

REPORT NUMBER: NCAP-CAL-22-001

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

**KIA Corporation
2022 KIA Niro EV EX
SUV**

NHTSA No: M20224209

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



June 15, 2022

FINAL REPORT

**PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVE SE, ROOM W43-410
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.

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof.

If trade or manufacturers' names or products are mentioned it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by: Matthew Pronko Date: June 15, 2022
Matthew Pronko, Test Engineer

Approved by: Vanessa Hansen Date: June 15, 2022
Vanessa Hansen, Operations Manager

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. NCAP-CAL-22-001	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 2022 KIA Niro EV EX SUV NHTSA No.: M20224209		5. Report Date June 15, 2022																																																							
		6. Performing Organization Code CAL																																																							
7. Author(s) Matthew Pronko, Test Engineer Vanessa Hansen, Operations Manager		8. Performing Organization Report No. CAL-DOT-2022-001																																																							
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 104625		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, Room W43-410 Washington, D.C. 20590		13. Type of Report and Period Covered: Final Test Report February 8, 2022 - June 15, 2022																																																							
		14. Sponsoring Agency Code NRM-100																																																							
15. Supplementary Notes None																																																									
16. Abstract A 56.30 km/h (35 mph), NCAP frontal rigid barrier impact test was conducted on a 2022 KIA Niro EV EX 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 February 8, 2022. The impact velocity of the vehicle was 56.32 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 545 mm at C4 to the right side of the front bumper. The test vehicle's occupant performance data is as follows:																																																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 30%;">Measurement Description</th> <th rowspan="2" style="width: 5%;">Units</th> <th colspan="2" style="width: 20%;">Driver ATD (Serial No. 142)</th> <th colspan="2" style="width: 20%;">Passenger ATD (Serial No. 137)</th> </tr> <tr> <th style="width: 10%;">Threshold</th> <th style="width: 10%;">Result</th> <th style="width: 10%;">Threshold</th> <th style="width: 10%;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td></td> <td style="text-align: center;">700</td> <td style="text-align: center;">179.665</td> <td style="text-align: center;">700</td> <td style="text-align: center;">229.261</td> </tr> <tr> <td>Maximum Chest Compression</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">63</td> <td style="text-align: center;">-31.553</td> <td style="text-align: center;">52</td> <td style="text-align: center;">-16.266</td> </tr> <tr> <td>Nij</td> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">0.209</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0.410</td> </tr> <tr> <td>Neck Tension</td> <td style="text-align: center;">N</td> <td style="text-align: center;">4,170</td> <td style="text-align: center;">927.024</td> <td style="text-align: center;">2,620</td> <td style="text-align: center;">809.425</td> </tr> <tr> <td>Neck Compression</td> <td style="text-align: center;">N</td> <td style="text-align: center;">4,000</td> <td style="text-align: center;">-219.849</td> <td style="text-align: center;">2,520</td> <td style="text-align: center;">-105.453</td> </tr> <tr> <td>Left Femur Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">10,008</td> <td style="text-align: center;">-625.928</td> <td style="text-align: center;">6,805</td> <td style="text-align: center;">-1178.143</td> </tr> <tr> <td>Right Femur Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">10,008</td> <td style="text-align: center;">-1192.384</td> <td style="text-align: center;">6,805</td> <td style="text-align: center;">-96.569</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD (Serial No. 142)		Passenger ATD (Serial No. 137)		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)		700	179.665	700	229.261	Maximum Chest Compression	mm	63	-31.553	52	-16.266	Nij		1	0.209	1	0.410	Neck Tension	N	4,170	927.024	2,620	809.425	Neck Compression	N	4,000	-219.849	2,520	-105.453	Left Femur Force	N	10,008	-625.928	6,805	-1178.143	Right Femur Force	N	10,008	-1192.384	6,805	-96.569
Measurement Description	Units	Driver ATD (Serial No. 142)		Passenger ATD (Serial No. 137)																																																					
		Threshold	Result	Threshold	Result																																																				
Head Injury Criteria (HIC ₁₅)		700	179.665	700	229.261																																																				
Maximum Chest Compression	mm	63	-31.553	52	-16.266																																																				
Nij		1	0.209	1	0.410																																																				
Neck Tension	N	4,170	927.024	2,620	809.425																																																				
Neck Compression	N	4,000	-219.849	2,520	-105.453																																																				
Left Femur Force	N	10,008	-625.928	6,805	-1178.143																																																				
Right Femur Force	N	10,008	-1192.384	6,805	-96.569																																																				
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) UNCLASSIFIED	20. Security Class. (of this page) UNCLASSIFIED	21. No. of Pages 195	22. Price																																																						

TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1	Purpose and Summary of the Test	1-1
2	Occupant and Vehicle Information / Data Sheets	2-1
<u>Data Sheet</u>		<u>Page</u>
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	2-18
13	Accident Investigation Division Data	2-20
14	Vehicle Intrusion Measurements	2-21
15	Summary of Indicant FMVSS No.212 and FMVSS No.219 (Partial) Data	2-23
16	FMVSS 301 Barrier Impact & Static Rollover Results	2-25
17	Dummy/Vehicle Temperature Stabilization Chart	2-26
305-1	General Test and Vehicle Parameter Data for Indicant FMVSS No. 305 Testing	2-27
305-2	Pre-Impact Data for Indicant FMVSS No.305 Testing	2-28
305-3	Pre-Impact Electrical Isolation Measurements and Calculations for Indicant FMVSS No. 305 Testing	2-29
305-4	Post-Impact Data for Indicant FMVSS No. 305 Testing	2-30
305-5	Static Rollover Test Data for Indicant FMVSS No. 305 Testing	2-31
<u>Appendix</u>		<u>Page</u>
A	Photographs	A-1
B	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 2022 KIA Niro EV EX SUV at a velocity of 56.32 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 8, 2022. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. One real-time camera and 16 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of this report.

One Part 572E, 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, femur load cells, and lower leg instrumentation. Seat belt load cells were installed on the driver's and passenger's shoulder belts to measure dummy torso section loading. The driver (position 1) ATD (Serial No. 142) and the right-front passenger (position 2) ATD (Serial No. 137) were qualified prior to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

The 486 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was a total of 0.0 grams of stoddard solvent leakage after the event or during any phase of the static rollover. The maximum static crush of the vehicle was 545 mm and both driver and passenger side doors remained closed during the impact event and were operable after the impact.

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

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

The occupant data is summarized below.

ATD Position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	179.665	0.209	927.024	-219.849	38.086	-31.553	-625.928	-1192.384
Passenger (5 th)	229.261	0.410	809.425	-105.453	45.727	-16.266	-1178.143	-96.569

GENERAL COMMENTS:

1. P1 (Driver) serial number - 142
2. P2 (Passenger) serial number - 137

Data Anomalies:

- Barrier D-01 Fx, Questionable Data
- Driver Head Y Angular Velocity – Questionable spike at 100 ms
- Driver Lap Belt Load Cell not used
- Passenger Lap Belt Load Cell not used

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

This section contains information reporting for the following Data Sheets:

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

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

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Seat Belt Positioning Data

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

Data Sheet No. 7 – Vehicle Accelerometer Locations

Data Sheet No. 8 – Photographic Reference Target Locations

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

Data Sheet No. 10 – Test Vehicle Summary of Results

Data Sheet No. 11 – Post-Test Observations

Data Sheet No. 12 – Vehicle Profile Measurements

Data Sheet No. 13 – Accident Investigation Division Data

Data Sheet No. 14 – Vehicle Intrusion Measurements

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

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

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

Data Sheet No. 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: 2022 KIA Niro Electric
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20224209	Traction Control System (TCS)	Yes
Model Year	2022	Power Steering	Yes
Make	KIA	Power Window Auto-Reverse	No
Model	Niro EV EX	Driver Frontal Airbag	Yes
Body Style	SUV	Driver Curtain Airbag	Yes
VIN	KNDC33LG0N5135830	Driver Head/Torso Airbag	No
Body Color	Red	Driver Torso Airbag	No
Odometer Reading (km /mi)	9 miles	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	N/A	Driver Pelvis Airbag	No
Type / No. Cylinders	Electric Vehicle	Driver Knee Airbag	Yes
Engine Placement	Transverse	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	Direct Drive	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	Front Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other –	-

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

No

DATA FROM CERTIFICATION LABEL

Manufactured By	KIA Corporation	GVWR (kg)	2230
Date of Manufacture	10/21	GAWR Front (kg)	1160
		GAWR Rear (kg)	1160

VEHICLE SEATING AND WEIGHT CAPACITY DATA

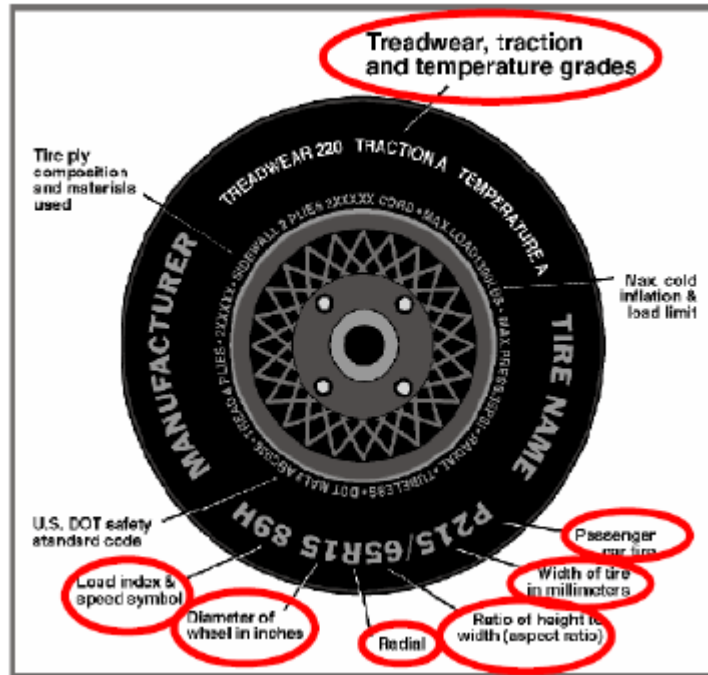
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	-	
Number of Occupants	2	3	-	5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				44.8

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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

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



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	250	250
Recommended Tire Size	215/55R17	215/55R17
Tire Size on Vehicle	215/55R17	215/55R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Primary MXV 4	Primary MXV 4
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 1 Polyamide, 2 Steel	2 Polyester, 1 Polyamide, 2 Steel
Load Index / Speed Symbol	94V	94V
Tire Material	Rubber	Rubber
DOT Safety Code Left	B33F01VX2621	B33F01VX2621
DOT Safety Code Right	B33F01VX2621	B33F01VX2521

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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	482	409		528	460	
Right	kg	473	393		511	437	
Ratio	%	54	46		54	46	
Totals	kg	955	802	1757	1039	897	1936

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1757	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	142	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	44.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1943.8	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	819	819	825	825	1232
As Tested	mm	806	808	807	809	1250
Post-Test	mm	878	833	820	795	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2,699
Total Vehicle Length at Left Side	mm	4,304
Total Vehicle Length at Centerline	mm	4,370
Total Vehicle Length at Right Side	mm	4,304
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	61
Amount of Stoddard Solvent in Fuel Tank	L	N/A – Electric Vehicle

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Bumper skin, Tail lights wiper motor, Rear seats, trunk carpeting, air pump kit.

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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	4370
2	Total Width	1795
3*	Bumper Top Height	7
4*	Bumper Bottom Height	130
5*	Longitudinal Member Top Height	49
6	Distance Between Longitudinal Members	1018
7	Longitudinal Member Width	42
8*	Engine Top Height	-117
9*	Engine Bottom Height	404
10	Engine and Gearbox Width	291
11	Front Bumper-Engine Distance	494
12*	Front Shock Absorber Fixing Height	-366
13*	Bonnet Leading Edge Height	-275
14	Front Shock Absorber Fixing Width	1184
15	Front Bumper – Front Axle Distance	884
16	Front Axle – A Pillar Distance	471
17	A-Pillar – B-Pillar Distance	1121
18	B-Pillar – Rear Axle Distance	1107
19	B-Pillar – C-Pillar Distance	954
20*	Roof Sill Bottom Height	1447
21*	Roof Sill Top Height	1471
22*	Floor Sill Bottom Height	319
23*	Floor Sill Top Height	404

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

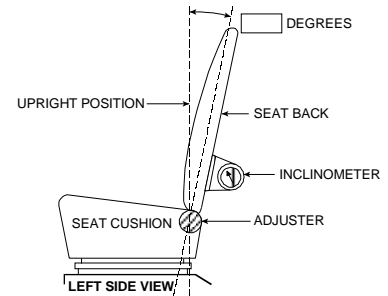
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

NOMINAL DESIGN RIDING POSITION

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



FRONT SEAT ASSEMBLY

Seating Position	Degrees
Driver Seat Back Angle	+0.4
Passenger Seat Back Angle	+4.0

SEAT FORE / AFT POSITIONS

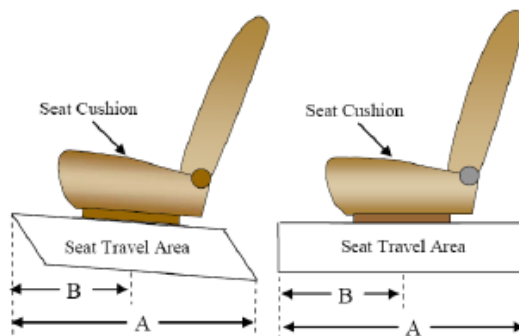
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	291	145.5
Passenger Seat	64 (0-63)	0

SEAT BELT UPPER ANCHORAGE

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

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



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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

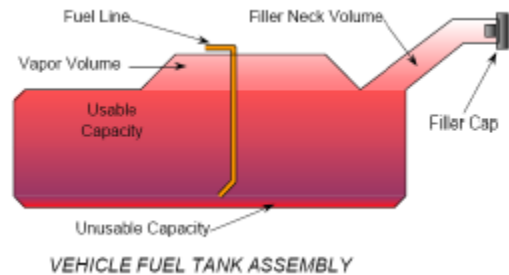
NHTSA No.: M20224209
 Test Date: 02/08/2022

FUEL TANK CAPACITY

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

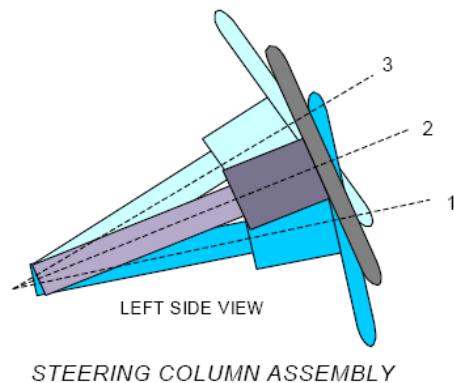
FUEL PUMP

The vehicle is a fully electric vehicle. The charge port is on the left front of the vehicle.



STEERING COLUMN ADJUSTMENT

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



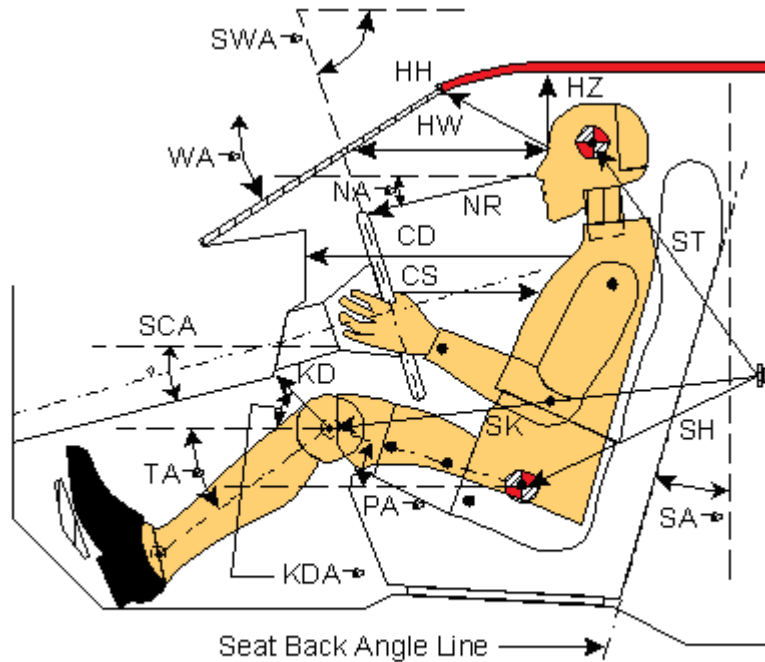
STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	20.3	
Geometric center position No. 2	23.3	
Uppermost position No. 3	25.8	
Telescoping Steering Wheel Travel		50
Test Position	23.3	25

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2022 KIA Niro EV EX SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
Test Date: 02/08/2022



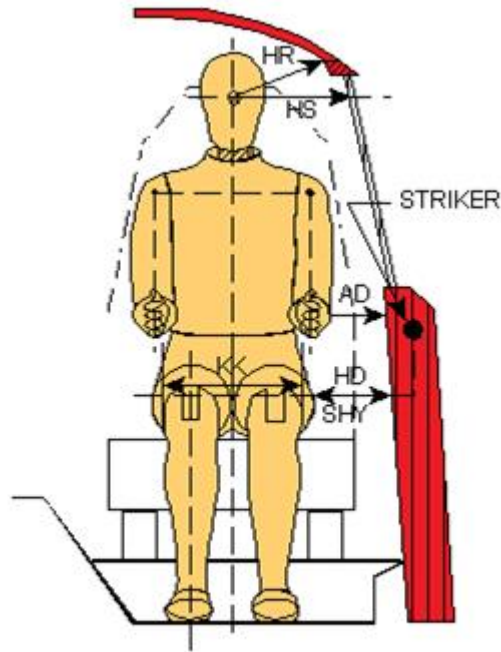
Left Side View

Code	Measurement Description	Driver (SN: 137)		Passenger (SN: 142)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.9		
SWA°	Steering Wheel Angle		23.5		
SCA°	Steering Column Angle		66.5		
SA°	Seat Back Angle (on headrest post)		+0.4		+4.0
HZ	Head to Roof (Z)	192	90	215	90
HH	Head to Header	362	22.3	323	44.8
HW	Head to Windshield	669	0.0	647	0.0
NR	Nose to Rim / Dash	387	10.8	484	11.3
CD	Chest to Dash	525		403	
CS	Chest to Steering Hub	299	7.8		
RA	Rim to Abdomen	199	13.5		
KDL	Left Knee to Dash	218	21.8	120	36.4
KDR	Right Knee to Dash	169	17.3	127	35.5
PA°	Pelvic Angle		22.1		19.8
TA°	Tibia Angle		33.2		42.2
SK	Striker to Knee	622	15.6	735	15.5
ST	Striker to Head	408	67.0	373	54.2
SH	Striker to H-Point	347	53.5	427	36.3

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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022



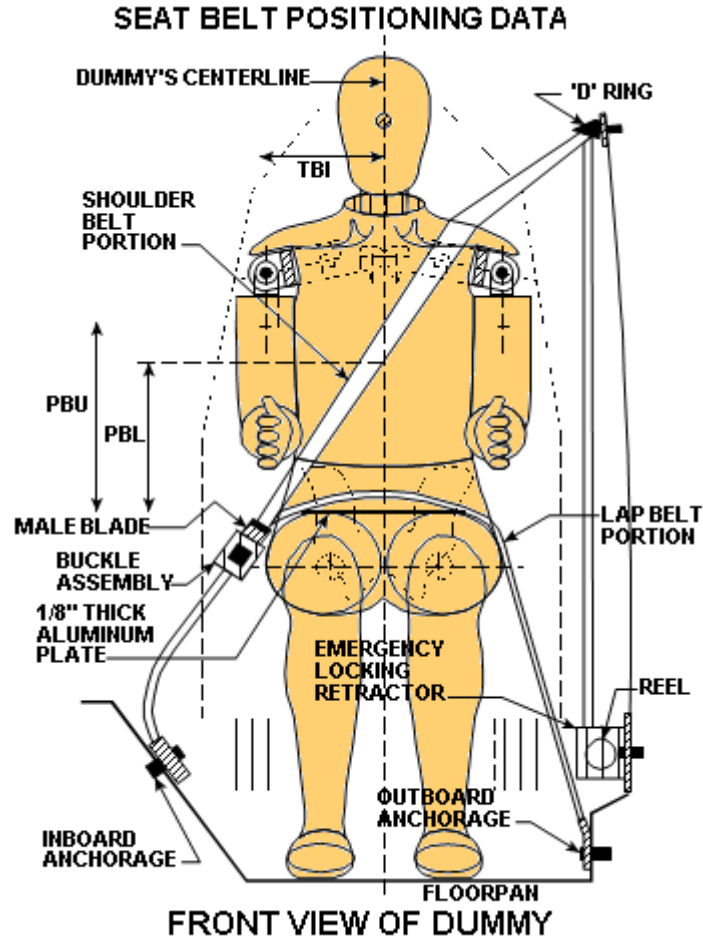
Front View

Code	Description	Driver (S/N:137) (mm)	Passenger (S/N: 142) (mm)
AD	Arm to Door	143	86
HD	H-Point to Door	153	182
HR	Head to Side Header	221	64
HS	Head to Side Window	345	374
KK	Knee to Knee	352	211
SHY	Striker to H-Point (Y Direction)	246	285
AA	Ankle to Ankle	378	166

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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	301	289
PBL — Top surface of reference to belt lower edge	mm	222	204

BELT LENGTH DATA

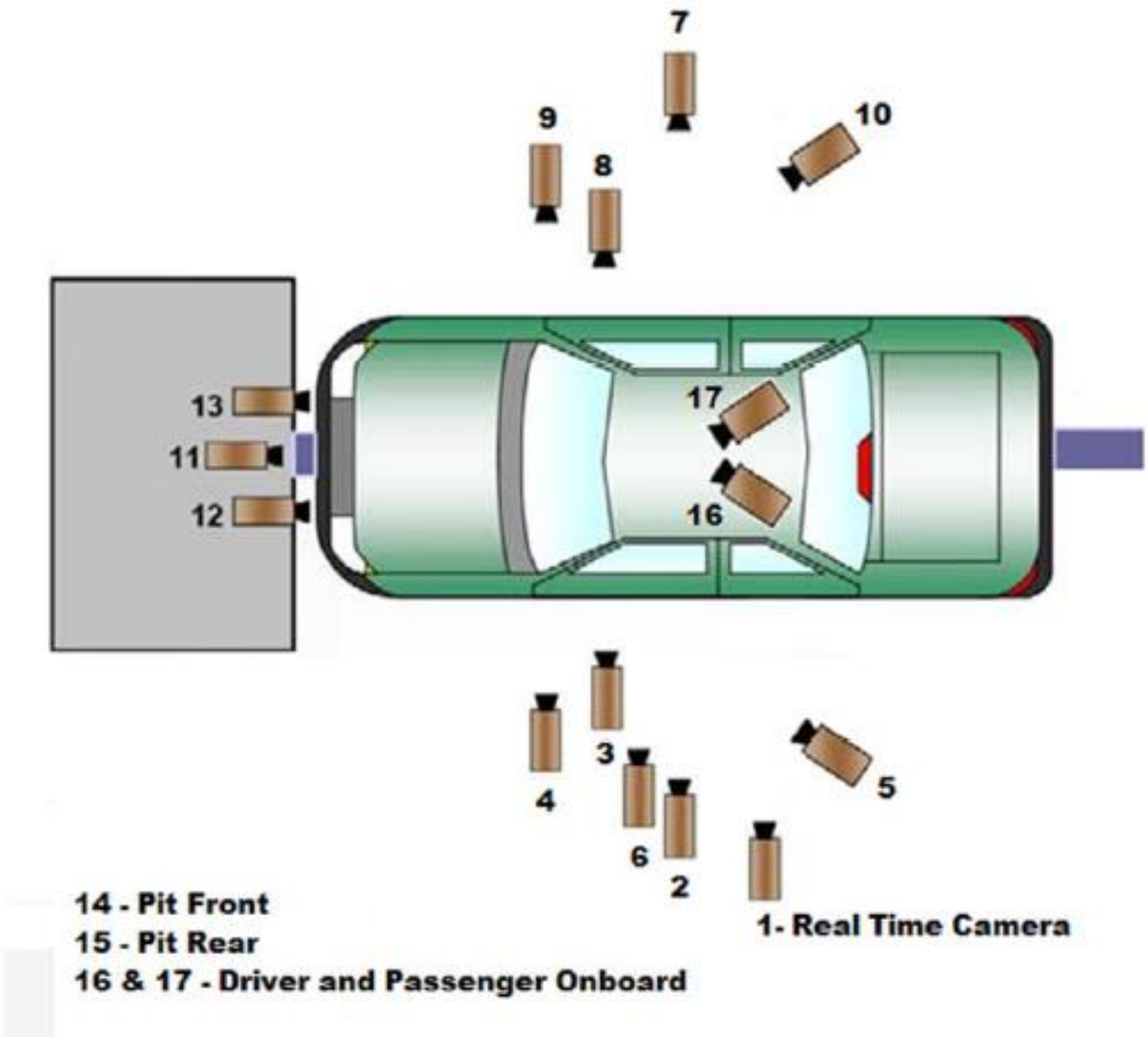
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	864	920
Lap Belt Length as measured on ATD	mm	546	610
Remainder of belt on reel	mm	920	800
Total belt length for continuous webbing systems	mm	2330	2330

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

Test Vehicle: 2022 KIA Niro EV EX SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
Test Date: 02/08/2022

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

CAMERA LOCATIONS

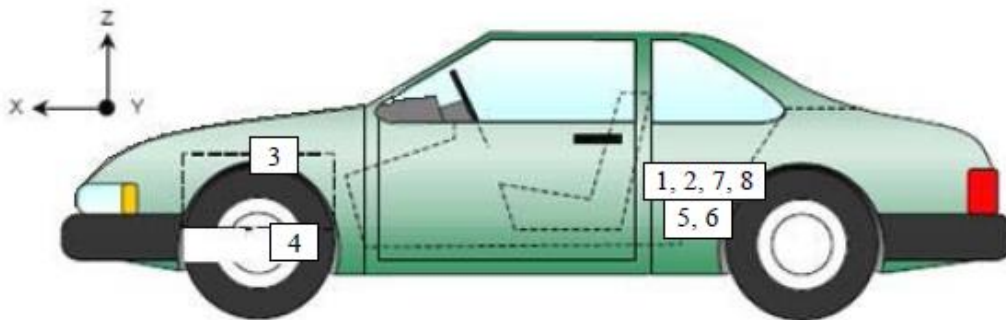
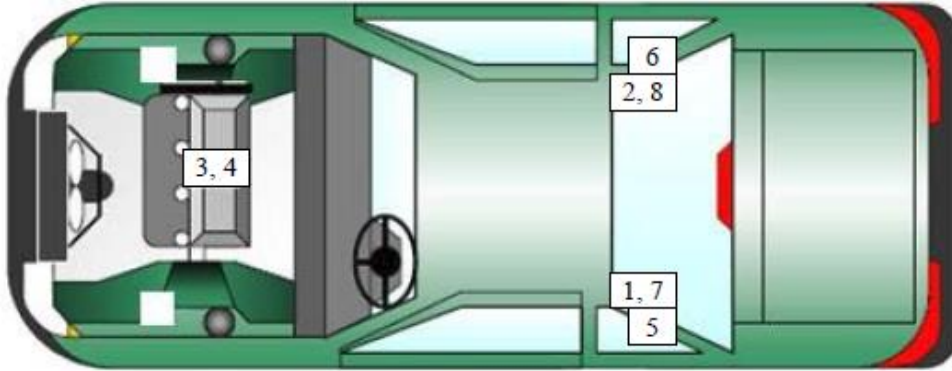
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-		60
2	Left Overall	-1915	-7513	-1544	24	1000
3	Driver Close-Up	-1351	-6953	-1451	50	1000
4	Left Front Half	-827	-6614	-1433	28	1000
5	Left Angle	-4857	-5252	-2500	50	1000
6	Steering Column	-1575	-7511	-2441	75	1000
7	Right Overall	-1935	-7506	-1449	24	1000
8	Passenger Close-Up	-1567	6792	-1554	50	1000
9	Right Front Half	-1206	6162	-1522	28	1000
10	Right Angle	-4945	5121	-2444	50	1000
11	Windshield	1317	0	-3475	12.5	1000
12	Driver Windshield	787	-393	-2279	25	1000
13	Passenger Windshield	787	393	-2270	25	1000
14	Pit Front	-1313	0	2327	12.5	1000
15	Pit Rear	-2615	0	2518	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: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1614	-282	183
2	Right Rear Accelerometer – X Direction	1613	328	200
3	Engine Top X	3679	138	-115
4	Engine Bottom X	4106	66	397
5	Left Rear Accelerometer – Z Direction	1614	-282	183
6	Right Rear Accelerometer – Z Direction	1613	328	200
7	Left Rear Accelerometer – X Direction Redundant	1614	-284	183
8	Right Rear Accelerometer – X Direction Redundant	1613	329	198

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

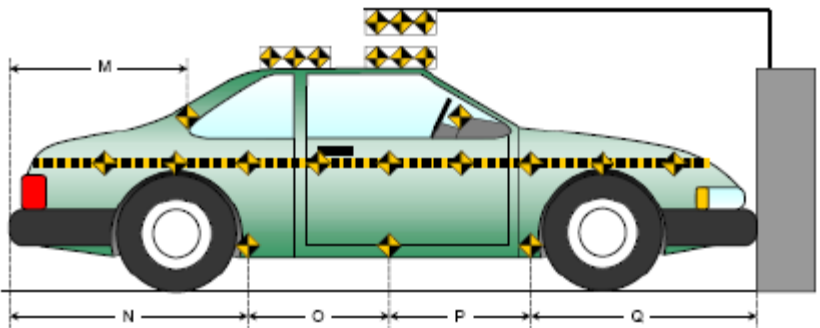
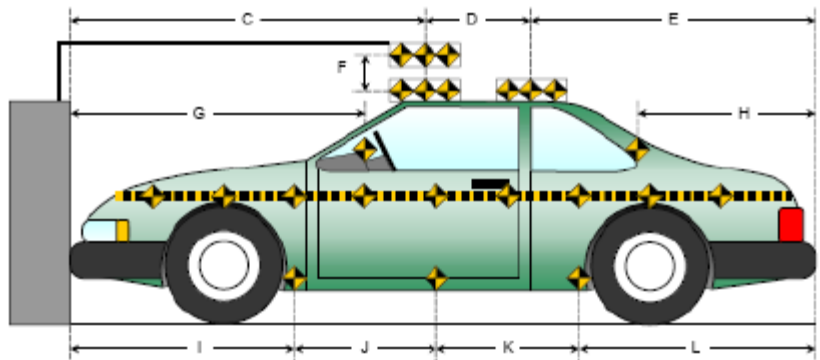
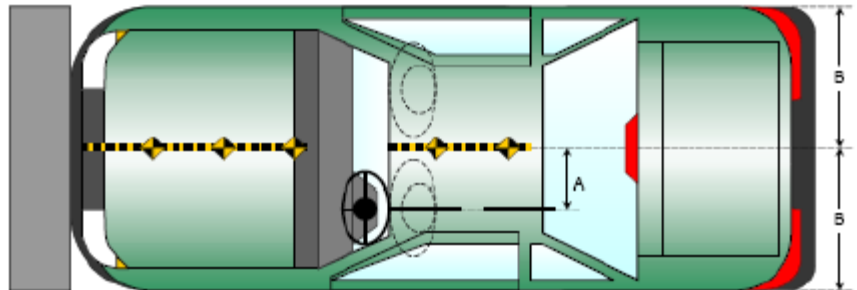
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

Item	Value
A	357
B	898
C	2503
D	608
E	1259
F	420
G	1685
H	848
I	1330
J	904
K	903
L	1233
M	857
N	1234
O	904
P	901
Q	1331

All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

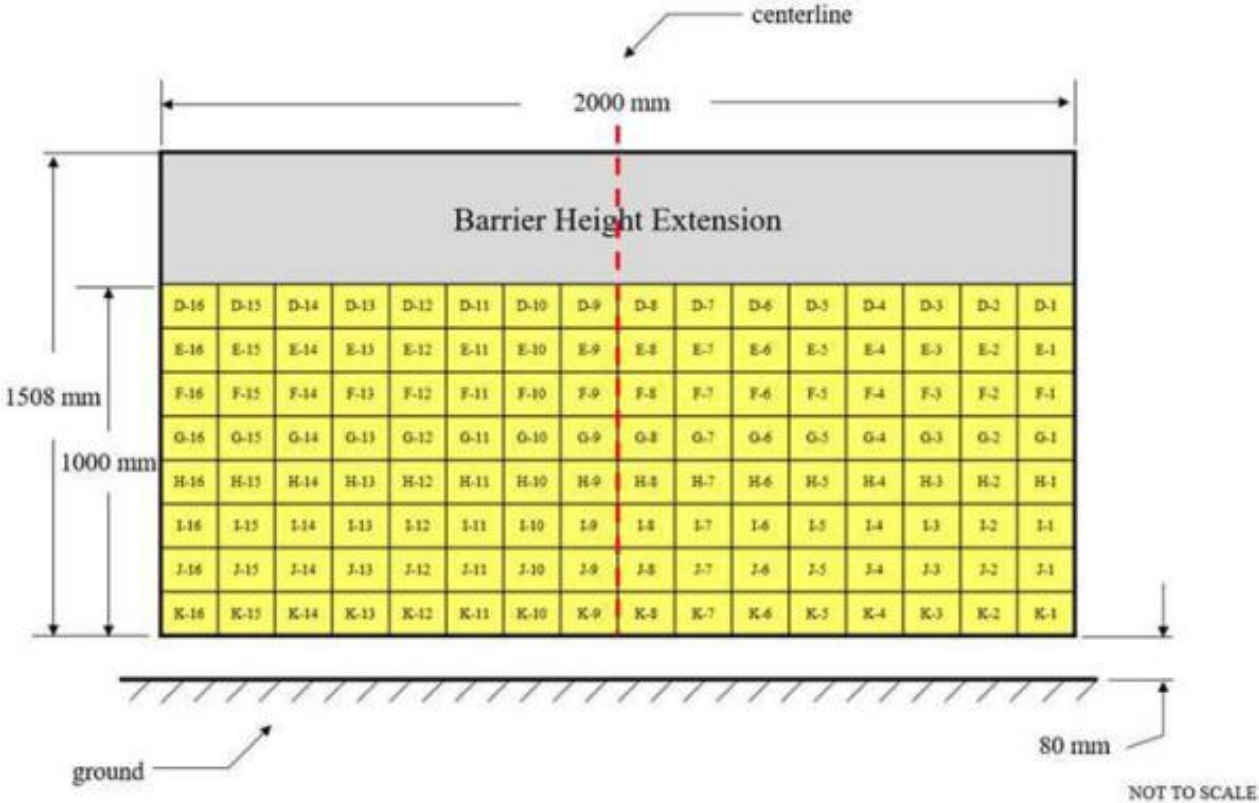


Figure 1 - Load Cell Locations on a 128-Load Cell Barrier with Plywood Height Extension*
 Please note above diagram is not actual representation of load cell barrier used.

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2022 KIA Niro EV EX SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
Test Date: 02/08/2022

INSTRUMENTATION

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

CAMERA COVERAGE

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

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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50 th Male / 142	P5720 5 th Female / 137
Head Contact	Frontal Airbag, Head Restraint	Frontal Airbag, Head Restraint
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Glove Box
Right Knee Contact	Knee Airbag	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger	Other
Locked / Unlocked Doors	Locked	Locked	
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	No	No	

**NOTE: Indicate "No", "N/A", or "Yes" described

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	1622
Center	mm	1558
Right Side	mm	1515
Average	mm	1565

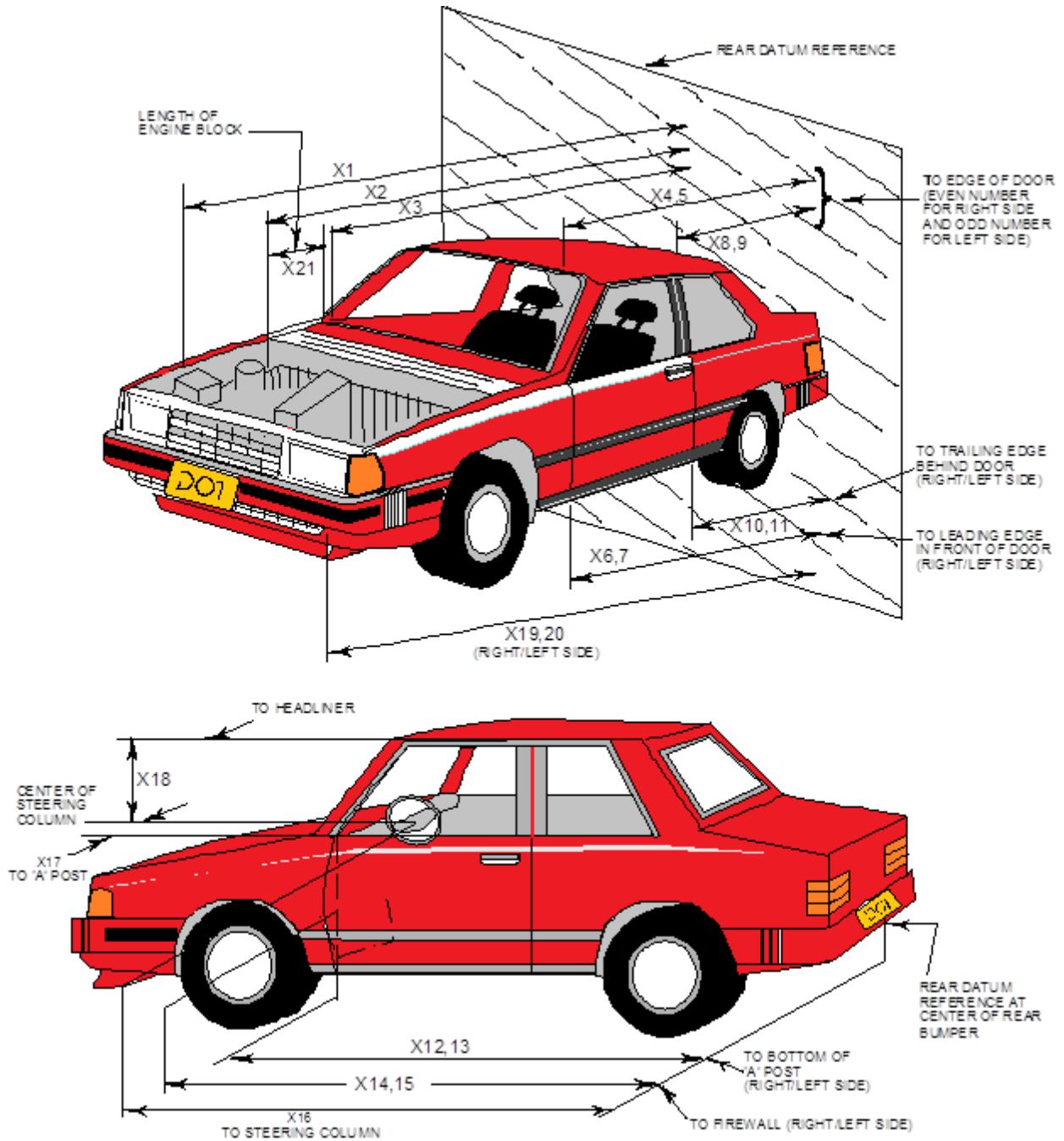
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022



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

Test Vehicle: 2022 KIA Niro EV EX SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
Test Date: 02/08/2022

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4370	3873	-497
2	Rear Surface of Vehicle (RSOV) to Front of Engine	3876	3537	-339
3	RSOV to Firewall	3254	3194	-60
4	RSOV to Upper Leading Edge of Right Door	3007	3007	0
5	RSOV to Upper Leading Edge of Left Door	3008	3008	0
6	RSOV to Lower Leading Edge of Right Door	2980	2981	1
7	RSOV to Lower Leading Edge of Left Door	2982	2981	-1
8	RSOV to Upper Trailing Edge of Right Door	1900	1901	1
9	RSOV to Upper Trailing Edge of Left Door	1901	1901	0
10	RSOV to Lower Trailing Edge of Right Door	1917	1917	0
11	RSOV to Lower Trailing Edge of Left Door	1916	1916	0
12	RSOV to Bottom of "A" Post of Right Side	3086	3087	1
13	RSOV to Bottom of "A" Post of Left Side	3086	3086	0
14	RSOV to Firewall, Right Side	3347	3363	16
15	RSOV to Firewall, Left Side	3344	3381	37
16	RSOV to Steering Column	2514	2563	49
17	Center of Steering Column to "A" Post	303	306	3
18	Center of Steering Column to Headliner	431	414	-17
19	RSOV to Right Side of Front Bumper	4329	3816	-513
20	RSOV to Left Side of Front Bumper	4329	3845	-484
21	Length of Engine Block	324	324	0
RD	RSOV to Right Side of Dash Panel	2828	2829	1
CD	RSOV to Center of Dash Panel	2693	2691	-2
LD	RSOV to Left Side of Dash Panel	2828	2826	-2

*UR= Unrecoverable data point
All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2022 KIA Niro EV EX SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
Test Date: 02/08/2022

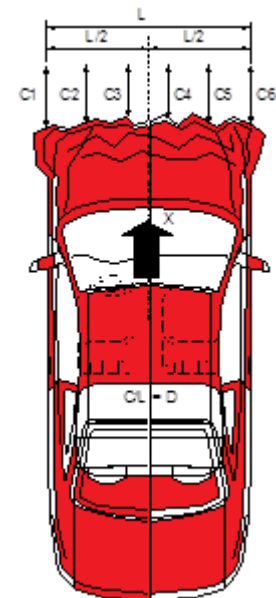
VEHICLE INFORMATION

VIN: KNDC33LG0N5135830
Vehicle Size Category: SUV

Wheelbase (mm): 2699
Test Weight (kg): 1936

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): 56.32
Velocity Change (km/h): 67.42
Time of Separation (ms): 159



CRUSH PROFILE

Collision Deformation Classification: 12FDEW3
Midpoint of Damage: C4
Damage Region Length (mm): 1382
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4169	3808	361
C2	Crush Zone 2 at Left Side	mm	4317	3831	486
C3	Crush Zone 3 at Left Side	mm	4349	3820	529
C4	Crush Zone 4 at Right Side	mm	4349	3804	545
C5	Crush Zone 5 at Right Side	mm	4317	3795	522
C6	Crush Zone 6 at Right Side	mm	4172	3756	416
L	C1 to C6	mm	1382	1363	19

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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

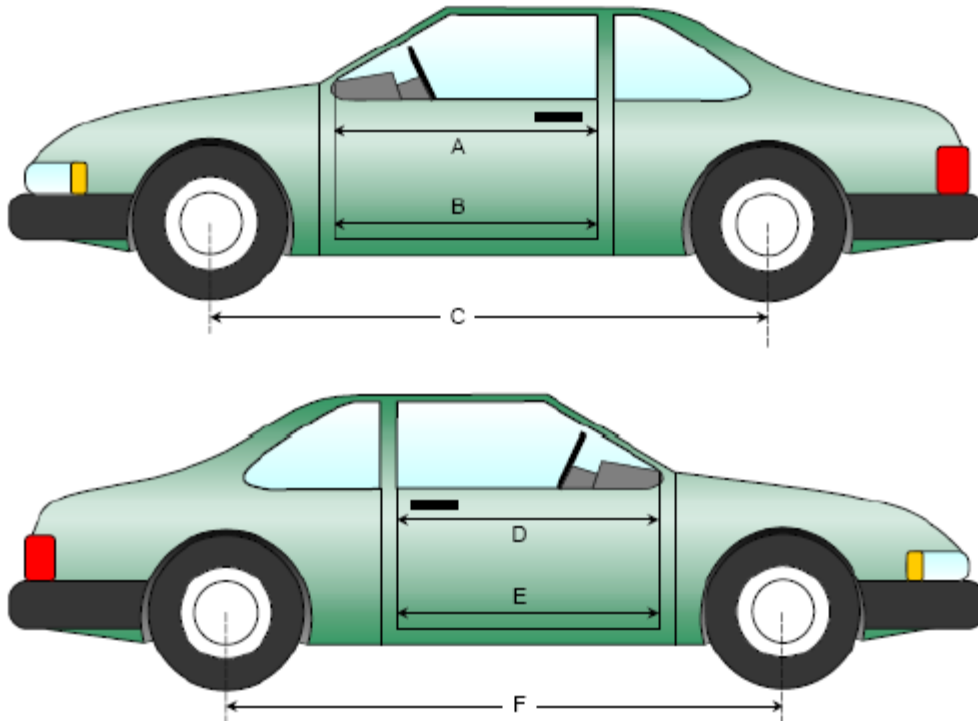
NHTSA No.: M20224209
 Test Date: 02/08/2022

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1012	1011	-1
B	Left Side Lower	mm	902	901	-1
D	Right Side Upper	mm	1012	1010	-2
E	Right Side Lower	mm	900	899	-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2699	2650	-49
F	Right Side Wheelbase	mm	2699	2561	-138



Left & Right Side Views

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

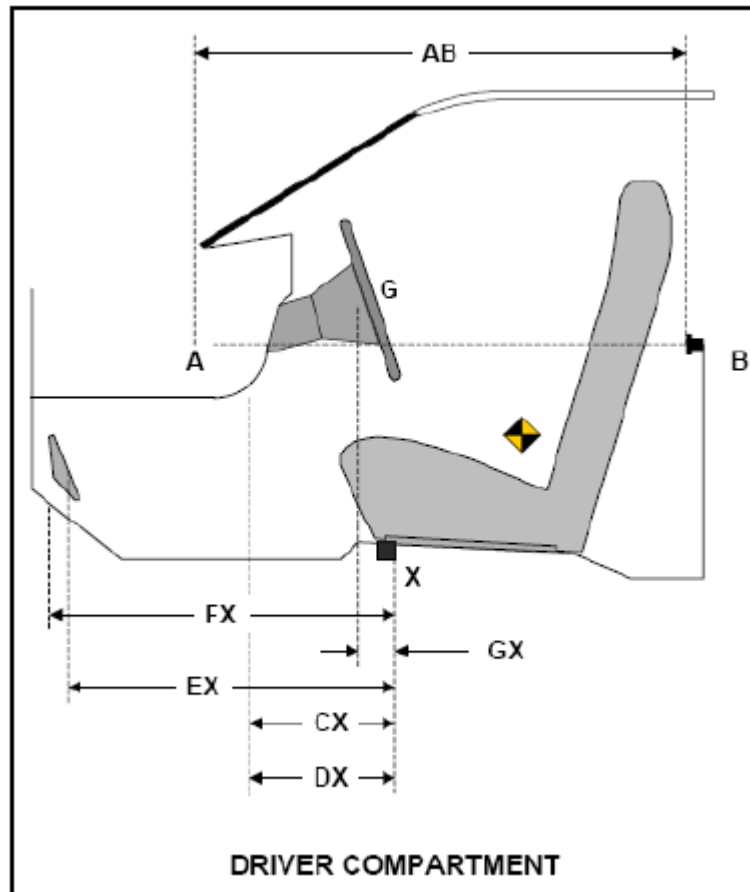
Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	778	779	1
CX	Left Knee Bolster to X	mm	332	326	-6
DX	Right Knee Bolster to X	mm	308	305	-3
EX	Brake Pedal to X	mm	564	473	-91
FX	Foot Rest to X	mm	585	557	-28
GX	Center of Steering Column Wheel Hub to X	mm	60	108	48

X = Front of Seat Track (Stationary)



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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

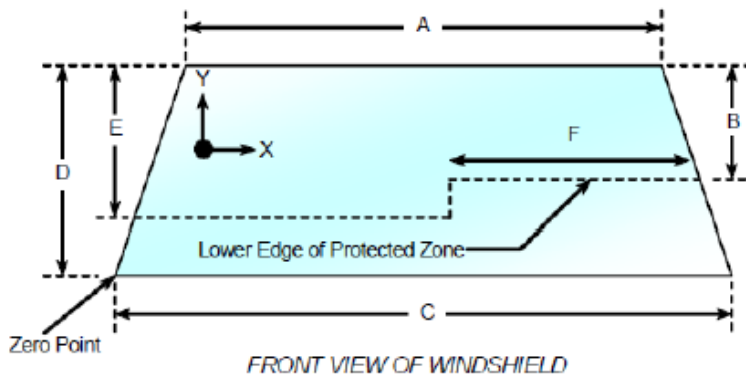
Windshield Mounting Details: A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2207.5	2207.5	100
Right Side	2207.5	2207.5	100
Total	4415	4415	100



Item	Units	Value
A	mm	1215
B	mm	506
C	mm	1480
D	mm	860
E	mm	559
F	mm	553

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

X	Y

- 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

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

Test Vehicle: 2022 KIA Niro EV EX SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
Test Date: 02/08/2022

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21 ° C

Test Time: 11:53 AM

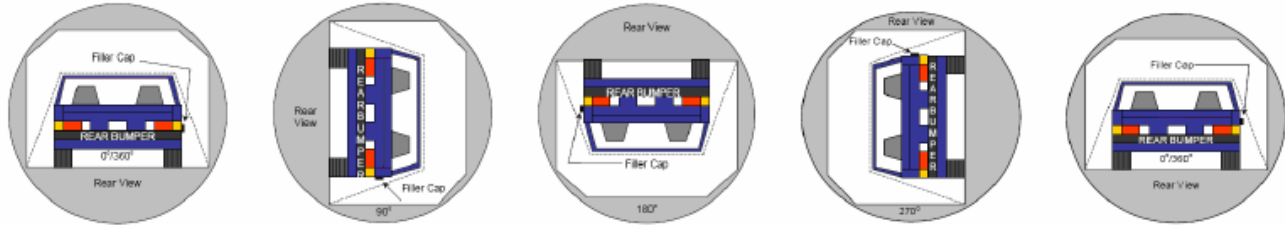
STODDARD SOLVENT SPILLAGE MEASUREMENTS

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

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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022



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

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

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	71	300	371
90° to 180°	65	300	365
180° to 270°	61	300	361
270° to 360°	68	300	368

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

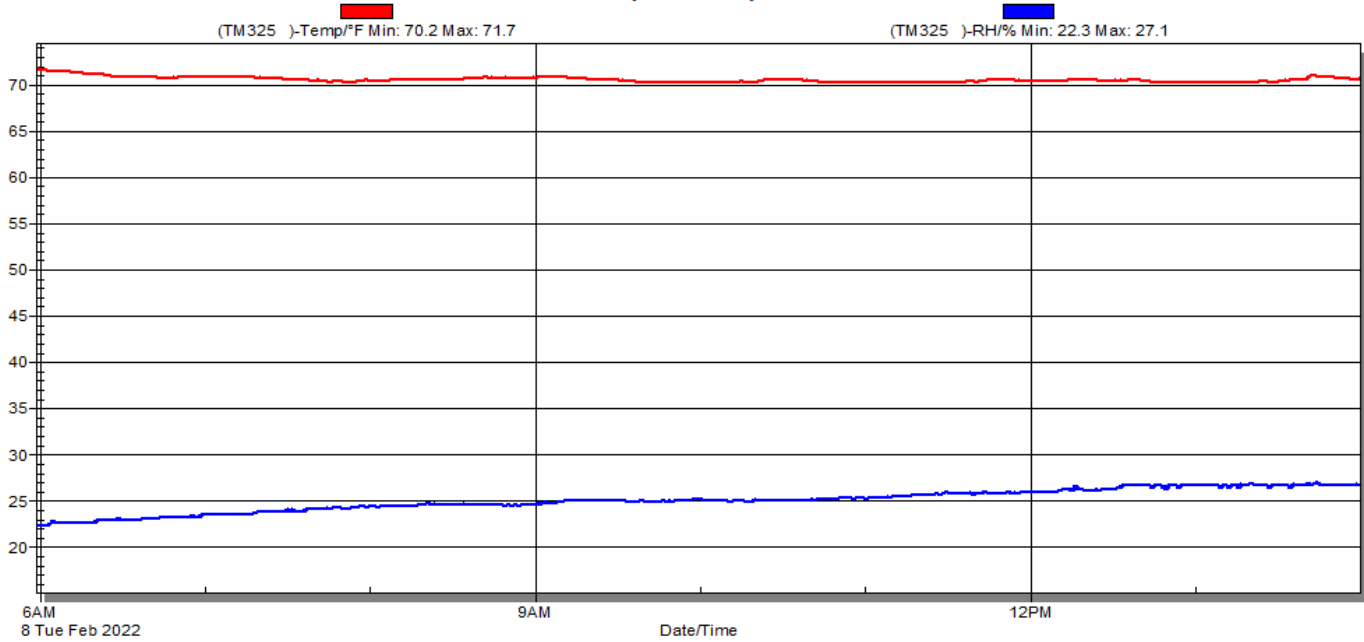
Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17
DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2022 KIA Niro EV EX SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
Test Date: 02/08/2022

Tuesday, February 8, 2022



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: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Electric
Propulsion Battery Type	Lithium-ion Polymer
Nominal Voltage (Volts)	356
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	In front of high voltage battery housing case under vehicle floor
Auxiliary Battery Type	12V MF

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	LiPF6 salt, Carbonate solvent
Electrolyte Fluid Specific Gravity	1.23
Electrolyte Fluid Kinematic Viscosity (centistokes)	3cps @ 25°C
Electrolyte Fluid Color	Transparent and Pale Yellow
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Water + Ethylene glycol
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Outside Passenger Compartment

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
<i>For all battery types:</i> Voltage Range corresponding to useable energy of the battery:		
Minimum State of Charge	V	245
Maximum State of Charge	V	421.4
95% of Maximum	V	400.3
Test Voltage *	V	406.4
<i>For batteries that are rechargeable ONLY by an energy source on the vehicle:</i> Voltage range corresponding to useable energy of the battery :		
Minimum State of Charge	V	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	

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

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

Test Vehicle: 2022 KIA Niro EV EX SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
Test Date: 02/08/2022

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

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Ground point was located on vehicle chassis located at the front of the battery pack.
Details of Propulsion Battery Components	All battery components are internal to the battery located on the underside of the vehicle.

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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

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		4/28/2022

NOTES:

- The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 MΩ
- 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	245 - 421.4
Propulsion Battery Voltage : (ready to drive position)	V_b	V	406.4
Propulsion Battery to Vehicle Chassis	V_1	V	282.0
Propulsion Battery to Vehicle Chassis	V_2	V	284.0
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	299,200
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	58.73
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	59.03
$R_{i1} = R_o * (1 + V_2/V_1) * [(V_1 - V_1')/V_1']$	R_{i1}	Ω	2,282,965
$fR_{i2} = R_o * (1 + V_1/V_2) * [(V_2 - V_2')/V_2']$	R_{i2}	Ω	2,272,540
Lesser value of R_{i1} and R_{i2}	R_i	Ω	2,272,540
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	5,592

Is the Electrical Isolation Value $\geq 500 \Omega/V$ (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 R_o (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: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		40950061
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V _b)	V	0.001

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 ₁ =	0.002	V	Time:	2	Minutes	35	Seconds
V ₂ =	0.002	V	Time:	2	Minutes	40	Seconds
R ₀ =	299,200	Ω	Time:		Minutes		Seconds
V ₁ ' =	0.001	V	Time:	2	Minutes	51	Seconds
V ₂ ' =	0.001	V	Time:	3	Minutes	4	Seconds
R ₁₁ =	598,400	Ω	Time:	2	Minutes	51	Seconds
R ₁₂ =	598,400	Ω	Time:	3	Minutes	4	Seconds
R _i =	598,400	Ω	Time:	3	Minutes	4	Seconds
R _i /V _b =	598,400,000	Ω/V	Time:	3	Minutes	4	Seconds

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

NOTES:

- $R_{i1} = R_0 * (1 + V_2/V_1) * [(V_1 - V_1')/V_1']$, $R_{i2} = R_0 * (1 + V_1/V_2) * [(V_2 - V_2')/V_2']$, $R_i =$ 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

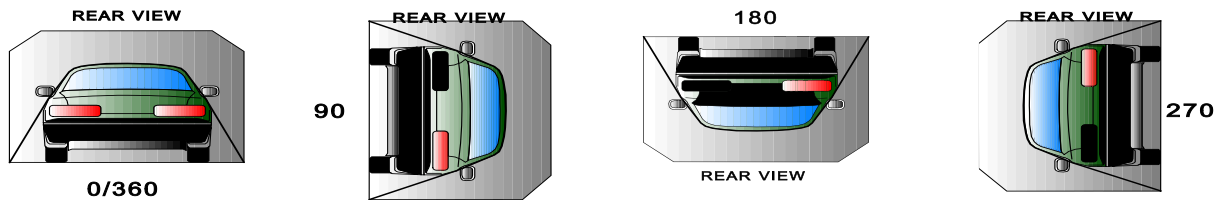
PROPULSION BATTERY SYSTEM COMPONENTS

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?		X	

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

Test Vehicle: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022



Rear View

DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Rollover Stage	Rotation Time (spec. 1 - 3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	11	5	6	11	7
90° to 180°	1	5	5	6	5	7
180° to 270°	1	1	5	6	1	7
270° to 360°	1	8	5	6	8	7

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

Rollover Stage	Propulsion Battery Electrolyte Spillage	Units	Spillage Location
0° to 90°	0.0	Liters	None
90° to 180°	0.0	Liters	None
180° to 270°	0.0	Liters	None
270° to 360°	0.0	Liters	None
Total Spillage	0.0	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) No
 Is propulsion battery electrolyte spillage visible in the passenger compartment? Yes (Fail) No

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 1587
Serial No.		40950061
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V _b)	V	0.001

NOTES:

- The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 MΩ
- 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: 2022 KIA Niro EV EX SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20224209
 Test Date: 02/08/2022

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units		Minutes	Seconds
$V_1 =$	90°	0.002	V	Time:	1	25
	180°	0.002	V		10	3
	270°	0.002	V		16	8
	360°	0.002	V		22	38
$V_2 =$	90°	0.002	V	Time:	1	32
	180°	0.002	V		10	13
	270°	0.002	V		16	15
	360°	0.002	V		22	44
$V_1' =$	90°	0.001	V	Time:	1	41
	180°	0.001	V		10	24
	270°	0.002	V		16	24
	360°	0.001	V		22	54
$V_2' =$	90°	0.001	V	Time:	1	43
	180°	0.001	V		10	33
	270°	0.001	V		16	33
	360°	0.001	V		22	57
$R_{i1} =$	90°	598,400	Ω	Time:	1	41
	180°	598,400	Ω		10	24
	270°	0	Ω		16	24
	360°	598,400	Ω		22	54
$R_{i2} =$	90°	598,400	Ω	Time:	1	43
	180°	598,400	Ω		10	33
	270°	598,400	Ω		16	33
	360°	598,400	Ω		22	57
$R_i =$	90°	598,400	Ω	Time:	1	43
	180°	598,400	Ω		10	33
	270°	0	Ω		16	33
	360°	598,400	Ω		22	57
$R_i/V_b =$	90°	598,400,000	Ω/V	Time:	1	43
	180°	598,400,000	Ω/V		10	33
	270°	0	Ω/V		16	33
	360°	598,400,000	Ω/V		1	43

Is the Electrical Isolation Value $\geq 500 \Omega/V$ (Yes/No)? 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	2020 KIA Niro Electric 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 Charging Port View	A-16
23	Post-Test Charging Port View	A-17
24	Pre-Test Front Underbody View ¹	A-17
25	Post-Test Front Underbody View ¹	A-18
26	Pre-Test Rear Underbody View ¹	A-18
27	Post-Test Rear Underbody View ¹	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 0° on Static Rollover Device	A-44
78	Vehicle at 90° on Static Rollover Device	A-44
79	Vehicle at 180° on Static Rollover Device	A-45
80	Vehicle at 270° on Static Rollover Device	A-45
81	Vehicle at 360° on Static Rollover Device	A-46
82	2020 KIA Niro Electric 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 or Other Test Devices	A-60

Fig.	Description	Page
305-27	Post-Impact View or 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

¹**NOTE:** *The underbody views should include the following vehicle components: fuel pump, fuel lines, sender unit, fuel tank filler pipe and any other visible system components.*



Figure A-1: Load Cell Location



Figure A-2: Pre-Test Load Cell Wall



Figure A-3: Post-Test Load Cell Wall



Figure A-4: Manufacturer's Label

M20224209



Figure A-5: Tire Placard



Figure A-6: 2020 KIA Niro Electric Frontal As Delivered



M20224209

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

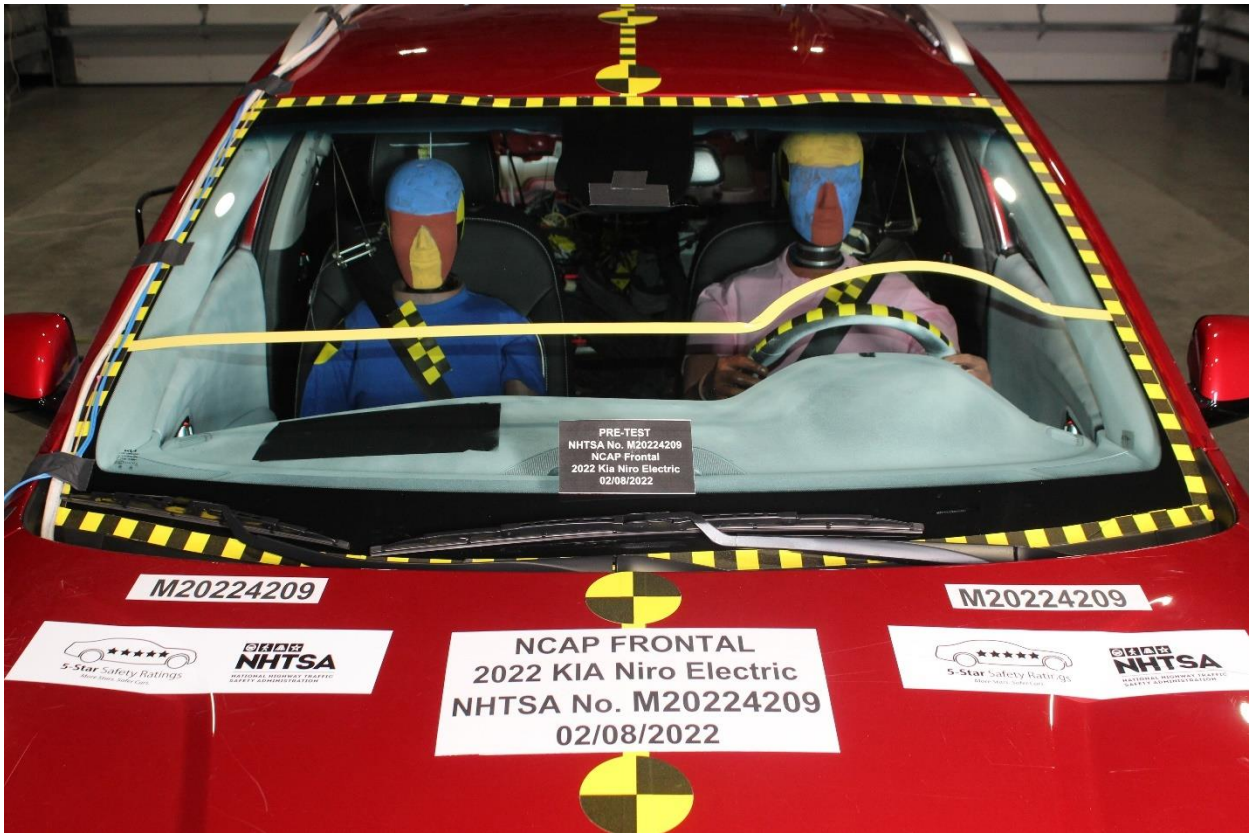


Figure A-18: Pre-Test Windshield View



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 Charging Port View

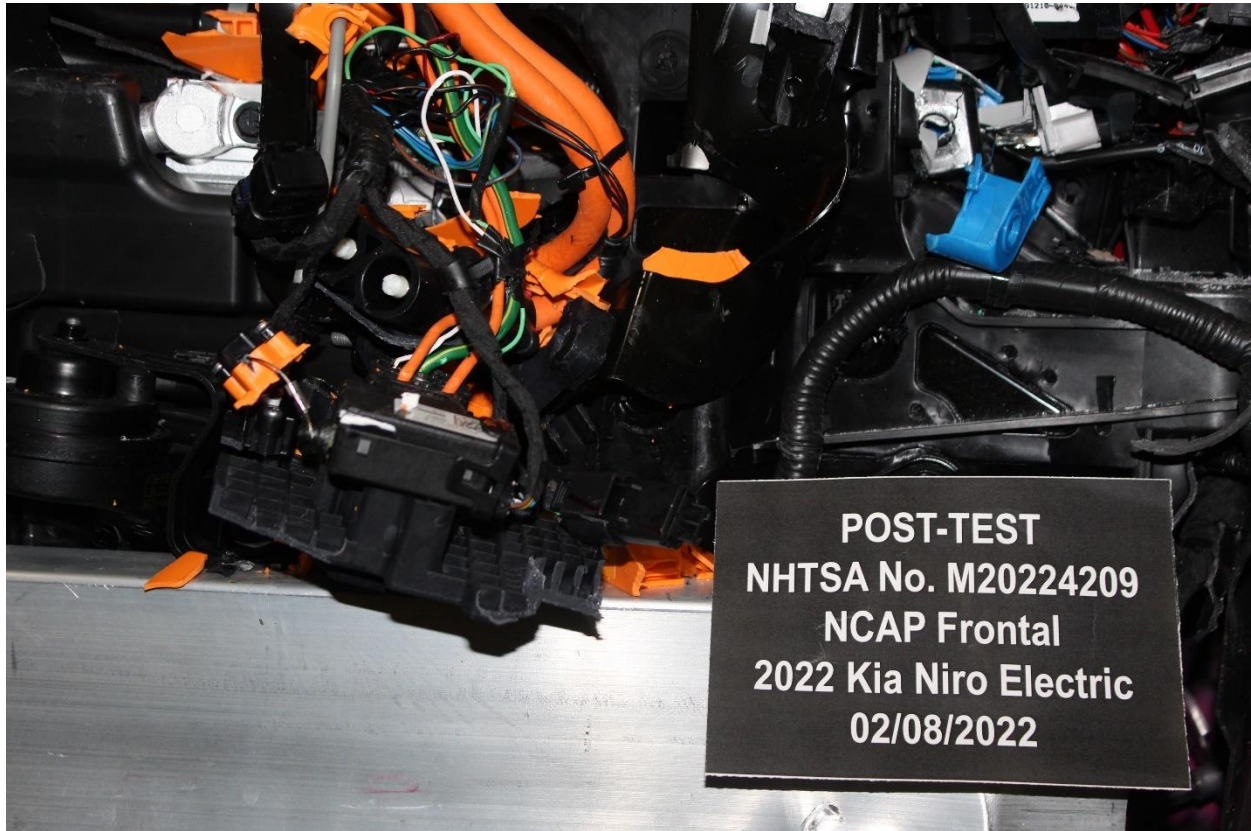


Figure A-23: Post-Test Charging Port View

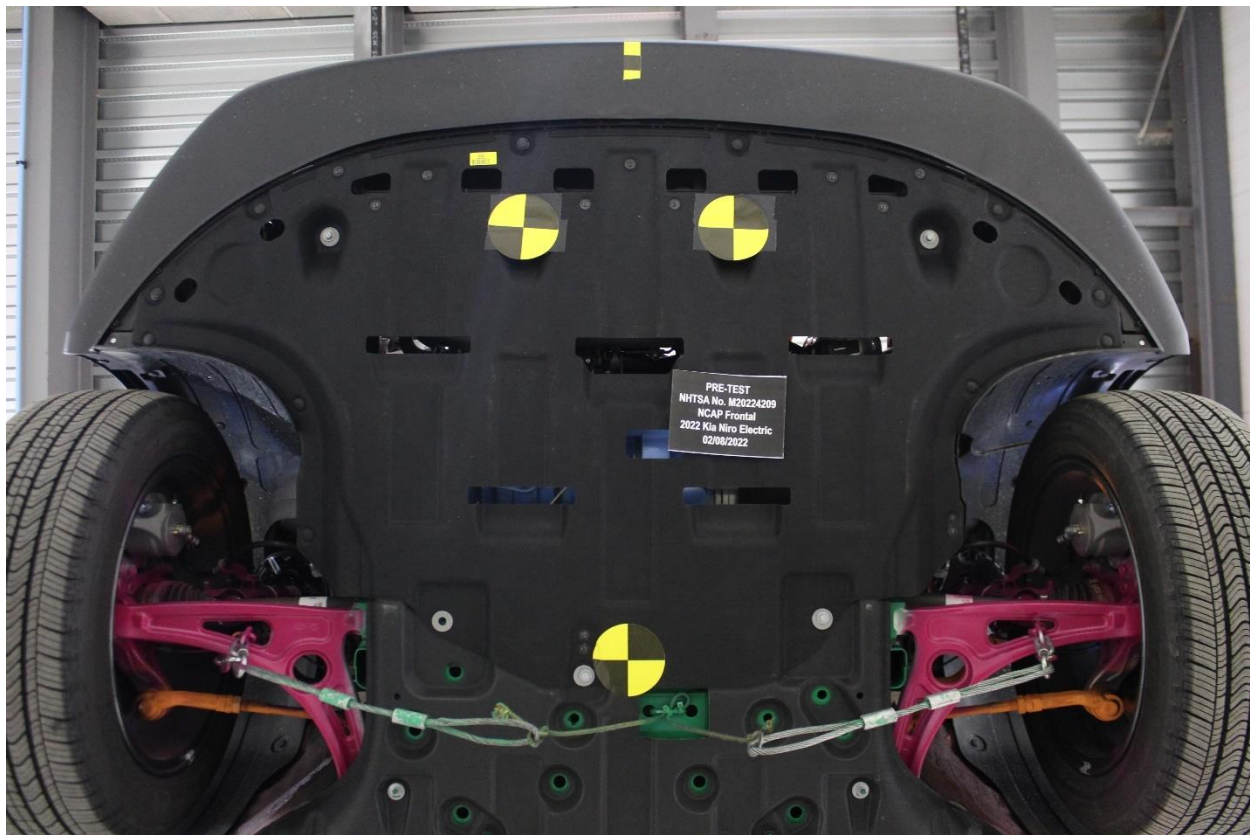


Figure A-24: Pre-Test Front Underbody View

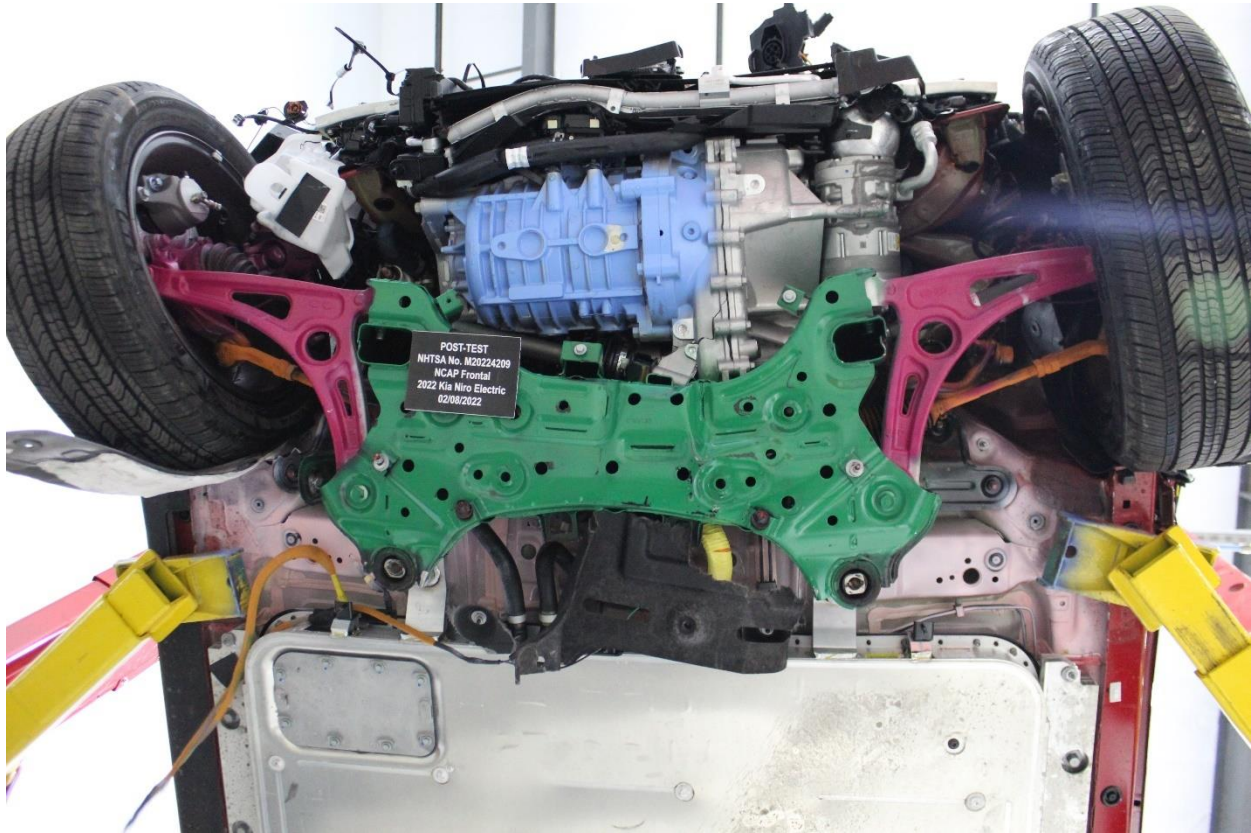


Figure A-25: Post-Test Front Underbody View

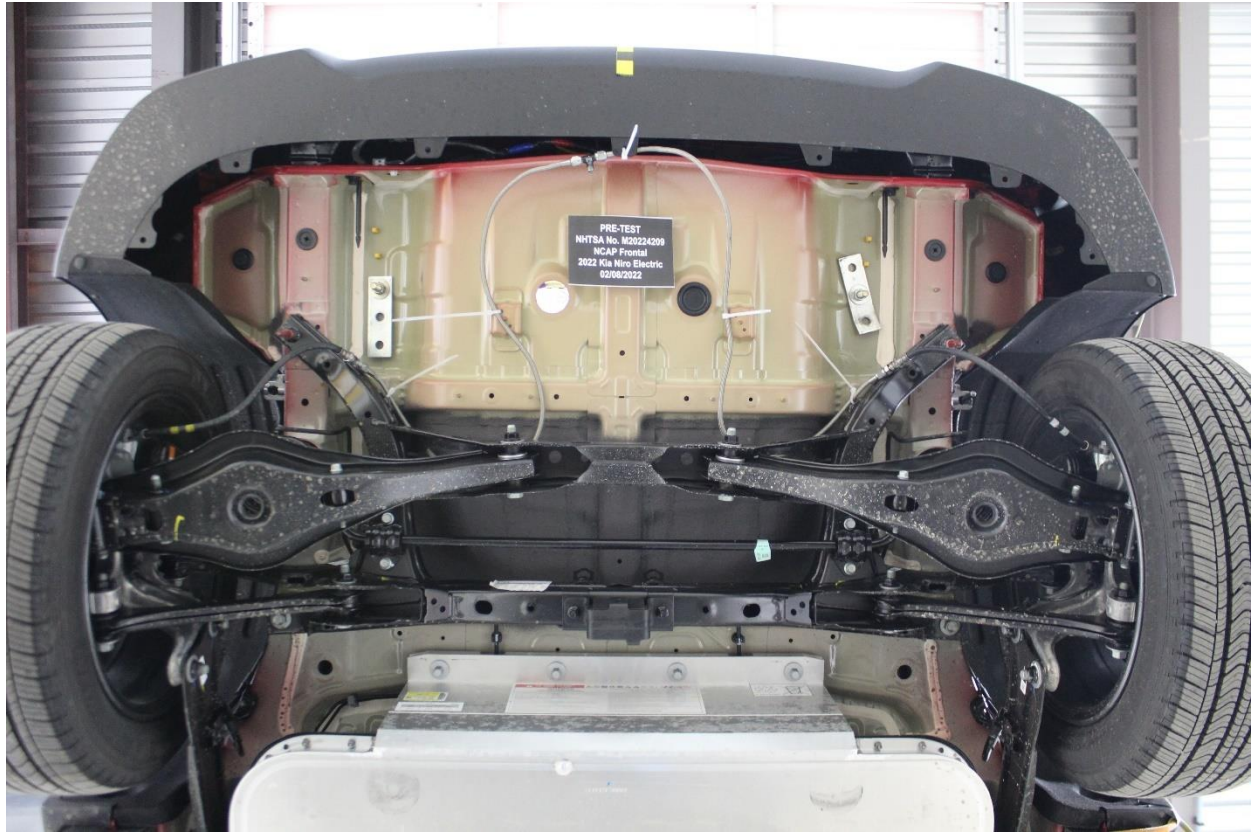


Figure A-26: Pre-Test Rear Underbody View

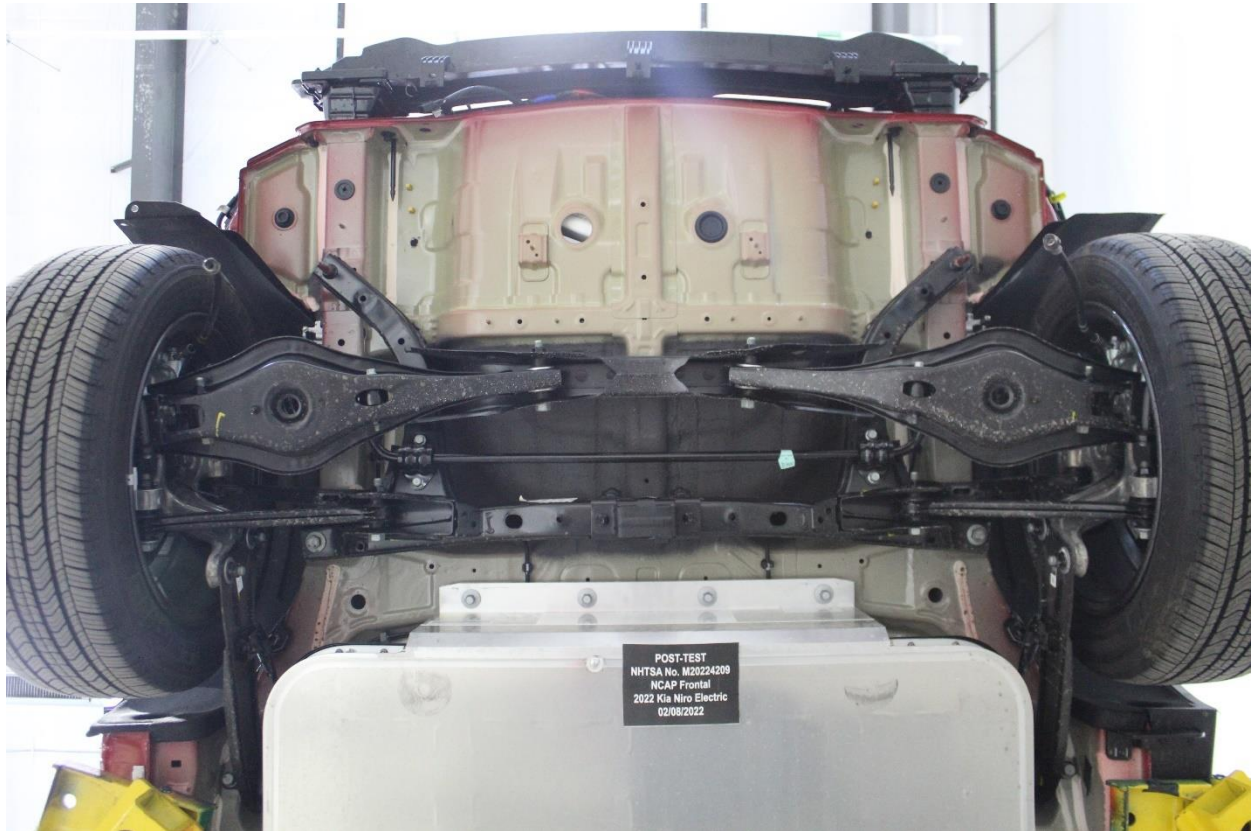


Figure A-27: Post-Test Rear Underbody View



Figure A-28: Pre-Test Dummy Cable Routing



Figure A-29: Post-Test Dummy Cable Routing

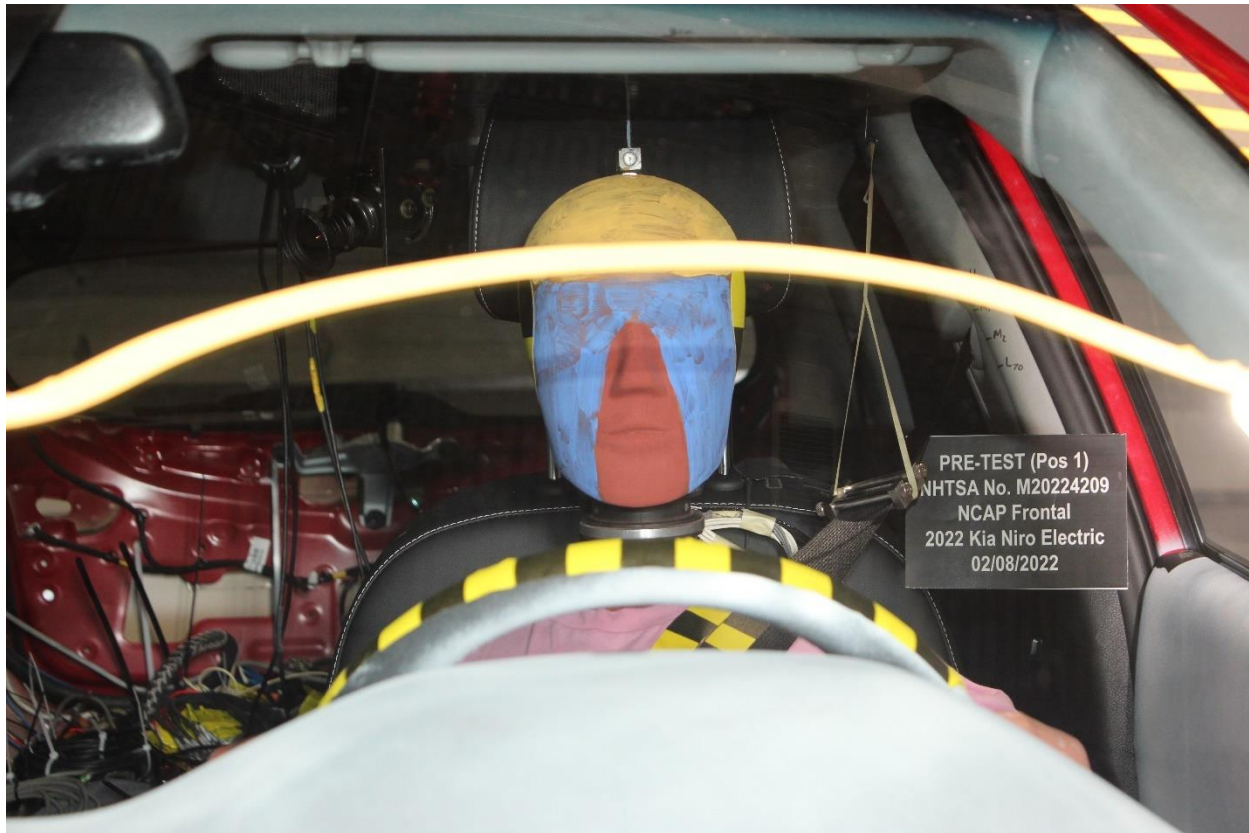


Figure A-30: Pre-Test Driver Dummy Front View



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



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



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



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



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

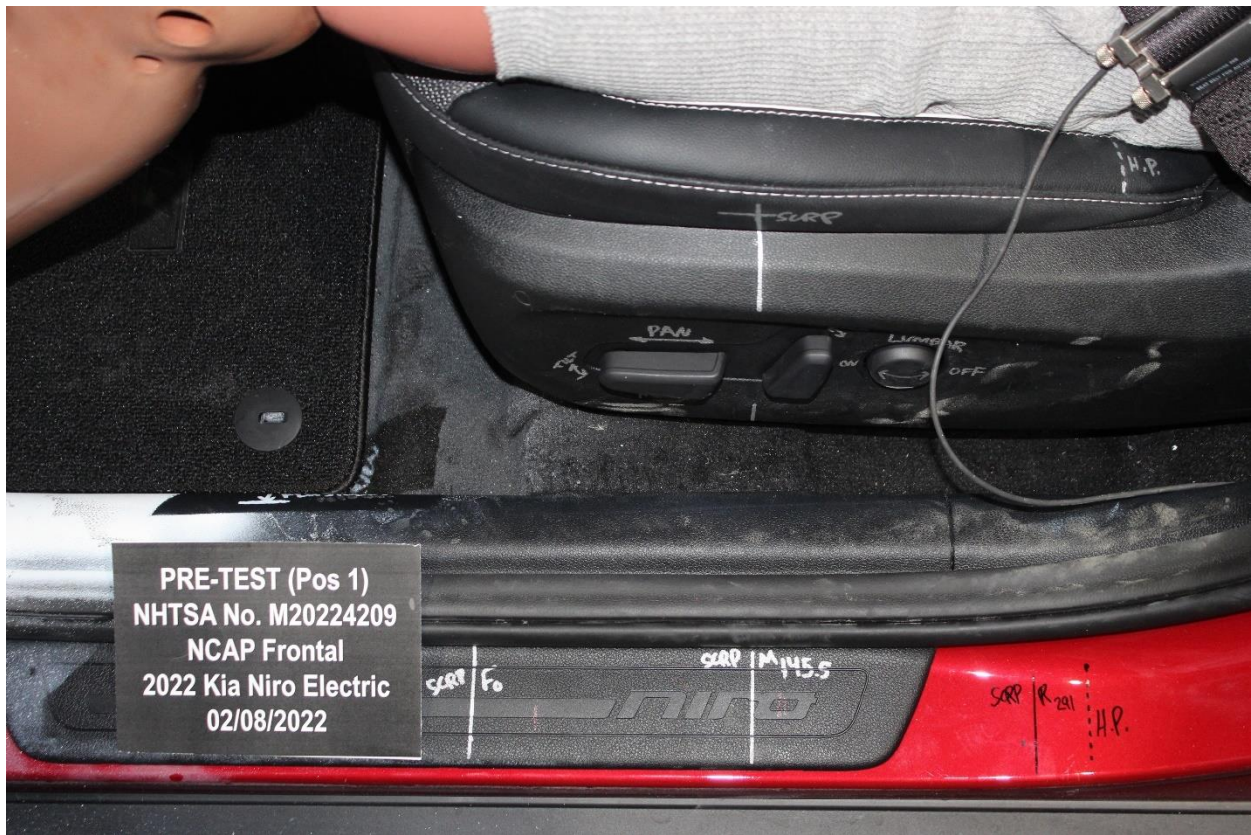


Figure A-36: Pre-Test Driver's Seat Fore-Aft Markings



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



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



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



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



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



Figure A-42: Pre-Test Driver Dummy Feet



Figure A-43: Post-Test Driver Dummy Feet



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



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



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



POST-TEST (Pos 1)
NHTSA No. M20224209
NCAP Frontal
2022 Kia Niro Electric
02/08/2022

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



POST-TEST (Pos 1)
NHTSA No. M20224209
NCAP Frontal
2022 Kia Niro Electric
02/08/2022

Figure A-48: Post-Test Driver Dummy Face



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



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



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

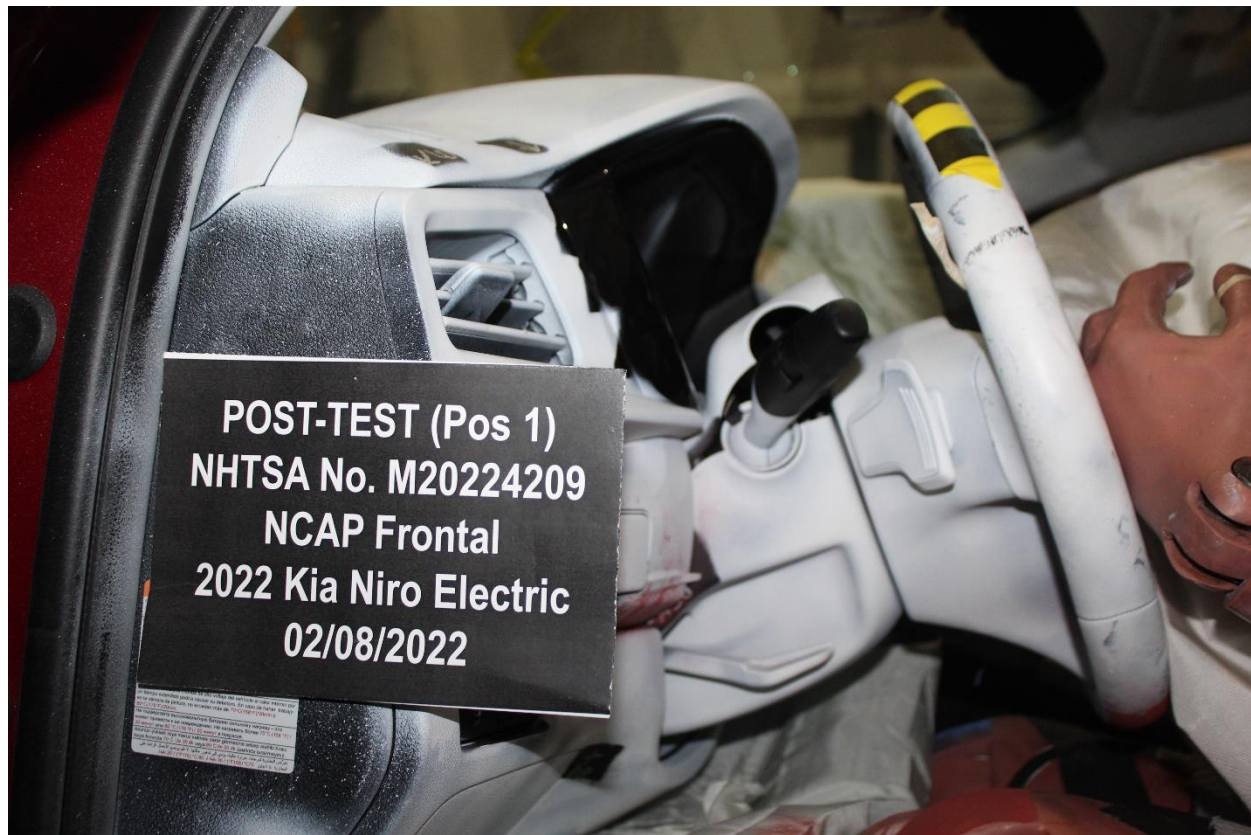


Figure A-52: Post-Test View of the Steering Wheel



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



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



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



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



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



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



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



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



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



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



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



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



Figure A-65: Pre-Test Passenger Dummy Feet



Figure A-66: Post-Test Passenger Dummy Feet

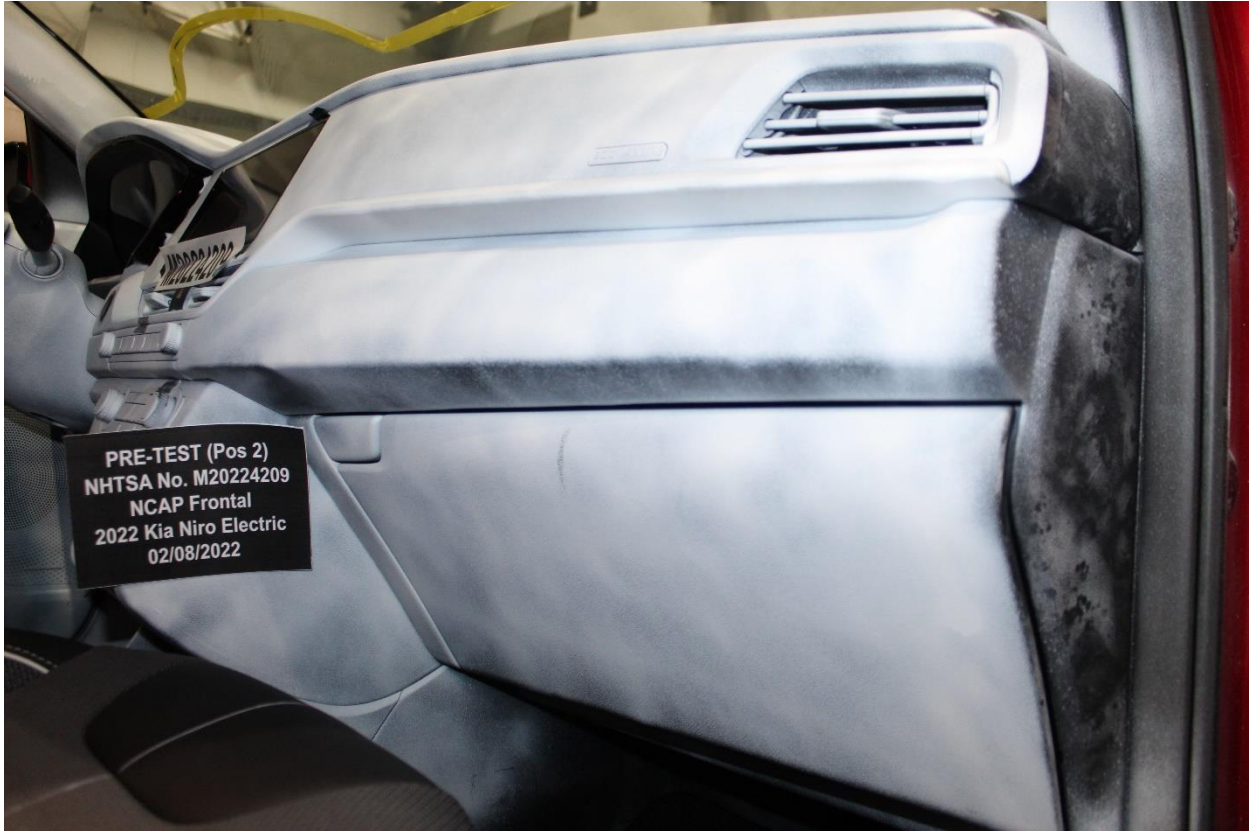


Figure A-67: Pre-Test Passenger's Side Knee Bolster



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



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



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



Figure A-71: Post-Test Passenger Dummy Face



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



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



Figure A-74: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

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



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



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

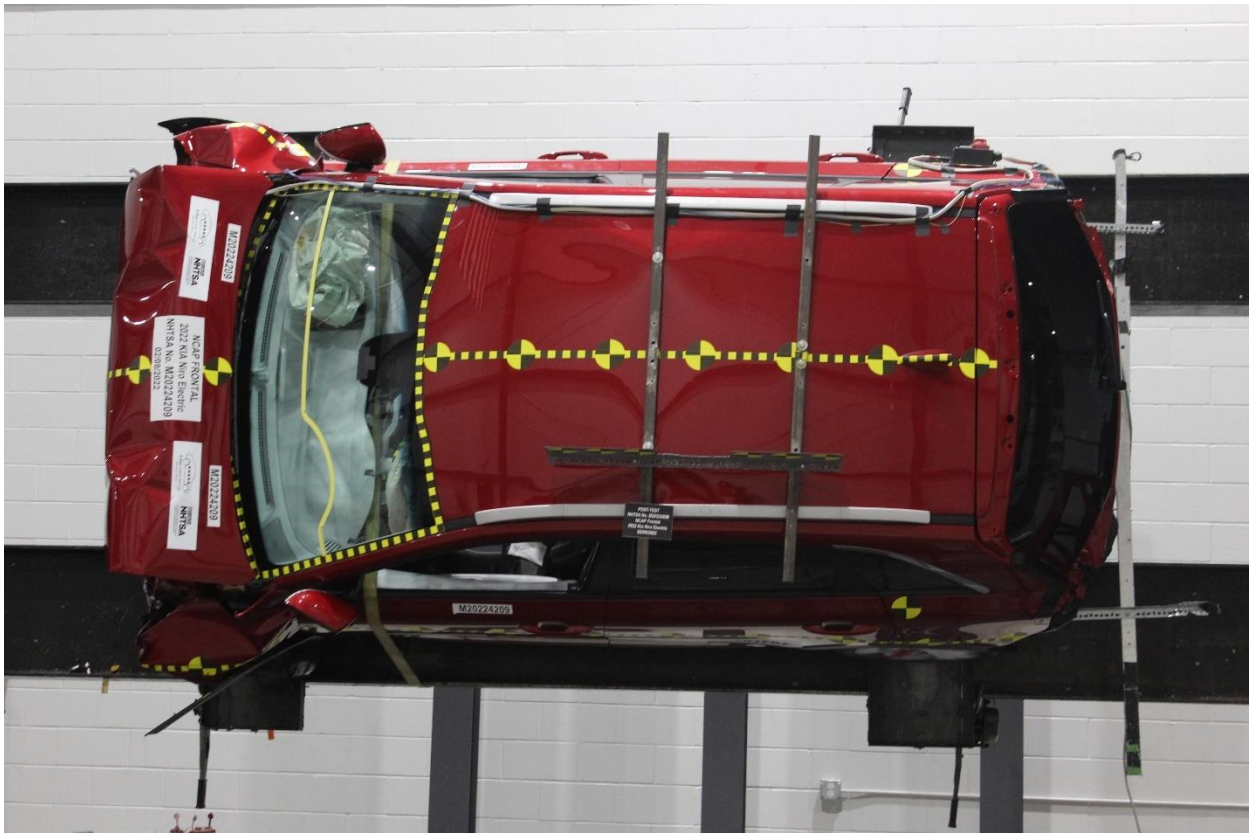


Figure A-78: Vehicle at 90° on Static Rollover Device



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

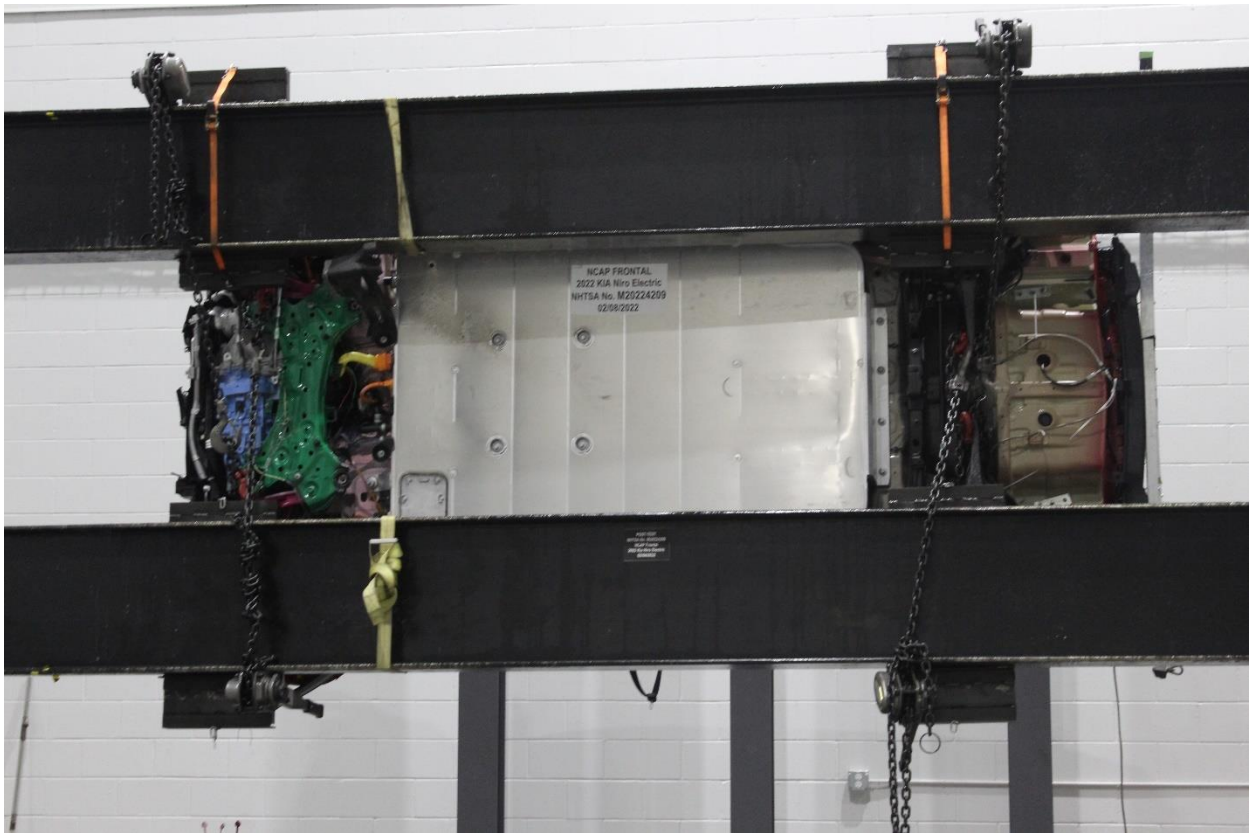


Figure A-80: Vehicle at 270° on Static Rollover Device



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



Figure A-82: 2020 KIA Niro Electric Frontal Impact Event




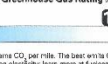
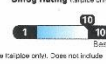


2022 NIRO EV EX MODEL/OPT. CODE: V1242 / 015 EXTERIOR COLOR: RUNWAY RED INTERIOR COLOR: CHARCOAL VEHICLE ID NUMBER: KNDCC3L00N6135930 PORT OF ENTRY: PHILADELPHIA		Sold To: NY096 Maguire Kia 370 ELMIRA ROAD ITHACA NY 14850 Ship To: NY096			
STANDARD FEATURES MECHANICAL 64kWh Lithium Ion Polymer Battery 150kW Electric Motor 7.2 kW On-Board Charger (OBC) DC Fast Charge Port (400V) in Front Grille Adjustable Regenerative Braking via Paddle Shifters Electronic Parking Brake w/ Auto Hold KIA DRIVEWISE DRIVER-ASSIST TECHNOLOGY Forward Collision-Avoidance Assist - Cyclist Blind-Spot Collision Warning Rear Cross-Traffic Collision Warning Lane Keeping Assist & Lane Following Assist Driver Attention Warning & High Beam Assist Smart Cruise Control w/Stop & Go SAFETY Dual Front Advanced Airbags & Driver's Knee Airbag Dual Front Seat-Mounted Side & Full-Length Curtain Airbags INTERIOR, COMFORT & CONVENIENCE 10.25" Touchscreen w/Navigation & MapCare Harman/Kardon Premium Audio System Wireless Phone Charger Rear View Camera with Dynamic Guidelines Android Auto and Apple CarPlay Kia Connect (w/4G LTE) w/free trial. *Where available** SIRIUSXM™ w/Free 3-Mo. Subscription* Smart Key w/ Push Button & Remote Start Cloth & SynTex Seating Material Power Adj. Driver's Seat w/ Power Lumbar Support Heated Front Seats Automatic Climate Control 7" Color Supervision Meter Cluster Luggage Board and Under Floor Storage Tray Rear Occupant Alert EXTERIOR 17" Alloy Wheels Roof Rails and Rear Privacy Glass Fog Lamps Power Folding Heated Outside Mirrors w/ Turn Signals WARRANTY 10 Year/100,000 Mile Limited Powertrain Warranty 10 Year/100,000 Mile Limited Battery Warranty 5 Year/60,000 Mile Limited Basic Warranty 5 Year/60,000 Mile Roadside Assistance		MANUFACTURER'S SUGGESTED RETAIL PRICE \$39,990.00 ADDITIONAL INSTALLED EQUIPMENT: (In addition to or in place of standard features) Cold Weather Package - Battery Heater - Heat Pump - Heated Steering Wheel \$1,100.00		EPA DOT Fuel Economy and Environment  Electric Vehicle Fuel Economy 112 MPGe <small>combined city/hwy</small> 123 102 30 <small>city highway kW-hrs per 100 miles</small> Driving Range  <small>Actual range varies by vehicle and load</small> Charge Time: 9.5 hours (24hr) 239 miles You save \$3,500 in fuel costs over 5 years <small>compared to the average new vehicle.</small> Annual fuel COST \$600 Fuel Economy & Greenhouse Gas Rating (passive only)  10 Smog Rating (passive only)  10 <small>*This vehicle emits 0 grams CO2 per mile. The best with 0 grams per mile (passive only). Does not include emissions from generating electricity; learn more at fuelconomy.gov. Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPGe and costs \$8,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$0.13 per kWh. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of global warming and smog. fuelconomy.gov Calculate personalized estimates and compare vehicles. SmartKey QR Code </small>	
MSRP INCLUDING OPTIONS \$41,090.00 INLAND FREIGHT AND HANDLING \$1,175.00 TOTAL MANUFACTURER'S SUGGESTED RETAIL PRICE \$42,265.00 TOTAL ADDITIONAL WEIGHT: 		GOVERNMENT 5-STAR SAFETY RATINGS Overall Vehicle Score Not Rated <small>Based on the combined rating of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.</small> Frontal Driver Not Rated Passenger Not Rated Crash Passenger Not Rated <small>Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.</small> Side Front seat Not Rated Rear seat Not Rated Crash Rear seat Not Rated <small>Star ratings based on the risk of injury in a side impact.</small> Rollover Not Rated <small>Star ratings based on the risk of rollover in a single-vehicle crash.</small> Star ratings range from 1 to 5 stars (*****), with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4239 <small>Manufacturer's suggested retail price includes Manufacturer's recommended pre-delivery service, license and title fees, state and local taxes and other dealer-installed options and accessories are not included in the manufacturer's suggested retail price.</small>		PARTS CONTENT INFORMATION FOR VEHICLES IN THIS CAR LINE U.S./CANADIAN PARTS CONTENT: 0% MAJOR SOURCES OF FOREIGN PARTS: KOREA: 65% CHINA: 30% <small>NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.</small> FOR THIS VEHICLE FINAL ASSEMBLY POINT: HWASUNG, KOREA COUNTRY OF ORIGIN: ENGINE: KOREA TRANSMISSION: KOREA	

Figure A-83: Monroney Label Photograph



Figure 305-1: Auxiliary Power Module Warning Label



Figure 305-2: Power Inverter Warning Label



Figure 305-3 First Responder Warning Label



Figure 305-4: First Responder Warning Label Location



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

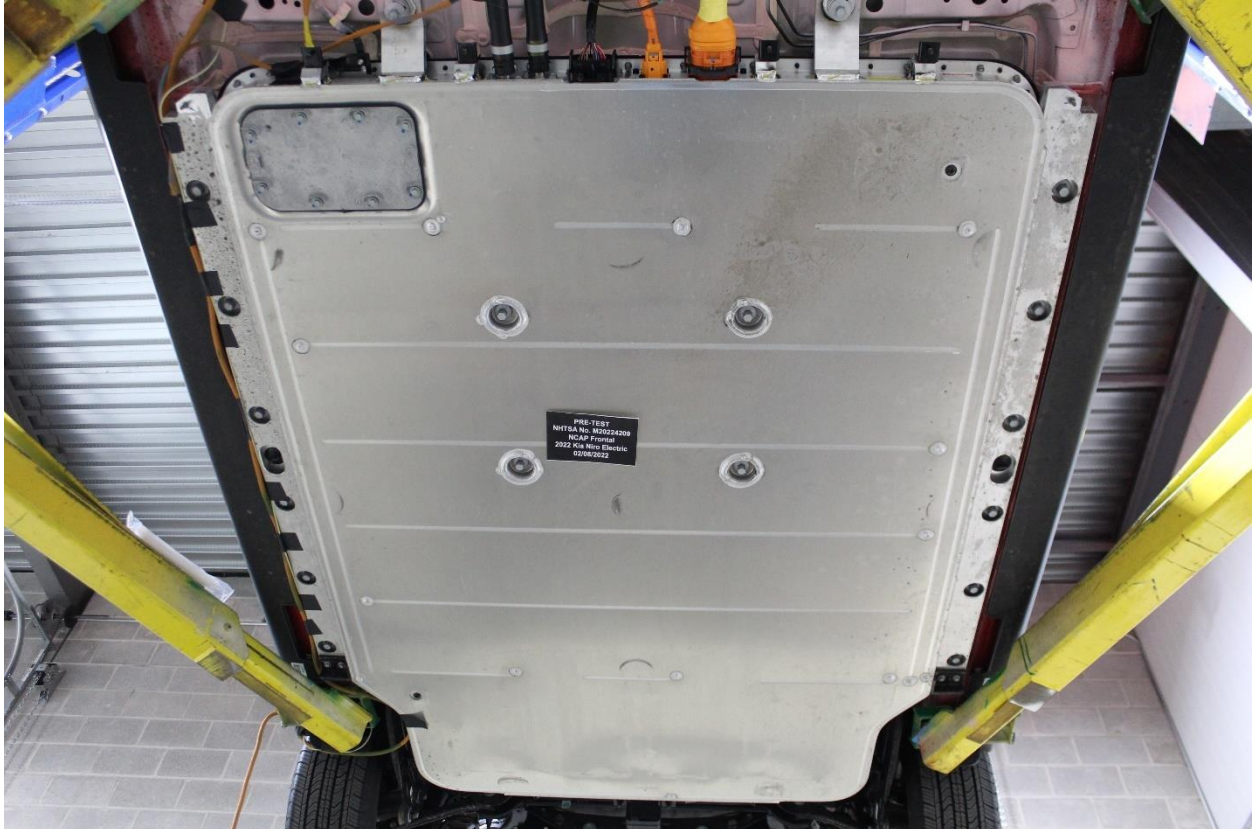


Figure 305-9: Pre-Impact View of Propulsion Battery



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)

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

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

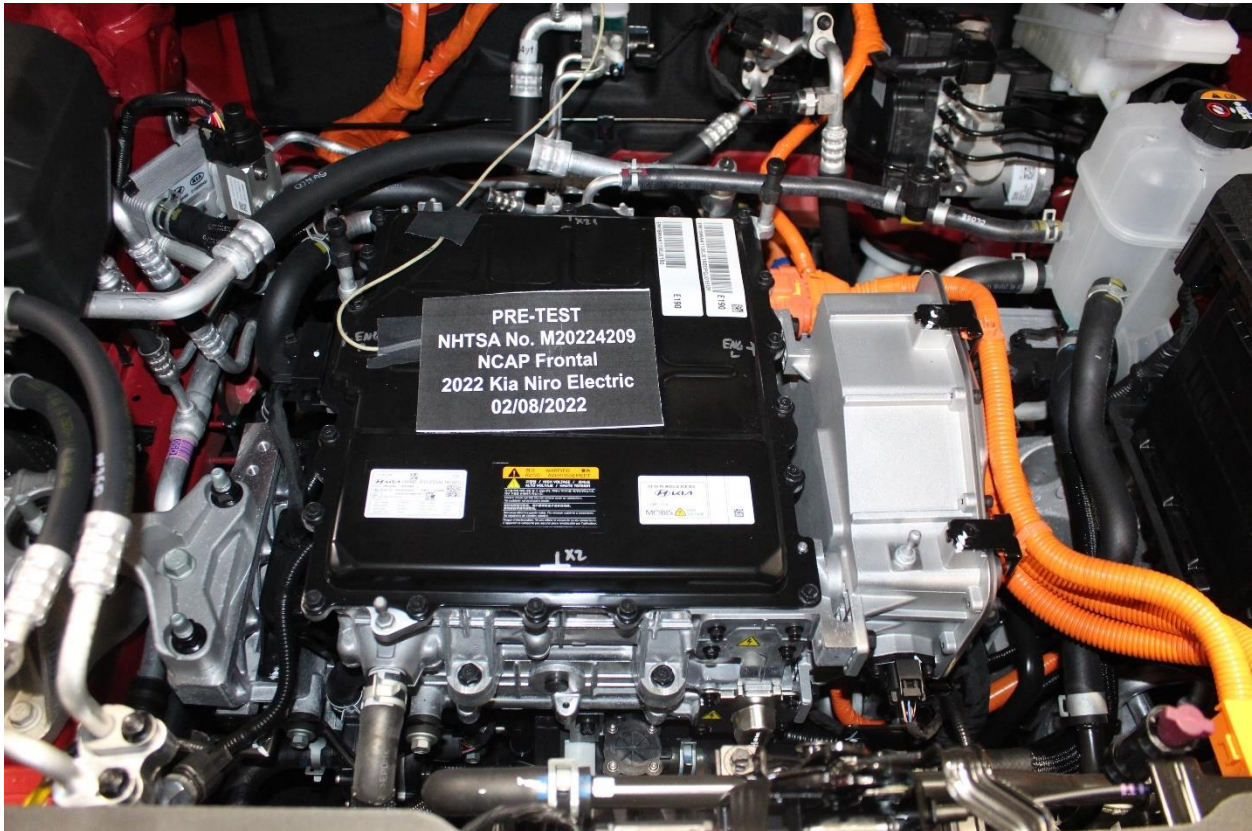


Figure 305-16: Pre-Impact View of Electric Propulsion Drive



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

Photo Not Applicable

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

Photo Not Applicable

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



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

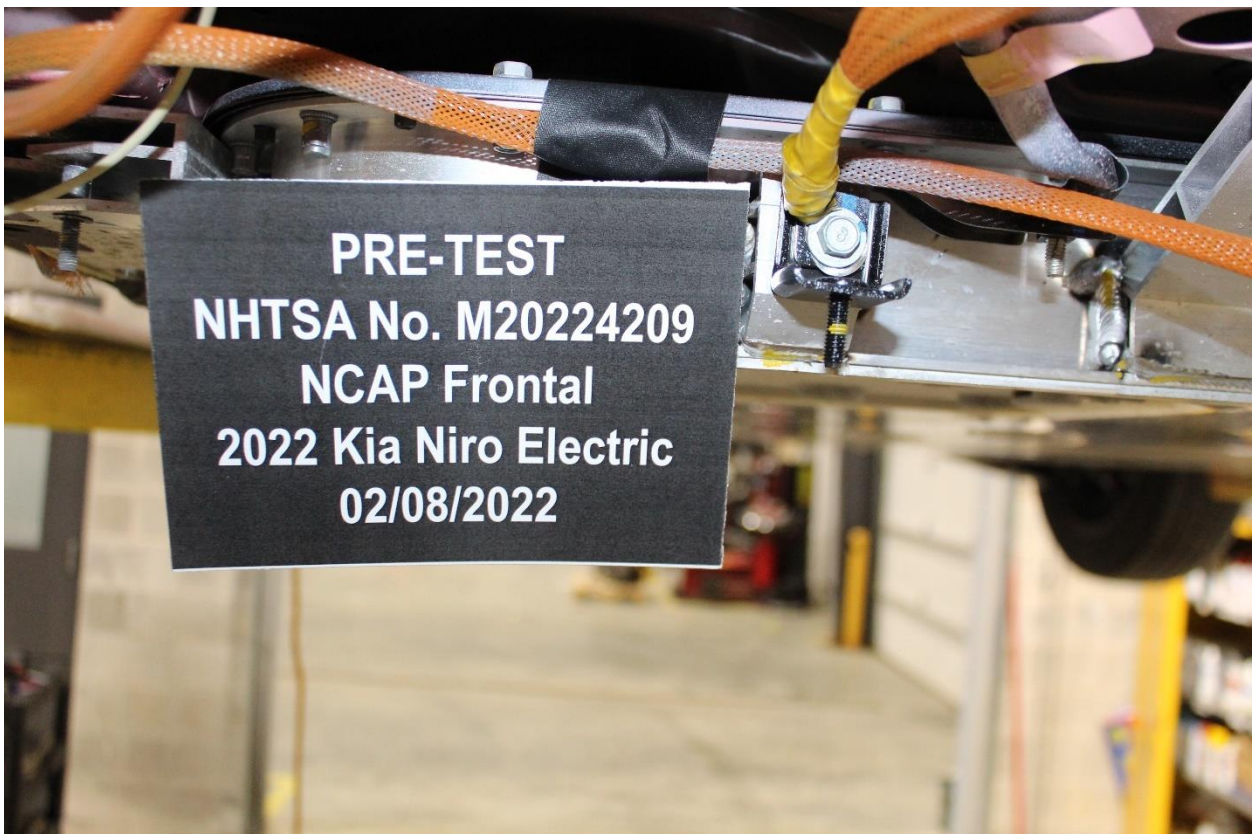


Figure 305-21: Pre-Impact View of Ground Lead Attached

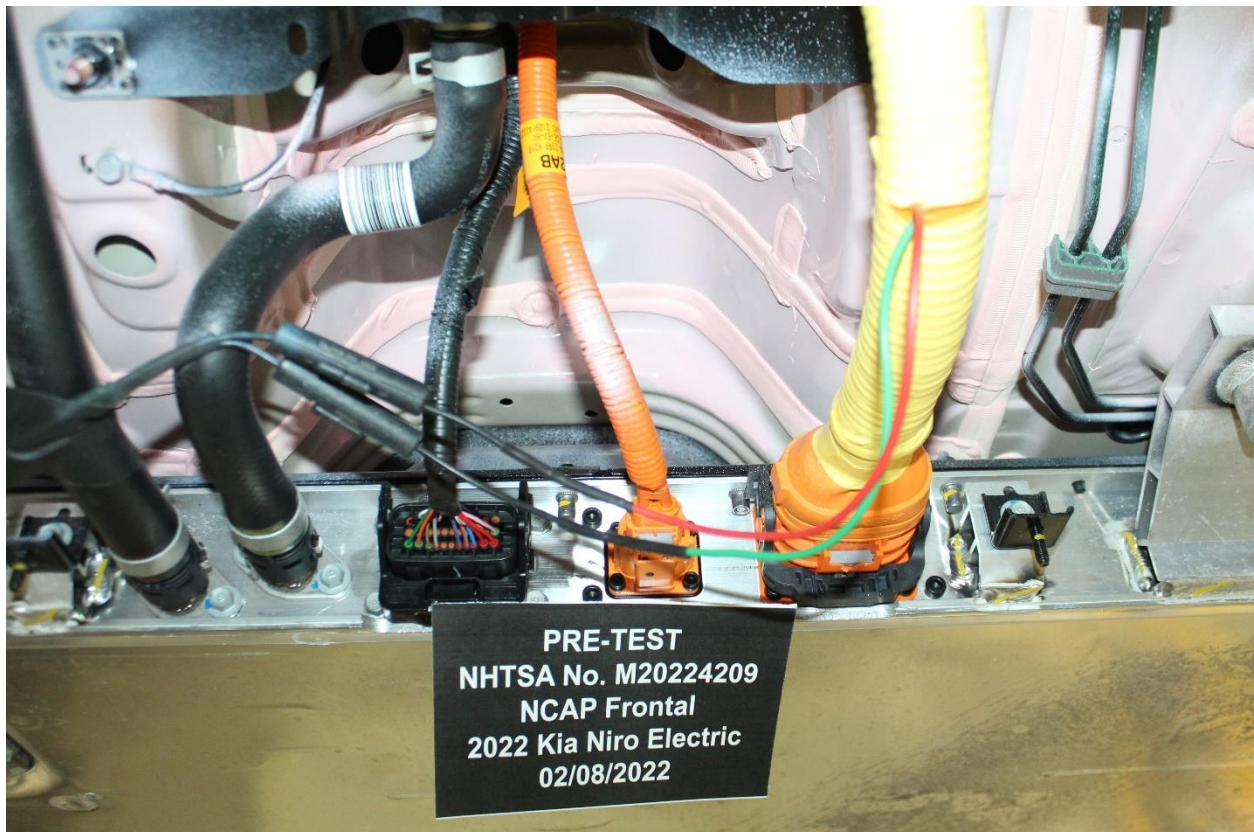


Figure 305-22: Pre-Impact View of High Voltage Leads Attached



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

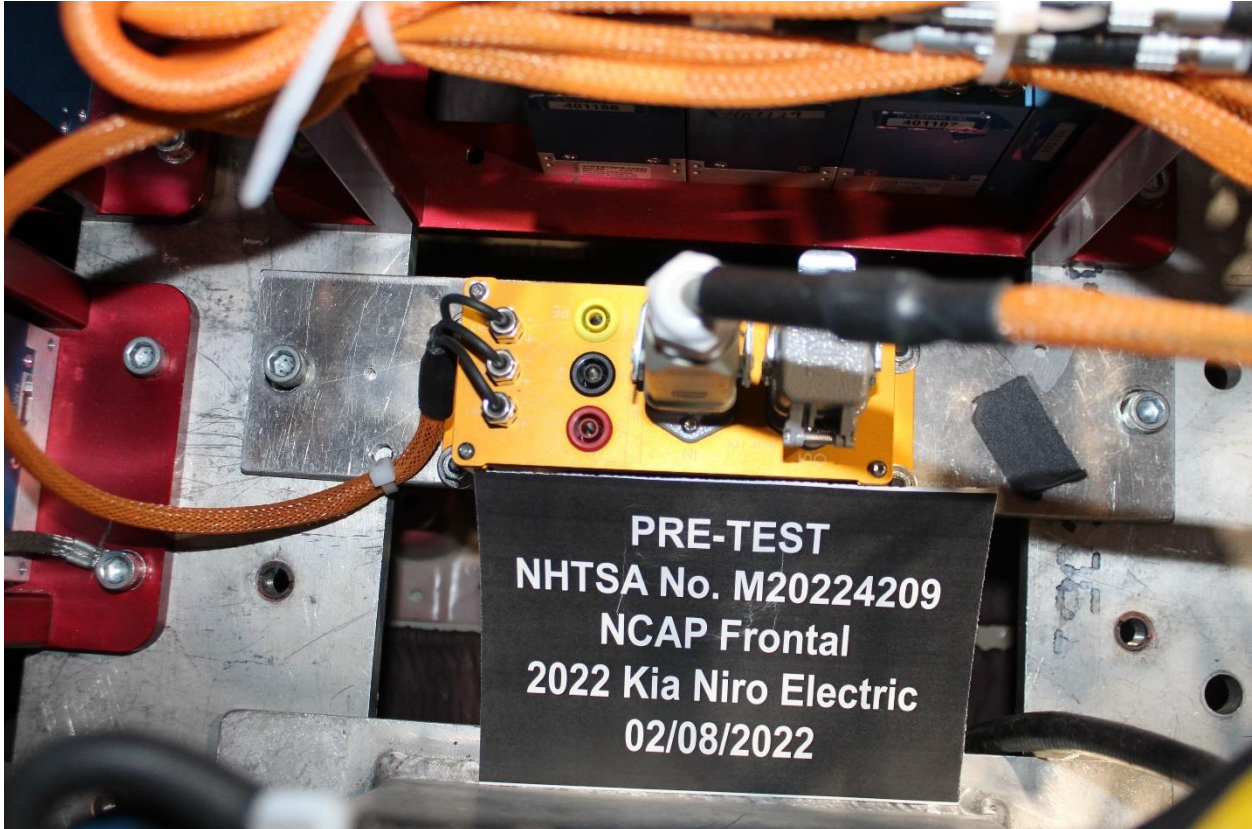


Figure 305-24: Pre-Impact View of Installed Test Interface Port

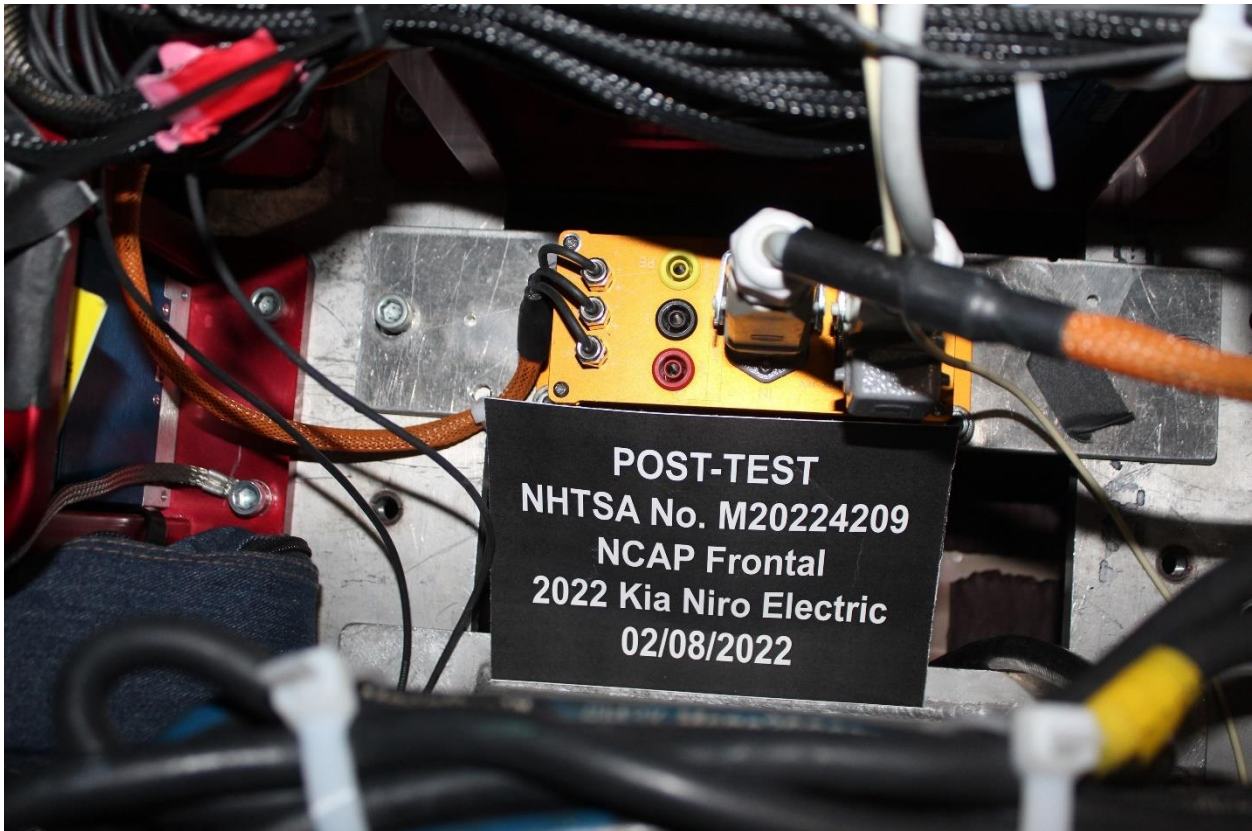


Figure 305-25: Post-Impact View of Installed Test Interface Port

Photo Not Applicable

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

Photo Not Applicable

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

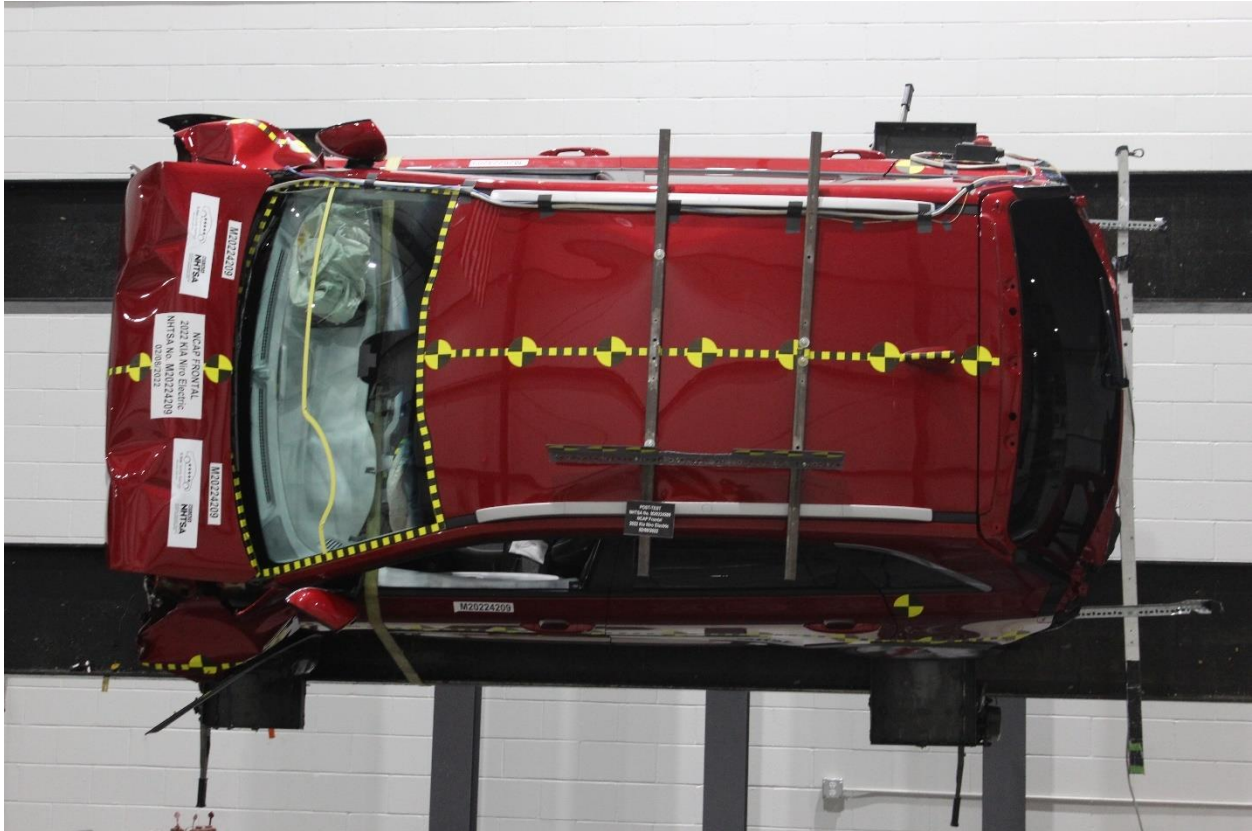


Figure 305-28: FMVSS No. 305 Static Rollover 90 Degrees



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

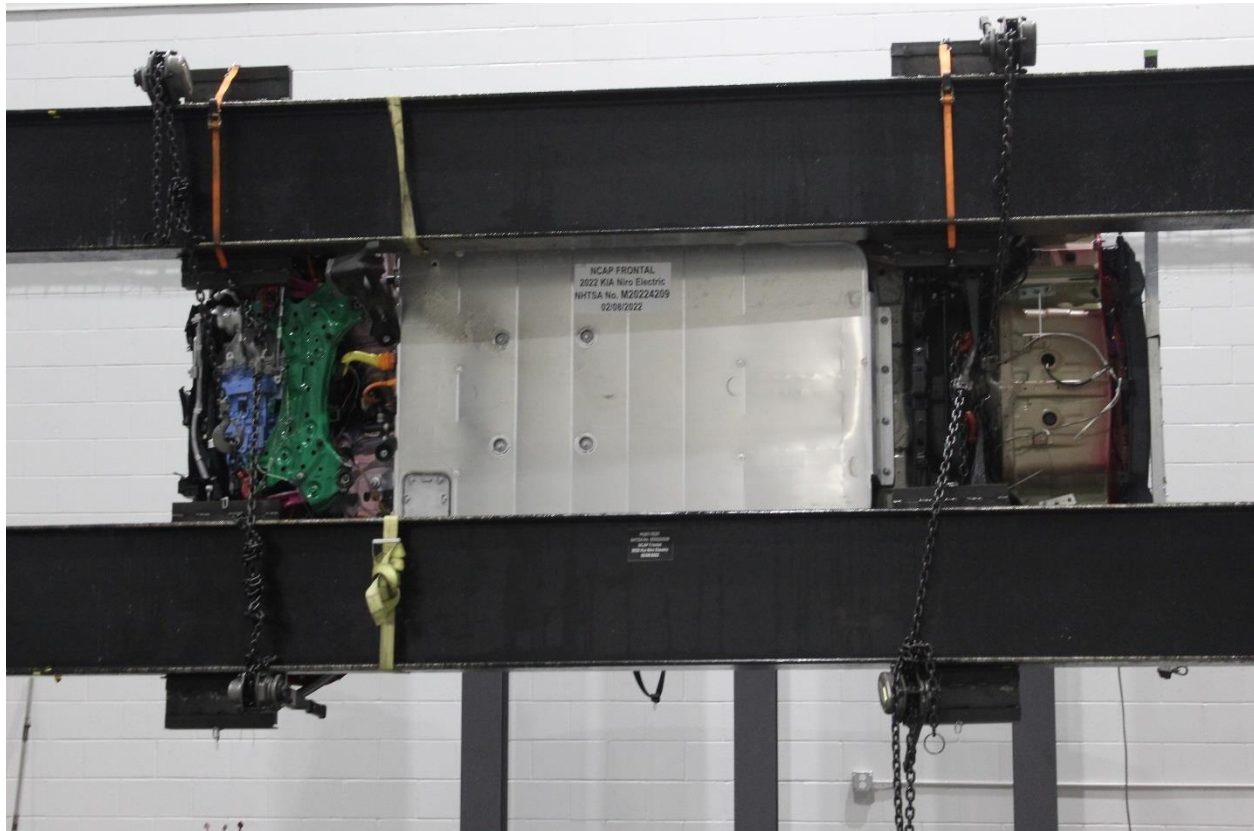


Figure 305-30: FMVSS No. 305 Static Rollover 270 Degrees



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

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

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

Photo Not Applicable

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

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots

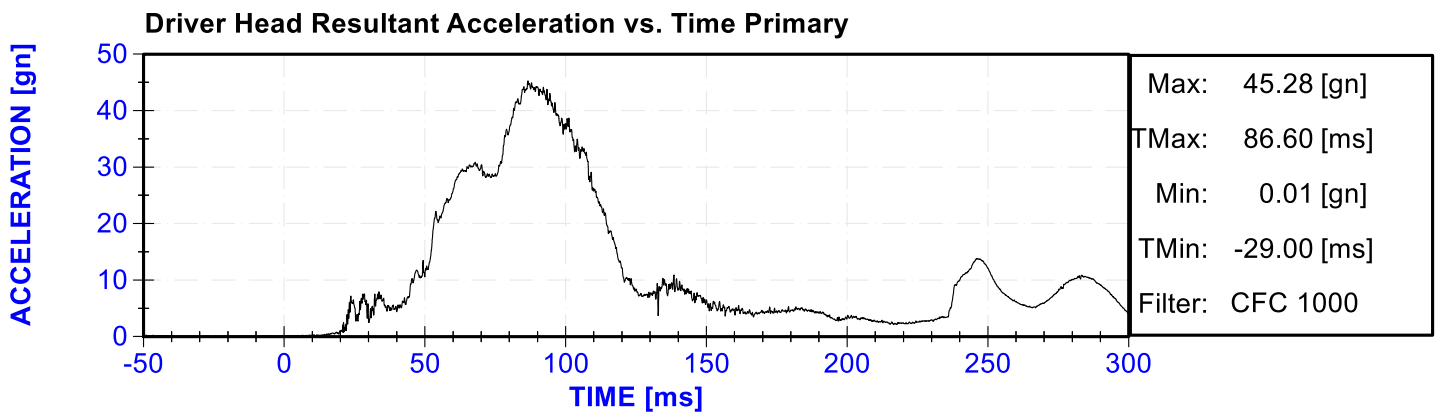
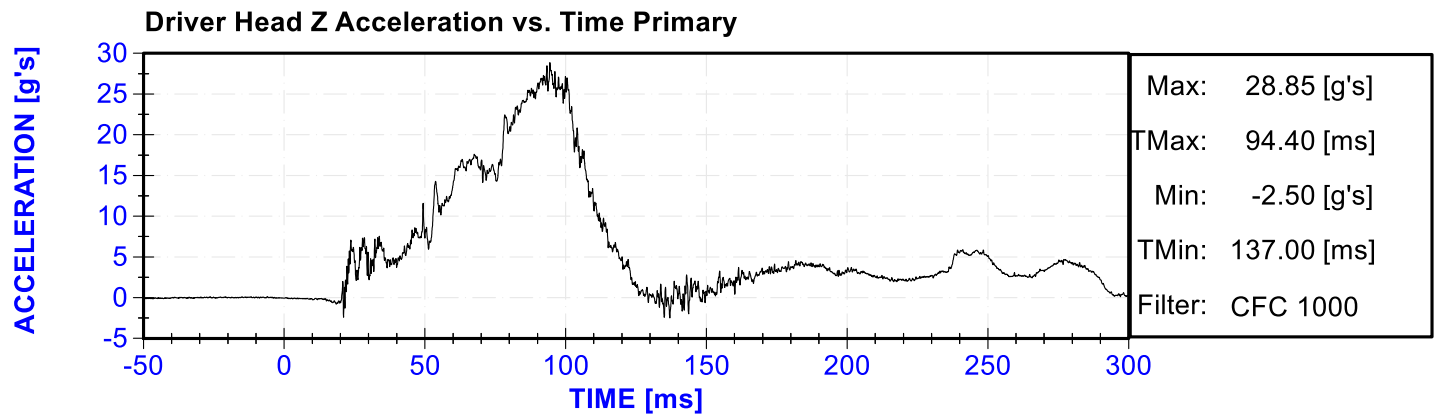
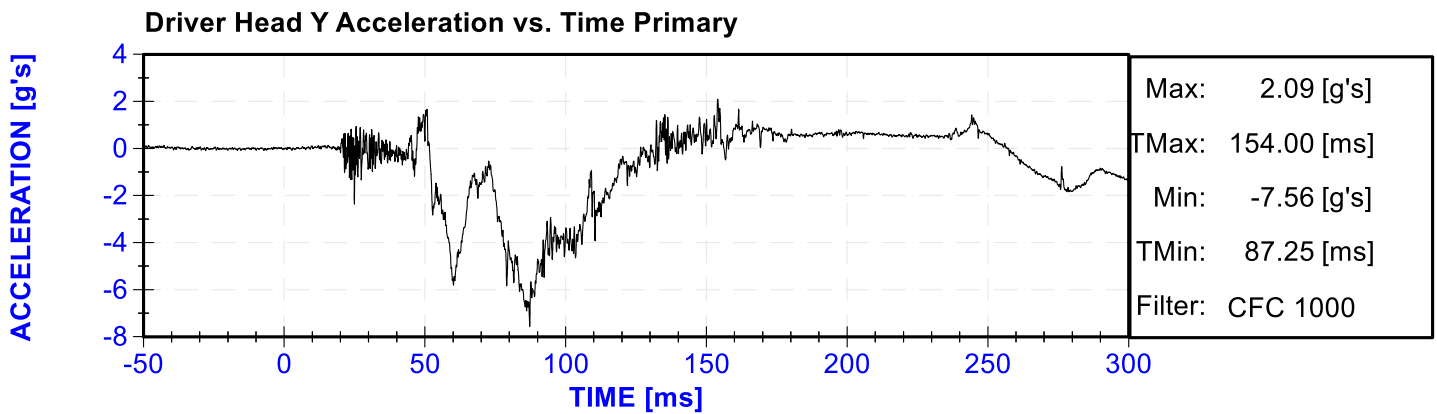
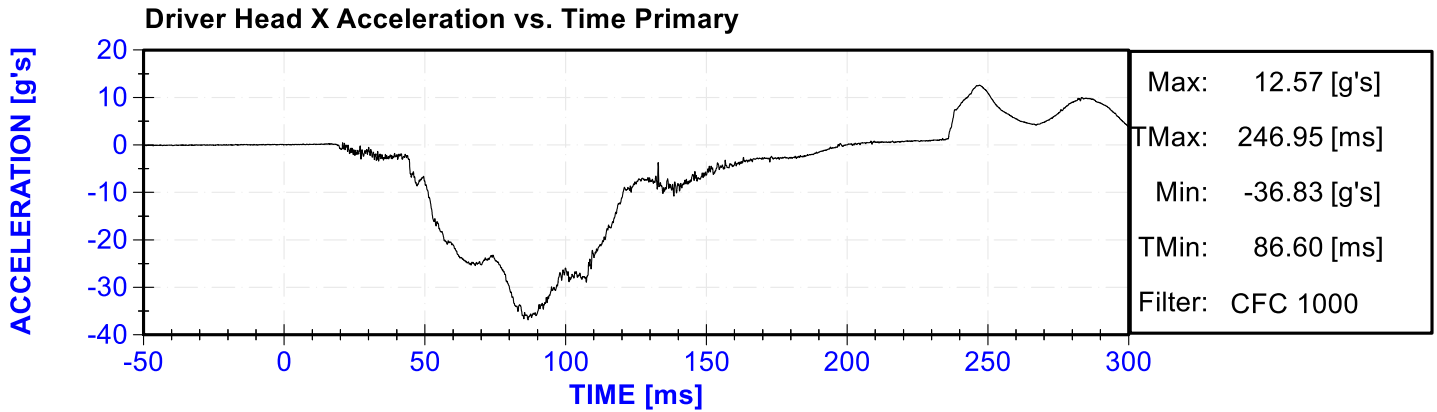
No.	Description	Page
Plot 1	Driver Head X Acceleration vs. Time Primary	B-5
Plot 2	Driver Head Y Acceleration vs. Time Primary	B-5
Plot 3	Driver Head Z Acceleration vs. Time Primary	B-5
Plot 4	Driver Head Resultant Acceleration vs. Time Primary	B-5
Plot 5	Driver Chest X Deflection vs. Time	B-6
Plot 6	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

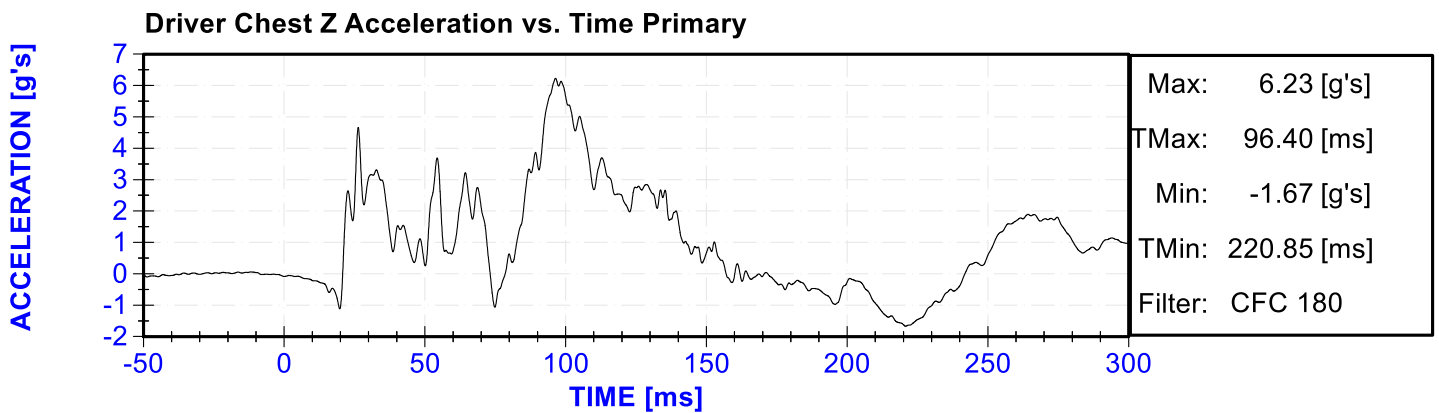
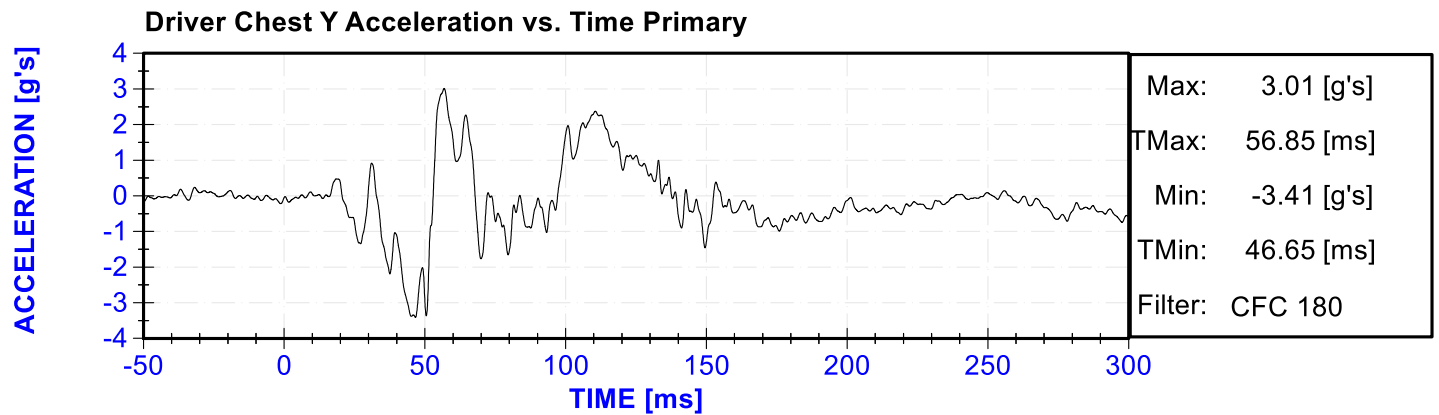
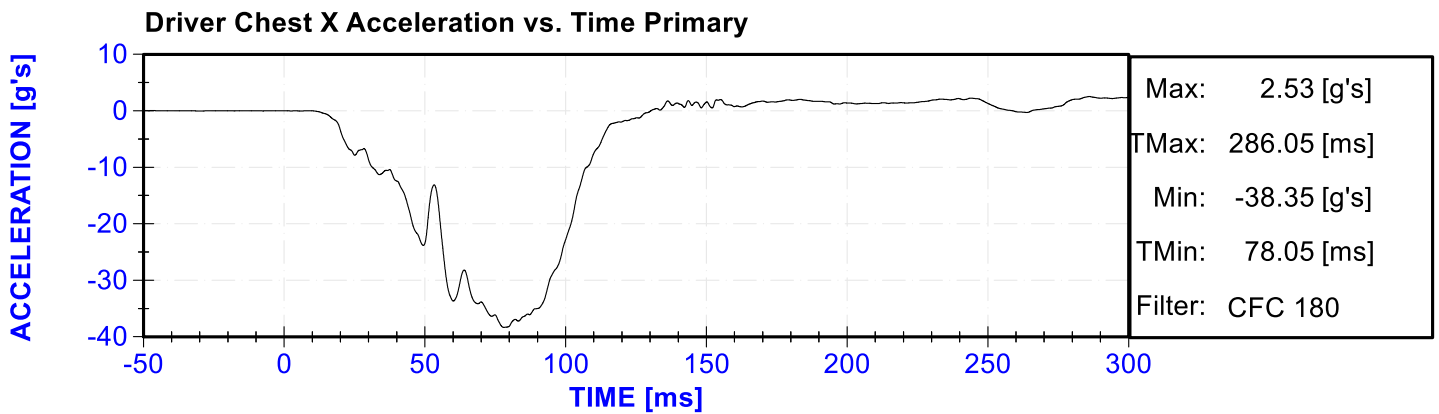
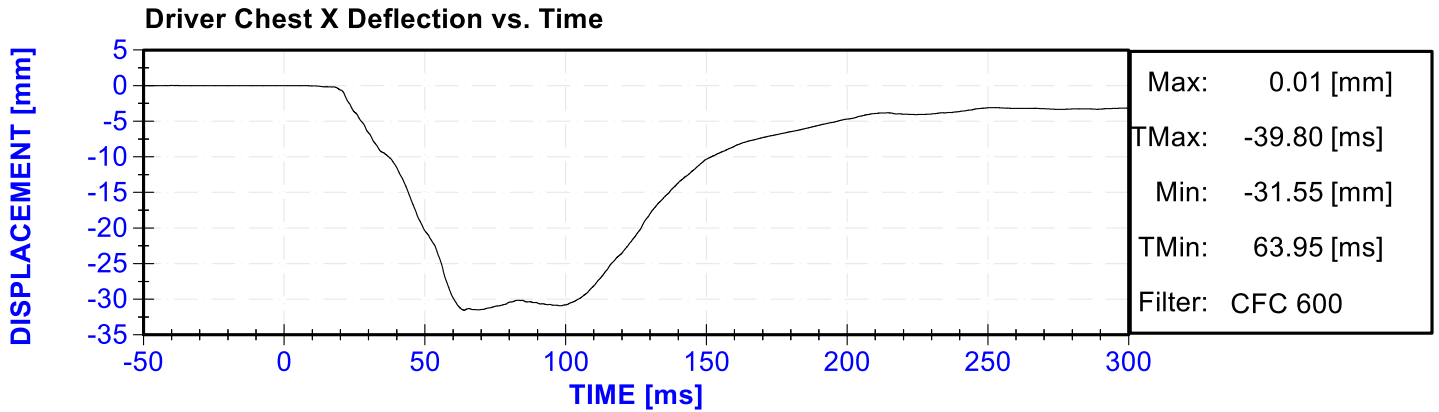
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.NHTSA.gov

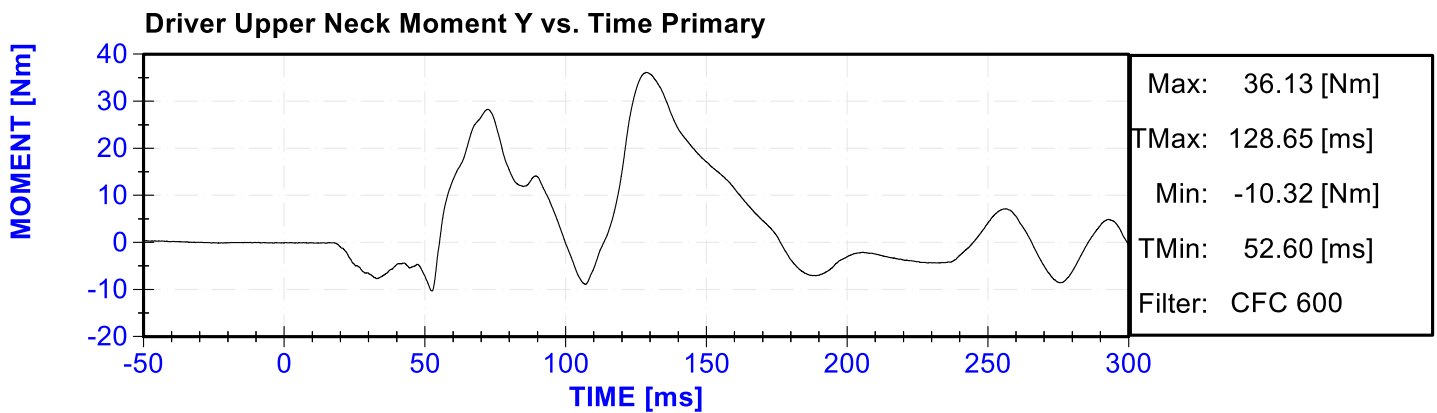
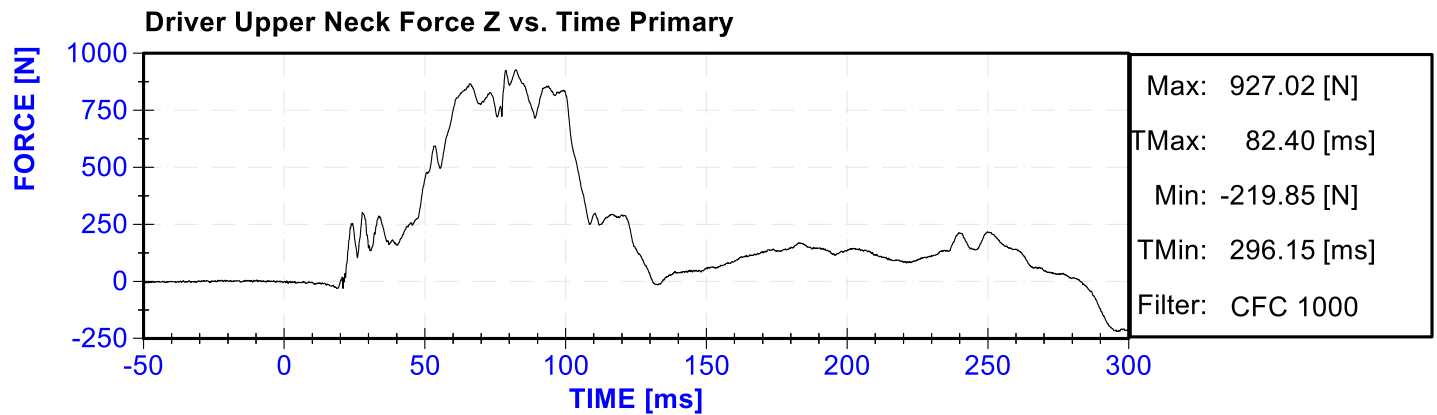
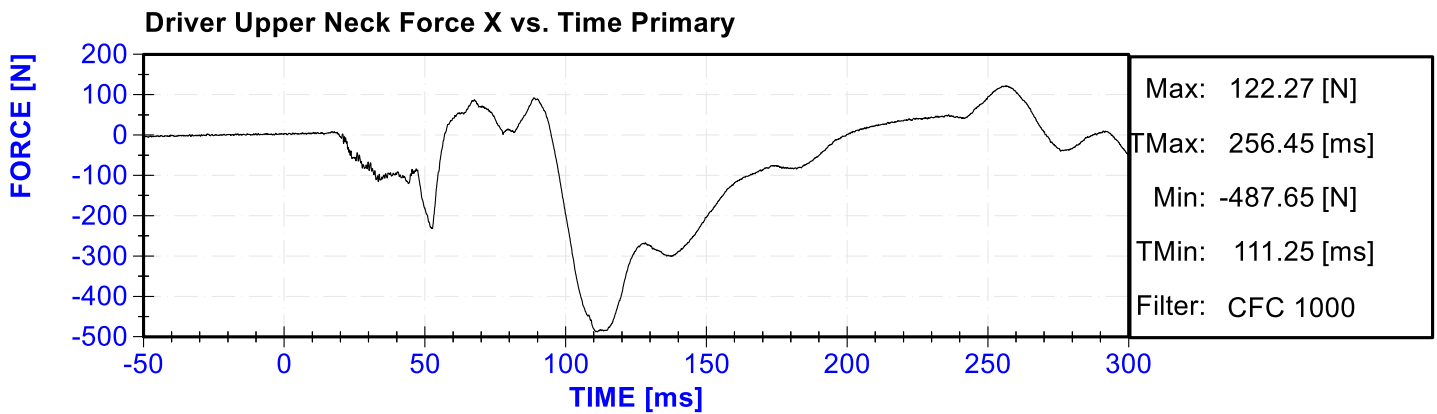
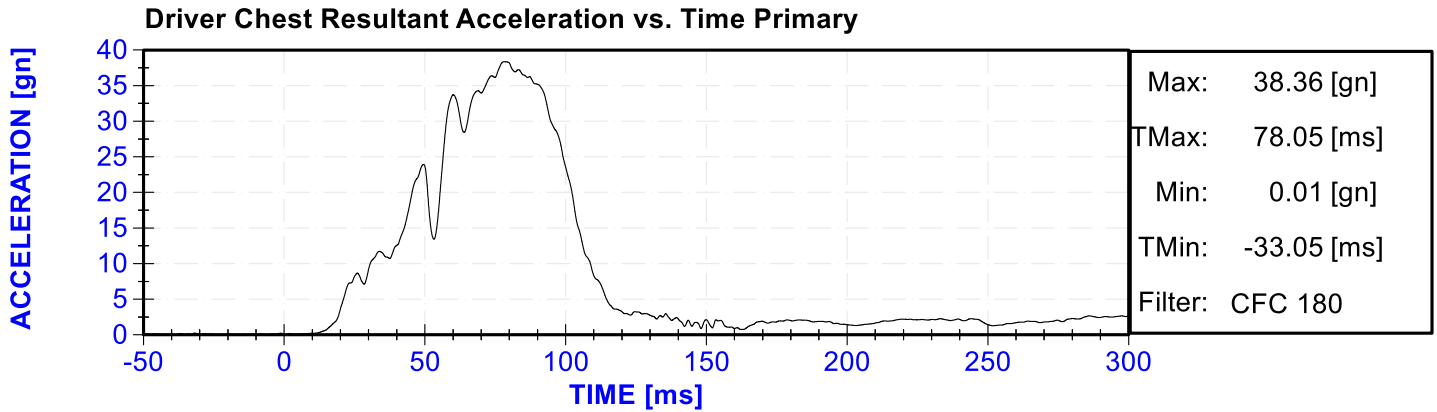
Driver Head X Acceleration Redundant
 Driver Head Y Acceleration Redundant
 Driver Head Z Acceleration Redundant
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Acceleration Redundant
 Driver Chest Y Acceleration Redundant
 Driver Chest Z Acceleration 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

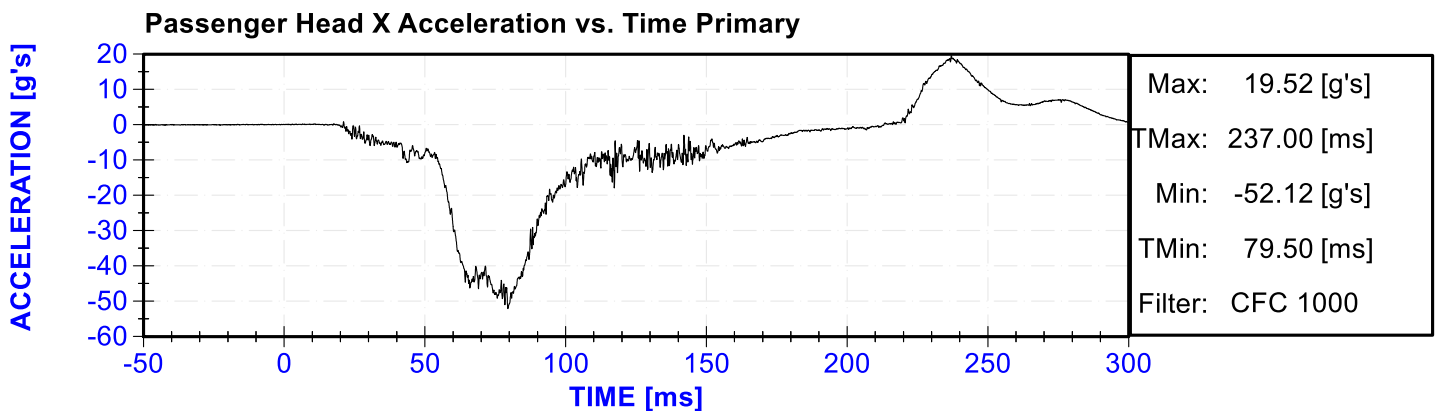
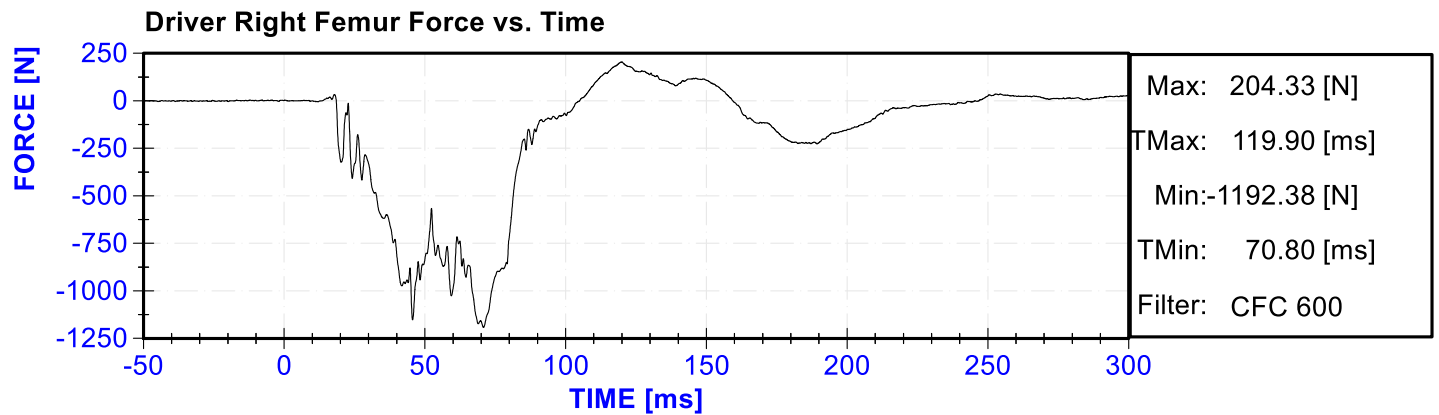
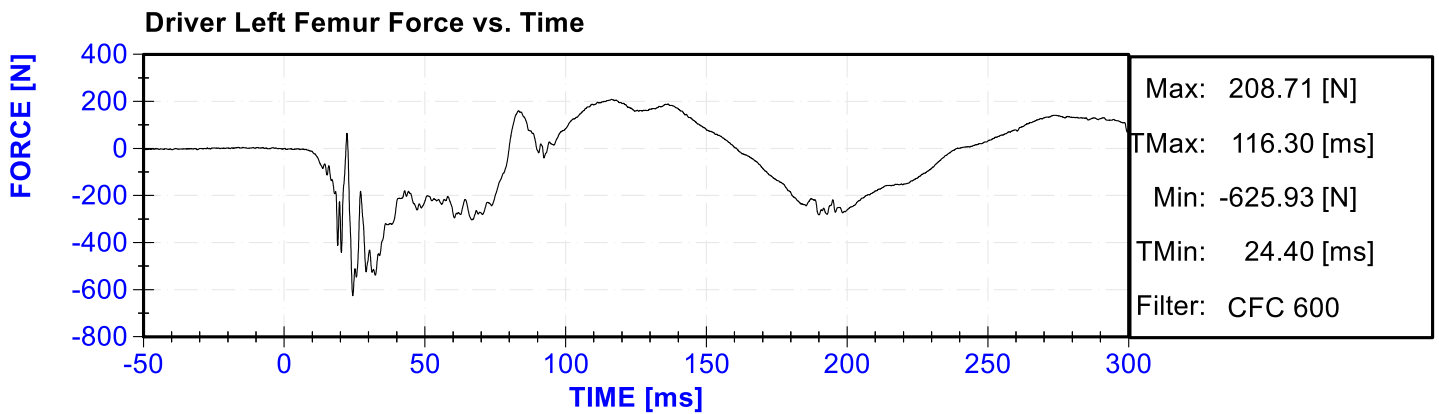
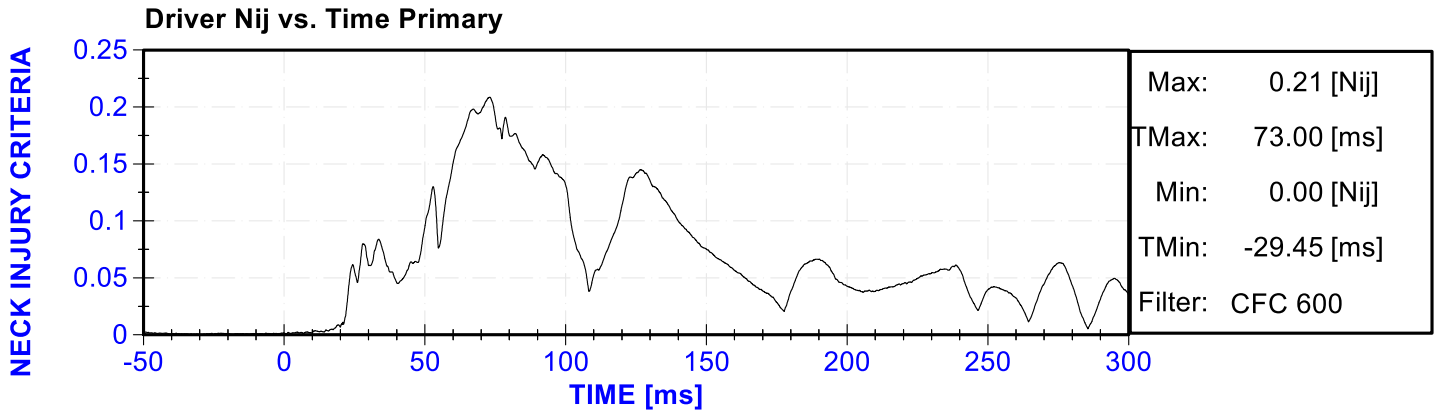
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver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

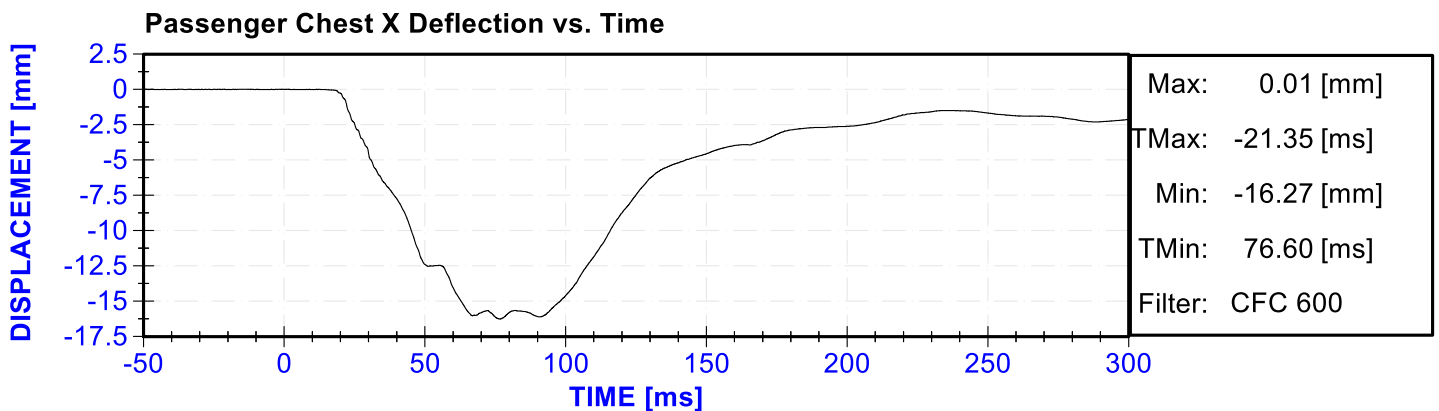
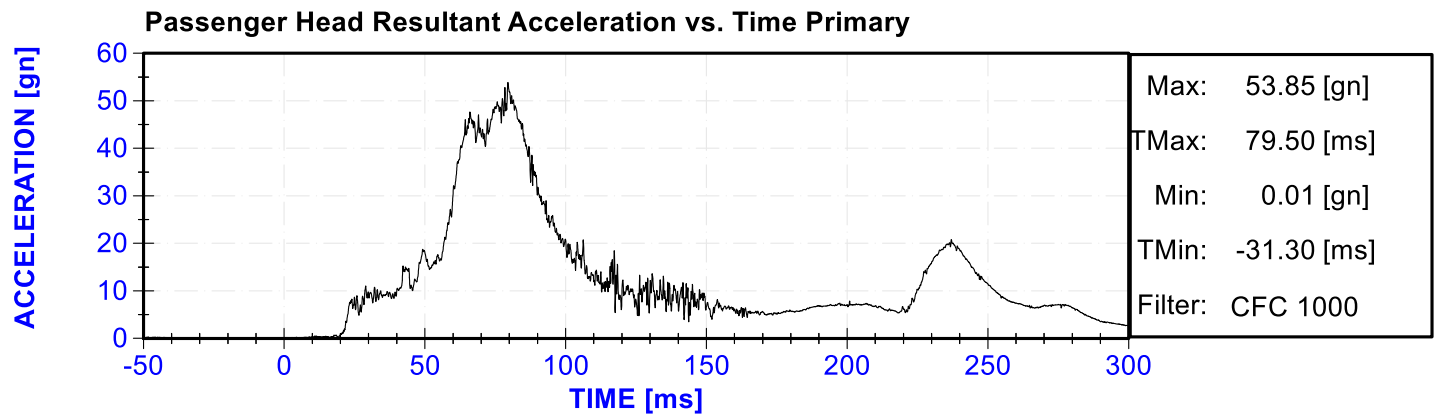
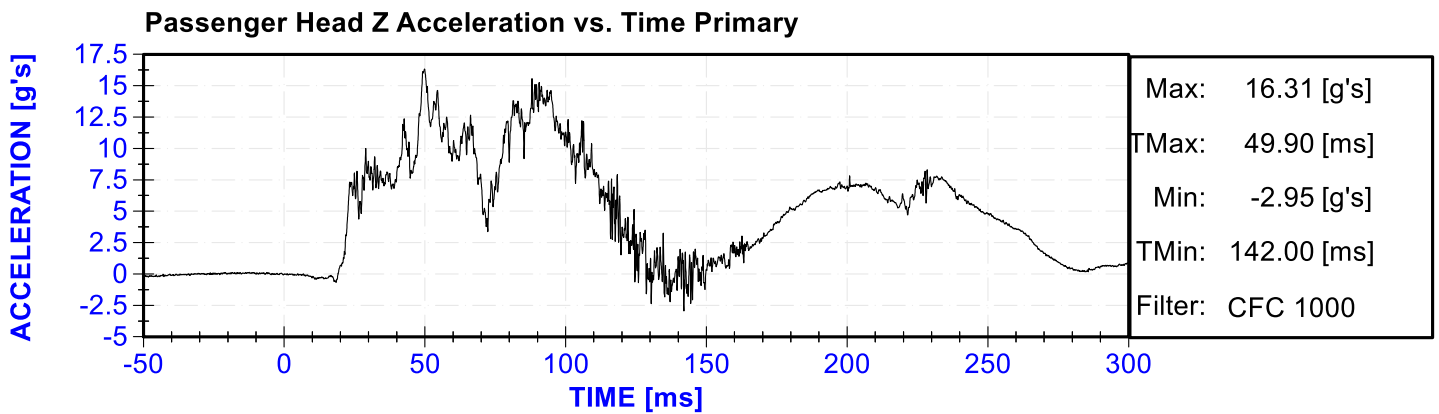
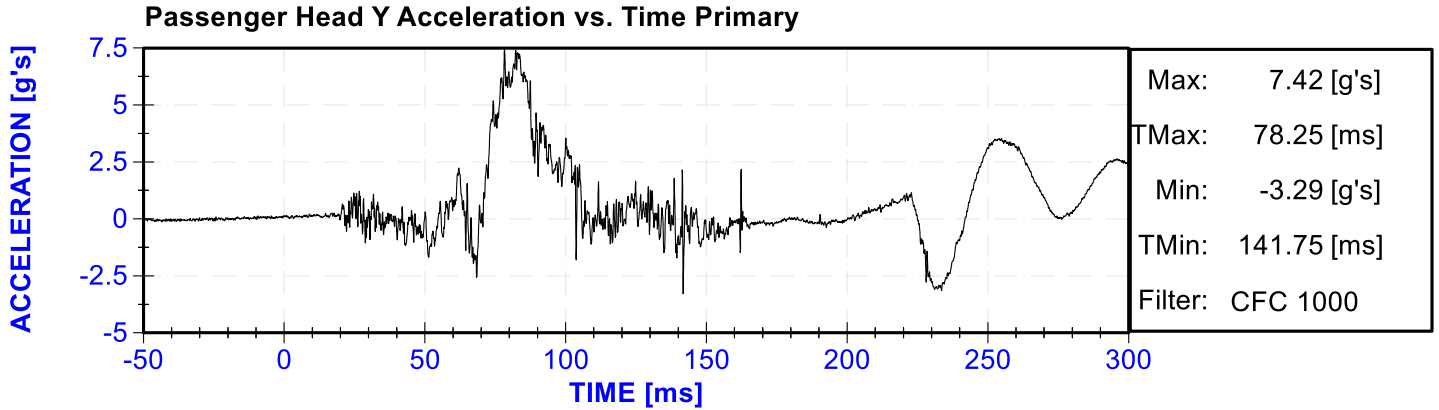
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Shoulder Belt Force
Passenger Lap Belt Force
Passenger Head Angular Velocity X
Passenger Head Angular Velocity Y
Passenger Head Angular Velocity Z
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right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

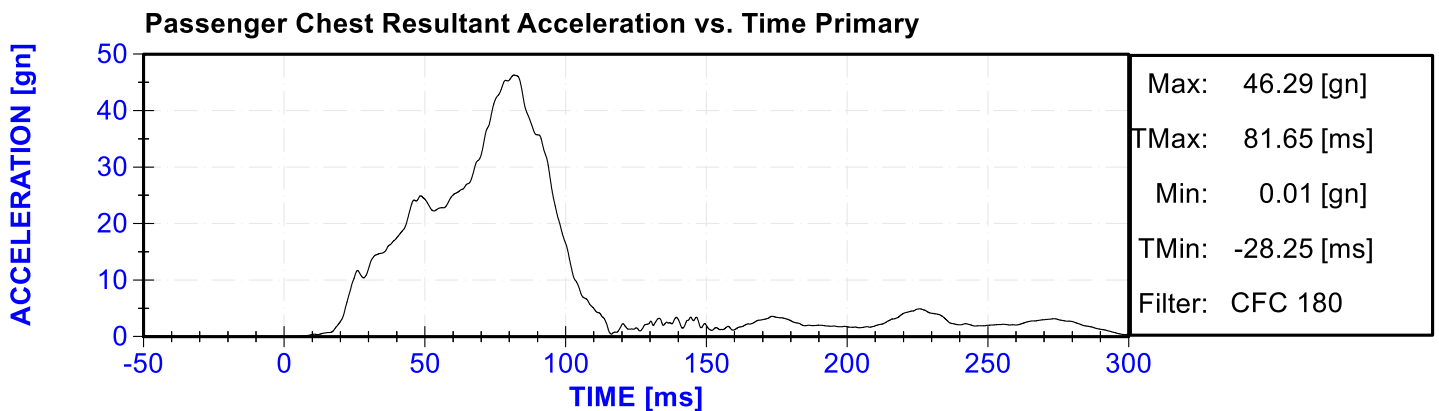
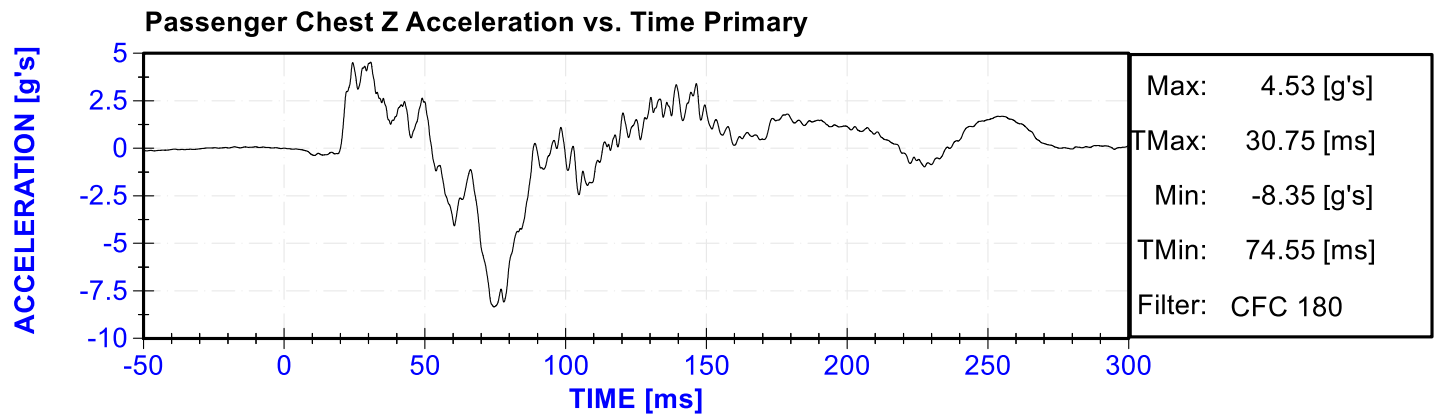
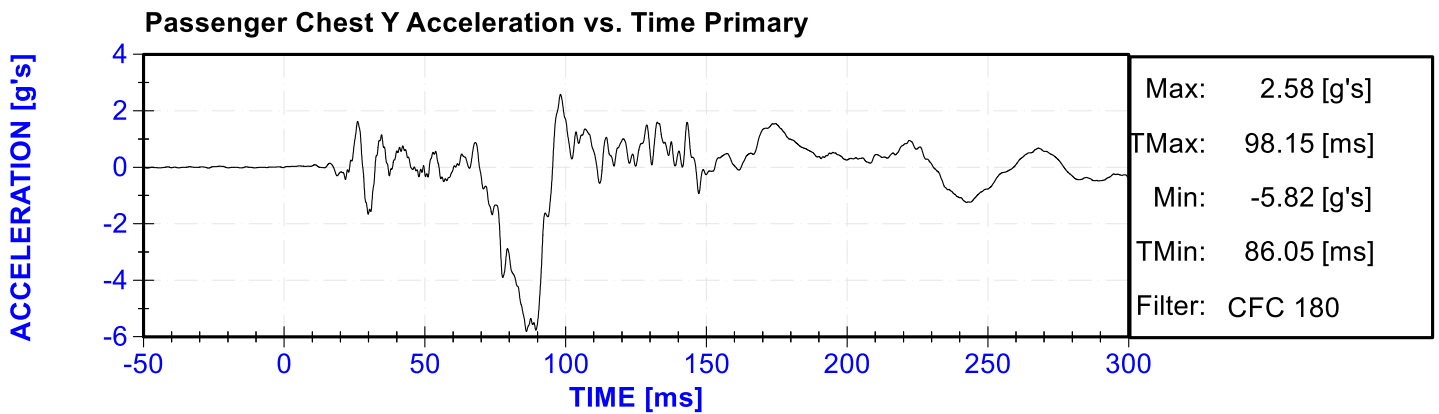
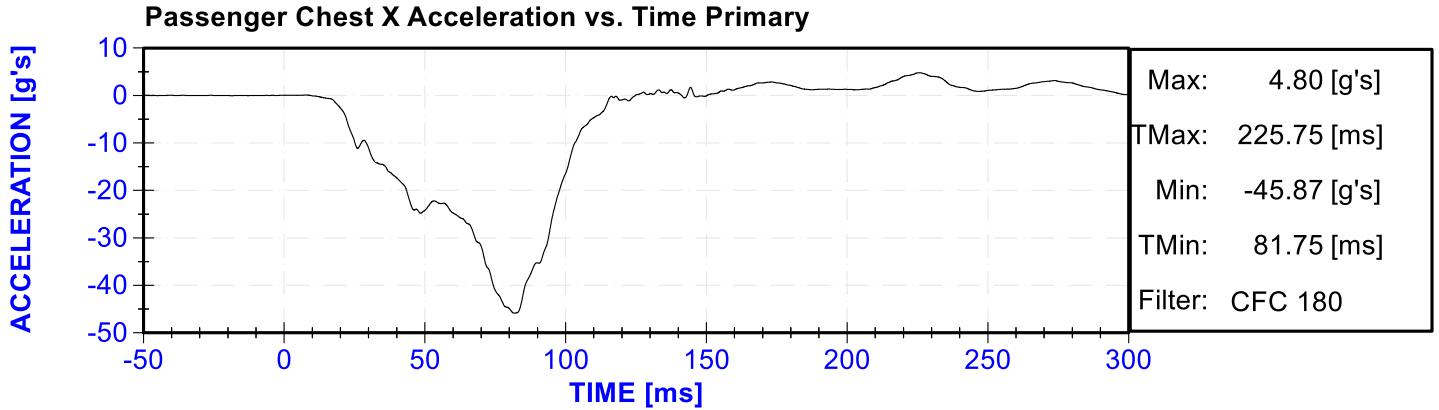


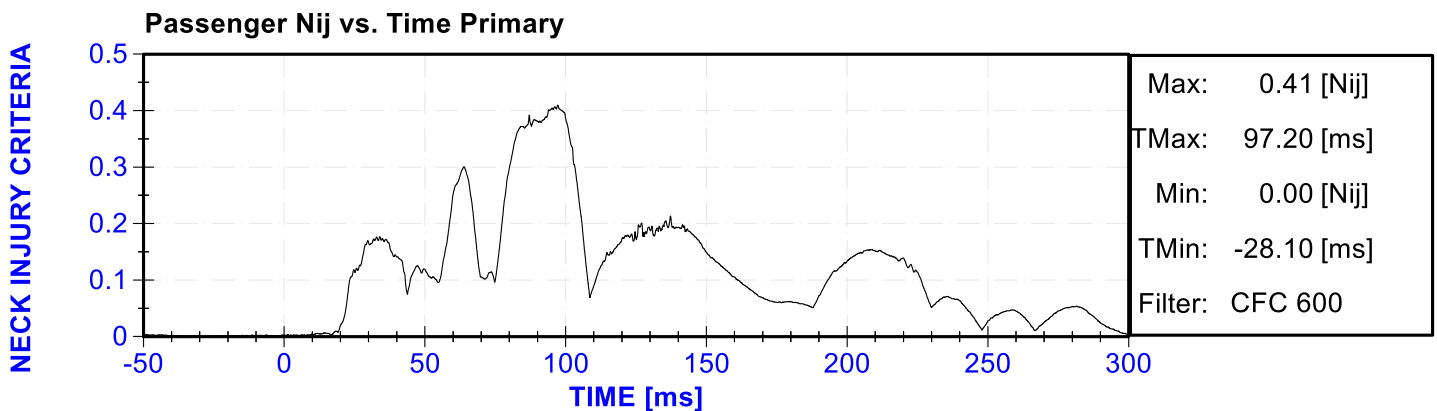
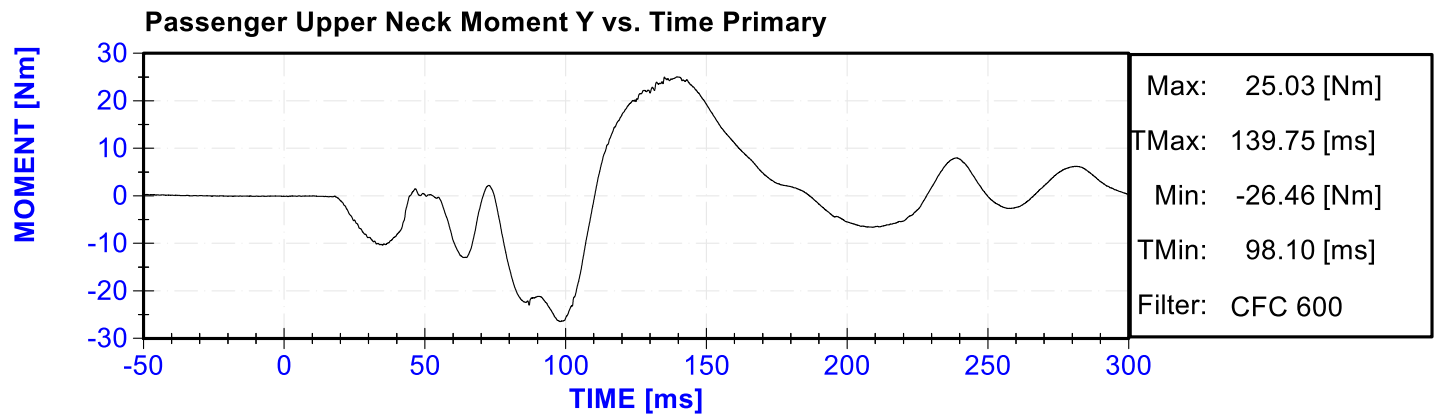
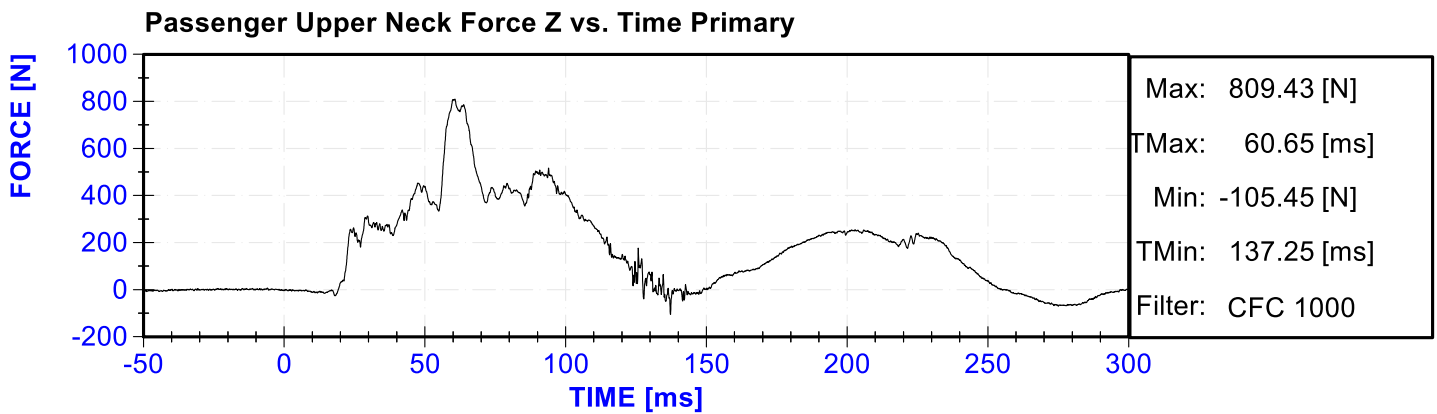
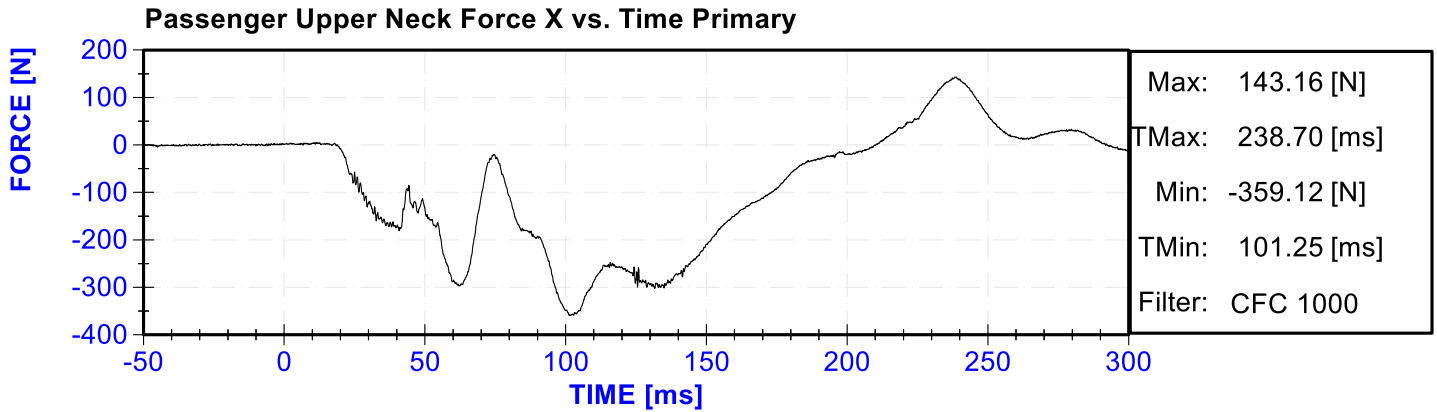


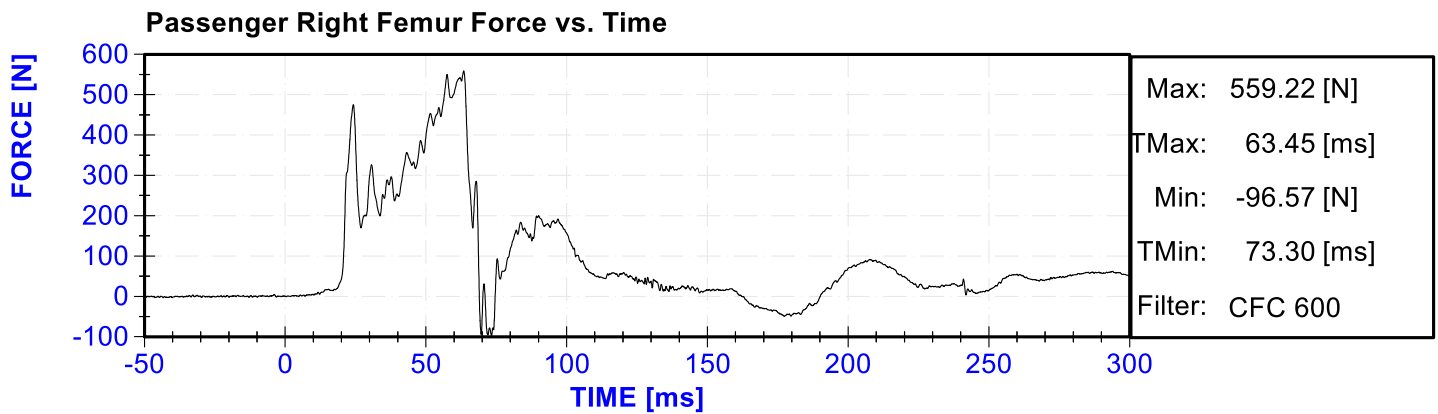
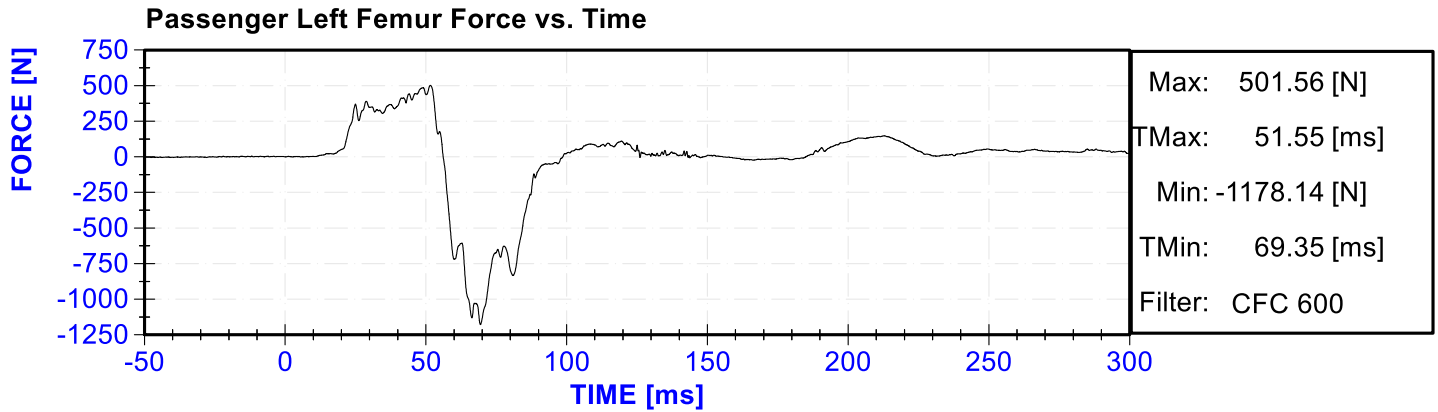












APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 142

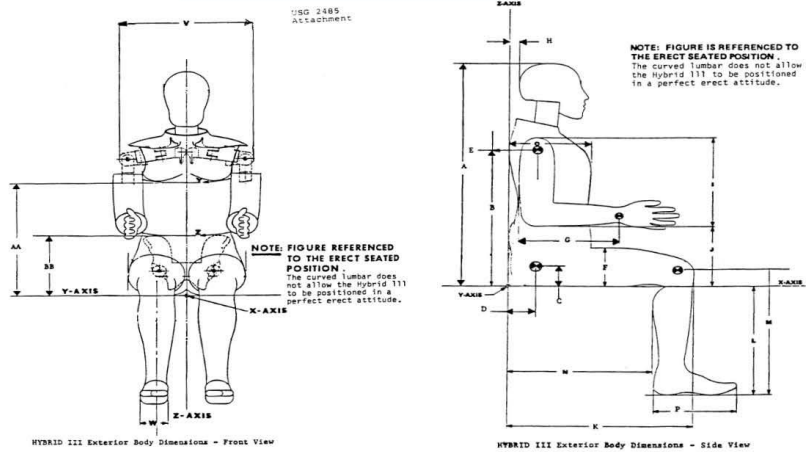


External Measurements - Hybrid 3 - 50th Male

Technician: K. Brogan

Date: 01/31/2022

Dummy Serial Number: 142



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.7	Pass
B	Shoulder Pivot Height	19.9	20.5	20.3	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	3.5	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	13.4	Pass
J	Elbow Rest Height	7.5	8.3	8.1	Pass
K	Buttock to Knee Length	22.8	23.8	23.2	Pass
L	Popliteal Height	16.9	17.9	17.5	Pass
M	Knee Pivot Height	19.1	19.7	19.4	Pass
N	Buttock Popliteal Length	17.8	18.8	18.3	Pass
O	Chest Depth without Jacket	8.4	9.0	8.6	Pass
P	Foot Length (right)	9.9	10.5	10.1	Pass
V	Shoulder Breadth	16.3	17.2	16.8	Pass
W	Foot Breadth	3.6	4.2	3.8	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.8	Pass
Z	Waist Circumference	32.9	34.1	33.7	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

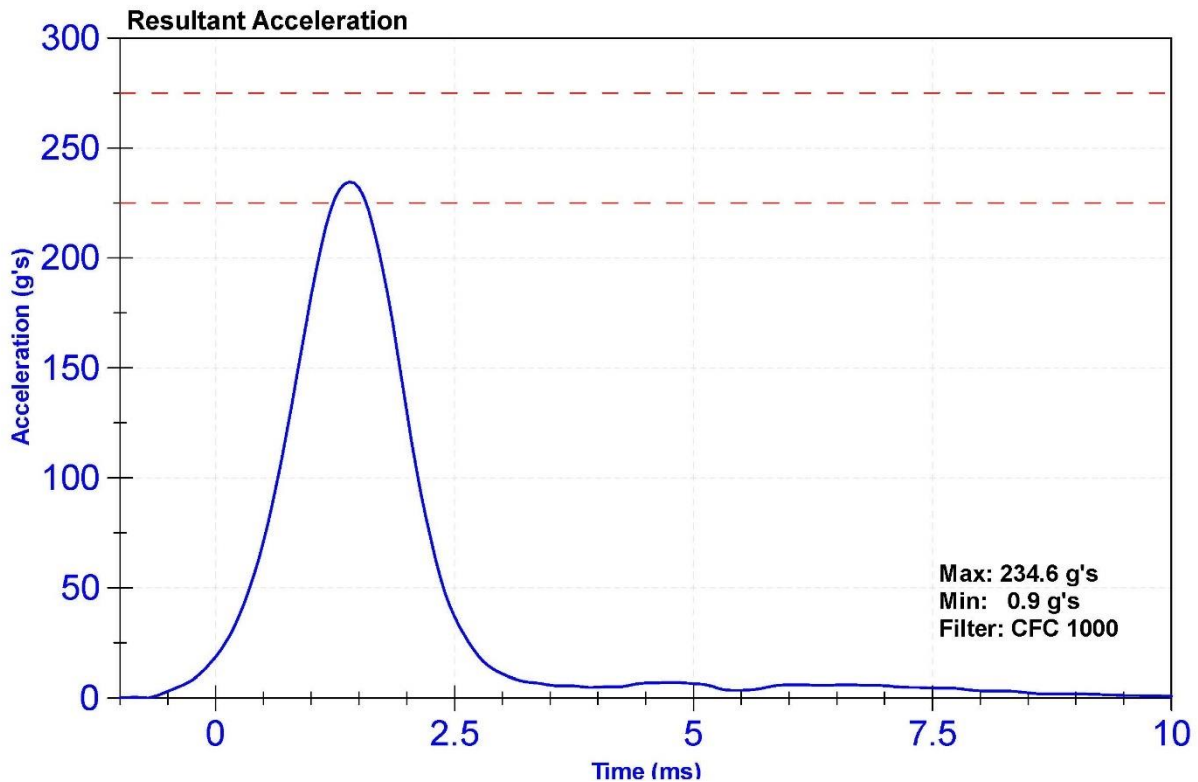
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

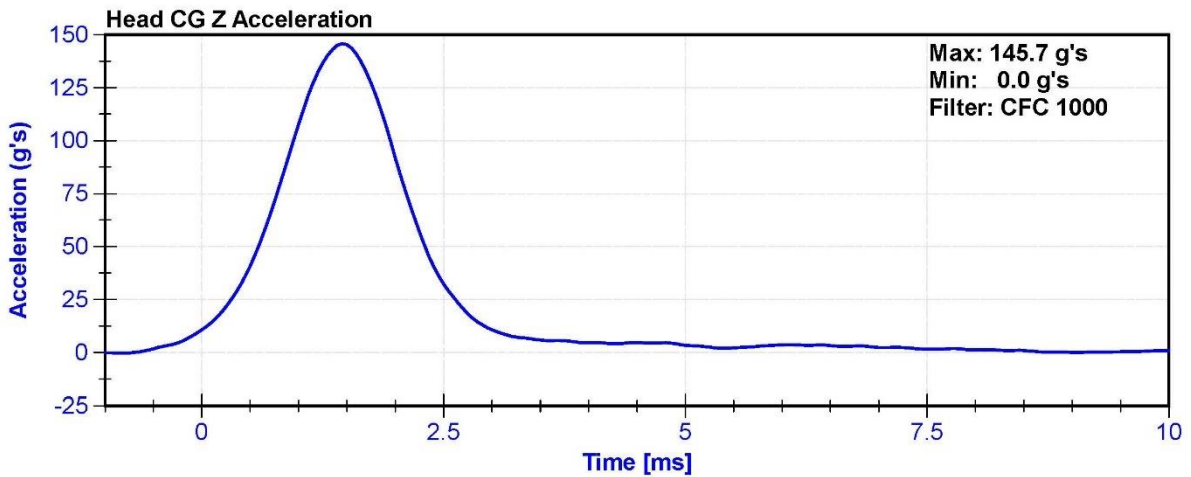
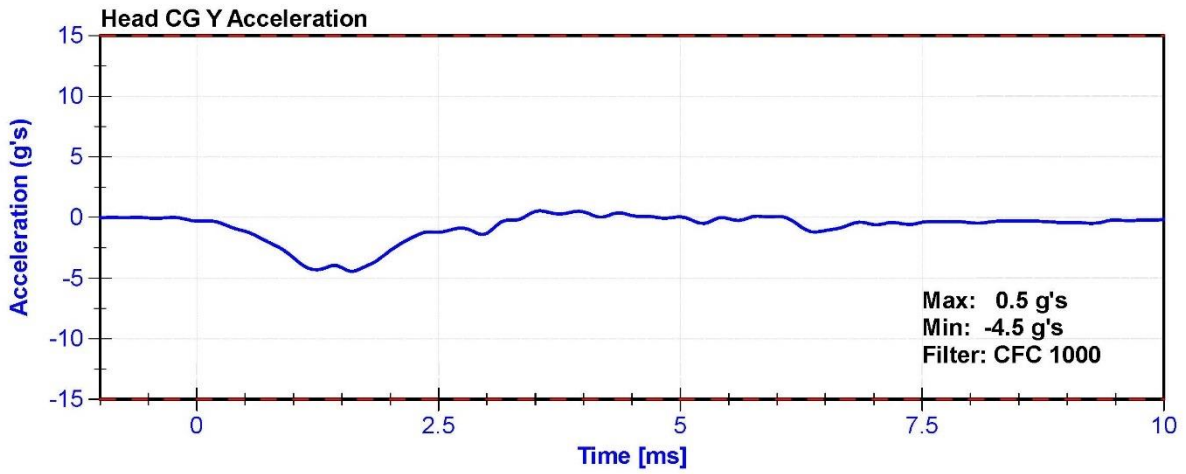
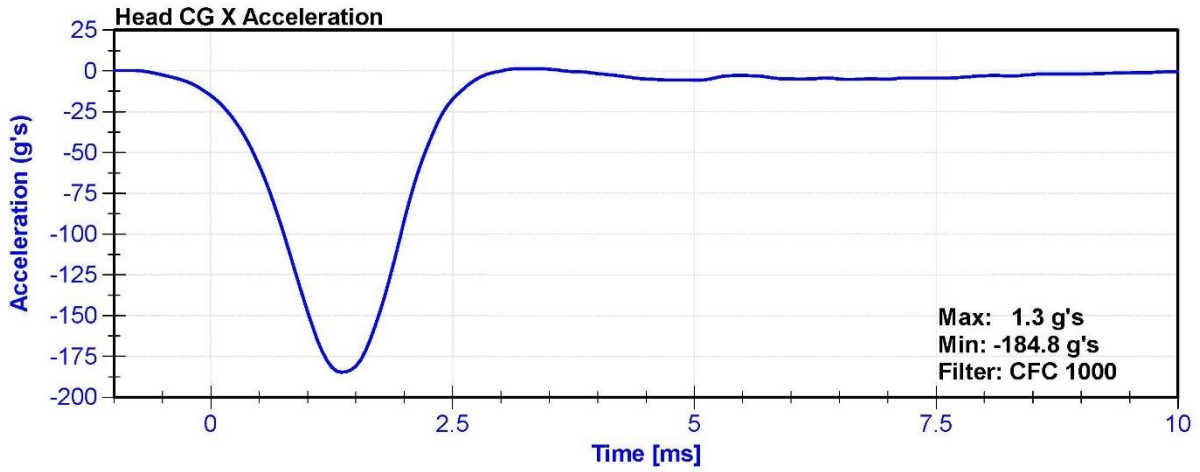
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.1	Pass
Humidity	10	70	%	12.8	Pass
Resultant Acceleration	225	275	g's	234.6	Pass
Oscillation	0	10	%	3.0	Pass
Lateral Acceleration	-15	15	g's	-4.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P51681	11/16/2021	5/15/2022
Y Accelerometer	Endevco	P64151	11/16/2021	5/15/2022
Z Accelerometer	Endevco	P52114	11/16/2021	5/15/2022





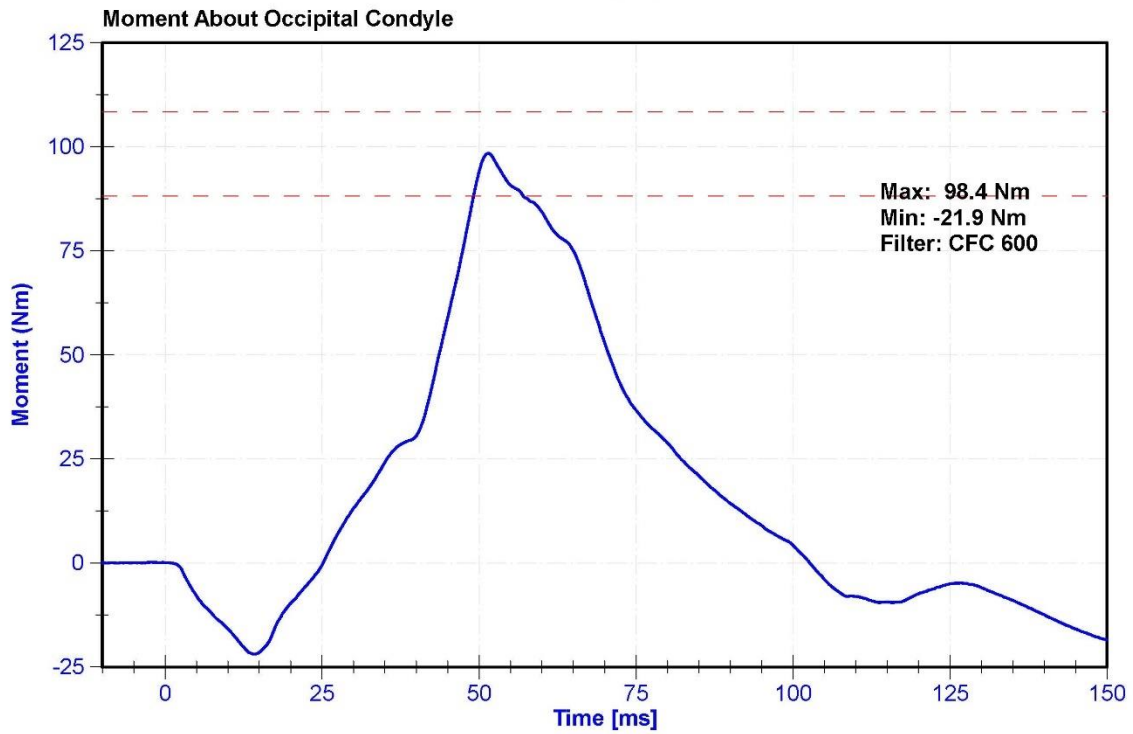
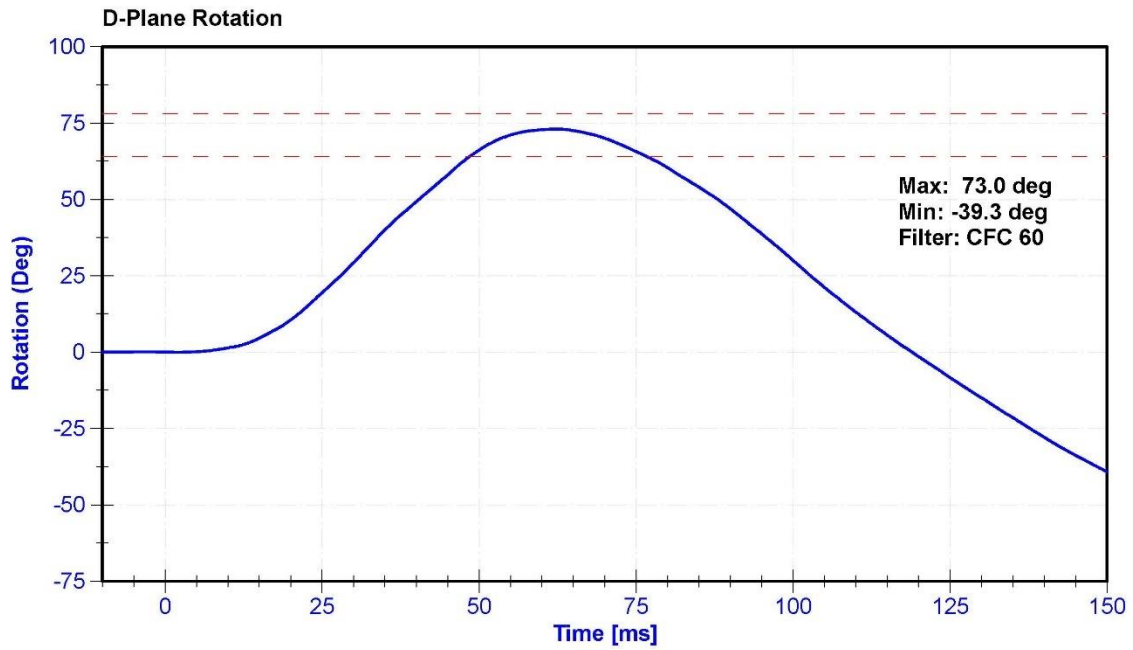
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

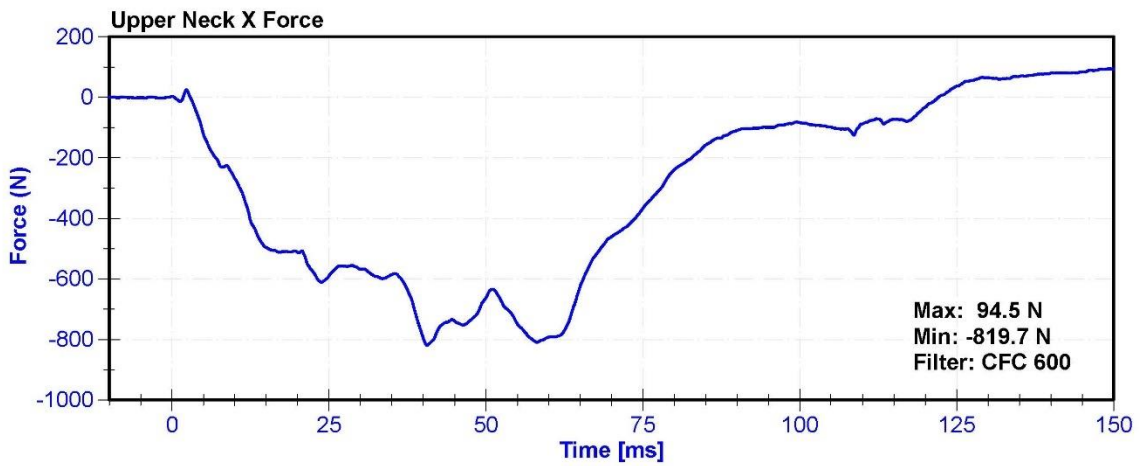
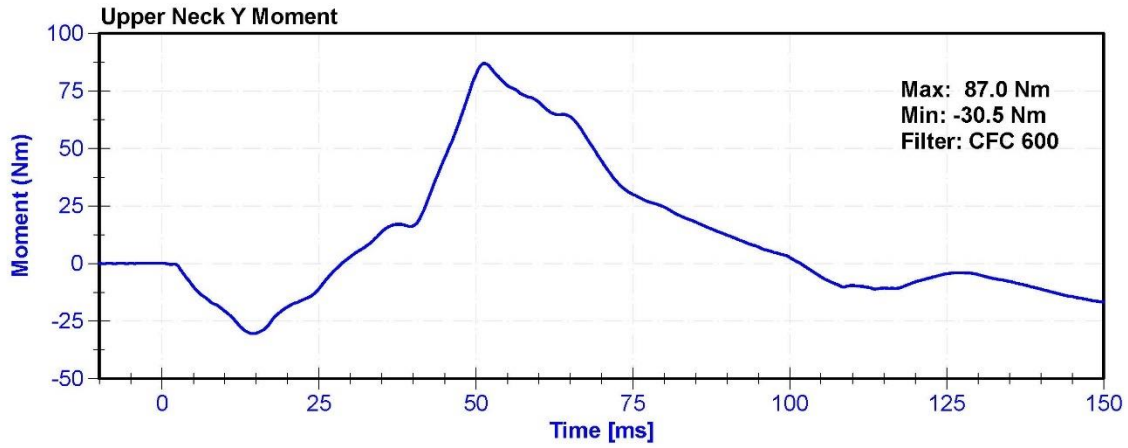
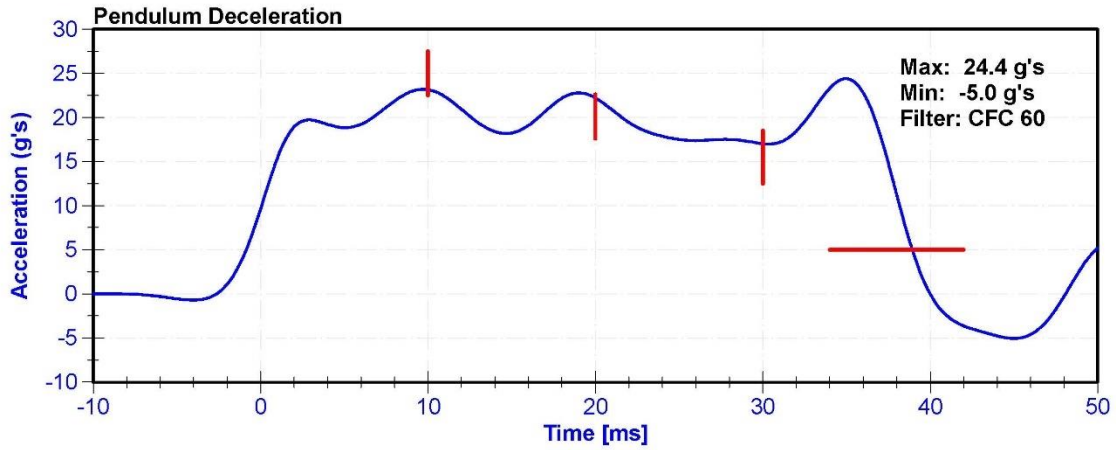
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	18.3	Pass
Velocity	6.89	7.13	m/s	6.972	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	23.16	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	22.21	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	17.00	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	24.4	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	38.9	Pass
Maximum D Plane Rotation	64	78	deg	73.0	Pass
Time to Maximum Rotation	57	64	ms	62.3	Pass
Rotation Decay to Zero	113	127	ms	118.9	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	98.36	Pass
Time to Maximum Moment	47	58	ms	51.4	Pass
Moment Decay to Zero	97	107	ms	102.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231CT	10/28/2021	10/28/2022
Pendulum Potentiometer	ETI	LABPOT1	5/7/2021	5/7/2022
Condyle Potentiometer	ETI	LABPOT2	5/7/2021	5/7/2022
Upper Neck Load Cell	FTSS	280-FX	9/14/2021	9/14/2022





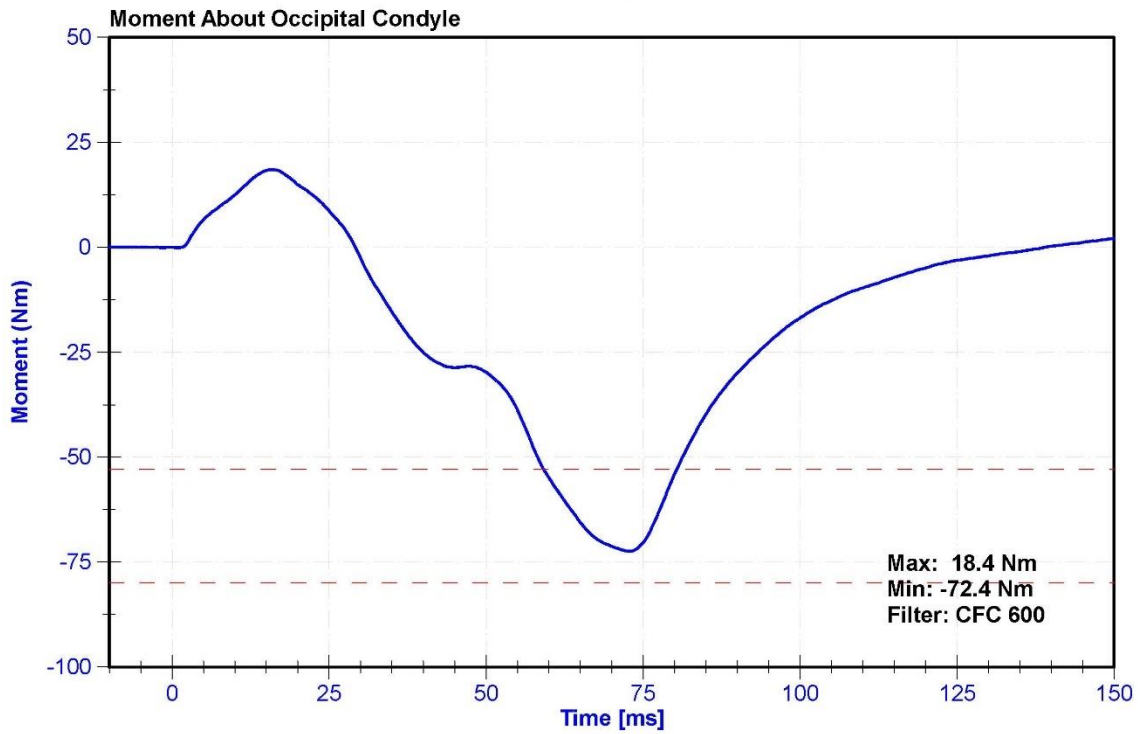
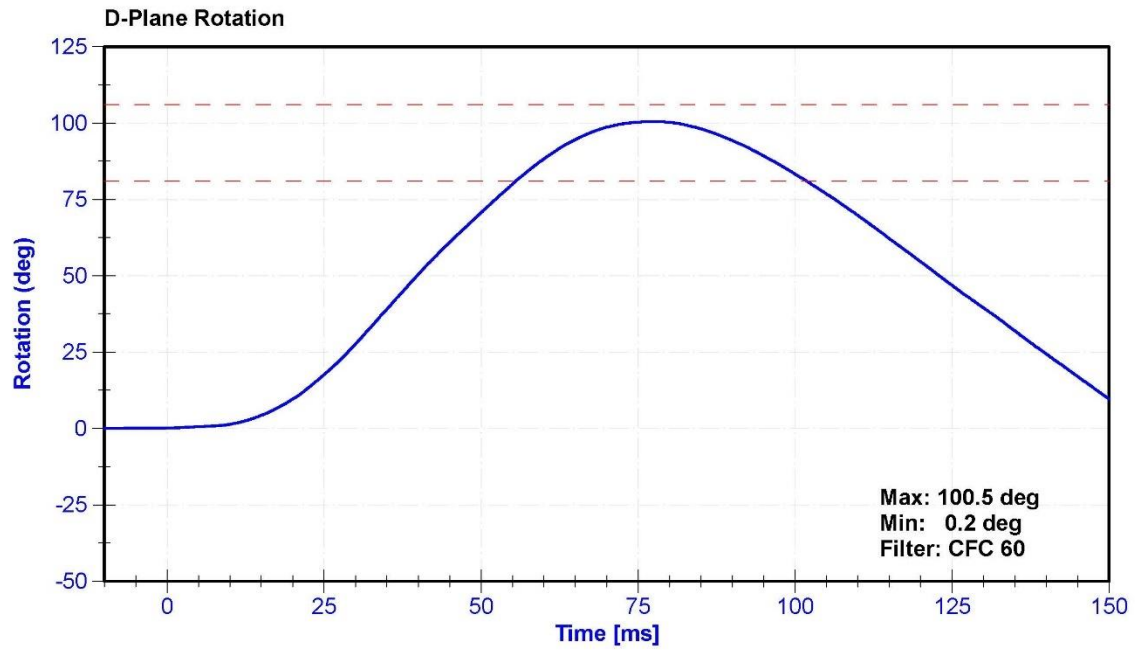
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

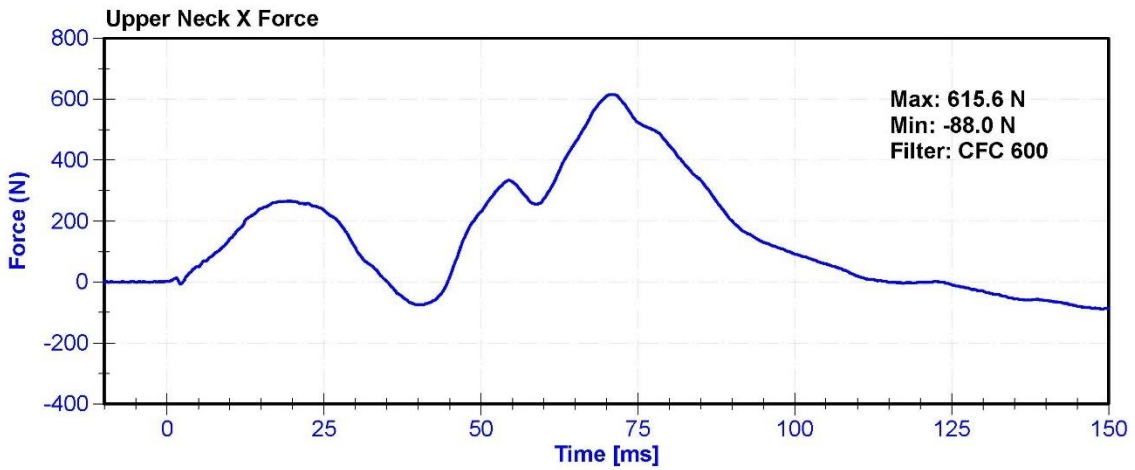
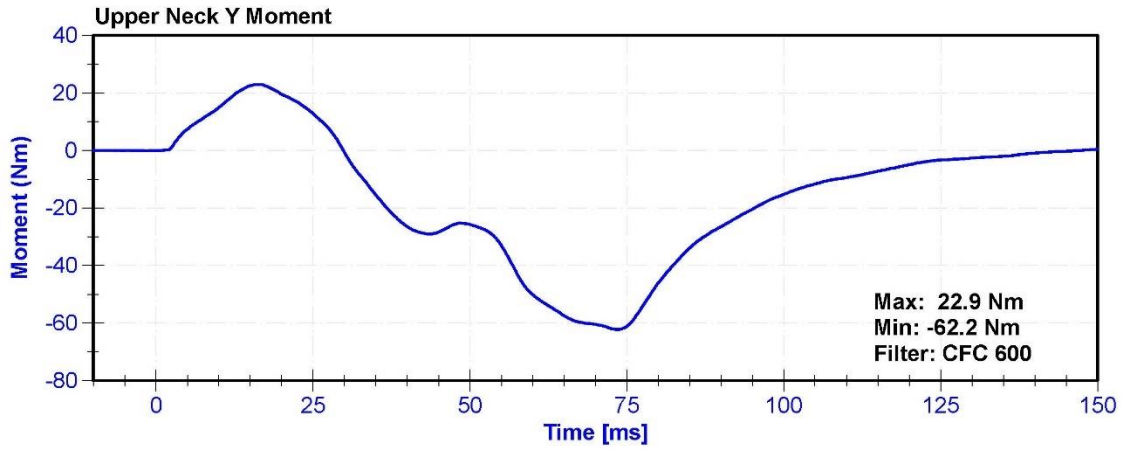
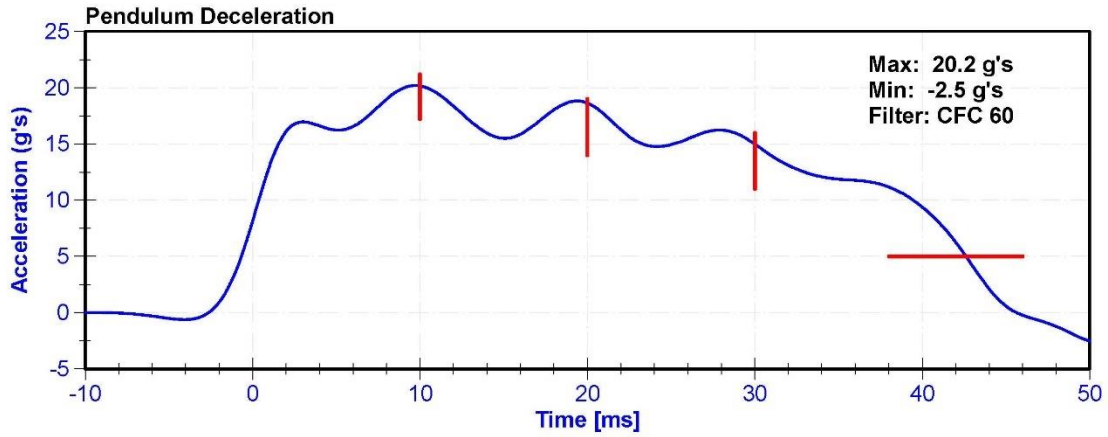
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	18.3	Pass
Velocity	5.94	6.19	m/s	6.051	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	20.17	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.7	Pass
Pendulum Deceleration at 30ms	11	16	g's	15.0	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	20.2	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	42.6	Pass
Maximum D Plane Rotation	81	106	deg	100.5	Pass
Time to Maximum Rotation	72	82	ms	77.4	Pass
Rotation Decay to Zero	147	174	ms	156.6	Pass
Minimum Moment About OC	-80	-52.9	Nm	-72.42	Pass
Time to Minimum Moment	65	79	ms	72.9	Pass
Moment Decay to Zero	120	148	ms	139.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Pendulum Potentiometer	ETI	LABPOT1	5/7/2021	5/7/2022
Condyle Potentiometer	ETI	LABPOT2	5/7/2021	5/7/2022
Upper Neck Load Cell	FTSS	280-FX	9/14/2021	9/14/2022





ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

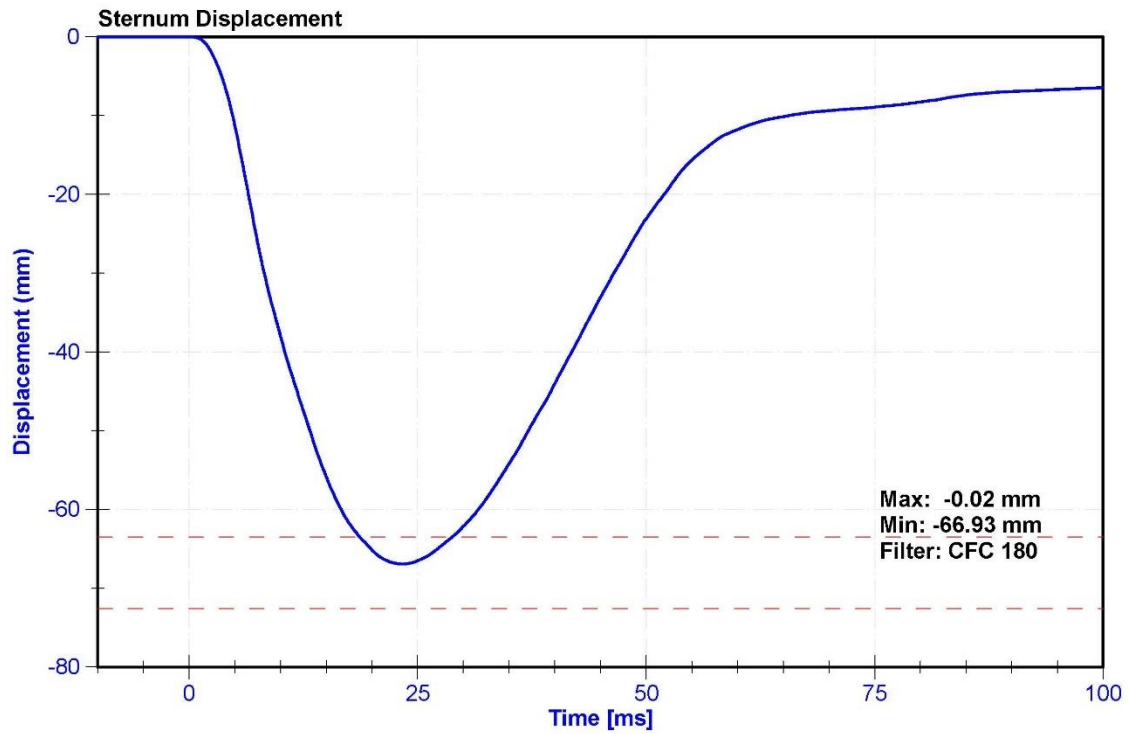
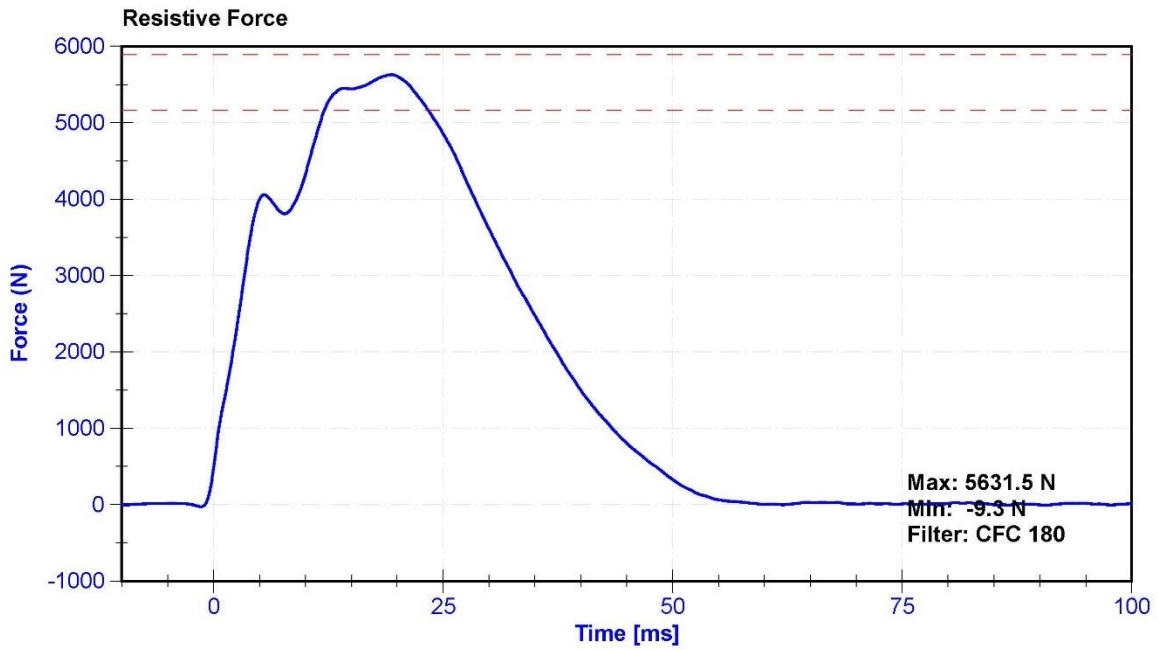
Results

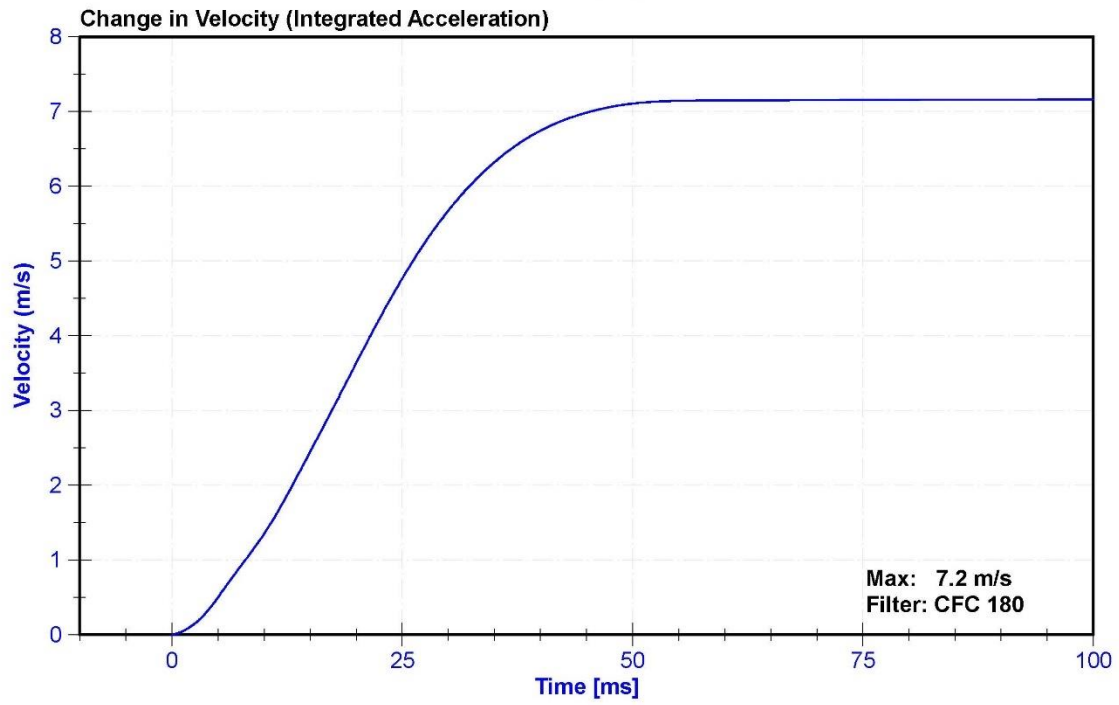
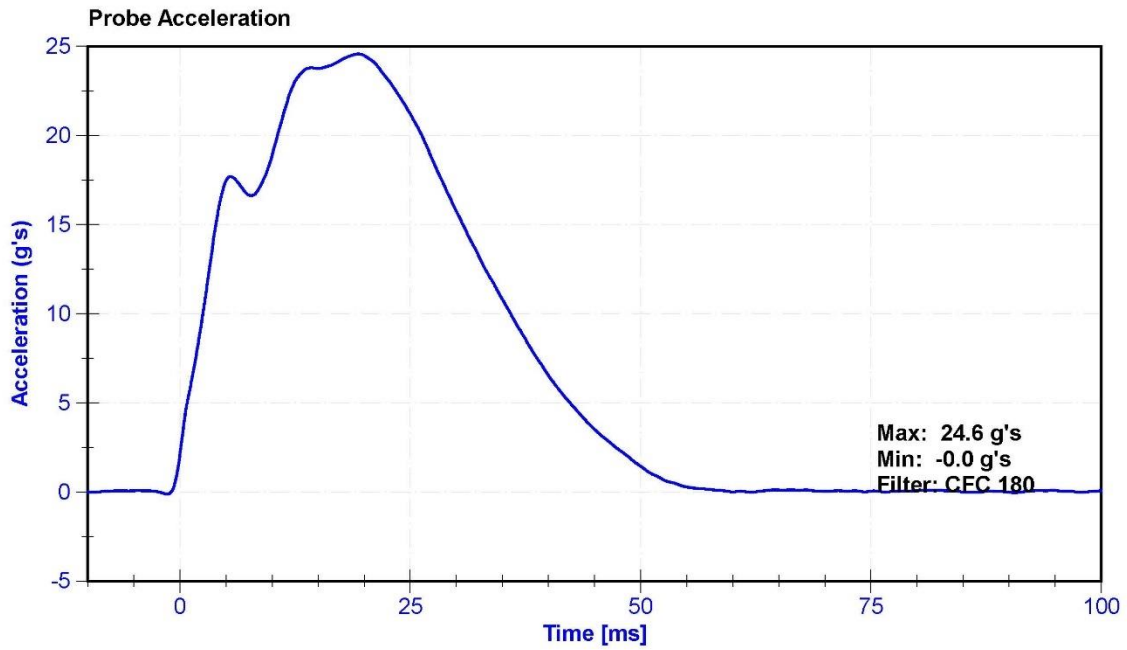
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	15.0	Pass
Velocity	6.59	6.83	m/s	6.745	Pass
Chest Displacement	-72.6	-63.5	mm	-66.93	Pass
Resistive Force	5160	5894	N	5631.5	Pass
Hysteresis	65	85	%	71.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Chest Potentiometer	Servo	142GFE	11/16/2021	5/17/2022







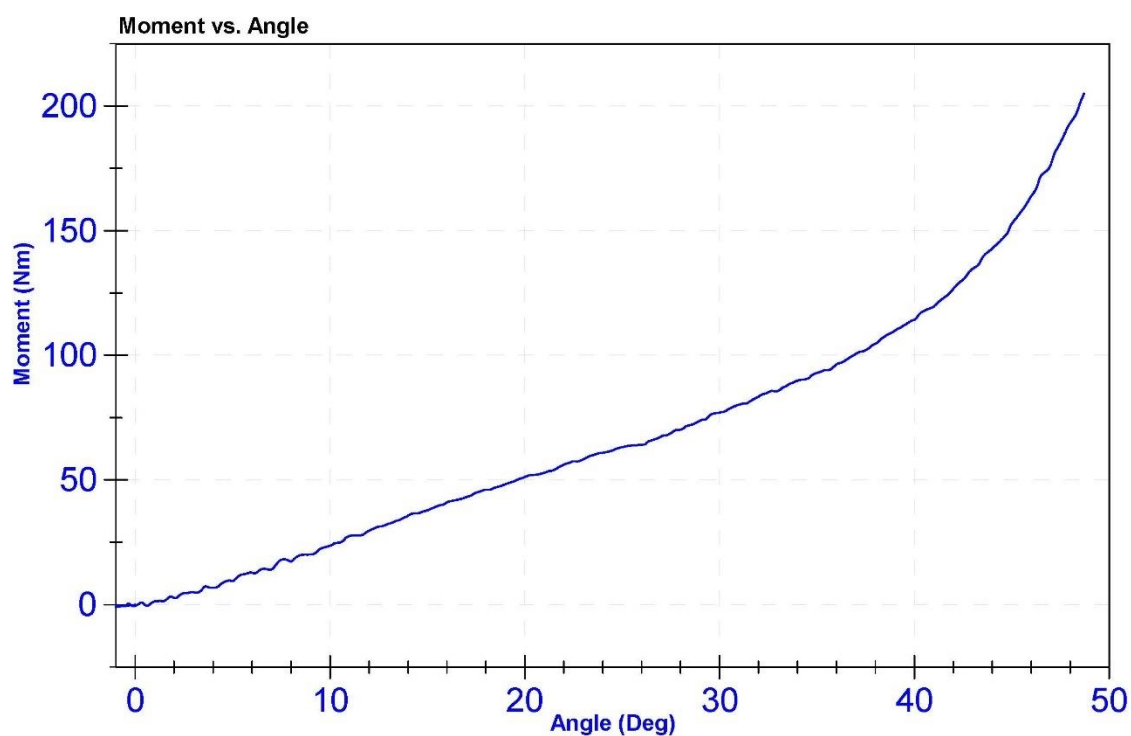
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.1	Pass
Humidity	10	70	%	12.8	Pass
Average Velocity	5	10	deg/s	7.8	Pass
Angle at 203Nm	40	50	deg	48.6	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	DS-0008	2021-09-27	2022-09-27
Load Cell	Key Trans 2301-02	LC-115 My	2021-08-13	2022-08-13



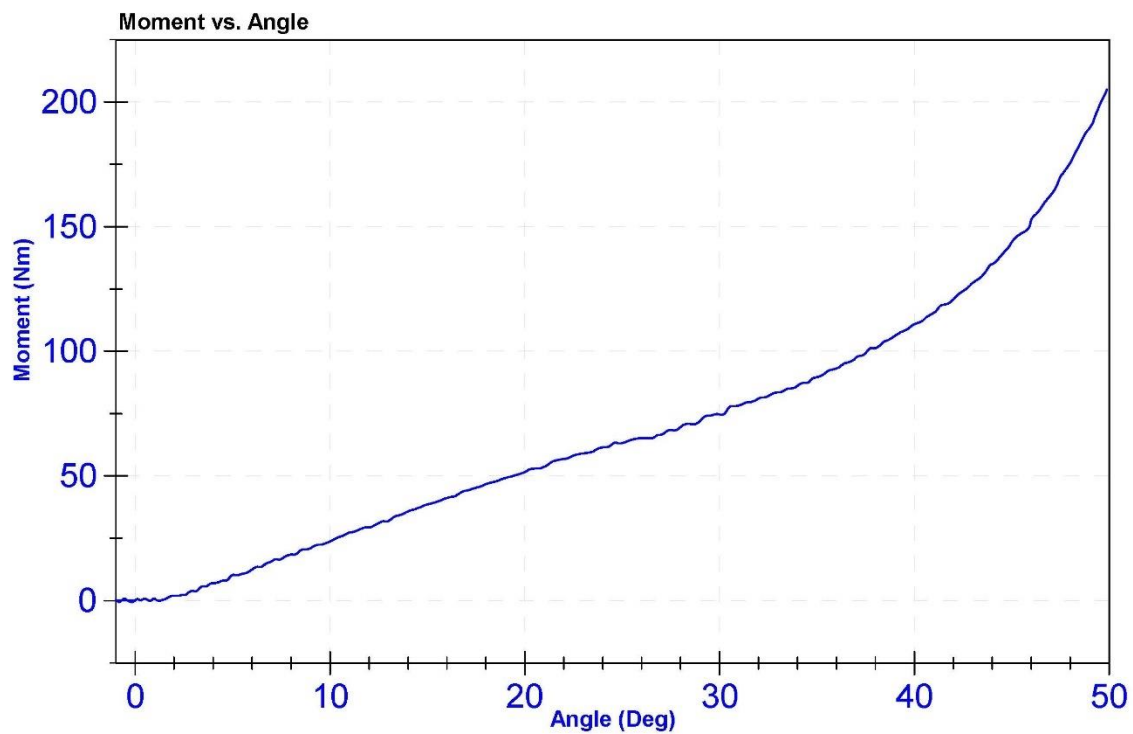
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.1	Pass
Humidity	10	70	%	12.8	Pass
Average Velocity	5	10	deg/s	7.5	Pass
Angle at 203Nm	40	50	deg	49.8	Pass
Moment at 30 degrees	0	94.9	Nm	74.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI	DS-0008	2021-09-27	2022-09-27
Load Cell	Key Trans 2301-02	LC-115 My	2021-08-13	2022-08-13



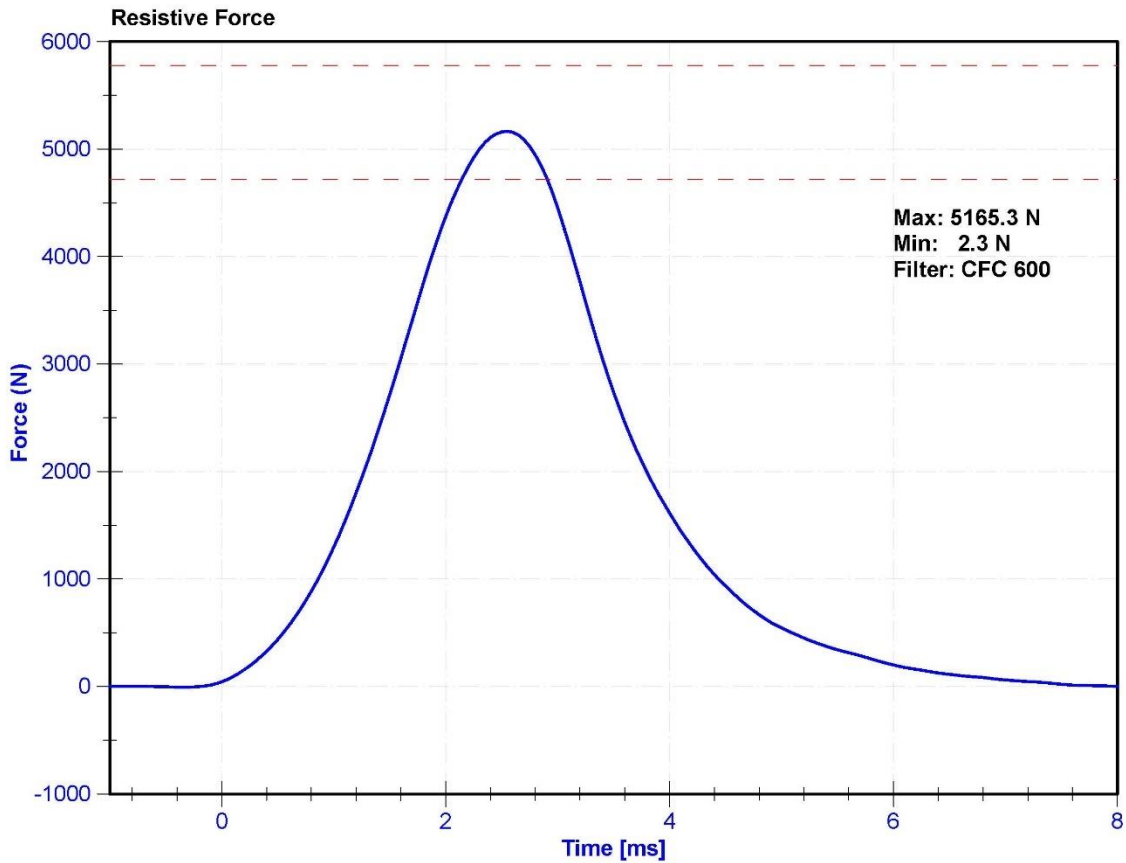
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

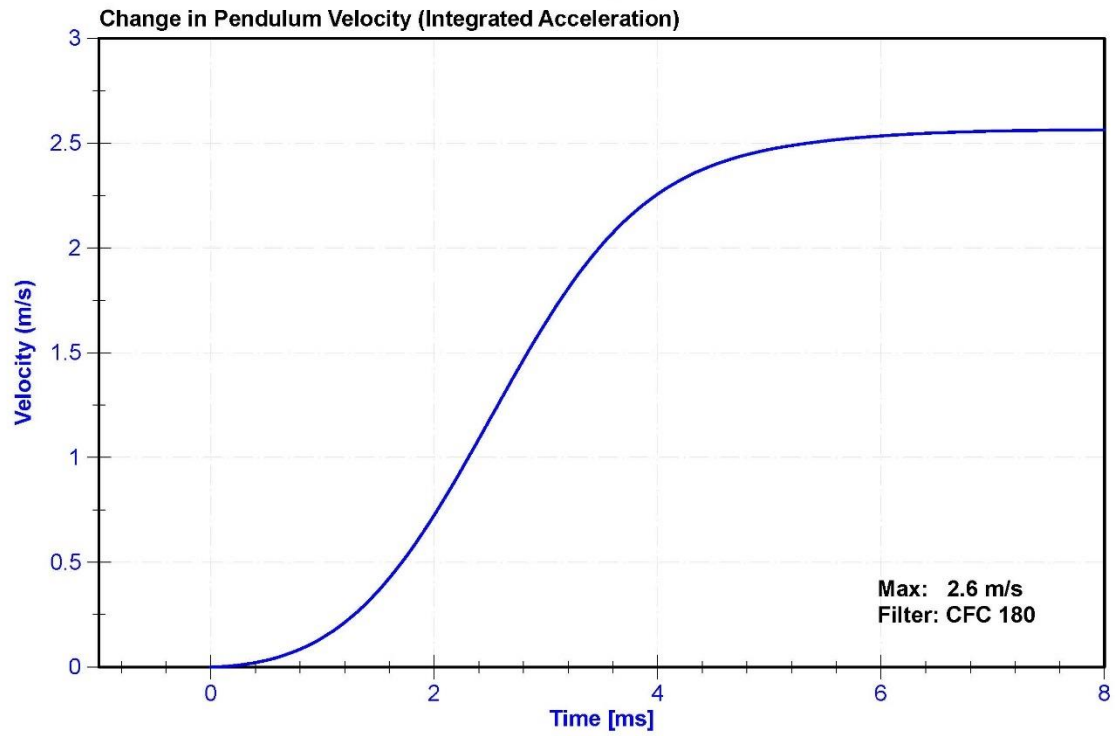
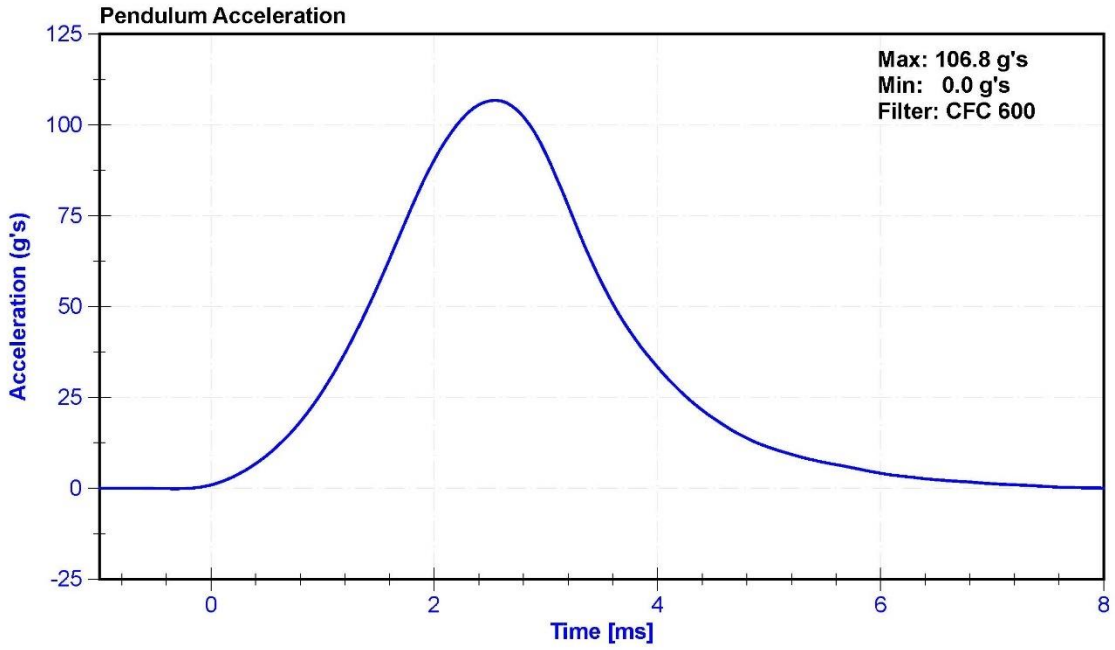
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.1	Pass
Humidity	10	70	%	12.8	Pass
Velocity	2.07	2.13	m/s	2.117	Pass
Maximum Resistive Force	4720	5780	N	5165.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022





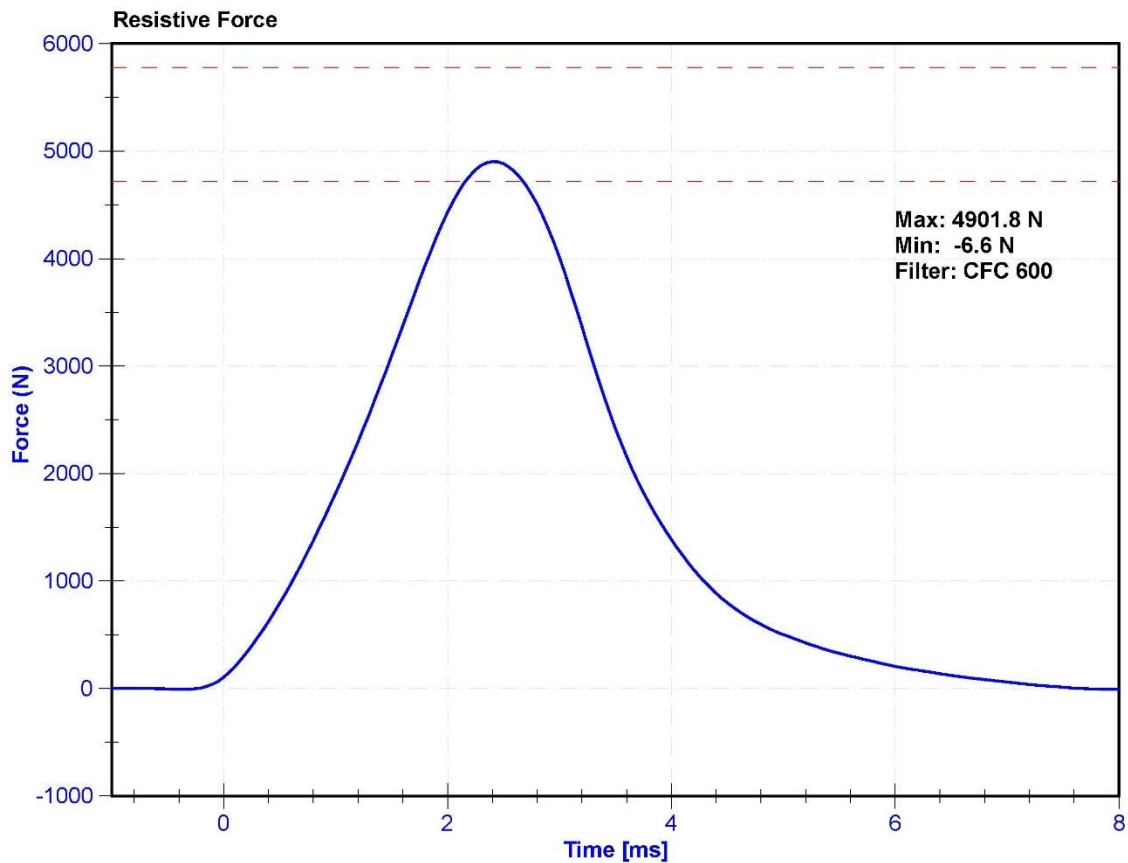
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

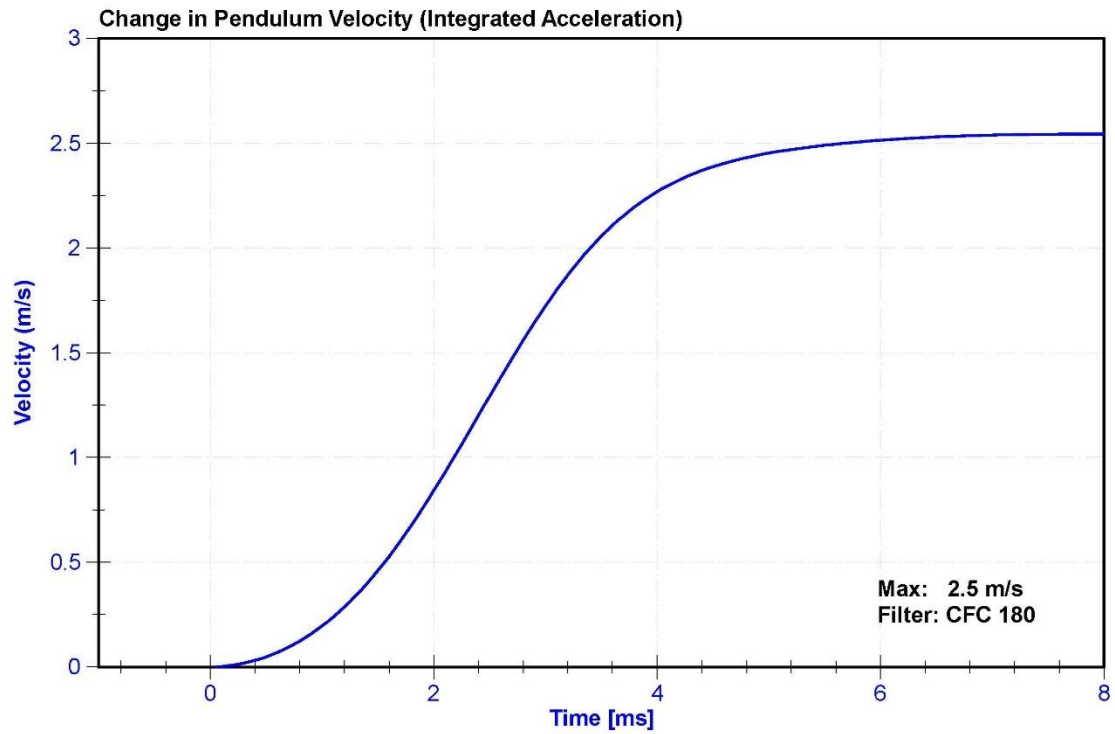
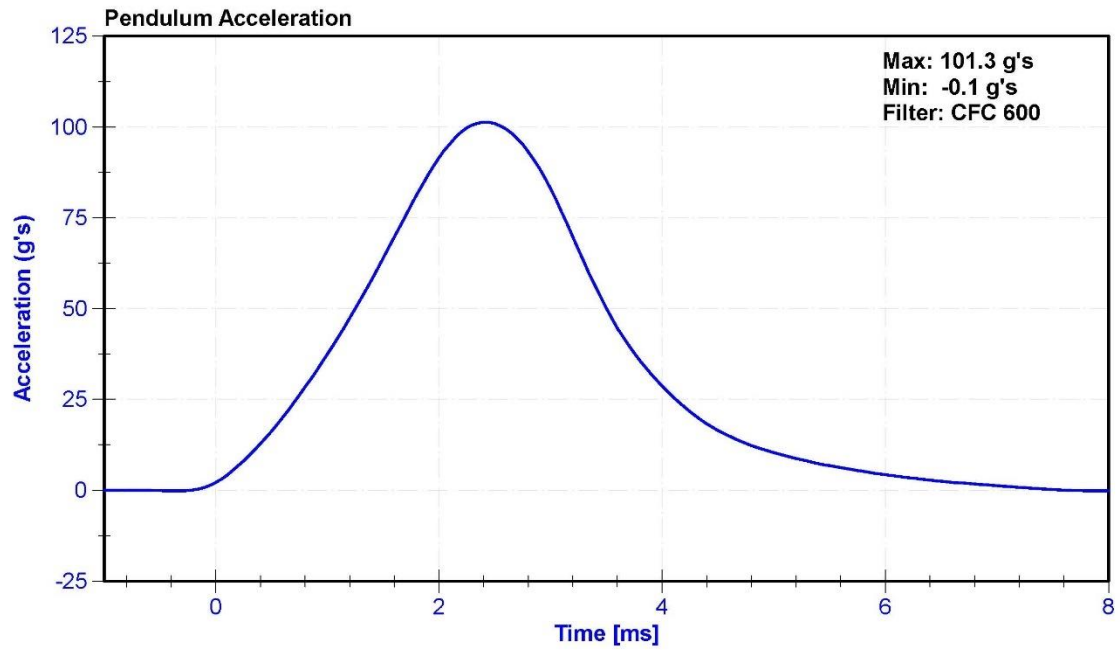
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.1	Pass
Humidity	10	70	%	12.8	Pass
Velocity	2.07	2.13	m/s	2.126	Pass
Maximum Resistive Force	4720	5780	N	4901.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022





CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE - PASSENGER ATD

SERIAL NO: 137

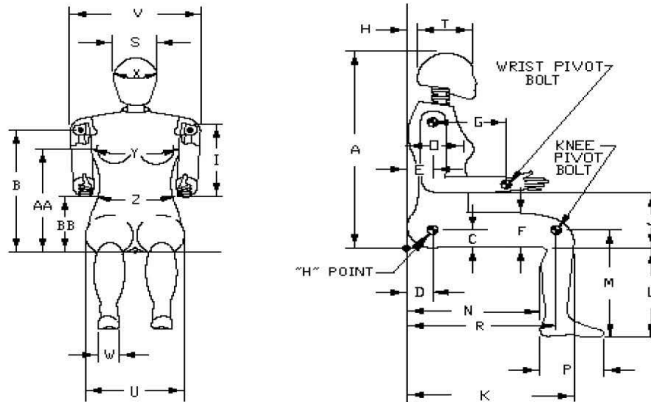


External Measurements - Hybrid 3 - 5th Female

Technician: K. Brogan

Date: 02/04/2021

Dummy Serial Number: 137



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	792	Pass
B	Shoulder Pivot Height	432	457	450	Pass
C	H-Point Height	81	86	83	Pass
D	H-Point from Backline	145	150	147	Pass
E	Shoulder Pivot from Backline	69	84	79	Pass
F	Thigh Clearance	119	135	125	Pass
G	Back of Elbow to Wrist Pivot	244	259	250	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	289	Pass
J	Elbow Rest Height	183	203	197	Pass
K	Buttock to Knee Length	521	546	541	Pass
L	Popliteal Height	356	376	365	Pass
M	Knee Pivot Height	394	419	412	Pass
N	Buttock Popliteal Length	414	439	428	Pass
O	Chest Depth without Jacket	175	191	181	Pass
P	Foot Length (right)	219	234	228	Pass
R	Buttock To Knee Pivot Length	457	483	466	Pass
S	Head Breadth	137	147	141	Pass
T	Head Depth	178	188	180	Pass
U	Hip Breadth	300	315	310	Pass
V	Shoulder Breadth	351	366	359	Pass
W	Foot Breadth	79	94	82	Pass
X	Head Circumference	528	549	540	Pass
Y	Chest Circumference with Jacket	851	881	874	Pass
Z	Waist Circumference	460	790	630	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

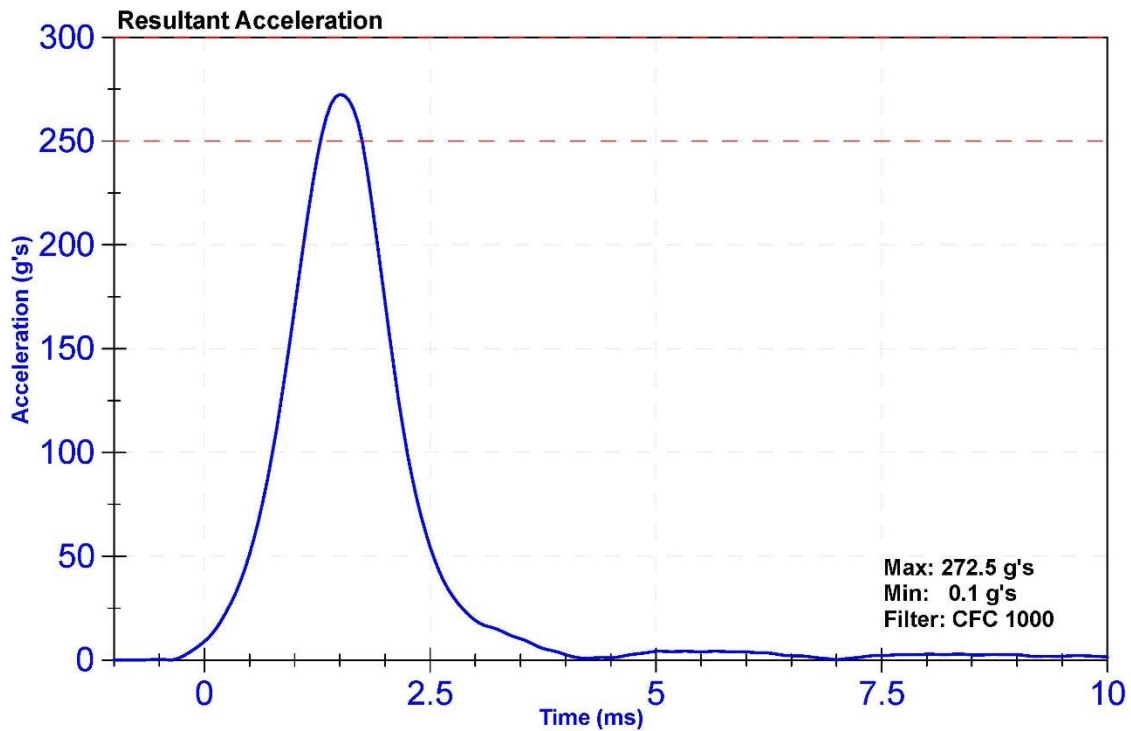
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

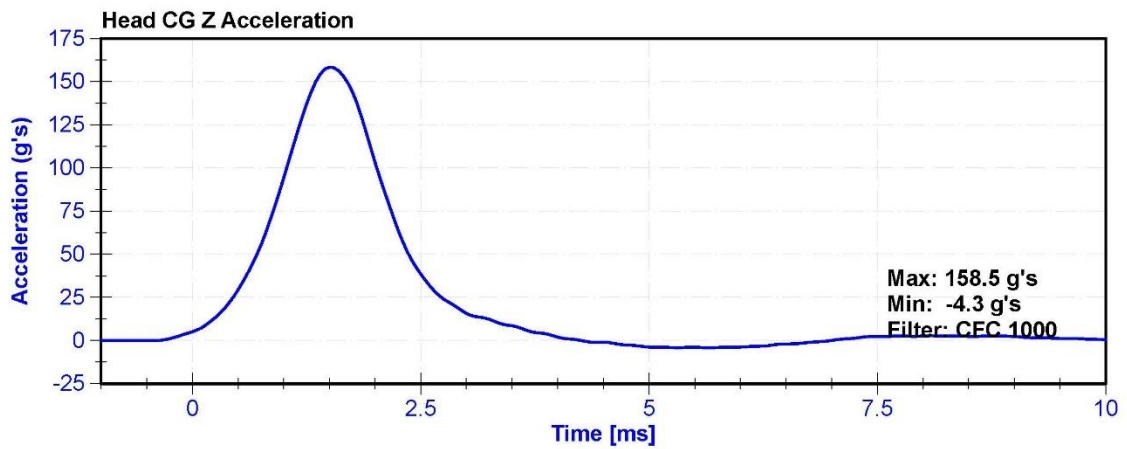
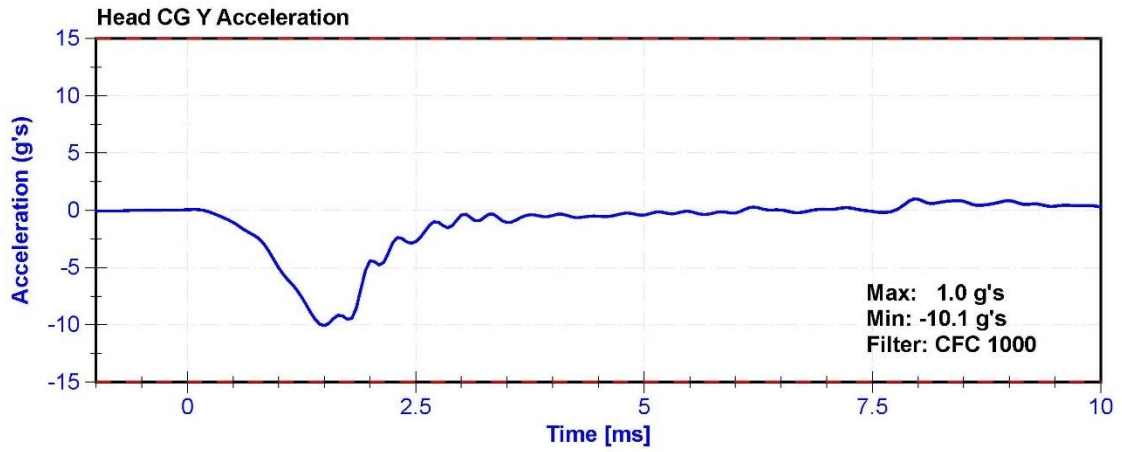
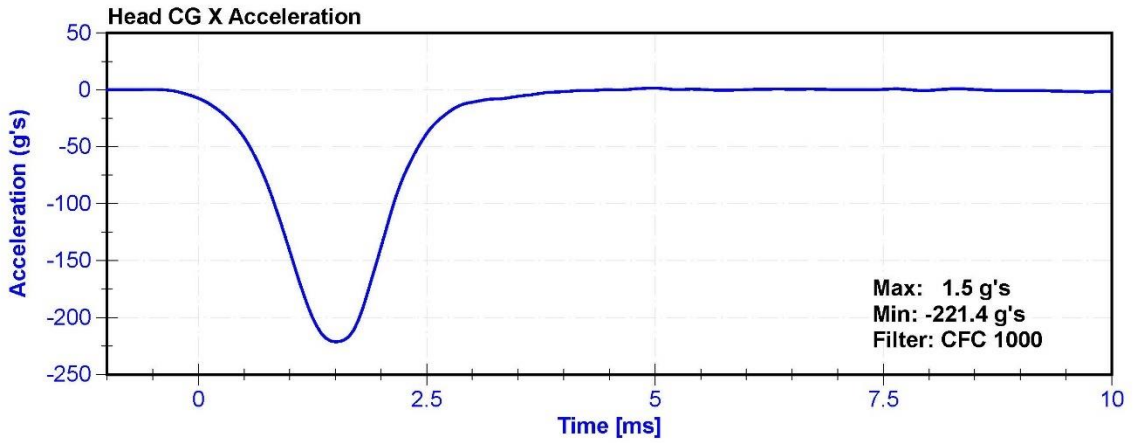
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.0	Pass
Humidity	10	70	%	15.0	Pass
Resultant Acceleration	250	300	g's	272.5	Pass
Oscillation	0	10	%	1.5	Pass
Lateral Acceleration	-15	15	g's	-10.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P79417	10/22/2021	4/20/2022
Y Accelerometer	Endevco	P83335	10/22/2021	4/20/2022
Z Accelerometer	Endevco	P64149	10/22/2021	4/20/2022





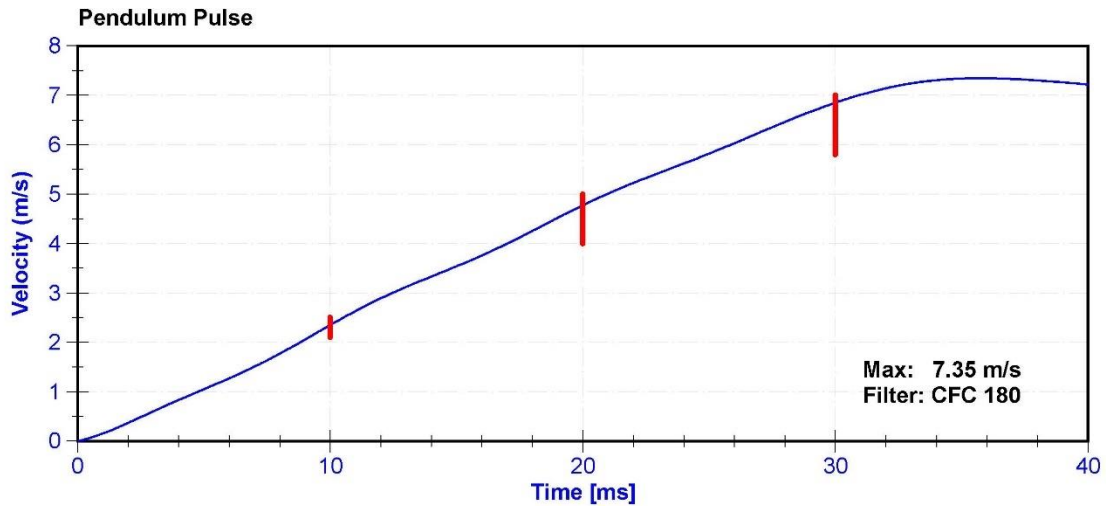
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

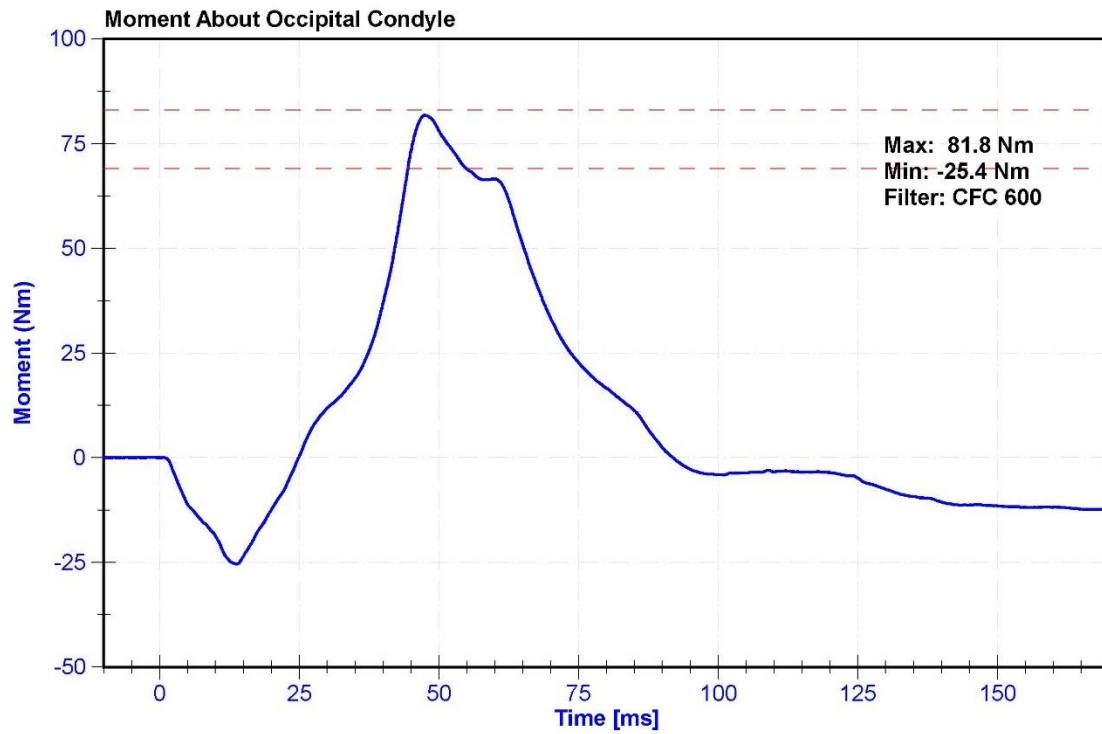
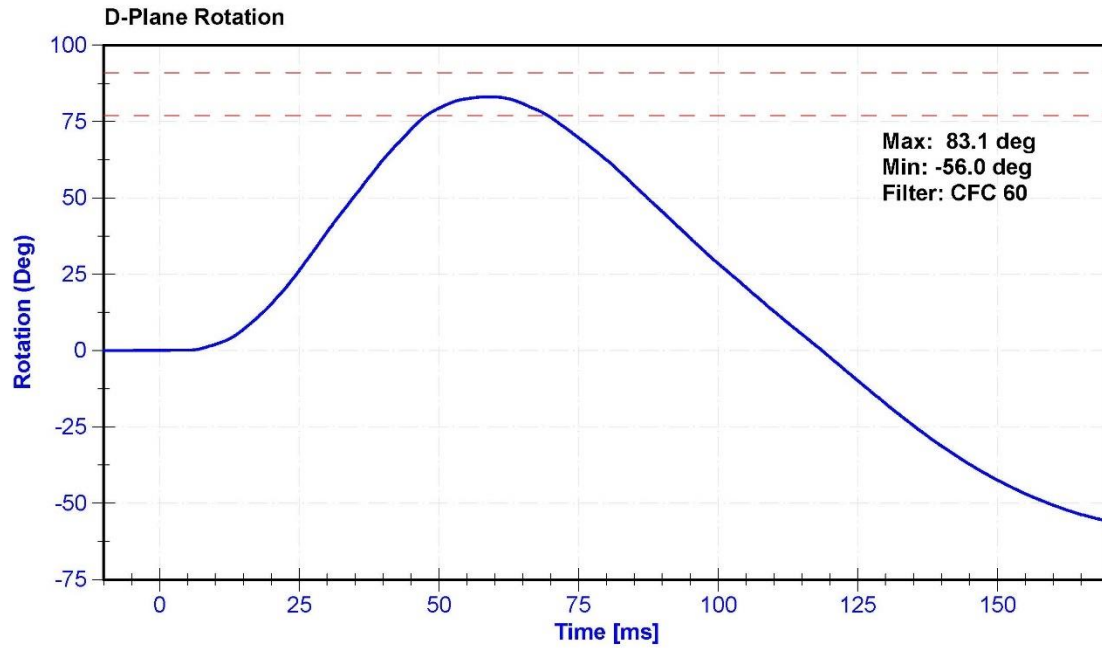
Results

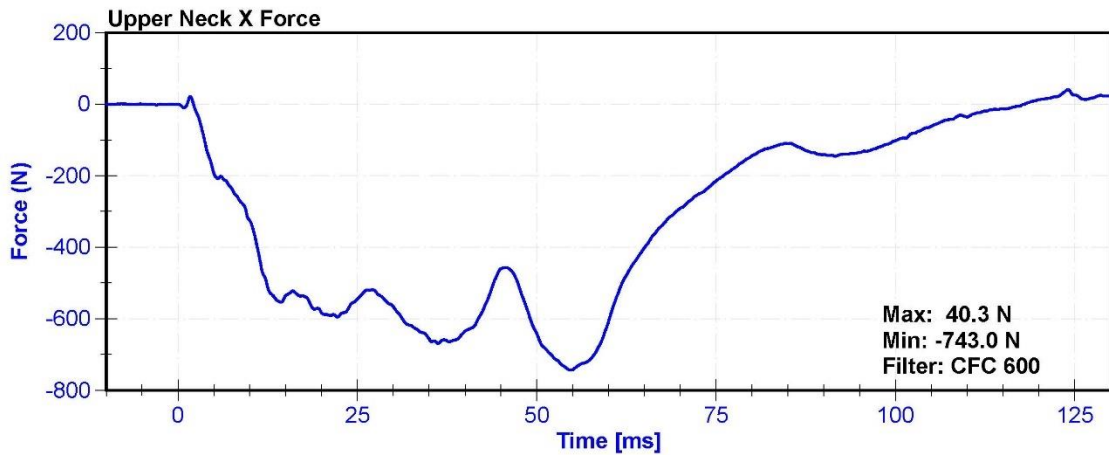
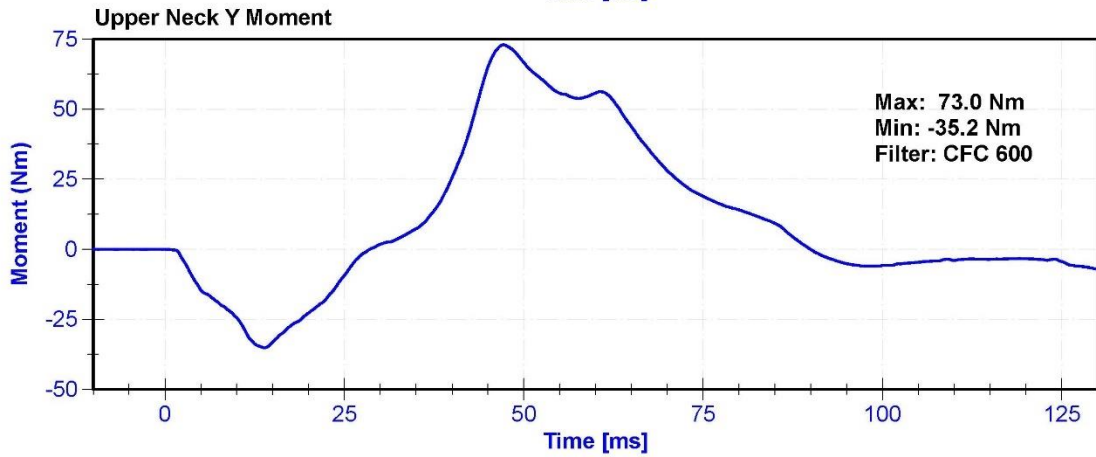
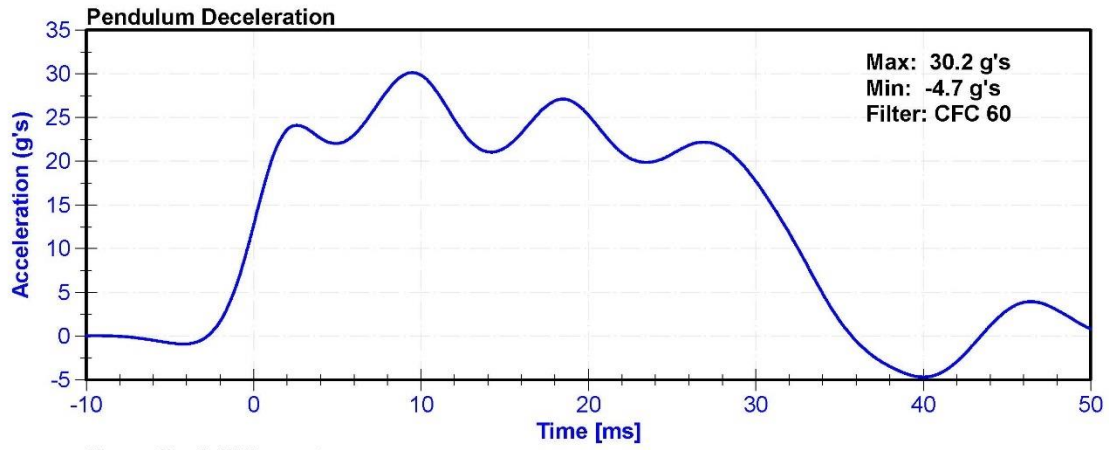
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	15.0	Pass
Velocity	6.89	7.13	m/s	7.072	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.35	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.77	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.85	Pass
Max D Plane Rotation	77	91	deg	83.1	Pass
Max Moment During Rotation Interval	69	83	Nm	81.8	Pass
Moment Decay to 10.0 Nm	80	100	ms	85.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	1/31/2022	7/30/2022
Pendulum Potentiometer	ETI	LABPOT1	5/7/2021	5/7/2022
Condyle Potentiometer	ETI	LABPOT2	5/7/2021	5/7/2022
Upper Neck Load Cell	Denton	2184-FX	6/24/2021	6/24/2022







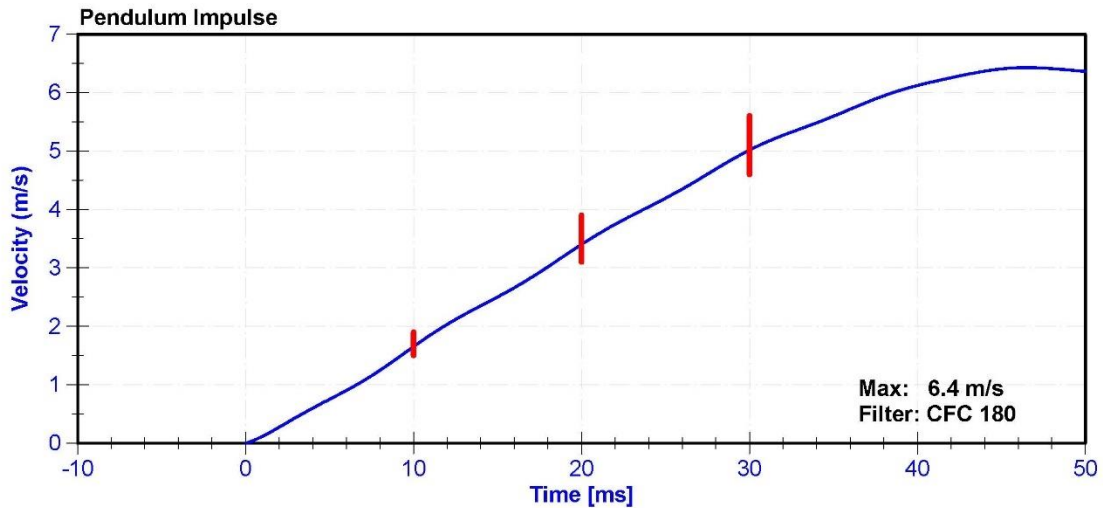
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

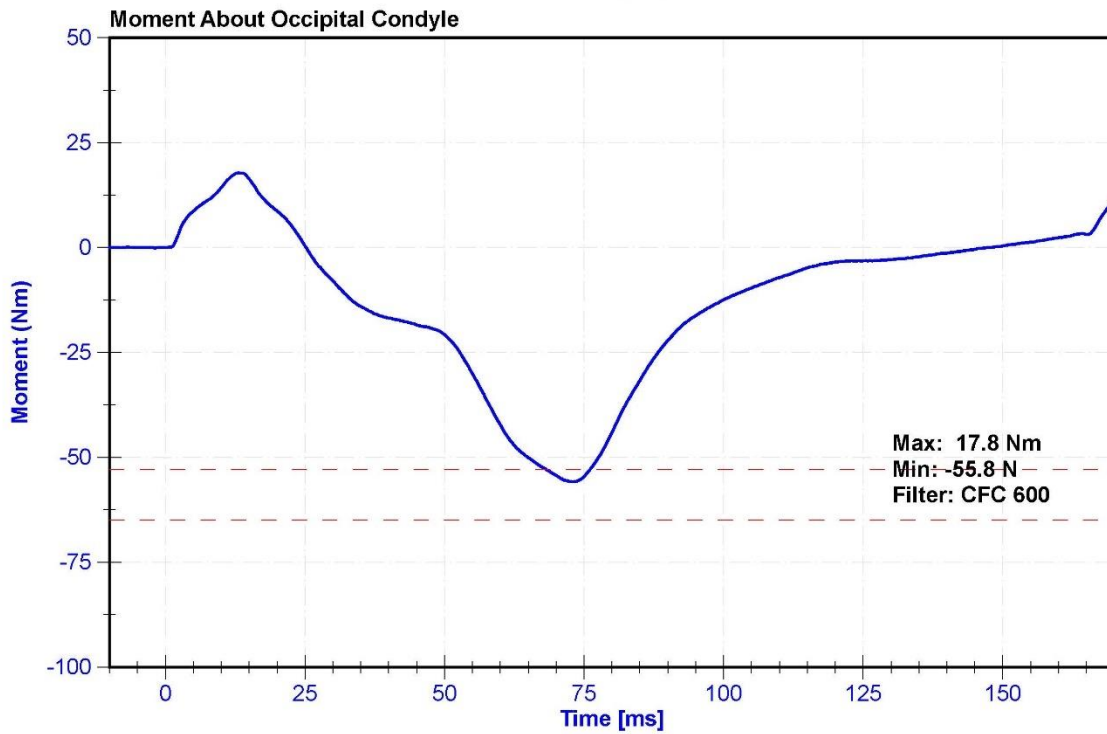
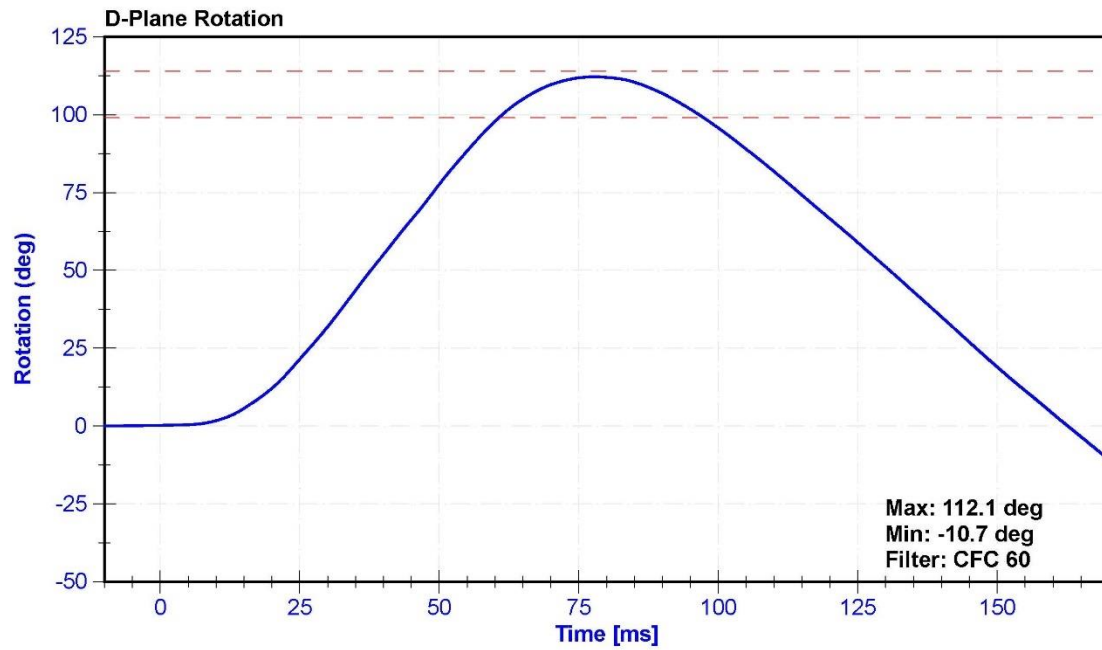
Results

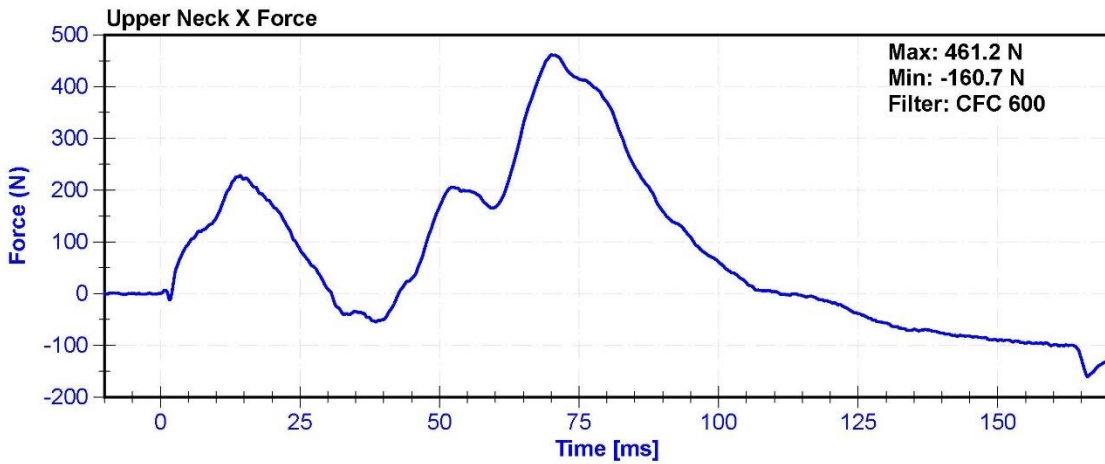
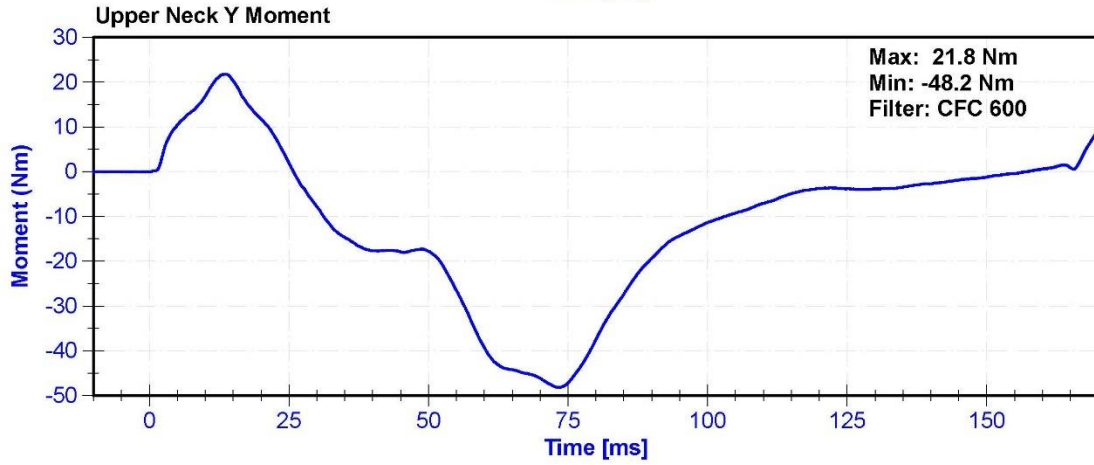
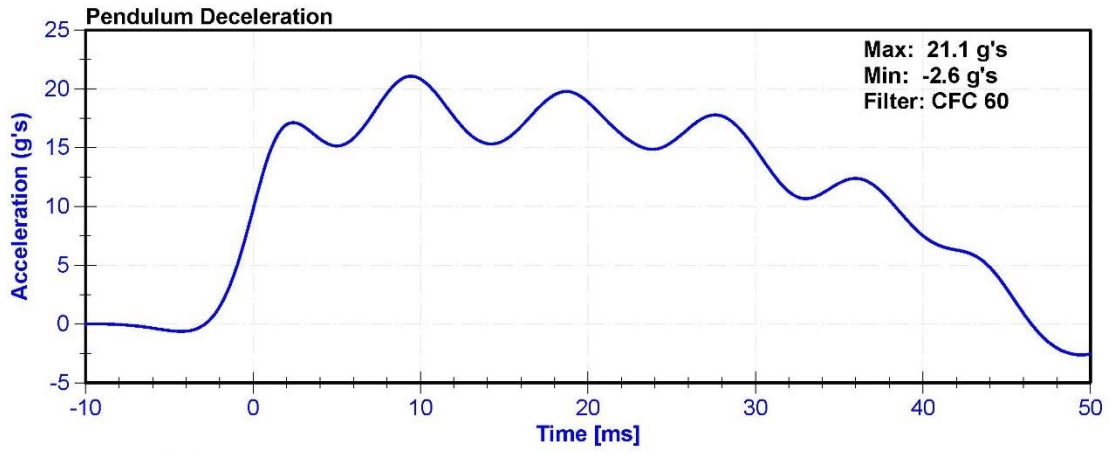
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	15.0	Pass
Velocity	5.95	6.19	m/s	6.186	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.65	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.40	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.02	Pass
D Plane Rotation	99	114	deg	112.1	Pass
Moment During Rotation Interval	-65	-53	Nm	-55.8	Pass
Moment Decay to -10Nm	94	114	ms	104.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16650	1/31/2022	7/30/2022
Pendulum Potentiometer	ETI	LABPOT1	5/7/2021	5/7/2022
Condyle Potentiometer	ETI	LABPOT2	5/7/2021	5/7/2022
Upper Neck Load Cell	Denton	2184-FX	6/24/2021	6/24/2022







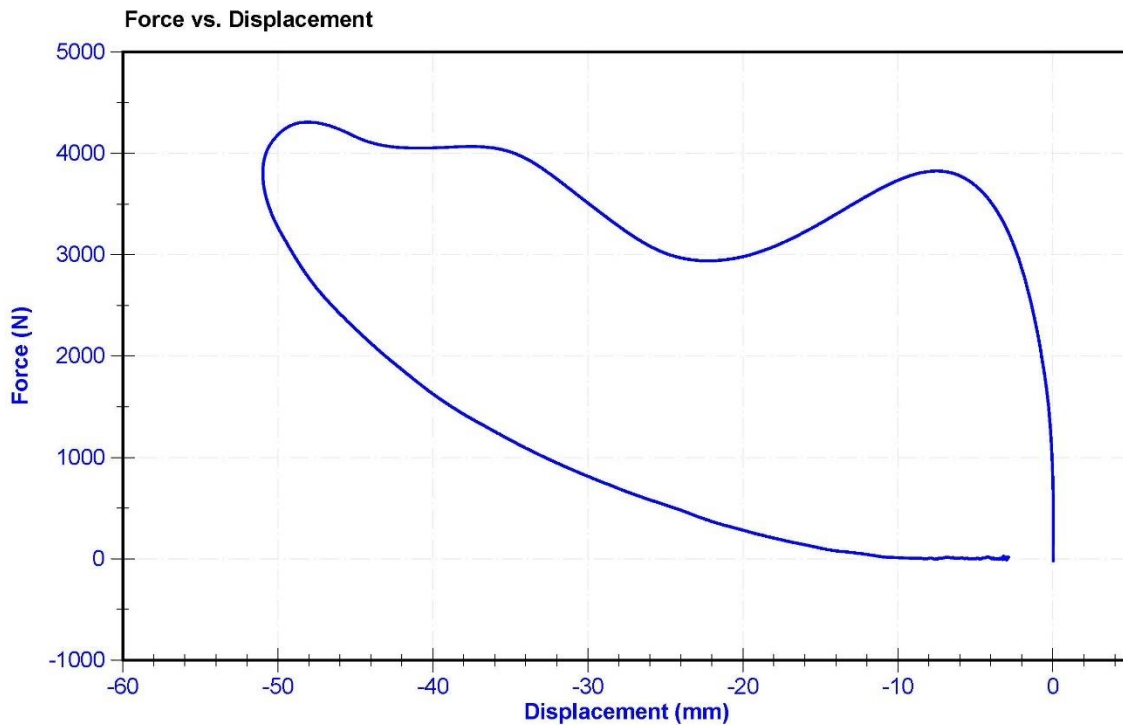
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

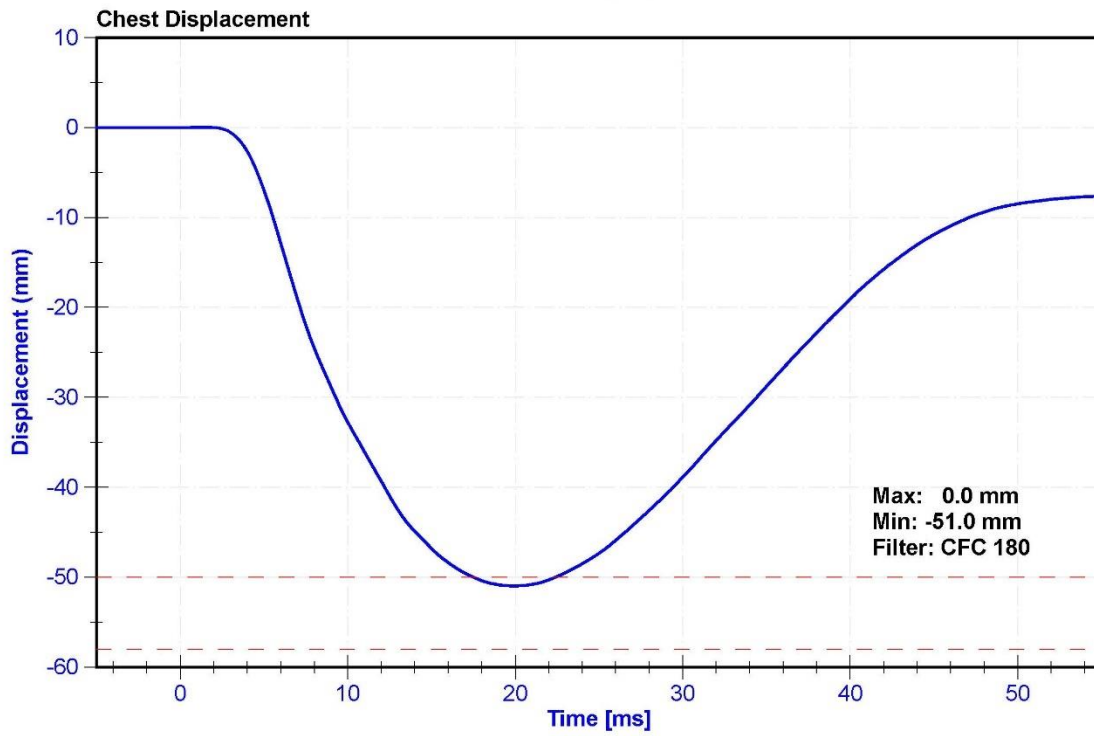
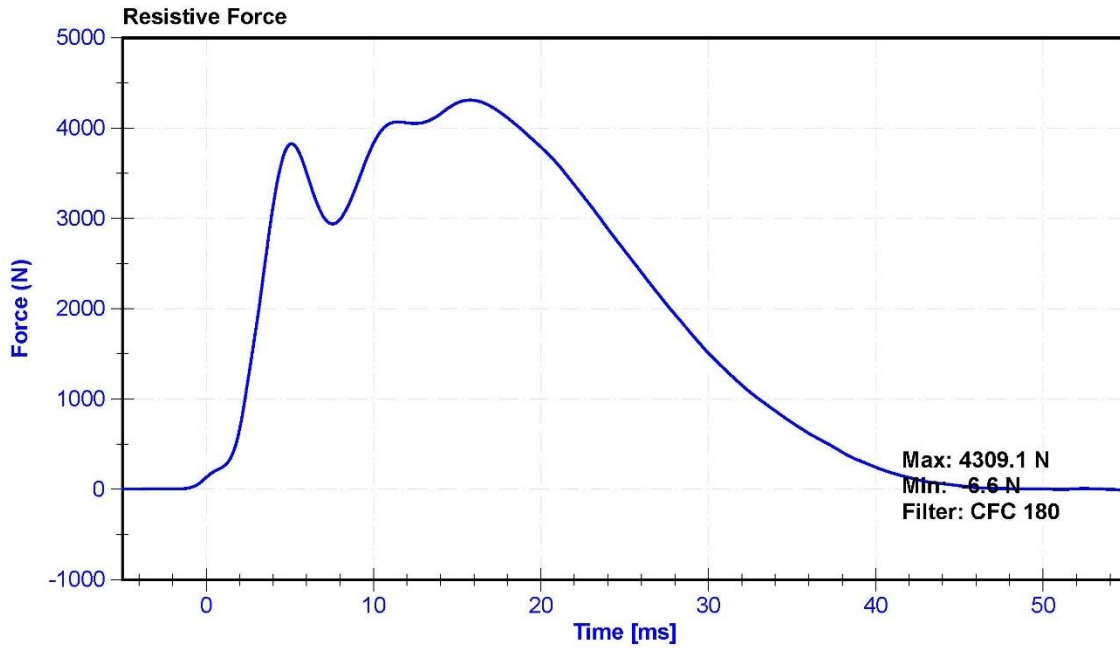
Results

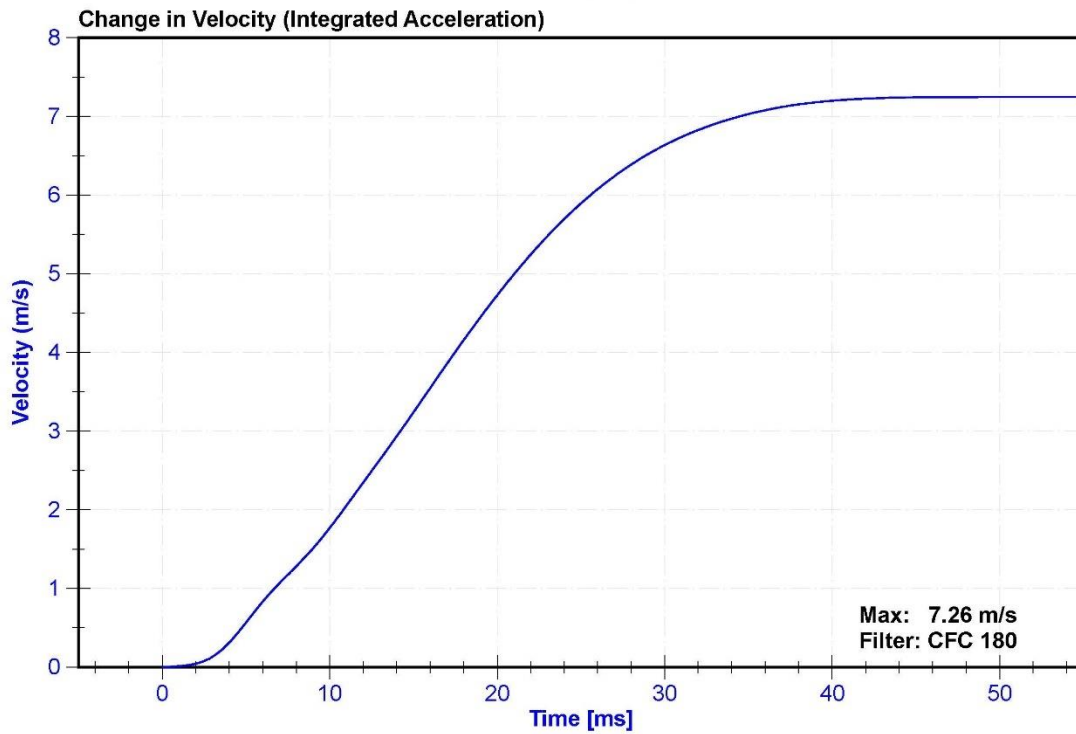
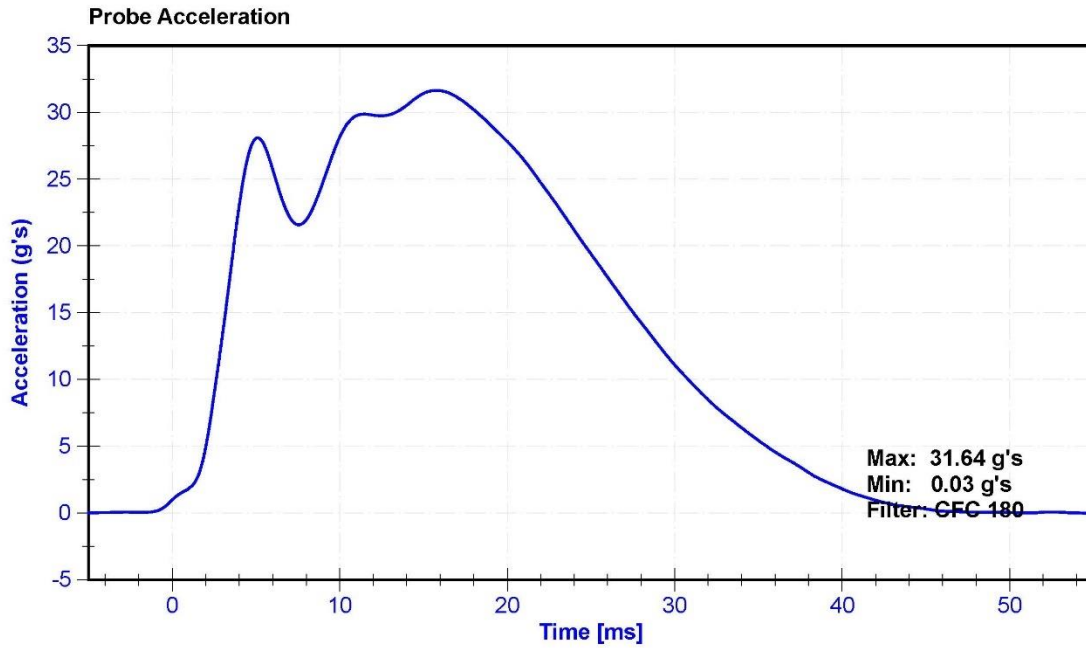
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	24.9	Pass
Velocity	6.59	6.83	m/s	6.733	Pass
Chest Deflection	-58	-50	mm	-51.0	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4182.6	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4309.1	Pass
Hysteresis	69	85	%	75.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Chest Potentiometer	Servo	0720	10/28/2021	4/28/2022







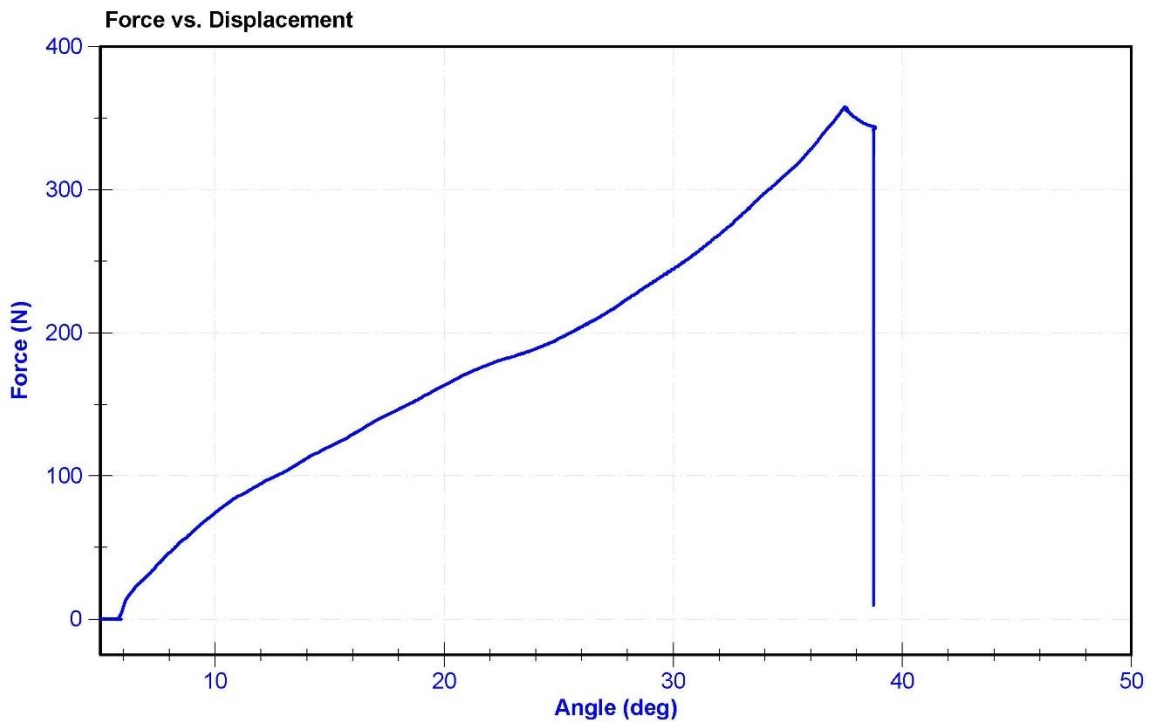
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	21.3	Pass
Humidity	10	70	%	24.9	Pass
Initial Angle	0	20	deg	5.6	Pass
Force at 45 Degrees	320	390	N	358.1	Pass
Return Angle Relative to Initial	0	8	deg	3.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker	DS-1905226	2021-11-01	2022-11-01
Load Cell	Interface	1134516	2021-08-27	2022-08-27



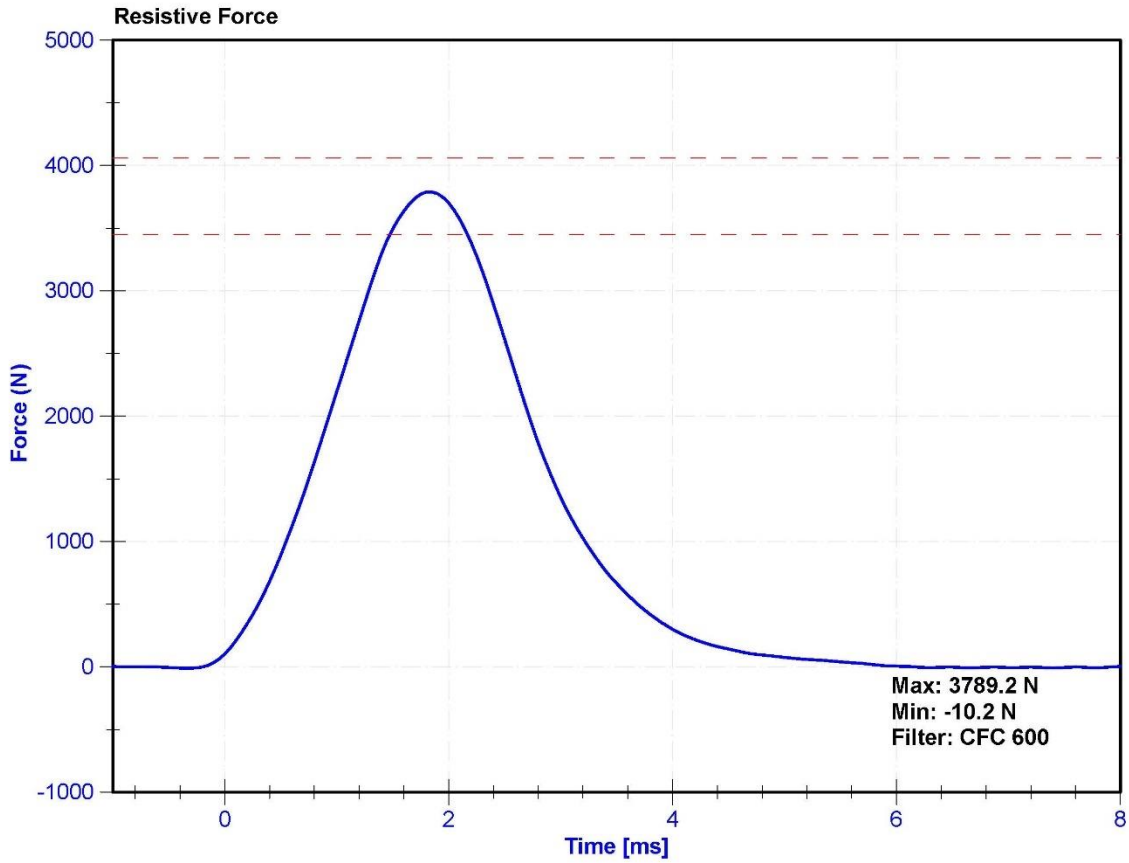
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

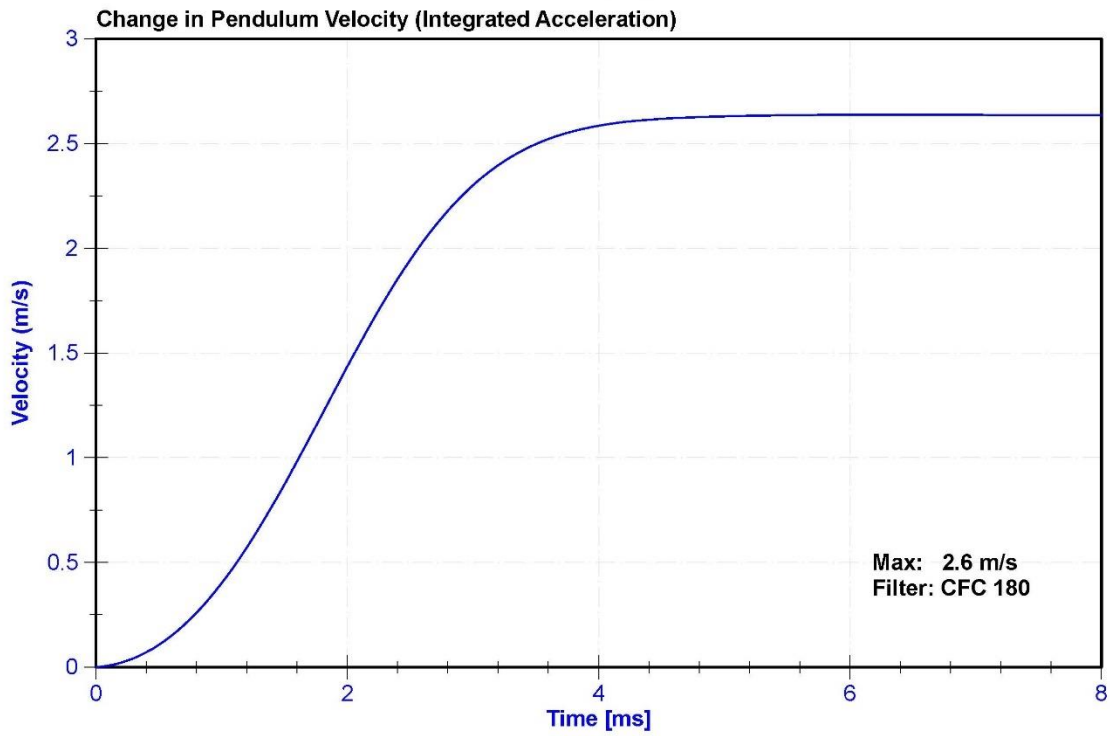
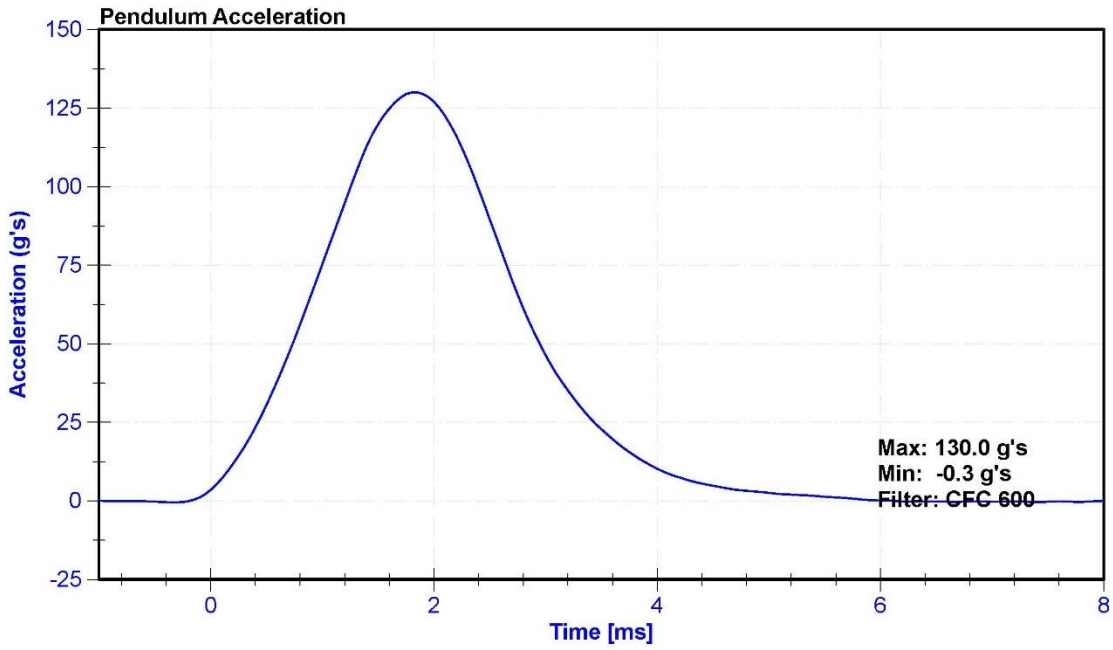
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.0	Pass
Humidity	10	70	%	15.0	Pass
Velocity	2.07	2.13	m/s	2.119	Pass
Resistive Force	3450	4060	N	3789.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022





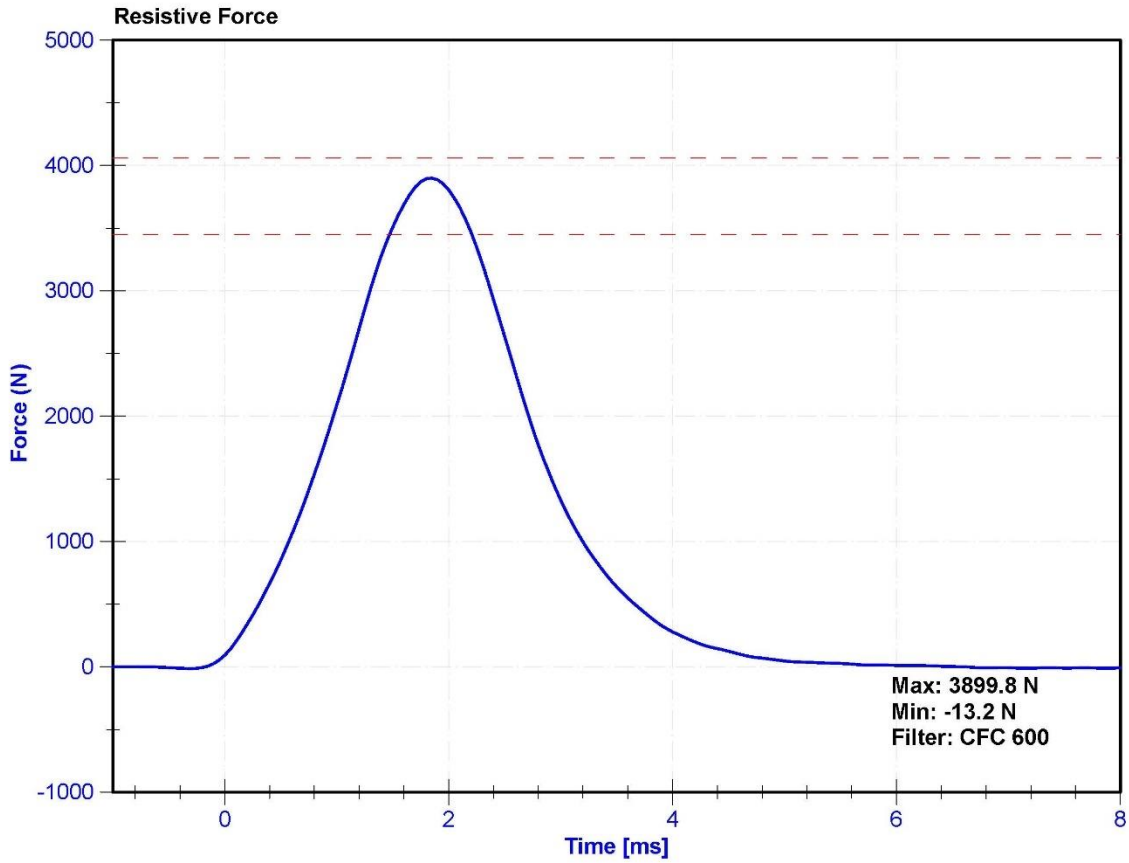
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

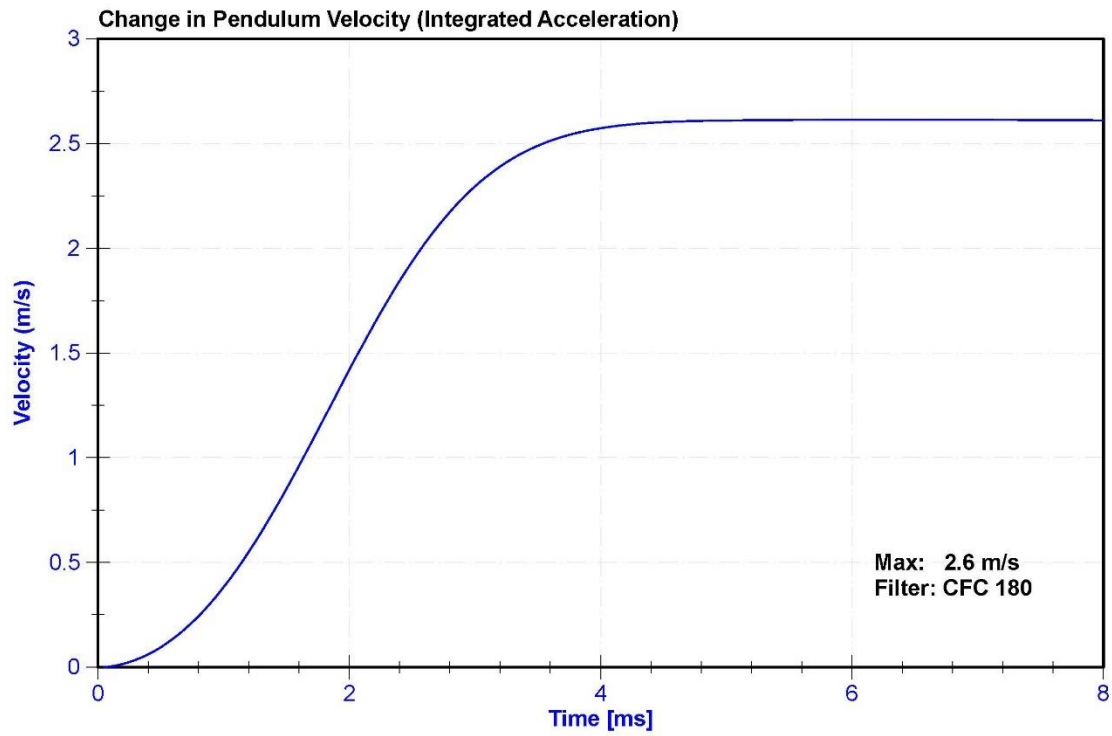
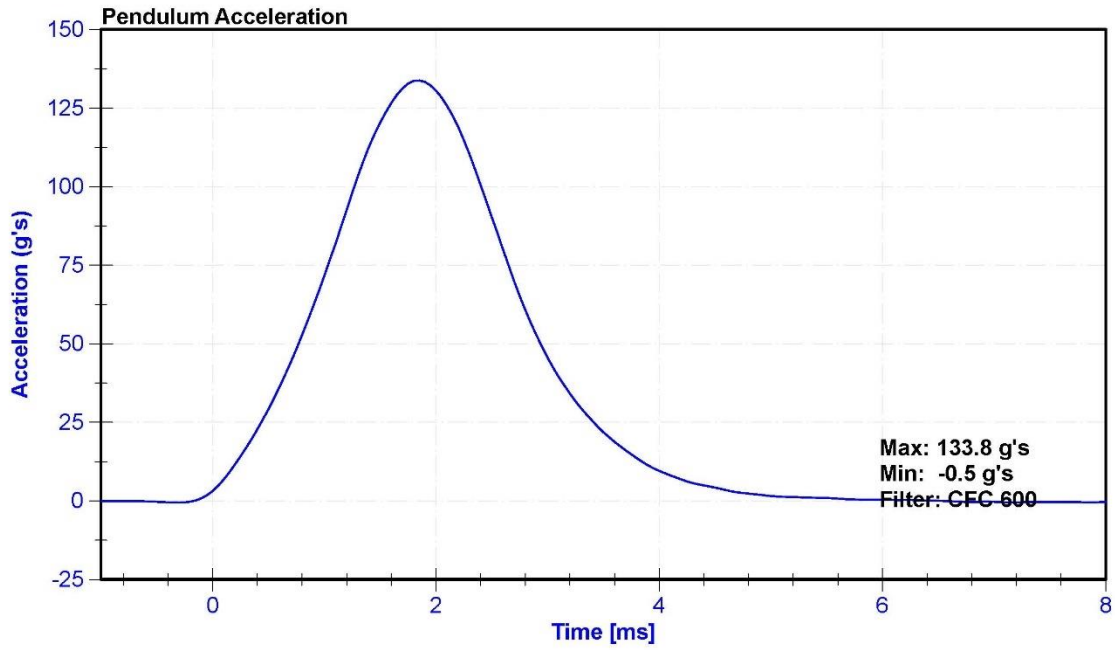
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.0	Pass
Humidity	10	70	%	15.0	Pass
Velocity	2.07	2.13	m/s	2.099	Pass
Resistive Force	3450	4060	N	3899.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022





CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 142

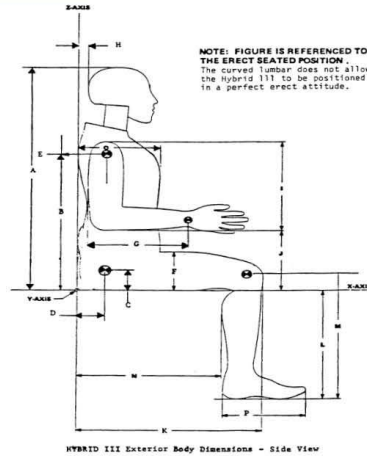
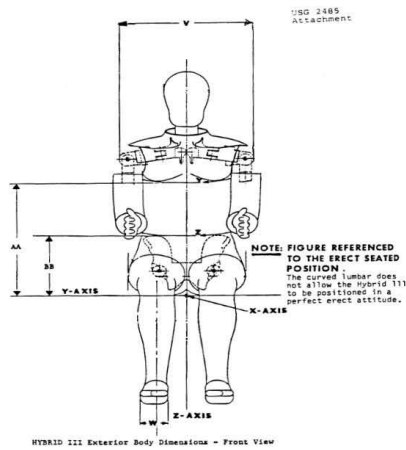


External Measurements - Hybrid 3 - 50th Male

Technician: K. Brogan

Date: 02/11/2022

Dummy Serial Number: 142



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	20.3	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	3.5	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	13.4	Pass
J	Elbow Rest Height	7.5	8.3	8.1	Pass
K	Buttock to Knee Length	22.8	23.8	23.2	Pass
L	Popliteal Height	16.9	17.9	17.2	Pass
M	Knee Pivot Height	19.1	19.7	19.4	Pass
N	Buttock Popliteal Length	17.8	18.8	18.3	Pass
O	Chest Depth without Jacket	8.4	9.0	8.8	Pass
P	Foot Length (right)	9.9	10.5	10.1	Pass
V	Shoulder Breadth	16.3	17.2	16.8	Pass
W	Foot Breadth	3.6	4.2	3.8	Pass
Y	Chest Circumference with Jacket	38.2	39.4	39.0	Pass
Z	Waist Circumference	32.9	34.1	33.7	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

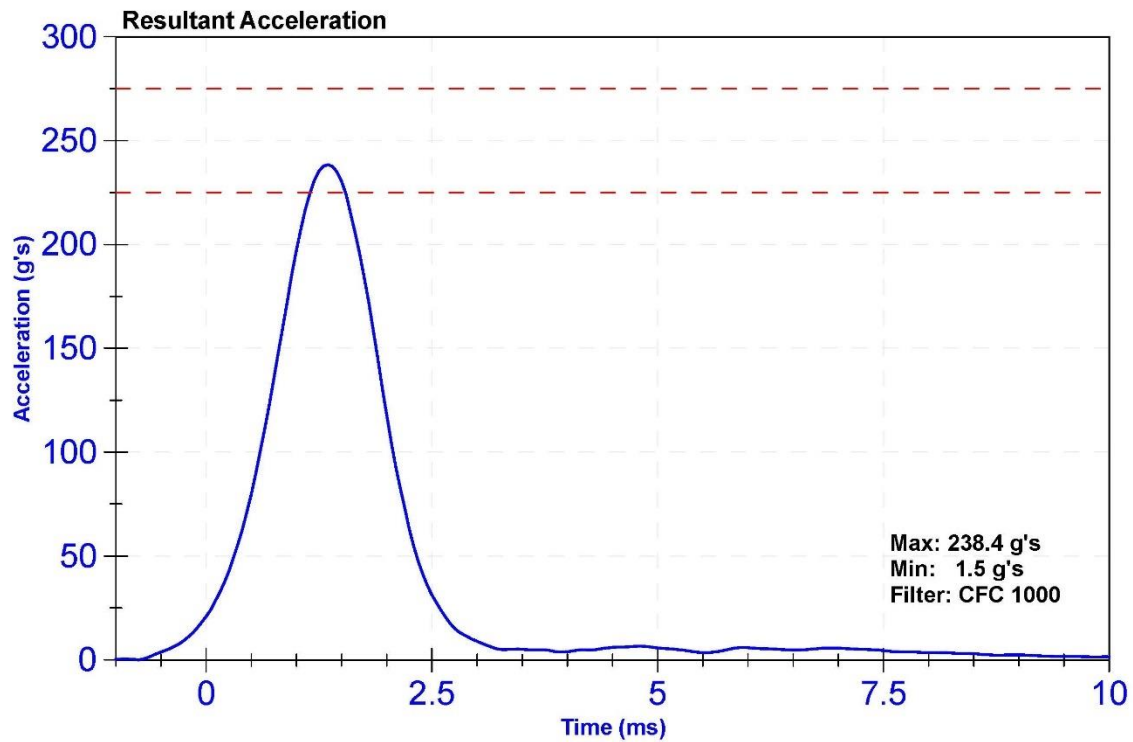
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

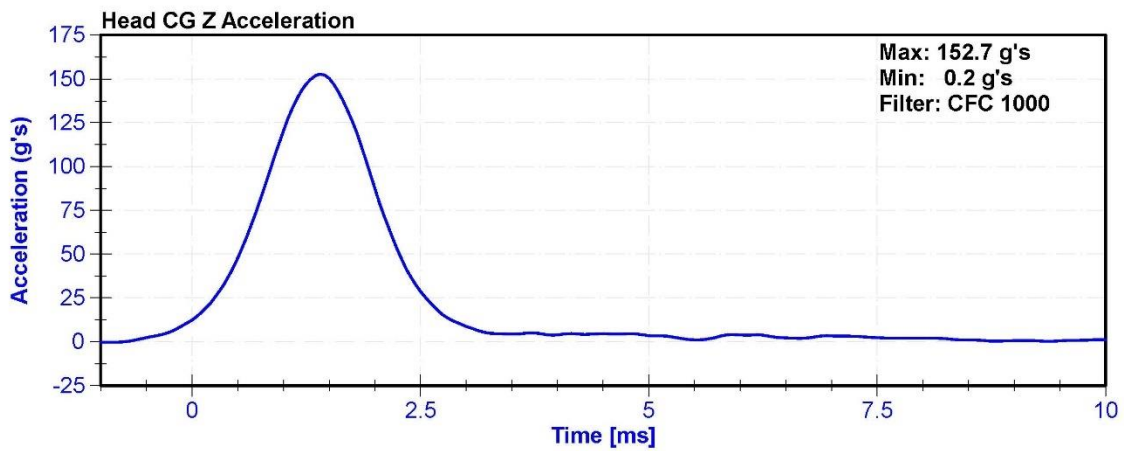
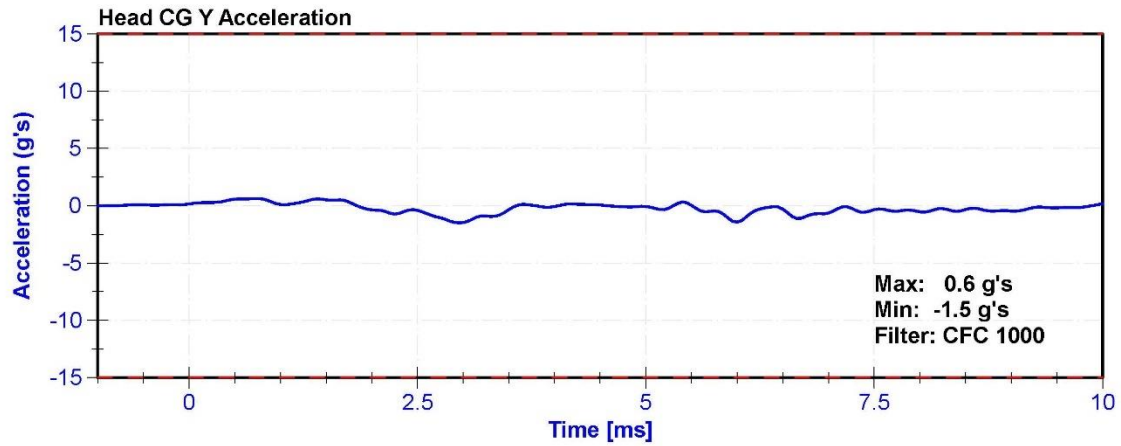
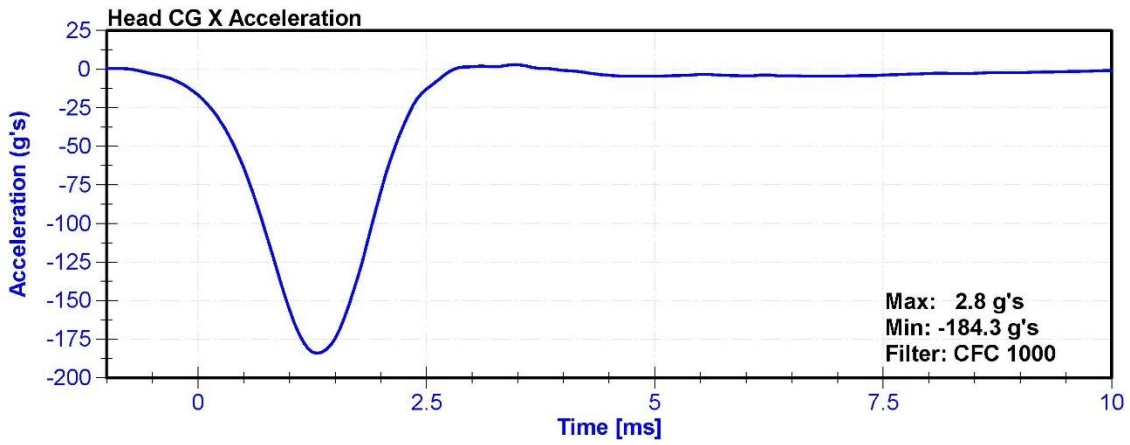
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	36	Pass
Resultant Acceleration	225	275	g's	238.4	Pass
Oscillation	0	10	%	2.7	Pass
Lateral Acceleration	-15	15	g's	-1.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P51681	11/16/2021	5/15/2022
Y Accelerometer	Endevco	P64151	11/16/2021	5/15/2022
Z Accelerometer	Endevco	P52114	11/16/2021	5/15/2022





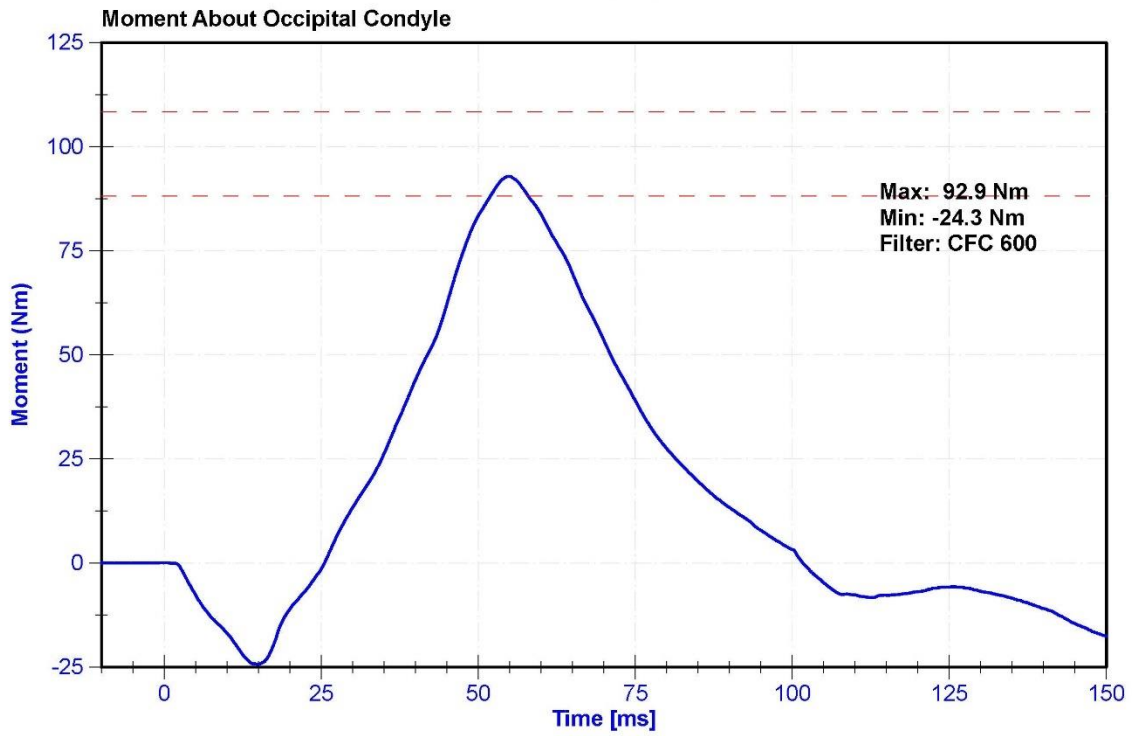
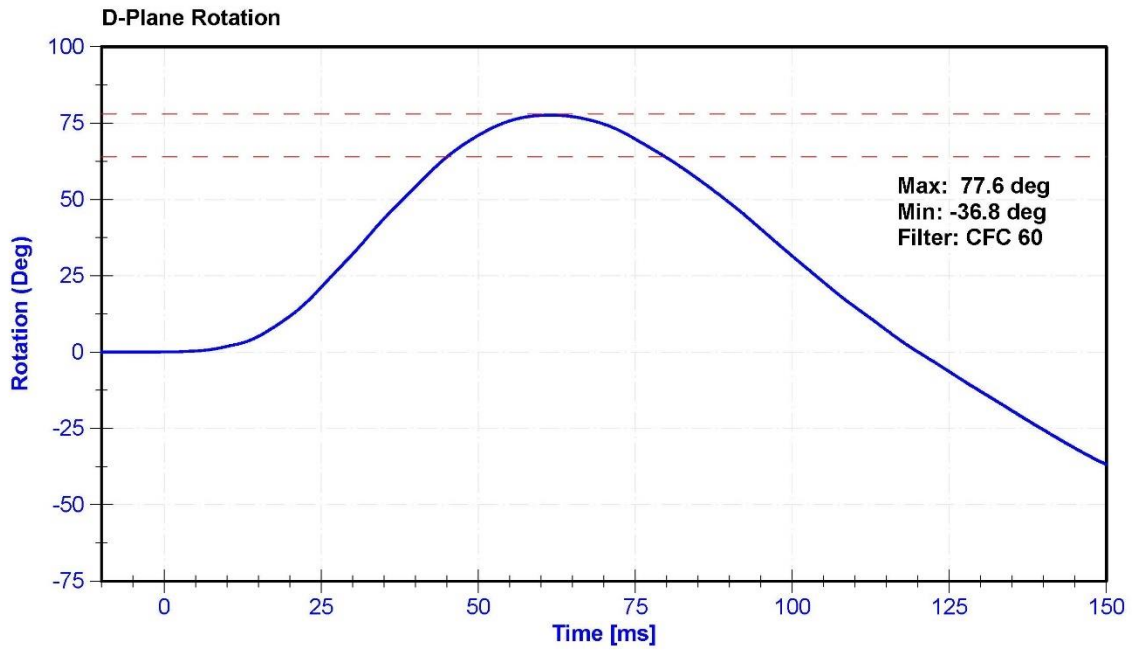
ATD Manufacturer	Humanetics	Test Technician	D. Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

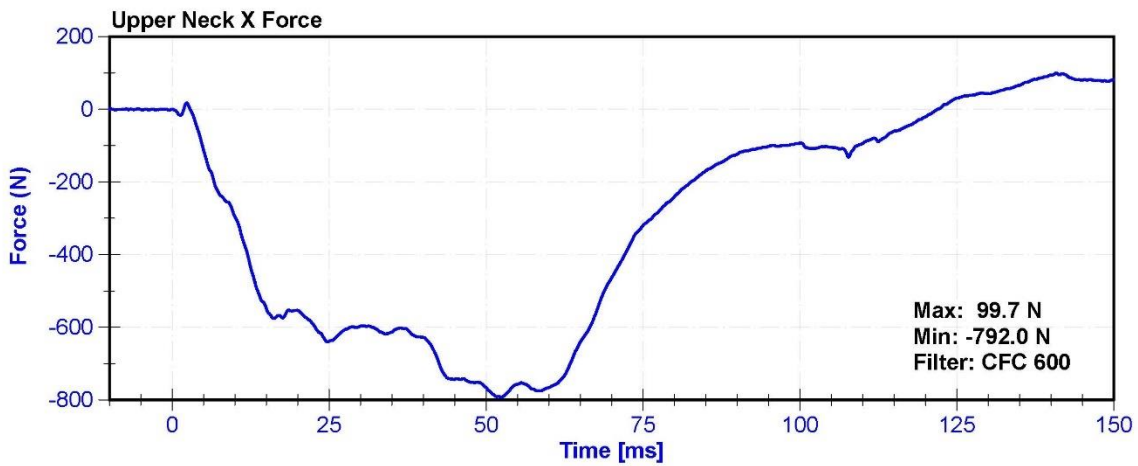
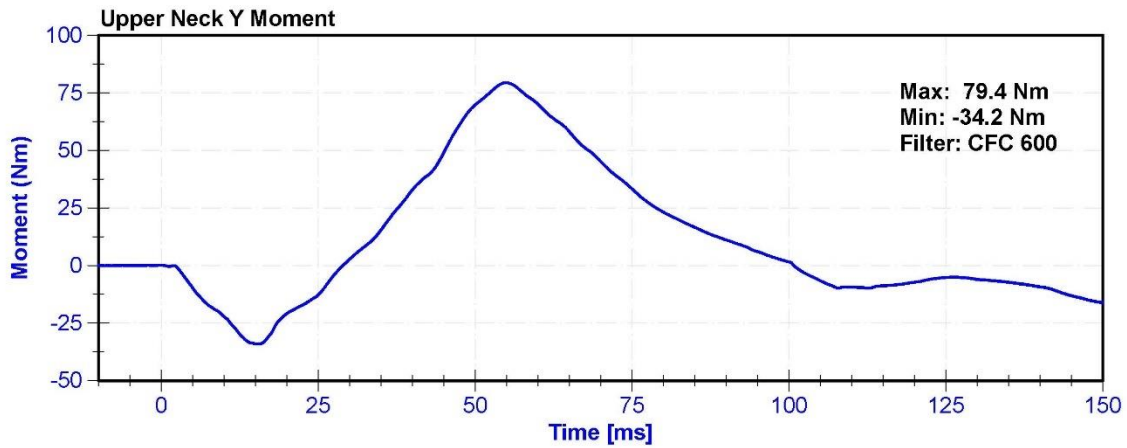
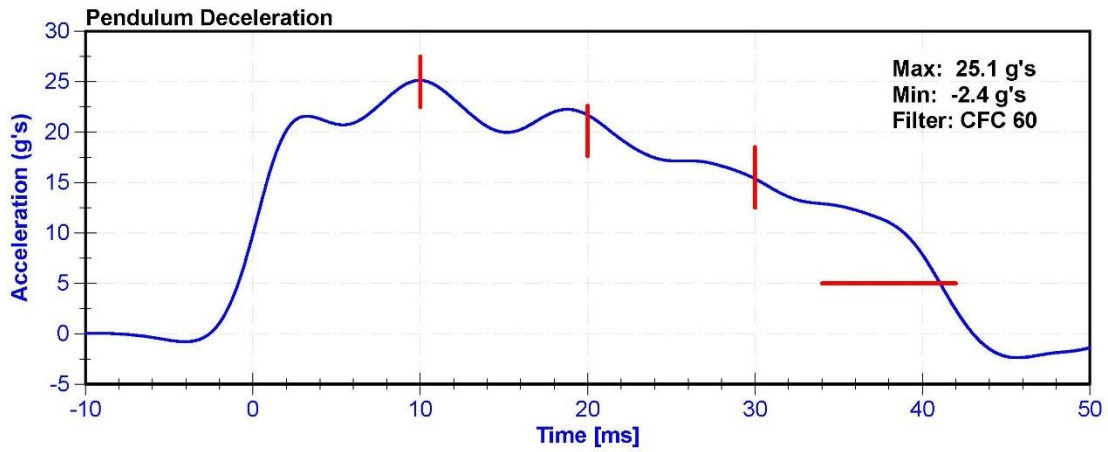
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	36	Pass
Velocity	6.89	7.13	m/s	6.964	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	25.13	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	21.69	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	15.37	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	25.1	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	41.1	Pass
Maximum D Plane Rotation	64	78	deg	77.6	Pass
Time to Maximum Rotation	57	64	ms	61.5	Pass
Rotation Decay to Zero	113	127	ms	120.0	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	92.86	Pass
Time to Maximum Moment	47	58	ms	54.9	Pass
Moment Decay to Zero	97	107	ms	101.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231CT	10/28/2021	10/28/2022
Pendulum Potentiometer	ETI	LABPOT1	5/7/2021	5/7/2022
Condyle Potentiometer	ETI	LABPOT2	5/7/2021	5/7/2022
Upper Neck Load Cell	FTSS	280-FX	9/14/2021	9/14/2022





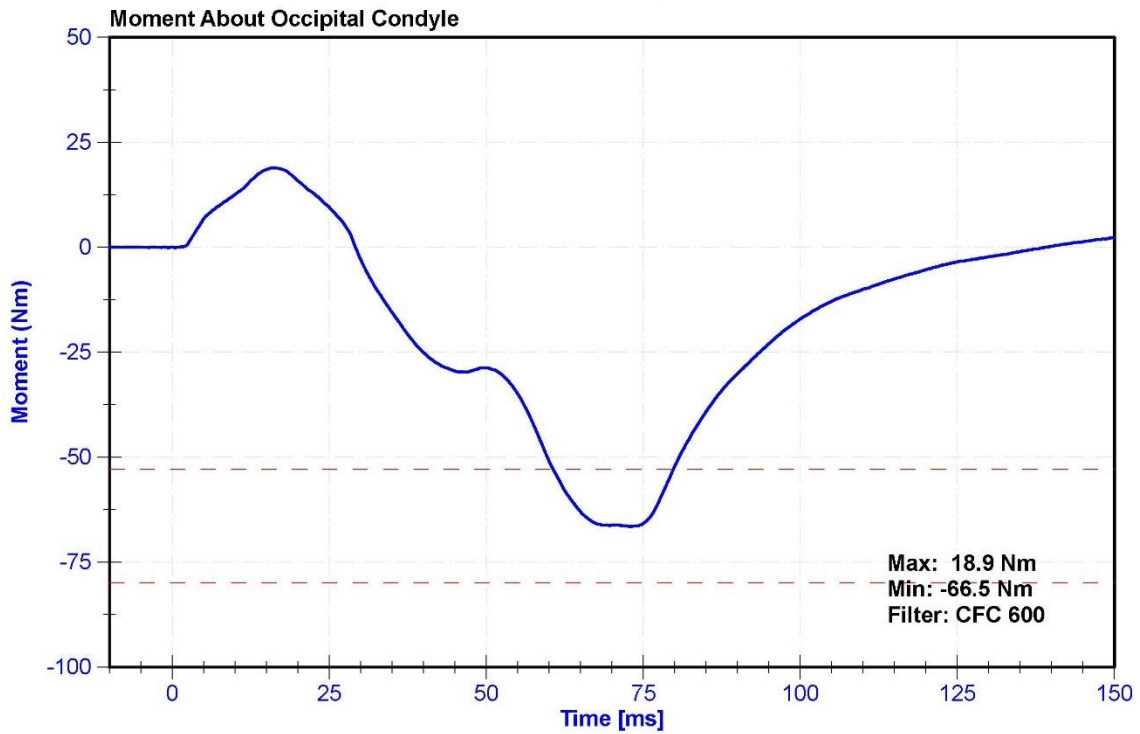
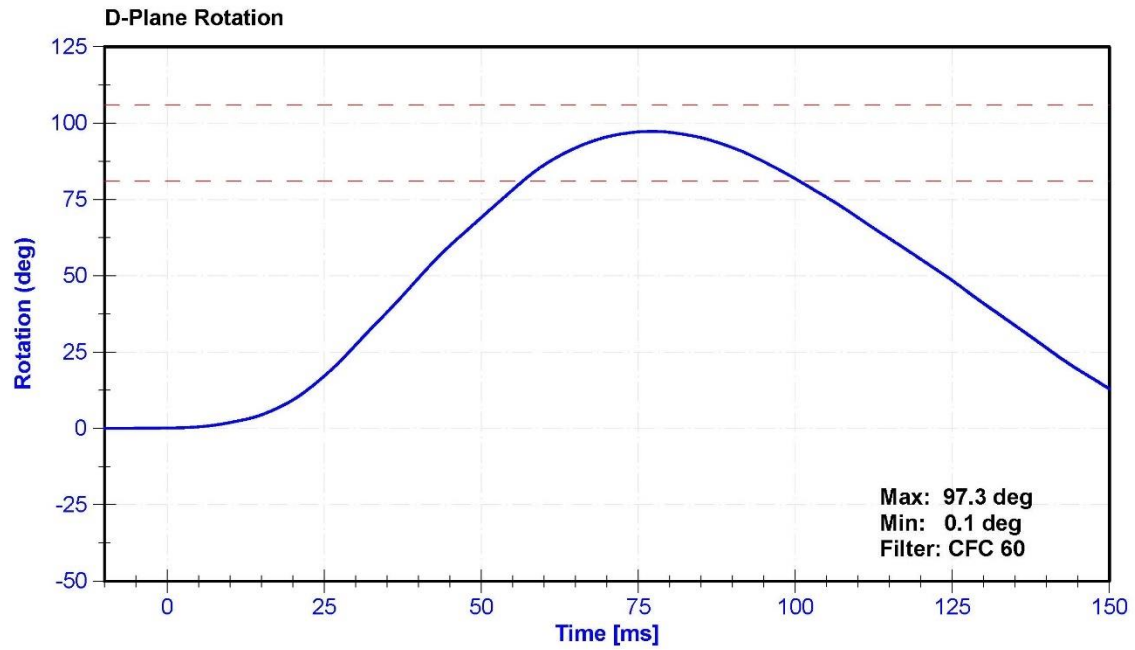
ATD Manufacturer	Humanetics	Test Technician	D. Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

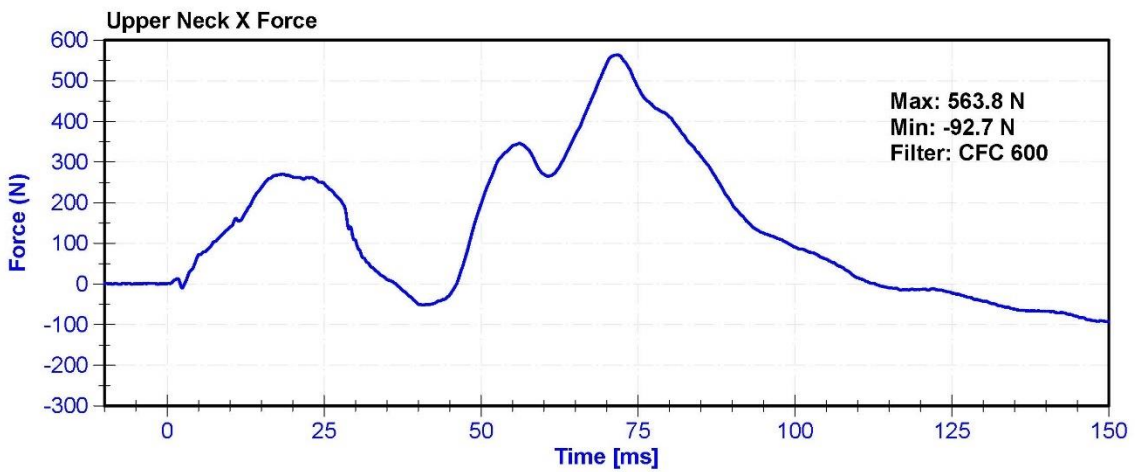
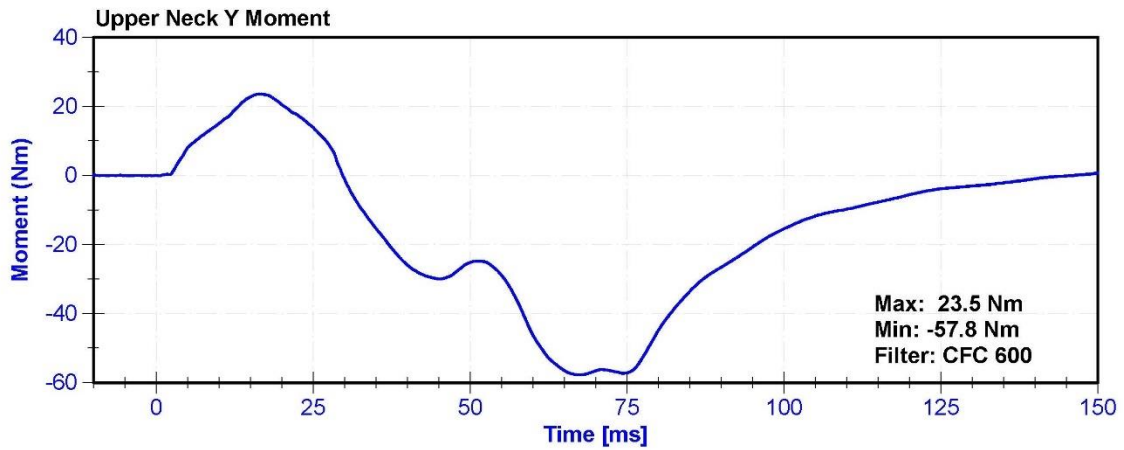
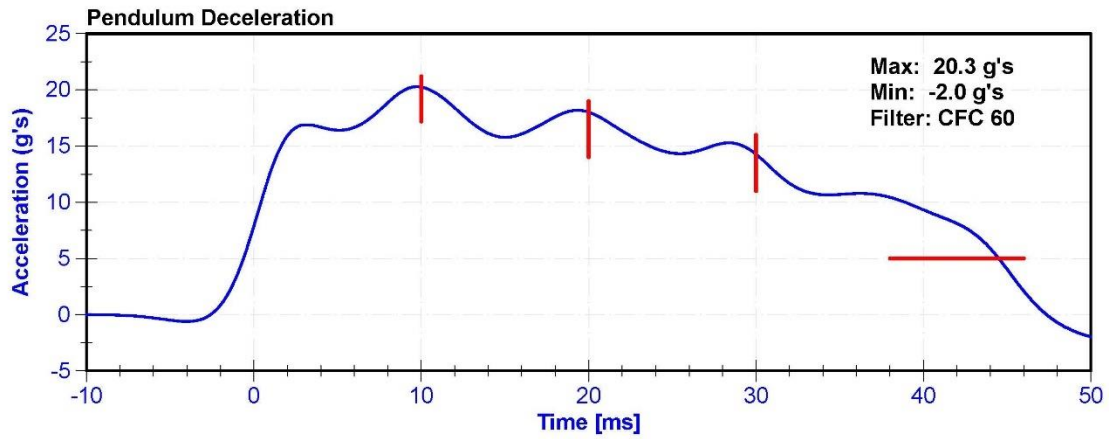
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	36	Pass
Velocity	5.94	6.19	m/s	6.049	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	20.25	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.0	Pass
Pendulum Deceleration at 30ms	11	16	g's	14.3	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	20.3	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	44.6	Pass
Maximum D Plane Rotation	81	106	deg	97.3	Pass
Time to Maximum Rotation	72	82	ms	77.3	Pass
Rotation Decay to Zero	147	174	ms	159.8	Pass
Minimum Moment About OC	-80	-52.9	Nm	-66.53	Pass
Time to Minimum Moment	65	79	ms	73.0	Pass
Moment Decay to Zero	120	148	ms	139.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Pendulum Potentiometer	ETI	LABPOT1	5/7/2021	5/7/2022
Condyle Potentiometer	ETI	LABPOT2	5/7/2021	5/7/2022
Upper Neck Load Cell	FTSS	280-FX	9/14/2021	9/14/2022





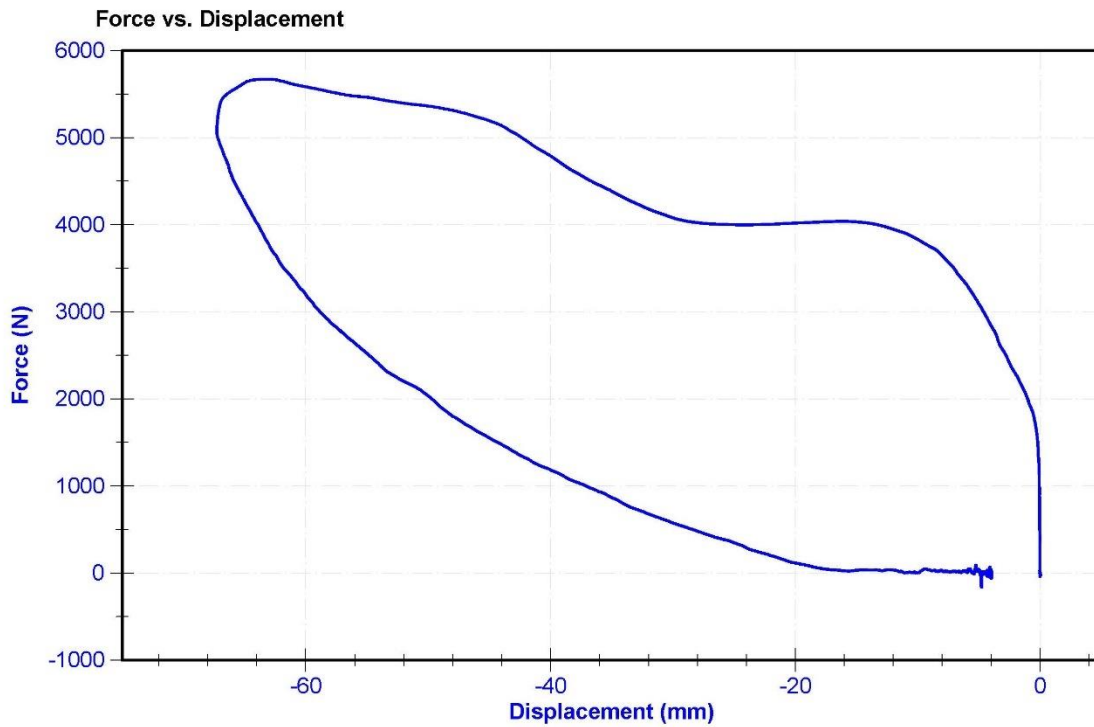
ATD Manufacturer	Humanetics	Test Technician	D. Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

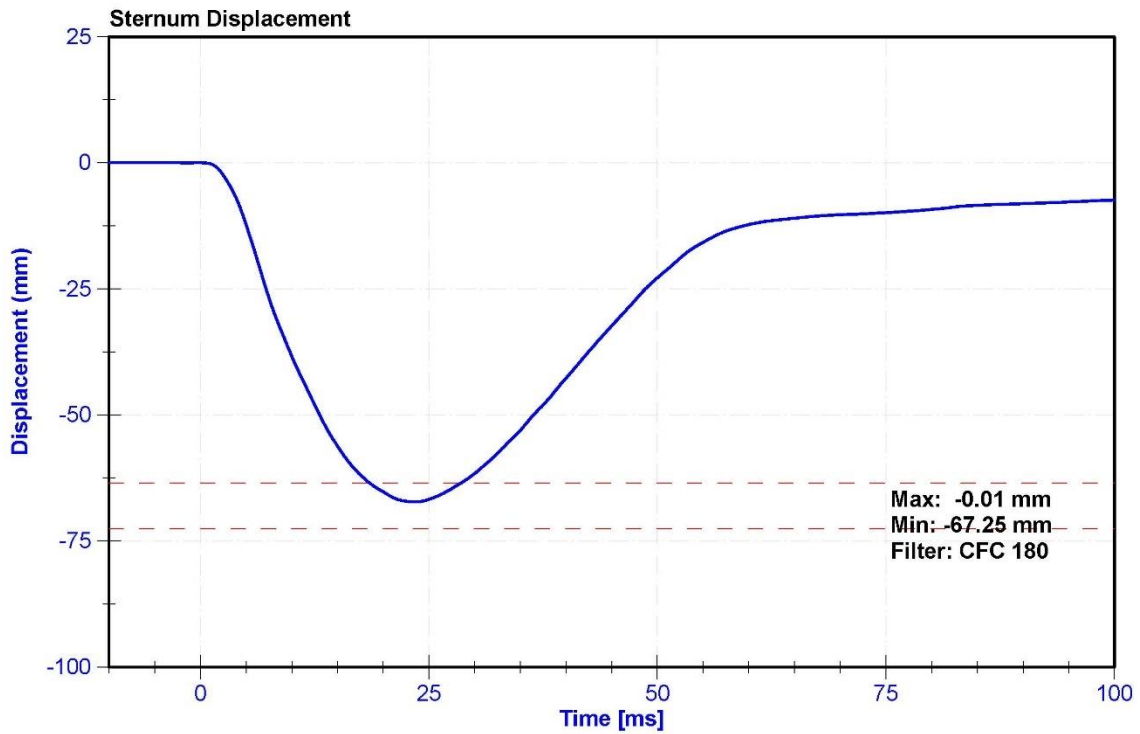
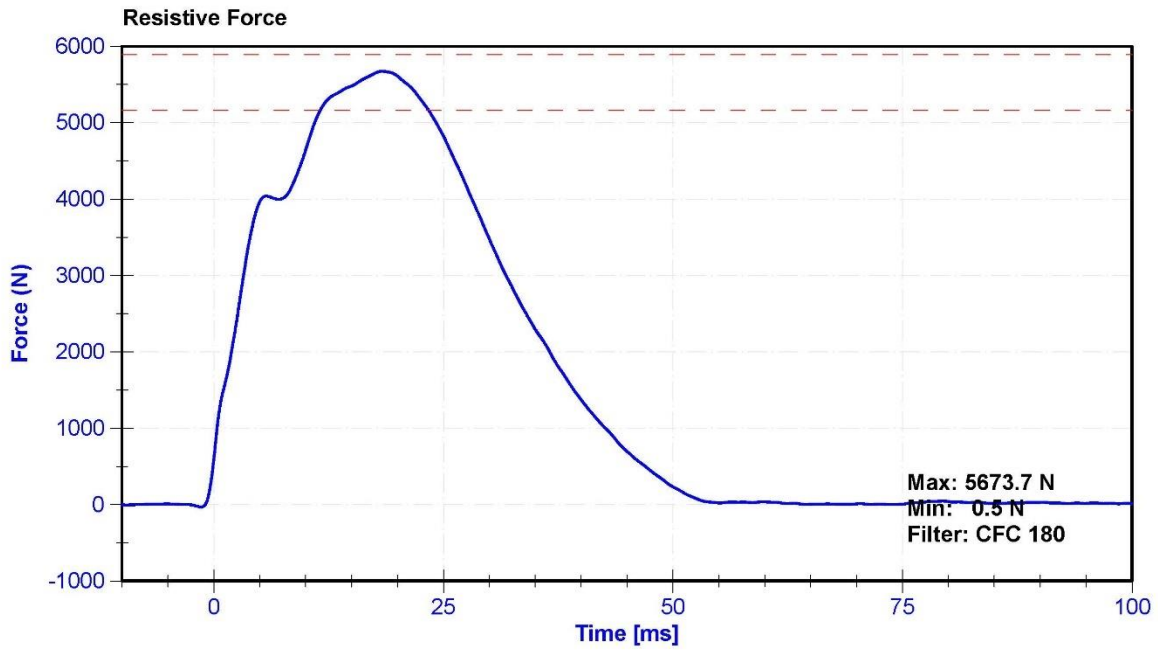
Results

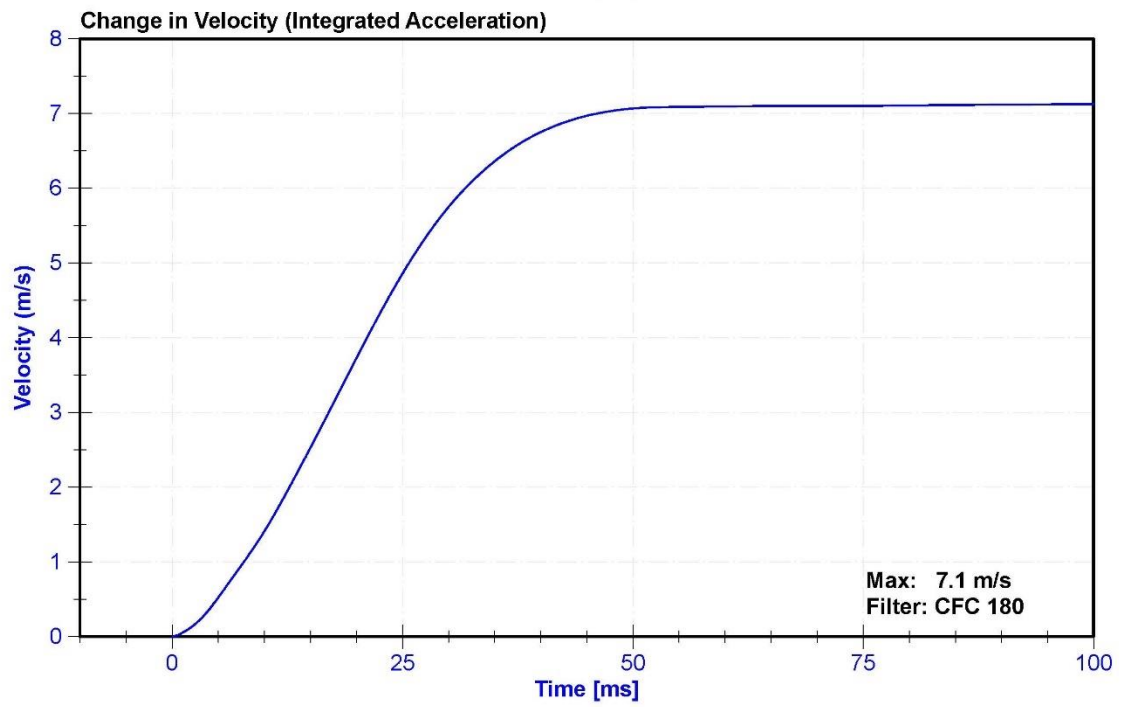
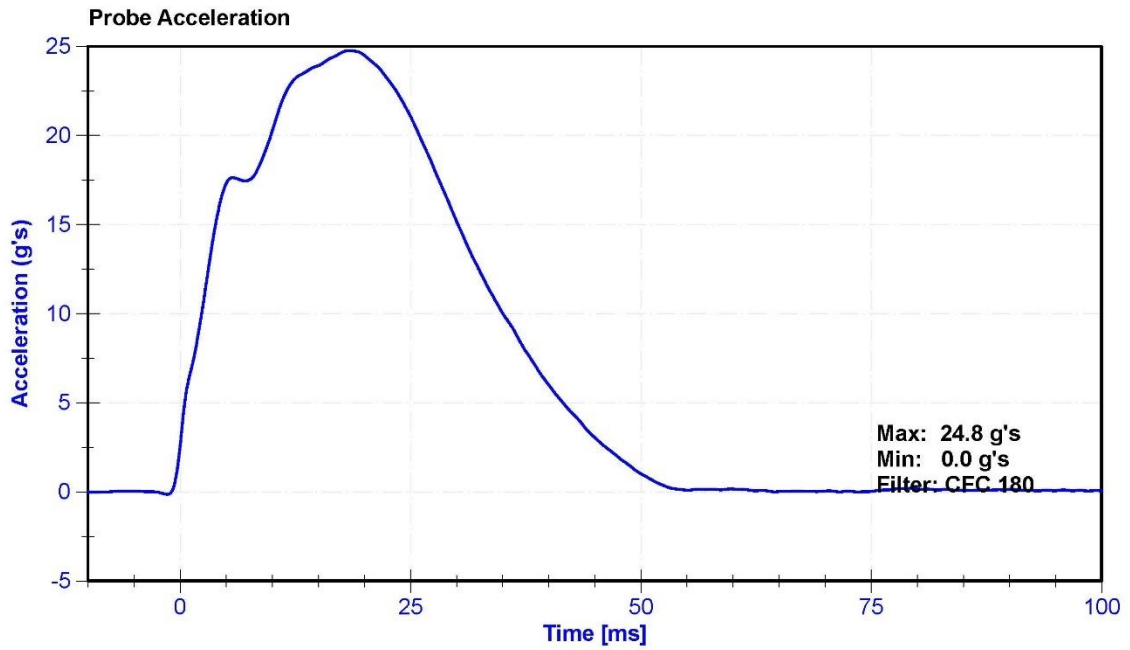
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	27.4	Pass
Velocity	6.59	6.83	m/s	6.718	Pass
Chest Displacement	-72.6	-63.5	mm	-67.25	Pass
Resistive Force	5160	5894	N	5673.7	Pass
Hysteresis	65	85	%	72.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Chest Potentiometer	Servo	142GFE	11/16/2021	5/17/2022







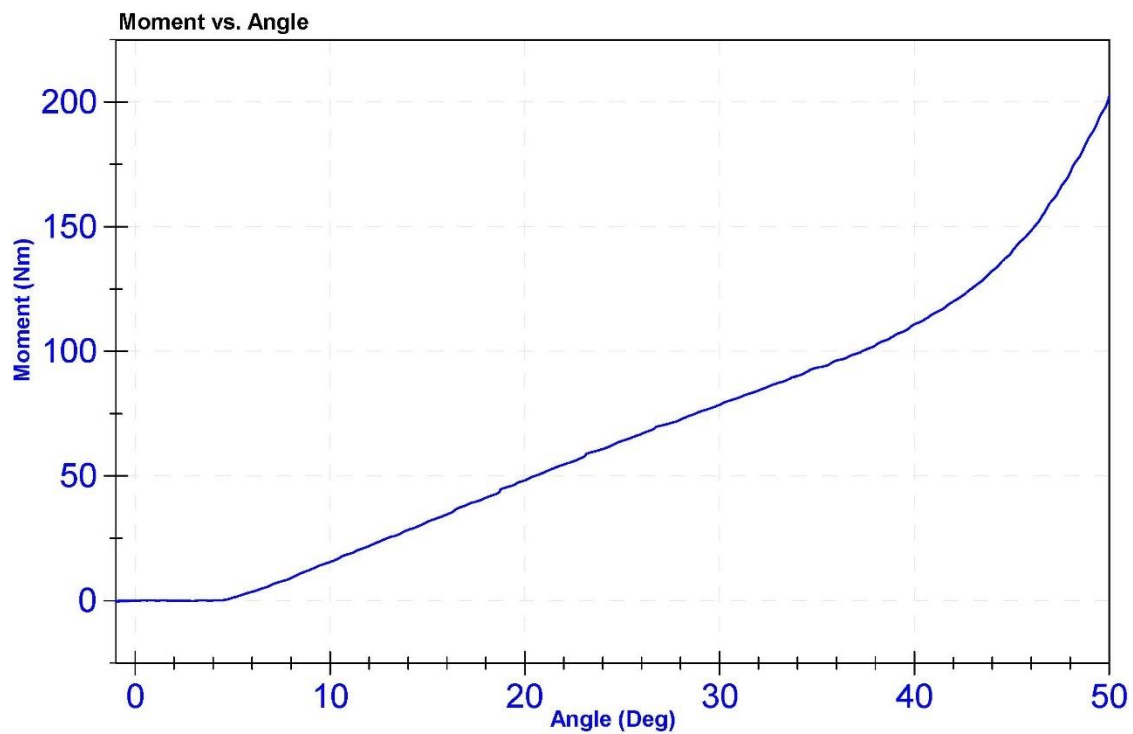
ATD Manufacturer	Humanetics	Test Technician	D. Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.4	Pass
Humidity	10	70	%	23.2	Pass
Average Velocity	5	10	deg/s	7.3	Pass
Angle at 203Nm	40	50	deg	50.0	Pass
Moment at 30 degrees	0	94.9	Nm	78.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI	DS-0008	2021-09-27	2022-09-27
Load Cell	Key Trans 2301-02	LC-115 My	2021-08-13	2022-08-13



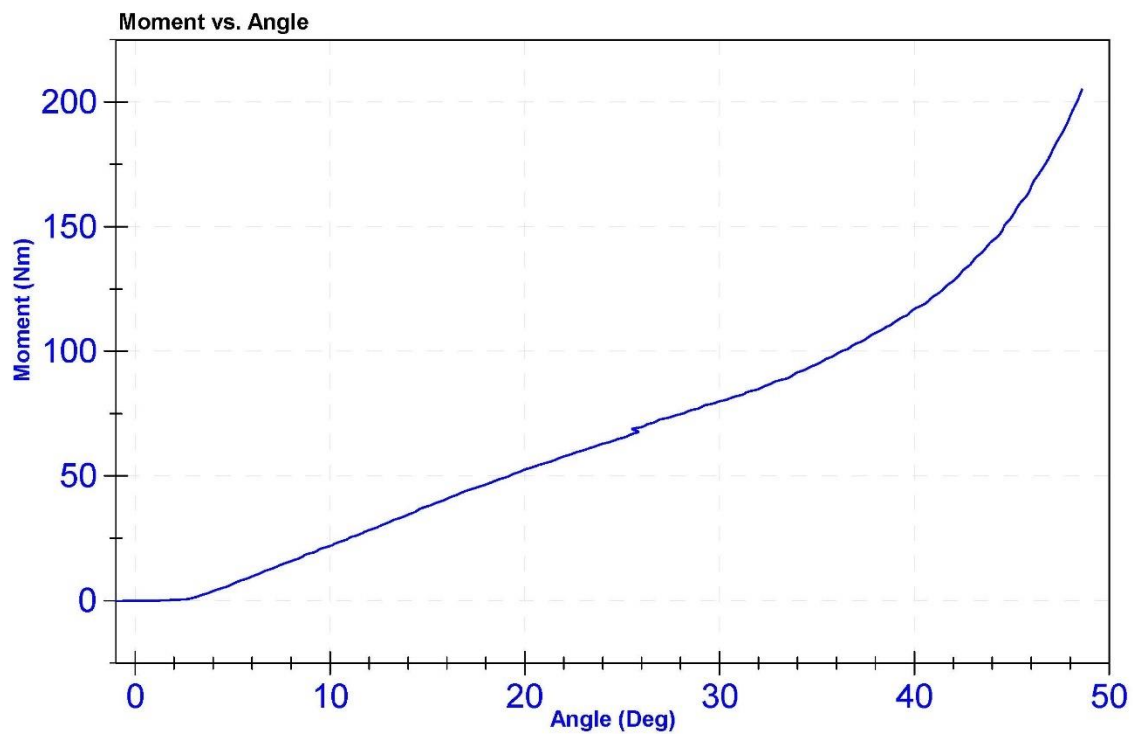
ATD Manufacturer	Humanetics	Test Technician	T. Roseman
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.4	Pass
Humidity	10	70	%	23.2	Pass
Average Velocity	5	10	deg/s	7.3	Pass
Angle at 203Nm	40	50	deg	48.5	Pass
Moment at 30 degrees	0	94.9	Nm	79.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI	DS-0008	2021-09-27	2022-09-27
Load Cell	Key Trans 2301-02	LC-115 My	2021-08-13	2022-08-13



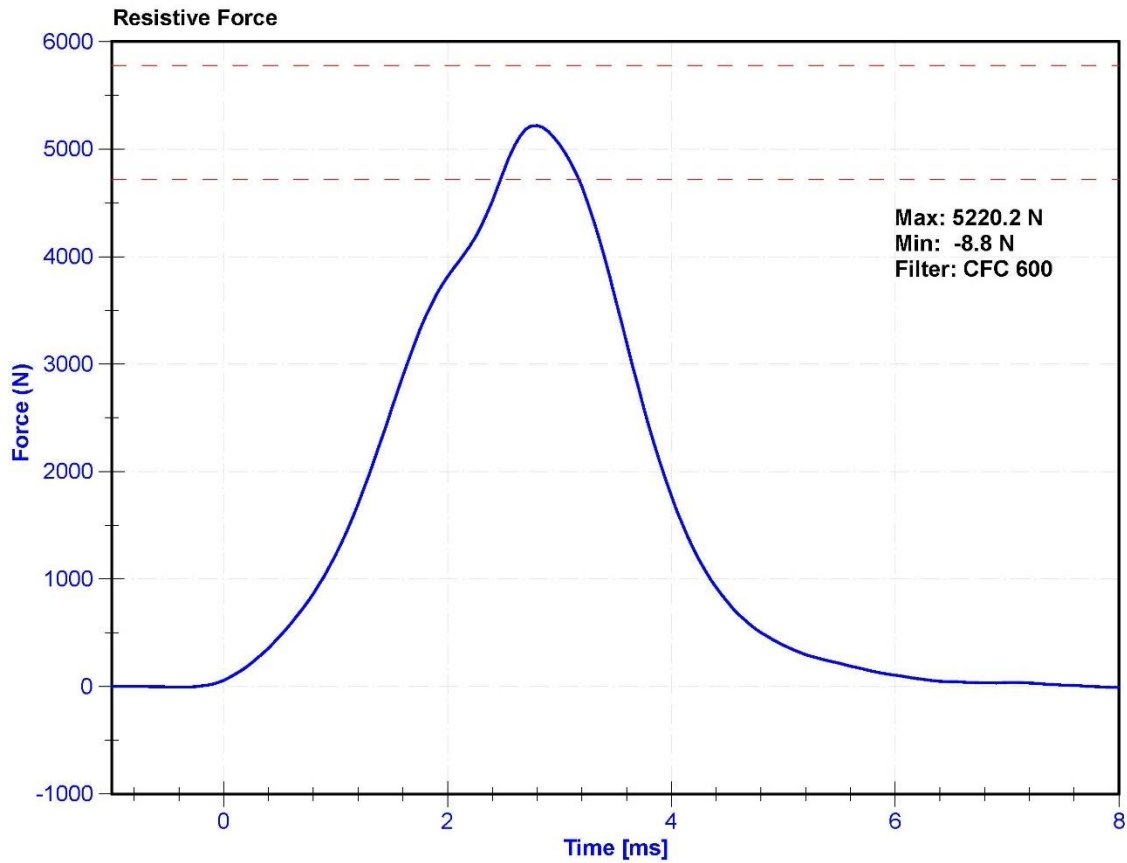
ATD Manufacturer	Humanetics	Test Technician	D. Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

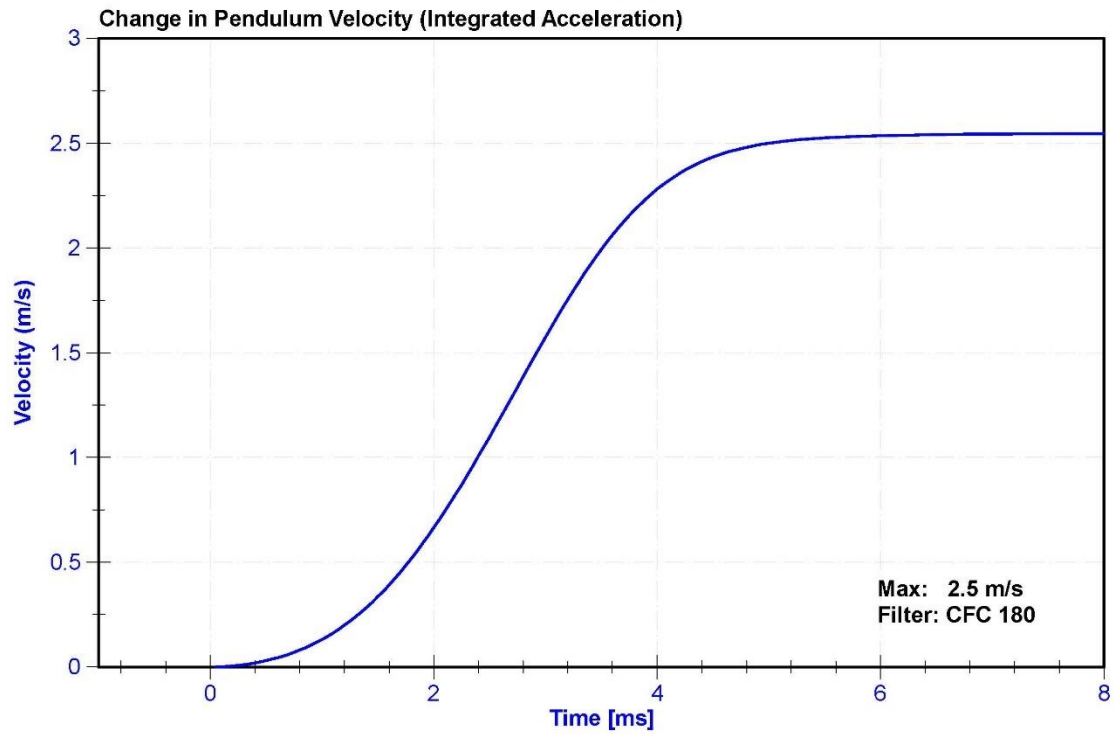
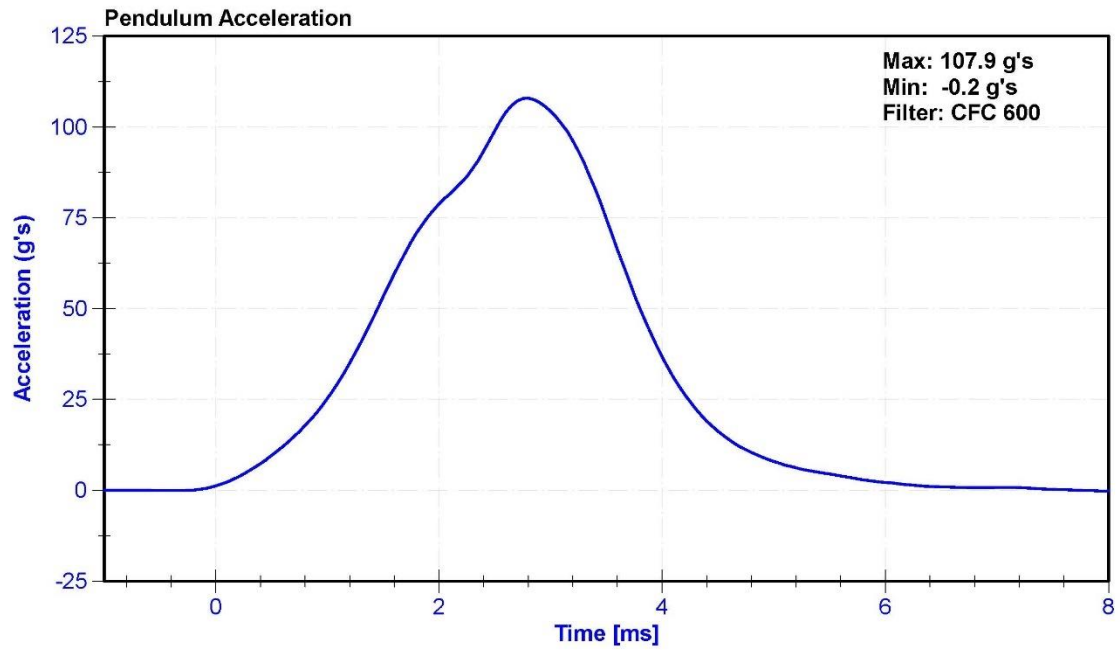
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	27	Pass
Velocity	2.07	2.13	m/s	2.114	Pass
Maximum Resistive Force	4720	5780	N	5220.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022





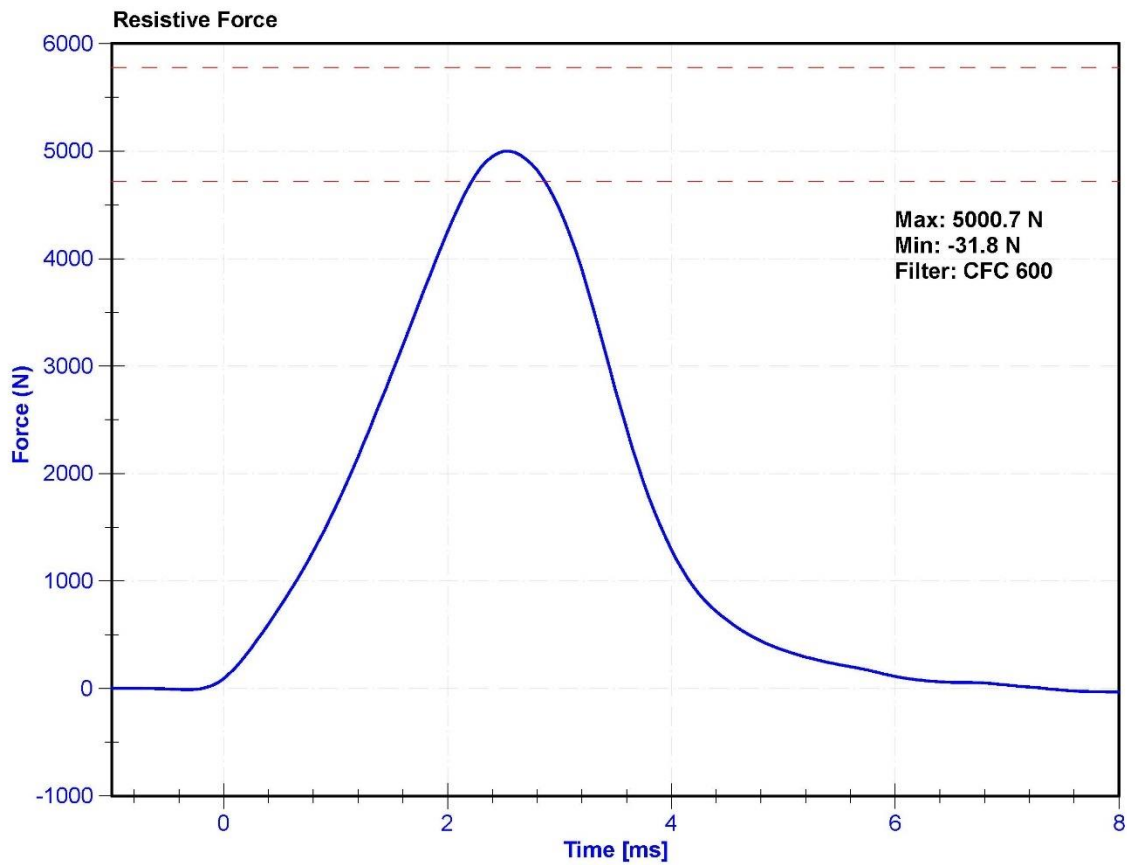
ATD Manufacturer	Humanetics	Test Technician	DR
ATD Serial Number	142	Laboratory Supervisor	Kevin Brogan

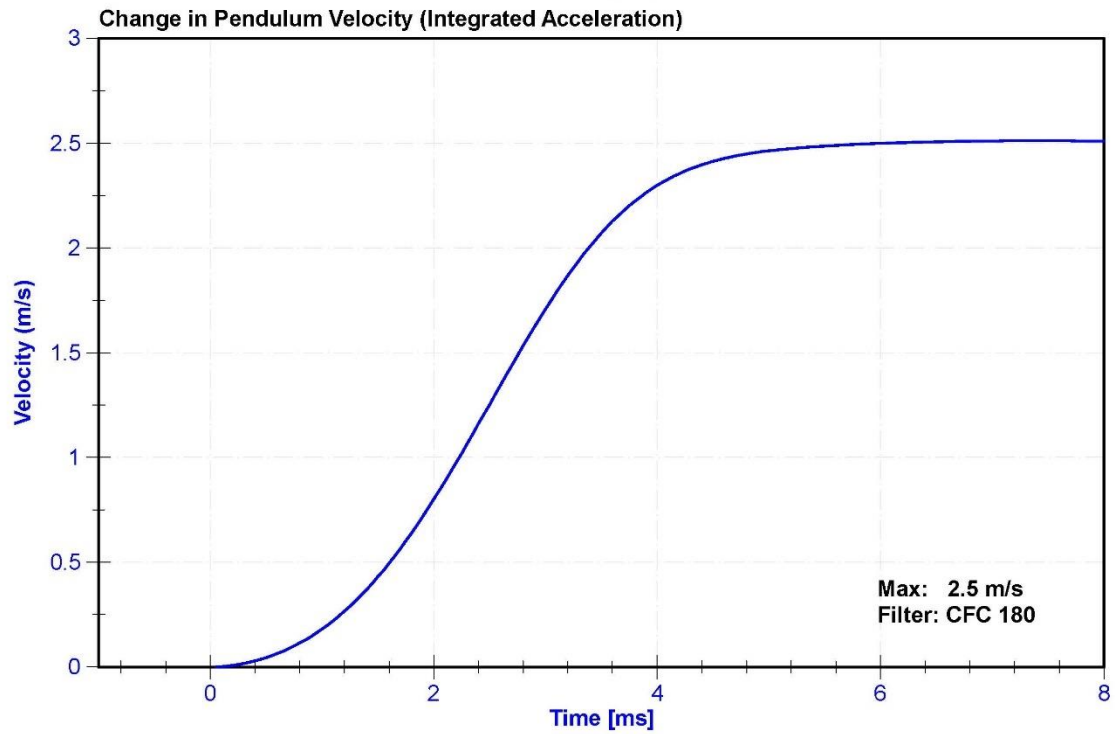
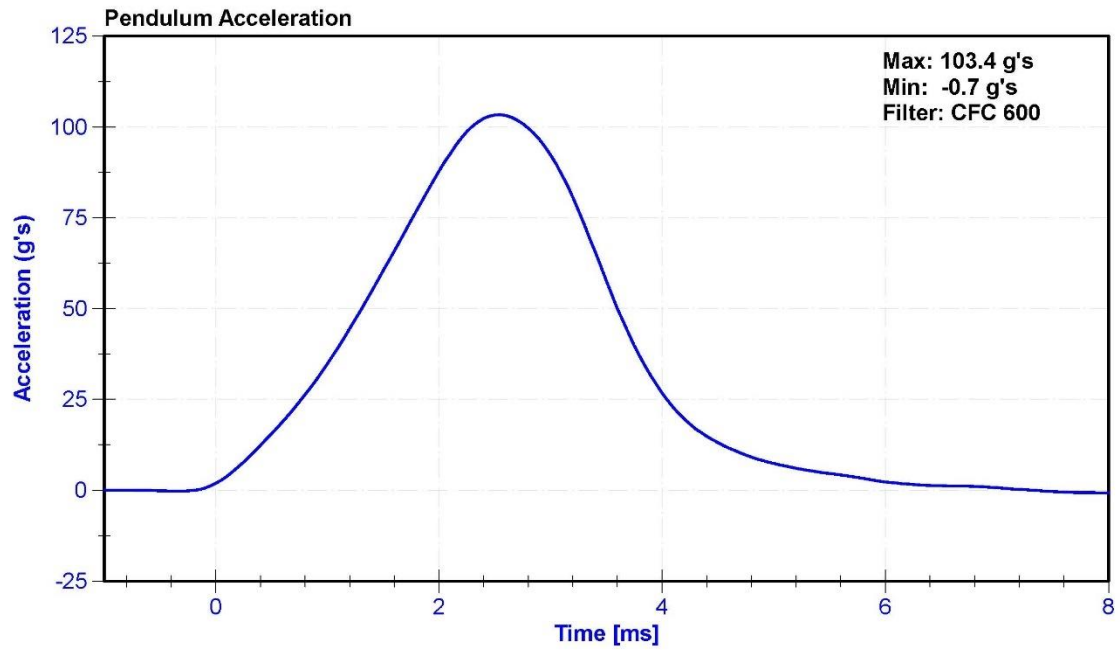
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.6	Pass
Humidity	10	70	%	30	Pass
Velocity	2.07	2.13	m/s	2.111	Pass
Maximum Resistive Force	4720	5780	N	5000.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022





CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 137

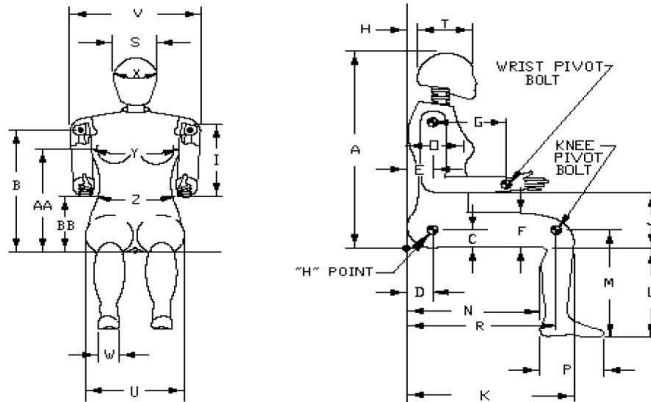


External Measurements - Hybrid 3 - 5th Female

Technician: K. Brogan

Date: 02/11/2021

Dummy Serial Number: 137



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	790	Pass
B	Shoulder Pivot Height	432	457	445	Pass
C	H-Point Height	81	86	83	Pass
D	H-Point from Backline	145	150	147	Pass
E	Shoulder Pivot from Backline	69	84	78	Pass
F	Thigh Clearance	119	135	125	Pass
G	Back of Elbow to Wrist Pivot	244	259	250	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	290	Pass
J	Elbow Rest Height	183	203	195	Pass
K	Buttock to Knee Length	521	546	541	Pass
L	Popliteal Height	356	376	365	Pass
M	Knee Pivot Height	394	419	412	Pass
N	Buttock Popliteal Length	414	439	425	Pass
O	Chest Depth without Jacket	175	191	181	Pass
P	Foot Length (right)	219	234	228	Pass
R	Buttock To Knee Pivot Length	457	483	466	Pass
S	Head Breadth	137	147	141	Pass
T	Head Depth	178	188	180	Pass
U	Hip Breadth	300	315	310	Pass
V	Shoulder Breadth	351	366	359	Pass
W	Foot Breadth	79	94	85	Pass
X	Head Circumference	528	549	540	Pass
Y	Chest Circumference with Jacket	851	881	874	Pass
Z	Waist Circumference	460	790	650	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

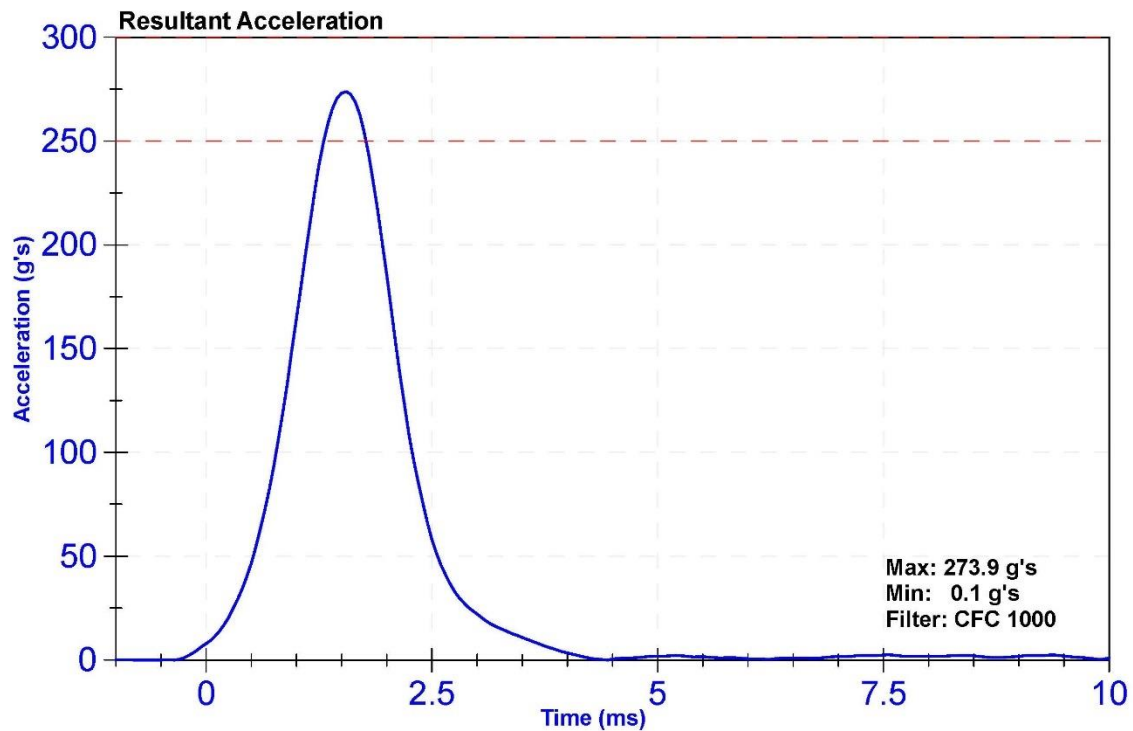
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

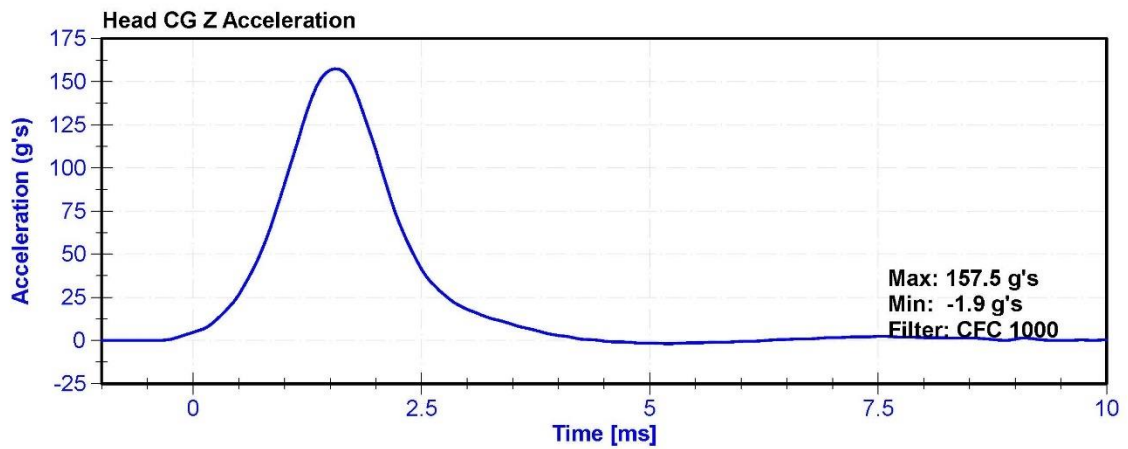
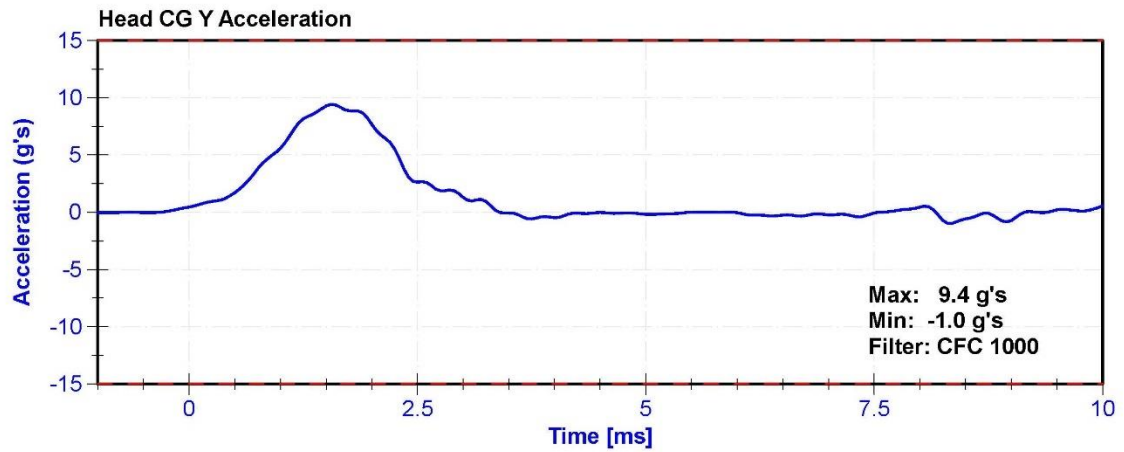
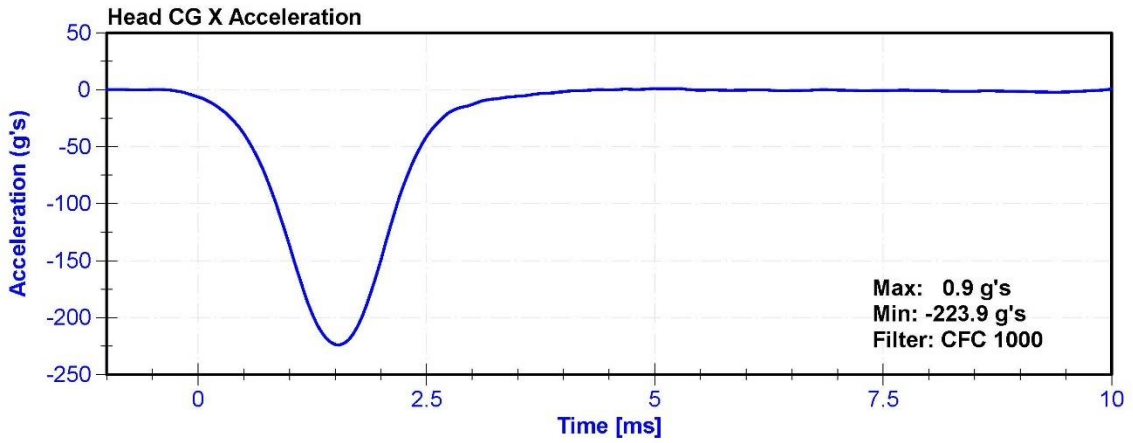
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	23.6	Pass
Resultant Acceleration	250	300	g's	273.9	Pass
Oscillation	0	10	%	1.9	Pass
Lateral Acceleration	-15	15	g's	9.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	P79417	2/1/2022	7/31/2022
Y Accelerometer	Endevco	P83335	2/1/2022	7/31/2022
Z Accelerometer	Endevco	P64149	2/1/2022	7/31/2022





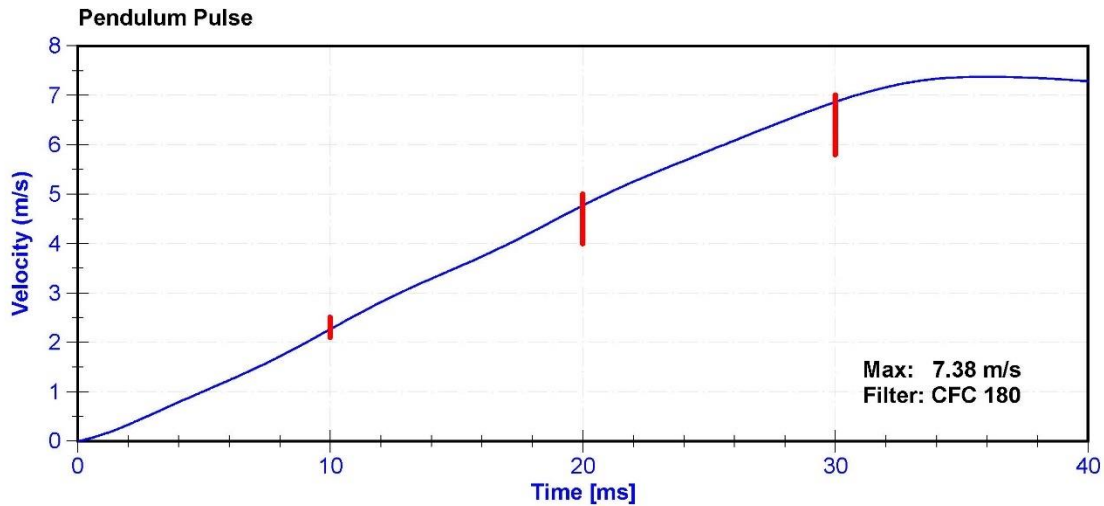
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

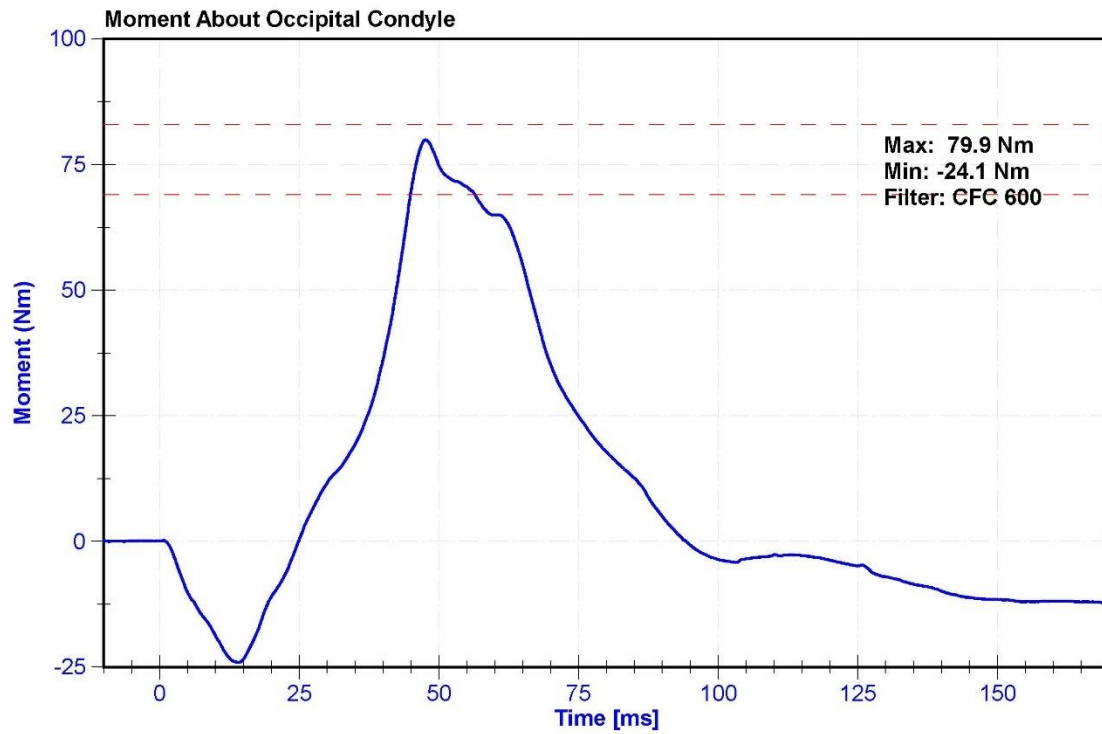
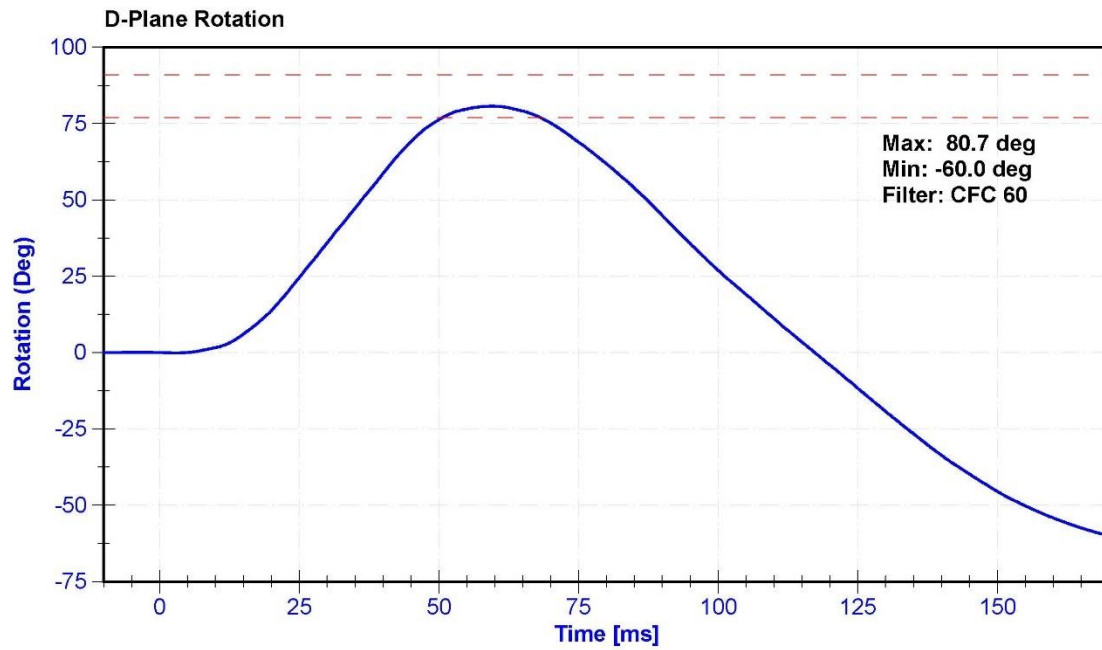
Results

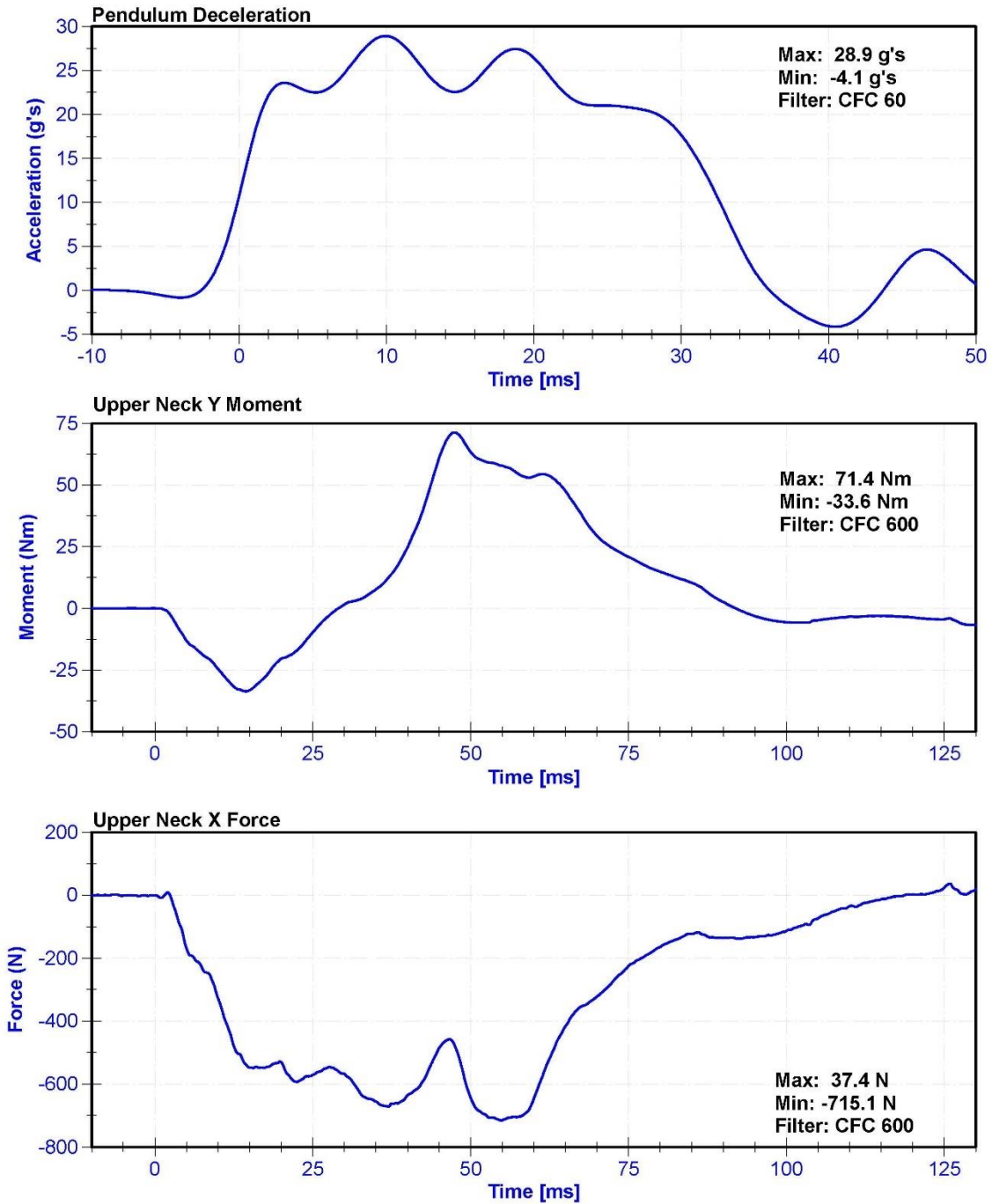
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	22.8	Pass
Velocity	6.89	7.13	m/s	7.023	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.26	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.77	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.87	Pass
Max D Plane Rotation	77	91	deg	80.7	Pass
Max Moment During Rotation Interval	69	83	Nm	79.9	Pass
Moment Decay to 10.0 Nm	80	100	ms	86.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231CT	10/28/2021	10/28/2022
Pendulum Potentiometer	ETI	LABPOT1	5/7/2021	5/7/2022
Condyle Potentiometer	ETI	LABPOT2	5/7/2021	5/7/2022
Upper Neck Load Cell	Denton	2184-FX	6/24/2021	6/24/2022







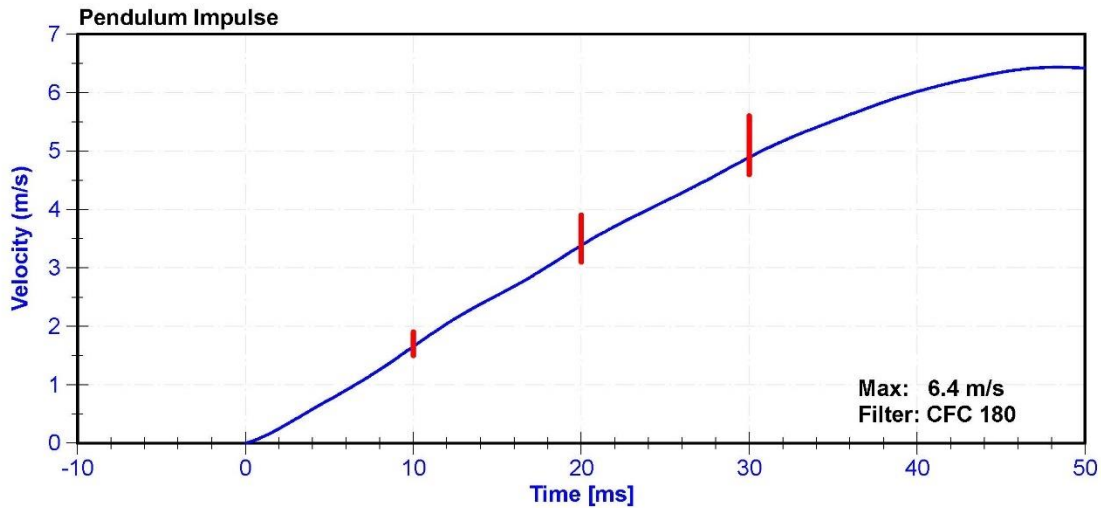
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

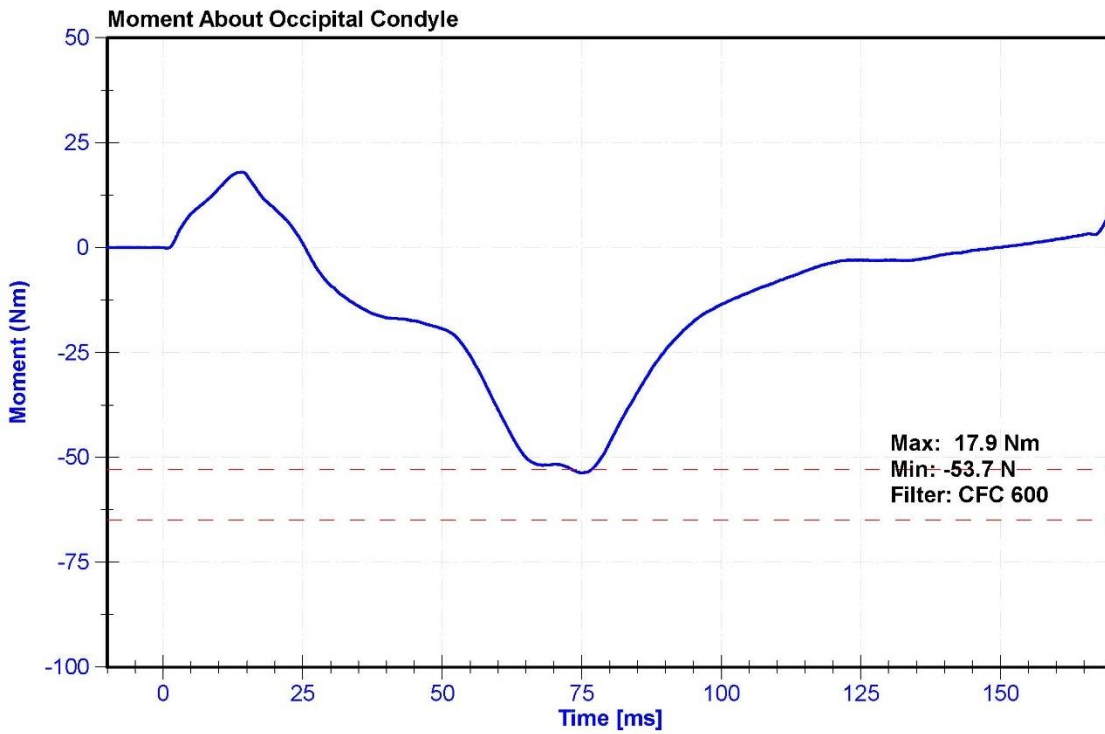
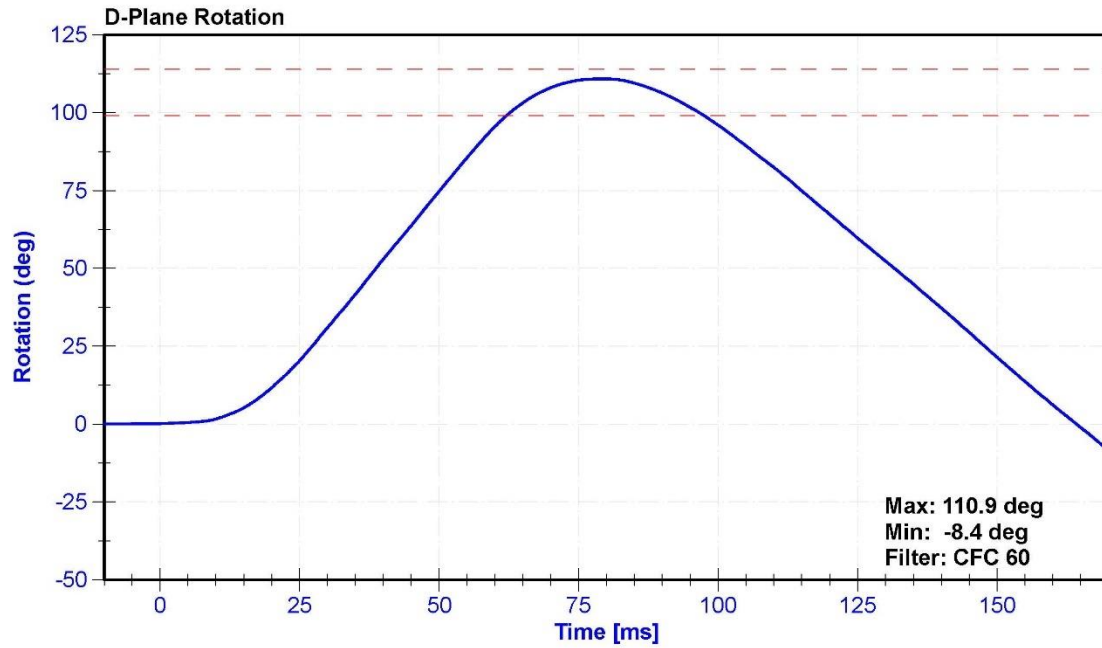
Results

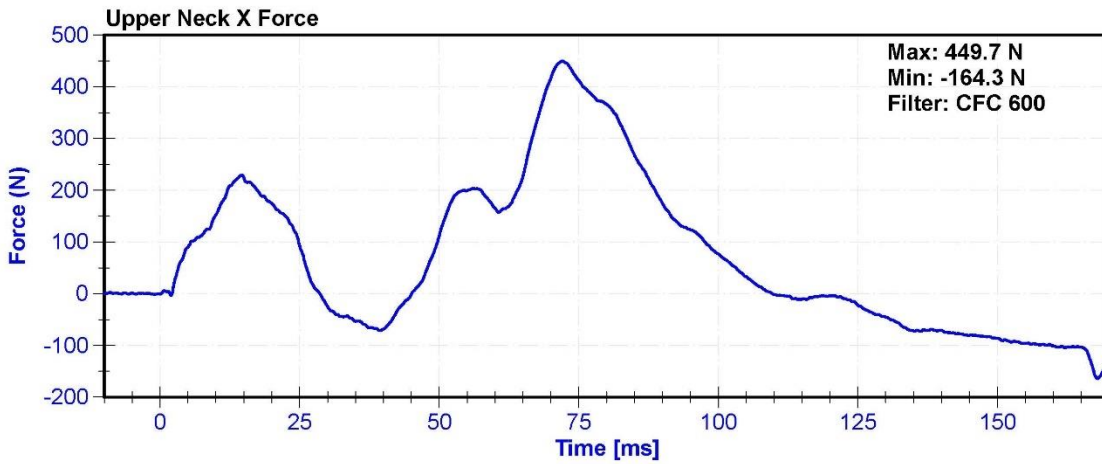
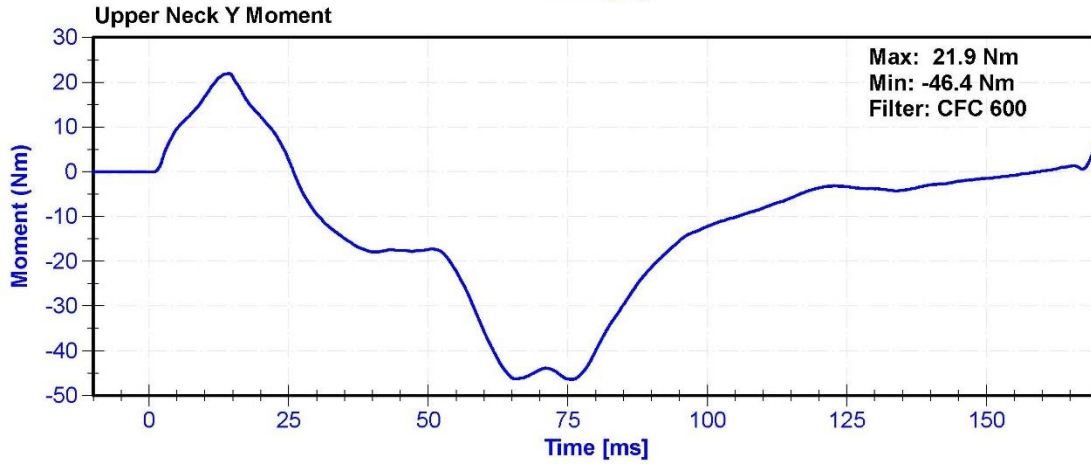
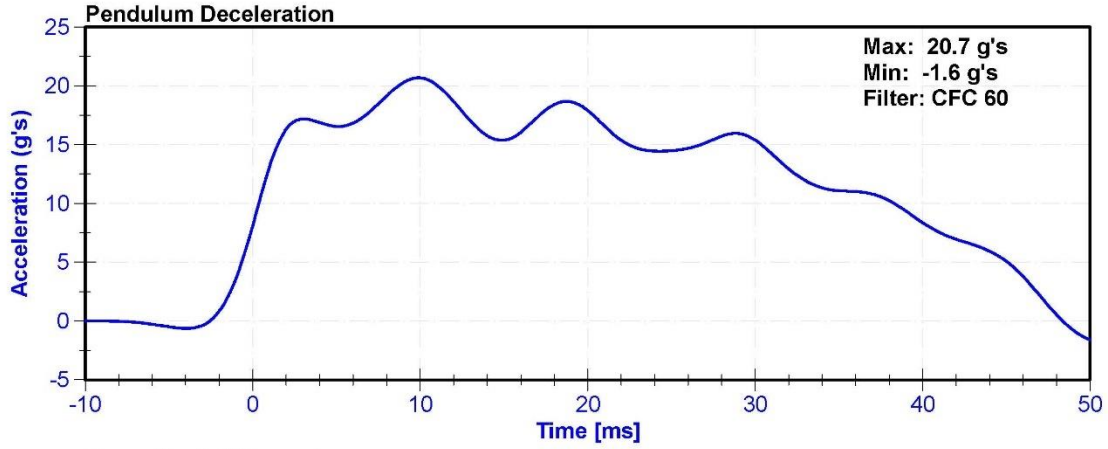
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	22.8	Pass
Velocity	5.95	6.19	m/s	6.136	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.65	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.39	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	4.89	Pass
D Plane Rotation	99	114	deg	110.9	Pass
Moment During Rotation Interval	-65	-53	Nm	-53.7	Pass
Moment Decay to -10Nm	94	114	ms	106.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/28/2021	10/28/2022
Pendulum Potentiometer	ETI	LABPOT1	5/7/2021	5/7/2022
Condyle Potentiometer	ETI	LABPOT2	5/7/2021	5/7/2022
Upper Neck Load Cell	Denton	2184-FX	6/24/2021	6/24/2022







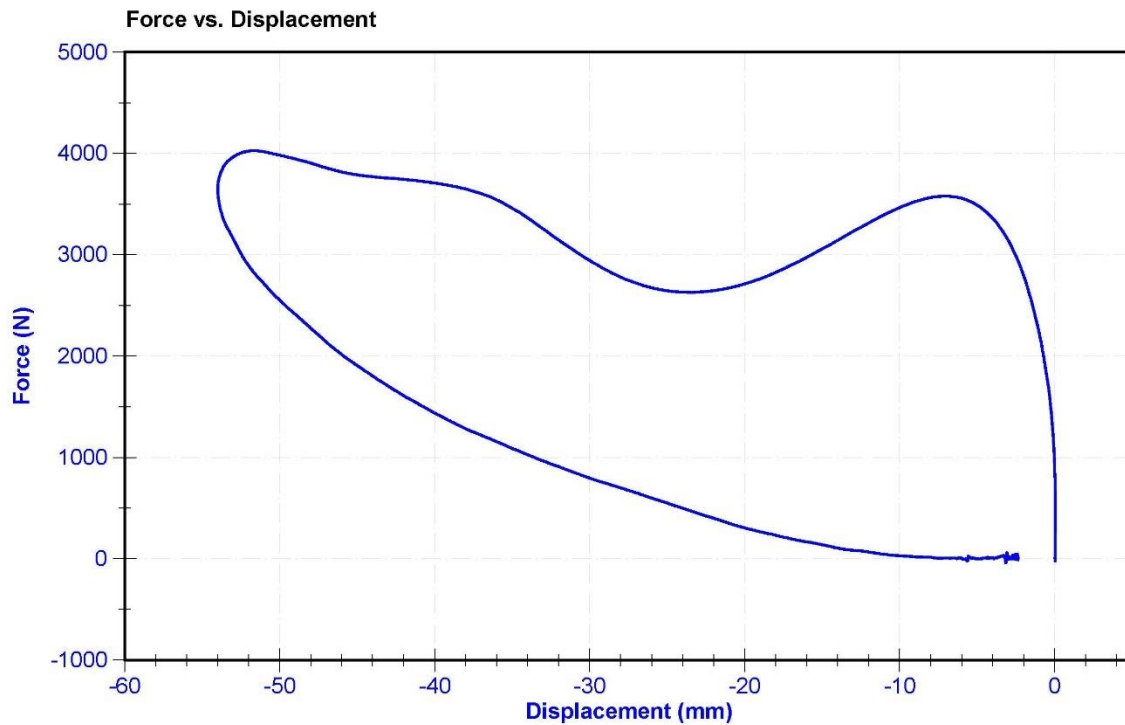
ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

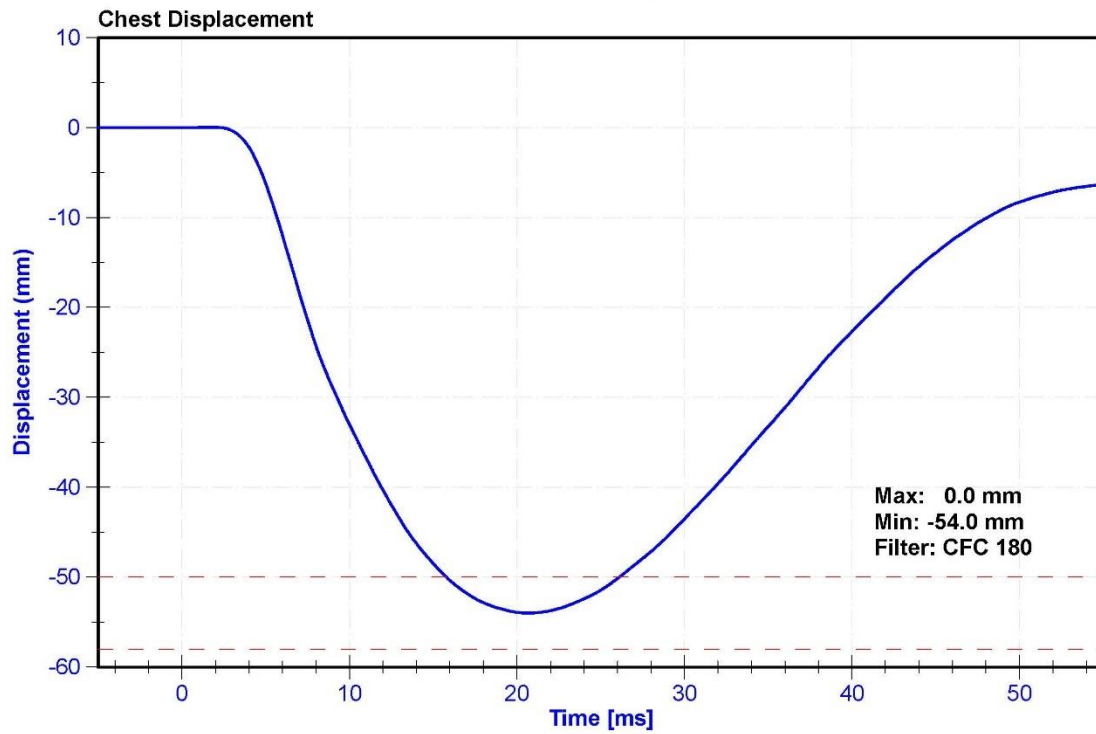
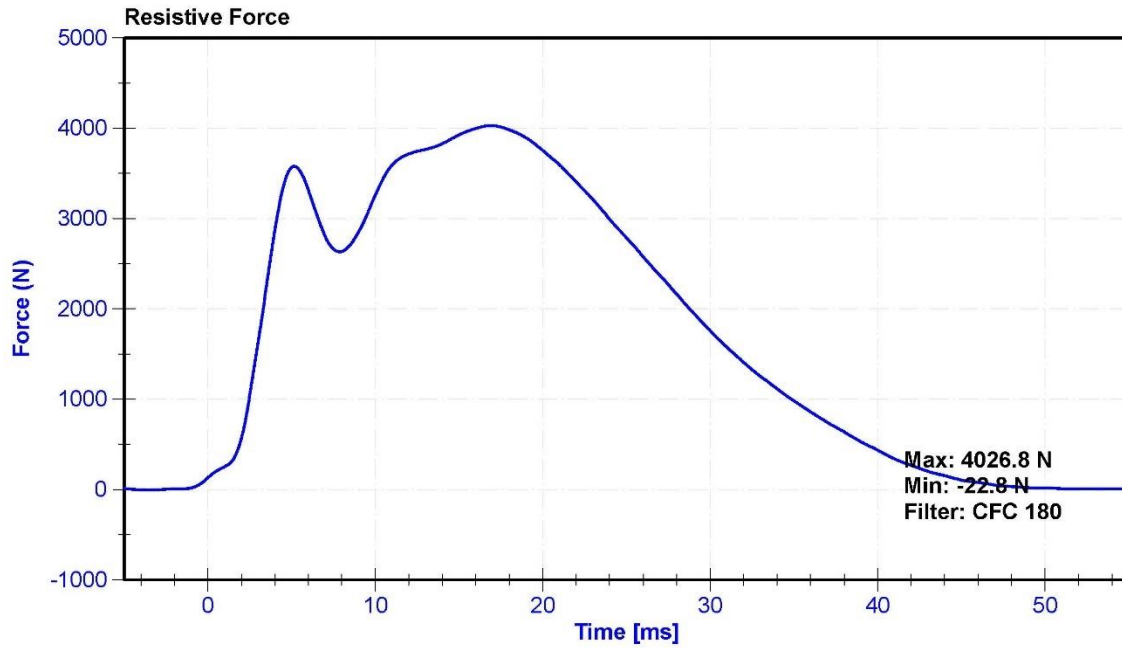
Results

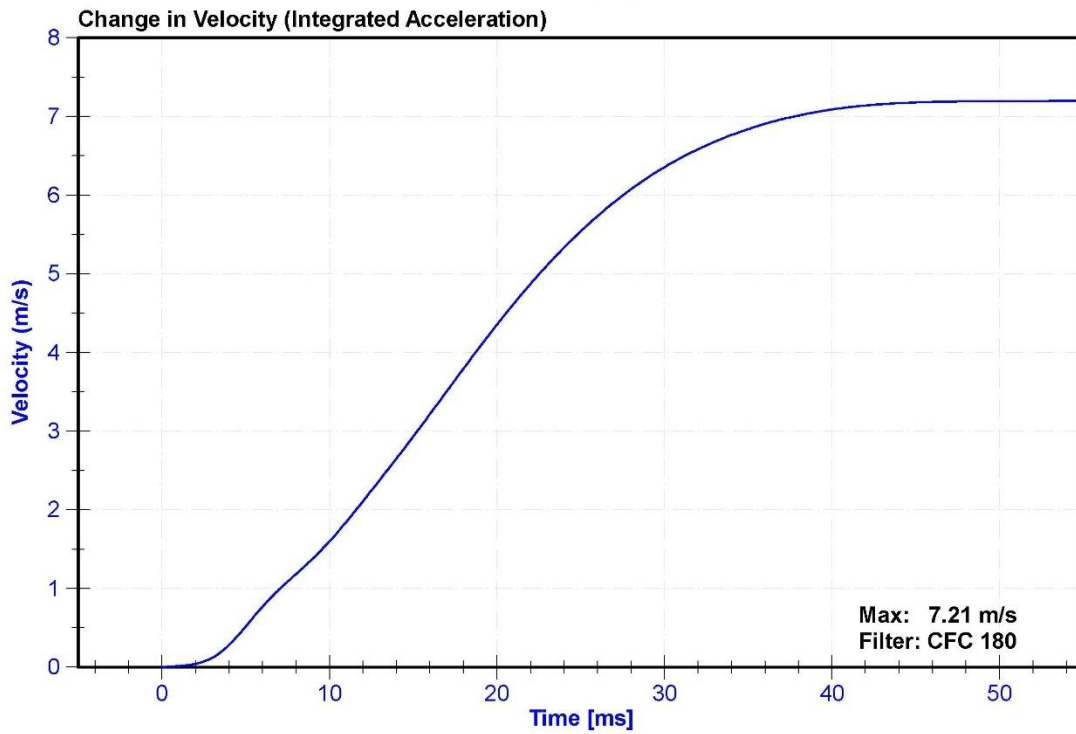
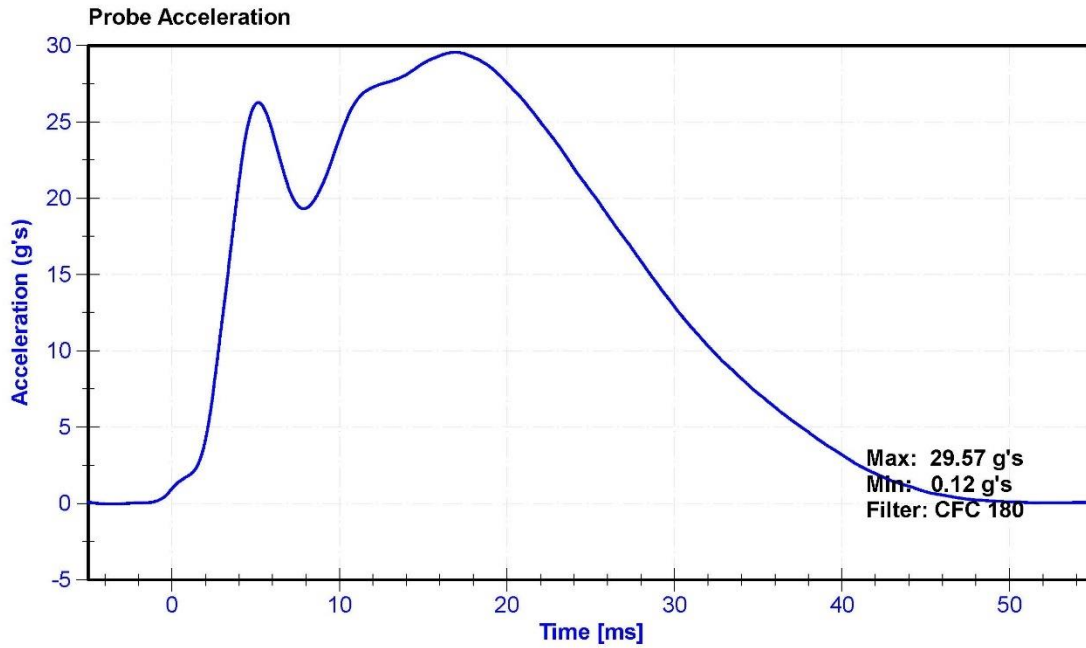
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	22.8	Pass
Velocity	6.59	6.83	m/s	6.733	Pass
Chest Deflection	-58	-50	mm	-54.0	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4026.8	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	3980.8	Pass
Hysteresis	69	85	%	72.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2021	4/23/2022
Chest Potentiometer	Servo	0720	10/28/2021	4/28/2022







ATD Manufacturer	Humanetics	Test Technician	B. Kirchner
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

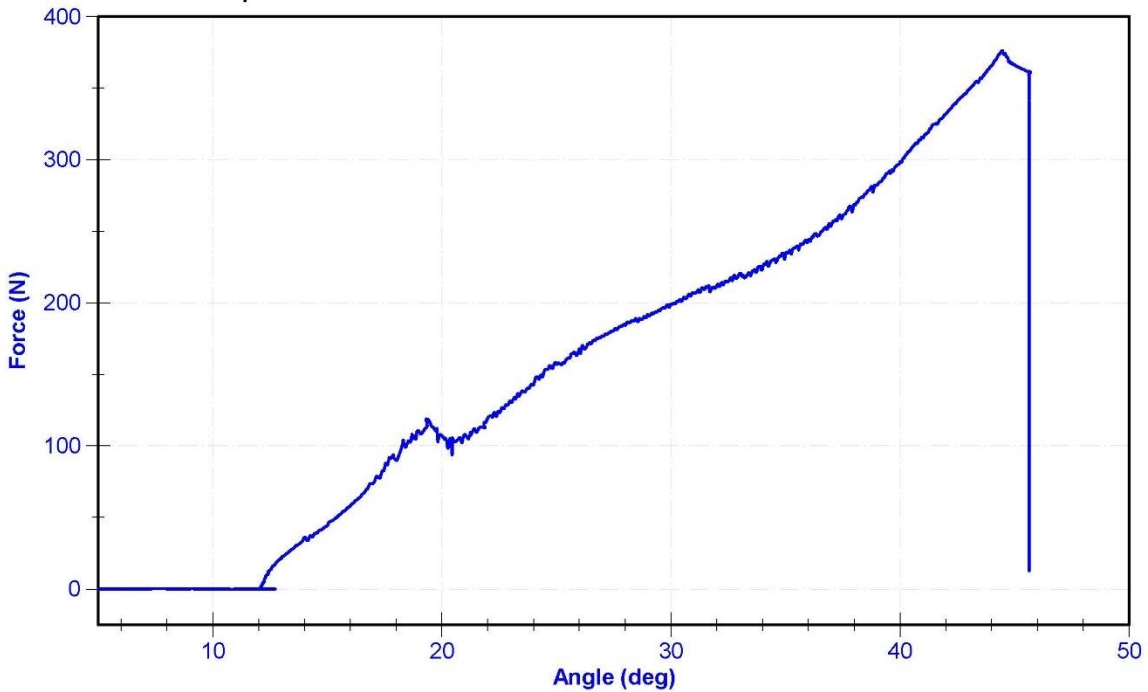
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	20.6	Pass
Humidity	10	70	%	23.6	Pass
Initial Angle	0	20	deg	11.8	Pass
Force at 45 Degrees	320	390	N	376.2	Pass
Return Angle Relative to Initial	0	8	deg	3.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker	DS-1905226	2021-11-01	2022-11-01
Load Cell	Interface	1134516	2021-08-27	2022-08-27

Force vs. Displacement



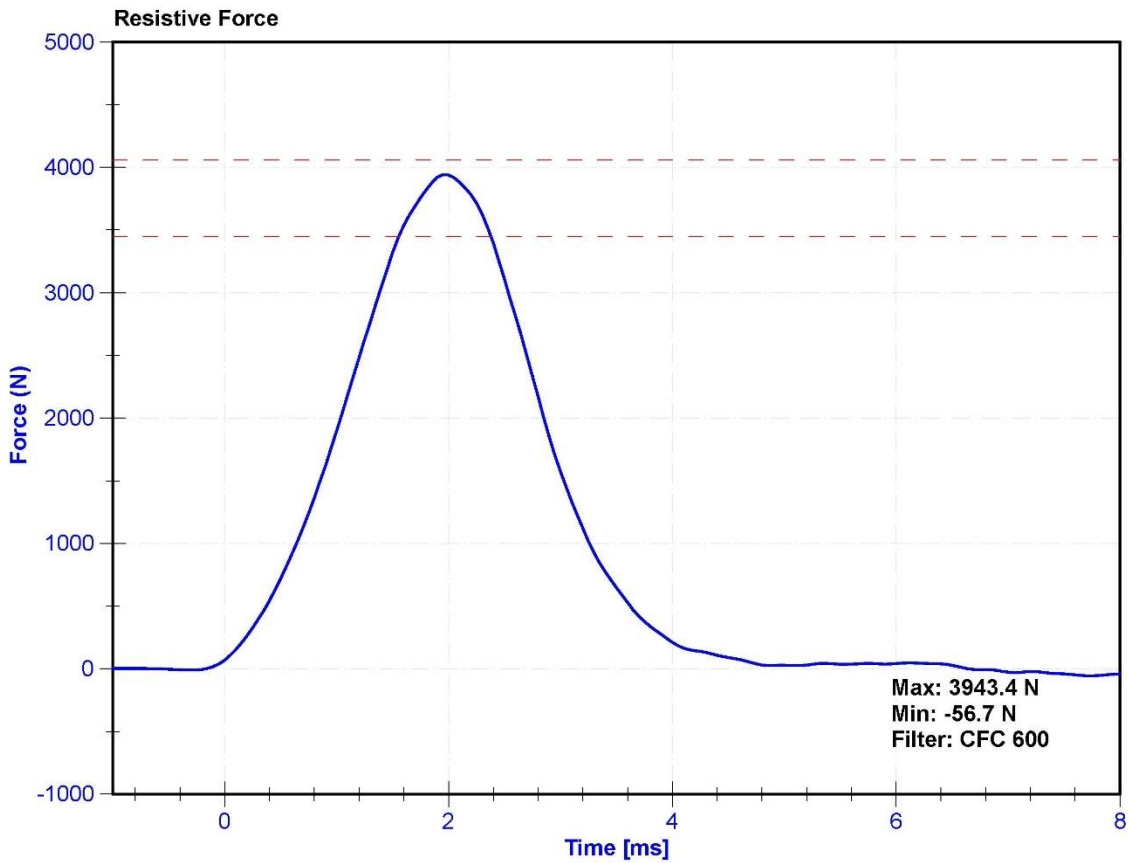
ATD Manufacturer	Humanetics	Test Technician	T. Roseman
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

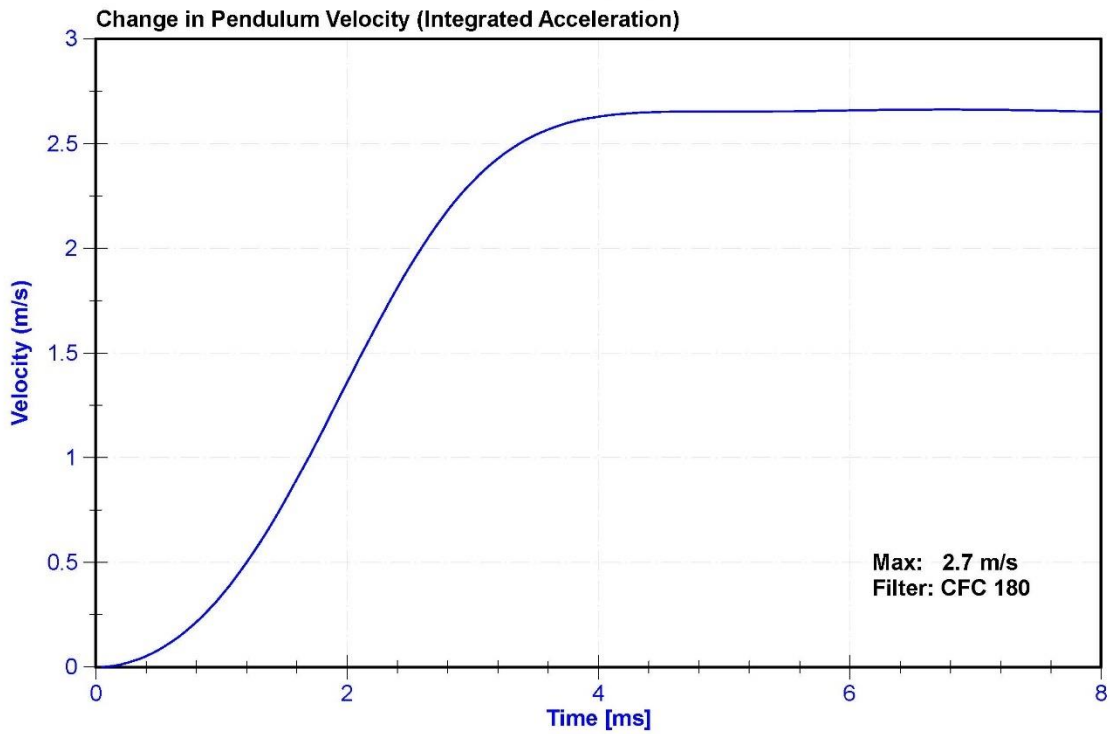
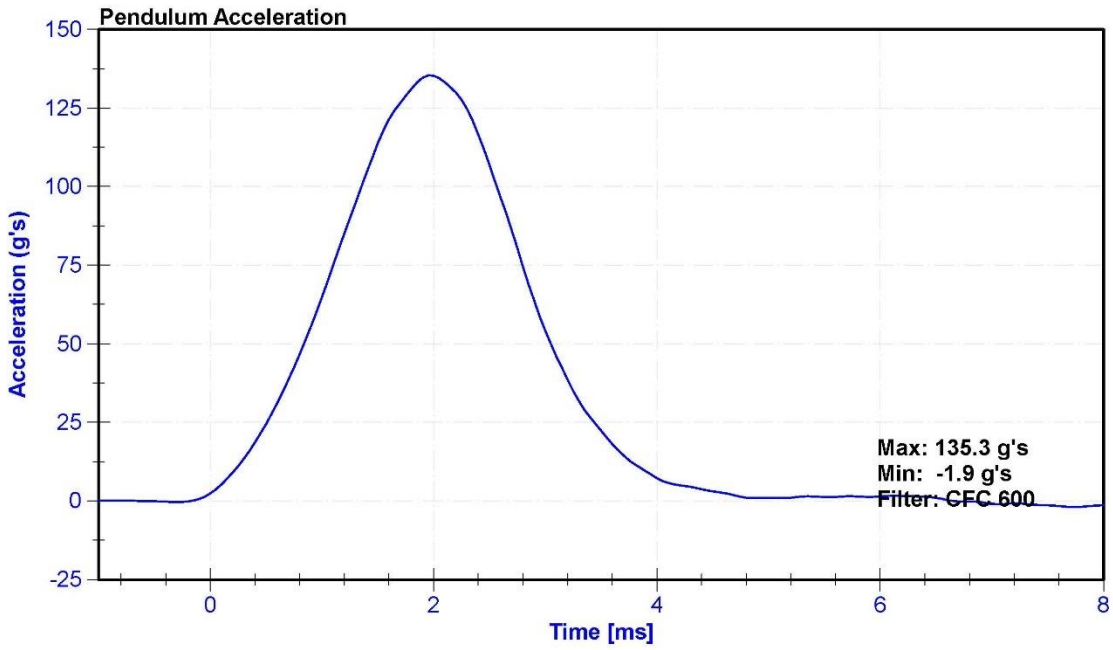
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	24	Pass
Velocity	2.07	2.13	m/s	2.092	Pass
Resistive Force	3450	4060	N	3943.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022





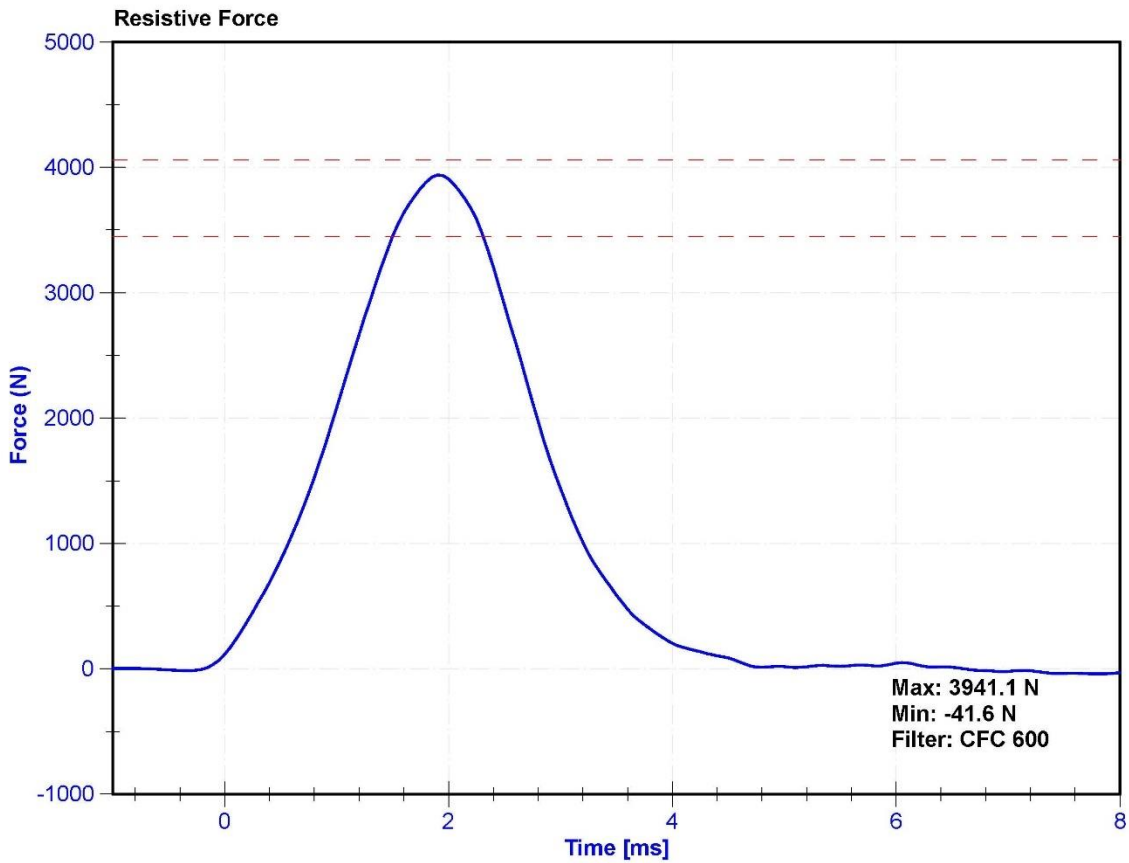
ATD Manufacturer	Humanetics	Test Technician	T. Roseman
ATD Serial Number	137	Laboratory Supervisor	K. Brogan

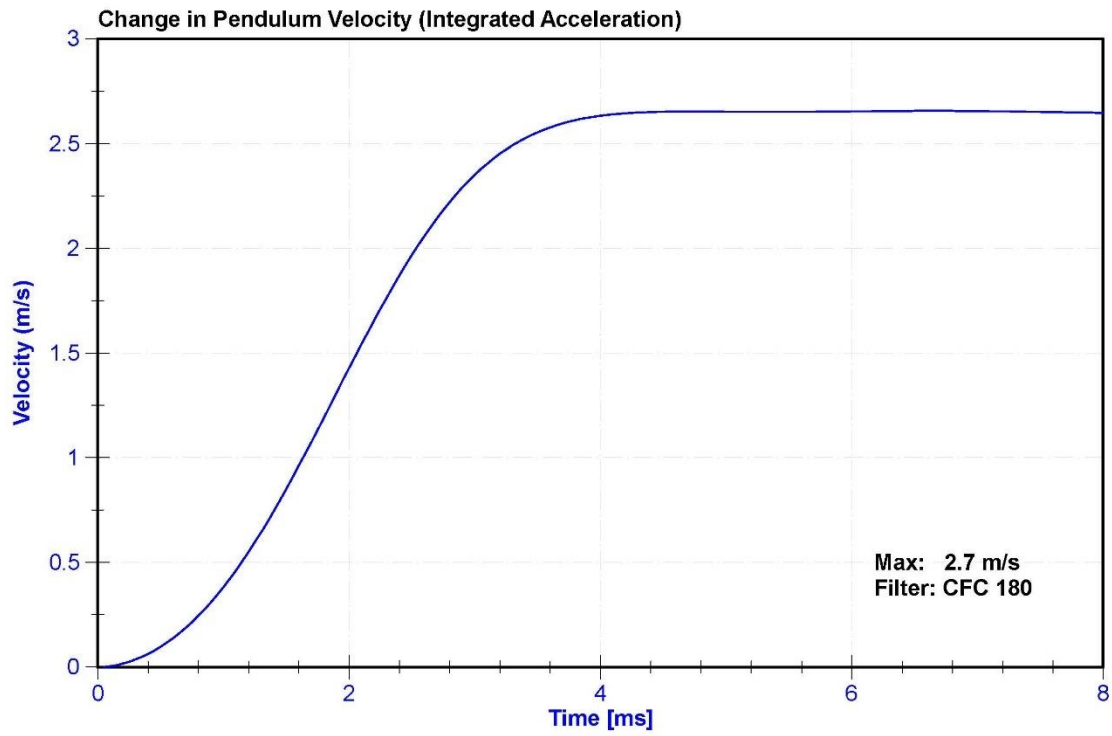
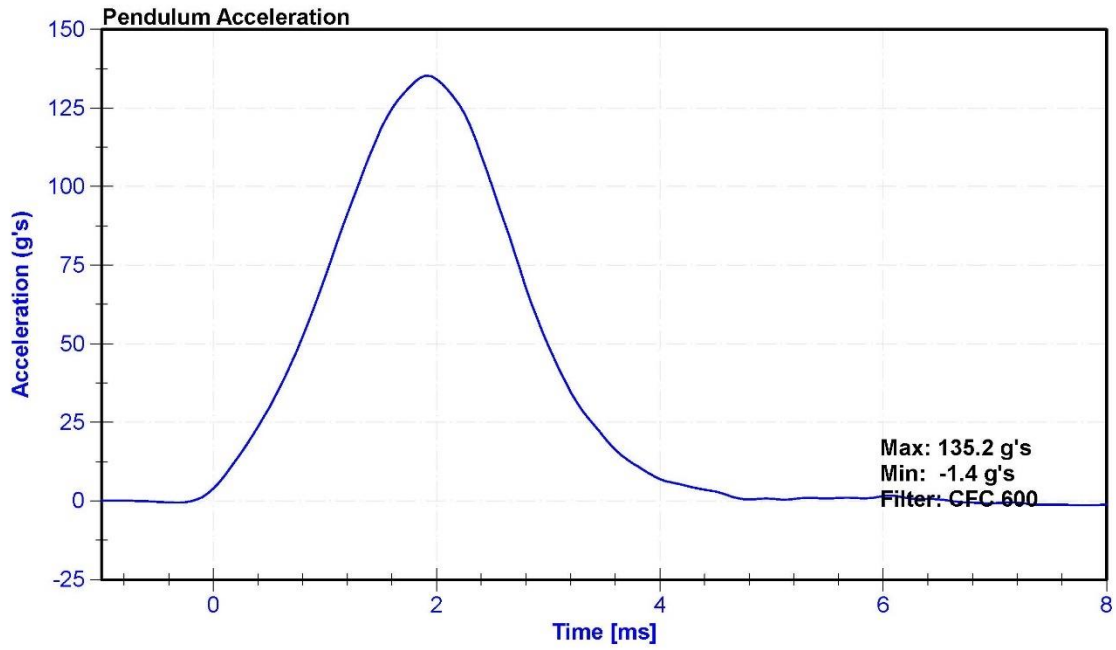
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	24	Pass
Velocity	2.07	2.13	m/s	2.091	Pass
Resistive Force	3450	4060	N	3941.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	T25885	10/25/2021	4/23/2022





APPENDIX D

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Table 1 – Driver Dummy Instrumentation

Instrumentation		Axis/Location	Hybrid III 50 th S/N: 142		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	7264C-2000-TZ-2_P51681	Endevco	11/16/2021
		Y	7264C-2000-TZ-2_P64151	Endevco	11/16/2021
		Z	7264C-2000-TZ-2_P52114	Endevco	11/16/2021
	Redundant	X	7264C-2000-TZ-2_P58833	Endevco	11/16/2021
		Y	7264C-2000-TZ-2_P58905	Endevco	11/16/2021
		Z	7264C-2000-TZ-2_P63996	Endevco	11/16/2021
Head Angular Rate Sensors		X	ARS PRO-18K_11335	DTS ARS PRO-18K	3/2/2021
		Y	ARS PRO-8K_11059	DTS ARS PRO-8K	3/2/2021
		Z	ARS PRO-8K_14934	DTS ARS PRO-18K	3/2/2021
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	IF-205_280-FX	FTSS IF-205-FX	9/14/2021
Chest Accelerometers	Primary	X	7264C-2000-TZ-2_P51991	Endevco	11/16/2021
		Y	7264C-2000-TZ-2_P80337	Endevco	1/14/2022
		Z	7264C-2000-TZ-2_P49185	Endevco	11/16/2021
	Redundant	X	7264C-2000-TZ-2_P68059	Endevco	11/16/2021
		Y	7264C-2000-TZ-2_P51713	Endevco	11/16/2021
		Z	7264C-2000-TZ-2_P78824	Endevco	11/16/2021
Chest Potentiometer		X	JDK 6209-2038_142GFE	Servo JDK 6209-2038	11/16/2021
Pelvis Accelerometer		X	7264C-2000-TZ-2_P58800	Endevco	11/16/2021
		Y	7264C-2000-TZ-2_P52157	Endevco	11/16/2021
		Z	7264C-2000-TZ-2_P52156	Endevco	11/16/2021
Femur Load Cells - Left	Primary	Z	3821JLN2_DT0998-FZ1	Denton 3821JLN2	6/30/2021
	Redundant	Z	3821JLN2_DT0998-FZ2	Denton 3821JLN2	6/30/2021
Femur Load Cells - Right	Primary	Z	3821JTF_117-FZ1	Denton 3821JTF	9/14/2021
	Redundant	Z	3821JTF_117-FZ2	Denton 3821JTF	9/14/2021
Tibia Load Cells - Left	Upper	MX, MY, FZ	3643_371-FZ	Denton 3643	7/30/2021
	Lower	MX, MY, FZ	3644JFL_673-FZ	Denton 3644JFL	7/30/2021
Tibia Load Cells – Right	Upper	MX, MY, FZ	3643_361-FZ	Denton 3643	7/30/2021
	Lower	MX, MY, FZ	3644_362-FZ	Denton 3644	7/30/2021
Foot Accelerometers - Left	Rear	X	7264C-2000-TZ-2_P82756	Endevco	11/16/2021
	Front	Z	7264C-2000-TZ-2_P51872	Endevco	11/16/2021
Foot Accelerometers - Right	Rear	X	7264C-2000-TZ-2_P49195	Endevco	11/16/2021
	Front	Z	7264C-2000-TZ-2_P58779	Endevco	11/16/2021
Seat belt Load Cells	Lap		NA	NA	NA
	Shoulder		LC-292	GFE IF-964	5/4/2021

Table 2 – Front Passenger Dummy Instrumentation

Instrumentation		Axis/Location	Hybrid III 5 th S/N: 137		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	7264C-2000-TZ-2_P79417	Endevco	2/1/2022
		Y	7264C-2000-TZ-2_P83335	Endevco	2/1/2022
		Z	7264C-2000-TZ-2_P64149	Endevco	2/1/2022
	Redundant	X	7264C-2000-TZ-2_P52008	Endevco	2/1/2022
		Y	7264C-2000-TZ-2_P52045	Endevco	2/1/2022
		Z	7264C-2000-TZ-2_P74774	Endevco	2/1/2022
Head Angular Rate Sensors		X	ARS PRO-18K_14909	DTS ARS PRO-18K	3/2/2021
		Y	ARS PRO-18K_14908	DTS ARS PRO-18K	3/2/2021
		Z	ARS PRO-8K_7553	DTS ARS-PRO-8K-	3/2/2021
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	1716ATF_2184-FX	Denton 1716ATF	6/24/2021
Chest Accelerometers	Primary	X	7264C-2000-TZ-2_T21142	Endevco	2/1/2022
		Y	7264C-2000-TZ-2_P83346	Endevco	2/1/2022
		Z	7264C-2000-TZ-2_P49190	Endevco	2/1/2022
	Redundant	X	7264C-2000-TZ-2_P58794	Endevco	2/1/2022
		Y	7264C-2000-TZ-2_P79602	Endevco	2/1/2022
		Z	7264C-2000-TZ-2_T11253	Endevco	2/1/2022
Chest Potentiometer		X	14CBI-3615_0720	Servo 14CBI-3615	10/28/2021
Pelvis Accelerometer		X	7264C-2000-TZ-2_P58735	Endevco	1/31/2022
		Y	7264C-2000-TZ-2_P77587	Endevco	1/31/2022
		Z	7264C-2000-TZ-2_P51285	Endevco	1/31/2022
Femur Load Cells - Left	Primary	Z	3821JTF_119-FZ1	Denton 3821JTF	6/30/2021
	Redundant	Z	3821JTF_119-FZ2	Denton 3821JTF	6/30/2021
Femur Load Cells - Right	Primary	Z	3821JTF_109-FZ1	Denton 3821JTF	6/30/2021
	Redundant	Z	3821JTF_109-FZ2	Denton 3821JTF	6/30/2021
Tibia Load Cells - Left	Upper	MX, MY, FZ	3643_406-FZ	Denton 3643	7/30/2021
	Lower	MX, MY, FZ	3644_360-FZ	Denton 3644	7/30/2021
Tibia Load Cells – Right	Upper	MX, MY, FZ	3643_476-FZ	Denton 3643	7/30/2021
	Lower	MX, MY, FZ	3644_359-FZ	Denton 3644	7/30/2021
Foot Accelerometers - Left	Rear	X	7264C-2000-TZ-2_P78959	Endevco	1/31/2022
	Front	Z	7264C-2000-TZ-2_P83418	Endevco	1/31/2022
Foot Accelerometers - Right	Rear	X	7264C-2000-TZ-2_P83428	Endevco	1/31/2022
	Front	Z	7264C-2000-TZ-2_P80265	Endevco	1/31/2022
Seat belt Load Cells	Lap		NA	NA	NA
	Shoulder		IF-964_290	GFE IF-964	5/4/2021

Table 3 – Vehicle Instrumentation

Instrumentation			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember/Rear Seat Accelerometers	Left	Primary	X	1201-1000_A400024	Measurement Specialties 1201-1000	2/4/2022
			Z	1201-1000_A352323	Measurement Specialties 1201-1000	11/16/2021
		Redundant	X	1201-1000_A352334	Measurement Specialties 1201-1000	11/16/2021
	Right	Primary	X	1201-1000_A280005	Measurement Specialties 1201-1000	11/12/2021
			Z	1201-1000_A374216	Measurement Specialties 1201-1000	11/12/2021
		Redundant	X	1201-1000_A284318	Measurement Specialties 1201-1000	11/12/2021
Engine Accelerometers	Top		X	1201-1000_A280206	Measurement Specialties 1201-1000	11/4/2021
	Bottom		X	1201-1000_A370912	Measurement Specialties 1201-1000	9/20/2021