REPORT NUMBER: NCAP-CAL-25-004

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

Toyota Motor Corporation
2025 Toyota Land Cruiser
5 Door SUV

NHTSA No: M20255107

PREPARED BY:
CALSPAN CORPORATION
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BUFFALO, NEW YORK 14225

April 23, 2025

FINAL REPORT

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

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number 693JJ919D000005.

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Date: April 23, 2025

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Date: April 23, 2025

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

B. ***Report No.*** NCAP-CAL-25-004	***2. Government Accession No.***	***3. Recipient's Catalog No.***
4. Title and Subtitle Final Report of New Car Assessment Program Frontal Impact Testing and FMVSS No. 305 Indicant Testing of a 2025 Toyota Land Cruiser 5 Door SUV NHTSA No.: M20255107		***5. Report Date*** April 23, 2025 ***6. Performing Organization Code*** CAL
7. Author(s) Matthew Pronko, Test Engineer Vanessa Hansen, Operations Manager		***8. Performing Organization Report No.*** CAL-DOT-2025-004
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225		***10. Work Unit No.*** ***11. Contract or Grant No.*** 693JJ919D000005
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards 1200 New Jersey Ave., SE Washington, D.C. 20590		***13. Type of Report and Period Covered:*** Final Test Report March 17, 2025 - April 23, 2025 ***14. Sponsoring Agency Code*** NRM-110
15. Supplementary Notes		

16. Abstract

A 56.30 km/h (35 mph), NCAP frontal rigid barrier impact test was conducted on a 2025 Toyota Land Cruiser 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 March 17, 2025.

The impact velocity of the vehicle was 56.68 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 604 mm at vehicle centerline. The test vehicle's occupant performance data is as follows:

Measurement Description	Units	Driver ATD (Serial No. 065)		Passenger ATD (Serial No. 137)	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC15)		700	205.437	700	238.431
Maximum Chest Compression	mm	63	30.709	52	18.743
Nij		1	0.387	1	0.385
Neck Tension	N	4170	2300.096	2620	1230.791
Neck Compression	N	4000	269.672	2520	371.675
Left Femur Force	N	10008	1748.752	6805	1843.393
Right Femur Force	N	10008	1456.910	6805	1795.620

17. Key Words 56.3 km/h (35 mph) Full Frontal Rigid Barrier Impact Test New Car Assessment Program (NCAP)	***18. Distribution Statement*** Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave, SE Washington, DC 20590

19. Security Class. (of this report)	***20. Security Class. (of this page)***	***21. No. of Pages***	***22. Price***
UNCLASSIFIED	UNCLASSIFIED	195	

Form DOT F1700.7 (8-69)

TABLE OF CONTENTS

Section		Page
1	Purpose and Summary of the Test	1-1
2	Occupant and Vehicle Information / Data Sheets	2-1

Data Sheet		Page
1	General Test and Vehicle Parameter Data	2-2
2	Seat Adjustment, Fuel System, and Steering Wheel Data	2-6
3	Dummy Longitudinal Clearance Dimensions	2-8
4	Dummy Lateral Clearance Dimensions	2-9
5	Seat Belt Positioning Data	2-10
6	High-Speed Camera Locations and Data	2-11
7	Vehicle Accelerometer Locations	2-13
8	Photographic Reference Target Locations	2-14
9	Load Cell Locations on Fixed Barrier	2-15
10	Test Vehicle Summary of Results	2-16
11	Post-Test Observations	2-17
12	Vehicle Profile Measurements	2-19
13	Accident Investigation Division Data	2-21
14	Vehicle Intrusion Measurements	2-22
15	Summary of FMVSS 212, 219 (Partial), and 301 Data	2-24
16	FMVSS 301 Static Rollover Results	2-26
17	Dummy/Vehicle Temperature Stabilization Chart	2-27
305-1	General Test and Vehicle Parameter Data for Indicant FMVSS No. 305 Testing	2-28
305-2	Pre-Impact Data for Indicant FMVSS No.305 Testing	2-29
305-3	Pre-Impact Electrical Isolation Measurements and Calculations for Indicant FMVSS No. 305 Testing	2-30
305-4	Post-Impact Data for Indicant FMVSS No. 305 Testing	2-31
305-5	Static Rollover Test Data for Indicant FMVSS No. 305 Testing	2-32

Appendix		Page
A	Photographs	A-1
B	Vehicle and Dummy Response Data Traces	B-1
C	Dummy Calibration and Performance Verification Data	C-1
D	Test Equipment and Instrumentation Calibration	D-1

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 2025 Toyota Land Cruiser 5 Door SUV at a velocity of 56.68 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on March 17, 2025. 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 loads cells were not installed on the driver's and passenger's lap and shoulder belts and dummy torso and pelvic section loading was not measured. The driver (position 1) ATD (Serial No. 065) and the right-front passenger (position 2) ATD (Serial No. 137) were qualified prior to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

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

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was a total of 0.0 grams of Stoddard solvent/electrolyte leakage after the event or during any phase of the static rollover. The maximum static crush of the vehicle was 604 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, curtain 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 knee airbag.

The occupant data is summarized below.

ATD Position	HIC_{15}	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50th)	205.437	0.387	2300.096	269.672	45.592	30.709	1748.752	1456.910
Passenger (5th)	238.431	0.385	1230.791	371.675	41.636	18.743	1843.393	1795.620

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:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20255107	Traction Control System (TCS)	Yes
Model Year	2025	Power Steering	Yes
Make	Toyota	Power Window Auto-Reverse	Yes
Model	Land Cruiser	Driver Frontal Airbag	Yes
Body Style	SUV	Driver Curtain Airbag	Yes
VIN	JTEABFAJXSK020025	Driver Head/Torso Airbag	No
Body Color	Black	Driver Torso Airbag	No
Odometer Reading (km /mi)		Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.4	Driver Pelvis Airbag	No
Type / No. Cylinders	I4	Driver Knee Airbag	Yes
Engine Placement	Inline	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	8-Speed	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	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	No	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other –Pass Seat Cushion Airbag	Yes

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation	GVWR (KG)	3050
Date of Manufacture	10/24	GAWR Front (KG)	1605
		GAWR Rear (KG)	1860

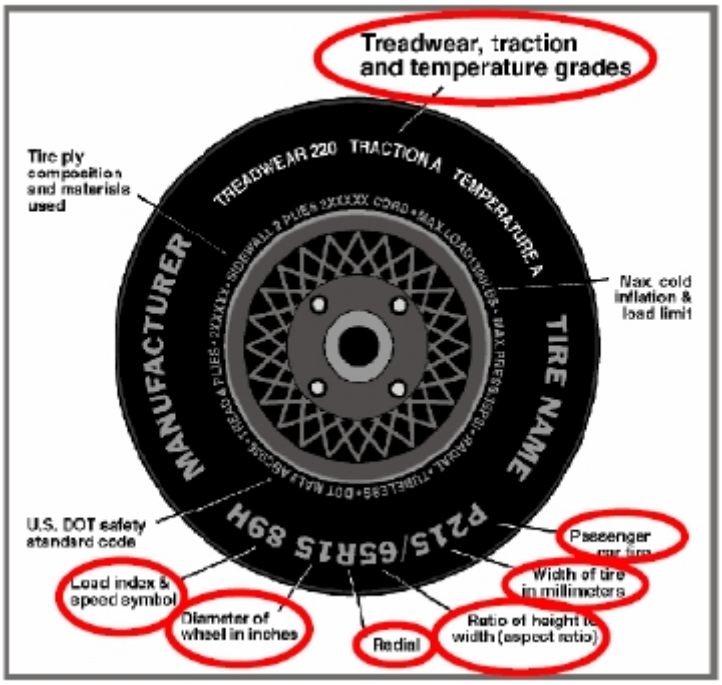
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	N/A	
Number of Occupants	2	3	N/A	5
Capacity Wt. (VCW) (kg)				499
Cargo Wt. (RCLW) (kg)				136

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

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

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



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	230
Recommended Tire Size	245/70R18	245/70R18
Tire Size on Vehicle	245/70R18	245/70R18
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Geolander X-CV	Geolander X-CV
Treadwear	520	520
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index / Speed Symbol	110H	110H
Tire Material	Rubber	Rubber
DOT Safety Code Left	147OMYED23824	147OMYED23824
DOT Safety Code Right	147OMYED23824	147OMYED23824

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

Test Vehicle: 2025 Toyota Land Cruiser 5 Door SUV
NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 03/17/2025

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	607	609		650	712	
Right	kg	598	612		632	703	
Ratio	%	49.7	50.3		47.5	52.5	
Total	kg	1205	1221	2426	1282	1415	2697

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2426	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	142	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	136	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2704	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	993	995	1027	1028	1438
As Tested	mm	984	986	996	996	1499
Post-Test	mm	958	958	1016	1007	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2857
Total Vehicle Length at Left Side	mm	4865
Total Vehicle Length at Centerline	mm	4984
Total Vehicle Length at Right Side	mm	4865
Weight of Ballast in Cargo Area	kg	65.77
Weight of Vehicle Components Removed	kg	16
Amount of Stoddard Solvent in Fuel Tank	L	62.1

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk Carpeting

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

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	4984
2	Total Width	1887
3*	Bumper Top Height	554
4*	Bumper Bottom Height	437
5*	Longitudinal Member Top Height	642
6	Distance Between Longitudinal Members	898
7	Longitudinal Member Width	63
8*	Engine Top Height	1118
9*	Engine Bottom Height	282
10	Engine and Gearbox Width	640
11	Front Bumper-Engine Distance	770
12*	Front Shock Absorber Fixing Height	780
13*	Bonnet Leading Edge Height	1074
14	Front Shock Absorber Fixing Width	805
15	Front Bumper – Front Axle Distance	931
16	Front Axle – A Pillar Distance	657
17	A-Pillar – B-Pillar Distance	1061
18	B-Pillar – Rear Axle Distance	1139
19	B-Pillar – C-Pillar Distance	966
20*	Roof Sill Bottom Height	1732
21*	Roof Sill Top Height	1812
22*	Floor Sill Bottom Height	541
23*	Floor Sill Top Height	584

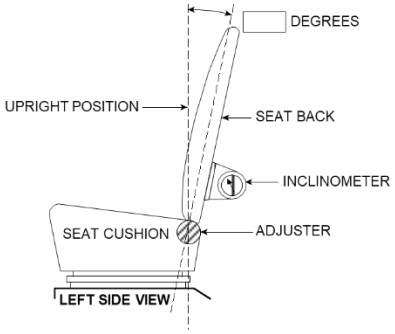
*Height Measurements are taken from the ground
Note: All measurements are in millimeters

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

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

NOMINAL DESIGN RIDING POSITION

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



FRONT SEAT ASSEMBLY

Seating Position	Degrees
Driver Seat Back Angle	1.1
Passenger Seat Back Angle	0.0

SEAT FORE / AFT POSITIONS

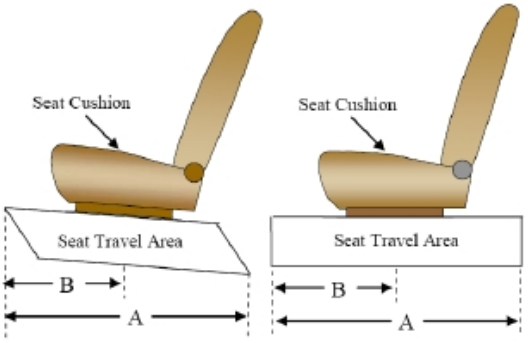
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	23 (0-22)	9
Passenger Seat	25 (0-24)	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



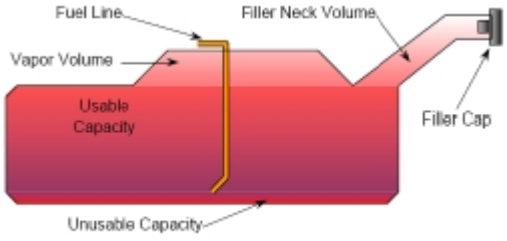
Test Vehicle: 2025 Toyota Land Cruiser 5 Door SUV | NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test | Test Date: 03/17/2025

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	66.9
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	61.5 - 62.9
Actual Amount of Solvent Used	62.1
1/3 of Usable Capacity	22.3

FUEL PUMP

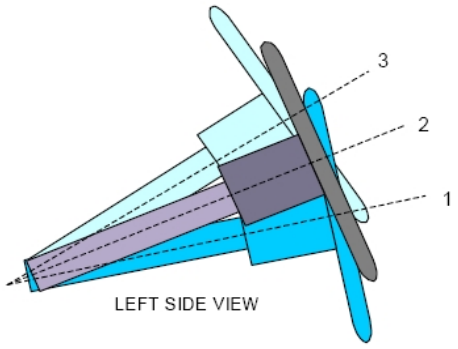
The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the left side of the vehicle. The pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. See form 1 for more information.



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.



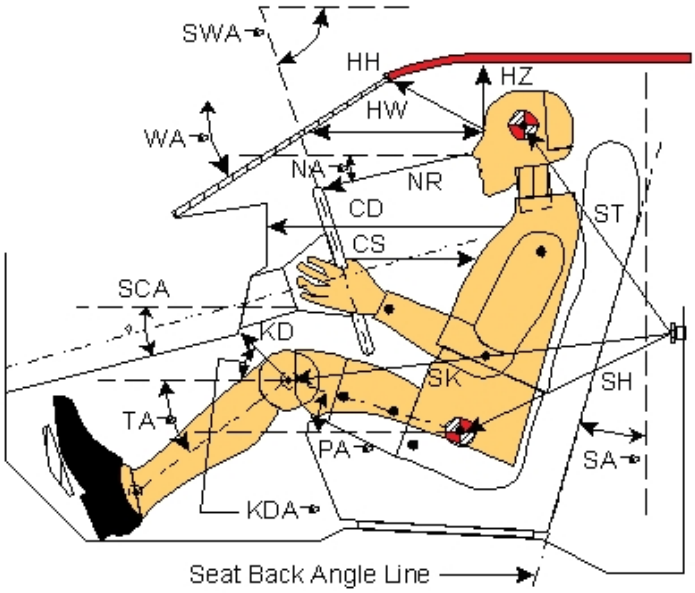
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	19.9	
Geometric center position No. 2	21.9	
Uppermost position No. 3	23.9	
Telescoping Steering Wheel Travel		60
Test Position	22.0	30

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2025 Toyota Land Cruiser 5 Door SUV
NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 03/17/2025

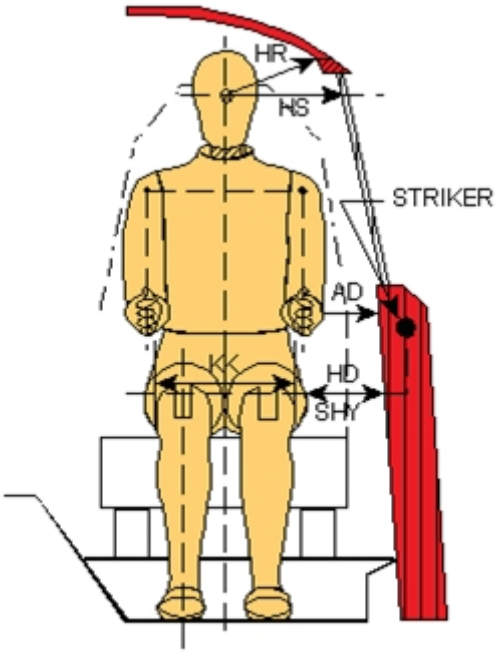


Left Side View

Code	Measurement Description	Driver (SN: 065)		Passenger (SN: 137)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		46.6		
SWA°	Steering Wheel Angle		21.9		
SCA°	Steering Column Angle		68.1		
SA°	Seat Back Angle (on headrest post)		1.1		0.0
HZ	Head to Roof (Z)	175	90	295	90
HH	Head to Header	540	22.3	455	31.3
HW	Head to Windshield	697	0.0	631	0.0
NR	Nose to Rim / Dash	403	9.9	416	28.2
CD	Chest to Dash	554		362	
CS	Chest to Steering Hub	333	6.3		
RA	Rim to Abdomen	210	0.0		
KDL	Left Knee to Dash	213	35.3	127	33.5
KDR	Right Knee to Dash	181	13.0	128	33.2
PA°	Pelvic Angle		23.7		19.6
TA°	Tibia Angle		35.7		47.6
SK	Striker to Knee	545	6.6	390	22.7
ST	Striker to Head	515	81.0	480	61.8
SH	Striker to H-Point	220	47.0	665	8.5

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

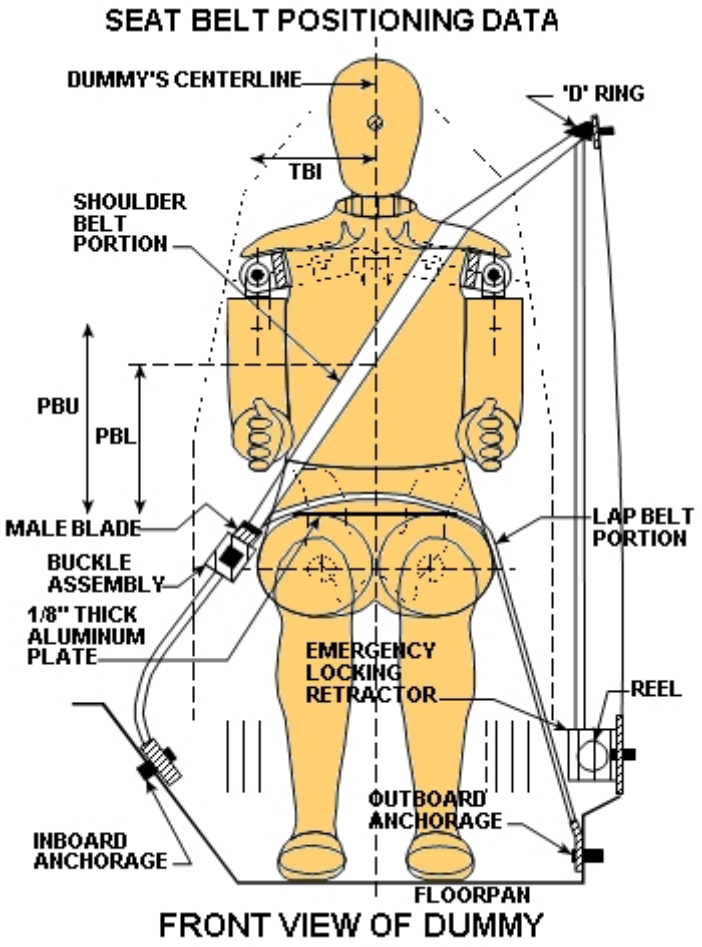


Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	121	85
HD	H-Point to Door	147	181
HR	Head to Side Header	254	295
HS	Head to Side Window	347	362
KK	Knee to Knee	335	216
SHY	Striker to H-Point (Y Direction)	245	275
AA	Ankle to Ankle	350	173

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	350	310
PBL — Top surface of reference to belt lower edge	mm	265	221

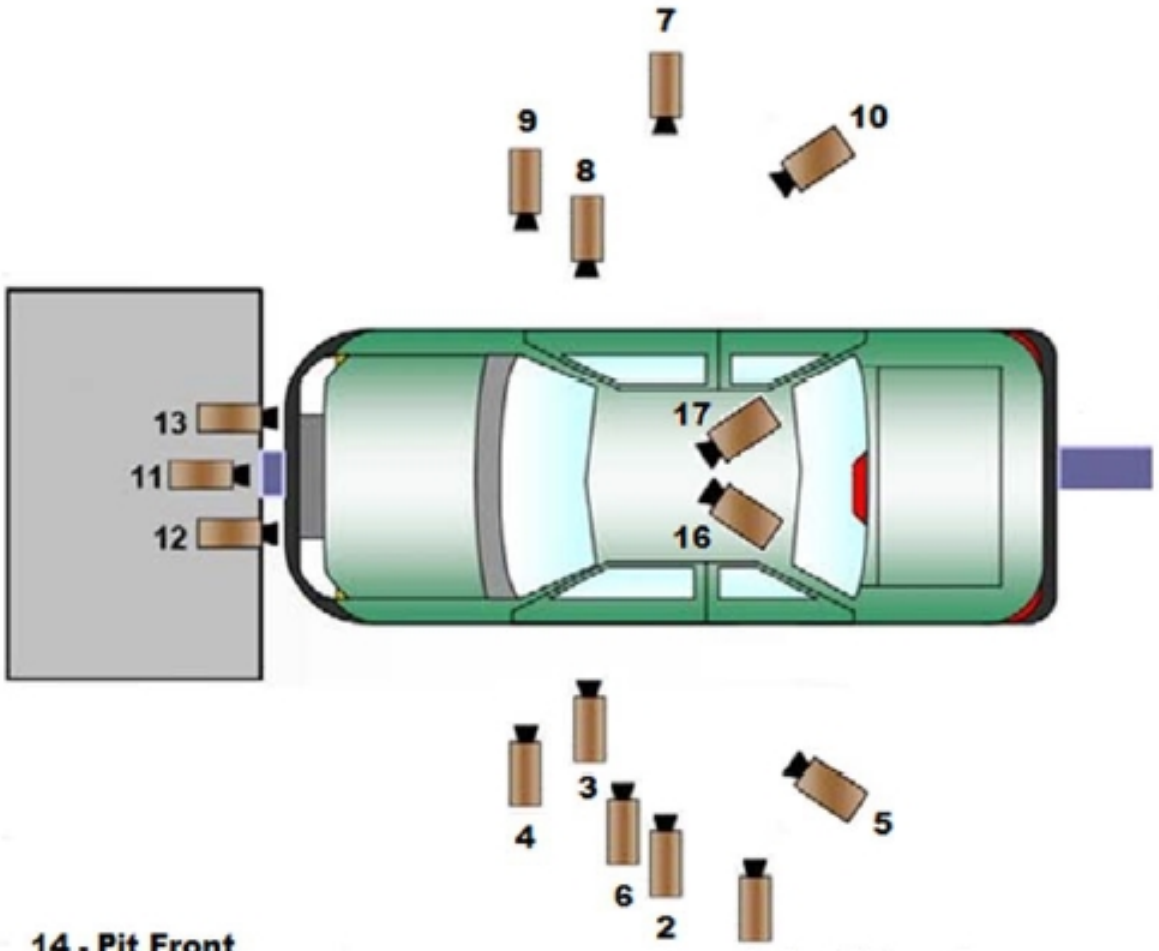
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	890	956
Lap Belt Length as measured on ATD	mm	690	770
Remainder of belt on reel	mm	870	724
Total belt length for continuous webbing systems	mm	2450	2450

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

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2025 Toyota Land Cruiser 5 Door SUV NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 03/17/2025

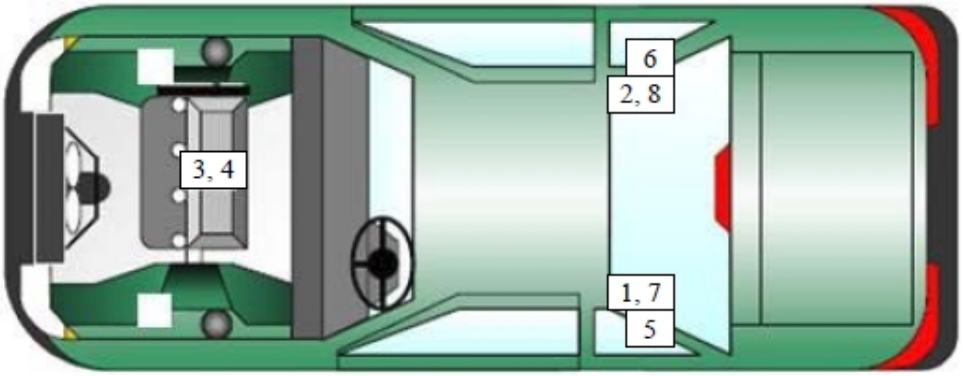
CAMERA LOCATIONS

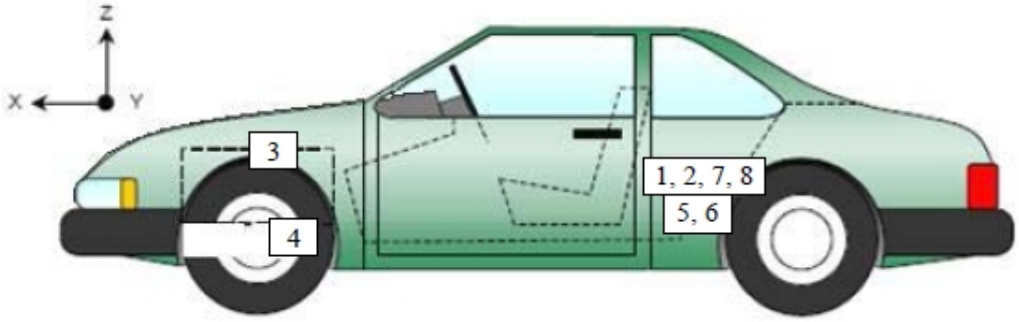
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall				Zoom	60
2	Left Overall	-1257	-7345	-1501	24	1000
3	Driver Close-Up	-1381	-6341	-1493	50	1000
4	Left Front Half	-904	-6245	-1487	28	1000
5	Left Angle	-3924	-4762	-2459	50	1000
6	Steering Column	-1403	-7241	-2351	75	1000
7	Right Overall	-1304	7032	-1520	24	1000
8	Passenger Close-Up	-1391	5956	-1493	50	1000
9	Right Front Half	-1003	6051	-1462	28	1000
10	Right Angle	-3941	4571	-2456	50	1000
11	Windshield	1168	0	-3471	12.5	1000
12	Driver Windshield	958	-452	-2204	25	1000
13	Passenger Windshield	958	452	-2204	25	1000
14	Pit Front	-832	0	2228	12.5	1000
15	Pit Rear	-3022	0	2234	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:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	2096	-360	-23
2	Right Rear Accelerometer – X Direction	2095	367	-37
3	Engine Top X	4092	-12	-485
4	Engine Bottom X	4496	70	359
5	Left Rear Accelerometer – Z Direction	2096	-360	-23
6	Right Rear Accelerometer – Z Direction	2095	367	-37
7	Left Rear Accelerometer – X Direction Redundant	2096	-372	-22
8	Right Rear Accelerometer – X Direction Redundant	2095	383	-34

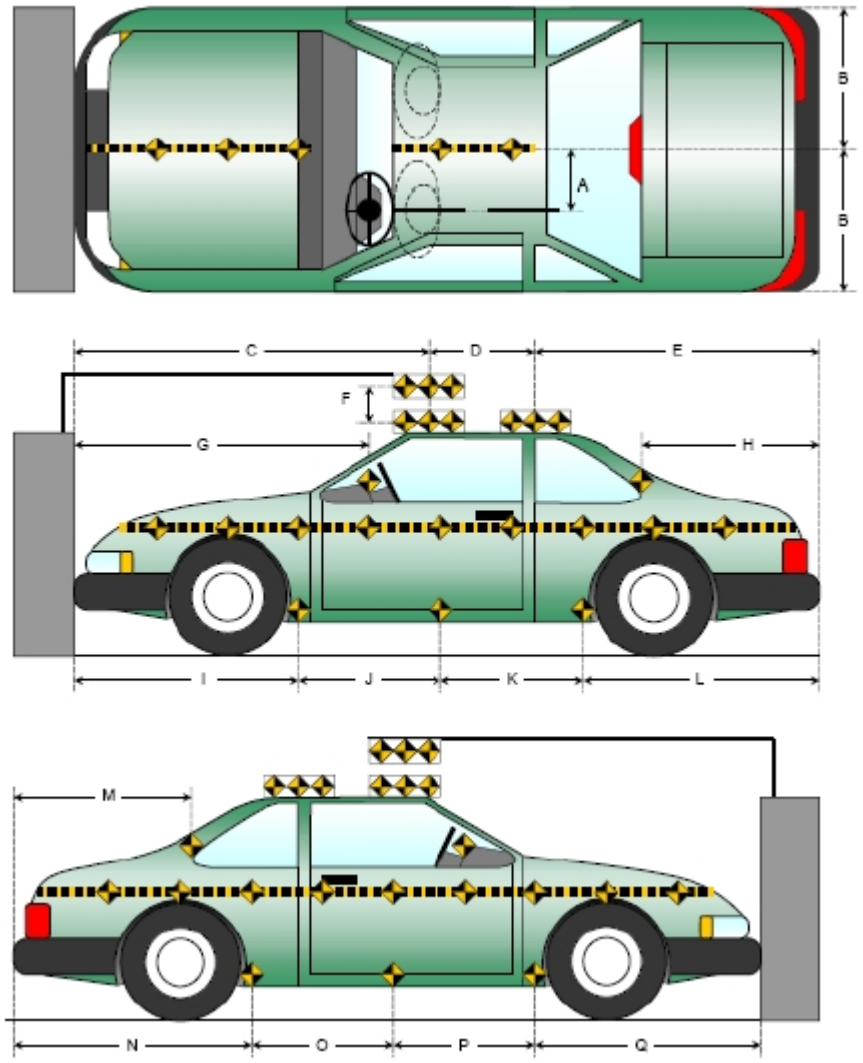
Reference Points:
X – Rear Surface of Vehicle (+ forward)
Y – Vehicle Centerline (+ to right)
Z – Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2025 Toyota Land Cruiser 5 Door SUV
NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 03/17/2025

Item	Value
A	404
B	944
C	2014
D	609
E	2361
F	170
G	1948
H	1312
I	1470
J	880
K	890
L	1744
M	1311
N	1744
O	882
P	886
Q	1472

All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

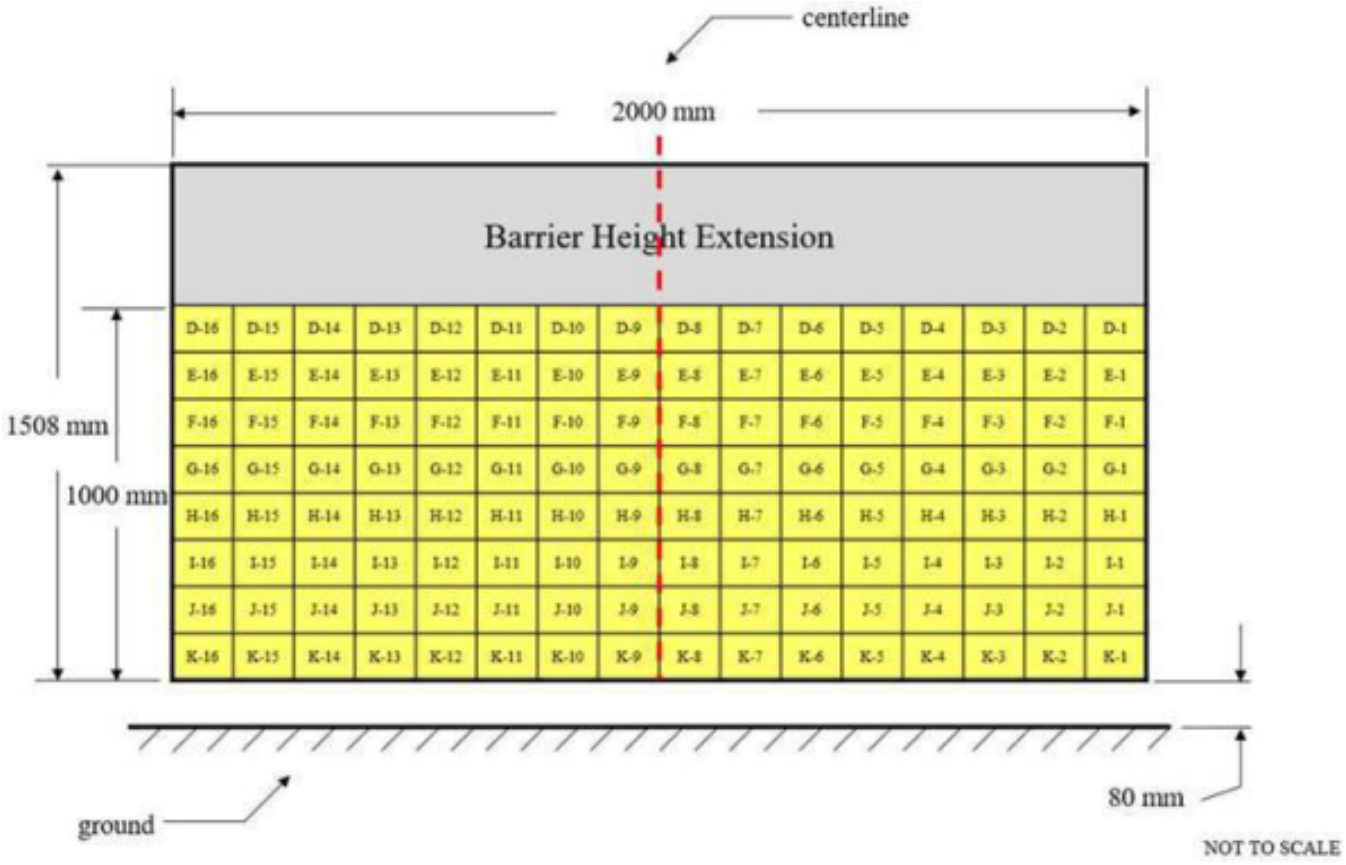


Figure 1 - Load Cell Locations on a 128-Load Cell Barrier with Plywood Height Extension*
Please note above diagram is not actual representation of load cell barrier used.

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

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: 2025 Toyota Land Cruiser 5 Door SUV
NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 03/17/2025

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, Curtain Airbag & Headrest	Frontal Airbag & Headrest
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

DOOR OPENING AND SEAT TRACK INFORMATION

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

POST-TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	329
Center	mm	330
Right Side	mm	339
Average	mm	333

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

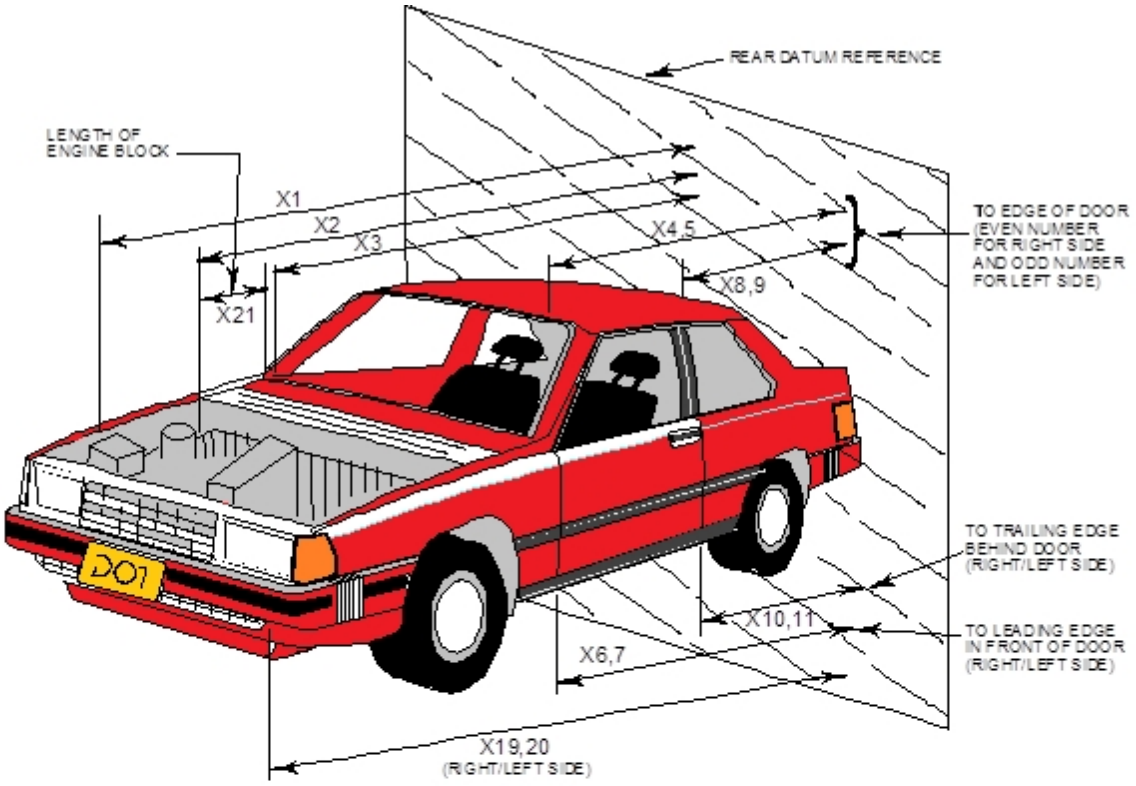
Test Vehicle: 2025 Toyota Land Cruiser 5 Door SUV NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 03/17/2025

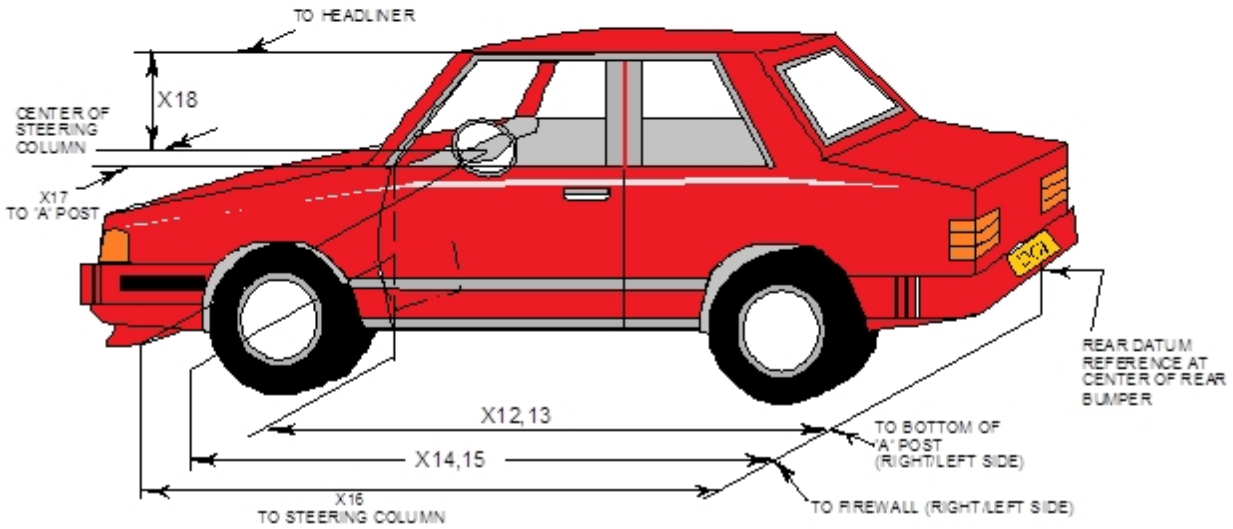
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025





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

Test Vehicle: 2025 Toyota Land Cruiser 5 Door SUV
NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 03/17/2025

No.	Measurement Description	Pre-Test	Post-Test	Change
1	Total Length of Vehicle at Centerline	4984	4380	-604
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4214	4014	-200
3	RSOV to Firewall	3760	3762	2
4	RSOV to Upper Leading Edge of Right Door	3386	3377	-9
5	RSOV to Upper Leading Edge of Left Door	3385	3384	-1
6	RSOV to Lower Leading Edge of Right Door	3352	3335	-17
7	RSOV to Lower Leading Edge of Left Door	3351	3344	-7
8	RSOV to Upper Trailing Edge of Right Door	2346	2339	-7
9	RSOV to Upper Trailing Edge of Left Door	2345	2343	-2
10	RSOV to Lower Trailing Edge of Right Door	2308	2295	-13
11	RSOV to Lower Trailing Edge of Left Door	2307	2298	-9
12	RSOV to Bottom of “A” Post of Right Side	3383	3375	-8
13	RSOV to Bottom of “A” Post of Left Side	3383	3380	-3
14	RSOV to Firewall, Right Side	3756	3646	-110
15	RSOV to Firewall, Left Side	3776	3646	-130
16	RSOV to Steering Column	2933	2978	45
17	Center of Steering Column to “A” Post	268	240	-28
18	Center of Steering Column to Headliner	473	449	-24
19	RSOV to Right Side of Front Bumper	4952	4386	-566
20	RSOV to Left Side of Front Bumper	4951	4395	-556
21	Length of Engine Block	410	410	0
RD	RSOV to Right Side of Dash Panel	3104	3086	-18
CD	RSOV to Center of Dash Panel	3067	3041	-26
LD	RSOV to Left Side of Dash Panel	3143	3116	-27

All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

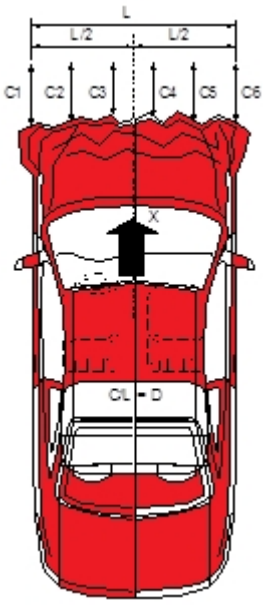
Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

VEHICLE INFORMATION

VIN:	JTEABFAJXSK020025	Wheelbase (mm):	2857
Vehicle Size Category:	MPV	Test Weight (kg):	2697

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):	56.68
Velocity Change (km/h):	64.480
Time of Separation (ms):	146



CRUSH PROFILE

Collision Deformation Classification:	12FDEW2
Midpoint of Damage:	C3
Damage Region Length (mm):	1548
Impact Mode:	Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Crush
C1	Crush Zone 1 at Left Side	mm	4798	4415	383
C2	Crush Zone 2 at Left Side	mm	4970	4396	574
C3	Crush Zone 3 at Left Side	mm	4982	4396	586
C4	Crush Zone 4 at Right Side	mm	4982	4396	586
C5	Crush Zone 5 at Right Side	mm	4971	4396	575
C6	Crush Zone 6 at Right Side	mm	4797	4342	455
L	C1 to C6	mm	1477	1548	-71

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

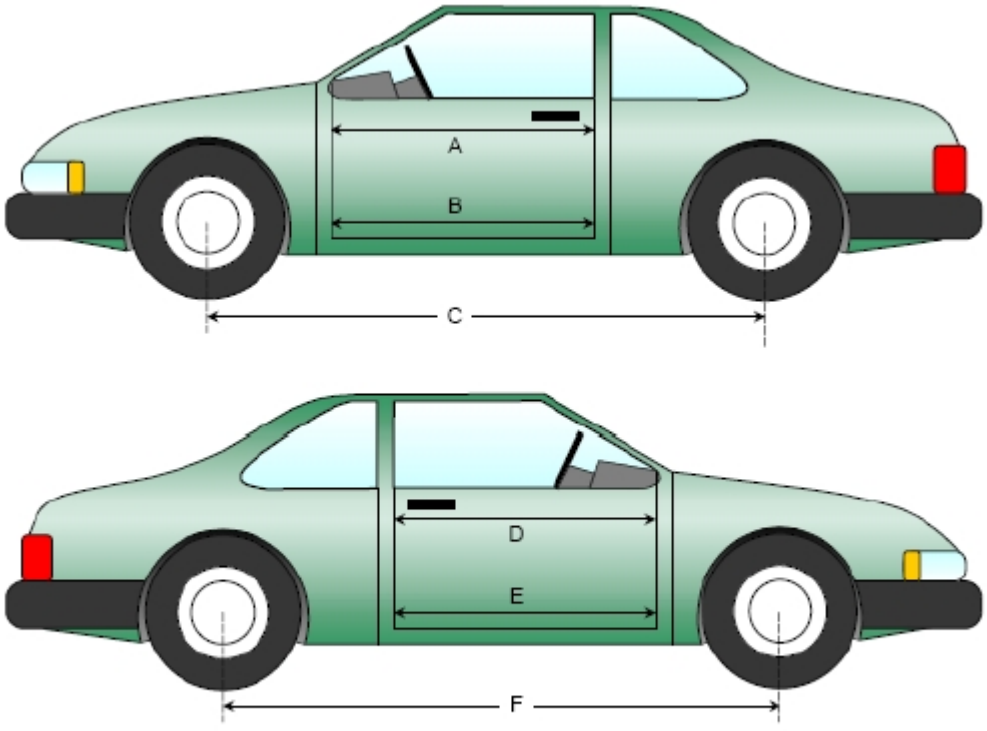
Test Vehicle: 2025 Toyota Land Cruiser 5 Door SUV
NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 03/17/2025

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Change
A	Left Side Upper	mm	970	968	-2
B	Left Side Lower	mm	786	786	0
D	Right Side Upper	mm	971	971	0
E	Right Side Lower	mm	788	788	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Change
C	Left Side Wheelbase	mm	2857	2795	-62
F	Right Side Wheelbase	mm	2857	2785	-72



Left & Right Side Views

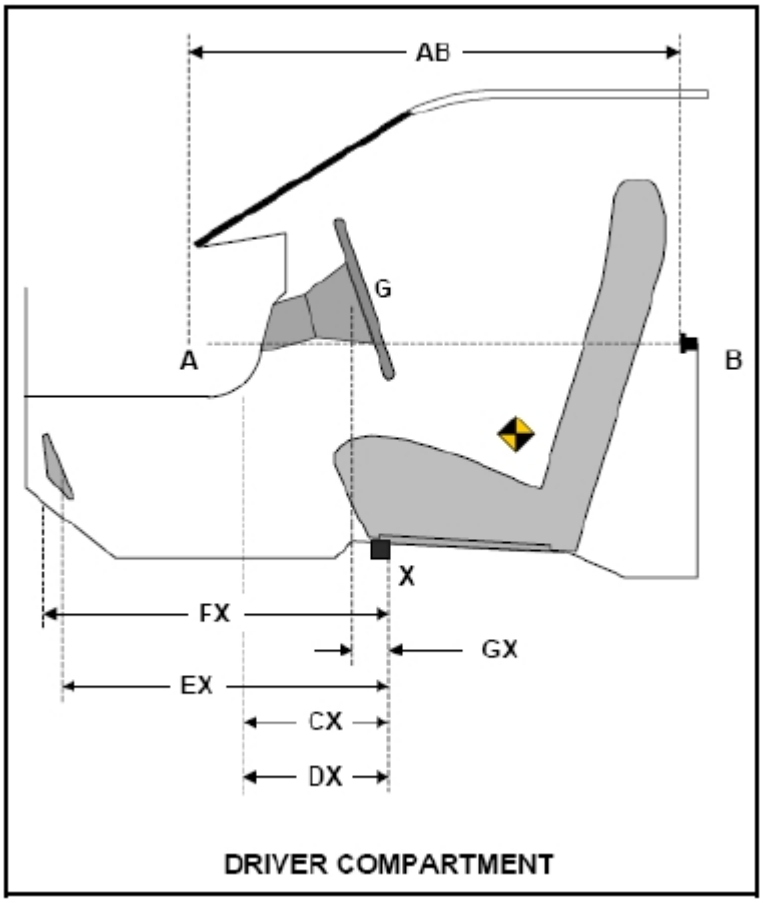
DATA SHEET NO.14 … (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2025 Toyota Land Cruiser 5 Door SUV
NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 03/17/2025

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Change
AB	Door Opening (Inside Window Jam)	mm	792	795	3
CX	Left Knee Bolster to X	mm	340	336	-4
DX	Right Knee Bolster to X	mm	338	317	-21
EX	Brake Pedal to X	mm	550	558	8
FX	Foot Rest to X	mm	565	556	-9
GX	Center of Steering Column Wheel Hub to X	mm	68	120	52

X = Front of Seat Track (Stationary)



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

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

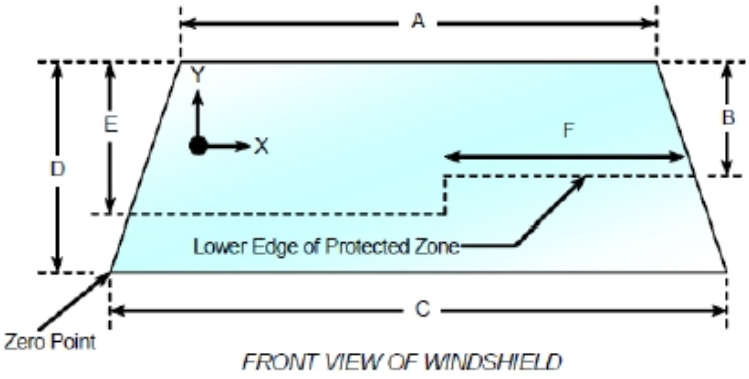
Windshield Mounting Details: A trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2014	2014.0	100%
Right Side	2014	2014.0	100%
Total	4028	4028	100%



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1290
B	mm	340
C	mm	1502
D	mm	618
E	mm	385
F	mm	305

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:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21°C Test Time: 11:53 AM

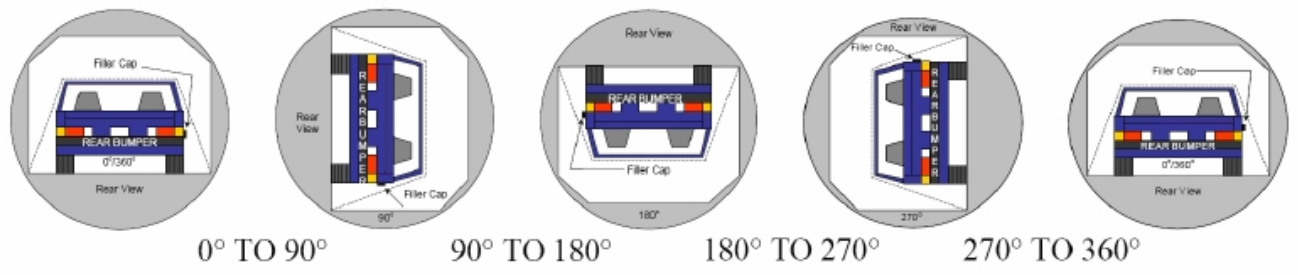
STODDARD SOLVENT SPILLAGE MEASUREMENTS

A. From impact until vehicle motion ceases (Maximum allowable is 1 oz.)	0	oz
B. For the 5-minute period after motion ceases (Maximum allowable is 5 oz.)	0	oz
C. For the following 25 minutes: (Maximum allowable is 1 oz.)	0	oz

D. Spillage Detail: No Spillage

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025



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

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	68	300	368
90° to 180°	69	300	369
180° to 270°	64	300	364
270° to 360°	63	300	363

FMVSS 301 SPILLAGE TABLE

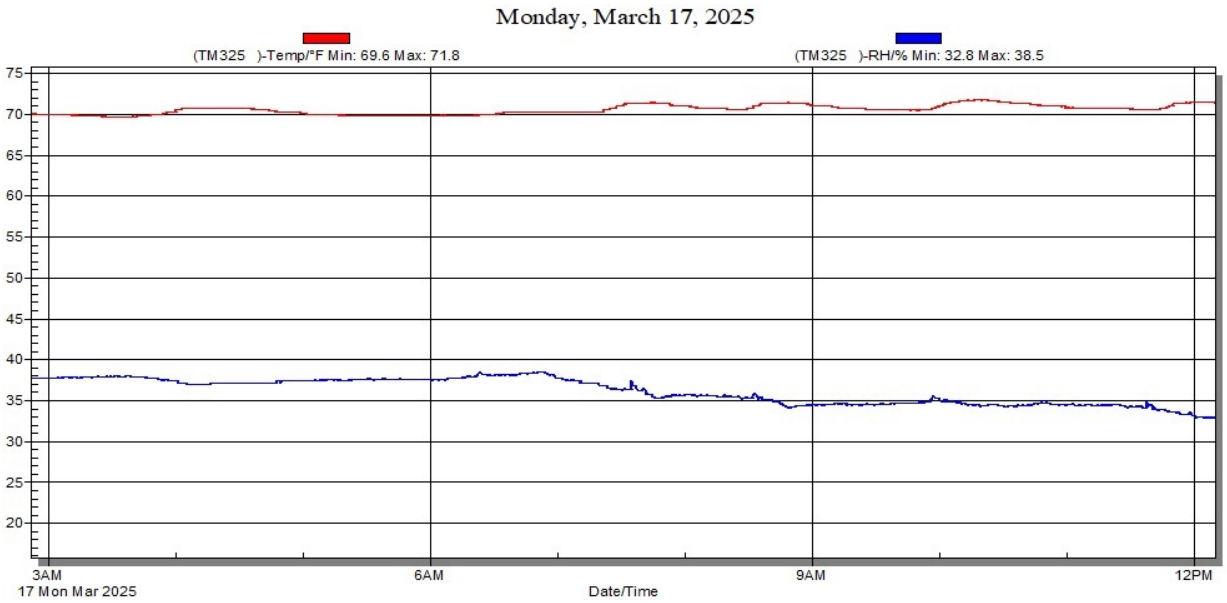
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17
DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025



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: 2025 Toyota Land Cruiser 5 Door SUV NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 03/17/2025

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Gas-Electric Hybrid
Propulsion Battery Type	Nickel Metal Hydride
Nominal Voltage (Volts)	288
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Inside the Battery
Auxiliary Battery Type	LN3

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	KOH
Electrolyte Fluid Specific Gravity	1.26 g/cm3
Electrolyte Fluid Kinematic Viscosity (centistokes)	1.8 cSt
Electrolyte Fluid Color	Clear
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Air Cooled
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Inside 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	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	
For batteries that are rechargeable ONLY by an energy source on the vehicle: Voltage range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	240
Maximum State of Charge	V	400
95% of Maximum	V	380
Test Voltage *	V	295

* *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:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

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

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Ground point located on vehicle body in trunk area
Details of Propulsion Battery Components	Battery is located inside the trunk area under the deck board assembly

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

Test Vehicle:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025

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	240 - 400
Propulsion Battery Voltage: (ready to drive position)	V_b	V	295.0
Propulsion Battery to Vehicle Chassis	V_1	V	115.0
Propulsion Battery to Vehicle Chassis	V_2	V	162.0
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	200,000
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	15.0
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	25.0
$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$	R_{i1}	Ω	3,211,594
$R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$	R_{i2}	Ω	1,874,025
Lesser value of R_{i1} and R_{i2}	R_i	Ω	1,874,025
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	6,353

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: 2025 Toyota Land Cruiser 5 Door SUV NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 03/17/2025

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		49210189
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		04/06/2024

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 =	300.0	V	Time:	1	Minutes	16	Seconds
V_1 =	120.0	V	Time:	1	Minutes	27	Seconds
V_2 =	190.0	V	Time:	1	Minutes	34	Seconds
R_o =	200,000	Ω					
V_1' =	12.0	V	Time:	1	Minutes	43	Seconds
V_2' =	21.0	Ω	Time:	1	Minutes	51	Seconds
R_{i1} =	4,650,000	Ω	Time:	1	Minutes	43	Seconds
R_{i2} =	2,626,065	Ω	Time:	1	Minutes	51	Seconds
R_i =	2,626,065	Ω/V	Time:	1	Minutes	51	Seconds
R_i/V_b =	8,754	Ω/V	Time:	1	Minutes	51	Seconds

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

NOTES:

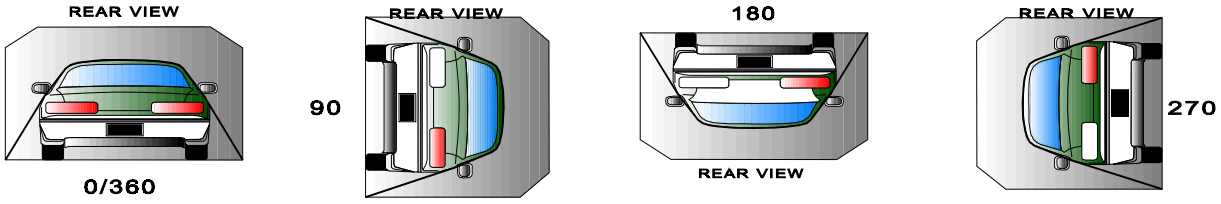
- *R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1'], R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2'], R_i = Lesser value of R_{i1} and R_{i2}*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*
- *Minimum Electrical 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:	2025 Toyota Land Cruiser 5 Door SUV	NHTSA No.:	M20255107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	03/17/2025



Rear View

DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Rollover Stage	Rotation Time (spec. 1 -3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	8	5	6	8	7
90° to 180°	1	9	5	6	9	7
180° to 270°	1	4	5	6	4	7
270° to 360°	1	3	5	6	3	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.		49210189
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		04/06/2024

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: 2025 Toyota Land Cruiser 5 Door SUV NHTSA No.: M20255107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 03/17/2025

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units	Ro=200,000 Ω	Minutes	Seconds
V_b =	90°	304.5	V	Time:	2	35
	180°	304.5	V		8	44
	270°	304.5	V		15	3
	360°	304.6	V		21	17
V_1 =	90°	144.0	V	Time:	2	43
	180°	144.0	V		8	55
	270°	138.0	V		15	13
	360°	144.0	V		21	26
V_2 =	90°	159.0	V	Time:	2	50
	180°	157.0	V		9	1
	270°	159.0	V		15	18
	360°	165.0	V		21	31
V_1' =	90°	9.3	V	Time:	2	57
	180°	8.9	V		9	9
	270°	8.8	V		15	33
	360°	11.8	V		21	38
V_2' =	90°	13.0	Ω	Time:	3	13
	180°	13.4	Ω		9	16
	270°	12.2	Ω		15	42
	360°	12.4	Ω		21	48
R_{i1} =	90°	6,095,296	Ω	Time:	2	57
	180°	6,345,989	Ω		9	9
	270°	6,319,565	Ω		15	33
	360°	4,808,121	Ω		21	38
R_{i2} =	90°	4,280,406	Ω	Time:	3	13
	180°	4,109,098	Ω		9	16
	270°	4,495,268	Ω		15	42
	360°	4,609,326	Ω		21	48
R_i =	90°	4,280,406	Ω/V	Time:	3	13
	180°	4,109,098	Ω/V		9	16
	270°	4,495,268	Ω/V		15	42
	360°	4,609,326	Ω/V		21	48
R_i/V_b =	90°	14,057	Ω/V	Time:	3	13
	180°	13,495	Ω/V		9	16
	270°	14,763	Ω/V		15	42
	360°	15,132	Ω/V		21	48

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

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Fig.	Description	Page
1	Load Cell Location	A-6
2	Pre-Test Load Cell Wall	A-6
3	Post-Test Load Cell Wall	A-7
4	Manufacturer's Label	A-7
5	Tire Placard	A-8
6	2025 Toyota Land Cruiser Frontal As Delivered	A-8
7	Left Rear 3-4 View, as Received	A-9
8	Pre-Test Front View of Test Vehicle	A-9
9	Post-Test Front View of Test Vehicle	A-10
10	Pre-Test Left View of Test Vehicle	A-10
11	Post-Test Left View of Test Vehicle	A-11
12	Pre-Test Right View of Test Vehicle	A-11
13	Post-Test Right View of Test Vehicle	A-12
14	Pre-Test Right Front 3-4 View	A-12
15	Post-Test Right Front 3-4 View	A-13
16	Pre-Test Left Rear 3-4 View	A-13
17	Post-Test Left Rear 3-4 View	A-14
18	Pre-Test Windshield View	A-14
19	Post-Test Windshield View	A-15
20	Pre-Test Engine Compartment View	A-15
21	Post-Test Engine Compartment View	A-16
22	Pre-Test Fuel Filler View	A-16
23	Post-Test Fuel Filler View	A-17
24	Pre-Test Front Underbody View	A-17
25	Post-Test Front Underbody View	A-18
26	Pre-Test Rear Underbody View	A-18
27	Post-Test Rear Underbody View	A-19
28	Pre-Test Dummy Cable Routing	A-19
29	Post-Test Dummy Cable Routing	A-20
30	Pre-Test Driver Dummy Front View	A-20
31	Post-Test Driver Dummy Front View	A-21
32	Pre-Test Driver Dummy Window View	A-21
33	Post-Test Driver Dummy Window View	A-22
34	Pre-Test Driver Dummy and Vehicle Interior View	A-22
35	Post-Test Driver Dummy and Vehicle Interior View	A-23

Fig.	Description	Page
36	Pre-Test Driver's Seat Fore-Aft Markings	A-23
37	Post-Test Driver's Seat Fore-Aft Markings	A-24
38	Pre-Test View of Belt Anchorage for Driver Dummy	A-24
39	Post-Test View of Belt Anchorage for Driver Dummy	A-25
40	Pre-Test View of Belt Buckle and Latch Plate for Driver Dummy	A-25
41	Post-Test View of Belt Buckle and Latch Plate for Driver Dummy	A-26
42	Pre-Test Driver Dummy Feet	A-26
43	Post-Test Driver Dummy Feet	A-27
44	Pre-Test Driver's Side Knee Bolster	A-27
45	Post-Test Driver's Side Knee Bolster	A-28
46	Pre-Test Driver's Side Floorpan	A-28
47	Post-Test Driver's Side Floorpan	A-29
48	Post-Test Driver Dummy Face	A-29
49	Post-Test Driver Dummy Contact With Airbag	A-30
50	Post-Test Driver Dummy Contact With Headrest	A-30
51	Pre-Test View of the Steering Wheel	A-31
52	Post-Test View of the Steering Wheel	A-31
53	Pre-Test Passenger Dummy Front View	A-32
54	Post-Test Passenger Dummy Front View	A-32
55	Pre-Test Passenger Dummy Window View	A-33
56	Post-Test Passenger Dummy Window View	A-33
57	Pre-Test Passenger Dummy and Vehicle Interior View	A-34
58	Post-Test Passenger Dummy and Vehicle Interior View	A-34
59	Pre-Test Passenger's Seat Fore-Aft Markings	A-35
60	Post-Test Passenger's Seat Fore-Aft Markings	A-35
61	Pre-Test View of Belt Anchorage for Passenger Dummy	A-36
62	Post-Test View of Belt Anchorage for Passenger Dummy	A-36
63	Pre-Test View of Belt Buckle and Latch Plate for Passenger Dummy	A-37
64	Post-Test View of Belt Buckle and Latch Plate for Passenger Dummy	A-37
65	Pre-Test Passenger Dummy Feet	A-38
66	Post-Test Passenger Dummy Feet	A-38
67	Pre-Test Passenger's Side Knee Bolster	A-39
68	Post-Test Passenger's Side Knee Bolster	A-39
69	Pre-Test Passenger's Side Floorpan	A-40
70	Post-Test Passenger's Side Floorpan	A-40
71	Post-Test Passenger Dummy Face	A-41

Fig.	Description	Page
72	Post-Test Passenger Dummy Contact With Airbag	A-41
73	Post-Test Passenger Dummy Contact With Headrest	A-42
74	Photograph of Ballast Installed in Vehicle	A-42
75	Post-Test Stoddard Solvent Spillage Location View, if Required	A-43
76	Post-Test Speed Trap Read-Out	A-43
77	Vehicle at 0º on Static Rollover Device	A-44
78	Vehicle at 90º on Static Rollover Device	A-44
79	Vehicle at 180º on Static Rollover Device	A-45
80	Vehicle at 270º on Static Rollover Device	A-45
81	Vehicle at 360º on Static Rollover Device	A-46
82	2025 Toyota Land Cruiser Frontal Impact Event	A-46
83	Monroney Label Photograph	A-47
305-1	Auxiliary Power Module Warning Label	A-47
305-2	Power Inverter Warning Label	A-48
305-3	First Responder Warning Label	A-48
305-4	First Responder Warning Location	A-49
305-5	Other Vehicle Label(s) Related to Electrical Propulsion System	A-49
305-6	Manual High Voltage Service Disconnect in Place	A-50
305-7	Manual High Voltage Service Disconnect Removed (Plug)	A-50
305-8	Manual High Voltage Service Disconnect Removed Location	A-51
305-9	Pre-Impact View of Propulsion Battery	A-51
305-10	Post-Impact Front View of Propulsion Battery	A-52
305-11	Post-Impact Rear View of Propulsion Battery (if any part of it is visible)	A-52
305-12	Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules	A-53
305-13	Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules	A-53
305-14	Pre-Impact View of Propulsion Battery Module(s)	A-54
305-15	Post-Impact View of Propulsion Battery Module(s)	A-54
305-16	Pre-Impact View of Electric Propulsion Drive	A-55
305-17	Post-Impact View of Electric Propulsion Drive	A-55
305-18	Pre-Impact View of High Voltage Interconnects	A-56
305-19	Pre-Impact View of Propulsion Venting System(s)	A-56
305-20	Pre-Impact View of Other Visible Electric Propulsion Components	A-57
305-21	Pre-Impact View of Ground Lead Attached	A-57
305-22	Pre-Impact View of High Voltage Leads Attached	A-58
305-23	Pre-Impact Close-Up View of High Voltage Leads Attached	A-58
305-24	Pre-Impact View of Installed Test Interface Port	A-59
305-25	Post-Impact View of Installed Test Interface Port	A-59
305-26	Pre-Impact View of Other Test Devices	A-60

Fig.	Description	Page
305-27	Post-Impact View of Other Test Devices	A-60
305-28	FMVSS No. 305 Static Rollover 90 Degrees	A-61
305-29	FMVSS No. 305 Static Rollover 180 Degrees	A-61
305-30	FMVSS No. 305 Static Rollover 270 Degrees	A-62
305-31	FMVSS No. 305 Static Rollover 360 Degrees	A-62
305-32	Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery	A-63
305-33	Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery	A-63
305-34	Post-Impact Propulsion Battery System Mounting and/or Intrusion Failure(s)	A-64
305-35	Post-Impact View of Battery Component Intrusion	A-64
305-36	Post-Impact View of Battery Module Movement or Retention Loss	A-65
305-37	Post –Impact View of Propulsion Battery Electrolyte Spillage Location (Prior to static roll)	A-65
305-38	Post –Impact View of Propulsion Battery Electrolyte Spillage Location (After to static roll)	A-66

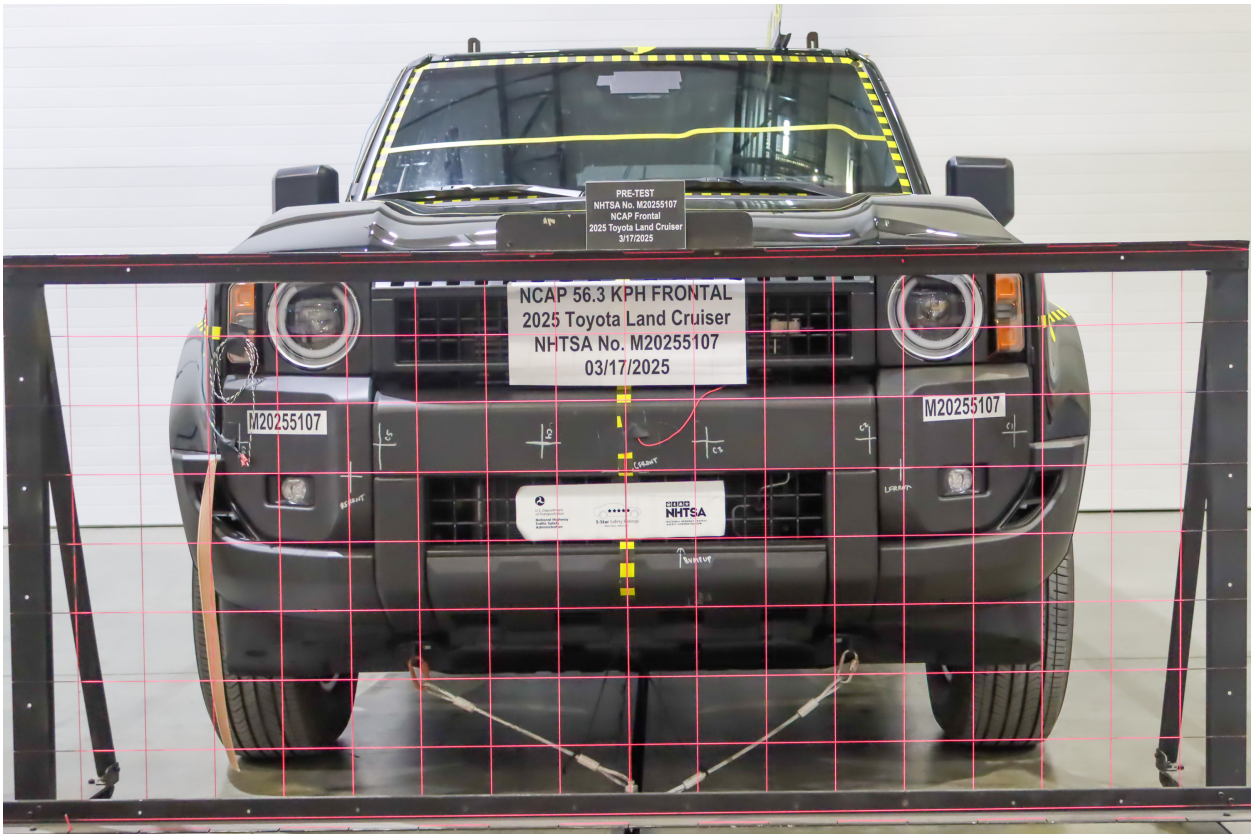


Figure A-1: Load Cell Location



Figure A-2: Pre-Test Load Cell Wall



Figure A-3: Post-Test Load Cell Wall

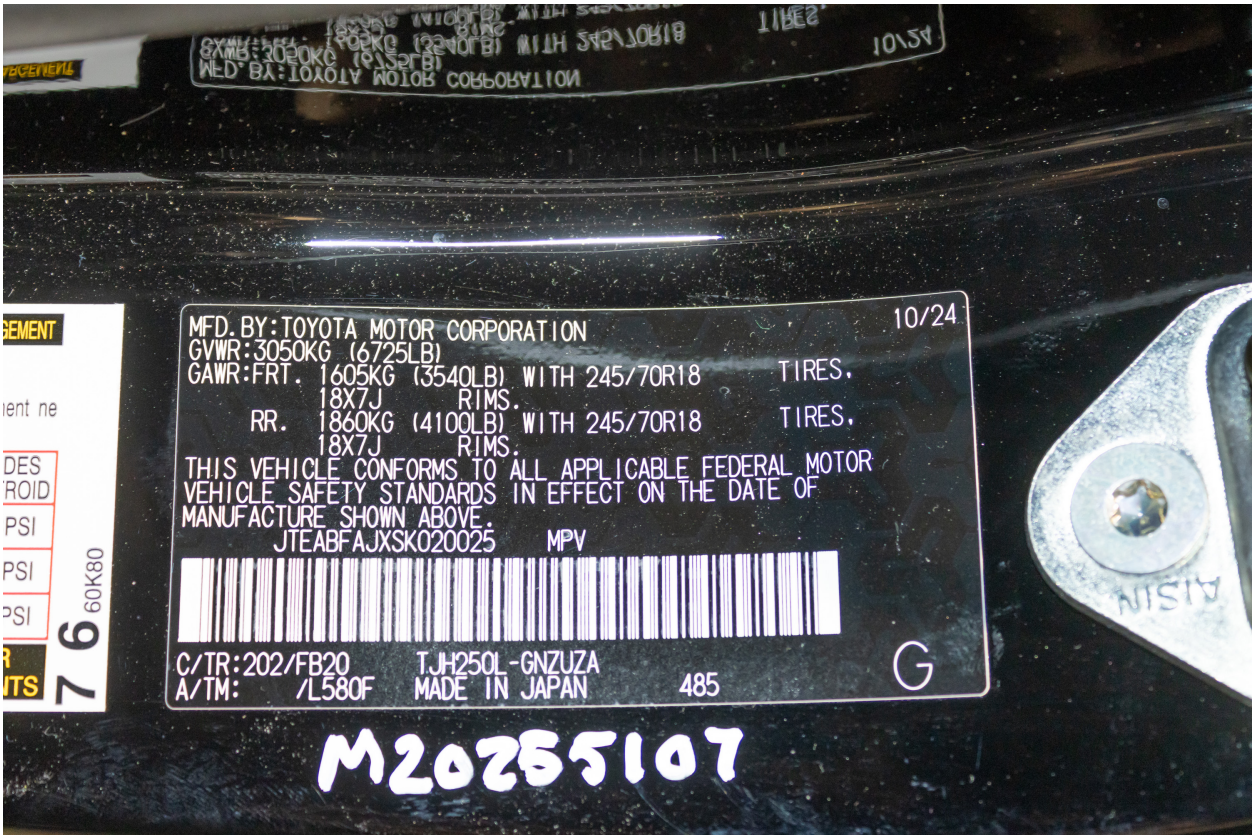


Figure A-4: Manufacturer's Label



Figure A-5: Tire Placard



Figure A-6: 2025 Toyota Land Cruiser 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

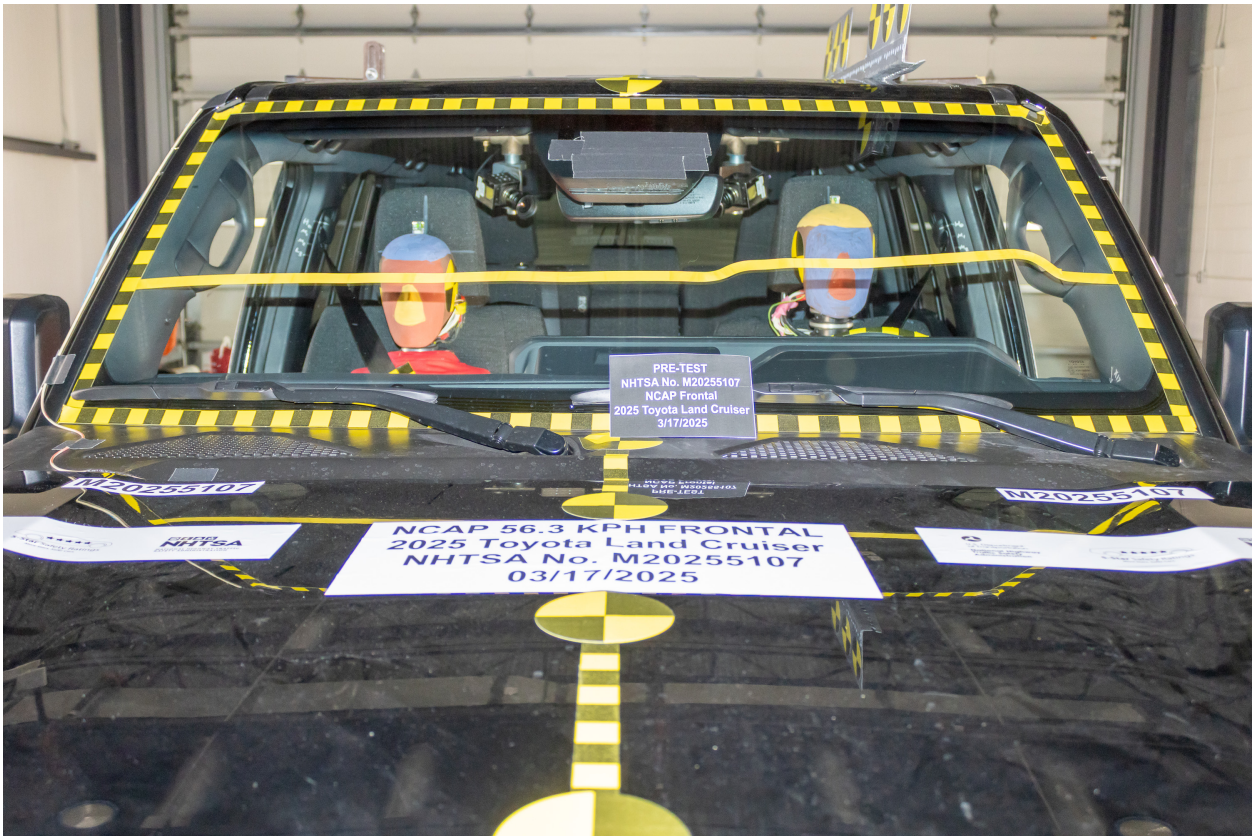


Figure A-18: Pre-Test Windshield View



Figure A-19: Post-Test Windshield View



Figure A-20: Pre-Test Engine Compartment View

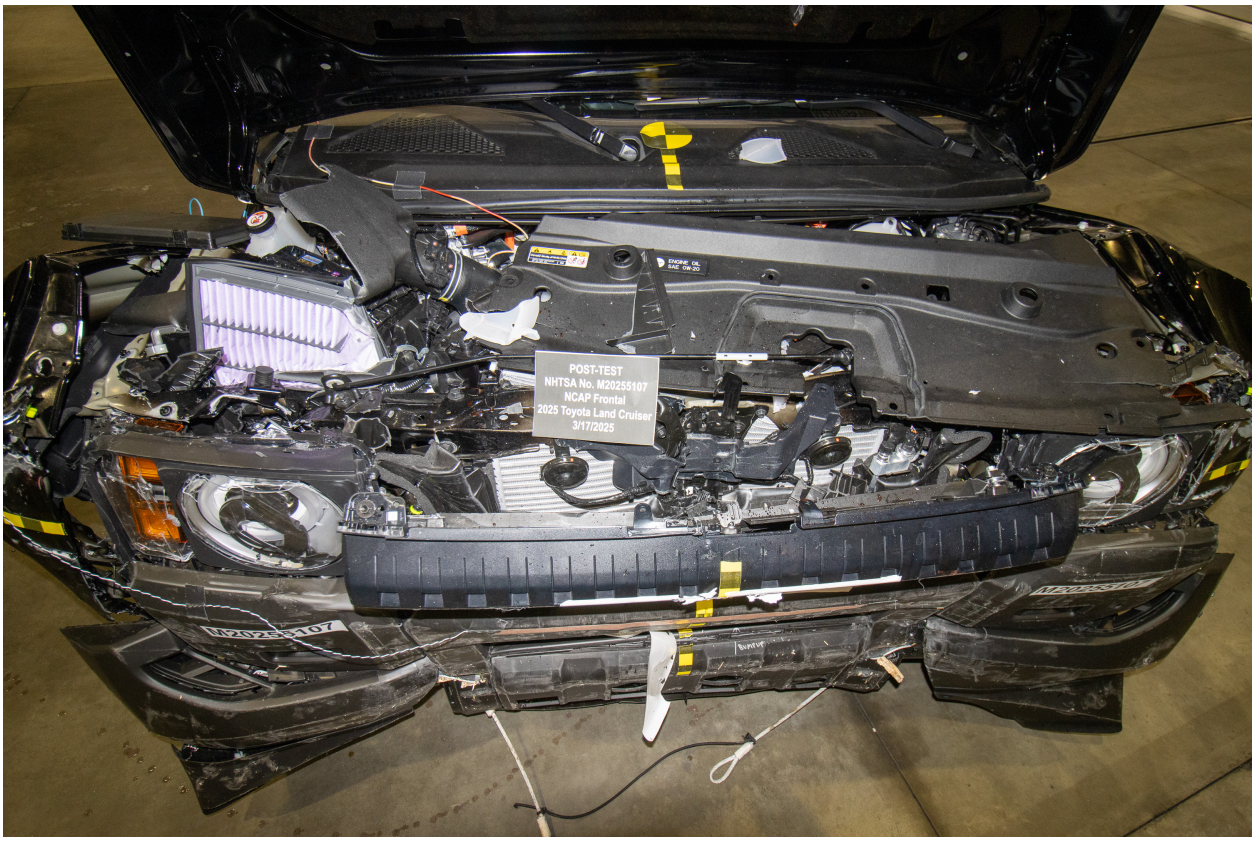


Figure A-21: Post-Test Engine Compartment View



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

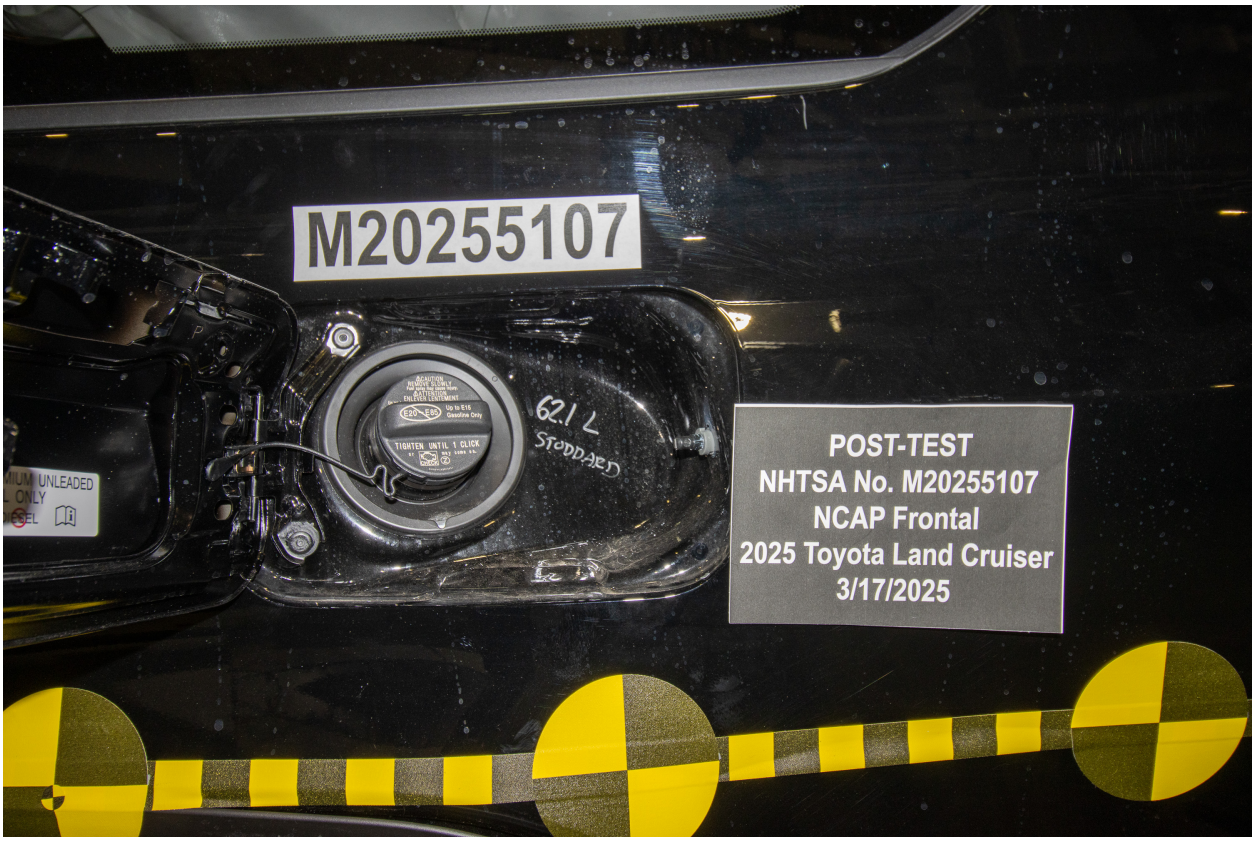


Figure A-23: Post-Test Fuel Filler Cap View

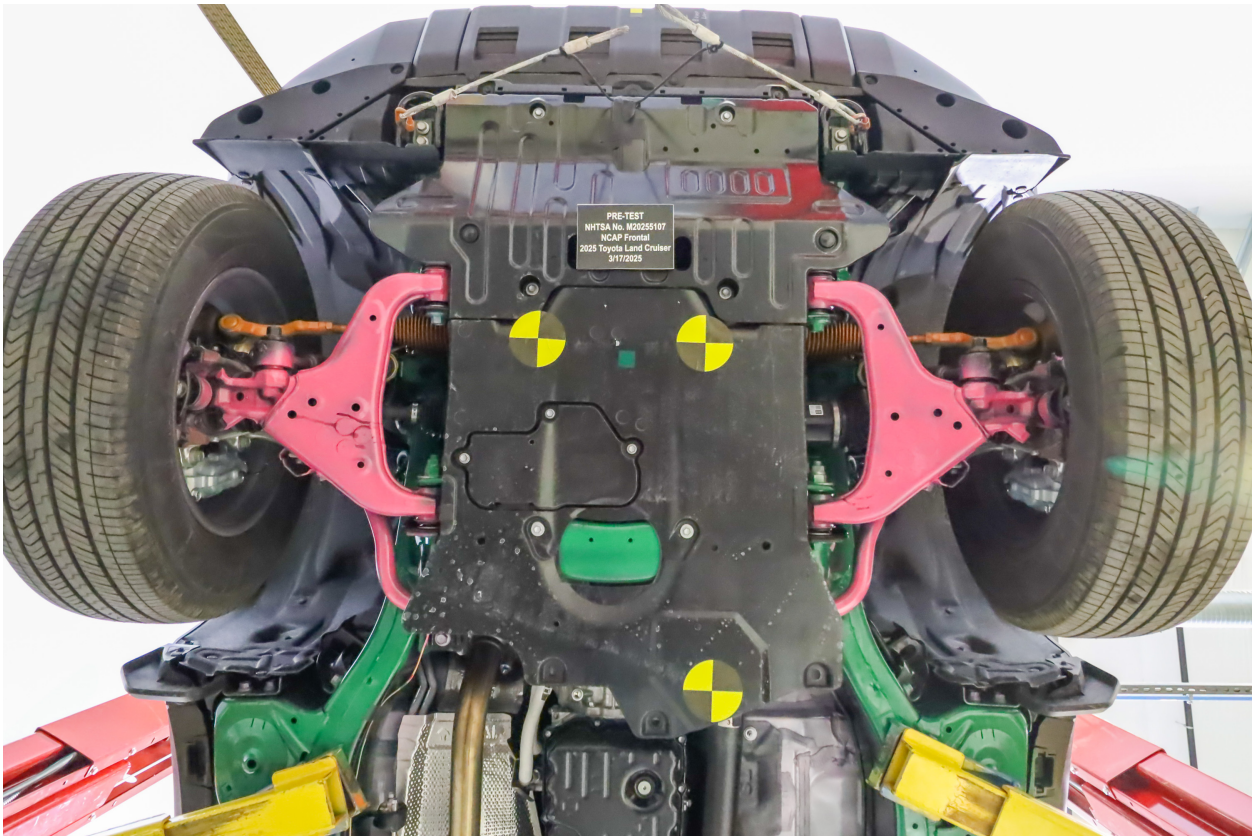


Figure A-24: Pre-Test Front Underbody View

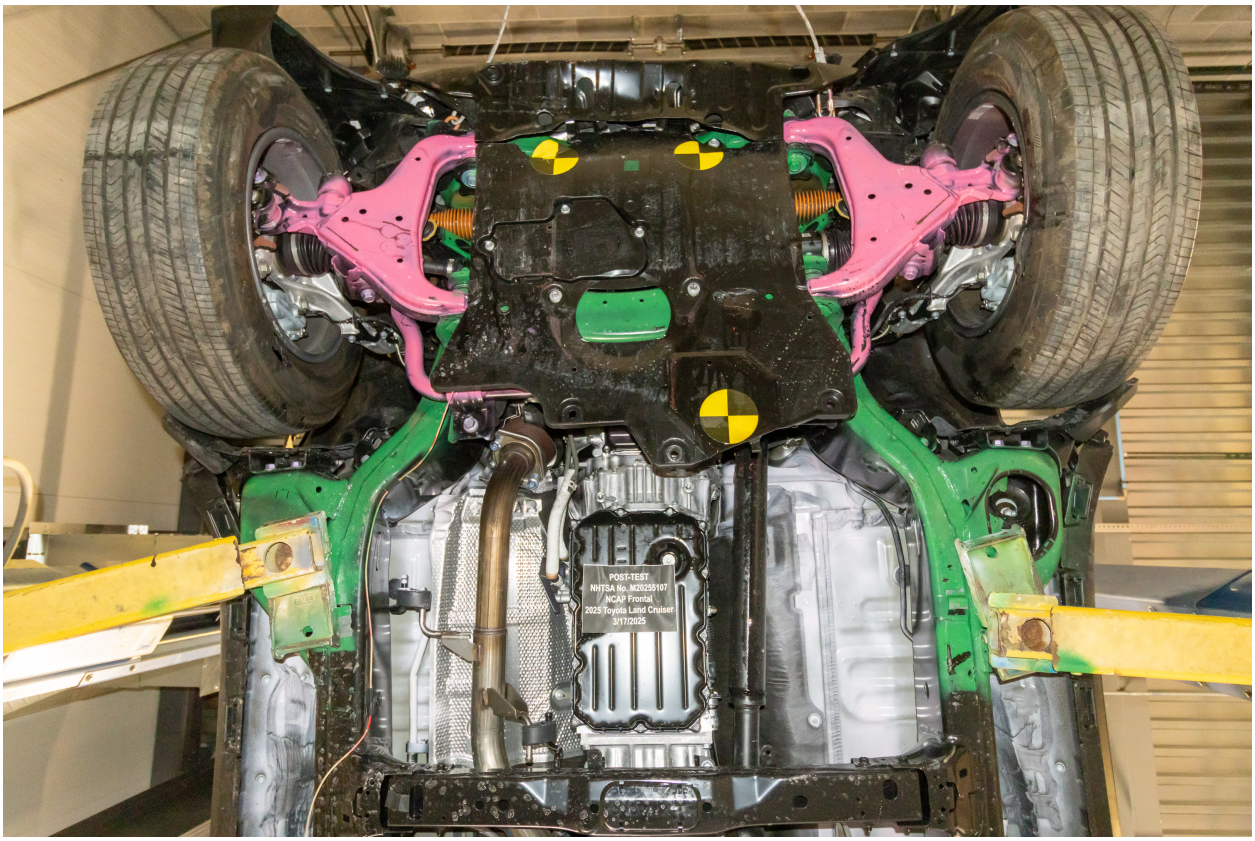


Figure A-25: Post-Test Front Underbody View

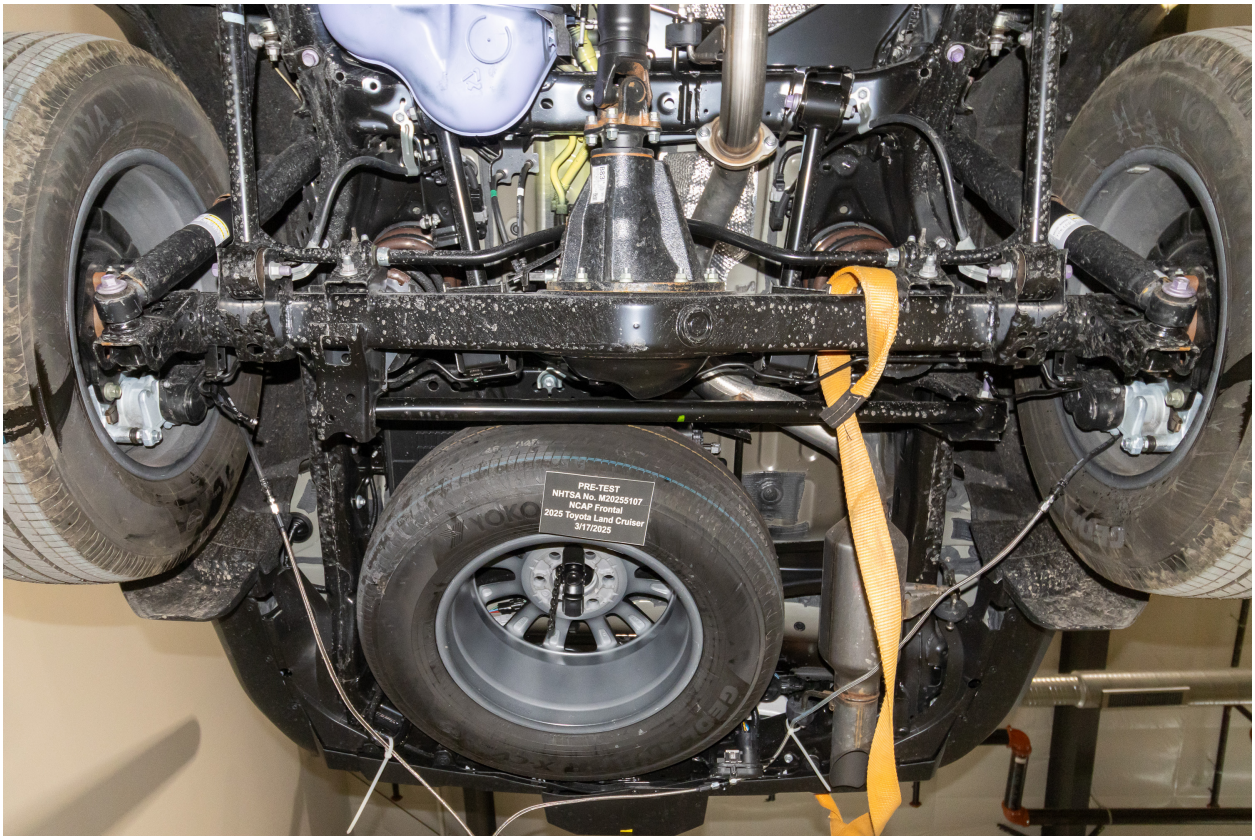


Figure A-26: Pre-Test Rear Underbody View

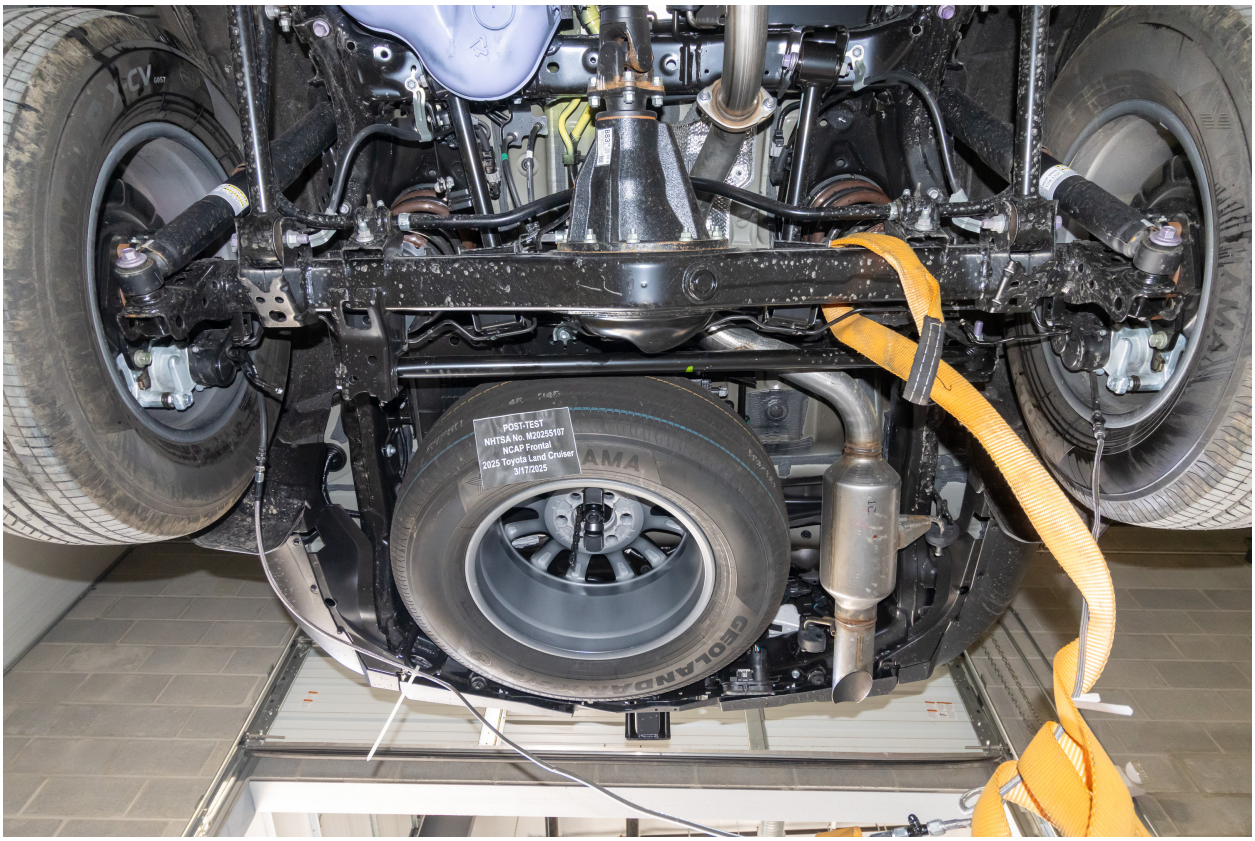


Figure A-27: Post-Test Rear Underbody View



Figure A-28: Pre-Test Dummy Cable Routing

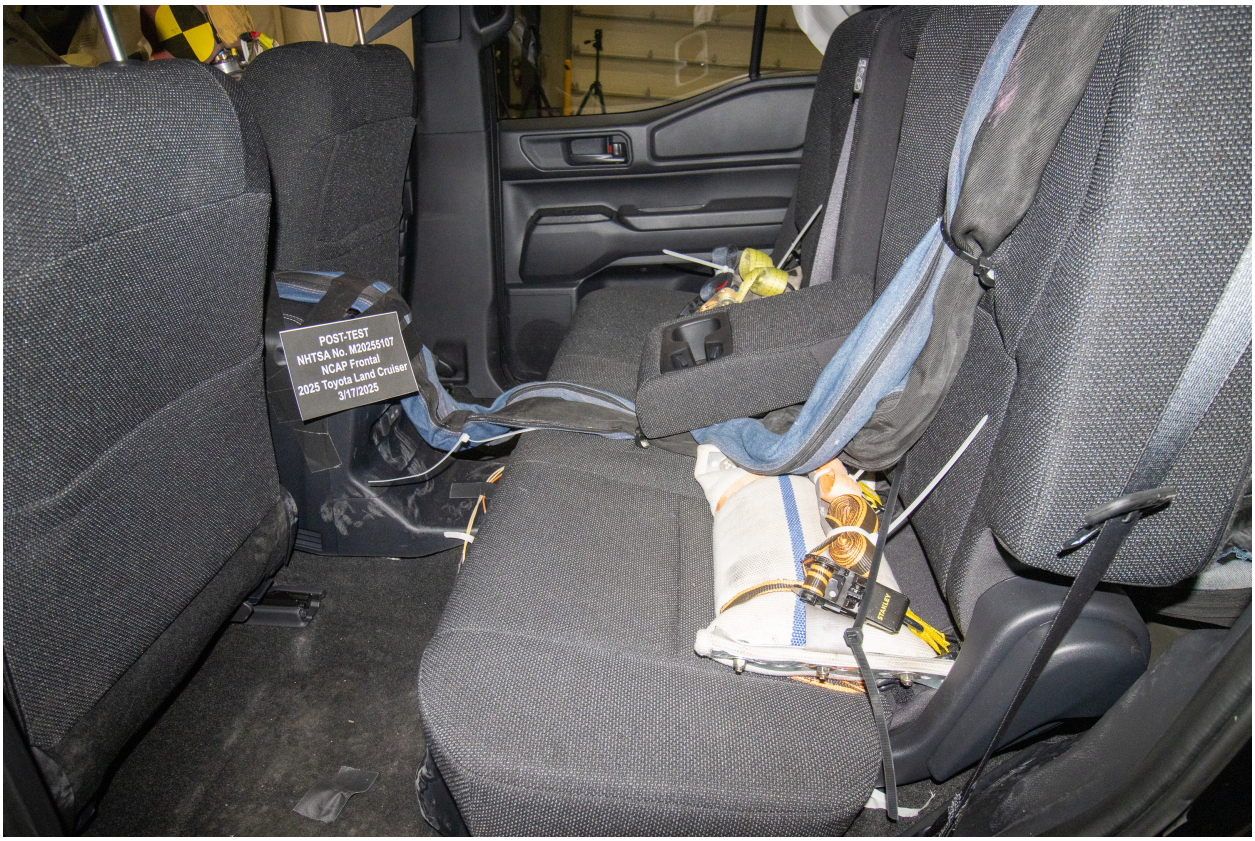


Figure A-29: Post-Test Dummy Cable Routing



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



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



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



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



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



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

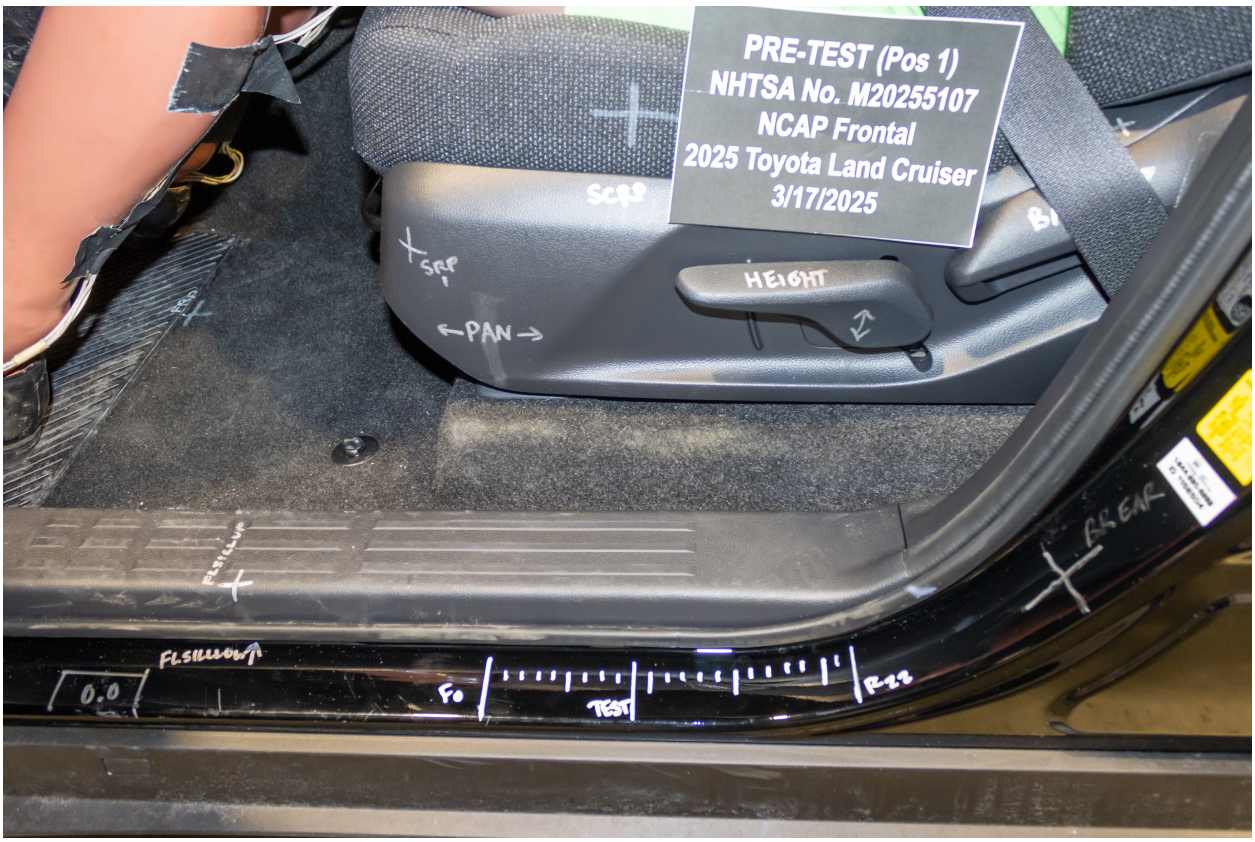


Figure A-36: Pre-Test Driver's Seat Fore-Aft Markings



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



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



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



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



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



Figure A-42: Pre-Test Driver Dummy Feet



Figure A-43: Post-Test Driver Dummy Feet



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



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



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



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

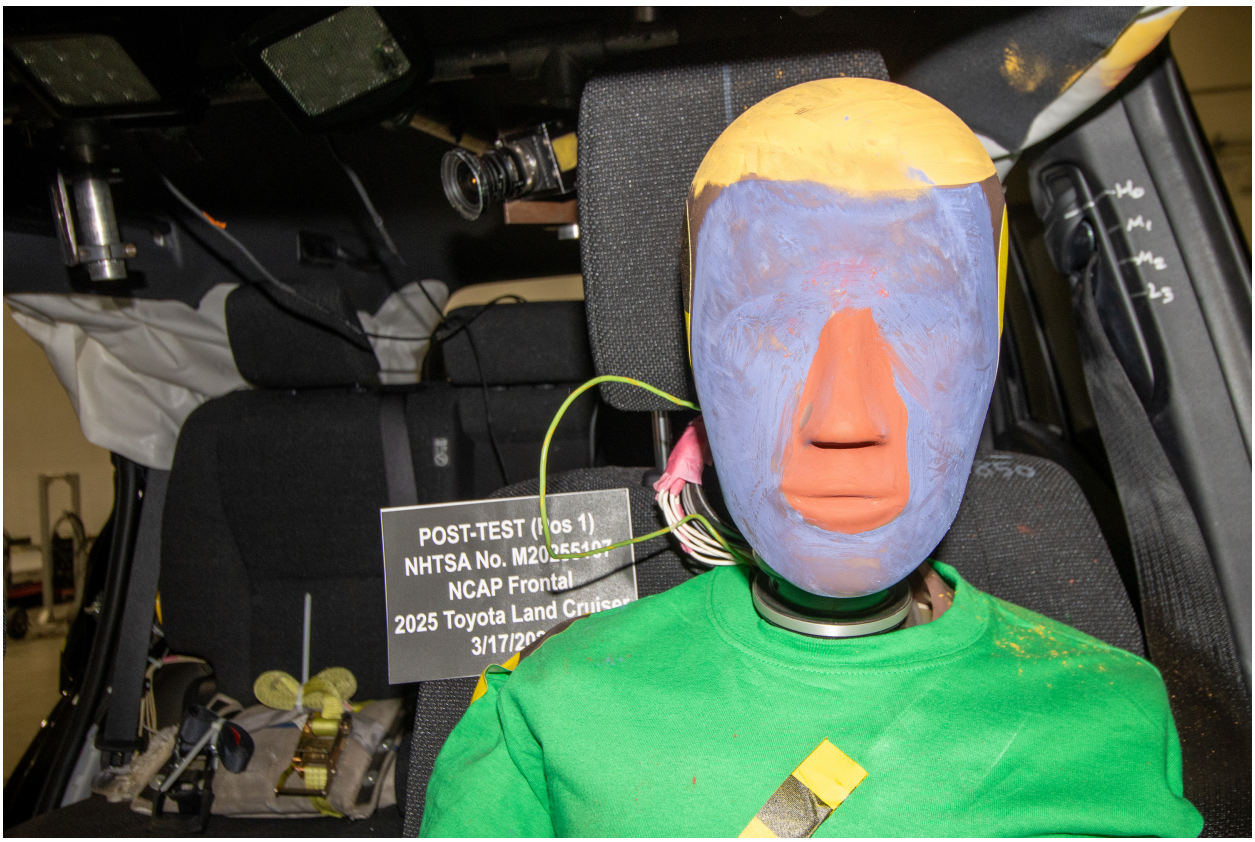


Figure A-48: Post-Test Driver Dummy Face

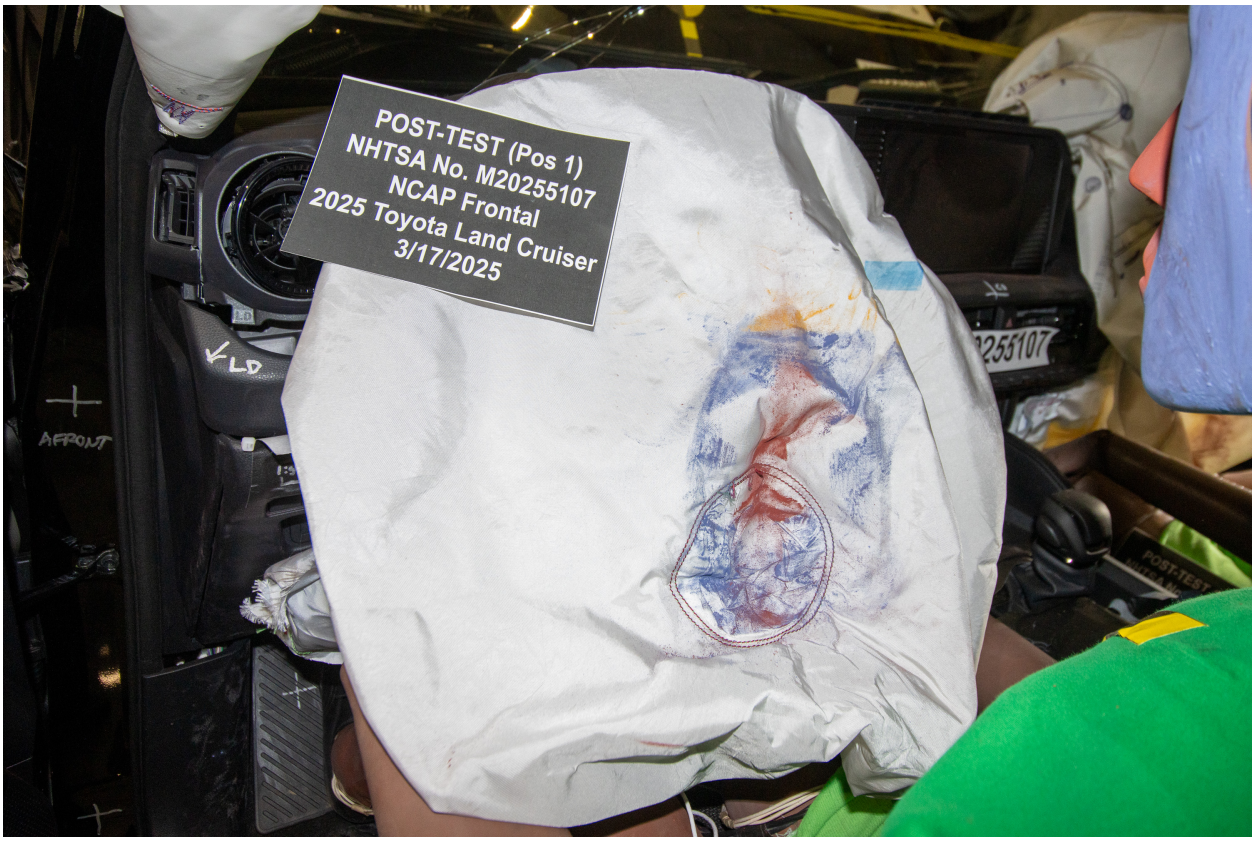


Figure A-49: Post-Test Driver Dummy Contact With Airbag

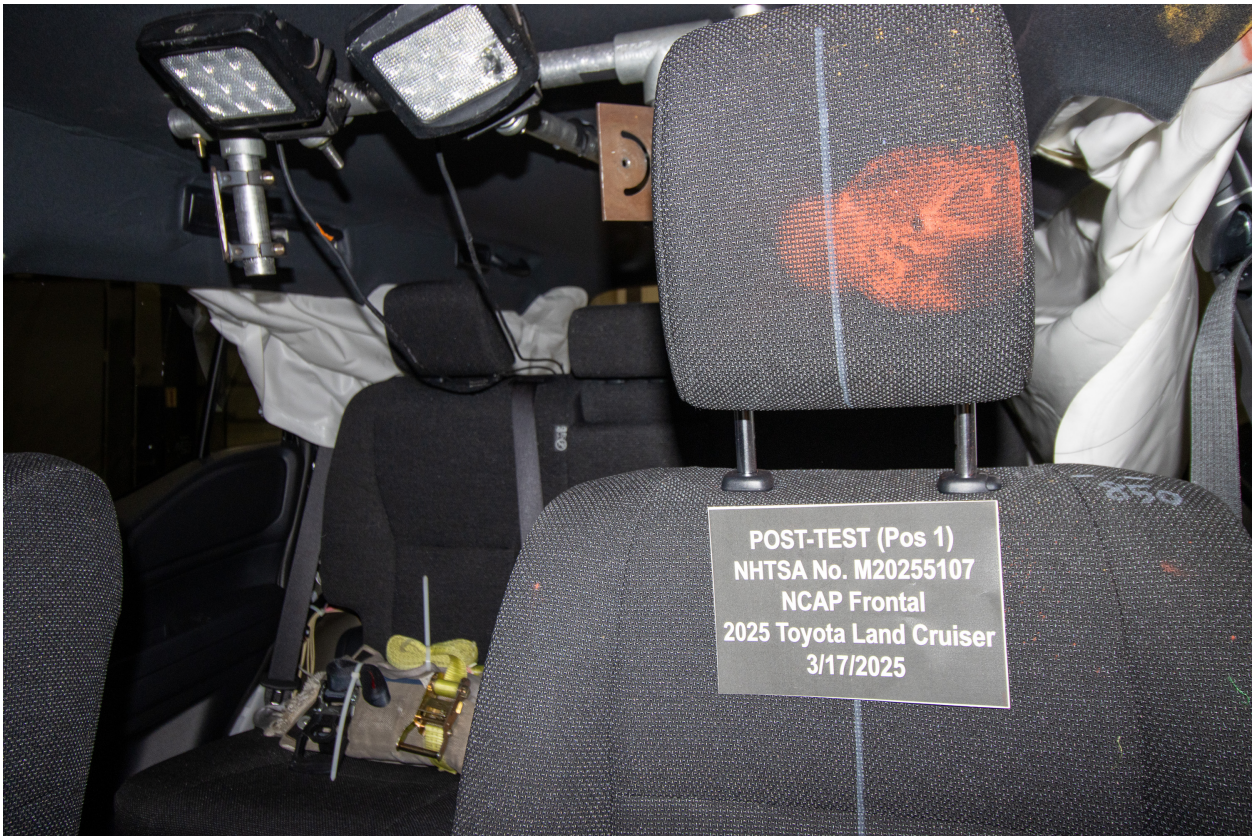


Figure A-50: Post-Test Driver Dummy Contact With Headrest



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



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



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

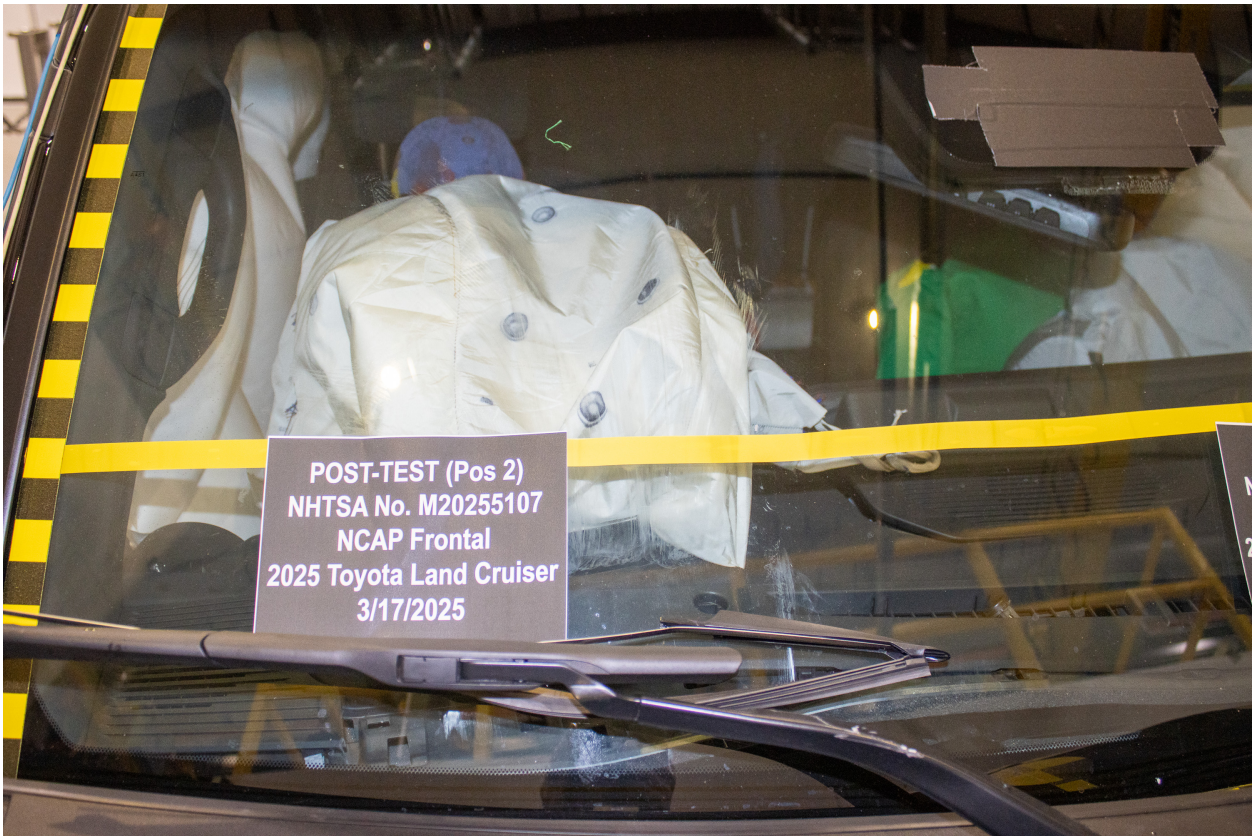


Figure A-54: Post-Test Passenger Dummy Front View



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



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



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



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



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



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



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



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



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



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



Figure A-65: Pre-Test Passenger Dummy Feet



Figure A-66: Post-Test Passenger Dummy Feet



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



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



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



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



Figure A-71: Post-Test Passenger Dummy Face



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



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

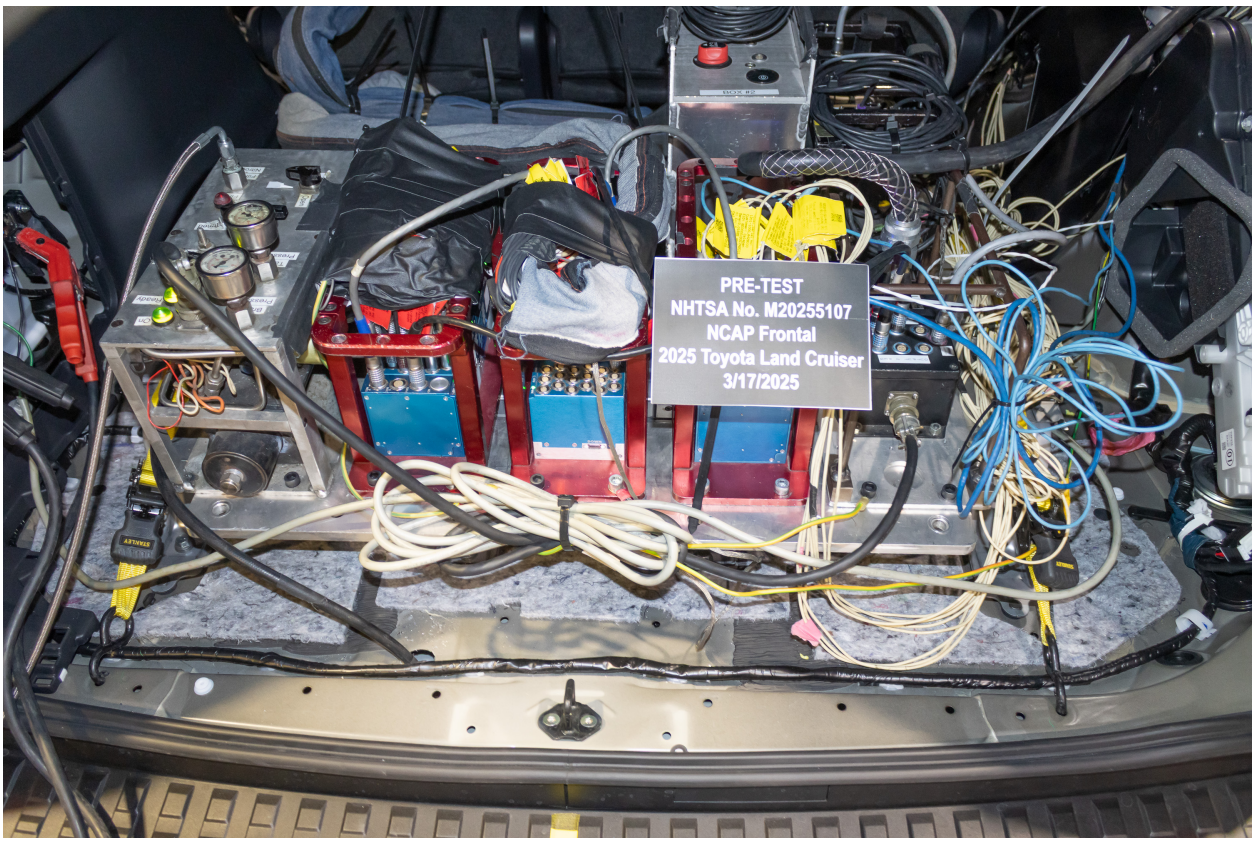


Figure A-74: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

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



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



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

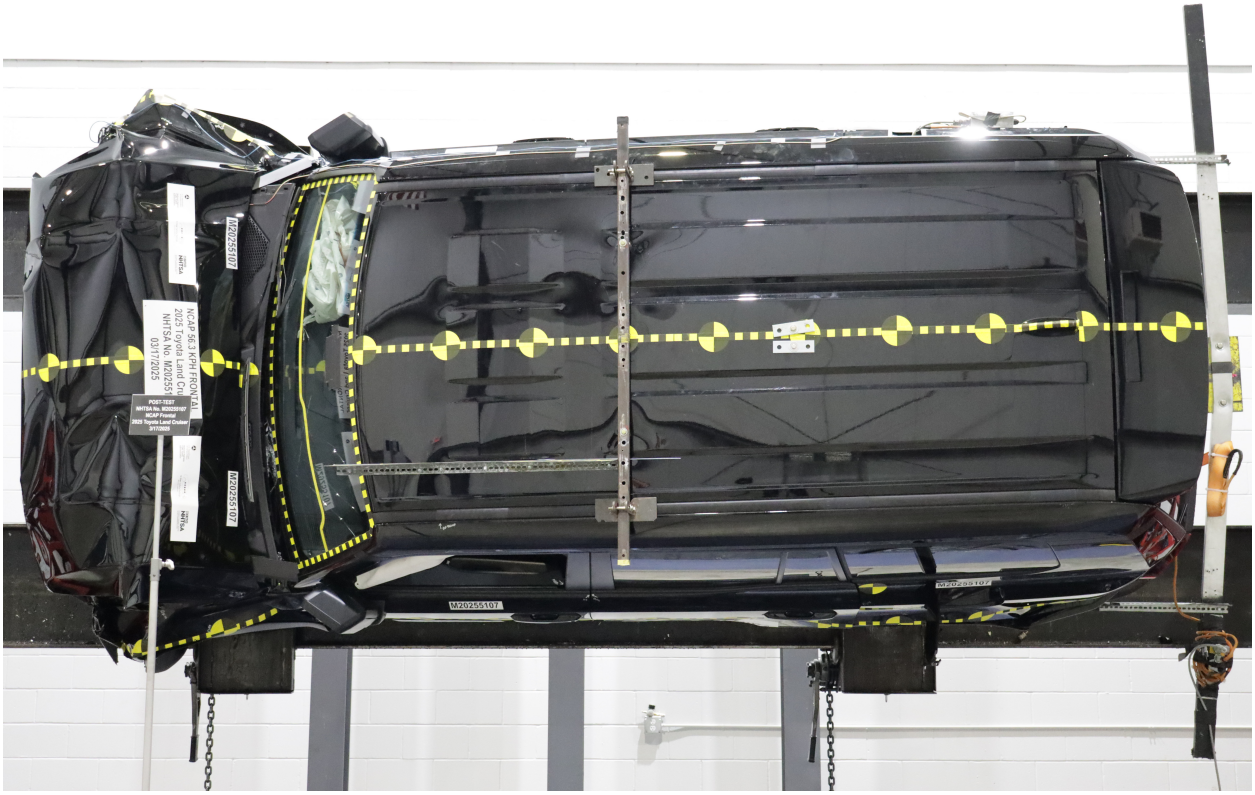


Figure A-78: Vehicle at 90º on Static Rollover Device

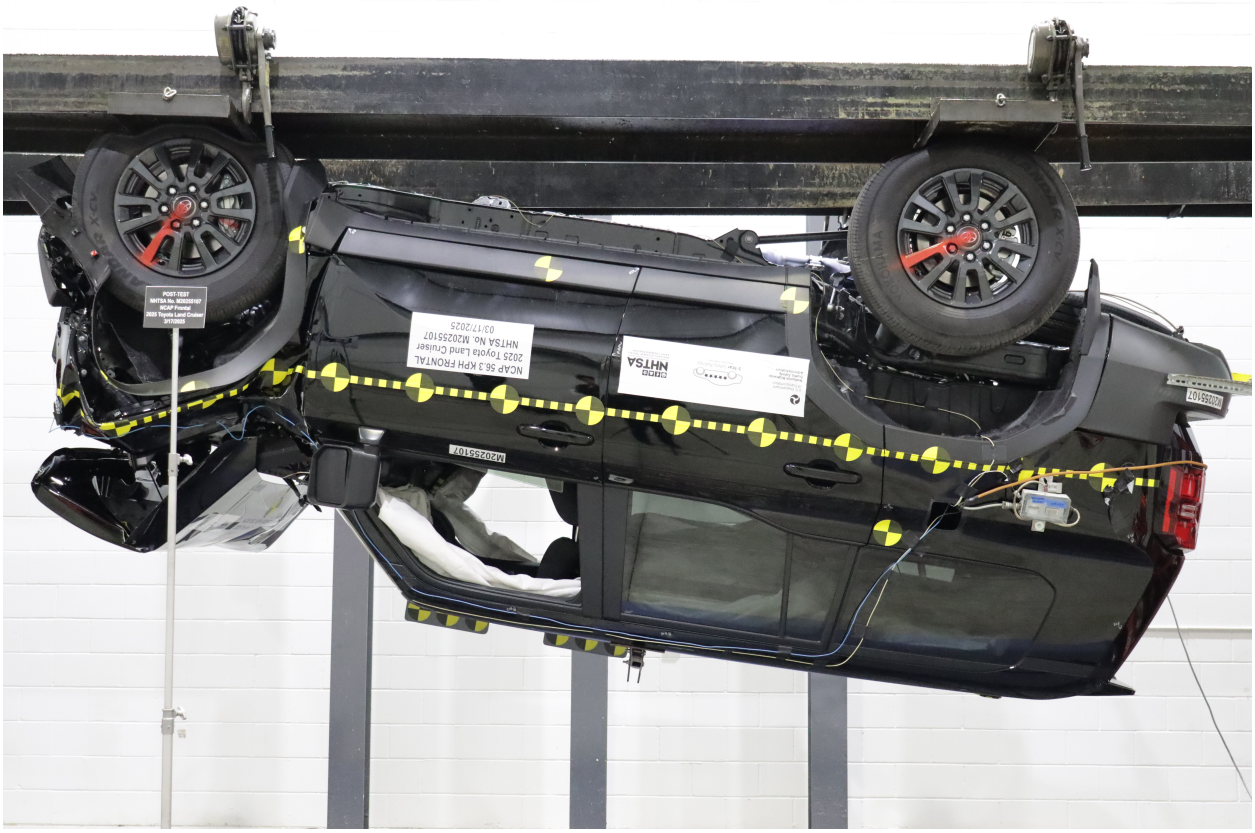


Figure A-79: Vehicle at 180º on Static Rollover Device

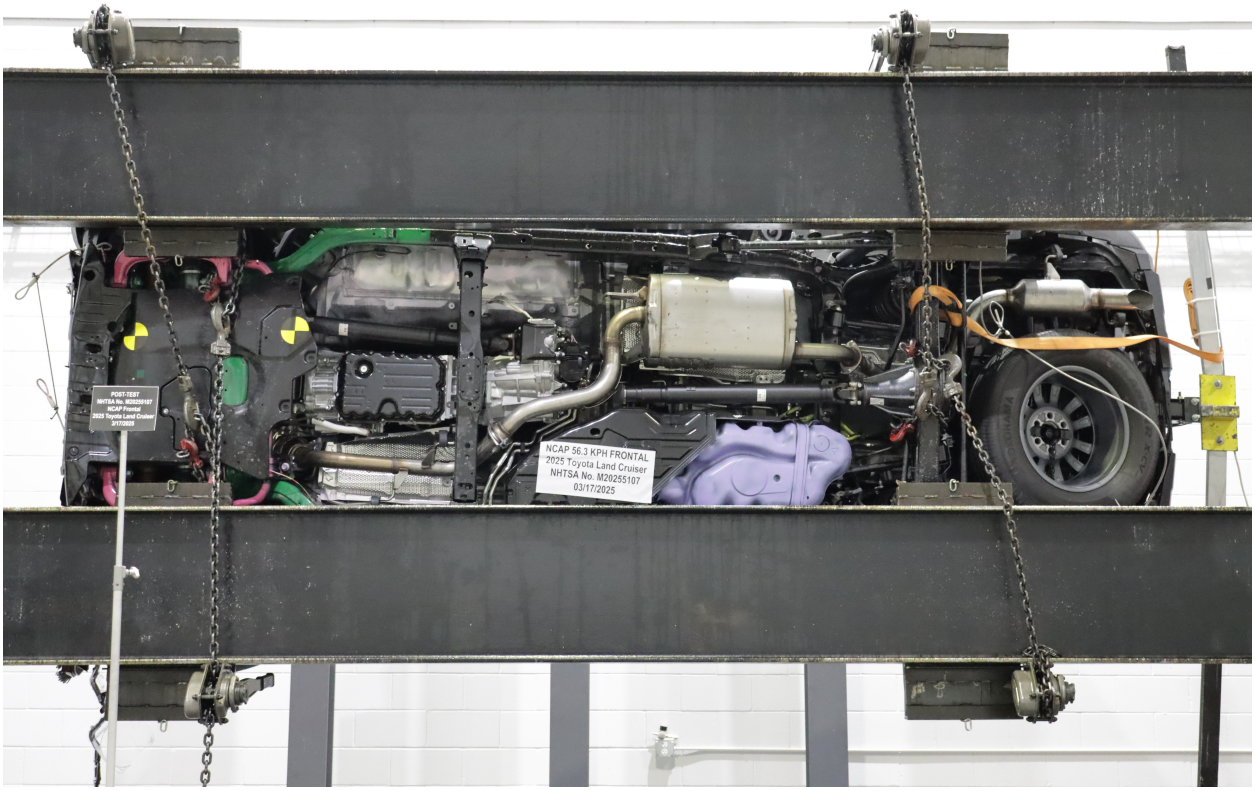


Figure A-80: Vehicle at 270º on Static Rollover Device



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

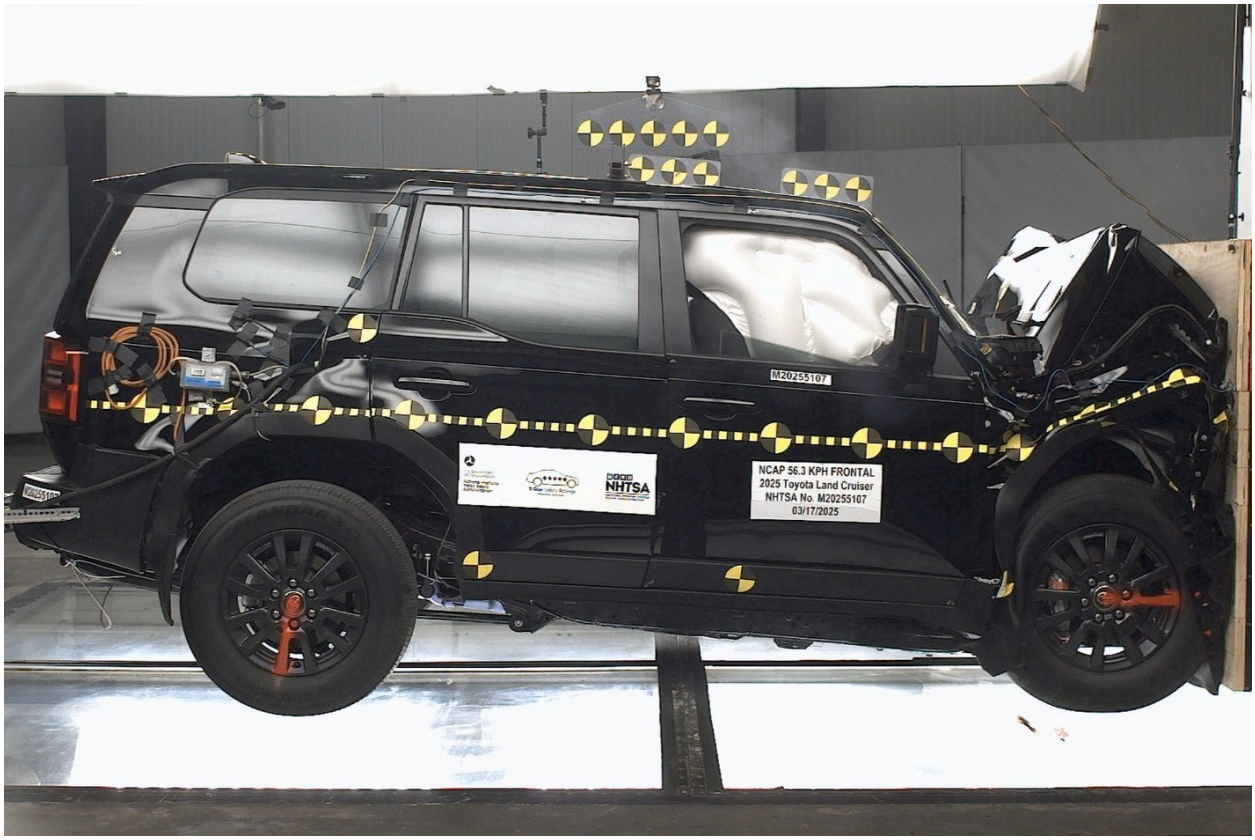


Figure A-82: 2025 Toyota Land Cruiser Frontal Impact Event

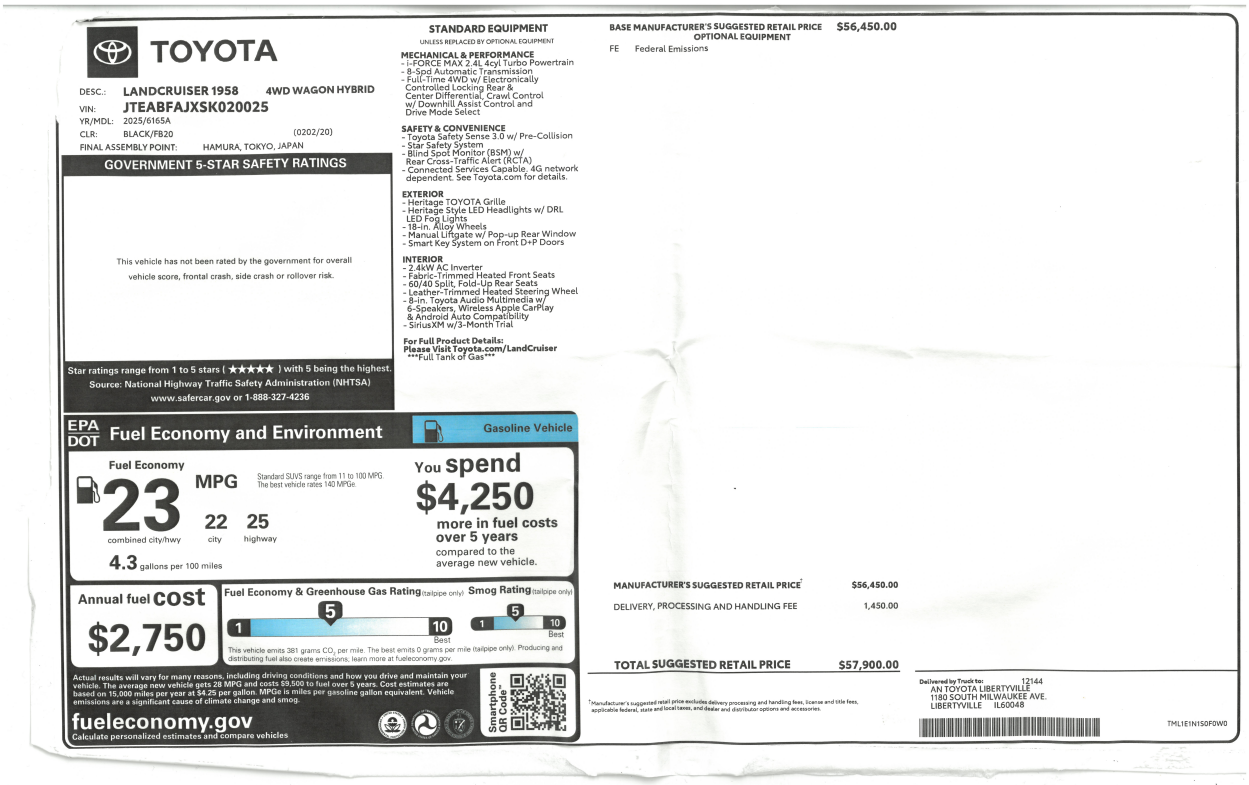


Figure A-83: Monroney Label Photograph



Figure 305-1: Auxiliary Power Module Warning Label

Photo Not Applicable

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

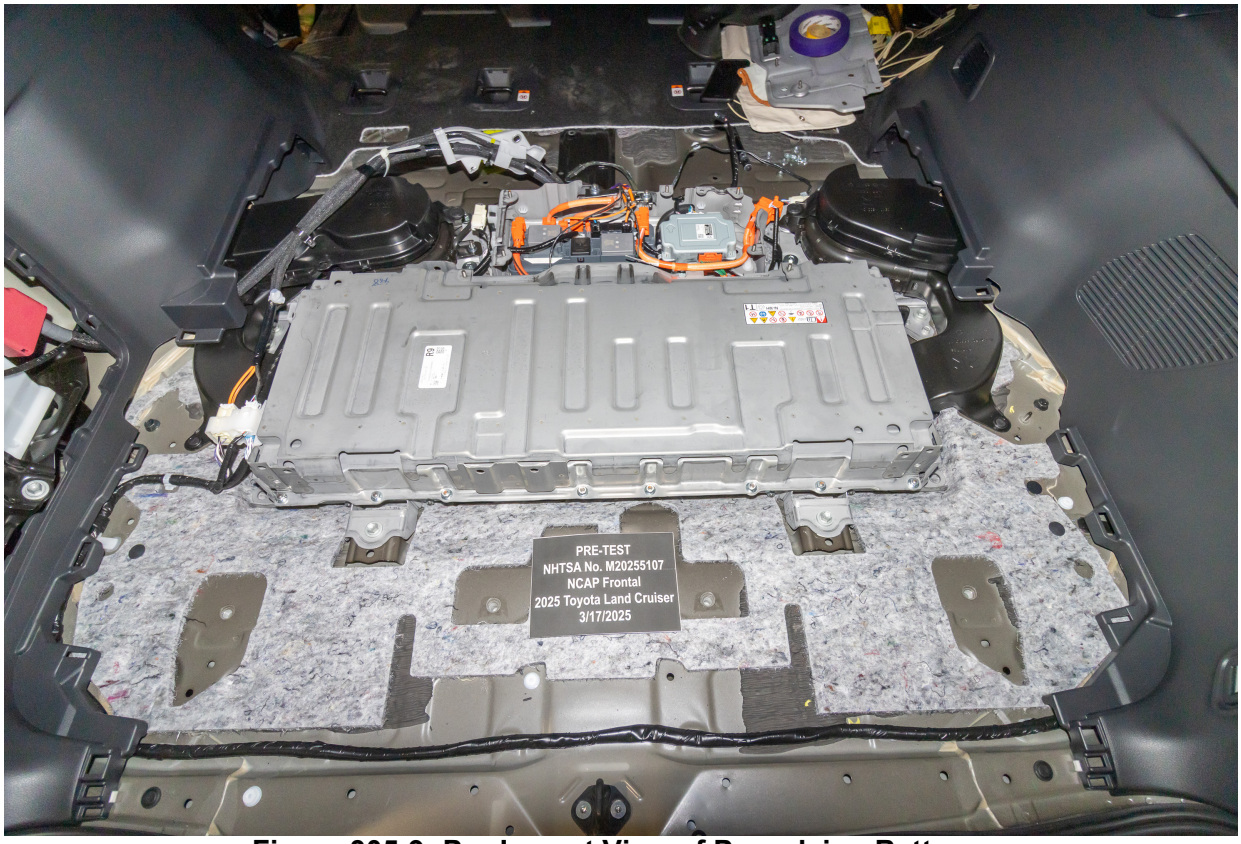


Figure 305-9: Pre-Impact View of Propulsion Battery

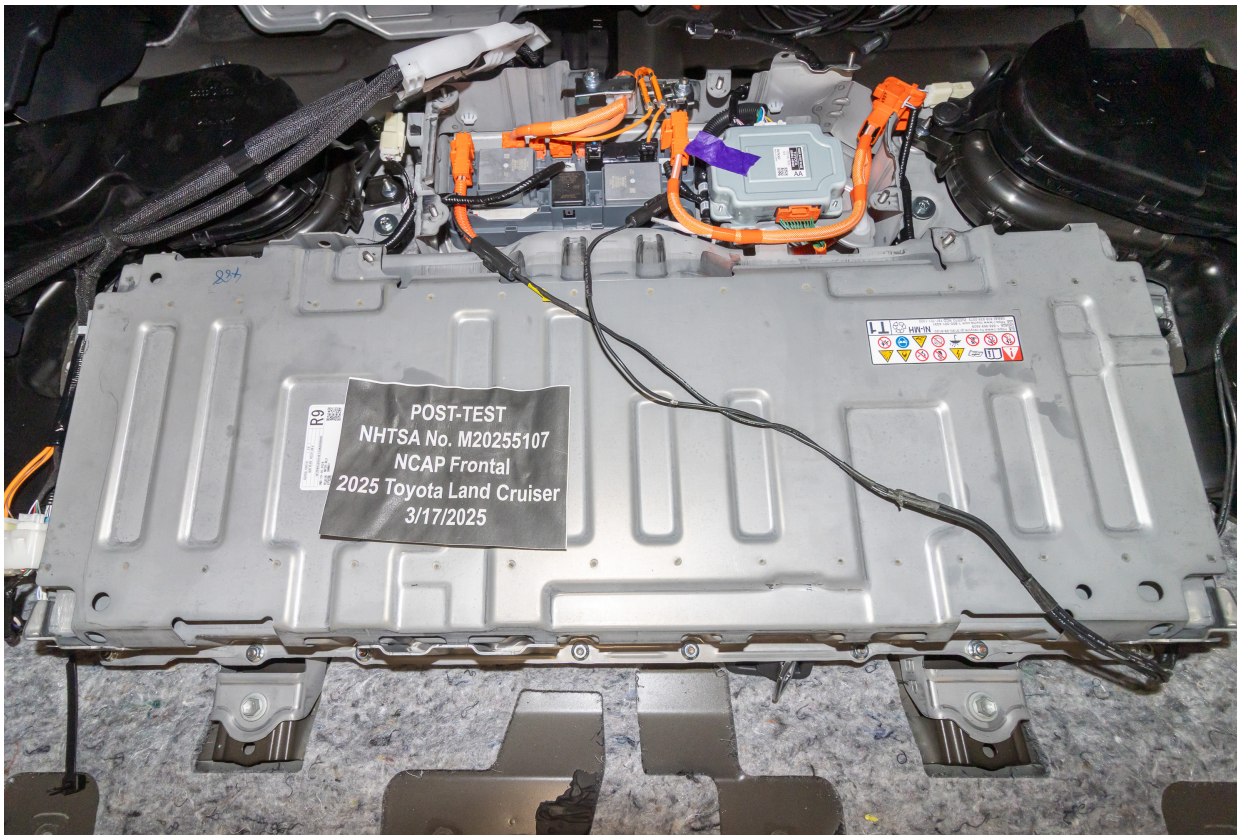


Figure 305-10: Post-Impact Front View of Propulsion Battery

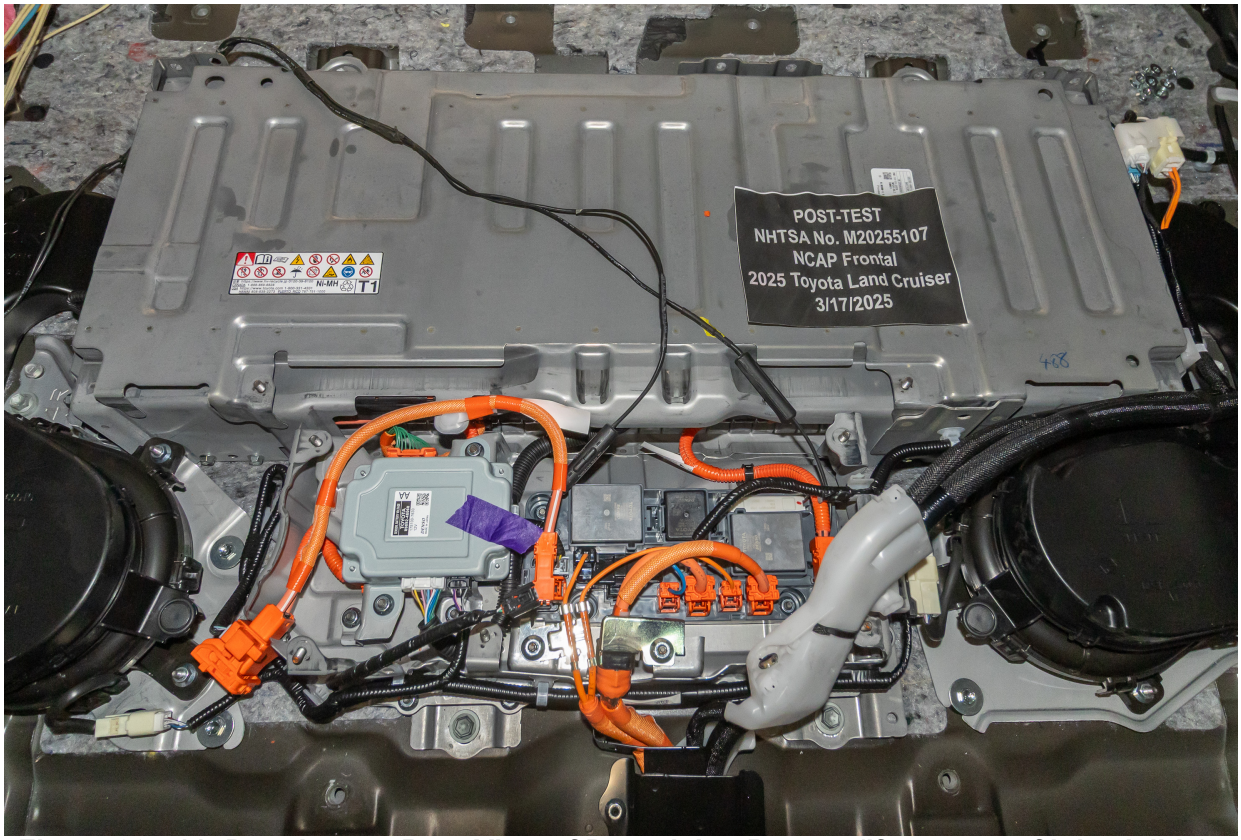


Figure 305-11: Post-Impact Rear View of Propulsion Battery (if any part of it is visible)



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

Photo Not Applicable

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

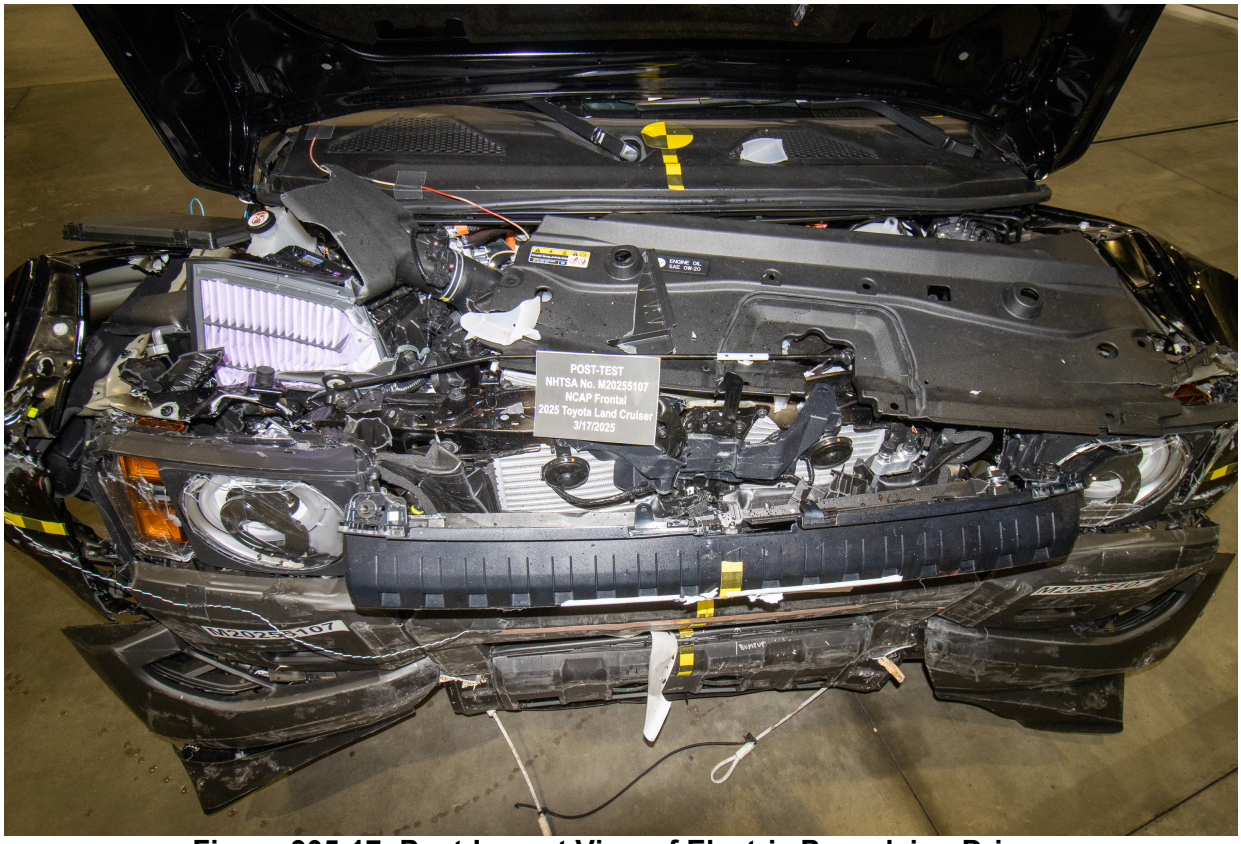


Figure 305-17: Post-Impact View of Electric Propulsion Drive

Photo Not Applicable

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

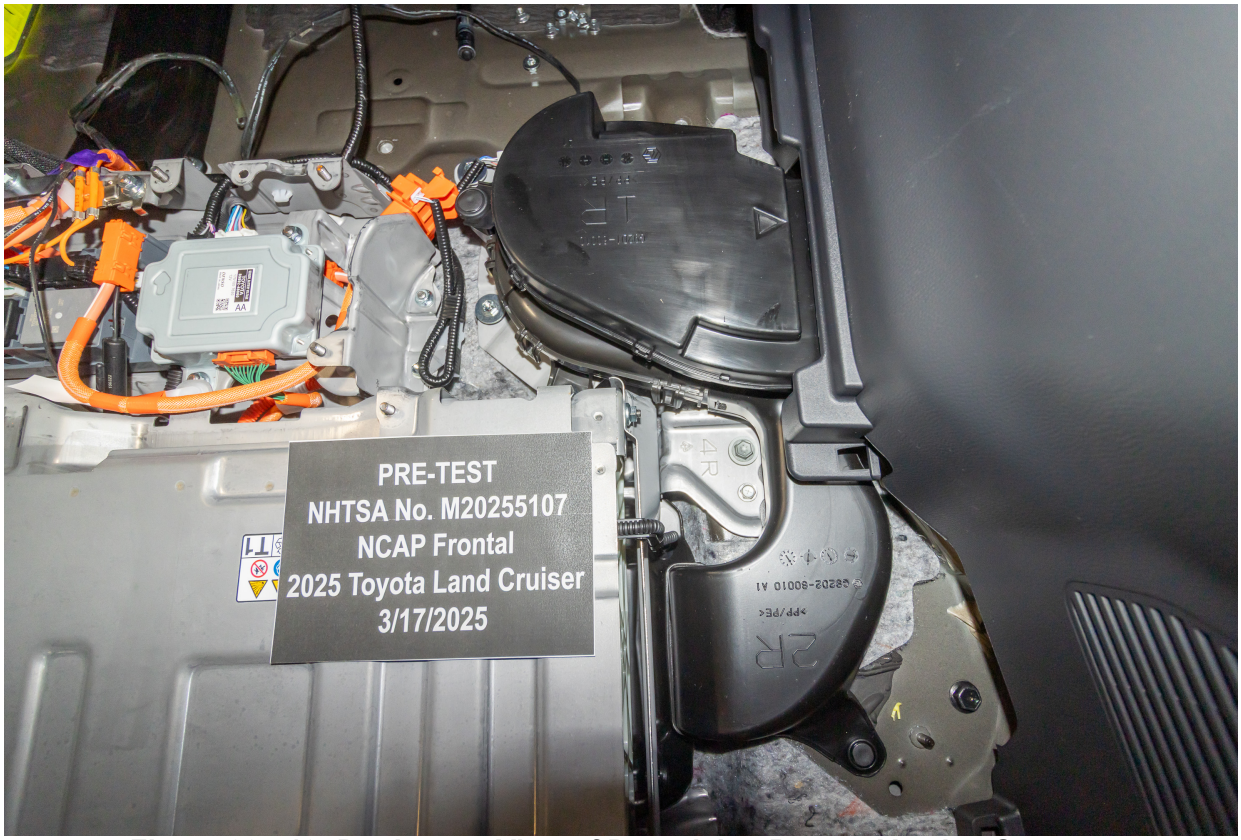


Figure 305-19: Pre-Impact View of Propulsion Battery Venting System

Photo Not Applicable

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



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

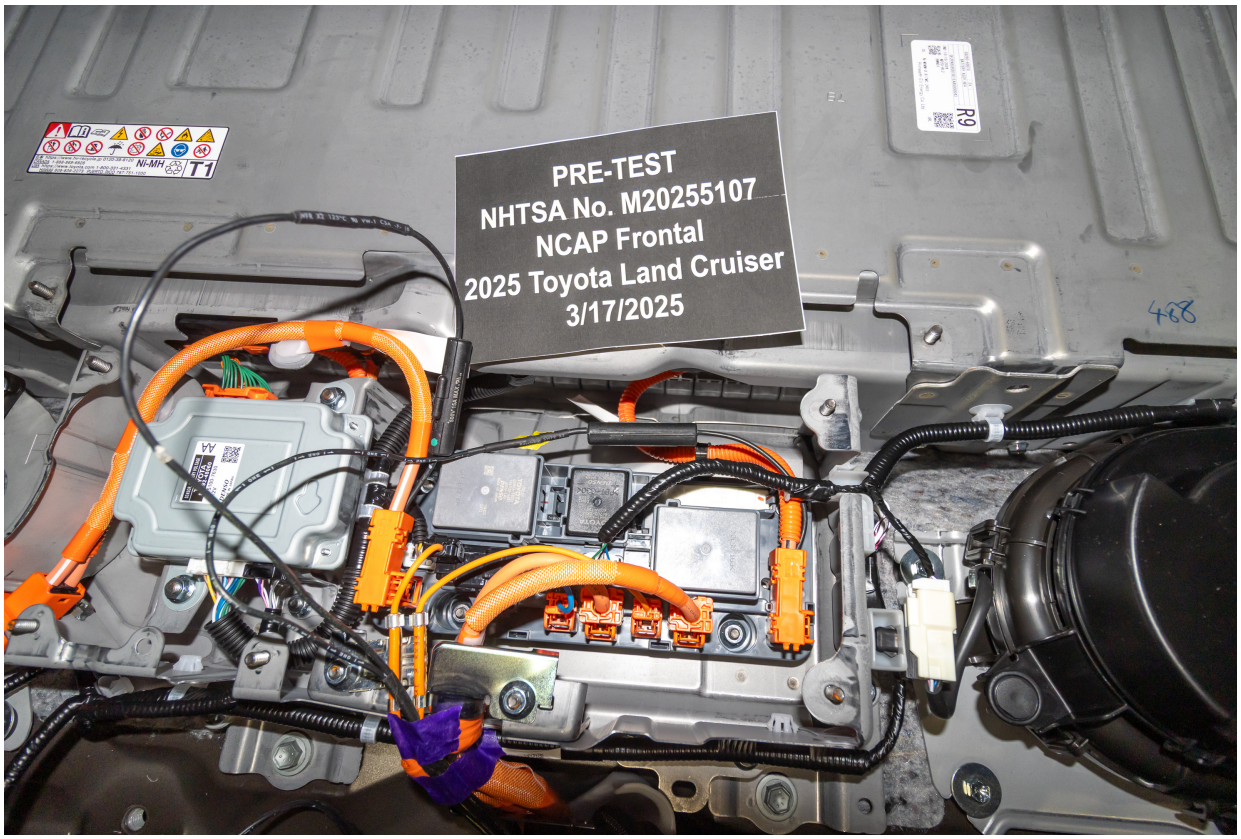


Figure 305-22: Pre-Impact View of High Voltage Leads Attached



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



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



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



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

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

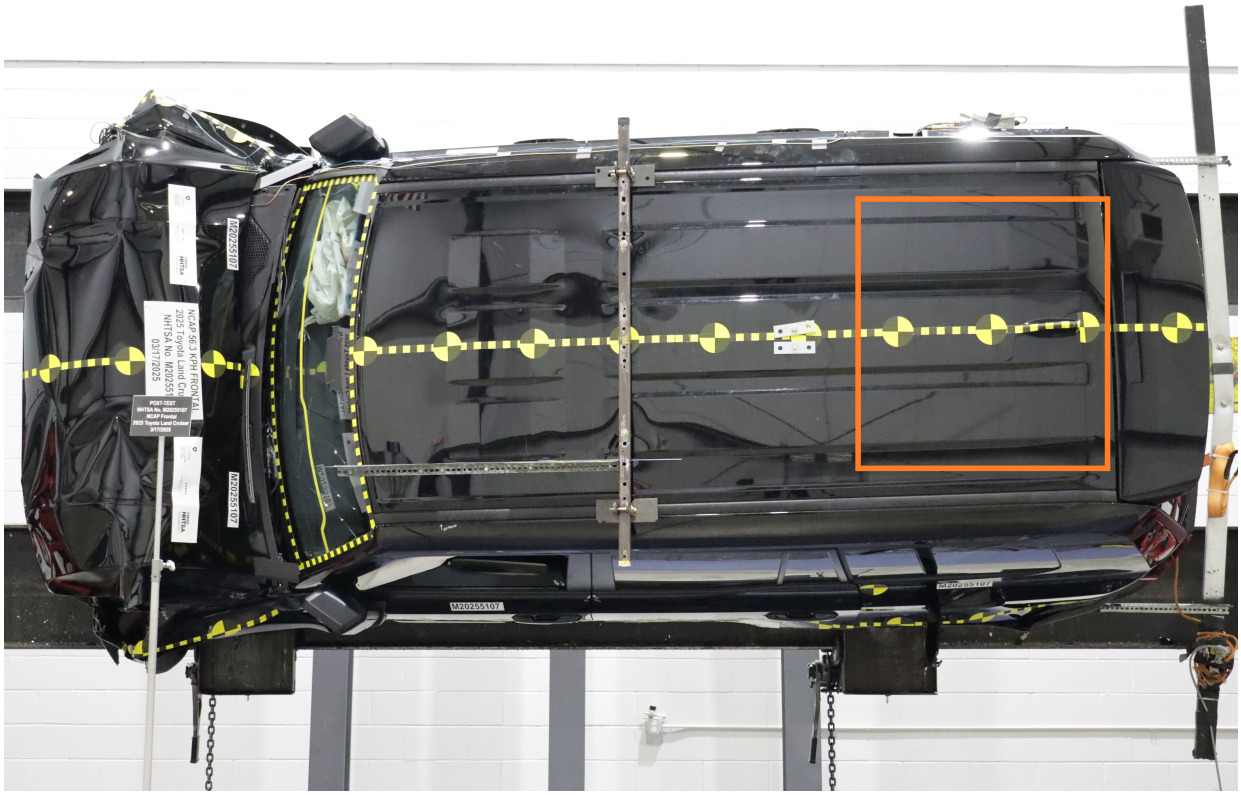


Figure 305-28: FMVSS No. 305 Static Rollover 90 Degrees

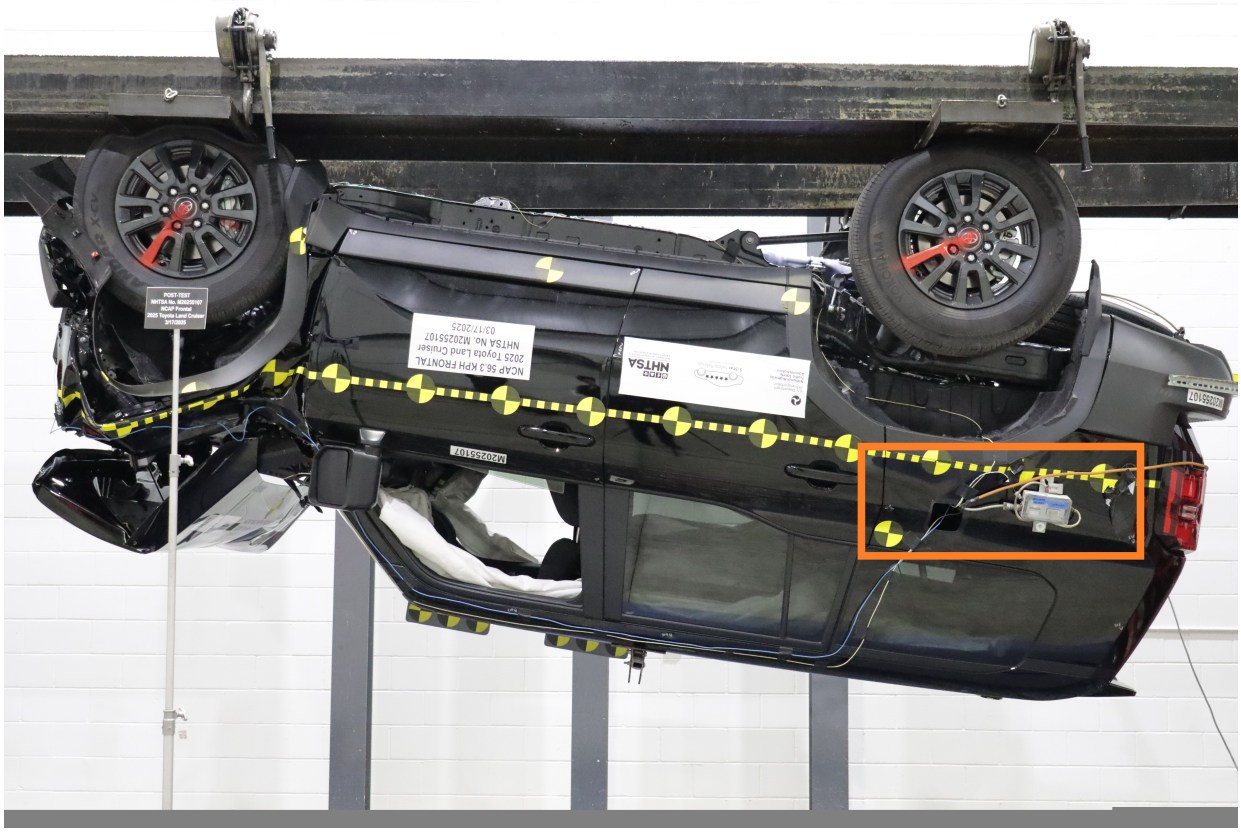


Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees

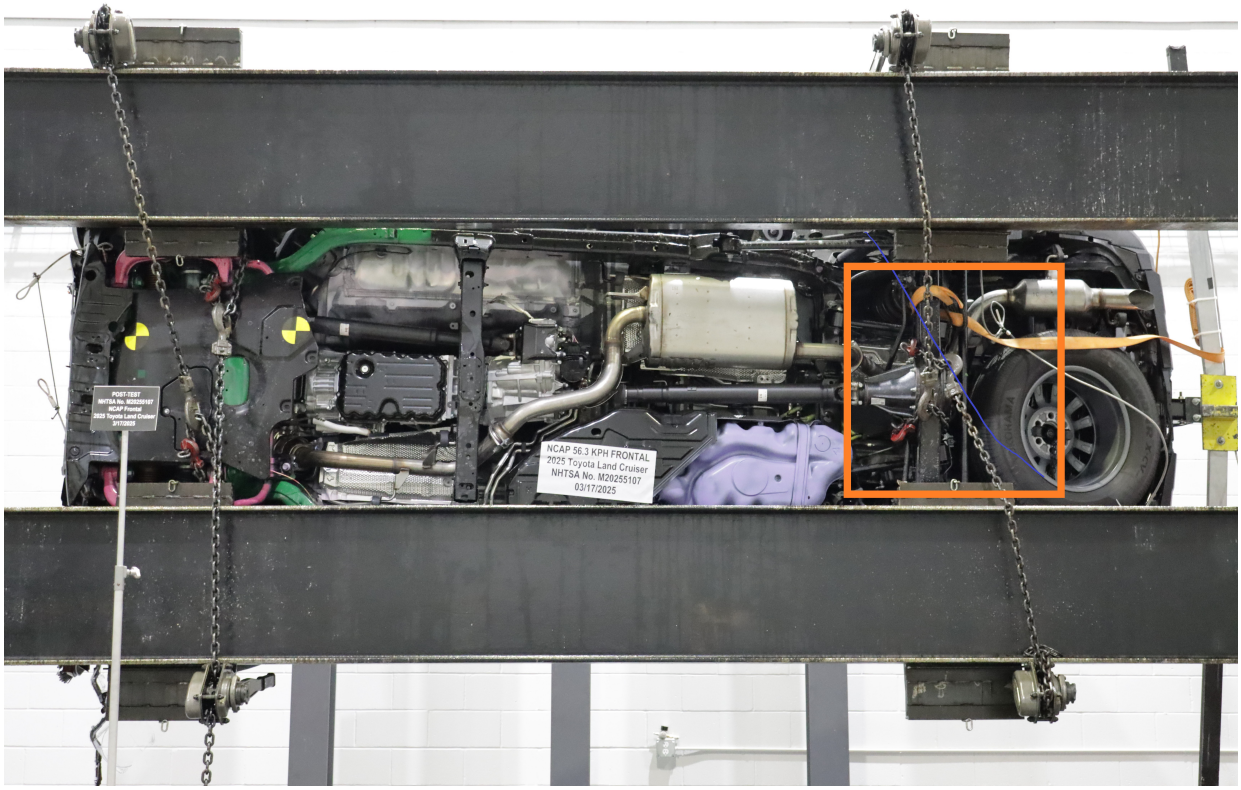


Figure 305-30: FMVSS No. 305 Static Rollover 270 Degrees

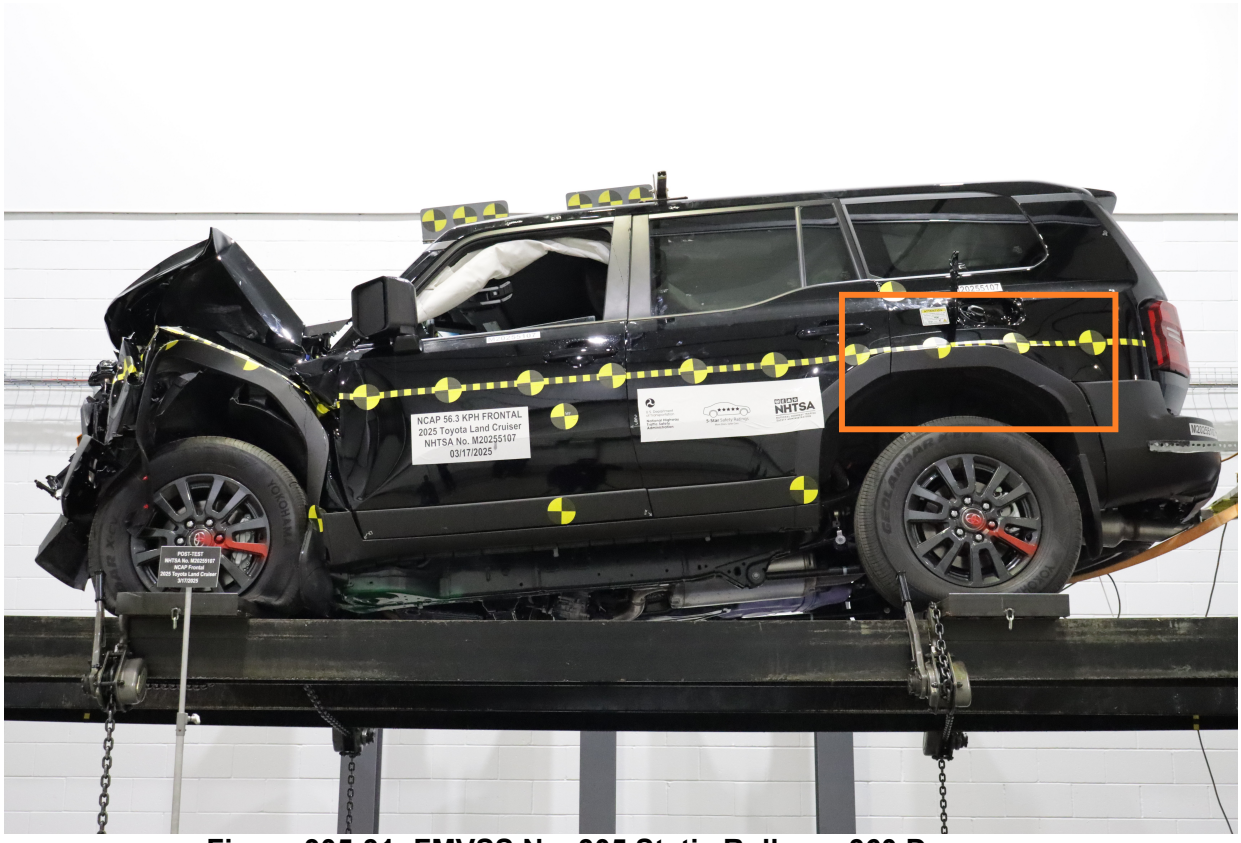


Figure 305-31: FMVSS No. 305 Static Rollover 360 Degrees



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



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

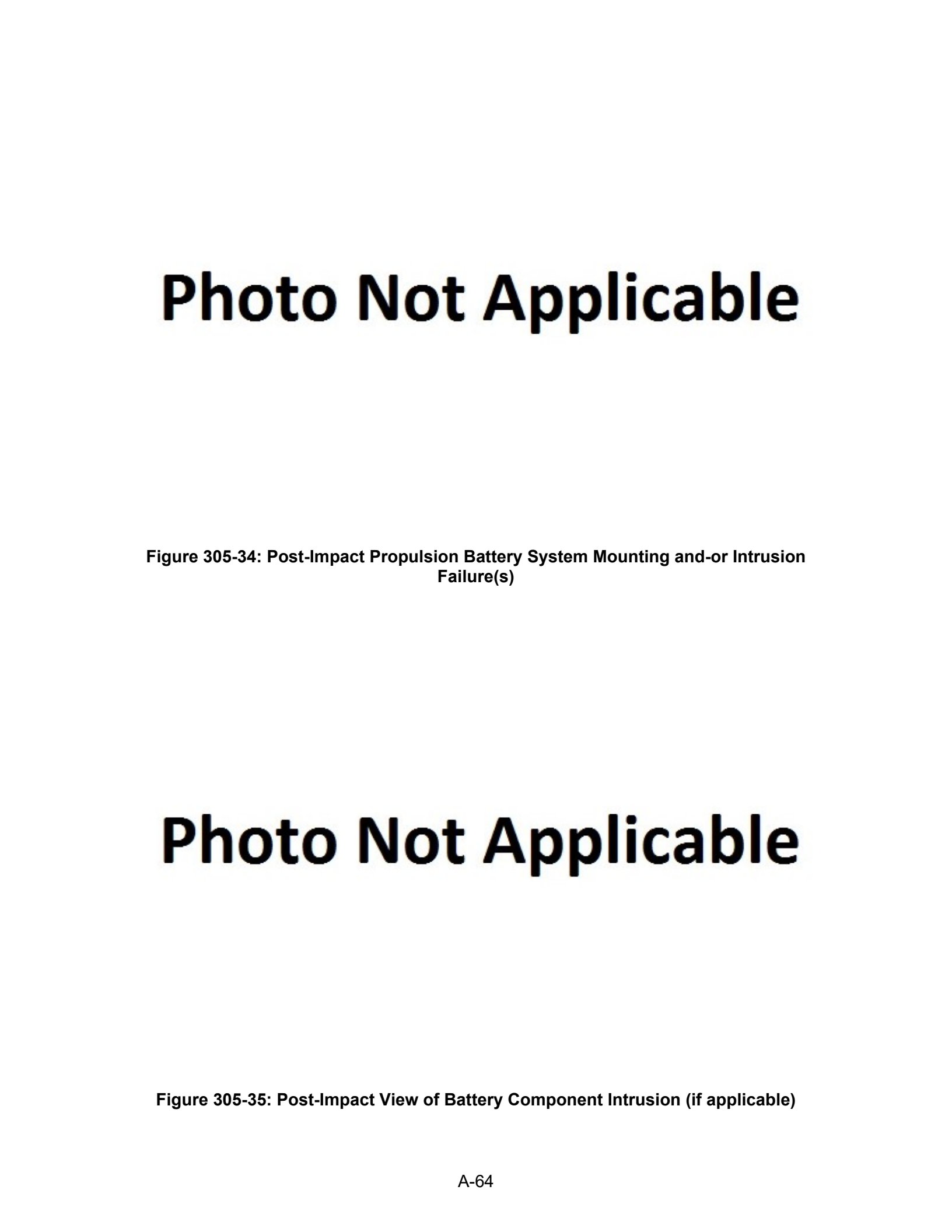


Figure 305-34: Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

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

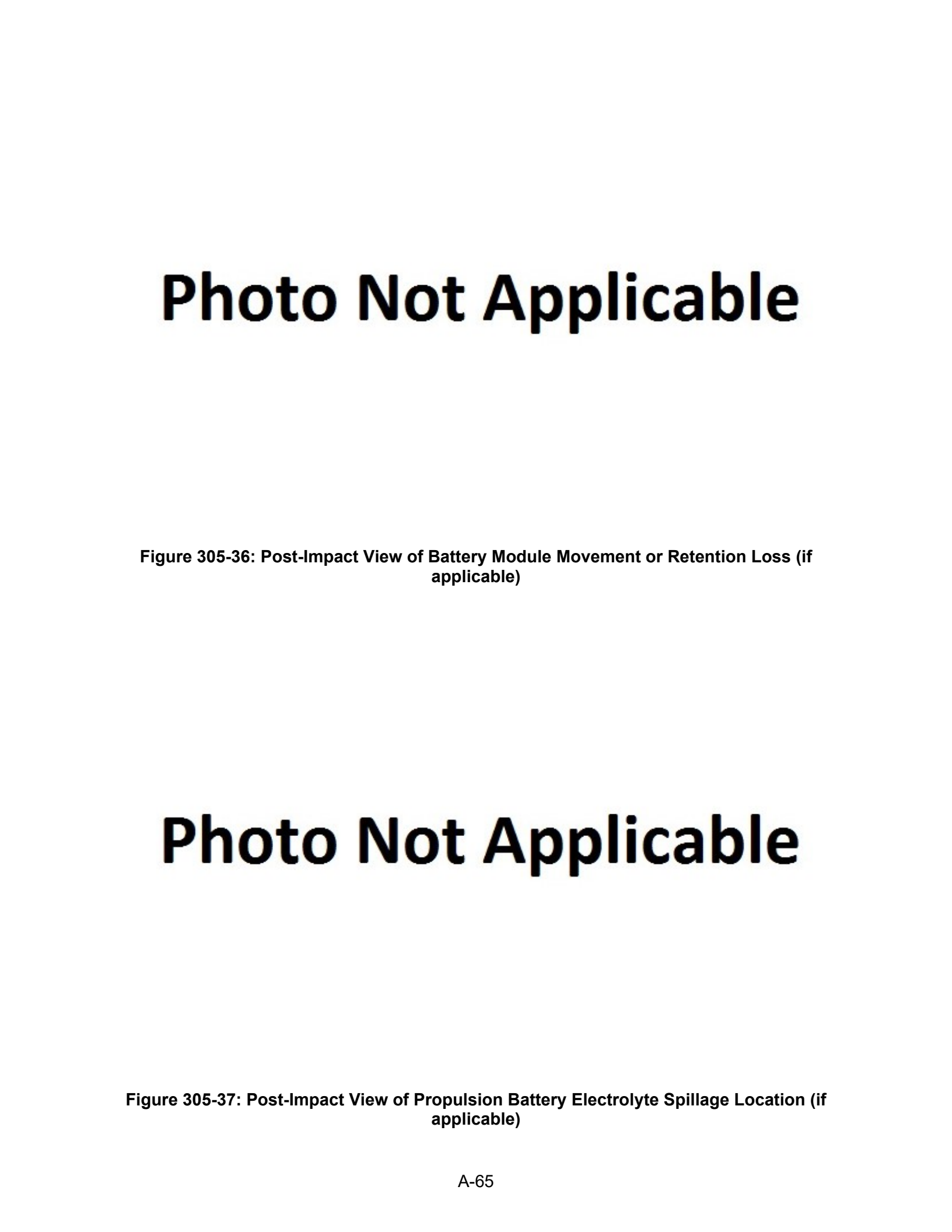


Figure 305-36: Post-Impact View of Battery Module Movement or Retention Loss (if applicable)

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

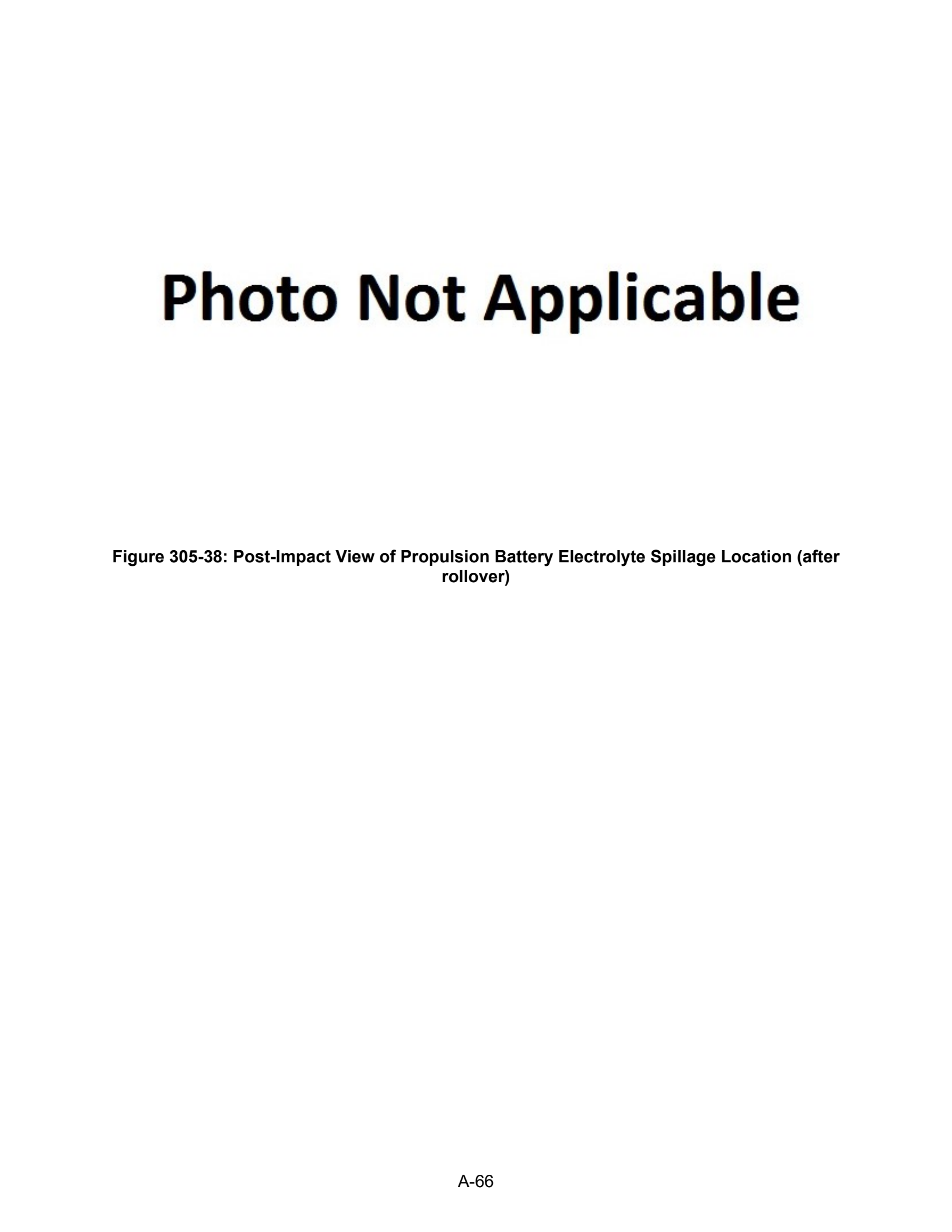


Figure 305-38: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (after rollover)

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA TRACES

Table of Data Plots

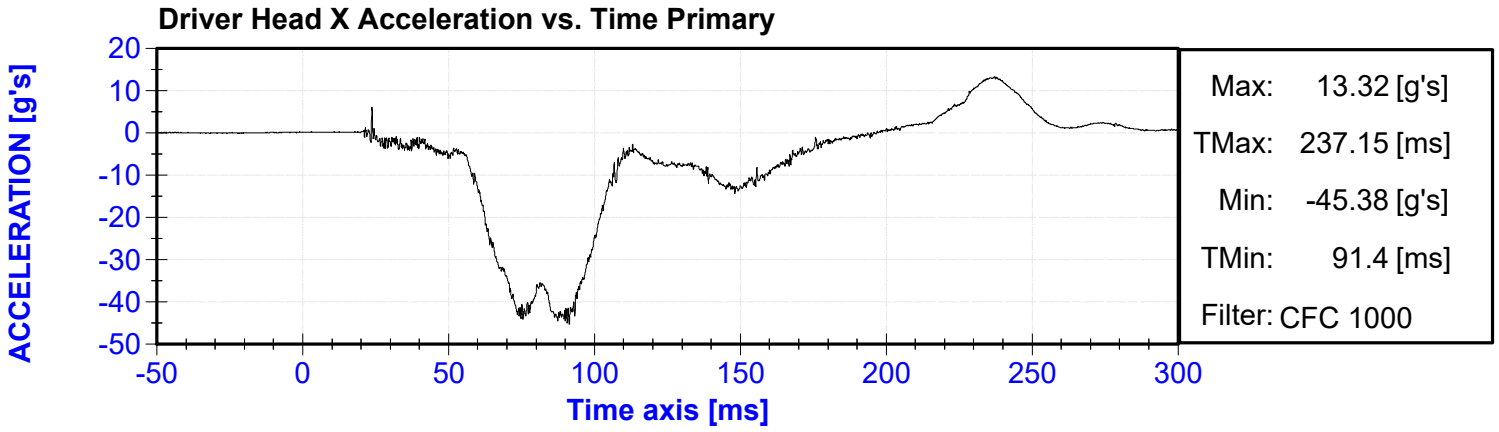
Fig.	Description	Page
Plot 1	Driver Head X Acceleration vs. Time Primary	B-5
Plot 2	Driver Head Y Acceleration vs. Time Primary	B-5
Plot 3	Driver Head Z Acceleration vs. Time Primary	B-5
Plot 4	Driver Head Resultant Acceleration vs. Time Primary	B-5
Plot 5	Driver Chest X Deflection vs. Time	B-6
Plot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

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

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

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

Passenger Right Food Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Shoulder Belt Force
Passenger Lap Belt Force
Passenger Head Angular Velocity X
Passenger Head Angular Velocity Y
Passenger Head Angular Velocity Z
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember X Redundant
Right Rear Seat Crossmember X Redundant
Vehicle Engine Top X
Vehicle Engine Bottom X
Load Cell Barrier Forces and Moments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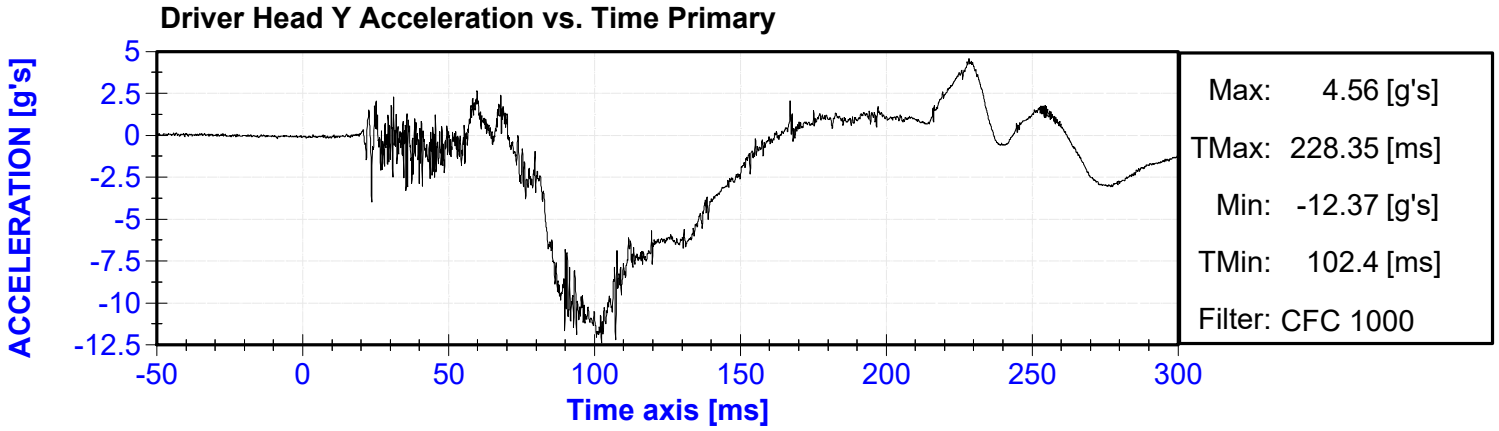
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Time axis [ms]
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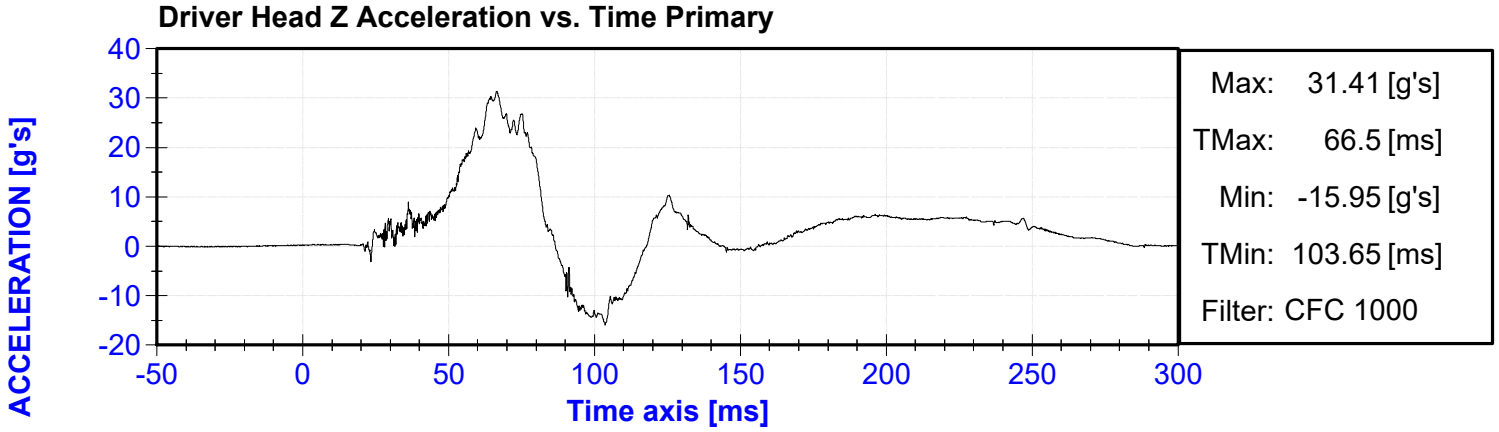
Filter: CFC 1000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Time axis [ms]
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Min: -15.95 [g's]
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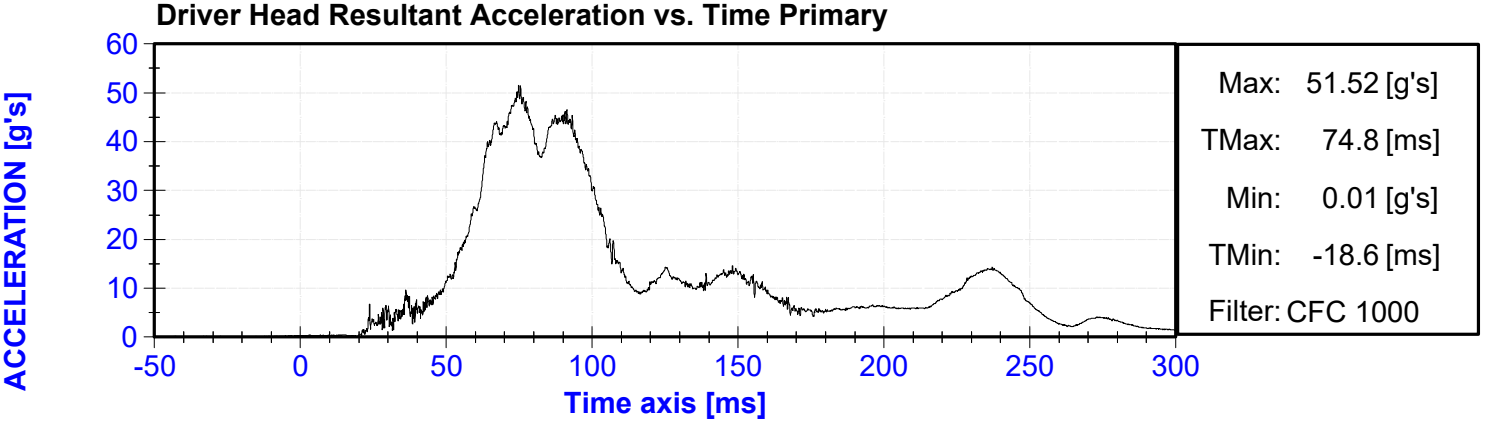
Filter: CFC 1000


Driver Head Resultant Acceleration vs. Time Primary
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Time axis [ms]
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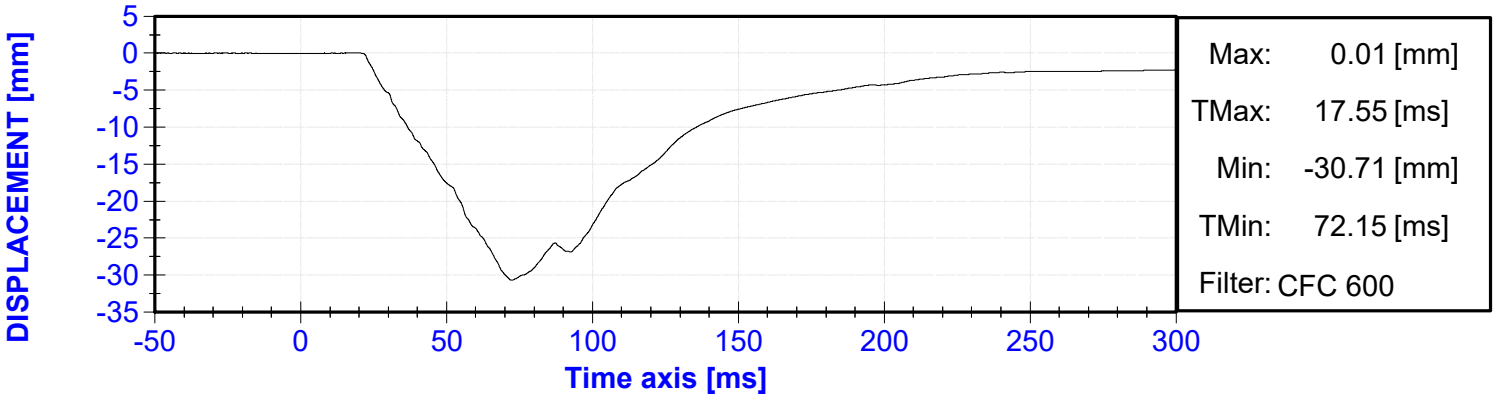
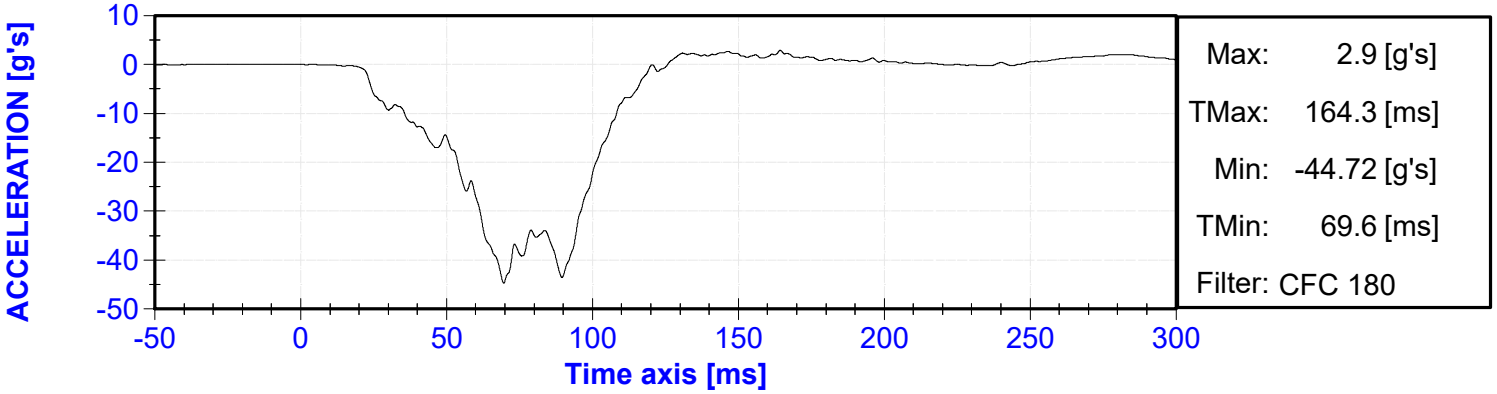
Filter: CFC 1000

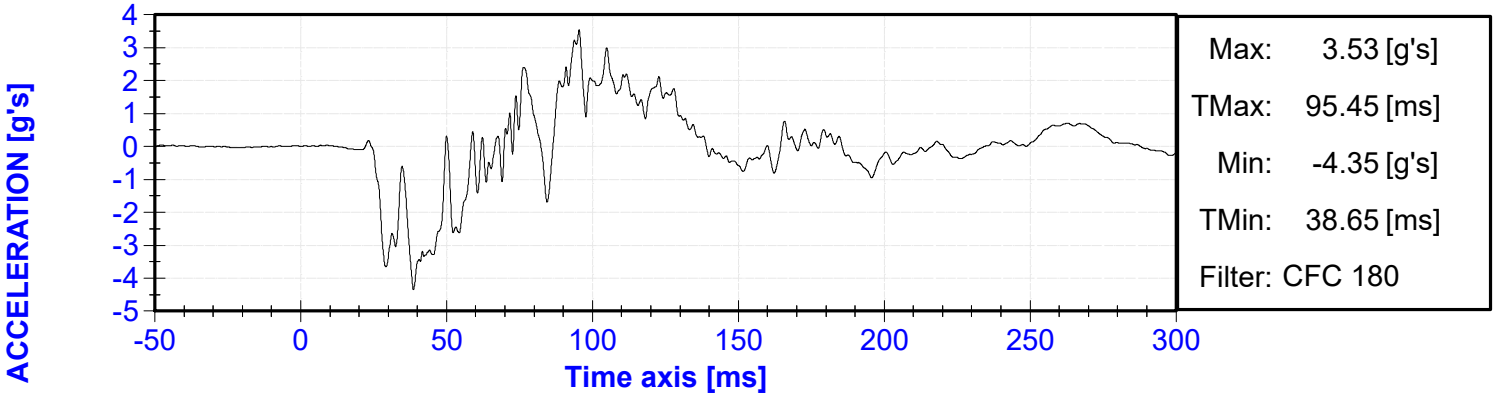
Driver Chest X Deflection vs. Time



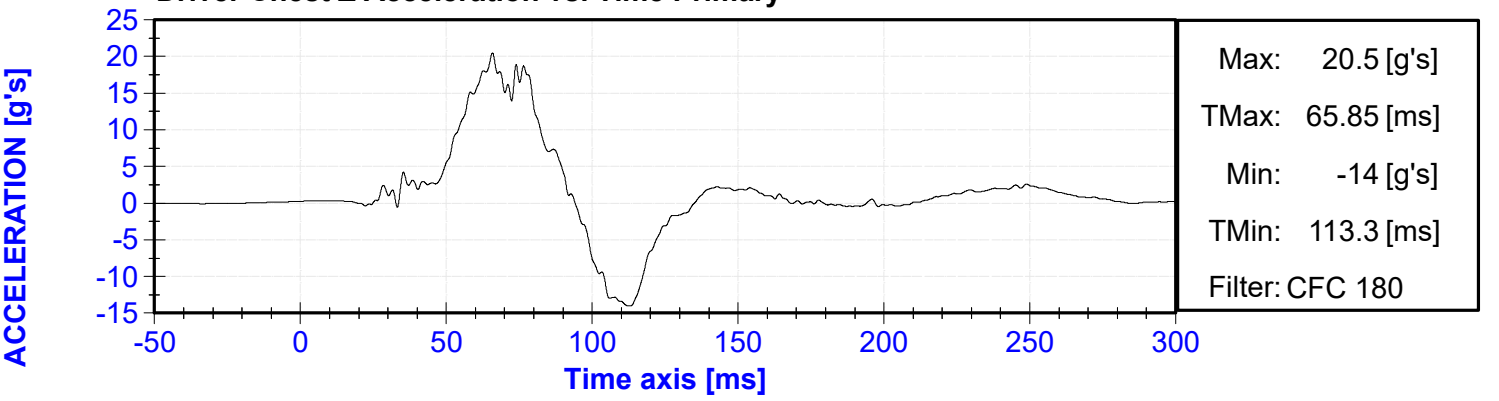
Driver Chest X Acceleration vs. Time Primary



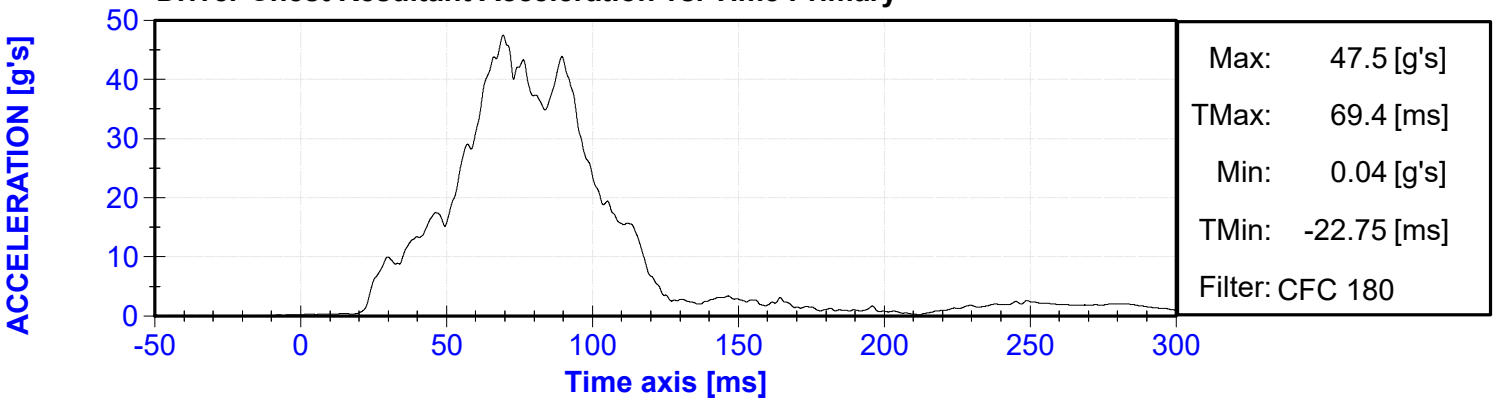
Driver Chest Y Acceleration vs. Time Primary



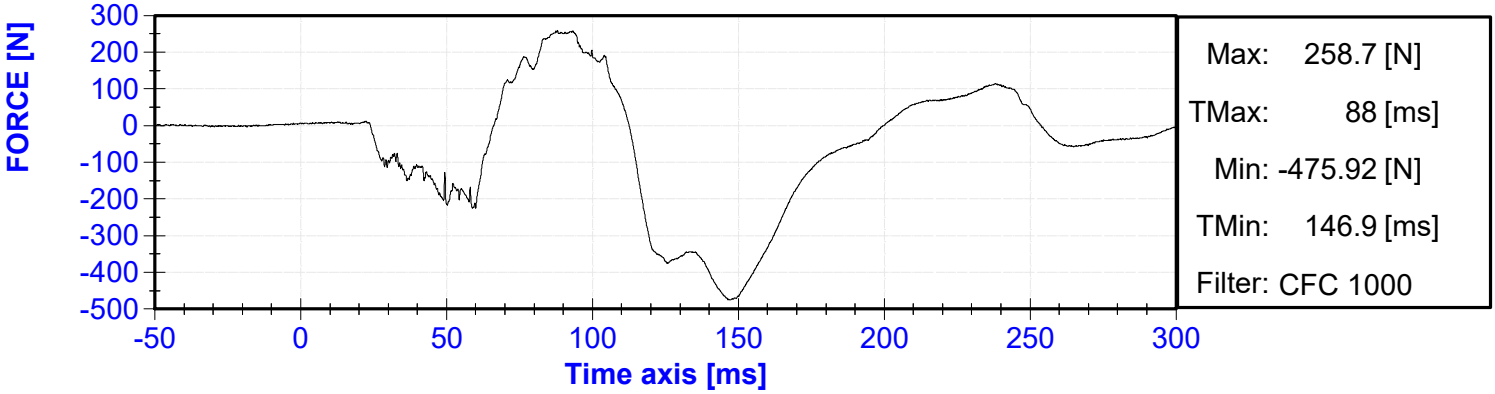
Driver Chest Z Acceleration vs. Time Primary



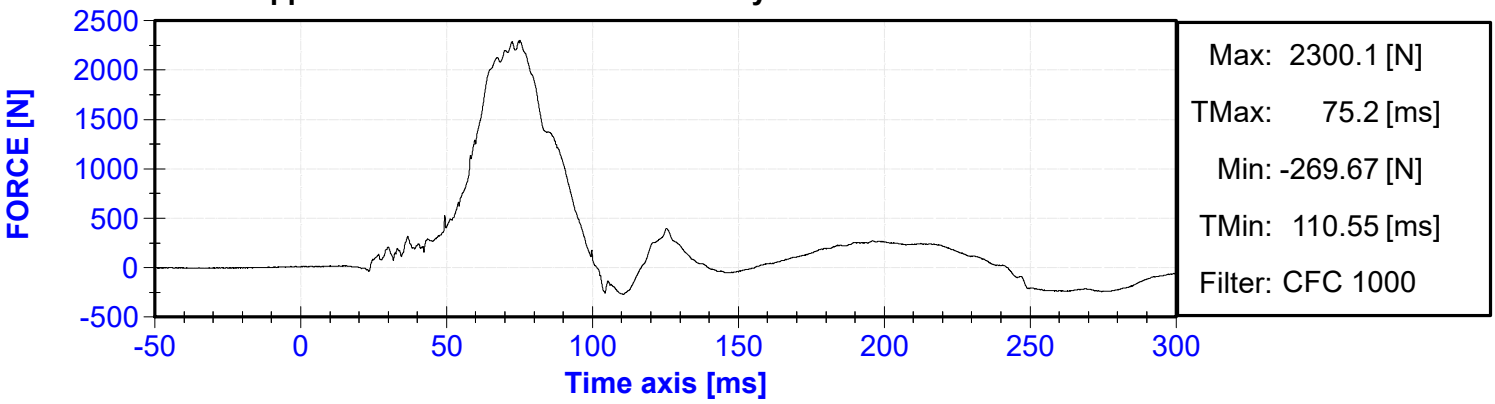
Driver Chest Resultant Acceleration vs. Time Primary



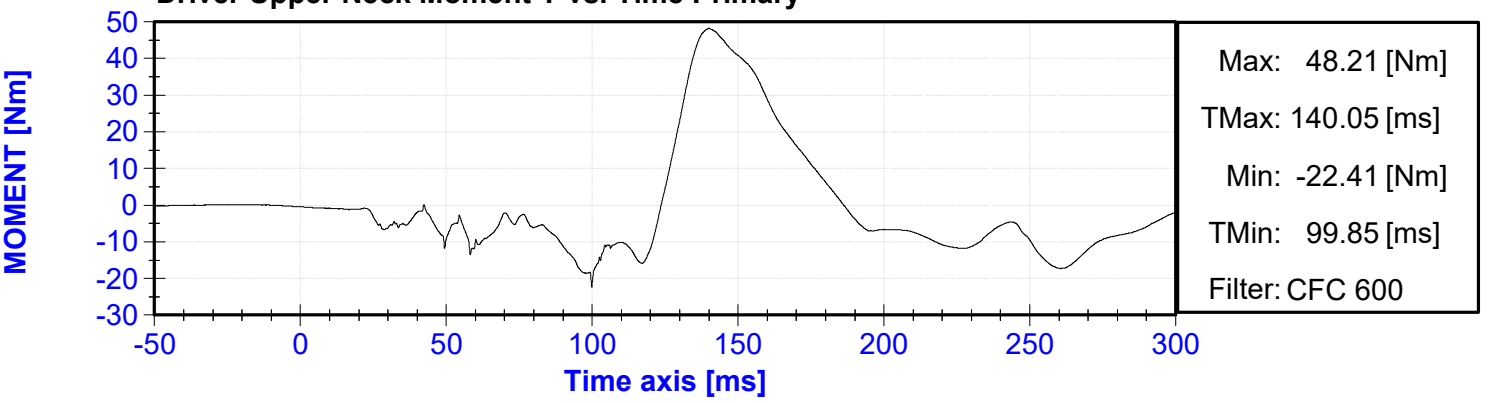
Driver Upper Neck Force X vs. Time Primary



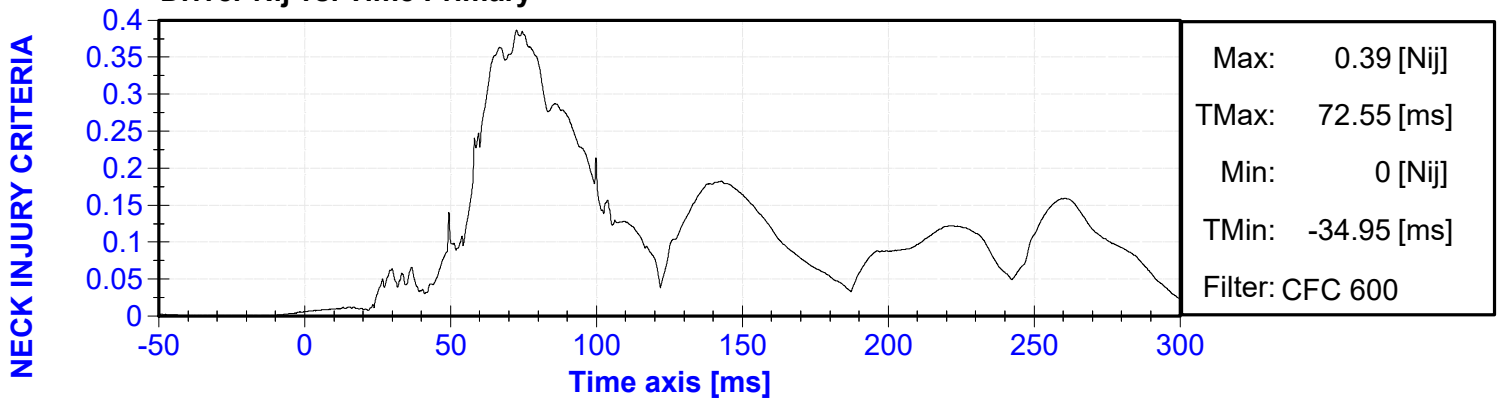
Driver Upper Neck Force Z vs. Time Primary



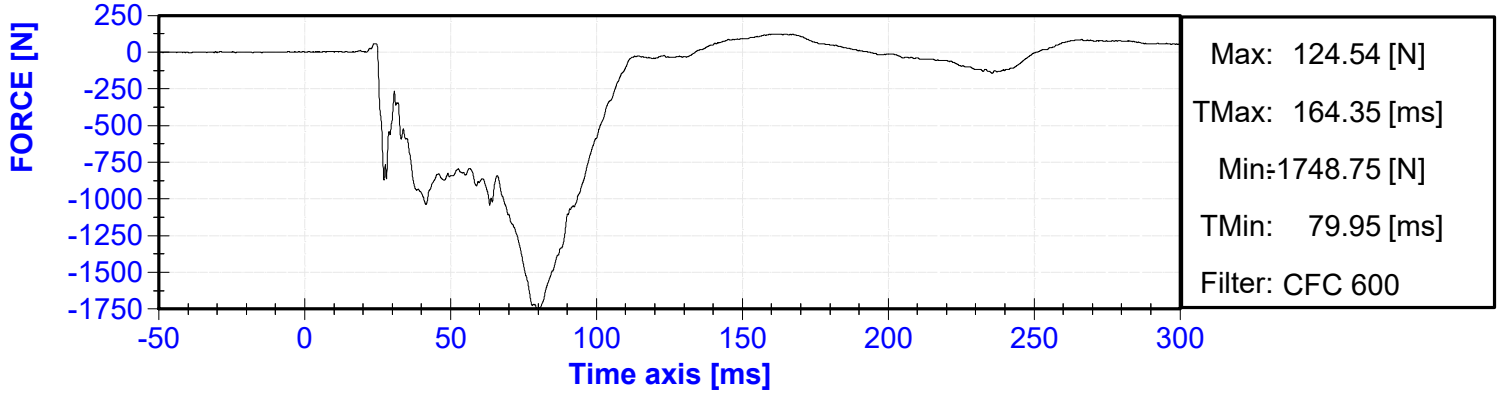
Driver Upper Neck Moment Y vs. Time Primary



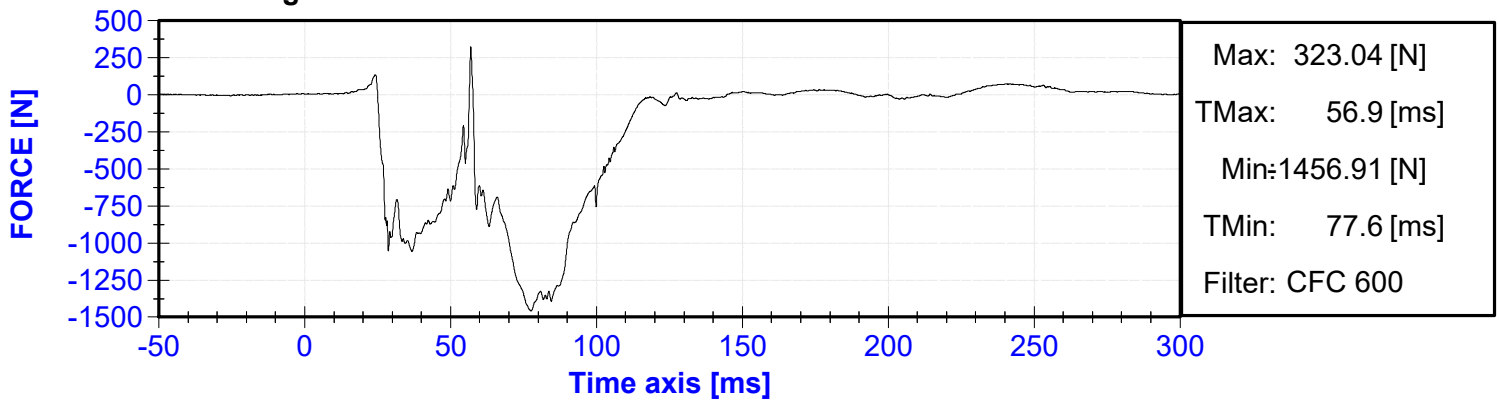
Driver Nij vs. Time Primary



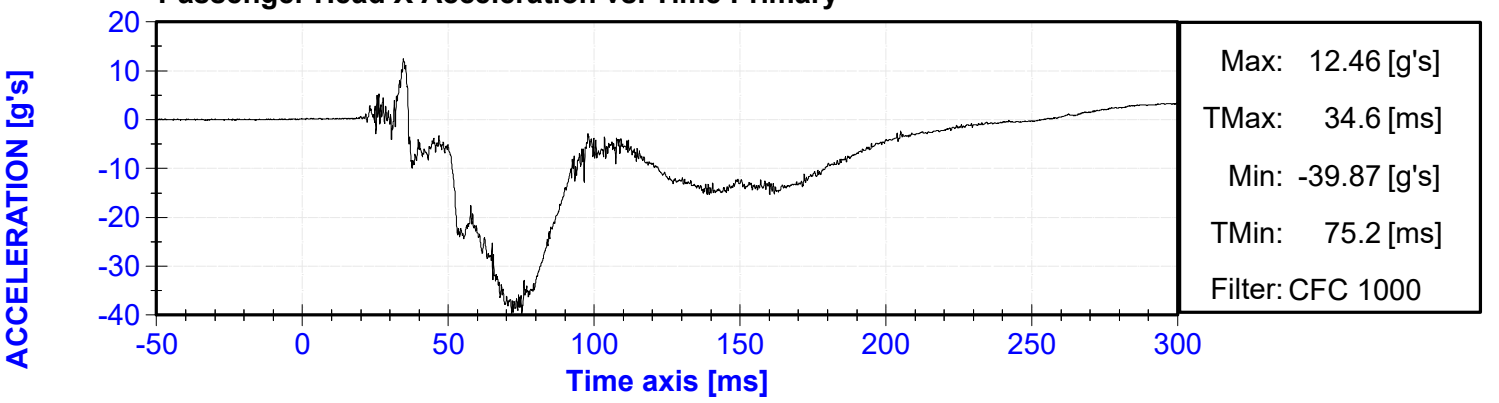
Driver Left Femur Force vs. Time



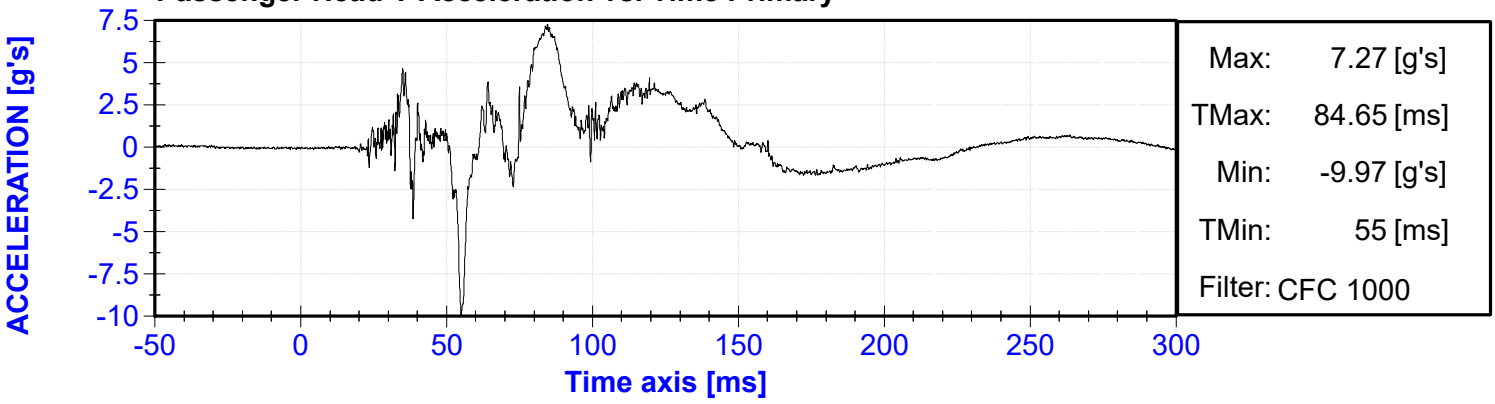
Driver Right Femur Force vs. Time



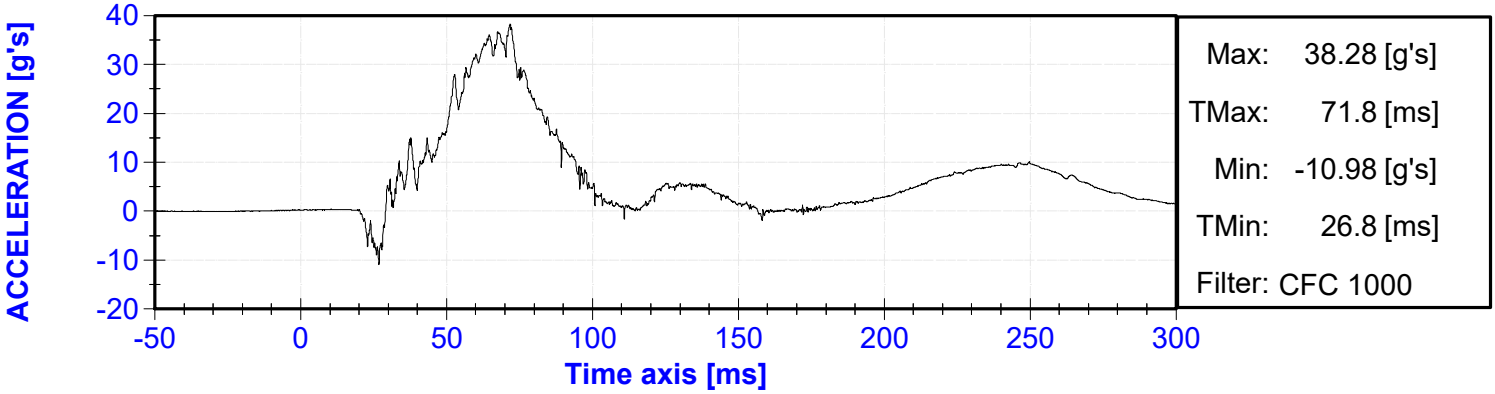
Passenger Head X Acceleration vs. Time Primary



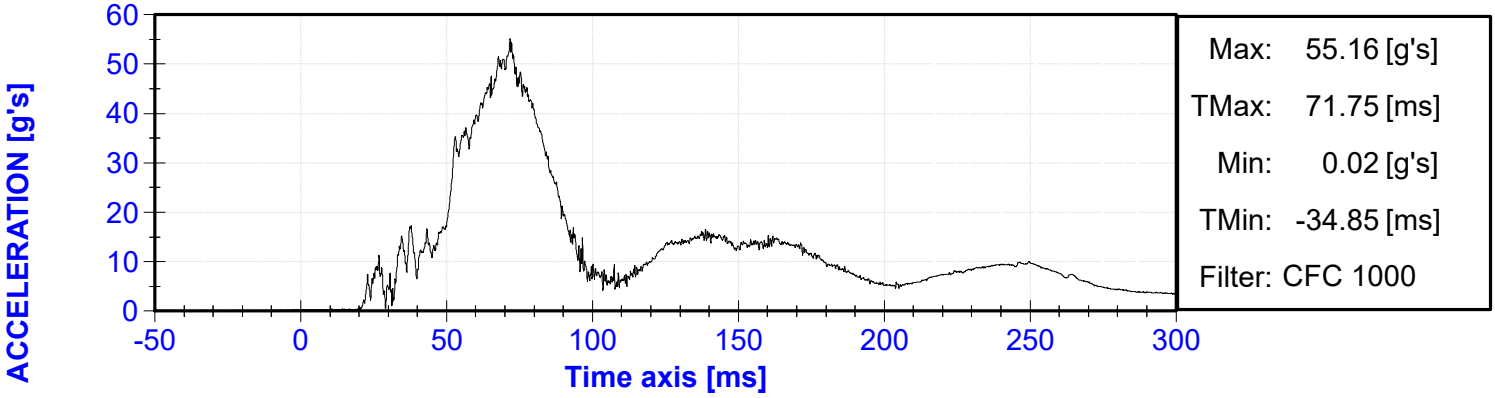
Passenger Head Y Acceleration vs. Time Primary



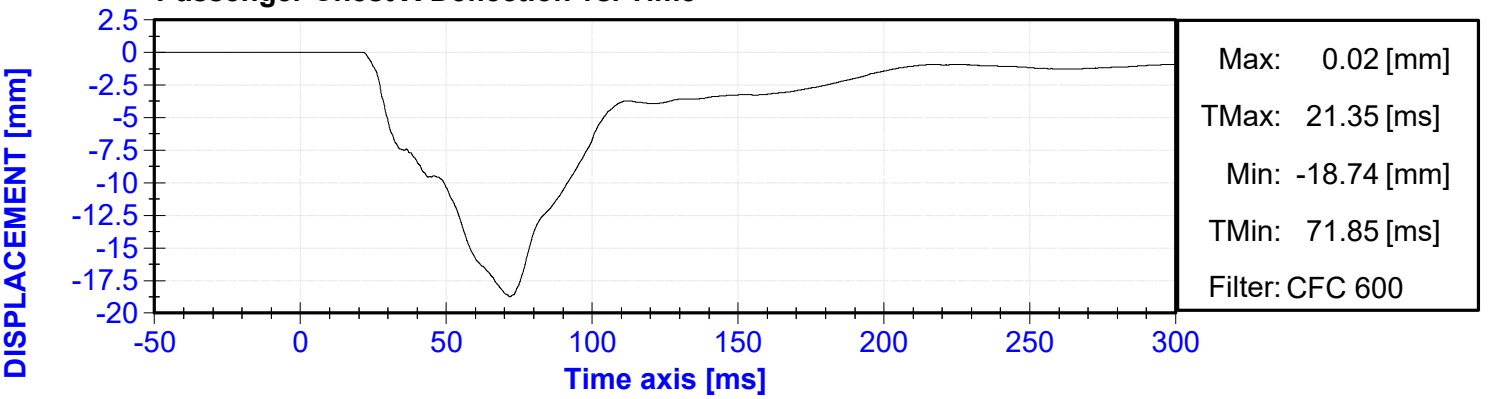
Passenger Head Z Acceleration vs. Time Primary

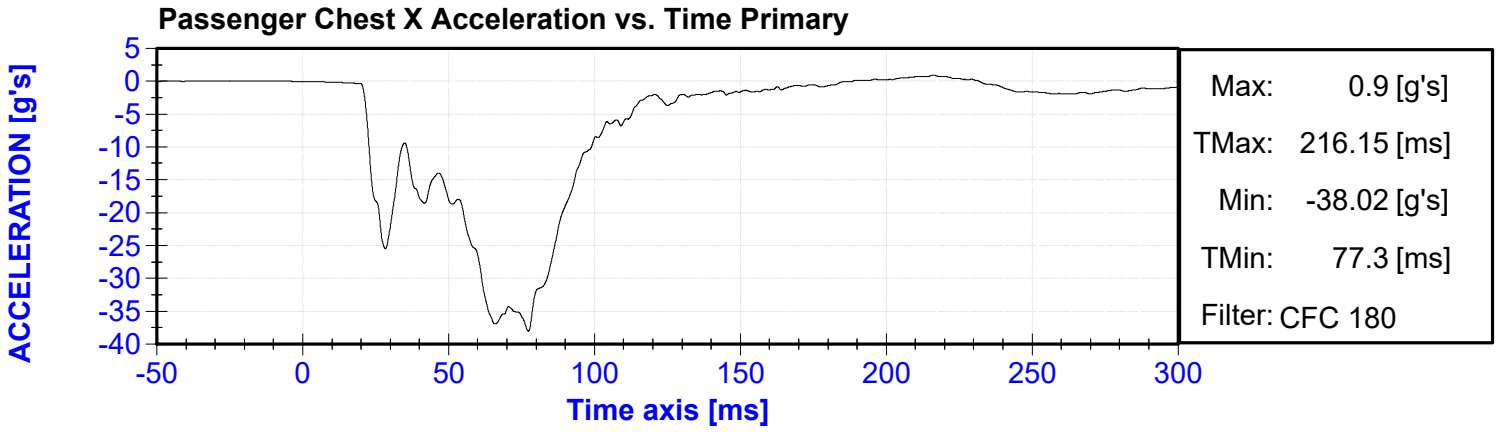


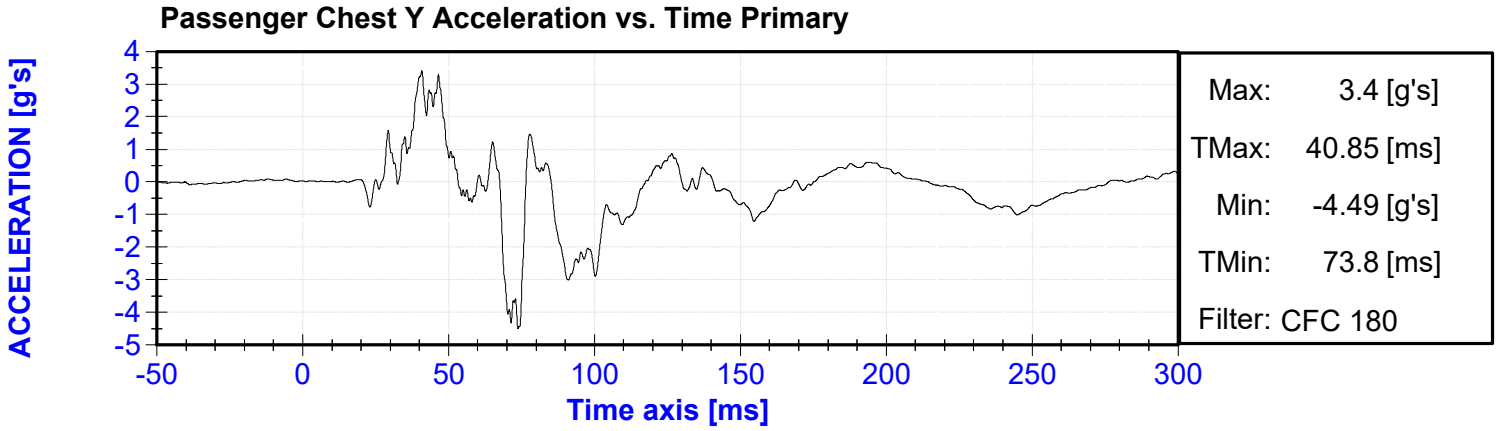
Passenger Head Resultant Acceleration vs. Time Primary

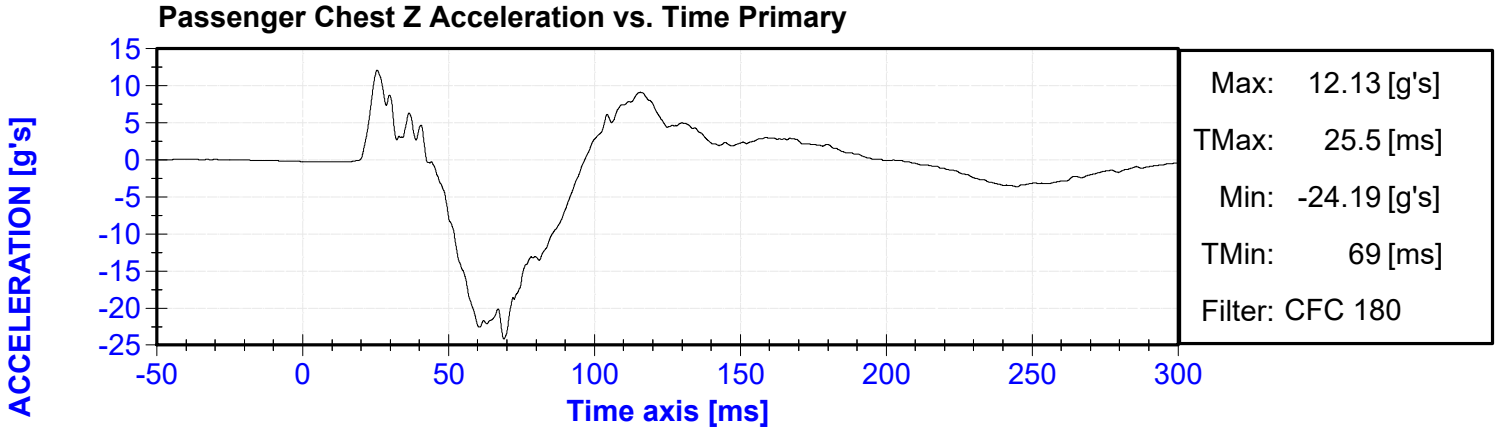


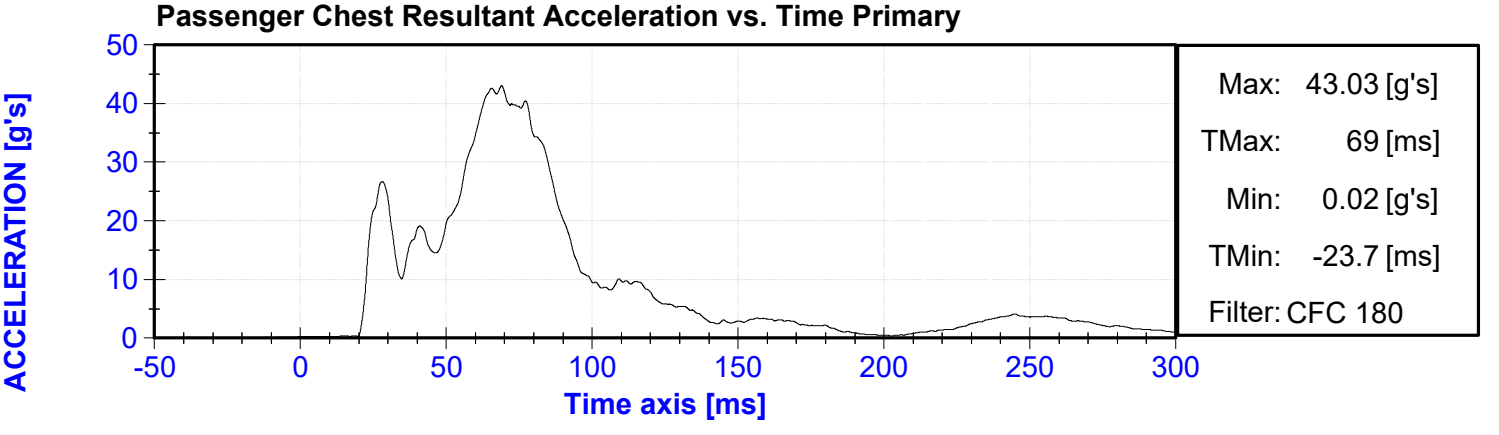
Passenger Chest X Deflection vs. Time



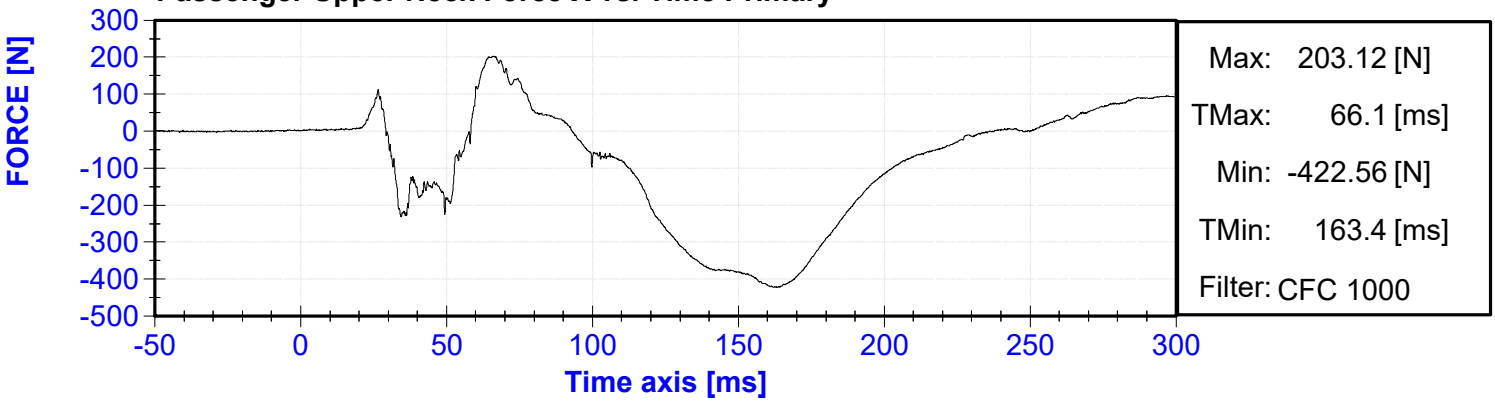

Passenger Chest X Acceleration vs. Time Primary
ACCELERATION [g's]
Time axis [ms]
Max: 0.9 [g's]
TMax: 216.15 [ms]
Min: -38.02 [g's]
TMin: 77.3 [ms]
Filter: CFC 180


Passenger Chest Y Acceleration vs. Time Primary
ACCELERATION [g's]
Time axis [ms]
Max: 3.4 [g's]
TMax: 40.85 [ms]
Min: -4.49 [g's]
TMin: 73.8 [ms]
Filter: CFC 180

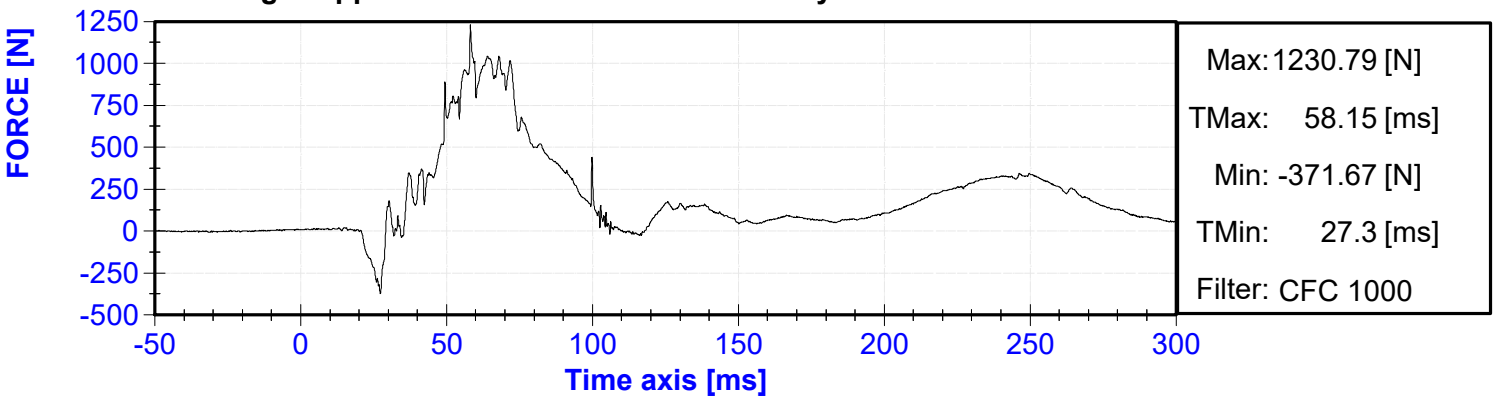

Passenger Chest Z Acceleration vs. Time Primary
ACCELERATION [g's]
Time axis [ms]
Max: 12.13 [g's]
TMax: 25.5 [ms]
Min: -24.19 [g's]
TMin: 69 [ms]
Filter: CFC 180


Passenger Chest Resultant Acceleration vs. Time Primary
ACCELERATION [g's]
Time axis [ms]
Max: 43.03 [g's]
TMax: 69 [ms]
Min: 0.02 [g's]
TMin: -23.7 [ms]
Filter: CFC 180

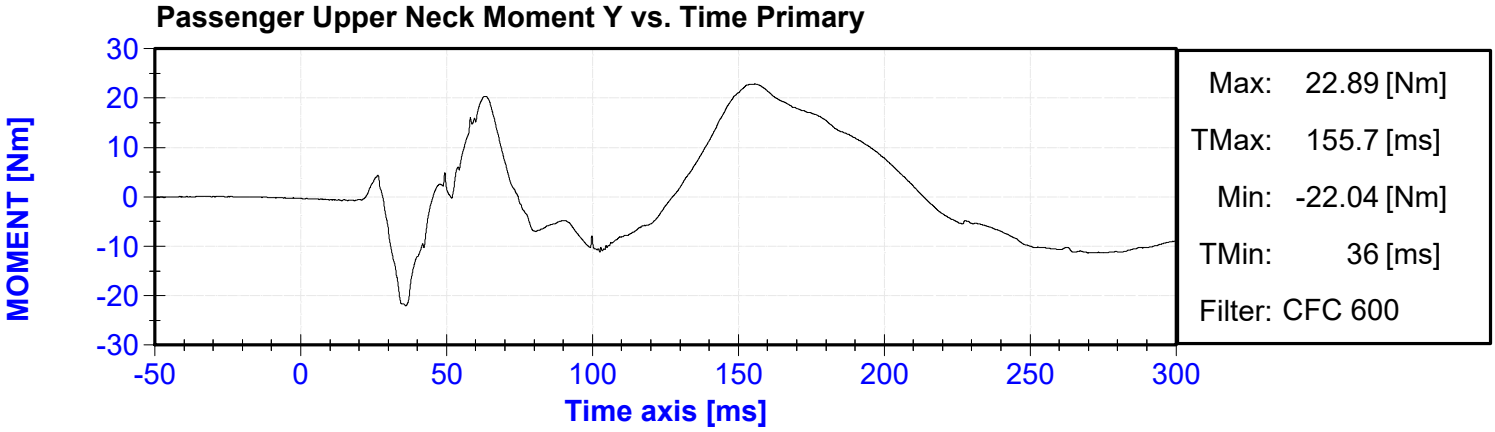
Passenger Upper Neck Force X vs. Time Primary



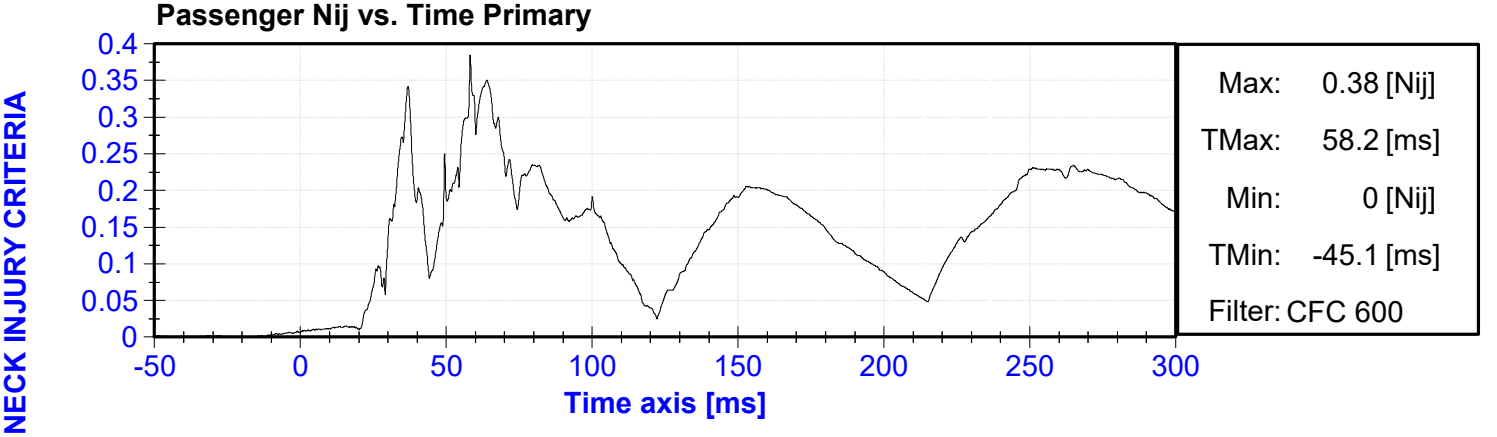
Passenger Upper Neck Force Z vs. Time Primary

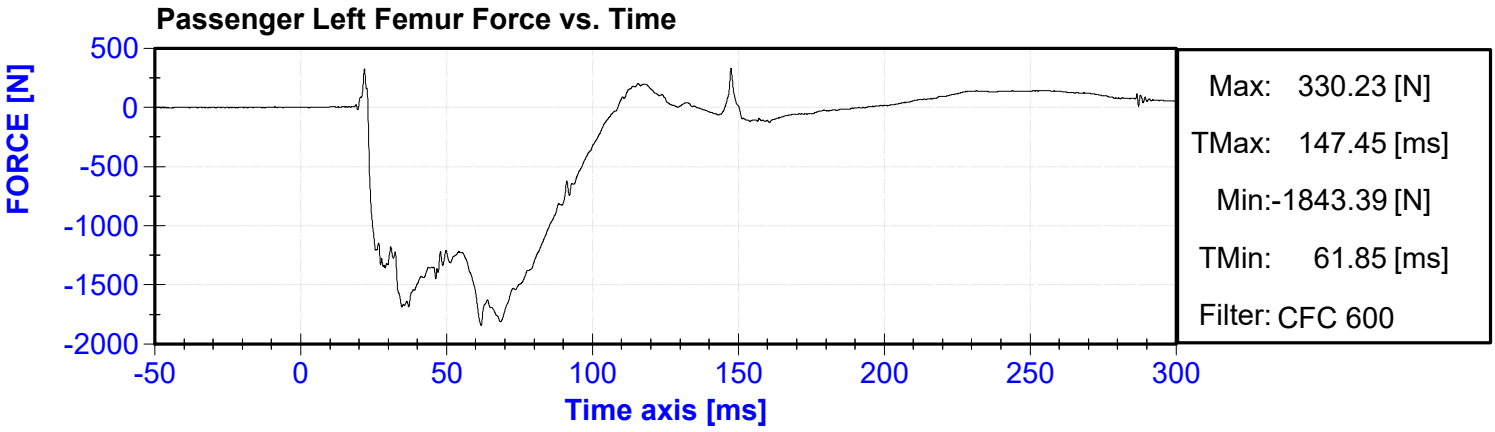


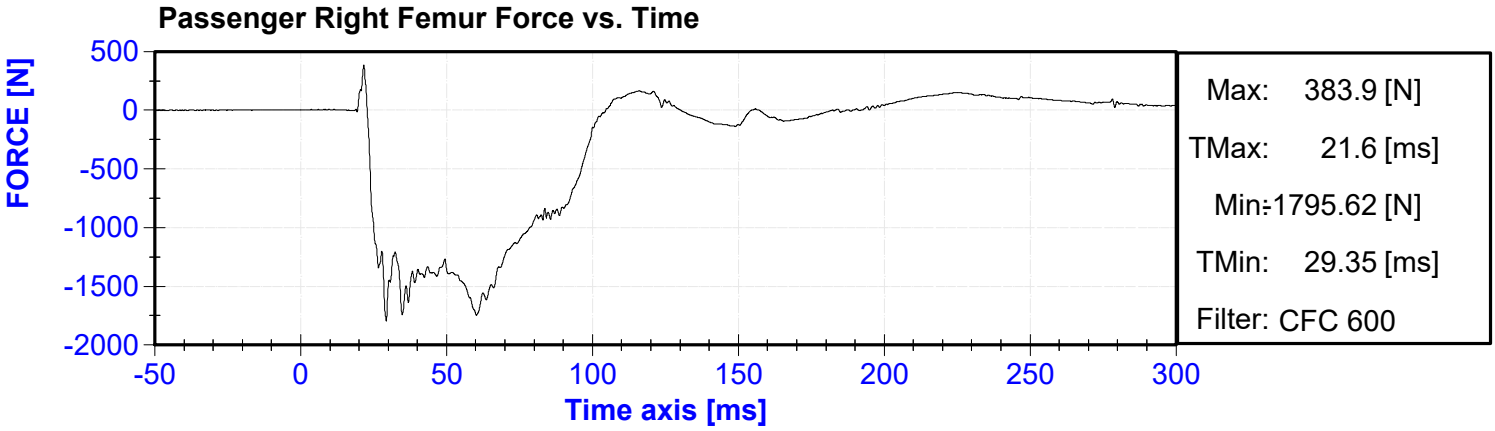
Passenger Upper Neck Moment Y vs. Time Primary



Passenger Nij vs. Time Primary




Passenger Left Femur Force vs. Time
FORCE [N]
500
0
-500
-1000
-1500
-2000
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 330.23 [N]
TMax: 147.45 [ms]
Min:-1843.39 [N]
TMin: 61.85 [ms]
Filter: CFC 600


Passenger Right Femur Force vs. Time
FORCE [N]
500
0
-500
-1000
-1500
-2000
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 383.9 [N]
TMax: 21.6 [ms]
Min:-1795.62 [N]
TMin: 29.35 [ms]
Filter: CFC 600

APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

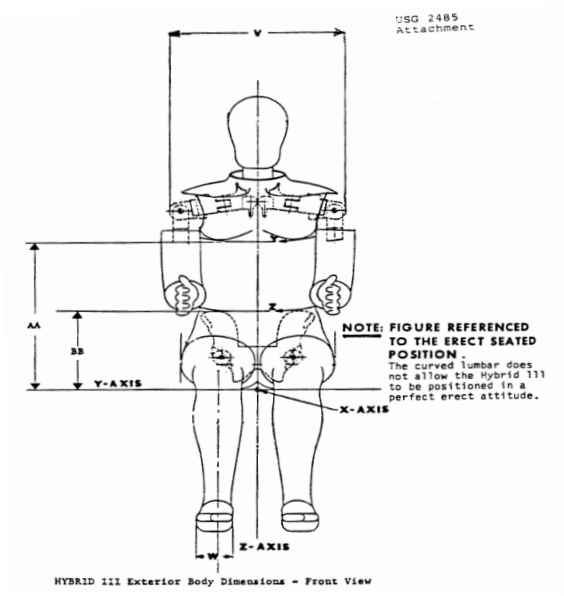
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 065

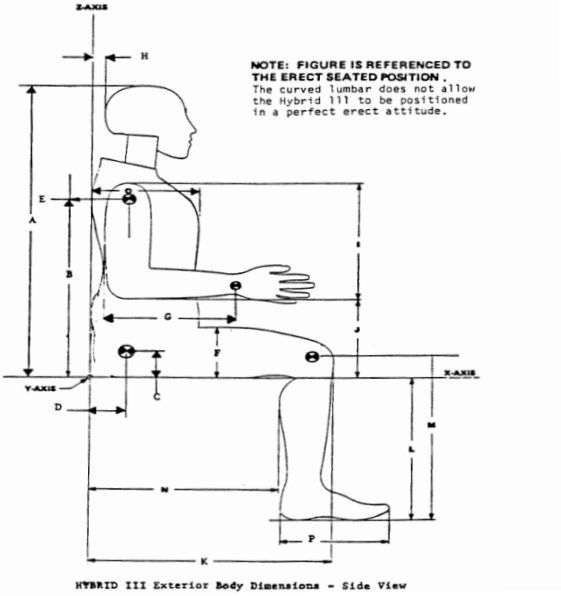
External Measurements - Hybrid 3 - 50th Male

Technician: J. Rios Date: 2/11/2025

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	34.8	Pass
B	Shoulder Pivot Height	19.9	20.5	20.2	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.6	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	7.9	Pass
K	Buttock to Knee Length	22.8	23.8	23.4	Pass
L	Popliteal Height	16.9	17.9	17.3	Pass
M	Knee Pivot Height	19.1	19.7	19.6	Pass
N	Buttock Popliteal Length	17.8	18.8	18.5	Pass
O	Chest Depth without Jacket	8.4	9.0	8.8	Pass
P	Foot Length (right)	9.9	10.5	10.4	Pass
V	Shoulder Breadth	16.3	17.2	16.7	Pass
W	Foot Breadth	3.6	4.2	3.9	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.7	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	9.0	Pass

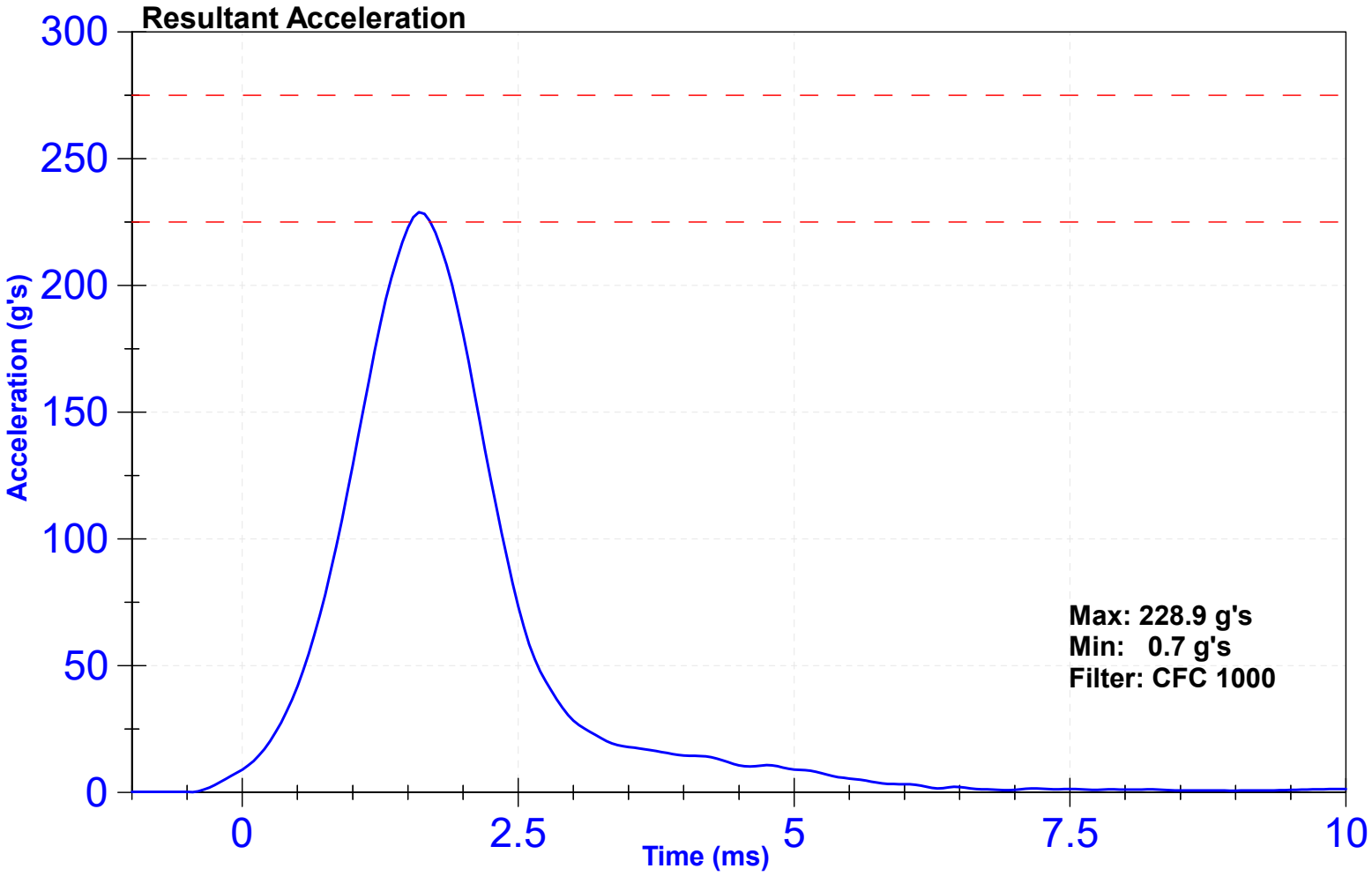
ATD Manufacturer	Humanetics	Test Technician	E. Andruczyk
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

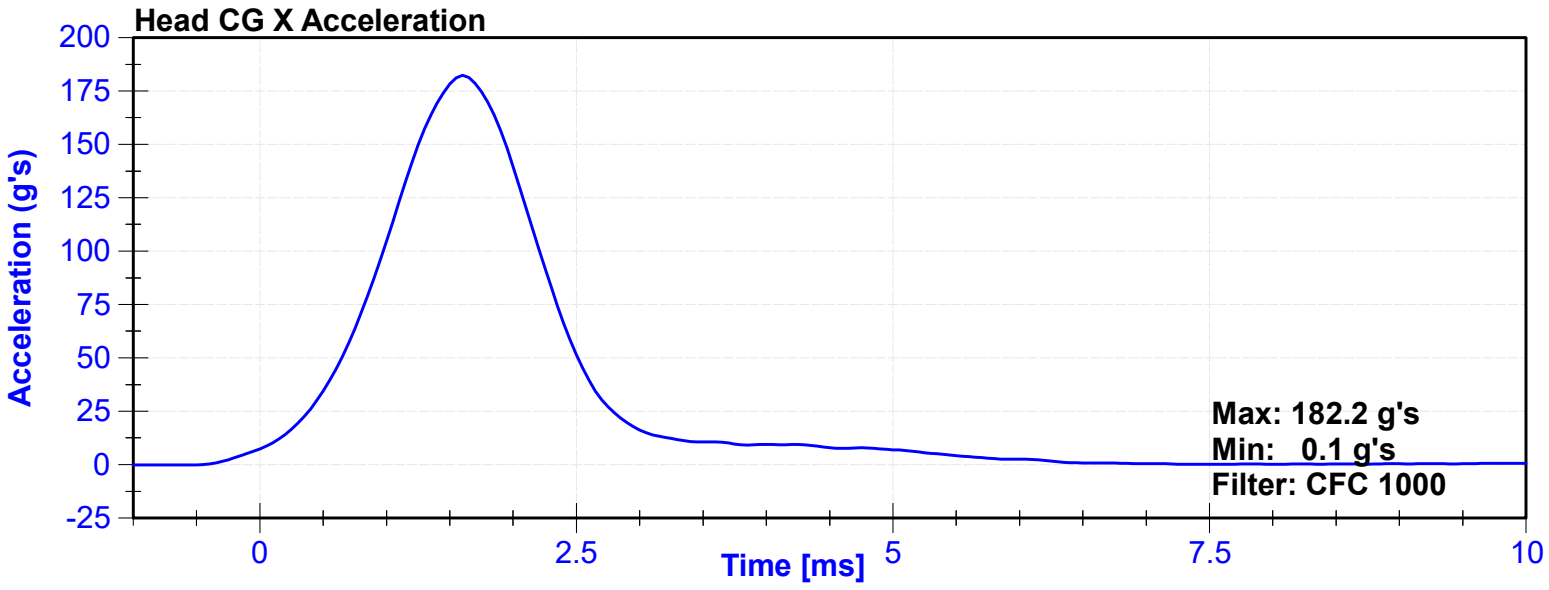
Results

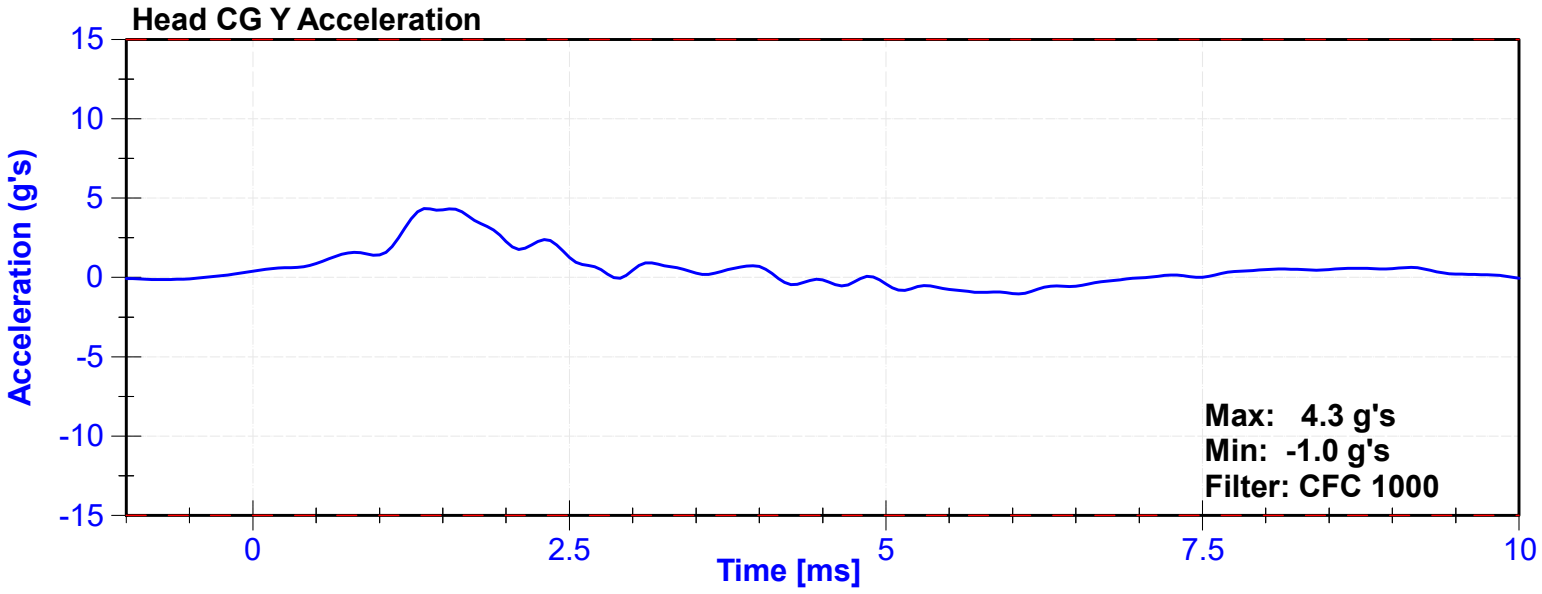
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21	Pass
Humidity	10	70	%	20	Pass
Resultant Acceleration	225	275	g's	228.9	Pass
Oscillation	0	10	%	4.6	Pass
Lateral Acceleration	-15	15	g's	4.3	Pass

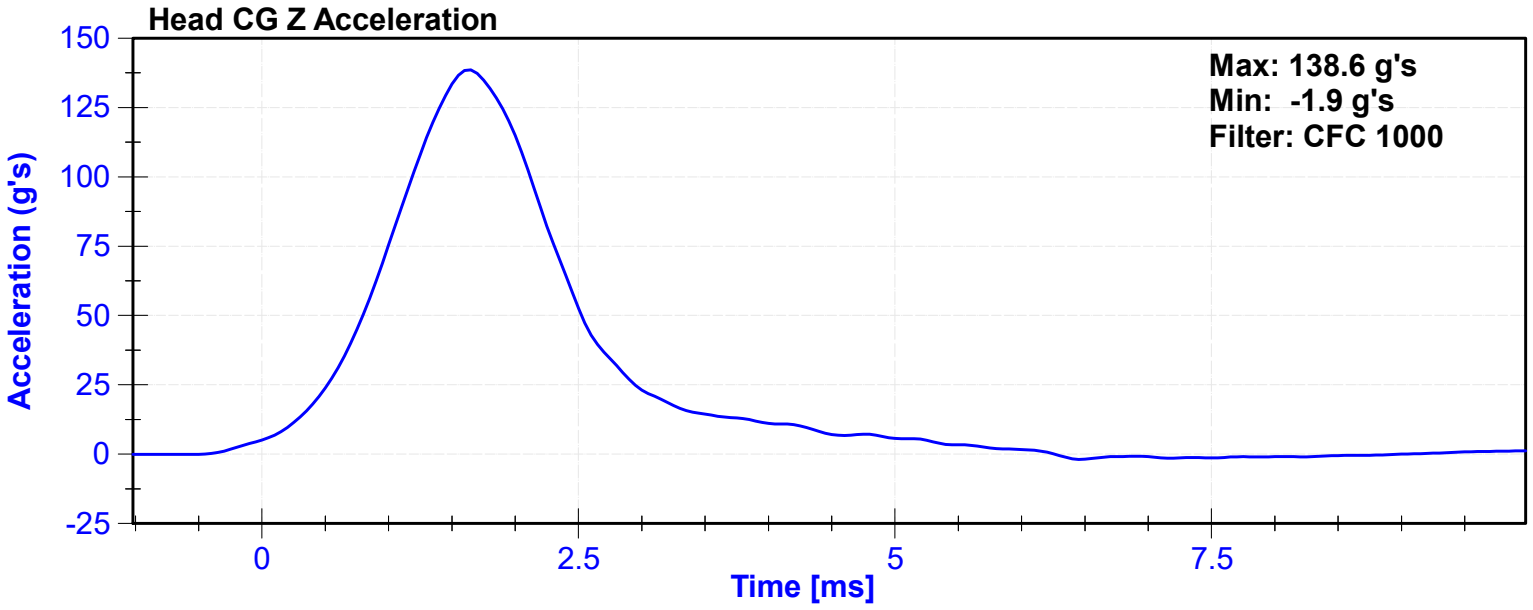
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P32464	3/20/2024	3/20/2025
Y Accelerometer	Endevco	P51736	3/20/2024	3/20/2025
Z Accelerometer	Endevco	T30979	3/20/2024	3/20/2025




Head CG X Acceleration
Acceleration (g's)
200
175
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 182.2 g's
Min: 0.1 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 4.3 g's
Min: -1.0 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
Time [ms]
Max: 138.6 g's
Min: -1.9 g's
Filter: CFC 1000

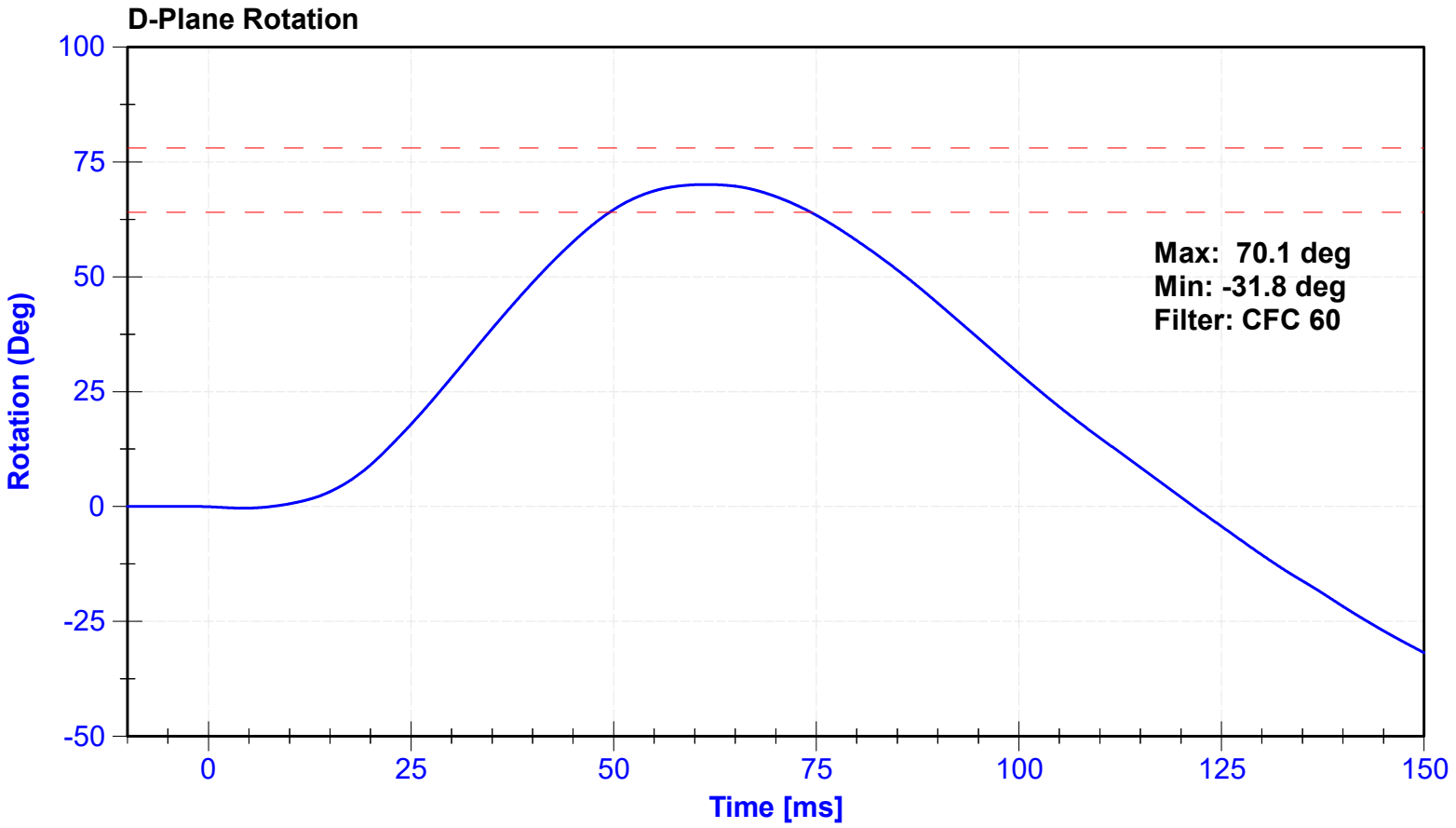
ATD Manufacturer	Humanetics	Test Technician	E. Andruczyk
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

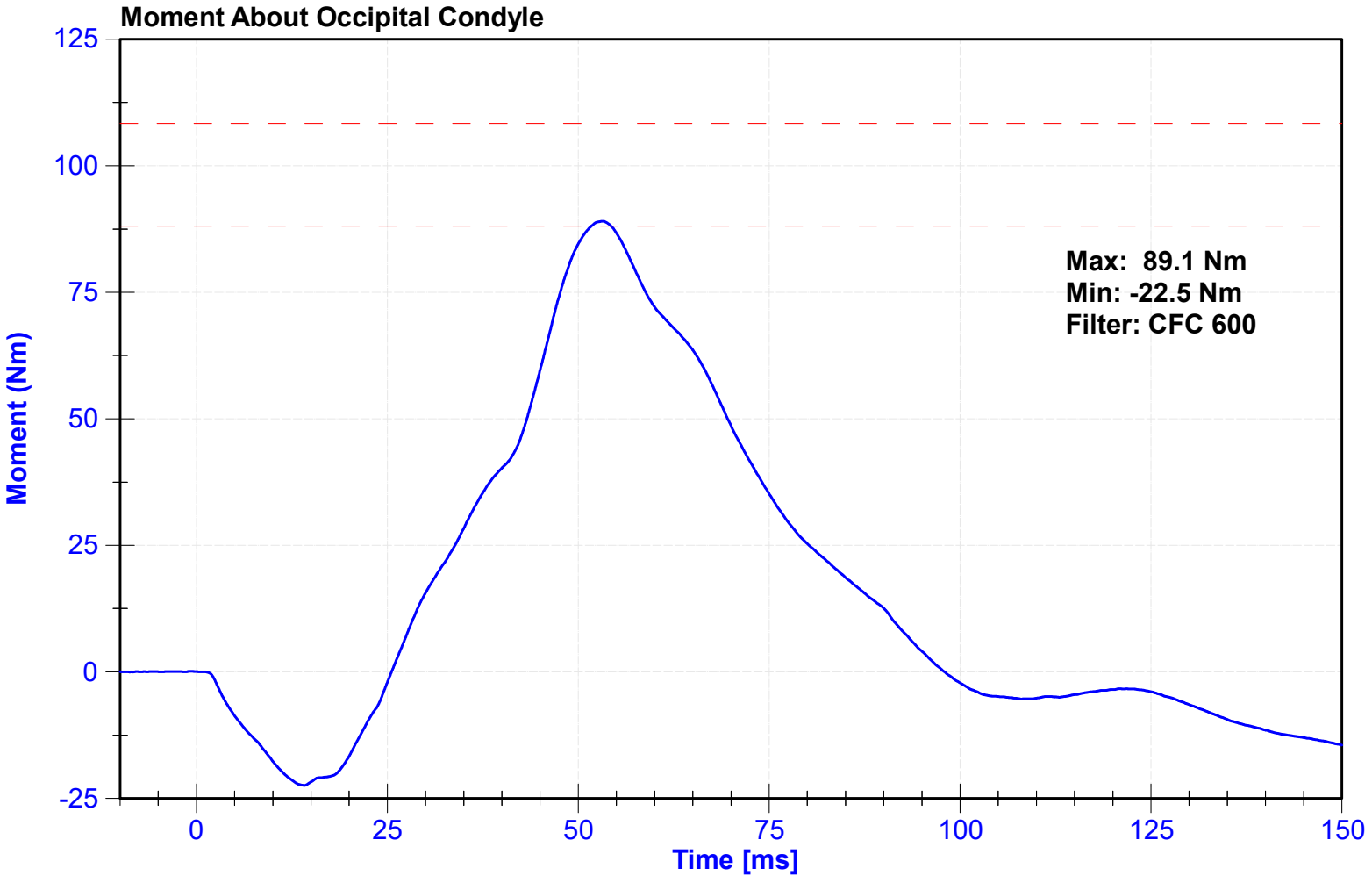
Results

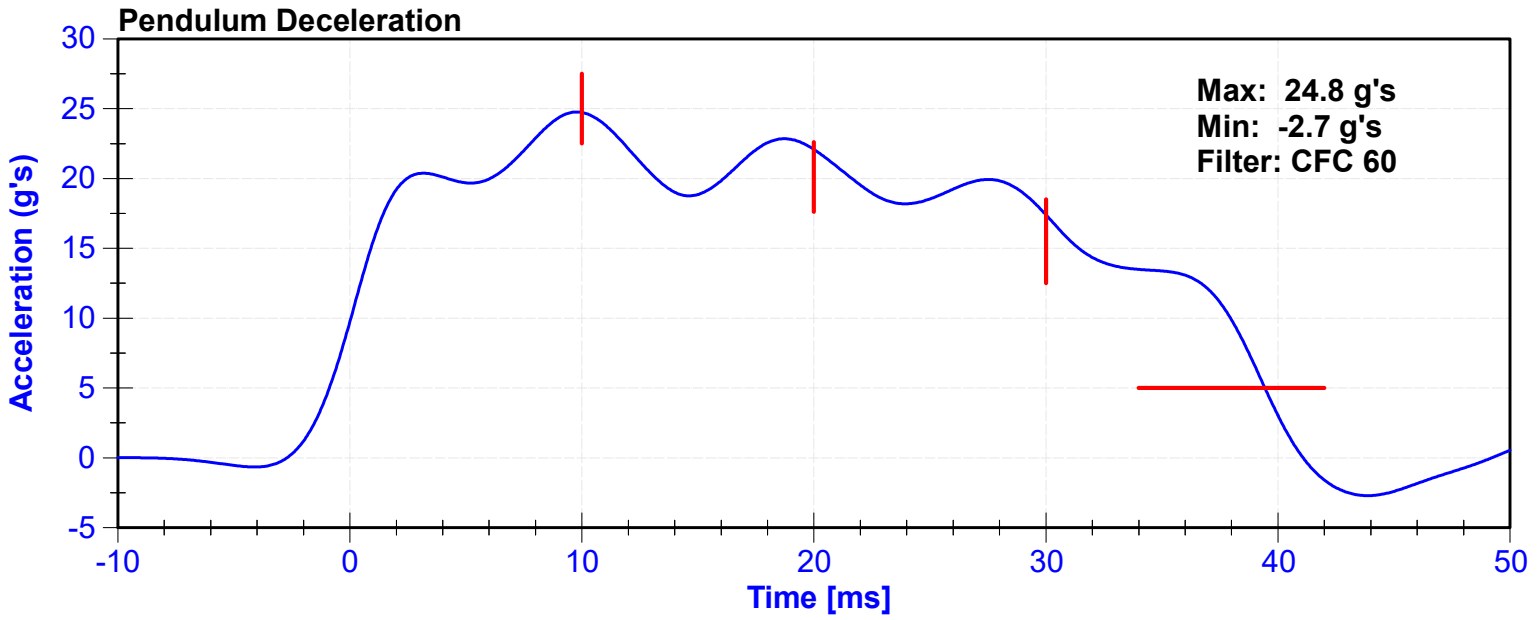
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	20	Pass
Velocity	6.89	7.13	m/s	6.904	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	24.73	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	22.07	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	17.39	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	24.8	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	39.4	Pass
Maximum D Plane Rotation	64	78	deg	70.1	Pass
Time to Maximum Rotation	57	64	ms	61.4	Pass
Rotation Decay to Zero	113	127	ms	121.6	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	89.06	Pass
Time to Maximum Moment	47	58	ms	53.2	Pass
Moment Decay to Zero	97	107	ms	97.9	Pass

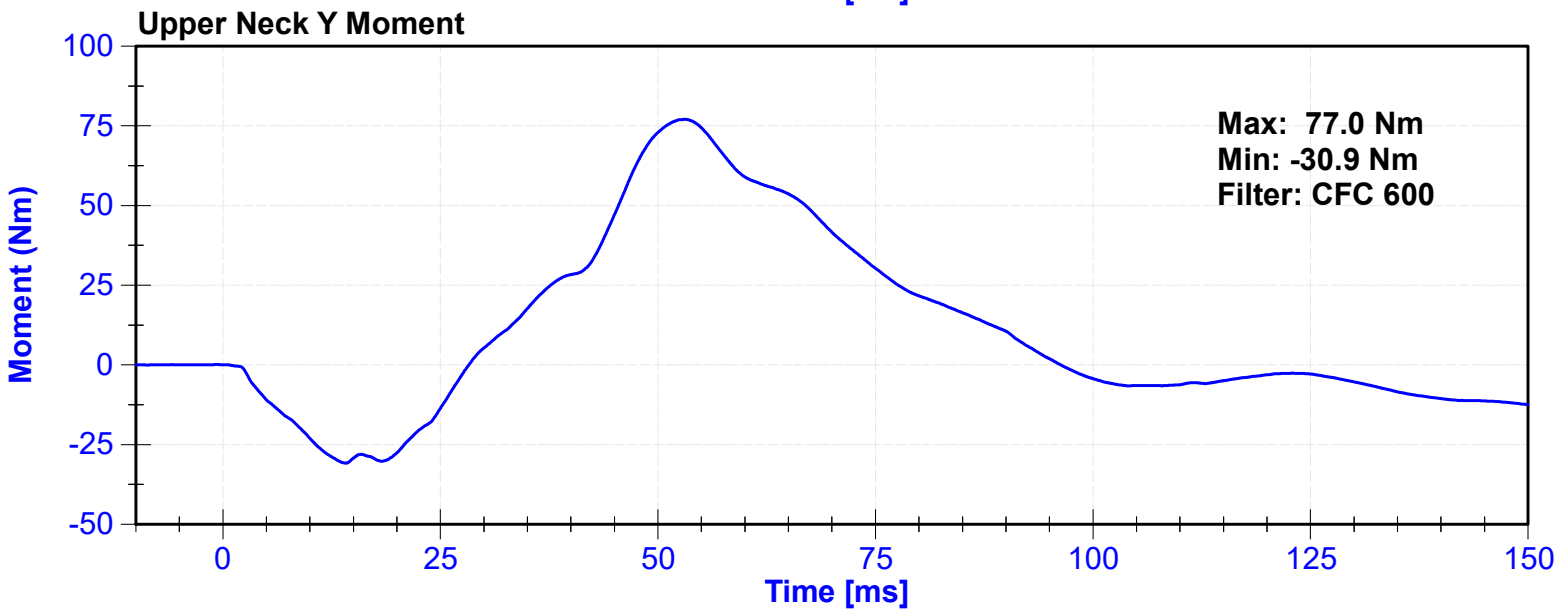
Transducer Calibrations

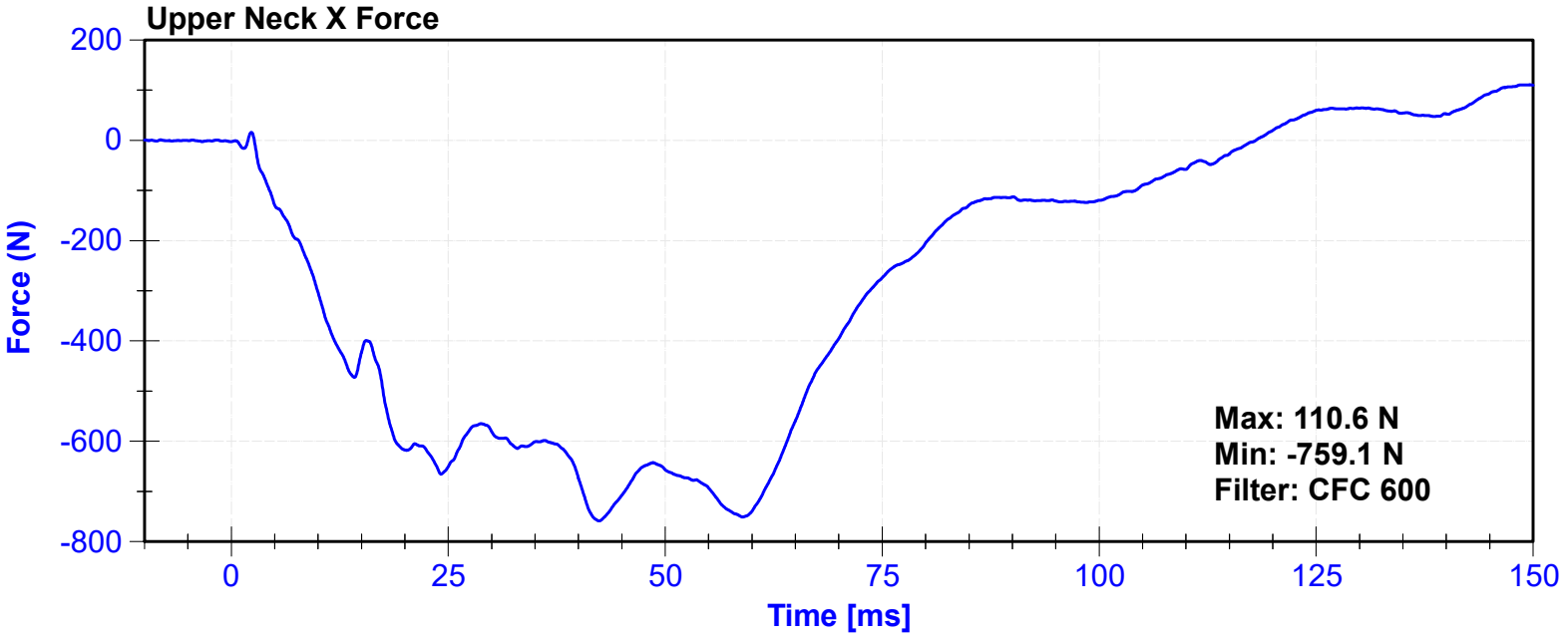
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16646	10/17/2024	4/15/2025
Pendulum Potentiometer	ETI	LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Humanetics	851-FX	5/22/2024	5/22/2025


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 70.1 deg
Min: -31.8 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
125
100
75
50
25
0
-25
0
25
50
75
100
125
150
Time [ms]
Max: 89.1 Nm
Min: -22.5 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 24.8 g's
Min: -2.7 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 77.0 Nm
Min: -30.9 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 110.6 N
Min: -759.1 N
Filter: CFC 600
Force (N)
Time [ms]

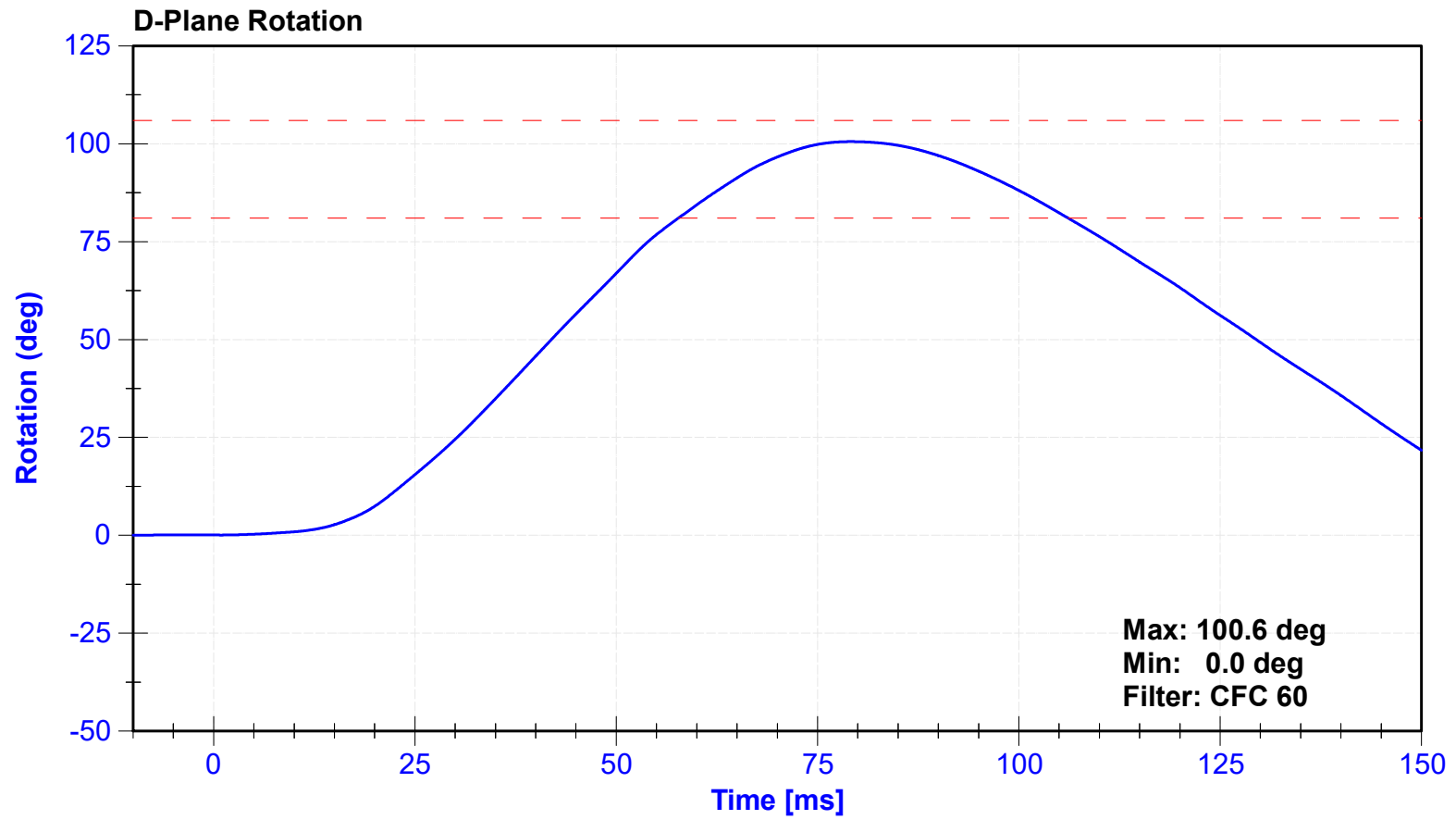
ATD Manufacturer	Humanetics	Test Technician	E. Andruczyk
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

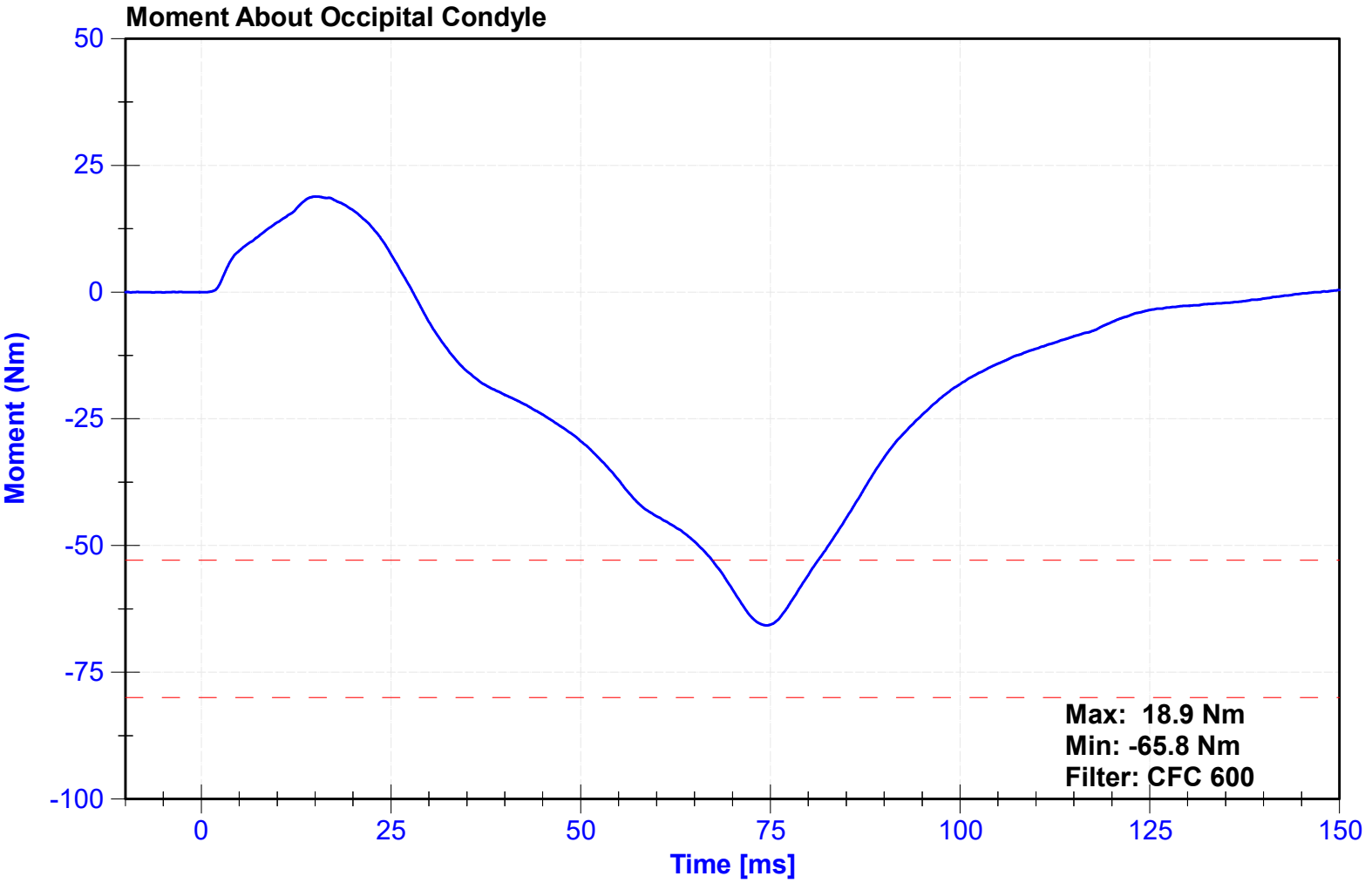
Results

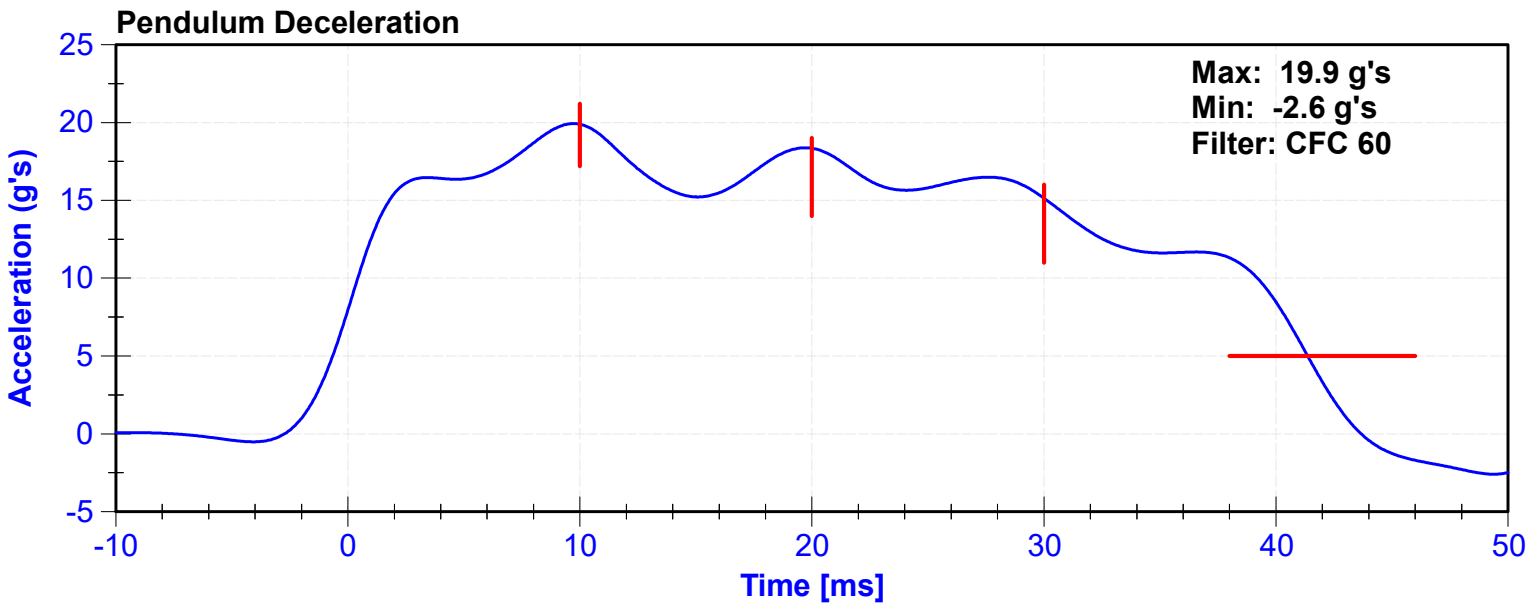
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	20	Pass
Velocity	5.94	6.19	m/s	5.953	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	19.88	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.3	Pass
Pendulum Deceleration at 30ms	11	16	g's	15.1	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	19.9	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	41.4	Pass
Maximum D Plane Rotation	81	106	deg	100.6	Pass
Time to Maximum Rotation	72	82	ms	79.1	Pass
Rotation Decay to Zero	147	174	ms	166.1	Pass
Minimum Moment About OC	-80	-52.9	Nm	-65.76	Pass
Time to Minimum Moment	65	79	ms	74.6	Pass
Moment Decay to Zero	120	148	ms	146.8	Pass

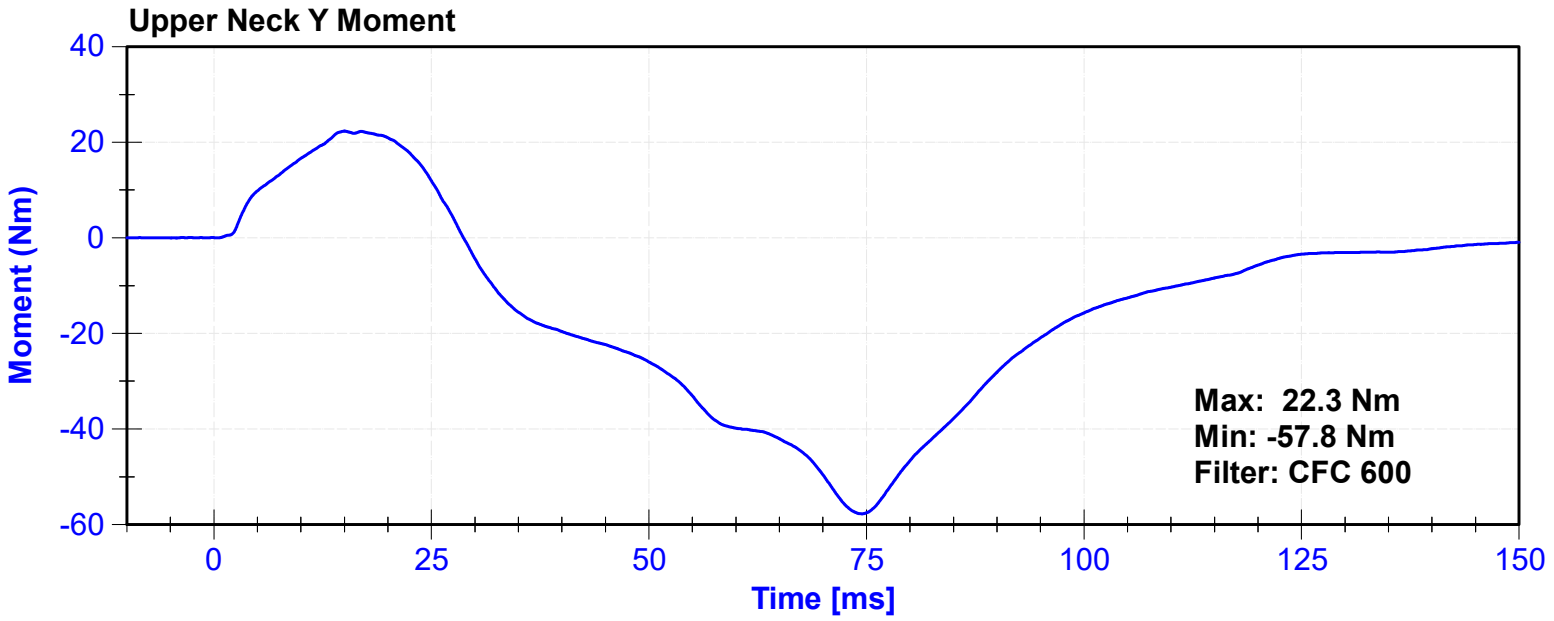
Transducer Calibrations

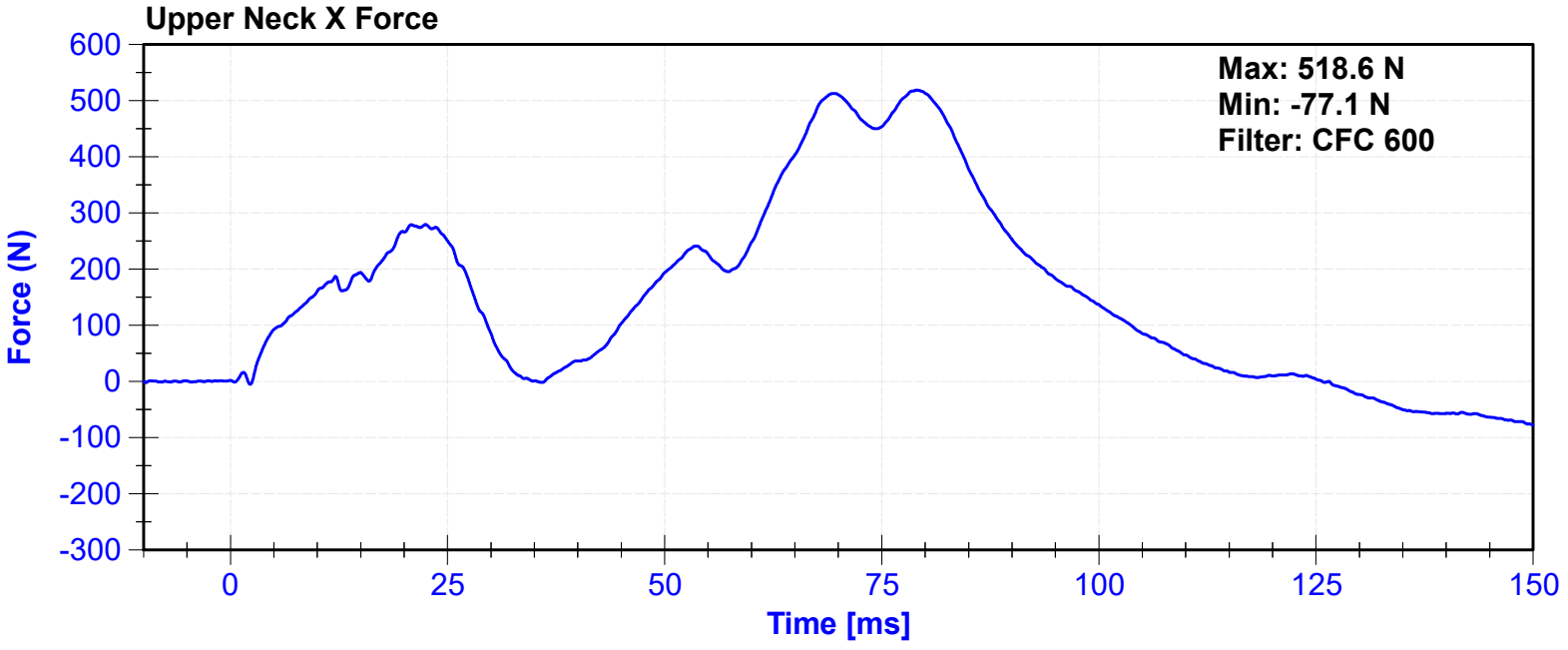
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16646	10/17/2024	4/15/2025
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Humanetics	851-FX	5/22/2024	5/22/2025


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 100.6 deg
Min: 0.0 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 18.9 Nm
Min: -65.8 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 19.9 g's
Min: -2.6 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: 22.3 Nm
Min: -57.8 Nm
Filter: CFC 600
Moment (Nm)
40
20
0
-20
-40
-60
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 518.6 N
Min: -77.1 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]

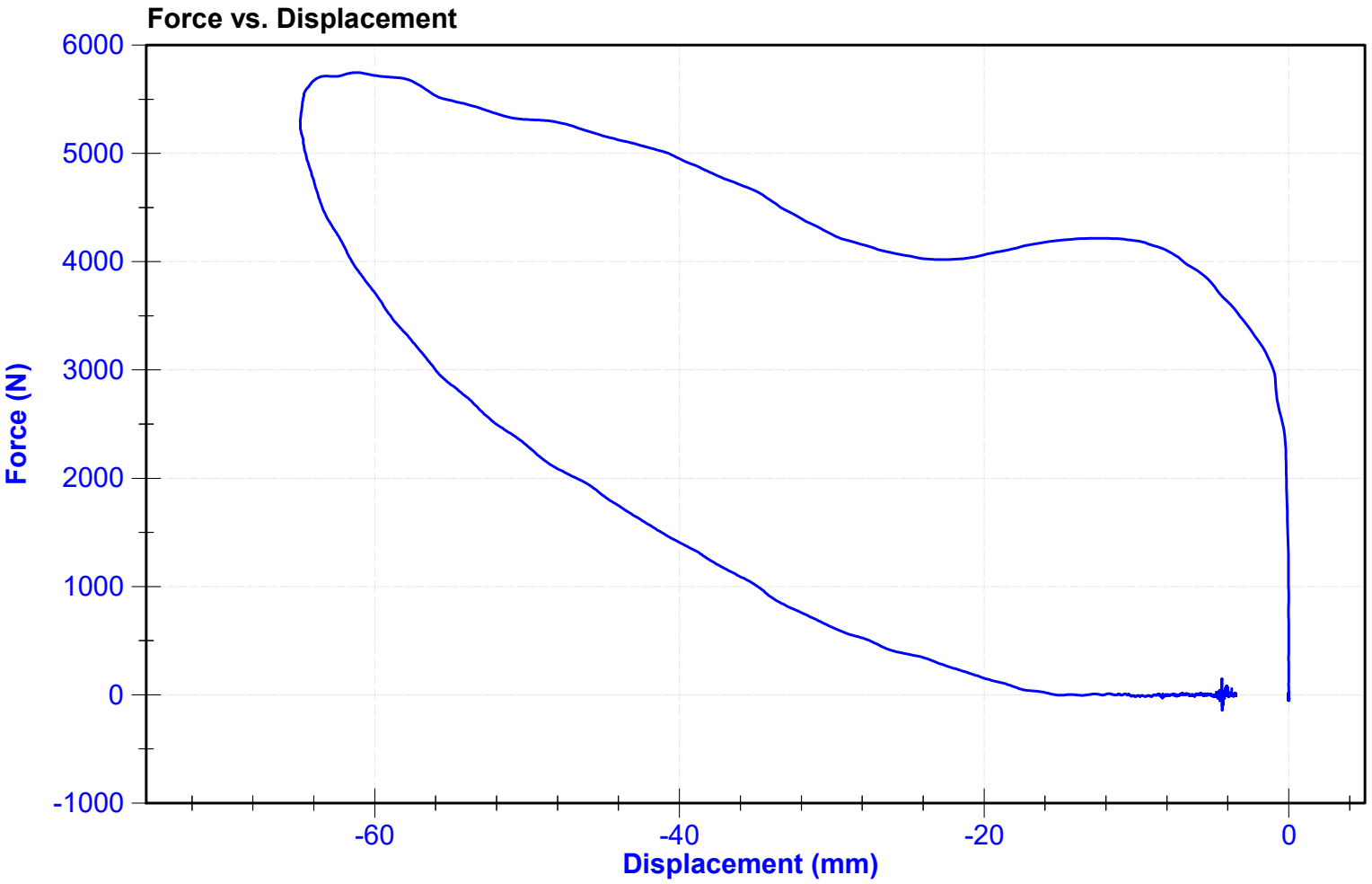
ATD Manufacturer	Humanetics	Test Technician	E. Andruczyk
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

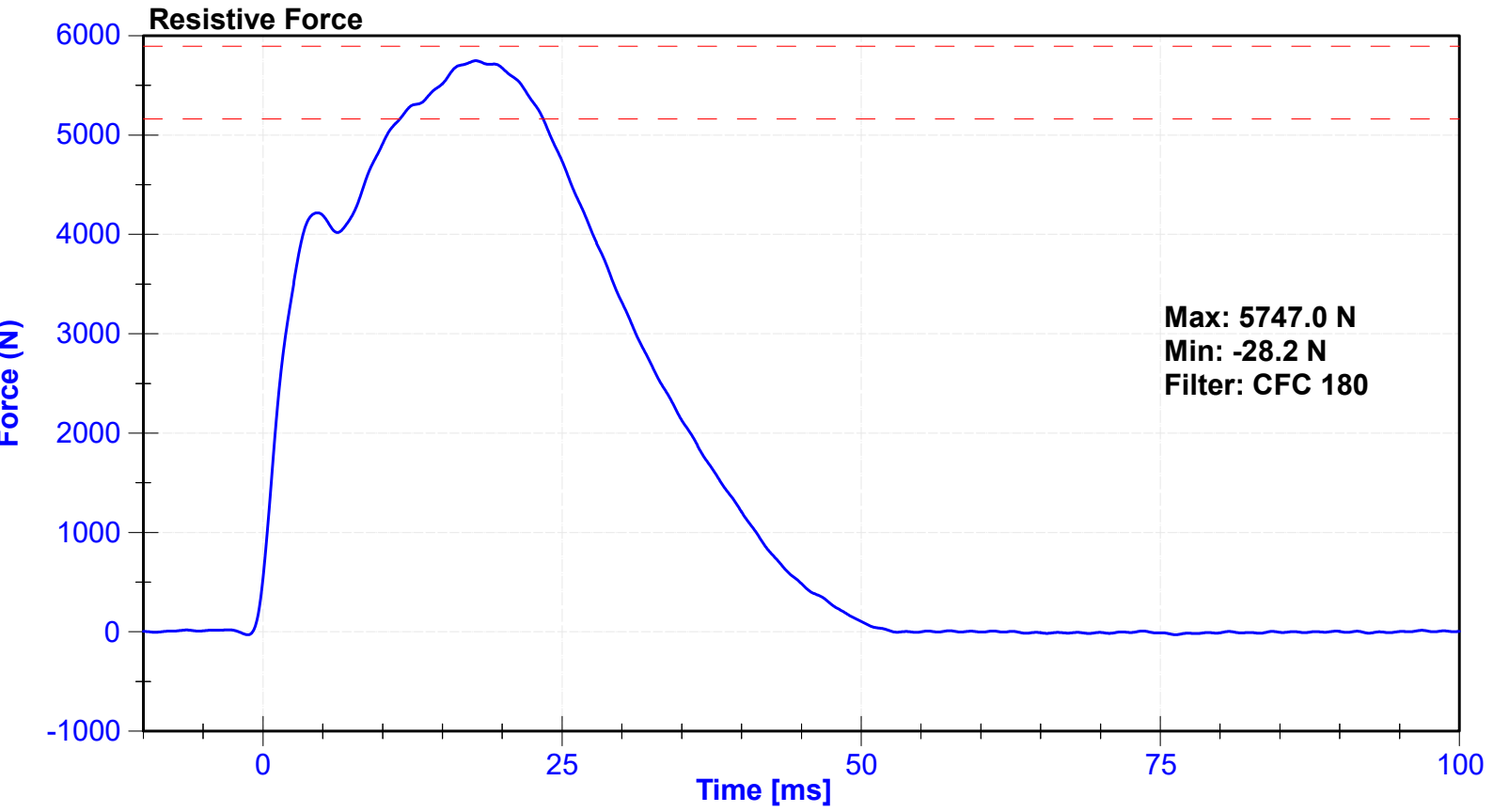
Results

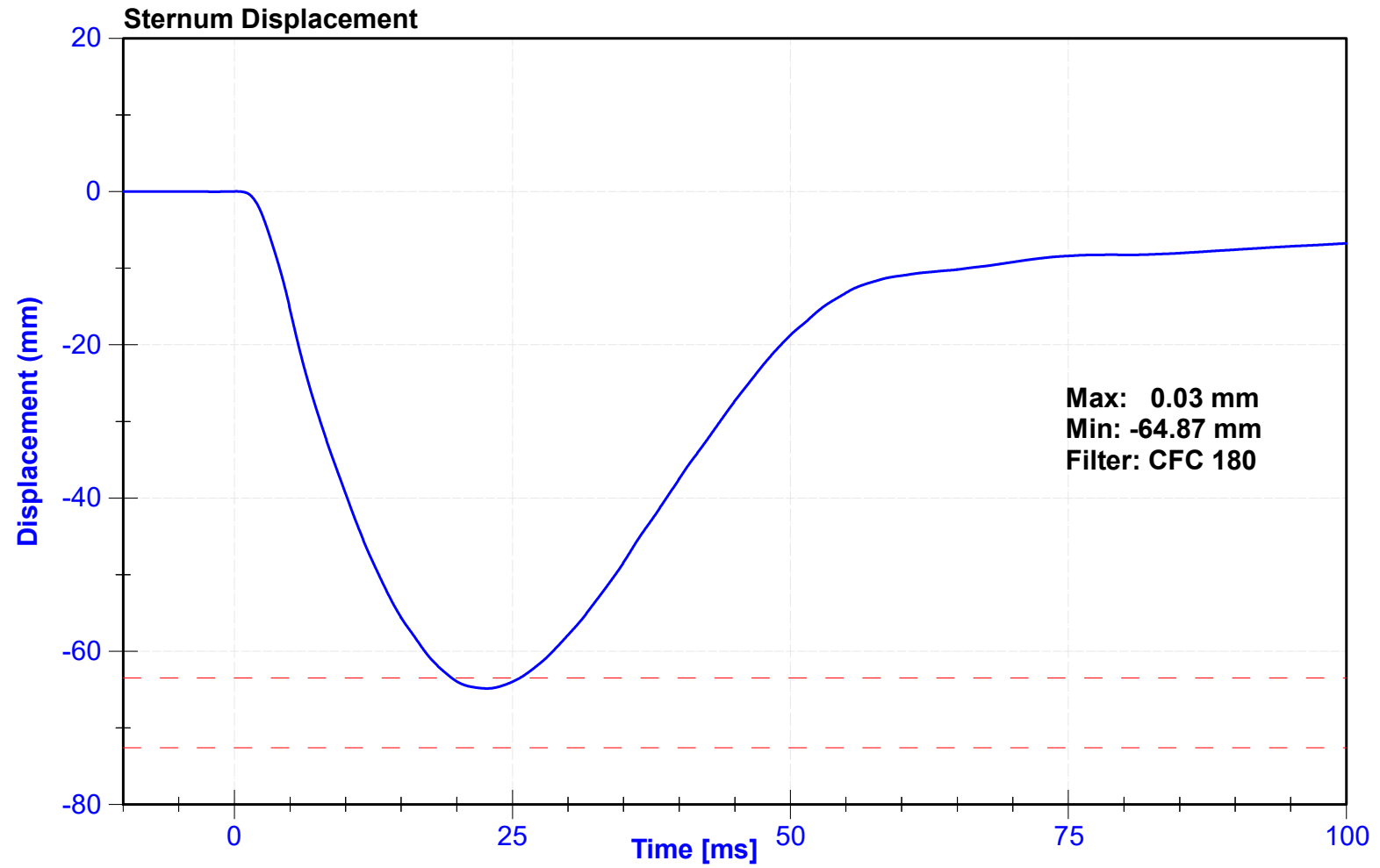
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21	Pass
Humidity	10	70	%	20	Pass
Velocity	6.59	6.83	m/s	6.648	Pass
Chest Displacement	-72.6	-63.5	mm	-64.87	Pass
Resistive Force	5160	5894	N	5747.0	Pass
Hysteresis	69	85	%	72.4	Pass

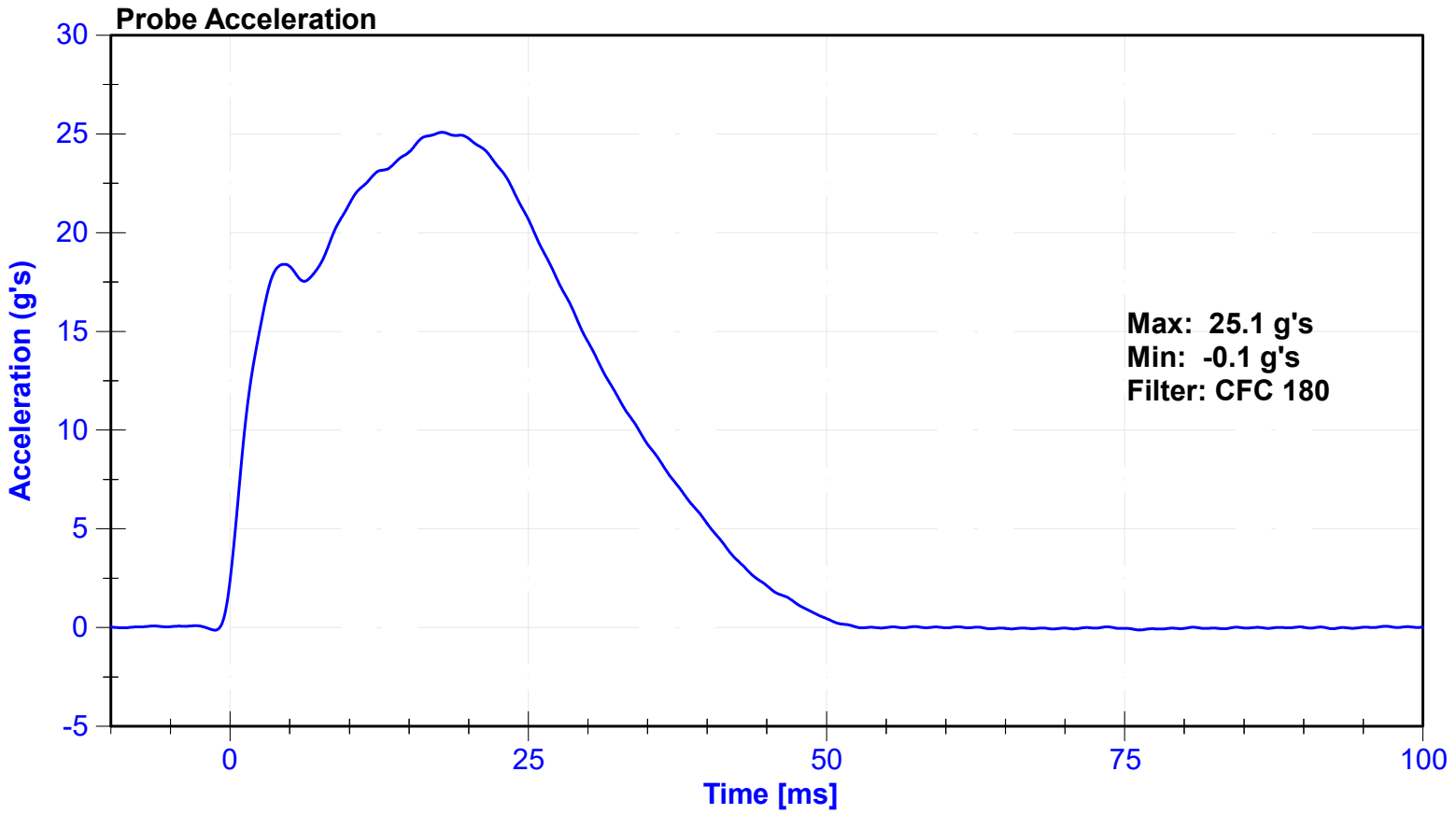
Transducer Calibrations

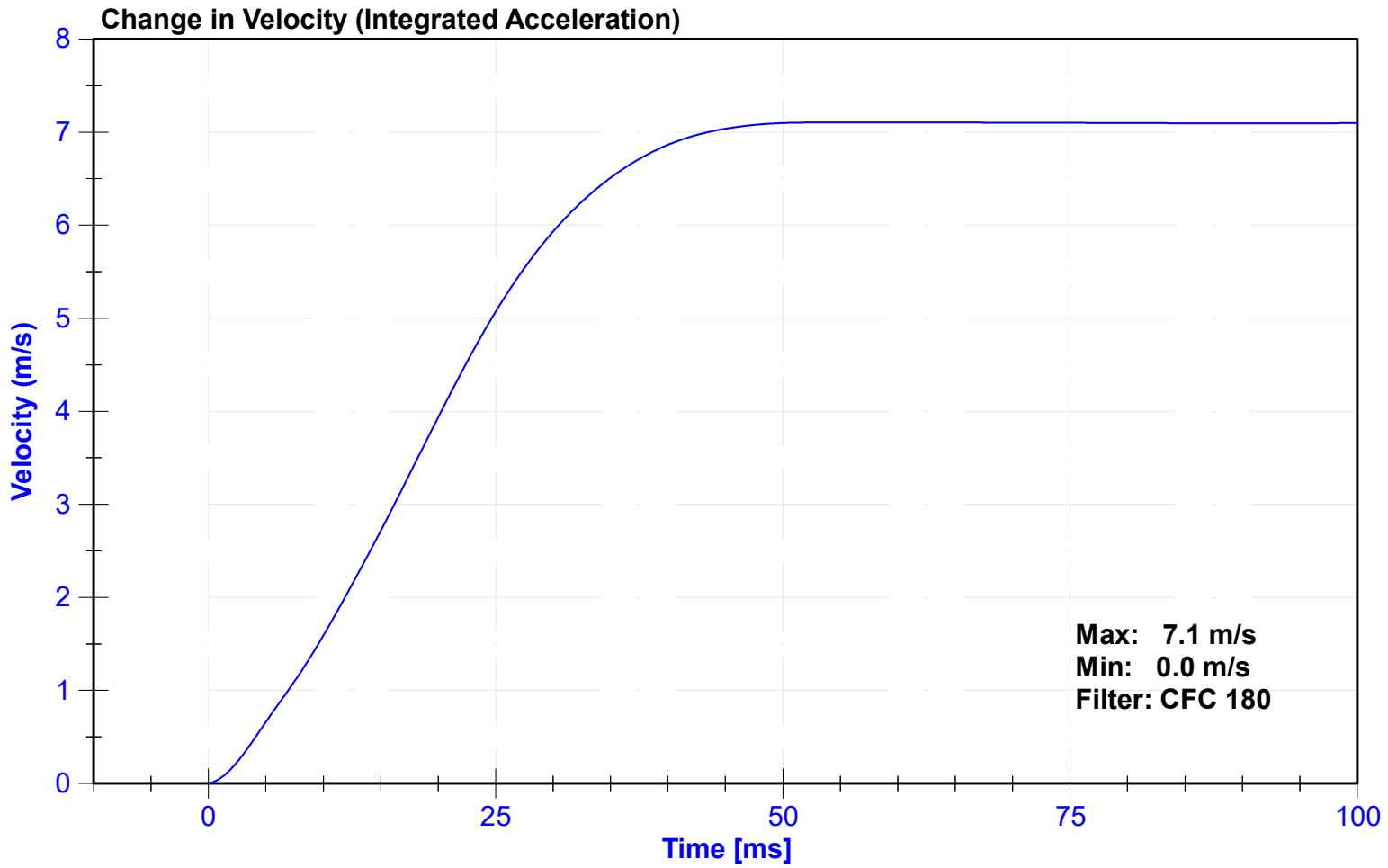
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Chest Potentiometer	Servo	1046	10/31/2024	5/1/2025




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
25
50
75
100
Time [ms]
Max: 5747.0 N
Min: -28.2 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: -64.87 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: 25.1 g's
Min: -0.1 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
25
50
75
100
Time [ms]
Max: 7.1 m/s
Min: 0.0 m/s
Filter: CFC 180

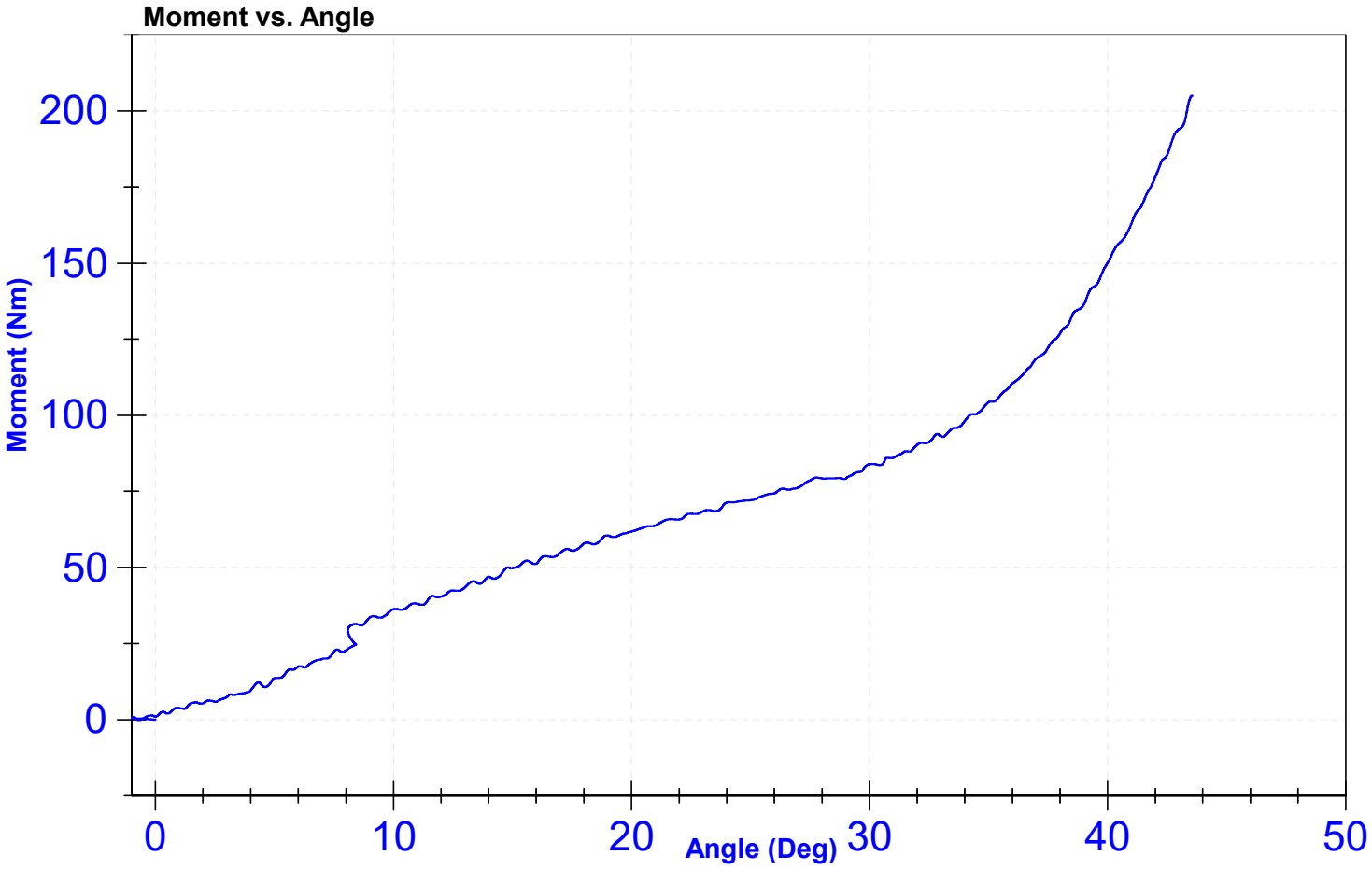
ATD Manufacturer	Humanetics	Test Technician	E. Andruczyk
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21	Pass
Humidity	10	70	%	20	Pass
Average Velocity	5	10	deg/s	7.1	Pass
Angle at 203Nm	40	50	deg	43.4	Pass
Moment at 30 degrees	0	94.9	Nm	83.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/23/2024	9/23/2025
Load Cell	PCB 2301-02	115	2024-11-11	2025-11-11



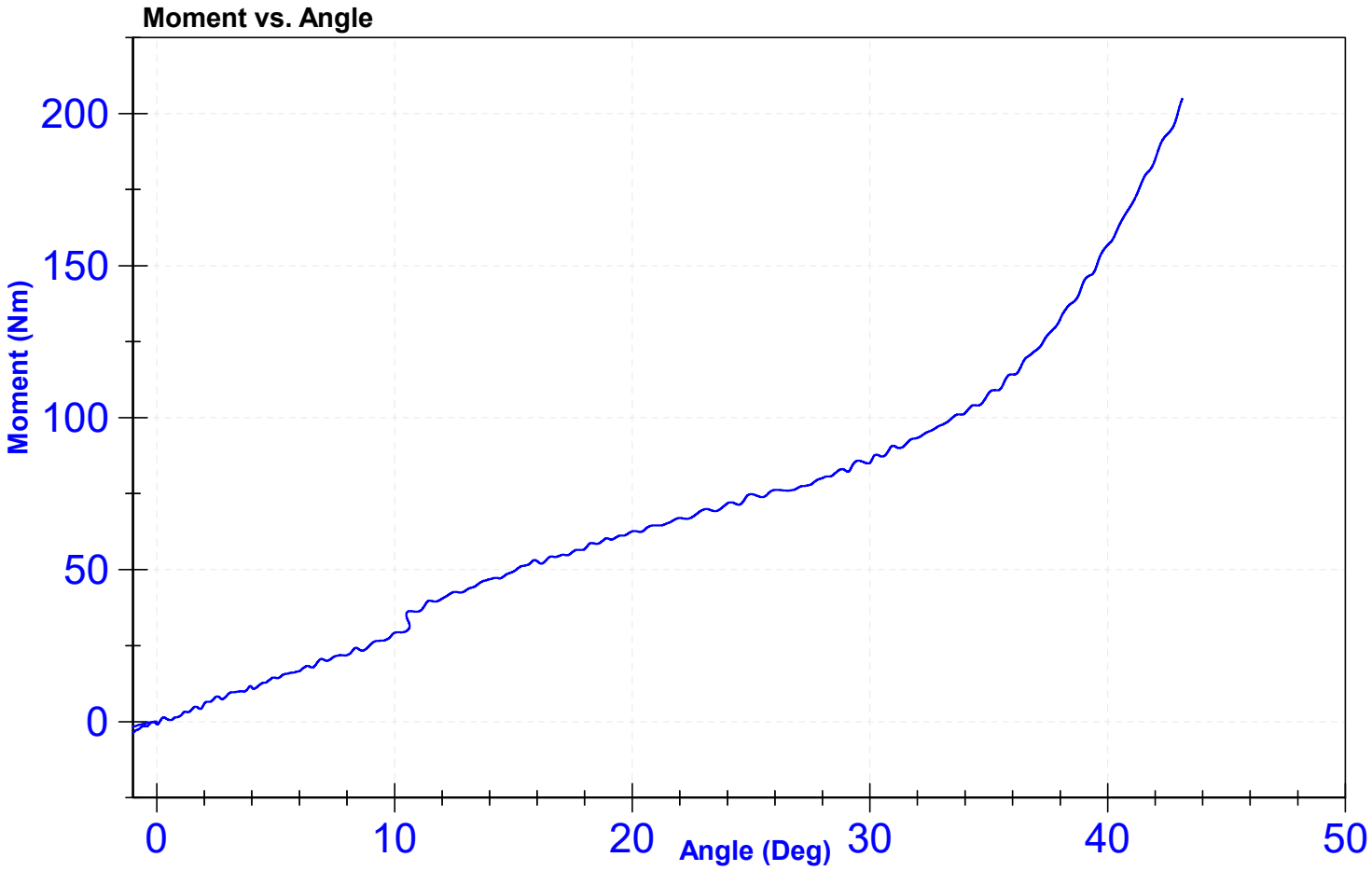
ATD Manufacturer	Humanetics	Test Technician	E. Andruczyk
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21	Pass
Humidity	10	70	%	20	Pass
Average Velocity	5	10	deg/s	7.1	Pass
Angle at 203Nm	40	50	deg	43.1	Pass
Moment at 30 degrees	0	94.9	Nm	85.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/23/2024	9/23/2025
Load Cell	PCB 2301-02	115	2024-11-11	2025-11-11



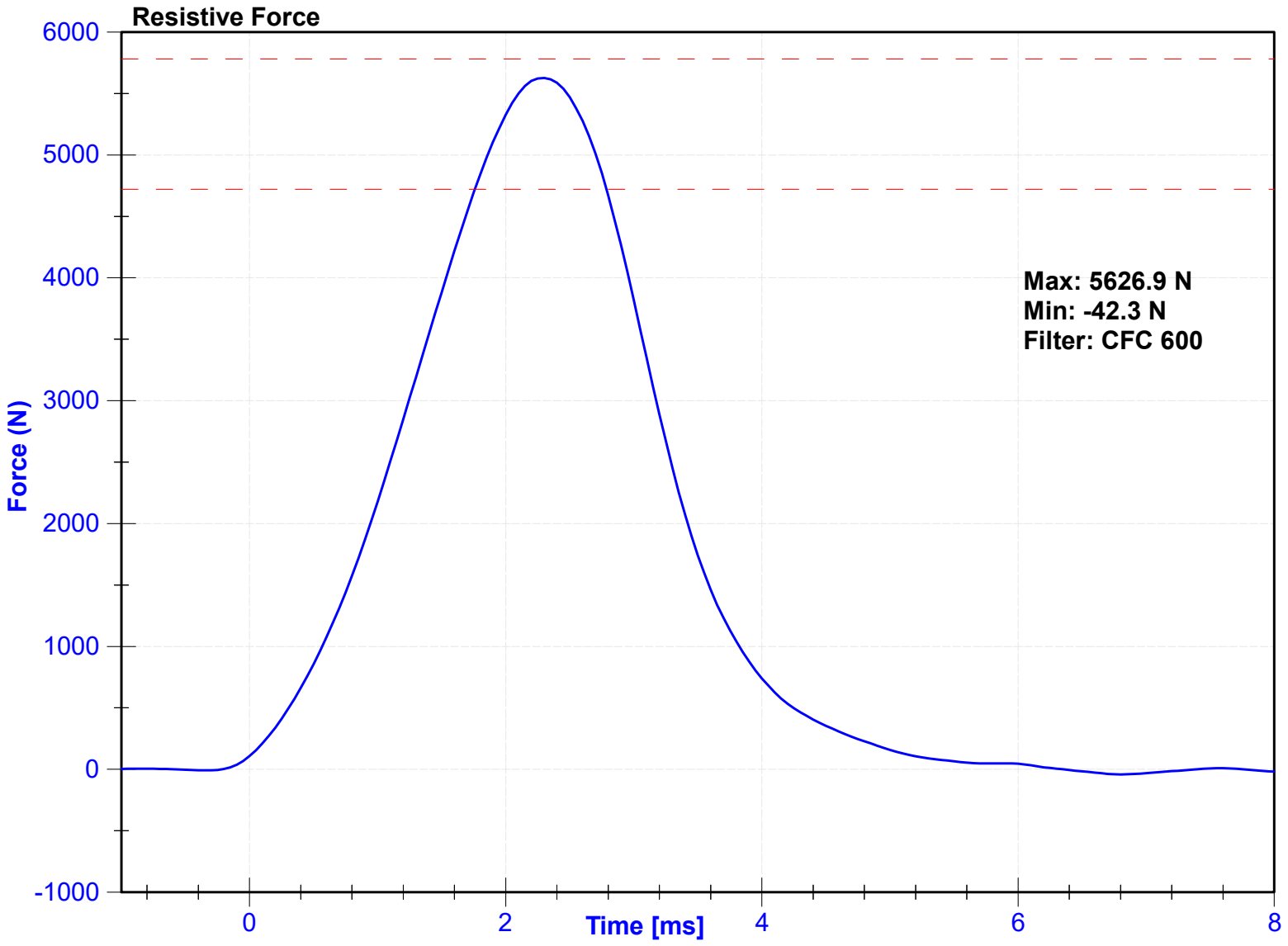
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

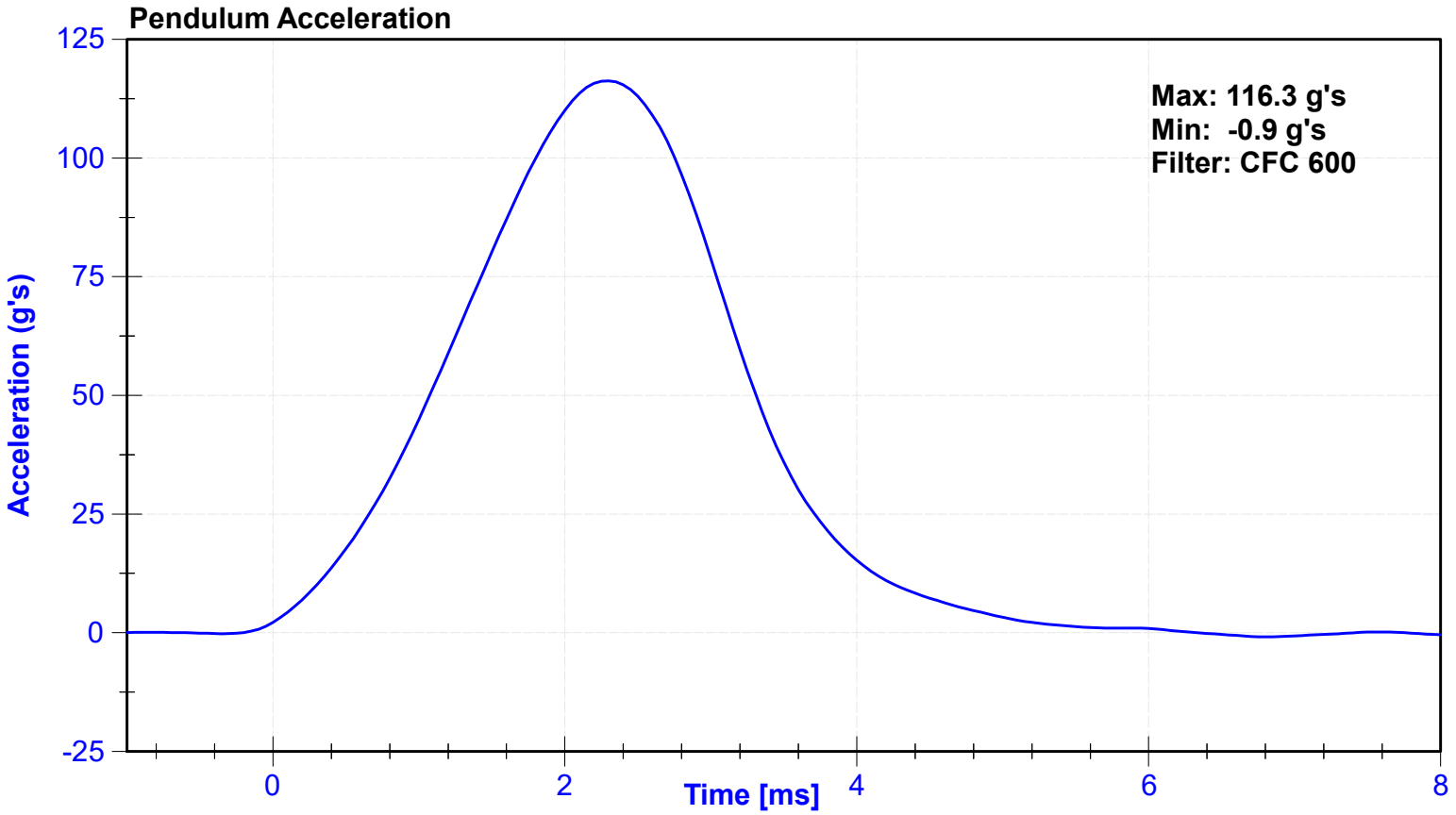
Results

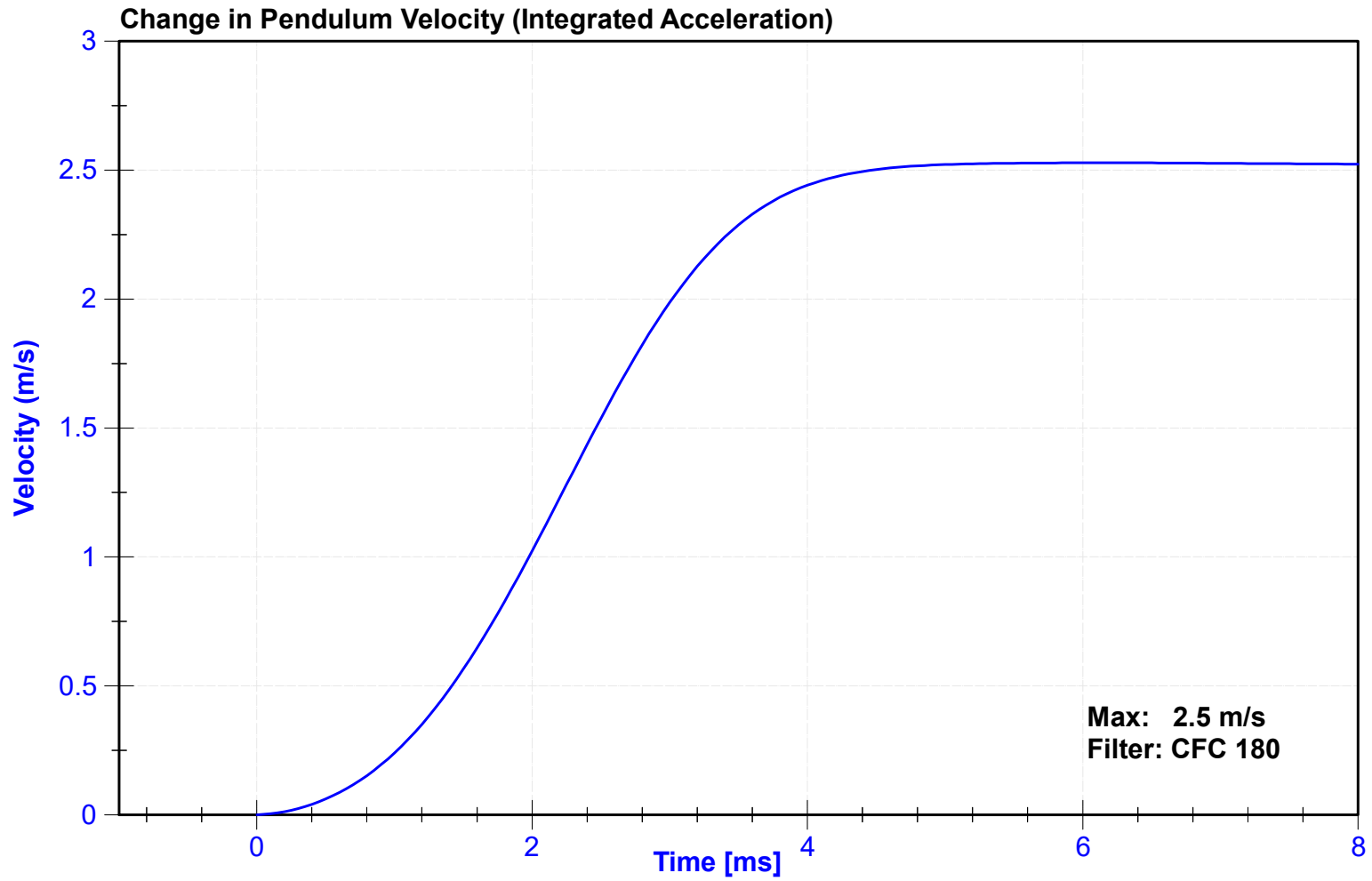
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.9	Pass
Humidity	10	70	%	15	Pass
Velocity	2.07	2.13	m/s	2.121	Pass
Maximum Resistive Force	4720	5780	N	5626.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25863	1/17/2025	7/16/2025




Pendulum Acceleration
Max: 116.3 g's
Min: -0.9 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


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

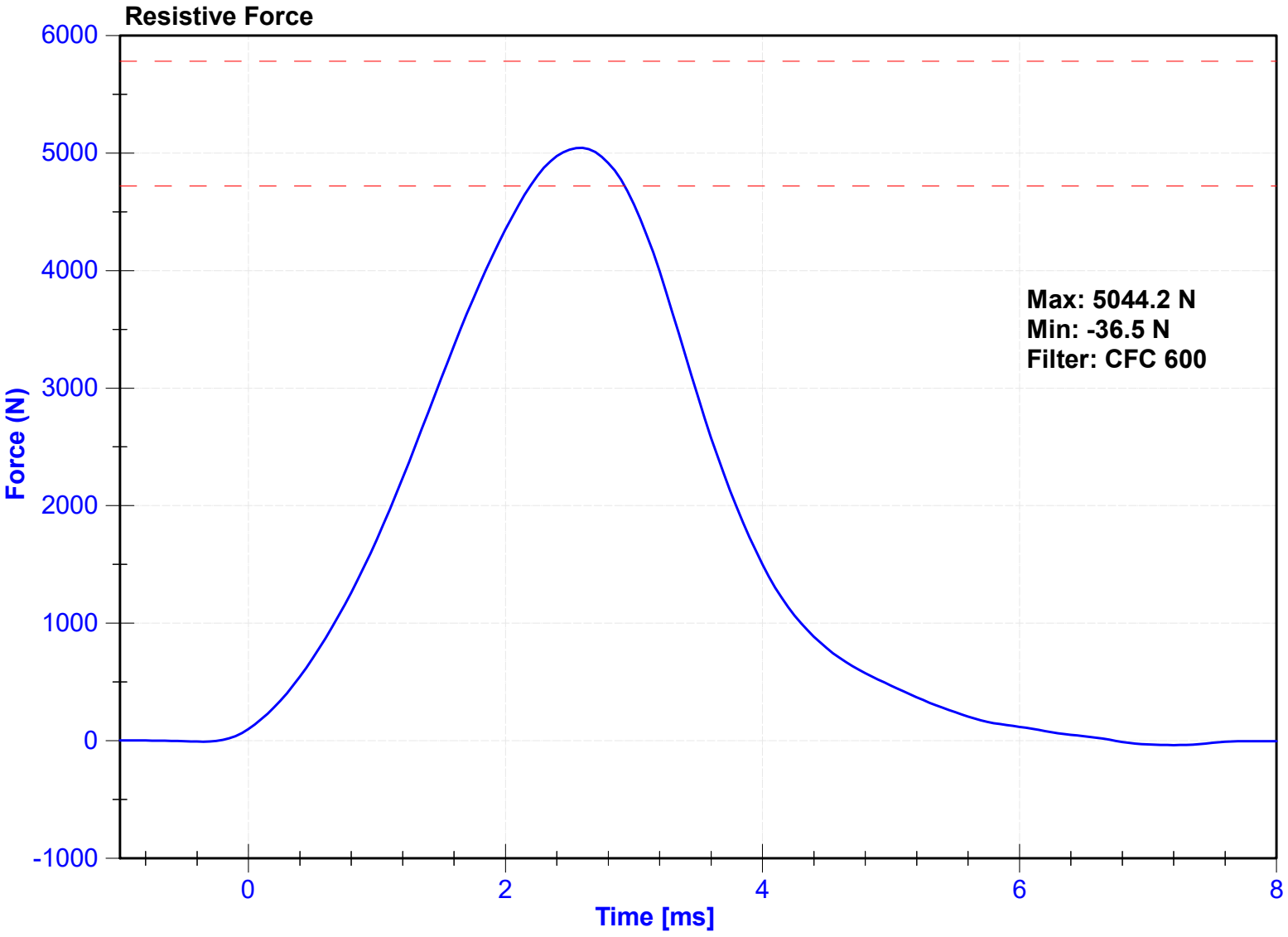
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

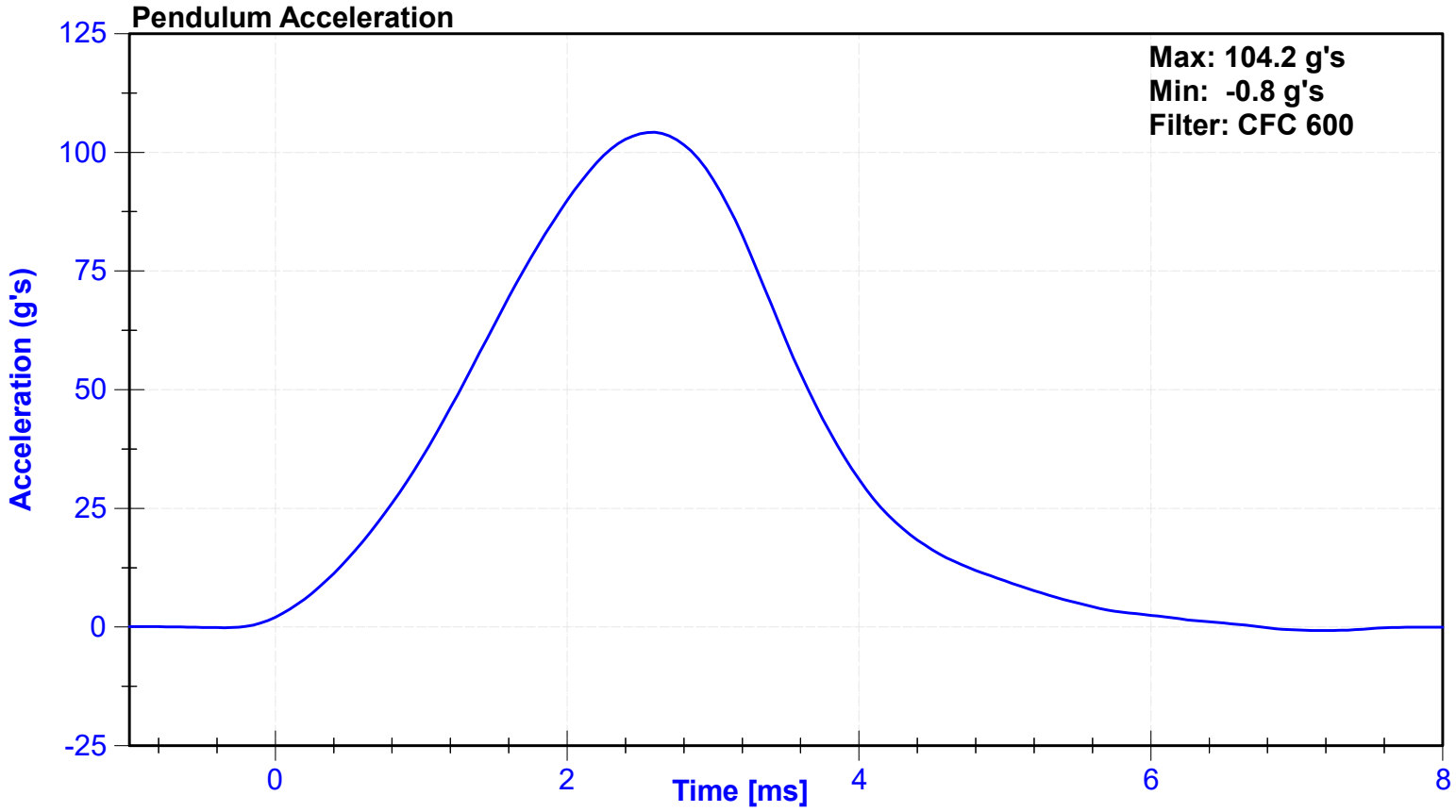
Results

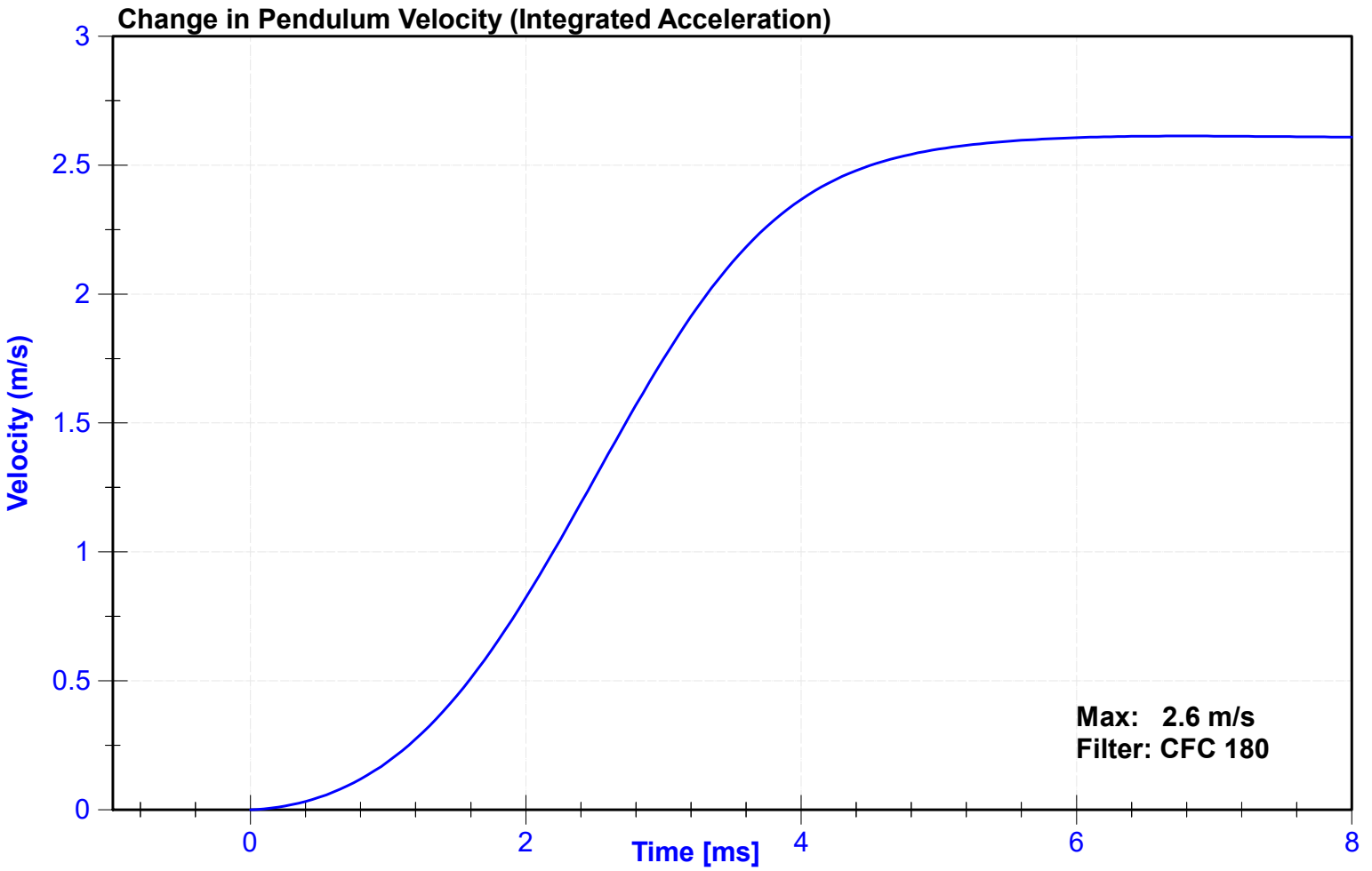
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.9	Pass
Humidity	10	70	%	15	Pass
Velocity	2.07	2.13	m/s	2.118	Pass
Maximum Resistive Force	4720	5780	N	5044.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25863	1/17/2025	7/16/2025




Pendulum Acceleration
Max: 104.2 g's
Min: -0.8 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


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

CALIBRATION TEST RESULTS

PRE-TEST

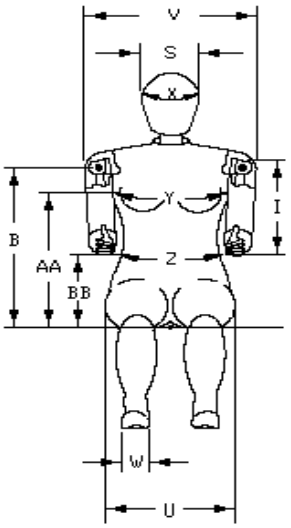
HYBRID III 5TH PERCENTILE - PASSENGER ATD

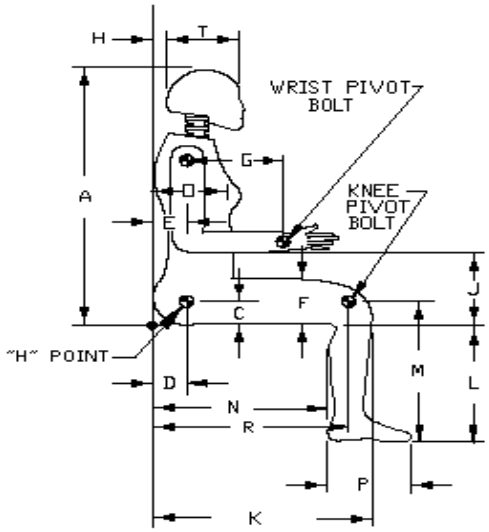
SERIAL NO: 137

External Measurements - Hybrid 3 - 5th Female

Technician: J. Rios Date: 2/10/2025

Dummy Serial Number: 137





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	783	Pass
B	Shoulder Pivot Height	432	457	442	Pass
C	H-Point Height	81	86	85	Pass
D	H-Point from Backline	145	150	148	Pass
E	Shoulder Pivot from Backline	69	84	77	Pass
F	Thigh Clearance	119	135	128	Pass
G	Back of Elbow to Wrist Pivot	244	259	251	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	287	Pass
J	Elbow Rest Height	183	203	195	Pass
K	Buttock to Knee Length	521	546	532	Pass
L	Popliteal Height	356	376	362	Pass
M	Knee Pivot Height	394	419	404	Pass
N	Buttock Popliteal Length	414	439	431	Pass
O	Chest Depth without Jacket	175	191	187	Pass
P	Foot Length (right)	219	234	224	Pass
R	Buttock To Knee Pivot Length	457	483	465	Pass
S	Head Breadth	137	147	141	Pass
T	Head Depth	178	188	182	Pass
U	Hip Breadth	300	315	307	Pass
V	Shoulder Breadth	351	366	360	Pass
W	Foot Breadth	79	94	84	Pass
X	Head Circumference	528	549	537	Pass
Y	Chest Circumference with Jacket	851	881	871	Pass
Z	Waist Circumference	460	790	622	Pass
AA	Reference Location (Chest Circumference)	333	358	344	Pass
BB	Reference Location (Waist Circumference)	160	170	166	Pass

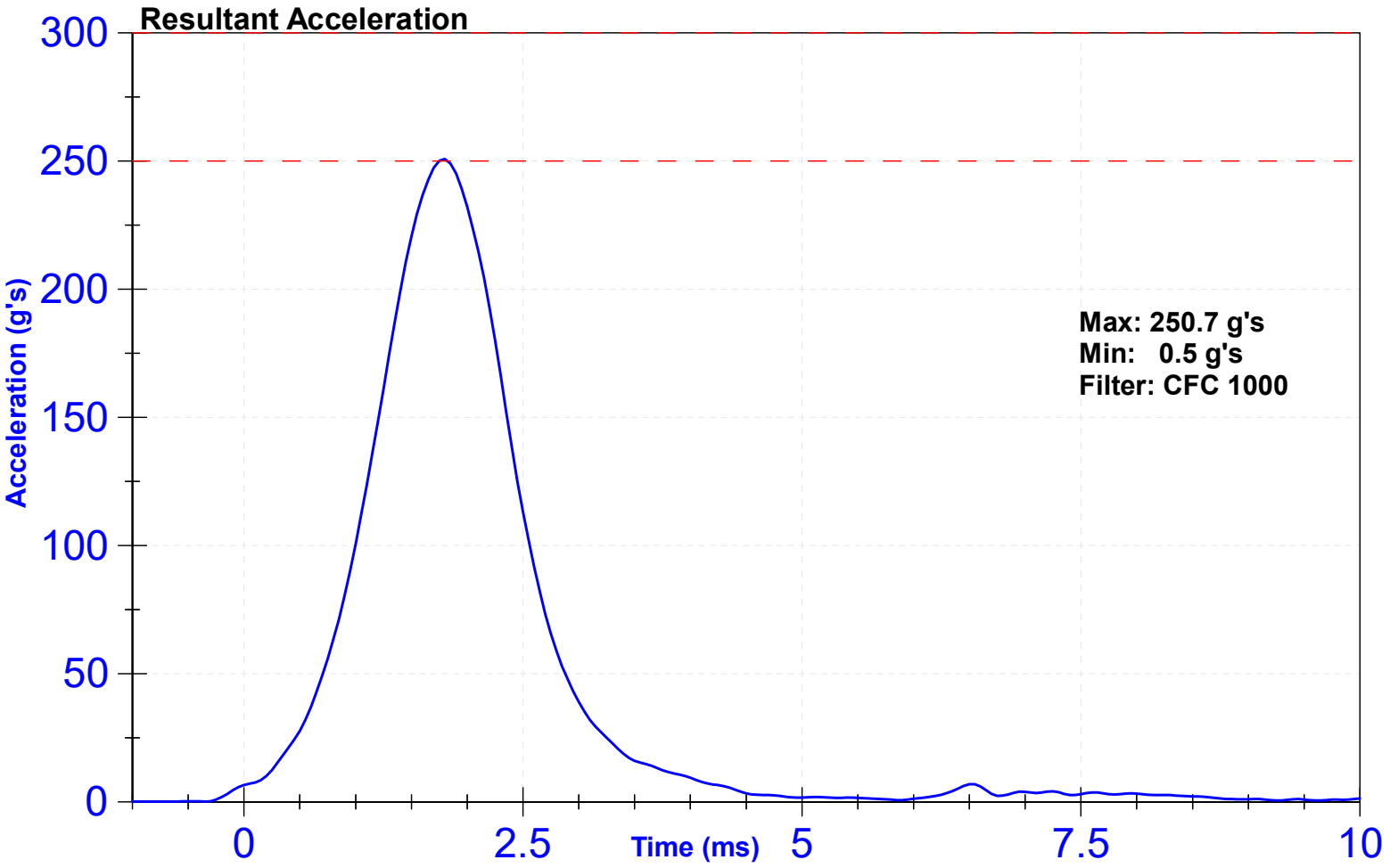
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

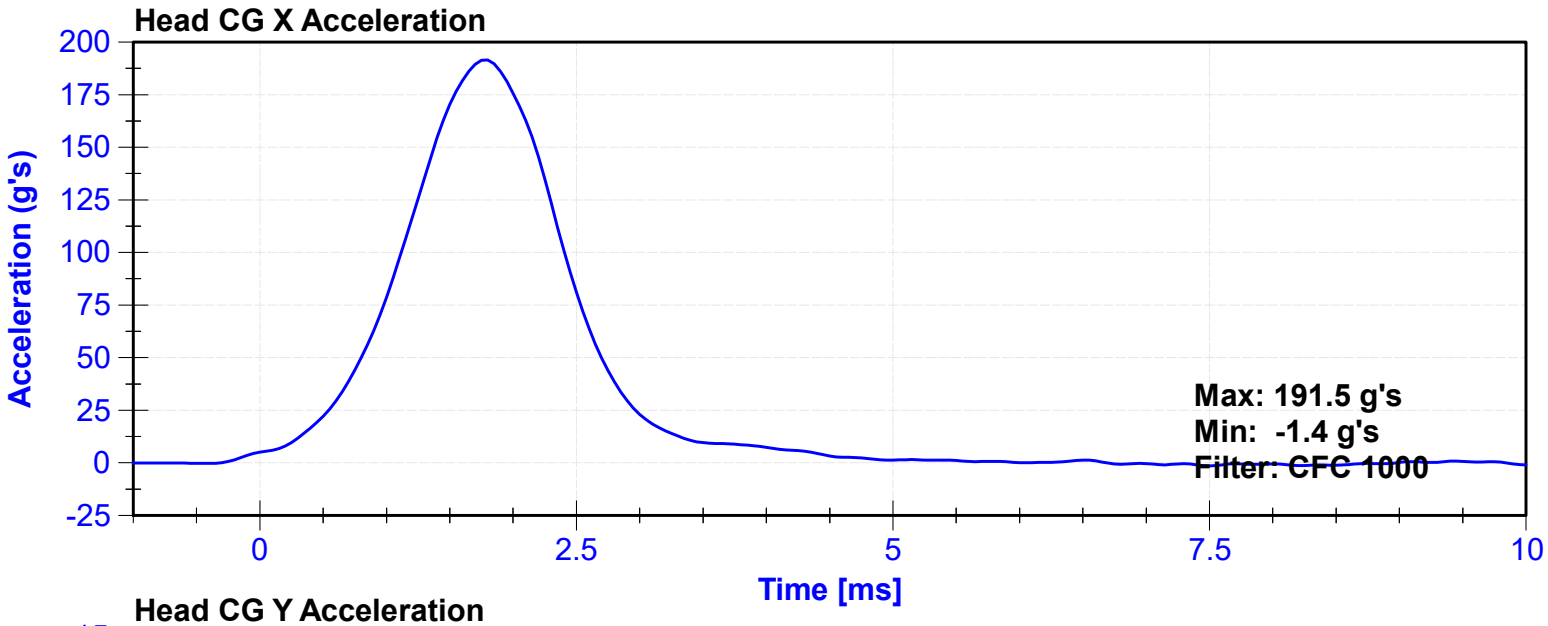
Results

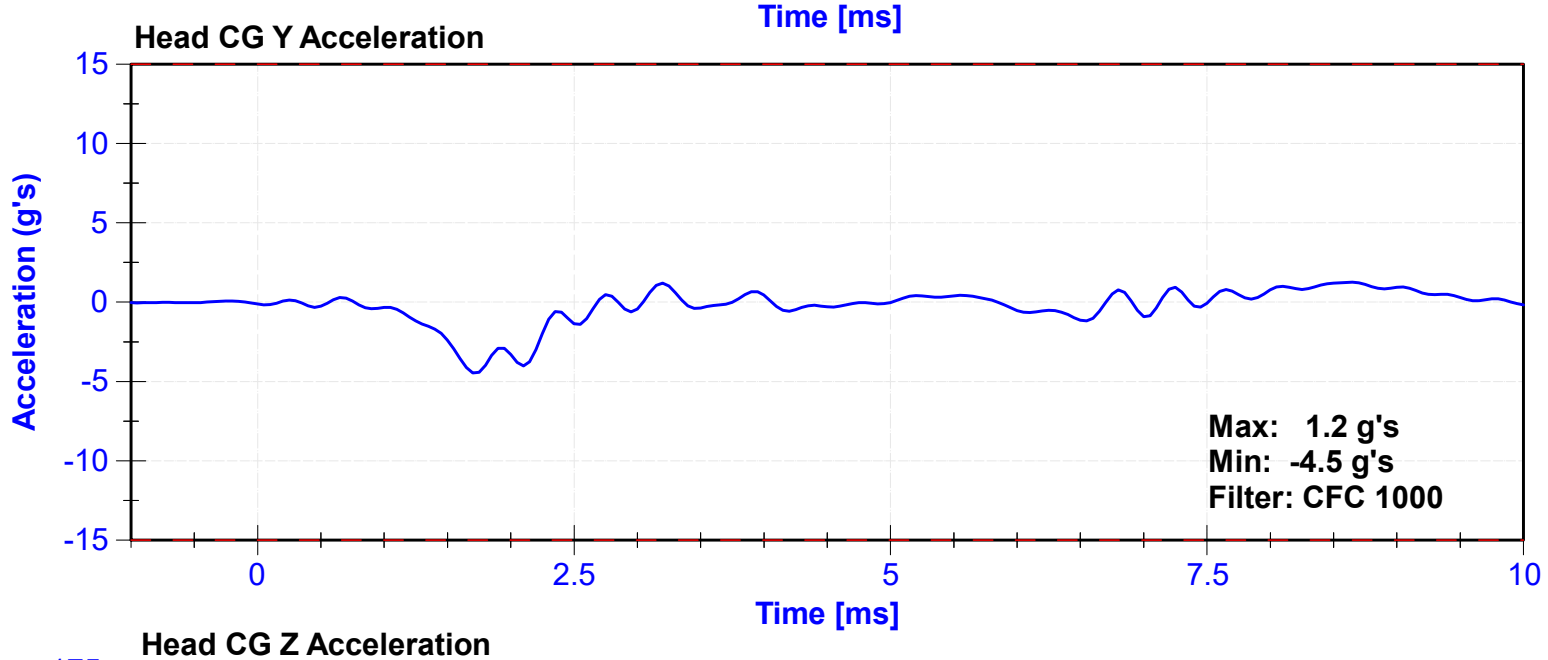
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.7	Pass
Humidity	10	70	%	17	Pass
Resultant Acceleration	250	300	g's	250.7	Pass
Oscillation	0	10	%	2.7	Pass
Lateral Acceleration	-15	15	g's	-4.5	Pass

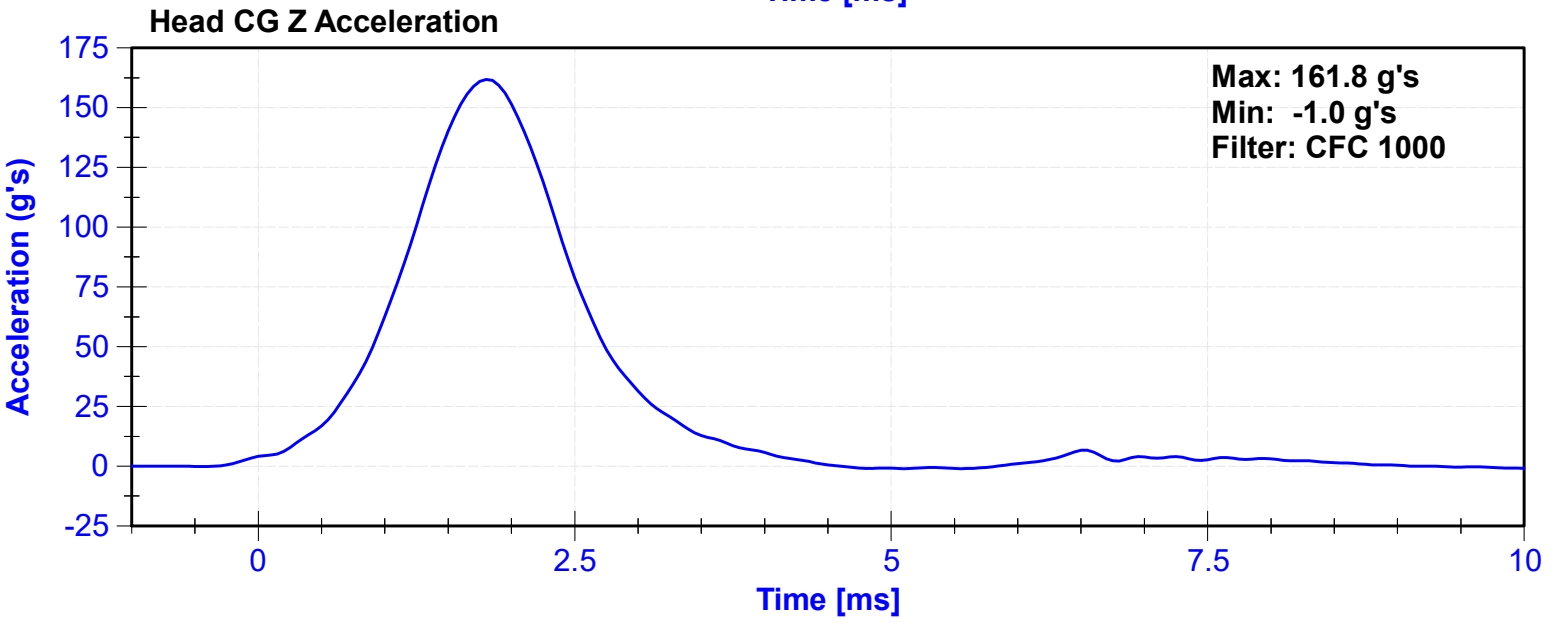
Transducer Calibrations

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)
200
175
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 191.5 g's
Min: -1.4 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 1.2 g's
Min: -4.5 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
175
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 161.8 g's
Min: -1.0 g's
Filter: CFC 1000

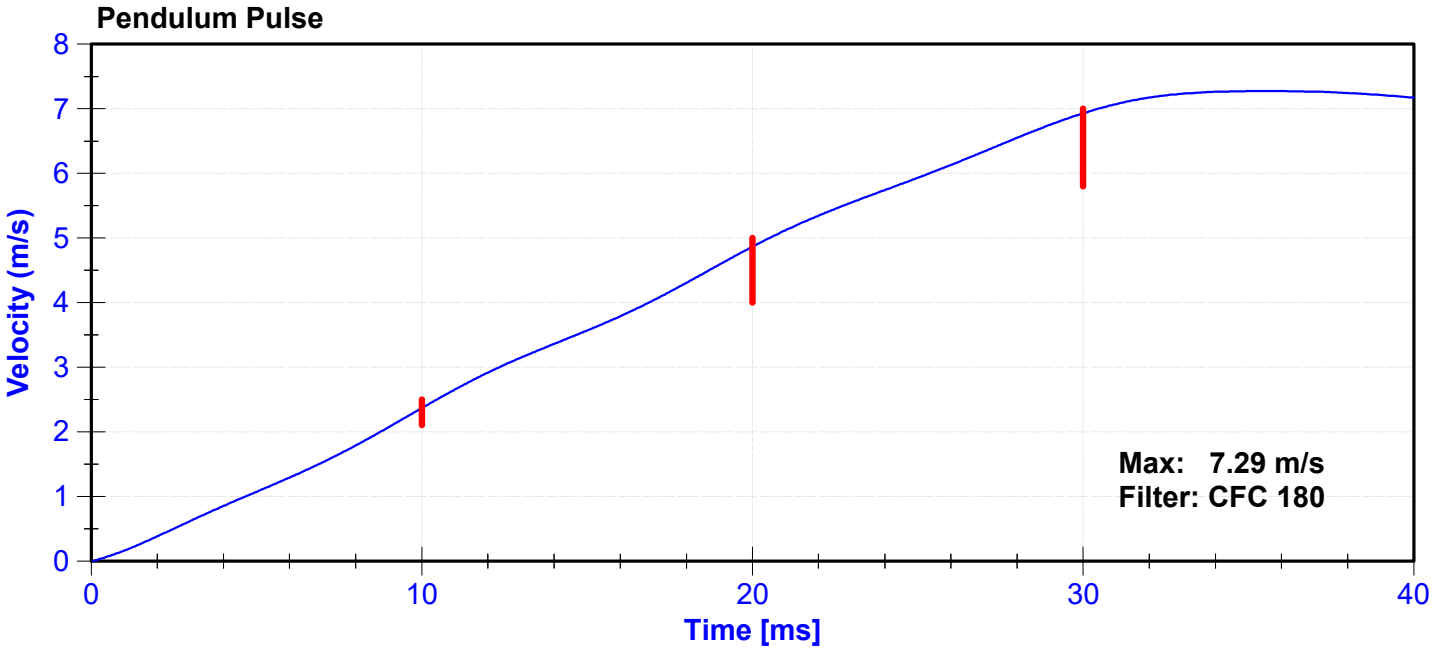
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

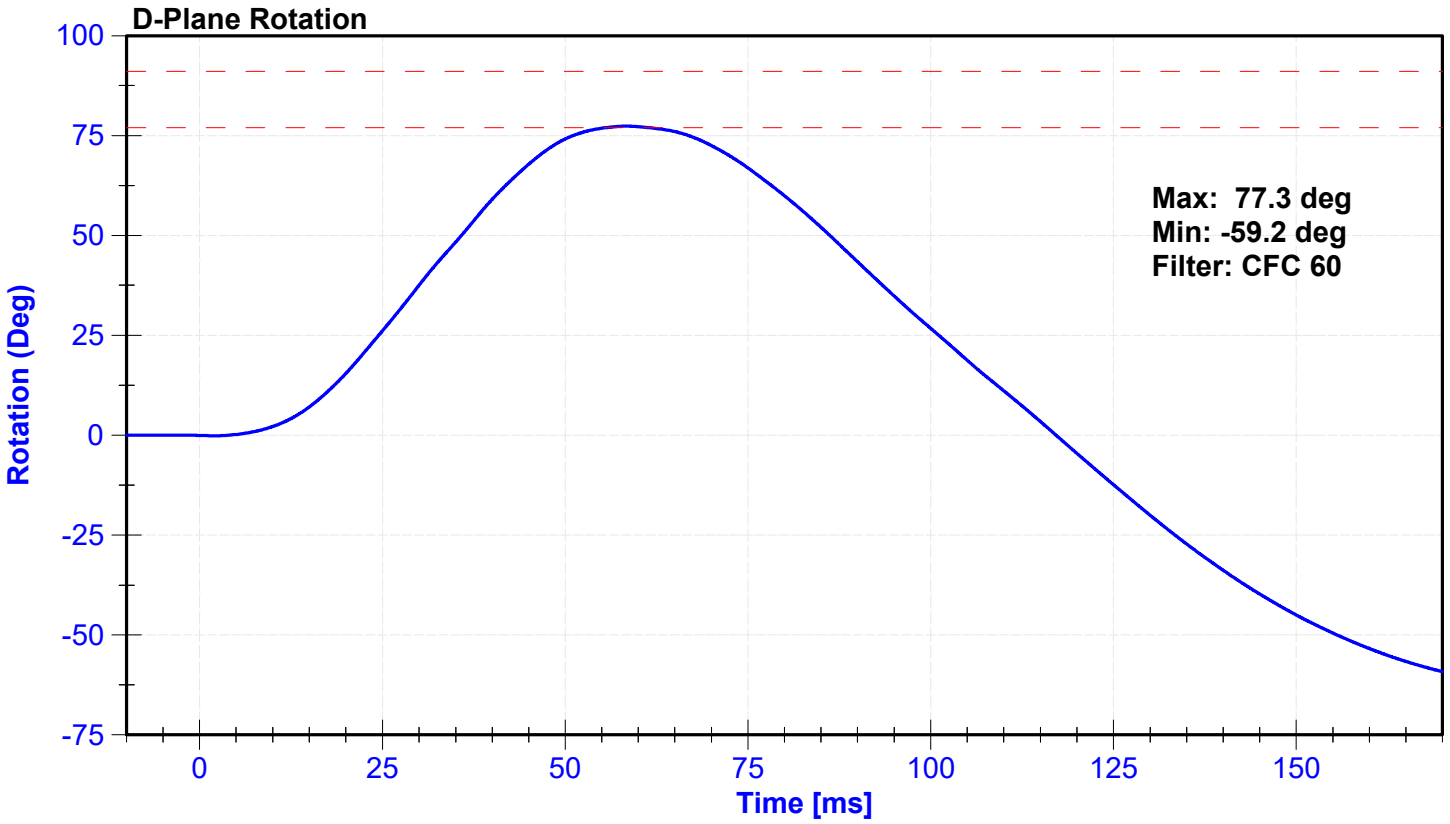
Results

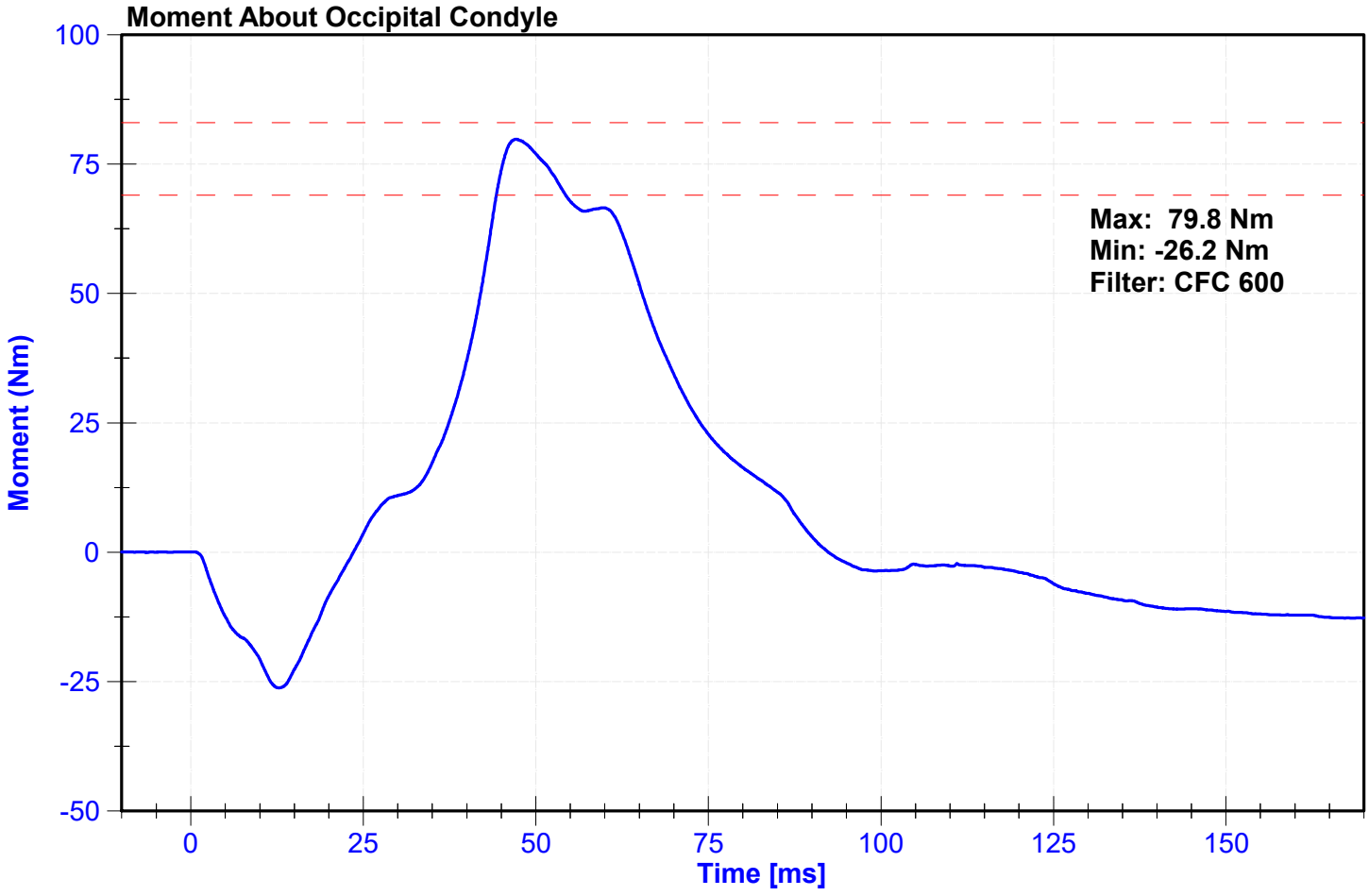
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	17	Pass
Velocity	6.89	7.13	m/s	7.052	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.37	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.86	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.93	Pass
Max D Plane Rotation	77	91	deg	77.3	Pass
Max Moment During Rotation Interval	69	83	Nm	79.8	Pass
Moment Decay to 10.0 Nm	80	100	ms	86.3	Pass

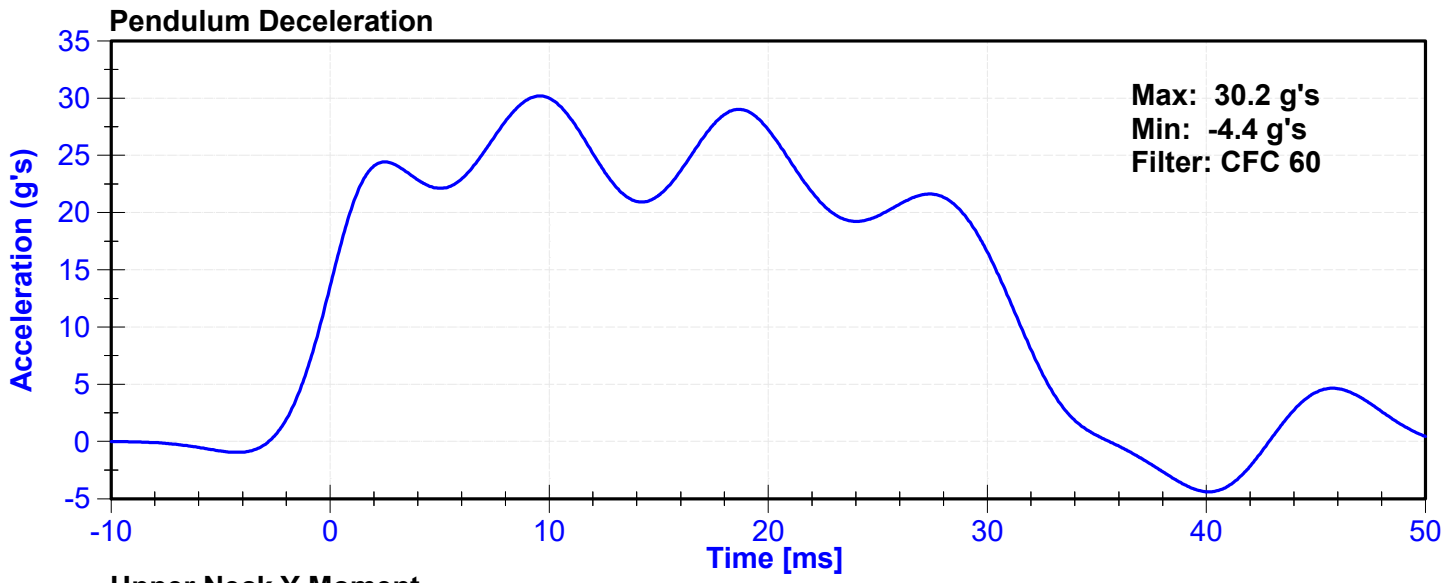
Transducer Calibrations

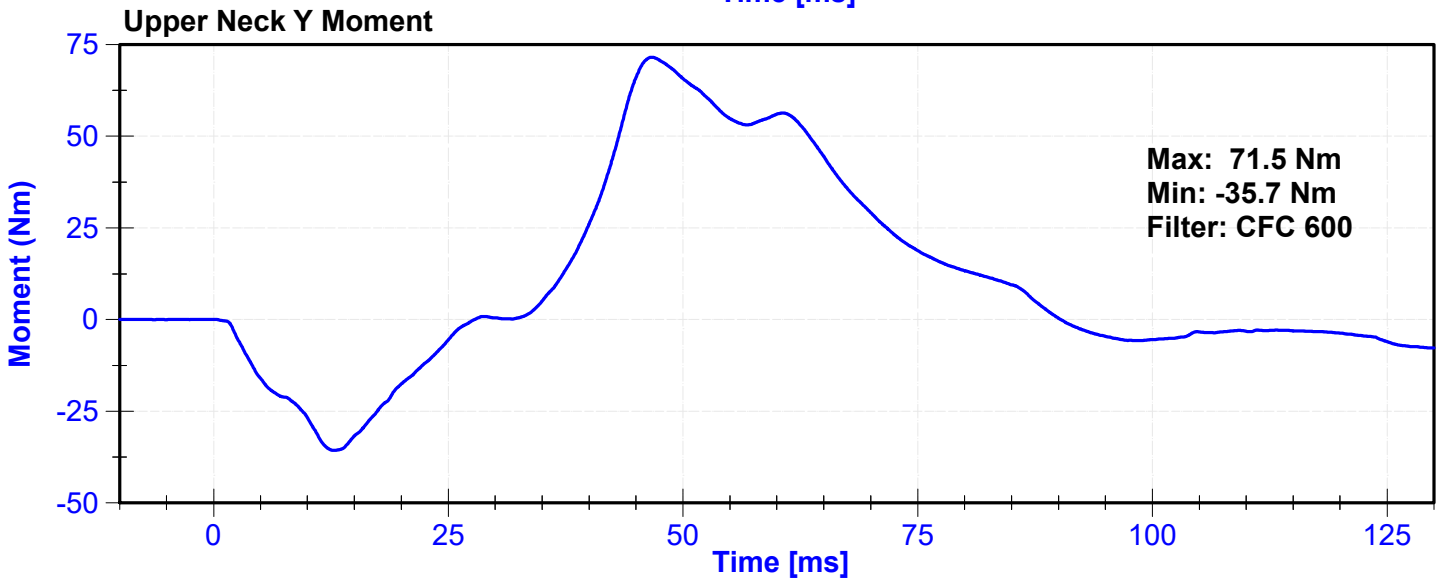
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	11/1/2024	11/1/2025
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025

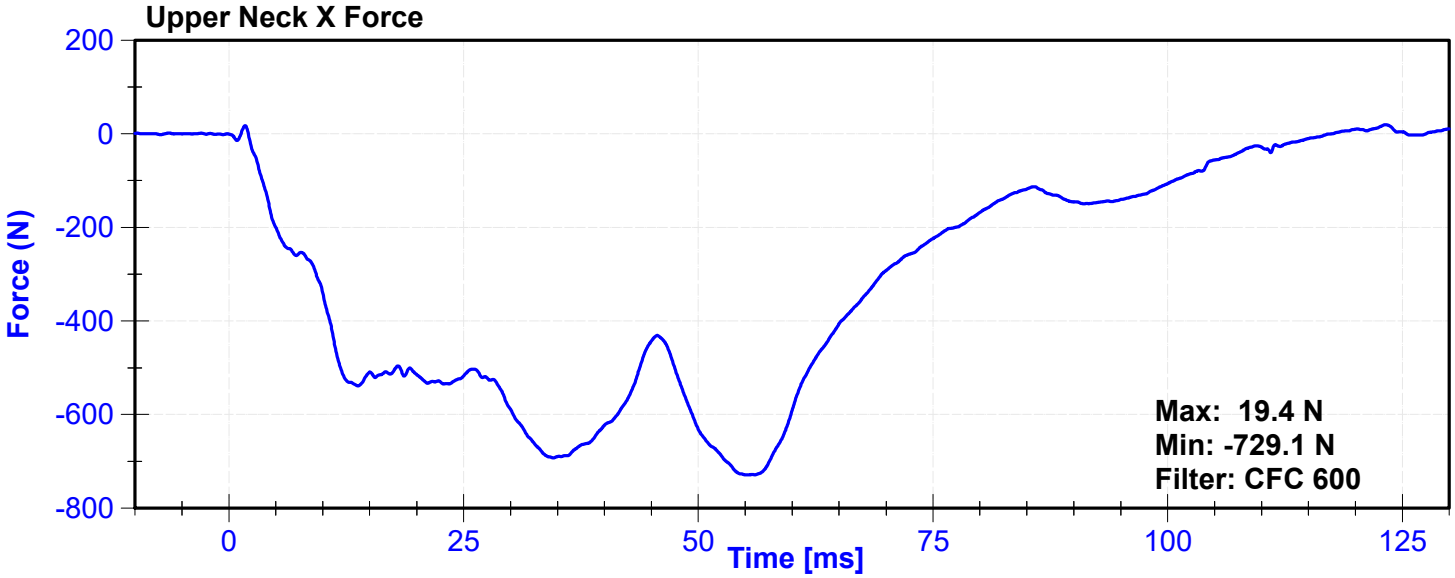



D-Plane Rotation
Max: 77.3 deg
Min: -59.2 deg
Filter: CFC 60
Rotation (Deg)
Time [ms]
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150


Moment About Occipital Condyle
Max: 79.8 Nm
Min: -26.2 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: 30.2 g's
Min: -4.4 g's
Filter: CFC 60


Upper Neck Y Moment
Moment (Nm)
Time [ms]
Max: 71.5 Nm
Min: -35.7 Nm
Filter: CFC 600


Upper Neck X Force
Force (N)
Time [ms]
Max: 19.4 N
Min: -729.1 N
Filter: CFC 600

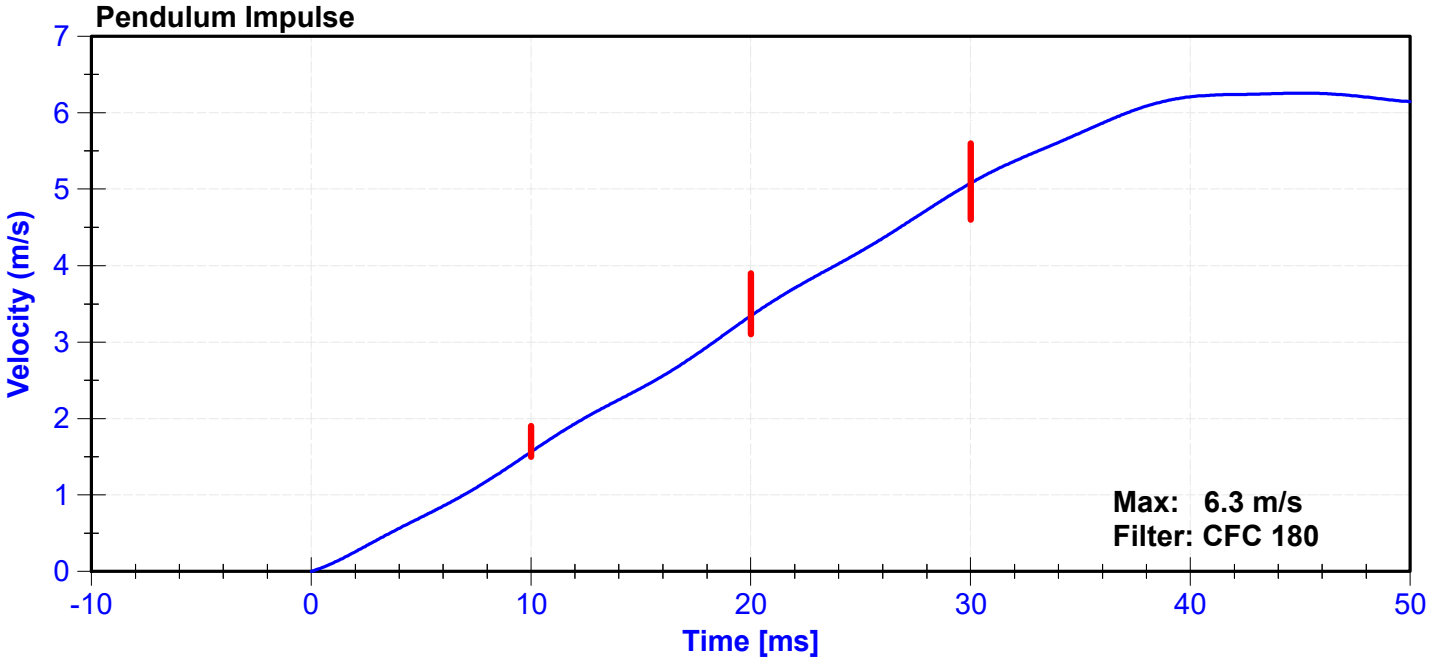
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

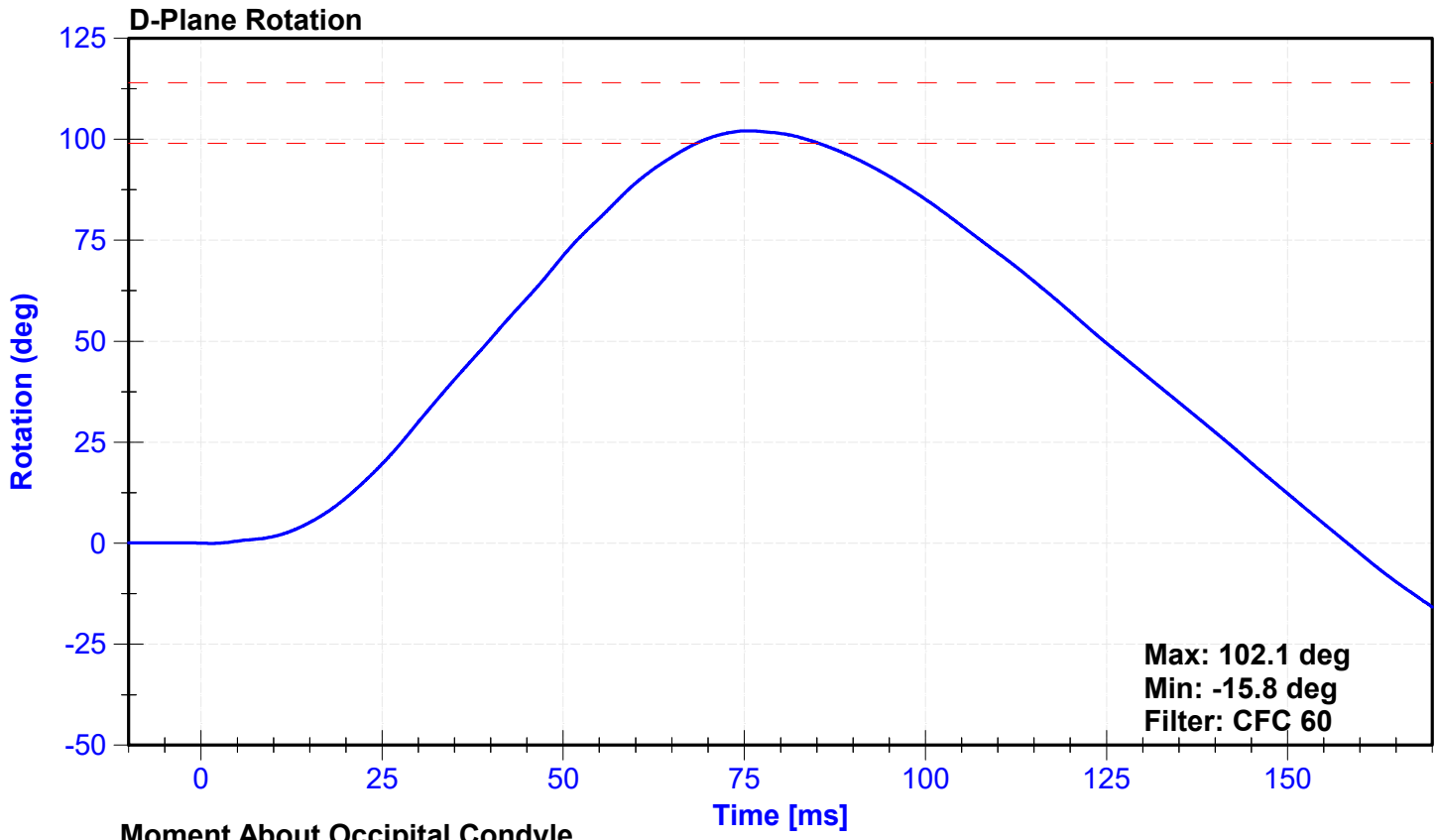
Results

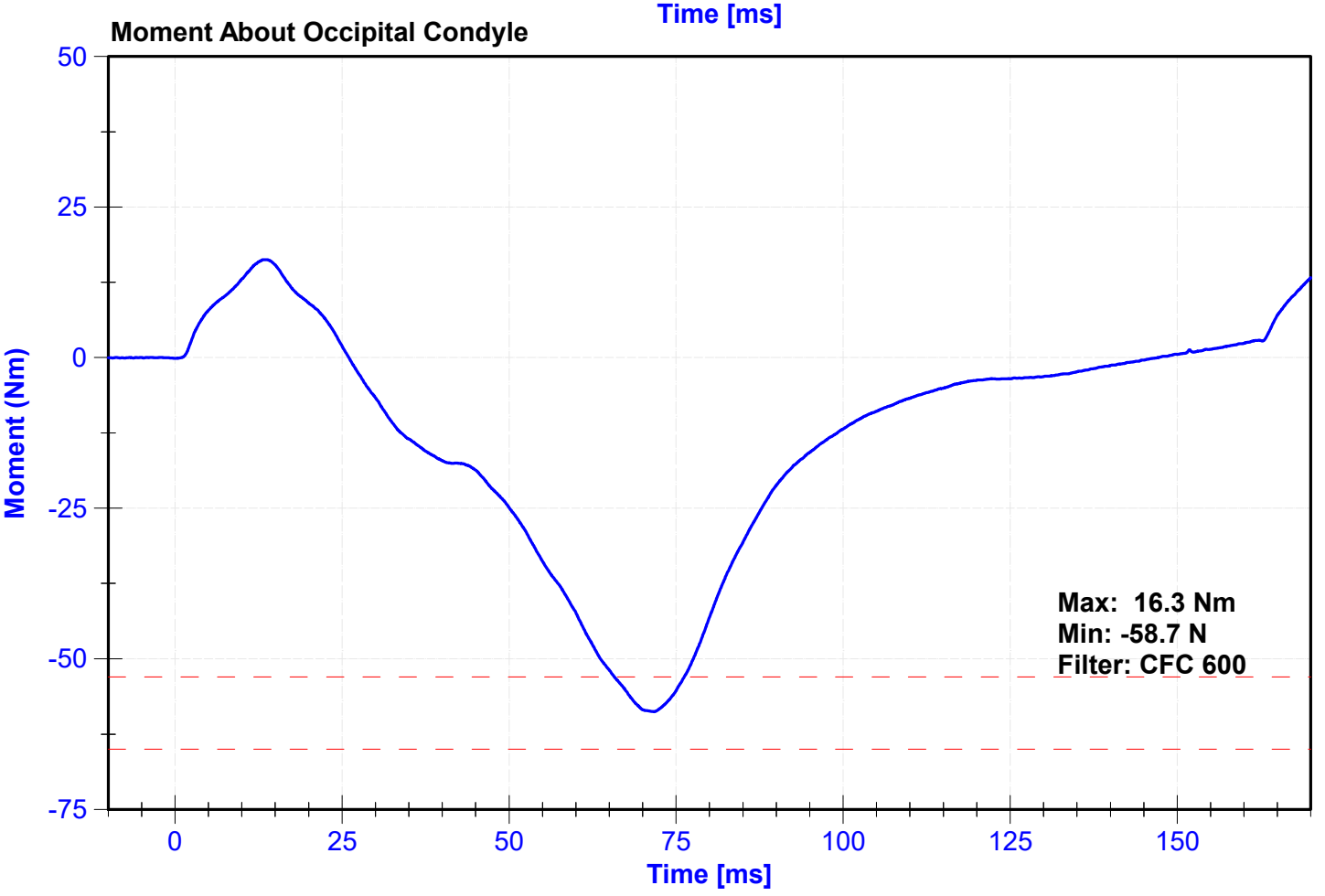
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	17	Pass
Velocity	5.95	6.19	m/s	6.042	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.56	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.34	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.08	Pass
D Plane Rotation	99	114	deg	102.1	Pass
Moment During Rotation Interval	-65	-53	Nm	-58.7	Pass
Moment Decay to -10Nm	94	114	ms	102.8	Pass

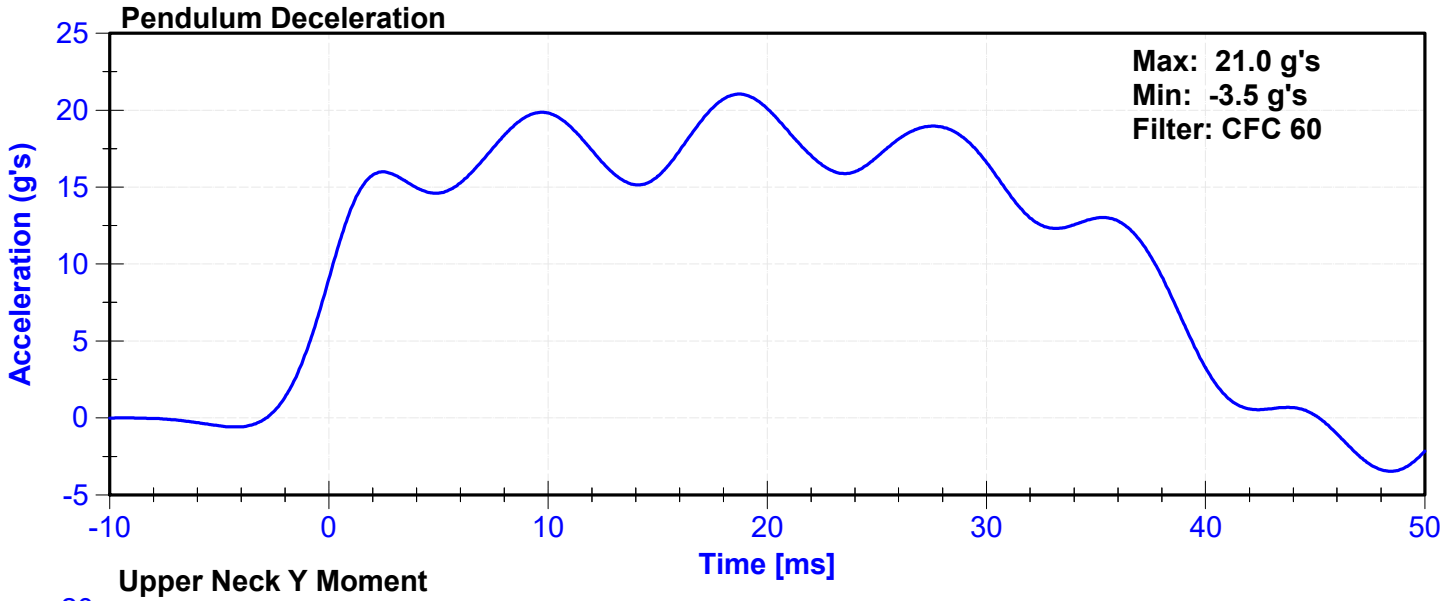
Transducer Calibrations

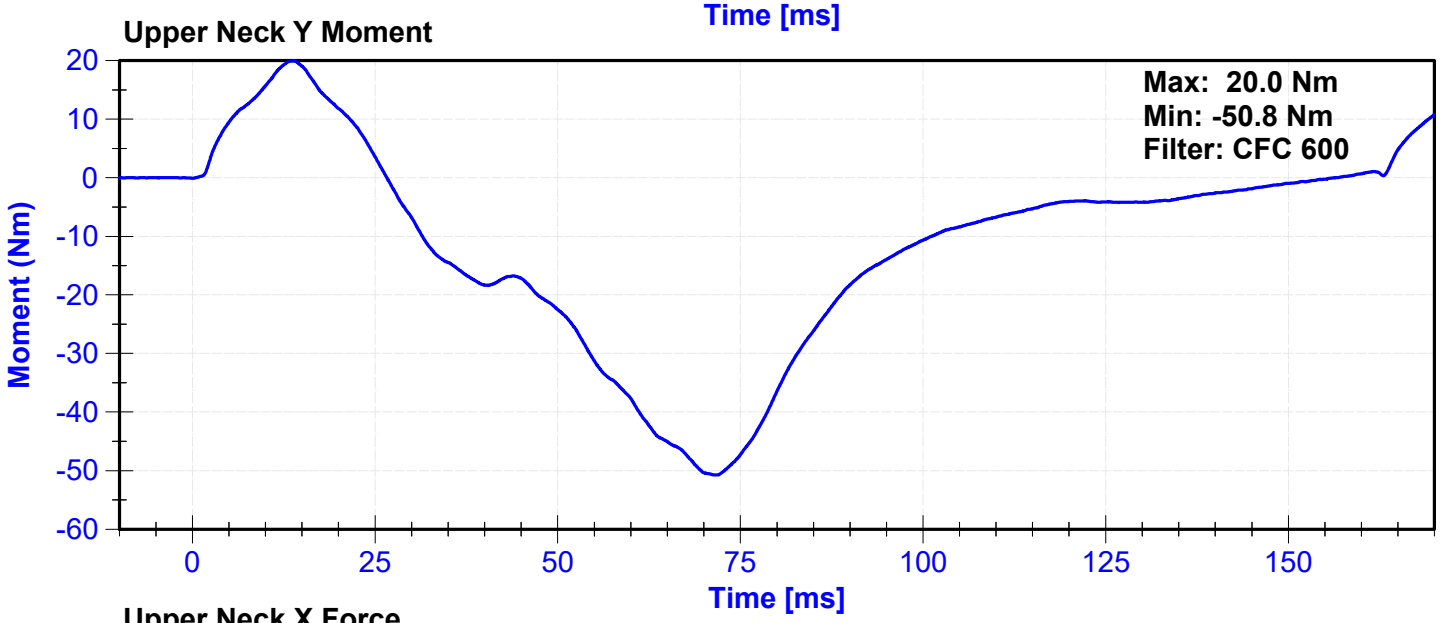
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	11/1/2024	11/1/2025
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025

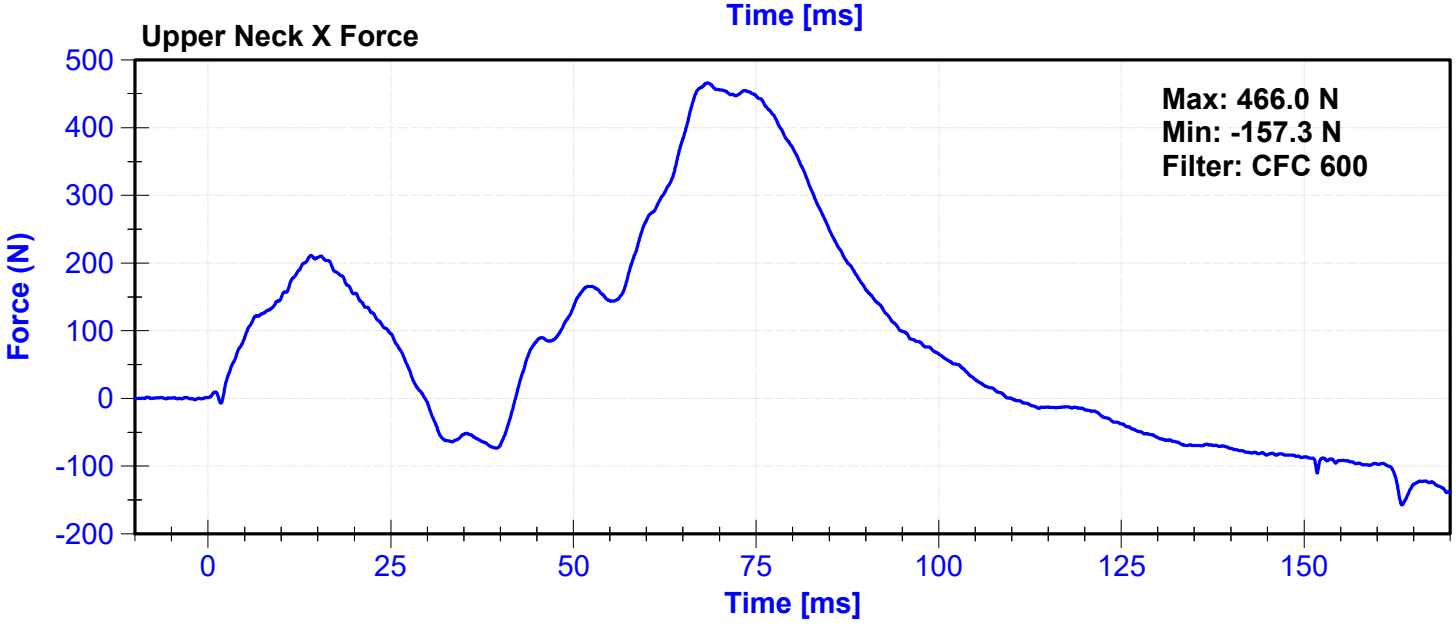



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 102.1 deg
Min: -15.8 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]
Max: 16.3 Nm
Min: -58.7 N
Filter: CFC 600


Pendulum Deceleration
Max: 21.0 g's
Min: -3.5 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: -50.8 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: 466.0 N
Min: -157.3 N
Filter: CFC 600
Force (N)
500
400
300
200
100
0
-100
-200
0
25
50
75
100
125
150
Time [ms]

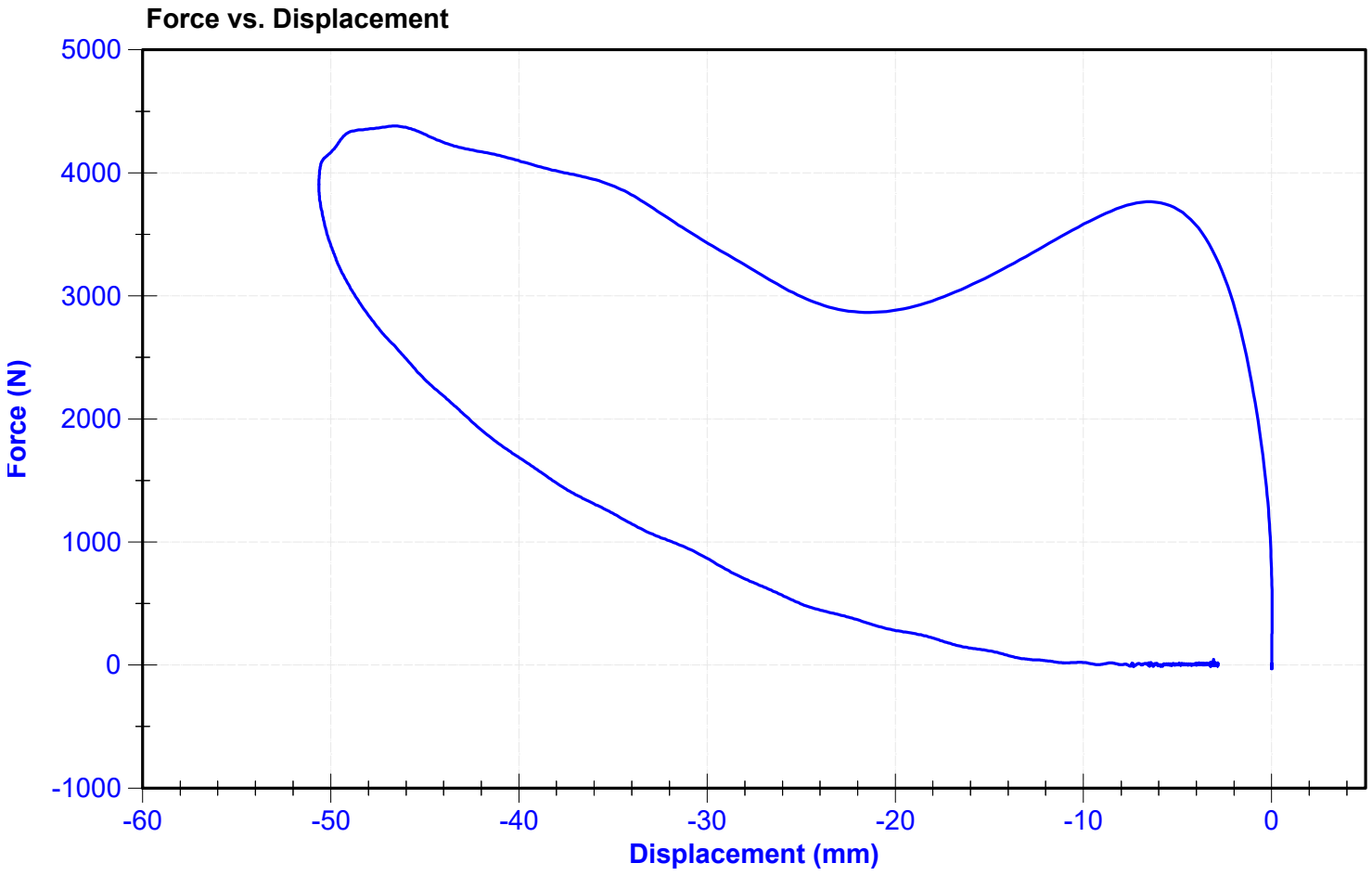
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

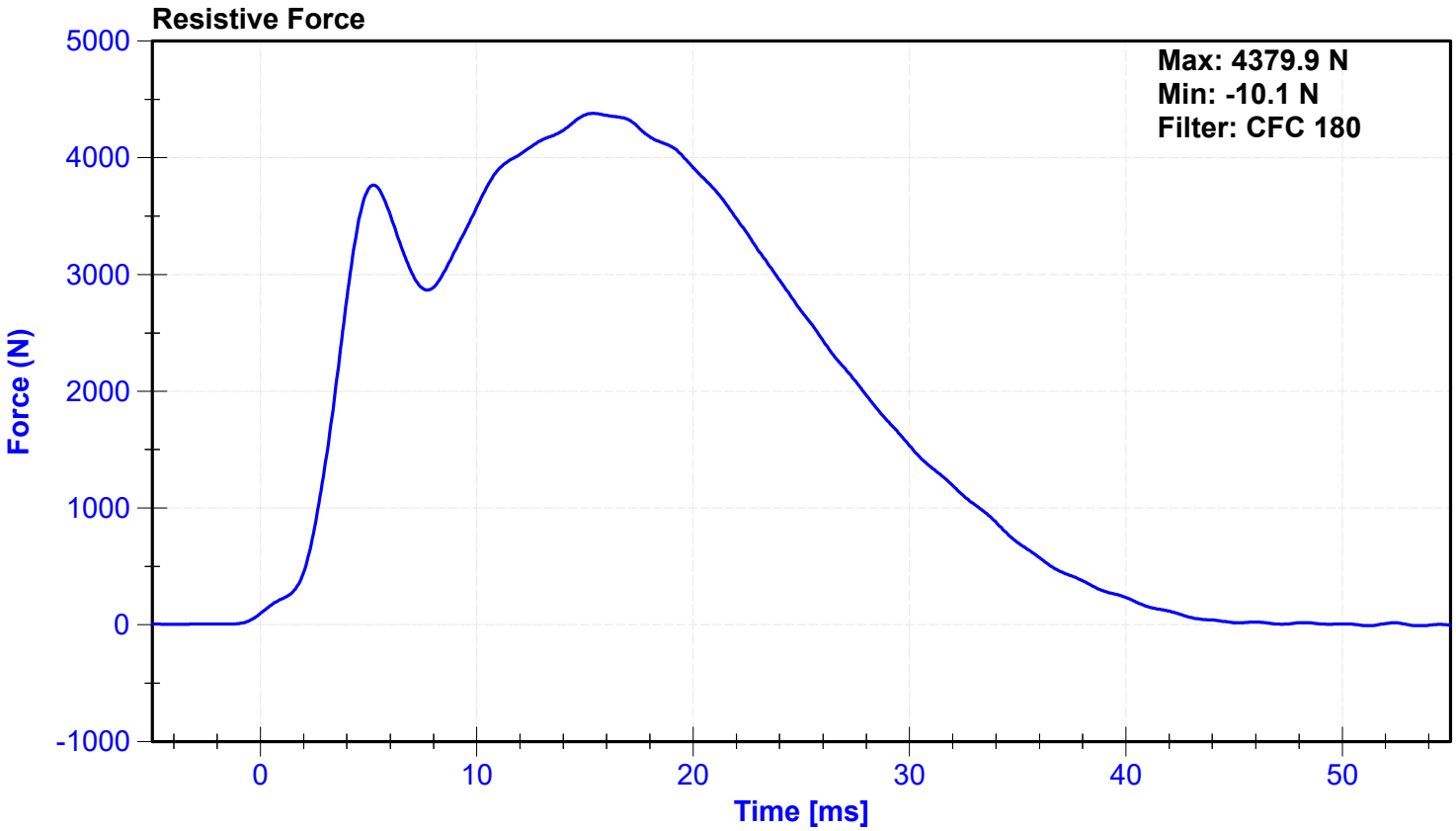
Results

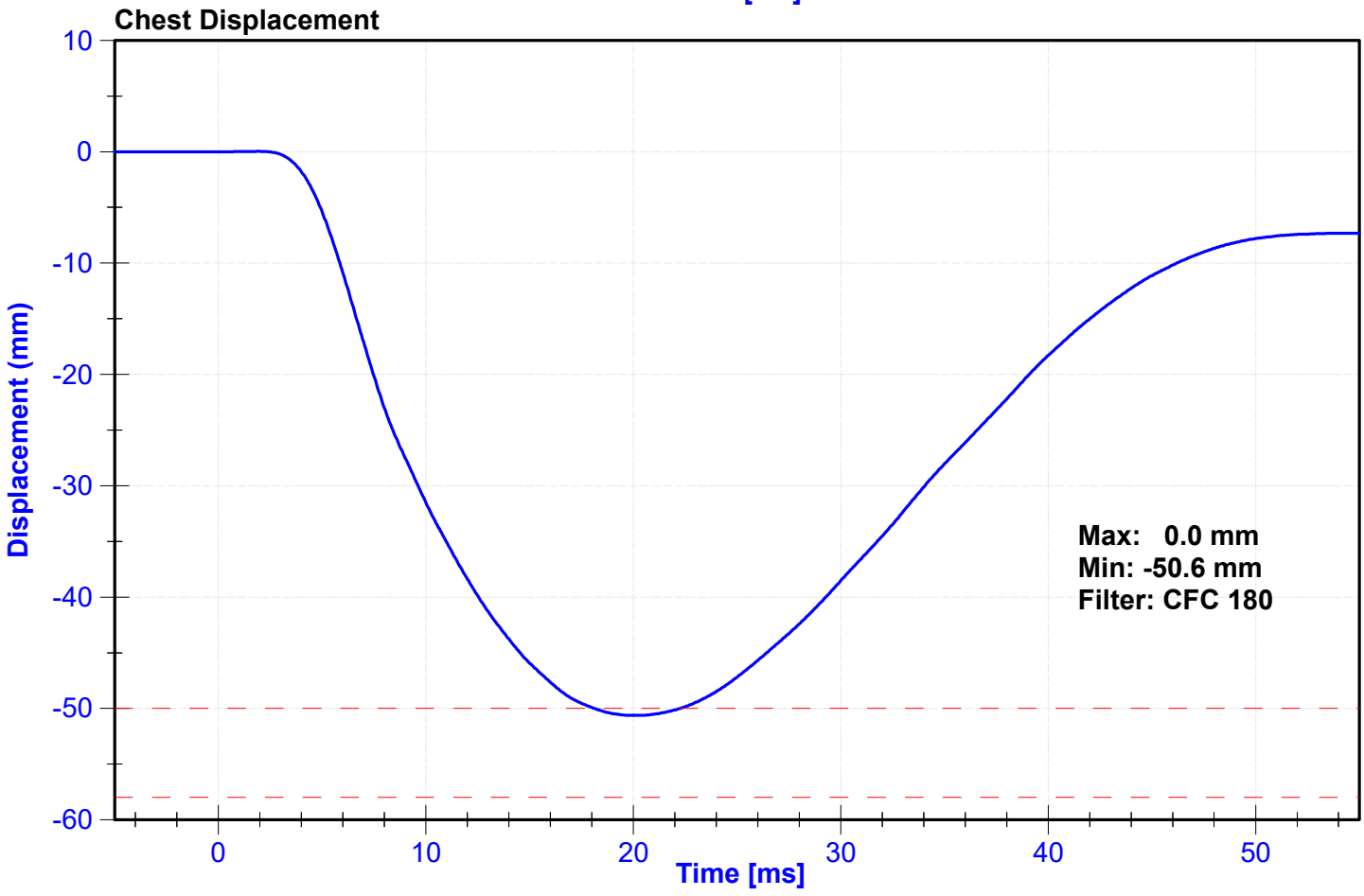
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	17	Pass
Velocity	6.59	6.83	m/s	6.672	Pass
Chest Deflection	-58	-50	mm	-50.6	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4166.6	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4379.9	Pass
Hysteresis	69	85	%	74.8	Pass

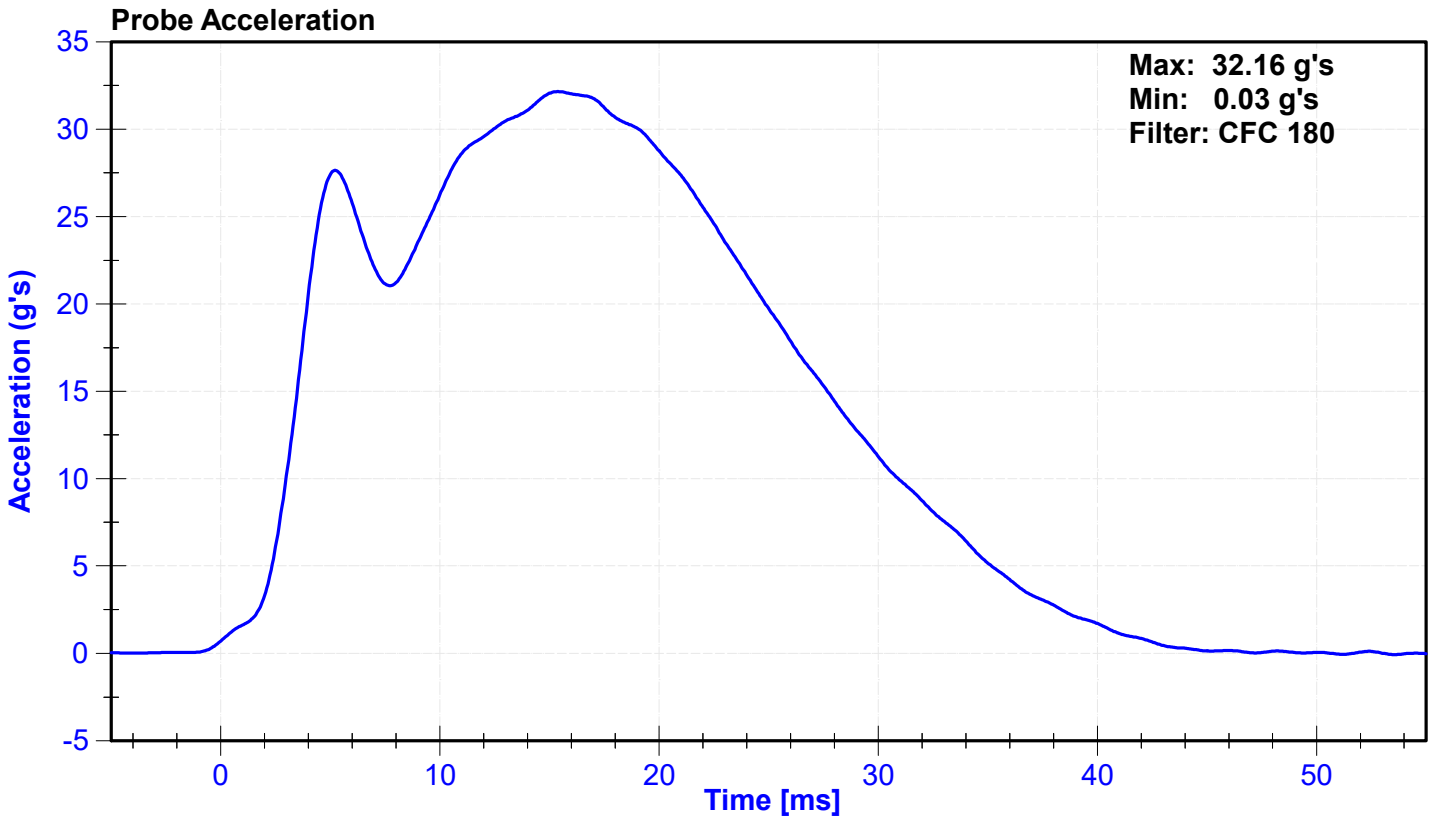
Transducer Calibrations

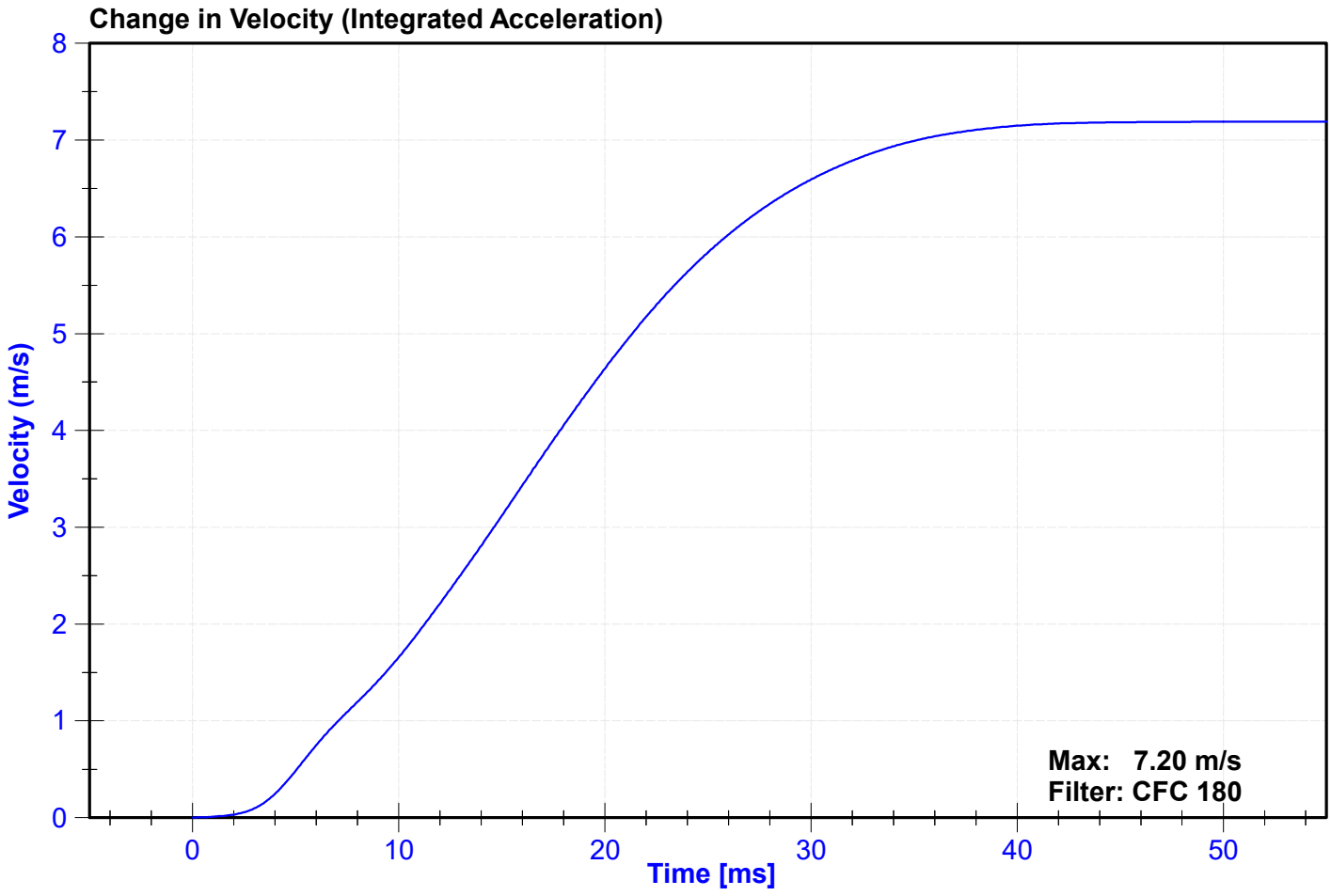
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18566	11/26/2024	05/26/2025
Chest Potentiometer	Servo	0720	08/19/2024	02/17/2025




Resistive Force
Max: 4379.9 N
Min: -10.1 N
Filter: CFC 180
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]


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


Probe Acceleration
Max: 32.16 g's
Min: 0.03 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: 7.20 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	J. Kinderman

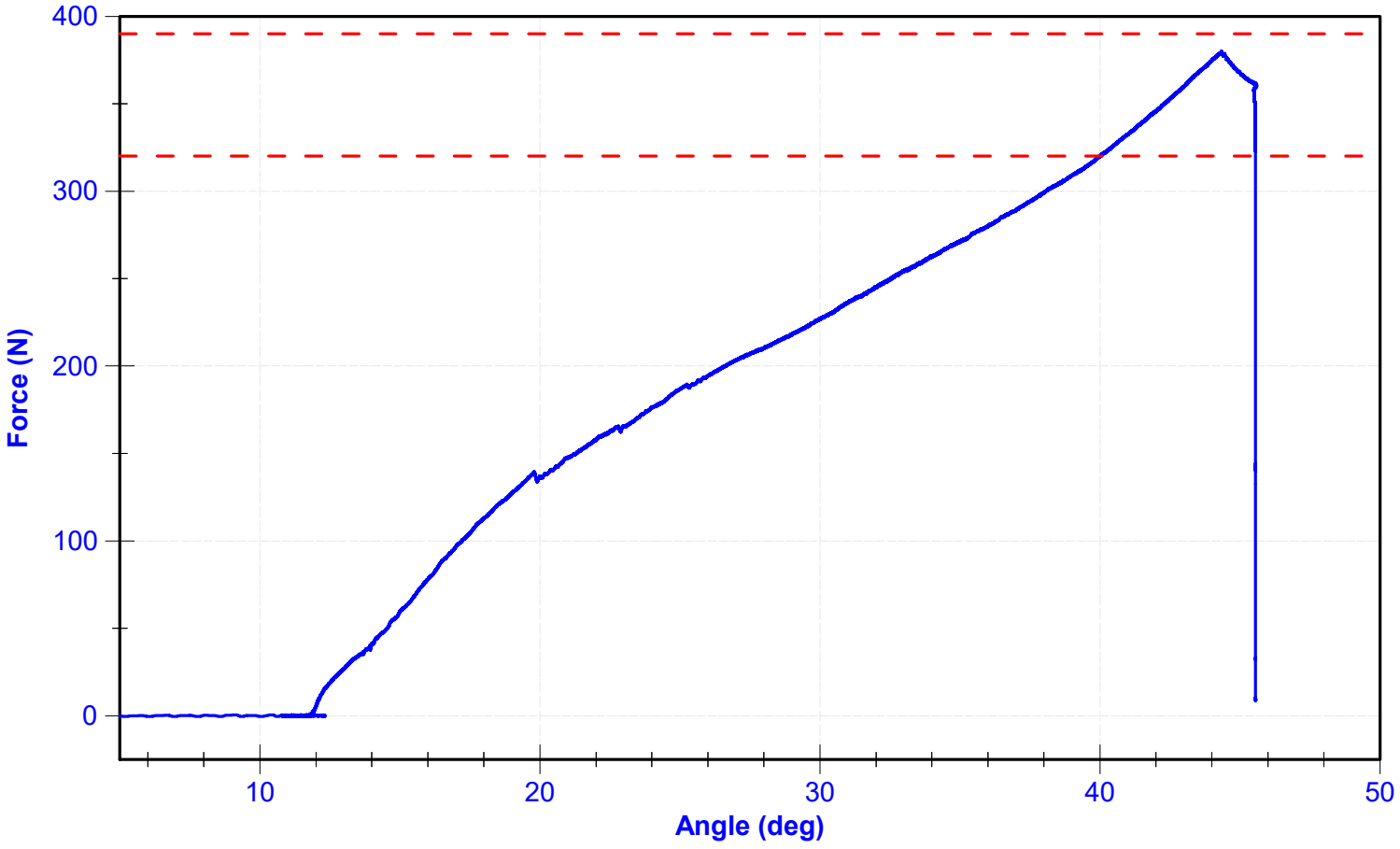
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	ºC	20.9	Pass
Humidity	10	70	%	17	Pass
Initial Angle	0	20	deg	11.5	Pass
Force at 45 Degrees	320	390	N	380.1	Pass
Return Angle Relative to Initial	0	8	deg	5.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker	DS-1905226	2024-11-16	2025-11-16
Load Cell	Load Cell	493319	2024-08-14	2025-08-14

Force vs. Displacement



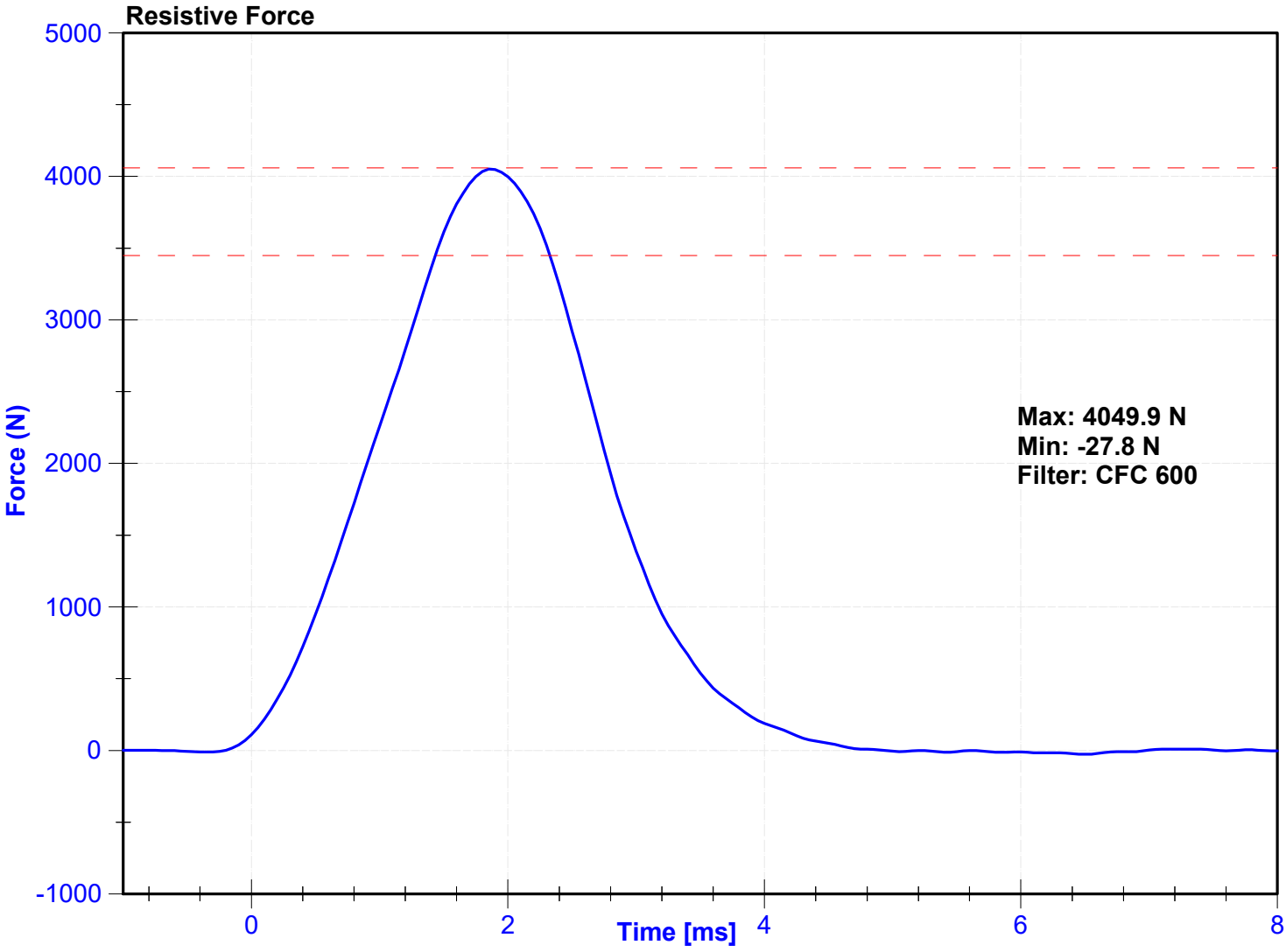
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

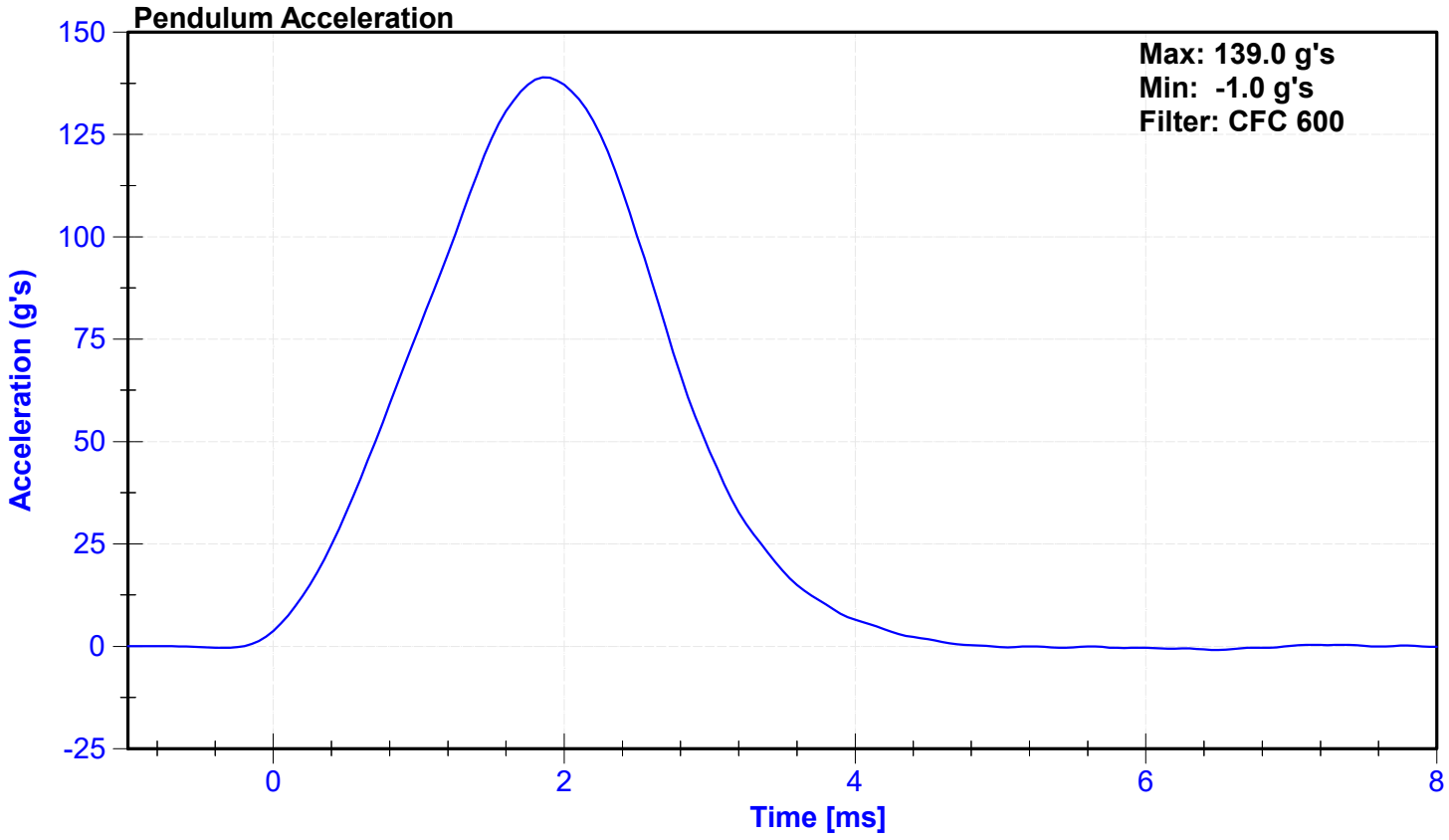
Results

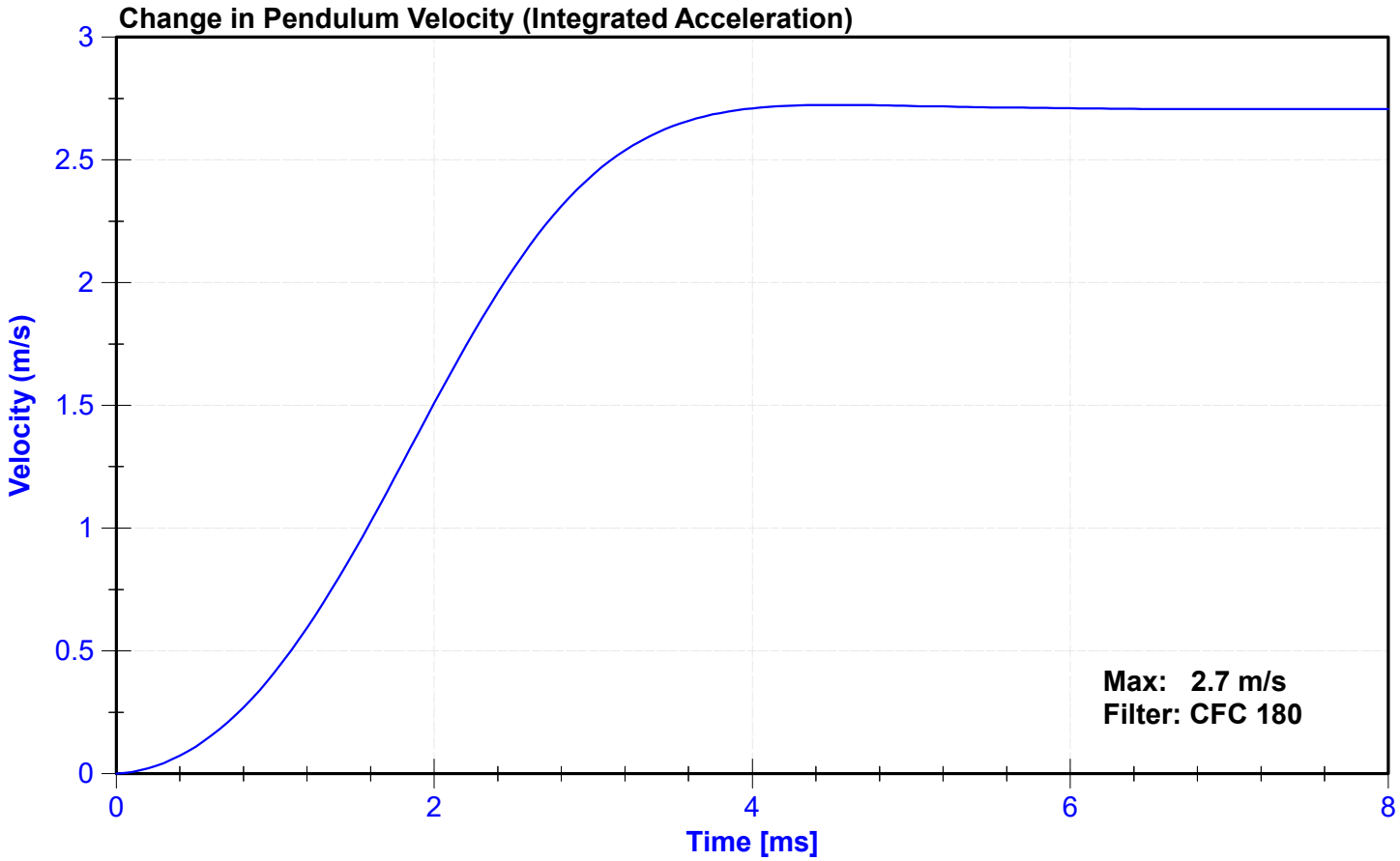
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.9	Pass
Humidity	10	70	%	17	Pass
Velocity	2.07	2.13	m/s	2.123	Pass
Resistive Force	3450	4060	N	4049.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25863	1/17/2025	7/16/2025




Pendulum Acceleration
Max: 139.0 g's
Min: -1.0 g's
Filter: CFC 600
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


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

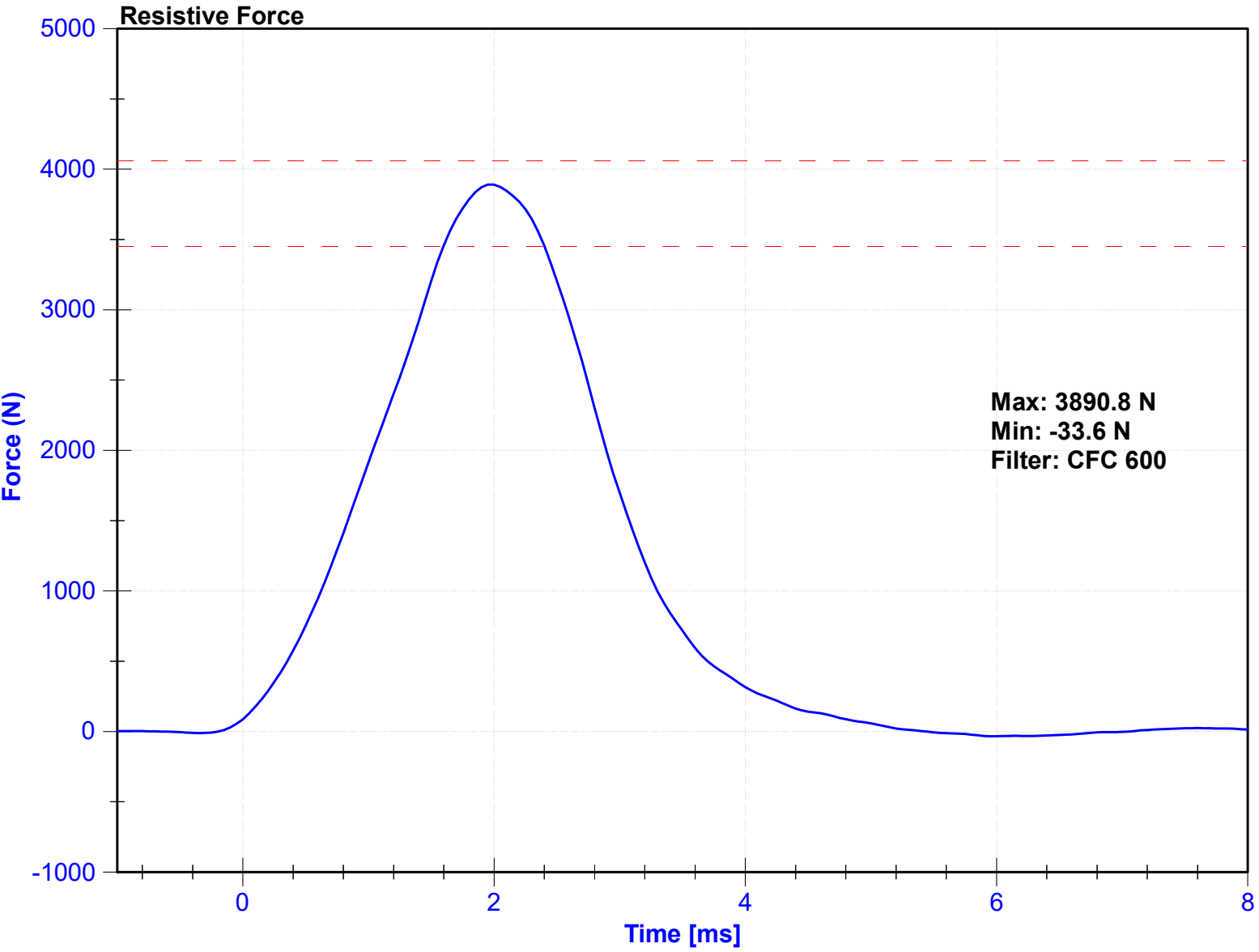
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

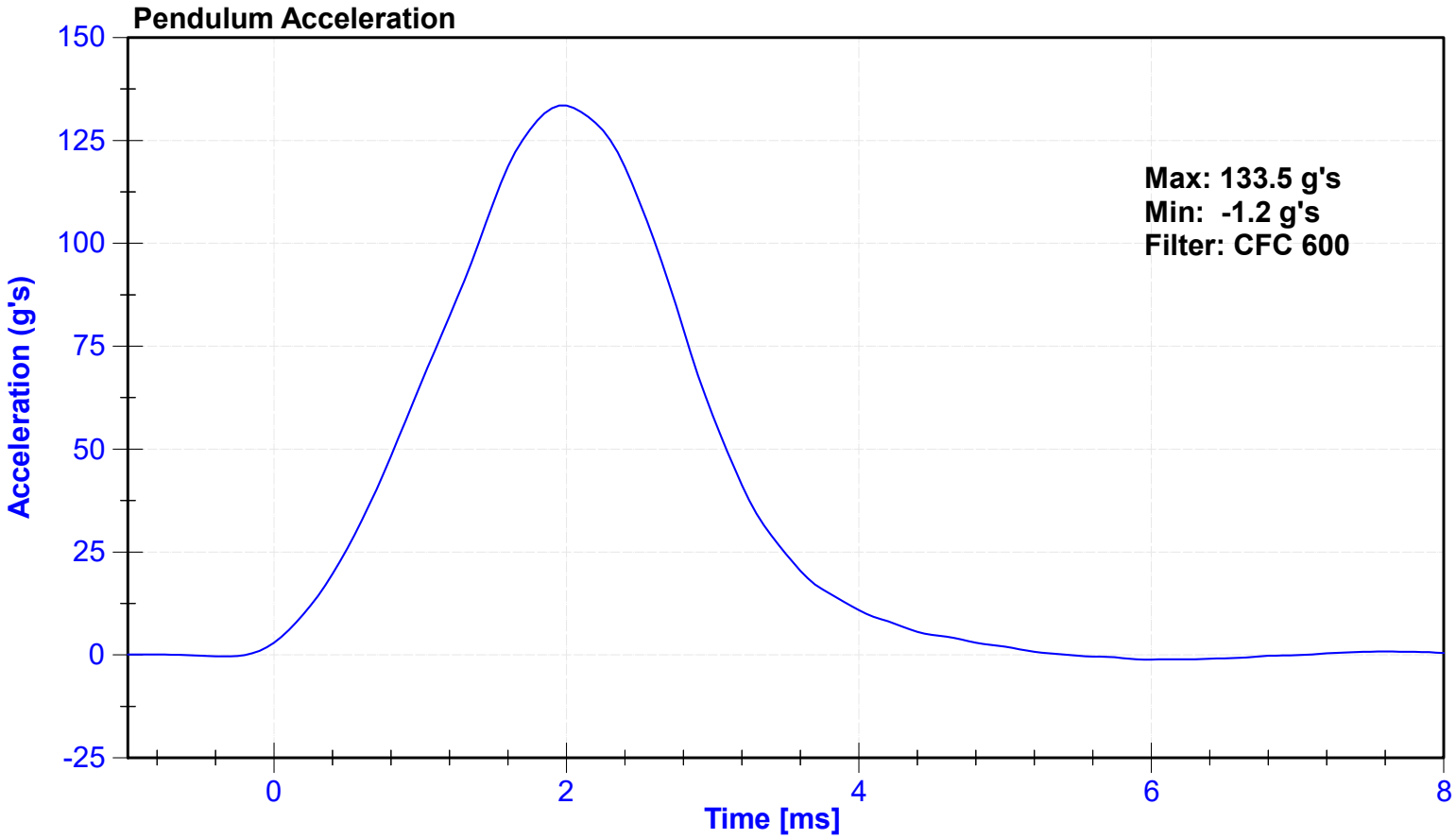
Results

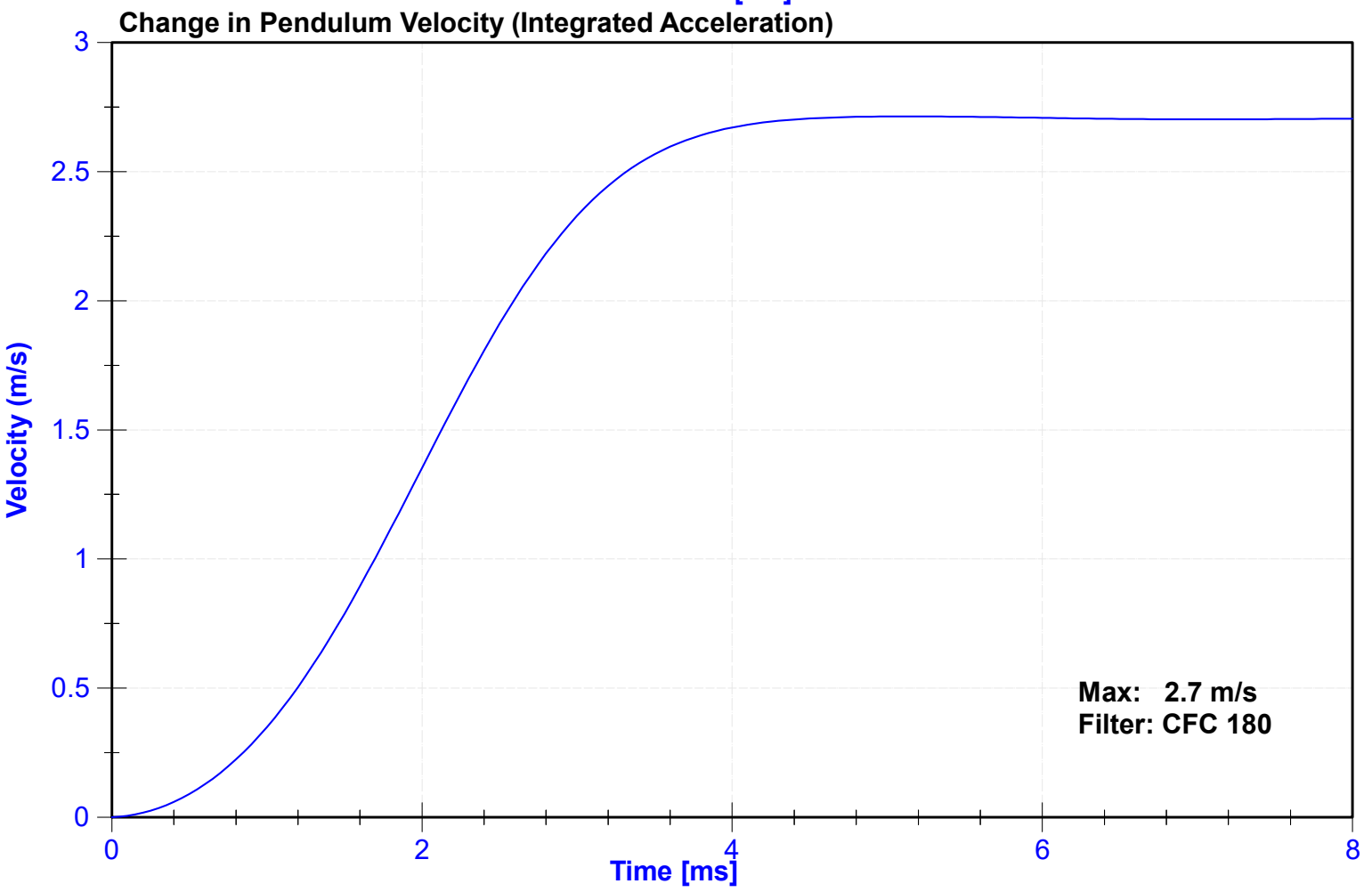
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	20.9	Pass
Humidity	10	70	%	17	Pass
Velocity	2.07	2.13	m/s	2.121	Pass
Resistive Force	3450	4060	N	3890.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25863	1/17/2025	7/16/2025




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 133.5 g's
Min: -1.2 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

CALIBRATION TEST RESULTS

POST-TEST

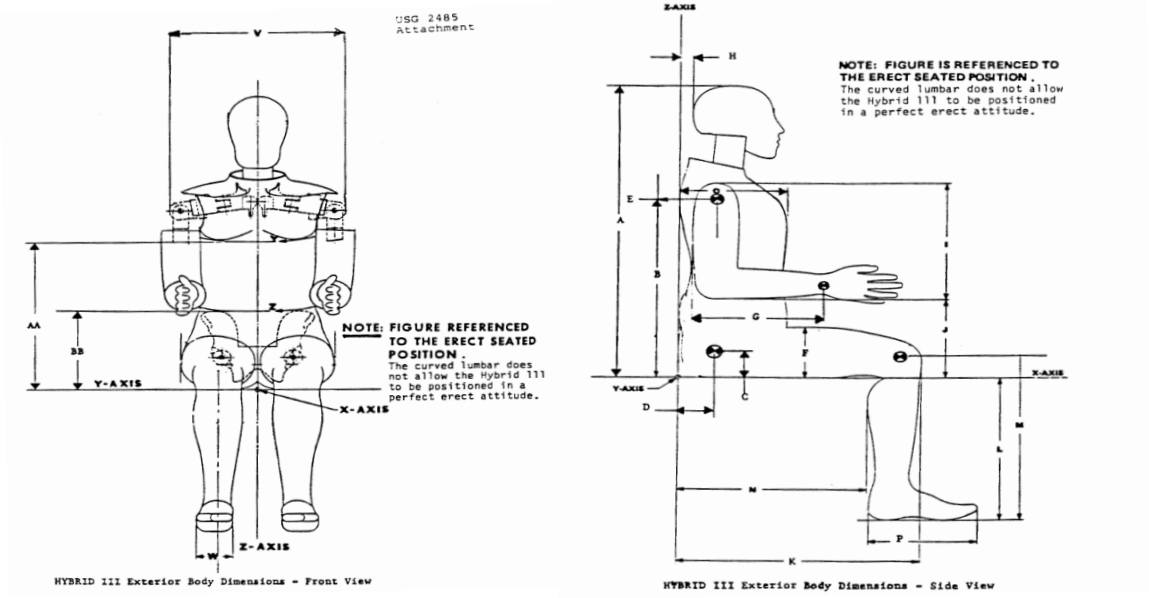
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 065

External Measurements - Hybrid 3 - 50th Male

Technician: J. Rios Date: 3/21/2025

Dummy Serial Number: 065



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.9	Pass
B	Shoulder Pivot Height	19.9	20.5	20.1	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.3	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.5	Pass
F	Thigh Clearance	5.5	6.1	6.0	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	13.5	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	17.3	Pass
M	Knee Pivot Height	19.1	19.7	19.5	Pass
N	Buttock Popliteal Length	17.8	18.8	18.5	Pass
O	Chest Depth without Jacket	8.4	9.0	8.7	Pass
P	Foot Length (right)	9.9	10.5	10.3	Pass
V	Shoulder Breadth	16.3	17.2	16.6	Pass
W	Foot Breadth	3.6	4.2	3.9	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.8	Pass
Z	Waist Circumference	32.9	34.1	33.5	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.0	Pass

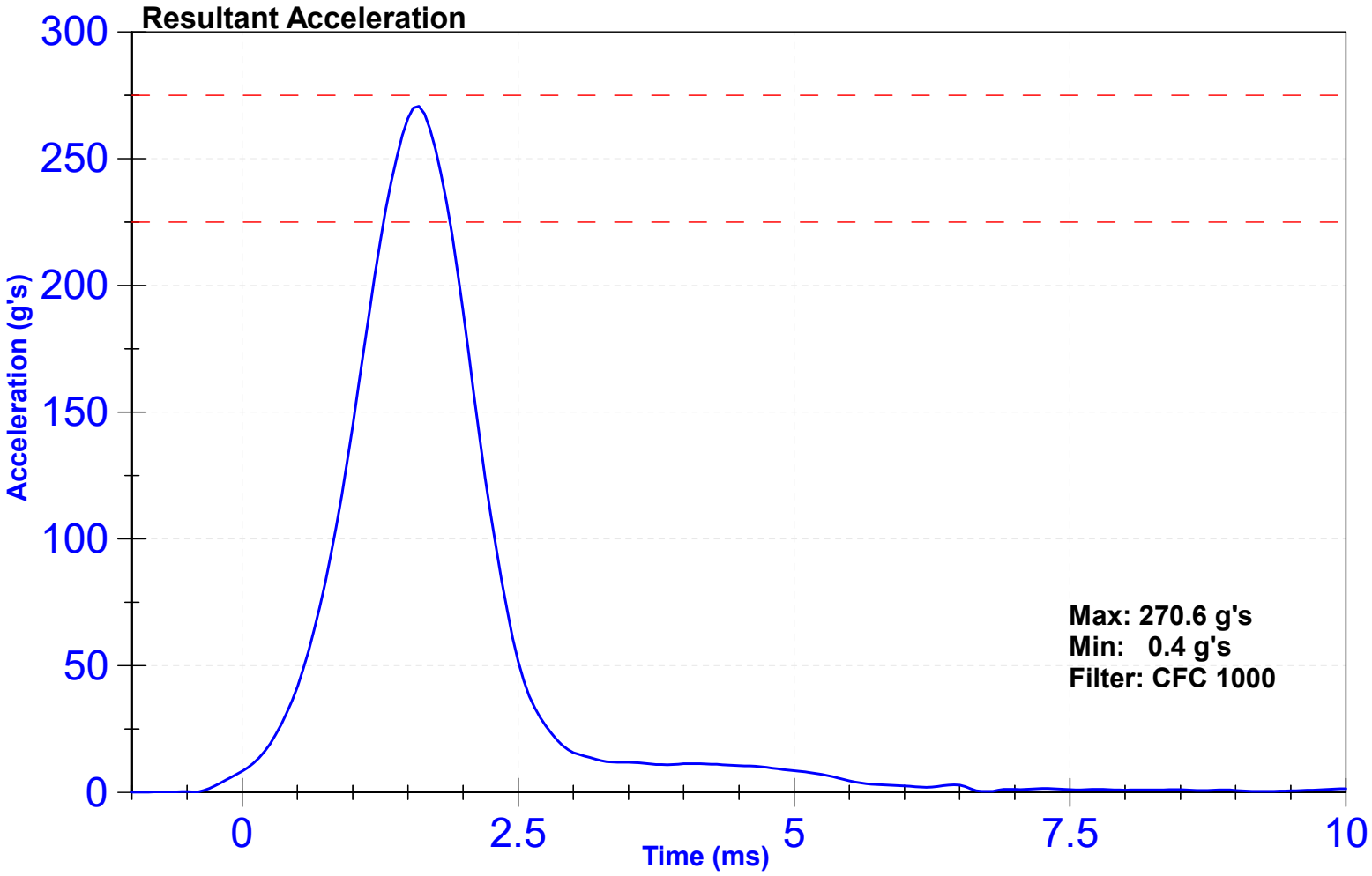
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

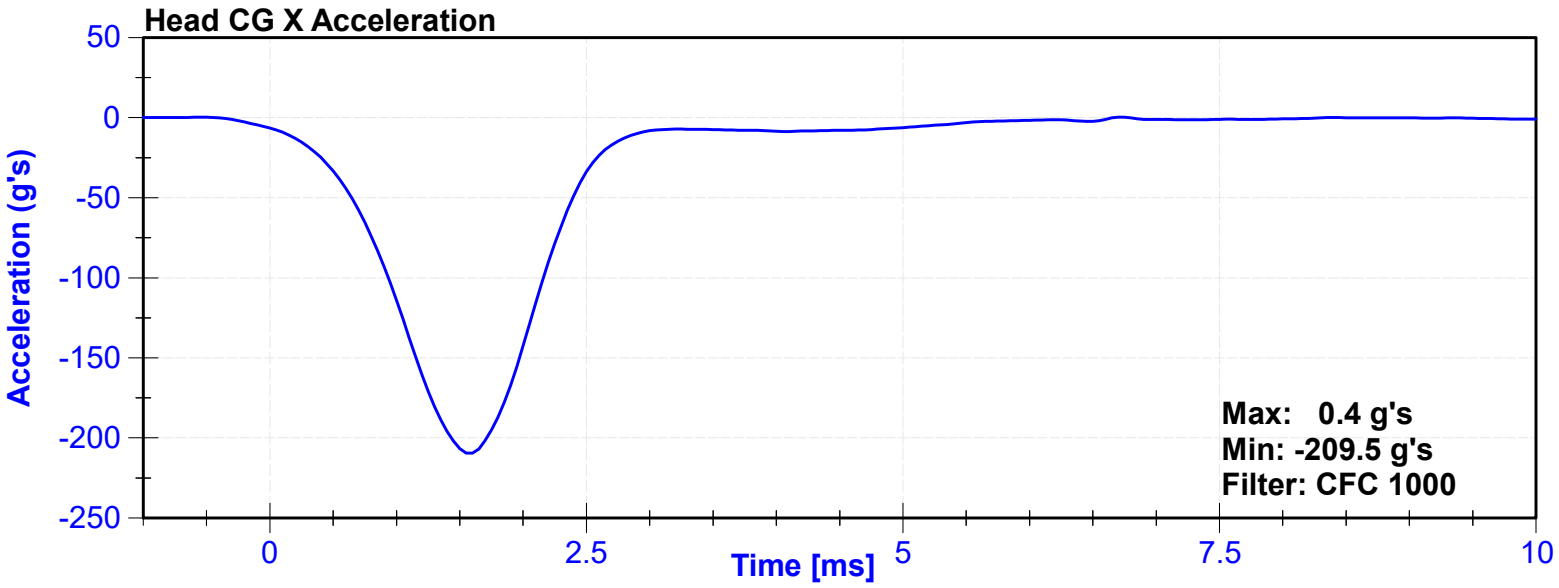
Results

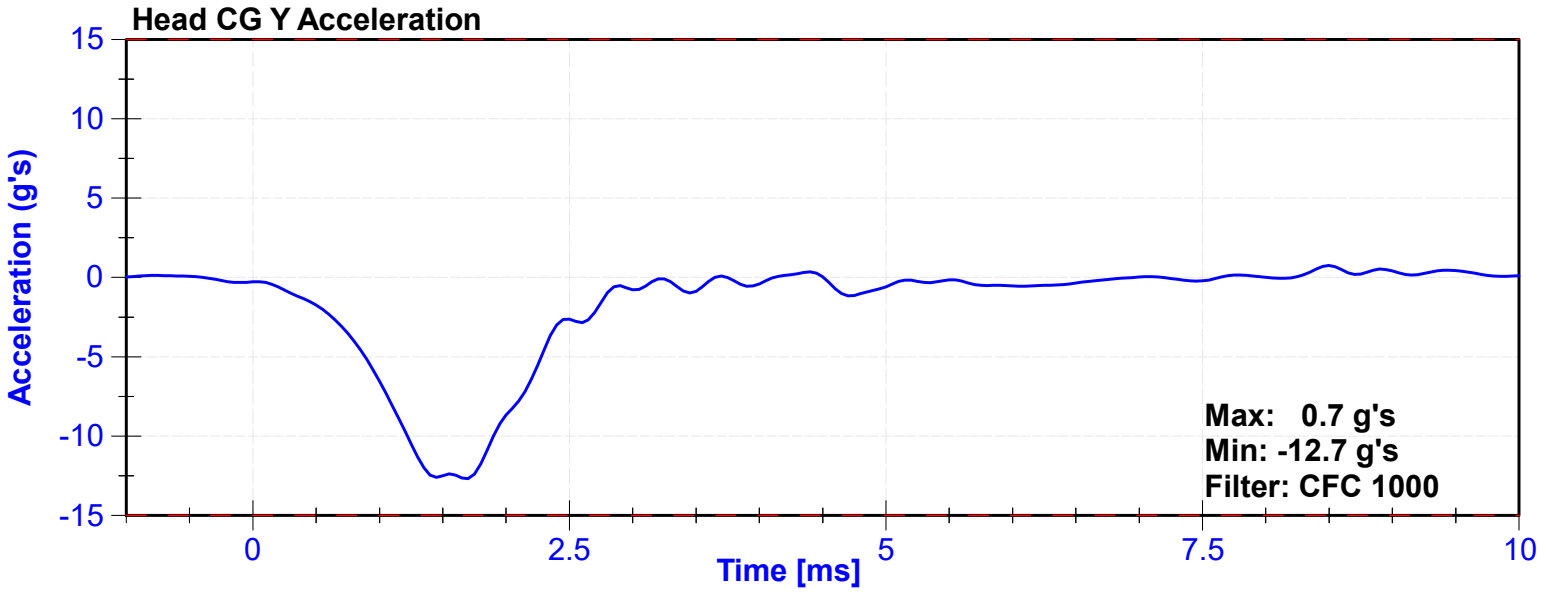
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21	Pass
Humidity	10	70	%	29	Pass
Resultant Acceleration	225	275	g's	270.6	Pass
Oscillation	0	10	%	4.3	Pass
Lateral Acceleration	-15	15	g's	-12.7	Pass

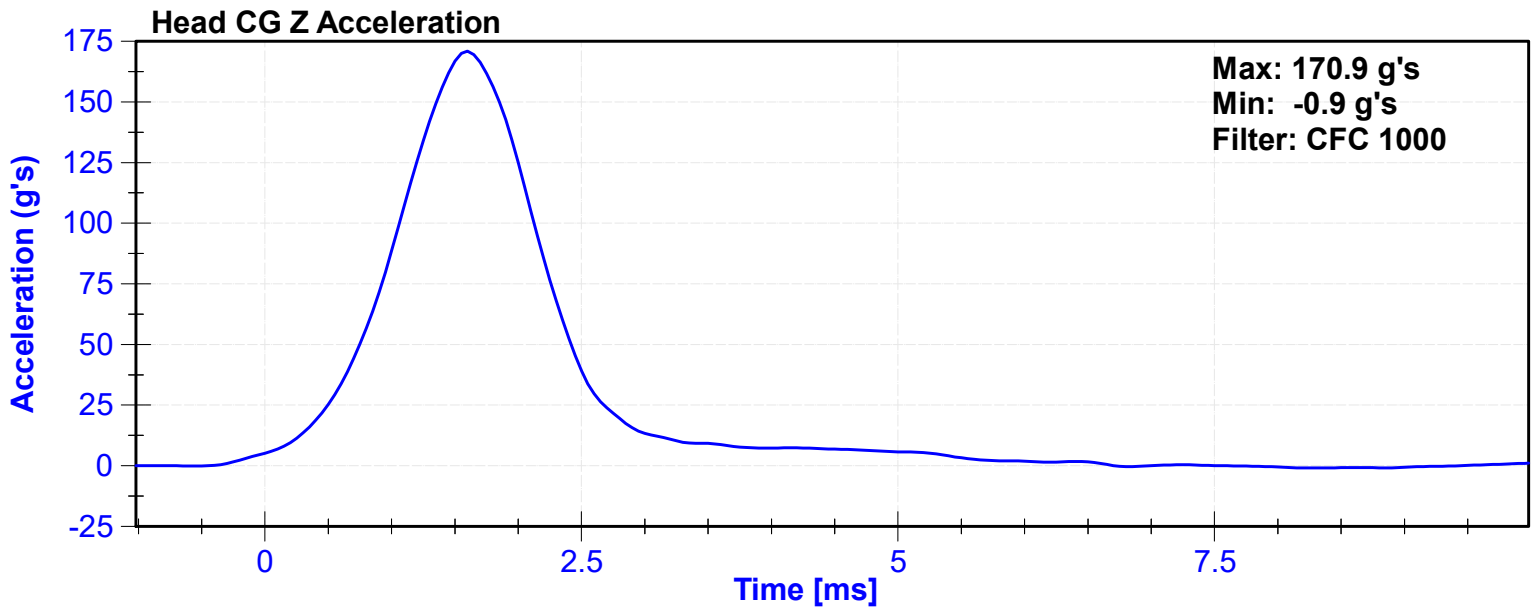
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P52152	10/31/2024	4/29/2025
Y Accelerometer	Endevco	P58888	10/31/2024	4/29/2025
Z Accelerometer	Endevco	P58911	10/31/2024	4/29/2025




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 0.4 g's
Min: -209.5 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: 0.7 g's
Min: -12.7 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
175
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
Time [ms]
Max: 170.9 g's
Min: -0.9 g's
Filter: CFC 1000

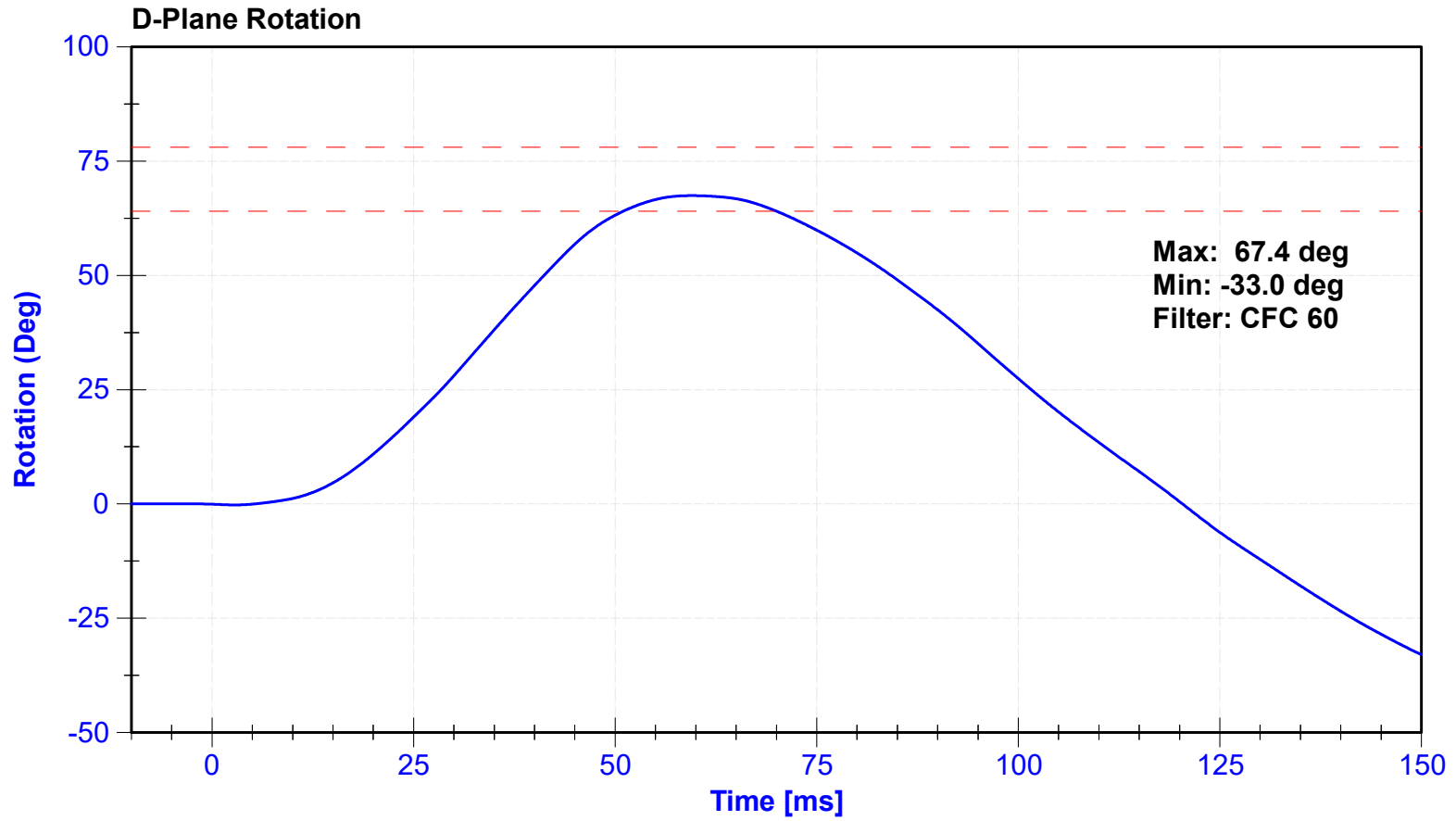
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

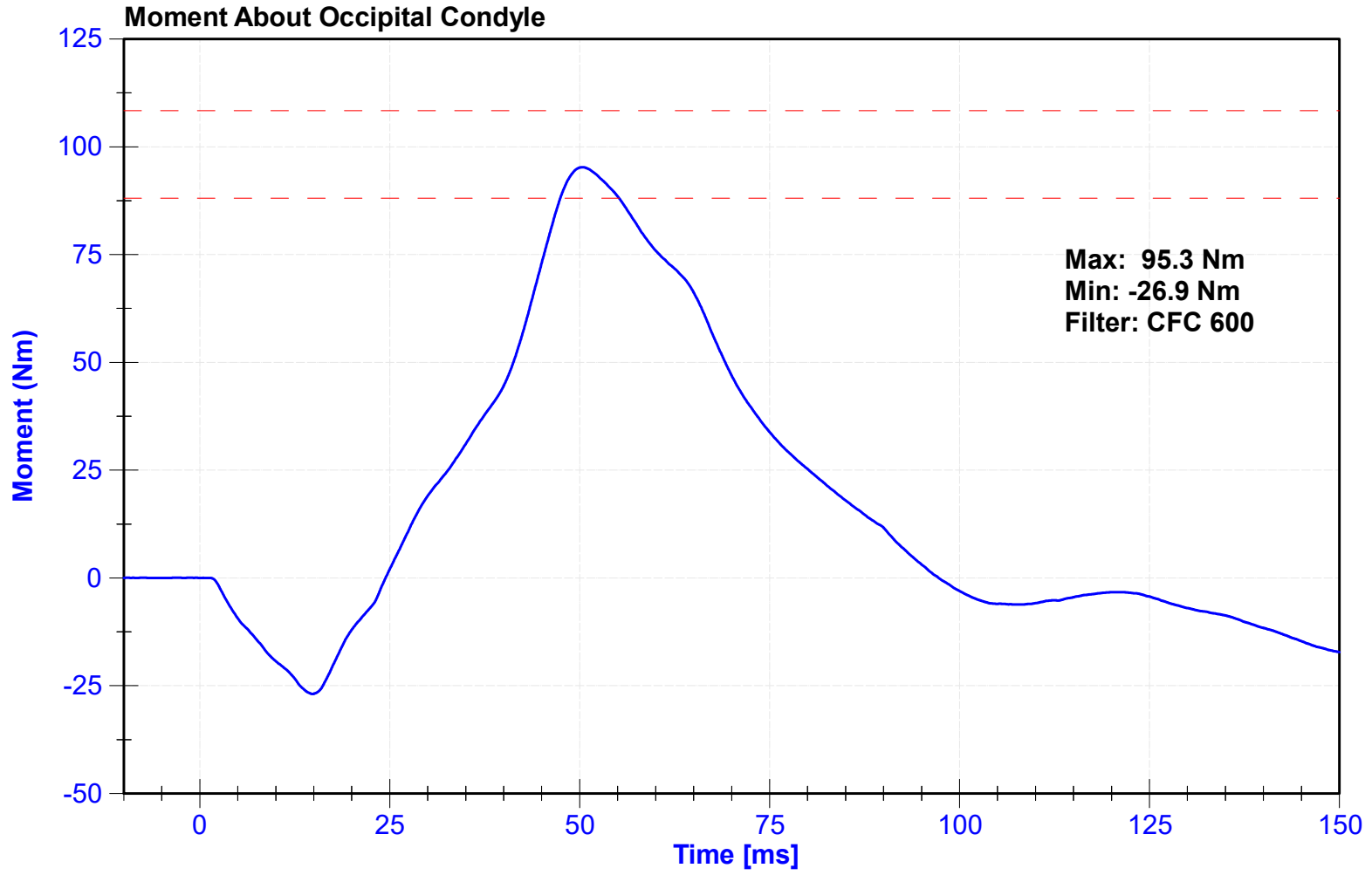
Results

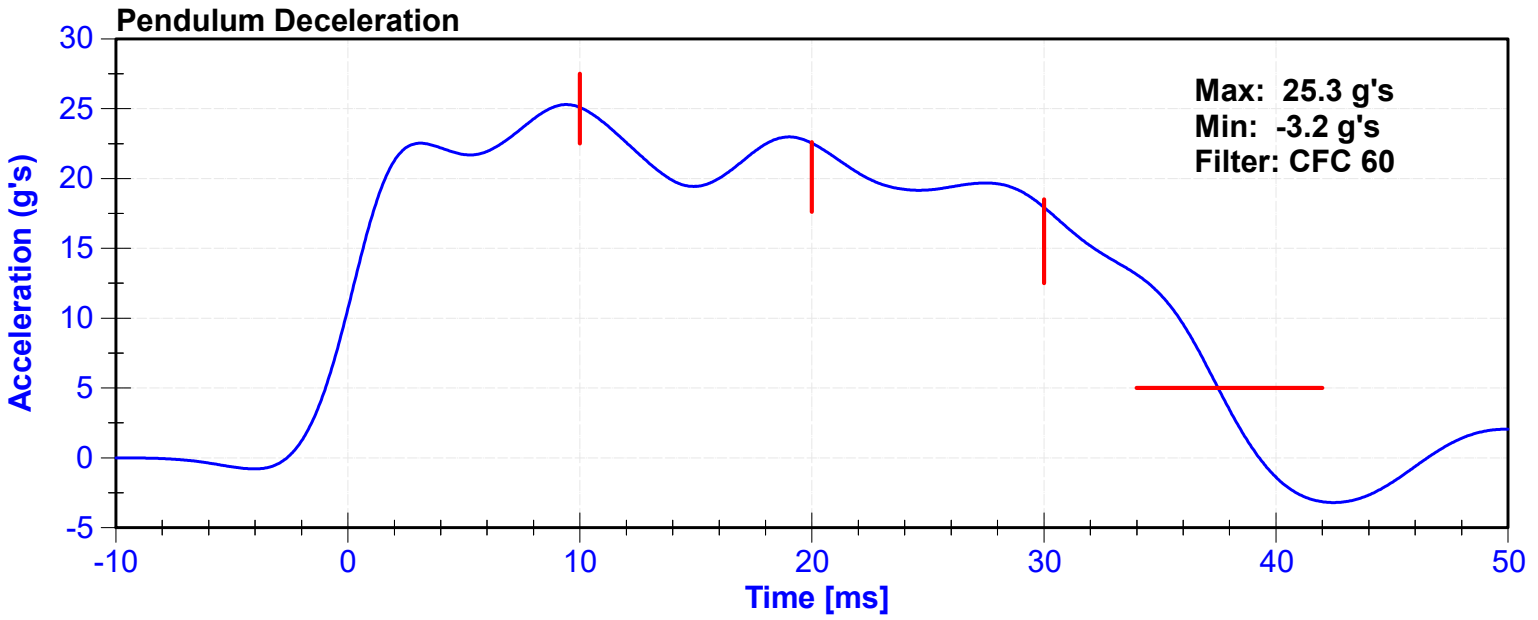
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	21	Pass
Velocity	6.89	7.13	m/s	6.925	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	25.08	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	22.52	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	17.94	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	25.3	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	37.5	Pass
Maximum D Plane Rotation	64	78	deg	67.4	Pass
Time to Maximum Rotation	57	64	ms	59.5	Pass
Rotation Decay to Zero	113	127	ms	120.4	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	95.27	Pass
Time to Maximum Moment	47	58	ms	50.4	Pass
Moment Decay to Zero	97	107	ms	97.2	Pass

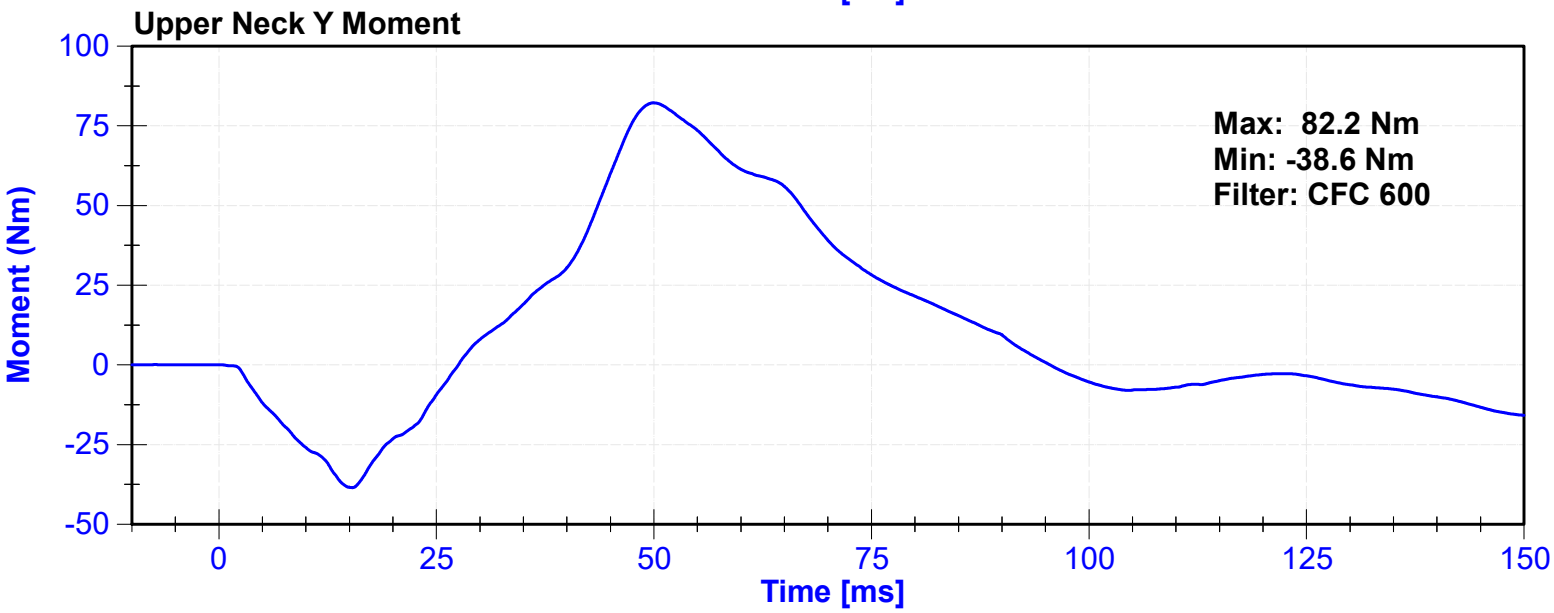
Transducer Calibrations

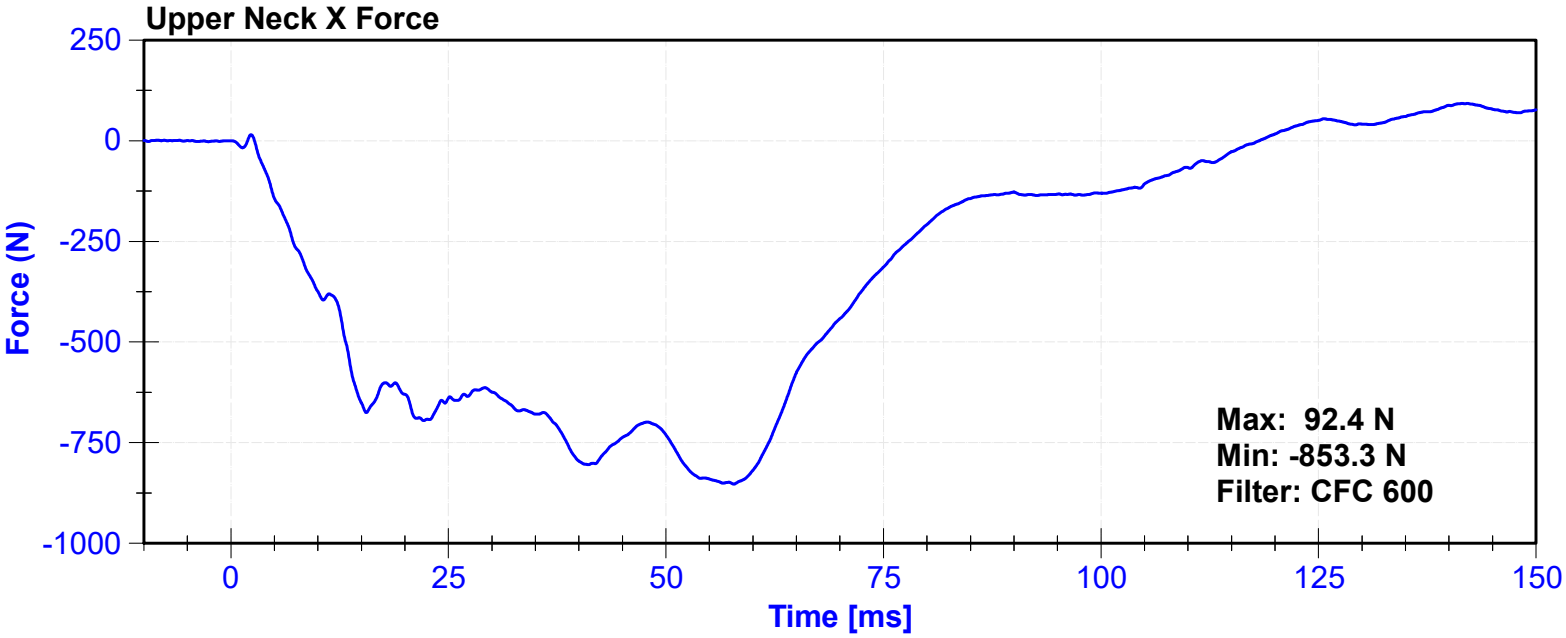
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16646	10/17/2024	4/15/2025
Pendulum Potentiometer	ETI	LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Humanetics	851-FX	5/22/2024	5/22/2025


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 67.4 deg
Min: -33.0 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: 95.3 Nm
Min: -26.9 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 25.3 g's
Min: -3.2 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 82.2 Nm
Min: -38.6 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 92.4 N
Min: -853.3 N
Filter: CFC 600
Force (N)
Time [ms]

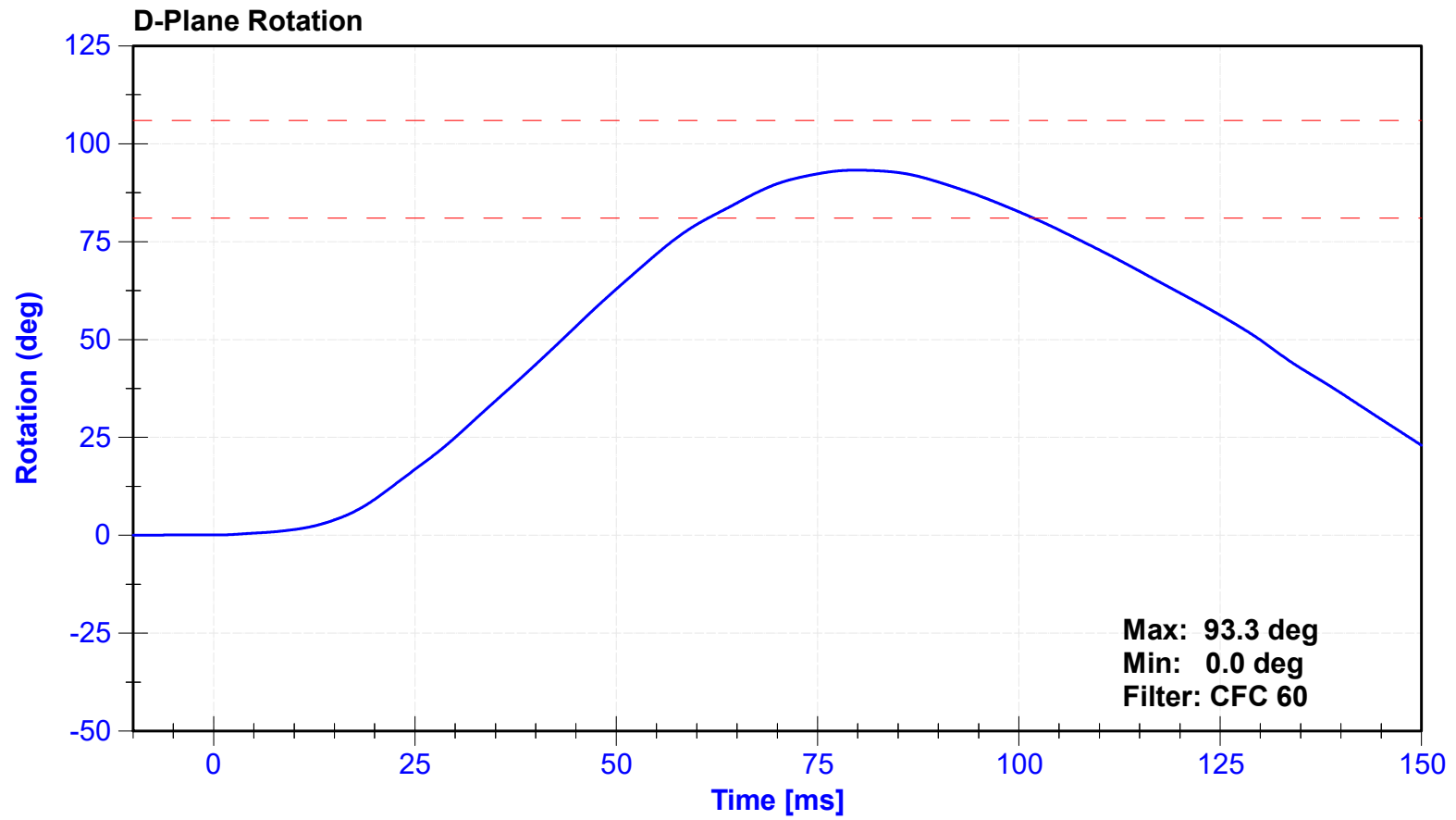
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

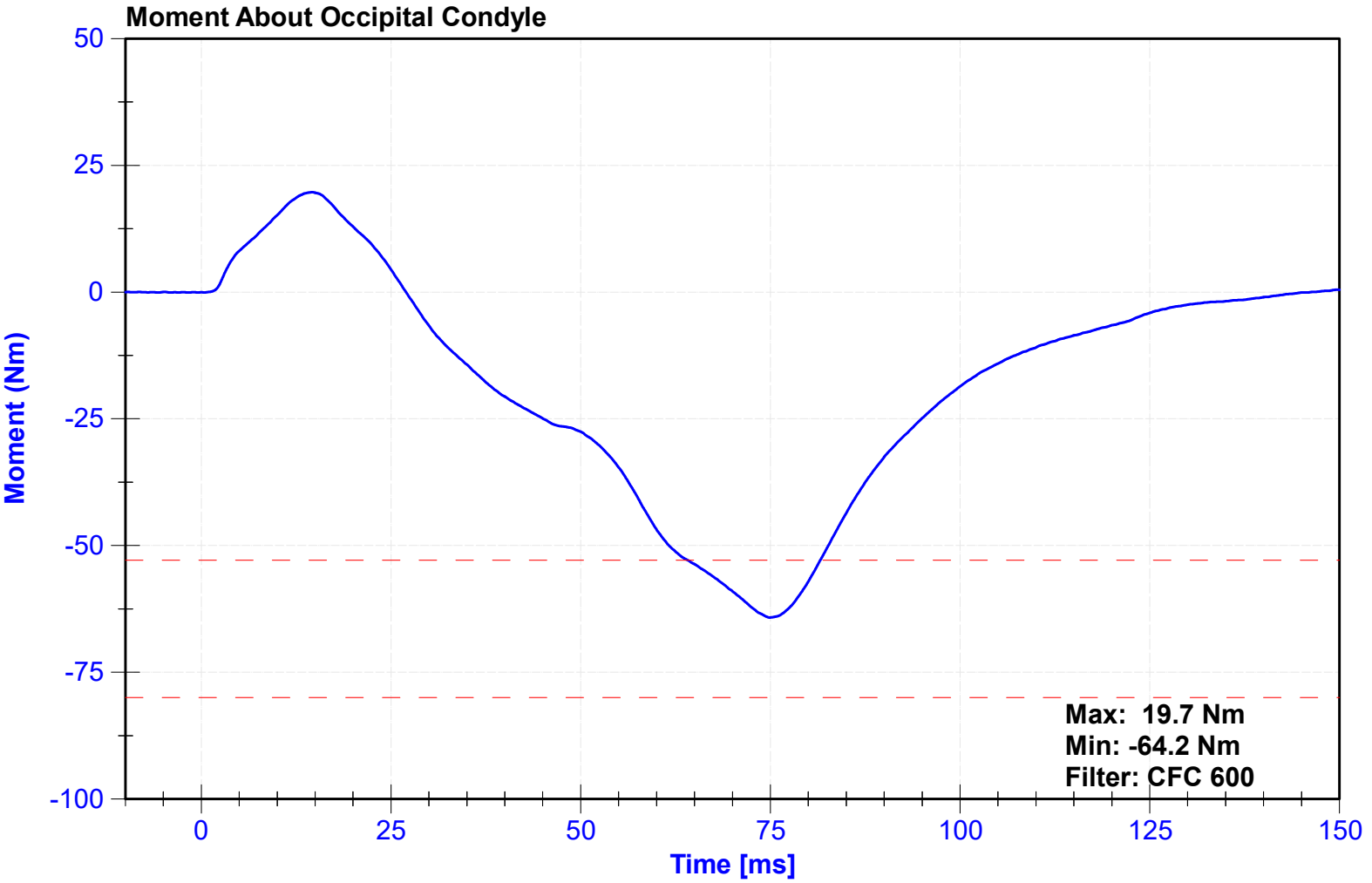
Results

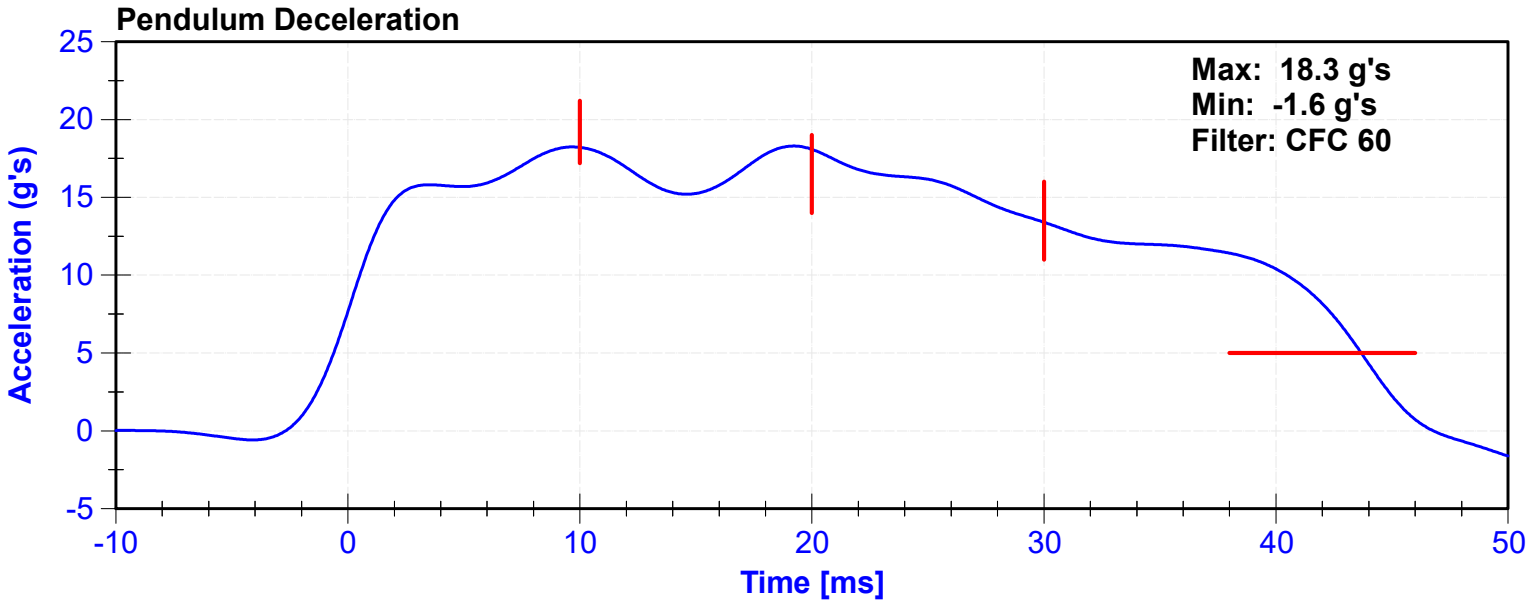
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	21	Pass
Velocity	5.94	6.19	m/s	5.983	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	18.21	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.1	Pass
Pendulum Deceleration at 30ms	11	16	g's	13.4	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	18.3	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	43.7	Pass
Maximum D Plane Rotation	81	106	deg	93.3	Pass
Time to Maximum Rotation	72	82	ms	79.8	Pass
Rotation Decay to Zero	147	174	ms	167.7	Pass
Minimum Moment About OC	-80	-52.9	Nm	-64.21	Pass
Time to Minimum Moment	65	79	ms	74.9	Pass
Moment Decay to Zero	120	148	ms	146.3	Pass

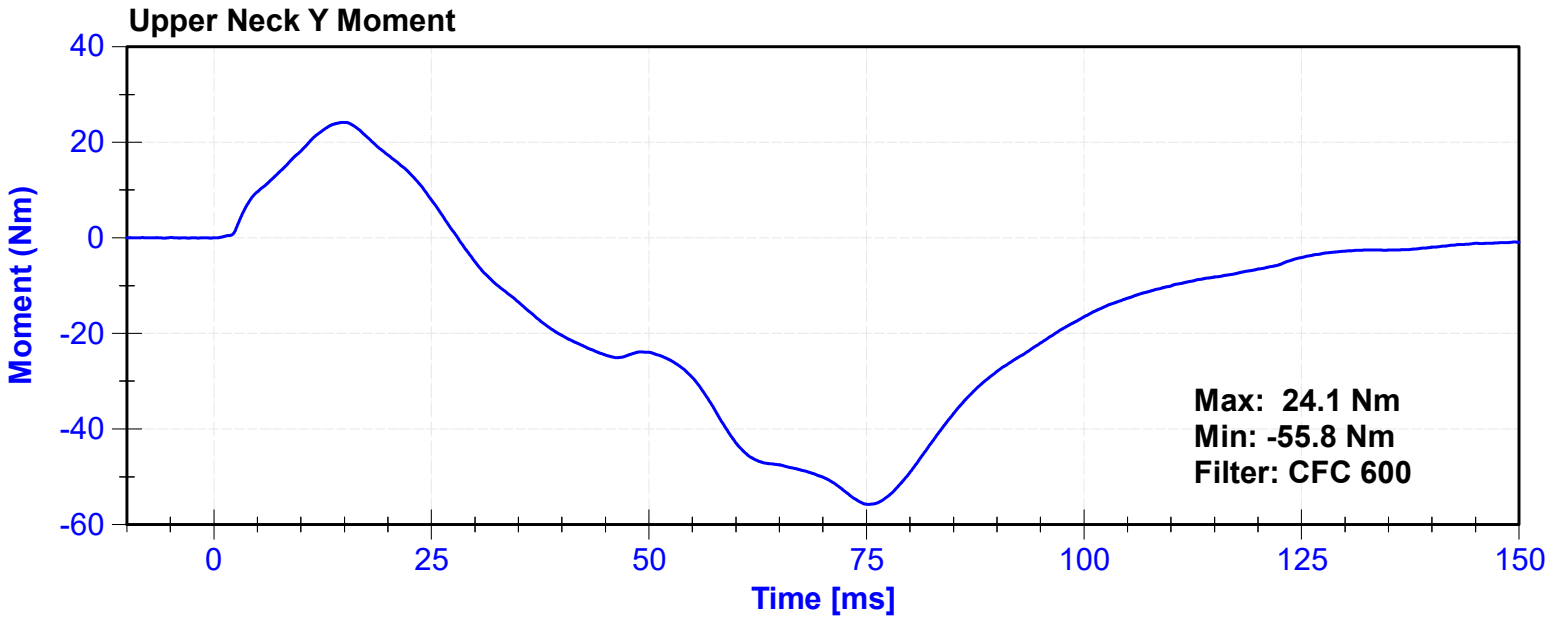
Transducer Calibrations

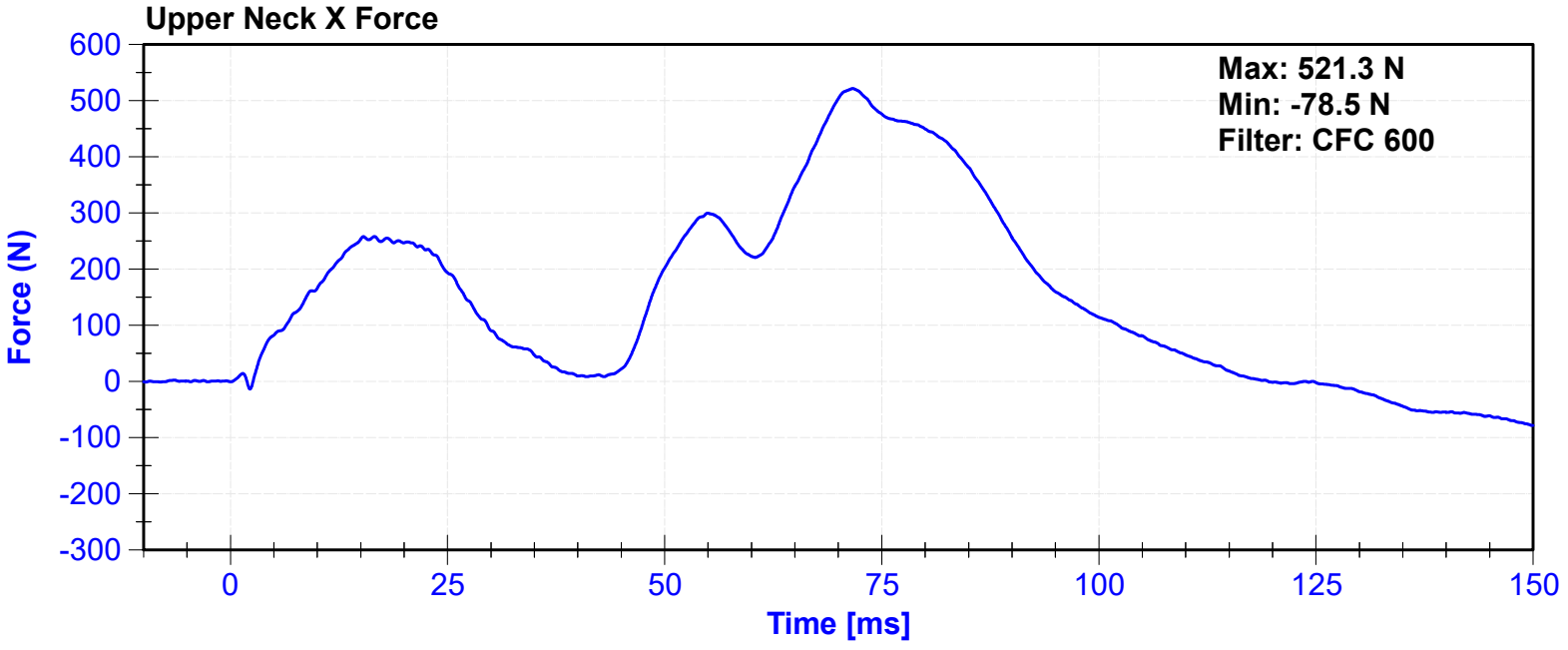
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16646	10/17/2024	4/15/2025
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Humanetics	851-FX	5/22/2024	5/22/2025


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 93.3 deg
Min: 0.0 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 19.7 Nm
Min: -64.2 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 18.3 g's
Min: -1.6 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: 24.1 Nm
Min: -55.8 Nm
Filter: CFC 600
Moment (Nm)
40
20
0
-20
-40
-60
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 521.3 N
Min: -78.5 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]

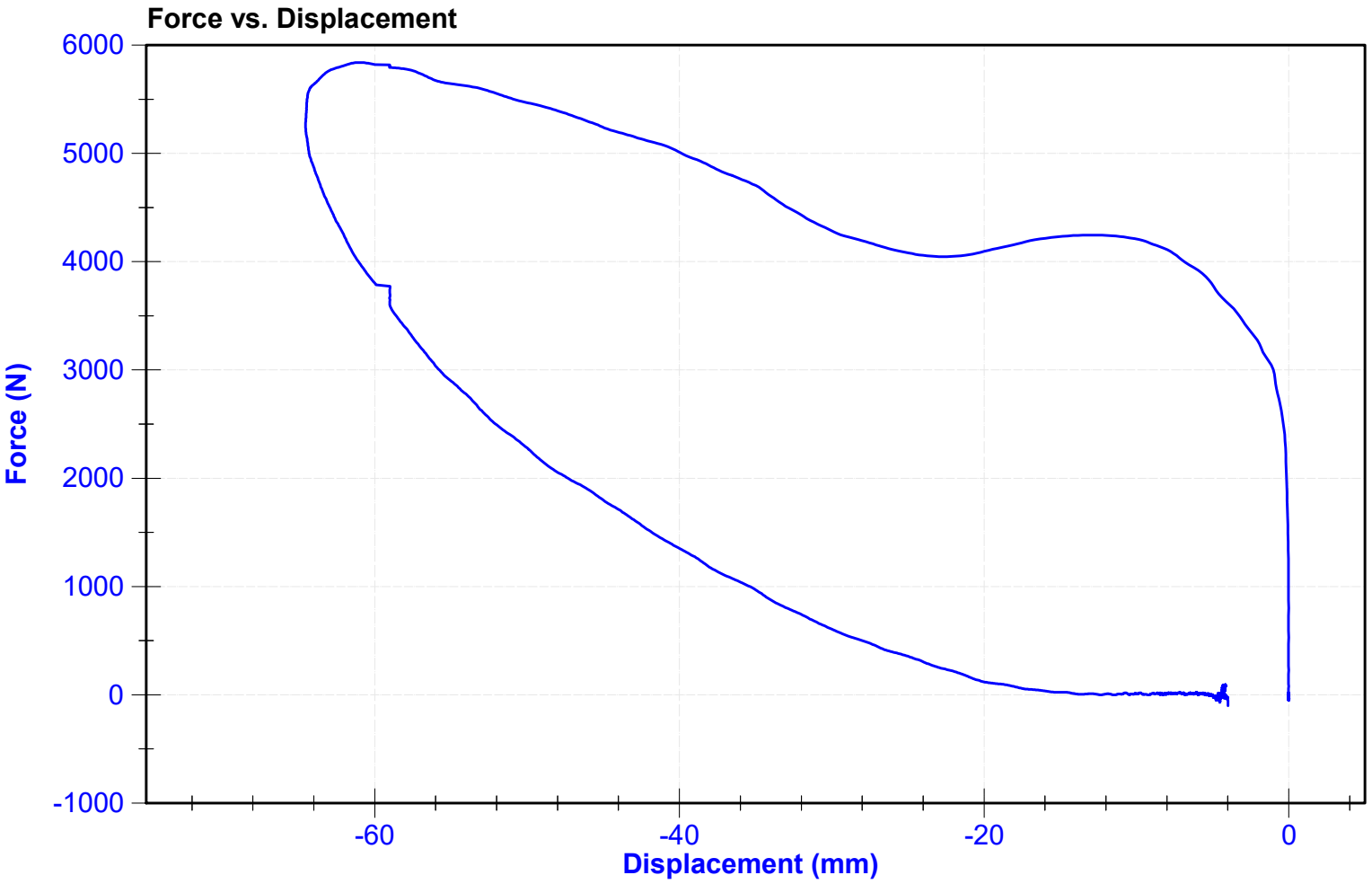
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

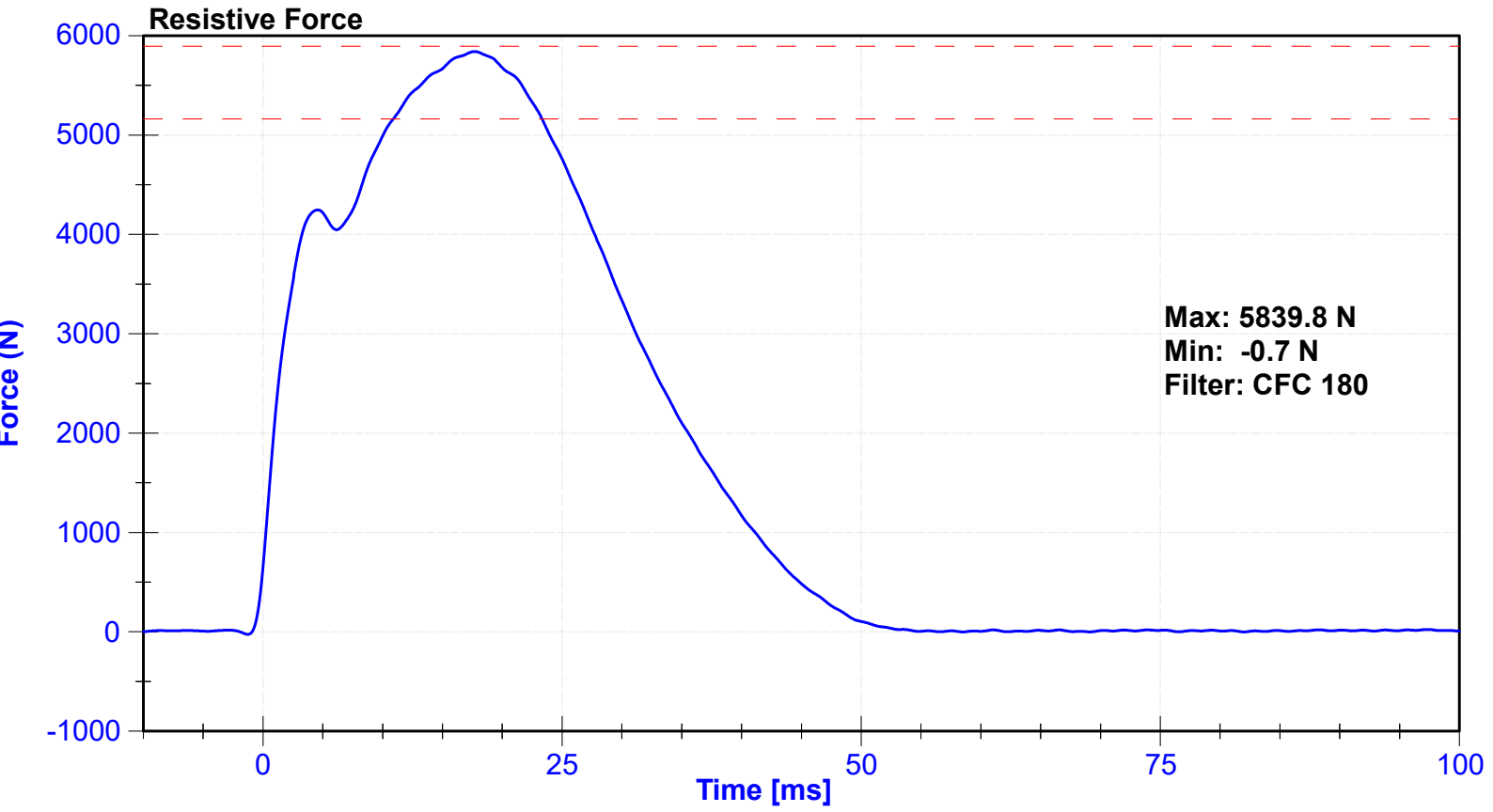
Results

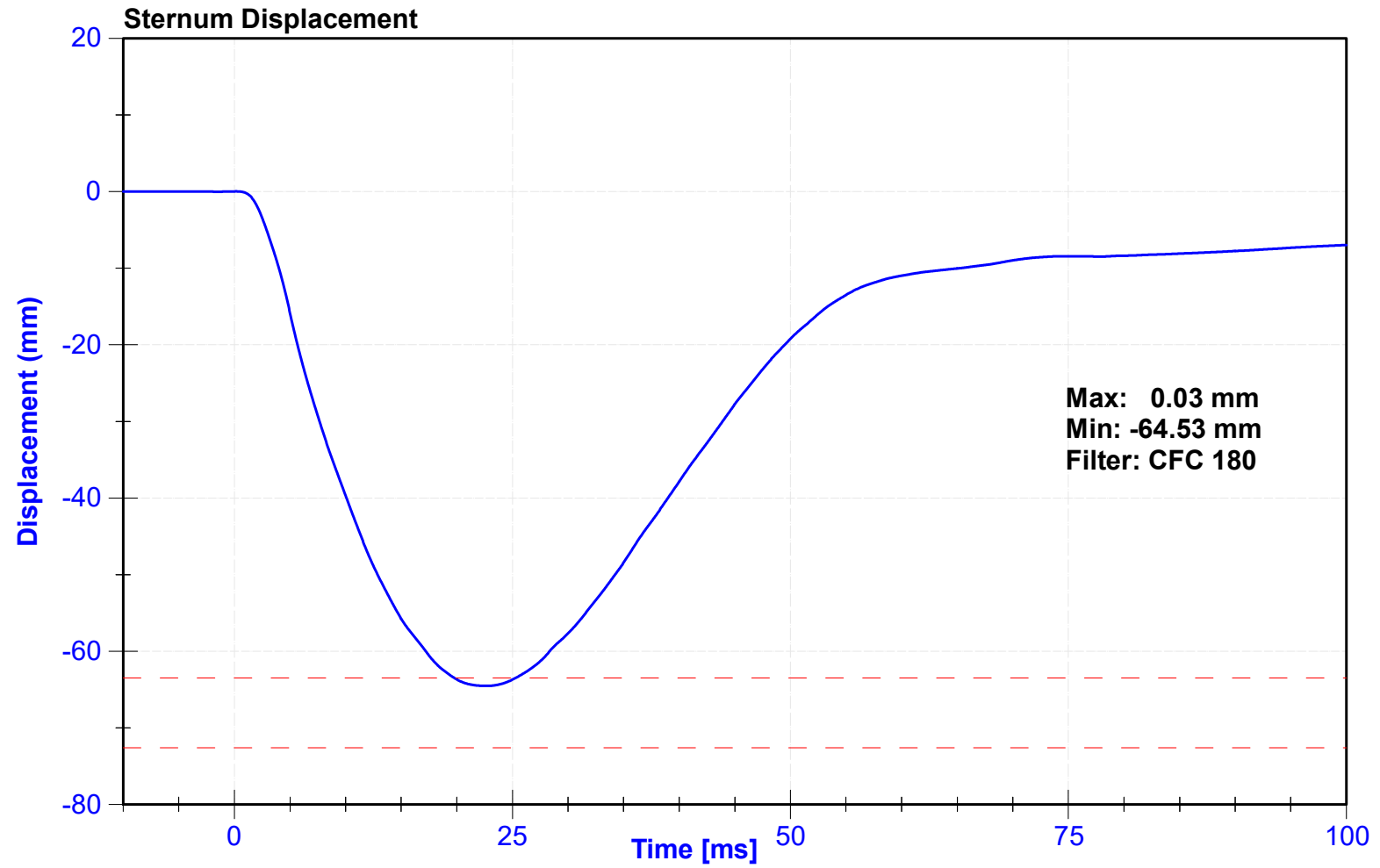
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	22	Pass
Velocity	6.59	6.83	m/s	6.713	Pass
Chest Displacement	-72.6	-63.5	mm	-64.53	Pass
Resistive Force	5160	5894	N	5839.8	Pass
Hysteresis	69	85	%	73.2	Pass

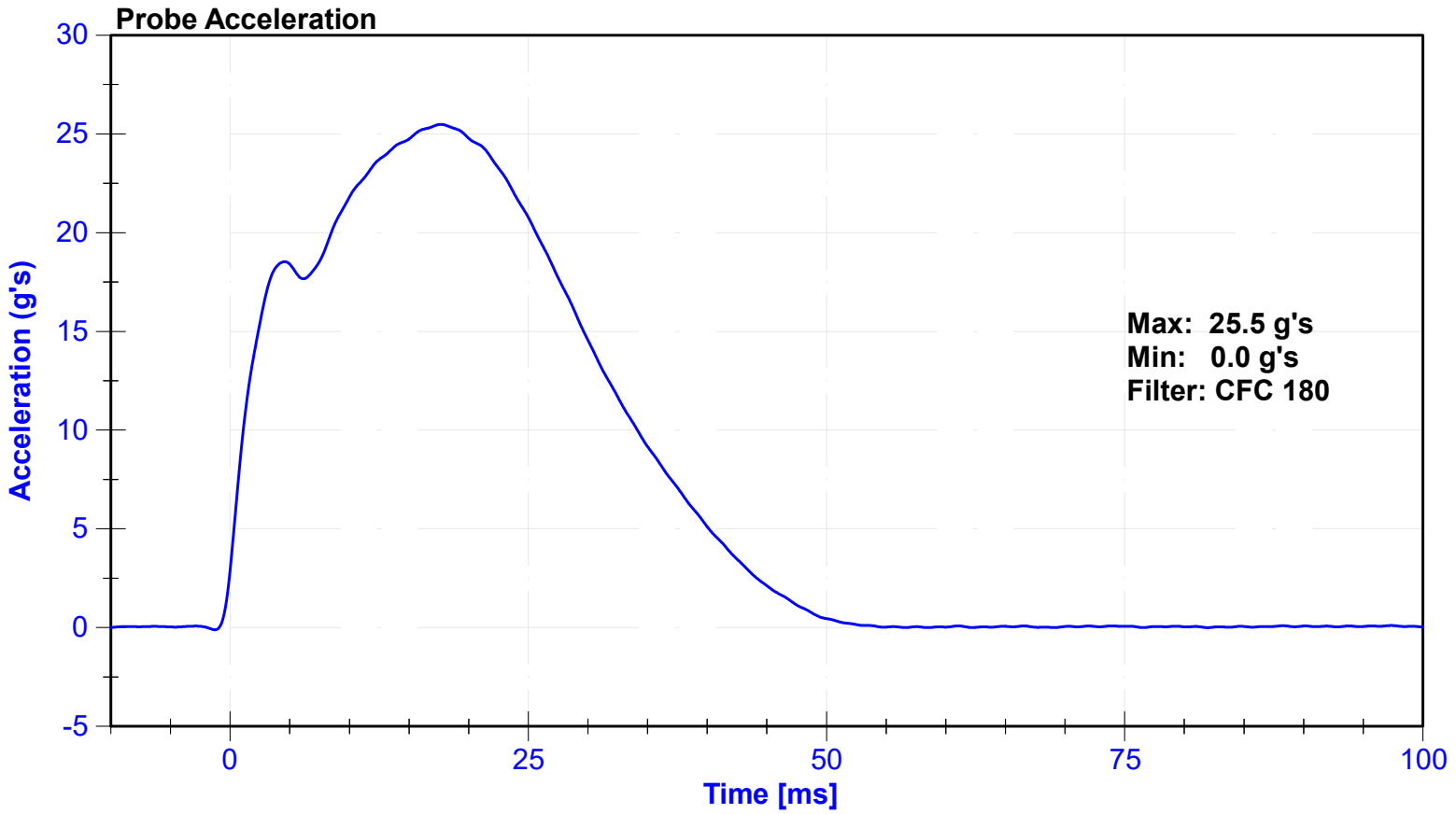
Transducer Calibrations

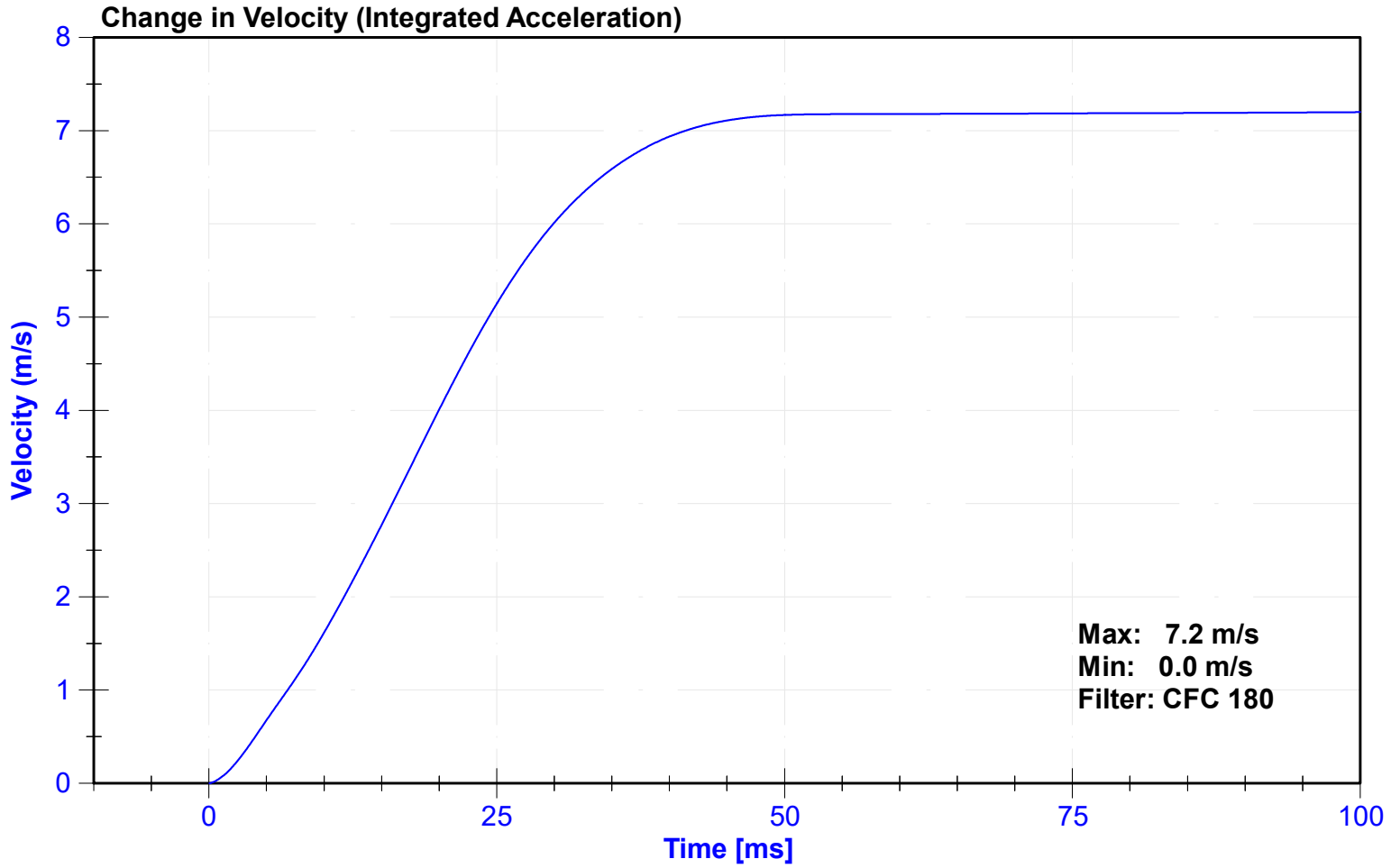
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25962	2/15/2025	8/14/2025
Chest Potentiometer	Servo	1046	10/31/2024	5/1/2025




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
25
50
75
100
Time [ms]
Max: 5839.8 N
Min: -0.7 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: -64.53 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: 25.5 g's
Min: 0.0 g's
Filter: CFC 180


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

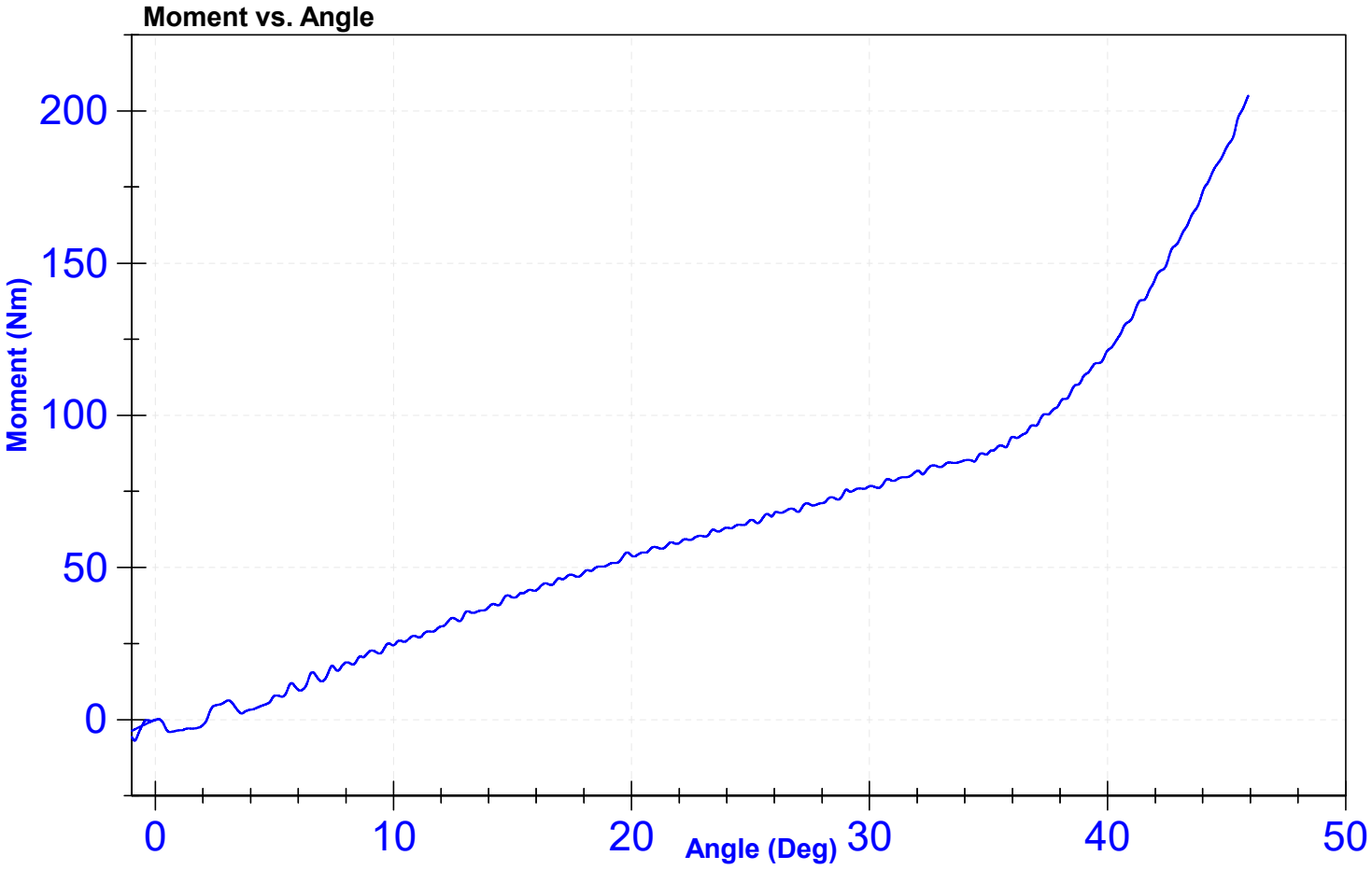
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21,9	Pass
Humidity	10	70	%	21	Pass
Average Velocity	5	10	deg/s	7.3	Pass
Angle at 203Nm	40	50	deg	45.8	Pass
Moment at 30 degrees	0	94.9	Nm	76.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS0008	9/23/2024	9/23/2025
Load Cell	PCB 2301-02	115	2024-11-11	2025-11-11



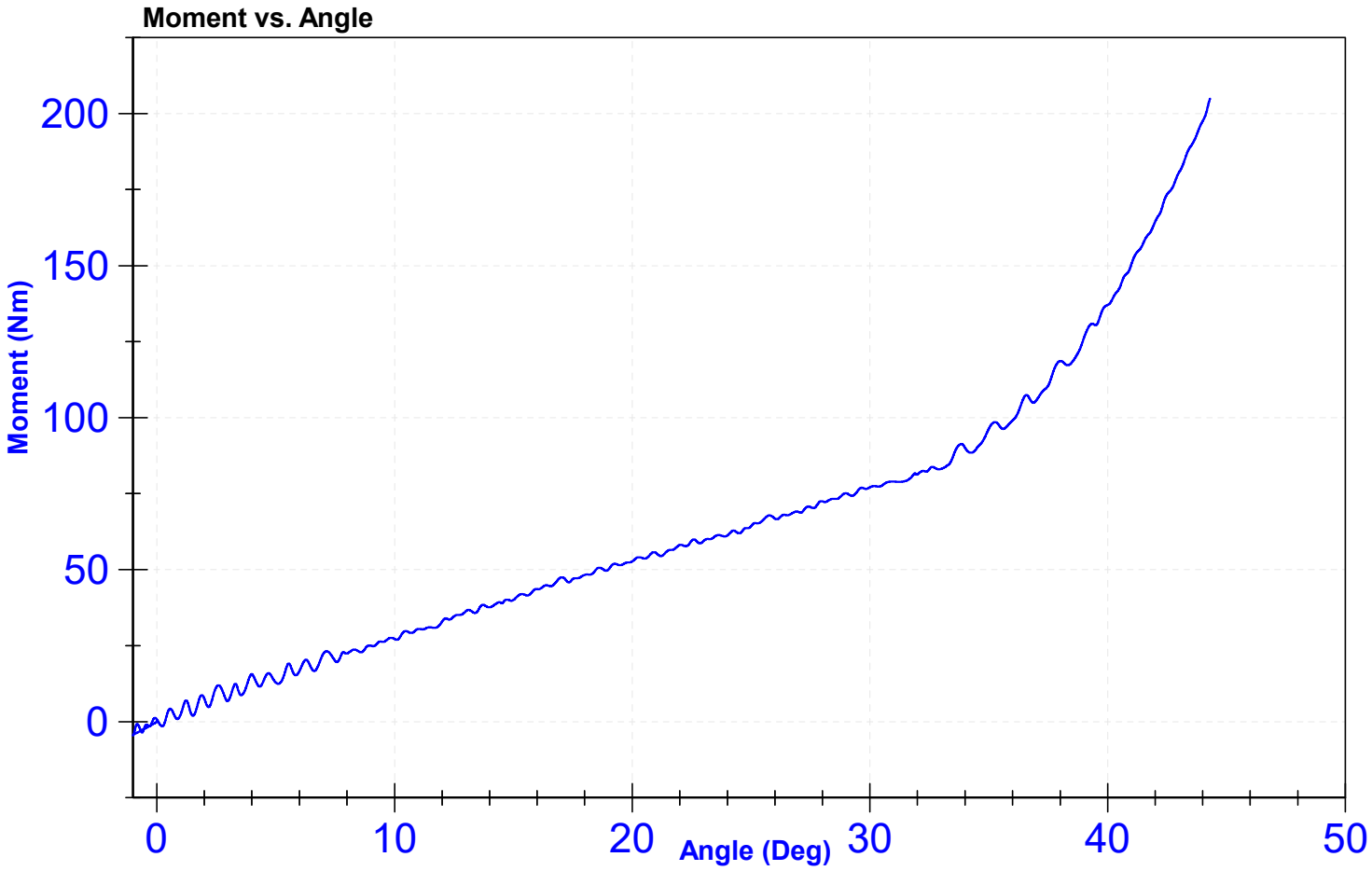
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21,9	Pass
Humidity	10	70	%	21	Pass
Average Velocity	5	10	deg/s	7.4	Pass
Angle at 203Nm	40	50	deg	44.2	Pass
Moment at 30 degrees	0	94.9	Nm	77.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS0008	9/23/2024	9/23/2025
Load Cell	PCB 2301-02	115	2024-11-11	2025-11-11



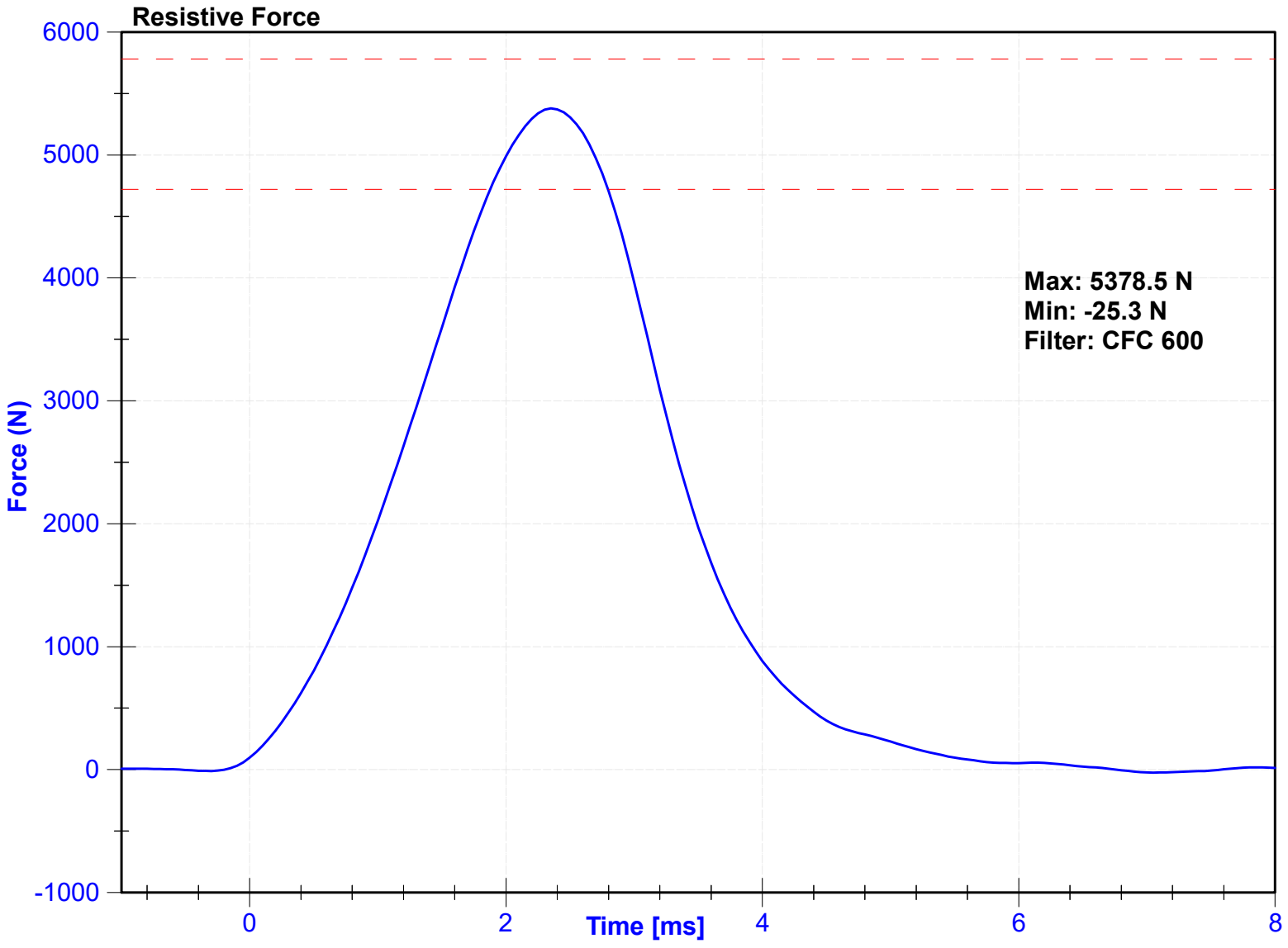
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

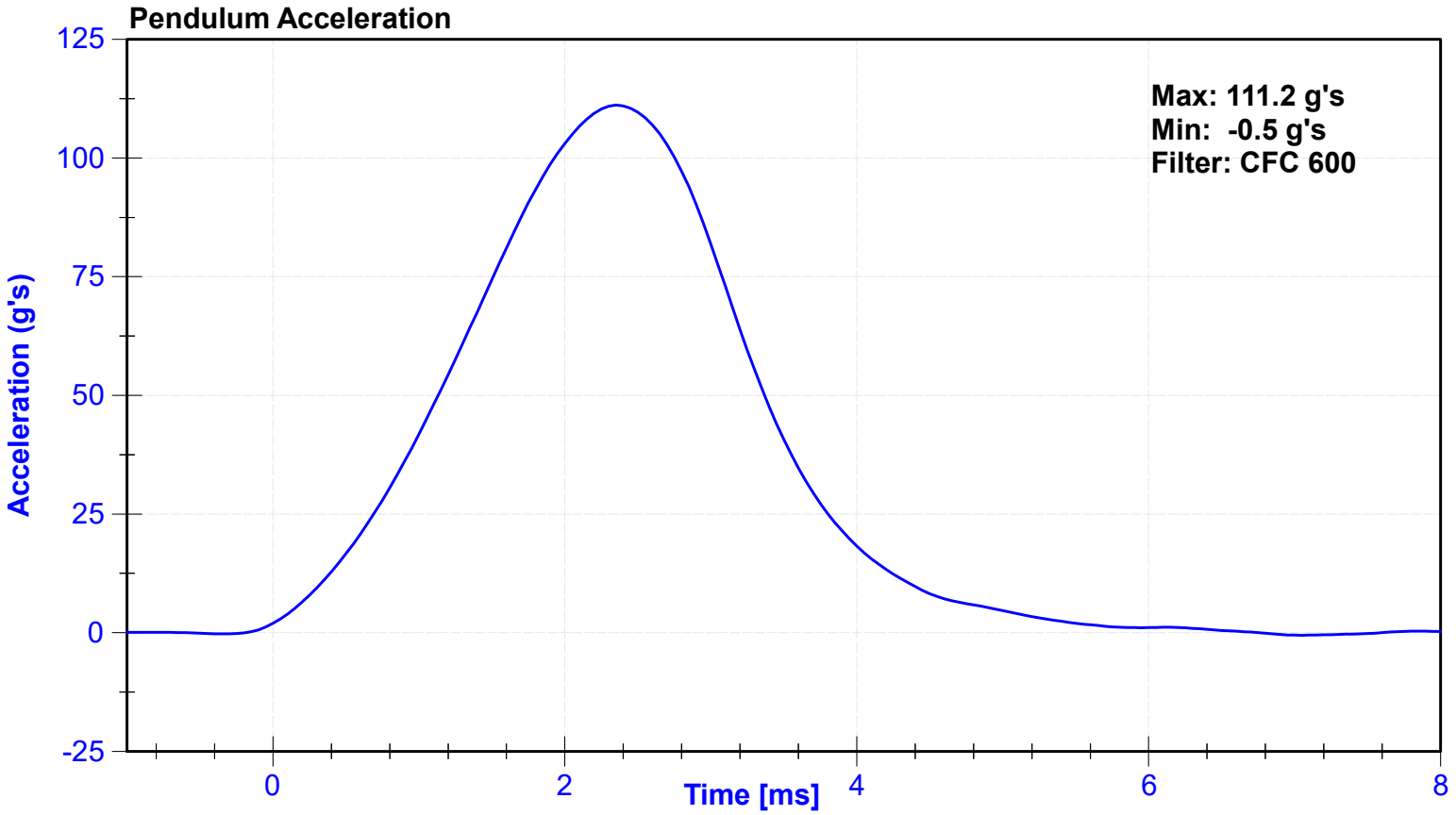
Results

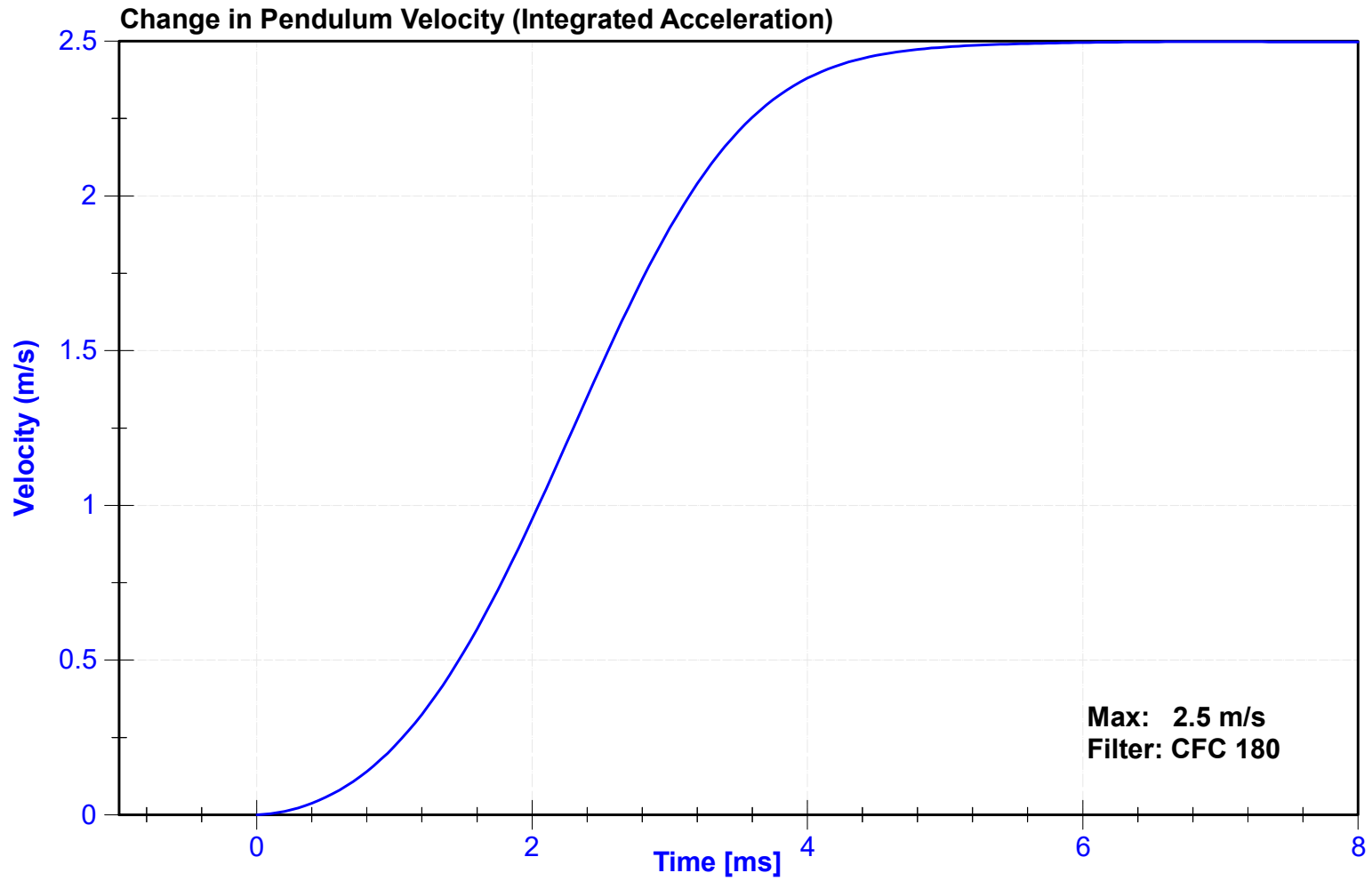
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.8	Pass
Humidity	10	70	%	32	Pass
Velocity	2.07	2.13	m/s	2.090	Pass
Maximum Resistive Force	4720	5780	N	5378.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25962	2/15/2025	8/14/2025




Pendulum Acceleration
Max: 111.2 g's
Min: -0.5 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


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

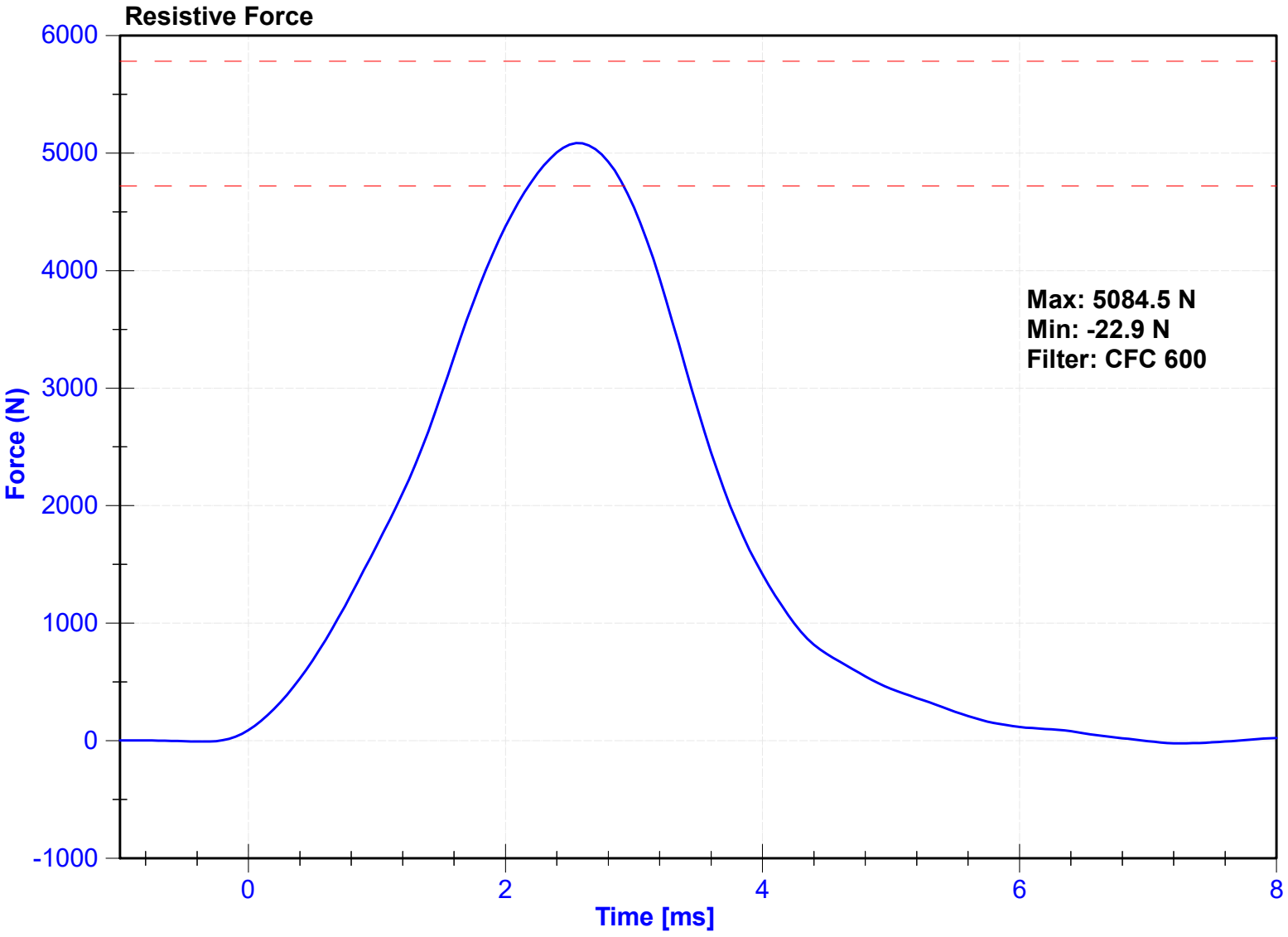
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	065	Laboratory Supervisor	J. Kinderman

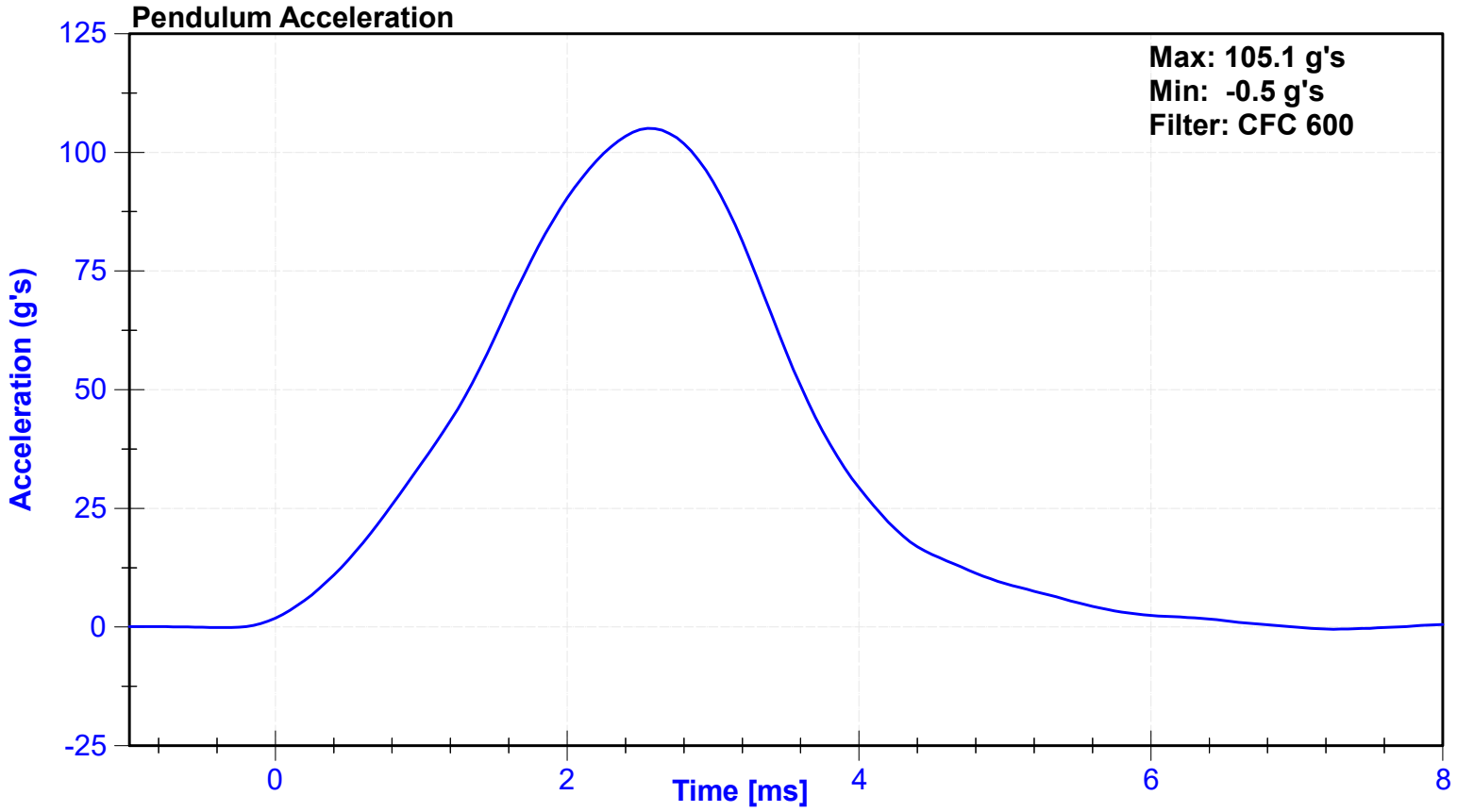
Results

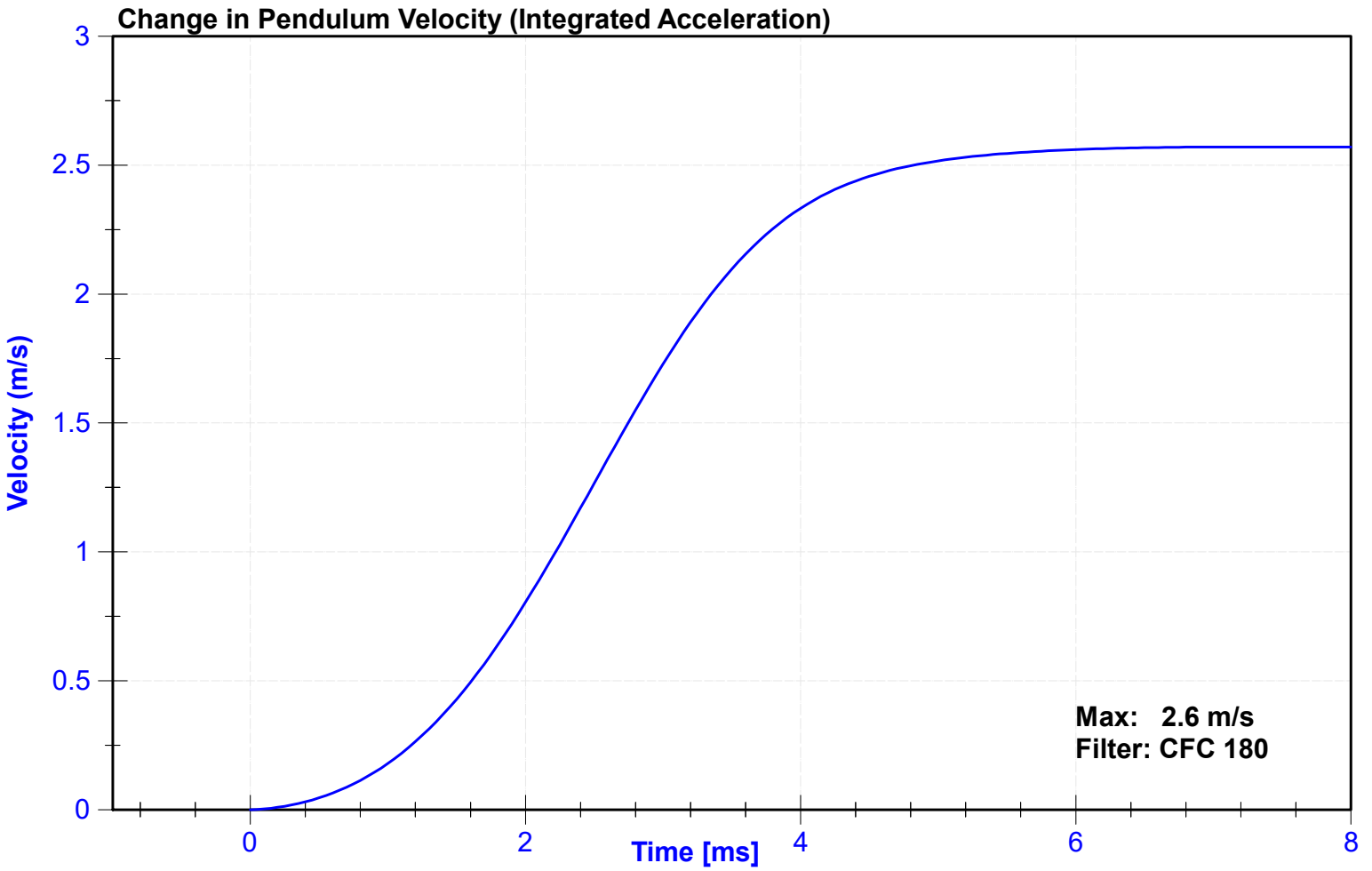
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.8	Pass
Humidity	10	70	%	32	Pass
Velocity	2.07	2.13	m/s	2.090	Pass
Maximum Resistive Force	4720	5780	N	5084.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25962	2/15/2025	8/14/2025




Pendulum Acceleration
Max: 105.1 g's
Min: -0.5 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


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

CALIBRATION TEST RESULTS

POST-TEST

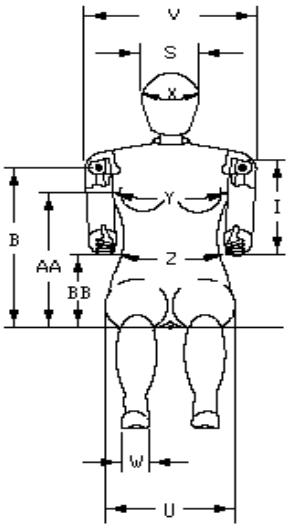
HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

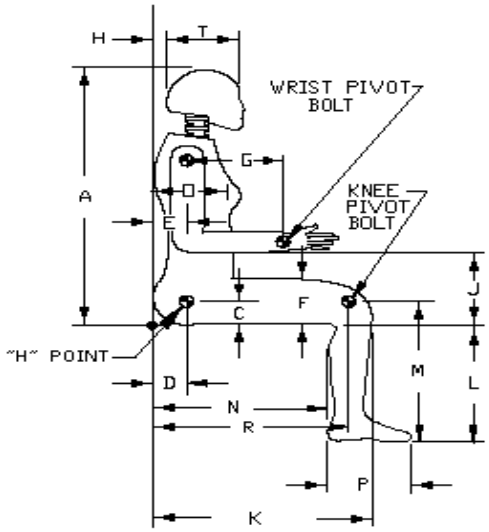
SERIAL NO: 137

External Measurements - Hybrid 3 - 5th Female

Technician: J. Rios Date: 3/20/2025

Dummy Serial Number: 137





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	784	Pass
B	Shoulder Pivot Height	432	457	442	Pass
C	H-Point Height	81	86	83	Pass
D	H-Point from Backline	145	150	146	Pass
E	Shoulder Pivot from Backline	69	84	77	Pass
F	Thigh Clearance	119	135	131	Pass
G	Back of Elbow to Wrist Pivot	244	259	251	Pass
H	Head Back to Backline	43	48	46	Pass
I	Shoulder to Elbow Length	277	297	290	Pass
J	Elbow Rest Height	183	203	195	Pass
K	Buttock to Knee Length	521	546	530	Pass
L	Popliteal Height	356	376	362	Pass
M	Knee Pivot Height	394	419	411	Pass
N	Buttock Popliteal Length	414	439	431	Pass
O	Chest Depth without Jacket	175	191	184	Pass
P	Foot Length (right)	219	234	224	Pass
R	Buttock To Knee Pivot Length	457	483	459	Pass
S	Head Breadth	137	147	141	Pass
T	Head Depth	178	188	185	Pass
U	Hip Breadth	300	315	307	Pass
V	Shoulder Breadth	351	366	358	Pass
W	Foot Breadth	79	94	84	Pass
X	Head Circumference	528	549	535	Pass
Y	Chest Circumference with Jacket	851	881	871	Pass
Z	Waist Circumference	460	790	641	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	166	Pass

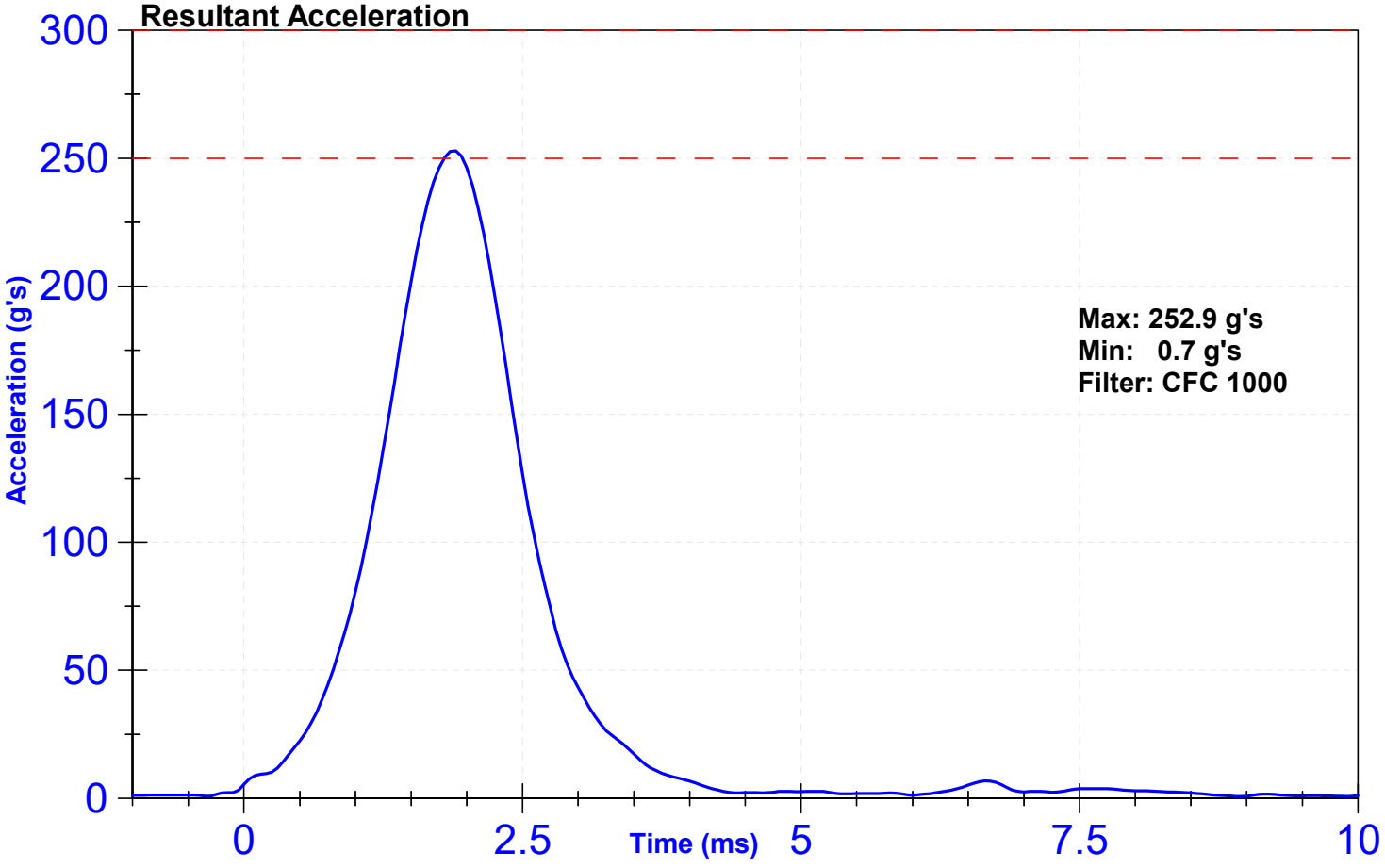
ATD Manufacturer	Humanetics	Test Technician	Z. Nyhart
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

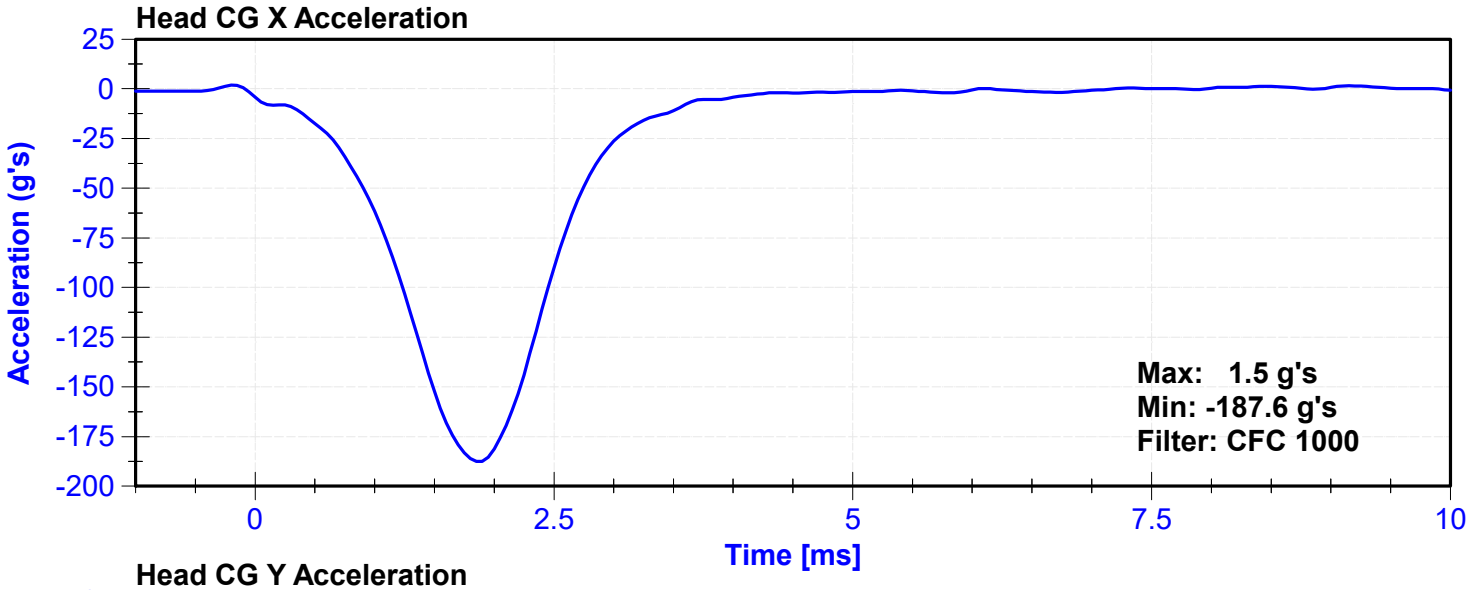
Results

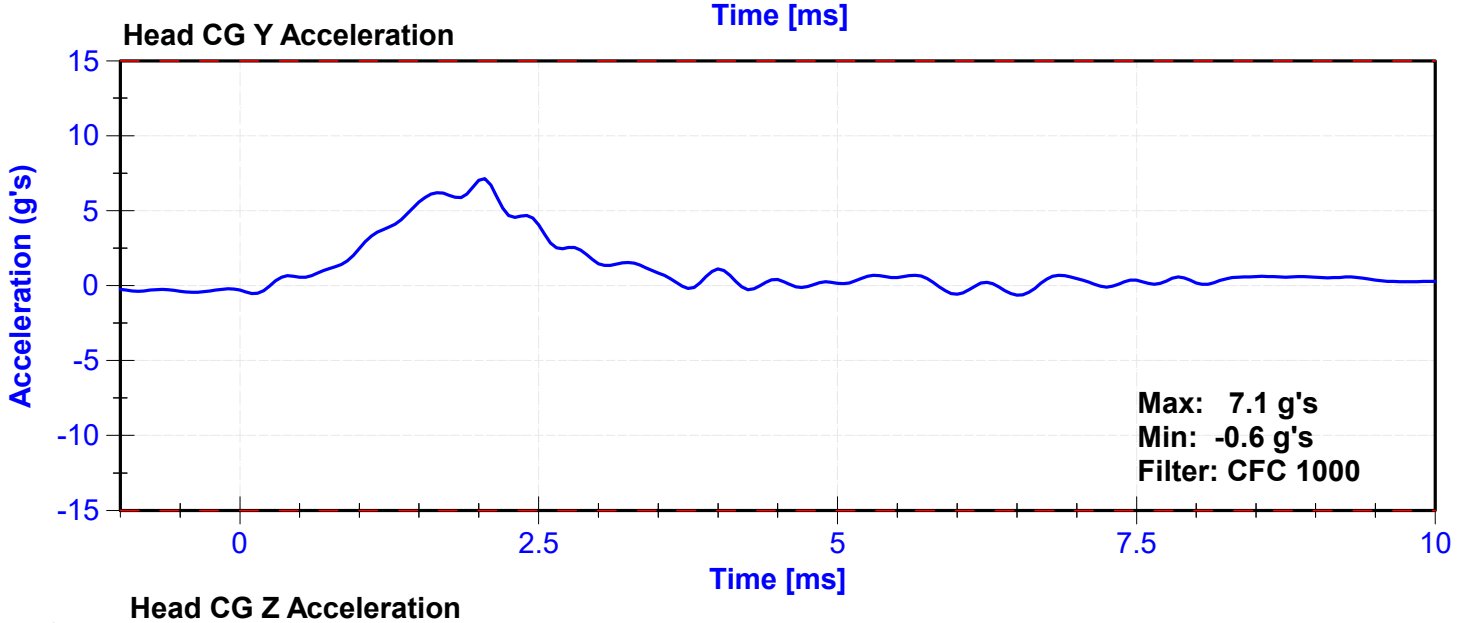
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.9	Pass
Humidity	10	70	%	26	Pass
Resultant Acceleration	250	300	g's	252.9	Pass
Oscillation	0	10	%	2.7	Pass
Lateral Acceleration	-15	15	g's	7.1	Pass

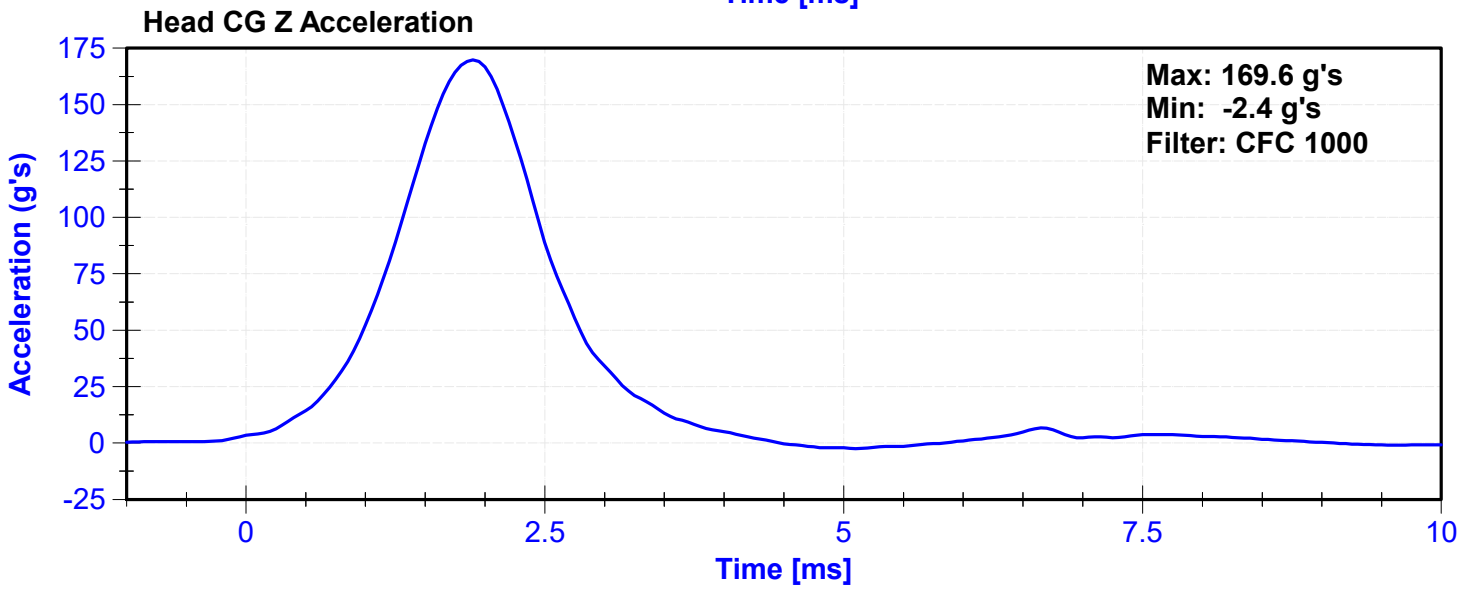
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P79417	2/14/2025	8/13/2025
Y Accelerometer	Endevco	P83335	2/14/2025	8/13/2025
Z Accelerometer	Endevco	P64149	2/14/2025	8/13/2025




Head CG X Acceleration
Acceleration (g's)
25
0
-25
-50
-75
-100
-125
-150
-175
-200
0
2.5
5
7.5
10
Time [ms]
Max: 1.5 g's
Min: -187.6 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: 7.1 g's
Min: -0.6 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
175
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 169.6 g's
Min: -2.4 g's
Filter: CFC 1000

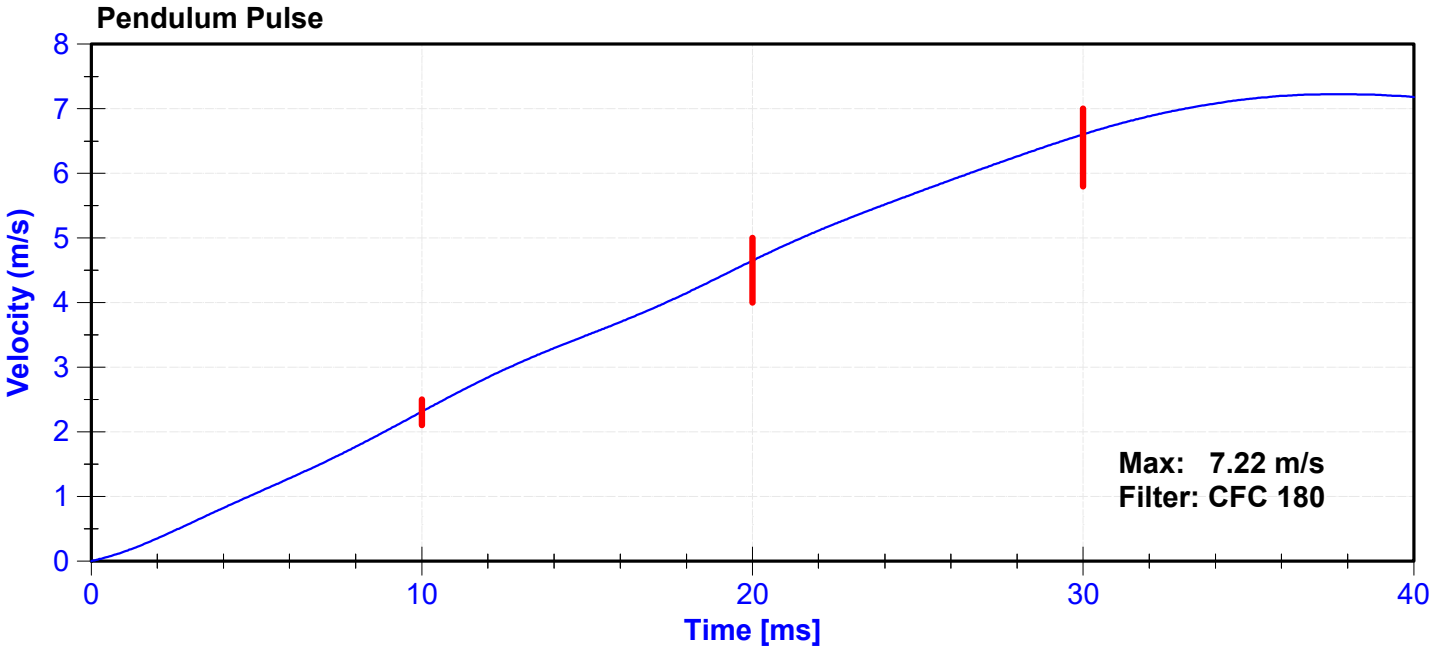
ATD Manufacturer	Humanetics	Test Technician	Z. Nyhart
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

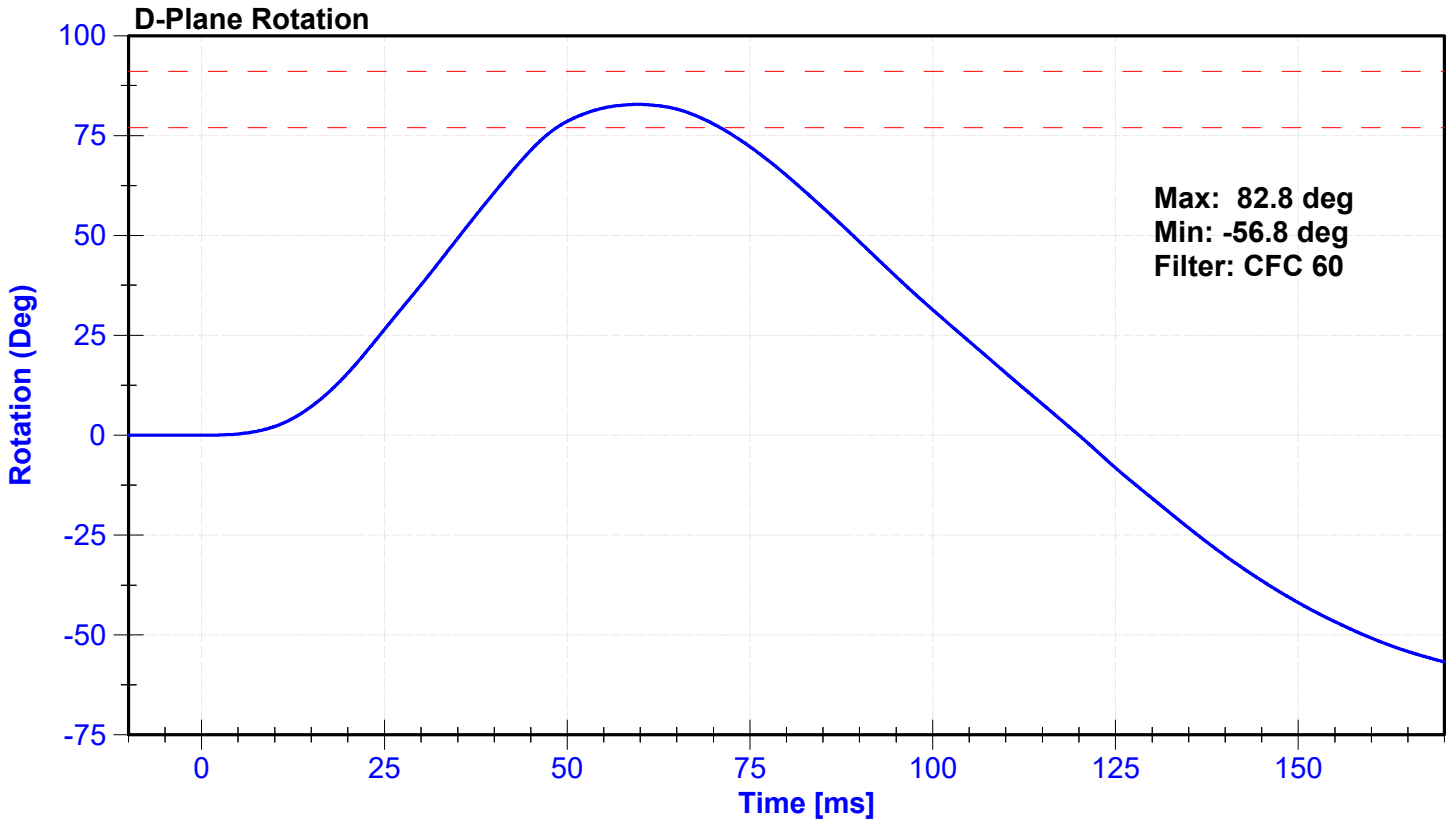
Results

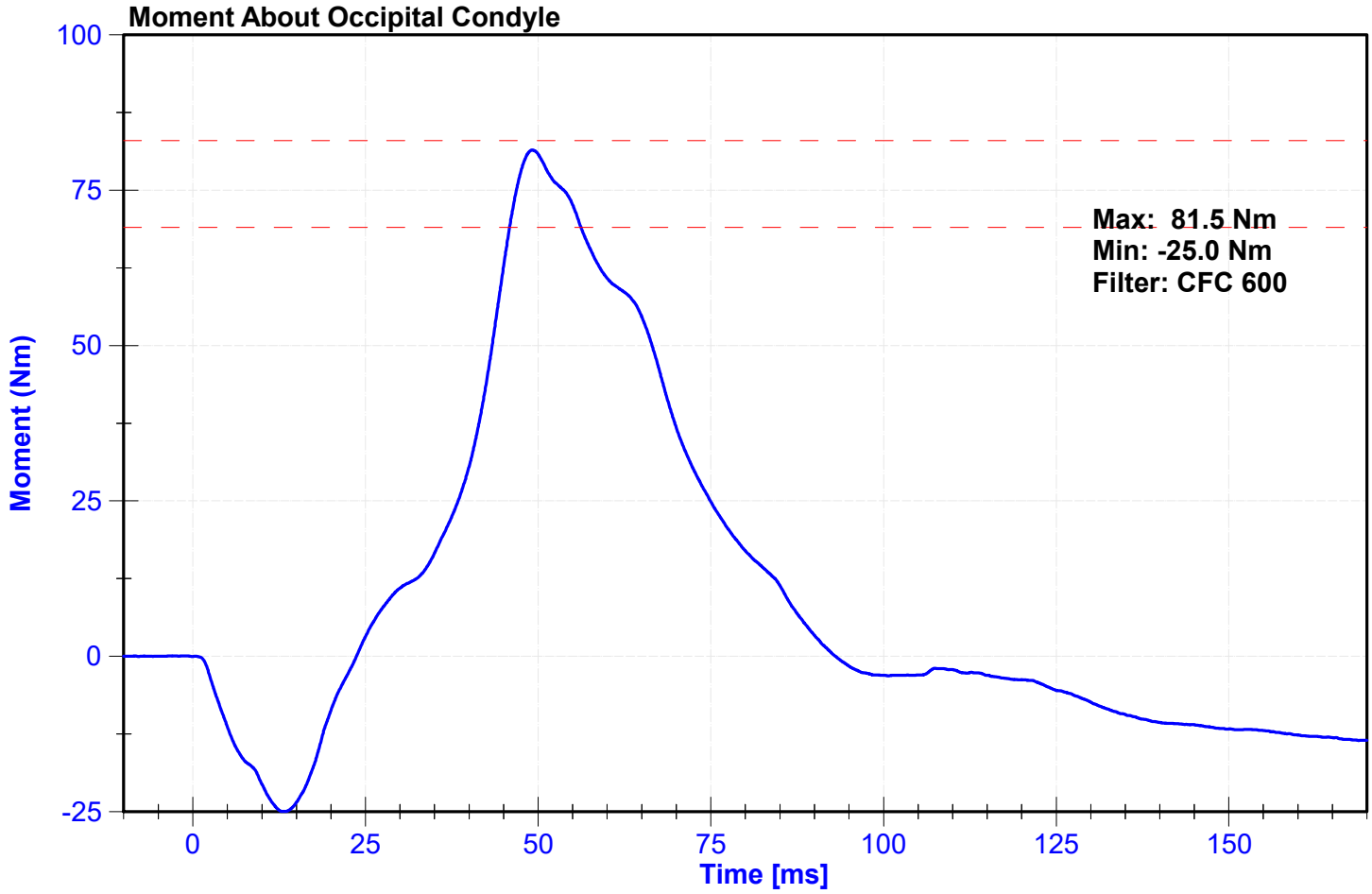
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	25	Pass
Velocity	6.89	7.13	m/s	7.008	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.31	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.65	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.60	Pass
Max D Plane Rotation	77	91	deg	82.8	Pass
Max Moment During Rotation Interval	69	83	Nm	81.5	Pass
Moment Decay to 10.0 Nm	80	100	ms	85.8	Pass

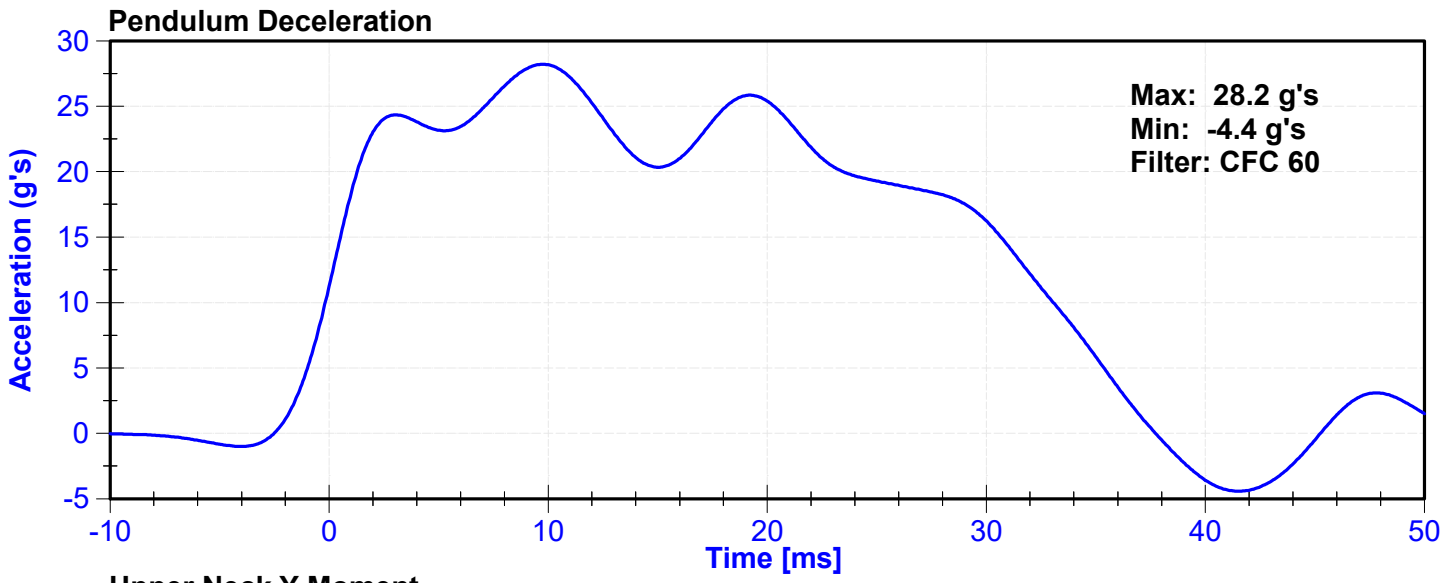
Transducer Calibrations

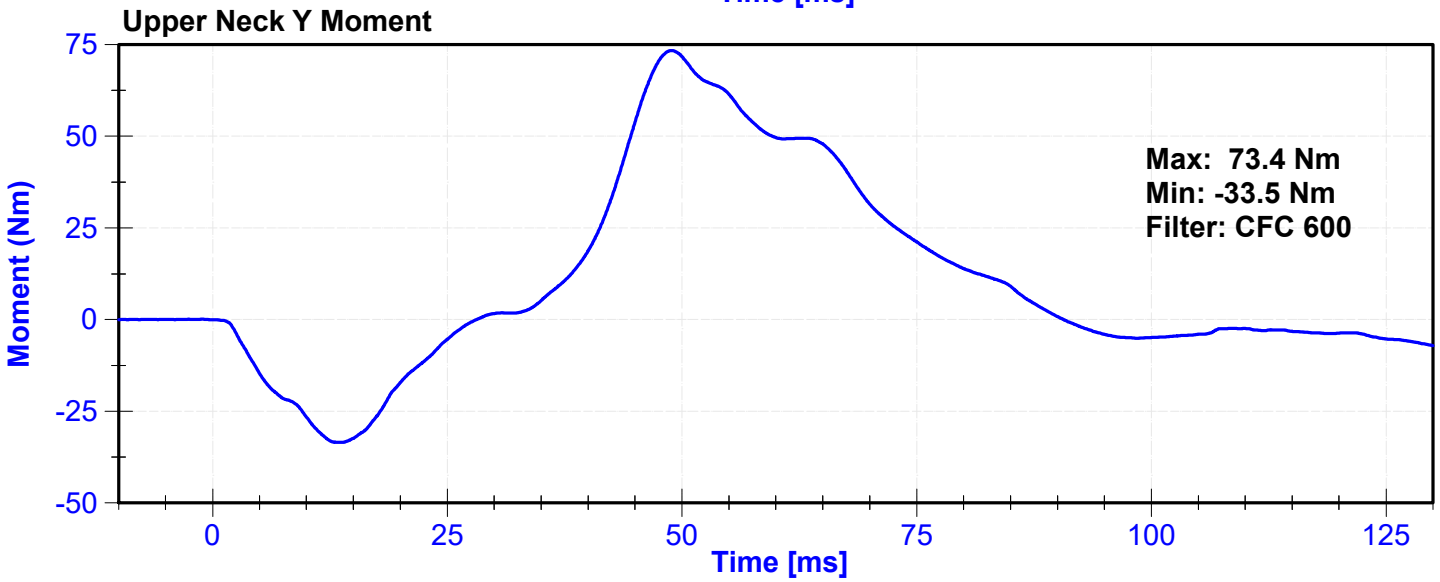
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16646	10/17/2024	4/15/2025
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Denton	2184-FX	7/10/2024	7/10/2025

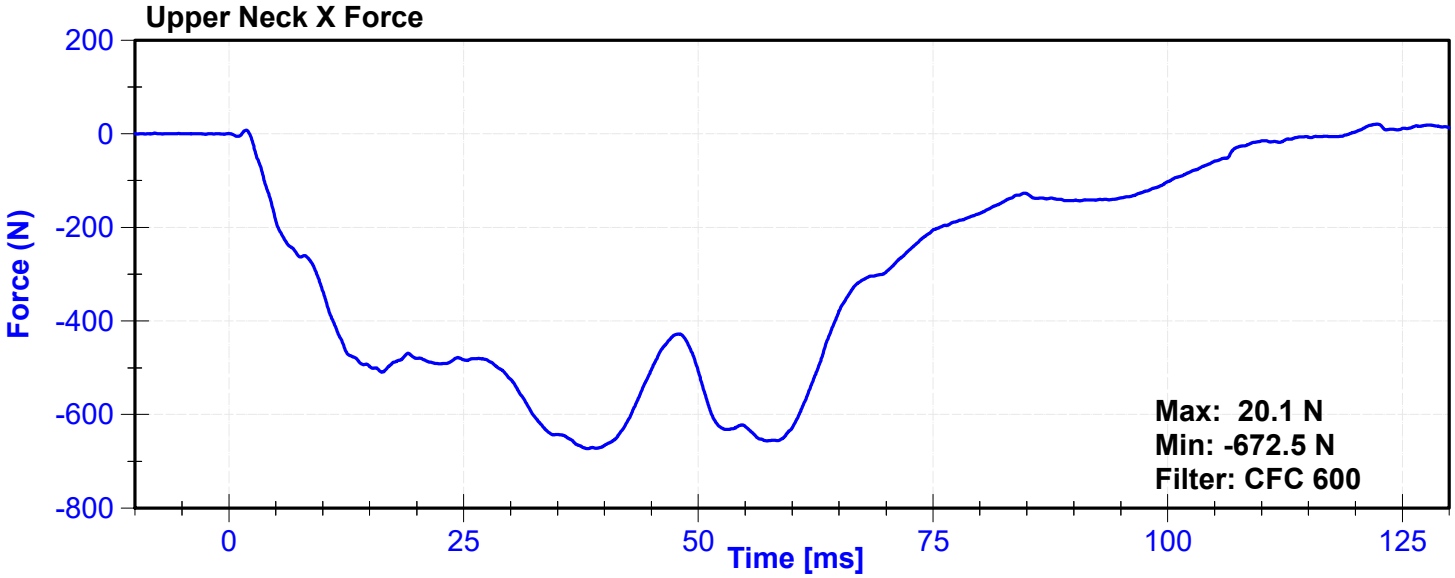



D-Plane Rotation
Rotation (Deg)
Time [ms]
Max: 82.8 deg
Min: -56.8 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
Time [ms]
Max: 81.5 Nm
Min: -25.0 Nm
Filter: CFC 600


Pendulum Deceleration
Acceleration (g's)
Time [ms]
Max: 28.2 g's
Min: -4.4 g's
Filter: CFC 60


Upper Neck Y Moment
Moment (Nm)
Time [ms]
Max: 73.4 Nm
Min: -33.5 Nm
Filter: CFC 600


Upper Neck X Force
Force (N)
Time [ms]
Max: 20.1 N
Min: -672.5 N
Filter: CFC 600

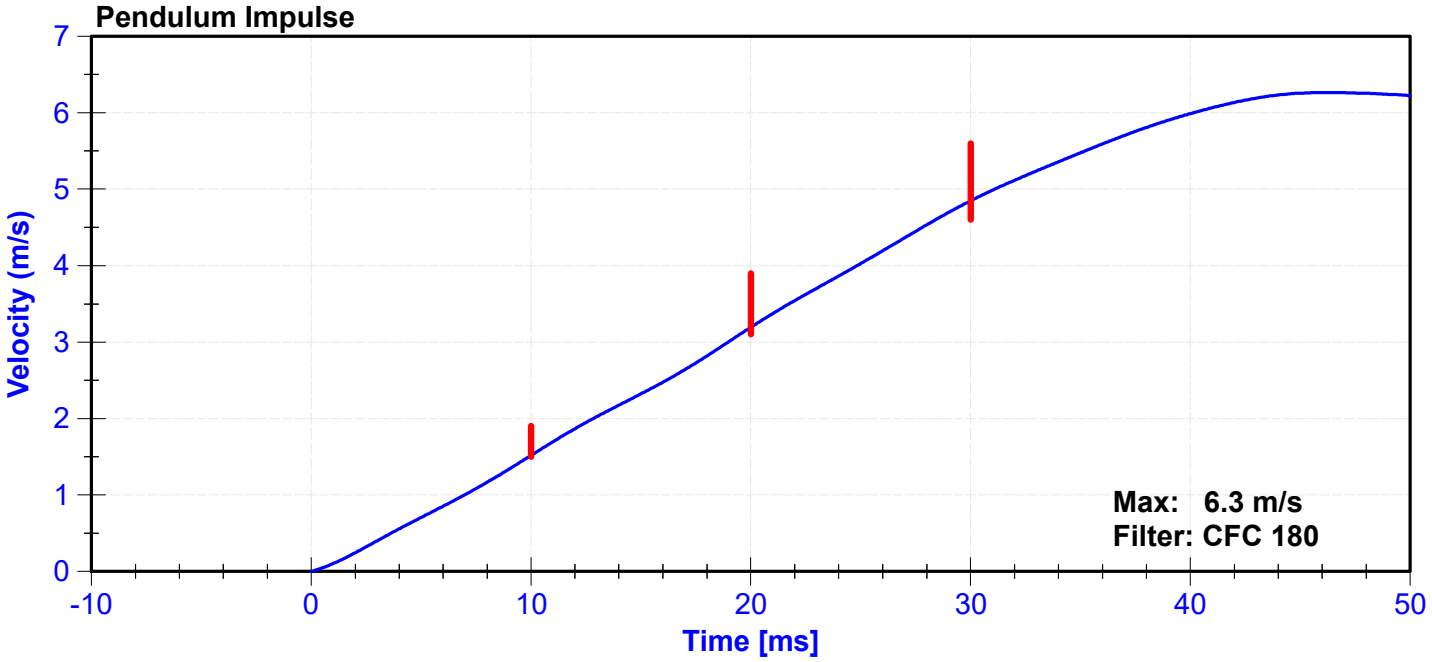
ATD Manufacturer	Humanetics	Test Technician	Z. Nyhart
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

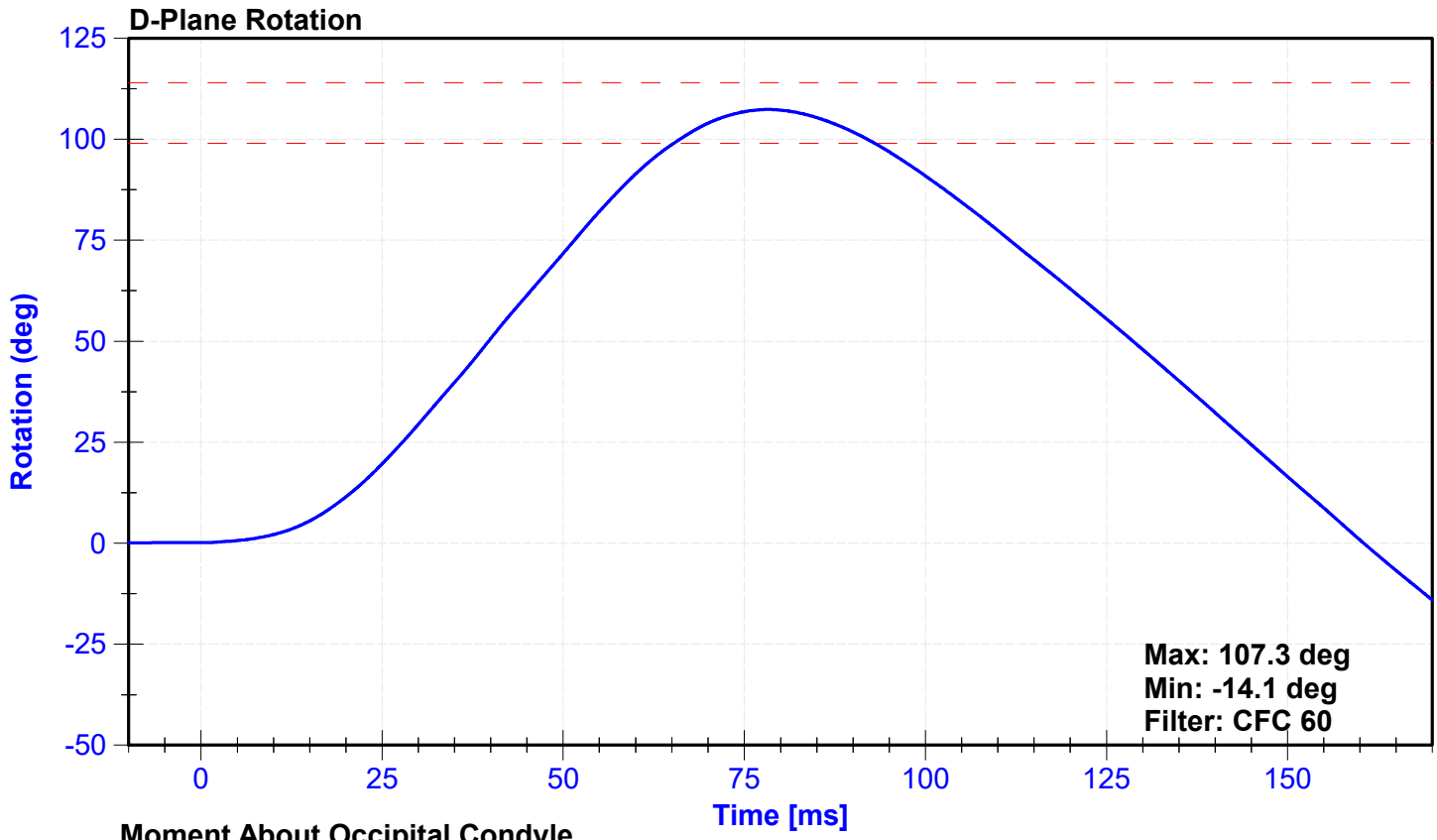
Results

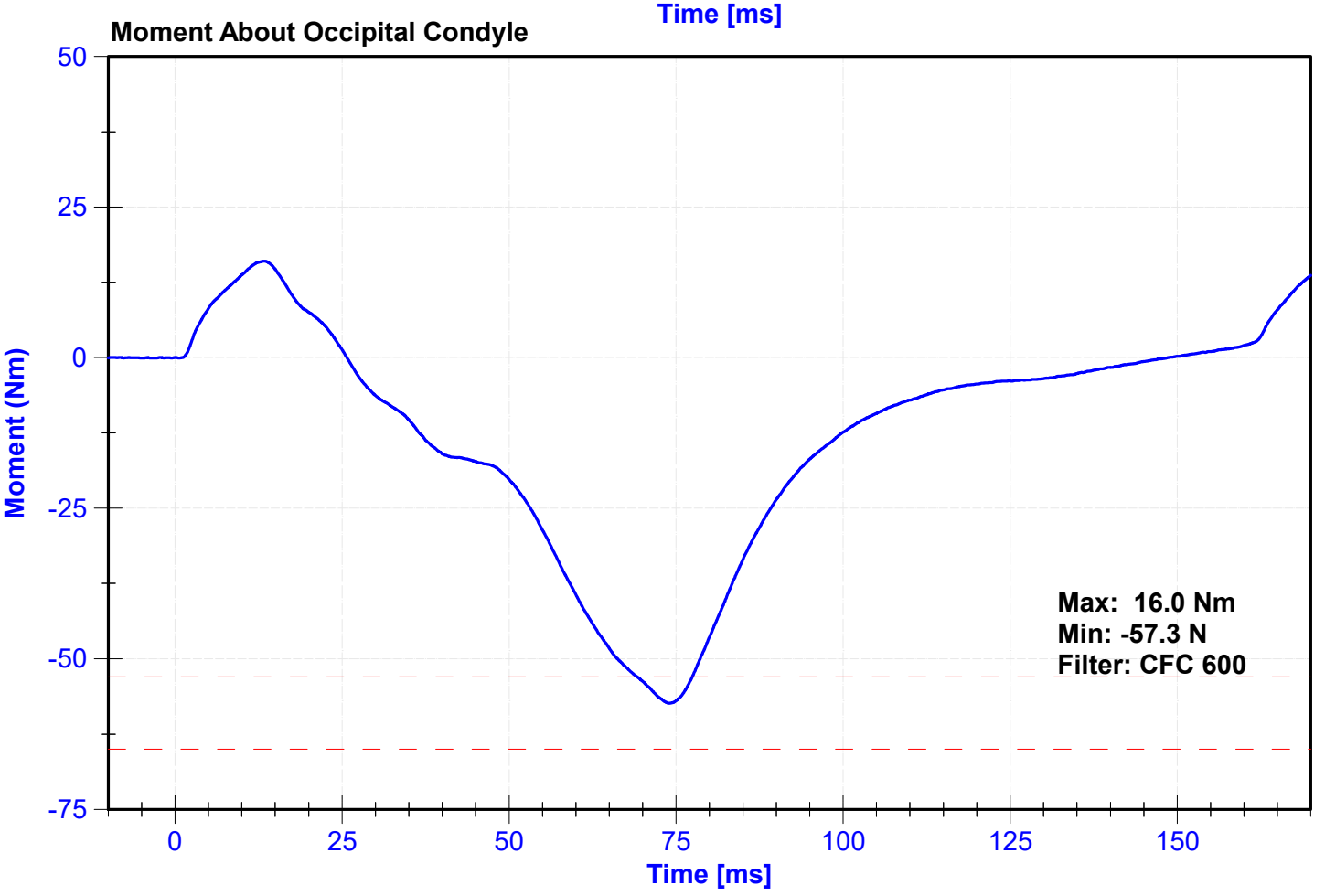
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	25	Pass
Velocity	5.95	6.19	m/s	6.015	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.52	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.19	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	4.85	Pass
D Plane Rotation	99	114	deg	107.3	Pass
Moment During Rotation Interval	-65	-53	Nm	-57.3	Pass
Moment Decay to -10Nm	94	114	ms	103.5	Pass

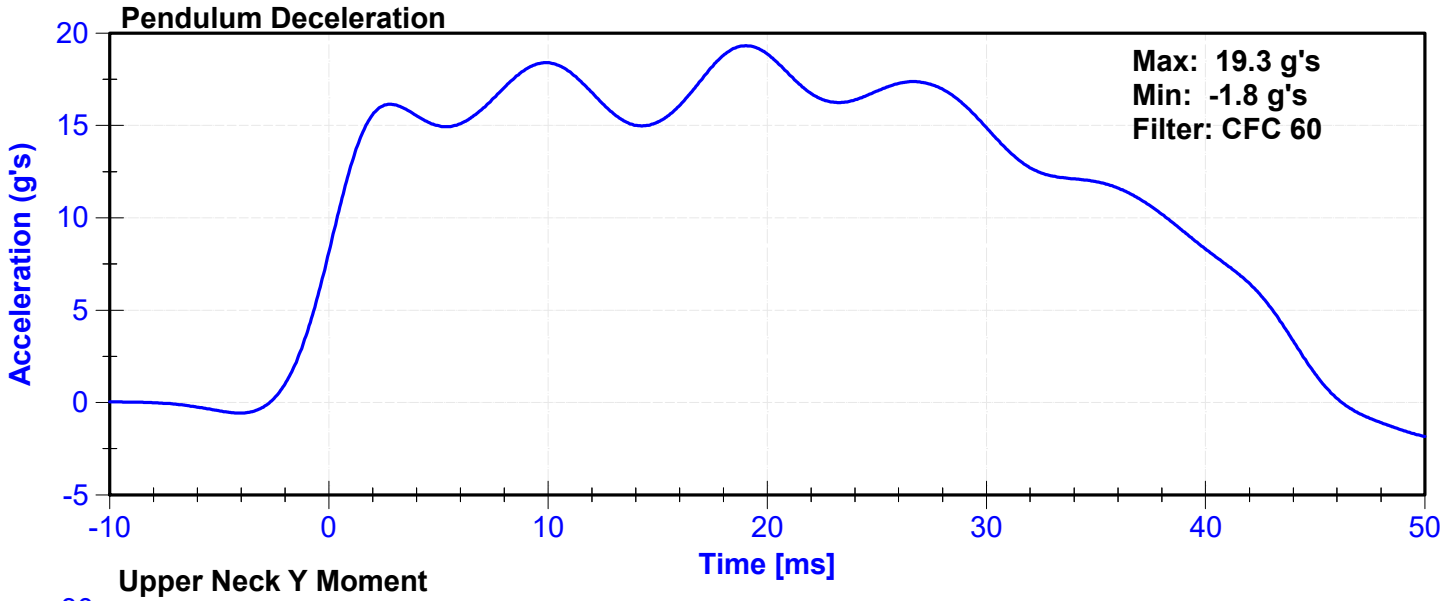
Transducer Calibrations

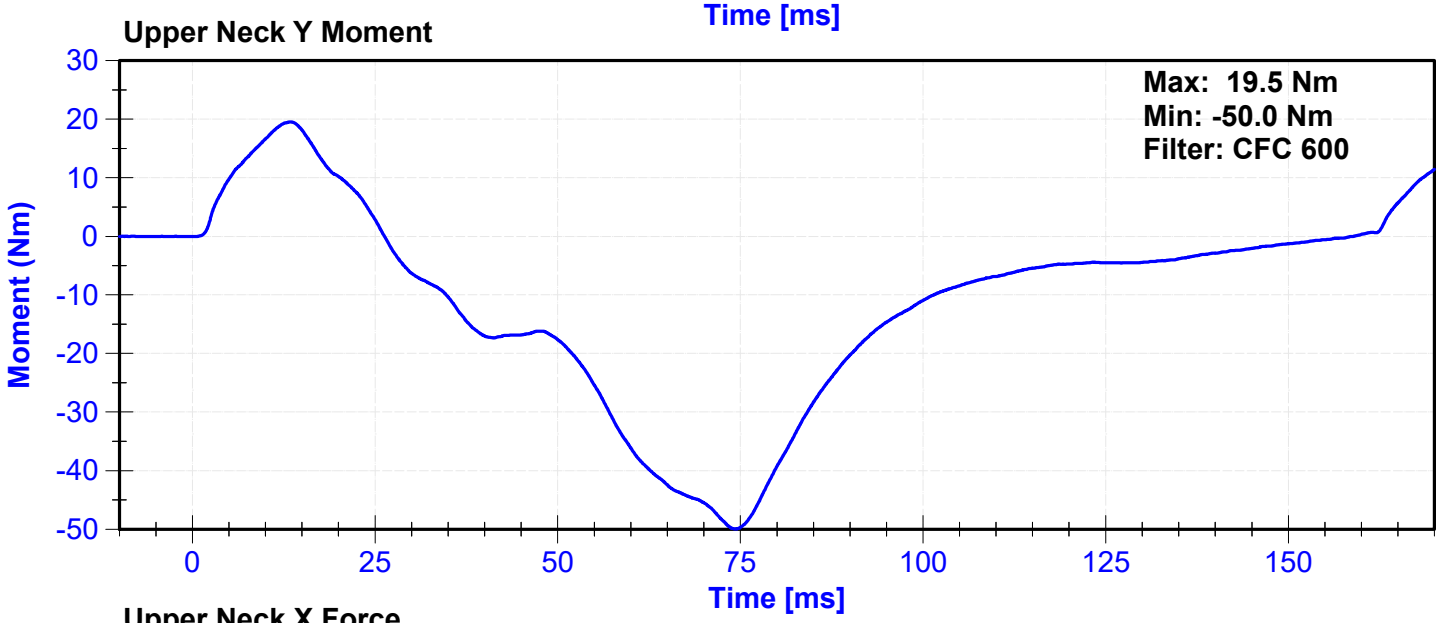
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16646	10/17/2024	4/15/2025
Pendulum Potentiometer	ETI	SP22G_LABPOT1	5/7/2024	5/7/2025
Condyle Potentiometer	ETI	SP22G_LABPOT2	5/7/2024	5/7/2025
Upper Neck Load Cell	Denton	1716ATF	7/10/2024	7/10/2025

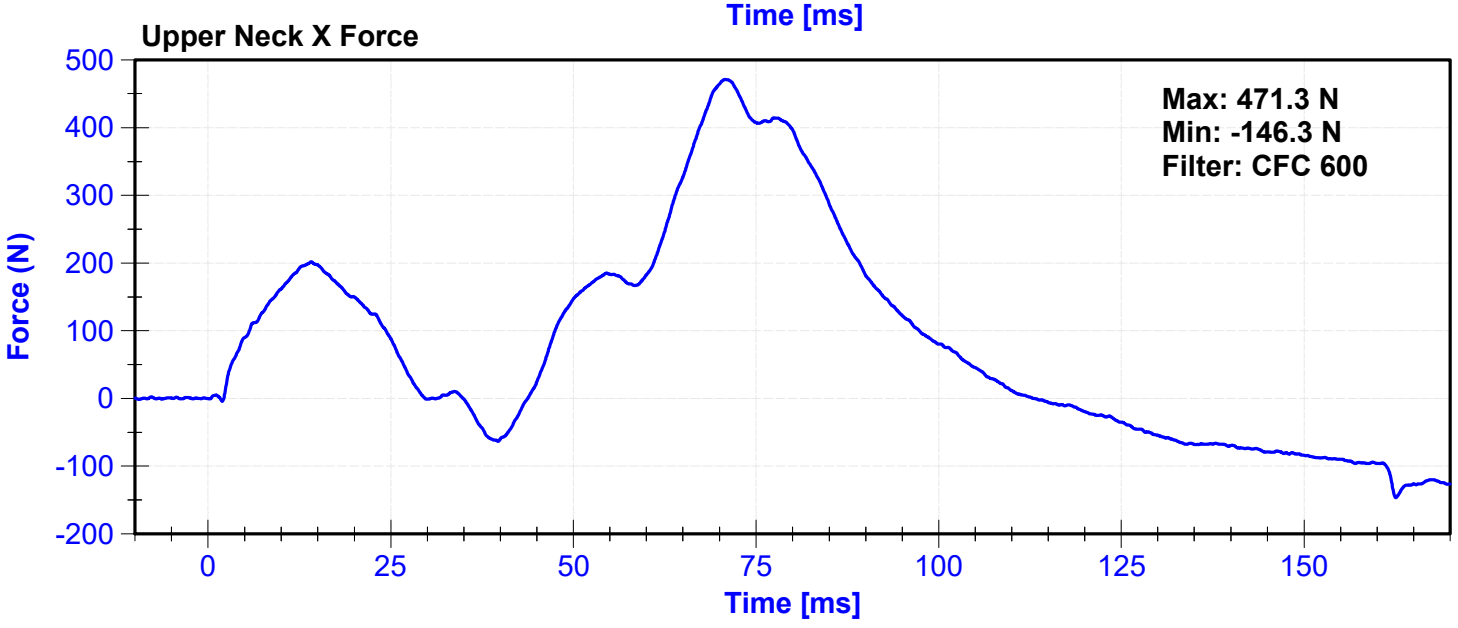



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 107.3 deg
Min: -14.1 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]
Max: 16.0 Nm
Min: -57.3 N
Filter: CFC 600


Pendulum Deceleration
Max: 19.3 g's
Min: -1.8 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 19.5 Nm
Min: -50.0 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 471.3 N
Min: -146.3 N
Filter: CFC 600
Force (N)
Time [ms]

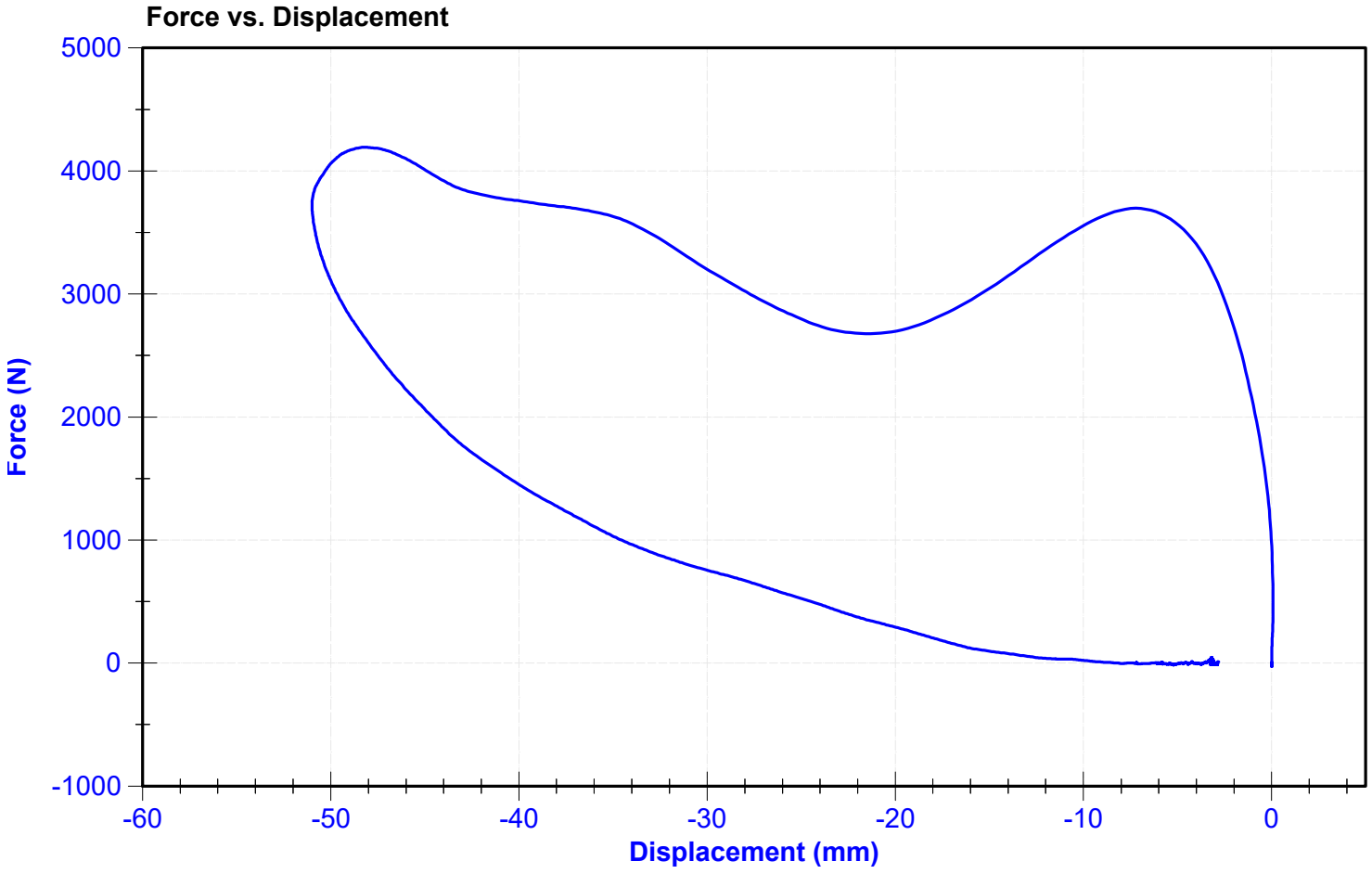
ATD Manufacturer	Humanetics	Test Technician	Z. Nyhart
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

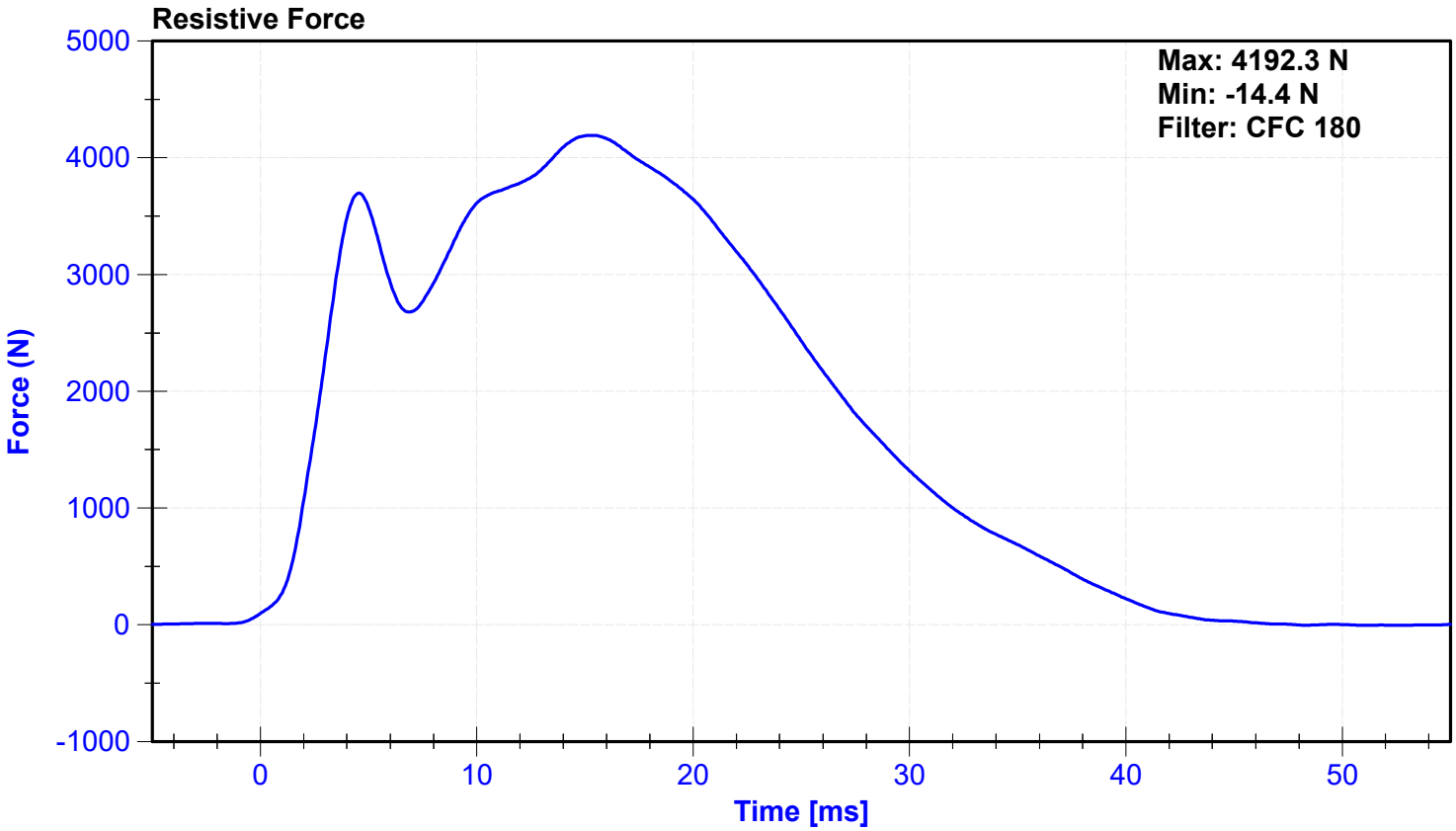
Results

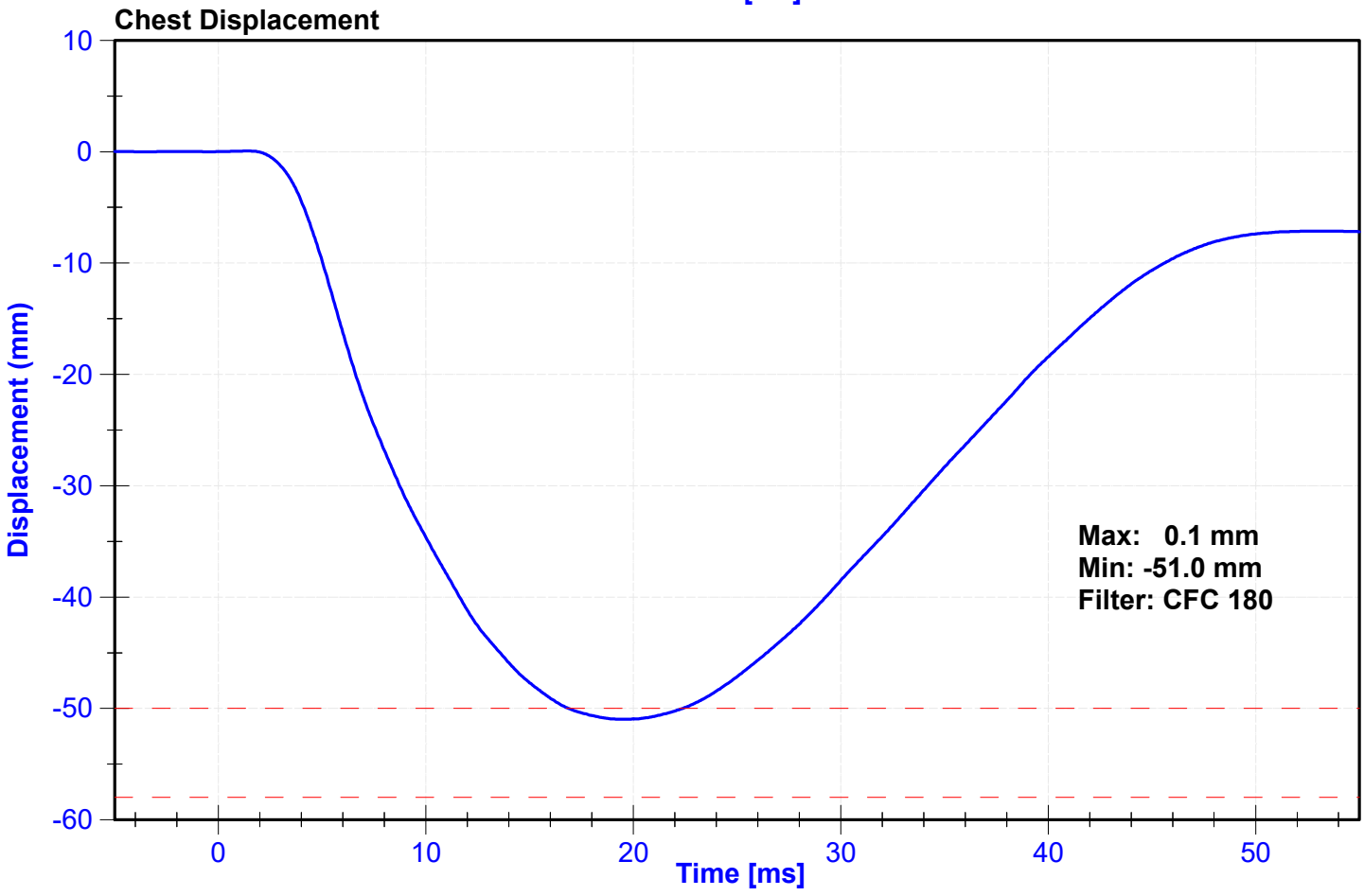
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	30	Pass
Velocity	6.59	6.83	m/s	6.682	Pass
Chest Deflection	-58	-50	mm	-51.0	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4062.6	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4192.3	Pass
Hysteresis	69	85	%	75.6	Pass

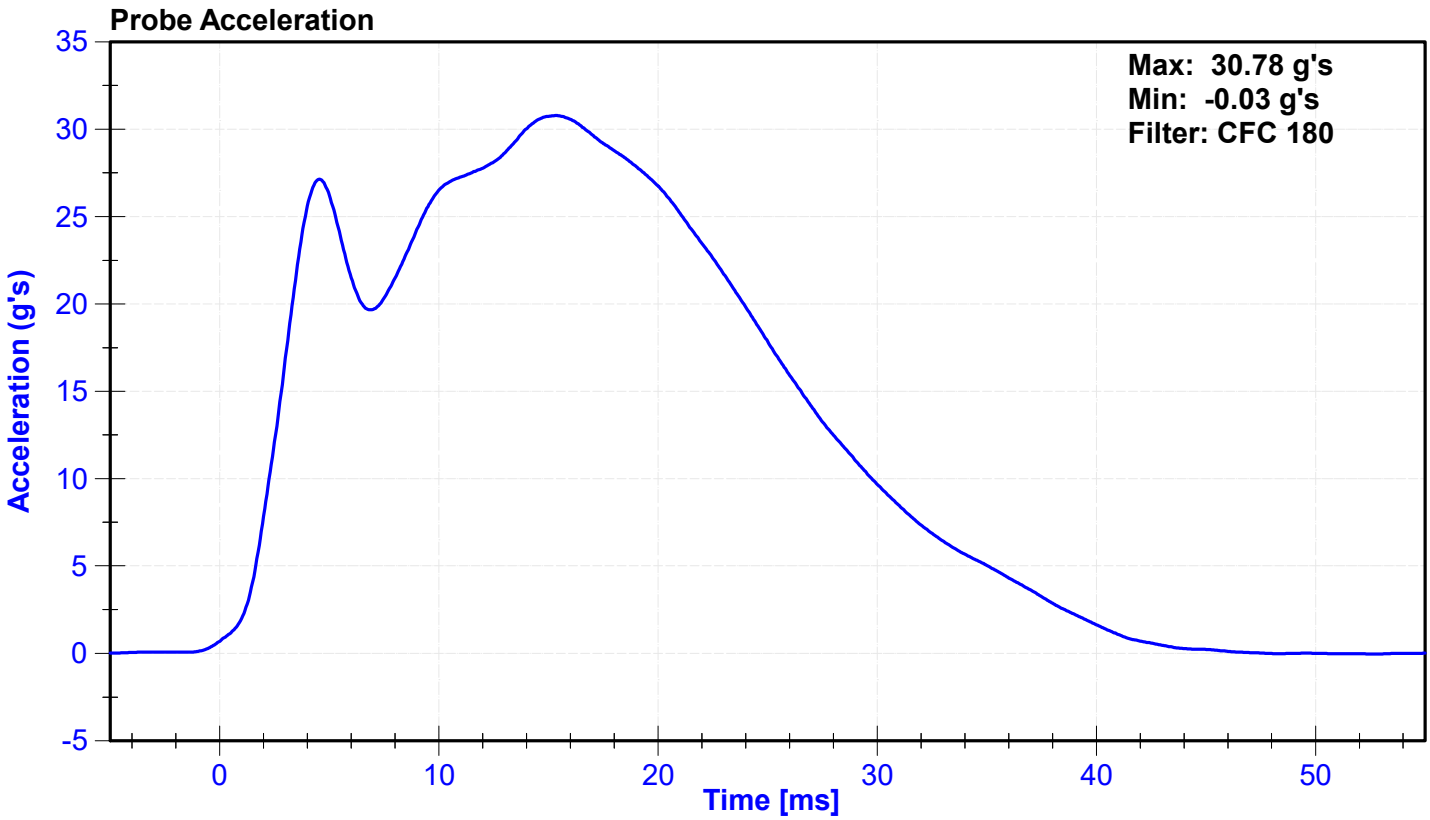
Transducer Calibrations

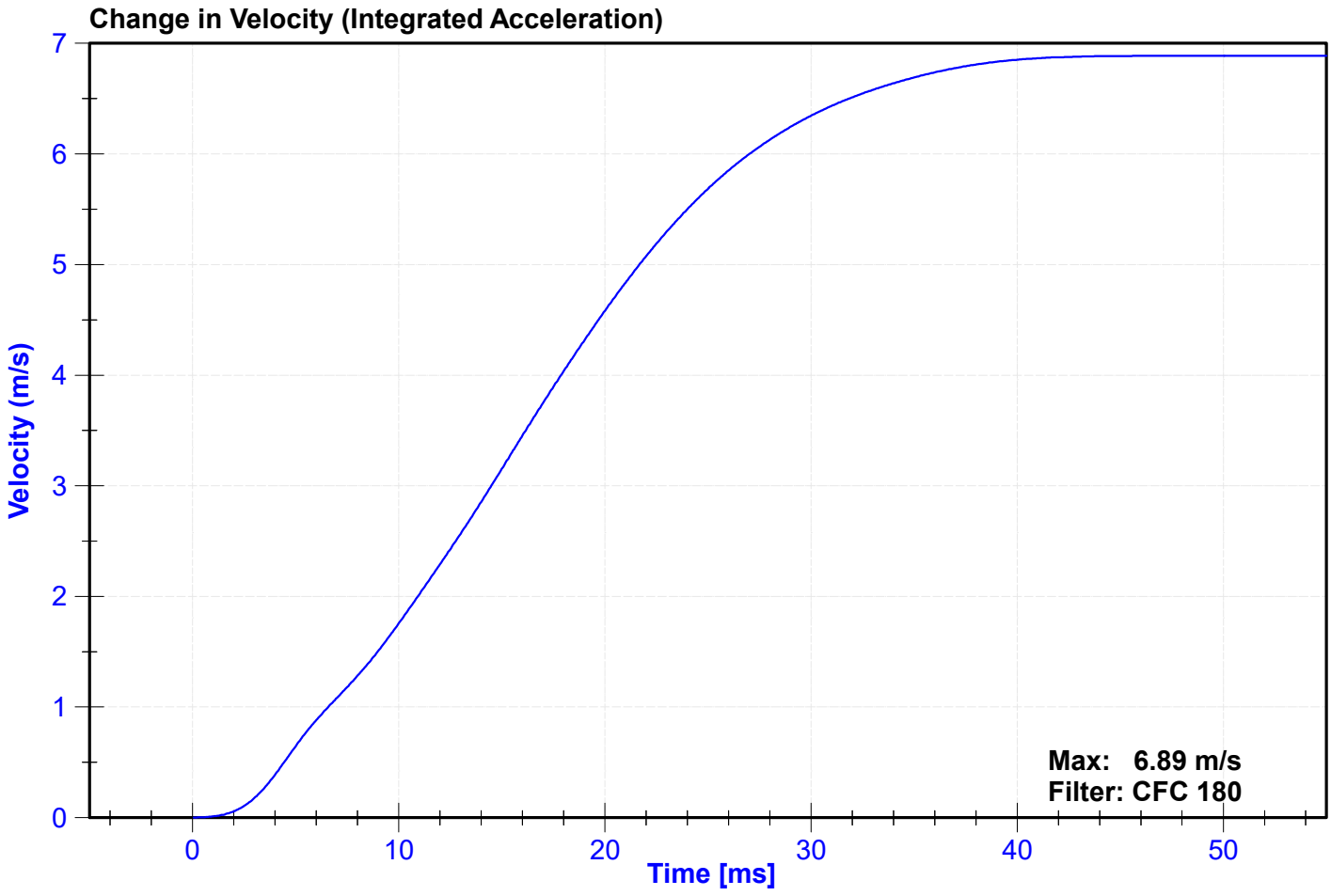
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18566	11/26/2024	5/25/2025
Chest Potentiometer	Servo	0720	2/17/2025	8/18/2025




Resistive Force
Max: 4192.3 N
Min: -14.4 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: -51.0 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: 30.78 g's
Min: -0.03 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: 6.89 m/s
Filter: CFC 180
Velocity (m/s)
7
6
5
4
3
2
1
0
0
10
20
30
40
50
Time [ms]

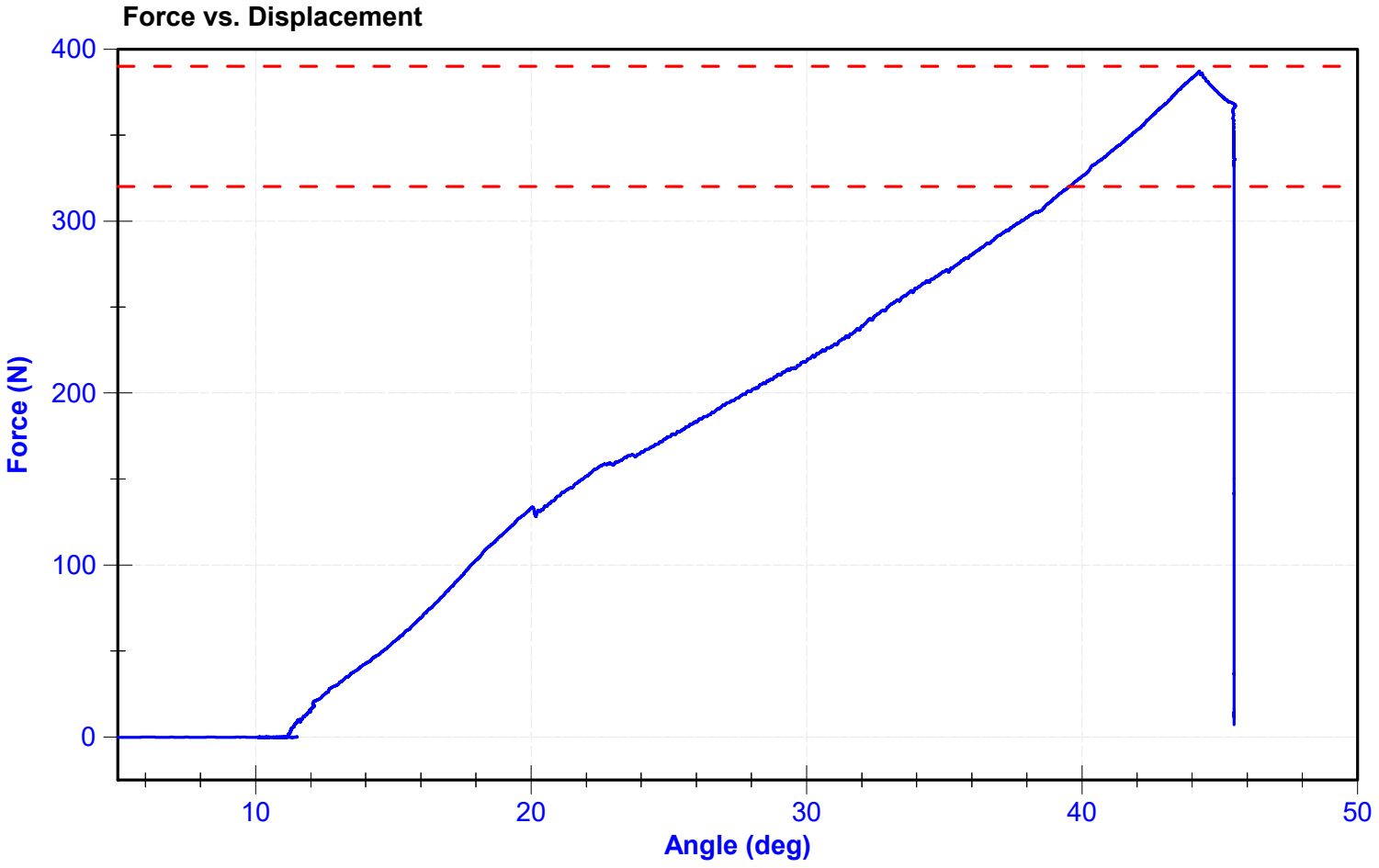
ATD Manufacturer	Humanetics	Test Technician	J. Rios
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	ºC	21.5	Pass
Humidity	10	70	%	31	Pass
Initial Angle	0	20	deg	10.8	Pass
Force at 45 Degrees	320	390	N	387.3	Pass
Return Angle Relative to Initial	0	8	deg	2.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker	DS-1905226	2024-11-16	2025-11-16
Load Cell	Interface	493319	2024-08-14	2025-08-14



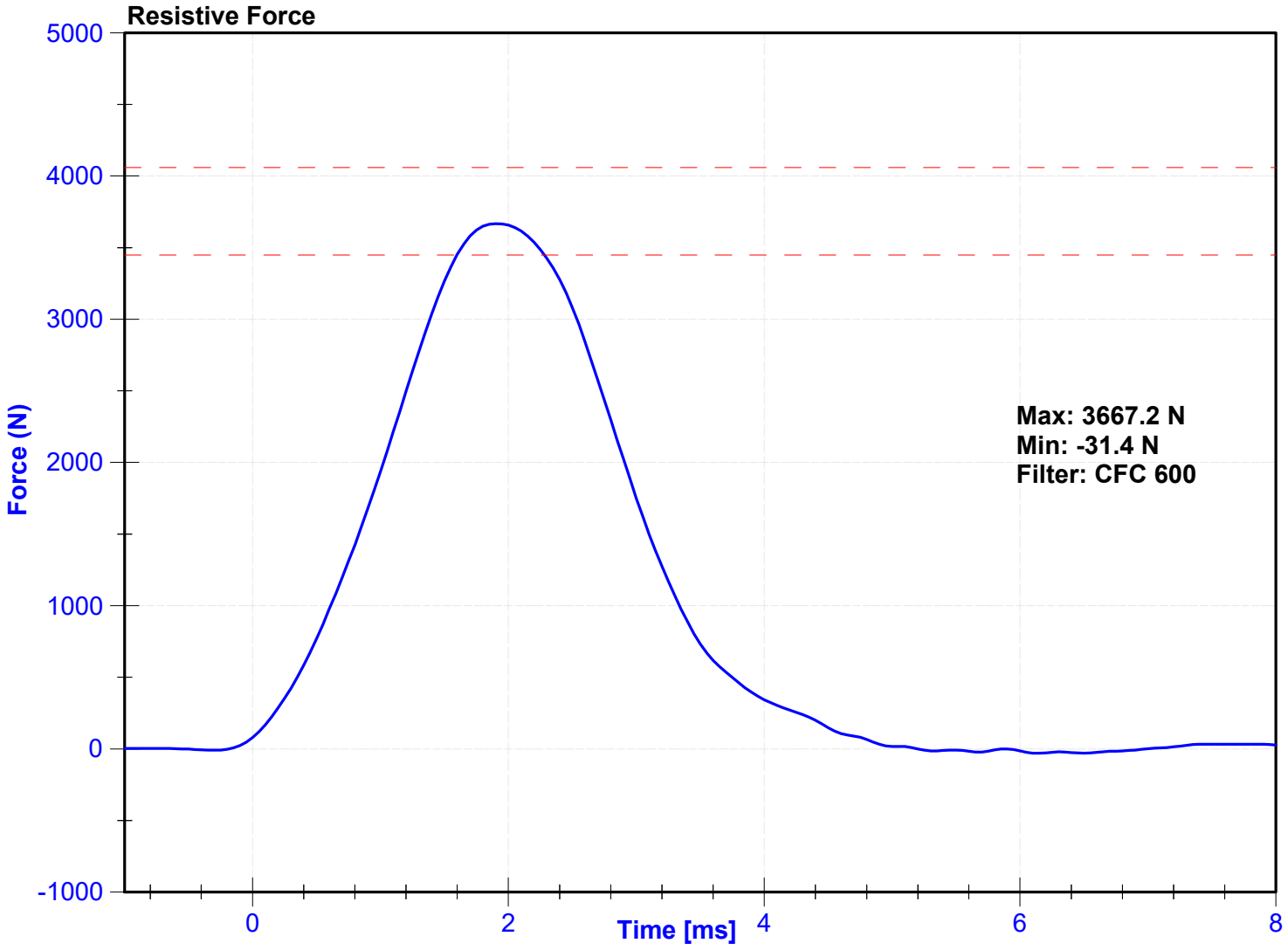
ATD Manufacturer	Humanetics	Test Technician	Z. Nyhart
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

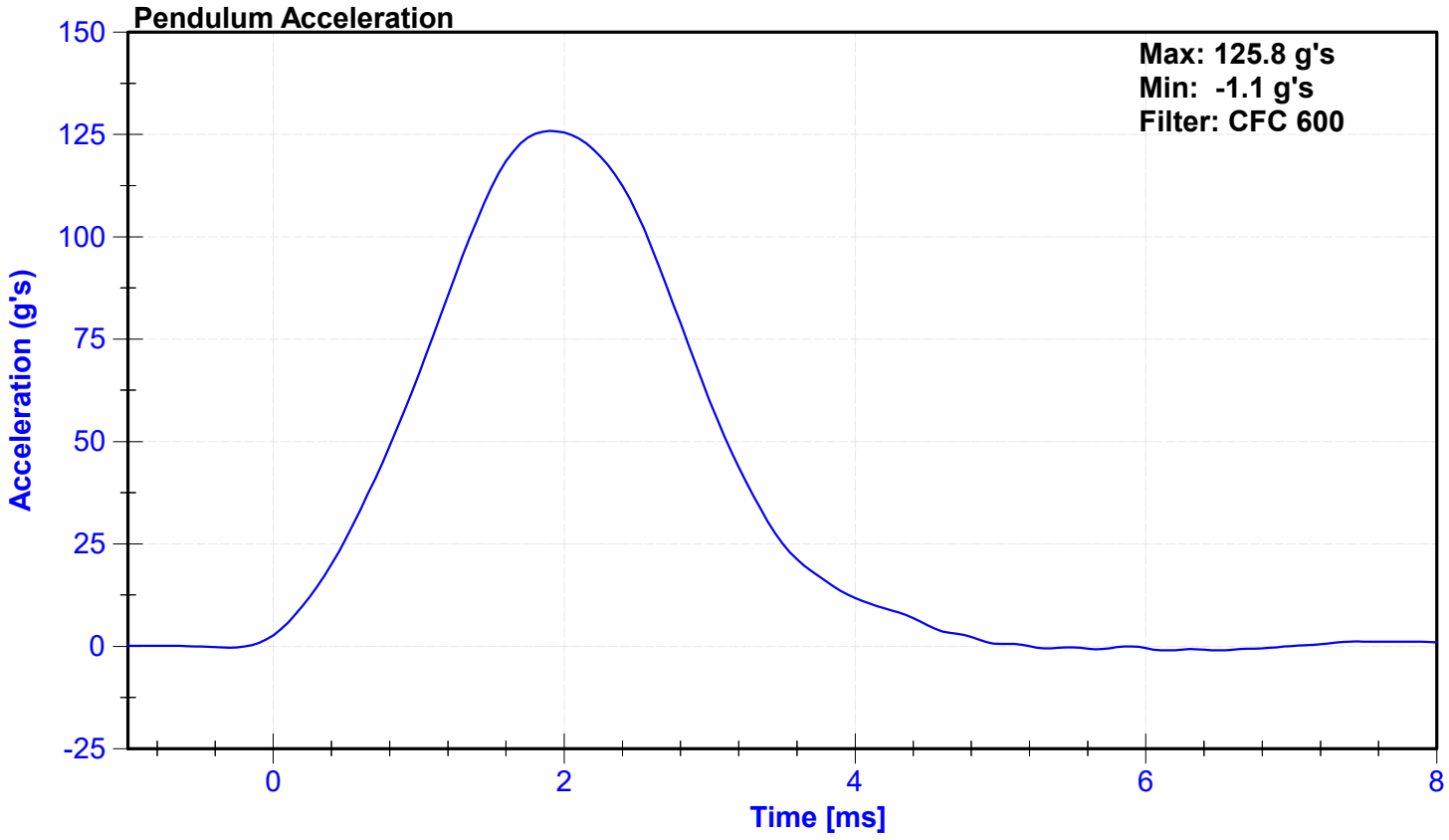
Results

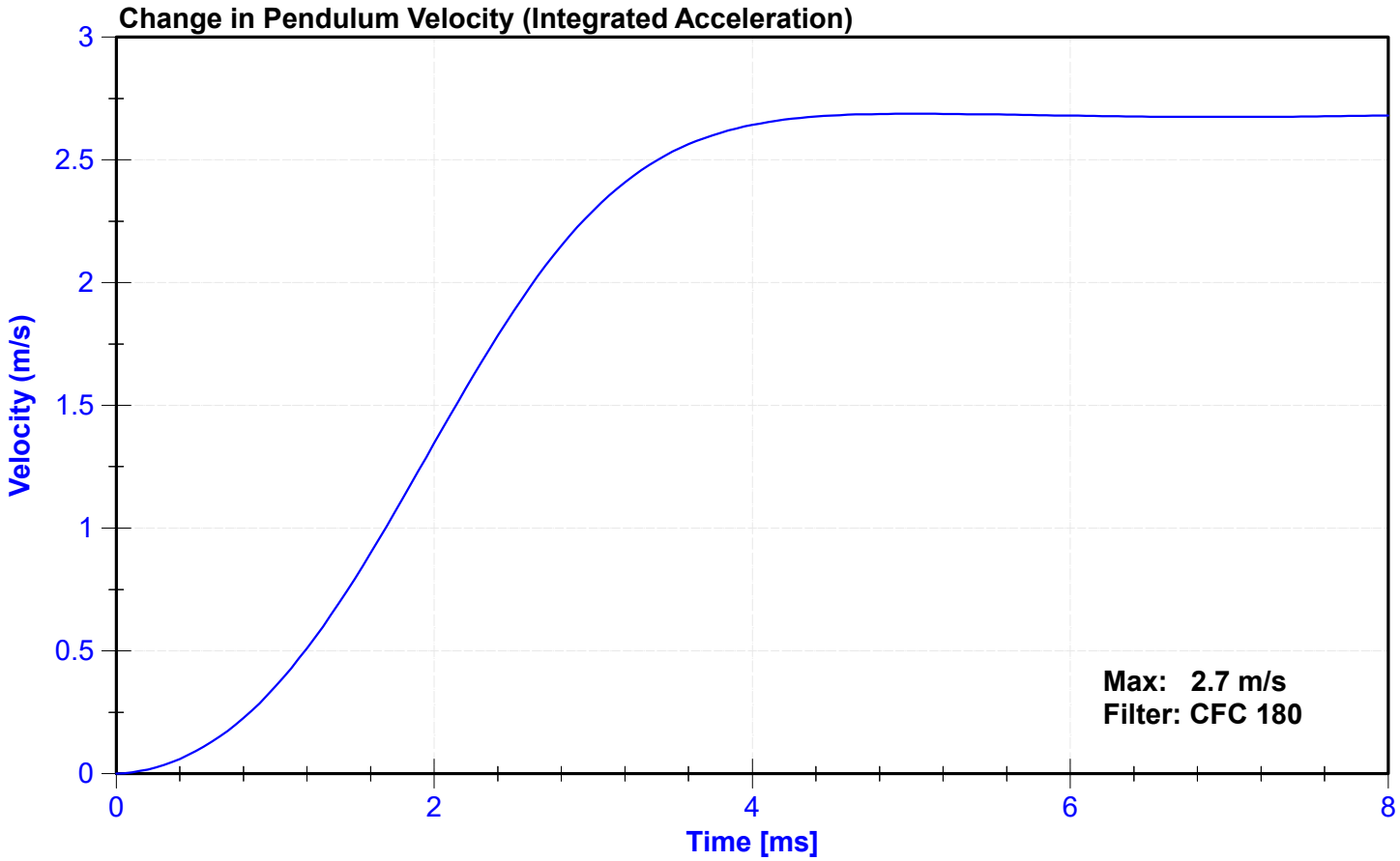
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.7	Pass
Humidity	10	70	%	25	Pass
Velocity	2.07	2.13	m/s	2.099	Pass
Resistive Force	3450	4060	N	3667.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25962	2/15/2025	8/14/2025




Pendulum Acceleration
Max: 125.8 g's
Min: -1.1 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)
Max: 2.7 m/s
Filter: CFC 180
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

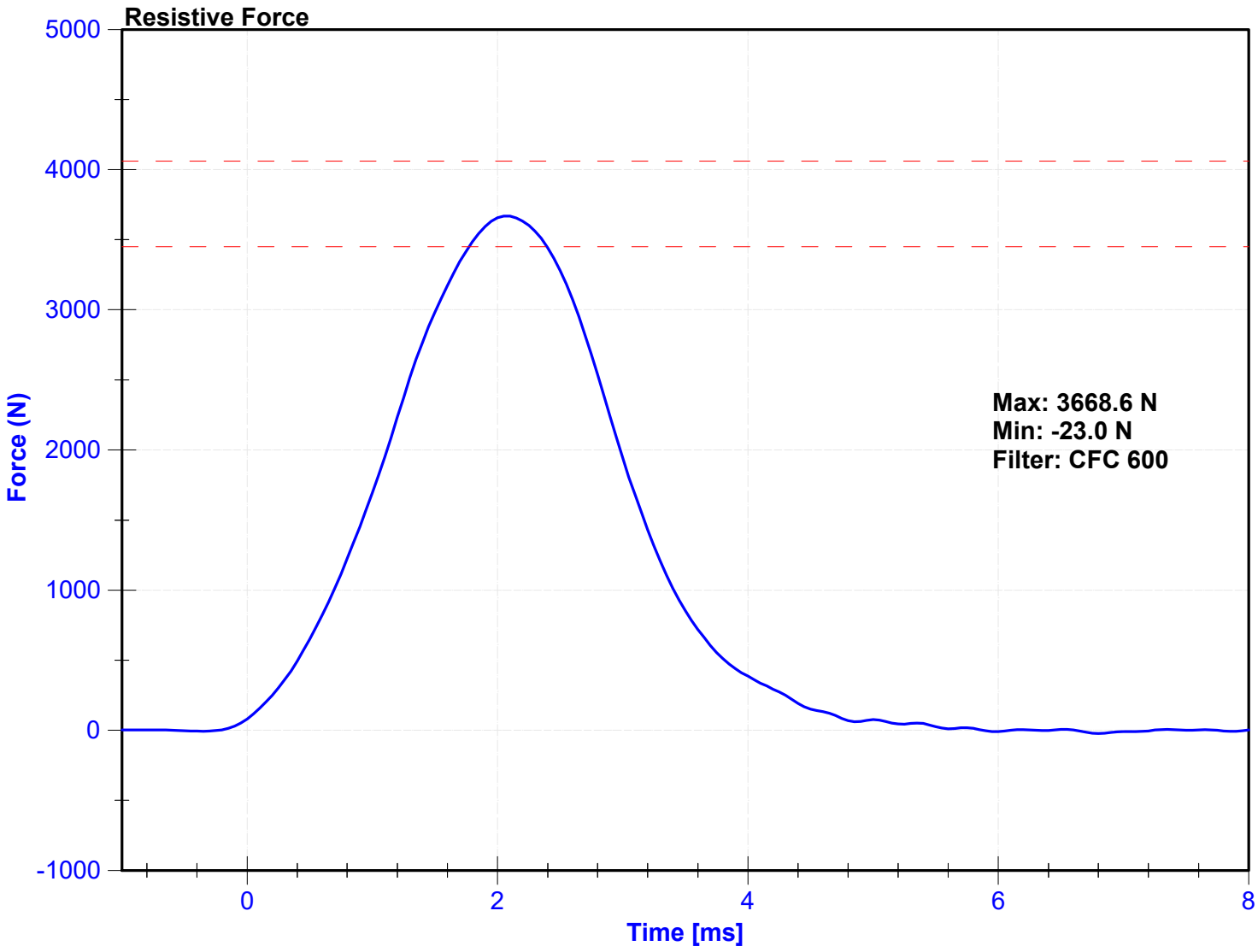
ATD Manufacturer	Humanetics	Test Technician	Z. Nyhart
ATD Serial Number	137	Laboratory Supervisor	J. Kinderman

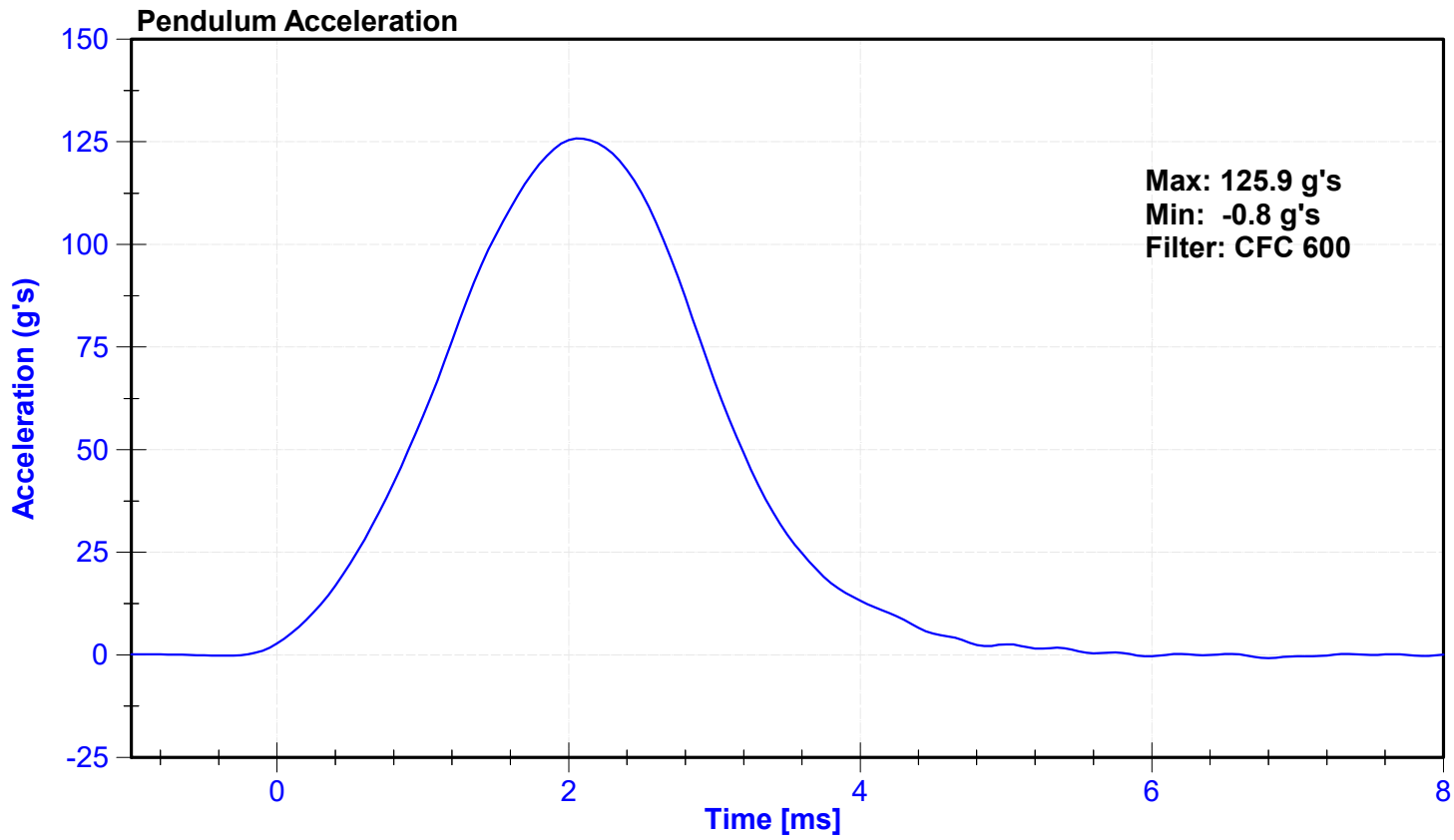
Results

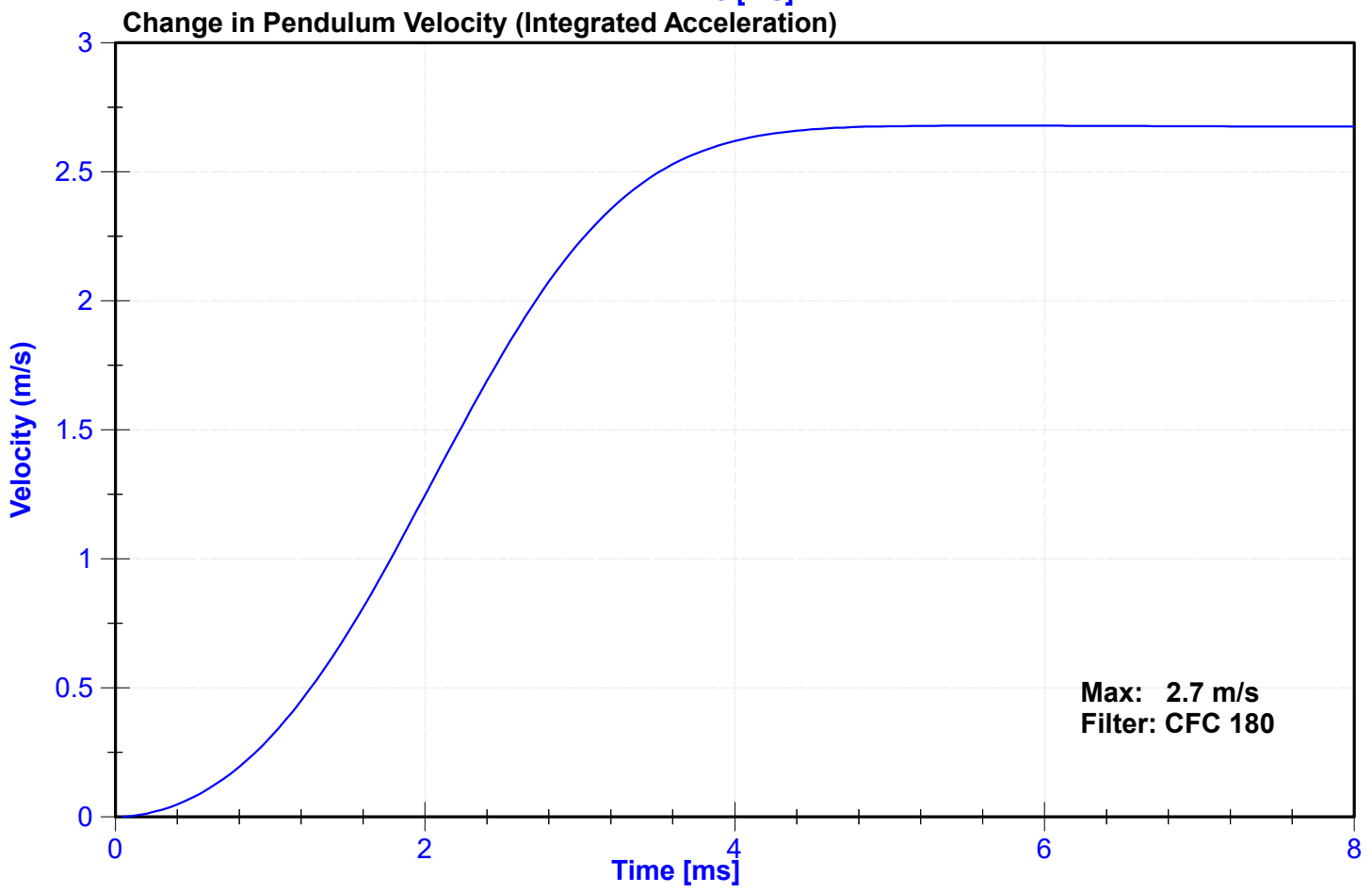
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	ºC	21.7	Pass
Humidity	10	70	%	25	Pass
Velocity	2.07	2.13	m/s	2.102	Pass
Resistive Force	3450	4060	N	3668.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25962	2/15/2025	8/14/2025




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 125.9 g's
Min: -0.8 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

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

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	10/31/2024
		Y	P58888	Endevco	10/31/2024
		Z	P58911	Endevco	10/31/2024
	Redundant	X	P52012	Endevco	10/31/2024
		Y	P51979	Endevco	10/31/2024
		Z	P49204	Endevco	10/31/2024
Head Angular Rate Sensors		X	21126	DTS ARS	07/31/2024
		Y	15697	DTS PRO-18K	07/31/2024
		Z	11335	DTS ARS	07/31/2024
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	851-FX	Humanetics	05/22/2024
Chest Accelerometers	Primary	X	P58887	Endevco	10/31/2024
		Y	P66917	Endevco	10/31/2024
		Z	P49197	Endevco	10/31/2024
	Redundant	X	P49213	Endevco	10/31/2024
		Y	P63840	Endevco	10/31/2024
		Z	P83313	Endevco	10/31/2024
Chest Potentiometer		X	1046	Servo	10/31/2024
Pelvis Accelerometer		X	P51699	Endevco	10/31/2024
		Y	P94090	Endevco	10/31/2024
		Z	P83437	Endevco	10/31/2024
Femur Load Cells - Left	Primary	Z	117-FZ1	Denton	05/22/2024
	Redundant	Z	117-FZ2	Denton	05/22/2024
Femur Load Cells - Right	Primary	Z	109-FZ1	Denton	05/22/2024
	Redundant	Z	109-FZ2	Denton	05/22/2024
Tibia Load Cells - Left	Upper	MX, MY, FZ	652-FZ	Denton	05/20/2024
	Lower	MX, MY, FZ	364-FZ	Denton	09/13/2024
Tibia Load Cells – Right	Upper	MX, MY, FZ	371-FZ	Denton	05/20/2024
	Lower	MX, MY, FZ	673-FZ	Denton	05/20/2024
Foot Accelerometers - Left	Rear	X	P69797	Endevco	10/31/2024
	Front	Z	P51729	Endevco	10/31/2024
Foot Accelerometers - Right	Rear	X	T20878	Endevco	10/31/2024
	Front	Z	P51685	Endevco	10/31/2024

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	02/14/2025
		Y	P83335	Endevco	02/14/2025
		Z	P64149	Endevco	02/14/2025
	Redundant	X	P52008	Endevco	02/14/2025
		Y	P52045	Endevco	02/14/2025
		Z	P74774	Endevco	02/14/2025
Head Angular Rate Sensors		X	15696	DTS ARS	07/31/2024
		Y	14908	DTS ARS	07/31/2024
		Z	14909	DTS ARS	07/31/2024
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	2184-FX	Denton	07/10/2024
Chest Accelerometers	Primary	X	P58780	Endevco	02/14/2025
		Y	P83346	Endevco	02/14/2025
		Z	P49190	Endevco	02/14/2025
	Redundant	X	P58794	Endevco	02/14/2025
		Y	P69791	Endevco	02/14/2025
		Z	T11253	Endevco	02/14/2025
Chest Potentiometer		X	0720	Servo	02/17/2025
Pelvis Accelerometer		X	P58735	Endevco	02/14/2025
		Y	P77587	Endevco	02/14/2025
		Z	P51285	Endevco	02/14/2025
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	02/13/2025
	Front	Z	P83418	Endevco	02/13/2025
Foot Accelerometers - Right	Rear	X	P63998	Endevco	02/13/2025
	Front	Z	P80265	Endevco	02/13/2025

Table 3 – Vehicle Instrumentation

Instrumentation			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember/Rear Seat Accelerometers	Left	Primary	X	G23438	Endevco	11/18/2024
			Z	A431372	Measurement Specialties	02/12/2025
		Redundant	X	G26005	Endevco	12/17/2024
	Right	Primary	X	G23878	Endevco	11/16/2024
			Z	G24196	Endevco	11/16/2024
		Redundant	X	G24187	Endevco	11/16/2024
Engine Accelerometers	Top		X	A428000	Measurement Specialties	02/19/2025
	Bottom		X	G22909	Endevco	02/19/2025