

**REPORT NUMBER: NCAP-CAL-24-009**

**NEW CAR ASSESSMENT PROGRAM (NCAP)  
FRONTAL BARRIER IMPACT TEST**

**Hyundai Motor Manufacturing Alabama, LLC.  
2024 Hyundai Santa Fe  
5 Door SUV**

**NHTSA No: M20244200**

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



**U.S. DOT (202)**


**FINAL REPORT**

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

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Prepared by:  Date: January 7, 2025  
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Approved by:  Date: January 7, 2025  
Vanessa Hansen, Operations Manager

**FINAL REPORT ACCEPTANCE BY OCWS:**

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

Date: \_\_\_\_\_

\_\_\_\_\_  
COTR, New Car Assessment Program  
NHTSA, Office of Crashworthiness Standards

Date: \_\_\_\_\_

**TECHNICAL REPORT DOCUMENTATION PAGE**

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<b>15. Supplementary Notes</b>																																																									
<b>16. Abstract</b> A 56.30 km/h (35 mph), NCAP frontal rigid barrier impact test was conducted on a 2024 Hyundai Santa Fe 5 Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. The test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on November 20, 2024.  The impact velocity of the vehicle was 56.31 km/h, and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle post-test maximum crush was 441 mm at crush zone 4. The test vehicle's occupant performance data is as follows:																																																									
<table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD (Serial No. 065)</th> <th colspan="2">Passenger ATD (Serial No. 137)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC15)</td> <td></td> <td>700</td> <td>460.274</td> <td>700</td> <td>369.180</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-22.129</td> <td>52</td> <td>-14.657</td> </tr> <tr> <td>Nij</td> <td></td> <td>1</td> <td>0.280</td> <td>1</td> <td>0.325</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>1212.169</td> <td>2620</td> <td>466.913</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>-144.673</td> <td>2520</td> <td>-622.163</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>-1290.938</td> <td>6805</td> <td>-3227.959</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>-1881.104</td> <td>6805</td> <td>-2901.969</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD (Serial No. 065)		Passenger ATD (Serial No. 137)		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC15)		700	460.274	700	369.180	Maximum Chest Compression	mm	63	-22.129	52	-14.657	Nij		1	0.280	1	0.325	Neck Tension	N	4170	1212.169	2620	466.913	Neck Compression	N	4000	-144.673	2520	-622.163	Left Femur Force	N	10008	-1290.938	6805	-3227.959	Right Femur Force	N	10008	-1881.104	6805	-2901.969
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<b>17. Key Words</b> 56.3 km/h (35 mph) Full Frontal Rigid Barrier Impact Test New Car Assessment Program (NCAP)				<b>18. Distribution Statement</b> <u>Copies of this report are available from:</u> National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave, SE Washington, DC 20590																																																					
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## SECTION 1

### PURPOSE AND SUMMARY OF TEST

#### PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. 693JJ919D000005. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing.

#### SUMMARY

A load cell barrier consisting of 128 load cells was impacted by a 2024 Hyundai Santa Fe 5 Door SUV at a velocity of 56.31 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on November 20, 2024. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. One real-time camera and 16 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of this report.

One Part 572E, 50<sup>th</sup> percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5<sup>th</sup> percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, femur load cells, and lower leg instrumentation. Seat belt load cells were installed on the driver's lap and shoulder belts and Passenger's Shoulder belt to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 065) and the right-front passenger (position 2) ATD (Serial No. 137) were qualified prior to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

The 230 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was a total of 0.0 grams of Stoddard solvent leakage after the event or during any phase of the static rollover. The maximum static crush of the vehicle was 441 mm and both driver and passenger side doors remained closed during the impact event and were operable after the impact. There was also a small fire post test from possible shorted wire being pinched somewhere by the radiator during impact and was extinguished.

The driver's visible contact points were as follows: The driver's head contacted the frontal airbag and the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee air bag.

The passenger's visible contact points were as follows: The passenger's head contacted the frontal airbag and the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the glove box.

The occupant data is summarized below.

ATD Position	HIC <sub>15</sub>	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50th)	460.274	0.280	1212.169	-144.673	47.797	-22.129	-1290.938	-1881.104
Passenger (5th)	369.180	0.325	466.913	-622.163	45.514	-14.657	-3227.959	-2901.969

**GENERAL COMMENTS:**

1. P1 (Driver) serial number - 065
2. P2 (Passenger) serial number - 137

**Data Anomalies:**

- No Questionable Channels

## **SECTION 2**

### **OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS**

This section contains information reporting for the following Data Sheets:

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

Data Sheet No. 2 – Seat Adjustment, Fuel System, and Steering Wheel Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Seat Belt Positioning Data

Data Sheet No. 6 – High-Speed Camera Locations and Data

Data Sheet No. 7 – Vehicle Accelerometer Locations

Data Sheet No. 8 – Photographic Reference Target Locations

Data Sheet No. 9 – Load Cell Locations on Fixed Barrier

Data Sheet No. 10 – Test Vehicle Summary of Results

Data Sheet No. 11 – Post-Test Observations

Data Sheet No. 12 – Vehicle Profile Measurements

Data Sheet No. 13 – Accident Investigation Division Data

Data Sheet No. 14 – Vehicle Intrusion Measurements

Data Sheet No. 15 – Summary of Indicant FMVSS No. 212 and FMVSS No. 219 (Partial)

Data Sheet No. 16 – FMVSS 301 Barrier Impact and Static Rollover Results

Data Sheet No. 17 – Dummy/Vehicle Temperature Stabilization Chart

**DATA SHEET NO. 1  
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	M20244200
Model Year	2024
Make	Hyundai
Model	Santa Fe
Body Style	SUV
VIN	5NMP1DGLXRH057998
Body Color	Shimmering Silver
Odometer Reading (km /mi)	22 mi
Engine Displacement (L)	2.5
Type / No. Cylinders	14
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	8-Speed
Overdrive	Yes
Final Drive	All Wheel Drive
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

Traction Control System (TCS)	Yes
Power Steering	Yes
Power Window Auto-Reverse	Yes
Driver Frontal Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Front Pass. Frontal Airbag	Yes
Front Pass. Curtain Airbag	Yes
Front Pass. Head/Torso Airbag	No
Front Pass. Torso Airbag	No
Front Pass. Torso/Pelvis Airbag	Yes
Front Pass. Pelvis Airbag	No
Front Pass. Knee Airbag	No
Driver Pretensioner	Yes
Driver Load Limiter	Yes
Front Pass. Pretensioner	Yes
Front Pass. Load Limiter	Yes
Other –	N/A

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

**DATA FROM CERTIFICATION LABEL**

Manufactured By	Hyundai Motor Manufacturing Alabama, LLC.
Date of Manufacture	JUN/18/24

GVWR (KG)	2575
GAWR Front (KG)	1340
GAWR Rear (KG)	1410

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

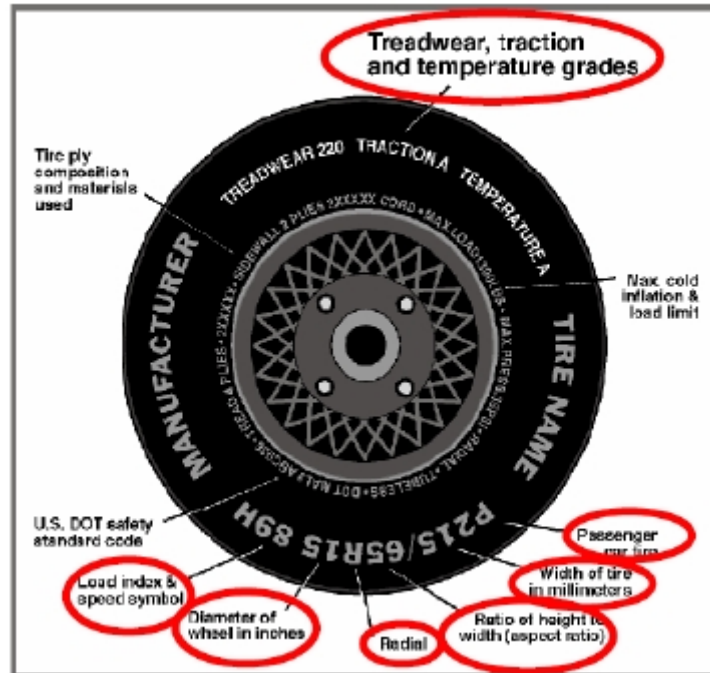
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	Bench	
Number of Occupants	2	3	2	7
Capacity Wt. (VCW) (kg)				480
Cargo Wt. (RCLW) (kg)				4

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

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

Collect items circled in red, tire manufacturer, and tire name.



**VEHICLE TIRE INFORMATION**

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	235/60R18	235/60R18
Tire Size on Vehicle	235/60R18	235/60R18
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Assurance	Assurance
Treadwear	540	540
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Polyamide	2 Polyester, 2 Steel, 1 Polyamide
Load Index / Speed Symbol	103H	103H
Tire Material	Rubber	Rubber
DOT Safety Code Left	1PL45JDTR1624	1PL45JDTR1624
DOT Safety Code Right	1PL45JDTR1624	1PL45JDTR1624

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

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

**TEST VEHICLE WEIGHTS**

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	528	440		562	480	
Right	kg	533	410		570	440	
Ratio	%	55.5	44.5		55.2	44.8	
Total	kg	1061	850	1911	1132	920	2052

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1911	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	142	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	4	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2057	(A+B+C)

**TEST VEHICLE ATTITUDES AND CG**

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	859	862	901	906	1252
As Tested	mm	835	847	865	874	1262
Post-Test	mm	901	910	860	862	

**GENERAL TEST VEHICLE DATA**

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2815
Total Vehicle Length at Left Side	mm	4746
Total Vehicle Length at Centerline	mm	4826
Total Vehicle Length at Right Side	mm	4746
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	67
Amount of Stoddard Solvent in Fuel Tank	L	62.3

**LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:**

Trunk Carpeting, 3rd Row, and Spare Tire  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

**TARGET VEHICLE STRUCTURAL MEASUREMENT**

No.	Description	Pre-Test
1	Total Length	4826
2	Total Width	1901
3*	Bumper Top Height	584
4*	Bumper Bottom Height	469
5*	Longitudinal Member Top Height	581
6	Distance Between Longitudinal Members	1058
7	Longitudinal Member Width	64
8*	Engine Top Height	880
9*	Engine Bottom Height	215
10	Engine and Gearbox Width	423
11	Front Bumper-Engine Distance	701
12*	Front Shock Absorber Fixing Height	981
13*	Bonnet Leading Edge Height	979
14	Front Shock Absorber Fixing Width	1200
15	Front Bumper – Front Axle Distance	915
16	Front Axle – A Pillar Distance	524
17	A-Pillar – B-Pillar Distance	1074
18	B-Pillar – Rear Axle Distance	1217
19	B-Pillar – C-Pillar Distance	1059
20*	Roof Sill Bottom Height	1610
21*	Roof Sill Top Height	1678
22*	Floor Sill Bottom Height	425
23*	Floor Sill Top Height	463

\*Height Measurements are taken from the ground  
 Note: All measurements are in millimeters

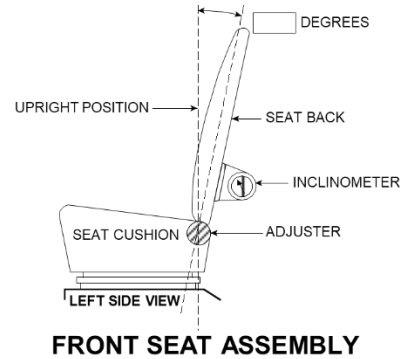
**DATA SHEET NO. 2**  
**SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

**NOMINAL DESIGN RIDING POSITION**

The driver's seat back was set to the manufacturer's designated angle. The passenger's seat back was positioned in a similar manner as the driver's seat back. Seat back angles are measured at the headrest post bezel using a digital inclinometer.



Seating Position	Degrees
Driver Seat Back Angle	0.5
Passenger Seat Back Angle	8.45

**SEAT FORE / AFT POSITIONS**

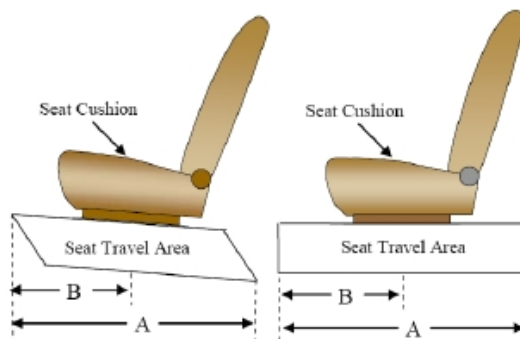
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	35 (0-34)	13
Passenger Seat	38 (0-37)	0

**SEAT BELT UPPER ANCHORAGE**

The driver's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 50<sup>th</sup> percentile adult male ATD. The passenger's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 5<sup>th</sup> percentile adult female ATD. For this test zero is defined as the uppermost position.

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



**DATA SHEET NO. 2 ... (CONTINUED)**  
**SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

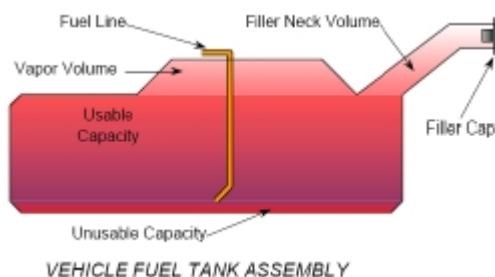
NHTSA No.: M20244200  
 Test Date: 11/20/2024

**FUEL TANK CAPACITY**

Description	Liters
Usable Capacity of "Standard Tank"	67.0
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	61.64 - 62.98
Actual Amount of Solvent Used	62.3
1/3 of Usable Capacity	22.3

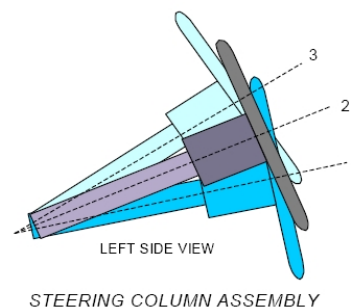
**FUEL PUMP**

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.



**STEERING COLUMN ADJUSTMENT**

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. For angular measurements, a digital inclinometer was used to measure a plate which was placed across the steering wheel rim. A tape measure was used to measure the telescoping steering wheel travel.



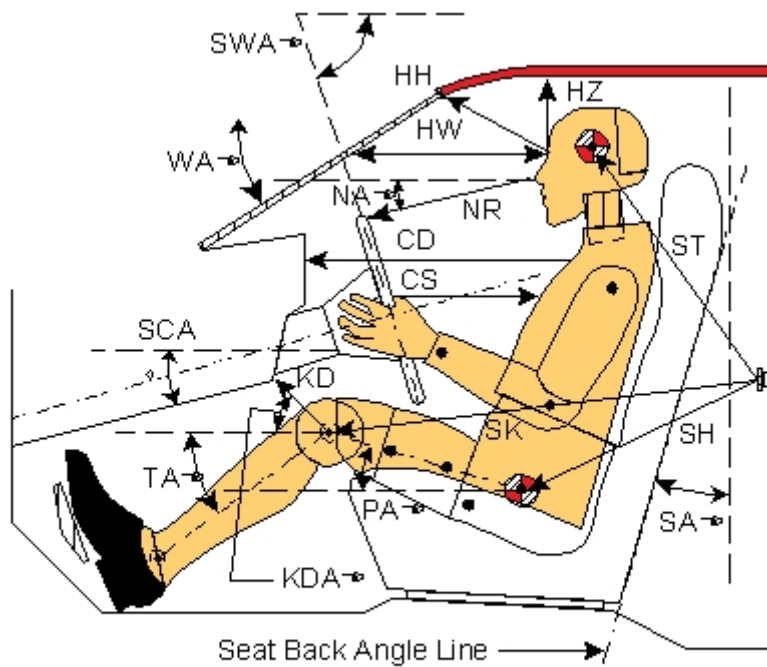
**STEERING COLUMN POSITIONS**

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	23.8	
Geometric center position No. 2	26.2	
Uppermost position No. 3	28.7	
Telescoping Steering Wheel Travel		50
Test Position	26.2	25

**DATA SHEET NO. 3**  
**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
Test Date: 11/20/2024



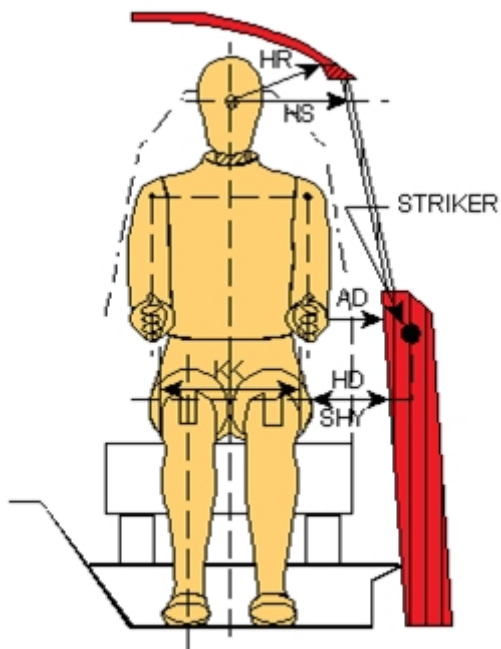
**Left Side View**

Code	Measurement Description	Driver (SN: 065)		Passenger (SN: 137)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
<b>WA°</b>	Windshield Angle		33.1		
<b>SWA°</b>	Steering Wheel Angle		26.2		
<b>SCA°</b>	Steering Column Angle		63.8		
<b>SA°</b>	Seat Back Angle (on headrest post)		0.5		8.45
<b>HZ</b>	Head to Roof (Z)	270	90.0	237	90.0
<b>HH</b>	Head to Header	451	26.8	338	50.6
<b>HW</b>	Head to Windshield	748	0.1	600	0.1
<b>NR</b>	Nose to Rim / Dash	415	7.3	458	18.3
<b>CD</b>	Chest to Dash	620		391	
<b>CS</b>	Chest to Steering Hub	331	21.5		
<b>RA</b>	Rim to Abdomen	211	0.1		
<b>KDL</b>	Left Knee to Dash	212	18.9	74	43.3
<b>KDR</b>	Right Knee to Dash	195	16.5	85	38.7
<b>PA°</b>	Pelvic Angle		24.7		20.8
<b>TA°</b>	Tibia Angle		50.2		44.5
<b>SK</b>	Striker to Knee	635	19.8	754	19.1
<b>ST</b>	Striker to Head	363	79.8	408	51.0
<b>SH</b>	Striker to H-Point	390	56.7	460	40.0

**DATA SHEET NO. 4  
DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024



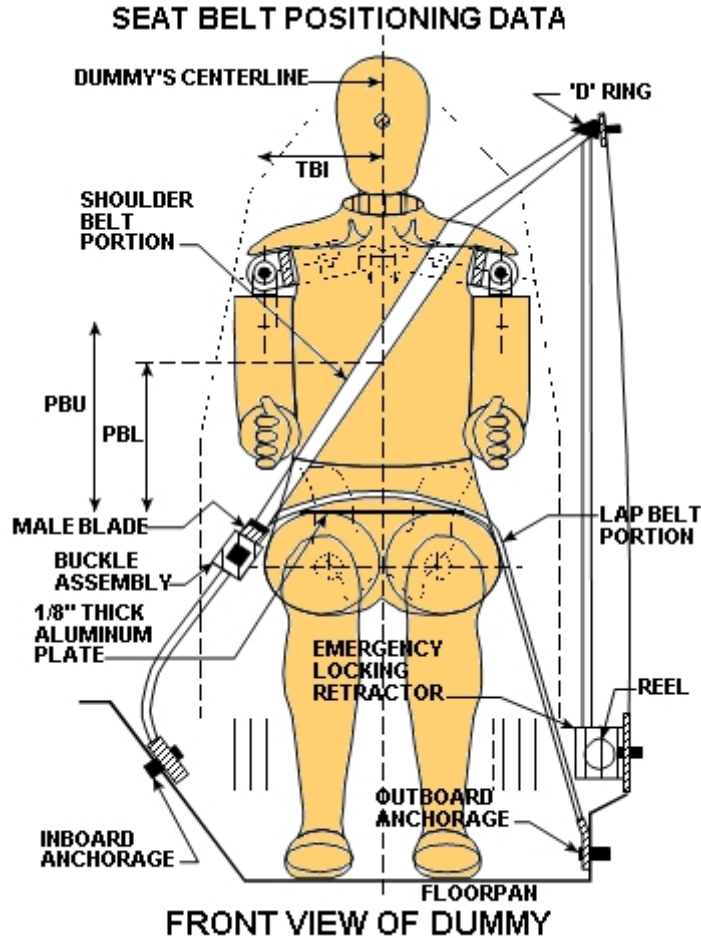
**Front View**

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	150	85
HD	H-Point to Door	168	267
HR	Head to Side Header	283	298
HS	Head to Side Window	392	406
KK	Knee to Knee	318	212
SHY	Striker to H-Point (Y Direction)	266	305
AA	Ankle to Ankle	308	167

**DATA SHEET NO. 5  
SEAT BELT POSITIONING DATA**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024



**SEAT BELT POSITIONING MEASUREMENTS**

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	385	340
PBL — Top surface of reference to belt lower edge	mm	295	245

**BELT LENGTH DATA**

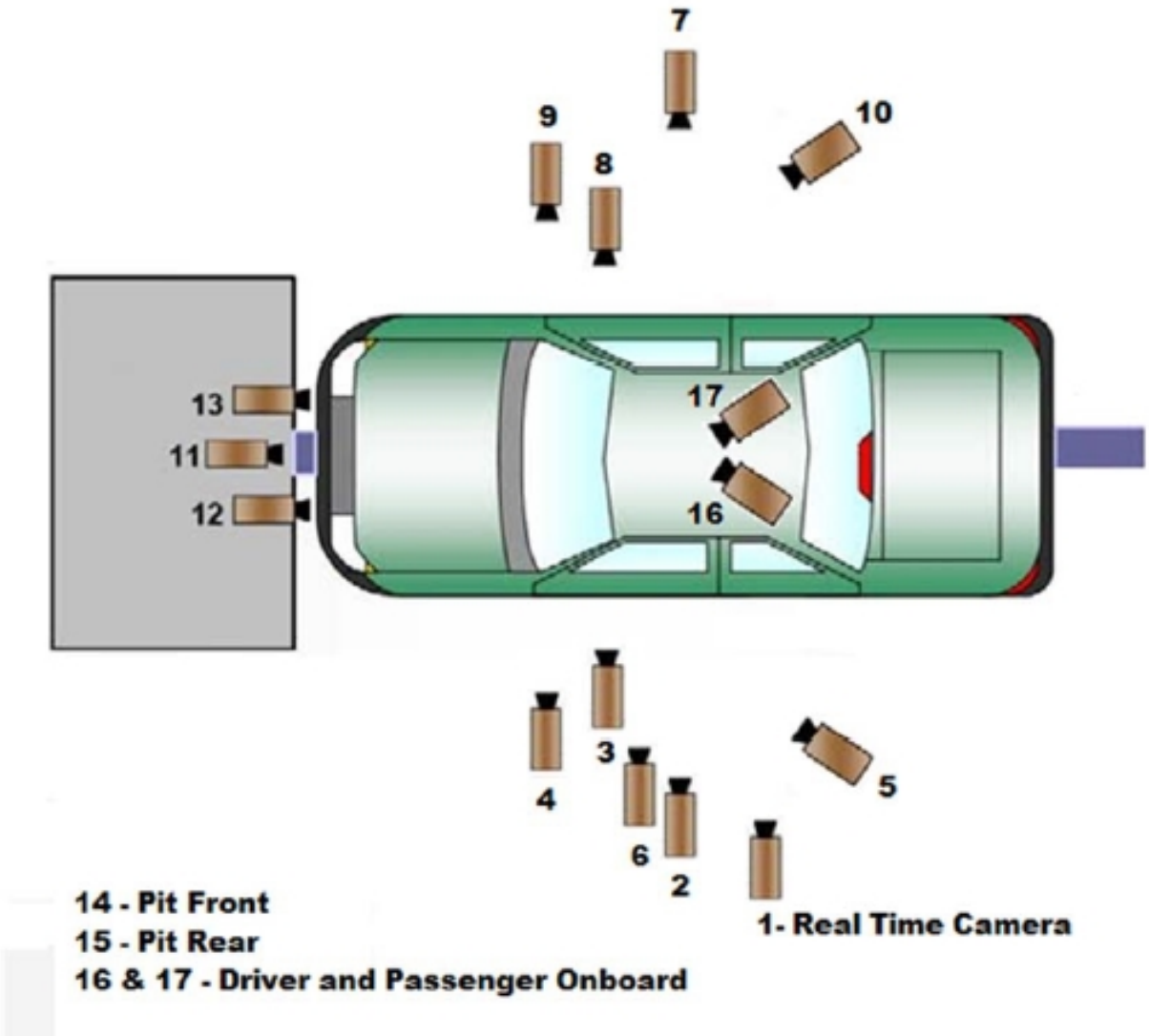
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	910	1020
Lap Belt Length as measured on ATD	mm	575	690
Remainder of belt on reel	mm	1055	840
Total belt length for continuous webbing systems	mm	2540	2550

**DATA SHEET NO. 6  
HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
Test Date: 11/20/2024

**CAMERA POSITIONS FOR FRONTAL IMPACTS**



**DATA SHEET NO. 6 ... (CONTINUED)**  
**HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

**CAMERA LOCATIONS**

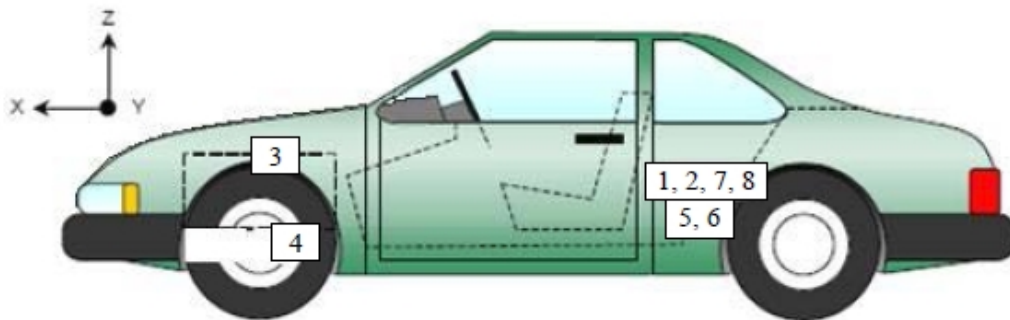
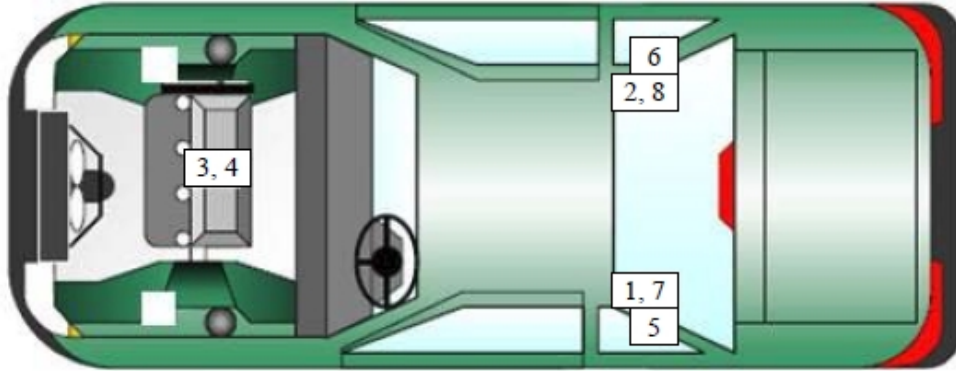
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall				Zoom	60
2	Left Overall	-2228	-8003	-1466	24	1000
3	Driver Close-Up	-1740	-7038	-1540	50	1000
4	Left Front Half	-1229	-6621	-1553	28	1000
5	Left Angle	-3987	-4231	-2503	50	1000
6	Steering Column	-1540	-7724	-2429	75	1000
7	Right Overall	-1983	7719	-1587	24	1000
8	Passenger Close-Up	-1359	7443	-1671	50	1000
9	Right Front Half	-968	6755	-1409	28	1000
10	Right Angle	-3971	4109	-2523	50	1000
11	Windshield	1178	0	-2830	12.5	1000
12	Driver Windshield	874	-373	-2193	25	1000
13	Passenger Windshield	874	373	-2193	25	1000
14	Pit Front	-1030	0	2087	12.5	1000
15	Pit Rear	-2959	0	2061	12.5	1000
16	Onboard Driver Airbag (Optional)				8	1000
17	Onboard Passenger Airbag (Optional)				8	1000

\* COORDINATES:      +X = forward of impact plane  
                              +Y = right of monorail center  
                              +Z = into ground

**DATA SHEET NO. 7  
VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024



**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1985	-368	-24
2	Right Rear Accelerometer – X Direction	1986	369	-25
3	Engine Top X	4123	183	-458
4	Engine Bottom X	4076	181	232
5	Left Rear Accelerometer – Z Direction	1985	-368	-24
6	Right Rear Accelerometer – Z Direction	1986	369	-25
7	Left Rear Accelerometer – X Direction Redundant	1985	-368	-24
8	Right Rear Accelerometer – X Direction Redundant	1986	361	-25

*Reference Points:*      X – Rear Surface of Vehicle (+ forward)  
                                   Y – Vehicle Centerline (+ to right)  
                                   Z – Ground Plane (+ down)

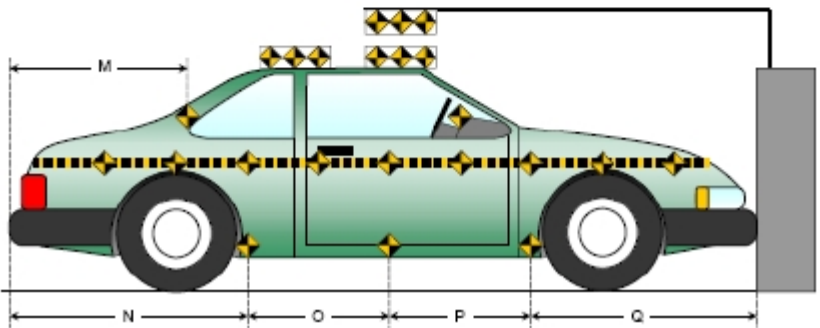
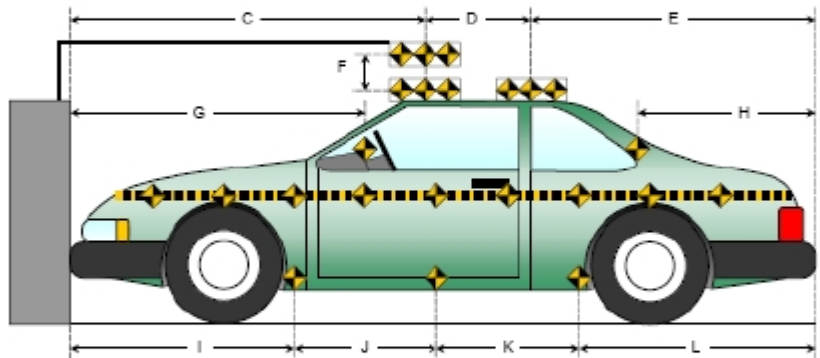
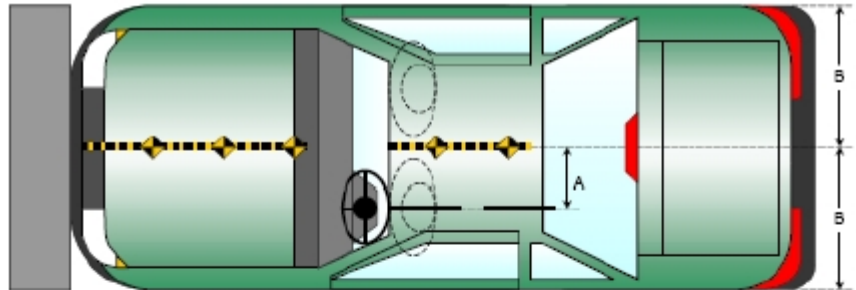
**DATA SHEET NO. 8**  
**PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

Item	Value
A	384
B	951
C	2555
D	611
E	1660
F	238
G	1746
H	1196
I	1390
J	946
K	903
L	1587
M	1195
N	1587
O	1012
P	833
Q	1394

All units in millimeters



**DATA SHEET NO. 9**  
**LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

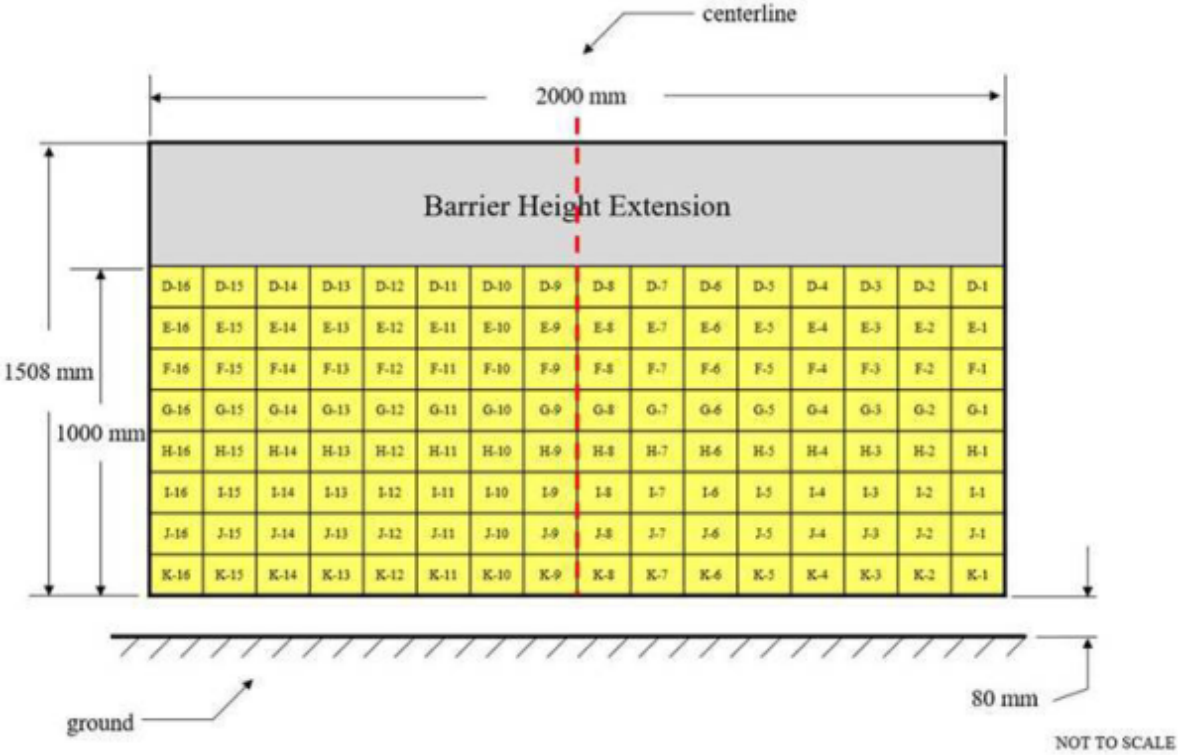


Figure 1 - Load Cell Locations on a 128-Load Cell Barrier with Plywood Height Extension\*  
 Please note above diagram is not actual representation of load cell barrier used.

**DATA SHEET NO. 10**  
**TEST VEHICLE SUMMARY OF RESULTS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

**INSTRUMENTATION**

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	47
Passenger Dummy Accelerometers	47
Vehicle Structure Accelerometers	8
Load Cell Barrier	128
Total	230

**CAMERA COVERAGE**

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	14
Real-Time Panning	1
Total	17

**DATA SHEET NO. 11  
POST-TEST OBSERVATIONS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

**TEST DUMMY INFORMATION AND CONTACT LOCATIONS**

Description	Driver	Passenger
Dummy Type / Serial No.	Hybrid III 50th Male / 065	Hybrid III 5th Female / 137
Head Contact	Headrest & Frontal Airbag	Headrest & Frontal Airbag
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Glove Box
Right Knee Contact	Knee Airbag	Glove Box

**DOOR OPENING AND SEAT TRACK INFORMATION**

Description	Driver	Passenger	Other
Locked / Unlocked Doors	Unlocked	Unlocked	
Front Door Opening	Closed & Operational	Closed & Operational	
Rear Door Opening	Closed & Operational	Closed & Operational	
Trunk/Hatch/Tailgate Opening			Closed & Operational
Seat Track Shift (mm)	0	0	
Seat Back Movement from Initial Position	None	None	

**POST-TEST STRUCTURAL OBSERVATIONS**

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracked throughout
Window Damage	None
Other	Small 12V fire in engine compartment was extinguished

**VEHICLE REBOUND FROM BARRIER**

Measured Parameter	Units	Value
Left Side	mm	1035
Center	mm	1040
Right Side	mm	1036
Average	mm	1037

**DATA SHEET NO. 11 ... (CONTINUED)  
POST-TEST OBSERVATIONS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

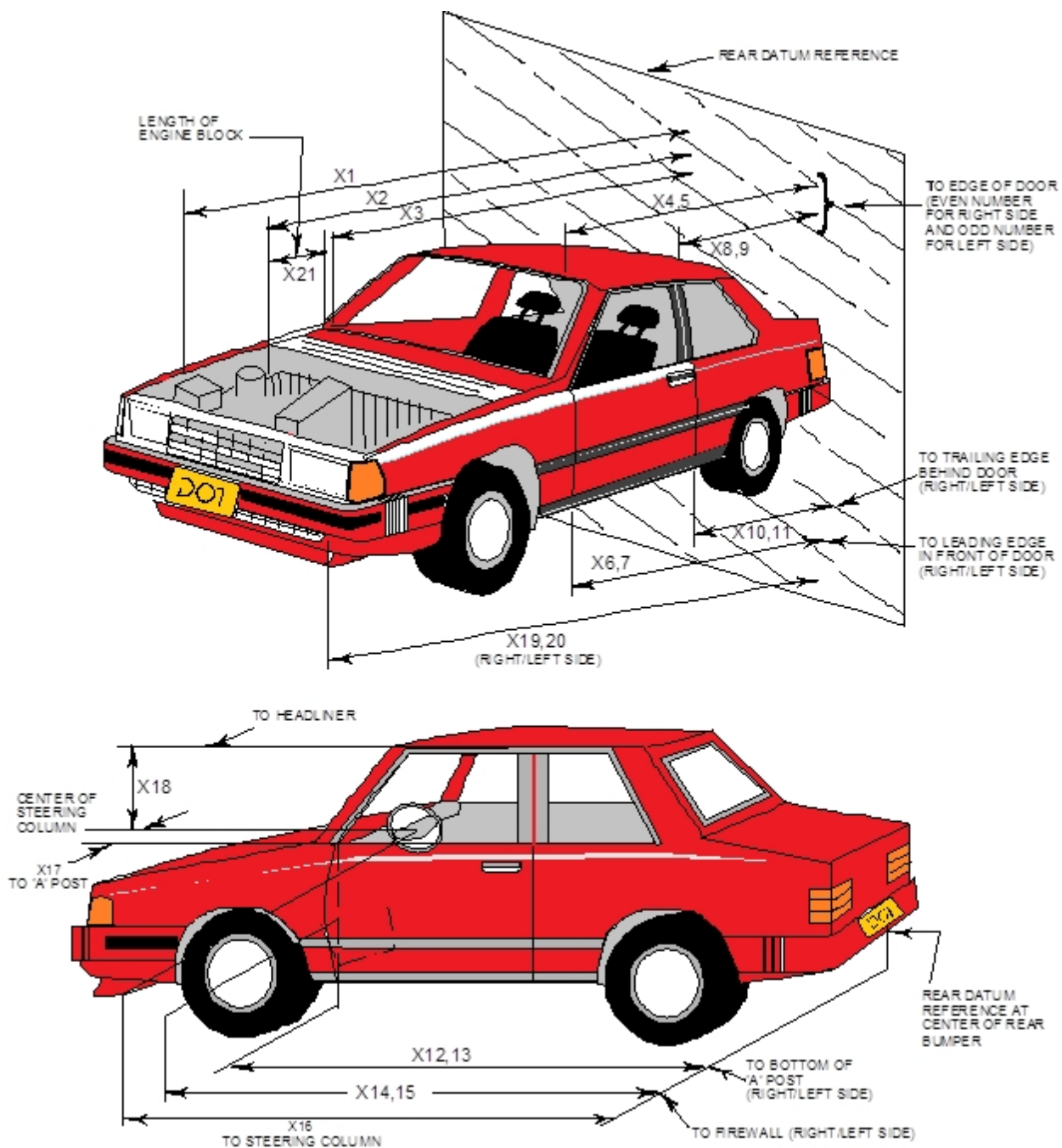
**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

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

**DATA SHEET NO. 12**  
**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024



**DATA SHEET NO. 12 ... (CONTINUED)  
VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

No.	Measurement Description	Pre-Test	Post-Test	Change
1	Total Length of Vehicle at Centerline	4826	4385	-441
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4125	3970	-155
3	RSOV to Firewall	3804	3809	5
4	RSOV to Upper Leading Edge of Right Door	3384	3381	-3
5	RSOV to Upper Leading Edge of Left Door	3386	3389	3
6	RSOV to Lower Leading Edge of Right Door	3391	3388	-3
7	RSOV to Lower Leading Edge of Left Door	3391	3394	3
8	RSOV to Upper Trailing Edge of Right Door	2311	2309	-2
9	RSOV to Upper Trailing Edge of Left Door	2314	2315	1
10	RSOV to Lower Trailing Edge of Right Door	2345	2345	0
11	RSOV to Lower Trailing Edge of Left Door	2346	2348	2
12	RSOV to Bottom of "A" Post of Right Side	3536	3533	-3
13	RSOV to Bottom of "A" Post of Left Side	3535	3538	3
14	RSOV to Firewall, Right Side	3995	3953	-42
15	RSOV to Firewall, Left Side	3991	3990	-1
16	RSOV to Steering Column	2910	2981	71
17	Center of Steering Column to "A" Post	331	329	-2
18	Center of Steering Column to Headliner	465	456	-9
19	RSOV to Right Side of Front Bumper	4789	4371	-418
20	RSOV to Left Side of Front Bumper	4789	4366	-423
21	Length of Engine Block	158	158	0
RD	RSOV to Right Side of Dash Panel	3146	3143	-3
CD	RSOV to Center of Dash Panel	3101	3106	5
LD	RSOV to Left Side of Dash Panel	3147	3147	0

All Dimensions in mm

**DATA SHEET NO. 13**  
**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

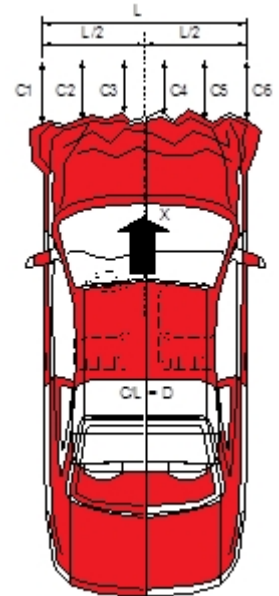
NHTSA No.: M20244200  
Test Date: 11/20/2024

**VEHICLE INFORMATION**

VIN: 5NMP1DGLXRH057998 Wheelbase (mm): 2815  
Vehicle Size Category: MPV Test Weight (kg): 2052

**ACCELEROMETER DATA**

Accelerometer Locations: Please See Data Sheet No. 7  
Cal. Procedure / Interval: Calspan Procedure / 6 month  
Integration Algorithm: Trapezoidal  
Linearity: > 99%  
Impact Velocity (km/h): 56.31  
Velocity Change (km/h): 62.40  
Time of Separation (ms): 69



**CRUSH PROFILE**

Collision Deformation Classification: 12FDEW2  
Midpoint of Damage: C4  
Damage Region Length (mm): 1637  
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Crush
C1	Crush Zone 1 at Left Side	mm	4618	4293	325
C2	Crush Zone 2 at Left Side	mm	4795	4376	419
C3	Crush Zone 3 at Left Side	mm	4823	4394	429
C4	Crush Zone 4 at Right Side	mm	4822	4391	431
C5	Crush Zone 5 at Right Side	mm	4796	4376	420
C6	Crush Zone 6 at Right Side	mm	4627	4326	301
L	C1 to C6	mm	1552	1637	-85

**DATA SHEET NO. 14  
VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

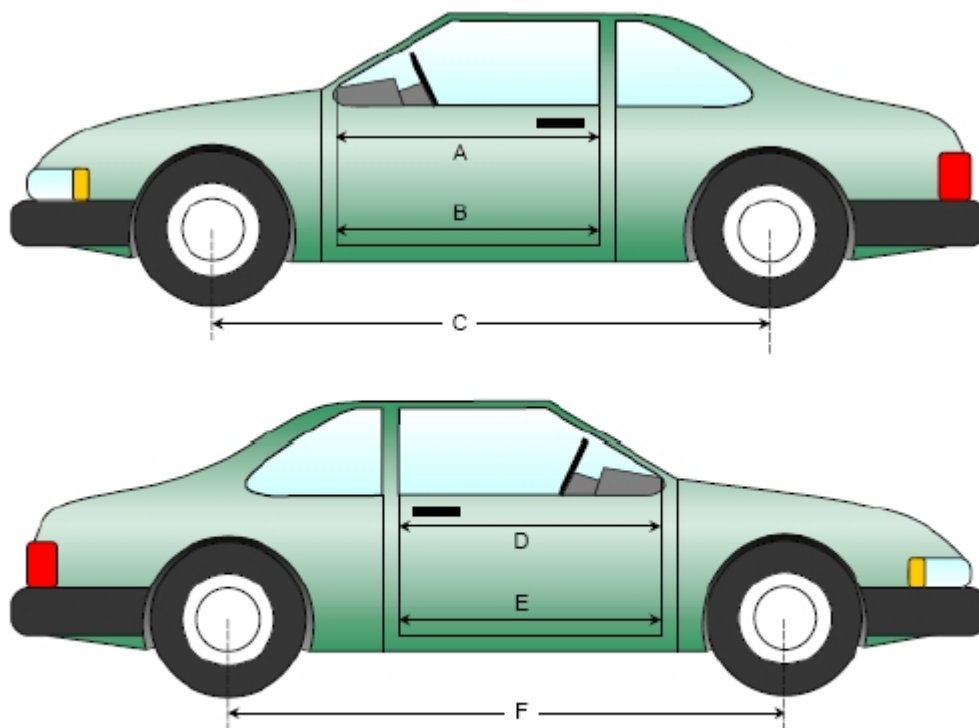
NHTSA No.: M20244200  
 Test Date: 11/20/2024

**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Change
A	Left Side Upper	mm	956	956	0
B	Left Side Lower	mm	877	877	0
D	Right Side Upper	mm	956	957	1
E	Right Side Lower	mm	877	877	0

**WHEELBASE MEASUREMENTS**

Item	Description	Units	Pre-Test	Post-Test	Change
C	Left Side Wheelbase	mm	2815	2752	-63
F	Right Side Wheelbase	mm	2815	2744	-71



**Left & Right Side Views**

**DATA SHEET NO.14 ... (CONTINUED)  
VEHICLE INTRUSION MEASUREMENTS**

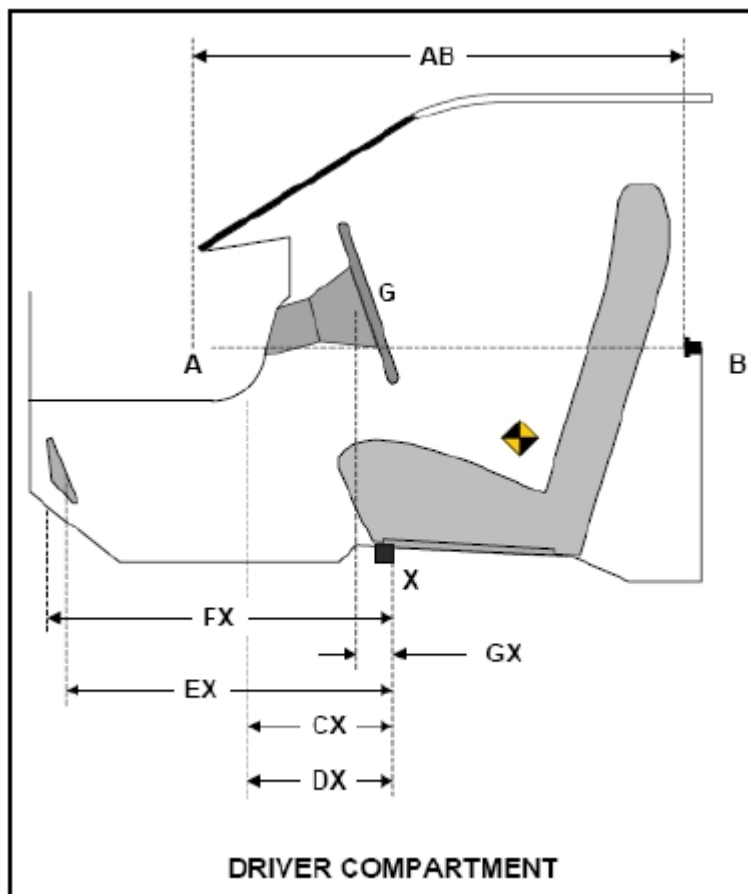
Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024

**DRIVER COMPARTMENT INTRUSION**

Item	Description	Units	Pre-Test	Post-Test	Change
AB	Door Opening (Inside Window Jam)	mm	705	702	-3
CX	Left Knee Bolster to X	mm	280	281	1
DX	Right Knee Bolster to X	mm	278	282	4
EX	Brake Pedal to X	mm	530	486	-44
FX	Foot Rest to X	mm	524	516	-8
GX	Center of Steering Column Wheel Hub to X	mm	14	84	70

*X = Front of Seat Track (Stationary)*





**DATA SHEET NO. 15 ... (CONTINUED)**  
**SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
Test Date: 11/20/2024

**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Temperature at Time of Impact: 21°C

Test Time: 9:58 AM

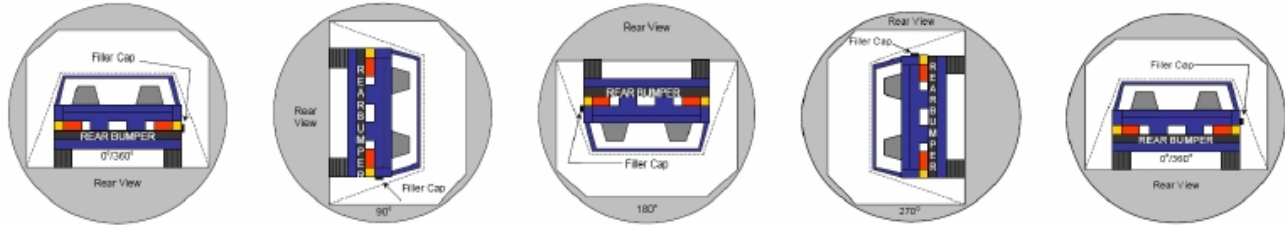
**STODDARD SOLVENT SPILLAGE MEASUREMENTS**

- A. From impact until vehicle motion ceases 0 oz  
(Maximum allowable is 1 oz.)
- B. For the 5-minute period after motion ceases 0 oz  
(Maximum allowable is 5 oz.)
- C. For the following 25 minutes: 0 oz  
(Maximum allowable is 1 oz.)
- D. Spillage: No Spillage

**DATA SHEET NO. 16  
FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
 Test Date: 11/20/2024



0° TO 90°                      90° TO 180°                      180° TO 270°                      270° TO 360°

1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent Spillage: No Spillage

**SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	69	300	369
90° to 180°	66	300	366
180° to 270°	63	300	363
270° to 360°	68	300	368

**FMVSS 301 SPILLAGE TABLE**

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

**SOLVENT SPILLAGE LOCATION TABLE**

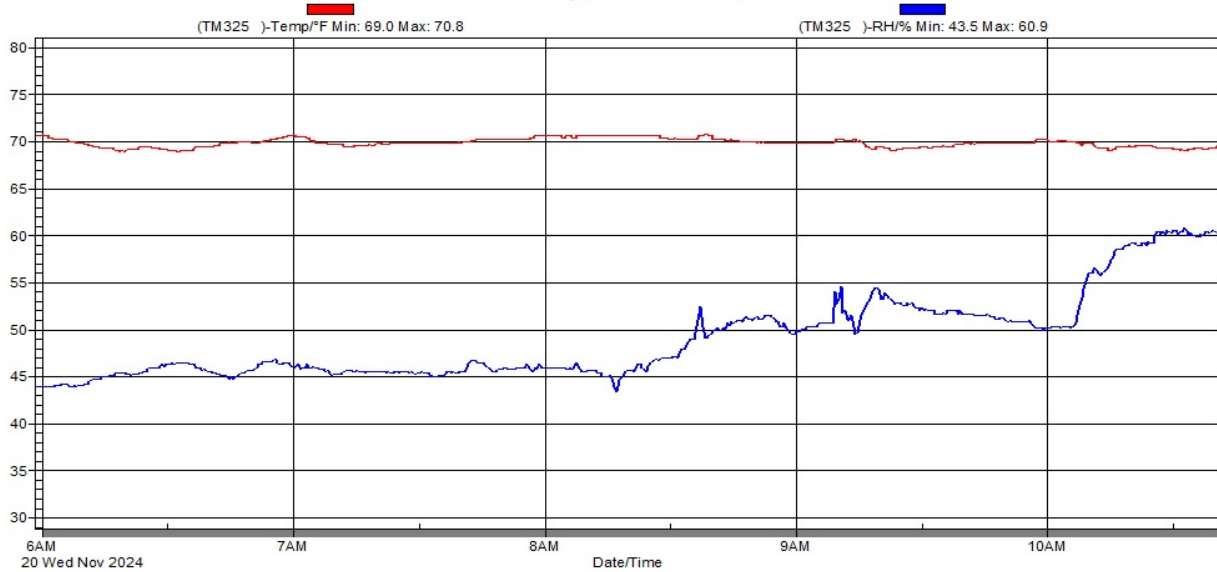
Test Phase	Spillage Location
0° to 90°	No Spillage
90° to 180°	No Spillage
180° to 270°	No Spillage
270° to 360°	No Spillage

**DATA SHEET NO. 17**  
**DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART**

Test Vehicle: 2024 Hyundai Santa Fe 5 Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20244200  
Test Date: 11/20/2024

Wednesday, November 20, 2024



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

**APPENDIX A**  
**PHOTOGRAPHS**

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<b>Fig.</b>	<b>Description</b>	<b>Page</b>
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**<sup>1</sup>NOTE:** *The underbody views should include the following vehicle components: fuel pump, fuel lines, sender unit, fuel tank filler pipe and any other visible system components.*



**Figure A-1: Load Cell Location**



**Figure A-2: Pre-Test Load Cell Wall**



Figure A-3: Post-Test Load Cell Wall



Figure A-4: Manufacturer's Label



**Figure A-5: Tire Placard**



**Figure A-6: 2024 Hyundai Santa Fe Frontal As Delivered**



**M20244200**

**Figure A-7: Left Rear 3-4 View, As Received**



**Figure A-8: Pre-Test Front View of Test Vehicle**



**Figure A-9: Post-Test Front View of Test Vehicle**



**Figure A-10: Pre-Test Left View of Test Vehicle**



**Figure A-11: Post-Test Left View of Test Vehicle**



**Figure A-12: Pre-Test Right View of Test Vehicle**



Figure A-13: Post-Test Right View of Test Vehicle



Figure A-14: Pre-Test Right Front 3-4 View



**Figure A-15: Post-Test Right Front 3-4 View**

**Photo Not Available**

**Figure A-16: Pre-Test Left Rear 3-4 View**

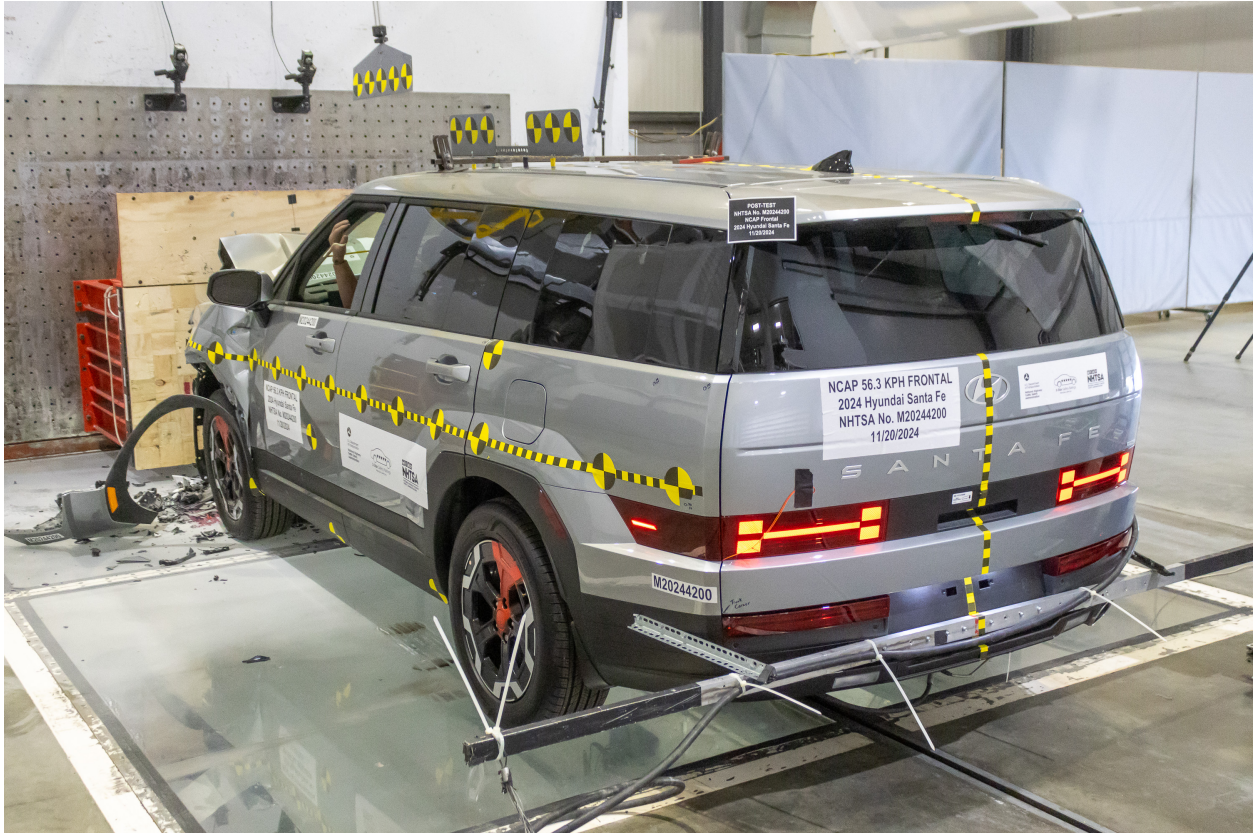


Figure A-17: Post-Test Left Rear 3-4 View



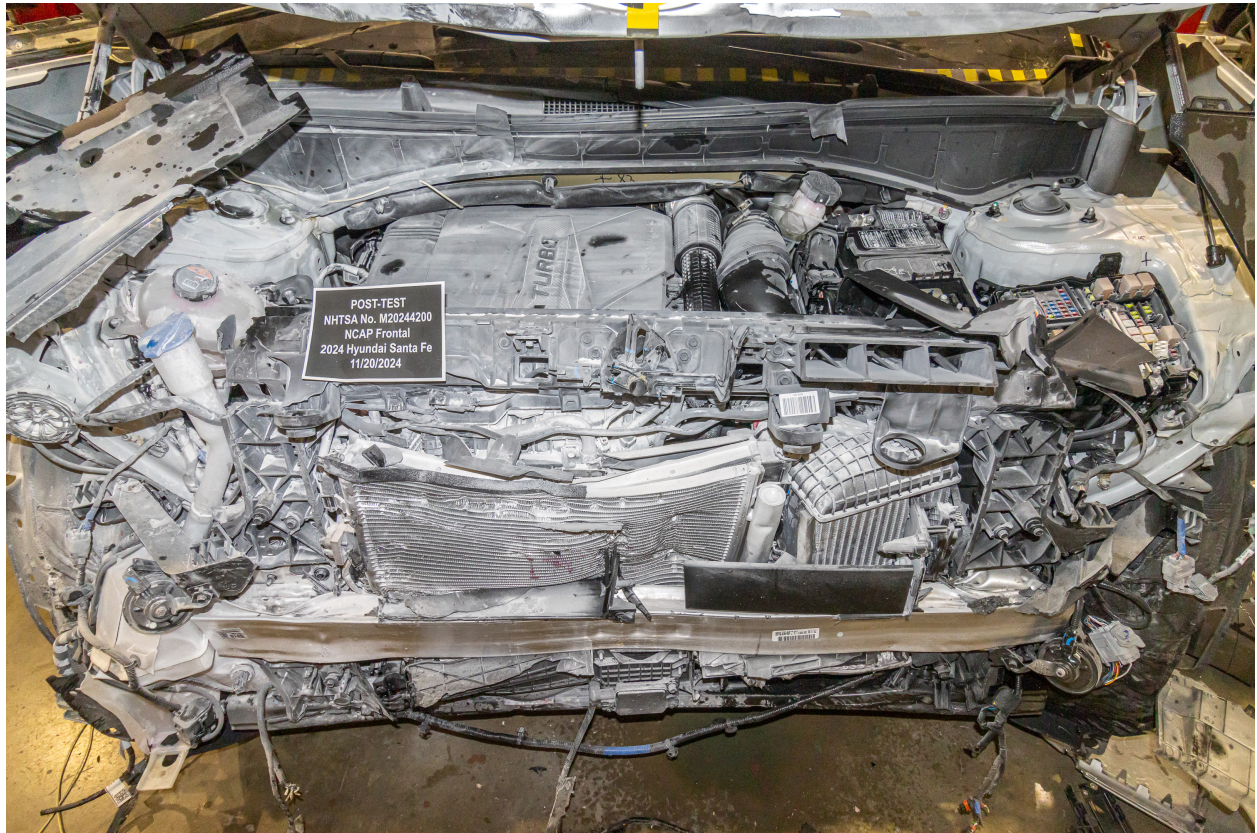
Figure A-18: Pre-Test Windshield View



**Figure A-19: Post-Test Windshield View**



**Figure A-20: Pre-Test Engine Compartment View**



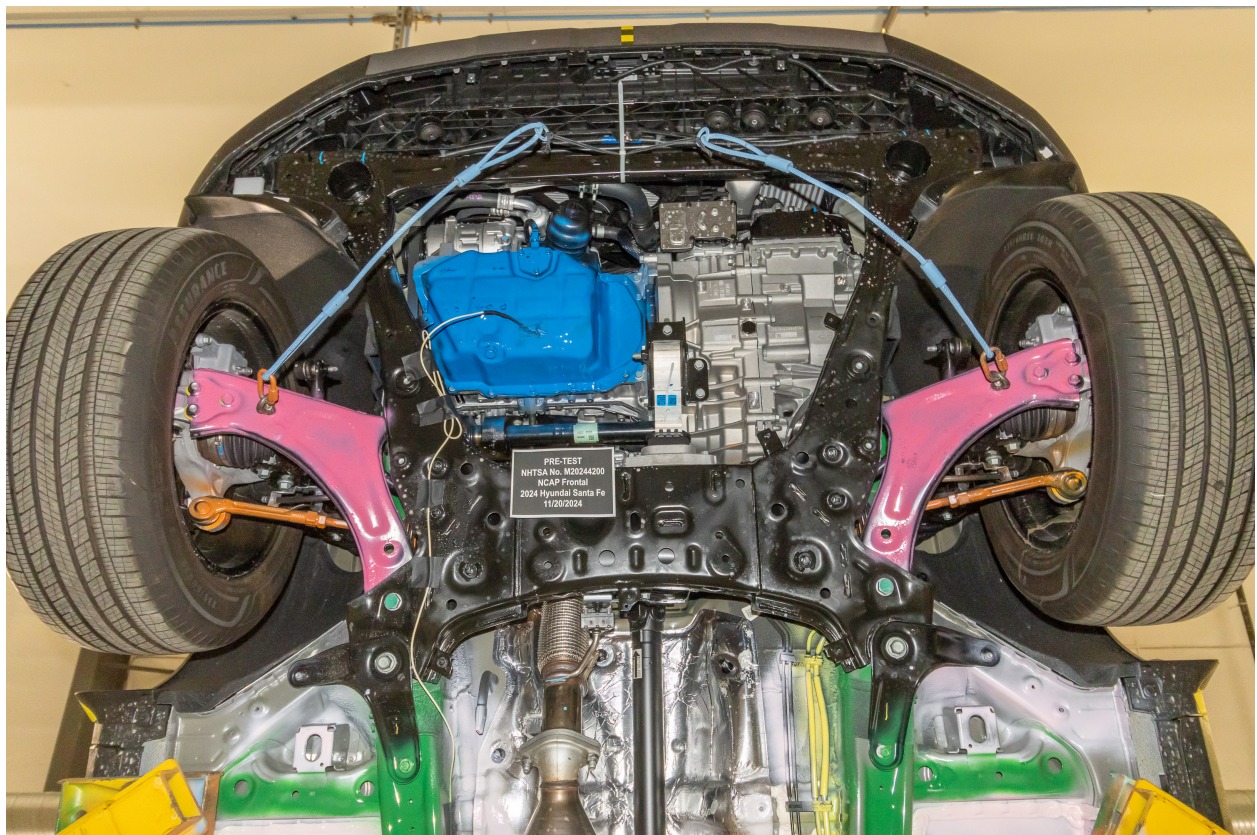
**Figure A-21: Post-Test Engine Compartment View**



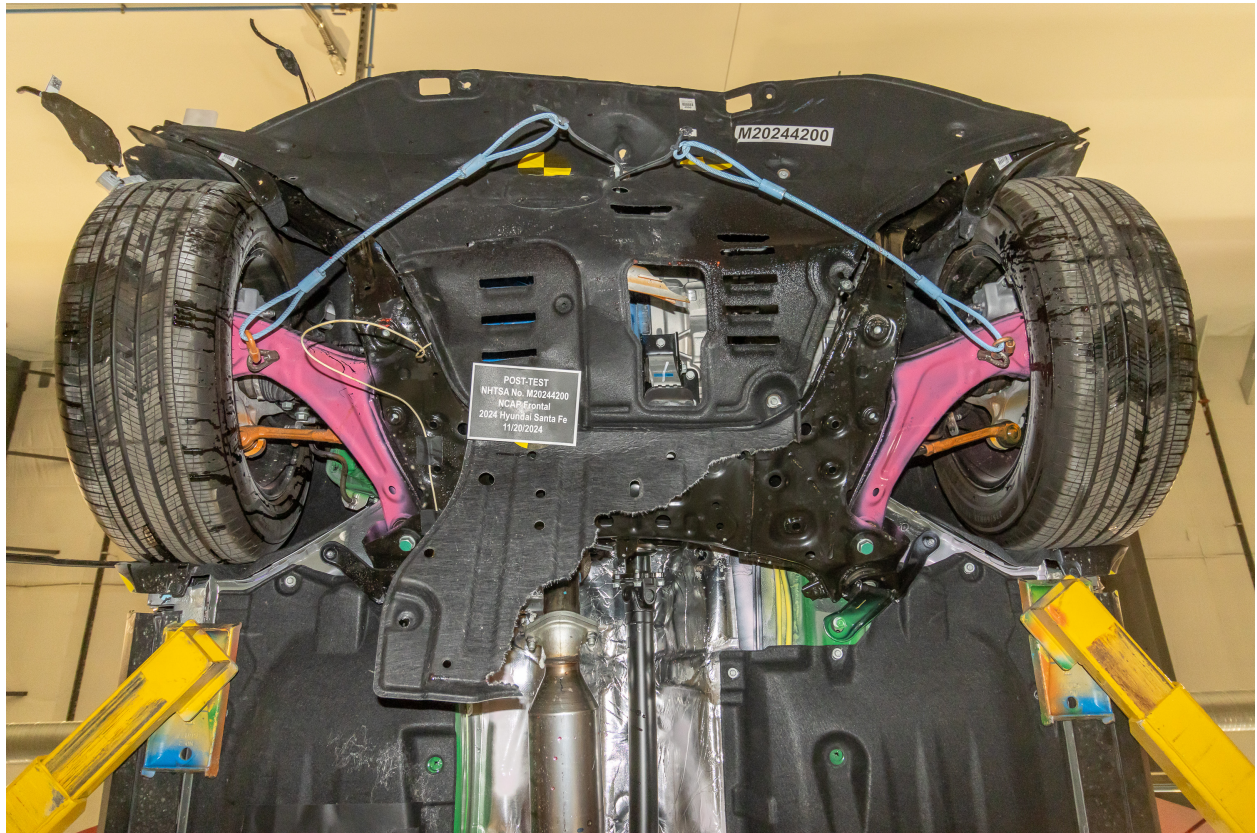
**Figure A-22: Pre-Test Fuel Filler Cap View**



**Figure A-23: Post-Test Fuel Filler Cap View**



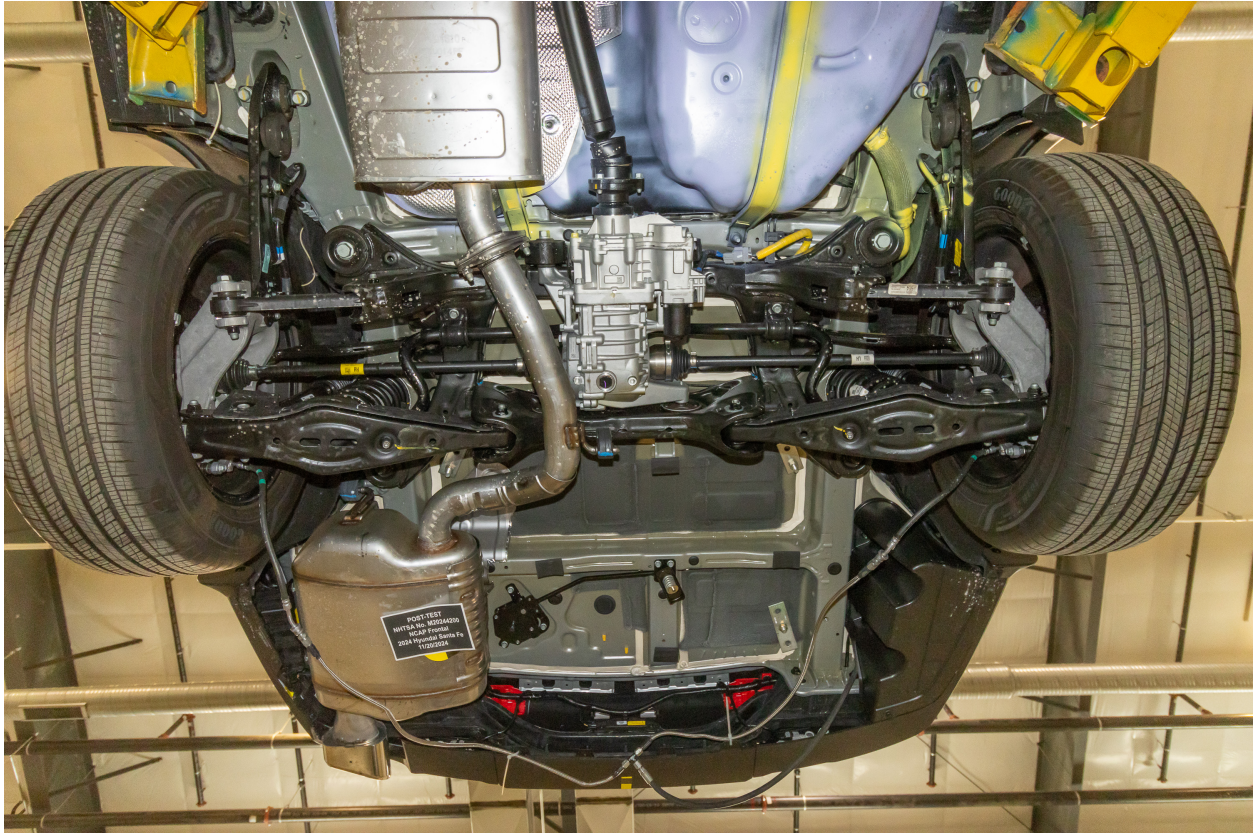
**Figure A-24: Pre-Test Front Underbody View**



**Figure A-25: Post-Test Front Underbody View**



**Figure A-26: Pre-Test Rear Underbody View**



**Figure A-27: Post-Test Rear Underbody View**



**Figure A-28: Pre-Test Dummy Cable Routing**



**Figure A-29: Post-Test Dummy Cable Routing**



**Figure A-30: Pre-Test Driver Dummy Front View**



**Figure A-31: Post-Test Driver Dummy Front View**



**Figure A-32: Pre-Test Driver Dummy Window View**



**Figure A-33: Post-Test Driver Dummy Window View**



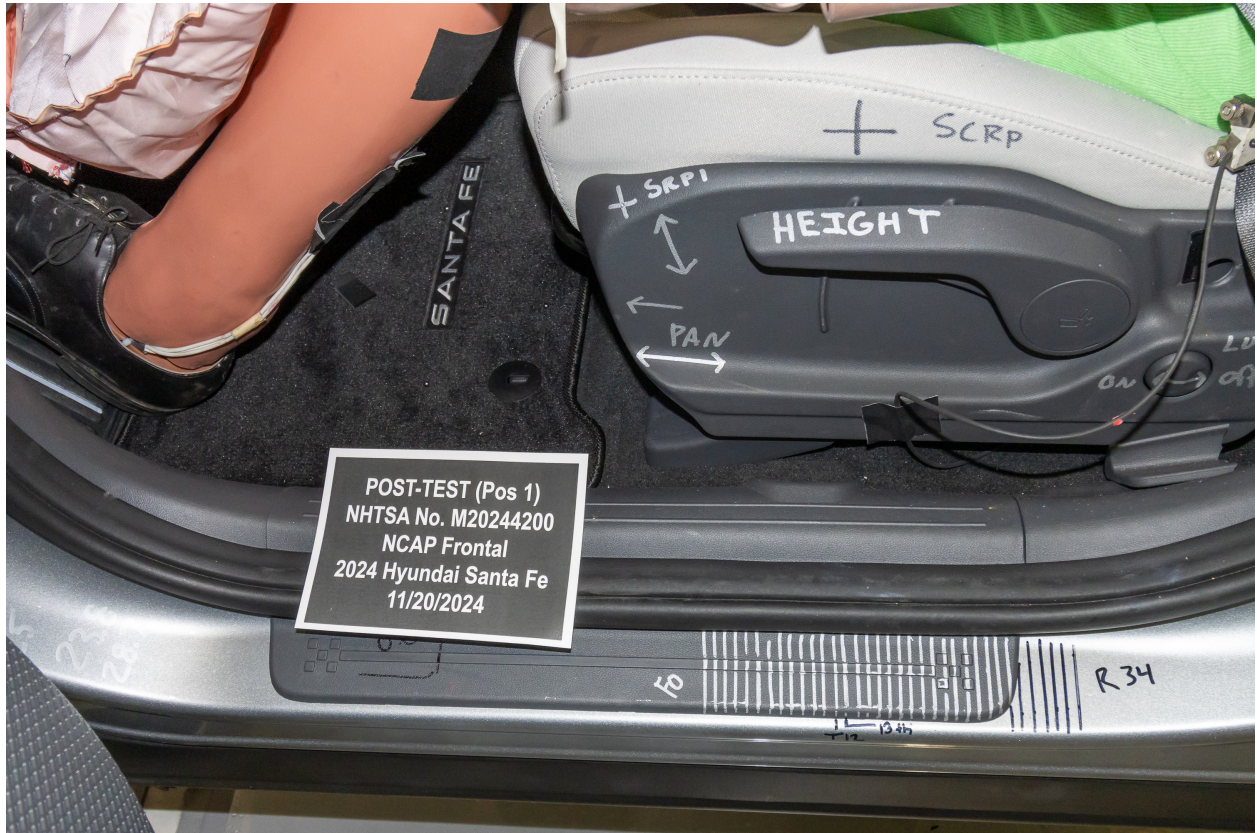
**Figure A-34: Pre-Test Driver Dummy and Vehicle Interior View**



Figure A-35: Post-Test Driver Dummy and Vehicle Interior View



Figure A-36: Pre-Test Driver's Seat Fore-Aft Markings



**Figure A-37: Post-Test Driver's Seat Fore-Aft Markings**



**Figure A-38: Pre-Test View of Belt Anchorage for Driver Dummy**



Figure A-39: Post-Test View of Belt Anchorage for Driver Dummy



Figure A-40: Pre-Test View of Belt Buckle and Latch Plate for Driver Dummy



**Figure A-41: Post-Test View of Belt Buckle and Latch Plate for Driver Dummy**



**Figure A-42: Pre-Test Driver Dummy Feet**



**Figure A-43: Post-Test Driver Dummy Feet**



**Figure A-44: Pre-Test Driver's Side Knee Bolster**



**Figure A-45: Post-Test Driver's Side Knee Bolster**



**Figure A-46: Pre-Test Driver's Side Floorpan**



Figure A-47: Post-Test Driver's Side Floorpan



Figure A-48: Post-Test Driver Dummy Face



**Figure A-49: Post-Test Driver Dummy Contact With Airbag**



**Figure A-50: Post-Test Driver Dummy Contact With Headrest**



**Figure A-51: Pre-Test View of the Steering Wheel**



**Figure A-52: Post-Test View of the Steering Wheel**



**Figure A-53: Pre-Test Passenger Dummy Front View**



**Figure A-54: Post-Test Passenger Dummy Front View**



**Figure A-55: Pre-Test Passenger Dummy Window View**



**Figure A-56: Post-Test Passenger Dummy Window View**



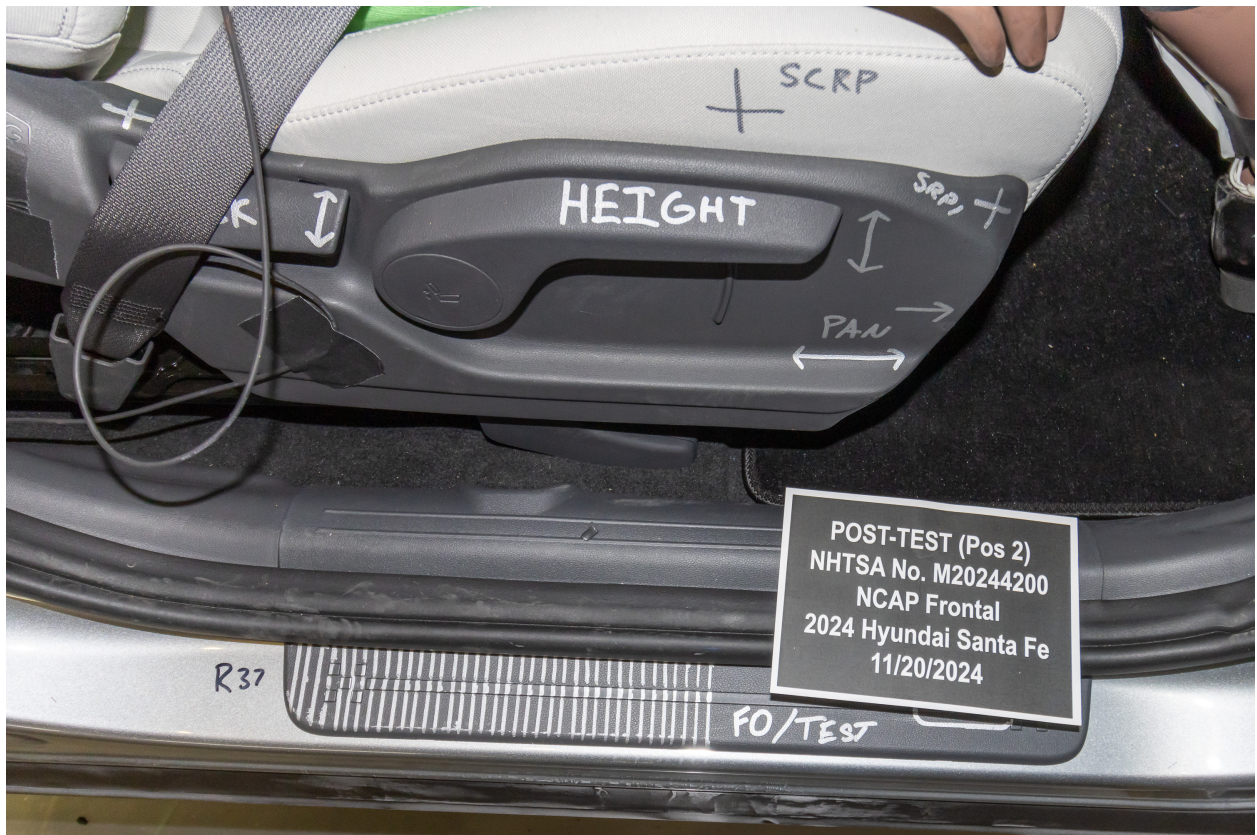
**Figure A-57: Pre-Test Passenger Dummy and Vehicle Interior View**



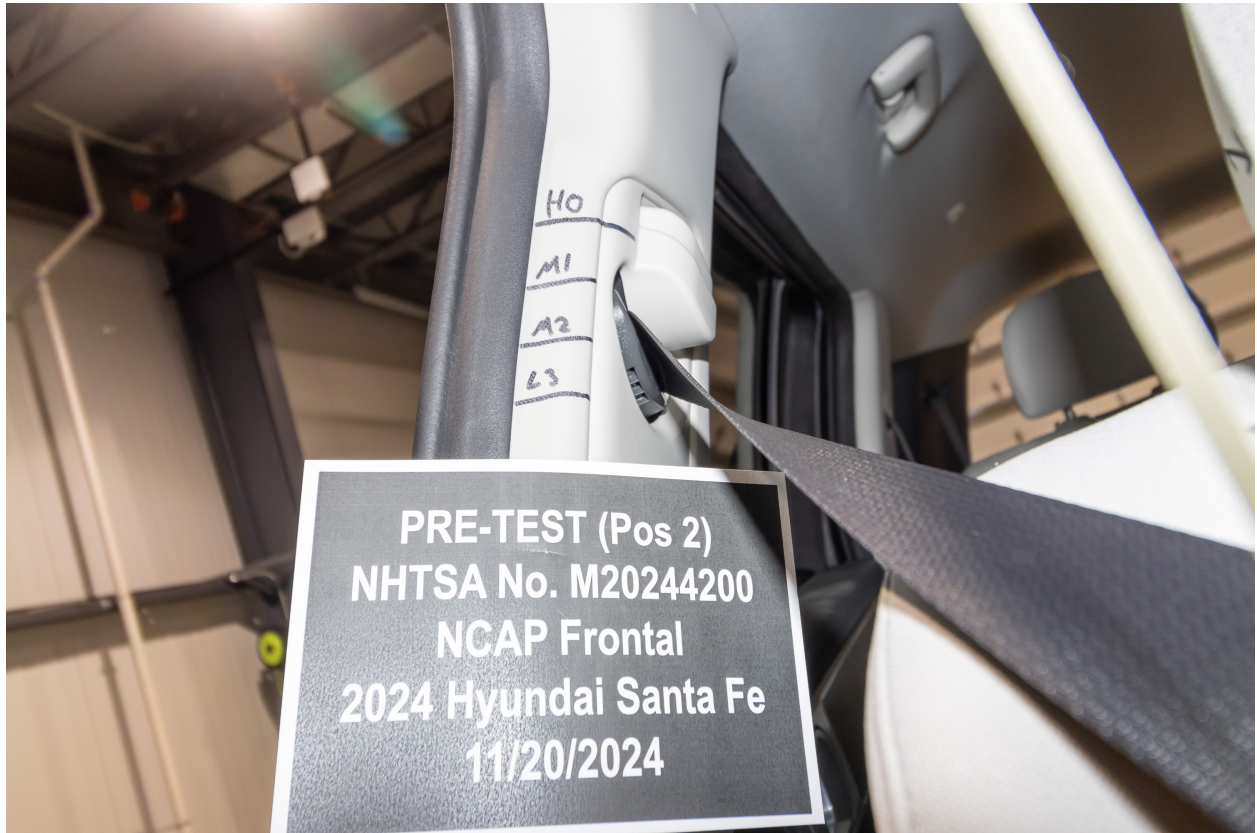
**Figure A-58: Post-Test Passenger Dummy and Vehicle Interior View**



**Figure A-59: Pre-Test Passenger's Seat Fore-Aft Markings**



**Figure A-60: Post-Test Passenger's Seat Fore-Aft Markings**



**Figure A-61: Pre-Test View of Belt Anchorage for Passenger Dummy**



**Figure A-62: Post-Test View of Belt Anchorage for Passenger Dummy**



**Figure A-63: Pre-Test View of Belt Buckle and Latch Plate for Passenger Dummy**



**Figure A-64: Post-Test View of Belt Buckle and Latch Plate for Passenger Dummy**



**Figure A-65: Pre-Test Passenger Dummy Feet**



**Figure A-66: Post-Test Passenger Dummy Feet**



**Figure A-67: Pre-Test Passenger's Side Knee Bolster**



**Figure A-68: Post-Test Passenger's Side Knee Bolster**



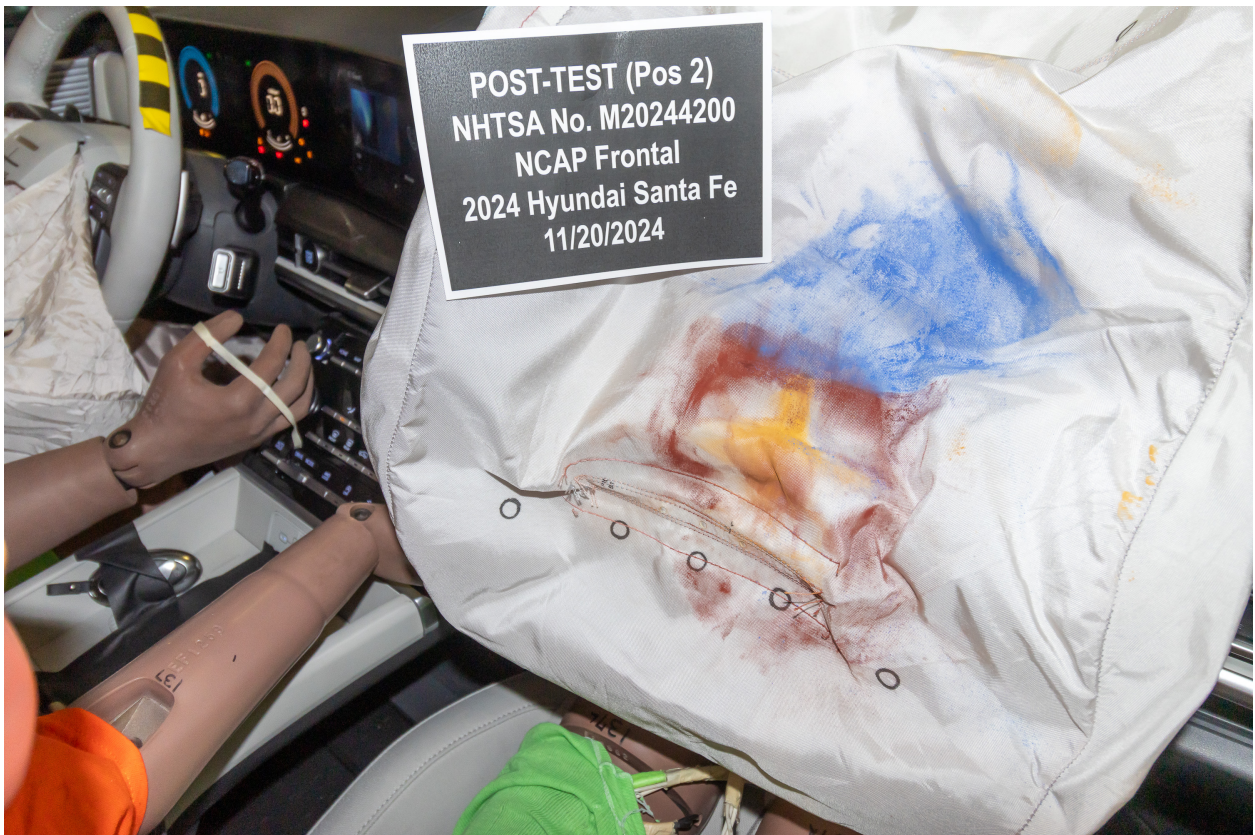
**Figure A-69: Pre-Test Passenger's Side Floorpan**



**Figure A-70: Post-Test Passenger's Side Floorpan**



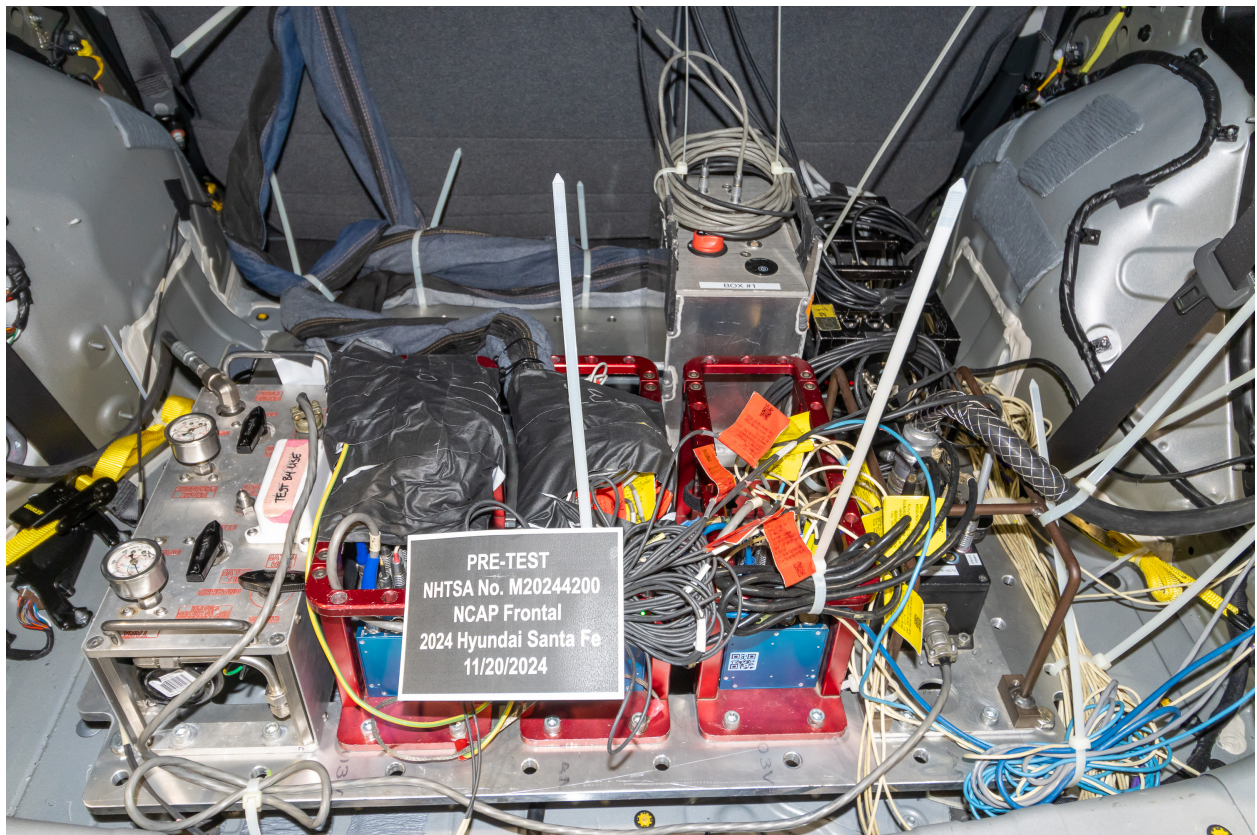
**Figure A-71: Post-Test Passenger Dummy Face**



**Figure A-72: Post-Test Passenger Dummy Contact With Airbag**



**Figure A-73: Post-Test Passenger Dummy Contact With Headrest**



**Figure A-74: Photograph of Ballast Installed in Vehicle**

# Photo Not Applicable

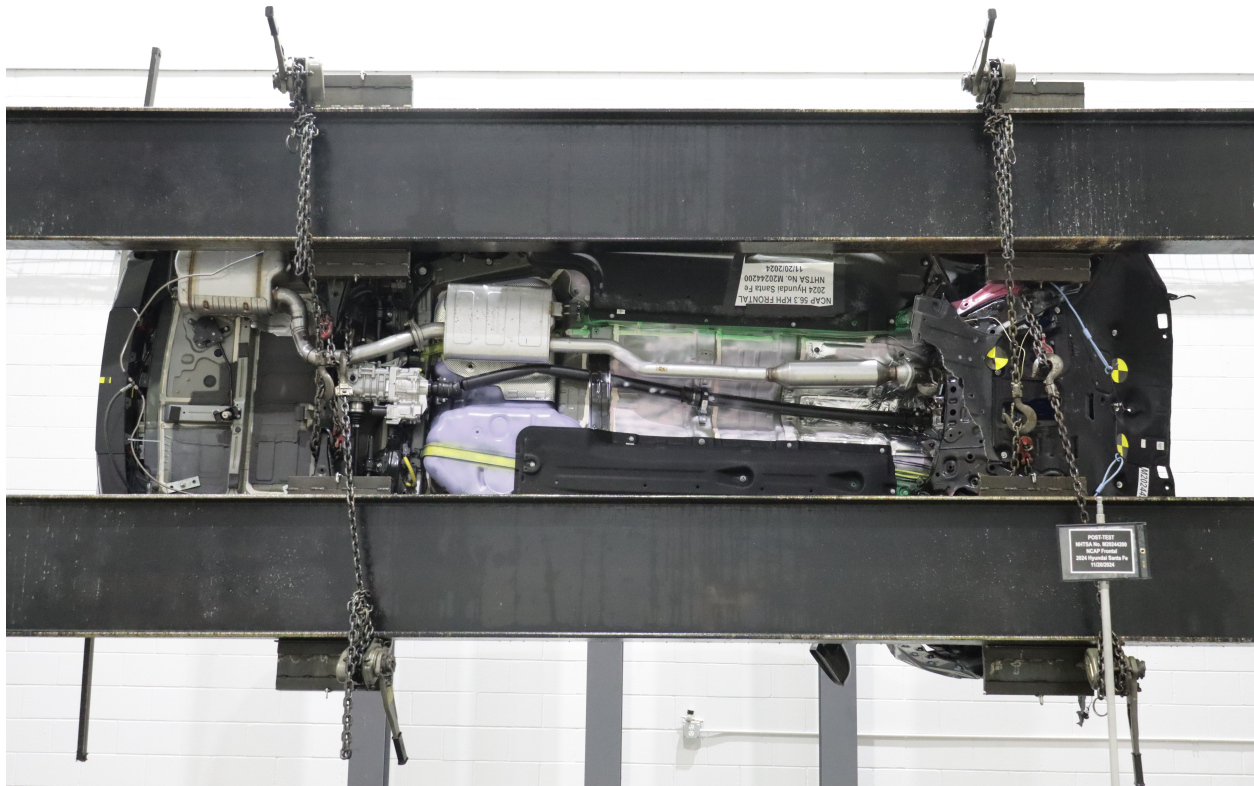
Figure A-75: Post-Test Stoddard Solvent Spillage Location View, If Required



Figure A-76: Post-Test Speed Trap Read-Out



**Figure A-77: Vehicle at 0° on Static Rollover Device**



**Figure A-78: Vehicle at 90° on Static Rollover Device**



**Figure A-79: Vehicle at 180° on Static Rollover Device**



**Figure A-80: Vehicle at 270° on Static Rollover Device**



**Figure A-81: Vehicle at 360° on Static Rollover Device**



**Figure A-82: 2024 Hyundai Santa Fe Frontal Impact Event**



2024 SANTA FE SE 2.5T AWD

NEXT-LEVEL 3-ROW SANTA FE. FOR NEXT-LEVEL ADVENTURES.



SOLD TO: NY148 SHIPPED TO: NY148
MATTHEW HYUNDAI OF SCHENECTADY
4101 STATE STREET SCHENECTADY NY 12304
VIN: SNMP1DGLXRH057998
MODEL: 65402AT5
ENGINE: G4KPRK104670
PORT OF ENTRY: MA
EXTERIOR COLOR: SHIMMERING SILVER
INTERIOR/SEAT COLOR: GRAY/GRAY
TRANSPORT: TRUCK
ACCESSORY WEIGHT: 14 lbs./ 6 kgs.
EMISSIONS: This vehicle is certified to meet emission requirements in all 50 states

GOVERNMENT 5-STAR SAFETY RATINGS
This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.
Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4236

STANDARD FEATURES:
AMERICA'S BEST WARRANTY
5-year/60,000-mile New Vehicle Warranty\*
10-year/100,000-mile Powertrain Warranty\*
7-year/Unlimited-mile Anti-perforation Warranty\*
3-year/36,000-mile Complimentary Maintenance\*
5-year/Unlimited-mile Roadside Assistance
\*Limited warranties, see dealer for details
ADVANCED SAFETY TECHNOLOGY
Forward Collision-Avoidance Assist
Blind-Spot Collision Warning
Rear Cross-Traffic Collision-Avoidance Assist
Lane Following Assist / Lane-Keeping Assist
Driver Attention Warning
Part Distance Warning - Forward/Reverse
Rearview Camera
POWERTRAIN TECHNOLOGY
2.5L Turbocharged 4-Cylinder Engine w/ GDI and MPI
8-Speed Wet Dual Clutch Transmission w/ Paddle Shifters
HYUNDAI AWD
Idle Stop & Go (ISG)
Electronic Parking Brake w/ Auto Hold
EXTERIOR
18" Alloy Wheels
LED Headlights & Daytime Running Lights
LED Taillights
Power Liftgate w/ Extra Wide Opening
COMFORT & CONVENIENCE
Proximity Key Entry w/ Push Button Start
Air Conditioning w/ 2nd Row Vents
Smart Cruise Control w/ Stop & Go
60/40 Split-Folding 2nd Row Seats
60/30 Split-Folding 3rd Row Seats
Front and 2nd Row USB Charging Ports
8-Directional Center Console Armrest
Tilt & Telescopic Leather-Wrapped Steering Wheel
Bluetooth Hands-Free System
12.3" Color Touchscreen Audio Display (w/ AM/FM/HD Radio8)
Wireless Android Auto & Apple CarPlay
SiriusXM3 w/ 90-Day Platinum trial subscription;
Not Available in AK & HI
BlueLink+ All-Inclusive Connected Services (enrollment required)
Temporary Spare Tire
Full Tank of Fuel

Manufacturer's Suggested Retail Price: \$38,790.00
ADDED FEATURES:
Carpeted Floor Mats \$210.00
\*First Aid Kit \$30.00
\*Metal Guards \$130.00
\*Wheel Locks \$70.00
Island Freight & Handling: \$1,415.00
Total Price: \$37,605.00

Fuel Economy and Environment Gasoline Vehicle
Fuel Economy: 23 MPG combined city/hwy, 20 city, 28 highway, 4.3 gallons per 100 miles
You spend \$2,000 more in fuel costs over 5 years compared to the average new vehicle.
Annual fuel cost \$2,350
Fuel Economy & Greenhouse Gas Rating: 5 (Best)
Smog Rating: 7 (Best)
fueleconomy.gov

PARTS CONTENT INFORMATION
FOR VEHICLE IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 50 %
MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA: 30 %
Note: Parts content does not include final assembly, distribution, or other non-parts costs.
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: MONTGOMERY, ALABAMA U.S.A.
COUNTRY OF ORIGIN:
ENGINE: U.S.A
TRANSMISSION: KOREA

Figure A-83: Monroney Label Photograph

**APPENDIX B**  
**VEHICLE AND DUMMY RESPONSE DATA TRACES**

## Table of Data Plots

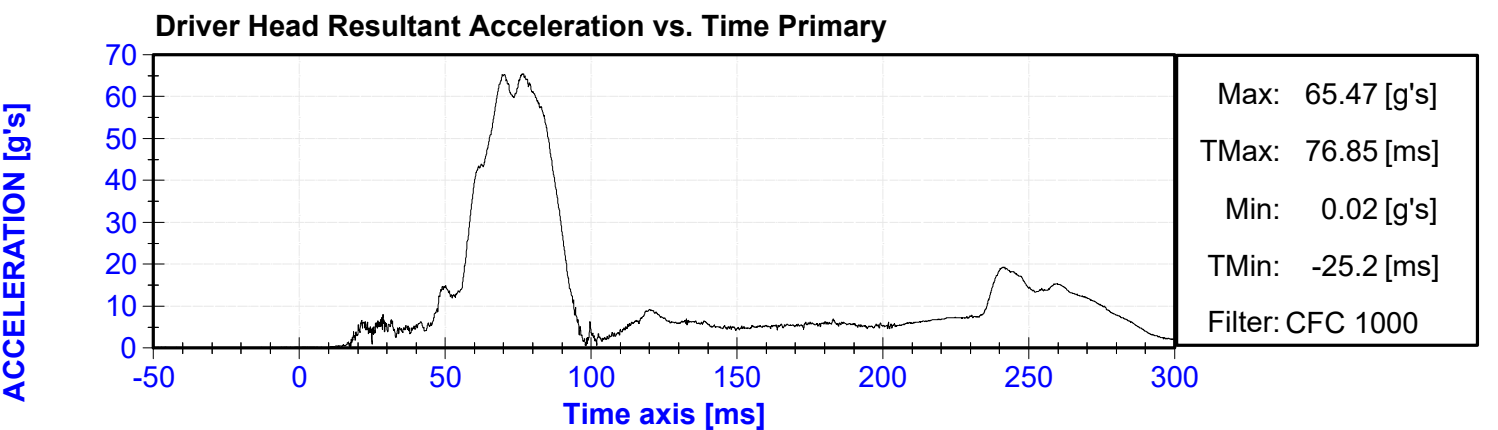
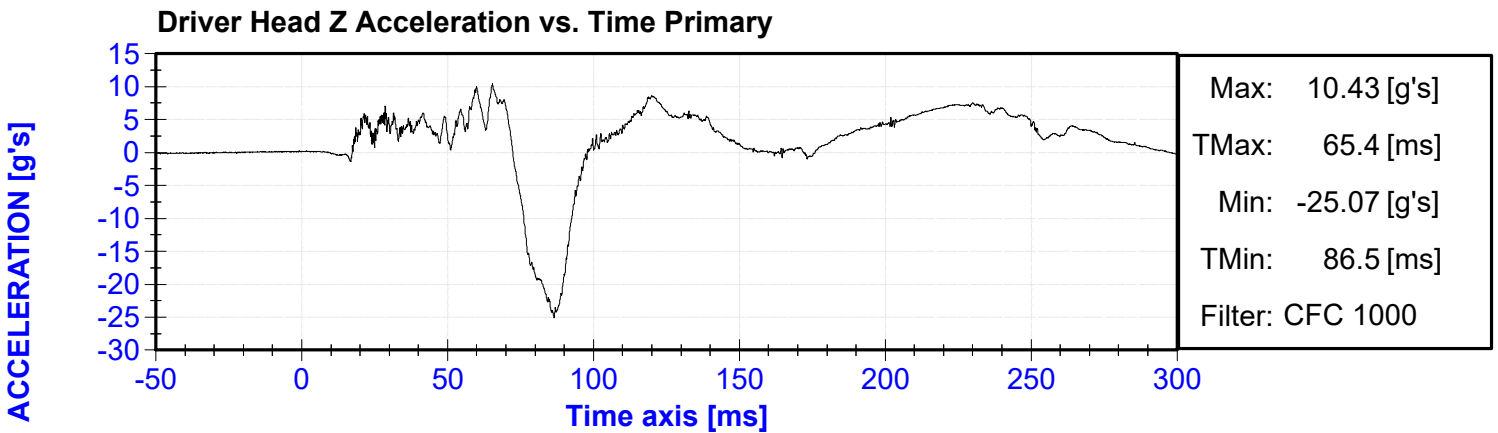
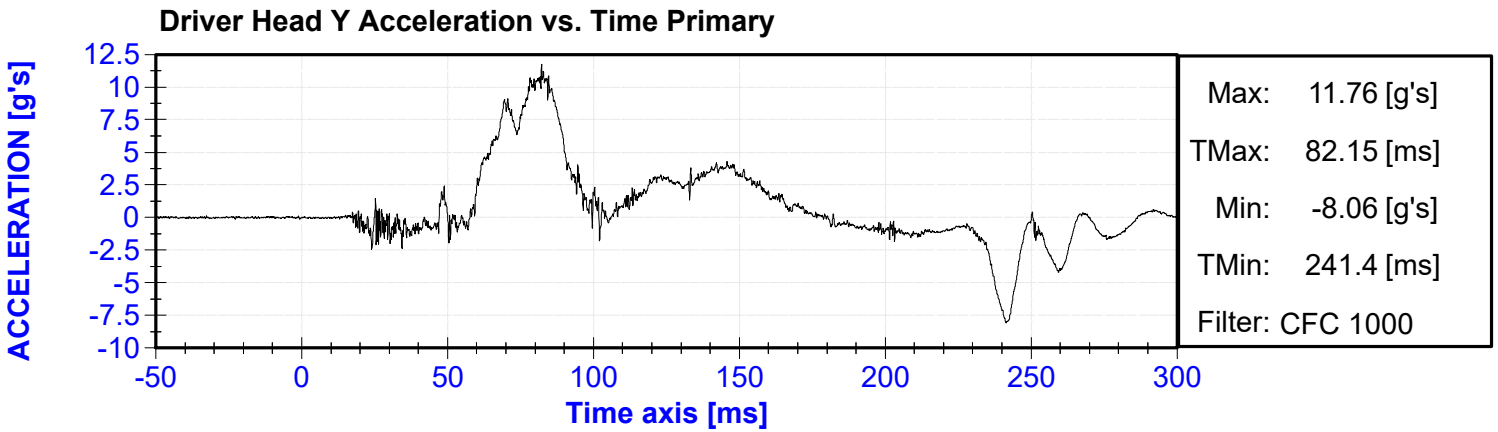
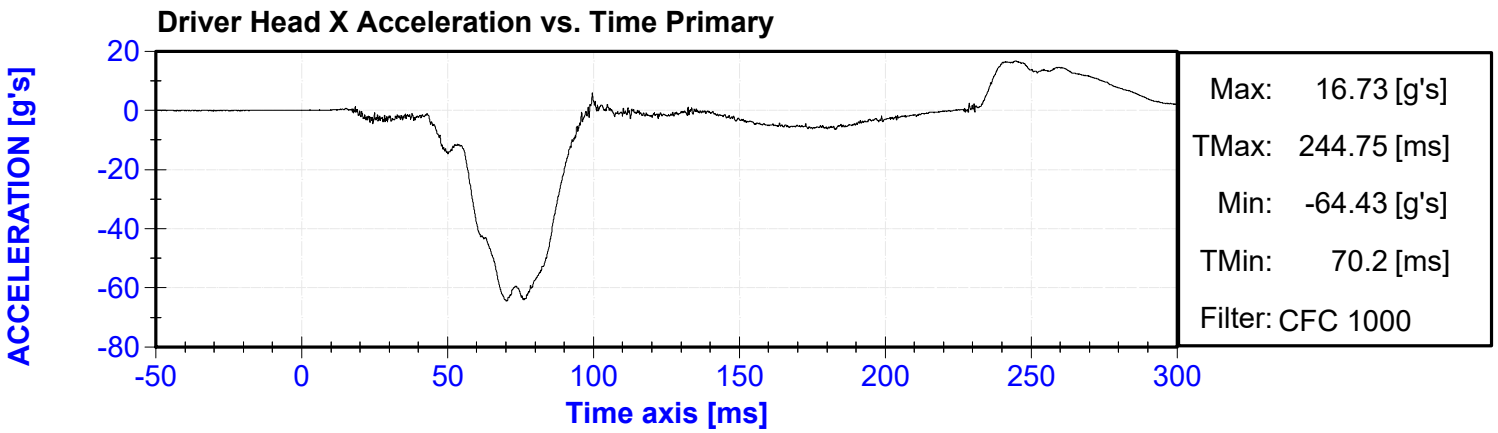
Fig.	Description	Page
Plot 1	Driver Head X Acceleration vs. Time Primary	B-5
Plot 2	Driver Head Y Acceleration vs. Time Primary	B-5
Plot 3	Driver Head Z Acceleration vs. Time Primary	B-5
Plot 4	Driver Head Resultant Acceleration vs. Time Primary	B-5
Plot 5	Driver Chest X Deflection vs. Time	B-6
Plot 6	Driver Chest X Acceleration vs. Time Primary	B-6
Plot 7	Driver Chest Y Acceleration vs. Time Primary	B-6
Plot 8	Driver Chest Z Acceleration vs. Time Primary	B-6
Plot 9	Driver Chest Resultant Acceleration vs. Time Primary	B-7
Plot 10	Driver Upper Neck Force X vs. Time Primary	B-7
Plot 11	Driver Upper Neck Force Z vs. Time Primary	B-7
Plot 12	Driver Upper Neck Moment Y vs. Time Primary	B-7
Plot 13	Driver Nij vs. Time Primary	B-8
Plot 14	Driver Left Femur Force vs. Time	B-8
Plot 15	Driver Right Femur Force vs. Time	B-8
Plot 16	Passenger Head X Acceleration vs. Time Primary	B-8
Plot 17	Passenger Head Y Acceleration vs. Time Primary	B-9
Plot 18	Passenger Head Z Acceleration vs. Time Primary	B-9
Plot 19	Passenger Head Resultant Acceleration vs. Time Primary	B-9
Plot 20	Passenger Chest X Deflection vs. Time	B-9
Plot 21	Passenger Chest X Acceleration vs. Time Primary	B-10
Plot 22	Passenger Chest Y Acceleration vs. Time Primary	B-10
Plot 23	Passenger Chest Z Acceleration vs. Time Primary	B-10
Plot 24	Passenger Chest Resultant Acceleration vs. Time Primary	B-10
Plot 25	Passenger Upper Neck Force X vs. Time Primary	B-11
Plot 26	Passenger Upper Neck Force Z vs. Time Primary	B-11
Plot 27	Passenger Upper Neck Moment Y vs. Time Primary	B-11
Plot 28	Passenger Nij vs. Time Primary	B-11
Plot 29	Passenger Left Femur Force vs. Time	B-12
Plot 30	Passenger Right Femur Force vs. Time	B-12

**The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at [www.NHTSA.gov](http://www.NHTSA.gov)**

Driver Head X Acceleration Redundant  
 Driver Head Y Acceleration Redundant  
 Driver Head Z Acceleration Redundant  
 Driver Upper Neck Force Y  
 Driver Upper Neck Moment X  
 Driver Upper Neck Moment Z  
 Driver Chest X Acceleration Redundant  
 Driver Chest Y Acceleration Redundant  
 Driver Chest Z Acceleration Redundant  
 Driver Pelvis X  
 Driver Pelvis Y  
 Driver Pelvis Z  
 Driver Left Femur Redundant  
 Driver Right Femur Redundant  
 Driver Left Upper Tibia Moment X  
 Driver Left Upper Tibia Moment Y

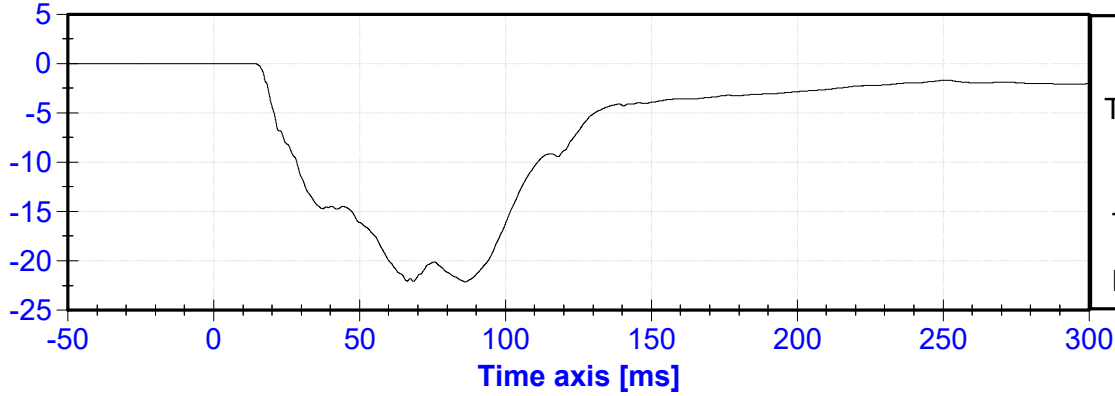
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Driver Left Lower Tibia Moment X  
Driver Left Lower Tibia Moment Y  
Driver Left Lower Tibia Force Z  
Driver Right Upper Tibia Moment X  
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Driver Right Upper Tibia Force Z  
Driver Right Lower Tibia Moment X  
Driver Right Lower Tibia Moment Y  
Driver Right Lower Tibia Force Z  
Driver Left Foot Fore Z  
Driver Left Foot Aft X  
Driver Left Foot Aft Z  
Driver Right Foot Fore Z  
Driver Right Foot Aft X  
Driver Right Foot Aft Z  
Driver Shoulder Belt Force  
Driver Lap Belt Force  
Driver Head Angular Velocity X  
Driver Head Angular Velocity Y  
Driver Head Angular Velocity Z  
Passenger Head X Acceleration Redundant  
Passenger Head Y Acceleration Redundant  
Passenger Head Z Acceleration Redundant  
Passenger Upper Neck Force X  
Passenger Upper Neck Force Z  
Passenger Upper Neck Moment Y  
Passenger Chest X Acceleration Redundant  
Passenger Chest Y Acceleration Redundant  
Passenger Chest Z Acceleration Redundant  
Passenger Pelvis X  
Passenger Pelvis Y  
Passenger Pelvis Z  
Passenger Left Femur Redundant  
Passenger Right Femur Redundant  
Passenger Left Upper Tibia Moment X  
Passenger Left Upper Tibia Moment Y  
Passenger Left Upper Tibia Force Z  
Passenger Left Lower Tibia Moment X  
Passenger Left Lower Tibia Moment Y  
Passenger Left Lower Tibia Force Z  
Passenger Right Upper Tibia Moment X  
Passenger Right Upper Tibia Moment Y  
Passenger Right Upper Tibia Force Z  
Passenger Right Lower Tibia Moment X  
Passenger Right Lower Tibia Moment Y  
Passenger Right Lower Tibia Force Z  
Passenger Left Foot Fore Z  
Passenger Left Foot Aft X  
Passenger Left Foot Aft Z

Passenger Right Foot Fore Z  
Passenger Right Foot Aft X  
Passenger Right Foot Aft Z  
Passenger Shoulder Belt Force  
Passenger Lap Belt Force  
Passenger Head Angular Velocity X  
Passenger Head Angular Velocity Y  
Passenger Head Angular Velocity Z  
Left Rear Seat Crossmember X  
Left Rear Seat Crossmember Z  
Right Rear Seat Crossmember X  
Right Rear Seat Crossmember Z  
Left Rear Seat Crossmember X Redundant  
Right Rear Seat Crossmember X Redundant  
Vehicle Engine Top X  
Vehicle Engine Bottom X  
Load Cell Barrier Forces and Moments



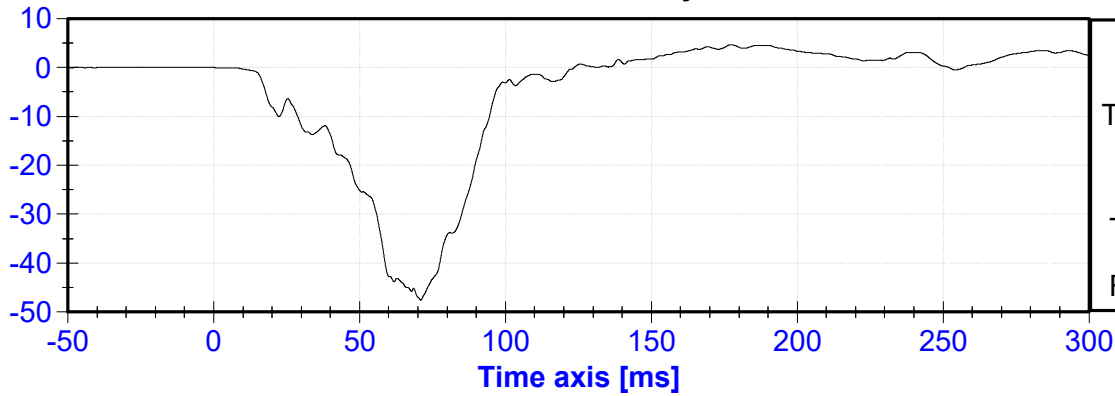
DISPLACEMENT [mm]

Driver Chest X Deflection vs. Time



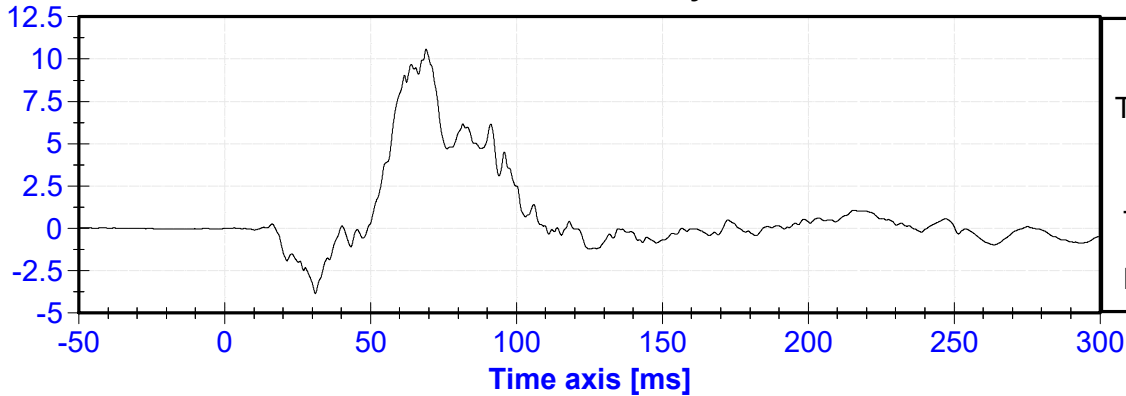
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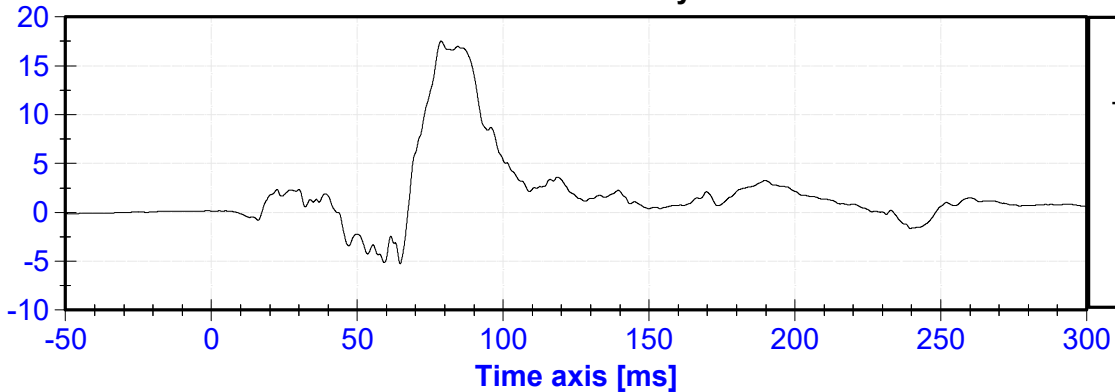
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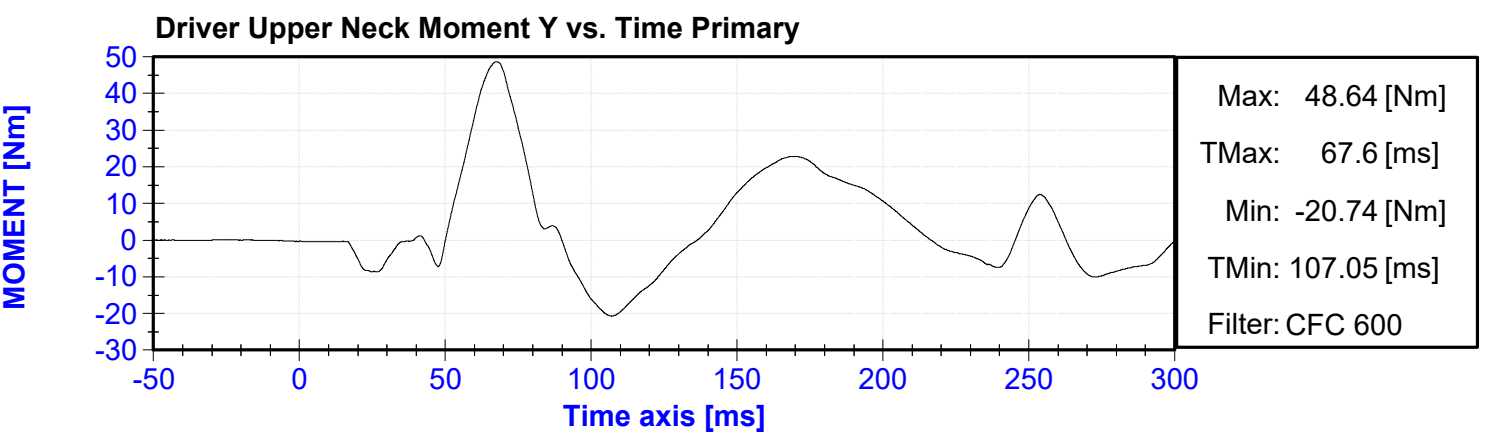
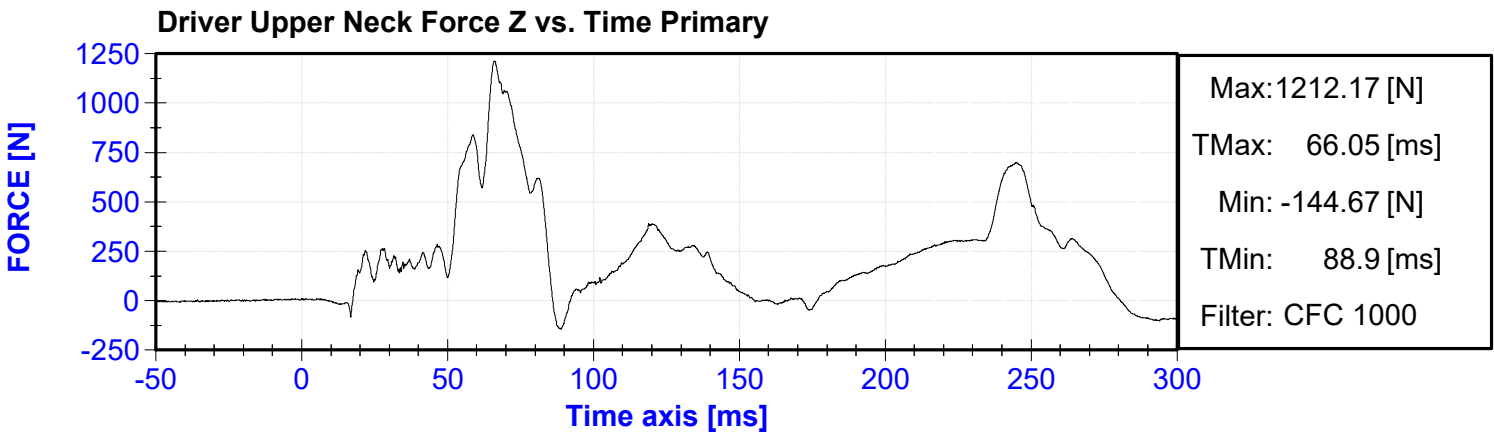
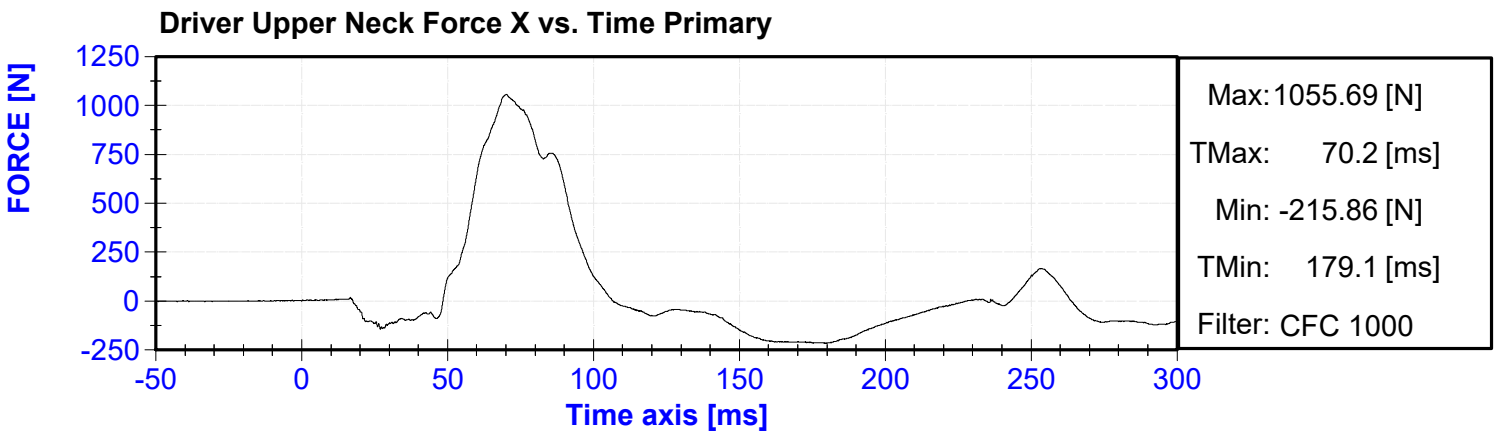
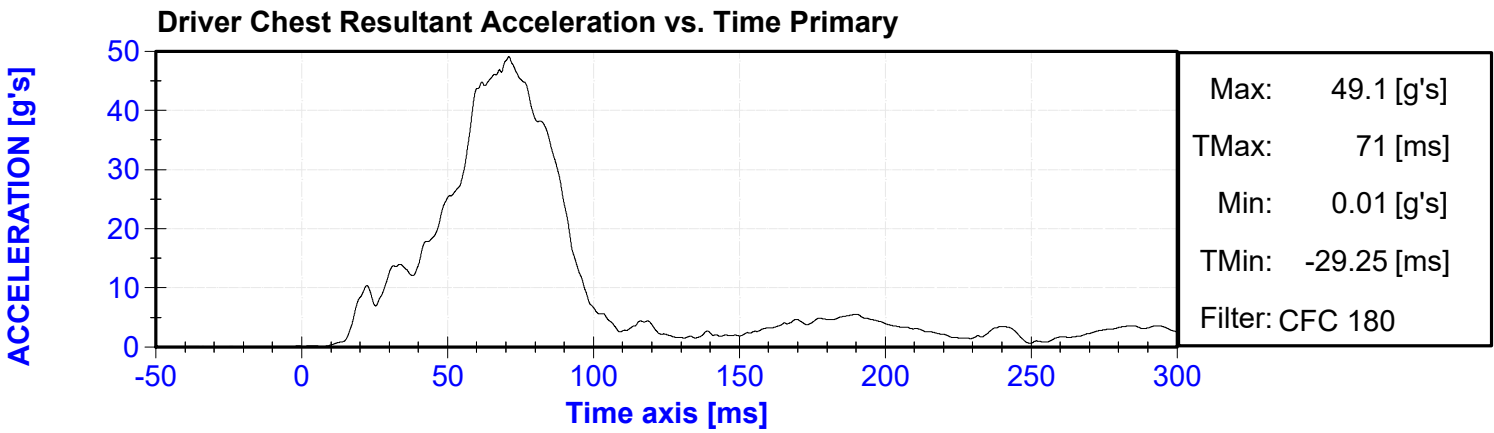
Driver Chest Y Acceleration vs. Time Primary



ACCELERATION [g's]

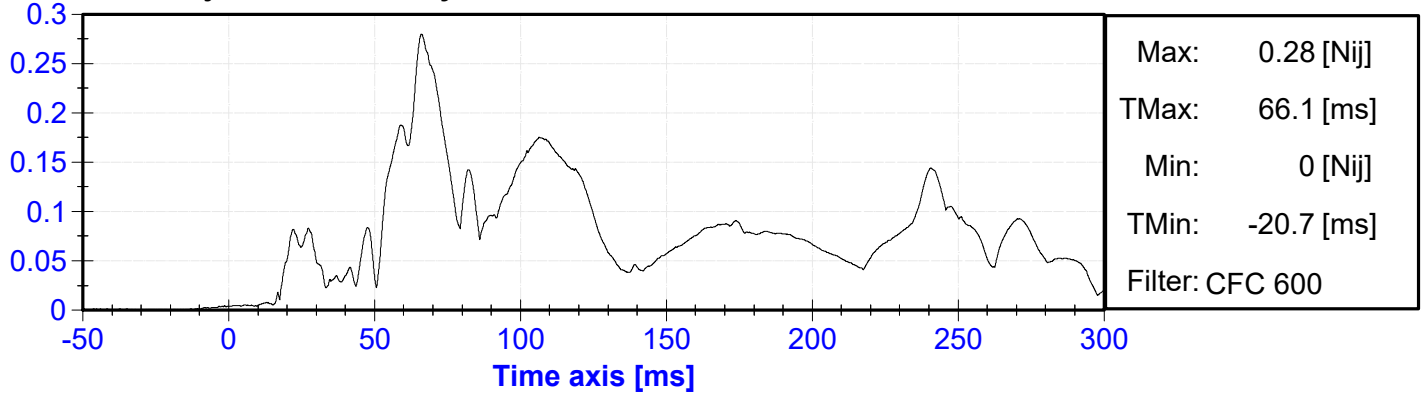
Driver Chest Z Acceleration vs. Time Primary





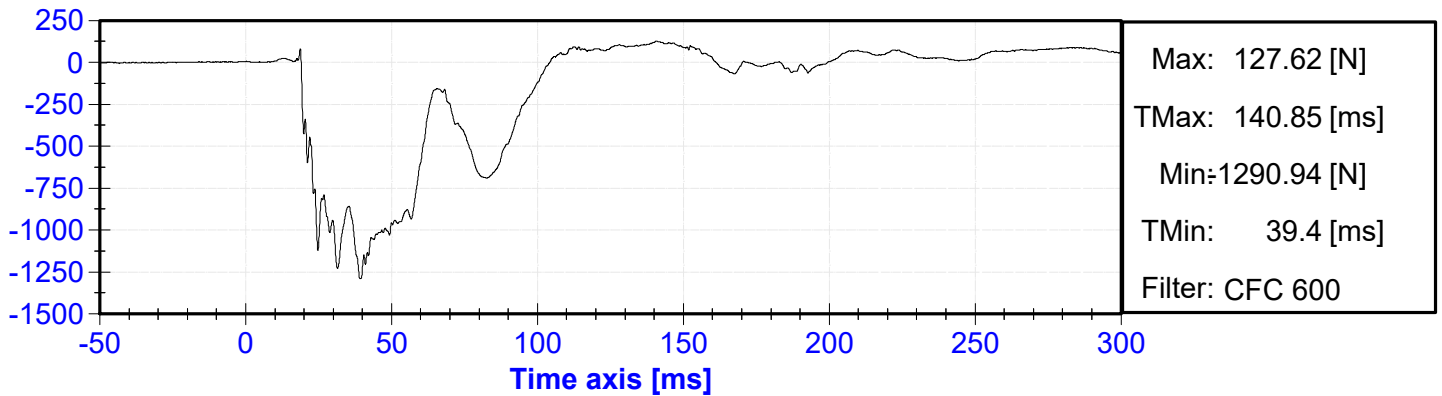
NECK INJURY CRITERIA

Driver Nij vs. Time Primary



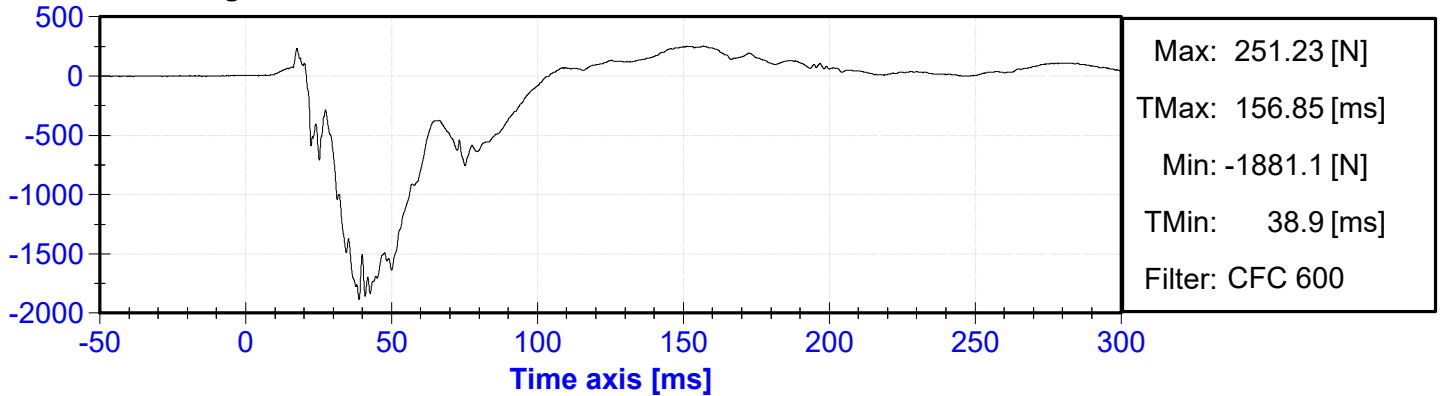
FORCE [N]

Driver Left Femur Force vs. Time



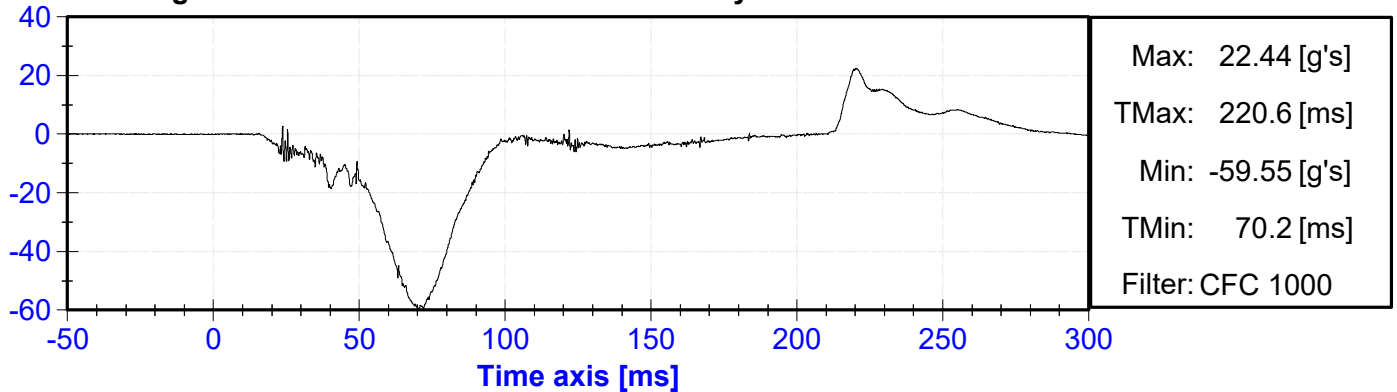
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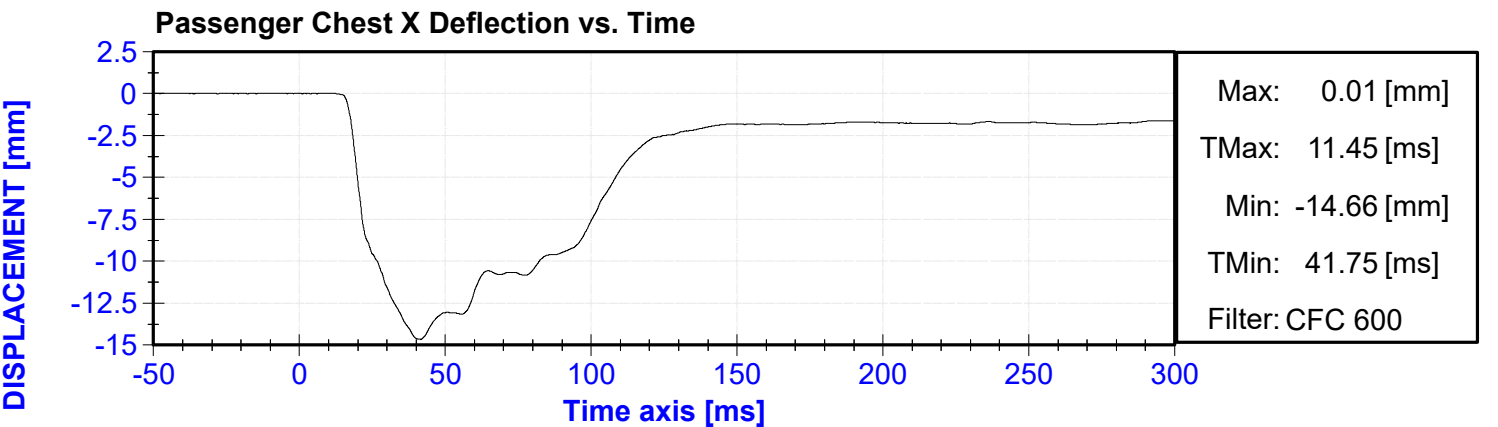
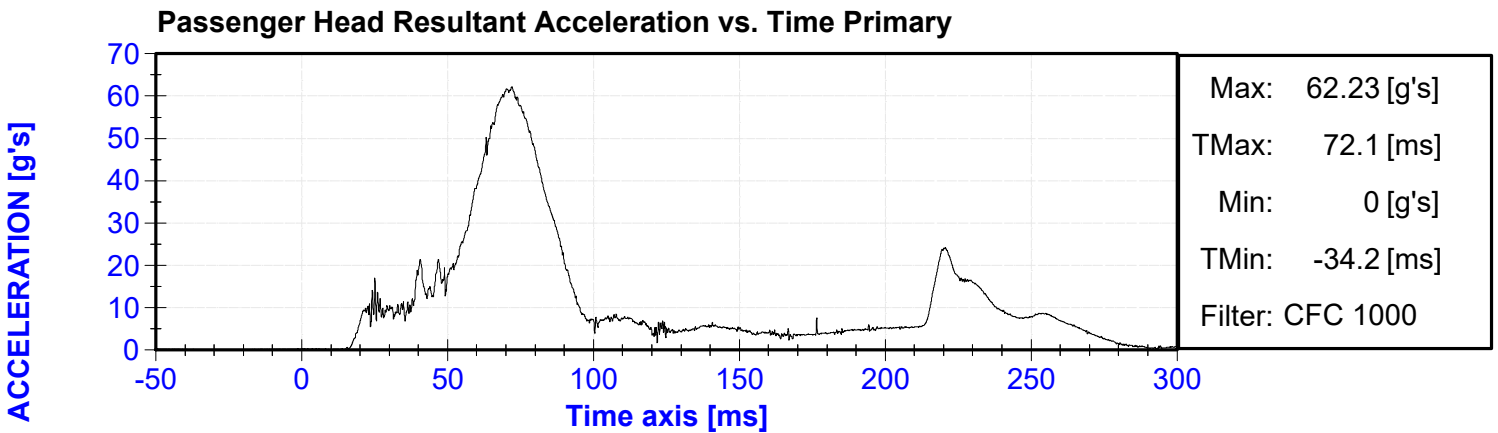
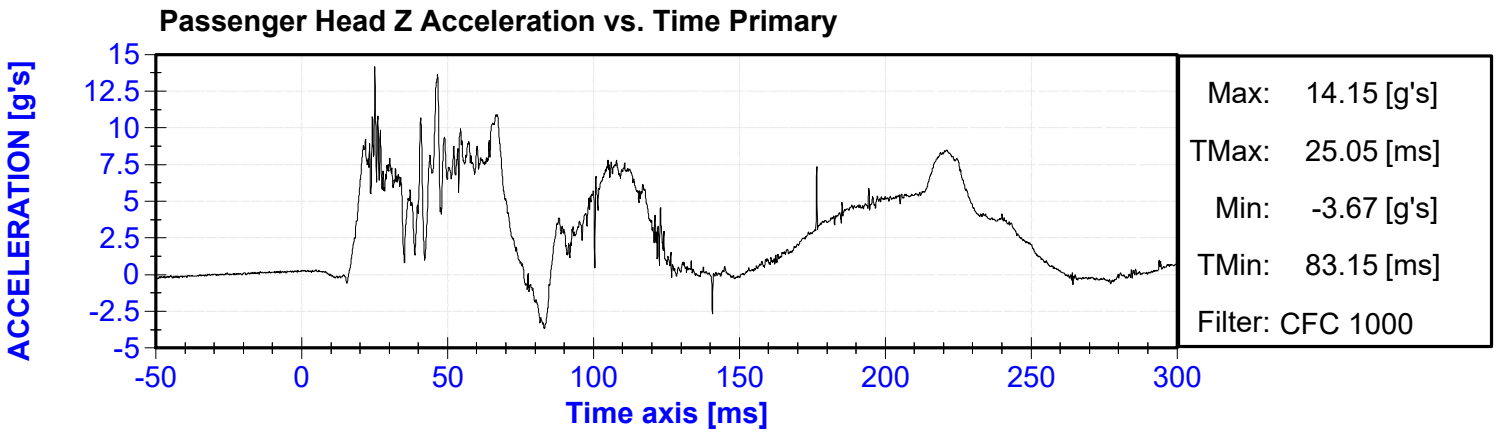
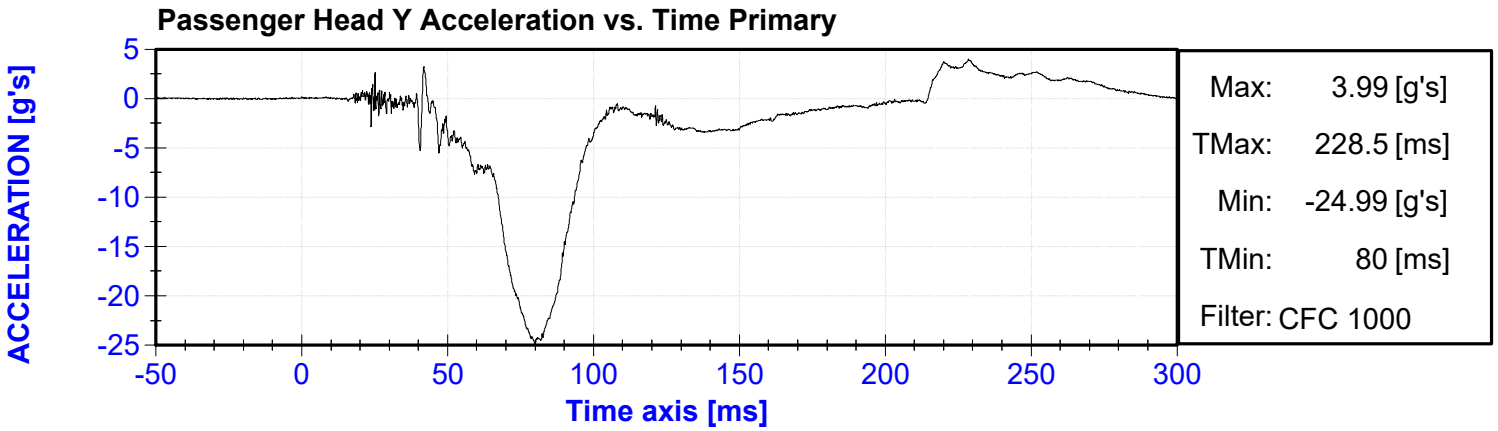
Driver Right Femur Force vs. Time

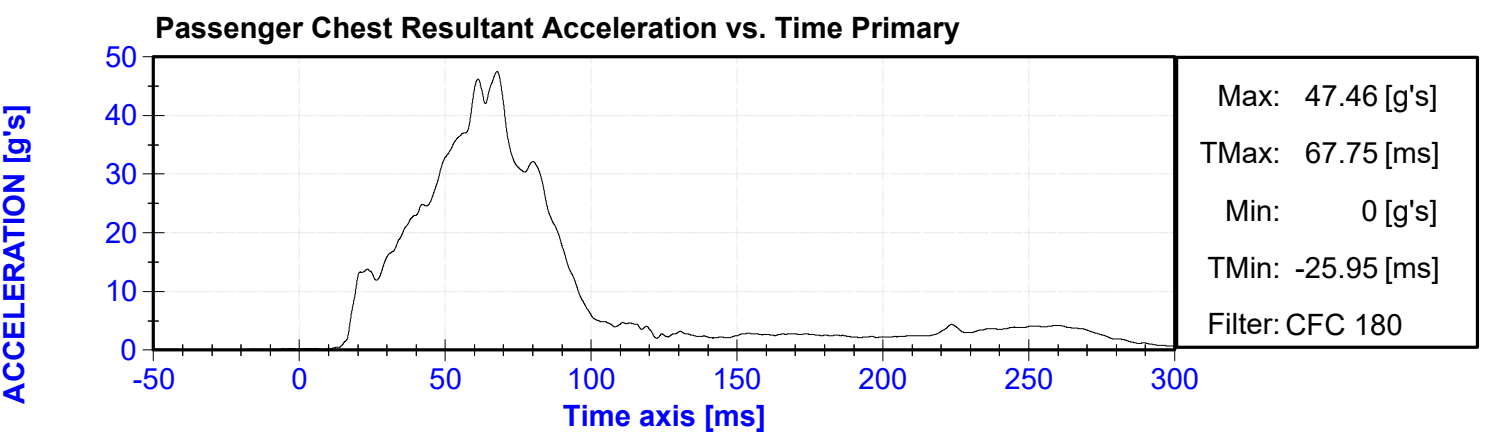
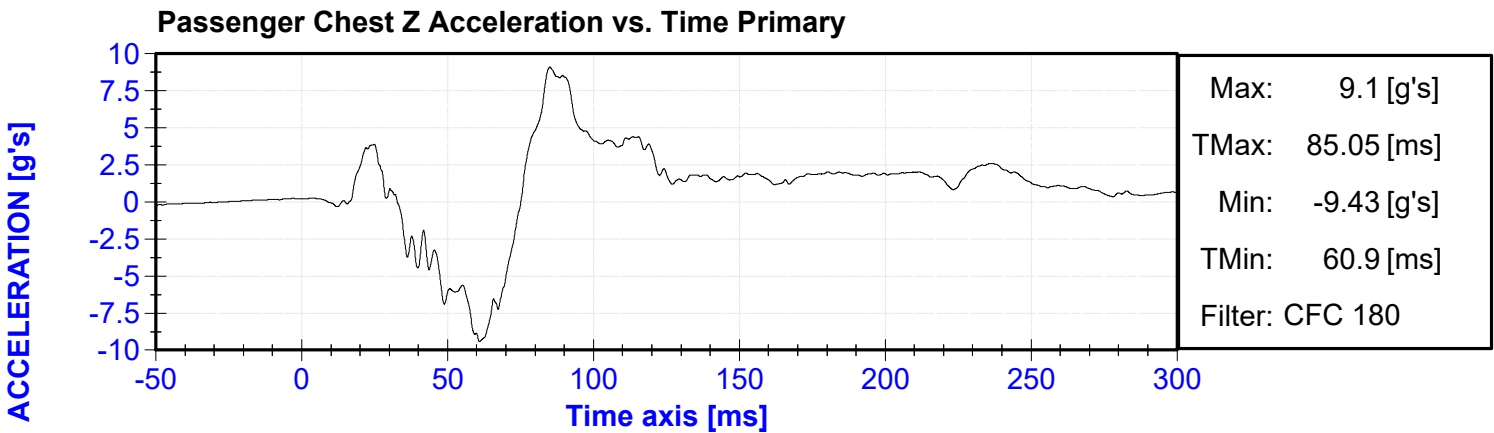
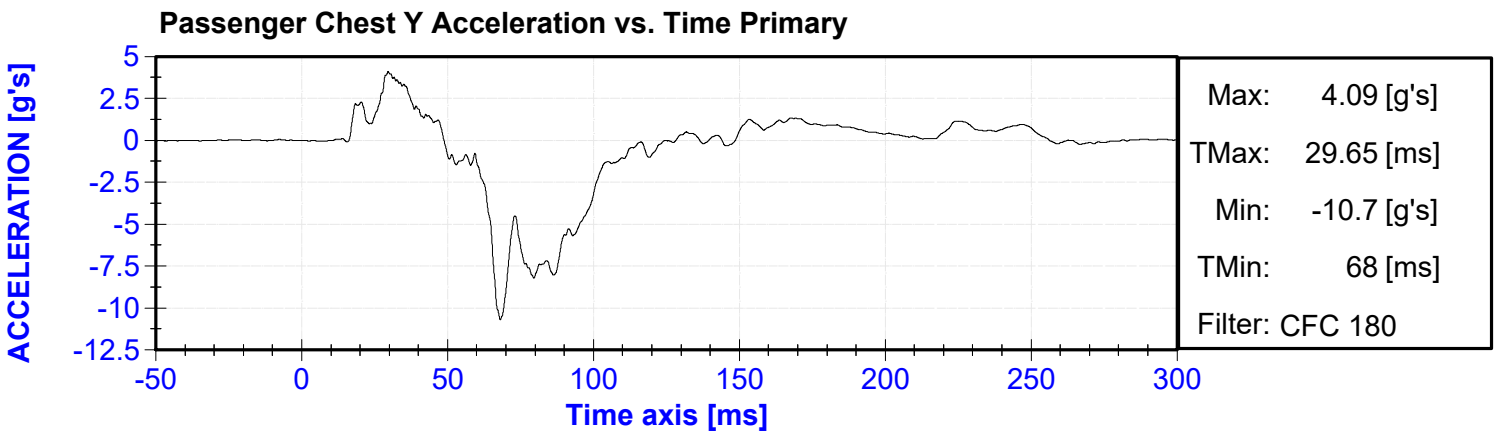
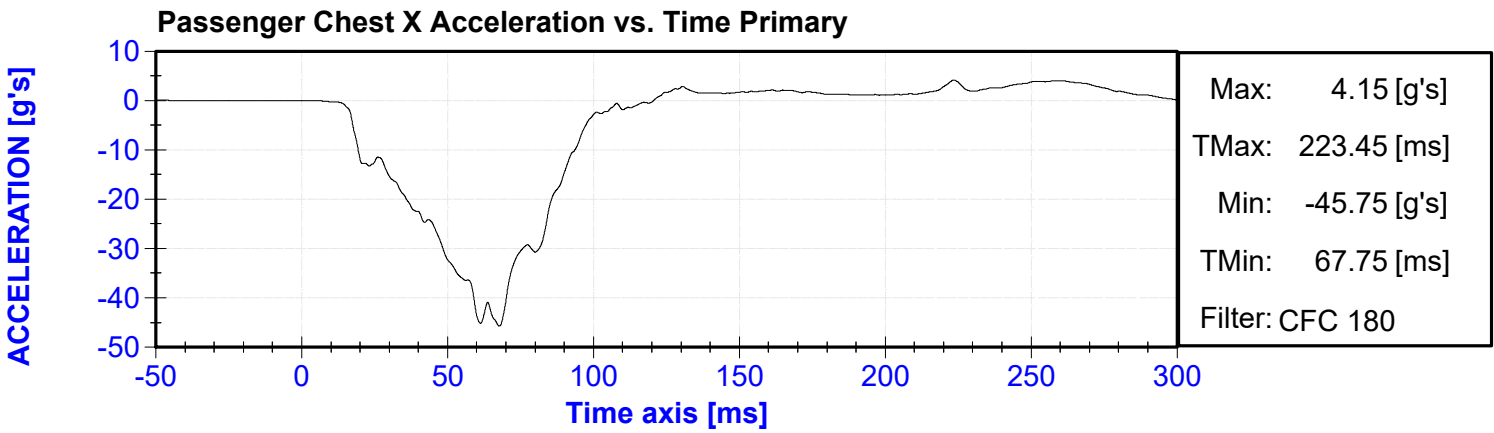


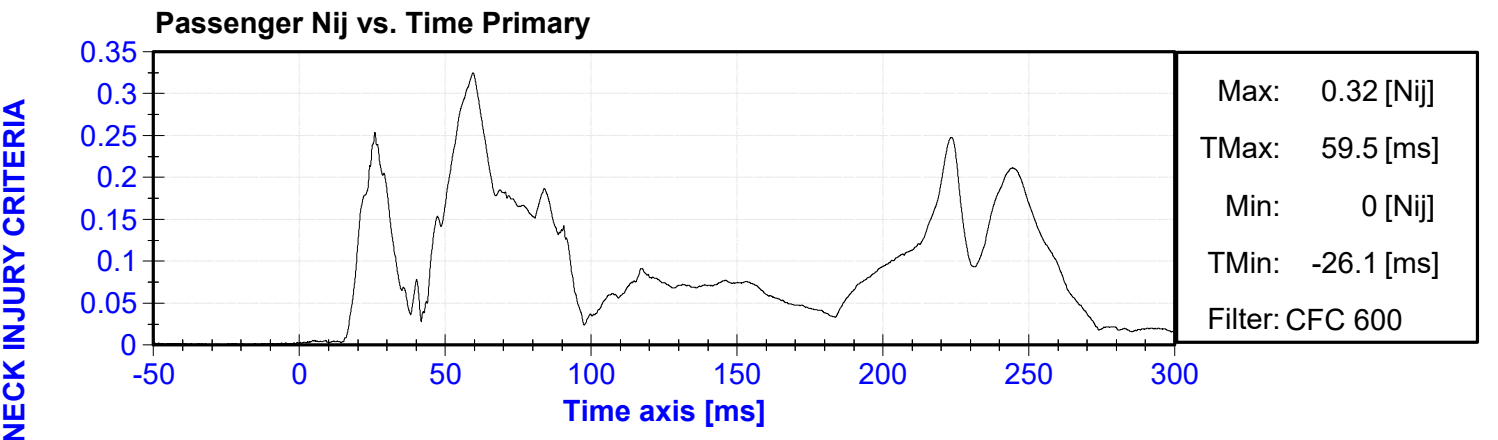
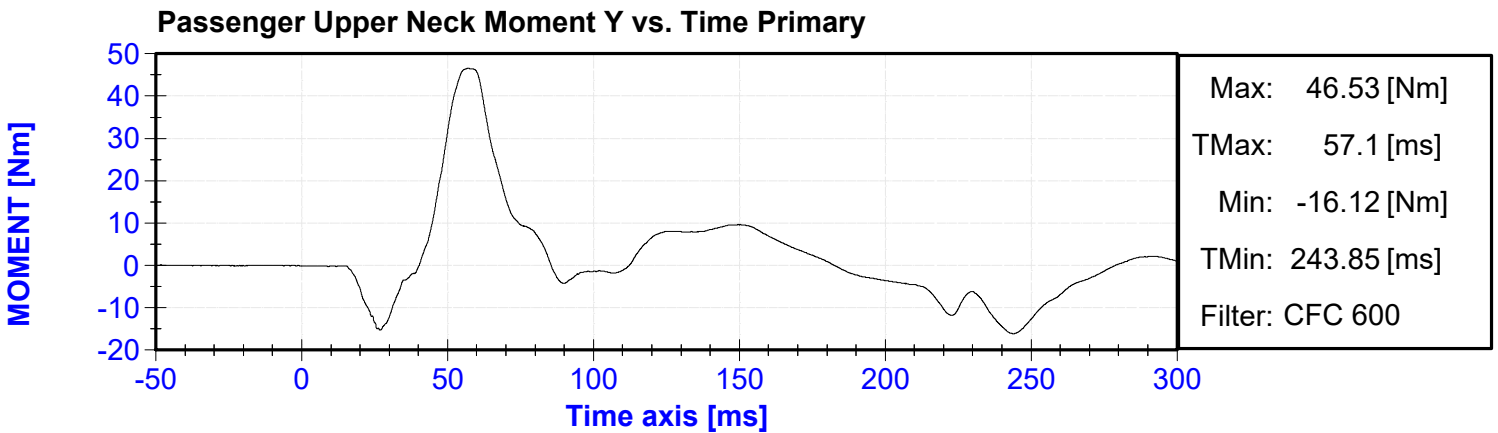
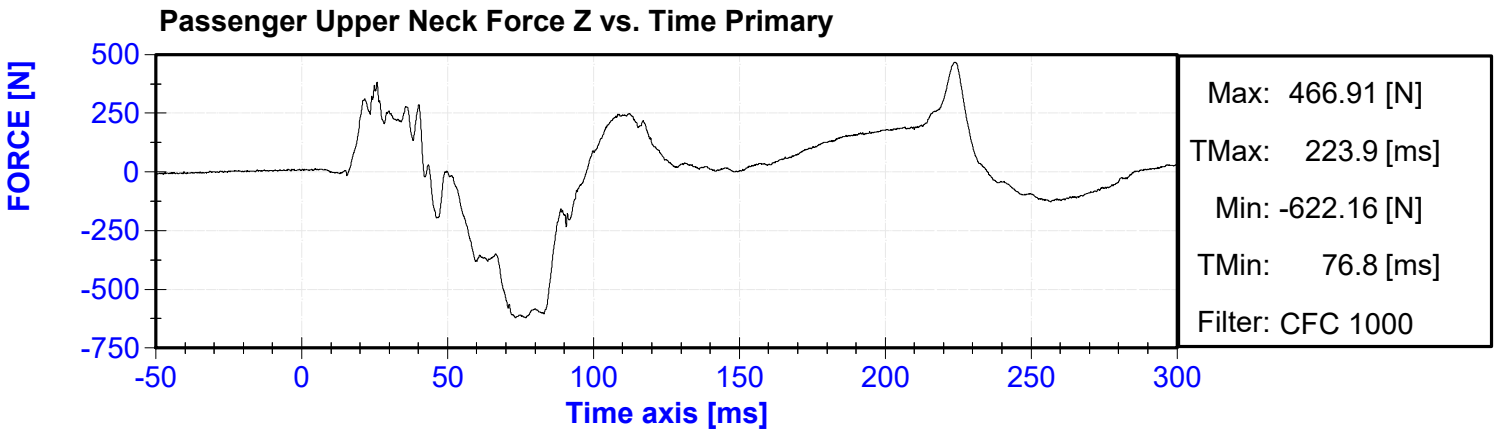
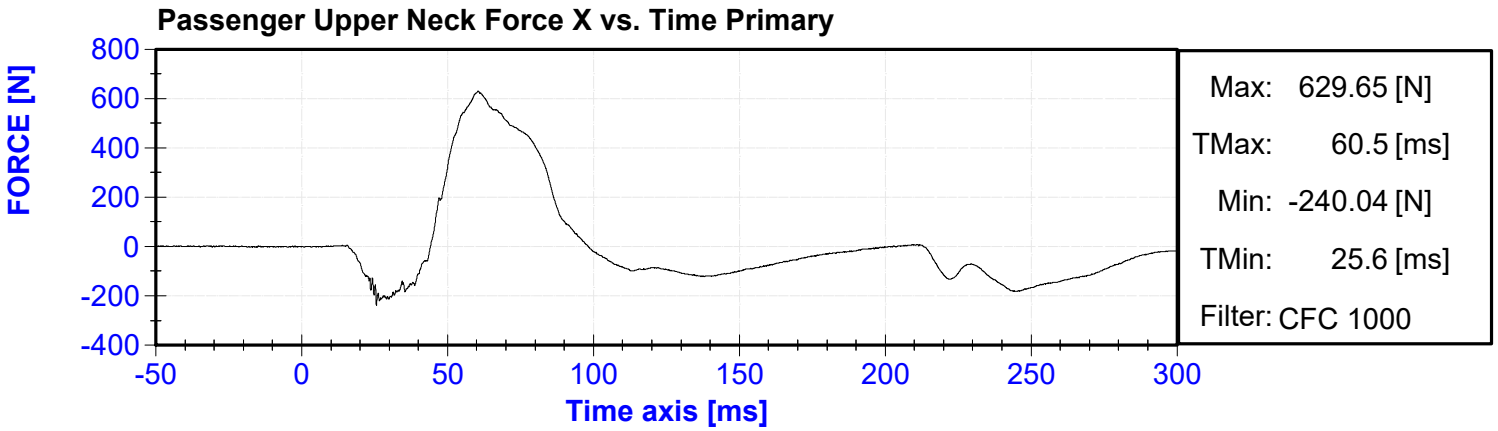
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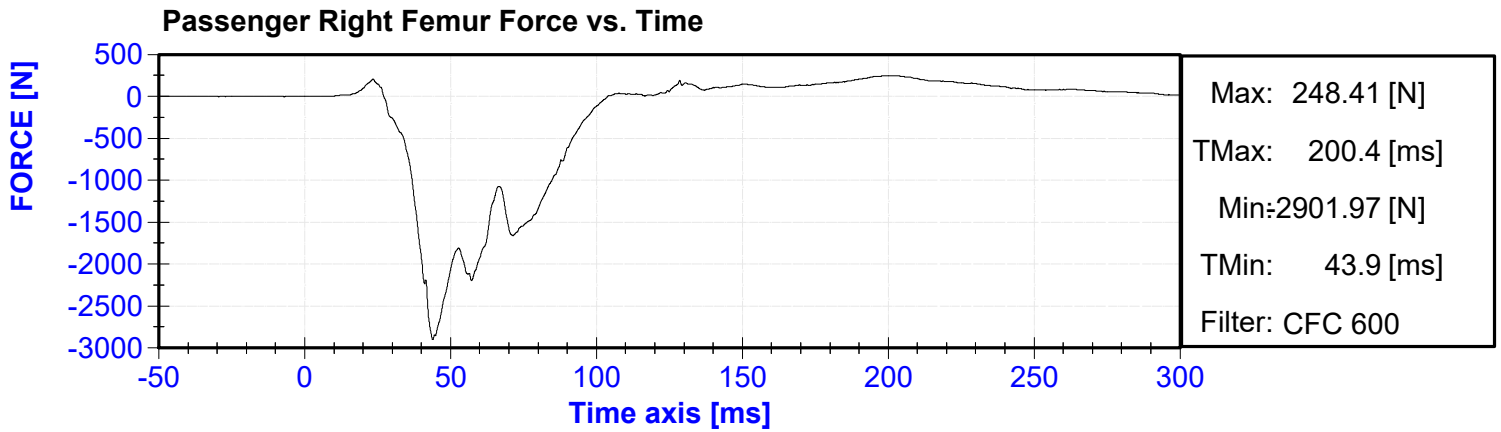
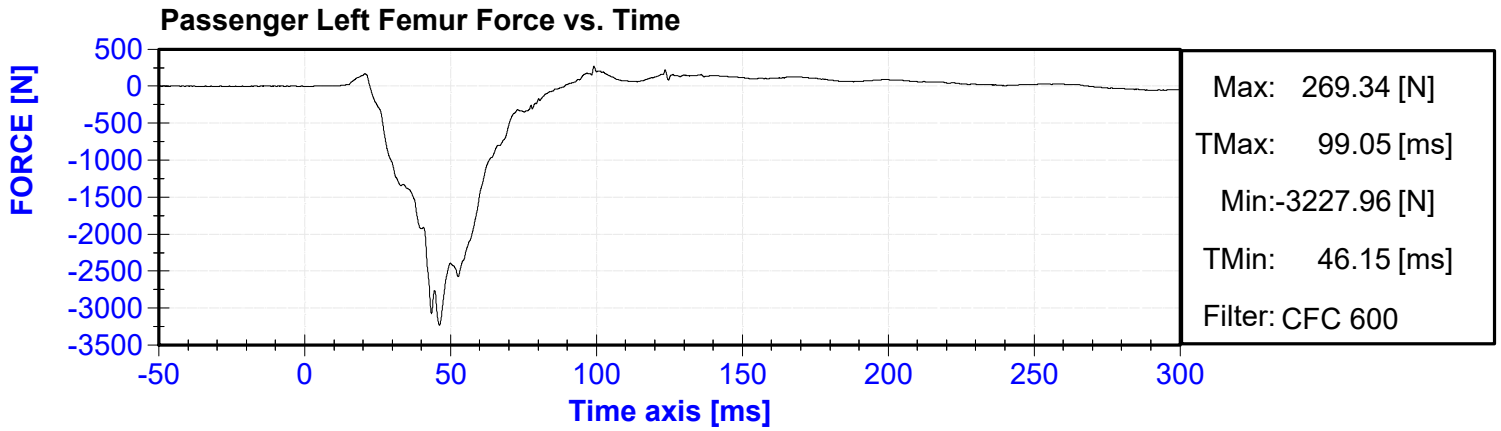
Passenger Head X Acceleration vs. Time Primary











## APPENDIX C

### DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

**CALIBRATION TEST RESULTS**

**PRE-TEST**

**HYBRID III 50<sup>TH</sup> PERCENTILE MALE - DRIVER ATD**

**SERIAL NO: 065**

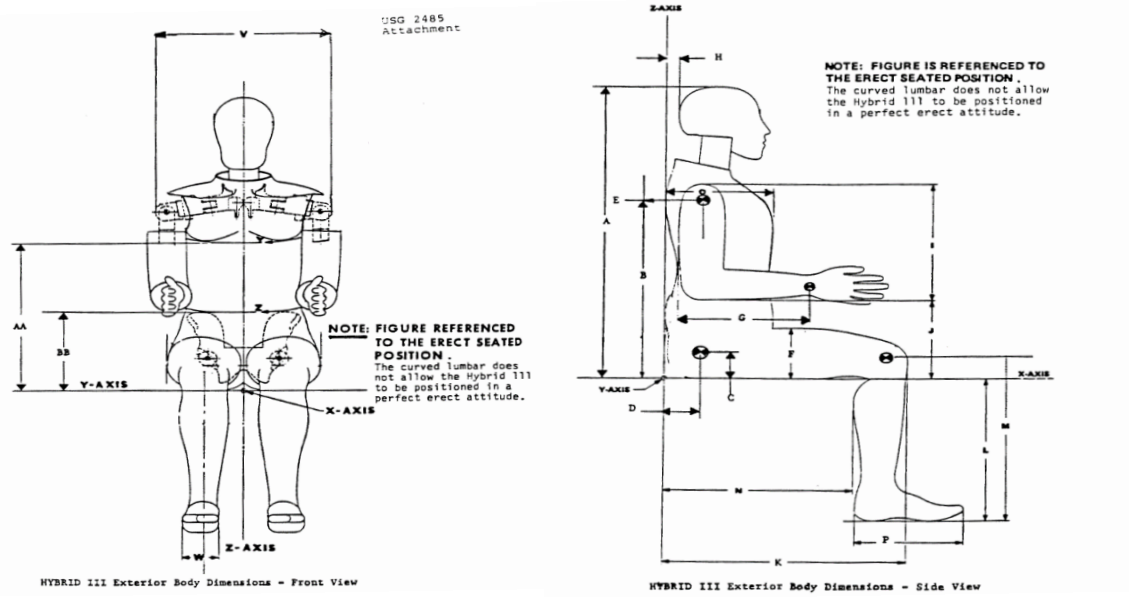


External Measurements - Hybrid 3 - 50th Male

Technician: J. Rios

Date: 11/18/2024

Dummy Serial Number: 065



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.9	Pass
B	Shoulder Pivot Height	19.9	20.5	20.0	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.5	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.4	Pass
F	Thigh Clearance	5.5	6.1	5.9	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.6	Pass
H	Head Back to Backline	1.6	1.8	1.6	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.2	Pass
J	Elbow Rest Height	7.5	8.3	7.7	Pass
K	Buttock to Knee Length	22.8	23.8	23.1	Pass
L	Popliteal Height	16.9	17.9	17.3	Pass
M	Knee Pivot Height	19.1	19.7	19.6	Pass
N	Buttock Popliteal Length	17.8	18.8	18.2	Pass
O	Chest Depth without Jacket	8.4	9.0	8.7	Pass
P	Foot Length (right)	9.9	10.5	10.3	Pass
V	Shoulder Breadth	16.3	17.2	16.5	Pass
W	Foot Breadth	3.6	4.2	3.9	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.8	Pass
Z	Waist Circumference	32.9	34.1	33.6	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	8.9	Pass

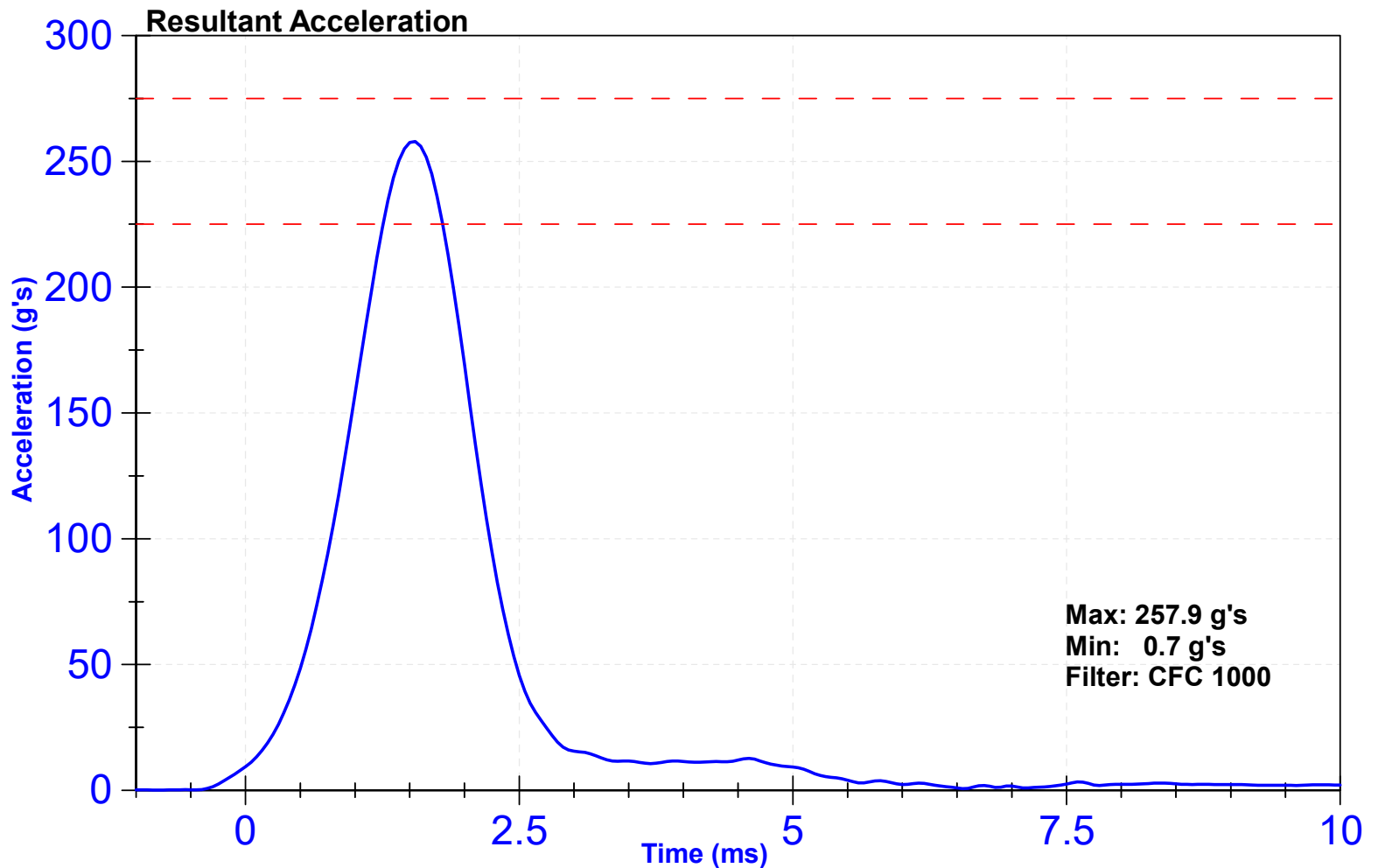
ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	065	Laboratory Supervisor	ZP

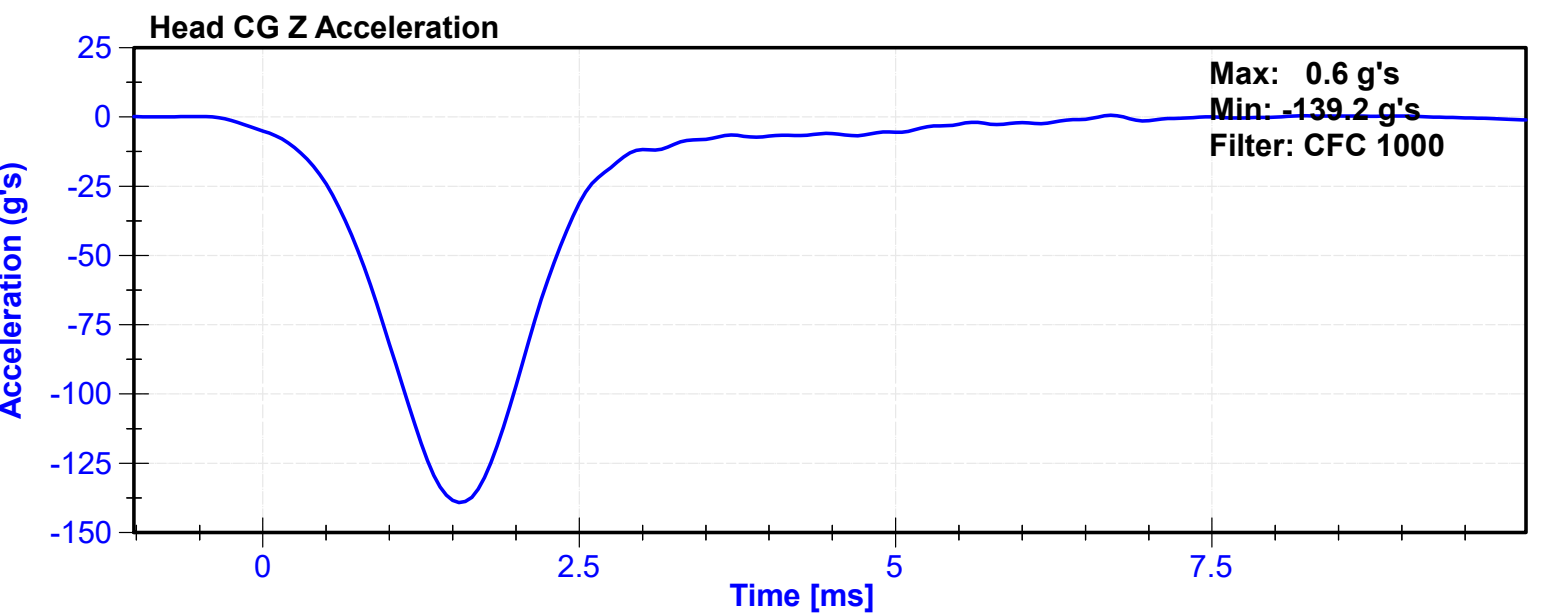
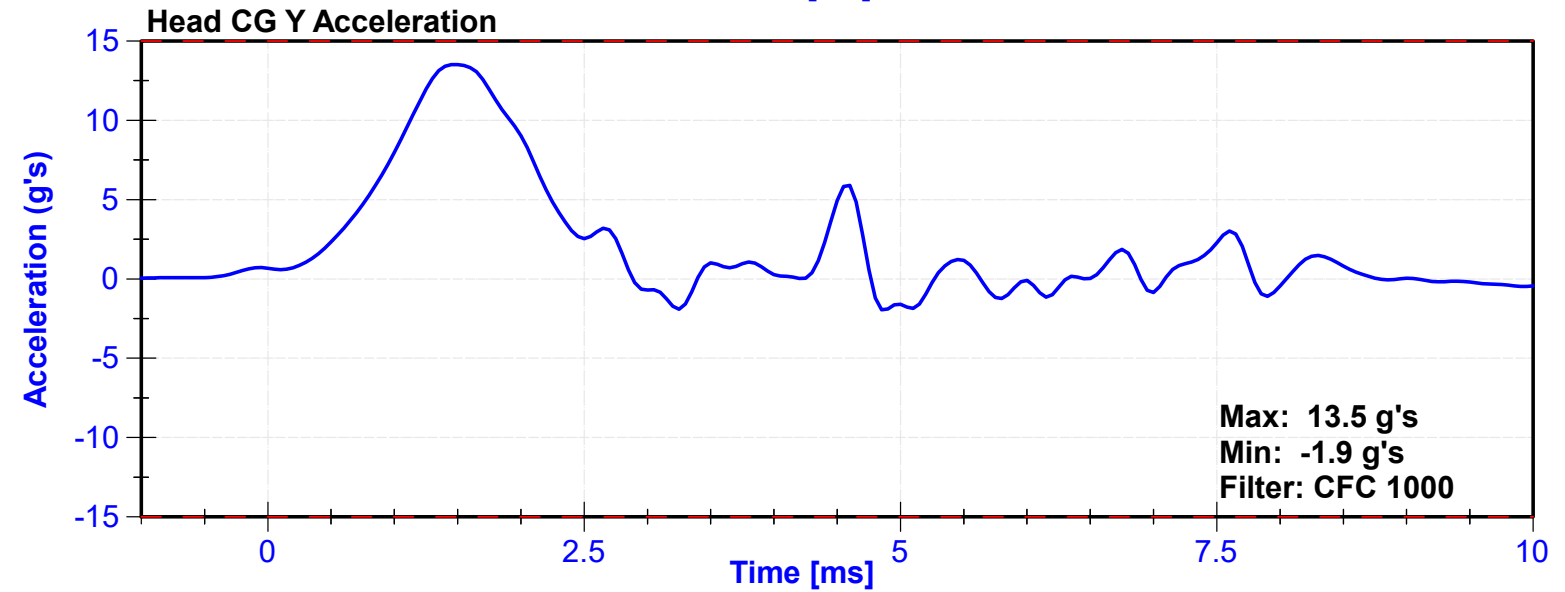
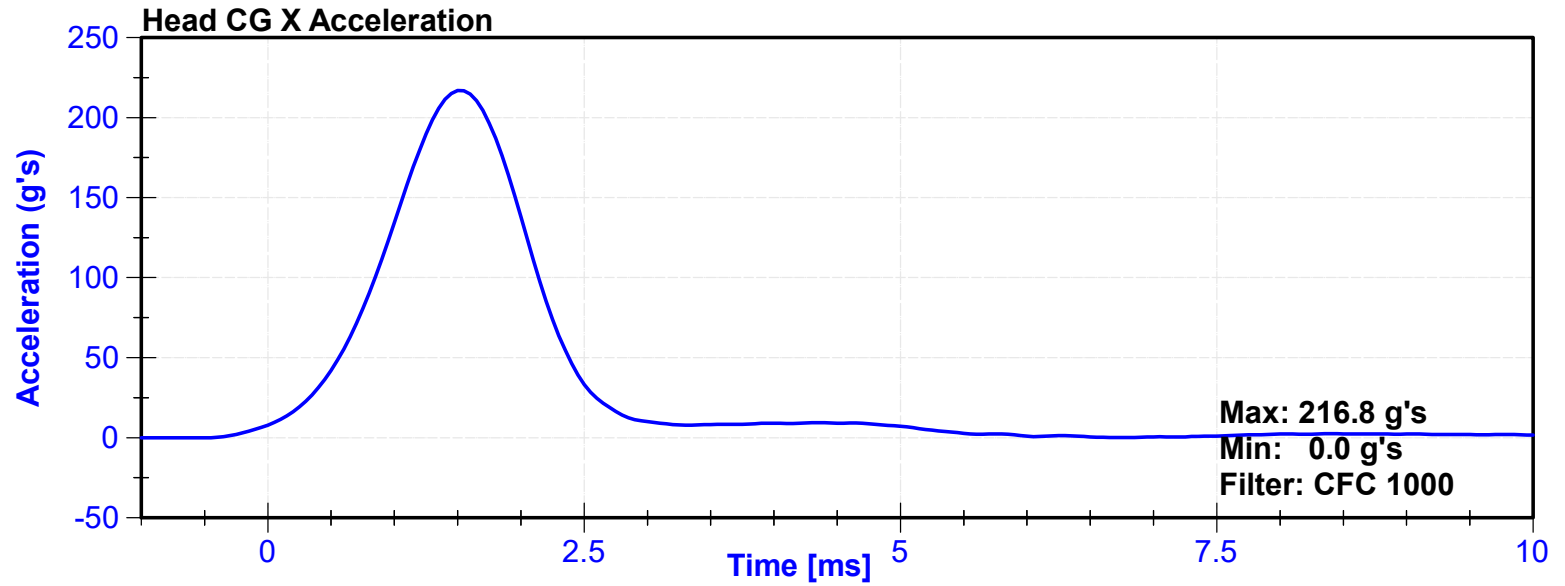
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.8	Pass
Humidity	10	70	%	48.1	Pass
Resultant Acceleration	225	275	g's	257.9	Pass
Oscillation	0	10	%	4.9	Pass
Lateral Acceleration	-15	15	g's	13.5	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P52383	9/9/2024	3/8/2025
Y Accelerometer	Measurement Specialties	A341256	9/9/2024	3/8/2025
Z Accelerometer	Endevco	P71303	9/9/2024	3/8/2025





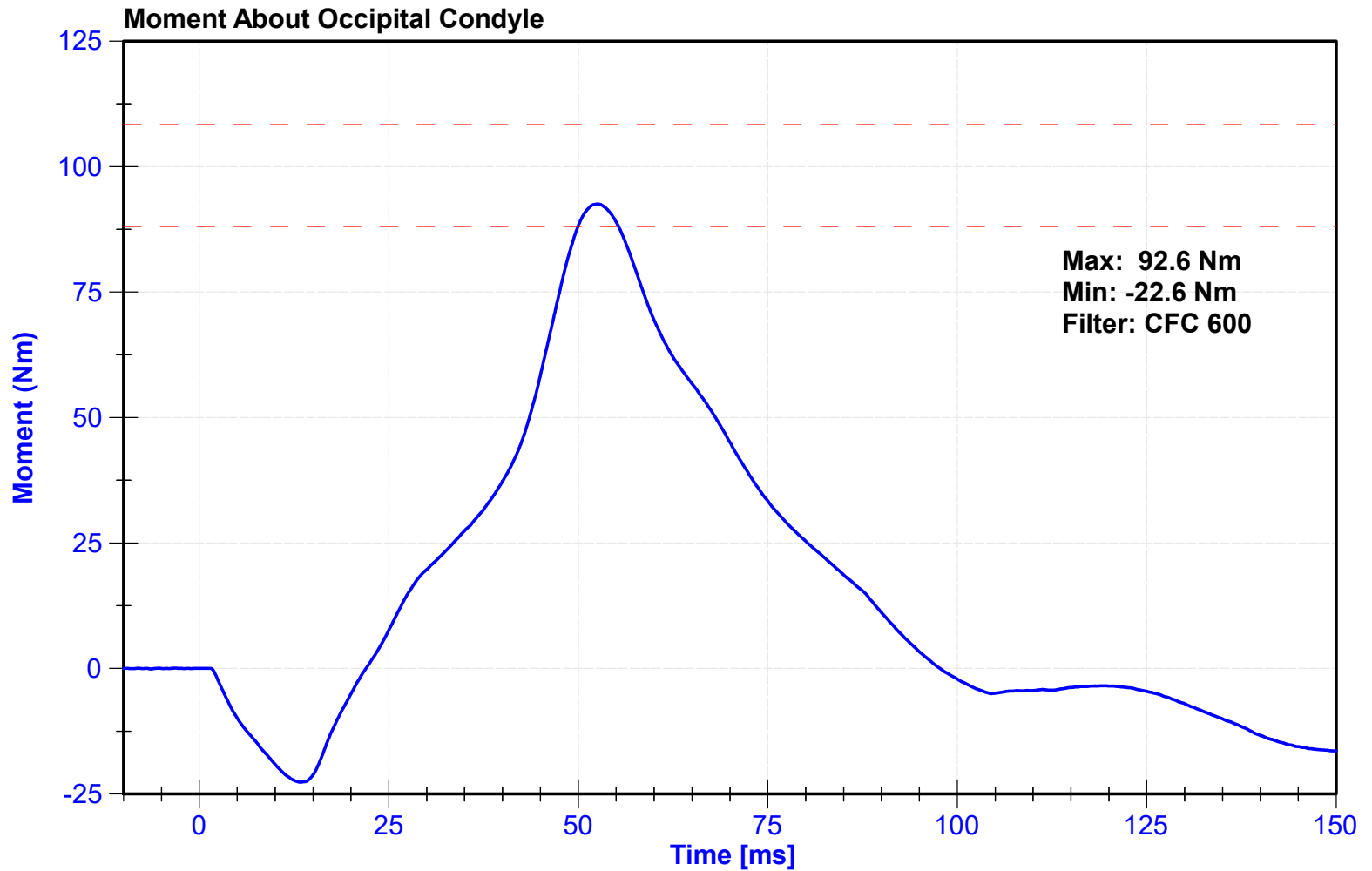
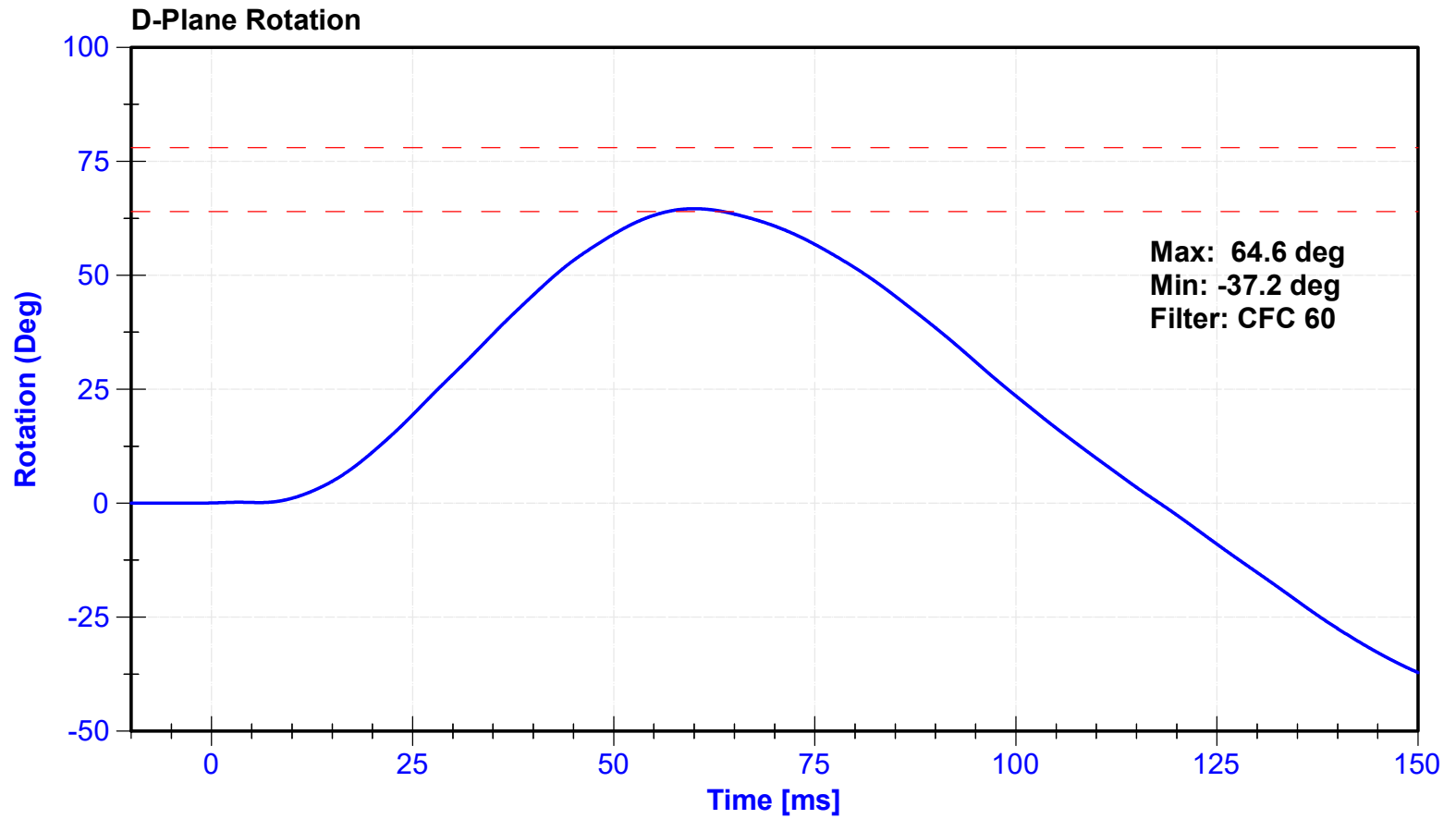
ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	065	Laboratory Supervisor	ZP

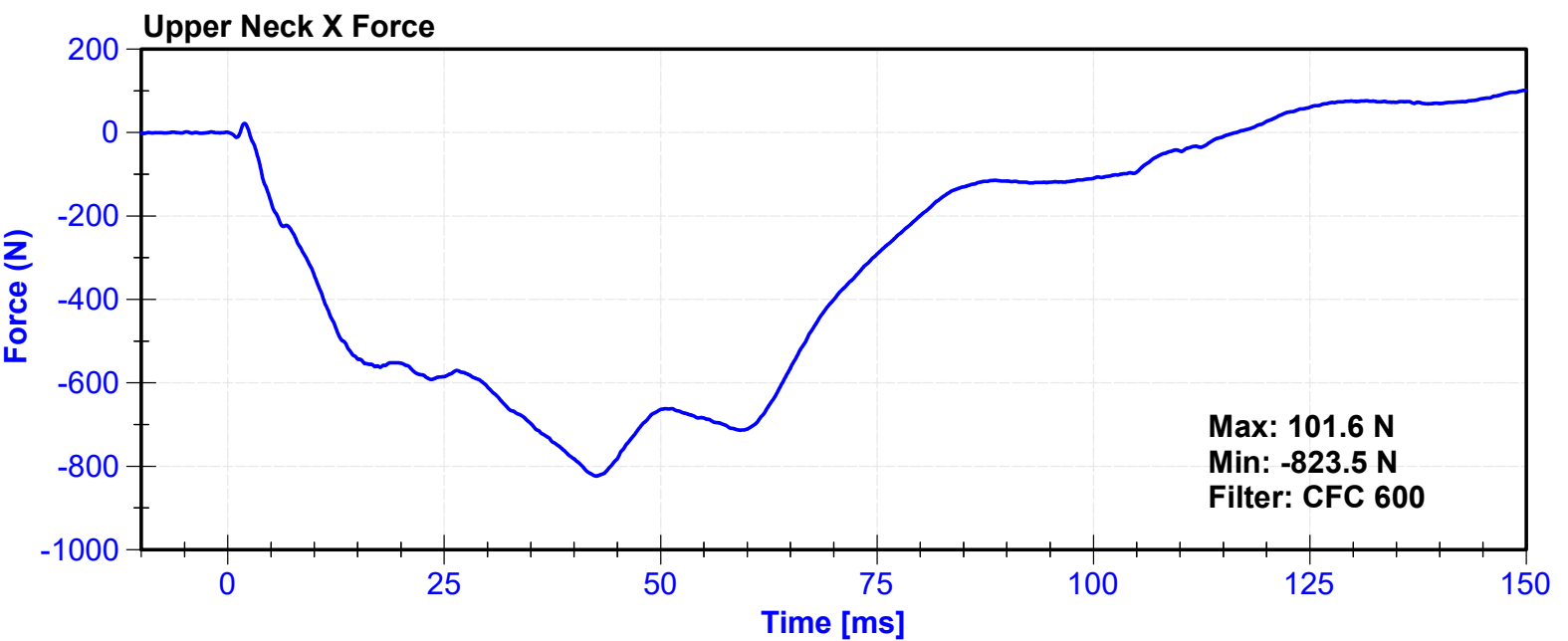
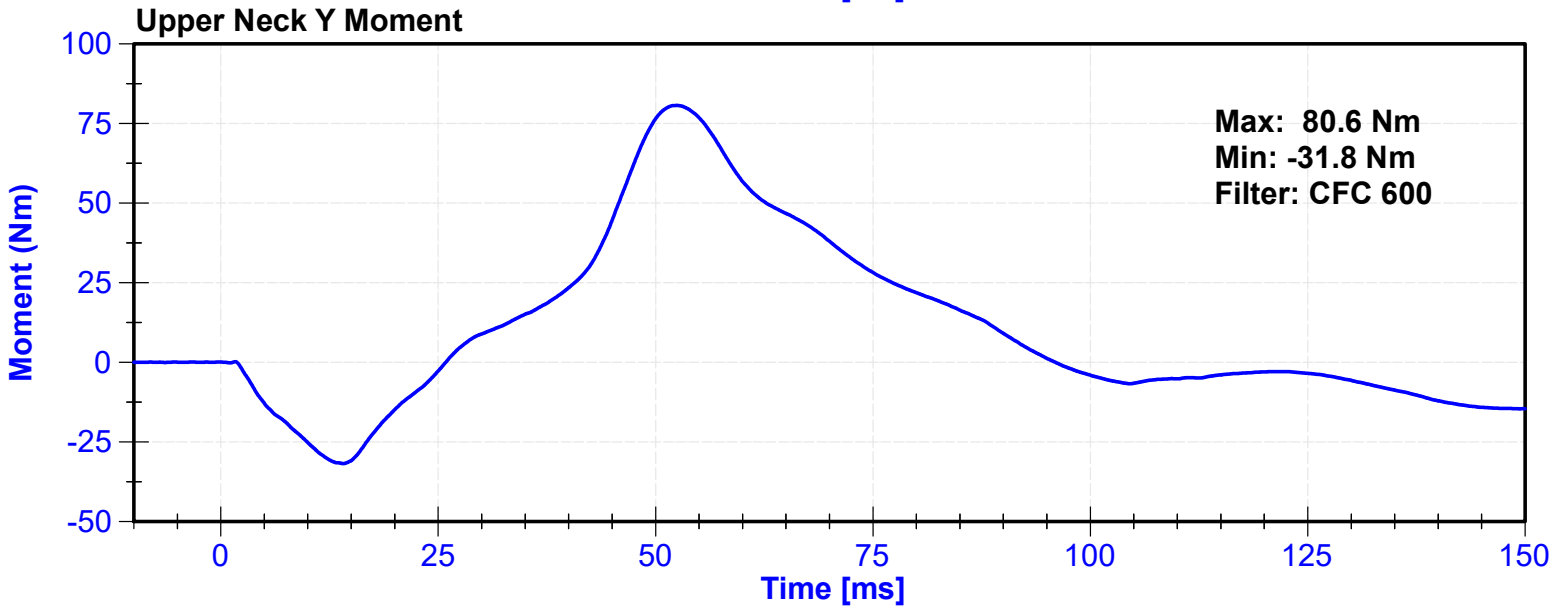
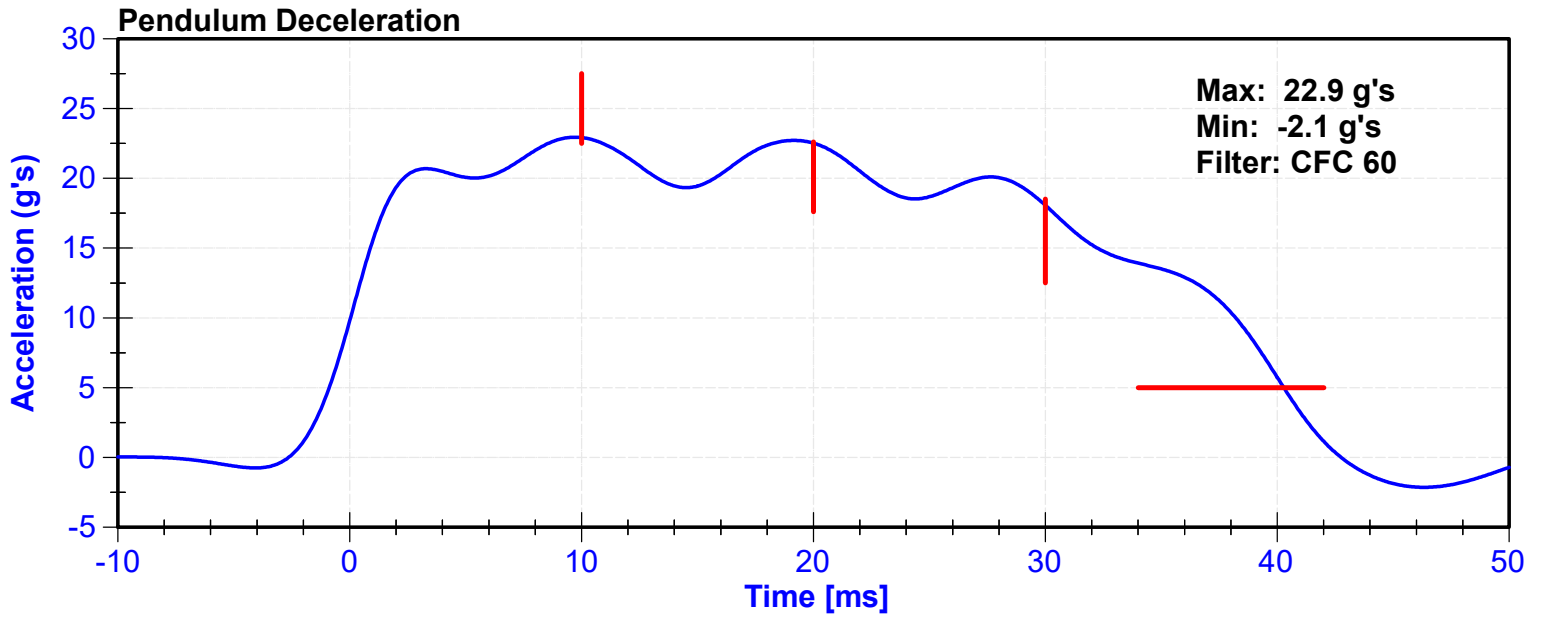
**Results**

<b>Test Parameter</b>	<b>Minimum Specification</b>	<b>Maximum Specification</b>	<b>Unit</b>	<b>Result</b>	<b>Pass/Fail</b>
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40.7	Pass
Velocity	6.89	7.13	m/s	7.047	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	22.91	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	22.51	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	18.06	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	22.9	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	40.3	Pass
Maximum D Plane Rotation	64	78	deg	64.6	Pass
Time to Maximum Rotation	57	64	ms	60.0	Pass
Rotation Decay to Zero	113	127	ms	117.9	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	92.56	Pass
Time to Maximum Moment	47	58	ms	52.5	Pass
Moment Decay to Zero	97	107	ms	97.8	Pass

**Transducer Calibrations**

<b>Channel</b>	<b>Manufacturer</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Pendulum Accelerometer	Endevco	C16678	8/29/2024	2/25/2025
Pendulum Potentiometer	ETI	1412	12/18/2023	12/17/2024
Condyle Potentiometer	ETI	1911	12/18/2023	12/17/2024
Upper Neck Load Cell	Humanetics	851-FX	5/22/2024	5/22/2025





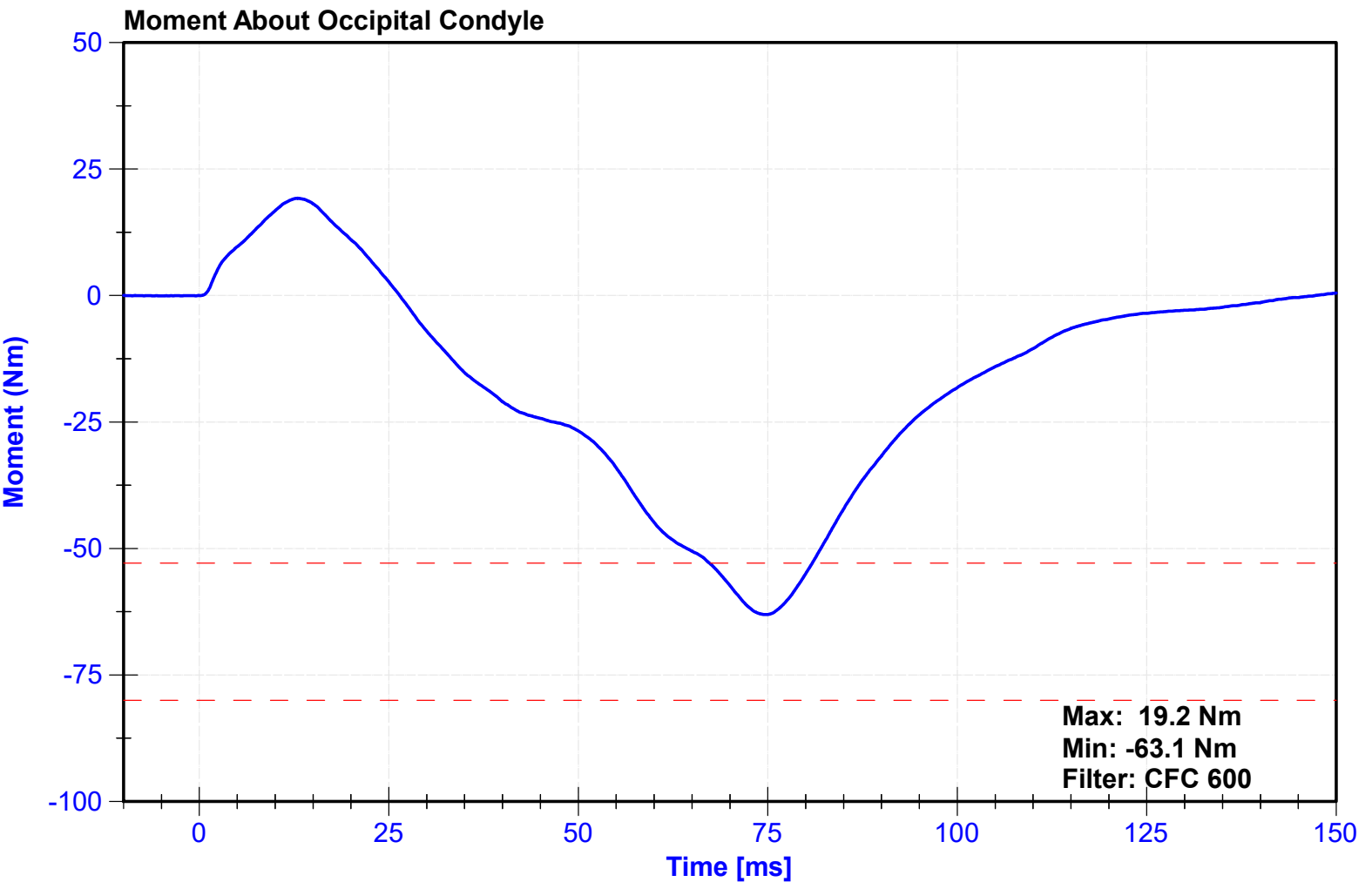
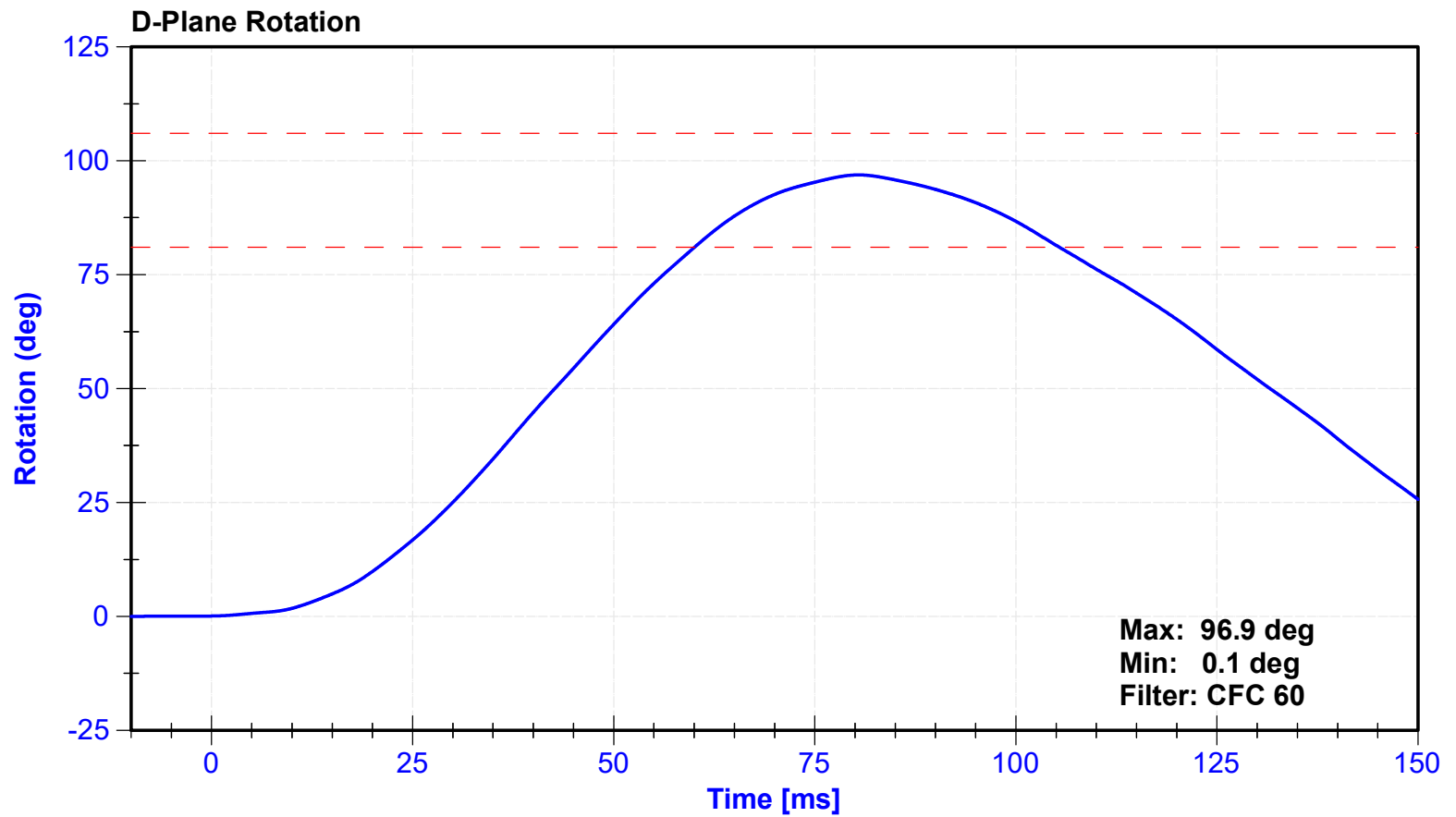
ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	065	Laboratory Supervisor	ZP

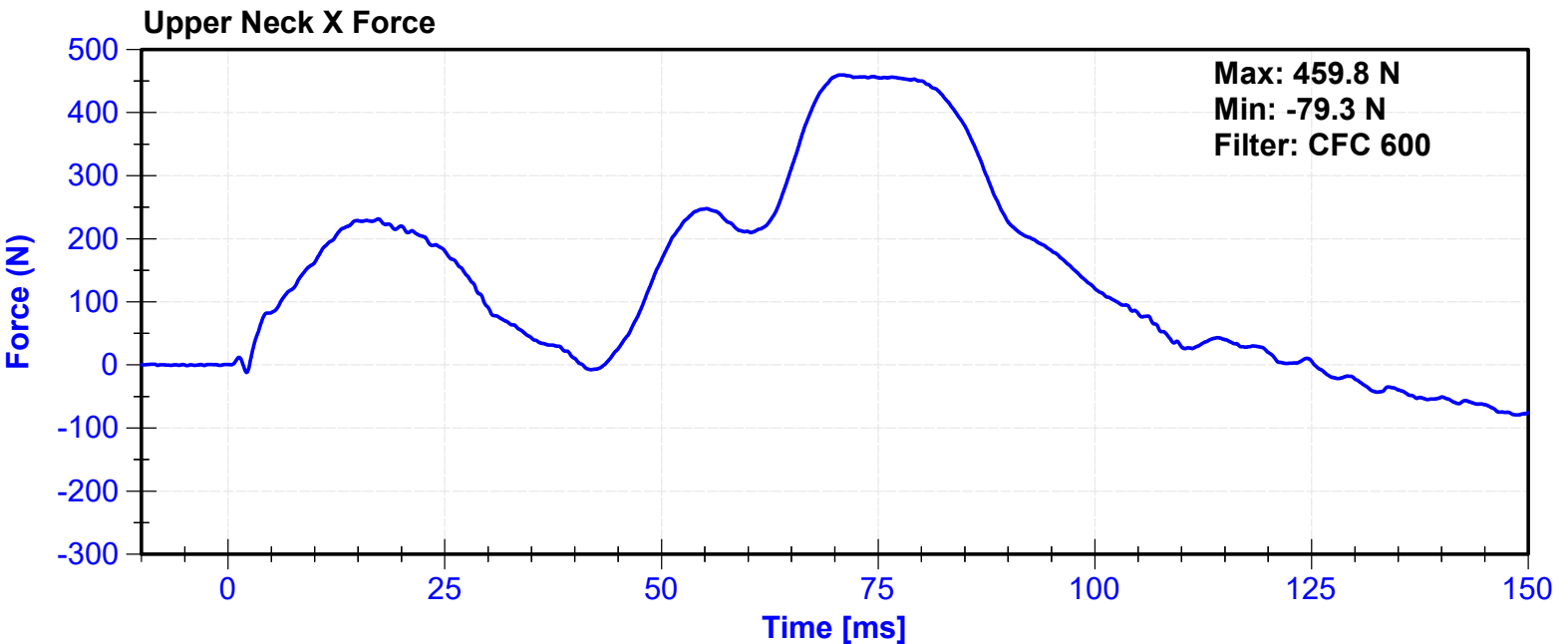
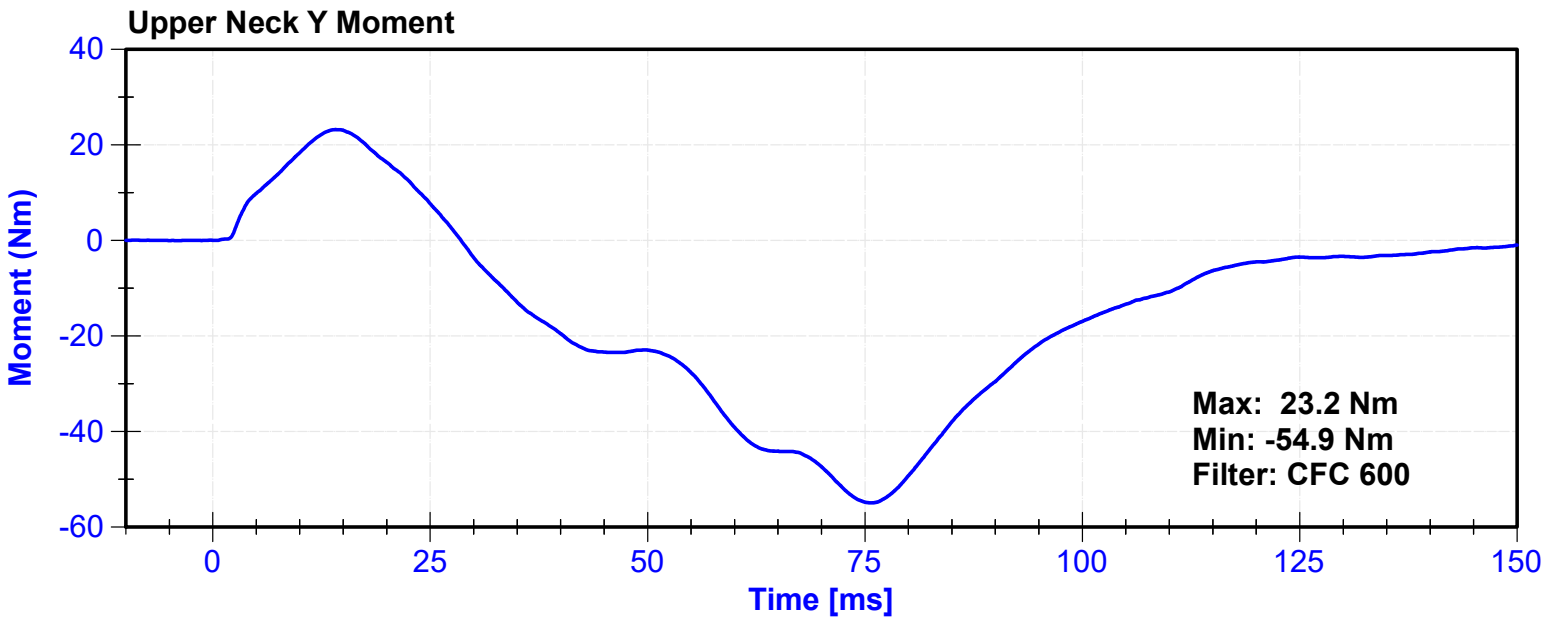
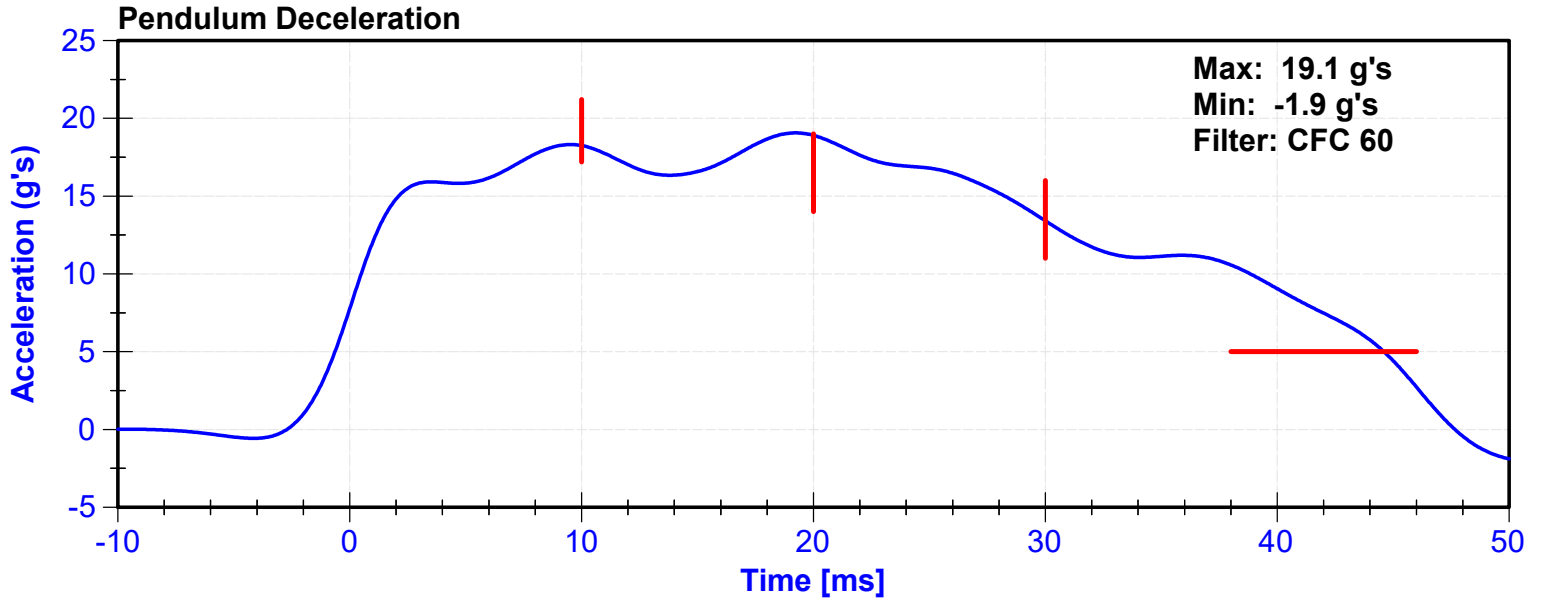
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40.7	Pass
Velocity	5.94	6.19	m/s	6.093	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	18.25	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.9	Pass
Pendulum Deceleration at 30ms	11	16	g's	13.4	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	19.1	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	44.6	Pass
Maximum D Plane Rotation	81	106	deg	96.9	Pass
Time to Maximum Rotation	72	82	ms	80.5	Pass
Rotation Decay to Zero	147	174	ms	170.4	Pass
Minimum Moment About OC	-80	-52.9	Nm	-63.05	Pass
Time to Minimum Moment	65	79	ms	74.7	Pass
Moment Decay to Zero	120	148	ms	147.2	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16678	8/29/2024	2/25/2025
Pendulum Potentiometer	ETI	SP22G_1412	12/18/2023	12/17/2024
Condyle Potentiometer	ETI	SP22G_1911	12/18/2023	12/17/2024
Upper Neck Load Cell	Humanetics	851-FX	5/22/2024	5/22/2025





ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	065	Laboratory Supervisor	ZP

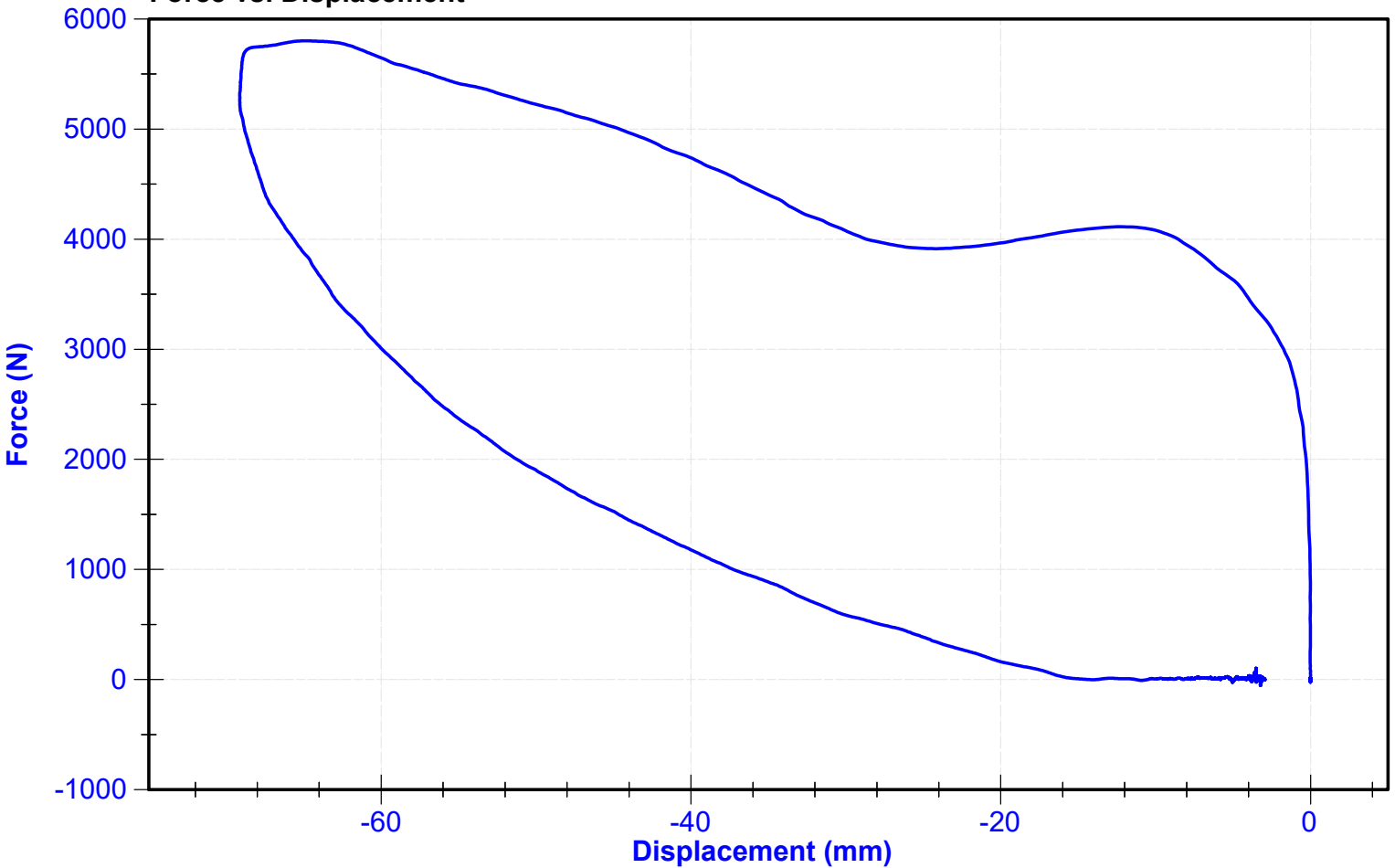
**Results**

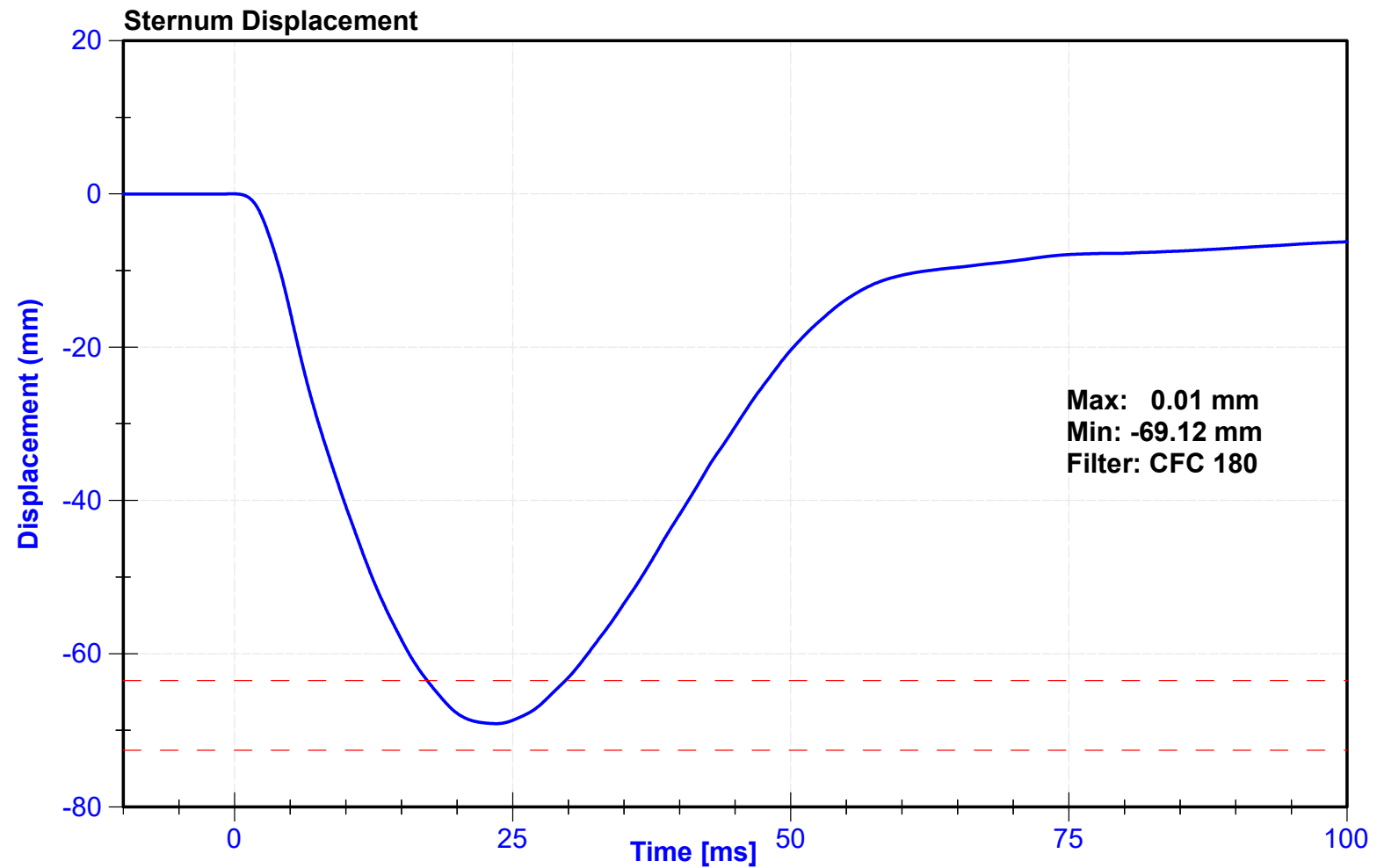
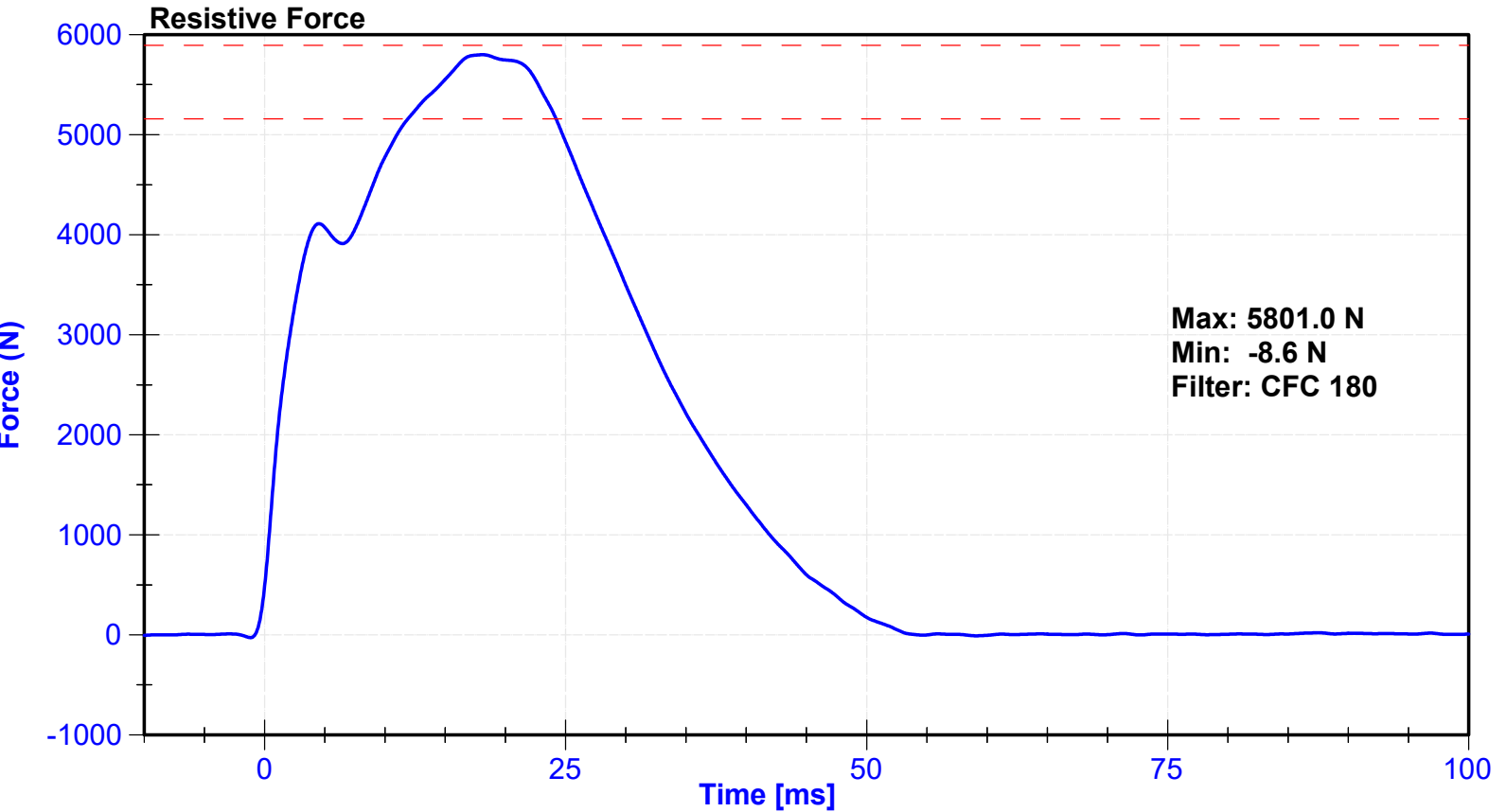
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	44.7	Pass
Velocity	6.59	6.83	m/s	6.728	Pass
Chest Displacement	-72.6	-63.5	mm	-69.12	Pass
Resistive Force	5160	5894	N	5801.0	Pass
Hysteresis	69	85	%	72.3	Pass

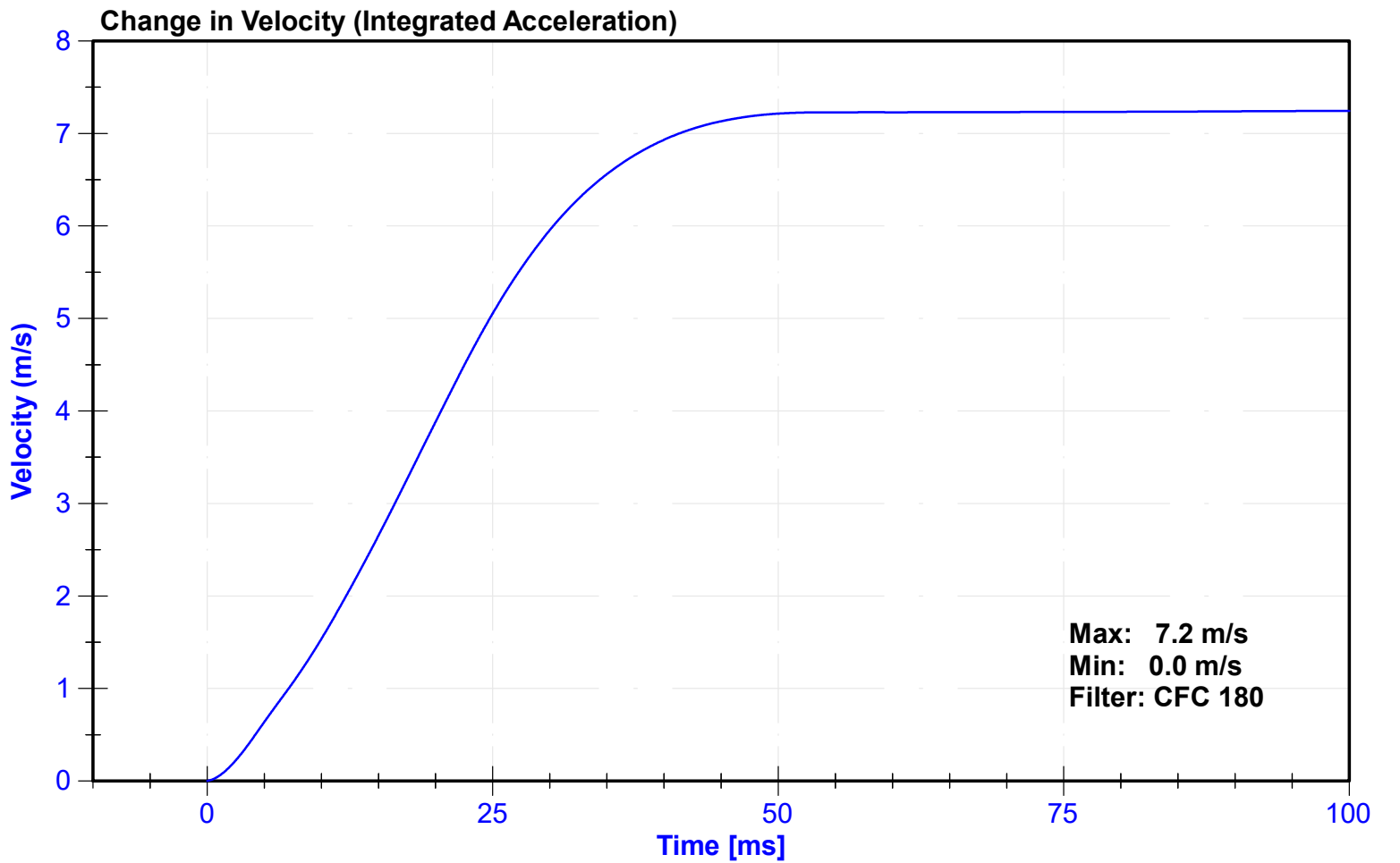
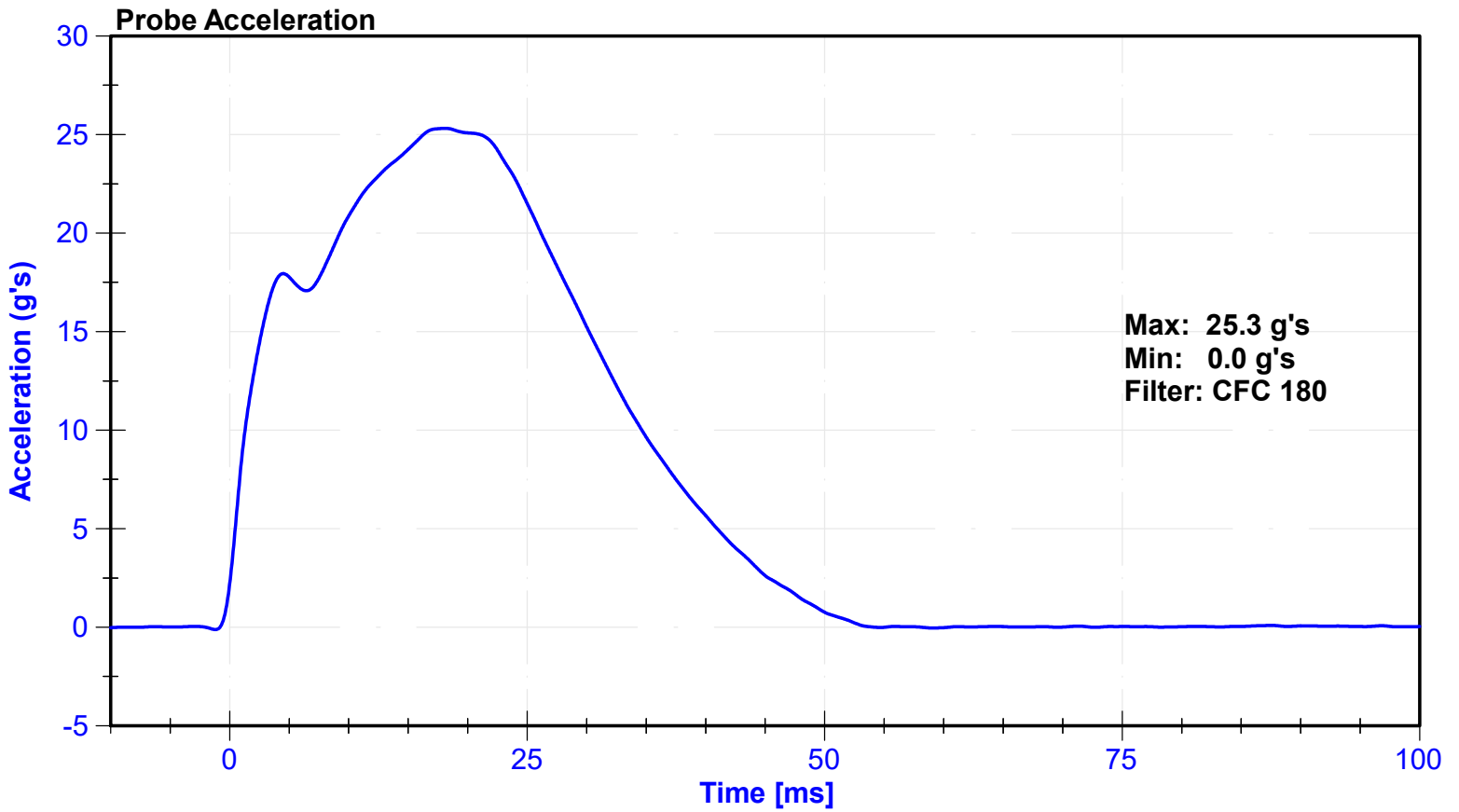
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P94662	10/3/2024	4/1/2025
Chest Potentiometer	Servo	1046	10/31/2024	5/1/2025

**Force vs. Displacement**







ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

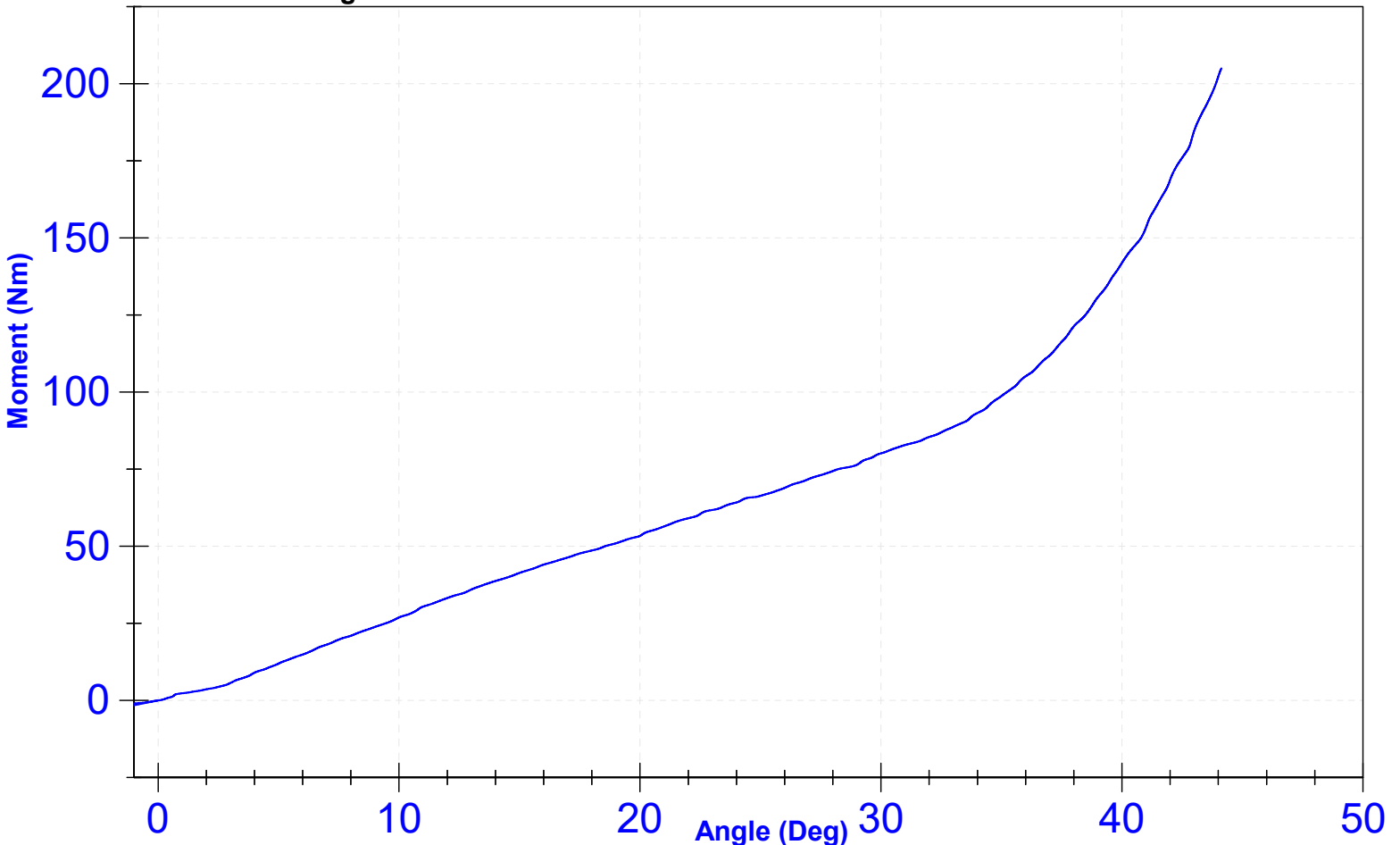
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	39	Pass
Average Velocity	5	10	deg/s	7.3	Pass
Angle at 203Nm	40	50	deg	44.0	Pass
Moment at 30 degrees	0	94.9	Nm	80.1	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	0008	9/23/2024	9/23/2025
Load Cell	PCB 2301-02A	694	2024-01-31	2025-01-30

**Moment vs. Angle**

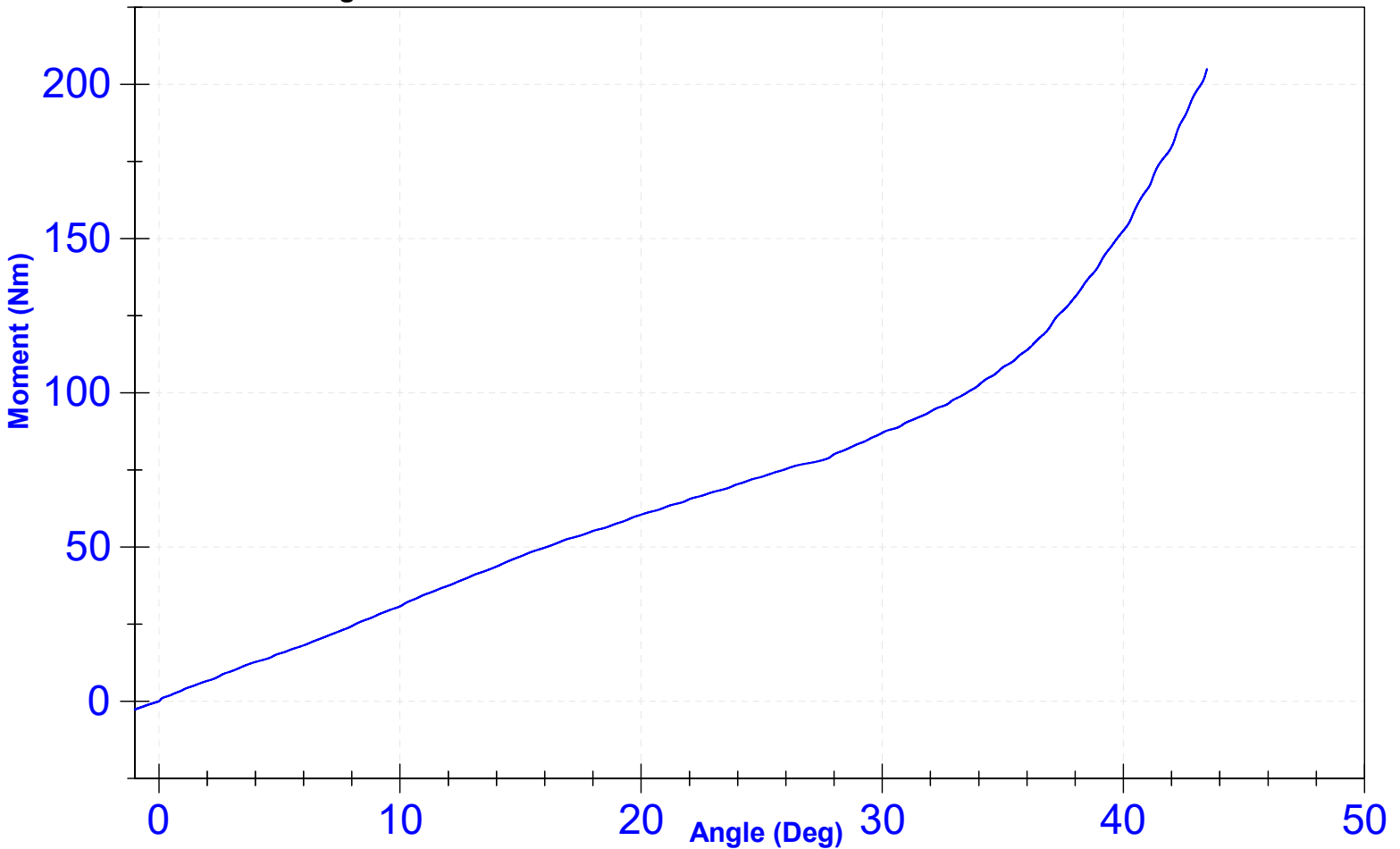


ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

Test Parameter	Results		Unit	Result	Pass/Fail
	Minimum Specification	Maximum Specification			
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	39	Pass
Average Velocity	5	10	deg/s	7.2	Pass
Angle at 203Nm	40	50	deg	43.4	Pass
Moment at 30 degrees	0	94.9	Nm	87.0	Pass

Transducer Calibrations				
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/23/2024	9/23/2025
Load Cell	PCB 2301-02A	694	2024-01-31	2025-01-30

**Moment vs. Angle**



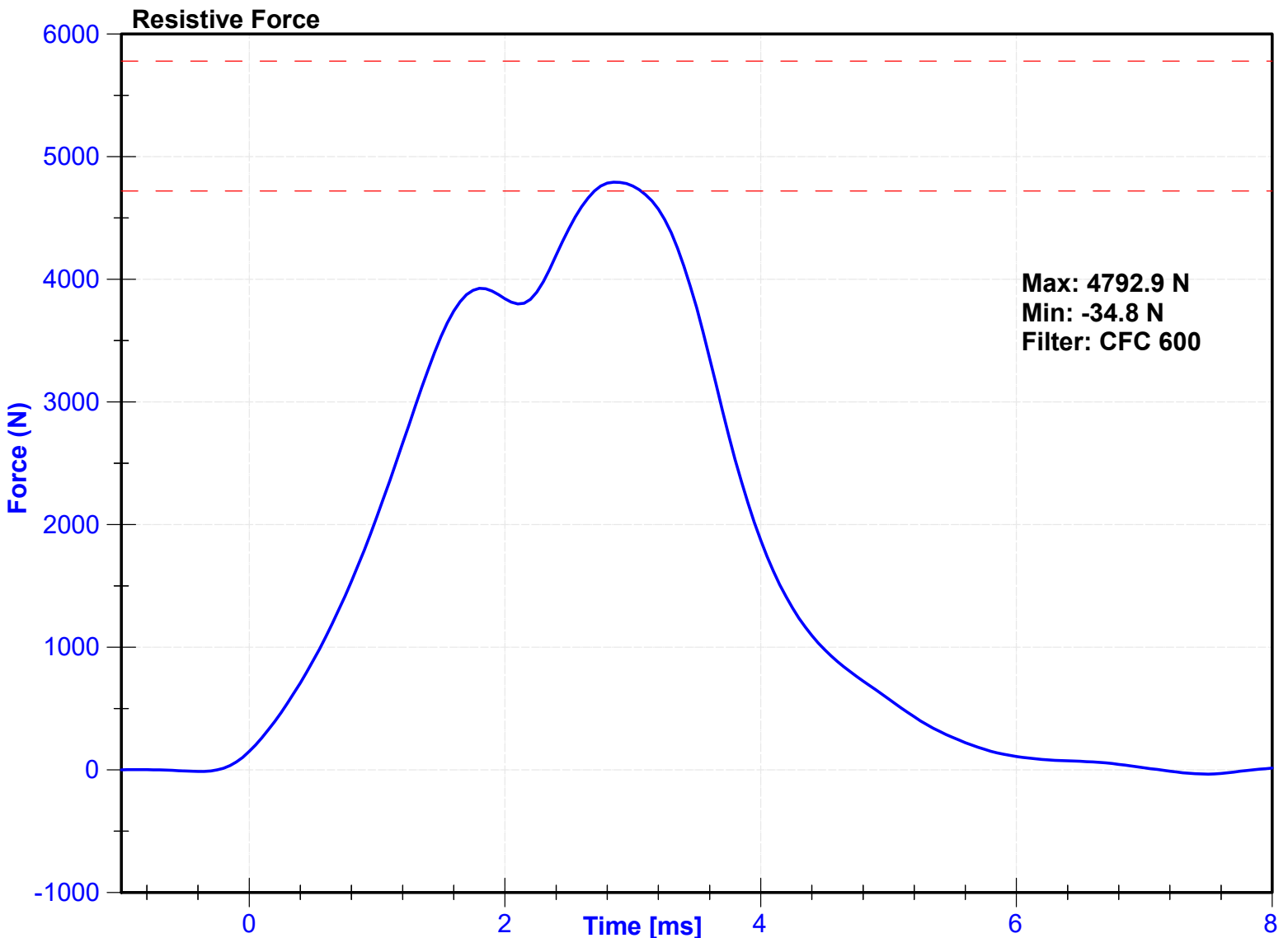
ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	065	Laboratory Supervisor	ZP

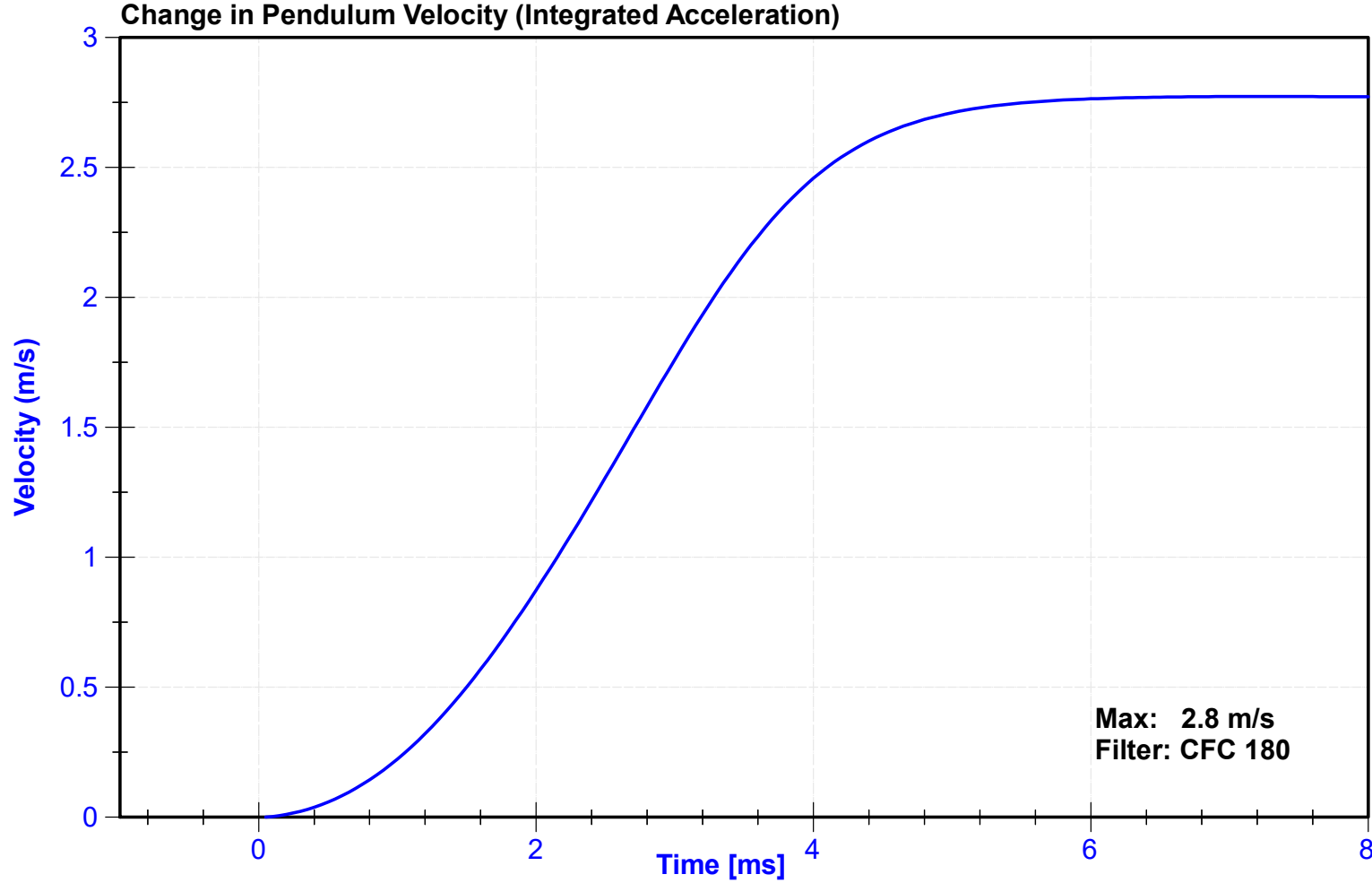
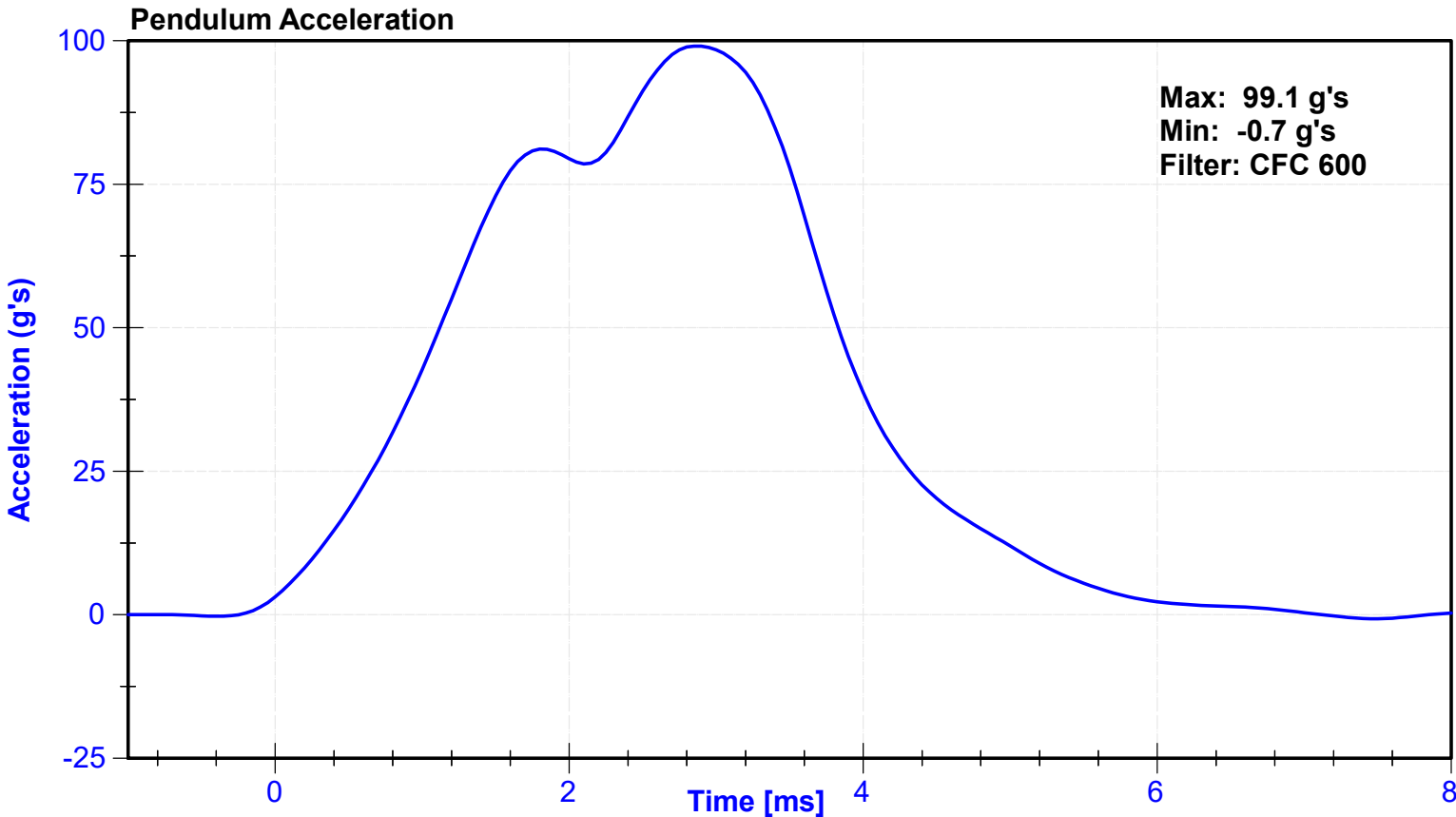
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	44.7	Pass
Velocity	2.07	2.13	m/s	2.127	Pass
Maximum Resistive Force	4720	5780	N	4792.9	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T29720	6/12/2024	12/9/2024





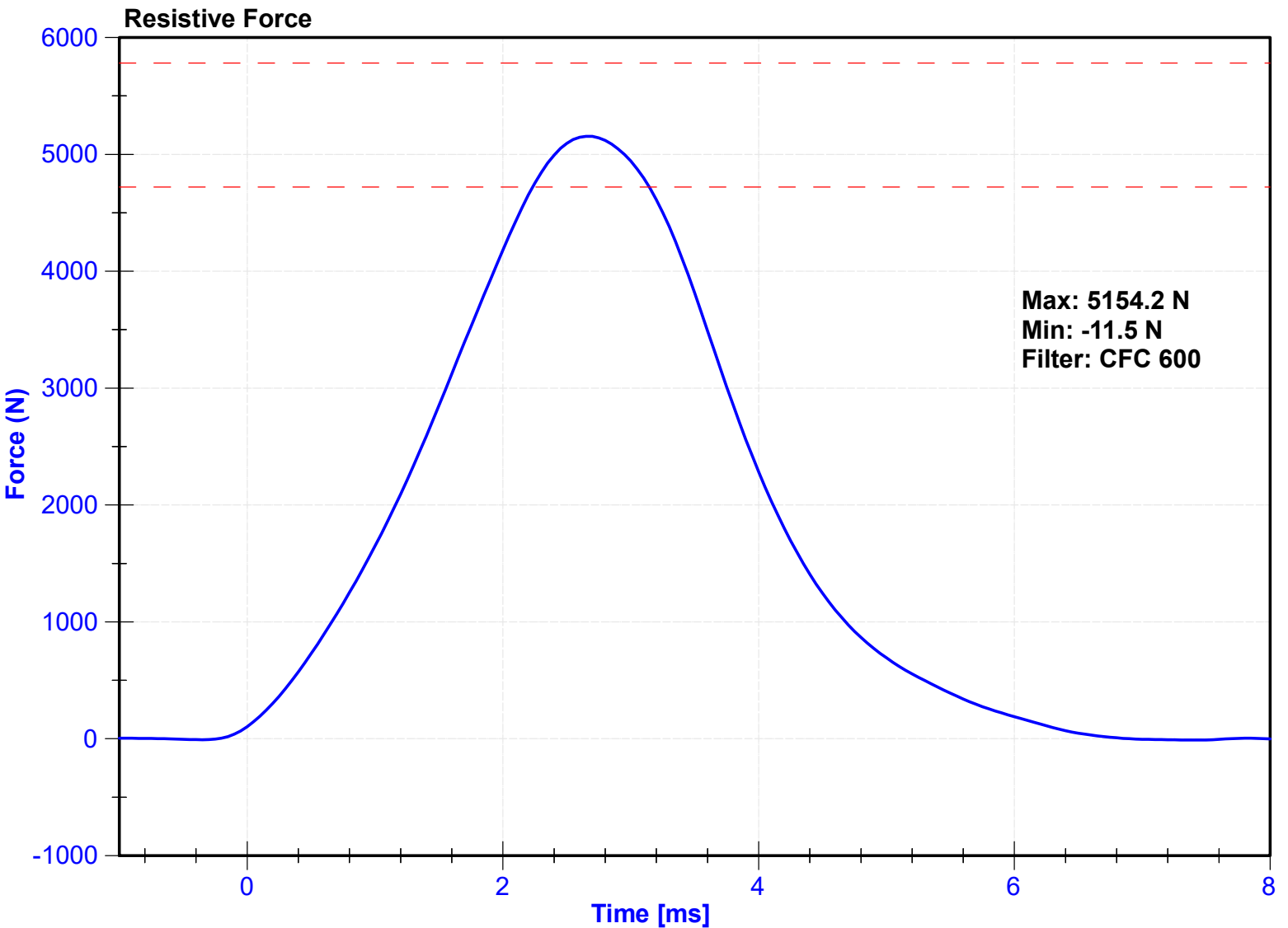
ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	065	Laboratory Supervisor	ZP

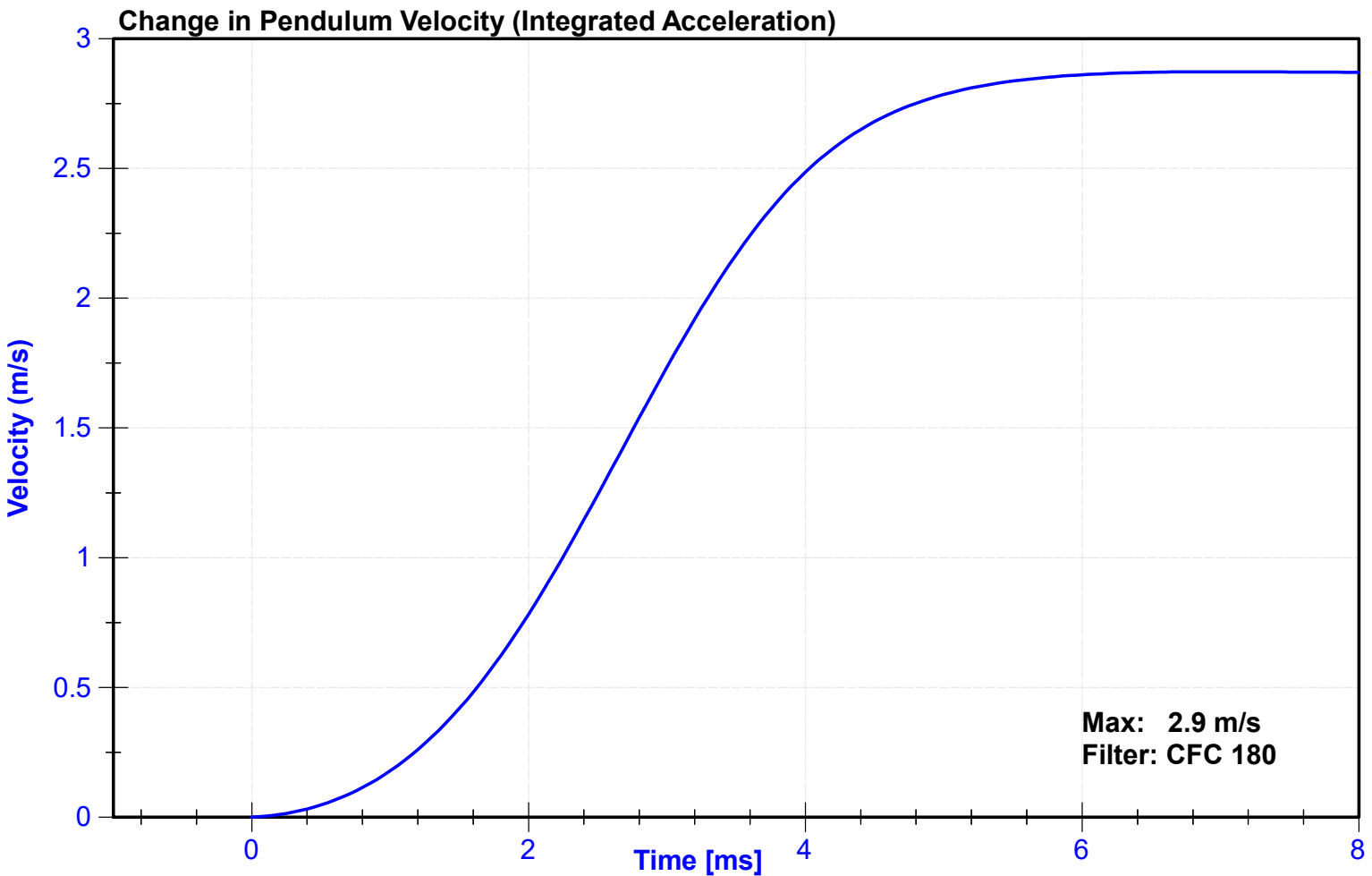
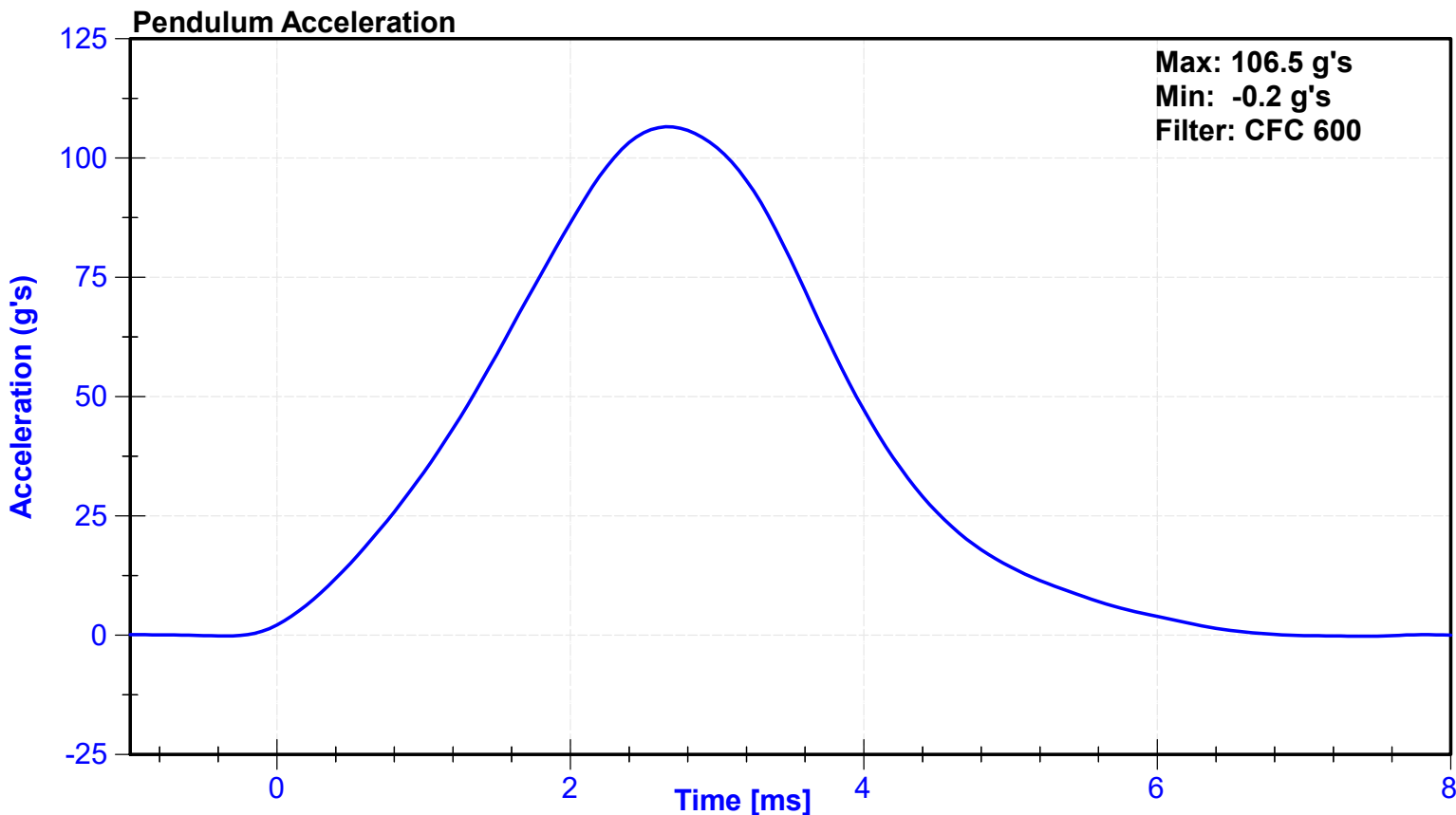
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	44.7	Pass
Velocity	2.07	2.13	m/s	2.095	Pass
Maximum Resistive Force	4720	5780	N	5154.2	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T29720	6/12/2024	12/9/2024





**CALIBRATION TEST RESULTS**

**PRE-TEST**

**HYBRID III 5<sup>TH</sup> PERCENTILE - PASSENGER ATD**

**SERIAL NO: 137**

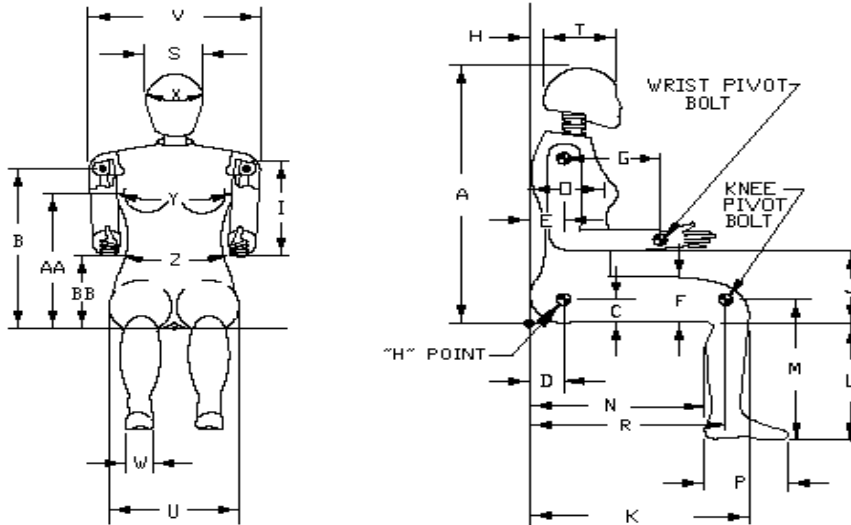


External Measurements - Hybrid 3 - 5th Female

Technician: J. Rios

Date: 11/18/2024

Dummy Serial Number: 137



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	781	Pass
B	Shoulder Pivot Height	432	457	441	Pass
C	H-Point Height	81	86	85	Pass
D	H-Point from Backline	145	150	148	Pass
E	Shoulder Pivot from Backline	69	84	74	Pass
F	Thigh Clearance	119	135	121	Pass
G	Back of Elbow to Wrist Pivot	244	259	251	Pass
H	Head Back to Backline	43	48	46	Pass
I	Shoulder to Elbow Length	277	297	282	Pass
J	Elbow Rest Height	183	203	189	Pass
K	Buttock to Knee Length	521	546	532	Pass
L	Popliteal Height	356	376	362	Pass
M	Knee Pivot Height	394	419	409	Pass
N	Buttock Popliteal Length	414	439	428	Pass
O	Chest Depth without Jacket	175	191	184	Pass
P	Foot Length (right)	219	234	227	Pass
R	Buttock To Knee Pivot Length	457	483	467	Pass
S	Head Breadth	137	147	143	Pass
T	Head Depth	178	188	184	Pass
U	Hip Breadth	300	315	311	Pass
V	Shoulder Breadth	351	366	360	Pass
W	Foot Breadth	79	94	85	Pass
X	Head Circumference	528	549	537	Pass
Y	Chest Circumference with Jacket	851	881	867	Pass
Z	Waist Circumference	460	790	607	Pass
AA	Reference Location (Chest Circumference)	333	358	341	Pass
BB	Reference Location (Waist Circumference)	160	170	167	Pass

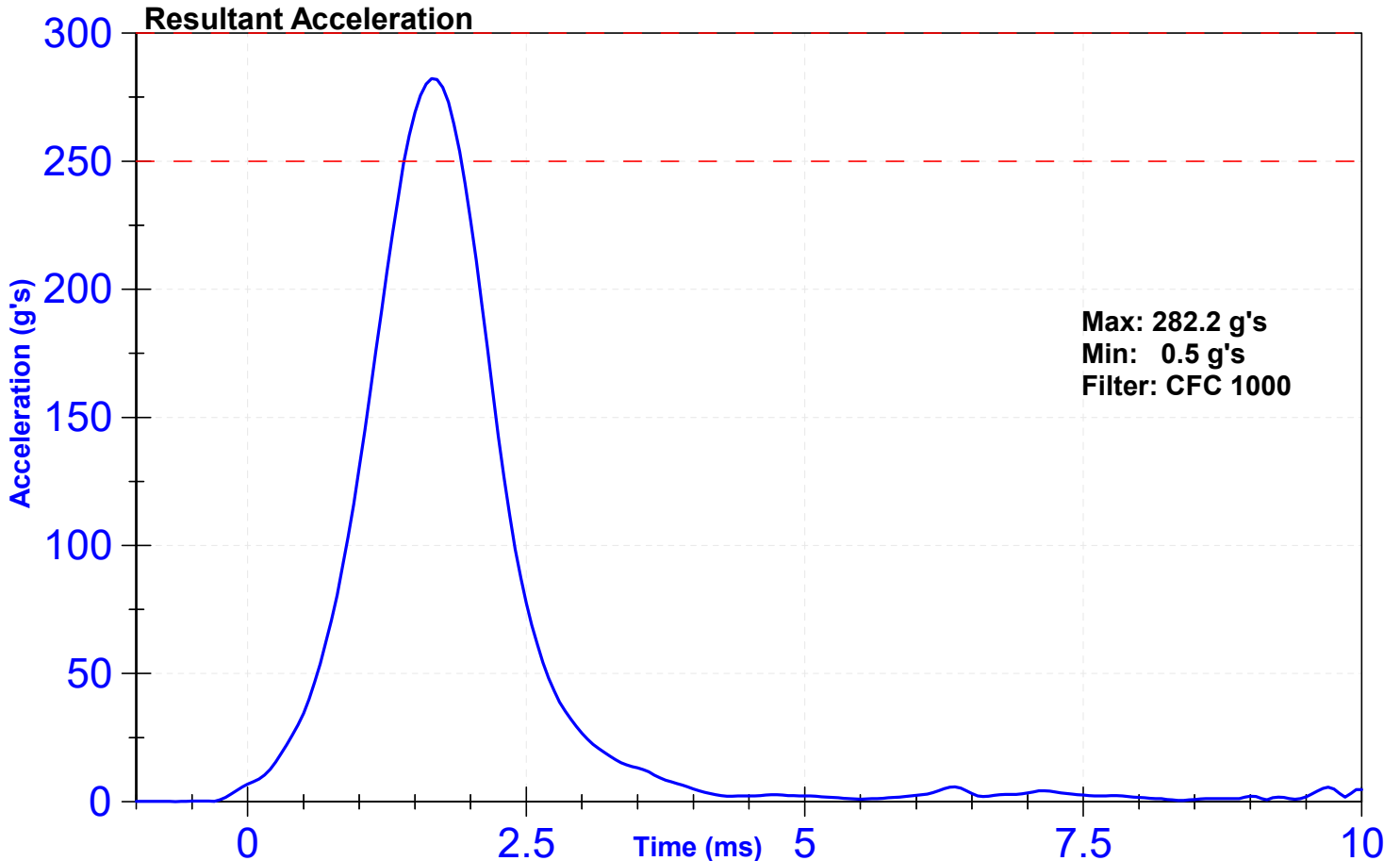
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

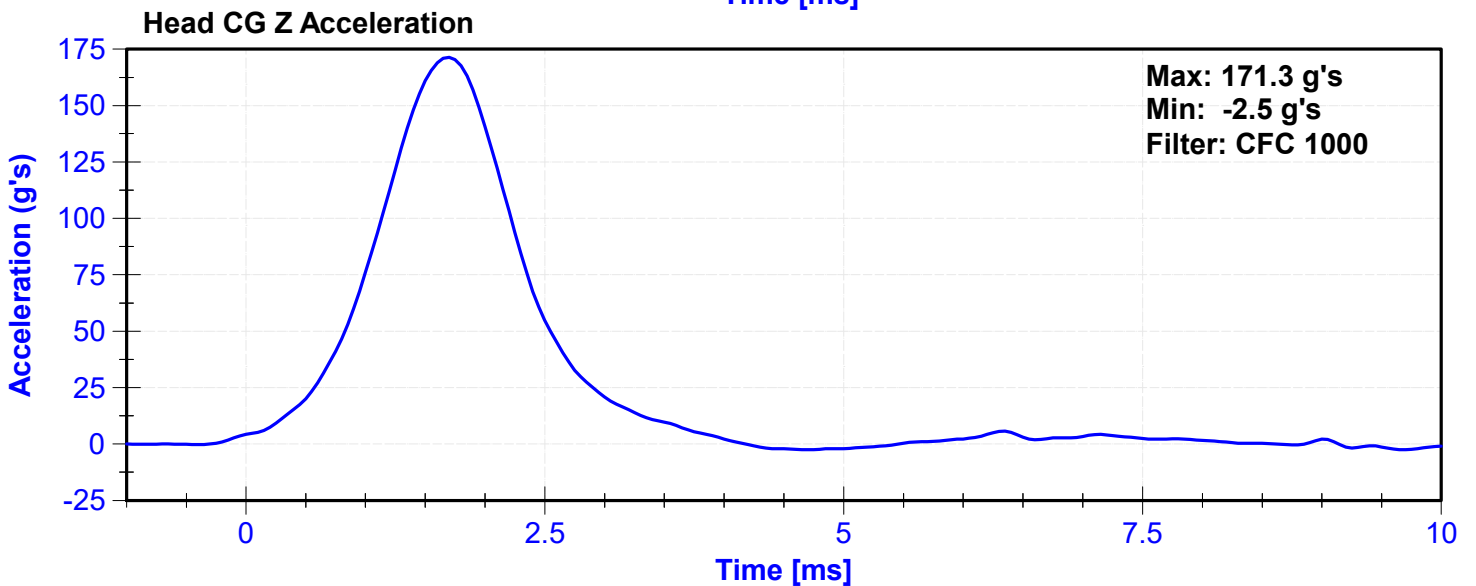
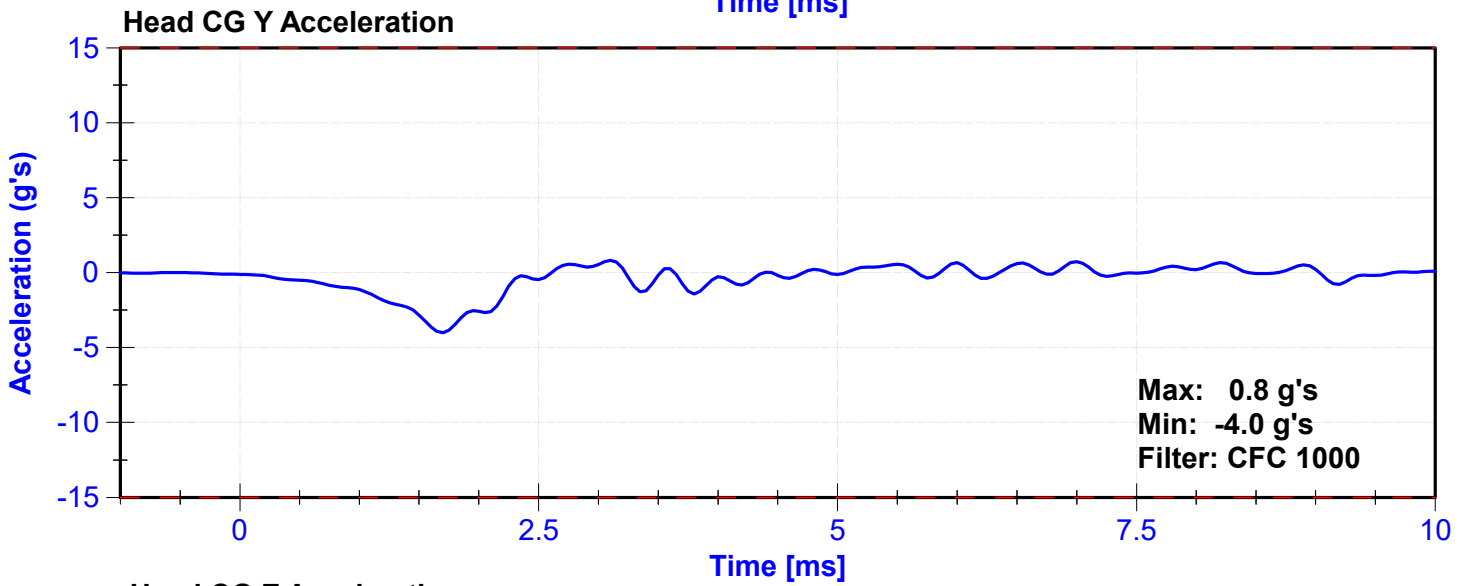
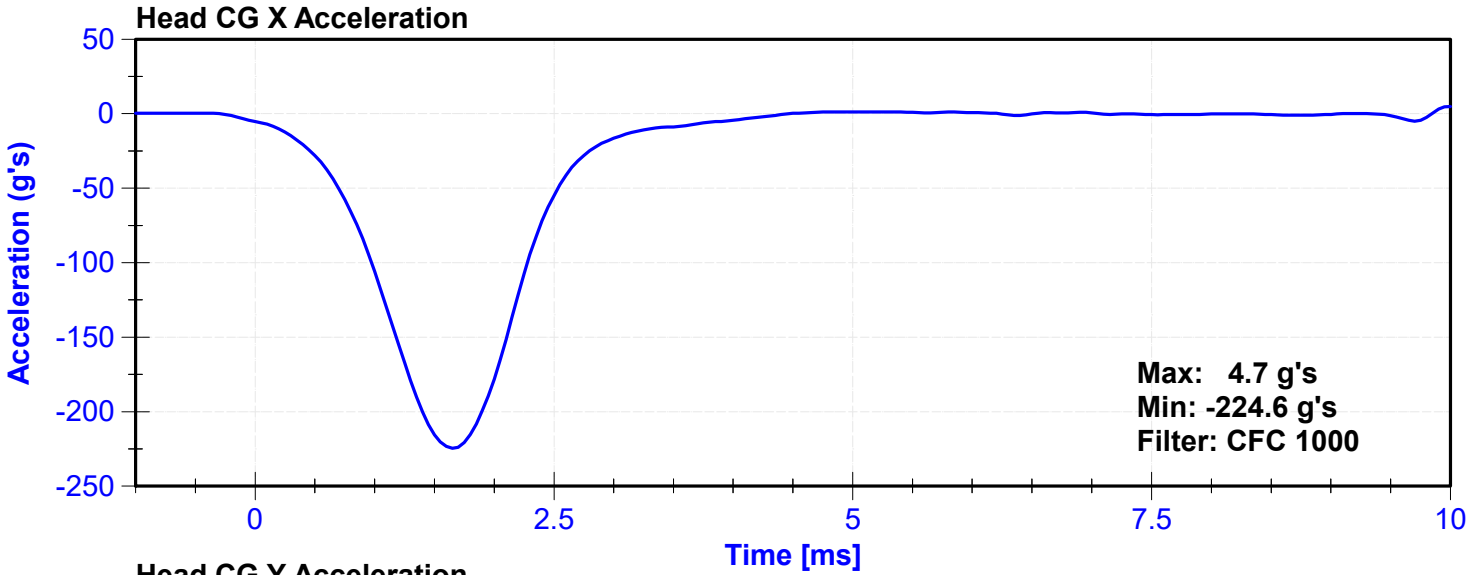
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	35	Pass
Resultant Acceleration	250	300	g's	282.2	Pass
Oscillation	0	10	%	2.0	Pass
Lateral Acceleration	-15	15	g's	-4.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P79417	8/19/2024	2/15/2025
Y Accelerometer	Endevco	P83335	8/19/2024	2/15/2025
Z Accelerometer	Endevco	P64149	8/19/2024	2/15/2025





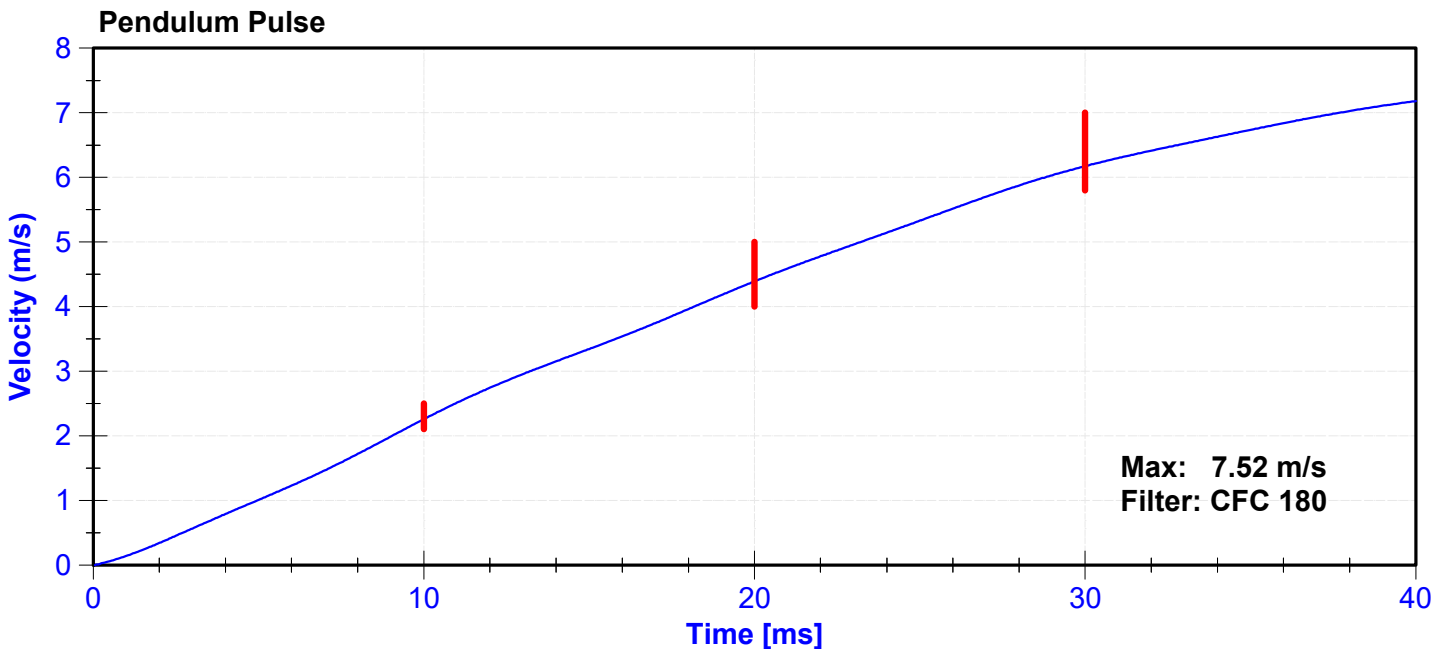
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

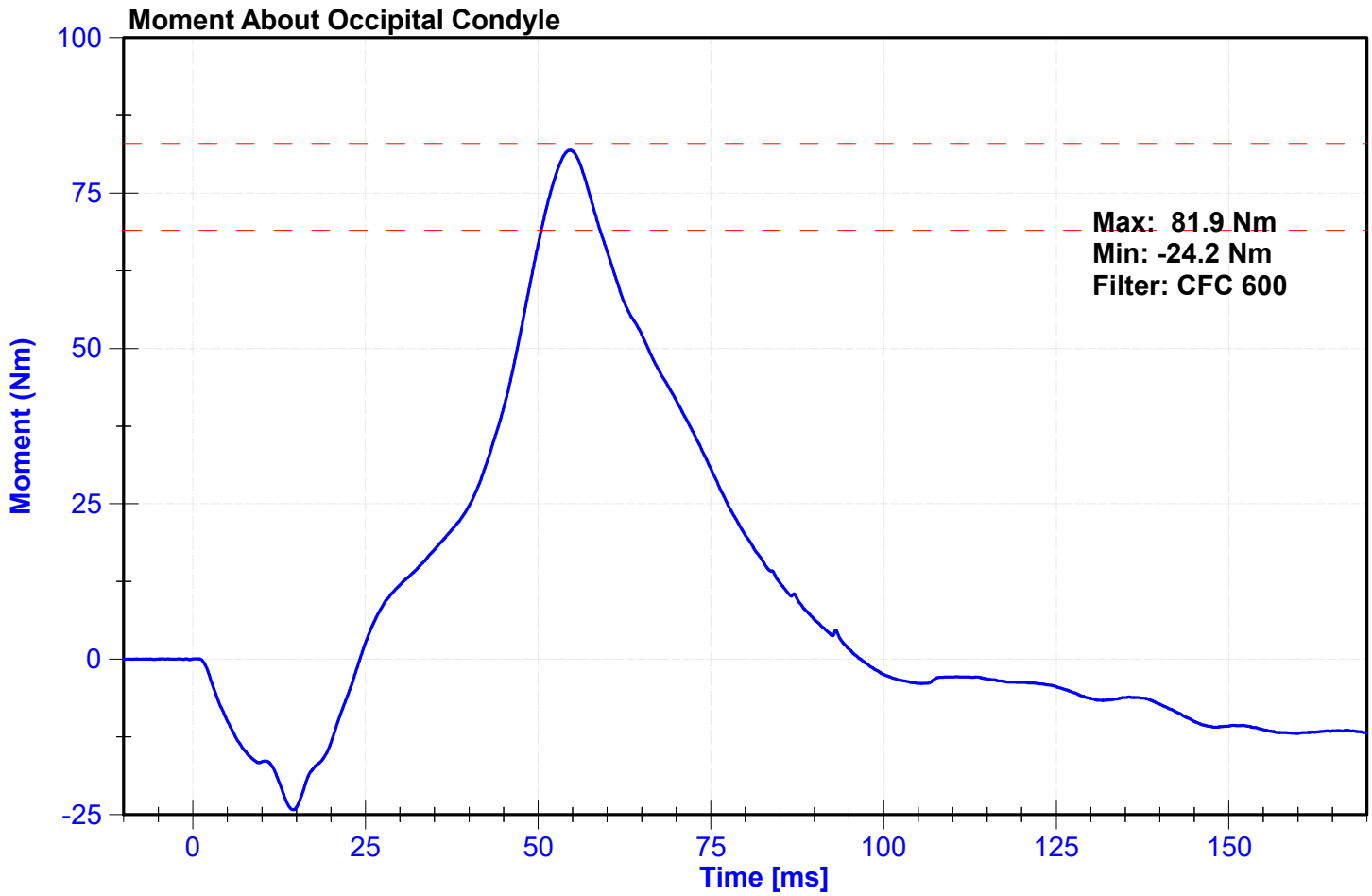
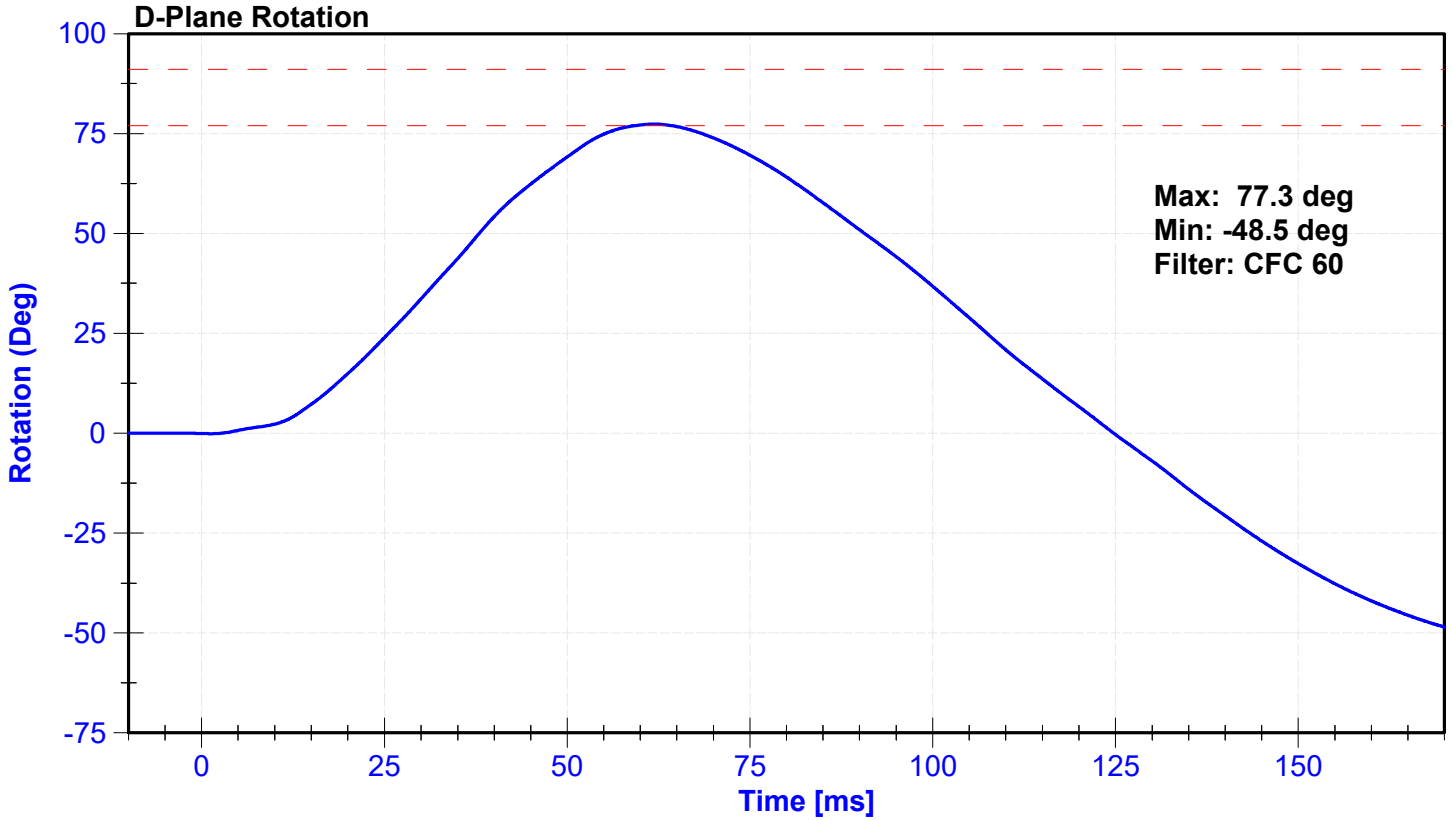
**Results**

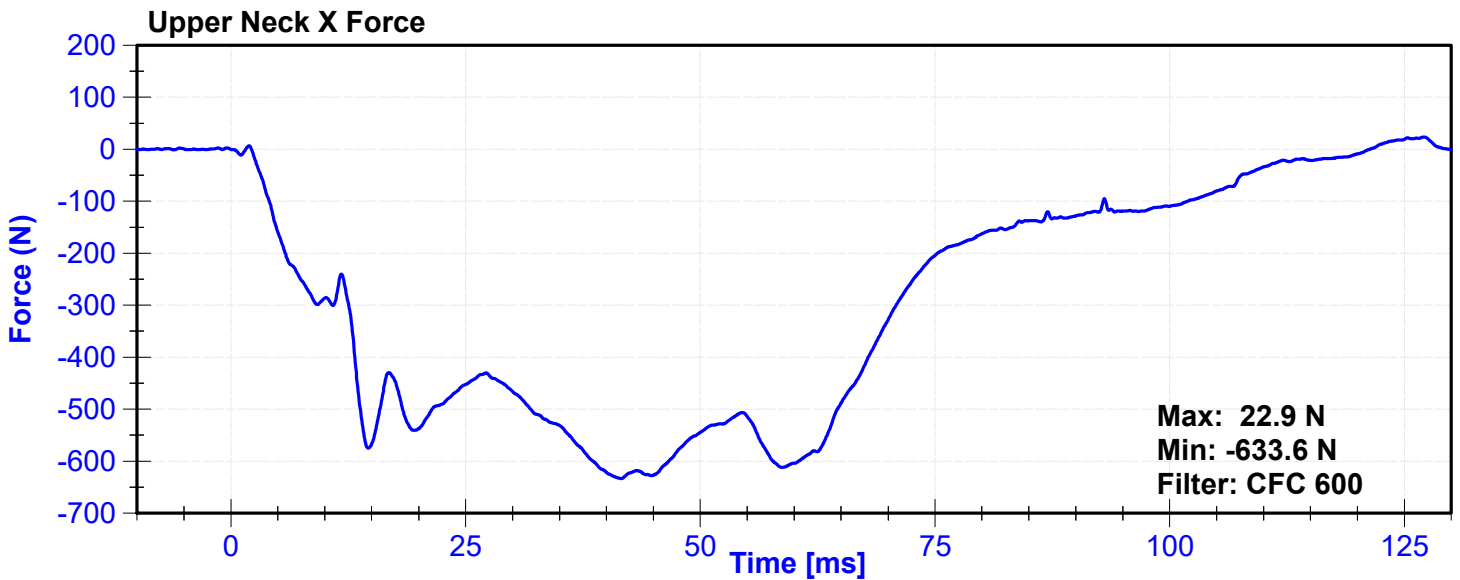
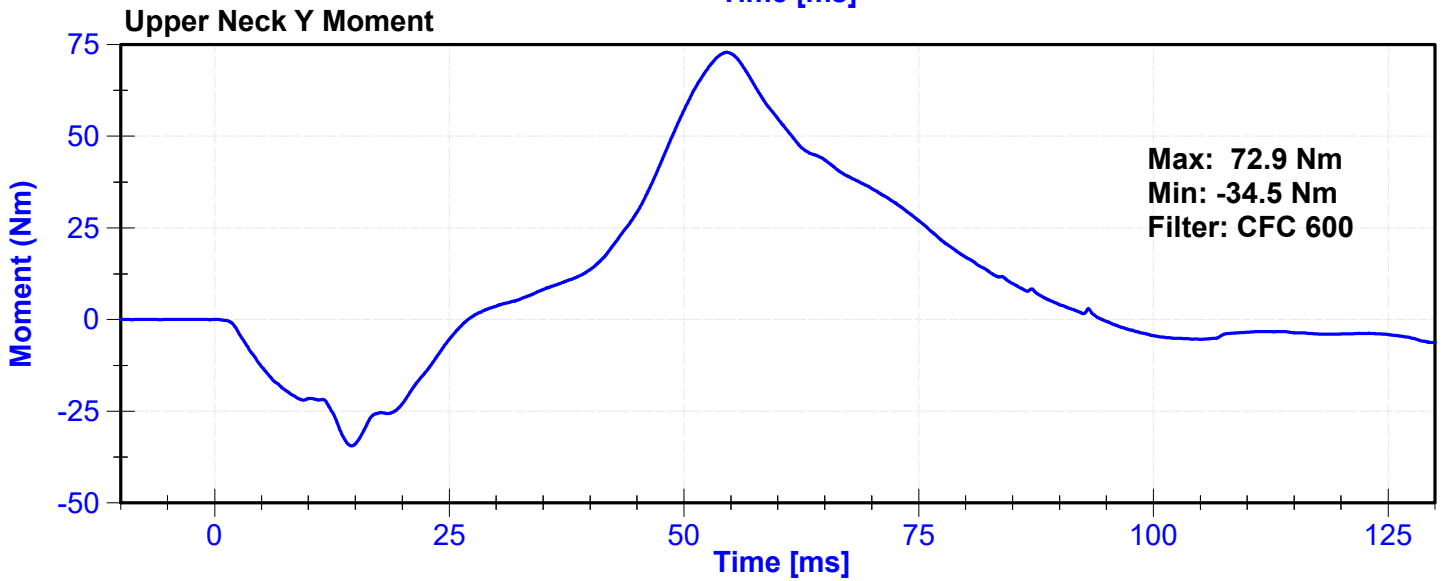
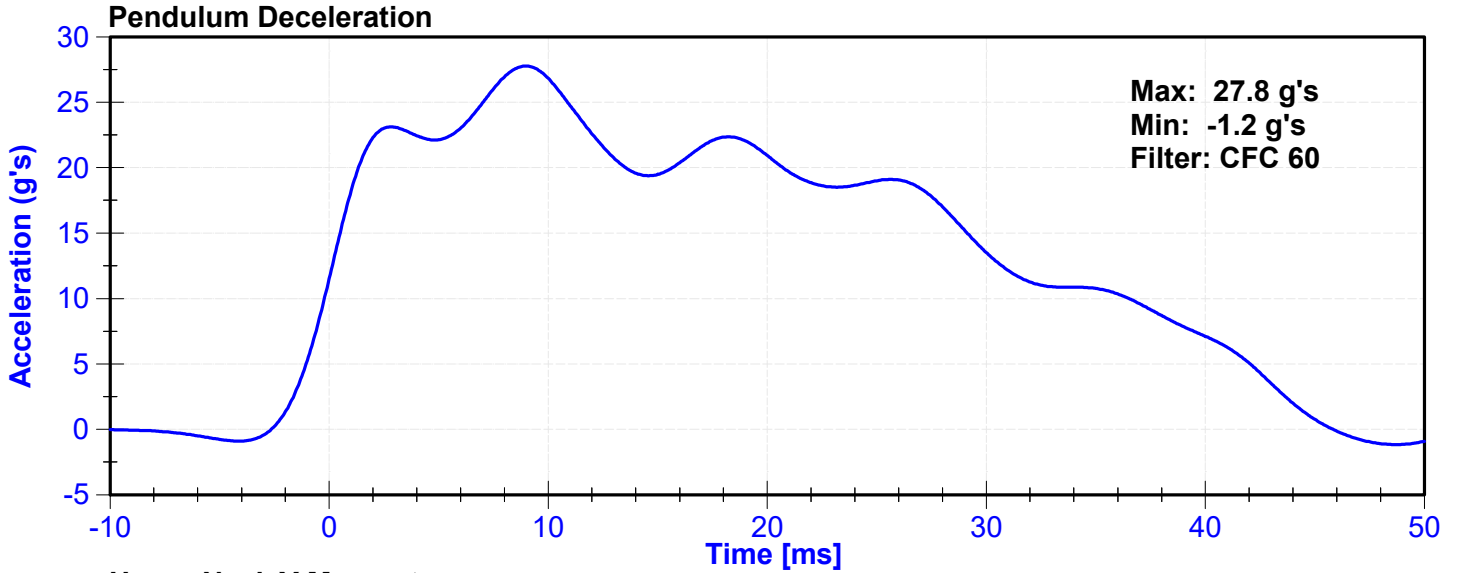
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	32	Pass
Velocity	6.89	7.13	m/s	7.033	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.26	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.39	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.17	Pass
Max D Plane Rotation	77	91	deg	77.3	Pass
Max Moment During Rotation Interval	69	83	Nm	81.9	Pass
Moment Decay to 10.0 Nm	80	100	ms	87.4	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/30/2024	4/28/2025
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025







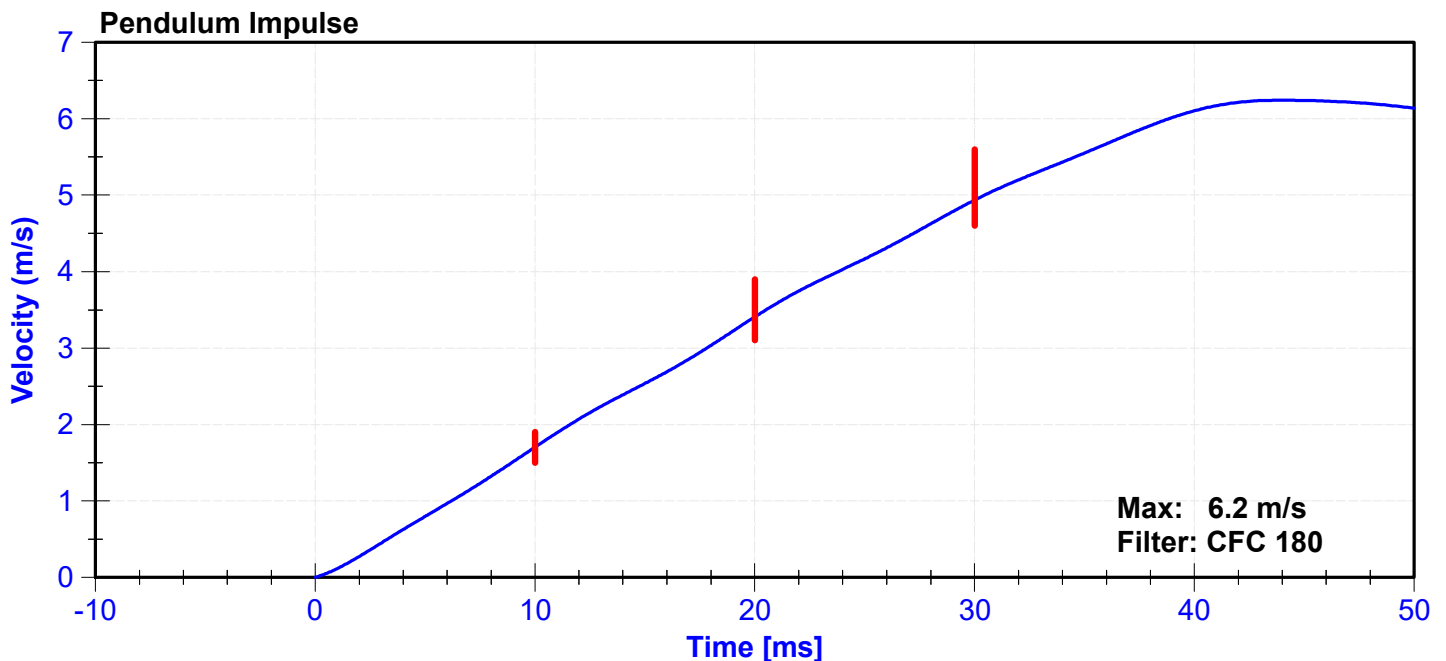
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

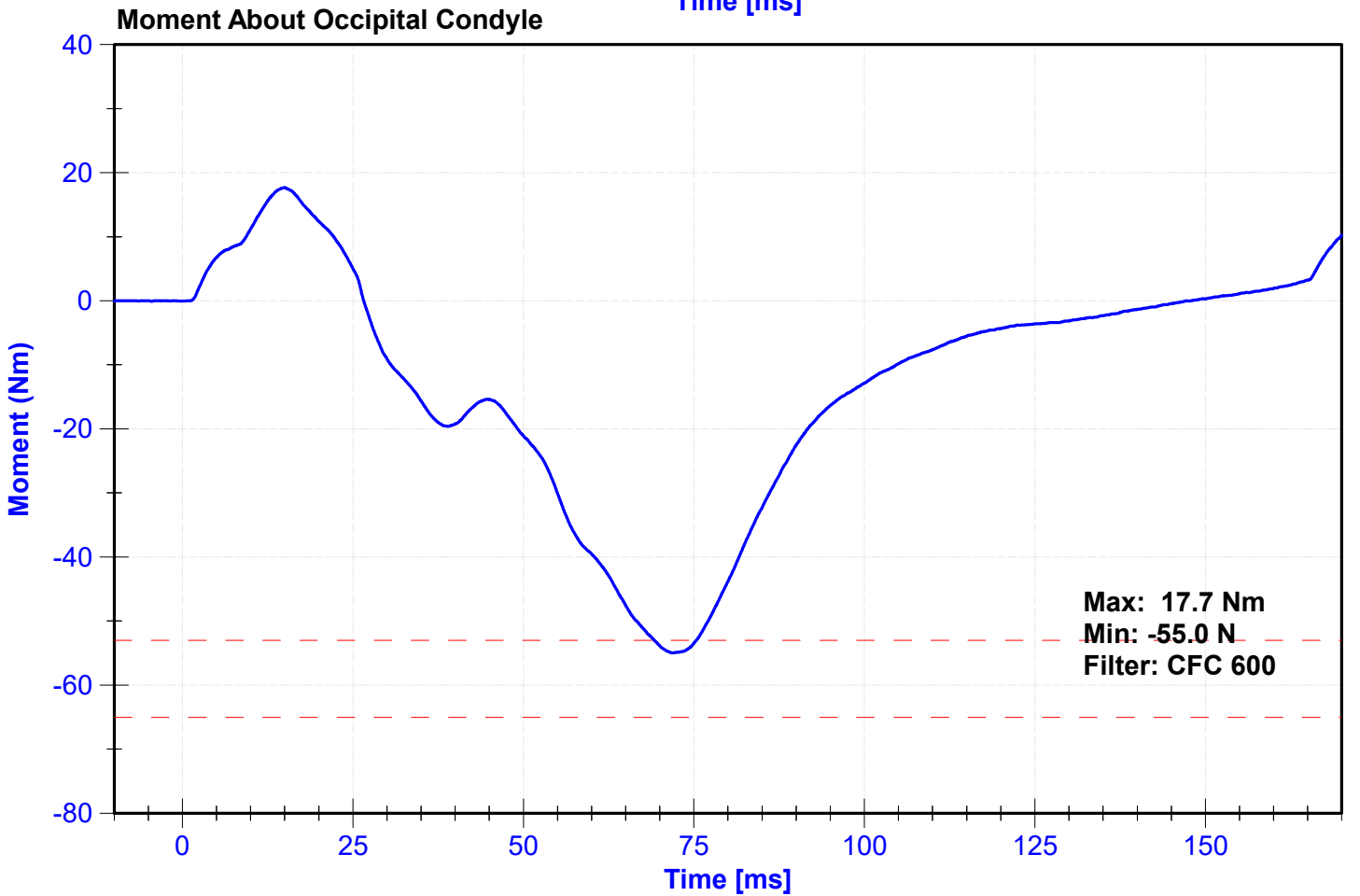
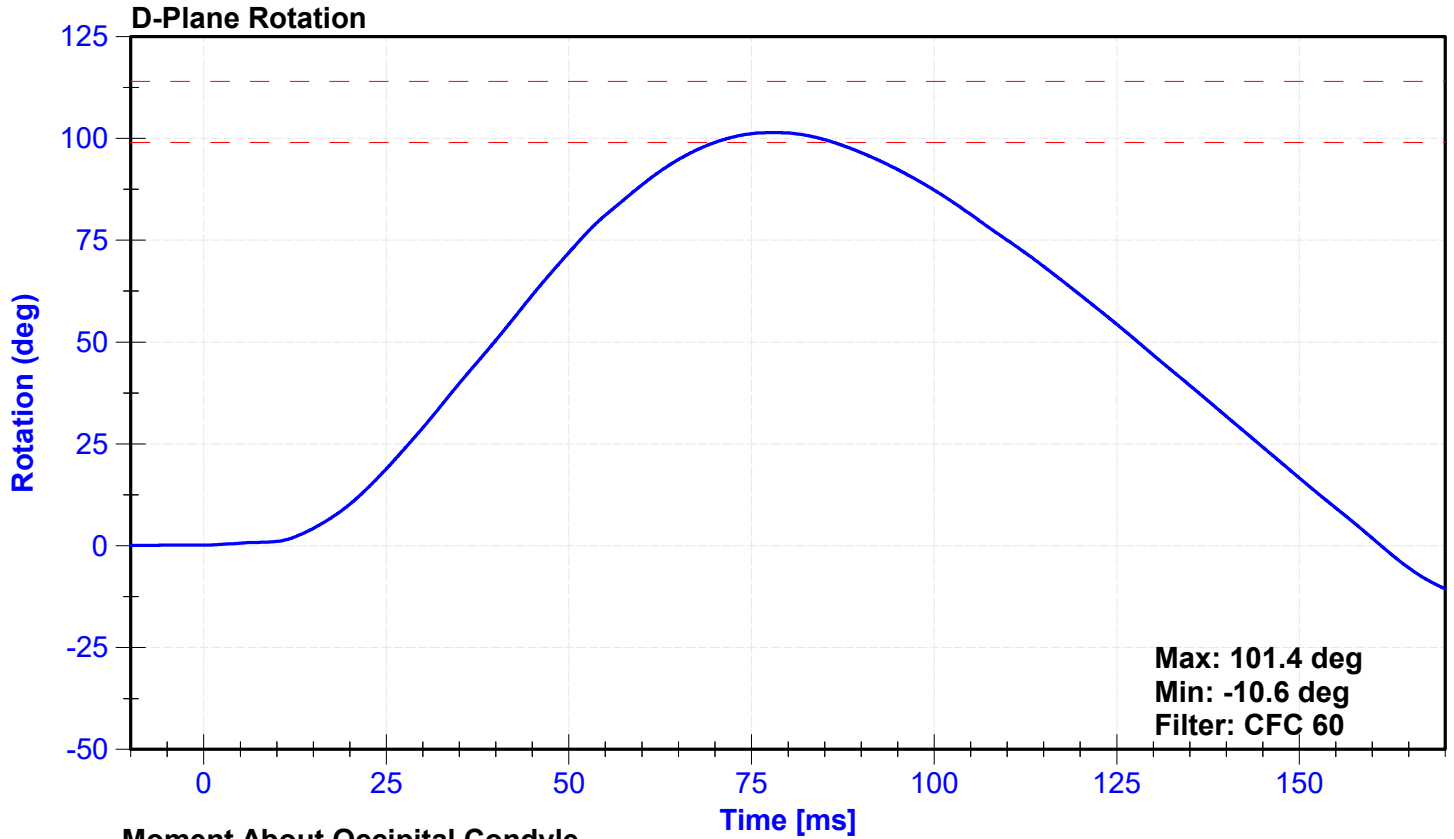
**Results**

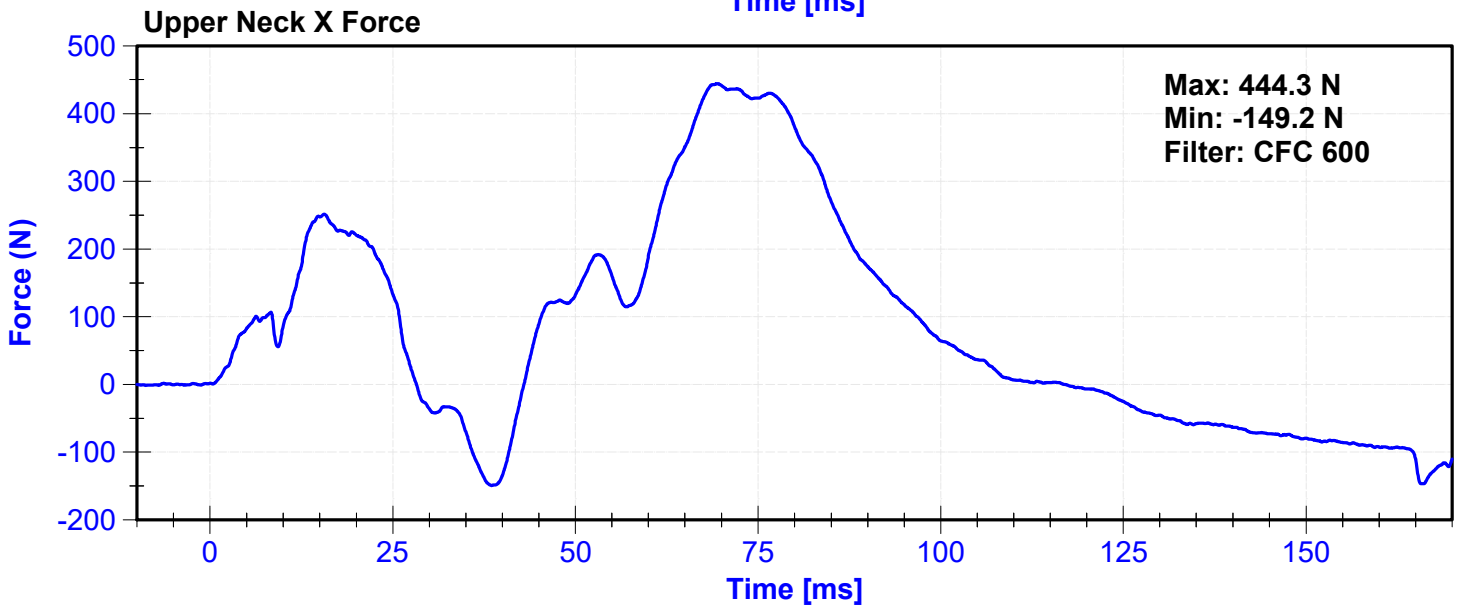
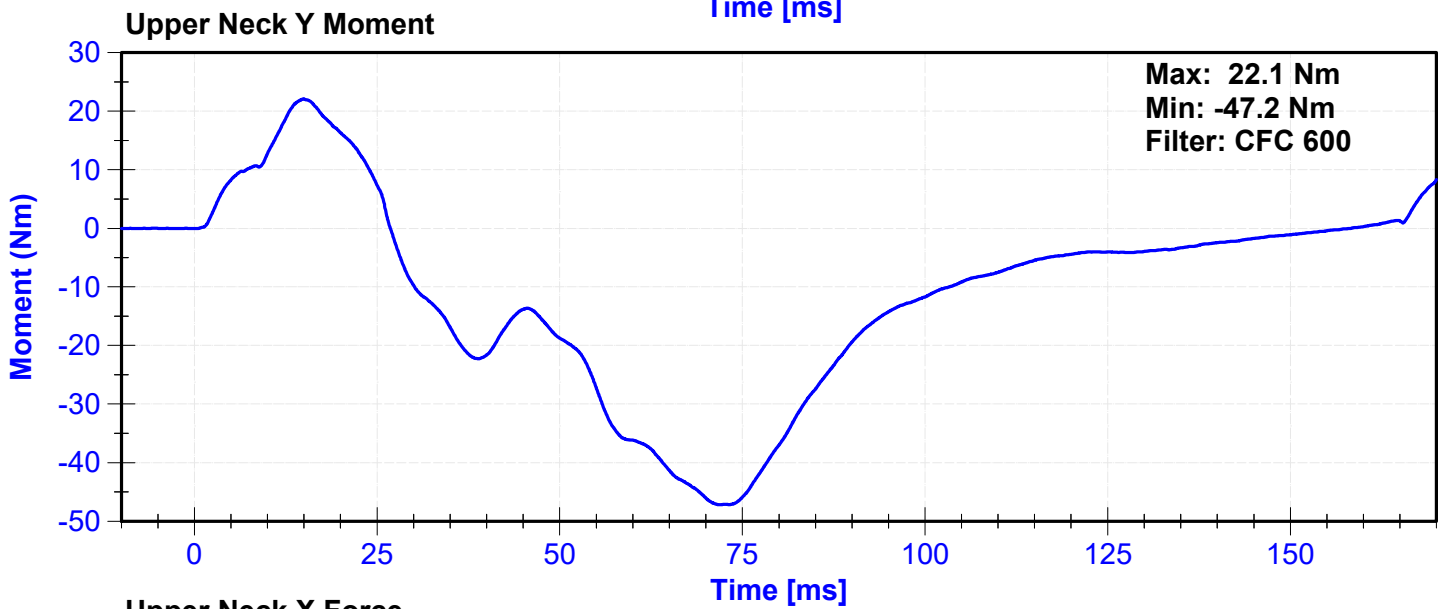
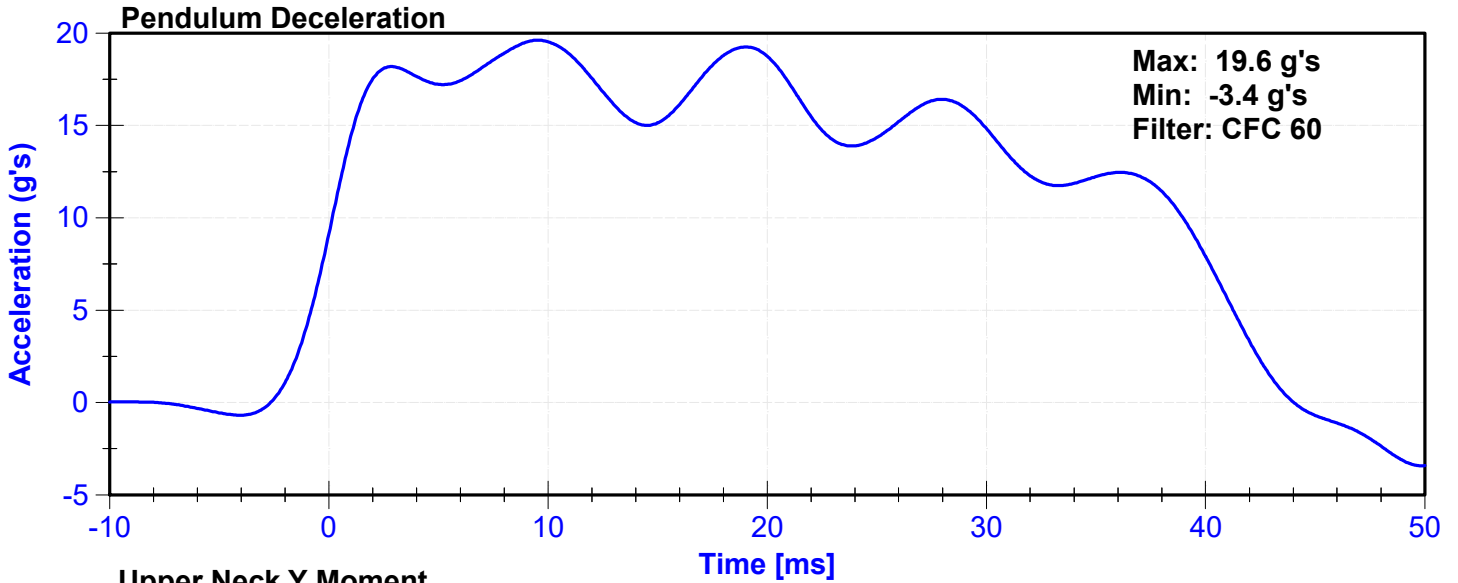
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	32	Pass
Velocity	5.95	6.19	m/s	6.012	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.70	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.41	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	4.94	Pass
D Plane Rotation	99	114	deg	101.4	Pass
Moment During Rotation Interval	-65	-53	Nm	-55.0	Pass
Moment Decay to -10Nm	94	114	ms	104.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/30/2024	4/28/2025
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025







ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

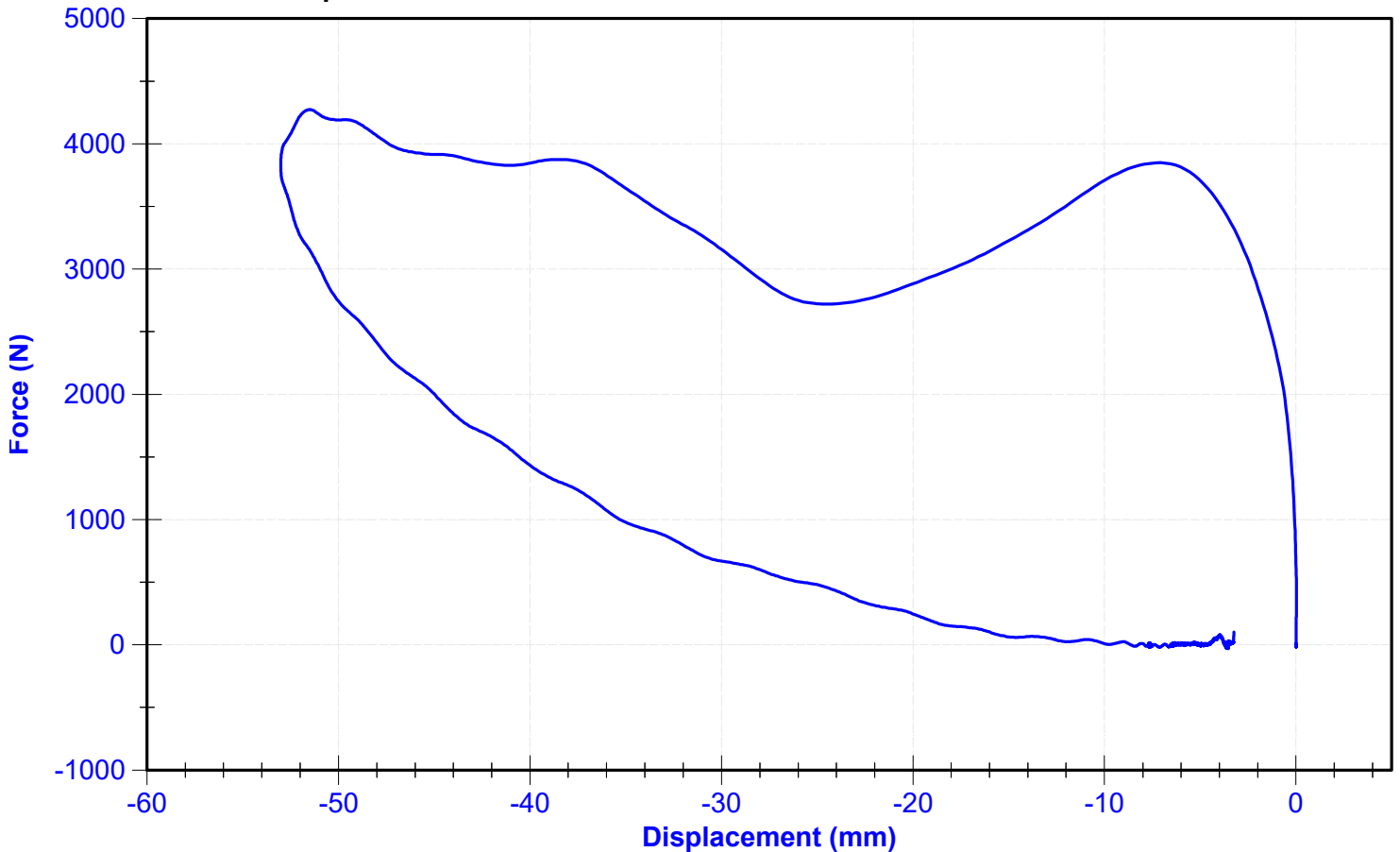
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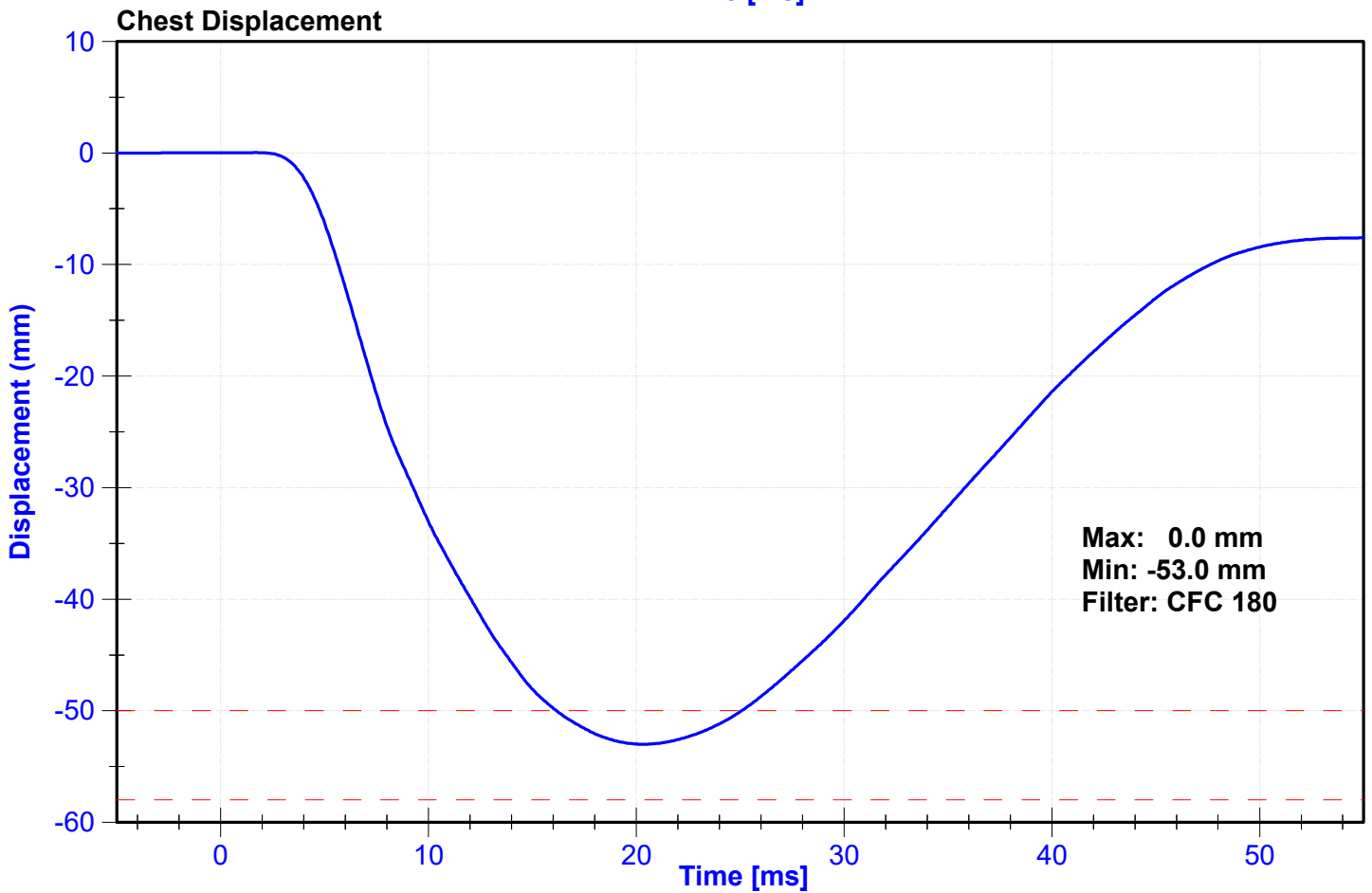
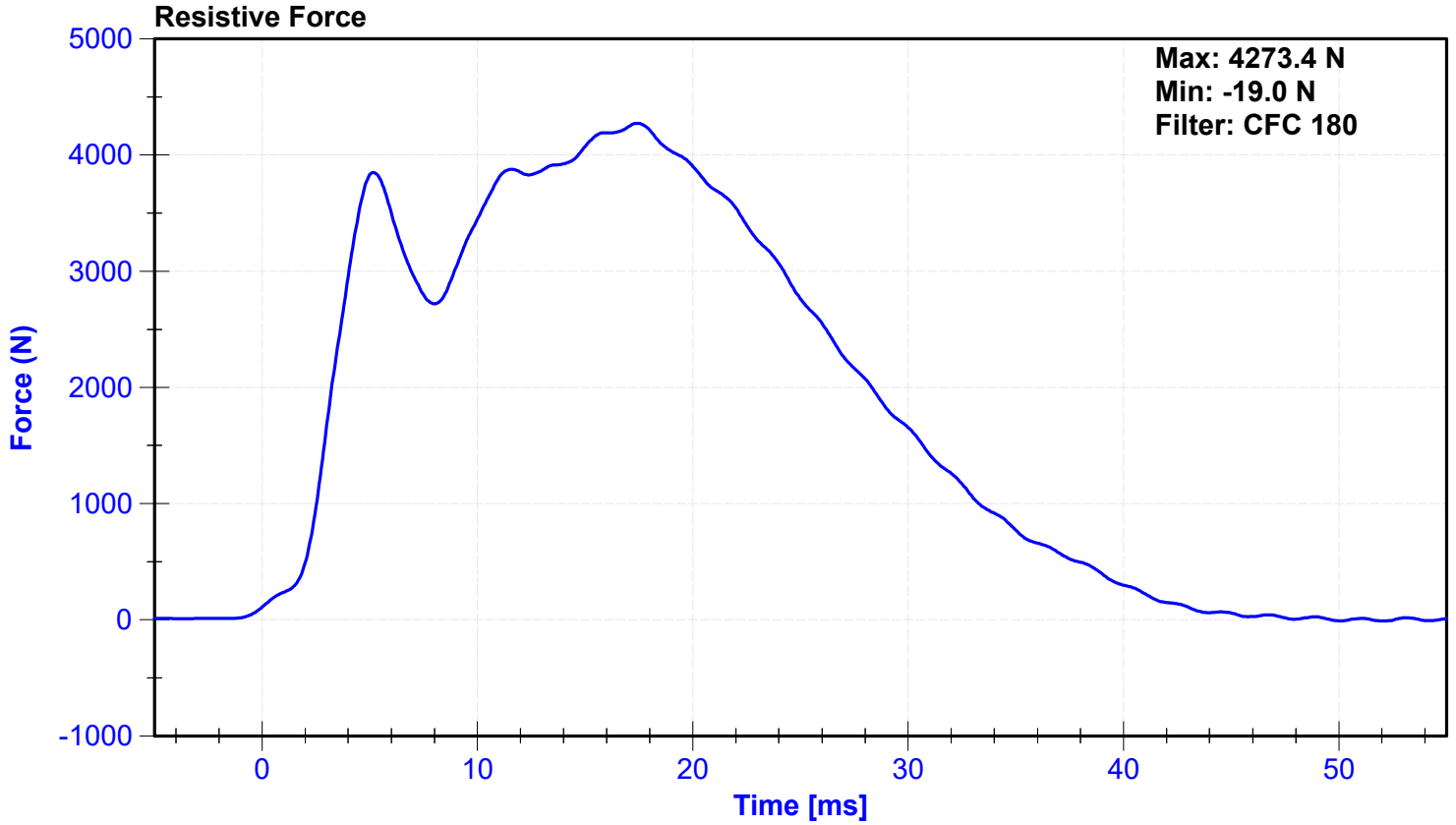
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	33	Pass
Velocity	6.59	6.83	m/s	6.692	Pass
Chest Deflection	-58	-50	mm	-53.0	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4273.4	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4192.4	Pass
Hysteresis	69	85	%	75.0	Pass

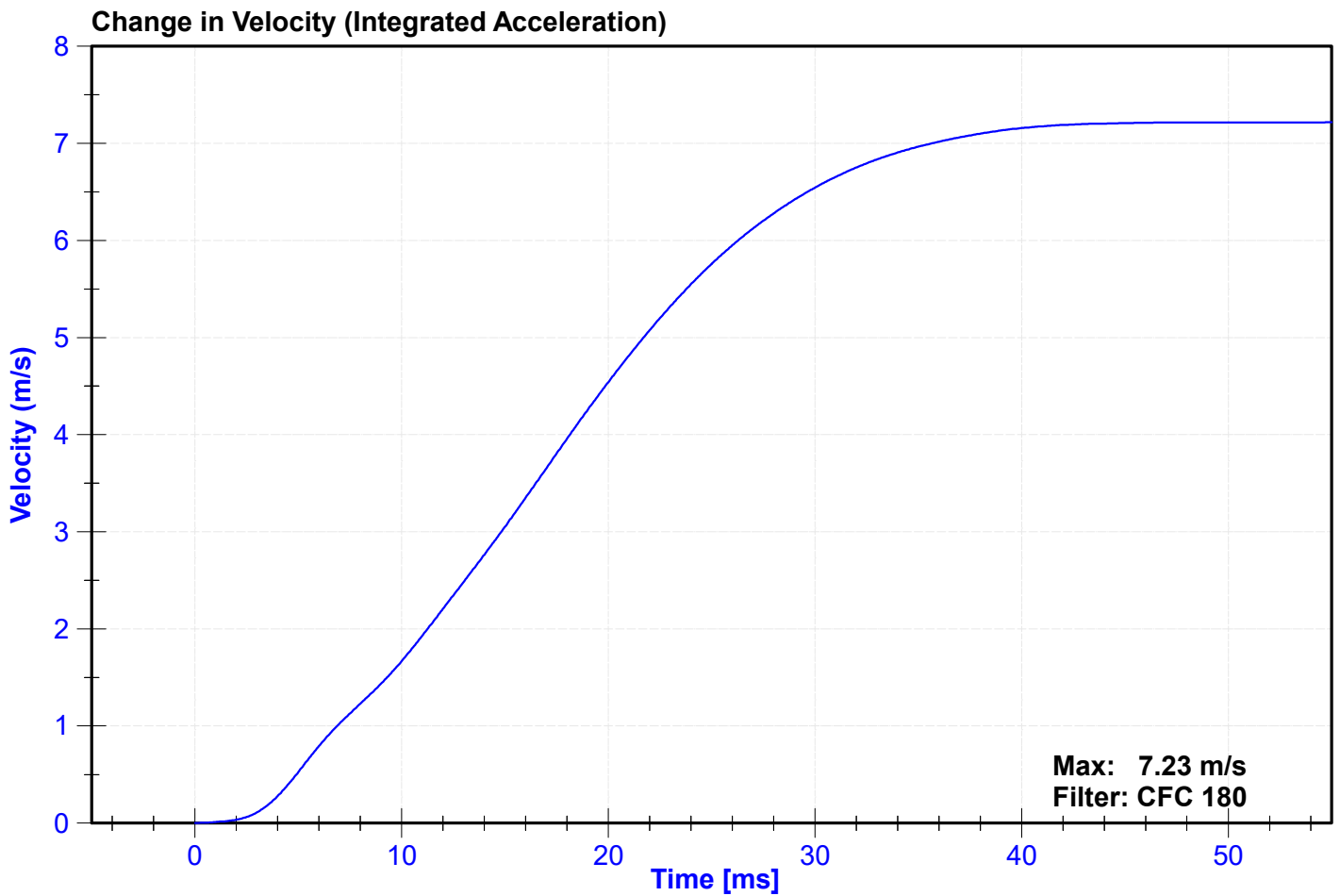
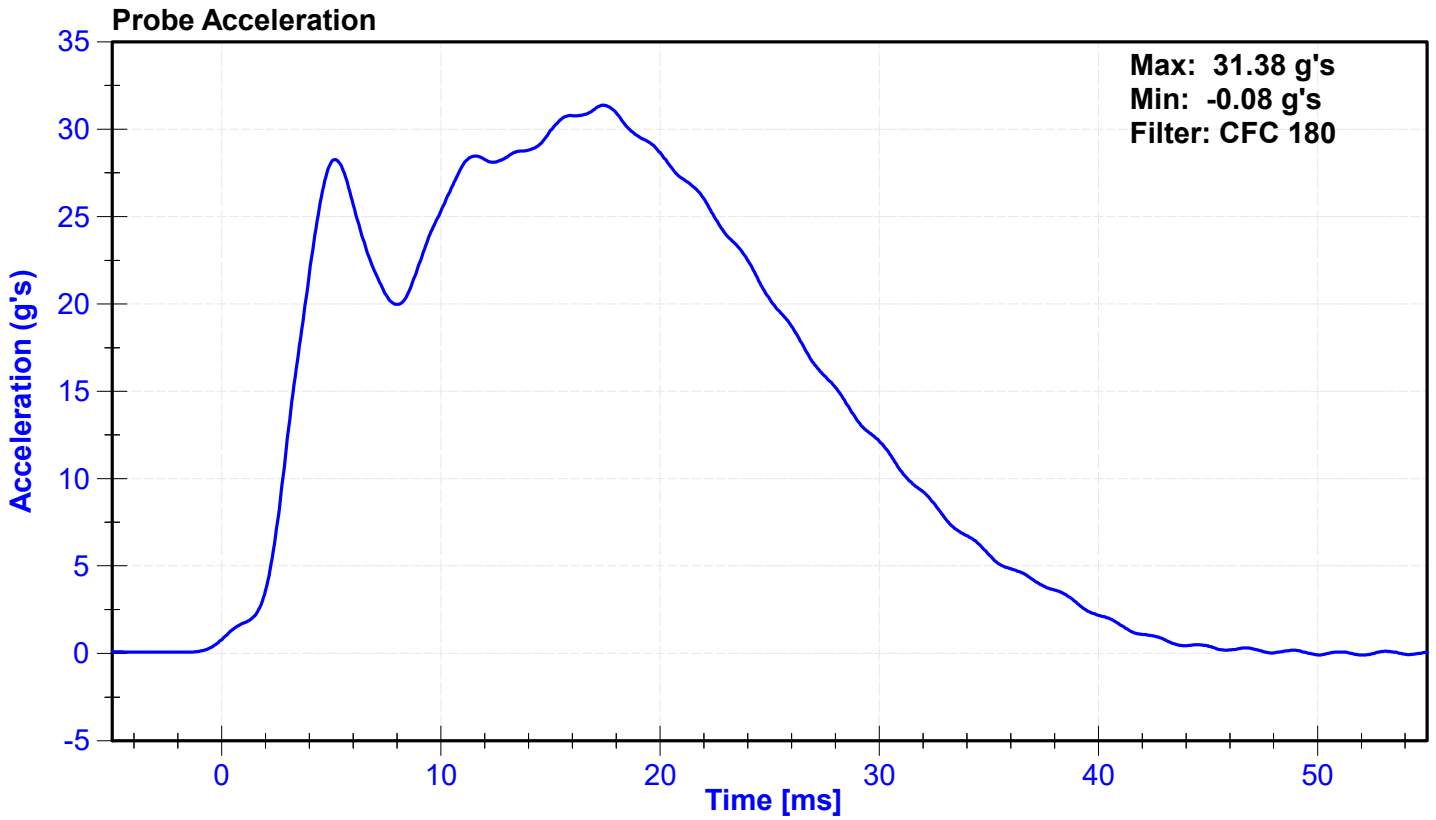
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Chest Potentiometer	Servo	0720	8/19/2024	2/17/2025

**Force vs. Displacement**







ATD Manufacturer	Humanetics	Test Technician	J.Kinderman
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

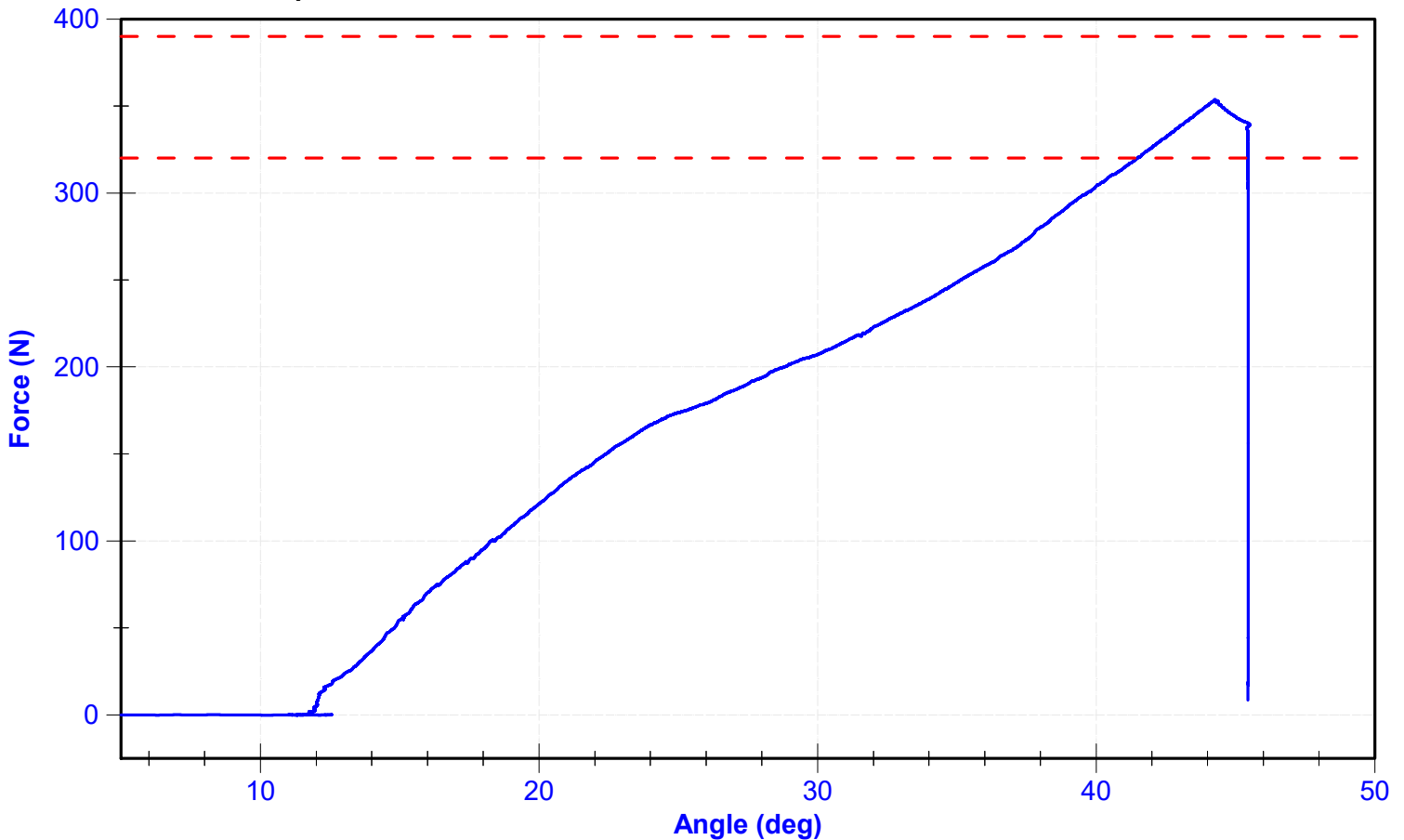
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	21.2	Pass
Humidity	10	70	%	39	Pass
Initial Angle	0	20	deg	11.7	Pass
Force at 45 Degrees	320	390	N	353.9	Pass
Return Angle Relative to Initial	0	8	deg	4.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker	DS-1905226	2024-11-16	2025-11-16
Load Cell	Interface	1134516	2023-11-30	2024-11-29

**Force vs. Displacement**



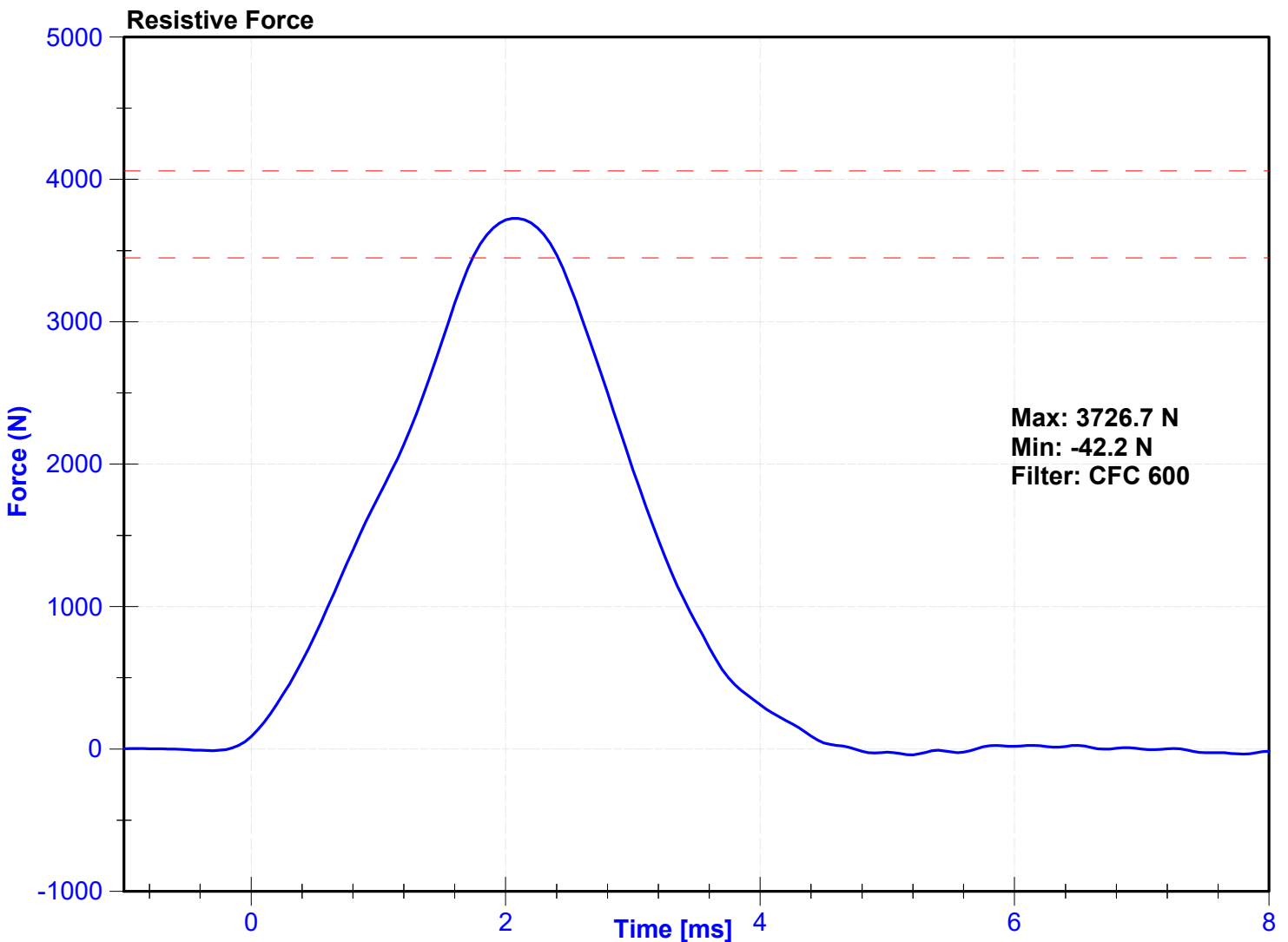
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

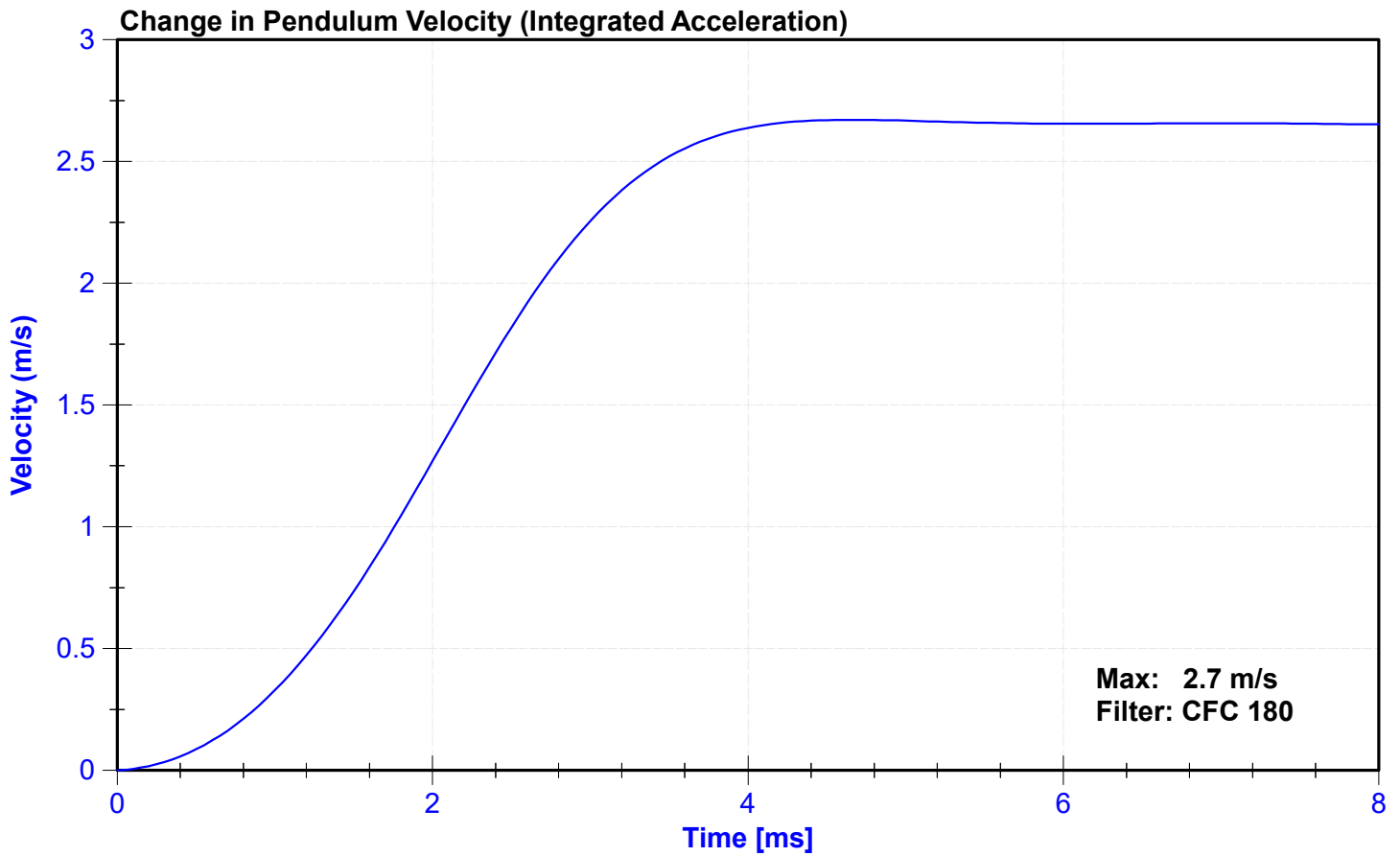
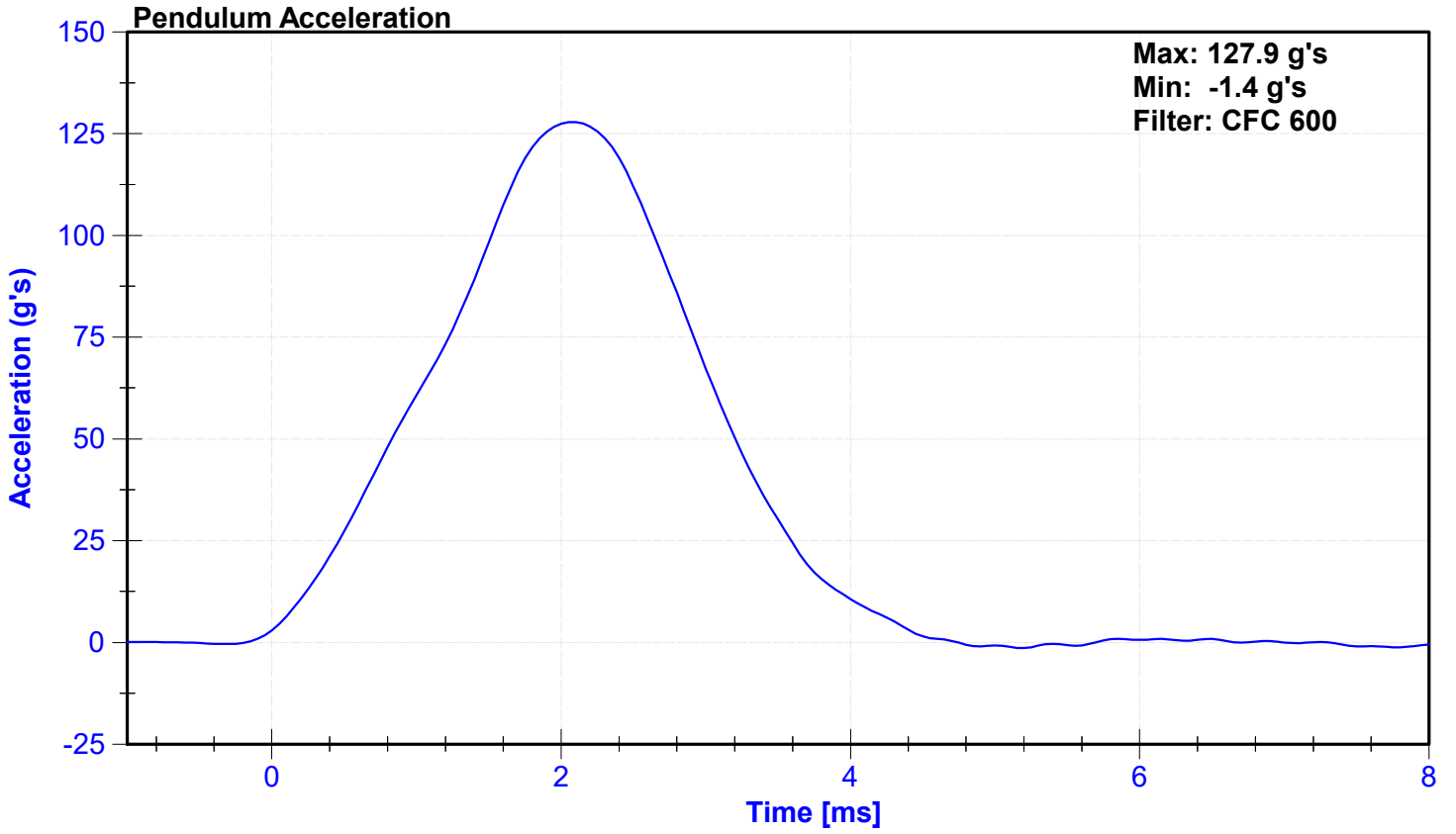
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	35	Pass
Velocity	2.07	2.13	m/s	2.091	Pass
Resistive Force	3450	4060	N	3726.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025





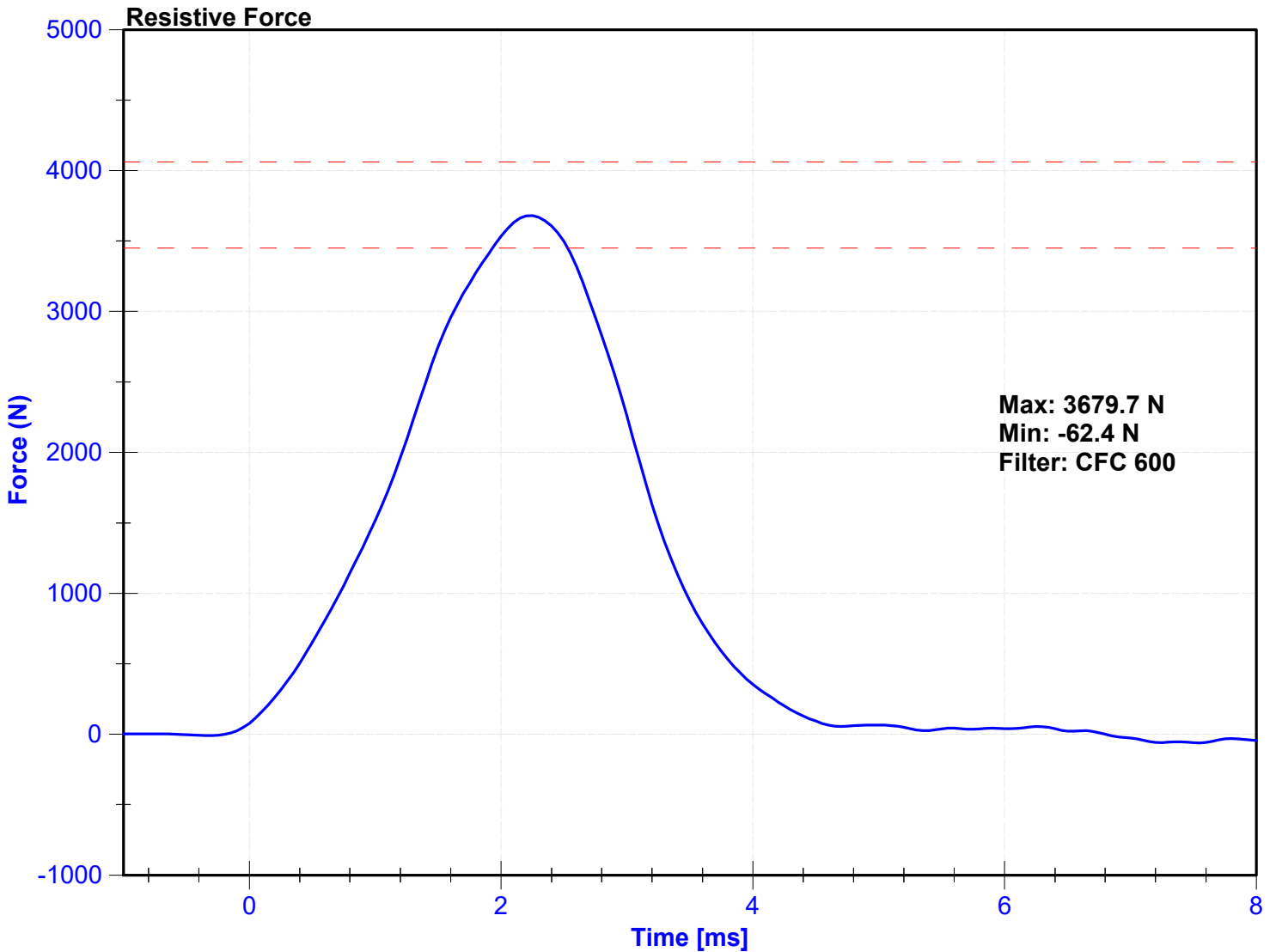
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

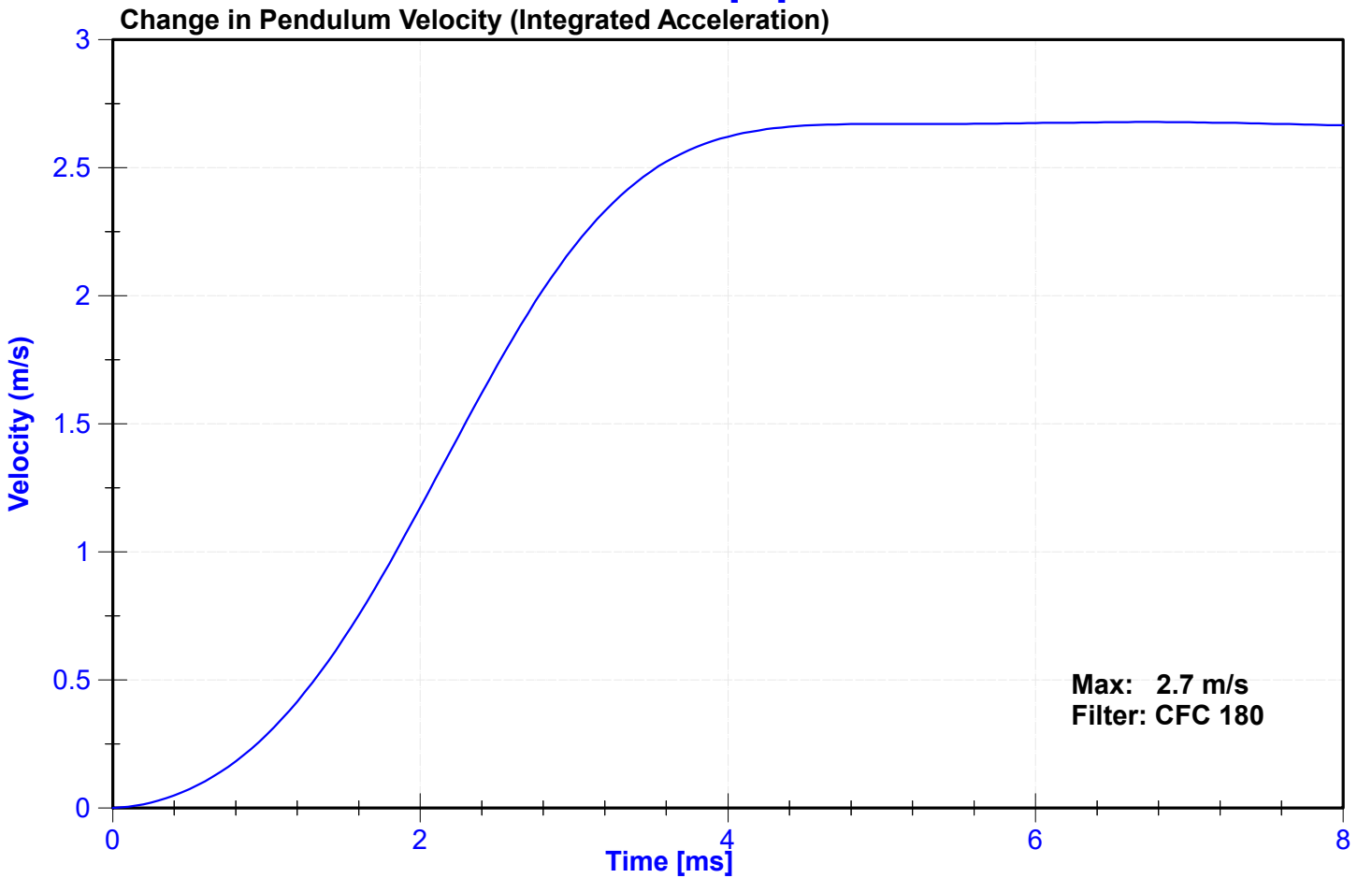
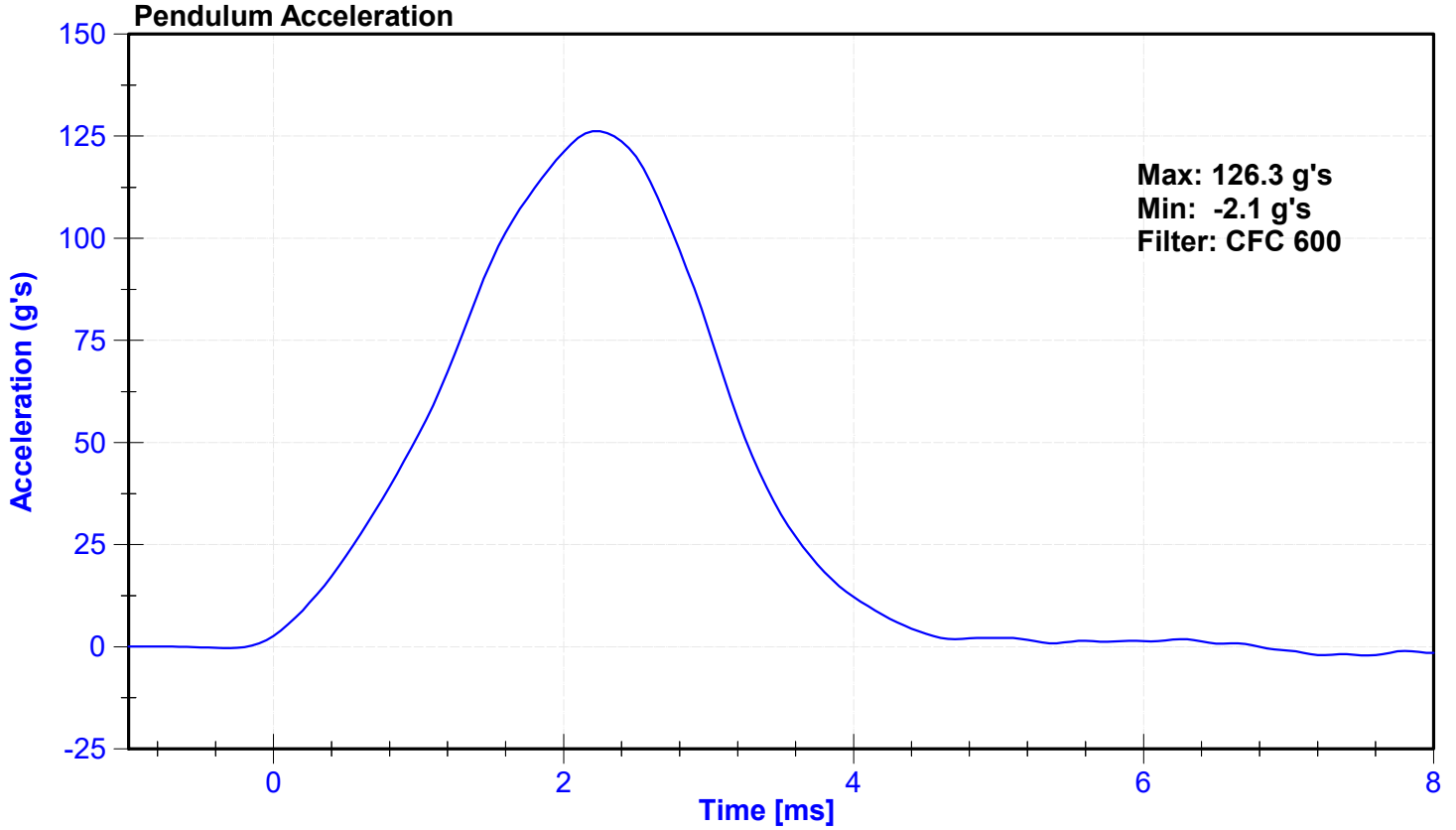
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	35	Pass
Velocity	2.07	2.13	m/s	2.097	Pass
Resistive Force	3450	4060	N	3679.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025





**CALIBRATION TEST RESULTS**

**POST-TEST**

**HYBRID III 50<sup>TH</sup> PERCENTILE MALE - DRIVER ATD**

**SERIAL NO: 065**

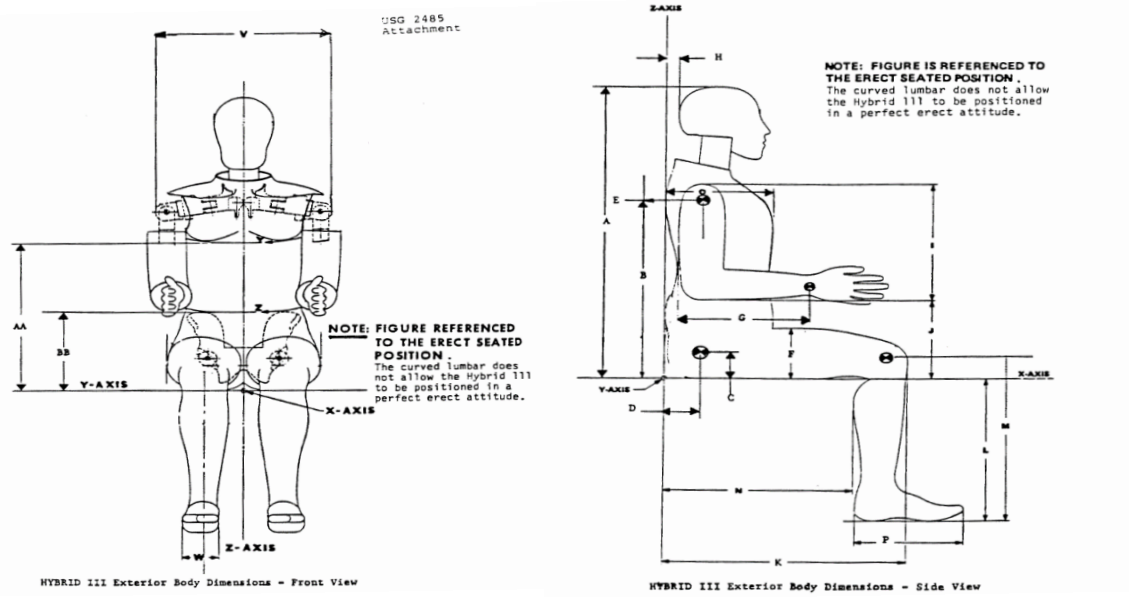


External Measurements - Hybrid 3 - 50th Male

Technician: J. Rios

Date: 11/26/2024

Dummy Serial Number: 065



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.9	Pass
B	Shoulder Pivot Height	19.9	20.5	20.1	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.5	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.5	Pass
F	Thigh Clearance	5.5	6.1	5.8	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.6	Pass
H	Head Back to Backline	1.6	1.8	1.6	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.2	Pass
J	Elbow Rest Height	7.5	8.3	7.8	Pass
K	Buttock to Knee Length	22.8	23.8	23.0	Pass
L	Popliteal Height	16.9	17.9	17.5	Pass
M	Knee Pivot Height	19.1	19.7	19.6	Pass
N	Buttock Popliteal Length	17.8	18.8	18.3	Pass
O	Chest Depth without Jacket	8.4	9.0	8.6	Pass
P	Foot Length (right)	9.9	10.5	10.3	Pass
V	Shoulder Breadth	16.3	17.2	16.5	Pass
W	Foot Breadth	3.6	4.2	3.9	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.9	Pass
Z	Waist Circumference	32.9	34.1	33.6	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	8.9	Pass

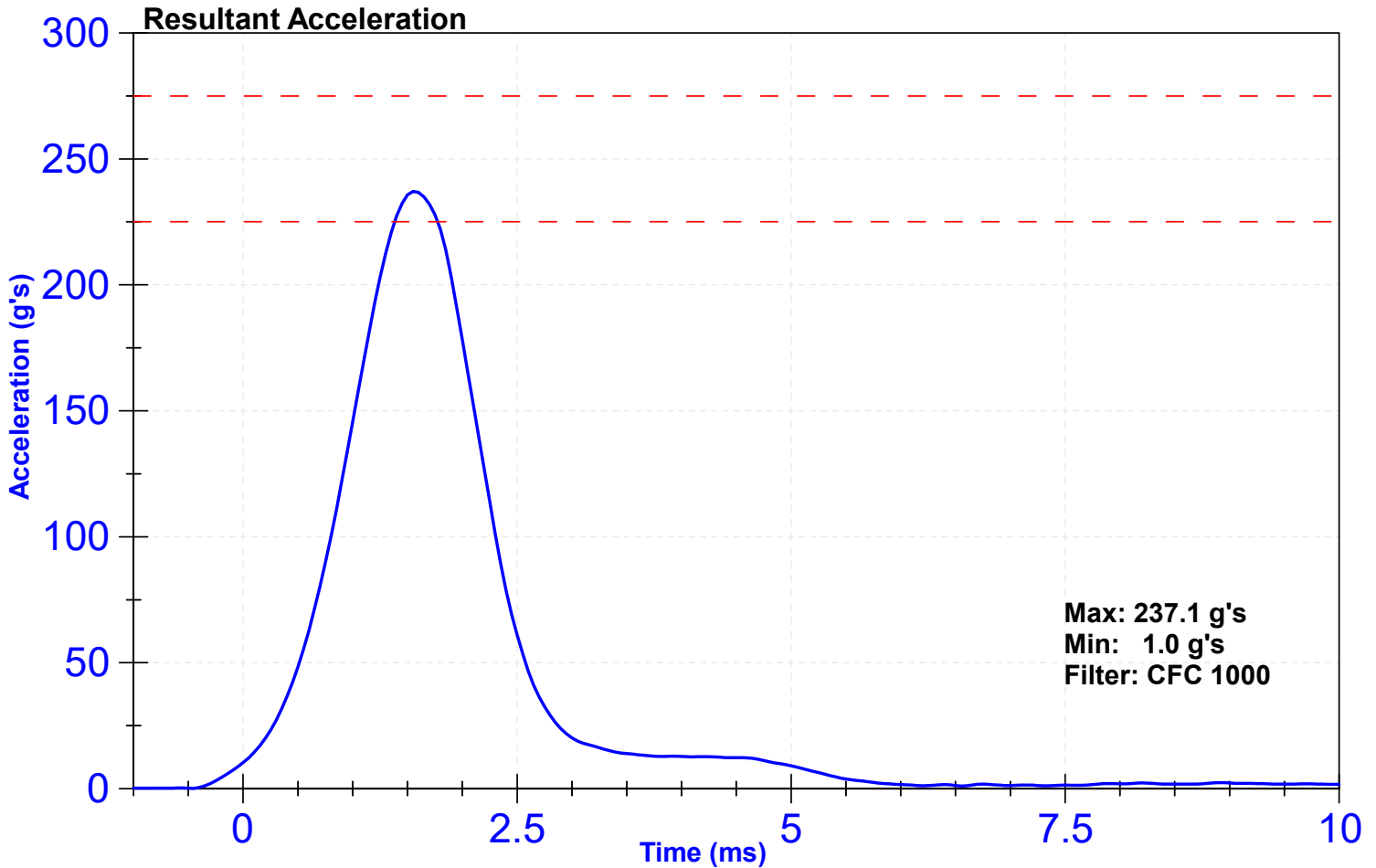
ATD Manufacturer	Humanetics	Test Technician	Z.Putt
ATD Serial Number	065	Laboratory Supervisor	Z.Putt

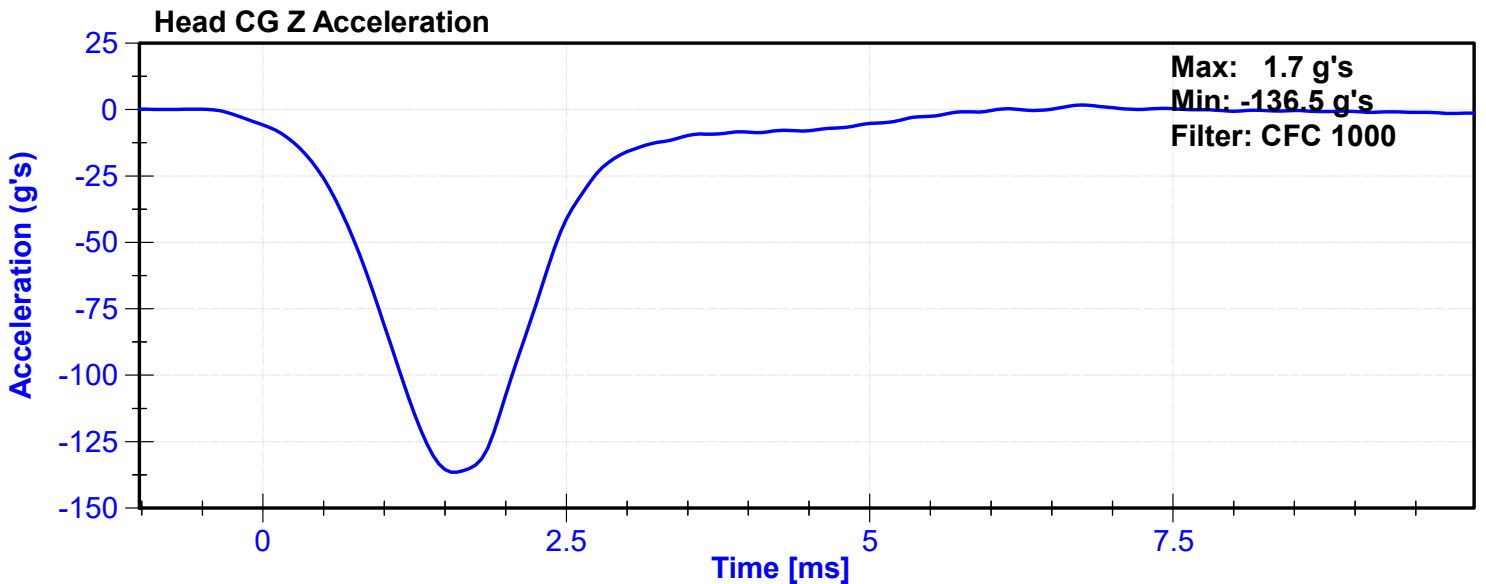
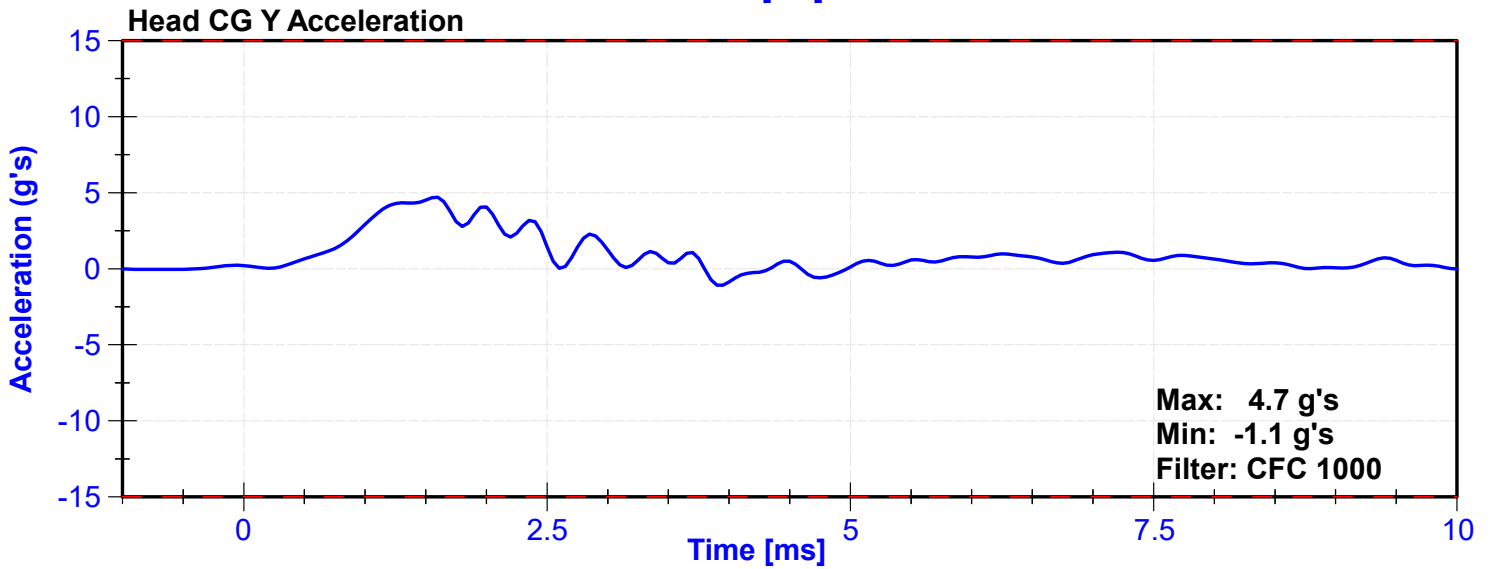
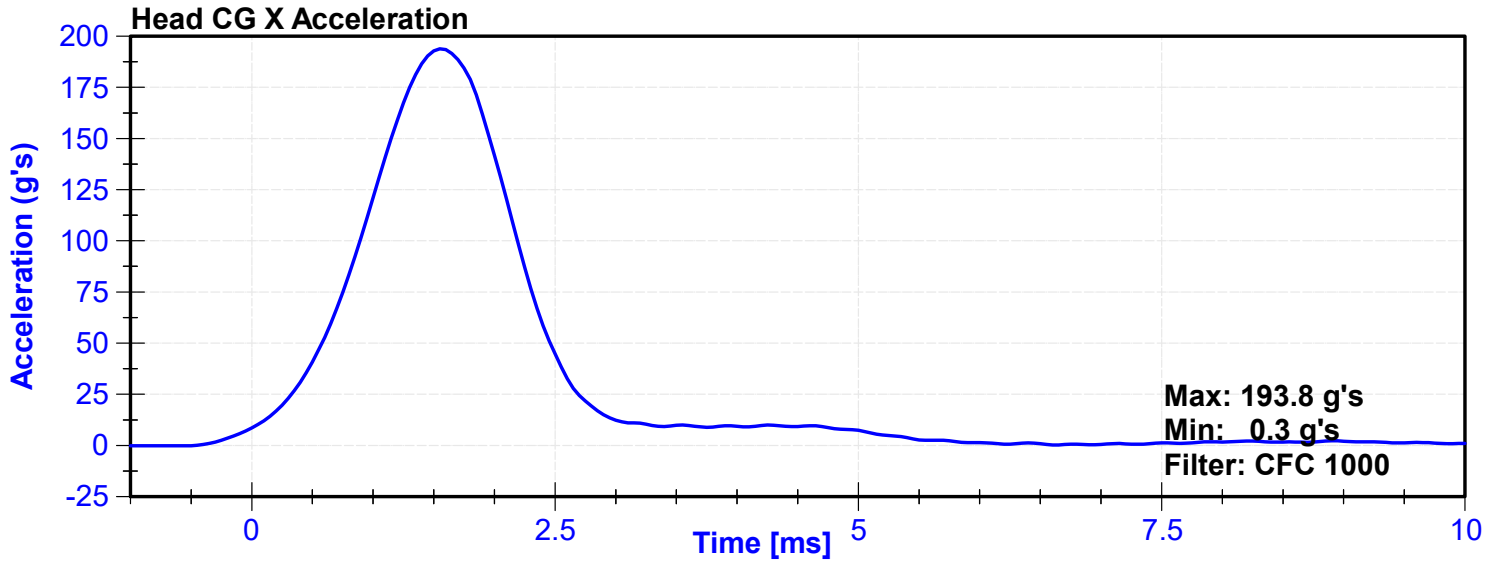
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.8	Pass
Humidity	10	70	%	48.1	Pass
Resultant Acceleration	225	275	g's	237.1	Pass
Oscillation	0	10	%	5.4	Pass
Lateral Acceleration	-15	15	g's	4.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P52383	9/9/2024	3/8/2025
Y Accelerometer	Measurement Specialties	A341256	9/9/2024	3/8/2025
Z Accelerometer	Endevco	P71303	9/9/2024	3/8/2025





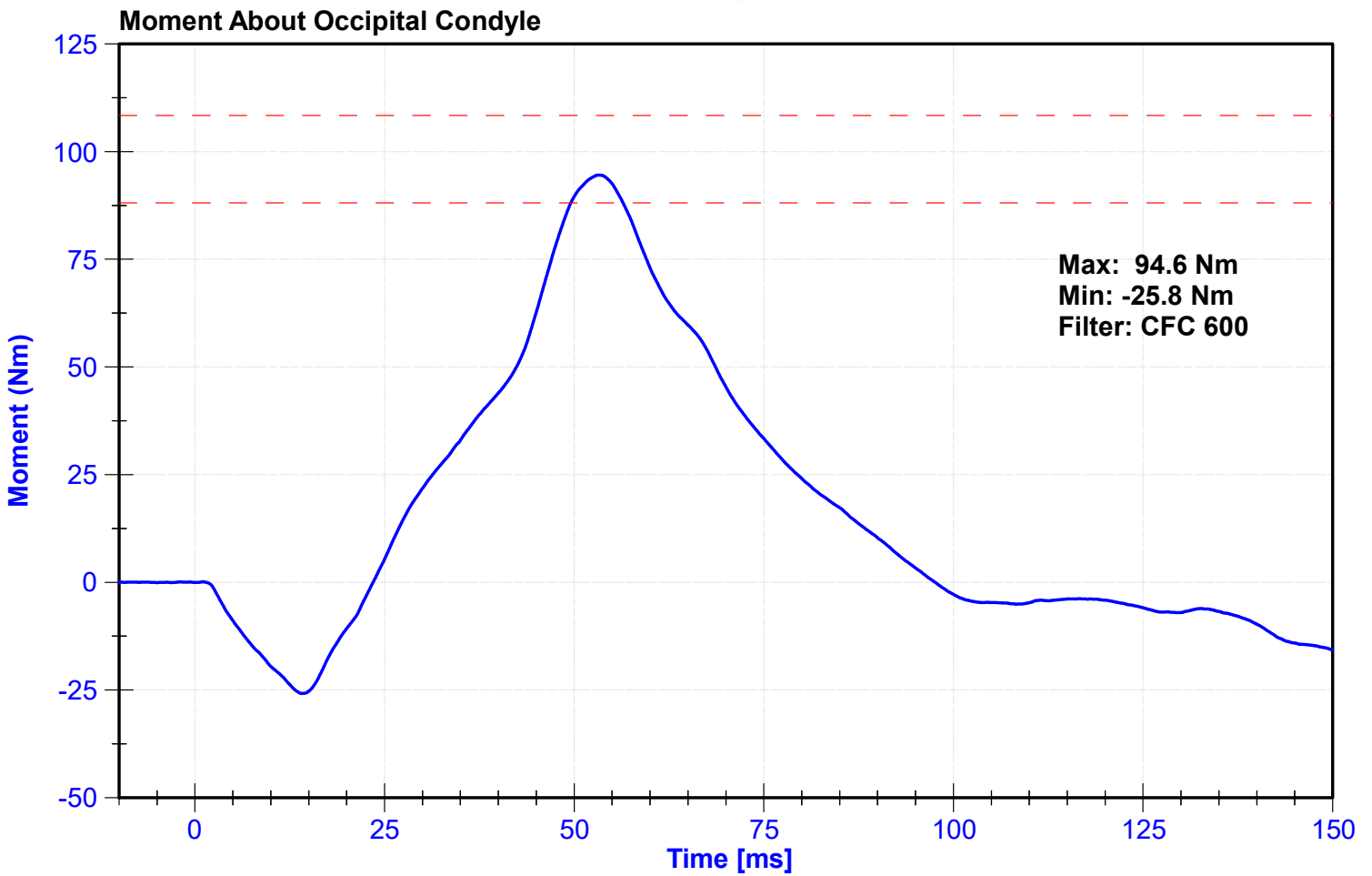
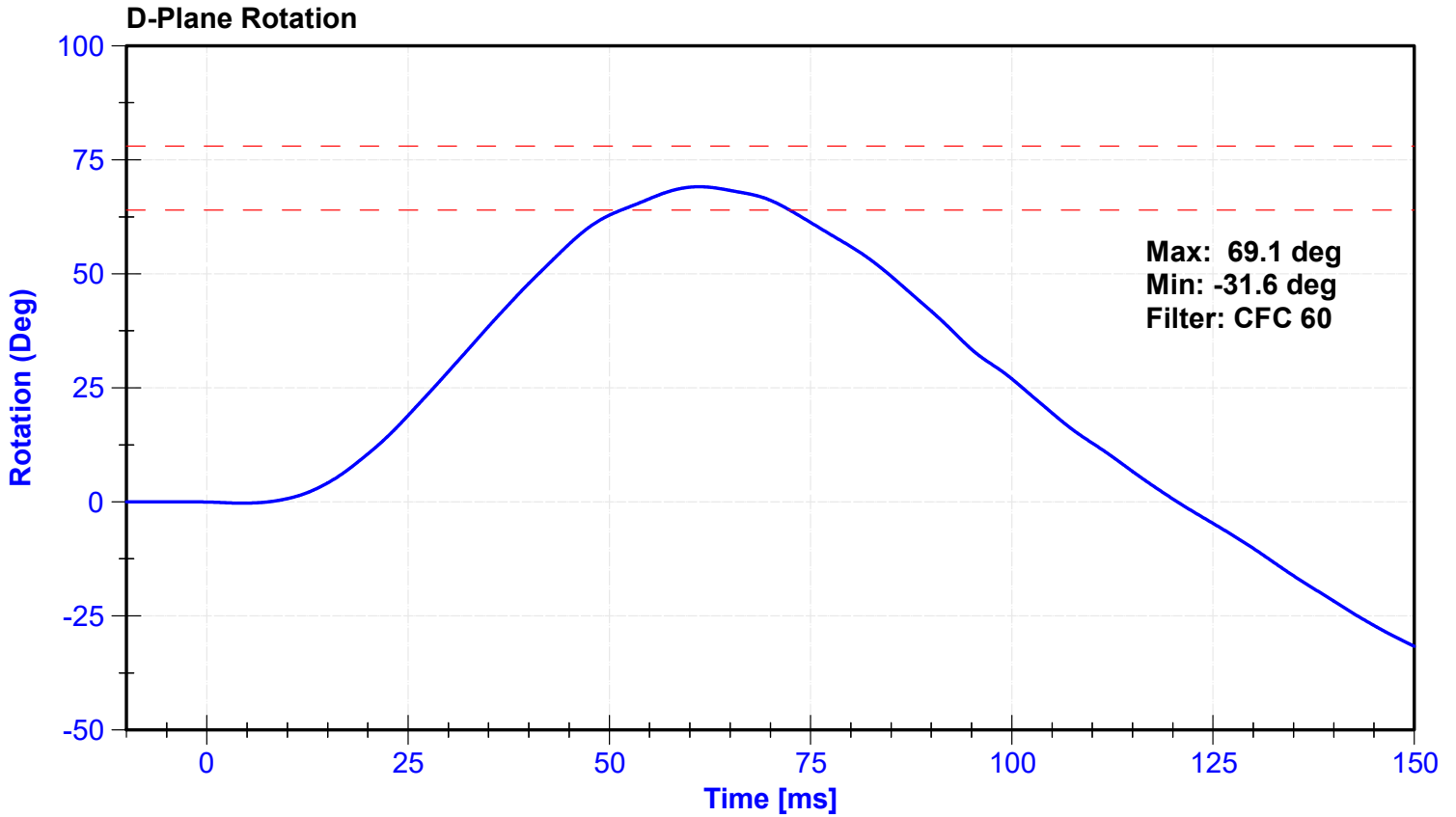
ATD Manufacturer	Humanetics	Test Technician	Z.Putt
ATD Serial Number	065	Laboratory Supervisor	Z.Putt

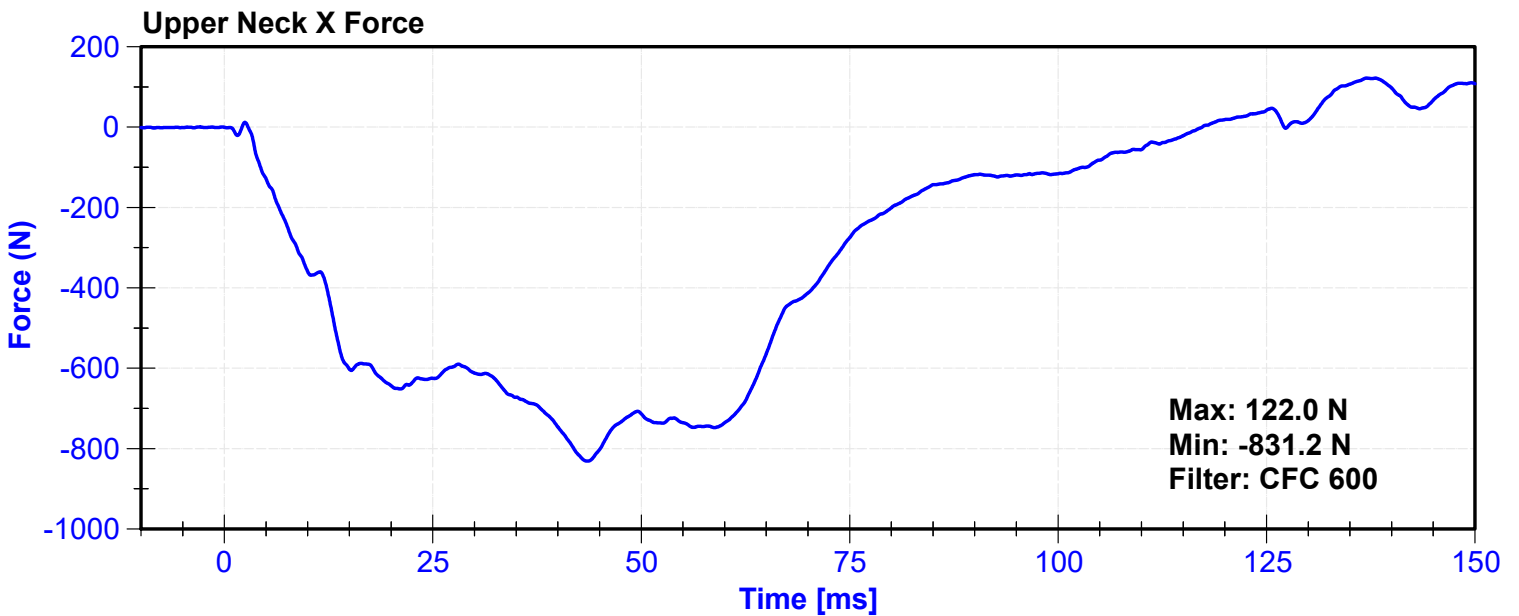
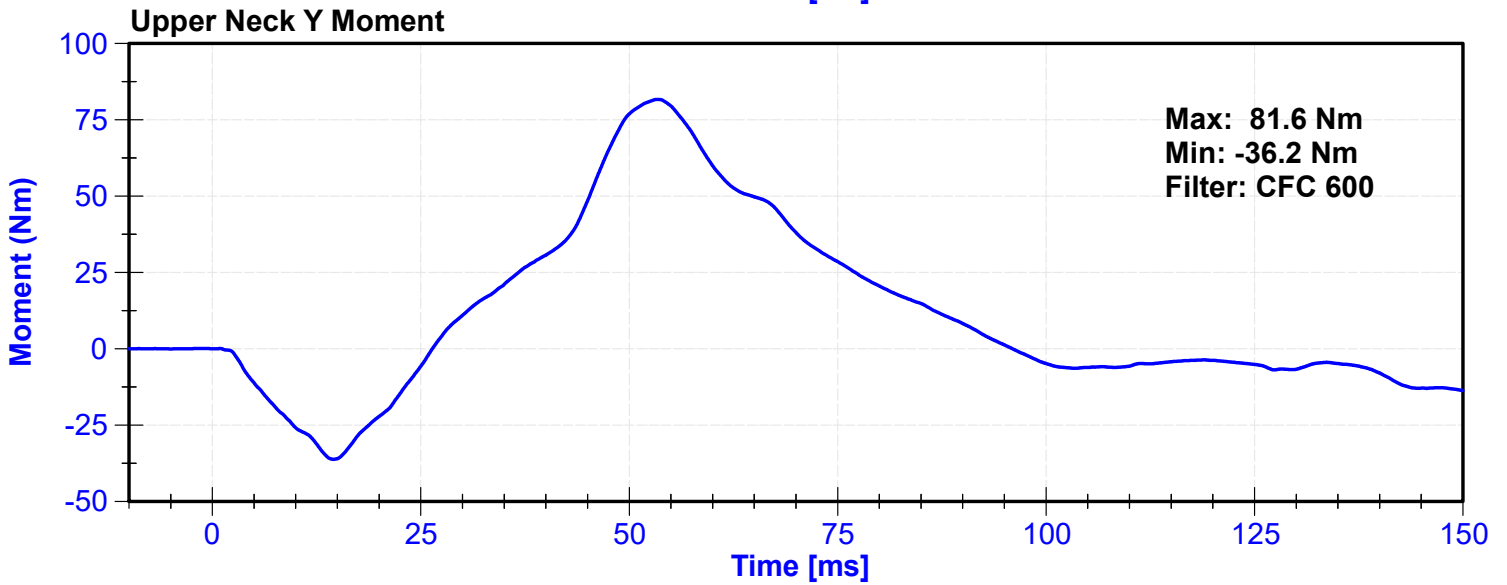
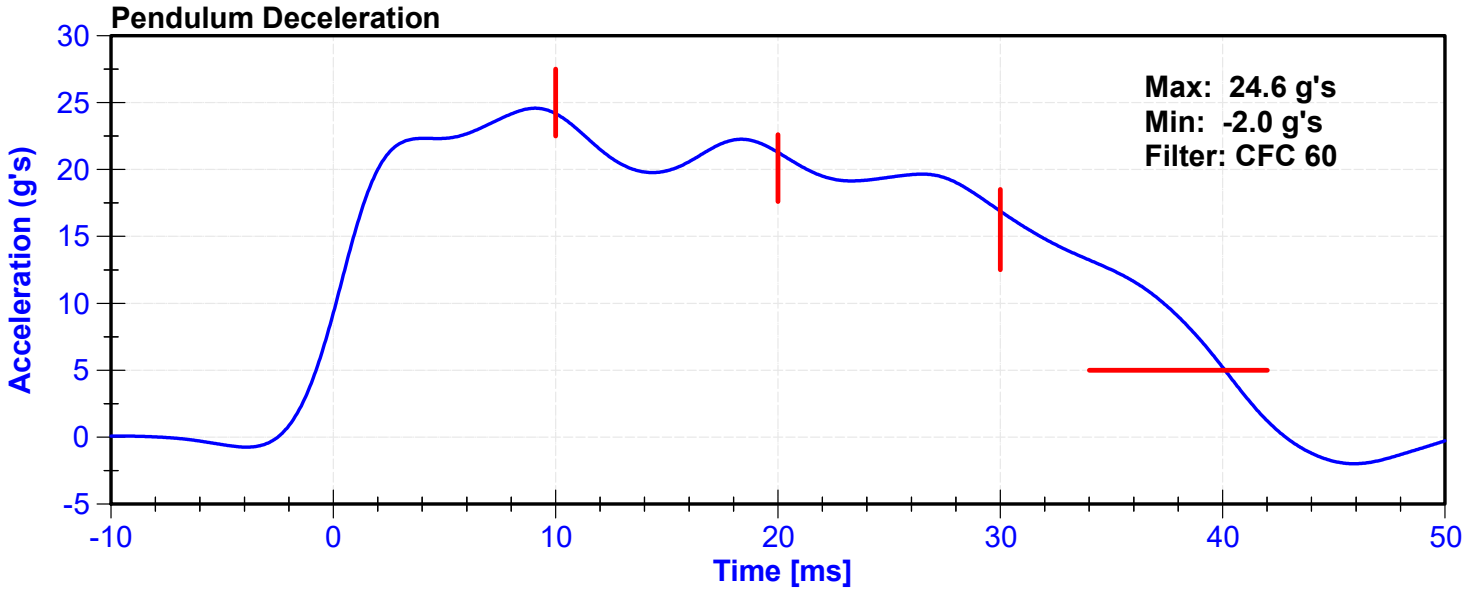
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40.7	Pass
Velocity	6.89	7.13	m/s	7.025	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	24.17	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	21.27	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	16.88	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	24.6	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	40.1	Pass
Maximum D Plane Rotation	64	78	deg	69.1	Pass
Time to Maximum Rotation	57	64	ms	61.1	Pass
Rotation Decay to Zero	113	127	ms	120.6	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	94.56	Pass
Time to Maximum Moment	47	58	ms	53.1	Pass
Moment Decay to Zero	97	107	ms	97.6	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16686	8/28/2024	2/24/2025
Pendulum Potentiometer	Honeywell	A825	9/13/2024	9/13/2025
Condyle Potentiometer	Honeywell	J119	9/13/2024	9/13/2025
Upper Neck Load Cell	Humanetics	851-FX	5/22/2024	5/22/2025





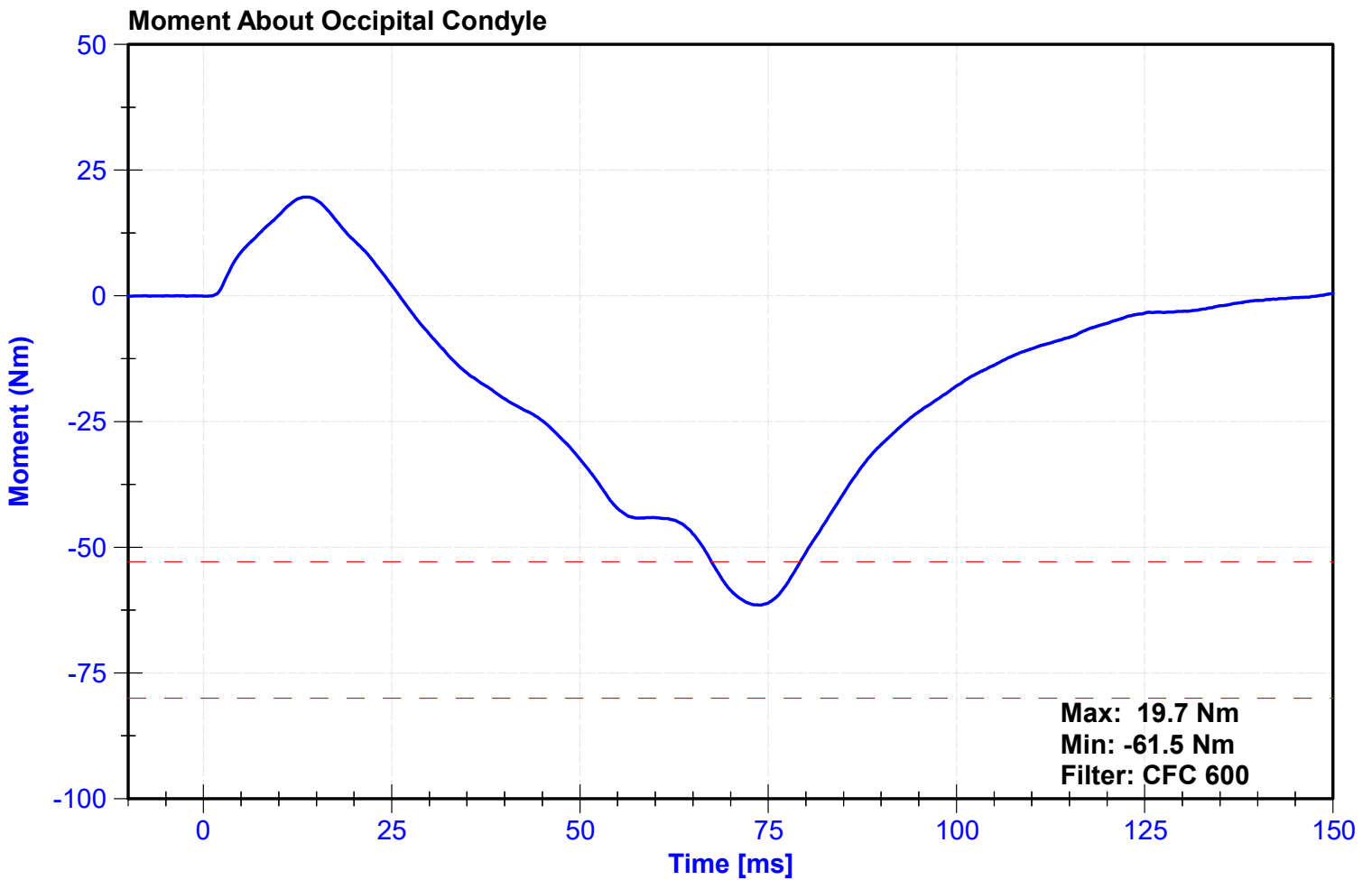
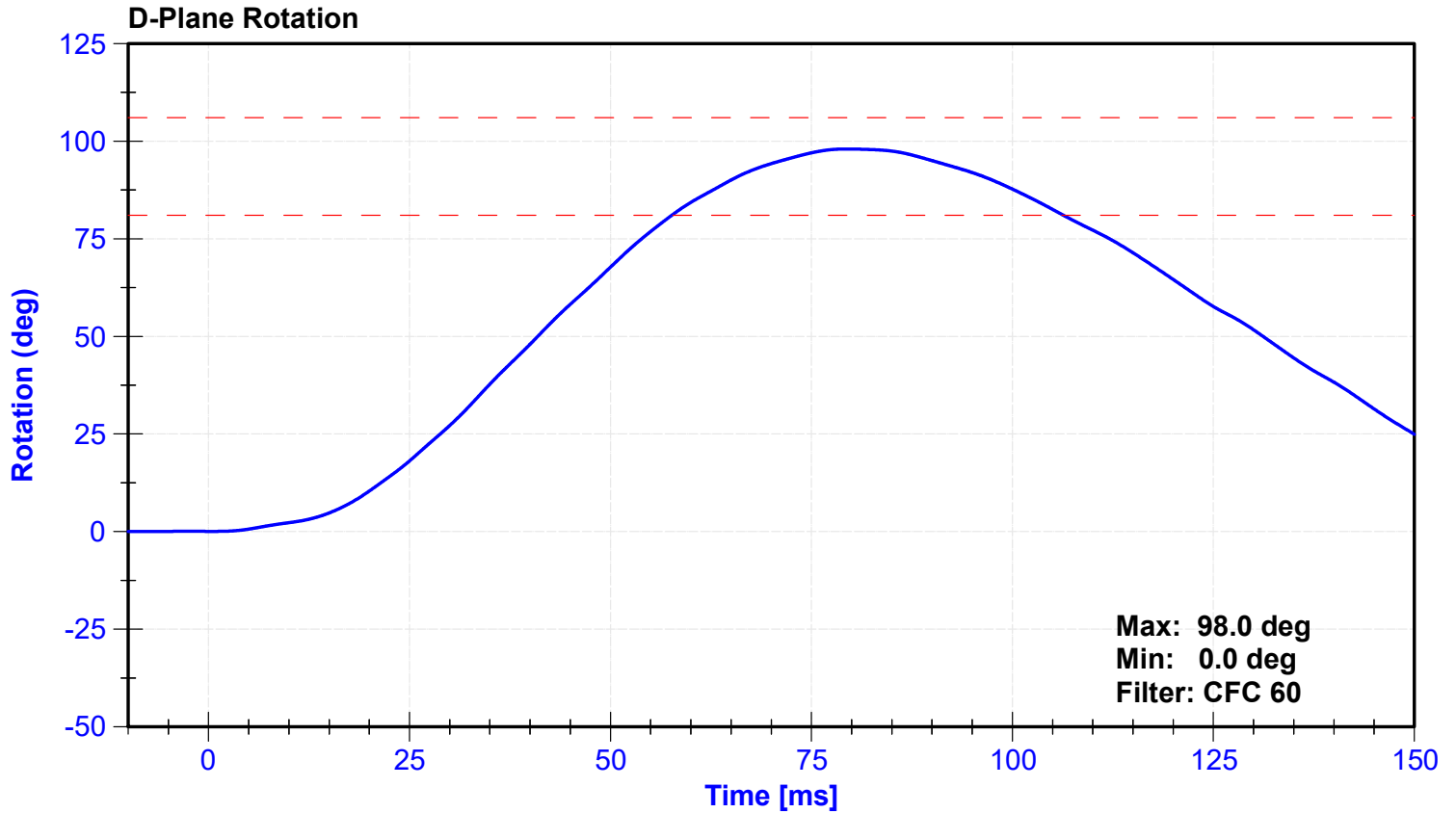
ATD Manufacturer	Humanetics	Test Technician	Z.Putt
ATD Serial Number	065	Laboratory Supervisor	Z.Putt

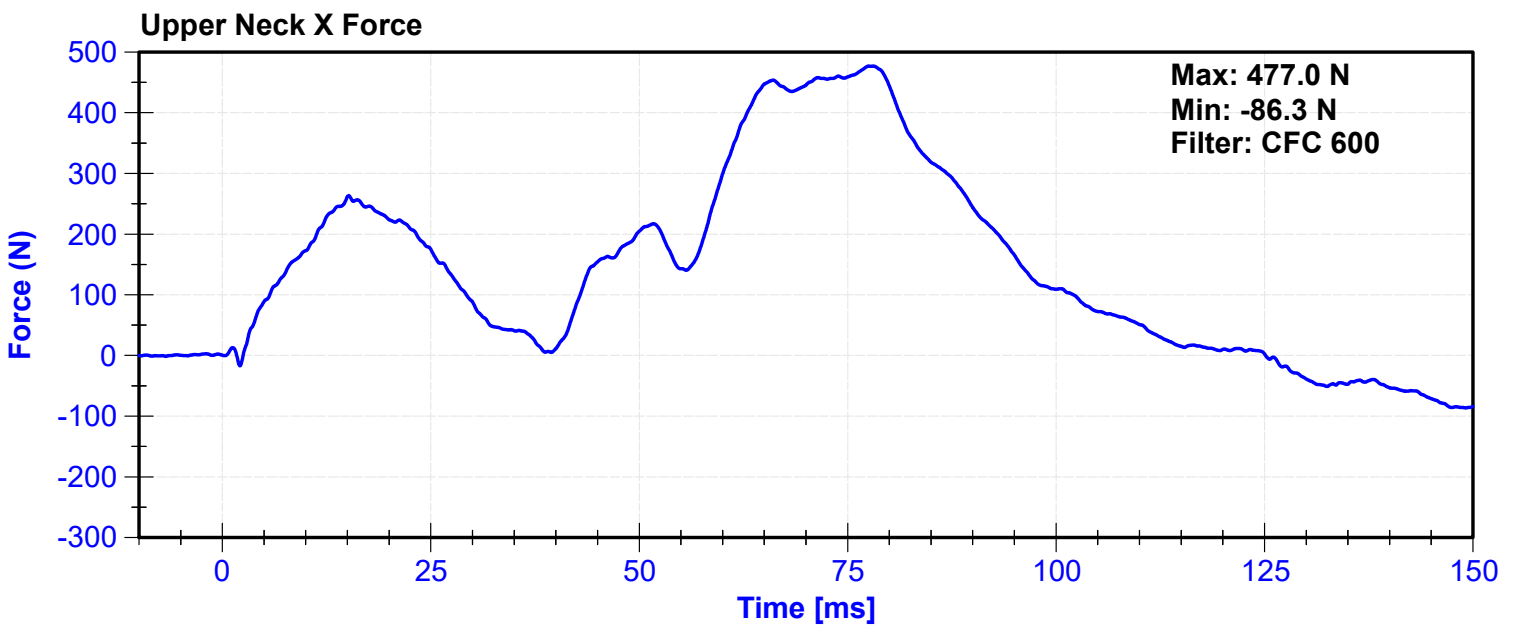
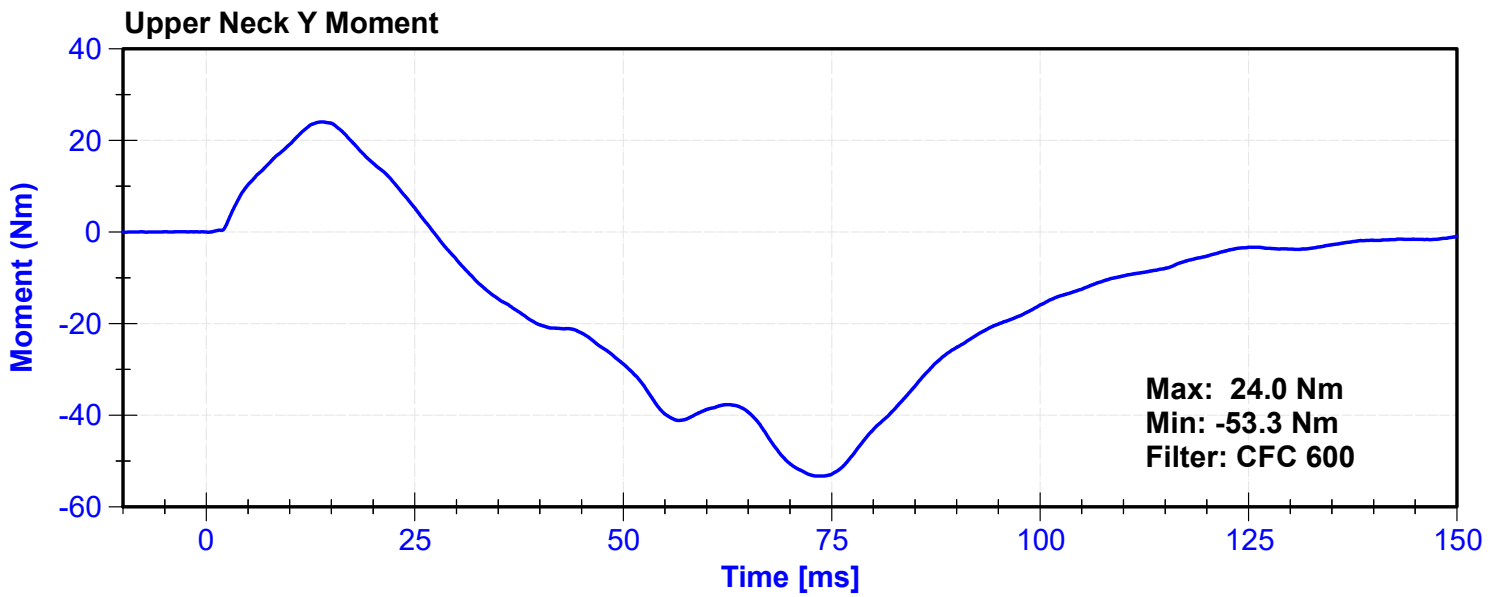
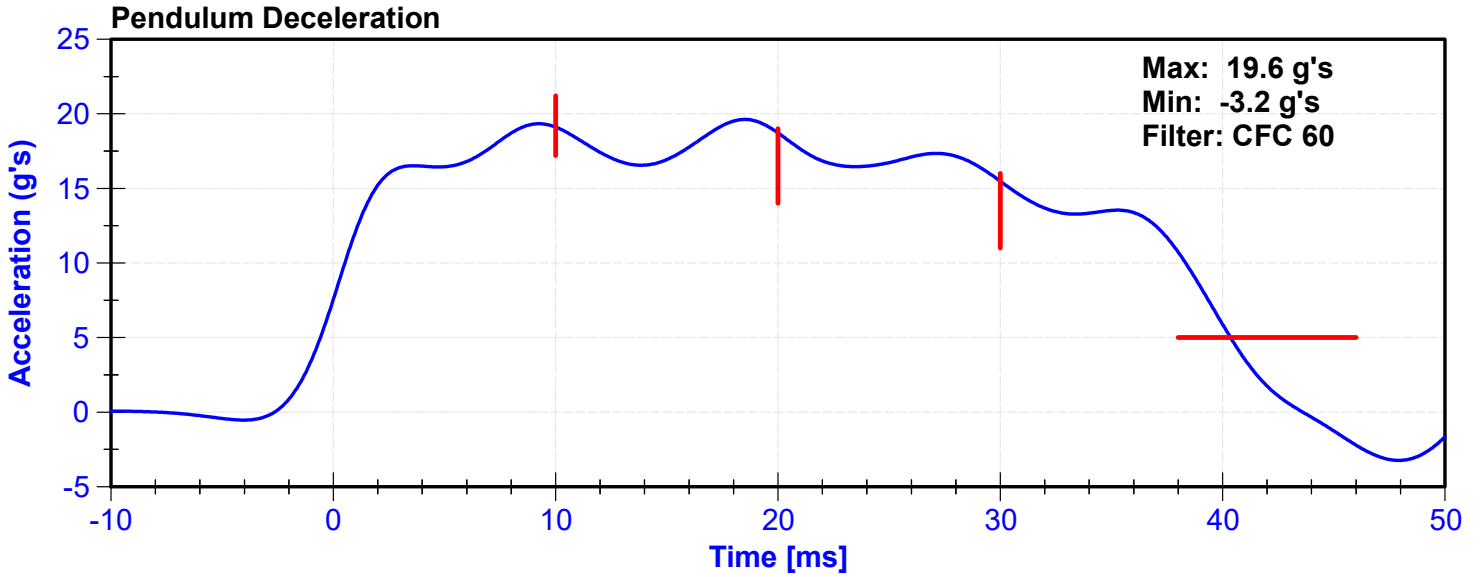
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40.7	Pass
Velocity	5.94	6.19	m/s	6.035	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	19.11	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.7	Pass
Pendulum Deceleration at 30ms	11	16	g's	15.5	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	19.6	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	40.4	Pass
Maximum D Plane Rotation	81	106	deg	98.0	Pass
Time to Maximum Rotation	72	82	ms	79.4	Pass
Rotation Decay to Zero	147	174	ms	168.9	Pass
Minimum Moment About OC	-80	-52.9	Nm	-61.49	Pass
Time to Minimum Moment	65	79	ms	73.9	Pass
Moment Decay to Zero	120	148	ms	148.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16686	8/28/2024	2/24/2025
Pendulum Potentiometer	Honeywell	F78BA102-B1_A825	9/13/2024	9/13/2025
Condyle Potentiometer	Honeywell	F78BA102-B1_J119	9/13/2024	9/13/2025
Upper Neck Load Cell	Humanetics	851-FX	5/22/2024	5/22/2025





ATD Manufacturer	Humanetics	Test Technician	Z.Putt
ATD Serial Number	065	Laboratory Supervisor	Z.Putt

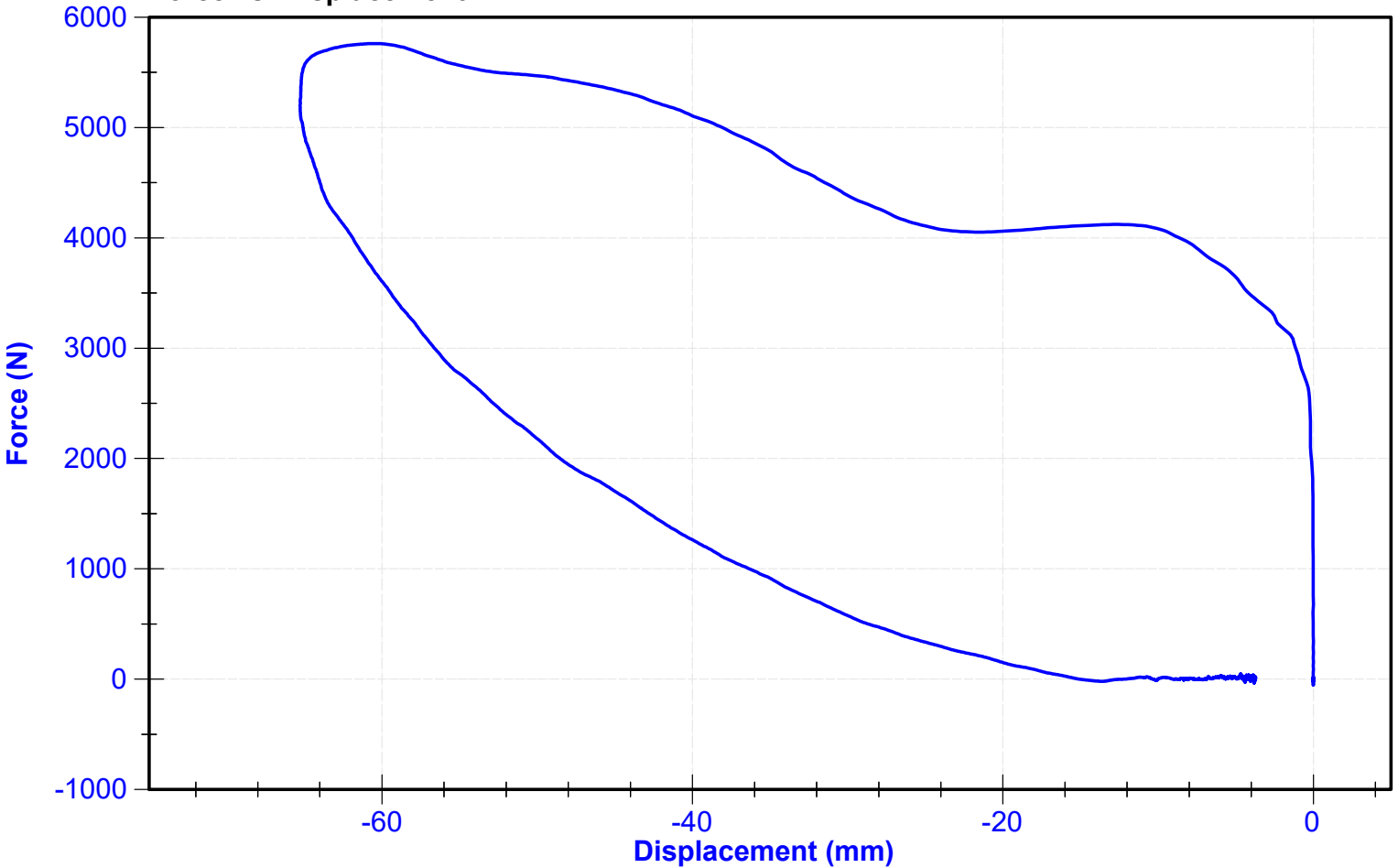
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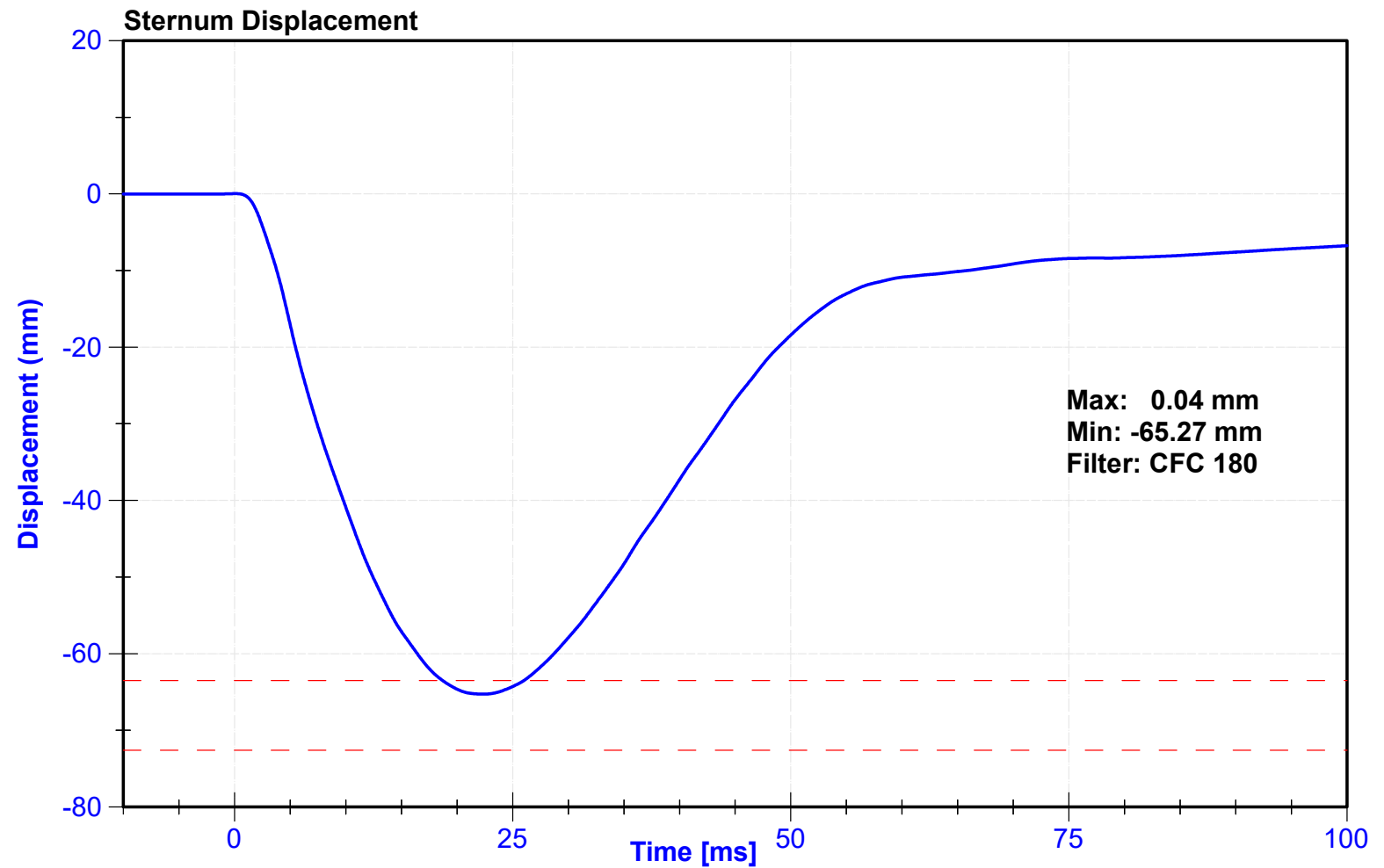
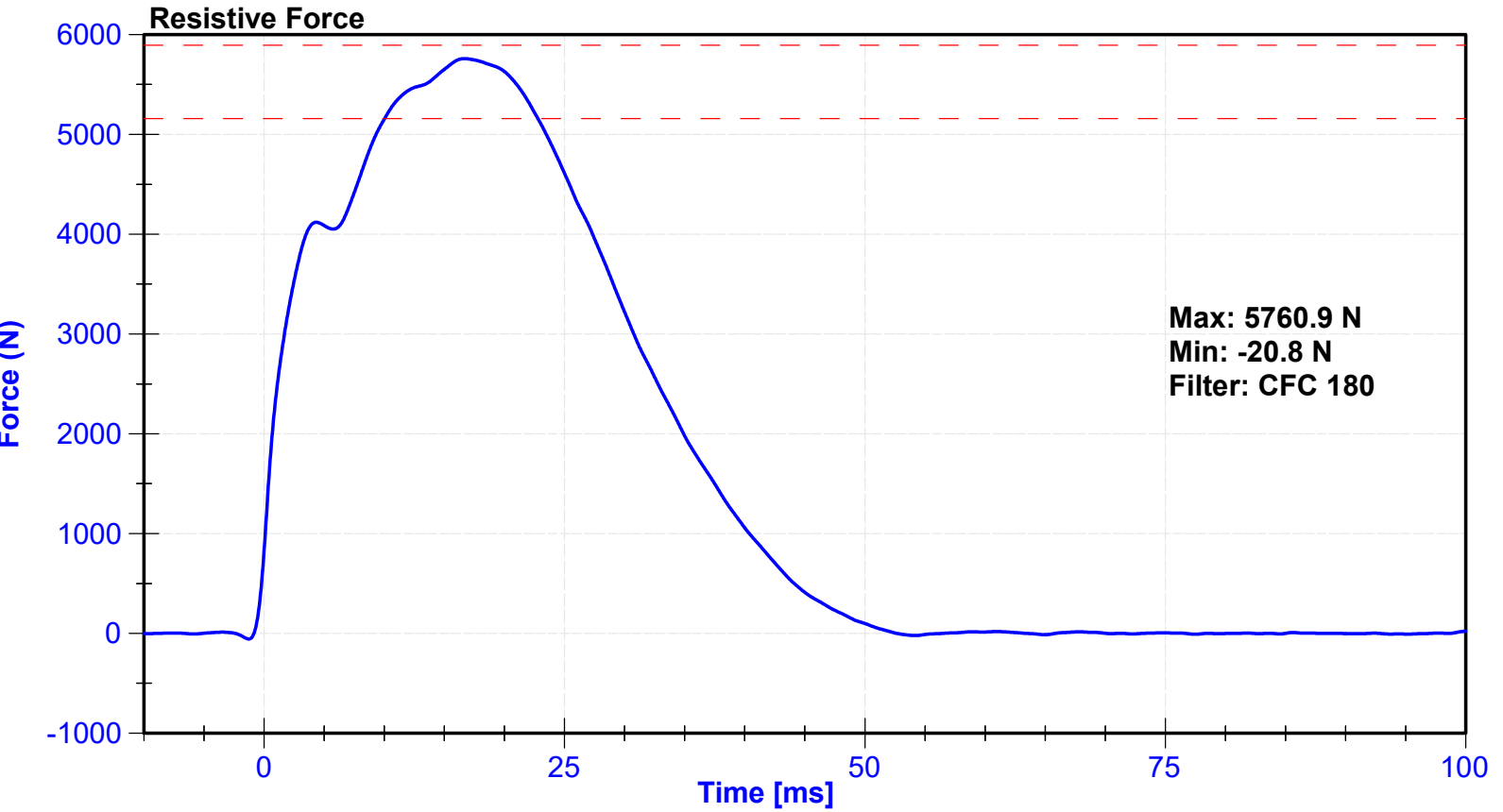
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	44.7	Pass
Velocity	6.59	6.83	m/s	6.721	Pass
Chest Displacement	-72.6	-63.5	mm	-65.27	Pass
Resistive Force	5160	5894	N	5760.9	Pass
Hysteresis	69	85	%	73.7	Pass

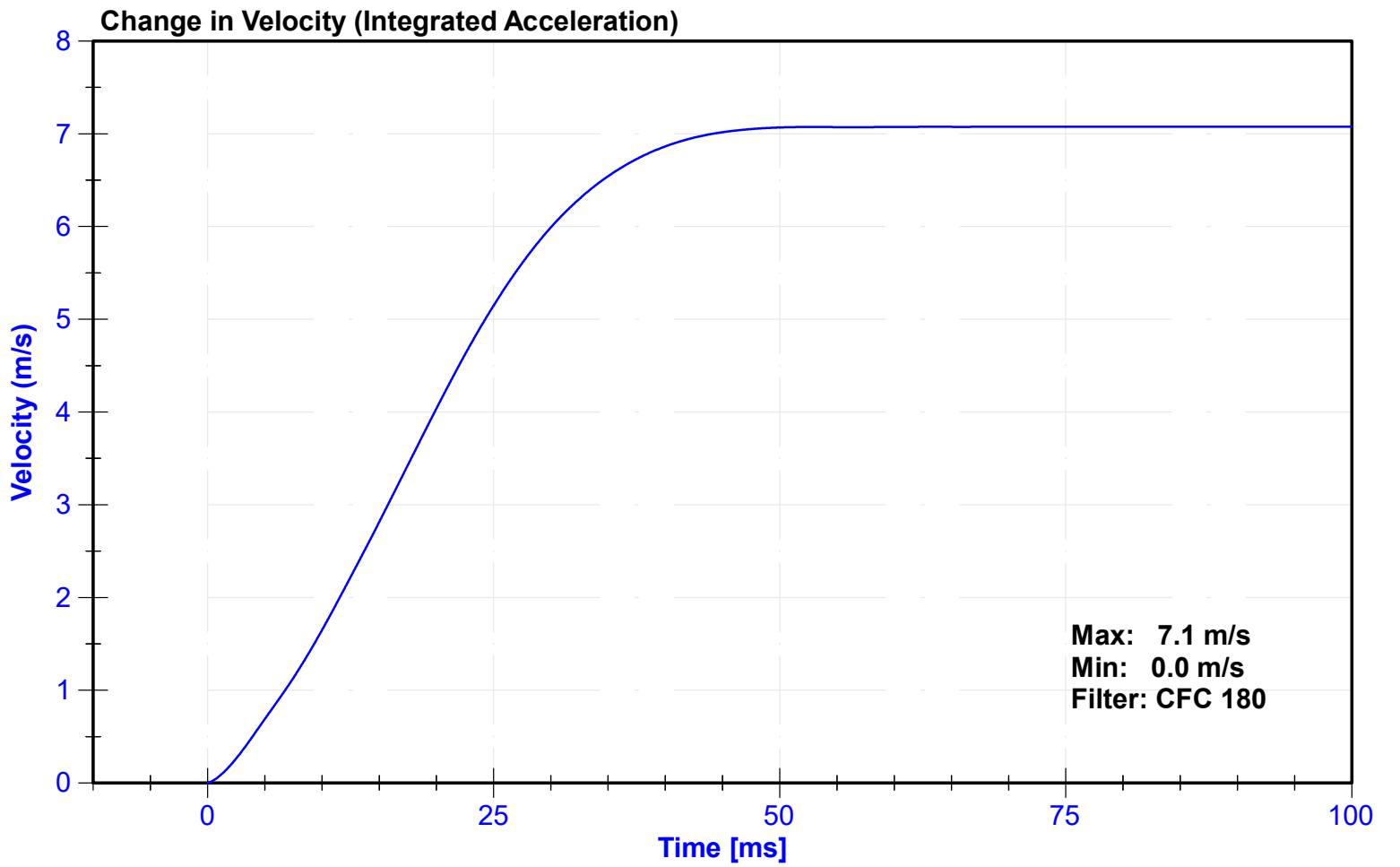
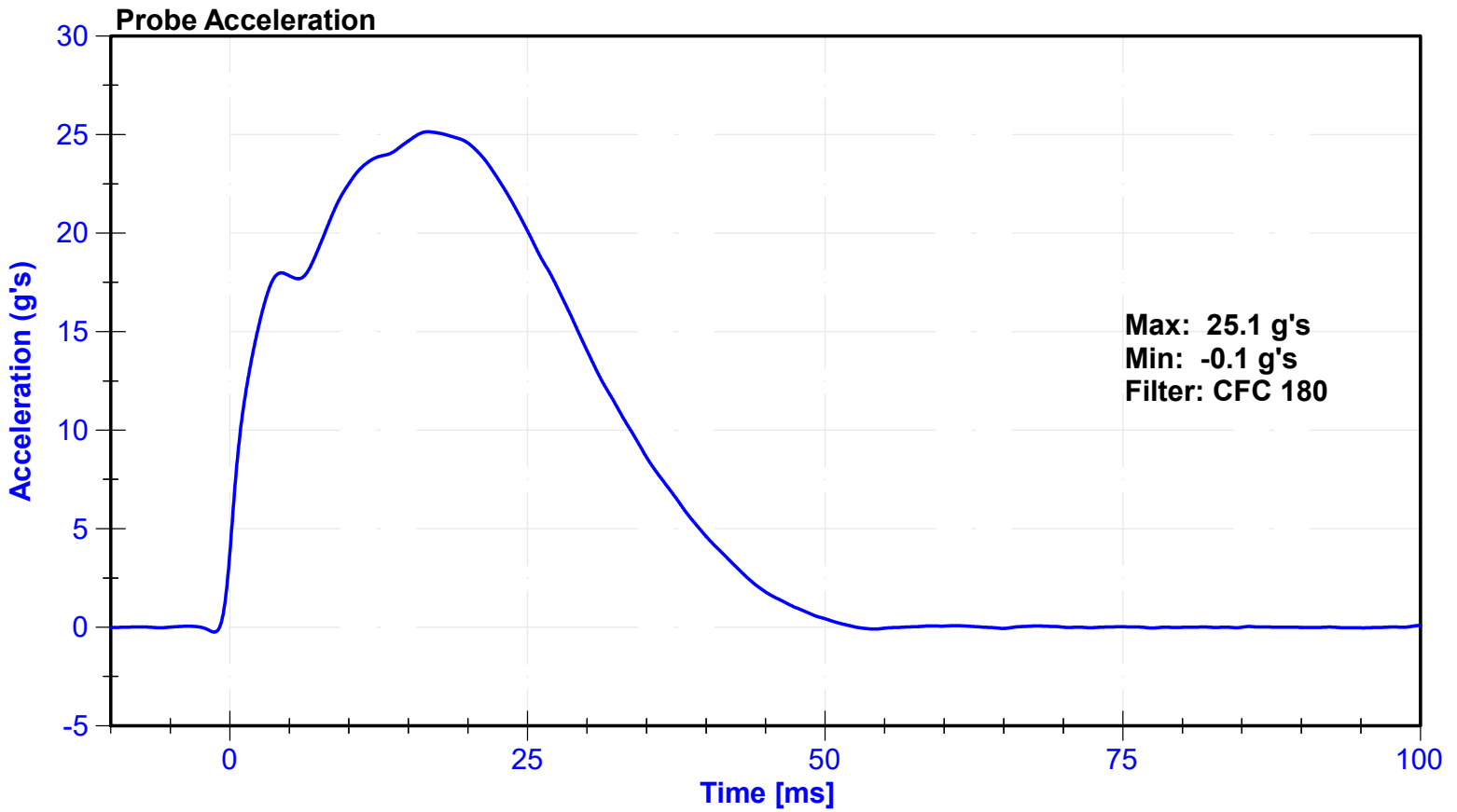
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P94662	10/3/2024	4/1/2025
Chest Potentiometer	Servo	1046	10/31/2024	5/1/2025

**Force vs. Displacement**







ATD Manufacturer	Humanetics	Test Technician	Z.Putt
ATD Serial Number	065	Laboratory Supervisor	Z.Putt

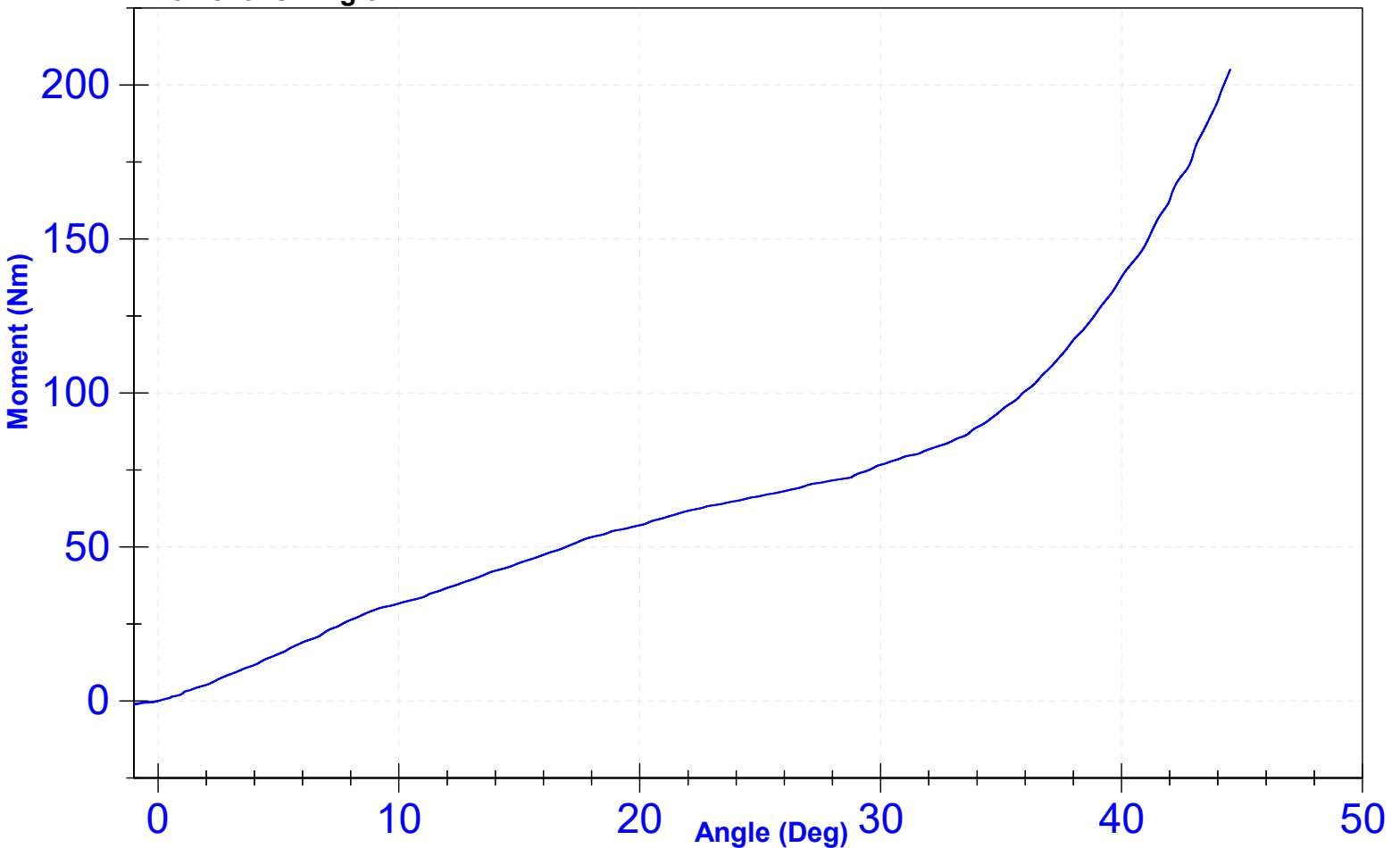
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	34	Pass
Average Velocity	5	10	deg/s	7.4	Pass
Angle at 203Nm	40	50	deg	44.4	Pass
Moment at 30 degrees	0	94.9	Nm	76.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/23/2024	9/23/2025
Load Cell	PCB 2301-02A	694	2024-01-31	2025-01-30

**Moment vs. Angle**

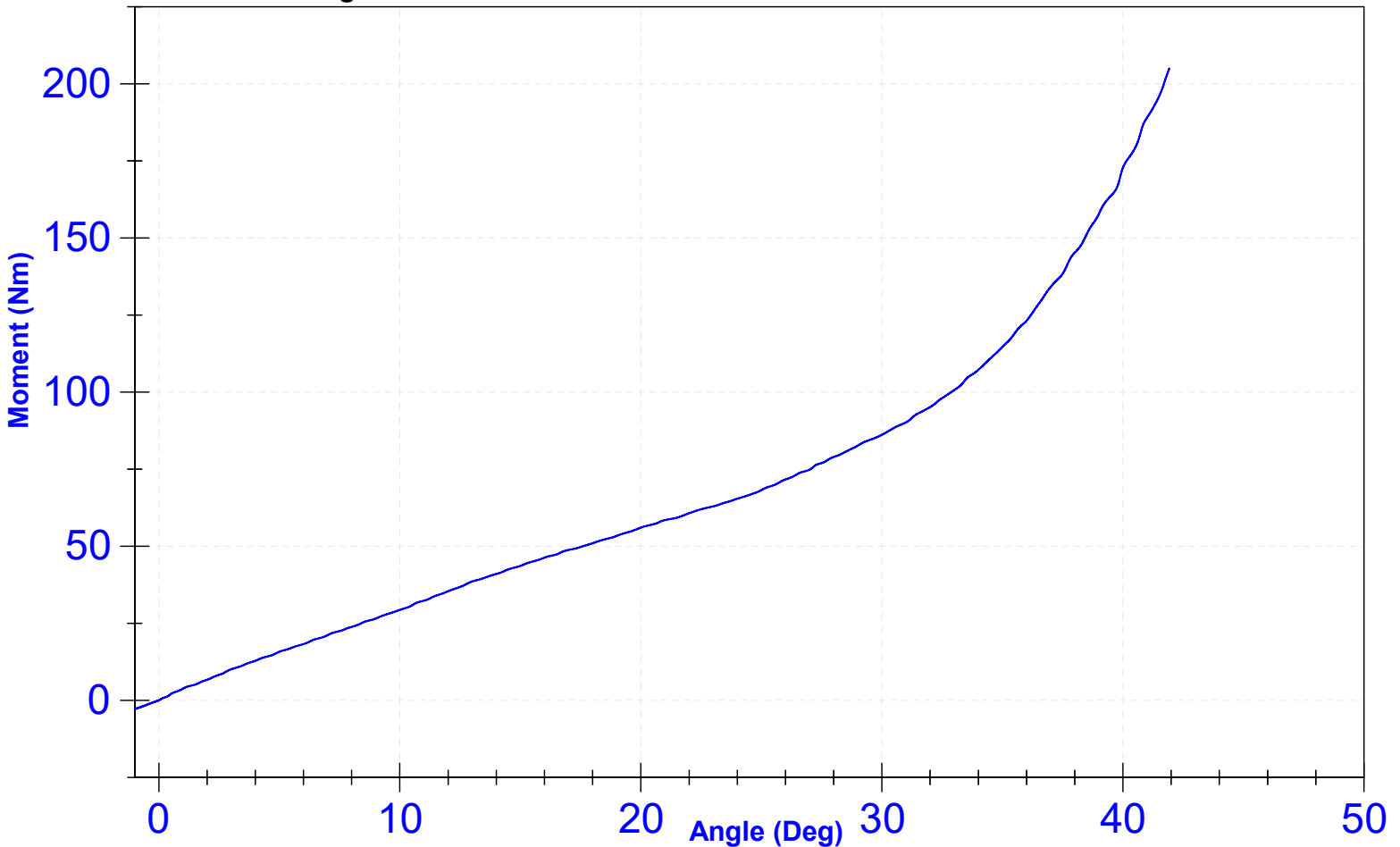


ATD Manufacturer	Humanetics	Test Technician	Z.Putt
ATD Serial Number	065	Laboratory Supervisor	Z.Putt

Test Parameter	Results		Unit	Result	Pass/Fail
	Minimum Specification	Maximum Specification			
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	34	Pass
Average Velocity	5	10	deg/s	7.1	Pass
Angle at 203Nm	40	50	deg	41.8	Pass
Moment at 30 degrees	0	94.9	Nm	86.1	Pass

Transducer Calibrations				
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/23/2024	9/23/2025
Load Cell	PCB 2301-02A	694	2024-01-31	2025-01-30

**Moment vs. Angle**



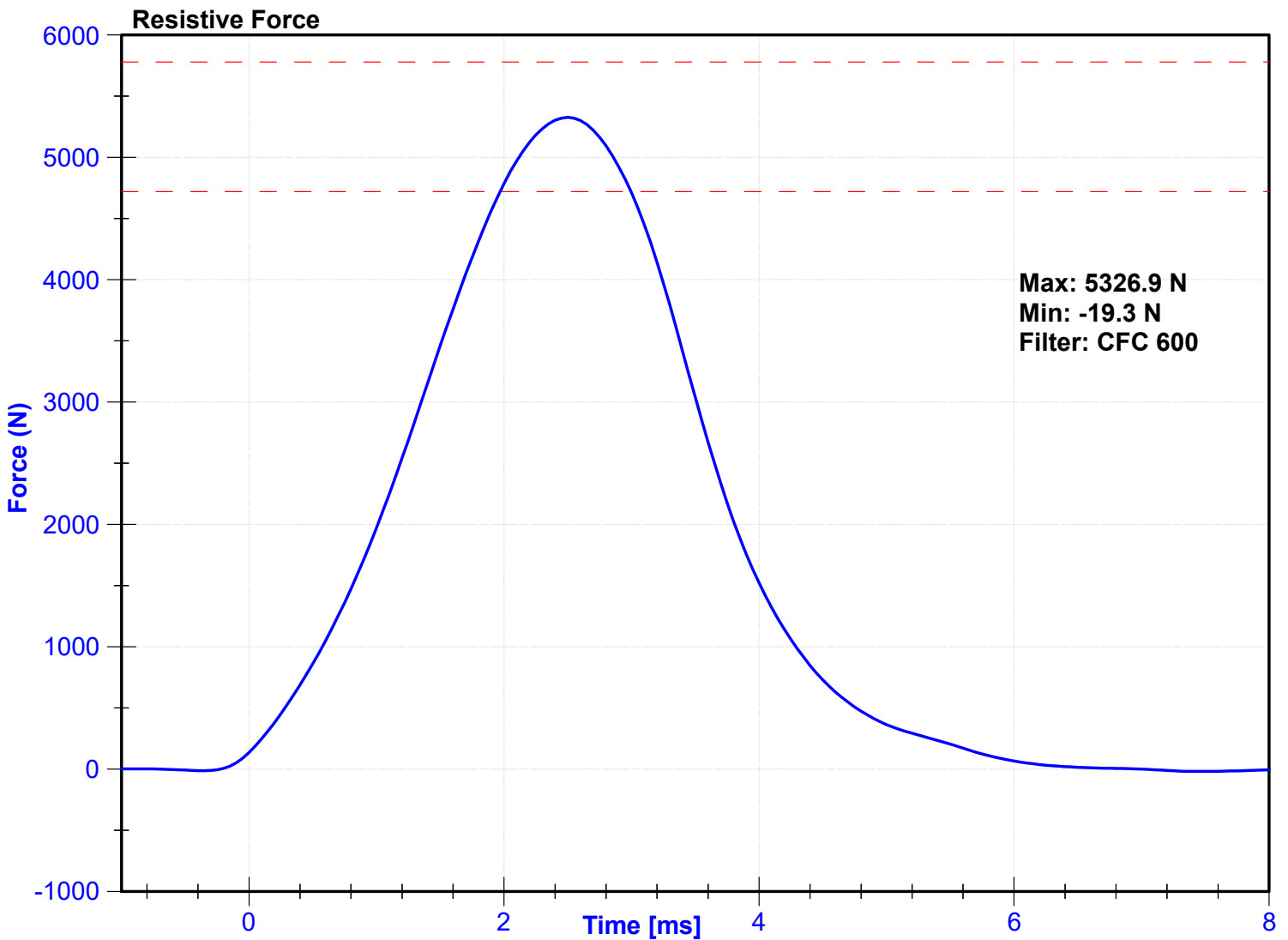
ATD Manufacturer	Humanetics	Test Technician	Z.Putt
ATD Serial Number	065	Laboratory Supervisor	Z.Putt

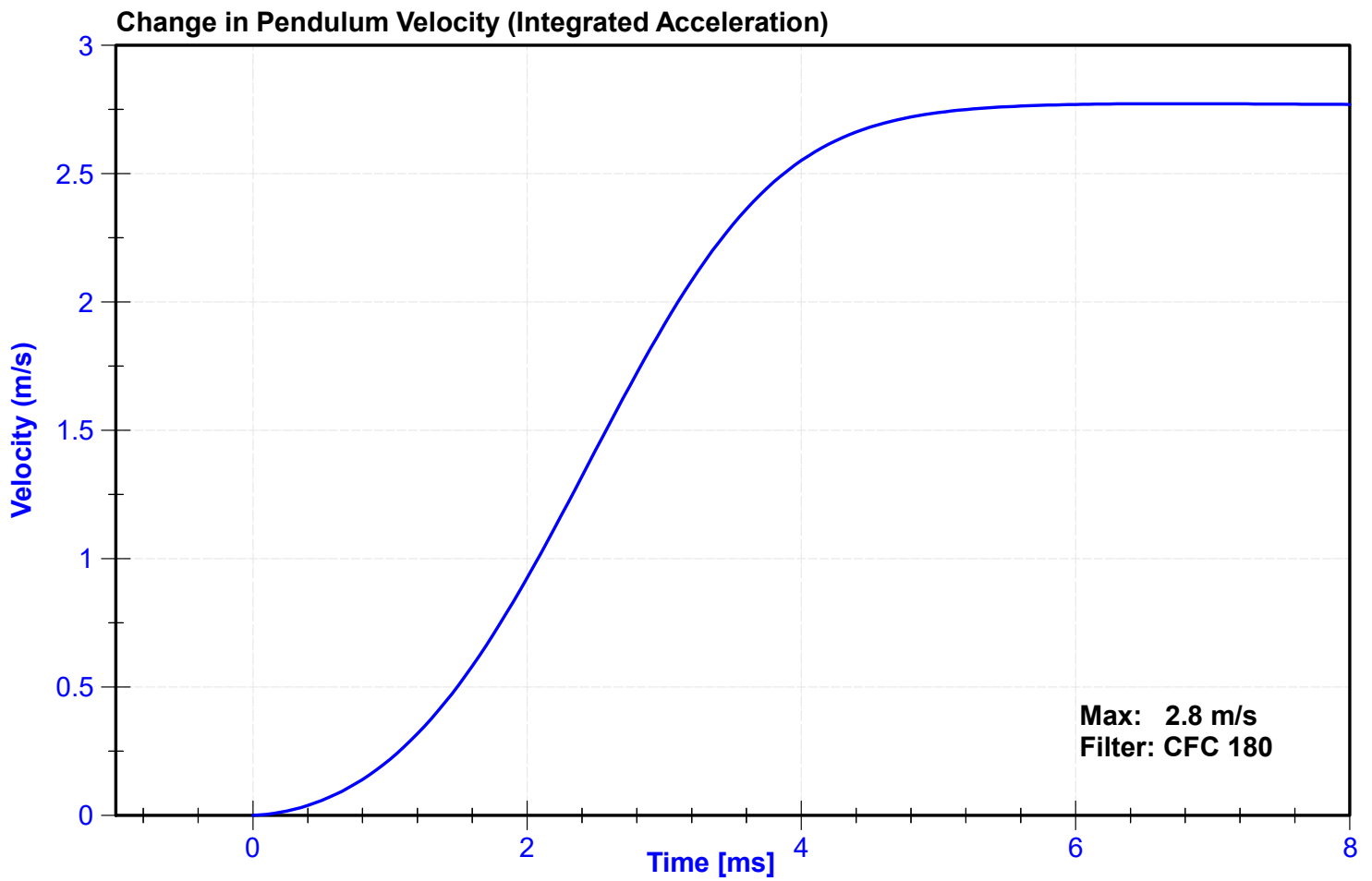
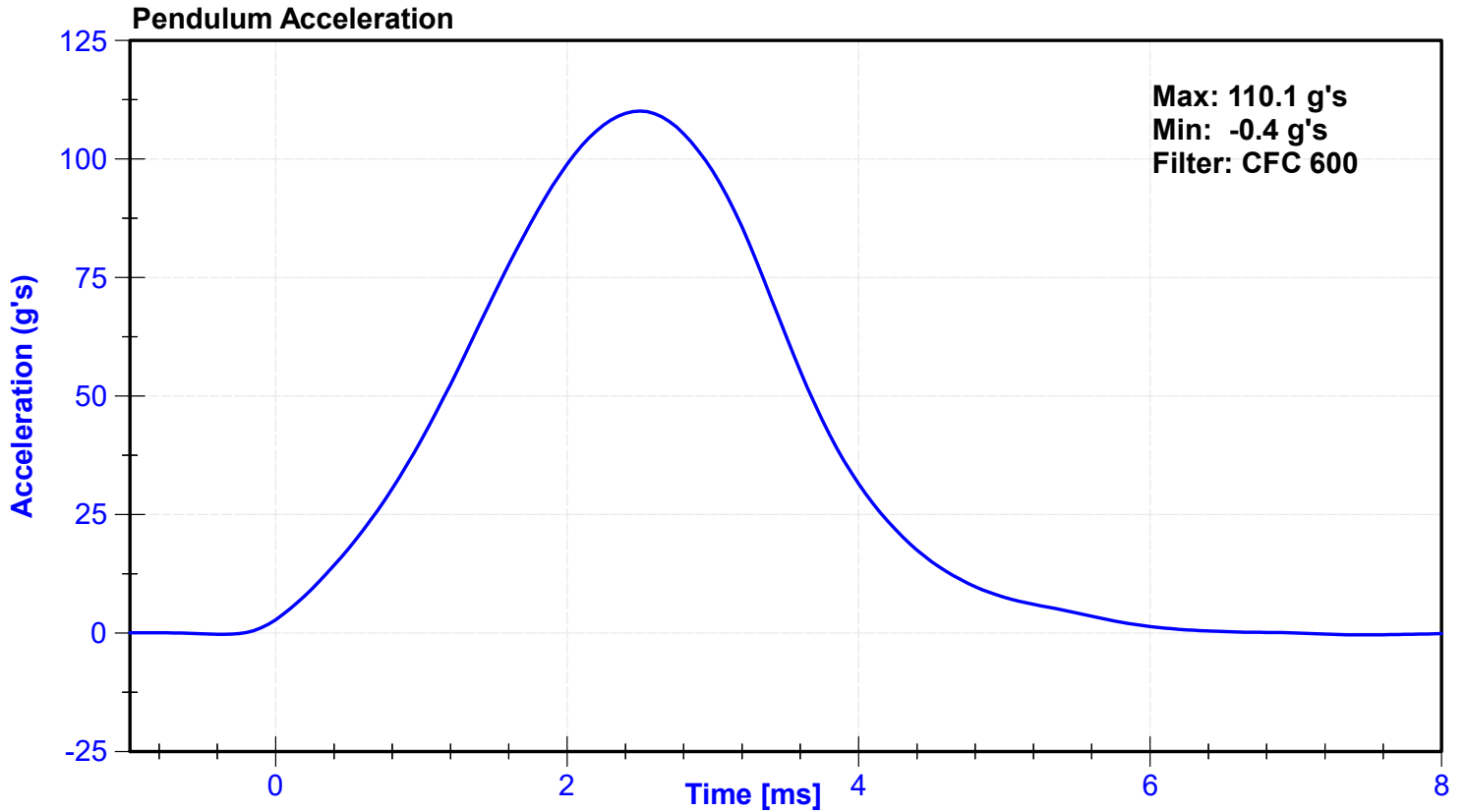
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	44.7	Pass
Velocity	2.07	2.13	m/s	2.071	Pass
Maximum Resistive Force	4720	5780	N	5326.9	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T29720	6/12/2024	12/9/2024





ATD Manufacturer	Humanetics	Test Technician	Z.Putt
ATD Serial Number	065	Laboratory Supervisor	Z.Putt

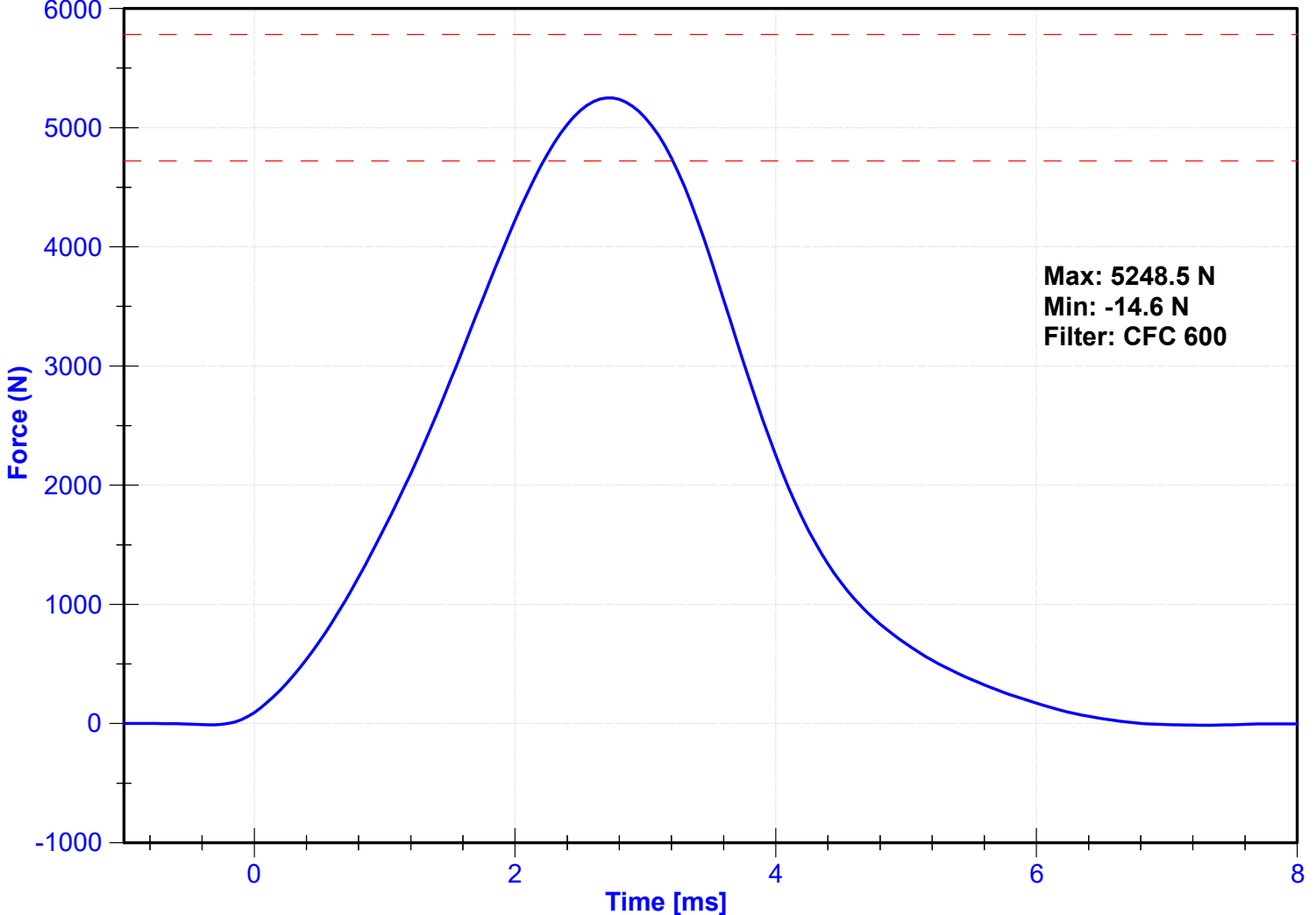
**Results**

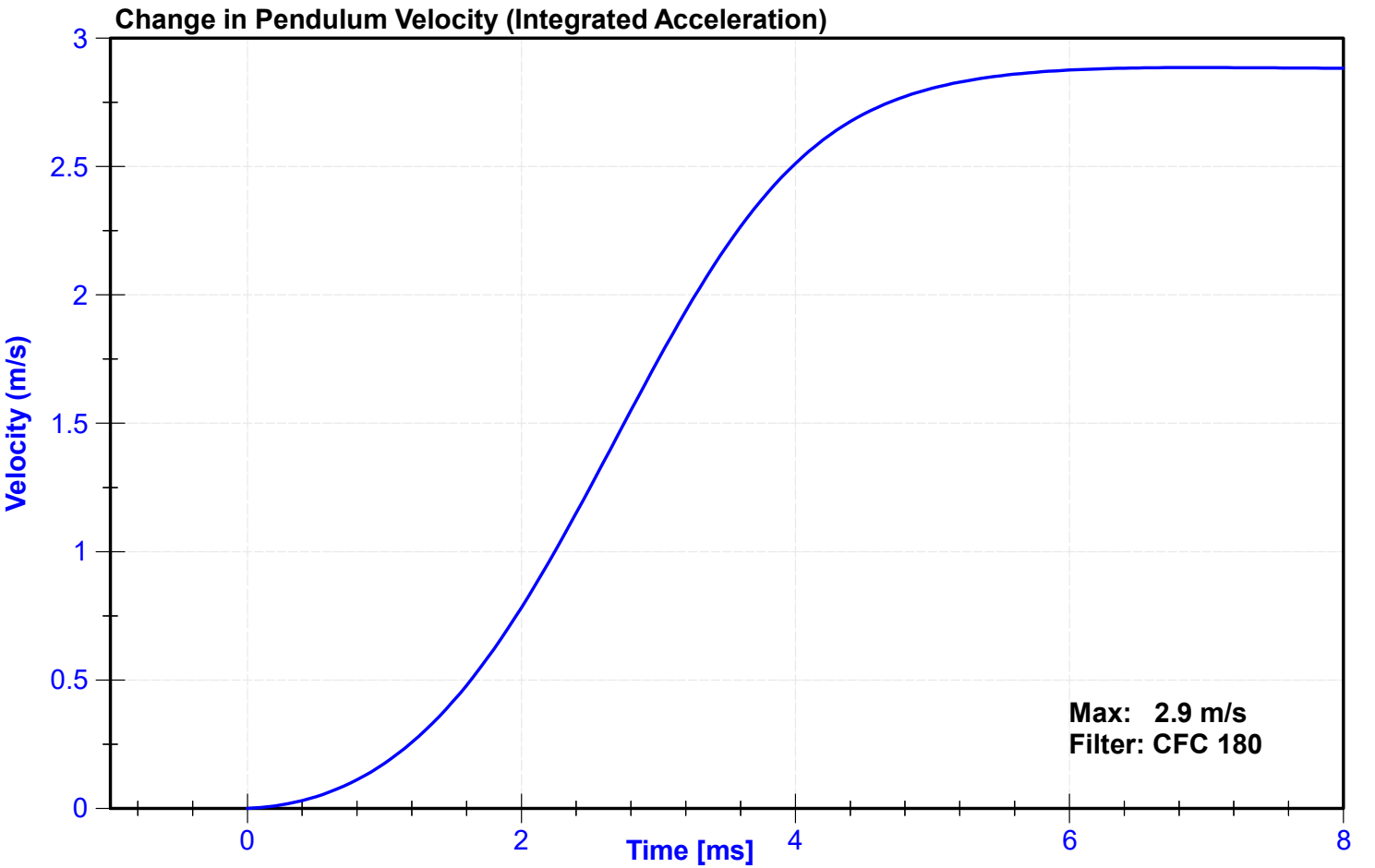
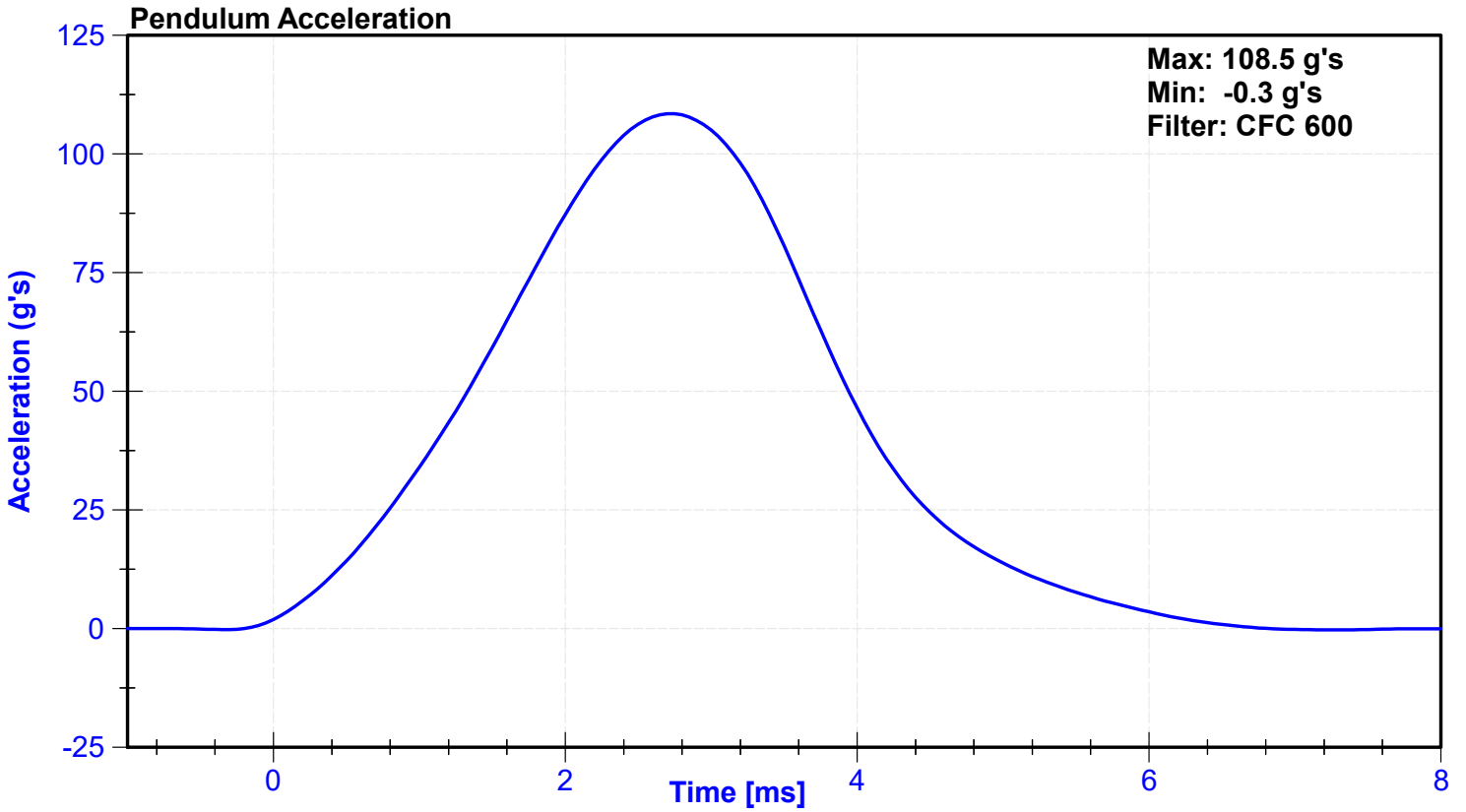
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	44.7	Pass
Velocity	2.07	2.13	m/s	2.07	Pass
Maximum Resistive Force	4720	5780	N	5248.5	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T29720	6/12/2024	12/9/2024

**Resistive Force**





**CALIBRATION TEST RESULTS**

**POST-TEST**

**HYBRID III 5<sup>TH</sup> PERCENTILE FEMALE - PASSENGER ATD**

**SERIAL NO: 137**

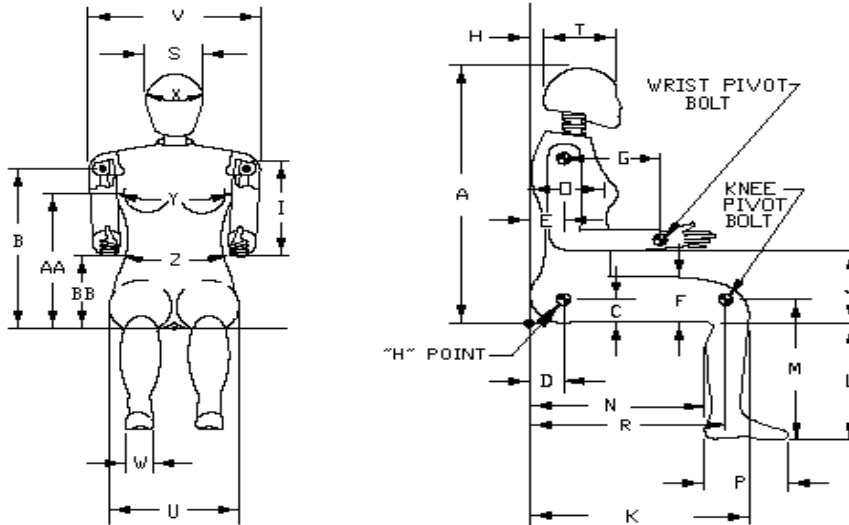


External Measurements - Hybrid 3 - 5th Female

Technician: J. Rios

Date: 11/21/2024

Dummy Serial Number: 137



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	779	Pass
B	Shoulder Pivot Height	432	457	451	Pass
C	H-Point Height	81	86	85	Pass
D	H-Point from Backline	145	150	146	Pass
E	Shoulder Pivot from Backline	69	84	74	Pass
F	Thigh Clearance	119	135	131	Pass
G	Back of Elbow to Wrist Pivot	244	259	251	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	282	Pass
J	Elbow Rest Height	183	203	192	Pass
K	Buttock to Knee Length	521	546	532	Pass
L	Popliteal Height	356	376	364	Pass
M	Knee Pivot Height	394	419	407	Pass
N	Buttock Popliteal Length	414	439	430	Pass
O	Chest Depth without Jacket	175	191	185	Pass
P	Foot Length (right)	219	234	226	Pass
R	Buttock To Knee Pivot Length	457	483	472	Pass
S	Head Breadth	137	147	143	Pass
T	Head Depth	178	188	183	Pass
U	Hip Breadth	300	315	308	Pass
V	Shoulder Breadth	351	366	360	Pass
W	Foot Breadth	79	94	85	Pass
X	Head Circumference	528	549	541	Pass
Y	Chest Circumference with Jacket	851	881	874	Pass
Z	Waist Circumference	460	790	614	Pass
AA	Reference Location (Chest Circumference)	333	358	337	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

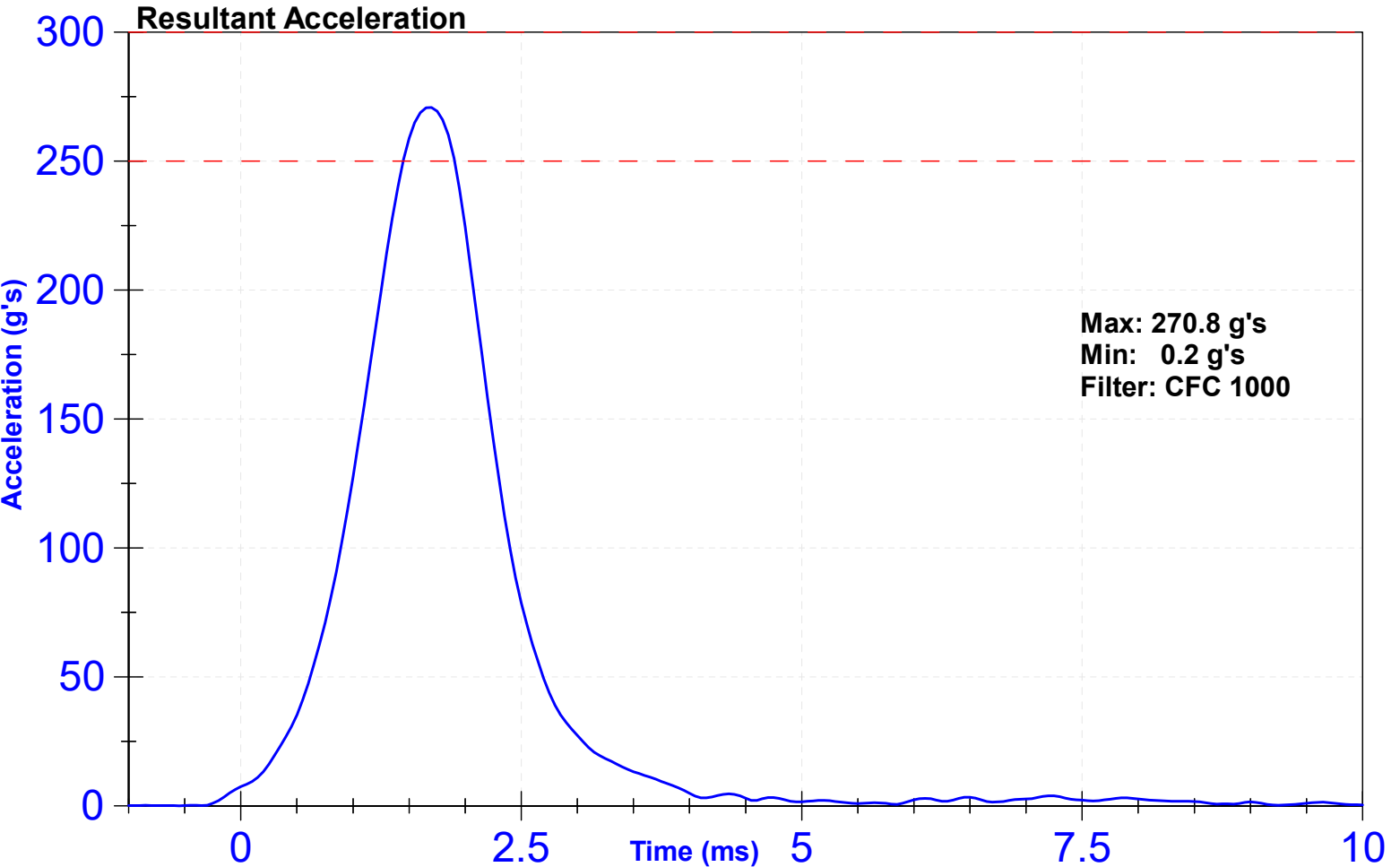
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

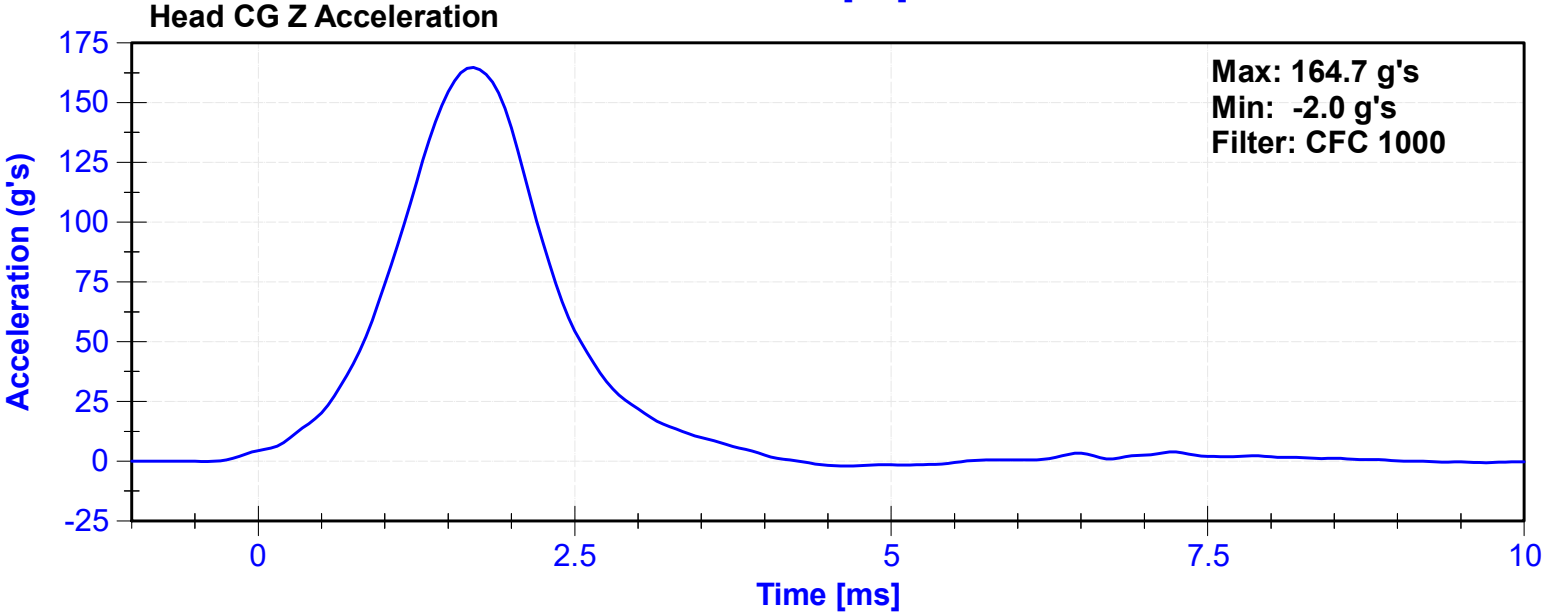
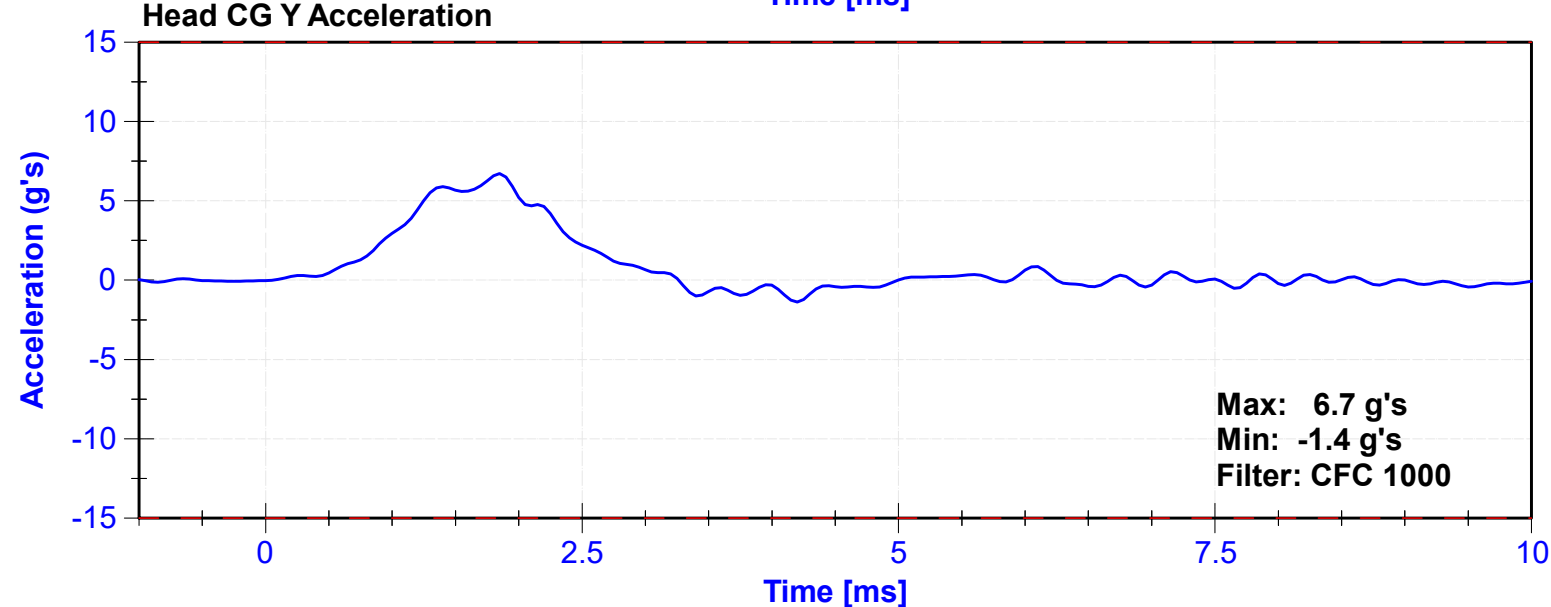
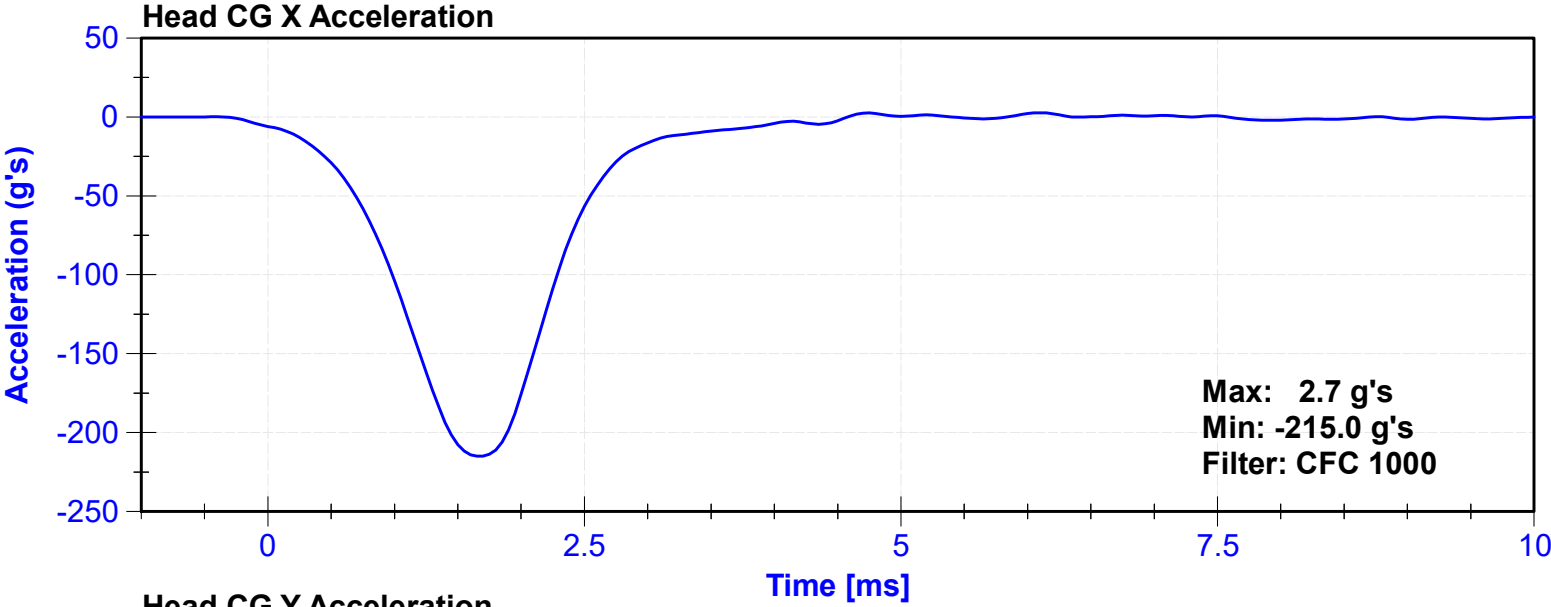
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	35	Pass
Resultant Acceleration	250	300	g's	270.8	Pass
Oscillation	0	10	%	1.7	Pass
Lateral Acceleration	-15	15	g's	6.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P79417	8/19/2024	2/15/2025
Y Accelerometer	Endevco	P83335	8/19/2024	2/15/2025
Z Accelerometer	Endevco	P64149	8/19/2024	2/15/2025





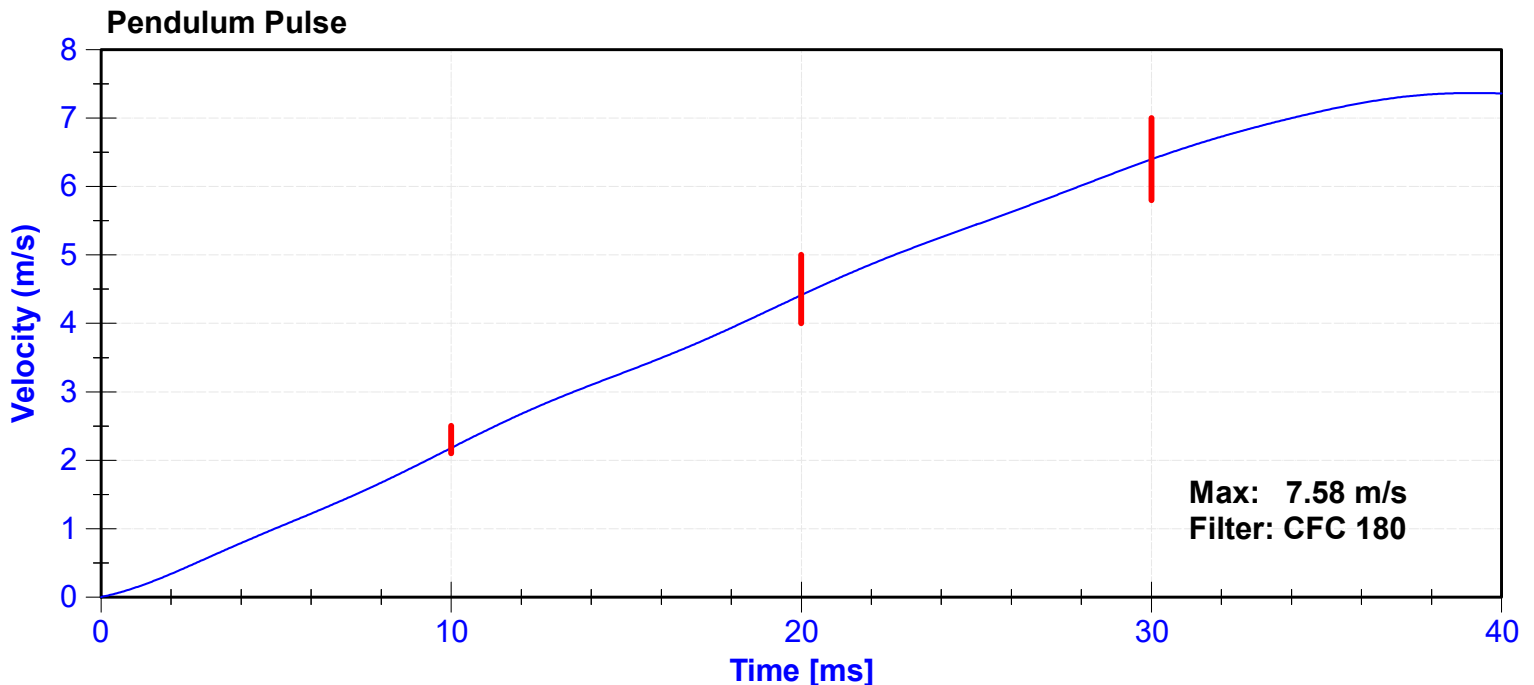
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

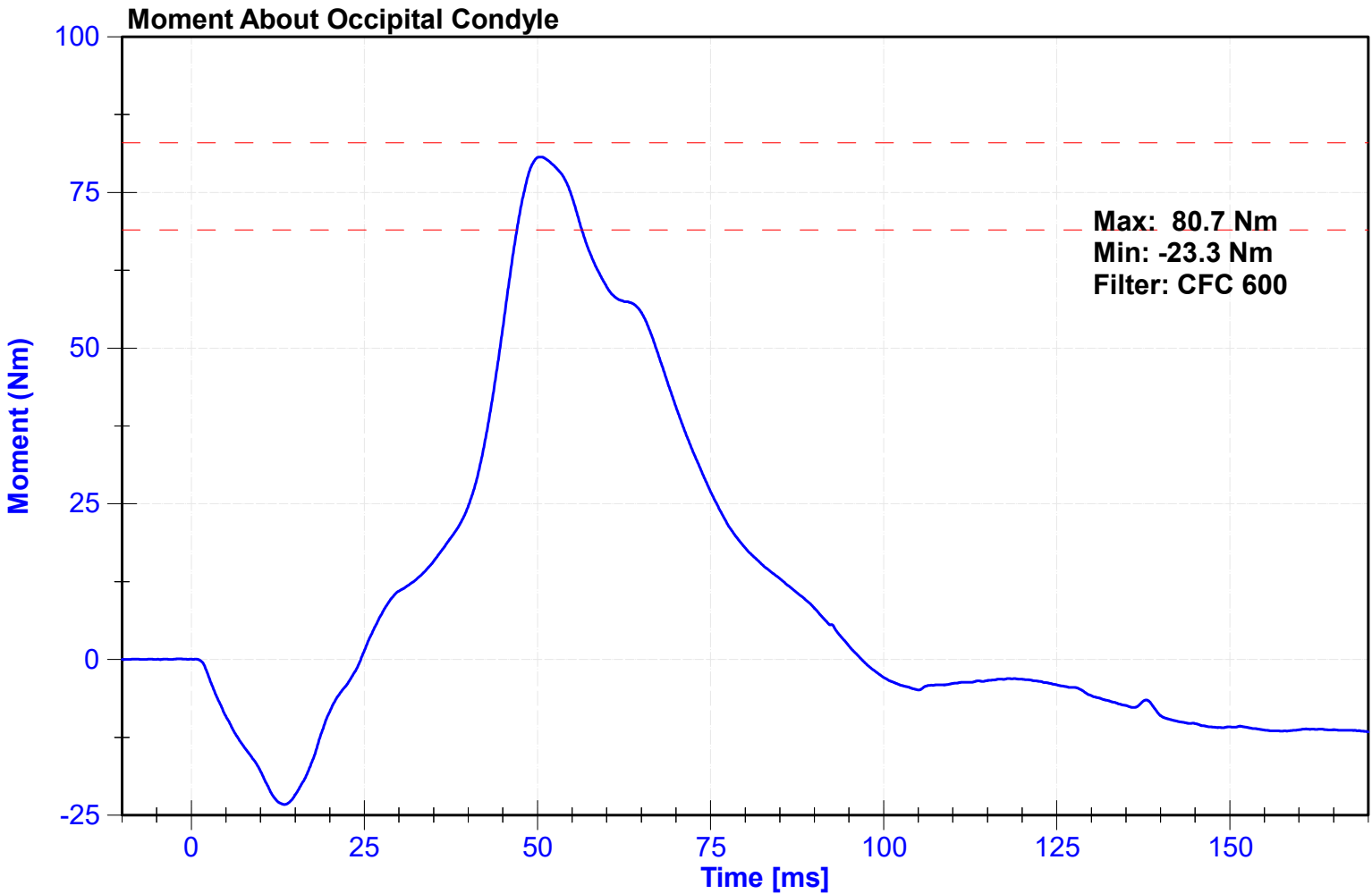
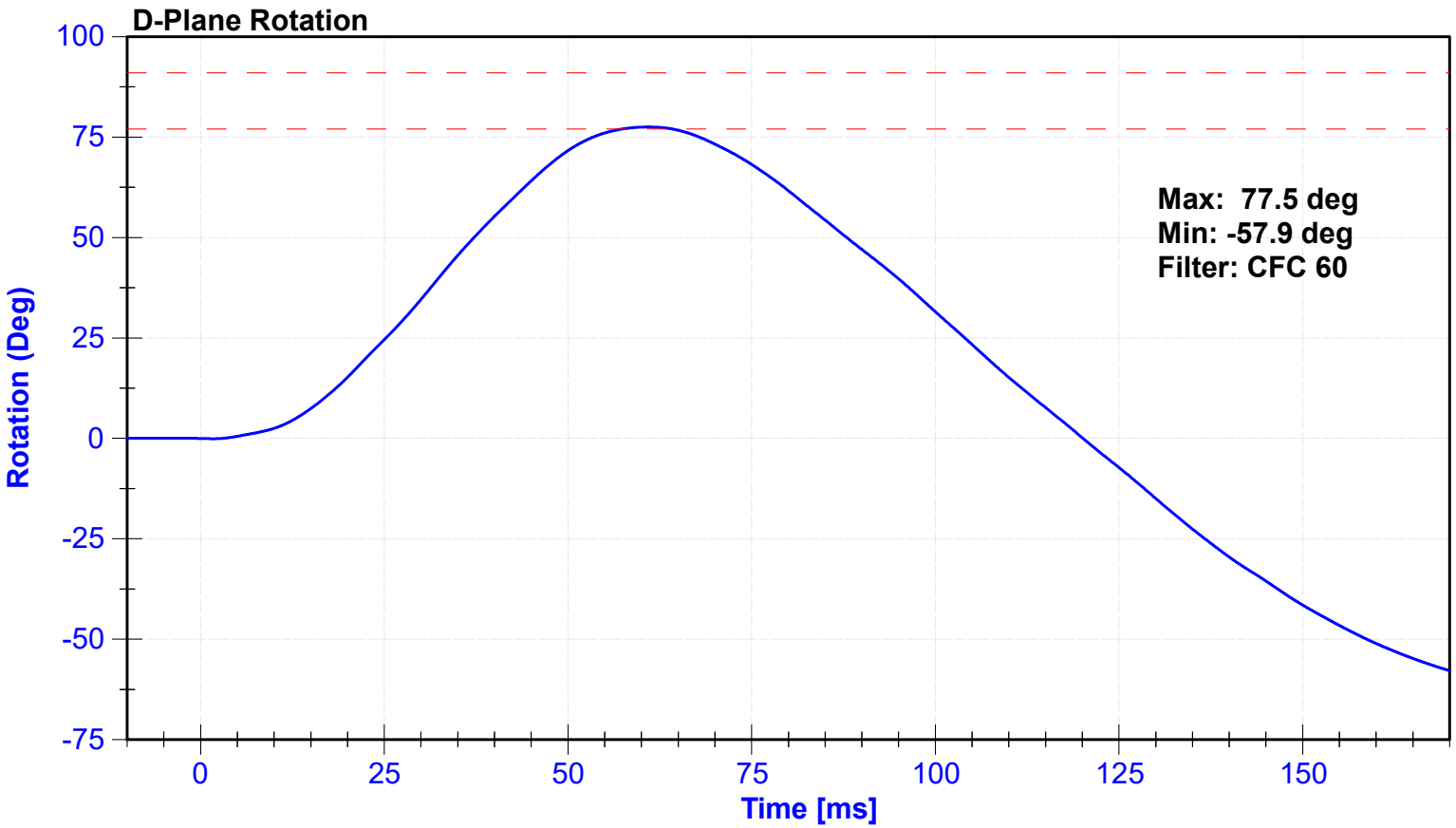
**Results**

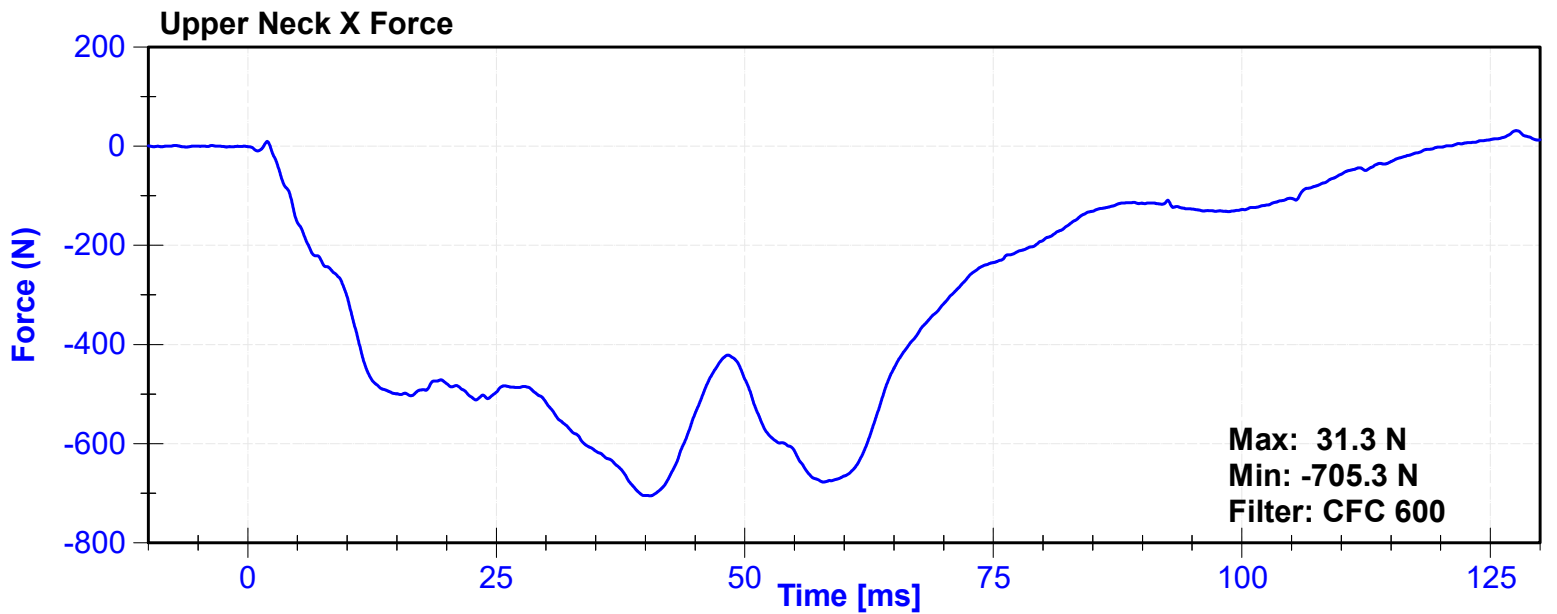
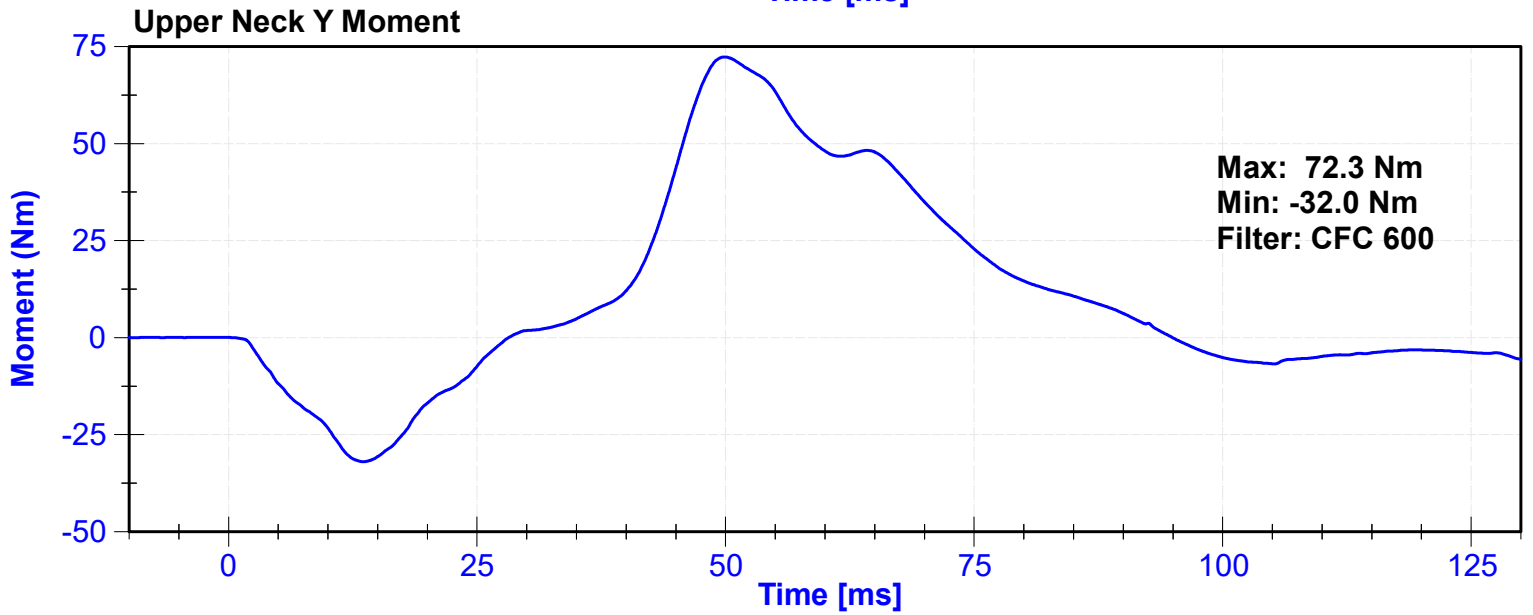
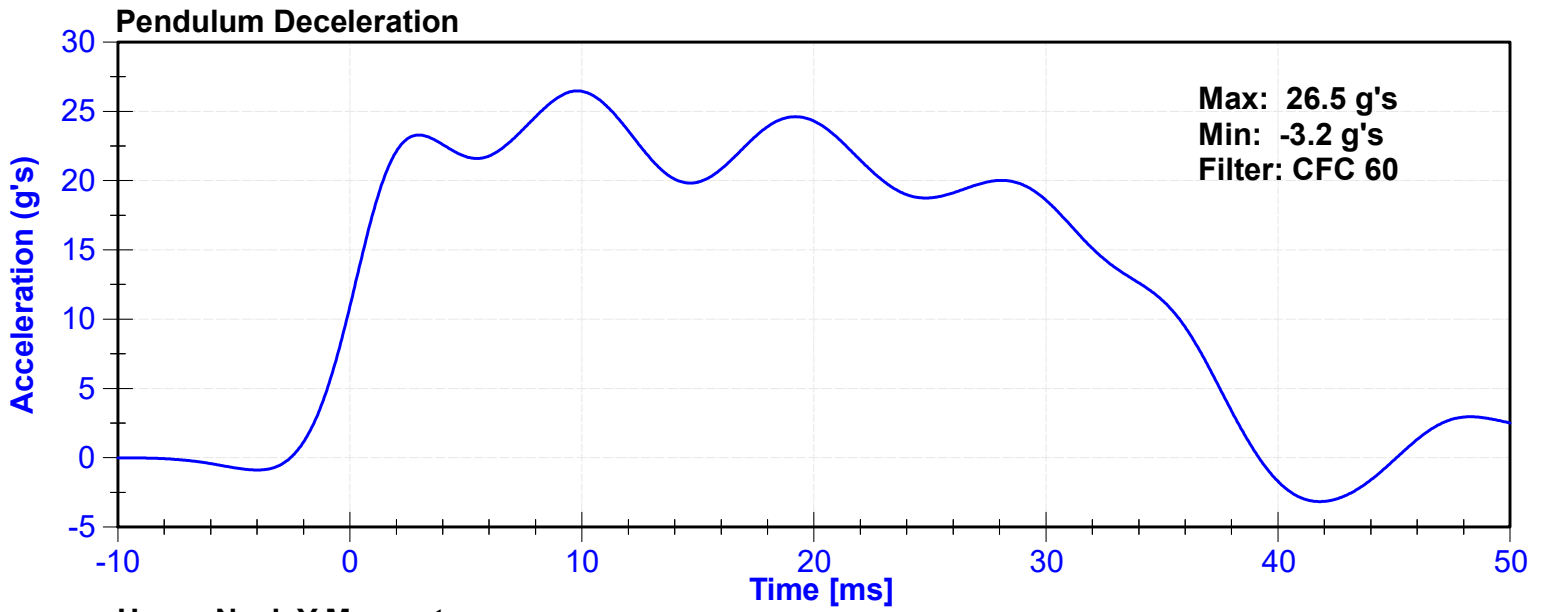
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	63	Pass
Velocity	6.89	7.13	m/s	7.023	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.18	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.41	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.40	Pass
Max D Plane Rotation	77	91	deg	77.5	Pass
Max Moment During Rotation Interval	69	83	Nm	80.7	Pass
Moment Decay to 10.0 Nm	80	100	ms	88.4	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/30/2024	4/28/2025
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025







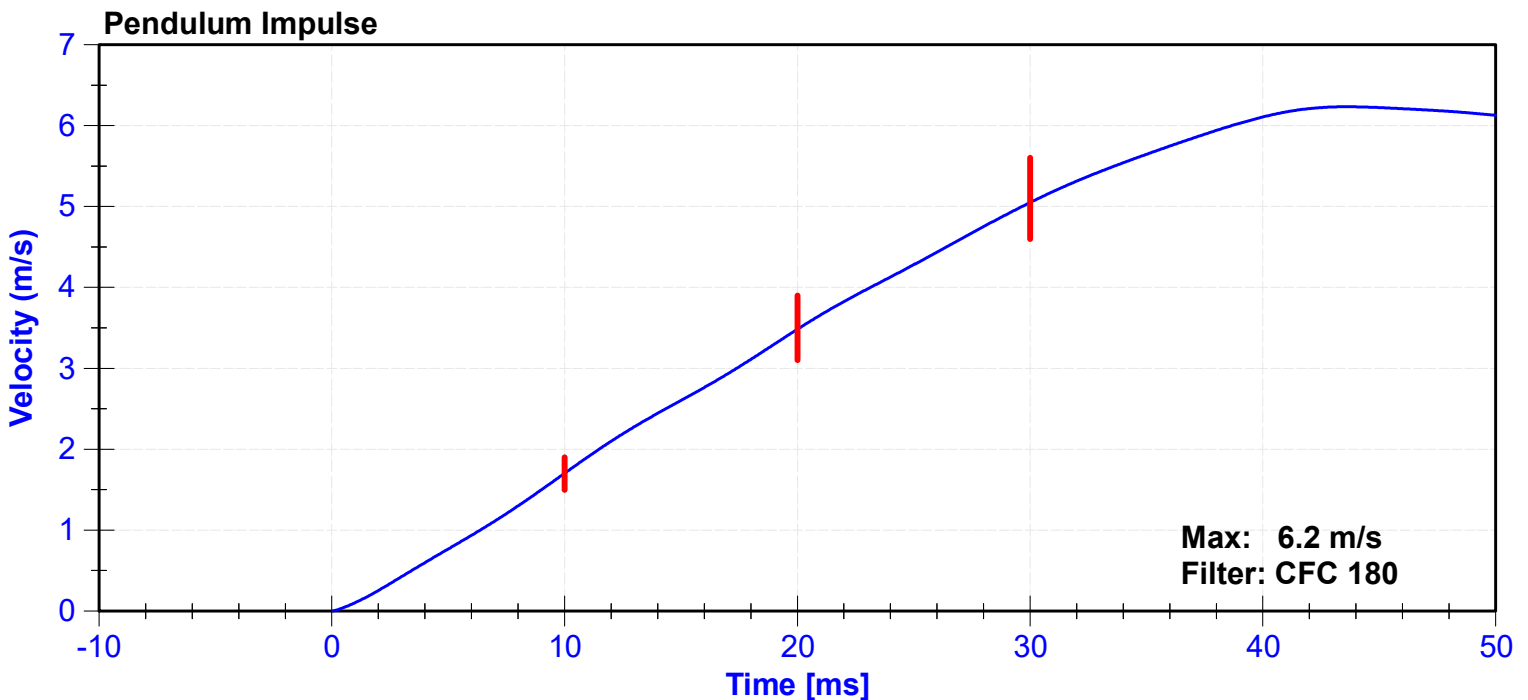
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

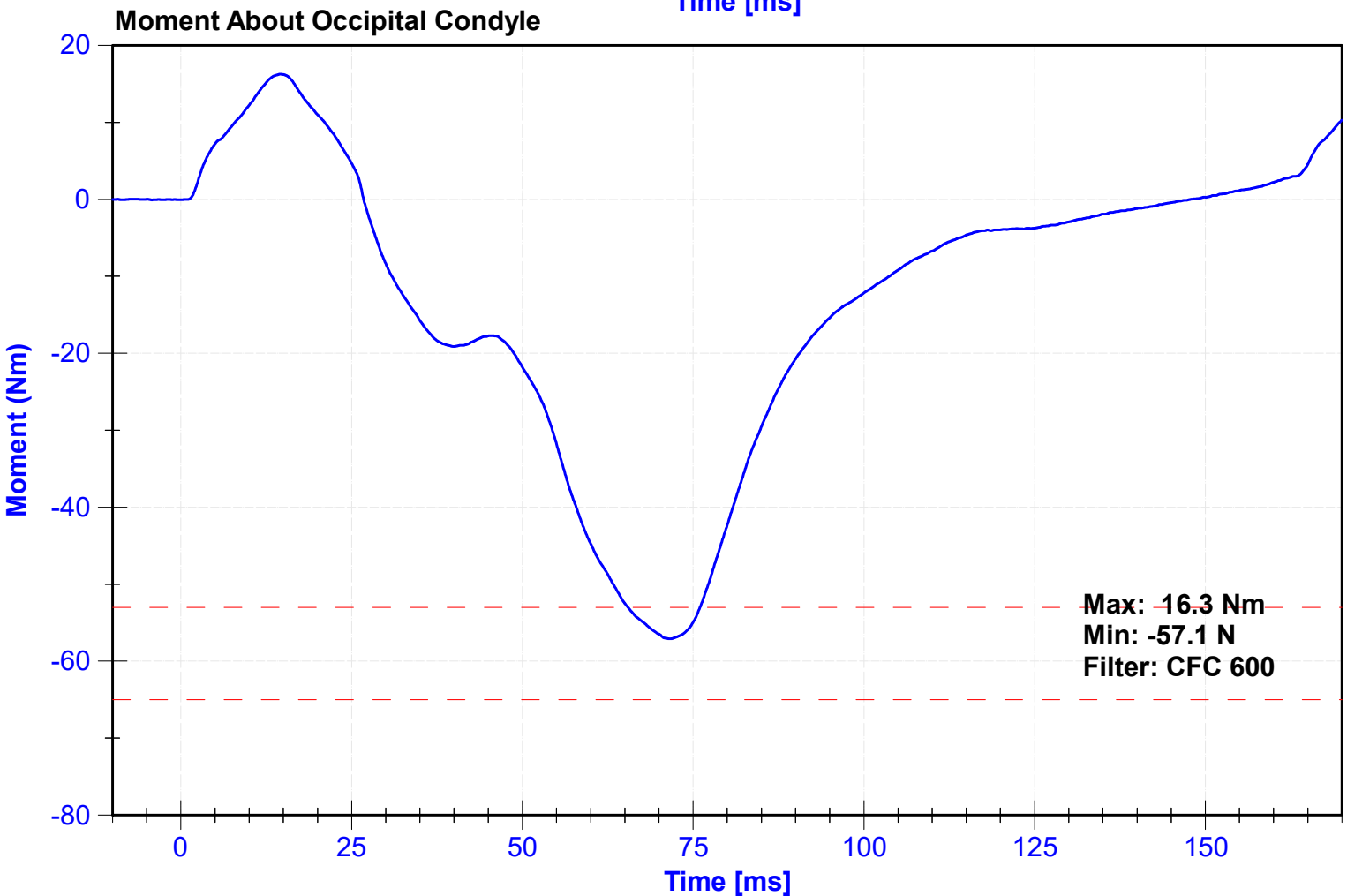
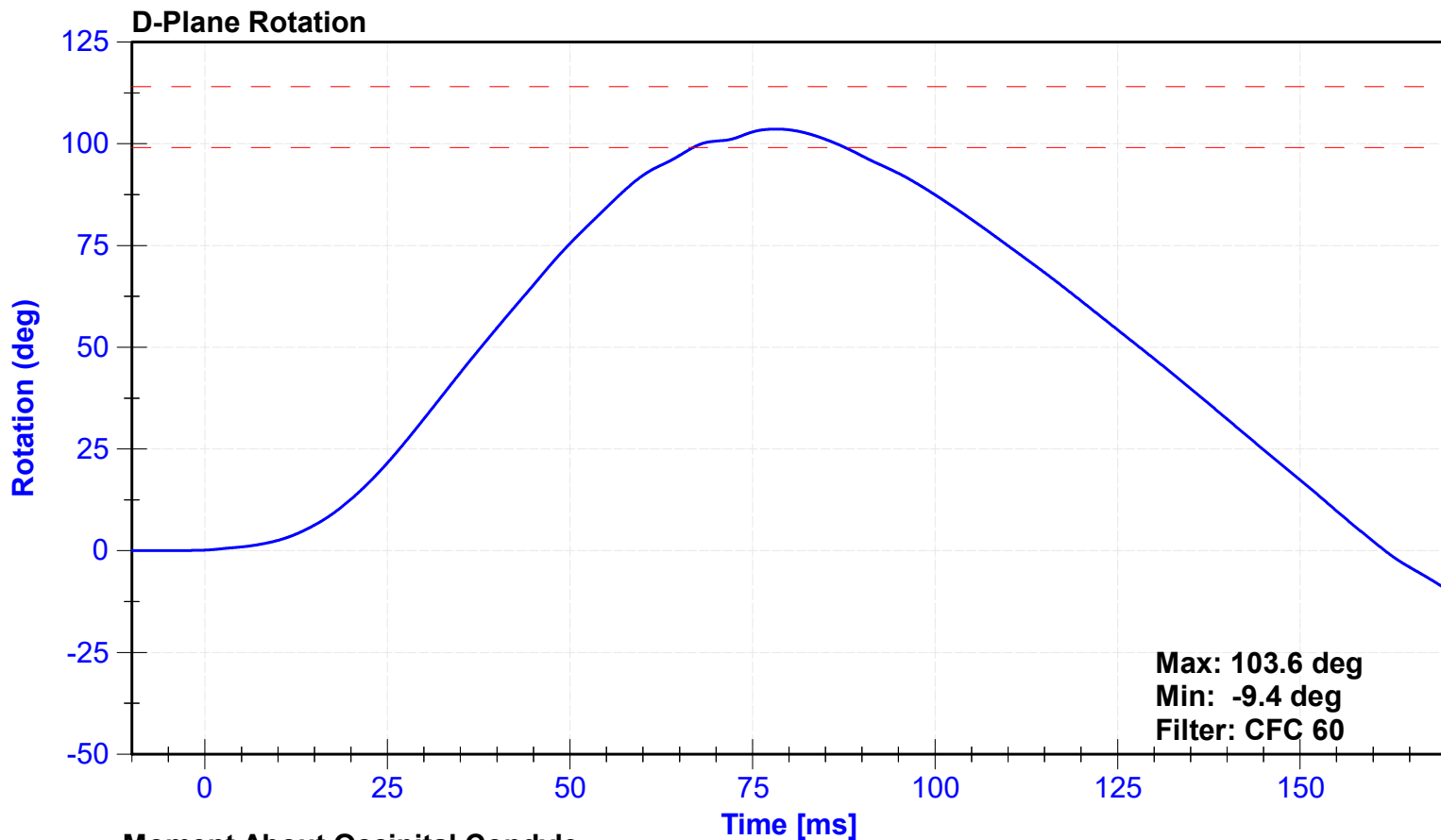
**Results**

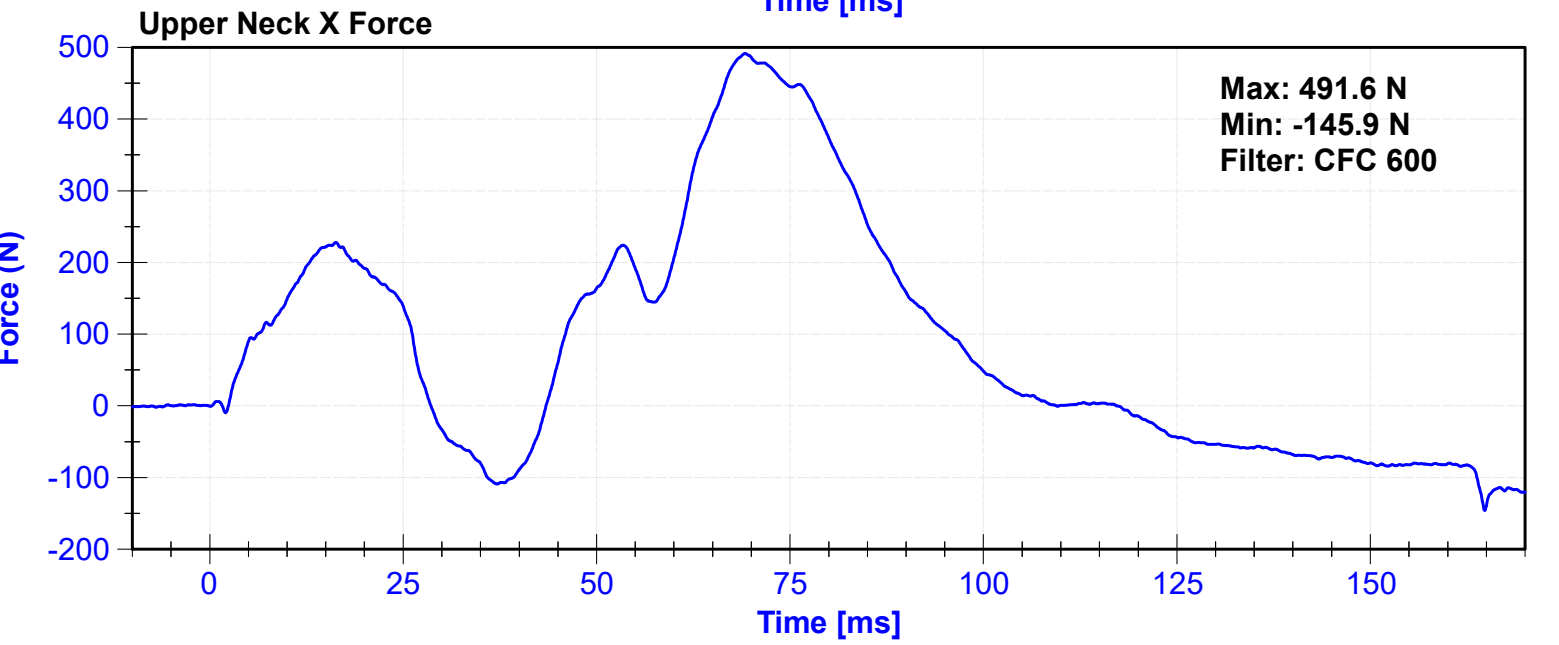
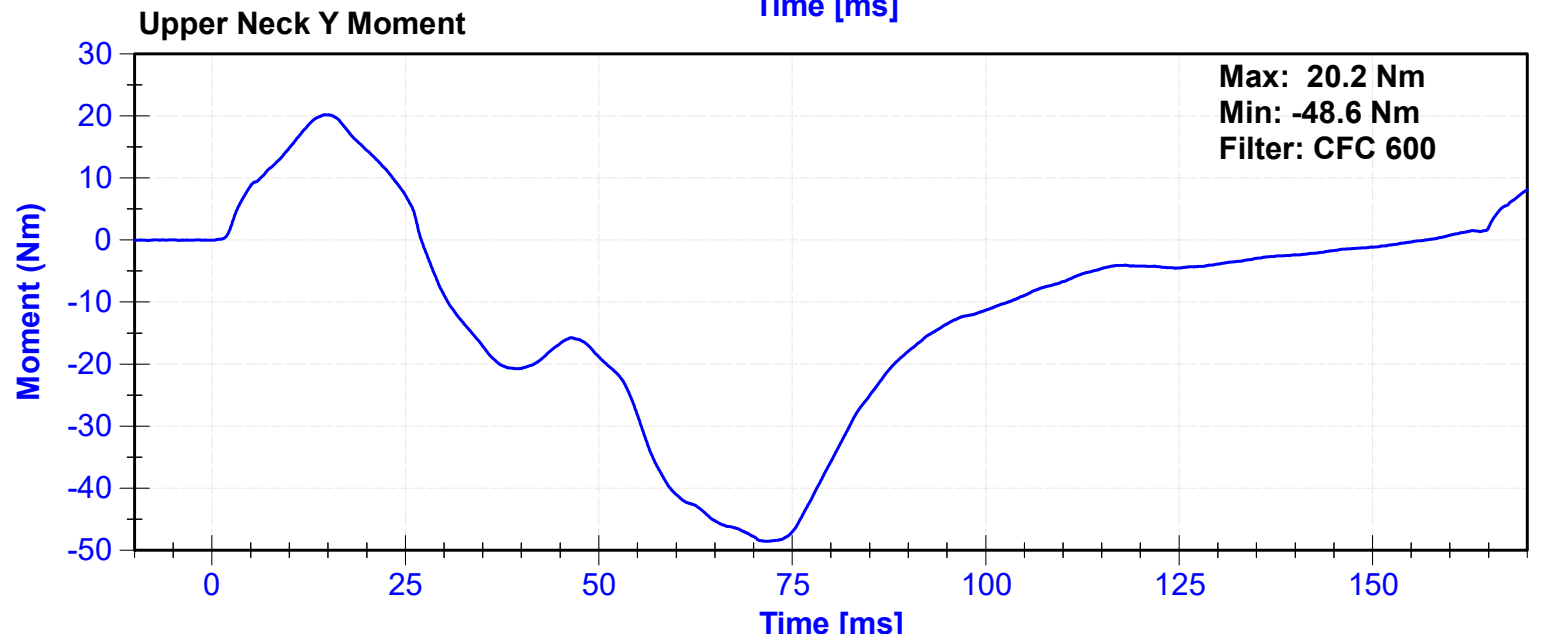
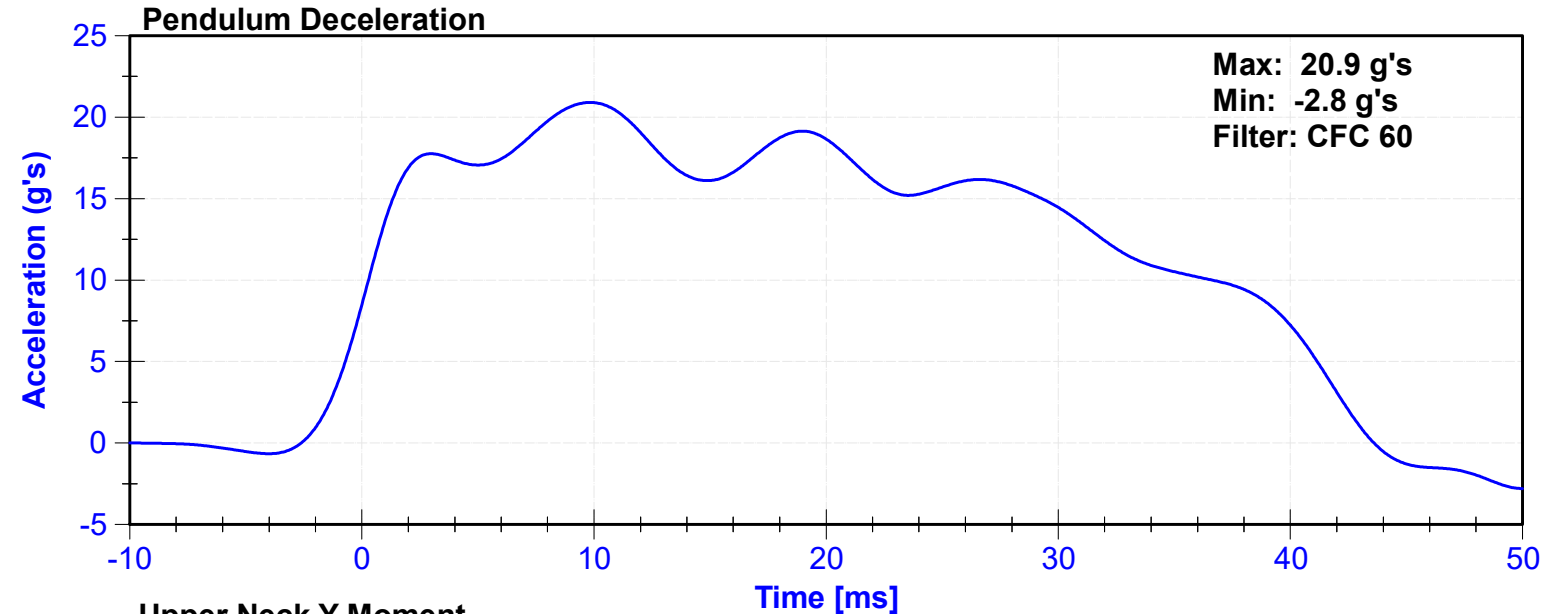
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	35	Pass
Velocity	5.95	6.19	m/s	6.002	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.70	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.48	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.05	Pass
D Plane Rotation	99	114	deg	103.6	Pass
Moment During Rotation Interval	-65	-53	Nm	-57.1	Pass
Moment Decay to -10Nm	94	114	ms	103.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/30/2024	4/28/2025
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025







ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

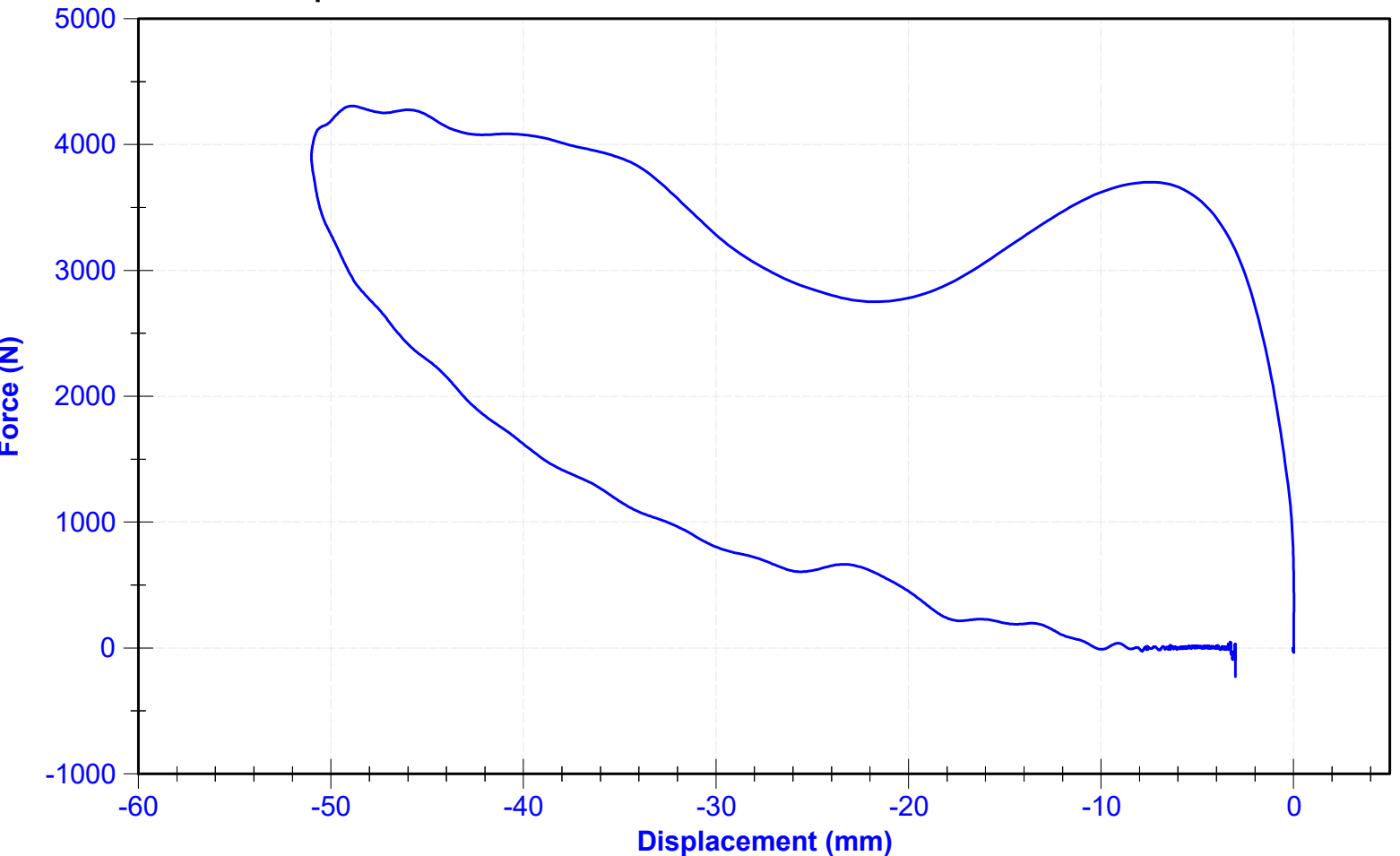
**Results**

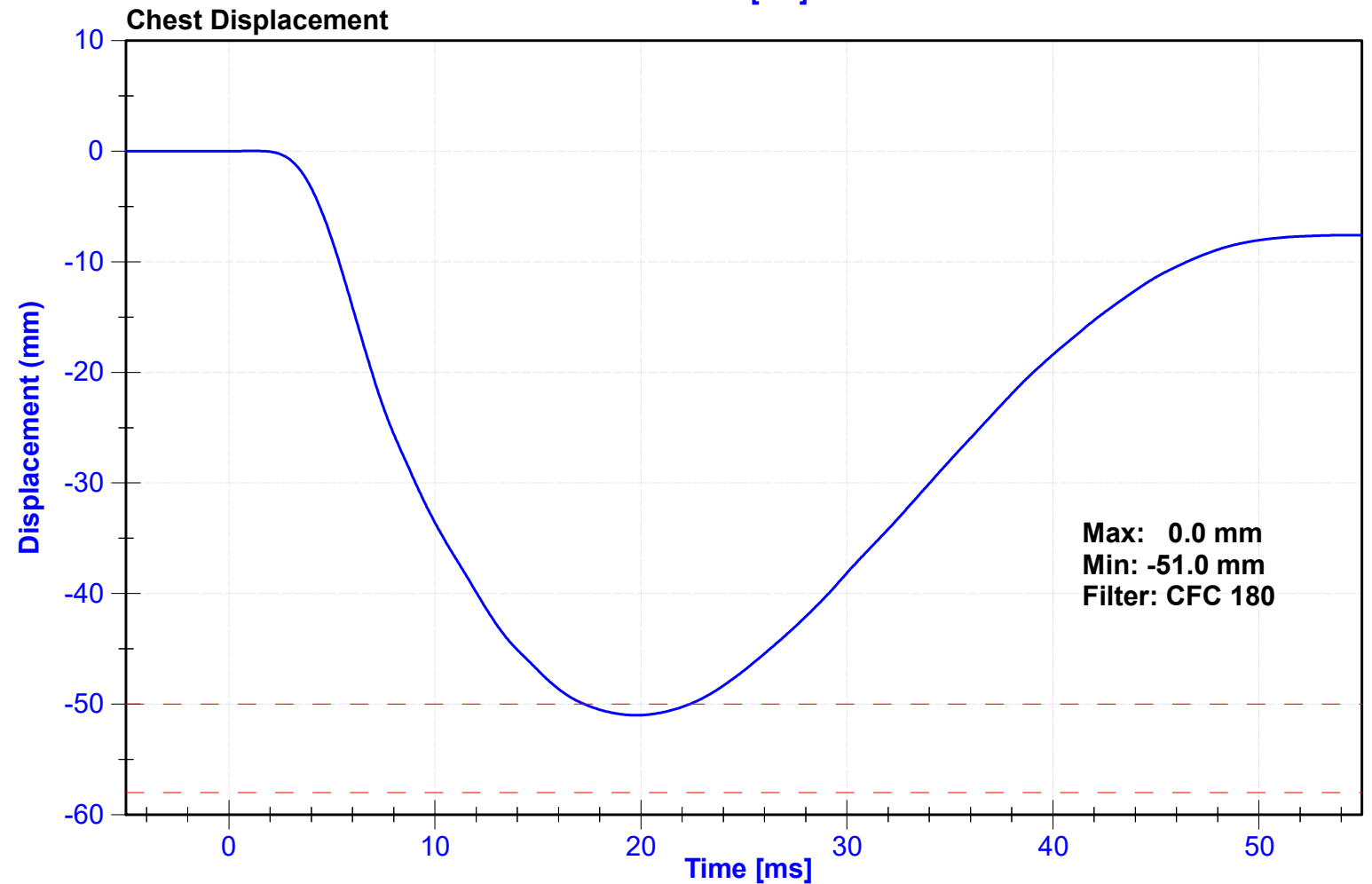
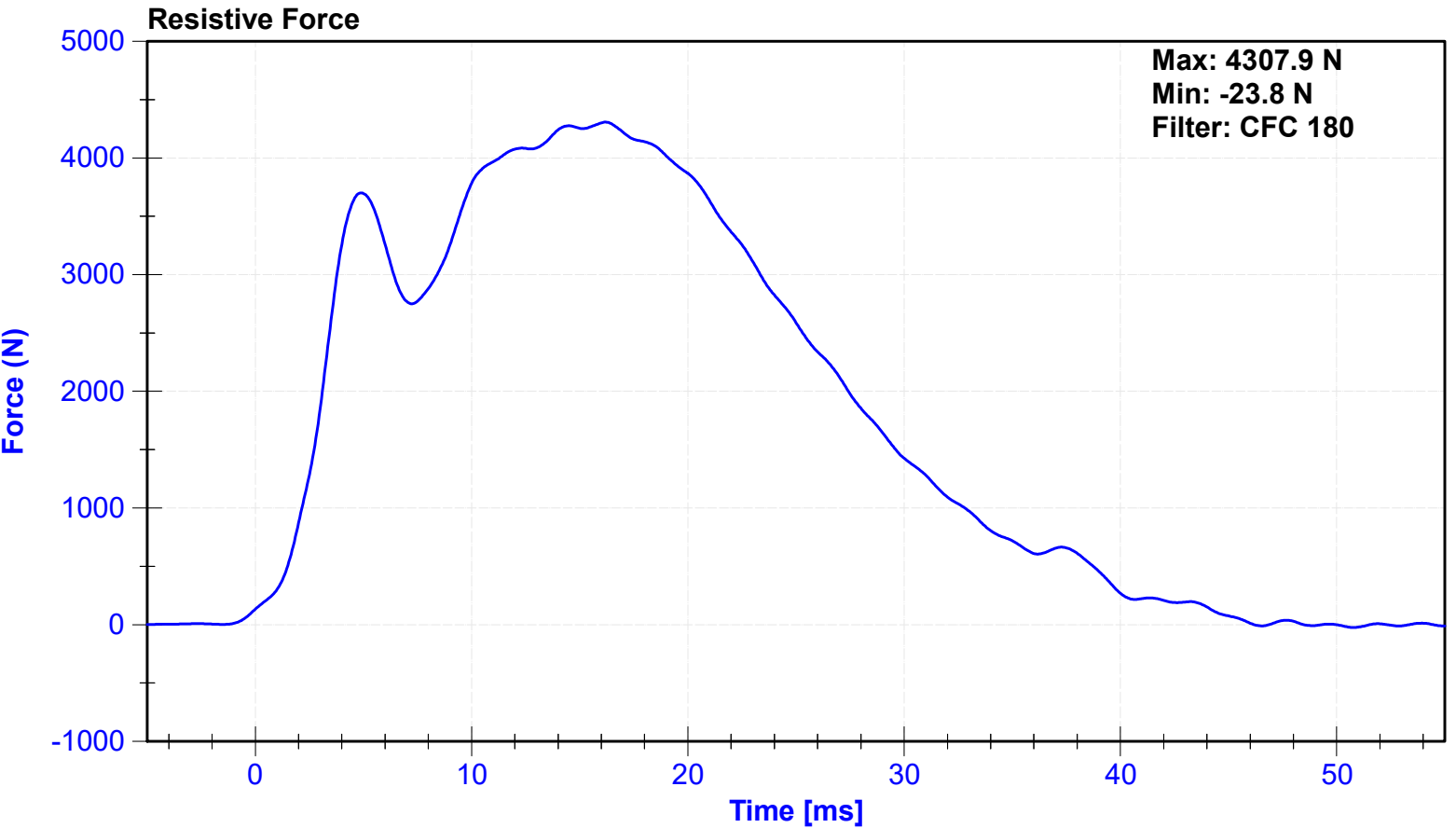
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	35	Pass
Velocity	6.59	6.83	m/s	6.686	Pass
Chest Deflection	-58	-50	mm	-51.0	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4192.7	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4307.9	Pass
Hysteresis	69	85	%	73.4	Pass

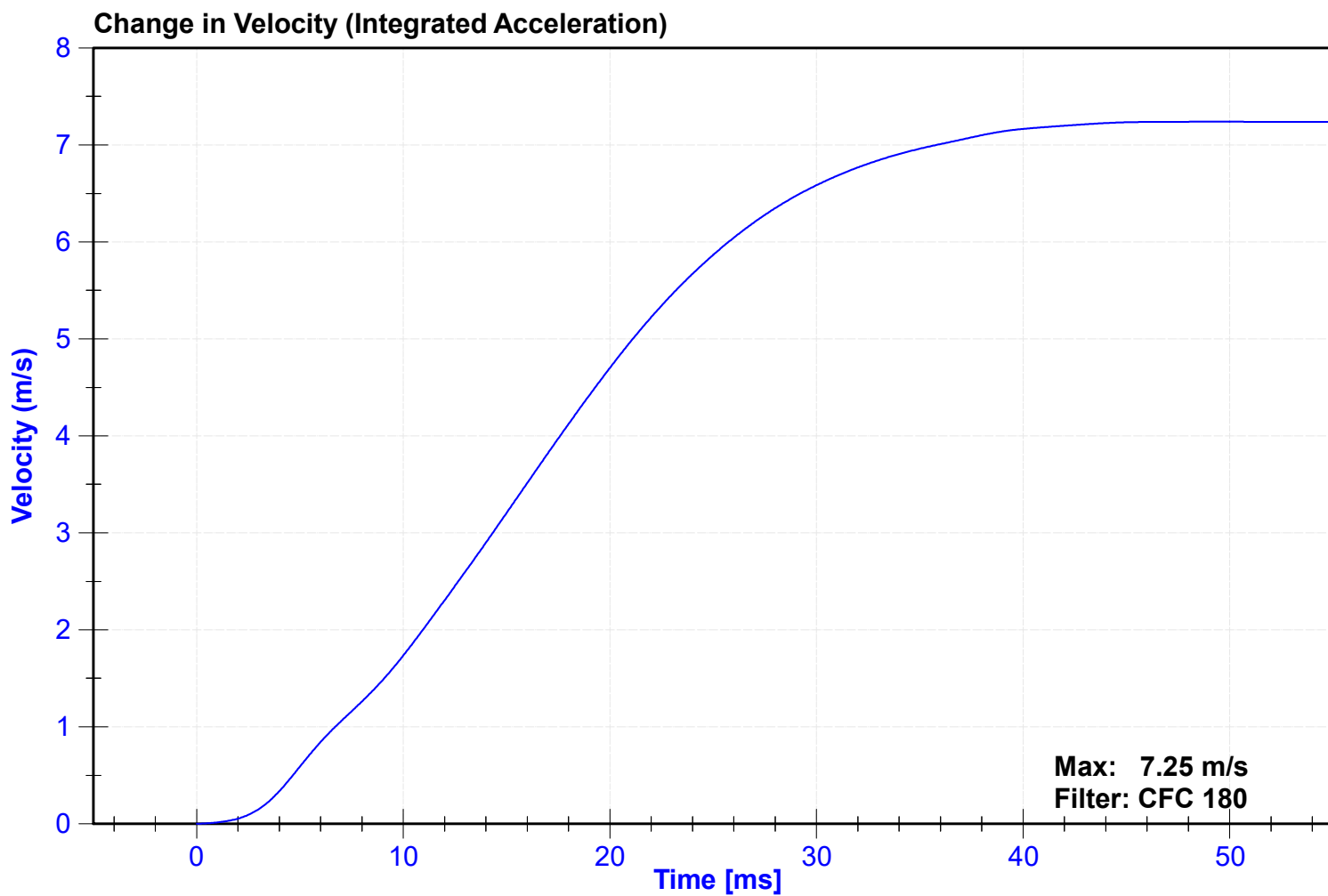
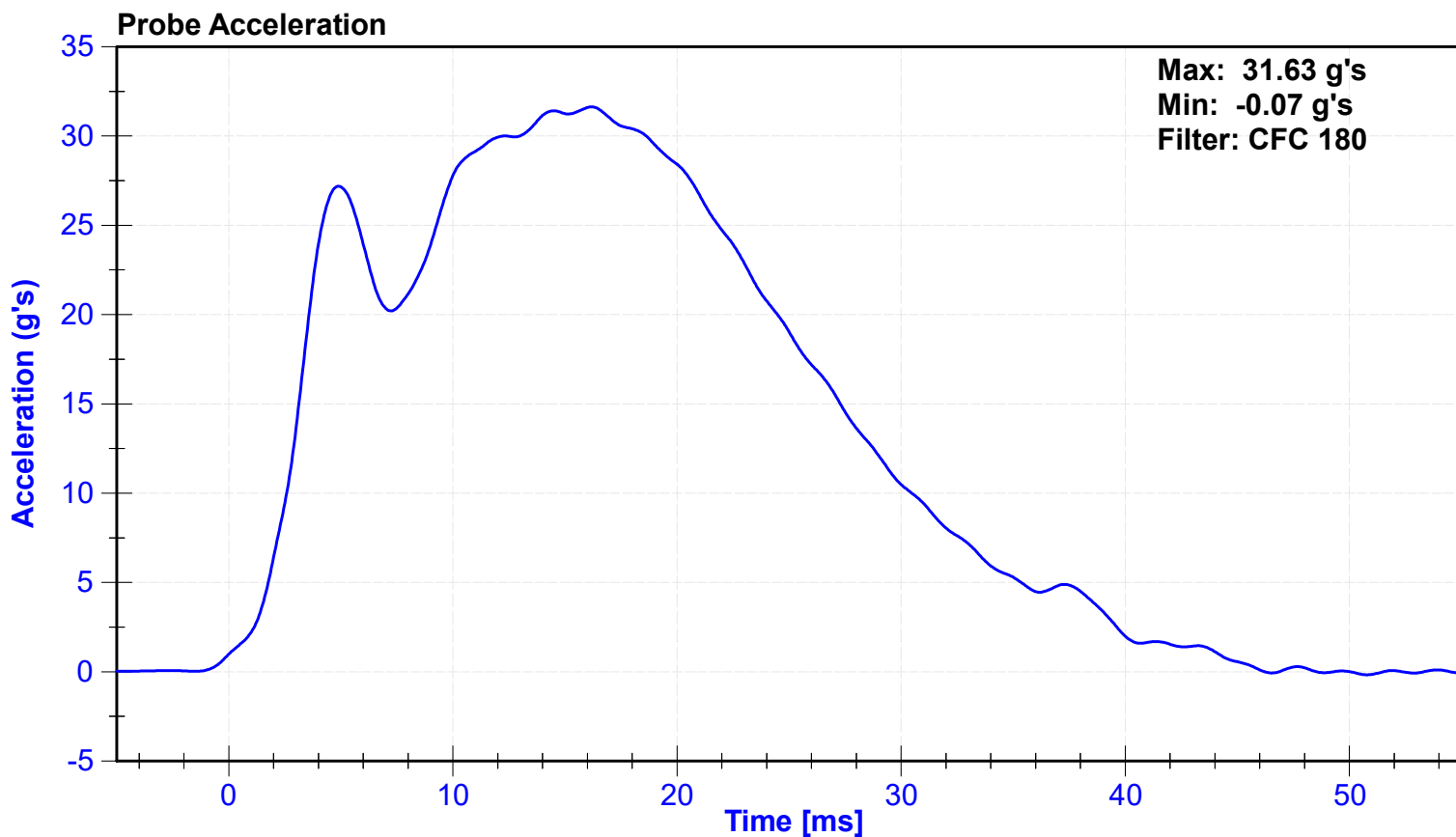
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18599	9/13/2024	3/12/2025
Chest Potentiometer	Servo	0720	8/19/2024	2/17/2025

**Force vs. Displacement**







ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

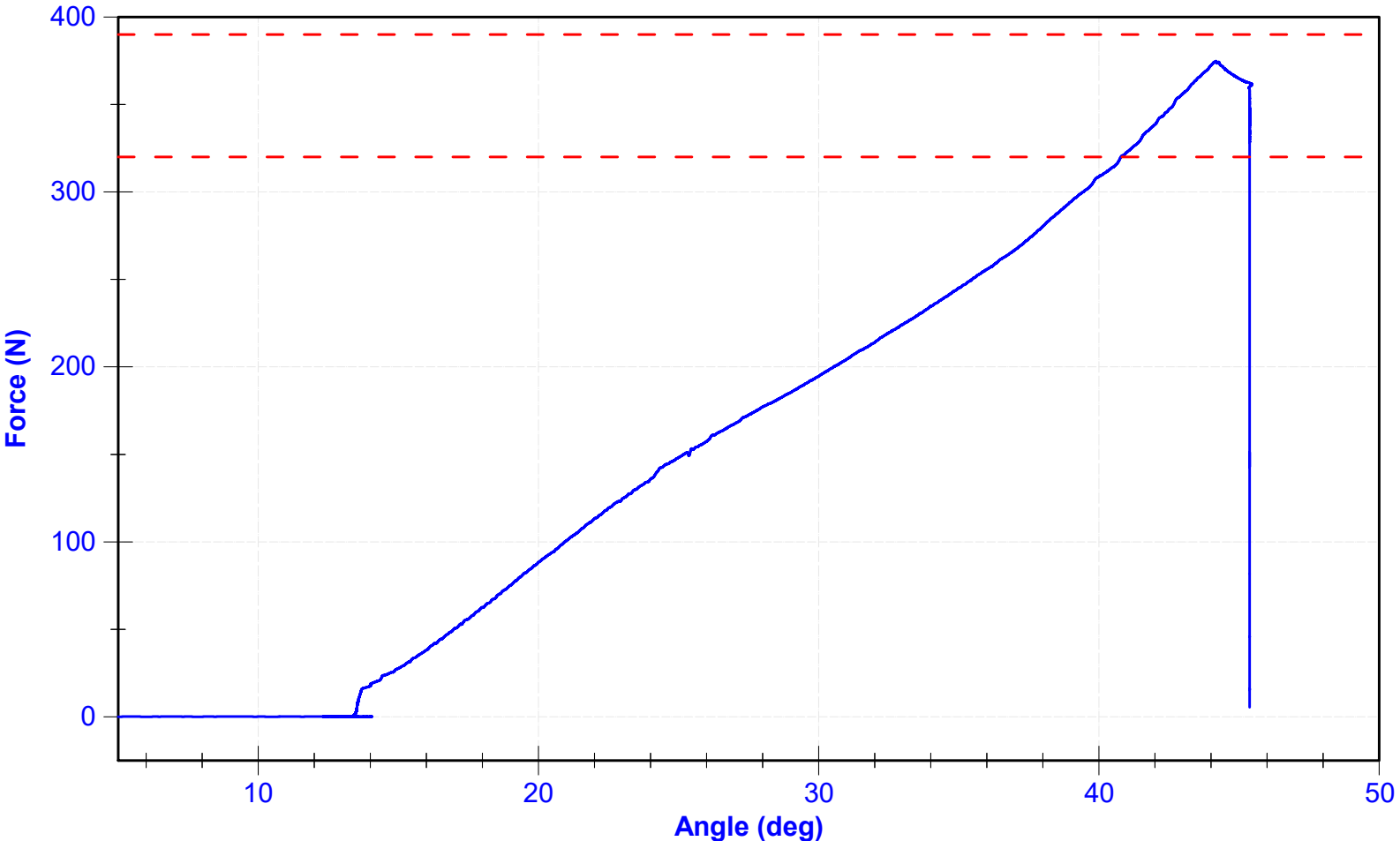
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	20.6	Pass
Humidity	10	70	%	35	Pass
Initial Angle	0	20	deg	13.1	Pass
Force at 45 Degrees	320	390	N	374.8	Pass
Return Angle Relative to Initial	0	8	deg	4.4	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker	DS-1905226	2024-11-16	2025-11-16
Load Cell	Interface	1134516	2023-11-30	2024-11-29

**Force vs. Displacement**



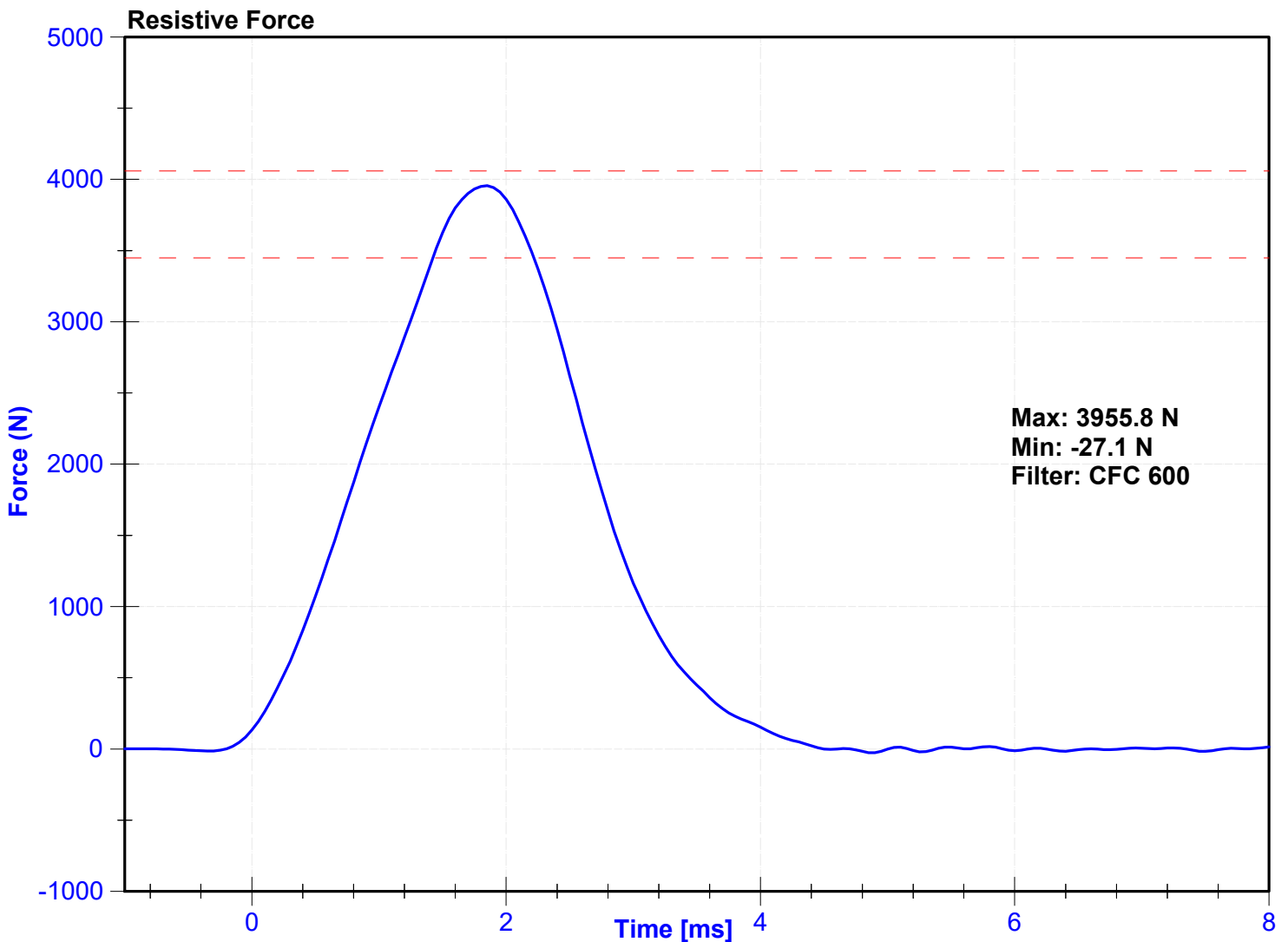
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

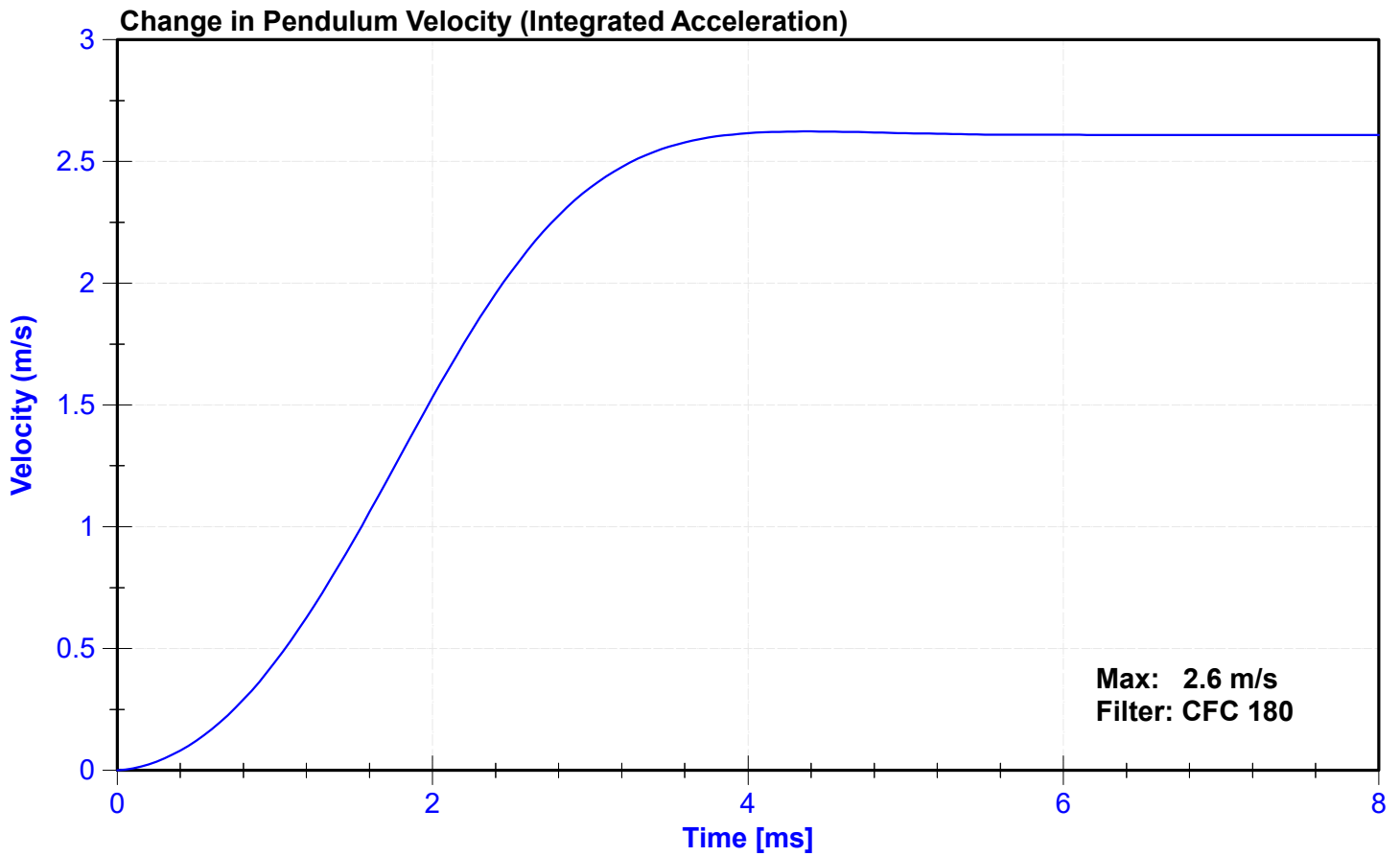
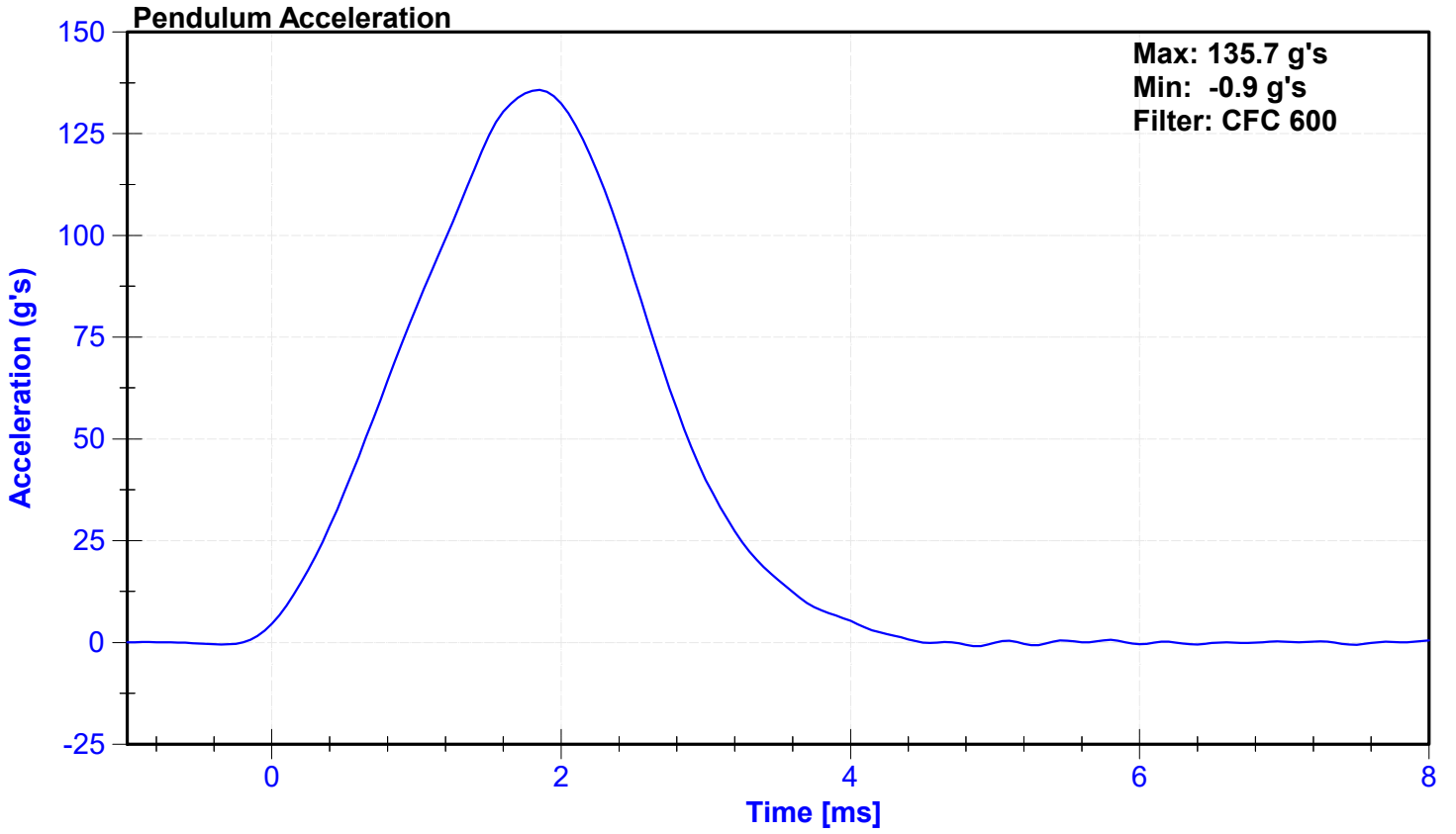
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.8	Pass
Humidity	10	70	%	41	Pass
Velocity	2.07	2.13	m/s	2.082	Pass
Resistive Force	3450	4060	N	3955.8	Pass

**Transducer Calibrations**

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





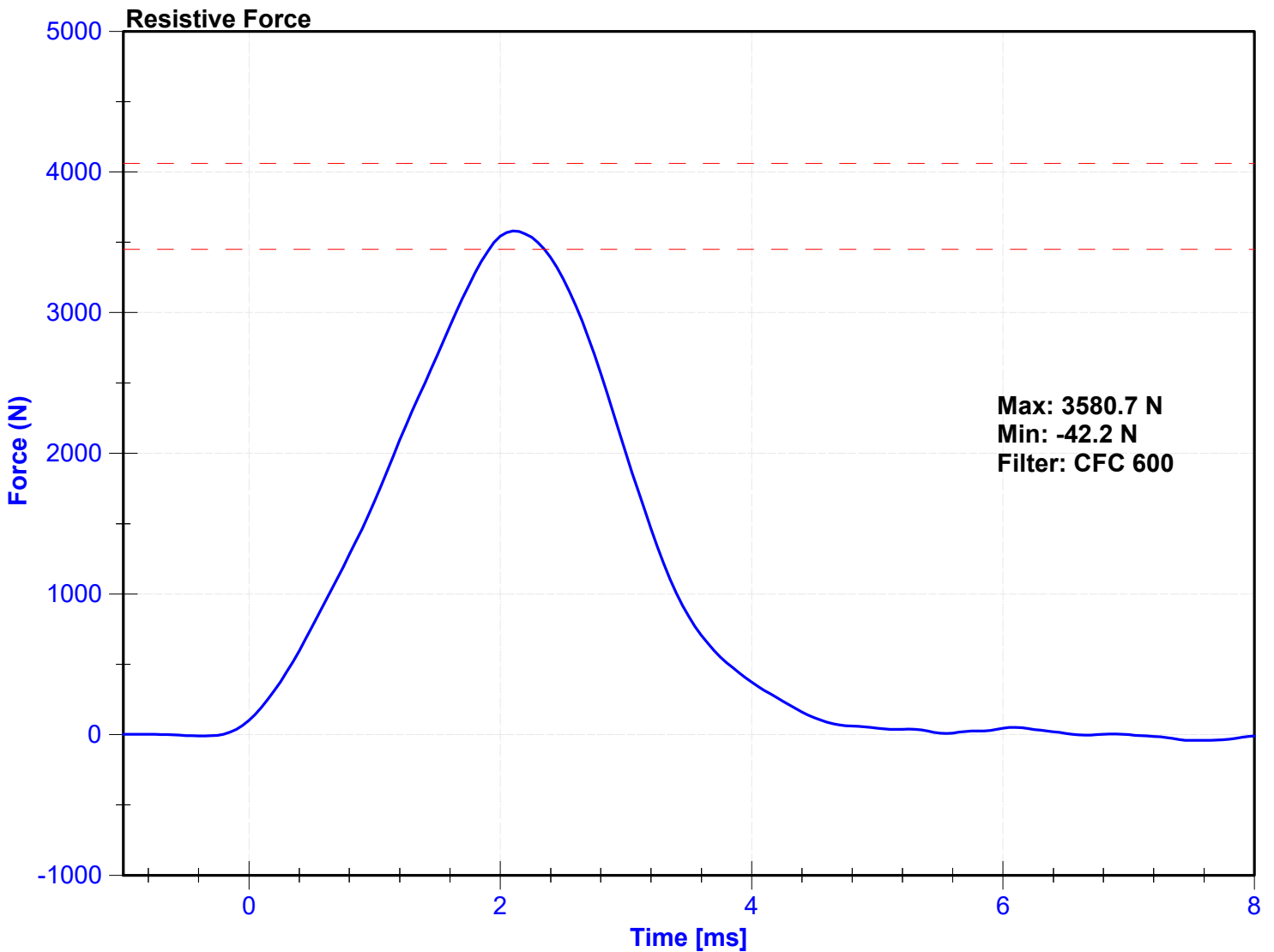
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

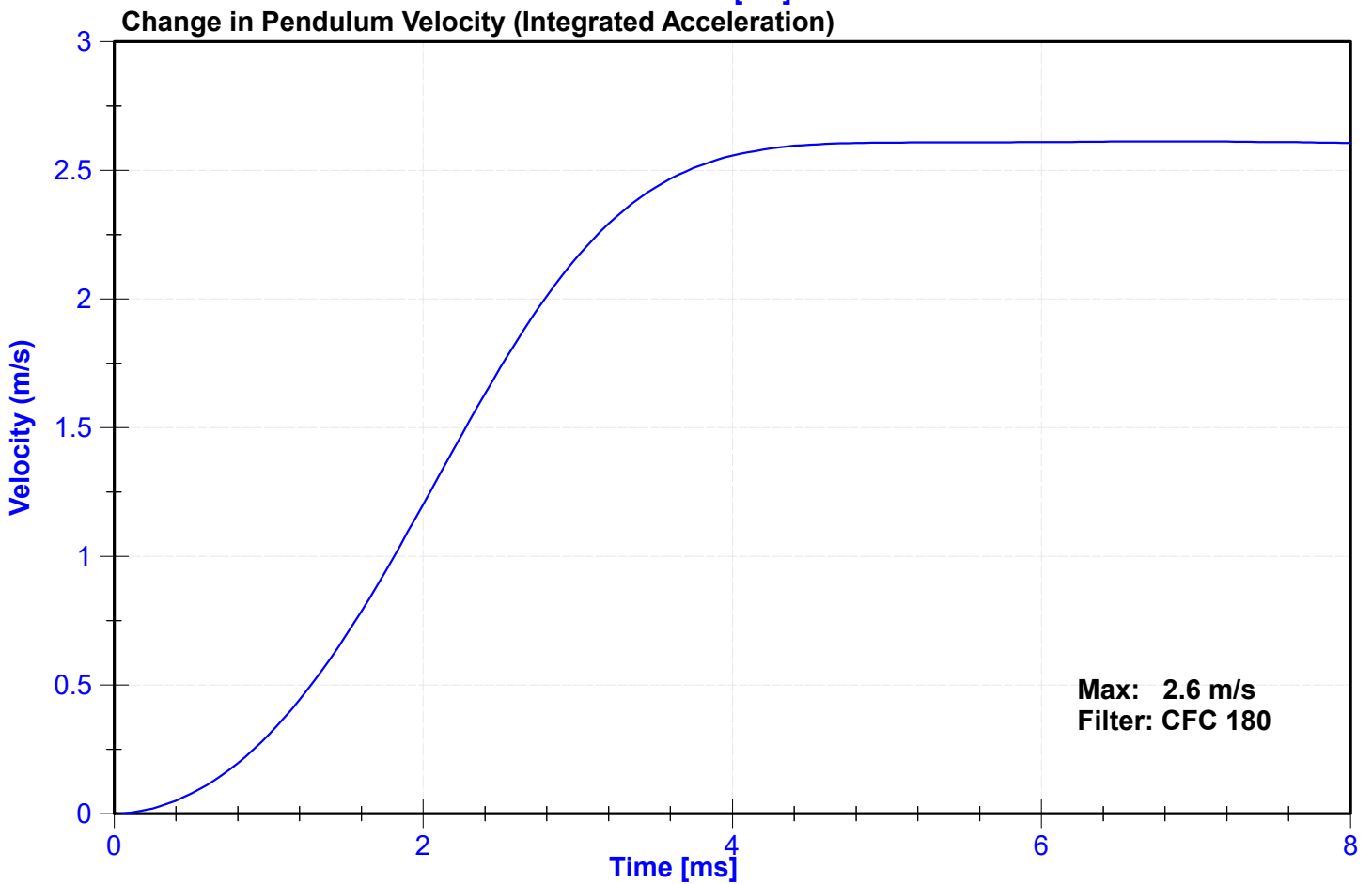
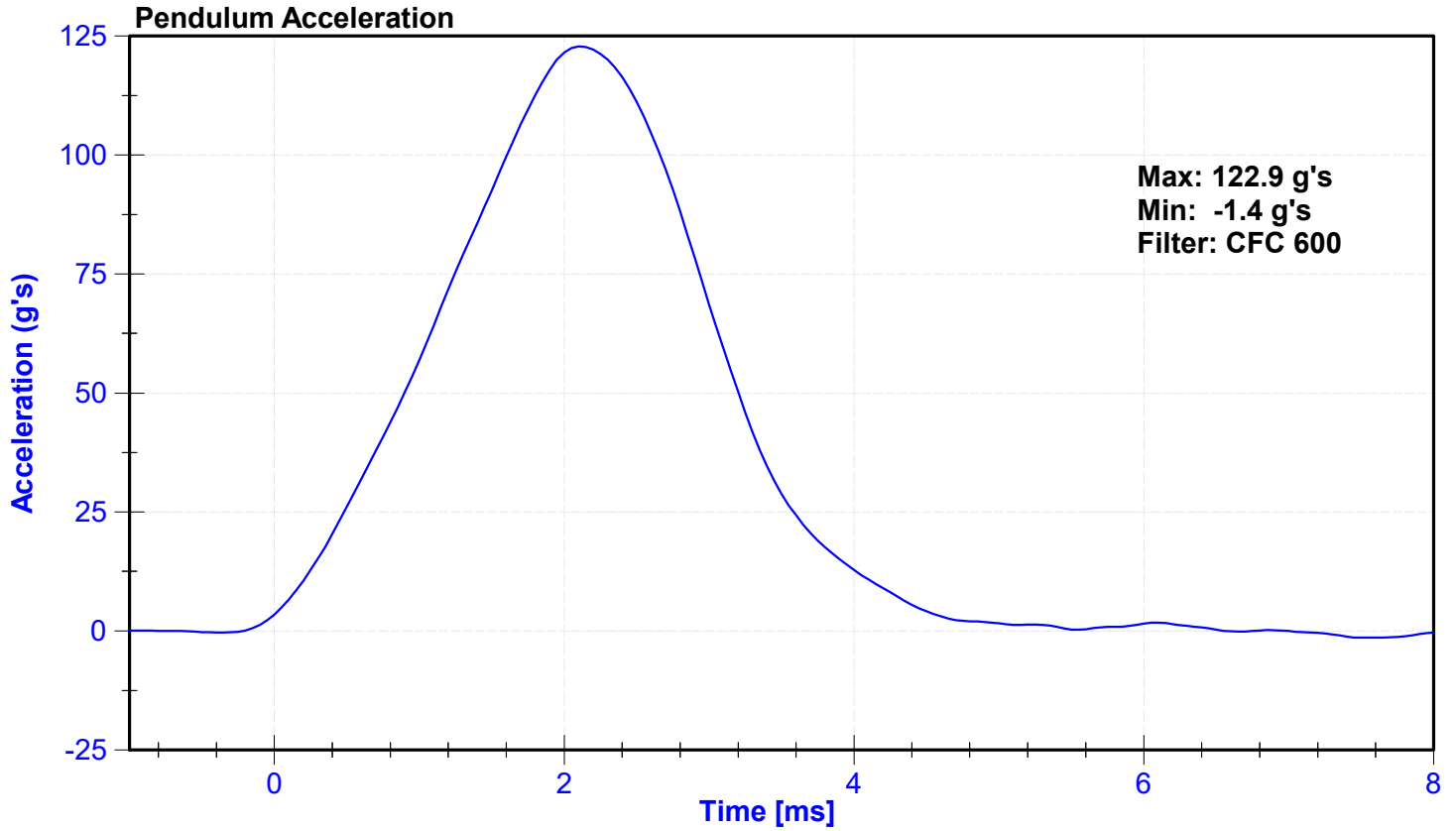
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.8	Pass
Humidity	10	70	%	41	Pass
Velocity	2.07	2.13	m/s	2.081	Pass
Resistive Force	3450	4060	N	3580.7	Pass

**Transducer Calibrations**

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





## APPENDIX D

### DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

**Table 1 – Driver Dummy Instrumentation**

Instrumentation		Axis/Location	Hybrid III 50 <sup>th</sup> S/N: 065		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	P52152	Endevco	10/31/2024
		Y	P58888	Endevco	10/31/2024
		Z	P58911	Endevco	10/31/2024
	Redundant	X	P52012	Endevco	10/31/2024
		Y	P51979	Endevco	10/31/2024
		Z	P49204	Endevco	10/31/2024
Head Angular Rate Sensors		X	21126	DTS ARS	07/31/2024
		Y	15697	DTS PRO-18K	07/31/2024
		Z	11335	DTS ARS	07/31/2024
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	851-FX	Humanetics	05/22/2024
Chest Accelerometers	Primary	X	P58887	Endevco	10/31/2024
		Y	P63840	Endevco	10/31/2024
		Z	P49197	Endevco	10/31/2024
	Redundant	X	P49213	Endevco	10/31/2024
		Y	P66917	Endevco	10/31/2024
		Z	P83313	Endevco	10/31/2024
Chest Potentiometer		X	1046	Servo	10/31/2024
Pelvis Accelerometer		X	P51699	Endevco	10/31/2024
		Y	P94090	Endevco	10/31/2024
		Z	P83437	Endevco	10/31/2024
Femur Load Cells - Left	Primary	Z	117-FZ1	Denton	05/22/2024
	Redundant	Z	117-FZ2	Denton	05/22/2024
Femur Load Cells - Right	Primary	Z	109-FZ1	Denton	05/22/2024
	Redundant	Z	109-FZ2	Denton	05/22/2024
Tibia Load Cells - Left	Upper	MX, MY, FZ	652-FZ	Denton	05/20/2024
	Lower	MX, MY, FZ	364-FZ	Denton	09/13/2024
Tibia Load Cells – Right	Upper	MX, MY, FZ	371-FZ	Denton	05/20/2024
	Lower	MX, MY, FZ	673-FZ	Denton	05/20/2024
Foot Accelerometers - Left	Rear	X	P69797	Endevco	10/31/2024
	Front	Z	P51729	Endevco	10/31/2024
Foot Accelerometers - Right	Rear	X	T20878	Endevco	10/31/2024
	Front	Z	P51685	Endevco	10/31/2024
Seat belt Load Cells	Lap		295	GFE	02/08/2024
	Shoulder		292	GFE	02/08/2024

**Table 2 – Front Passenger Dummy Instrumentation**

Instrumentation		Axis/Location	Hybrid III 5 <sup>th</sup> S/N: 137		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	P79417	Endevco	08/19/2024
		Y	P83335	Endevco	08/19/2024
		Z	P64149	Endevco	08/19/2024
	Redundant	X	P52008	Endevco	08/19/2024
		Y	P52045	Endevco	08/19/2024
		Z	P74774	Endevco	08/19/2024
Head Angular Rate Sensors		X	15696	DTS ARS	07/31/2024
		Y	14908	DTS ARS	07/31/2024
		Z	14909	DTS ARS	07/31/2024
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	2184-FX	Denton	07/10/2024
Chest Accelerometers	Primary	X	P58780	Endevco	08/19/2024
		Y	P83346	Endevco	08/19/2024
		Z	P49190	Endevco	08/19/2024
	Redundant	X	P58794	Endevco	08/19/2024
		Y	P69791	Endevco	08/19/2024
		Z	T11253	Endevco	08/19/2024
Chest Potentiometer		X	0720	Servo	08/19/2024
Pelvis Accelerometer		X	P58735	Endevco	08/19/2024
		Y	P77587	Endevco	08/19/2024
		Z	P51285	Endevco	08/19/2024
Femur Load Cells - Left	Primary	Z	DT0998-FZ1	Denton	05/22/2024
	Redundant	Z	DT0998-FZ2	Denton	05/22/2024
Femur Load Cells - Right	Primary	Z	DH3271-FZ1	Denton	05/22/2024
	Redundant	Z	DH3271-FZ2	Denton	05/22/2024
Tibia Load Cells - Left	Upper	MX, MY, FZ	476-FZ	Denton	05/20/2024
	Lower	MX, MY, FZ	363-FZ	Denton	05/20/2024
Tibia Load Cells – Right	Upper	MX, MY, FZ	361-FZ	Denton	05/20/2024
	Lower	MX, MY, FZ	359-FZ	Denton	05/20/2024
Foot Accelerometers - Left	Rear	X	P78959	Endevco	08/19/2024
	Front	Z	P83418	Endevco	08/19/2024
Foot Accelerometers - Right	Rear	X	P63998	Endevco	08/19/2024
	Front	Z	P80265	Endevco	08/19/2024
Seat belt Load Cells	Lap				
	Shoulder		168	Denton	06/21/2024

**Table 3 – Vehicle Instrumentation**

Instrumentation			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember/Rear Seat Accelerometers	Left	Primary	X	G23670	Endevco	10/14/2024
			Z	G25537	Endevco	10/14/2024
		Redundant	X	G23873	Endevco	10/14/2024
	Right	Primary	X	A280966	Measurement Specialties	10/21/2024
			Z	A315865	Measurement Specialties	10/21/2024
		Redundant	X	A284983	Measurement Specialties	10/21/2024
Engine Accelerometers	Top		X	G24607	Endevco	11/04/2024
	Bottom		X	G25228	Endevco	11/04/2024