REPORT NUMBER: NCAP-CAL-24-005

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

KIA Corporation
2024 KIA EV9
5 Door SUV

NHTSA No: O20244219

PREPARED BY:
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January 7, 2025

FINAL REPORT

PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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WASHINGTON, D.C. 20590

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Date: January 7, 2025

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FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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16. Abstract

A 56.30 km/h (35 mph), NCAP frontal rigid barrier impact test was conducted on a 2024 KIA EV9 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 August 28, 2024.

The impact velocity of the vehicle was 56.34 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 642 mm at C4. 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	264.755	700	267.433
Maximum Chest Compression	mm	63	-25.265	52	-19.216
Nij		1	0.319	1	0.274
Neck Tension	N	4170	893.404	2620	574.032
Neck Compression	N	4000	-55.959	2520	-270.717
Left Femur Force	N	10008	-1212.254	6805	-2052.871
Right Femur Force	N	10008	-1808.693	6805	-2094.502

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

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

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

SUMMARY

A load cell barrier consisting of 128 load cells was impacted by a 2024 KIA EV9 5 Door SUV at a velocity of 56.34 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on August 28, 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 lap and shoulder belts and Passenger's Shoulder belt to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 065) and the right-front passenger (position 2) ATD (Serial No. 137) were qualified prior to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

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

There was 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 642 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 and the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee air bag.

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

The occupant data is summarized below.

ATD Position	HIC_{15}	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50th)	264.755	0.319	893.404	-55.959	44.614	-25.265	-1212.254	-1808.693
Passenger (5th)	267.433	0.274	574.032	-270.717	50.481	-19.216	-2052.871	-2094.502

GENERAL COMMENTS:

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

Data Anomalies:

- No Questionable Channels

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

This section contains information reporting for the following Data Sheets:

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

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

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Seat Belt Positioning Data

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

Data Sheet No. 7 – Vehicle Accelerometer Locations

Data Sheet No. 8 – Photographic Reference Target Locations

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

Data Sheet No. 10 – Test Vehicle Summary of Results

Data Sheet No. 11 – Post-Test Observations

Data Sheet No. 12 – Vehicle Profile Measurements

Data Sheet No. 13 – Accident Investigation Division Data

Data Sheet No. 14 – Vehicle Intrusion Measurements

Data Sheet No. 15 – Summary of 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 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20244219	Traction Control System (TCS)	Yes
Model Year	2024	Power Steering	Yes
Make	KIA	Power Window Auto-Reverse	Yes
Model	EV9	Driver Frontal Airbag	Yes
Body Style	SUV	Driver Curtain Airbag	Yes
VIN	KNDAFFS56R6037224	Driver Head/Torso Airbag	No
Body Color	Snow White Pearl	Driver Torso Airbag	No
Odometer Reading (km /mi)	37 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	N/A	Driver Pelvis Airbag	No
Type / No. Cylinders	N/A	Driver Knee Airbag	Yes
Engine Placement	N/A	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	No
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 – Center Seat Airbag	Yes

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

DATA FROM CERTIFICATION LABEL

Manufactured By	KIA Corporation	GVWR (kg)	3260
Date of Manufacture	12/23	GVWR Front (kg)	1590
		GVWR Rear (kg)	1860

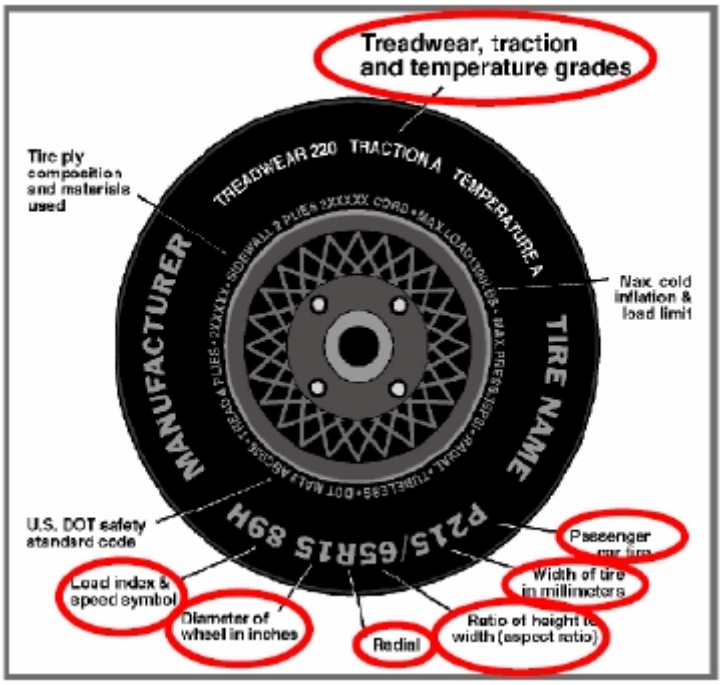
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	Bench	
Number of Occupants	2	3	2	7
Capacity Wt. (VCW) (kg)				560
Cargo Wt. (RCLW) (kg)				84

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

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

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



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	340	340
Cold Pressure (kPa)	260	260
Recommended Tire Size	255/60R19	255/60R19
Tire Size on Vehicle	255/60R19	255/60R19
Tire Manufacturer	KUMHO	KUMHO
Tire Model	Crugen EV	Crugen EV
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Steel, 2 Polyester, 1 Polyamide	2 Steel, 2 Polyester, 1 Polyamide
Load Index / Speed Symbol	113V	113V
Tire Material	Rubber	Rubber
DOT Safety Code Left	1H2KMYC8E5223	1H2KMYC8E5123
DOT Safety Code Right	1H2KMYC8E5223	1H2KMYC8E5123

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

Test Vehicle: 2024 KIA EV9 5 Door SUV | NHTSA No.: O20244219
Test Program: NCAP Frontal Barrier Impact Test | Test Date: 08/28/2024

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	629	685		688	729	
Right	kg	608	690		658	757	
Ratio	%	47.0	53.0		48.0	52.0	
Total	kg	1237	1375	2612	1346	1486	2832

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2612	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	142	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	84	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2838	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	992	996	1016	1014	1635
As Tested	mm	952	956	975	979	1630
Post-Test	mm	1004	949	1025	954	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3106
Total Vehicle Length at Left Side	mm	4940
Total Vehicle Length at Centerline	mm	5009
Total Vehicle Length at Right Side	mm	4940
Weight of Ballast in Cargo Area	kg	61.3
Weight of Vehicle Components Removed	kg	50.5
Amount of Stoddard Solvent in Fuel Tank	L	Electric Vehicle

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting, tire kit, third row seats, charger

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

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	5009
2	Total Width	1987
3*	Bumper Top Height	624
4*	Bumper Bottom Height	522
5*	Longitudinal Member Top Height	608
6	Distance Between Longitudinal Members	988
7	Longitudinal Member Width	93
8*	Engine Top Height	834
9*	Engine Bottom Height	197
10	Engine and Gearbox Width	322
11	Front Bumper-Engine Distance	643
12*	Front Shock Absorber Fixing Height	1060
13*	Bonnet Leading Edge Height	975
14	Front Shock Absorber Fixing Width	1263
15	Front Bumper – Front Axle Distance	873
16	Front Axle – A Pillar Distance	584
17	A-Pillar – B-Pillar Distance	1106
18	B-Pillar – Rear Axle Distance	1412
19	B-Pillar – C-Pillar Distance	1097
20*	Roof Sill Bottom Height	1640
21*	Roof Sill Top Height	1686
22*	Floor Sill Bottom Height	437
23*	Floor Sill Top Height	474

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

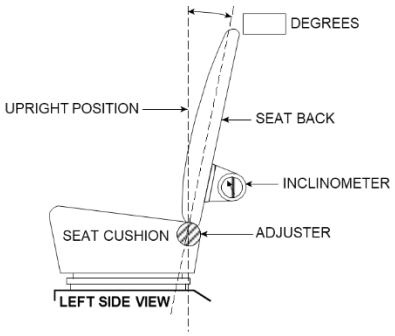
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

NOMINAL DESIGN RIDING POSITION

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

Seating Position	Degrees
Driver Seat Back Angle	3.1
Passenger Seat Back Angle	1.35



FRONT SEAT ASSEMBLY

SEAT FORE / AFT POSITIONS

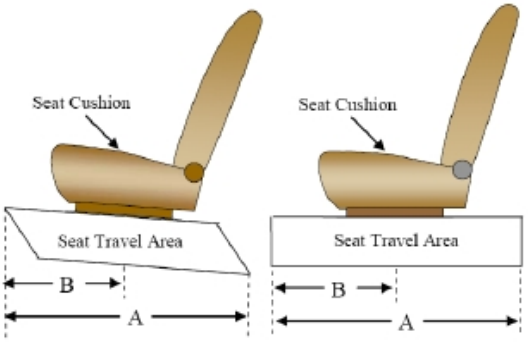
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	336	168
Passenger Seat	259	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

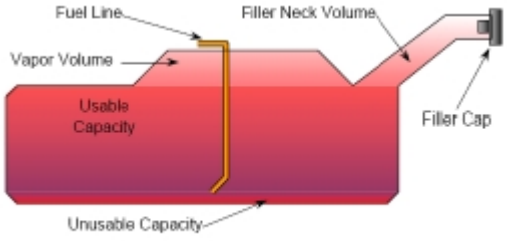
Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

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

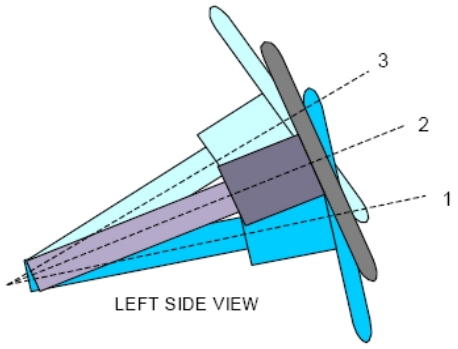
The vehicle is equipped with an electric charge port on the right rear of the vehicle.



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.



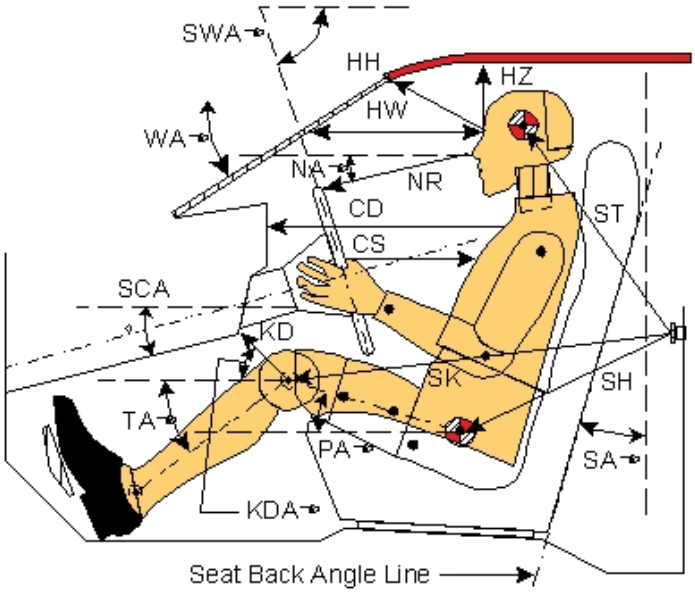
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	22.6	
Geometric center position No. 2	25.1	
Uppermost position No. 3	27.5	
Telescoping Steering Wheel Travel		56
Test Position	25.1	28

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

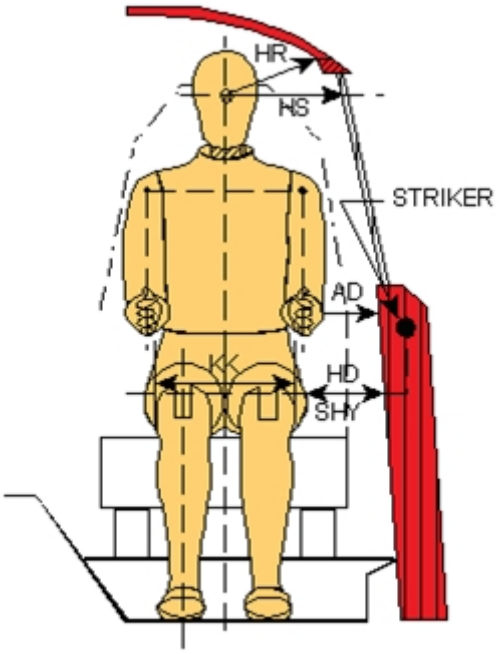


Left Side View

Code	Measurement Description	Driver (SN: 065)		Passenger (SN: 137)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		34.6		
SWA°	Steering Wheel Angle		26.1		
SCA°	Steering Column Angle		63.9		
SA°	Seat Back Angle (on headrest post)		3.1		1.35
HZ	Head to Roof (Z)	248	90	250	90
HH	Head to Header	435	24.5	367	44.6
HW	Head to Windshield	690	0.1	650	0.2
NR	Nose to Rim / Dash	432	8.2	487	30.4
CD	Chest to Dash	608		395	
CS	Chest to Steering Hub	344	1.9		
RA	Rim to Abdomen	235	0.1		
KDL	Left Knee to Dash	204	24.1	109	34.2
KDR	Right Knee to Dash	195	29.5	111	33.4
PA°	Pelvic Angle		22.35		20.4
TA°	Tibia Angle		29.5		42.4
SK	Striker to Knee	610	8.2	722	7.2
ST	Striker to Head	510	74.5	485	59.6
SH	Striker to H-Point	245	40.5	416	24.5

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

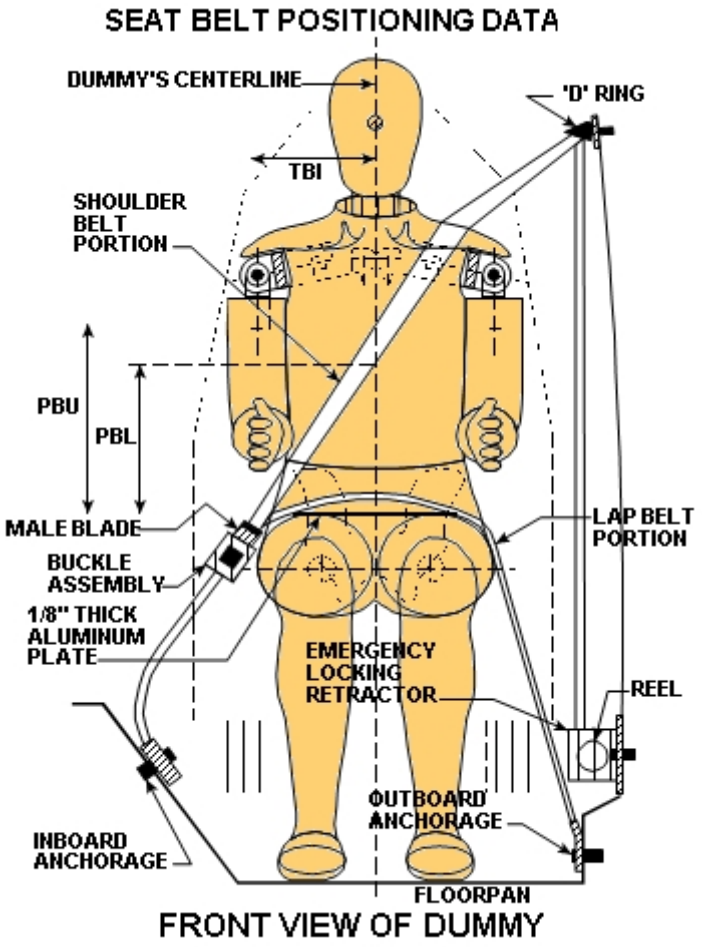


Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	135	84
HD	H-Point to Door	185	195
HR	Head to Side Header	276	297
HS	Head to Side Window	375	381
KK	Knee to Knee	355	212
SHY	Striker to H-Point (Y Direction)	280	310
AA	Ankle to Ankle	360	166

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	346	310
PBL — Top surface of reference to belt lower edge	mm	262	220

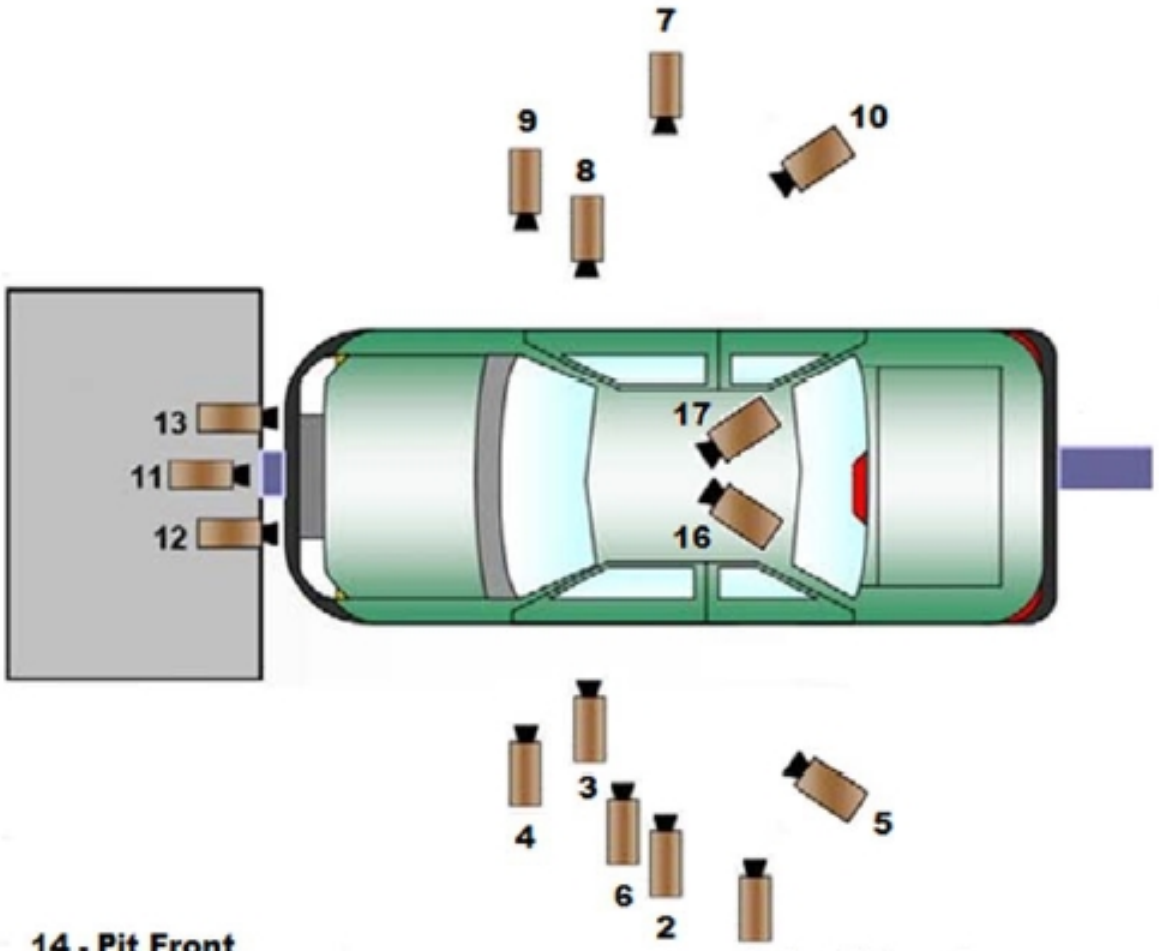
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	920	995
Lap Belt Length as measured on ATD	mm	750	825
Remainder of belt on reel	mm	930	780
Total belt length for continuous webbing systems	mm	2600	2600

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

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

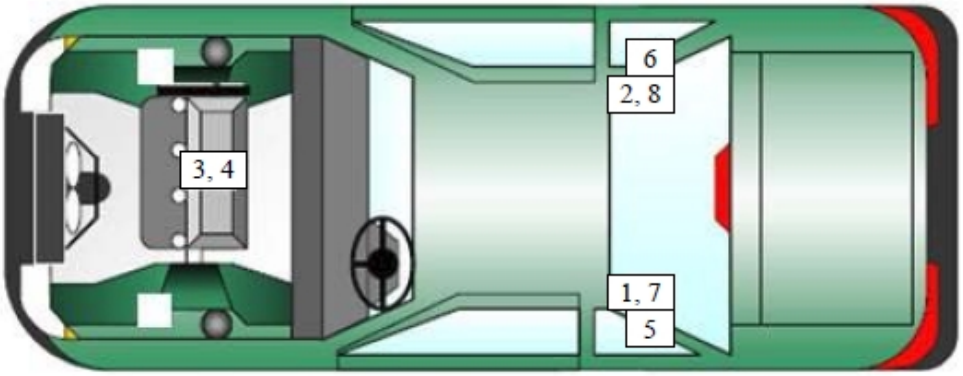
CAMERA LOCATIONS

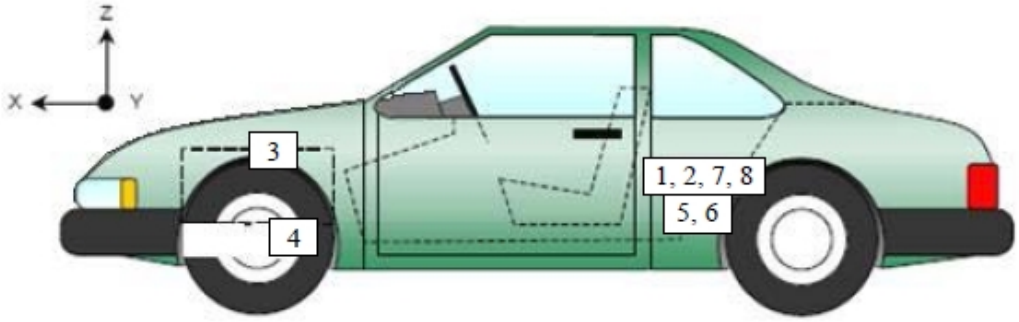
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall				Zoom	60
2	Left Overall	-2685	-8055	-1400	24	1000
3	Driver Close-Up	-1625	-7040	-1600	50	1000
4	Left Front Half	-874	-6955	-1350	28	1000
5	Left Angle	-4200	-4206	-2565	50	1000
6	Steering Column	-1625	-8310	-2310	75	1000
7	Right Overall	-2595	8025	-1420	24	1000
8	Passenger Close-Up	-1392	7277	-1600	50	1000
9	Right Front Half	-735	-7270	-1400	28	1000
10	Right Angle	-4171	-4518	-2475	50	1000
11	Windshield	1181	0	-3850	12.5	1000
12	Driver Windshield	690	-400	-2400	25	1000
13	Passenger Windshield	690	400	-2400	25	1000
14	Pit Front	-950	0	2300	12.5	1000
15	Pit Rear	-3040	0	2300	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 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	2070	-325	66
2	Right Rear Accelerometer – X Direction	2070	390	65
3	Engine Top X	4265	62	-366
4	Engine Bottom X	4596	-12	281
5	Left Rear Accelerometer – Z Direction	2070	-325	66
6	Right Rear Accelerometer – Z Direction	2070	390	65
7	Left Rear Accelerometer – X Direction Redundant	2069	-311	66
8	Right Rear Accelerometer – X Direction Redundant	2069	374	66

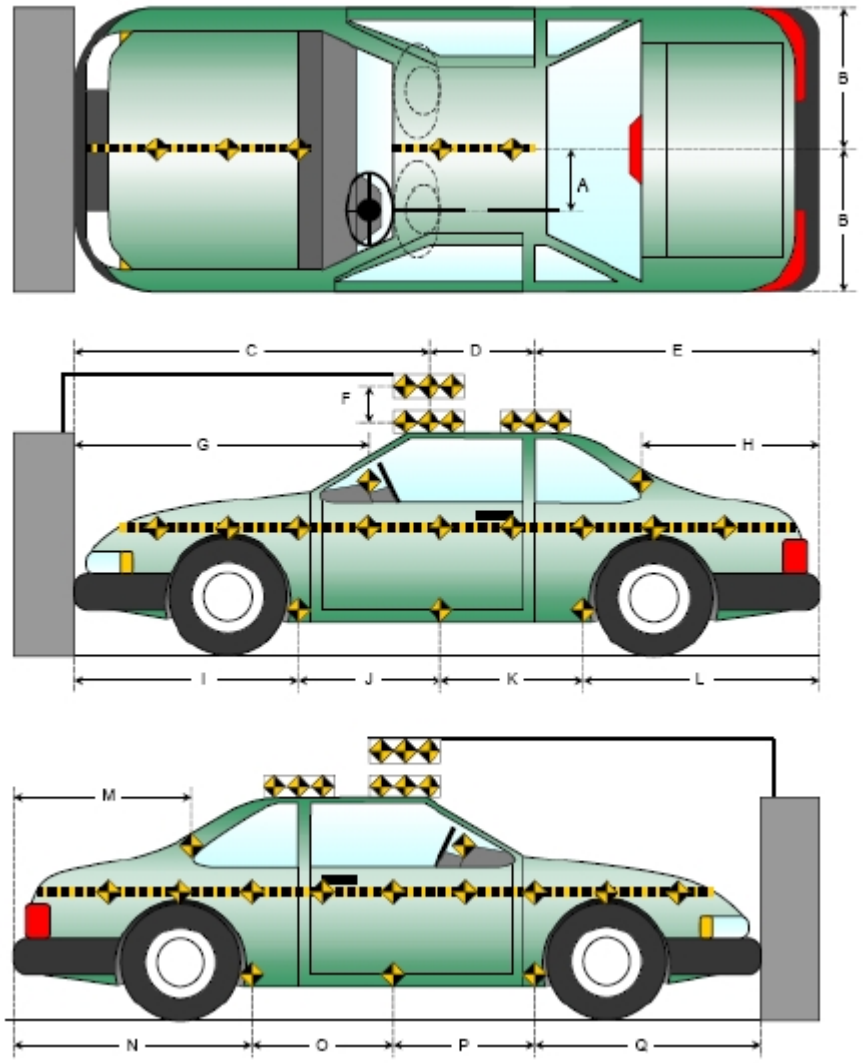
Reference Points: *X – Rear Surface of Vehicle (+ forward)*
Y – Vehicle Centerline (+ to right)
Z – Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

Item	Value
A	422
B	994
C	2842
D	609
E	1558
F	255
G	1717
H	1325
I	1380
J	1041
K	1039
L	1549
M	1331
N	1550
O	1041
P	1041
Q	1377

All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

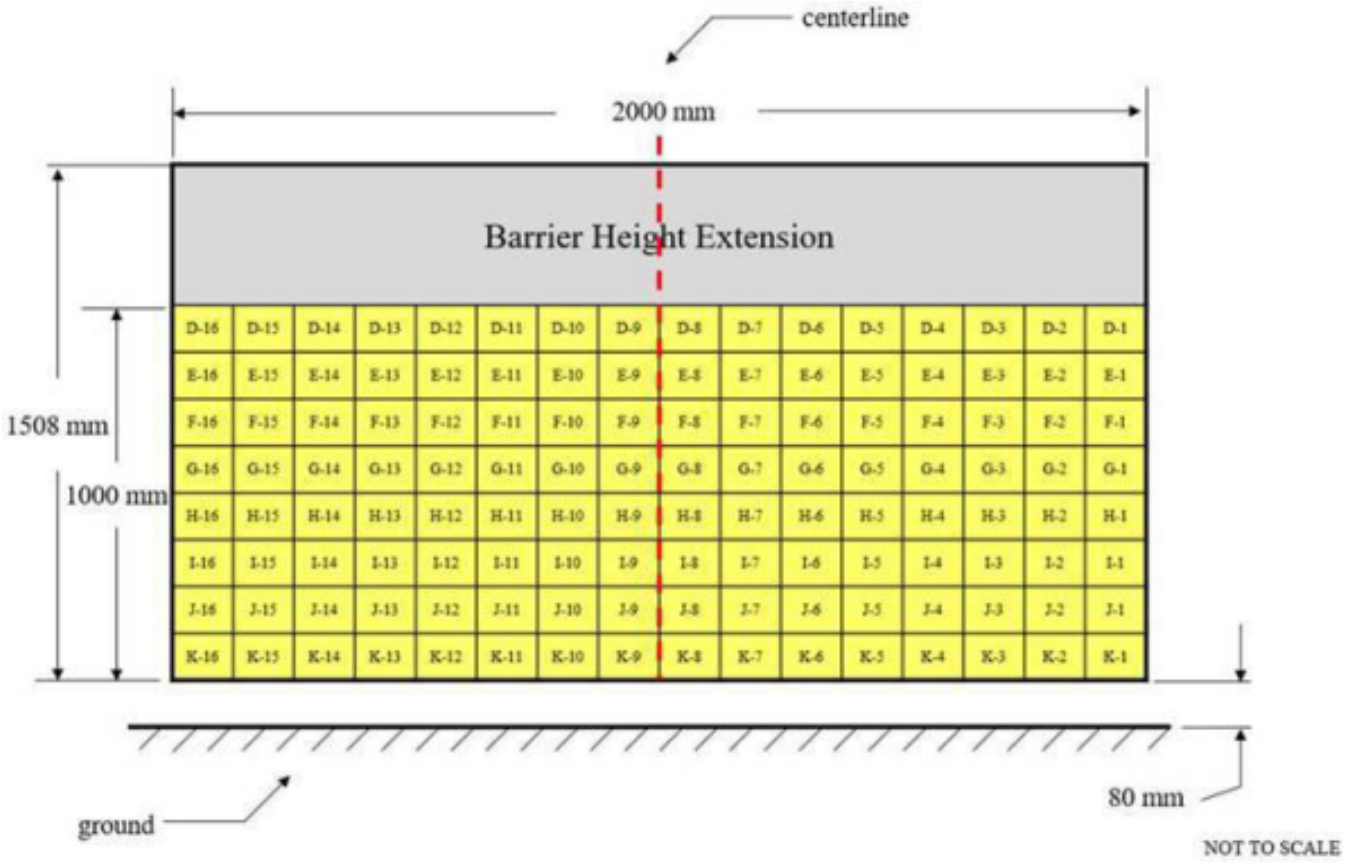


Figure 1 - Load Cell Locations on a 128-Load Cell Barrier with Plywood Height Extension*
Please note above diagram is not actual representation of load cell barrier used.

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

INSTRUMENTATION

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

CAMERA COVERAGE

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

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2024 KIA EV9 5 Door SUV NHTSA No.: O20244219
Test Program: NCAP Frontal Barrier Impact Test Test Date: 08/28/2024

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

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

DOOR OPENING AND SEAT TRACK INFORMATION

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracks throughout
Window Damage	None
Other	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1441
Center	mm	1442
Right Side	mm	1444
Average	mm	1442

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

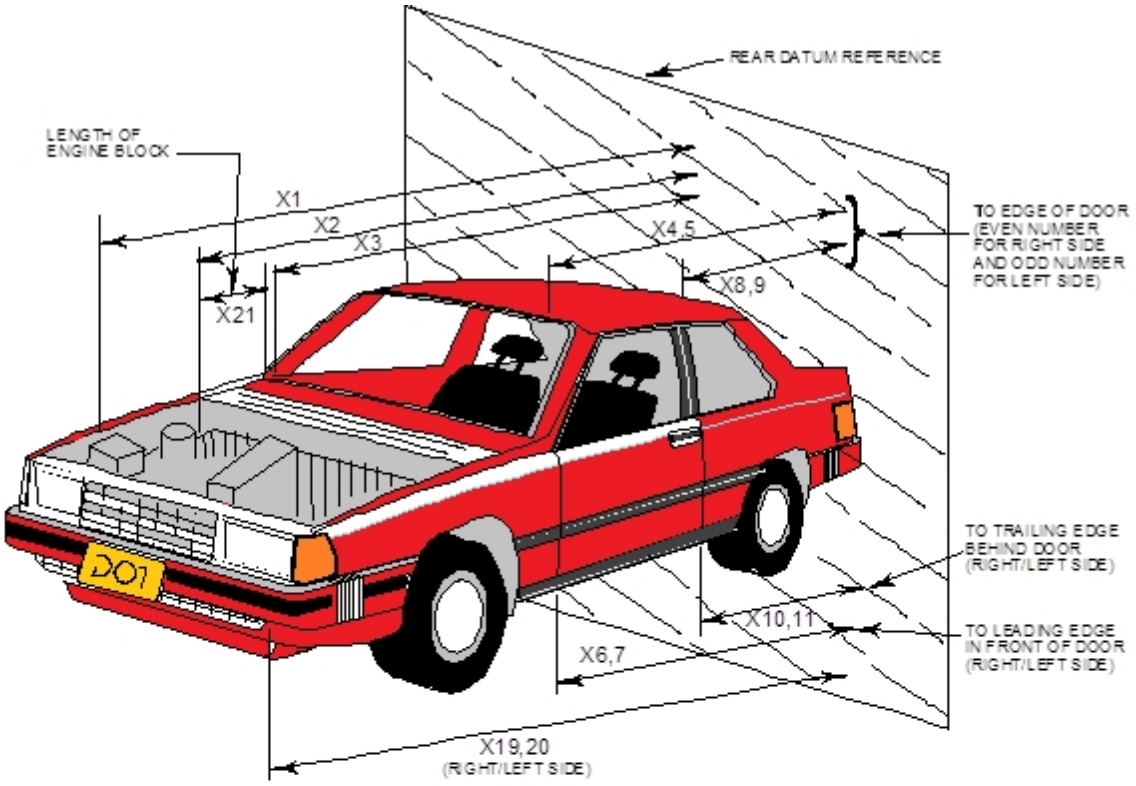
Test Vehicle: 2024 KIA EV9 5 Door SUV NHTSA No.: O20244219
Test Program: NCAP Frontal Barrier Impact Test Test Date: 08/28/2024

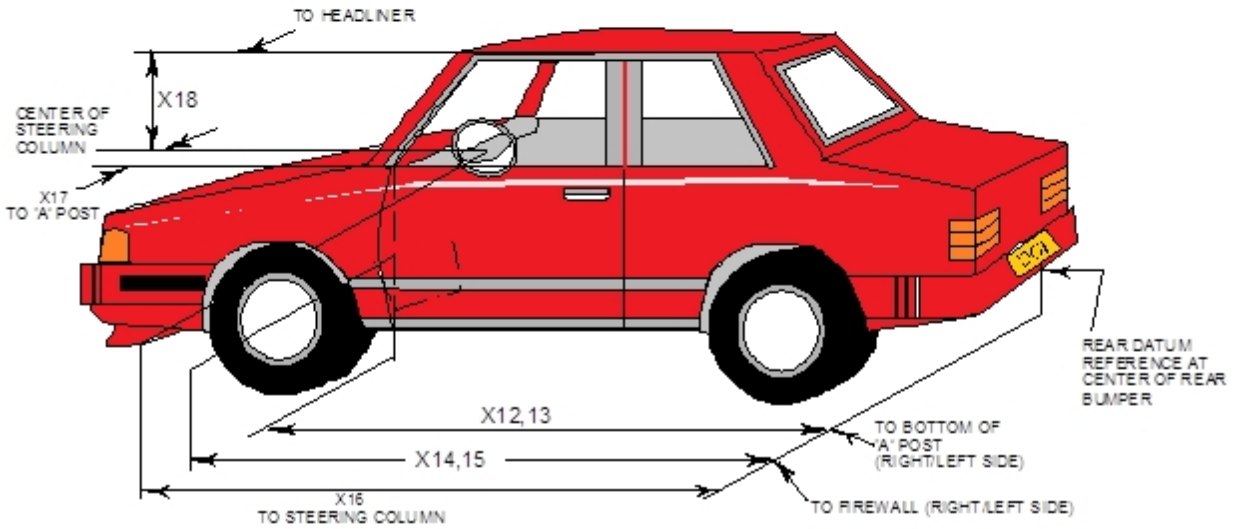
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024





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

Test Vehicle: 2024 KIA EV9 5 Door SUV NHTSA No.: O20244219
Test Program: NCAP Frontal Barrier Impact Test Test Date: 08/28/2024

No.	Measurement Description	Pre-Test	Post-Test	Change
1	Total Length of Vehicle at Centerline	5009	4367	-642
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4366	4081	-285
3	RSOV to Firewall	4087	4074	-13
4	RSOV to Upper Leading Edge of Right Door	3551	3551	0
5	RSOV to Upper Leading Edge of Left Door	3552	3547	-5
6	RSOV to Lower Leading Edge of Right Door	3562	3559	-3
7	RSOV to Lower Leading Edge of Left Door	3563	3558	-5
8	RSOV to Upper Trailing Edge of Right Door	2456	2456	0
9	RSOV to Upper Trailing Edge of Left Door	2458	2458	0
10	RSOV to Lower Trailing Edge of Right Door	2497	2493	-4
11	RSOV to Lower Trailing Edge of Left Door	2498	2493	-5
12	RSOV to Bottom of “A” Post of Right Side	3523	3523	0
13	RSOV to Bottom of “A” Post of Left Side	3525	3525	0
14	RSOV to Firewall, Right Side	3948	3930	-18
15	RSOV to Firewall, Left Side	3950	3944	-6
16	RSOV to Steering Column	3127	3176	49
17	Center of Steering Column to “A” Post	291	293	2
18	Center of Steering Column to Headliner	428	451	23
19	RSOV to Right Side of Front Bumper	4972	4423	-549
20	RSOV to Left Side of Front Bumper	4972	4458	-514
21	Length of Engine Block	207	207	0
RD	RSOV to Right Side of Dash Panel	3382	3383	1
CD	RSOV to Center of Dash Panel	3431	3429	-2
LD	RSOV to Left Side of Dash Panel	3381	3381	0

All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

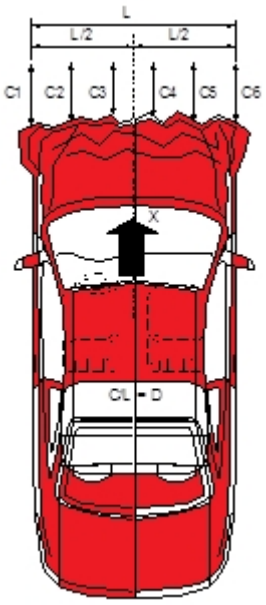
Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

VEHICLE INFORMATION

VIN:	KNDAFFS56R6037224	Wheelbase (mm):	3106
Vehicle Size Category:	MPV	Test Weight (kg):	2832

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):	56.34
Velocity Change (km/h):	68.580
Time of Separation (ms):	139



CRUSH PROFILE

Collision Deformation Classification:	12FDEW3
Midpoint of Damage:	C4
Damage Region Length (mm):	1709
Impact Mode:	Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Crush
C1	Crush Zone 1 at Left Side	mm	4822	4431	391
C2	Crush Zone 2 at Left Side	mm	4973	4399	574
C3	Crush Zone 3 at Left Side	mm	5005	4388	617
C4	Crush Zone 4 at Right Side	mm	5006	4387	619
C5	Crush Zone 5 at Right Side	mm	4973	4403	570
C6	Crush Zone 6 at Right Side	mm	4824	4356	468
L	C1 to C6	mm	1636	1709	-73

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

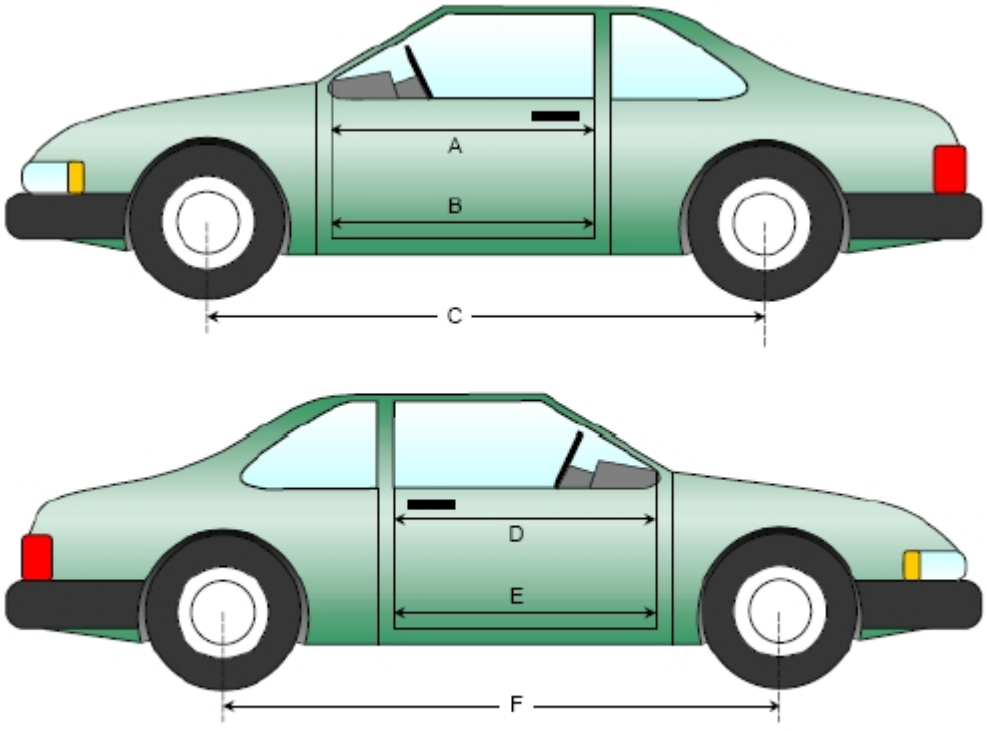
Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Change
A	Left Side Upper	mm	991	991	0
B	Left Side Lower	mm	887	887	0
D	Right Side Upper	mm	992	992	0
E	Right Side Lower	mm	886	885	-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Change
C	Left Side Wheelbase	mm	3106	2979	-127
F	Right Side Wheelbase	mm	3106	2925	-181



Left & Right Side Views

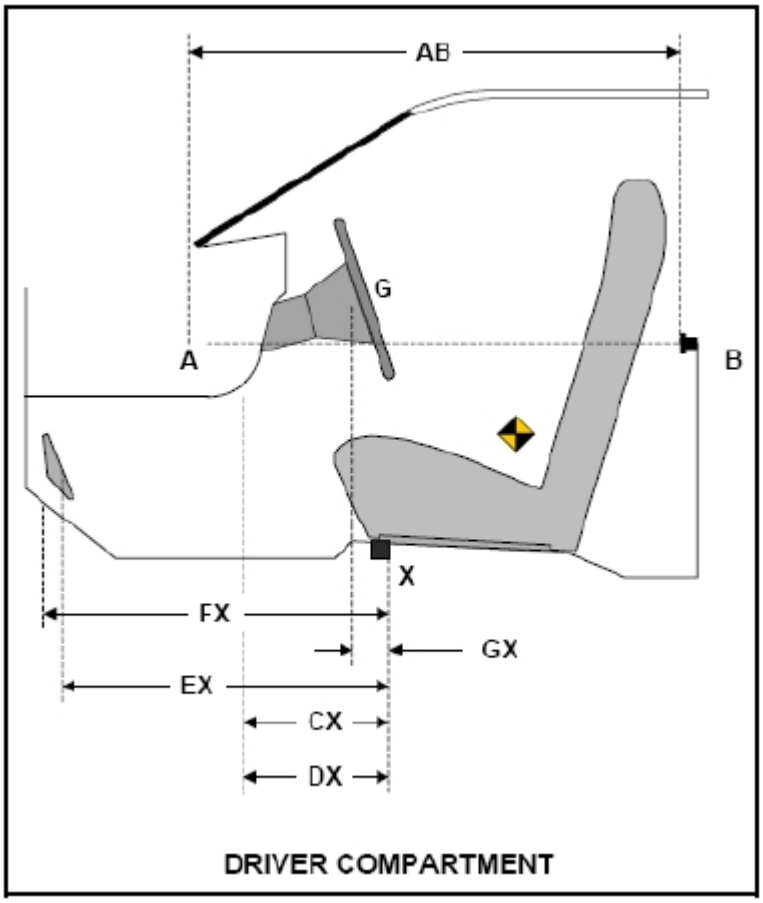
DATA SHEET NO.14 … (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Change
AB	Door Opening (Inside Window Jam)	mm	778	780	2
CX	Left Knee Bolster to X	mm	245	245	0
DX	Right Knee Bolster to X	mm	240	239	-1
EX	Brake Pedal to X	mm	481	446	-35
FX	Foot Rest to X	mm	477	473	-4
GX	Center of Steering Column Wheel Hub to X	mm	-13	36	49

X = Front of Seat Track (Stationary)



DRIVER COMPARTMENT

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

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

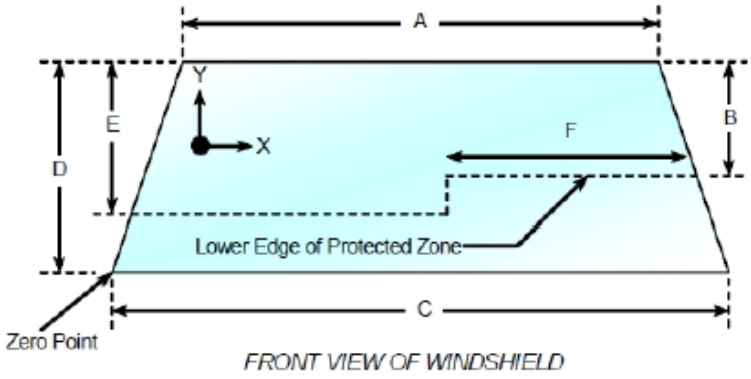
Windshield Mounting Details: A trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2312	2312	100
Right Side	2312	2312	100
Total	4624	4624	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1373
B	mm	540
C	mm	1531
D	mm	860
E	mm	550
F	mm	420

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 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21°C Test Time: 10:35 AM

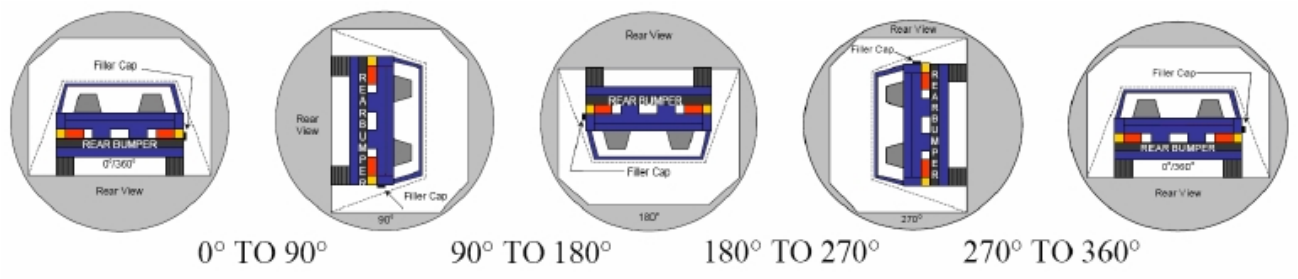
STODDARD SOLVENT SPILLAGE MEASUREMENTS

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 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024



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

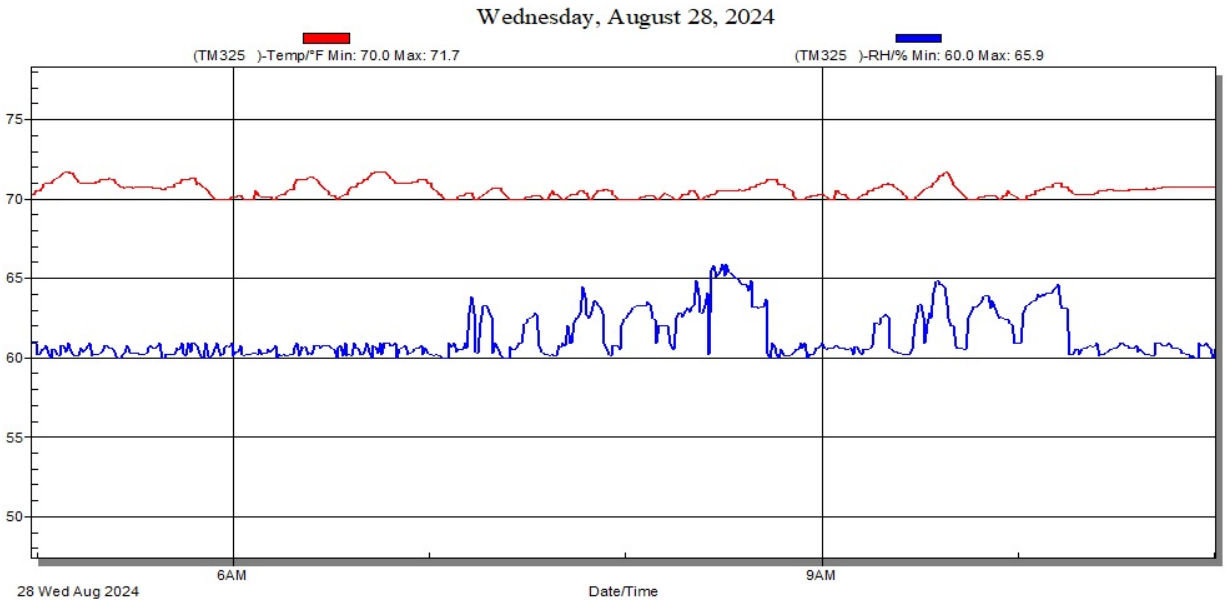
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°				
90° to 180°				
180° to 270°				
270° to 360°				

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 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024



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

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

Test Vehicle: 2024 KIA EV9 5 Door SUV NHTSA No.: O20244219
Test Program: NCAP Frontal Barrier Impact Test Test Date: 08/28/2024

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Electric
Propulsion Battery Type	Lithium-Ion
Nominal Voltage (Volts)	552
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Inside of propulsion battery
Auxiliary Battery Type	Lead-Acid

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	LiPF6 Salt, Carbonate Solvent
Electrolyte Fluid Specific Gravity	1.21 g/cm3
Electrolyte Fluid Kinematic Viscosity (centistokes)	3.87 cP @25C
Electrolyte Fluid Color	Transparent & Pale Yellow
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Applied Water Cooled/Pink
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	OUtside Passenger Compartment

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	380
Maximum State of Charge	V	654
95% of Maximum	V	621.3
Test Voltage *	V	624.0
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 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

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

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Vehicle chassis
Details of Propulsion Battery Components	HV battery main cable is located at the rear side of the battery pack

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

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024

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		06/20/2024

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	380-654
Propulsion Battery Voltage: (ready to drive position)	V_b	V	624.0
Propulsion Battery to Vehicle Chassis	V_1	V	422.0
Propulsion Battery to Vehicle Chassis	V_2	V	386.0
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	400,000
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	93.0
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	93.3
$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$	R_{i1}	Ω	2,709,392
$R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$	R_{i2}	Ω	2,626,789
Lesser value of R_{i1} and R_{i2}	R_i	Ω	2,626,789
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	4,210

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

NOTES:

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

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

Test Vehicle: 2024 KIA EV9 5 Door SUV NHTSA No.: O20244219
Test Program: NCAP Frontal Barrier Impact Test Test Date: 08/28/2024

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		06/20/2024

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 =	2.2	V	Time:	2	Minutes	15	Seconds
V_1 =	1.5	V	Time:	2	Minutes	23	Seconds
V_2 =	0.1	V	Time:	2	Minutes	29	Seconds
R_o =	400,000	Ω					
V_1' =	0.9	V	Time:	2	Minutes	35	Seconds
V_2' =	0.0	Ω	Time:	2	Minutes	42	Seconds
R_{i1} =	284,444	Ω	Time:	2	Minutes	35	Seconds
R_{i2} =	Zero Volts	Ω	Time:	2	Minutes	42	Seconds
R_i =	284,444	Ω/V	Time:	2	Minutes	35	Seconds
R_i/V_b =	129,293	Ω/V	Time:	2	Minutes	35	Seconds

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

NOTES:

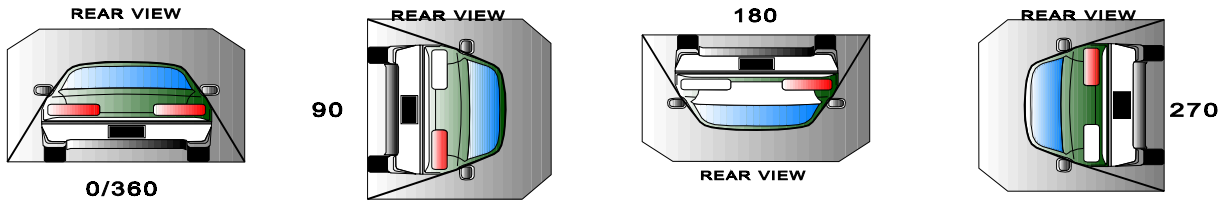
- *R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1'], R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2'], R_i = Lesser value of R_{i1} and R_{i2}*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*
- *Minimum Electrical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

PROPULSION BATTERY SYSTEM COMPONENTS

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

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

Test Vehicle:	2024 KIA EV9 5 Door SUV	NHTSA No.:	O20244219
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	08/28/2024



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	10	5	6	10	7
90° to 180°	1	3	5	6	3	7
180° to 270°	1	2	5	6	2	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	None
90° to 180°	0	Liters	None
180° to 270°	0	Liters	None
270° to 360°	0	Liters	None
Total Spillage	0	Liters	None

** 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.		58100115
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		06/20/2024

NOTES:

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

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

Test Vehicle: 2024 KIA EV9 5 Door SUV NHTSA No.: O20244219
Test Program: NCAP Frontal Barrier Impact Test Test Date: 08/28/2024

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units	Ro=200,500 Ω	Minutes	Seconds
V_b =	90°	0.0	V	Time:	6	8
	180°	0.0	V		10	21
	270°	0.0	V		20	15
	360°	0.0	V		25	31
V_1 =	90°	0.0	V	Time:	6	16
	180°	0.0	V		10	38
	270°	0.0	V		20	20
	360°	0.0	V		25	43
V_2 =	90°	0.0	V	Time:	6	20
	180°	0.0	V		10	45
	270°	0.0	V		20	25
	360°	0.0	V		25	51
V_1' =	90°	0.0	V	Time:	6	23
	180°	0.0	V		10	48
	270°	0.0	V		20	28
	360°	0.0	V		25	55
V_2' =	90°	0.0	Ω	Time:	6	27
	180°	0.0	Ω		10	51
	270°	0.0	Ω		20	30
	360°	0.0	Ω		25	59
R_{i1} =	90°	Zero Volts	Ω	Time:	6	23
	180°	Zero Volts	Ω		10	48
	270°	Zero Volts	Ω		20	28
	360°	Zero Volts	Ω		25	55
R_{i2} =	90°	Zero Volts	Ω	Time:	6	27
	180°	Zero Volts	Ω		10	51
	270°	Zero Volts	Ω		20	30
	360°	Zero Volts	Ω		25	59
R_i =	90°	Zero Volts	Ω/V	Time:	6	27
	180°	Zero Volts	Ω/V		10	51
	270°	Zero Volts	Ω/V		20	30
	360°	Zero Volts	Ω/V		25	59
R_i/V_b =	90°	Zero Volts	Ω/V	Time:	6	27
	180°	Zero Volts	Ω/V		10	51
	270°	Zero Volts	Ω/V		20	30
	360°	Zero Volts	Ω/V		25	59

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

APPENDIX A

PHOTOGRAPHS

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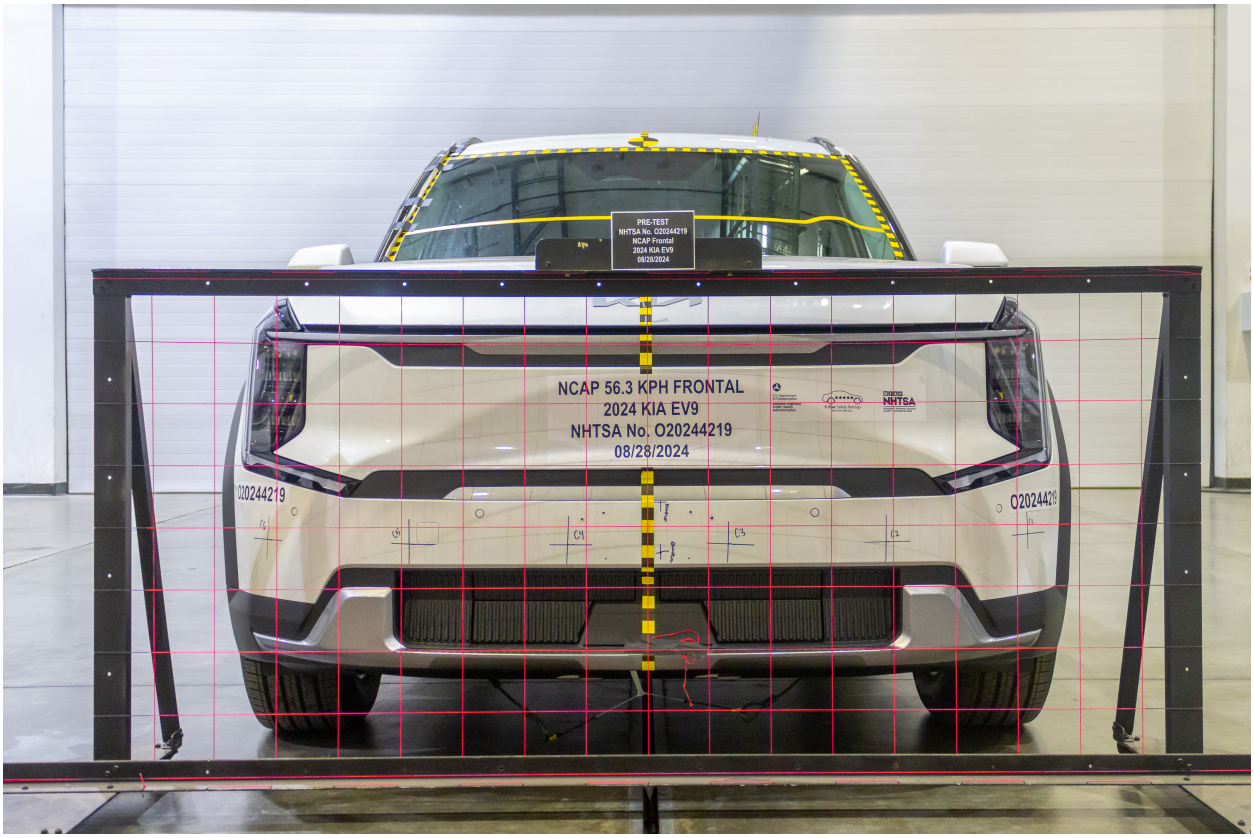


Figure A-1: Load Cell Location



Figure A-2: Pre-Test Load Cell Wall



Figure A-3: Post-Test Load Cell Wall

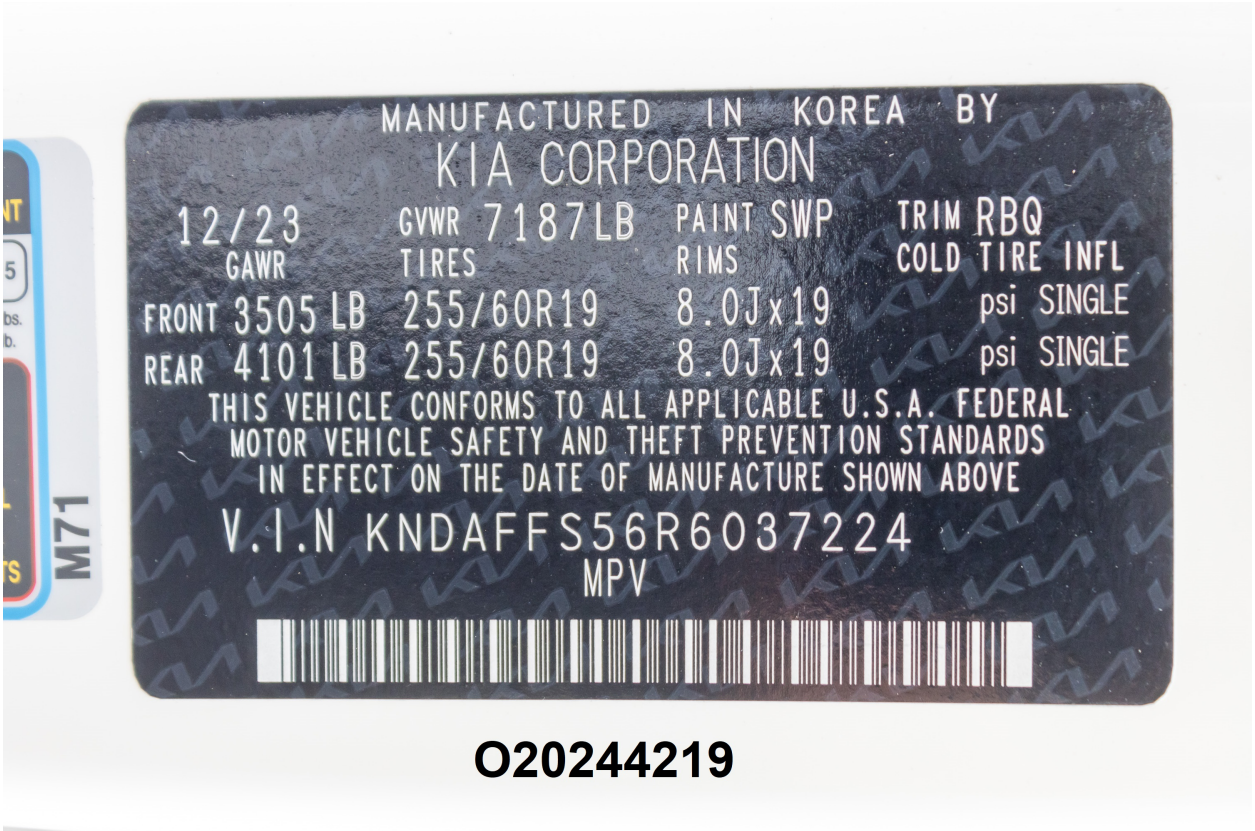


Figure A-4: Manufacturer's Label

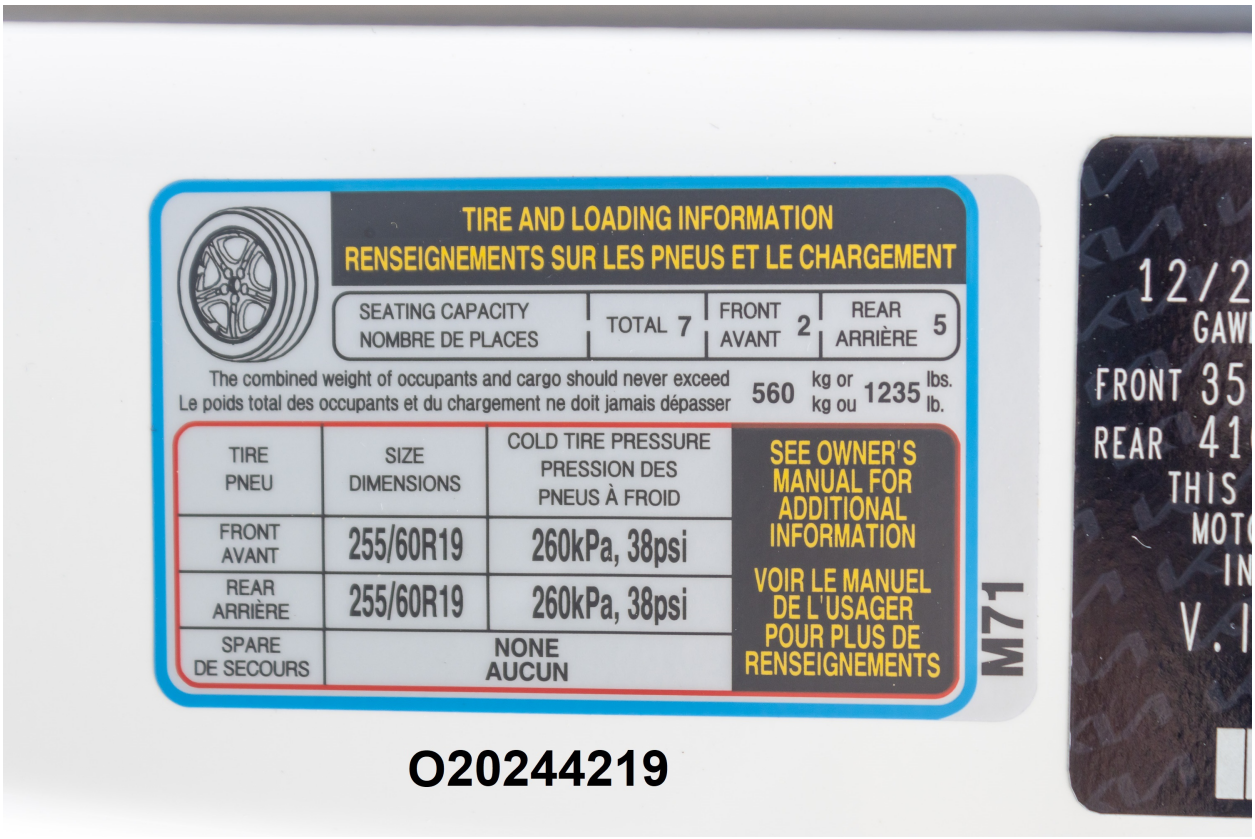


Figure A-5: Tire Placard



Figure A-6: 2024 KIA EV9 Frontal As Delivered



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

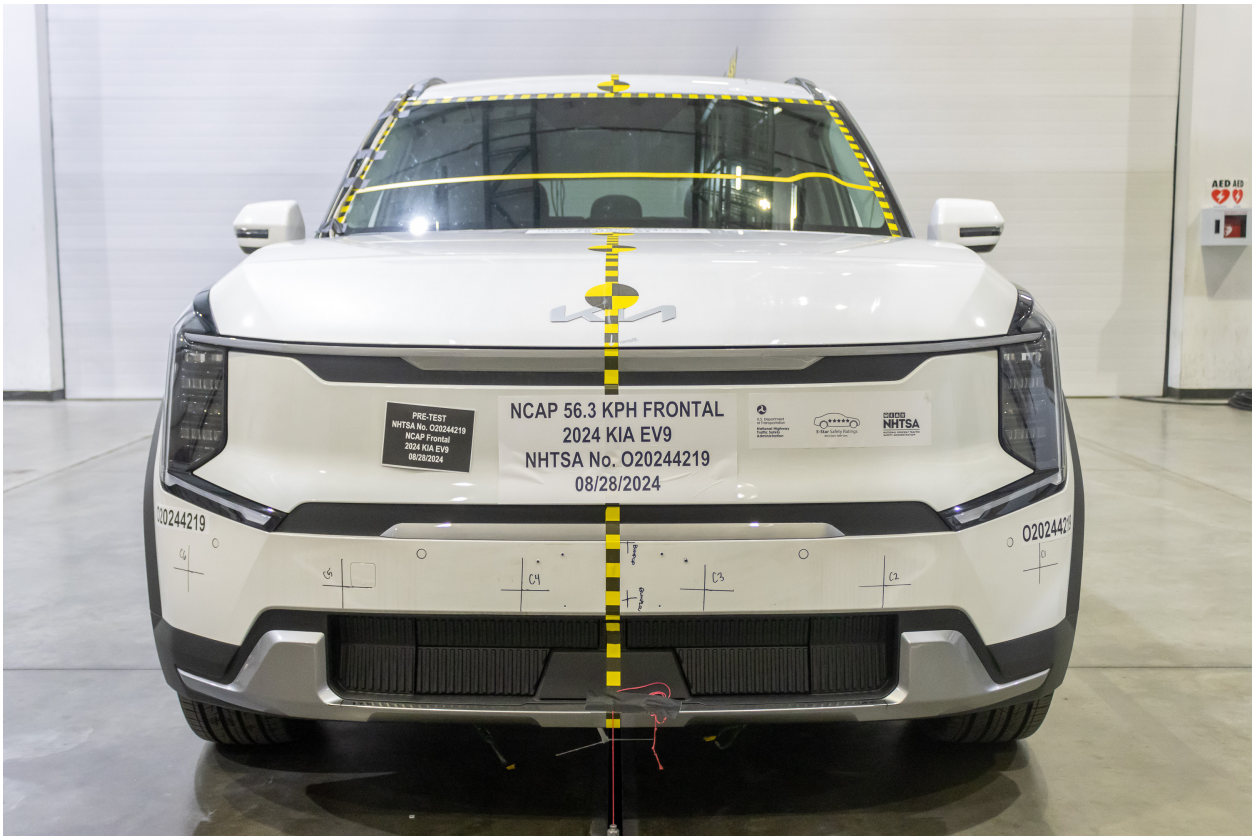


Figure A-8: Pre-Test Front View of Test Vehicle



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

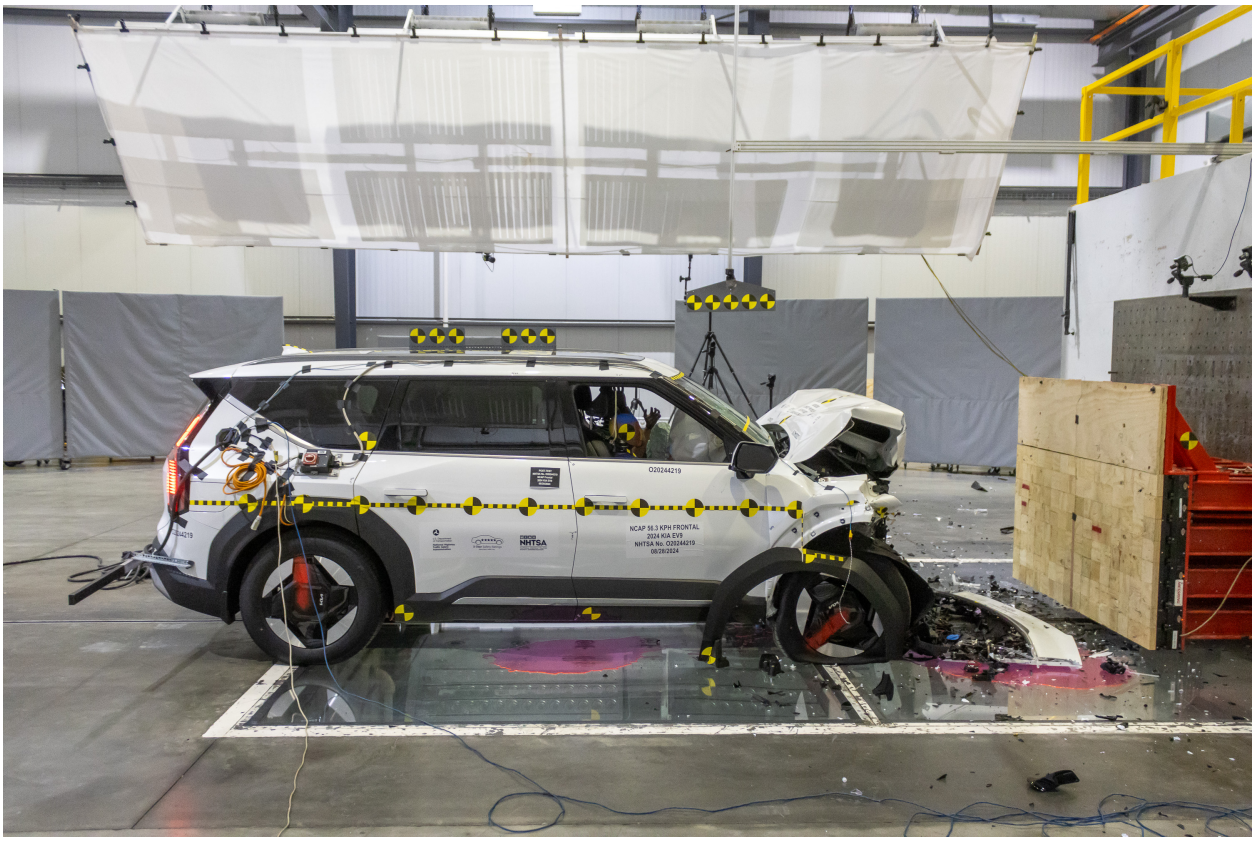


Figure A-13: Post-Test Right View of Test Vehicle



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

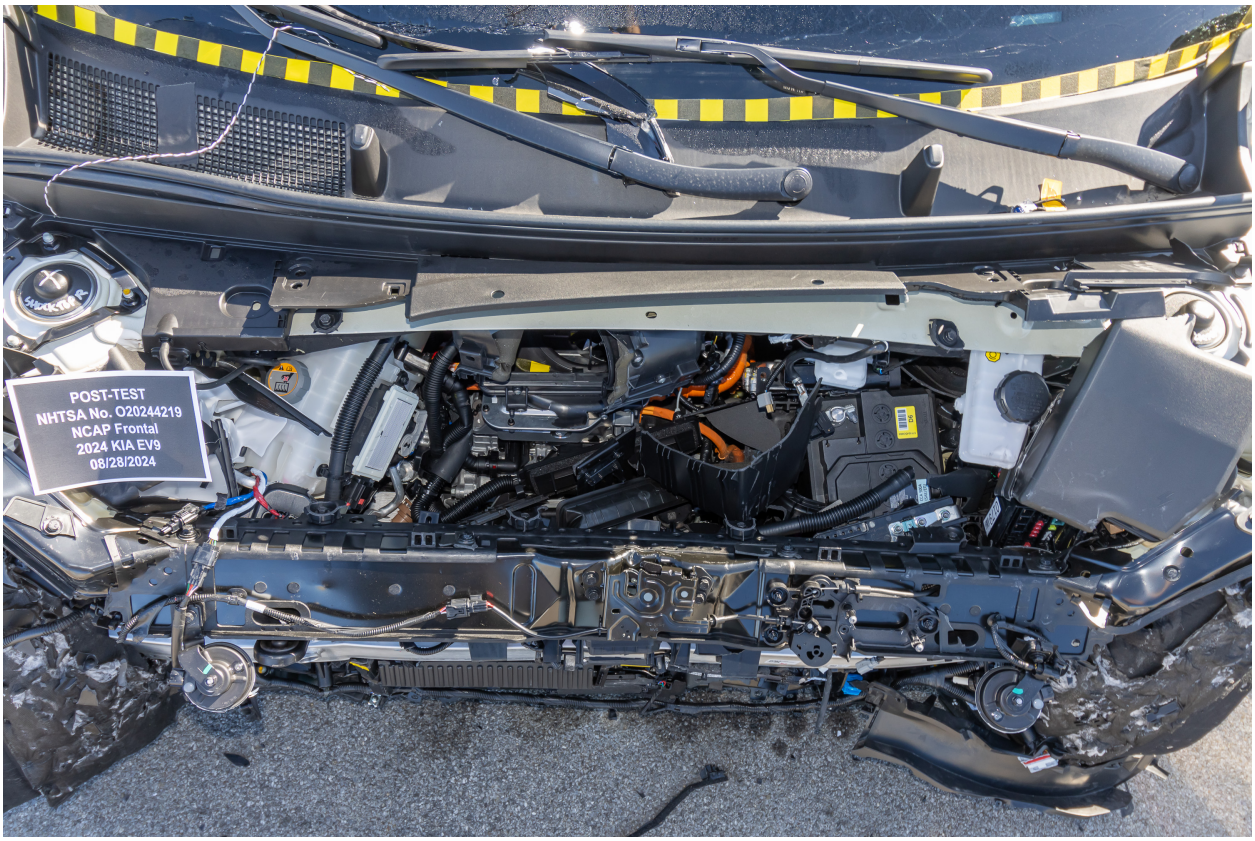


Figure A-21: Post-Test Engine Compartment View



Figure A-22: Pre-Test Charge Port View



Figure A-23: Post-Test Charge Port View

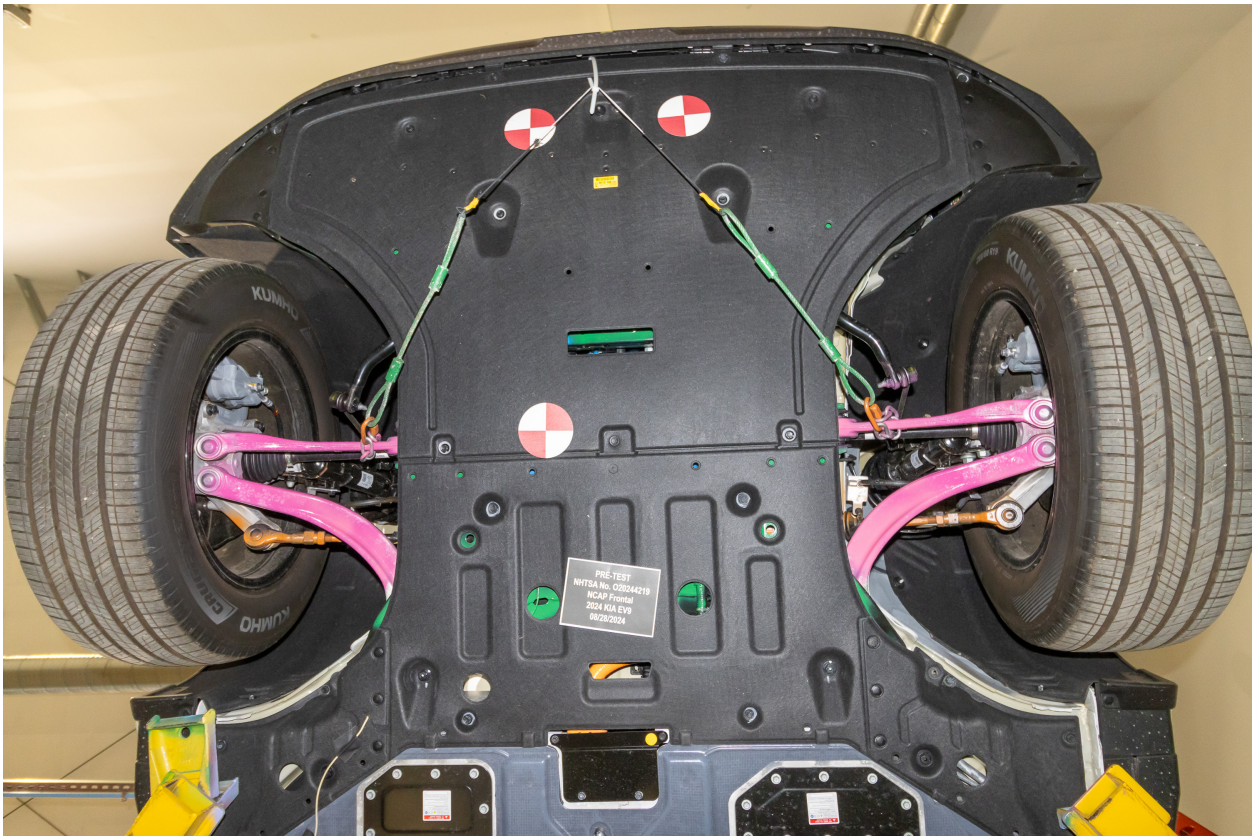


Figure A-24: Pre-Test Front Underbody View



Figure A-25: Post-Test Front Underbody View

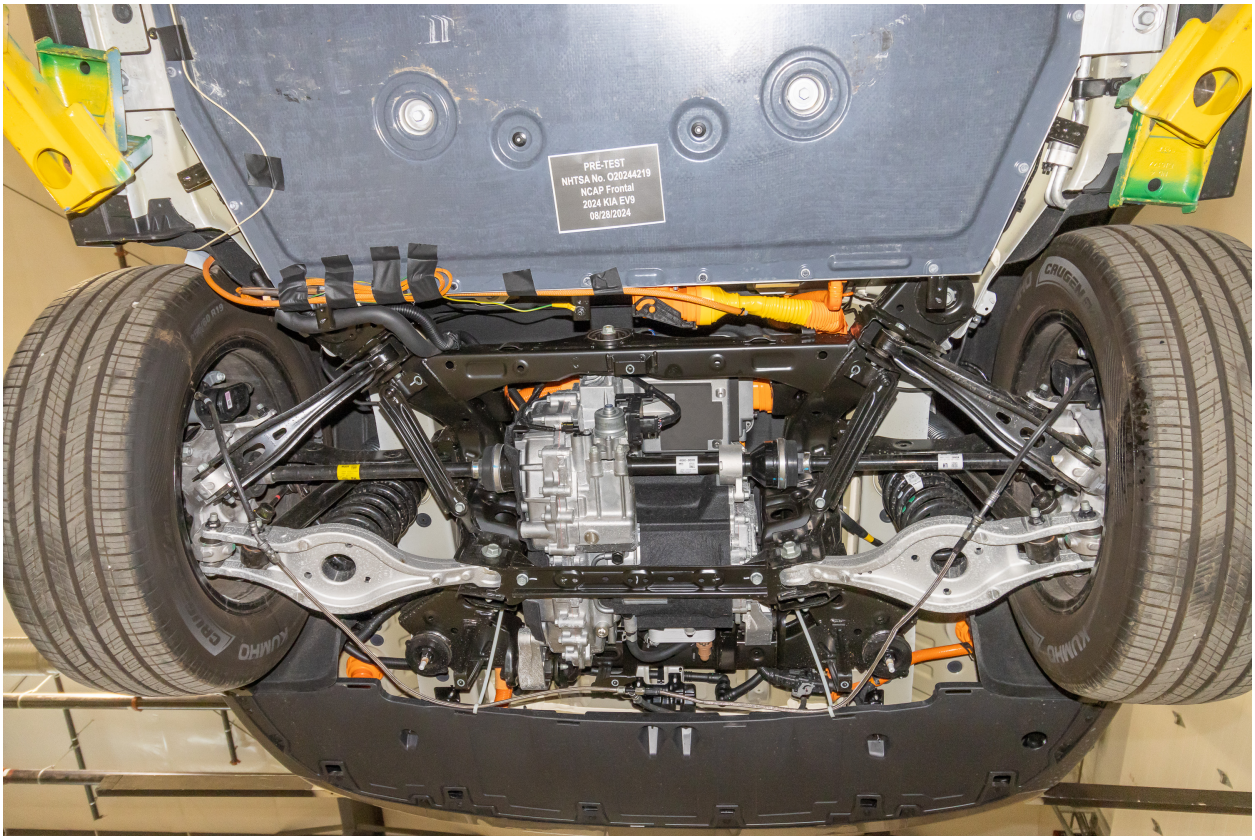


Figure A-26: Pre-Test Rear Underbody View

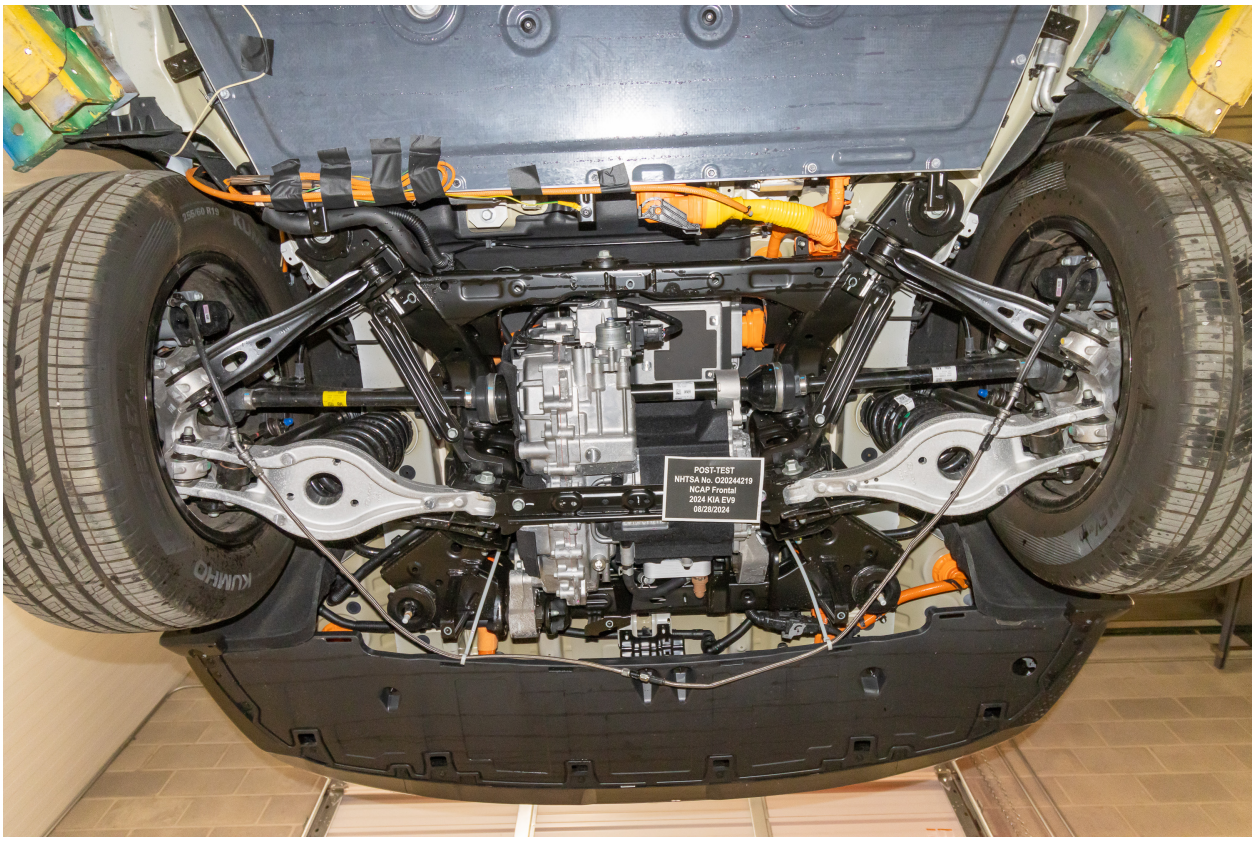


Figure A-27: Post-Test Rear Underbody View



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

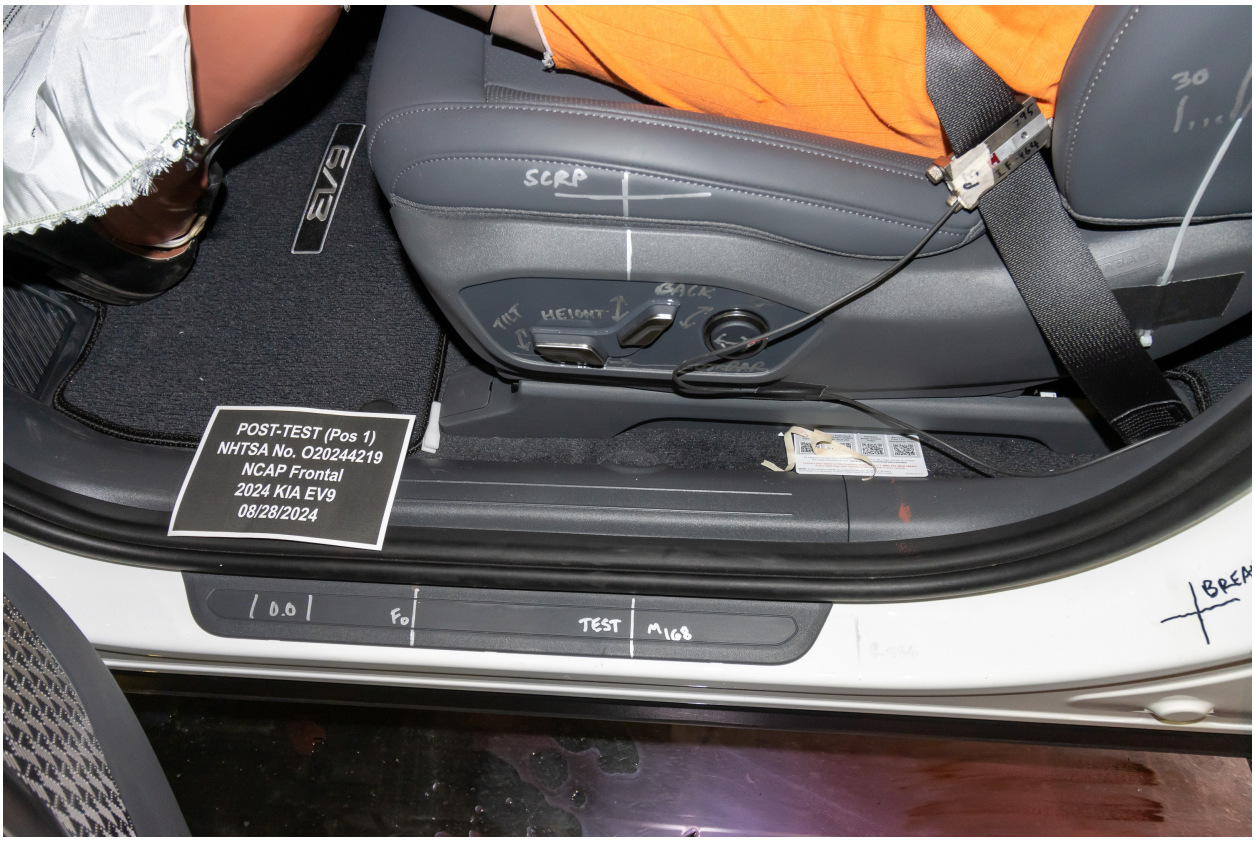


Figure A-37: Post-Test Driver's Seat Fore-Aft Markings



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

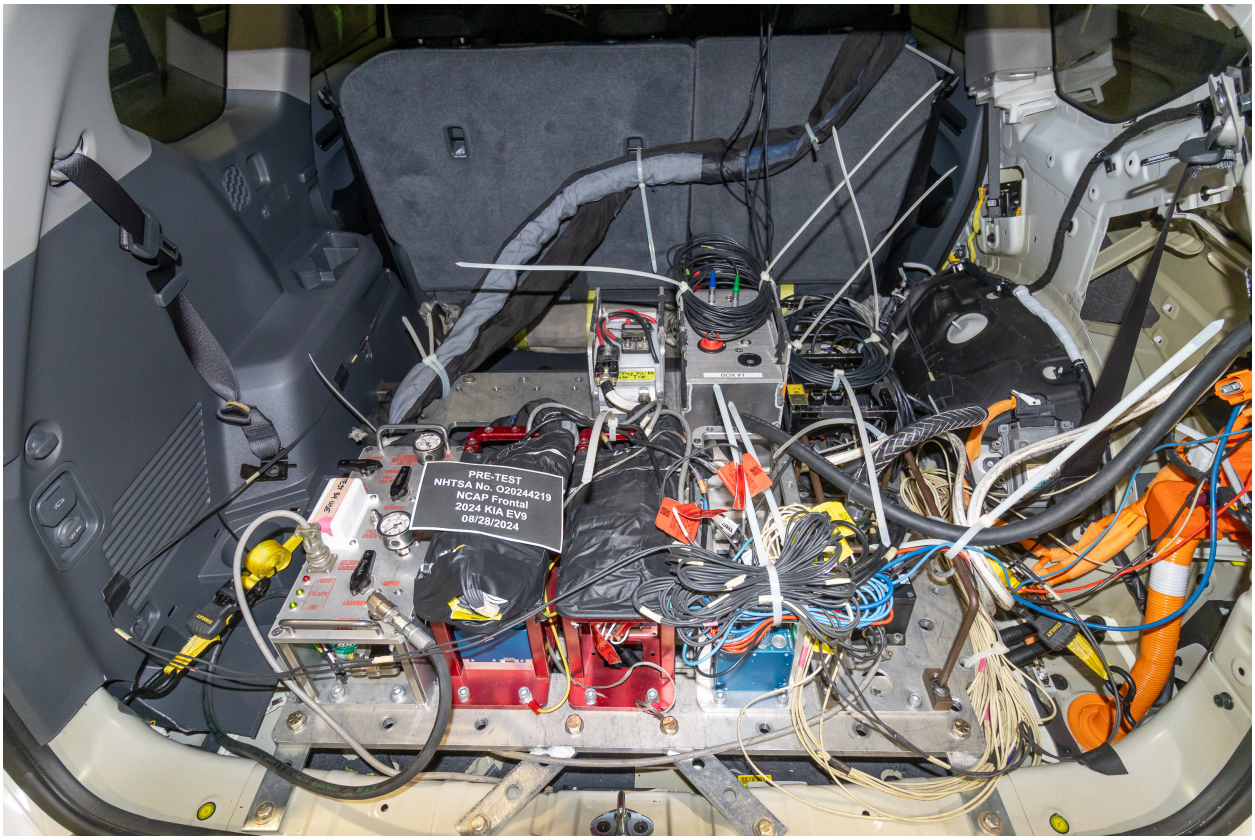


Figure A-74: Photograph of Ballast Installed in Vehicle

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

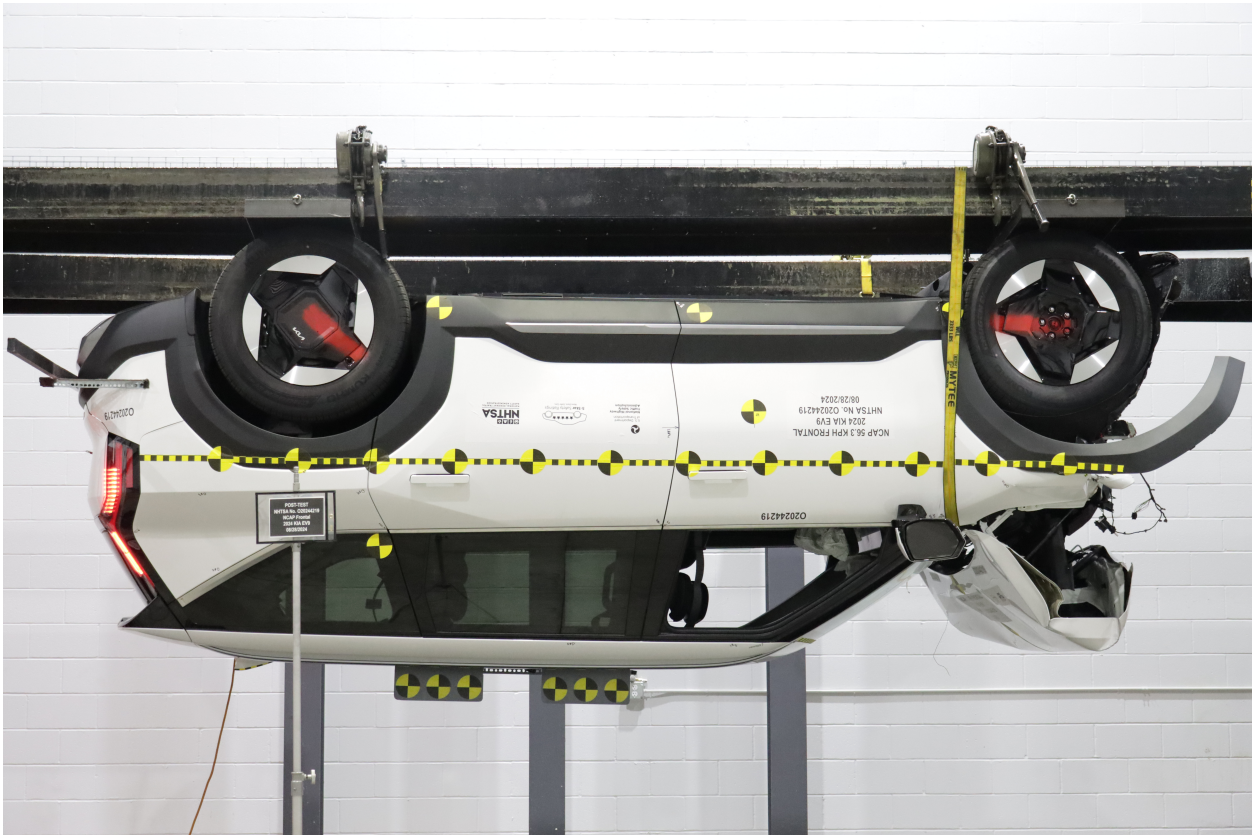


Figure A-79: Vehicle at 180º on Static Rollover Device

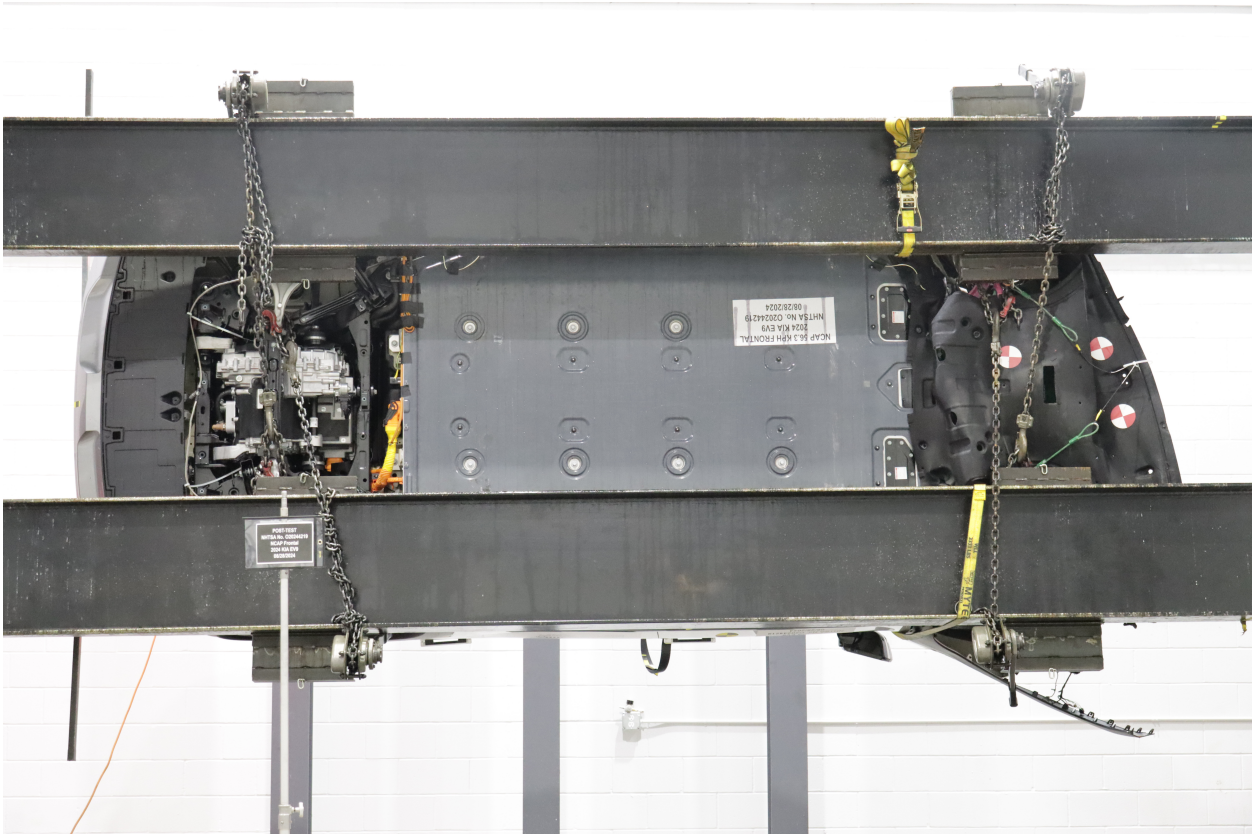


Figure A-80: Vehicle at 270º on Static Rollover Device



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

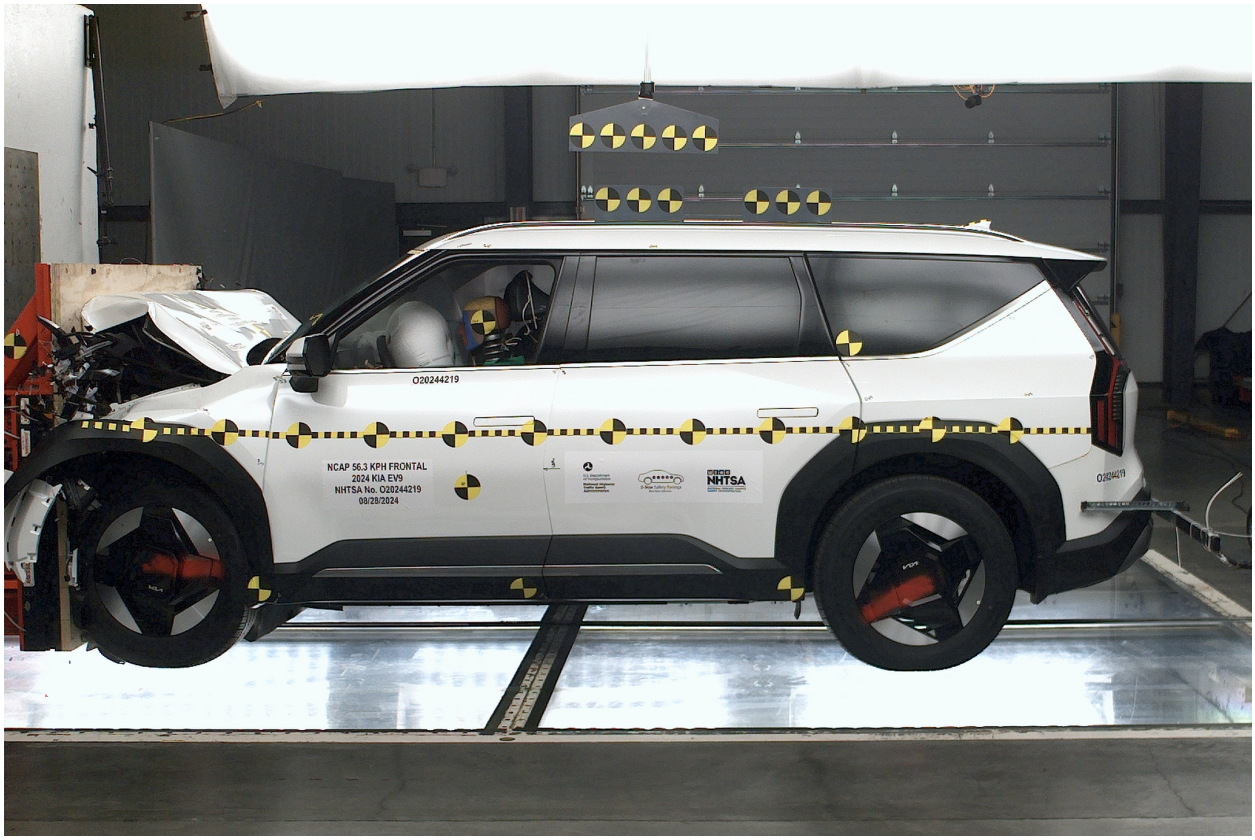
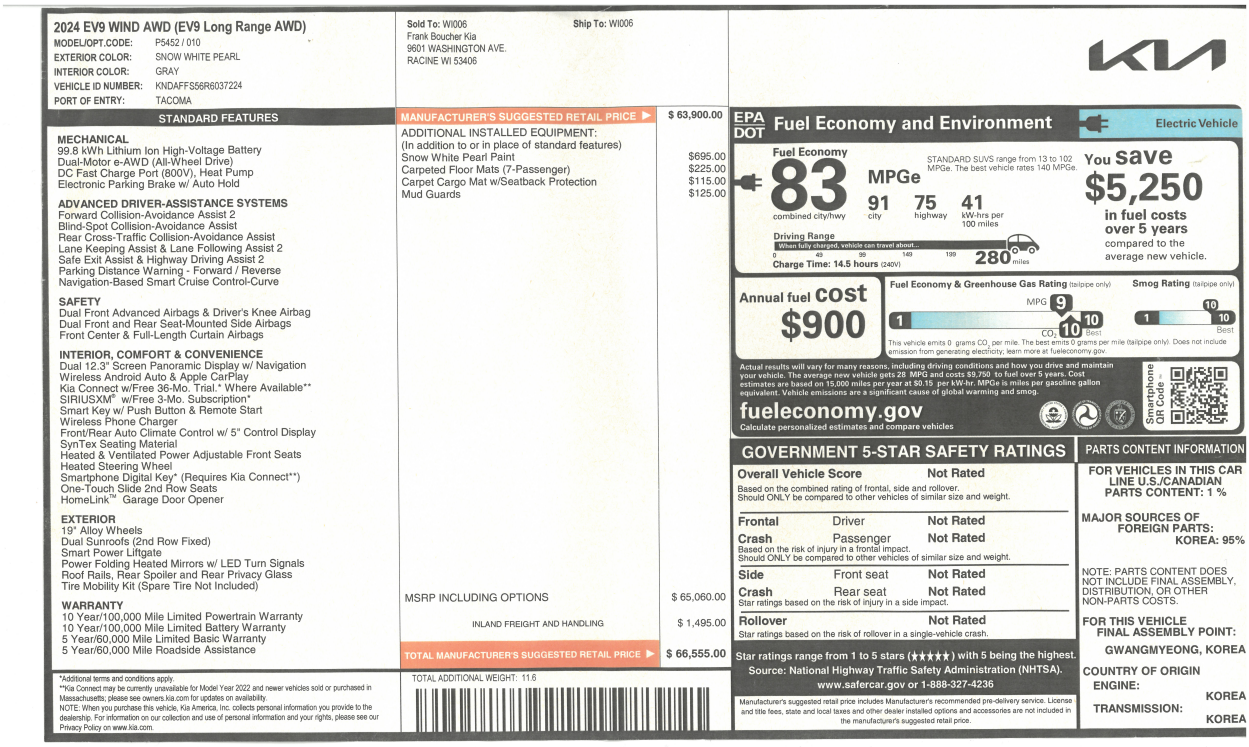


Figure A-82: 2024 KIA EV9 Frontal Impact Event



2024 EV9 WIND AWD (EV9 Long Range AWD)
MODEL/OPT.CODE: P5452 / 010
EXTERIOR COLOR: SNOW WHITE PEARL
INTERIOR COLOR: GRAY
VEHICLE ID NUMBER: KNDAFFS56R6037224
PORT OF ENTRY: TACOMA

Sold To: WI006
Frank Boucher Kia
9601 WASHINGTON AVE.
RACINE WI 53406

Ship To: WI006

STANDARD FEATURES

MECHANICAL
99.8 kWh Lithium Ion High-Voltage Battery
Dual-Motor e-AWD (All-Wheel Drive)
DC Fast Charge Port (800V), Heat Pump
Electronic Parking Brake w/ Auto Hold

ADVANCED DRIVER-ASSISTANCE SYSTEMS
Forward Collision-Avoidance Assist 2
Blind-Spot Collision-Avoidance Assist
Rear Cross-Traffic Collision-Avoidance Assist
Lane Keeping Assist & Lane Following Assist 2
Safe Exit Assist & Highway Driving Assist 2
Parking Distance Warning - Forward / Reverse
Navigation-Based Smart Cruise Control-Curve

SAFETY
Dual Front Advanced Airbags & Driver's Knee Airbag
Dual Front and Rear Seat-Mounted Side Airbags
Front Center & Full-Length Curtain Airbags

INTERIOR, COMFORT & CONVENIENCE
Dual 12.3" Screen Panoramic Display w/ Navigation
Wireless Android Auto & Apple CarPlay
Kia Connect w/Free 36-Mo. Trial.* Where Available**
SIRIUSXM® w/Free 3-Mo. Subscription*
Smart Key w/ Push Button & Remote Start
Wireless Phone Charger
Front/Rear Auto Climate Control w/ 5" Control Display
SynTex Seating Material
Heated & Ventilated Power Adjustable Front Seats
Heated Steering Wheel
Smartphone Digital Key* (Requires Kia Connect**)
One-Touch Slide 2nd Row Seats
HomeLink™ Garage Door Opener

EXTERIOR
19" Alloy Wheels
Dual Sunroofs (2nd Row Fixed)
Smart Power Liftgate
Power Folding Heated Mirrors w/ LED Turn Signals
Roof Rails, Rear Spoiler and Rear Privacy Glass
Tire Mobility Kit (Spare Tire Not Included)

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

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

MANUFACTURER'S SUGGESTED RETAIL PRICE ▶	$ 63,900.00
ADDITIONAL INSTALLED EQUIPMENT: (In addition to or in place of standard features)	
Snow White Pearl Paint	$695.00
Carpeted Floor Mats (7-Passenger)	$225.00
Carpet Cargo Mat w/Seatback Protection	$115.00
Mud Guards	$125.00
MSRP INCLUDING OPTIONS	$ 65,060.00
INLAND FREIGHT AND HANDLING	$ 1,495.00
TOTAL MANUFACTURER'S SUGGESTED RETAIL PRICE ▶	$ 66,555.00

TOTAL ADDITIONAL WEIGHT: 11.6

EPA DOT Fuel Economy and Environment — Electric Vehicle

Fuel Economy: 83 MPGe combined city/hwy (91 city, 75 highway, 41 kW-hrs per 100 miles)
STANDARD SUVS range from 13 to 102 MPGe. The best vehicle rates 140 MPGe.
Driving Range: When fully charged, vehicle can travel about... 280 miles
Charge Time: 14.5 hours (240V)

You save $5,250 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost $900

Fuel Economy & Greenhouse Gas Rating (tailpipe only): MPG 9, CO2 10 Best
Smog Rating (tailpipe only): 10 Best
This vehicle emits 0 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Does not include emission from generating electricity, learn more at fueleconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 28 MPG and costs $9,750 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $0.15 per kW-hr. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of global warming and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score: Not Rated
Based on the combined rating of frontal, side and rollover.
Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash — Driver: Not Rated; Passenger: Not Rated
Based on the risk of injury in a frontal impact.
Should ONLY be compared to other vehicles of similar size and weight.

Side Crash — Front seat: Not Rated; Rear seat: Not Rated
Star ratings based on the risk of injury in a side impact.

Rollover: Not Rated
Star ratings based on the risk of rollover in a single-vehicle crash.

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

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

PARTS CONTENT INFORMATION

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

MAJOR SOURCES OF FOREIGN PARTS: KOREA: 95%

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

FOR THIS VEHICLE FINAL ASSEMBLY POINT: GWANGMYEONG, KOREA

COUNTRY OF ORIGIN
ENGINE: KOREA
TRANSMISSION: KOREA

Figure A-83: Monroney Label Photograph

Photo Not Available

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)

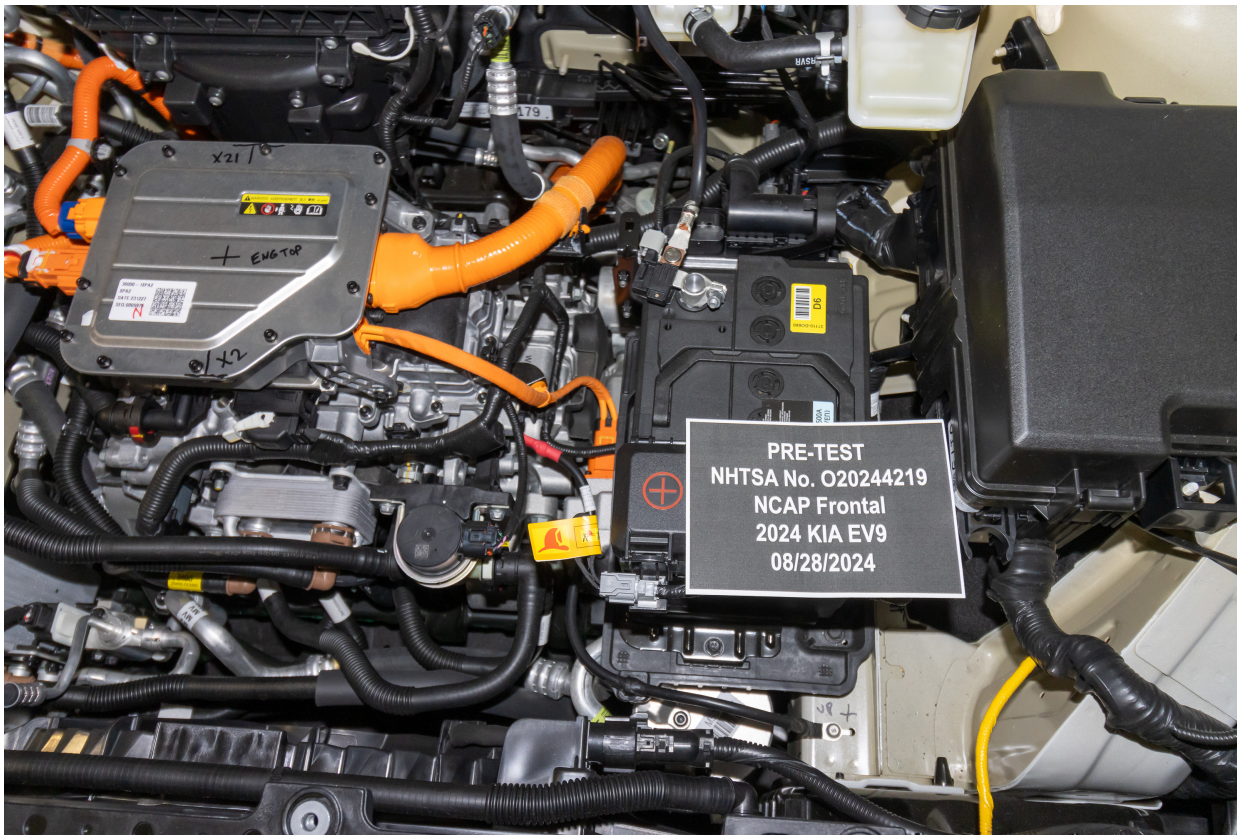


Figure 305-8: Manual High Voltage Service Disconnect Removed Location



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

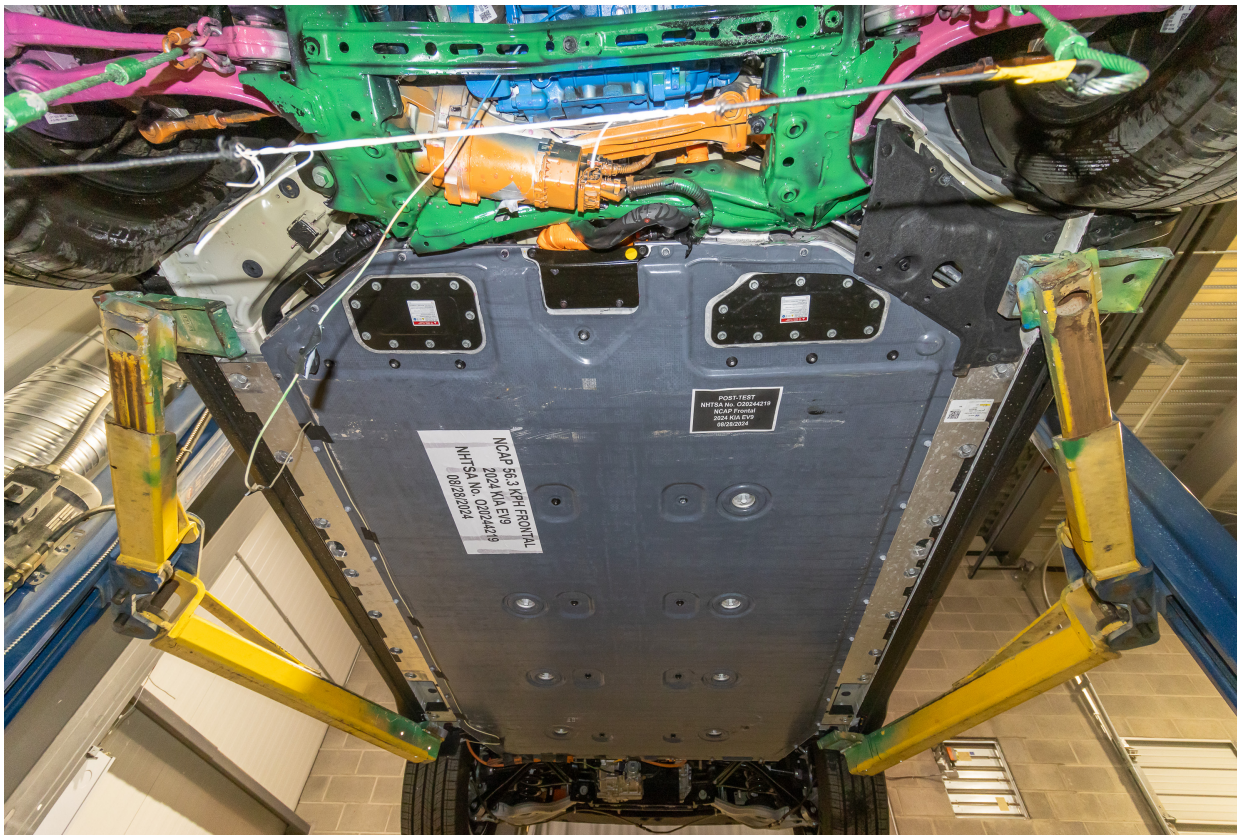


Figure 305-10: Post-Impact Front View of Propulsion Battery



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

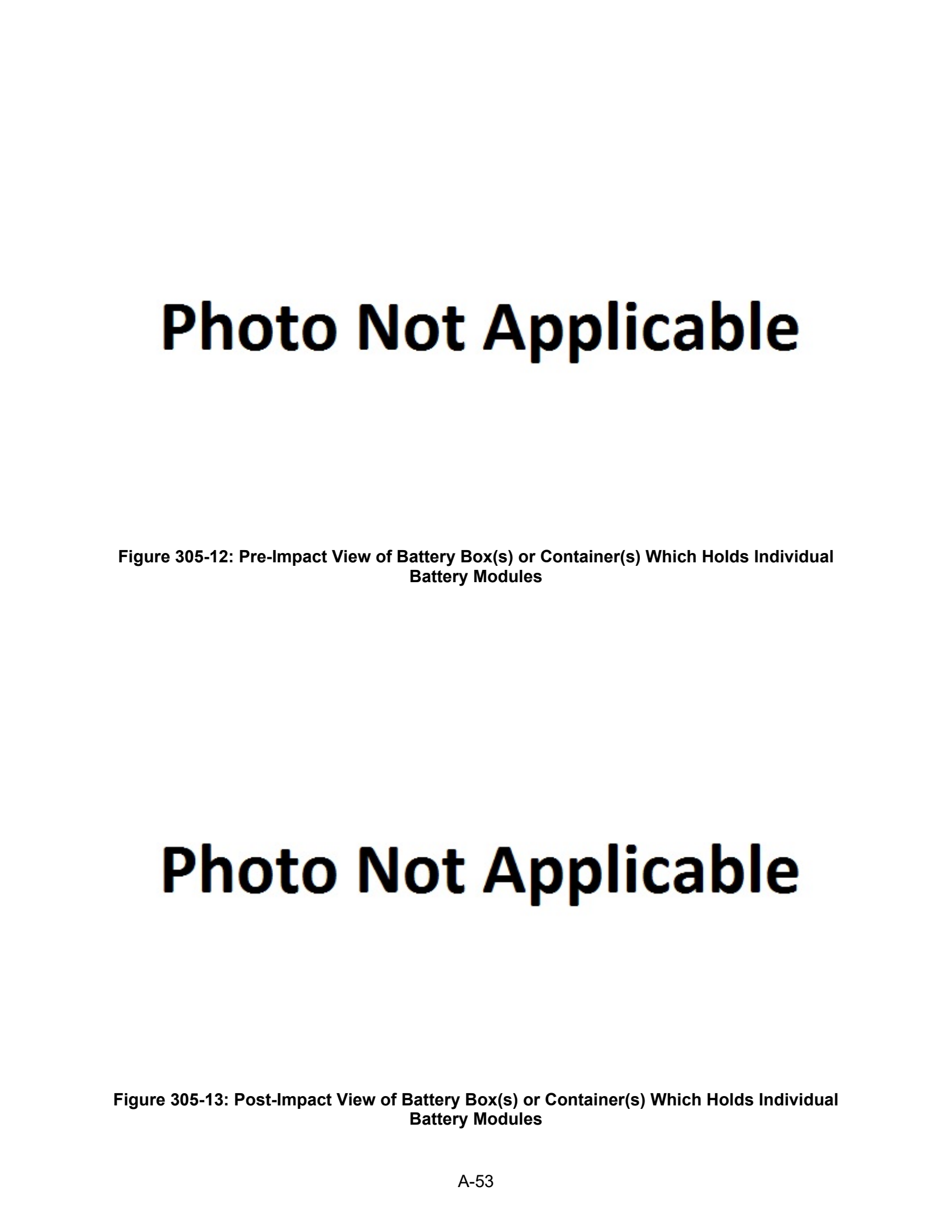


Figure 305-12: Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

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)

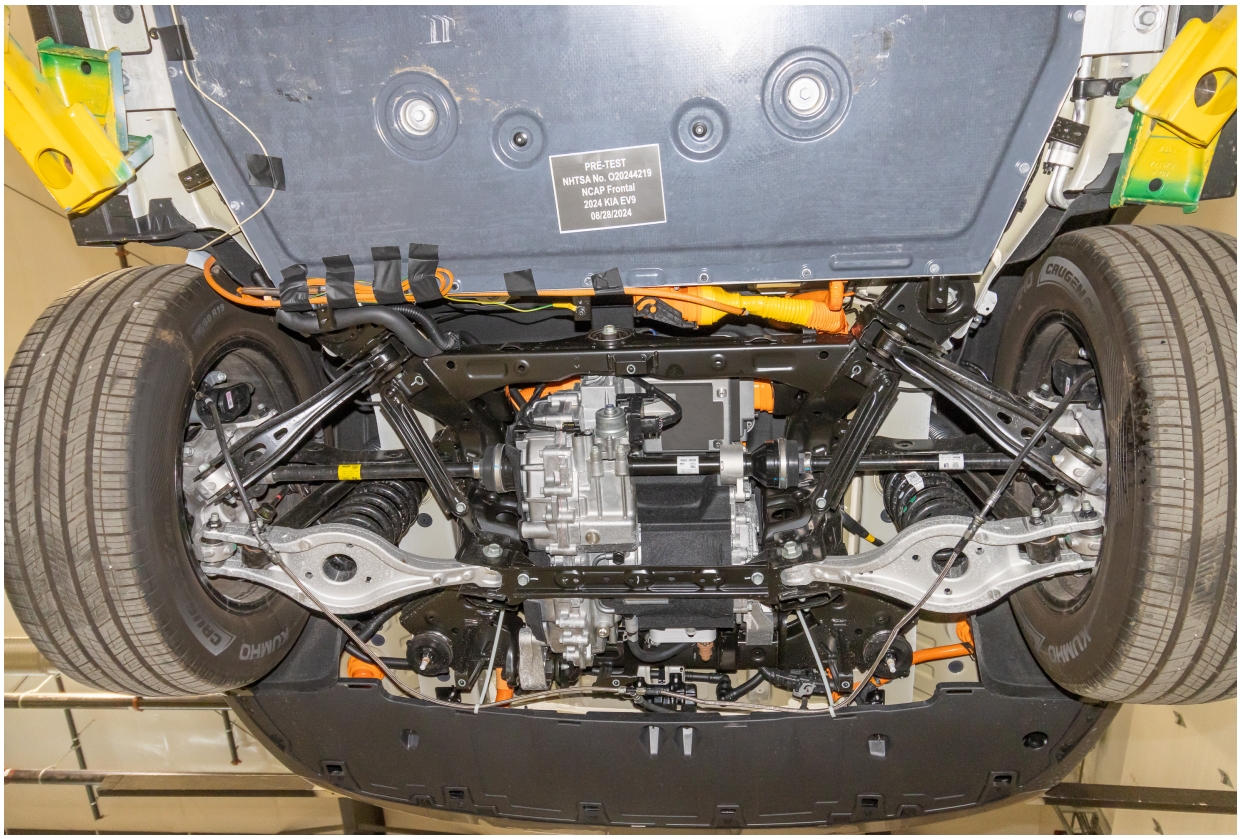


Figure 305-16: Pre-Impact View of Electric Propulsion Drive

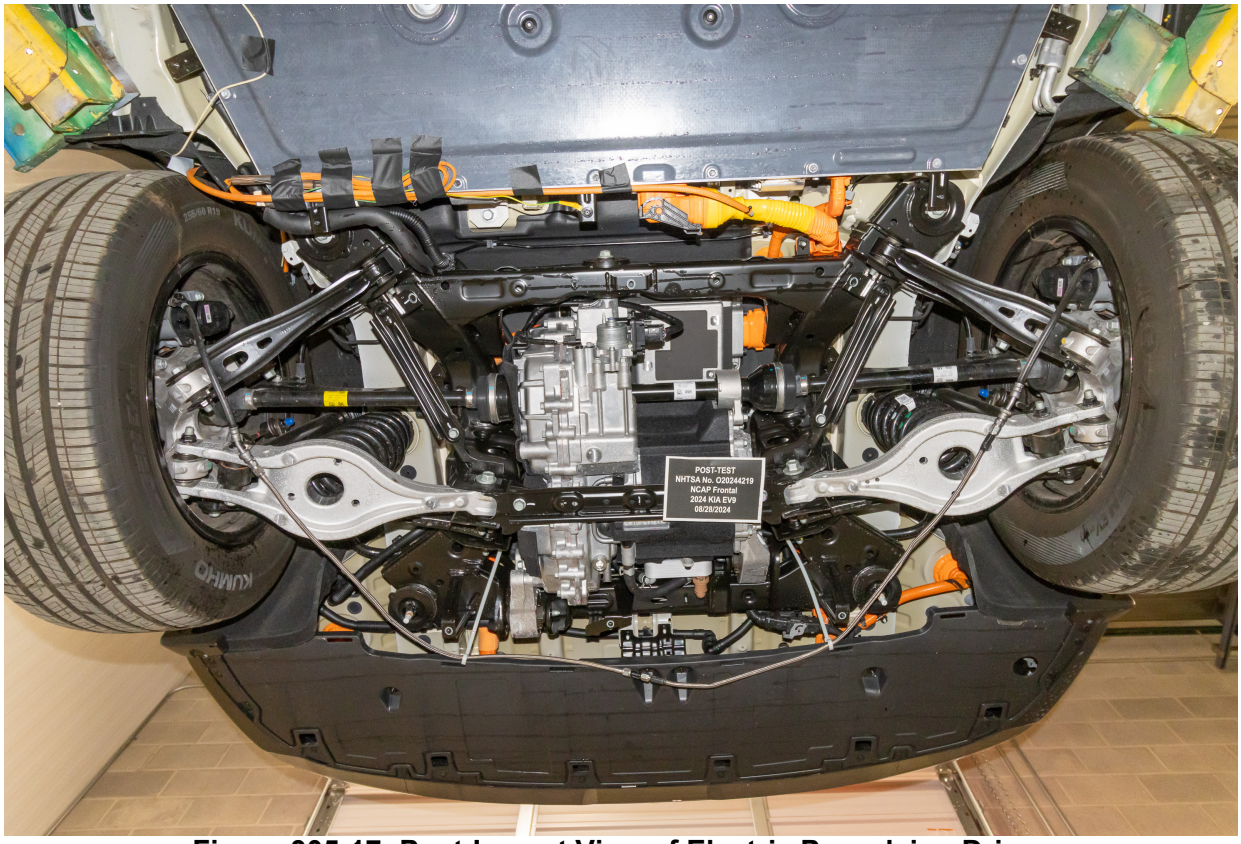


Figure 305-17: Post-Impact View of Electric Propulsion Drive

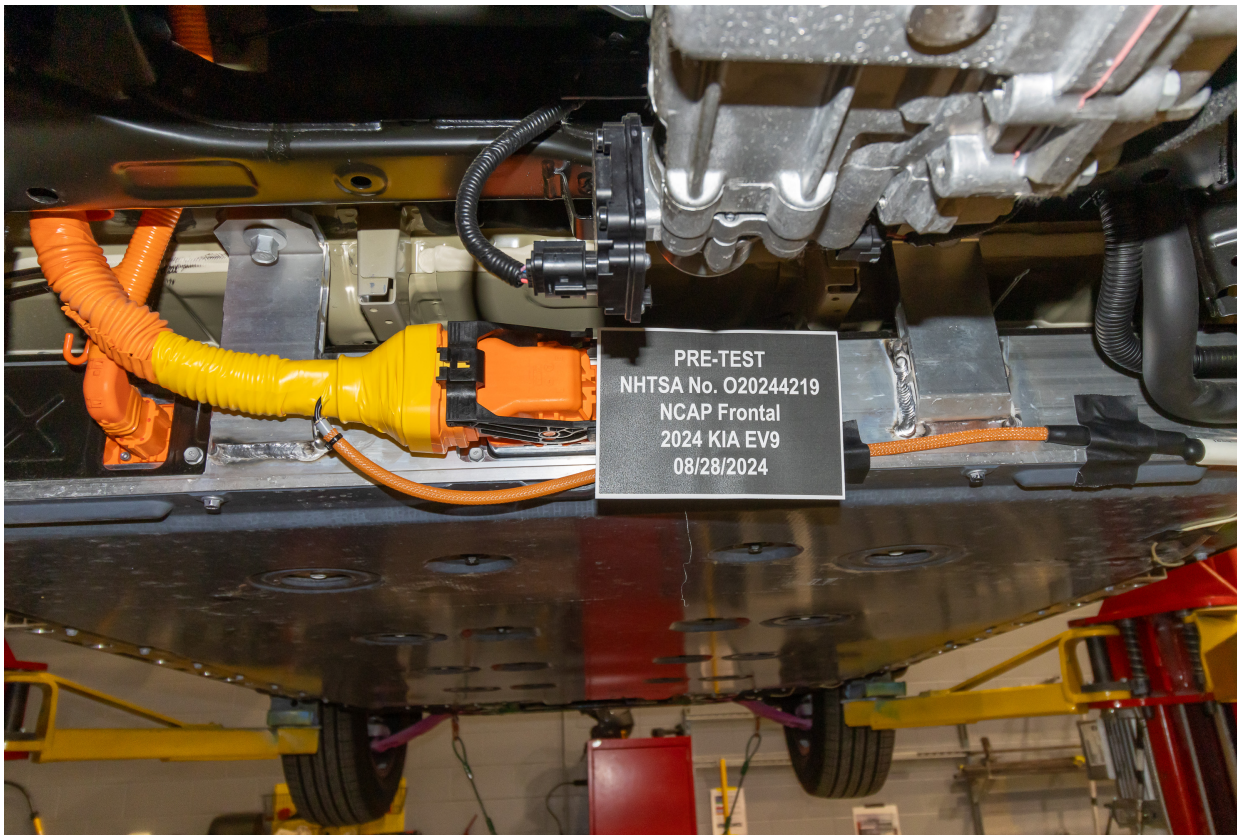


Figure 305-18: Pre-Impact View of High Voltage Interconnects

Photo Not Applicable

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

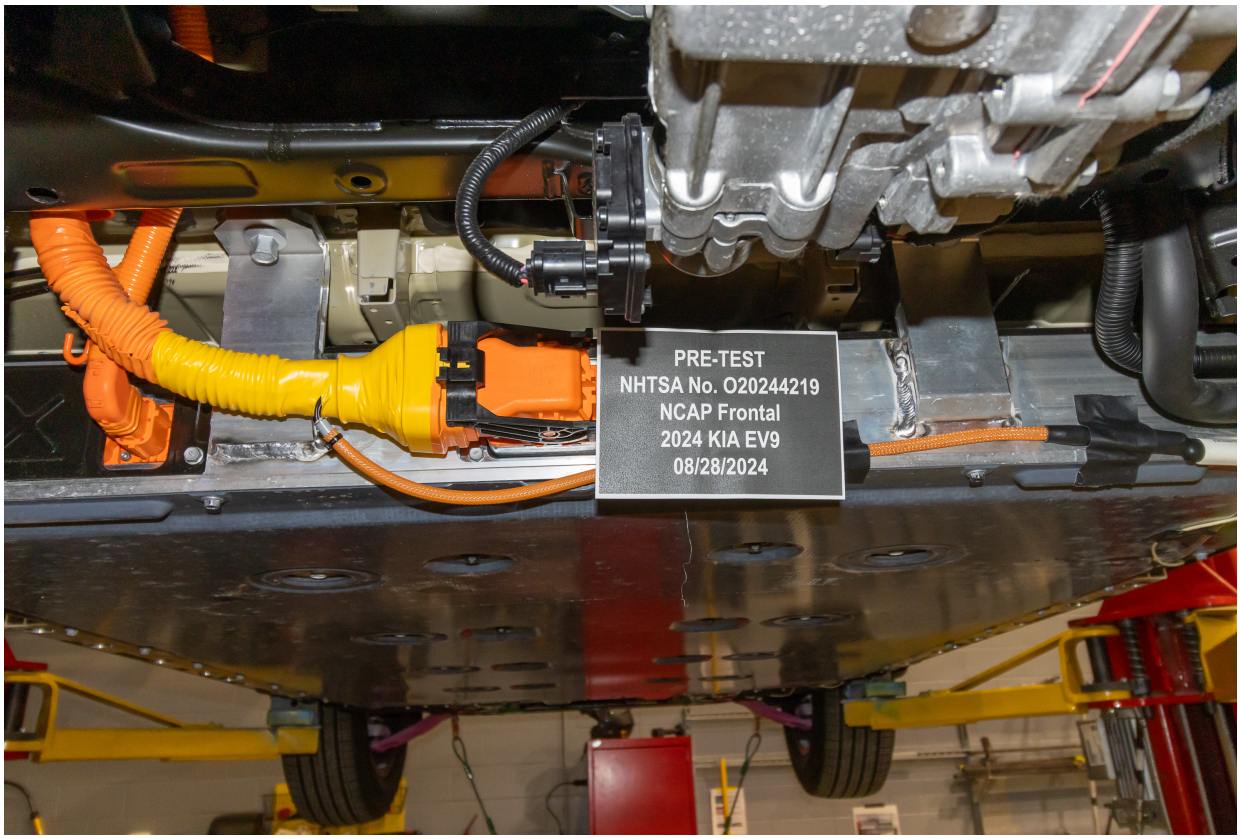


Figure 305-22: Pre-Impact View of High Voltage Leads Attached



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

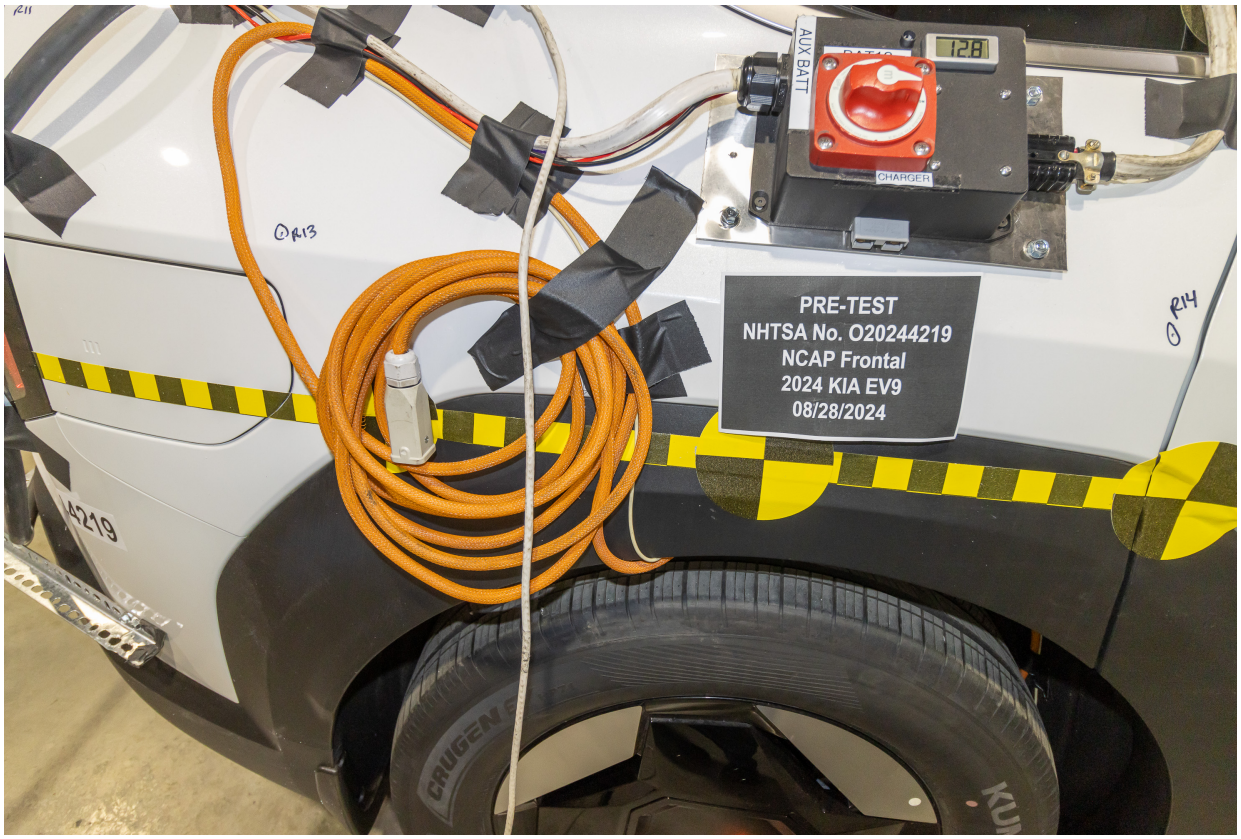


Figure 305-24: Pre-Impact View of Installed Test Interface Port

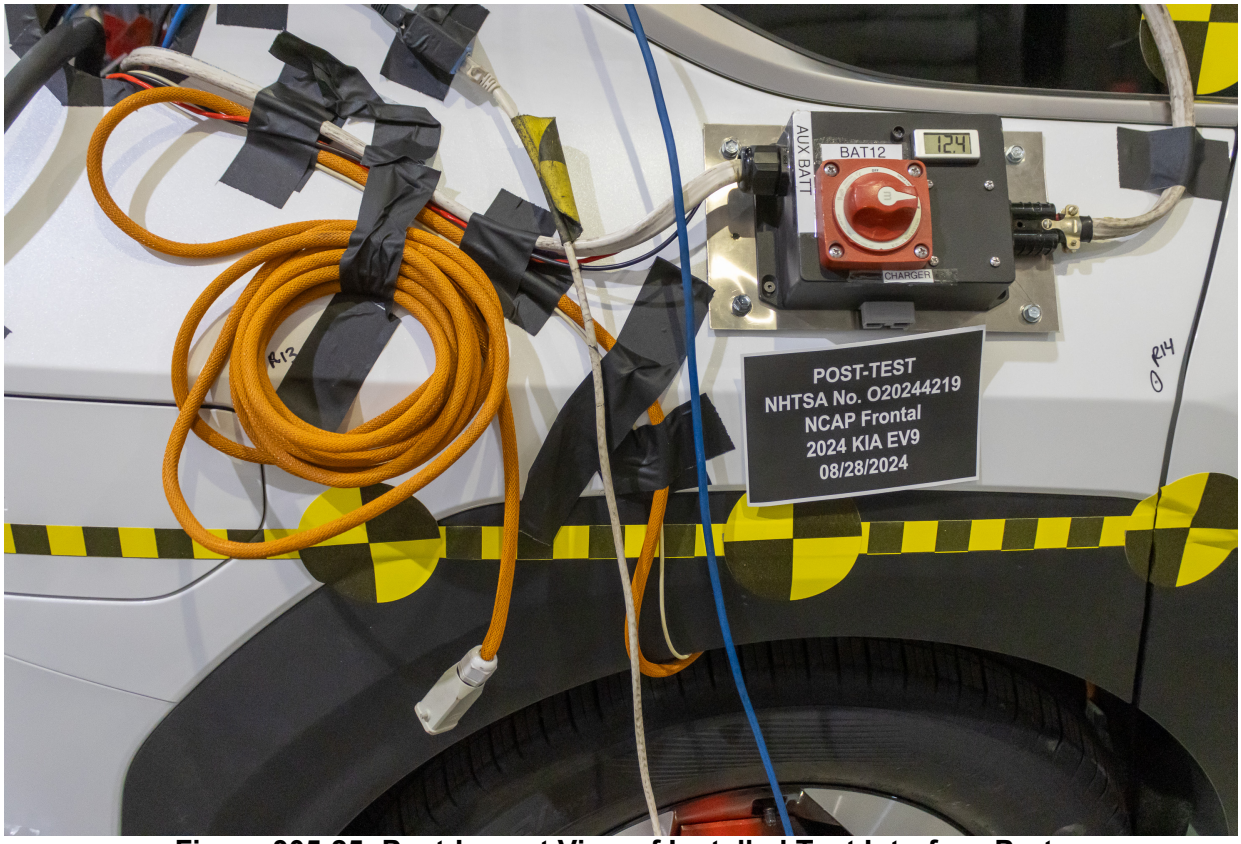


Figure 305-25: Post-Impact View of Installed Test Interface Port



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

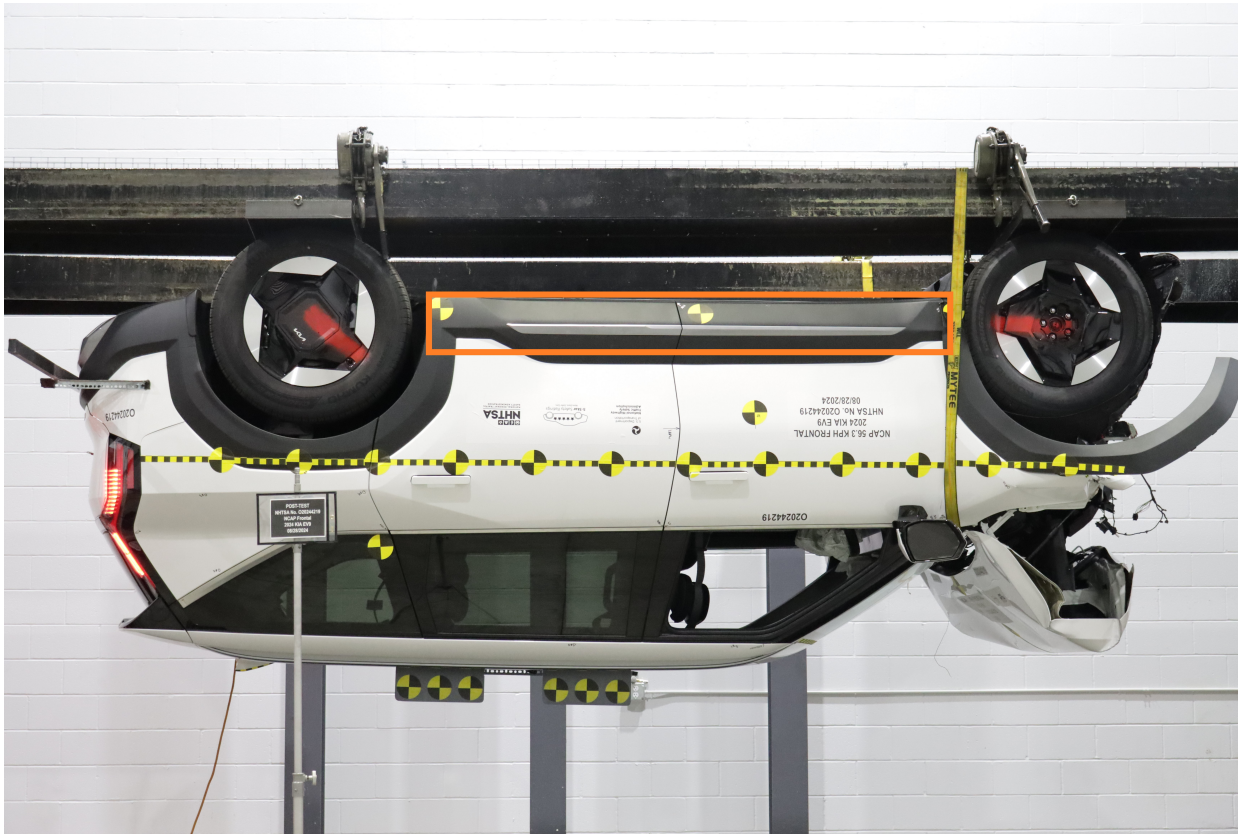


Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees

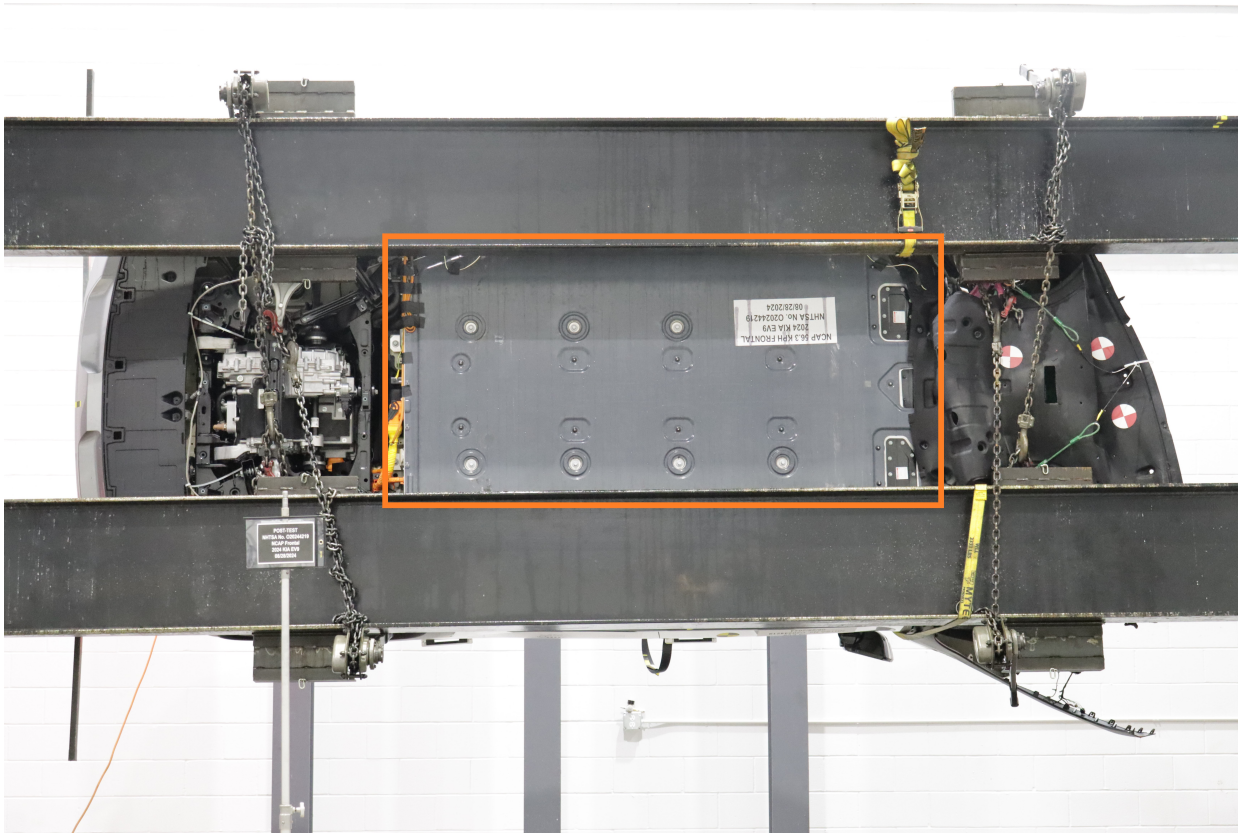


Figure 305-30: FMVSS No. 305 Static Rollover 270 Degrees



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

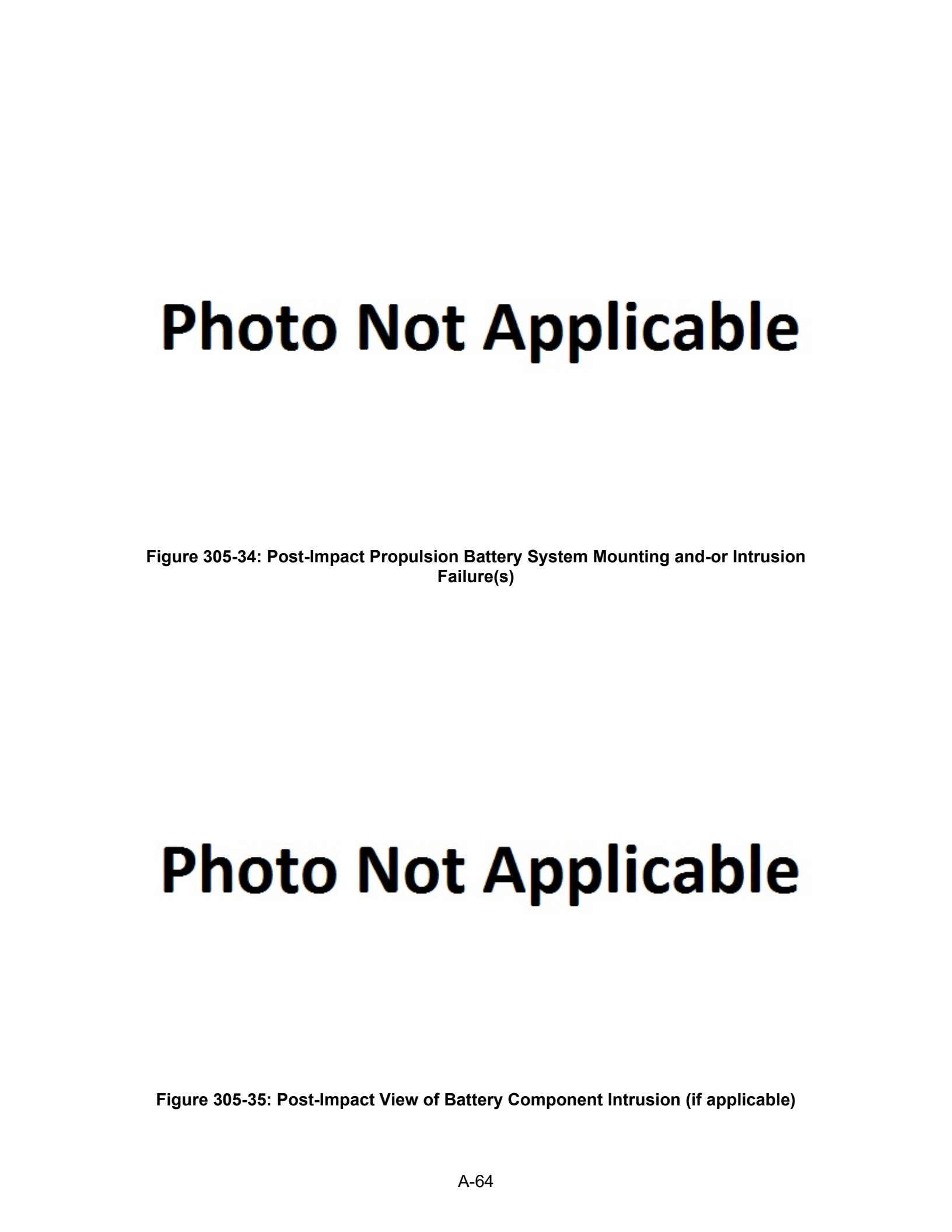


Figure 305-34: Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

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

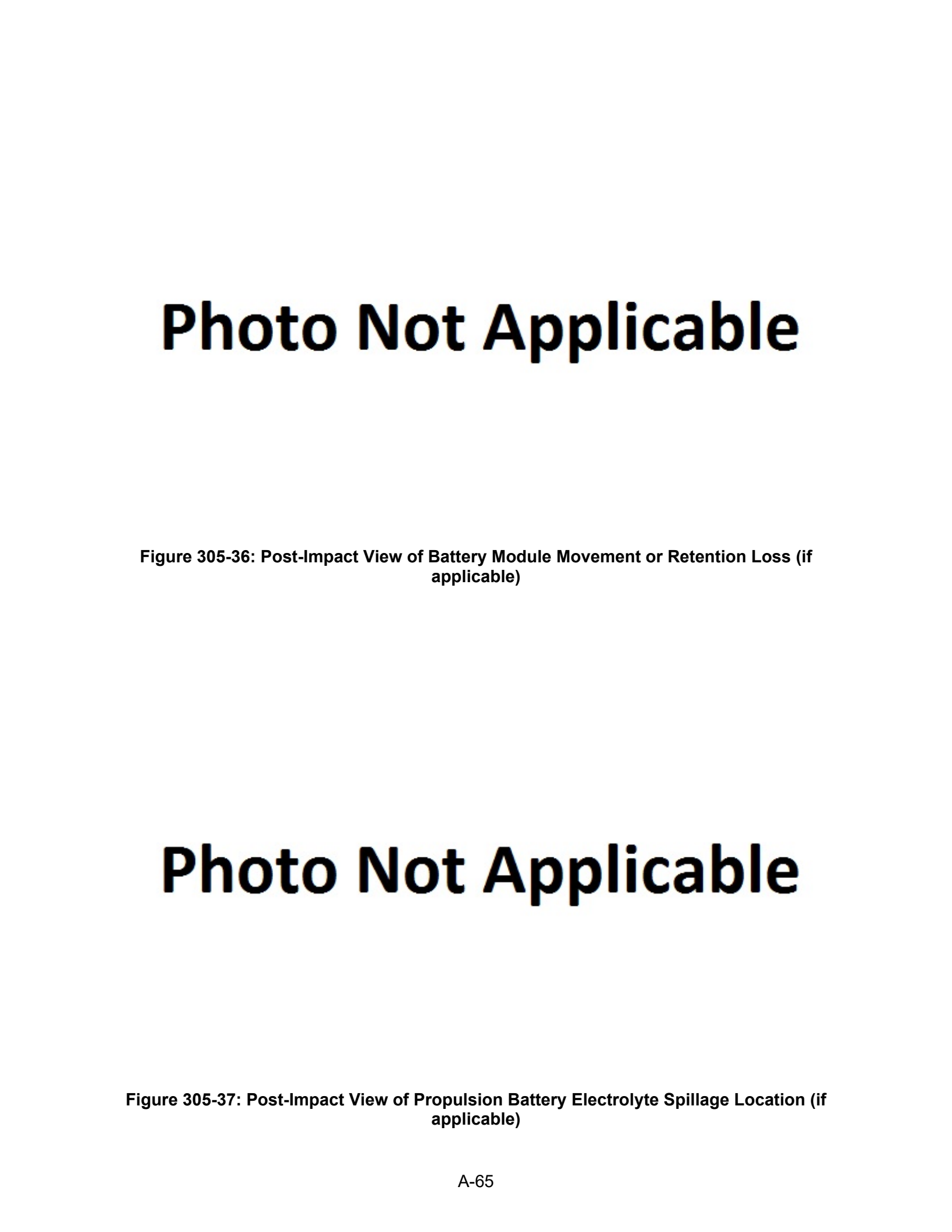


Figure 305-36: Post-Impact View of Battery Module Movement or Retention Loss (if applicable)

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

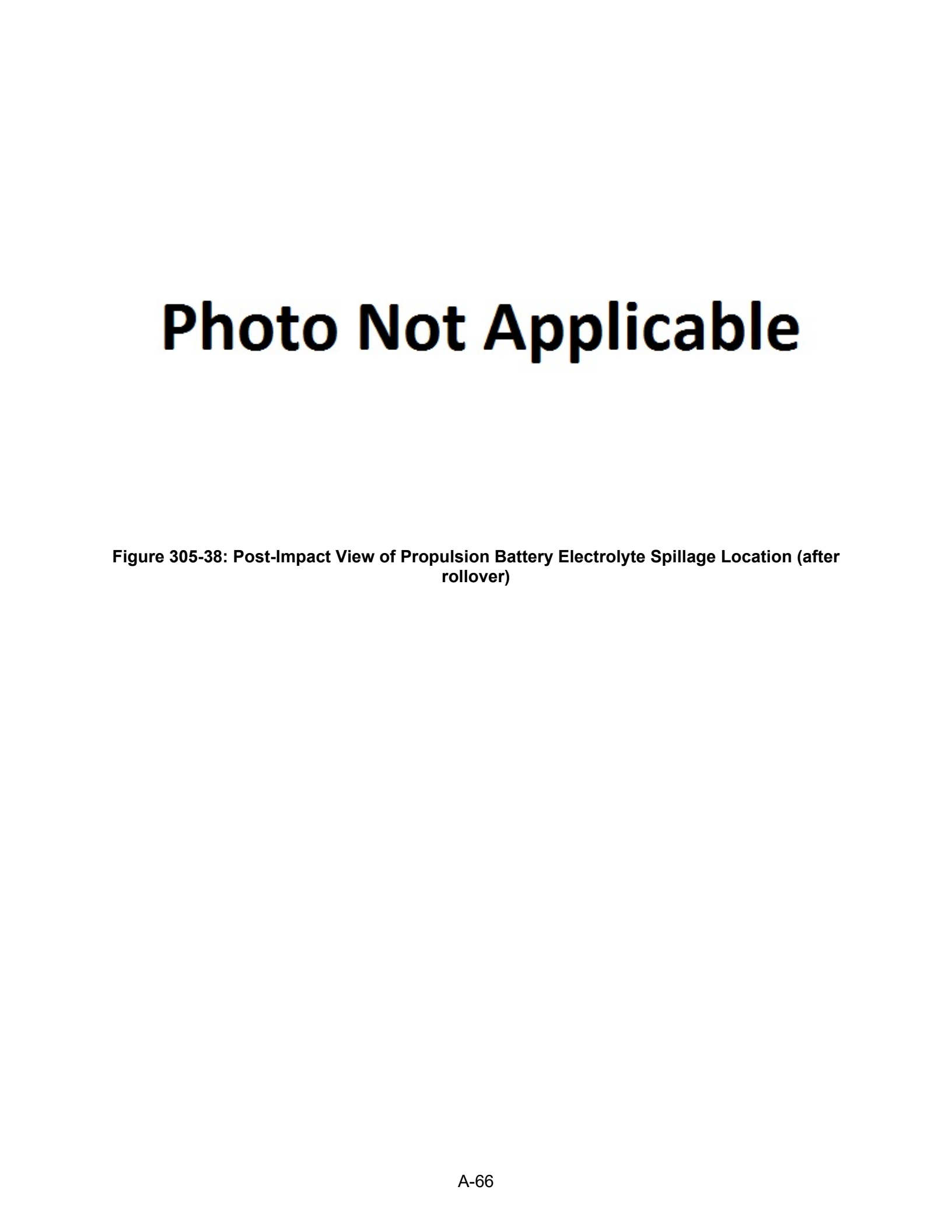


Figure 305-38: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (after rollover)

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA TRACES

Table of Data Plots

Fig.	Description	Page
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Plot 8	Driver Chest Z Acceleration vs. Time Primary	B-6
Plot 9	Driver Chest Resultant Acceleration vs. Time Primary	B-7
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Plot 11	Driver Upper Neck Force Z vs. Time Primary	B-7
Plot 12	Driver Upper Neck Moment Y vs. Time Primary	B-7
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Plot 18	Passenger Head Z Acceleration vs. Time Primary	B-9
Plot 19	Passenger Head Resultant Acceleration vs. Time Primary	B-9
Plot 20	Passenger Chest X Deflection vs. Time	B-9
Plot 21	Passenger Chest X Acceleration vs. Time Primary	B-10
Plot 22	Passenger Chest Y Acceleration vs. Time Primary	B-10
Plot 23	Passenger Chest Z Acceleration vs. Time Primary	B-10
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Plot 27	Passenger Upper Neck Moment Y vs. Time Primary	B-11
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Plot 29	Passenger Left Femur Force vs. Time	B-12
Plot 30	Passenger Right Femur Force vs. Time	B-12

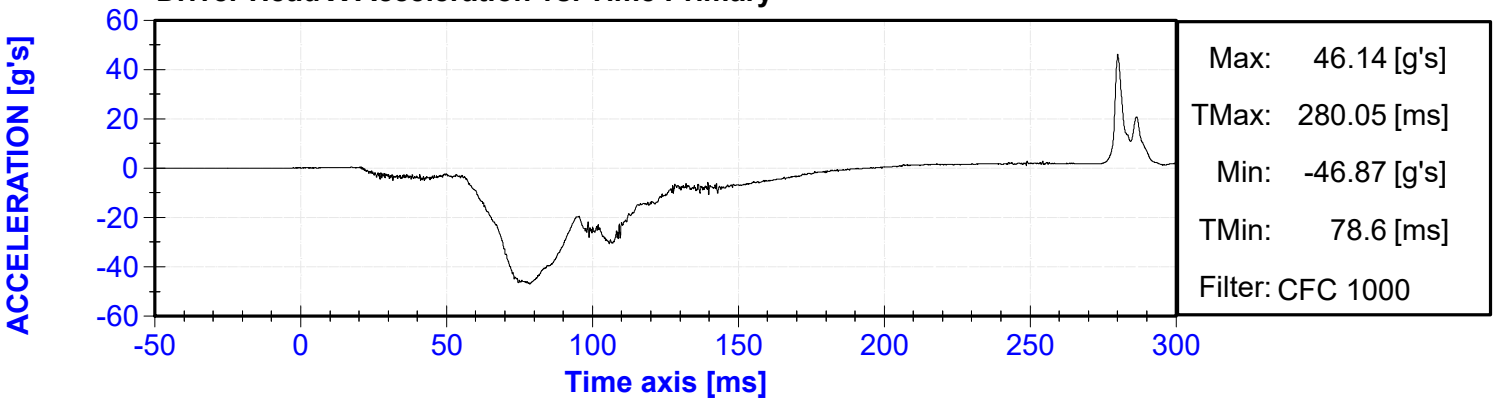
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.NHTSA.gov

Driver Head X Acceleration Redundan
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

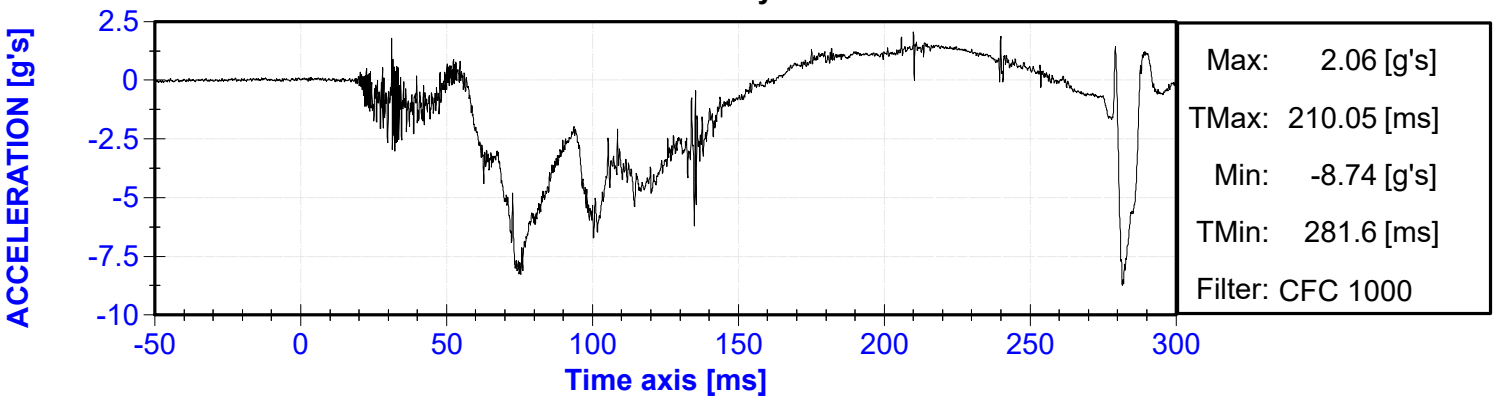
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver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

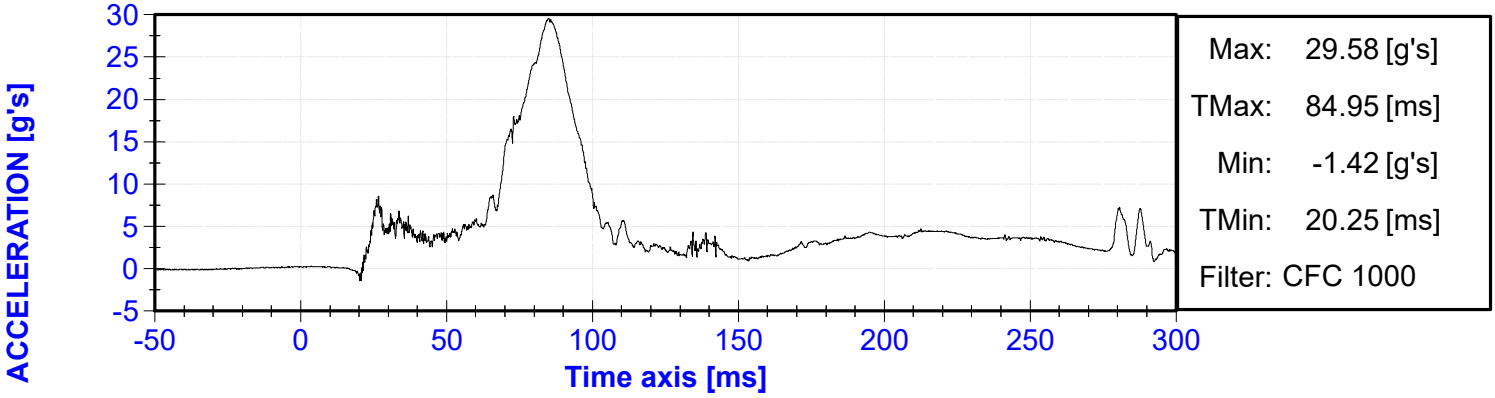
Driver Head X Acceleration vs. Time Primary



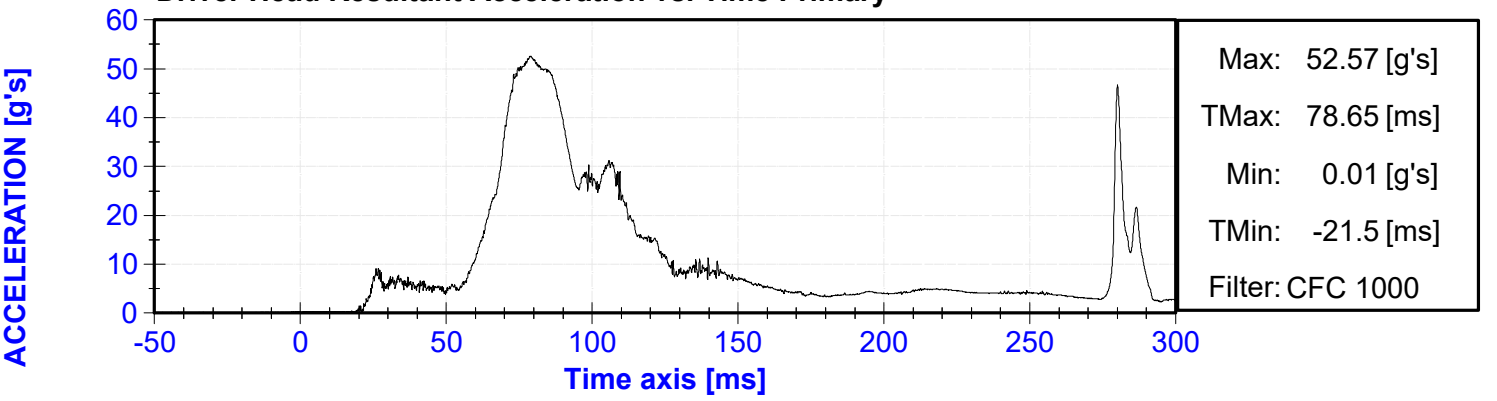
Driver Head Y Acceleration vs. Time Primary



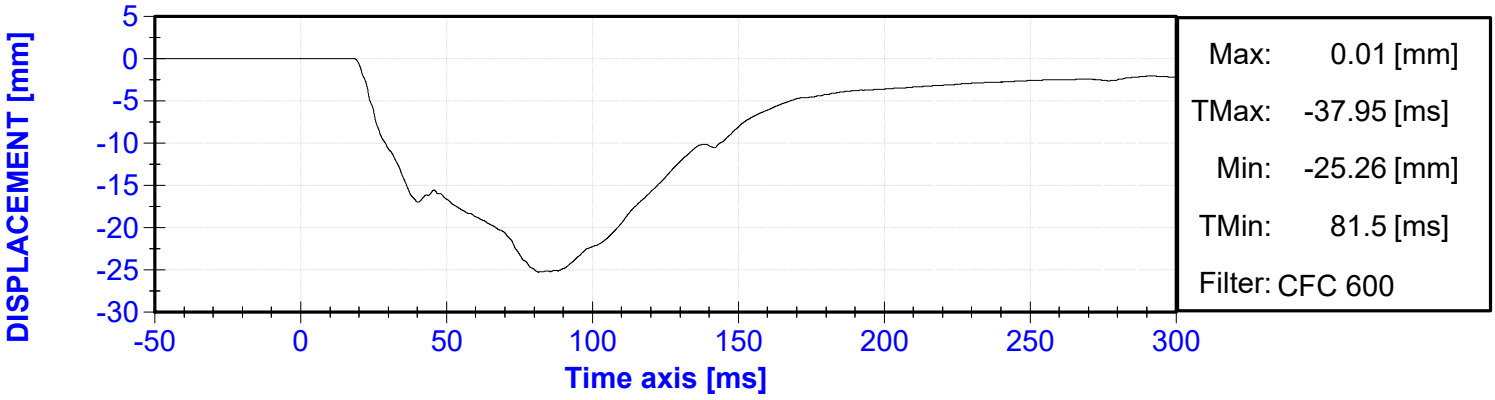
Driver Head Z Acceleration vs. Time Primary



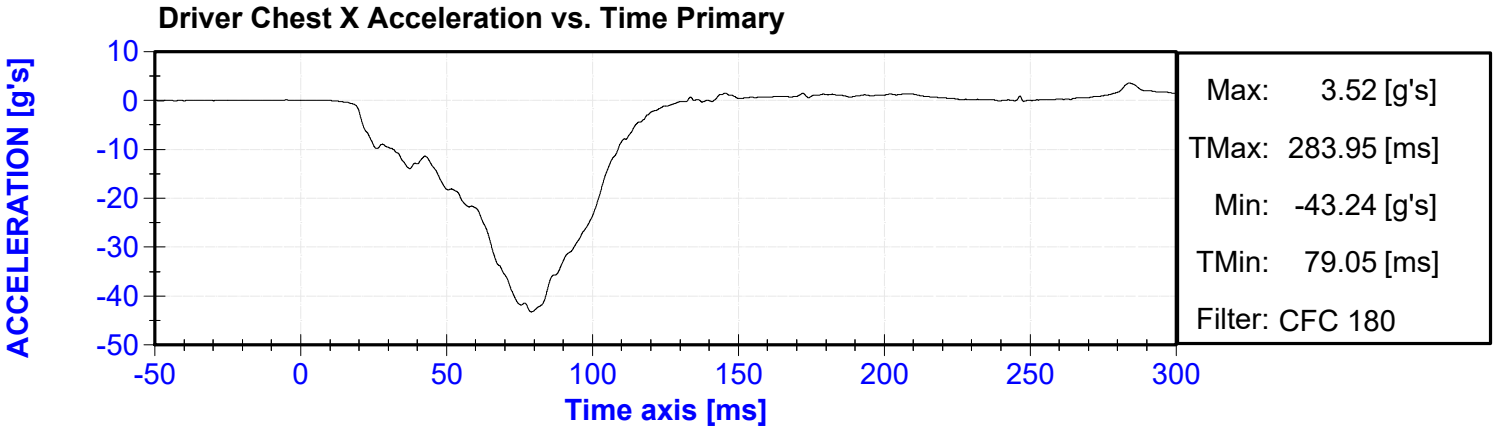
Driver Head Resultant Acceleration vs. Time Primary



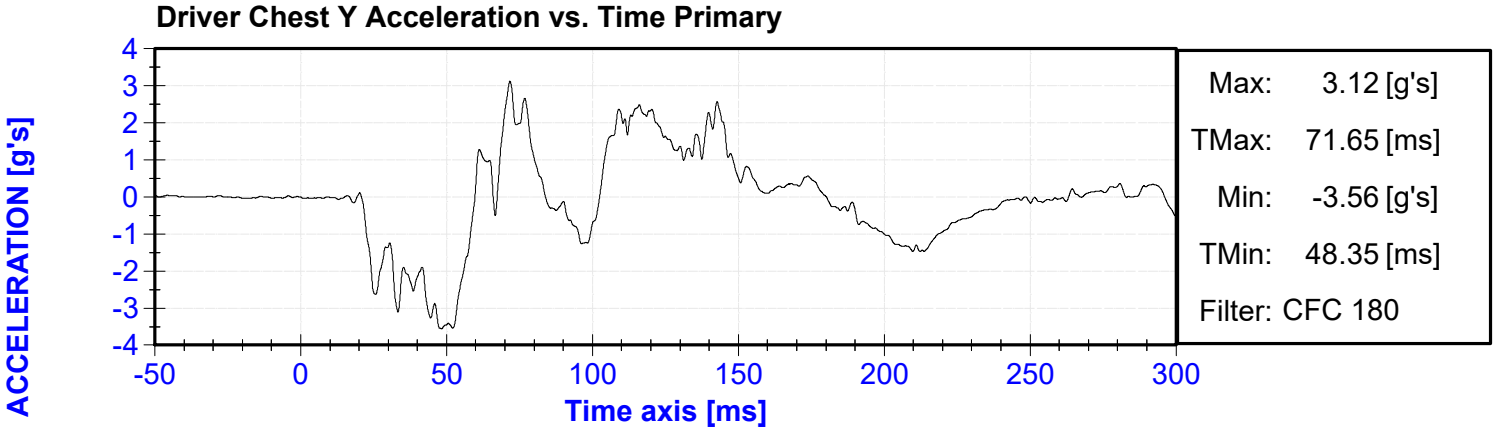
Driver Chest X Deflection vs. Time



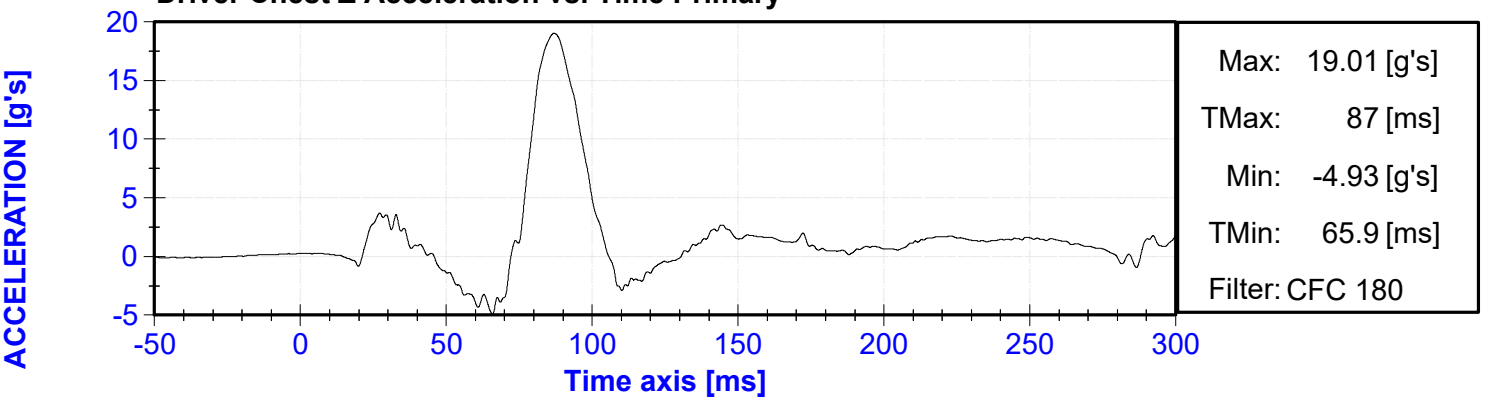
Driver Chest X Acceleration vs. Time Primary



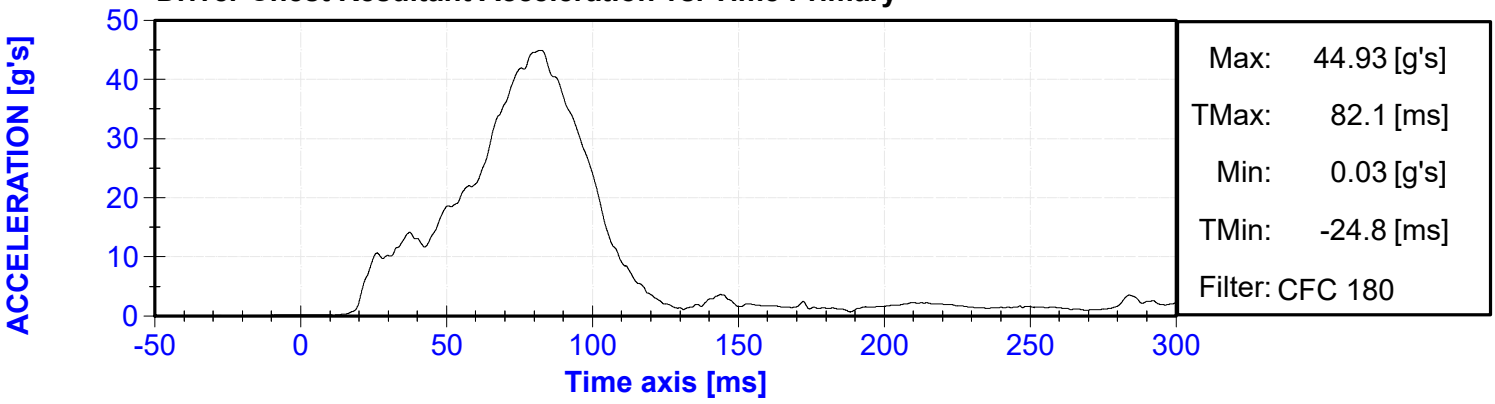
Driver Chest Y Acceleration vs. Time Primary



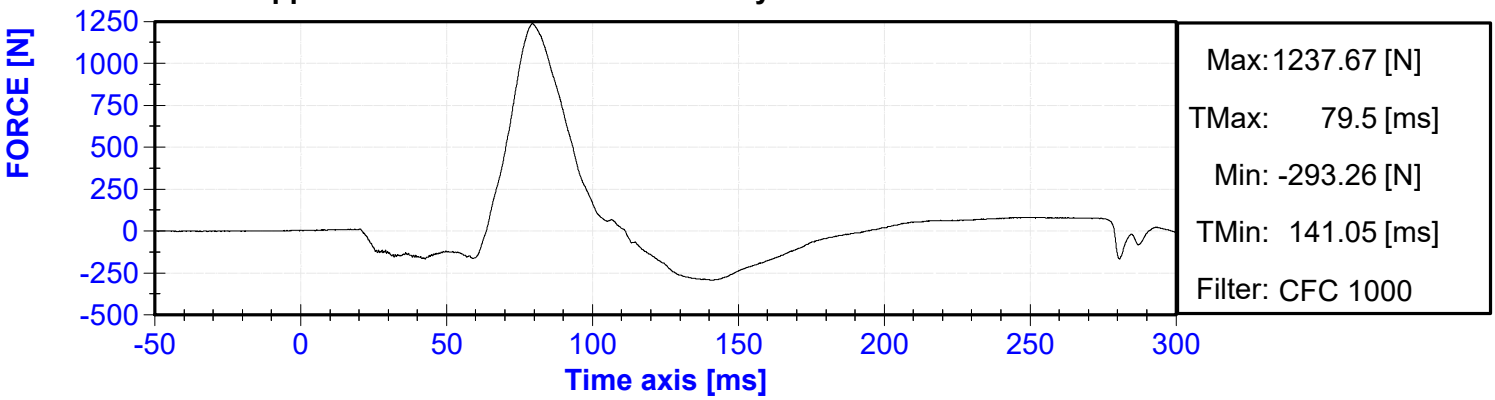
Driver Chest Z Acceleration vs. Time Primary



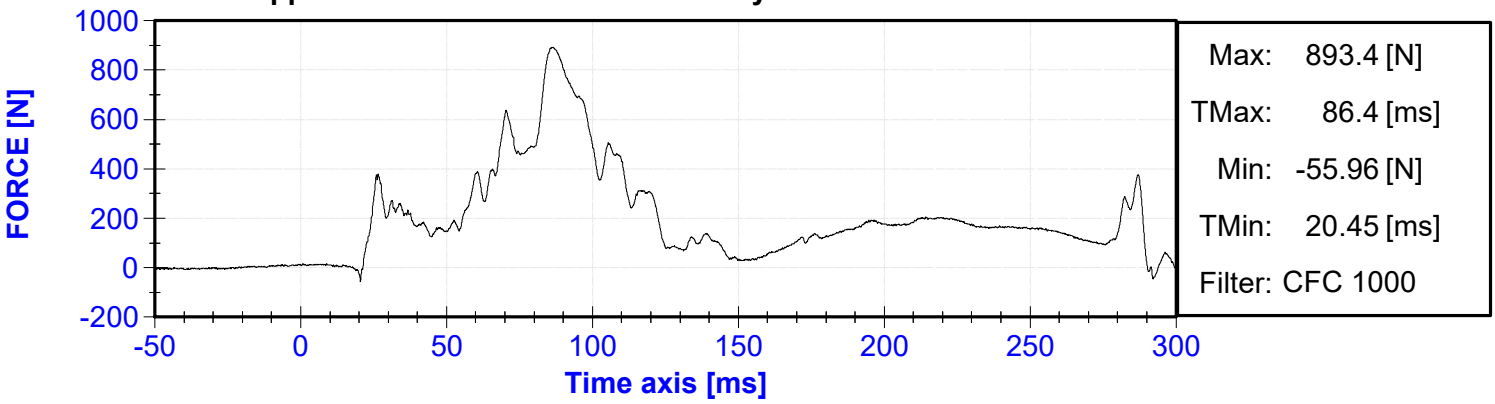
Driver Chest Resultant Acceleration vs. Time Primary



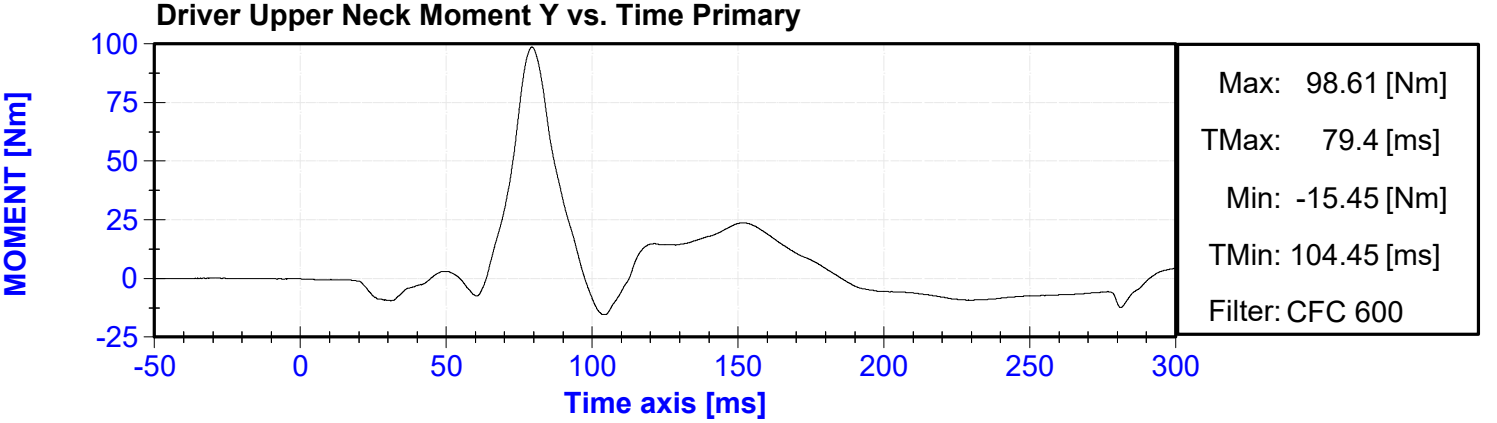
Driver Upper Neck Force X vs. Time Primary

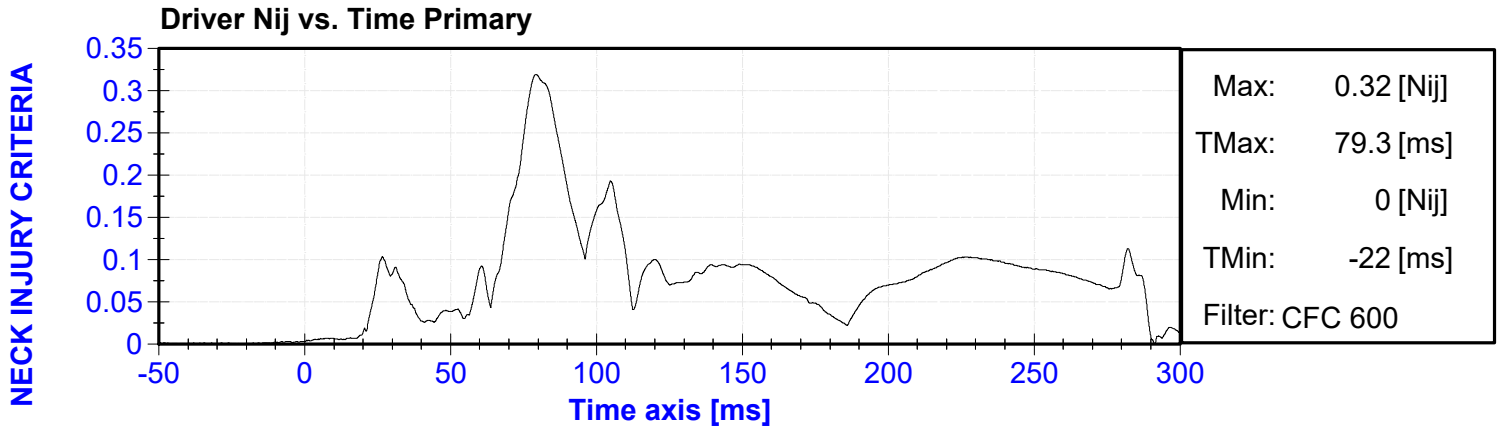


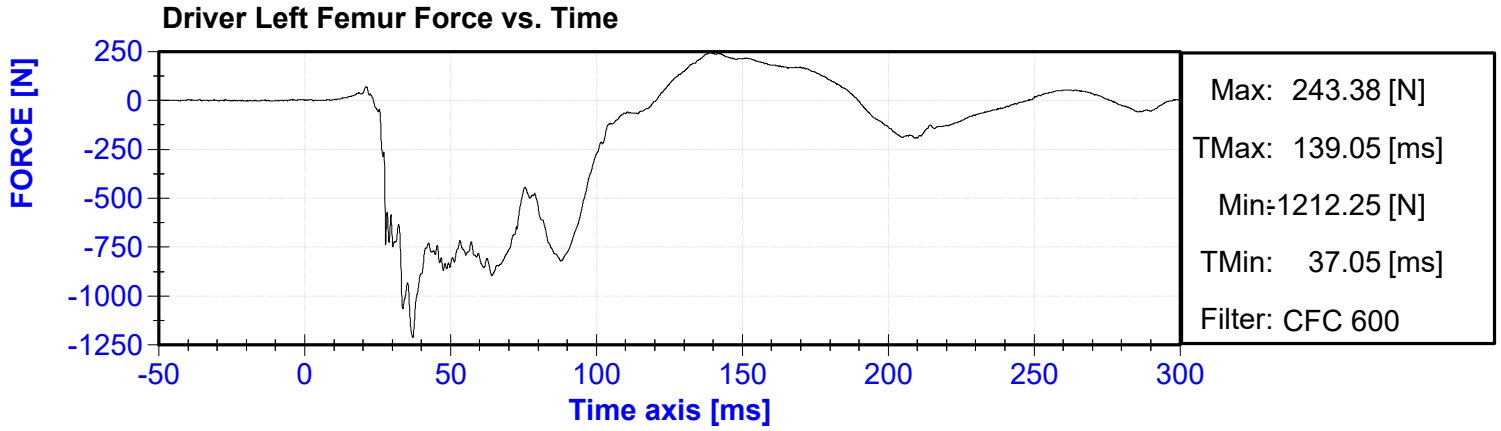
Driver Upper Neck Force Z vs. Time Primary



Driver Upper Neck Moment Y vs. Time Primary




Driver Nij vs. Time Primary
NECK INJURY CRITERIA
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 0.32 [Nij]
TMax: 79.3 [ms]
Min: 0 [Nij]
TMin: -22 [ms]
Filter: CFC 600


Driver Left Femur Force vs. Time
FORCE [N]
250
0
-250
-500
-750
-1000
-1250
-50
0
50
100
150
200
250
300
Time axis [ms]
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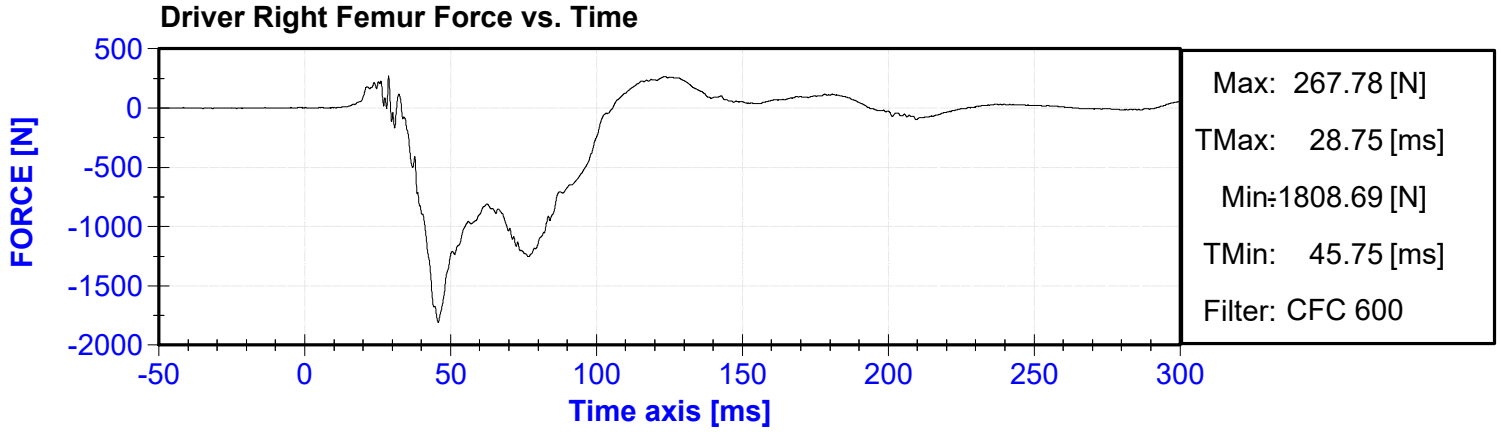
Min: -1212.25 [N]
TMin: 37.05 [ms]
Filter: CFC 600


Driver Right Femur Force vs. Time
FORCE [N]
500
0
-500
-1000
-1500
-2000
-50
0
50
100
150
200
250
300
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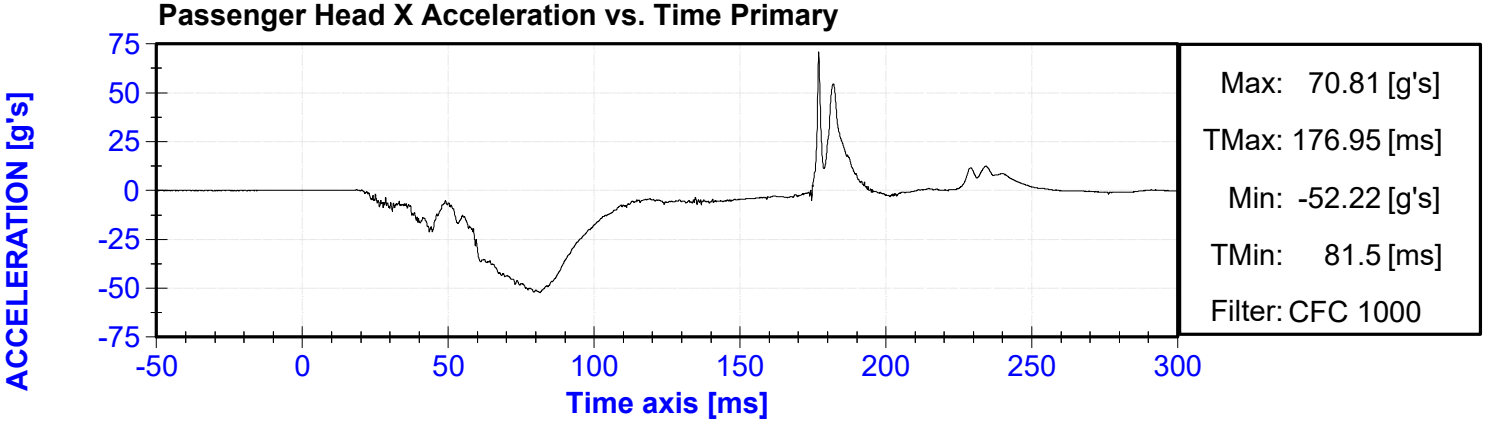
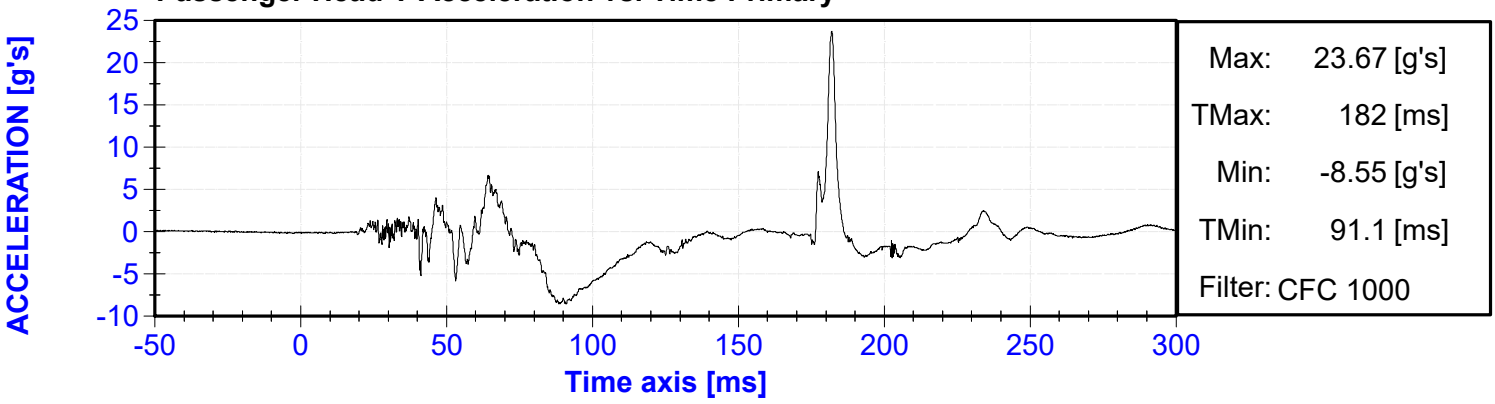
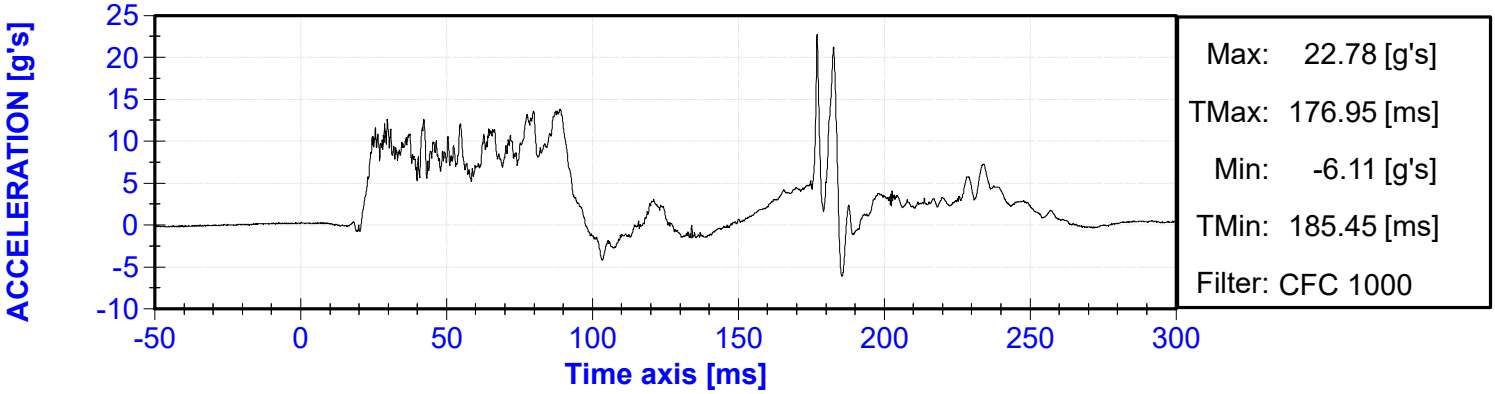
TMin: 45.75 [ms]
Filter: CFC 600


Passenger Head X Acceleration vs. Time Primary
ACCELERATION [g's]
75
50
25
0
-25
-50
-75
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 70.81 [g's]
TMax: 176.95 [ms]
Min: -52.22 [g's]
TMin: 81.5 [ms]
Filter: CFC 1000

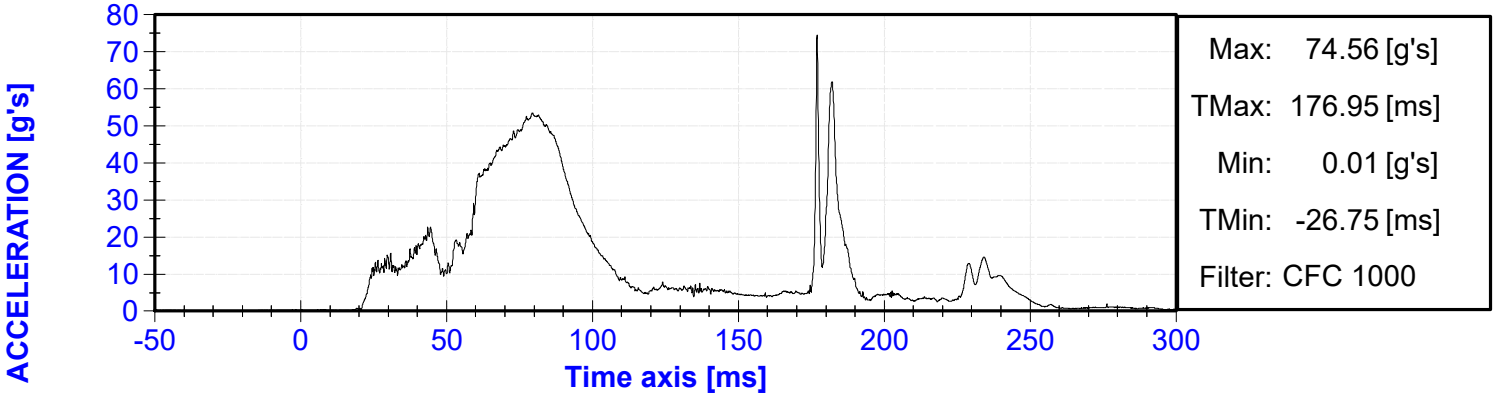
Passenger Head Y Acceleration vs. Time Primary



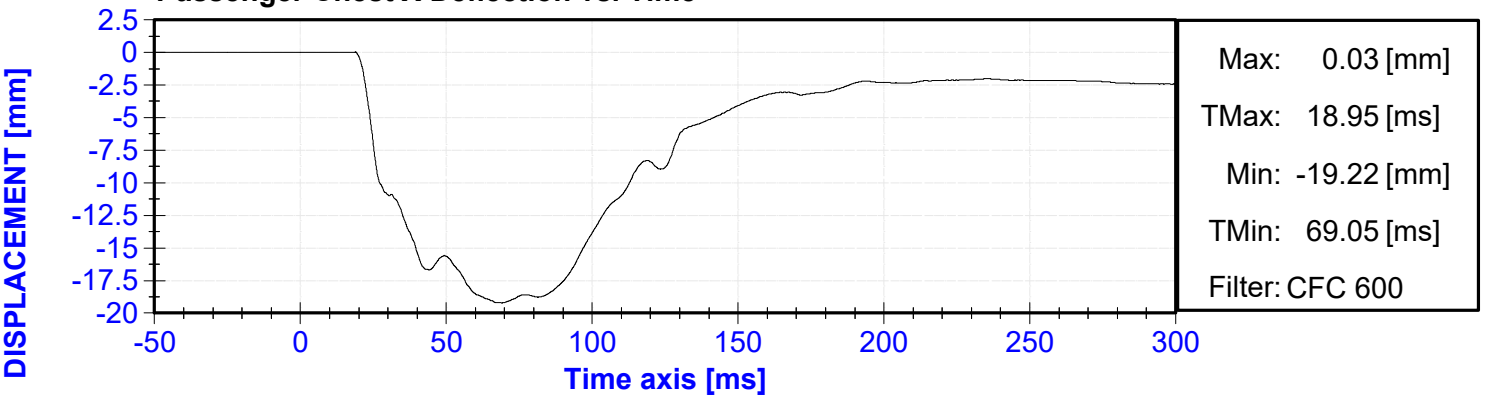
Passenger Head Z Acceleration vs. Time Primary



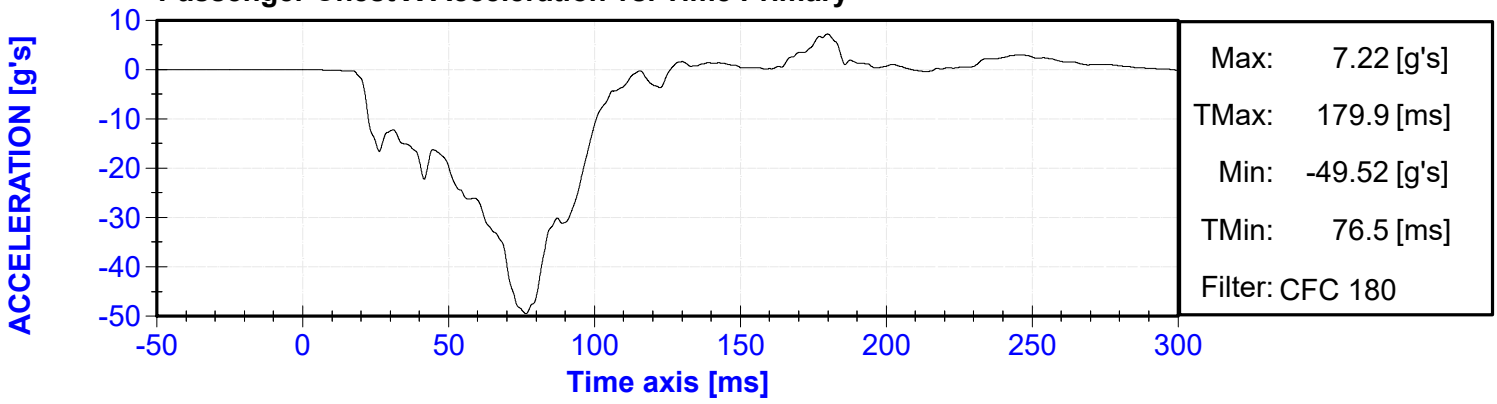
Passenger Head Resultant Acceleration vs. Time Primary



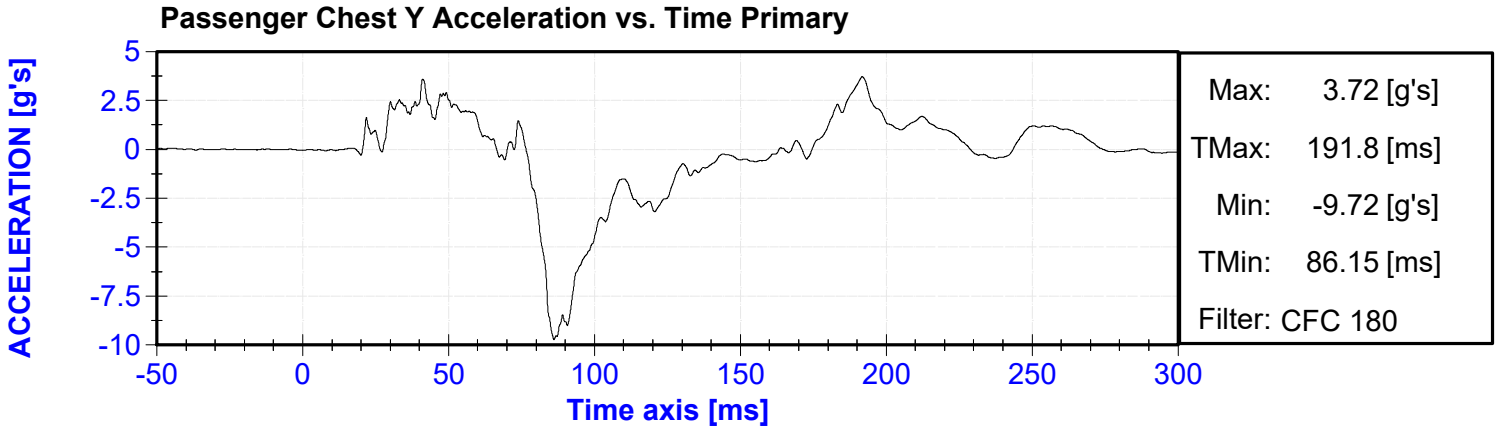
Passenger Chest X Deflection vs. Time



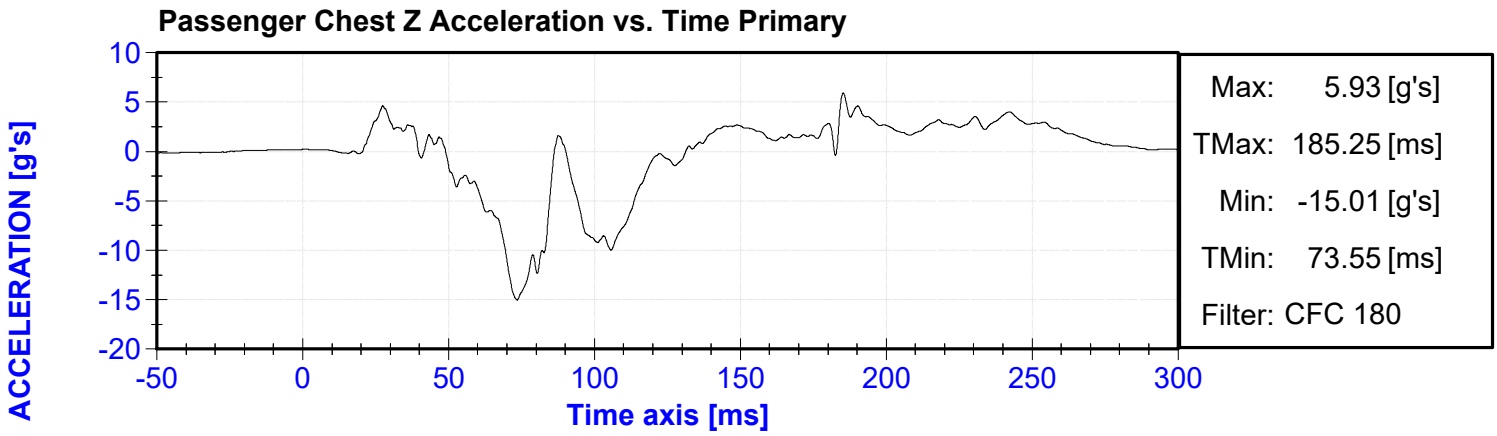
Passenger Chest X Acceleration vs. Time Primary



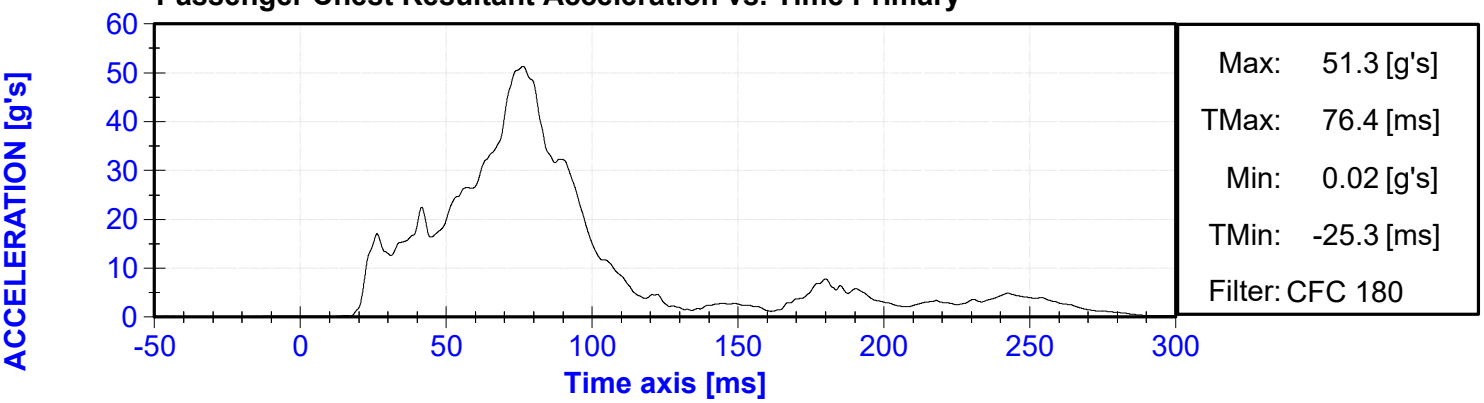
Passenger Chest Y Acceleration vs. Time Primary

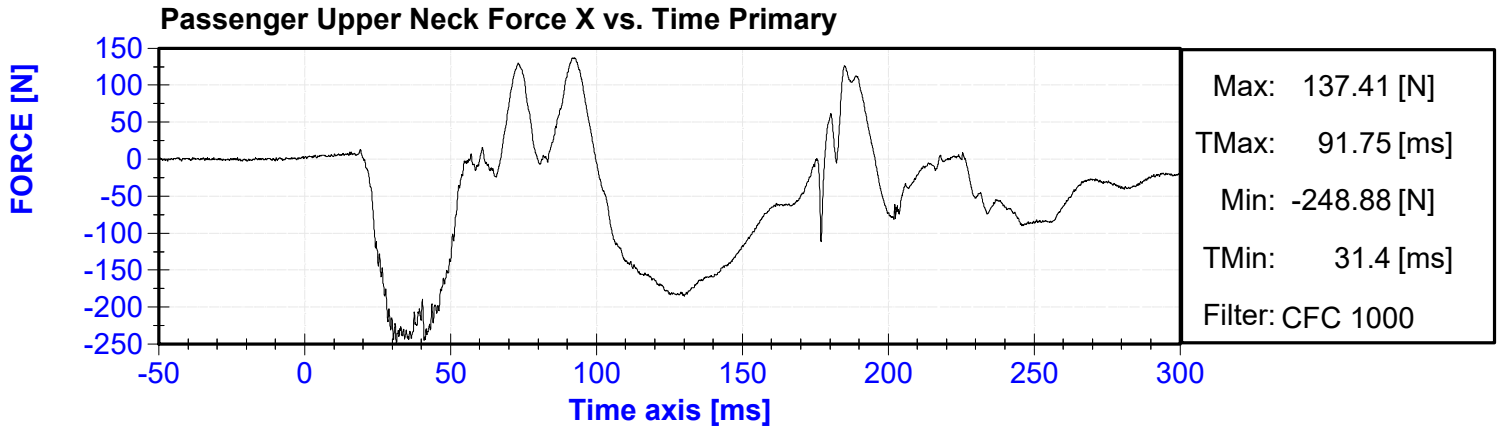


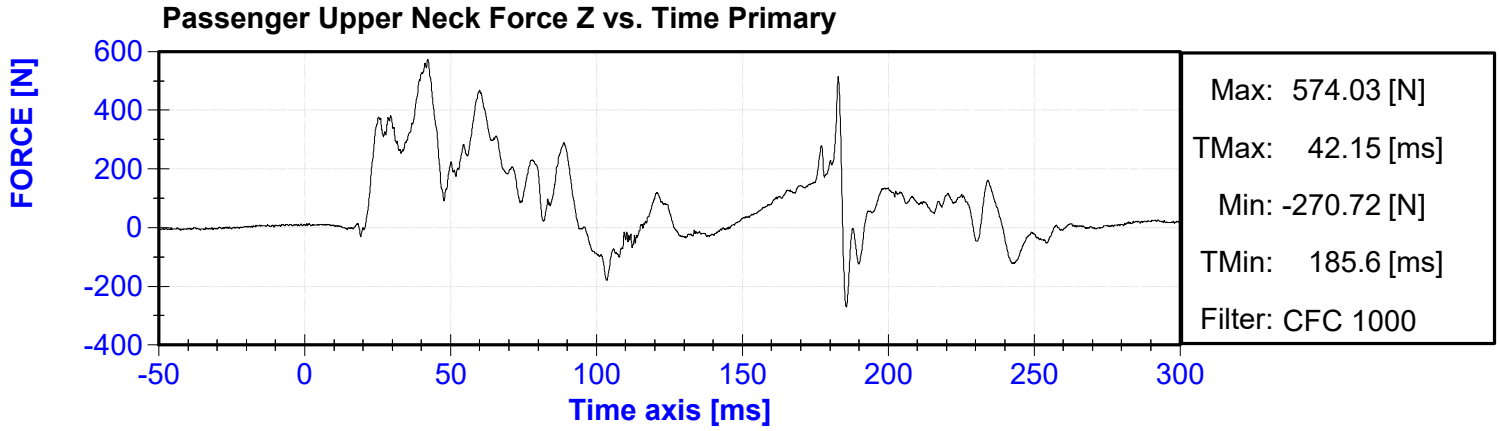
Passenger Chest Z Acceleration vs. Time Primary

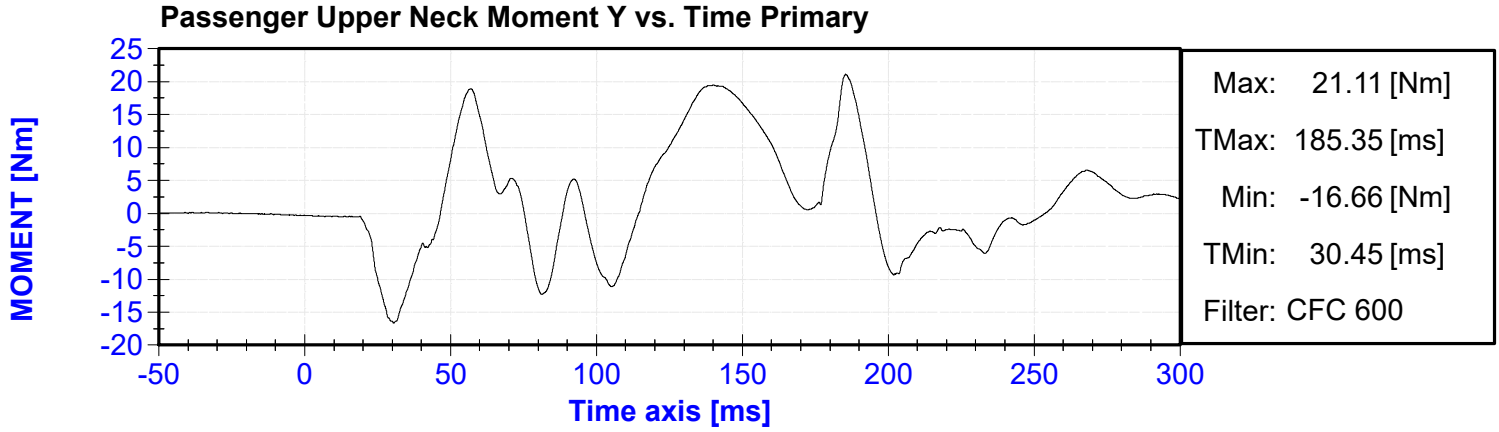


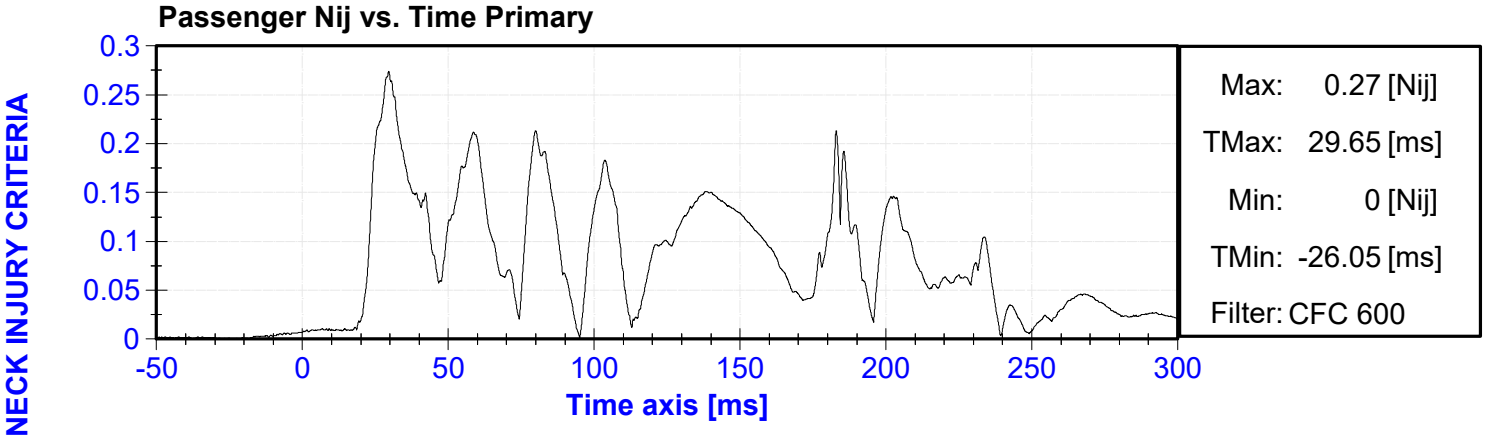
Passenger Chest Resultant Acceleration vs. Time Primary

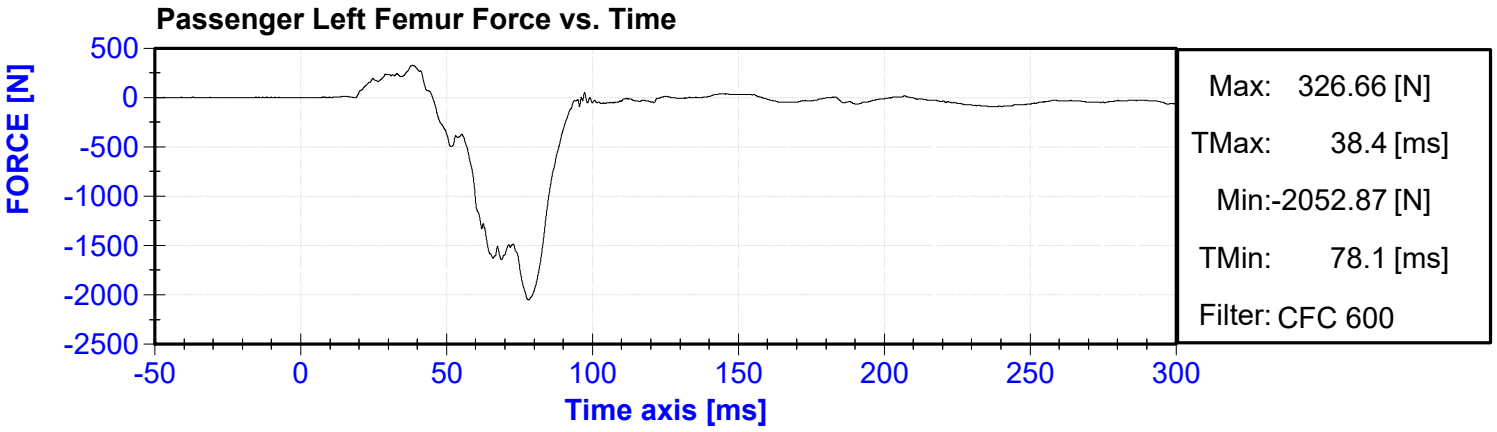


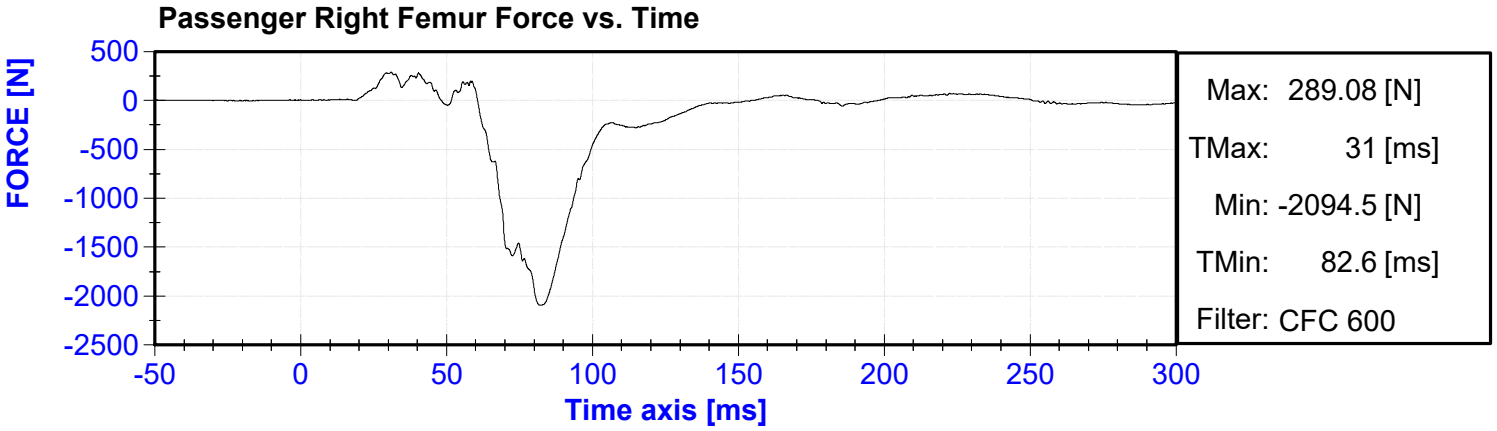

Passenger Upper Neck Force X vs. Time Primary
FORCE [N]
Time axis [ms]
Max: 137.41 [N]
TMax: 91.75 [ms]
Min: -248.88 [N]
TMin: 31.4 [ms]
Filter: CFC 1000


Passenger Upper Neck Force Z vs. Time Primary
FORCE [N]
Time axis [ms]
Max: 574.03 [N]
TMax: 42.15 [ms]
Min: -270.72 [N]
TMin: 185.6 [ms]
Filter: CFC 1000


Passenger Upper Neck Moment Y vs. Time Primary
MOMENT [Nm]
Time axis [ms]
Max: 21.11 [Nm]
TMax: 185.35 [ms]
Min: -16.66 [Nm]
TMin: 30.45 [ms]
Filter: CFC 600


Passenger Nij vs. Time Primary
NECK INJURY CRITERIA
Time axis [ms]
Max: 0.27 [Nij]
TMax: 29.65 [ms]
Min: 0 [Nij]
TMin: -26.05 [ms]
Filter: CFC 600


Passenger Left Femur Force vs. Time
FORCE [N]
500
0
-500
-1000
-1500
-2000
-2500
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 326.66 [N]
TMax: 38.4 [ms]
Min:-2052.87 [N]
TMin: 78.1 [ms]
Filter: CFC 600


Passenger Right Femur Force vs. Time
FORCE [N]
500
0
-500
-1000
-1500
-2000
-2500
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 289.08 [N]
TMax: 31 [ms]
Min: -2094.5 [N]
TMin: 82.6 [ms]
Filter: CFC 600

APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

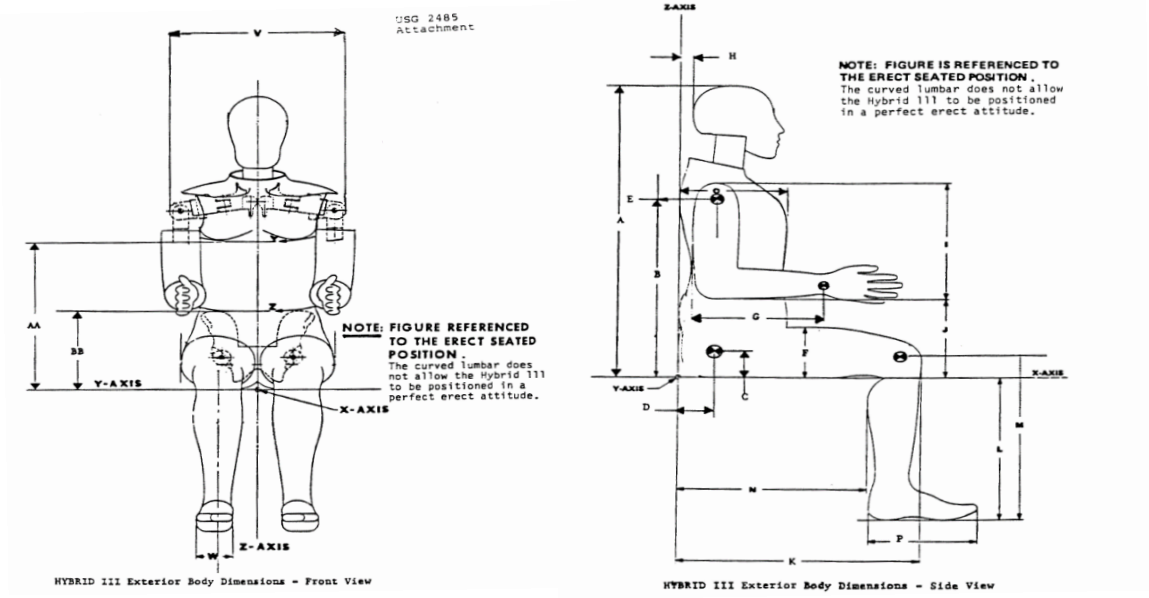
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 065

External Measurements - Hybrid 3 - 50th Male

Technician: J. Rios Date: 08/22/2024

Dummy Serial Number: 065



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.7	Pass
B	Shoulder Pivot Height	19.9	20.5	20.1	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.3	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.4	Pass
F	Thigh Clearance	5.5	6.1	5.8	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.7	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.3	Pass
J	Elbow Rest Height	7.5	8.3	8.1	Pass
K	Buttock to Knee Length	22.8	23.8	23.5	Pass
L	Popliteal Height	16.9	17.9	17.4	Pass
M	Knee Pivot Height	19.1	19.7	19.5	Pass
N	Buttock Popliteal Length	17.8	18.8	18.3	Pass
O	Chest Depth without Jacket	8.4	9.0	8.8	Pass
P	Foot Length (right)	9.9	10.5	10.1	Pass
V	Shoulder Breadth	16.3	17.2	16.9	Pass
W	Foot Breadth	3.6	4.2	3.8	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.8	Pass
Z	Waist Circumference	32.9	34.1	33.5	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.1	Pass

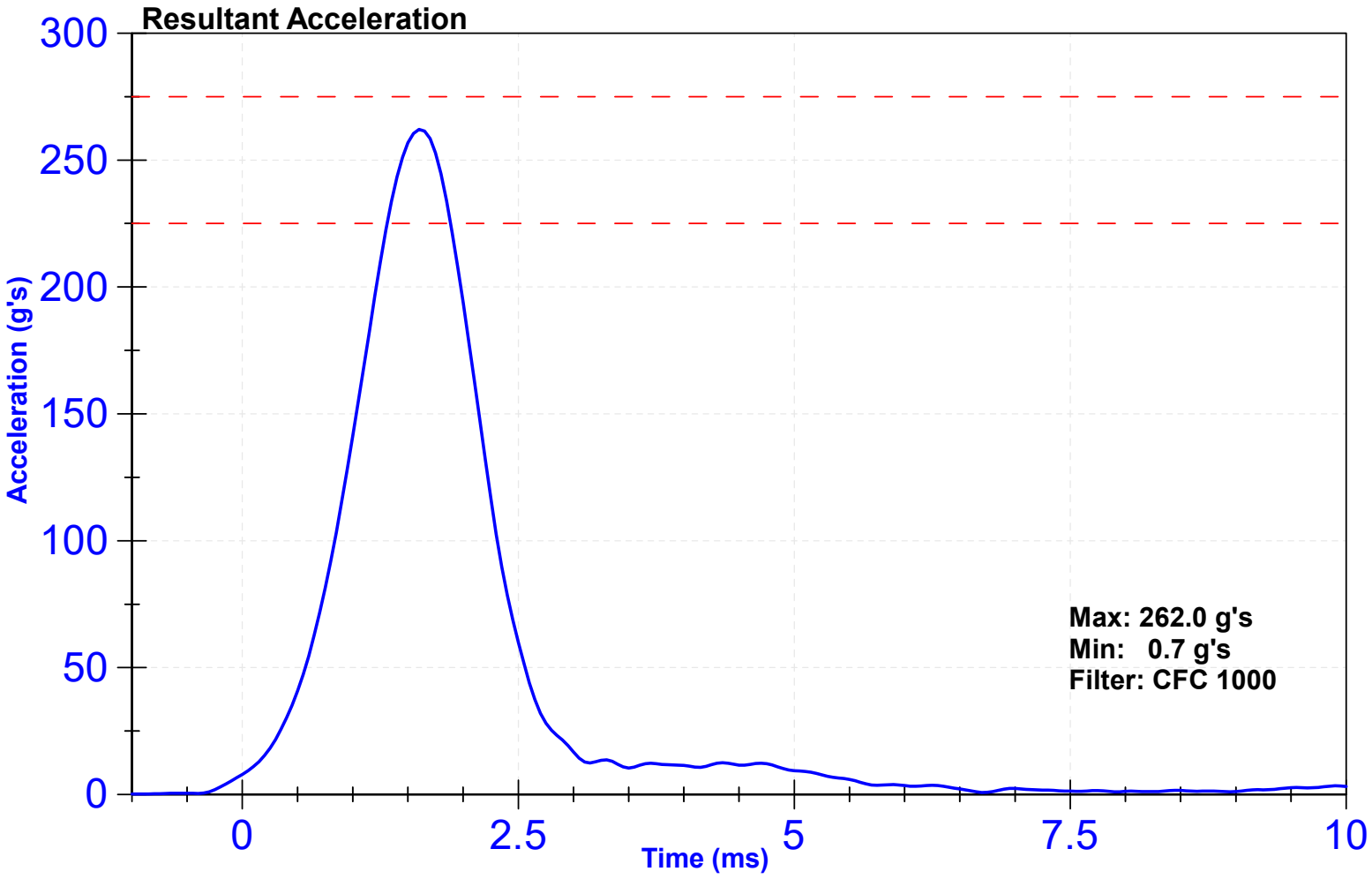
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

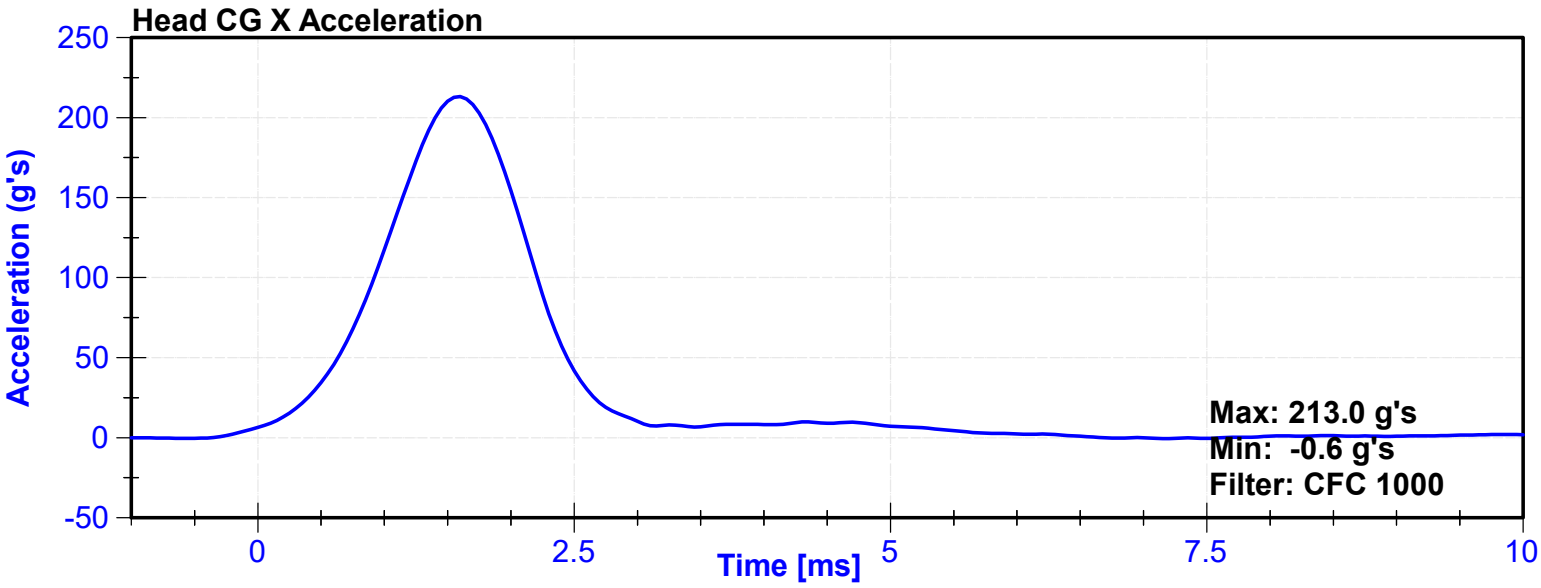
Results

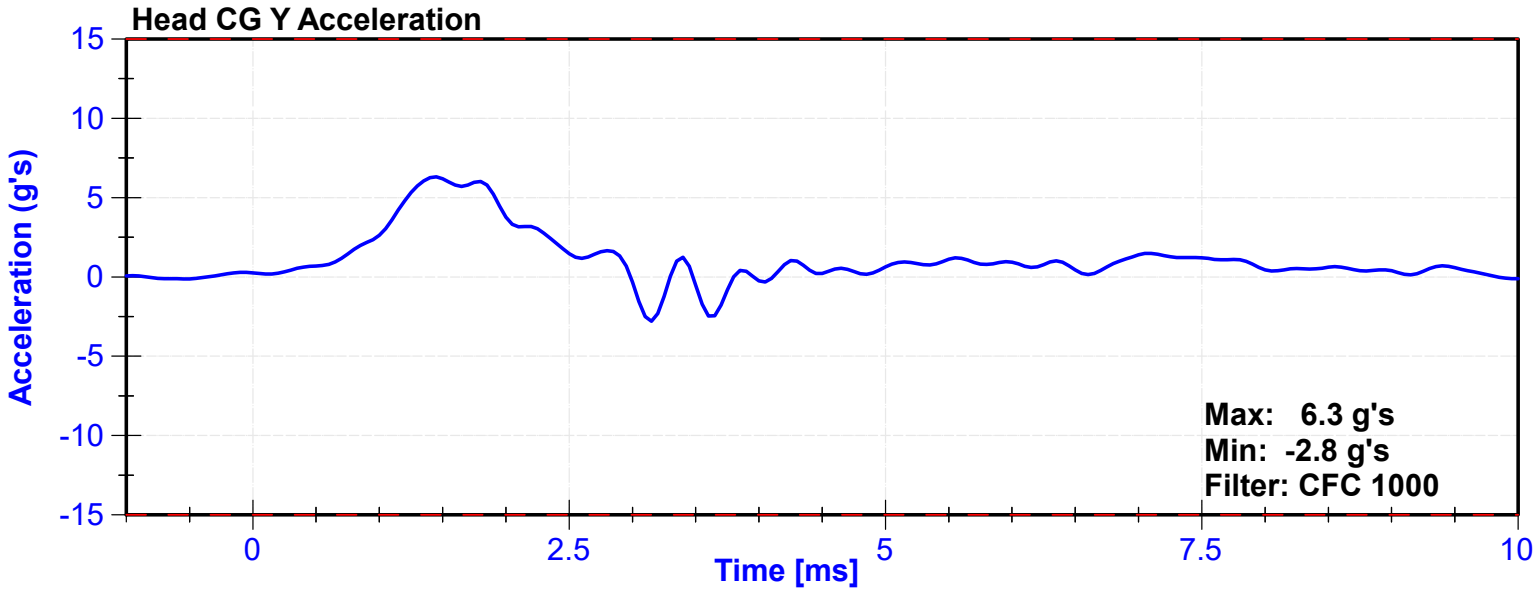
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.2	Pass
Humidity	10	70	%	48.7	Pass
Resultant Acceleration	225	275	g's	262.0	Pass
Oscillation	0	10	%	5.2	Pass
Lateral Acceleration	-15	15	g's	6.3	Pass

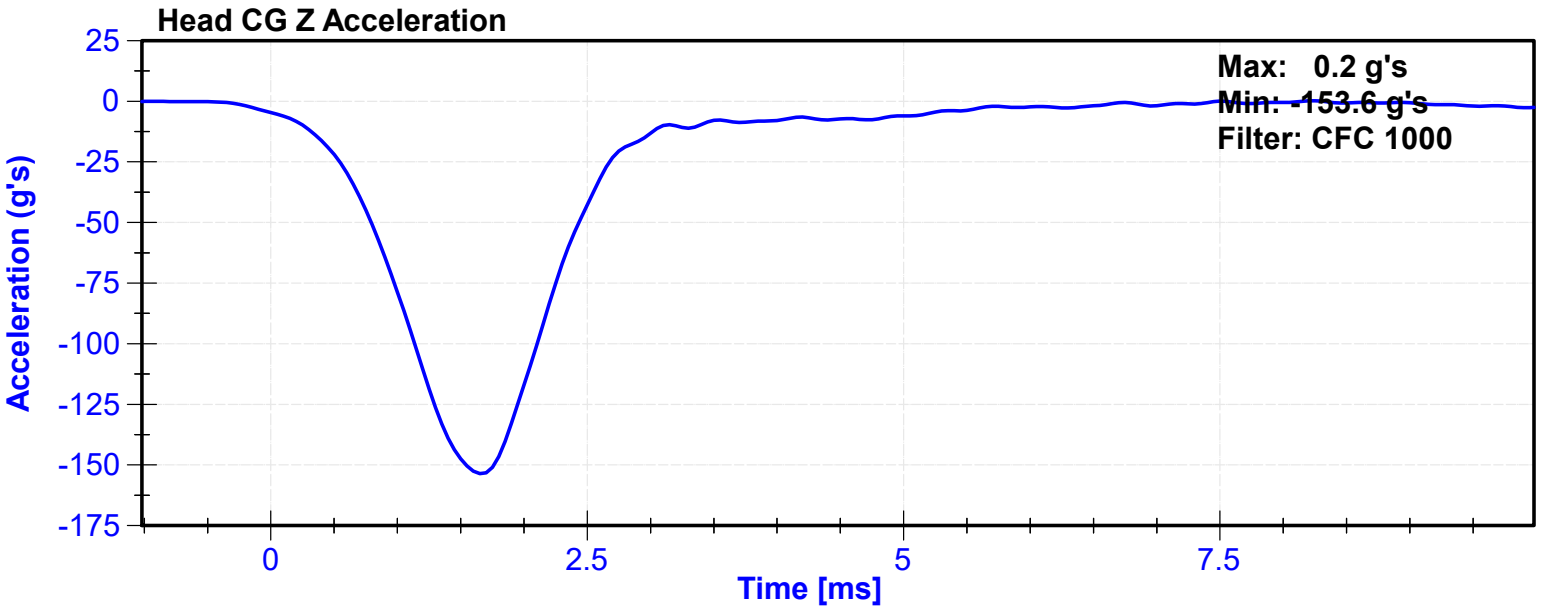
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Measurement Specialties	A260183	7/10/2024	1/6/2025
Y Accelerometer	Measurement Specialties	A341246	3/13/2024	9/9/2024
Z Accelerometer	Measurement Specialties	A260527	7/10/2024	1/6/2025




Head CG X Acceleration
Acceleration (g's)
250
200
150
100
50
0
-50
0
2.5
5
7.5
10
Time [ms]
Max: 213.0 g's
Min: -0.6 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: 6.3 g's
Min: -2.8 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
25
0
-25
-50
-75
-100
-125
-150
-175
0
2.5
5
7.5
Time [ms]
Max: 0.2 g's
Min: -153.6 g's
Filter: CFC 1000

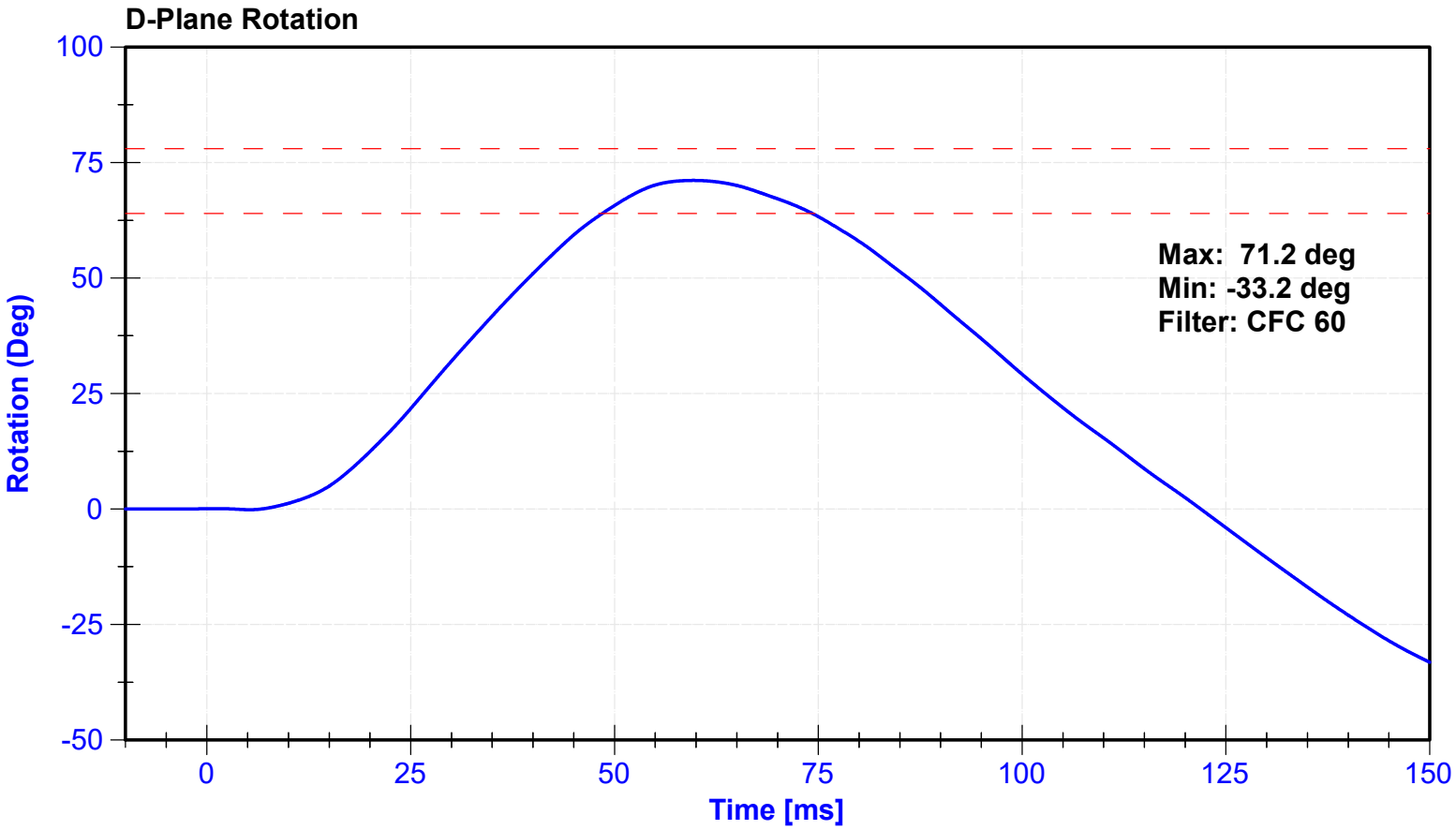
ATD Manufacturer	Humaetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

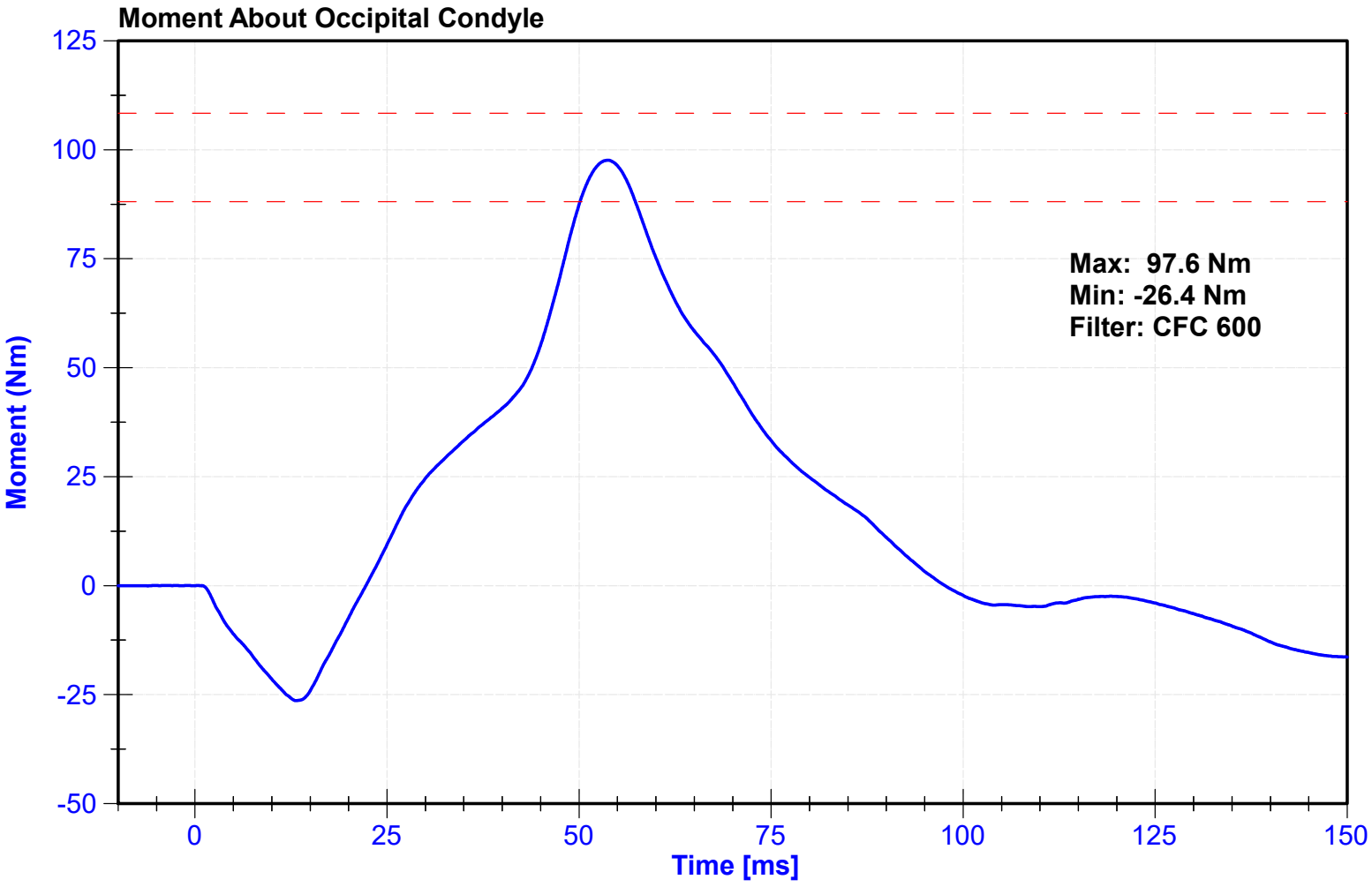
Results

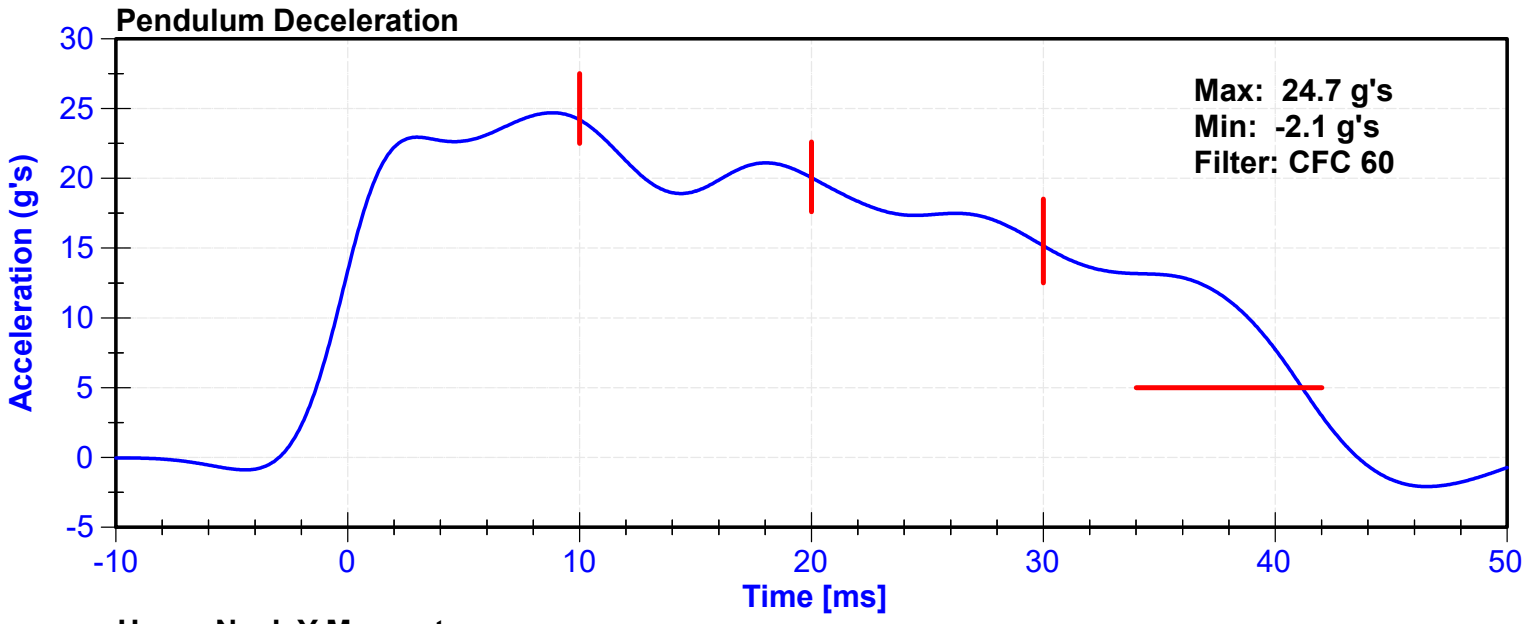
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	46.0	Pass
Velocity	6.89	7.13	m/s	7.039	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	24.18	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	20.04	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	15.16	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	24.7	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	41.2	Pass
Maximum D Plane Rotation	64	78	deg	71.2	Pass
Time to Maximum Rotation	57	64	ms	59.7	Pass
Rotation Decay to Zero	113	127	ms	122.0	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	97.63	Pass
Time to Maximum Moment	47	58	ms	53.8	Pass
Moment Decay to Zero	97	107	ms	97.7	Pass

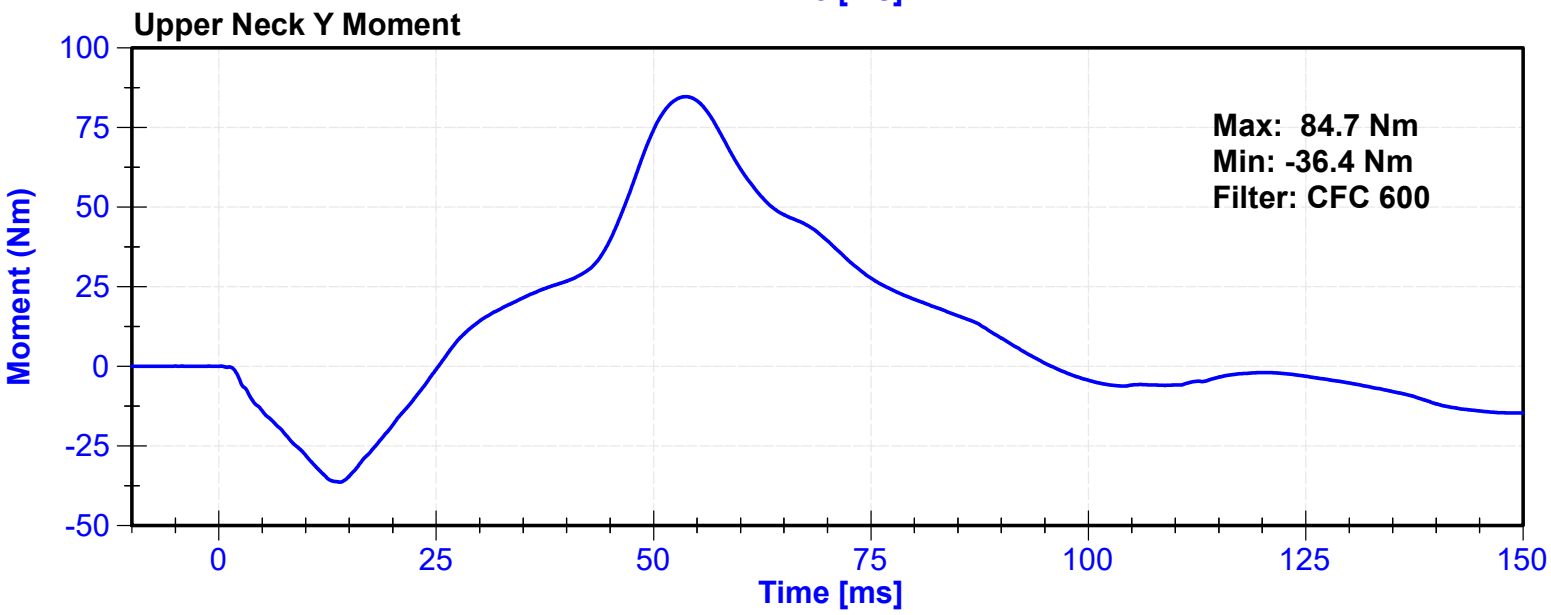
Transducer Calibrations

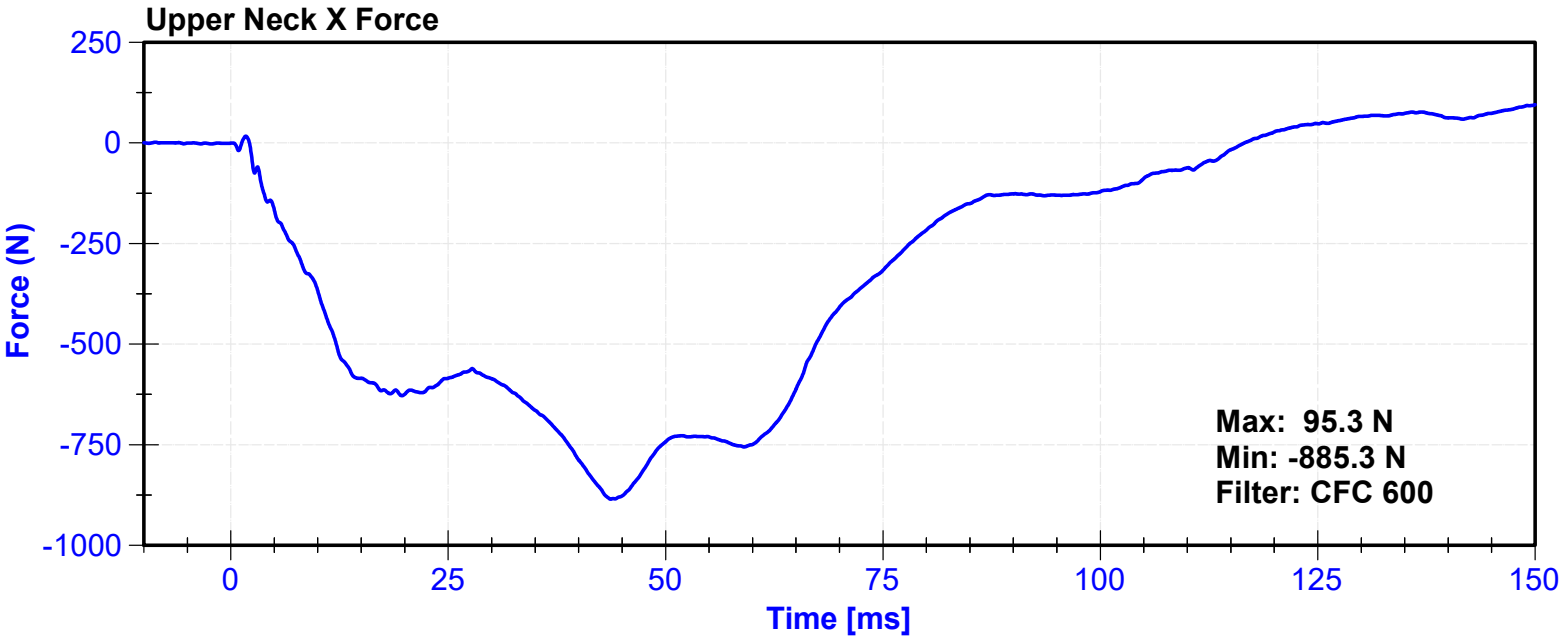
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16499	2/28/2024	8/26/2024
Pendulum Potentiometer	ETI	1412	12/18/2023	12/17/2024
Condyle Potentiometer	ETI	1911	12/18/2023	12/17/2024
Upper Neck Load Cell	Denton	1629-FX	12/8/2023	12/7/2024


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 71.2 deg
Min: -33.2 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: 97.6 Nm
Min: -26.4 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 24.7 g's
Min: -2.1 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 84.7 Nm
Min: -36.4 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 95.3 N
Min: -885.3 N
Filter: CFC 600
Force (N)
Time [ms]

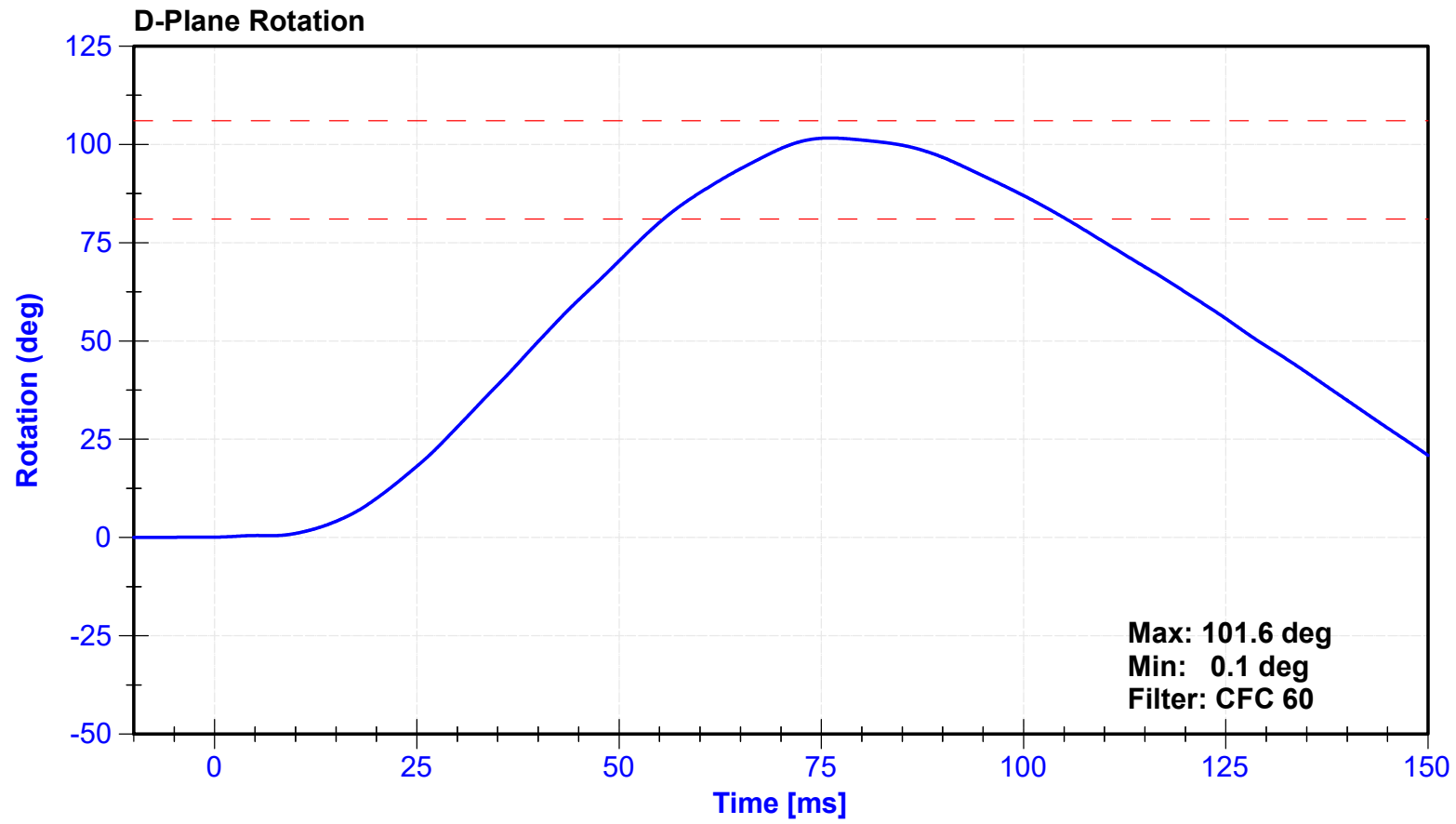
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

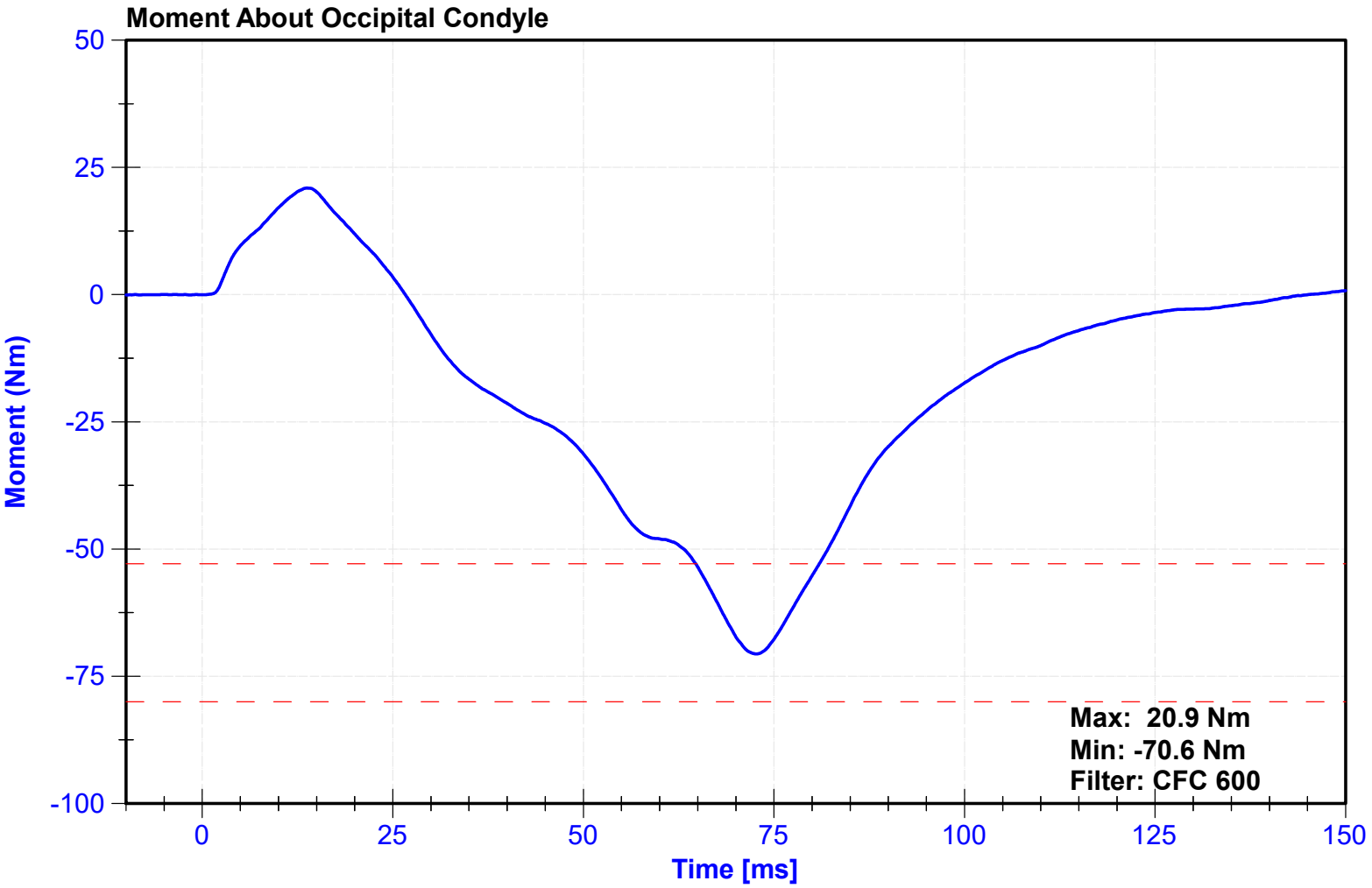
Results

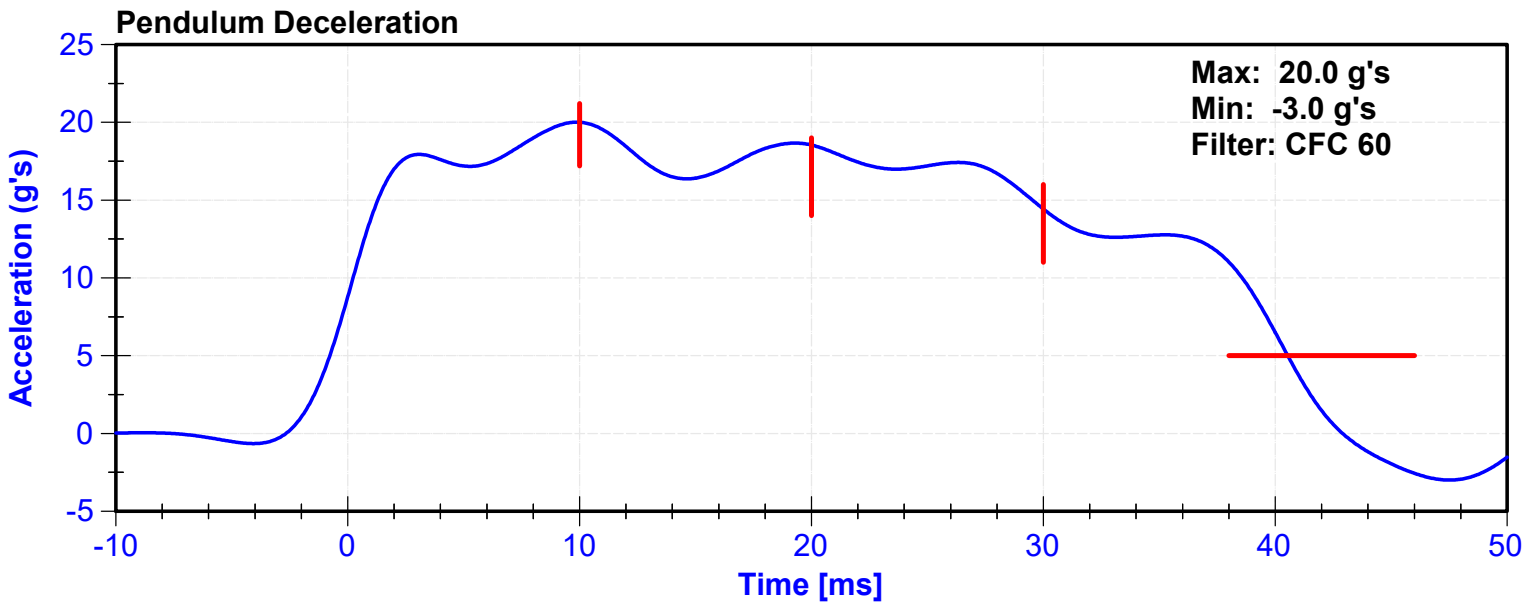
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	58.9	Pass
Velocity	5.94	6.19	m/s	6.114	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	20.01	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.5	Pass
Pendulum Deceleration at 30ms	11	16	g's	14.4	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	20.0	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	40.6	Pass
Maximum D Plane Rotation	81	106	deg	101.6	Pass
Time to Maximum Rotation	72	82	ms	76.1	Pass
Rotation Decay to Zero	147	174	ms	165.1	Pass
Minimum Moment About OC	-80	-52.9	Nm	-70.60	Pass
Time to Minimum Moment	65	79	ms	72.7	Pass
Moment Decay to Zero	120	148	ms	145.1	Pass

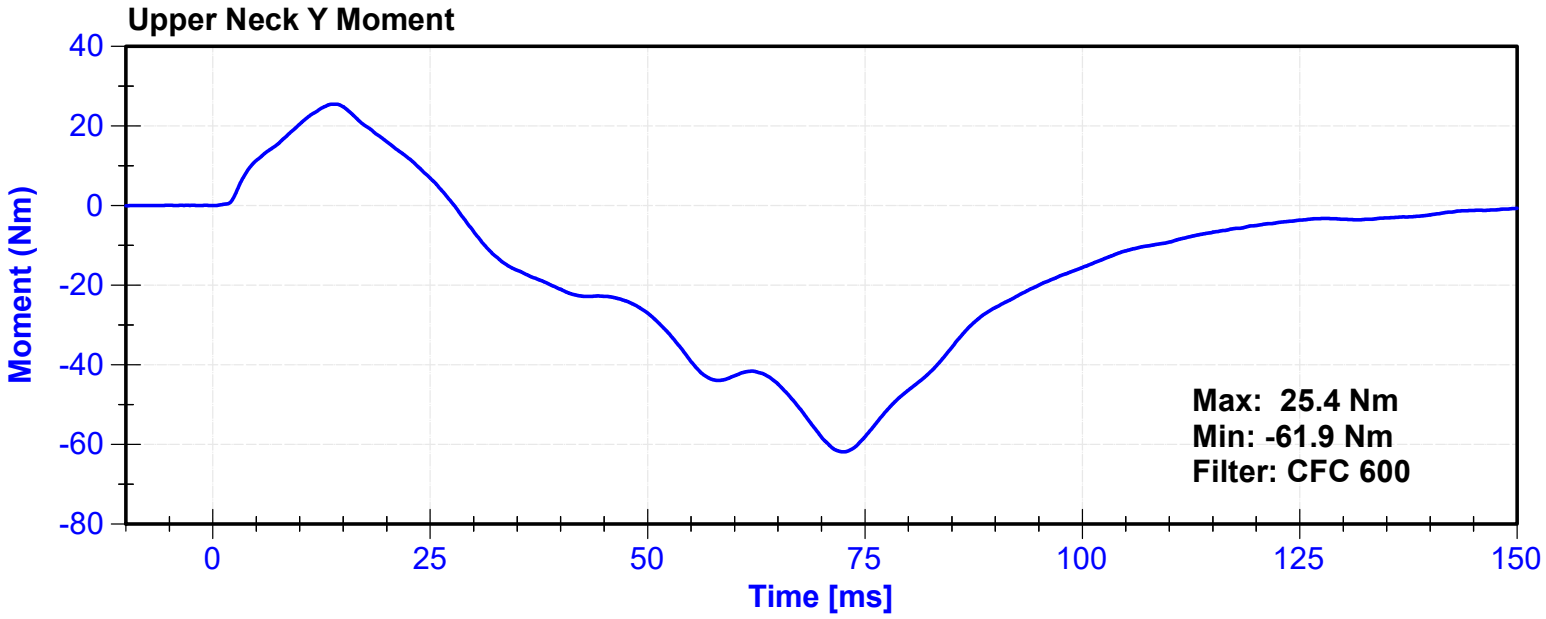
Transducer Calibrations

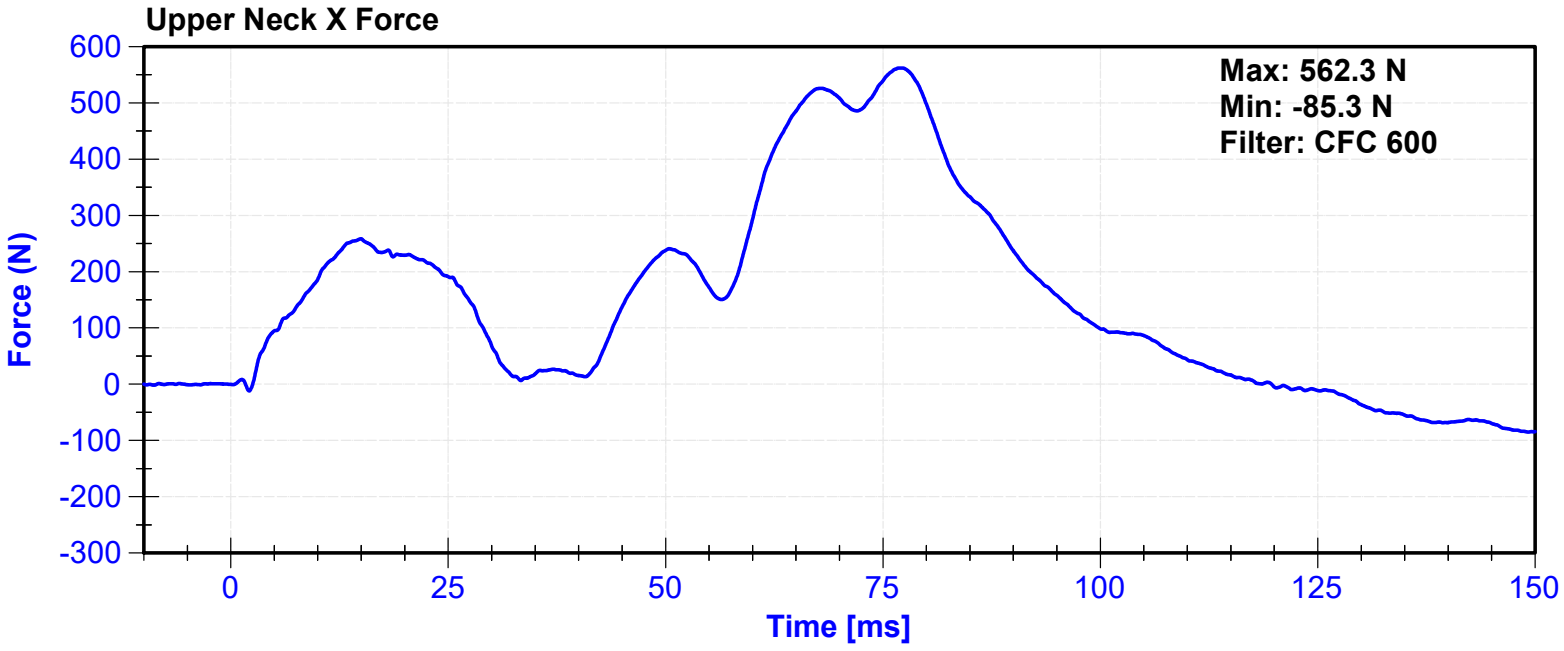
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16499	2/28/2024	8/26/2024
Pendulum Potentiometer	ETI	SP22G_1412	12/18/2023	12/17/2024
Condyle Potentiometer	ETI	SP22G_1911	12/18/2023	12/17/2024
Upper Neck Load Cell	Denton	1629-FX	12/8/2023	12/7/2024


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 101.6 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: 20.9 Nm
Min: -70.6 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 20.0 g's
Min: -3.0 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: 25.4 Nm
Min: -61.9 Nm
Filter: CFC 600
Moment (Nm)
40
20
0
-20
-40
-60
-80
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 562.3 N
Min: -85.3 N
Filter: CFC 600
Force (N)
600
500
400
300
200
100
0
-100
-200
-300
0
25
50
75
100
125
150
Time [ms]

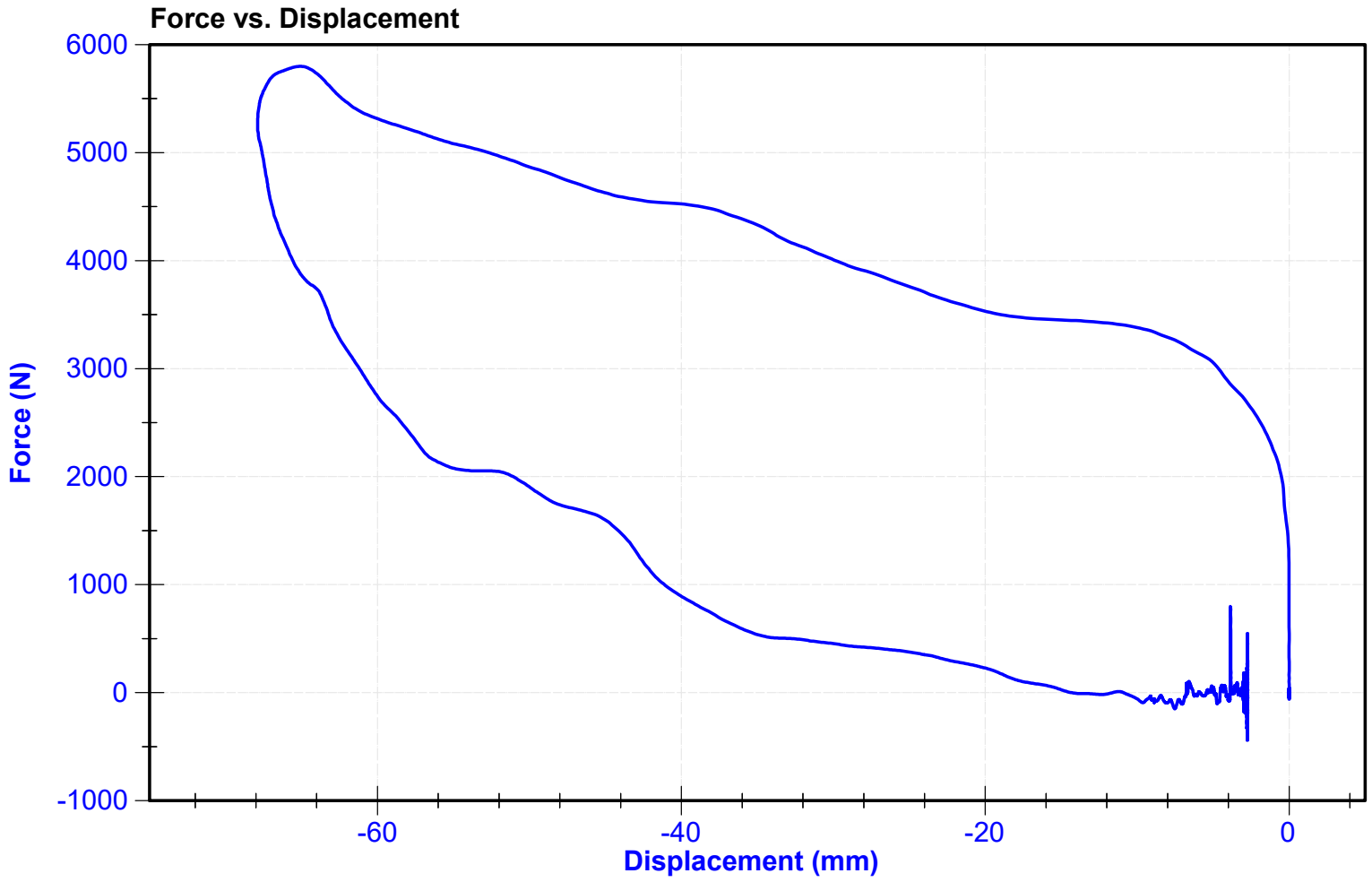
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

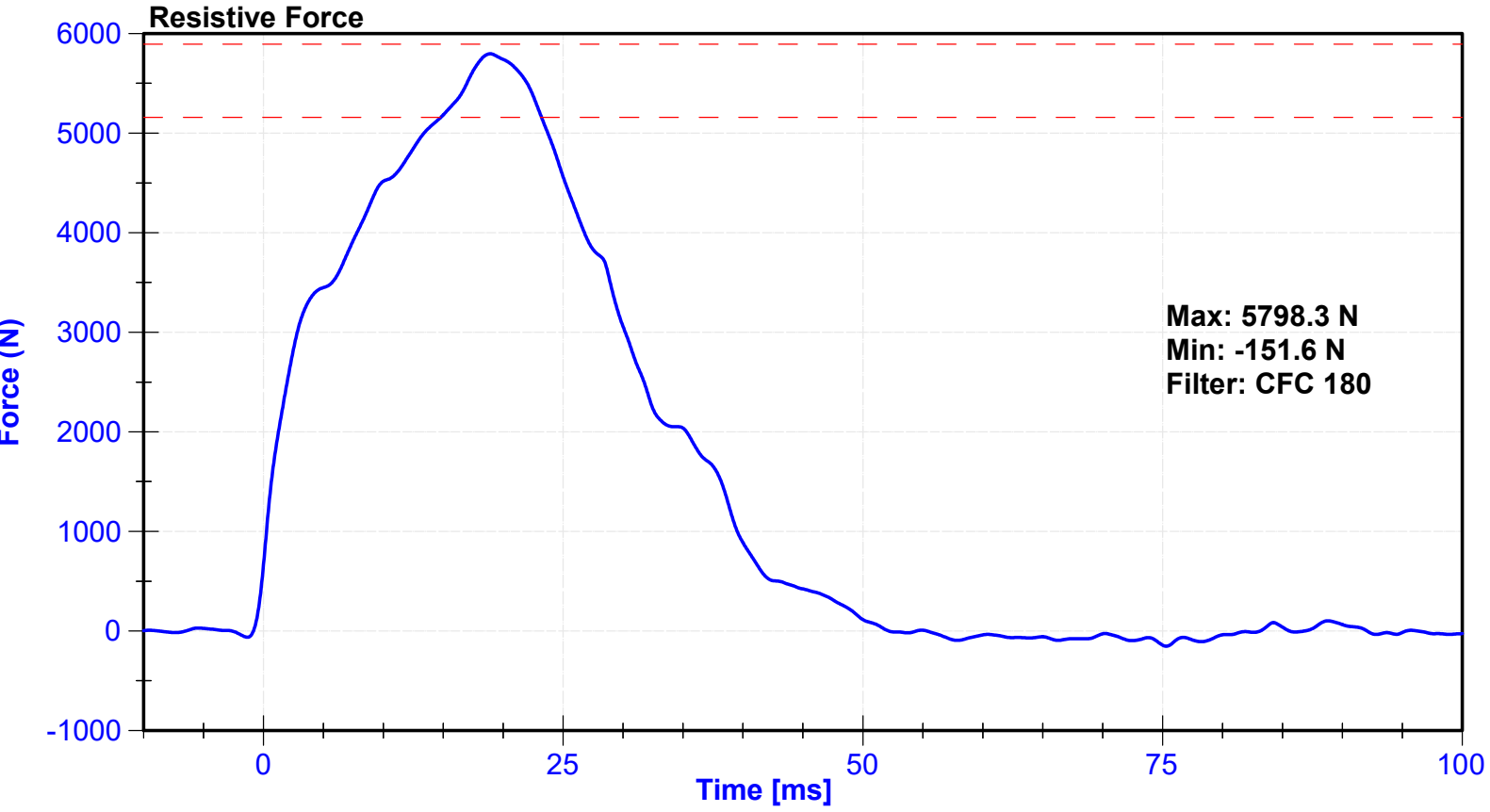
Results

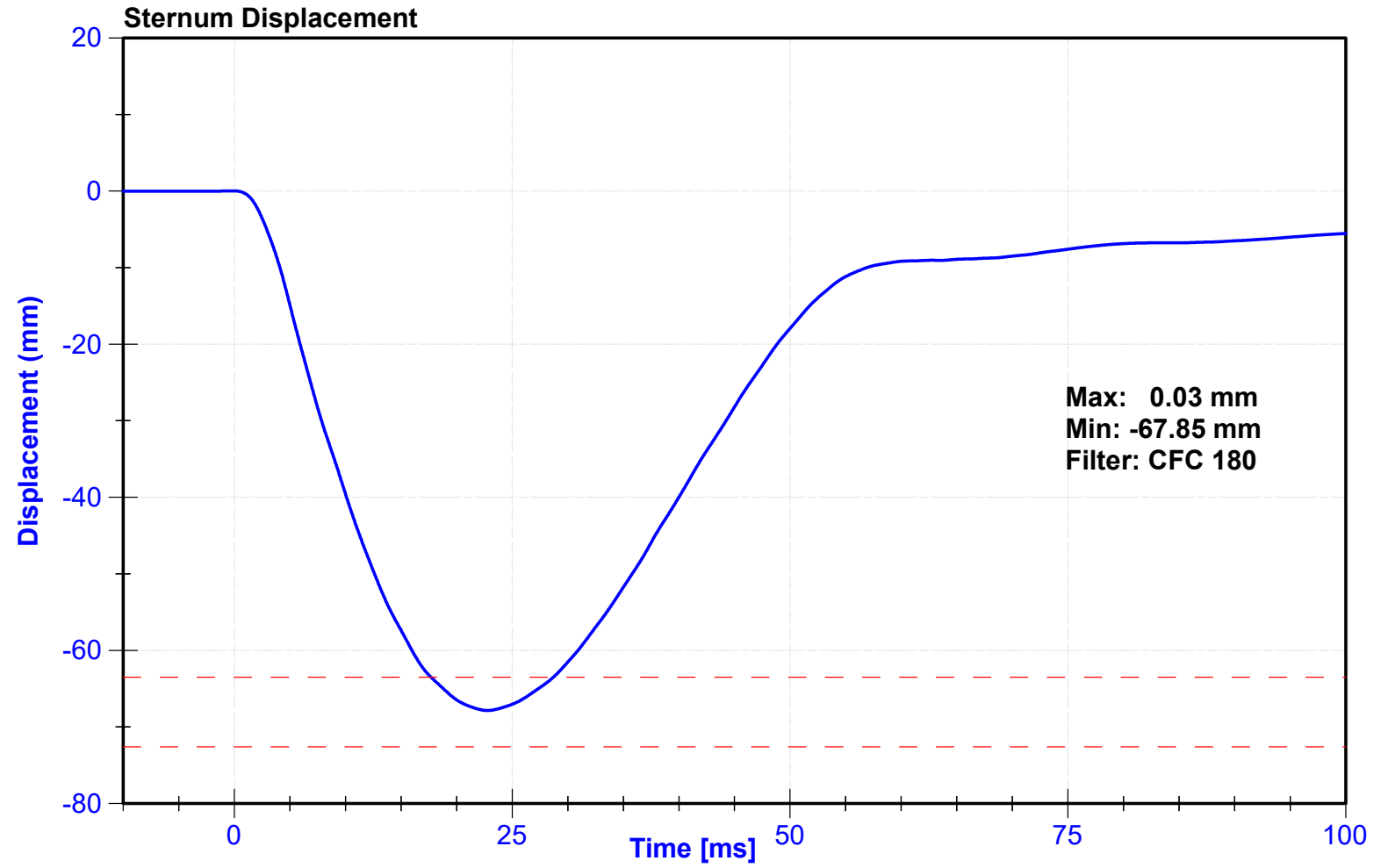
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.4	Pass
Humidity	10	70	%	45.7	Pass
Velocity	6.59	6.83	m/s	6.615	Pass
Chest Displacement	-72.6	-63.5	mm	-67.85	Pass
Resistive Force	5160	5894	N	5798.3	Pass
Hysteresis	69	85	%	73.4	Pass

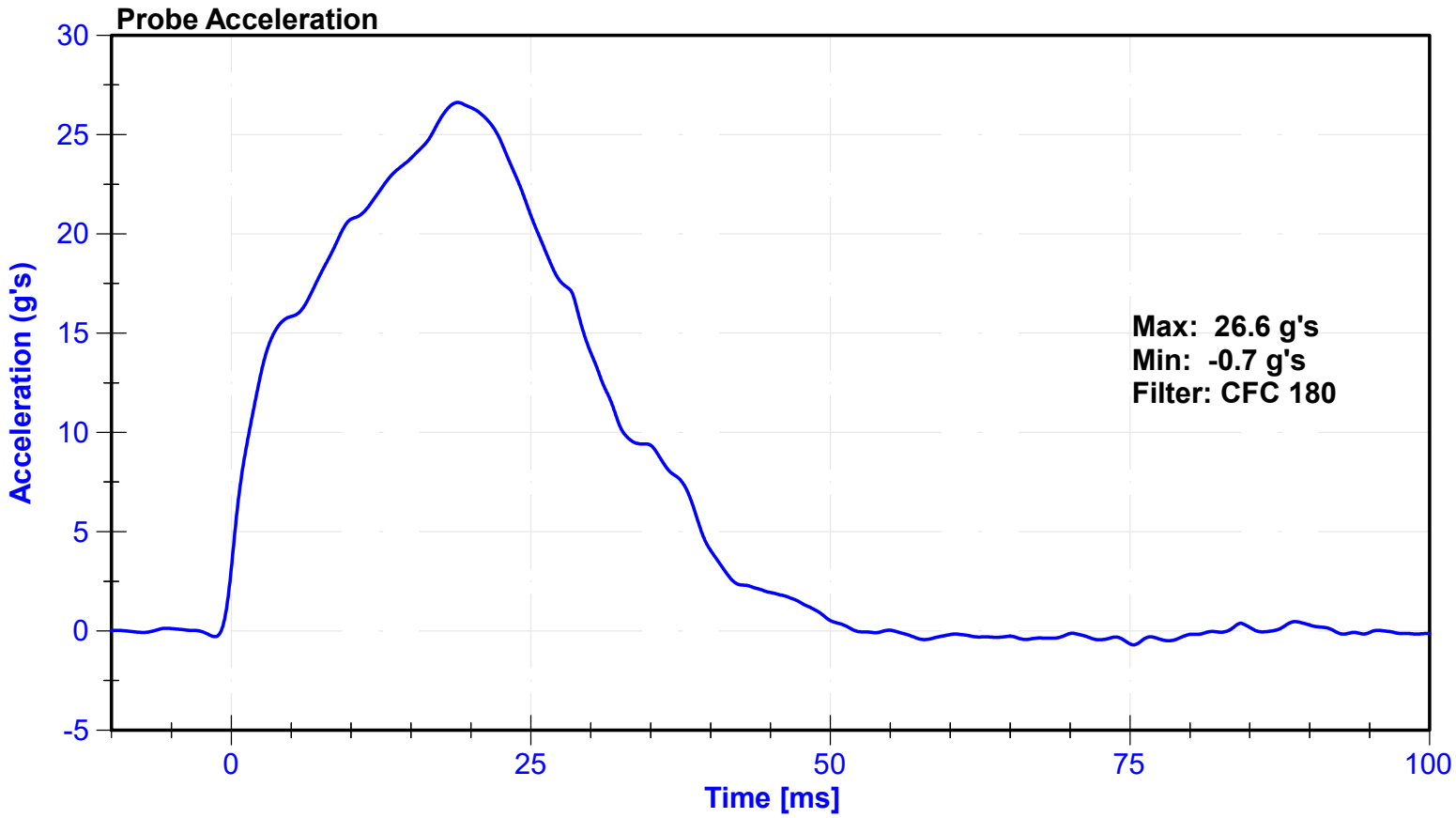
Transducer Calibrations

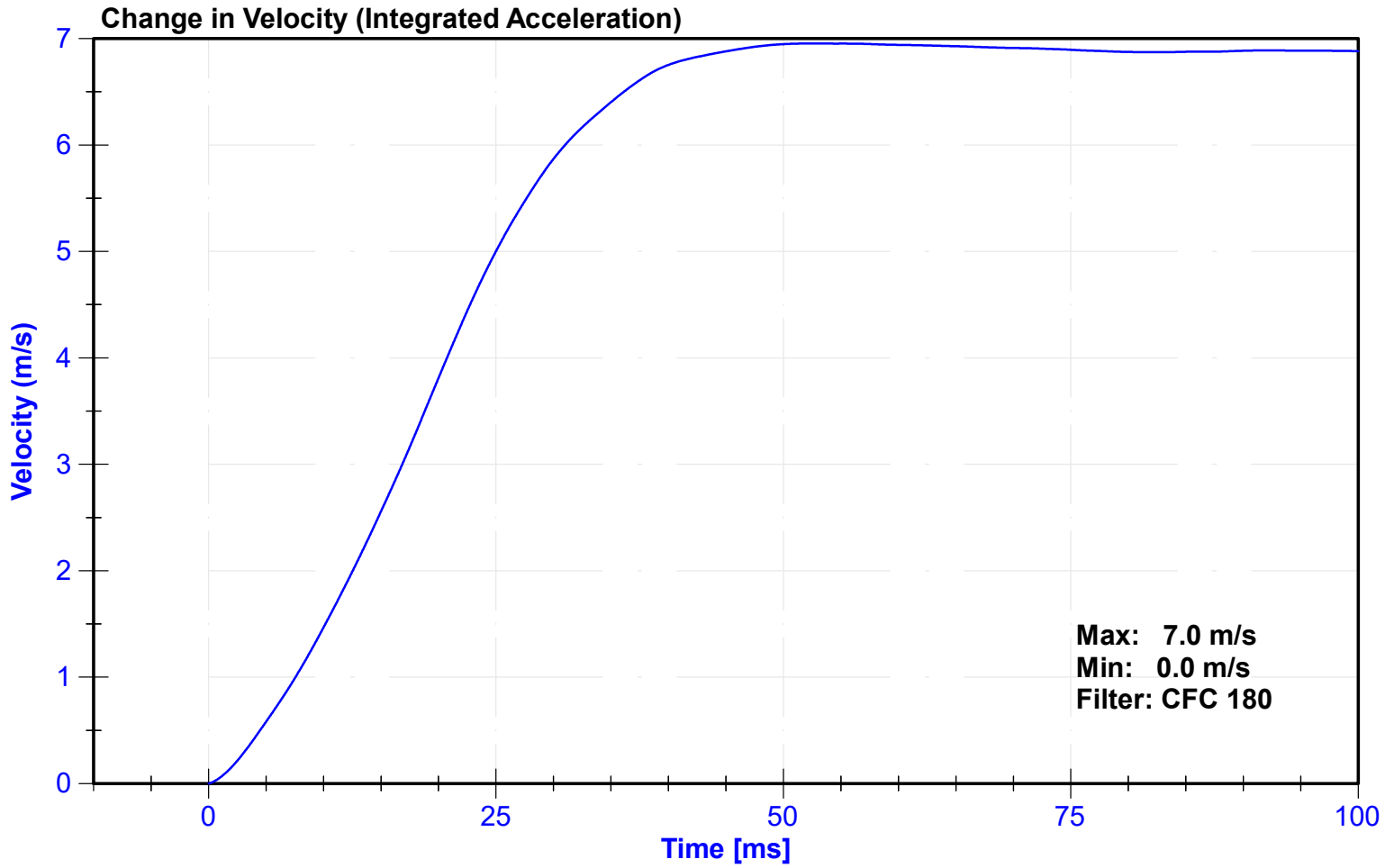
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Measurement	MS26647	3/27/2024	9/23/2024
Chest Potentiometer	Servo	1046	4/30/2024	10/29/2024




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
25
50
75
100
Time [ms]
Max: 5798.3 N
Min: -151.6 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: -67.85 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: 26.6 g's
Min: -0.7 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
7
6
5
4
3
2
1
0
0
25
50
75
100
Time [ms]
Max: 7.0 m/s
Min: 0.0 m/s
Filter: CFC 180

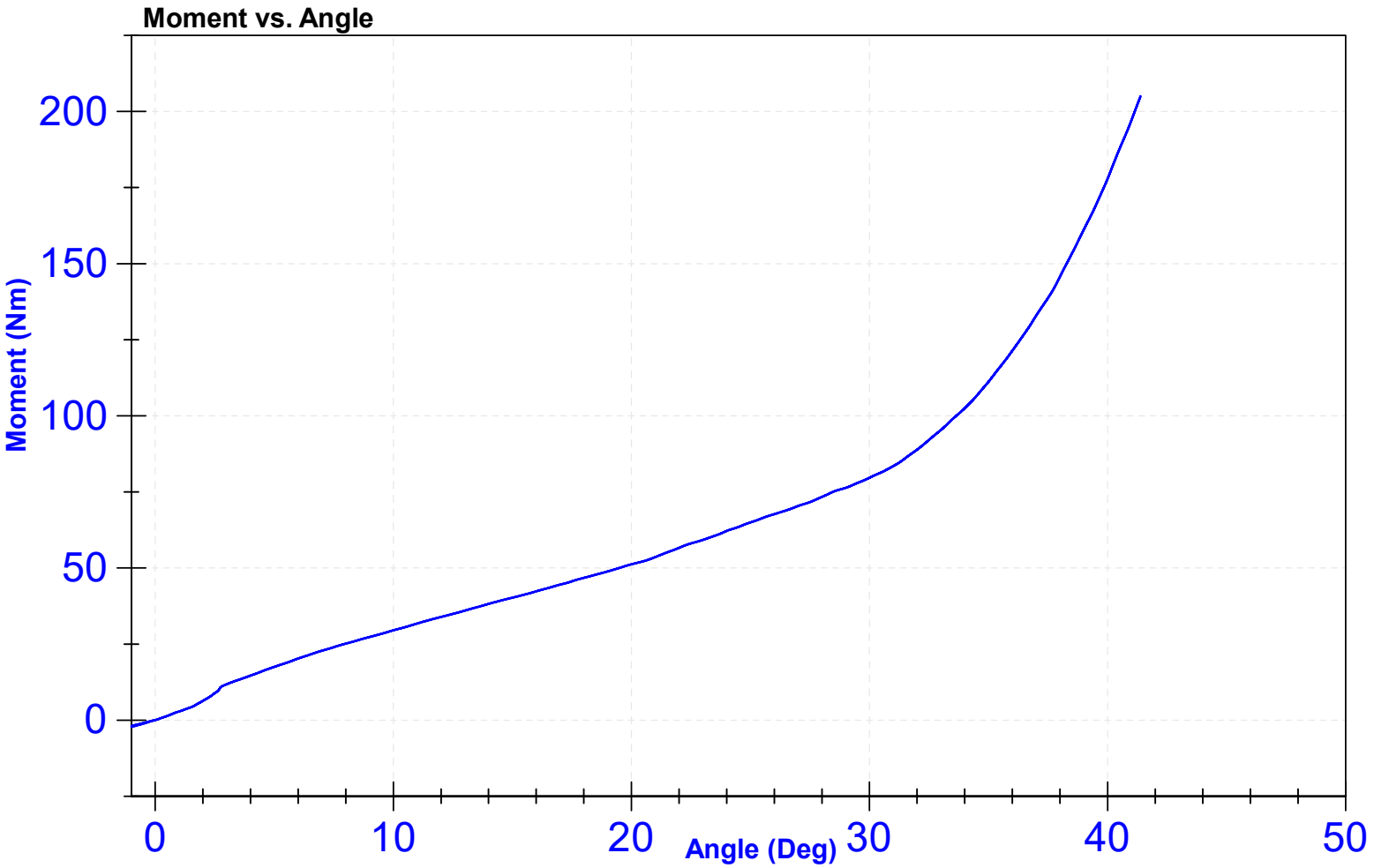
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.7	Pass
Humidity	10	70	%	46.5	Pass
Average Velocity	5	10	deg/s	7.1	Pass
Angle at 203Nm	40	50	deg	41.3	Pass
Moment at 30 degrees	0	94.9	Nm	79.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Servo 14CB1-3615	3203	11/16/2023	11/15/2024
Load Cell	PCB 2301-02A	111	2023-09-21	2024-09-20



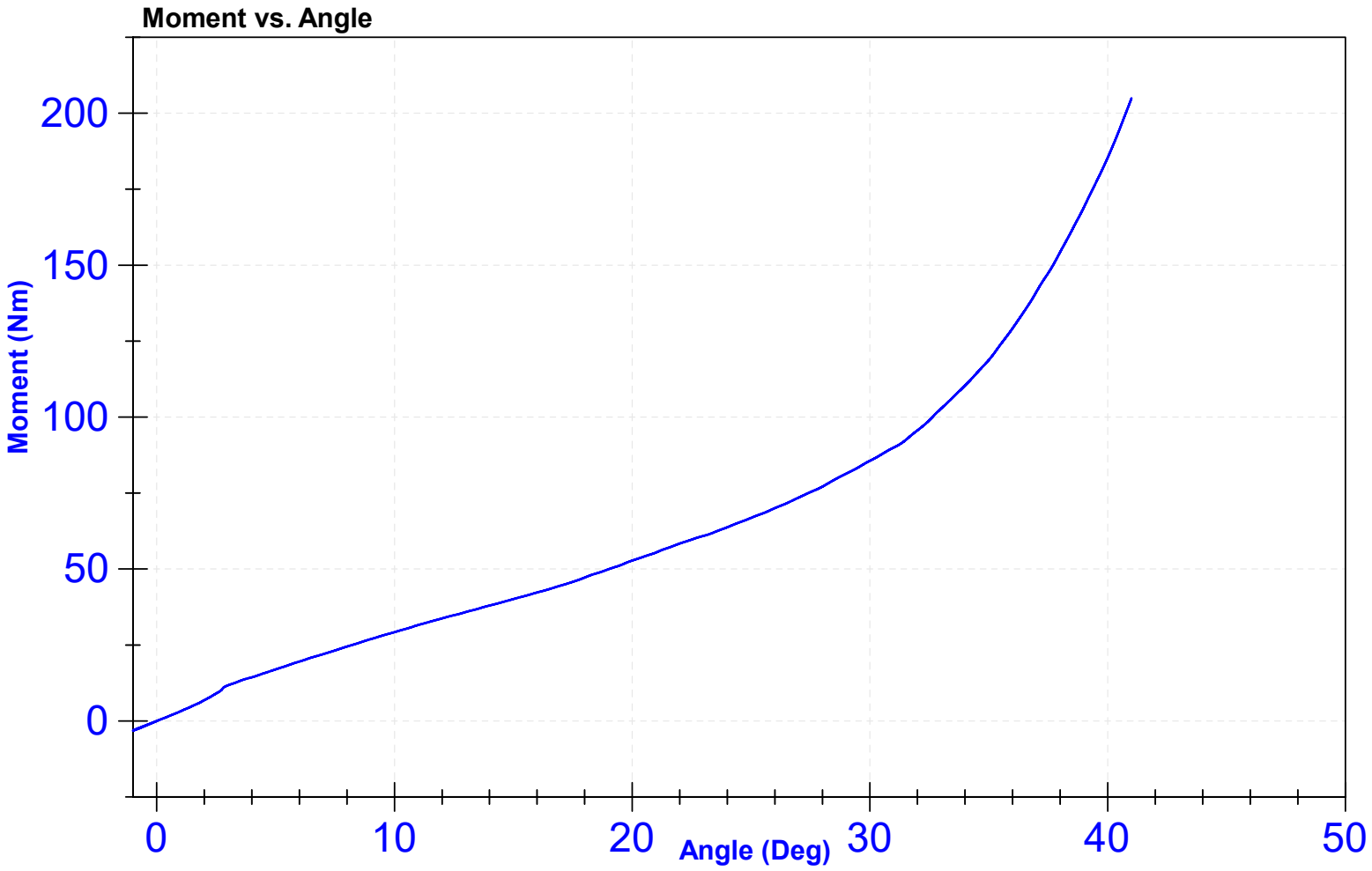
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.7	Pass
Humidity	10	70	%	46.5	Pass
Average Velocity	5	10	deg/s	7.0	Pass
Angle at 203Nm	40	50	deg	40.9	Pass
Moment at 30 degrees	0	94.9	Nm	85.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Servo 14CB1-3615	3203	11/16/2023	11/15/2024
Load Cell	PCB 2301-02A	111	2023-09-21	2024-09-20



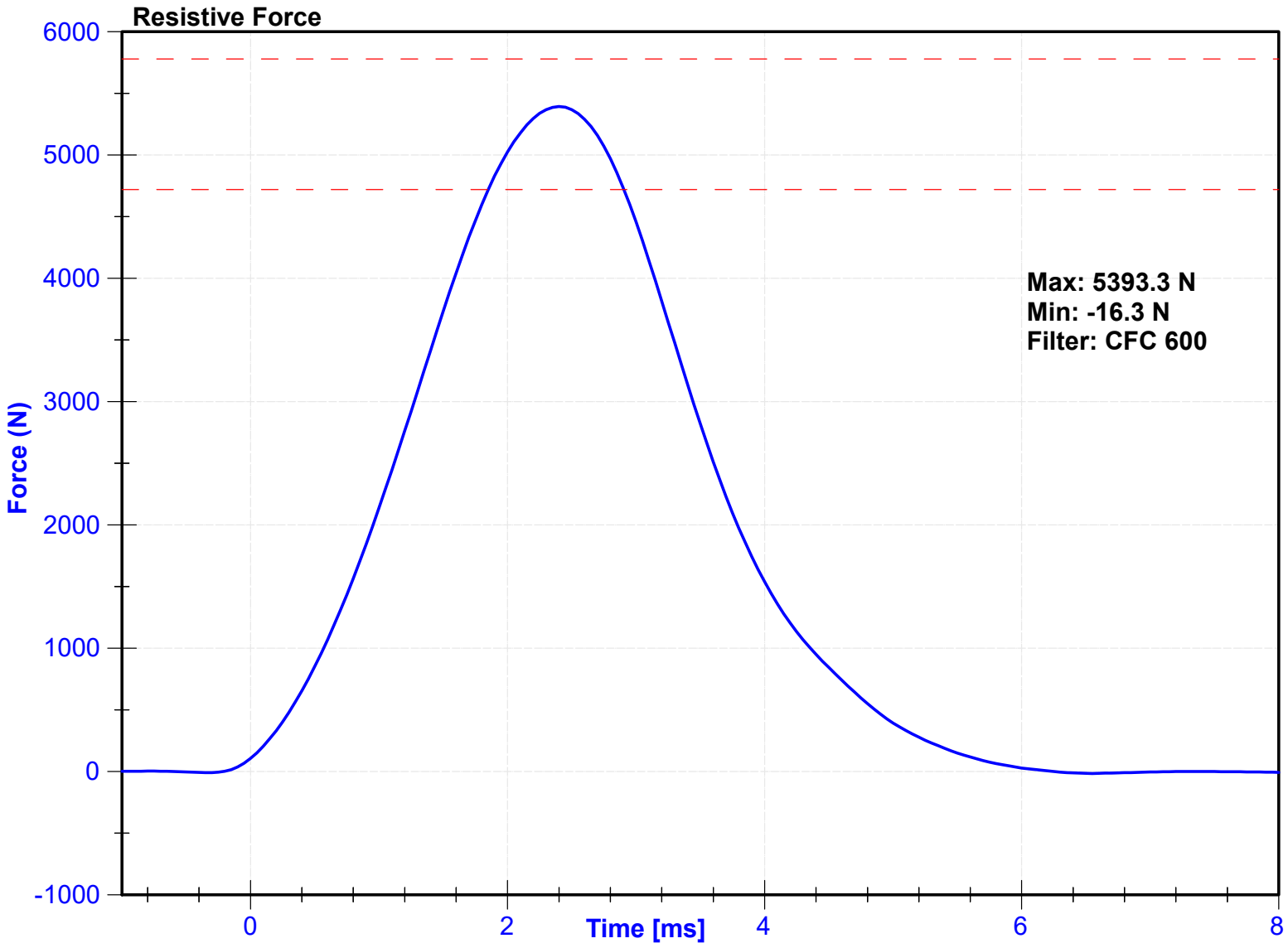
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

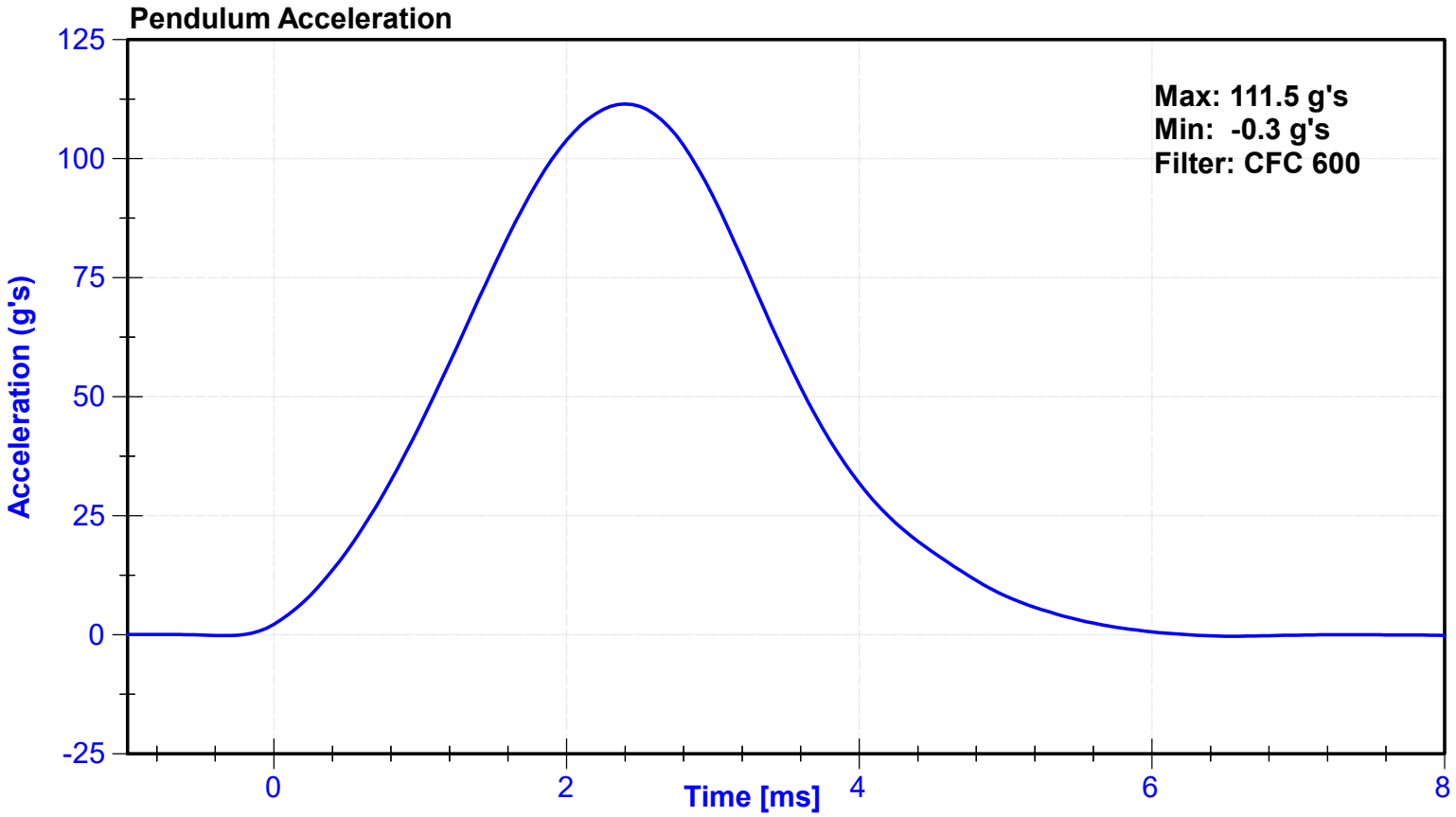
Results

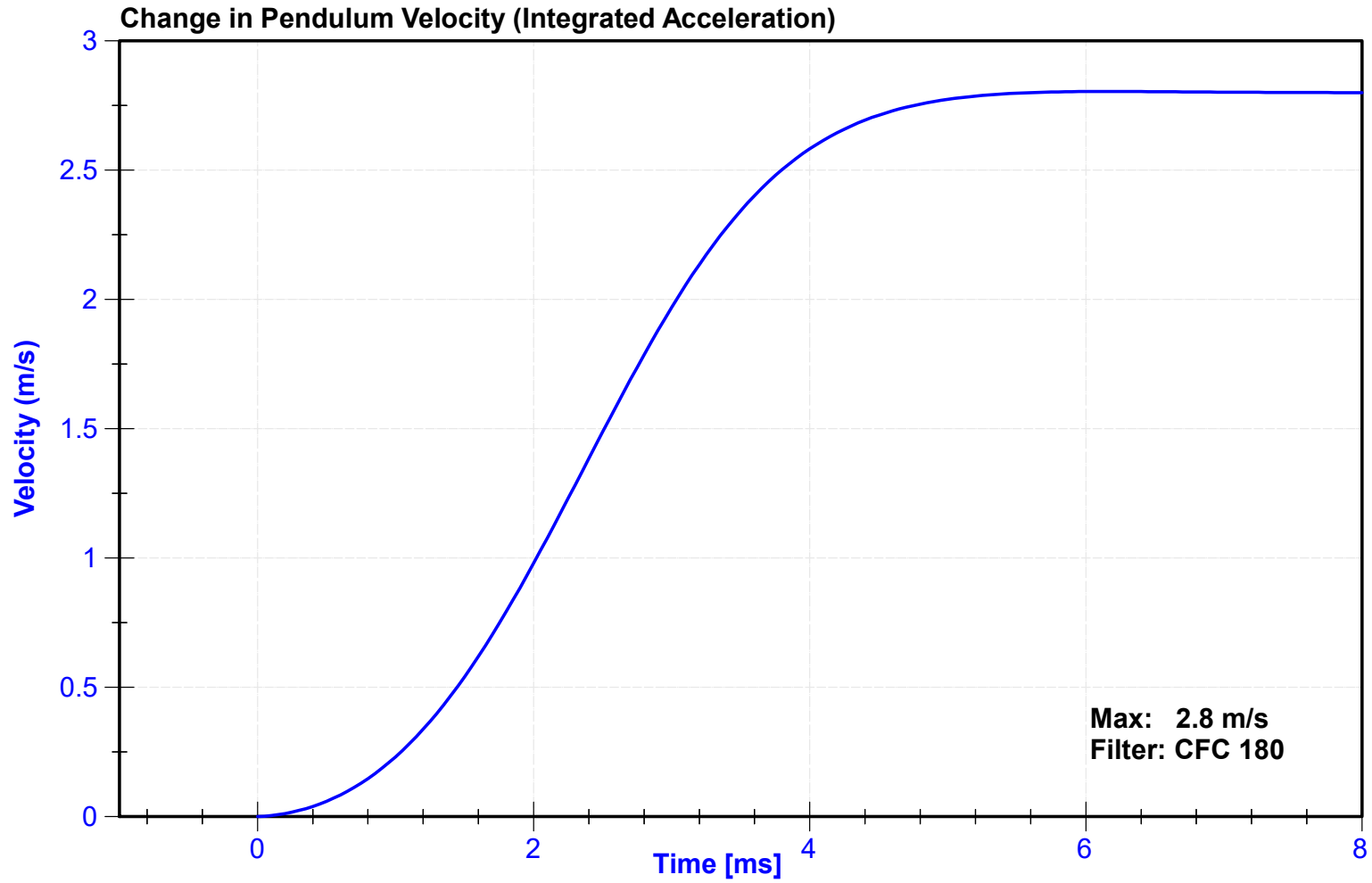
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.3	Pass
Humidity	10	70	%	51.8	Pass
Velocity	2.07	2.13	m/s	2.129	Pass
Maximum Resistive Force	4720	5780	N	5393.3	Pass

Transducer Calibrations

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




Pendulum Acceleration
Max: 111.5 g's
Min: -0.3 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: 2.8 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]

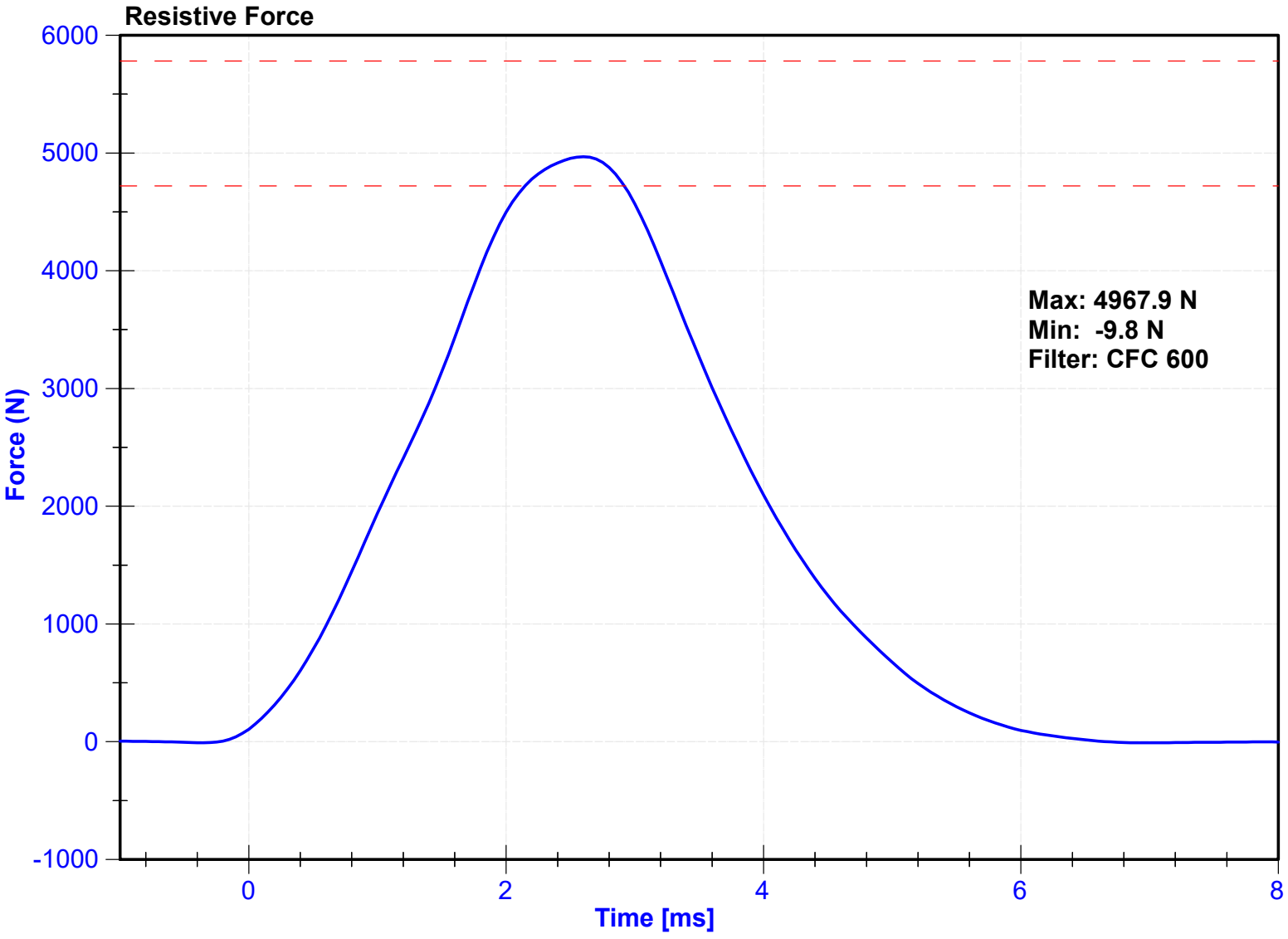
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

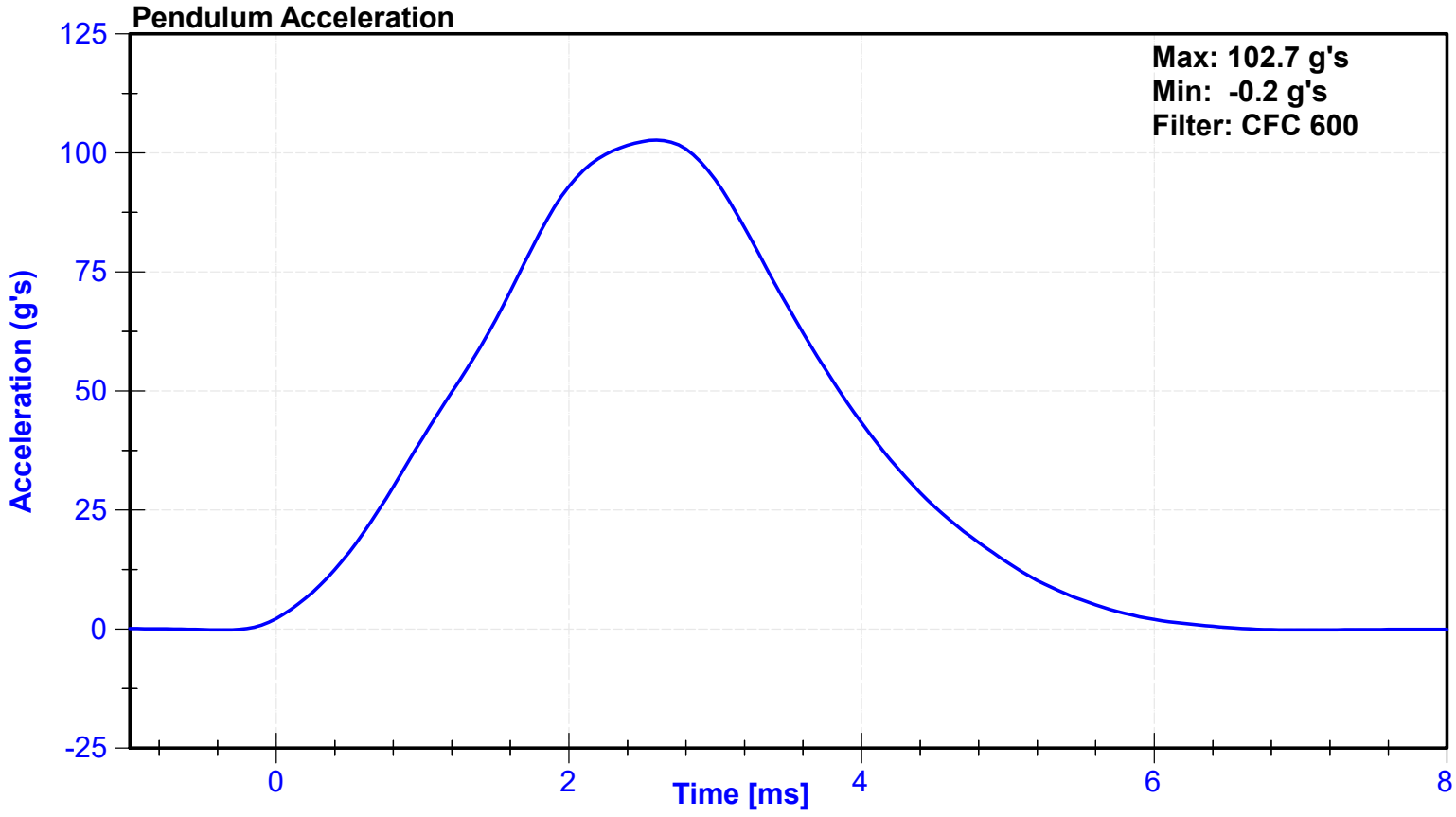
Results

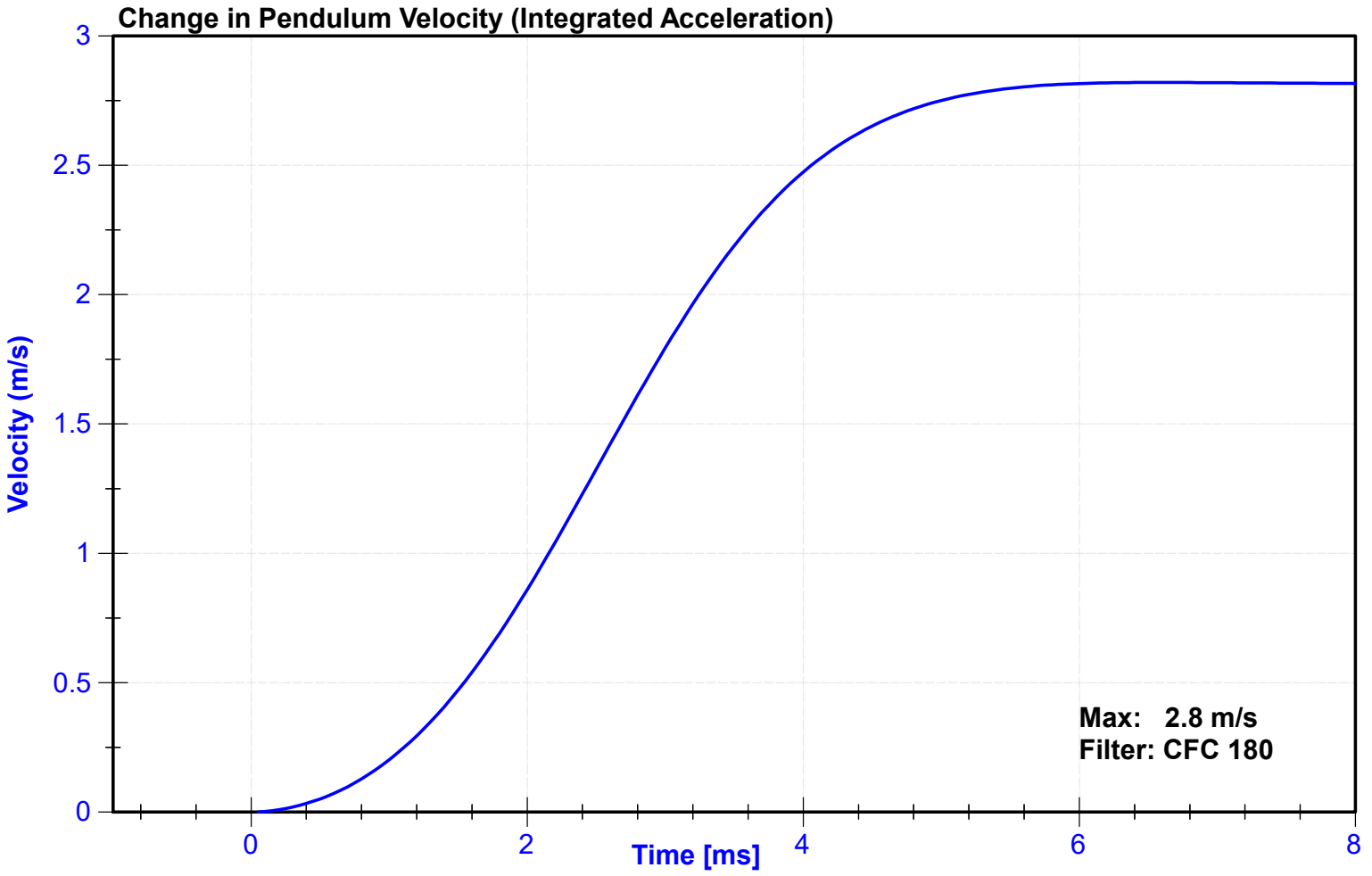
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.3	Pass
Humidity	10	70	%	51.8	Pass
Velocity	2.07	2.13	m/s	2.114	Pass
Maximum Resistive Force	4720	5780	N	4967.9	Pass

Transducer Calibrations

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




Pendulum Acceleration
Max: 102.7 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: 2.8 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

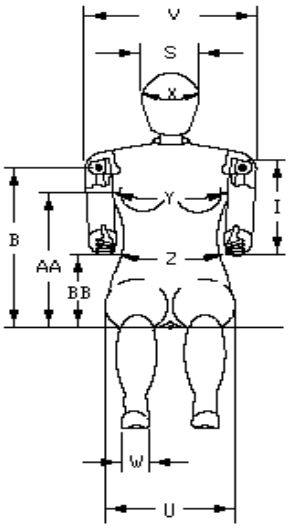
HYBRID III 5TH PERCENTILE - PASSENGER ATD

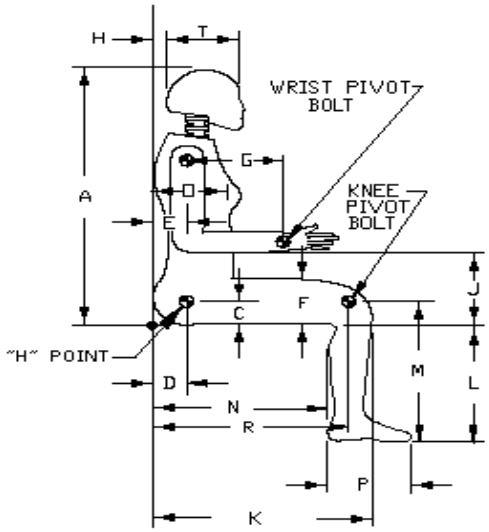
SERIAL NO: 137

External Measurements - Hybrid 3 - 5th Female

Technician: J. Rios Date: 08/27/2024

Dummy Serial Number: 137





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	791	Pass
B	Shoulder Pivot Height	432	457	435	Pass
C	H-Point Height	81	86	82	Pass
D	H-Point from Backline	145	150	145	Pass
E	Shoulder Pivot from Backline	69	84	73	Pass
F	Thigh Clearance	119	135	129	Pass
G	Back of Elbow to Wrist Pivot	244	259	250	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	284	Pass
J	Elbow Rest Height	183	203	199	Pass
K	Buttock to Knee Length	521	546	533	Pass
L	Popliteal Height	356	376	369	Pass
M	Knee Pivot Height	394	419	407	Pass
N	Buttock Popliteal Length	414	439	425	Pass
O	Chest Depth without Jacket	175	191	179	Pass
P	Foot Length (right)	219	234	230	Pass
R	Buttock To Knee Pivot Length	457	483	462	Pass
S	Head Breadth	137	147	145	Pass
T	Head Depth	178	188	181	Pass
U	Hip Breadth	300	315	310	Pass
V	Shoulder Breadth	351	366	362	Pass
W	Foot Breadth	79	94	85	Pass
X	Head Circumference	528	549	538	Pass
Y	Chest Circumference with Jacket	851	881	854	Pass
Z	Waist Circumference	460	790	614	Pass
AA	Reference Location (Chest Circumference)	333	358	338	Pass
BB	Reference Location (Waist Circumference)	160	170	164	Pass

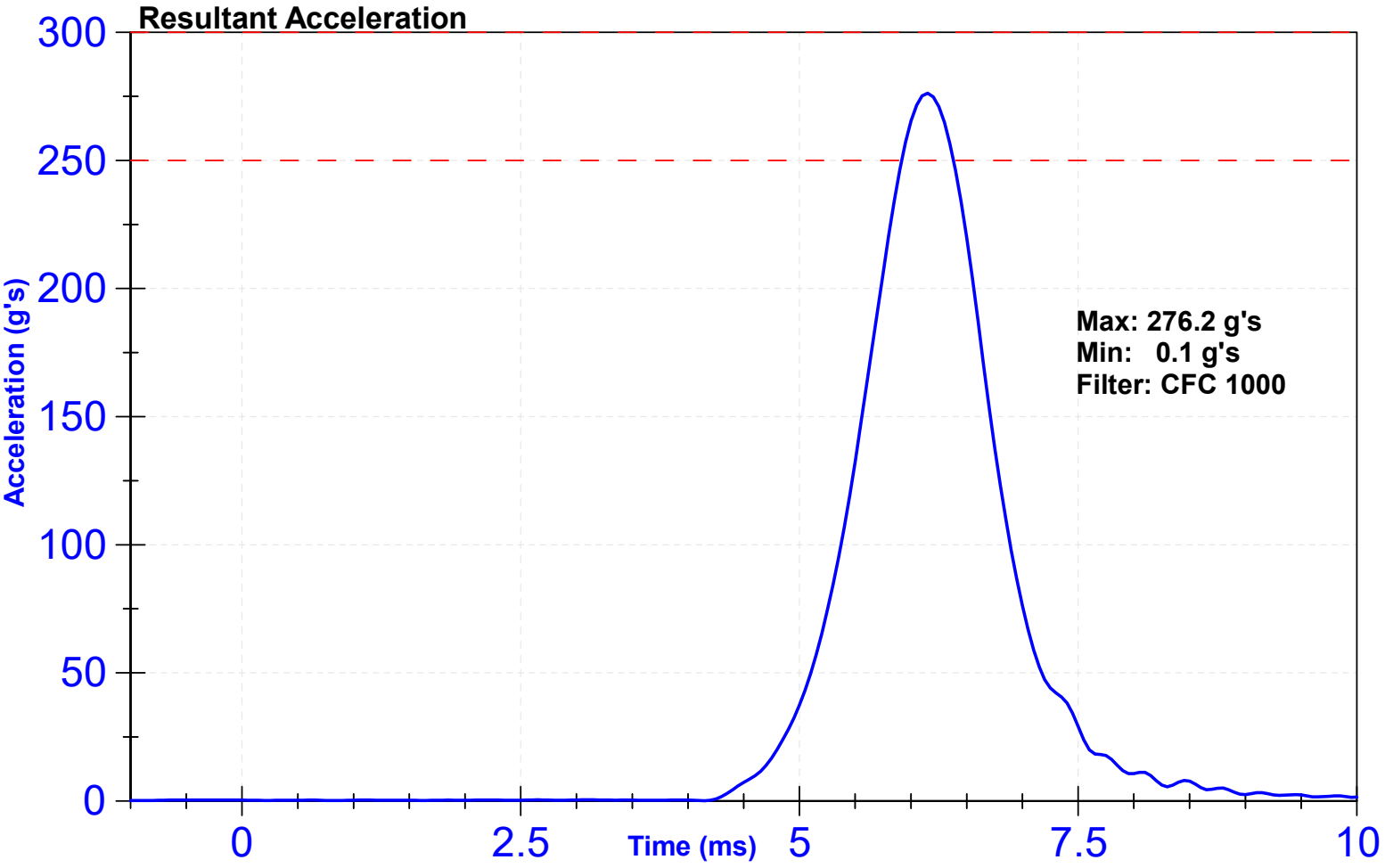
ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	137	Laboratory Supervisor	ZP

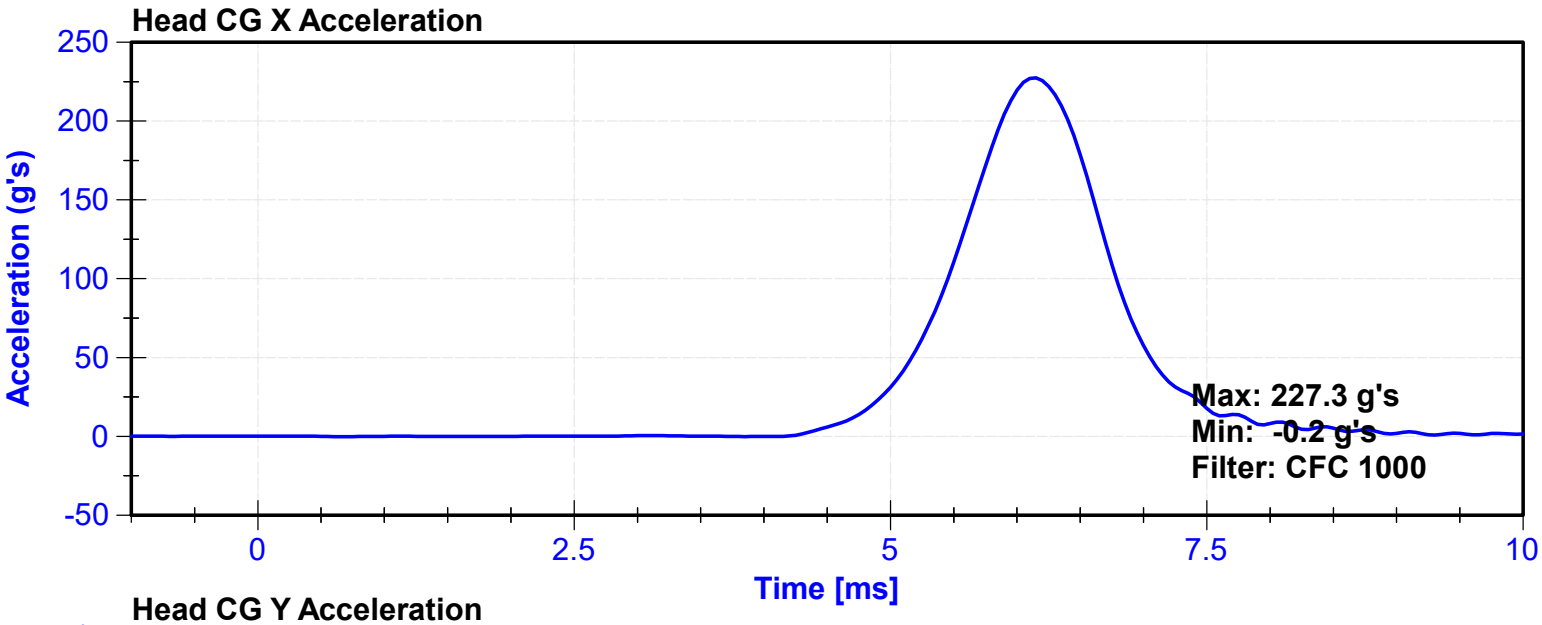
Results

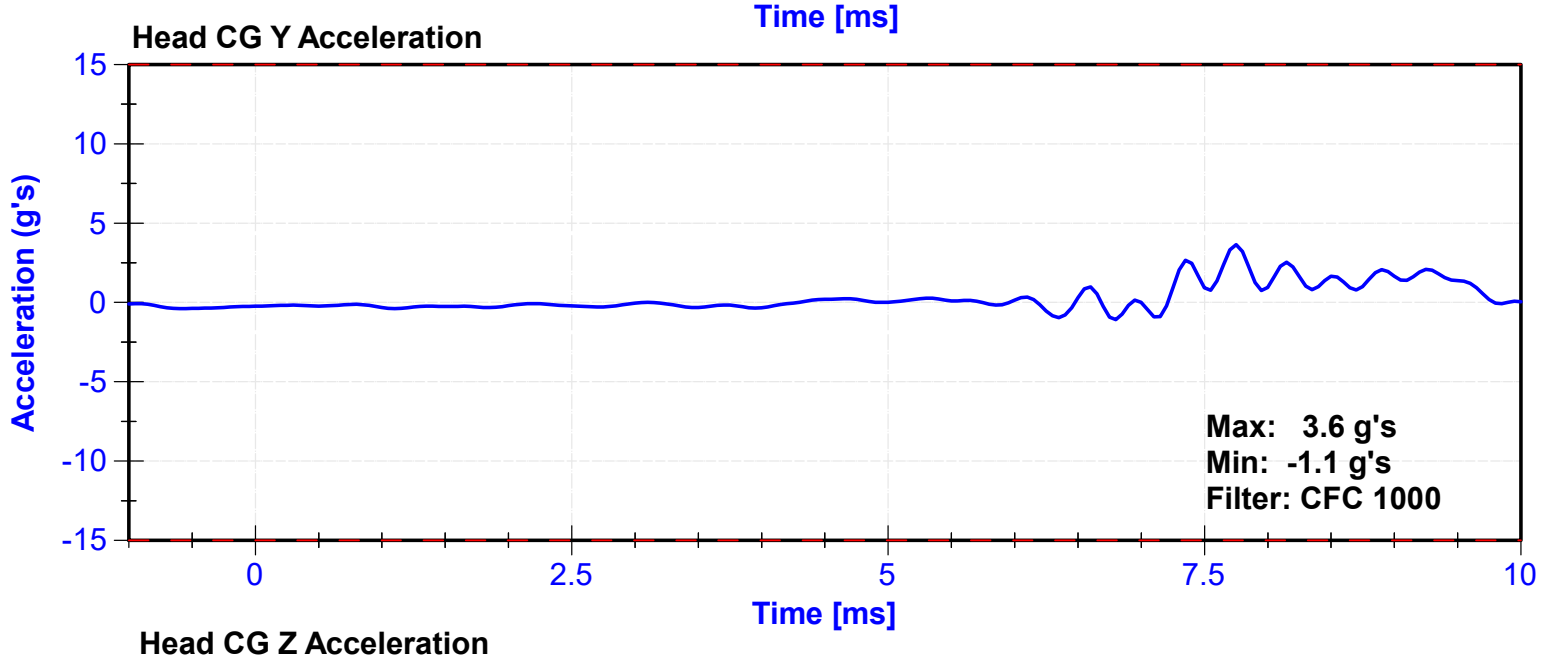
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21	Pass
Humidity	10	70	%	52.1	Pass
Resultant Acceleration	250	300	g's	276.2	Pass
Oscillation	0	10	%	4.2	Pass
Lateral Acceleration	-15	15	g's	3.6	Pass

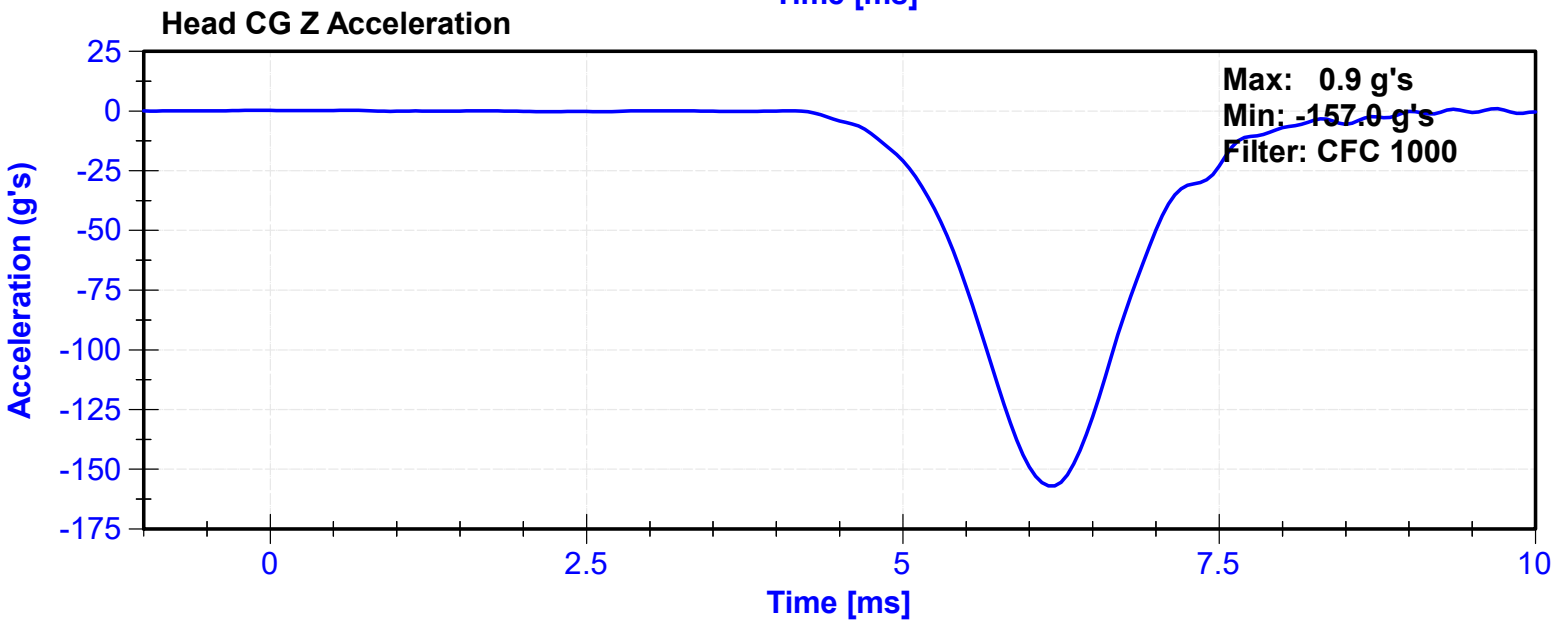
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Measurement Specialties	A260183	7/10/2024	1/6/2025
Y Accelerometer	Measurement Specialties	A341246	3/13/2024	9/9/2024
Z Accelerometer	Measurement Specialties	A260527	7/10/2024	1/6/2025




Head CG X Acceleration
Acceleration (g's)
250
200
150
100
50
0
-50
0
2.5
5
7.5
10
Time [ms]
Max: 227.3 g's
Min: -0.2 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: 3.6 g's
Min: -1.1 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
25
0
-25
-50
-75
-100
-125
-150
-175
0
2.5
5
7.5
10
Time [ms]
Max: 0.9 g's
Min: -157.0 g's
Filter: CFC 1000

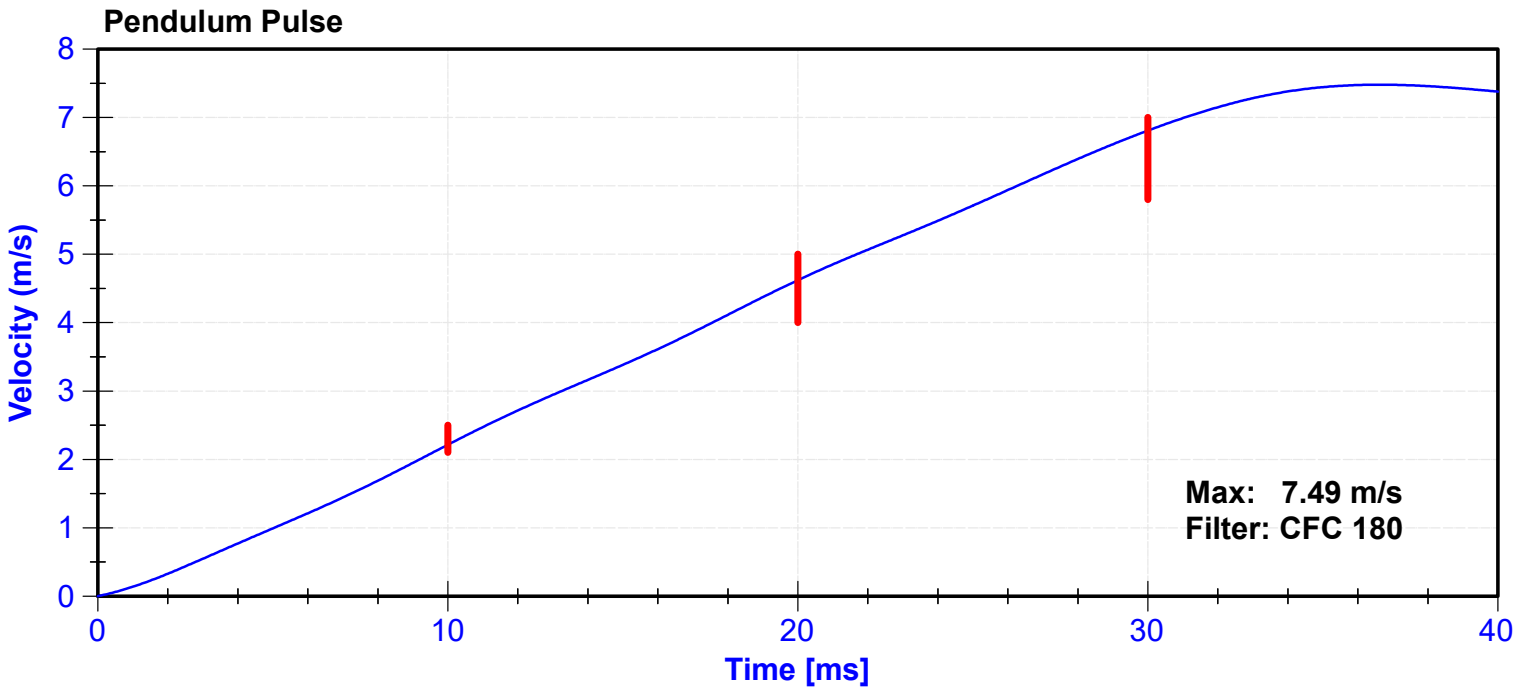
ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	137	Laboratory Supervisor	ZP

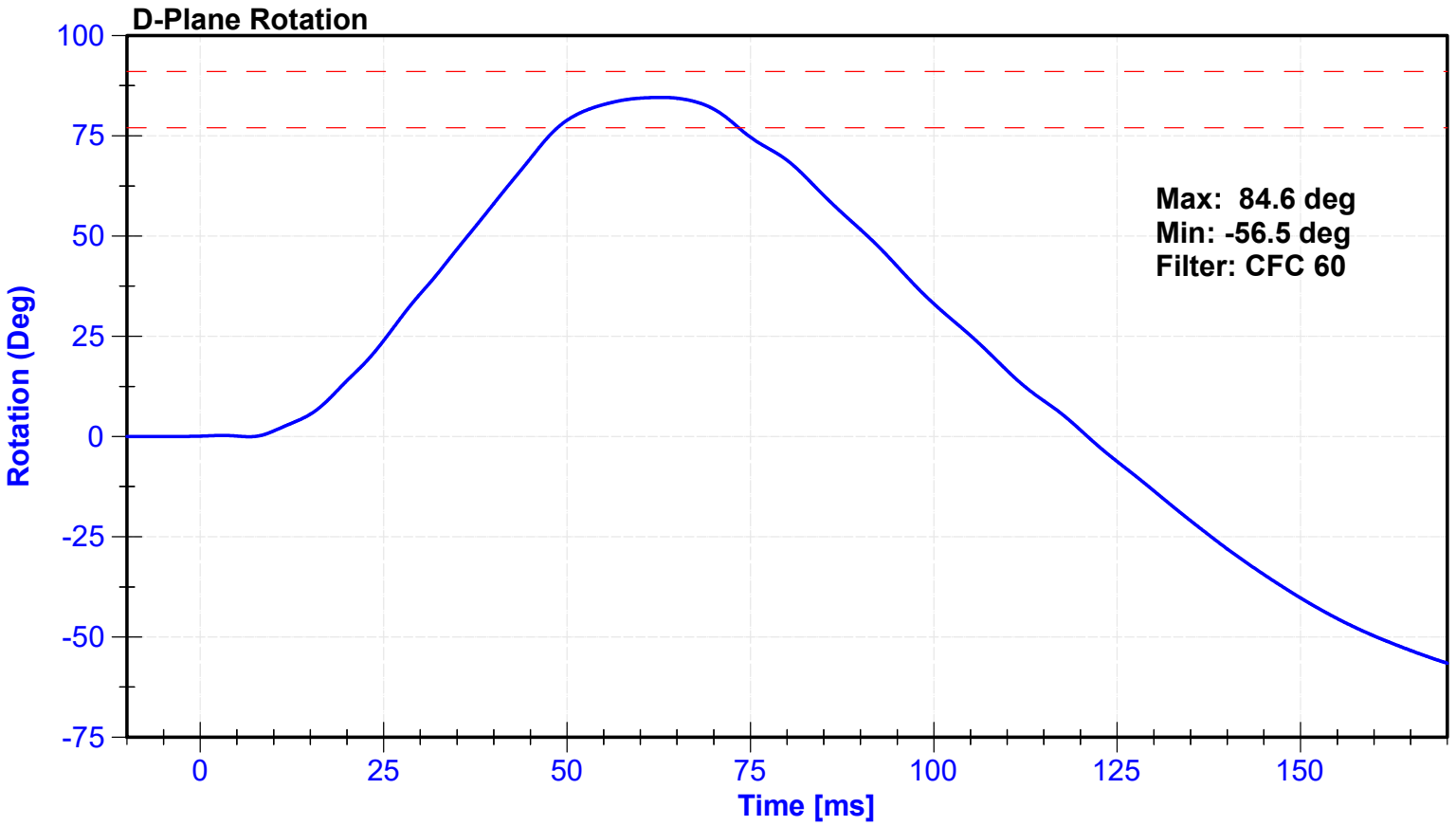
Results

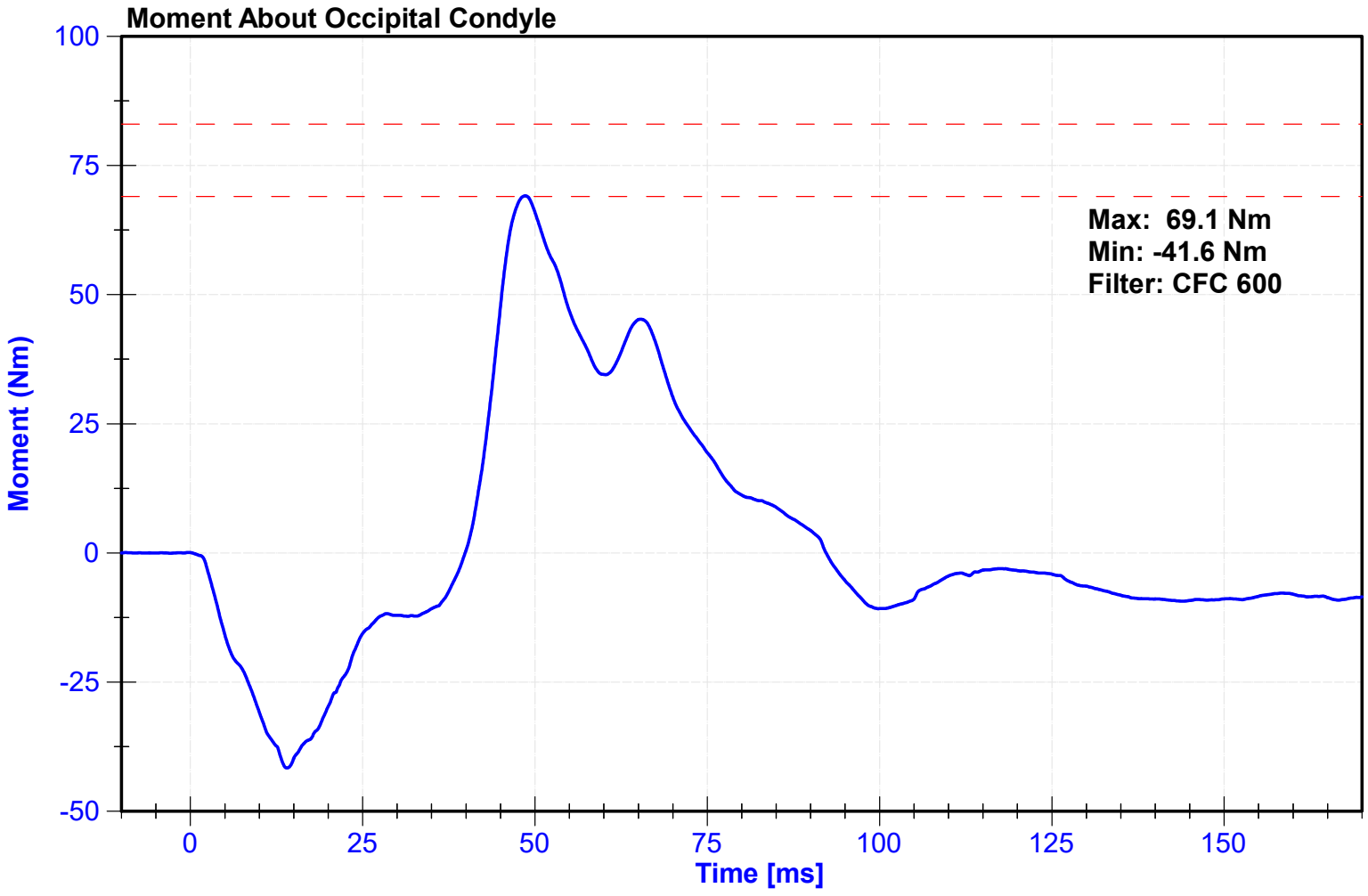
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	56.3	Pass
Velocity	6.89	7.13	m/s	7.129	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.21	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.62	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.81	Pass
Max D Plane Rotation	77	91	deg	84.6	Pass
Max Moment During Rotation Interval	69	83	Nm	69.1	Pass
Moment Decay to 10.0 Nm	80	100	ms	83.1	Pass

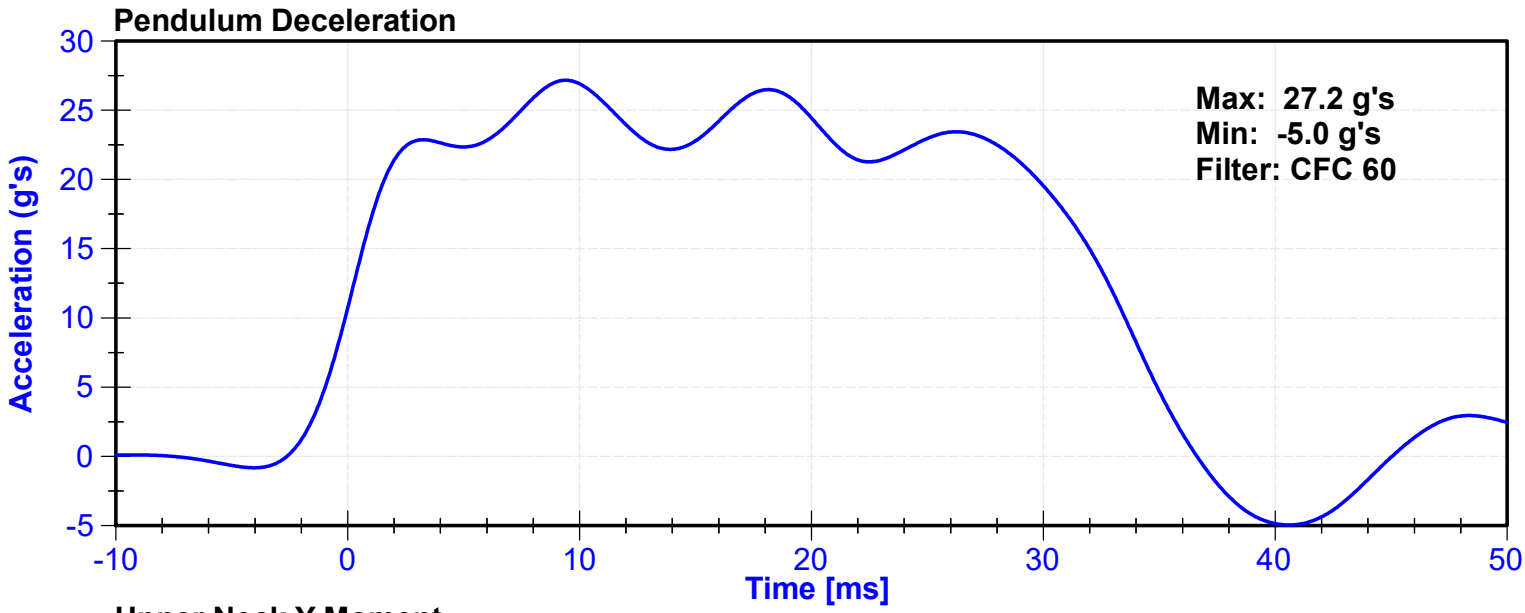
Transducer Calibrations

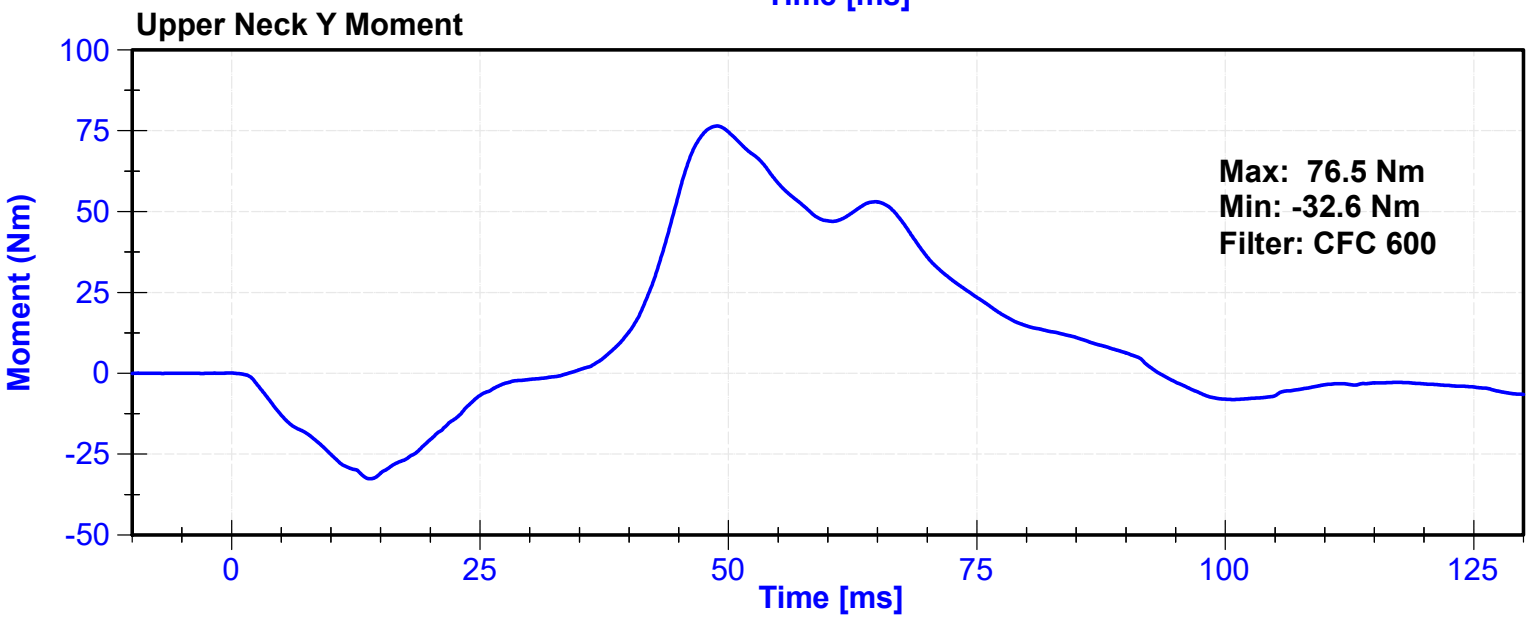
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16692	2/28/2024	8/26/2024
Pendulum Potentiometer	Honeywell	F78BA102-B1_A825	9/12/2023	9/11/2024
Condyle Potentiometer	Honeywell	F78BA102-B1_J119	9/12/2023	9/11/2024
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025

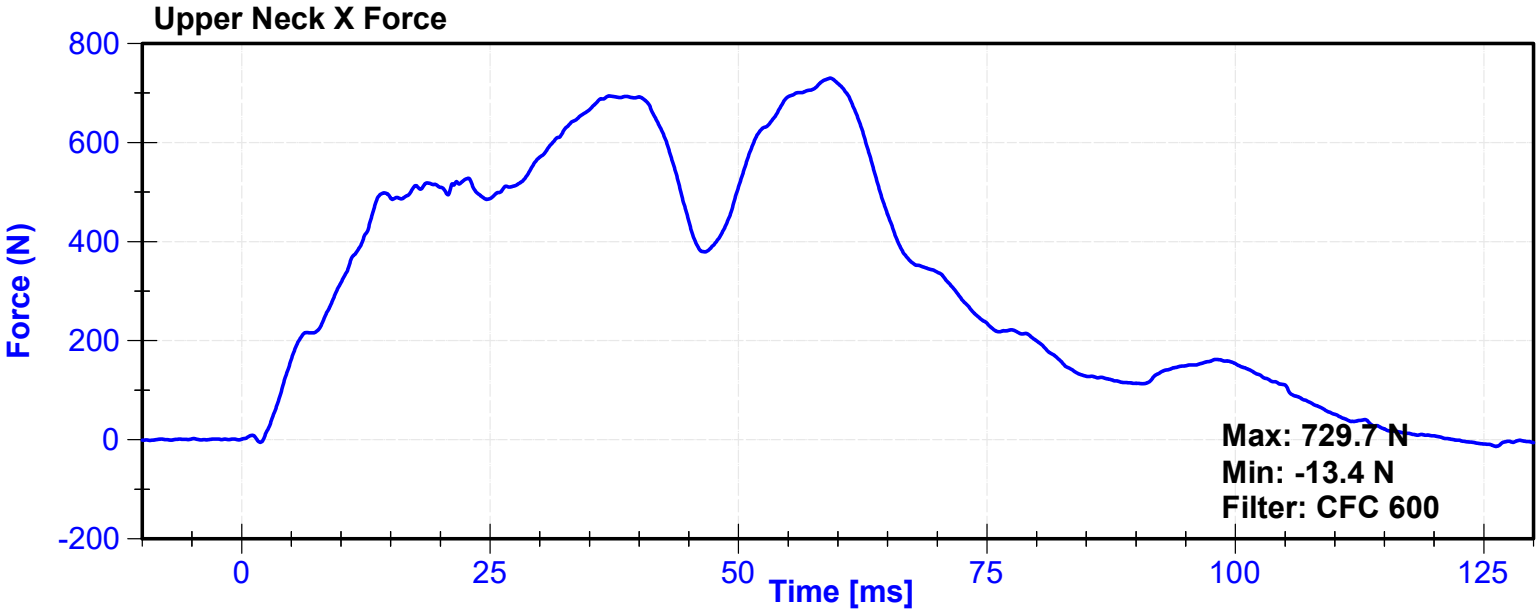



D-Plane Rotation
Max: 84.6 deg
Min: -56.5 deg
Filter: CFC 60
Rotation (Deg)
Time [ms]
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150


Moment About Occipital Condyle
Max: 69.1 Nm
Min: -41.6 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150


Pendulum Deceleration
Acceleration (g's)
Time [ms]
Max: 27.2 g's
Min: -5.0 g's
Filter: CFC 60


Upper Neck Y Moment
Moment (Nm)
Time [ms]
Max: 76.5 Nm
Min: -32.6 Nm
Filter: CFC 600


Upper Neck X Force
Force (N)
Time [ms]
Max: 729.7 N
Min: -13.4 N
Filter: CFC 600

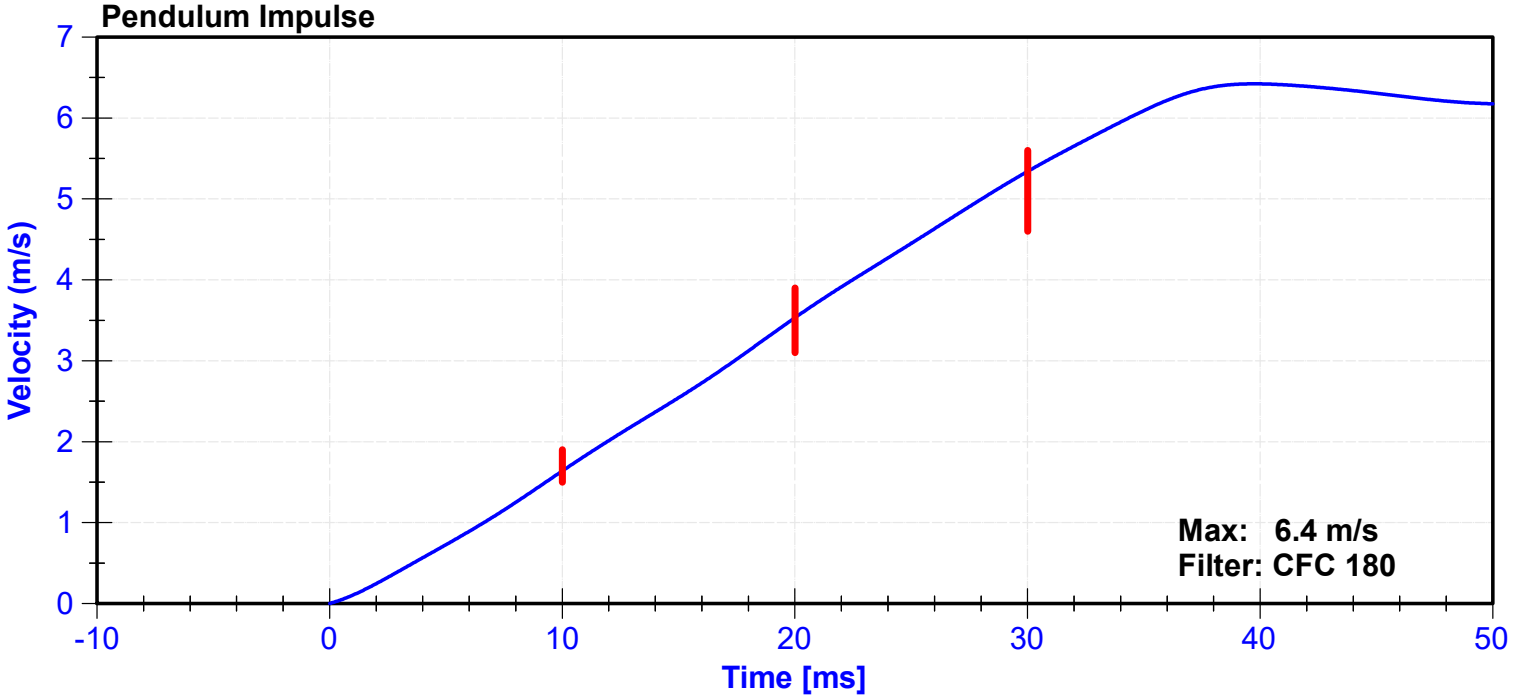
ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	137	Laboratory Supervisor	ZP

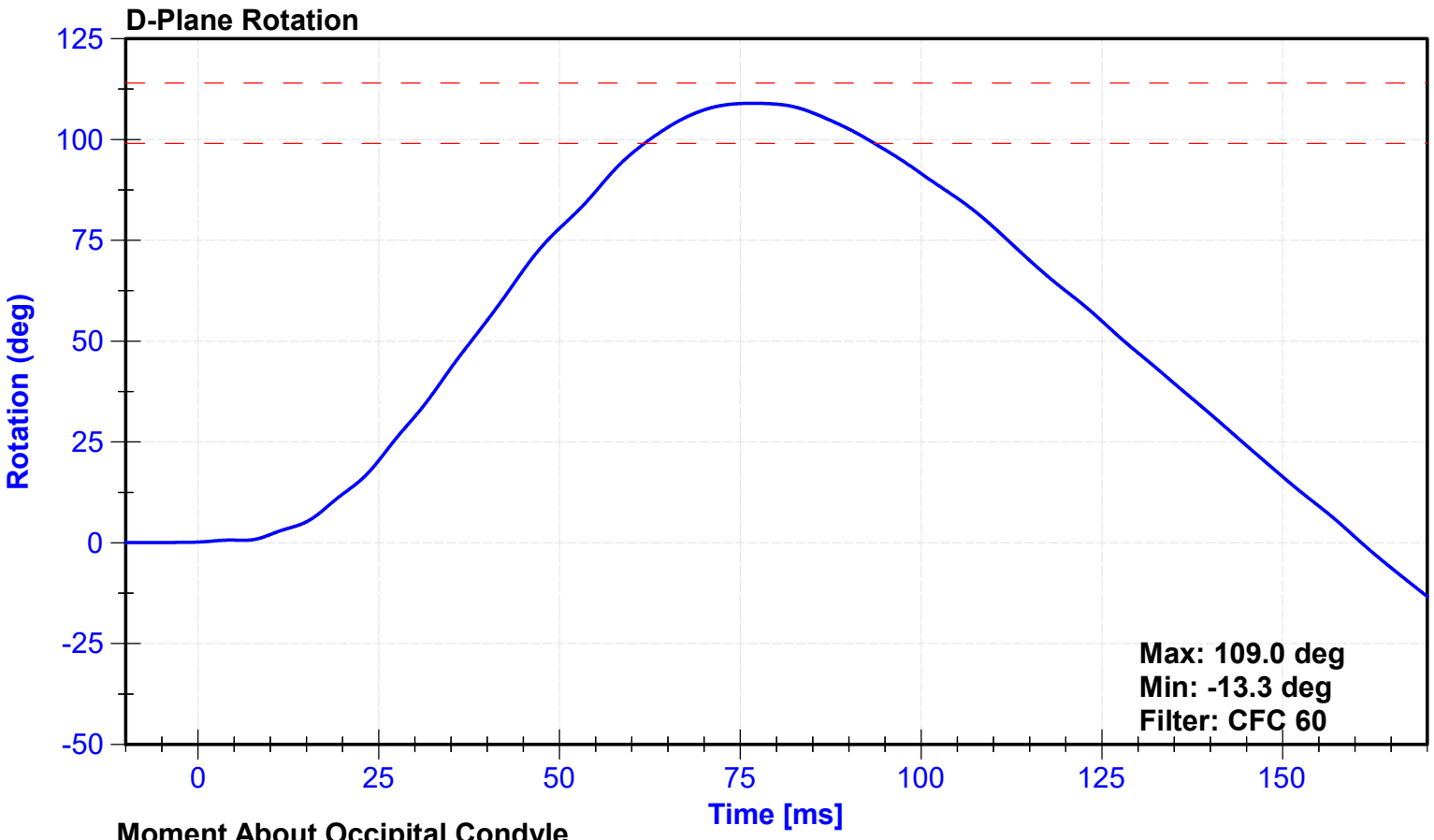
Results

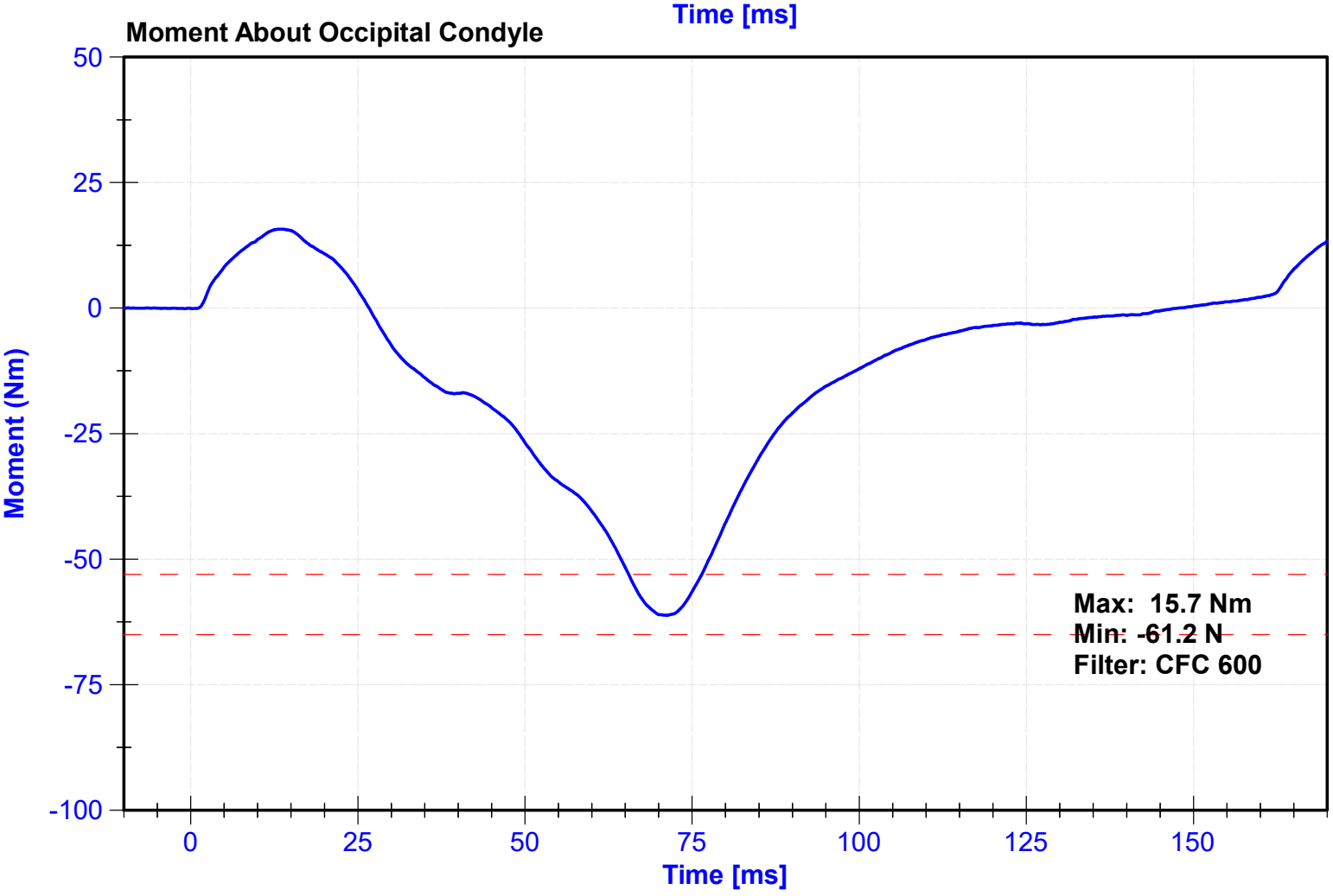
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	56.3	Pass
Velocity	5.95	6.19	m/s	6.152	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.64	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.53	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.34	Pass
D Plane Rotation	99	114	deg	109.0	Pass
Moment During Rotation Interval	-65	-53	Nm	-61.2	Pass
Moment Decay to -10Nm	94	114	ms	103.1	Pass

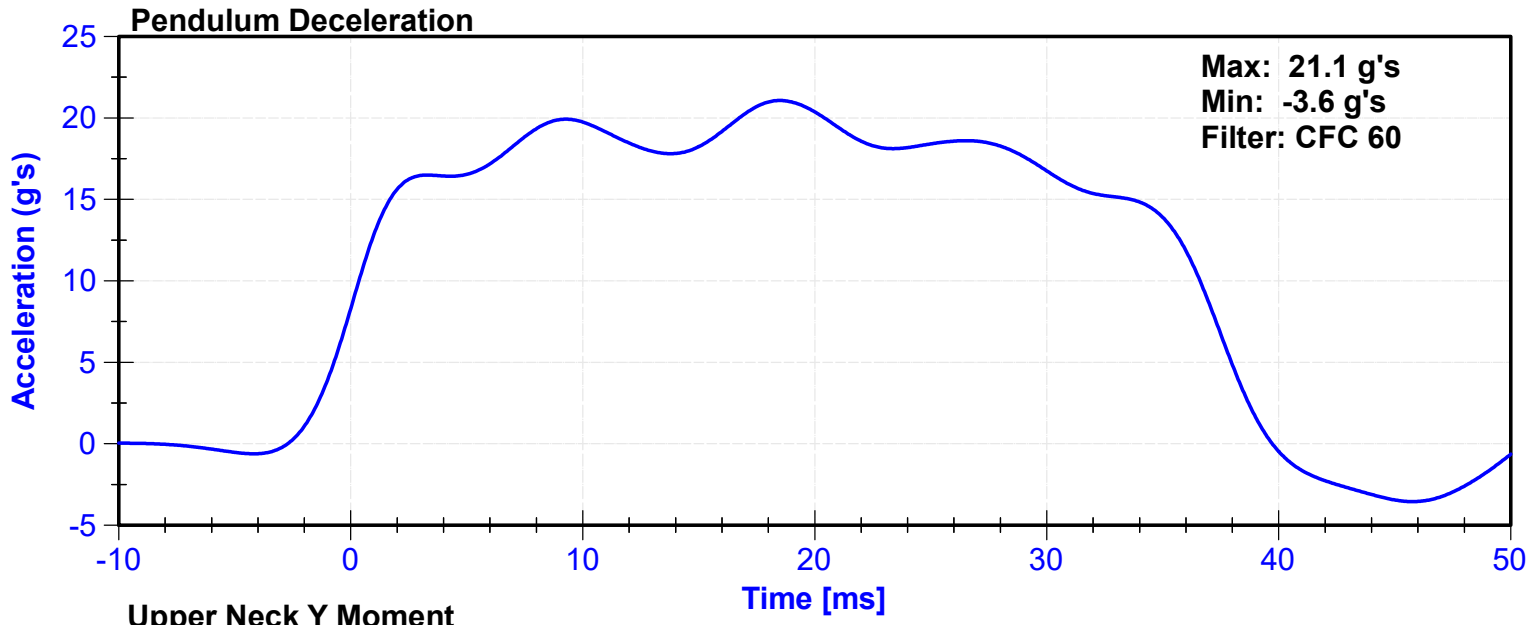
Transducer Calibrations

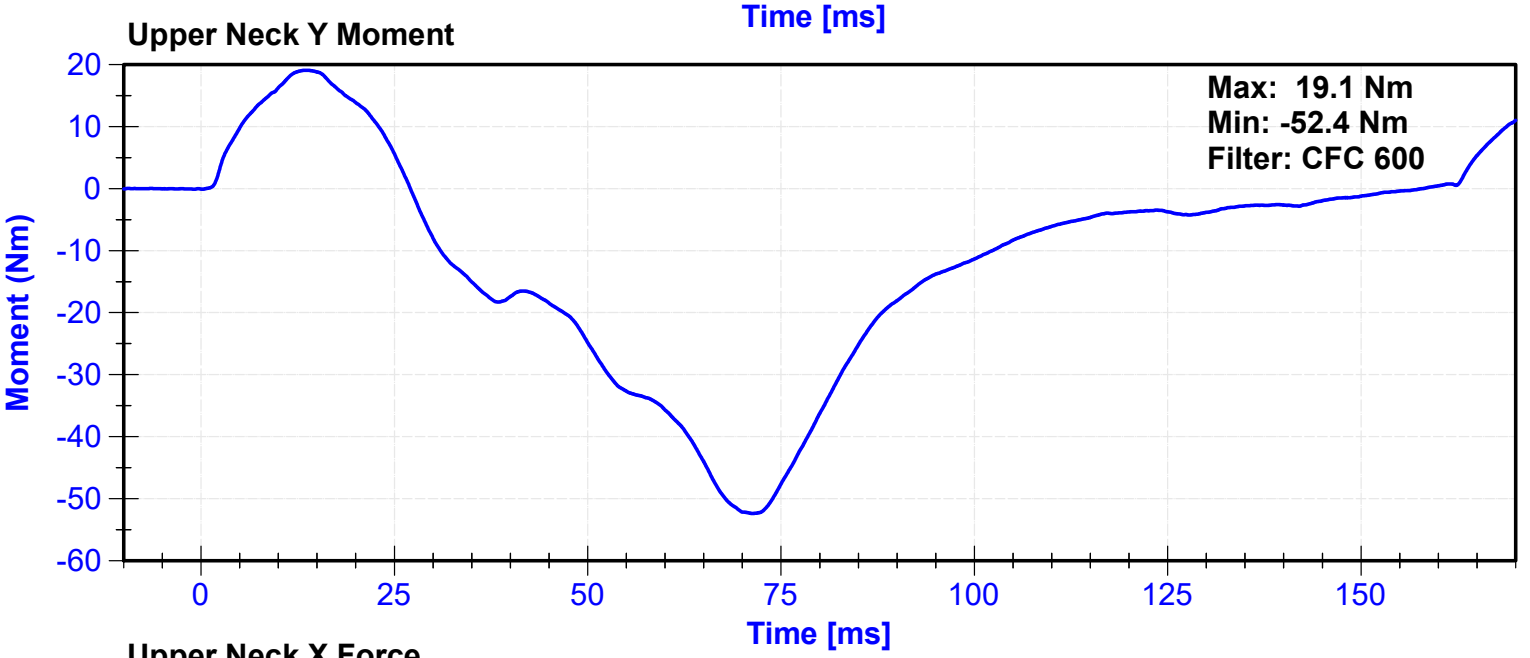
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16692	2/28/2024	8/26/2024
Pendulum Potentiometer	Honeywell	F78BA102-B1_A825	9/12/2023	9/11/2024
Condyle Potentiometer	Honeywell	F78BA102-B1_J119	9/12/2023	9/11/2024
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025

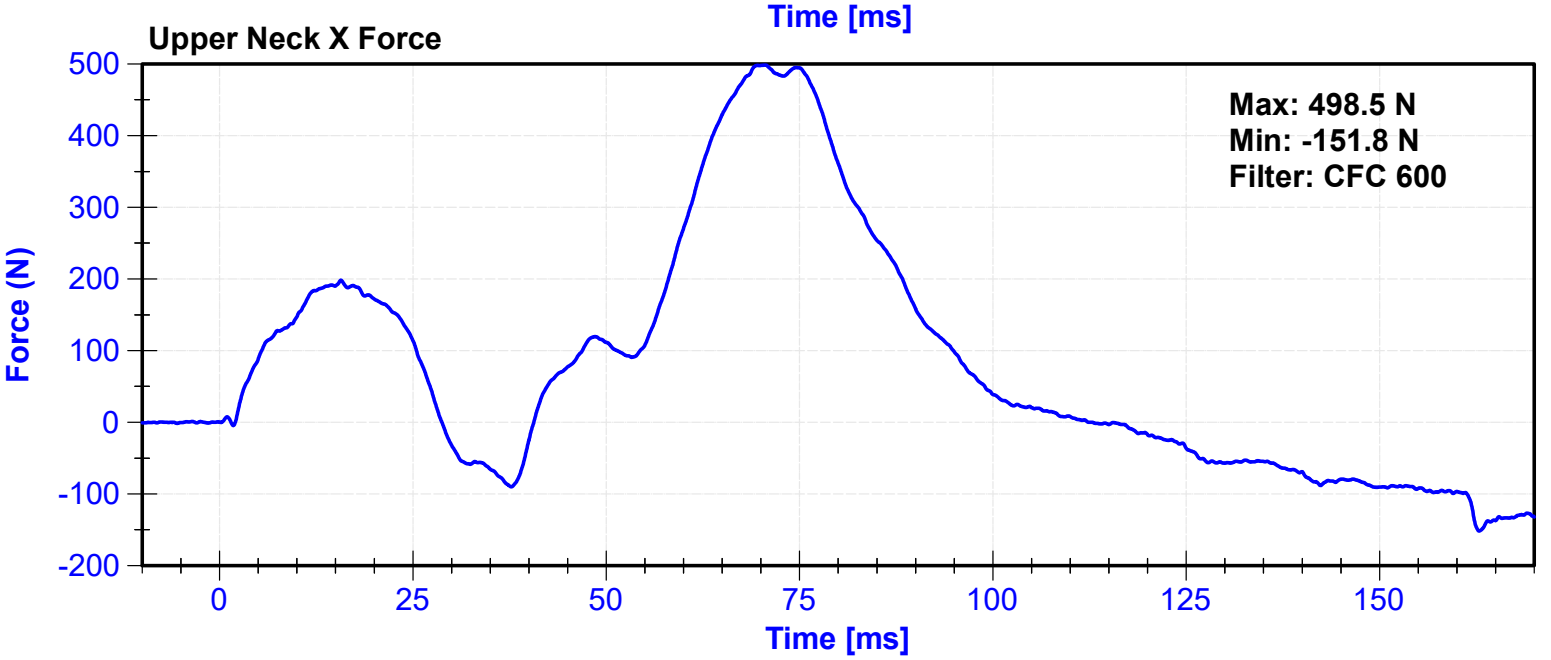



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 109.0 deg
Min: -13.3 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 15.7 Nm
Min: -61.2 N
Filter: CFC 600


Pendulum Deceleration
Max: 21.1 g's
Min: -3.6 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: 19.1 Nm
Min: -52.4 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: 498.5 N
Min: -151.8 N
Filter: CFC 600
Force (N)
500
400
300
200
100
0
-100
-200
0
25
50
75
100
125
150
Time [ms]

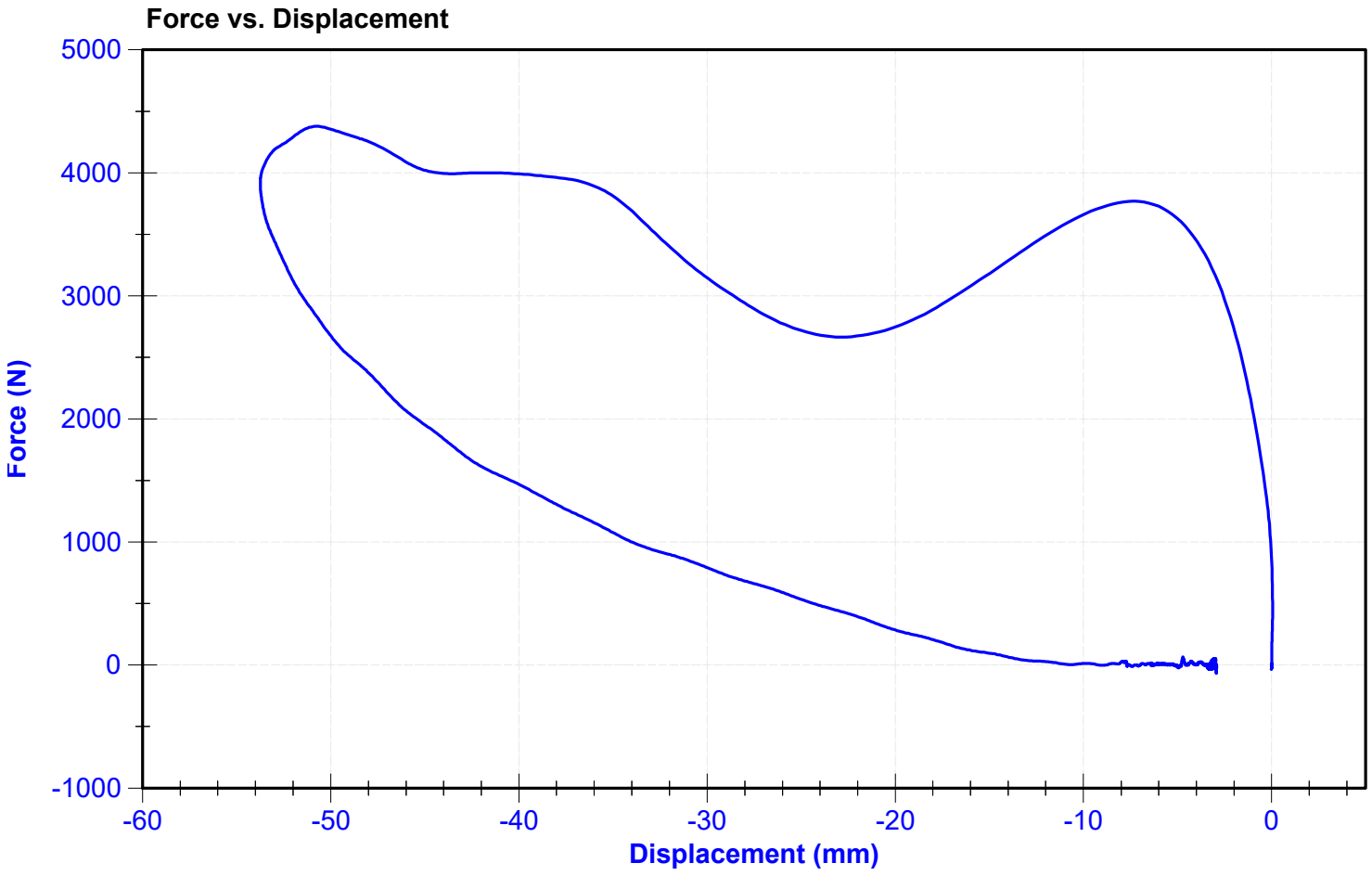
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

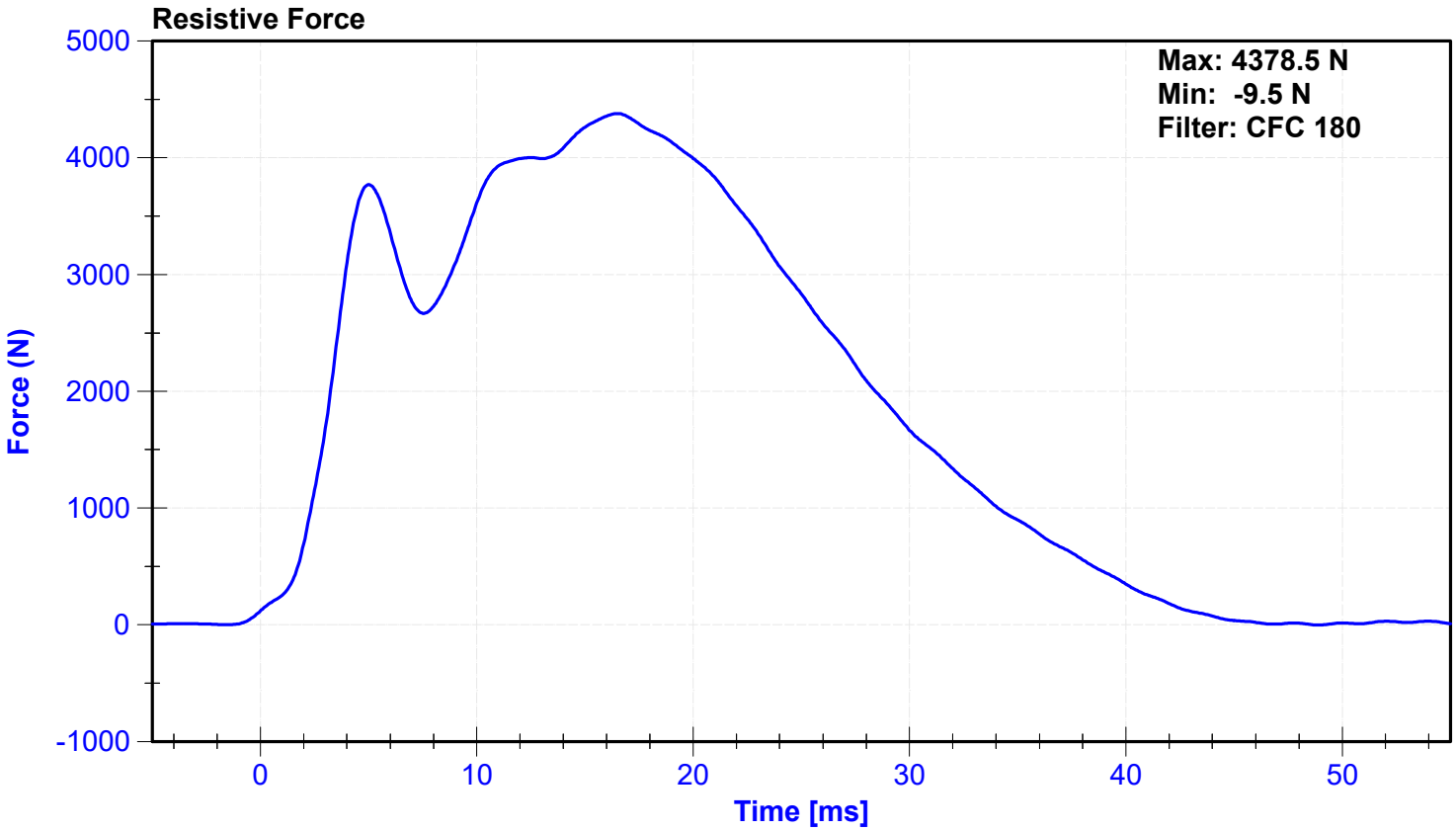
Results

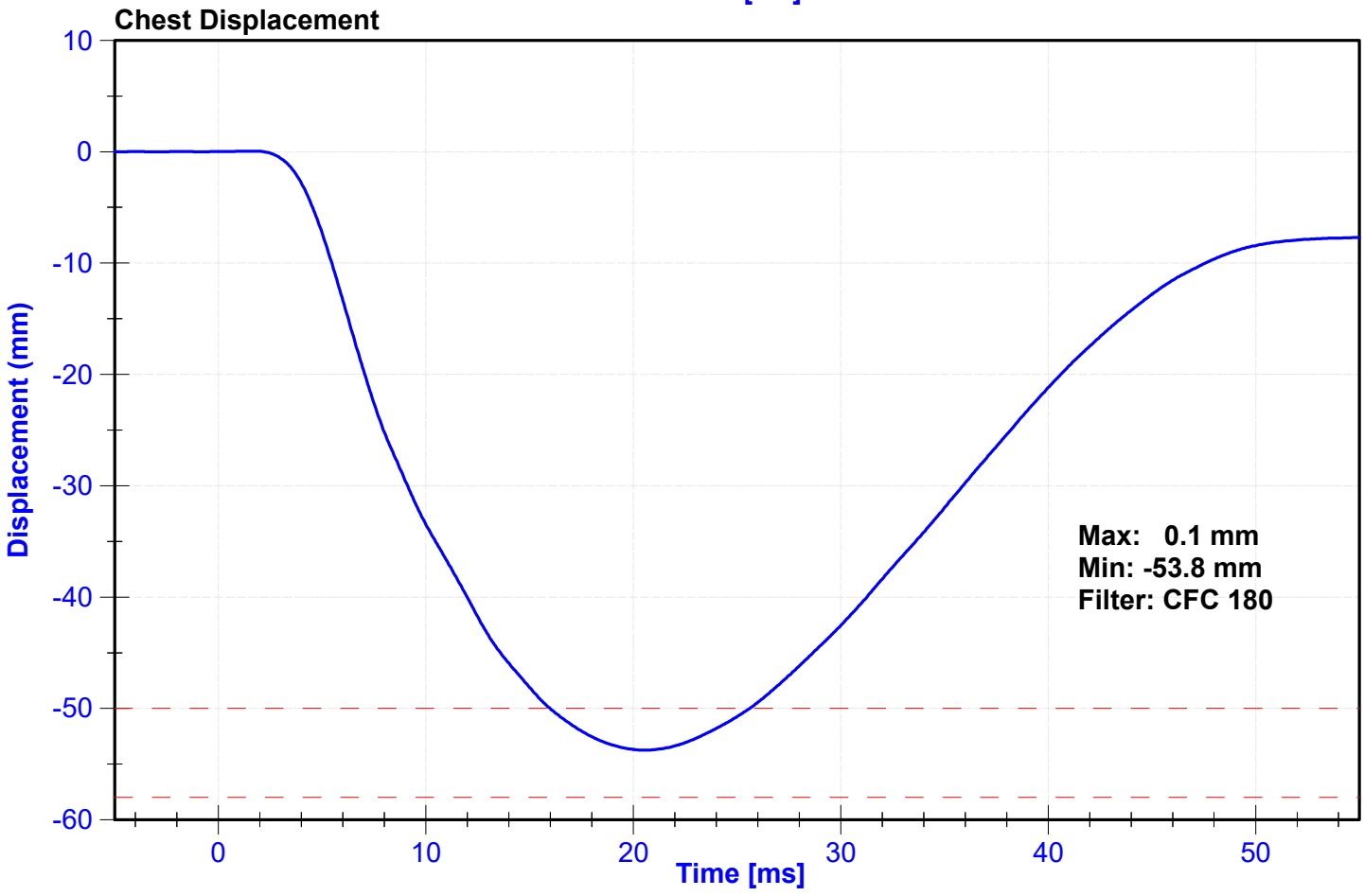
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21	Pass
Humidity	10	70	%	57	Pass
Velocity	6.59	6.83	m/s	6.680	Pass
Chest Deflection	-58	-50	mm	-53.8	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4378.5	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4353.2	Pass
Hysteresis	69	85	%	73.6	Pass

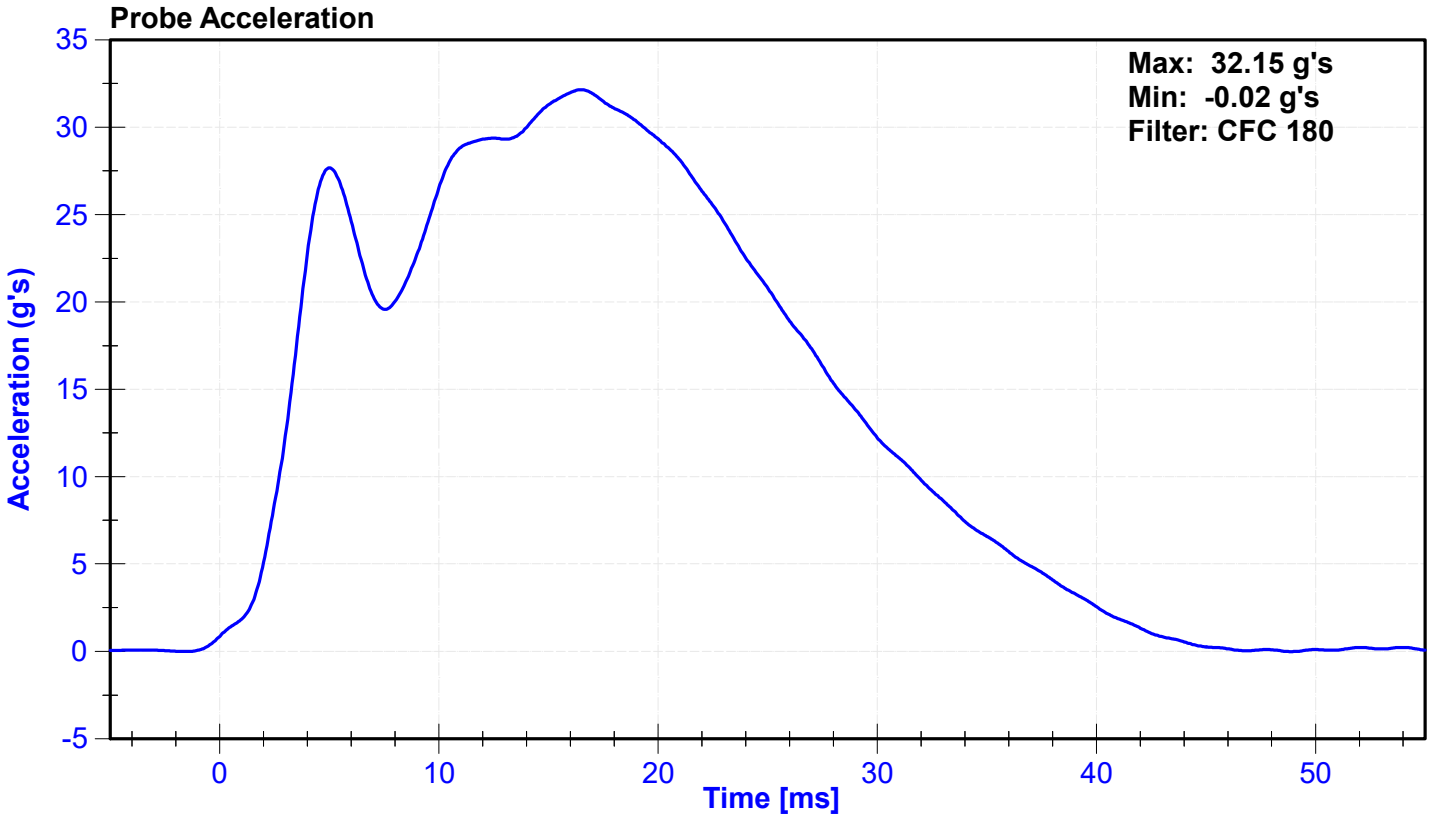
Transducer Calibrations

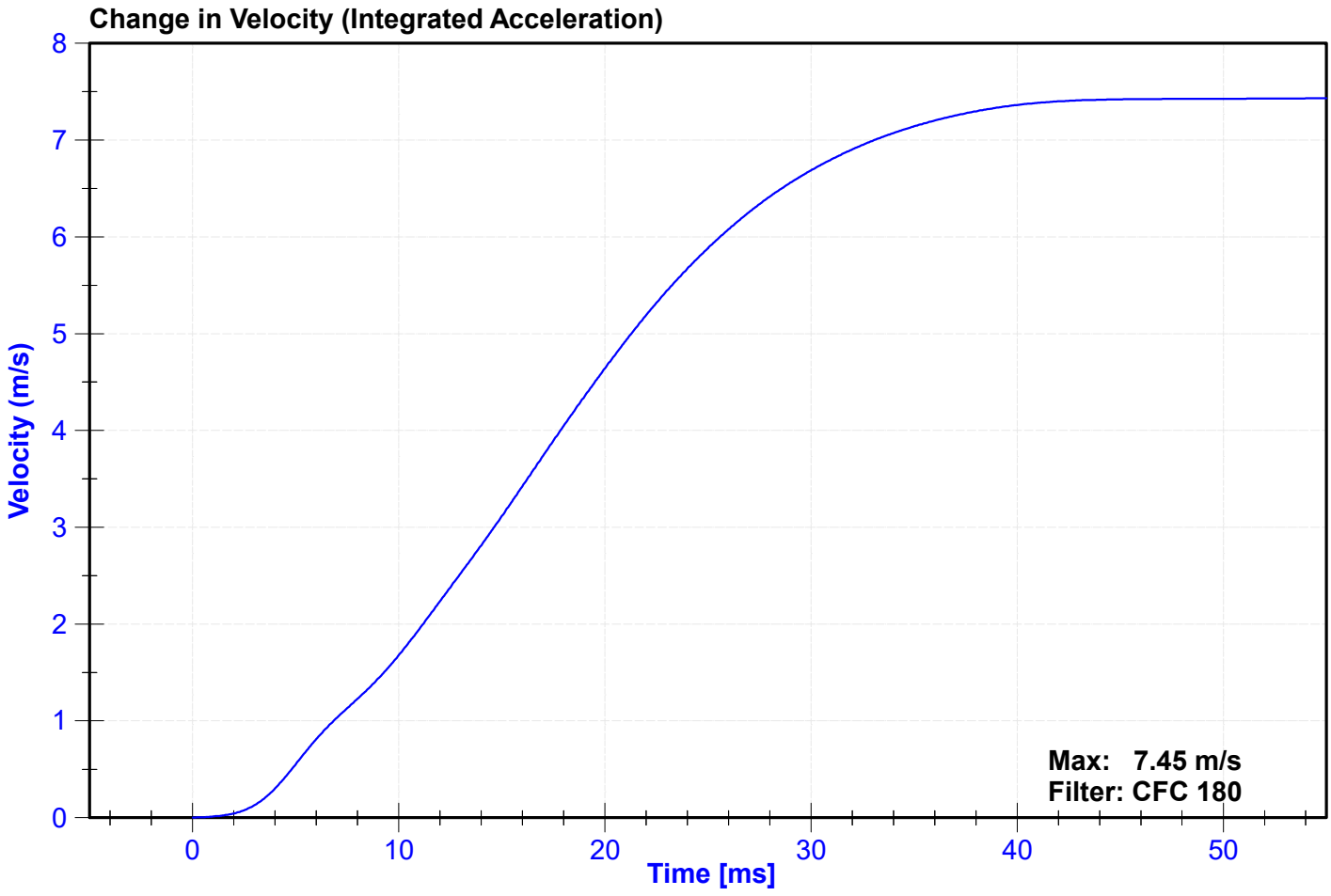
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Chest Potentiometer	Servo	0720	8/19/2024	2/17/2025




Resistive Force
Max: 4378.5 N
Min: -9.5 N
Filter: CFC 180
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]


Chest Displacement
Max: 0.1 mm
Min: -53.8 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: 32.15 g's
Min: -0.02 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)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
Max: 7.45 m/s
Filter: CFC 180
0
10
20
30
40
50
Time [ms]

ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

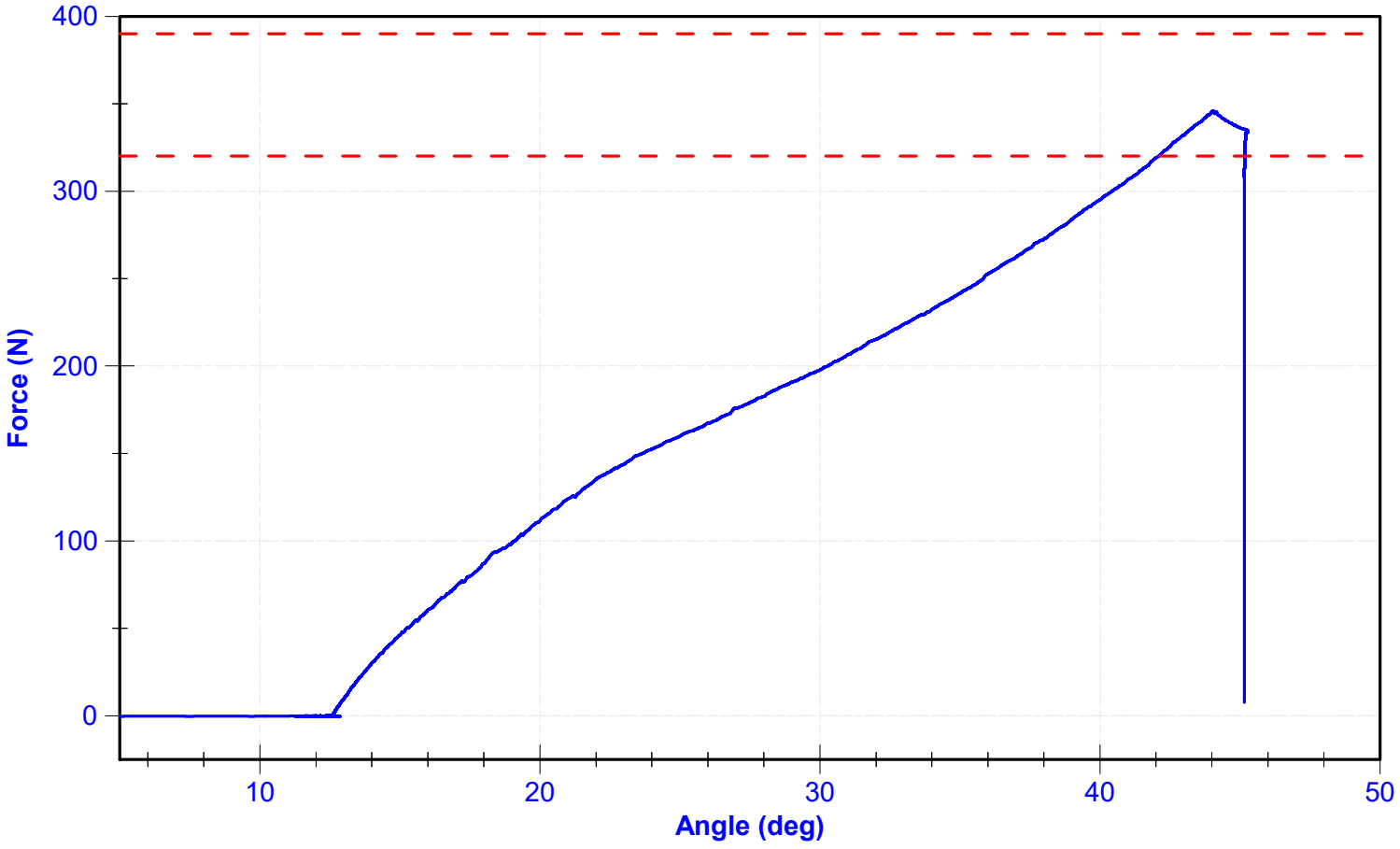
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	ºC	21.0	Pass
Humidity	10	70	%	58	Pass
Initial Angle	0	20	deg	12.1	Pass
Force at 45 Degrees	320	390	N	346.1	Pass
Return Angle Relative to Initial	0	8	deg	4.7	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

Force vs. Displacement



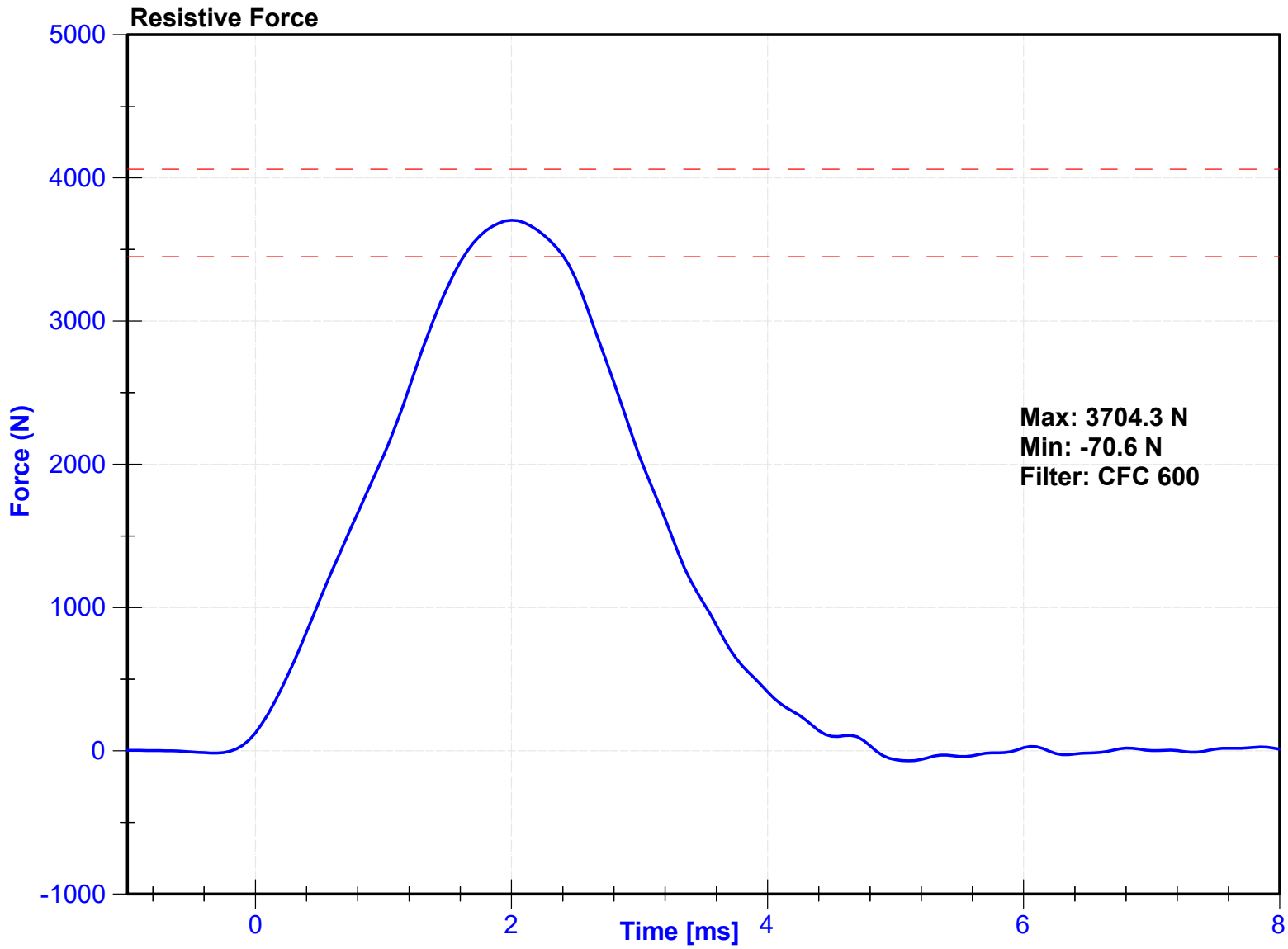
ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	137	Laboratory Supervisor	ZP

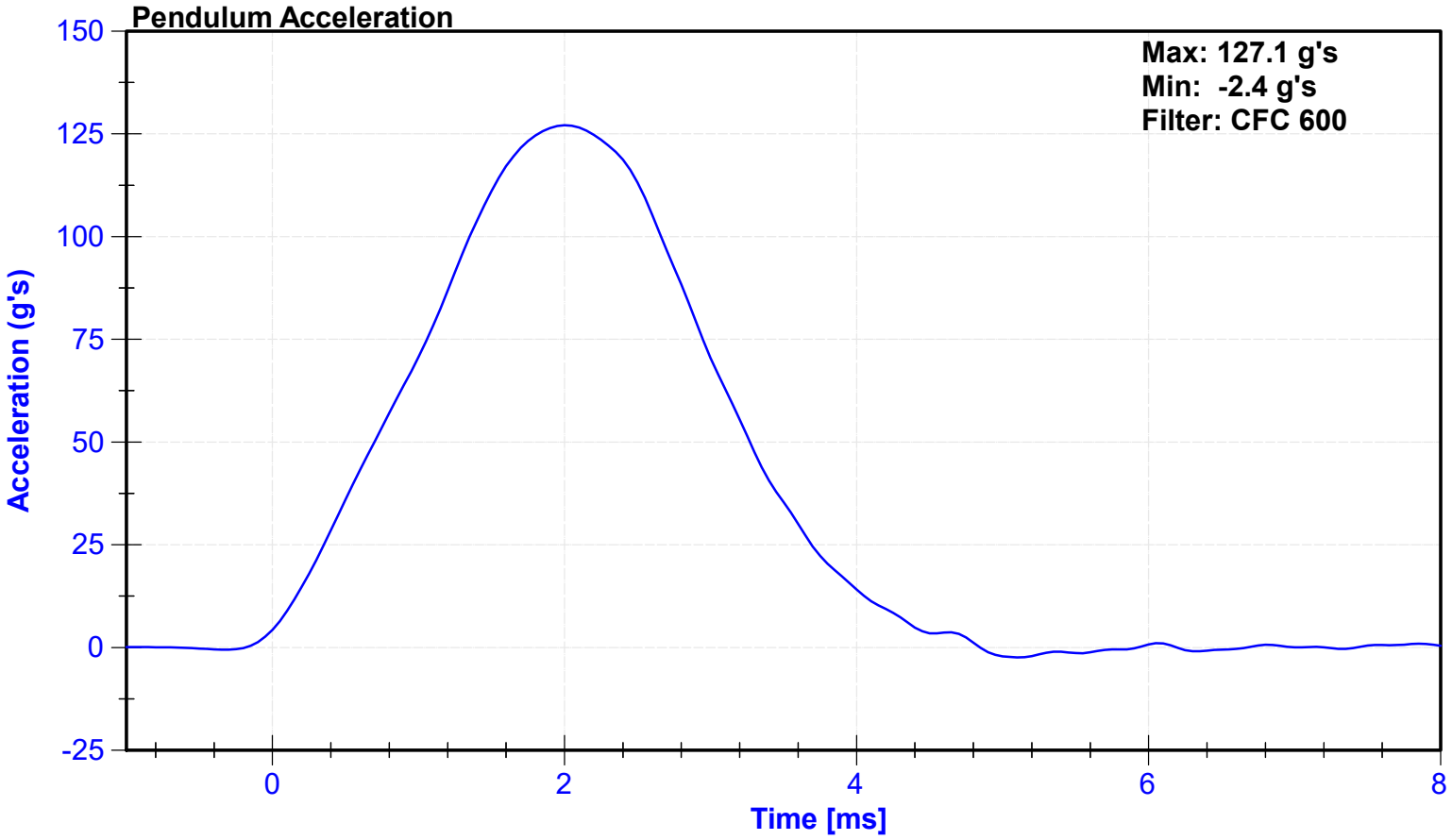
Results

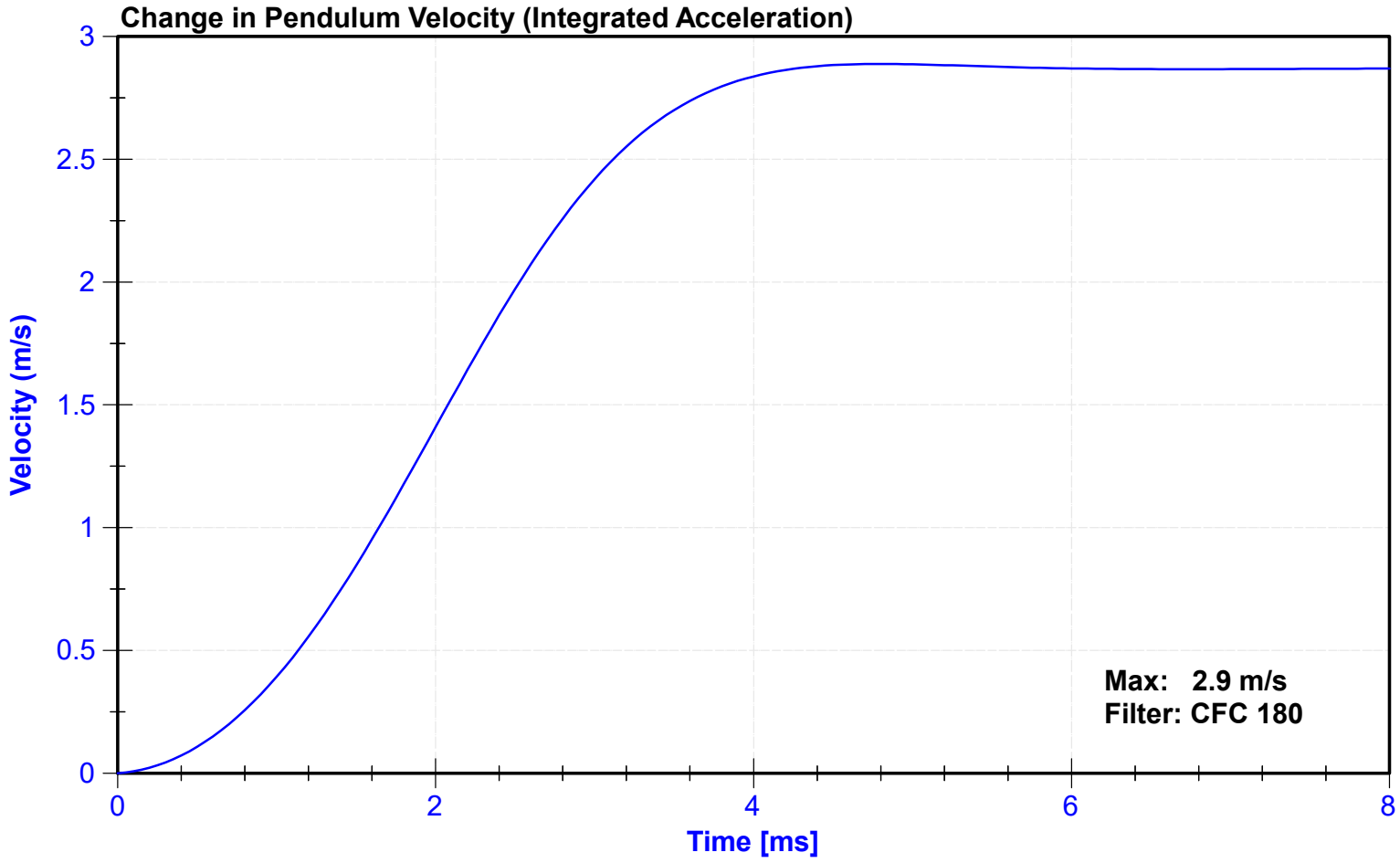
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.7	Pass
Humidity	10	70	%	56.3	Pass
Velocity	2.07	2.13	m/s	2.104	Pass
Resistive Force	3450	4060	N	3704.3	Pass

Transducer Calibrations

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




Pendulum Acceleration
Max: 127.1 g's
Min: -2.4 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: 2.9 m/s
Filter: CFC 180

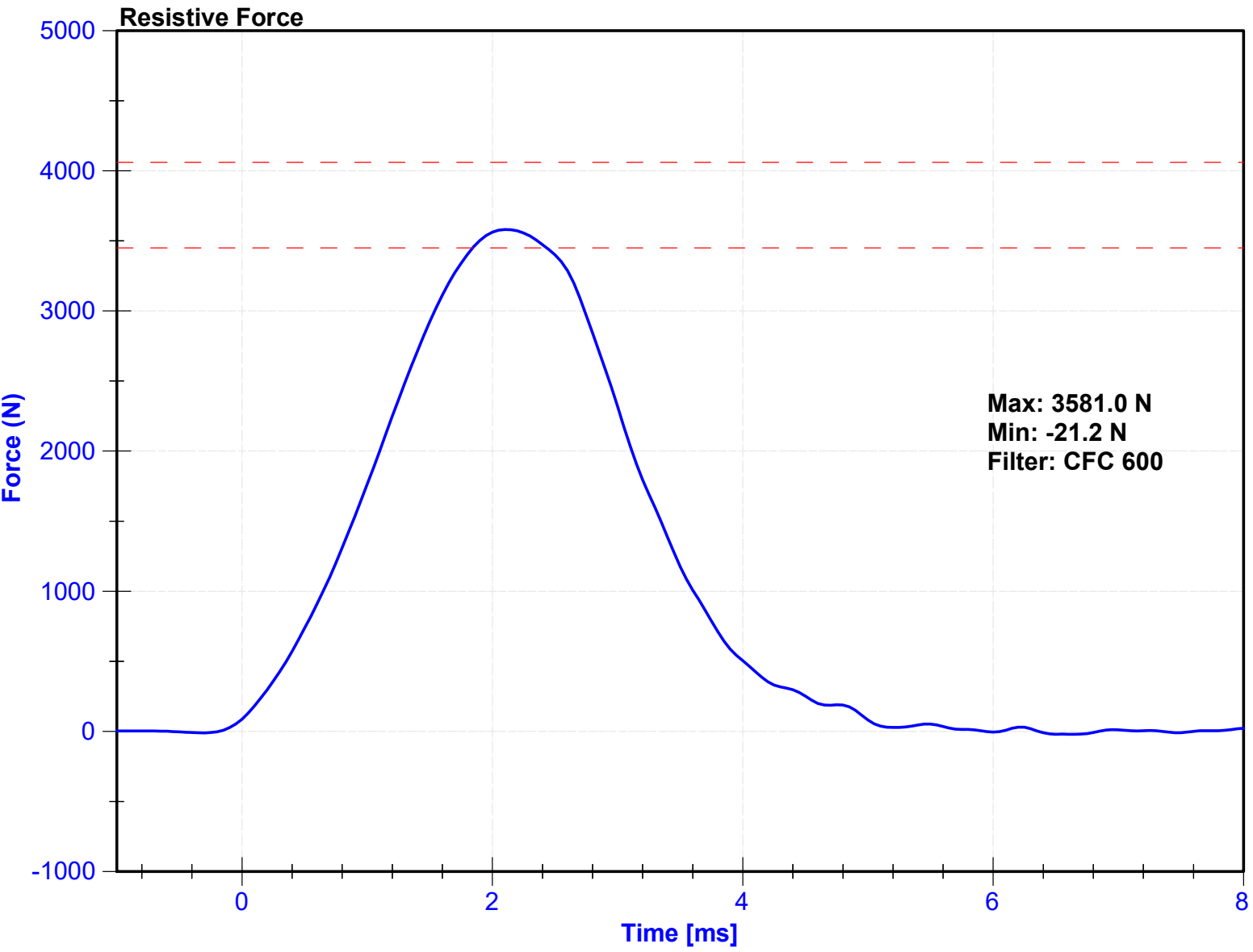
ATD Manufacturer	Humanetics	Test Technician	CL
ATD Serial Number	137	Laboratory Supervisor	ZP

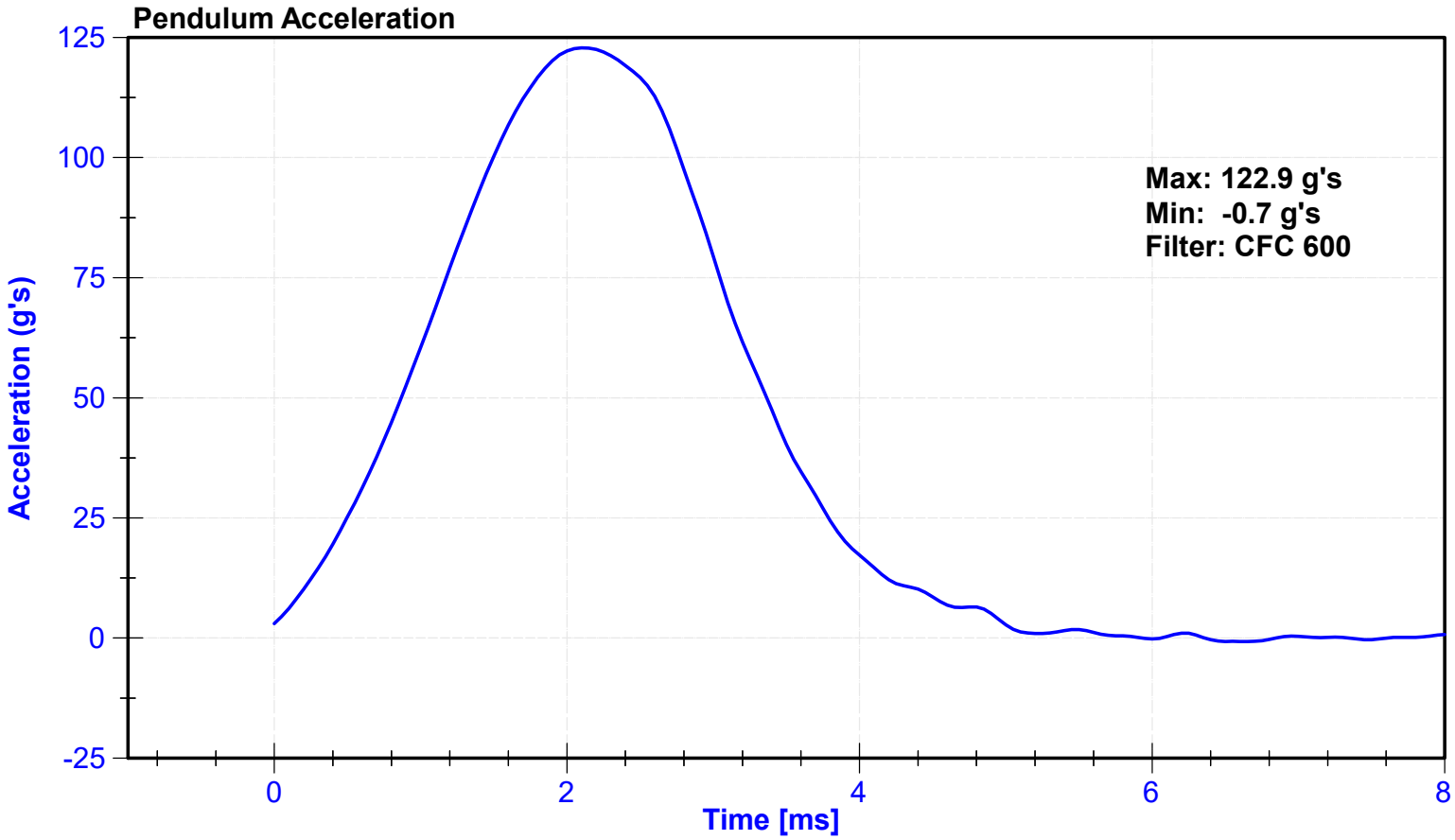
Results

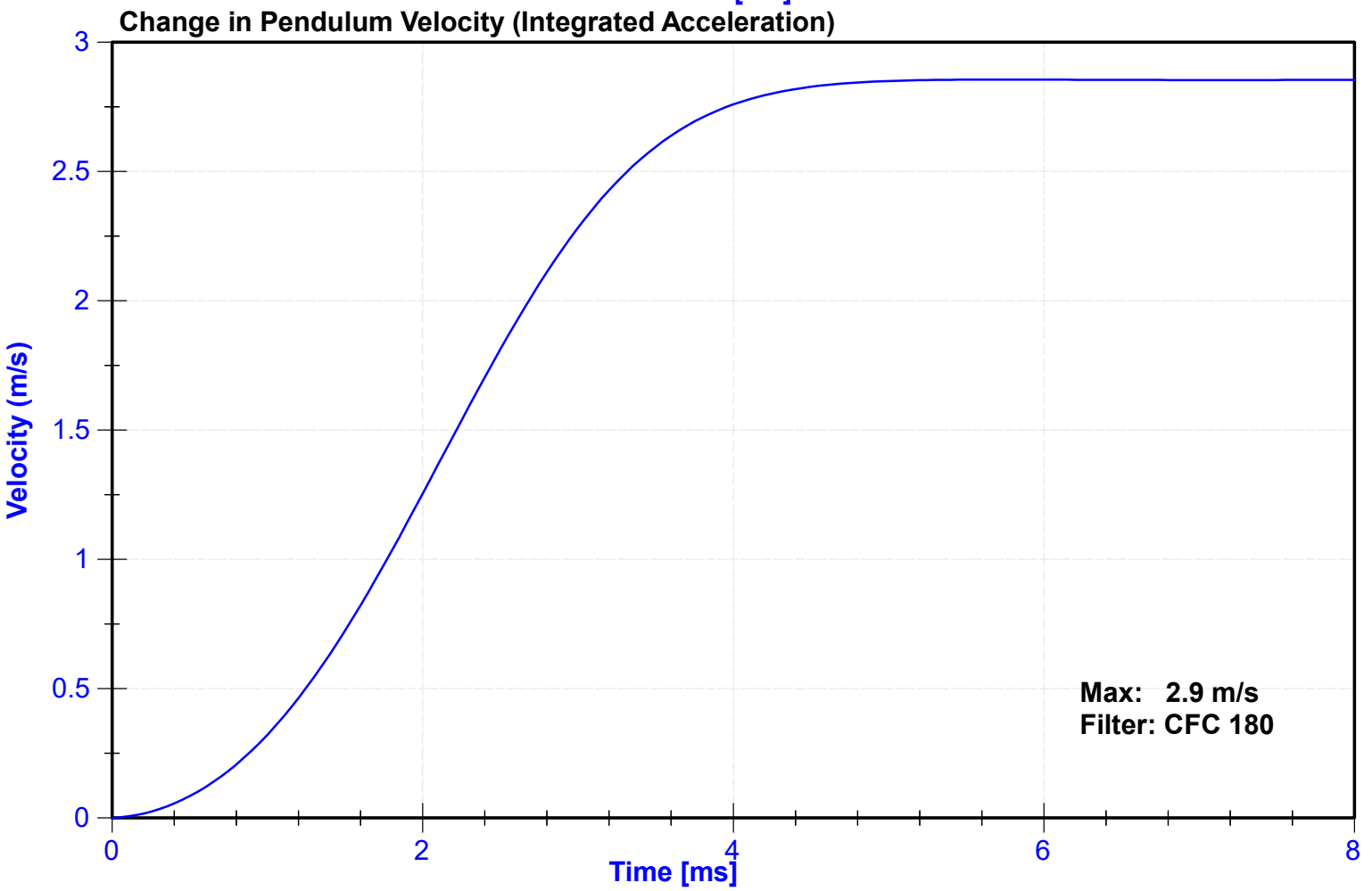
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.7	Pass
Humidity	10	70	%	56.3	Pass
Velocity	2.07	2.13	m/s	2.105	Pass
Resistive Force	3450	4060	N	3581.0	Pass

Transducer Calibrations

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




Pendulum Acceleration
Max: 122.9 g's
Min: -0.7 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: 2.9 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

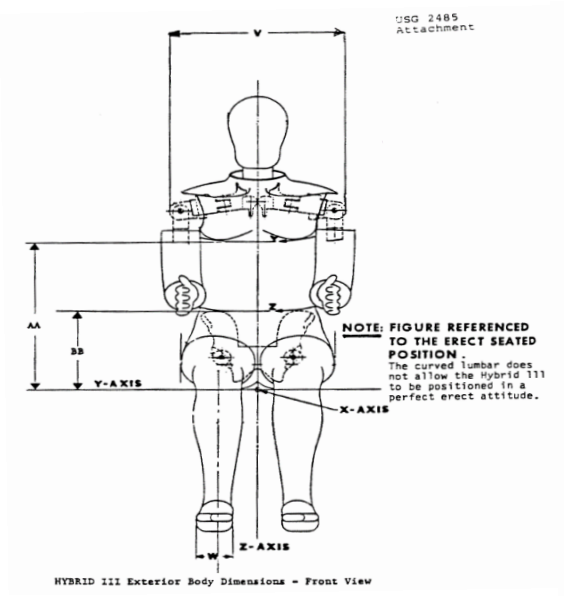
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 065

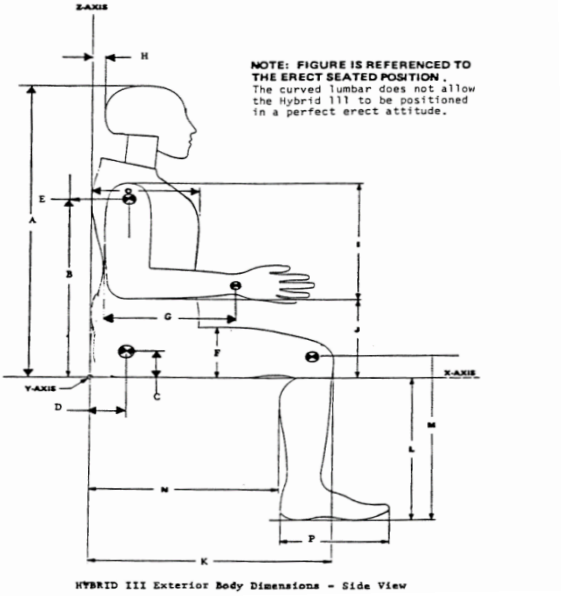
External Measurements - Hybrid 3 - 50th Male

Technician: J. Rios Date: 09/04/2024

Dummy Serial Number: 065



HYBRID III Exterior Body Dimensions - Front View



HYBRID III Exterior Body Dimensions - Side View

Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.9	Pass
B	Shoulder Pivot Height	19.9	20.5	20.4	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.5	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.6	Pass
F	Thigh Clearance	5.5	6.1	5.8	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.8	Pass
H	Head Back to Backline	1.6	1.8	1.6	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.3	Pass
J	Elbow Rest Height	7.5	8.3	7.8	Pass
K	Buttock to Knee Length	22.8	23.8	23.7	Pass
L	Popliteal Height	16.9	17.9	17.4	Pass
M	Knee Pivot Height	19.1	19.7	19.4	Pass
N	Buttock Popliteal Length	17.8	18.8	18.3	Pass
O	Chest Depth without Jacket	8.4	9.0	8.7	Pass
P	Foot Length (right)	9.9	10.5	10.1	Pass
V	Shoulder Breadth	16.3	17.2	16.8	Pass
W	Foot Breadth	3.6	4.2	3.8	Pass
Y	Chest Circumference with Jacket	38.2	39.4	39.1	Pass
Z	Waist Circumference	32.9	34.1	33.6	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	8.9	Pass

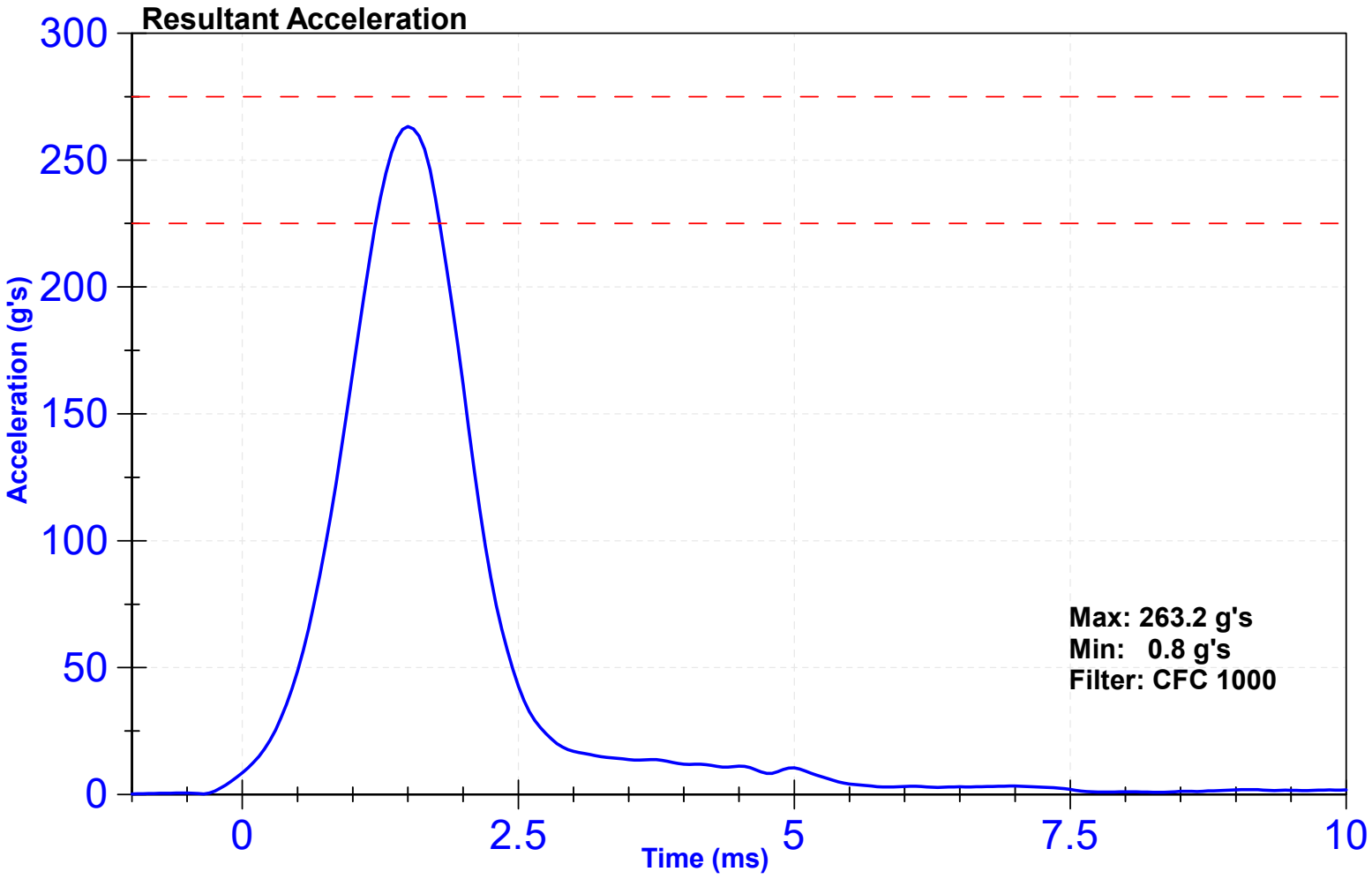
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

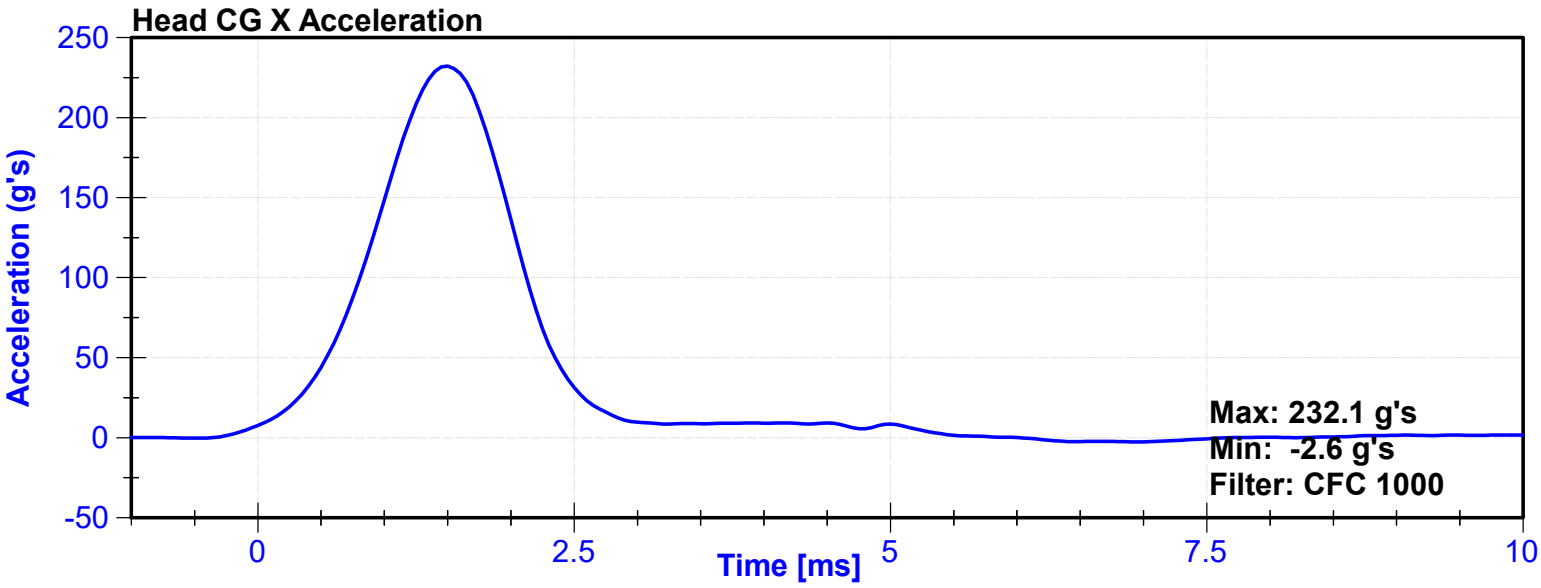
Results

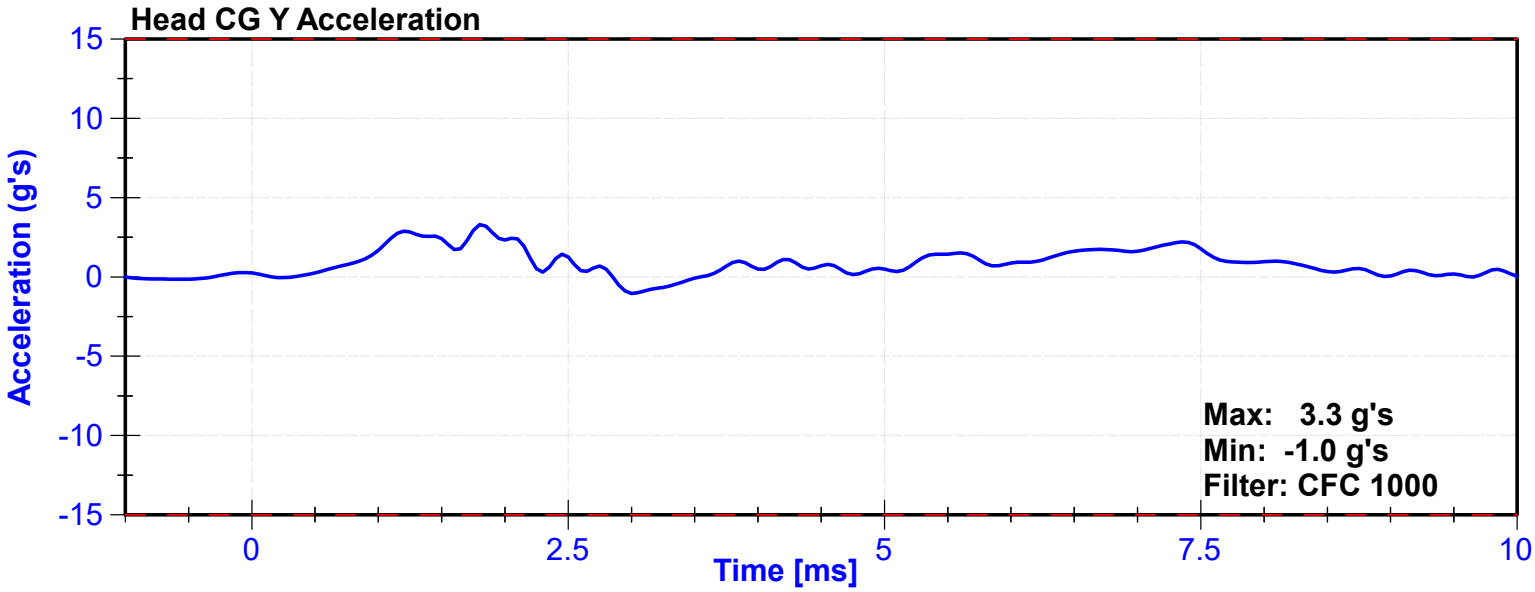
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.2	Pass
Humidity	10	70	%	48.7	Pass
Resultant Acceleration	225	275	g's	263.2	Pass
Oscillation	0	10	%	5.2	Pass
Lateral Acceleration	-15	15	g's	3.3	Pass

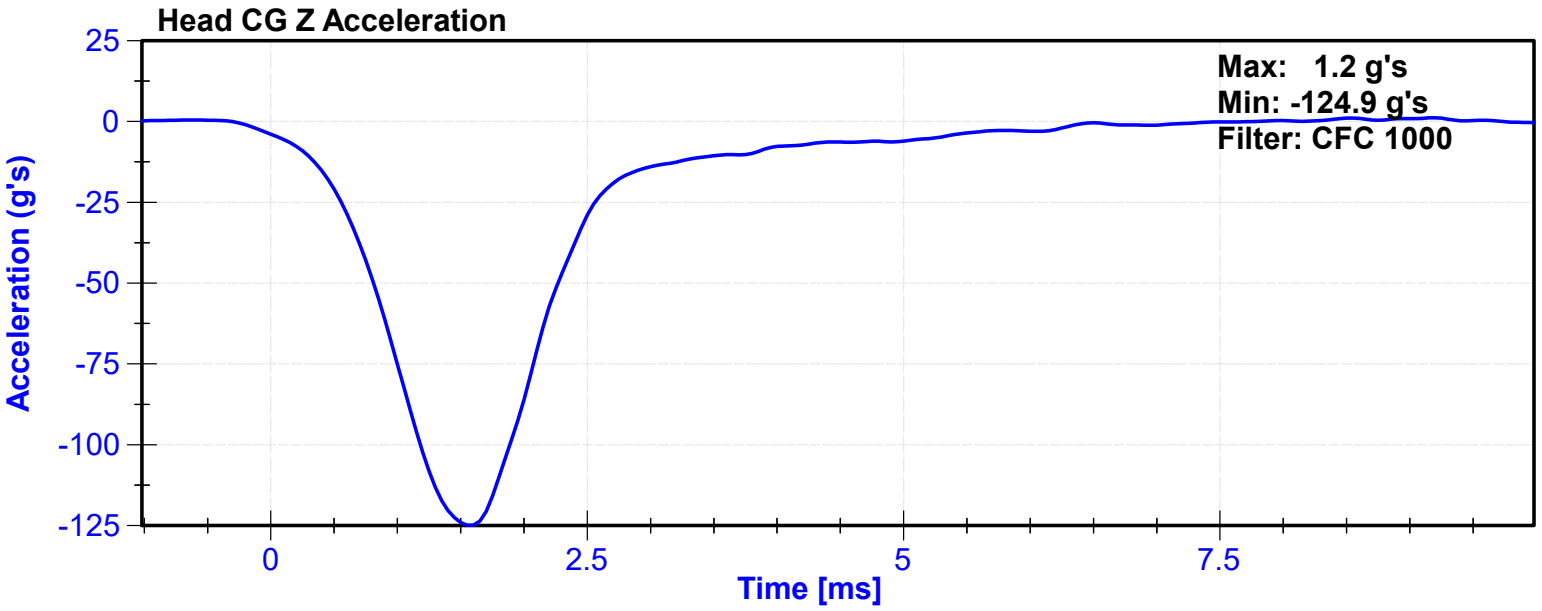
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Measurement Specialties	A260183	7/10/2024	1/6/2025
Y Accelerometer	Measurement Specialties	A341246	3/13/2024	9/9/2024
Z Accelerometer	Measurement Specialties	A260527	7/10/2024	1/6/2025




Head CG X Acceleration
Acceleration (g's)
250
200
150
100
50
0
-50
0
2.5
5
7.5
10
Time [ms]
Max: 232.1 g's
Min: -2.6 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: 3.3 g's
Min: -1.0 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
25
0
-25
-50
-75
-100
-125
0
2.5
5
7.5
Time [ms]
Max: 1.2 g's
Min: -124.9 g's
Filter: CFC 1000

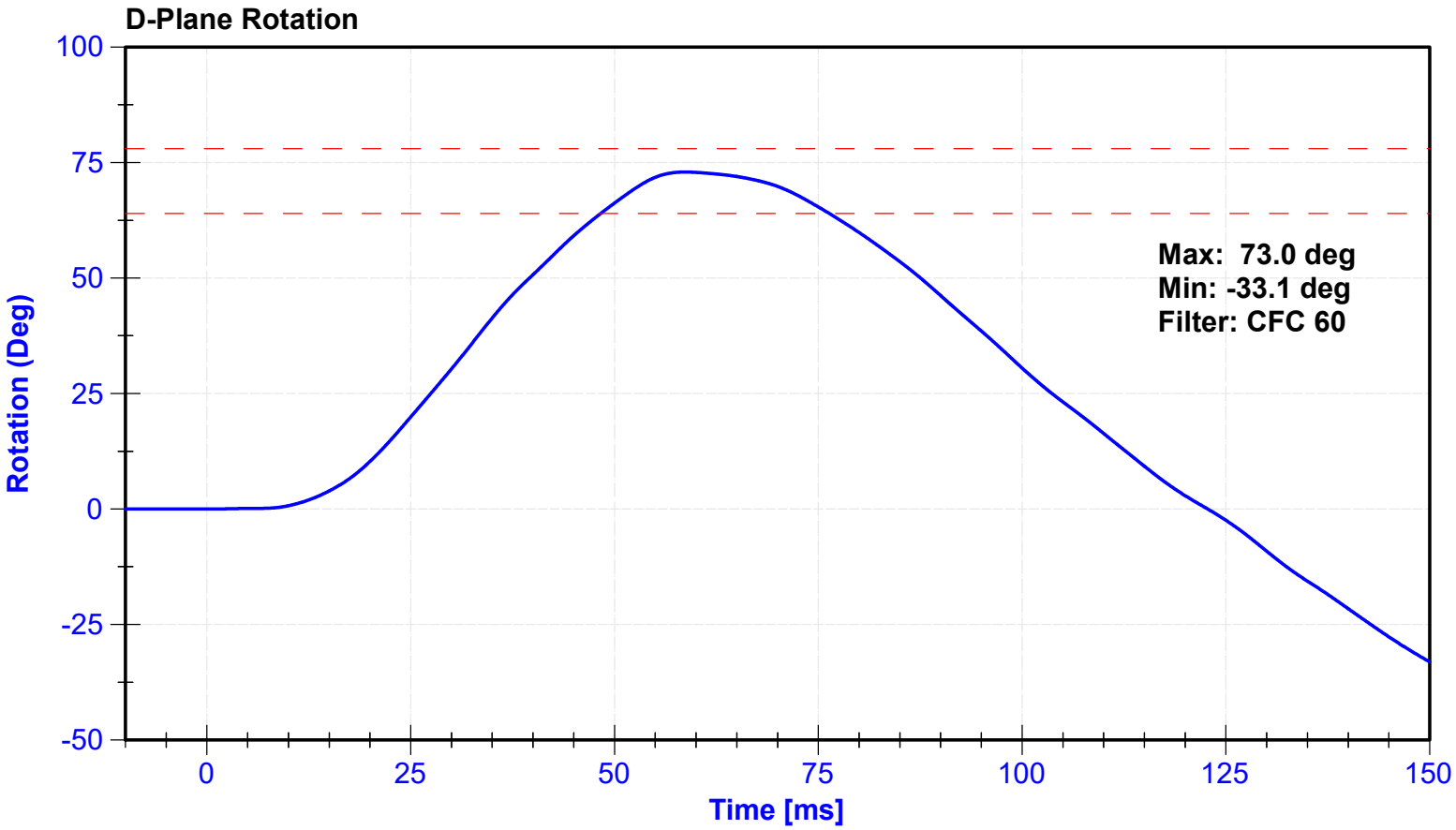
ATD Manufacturer	Humaetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

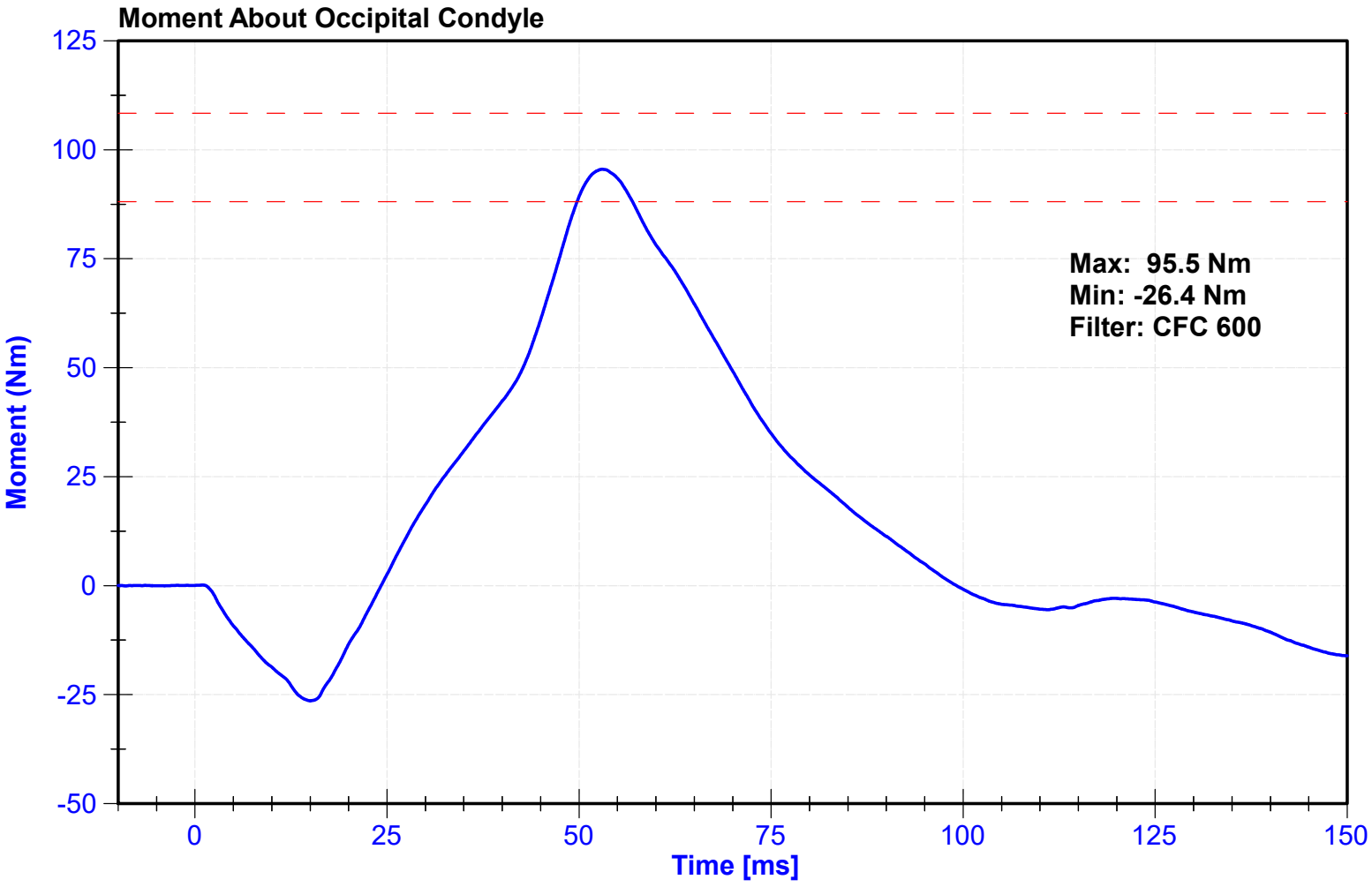
Results

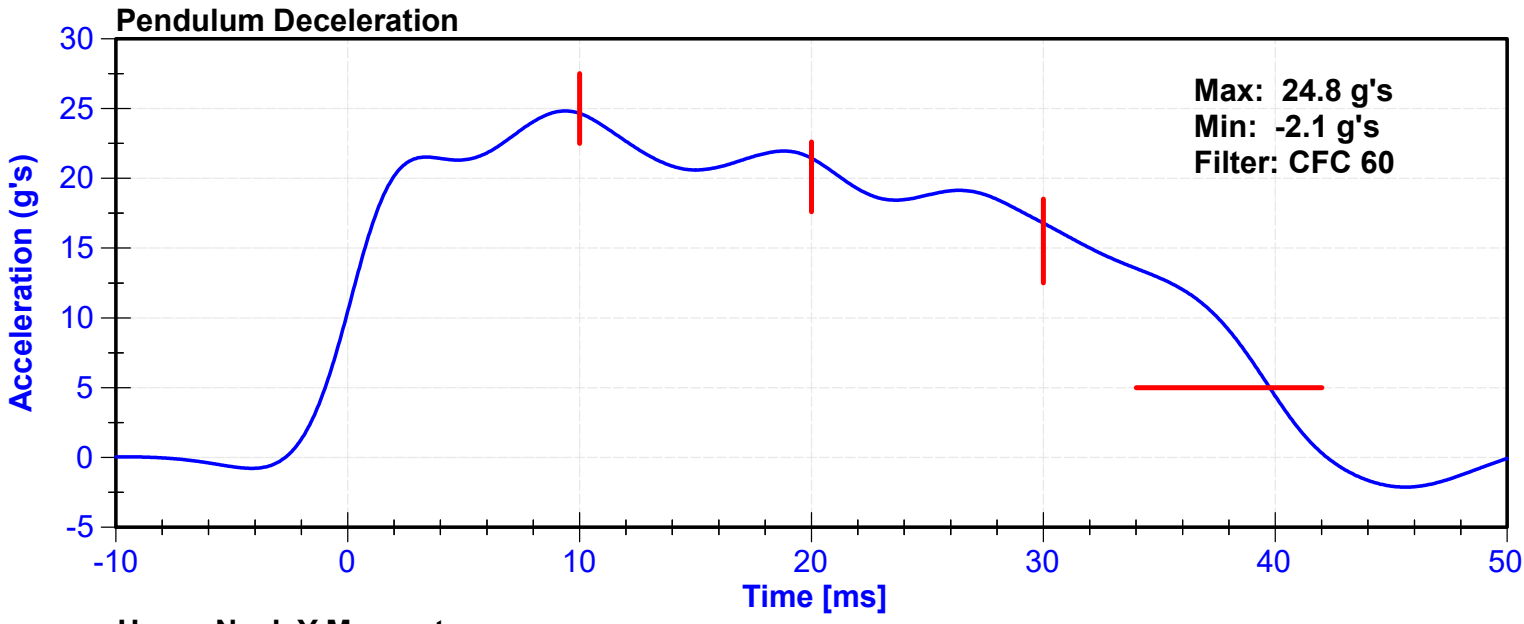
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	40.7	Pass
Velocity	6.89	7.13	m/s	7.031	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	24.65	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	21.43	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	16.78	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	24.8	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	39.8	Pass
Maximum D Plane Rotation	64	78	deg	73.0	Pass
Time to Maximum Rotation	57	64	ms	58.7	Pass
Rotation Decay to Zero	113	127	ms	122.8	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	95.54	Pass
Time to Maximum Moment	47	58	ms	53.0	Pass
Moment Decay to Zero	97	107	ms	99.2	Pass

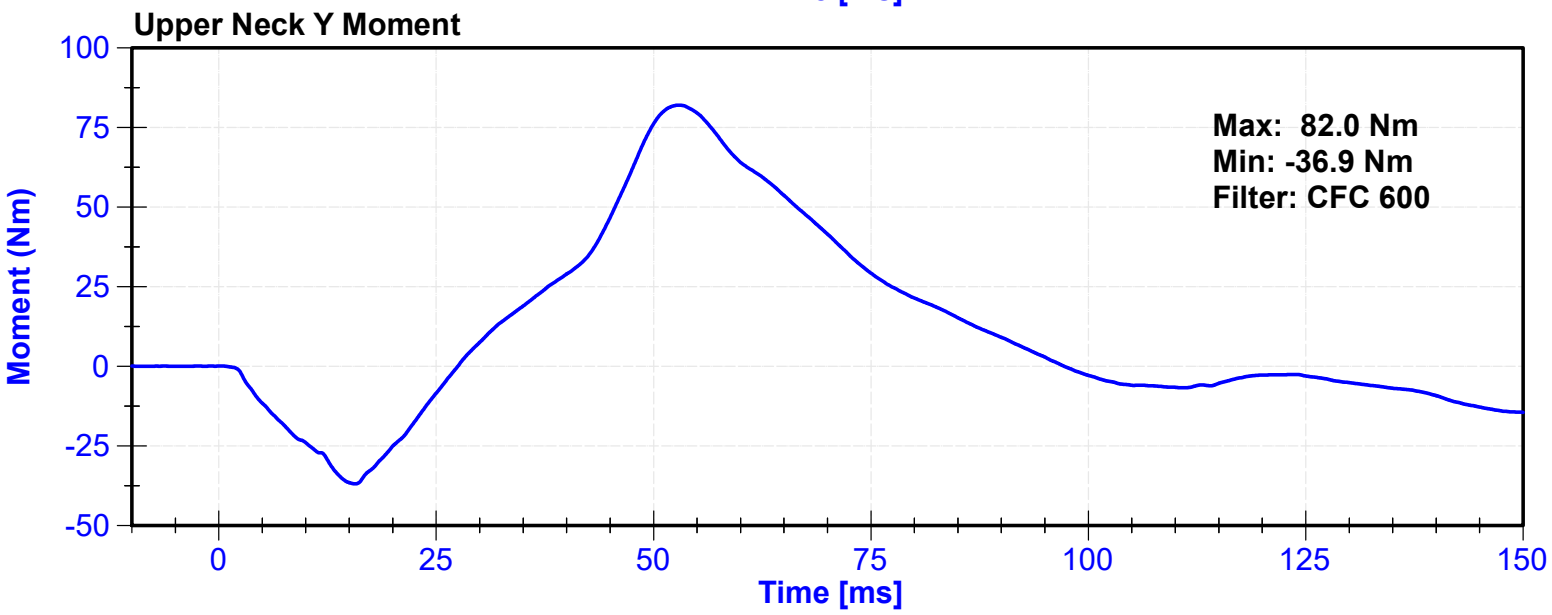
Transducer Calibrations

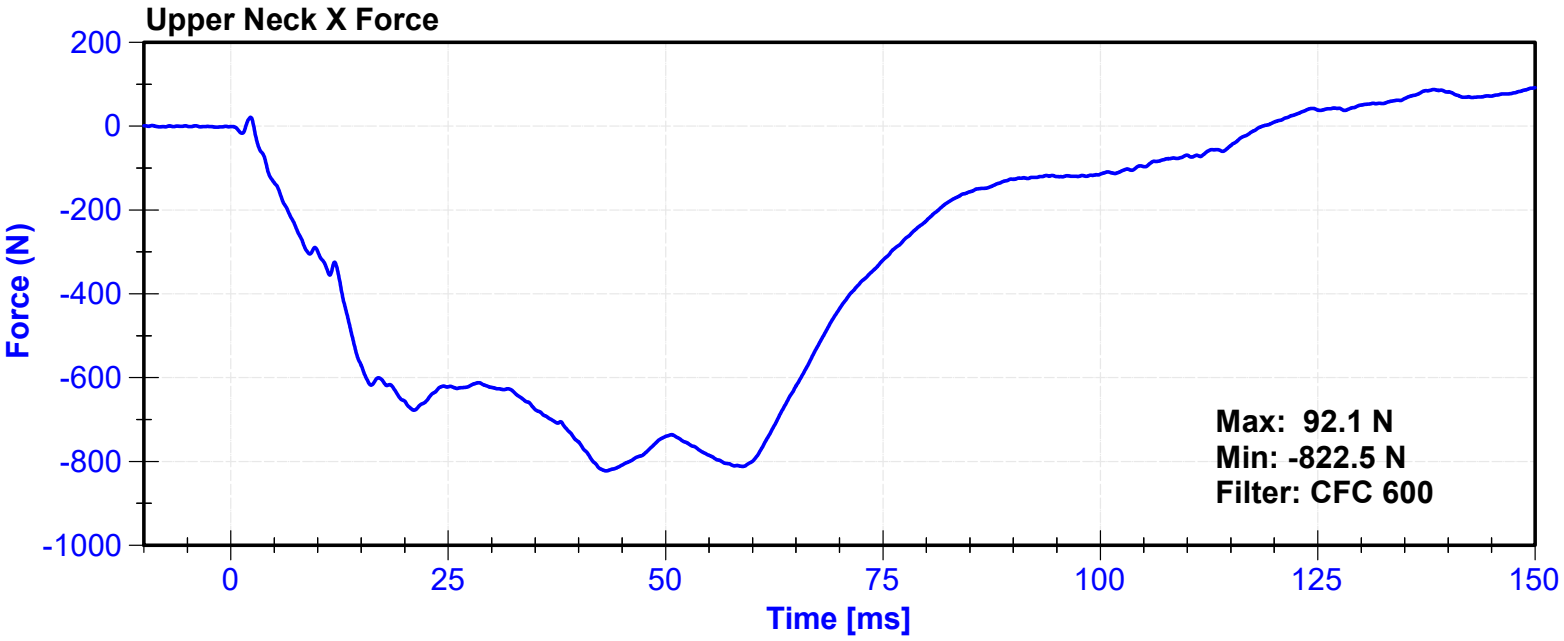
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16678	8/29/2024	2/25/2025
Pendulum Potentiometer	ETI	1412	12/18/2023	12/17/2024
Condyle Potentiometer	ETI	1911	12/18/2023	12/17/2024
Upper Neck Load Cell	Denton	1629-FX	12/8/2023	12/7/2024


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 73.0 deg
Min: -33.1 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: 95.5 Nm
Min: -26.4 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 24.8 g's
Min: -2.1 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 82.0 Nm
Min: -36.9 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 92.1 N
Min: -822.5 N
Filter: CFC 600
Force (N)
Time [ms]

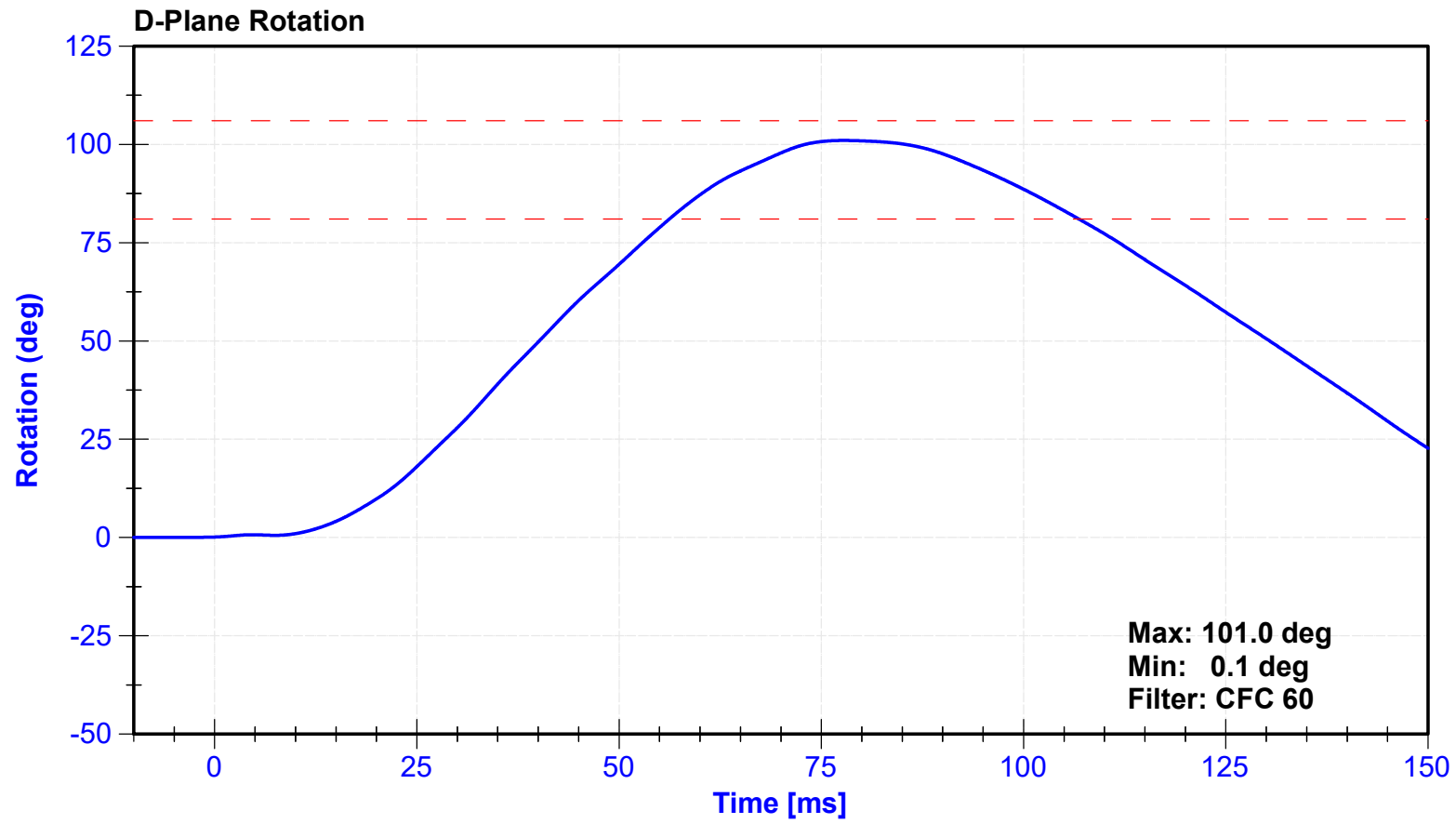
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

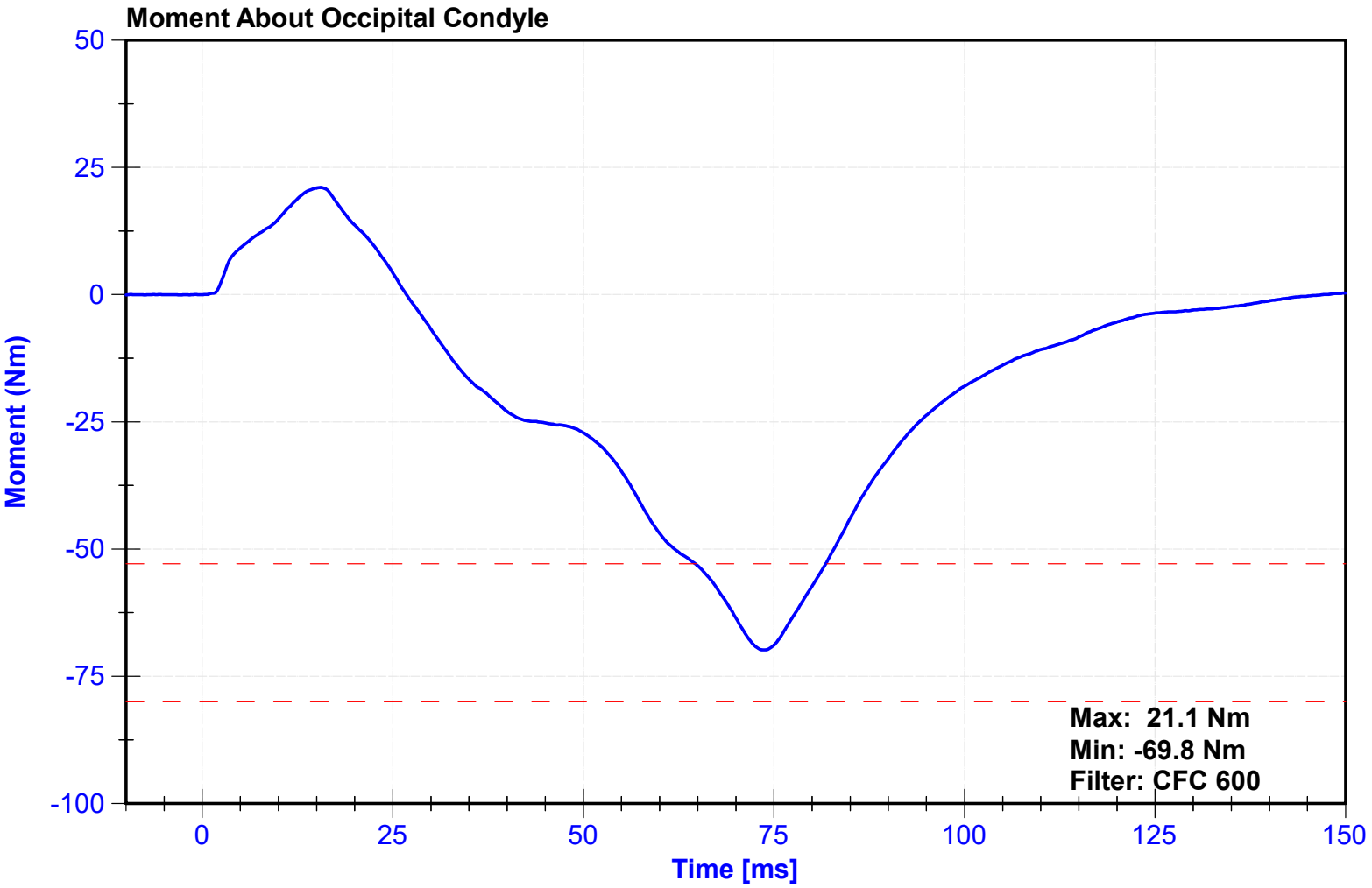
Results

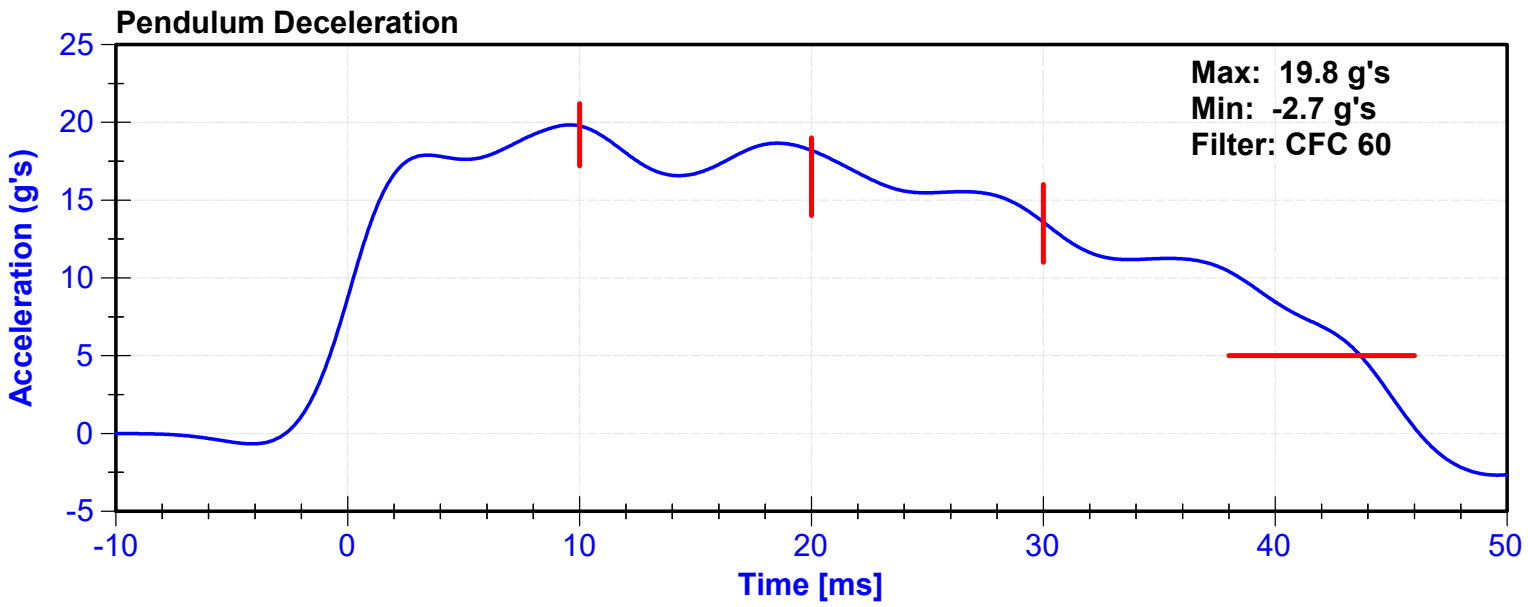
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	40.7	Pass
Velocity	5.94	6.19	m/s	6.136	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	19.77	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.2	Pass
Pendulum Deceleration at 30ms	11	16	g's	13.6	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	19.8	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	43.7	Pass
Maximum D Plane Rotation	81	106	deg	101.0	Pass
Time to Maximum Rotation	72	82	ms	77.8	Pass
Rotation Decay to Zero	147	174	ms	166.7	Pass
Minimum Moment About OC	-80	-52.9	Nm	-69.80	Pass
Time to Minimum Moment	65	79	ms	73.8	Pass
Moment Decay to Zero	120	148	ms	147.0	Pass

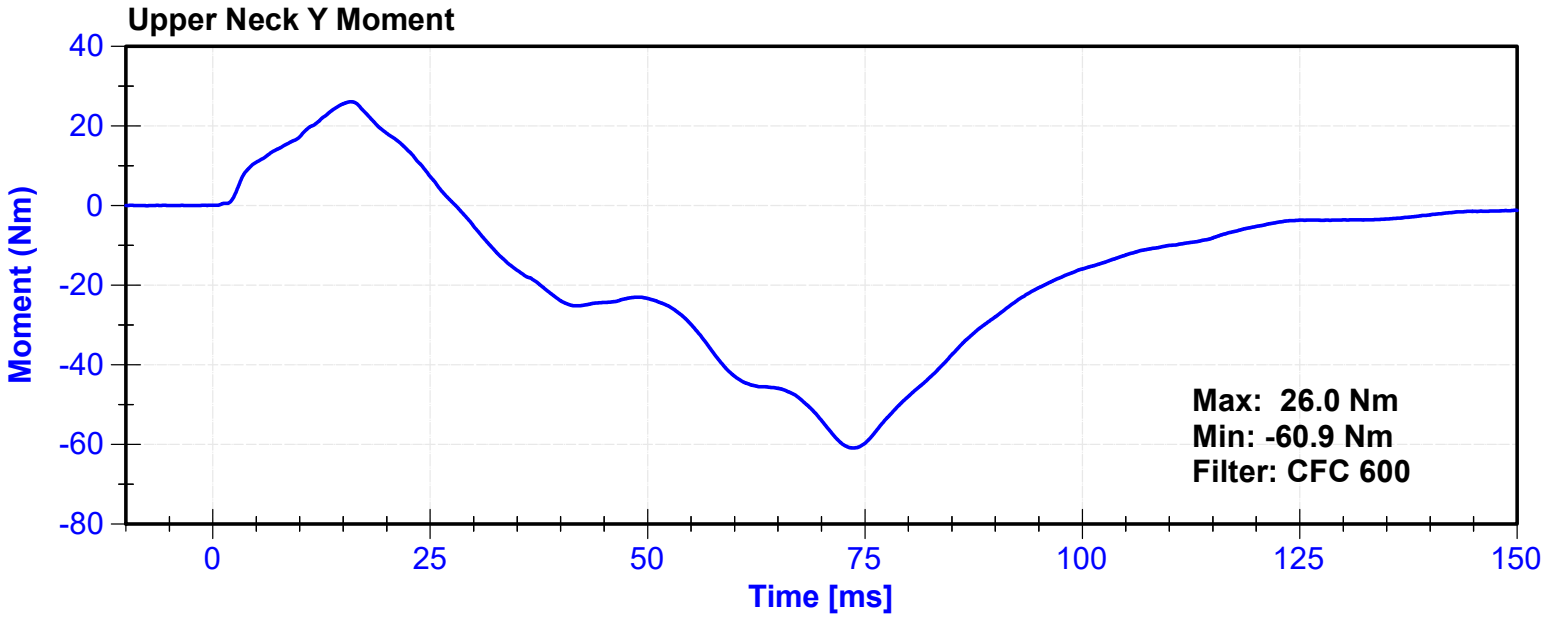
Transducer Calibrations

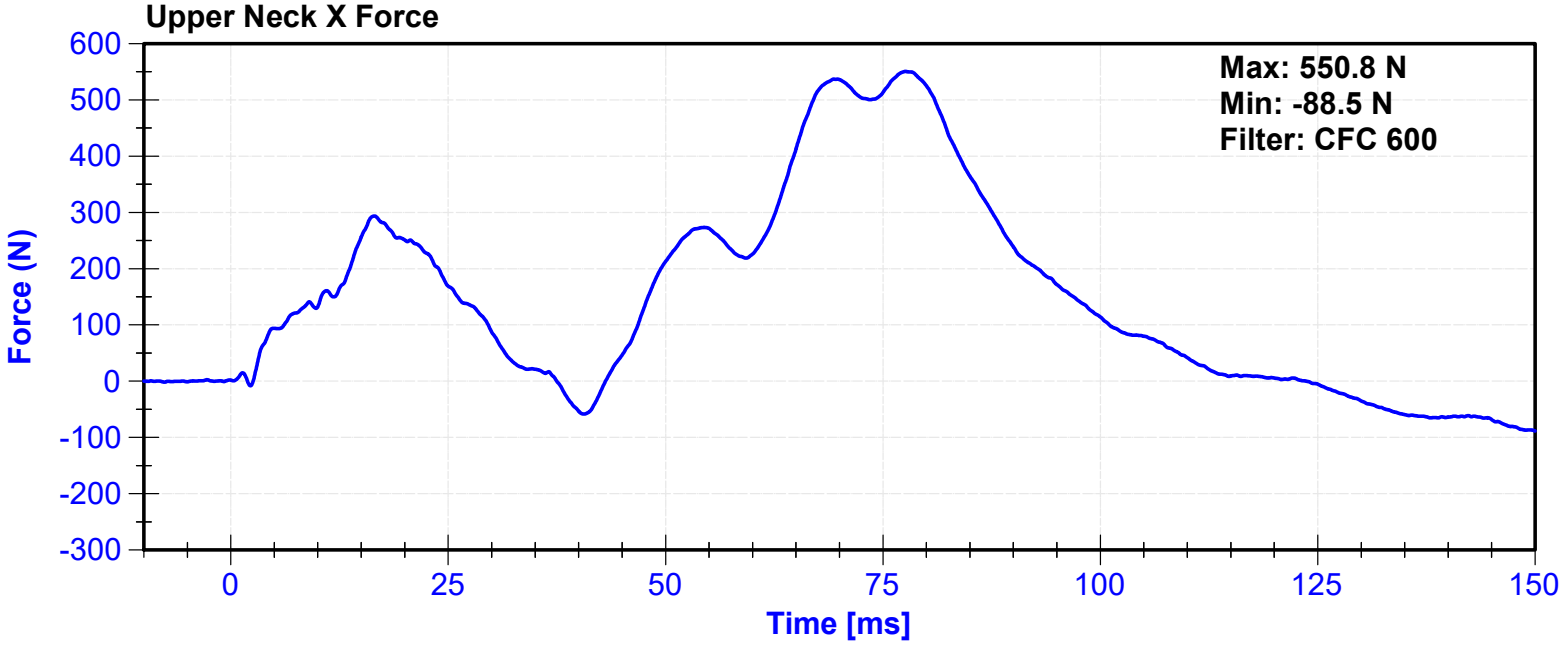
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16678	8/29/2024	2/25/2025
Pendulum Potentiometer	ETI	SP22G_1412	12/18/2023	12/17/2024
Condyle Potentiometer	ETI	SP22G_1911	12/18/2023	12/17/2024
Upper Neck Load Cell	Denton	1629-FX	12/8/2023	12/7/2024


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 101.0 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: 21.1 Nm
Min: -69.8 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 19.8 g's
Min: -2.7 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: 26.0 Nm
Min: -60.9 Nm
Filter: CFC 600
Moment (Nm)
40
20
0
-20
-40
-60
-80
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 550.8 N
Min: -88.5 N
Filter: CFC 600
Force (N)
600
500
400
300
200
100
0
-100
-200
-300
0
25
50
75
100
125
150
Time [ms]

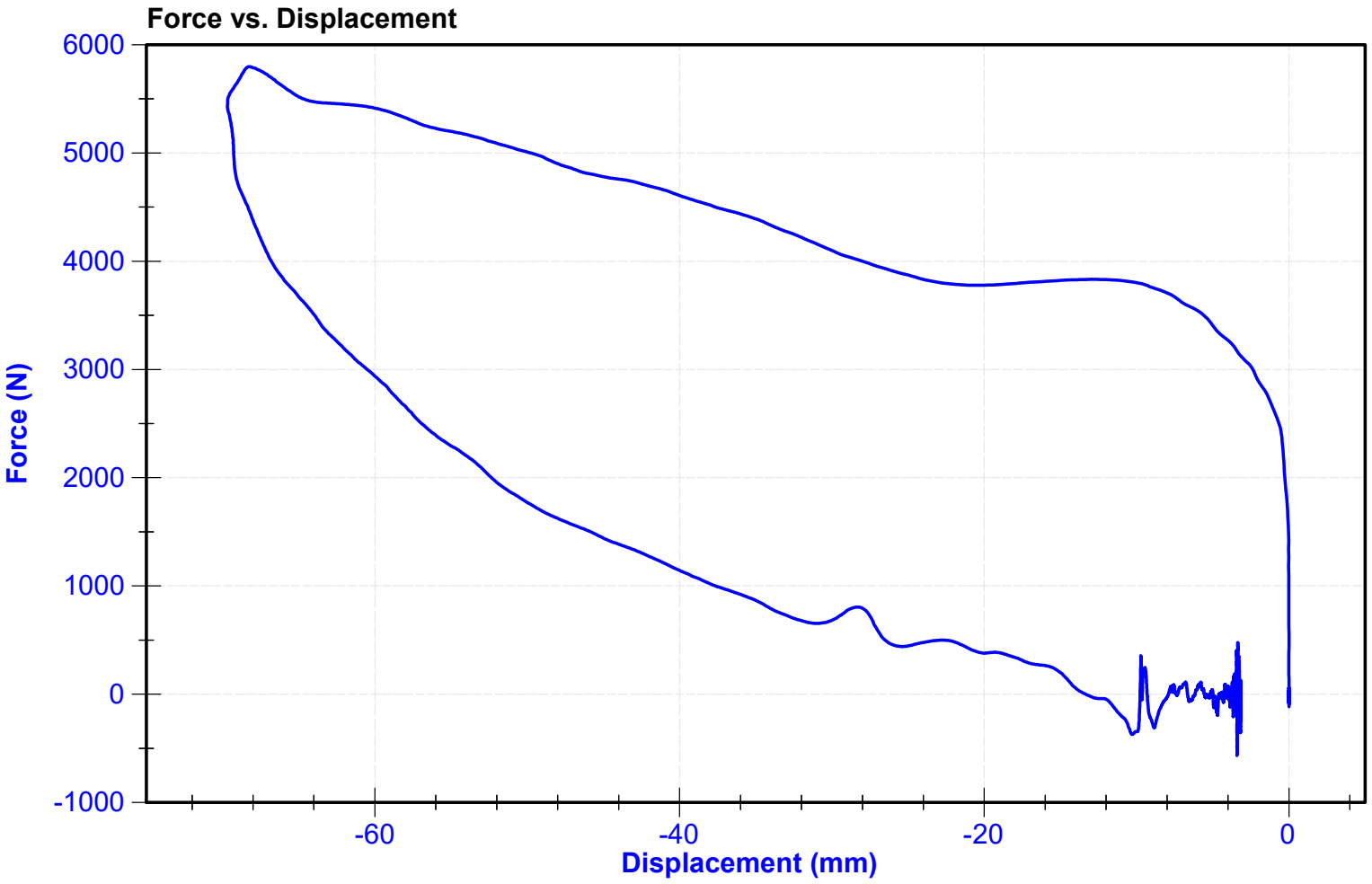
ATD Manufacturer	HUMANETICS	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

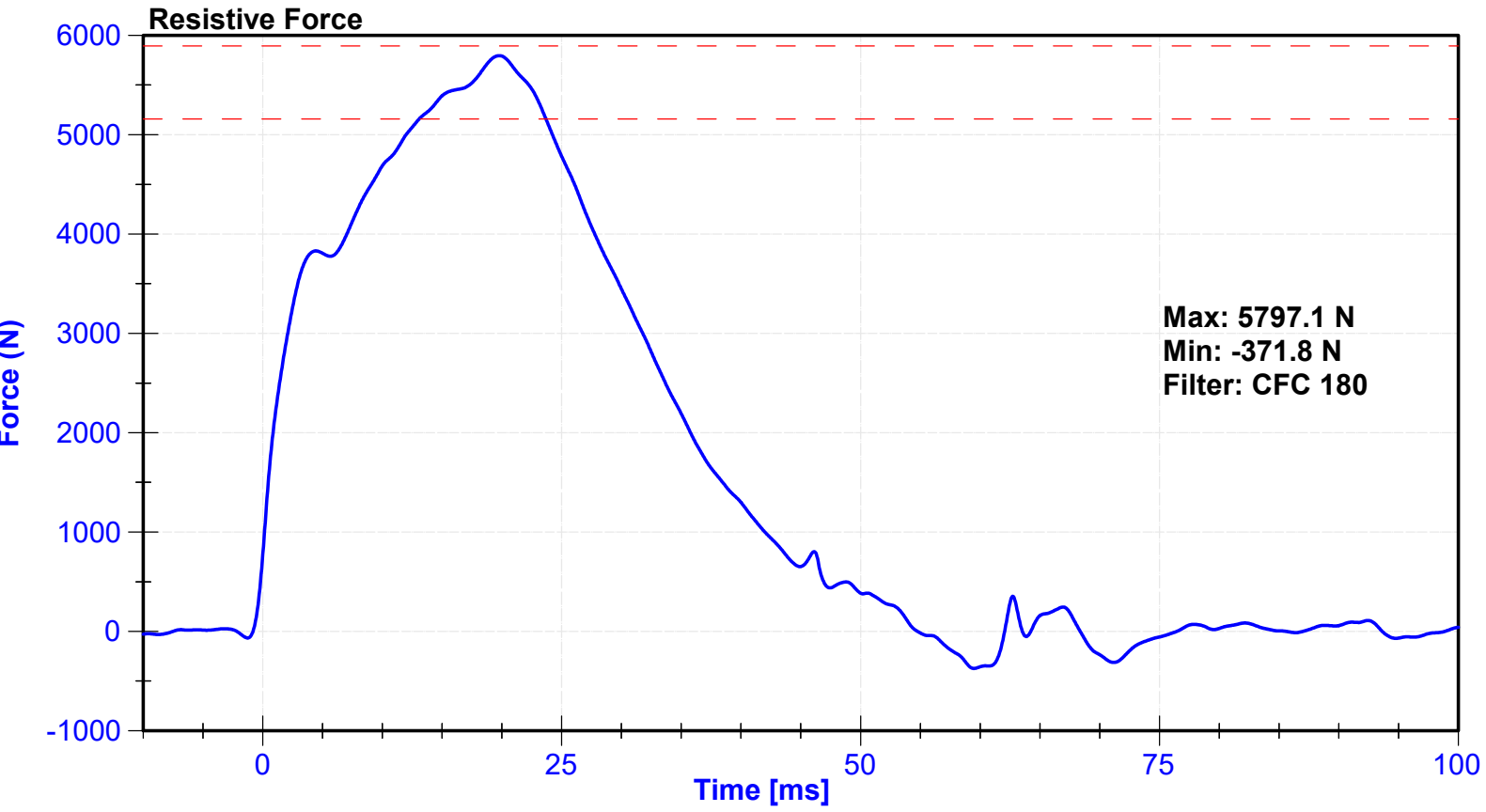
Results

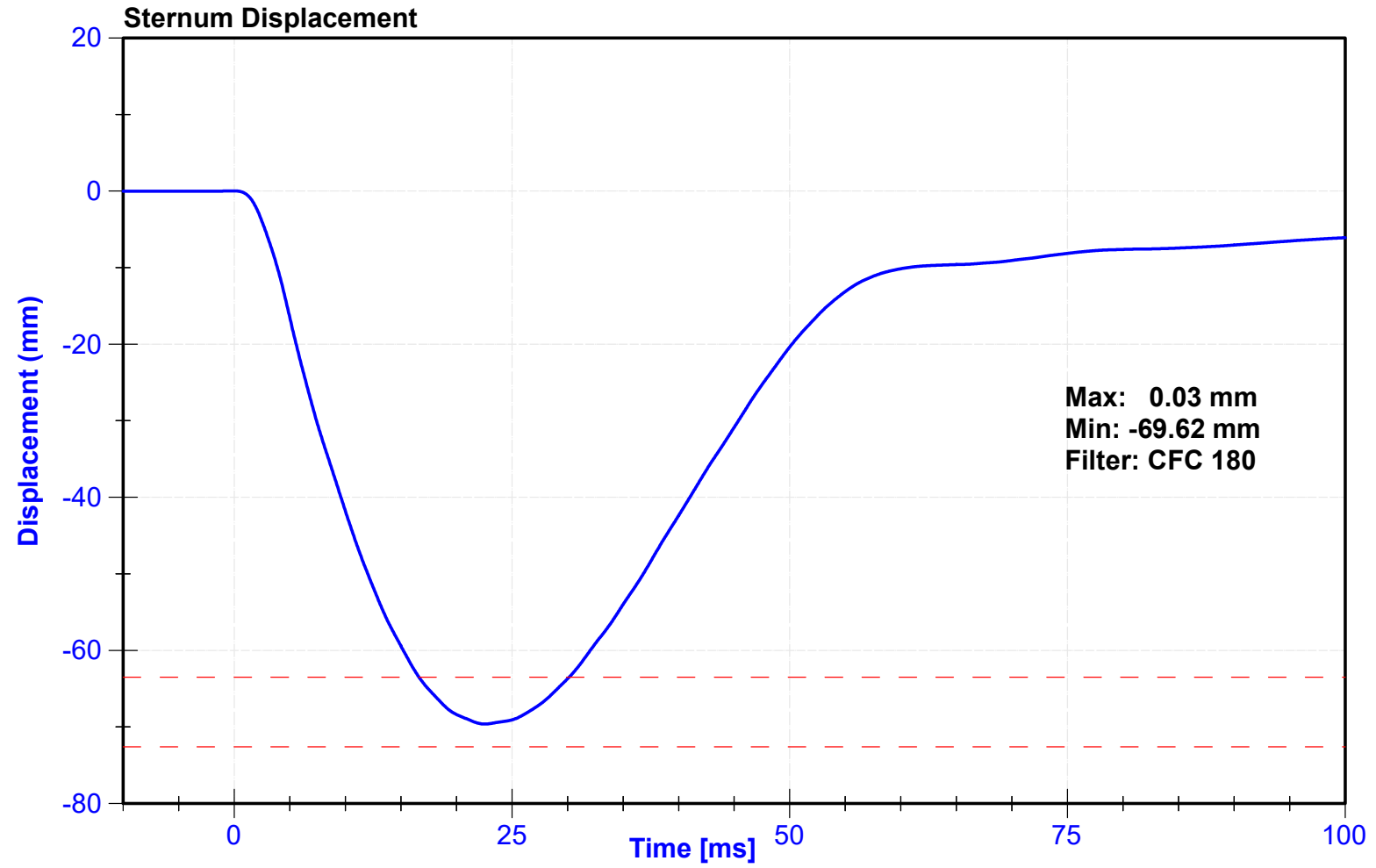
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	52.6	Pass
Velocity	6.59	6.83	m/s	6.734	Pass
Chest Displacement	-72.6	-63.5	mm	-69.62	Pass
Resistive Force	5160	5894	N	5797.1	Pass
Hysteresis	69	85	%	70.9	Pass

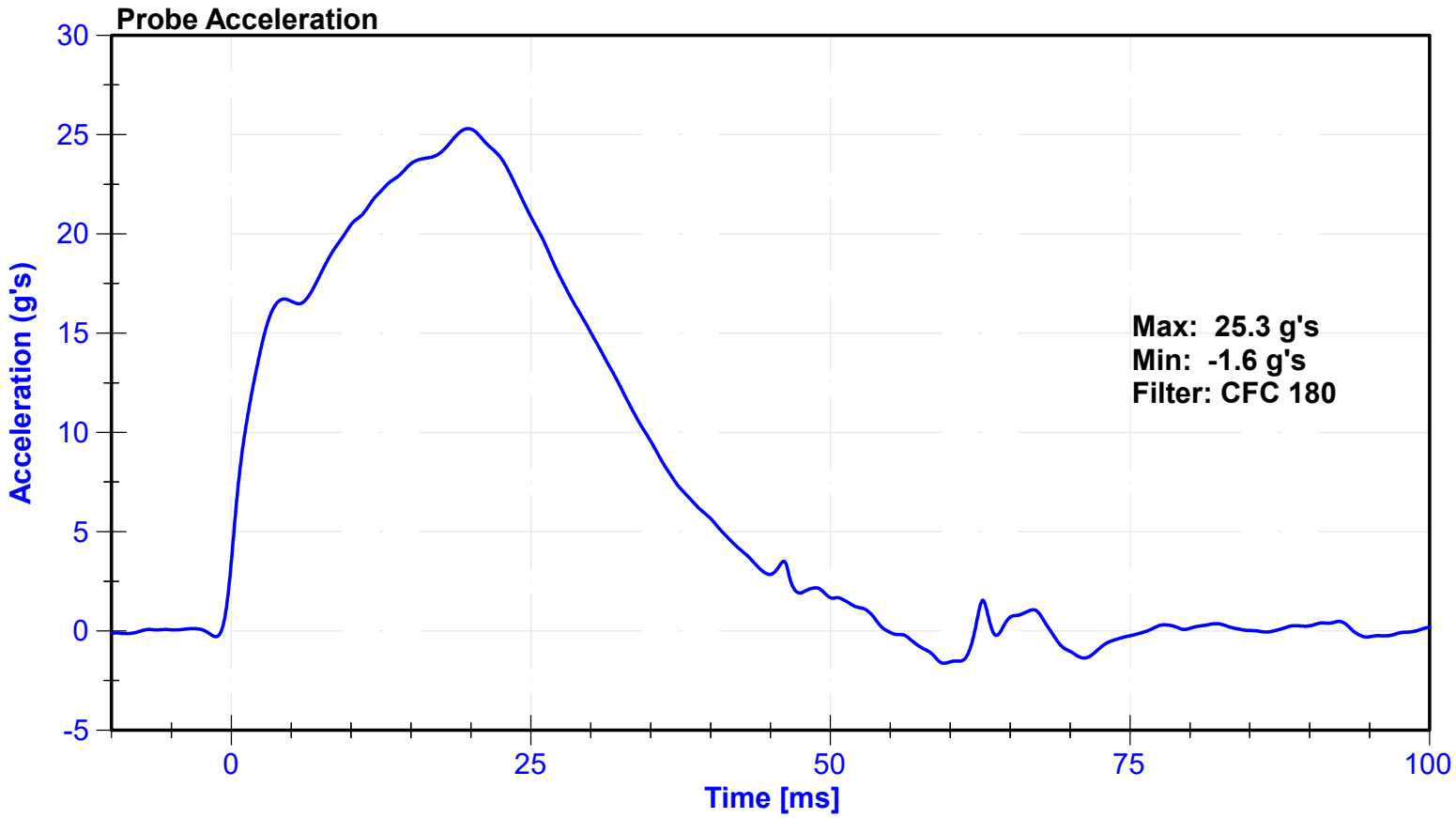
Transducer Calibrations

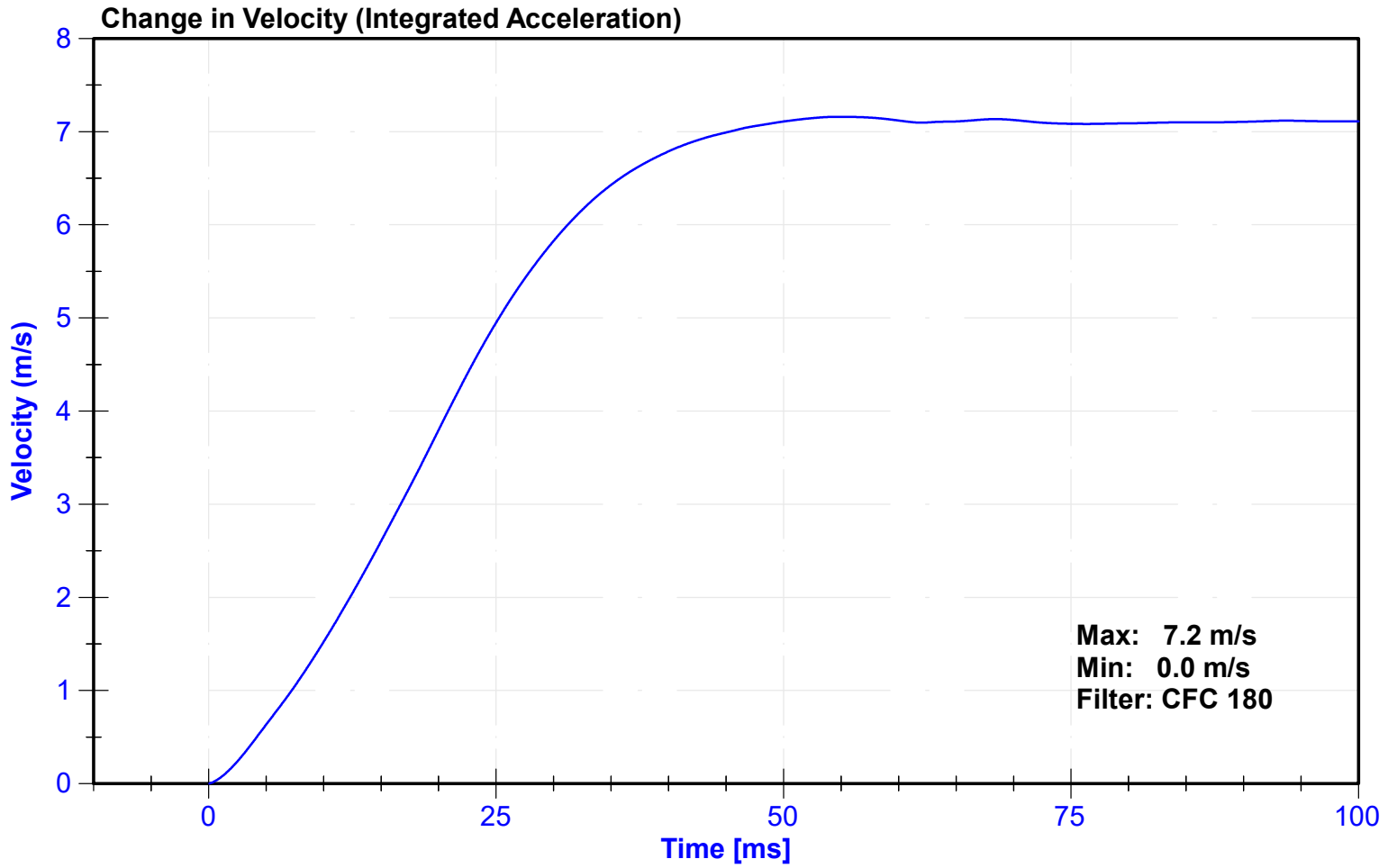
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Measurement	MS26647	3/27/2024	9/23/2024
Chest Potentiometer	Servo	1046	4/30/2024	10/29/2024




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
25
50
75
100
Time [ms]
Max: 5797.1 N
Min: -371.8 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: -69.62 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: -1.6 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

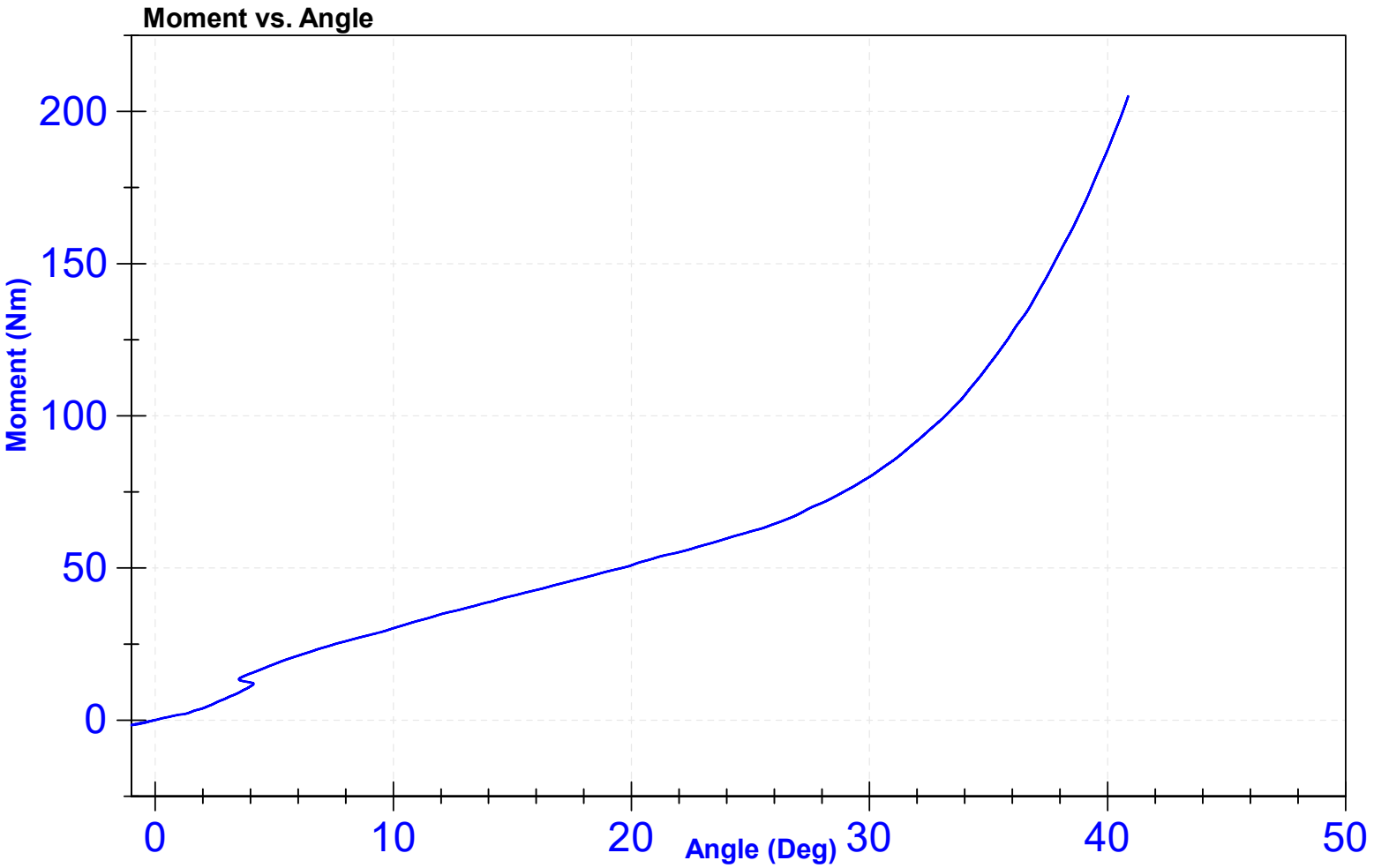
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.6	Pass
Humidity	10	70	%	40.2	Pass
Average Velocity	5	10	deg/s	6.8	Pass
Angle at 203Nm	40	50	deg	40.8	Pass
Moment at 30 degrees	0	94.9	Nm	79.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Servo 14CB1-3615	3203	11/16/2023	11/15/2024
Load Cell	PCB 2301-02A	111	2023-09-21	2024-09-20



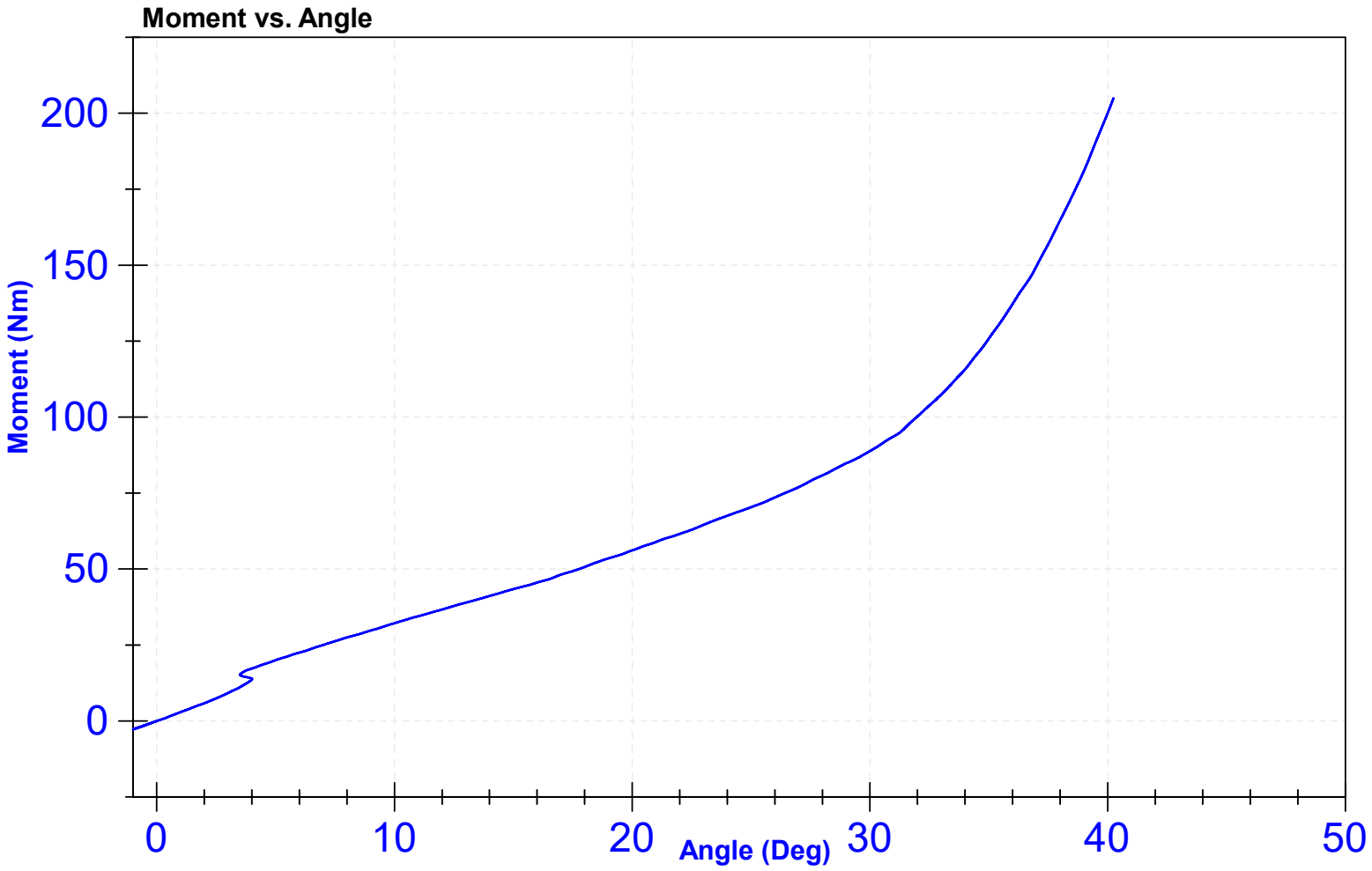
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.6	Pass
Humidity	10	70	%	40.2	Pass
Average Velocity	5	10	deg/s	6.9	Pass
Angle at 203Nm	40	50	deg	40.1	Pass
Moment at 30 degrees	0	94.9	Nm	88.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Servo 14CB1-3615	3203	11/16/2023	11/15/2024
Load Cell	PCB 2301-02A	111	2023-09-21	2024-09-20



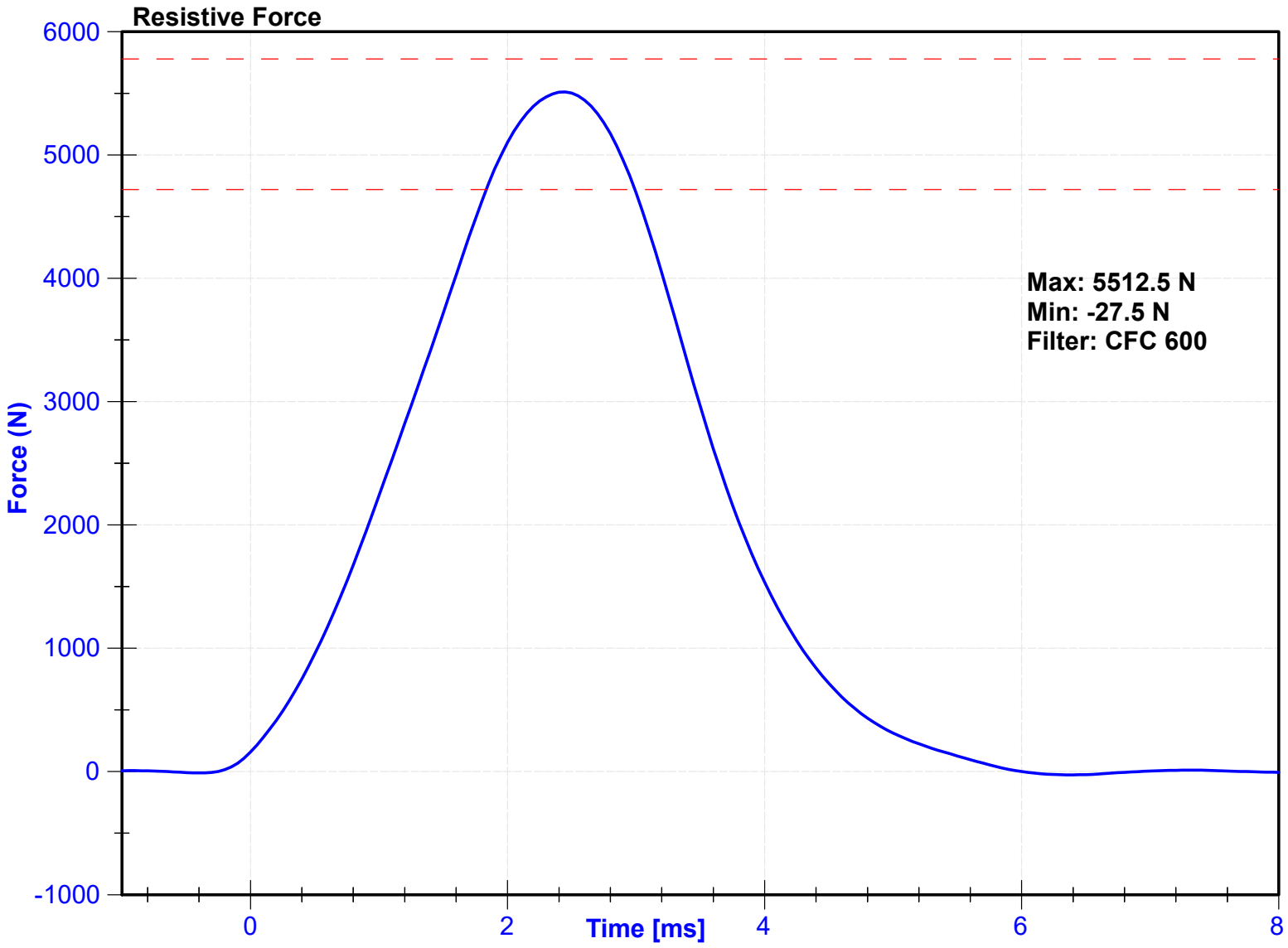
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

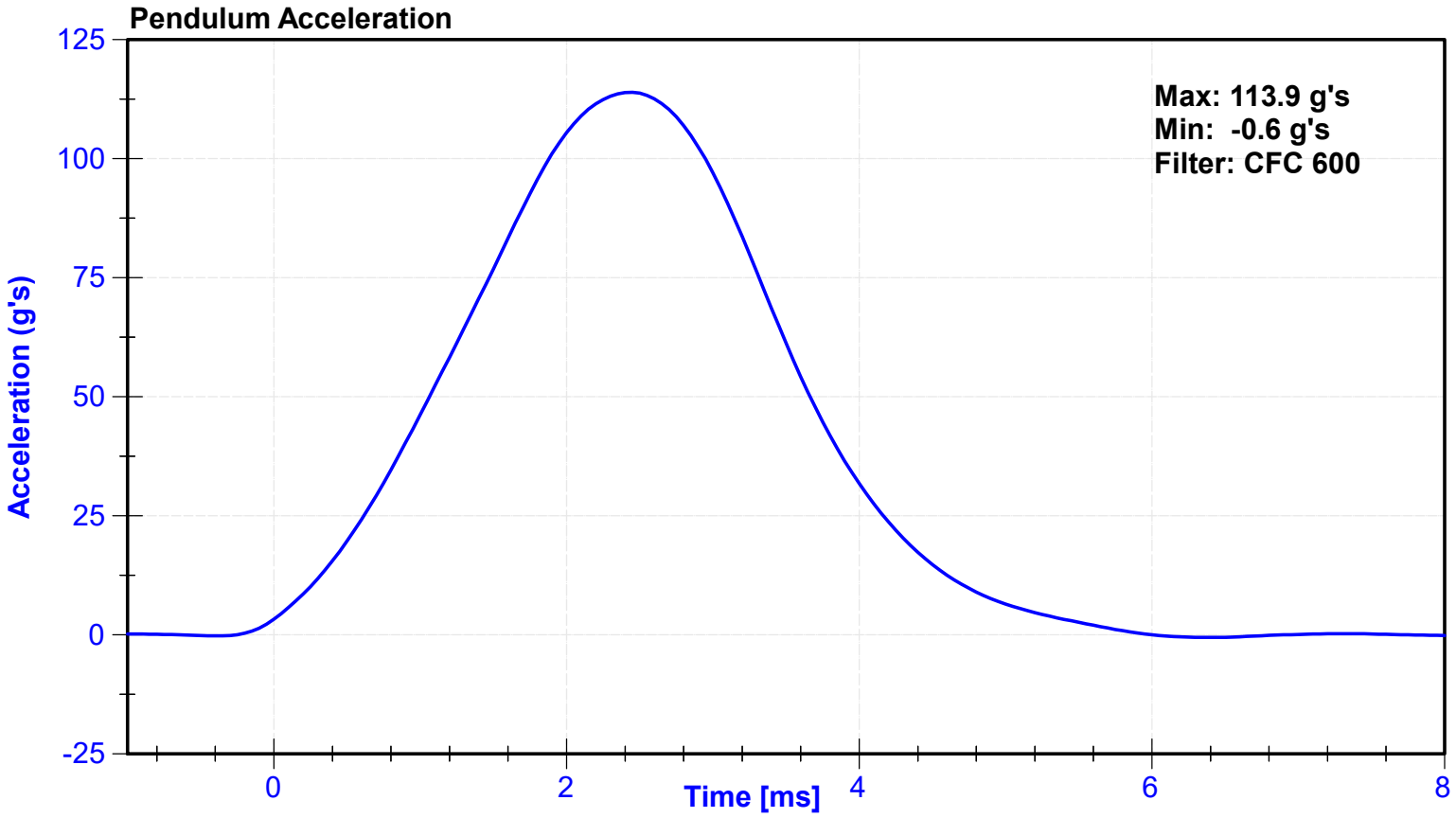
Results

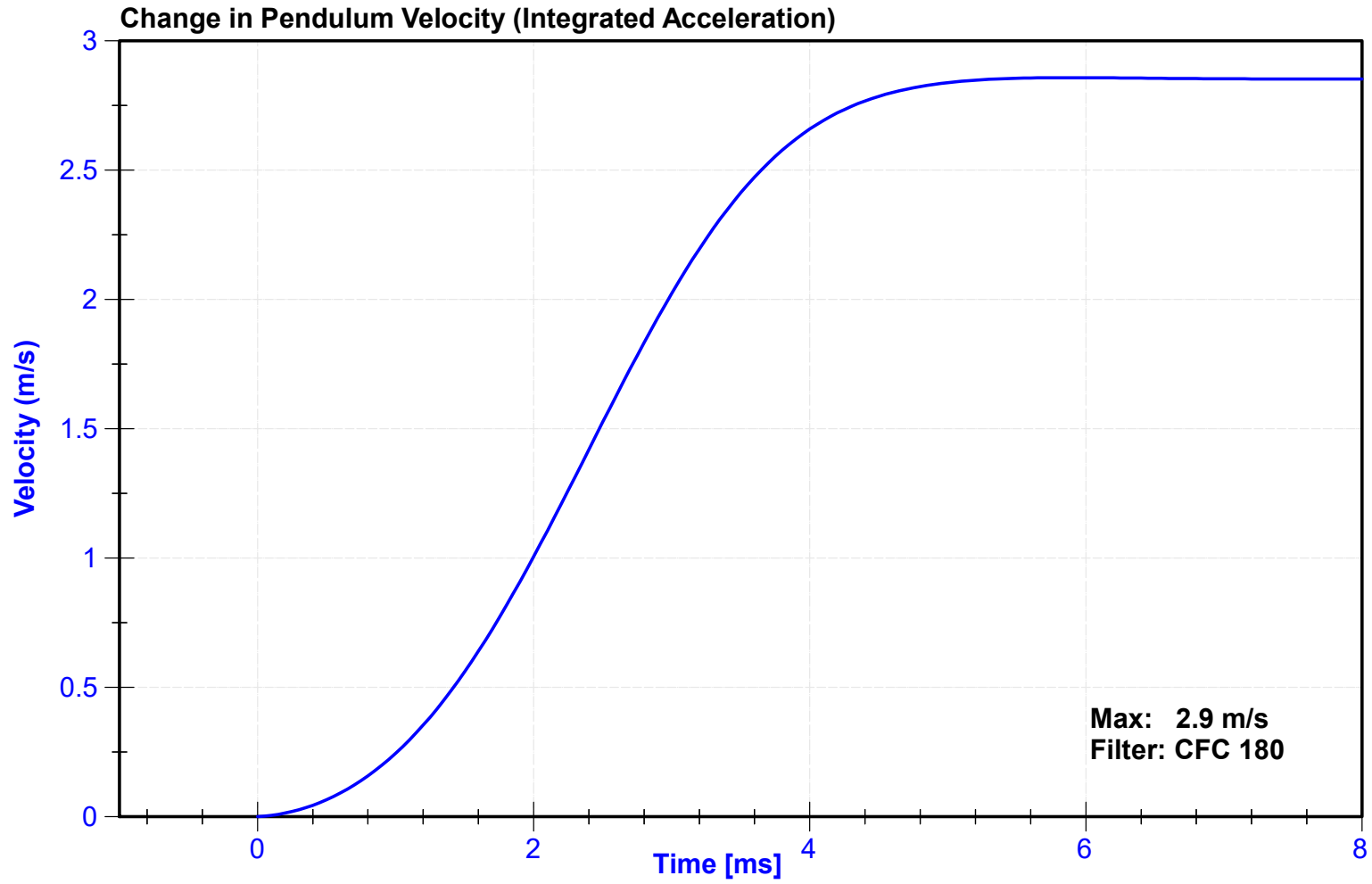
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.3	Pass
Humidity	10	70	%	51.8	Pass
Velocity	2.07	2.13	m/s	2.13	Pass
Maximum Resistive Force	4720	5780	N	5512.5	Pass

Transducer Calibrations

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




Pendulum Acceleration
Max: 113.9 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: 2.9 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]

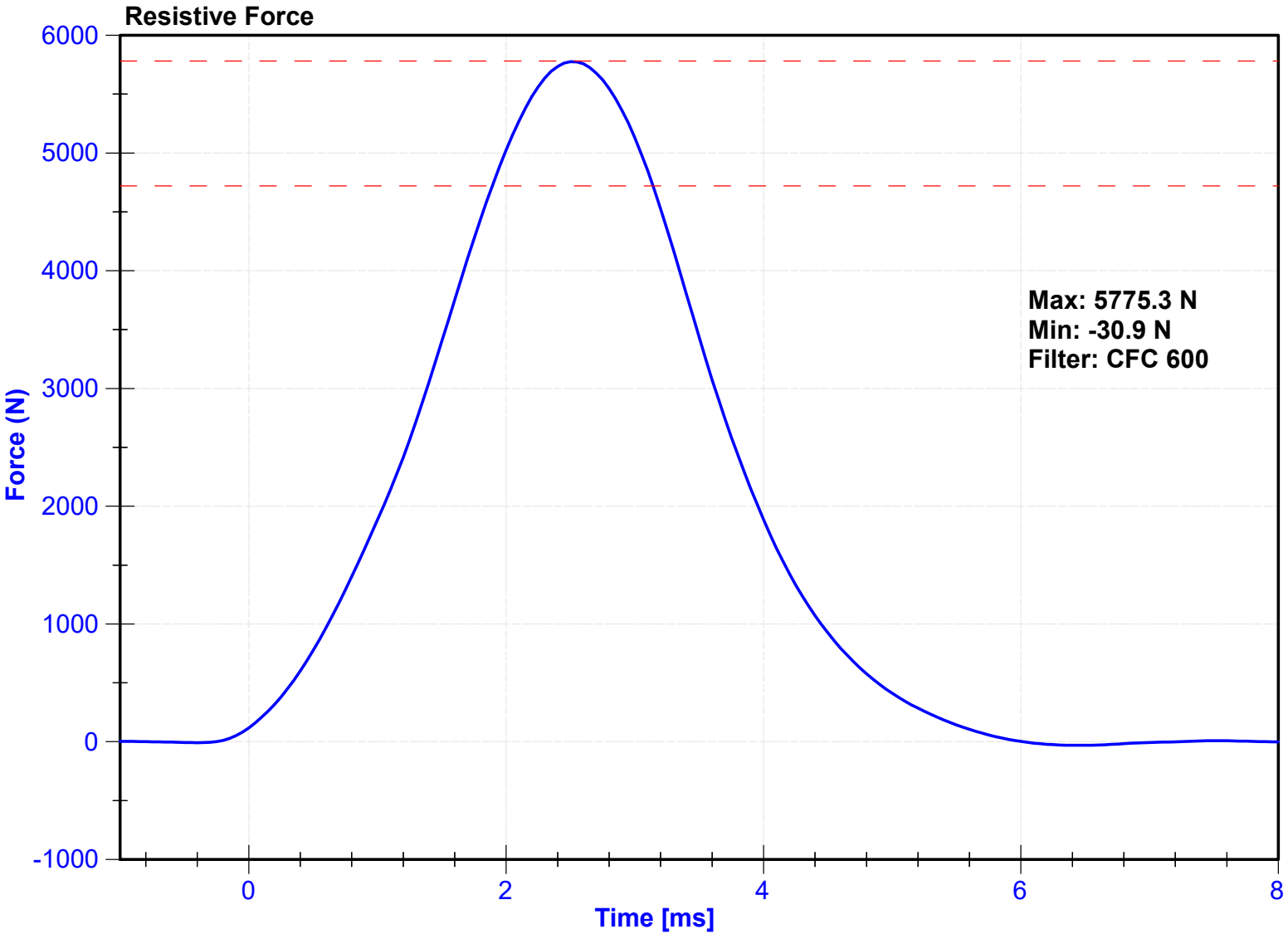
ATD Manufacturer	Humanetics	Test Technician	AG
ATD Serial Number	065	Laboratory Supervisor	ZP

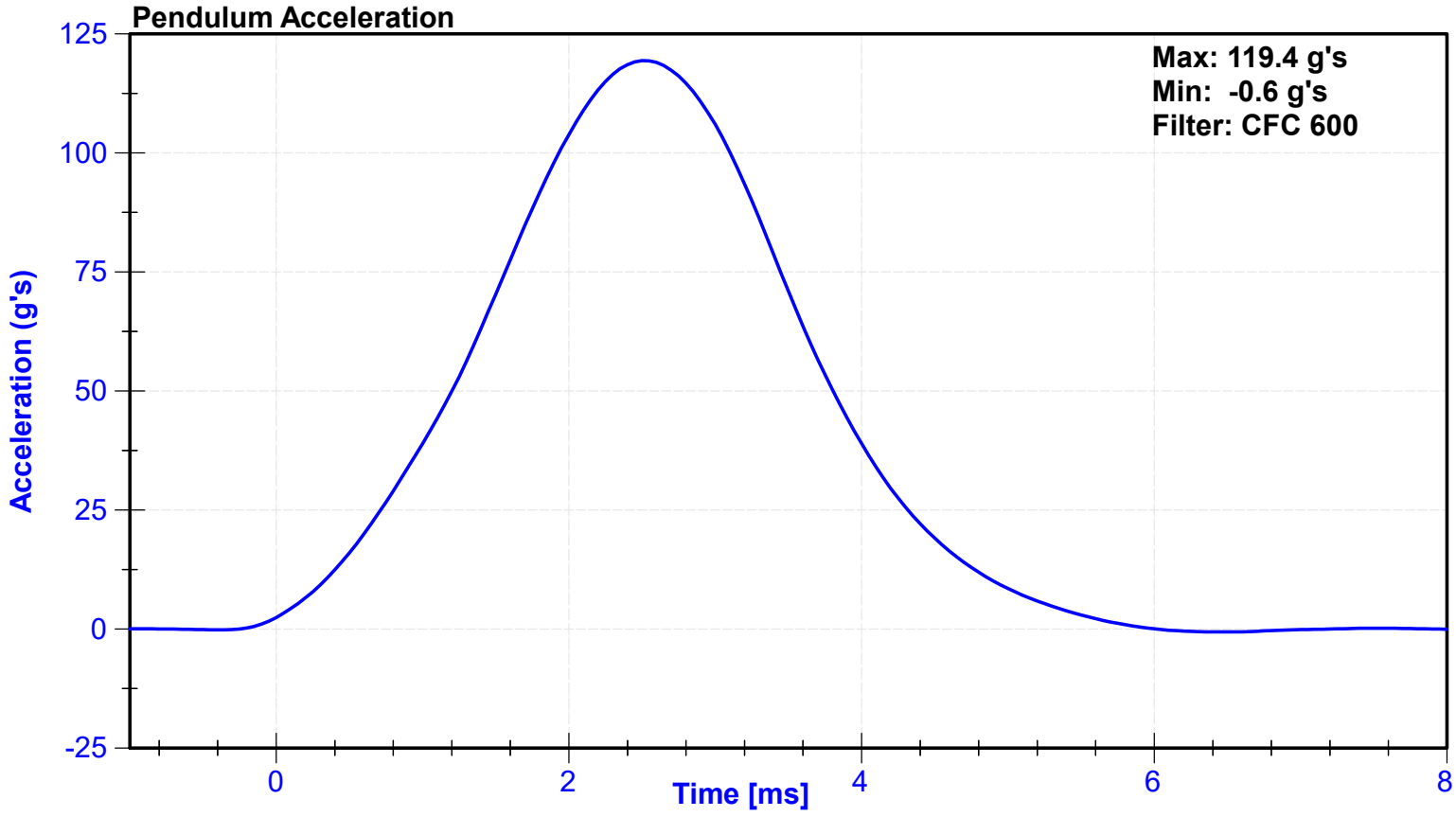
Results

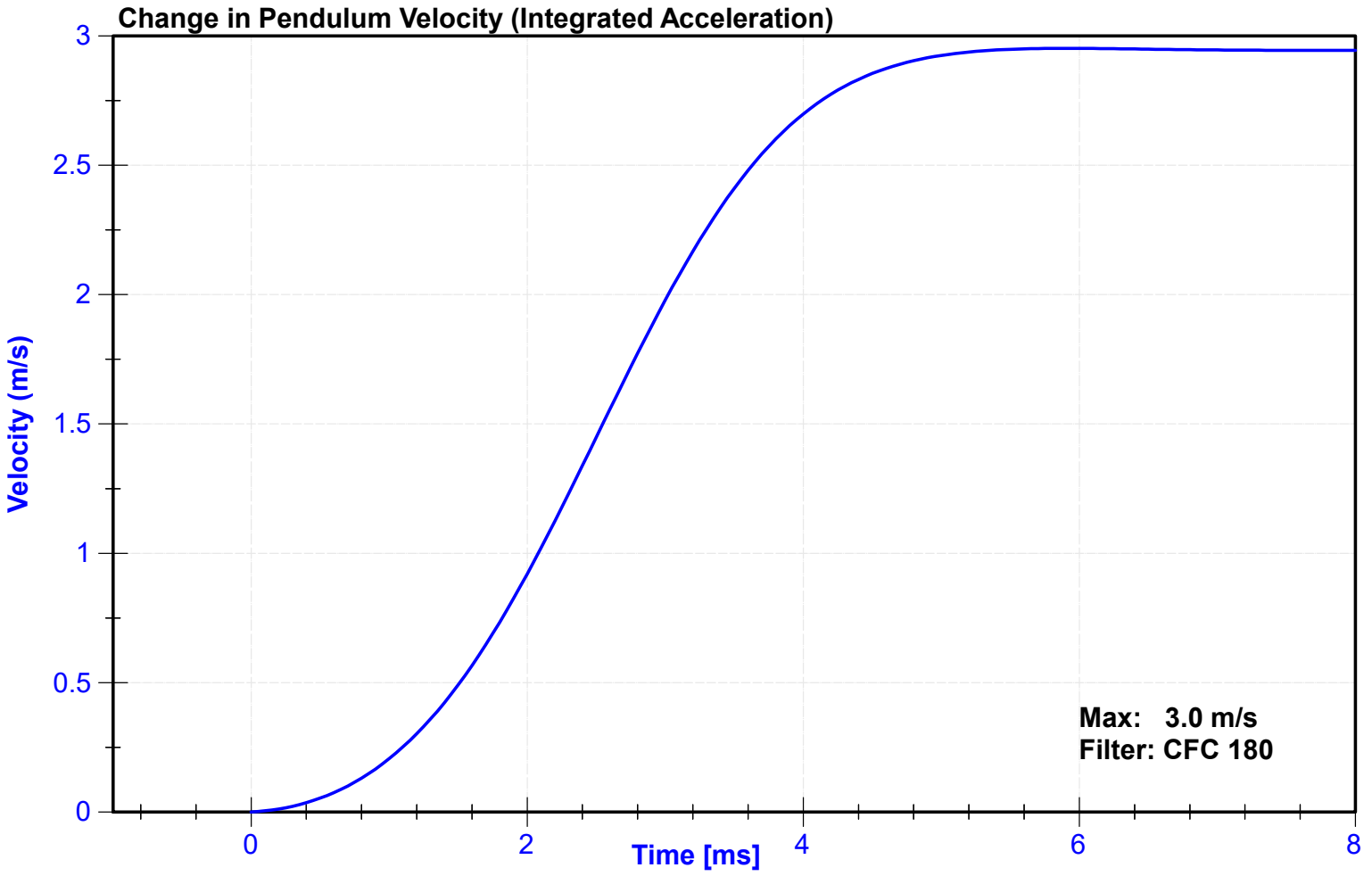
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.3	Pass
Humidity	10	70	%	51.8	Pass
Velocity	2.07	2.13	m/s	2.120	Pass
Maximum Resistive Force	4720	5780	N	5775.3	Pass

Transducer Calibrations

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




Pendulum Acceleration
Max: 119.4 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: 3.0 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

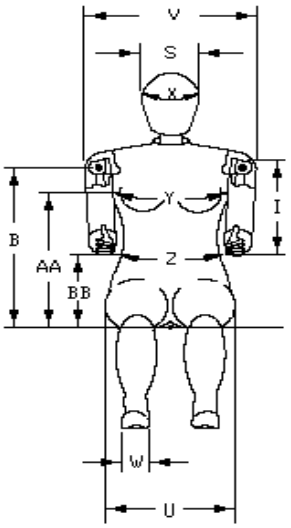
HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

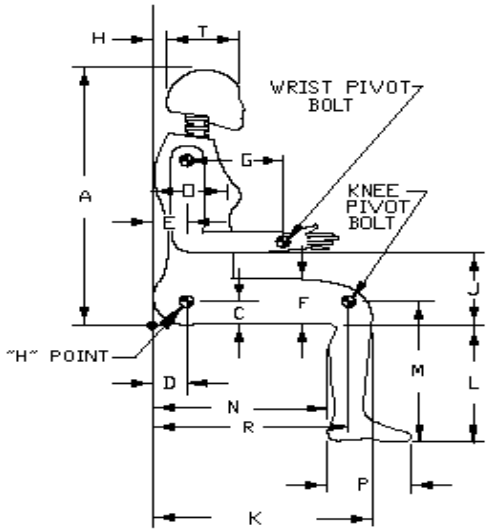
SERIAL NO: 137

External Measurements - Hybrid 3 - 5th Female

Technician: J. Rios Date: 09/04/2024

Dummy Serial Number: 137





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	795	Pass
B	Shoulder Pivot Height	432	457	435	Pass
C	H-Point Height	81	86	84	Pass
D	H-Point from Backline	145	150	145	Pass
E	Shoulder Pivot from Backline	69	84	76	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	285	Pass
J	Elbow Rest Height	183	203	199	Pass
K	Buttock to Knee Length	521	546	525	Pass
L	Popliteal Height	356	376	369	Pass
M	Knee Pivot Height	394	419	411	Pass
N	Buttock Popliteal Length	414	439	425	Pass
O	Chest Depth without Jacket	175	191	183	Pass
P	Foot Length (right)	219	234	230	Pass
R	Buttock To Knee Pivot Length	457	483	466	Pass
S	Head Breadth	137	147	145	Pass
T	Head Depth	178	188	183	Pass
U	Hip Breadth	300	315	311	Pass
V	Shoulder Breadth	351	366	362	Pass
W	Foot Breadth	79	94	86	Pass
X	Head Circumference	528	549	538	Pass
Y	Chest Circumference with Jacket	851	881	852	Pass
Z	Waist Circumference	460	790	611	Pass
AA	Reference Location (Chest Circumference)	333	358	339	Pass
BB	Reference Location (Waist Circumference)	160	170	166	Pass

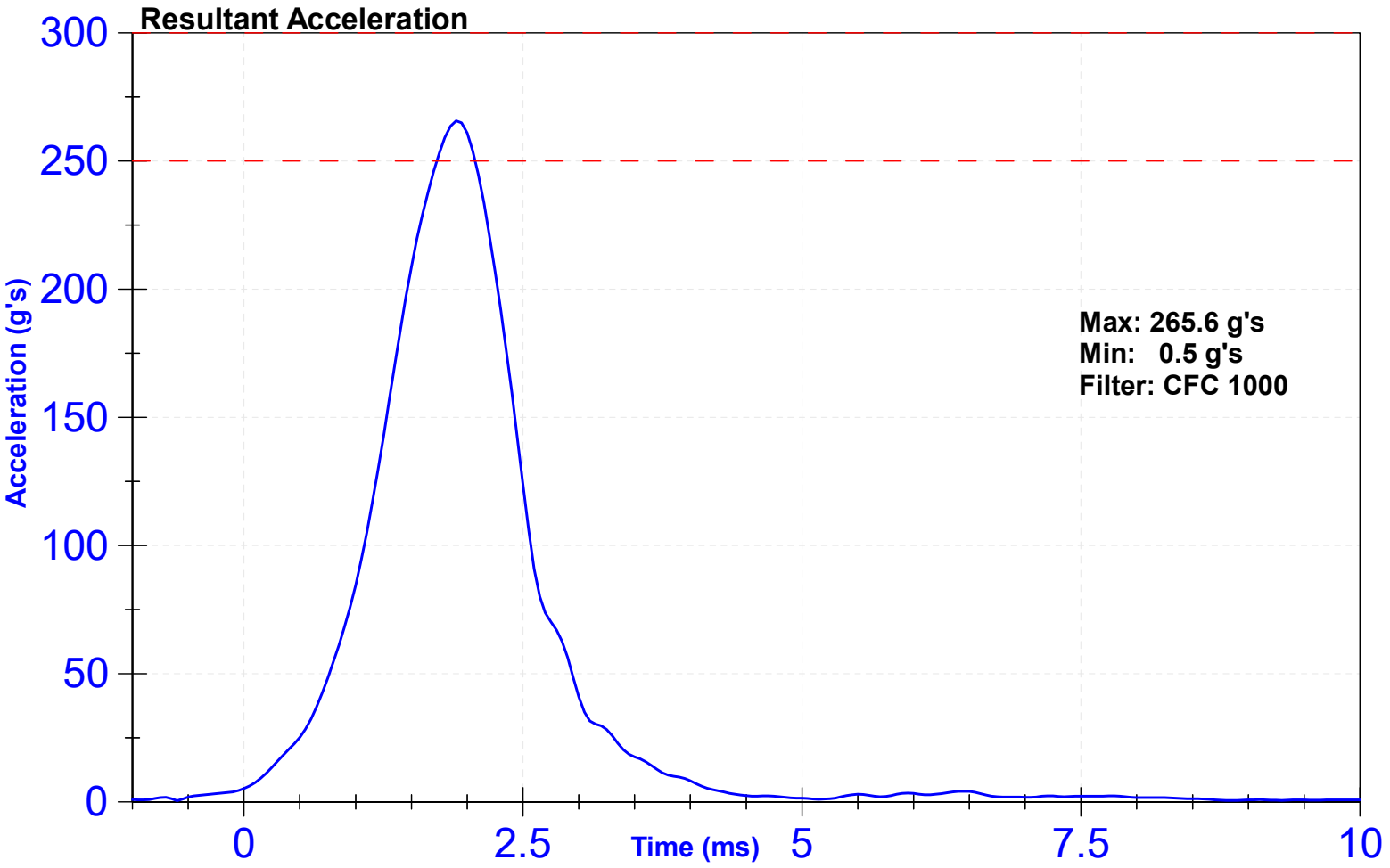
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

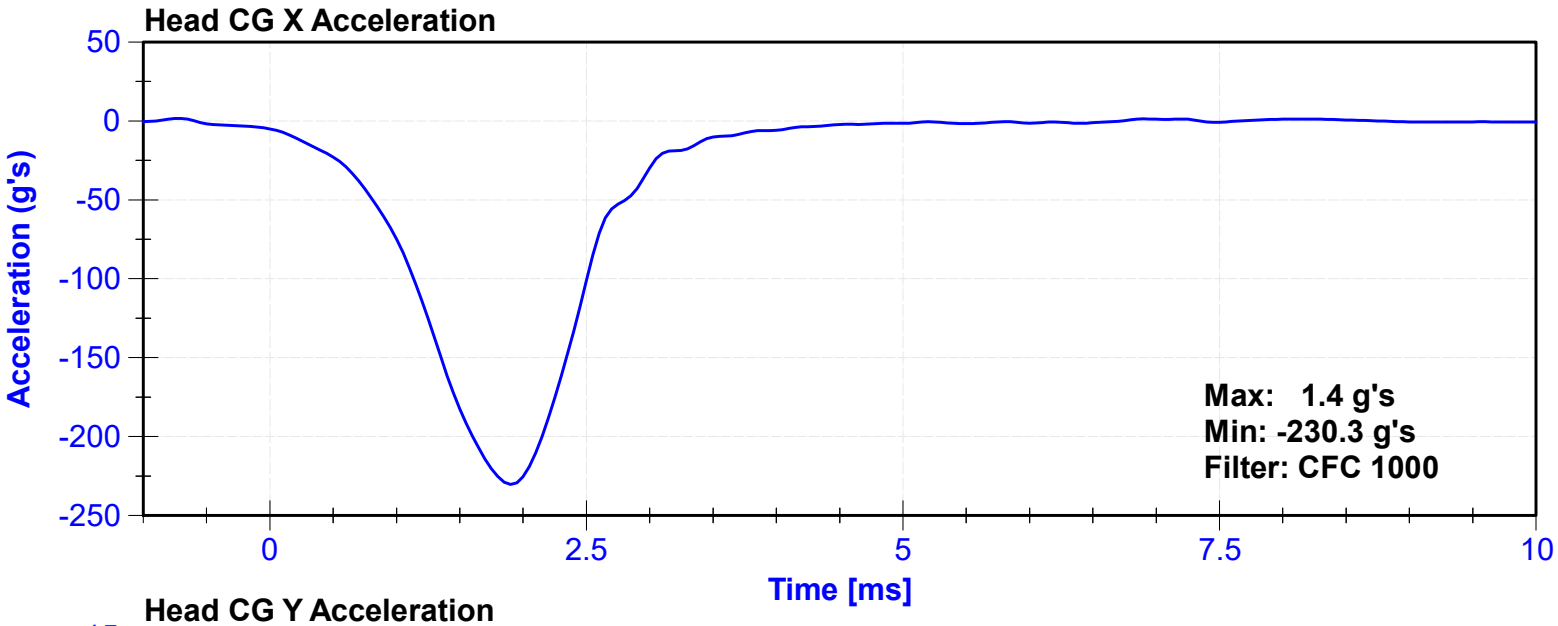
Results

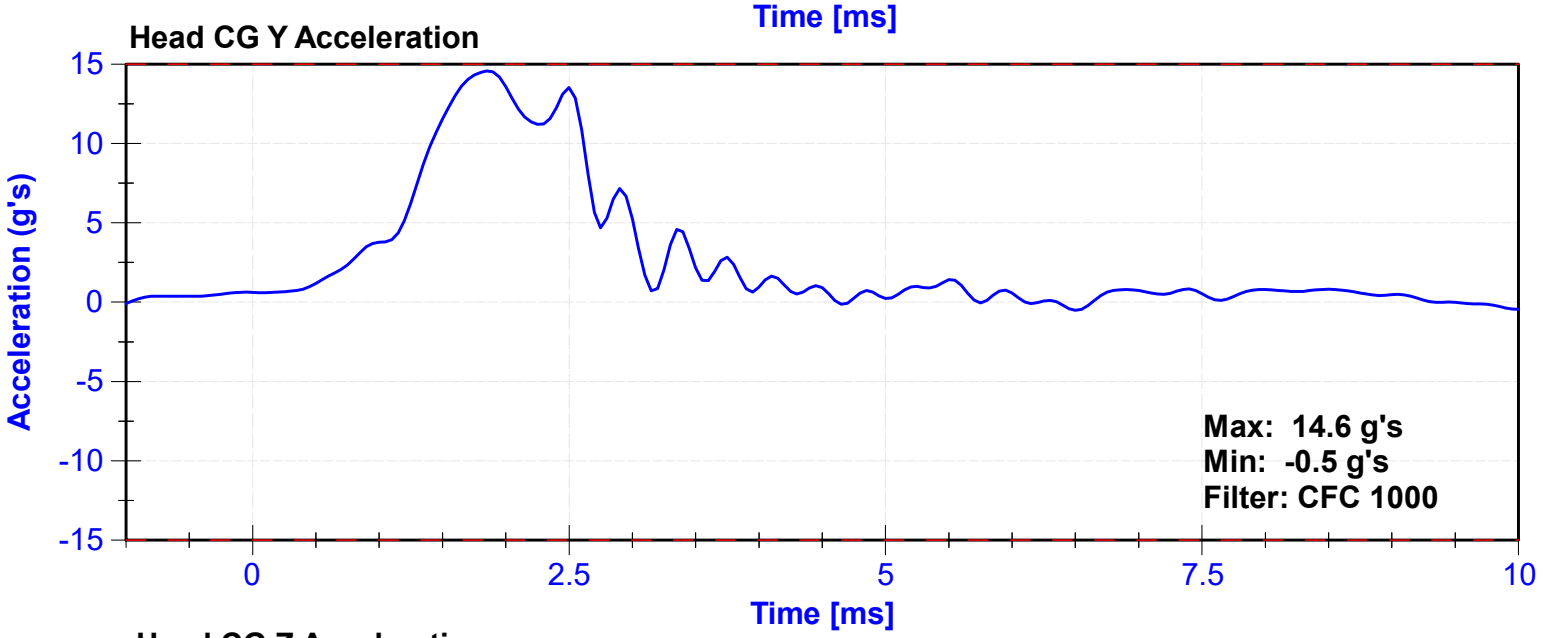
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.9	Pass
Humidity	10	70	%	64	Pass
Resultant Acceleration	250	300	g's	265.6	Pass
Oscillation	0	10	%	1.7	Pass
Lateral Acceleration	-15	15	g's	14.6	Pass

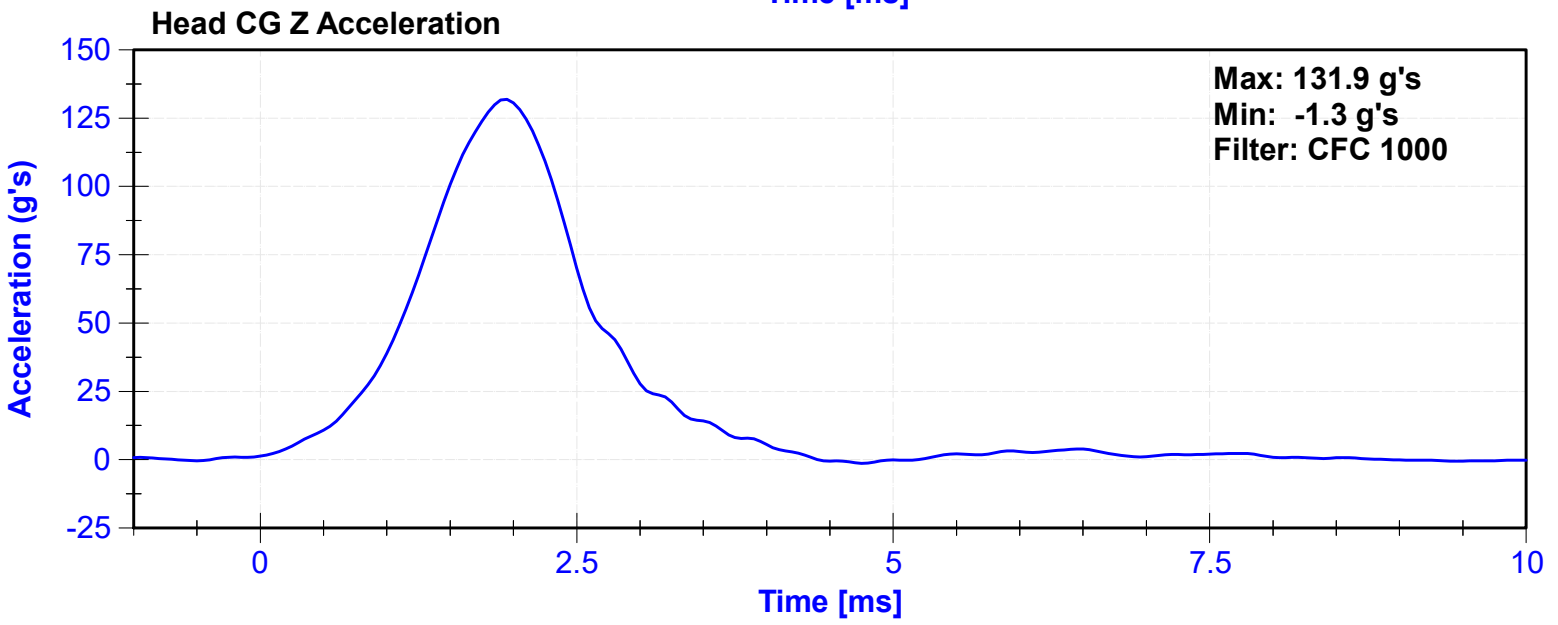
Transducer Calibrations

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




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 1.4 g's
Min: -230.3 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: 14.6 g's
Min: -0.5 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: 131.9 g's
Min: -1.3 g's
Filter: CFC 1000

ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

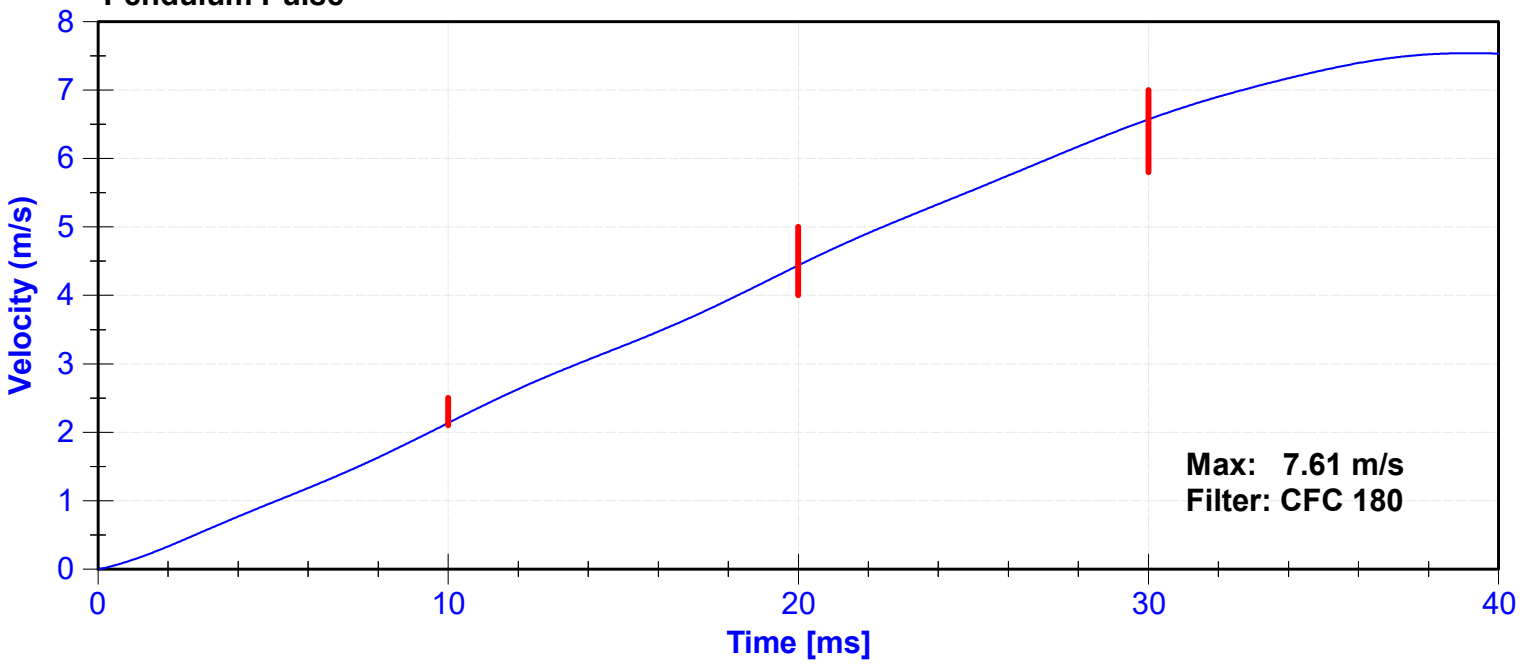
Results

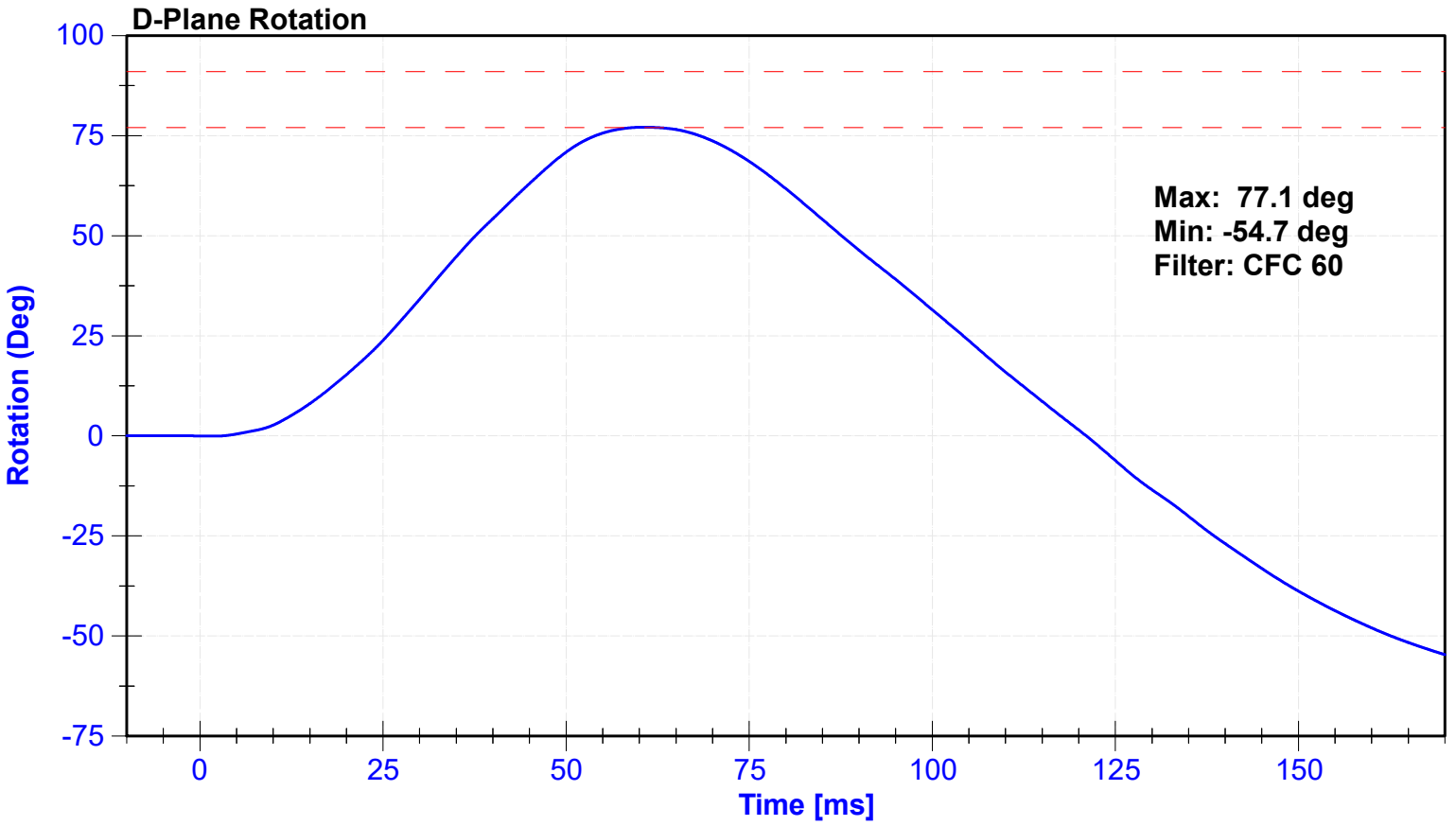
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21..	Pass
Humidity	10	70	%	64.4	Pass
Velocity	6.89	7.13	m/s	7.018	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.13	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.44	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.57	Pass
Max D Plane Rotation	77	91	deg	77.1	Pass
Max Moment During Rotation Interval	69	83	Nm	80.3	Pass
Moment Decay to 10.0 Nm	80	100	ms	88.6	Pass

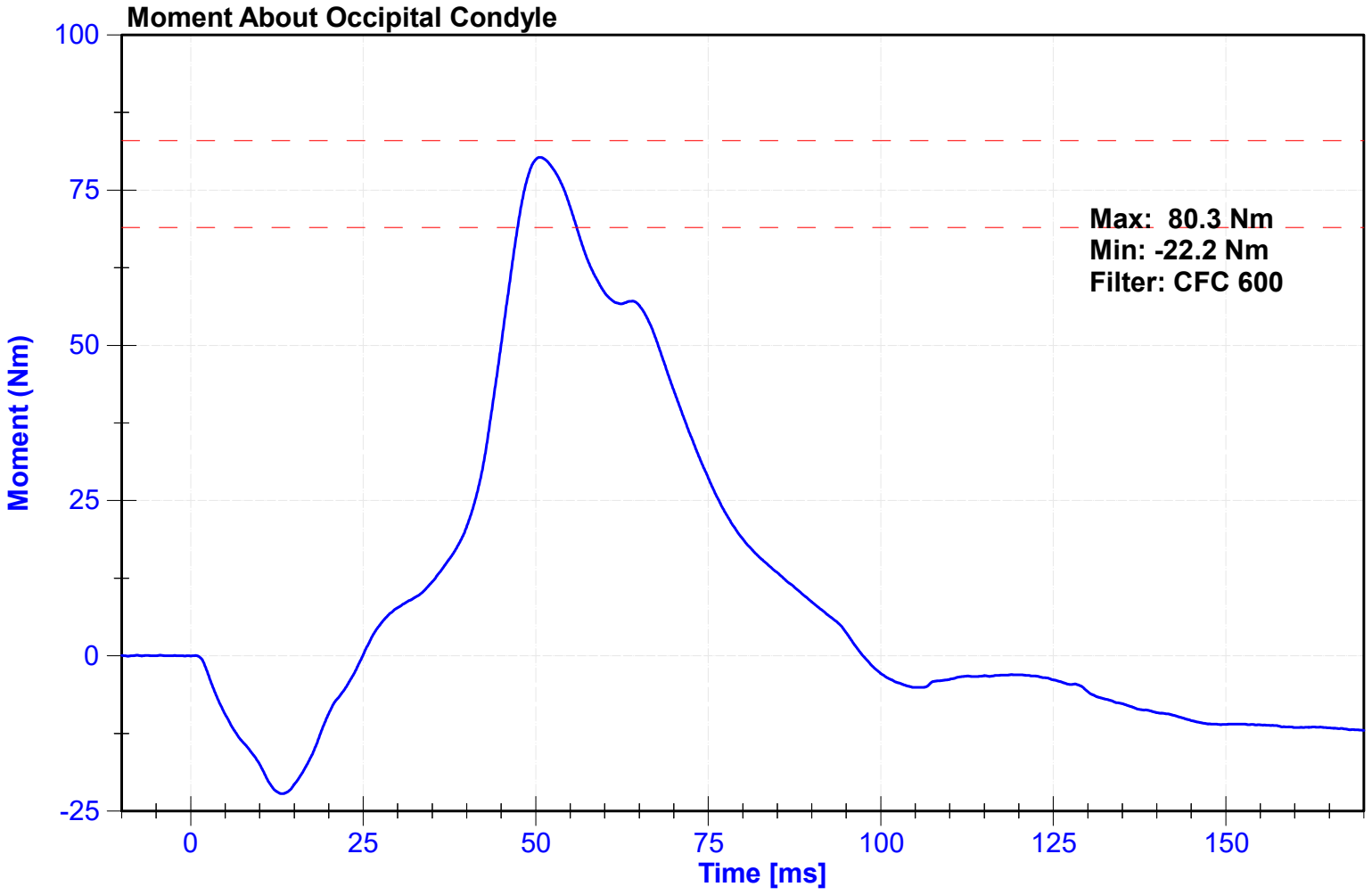
Transducer Calibrations

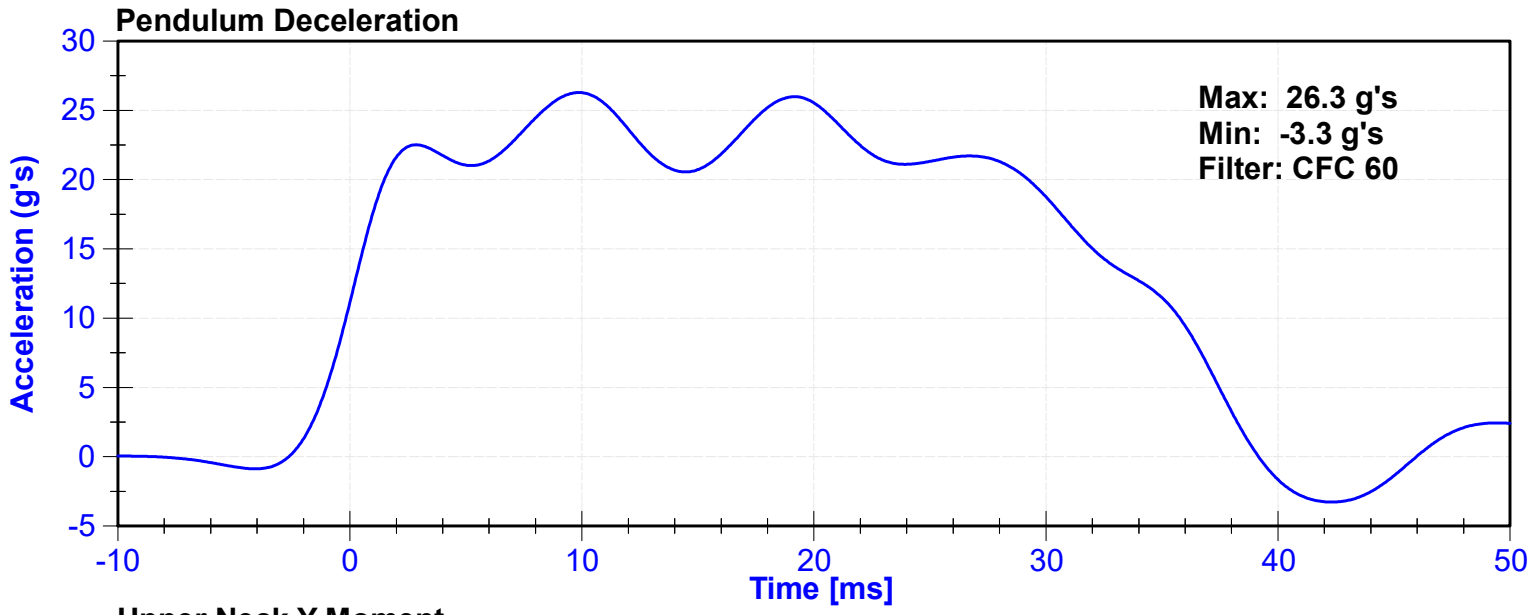
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	4/29/2024	10/26/2024
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025

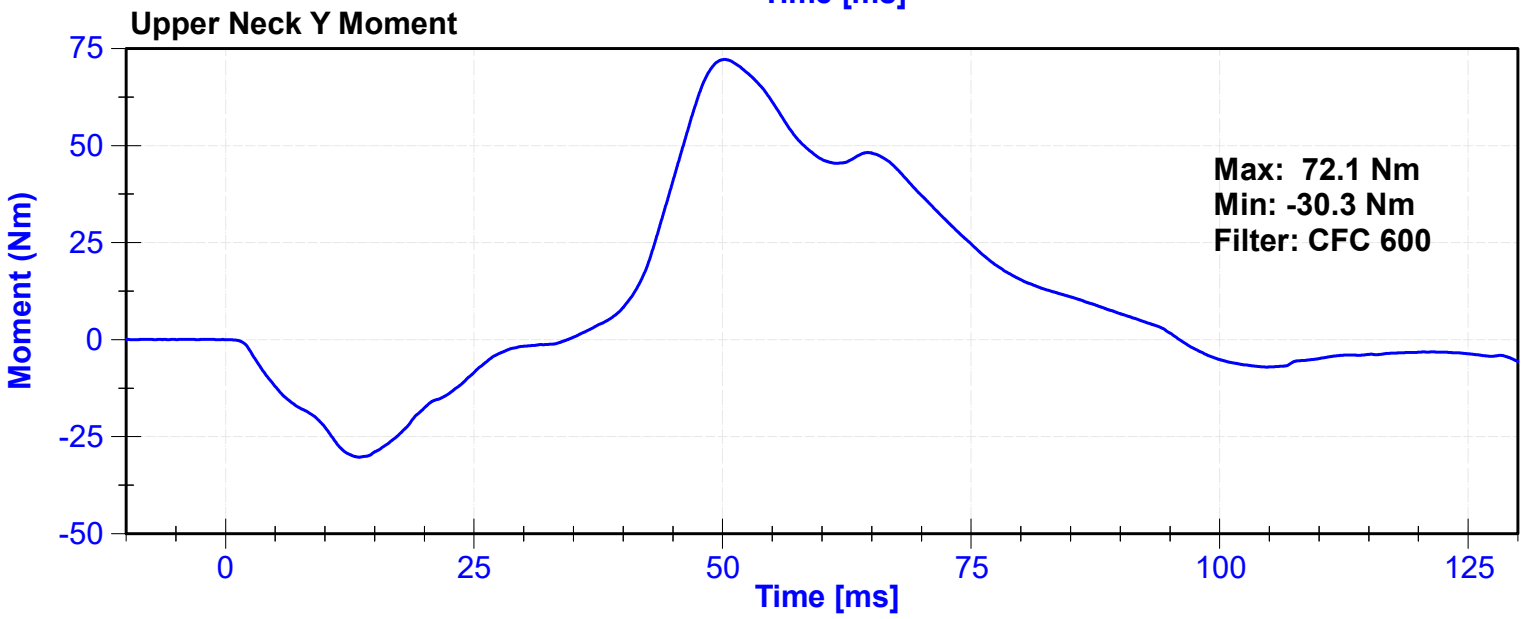
Pendulum Pulse

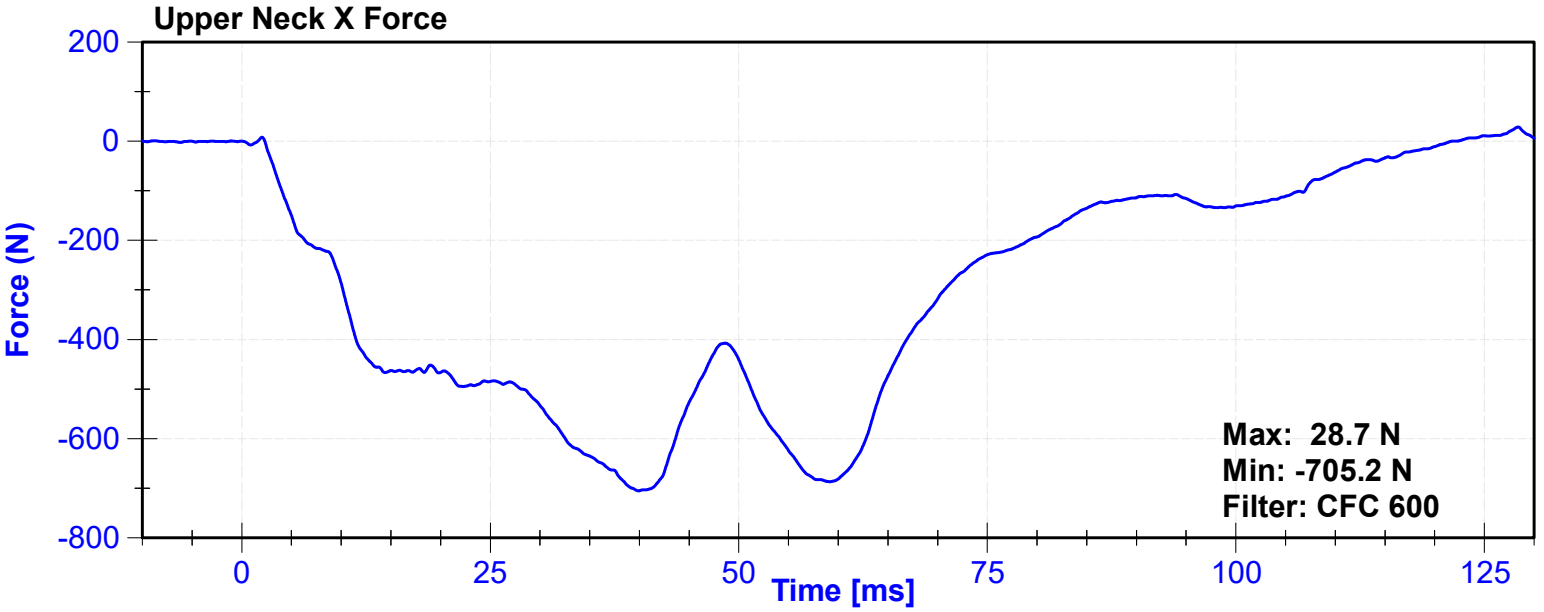



D-Plane Rotation
Max: 77.1 deg
Min: -54.7 deg
Filter: CFC 60
Rotation (Deg)
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 80.3 Nm
Min: -22.2 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: 26.3 g's
Min: -3.3 g's
Filter: CFC 60


Upper Neck Y Moment
Moment (Nm)
Time [ms]
Max: 72.1 Nm
Min: -30.3 Nm
Filter: CFC 600


Upper Neck X Force
Force (N)
Time [ms]
Max: 28.7 N
Min: -705.2 N
Filter: CFC 600

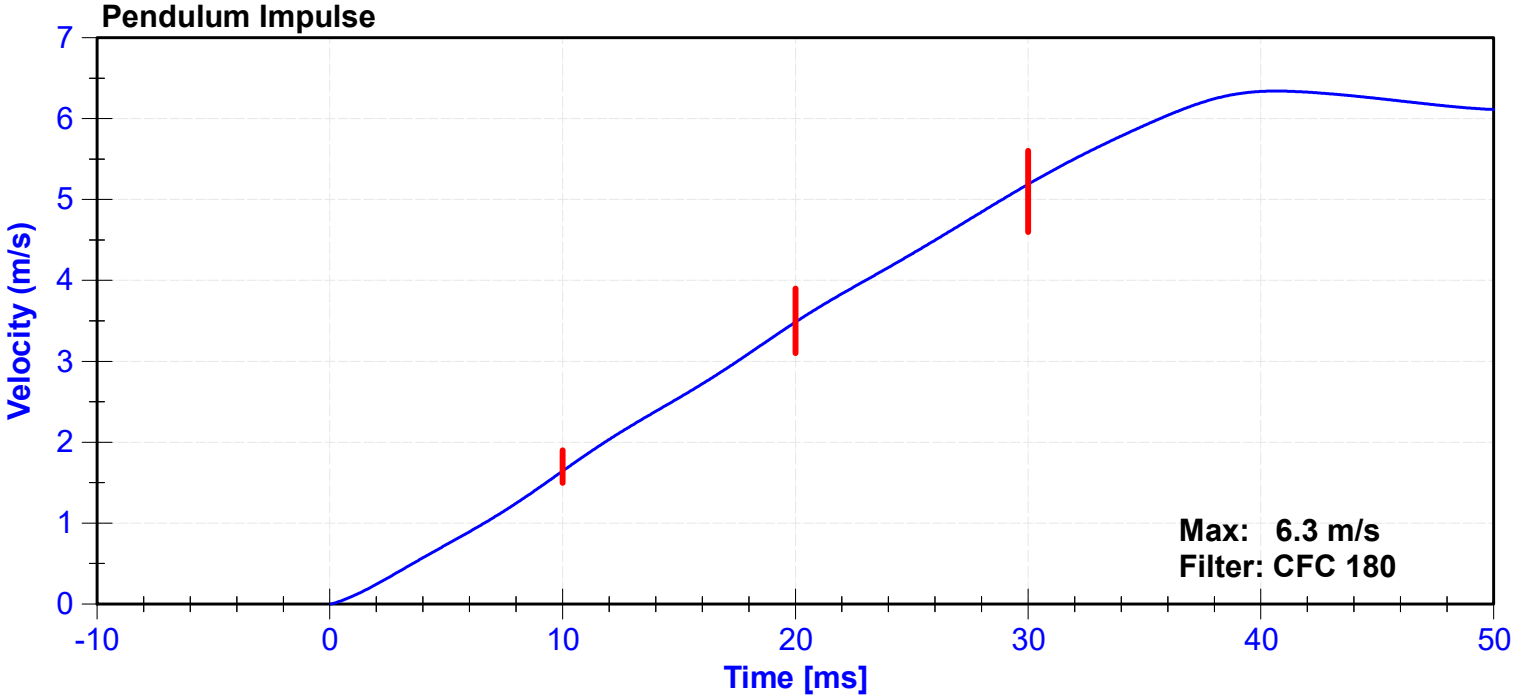
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

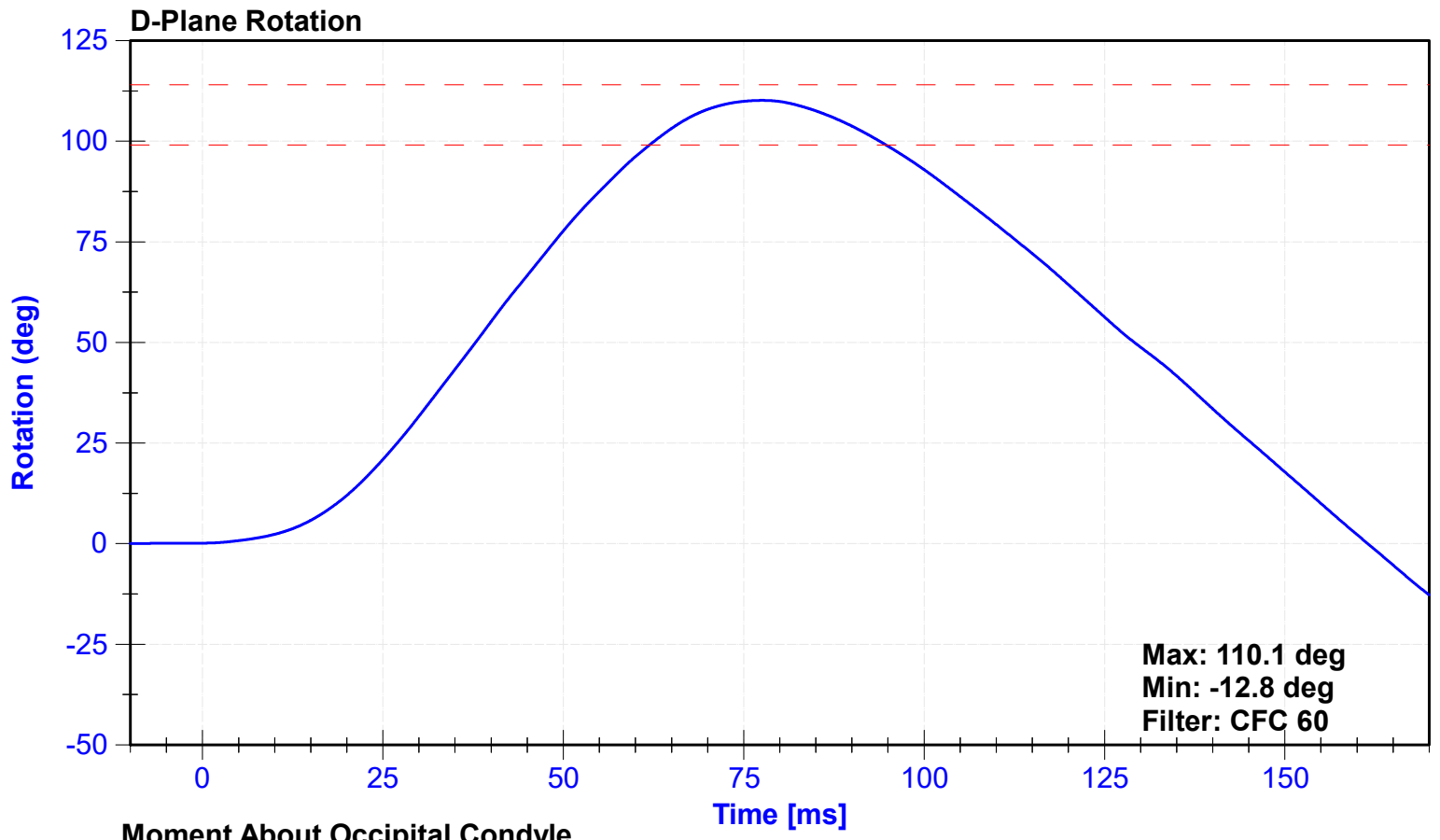
Results

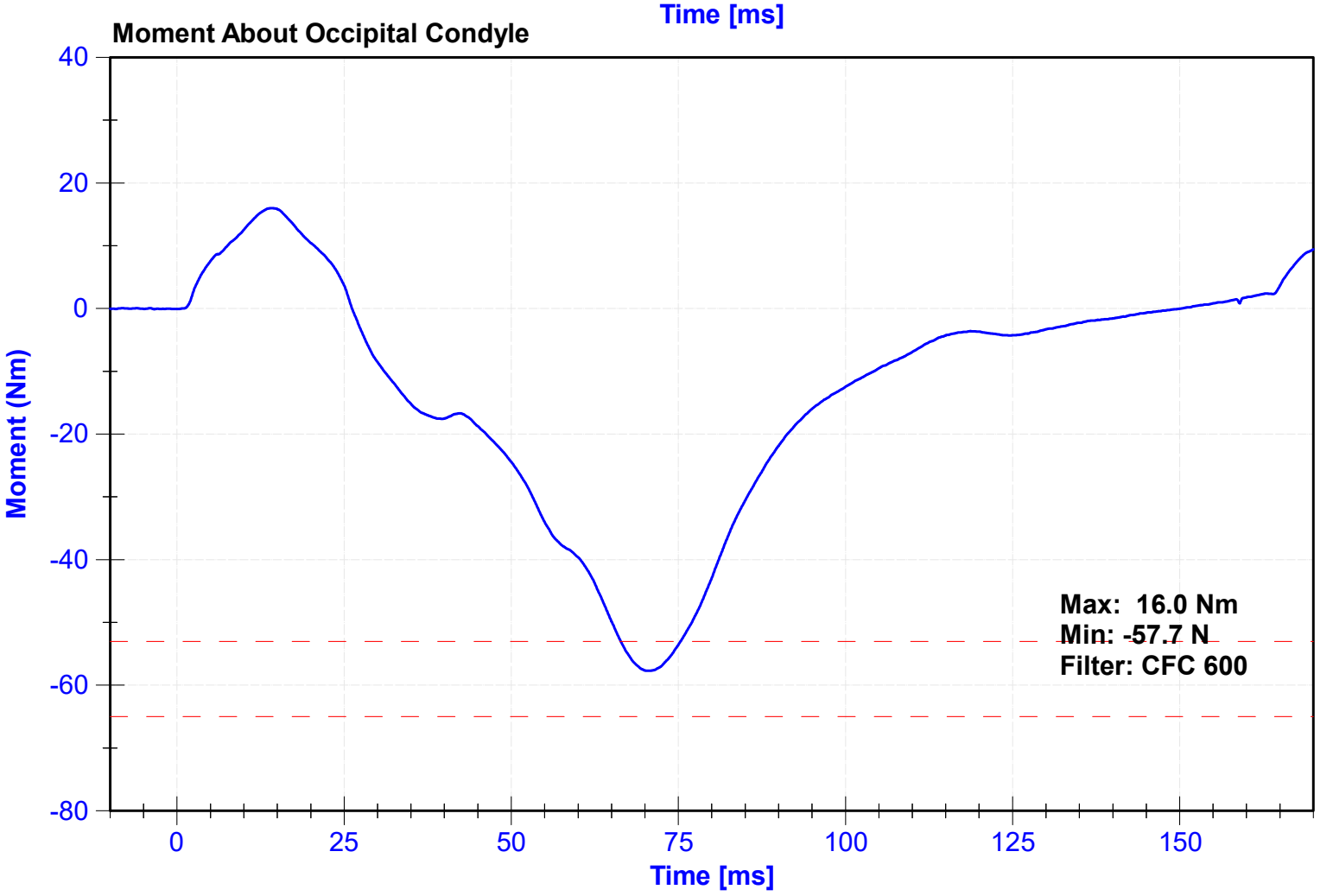
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21..	Pass
Humidity	10	70	%	64.4	Pass
Velocity	5.95	6.19	m/s	5.991	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.64	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.48	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.19	Pass
D Plane Rotation	99	114	deg	110.1	Pass
Moment During Rotation Interval	-65	-53	Nm	-57.7	Pass
Moment Decay to -10Nm	94	114	ms	104.3	Pass

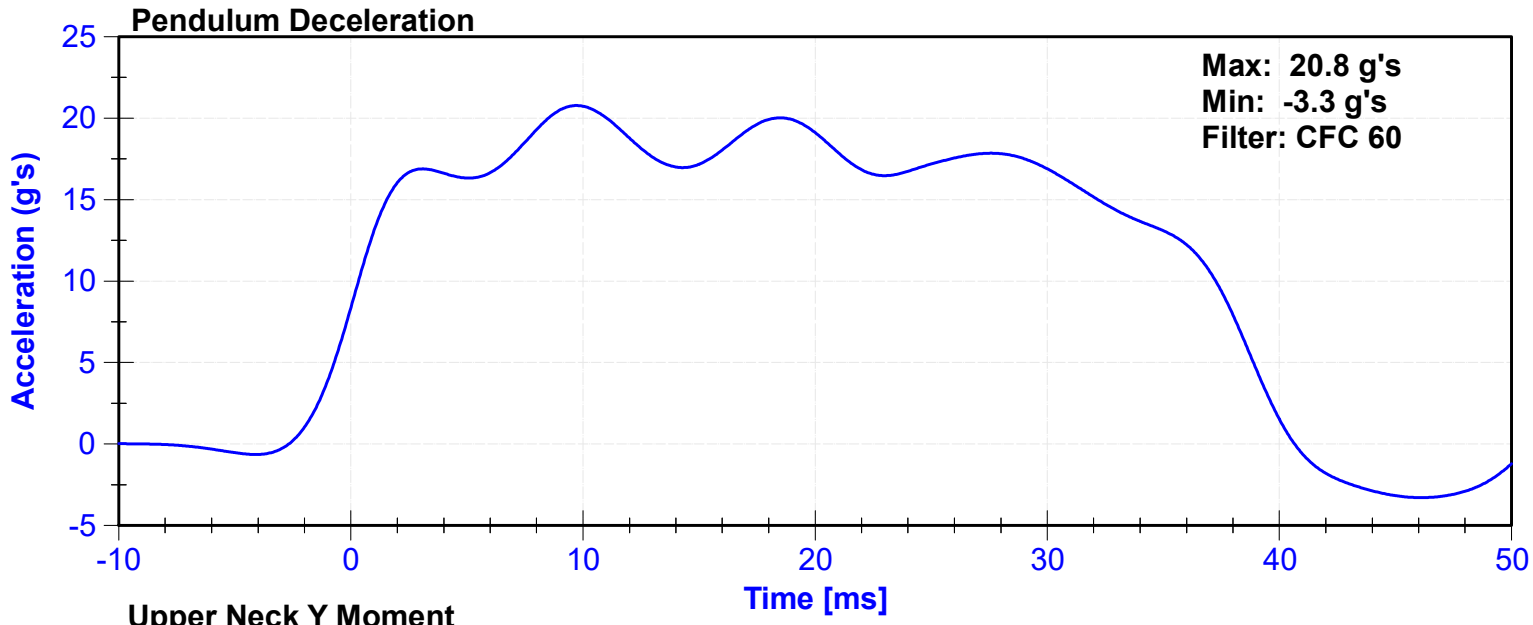
Transducer Calibrations

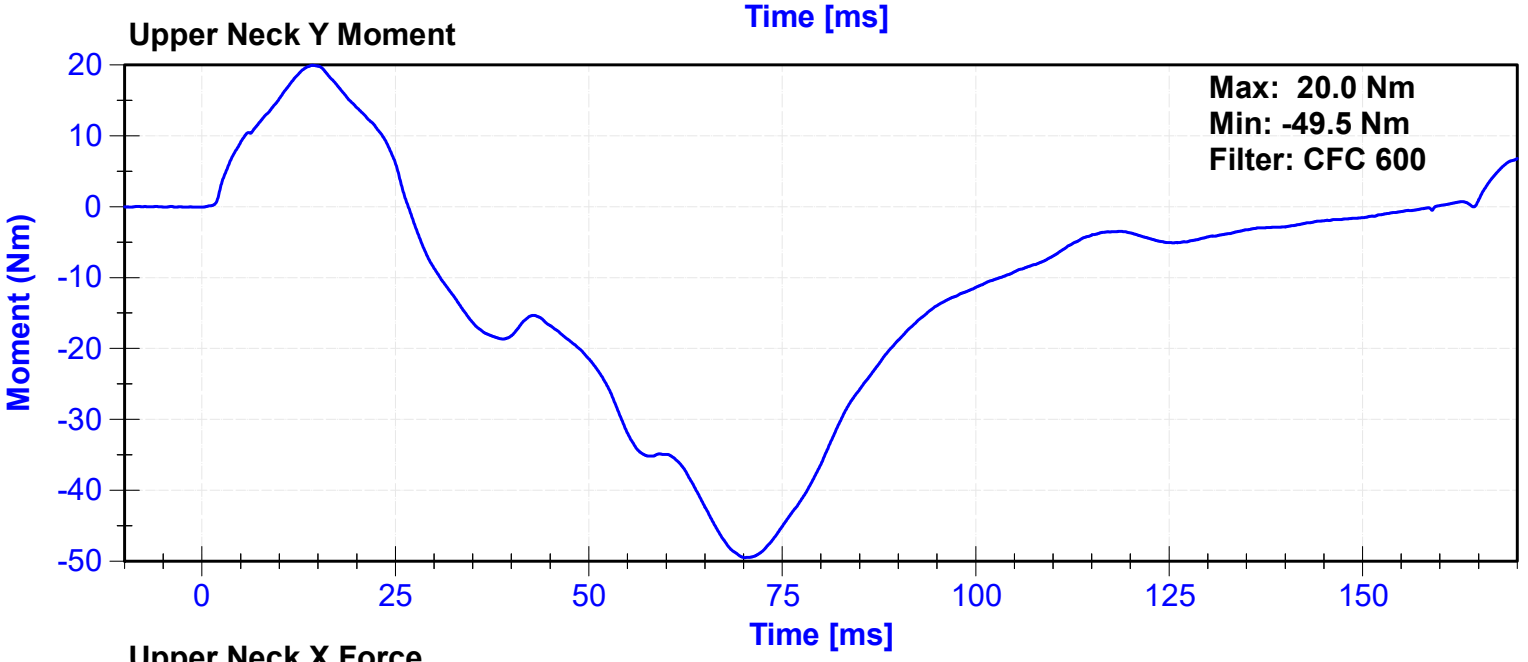
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	4/29/2024	10/26/2024
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025

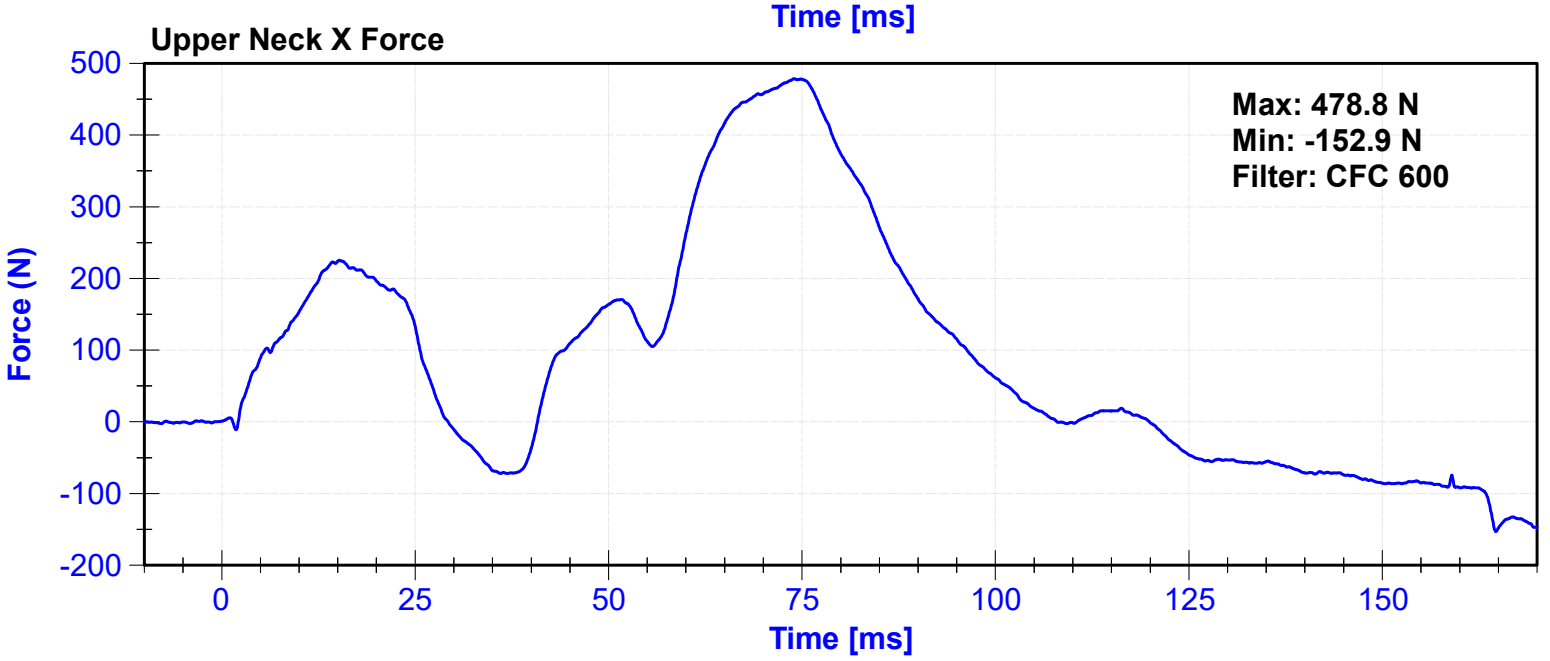



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 110.1 deg
Min: -12.8 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
40
20
0
-20
-40
-60
-80
0
25
50
75
100
125
150
Time [ms]
Max: 16.0 Nm
Min: -57.7 N
Filter: CFC 600


Pendulum Deceleration
Max: 20.8 g's
Min: -3.3 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: 20.0 Nm
Min: -49.5 Nm
Filter: CFC 600
Moment (Nm)
20
10
0
-10
-20
-30
-40
-50
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 478.8 N
Min: -152.9 N
Filter: CFC 600
Force (N)
500
400
300
200
100
0
-100
-200
0
25
50
75
100
125
150
Time [ms]

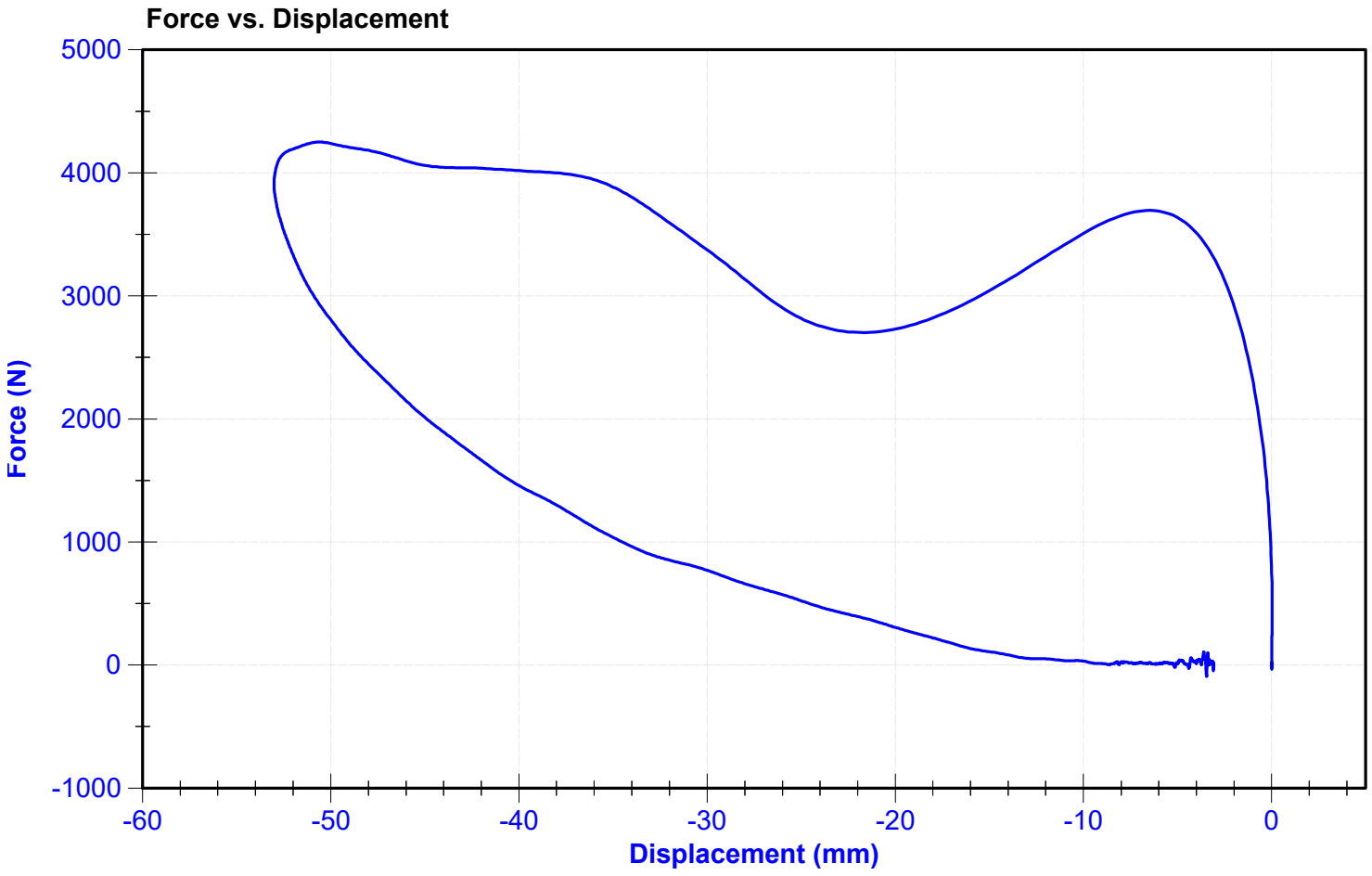
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	C. Mantel

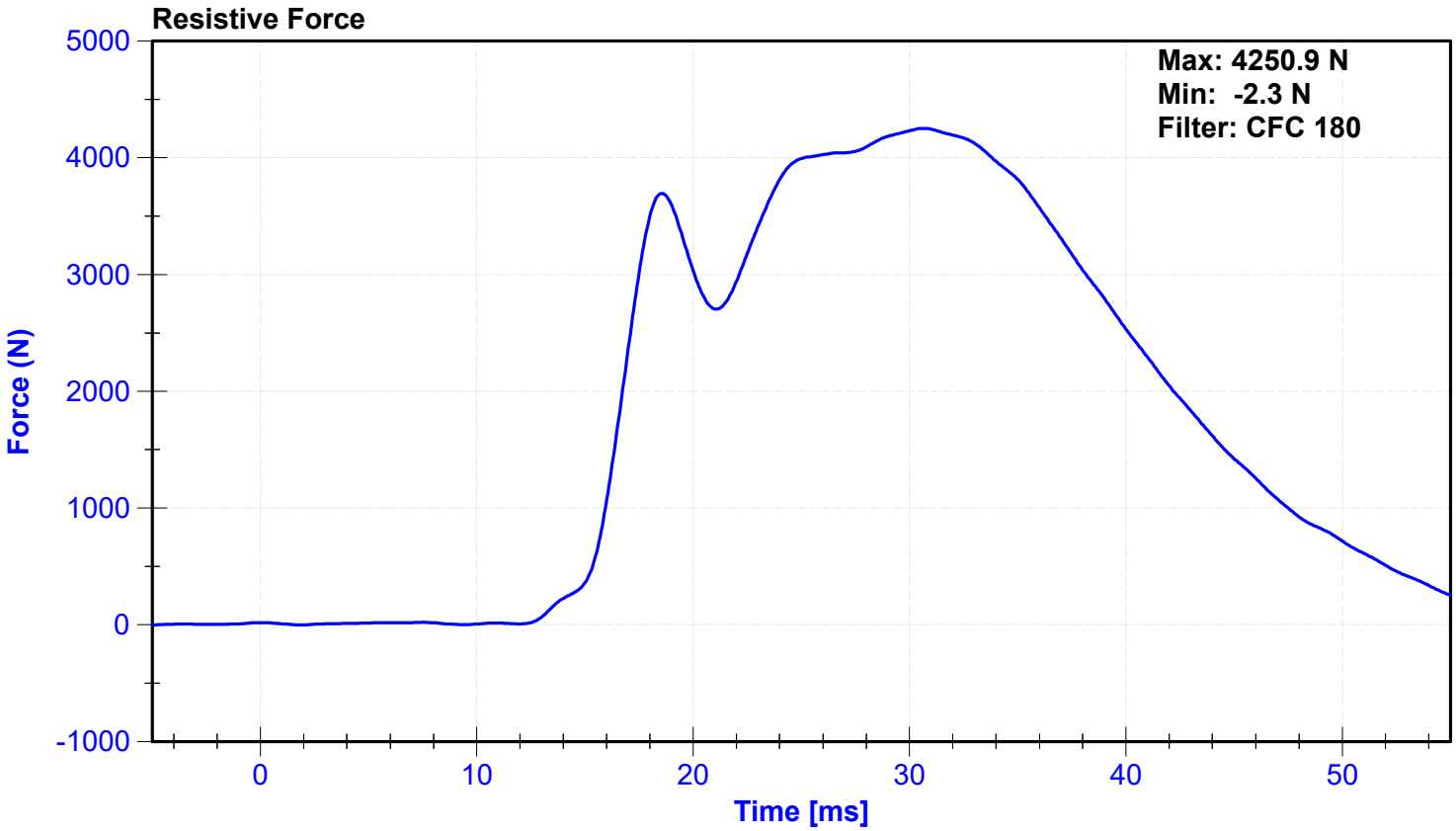
Results

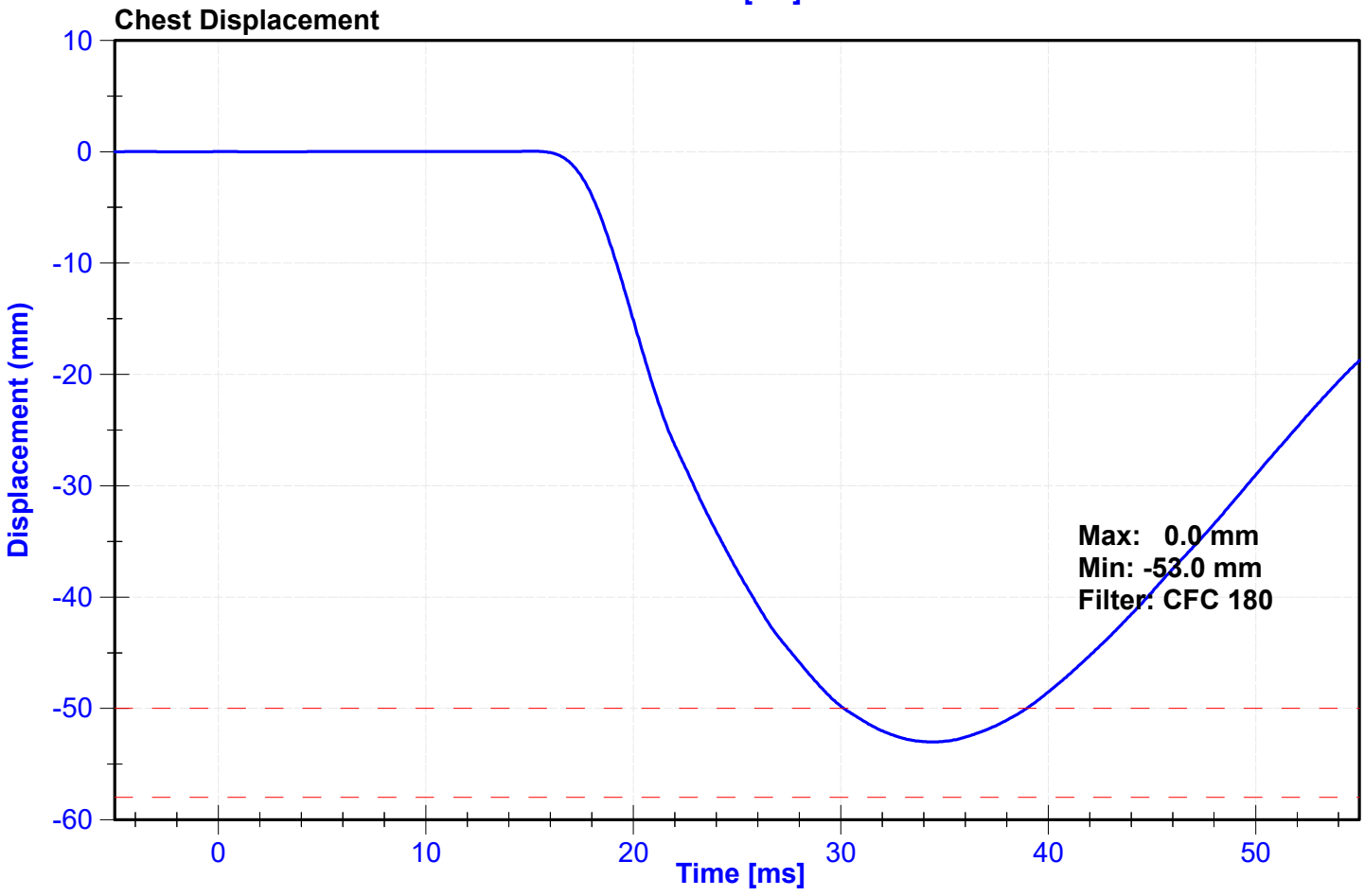
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	47	Pass
Velocity	6.59	6.83	m/s	6.645	Pass
Chest Deflection	-58	-50	mm	-53.0	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4250.9	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4236.1	Pass
Hysteresis	69	85	%	74.2	Pass

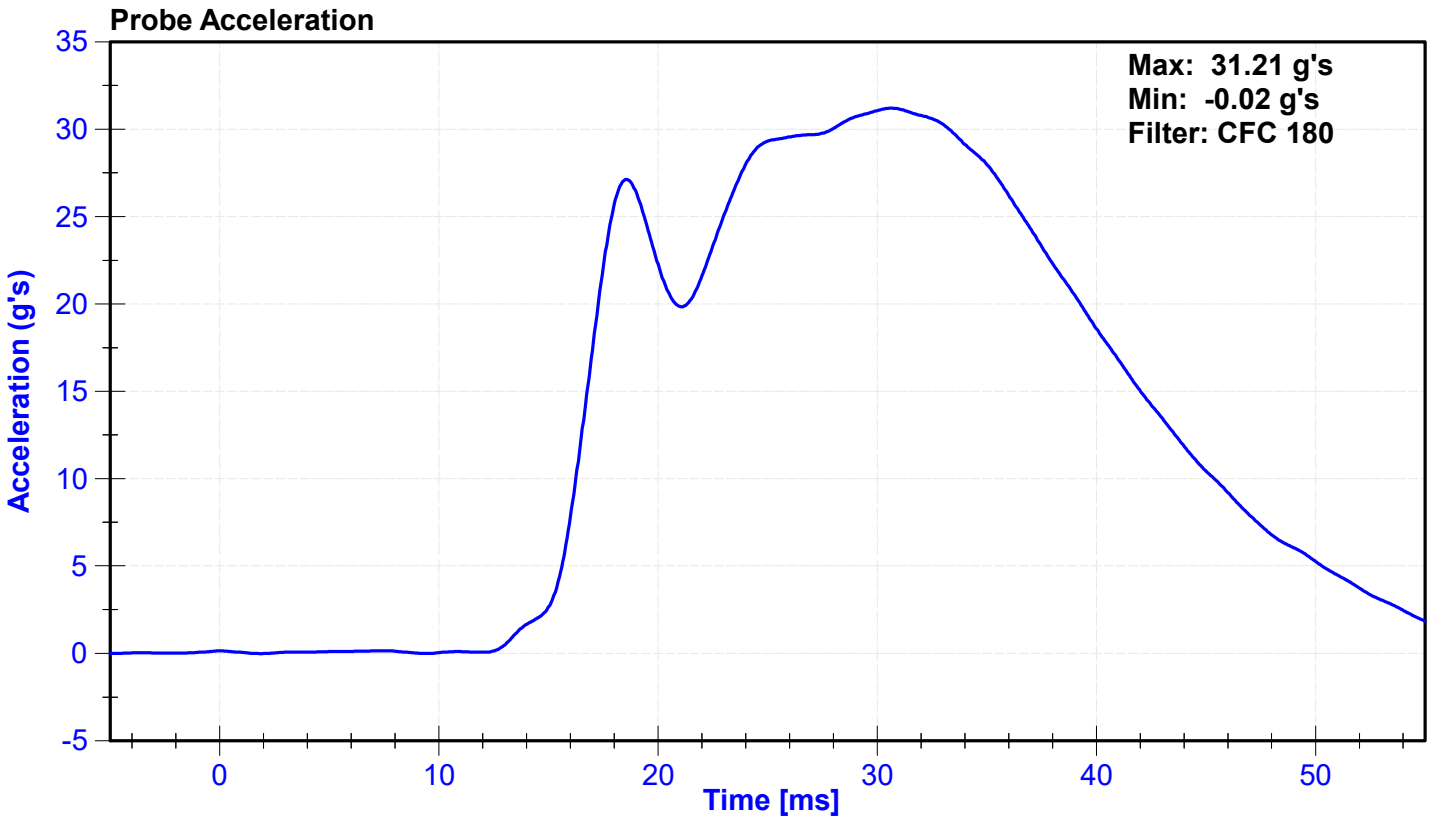
Transducer Calibrations

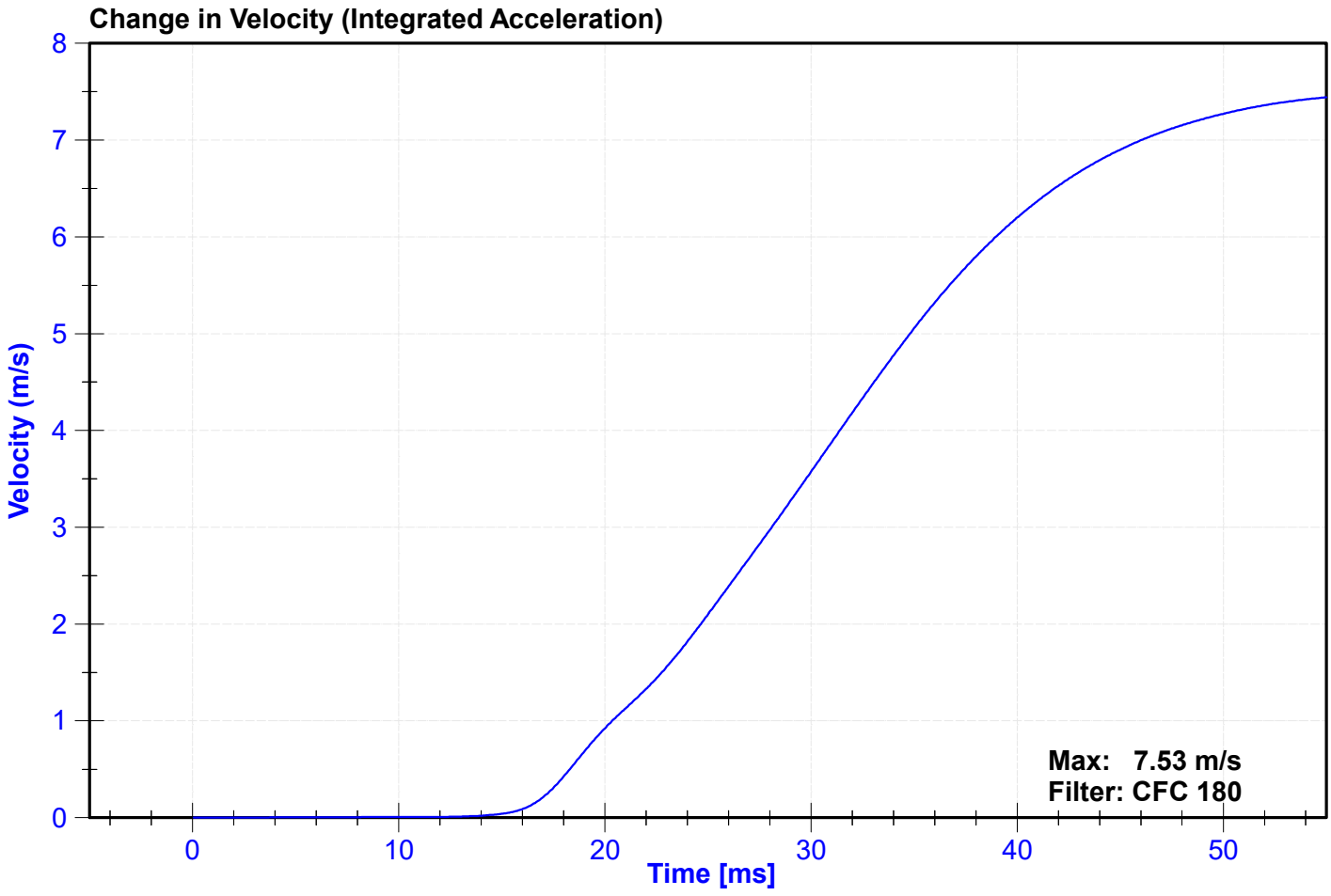
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Chest Potentiometer	Servo	0720	8/19/2024	2/17/2025




Resistive Force
Max: 4250.9 N
Min: -2.3 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: -53.0 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: 31.21 g's
Min: -0.02 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: 7.53 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]

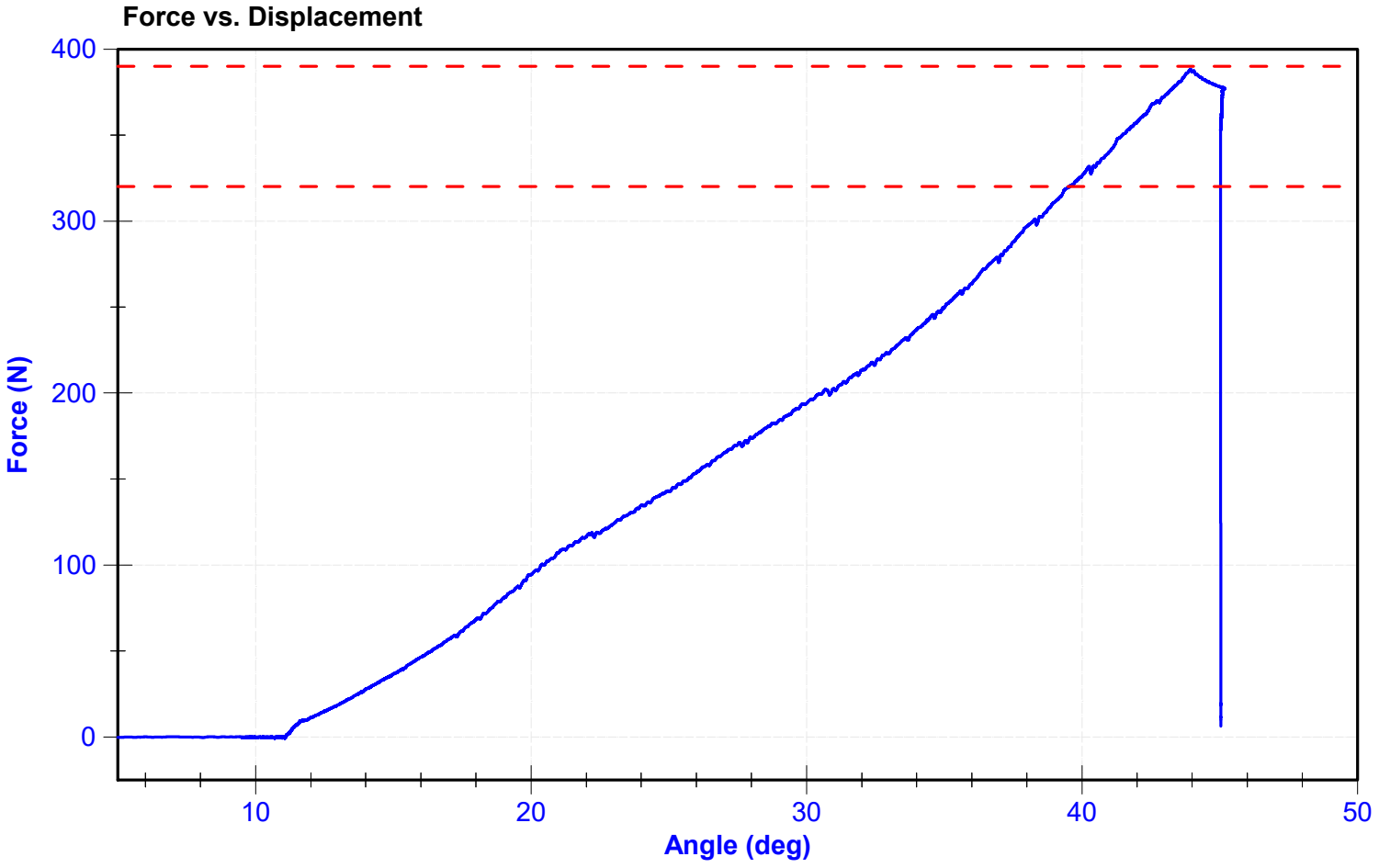
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	ºC	20.9	Pass
Humidity	10	70	%	42	Pass
Initial Angle	0	20	deg	10.3	Pass
Force at 45 Degrees	320	390	N	388.3	Pass
Return Angle Relative to Initial	0	8	deg	6.0	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



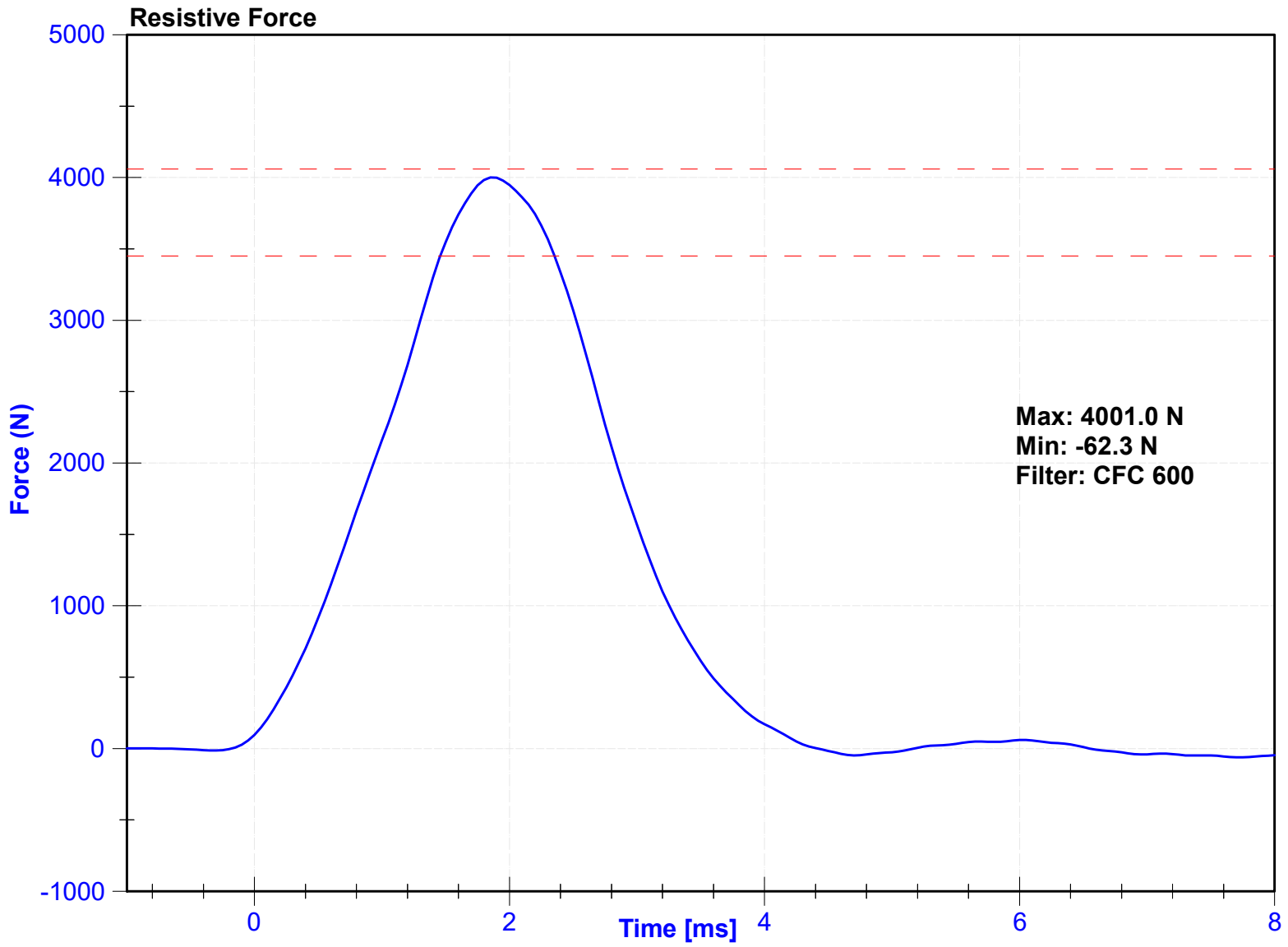
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	143	Laboratory Supervisor	C. Mantell

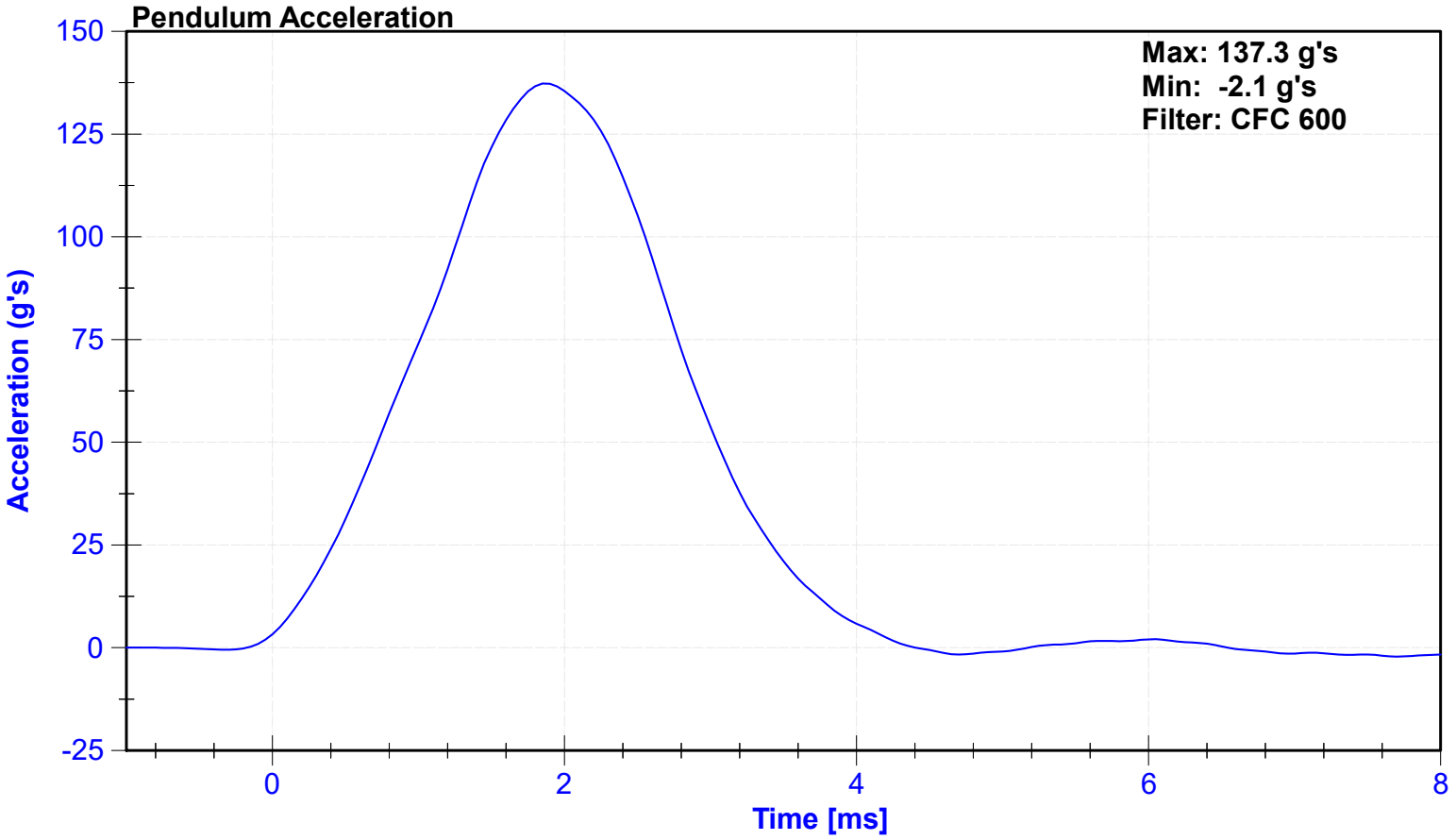
Results

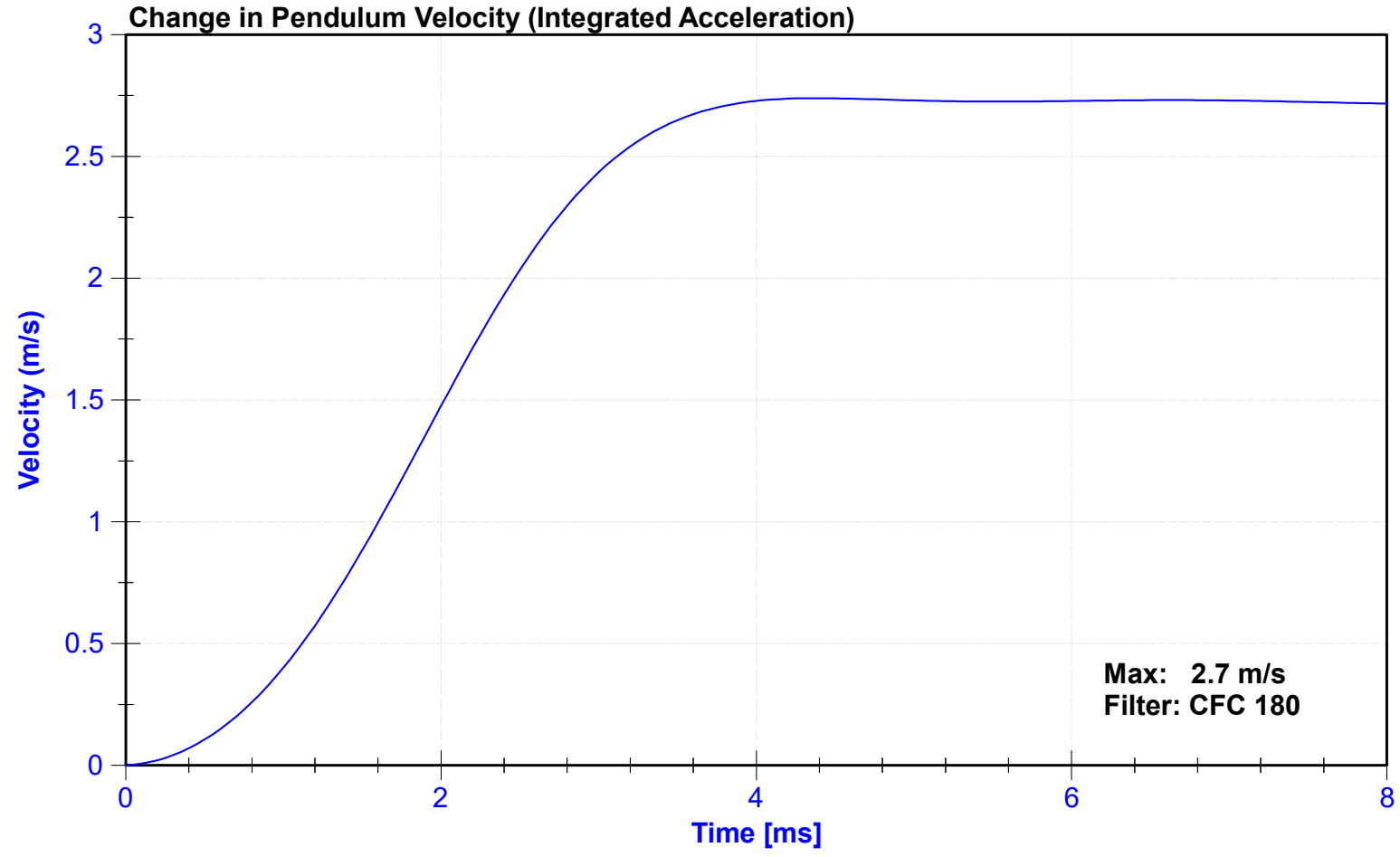
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.5	Pass
Humidity	10	70	%	61	Pass
Velocity	2.07	2.13	m/s	2.099	Pass
Resistive Force	3450	4060	N	4001.0	Pass

Transducer Calibrations

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




Pendulum Acceleration
Max: 137.3 g's
Min: -2.1 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

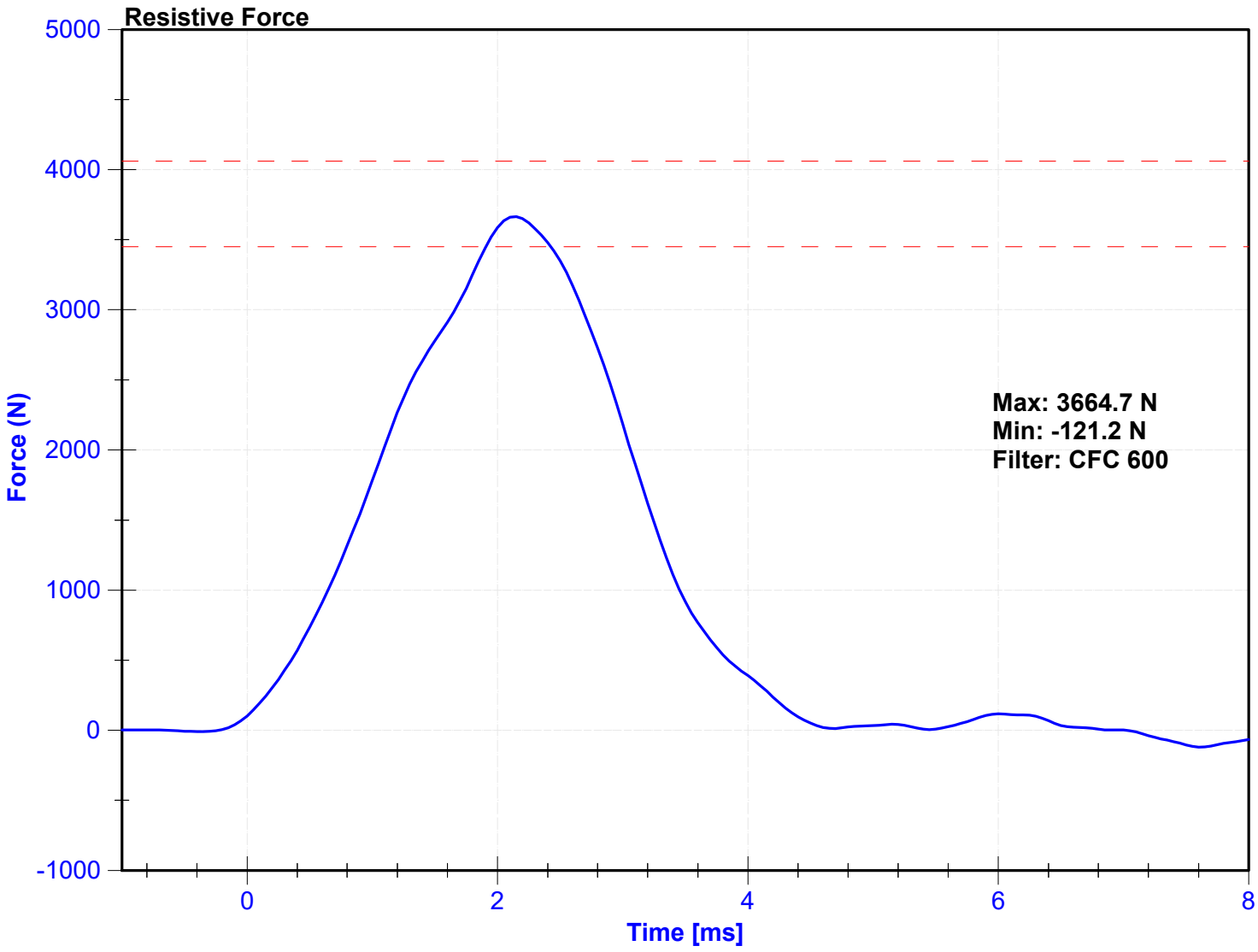
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	143	Laboratory Supervisor	C. Mantell

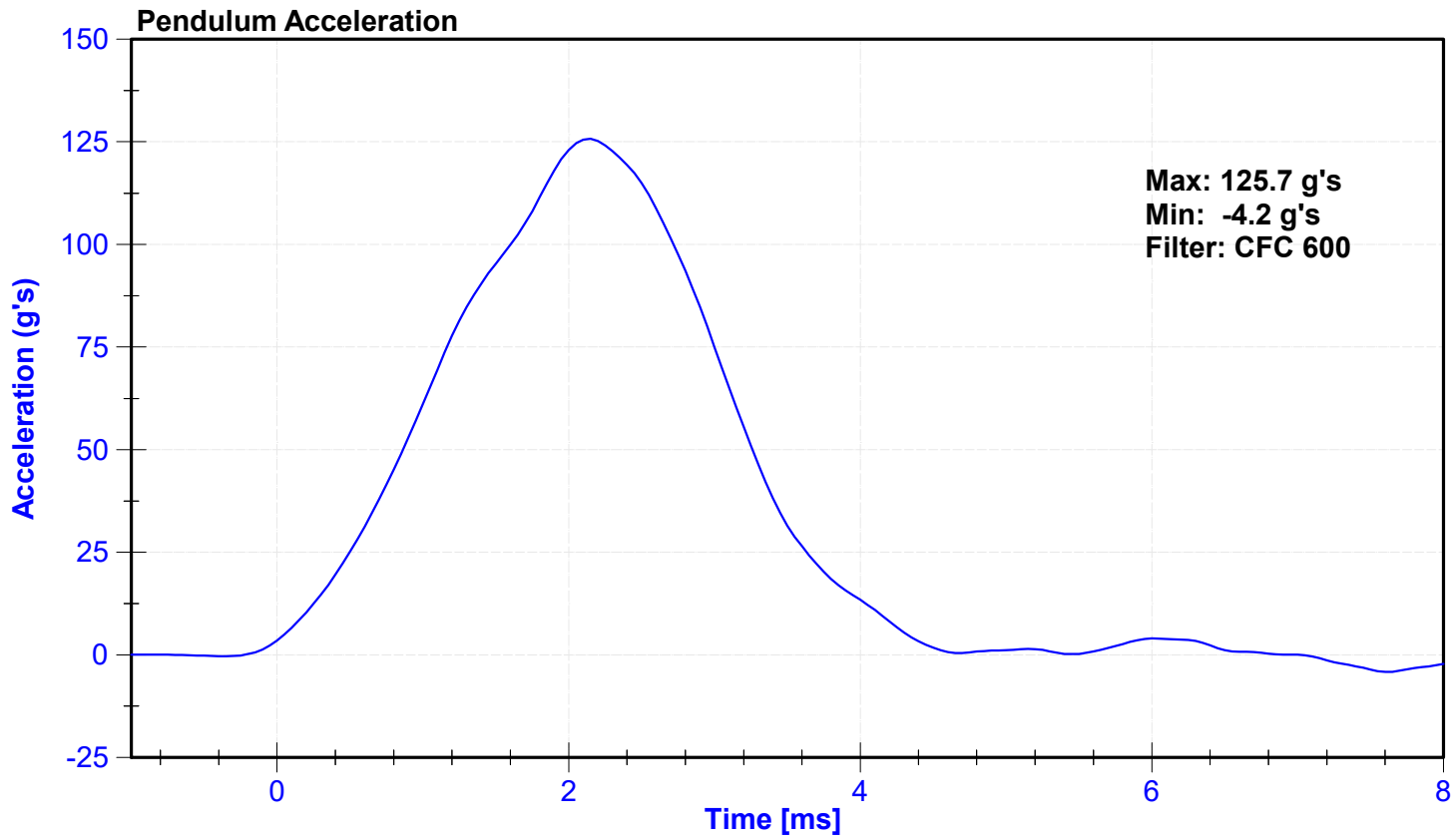
Results

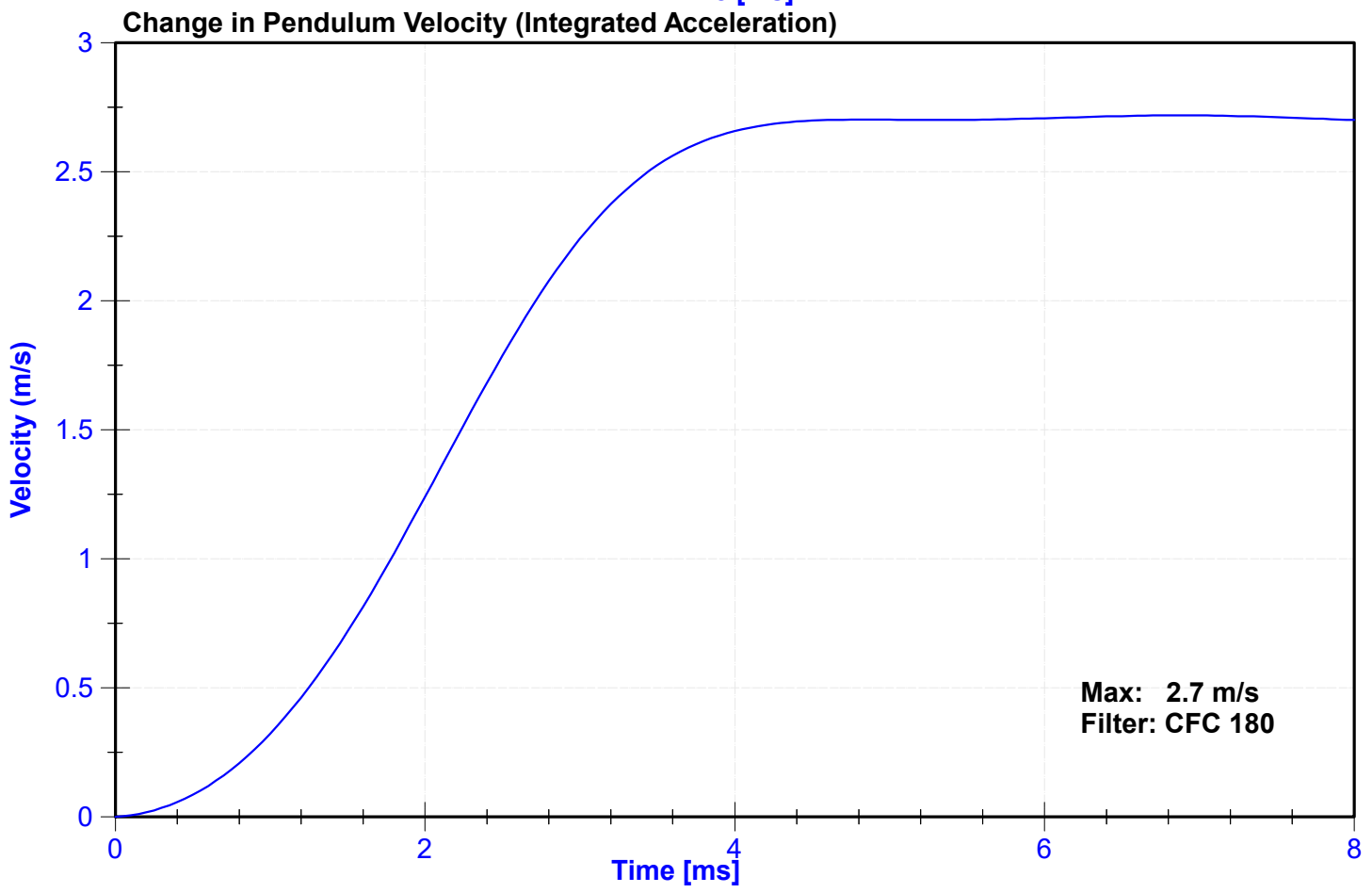
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.8	Pass
Humidity	10	70	%	41	Pass
Velocity	2.07	2.13	m/s	2.093	Pass
Resistive Force	3450	4060	N	3664.7	Pass

Transducer Calibrations

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




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 125.7 g's
Min: -4.2 g's
Filter: CFC 600


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

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	P52152	Endevco	04/30/2024
		Y	P58888	Endevco	04/30/2024
		Z	P58911	Endevco	04/30/2024
	Redundant	X	P52012	Endevco	05/17/2024
		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	851-FX	Humanetics	05/22/2024
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	117-FZ1	Denton	05/22/2024
	Redundant	Z	117-FZ2	Denton	05/22/2024
Femur Load Cells - Right	Primary	Z	109-FZ1	Denton	05/22/2024
	Redundant	Z	109-FZ2	Denton	05/22/2024
Tibia Load Cells - Left	Upper	MX, MY, FZ	652-FZ	Denton	05/20/2024
	Lower	MX, MY, FZ	360-FZ	Denton	05/20/2024
Tibia Load Cells – Right	Upper	MX, MY, FZ	371-FZ	Denton	05/20/2024
	Lower	MX, MY, FZ	360-FZ	Denton	05/20/2024
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		295	GFE	02/08/2024
	Shoulder		292	GFE	02/08/2024

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	08/19/2024
		Y	P83335	Endevco	08/19/2024
		Z	P64149	Endevco	08/19/2024
	Redundant	X	P52008	Endevco	08/19/2024
		Y	P52045	Endevco	08/19/2024
		Z	P74774	Endevco	08/19/2024
Head Angular Rate Sensors		X	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	2184-FX	Denton	07/10/2024
Chest Accelerometers	Primary	X	P58780	Endevco	08/19/2024
		Y	P83346	Endevco	08/19/2024
		Z	P49190	Endevco	08/19/2024
	Redundant	X	P58794	Endevco	08/19/2024
		Y	P69791	Endevco	08/19/2024
		Z	T11253	Endevco	08/19/2024
Chest Potentiometer		X	0720	Servo	08/19/2024
Pelvis Accelerometer		X	P58735	Endevco	08/19/2024
		Y	P77587	Endevco	08/19/2024
		Z	P51285	Endevco	08/19/2024
Femur Load Cells - Left	Primary	Z	DT0998-FZ1	Denton	05/22/2024
	Redundant	Z	DT0998-FZ2	Denton	05/22/2024
Femur Load Cells - Right	Primary	Z	DH3271-FZ1	Denton	05/22/2024
	Redundant	Z	DH3271-FZ2	Denton	05/22/2024
Tibia Load Cells - Left	Upper	MX, MY, FZ	476-FZ	Denton	05/20/2024
	Lower	MX, MY, FZ	363-FZ	Denton	05/20/2024
Tibia Load Cells – Right	Upper	MX, MY, FZ	361-FZ	Denton	05/20/2024
	Lower	MX, MY, FZ	359-FZ	Denton	05/20/2024
Foot Accelerometers - Left	Rear	X	P78959	Endevco	08/19/2024
	Front	Z	P83418	Endevco	08/19/2024
Foot Accelerometers - Right	Rear	X	P63998	Endevco	08/19/2024
	Front	Z	P80265	Endevco	08/19/2024
Seat belt Load Cells	Lap		NA	NA	
	Shoulder		168	Denton	06/21/2024

Table 3 – Vehicle Instrumentation

Instrumentation			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember/Rear Seat Accelerometers	Left	Primary	X	G22198	Endevco	04/09/2024
			Z	G22232	Endevco	04/09/2024
		Redundant	X	A315727	Measurement Specialties	05/21/2024
	Right	Primary	X	A281024	Measurement Specialties	07/18/2024
			Z	A372865	Measurement Specialties	07/18/2024
		Redundant	X	A374309	Measurement Specialties	07/18/2024
Engine Accelerometers	Top		X	A350972	Measurement Specialties	07/08/2024
	Bottom		X	G22803	Endevco	05/02/2024