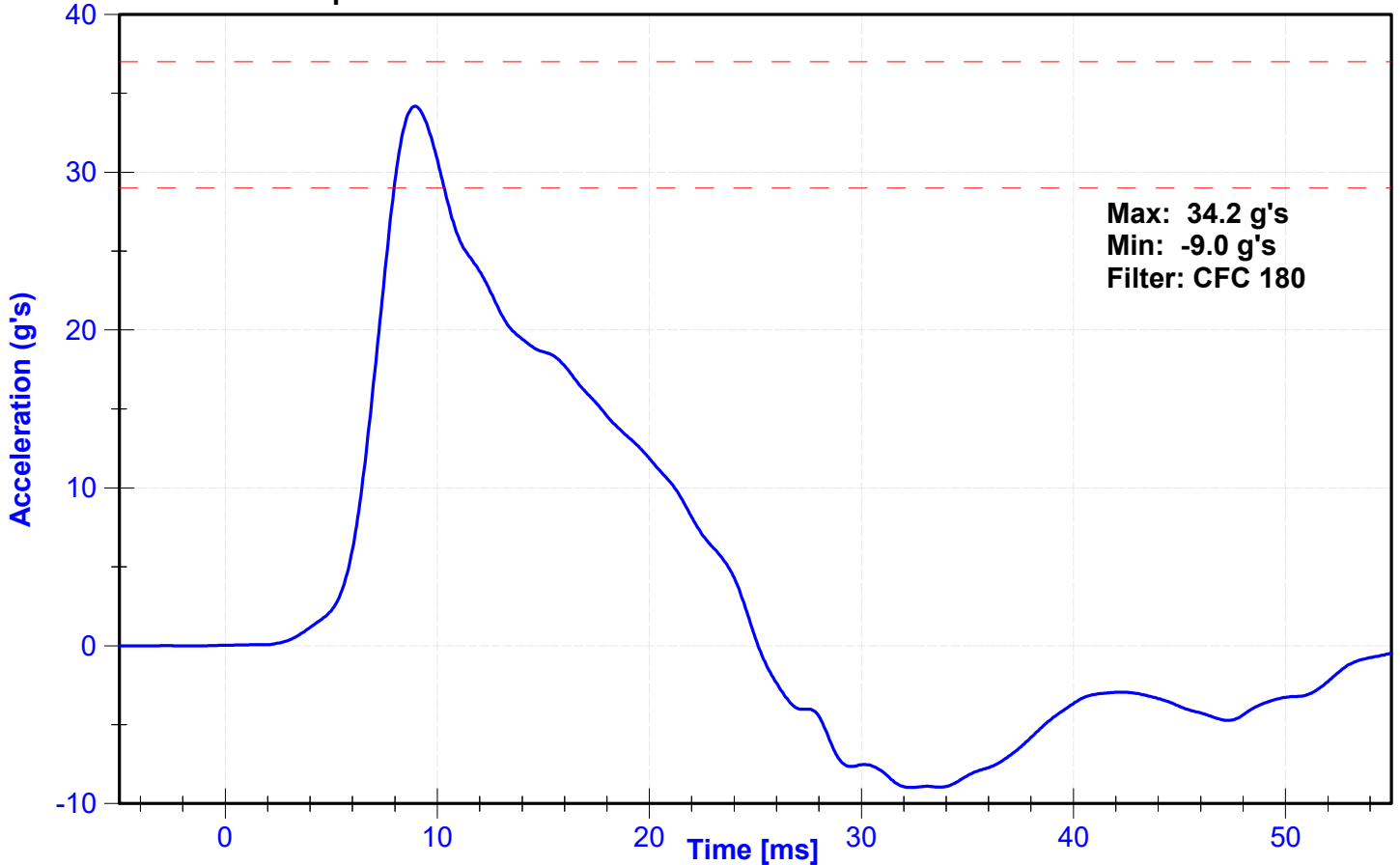




### Lateral Upper Spine Acceleration



### Lateral Lower Spine Acceleration



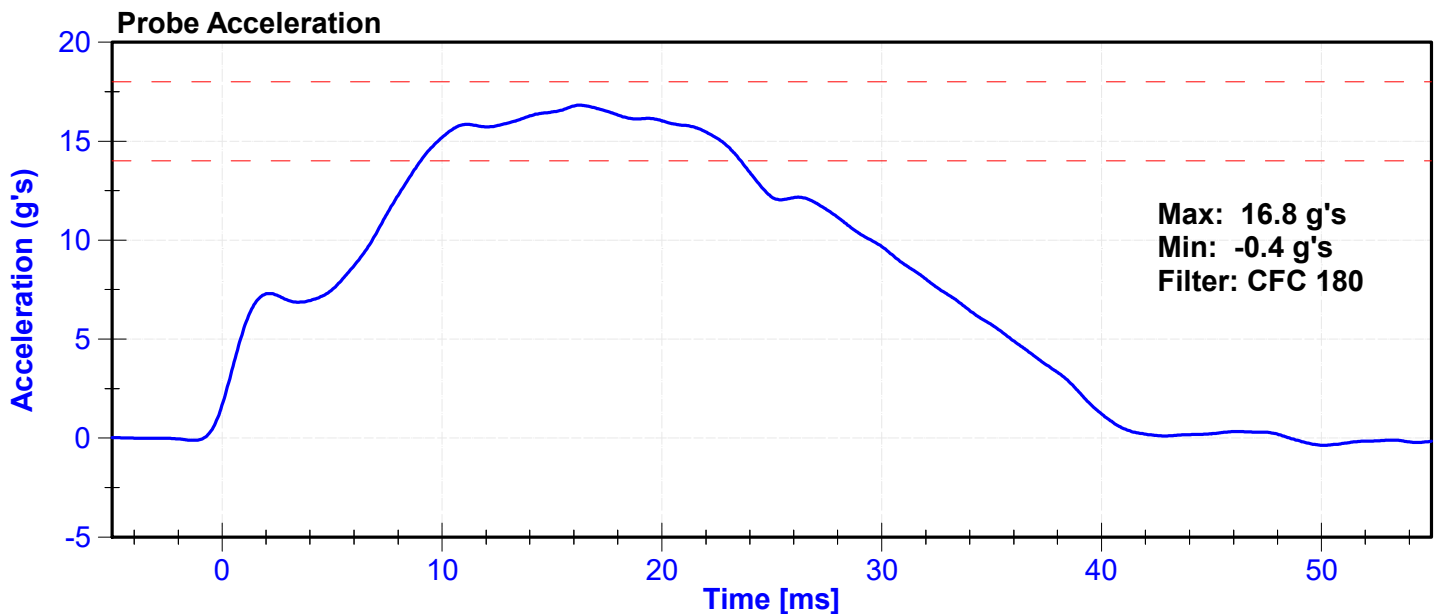
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	224	Laboratory Supervisor	J. Kinderman

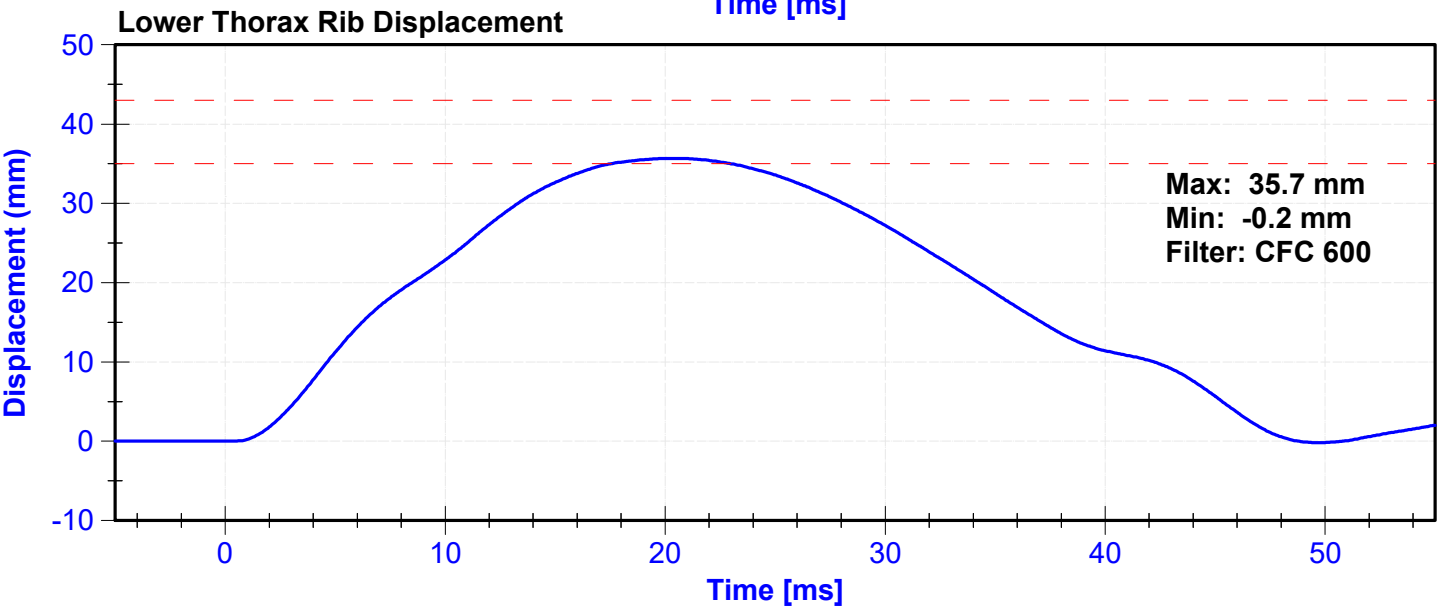
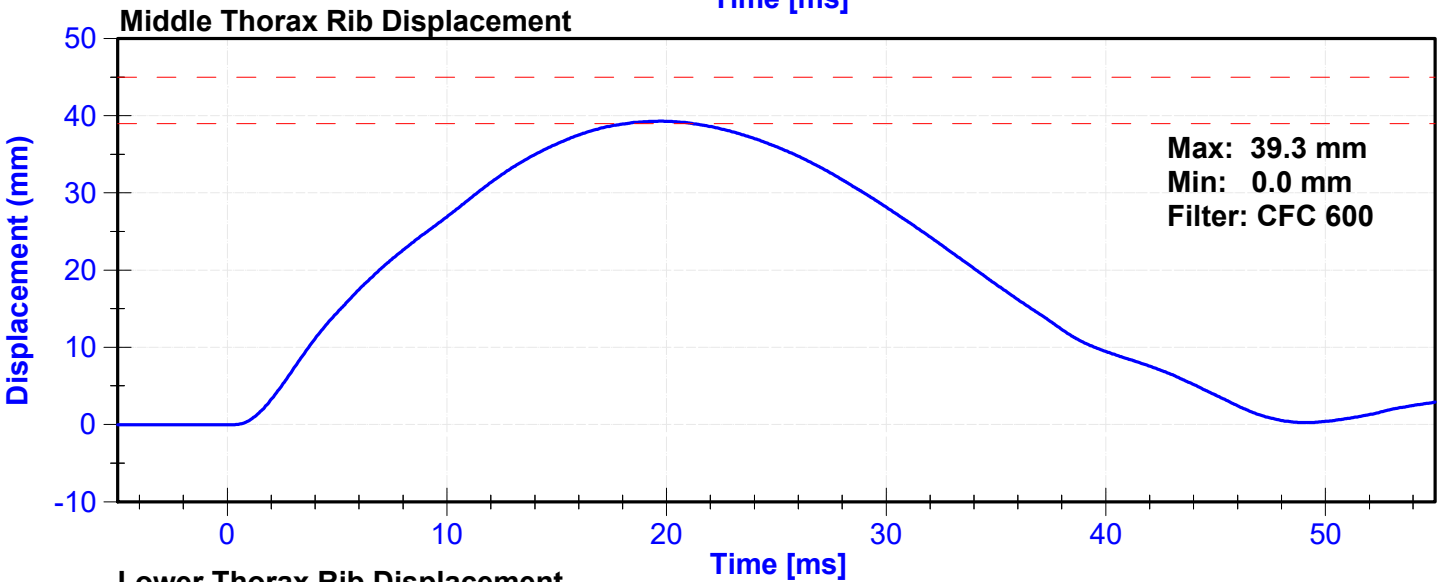
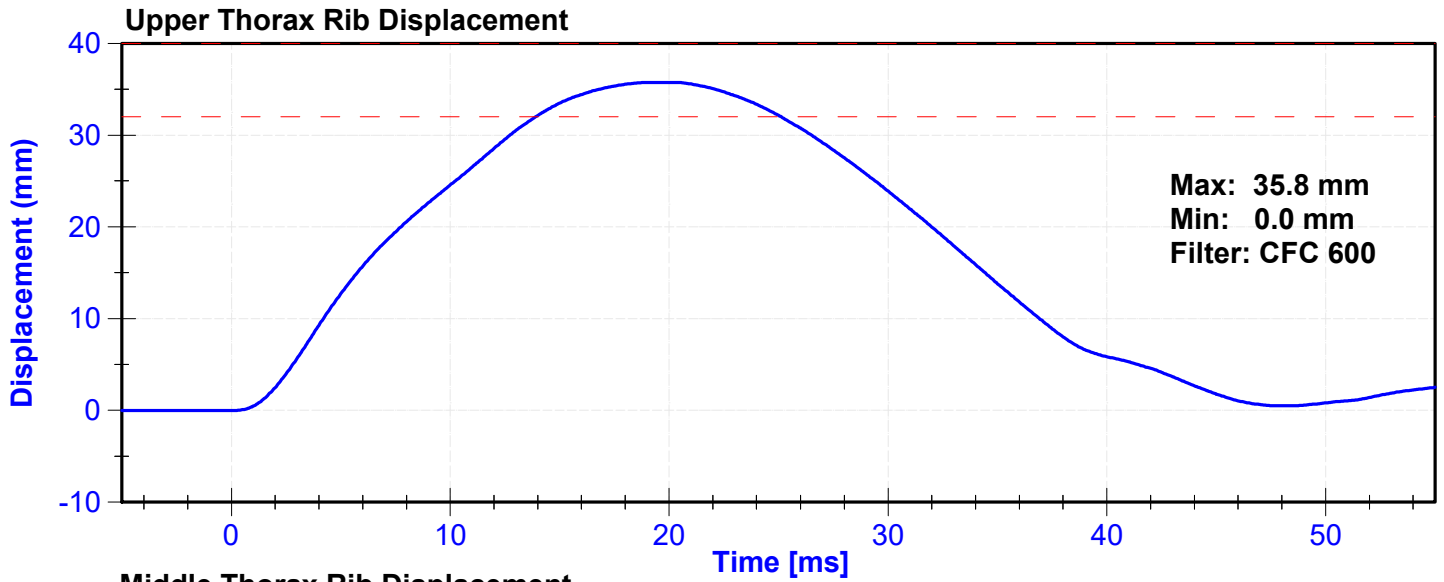
**Results**

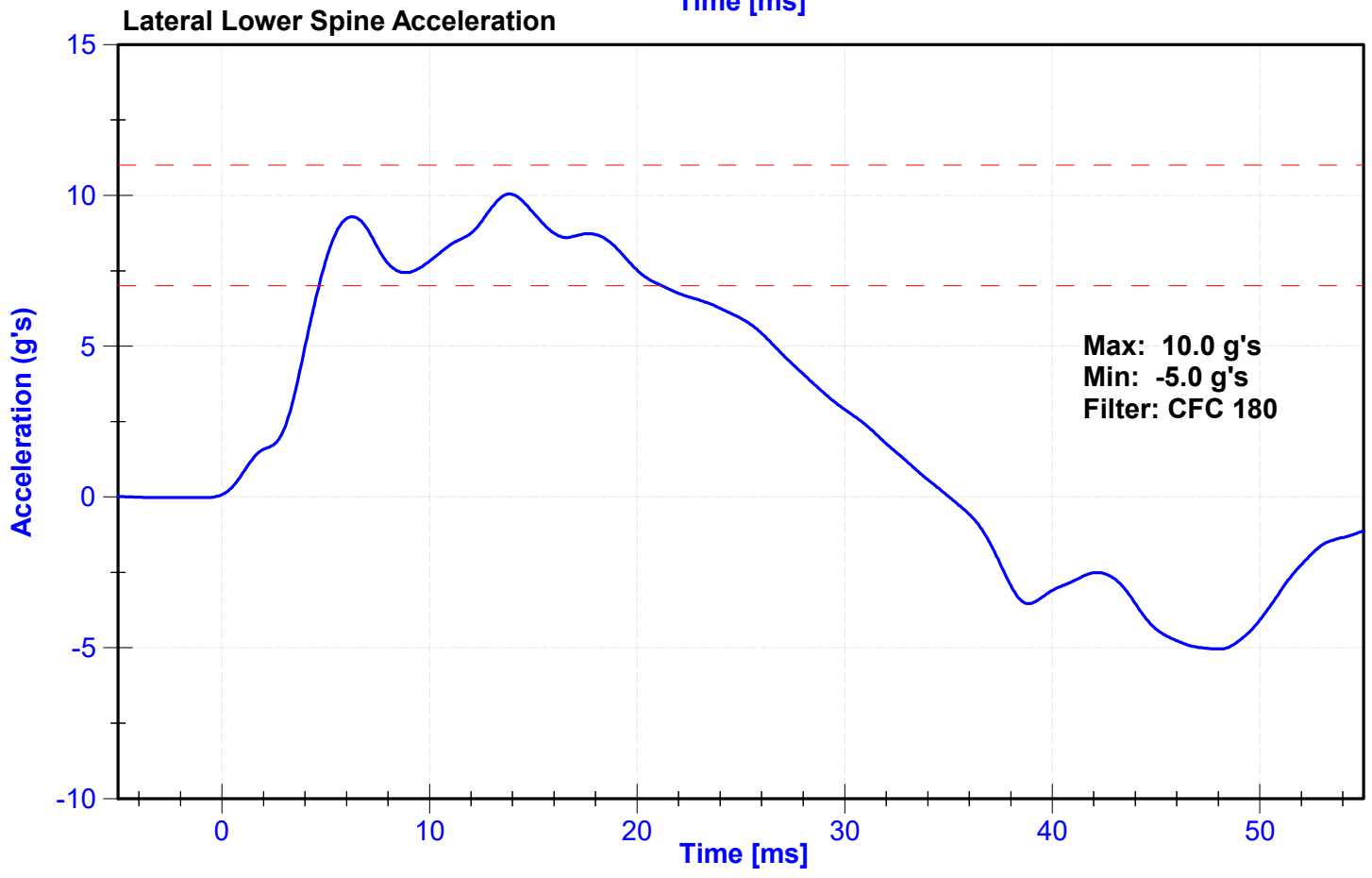
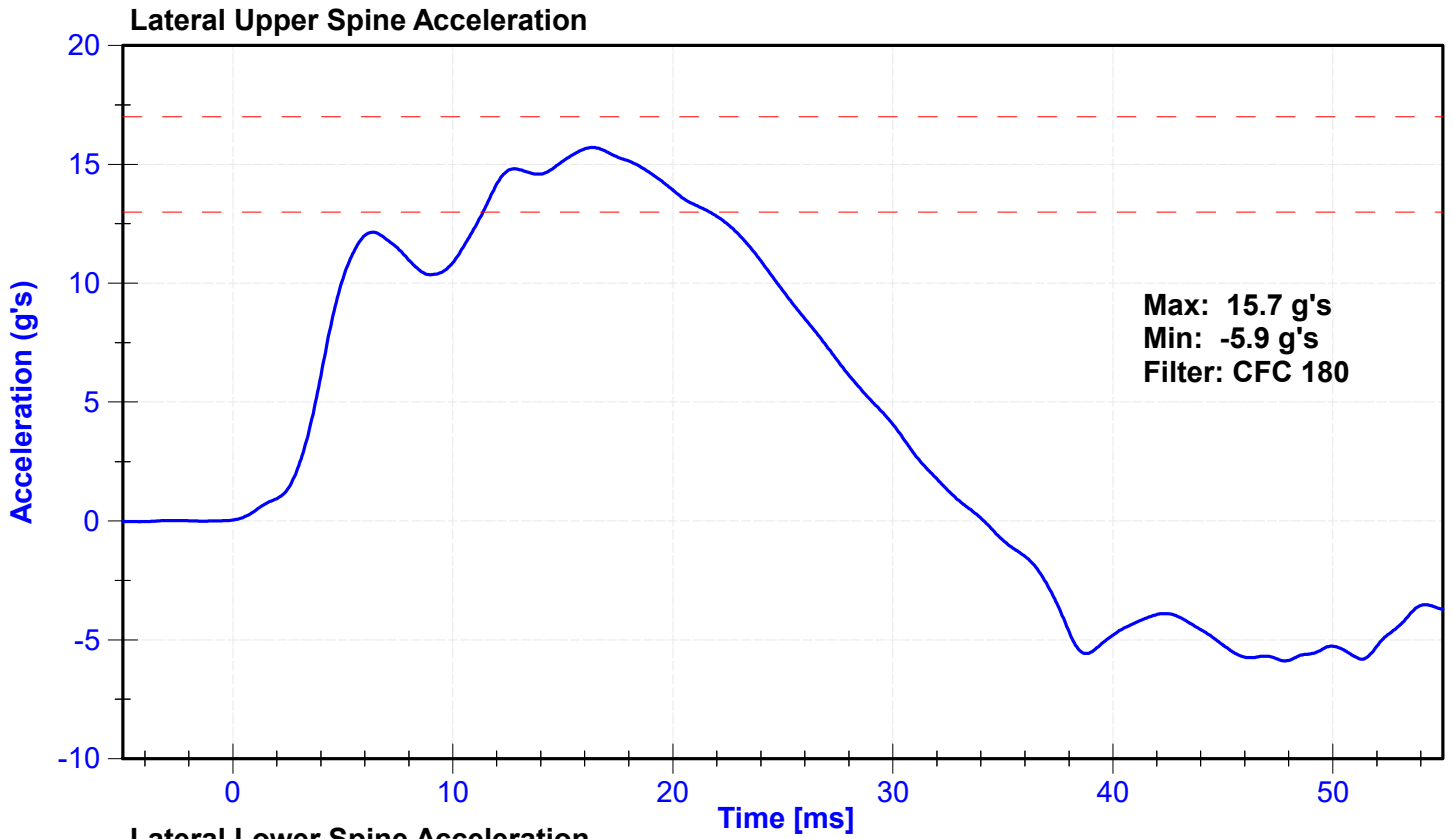
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	25	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	14	18	g's	16.8	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.7	Pass
Lateral Lower Spine Acceleration	7	11	g's	10.0	Pass
Upper Thorax Rib Deflection	32	40	mm	35.8	Pass
Middle Thorax Rib Deflection	39	45	mm	39.3	Pass
Lower Thorax Rib Deflection	35	43	mm	35.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Upper Spine Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025
Lower Spine Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Upper Thorax Rib Potentiometer	Servo	DS-049GFE	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Servo	080GFE	10/9/2024	4/9/2025
Lower Thorax Rib Potentiometer	Servo	076GFE	10/8/2024	4/8/2025







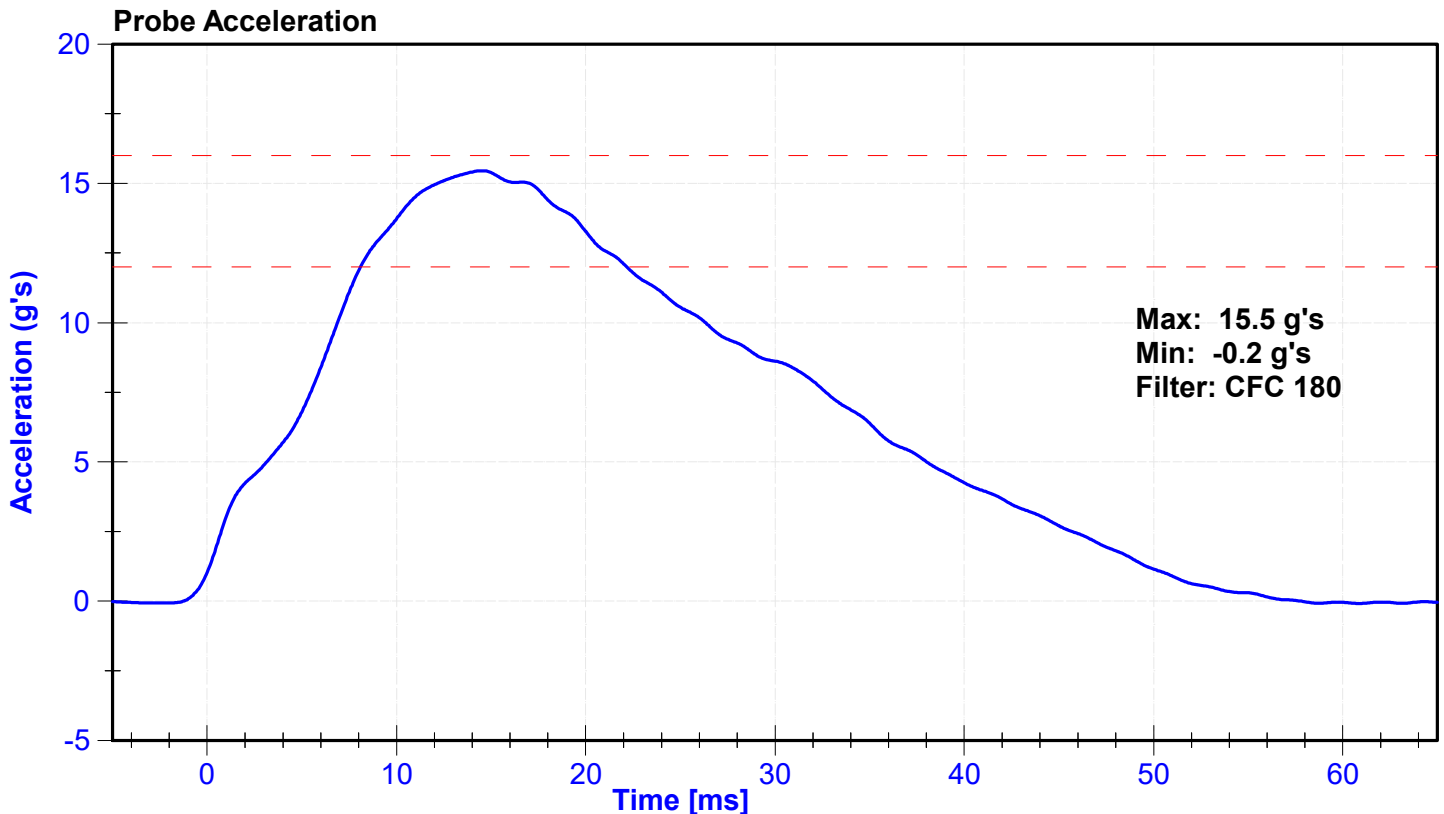
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	224	Laboratory Supervisor	J. Kinderman

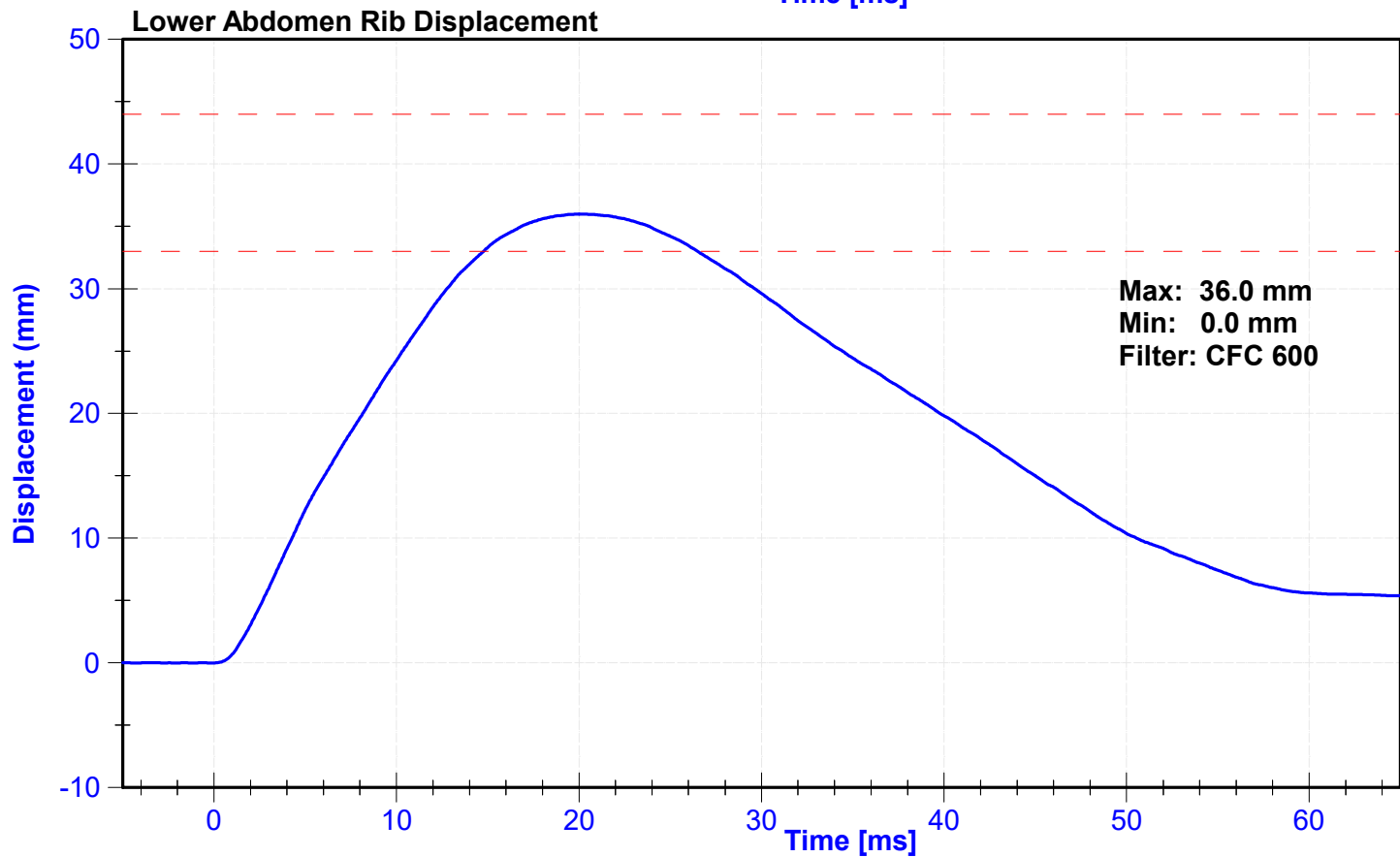
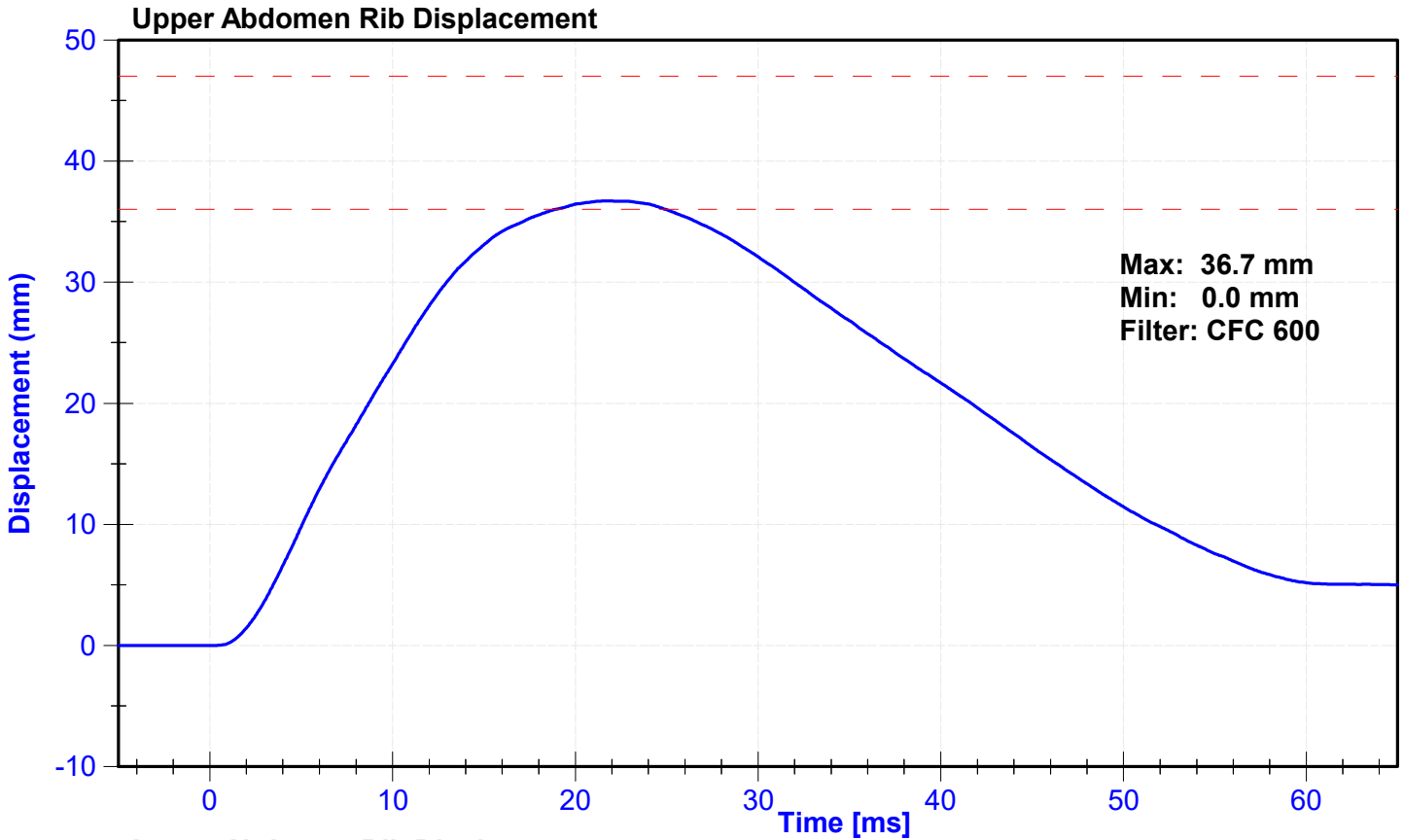
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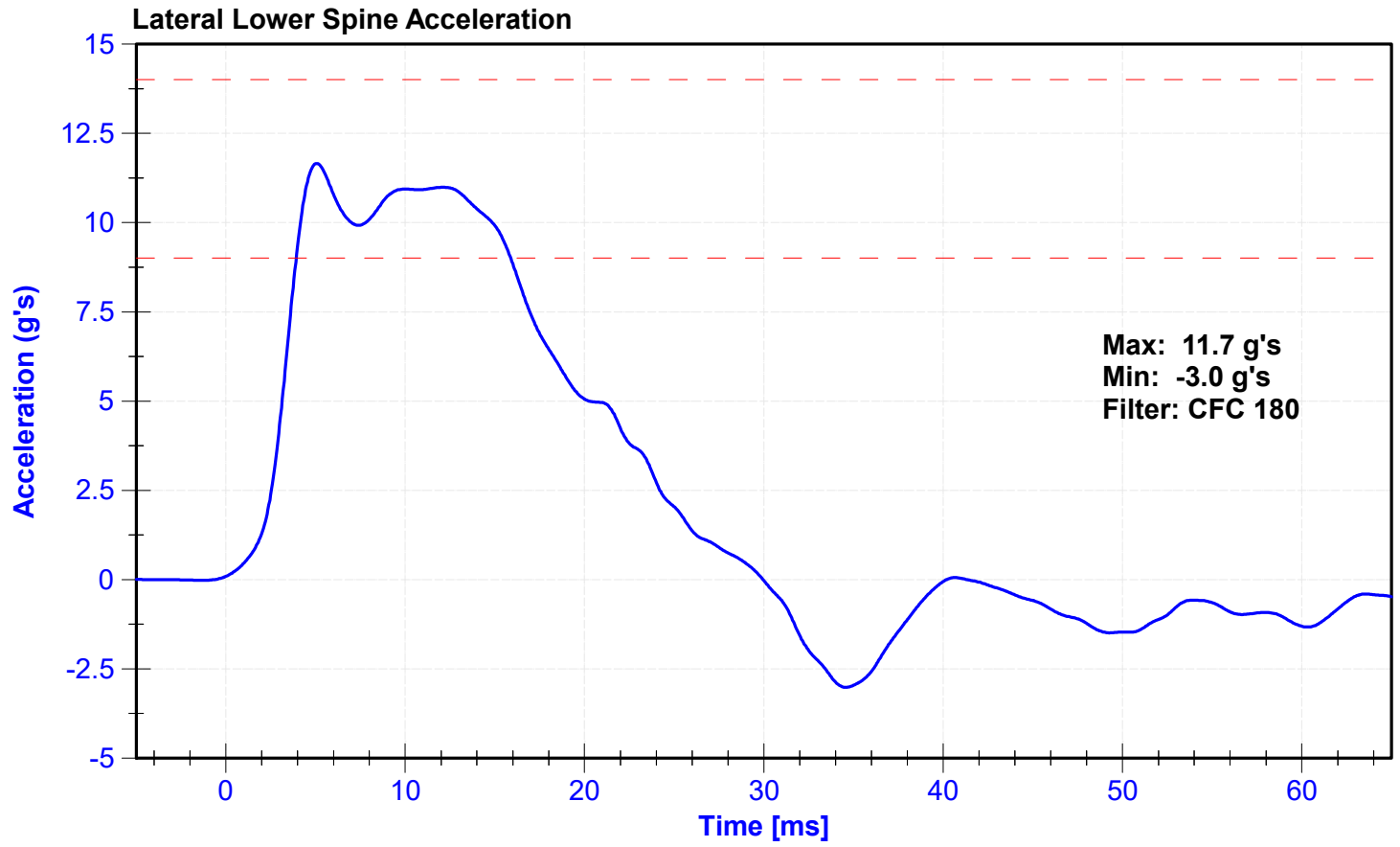
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	25	Pass
Velocity	4.2	4.4	m/s	4.30	Pass
Probe Acceleration	12	16	g's	15.5	Pass
Lateral Lower Spine Acceleration	9	14	g's	11.7	Pass
Upper Abdomen Rib Deflection	36	47	mm	36.7	Pass
Lower Abdomen Rib Deflection	33	44	mm	36.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Lower Spine Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Upper Abdomen Rib Potentiometer	Servo	DS-058GFE	10/8/2024	4/8/2025
Lower Abdomen Rib Potentiometer	Servo	1256GFE	10/8/2024	4/8/2025







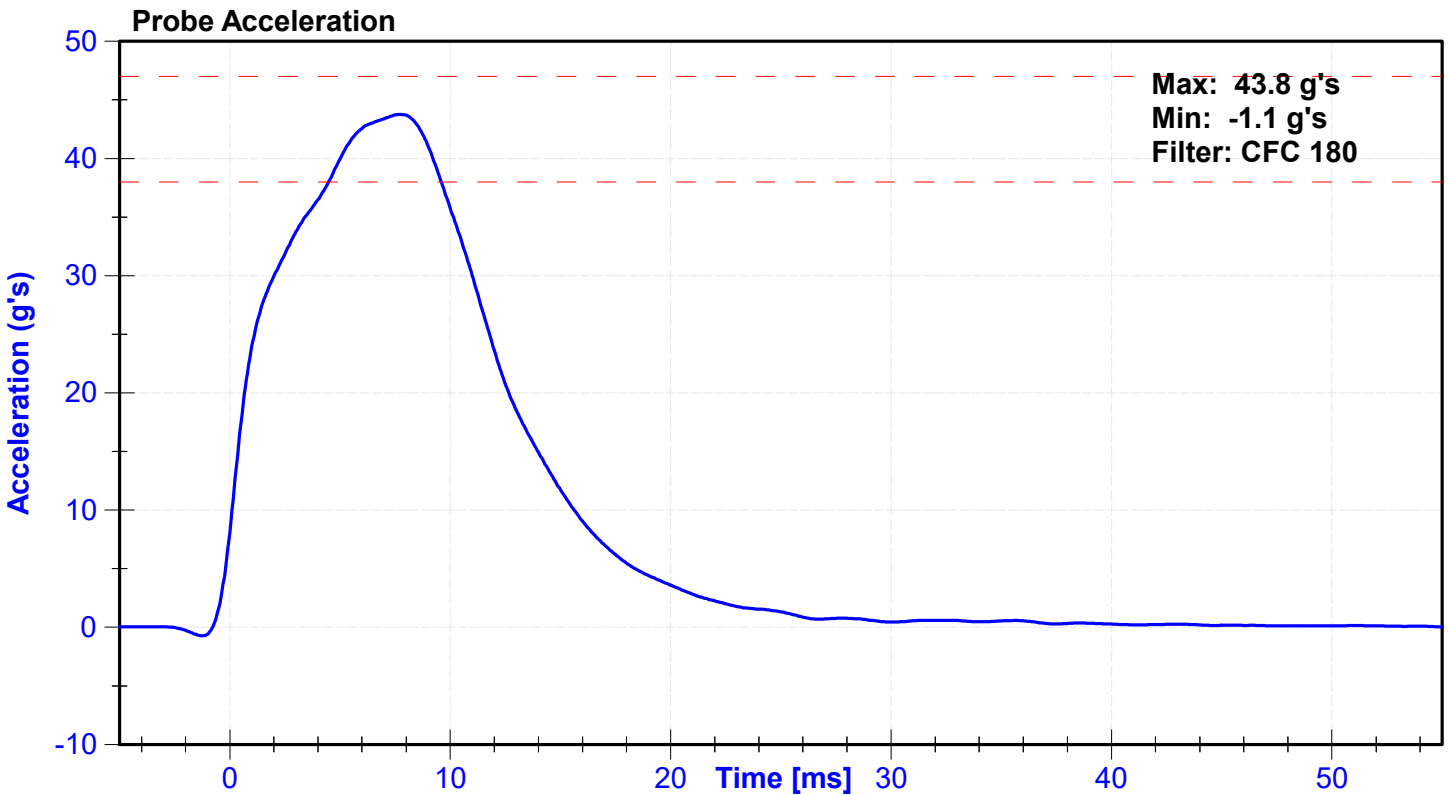
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	224	Laboratory Supervisor	J. Kinderman

**Results**

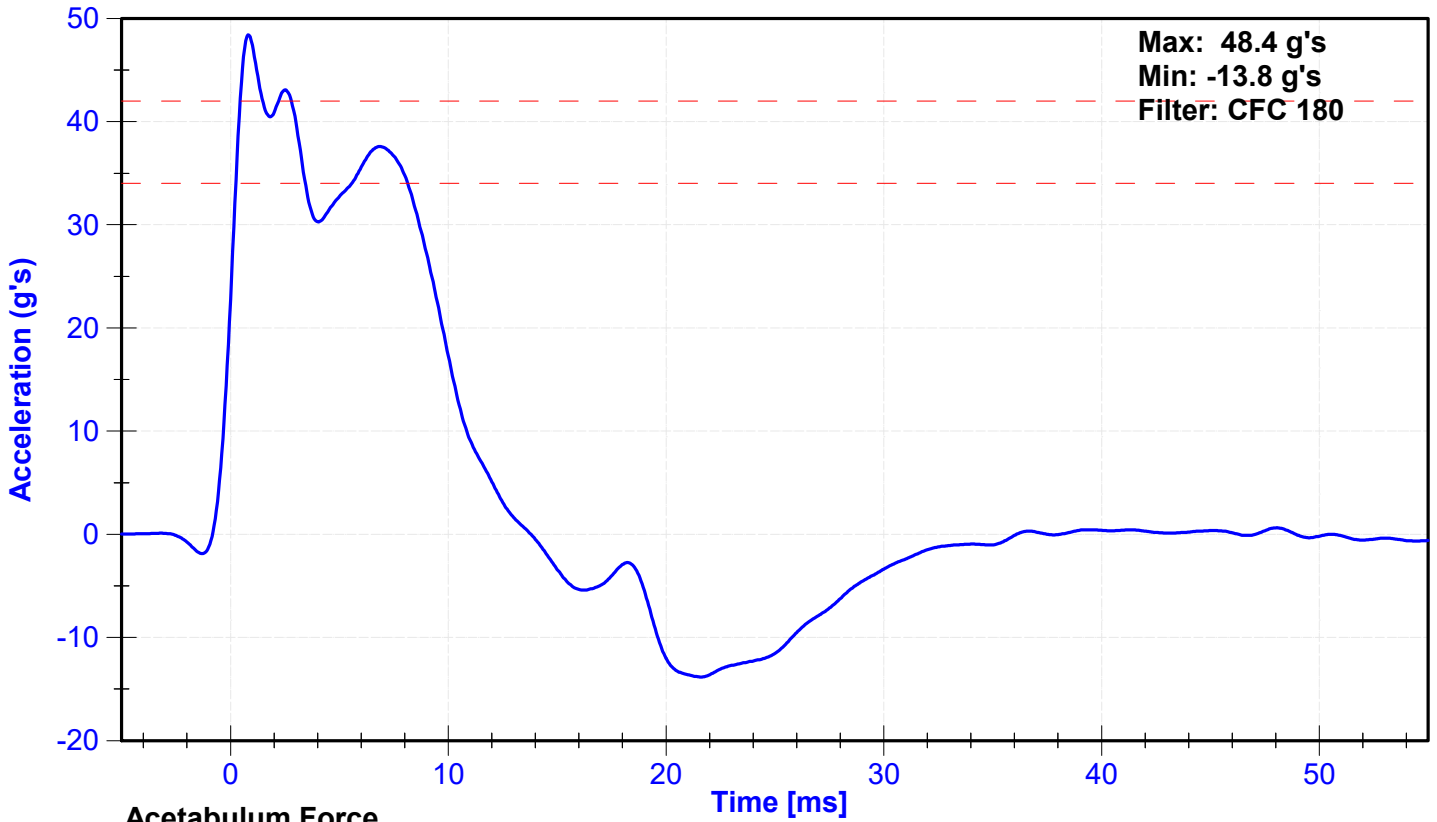
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	25	Pass
Velocity	6.6	6.8	m/s	6.67	Pass
Probe Acceleration	38	47	g's	43.8	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	37.6	Pass
Acetabulum Force	3600	4300	N	3995.1	Pass

**Transducer Calibrations**

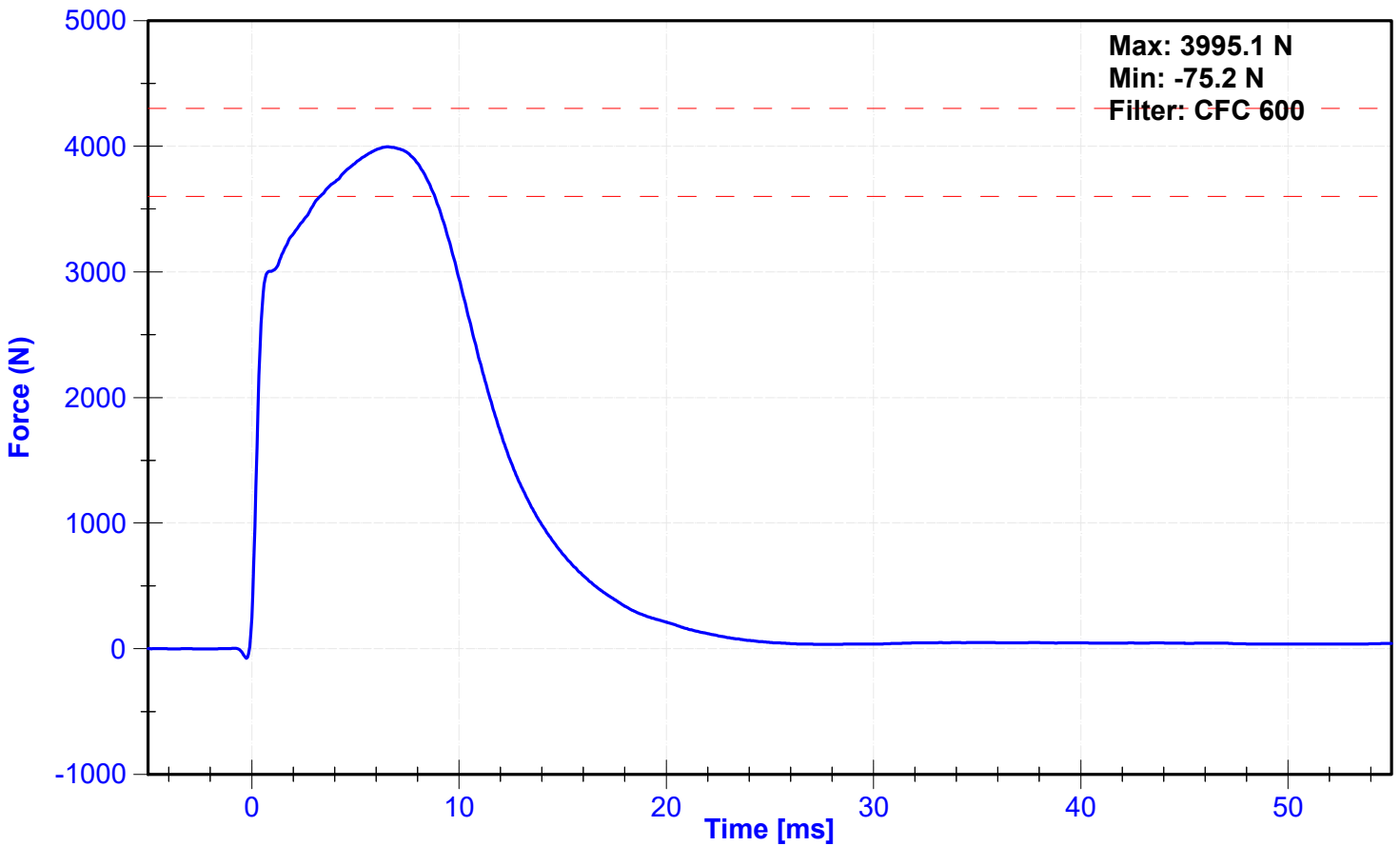
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Pelvis Y Accelerometer	Endevco	P63987	10/8/2024	4/6/2025
Acetabulum Load Cell	Denton	267-FY	9/16/2024	9/16/2025
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A



Lateral Pelvis Acceleration



Acetabulum Force





**SID-IIs Pelvis Plug Certification Test**

Plug S/N 16699

Test Number 23499

Report Number 23556

Test Date 7/22/2022 11:13:47 AM

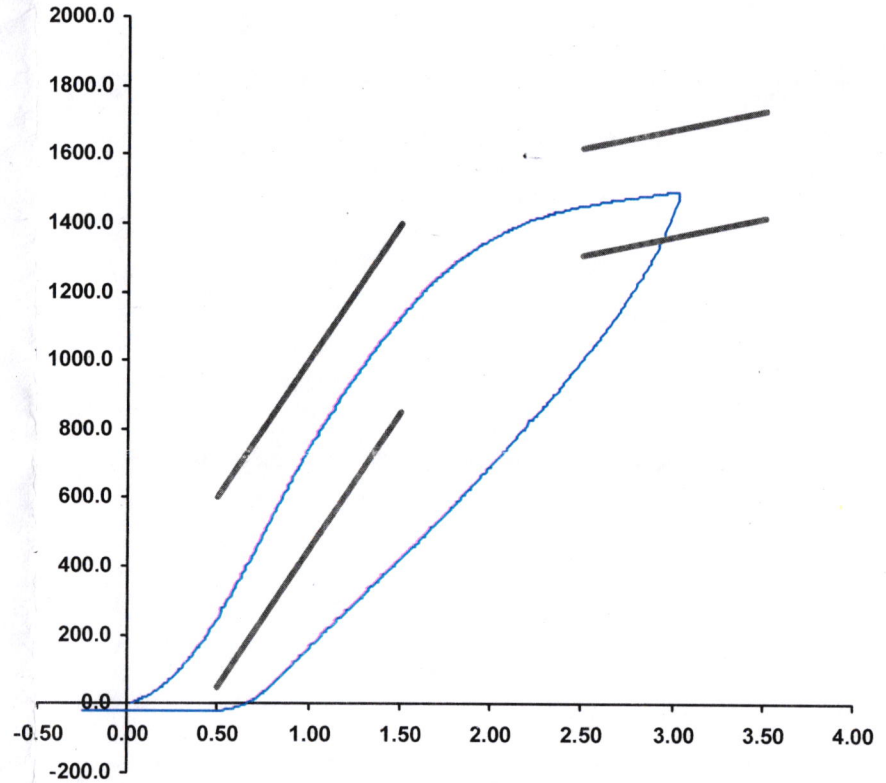
	<u>Test Results</u>	<u>Spec Min</u>	<u>Spec Max</u>
Force @ 0.5 mm (N)	251	50	600
Force @ 1.5 mm (N)	1,127	850	1,400
Force @ 2.5 mm (N)	1,452	1,306	1,618
Force @ 3.0 mm (N)	1,492	1,361	1,673

Testing Machine STM-20 5965542  
 Load Cell S/N (FI360947), Units (LBS ) 1000  
 Crosshead Speed ( mm / min ) or Rate 12.7  
 Extension or Position Measured by XHD\_100 ( XHD100 )

Notes:

Cert  
 12-5-24  
 224

Force (-N) vs Extension (-mm)



Operator \_\_\_\_\_  
 Part Number 180-4450

Template No 107 22-Jul-22  
 SACO Research

By : DC Date : 7/22/22



**SID-IIs Pelvis Plug Certification Test**

Plug S/N 16665

Test Number 23441

Report Number 23498

Test Date 7/21/2022 11:55:28 AM

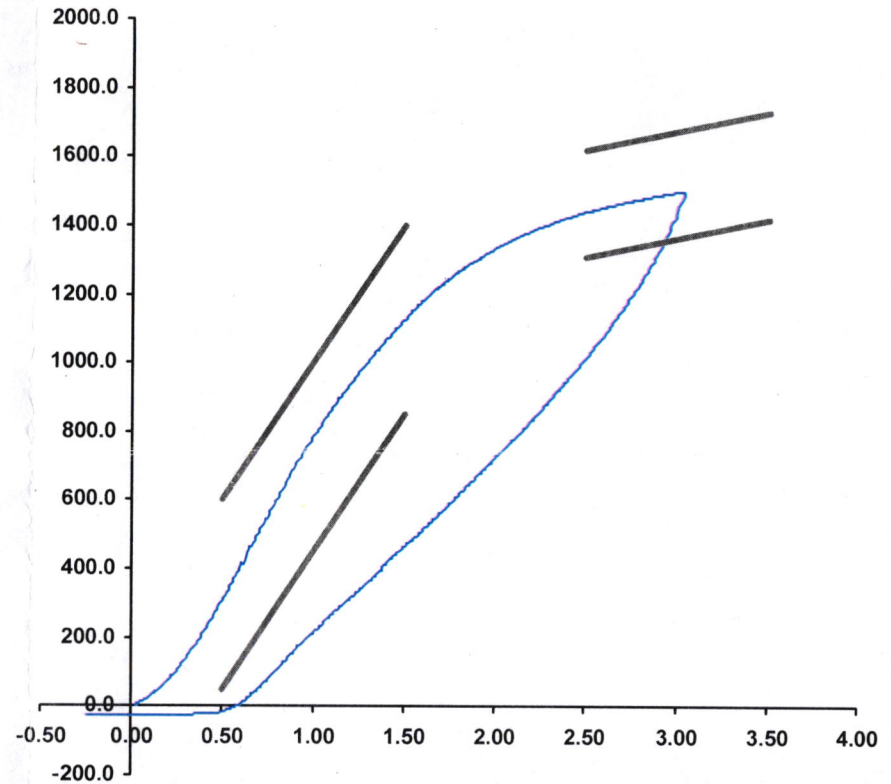
	<u>Test Results</u>	<u>Spec Min</u>	<u>Spec Max</u>
Force @ 0.5 mm (N)	308	50	600
Force @ 1.5 mm (N)	1,130	850	1,400
Force @ 2.5 mm (N)	1,440	1,306	1,618
Force @ 3.0 mm (N)	1,498	1,361	1,673

Testing Machine STM-20 596542  
 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*  
 12-5-24  
 224

Force (-N) vs Extension (-mm)



Operator \_\_\_\_\_  
 Part Number 180-4450

Template No 107 21-Jul-22

SACO Research

By : DC Date : 7/21/22



Non Impact  
12-5-24  
224

### SID-IIs Pelvis Plug Certification Test

Plug S/N 16735

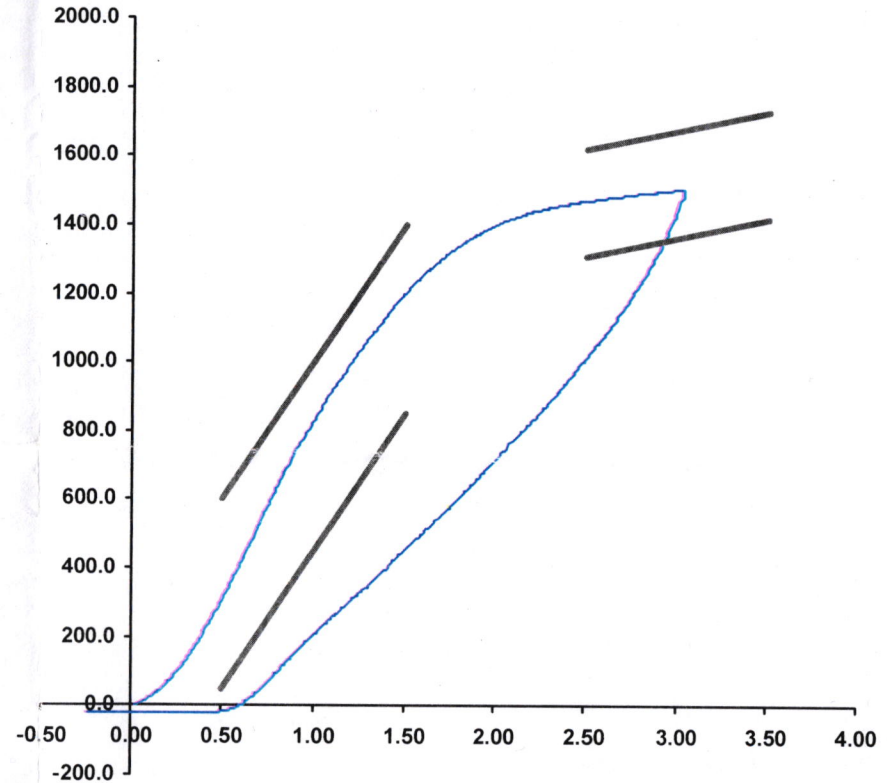
Test Number 23535

Report Number 23592

Test Date 7/22/2022 12:55:23 PM

Force (-N) vs Extension (-mm)

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	313	50	600
Force @ 1.5 mm (N)	1,200	850	1,400
Force @ 2.5 mm (N)	1,470	1,306	1,618
Force @ 3.0 mm (N)	1,503	1,361	1,673



Testing Machine STM-20 596542  
 Load Cell S/N (FI360947), Units (LBS ) 1000  
 Crosshead Speed ( mm / min ) or Rate 12.7  
 Extension or Position Measured by XHD\_100 ( XHD100 )

Notes:

Operator \_\_\_\_\_

Part Number 180-4450

Template No 107 22-Jul-22

SACO Research

By : DC Date : 7/22/22

ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	224	Laboratory Supervisor	J. Kinderman

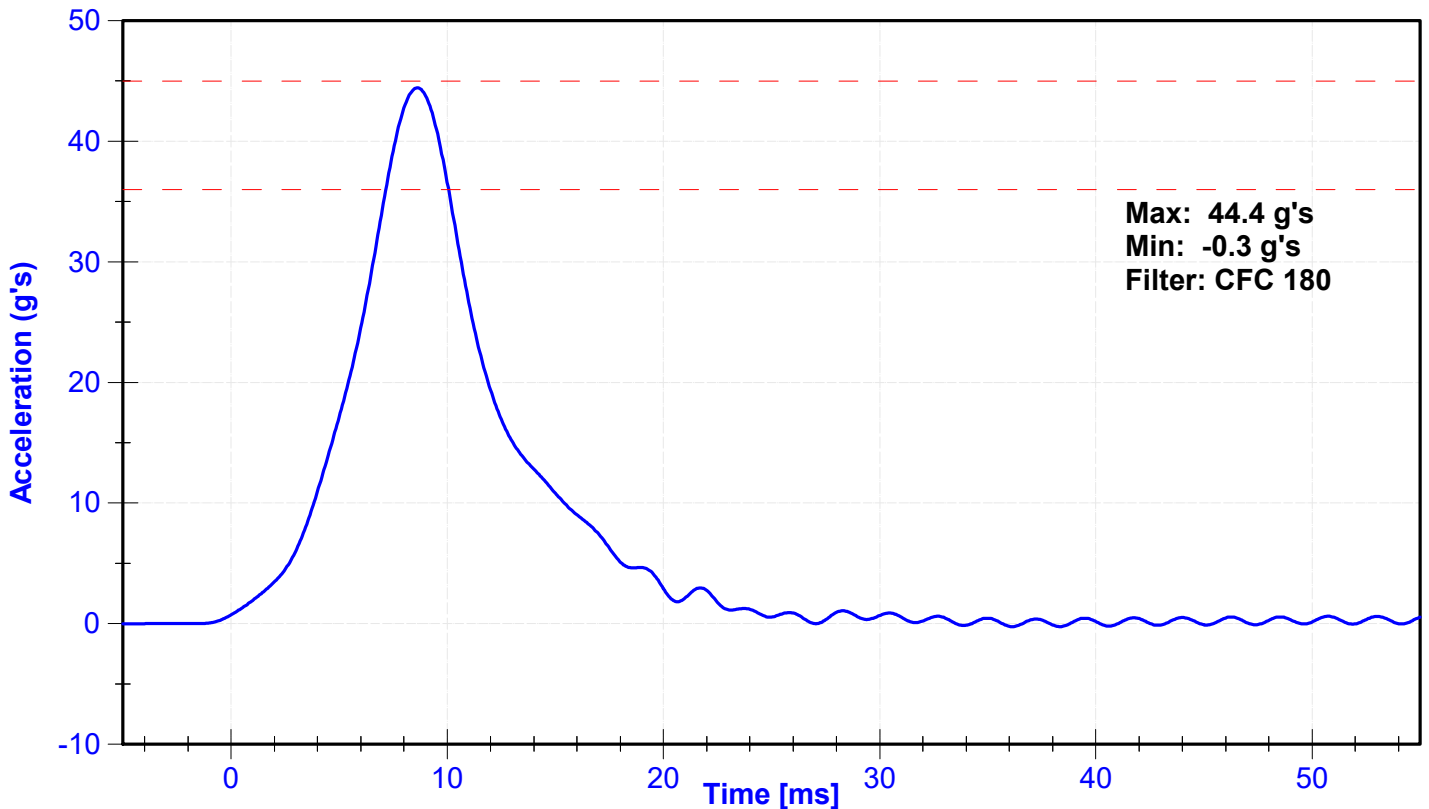
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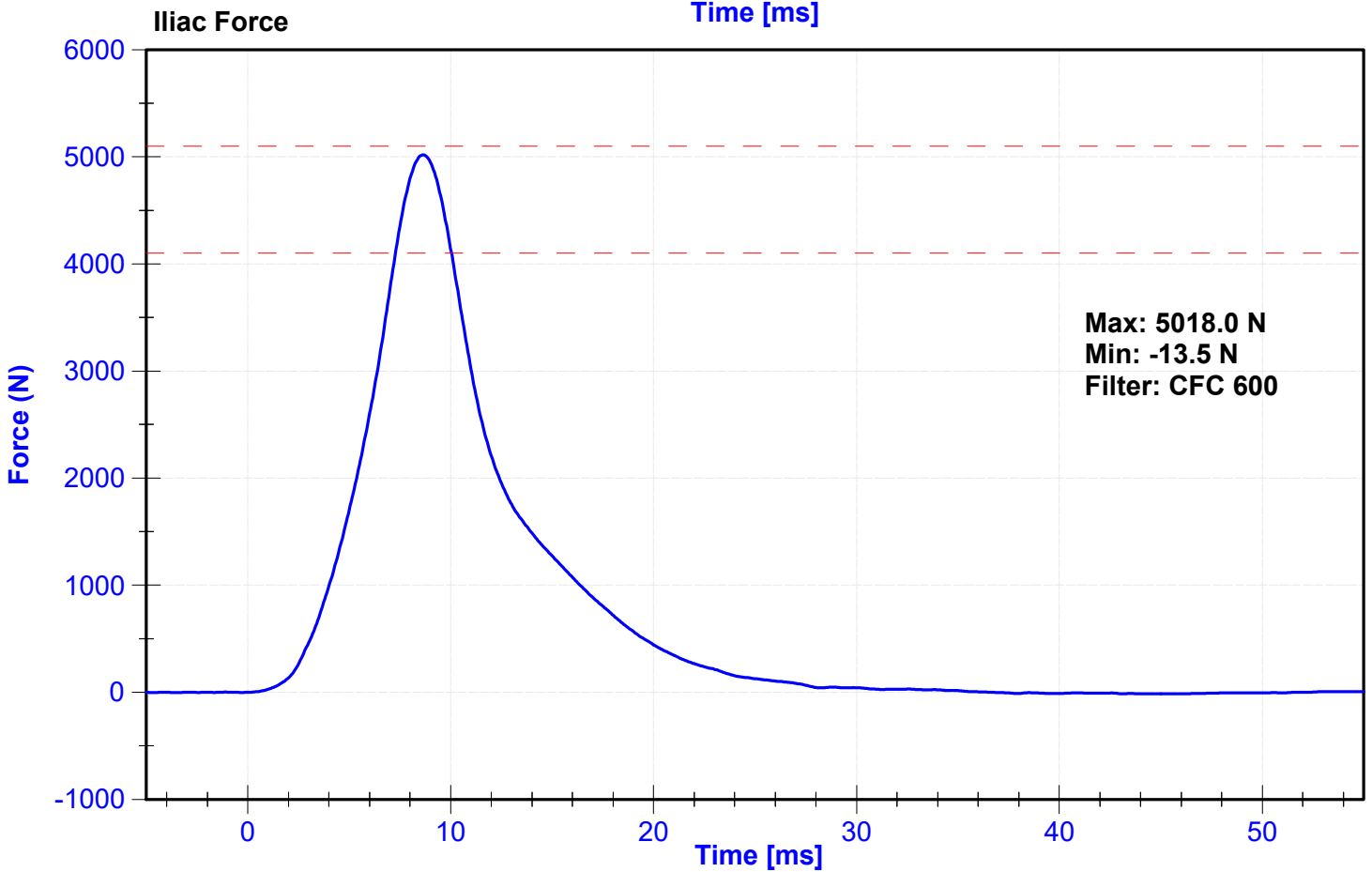
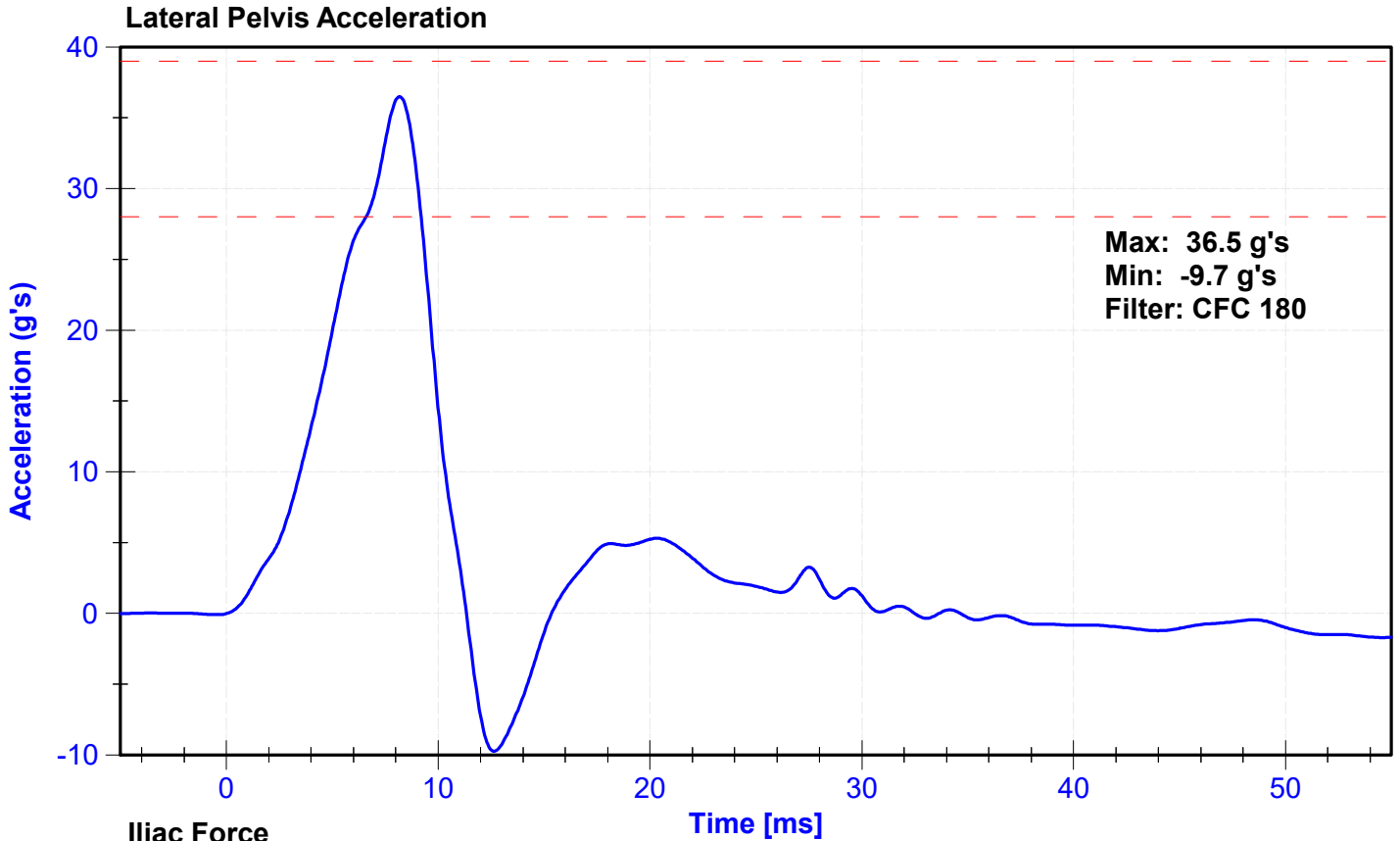
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	25	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	36	45	g's	44.4	Pass
Lateral Pelvis Acceleration	28	39	g's	36.5	Pass
Iliac Force	4100	5100	N	5018.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Pelvis Y Accelerometer	Endevco	P63987	10/8/2024	4/6/2025
Iliac Load Cell	Denton	280-FY	9/16/2024	9/16/2025

**Probe Acceleration**





**APPENDIX VII**

**TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION**

**TABLE 1 – Dummy Instrumentation (ES-2re)**

			ES-2re S/N _D037_		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	T21724	Endevco	10/08/2024
		Y	T22281	Endevco	10/08/2024
		Z	T26050	Endevco	10/08/2024
	Redundant	X	T21682	Endevco	10/08/2024
		Y	T25989	Endevco	10/08/2024
		Z	T25864	Endevco	10/08/2024
Thorax Rib Displacement Potentiometers	Upper	Y	0552-01	Honeywell	10/08/2024
	Middle	Y	807	Honeywell	10/08/2024
	Lower	Y	0552-03	Honeywell	10/08/2024
Abdomen Load Cells	Forward	Y	1512	Denton	09/16/2024
	Middle	Y	1526	Denton	09/16/2024
	Rear	Y	1516	Denton	09/16/2024
Lower Spine Accelerometers (T12)		X	P71278	Endevco	10/08/2024
		Y	18595	Endevco	10/08/2024
		Z	18509	Endevco	10/08/2024
Pubic Symphysis Load Cell		Y	464-FY	Denton	09/16/2024

**TABLE 2 – Dummy Instrumentation (SID-IIs)**

			SID-IIs S/N _224_			
			Serial Number	Manufacturer	Calibration Date	
Head Accelerometers	Primary	X	P51884	Endevco	10/08/2024	
		Y	P73161	Endevco	10/08/2024	
		Z	P79588	Endevco	10/08/2024	
	Redundant	X	P74963	Endevco	10/08/2024	
		Y	P58864	Endevco	10/08/2024	
		Z	P52030	Endevco	10/08/2024	
Displacement Potentiometers	Thoracic Rib	Upper	Y	DS-049GFE	Servo	10/08/2024
		Middle	Y	080GFE	Servo	10/09/2024
		Lower	Y	076GFE	Servo	10/08/2024
	Abdominal Rib	Upper	Y	DS-058GFE	Servo	10/08/2024
		Lower	Y	1256GFE	Servo	10/08/2024
Lower Spine Accelerometers (T12)		X	P82326	Endevco	10/08/2024	
		Y	T20906	Endevco	10/08/2024	
		Z	T21176	Endevco	10/08/2024	
Acetabulum Load Cell		Y	267-FY	Denton	09/16/2024	
Iliac Wing Load Cell		Y	280-FY	Denton	09/16/2024	
Pelvis Plug (struck side)			16704	SACO	07/22/2022	
Pelvis Plug (non-struck side)			16705	SACO	07/22/2022	

**TABLE 3 – Vehicle Instrumentation**

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	G22120	Endevco	11/18/2024
	Vehicle Center of Gravity	Y	G24238	Endevco	11/18/2024
	Vehicle Center of Gravity	Z	G25538	Endevco	11/18/2024
2	Right Sill at Front Seat	X	G25567	Endevco	11/19/2024
	Right Sill at Front Seat	Y	G25568	Endevco	11/19/2024
	Right Sill at Front Seat	Z	G25861	Endevco	11/19/2024
3	Right Sill at Rear Seat	X	G25565	Endevco	11/12/2024
	Right Sill at Rear Seat	Y	G25566	Endevco	11/12/2024
	Right Sill at Rear Seat	Z	G25865	Endevco	11/12/2024
4	Left Sill at Front Door	Y	G25577	Endevco	11/12/2024
5	Left Sill at Rear Door	Y	A315940	Measurement Specialties	06/21/2024
6	Left A-Post Lower	Y	G25581	Endevco	11/12/2024
7	Left A-Post Middle	Y	G24639	Endevco	11/12/2024
8	Left B-Post Lower	Y	A315988	Measurement Specialties	10/31/2024
9	Left B-Post Middle	Y	G25266	Endevco	11/04/2024
10	Front Seat Track	Y	G25868	Endevco	11/13/2024
11	Rear Seat Track or Structure	Y	G24613	Endevco	11/12/2024
12	Right Rear Occ. Compartment	Y	G23434	Endevco	08/21/2024
13	Rear Floorpan Above Axle	X	G25869	Endevco	11/18/2024
	Rear Floorpan Above Axle	Y	G25870	Endevco	11/18/2024
	Rear Floorpan Above Axle	Z	G25970	Endevco	07/18/2024

**TABLE 4 – MDB Instrumentation**

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle CG Acceleration vs. Time	X	A374299	Measurement Specialties	08/01/2024
Vehicle CG Acceleration vs. Time	Y	A399983	Measurement Specialties	08/01/2024
Vehicle CG Velocity vs. Time	Y	Calculated	Measurement Specialties	08/01/2024
Vehicle CG Acceleration vs. Time	Z	G23881	Endevco	08/01/2024
Vehicle CG Velocity vs. Time	Z	Calculated	Endevco	08/01/2024
Vehicle CG Resultant Acceleration vs. Time	R	Calculated	Measurement Specialties	08/01/2024