REPORT NUMBER: NCAP-CAL-24-001

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

General Motors LLC
2024 Cadillac LYRIQ
5 Door SUV

NHTSA No: M20240119

PREPARED BY:
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December 9, 2024

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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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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7. Author(s) Quinn Porzio, Test Engineer Vanessa Hansen, Operations Manager		***8. Performing Organization Report No.*** CAL-DOT-2024-001
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16. Abstract

A 56.30 km/h (35 mph), NCAP frontal rigid barrier impact test was conducted on a 2024 Cadillac LYRIQ 5 Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. This test was conducted to obtain data related to FMVSS Nos. 208, 212, 219 (partial), 301, and 305 performance. The test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on May 15, 2024.

The impact velocity of the vehicle was 56.44 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 617 mm at vehicle centerline. The test vehicle's occupant performance data is as follows:

Measurement Description	Units	Driver ATD (Serial No. 065)		Passenger ATD (Serial No. 137)	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC15)		700	183.225	700	258.736
Maximum Chest Compression	mm	63	-25.837	52	-14.571
Nij		1	0.188	1	0.436
Neck Tension	N	4170	802.615	2620	667.285
Neck Compression	N	4000	-106.207	2520	-241.674
Left Femur Force	N	10008	-425.812	6805	-1010.181
Right Femur Force	N	10008	-563.746	6805	-1177.562

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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 dated May 2018.

SUMMARY

A load cell barrier consisting of 128 load cells was impacted by a 2024 Cadillac LYRIQ 5 Door SUV at a velocity of 56.44 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on May 15, 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, 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th 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 and passenger's lap and shoulder belts 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 486 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/electrolyte leakage after the event or during any phase of the static rollover. The maximum static crush of the vehicle was 617 mm and both driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver's head contacted the frontal airbag, the sun visor, 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 and lower torso contacted the frontal airbag. Both knees contacted the knee airbag.

The occupant data is summarized below.

ATD Position	HIC_{15}	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50th)	183.225	0.188	802.615	-106.207	39.134	-25.837	-425.812	-563.746
Passenger (5th)	258.736	0.436	667.285	-241.674	41.777	-14.571	-1010.181	-1177.562

GENERAL COMMENTS:

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

Data Anomalies:

- Engine Bottom X Acceleration, Exceeded calibration range and saturated at 58.3 ms

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 FMVSS 212, 219 (Partial) and 301 Data

Data Sheet No. 16 – FMVSS 301 Static Rollover Results

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

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

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

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

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

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

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20240119	Traction Control System (TCS)	Yes
Model Year	2024	Power Steering	Yes
Make	Cadillac	Power Window Auto-Reverse	Yes
Model	LYRIQ	Driver Frontal Airbag	Yes
Body Style	5 Door SUV	Driver Curtain Airbag	Yes
VIN	1GYKPPRL2RZ113395	Driver Head/Torso Airbag	No
Body Color	Argent Silver Metallic	Driver Torso Airbag	No
Odometer Reading (km /mi)	32 miles	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	N/A	Driver Pelvis Airbag	No
Type / No. Cylinders	Electric Vehicle	Driver Knee Airbag	Yes
Engine Placement	Transverse	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	Direct Drive	Front Pass. Head/Torso Airbag	No
Overdrive	No	Front Pass. Torso Airbag	No
Final Drive	All Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	Yes	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other –	N/A

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

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors LLC	GVWR (KG)	3175
Date of Manufacture	11/23	GVWR Front (KG)	1550
		GVWR Rear (KG)	1700

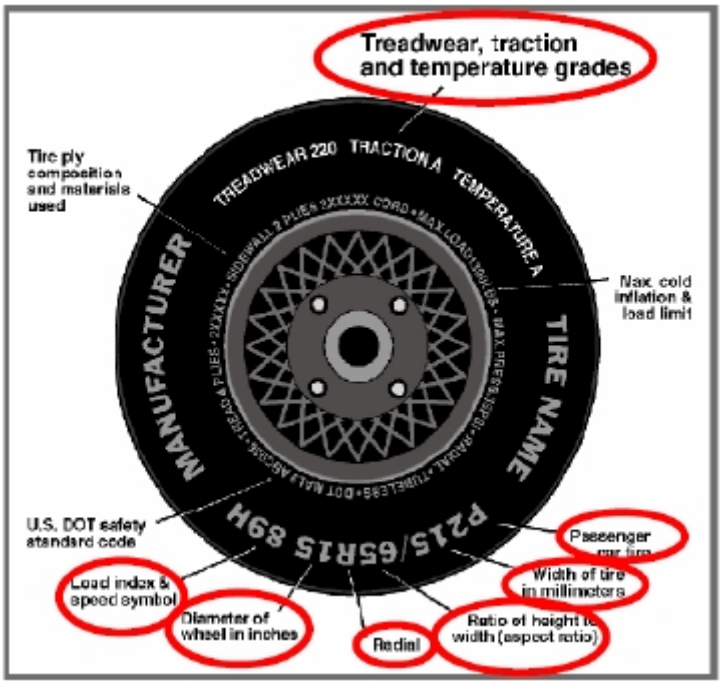
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	N/A	
Number of Occupants	2	3	N/A	5
Capacity Wt. (VCW) (kg)				519
Cargo Wt. (RCLW) (kg)				136
DSC x 68.0 kg				340

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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

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)	290	290
Recommended Tire Size	265/50R20	265/50R20
Tire Size on Vehicle	265/50R20	265/50R20
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy	Primacy
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	107H	107H
Tire Material	Rubber	Rubber
DOT Safety Code Left	03LUR01AX2523	03LUR01AX2423
DOT Safety Code Right	03LUR01AX2523	03LUR01AX3423

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

Test Vehicle: 2024 Cadillac LYRIQ 5 Door SUV
NHTSA No.: M20240119
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 05/15/2024

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	680	649		741	742	
Right	kg	654	659		686	744	
Ratio	%	50.5	49.5		49.0	51.0	
Total	kg	1334	1308	2642	1427	1486	2913

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2642	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	142	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	136	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2920	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	887	889	929	921	1531
As Tested	mm	879	879	896	897	1578
Post-Test	mm	854	857	902	888	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3093
Total Vehicle Length at Left Side	mm	4865
Total Vehicle Length at Centerline	mm	4997
Total Vehicle Length at Right Side	mm	4865
Weight of Ballast in Cargo Area	kg	68
Weight of Vehicle Components Removed	kg	30
Amount of Stoddard Solvent in Fuel Tank	L	Electric Vehicle

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting, rear underbody shields, and charging kit

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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	4997
2	Total Width	1957
3*	Bumper Top Height	616
4*	Bumper Bottom Height	522
5*	Longitudinal Member Top Height	863
6	Distance Between Longitudinal Members	1252
7	Longitudinal Member Width	98
8*	Engine Top Height	871
9*	Engine Bottom Height	664
10	Engine and Gearbox Width	385
11	Front Bumper-Engine Distance	650
12*	Front Shock Absorber Fixing Height	909
13*	Bonnet Leading Edge Height	886
14	Front Shock Absorber Fixing Width	929
15	Front Bumper – Front Axle Distance	900
16	Front Axle – A Pillar Distance	670
17	A-Pillar – B-Pillar Distance	1208
18	B-Pillar – Rear Axle Distance	1216
19	B-Pillar – C-Pillar Distance	994
20*	Roof Sill Bottom Height	1526
21*	Roof Sill Top Height	1570
22*	Floor Sill Bottom Height	385
23*	Floor Sill Top Height	457

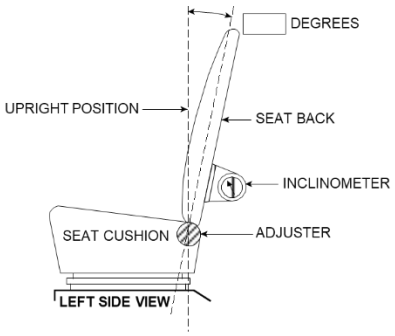
*Height Measurements are taken from the ground
Note: All measurements are in millimeters

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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

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.



FRONT SEAT ASSEMBLY

Seating Position	Degrees
Driver Seat Back Angle	-0.2
Passenger Seat Back Angle	5.8

SEAT FORE / AFT POSITIONS

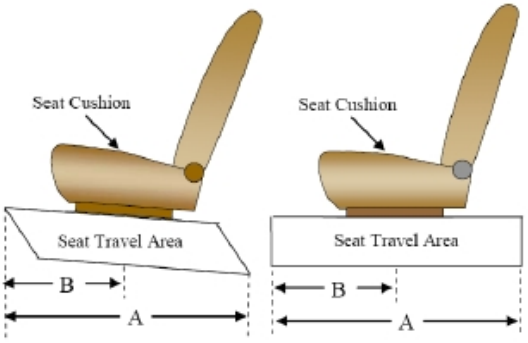
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	340	170
Passenger Seat	328	0

SEAT BELT UPPER ANCHORAGE

The driver's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 50th percentile adult male ATD. The passenger's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 5th 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

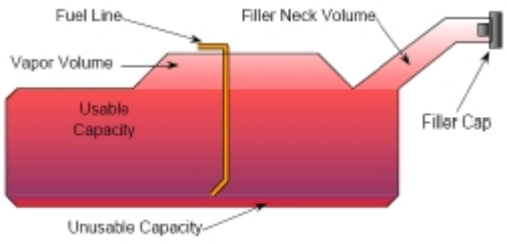
Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	
Usable Capacity of "Optional Tank"	
92%-94% of Usable Capacity	
Actual Amount of Solvent Used	Electric Vehicle
1/3 of Usable Capacity	

FUEL PUMP

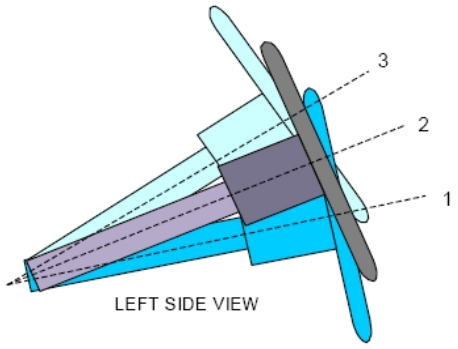
The vehicle is equipped with an electric charge port located on the left front of the vehicle.



VEHICLE FUEL TANK ASSEMBLY

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.



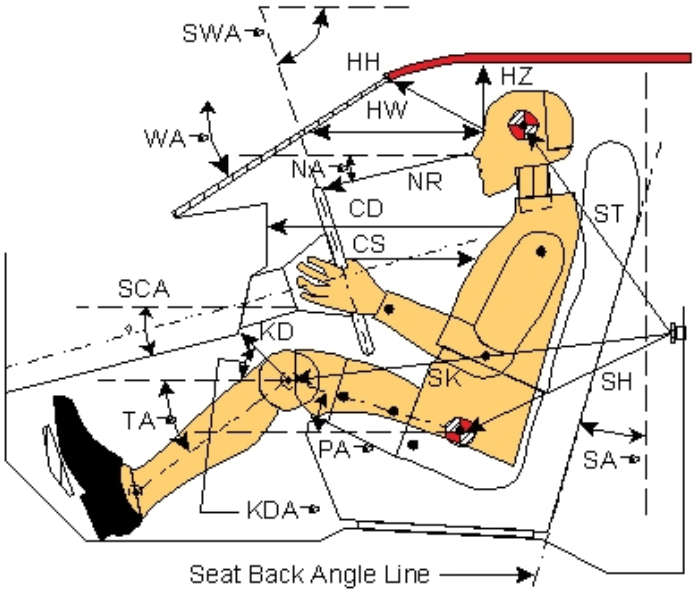
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	15.7	
Geometric center position No. 2	17.8	
Uppermost position No. 3	19.8	
Telescoping Steering Wheel Travel		54
Test Position	17.8	27

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

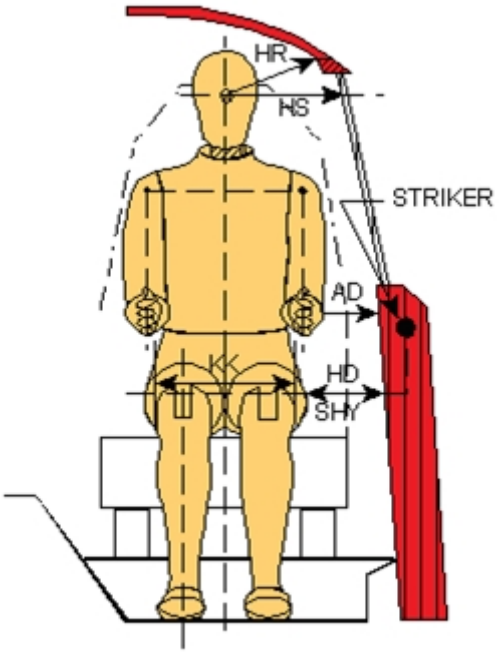


Left Side View

Code	Measurement Description	Driver (SN: 065)		Passenger (SN: 137)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		27.0		
SWA°	Steering Wheel Angle		17.8		
SCA°	Steering Column Angle		72.2		
SA°	Seat Back Angle (on headrest post)		0.2		5.8
HZ	Head to Roof (Z)	286	90	220	90
HH	Head to Header	397	30.3	317	53.6
HW	Head to Windshield	790	0.1	713	0.0
NR	Nose to Rim / Dash	390	9.3	431	26.0
CD	Chest to Dash	579		370	
CS	Chest to Steering Hub	335	3.0		
RA	Rim to Abdomen	213	0.1		
KDL	Left Knee to Dash	223	27.65	148	35.9
KDR	Right Knee to Dash	211	22.0	152	35.1
PA°	Pelvic Angle		24.75		20.0
TA°	Tibia Angle		52.55		39.1
SK	Striker to Knee	594	3.75	735	8.0
ST	Striker to Head	463	8.0	495	62.1
SH	Striker to H-Point	283	38.0	409	22.6

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

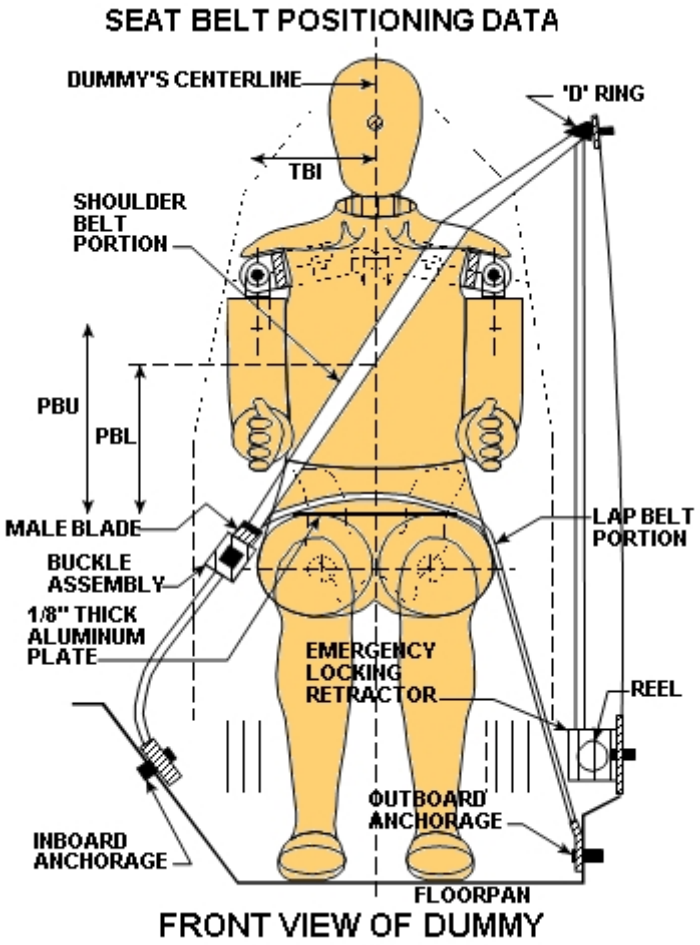


Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	33	114
HD	H-Point to Door	142	173
HR	Head to Side Header	243	265
HS	Head to Side Window	396	407
KK	Knee to Knee	315	212
SHY	Striker to H-Point (Y Direction)	276	330
AA	Ankle to Ankle	346	165

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	312	290
PBL — Top surface of reference to belt lower edge	mm	236	210

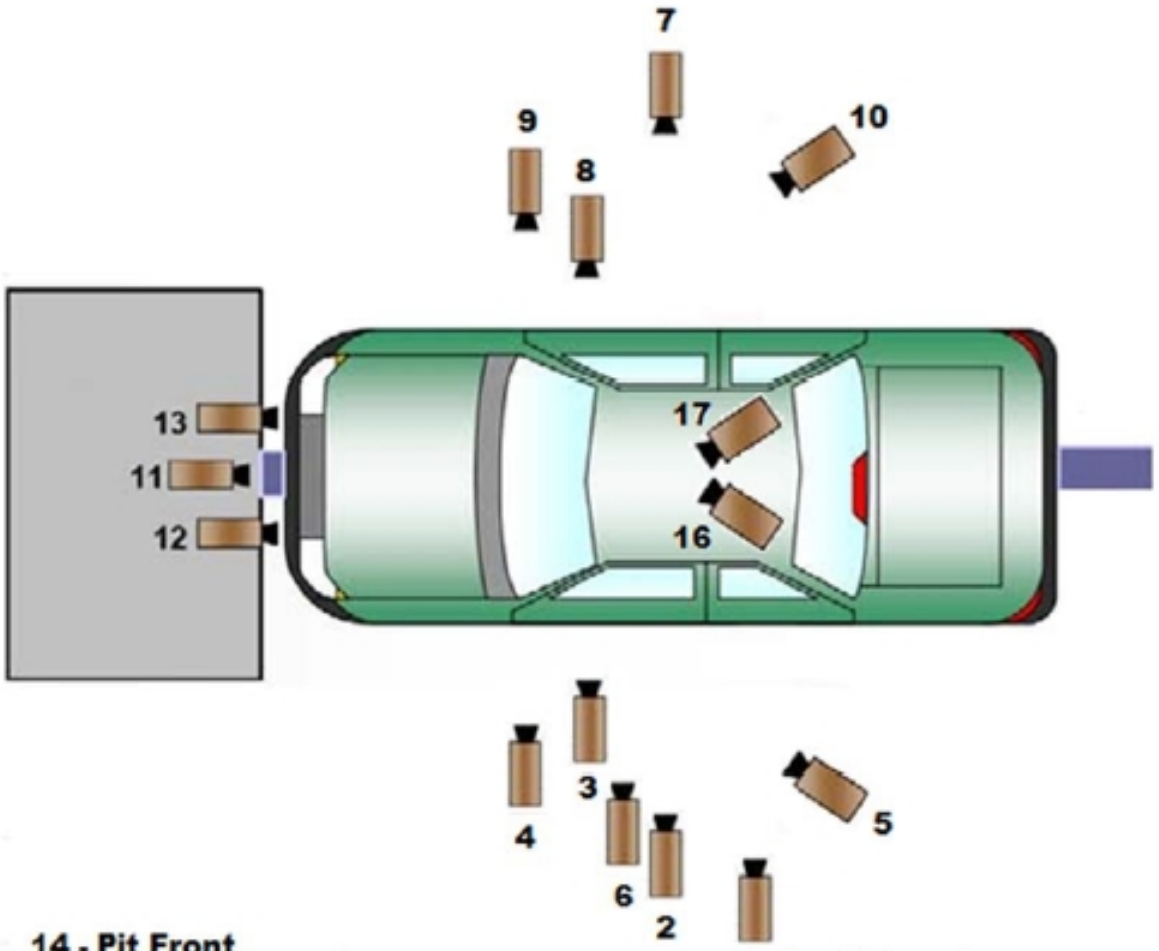
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	875	975
Lap Belt Length as measured on ATD	mm	546	650
Remainder of belt on reel	mm	989	745
Total belt length for continuous webbing systems	mm	2410	2370

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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2024 Cadillac LYRIQ 5 Door SUV NHTSA No.: M20240119
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/15/2024

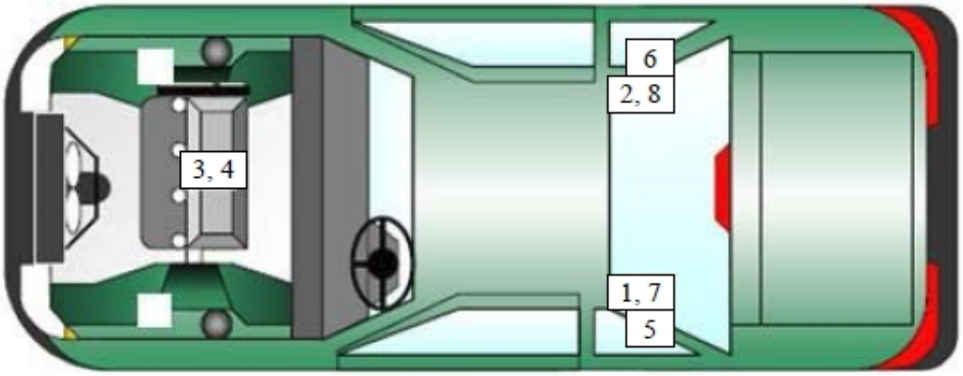
CAMERA LOCATIONS

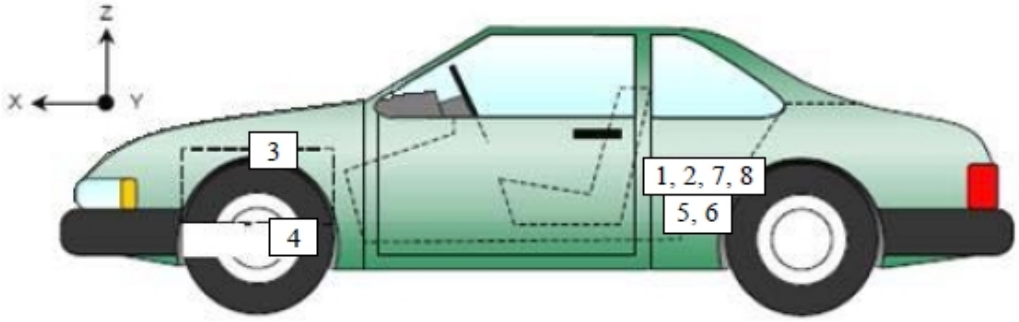
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall				Zoom	60
2	Left Overall	-1881	-8724	-1515	24	1000
3	Driver Close-Up	-1320	-7520	-1435	50	1000
4	Left Front Half	-800	-7325	-1470	28	1000
5	Left Angle	-4250	-5220	-2400	50	1000
6	Steering Column	-1250	-8450	-2450	75	1000
7	Right Overall	-1955	7980	-1540	24	1000
8	Passenger Close-Up	-1380	7100	-1450	50	1000
9	Right Front Half	-1100	7120	-1460	28	1000
10	Right Angle	-4300	4897	-2490	50	1000
11	Windshield	1820	0	-4150	12.5	1000
12	Driver Windshield	1670	-400	-2100	25	1000
13	Passenger Windshield	1670	400	-2100	25	1000
14	Pit Front	-1190	0	1970	12.5	1000
15	Pit Rear	-3044	0	1970	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 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1835	-374	171
2	Right Rear Accelerometer – X Direction	1836	332	168
3	Engine Top X	4280	49	-180
4	Engine Bottom X	4620	-53	345
5	Left Rear Accelerometer – Z Direction	1835	-374	171
6	Right Rear Accelerometer – Z Direction	1836	332	168
7	Left Rear Accelerometer – X Direction Redundant	1836	-388	172
8	Right Rear Accelerometer – X Direction Redundant	1836	341	169

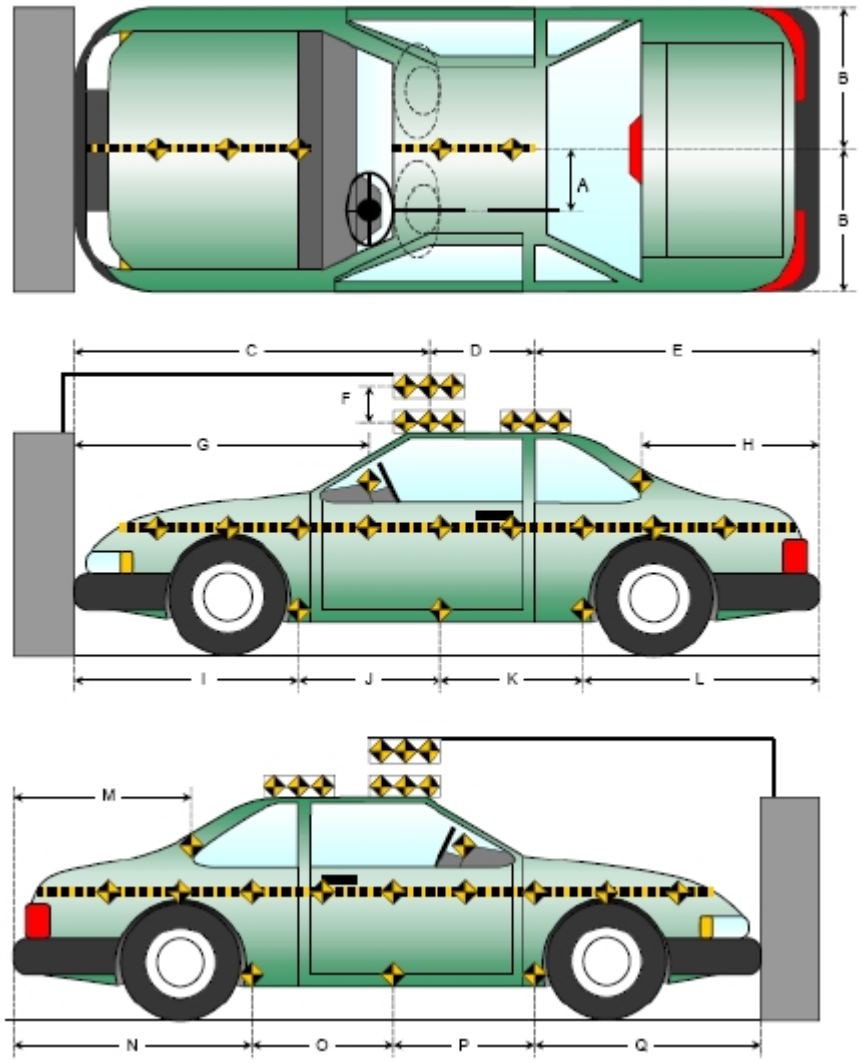
Reference Points: *X – Rear Surface of Vehicle (+ forward)*
Y – Vehicle Centerline (+ to right)
Z – Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

Item	Value
A	401
B	979
C	2985
D	609
E	1403
F	294
G	1934
H	1161
I	1434
J	1028
K	1025
L	1510
M	1163
N	1509
O	1030
P	1025
Q	1433

All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

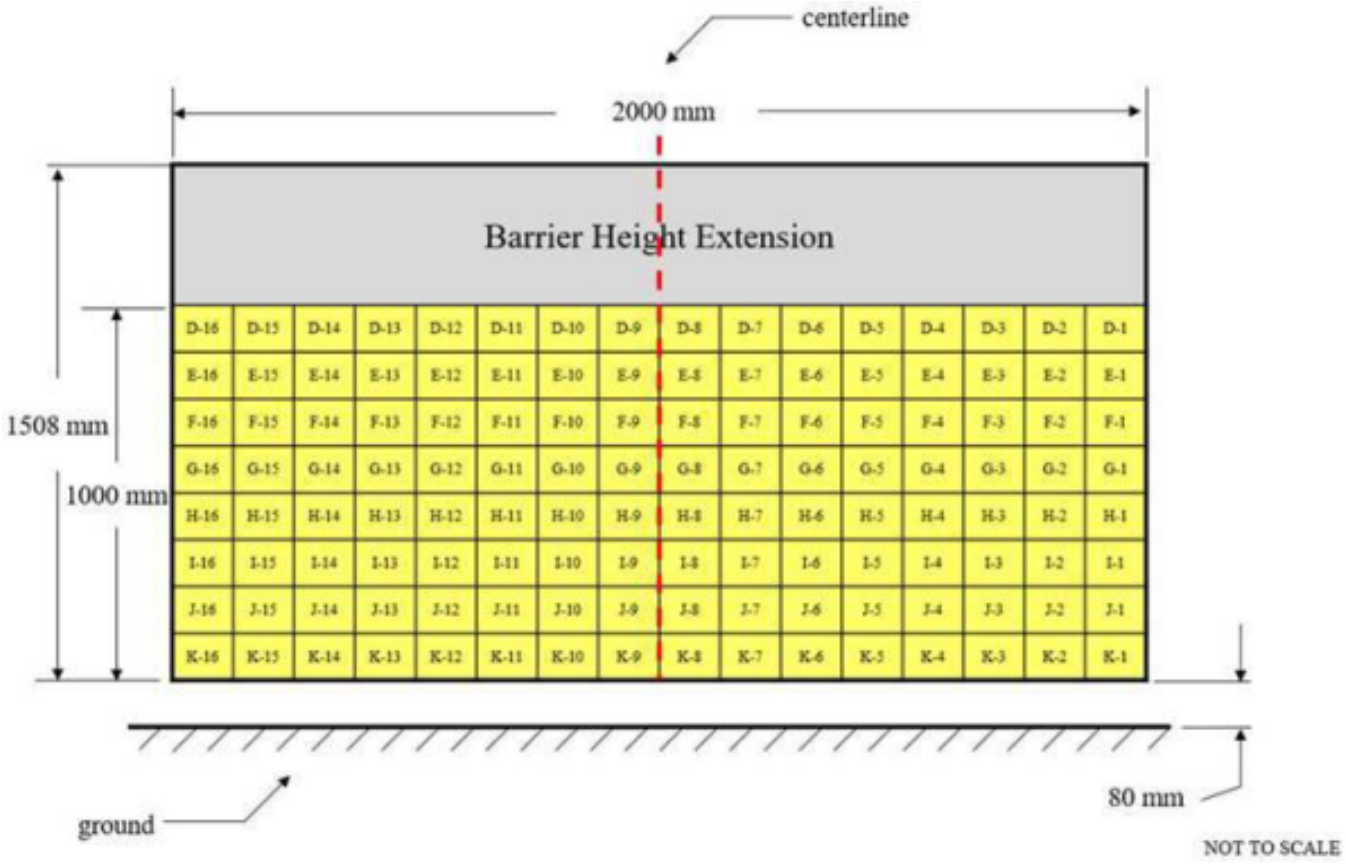


Figure 1 - Load Cell Locations on a 128-Load Cell Barrier with Plywood Height Extension*
Please note above diagram is not actual representation of load cell barrier used.

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	47
Passenger Dummy Accelerometers	47
Vehicle Structure Accelerometers	8
Load Cell Barrier	384
Total	486

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 Cadillac LYRIQ 5 Door SUV NHTSA No.: M20240119
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/15/2024

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII-50 / SN:065	HIII-05 / SN:137
Head Contact	Frontal Airbag, Sun Visor & Head Restraint	Frontal Airbag & Head Restraint
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	None	Frontal Airbag
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

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	None
Window Damage	None
Other	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	701
Center	mm	789
Right Side	mm	774
Average	mm	755

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

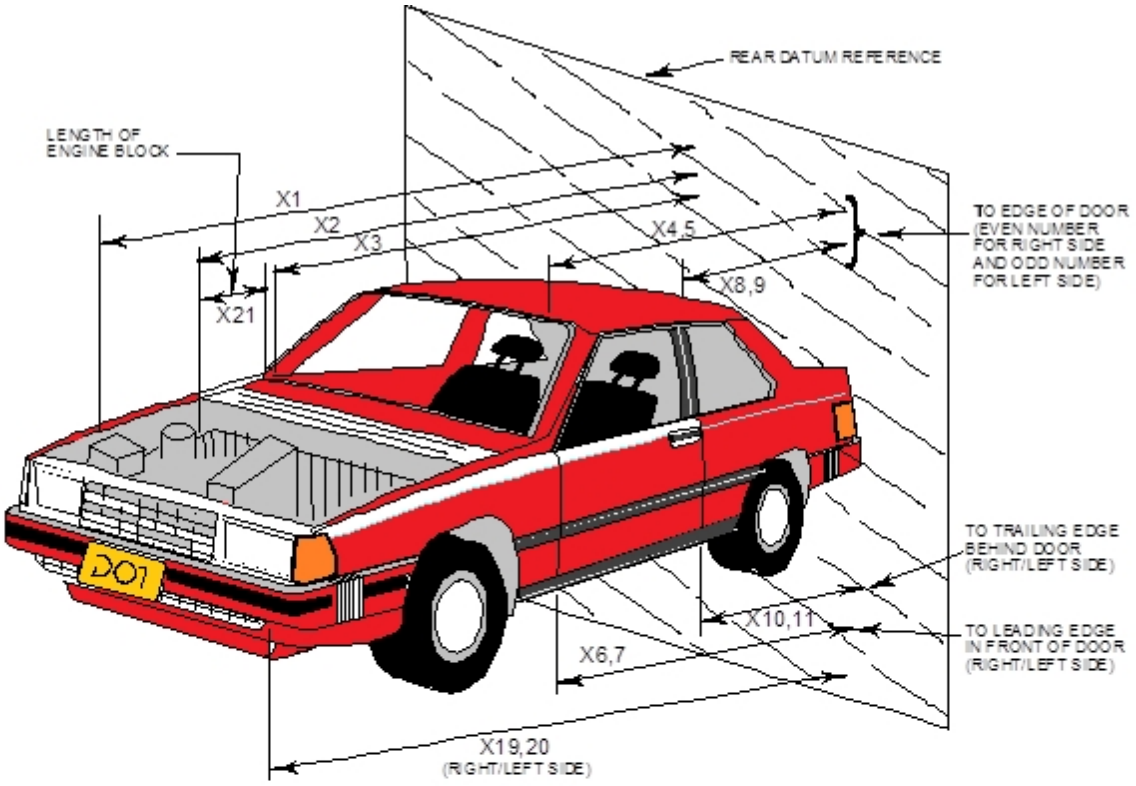
Test Vehicle: 2024 Cadillac LYRIQ 5 Door SUV NHTSA No.: M20240119
Test Program: NCAP Frontal Barrier Impact Test Test Date: 05/15/2024

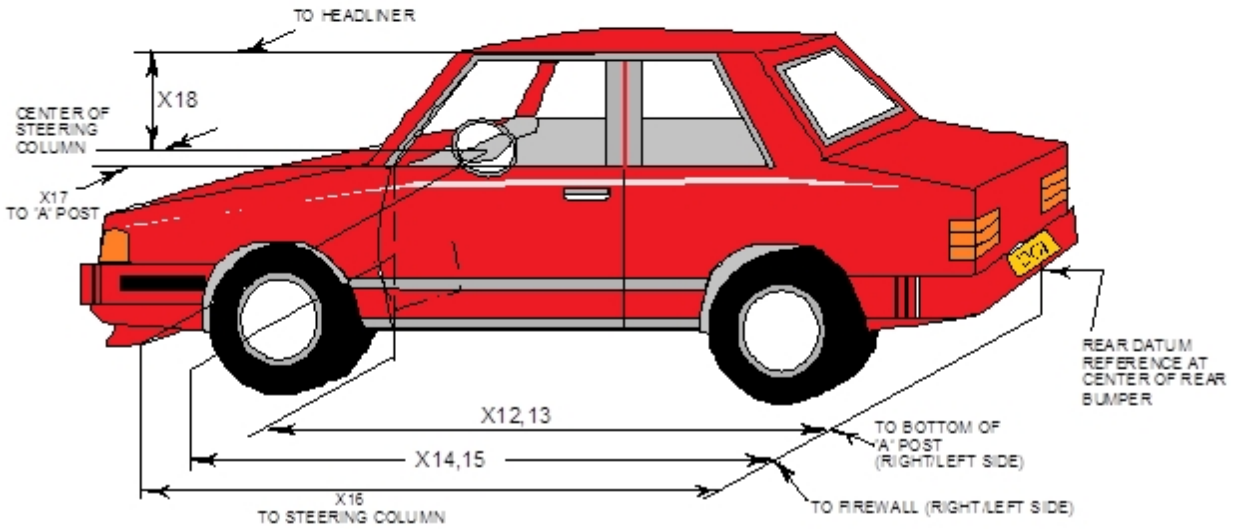
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024





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

Test Vehicle: 2024 Cadillac LYRIQ 5 Door SUV
NHTSA No.: M20240119
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 05/15/2024

No.	Measurement Description	Pre-Test	Post-Test	Change
1	Total Length of Vehicle at Centerline	4997	4380	-617
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4347	4088	-259
3	RSOV to Firewall	3899	3879	-20
4	RSOV to Upper Leading Edge of Right Door	3420	3422	2
5	RSOV to Upper Leading Edge of Left Door	3415	3414	-1
6	RSOV to Lower Leading Edge of Right Door	3391	3389	-2
7	RSOV to Lower Leading Edge of Left Door	3389	3386	-3
8	RSOV to Upper Trailing Edge of Right Door	2231	2230	-1
9	RSOV to Upper Trailing Edge of Left Door	2231	2229	-2
10	RSOV to Lower Trailing Edge of Right Door	2269	2263	-6
11	RSOV to Lower Trailing Edge of Left Door	2267	2261	-6
12	RSOV to Bottom of “A” Post of Right Side	3418	3417	-1
13	RSOV to Bottom of “A” Post of Left Side	3420	3419	-1
14	RSOV to Firewall, Right Side	3900	3895	-5
15	RSOV to Firewall, Left Side	3896	3897	1
16	RSOV to Steering Column	2898	2987	89
17	Center of Steering Column to “A” Post	316	317	1
18	Center of Steering Column to Headliner	439	468	29
19	RSOV to Right Side of Front Bumper	4918	4435	-483
20	RSOV to Left Side of Front Bumper	4920	4615	-305
21	Length of Engine Block	368	368	0
RD	RSOV to Right Side of Dash Panel	3131	3131	0
CD	RSOV to Center of Dash Panel	3145	3145	0
LD	RSOV to Left Side of Dash Panel	3112	3112	0

All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

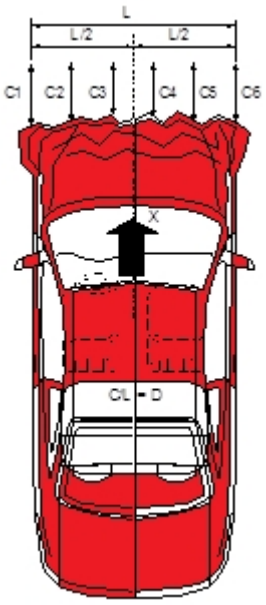
Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

VEHICLE INFORMATION

VIN:	1GYKPPRL2RZ113395	Wheelbase (mm):	3093
Vehicle Size Category:	MPV	Test Weight (kg):	2913

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):	56.44
Velocity Change (km/h):	66.67
Time of Separation (ms):	151



CRUSH PROFILE

Collision Deformation Classification:	12FDEW1
Midpoint of Damage:	C4
Damage Region Length (mm):	1583
Impact Mode:	Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Crush
C1	Crush Zone 1 at Left Side	mm	4766	4535	231
C2	Crush Zone 2 at Left Side	mm	4904	4585	319
C3	Crush Zone 3 at Left Side	mm	4957	4533	424
C4	Crush Zone 4 at Right Side	mm	4957	4463	494
C5	Crush Zone 5 at Right Side	mm	4904	4383	521
C6	Crush Zone 6 at Right Side	mm	4766	4554	212
L	C1 to C6	mm	1528	1583	-55

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

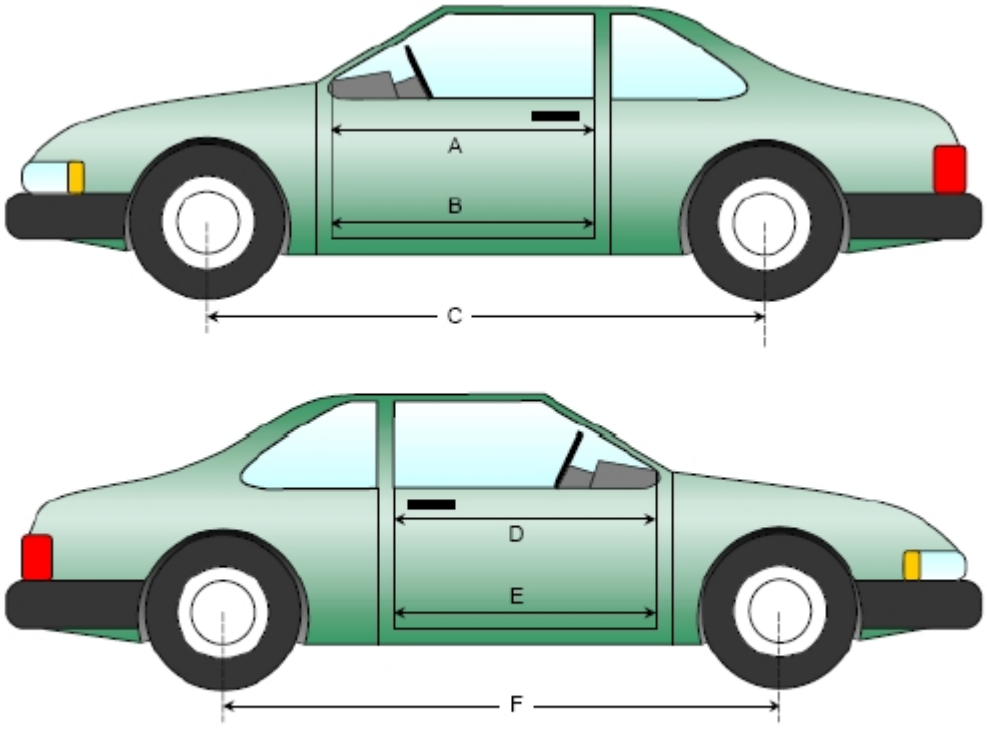
Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Change
A	Left Side Upper	mm	1070	1069	-1
B	Left Side Lower	mm	925	925	0
D	Right Side Upper	mm	1065	1064	-1
E	Right Side Lower	mm	937	935	-2

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Change
C	Left Side Wheelbase	mm	3093	2963	-130
F	Right Side Wheelbase	mm	3093	2948	-145



Left & Right Side Views

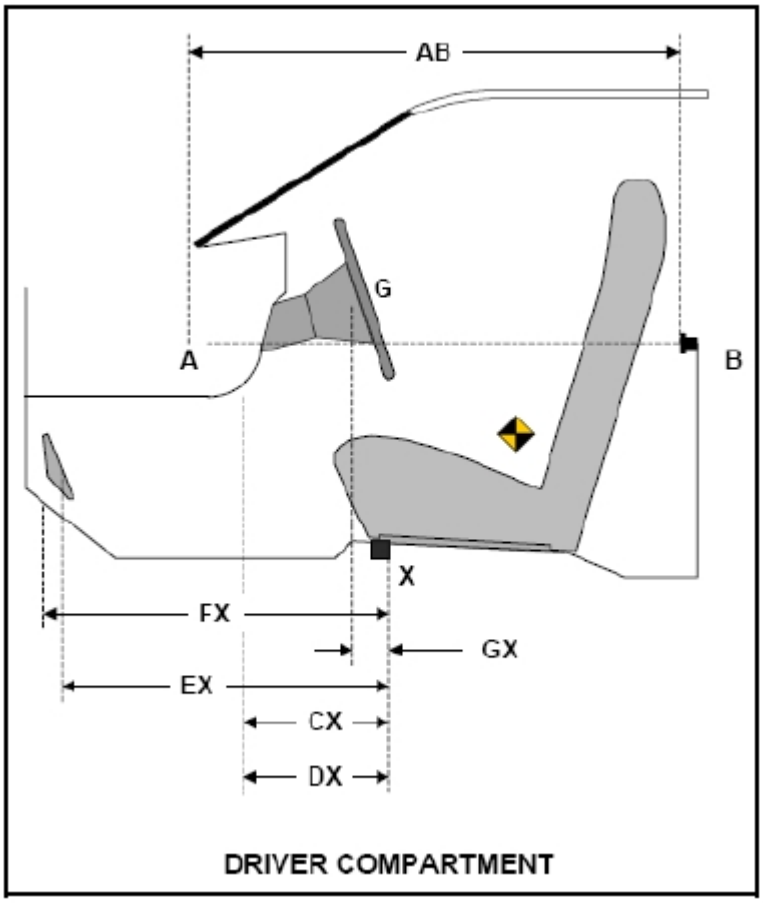
DATA SHEET NO.14 … (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Change
AB	Door Opening (Inside Window Jam)	mm	865	866	1
CX	Left Knee Bolster to X	mm	373	370	-3
DX	Right Knee Bolster to X	mm	377	373	-4
EX	Brake Pedal to X	mm	553	529	-24
FX	Foot Rest to X	mm	604	596	-8
GX	Center of Steering Column Wheel Hub to X	mm	86	173	87

X = Front of Seat Track (Stationary)



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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

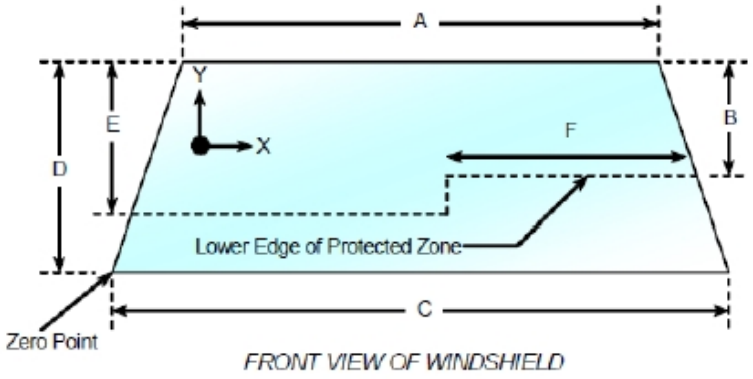
Windshield Mounting Details: A trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2436.5	2436.5	100%
Right Side	2436.5	2436.5	100%
Total	4873	4873	100%



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1253
B	mm	579
C	mm	1984
D	mm	818
E	mm	619
F	mm	385

AREAS OF PROTECTED ZONE FAILURES

A. *Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.*
   - No Penetration

B. *Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.*
   - No Penetration

X	Y

X	Y

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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21°C Test Time: 9:53 AM

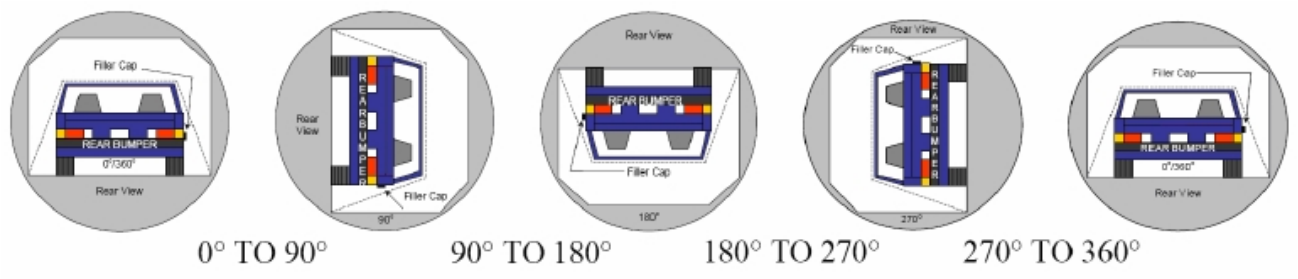
STODDARD SOLVENT SPILLAGE MEASUREMENTS

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

D. Spillage Detail: Electric Vehicle

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024



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: Electric Vehicle

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°			
90° to 180°			
180° to 270°			
270° to 360°			

FMVSS 301 SPILLAGE TABLE

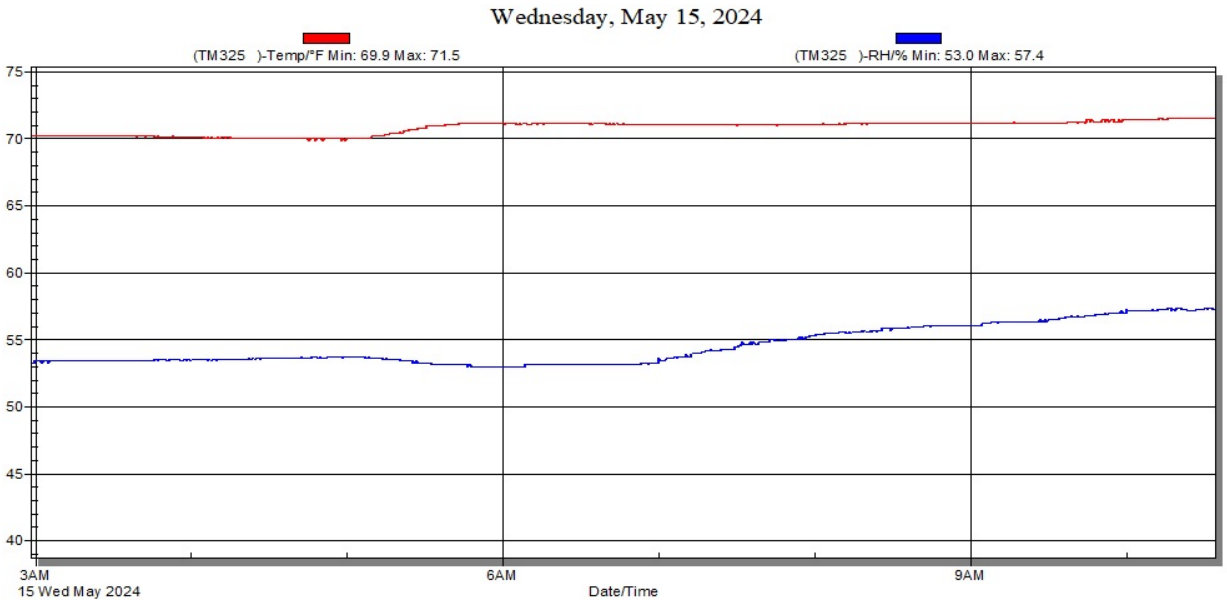
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°				
90° to 180°				
180° to 270°				
270° to 360°				

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET NO. 17
DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024



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

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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Electric
Propulsion Battery Type	High Voltage Li-Ion
Nominal Voltage (Volts)	350
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Inside Battery Pack
Auxiliary Battery Type	AGM 12V

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	Liquid
Electrolyte Fluid Specific Gravity	1.2g/cm3 @ 25°C
Electrolyte Fluid Kinematic Viscosity (centistokes)	4cP @ 25°C
Electrolyte Fluid Color	Colorless/light Yellow
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	50/50 Deionized water, Dexcool mix
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Outside

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
For all battery types: Voltage Range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	289
Maximum State of Charge	V	398
95% of Maximum	V	378.1
Test Voltage *	V	397.1
For batteries that are rechargeable ONLY by an energy source on the vehicle: Voltage range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	

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

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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

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

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Ground point is located on the vehicle body
Details of Propulsion Battery Components	No description provided by OEM

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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		58100115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		06/20/2023

NOTES:

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

PROPULSION BATTERY VOLTAGE, RESISTANCE & ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Measured Parameter	Symbol	Units	Value
Normal operating voltage range specified by the manufacturer	V_b	V	289-398
Propulsion Battery Voltage: (ready to drive position)	V_b	V	397.1
Propulsion Battery to Vehicle Chassis	V_1	V	183.2
Propulsion Battery to Vehicle Chassis	V_2	V	243.0
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	200,500
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	41.2
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	58.6
$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$	R_{i1}	Ω	1,607,657
$R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$	R_{i2}	Ω	1,106,585
Lesser value of R_{i1} and R_{i2}	R_i	Ω	1,106,585
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	2,787

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

NOTES:

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

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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024

VOLTMETER INFORMATION

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

NOTES:

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

ELECTRICAL ISOLATION MEASUREMENTS & IMPACT CALCULATIONS

Parameter	Value	Units		Value		Value	
V_b =	2.0	V	Time:	2	Minutes	52	Seconds
V_1 =	1.4	V	Time:	2	Minutes	59	Seconds
V_2 =	3.3	V	Time:	3	Minutes	2	Seconds
R_o =	200,500	Ω					
V_1' =	0.3	V	Time:	3	Minutes	7	Seconds
V_2' =	0.6	Ω	Time:	3	Minutes	13	Seconds
R_{i1} =	2,468,060	Ω	Time:	3	Minutes	7	Seconds
R_{i2} =	1,285,023	Ω	Time:	3	Minutes	13	Seconds
R_i =	1,285,023	Ω/V	Time:	3	Minutes	13	Seconds
R_i/V_b =	642,512	Ω/V	Time:	3	Minutes	13	Seconds

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

NOTES:

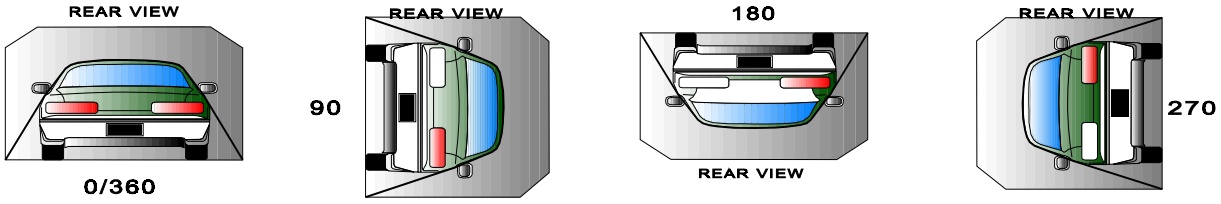
- *R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1'], R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2'], R_i = Lesser value of R_{i1} and R_{i2}*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*
- *Minimum Electrical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

PROPULSION BATTERY SYSTEM COMPONENTS

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

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

Test Vehicle:	2024 Cadillac LYRIQ 5 Door SUV	NHTSA No.:	M20240119
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	05/15/2024



Rear View

DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Rollover Stage	Rotation Time (spec. 1 -3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	11	5	6	11	7
90° to 180°	1	3	5	6	3	7
180° to 270°	1	5	5	6	5	7
270° to 360°	1	9	5	6	9	7

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

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

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

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

VOLTMETER INFORMATION

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

NOTES:

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

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

Test Vehicle: 2024 Cadillac LYRIQ 5 Door SUV
NHTSA No.: M20240119
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 05/15/2024

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units	Ro=200,500 Ω	Minutes	Seconds
V_b =	90°	0.0	V	Time:	4	1
	180°	0.0	V		10	14
	270°	0.0	V		16	37
	360°	0.0	V		22	56
V_1 =	90°	0.0	V	Time:	4	15
	180°	0.0	V		10	22
	270°	0.0	V		16	47
	360°	0.0	V		23	3
V_2 =	90°	0.0	V	Time:	4	22
	180°	0.0	V		10	26
	270°	0.0	V		17	1
	360°	0.0	V		23	6
V_1' =	90°	0.0	V	Time:	4	29
	180°	0.0	V		10	30
	270°	0.0	V		17	7
	360°	0.0	V		23	8
V_2' =	90°	0.0	Ω	Time:	4	36
	180°	0.0	Ω		10	34
	270°	0.0	Ω		17	9
	360°	0.0	Ω		23	12
R_{i1} =	90°	Zero Volts	Ω	Time:	4	29
	180°	Zero Volts	Ω		10	30
	270°	Zero Volts	Ω		17	7
	360°	Zero Volts	Ω		23	8
R_{i2} =	90°	Zero Volts	Ω	Time:	4	36
	180°	Zero Volts	Ω		10	34
	270°	Zero Volts	Ω		17	9
	360°	Zero Volts	Ω		23	12
R_i =	90°	Zero Volts	Ω/V	Time:	4	36
	180°	Zero Volts	Ω/V		10	34
	270°	Zero Volts	Ω/V		17	9
	360°	Zero Volts	Ω/V		23	12
R_i/V_b =	90°	Zero Volts	Ω/V	Time:	4	36
	180°	Zero Volts	Ω/V		10	34
	270°	Zero Volts	Ω/V		17	9
	360°	Zero Volts	Ω/V		23	12

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

APPENDIX A

PHOTOGRAPHS

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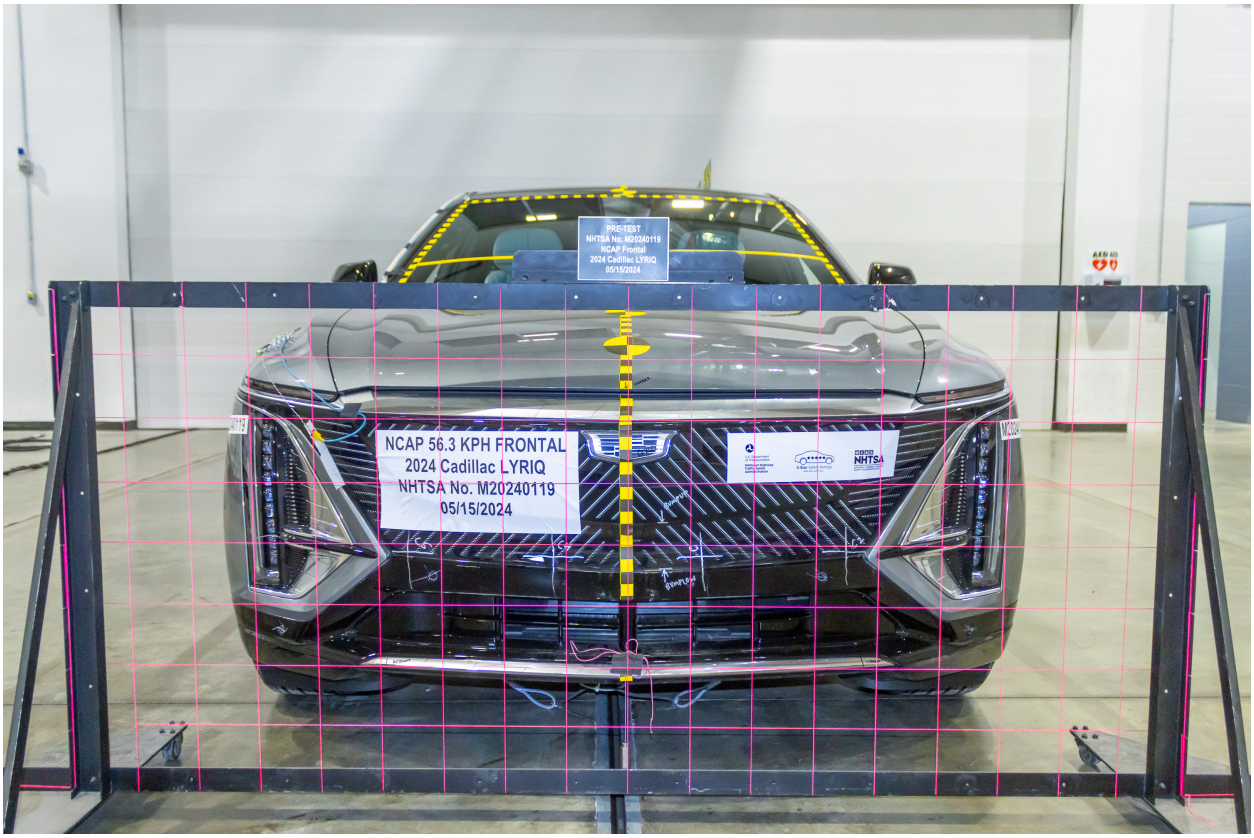

Figure A-1: Load Cell Location

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 Cadillac LYRIQ Frontal As Delivered

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

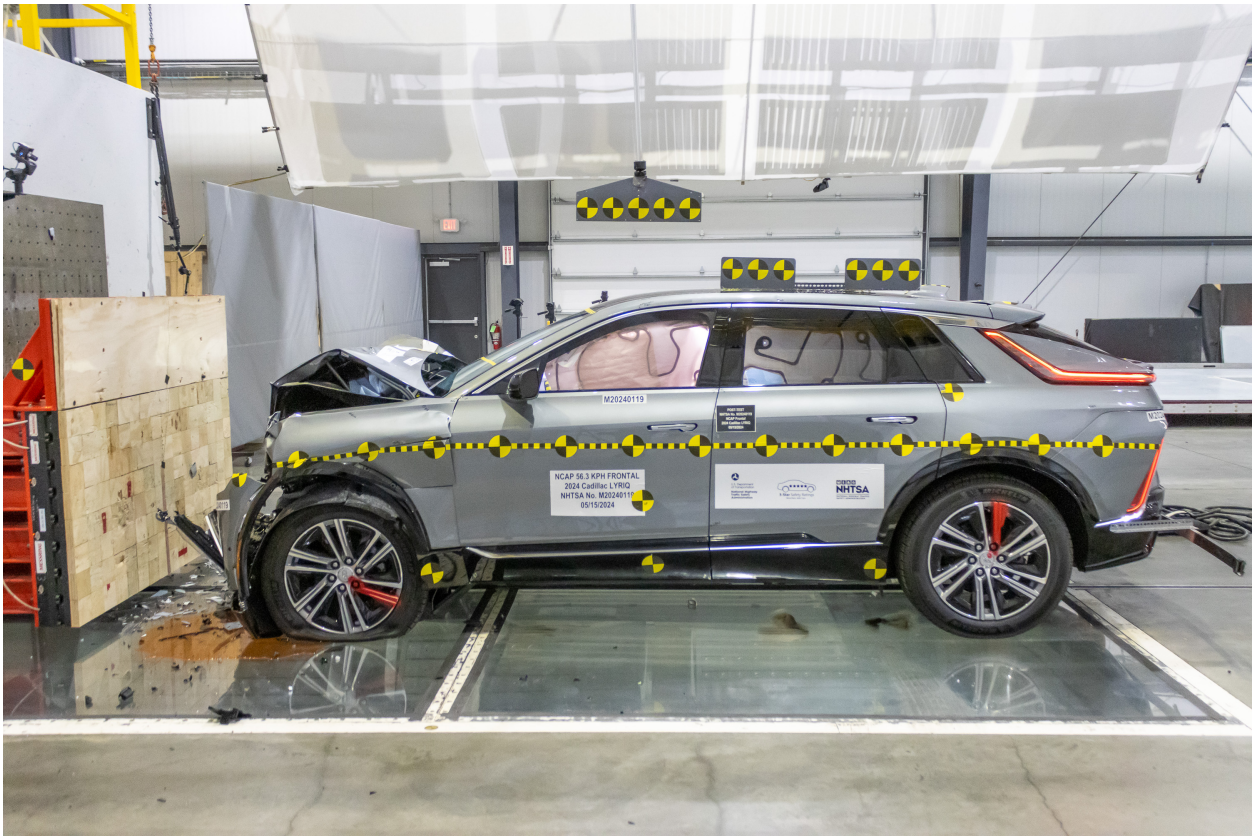

Figure A-11: Post-Test Left View of Test Vehicle

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

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 Charge Port View

Figure A-23: Post-Test Charge Port View

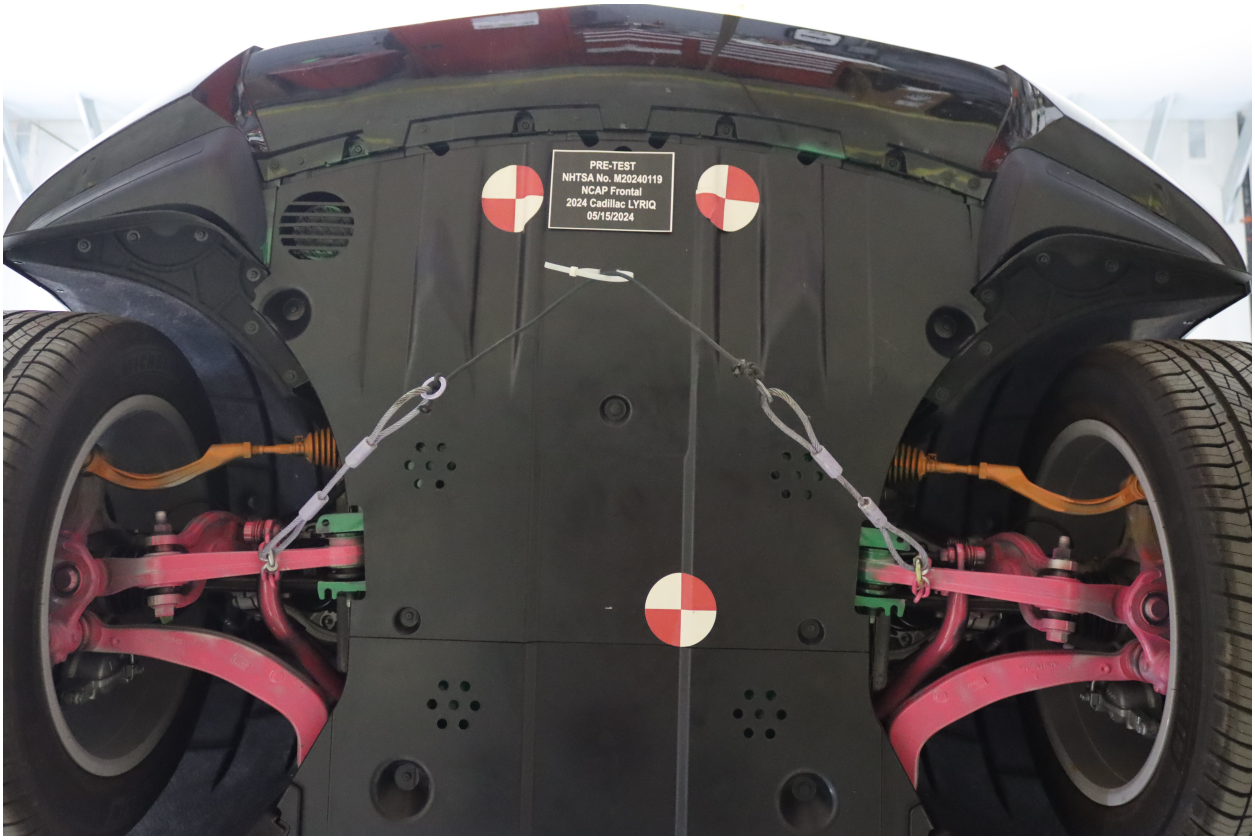

Figure A-24: Pre-Test Front Underbody View

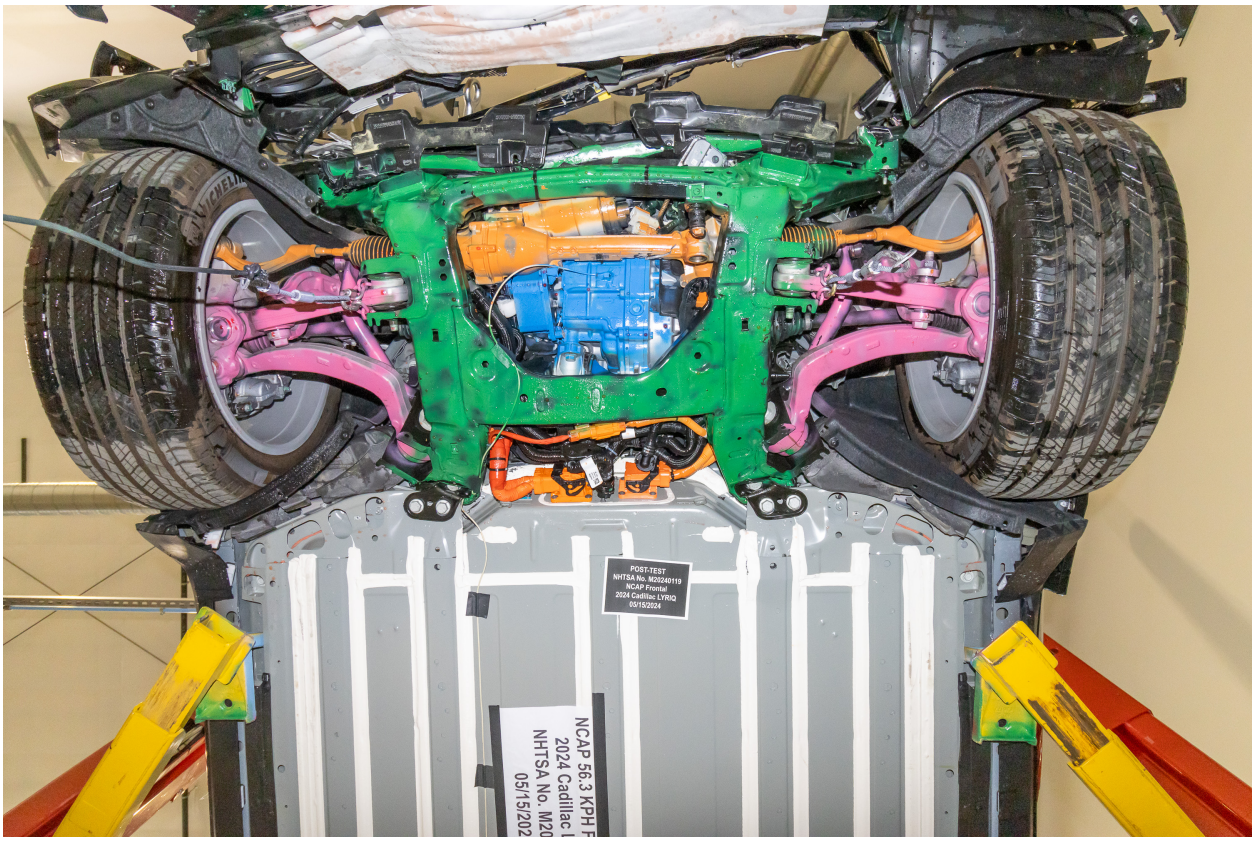

Figure A-25: Post-Test Front Underbody View

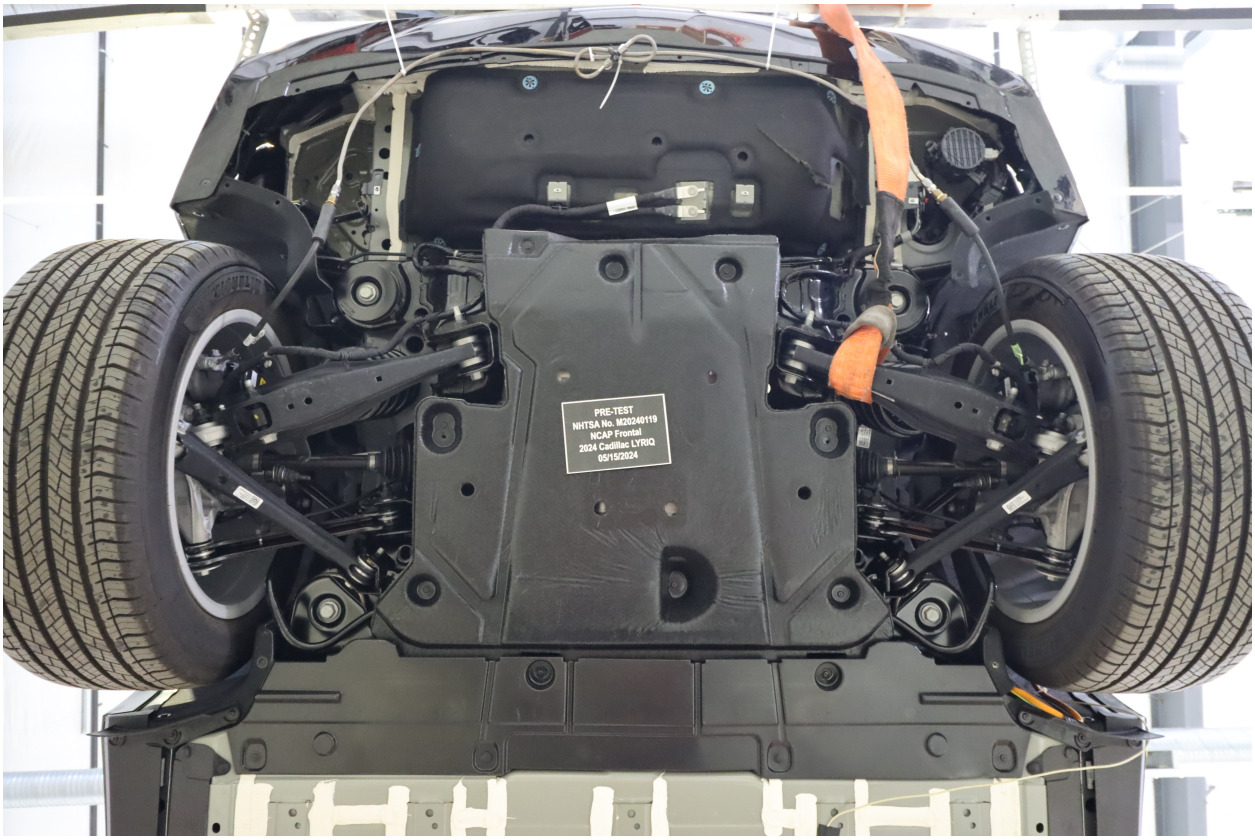

Figure A-26: Pre-Test Rear Underbody View

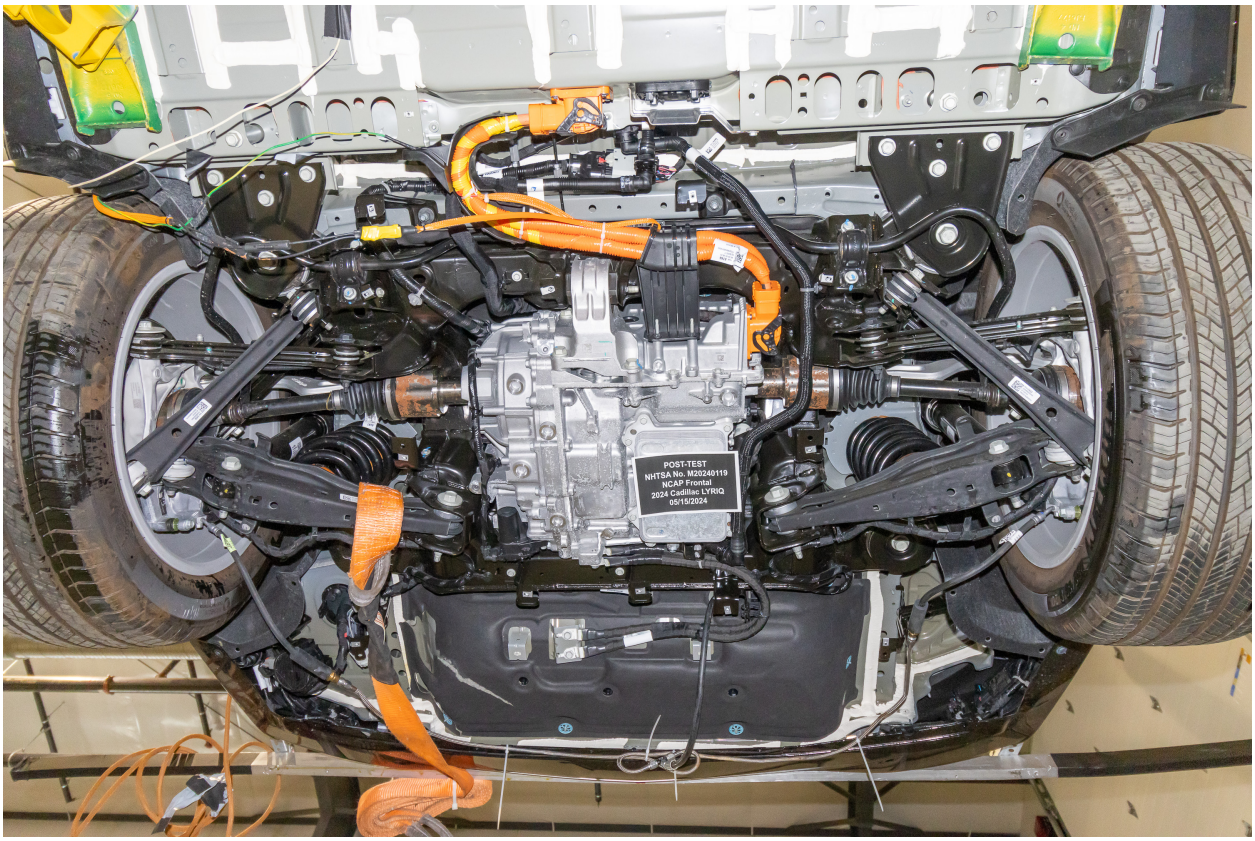

Figure A-27: Post-Test Rear Underbody View

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

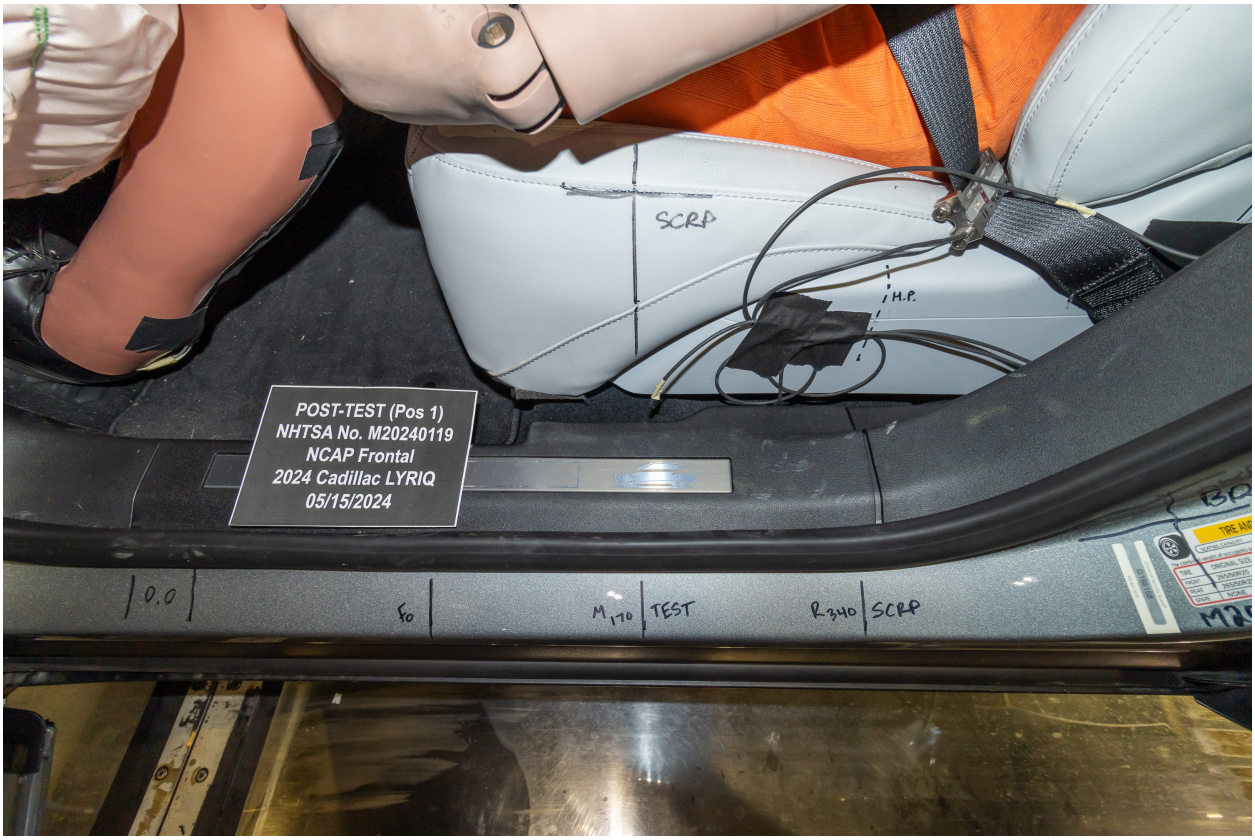

Figure A-37: Post-Test Driver's Seat Fore-Aft Markings

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

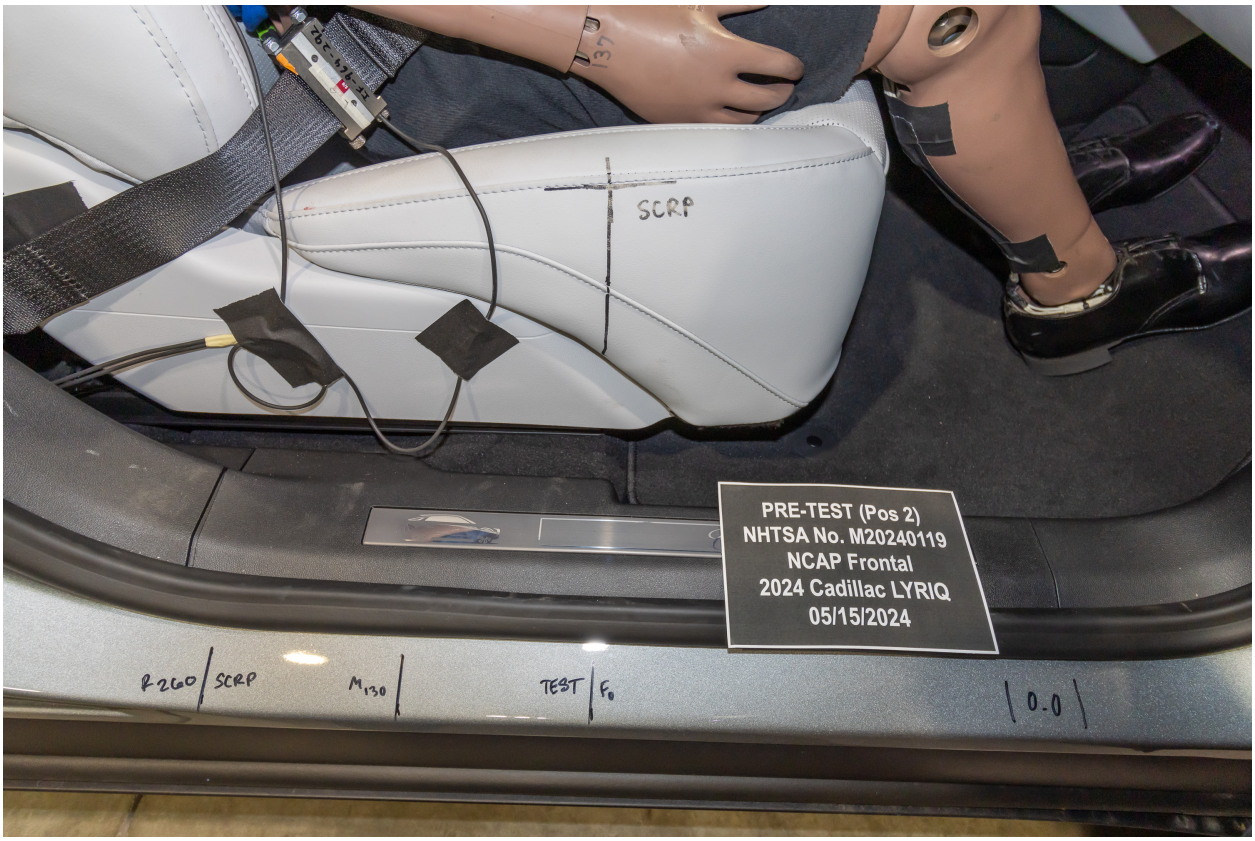

Figure A-59: Pre-Test Passenger's Seat Fore-Aft Markings

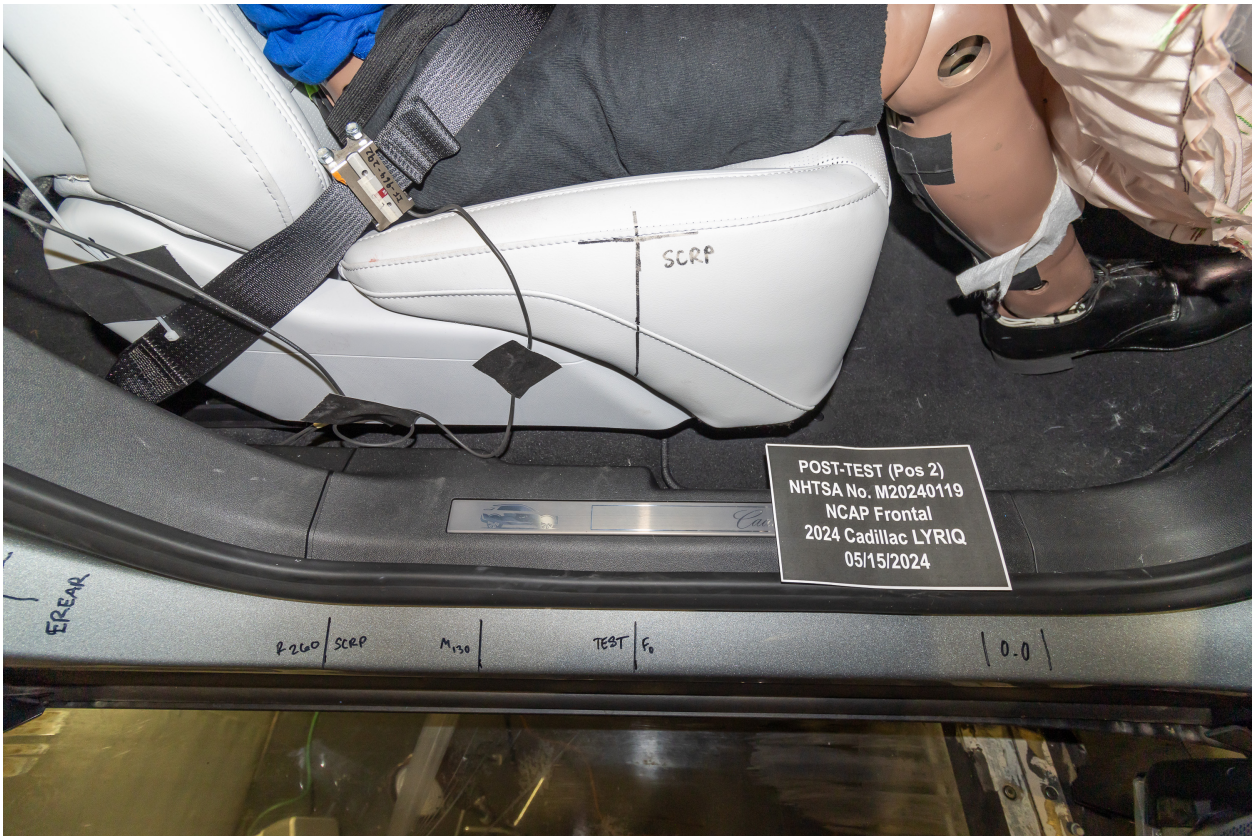

Figure A-60: Post-Test Passenger's Seat Fore-Aft Markings

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

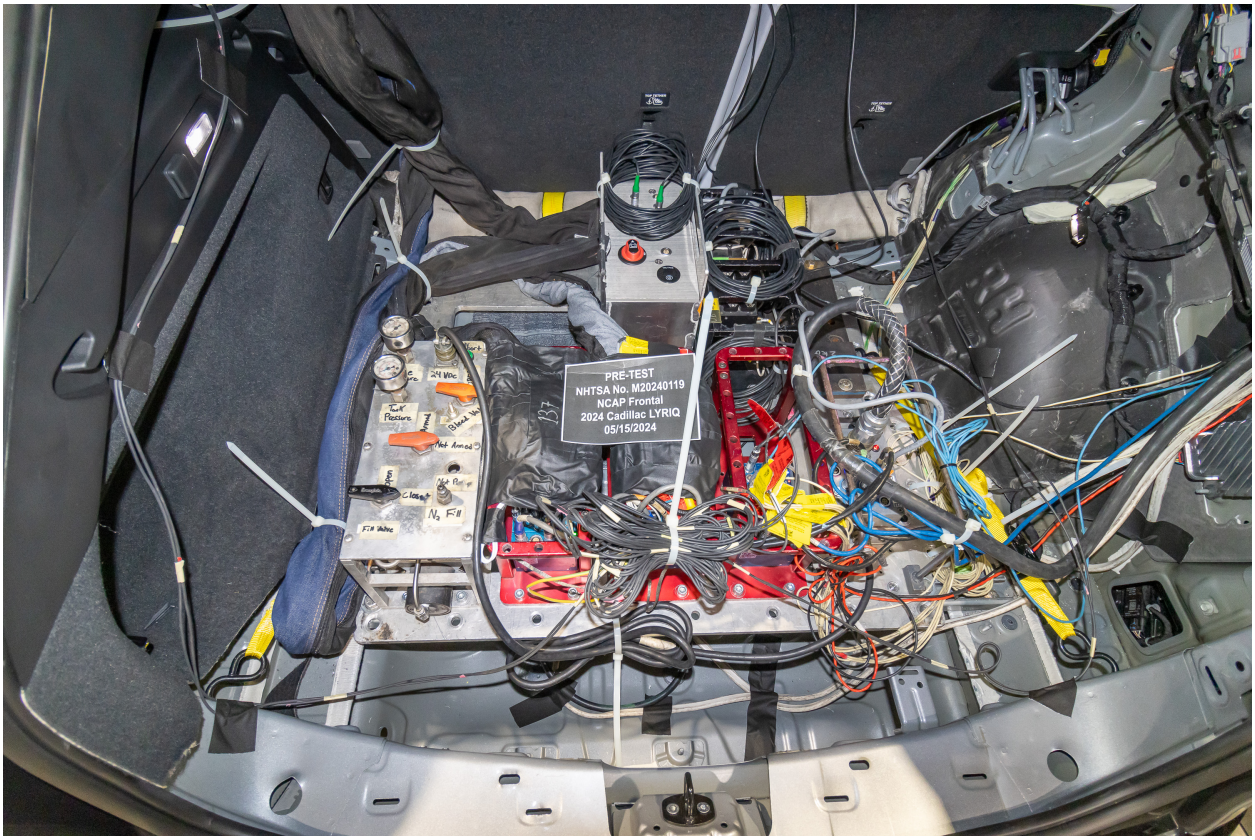

Figure A-74: Photograph of Ballast Installed in Vehicle

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 0º on Static Rollover Device

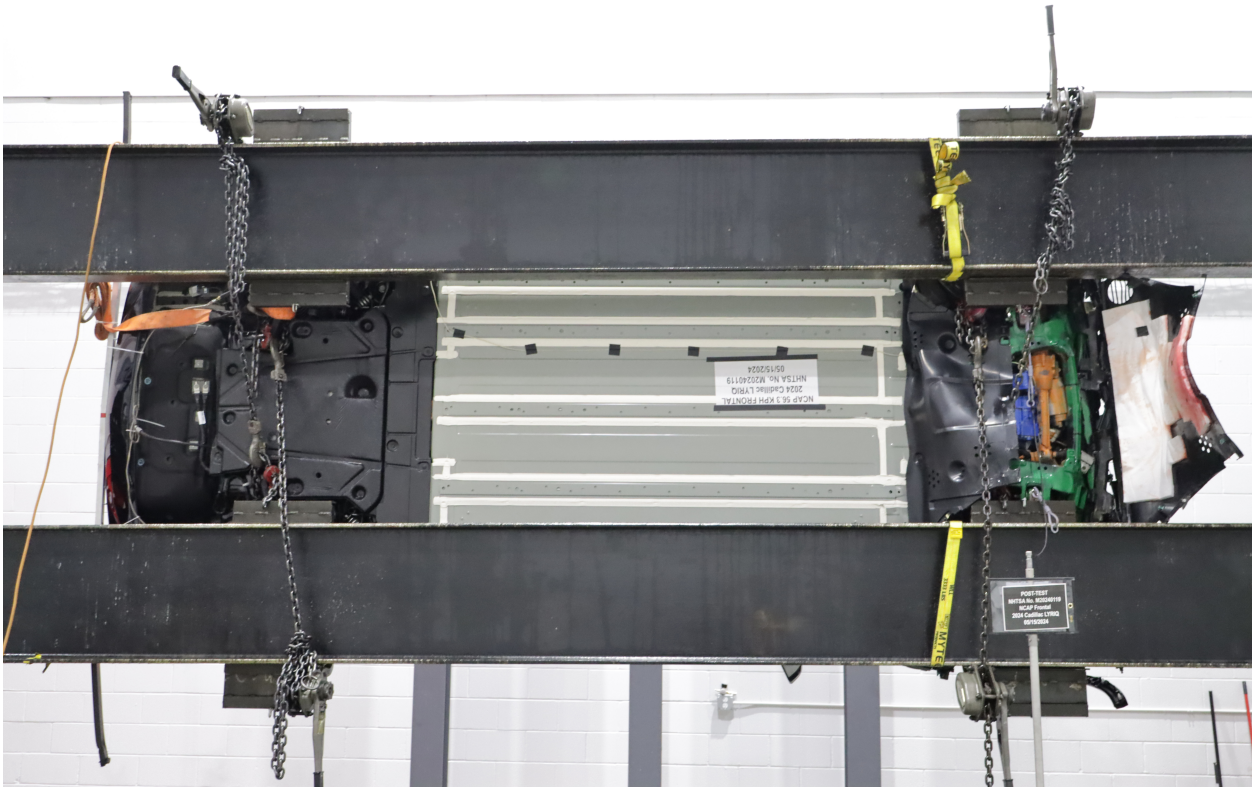

Figure A-78: Vehicle at 90º on Static Rollover Device

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

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

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

Figure A-82: 2024 Cadillac LYRIQ Frontal Impact Event

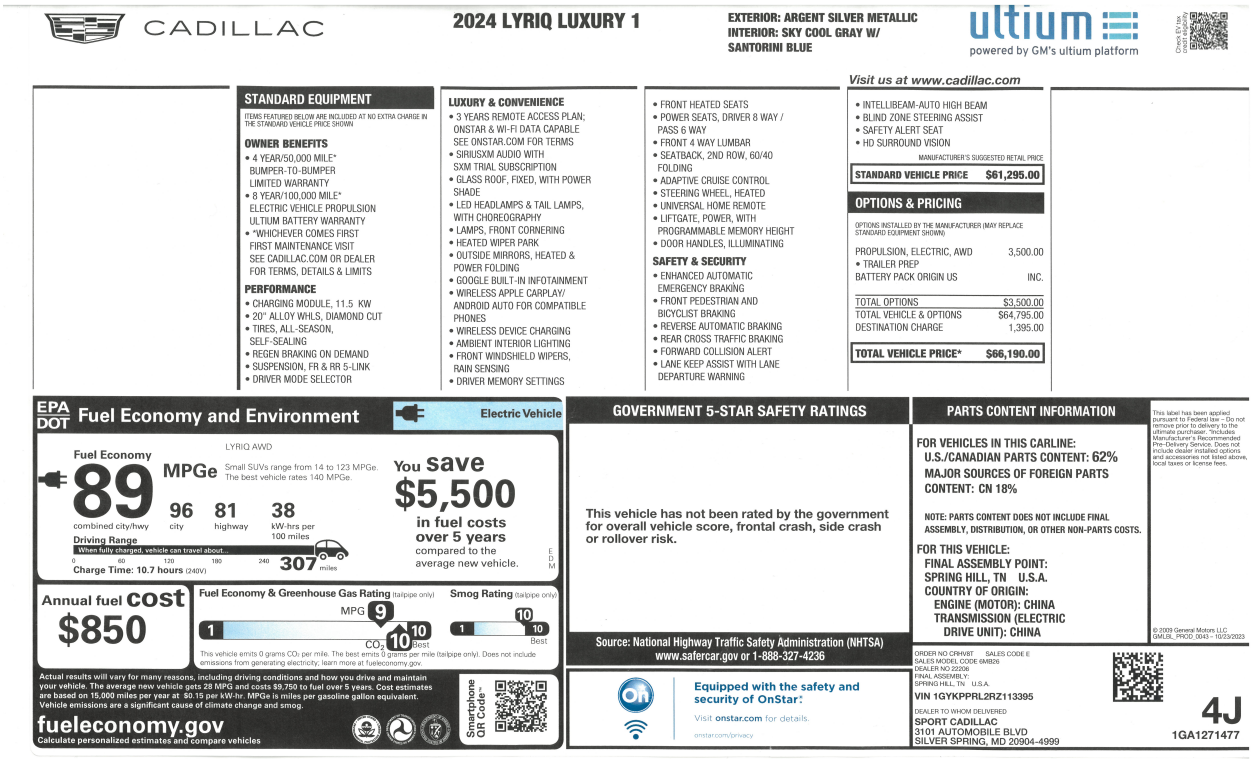

Figure A-83: Monroney Label Photograph

Photo Not Applicable

Figure 305-1: Auxiliary Power Module Warning Label

Figure 305-2: Power Inverter Warning Label

Figure 305-3 First Responder Warning Label

Figure 305-4: First Responder Warning Label Location

Photo Not Applicable

Figure 305-5: Other Vehicle Label Related to Electric Propulsion System

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

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

Figure 305-8: Manual High Voltage Service Disconnect Removed Location

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

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

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

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

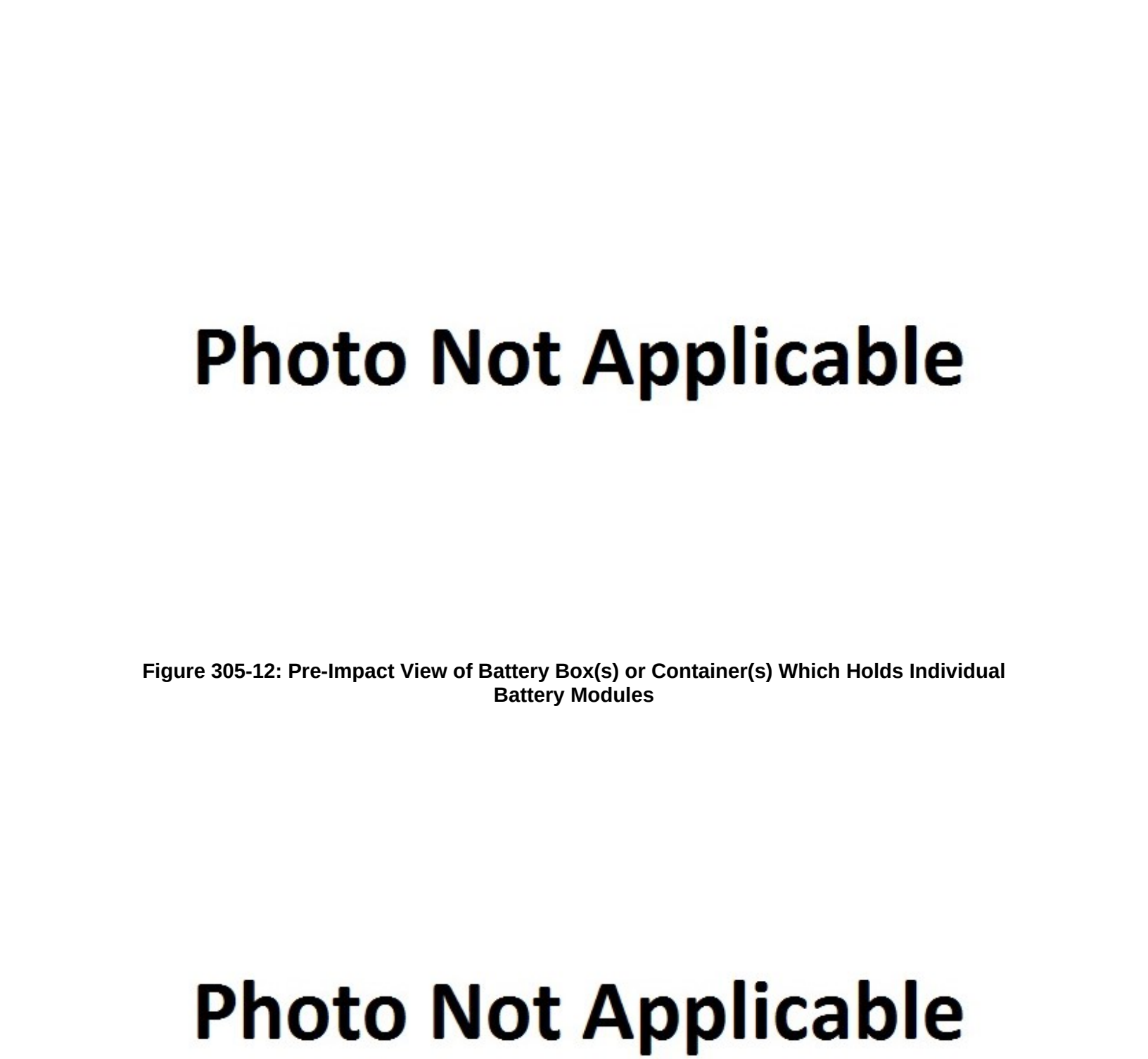

Figure 305-13: Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

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

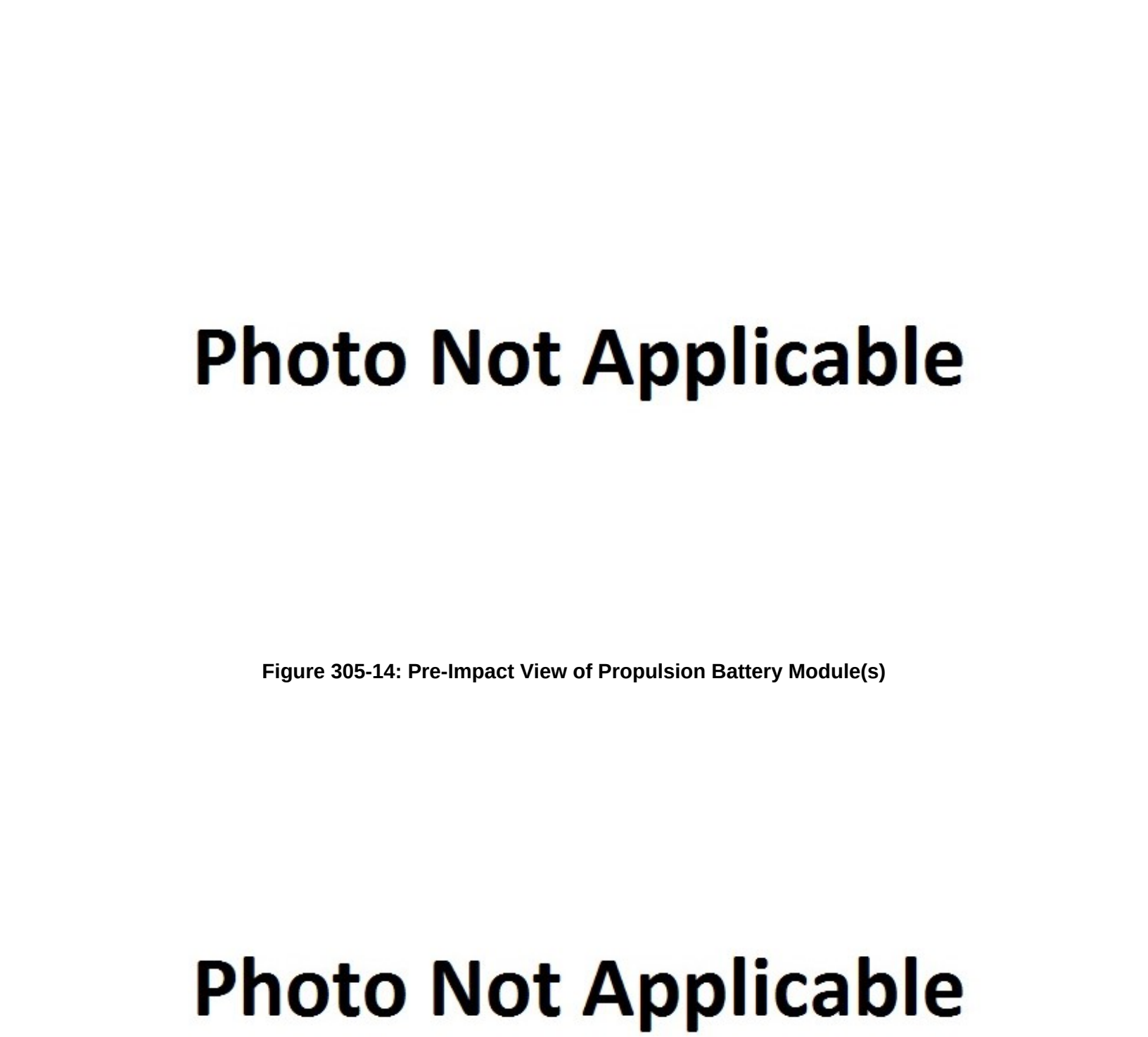

Figure 305-15: Post-Impact View of Propulsion Battery Module(s)

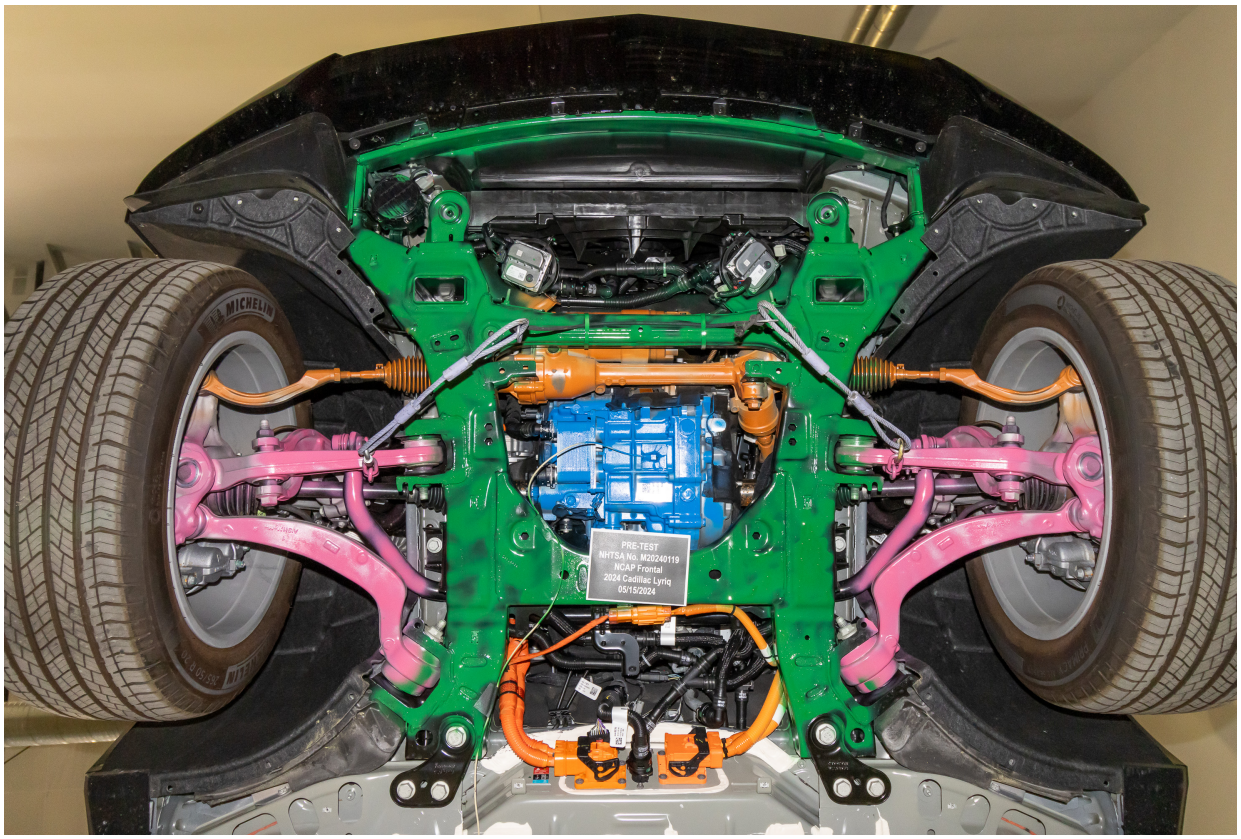

Figure 305-16: Pre-Impact View of Electric Propulsion Drive

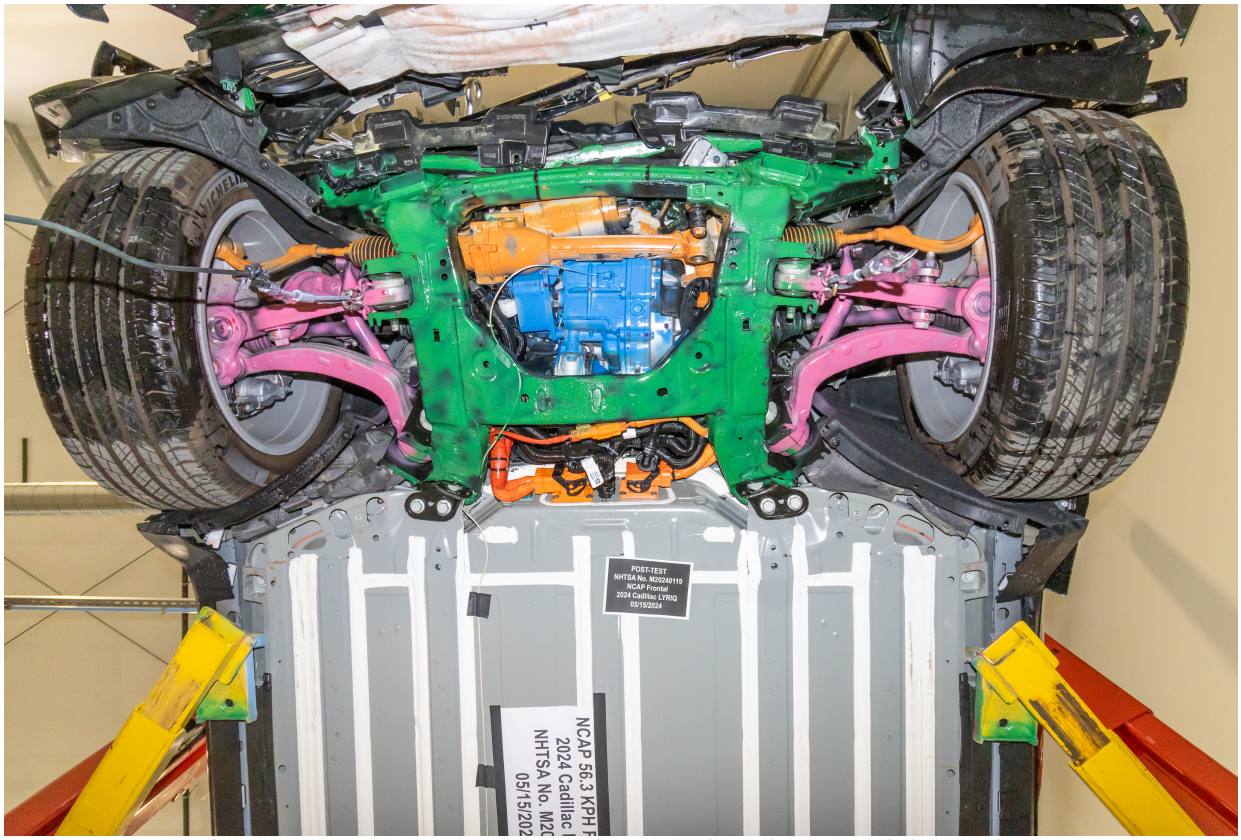

Figure 305-17: Post-Impact View of Electric Propulsion Drive

Figure 305-18: Pre-Impact View of High Voltage Interconnects

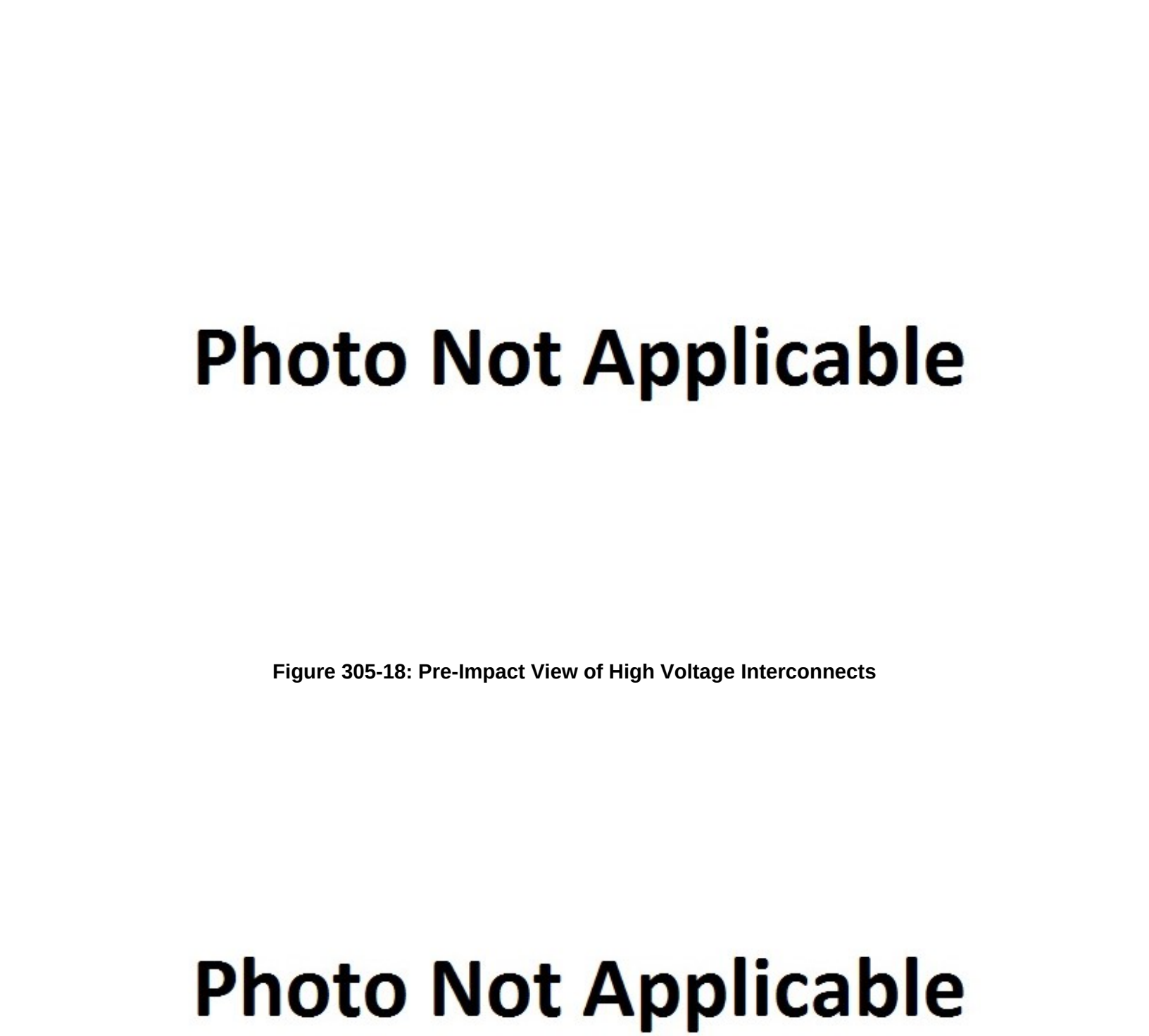

Figure 305-19: Pre-Impact View of Propulsion Battery Venting System

Photo Not Applicable

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

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

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

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

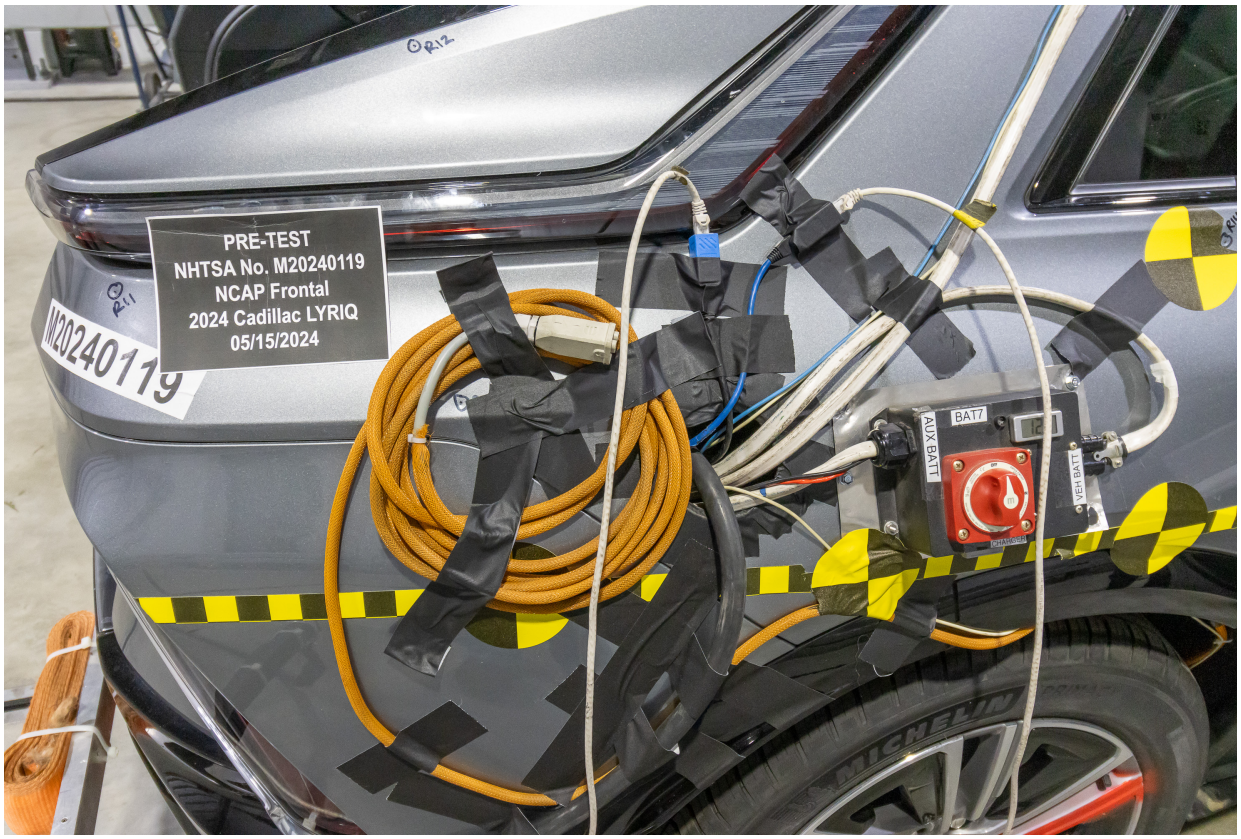

Figure 305-24: Pre-Impact View of Installed Test Interface Port

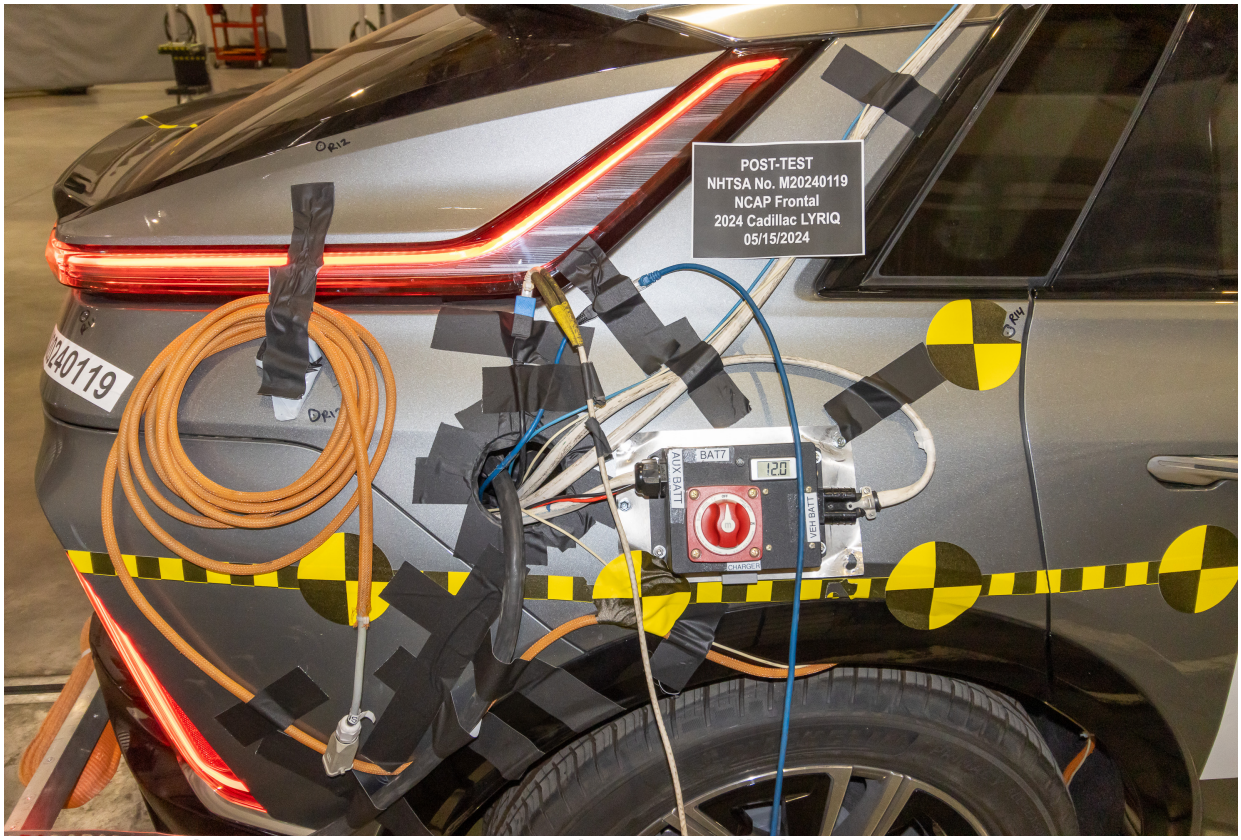

Figure 305-25: Post-Impact View of Installed Test Interface Port

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

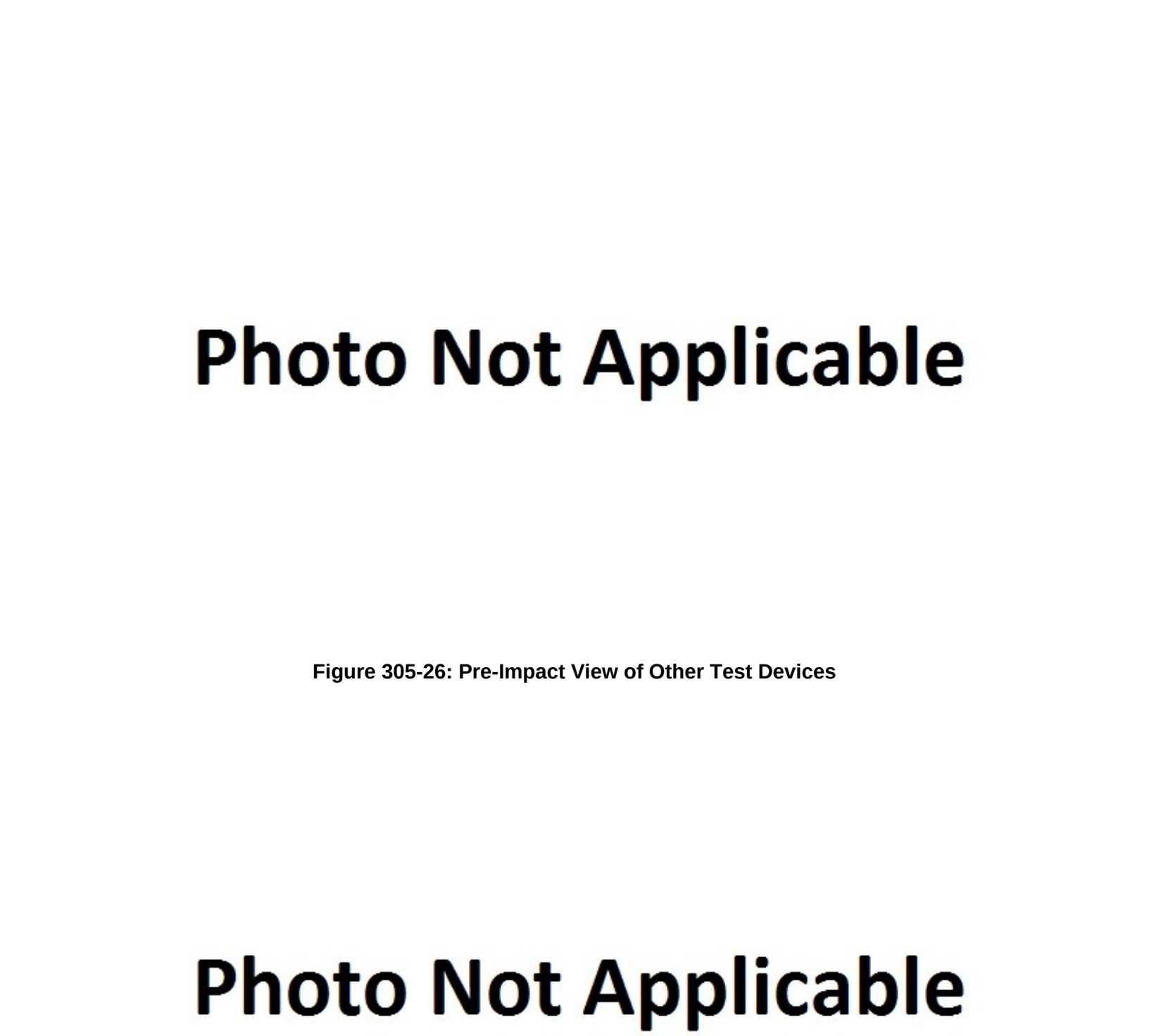

Figure 305-27: Post-Impact View of Other Test Devices

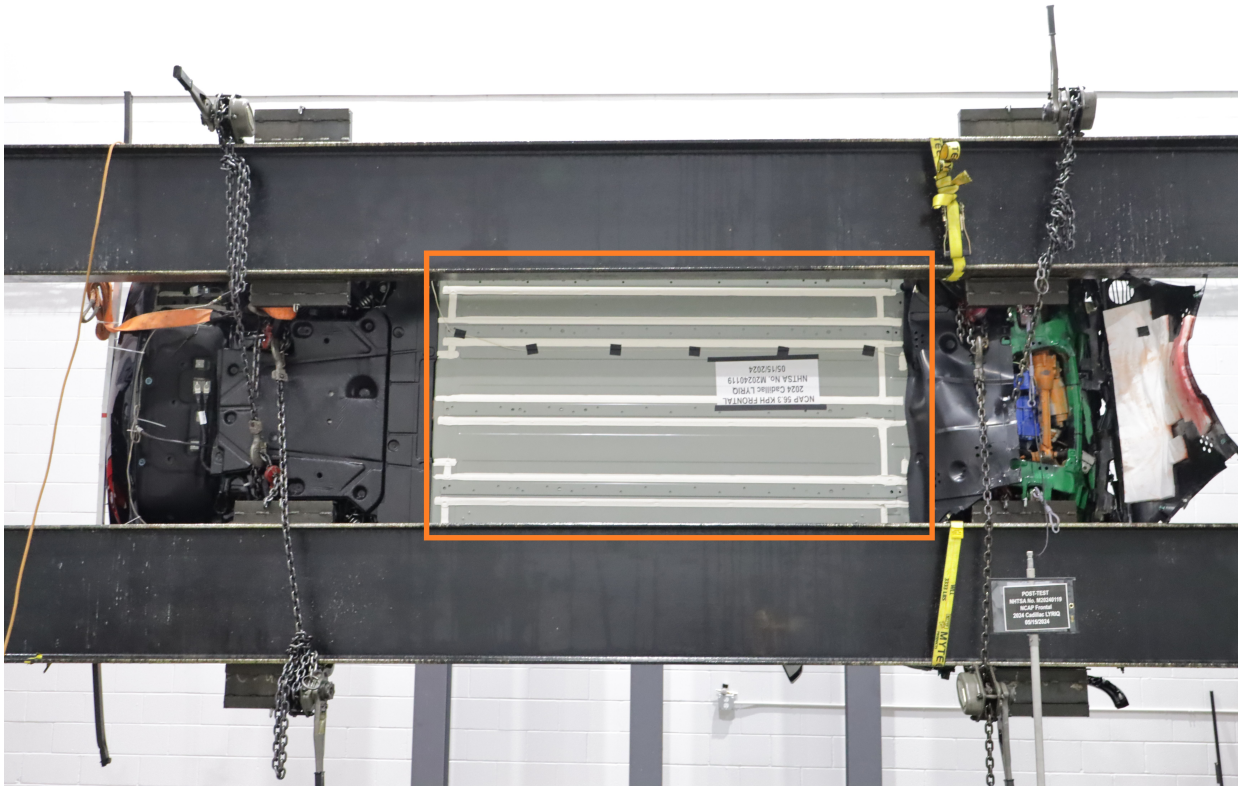

Figure 305-28: FMVSS No. 305 Static Rollover 90 Degrees

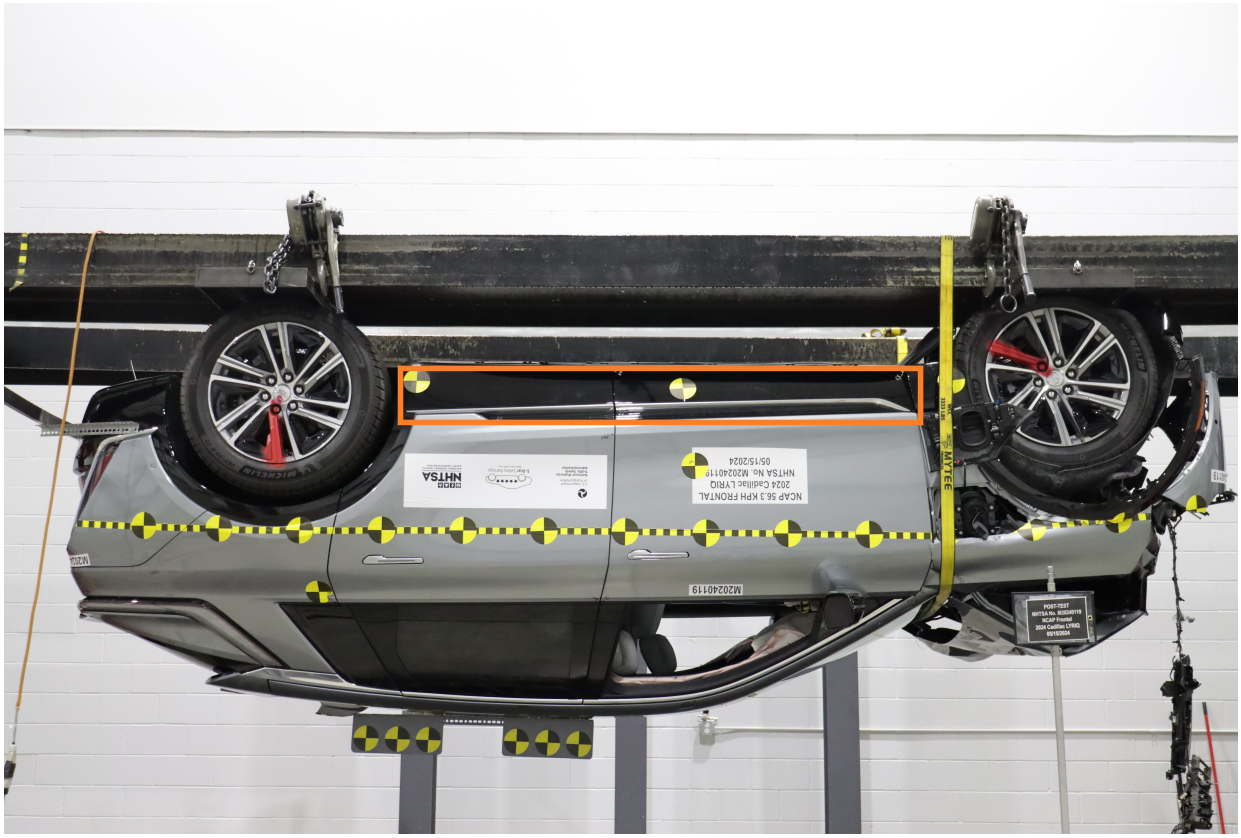

Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees

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

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

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

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

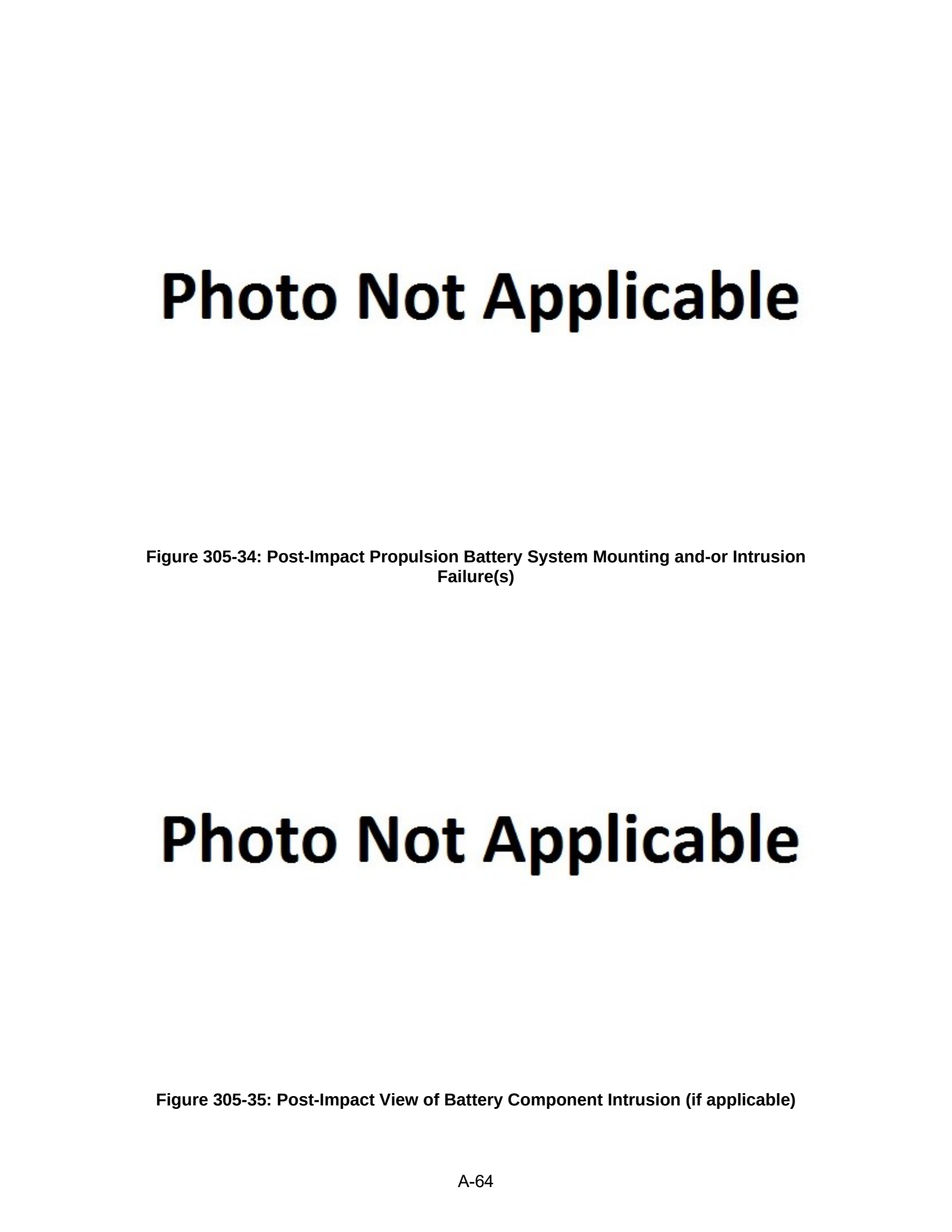

Figure 305-34: Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

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

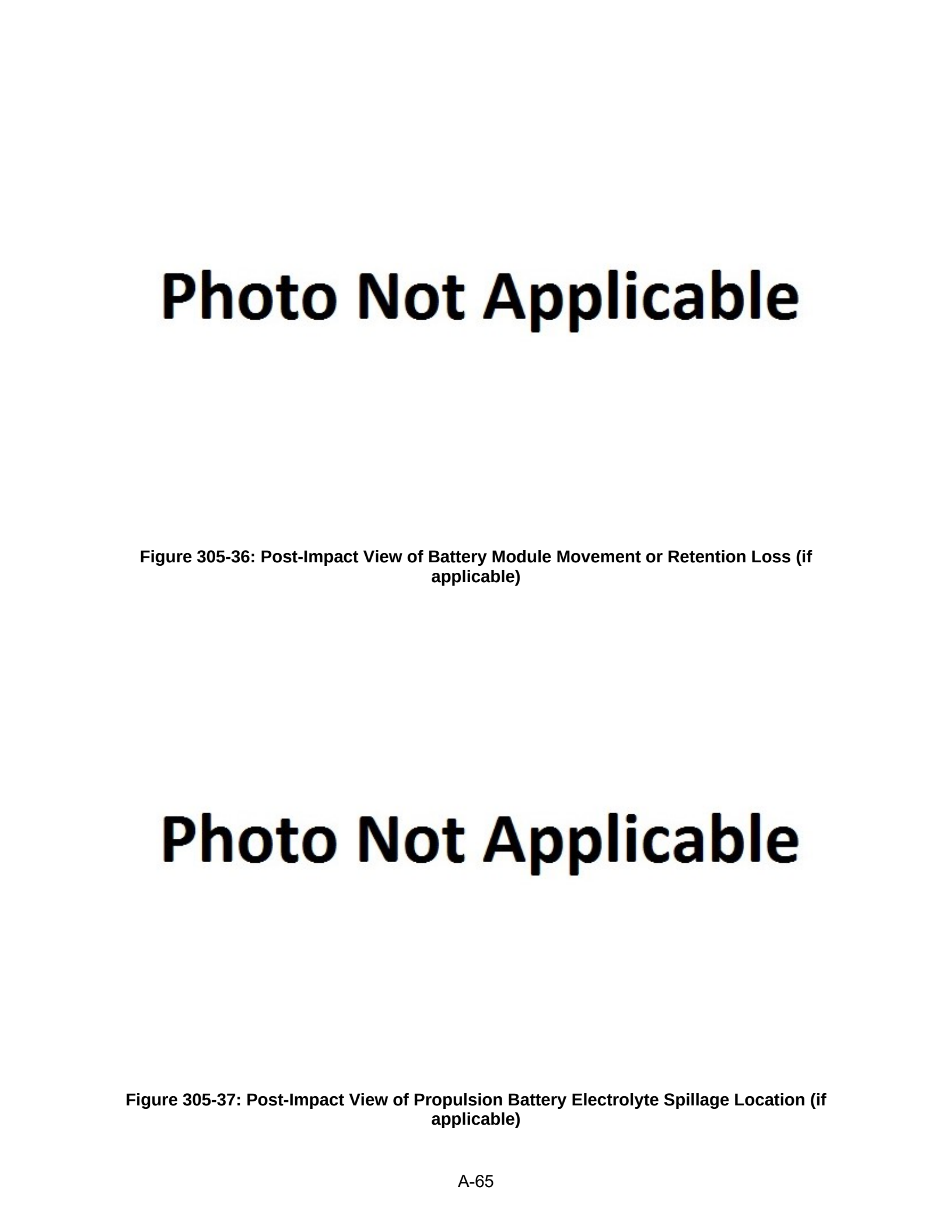

Figure 305-36: Post-Impact View of Battery Module Movement or Retention Loss (if applicable)

Figure 305-37: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (if applicable)

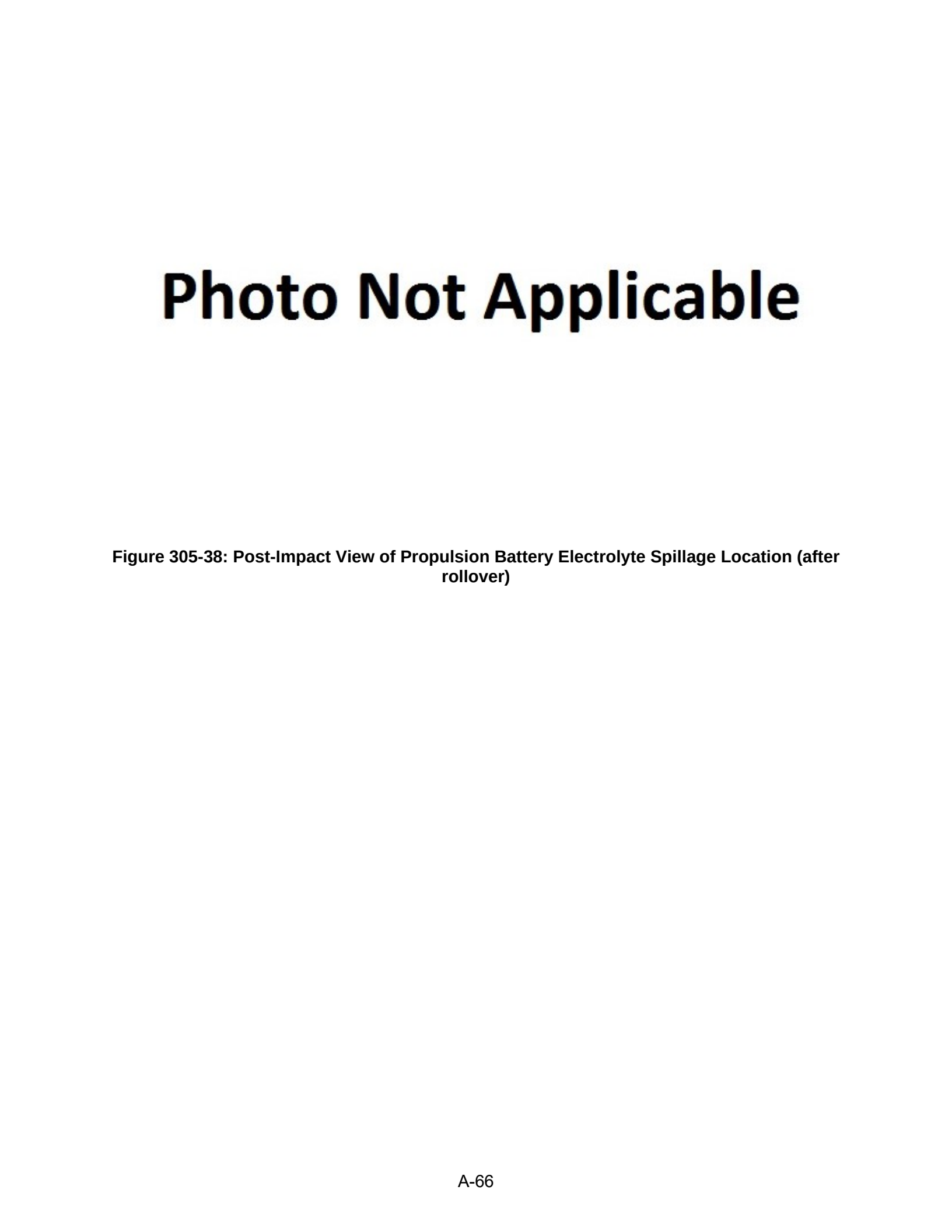

Figure 305-38: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (after rollover)

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA TRACES

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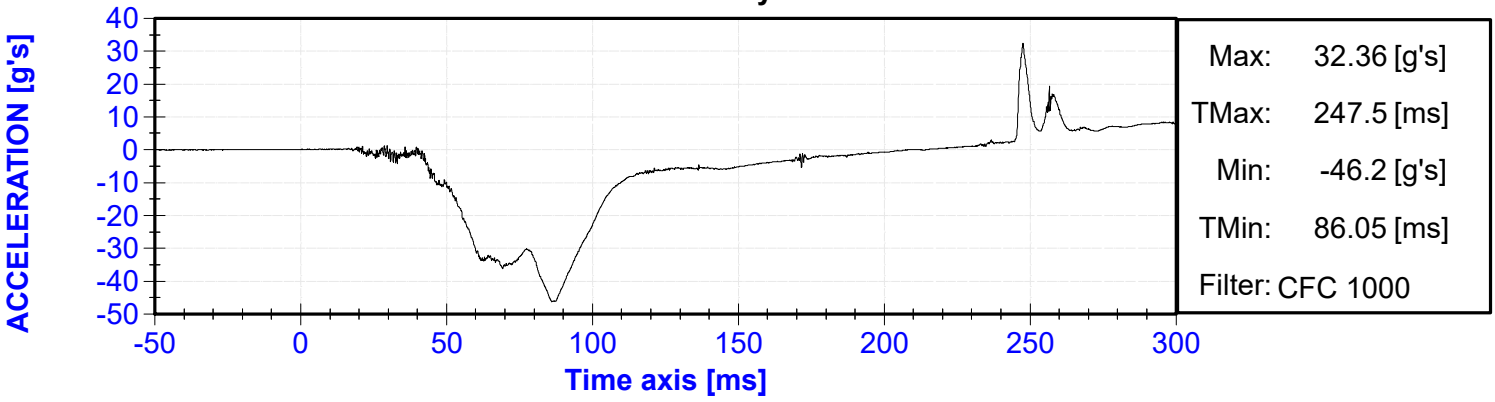
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.NHTSA.gov

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

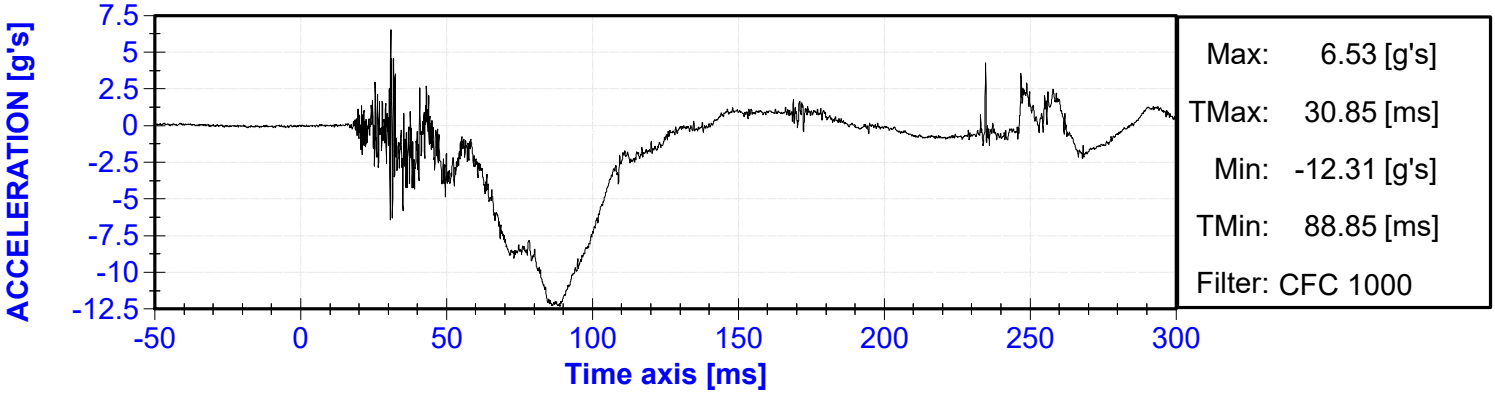
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver 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 Food 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

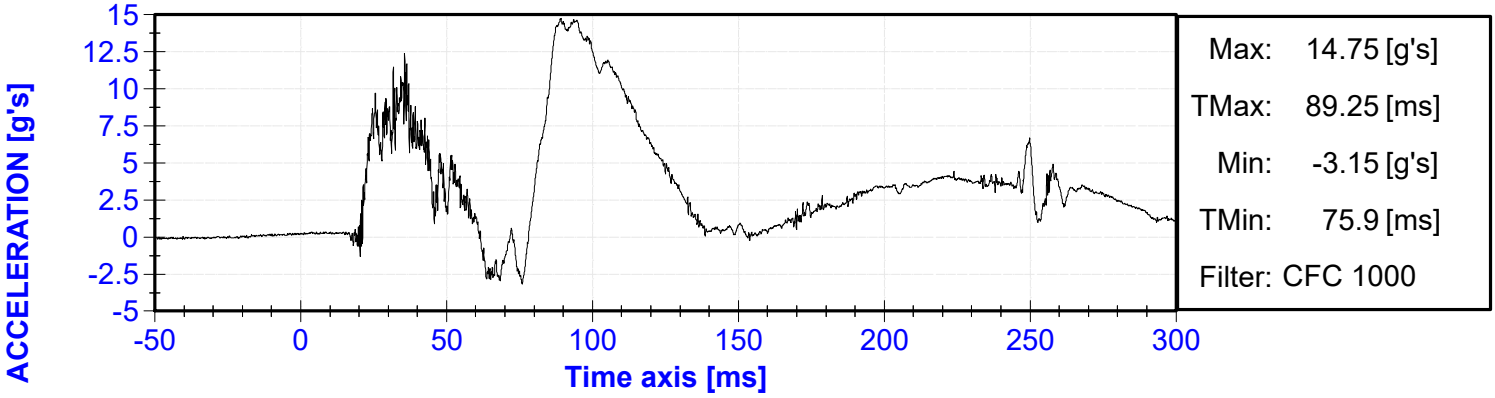
Driver Head X Acceleration vs. Time Primary



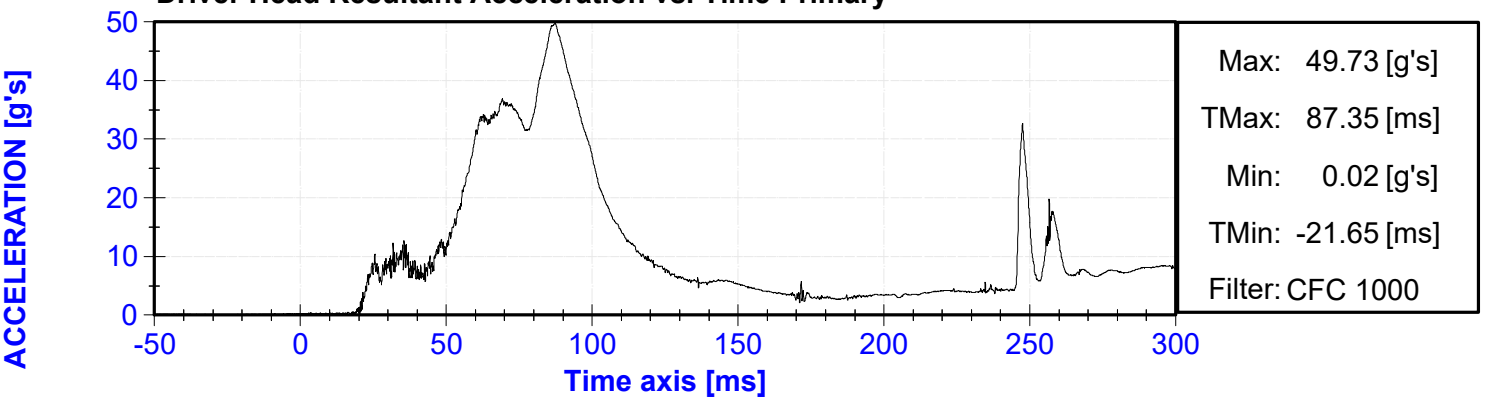
Driver Head Y Acceleration vs. Time Primary



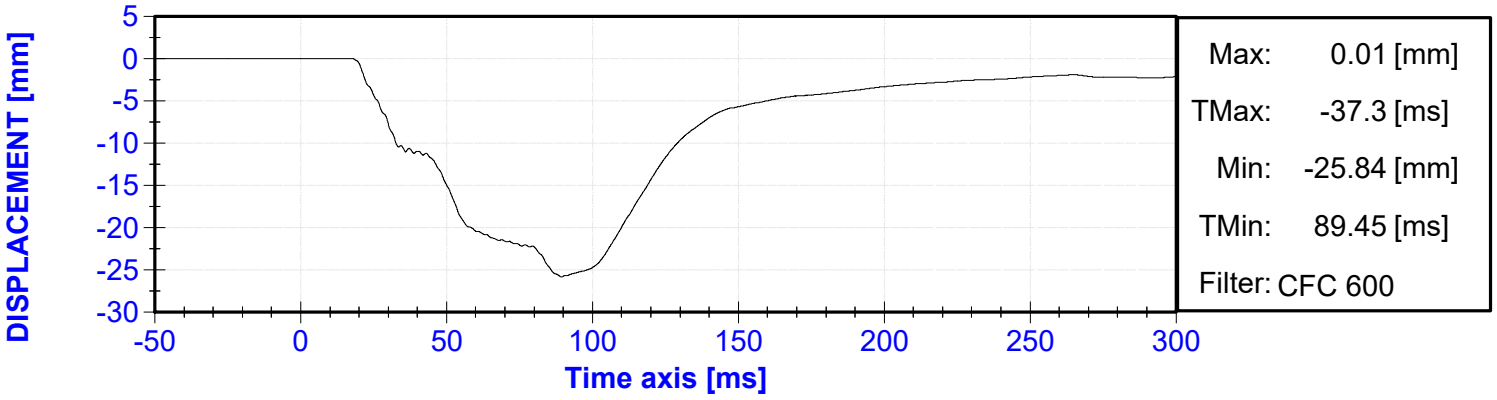
Driver Head Z Acceleration vs. Time Primary



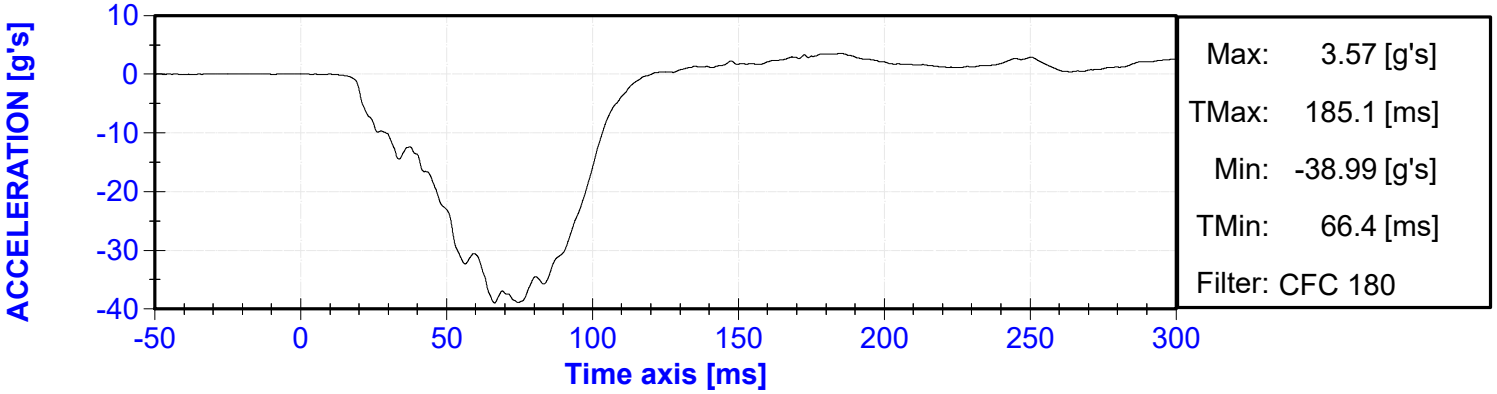
Driver Head Resultant Acceleration vs. Time Primary



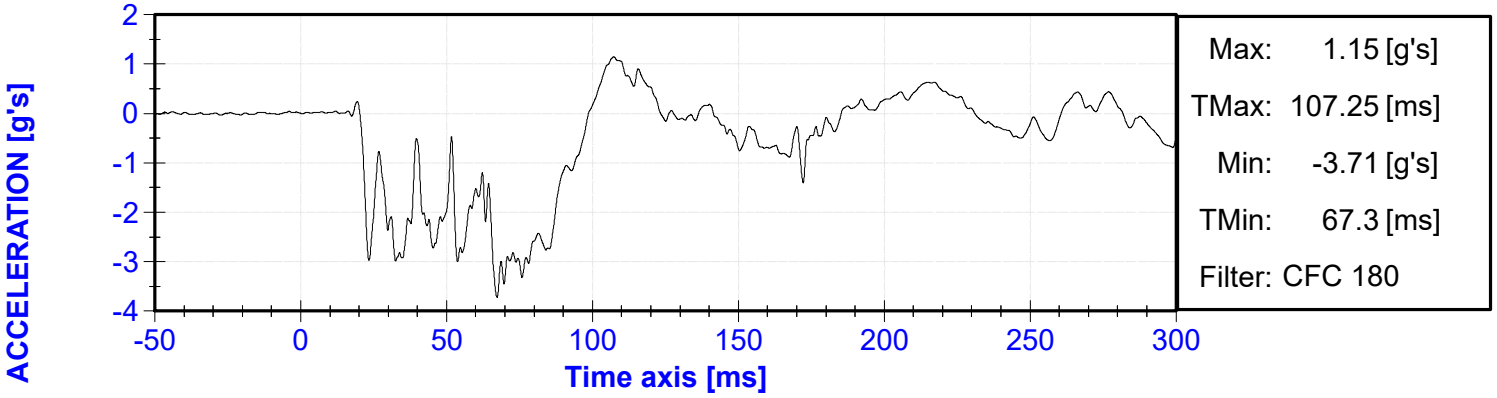
Driver Chest X Deflection vs. Time



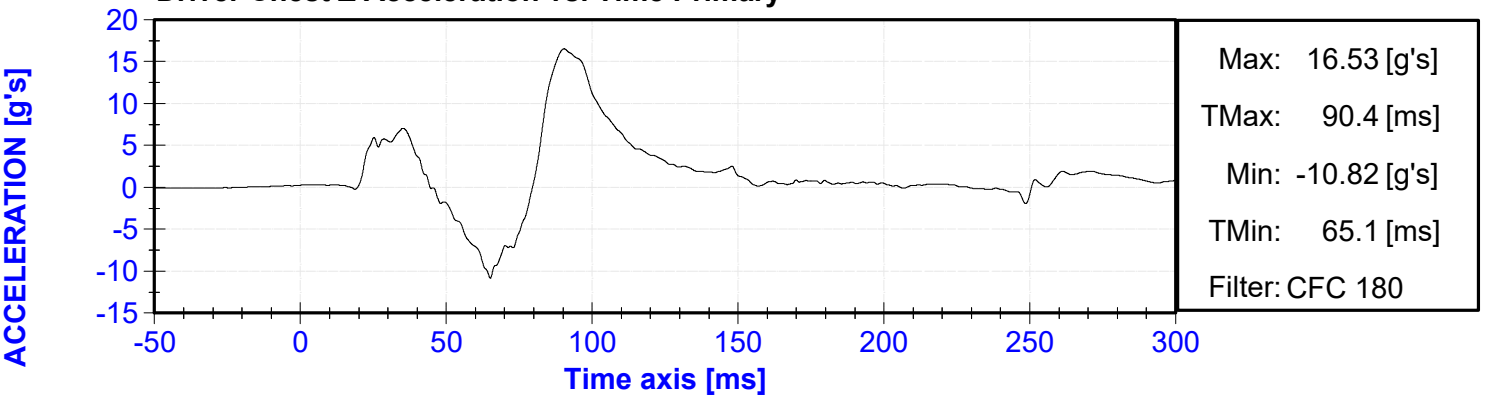
Driver Chest X Acceleration vs. Time Primary



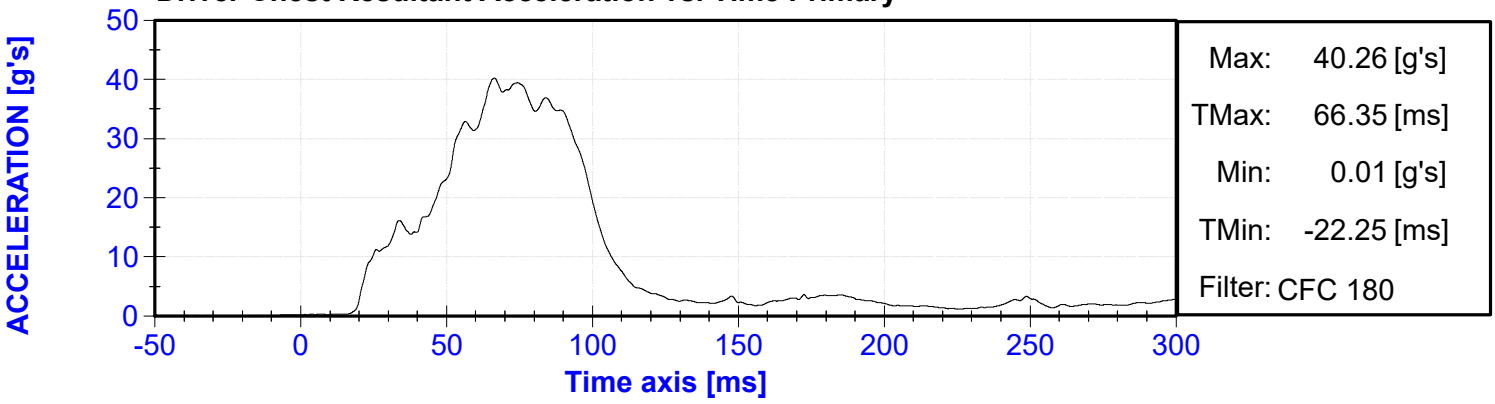
Driver Chest Y Acceleration vs. Time Primary



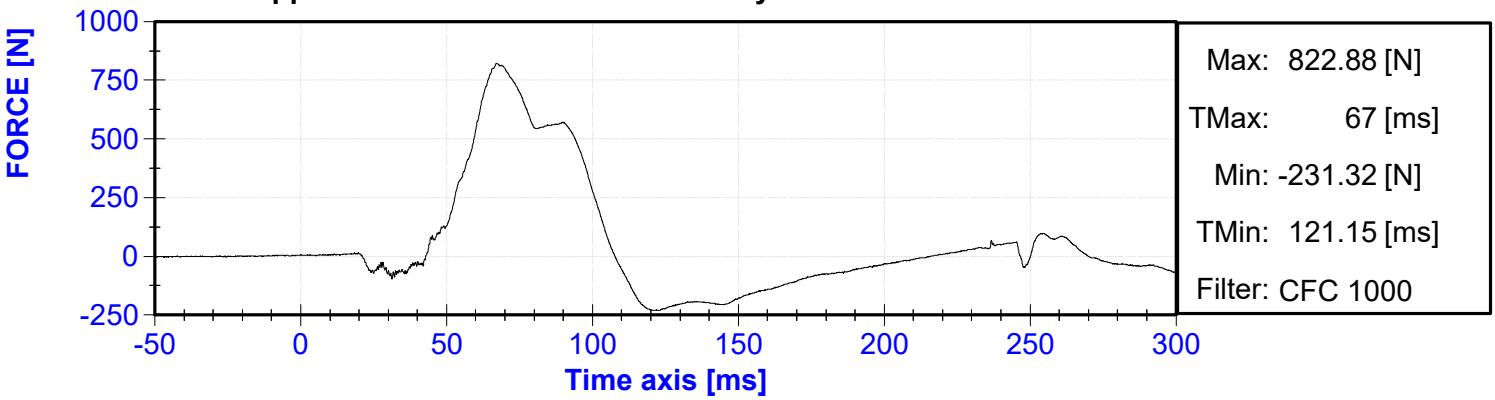
Driver Chest Z Acceleration vs. Time Primary



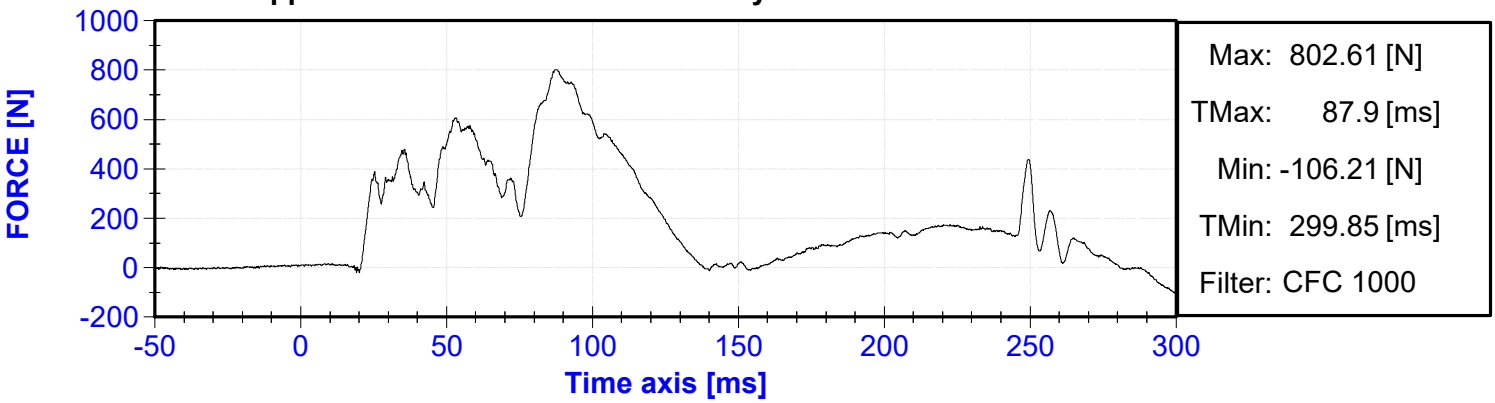
Driver Chest Resultant Acceleration vs. Time Primary



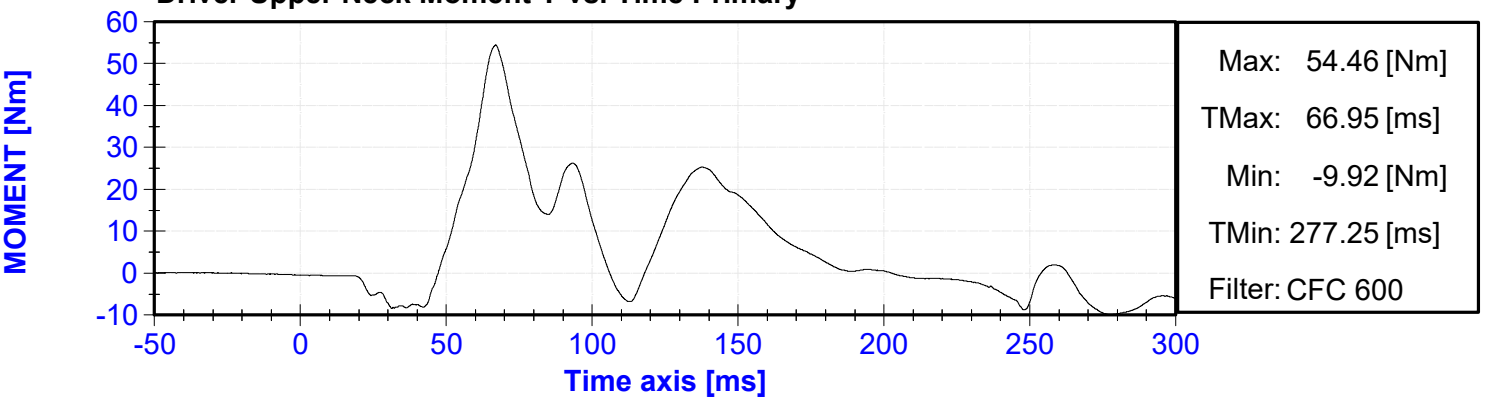
Driver Upper Neck Force X vs. Time Primary



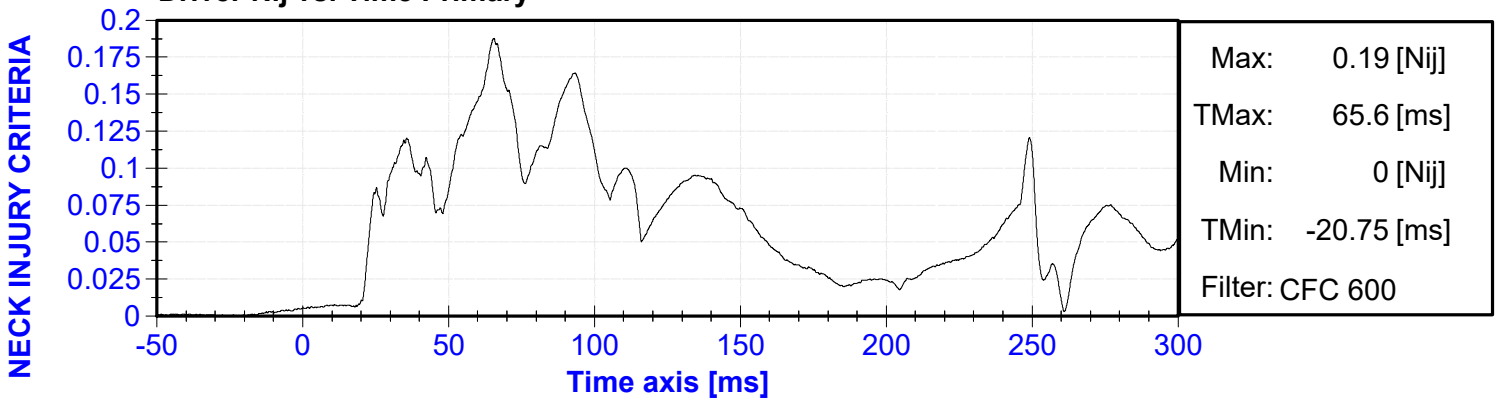
Driver Upper Neck Force Z vs. Time Primary



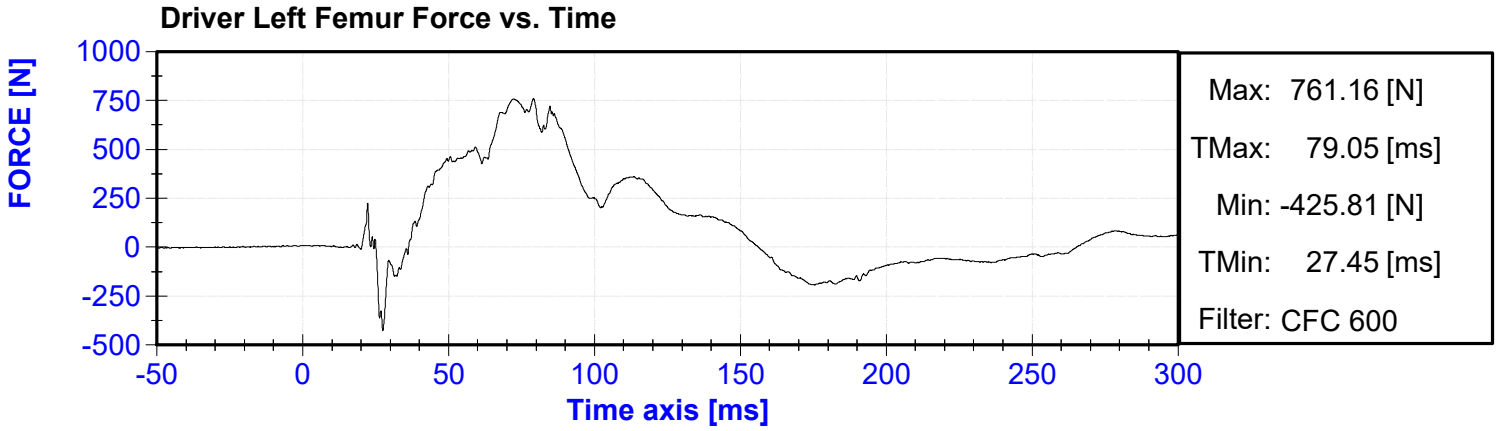
Driver Upper Neck Moment Y vs. Time Primary



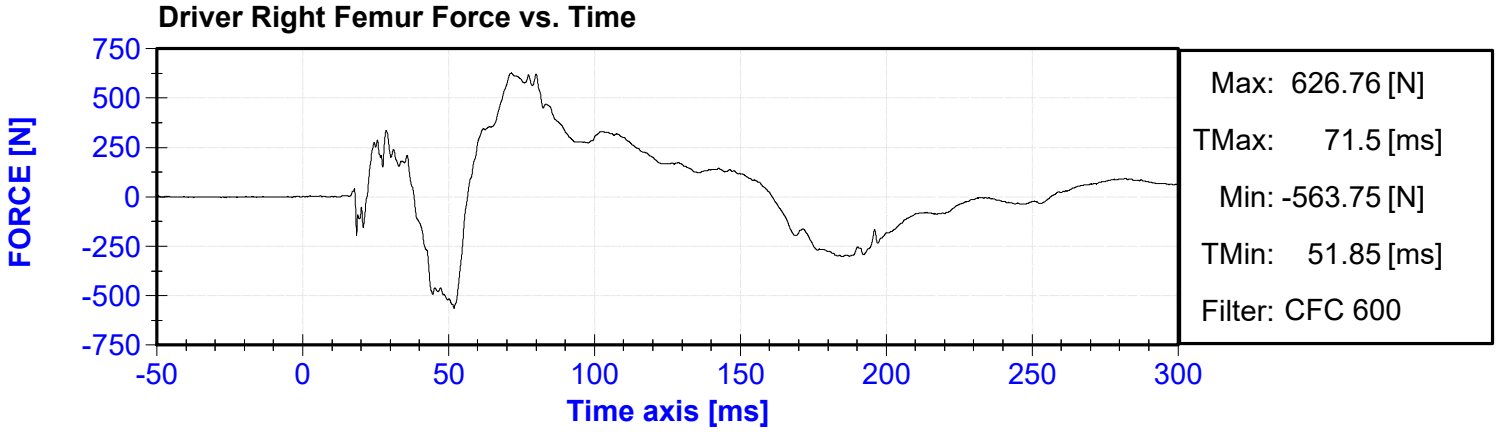
Driver Nij vs. Time Primary



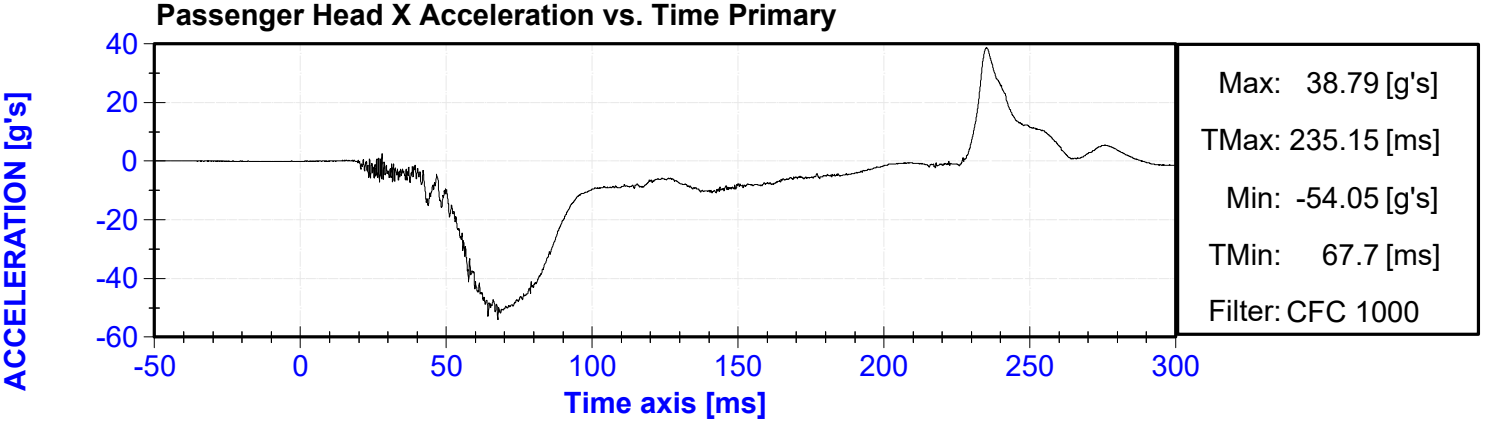
Driver Left Femur Force vs. Time



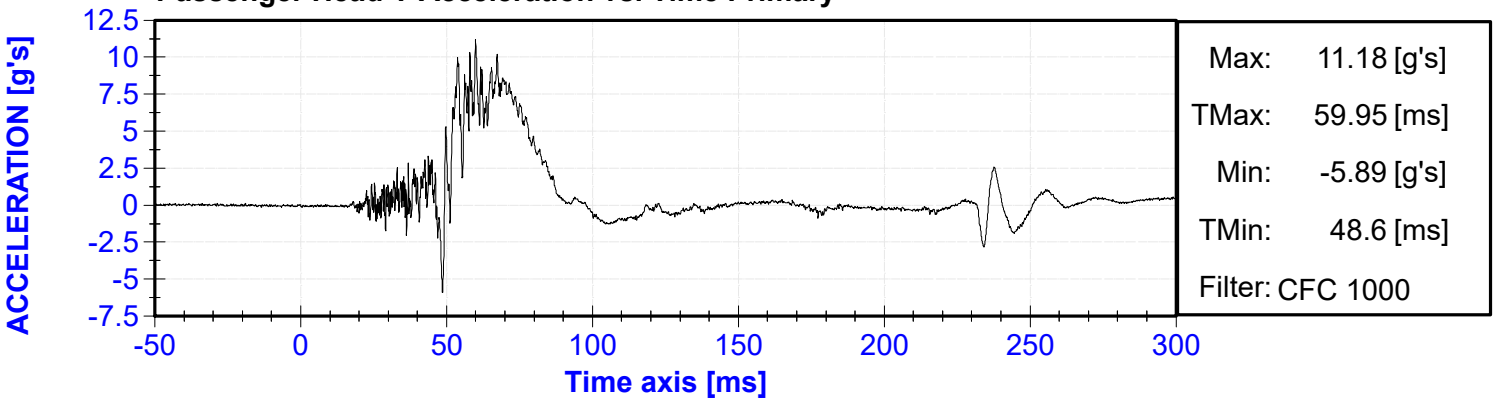
Driver Right Femur Force vs. Time



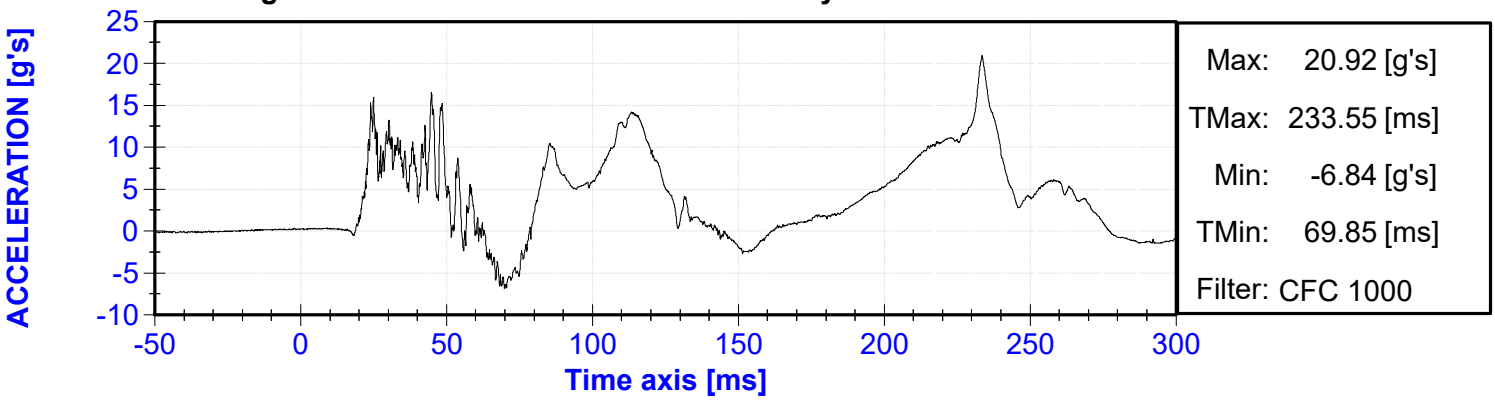
Passenger Head X Acceleration vs. Time Primary



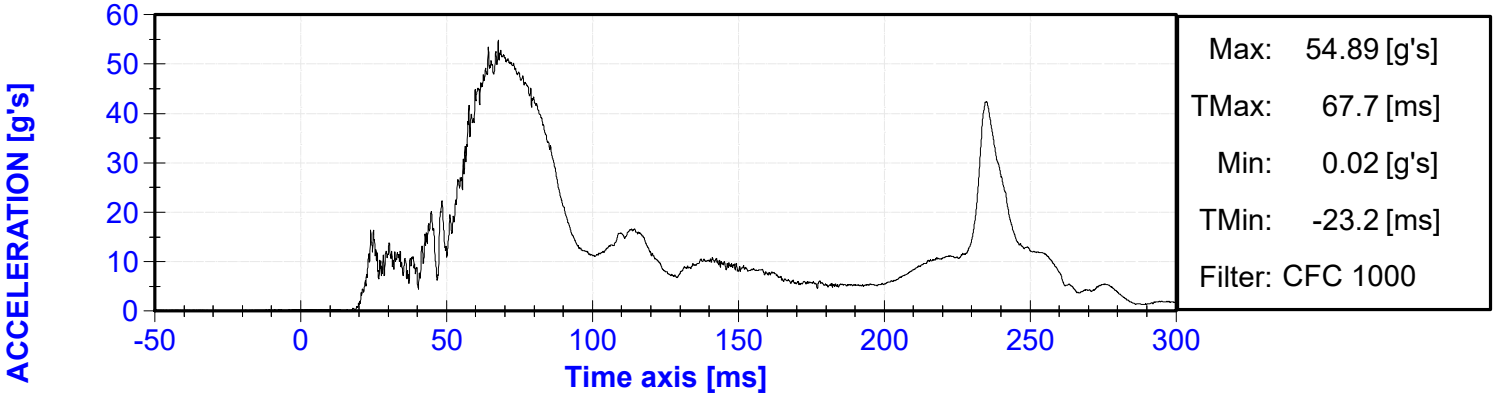
Passenger Head Y Acceleration vs. Time Primary



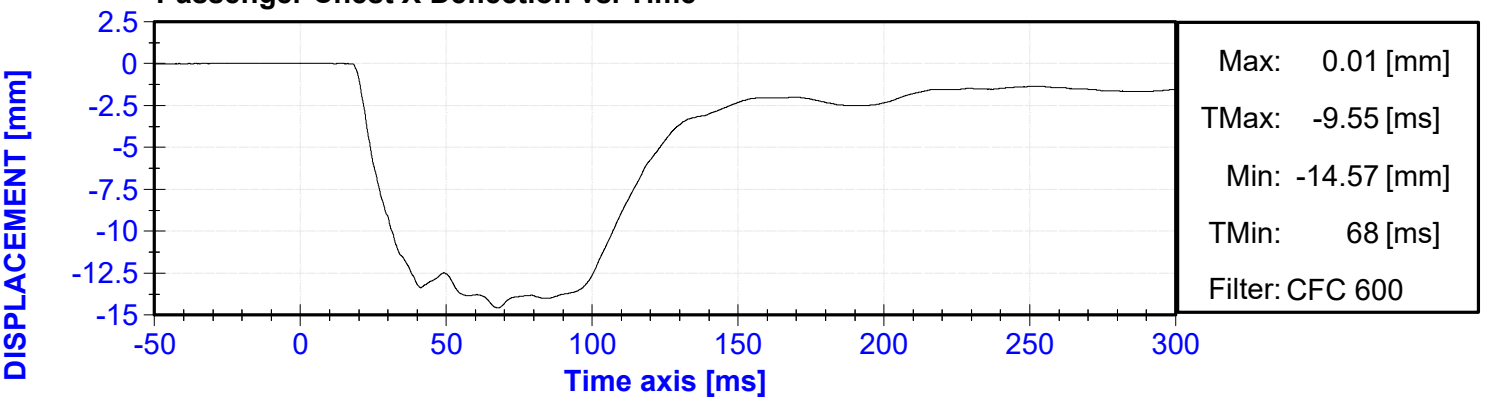
Passenger Head Z Acceleration vs. Time Primary



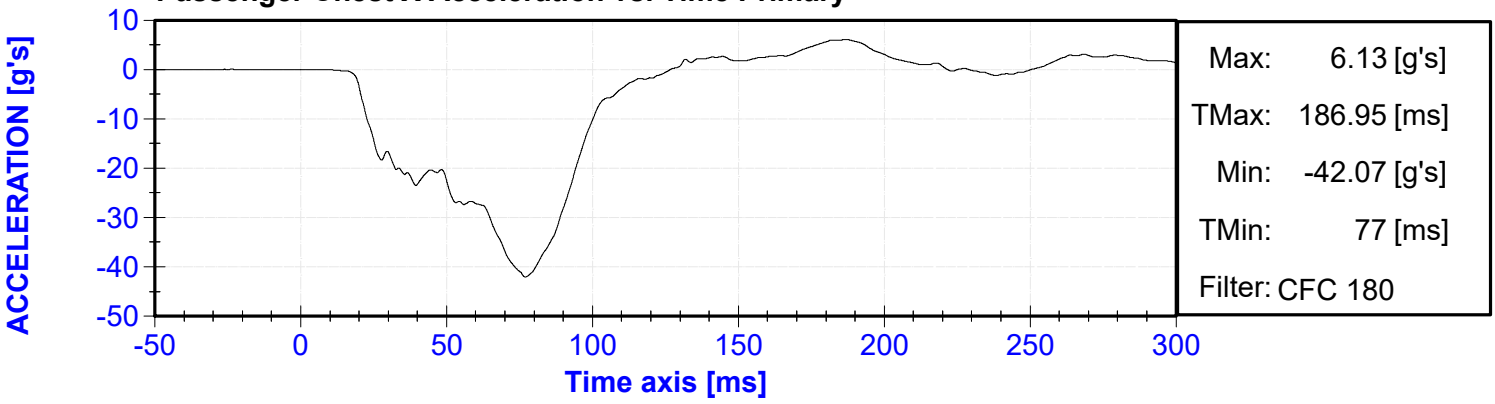
Passenger Head Resultant Acceleration vs. Time Primary



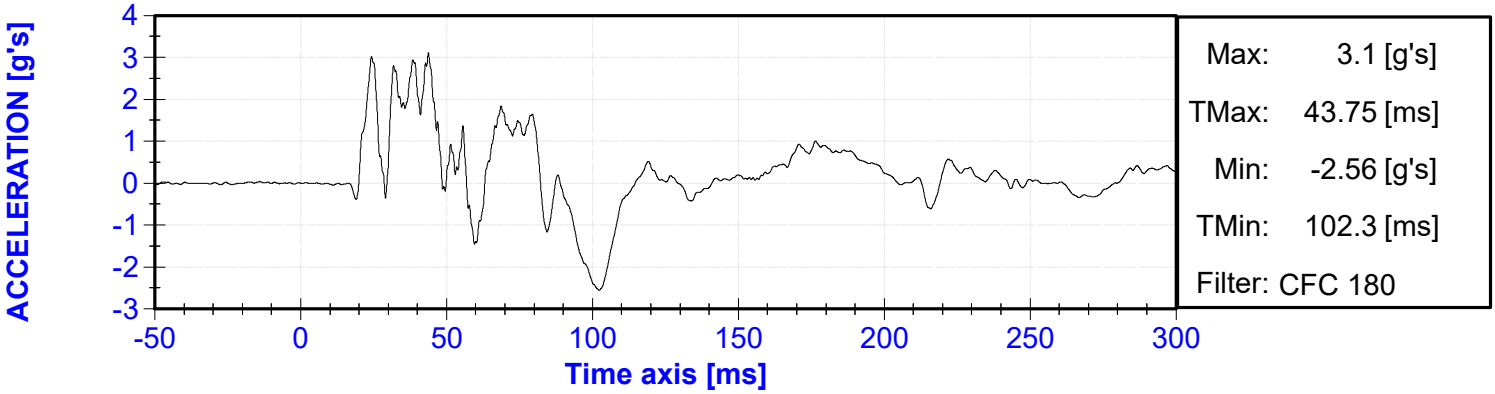
Passenger Chest X Deflection vs. Time



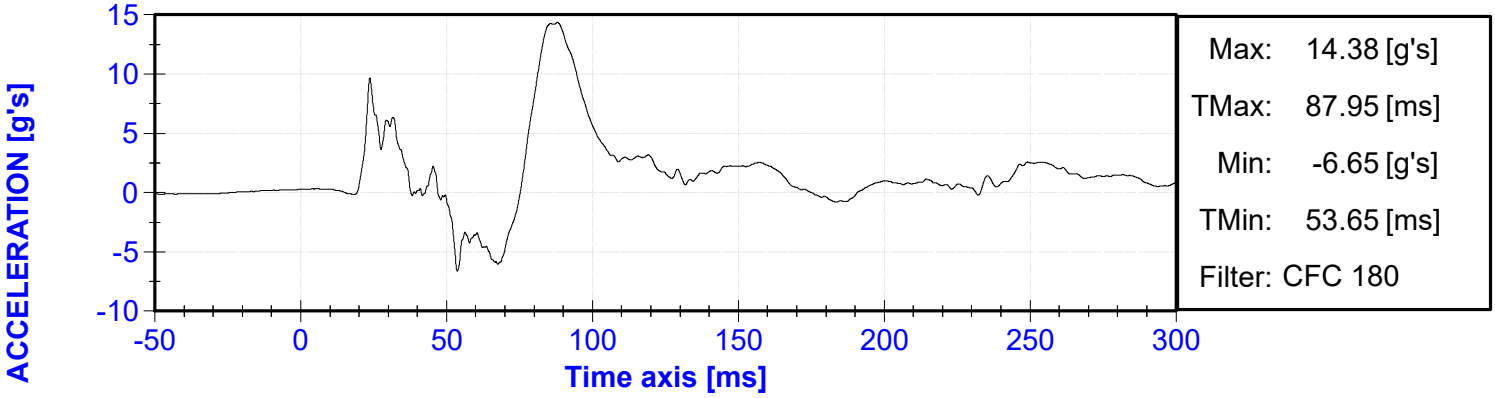
Passenger Chest X Acceleration vs. Time Primary



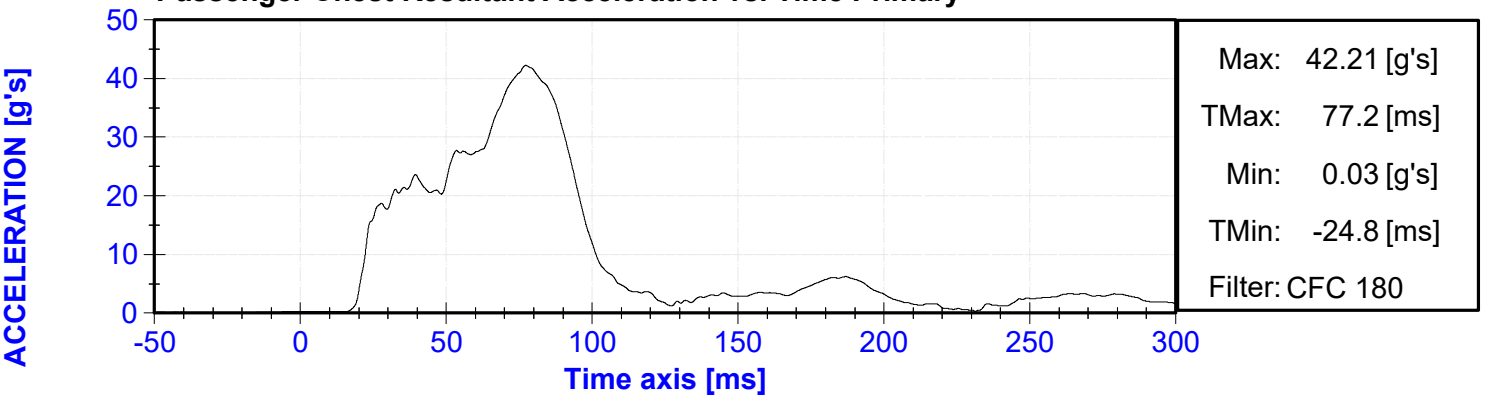
Passenger Chest Y Acceleration vs. Time Primary



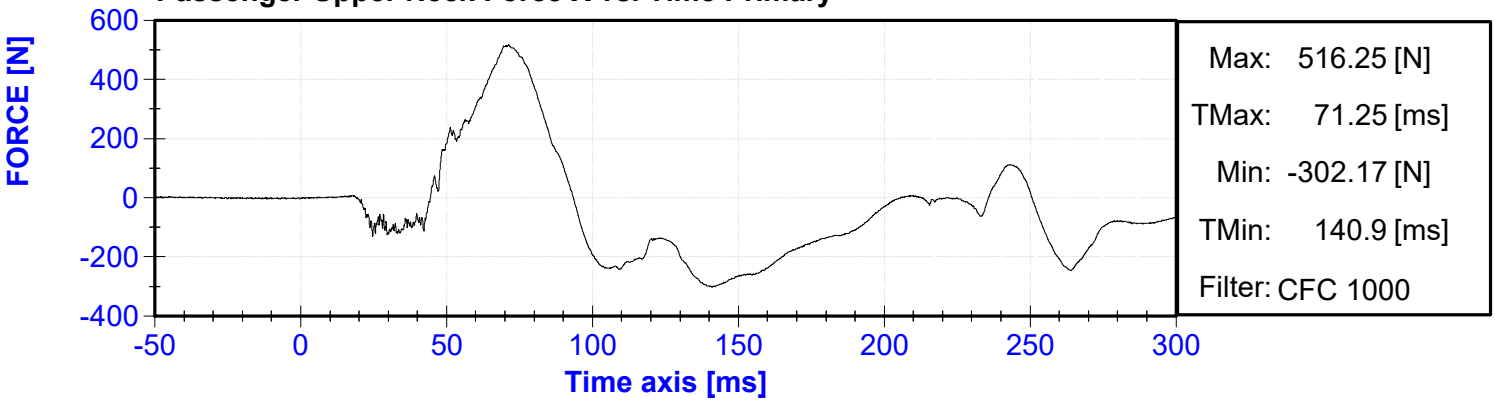
Passenger Chest Z Acceleration vs. Time Primary



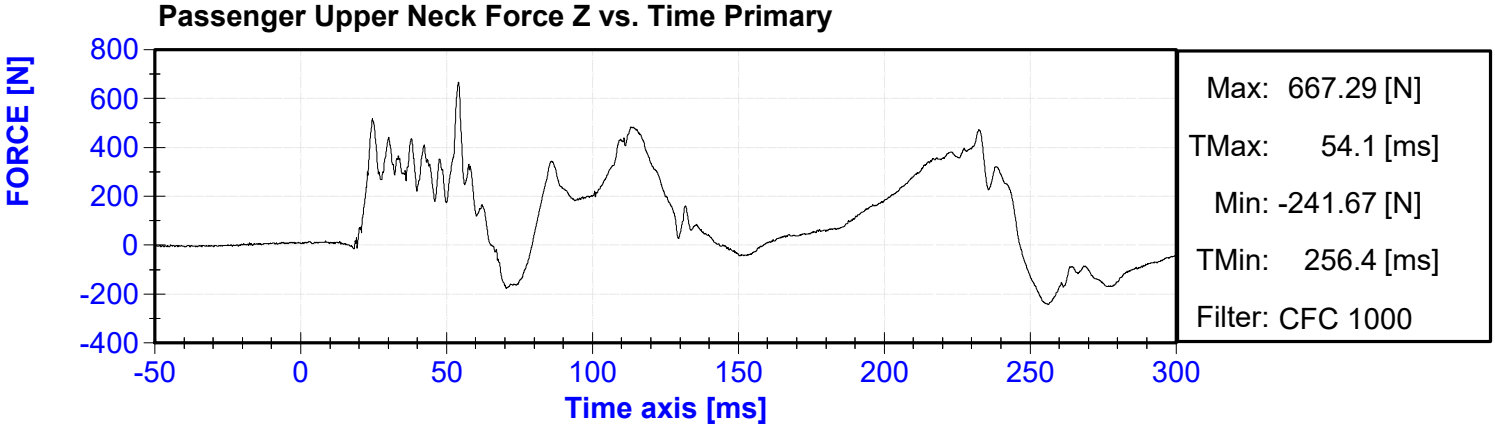
Passenger Chest Resultant Acceleration vs. Time Primary



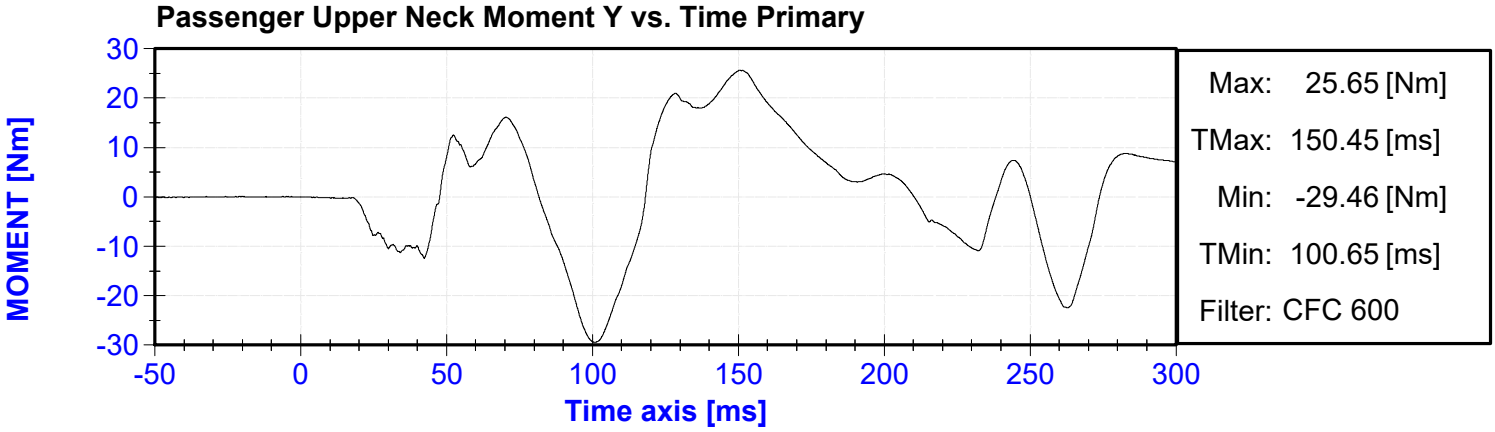
Passenger Upper Neck Force X vs. Time Primary



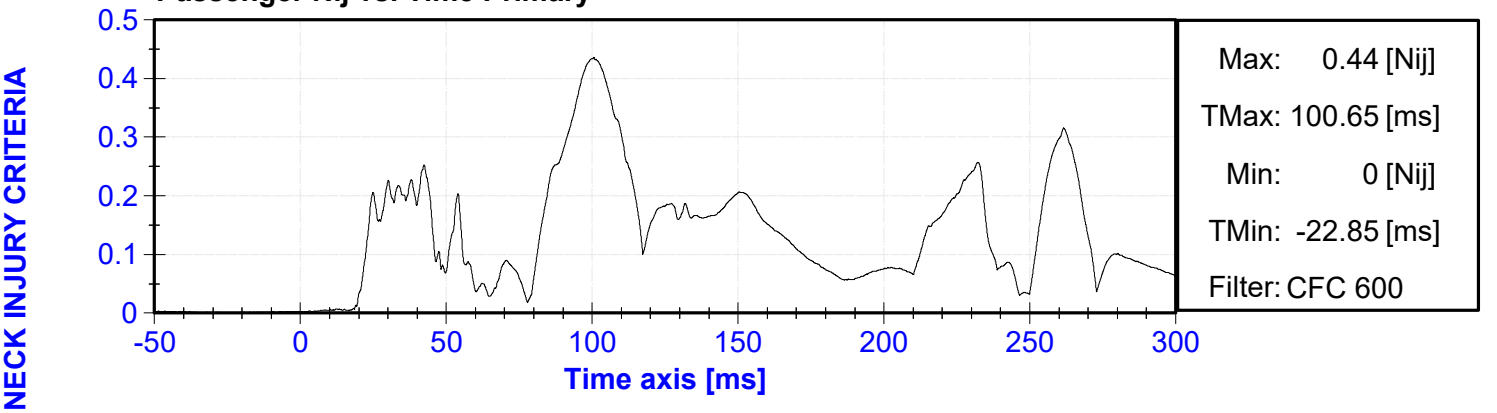
Passenger Upper Neck Force Z vs. Time Primary



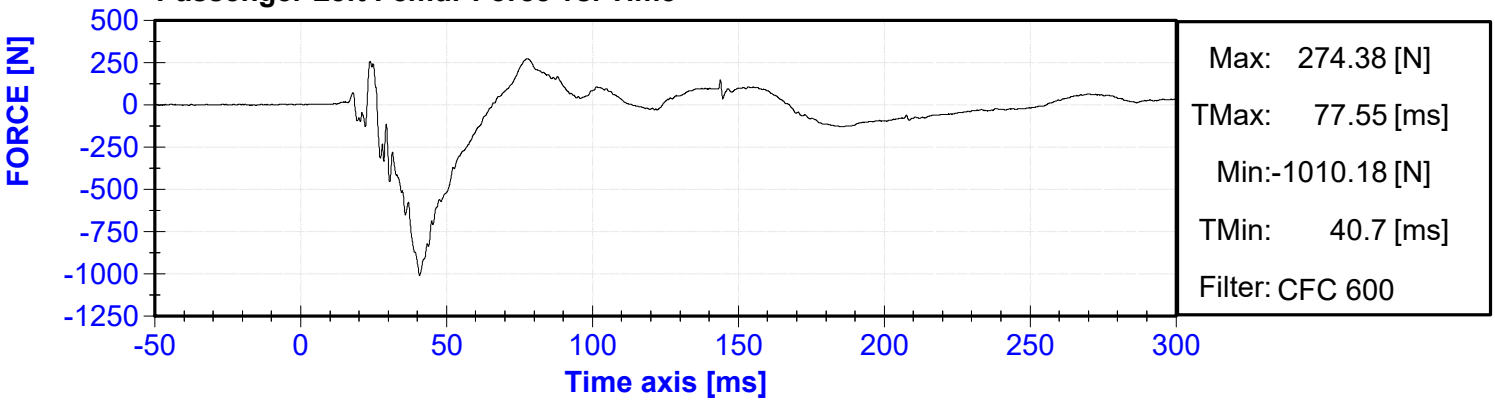
Passenger Upper Neck Moment Y vs. Time Primary



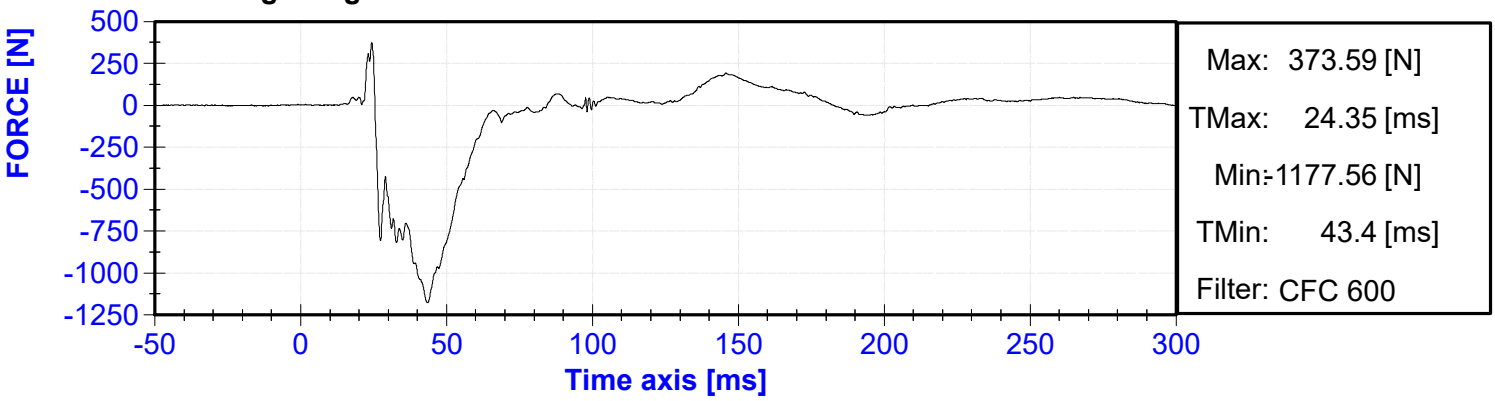
Passenger Nij vs. Time Primary



Passenger Left Femur Force vs. Time



Passenger Right Femur Force vs. Time



APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

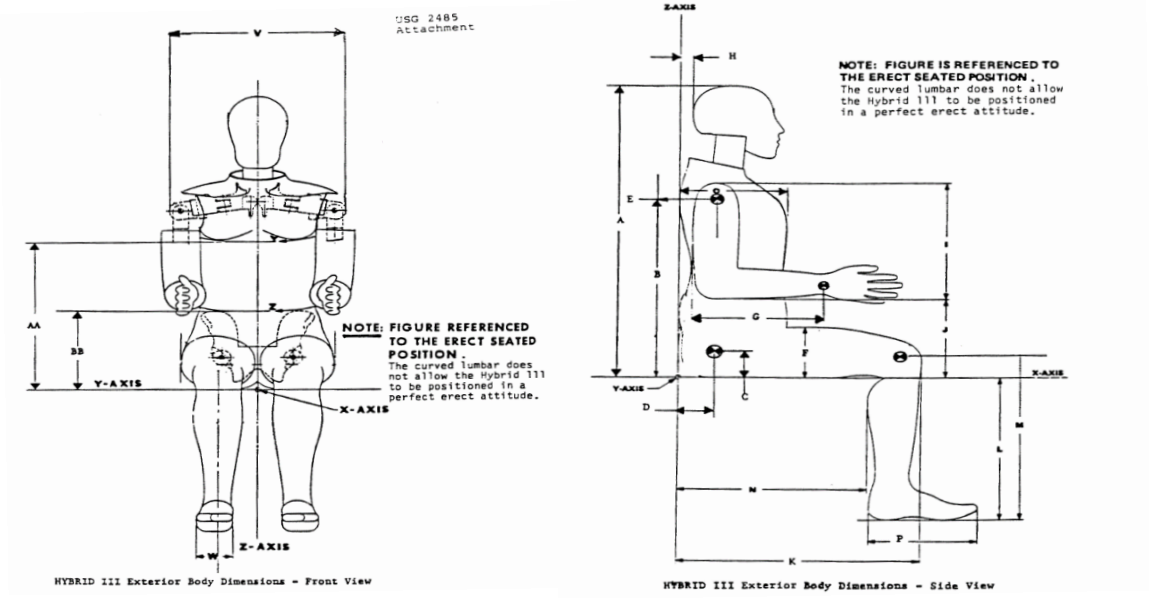
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 065

External Measurements - Hybrid 3 - 50th Male

Technician: T. Roseman Date: 05/03/2024

Dummy Serial Number: 065



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.8	Pass
B	Shoulder Pivot Height	19.9	20.5	20.2	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.4	Pass
F	Thigh Clearance	5.5	6.1	6.0	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.8	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.4	Pass
J	Elbow Rest Height	7.5	8.3	7.9	Pass
K	Buttock to Knee Length	22.8	23.8	23.5	Pass
L	Popliteal Height	16.9	17.9	17.5	Pass
M	Knee Pivot Height	19.1	19.7	19.5	Pass
N	Buttock Popliteal Length	17.8	18.8	18.4	Pass
O	Chest Depth without Jacket	8.4	9.0	8.8	Pass
P	Foot Length (right)	9.9	10.5	10.2	Pass
V	Shoulder Breadth	16.3	17.2	16.9	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	9.0	Pass

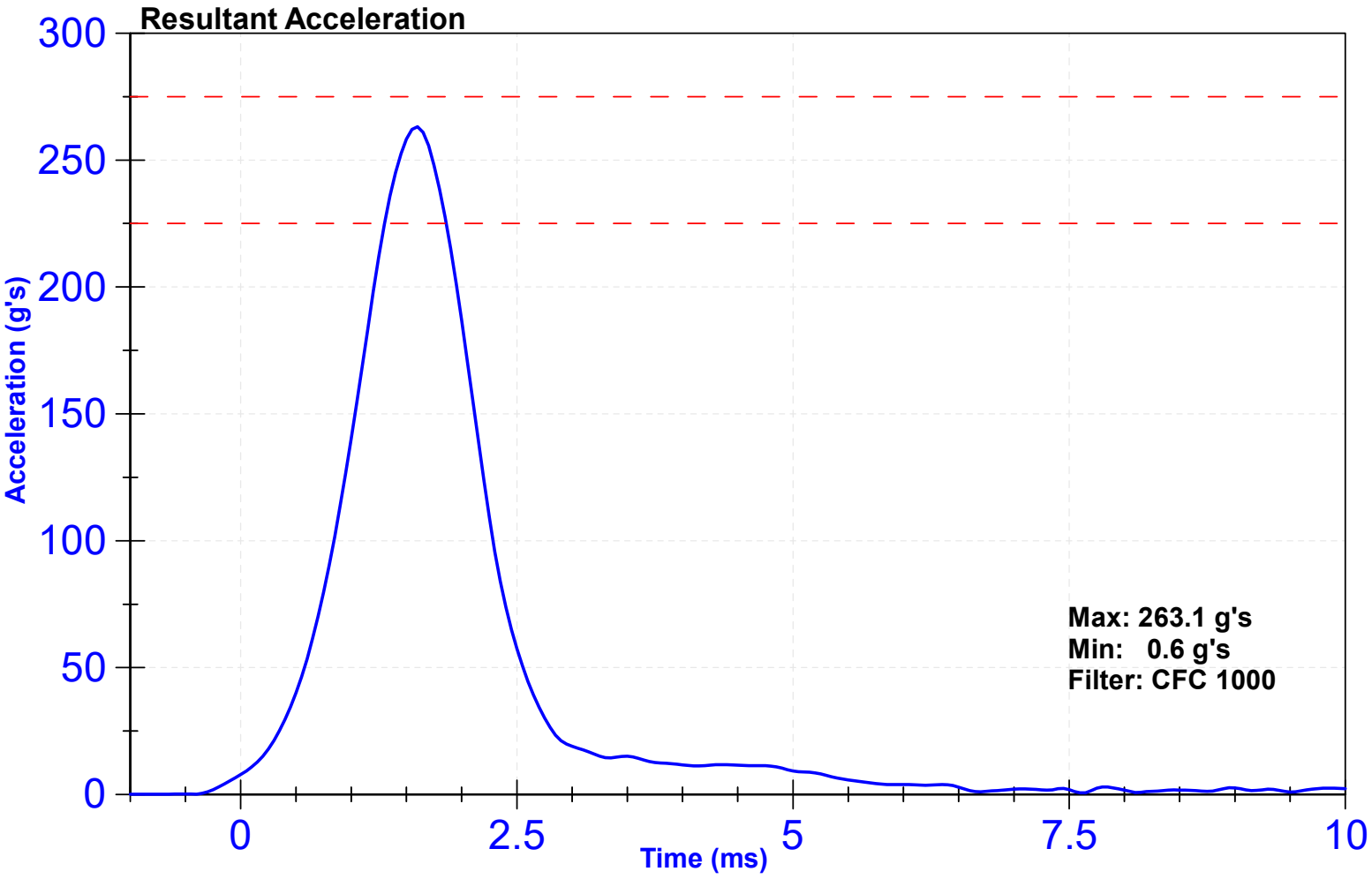
ATD Manufacturer	Humanetics	Test Technician	J.Kinderman
ATD Serial Number	065	Laboratory Supervisor	C.Mantel

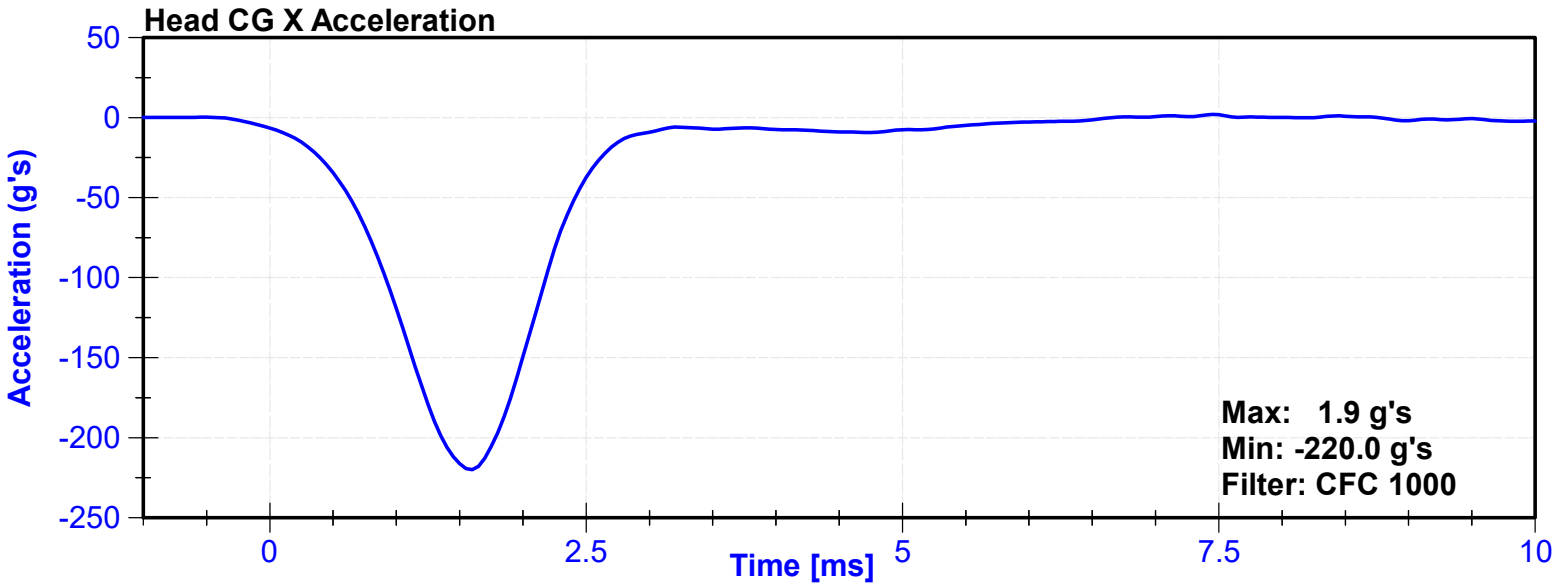
Results

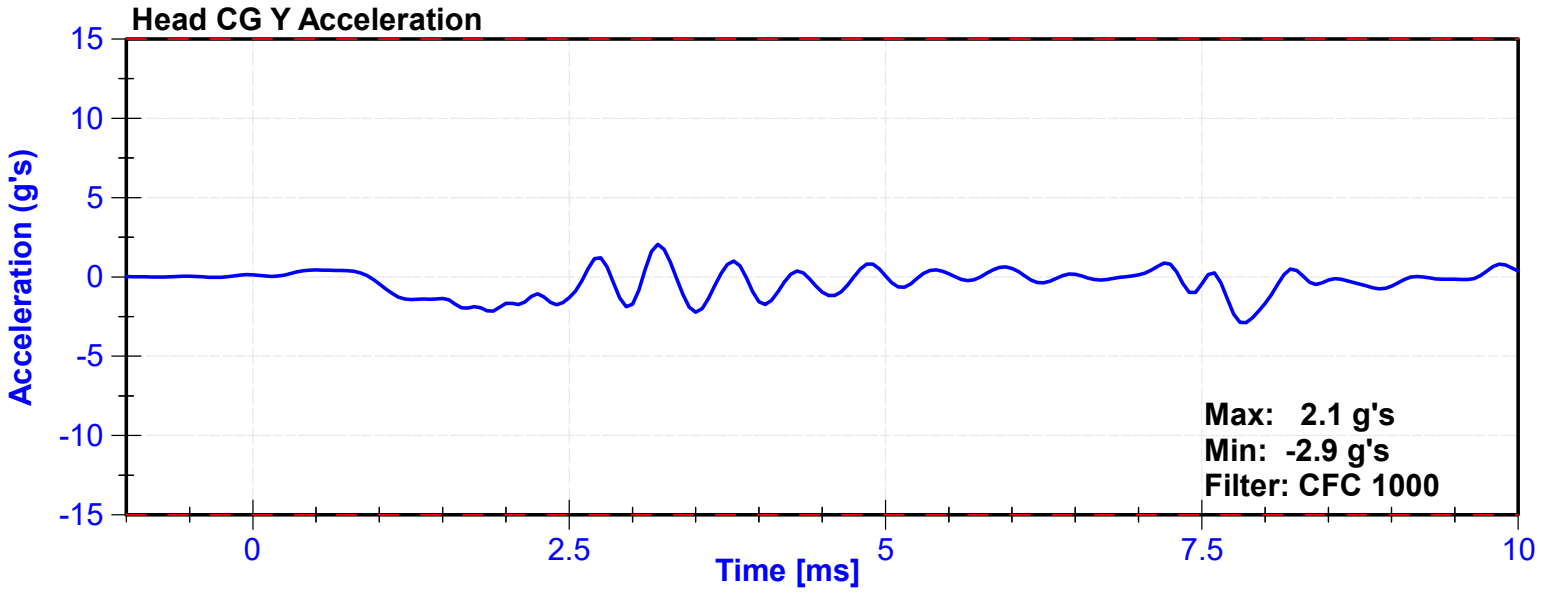
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.1	Pass
Humidity	10	70	%	43	Pass
Resultant Acceleration	225	275	g's	263.1	Pass
Oscillation	0	10	%	5.7	Pass
Lateral Acceleration	-15	15	g's	-3.8	Pass

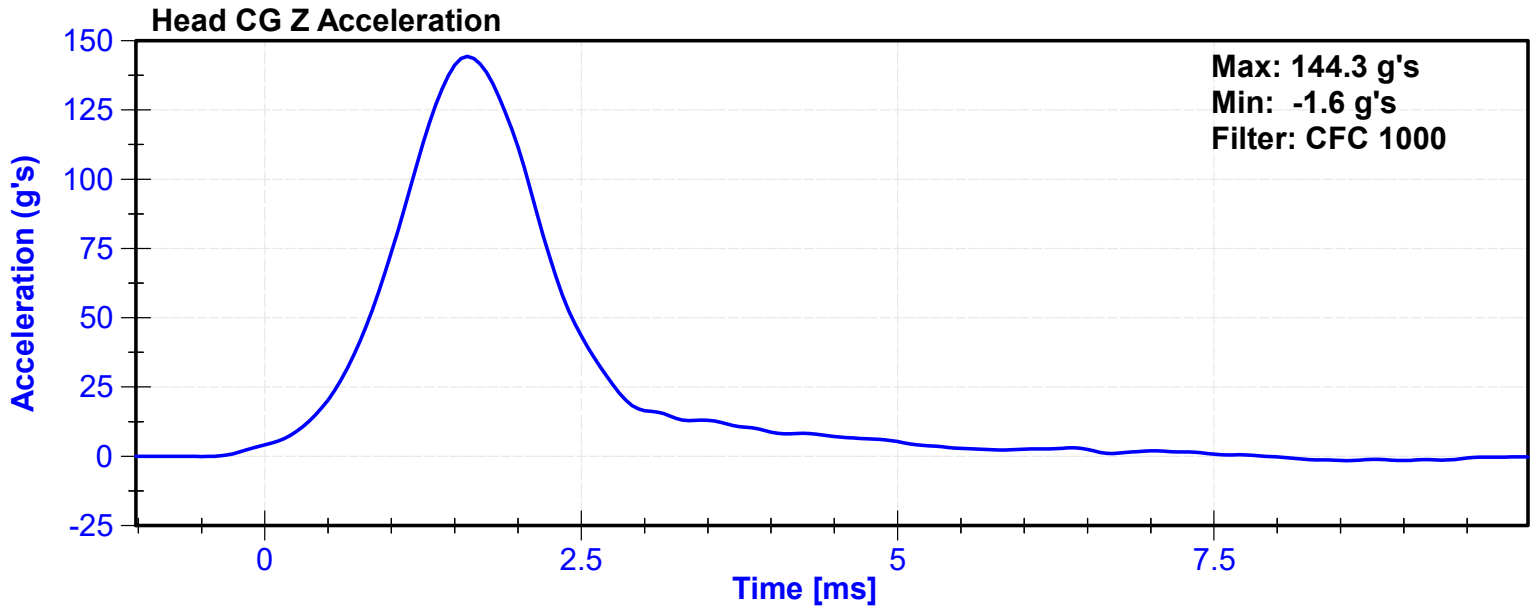
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P79591	4/30/2024	10/27/2024
Y Accelerometer	Endevco	P58888	4/30/2024	10/27/2024
Z Accelerometer	Endevco	P58911	4/30/2024	10/27/2024




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 1.9 g's
Min: -220.0 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 2.1 g's
Min: -2.9 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
Time [ms]
Max: 144.3 g's
Min: -1.6 g's
Filter: CFC 1000

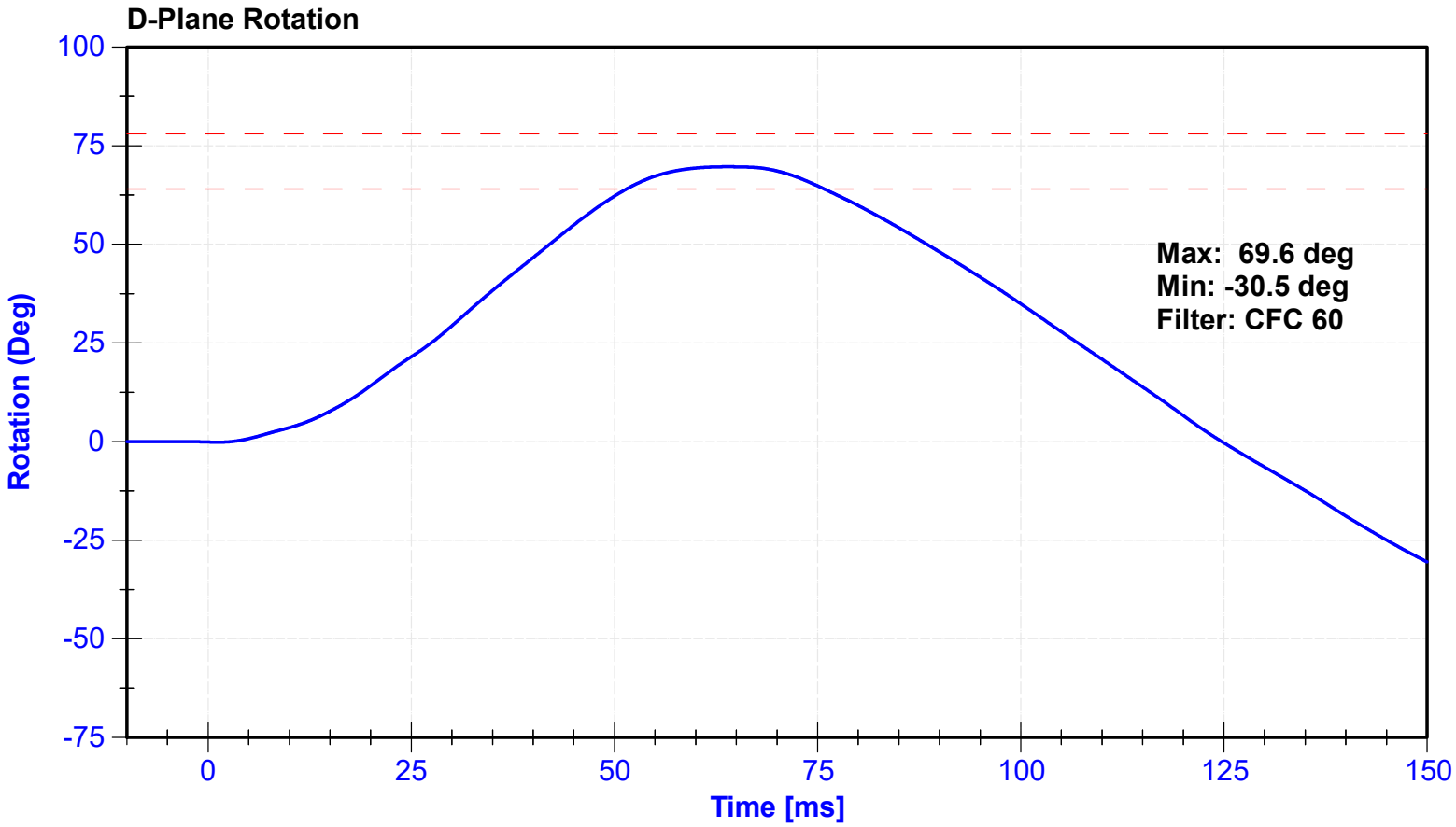
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

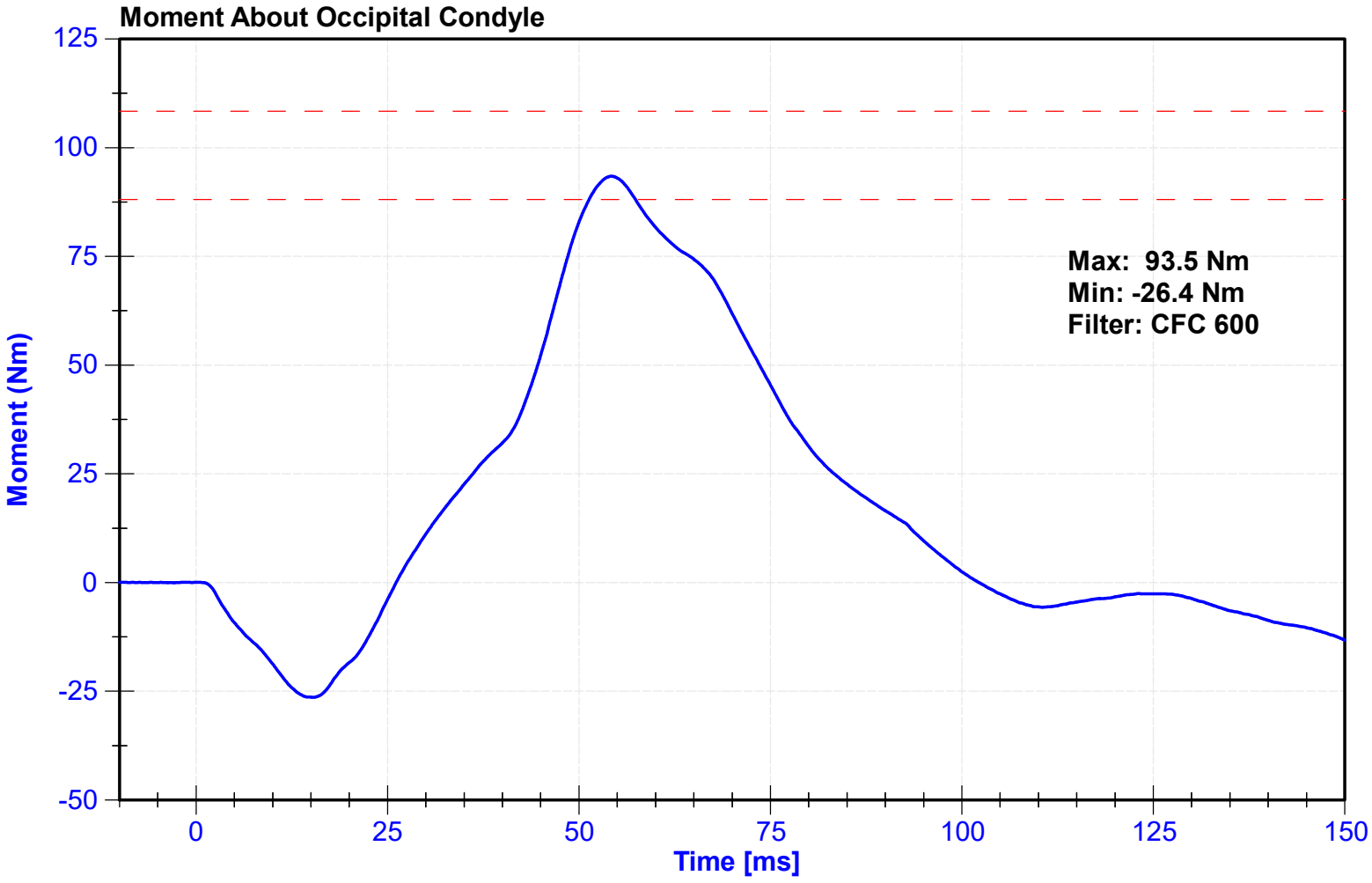
Results

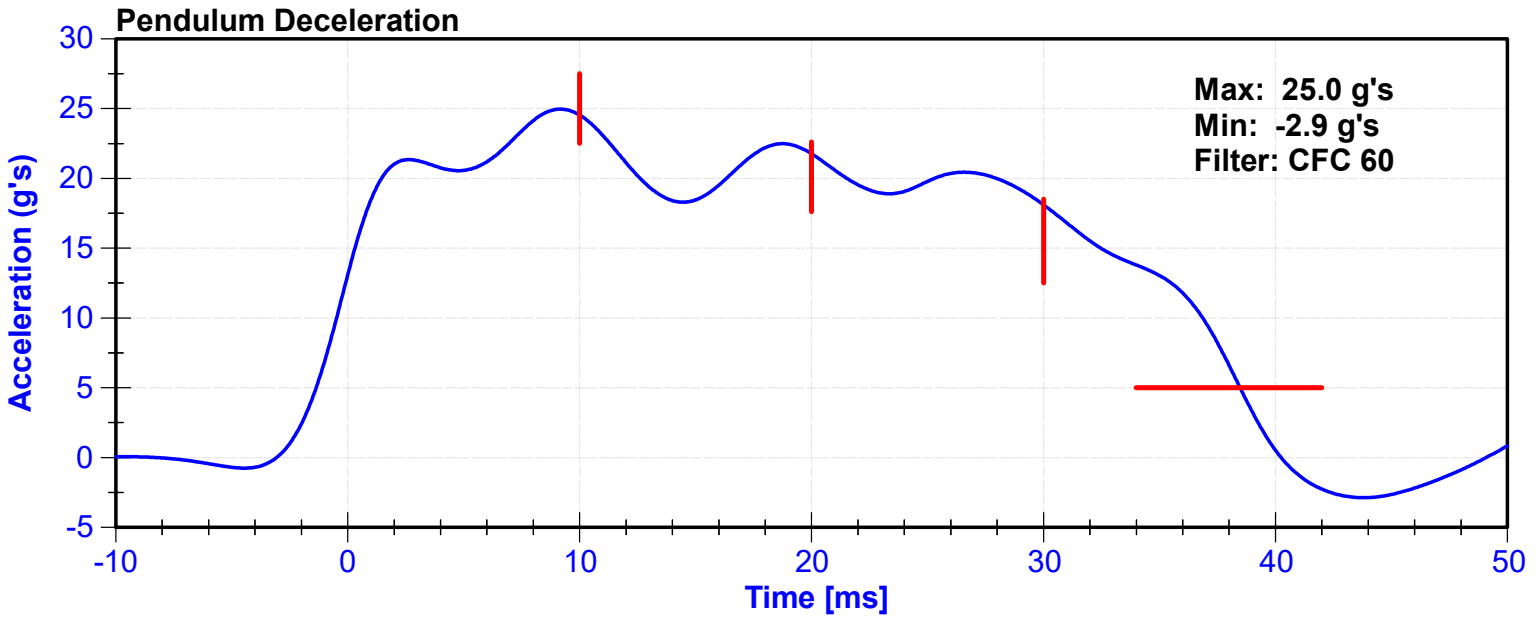
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	40	Pass
Velocity	6.89	7.13	m/s	6.908	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	24.52	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	21.75	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	18.10	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	25.0	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	38.5	Pass
Maximum D Plane Rotation	64	78	deg	69.6	Pass
Time to Maximum Rotation	57	64	ms	63.9	Pass
Rotation Decay to Zero	113	127	ms	124.7	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	93.47	Pass
Time to Maximum Moment	47	58	ms	54.3	Pass
Moment Decay to Zero	97	107	ms	102.3	Pass

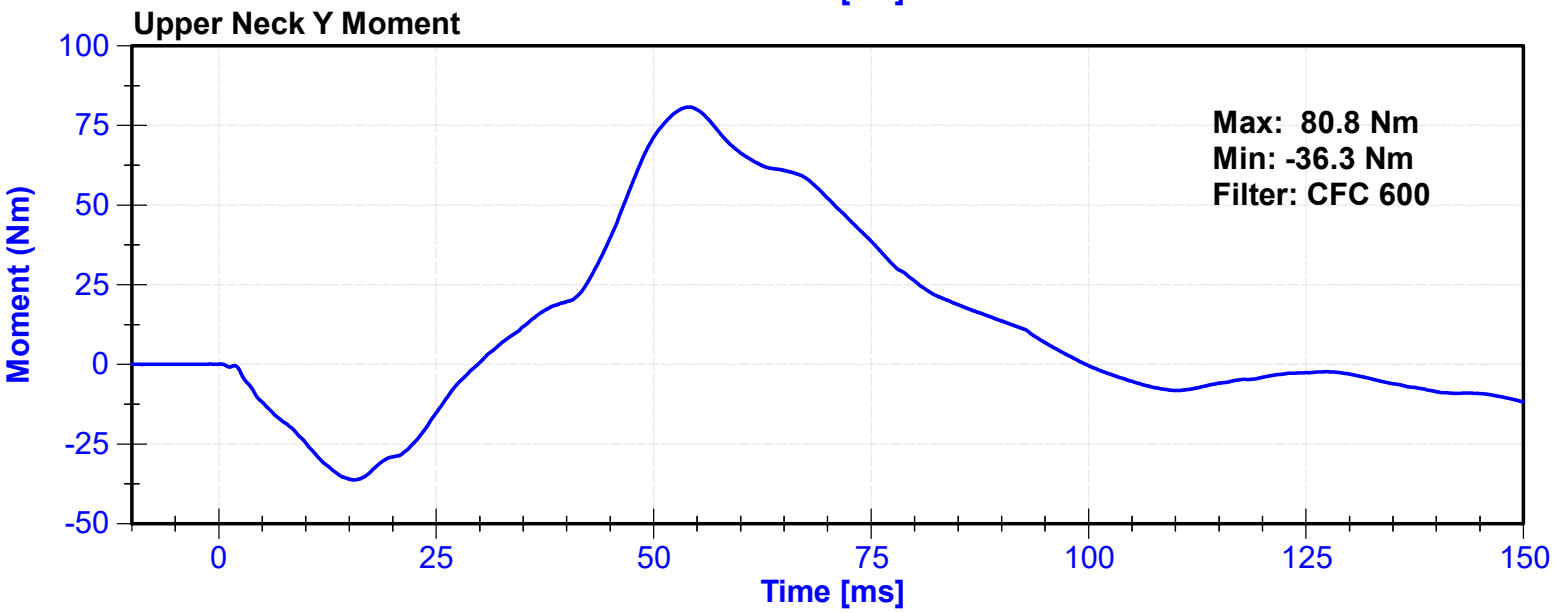
Transducer Calibrations

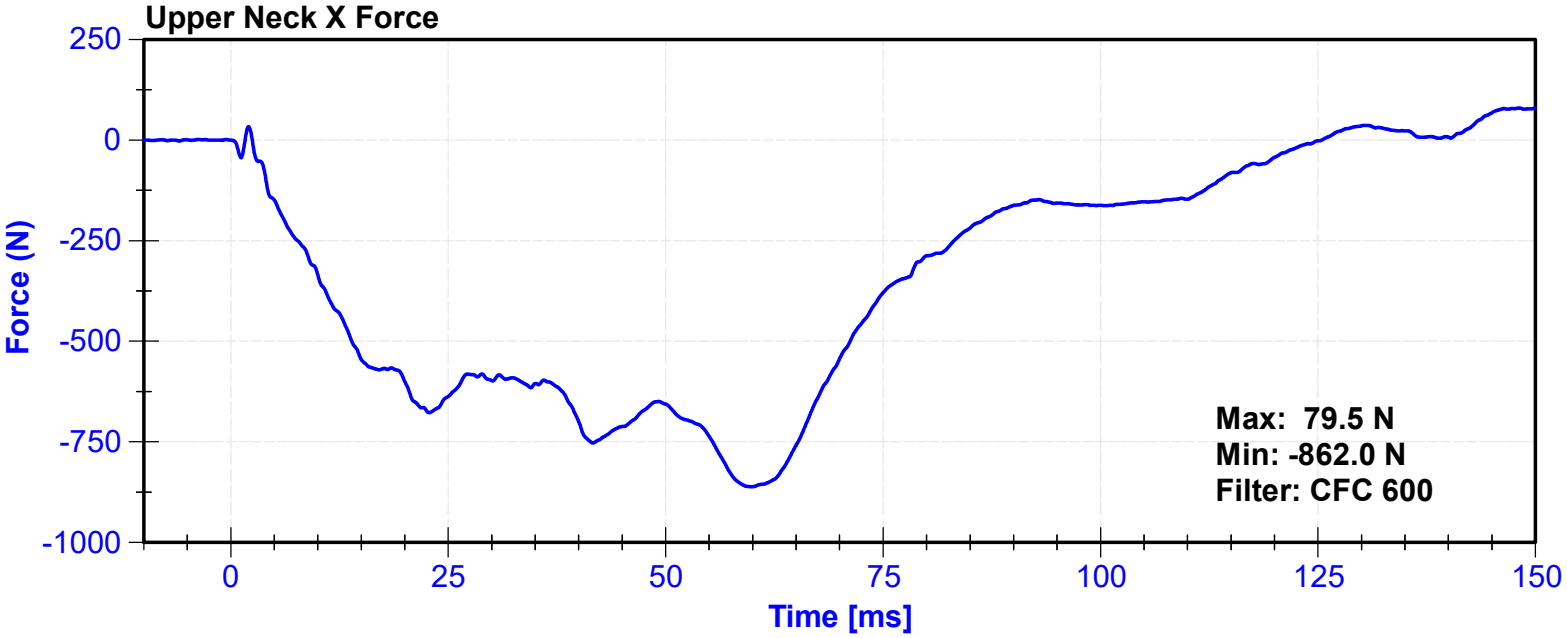
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	4/29/2024	10/26/2024
Pendulum Potentiometer	ETI	LABPOT1	5/5/2023	5/4/2024
Condyle Potentiometer	ETI	LABPOT2	7/19/2023	7/18/2024
Upper Neck Load Cell	Humanetics	1916-FX	9/12/2023	9/11/2024


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]
Max: 69.6 deg
Min: -30.5 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 93.5 Nm
Min: -26.4 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 25.0 g's
Min: -2.9 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 80.8 Nm
Min: -36.3 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 79.5 N
Min: -862.0 N
Filter: CFC 600
Force (N)
Time [ms]

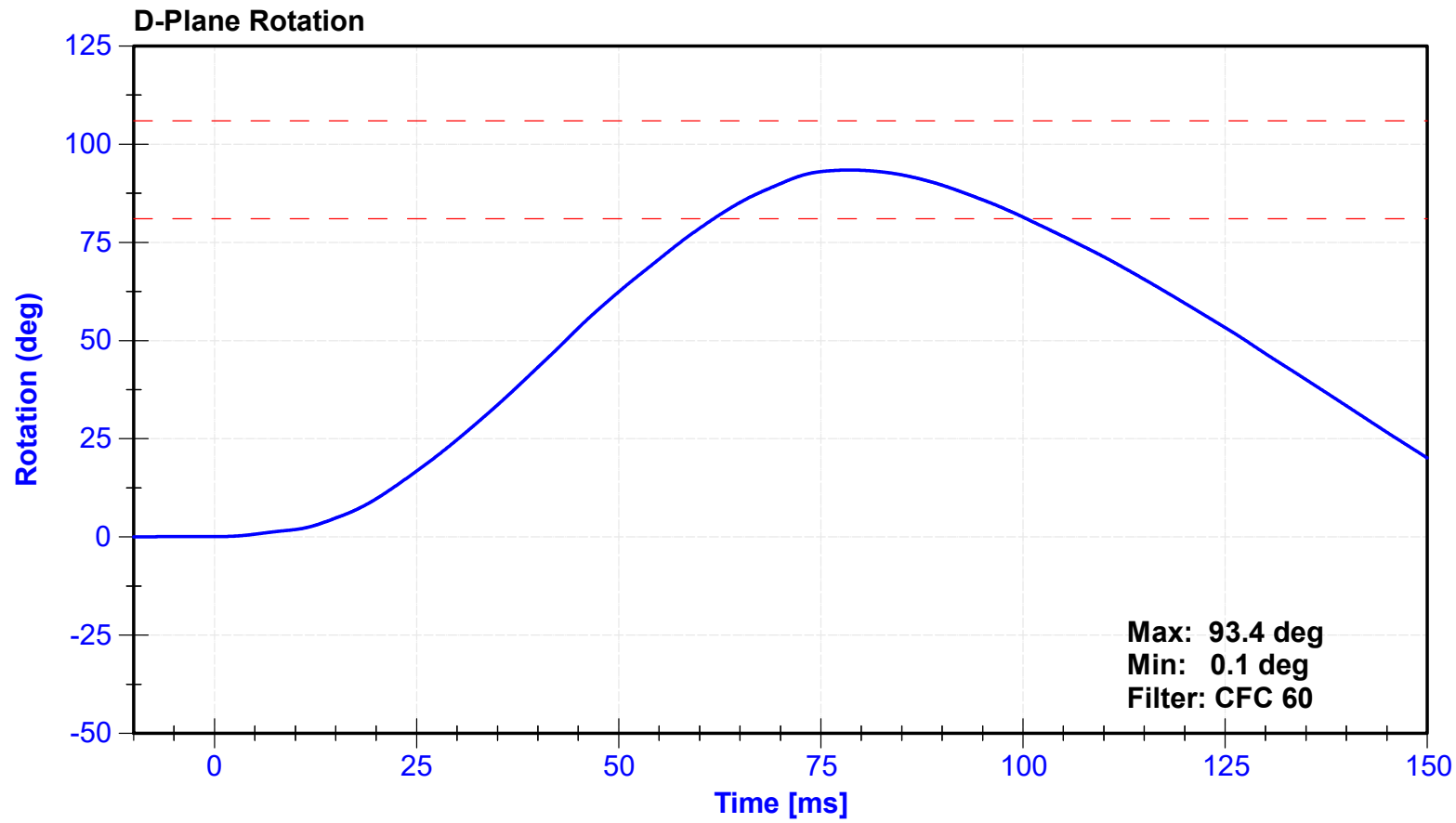
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

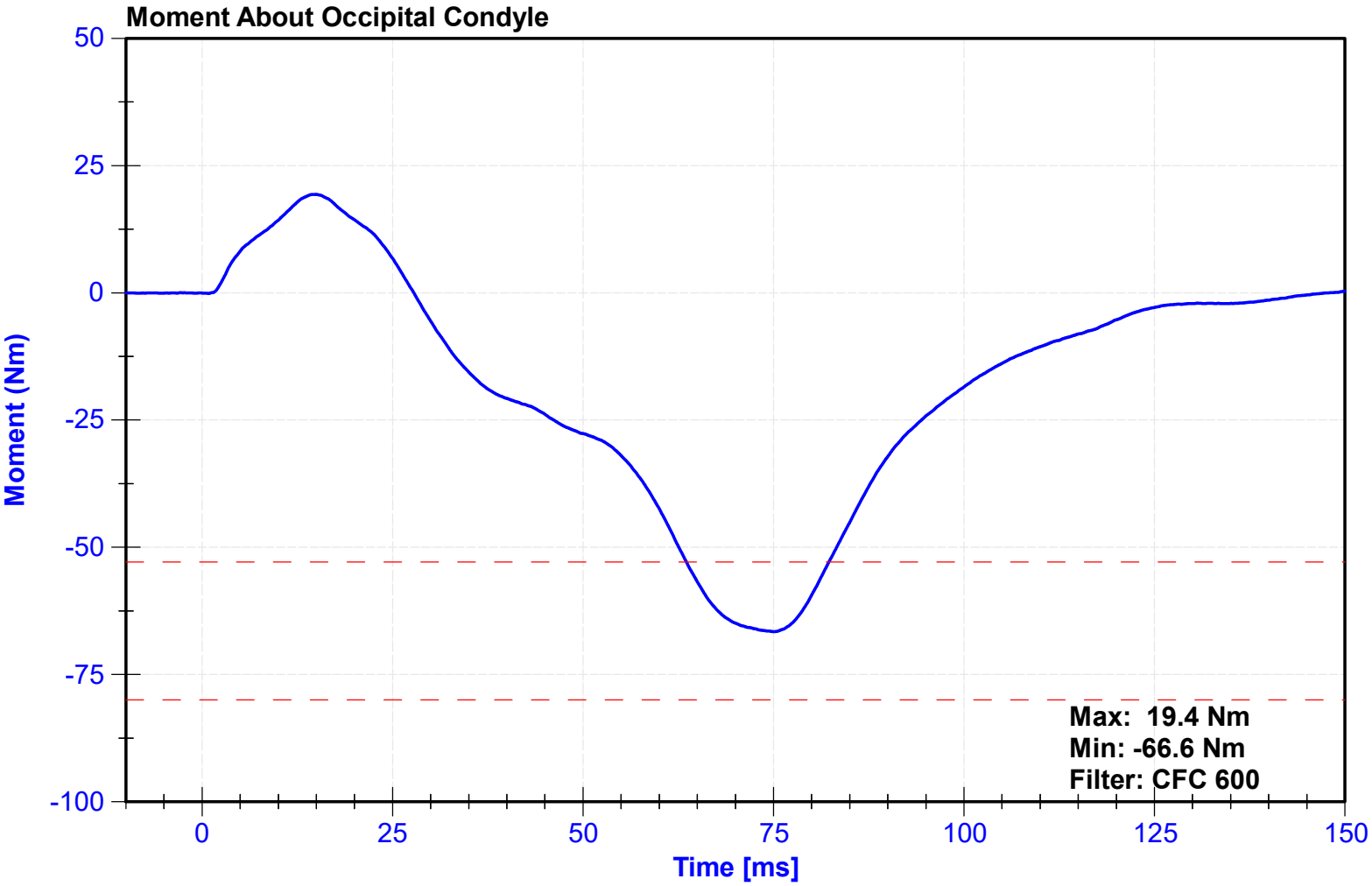
Results

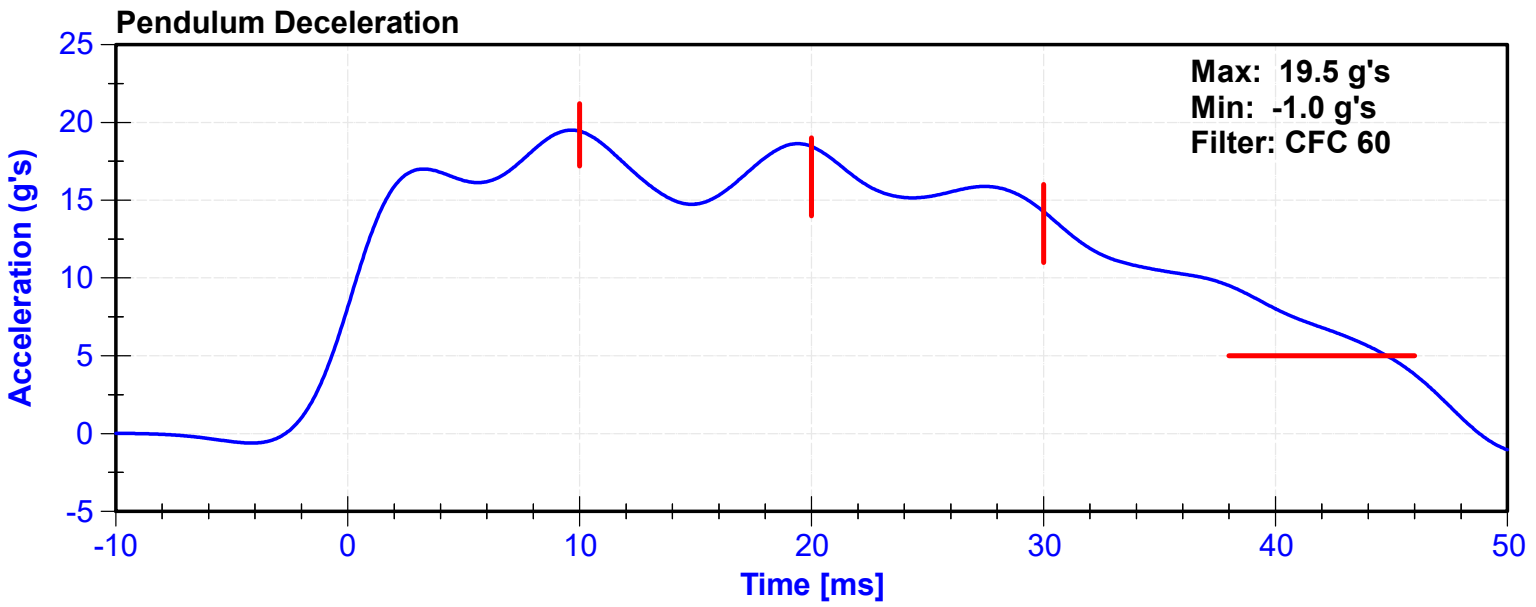
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	40	Pass
Velocity	5.94	6.19	m/s	6.030	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	19.43	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.4	Pass
Pendulum Deceleration at 30ms	11	16	g's	14.3	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	19.5	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	44.9	Pass
Maximum D Plane Rotation	81	106	deg	93.4	Pass
Time to Maximum Rotation	72	82	ms	78.6	Pass
Rotation Decay to Zero	147	174	ms	165.5	Pass
Minimum Moment About OC	-80	-52.9	Nm	-66.60	Pass
Time to Minimum Moment	65	79	ms	75.0	Pass
Moment Decay to Zero	120	148	ms	147.9	Pass

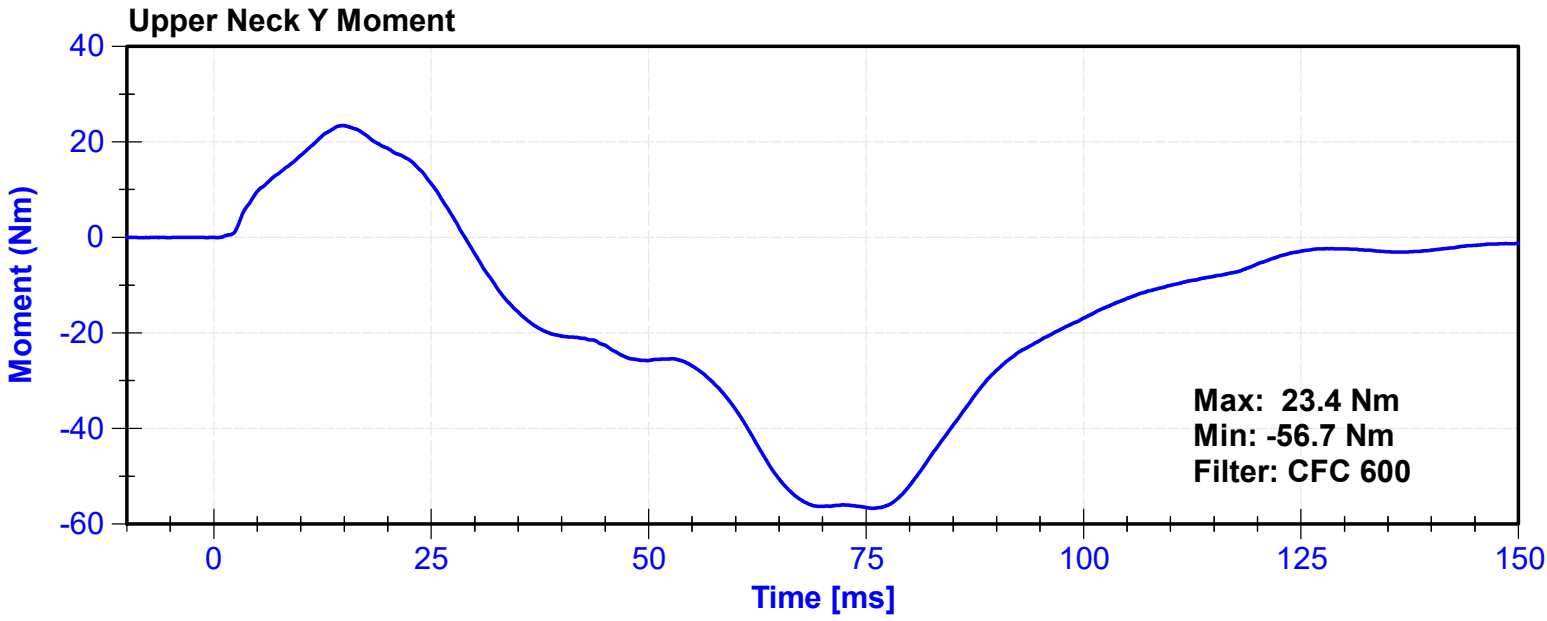
Transducer Calibrations

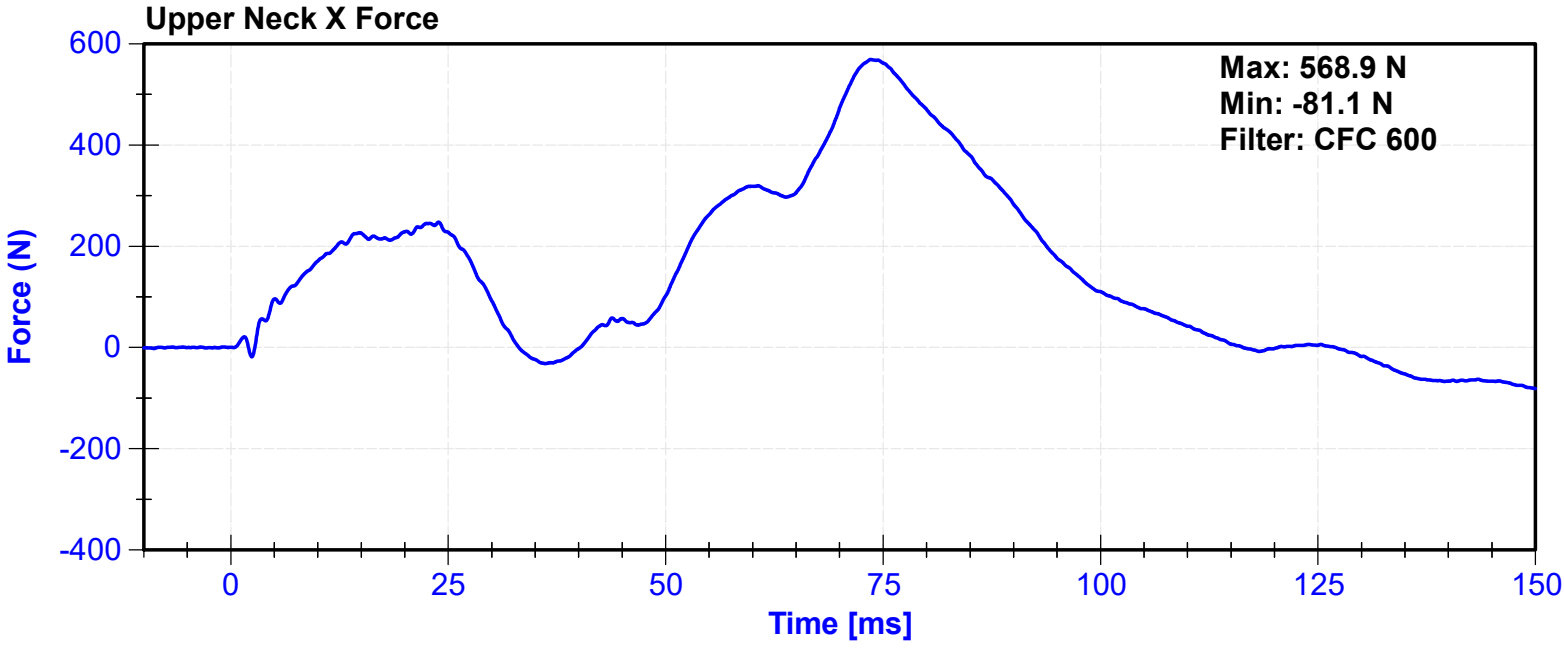
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	4/29/2024	10/26/2024
Pendulum Potentiometer	ETI	LABPOT1	5/5/2023	5/4/2024
Condyle Potentiometer	ETI	LABPOT2	7/19/2023	7/18/2024
Upper Neck Load Cell	Humanetics	1916-FX	9/12/2023	9/11/2024


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 93.4 deg
Min: 0.1 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 19.4 Nm
Min: -66.6 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 19.5 g's
Min: -1.0 g's
Filter: CFC 60
Acceleration (g's)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]


Upper Neck Y Moment
Max: 23.4 Nm
Min: -56.7 Nm
Filter: CFC 600
Moment (Nm)
40
20
0
-20
-40
-60
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 568.9 N
Min: -81.1 N
Filter: CFC 600
Force (N)
600
400
200
0
-200
-400
0
25
50
75
100
125
150
Time [ms]

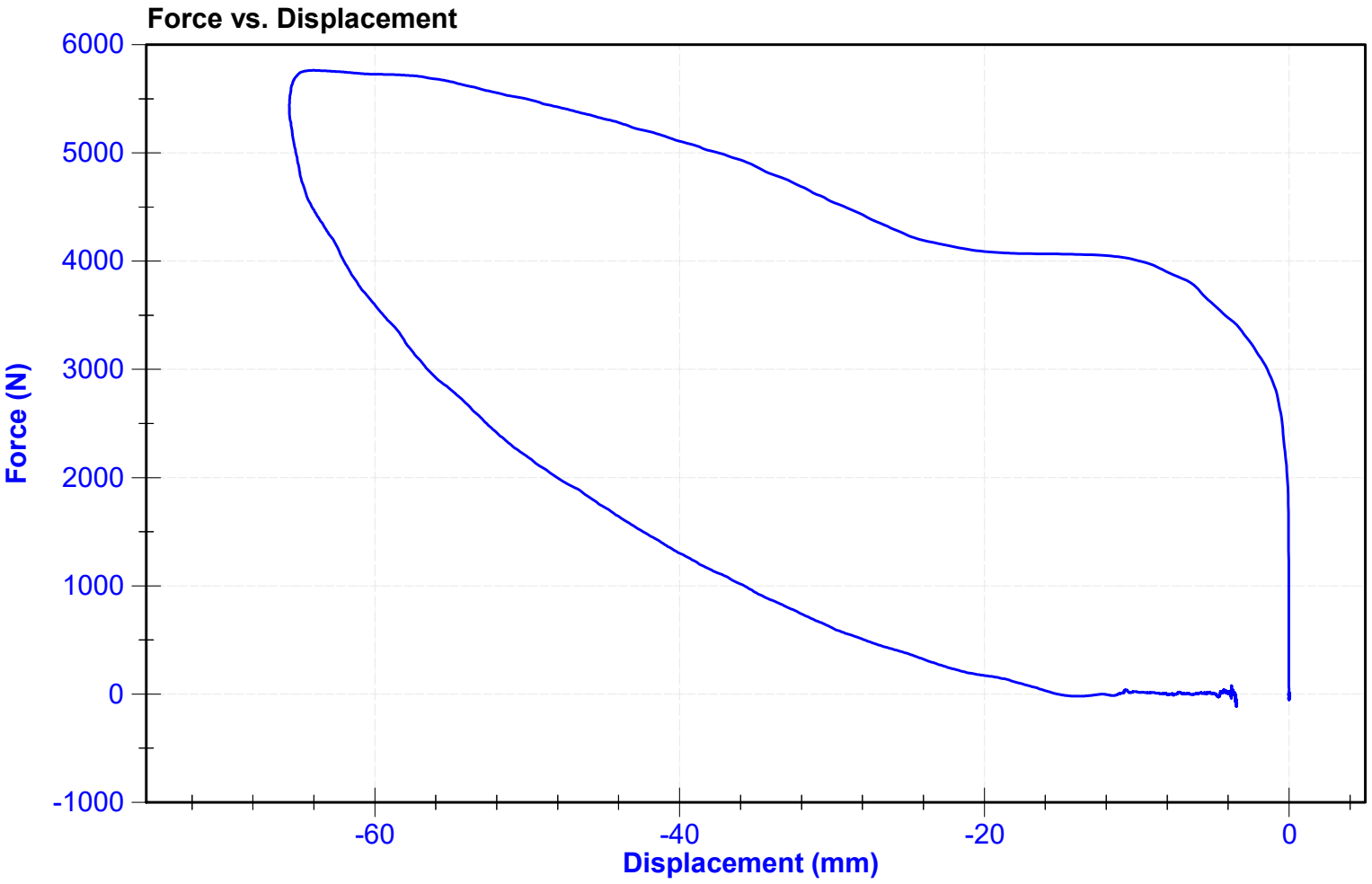
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

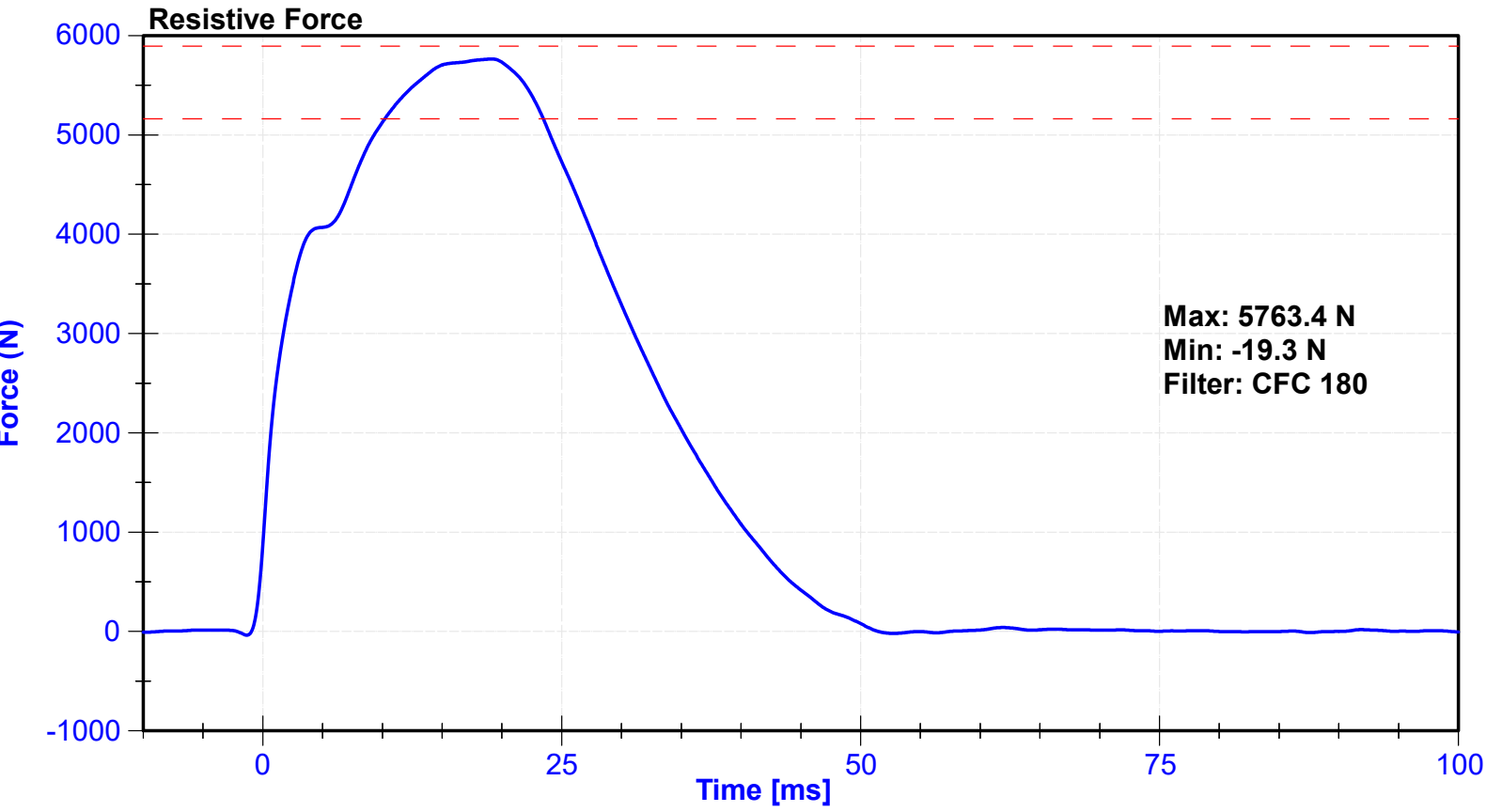
Results

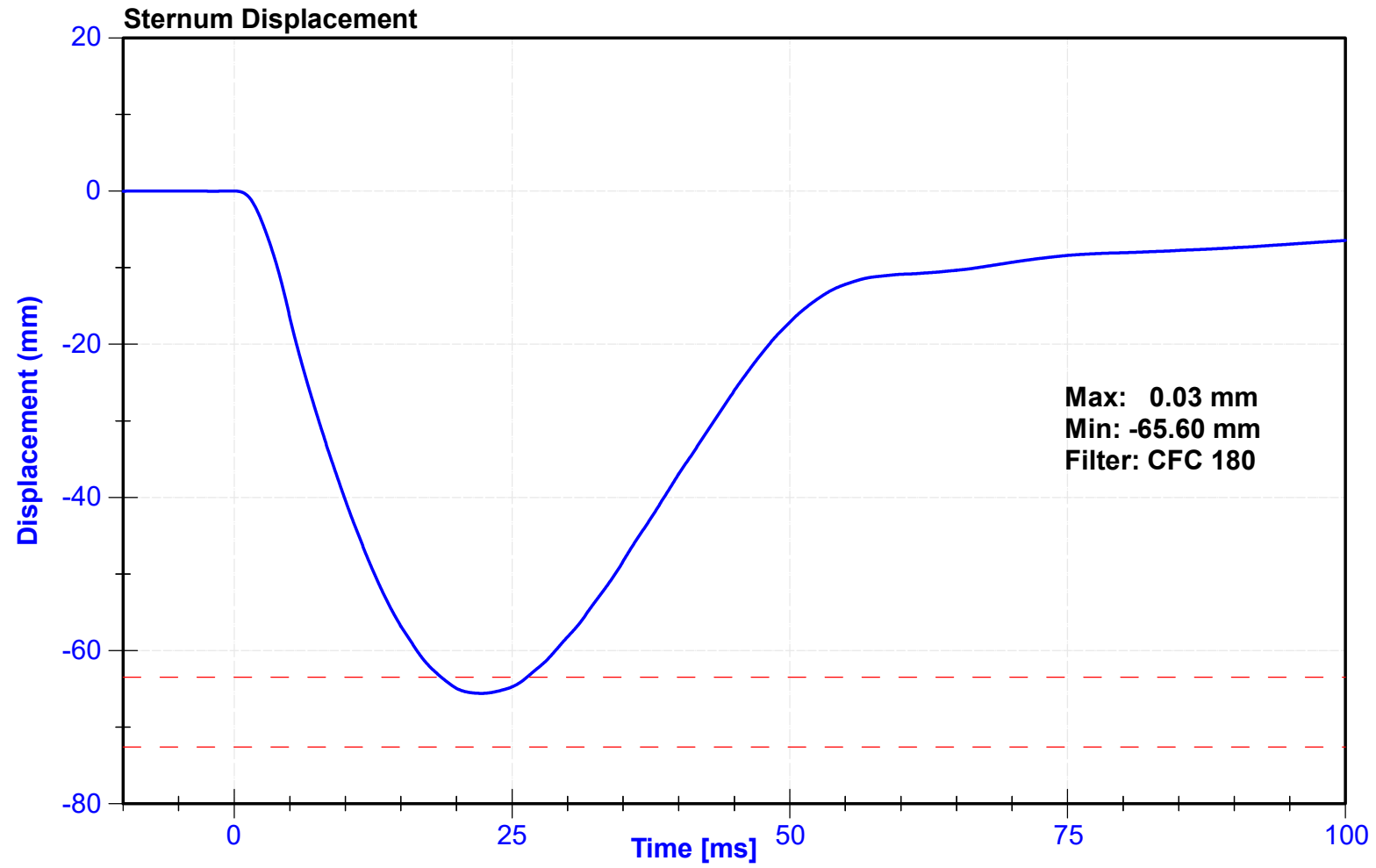
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.4	Pass
Humidity	10	70	%	36	Pass
Velocity	6.59	6.83	m/s	6.668	Pass
Chest Displacement	-72.6	-63.5	mm	-65.60	Pass
Resistive Force	5160	5894	N	5763.4	Pass
Hysteresis	69	85	%	73.0	Pass

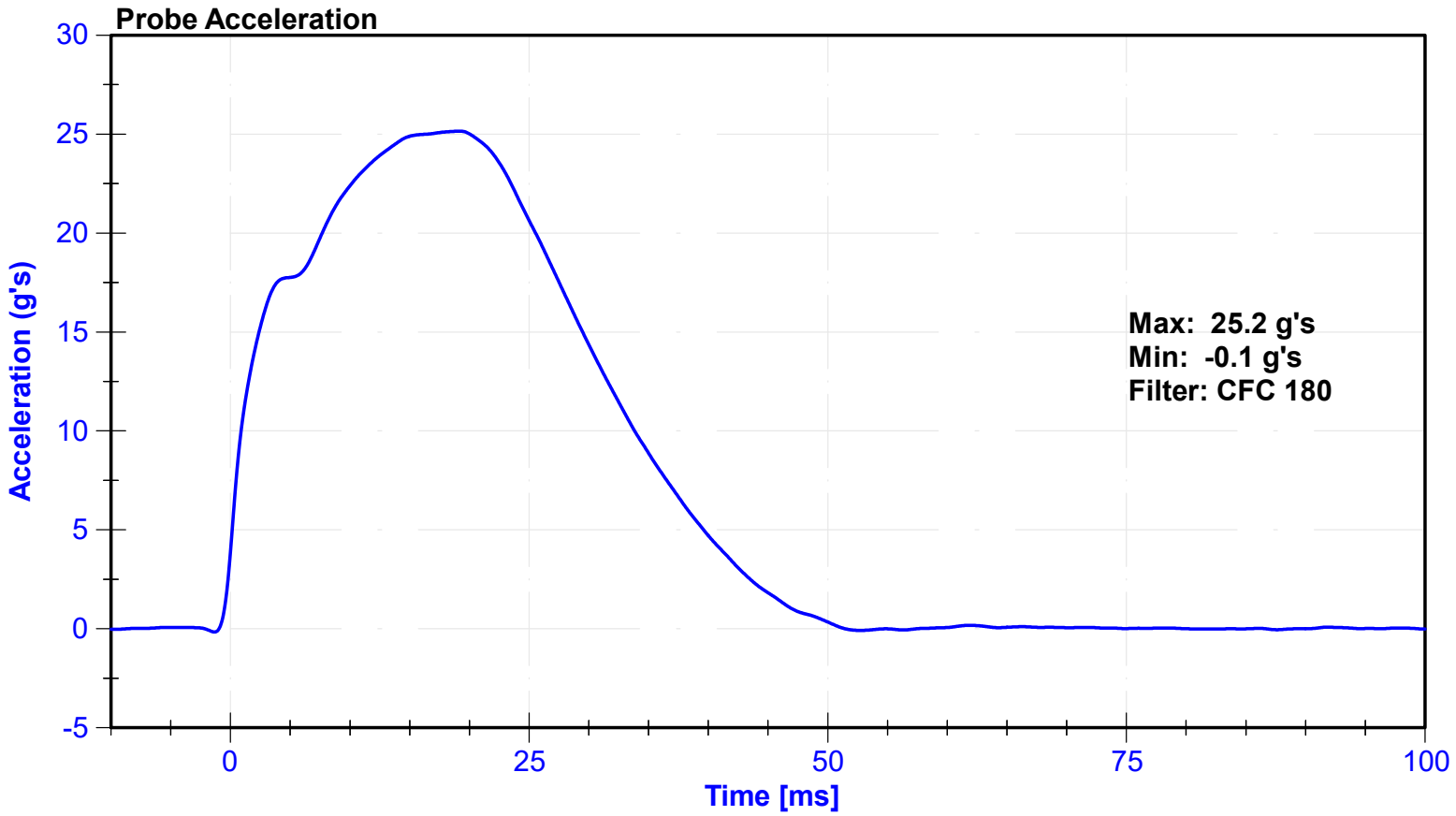
Transducer Calibrations

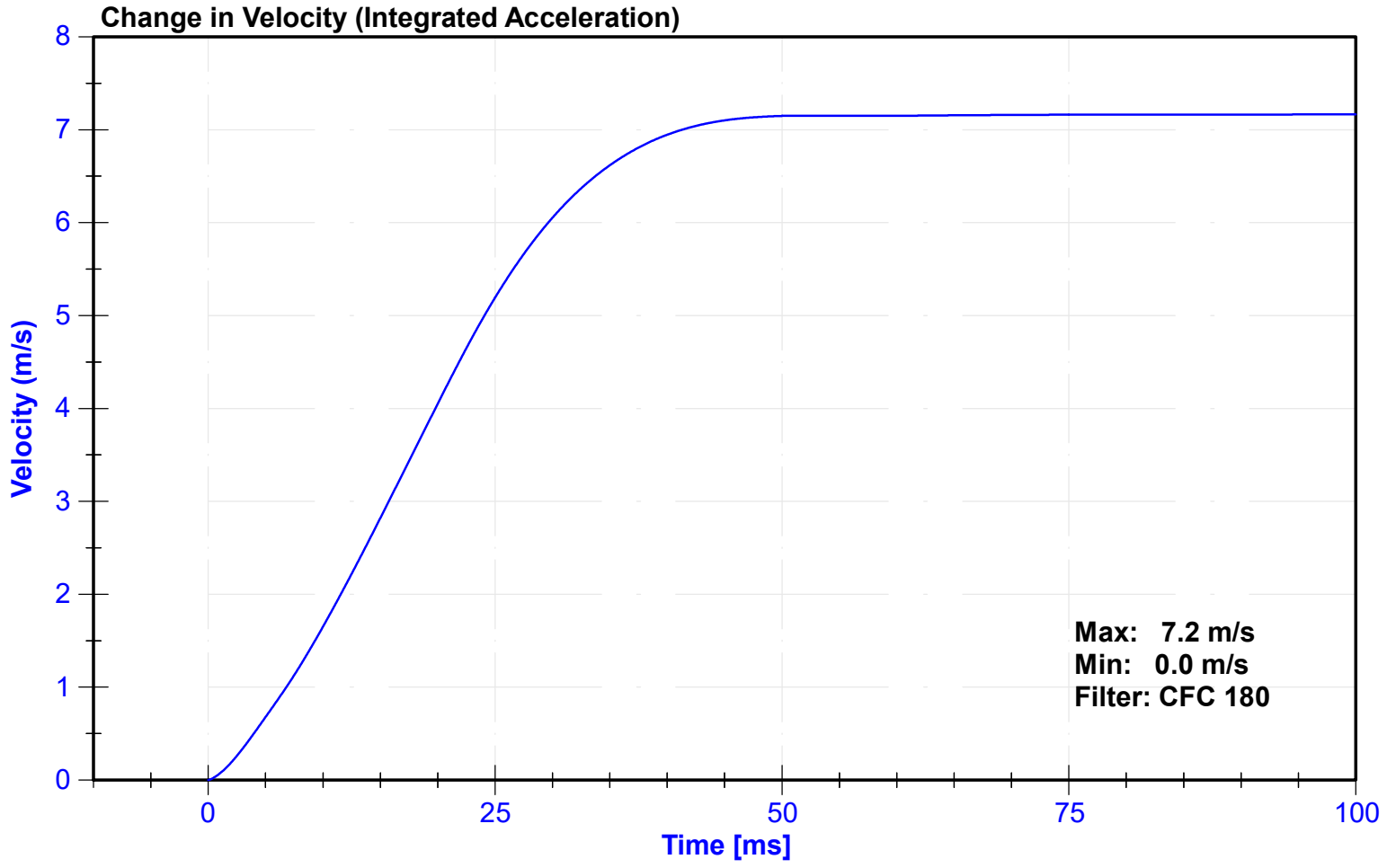
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Chest Potentiometer	Servo	1046	4/30/2024	10/29/2024




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
25
50
75
100
Time [ms]
Max: 5763.4 N
Min: -19.3 N
Filter: CFC 180


Sternum Displacement
Displacement (mm)
20
0
-20
-40
-60
-80
0
25
50
75
100
Time [ms]
Max: 0.03 mm
Min: -65.60 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
30
25
20
15
10
5
0
-5
0
25
50
75
100
Time [ms]
Max: 25.2 g's
Min: -0.1 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
25
50
75
100
Time [ms]
Max: 7.2 m/s
Min: 0.0 m/s
Filter: CFC 180

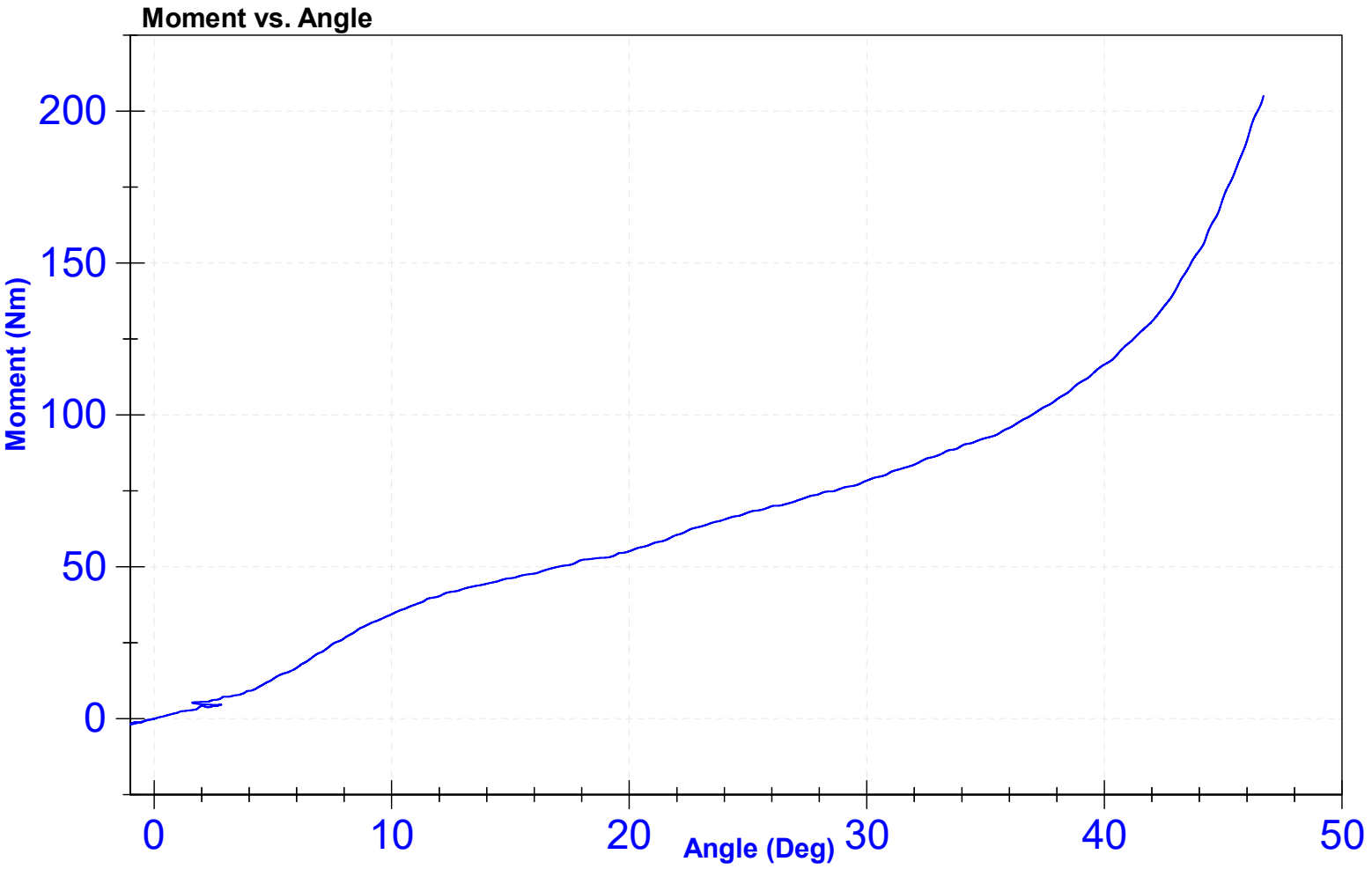
ATD Manufacturer	Humanetics	Test Technician	J.Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.0	Pass
Humidity	10	70	%	45	Pass
Average Velocity	5	10	deg/s	6.7	Pass
Angle at 203Nm	40	50	deg	46.6	Pass
Moment at 30 degrees	0	94.9	Nm	78.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	10/6/2023	10/5/2024
Load Cell	PCB 2301-02	2301-02_115	2023-10-30	2024-10-29



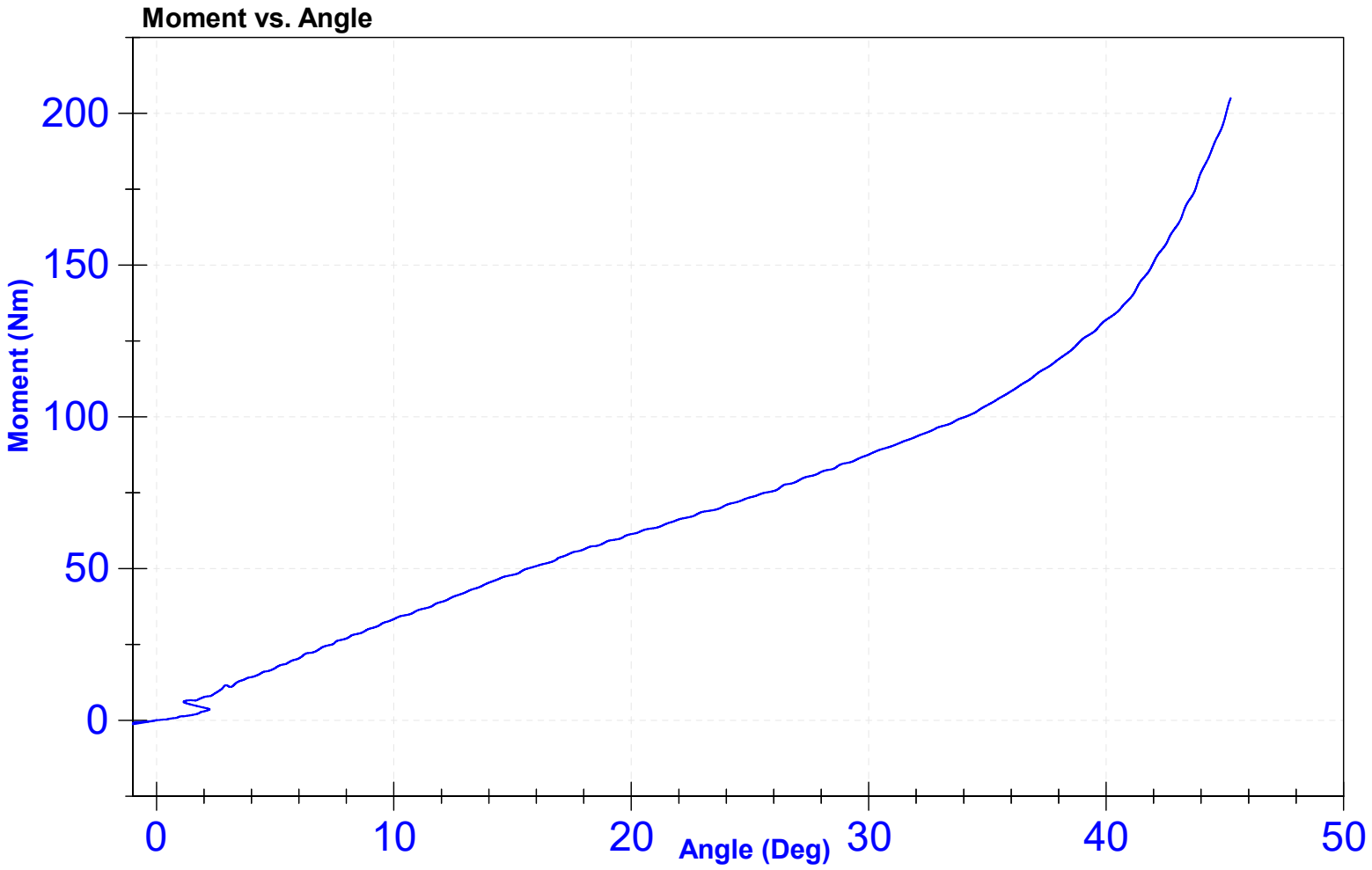
ATD Manufacturer	Humanetics	Test Technician	J.Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.0	Pass
Humidity	10	70	%	45	Pass
Average Velocity	5	10	deg/s	6.9	Pass
Angle at 203Nm	40	50	deg	45.2	Pass
Moment at 30 degrees	0	94.9	Nm	87.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	10/6/2023	10/5/2024
Load Cell	PCB 2301-02	2301-02_115	2023-10-30	2024-10-29



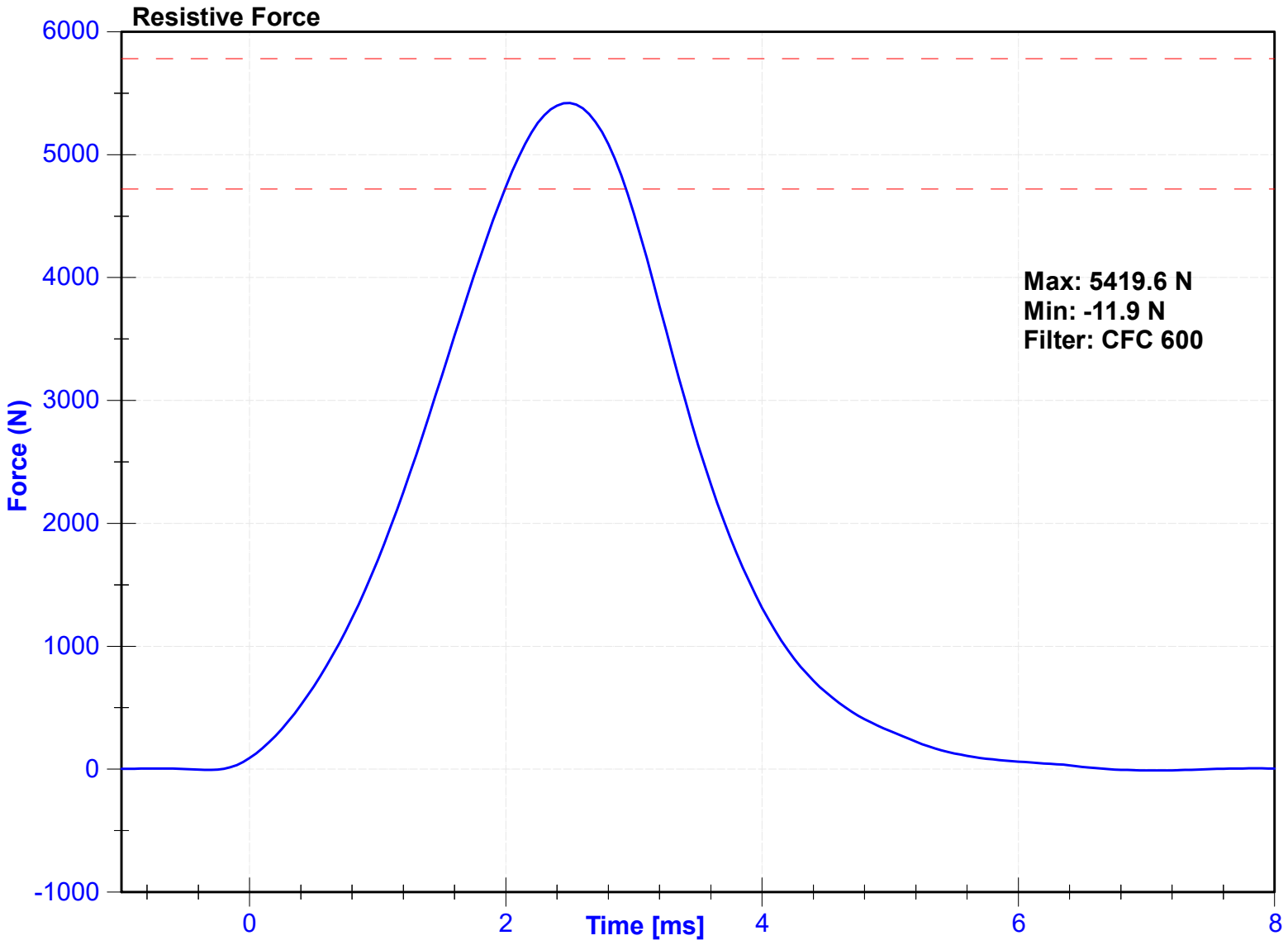
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

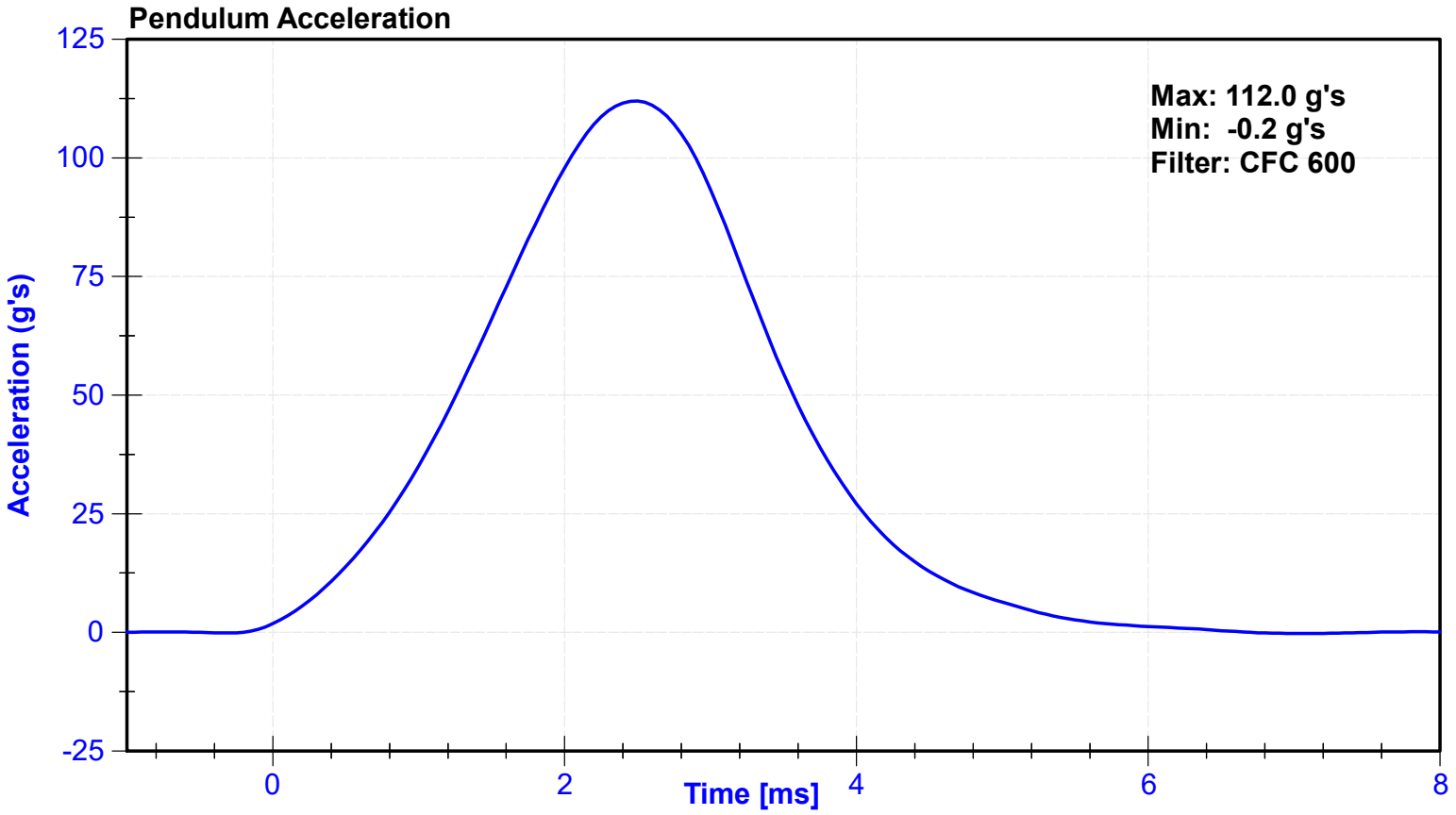
Results

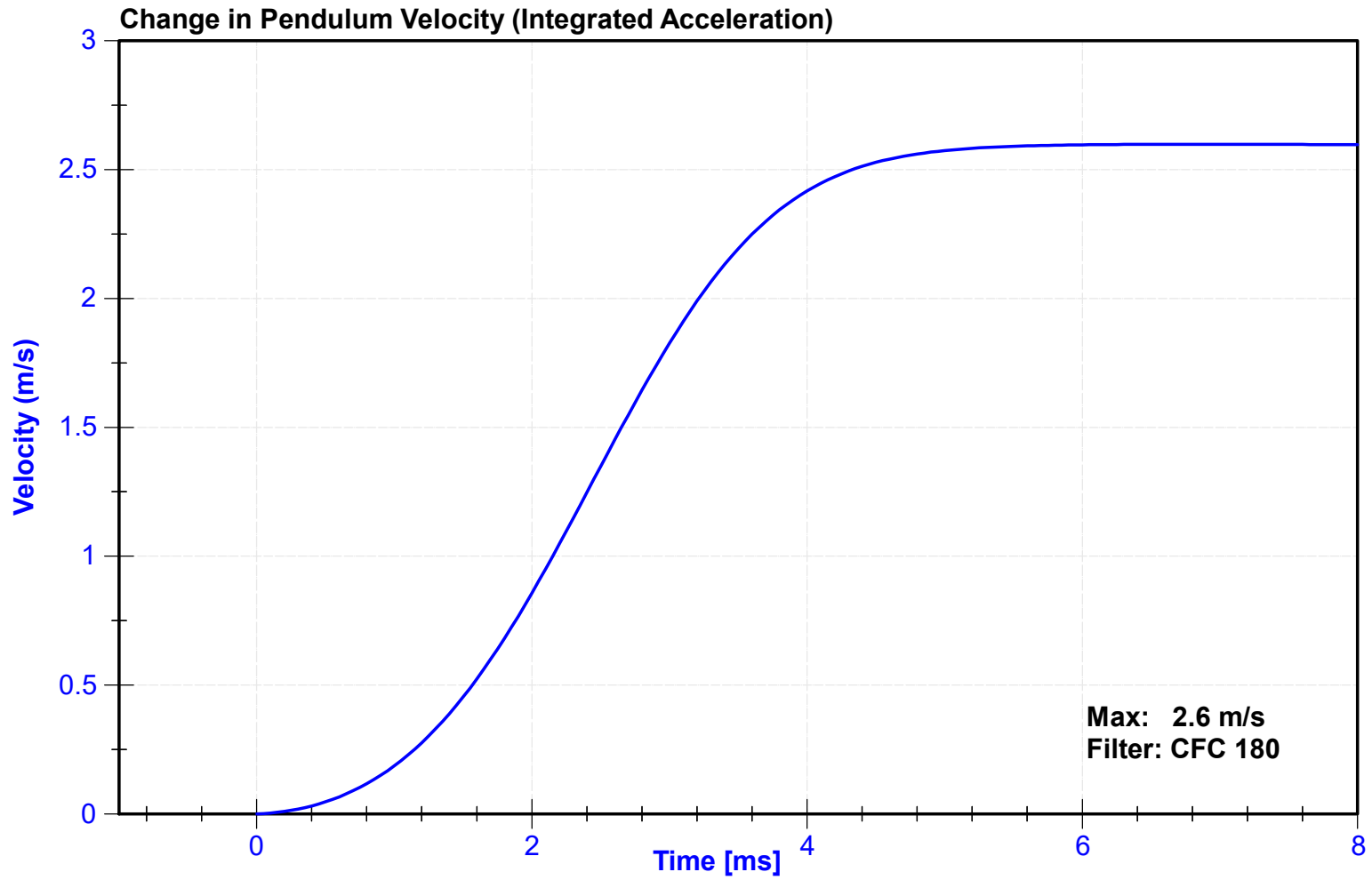
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	22.3	Pass
Humidity	10	70	%	48	Pass
Velocity	2.07	2.13	m/s	2.116	Pass
Maximum Resistive Force	4720	5780	N	5419.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	3/29/2024	9/25/2024




Pendulum Acceleration
Max: 112.0 g's
Min: -0.2 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Max: 2.6 m/s
Filter: CFC 180
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

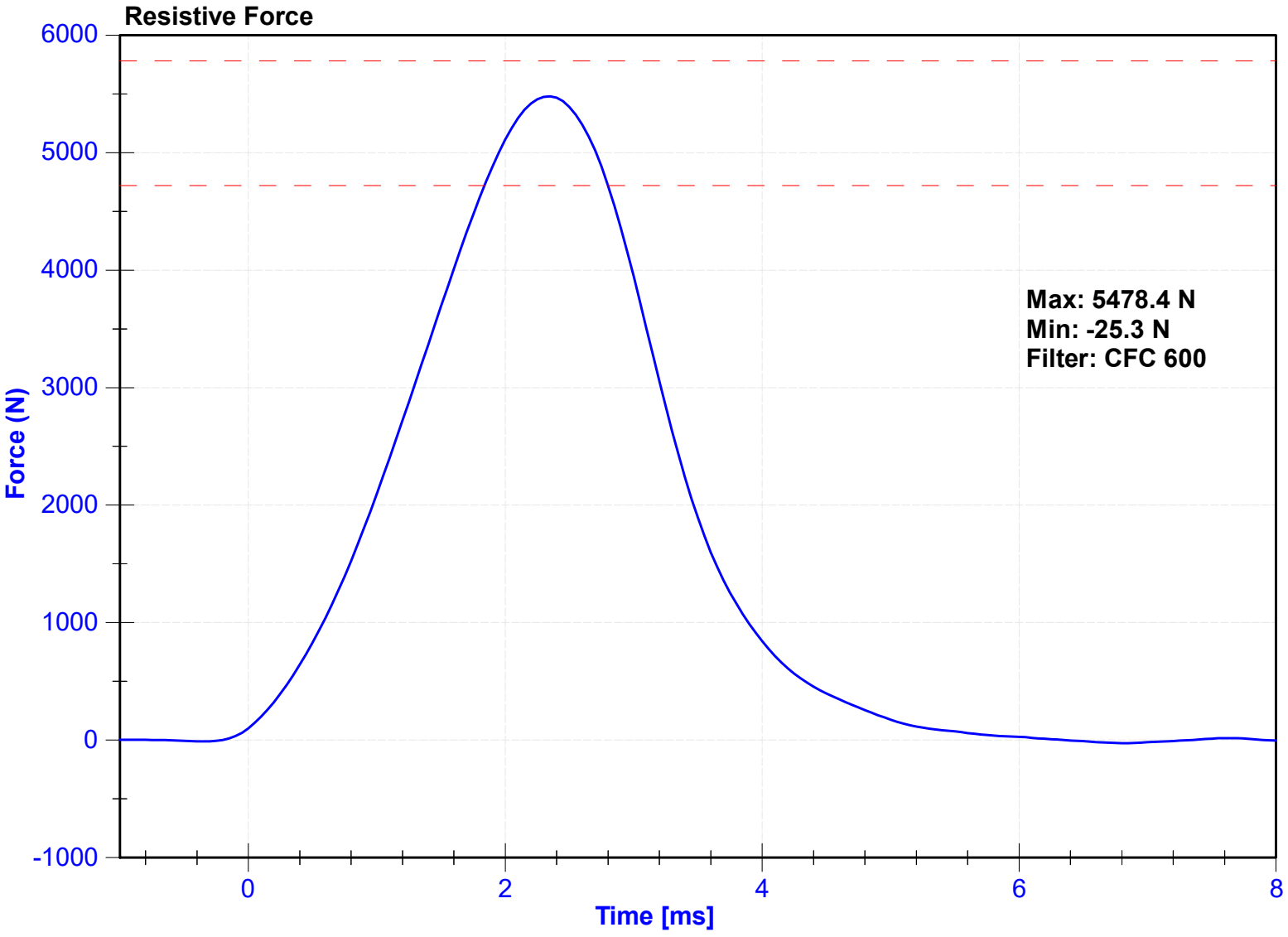
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

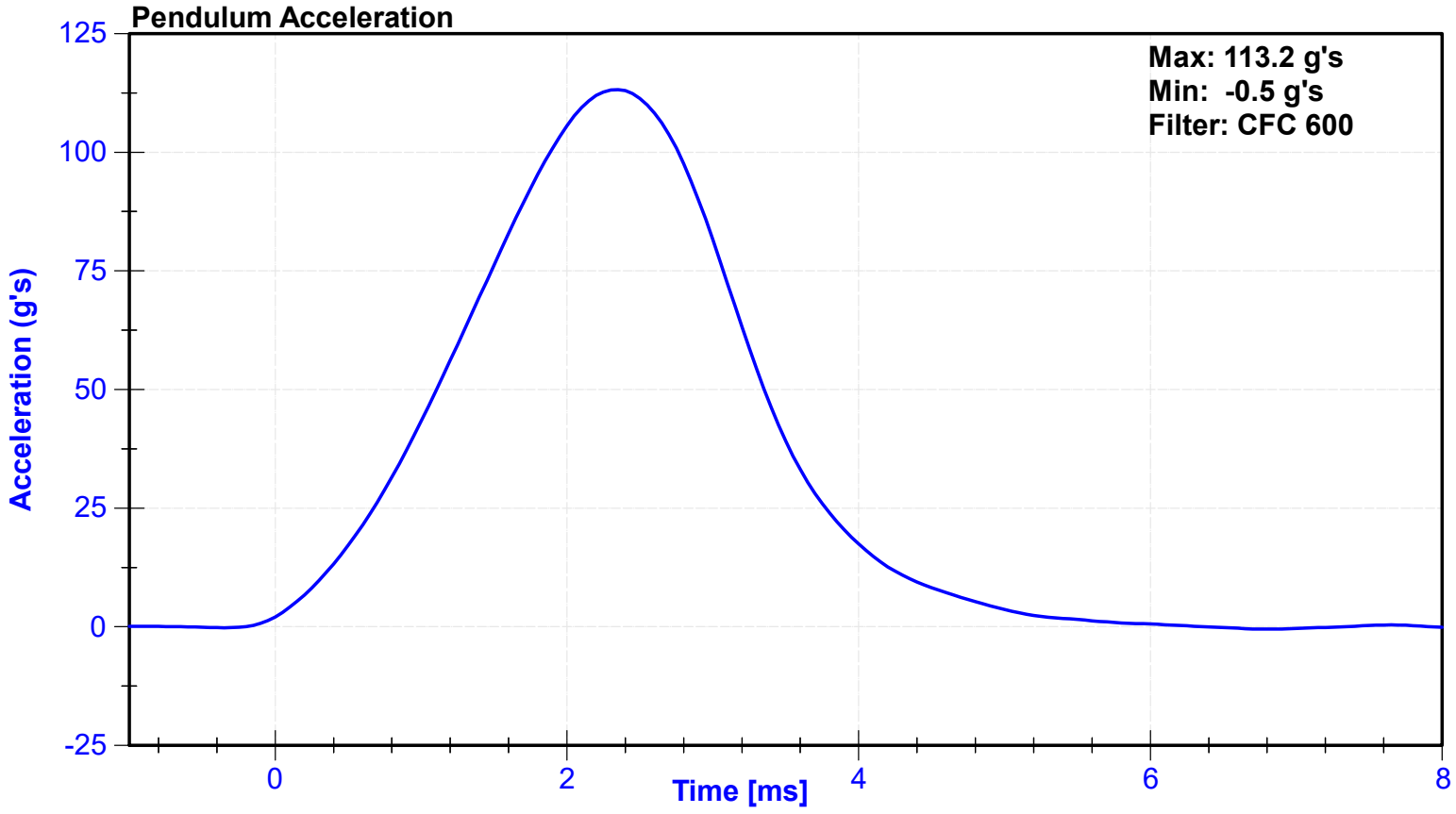
Results

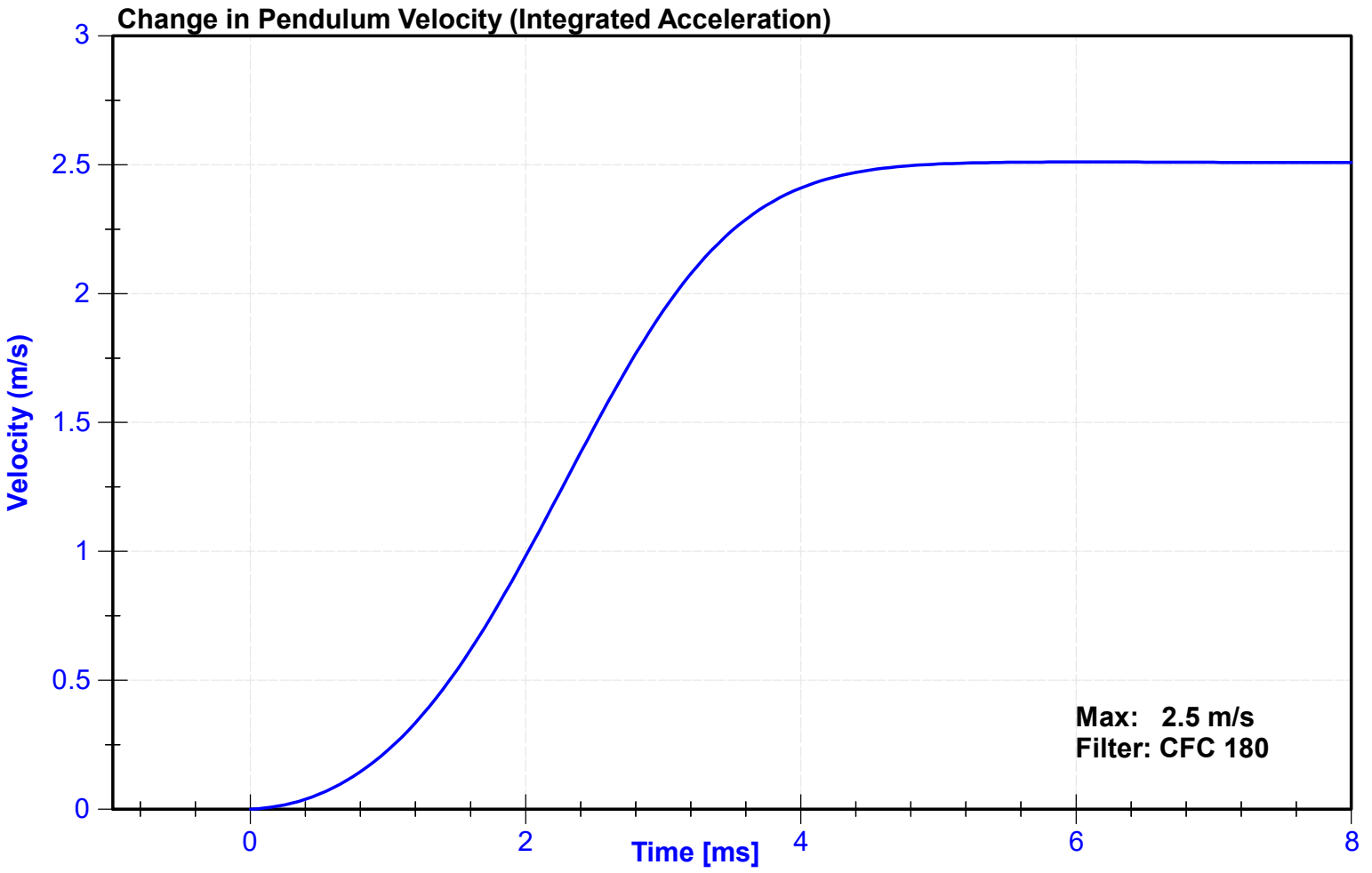
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	22.3	Pass
Humidity	10	70	%	48	Pass
Velocity	2.07	2.13	m/s	2.114	Pass
Maximum Resistive Force	4720	5780	N	5478.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	3/29/2024	9/25/2024




Pendulum Acceleration
Max: 113.2 g's
Min: -0.5 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Max: 2.5 m/s
Filter: CFC 180
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

CALIBRATION TEST RESULTS

PRE-TEST

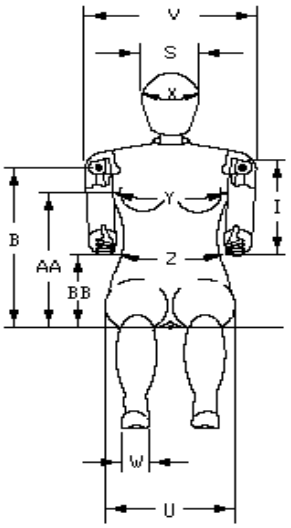
HYBRID III 5TH PERCENTILE - PASSENGER ATD

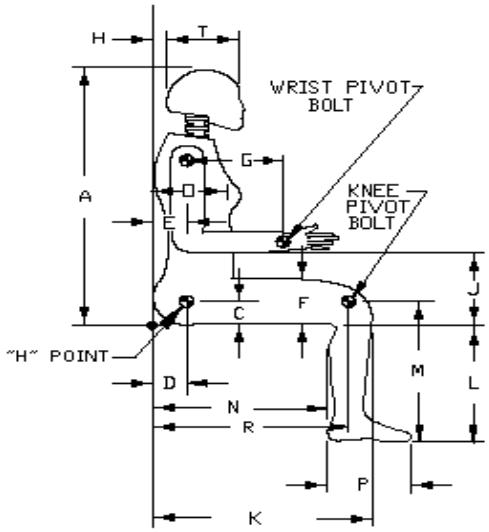
SERIAL NO: 137

External Measurements - Hybrid 3 - 5th Female

Technician: K. Brogan Date: 05/06/2024

Dummy Serial Number: 137





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	786	Pass
B	Shoulder Pivot Height	432	457	445	Pass
C	H-Point Height	81	86	84	Pass
D	H-Point from Backline	145	150	148	Pass
E	Shoulder Pivot from Backline	69	84	78	Pass
F	Thigh Clearance	119	135	129	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	287	Pass
J	Elbow Rest Height	183	203	199	Pass
K	Buttock to Knee Length	521	546	535	Pass
L	Popliteal Height	356	376	369	Pass
M	Knee Pivot Height	394	419	409	Pass
N	Buttock Popliteal Length	414	439	429	Pass
O	Chest Depth without Jacket	175	191	185	Pass
P	Foot Length (right)	219	234	230	Pass
R	Buttock To Knee Pivot Length	457	483	466	Pass
S	Head Breadth	137	147	142	Pass
T	Head Depth	178	188	183	Pass
U	Hip Breadth	300	315	311	Pass
V	Shoulder Breadth	351	366	360	Pass
W	Foot Breadth	79	94	86	Pass
X	Head Circumference	528	549	538	Pass
Y	Chest Circumference with Jacket	851	881	873	Pass
Z	Waist Circumference	460	790	651	Pass
AA	Reference Location (Chest Circumference)	333	358	346	Pass
BB	Reference Location (Waist Circumference)	160	170	168	Pass

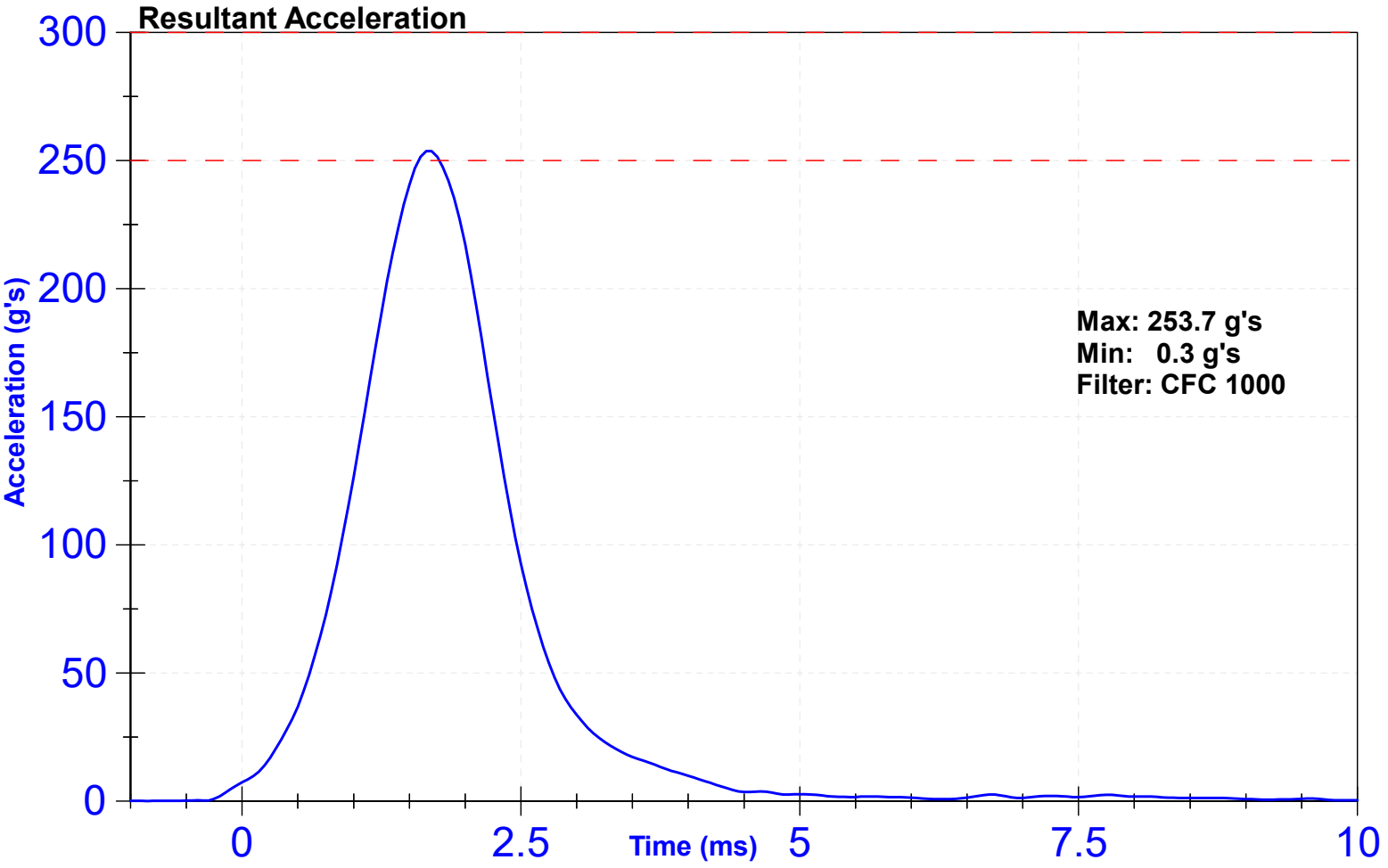
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

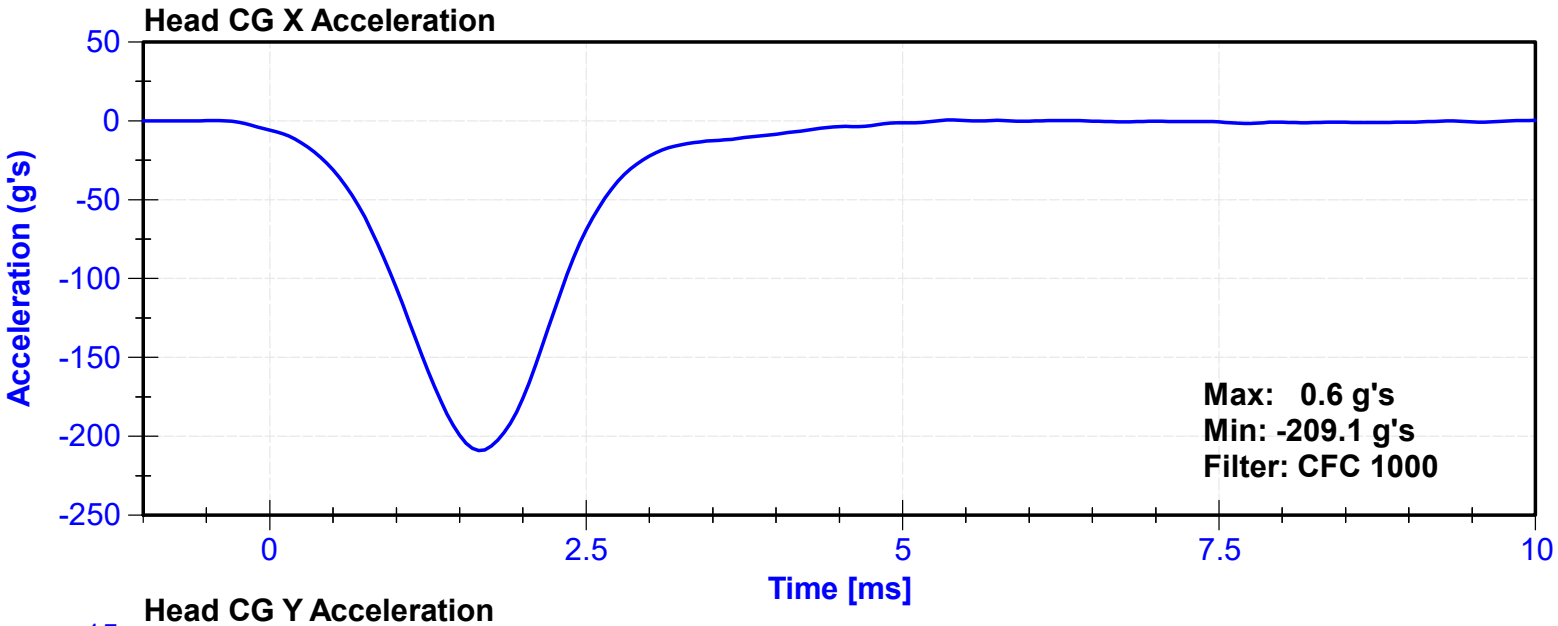
Results

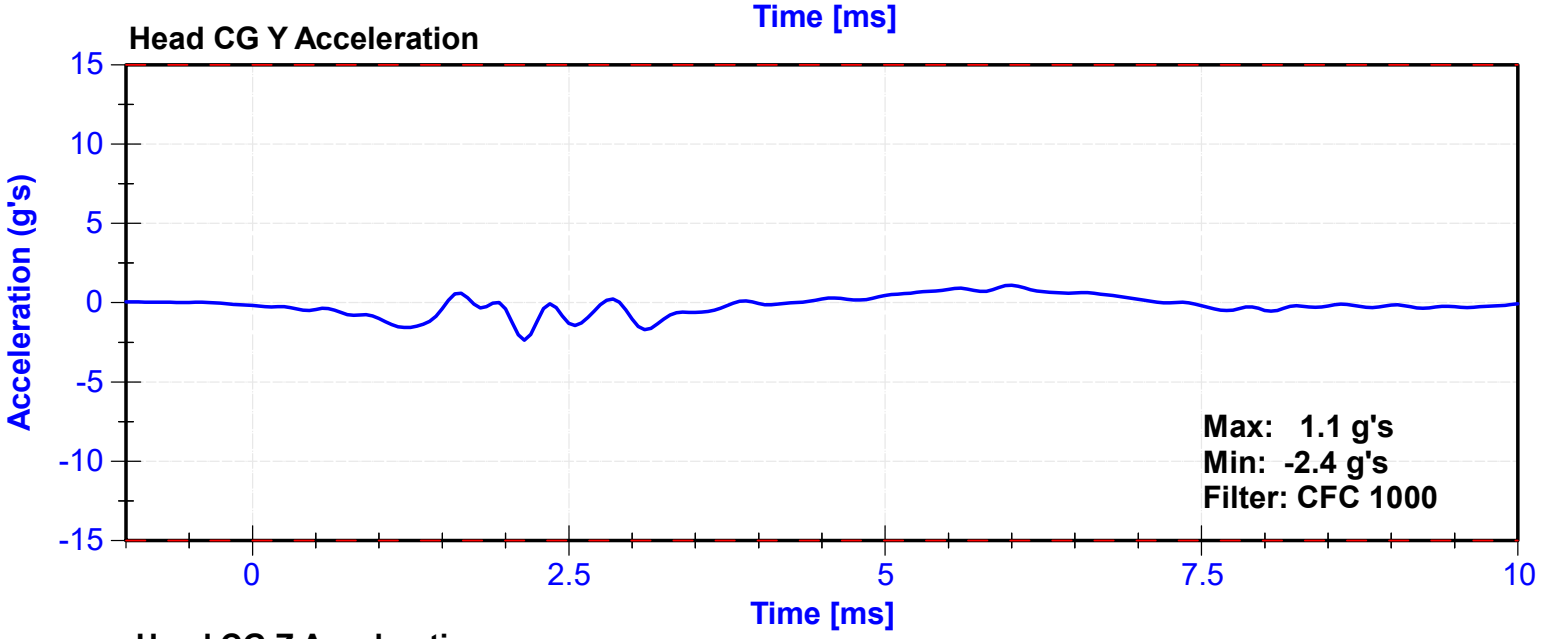
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	22.0	Pass
Humidity	10	70	%	45	Pass
Resultant Acceleration	250	300	g's	253.7	Pass
Oscillation	0	10	%	1.4	Pass
Lateral Acceleration	-15	15	g's	-2.4	Pass

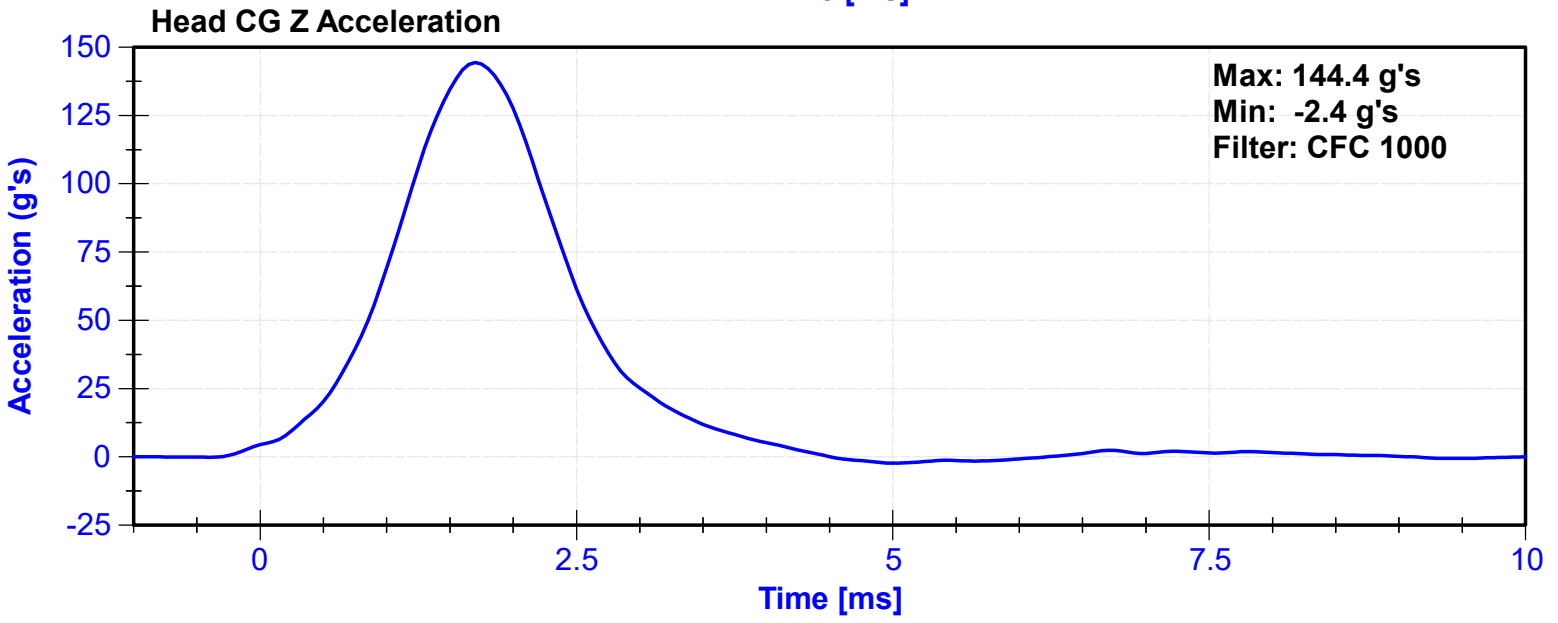
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P79417	1/4/2024	7/2/2024
Y Accelerometer	Endevco	P83335	1/4/2024	7/2/2024
Z Accelerometer	Endevco	P64149	1/4/2024	7/2/2024




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 0.6 g's
Min: -209.1 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 1.1 g's
Min: -2.4 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 144.4 g's
Min: -2.4 g's
Filter: CFC 1000

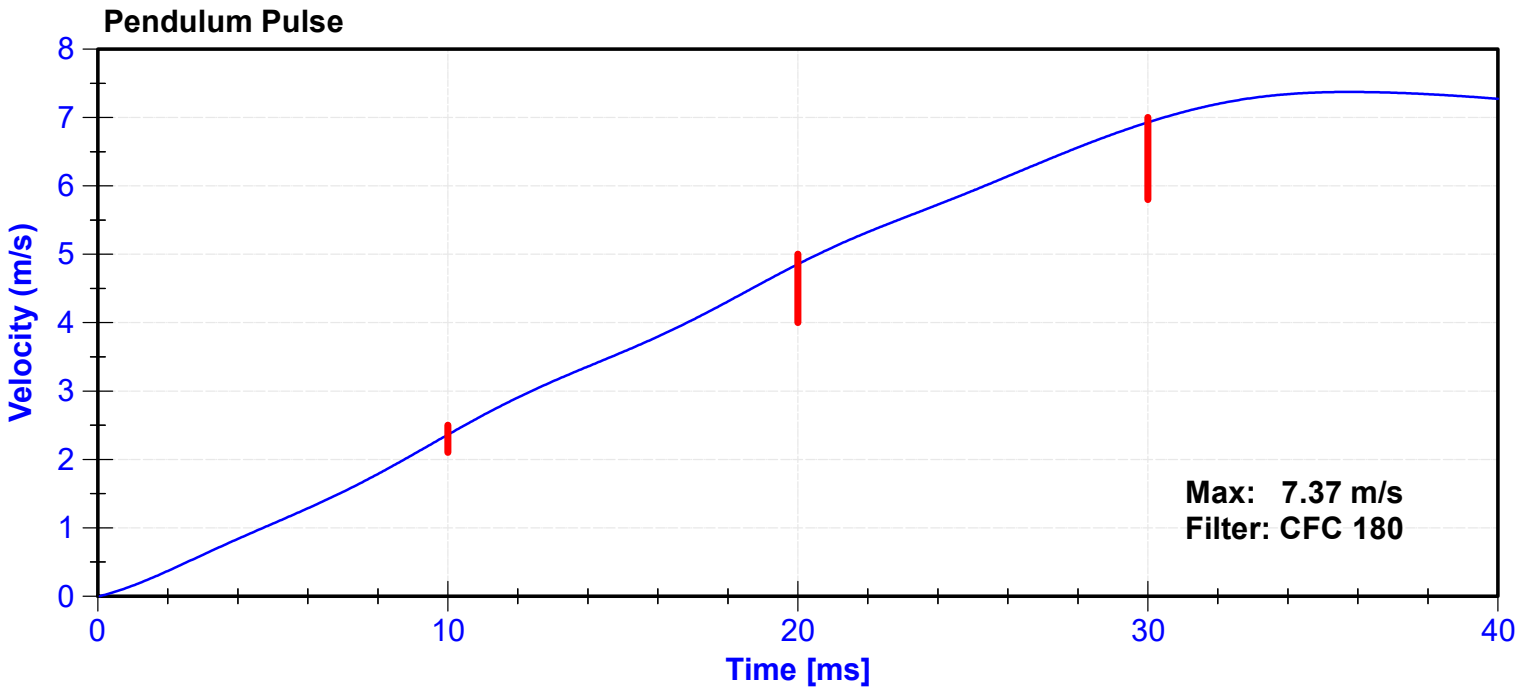
ATD Manufacturer	Humanetics	Test Technician	T. Roseman
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

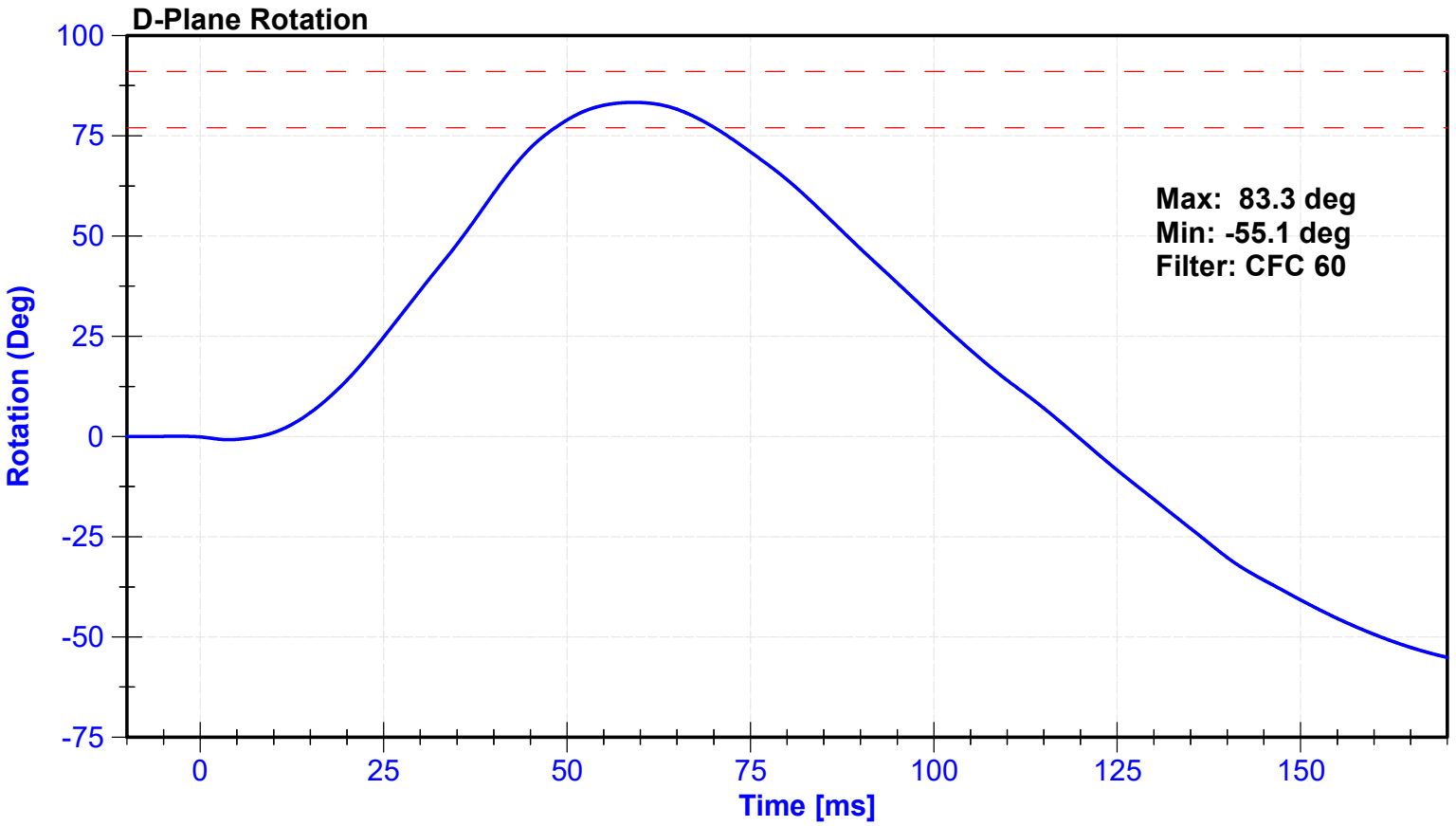
Results

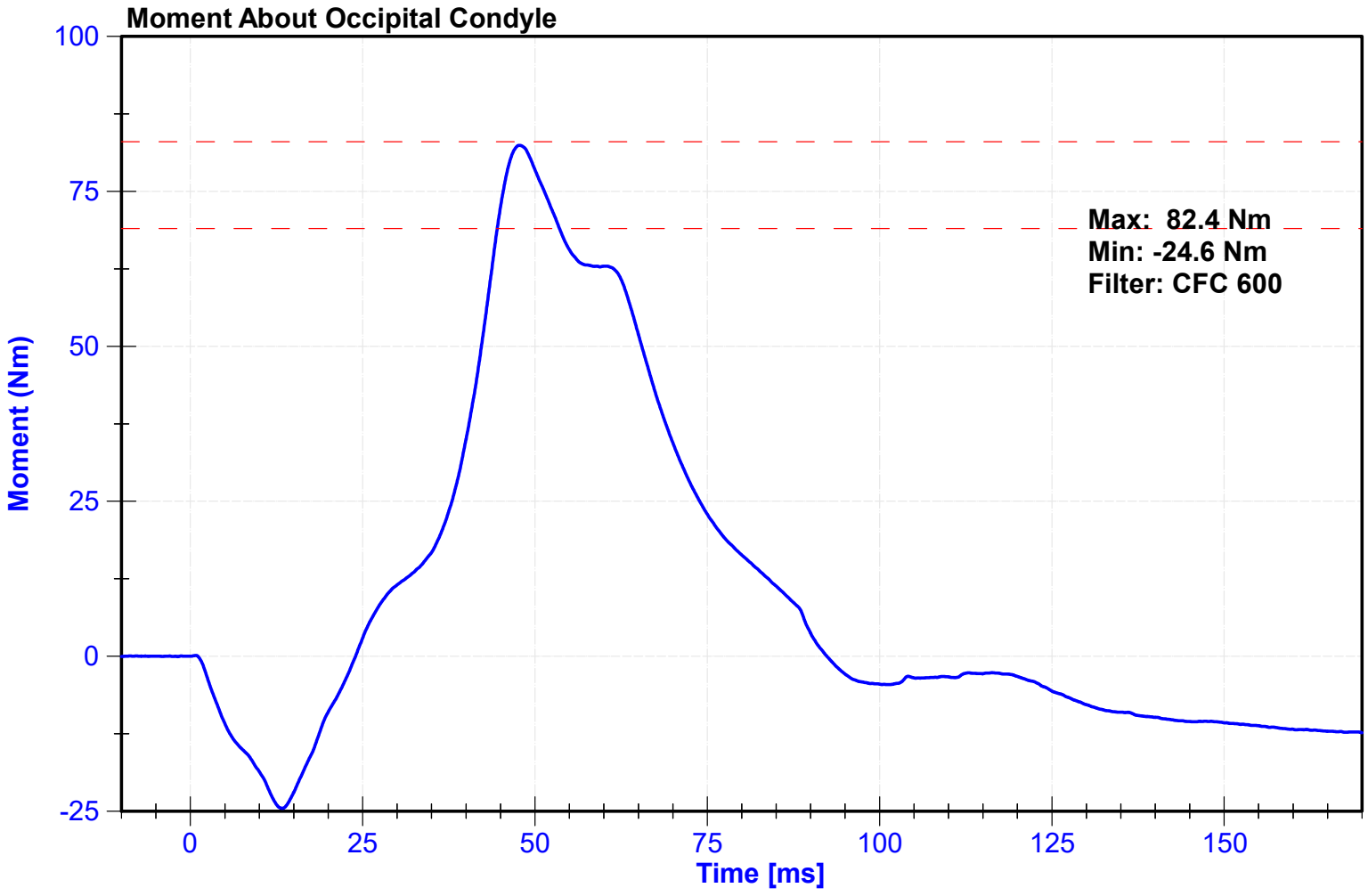
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	40	Pass
Velocity	6.89	7.13	m/s	7.027	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.36	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.85	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.93	Pass
Max D Plane Rotation	77	91	deg	83.3	Pass
Max Moment During Rotation Interval	69	83	Nm	82.4	Pass
Moment Decay to 10.0 Nm	80	100	ms	86.3	Pass

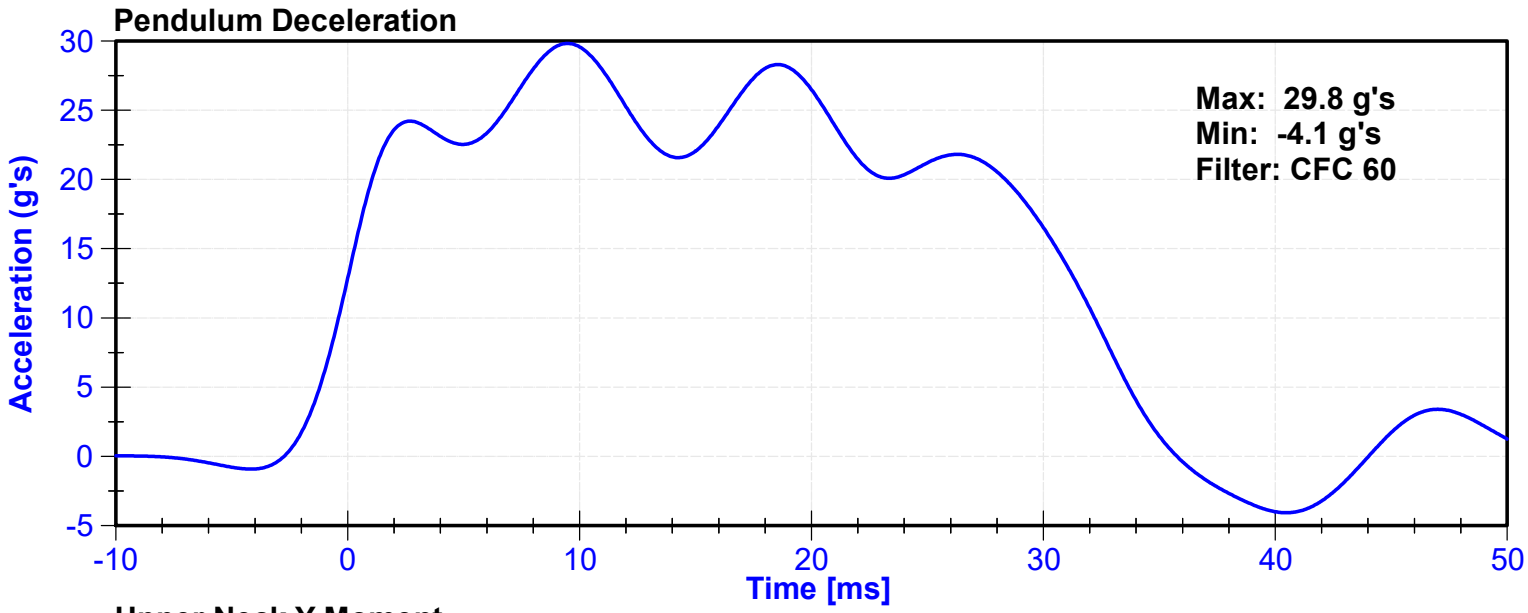
Transducer Calibrations

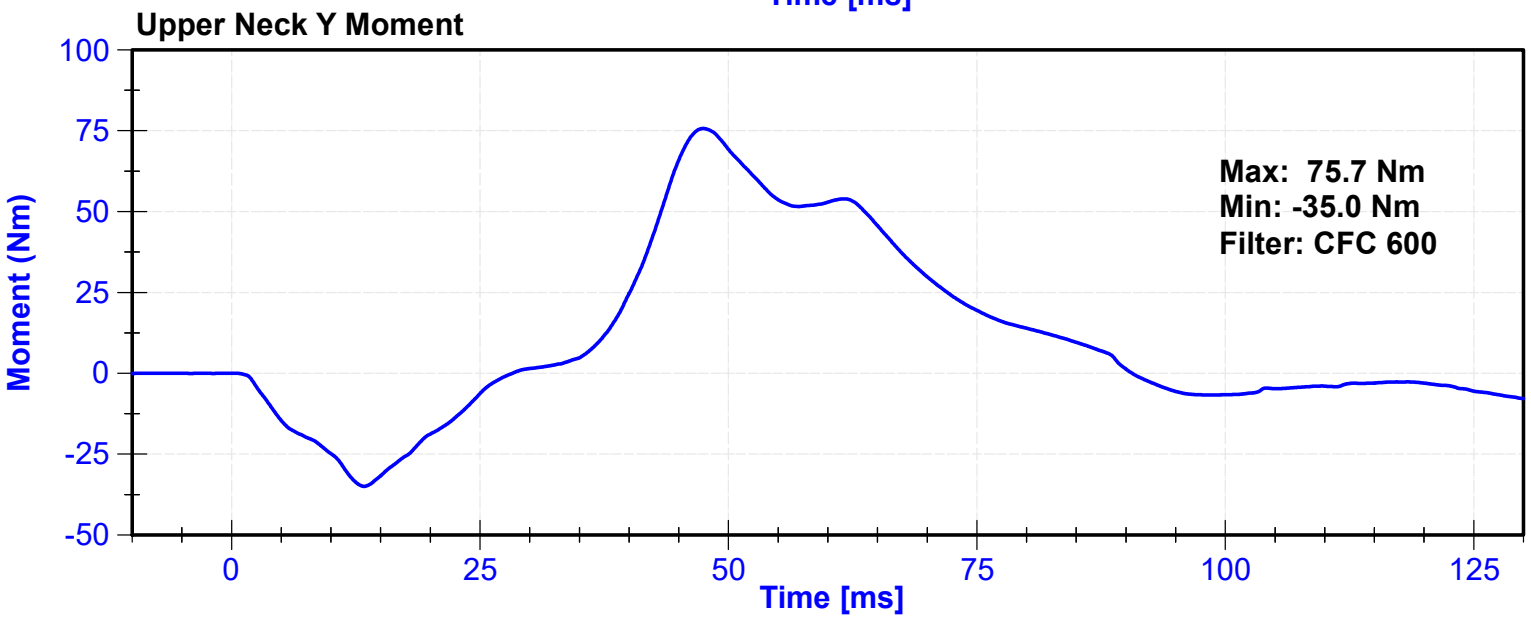
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	10/31/2023	10/30/2024
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Humanetics	2019-FX	9/12/2023	9/11/2024

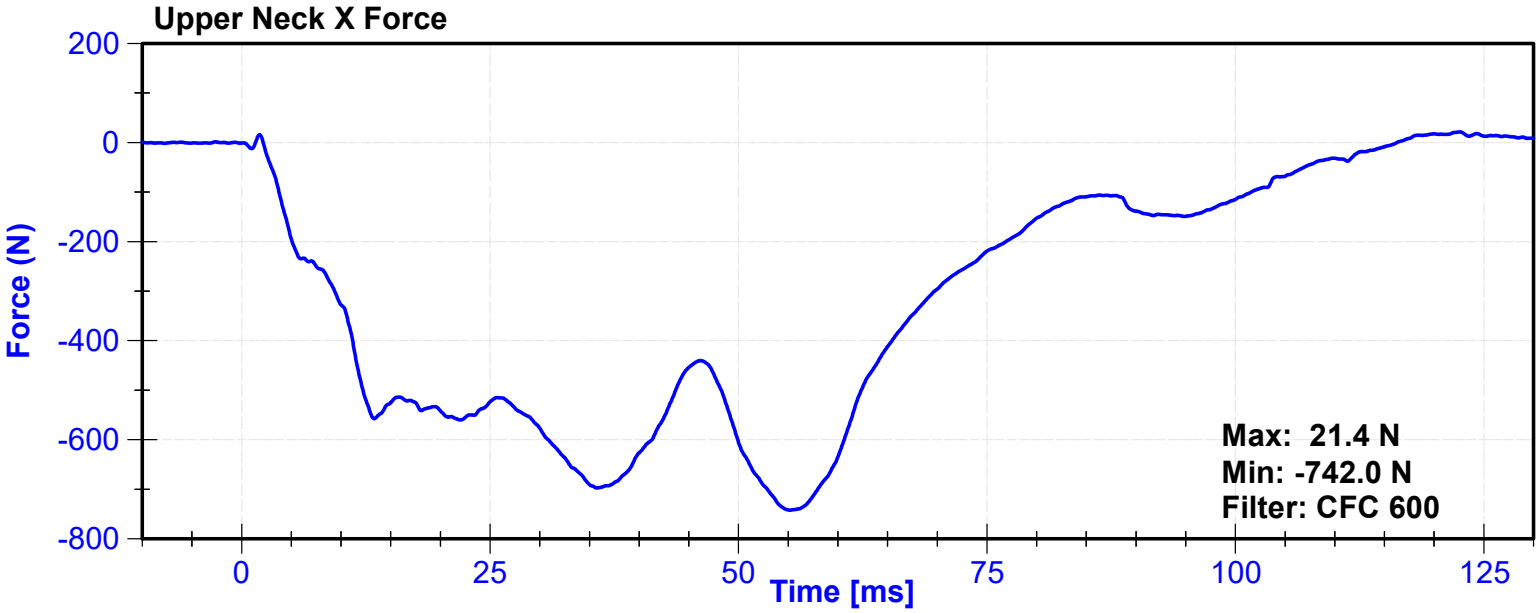



D-Plane Rotation
Max: 83.3 deg
Min: -55.1 deg
Filter: CFC 60
Rotation (Deg)
Time [ms]
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150


Moment About Occipital Condyle
Max: 82.4 Nm
Min: -24.6 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]
100
75
50
25
0
-25
0
25
50
75
100
125
150


Pendulum Deceleration
Acceleration (g's)
Time [ms]
Max: 29.8 g's
Min: -4.1 g's
Filter: CFC 60


Upper Neck Y Moment
Moment (Nm)
Time [ms]
Max: 75.7 Nm
Min: -35.0 Nm
Filter: CFC 600


Upper Neck X Force
Force (N)
Time [ms]
Max: 21.4 N
Min: -742.0 N
Filter: CFC 600

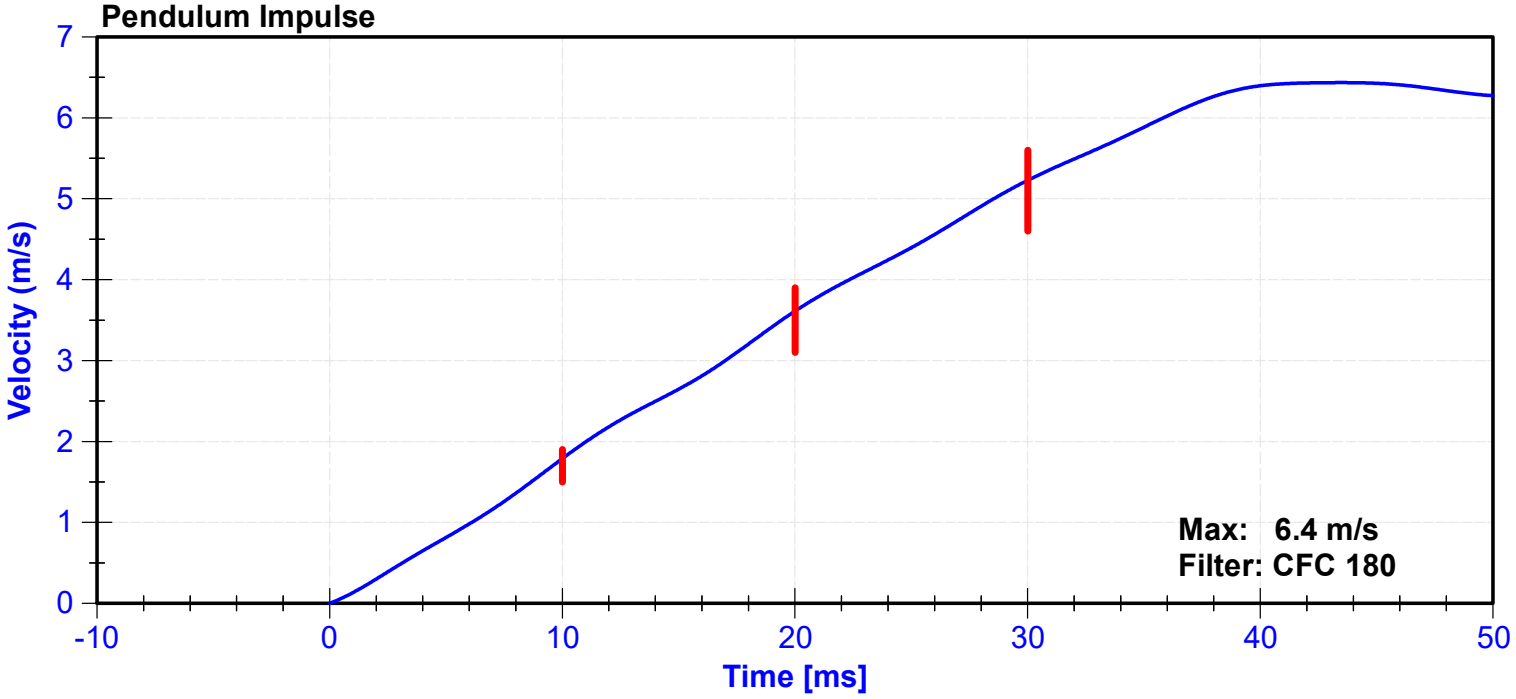
ATD Manufacturer	Humanetics	Test Technician	T. Roseman
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

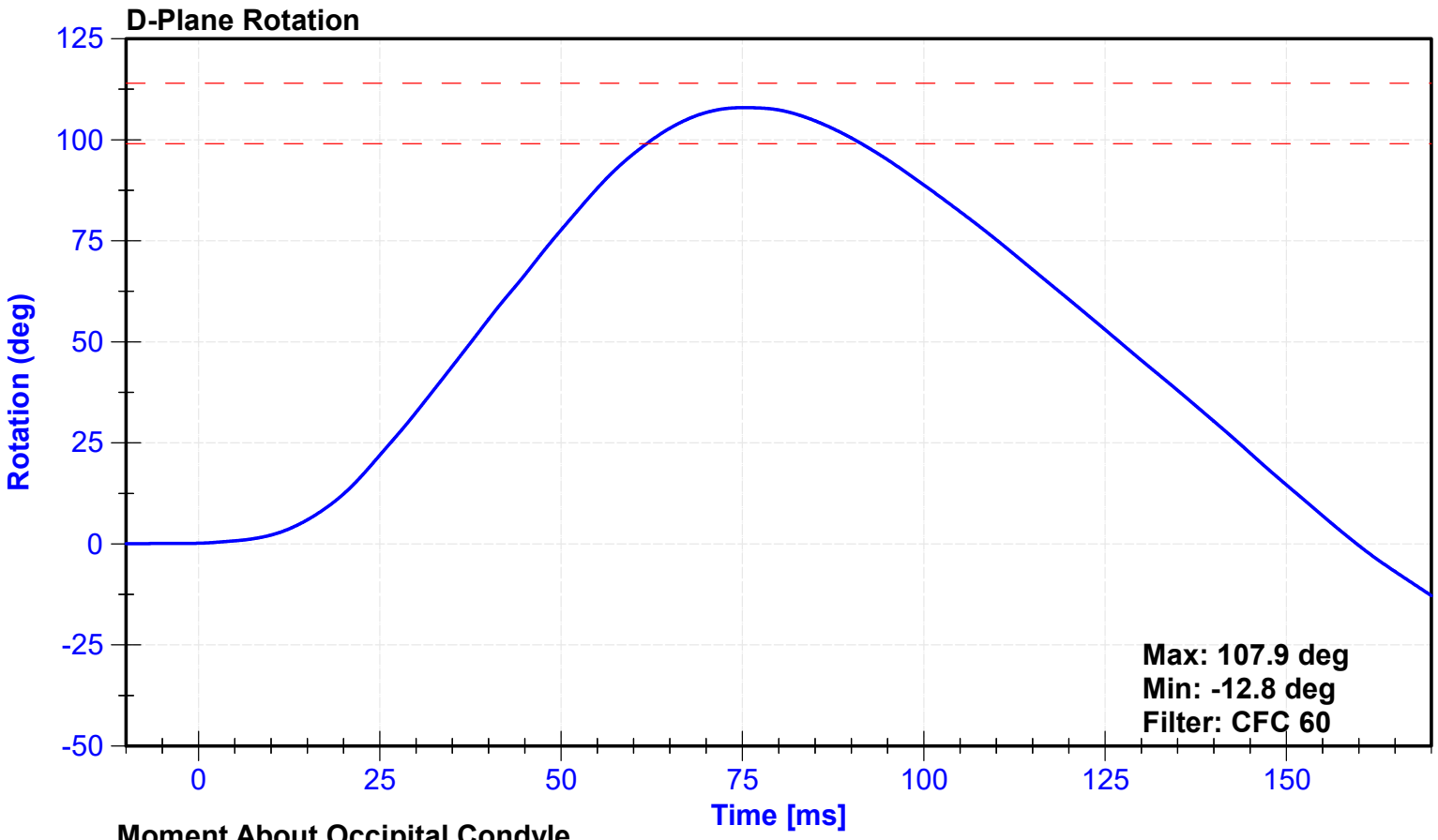
Results

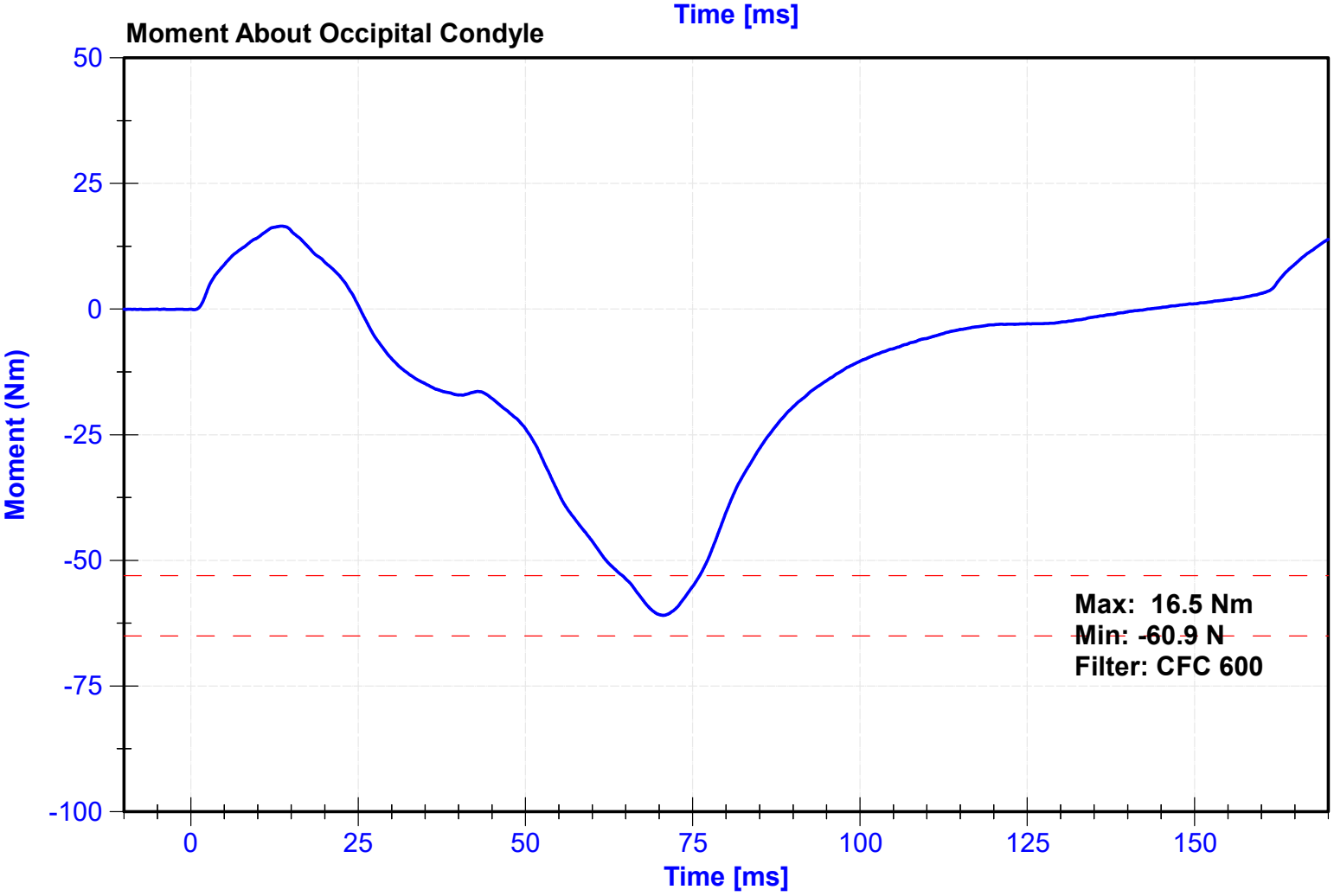
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	40	Pass
Velocity	5.95	6.19	m/s	6.150	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.79	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.61	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.23	Pass
D Plane Rotation	99	114	deg	107.9	Pass
Moment During Rotation Interval	-65	-53	Nm	-60.9	Pass
Moment Decay to -10Nm	94	114	ms	100.7	Pass

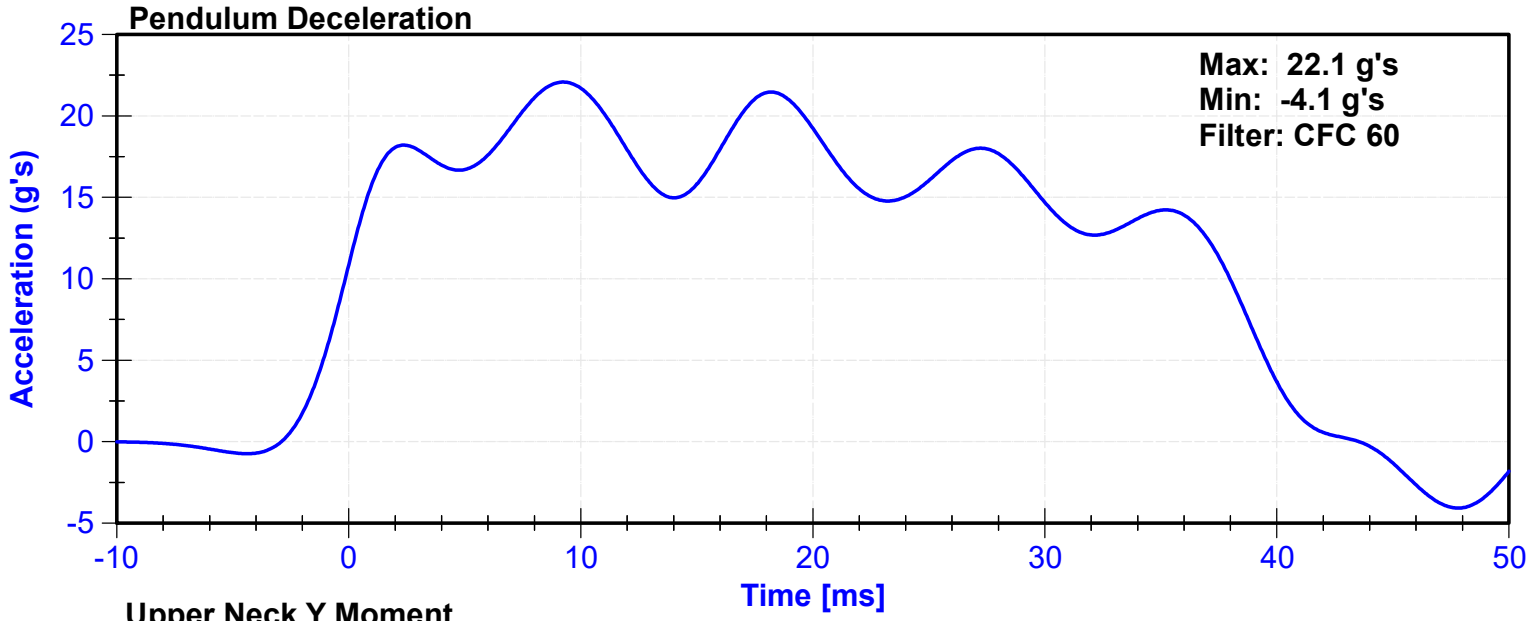
Transducer Calibrations

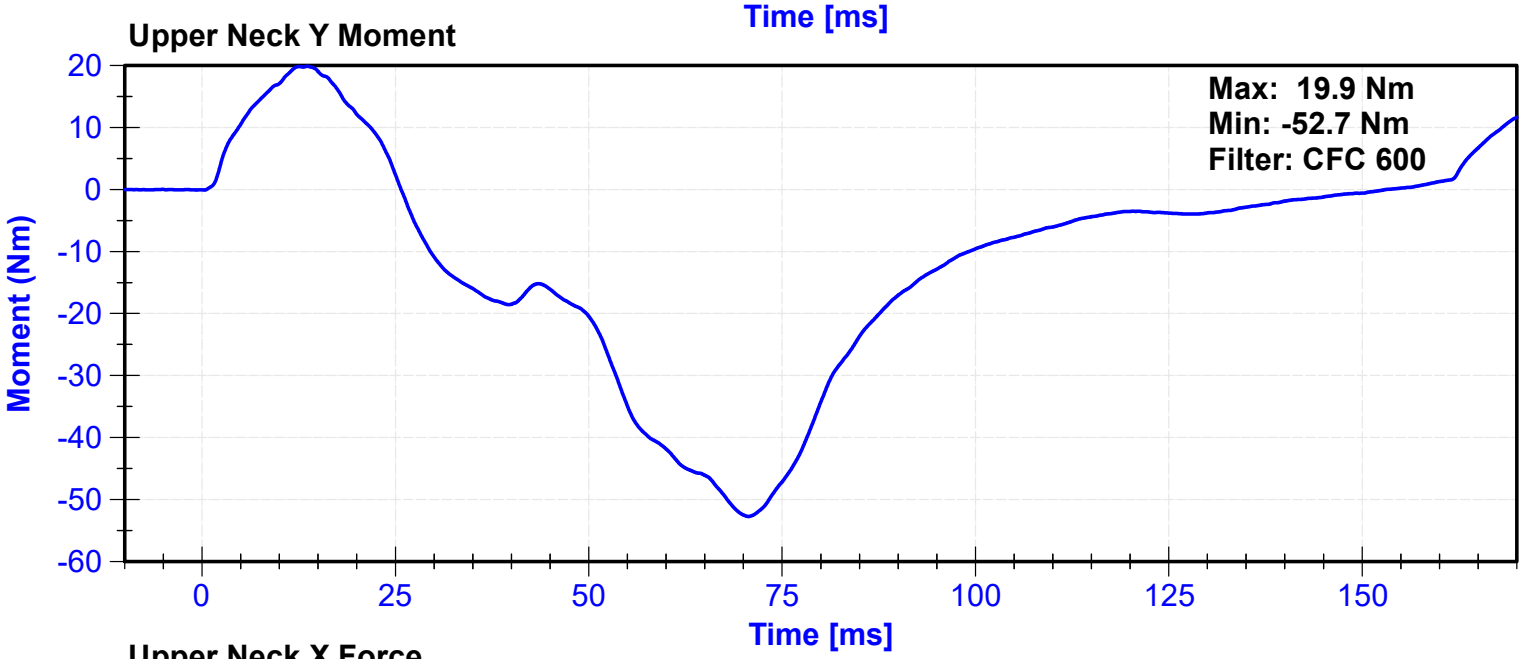
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	10/31/2023	10/30/2024
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Humanetics	2019-FX	9/12/2023	9/11/2024

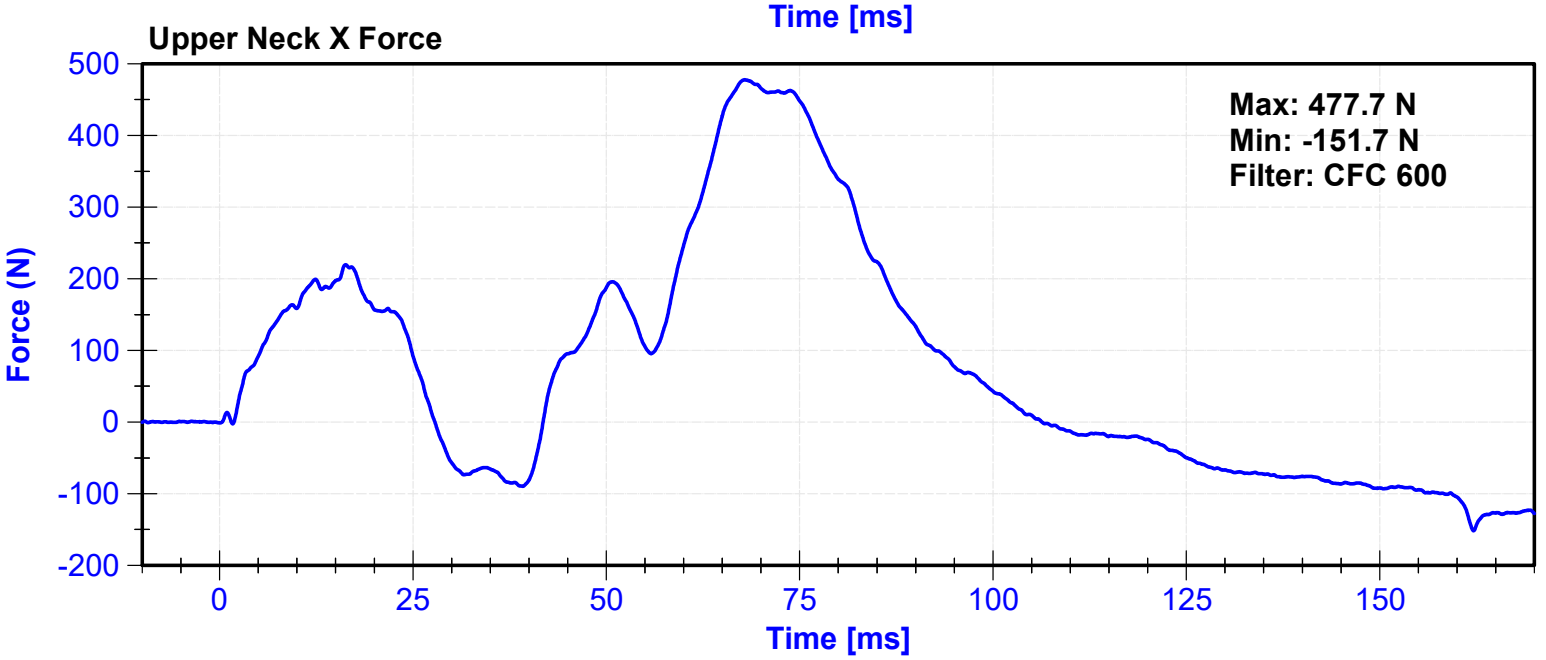



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 107.9 deg
Min: -12.8 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 16.5 Nm
Min: -60.9 N
Filter: CFC 600


Pendulum Deceleration
Max: 22.1 g's
Min: -4.1 g's
Filter: CFC 60
Acceleration (g's)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]


Upper Neck Y Moment
Max: 19.9 Nm
Min: -52.7 Nm
Filter: CFC 600
Moment (Nm)
20
10
0
-10
-20
-30
-40
-50
-60
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 477.7 N
Min: -151.7 N
Filter: CFC 600
Force (N)
500
400
300
200
100
0
-100
-200
0
25
50
75
100
125
150
Time [ms]

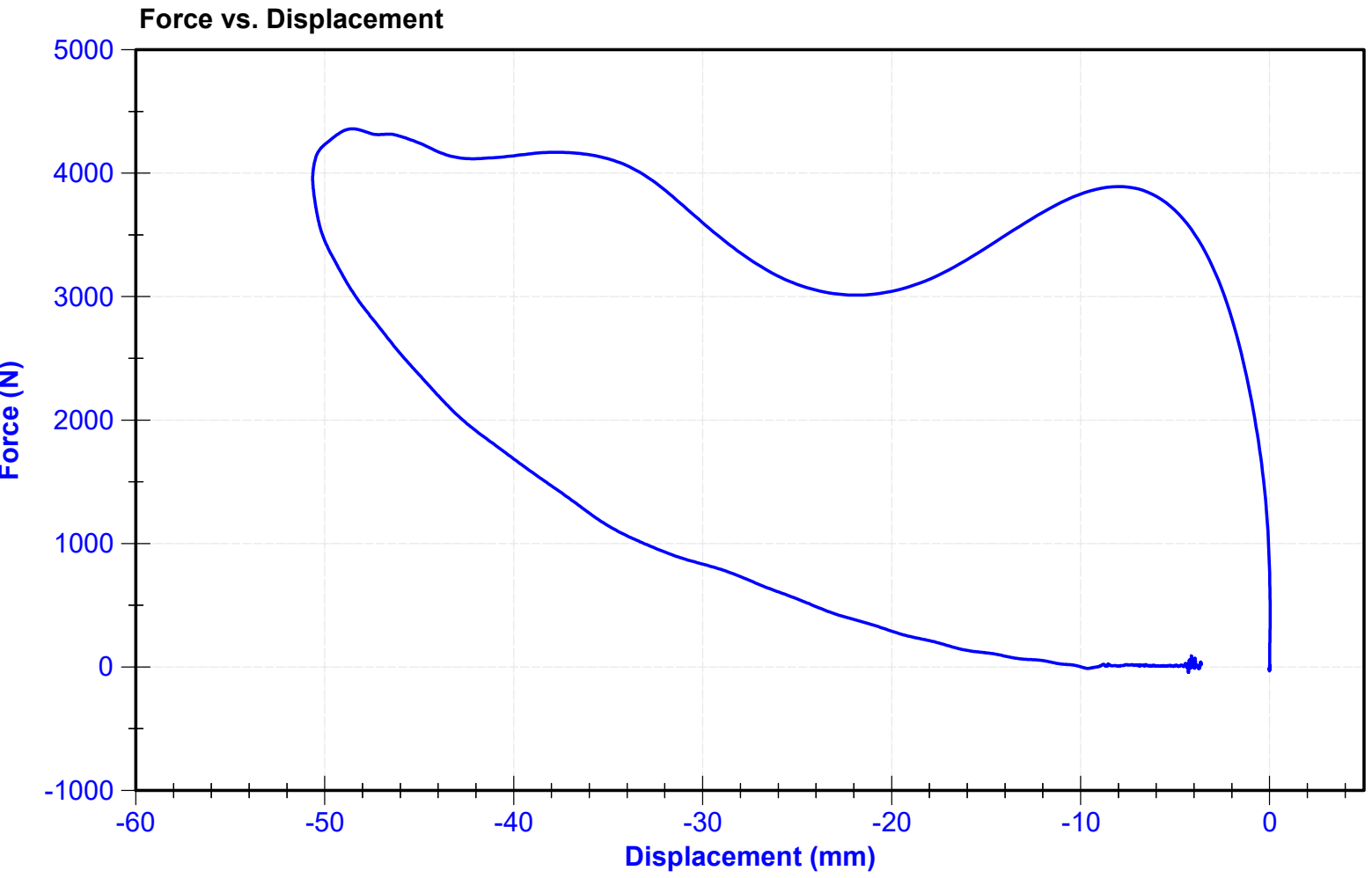
ATD Manufacturer	Humanetics	Test Technician	T. Roseman
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

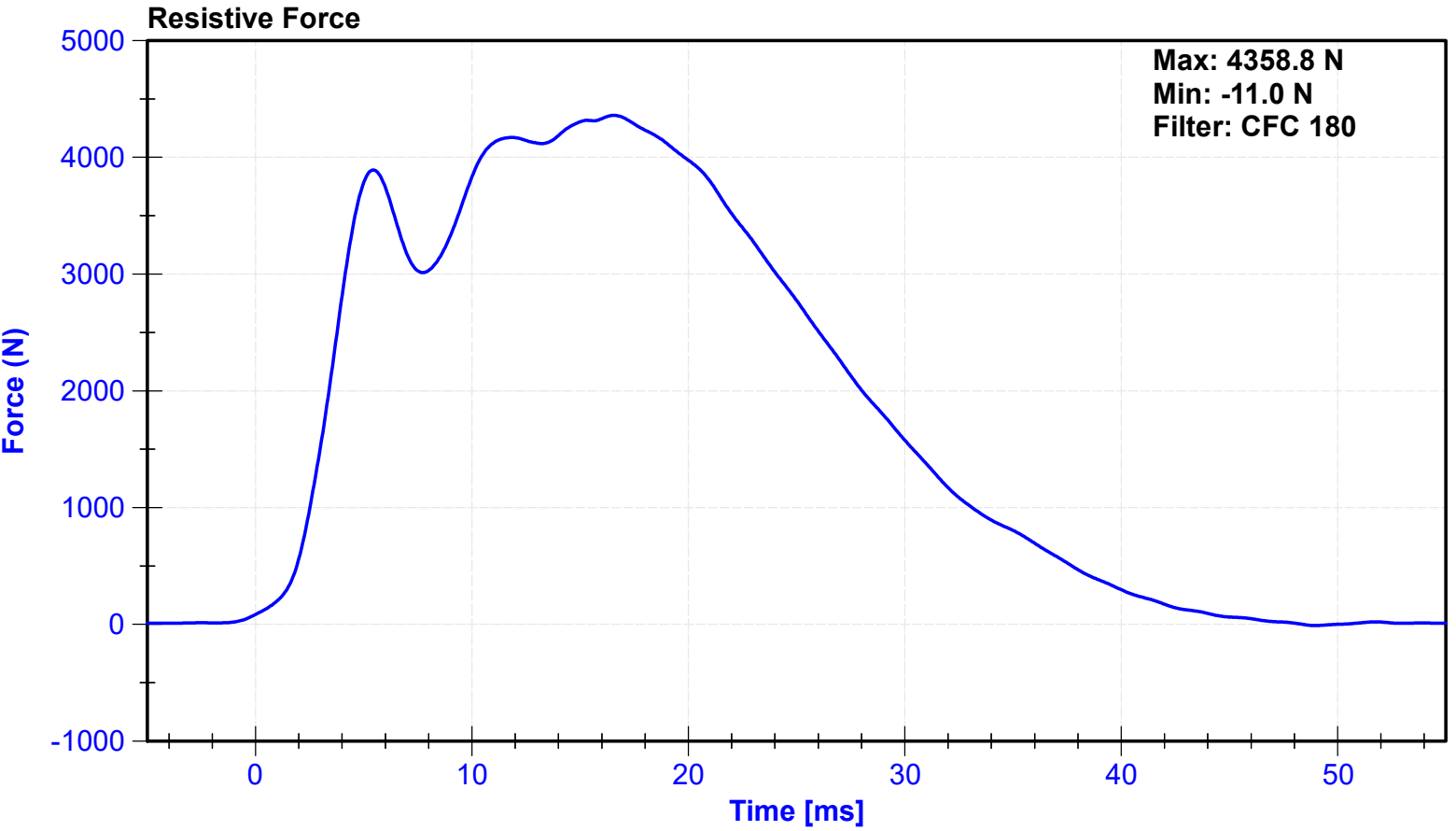
Results

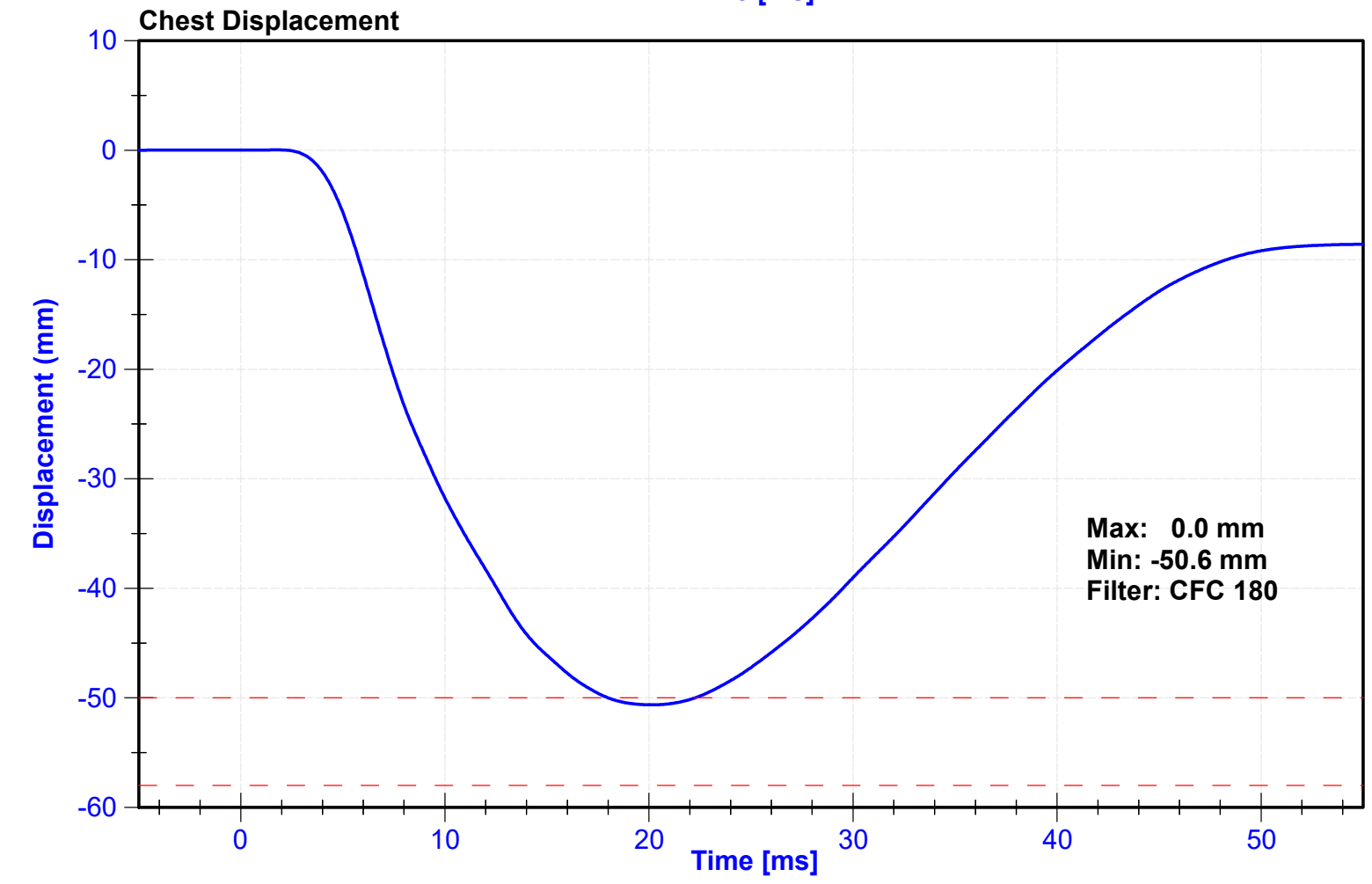
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	43	Pass
Velocity	6.59	6.83	m/s	6.702	Pass
Chest Deflection	-58	-50	mm	-50.6	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4236.2	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4358.8	Pass
Hysteresis	69	85	%	75.4	Pass

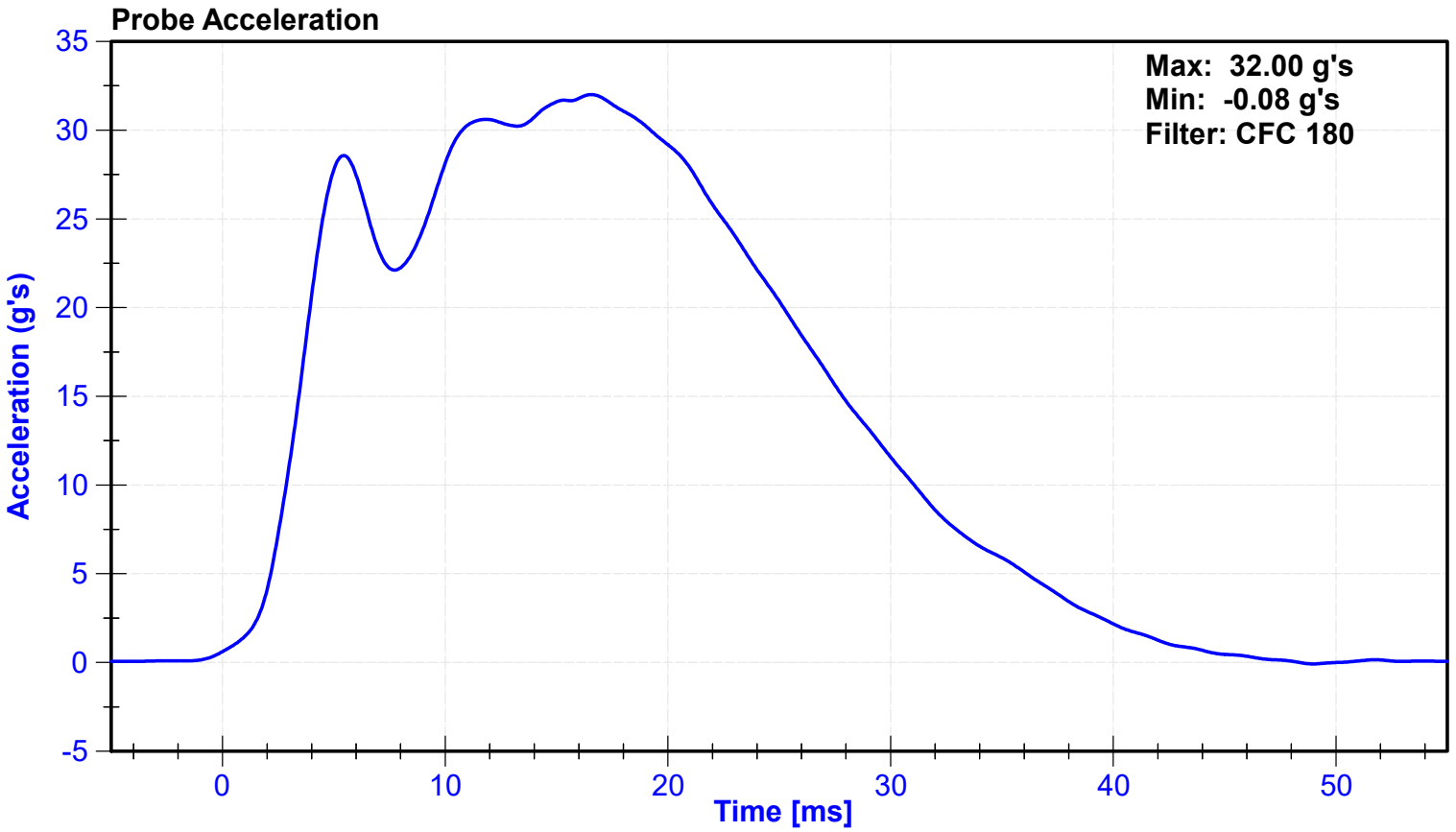
Transducer Calibrations

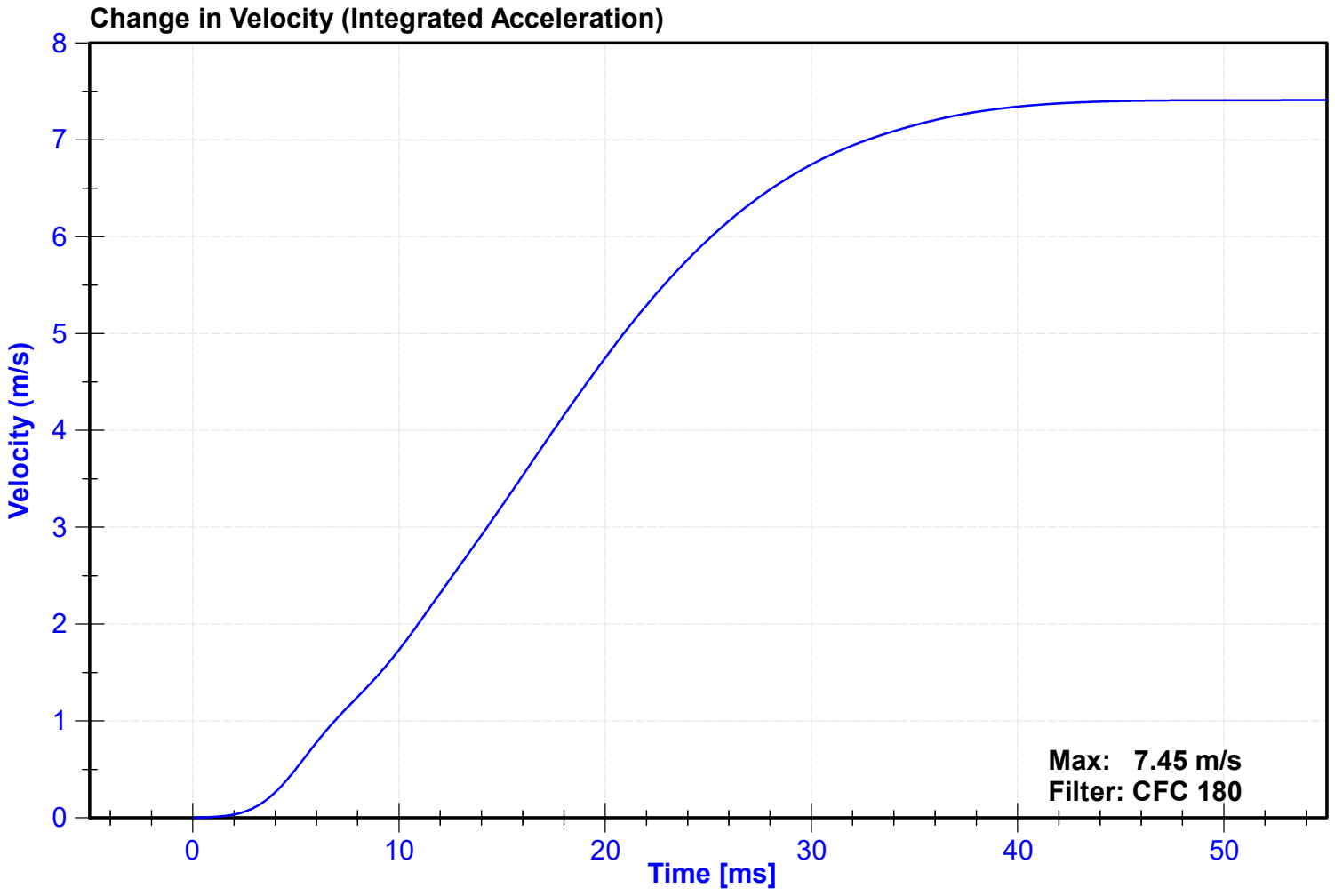
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Chest Potentiometer	Servo	0720	1/5/2024	7/5/2024




Resistive Force
Max: 4358.8 N
Min: -11.0 N
Filter: CFC 180
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]


Chest Displacement
Max: 0.0 mm
Min: -50.6 mm
Filter: CFC 180
Displacement (mm)
10
0
-10
-20
-30
-40
-50
-60
0
10
20
30
40
50
Time [ms]


Probe Acceleration
Max: 32.00 g's
Min: -0.08 g's
Filter: CFC 180
Acceleration (g's)
35
30
25
20
15
10
5
0
-5
0
10
20
30
40
50
Time [ms]


Change in Velocity (Integrated Acceleration)
Max: 7.45 m/s
Filter: CFC 180
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
10
20
30
40
50
Time [ms]

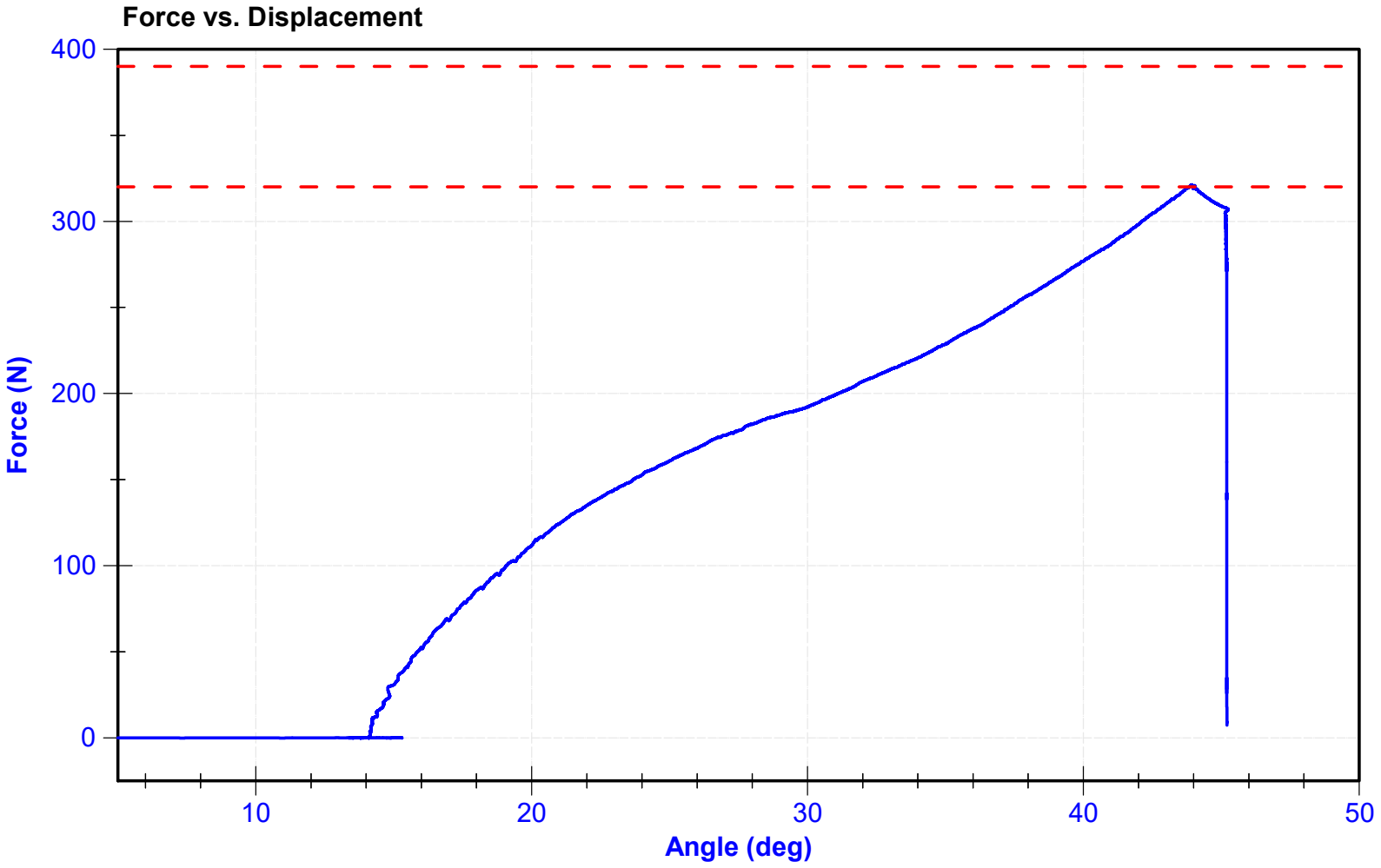
ATD Manufacturer	Humanetics	Test Technician	T. Roseman
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	ºC	21.9	Pass
Humidity	10	70	%	45	Pass
Initial Angle	0	20	deg	14.1	Pass
Force at 45 Degrees	320	390	N	321.3	Pass
Return Angle Relative to Initial	0	8	deg	3.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker	DS-1905226	2023-11-14	2024-11-13
Load Cell	Interface	1134516	2023-11-30	2024-11-29



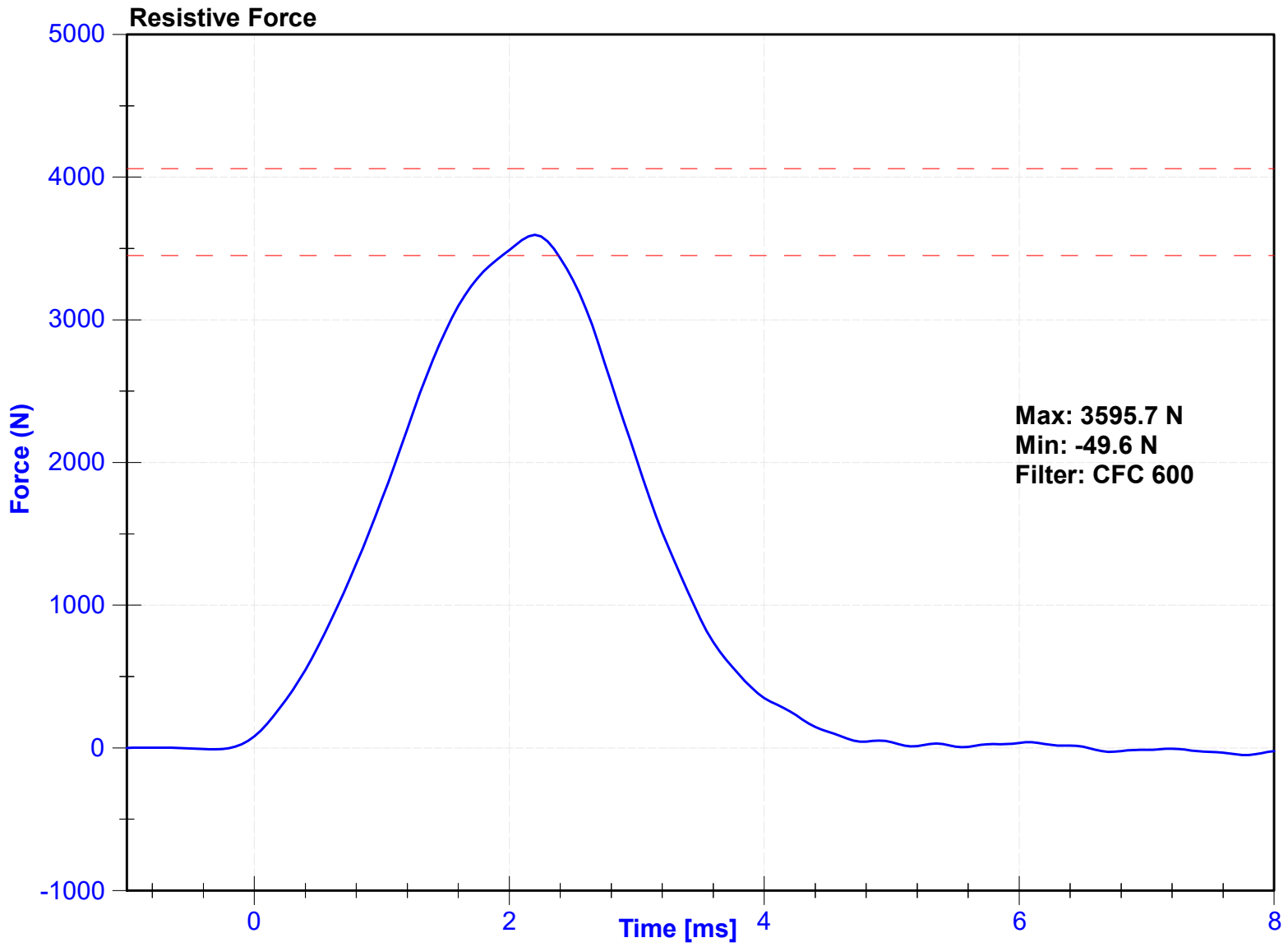
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

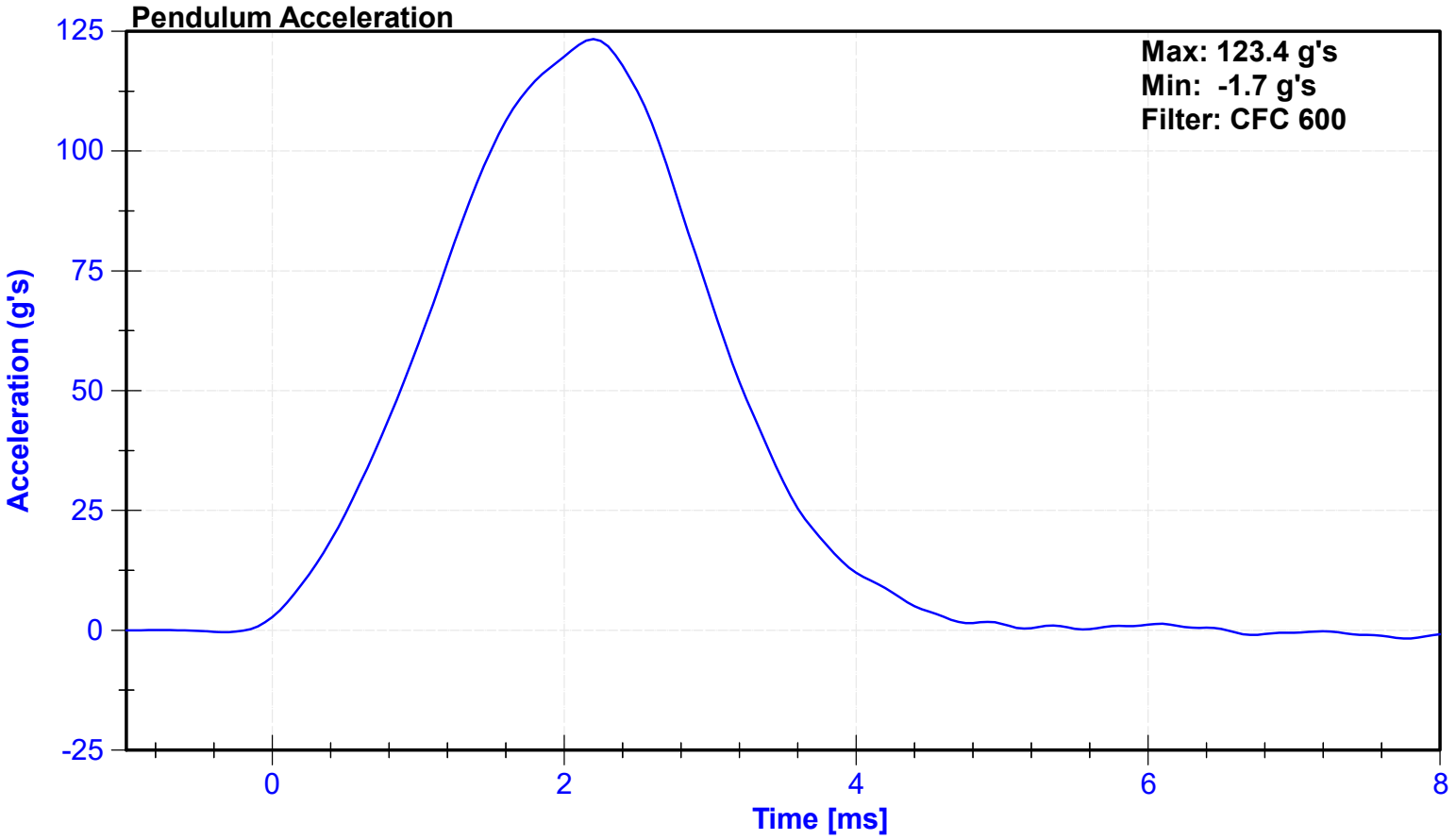
Results

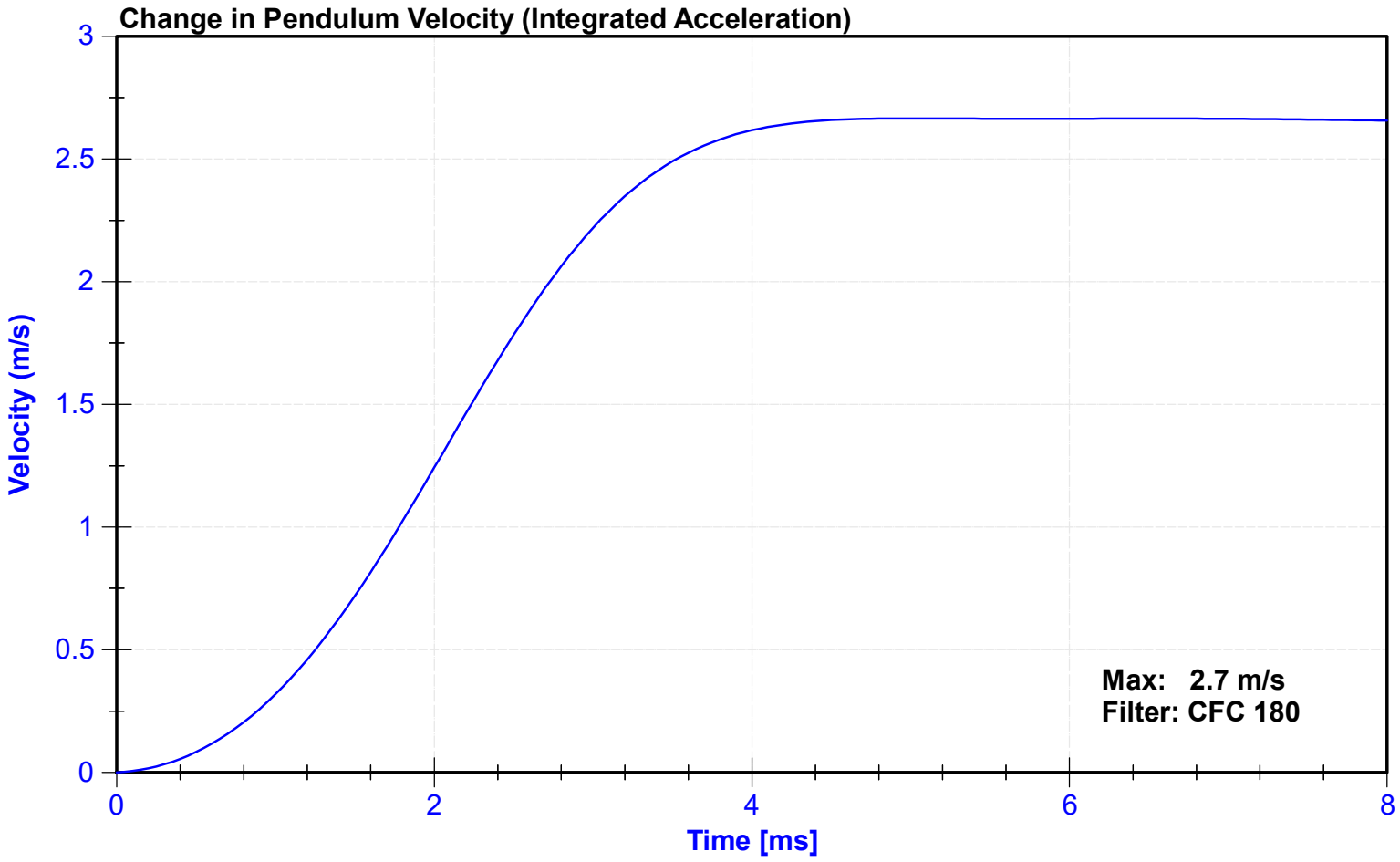
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	22.3	Pass
Humidity	10	70	%	48	Pass
Velocity	2.07	2.13	m/s	2.097	Pass
Resistive Force	3450	4060	N	3595.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	3/29/2024	9/25/2024




Pendulum Acceleration
Max: 123.4 g's
Min: -1.7 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Max: 2.7 m/s
Filter: CFC 180
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

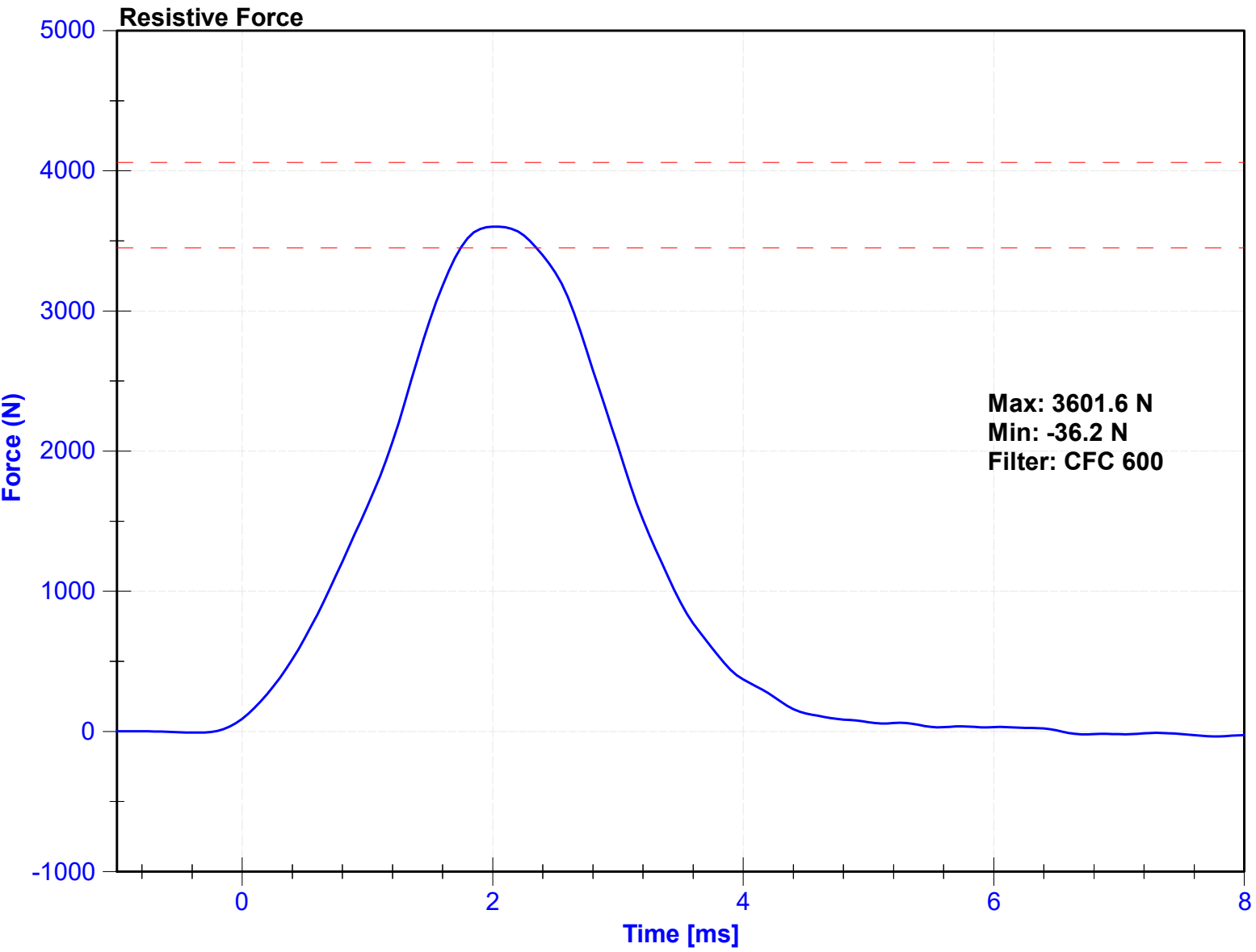
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

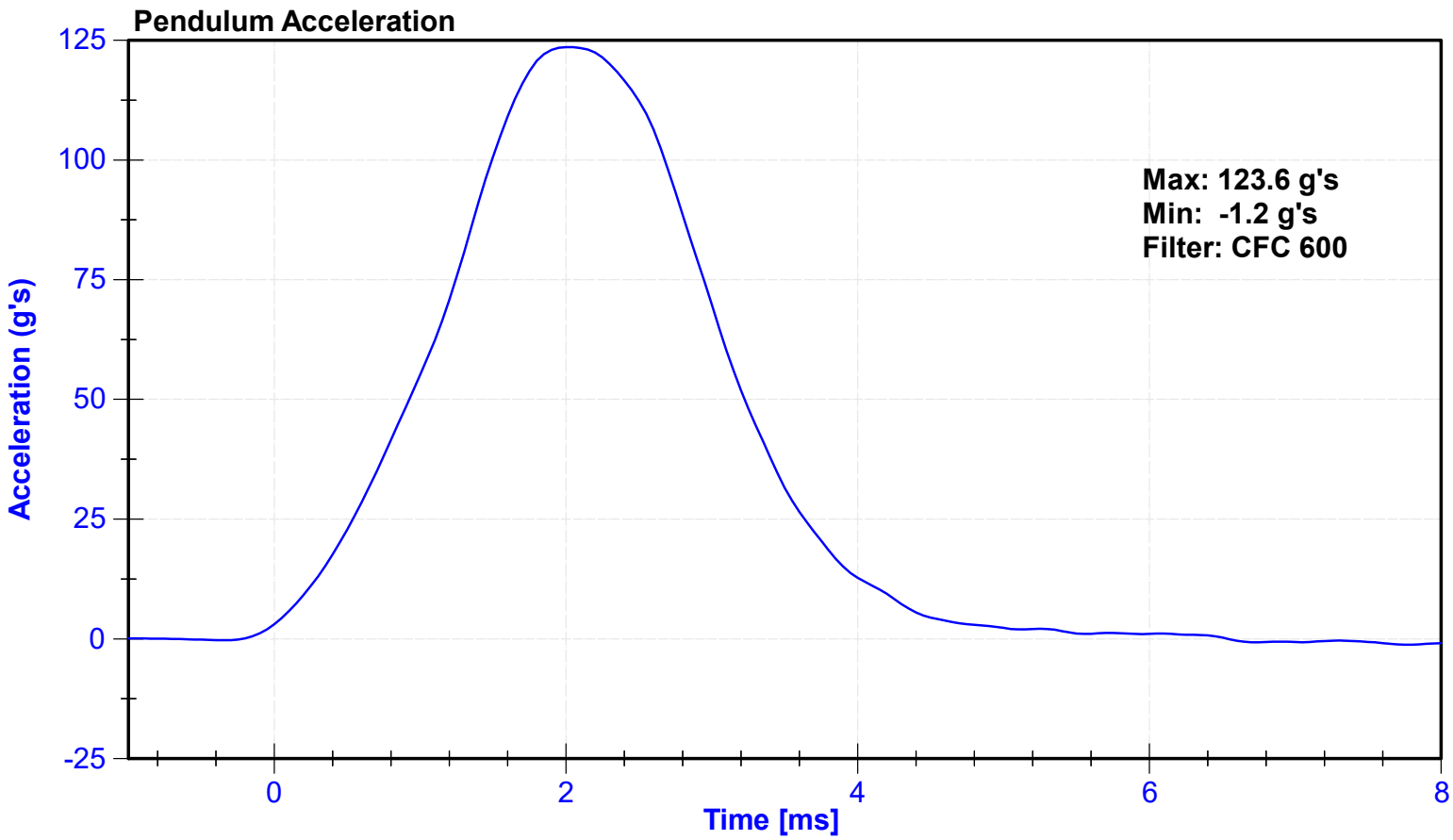
Results

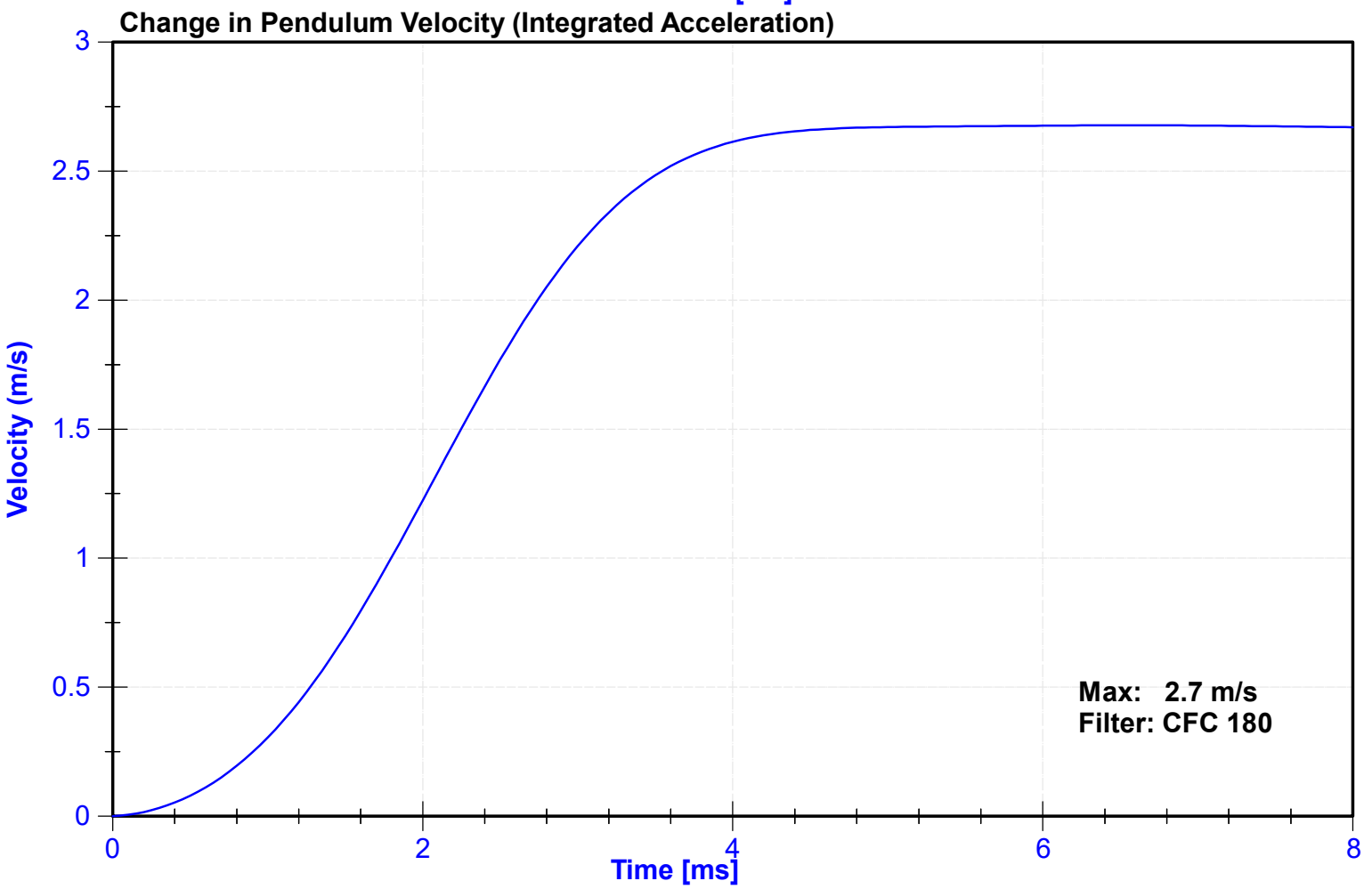
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	22.3	Pass
Humidity	10	70	%	48	Pass
Velocity	2.07	2.13	m/s	2.096	Pass
Resistive Force	3450	4060	N	3601.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	3/29/2024	9/25/2024




Pendulum Acceleration
Max: 123.6 g's
Min: -1.2 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Max: 2.7 m/s
Filter: CFC 180
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

CALIBRATION TEST RESULTS

POST-TEST

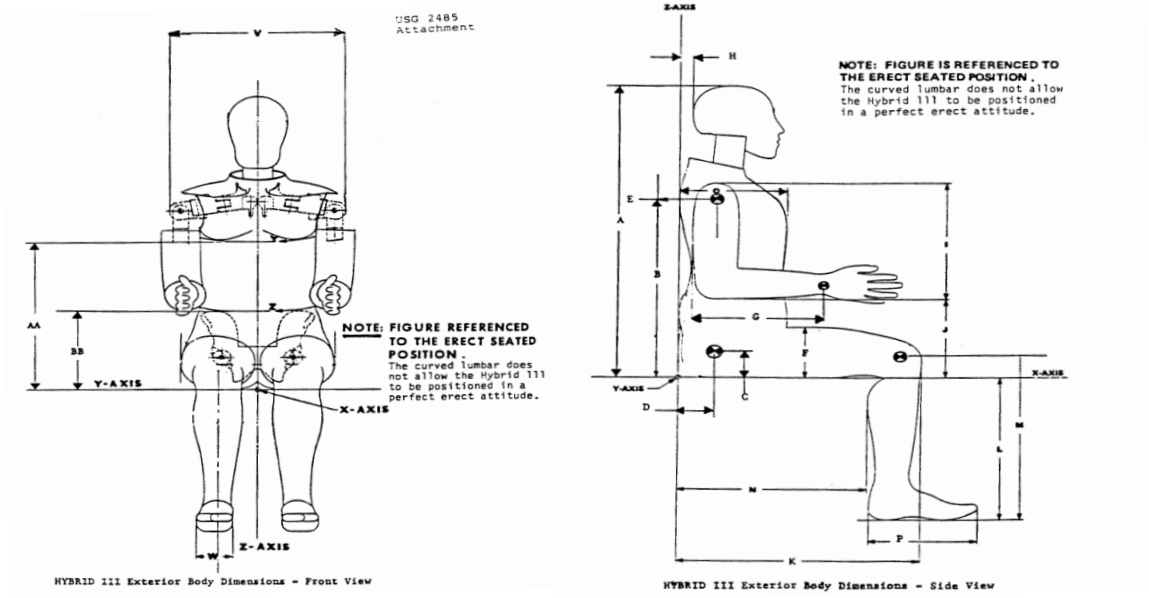
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 065

External Measurements - Hybrid 3 - 50th Male

Technician: K. Brogan Date: 05/17/2024

Dummy Serial Number: 065



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.8	Pass
B	Shoulder Pivot Height	19.9	20.5	20.2	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.4	Pass
F	Thigh Clearance	5.5	6.1	6.0	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.8	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.4	Pass
J	Elbow Rest Height	7.5	8.3	7.9	Pass
K	Buttock to Knee Length	22.8	23.8	23.5	Pass
L	Popliteal Height	16.9	17.9	17.5	Pass
M	Knee Pivot Height	19.1	19.7	19.5	Pass
N	Buttock Popliteal Length	17.8	18.8	18.4	Pass
O	Chest Depth without Jacket	8.4	9.0	8.8	Pass
P	Foot Length (right)	9.9	10.5	10.2	Pass
V	Shoulder Breadth	16.3	17.2	16.9	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	9.0	Pass

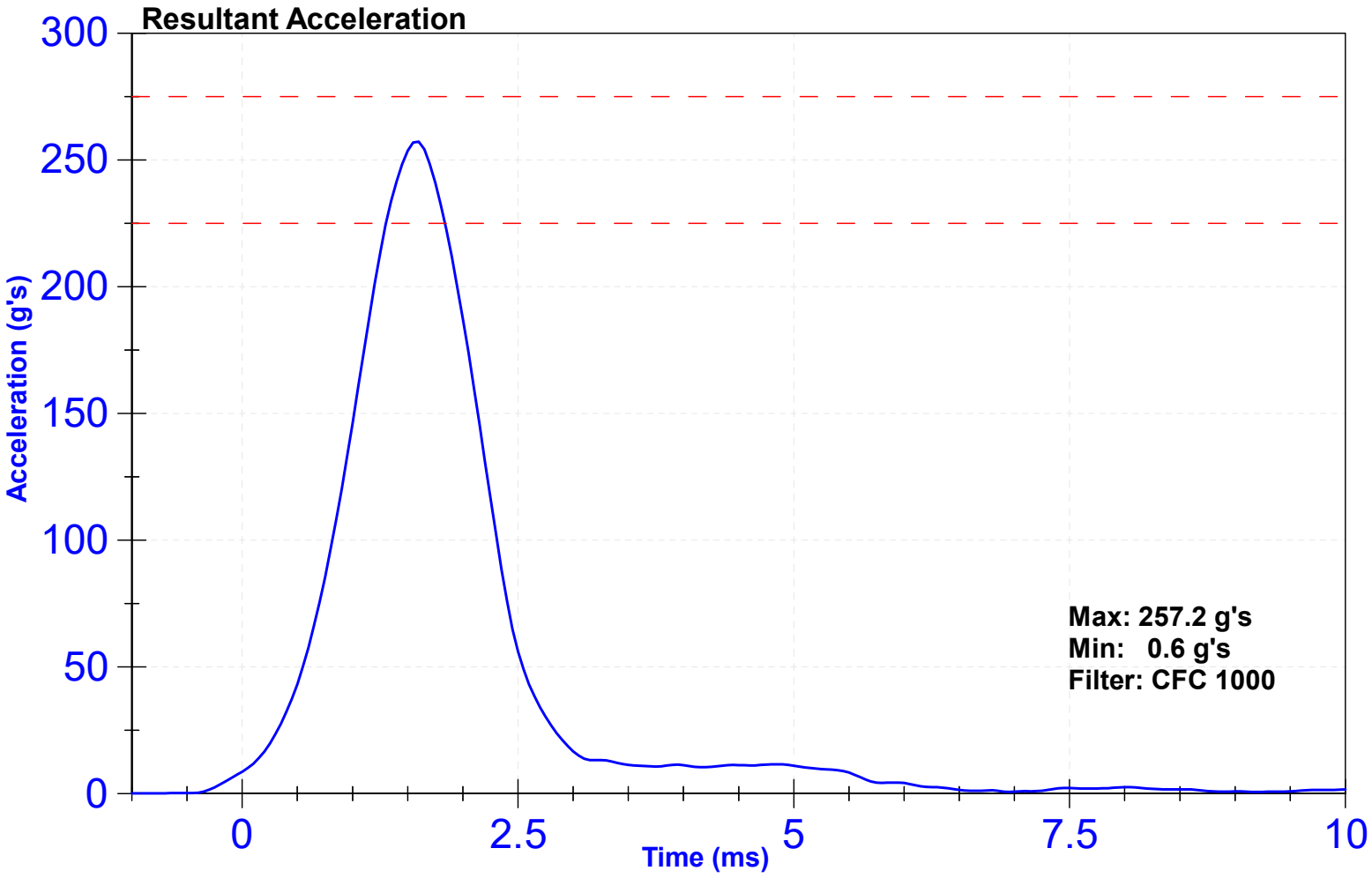
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

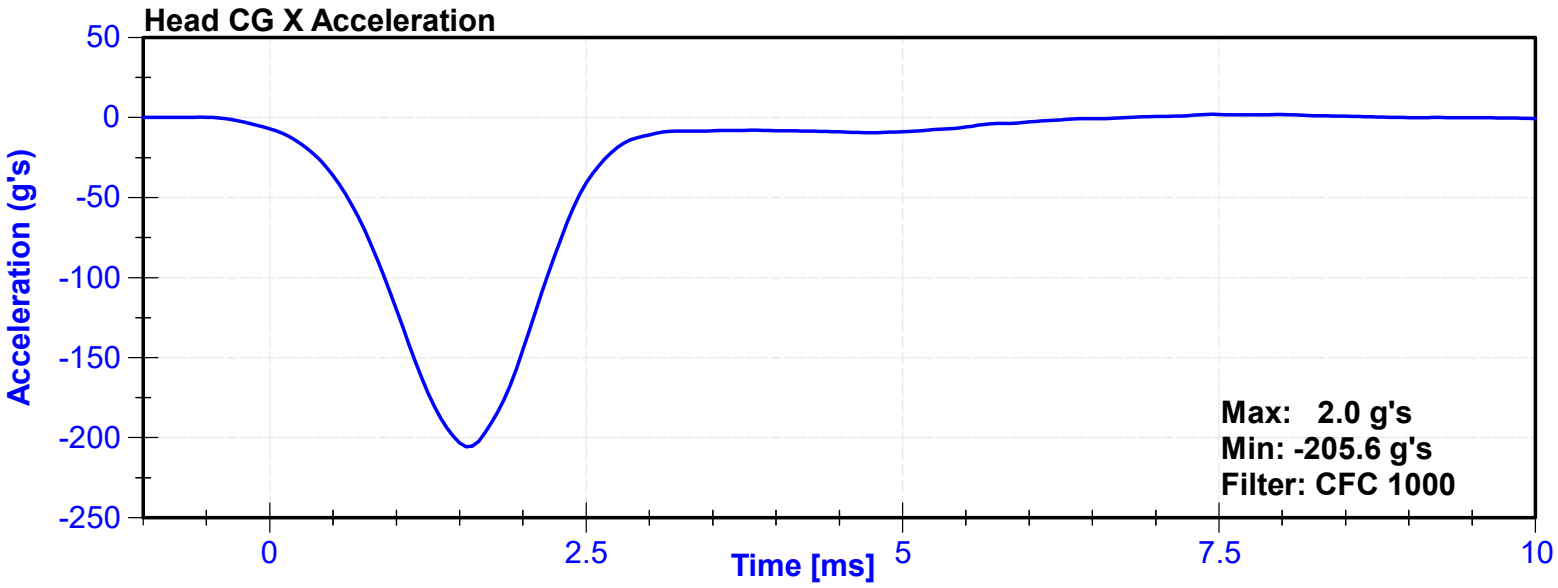
Results

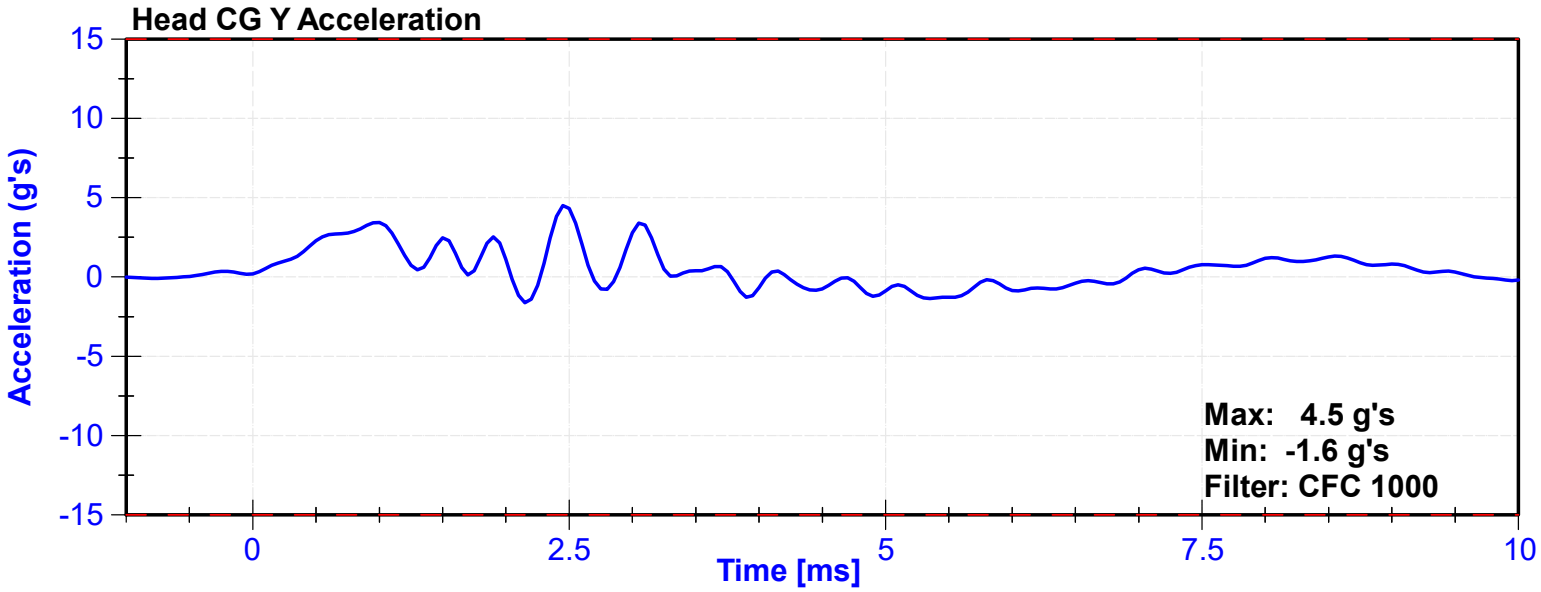
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.9	Pass
Humidity	10	70	%	40	Pass
Resultant Acceleration	225	275	g's	257.2	Pass
Oscillation	0	10	%	5.1	Pass
Lateral Acceleration	-15	15	g's	4.5	Pass

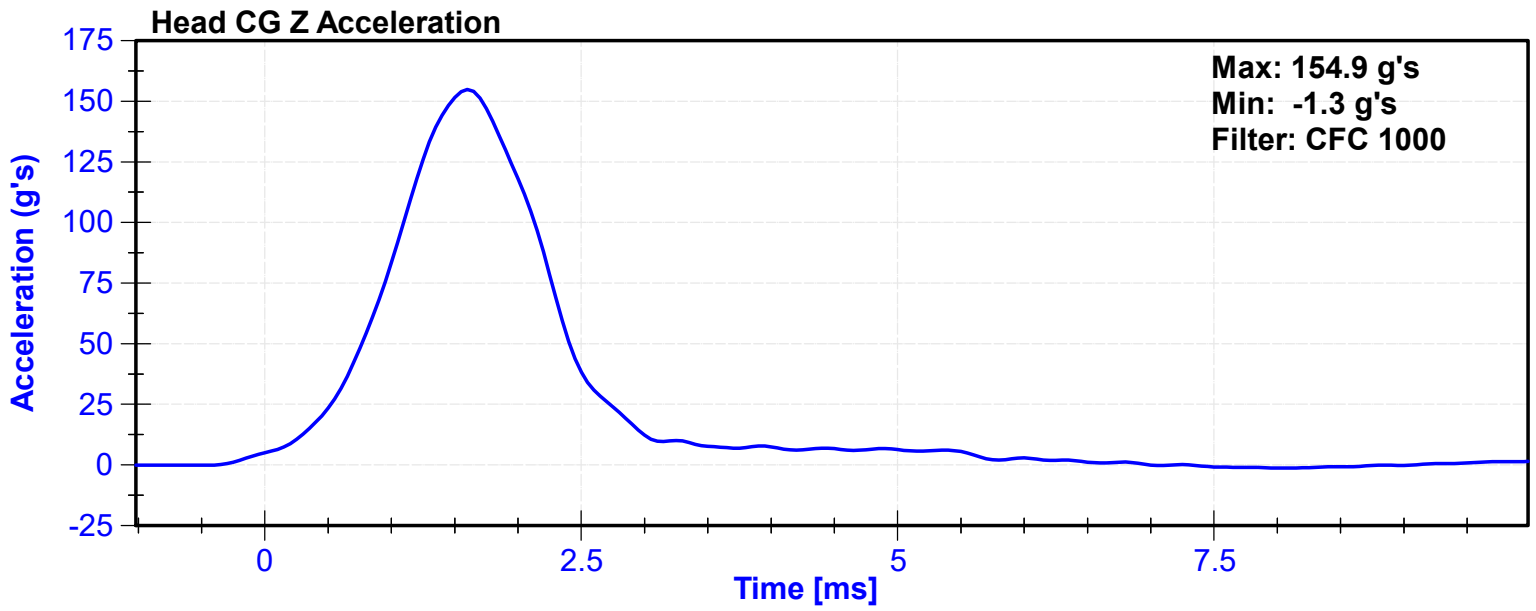
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P79591	4/30/2024	10/27/2024
Y Accelerometer	Endevco	P58888	4/30/2024	10/27/2024
Z Accelerometer	Endevco	P58911	4/30/2024	10/27/2024




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 2.0 g's
Min: -205.6 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 4.5 g's
Min: -1.6 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
175
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
Time [ms]
Max: 154.9 g's
Min: -1.3 g's
Filter: CFC 1000

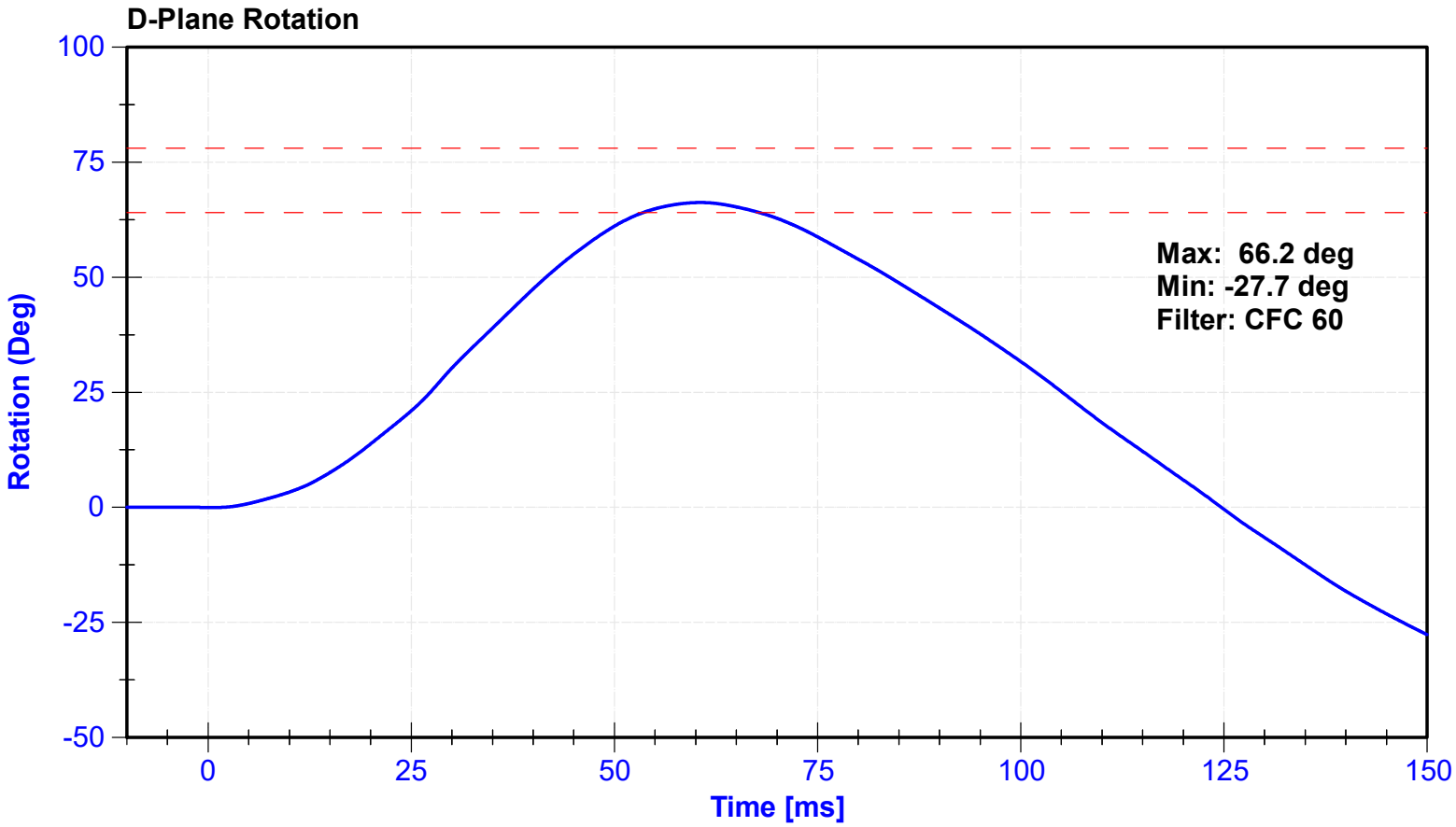
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

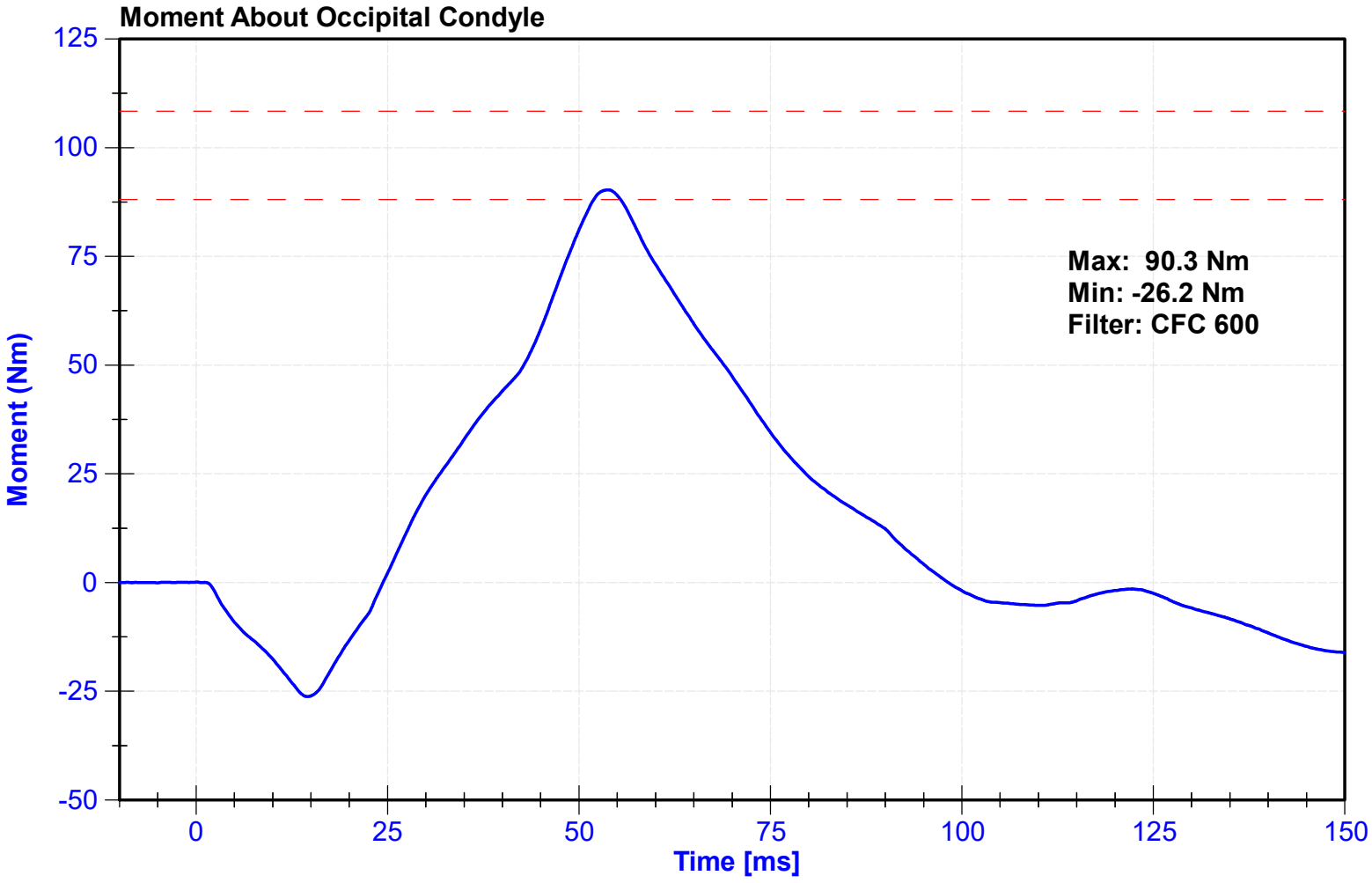
Results

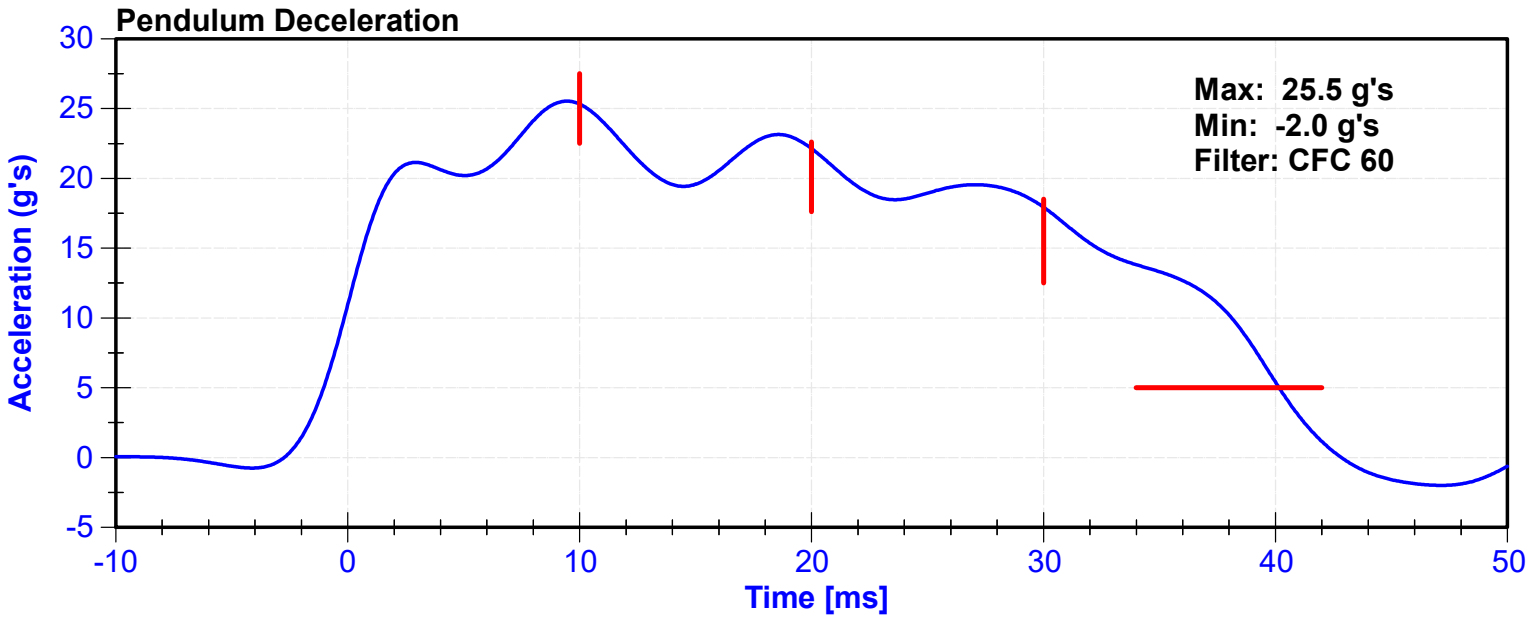
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	43	Pass
Velocity	6.89	7.13	m/s	7.060	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	25.31	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	22.12	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	17.93	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	25.5	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	40.2	Pass
Maximum D Plane Rotation	64	78	deg	66.2	Pass
Time to Maximum Rotation	57	64	ms	60.5	Pass
Rotation Decay to Zero	113	127	ms	124.7	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	90.31	Pass
Time to Maximum Moment	47	58	ms	53.8	Pass
Moment Decay to Zero	97	107	ms	98.2	Pass

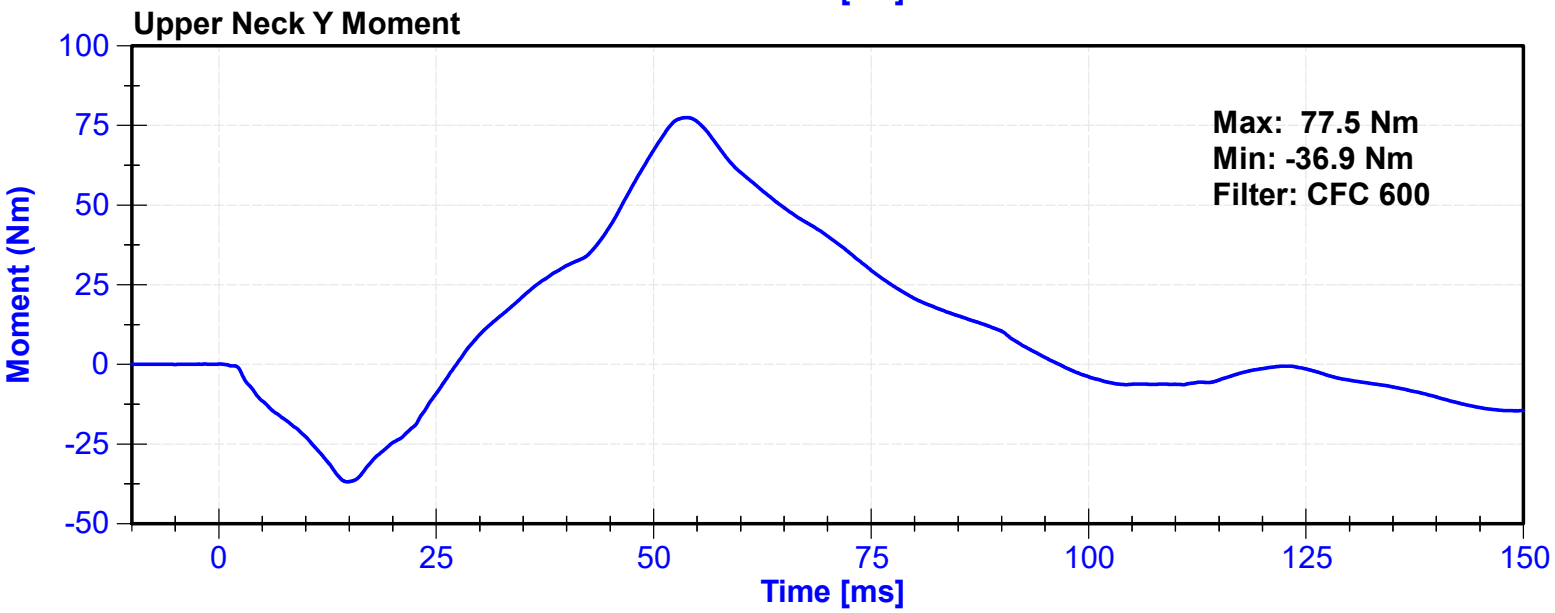
Transducer Calibrations

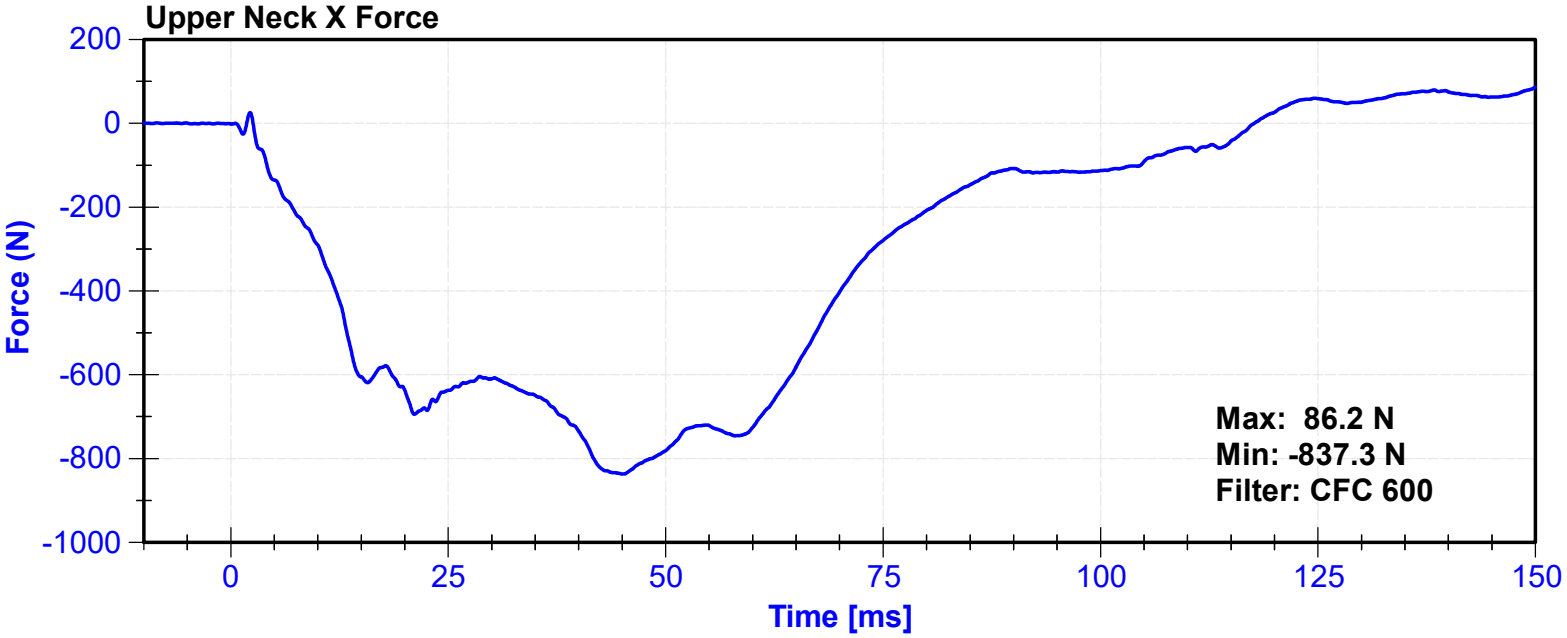
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	10/31/2023	10/30/2024
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Humanetics	1916-FX	9/12/2023	9/11/2024


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 66.2 deg
Min: -27.7 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 90.3 Nm
Min: -26.2 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 25.5 g's
Min: -2.0 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 77.5 Nm
Min: -36.9 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 86.2 N
Min: -837.3 N
Filter: CFC 600
Force (N)
Time [ms]

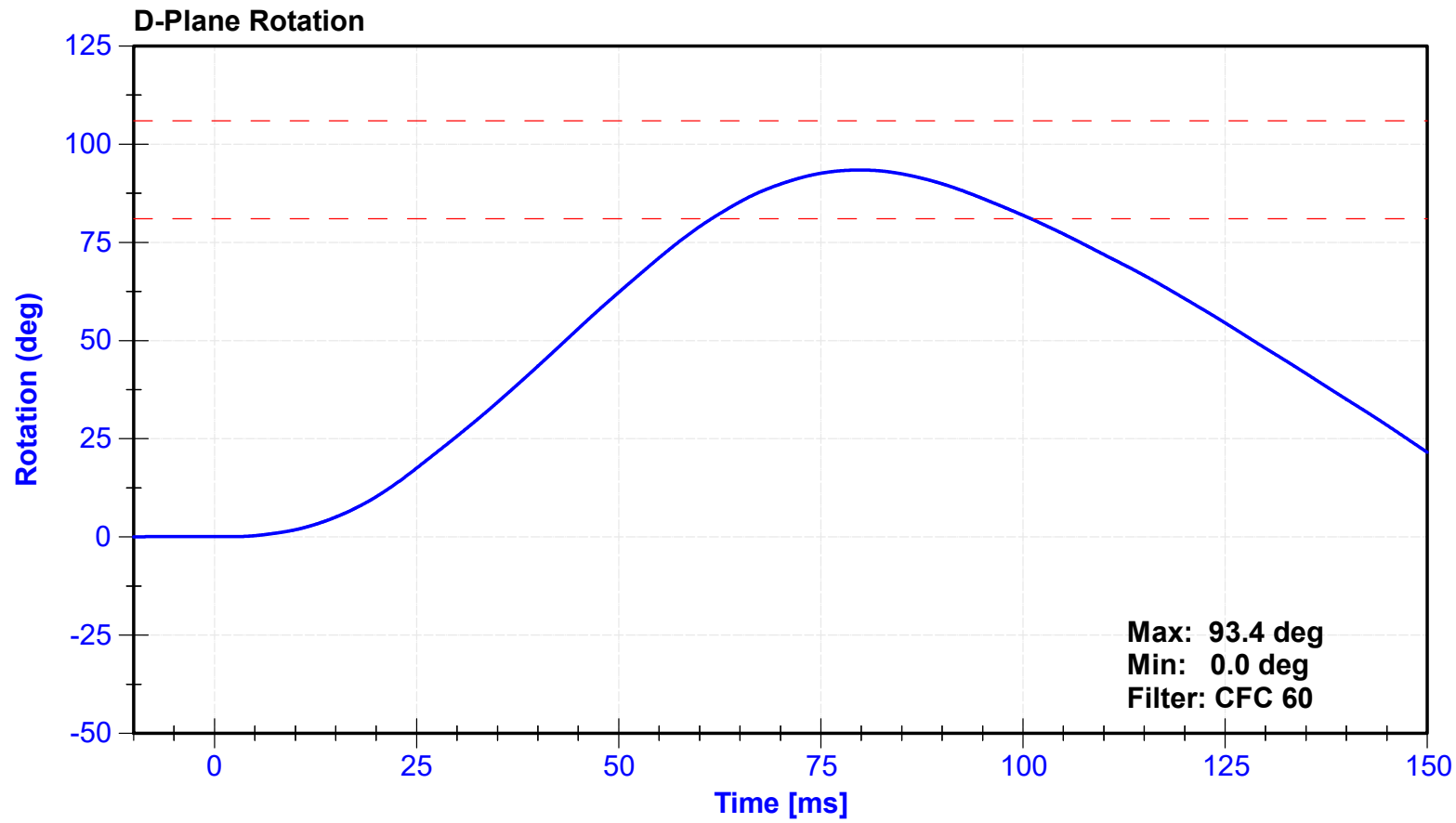
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

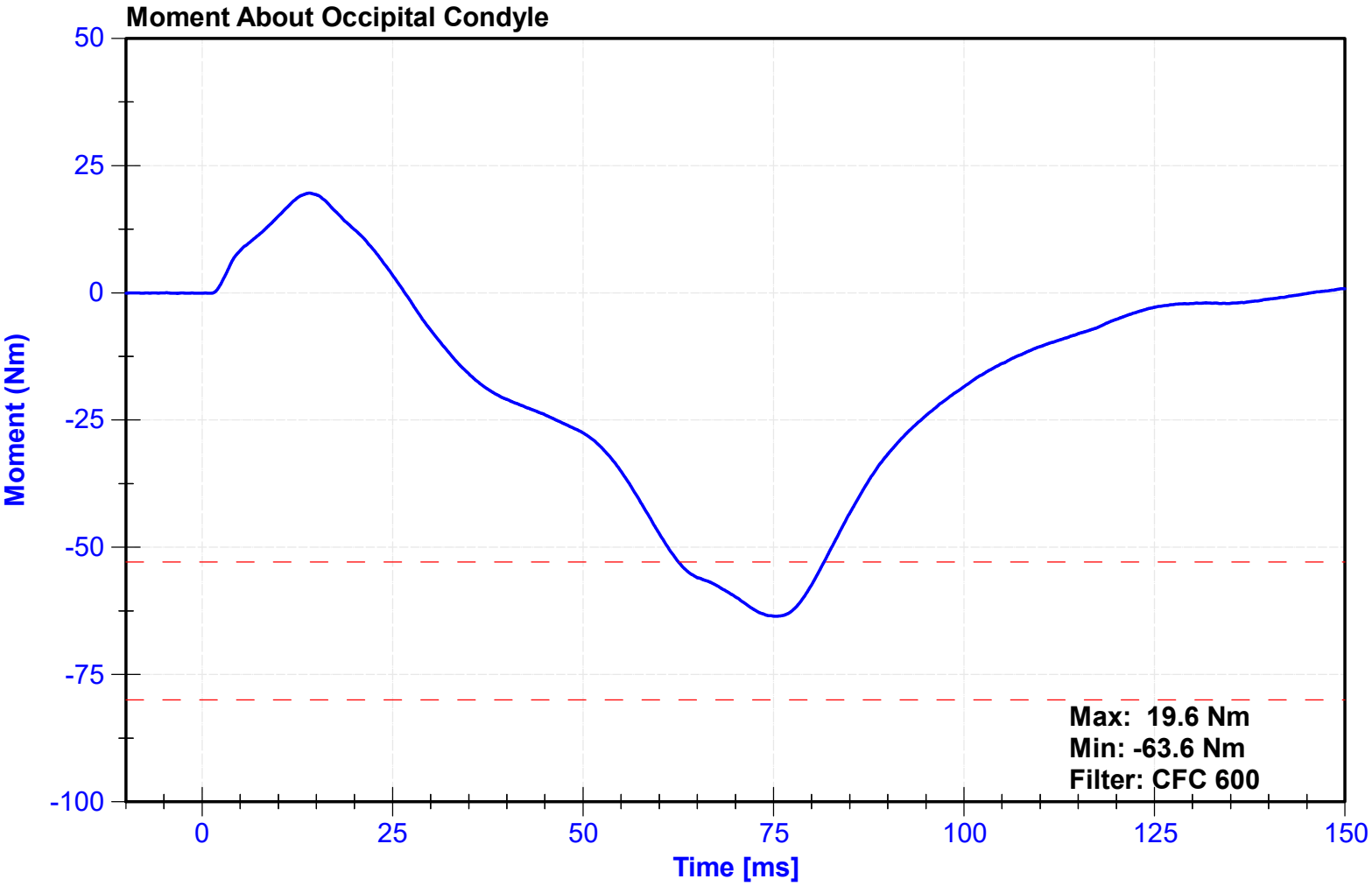
Results

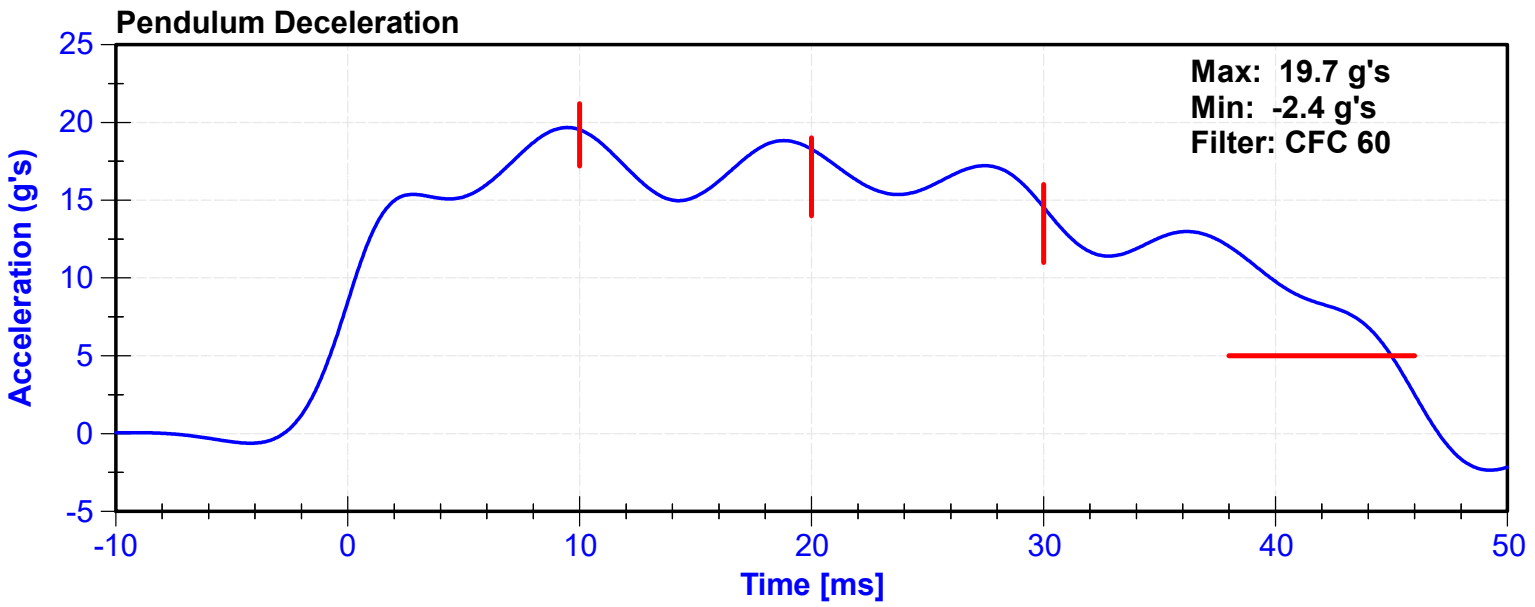
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	43	Pass
Velocity	5.94	6.19	m/s	6.185	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	19.52	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.3	Pass
Pendulum Deceleration at 30ms	11	16	g's	14.6	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	19.7	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	45.0	Pass
Maximum D Plane Rotation	81	106	deg	93.4	Pass
Time to Maximum Rotation	72	82	ms	79.9	Pass
Rotation Decay to Zero	147	174	ms	166.8	Pass
Minimum Moment About OC	-80	-52.9	Nm	-63.59	Pass
Time to Minimum Moment	65	79	ms	75.3	Pass
Moment Decay to Zero	120	148	ms	145.6	Pass

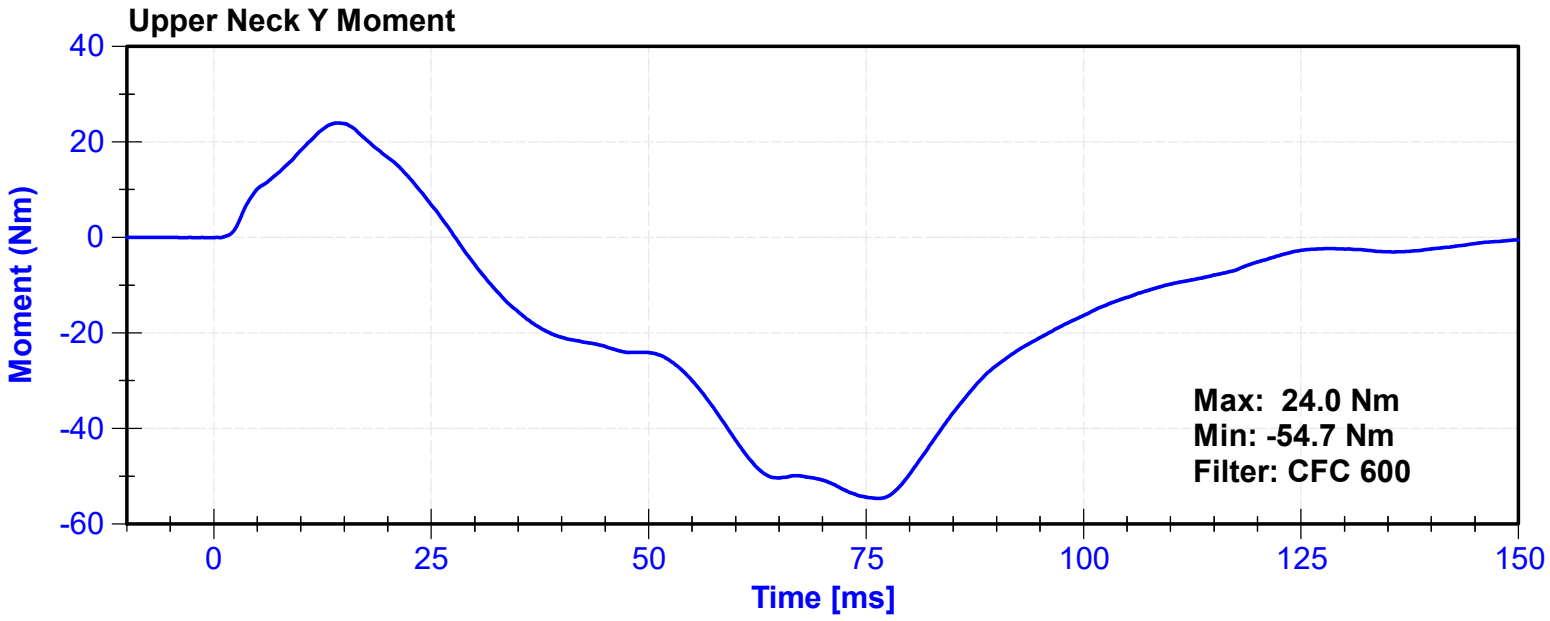
Transducer Calibrations

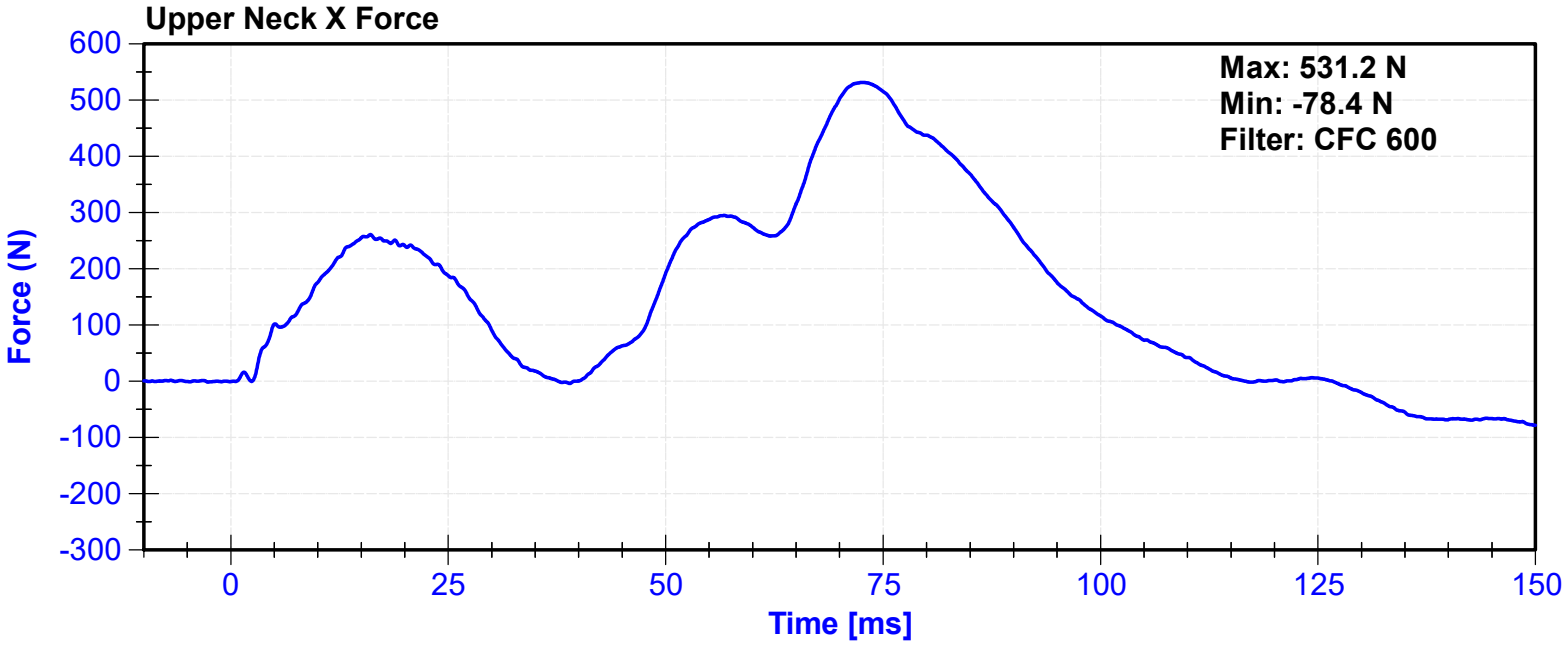
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	10/31/2023	10/30/2024
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Humanetics	1916-FX	9/12/2023	9/11/2024


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 93.4 deg
Min: 0.0 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 19.6 Nm
Min: -63.6 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 19.7 g's
Min: -2.4 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 24.0 Nm
Min: -54.7 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 531.2 N
Min: -78.4 N
Filter: CFC 600
Force (N)
Time [ms]

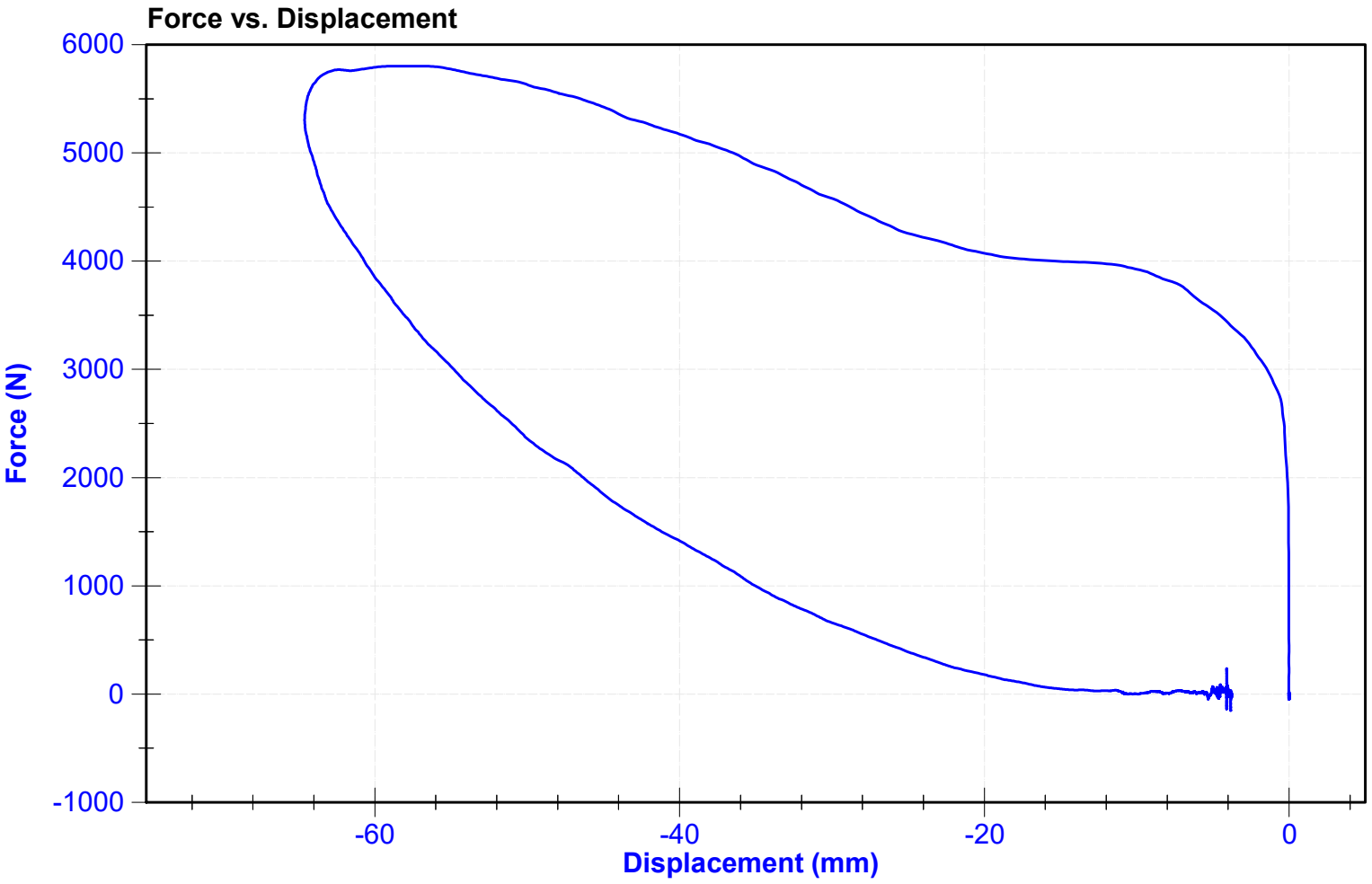
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

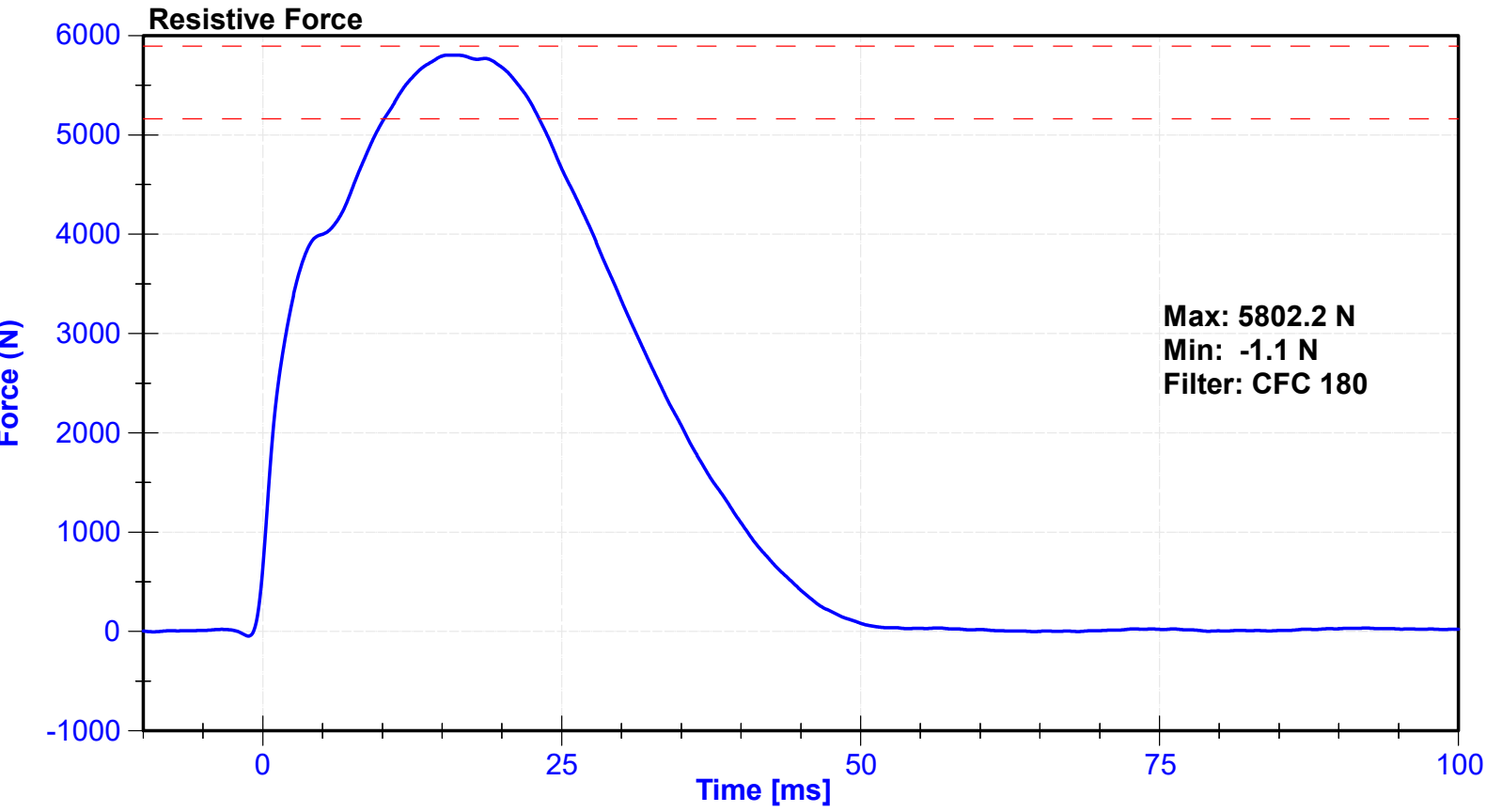
Results

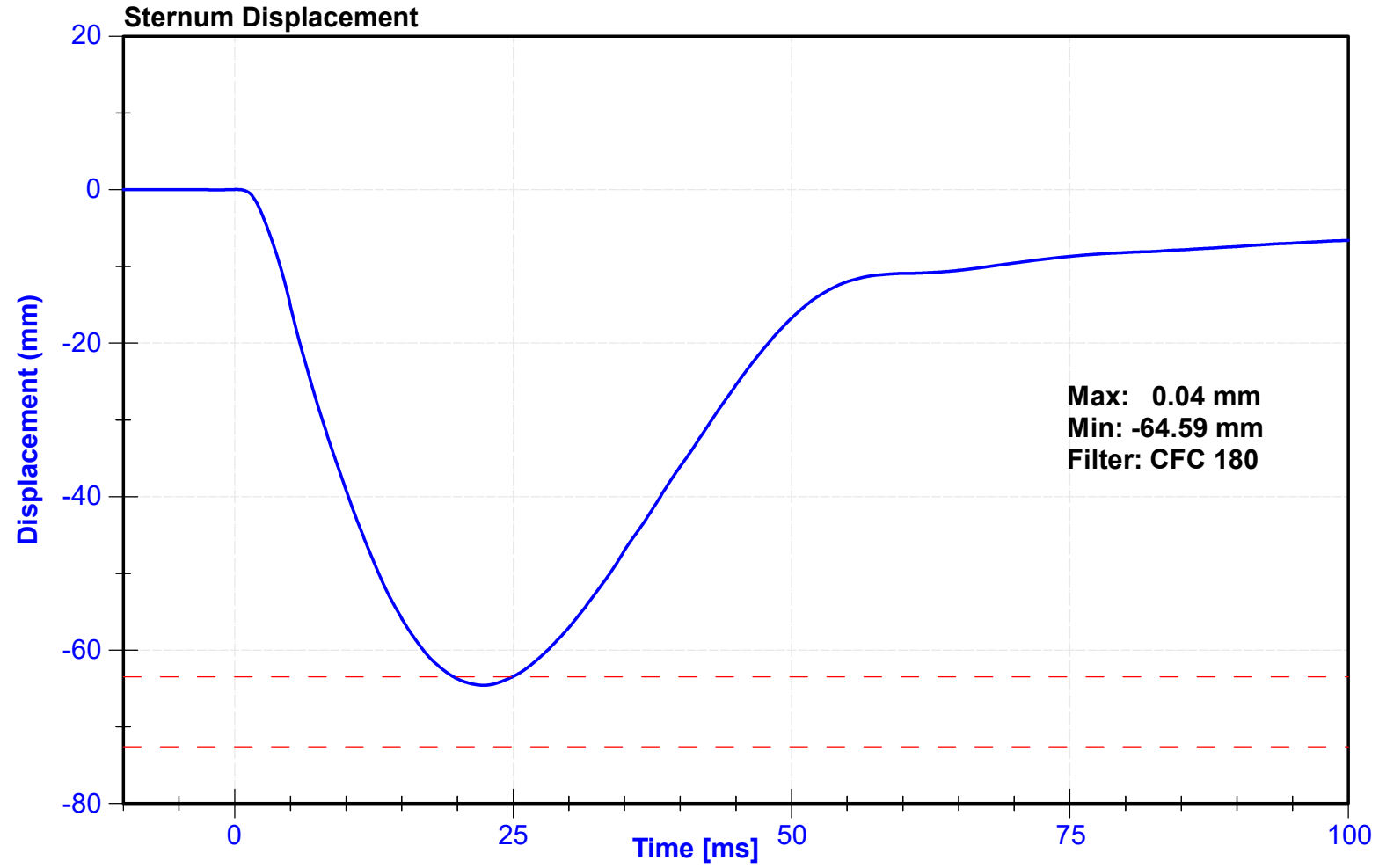
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21,4	Pass
Humidity	10	70	%	36	Pass
Velocity	6.59	6.83	m/s	6.661	Pass
Chest Displacement	-72.6	-63.5	mm	-64.59	Pass
Resistive Force	5160	5894	N	5802.2	Pass
Hysteresis	69	85	%	72.3	Pass

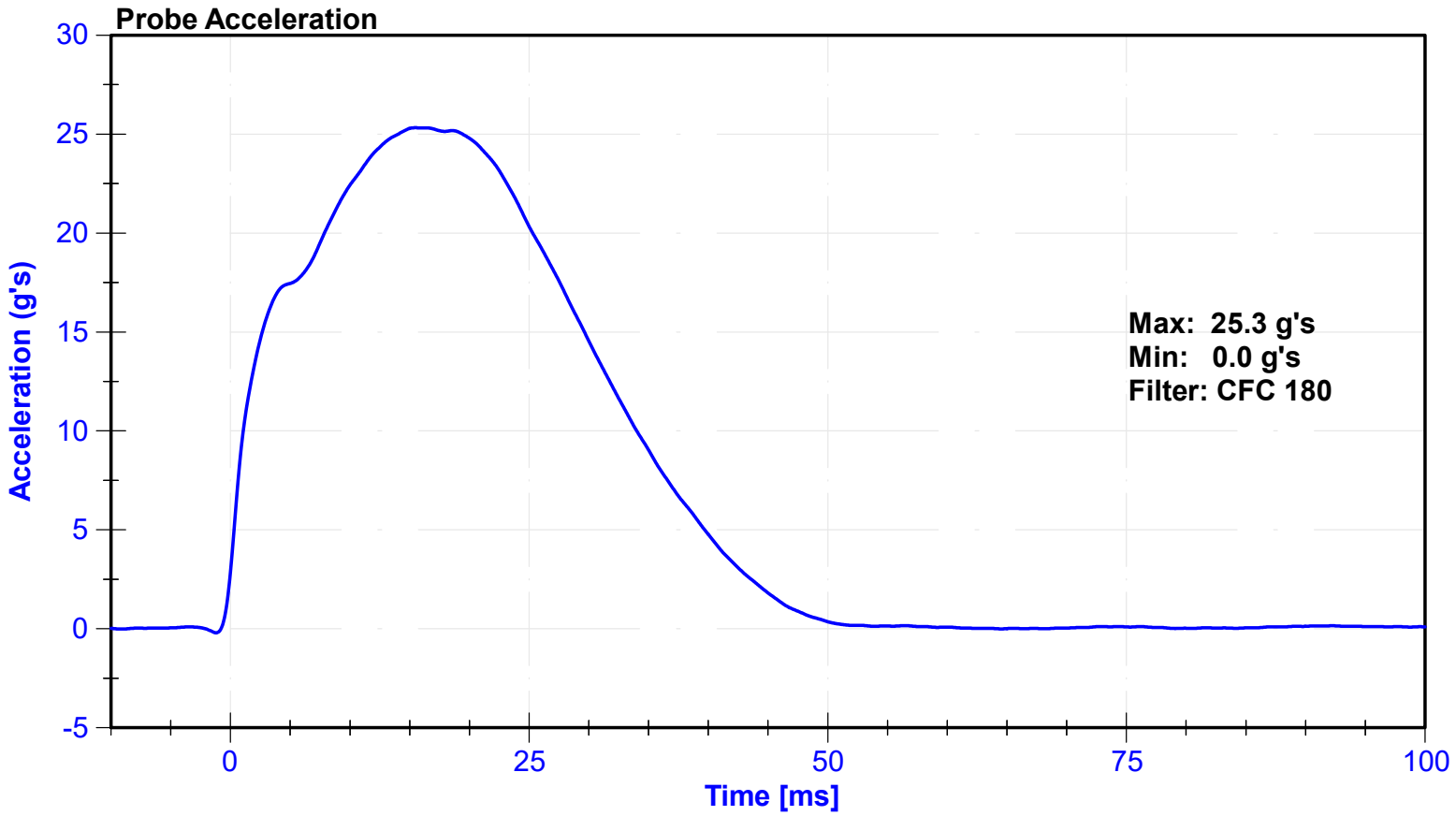
Transducer Calibrations

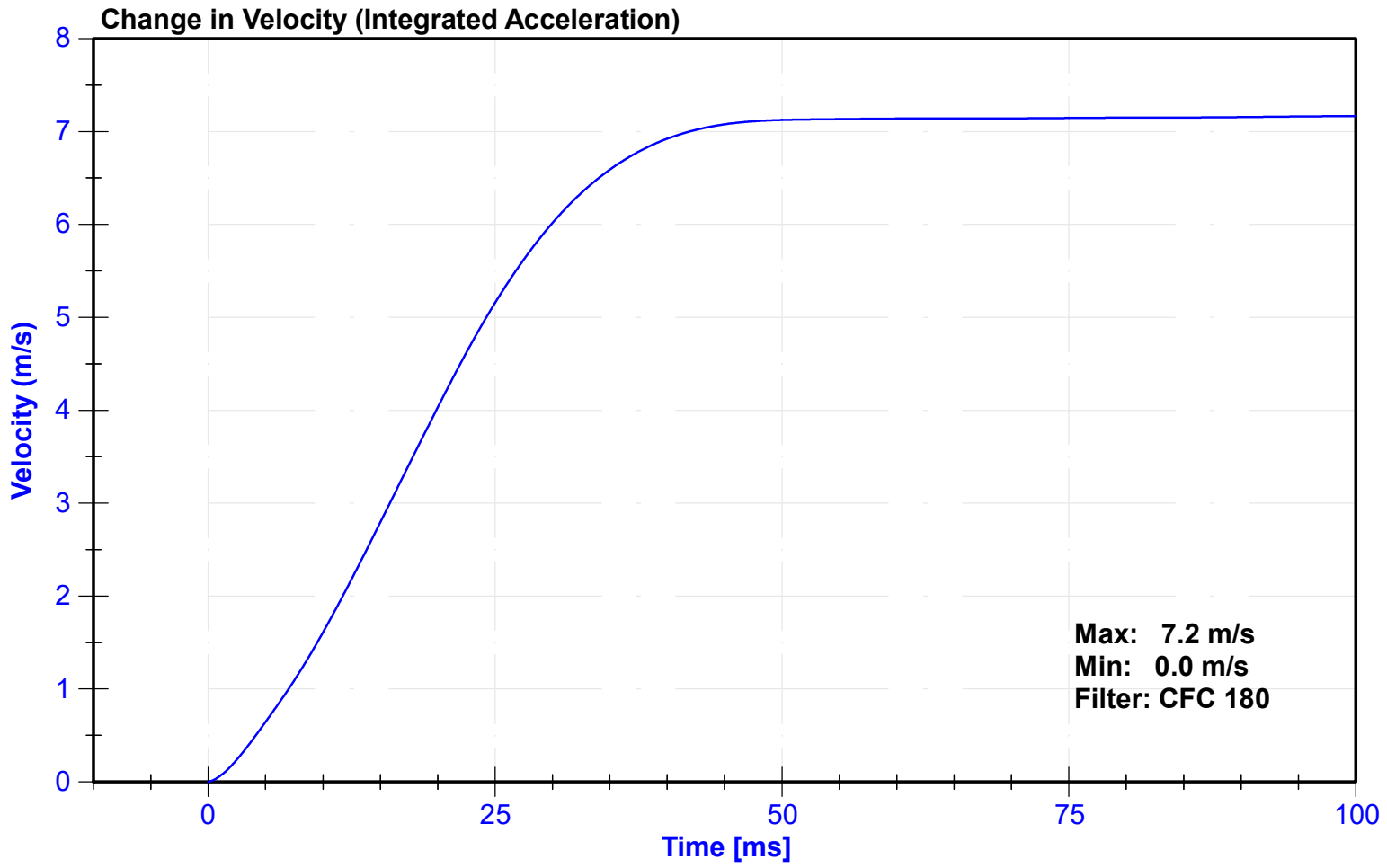
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Chest Potentiometer	Servo	1046	4/30/2024	10/29/2024




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
25
50
75
100
Time [ms]
Max: 5802.2 N
Min: -1.1 N
Filter: CFC 180


Sternum Displacement
Displacement (mm)
20
0
-20
-40
-60
-80
0
25
50
75
100
Time [ms]
Max: 0.04 mm
Min: -64.59 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
30
25
20
15
10
5
0
-5
0
25
50
75
100
Time [ms]
Max: 25.3 g's
Min: 0.0 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
25
50
75
100
Time [ms]
Max: 7.2 m/s
Min: 0.0 m/s
Filter: CFC 180

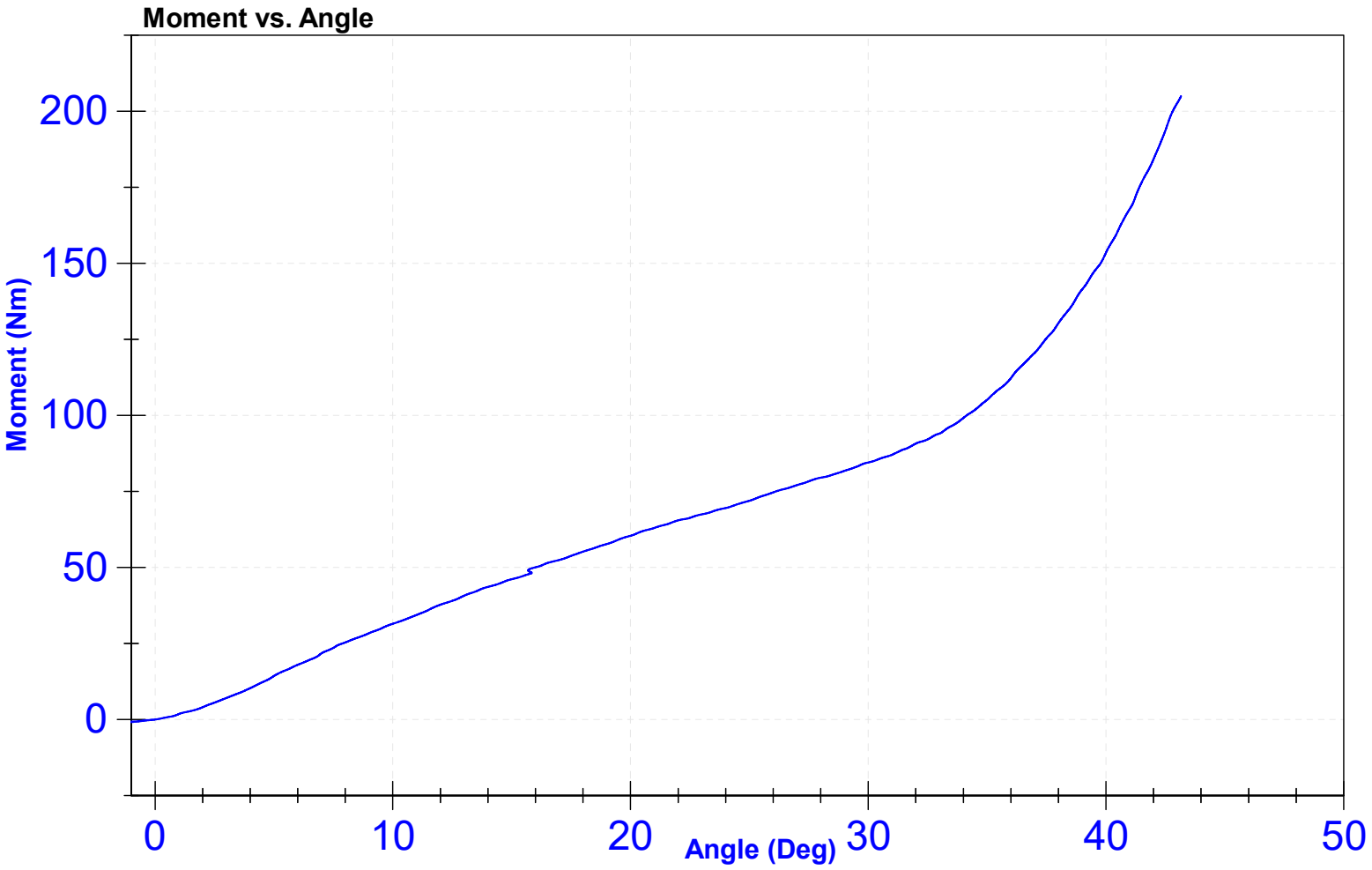
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.0	Pass
Humidity	10	70	%	45	Pass
Average Velocity	5	10	deg/s	7.1	Pass
Angle at 203Nm	40	50	deg	43.0	Pass
Moment at 30 degrees	0	94.9	Nm	84.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	10/6/2023	10/5/2024
Load Cell	PCB 2301-02	2301-02_115	2023-10-30	2024-10-29



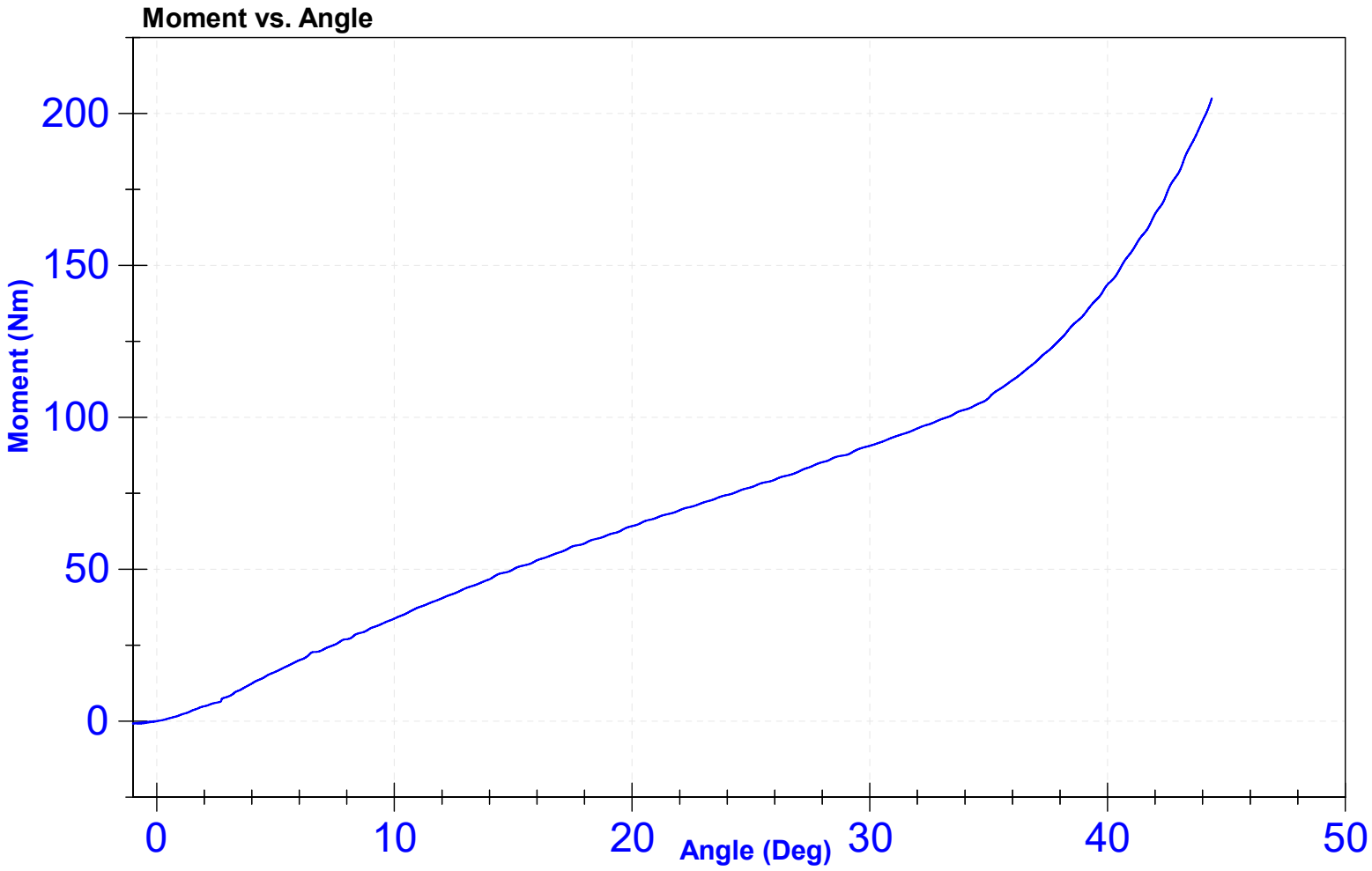
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.0	Pass
Humidity	10	70	%	45	Pass
Average Velocity	5	10	deg/s	6.9	Pass
Angle at 203Nm	40	50	deg	44.3	Pass
Moment at 30 degrees	0	94.9	Nm	90.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	10/6/2023	10/5/2024
Load Cell	PCB 2301-02	2301-02_115	2023-10-30	2024-10-29



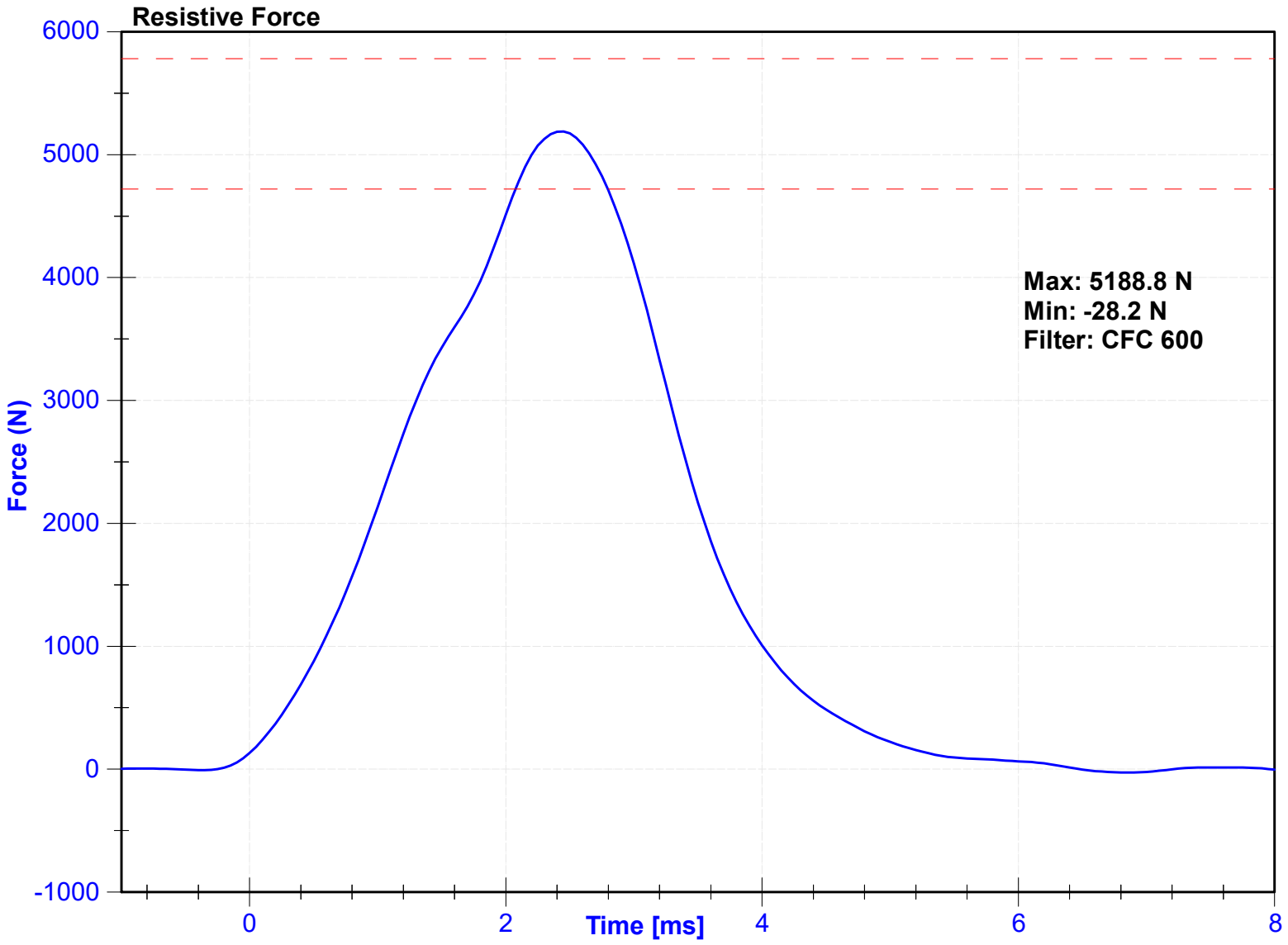
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

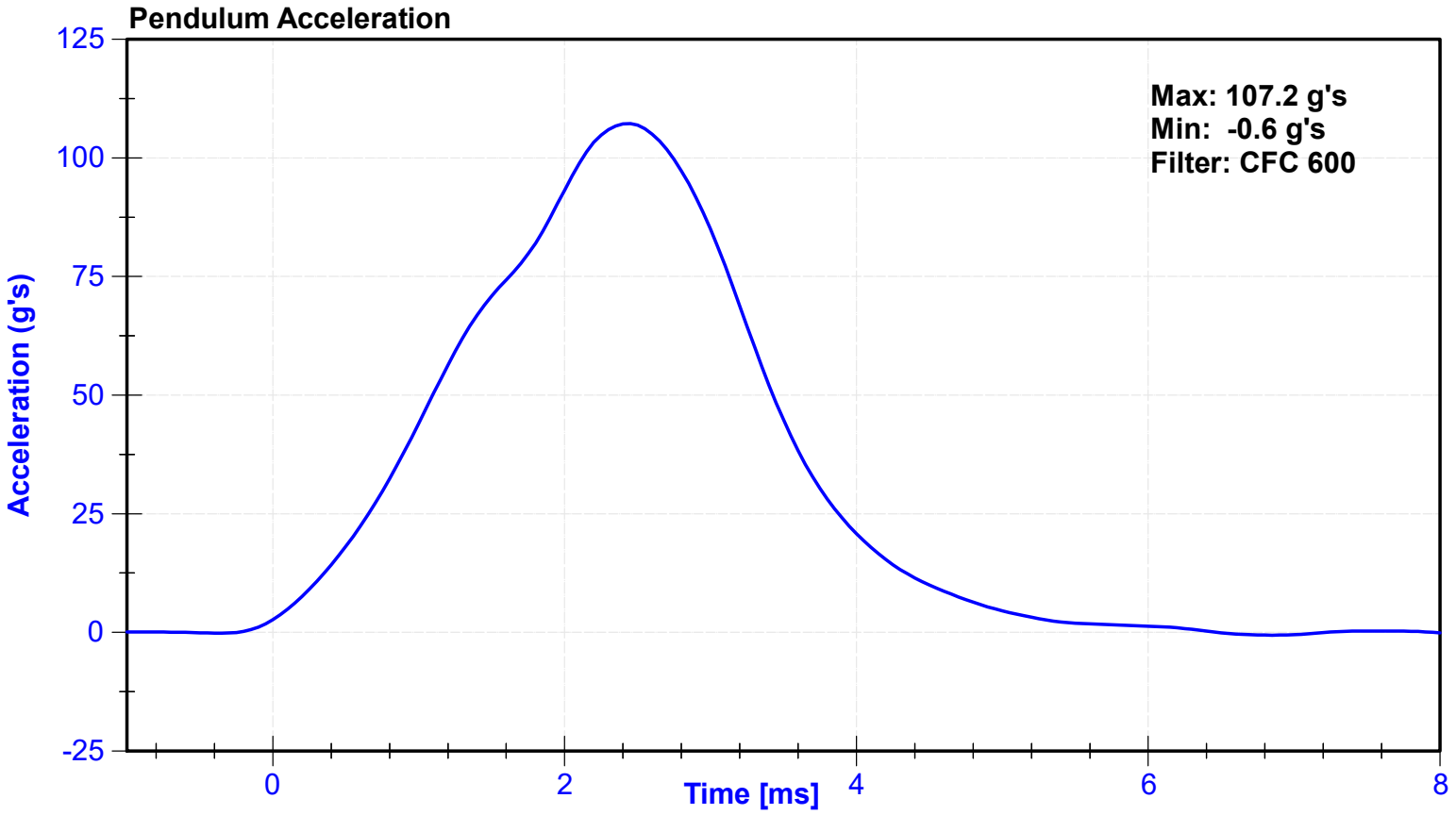
Results

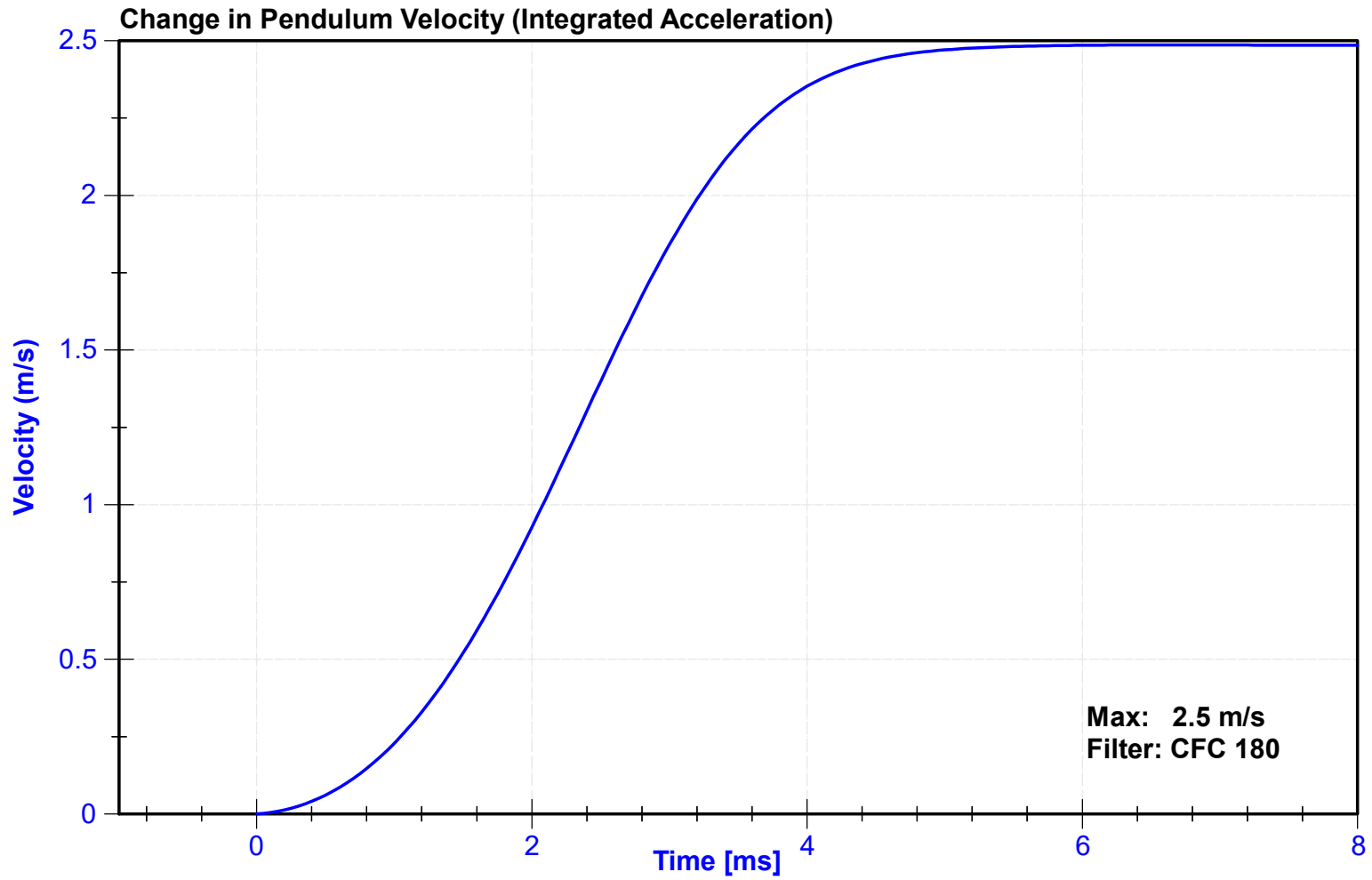
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.2	Pass
Humidity	10	70	%	47	Pass
Velocity	2.07	2.13	m/s	2.112	Pass
Maximum Resistive Force	4720	5780	N	5188.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	3/29/2024	9/25/2024




Pendulum Acceleration
Max: 107.2 g's
Min: -0.6 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Max: 2.5 m/s
Filter: CFC 180
Velocity (m/s)
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

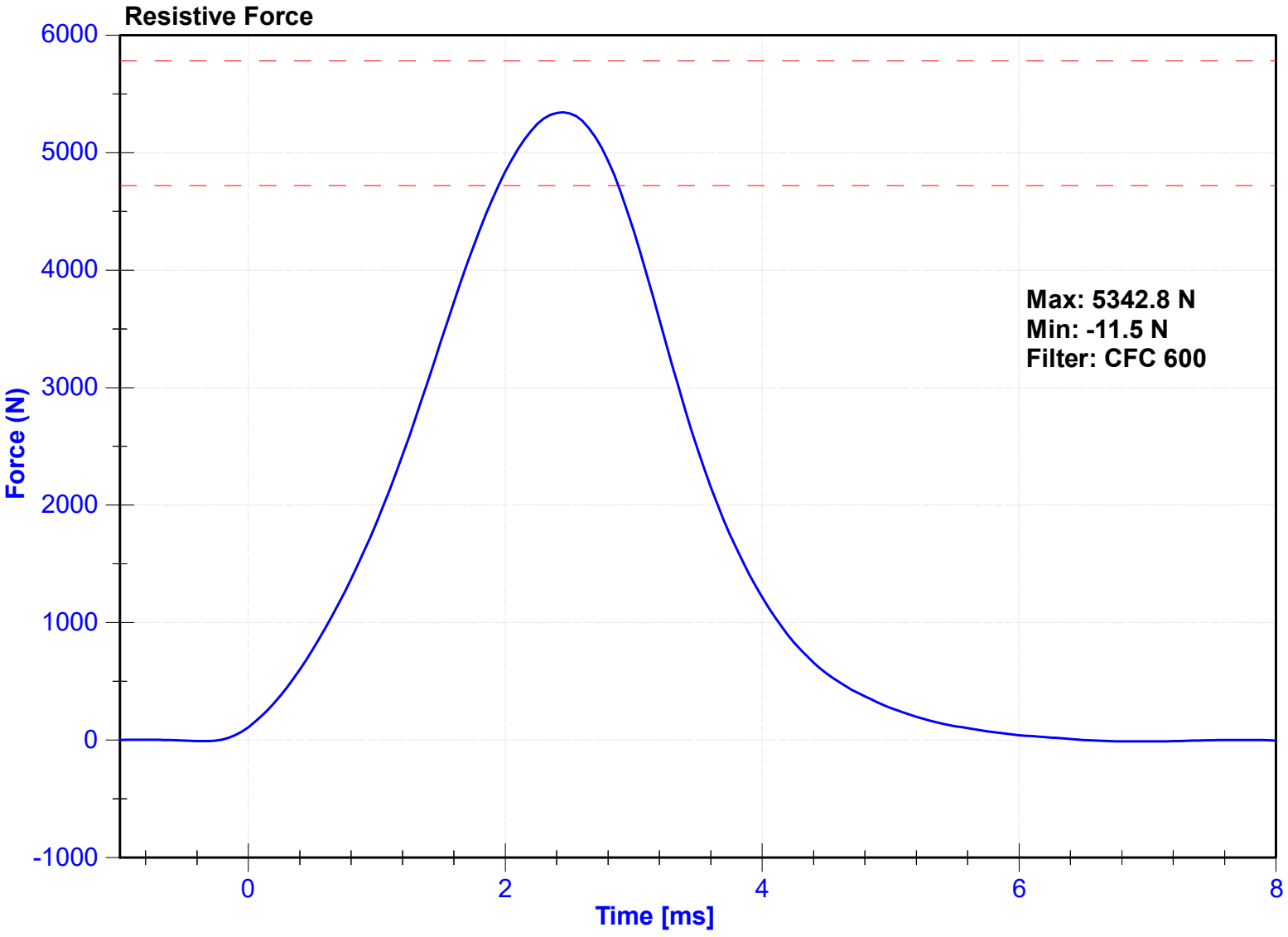
ATD Manufacturer	Humanetics	Test Technician	J. Kinderman
ATD Serial Number	065	Laboratory Supervisor	C. Mantell

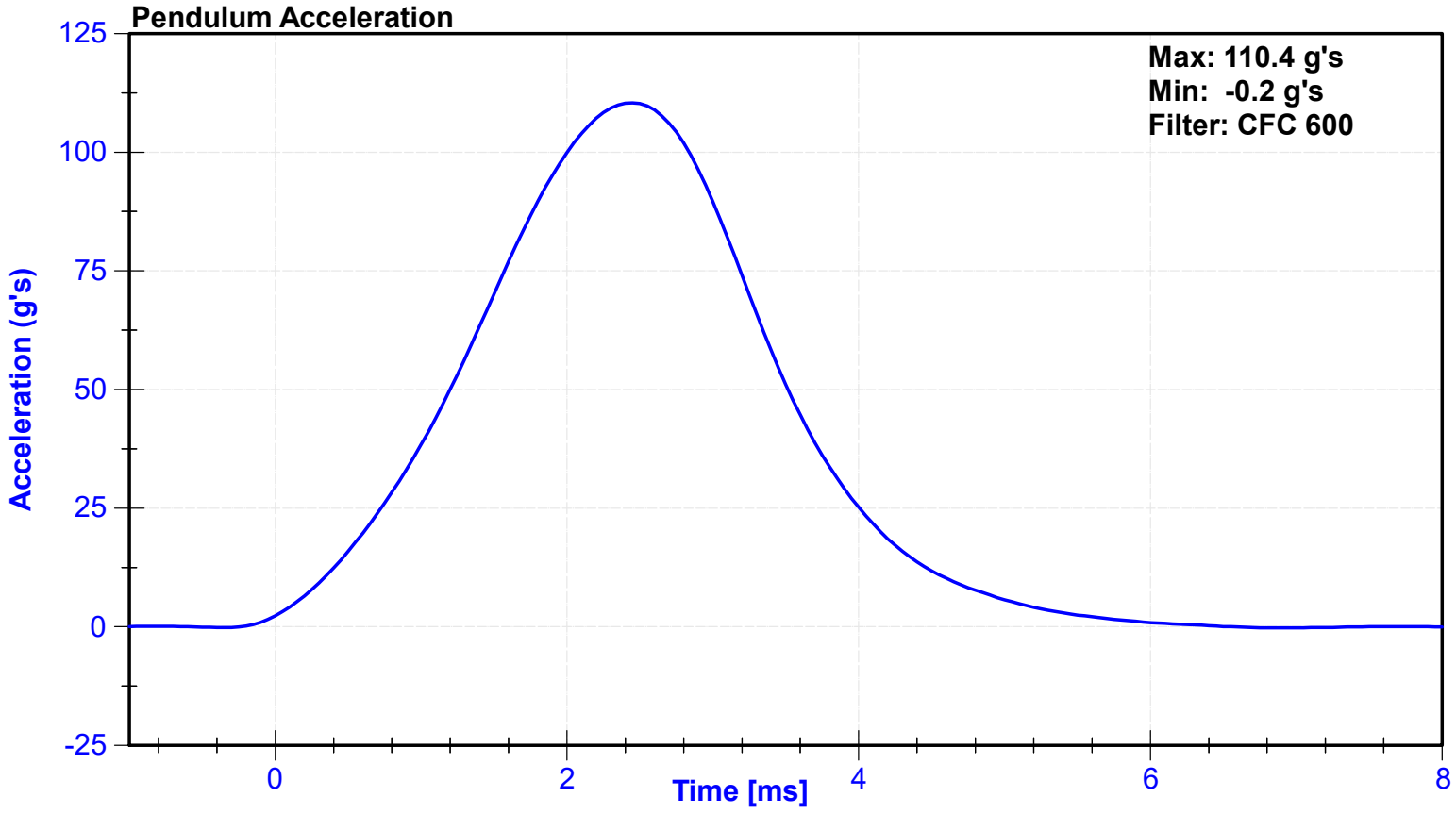
Results

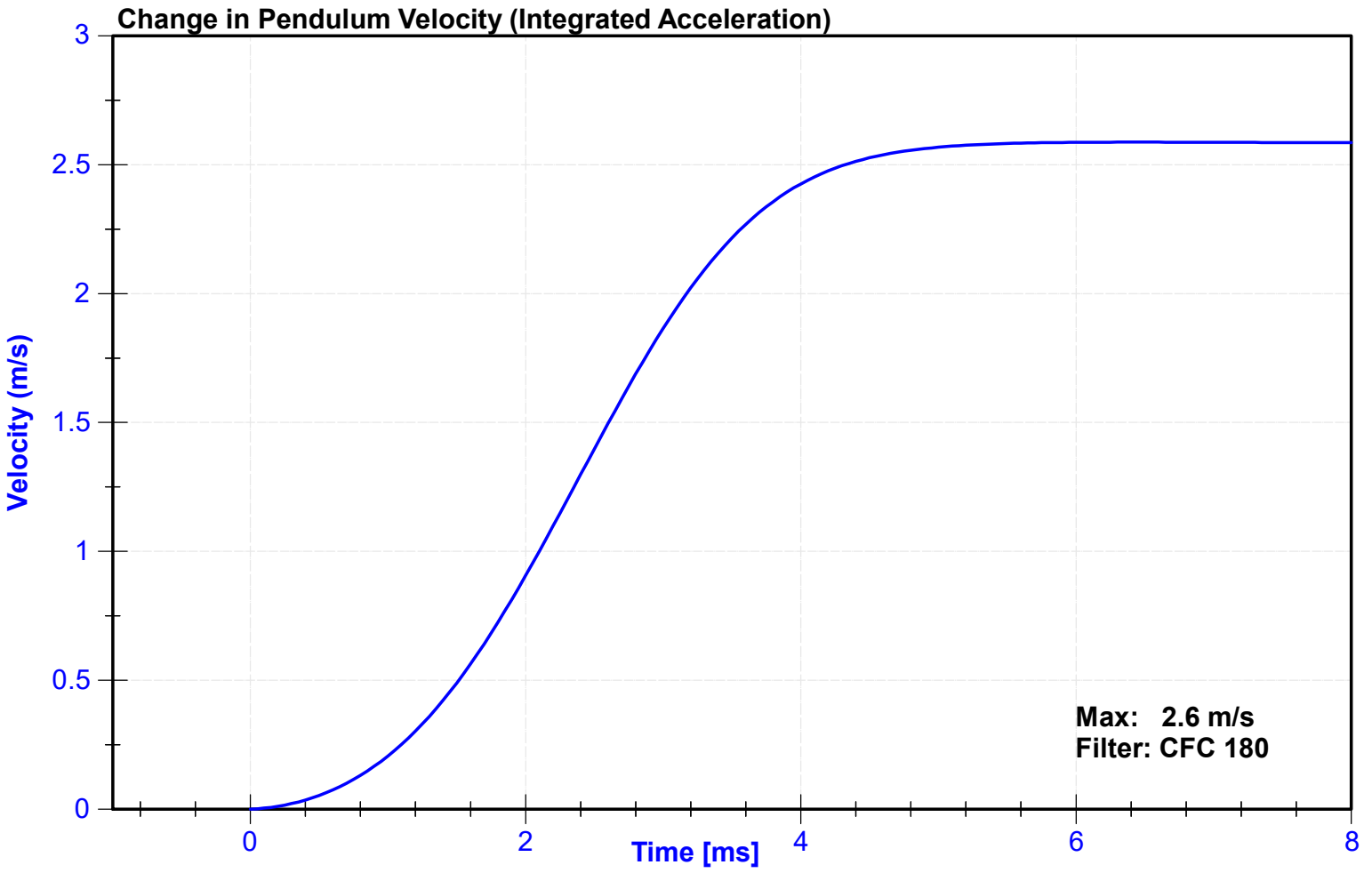
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.2	Pass
Humidity	10	70	%	47	Pass
Velocity	2.07	2.13	m/s	2.113	Pass
Maximum Resistive Force	4720	5780	N	5342.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	3/29/2024	9/25/2024




Pendulum Acceleration
Max: 110.4 g's
Min: -0.2 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Max: 2.6 m/s
Filter: CFC 180
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

CALIBRATION TEST RESULTS

POST-TEST

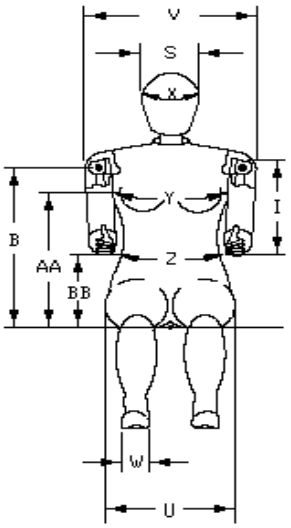
HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

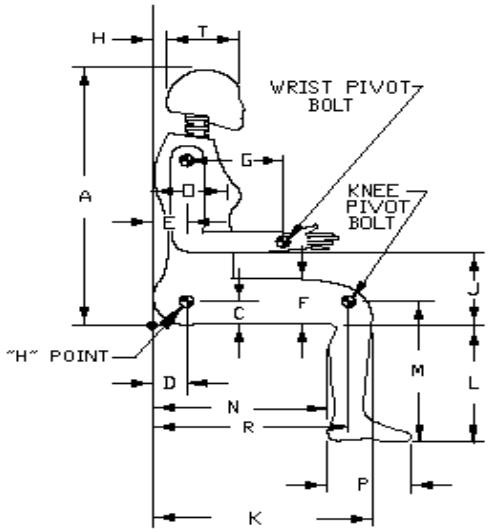
SERIAL NO: 137

External Measurements - Hybrid 3 - 5th Female

Technician: K. Brogan Date: 05/17/2024

Dummy Serial Number: 137





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	785	Pass
B	Shoulder Pivot Height	432	457	445	Pass
C	H-Point Height	81	86	84	Pass
D	H-Point from Backline	145	150	148	Pass
E	Shoulder Pivot from Backline	69	84	78	Pass
F	Thigh Clearance	119	135	129	Pass
G	Back of Elbow to Wrist Pivot	244	259	252	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	287	Pass
J	Elbow Rest Height	183	203	199	Pass
K	Buttock to Knee Length	521	546	535	Pass
L	Popliteal Height	356	376	369	Pass
M	Knee Pivot Height	394	419	409	Pass
N	Buttock Popliteal Length	414	439	429	Pass
O	Chest Depth without Jacket	175	191	185	Pass
P	Foot Length (right)	219	234	230	Pass
R	Buttock To Knee Pivot Length	457	483	466	Pass
S	Head Breadth	137	147	142	Pass
T	Head Depth	178	188	182	Pass
U	Hip Breadth	300	315	311	Pass
V	Shoulder Breadth	351	366	360	Pass
W	Foot Breadth	79	94	86	Pass
X	Head Circumference	528	549	538	Pass
Y	Chest Circumference with Jacket	851	881	872	Pass
Z	Waist Circumference	460	790	651	Pass
AA	Reference Location (Chest Circumference)	333	358	346	Pass
BB	Reference Location (Waist Circumference)	160	170	167	Pass

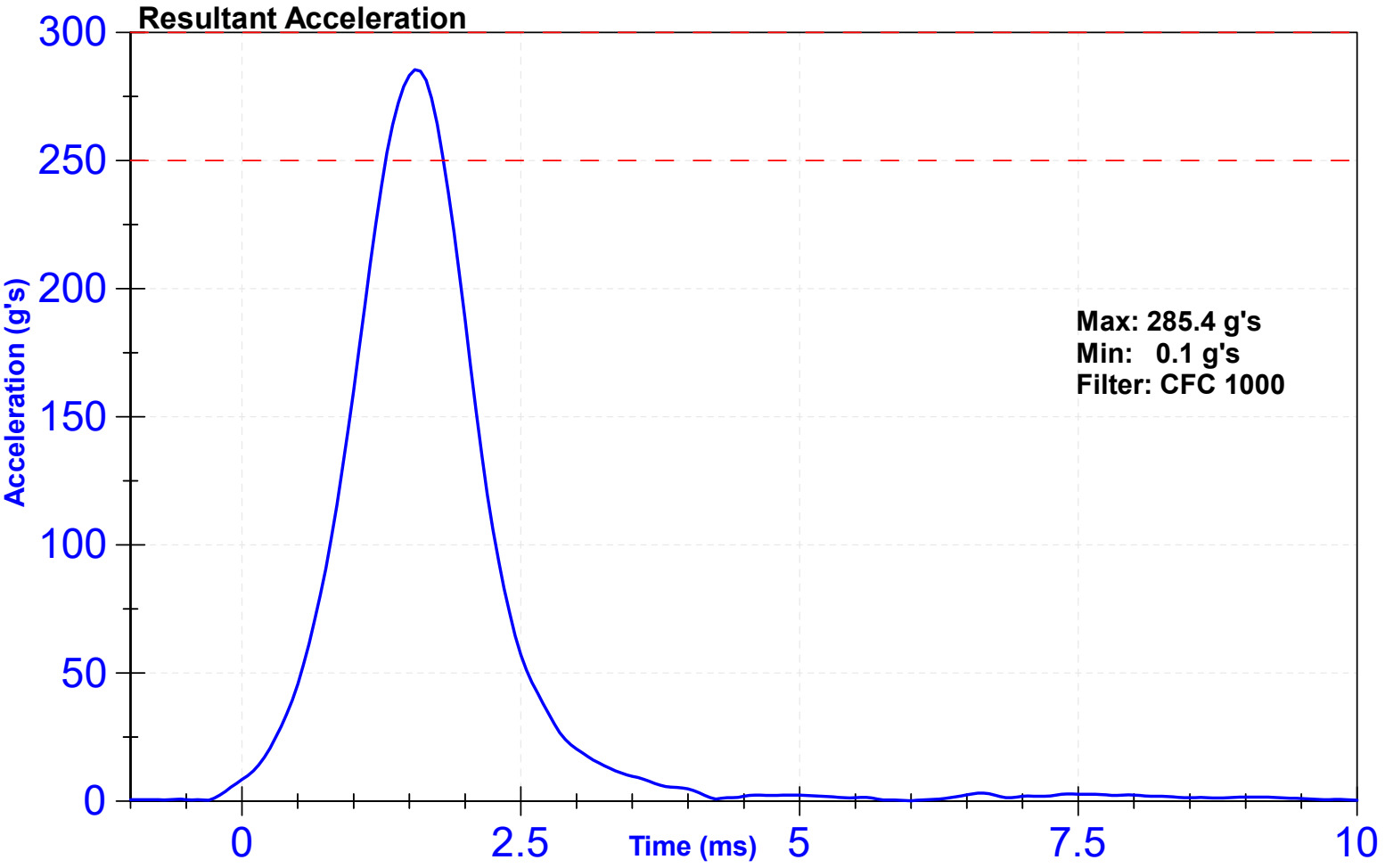
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

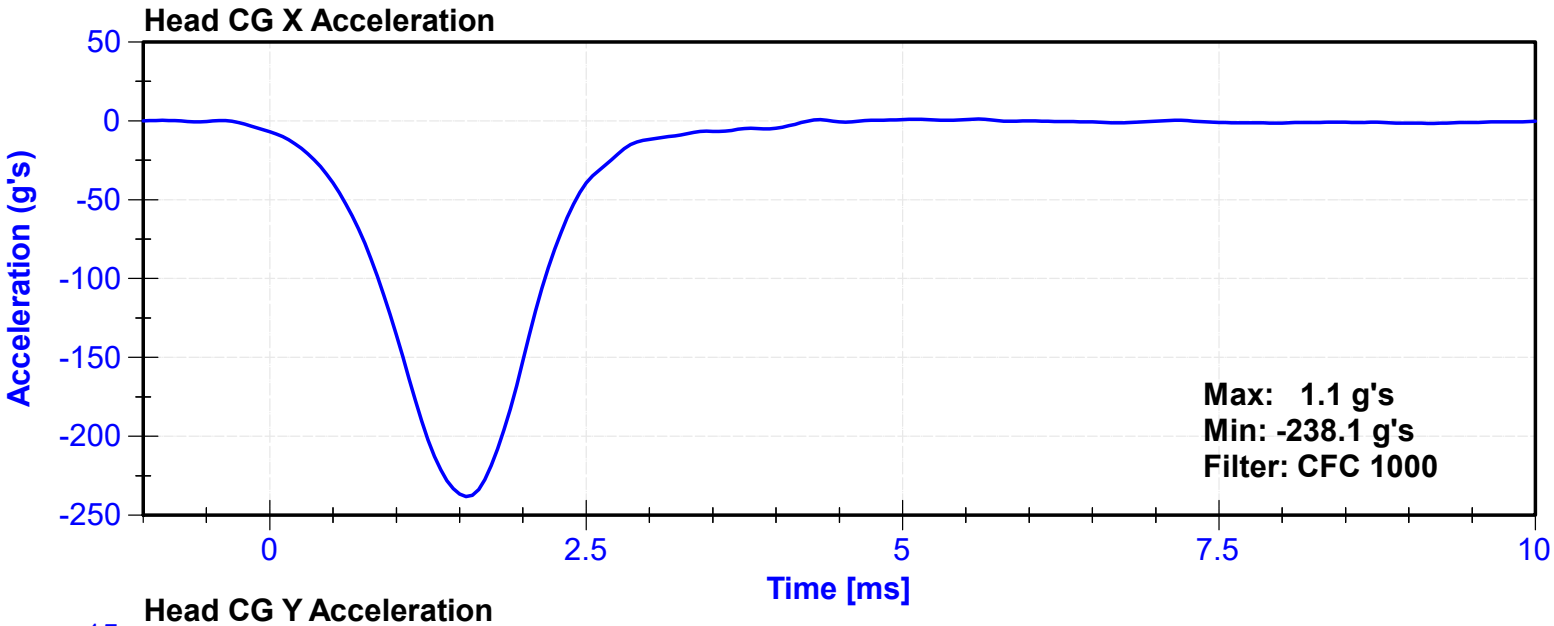
Results

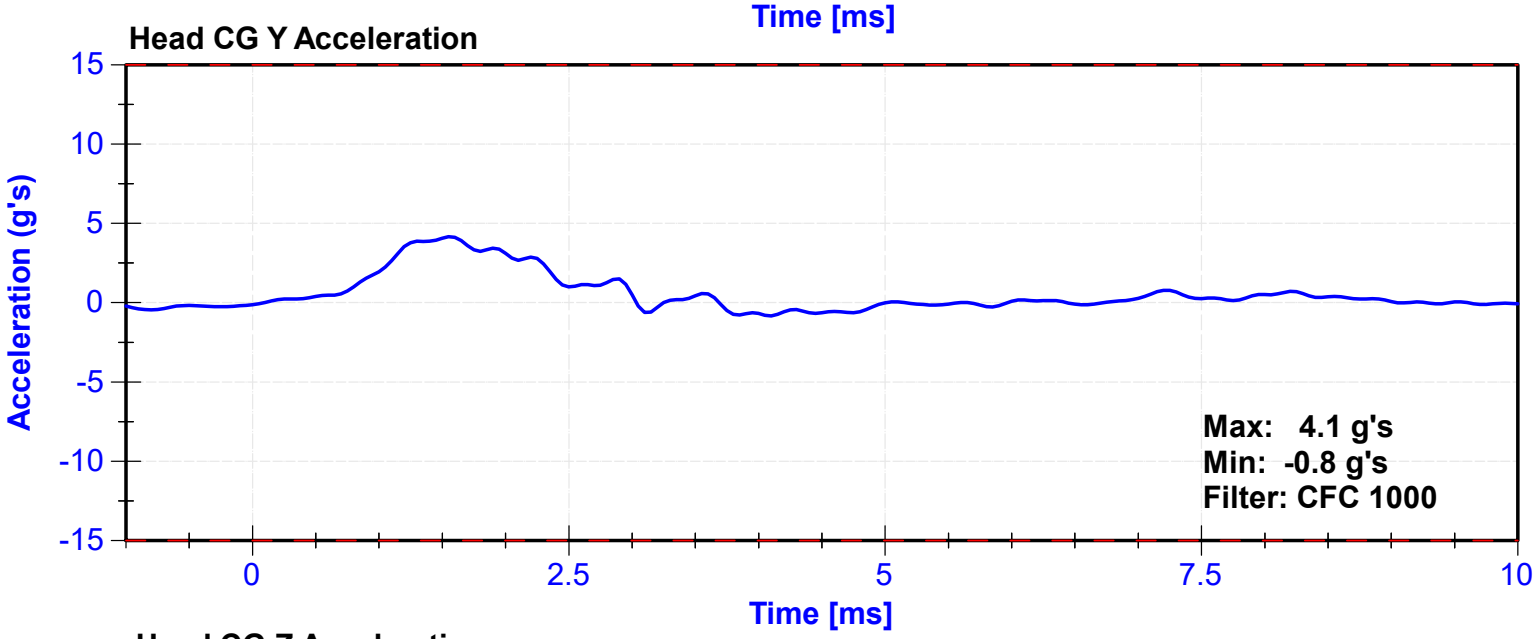
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	22.0	Pass
Humidity	10	70	%	45	Pass
Resultant Acceleration	250	300	g's	285.4	Pass
Oscillation	0	10	%	1.1	Pass
Lateral Acceleration	-15	15	g's	4.1	Pass

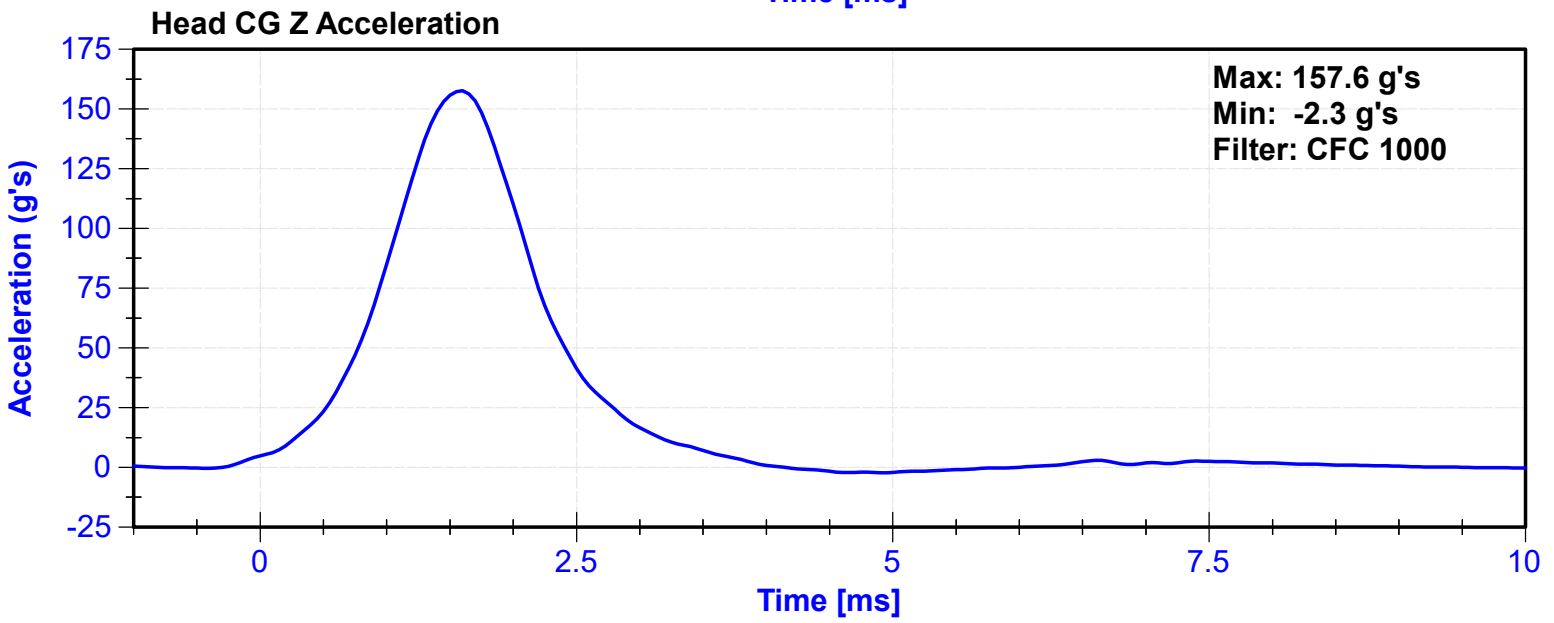
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P79417	1/4/2024	7/2/2024
Y Accelerometer	Endevco	P83335	1/4/2024	7/2/2024
Z Accelerometer	Endevco	P64149	1/4/2024	7/2/2024




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 1.1 g's
Min: -238.1 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 4.1 g's
Min: -0.8 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
175
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 157.6 g's
Min: -2.3 g's
Filter: CFC 1000

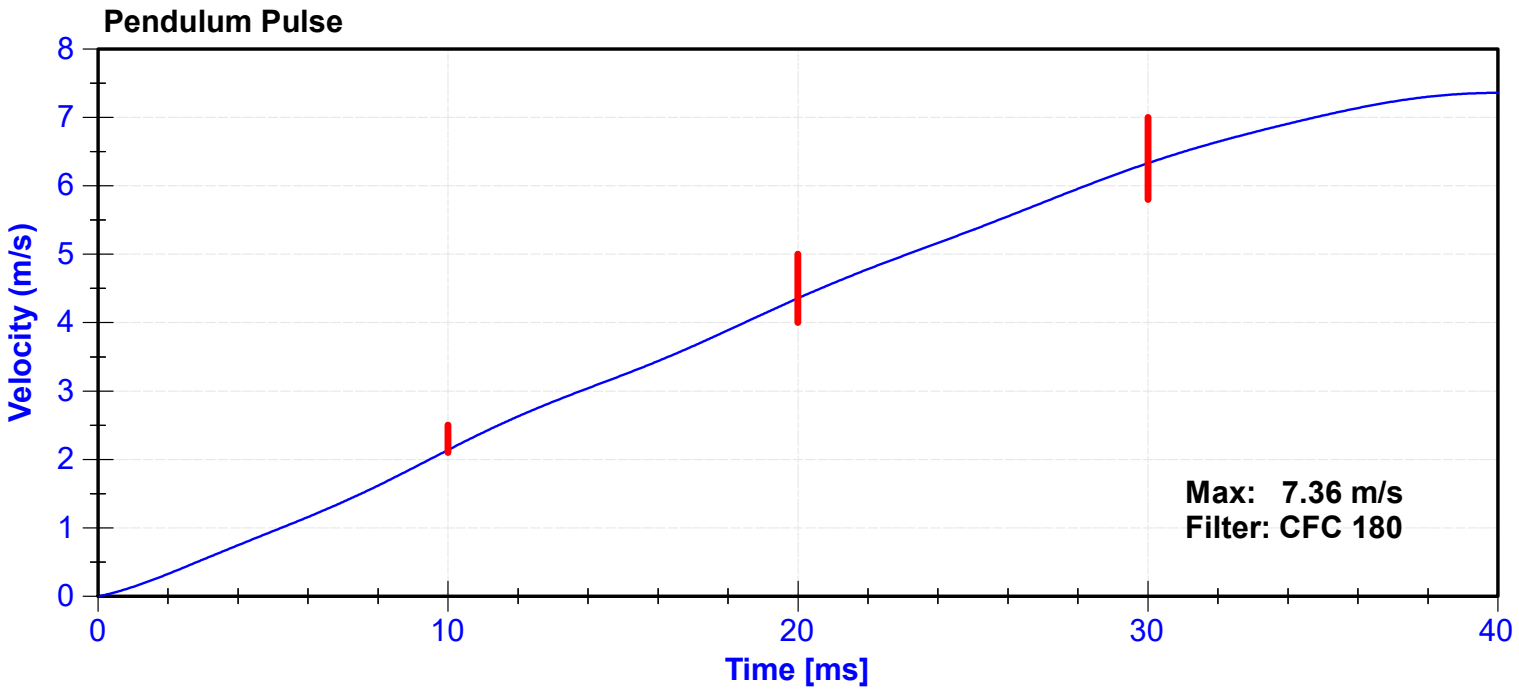
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

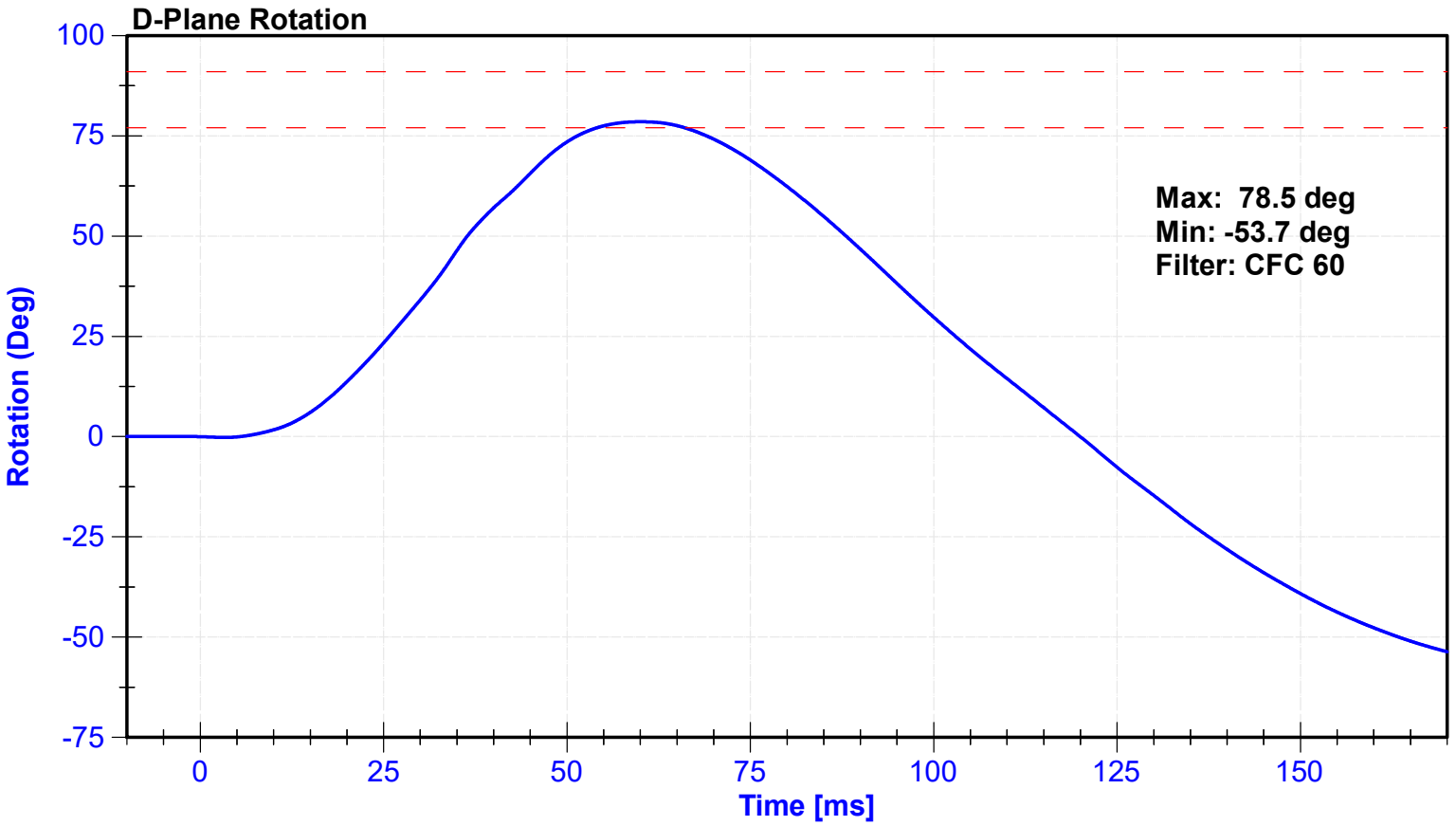
Results

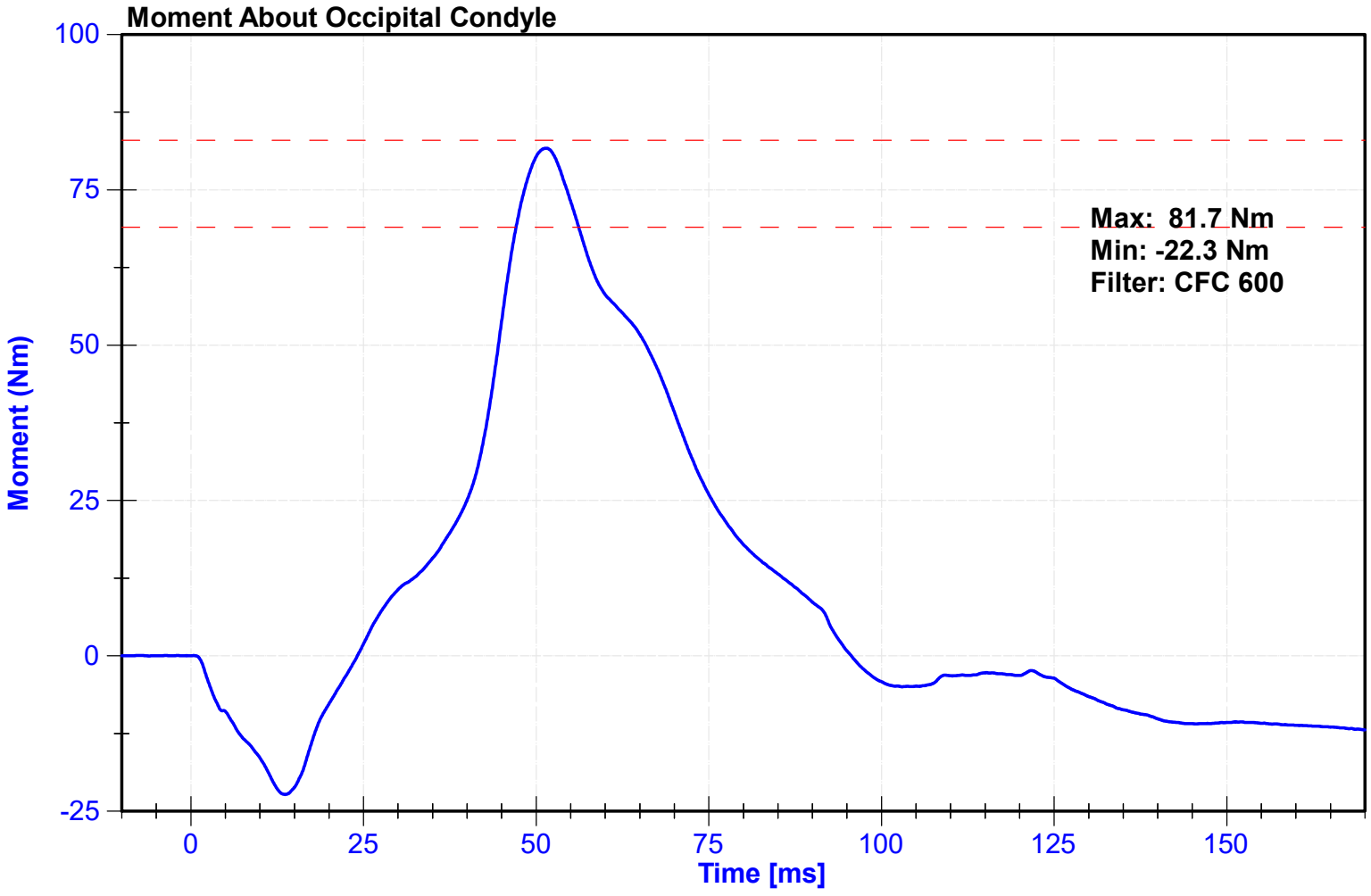
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	43	Pass
Velocity	6.89	7.13	m/s	7.026	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.14	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.36	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.33	Pass
Max D Plane Rotation	77	91	deg	78.5	Pass
Max Moment During Rotation Interval	69	83	Nm	81.7	Pass
Moment Decay to 10.0 Nm	80	100	ms	88.6	Pass

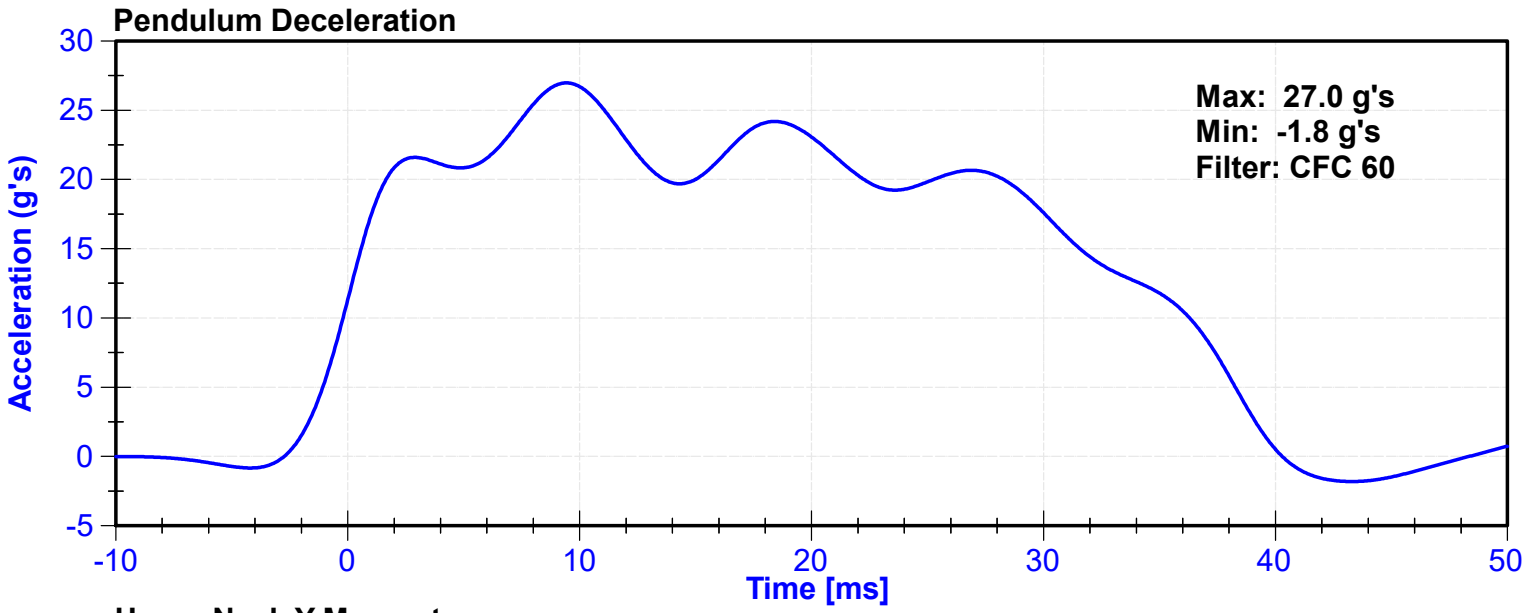
Transducer Calibrations

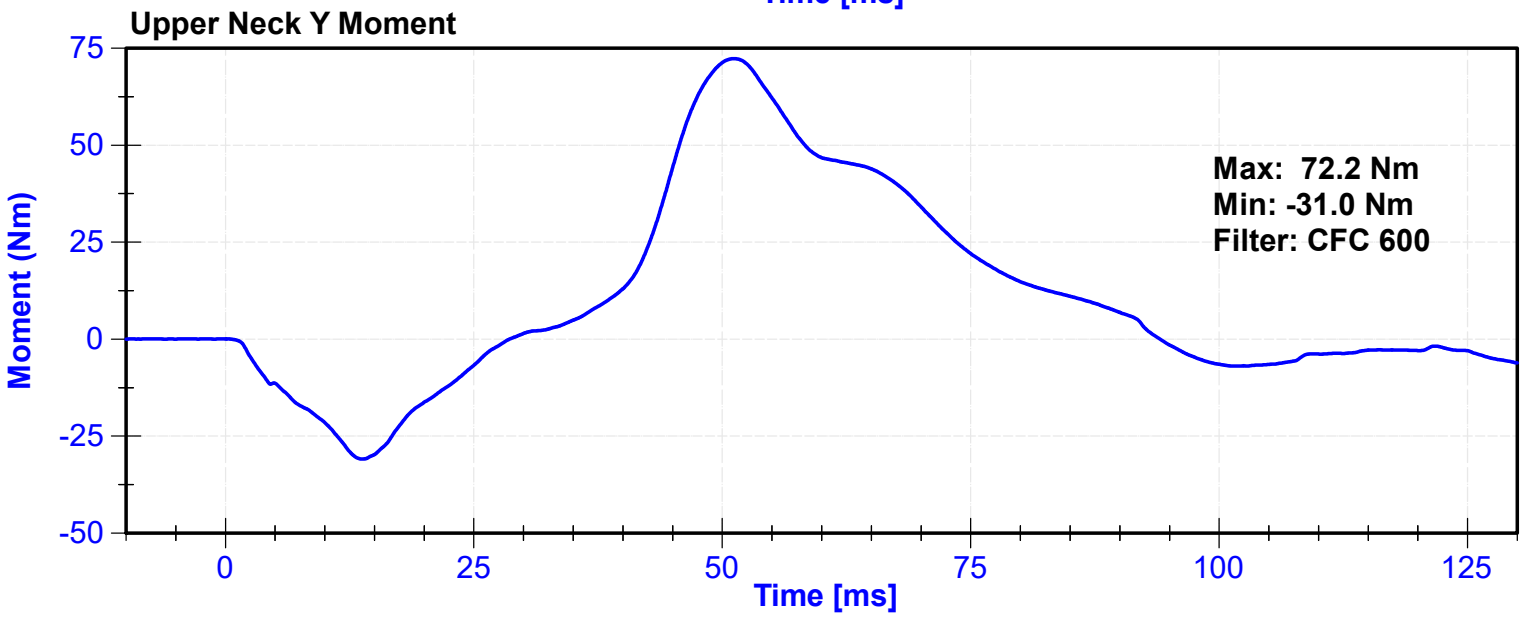
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	10/31/2023	10/30/2024
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Humanetics	2019-FX	9/12/2023	9/11/2024

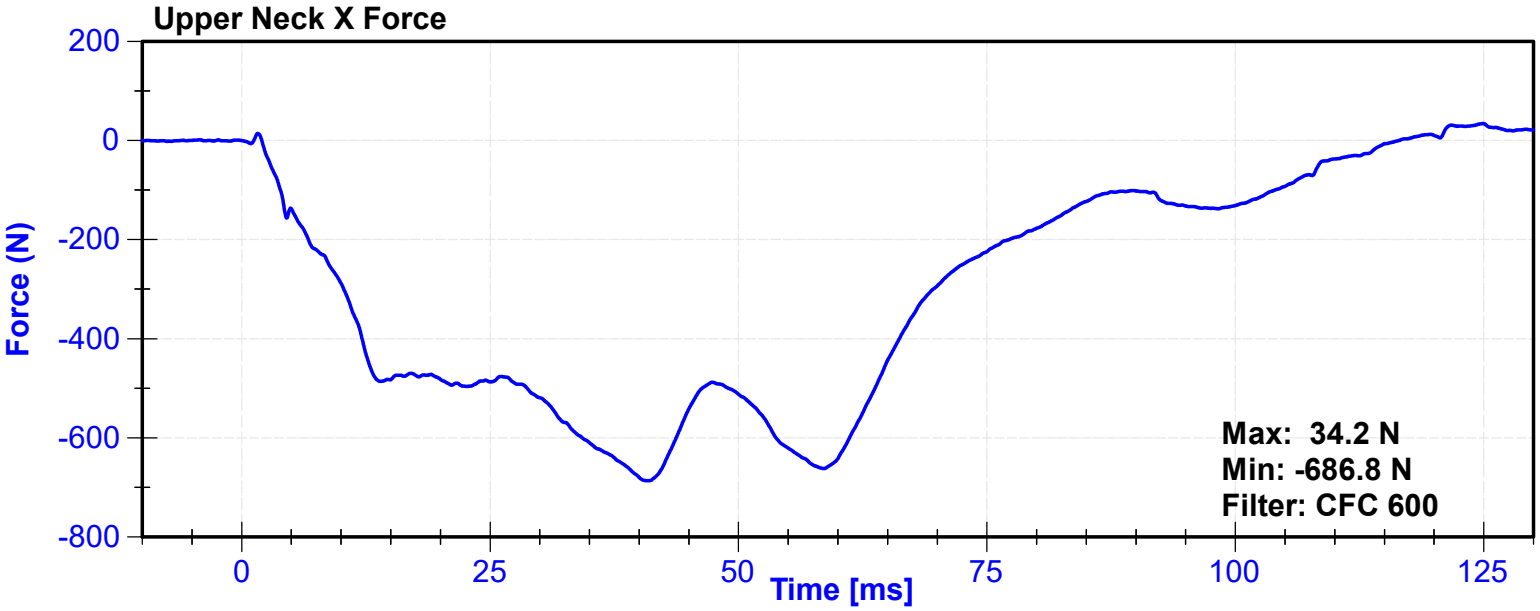



D-Plane Rotation
Max: 78.5 deg
Min: -53.7 deg
Filter: CFC 60
Rotation (Deg)
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 81.7 Nm
Min: -22.3 Nm
Filter: CFC 600
Moment (Nm)
100
75
50
25
0
-25
0
25
50
75
100
125
150
Time [ms]


Pendulum Deceleration
Acceleration (g's)
Time [ms]
Max: 27.0 g's
Min: -1.8 g's
Filter: CFC 60


Upper Neck Y Moment
Moment (Nm)
Time [ms]
Max: 72.2 Nm
Min: -31.0 Nm
Filter: CFC 600


Upper Neck X Force
Force (N)
Time [ms]
Max: 34.2 N
Min: -686.8 N
Filter: CFC 600

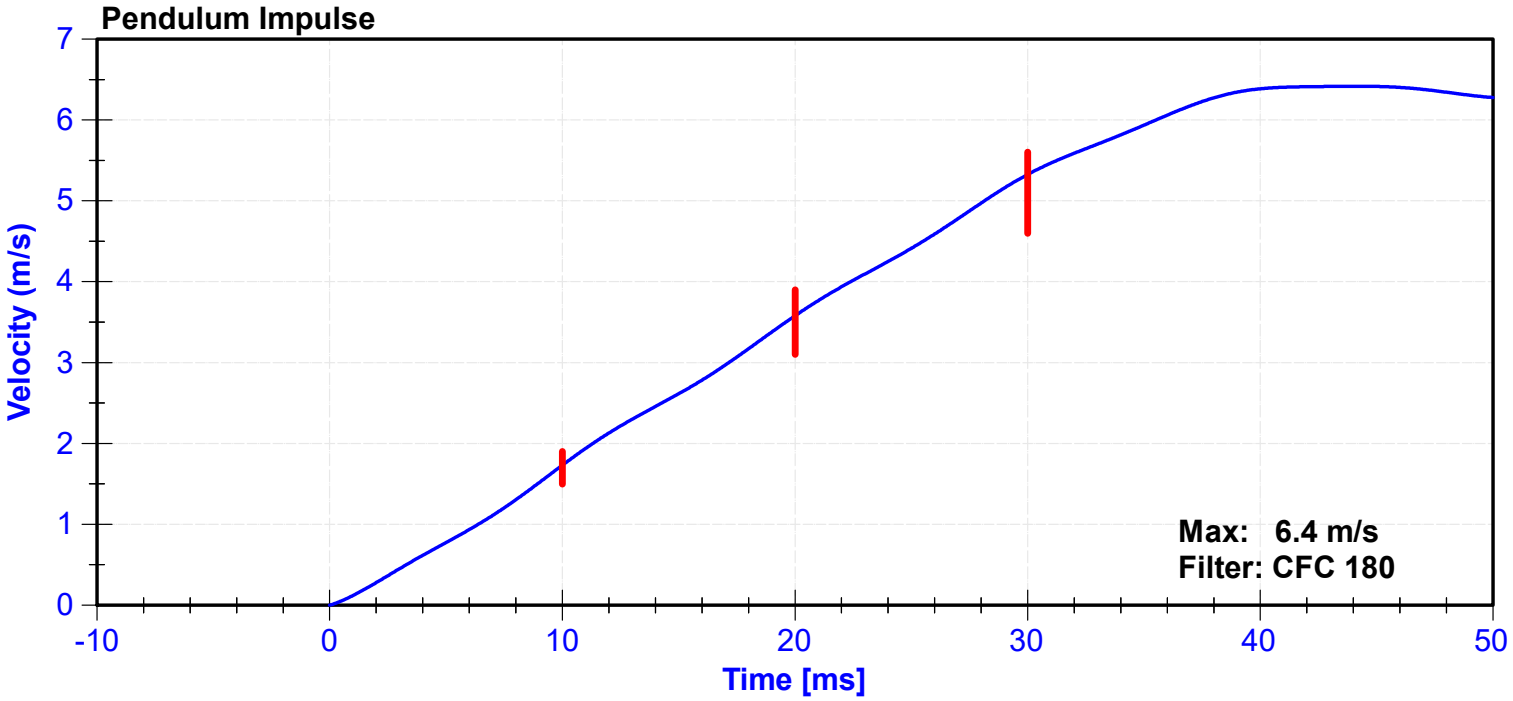
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

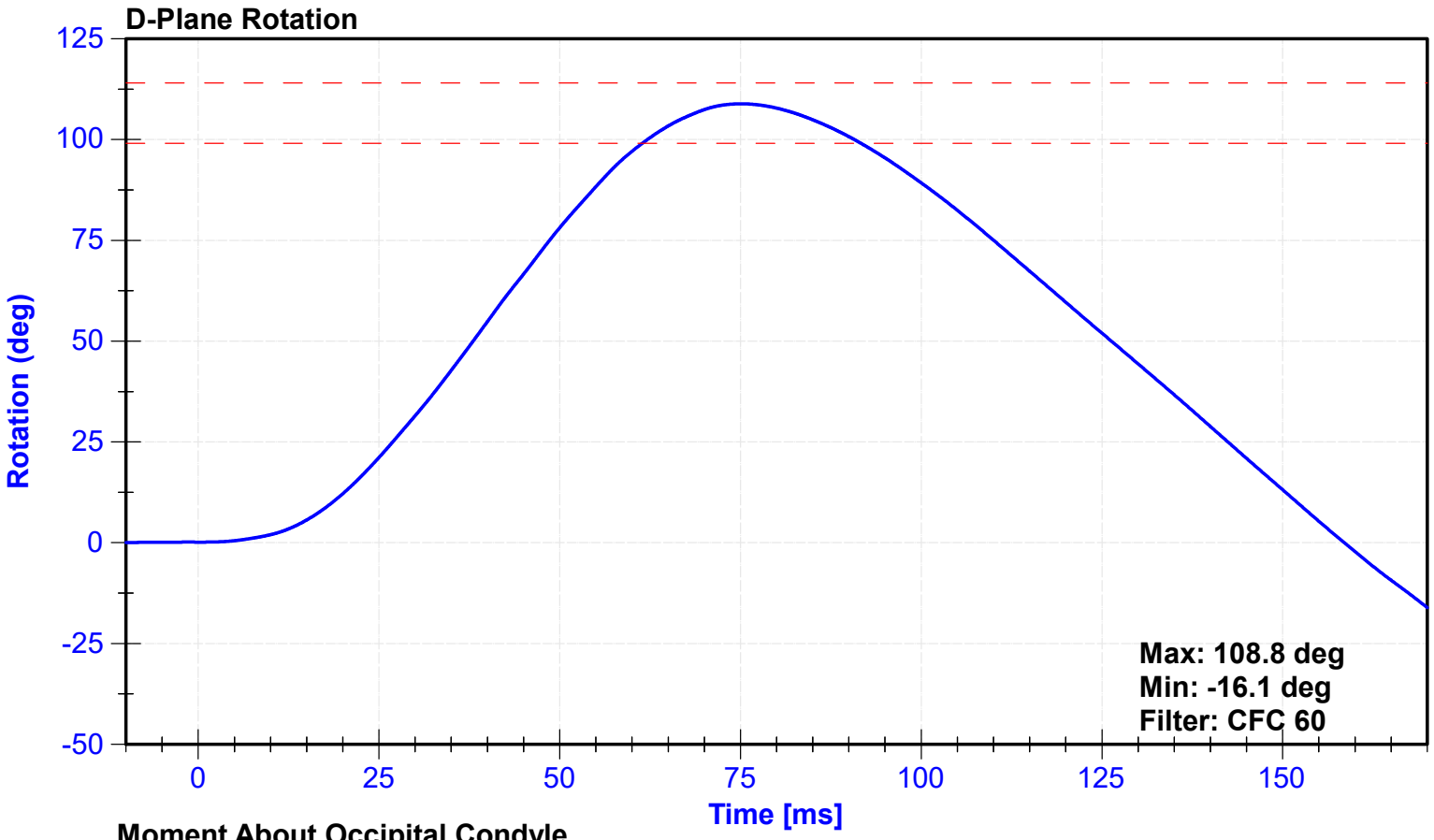
Results

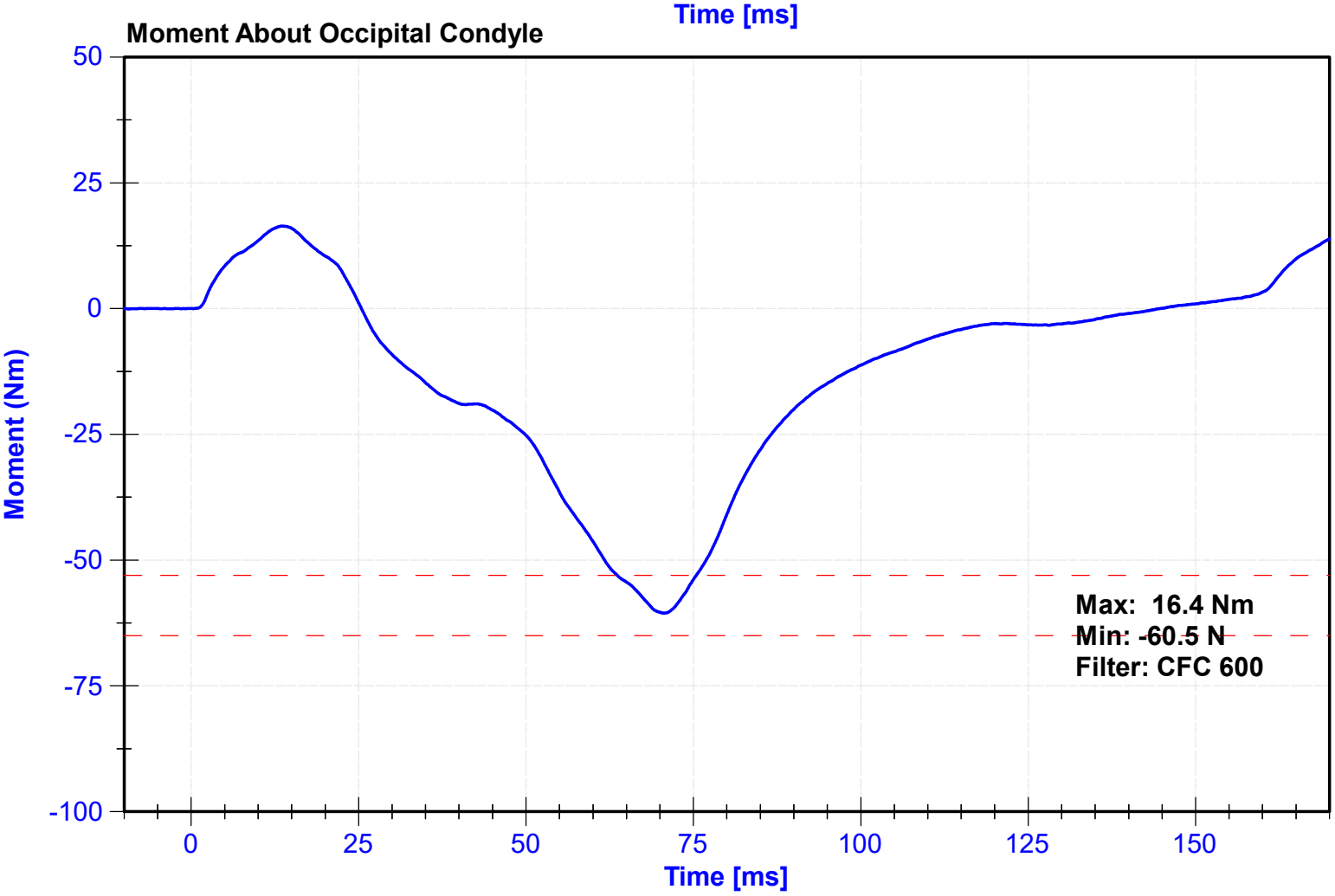
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	43	Pass
Velocity	5.95	6.19	m/s	6.141	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.73	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.58	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.33	Pass
D Plane Rotation	99	114	deg	108.8	Pass
Moment During Rotation Interval	-65	-53	Nm	-60.5	Pass
Moment Decay to -10Nm	94	114	ms	102.1	Pass

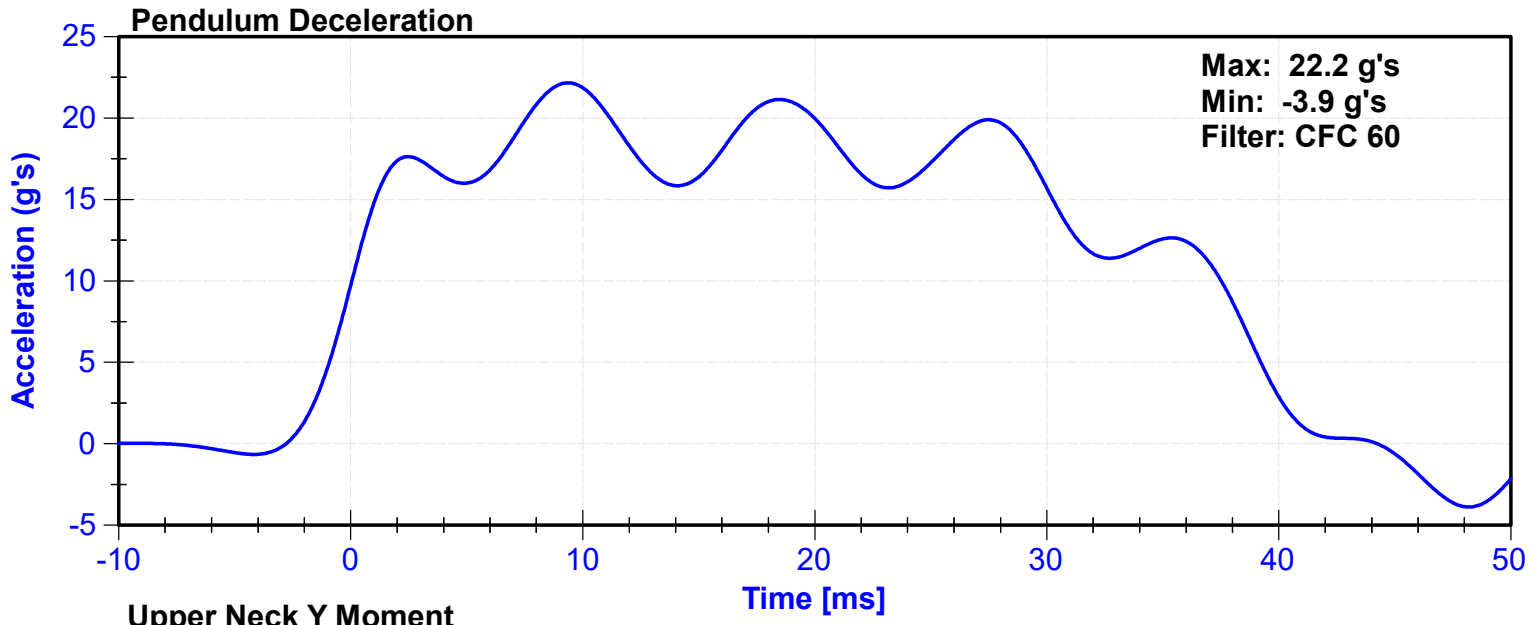
Transducer Calibrations

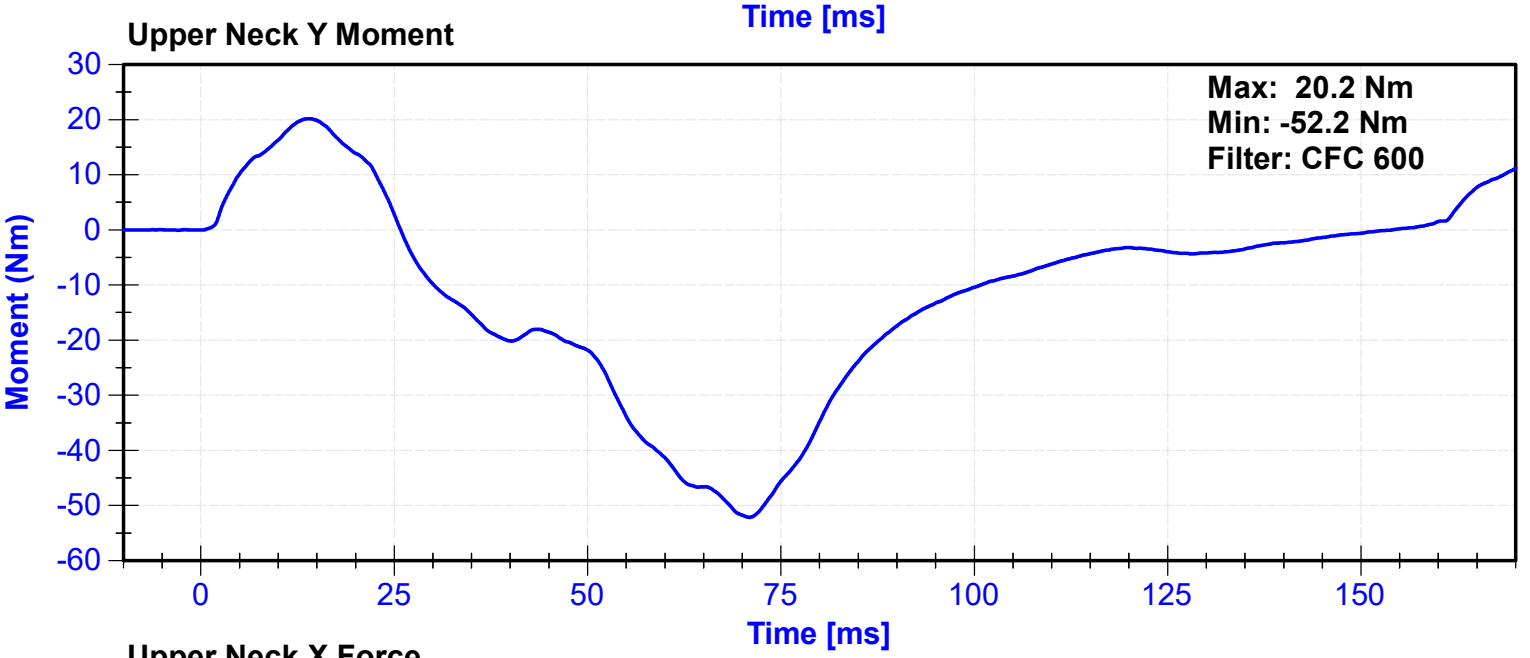
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	10/31/2023	10/30/2024
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Humanetics	2019-FX	9/12/2023	9/11/2024

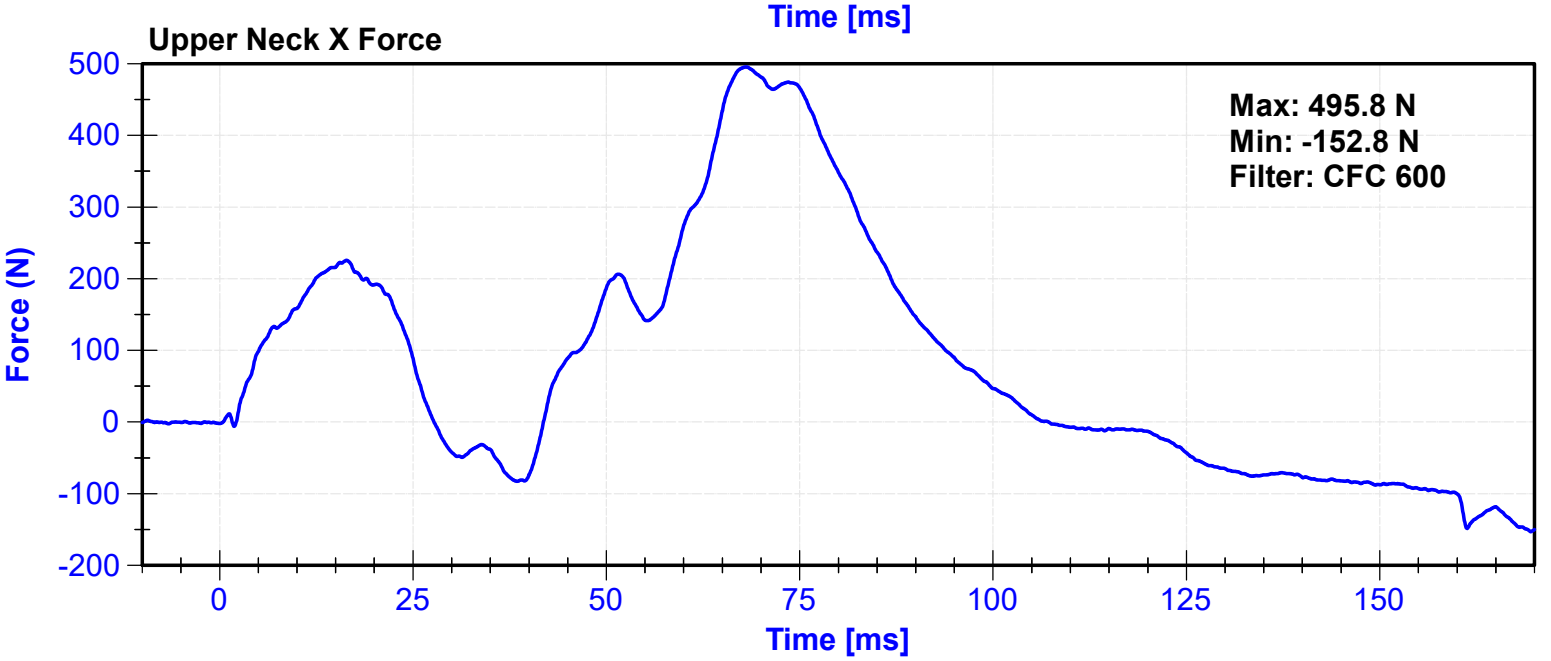



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 108.8 deg
Min: -16.1 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 16.4 Nm
Min: -60.5 N
Filter: CFC 600


Pendulum Deceleration
Max: 22.2 g's
Min: -3.9 g's
Filter: CFC 60
Acceleration (g's)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]


Upper Neck Y Moment
Max: 20.2 Nm
Min: -52.2 Nm
Filter: CFC 600
Moment (Nm)
30
20
10
0
-10
-20
-30
-40
-50
-60
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 495.8 N
Min: -152.8 N
Filter: CFC 600
Force (N)
500
400
300
200
100
0
-100
-200
0
25
50
75
100
125
150
Time [ms]

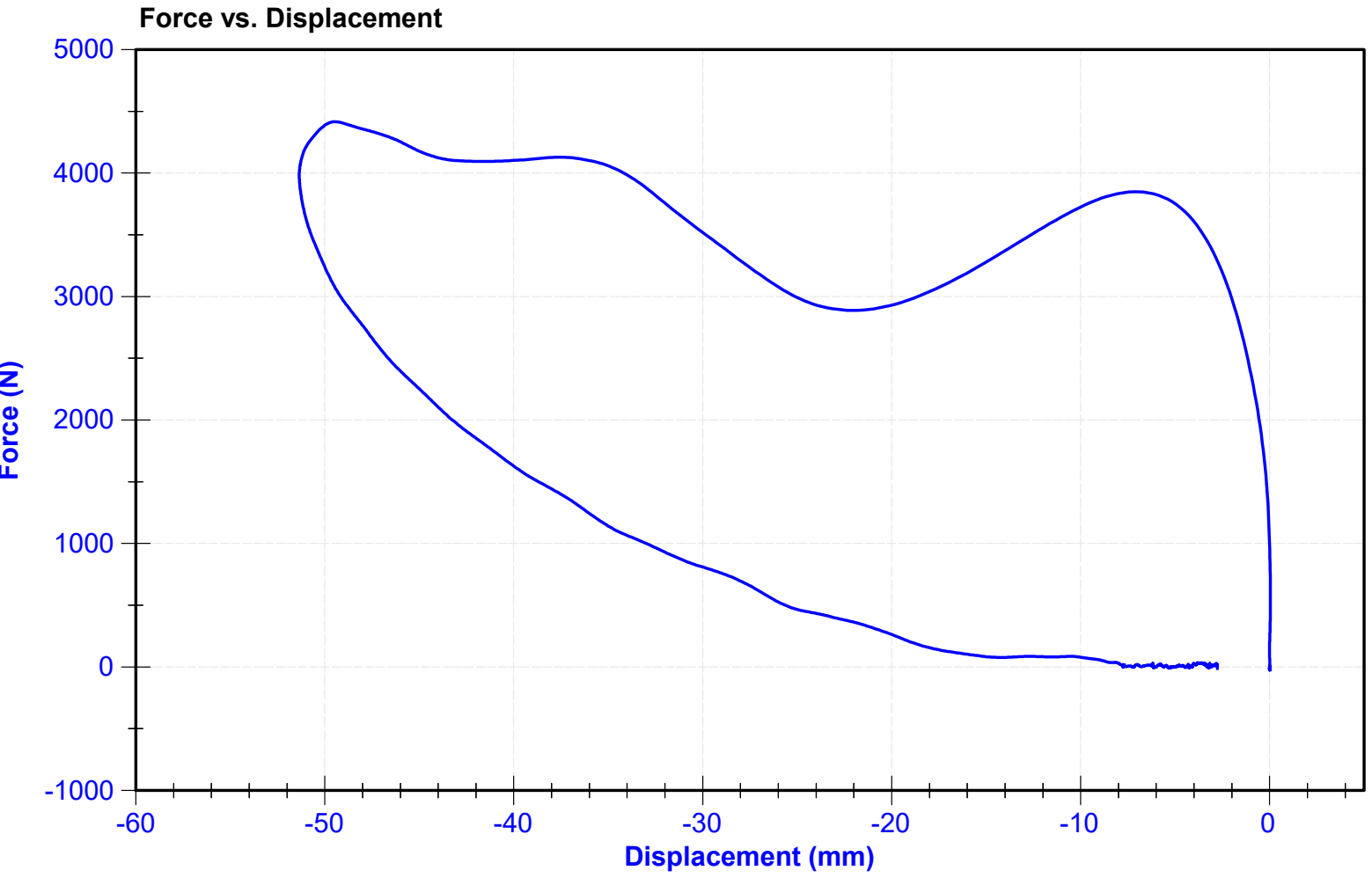
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantel

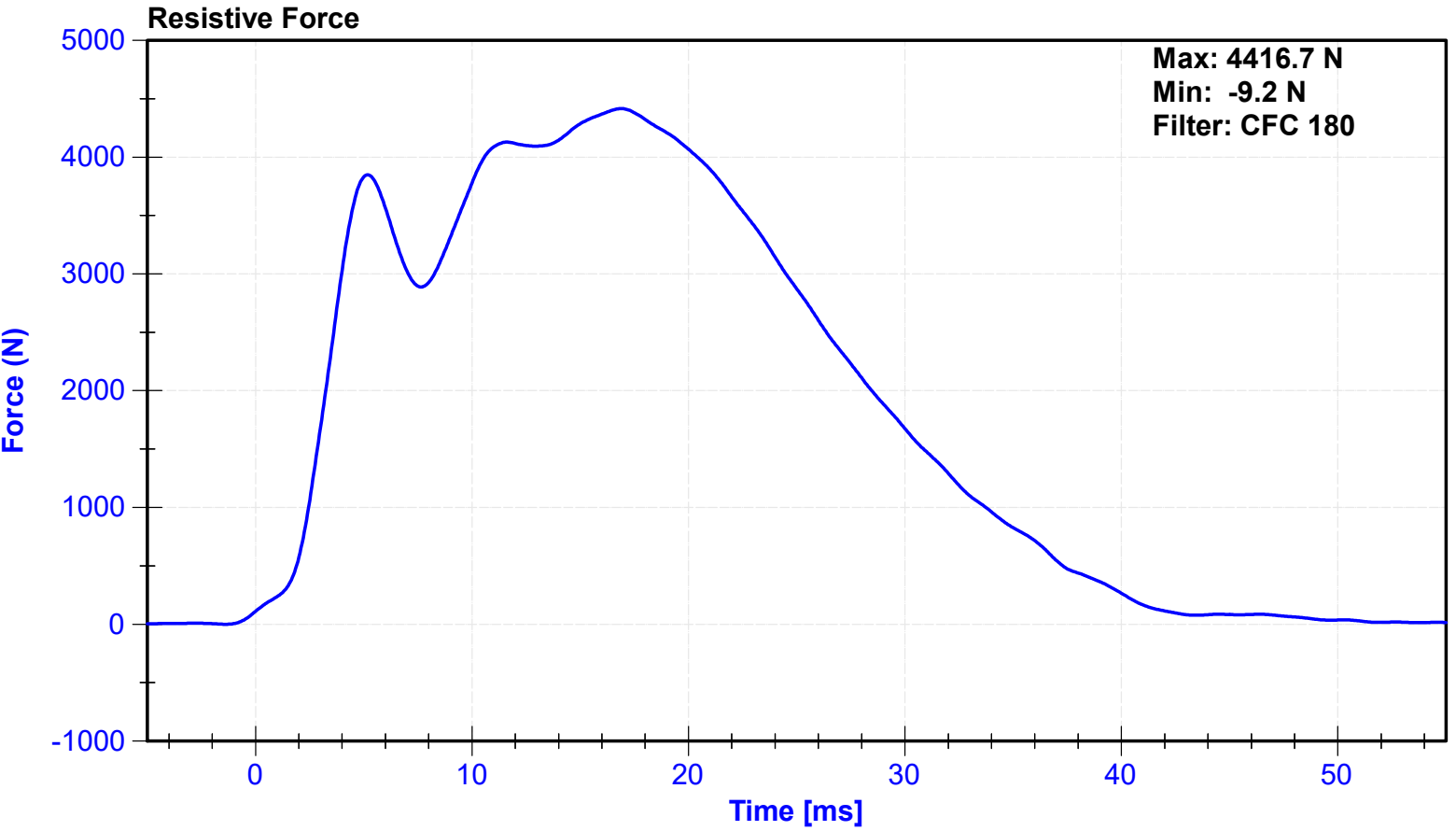
Results

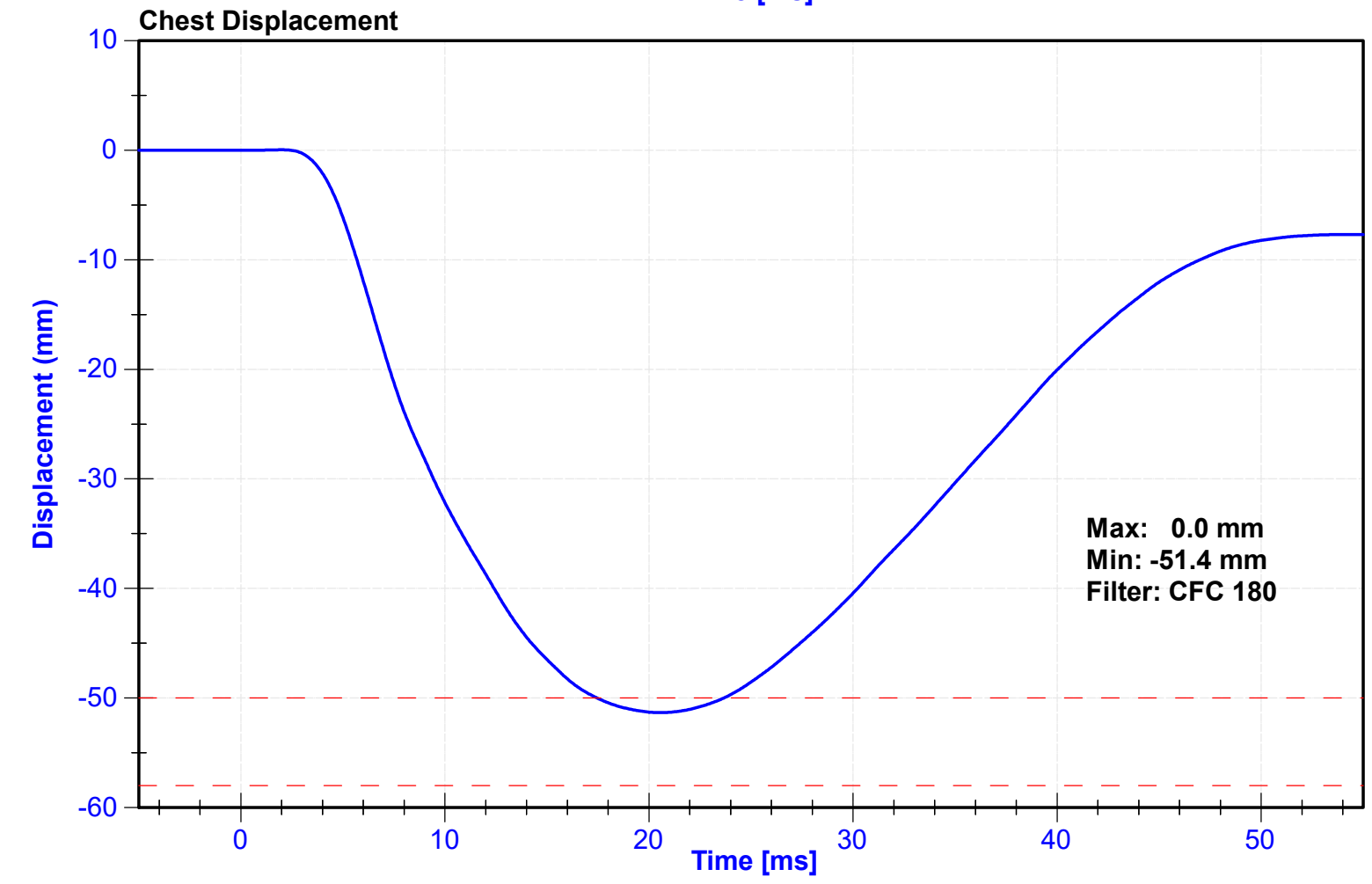
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	47	Pass
Velocity	6.59	6.83	m/s	6.697	Pass
Chest Deflection	-58	-50	mm	-51.4	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4391.1	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4416.7	Pass
Hysteresis	69	85	%	75.2	Pass

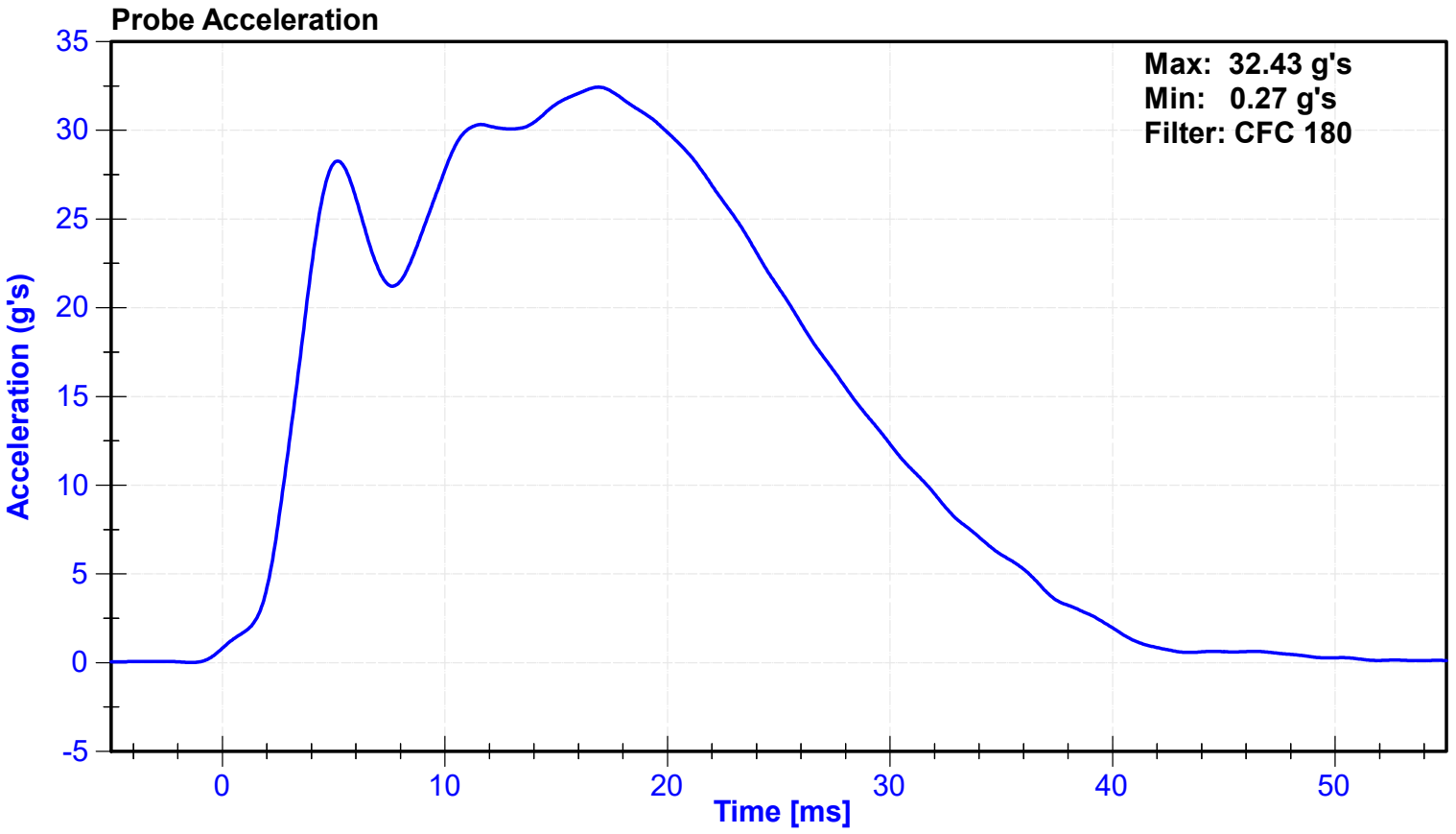
Transducer Calibrations

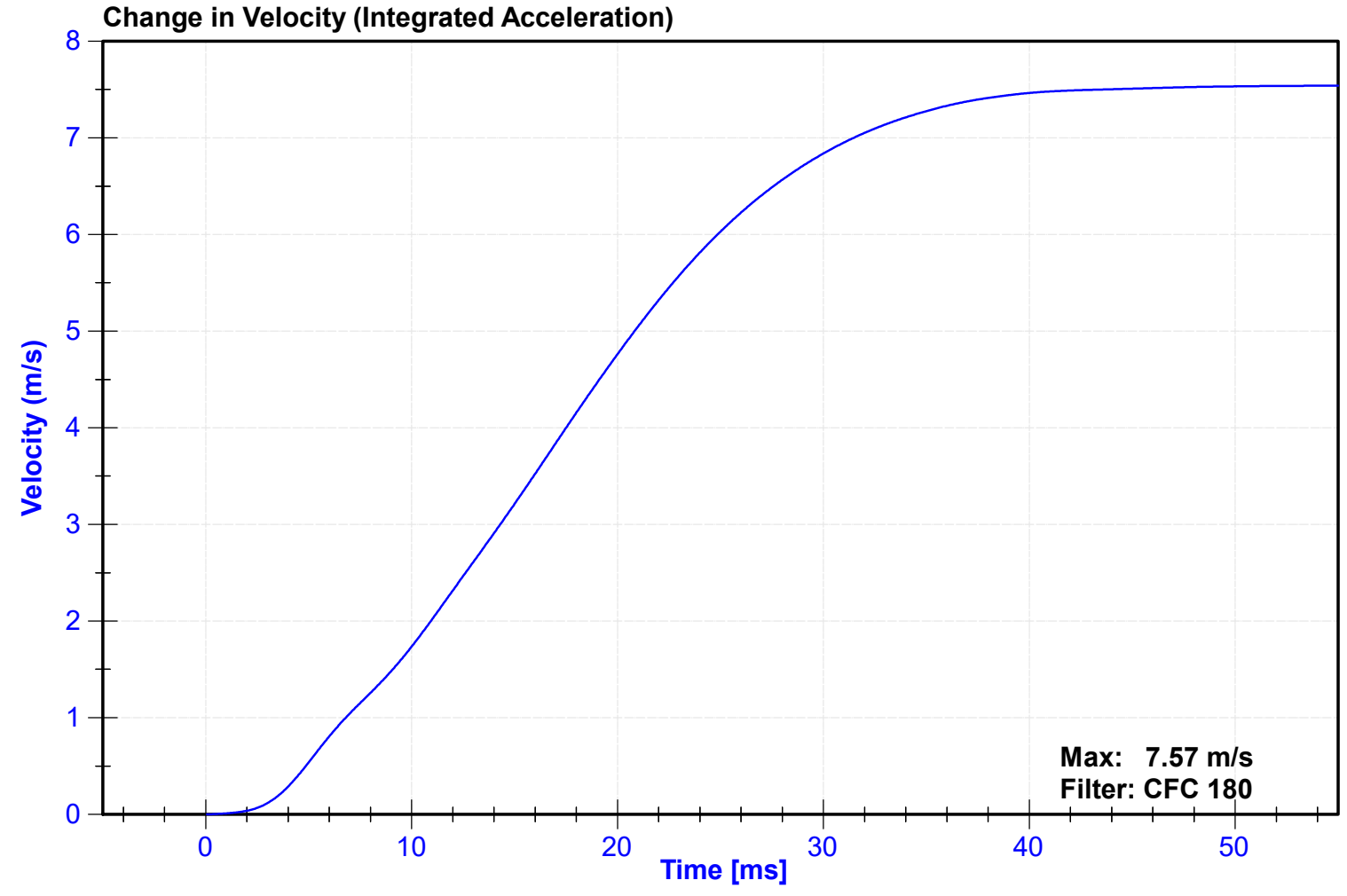
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Chest Potentiometer	Servo	0720	1/5/2024	7/5/2024




Resistive Force
Max: 4416.7 N
Min: -9.2 N
Filter: CFC 180
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]


Chest Displacement
Max: 0.0 mm
Min: -51.4 mm
Filter: CFC 180
Displacement (mm)
10
0
-10
-20
-30
-40
-50
-60
0
10
20
30
40
50
Time [ms]


Probe Acceleration
Max: 32.43 g's
Min: 0.27 g's
Filter: CFC 180
Acceleration (g's)
35
30
25
20
15
10
5
0
-5
0
10
20
30
40
50
Time [ms]


Change in Velocity (Integrated Acceleration)
Max: 7.57 m/s
Filter: CFC 180
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
10
20
30
40
50
Time [ms]

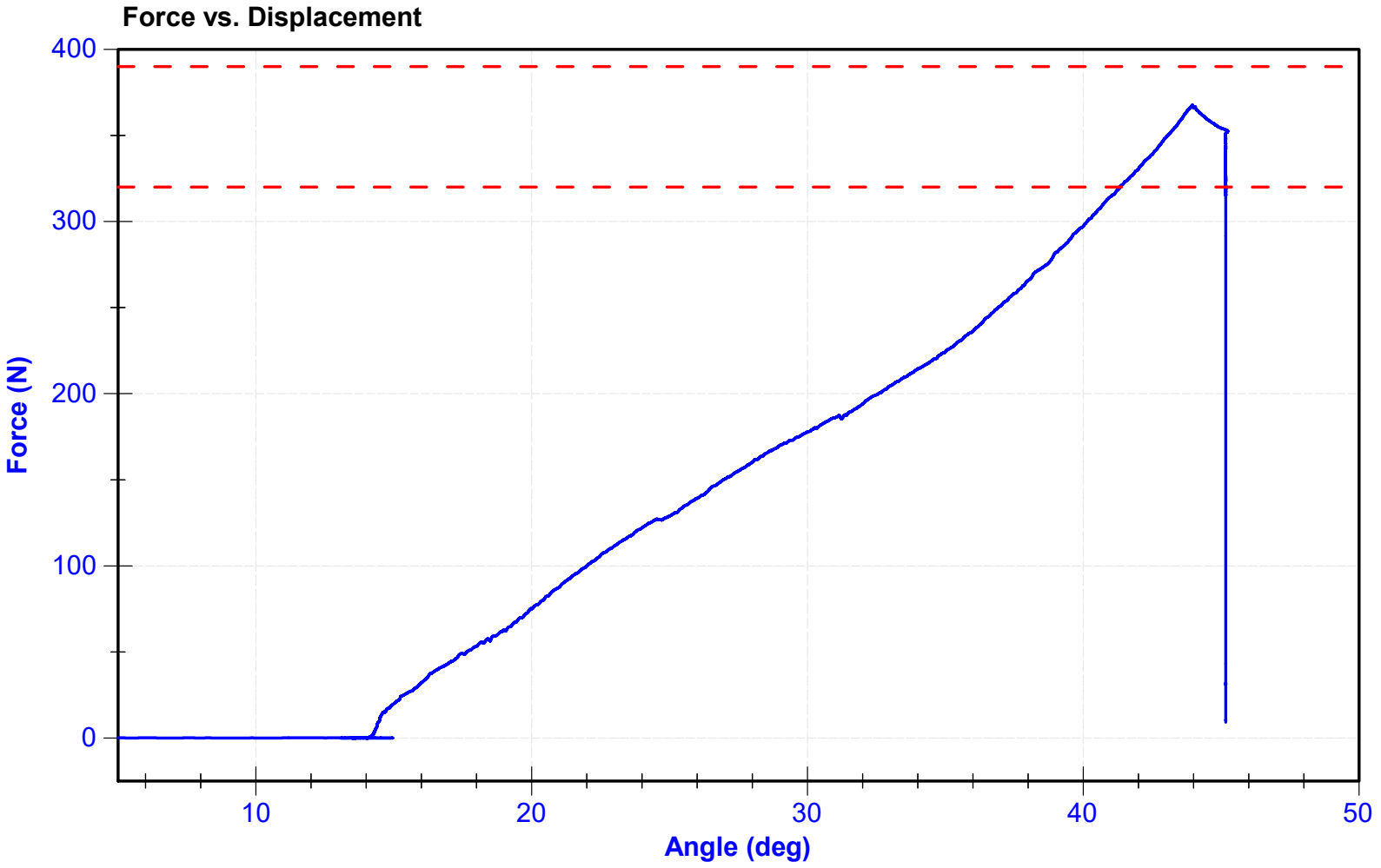
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	ºC	21.9	Pass
Humidity	10	70	%	45	Pass
Initial Angle	0	20	deg	13.9	Pass
Force at 45 Degrees	320	390	N	367.6	Pass
Return Angle Relative to Initial	0	8	deg	6.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker	DS-1905226	2023-11-14	2024-11-13
Load Cell	Interface	1134516	2023-11-30	2024-11-29



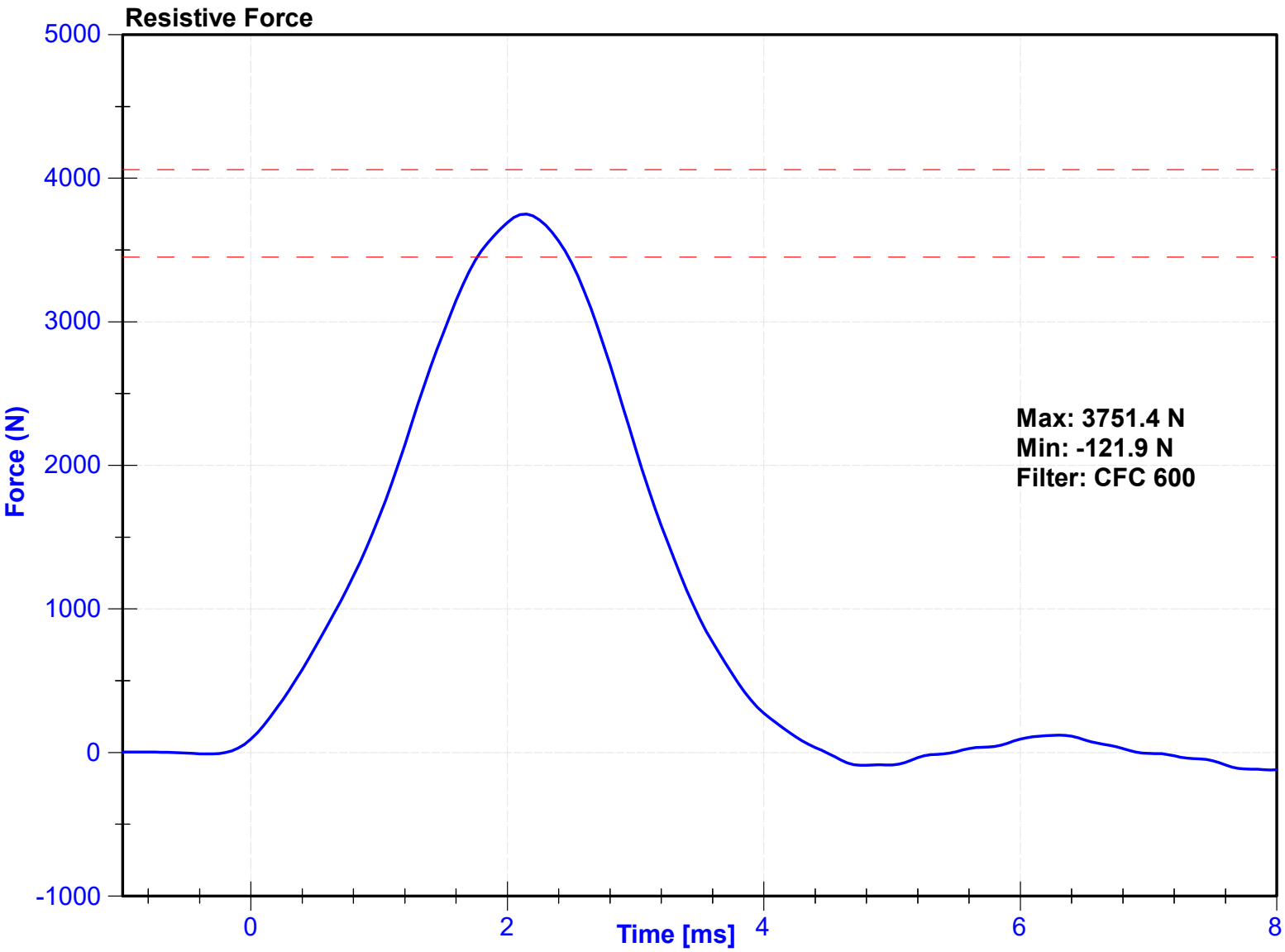
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

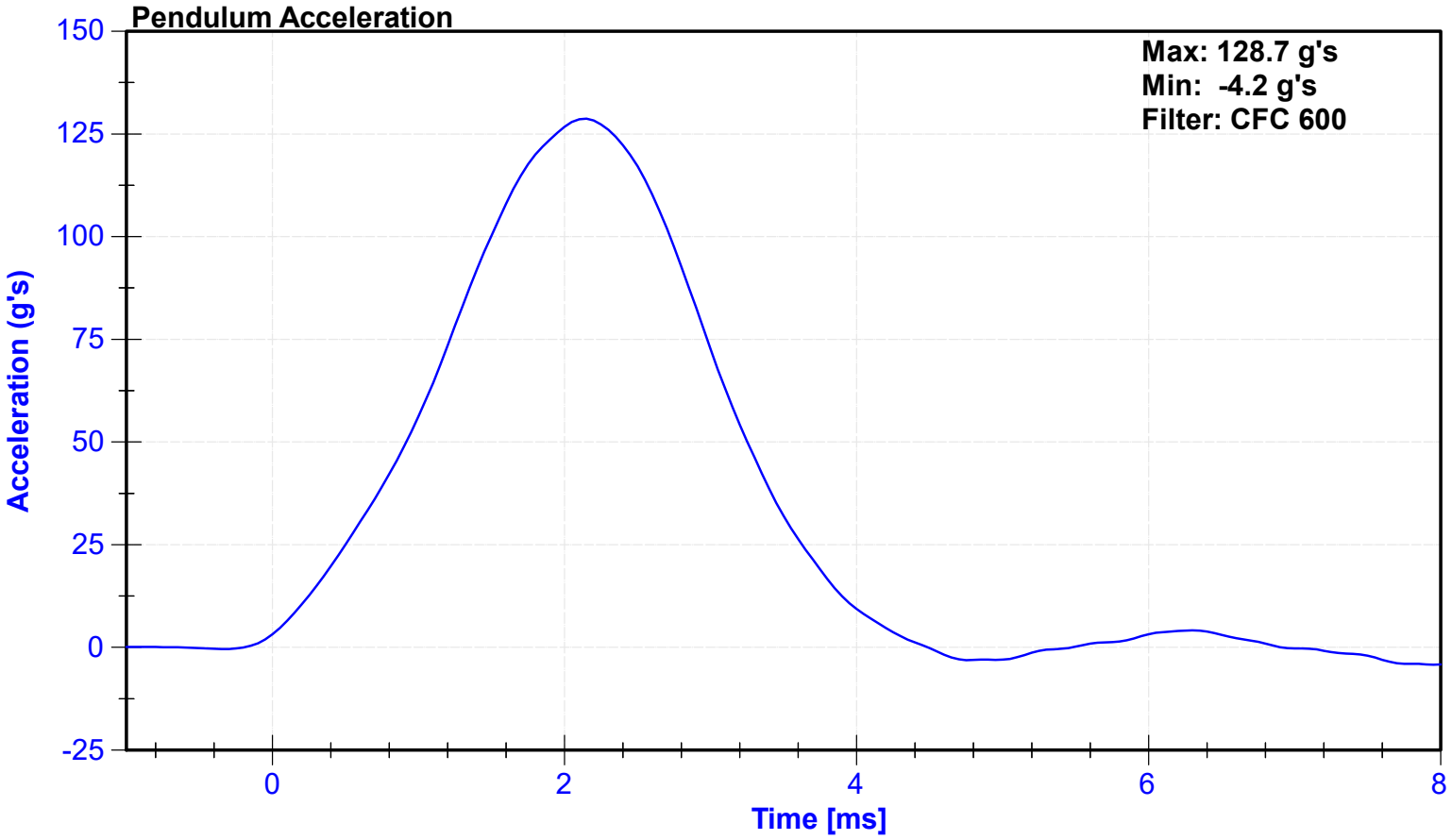
Results

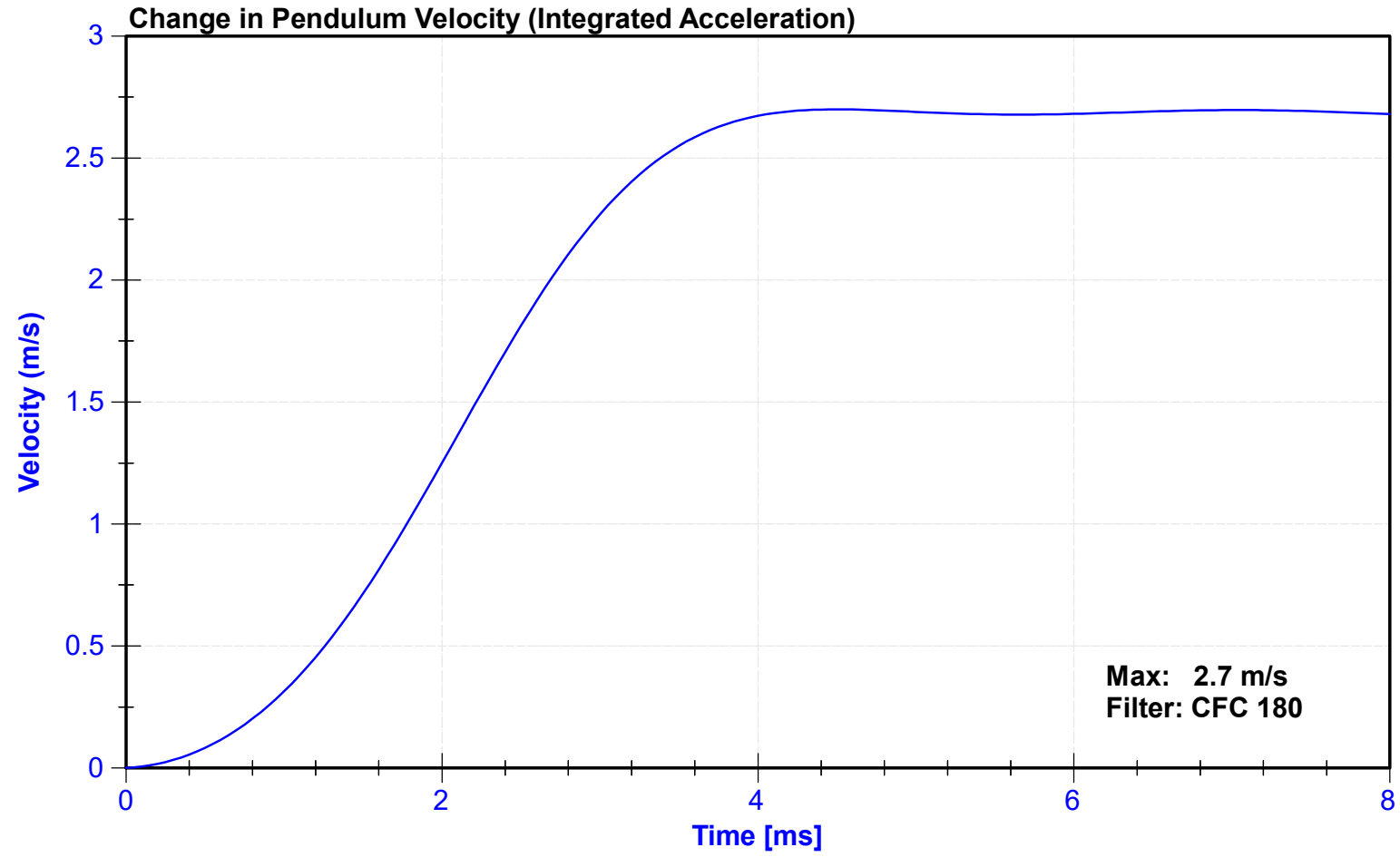
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.2	Pass
Humidity	10	70	%	47	Pass
Velocity	2.07	2.13	m/s	2.096	Pass
Resistive Force	3450	4060	N	3751.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	3/29/2024	9/25/2024




Pendulum Acceleration
Max: 128.7 g's
Min: -4.2 g's
Filter: CFC 600
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.7 m/s
Filter: CFC 180

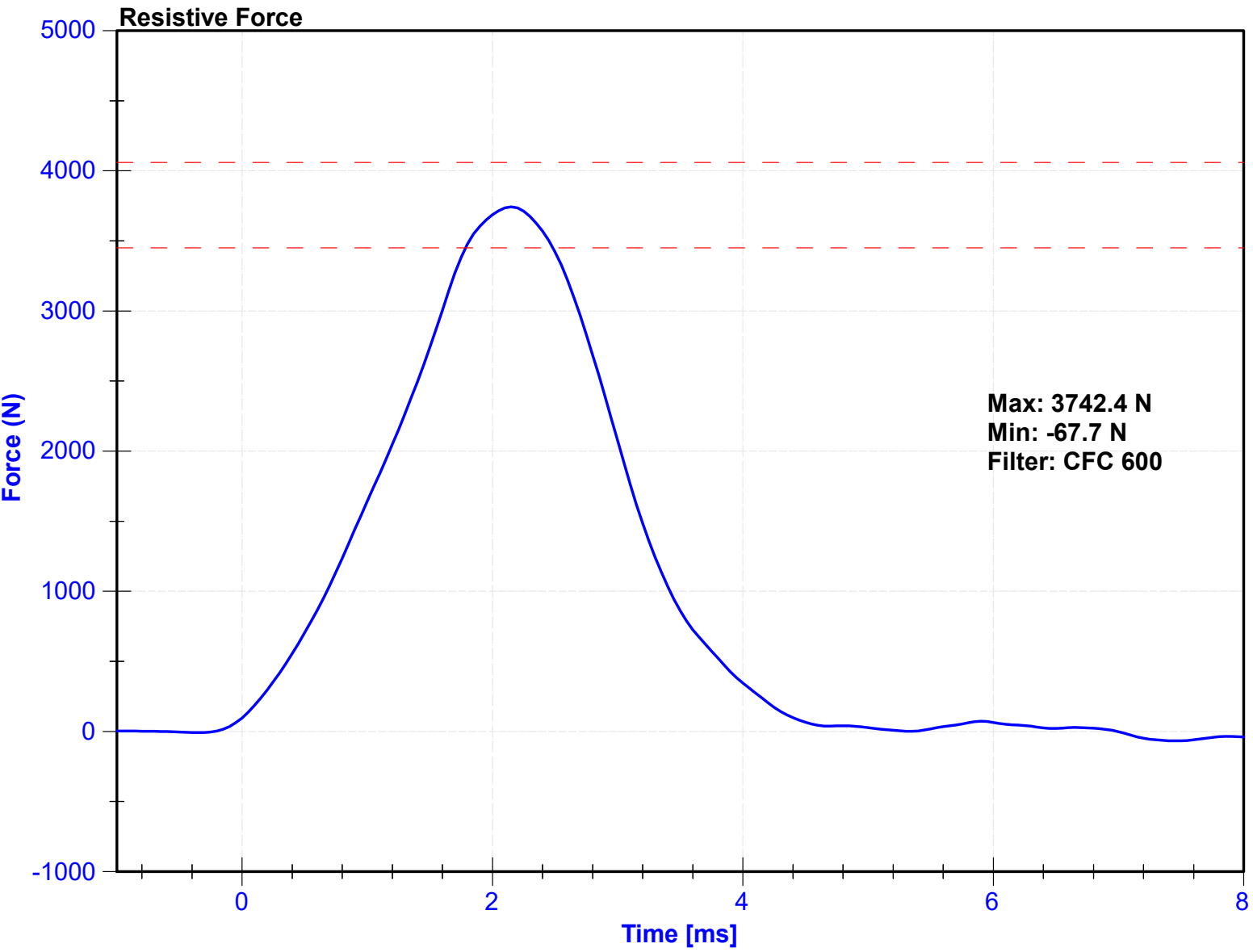
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

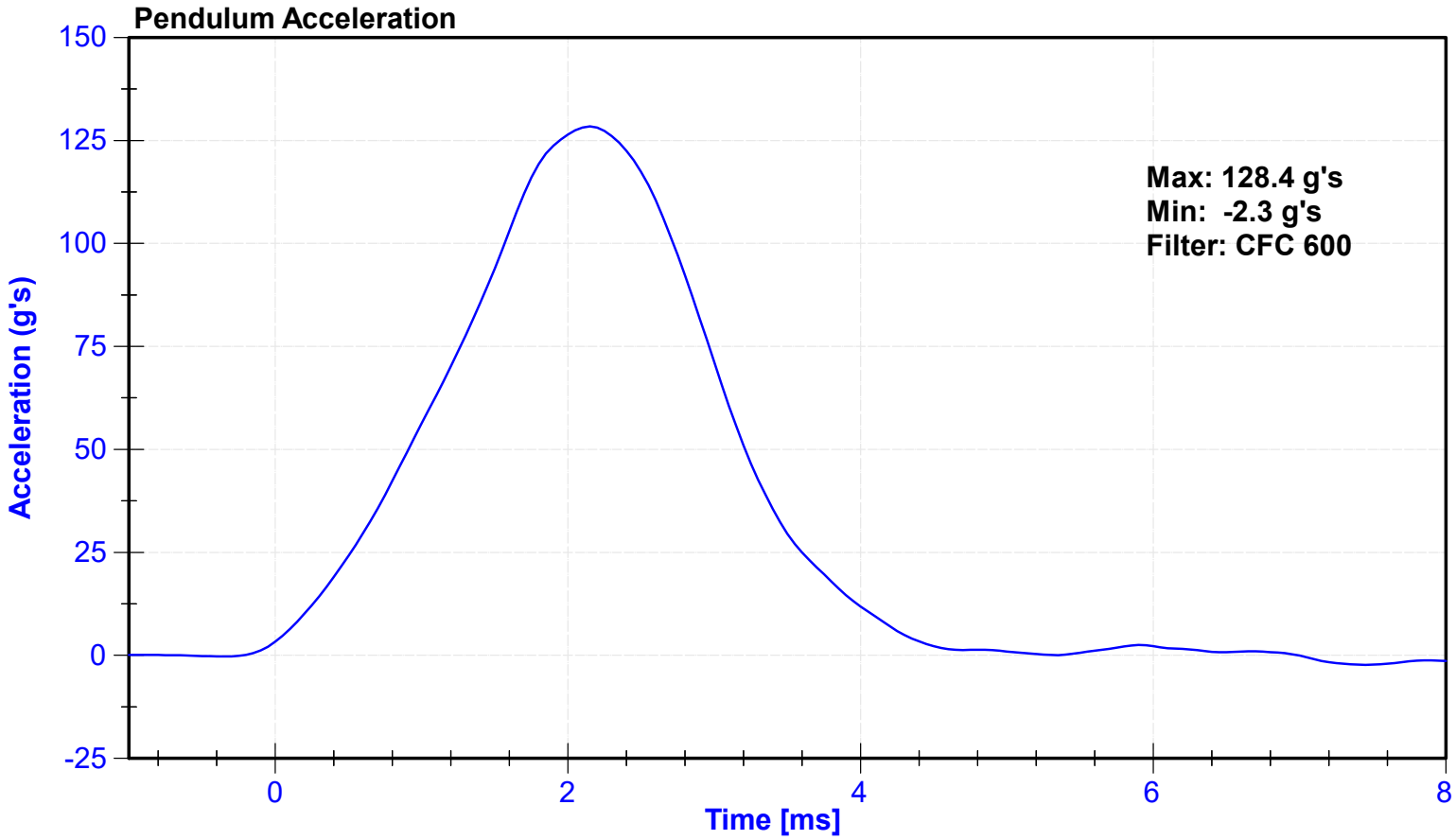
Results

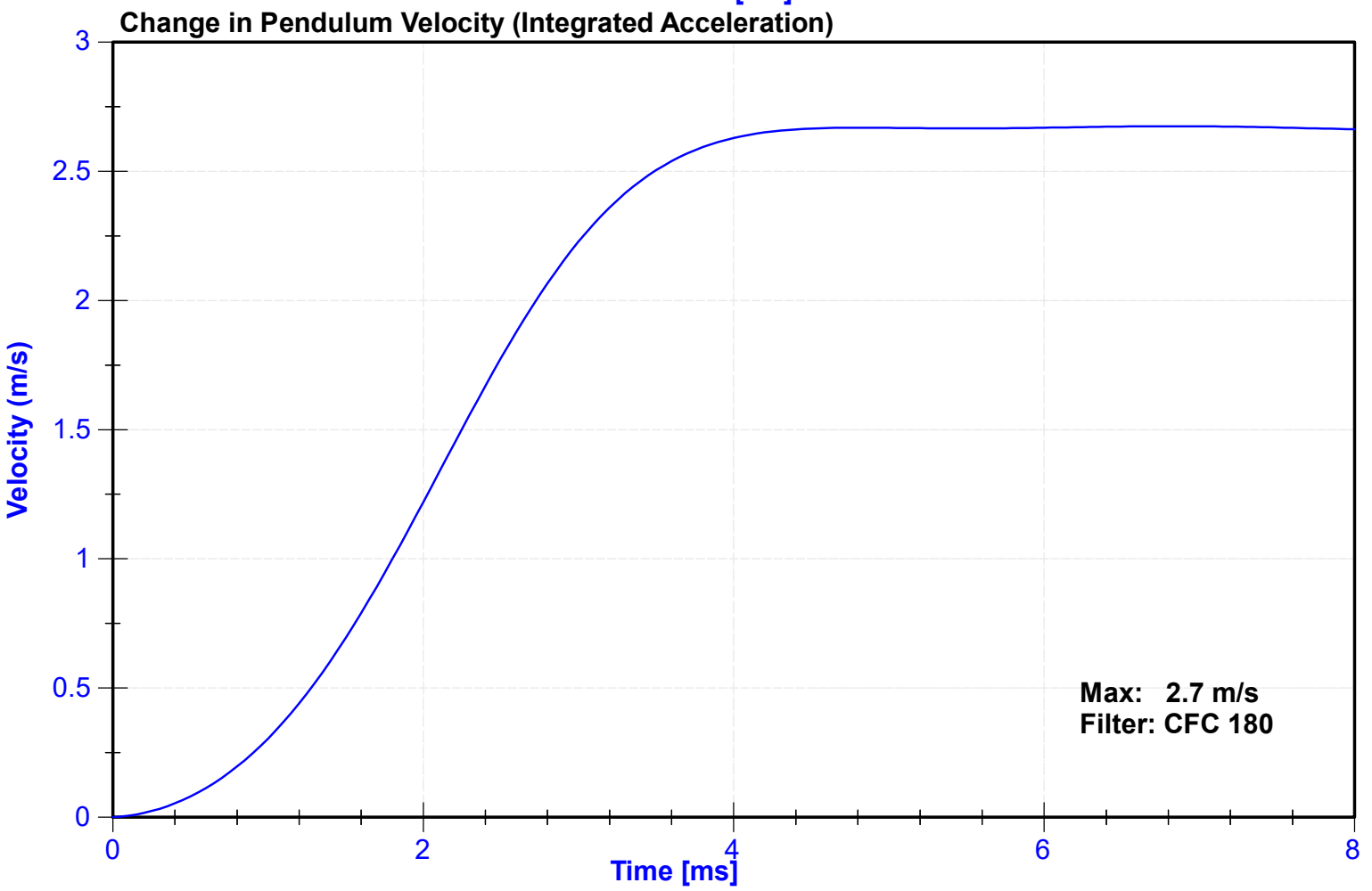
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.2	Pass
Humidity	10	70	%	47	Pass
Velocity	2.07	2.13	m/s	2.099	Pass
Resistive Force	3450	4060	N	3742.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	3/29/2024	9/25/2024




Pendulum Acceleration
Max: 128.4 g's
Min: -2.3 g's
Filter: CFC 600
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Max: 2.7 m/s
Filter: CFC 180
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

APPENDIX D

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Table 1 – Driver Dummy Instrumentation

Instrumentation		Axis/Location	Hybrid III 50th S/N: 065		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	P79591	Endevco	04/30/2024
		Y	P58888	Endevco	04/30/2024
		Z	P58911	Endevco	04/30/2024
	Redundant	X	P52152	Endevco	04/30/2024
		Y	P51979	Endevco	04/30/2024
		Z	P49204	Endevco	04/30/2024
Head Angular Rate Sensors		X	15212	DTS ARS	11/15/2023
		Y	15695	DTS ARS	11/17/2023
		Z	7603	DTS ARS	11/15/2023
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	1916-FX	Humanetics	09/12/2023
Chest Accelerometers	Primary	X	P58887	Endevco	04/30/2024
		Y	P66917	Endevco	04/30/2024
		Z	P49197	Endevco	04/30/2024
	Redundant	X	P49213	Endevco	04/30/2024
		Y	P63840	Endevco	04/30/2024
		Z	P83313	Endevco	04/30/2024
Chest Potentiometer		X	1046	Servo	04/30/2024
Pelvis Accelerometer		X	P51699	Endevco	04/30/2024
		Y	P94090	Endevco	04/30/2024
		Z	P83437	Endevco	04/30/2024
Femur Load Cells - Left	Primary	Z	DI4211-FZ1	Denton	09/12/2023
	Redundant	Z	DI4211-FZ2	Denton	09/12/2023
Femur Load Cells - Right	Primary	Z	136-FZ1	Denton	09/12/2023
	Redundant	Z	136-FZ2	Denton	09/12/2023
Tibia Load Cells - Left	Upper	MX, MY, FZ	407-FZ	Denton	09/13/2023
	Lower	MX, MY, FZ	490-FZ	Denton	09/13/2023
Tibia Load Cells – Right	Upper	MX, MY, FZ	368-FZ	Denton	09/13/2023
	Lower	MX, MY, FZ	396-FZ	Denton	09/13/2023
Foot Accelerometers - Left	Rear	X	P69797	Endevco	04/30/2024
	Front	Z	P51729	Endevco	04/30/2024
Foot Accelerometers - Right	Rear	X	T20878	Endevco	05/14/2024
	Front	Z	P51685	Endevco	04/30/2024
Seat belt Load Cells	Lap		174	GFE	02/08/2024
	Shoulder		168	Denton	06/22/2023

Table 2 – Front Passenger Dummy Instrumentation

Instrumentation		Axis/Location	Hybrid III 5th S/N: 137		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	P79417	Endevco	01/04/2024
		Y	P83335	Endevco	01/04/2024
		Z	P64149	Endevco	01/04/2024
	Redundant	X	P52008	Endevco	01/04/2024
		Y	P52045	Endevco	01/04/2024
		Z	P74774	Endevco	01/03/2024
Head Angular Rate Sensors		X	7589	DTS ARS	11/15/2023
		Y	13095	DTS ARS	11/15/2023
		Z	4718	DTS ARS	11/15/2023
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	2019-FX	Humanetics	09/12/2023
Chest Accelerometers	Primary	X	T21142	Endevco	01/03/2024
		Y	P83346	Endevco	01/04/2024
		Z	P49190	Endevco	01/04/2024
	Redundant	X	P58794	Endevco	01/03/2024
		Y	P69791	Endevco	01/03/2024
		Z	T11253	Endevco	01/04/2024
Chest Potentiometer		X	0720	Servo	01/05/2024
Pelvis Accelerometer		X	P58735	Endevco	01/03/2024
		Y	P77587	Endevco	01/03/2024
		Z	P51285	Endevco	01/03/2024
Femur Load Cells - Left	Primary	Z	135-FZ1	Denton	09/12/2023
	Redundant	Z	135-FZ2	Denton	09/12/2023
Femur Load Cells - Right	Primary	Z	115-FZ1	Denton	09/12/2023
	Redundant	Z	115-FZ2	Denton	09/12/2023
Tibia Load Cells - Left	Upper	MX, MY, FZ	362-FZ	Denton	09/13/2023
	Lower	MX, MY, FZ	364-FZ	Denton	09/13/2023
Tibia Load Cells – Right	Upper	MX, MY, FZ	364-FZ	Denton	09/13/2023
	Lower	MX, MY, FZ	492-FZ	Denton	10/04/2023
Foot Accelerometers - Left	Rear	X	P78959	Endevco	01/03/2024
	Front	Z	P83418	Endevco	01/04/2024
Foot Accelerometers - Right	Rear	X	P63998	Endevco	01/03/2024
	Front	Z	P80265	Endevco	01/03/2024
Seat belt Load Cells	Lap		292	GFE	02/08/2024
	Shoulder		295	GFE	02/08/2024

Table 3 – Vehicle Instrumentation

Instrumentation			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember/Rear Seat Accelerometers	Left	Primary	X	A398310	Measurement Specialties	01/23/2024
			Z	A405550	Measurement Specialties	01/23/2024
		Redundant	X	A399973	Measurement Specialties	01/23/2024
	Right	Primary	X	A280890	Measurement Specialties	04/29/2024
			Z	A284293	Measurement Specialties	04/29/2024
		Redundant	X	A284229	Measurement Specialties	04/29/2024
Engine Accelerometers	Top		X	G24340	Endevco	04/29/2024
	Bottom		X	G22773	Endevco	04/08/2024