

REPORT NUMBER: NCAP-MGA-23-050

**NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test**

**HYUNDAI MOTOR COMPANY
2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
NHTSA No.: O20234200**

**MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105**



Test Date: November 8, 2023

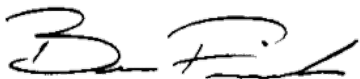
Final Report Date: October 10, 2024

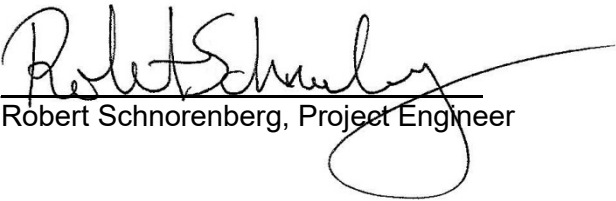
FINAL REPORT

**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
1200 New Jersey Ave, SE
Mail Code: NRM-100
Washington, DC 20590**

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Approval Date: October 10, 2024

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: _____

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16. Abstract A 56.3 km/h NCAP Frontal Rigid Barrier Impact Test was conducted on a 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan in accordance with the specifications of the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on November 8, 2023. The impact velocity of the vehicle was 55.99 km/h and the ambient temperature at the barrier face at the time of impact was 21.8°C. The target vehicle post-test maximum crush was 52464 mm located to the left of the vehicle centerline. The test vehicle's performance was as follows:		13. Type of Report and Period Covered Final Test Report November 8, 2023 to October 10, 2024																																																							
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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		<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td></td> <td>700</td> <td>206.757</td> <td>700</td> <td>174.966</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>29.126</td> <td>52</td> <td>14.285</td> </tr> <tr> <td>Nij</td> <td></td> <td>1</td> <td>0.258</td> <td>1</td> <td>0.338</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>1094.182</td> <td>2620</td> <td>637.644</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>265.862</td> <td>2520</td> <td>363.265</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>757.830</td> <td>6805</td> <td>1965.447</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>967.984</td> <td>6805</td> <td>1986.031</td> </tr> </tbody> </table>				Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)		700	206.757	700	174.966	Maximum Chest Compression	mm	63	29.126	52	14.285	Nij		1	0.258	1	0.338	Neck Tension	N	4170	1094.182	2620	637.644	Neck Compression	N	4000	265.862	2520	363.265	Left Femur Force	N	10008	757.830	6805	1965.447	Right Femur Force	N	10008	967.984	6805	1986.031
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SECTION 1 PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number 693JJ919D000006. 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 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 176 load cells was impacted by a 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan at a velocity of 55.99 km/h. The test was performed at MGA Research Corporation on November 8, 2023. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

Two (2) real-time cameras and sixteen (16) high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in 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 test device (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, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were installed on the driver's lap and shoulder belt and passenger's shoulder belt to measure dummy torso and pelvic section loading.

The driver (position 1) ATD (Serial No. 351) and the right-front passenger (position 2) ATD (Serial No. 142) were qualified previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 281 channels of data were recorded on a data acquisition system. Appendix B contains the 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 no battery electrolyte leakage and no loss of high-voltage battery isolation after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 524 mm located to the left of the vehicle centerline and both the 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 airbag. The driver's head also contacted the headrest. The driver's knees contacted the knee bolster.

The passenger's visible contact points were as follows: The passenger's head contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the glove box.

The occupant data is summarized below:

ATD position	HIC₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	206.757	0.258	1094.182	265.862	44.830	29.126	757.830	967.984
Passenger (5 th)	174.966	0.338	637.644	363.265	50.160	14.285	1965.447	1986.031

The test data can be found on the NHTSA website at www.nhtsa.gov

TEST NOTES

Passenger Lap Belt load cell was not installed.

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20234200	Traction Control System (TCS)	Yes
Model Year	2023	Power Steering	Yes
Make	Hyundai	Power Window Auto-Reverse	Yes
Model	IONIQ 6 SEL AWD	Driver Frontal Airbag	Yes
Body Style	4-Door Sedan	Driver Curtain Airbag	Yes
VIN	KMHHM34AC7PA022456	Driver Head/Torso Airbag	No
Body Color	Serenity White	Driver Torso Airbag	No
Odometer (km/mi)	24 km / 15 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)		Driver Pelvis Airbag	No
Type/No. Cylinders	Electric	Driver Knee Airbag	No
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds		Front Pass. Head/Torso Airbag	No
Overdrive	No	Front Pass. Torso Airbag	No
Final Drive	AWD	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	N/A

Does owner's manual provide instructions to turn off automatic door locks?	No
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DATA FROM CERTIFICATION LABEL

Manufactured By	HYUNDAI MOTOR COMPANY	GVWR (kg)	2520
Date of Manufacture	JAN/2023	GAWR Front (kg)	1280
		GAWR Rear (kg)	1355

VEHICLE SEATING AND WEIGHT CAPACITY DATA

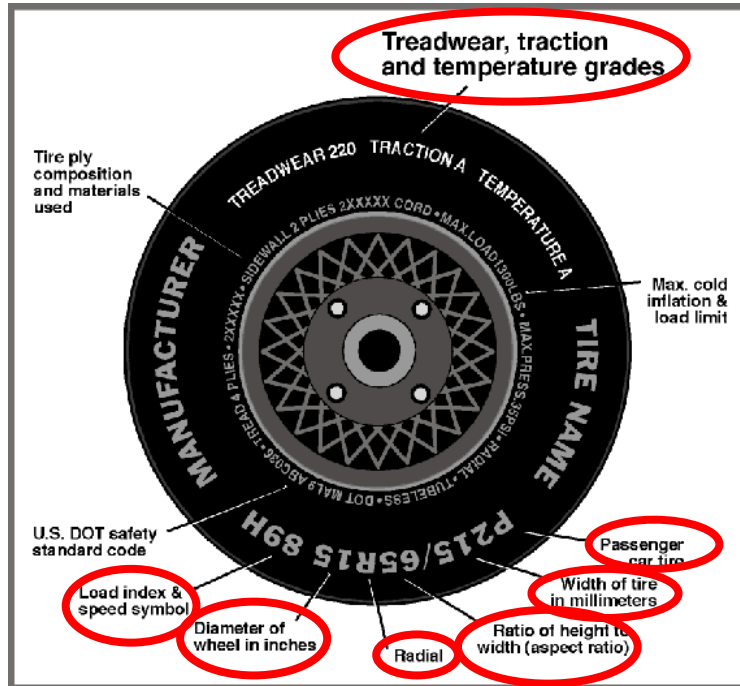
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contoured		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				390
Cargo Weight (RCLW) (kg)				50

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	255
Recommended Tire Size	245/40R20	245/40R20
Tire Size on Vehicle	245/40R20	245/40R20
Tire Manufacturer	Pirelli	Pirelli
Tire Model	P Zero All Season	P Zero All Season
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Polyamide	2 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	99W	99W
Tire Material	Rubber	Rubber
DOT Safety Code Left	1UN T0183P 3222	1UN T0183P 3222
DOT Safety Code Right	1UN T0183P 3122	1UN T0183P 3122

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	494.0	536.5		538.0	596.0	
Right	kg	519.0	506.5		552.0	553.5	
Ratio	%	49.3%	50.7%		48.7%	51.3%	
Totals	kg	1013.0	1043.0	2056.0	1090.0	1149.5	2239.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2056.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	50
Calculated Test Vehicle Target Weight (TVTW)	kg	2247.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	739	746	741	732	1500
As Tested	mm	730	728	722	728	1517
Post Test	mm	N/A	N/A	N/A	N/A	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2956
Total Vehicle Length at Left Side	mm	4710
Total Vehicle Length at Centerline	mm	4853
Total Vehicle Length at Right Side	mm	4710
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	33
Amount of Stoddard Solvent in Fuel Tank	L	

List of components removed to meet test weight: LR/RR taillight, spoiler, RR door trim panel.

List of components removed for instrumentation, data box, and equipment installation: Cargo area carpet/trim/divider, jack and tools, EV charging cable.

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4853
2	Total Width	1923
3	Bumper Top Height	516
4	Bumper Bottom Height	422
5	Longitudinal Member Top Height	552
6	Distance between Longitudinal Members	752
7	Longitudinal Member Width	76
8	Engine Top Height	802
9	Engine Bottom Height	224
10	Engine and Gearbox Width	332
11	Front Bumper-Engine Distance	488
12	Front Shock Absorber Fixing Height	923
13	Bonnet Leading Edge Height	704
14	Front Shock Absorber Fixing Width	1214
15	Front Bumper – Front Axle Distance	582
16	Front Axle – A-Pillar Distance	454
17	A-Pillar – B-Pillar Distance	1191
18	B-Pillar – Rear Axle Distance	1311
19	B-Pillar – C-Pillar Distance	1143
20	Roof Sill Bottom Height	1348
21	Roof Sill Top Height	1400
22	Floor Sill Bottom Height	175
23	Floor Sill Top Height	342

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

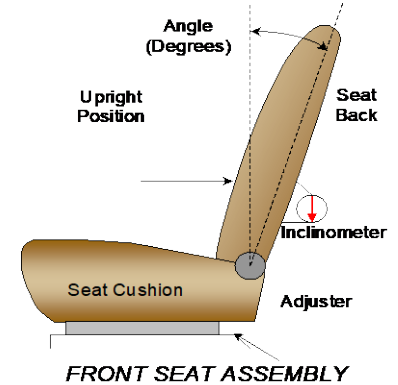
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NHTSA No.: O20234200
 Test Date: 11/8/2023

NOMINAL DESIGN RIDING POSITION

The driver seat back is positioned as close as possible to the manufacturer's design angle. For the passenger seat back, seat back is adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated May 2018.

	Degrees
Driver Seat Back Angle	0.3° on outboard headrest post
Passenger Seat Back Angle	0.0° on outboard headrest post



SEAT FORE/AFT POSITIONS

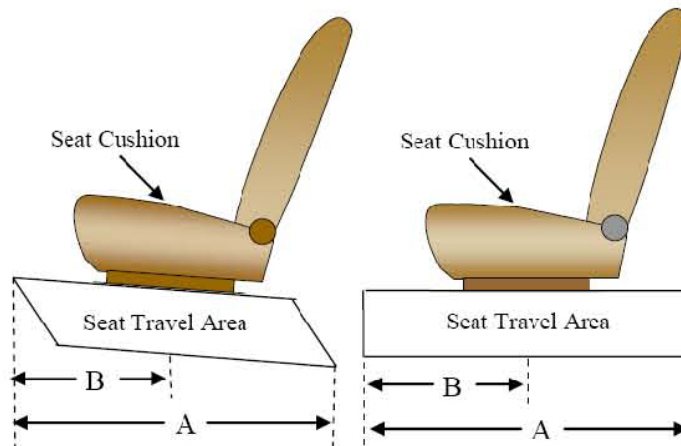
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated May 2018.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	323 mm	162 mm
Passenger Seat	260 mm / 27 detents (1 st as 1)	0 mm / 0 th detent (1 st as 0)

SEAT BELT UPPER ANCHORAGES

The seat belt upper anchorages are set following the manufacturer's specified position as listed in Form 1.

	Total # of Positions	Placed in Position #
Driver Seat	4 (1 st as 1)	0 (1 st as 0)
Passenger Seat	4 (1 st as 1)	0 (1 st as 0)



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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

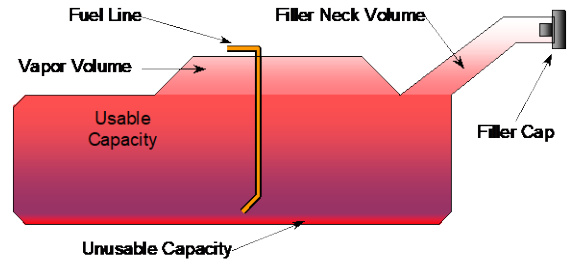
NHTSA No.: O20234200
 Test Date: 11/8/2023

FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	
Actual Amount of Solvent used	
1/3 of Usable Capacity	

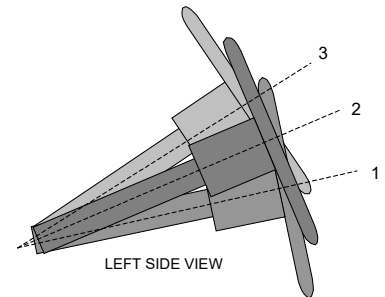
FUEL PUMP

Electric 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. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



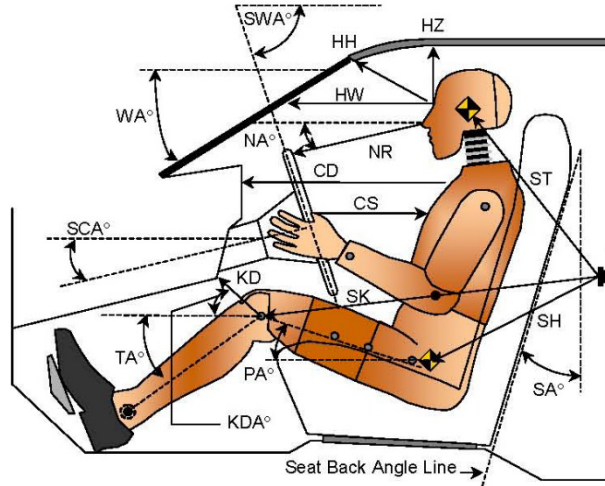
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	70.1	
Geometric Center Position 2	67.6	
Uppermost Position 3	65.1	
Telescoping Steering Wheel Travel		50
Test Position	67.6	25

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023



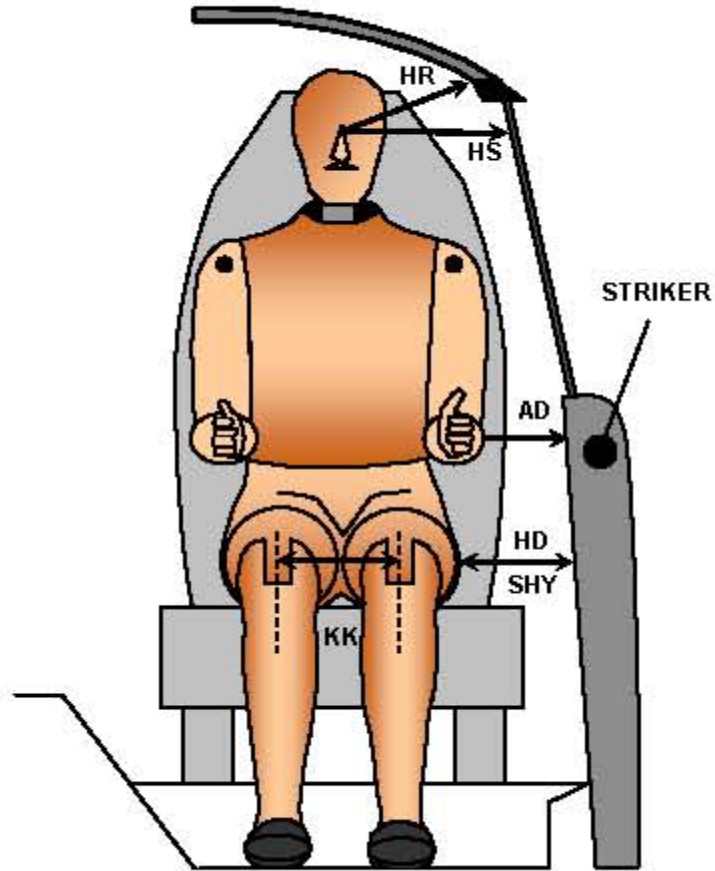
LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		24.6		
SWA°	Steering Wheel Angle		67.6		
SCA°	Steering Column Angle		22.4		
SA°	Seat Back Angle		0.3		0.0
HZ	Head to Roof (Z)	155	90	162	90
HH	Head to Header	295	21.3	252	40.6
HW	Head to Windshield	587	0	584	0
NR	Nose to Rim	368	7.4		
CD	Chest to Dash	567		412	
CS	Chest to Steering Hub	296	4.1		
RA	Rim to Abdomen	200	0		
KDL	Left Knee to Dash	182	21.2	114	31.3
KDR	Right Knee to Dash	181	21.3	114	31.0
PA°	Pelvic Angle		23.7		20.2
TA°	Tibia Angle		42.2		48.9
SK	Striker to Knee	567	93.6	694	97.4
ST	Striker to Head	452	12.8	452	33.4
SH	Striker to H-Point	314	132.7	432	110.4

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
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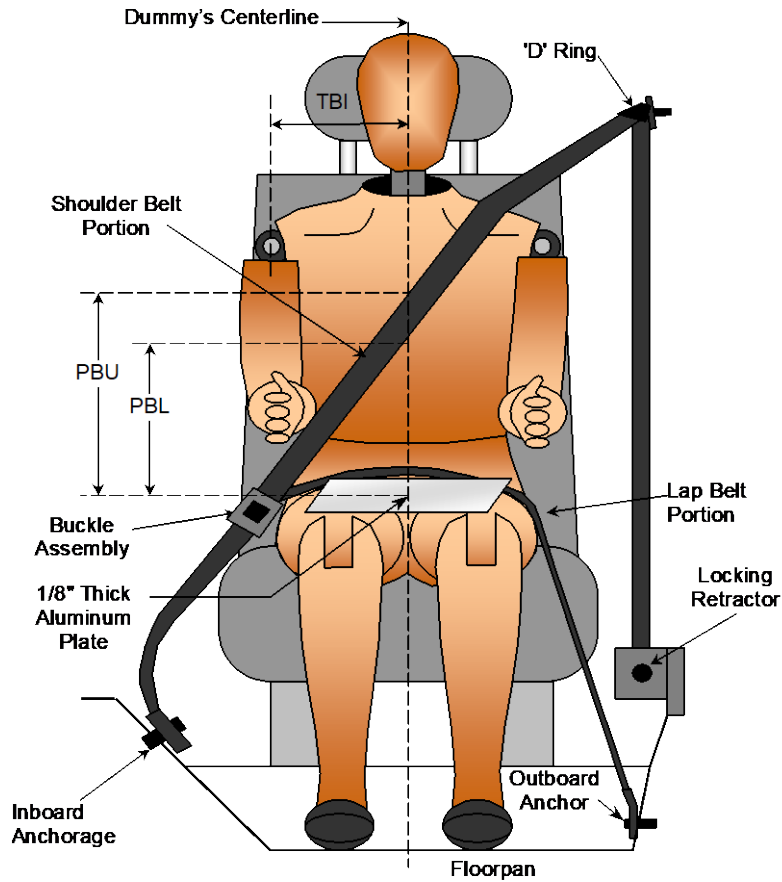
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	16	85
HD	H-Point to Door	141	244
HR	Head to Side Header	210	236
HS	Head to Side Window	345	370
KK	Knee to Knee	355	230
SHY	Striker to H-Point (Y Direction)	255	339
AA	Ankle to Ankle	342	170

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	380	320
PBL - Top surface of reference to belt lower edge	mm	260	230

BELT LENGTH DATA

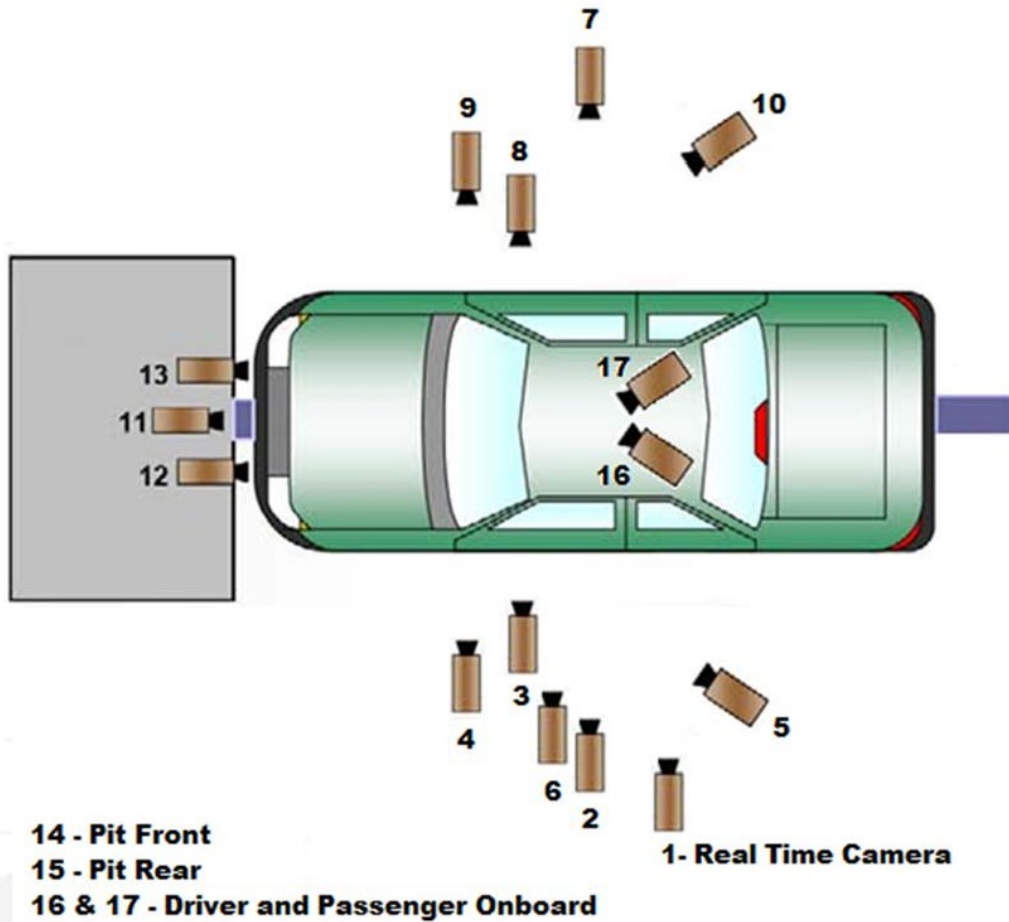
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	910	1010
Lap Belt Length as measured on ATD	mm	630	640
Remainder of belt on reel	mm	460	350
Total Belt Length for Continuous Webbing Systems	mm	2600	2600

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023

CAMERA POSITIONS FOR FRONTAL IMPACTS



***Camera locations are approximate and not to scale*

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

CAMERA LOCATIONS

No.	Camera View	Coordinates* (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall					30
2	Left Overall	-2140	-5650	-1450	12	1000
3	Driver Close-Up	-1480	-6970	-1900	50	1000
4	Left Front Half	-1250	-5540	-1400	24	1000
5	Left Angle	-7370	-5810	-2080	75	1000
6	Steering Column	-1020	-5450	-1230	50	1000
7	Right Overall	-2110	5820	-1470	12	1000
8	Passenger Close-Up	-1360	6610	-2100	50	1000
9	Right Front Half	-1100	5650	-1400	24	1000
10	Right Angle	-7450	5390	-2150	75	1000
11	Windshield	-120	0	-2310	12	1000
12	Driver Windshield	-60	-370	-2230	25	1000
13	Passenger Windshield	-60	370	-2230	25	1000
14	Pit Front	-980	0	3340	24	1000
15	Pit Rear	-3110	0	3340	24	1000
16	Driver Onboard				12	1000
17	Passenger Onboard				12	1000
18	Real-Time Pan View					30

*COORDINATES:

+X = forward of impact plane

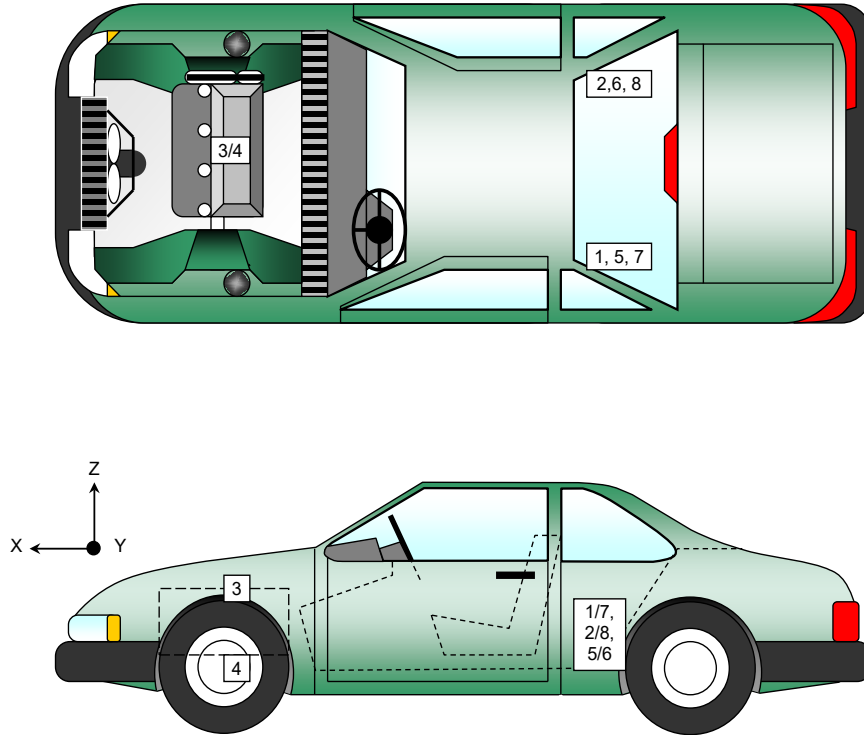
+Y = right of monorail centerline

+Z = below ground level

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1977	-325	-326
2	Right Rear Crossmember Accelerometer – X Direction	1977	325	-326
3	Engine Top X	4069	0	-802
4	Engine Bottom X	4029	0	-224
5	Left Rear Crossmember Accelerometer – Z Direction	1977	-325	-326
6	Right Rear Crossmember Accelerometer – Z Direction	1977	325	-326
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1977	-370	-326
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1977	370	-326

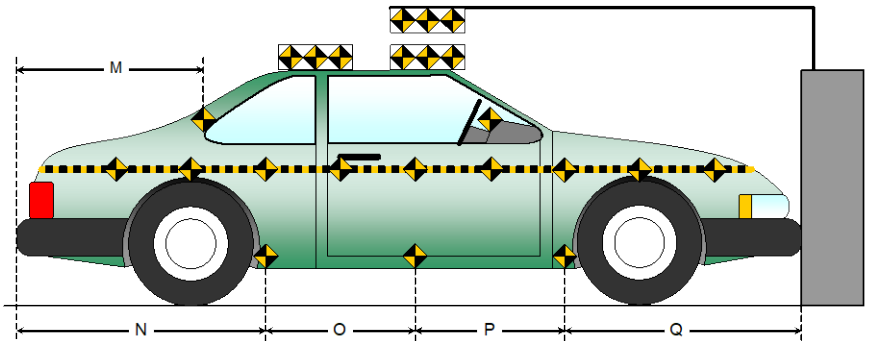
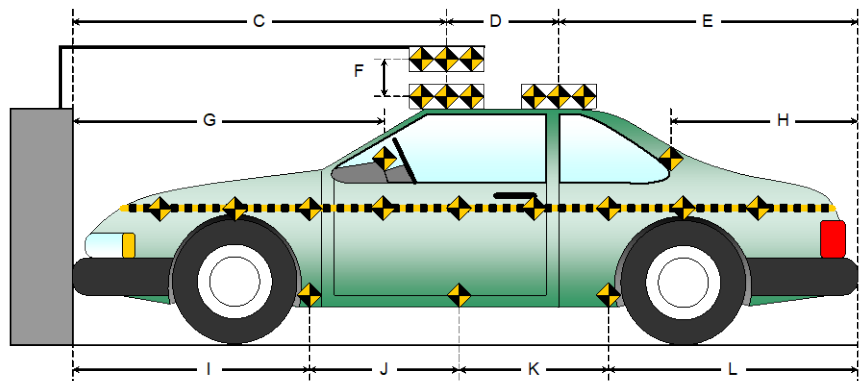
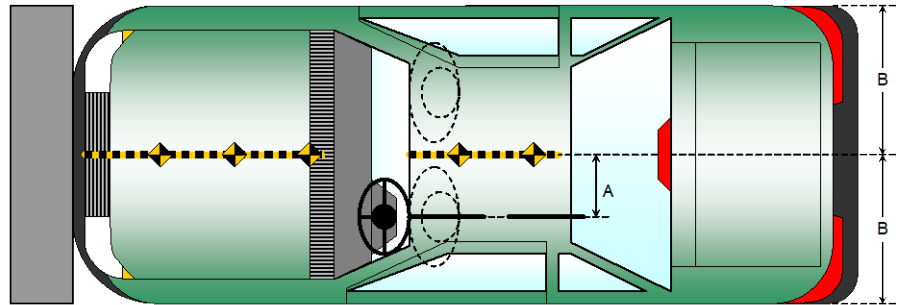
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

Item	Value (mm)
A	355
B	962
C	2085
D	615
E	2153
F	135
G	
H	1138
I	1320
J	1023
K	1023
L	1487
M	1138
N	1487
O	1023
P	1023
Q	1320



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023

ADVANCED RESEARCH LOAD CELL BARRIER

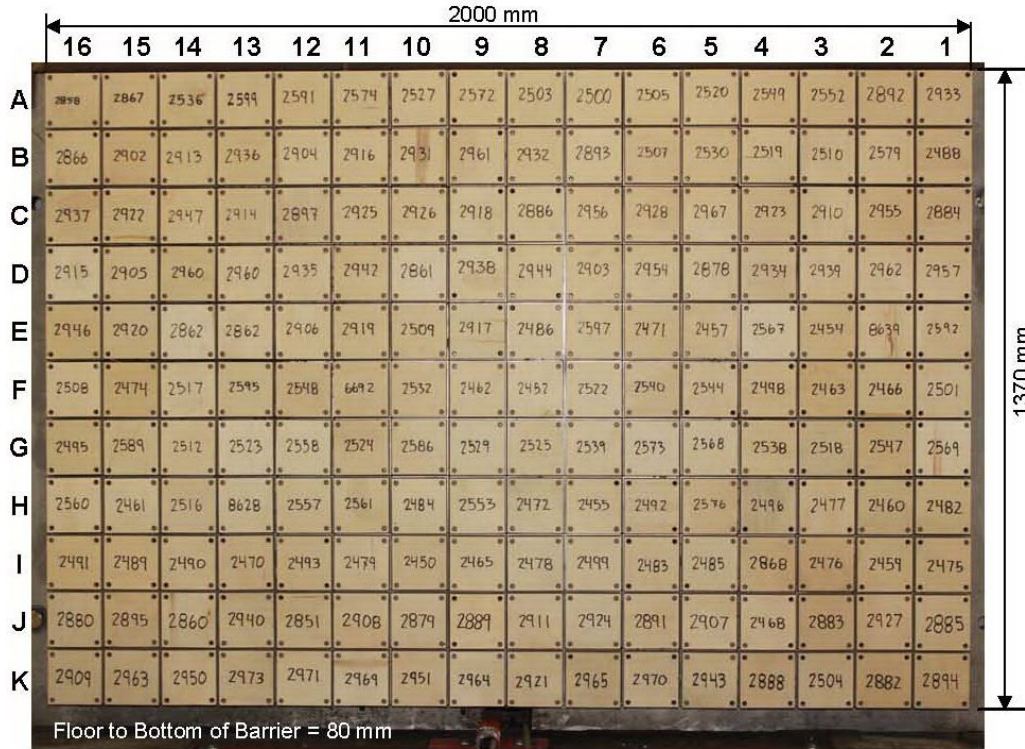


Photo for Reference Only

Centerline

A-16	A-15	A-14	A-13	A-12	A-11	A-10	A-09	A-08	A-07	A-06	A-05	A-04	A-03	A-02	A-01
B-16	B-15	B-14	B-13	B-12	B-11	B-10	B-09	B-08	B-07	B-06	B-05	B-04	B-03	B-02	B-01
C-16	C-15	C-14	C-13	C-12	C-11	C-10	C-09	C-08	C-07	C-06	C-05	C-04	C-03	C-02	C-01
D-16	D-15	D-14	D-13	D-12	D-11	D-10	D-09	D-08	D-07	D-06	D-05	D-04	D-03	D-02	D-01
E-16	E-15	E-14	E-13	E-12	E-11	E-10	E-09	E-08	E-07	E-06	E-05	E-04	E-03	E-02	E-01
F-16	F-15	F-14	F-13	F-12	F-11	F-10	F-09	F-08	F-07	F-06	F-05	F-04	F-03	F-02	F-01
G-16	G-15	G-14	G-13	G-12	G-11	G-10	G-09	G-08	G-07	G-06	G-05	G-04	G-03	G-02	G-01
H-16	H-15	H-14	H-13	H-12	H-11	H-10	H-09	H-08	H-07	H-06	H-05	H-04	H-03	H-02	H-01
I-16	I-15	I-14	I-13	I-12	I-11	I-10	I-09	I-08	I-07	I-06	I-05	I-04	I-03	I-02	I-01
J-16	J-15	J-14	J-13	J-12	J-11	J-10	J-09	J-08	J-07	J-06	J-05	J-04	J-03	J-02	J-01
K-16	K-15	K-14	K-13	K-12	K-11	K-10	K-09	K-08	K-07	K-06	K-05	K-04	K-03	K-02	K-01

Load Cells are 121 mm x 121 mm with a 7 mm gap in between each load cell.

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Data Channels	49
Passenger Dummy Data Channels	48
Vehicle Structure Accelerometers	8
Barrier Channels	176
Total	281

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	15
Real-Time	2
Total	19

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIIL 50% / AM50	HIIL 5% / AF05
Head Contact	Frontal Airbag, Headrest	Frontal Airbag, Headrest
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

DOOR OPENING, TRUNK OPENING, AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were locked	Doors were locked
Front Door Opening	Remained closed and unlocked; opened without tools	Remained closed and unlocked; opened without tools
Rear Door Opening	Remained closed and unlocked; opened without tools	Remained closed and unlocked; opened without tools
Trunk/Hatch/Tailgate Opening	Remained closed; opened without tools	
Seat Track Shift (mm)	0	0
Seat Back Movement	None	None

OTHER VEHICLE POST-TEST OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracked by passenger airbag and hood corners
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	N/A
Center	mm	N/A
Right Side	mm	N/A
Average	mm	N/A

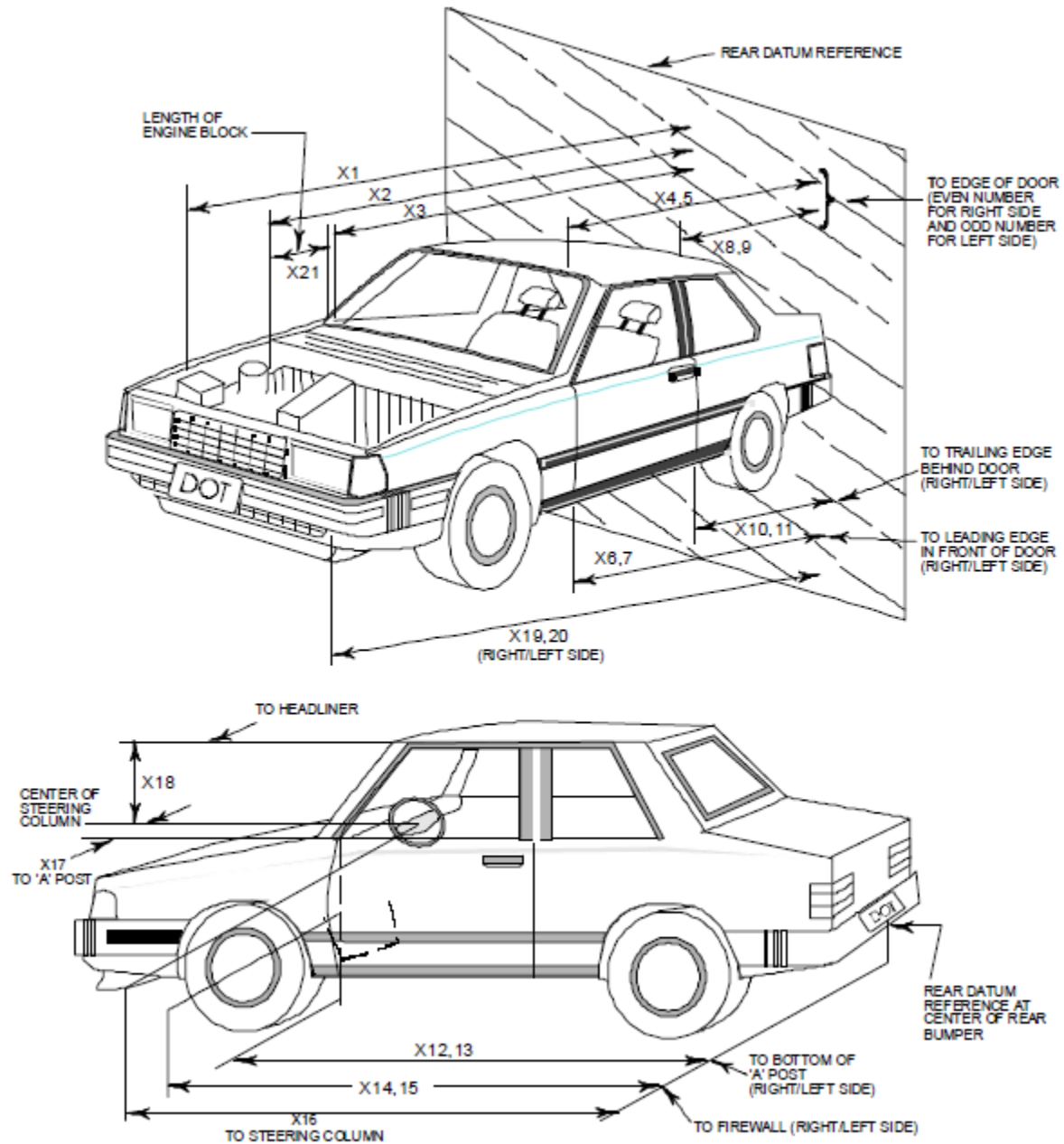
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver		Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Curtain Side Airbag	Yes	No	Yes	No
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Knee Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	
Other				

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023

No.	Measurement Description	Pre-Test	Post-Test	Change
1	Total Length of Vehicle at Centerline	4853	4404	-449
2	RSOV to Front of Engine	4244	3868	-376
3	RSOV to Firewall	3938	3886	-52
4	RSOV to Upper Leading Edge of Right Door	3456	3435	-21
5	RSOV to Upper Leading Edge of Left Door	3451	3434	-17
6	RSOV to Lower Leading Edge of Right Door	3455	3455	0
7	RSOV to Lower Leading Edge of Left Door	3446	3438	-8
8	RSOV to Upper Trailing Edge of Right Door	2293	2290	-3
9	RSOV to Upper Trailing Edge of Left Door	2288	2289	1
10	RSOV to Lower Trailing Edge of Right Door	2339	2309	-30
11	RSOV to Lower Trailing Edge of Left Door	2329	2307	-22
12	RSOV to Bottom of "A" Post of Right Side	3453	3430	-23
13	RSOV to Bottom of "A" Post of Left Side	3467	3443	-24
14	RSOV to Firewall, Right Side	3772	3762	-10
15	RSOV to Firewall, Left Side	3778	3764	-14
16	RSOV to Steering Column	2908	2895	-13
17	Center of Steering Column to "A" Post	363	349	-14
18	Center of Steering Column to Headliner	395	403	8
19	RSOV to Right Side of Front Bumper	4710	4277	-433
20	RSOV to Left Side of Front Bumper	4710	4282	-428
21	Length of Engine Block	192	192	0
RD	RSOV to Right Side of Dash Panel	3103	3104	1
CD	RSOV to Center of Dash Panel	3297	3340	43
LD	RSOV to Left Side of Dash Panel	3099	3082	-17

All dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023

VEHICLE INFORMATION

VIN: KMHM34AC7PA022456
Vehicle Size Category: Passenger Car

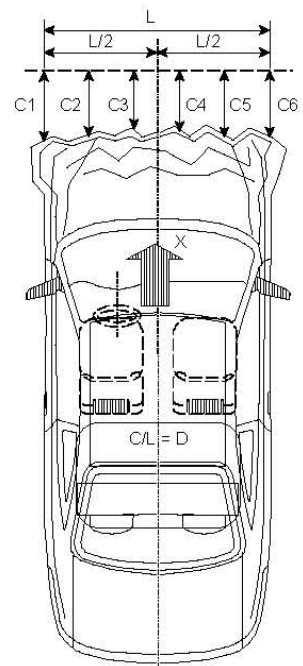
Wheelbase (mm): 2956
Test Weight (kg): 2239.5

ACCELEROMETER DATA

Accelerometer Locations: As per Data Sheet No. 7
Cal. Procedure/Interval: MGA Procedure / 6 month
Integration Algorithm: Trapezoidal
Linearity: > 99%
Impact Velocity (km/h): 55.99
Velocity Change (km/h): 67.8
Time of Separation (msec) 88

CRUSH PROFILE

Collision Deformation Classification: 12FDEW3
Midpoint of Damage: Centerline
Damage Region Length (mm): 1472
Impact Mode: Frontal



No.	Measurement Description	Units	Pre-Test	Post-Test	Exterior Crush
C1	Crush zone 1 at left side	mm	4710	4282	428
C2	Crush zone 2 at left side	mm	4814	4339	475
C3	Crush zone 3 at left side	mm	4848	4324	524
C4	Crush zone 4 at right side	mm	4848	4338	510
C5	Crush zone 5 at right side	mm	4814	4316	498
C6	Crush zone 6 at right side	mm	4710	4277	433
L	C1 TO C6	mm	1472	1483	-11

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

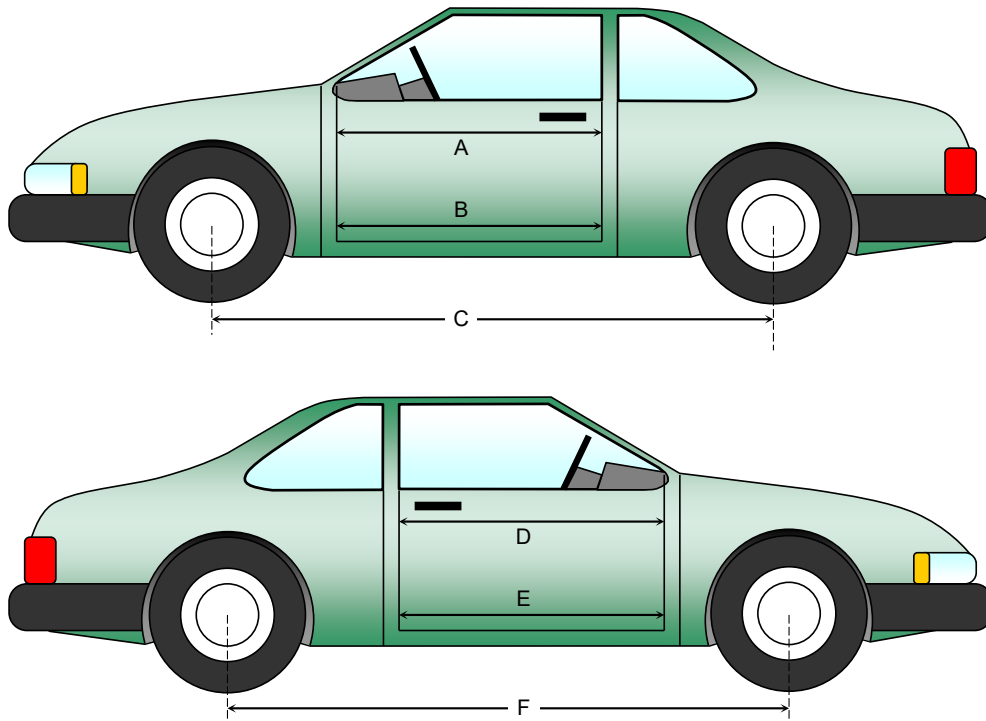
NHTSA No.: O20234200
Test Date: 11/8/2023

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Change
A	Left Side Upper	mm	1061	1061	0
B	Left Side Lower	mm	979	979	0
D	Right Side Upper	mm	1060	1060	0
E	Right Side Lower	mm	981	981	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Change
C	Left Side Wheelbase	mm	2956	2868	-88
F	Right Side Wheelbase	mm	2956	2884	-72



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

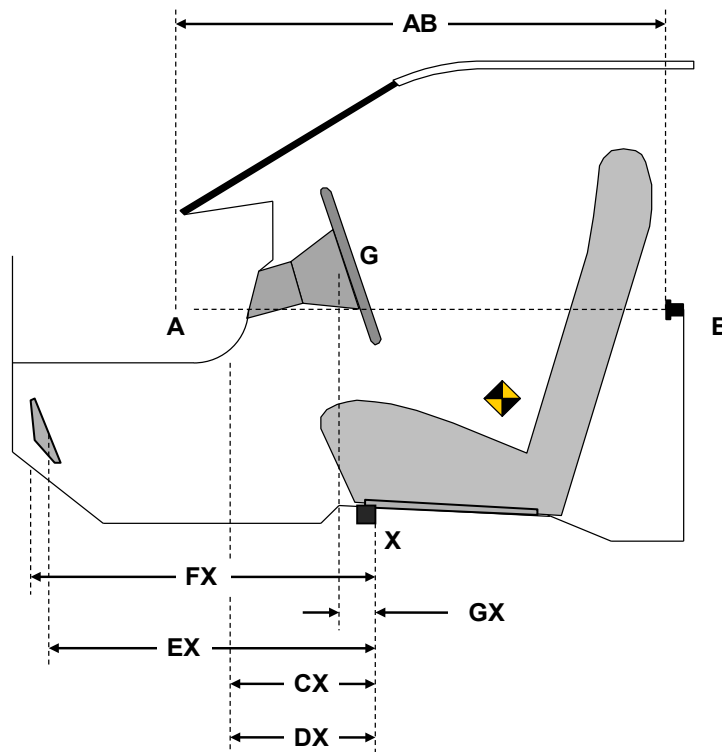
Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Change
AB	Door Opening (Inside Window Jam)	mm	800	800	0
CX	Left Knee Bolster to X	mm	331	316	-15
DX	Right Knee Bolster to X	mm	345	349	4
EX	Brake Pedal to X	mm	553	519	-34
FX	Foot Rest to X	mm	594	568	-26
GX	Center of Steering Column Wheel Hub to X	mm	68	54	-14

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

WINDSHIELD MOUNTING DETAILS

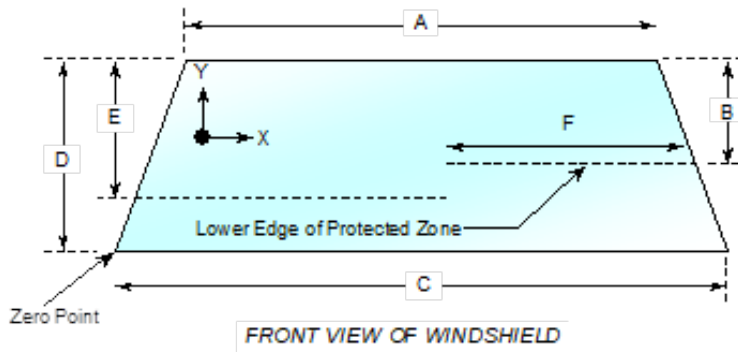
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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

Temperature of windshield molding during test: 21.8°C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2268	2268	100
Right Side	2268	2268	100
Total	4536	4536	100



Item	Units	Value
A	mm	1236
B	mm	408
C	mm	1588
D	mm	856
E	mm	507
F	mm	656

AREA OF PROTECTED ZONE FAILURES

A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield. **None**

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. **None**

X	Y

DATA SHEET NO. 16
FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

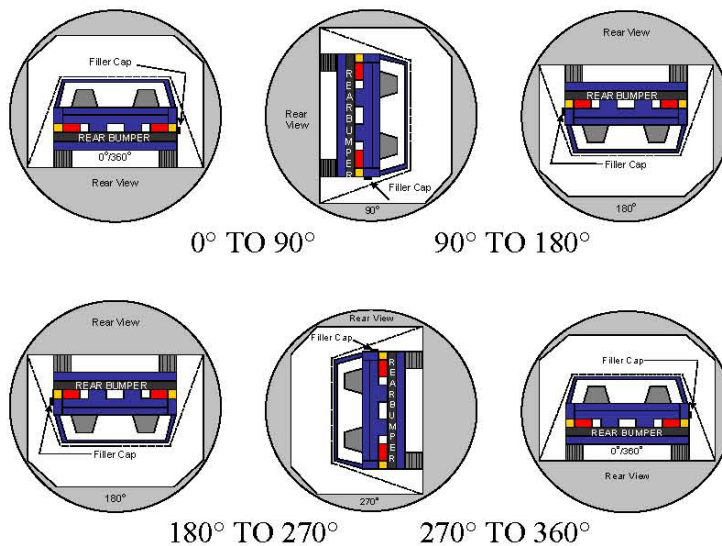
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.8°C

Test Time: 11:41 a.m.

- A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) N/A oz.
 B. For the 5 minute period after motion ceases: (Maximum Allowable = 5 ounces) N/A oz.
 C. For the following 25 minutes: (Maximum Allowable = 1 ounce / minute) N/A
 D. Spillage Details: N/A

FMVSS 301 STATIC ROLLOVER RESULTS



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: **N/A**

SOLVENT COLLECTION TIME TABLE IN SECONDS

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

DATA SHEET NO. 16 (CONTINUED)
FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

FMVSS 301 SPILLAGE TABLE (UNITS IN OUNCES)

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

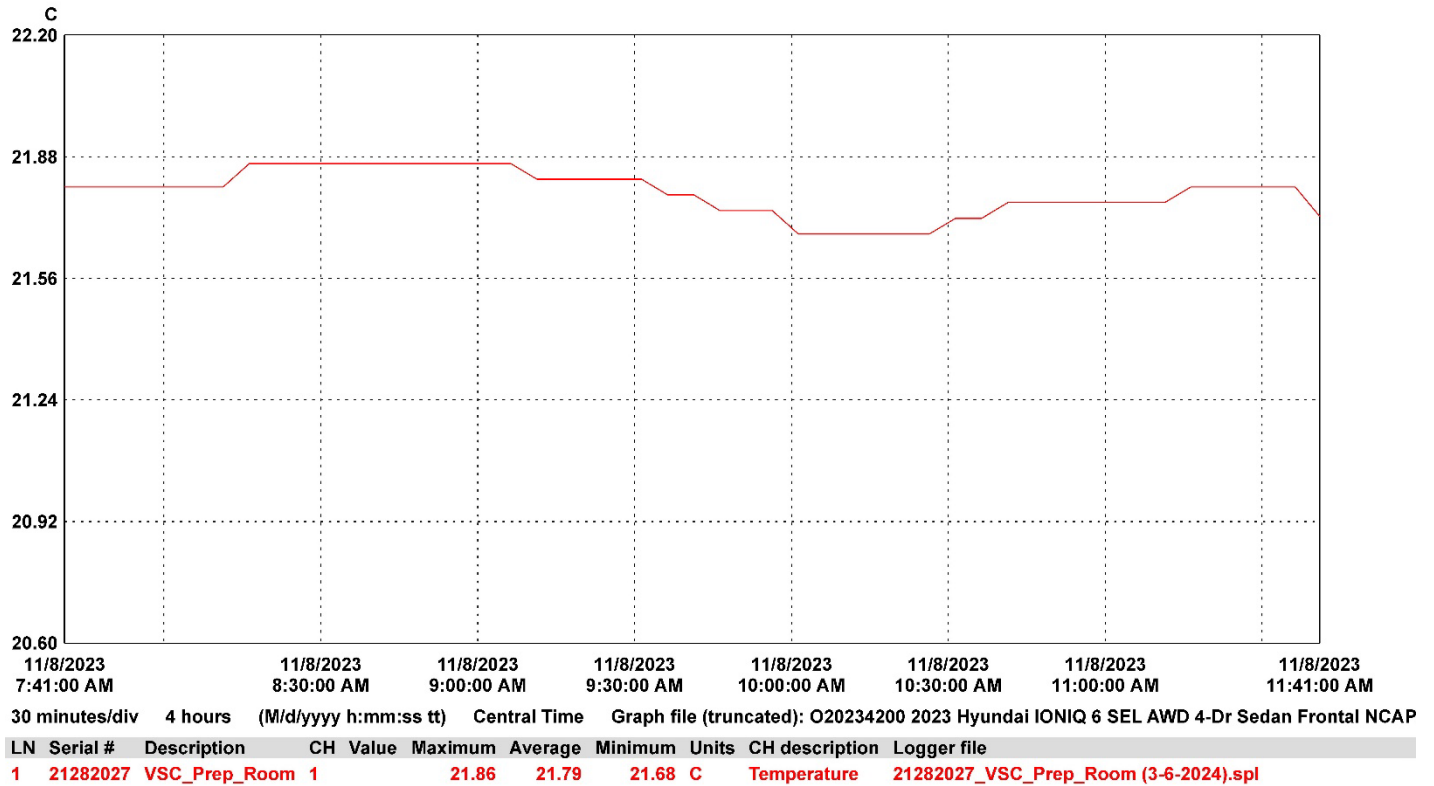
SOLVENT SPILLAGE LOCATION TABLE

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

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023



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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

ELECTRIC VEHICLE PROPULSION SYSTEM

	Units	Observations and Conclusions
Type of Electric Vehicle		Electric
Propulsion Battery Type		Lithium-ion Polymer Battery
Nominal Voltage	V	697
Physical Location of Automatic Propulsion Battery Disconnect		Inside of propulsion battery (Rear side)
Auxiliary Battery Type		Lead-acid battery

PROPULSION BATTERY SYSTEM DATA

	Units	Observations and Conclusions
Electrolyte Fluid Type		Liquid solution, LiPF6 salt, Carbonate solvent
Electrolyte Fluid Specific Gravity		1.19 g/cm ³
Electrolyte Fluid Kinematic Viscosity		2~3 cP @ 25°C
Electrolyte Fluid Color		Transparent & Pale Yellow
Propulsion Battery Coolant Type, Color, Specific Gravity (if applicable)		Applied (Water-cooled type), Blue
Location of Battery Modules		Inside Passenger Compartment
	X	Outside Passenger Compartment
		The high-voltage battery is located on the underside of the vehicle.

PROPULSION BATTERY STATE OF CHARGE

<i>For all battery types:</i>	
Voltage range corresponding to useable energy of the battery:	
Minimum State of Charge	480
Maximum State of Charge	826
95% of Maximum State of Charge	784.7
Test Voltage - No less than 95% of maximum State of Charge	798.0
<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	
Maximum State of Charge	
Test Voltage – 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: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
Test Date: 11/8/2023

VEHICLE CHASSIS GROUND POINT(S) LOCATION(S)

Details of Vehicle Chassis Ground Point(s) & Location(s)	Vehicle chassis on underbody
---	------------------------------

PROPULSION BATTERY SYSTEM

Details of Electric Energy Storage/Conversion System Test Points	Connected at + and – terminal ends of propulsion system
Additional Comments	None

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		62100018
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		7/14/2023

PROPULSION BATTERY VOLTAGE

Measurement shall be made with Energy Storage/Conversion System connected to the vehicle propulsion system, and the vehicle in the “ready-to-drive” (propulsion system energized) position.
NOTE: If voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.

Vb	V	798.0
----	---	-------

ELECTRIC ISOLATION MEASUREMENTS
PROPULSION BATTERY TO VEHICLE CHASSIS

Vehicle chassis point(s) determined and supplied to contractor by COTR.

V1	V	403.2
V2	V	254.0

PROPULSION BATTERY TO VEHICLE CHASSIS ACROSS RESISTOR

The known resistance Ro (in ohms) should be approximately 500 times the normal operating voltage of the vehicle (in volts) per SAE J1766.

Ro	Ω	226,000
----	---	---------

V1' Pre-Impact	V	8.3
V2' Pre-Impact	V	8.4

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts".
 This "zero voltage" condition is considered as being compliant.

$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$		
Ri1 Pre-Impact	Ω	17,526,472
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$		
Ri2 Pre-Impact	Ω	17,097,057
$R_i = \text{The lesser of } R_{i1} \text{ and } R_{i2}$		
Ri Pre-Impact	Ω	17,097,057
$R_i / V_b = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$		
Ri / Vb Pre-Impact	Ω	21,425

NOTE: The minimum Electrical Isolation Value is 500 Ω/V .

	Yes	No (Fail)
Is the measured Electrical Isolation Value $\geq 500 \Omega/V$?	X	
Additional Comments	None	

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		62100018
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		7/14/2023

ELECTRICAL ISOLATION MEASUREMENTS

Vb Post-Impact	V	13.8
----------------	---	------

V1 Post-Impact	V	0.0	Impact Time	1	Minutes	23	Seconds
V2 Post-Impact	V	13.6		1	Minutes	27	Seconds
V1' Post-Impact	V	0.3		1	Minutes	43	Seconds
V2' Post-Impact	V	11.7		1	Minutes	35	Seconds

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts".
 This "zero voltage" condition is considered as being compliant.

$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$							
Ri1 Post-Impact	Ω	Zero Volts	Impact Time	1	Minutes	43	Seconds
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$							
Ri2 Post-Impact	Ω	36,701	Impact Time	1	Minutes	35	Seconds
Ri = The lesser of Ri1 and Ri2							
Ri Post-Impact	Ω	Zero Volts	Impact Time	1	Minutes	43	Seconds
Ri / Vb = Electrical Isolation Value / Nominal Battery Voltage							
Ri / Vb Post-Impact	Ω	Zero Volts	Impact Time	1	Minutes	35	Seconds

NOTE: The minimum Electrical Isolation Value is 500 Ω/V.

	Yes	No (Fail)
Is the measured Electrical Isolation Value ≥ 500 Ω/V?	X	
Additional Comments	None	

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

PROPULSION BATTERY SYSTEM COMPONENTS

Describe any Propulsion Battery Module movement within the passenger compartment [Supply photographs as appropriate]:
Not Applicable

	Yes (Fail)	No
Has the Propulsion Battery Module moved within the passenger compartment?		X

Describe intrusion of an outside Propulsion Battery Component into the passenger compartment [Supply photographs as appropriate]:
No Intrusion

	Yes (Fail)	No
Has an outside Propulsion Battery Component intruded into the passenger compartment?		X

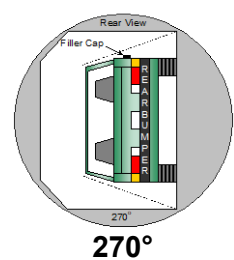
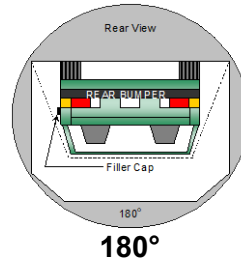
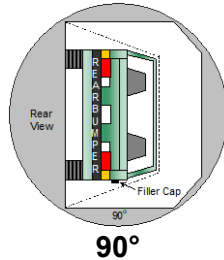
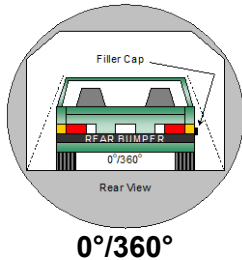
	Yes (Fail)	No
Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?		X

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

PROPULSION BATTERY SYSTEM COMPONENTS



PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Test Phase	Rotation Time (spec. 1-3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
0° - 90°	1	min	51	sec	5	min	6	min	51	sec	7	min
90° - 180°	1	min	51	sec	5	min	6	min	51	sec	7	min
180° - 270°	1	min	47	sec	5	min	6	min	47	sec	7	min
270° - 360°	1	min	50	sec	5	min	6	min	50	sec	7	min

TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

NOTE: The maximum allowable Propulsion Battery Electrolyte Spillage is 5.0 Liters.

Test Phase	Propulsion Battery Electrolyte Spillage (L)	Spillage Location
0° to 90°	0	Not Applicable
90° to 180°	0	Not Applicable
180° to 270°	0	Not Applicable
270° to 360°	0	Not Applicable
Total Spillage	0	

	Yes (Fail)	No
Is the total Propulsion Battery Electrolyte Spillage greater than 5.0 Liters?		X
Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?		X

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		62100018
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		7/14/2023

ELECTRICAL ISOLATION MEASUREMENTS

Vb Post-Impact	V	13.8
----------------	---	------

Record V1, V2, V1', V2' voltage measurements at the start of each successive increment of 90°, 180°, 270°, and 360° of the static rollover test.

	Voltage	Units	Test Phase	Time			
V1	0.0	V	0°		min		sec
	0.0		90°	2		15	
	0.0		180°	2		20	
	0.0		270°	2		21	
	0.0		360°	2		14	
V2	0.0	V	0°		min		sec
	0.0		90°	2		19	
	0.0		180°	2		22	
	0.0		270°	2		25	
	0.0		360°	2		17	
V1'	0.0	V	0°		min		sec
	0.0		90°	2		26	
	0.0		180°	2		30	
	0.0		270°	2		33	
	0.0		360°	2		30	
V2'	0.0	V	0°		min		sec
	0.0		90°	2		22	
	0.0		180°	2		27	
	0.0		270°	2		29	
	0.0		360°	2		21	

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

Test Vehicle: 2023 Hyundai IONIQ 6 SEL AWD 4-Door Sedan
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20234200
 Test Date: 11/8/2023

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts".
 This "zero voltage" condition is considered as being compliant.

	Voltage	Units	Test Phase	Time		
Ri1 = Ro (1 + V2/V1) [(V1-V1')/V1']						
Ri1	Zero Volts	Ω	0°			sec
	Zero Volts		90°	2	26	
	Zero Volts		180°	2	30	
	Zero Volts		270°	2	33	
	Zero Volts		360°	2	30	
Ri2 = Ro (1 + V1/V2) [(V2-V2')/V2']						
Ri2	Zero Volts	Ω	0°			sec
	Zero Volts		90°	2	22	
	Zero Volts		180°	2	27	
	Zero Volts		270°	2	29	
	Zero Volts		360°	2	21	
Ri = The lesser of Ri1 and Ri2						
Ri	Zero Volts	Ω	0°			sec
	Zero Volts		90°	2	22	
	Zero Volts		180°	2	27	
	Zero Volts		270°	2	29	
	Zero Volts		360°	2	21	
Ri / Vb = Electrical Isolation Value / Nominal Battery Voltage						
Ri / Vb	Zero Volts	Ω/V	0°			sec
	Zero Volts		90°	2	22	
	Zero Volts		180°	2	27	
	Zero Volts		270°	2	29	
	Zero Volts		360°	2	21	

NOTE: The minimum Electrical Isolation Value is 500 Ω/V .

	Yes	No (Fail)
Is the measured Electrical Isolation Value $\geq 500 \Omega/V$?	X	
Additional Comments	None	

**APPENDIX A
PHOTOGRAPHS**

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Photo No. 001 - Load Cell Location

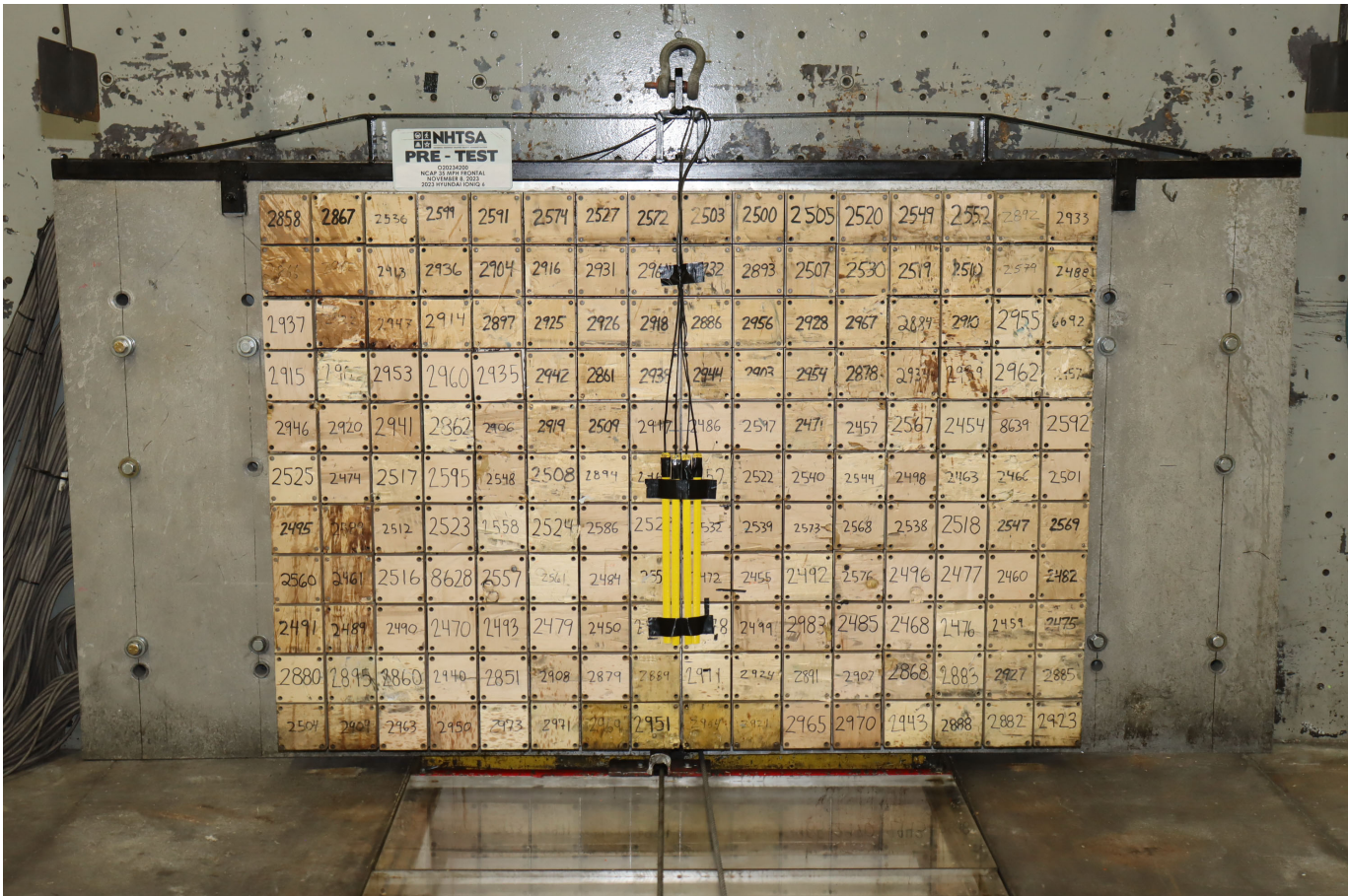


Photo No. 002 - Pre-Test Load Cell Wall



Photo No. 003 - Post-Test Load Cell Wall



Photo No. 004 - Manufacturer's Label



Photo No. 005 - Tire Placard



Photo No. 006 - 2023 Hyundai IONIQ 6 4-Door Sedan Frontal As Delivered



Photo No. 007 - Left Rear 3-4 View, As Received



Photo No. 008 - Pre-Test Front View of Test Vehicle



Photo No. 009 - Post-Test Front View of Test Vehicle



Photo No. 010 - Pre-Test Left View of Test Vehicle

PHOTOGRAPH NOT AVAILABLE

Photo No. 011 - Post-Test Left View of Test Vehicle



Photo No. 012 - Pre-Test Right View of Test Vehicle



Photo No. 013 - Post-Test Right View of Test Vehicle



Photo No. 014 - Pre-Test Right Front 3-4 View



Photo No. 015 - Post-Test Right Front 3-4 View



Photo No. 016 - Pre-Test Left Rear 3-4 View



Photo No. 017 - Post-Test Left Rear 3-4 View



Photo No. 018 - Pre-Test Windshield View



Photo No. 019 - Post-Test Windshield View



Photo No. 020 - Pre-Test Engine Compartment View

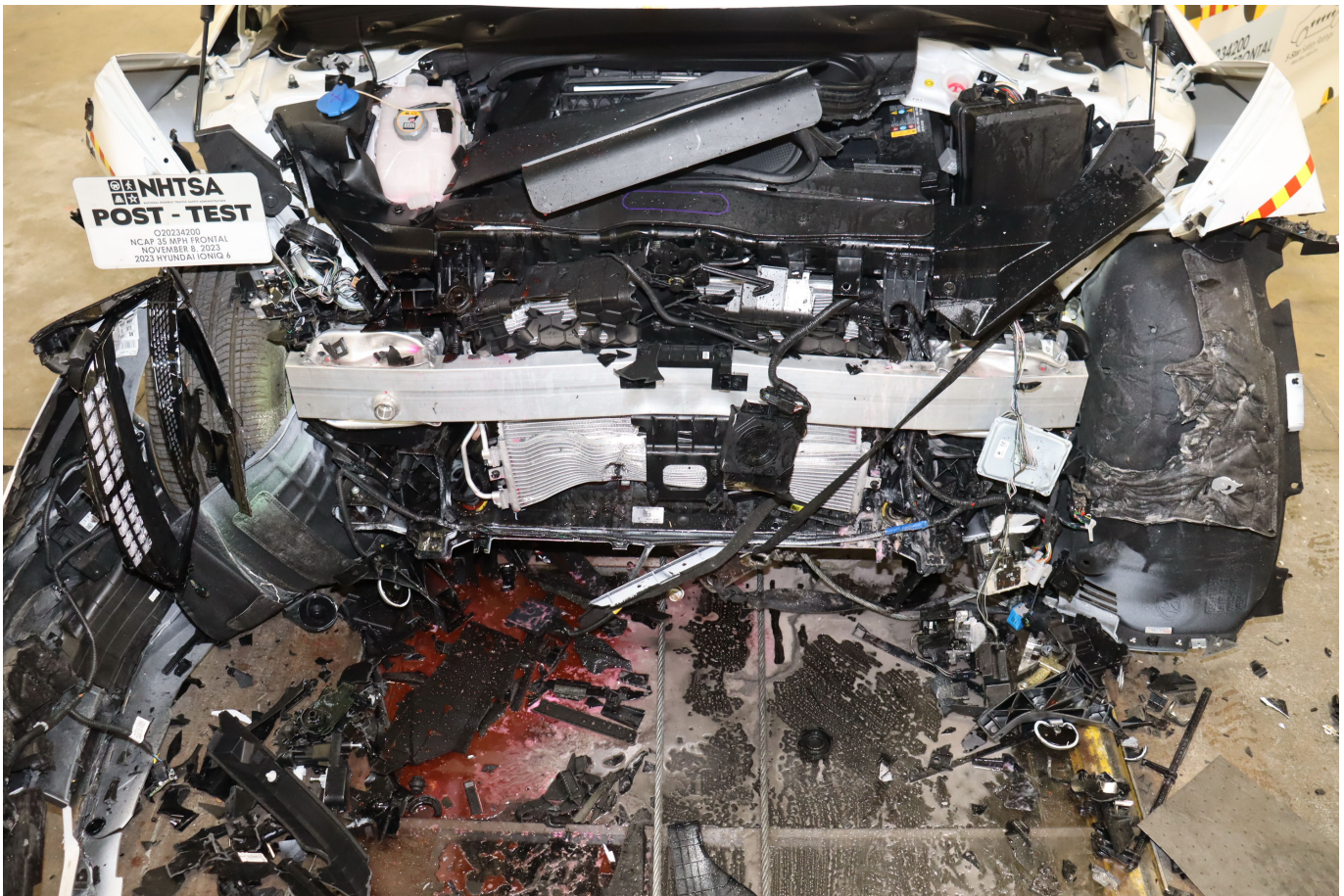


Photo No. 021 - Post-Test Engine Compartment View

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Photo No. 022 - Pre-Test Fuel Filler Cap View

PHOTOGRAPH NOT APPLICABLE

Photo No. 023 - Post-Test Fuel Filler Cap View

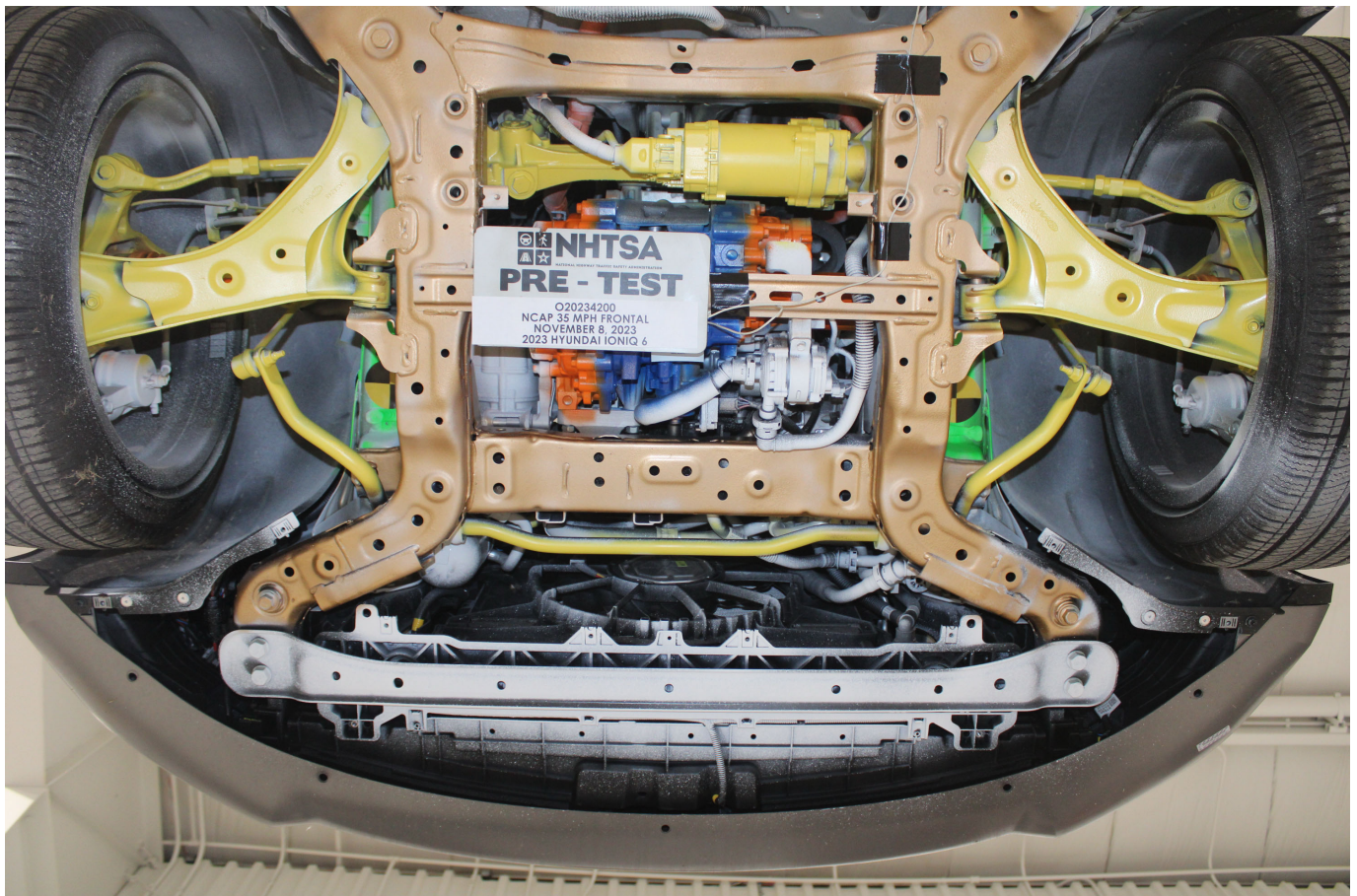


Photo No. 024 - Pre-Test Front Underbody View



Photo No. 025 - Post-Test Front Underbody View

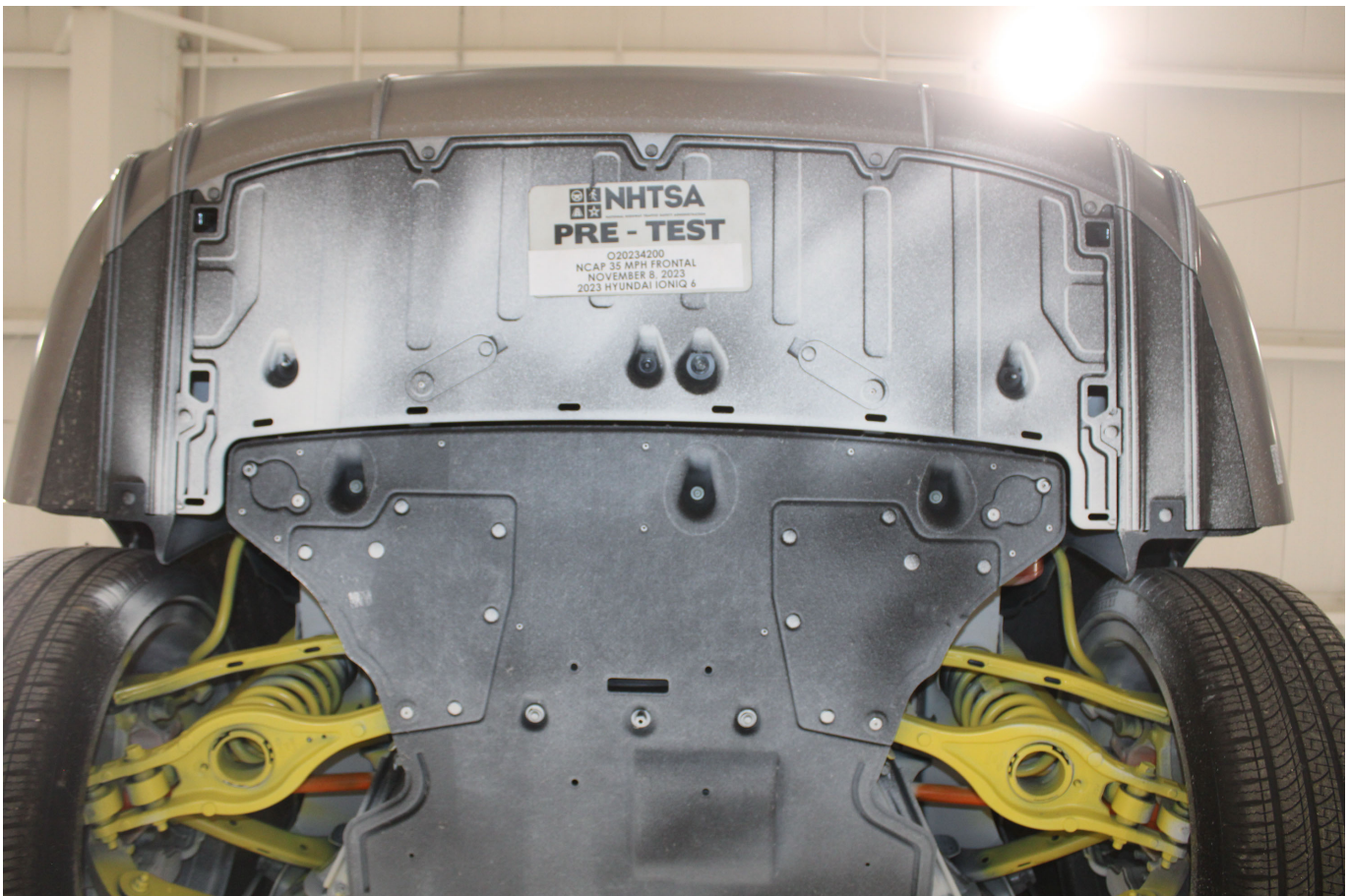


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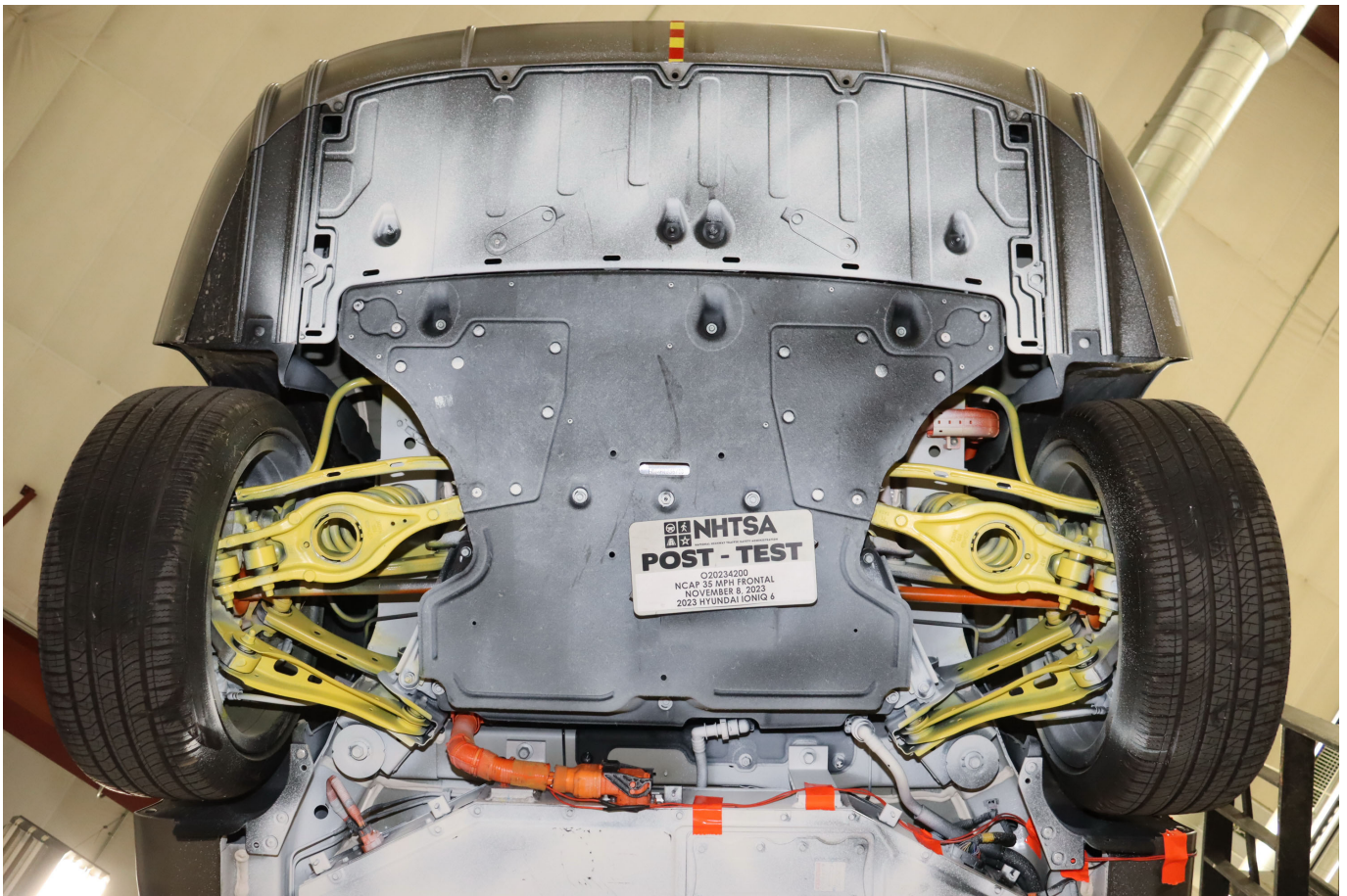


Photo No. 027 - Post-Test Rear Underbody View



Photo No. 028 - Pre-Test Dummy Cable Routing



Photo No. 029 - Post-Test Dummy Cable Routing



Photo No. 030 - Pre-Test Driver Dummy Front View



Photo No. 031 - Post-Test Driver Dummy Front View



Photo No. 032 - Pre-Test Driver Dummy Window View



Photo No. 033 - Post-Test Driver Dummy Window View



Photo No. 034 - Pre-Test Driver Dummy and Vehicle Interior View



Photo No. 035 - Post-Test Driver Dummy and Vehicle Interior View

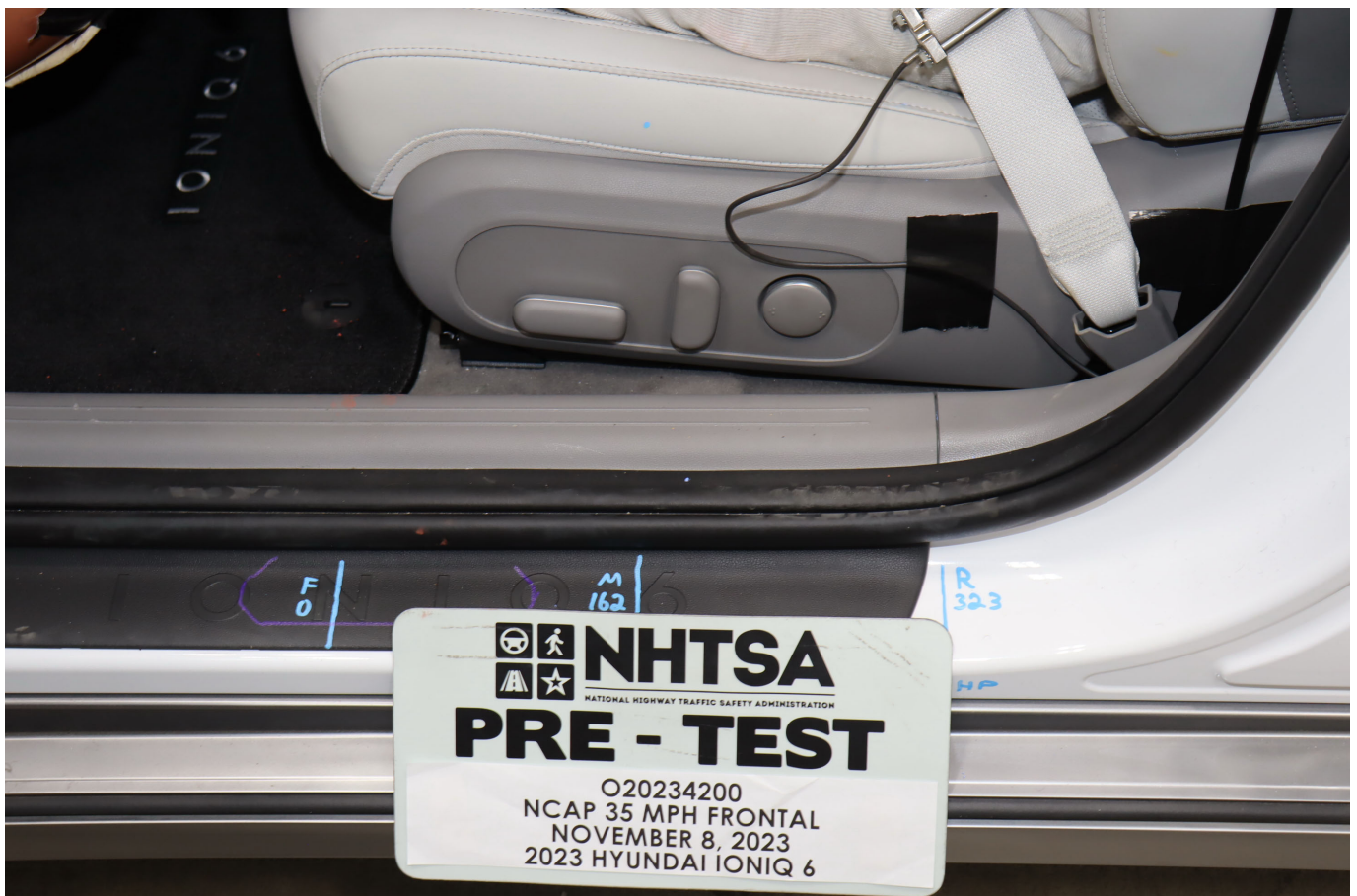


Photo No. 036 - Pre-Test Driver's Seat Fore-Aft Markings



Photo No. 037 - Post-Test Driver's Seat Fore-Aft Markings



Photo No. 038 - Pre-Test View of Belt Anchorage for Driver Dummy



Photo No. 039 - Post-Test View of Belt Anchorage for Driver Dummy



Photo No. 040 - Pre-Test View of Belt Buckle and Latch Plate for Driver Dummy



Photo No. 041 - Post-Test View of Belt Buckle and Latch Plate for Driver Dummy



Photo No. 042 - Pre-Test Driver Dummy Feet



Photo No. 043 - Post-Test Driver Dummy Feet



Photo No. 044 - Pre-Test Driver's Side Knee Bolster



Photo No. 045 - Post-Test Driver's Side Knee Bolster



Photo No. 046 - Pre-Test Driver's Side Floorpan



Photo No. 047 - Post-Test Driver's Side Floorpan



Photo No. 048 - Post-Test Driver Dummy Face

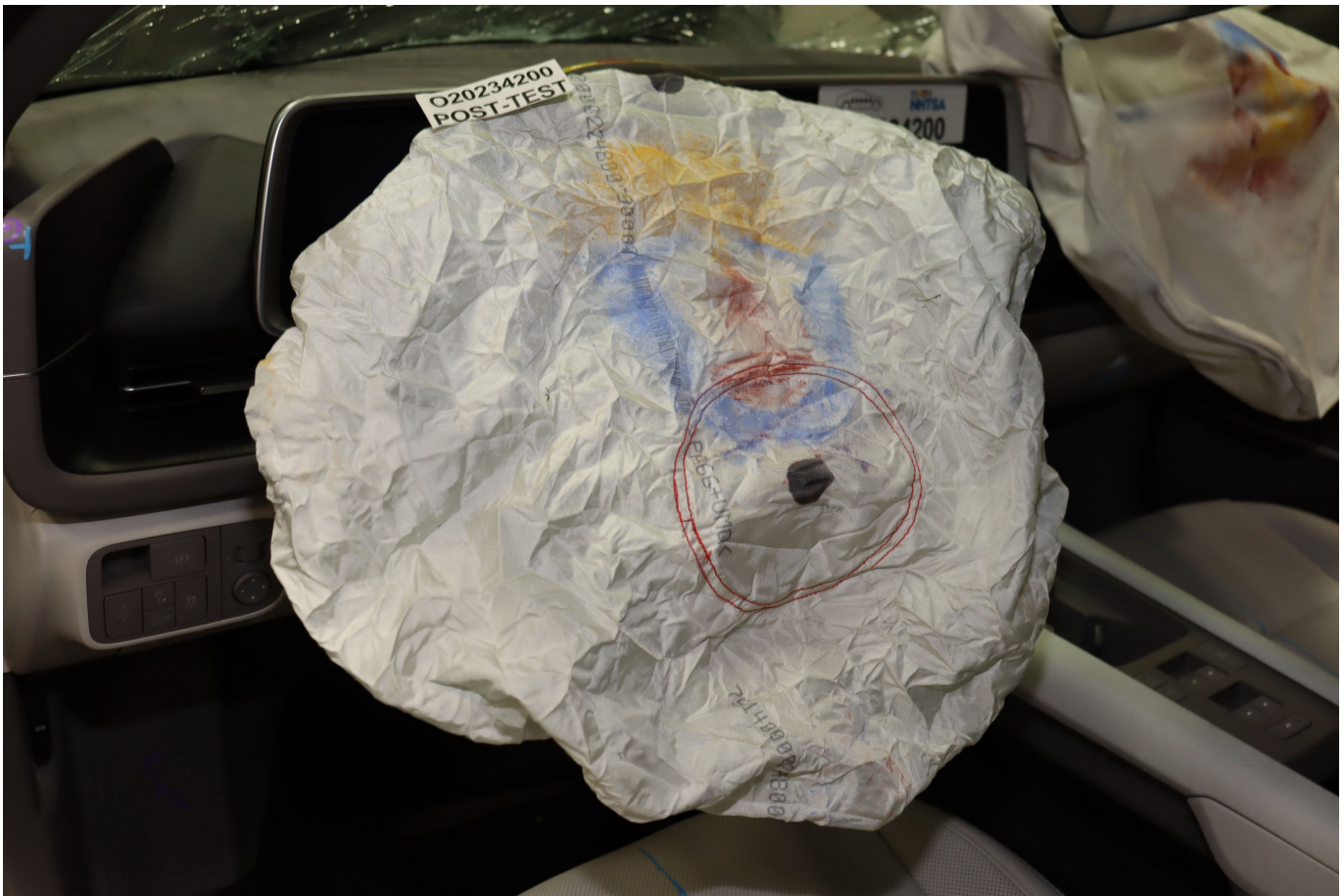


Photo No. 049 - Post-Test Driver Dummy Contact with Airbag



Photo No. 050 - Post-Test Driver Dummy Contact with Headrest



Photo No. 051 - Pre-Test View of the Steering Wheel



Photo No. 052 - Post-Test View of the Steering Wheel



Photo No. 053 - Pre-Test Passenger Dummy Front View



Photo No. 054 - Post-Test Passenger Dummy Front View



Photo No. 055 - Pre-Test Passenger Dummy Window View



Photo No. 056 - Post-Test Passenger Dummy Window View



Photo No. 057 - Pre-Test Passenger Dummy and Vehicle Interior View



Photo No. 058 - Post-Test Passenger Dummy and Vehicle Interior View



Photo No. 059 - Pre-Test Passenger's Seat Fore-Aft Markings



Photo No. 060 - Post-Test Passenger's Seat Fore-Aft Markings



Photo No. 061 - Pre-Test View of Belt Anchorage for Passenger Dummy



Photo No. 062 - Post-Test View of Belt Anchorage for Passenger Dummy

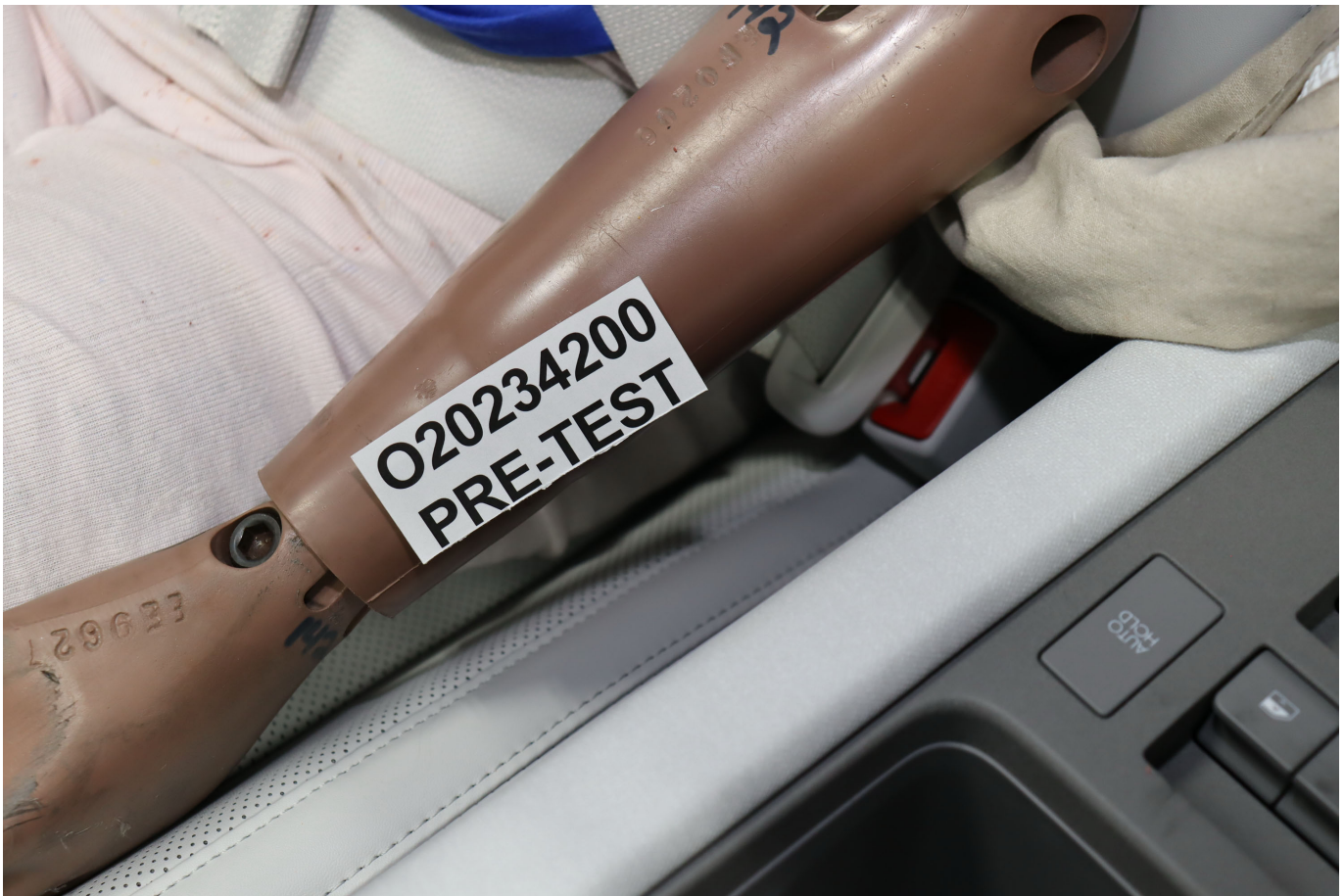


Photo No. 063 - Pre-Test View of Belt Buckle and Latch Plate for Passenger Dummy



Photo No. 064 - Post-Test View of Belt Buckle and Latch Plate for Passenger Dummy



Photo No. 065 - Pre-Test Passenger Dummy Feet



Photo No. 066 - Post-Test Passenger Dummy Feet



Photo No. 067 - Pre-Test Passenger's Side Knee Bolster



Photo No. 068 - Post-Test Passenger's Side Knee Bolster



Photo No. 069 - Pre-Test Passenger's Side Floorpan



Photo No. 070 - Post-Test Passenger's Side Floorpan



Photo No. 071 - Post-Test Passenger Dummy Face



Photo No. 072 - Post-Test Passenger Dummy Contact with Airbag



Photo No. 073 - Post-Test Passenger Dummy Contact with Headrest

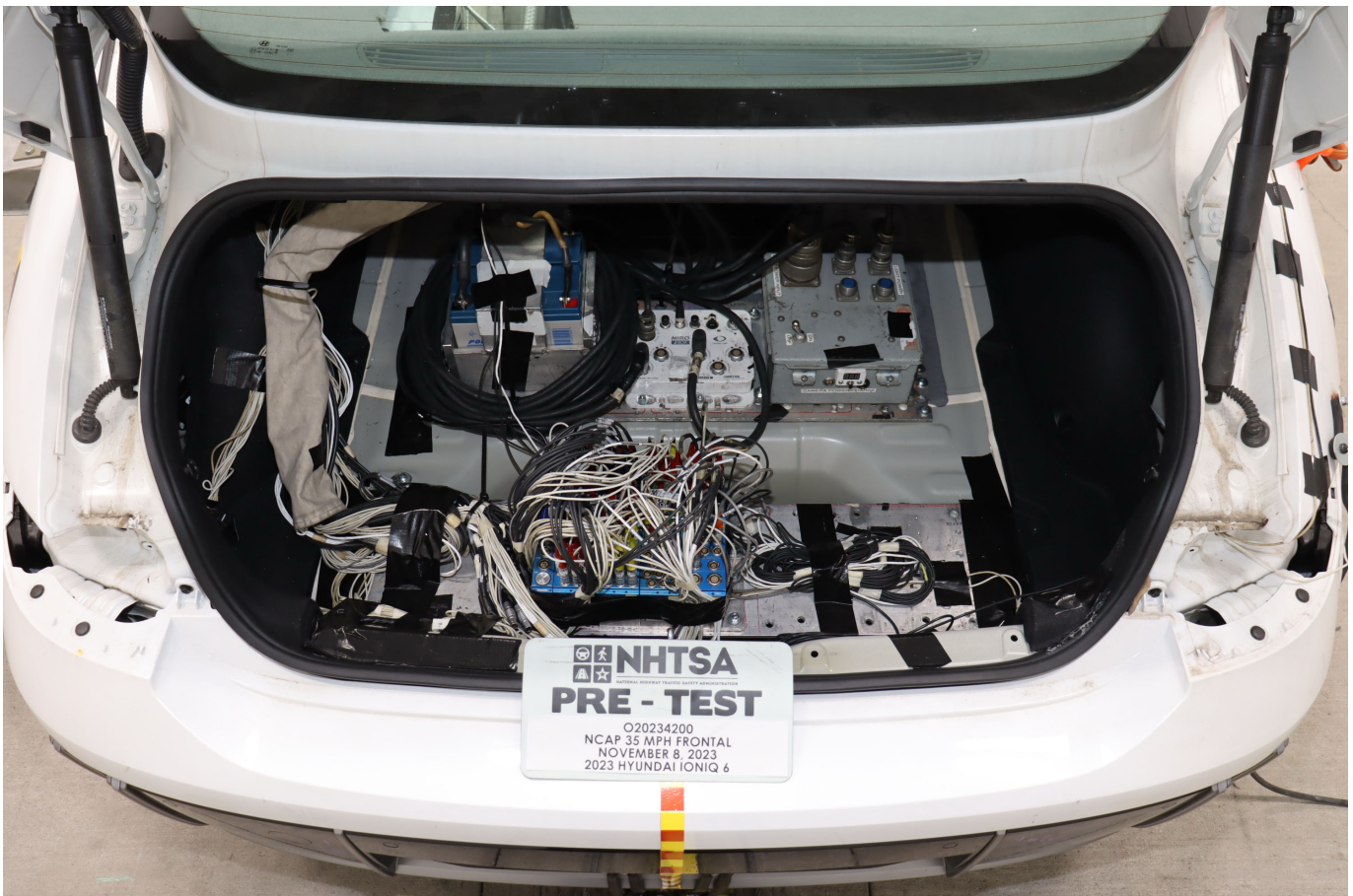


Photo No. 074 - Photograph of Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

Photo No. 075 - Post-Test Stoddard Solvent Spillage Location View



Photo No. 076 - Post-Test Speed Trap Read-Out



Photo No. 077 - Vehicle at 0 Degrees on Static Rollover Device



Photo No. 078 - Vehicle at 90 Degrees on Static Rollover Device



Photo No. 079 - Vehicle at 180 Degrees on Static Rollover Device

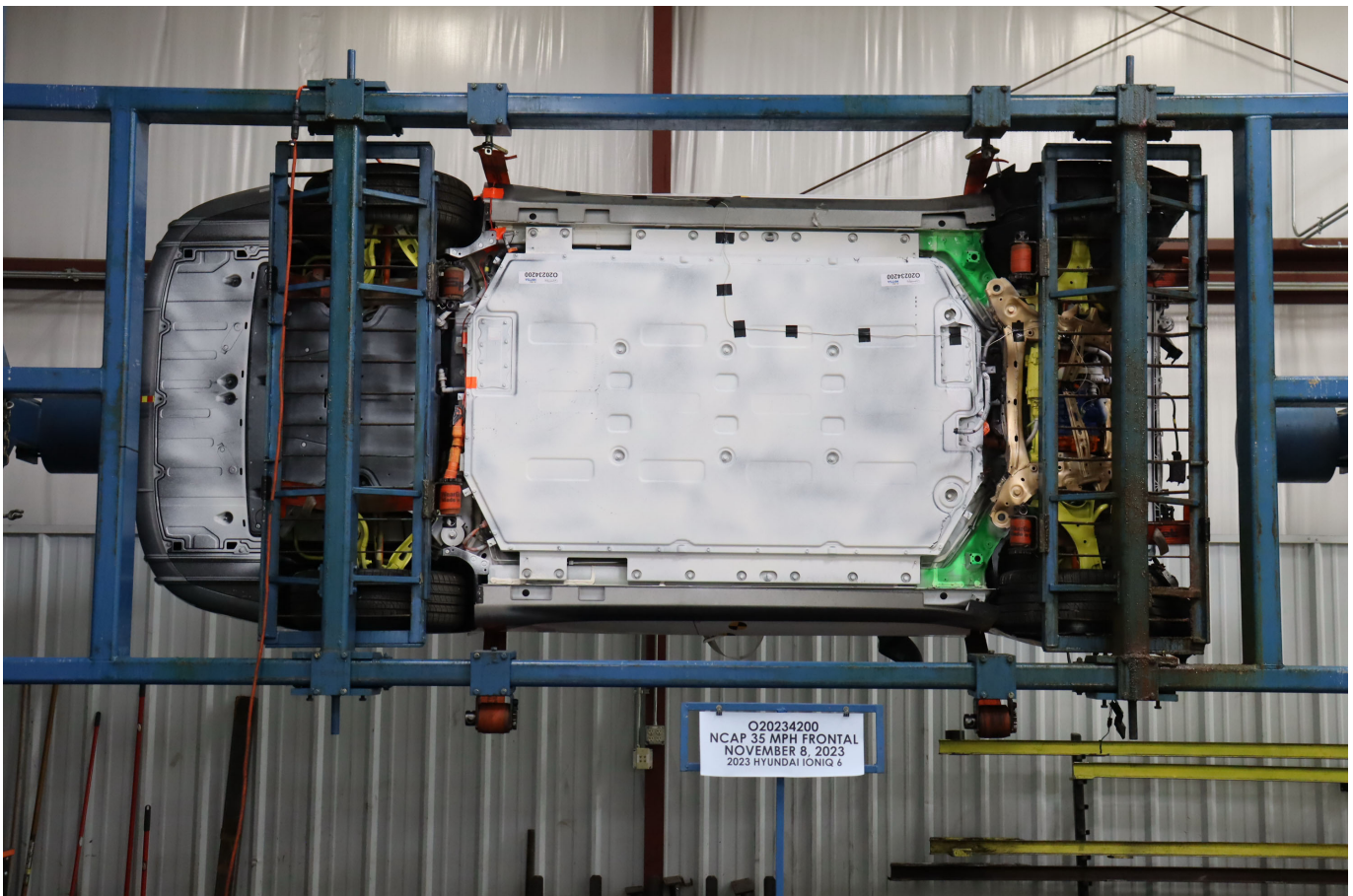


Photo No. 080 - Vehicle at 270 Degrees on Static Rollover Device



Photo No. 081 - Vehicle at 360 Degrees on Static Rollover Device



Photo No. 082 - 2023 Hyundai IONIQ 6 4-Door Sedan Frontal Impact Event

The First-Ever IONIQ 6
A New Form of Electricity

EPA Fuel Economy and Environment DOT

103 MPG
City
111 Highway
94 City
33 Highway
100 Combined
Only
Change Time = 7.5 hours (est.)
270 mi/gal (est.)

You Save \$4,500
Annual fuel cost compared to the average new sedan
based on 15,000 miles per year, \$3.50/gal.
MSRP \$700

fuel economy.gov

2023 IONIQ 6 SEL (LONG RANGE AWD 20" WHEELS)

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has earned the highest possible overall safety rating of 5 stars, the highest available for any vehicle in its class.

Source: National Highway Traffic Safety Administration (NHTSA).
www.safercar.gov or 1-888-327-4238

HYUNDAI

SOLD TO: NY077
3301 E. CHANDLER BLVD.
CHANDLER, ARIZONA 85226

SHIPPED TO: NY077
3301 E. CHANDLER BLVD.
CHANDLER, ARIZONA 85226

VIN: KMHGM42720020406
A0004042Z
PORT OF ENTRY: PH
INTERIOR COLOR: WHITE
EXTERIOR COLOR: GRAY/GRAY
ACCESSORY WEIGHT: 18.00 LBS
EMISSIONS: This vehicle meets federal requirements as all EPA-eligible vehicles in the United States.

SALES INFORMATION

1. Vehicle is sold as shown. All accessories are included in the price.
2. Vehicle is sold as shown. All accessories are included in the price.
3. Vehicle is sold as shown. All accessories are included in the price.
4. Vehicle is sold as shown. All accessories are included in the price.
5. Vehicle is sold as shown. All accessories are included in the price.
6. Vehicle is sold as shown. All accessories are included in the price.
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9. Vehicle is sold as shown. All accessories are included in the price.
10. Vehicle is sold as shown. All accessories are included in the price.

Photo No. 083 - Monroney Label Photograph



Photo No. 305-01 - Auxiliary Power Module Warning Label

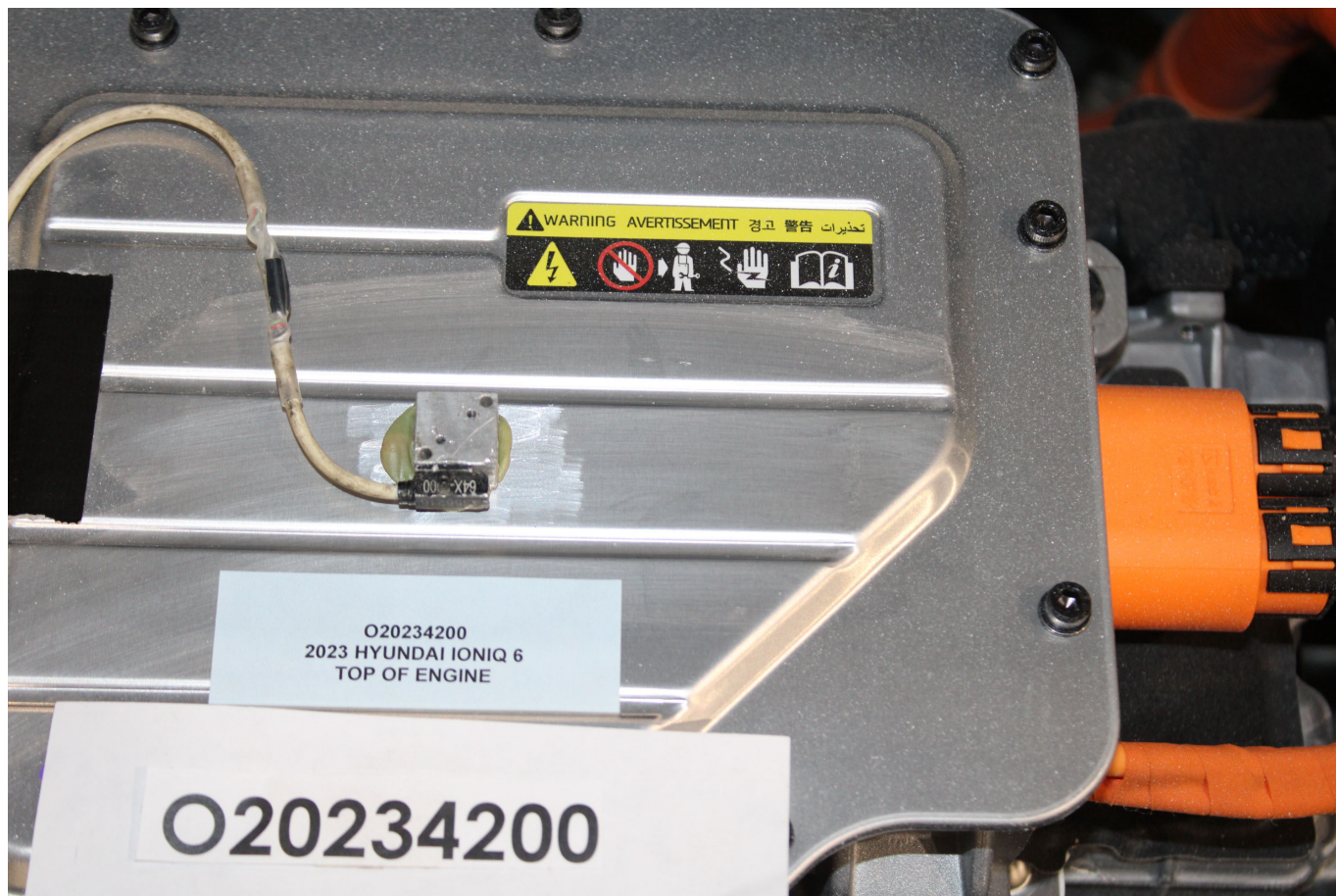


Photo No. 305-02 - Power Inverter Warning Label



Photo No. 305-03 - First Responder Warning Label



Photo No. 305-04 - First Responder Warning Location



Photo No. 305-05 - Other Vehicle Label(s) Related to Electrical Propulsion System

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-06 - Manual High Voltage Service Disconnect in Place

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-07 - Manual High Voltage Service Disconnect Removed

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-08 - Manual High Voltage Service Disconnect Removed



Photo No. 305-09 - Pre-Impact View of Propulsion Battery

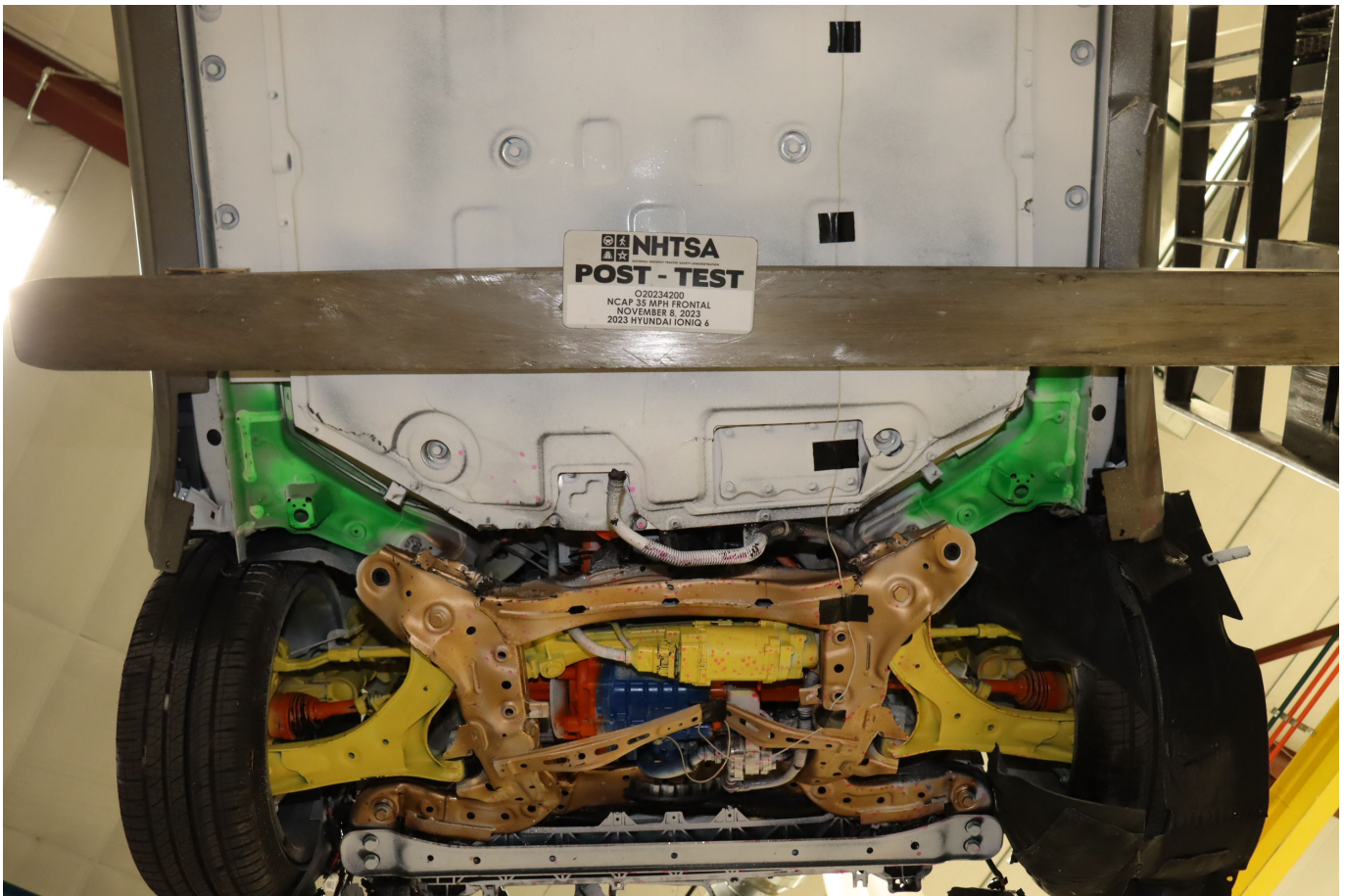


Photo No. 305-10 - Post-Impact Front View of Propulsion Battery

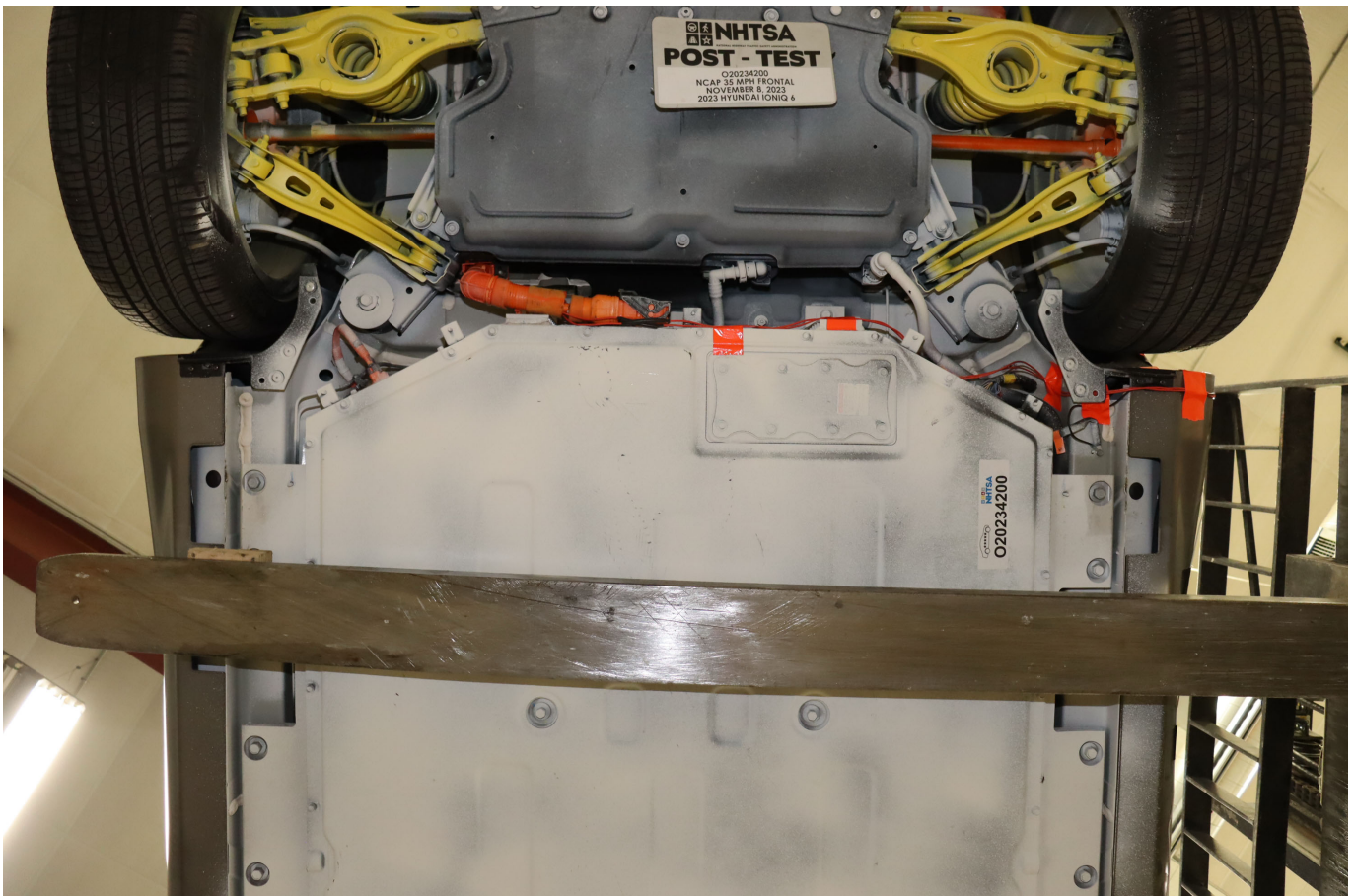


Photo No. 305-11 - Post-Impact Rear View of Propulsion Battery

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-12 - Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-13 - Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-14 - Pre-Impact View of Propulsion Battery Module(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-15 - Post-Impact View of Propulsion Battery Module(s)

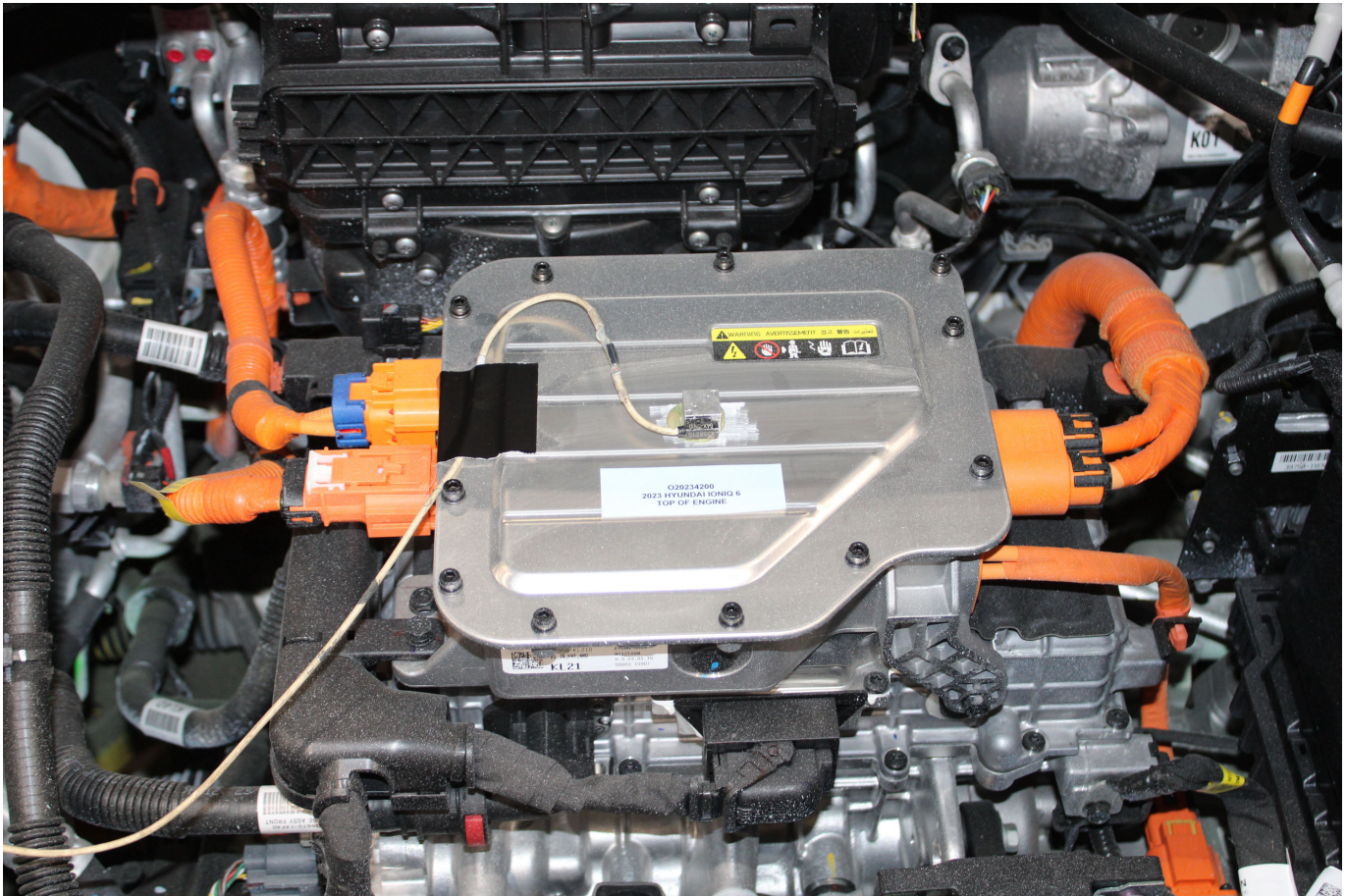


Photo No. 305-16 - Pre-Impact View of Electric Propulsion Drive

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-17 - Post-Impact View of Electric Propulsion Drive

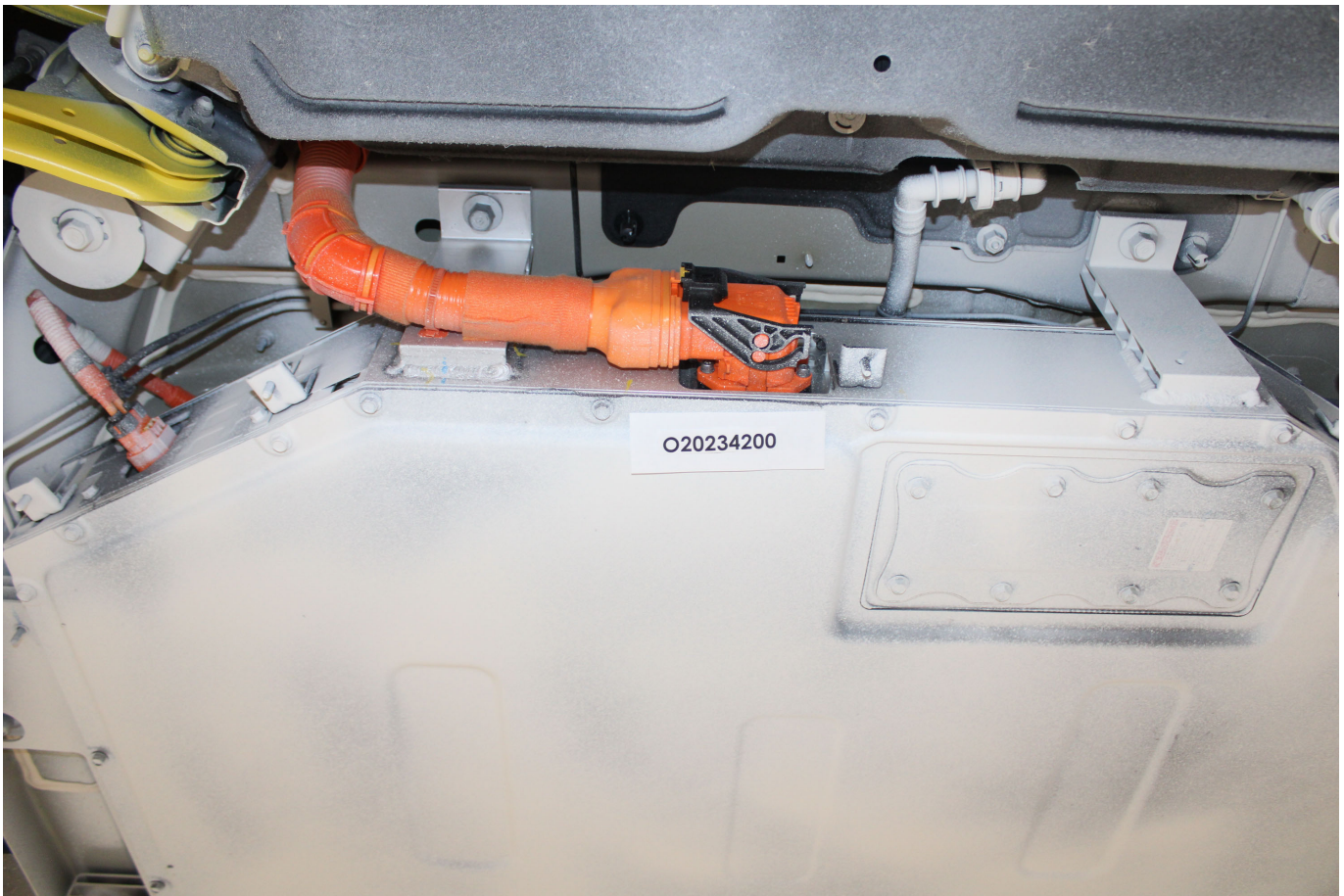


Photo No. 305-18 - Pre-Impact View of High Voltage Interconnect(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-19 - Pre-Impact View Propulsion Battery Venting System(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-20 - Pre-Impact View of Other Visible Electric Propulsion Components



Photo No. 305-21 - Pre-Impact View of Ground Lead Attached

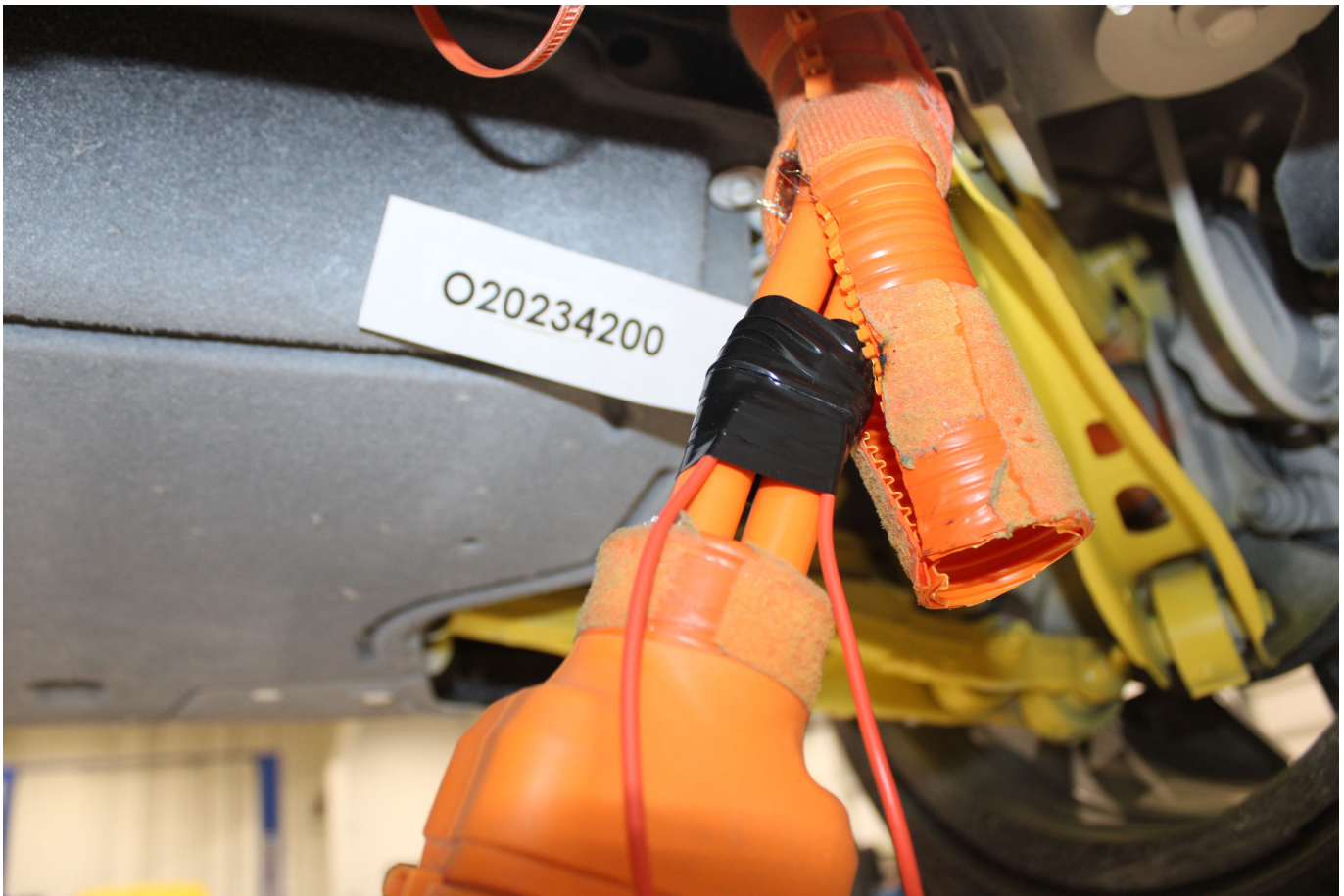


Photo No. 305-22 - Pre-Impact View of High Voltage Leads Attached



Photo No. 305-23 - Pre-Impact Close-Up View of High Voltage Leads Attached

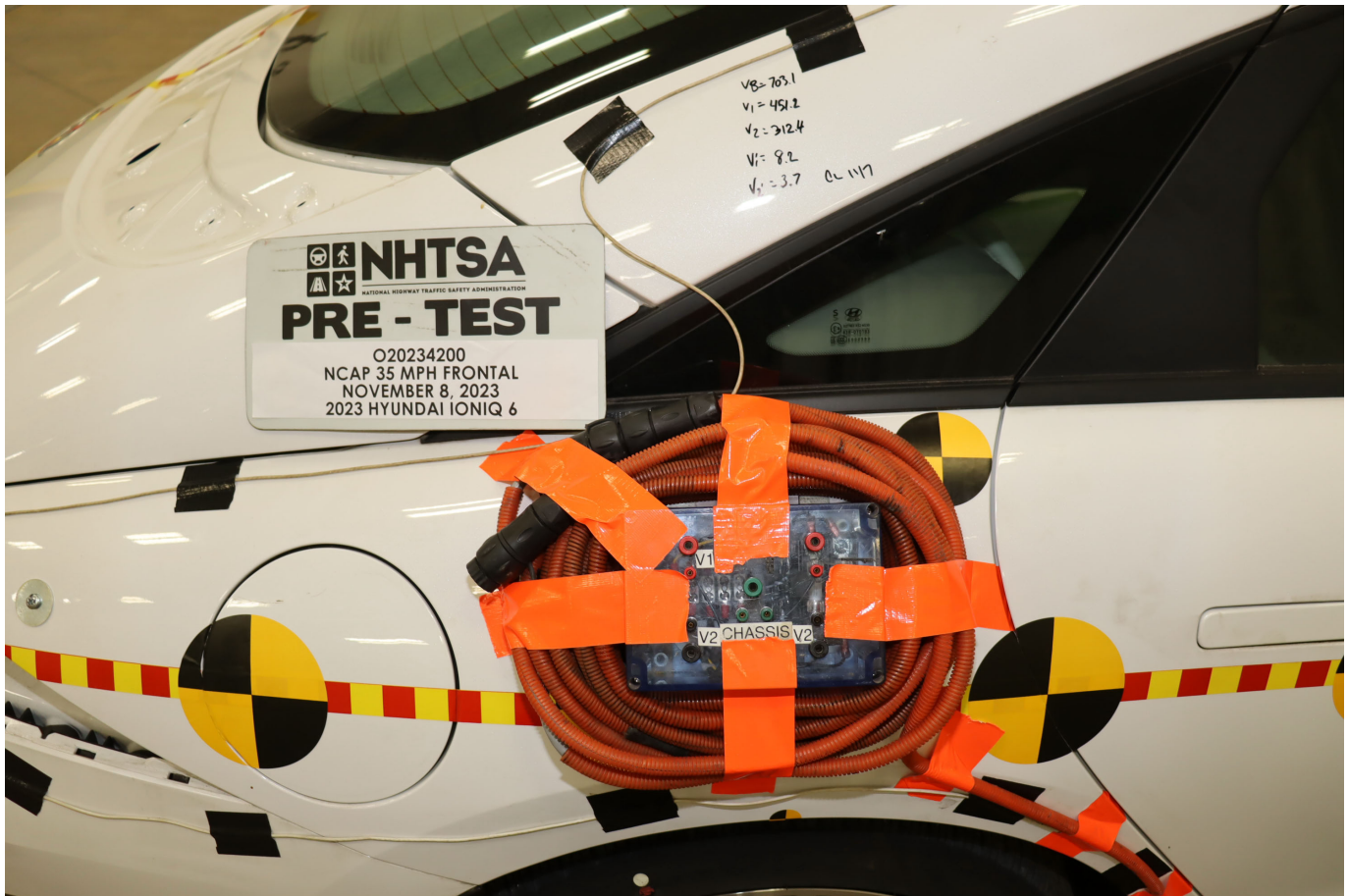


Photo No. 305-24 - Pre-Impact View of Installed Test Interface Port



Photo No. 305-25 - Post-Impact View of Installed Test Interface Port

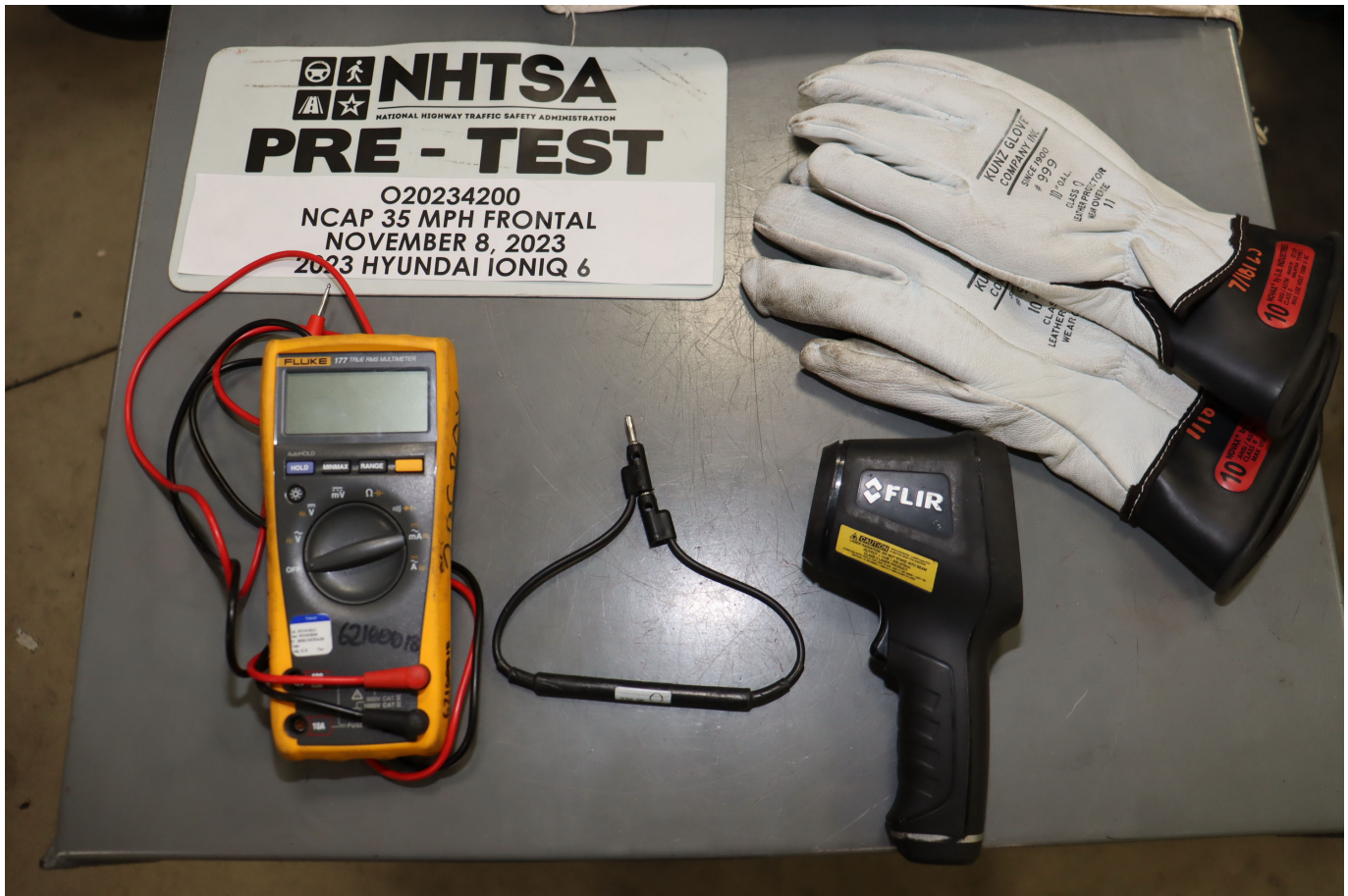


Photo No. 305-26 - Pre-Impact View of Other Test Devices



Photo No. 305-27 - Post-Impact View of Other Test Devices



Photo No. 305-28 - FMVSS No. 305 Static Rollover at 90 Degrees



Photo No. 305-29 - FMVSS No. 305 Static Rollover at 180 Degrees

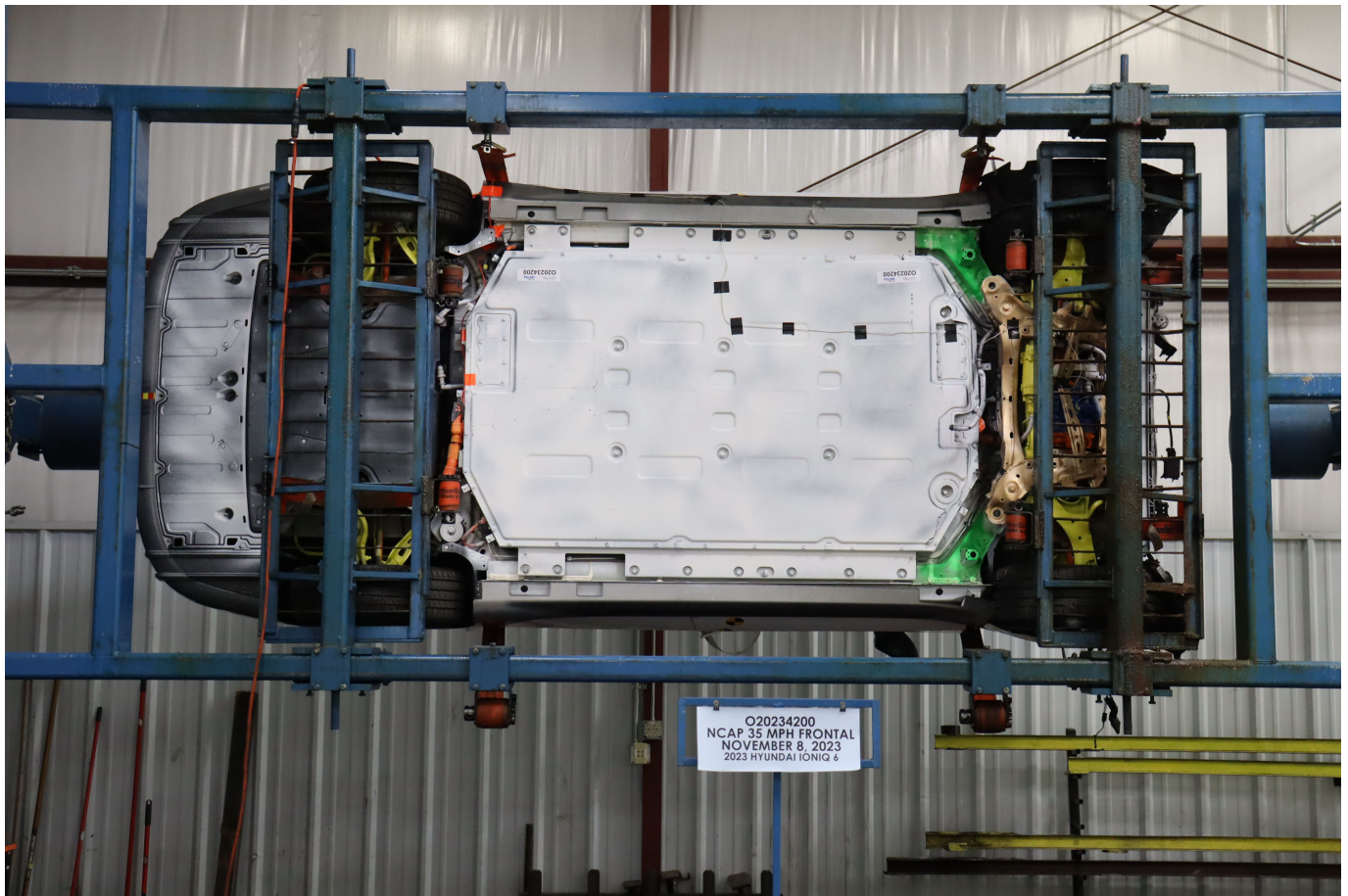


Photo No. 305-30 - FMVSS No. 305 Static Rollover at 270 Degrees



Photo No. 305-31 - FMVSS No. 305 Static Rollover at 360 Degrees



Photo No. 305-32 - Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery



Photo No. 305-33 - Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-34 - Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-35 - Post-Impact View of Battery Component Intrusion

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-36 - Post-Impact View of Battery Module Movement or Retention Loss

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-37 - Post-Impact View of Propulsion Battery Electrolyte Spillage Location

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-38 - Post-Test View of Propulsion Battery Electrolyte Spillage Location

APPENDIX B
DUMMY RESPONSE DATA TRACES

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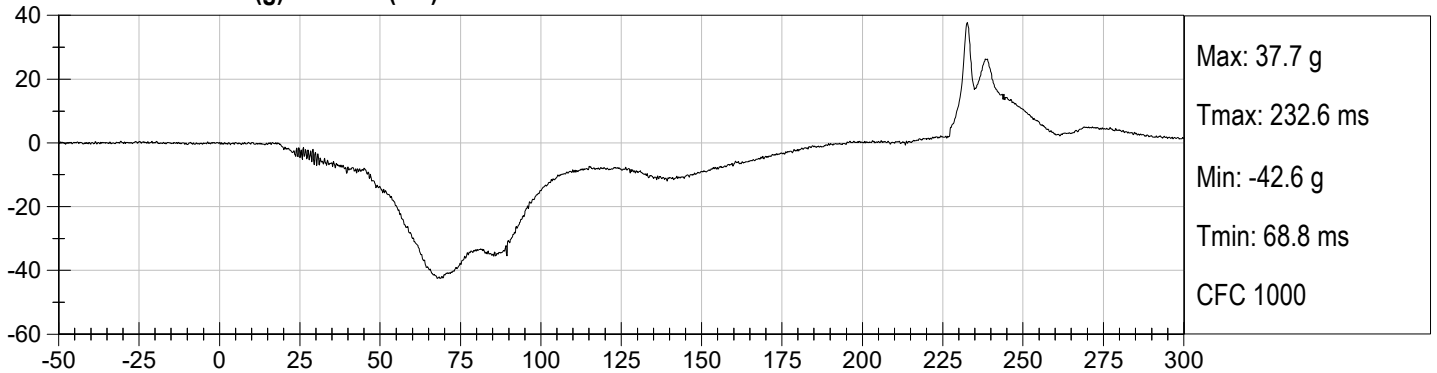
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.gov

Driver Head X Redundant
 Driver Head Y Redundant
 Driver Head Z Redundant
 Driver Head Angular Velocity X
 Driver Head Angular Velocity Y
 Driver Head Angular Velocity Z
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Redundant
 Driver Chest Y Redundant
 Driver Chest Z 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

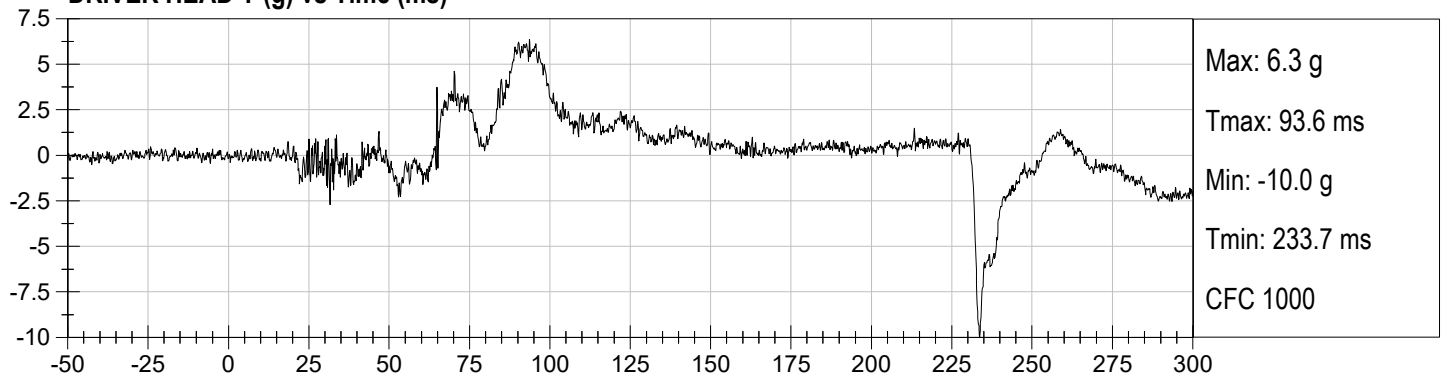
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver 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 Lap Belt Force
Driver Shoulder Belt Force
Passenger Head X Redundant
Passenger Head Y Redundant
Passenger Head Z Redundant
Passenger Head Angular Velocity X
Passenger Head Angular Velocity Y
Passenger Head Angular Velocity Z
Passenger Upper Neck Force Y
Passenger Upper Neck Moment X
Passenger Upper Neck Moment Z
Passenger Chest X Redundant
Passenger Chest Y Redundant
Passenger Chest Z 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 Lap Belt Force
Passenger Shoulder Belt Force
Left Rear Seat Crossmember X
Right Rear Seat Crossmember X
Vehicle Engine Top X
Vehicle Engine Bottom X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember Xr
Right Rear Seat Crossmember Xr
Advanced Research Load Cell Barrier – 528 channels

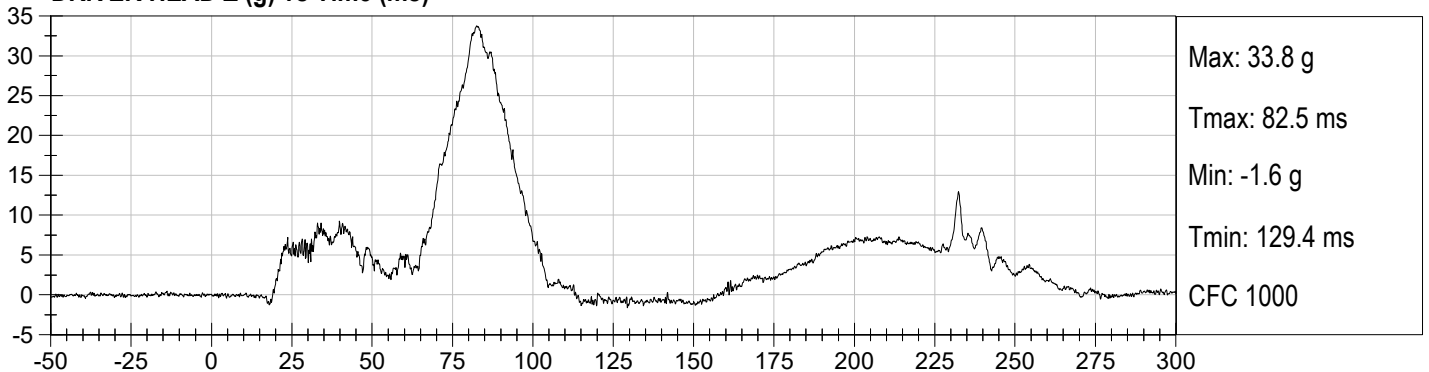
DRIVER HEAD X (g) vs Time (ms)



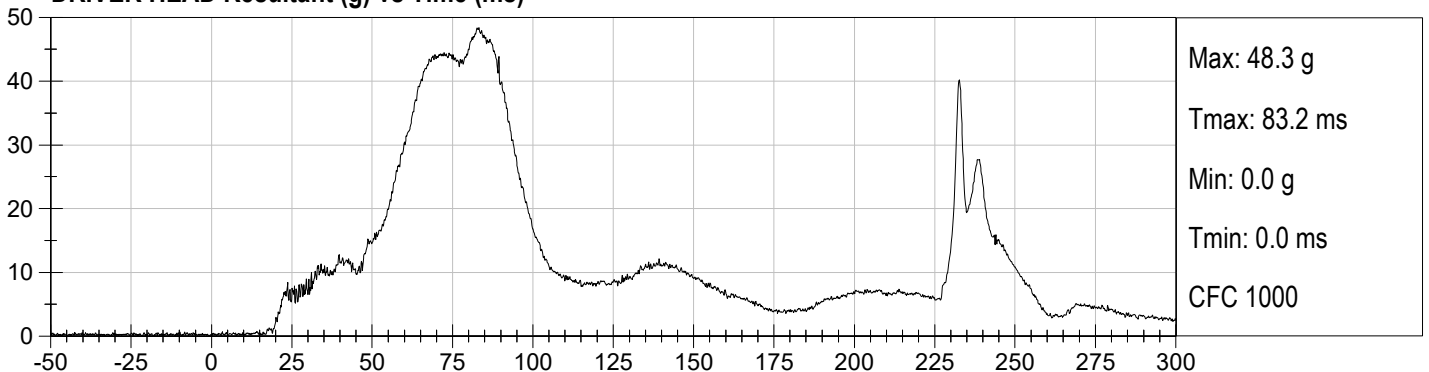
DRIVER HEAD Y (g) vs Time (ms)

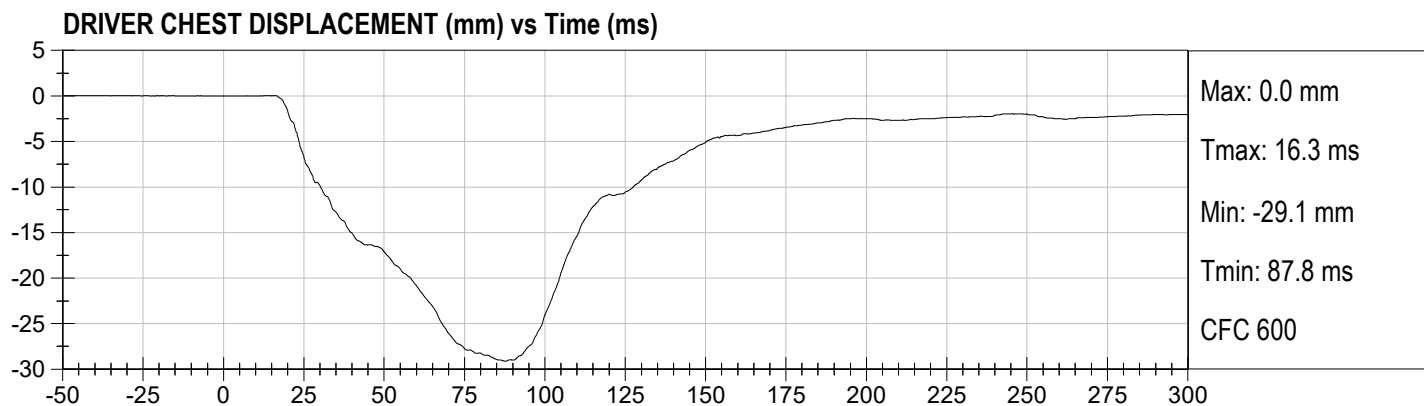


DRIVER HEAD Z (g) vs Time (ms)

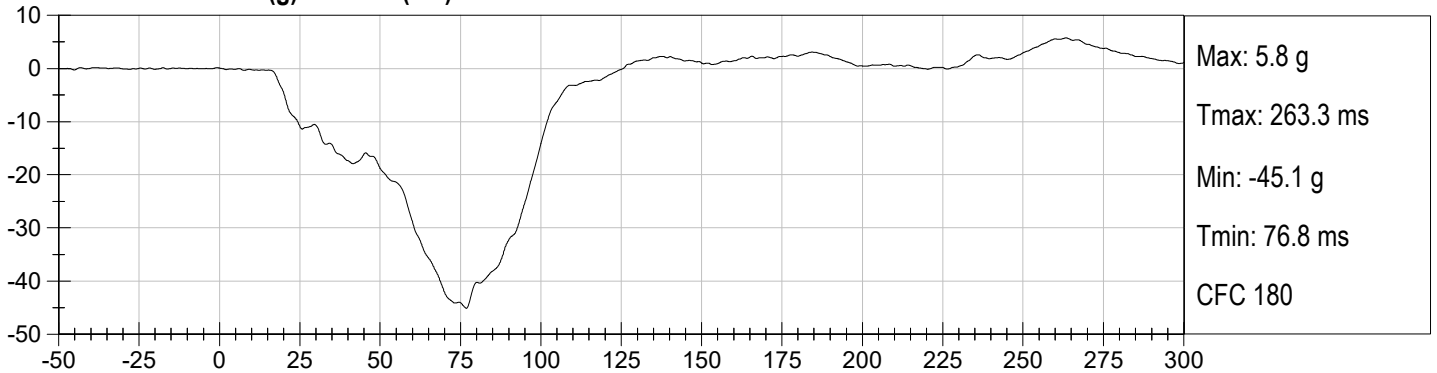


DRIVER HEAD Resultant (g) vs Time (ms)

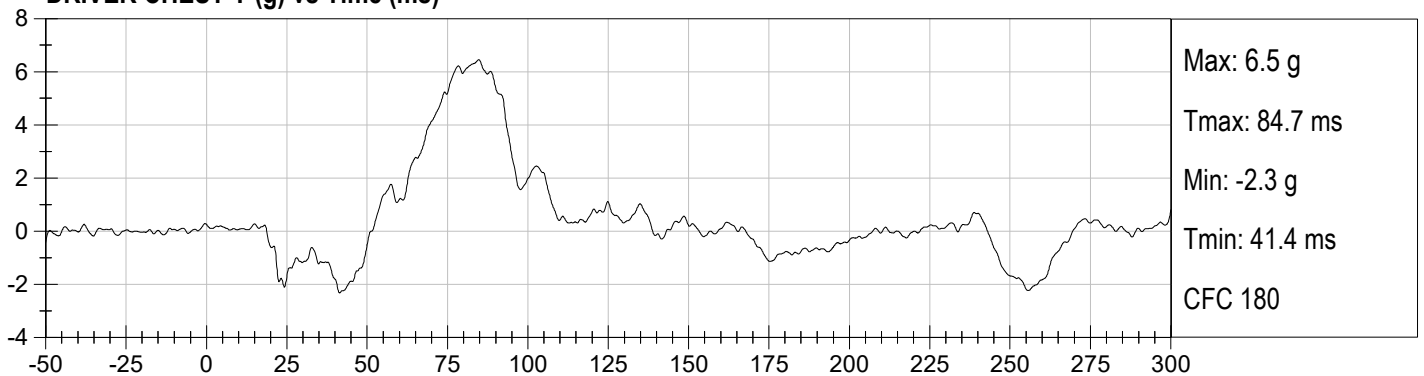




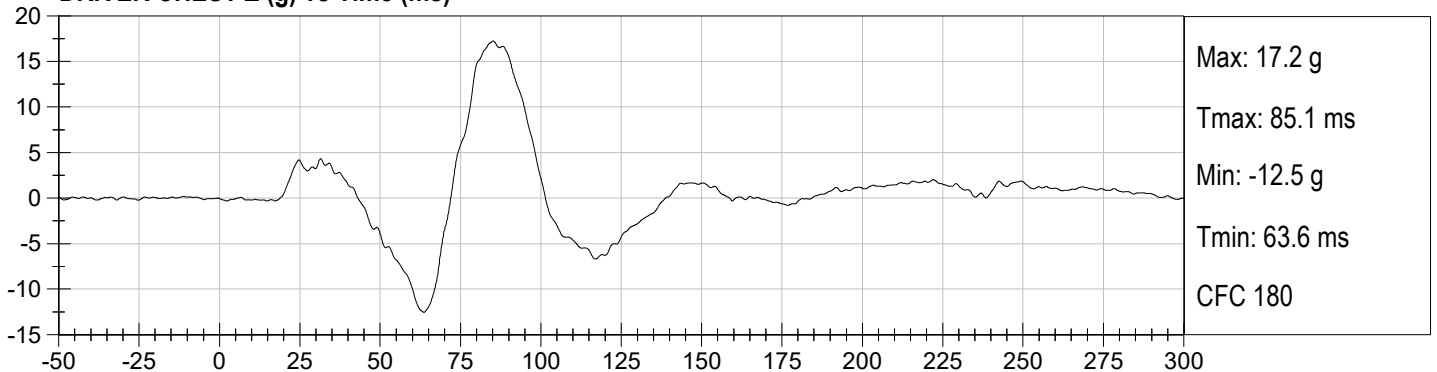
DRIVER CHEST X (g) vs Time (ms)



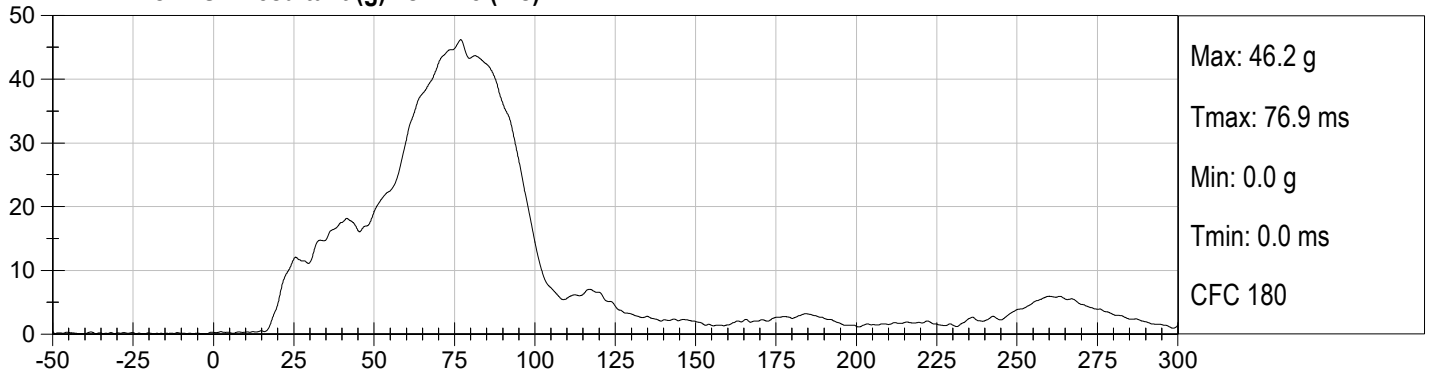
DRIVER CHEST Y (g) vs Time (ms)

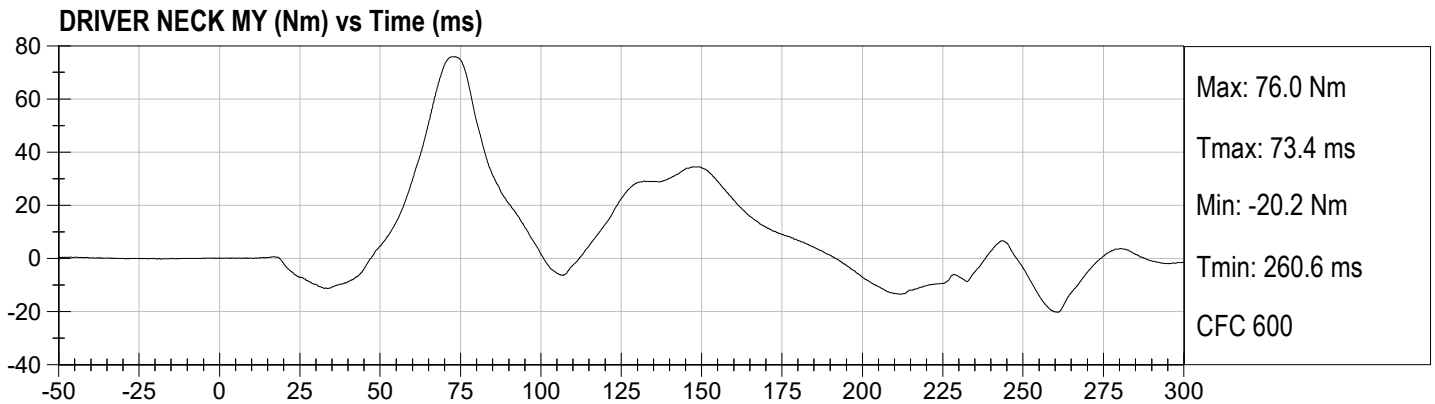
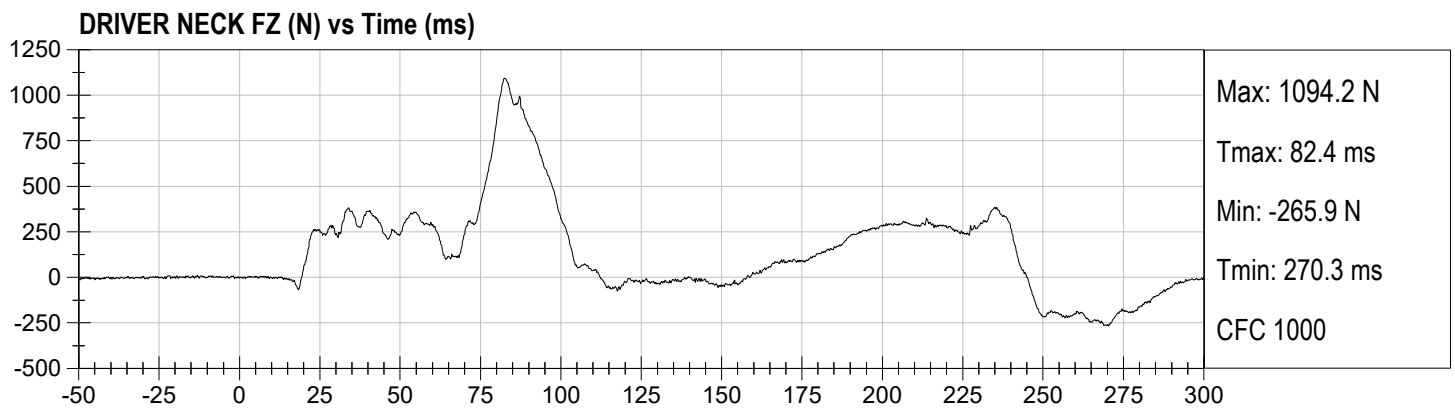
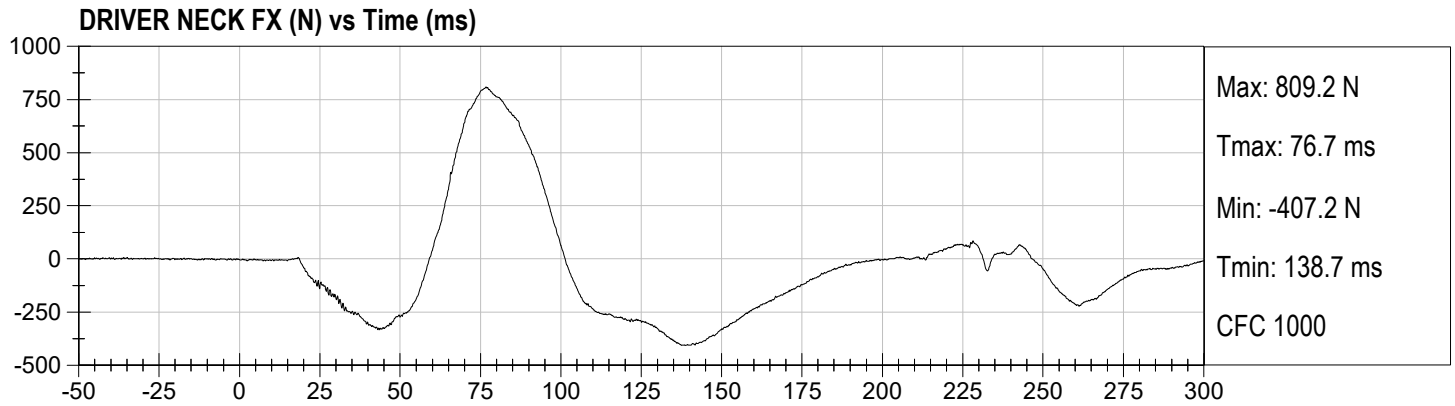


DRIVER CHEST Z (g) vs Time (ms)

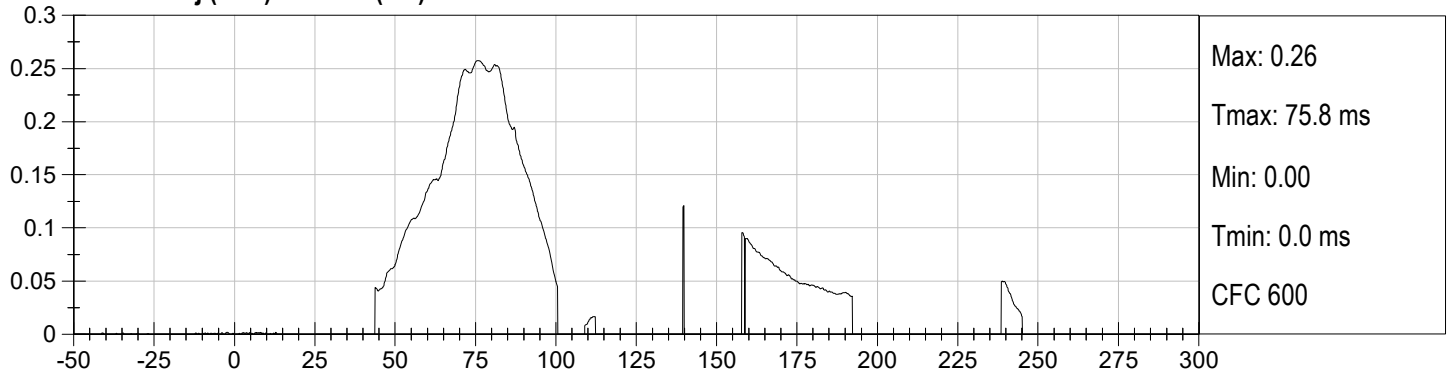


DRIVER CHEST Resultant (g) vs Time (ms)

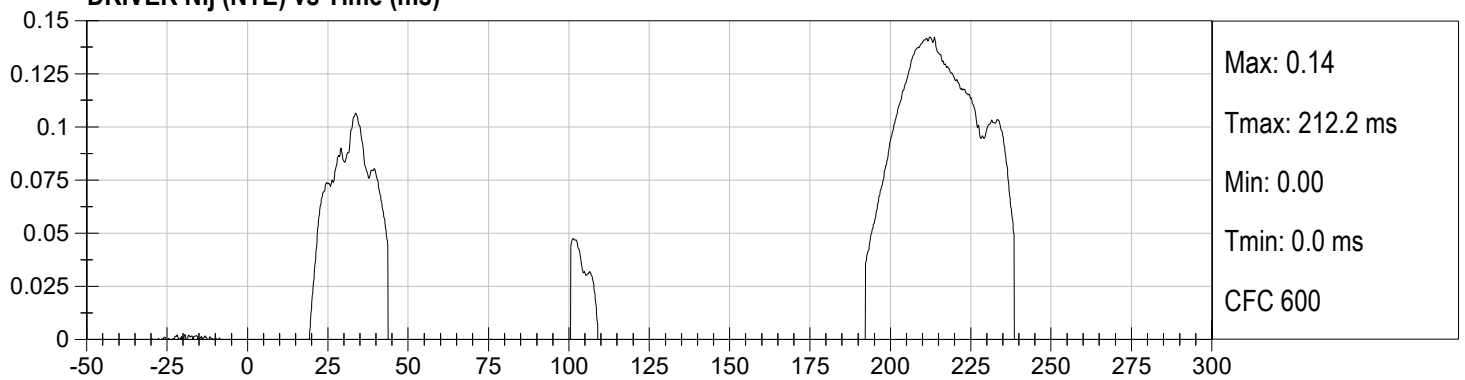




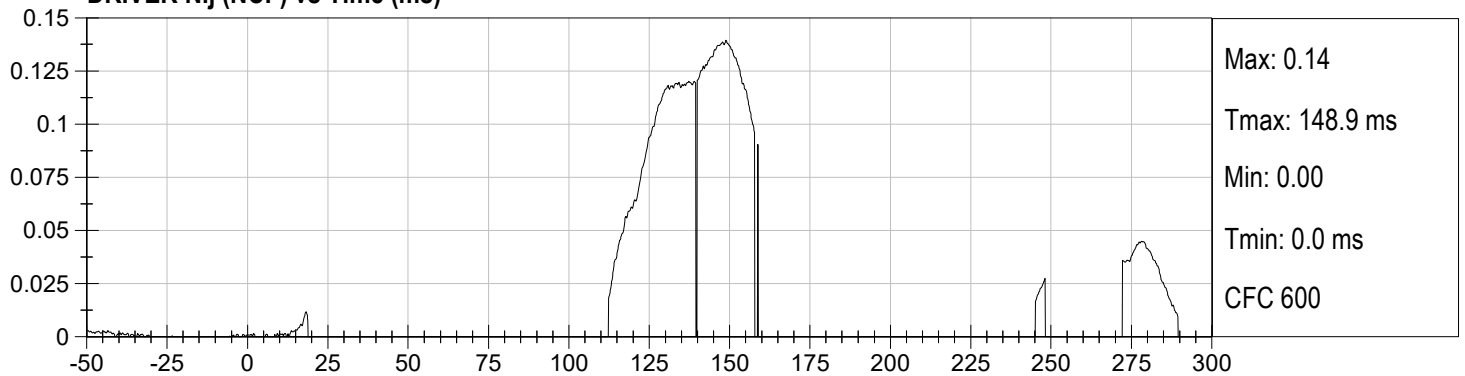
DRIVER Nij (NTF) vs Time (ms)



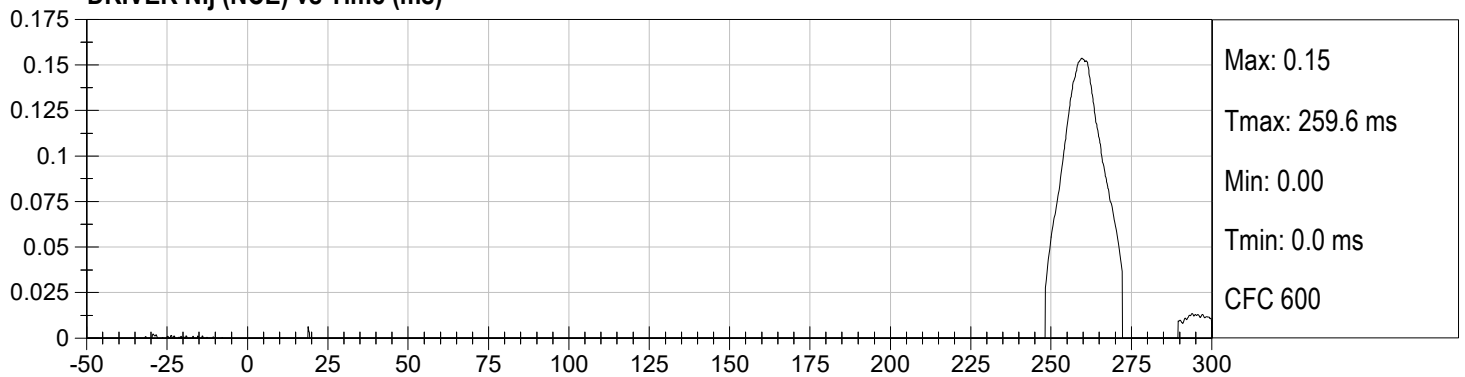
DRIVER Nij (NTE) vs Time (ms)



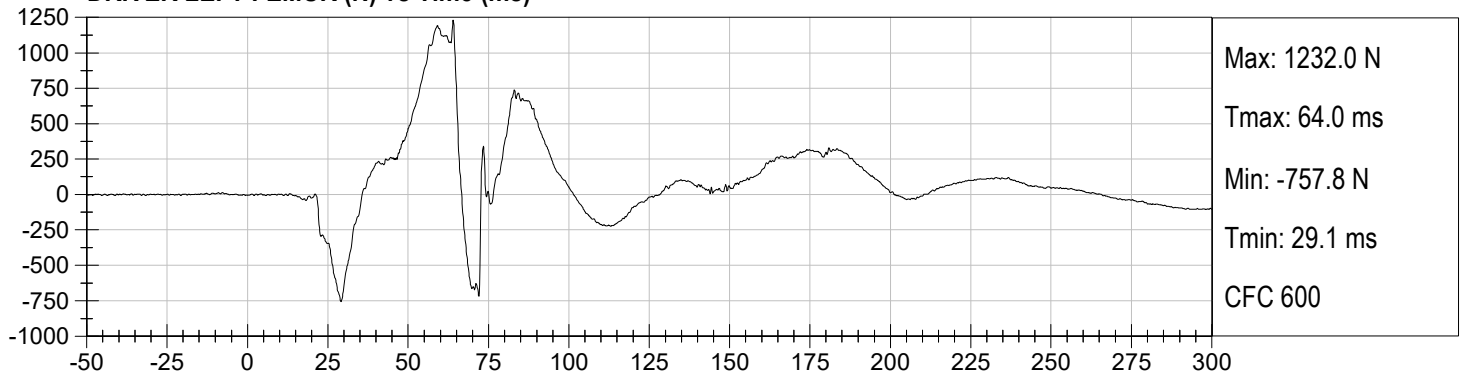
DRIVER Nij (NCF) vs Time (ms)



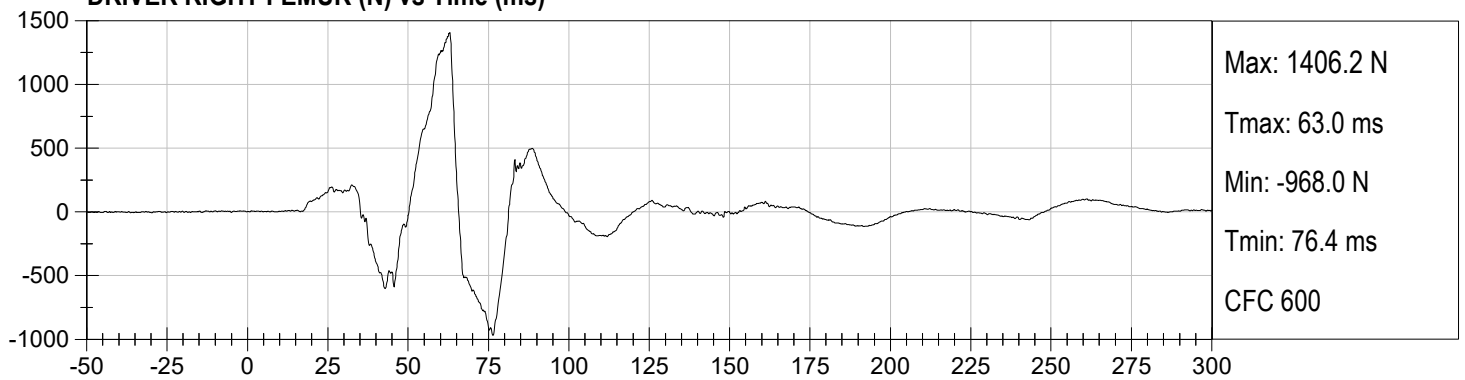
DRIVER Nij (NCE) vs Time (ms)



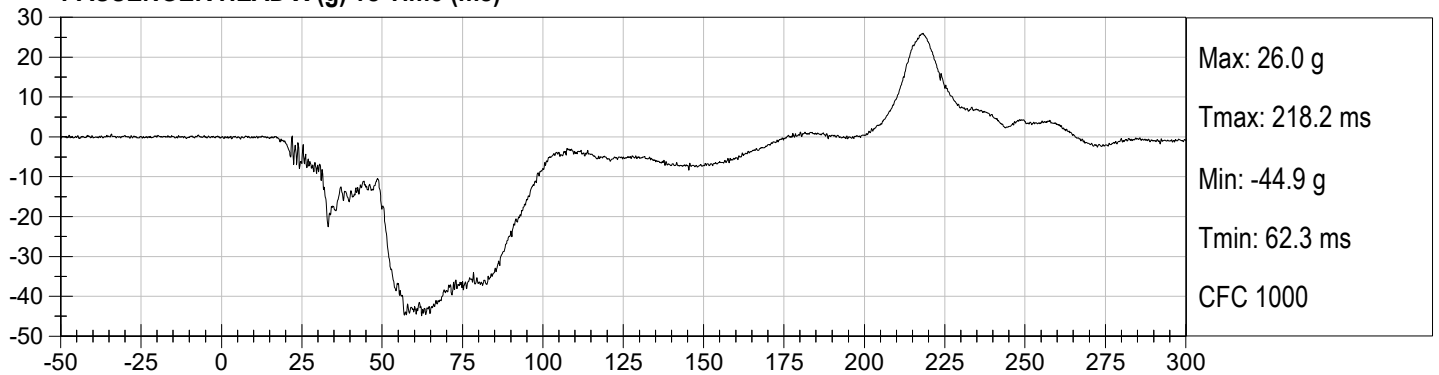
DRIVER LEFT FEMUR (N) vs Time (ms)



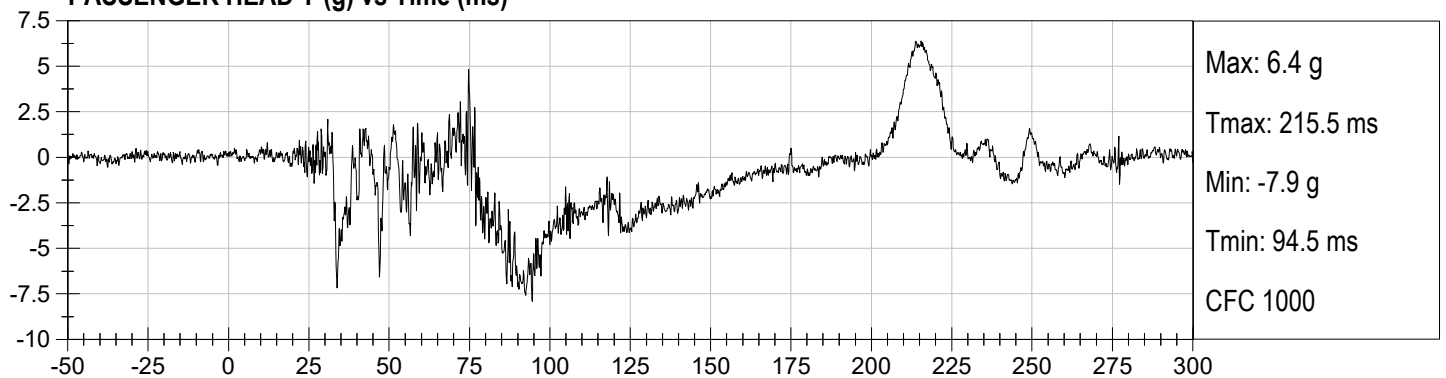
DRIVER RIGHT FEMUR (N) vs Time (ms)



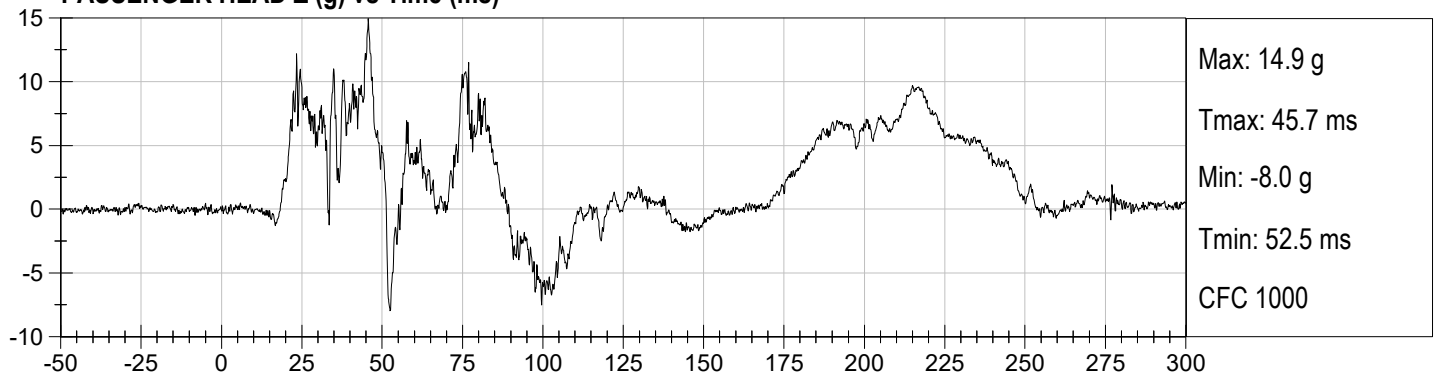
PASSENGER HEAD X (g) vs Time (ms)



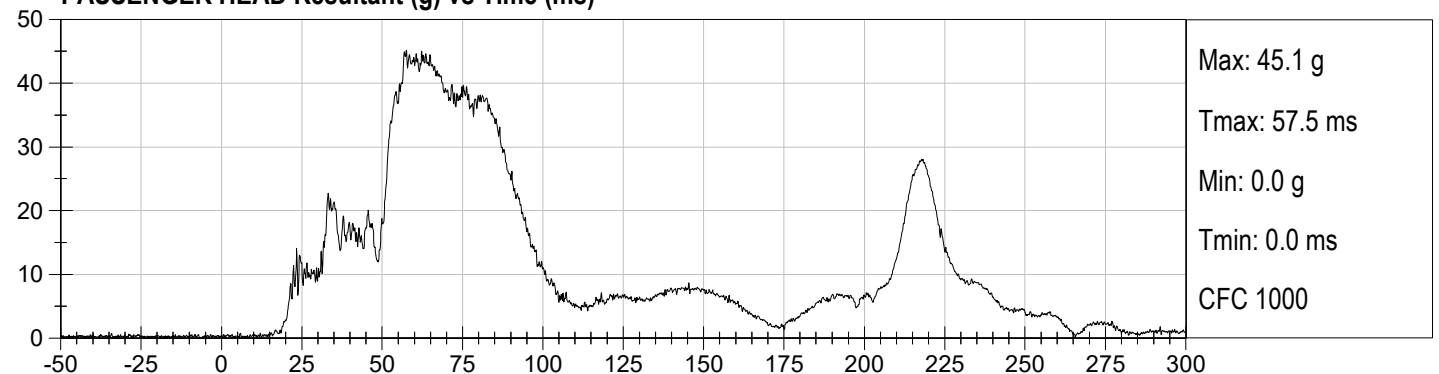
PASSENGER HEAD Y (g) vs Time (ms)

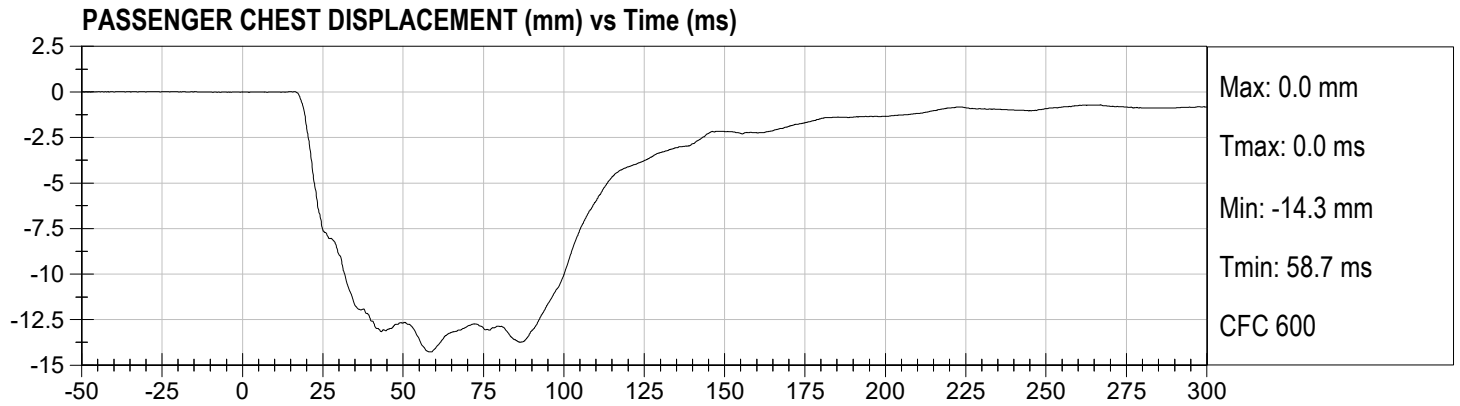


PASSENGER HEAD Z (g) vs Time (ms)

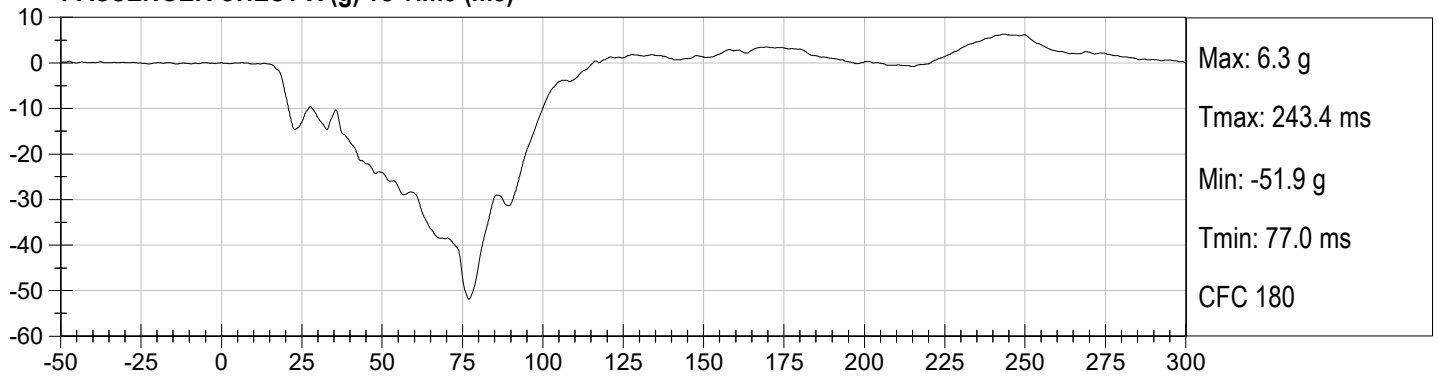


PASSENGER HEAD Resultant (g) vs Time (ms)

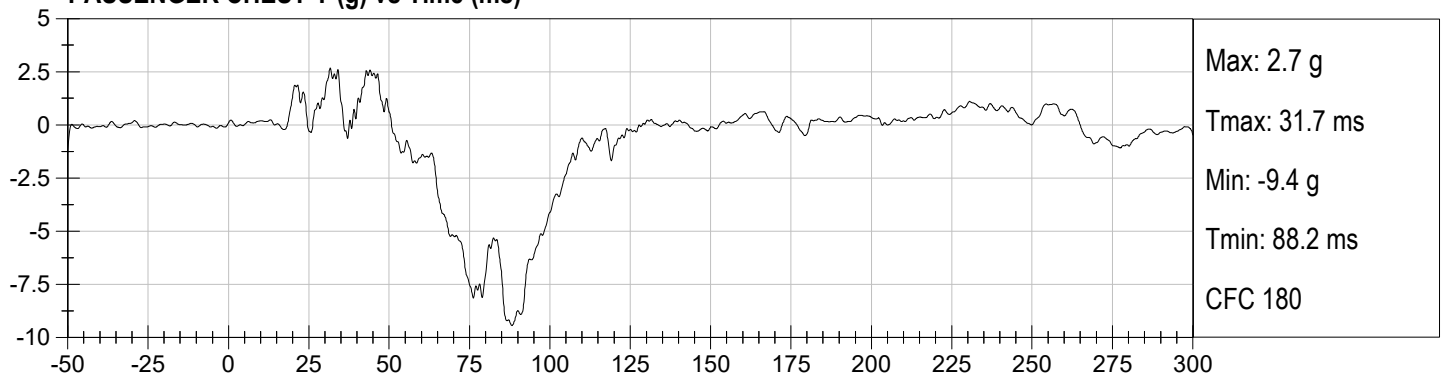




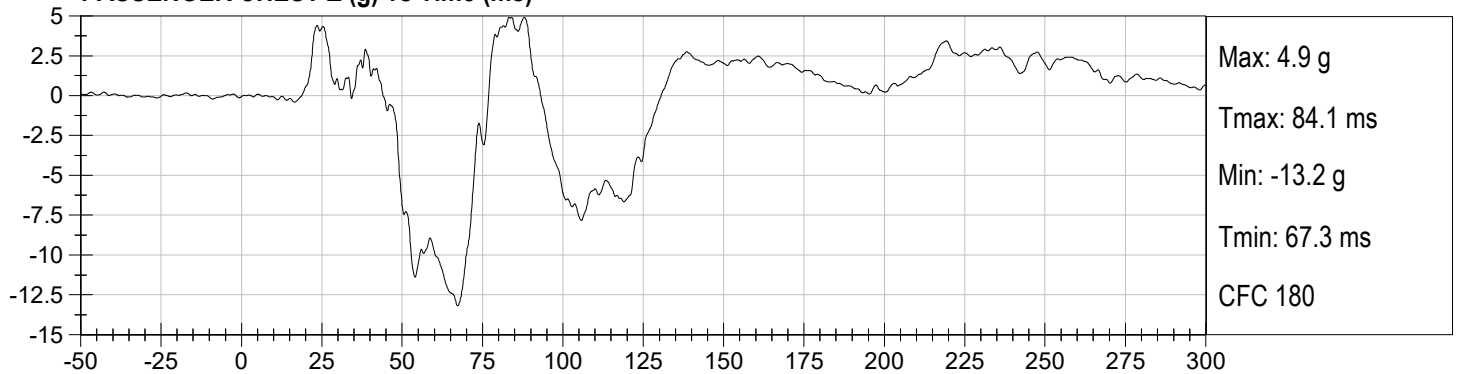
PASSENGER CHEST X (g) vs Time (ms)



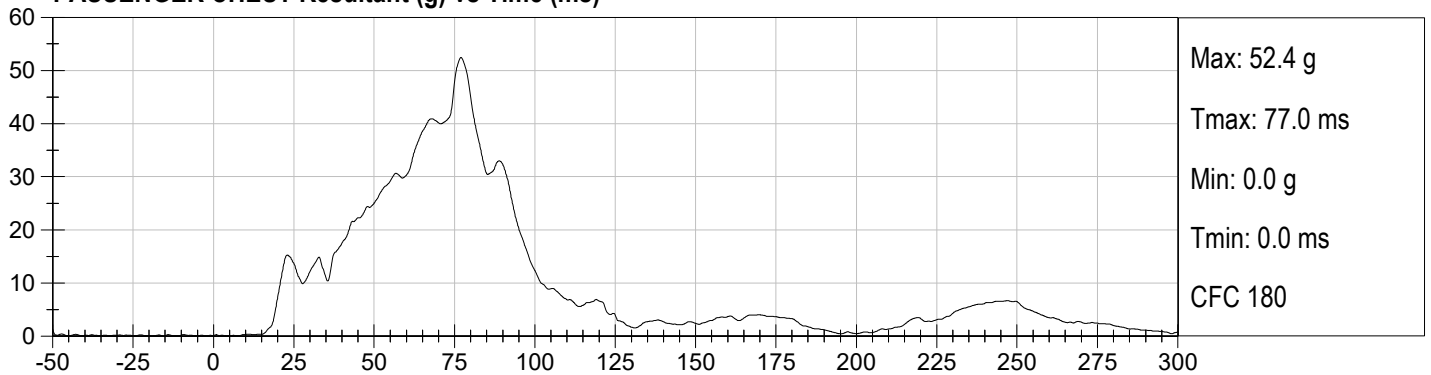
PASSENGER CHEST Y (g) vs Time (ms)



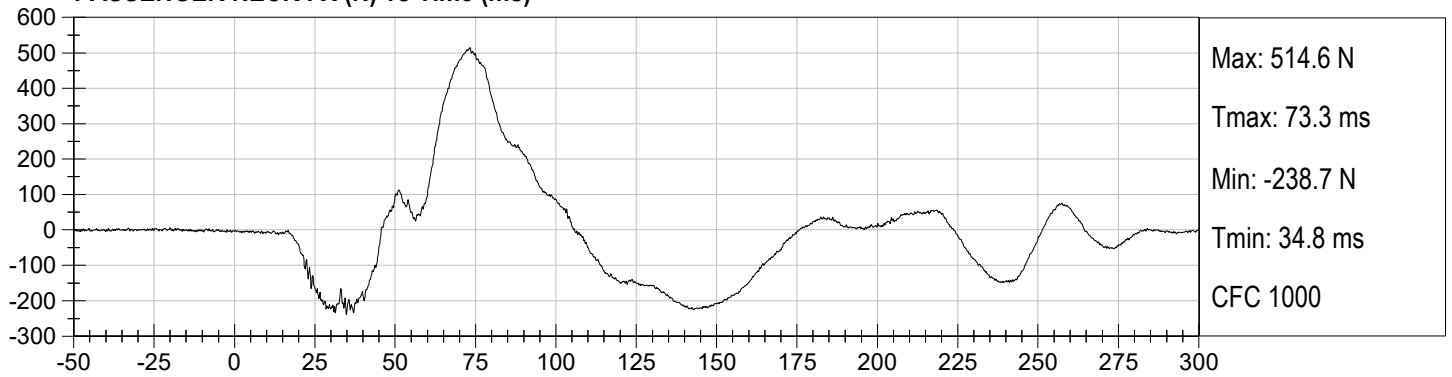
PASSENGER CHEST Z (g) vs Time (ms)



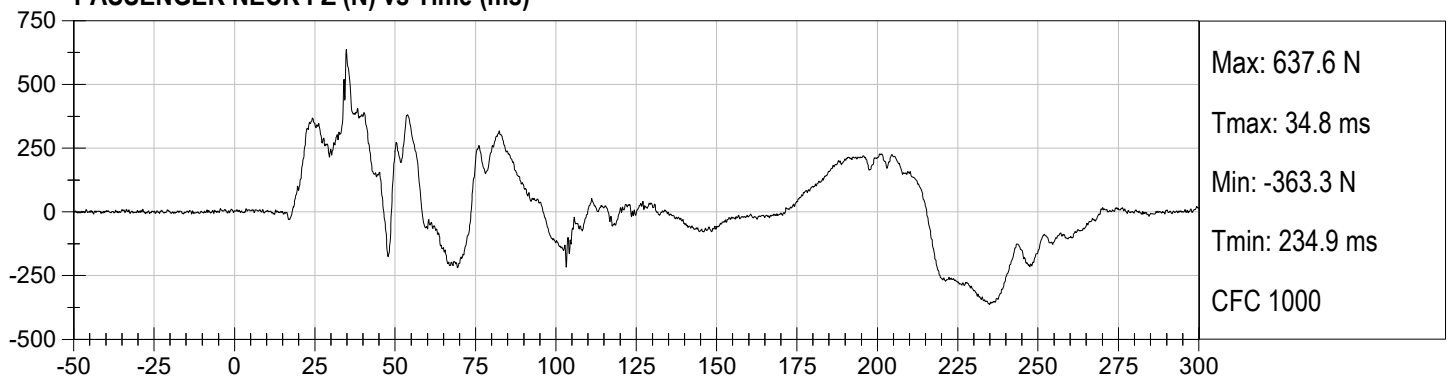
PASSENGER CHEST Resultant (g) vs Time (ms)



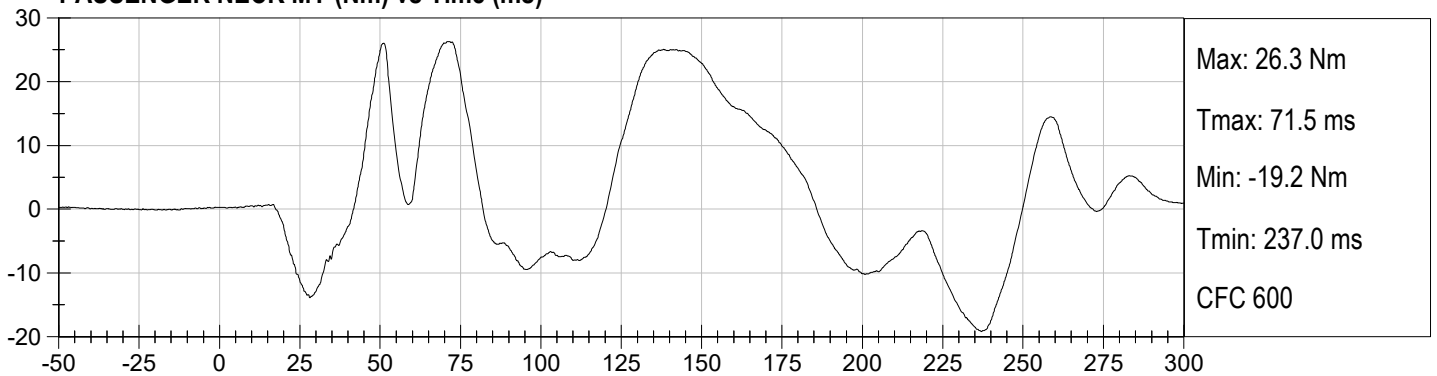
PASSENGER NECK FX (N) vs Time (ms)



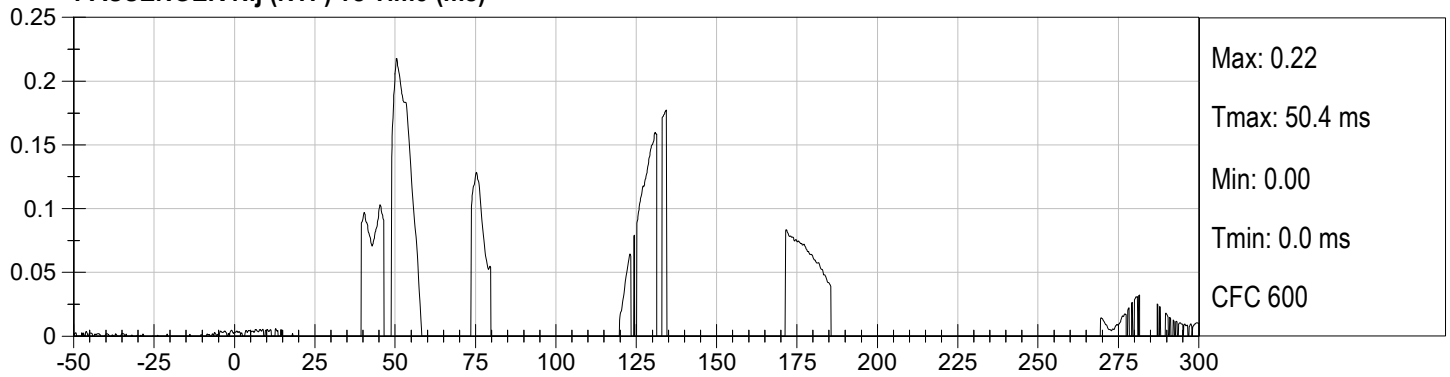
PASSENGER NECK FZ (N) vs Time (ms)



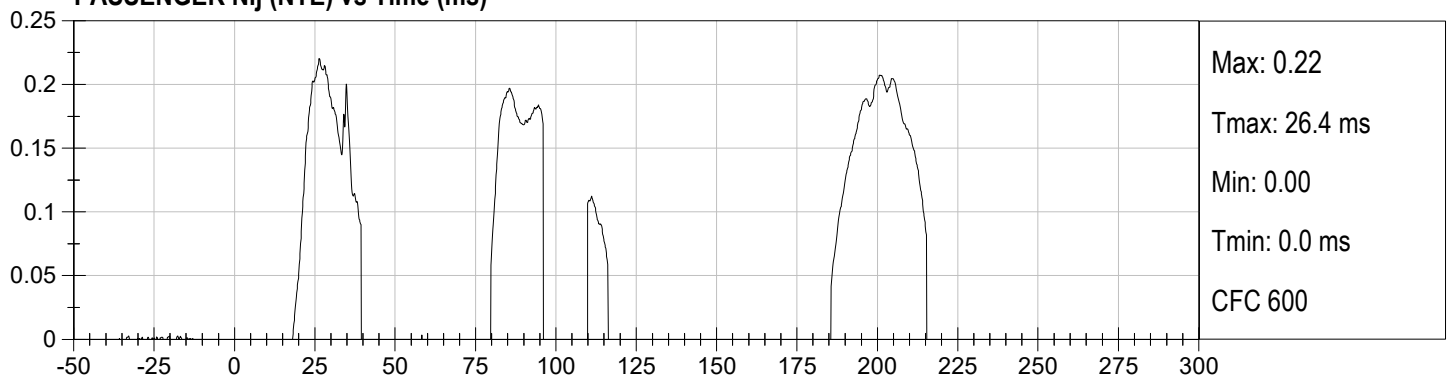
PASSENGER NECK MY (Nm) vs Time (ms)



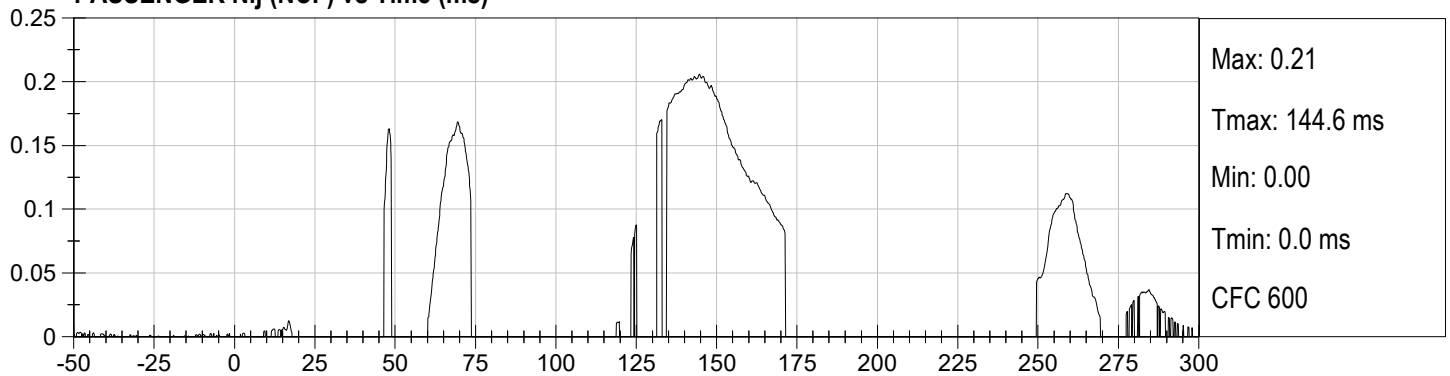
PASSENGER Nij (NTF) vs Time (ms)



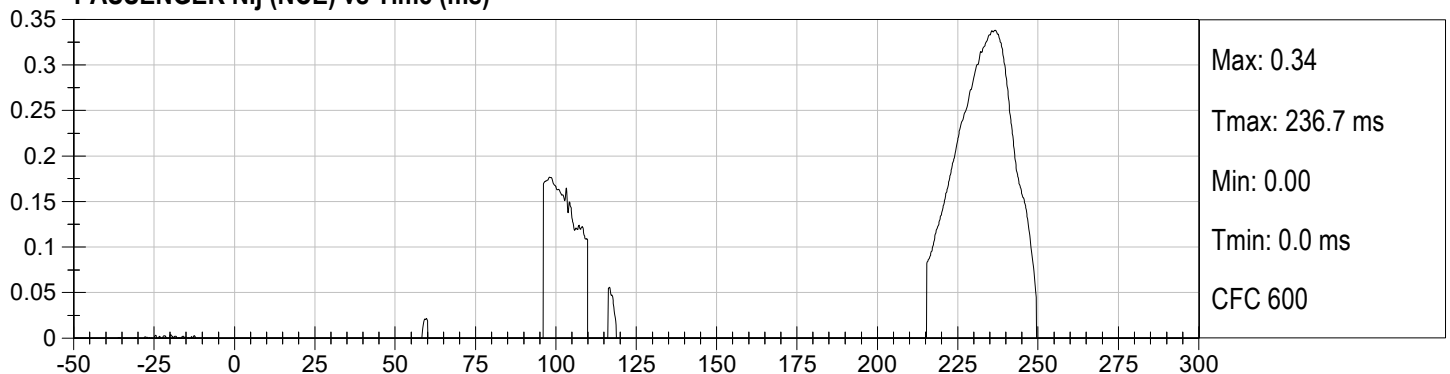
PASSENGER Nij (NTE) vs Time (ms)



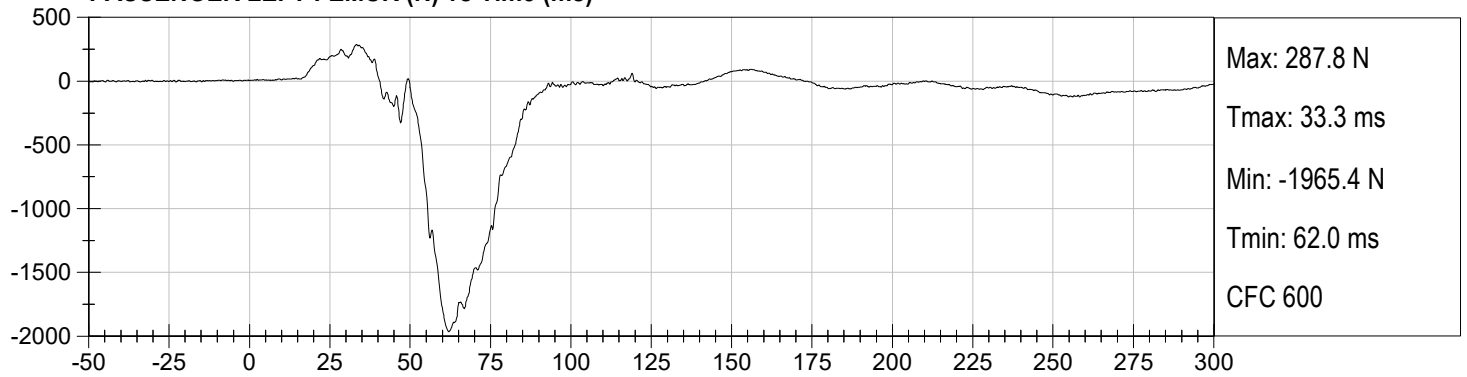
PASSENGER Nij (NCF) vs Time (ms)



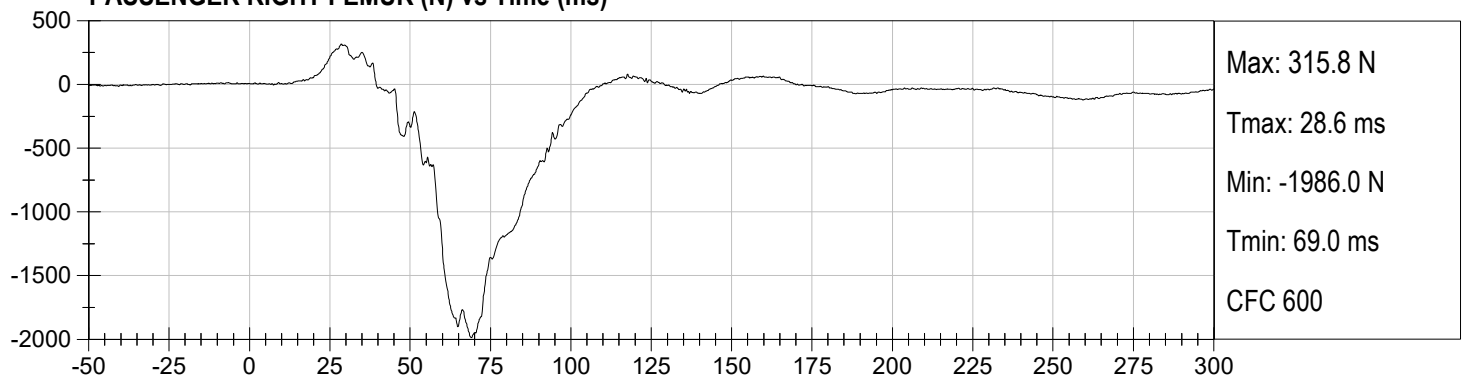
PASSENGER Nij (NCE) vs Time (ms)



PASSENGER LEFT FEMUR (N) vs Time (ms)



PASSENGER RIGHT FEMUR (N) vs Time (ms)



APPENDIX C
DUMMY QUALIFICATION AND PERFORMANCE VERIFICATION

QUALIFICATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

Hybrid III, 50th External Measurements
SN: 351

HYBRID III, PART 572, SUBPART E EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (inches)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	34.6–35.0	34.8
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	19.9-20.5	20.0
C	H-POINT HEIGHT	Reference	3.3-3.5	3.4
D	H-POINT LOCATION FROM BACKLINE	Reference	5.3-5.5	5.5
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.5
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	6.0
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	11.4-12.0	11.8
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	1.6-1.8	1.7
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	13.0-13.6	13.3
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.8
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	22.8-23.8	23.8
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	16.9-17.9	17.0
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	19.1-19.7	19.5
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	17.8-18.8	18.8

HYBRID III, SUBPART E EXTERIOR DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS		ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 16.9-17.1 in. above seat surface	8.4-9.0	8.5
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.3
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.5
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.0
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	39.2
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	33.7
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	16.9-17.1	17.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	8.9-9.1	9.0

NOTE: THE H-POINT IS LOCATED 1.83 INCHES FORWARD AND 2.57 INCHES DOWN FROM THE CENTER OF THE PELVIS ANGLE REFERENCE HOLE.

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

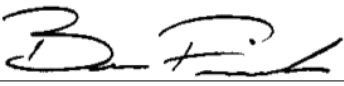
ATD Serial No: 351

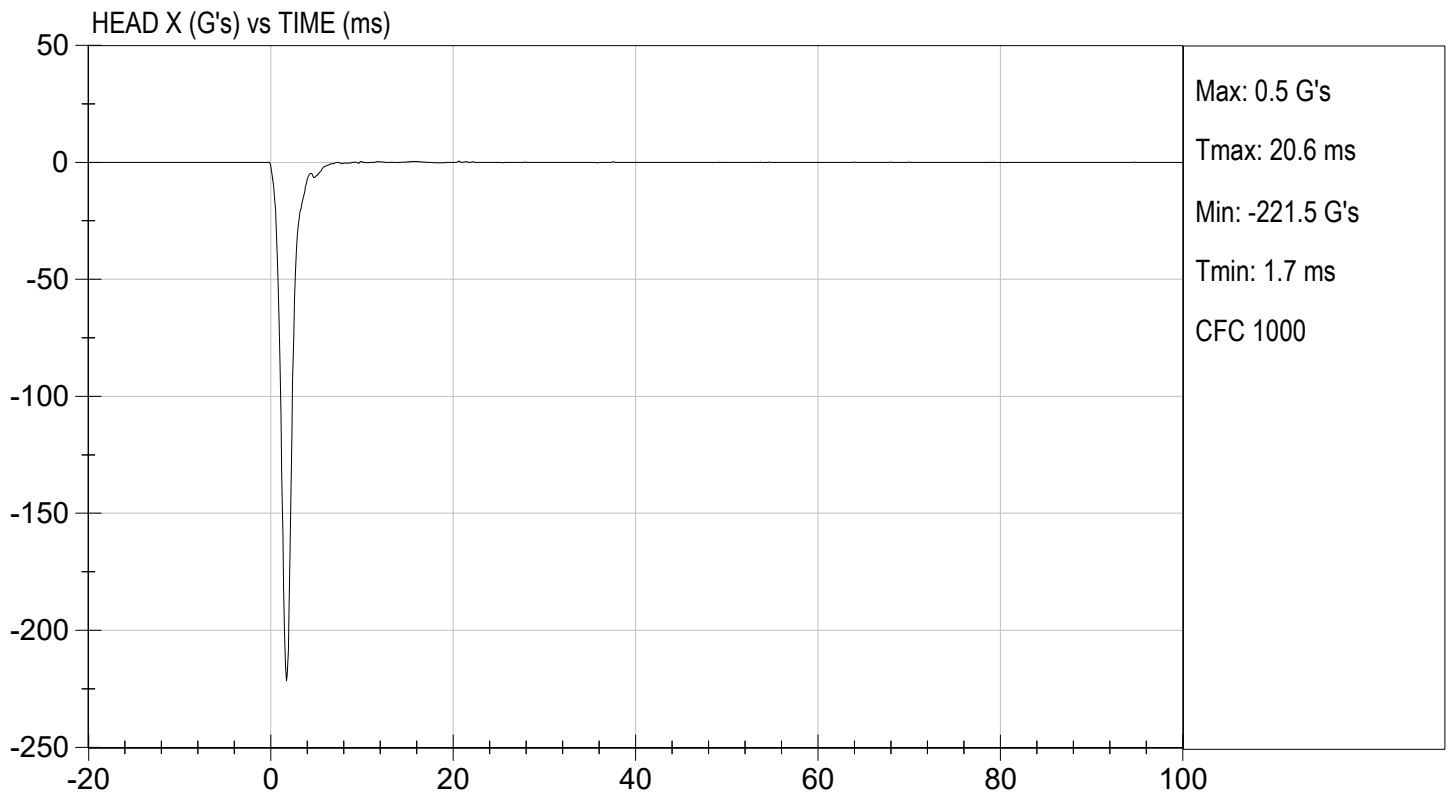
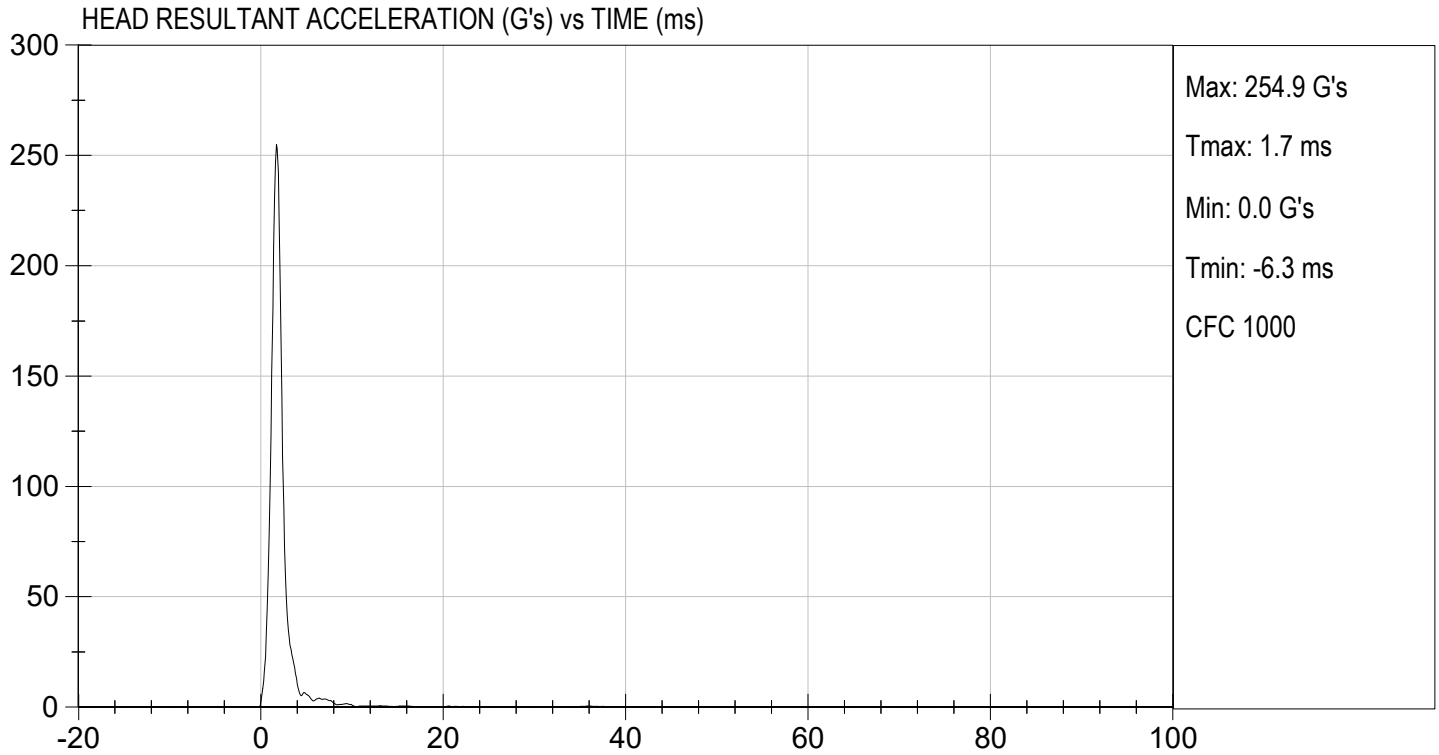
Test ID: D232911

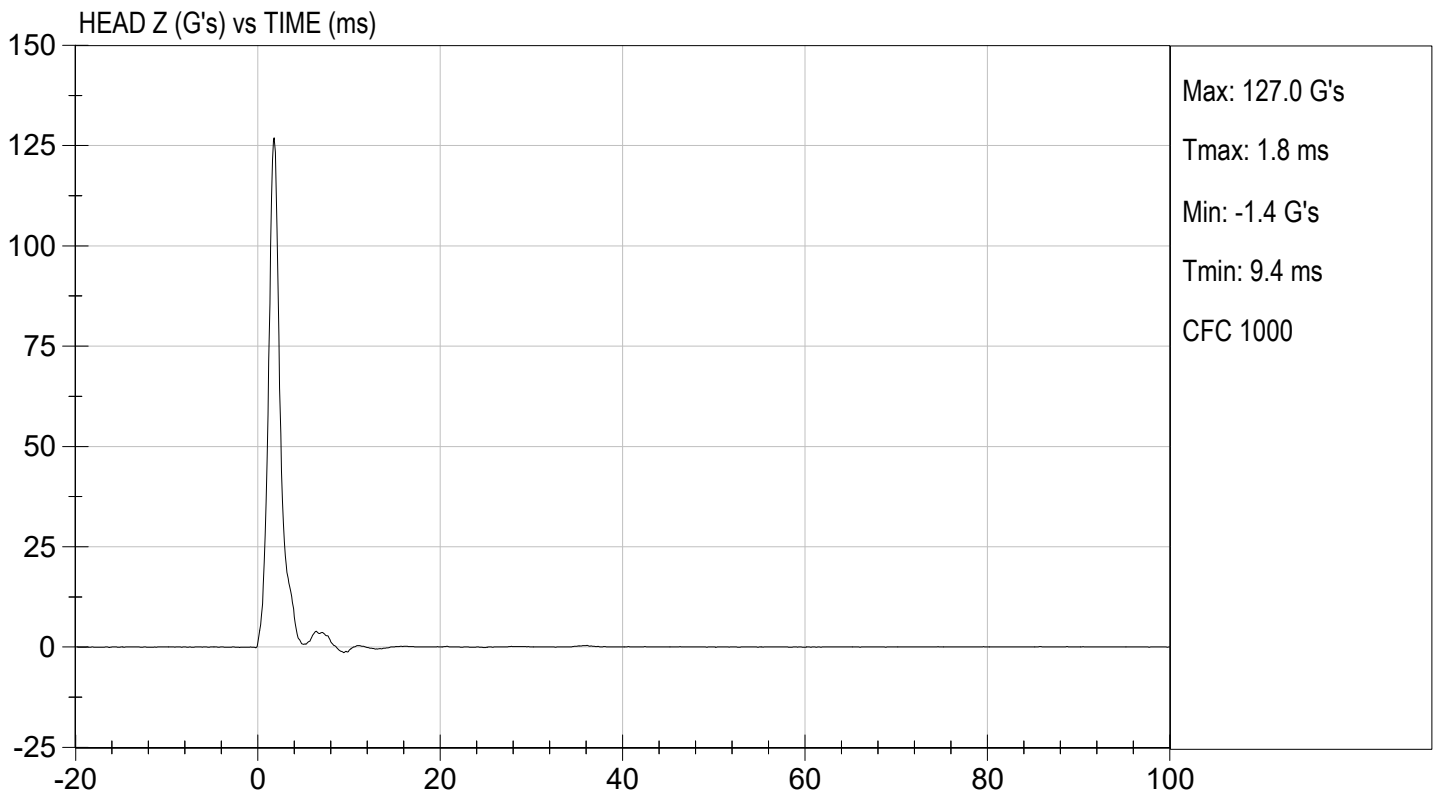
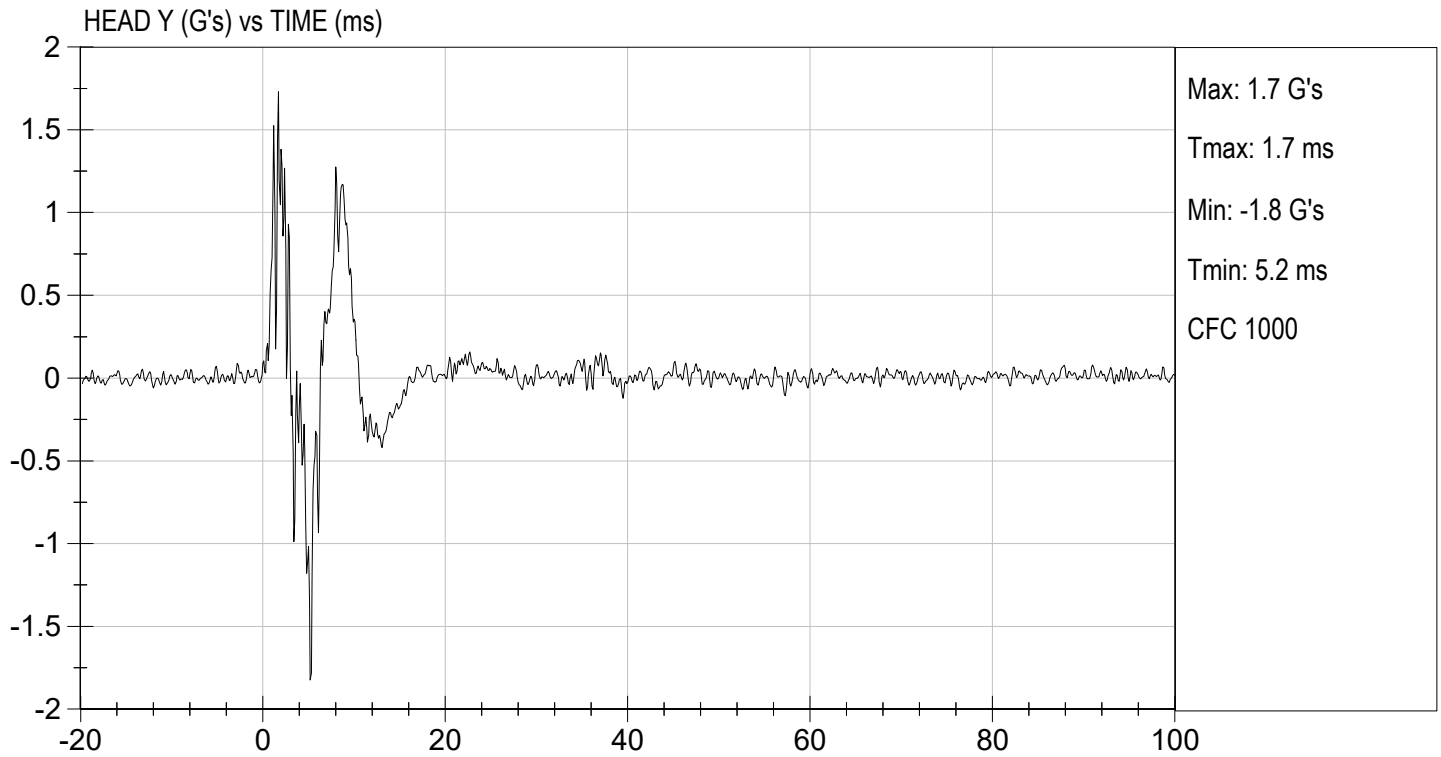
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Peak Resultant Acceleration	G's	225 to 275	255	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-1.8	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

10/27/2023
Test Date


Approved By



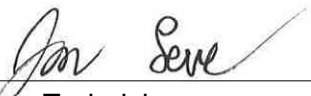


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

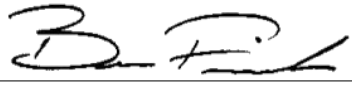
Test I.D: D232912

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	53	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	24.24	Pass
	20 ms	G's	17.60 to 22.60	22.31	Pass
	30 ms	G's	12.50 to 18.50	17.09	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	17.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	36.1	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	69.8	Pass
	Time	ms	57.0 to 64.0	58.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	115.0	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	99.6	Pass
	Time	ms	47.0 to 58.0	47.8	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.7	Pass
Overall Test Results					Pass


 Laboratory Technician

10/27/2023

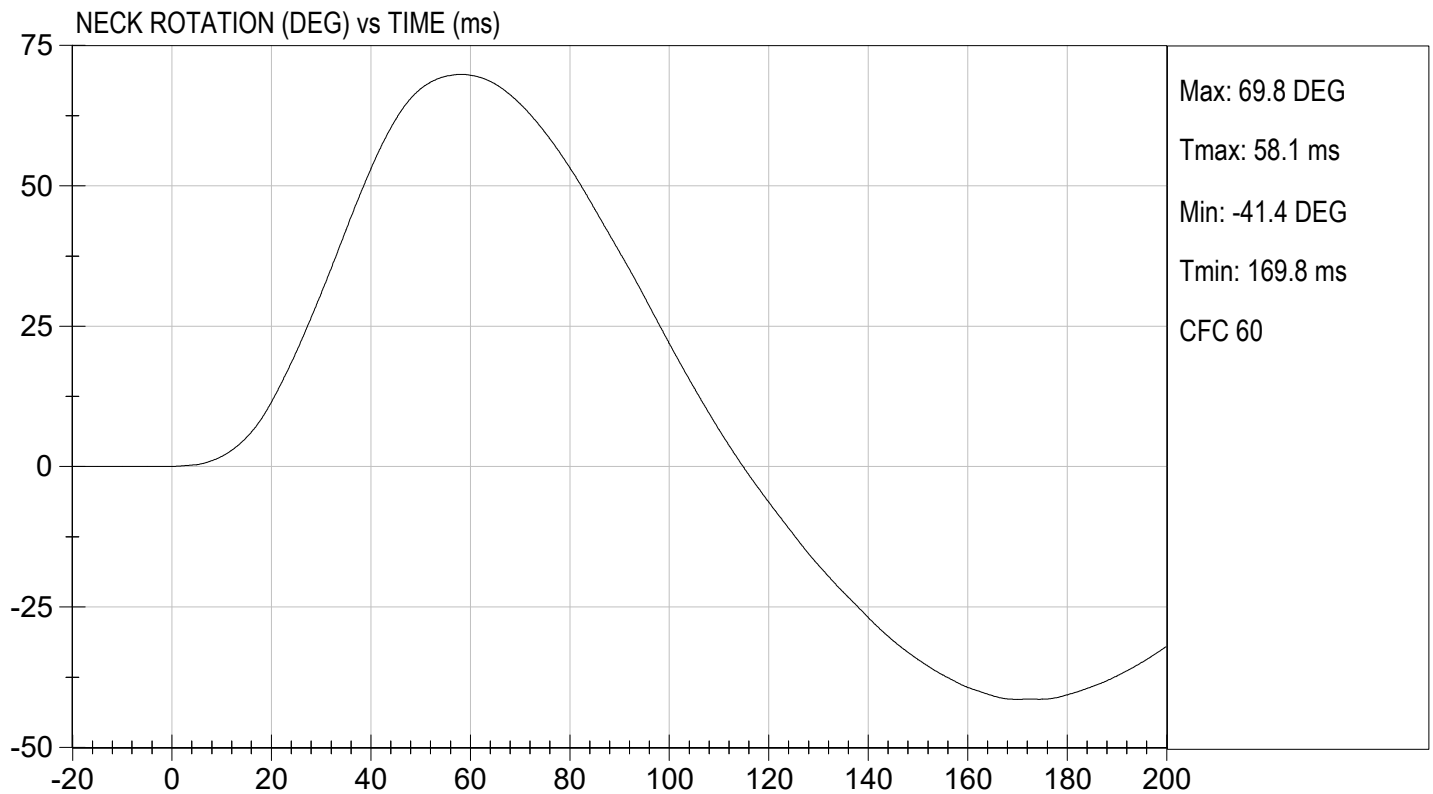
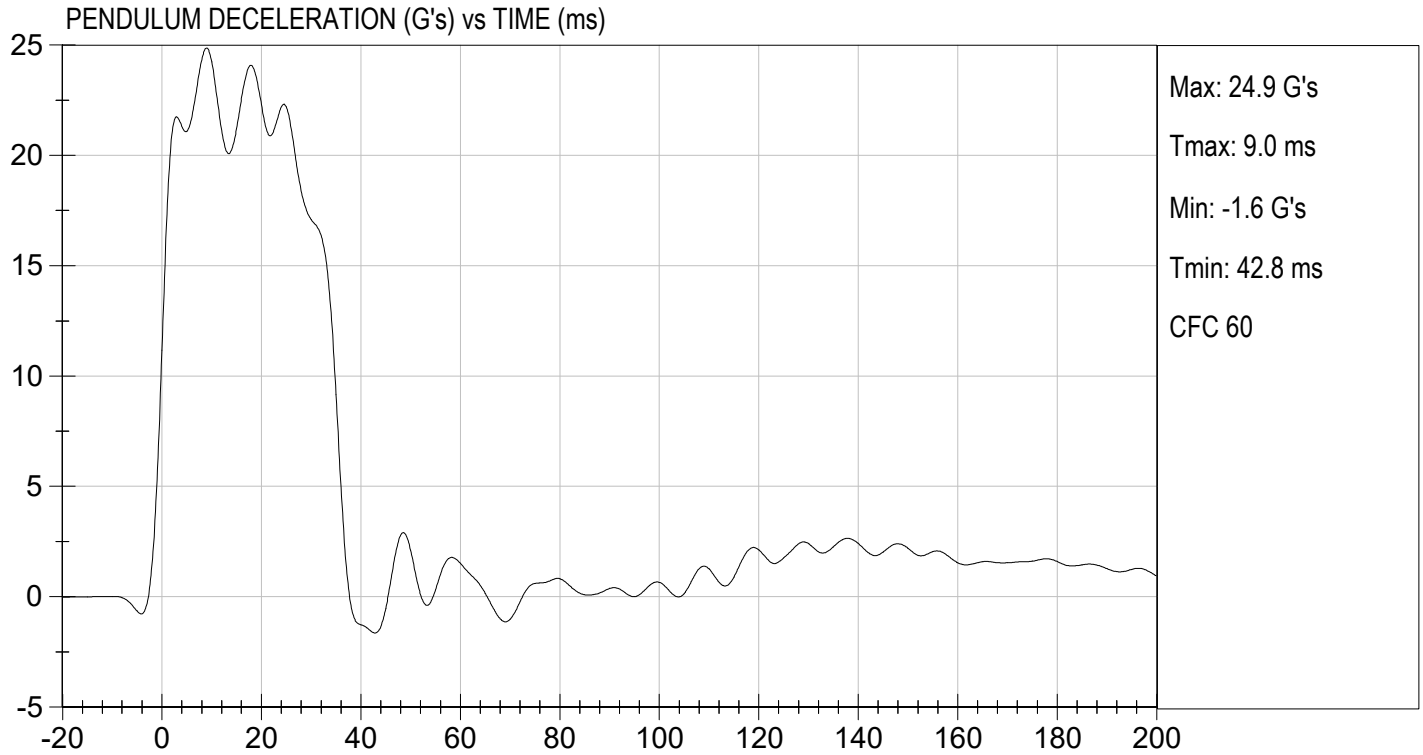
Test Date


 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

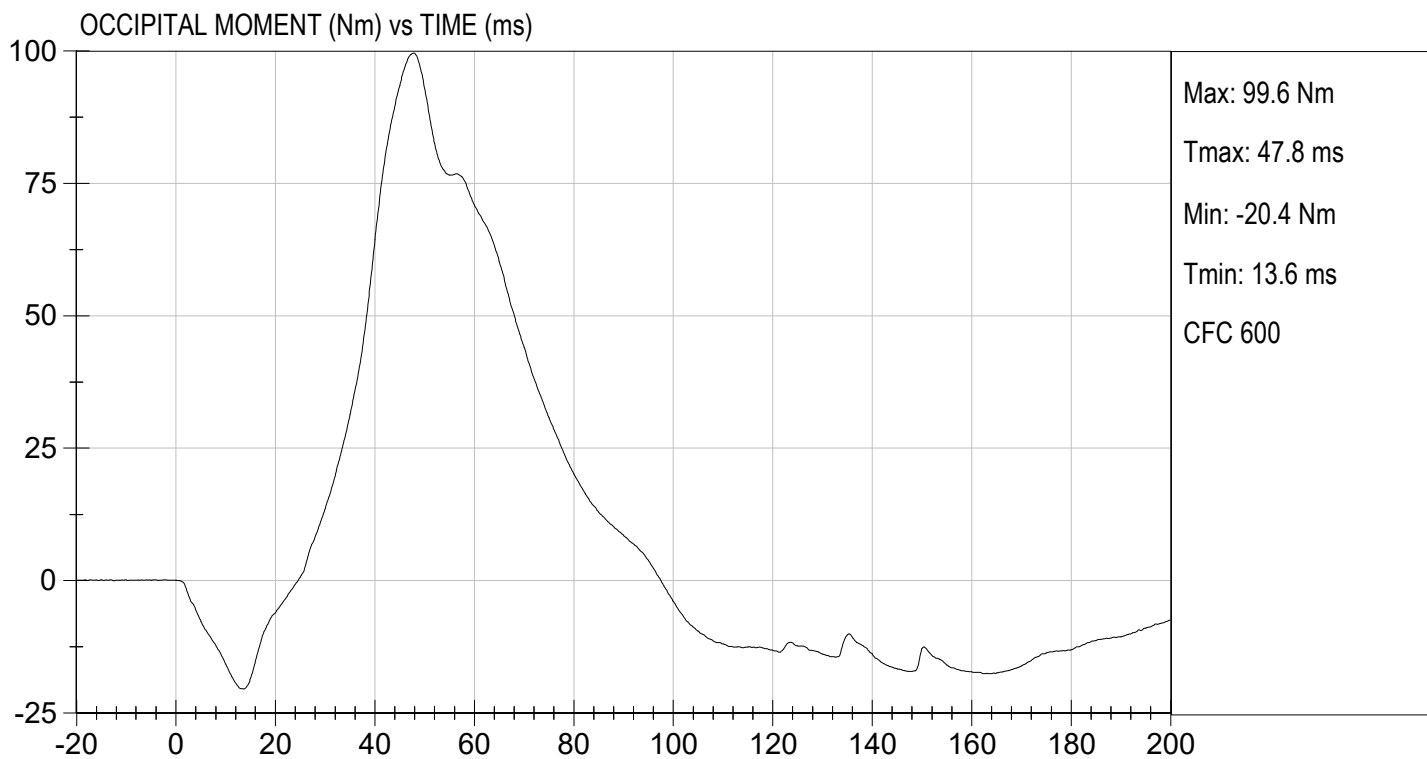
TEST DATE: 10/27/2023
TEST #: D232912





TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 10/27/2023
TEST #: D232912



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

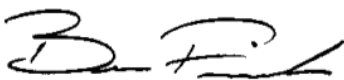
ATD Serial No: 351

Test I.D: D232913

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	51	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	20.96	Pass
	20 ms	G's	14.00 to 19.00	17.19	Pass
	30 ms	G's	11.00 to 16.00	12.88	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.8	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.0	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	93.9	Pass
	Time	ms	72.0 to 82.0	74.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	154.7	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-62.6	Pass
	Time	ms	65.0 to 79.0	68.6	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	140.7	Pass
Overall Test Results					Pass


 Laboratory Technician

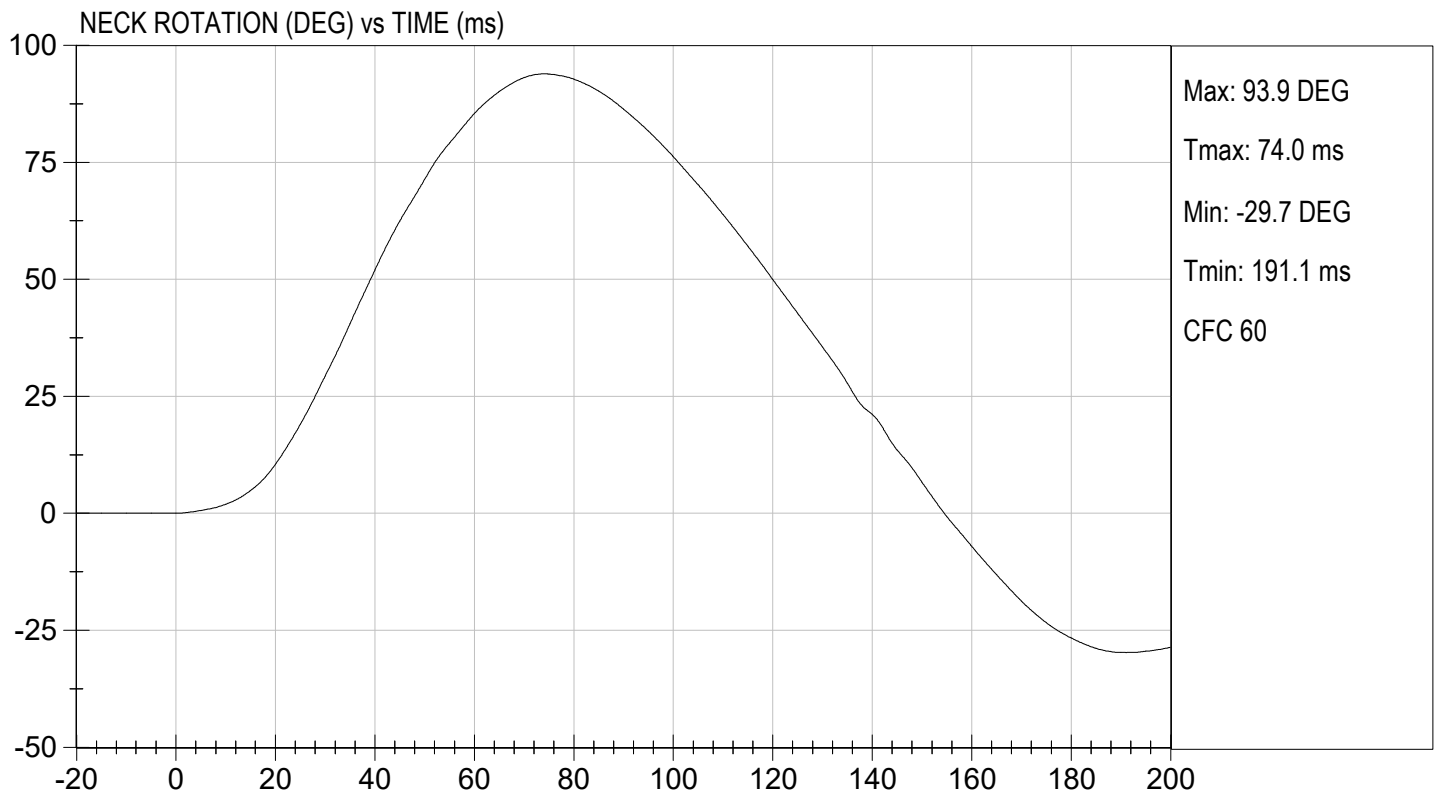
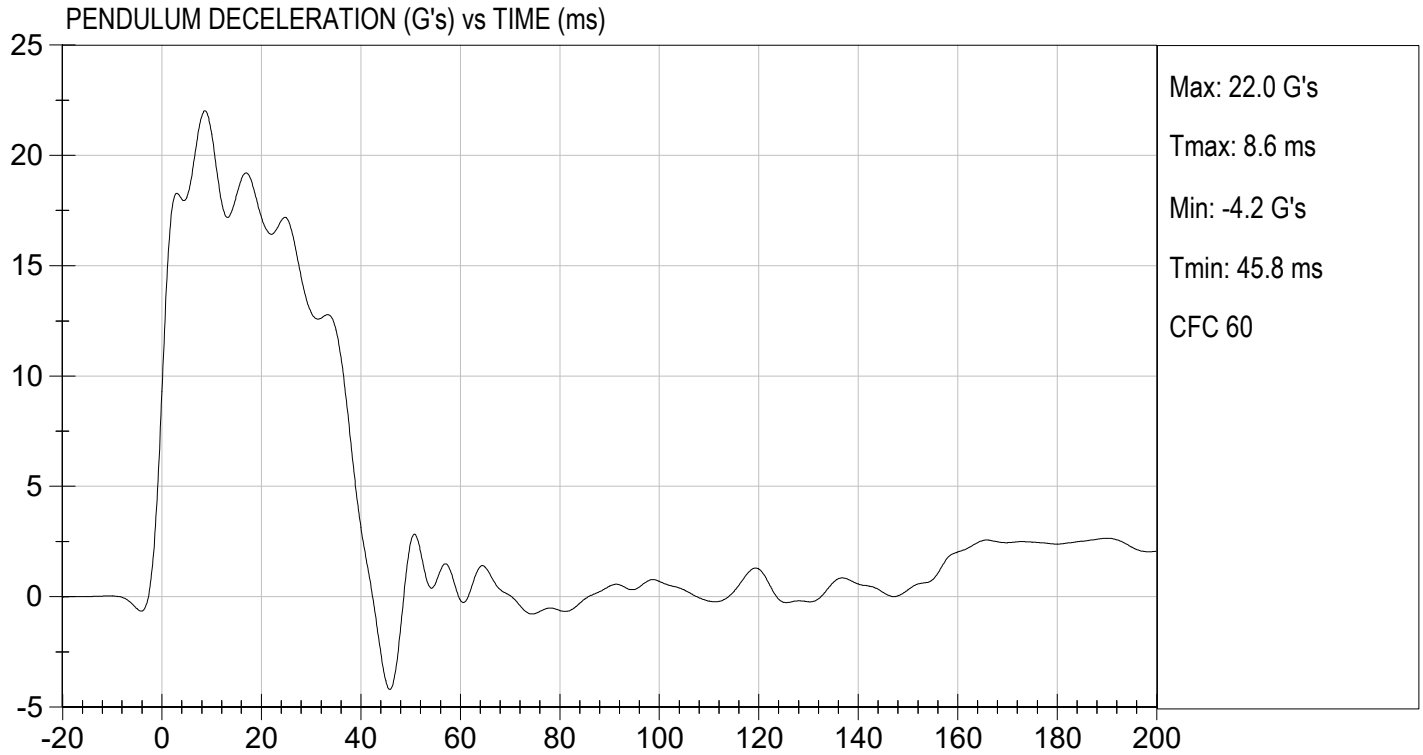
10/27/2023
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

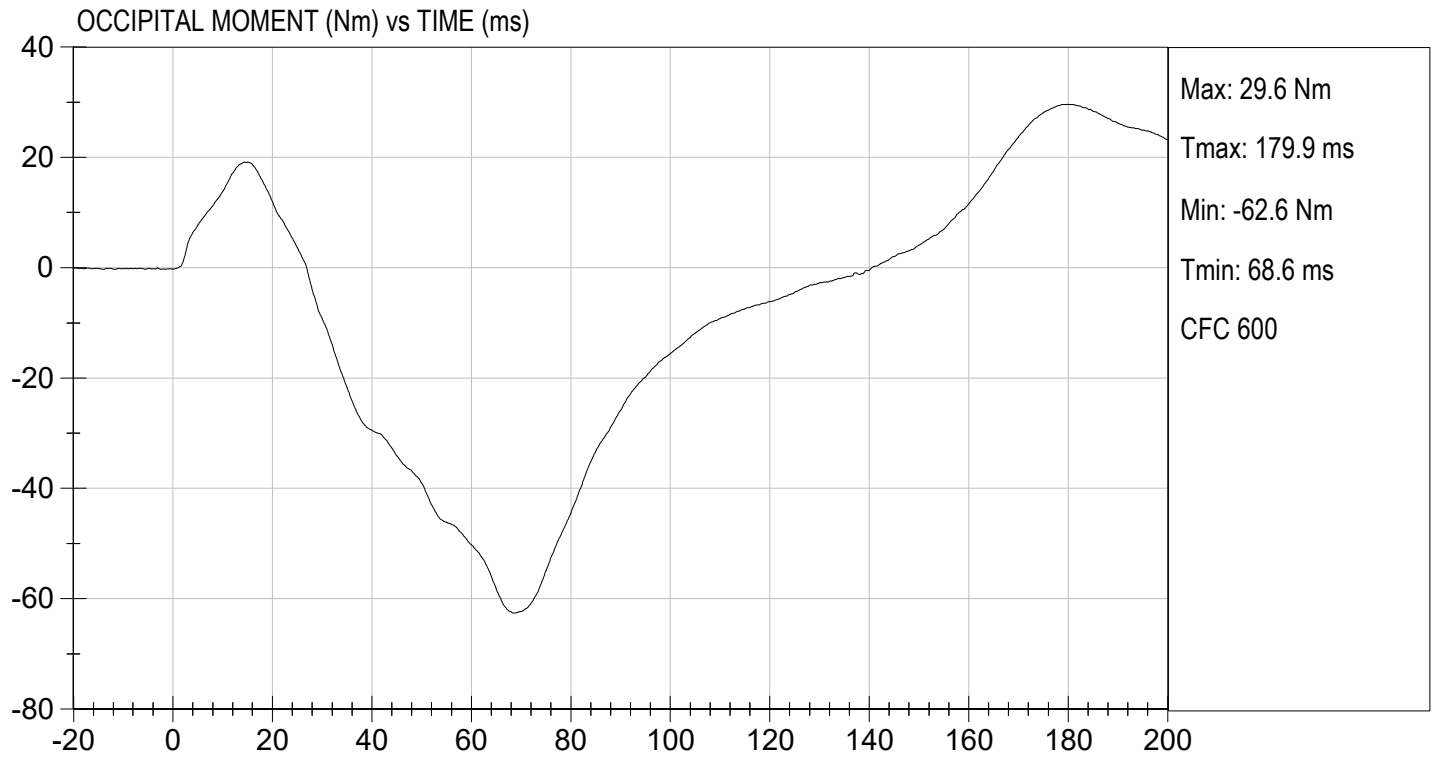
TEST DATE: 10/27/2023
TEST #: D232913





TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 10/27/2023
TEST #: D232913



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

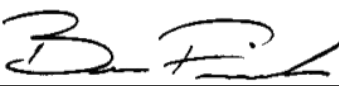
ATD Serial No: 351

Test I.D: D232914

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,601	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.74	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results				Pass


Laboratory Technician

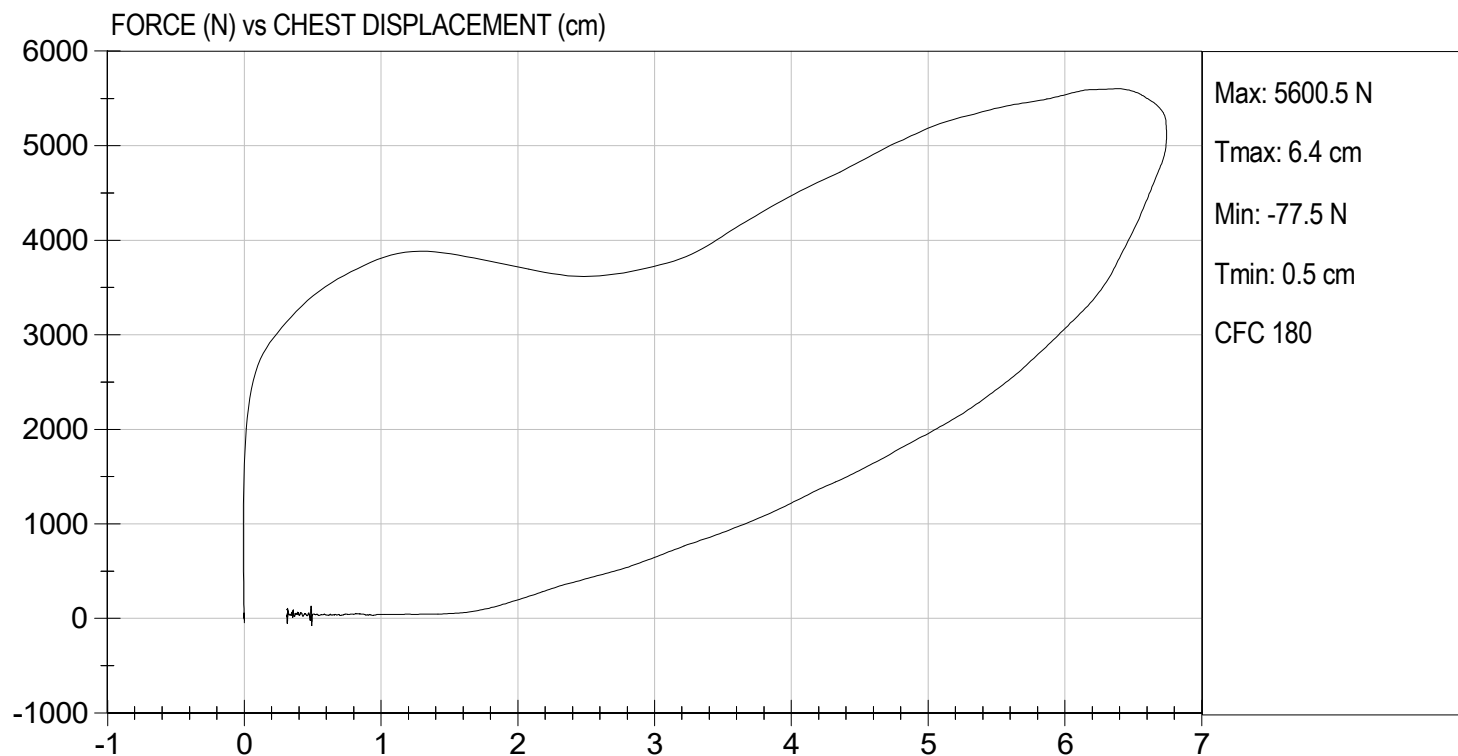
10/27/2023
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 10/27/2023
TEST #: D232914



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

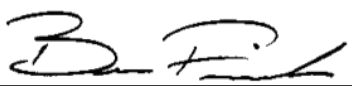
ATD Serial No: 351

Test I.D: D232915

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	5,656	Pass
Overall Test Results				Pass


Laboratory Technician

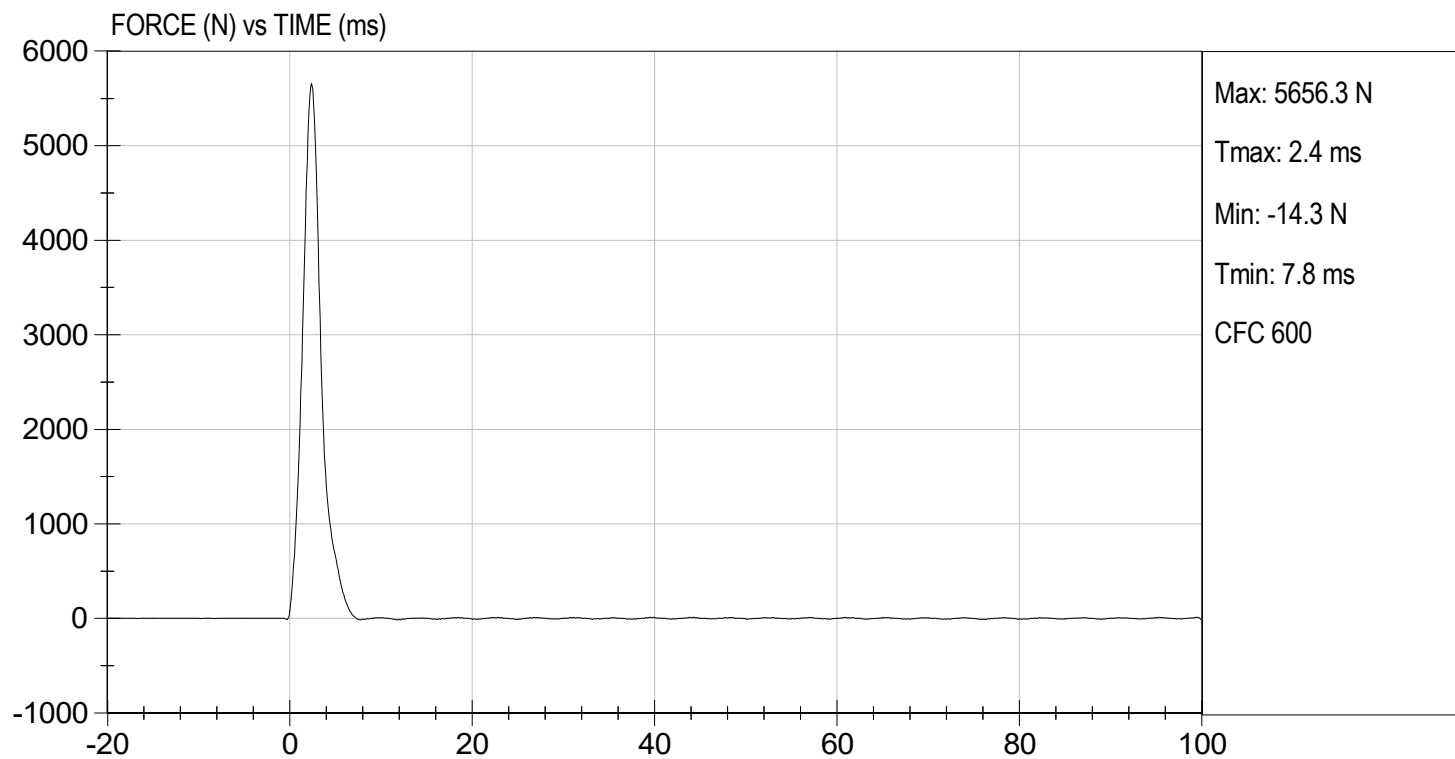
10/27/2023
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.89 ft/s, 2.10 m/s

TEST DATE: 10/27/2023
TEST #: D232915



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

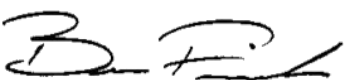
ATD Serial No: 351

Test I.D: D232916

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	5,634	Pass
Overall Test Results				Pass


Laboratory Technician

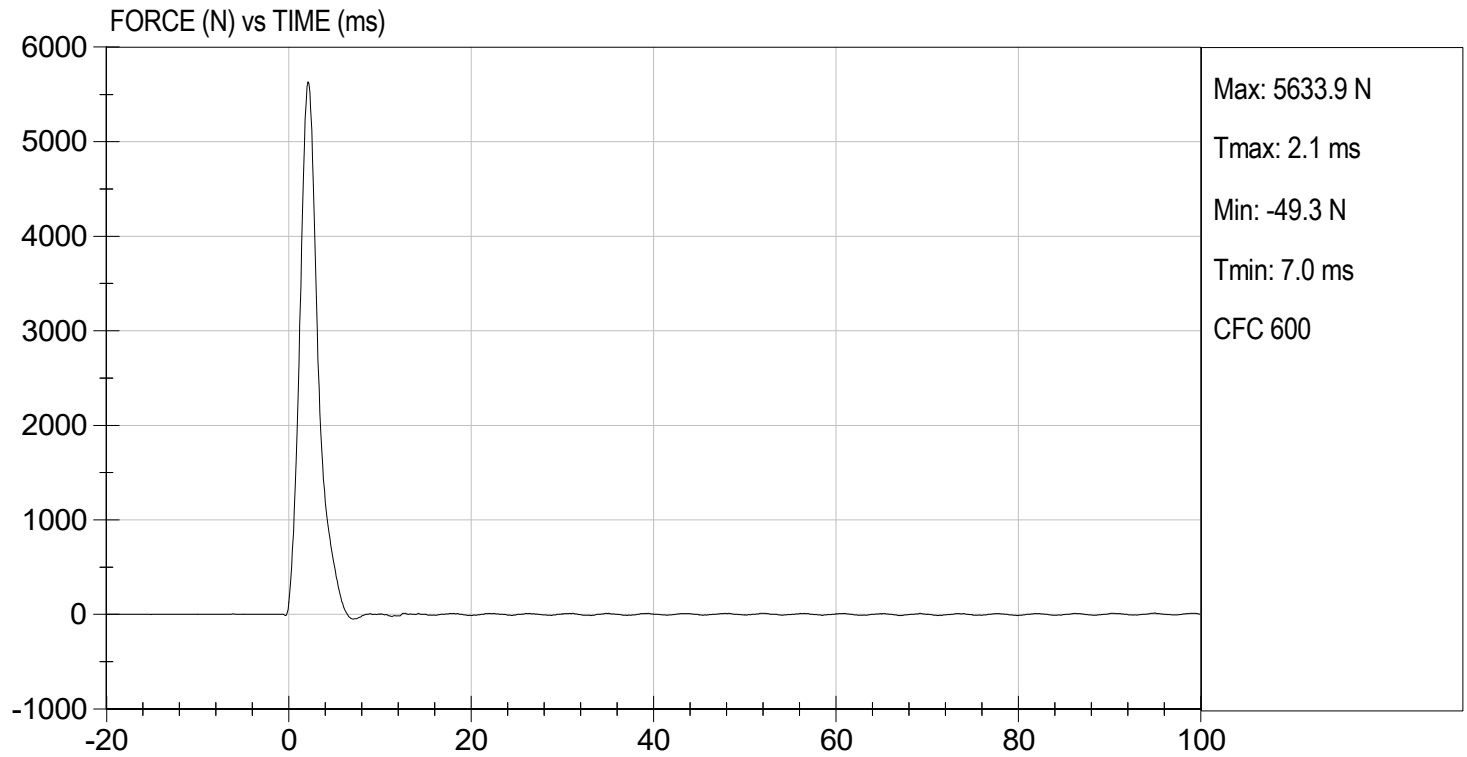
10/27/2023
Test Date


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.92 ft/s, 2.11 m/s

TEST DATE: 10/27/2023
TEST #: D232916



MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

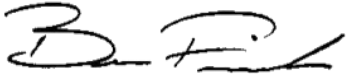
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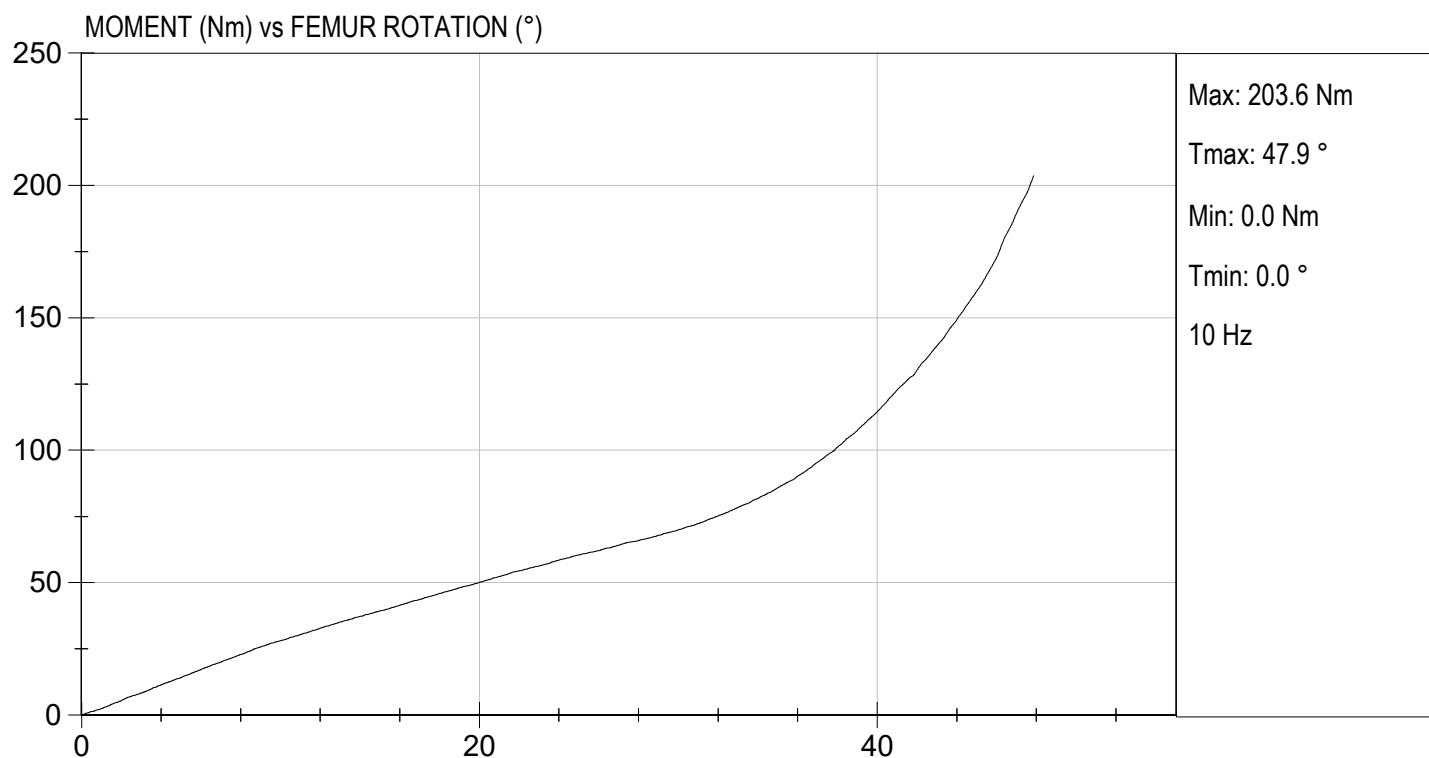
Test I.D: D232910

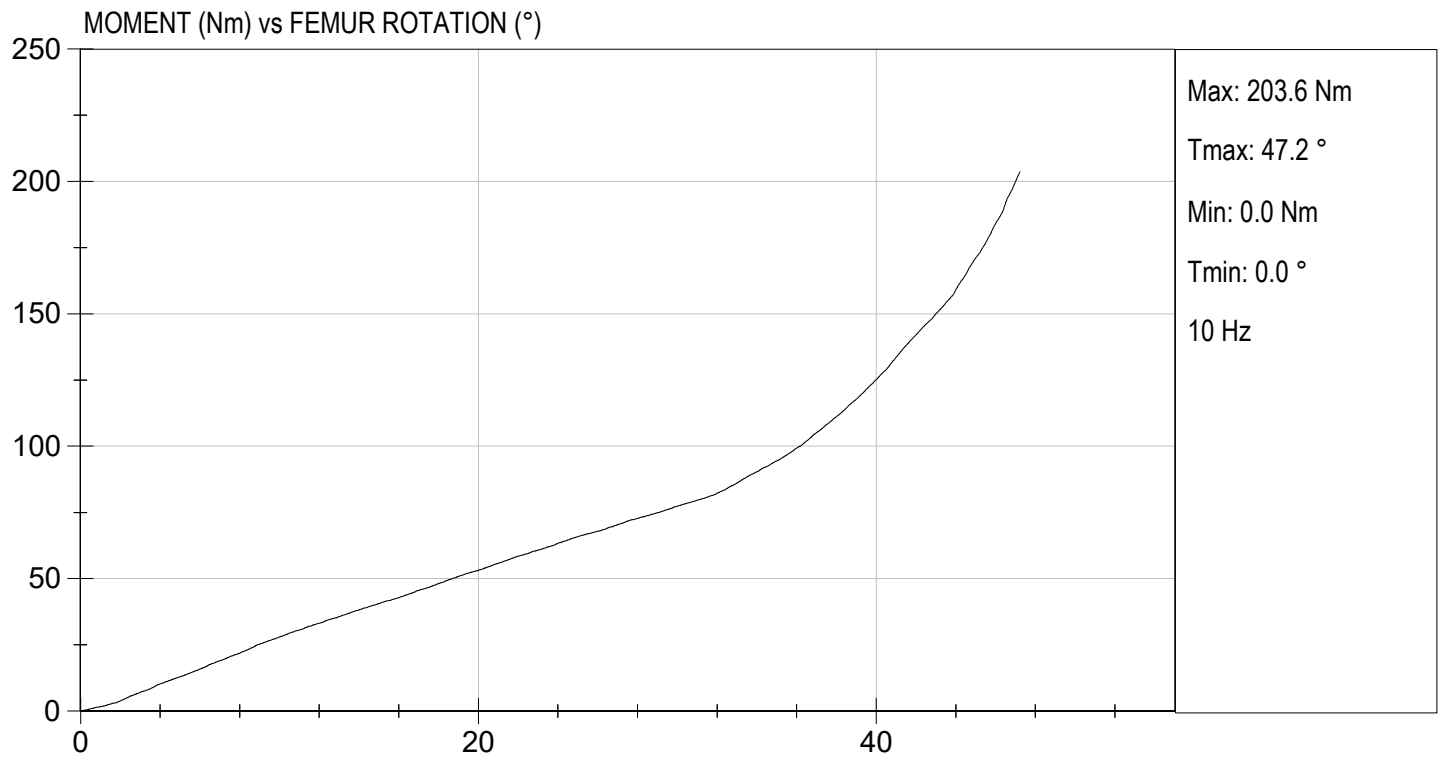
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	51	51	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.4	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	70.0	77.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	47.9	47.2	Pass
Overall Test Results					Pass


 Laboratory Technician

10/27/2023
 Test Date


 Approved By





QUALIFICATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

Test ID: D233031

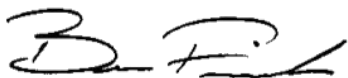
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	225 to 275	263	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass



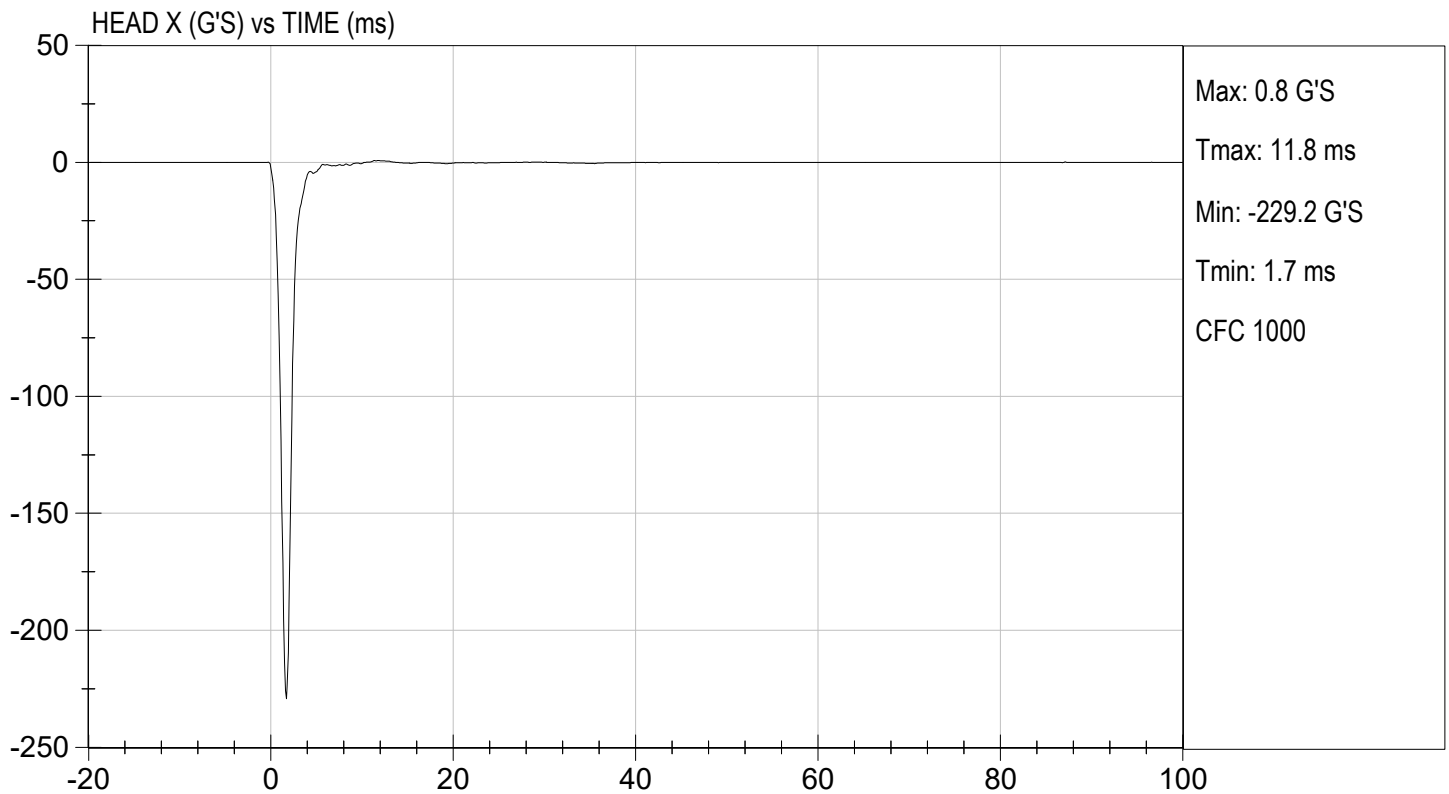
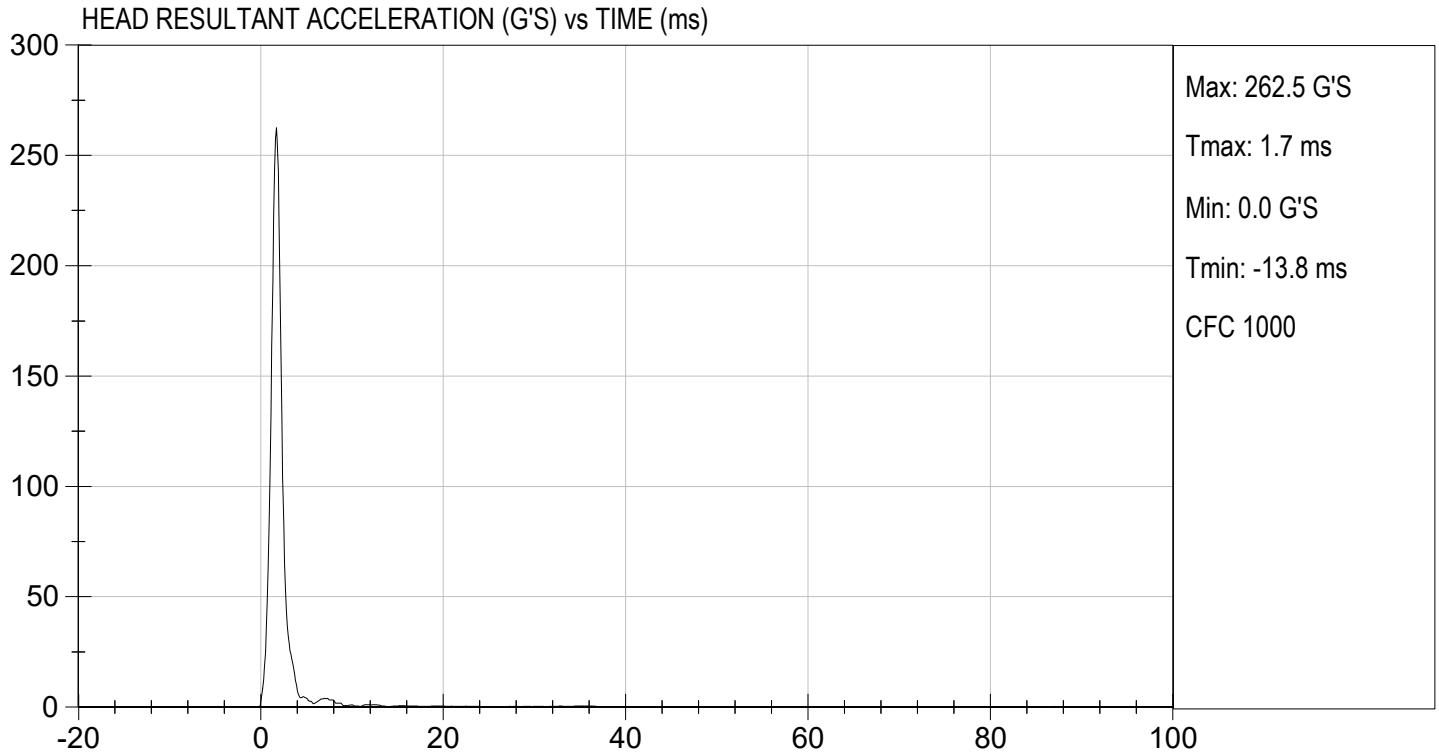
Laboratory Technician

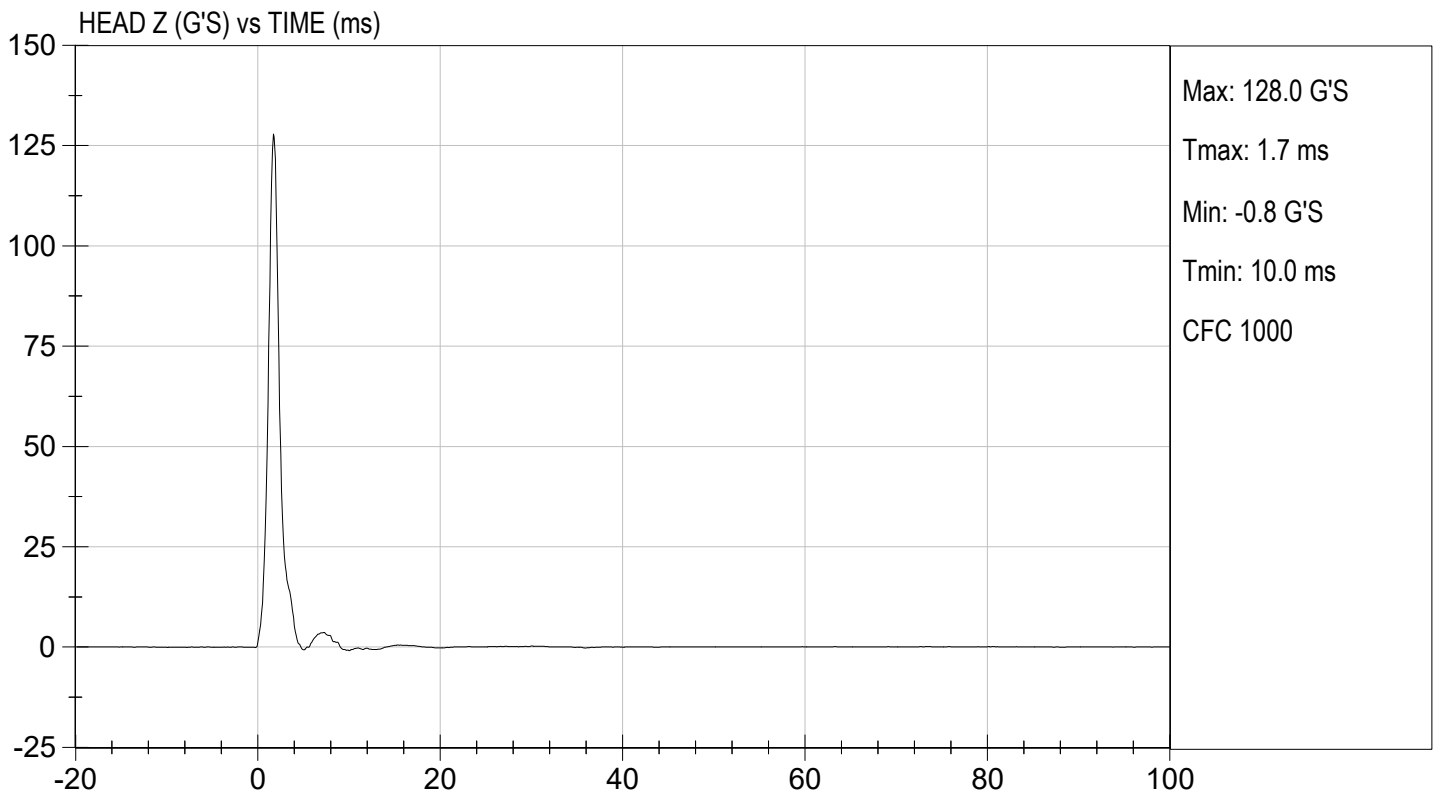
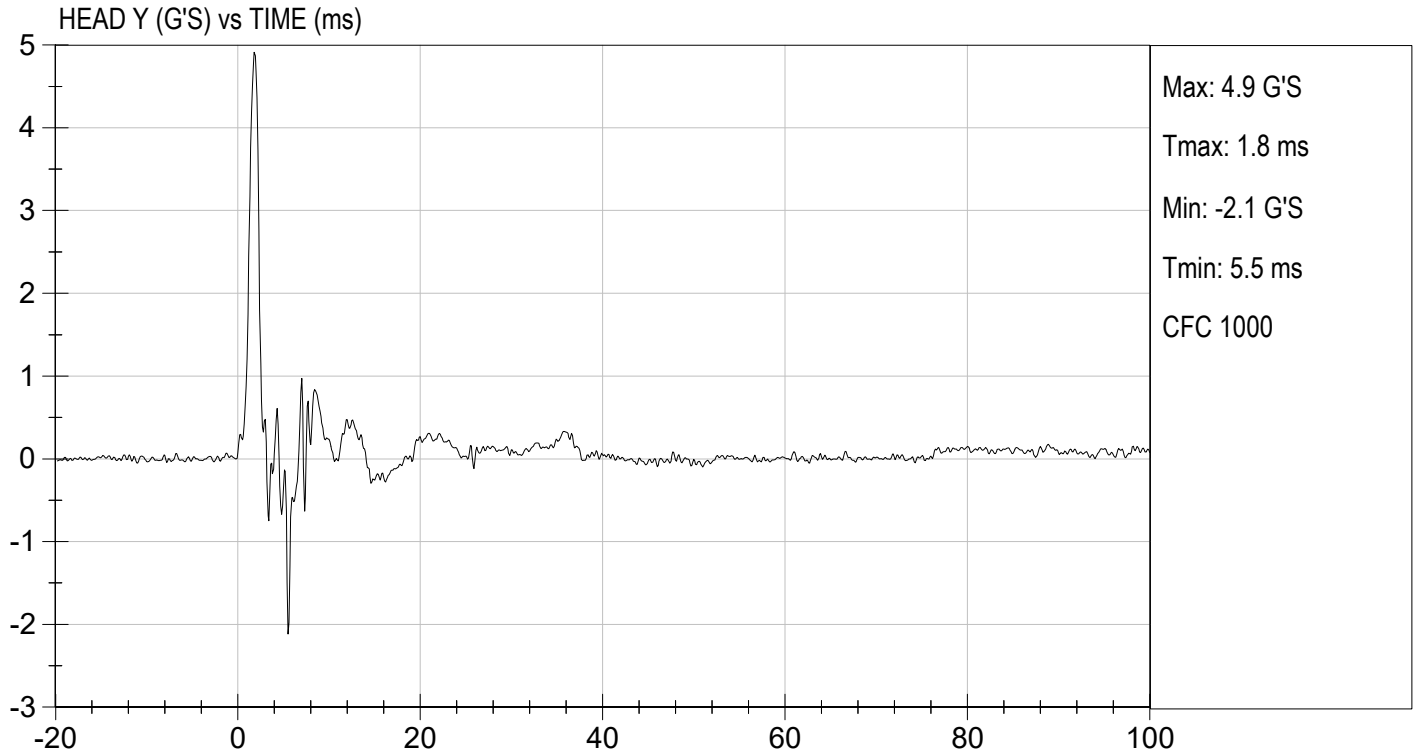
11/09/2023

Test Date



Approved By





MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351

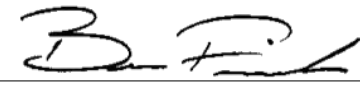
Test I.D: D233032

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.52	Pass
	20 ms	G's	17.60 to 22.60	20.00	Pass
	30 ms	G's	12.50 to 18.50	14.38	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	39.8	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	68.7	Pass
	Time	ms	57.0 to 64.0	58.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	115.9	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	95.2	Pass
	Time	ms	47.0 to 58.0	50.7	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	100.3	Pass
Overall Test Results					Pass


 Laboratory Technician

11/09/2023

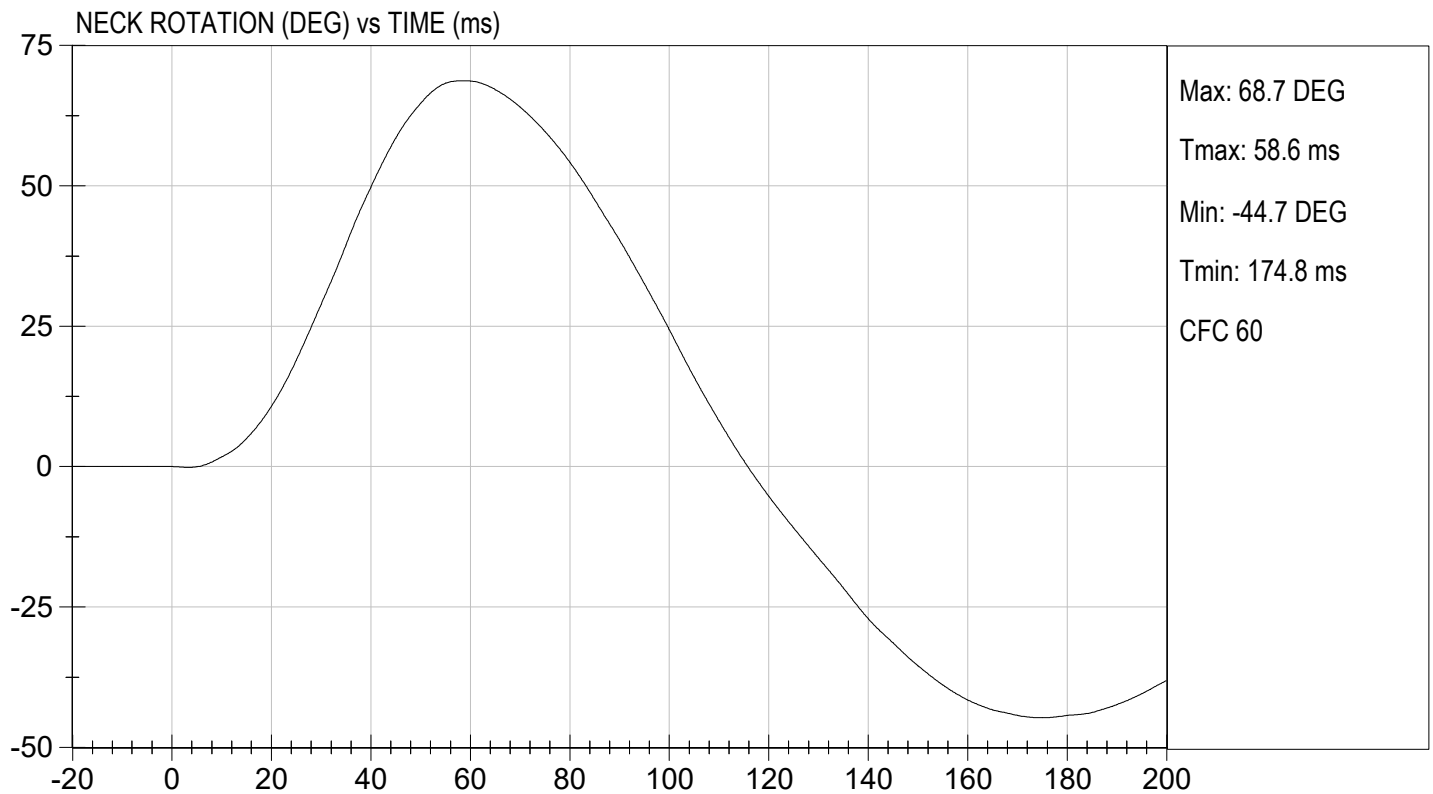
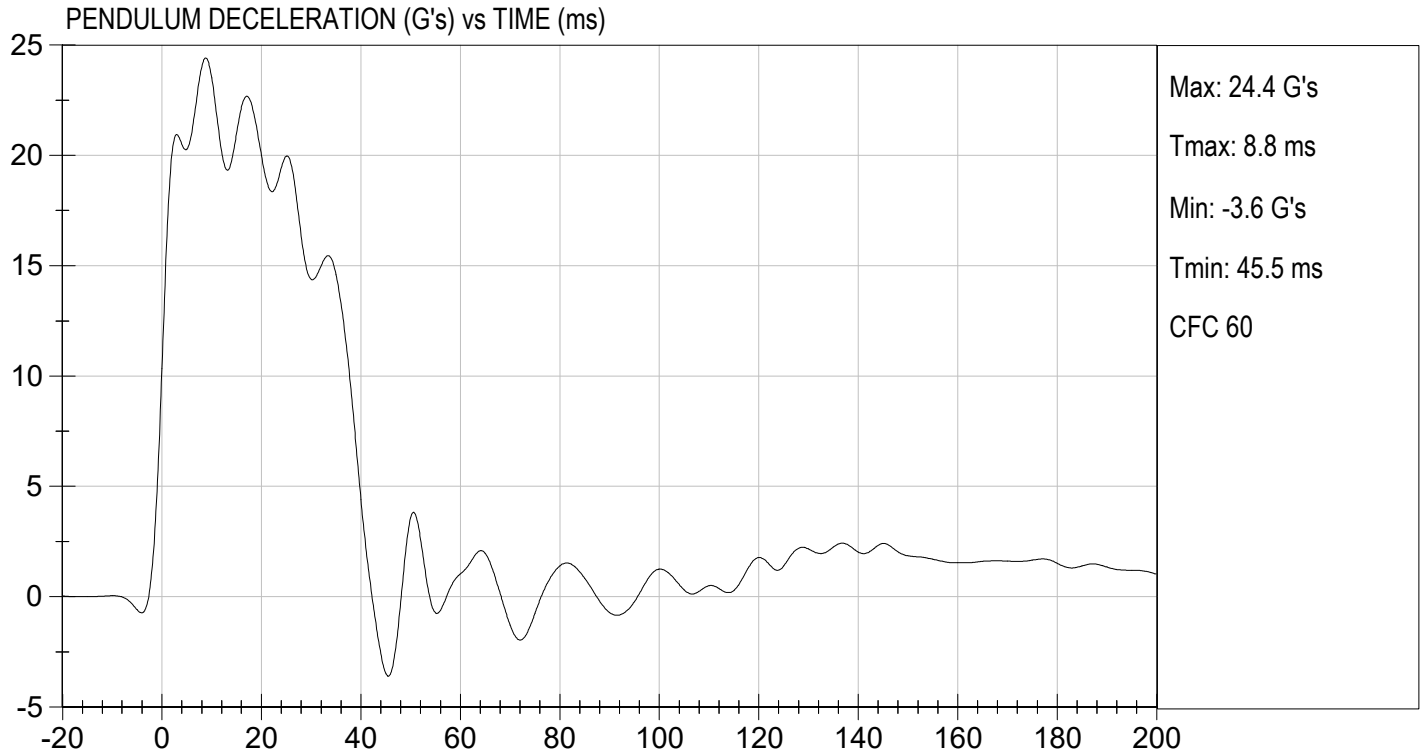
Test Date


 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

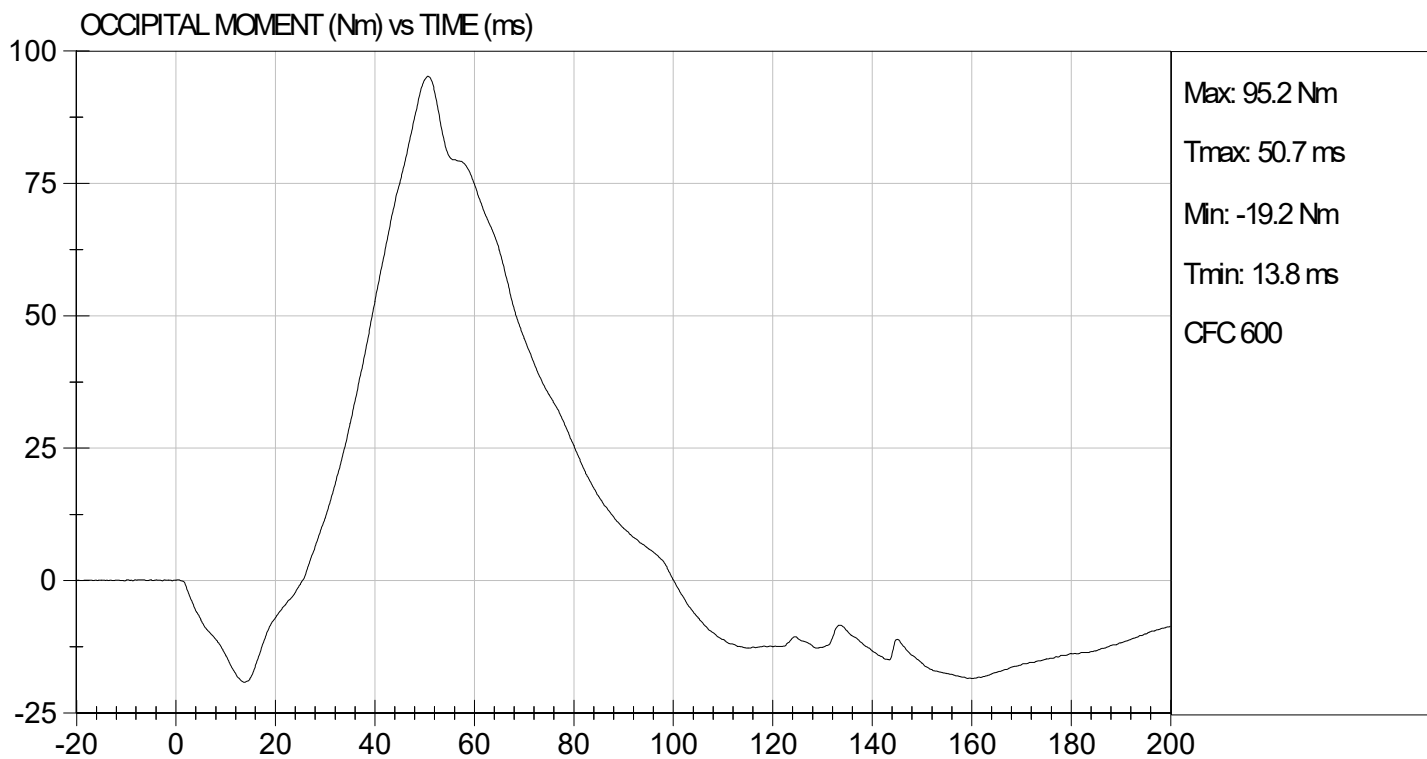
TEST DATE: 11/09/2023
TEST #: D233032





TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 11/09/2023
TEST #: D233032



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

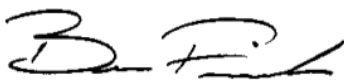
ATD Serial No: 351

Test I.D: D233033

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	20.01	Pass
	20 ms	G's	14.00 to 19.00	16.97	Pass
	30 ms	G's	11.00 to 16.00	14.46	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	95.9	Pass
	Time	ms	72.0 to 82.0	75.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	157.8	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-63.3	Pass
	Time	ms	65.0 to 79.0	70.6	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	139.1	Pass
Overall Test Results					Pass


 Laboratory Technician

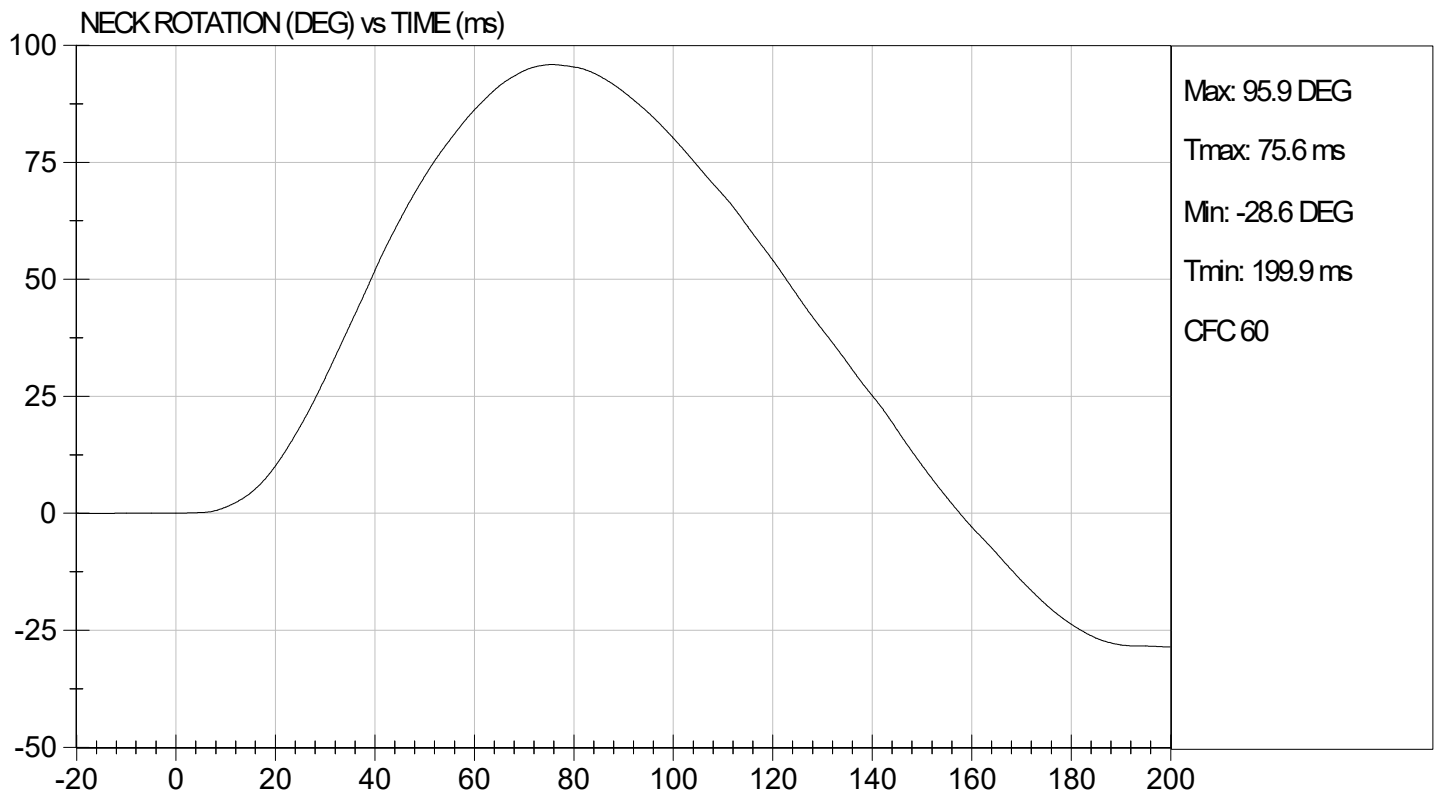
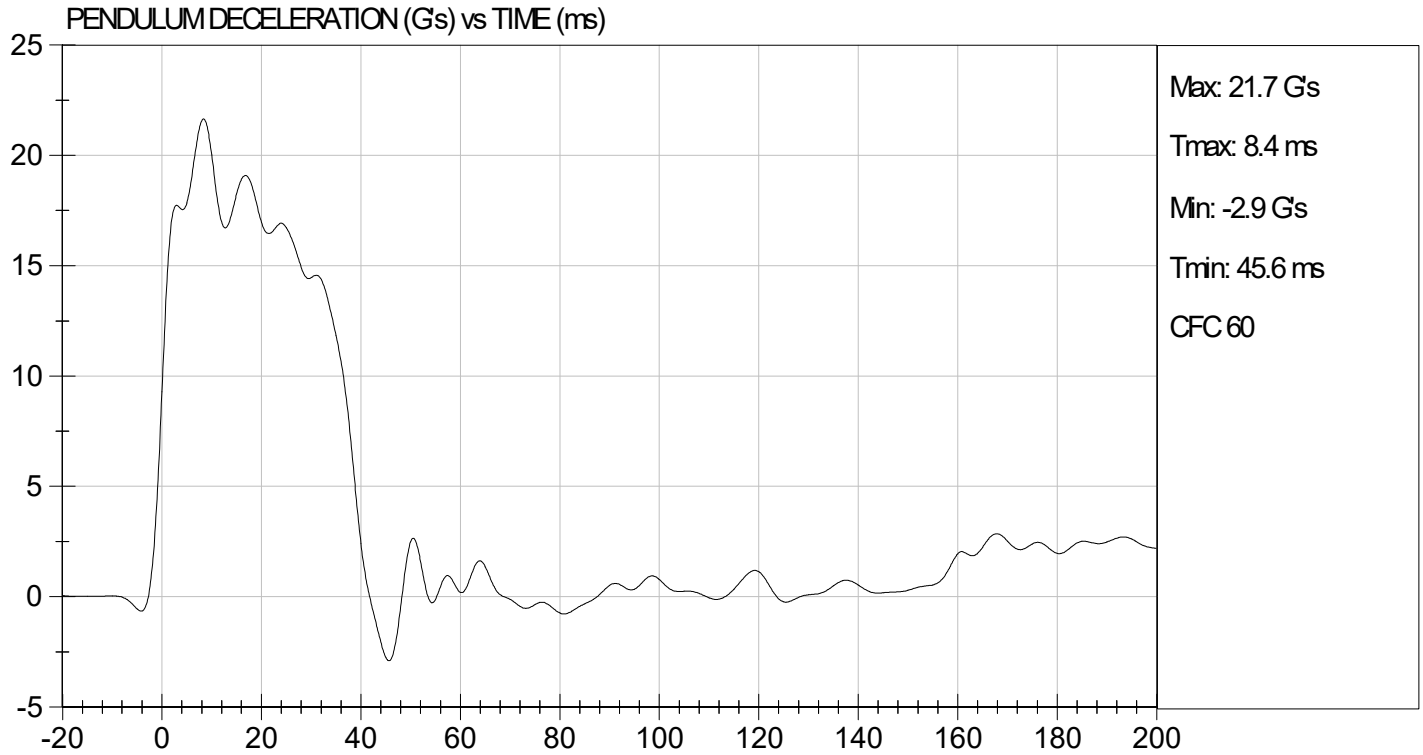
11/09/2023
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 11/09/2023
TEST #: D233033





TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 11/09/2023
TEST #: D233033



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

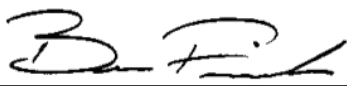
ATD Serial No: 351

Test I.D: D233034

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Probe Velocity	m/s	6.58 to 6.82	6.60	Pass
Peak Probe Force	N	5159 to 5893	5,544	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.83	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

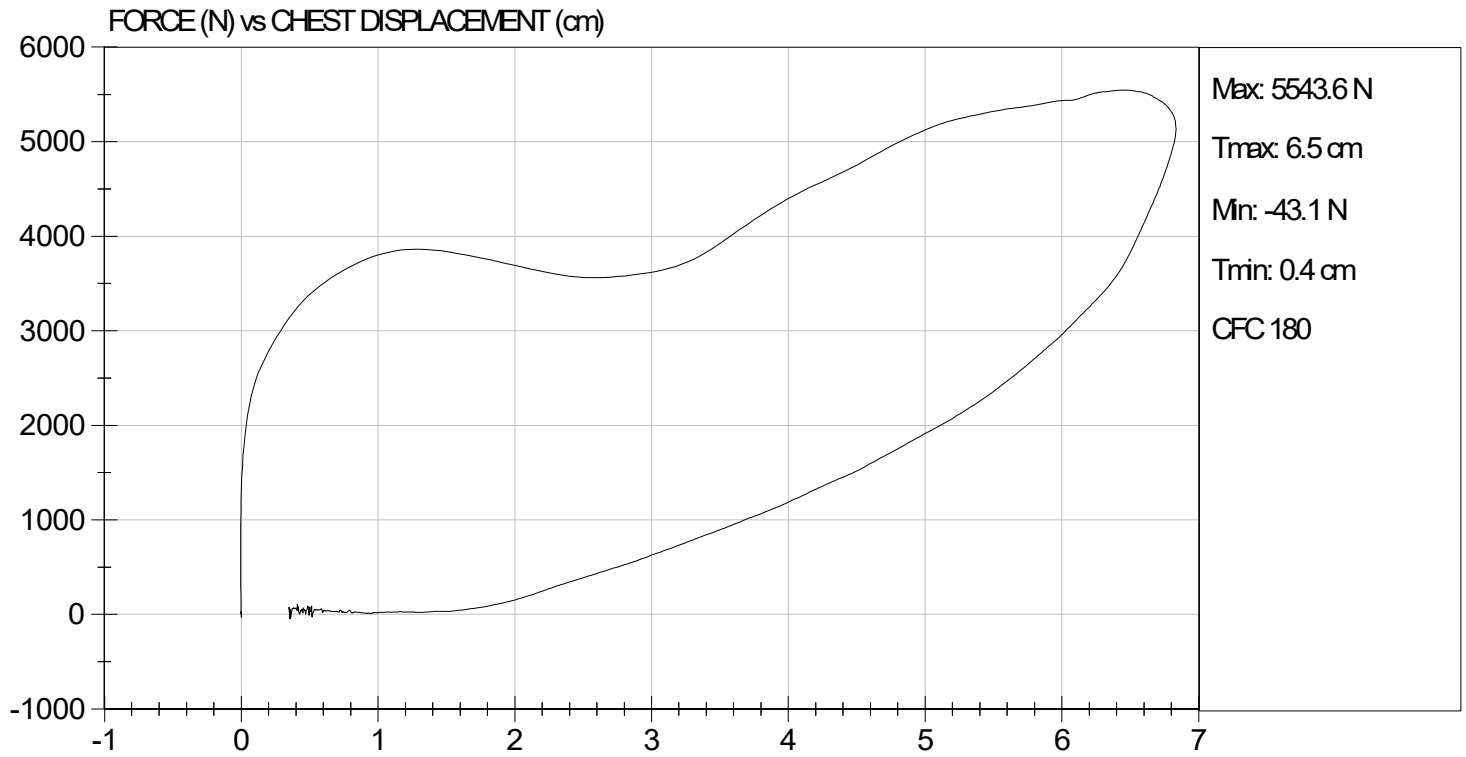
11/09/2023
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 11/09/2023
TEST #: D233034



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

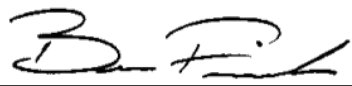
ATD Serial No: 351

Test I.D: D233035

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,780	Pass
Overall Test Results				Pass


Laboratory Technician

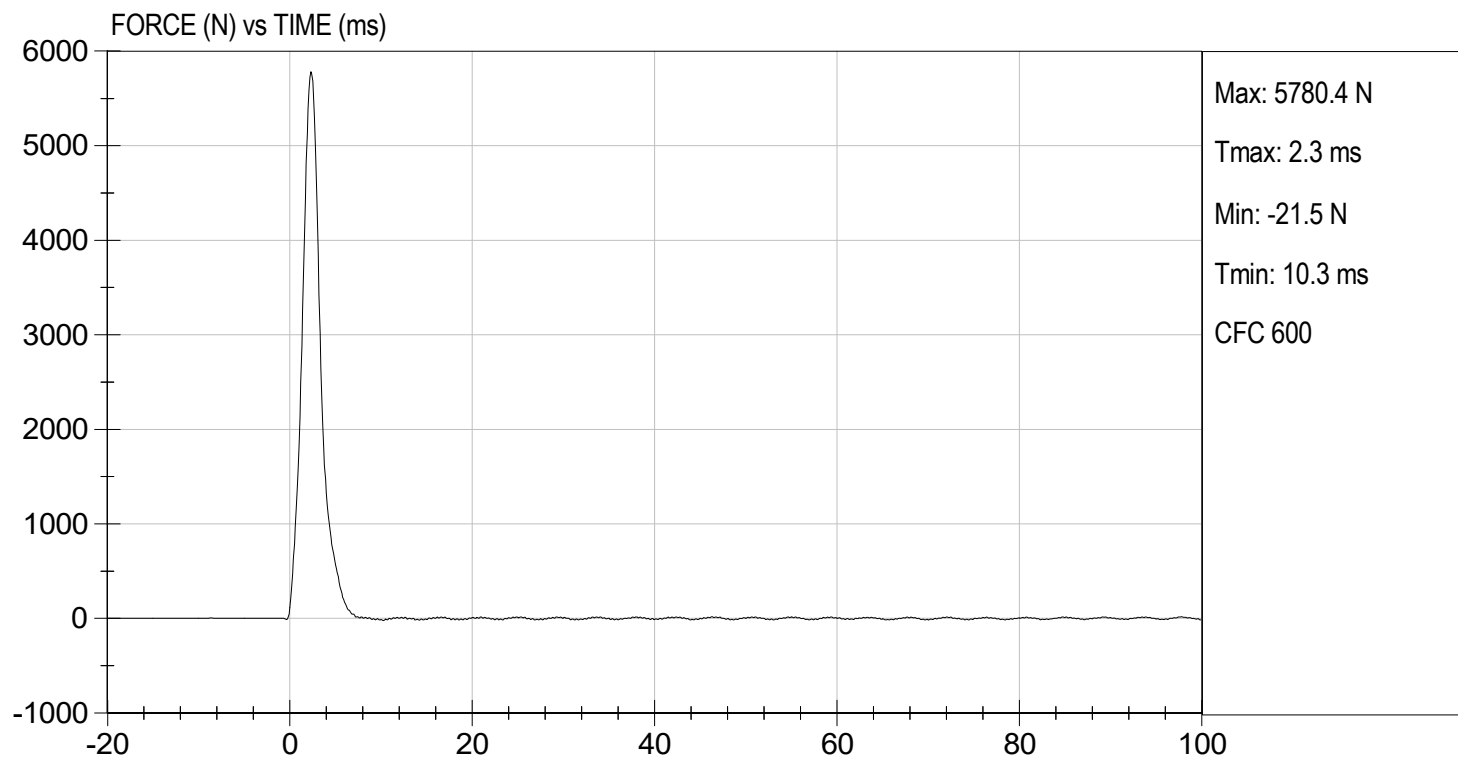
11/09/2023
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 11/09/2023
TEST #: D233035



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

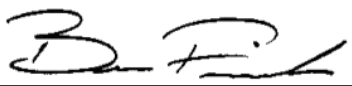
ATD Serial No: 351

Test I.D: D233036

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,729	Pass
Overall Test Results				Pass


Laboratory Technician

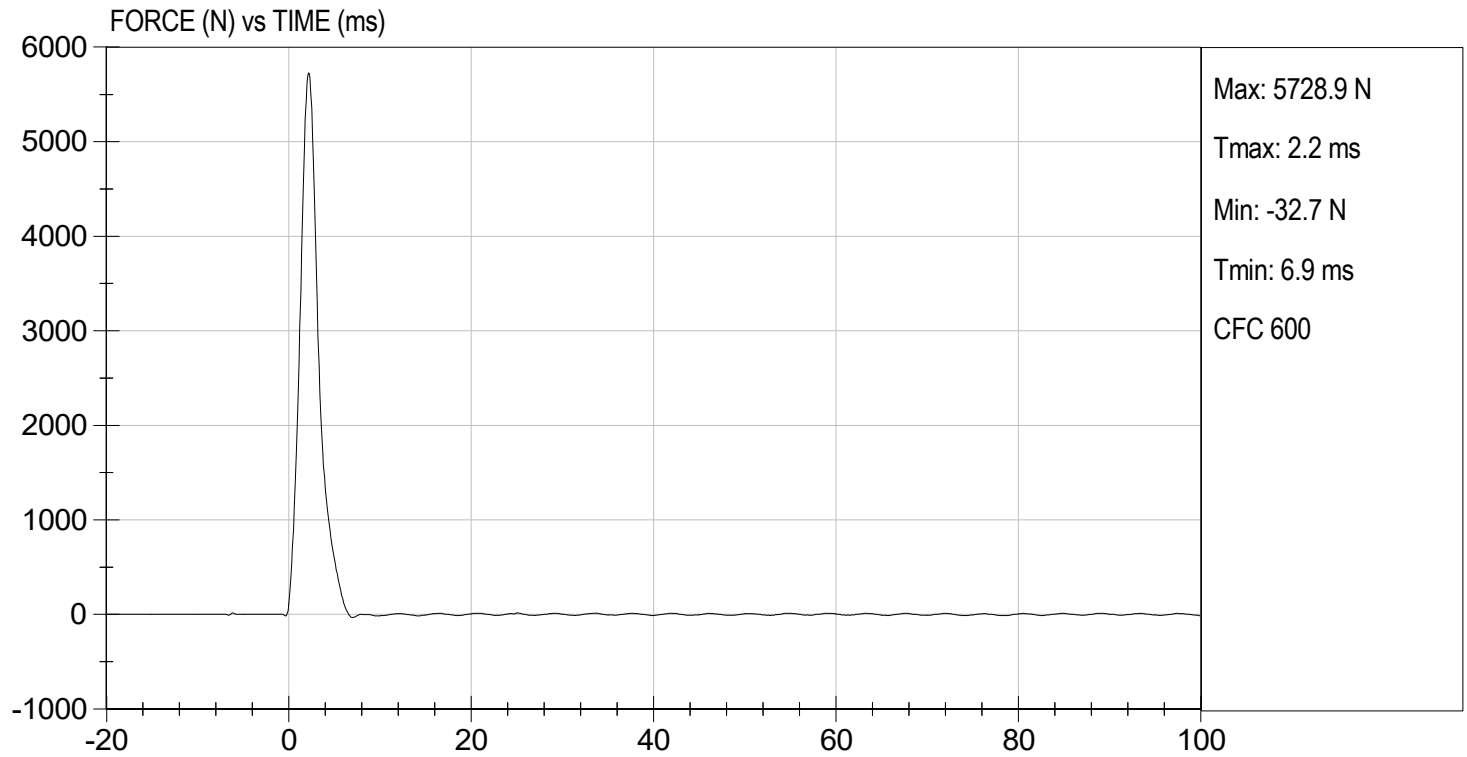
11/09/2023
Test Date


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.94 ft/s, 2.12 m/s

TEST DATE: 11/09/2023
TEST #: D233036



MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

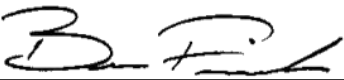
ATD Serial No: 351

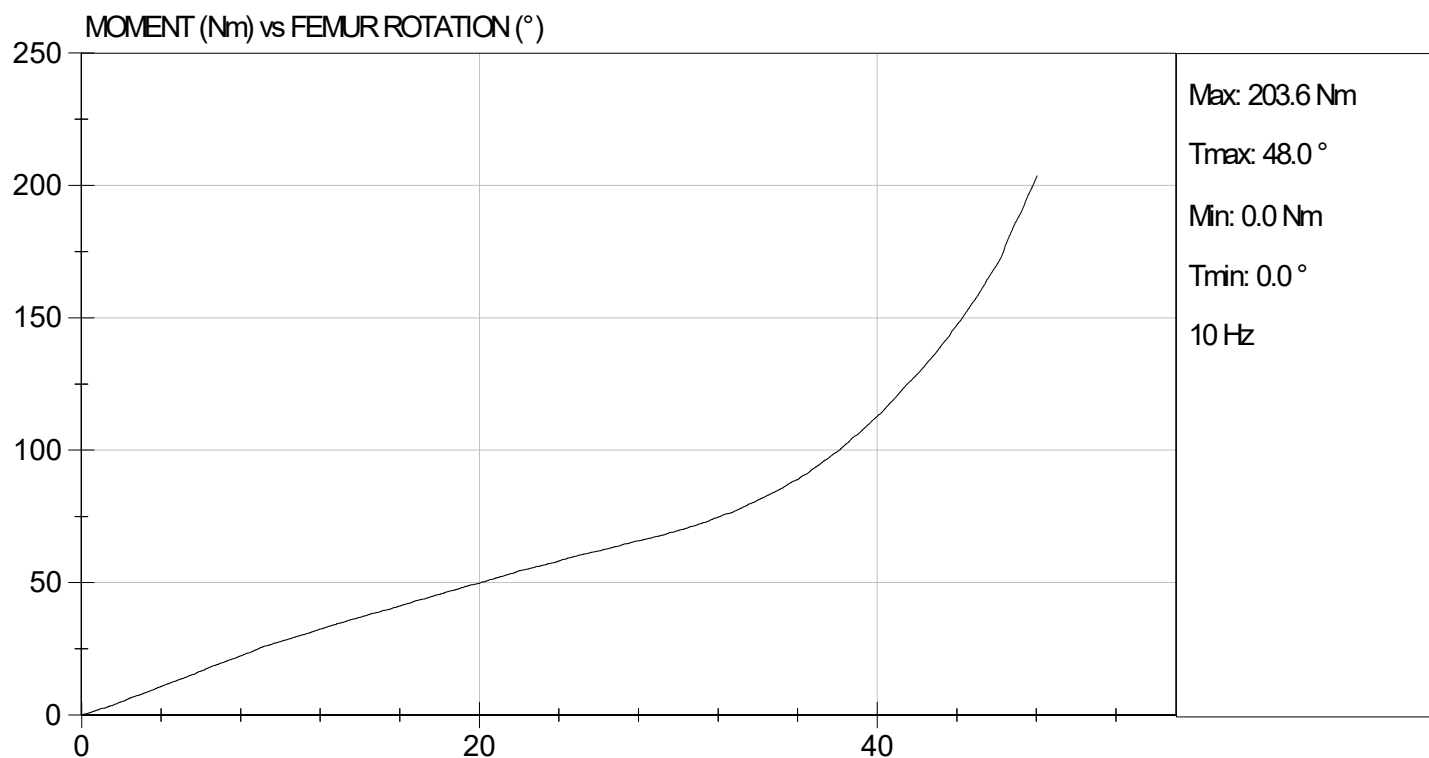
Test I.D: D233030

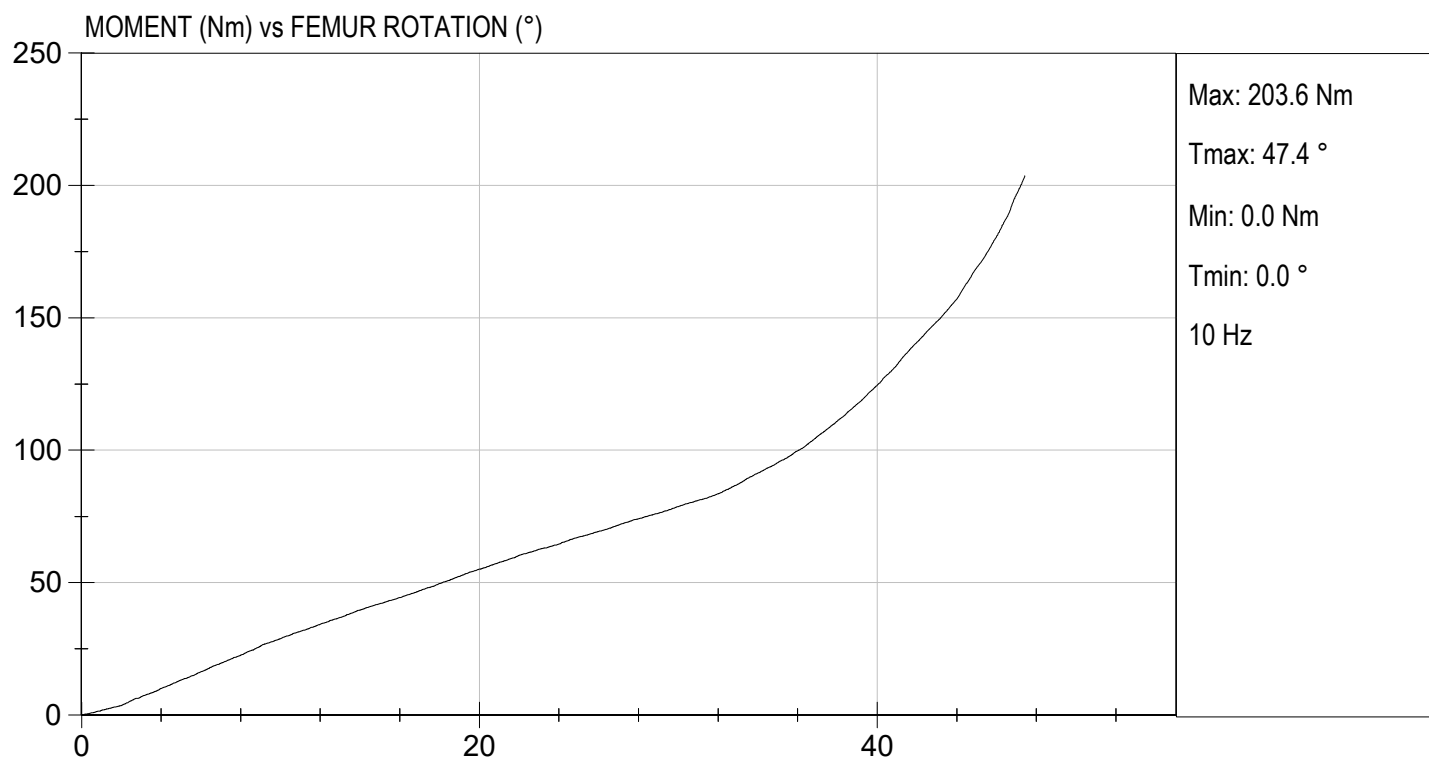
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	37	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.4	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	69.8	78.8	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	48.0	47.4	Pass
Overall Test Results					Pass


 Laboratory Technician

11/09/2023
 Test Date


 Approved By





QUALIFICATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

Hybrid III, 5th External Measurements
SN: 142

HYBRID III, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	775.0
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	438.2
C	H-POINT HEIGHT	Reference	81.3-86.3	81.8
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	148.3
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	83.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	124.4
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	245.2
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	43.4
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	281.1
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	197.2
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	537.2
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376	358.8
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	403.1
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	435.2

HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	181.2
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	227.3
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	475.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	138.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188	181.0
U	HIP BREADTH	The widest part of the hip	299.7-314.9	308.4
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	362.1
W	FOOT BREADTH	The widest part of the foot	78.8-94	82.8
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	545.2
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	870.7
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	779.9
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	350.1
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	170.0

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

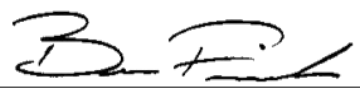
ATD Serial No: 142

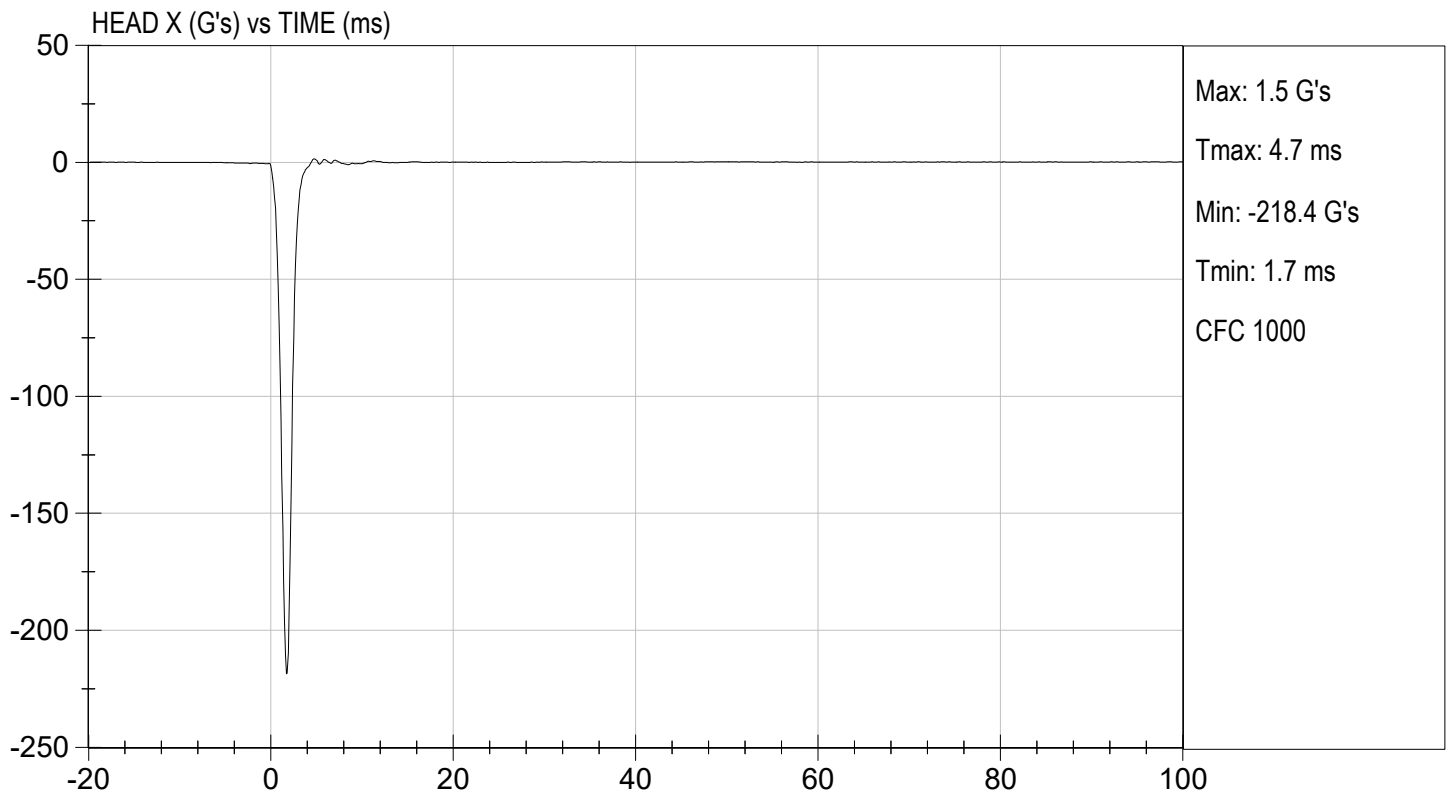
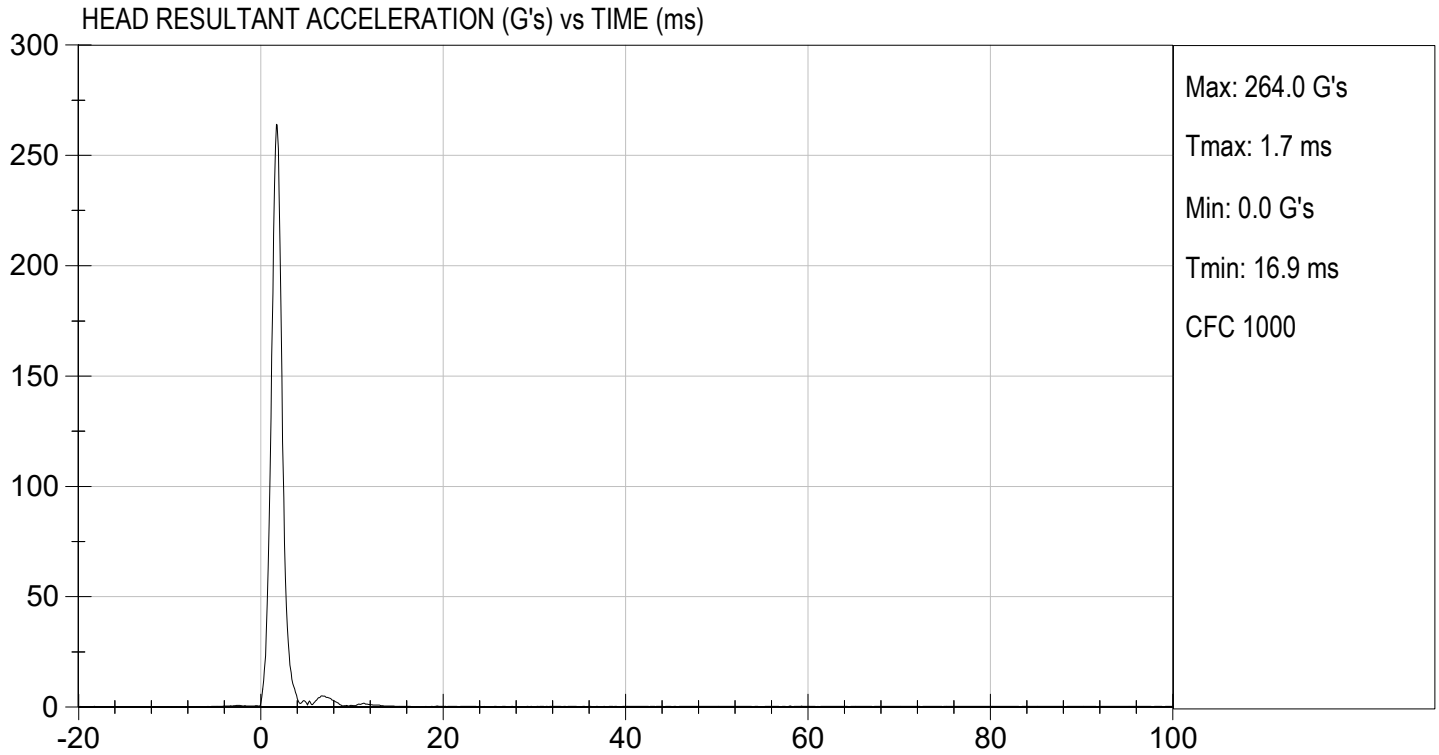
Test ID: D232921

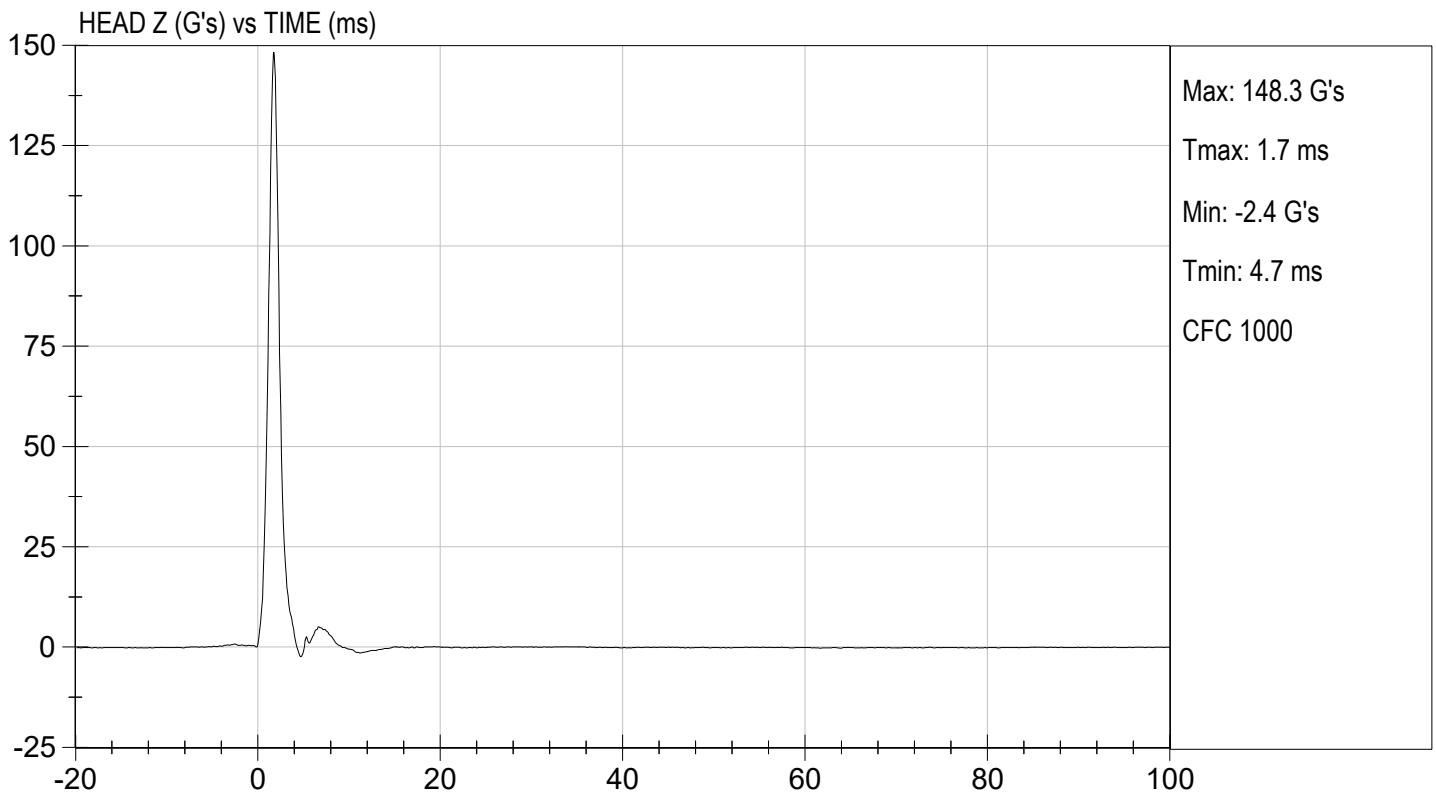
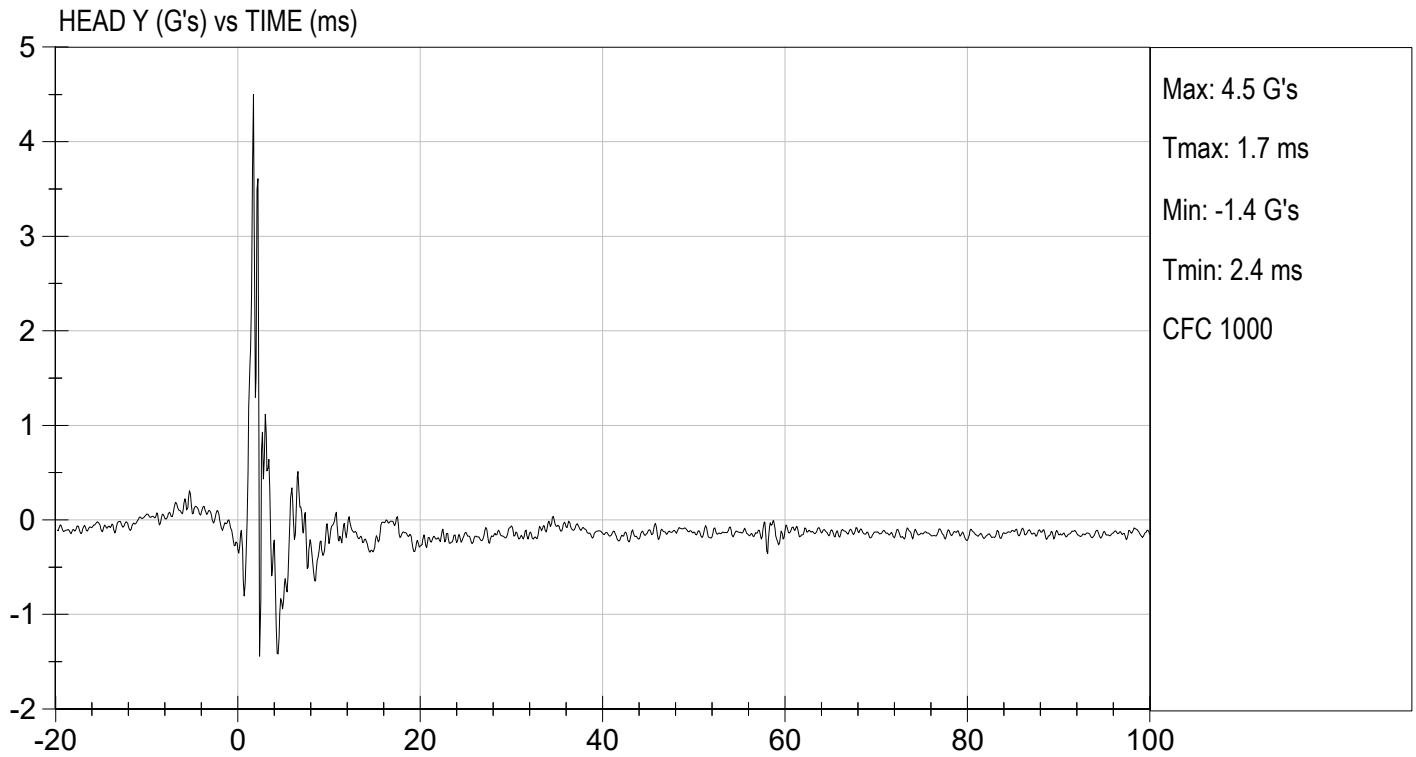
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Peak Resultant Acceleration	G's	250 to 300	264	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass


Laboratory Technician

10/27/2023
Test Date


Approved By





MGA RESEARCH CORPORATION

**NECK FLEXION TEST
HYBRID III 5TH PERCENTILE**

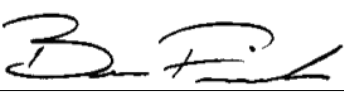
ATD Serial No: 142

Test I.D: D232922

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	52	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.8	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	71	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	84	Pass
Overall Results					Pass


Laboratory Technician

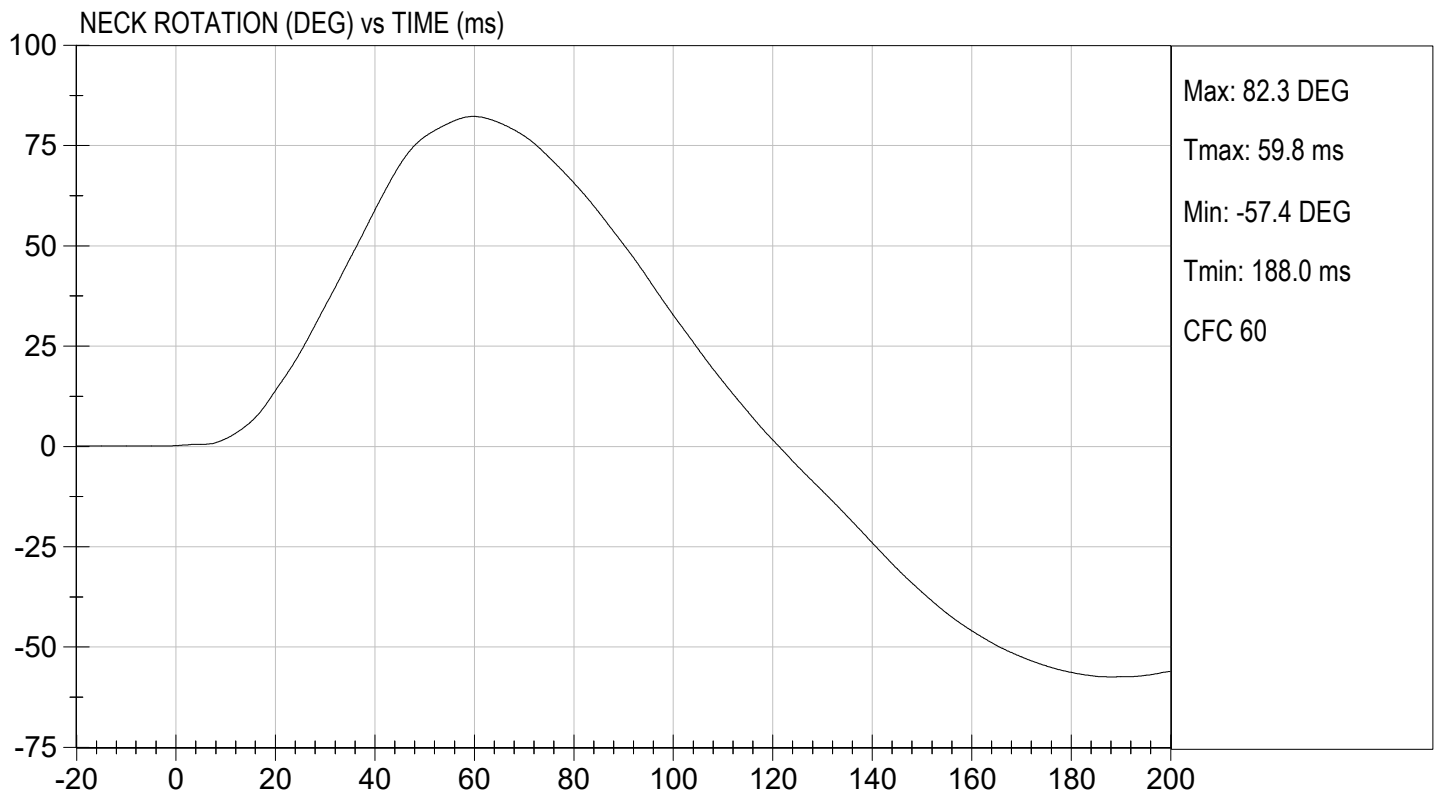
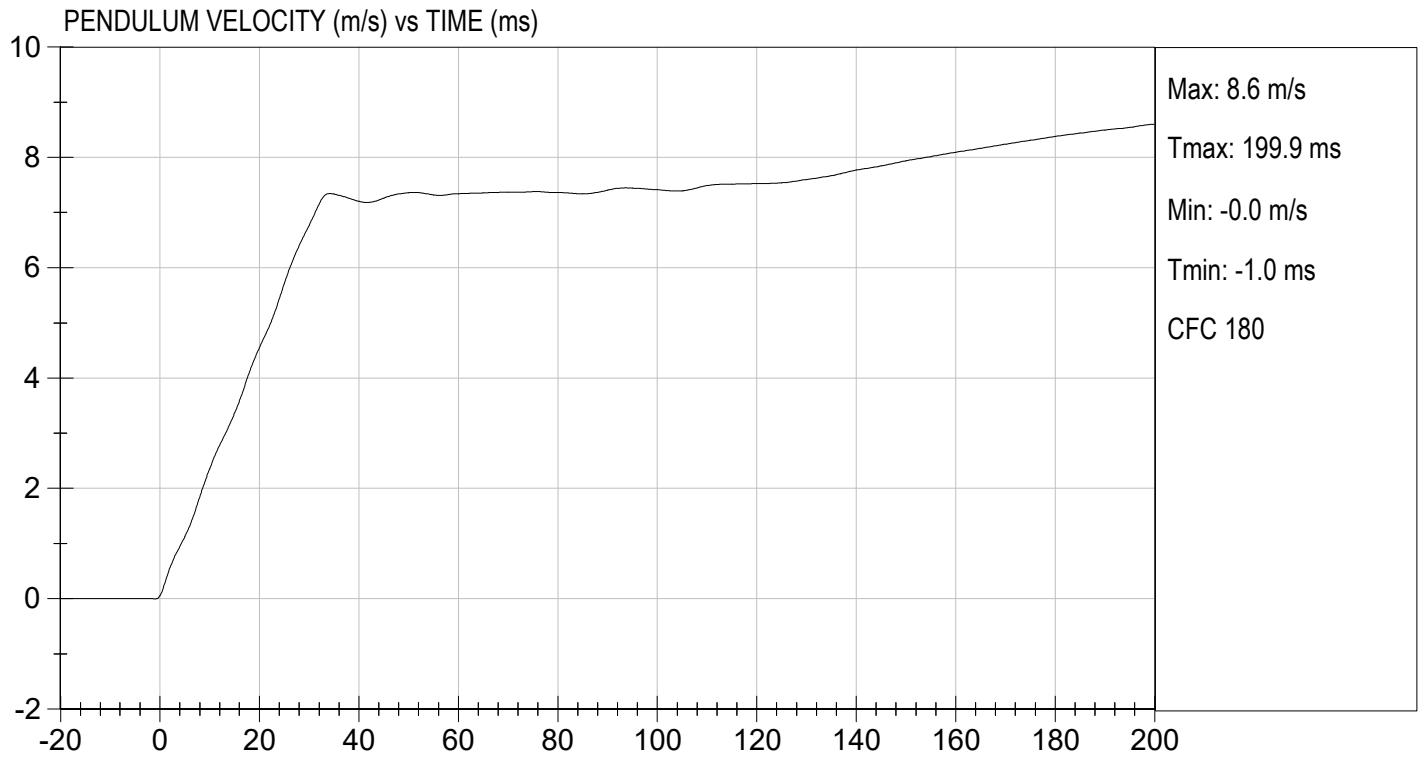
10/27/2023
Test Date


Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

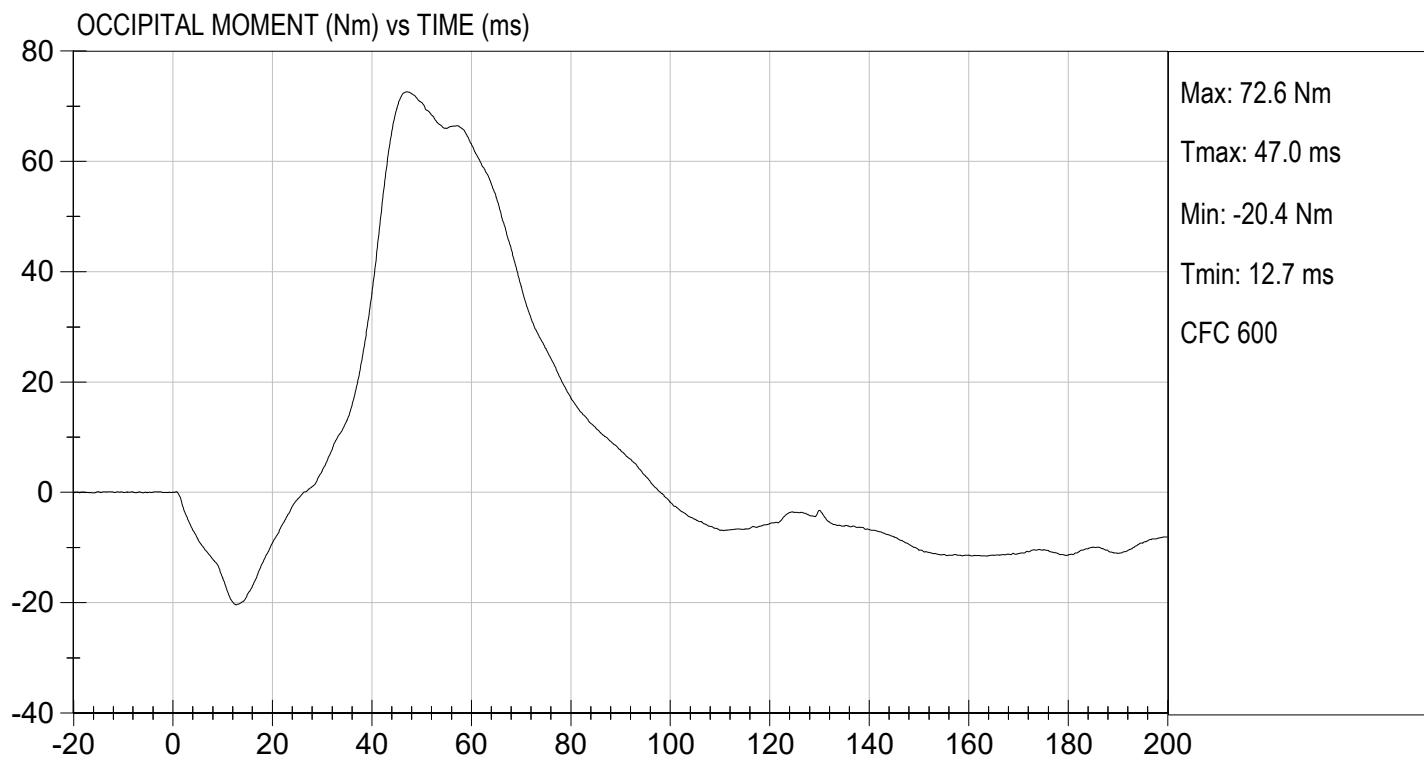
TEST DATE: 10/27/2023
TEST #: D232922





TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 10/27/2023
TEST #: D232922



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

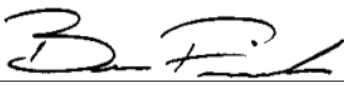
ATD Serial No: 142

Test I.D: D232923

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	52	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	110	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass


 Laboratory Technician

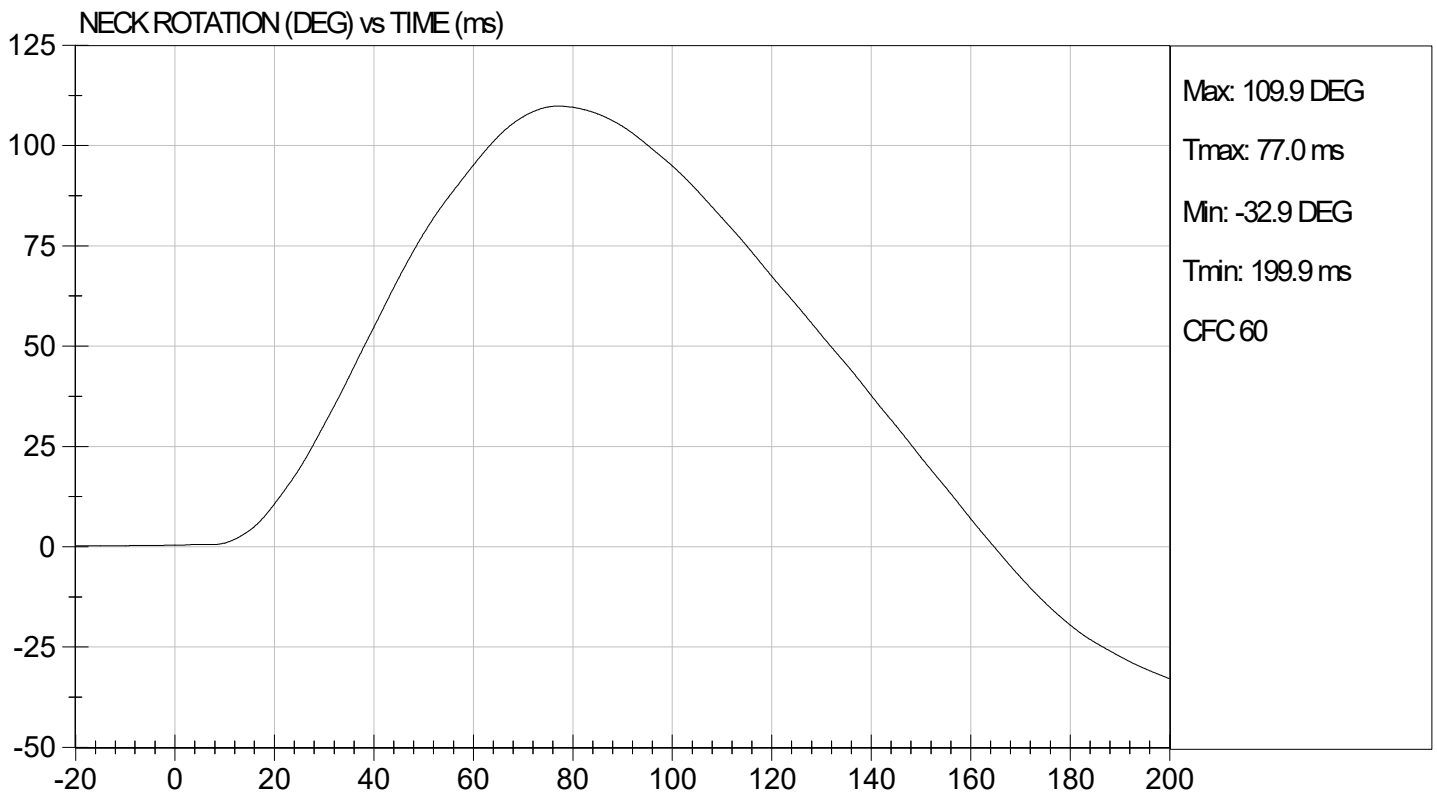
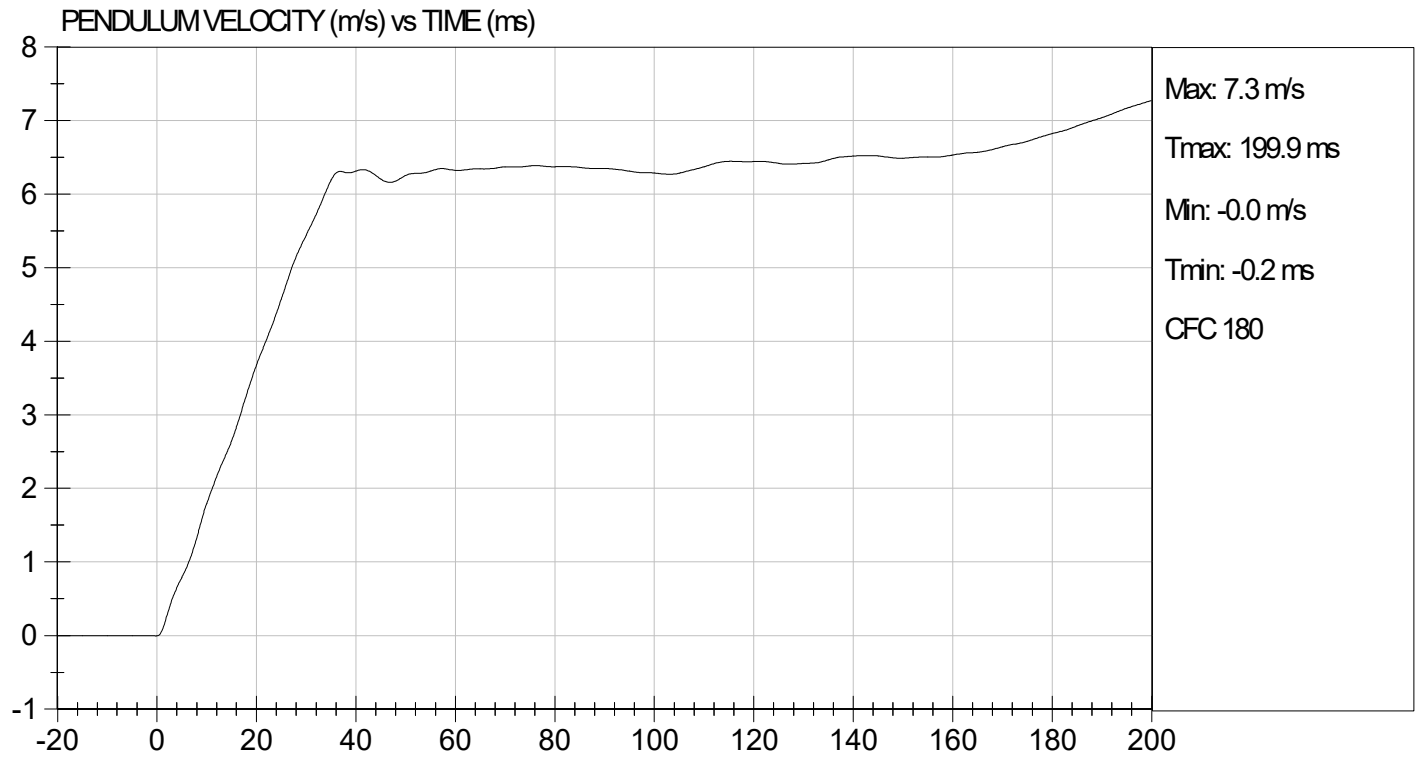
10/27/2023
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

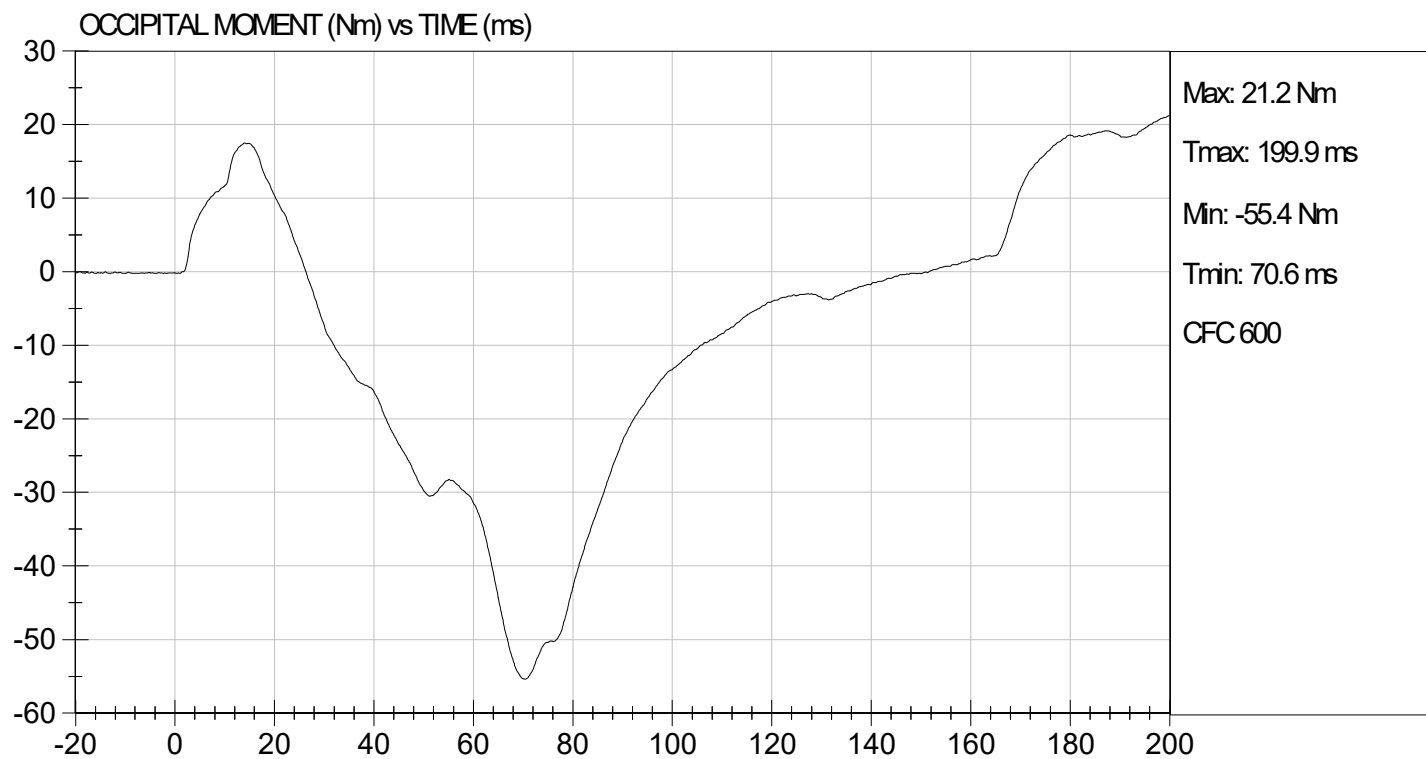
TEST DATE: 10/27/2023
TEST #: D232923





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 10/27/2023
TEST #: D232923



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 142

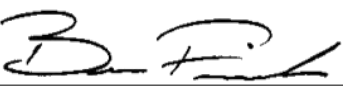
Test I.D: D232924

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	52	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4254	Pass
Internal Hysteresis	%	69 to 85	75	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4381	Pass
Overall Test Results				Pass


Laboratory Technician

10/27/2023

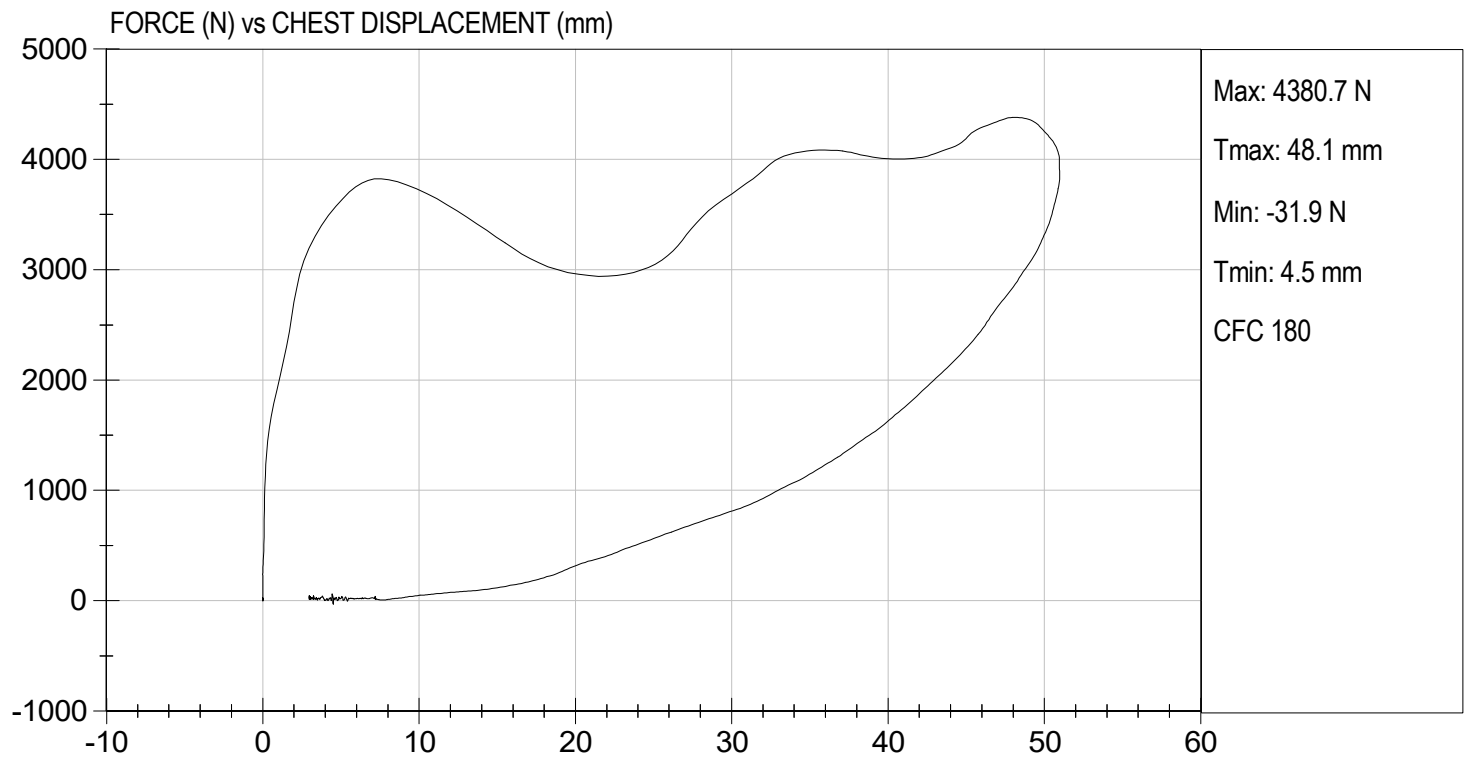
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 10/27/2023
TEST #: D232924



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

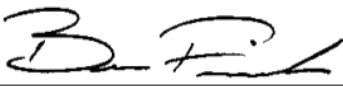
ATD Serial No: 142

Test I.D: D232925

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	4050	Pass
Overall Test Results				Pass


Laboratory Technician

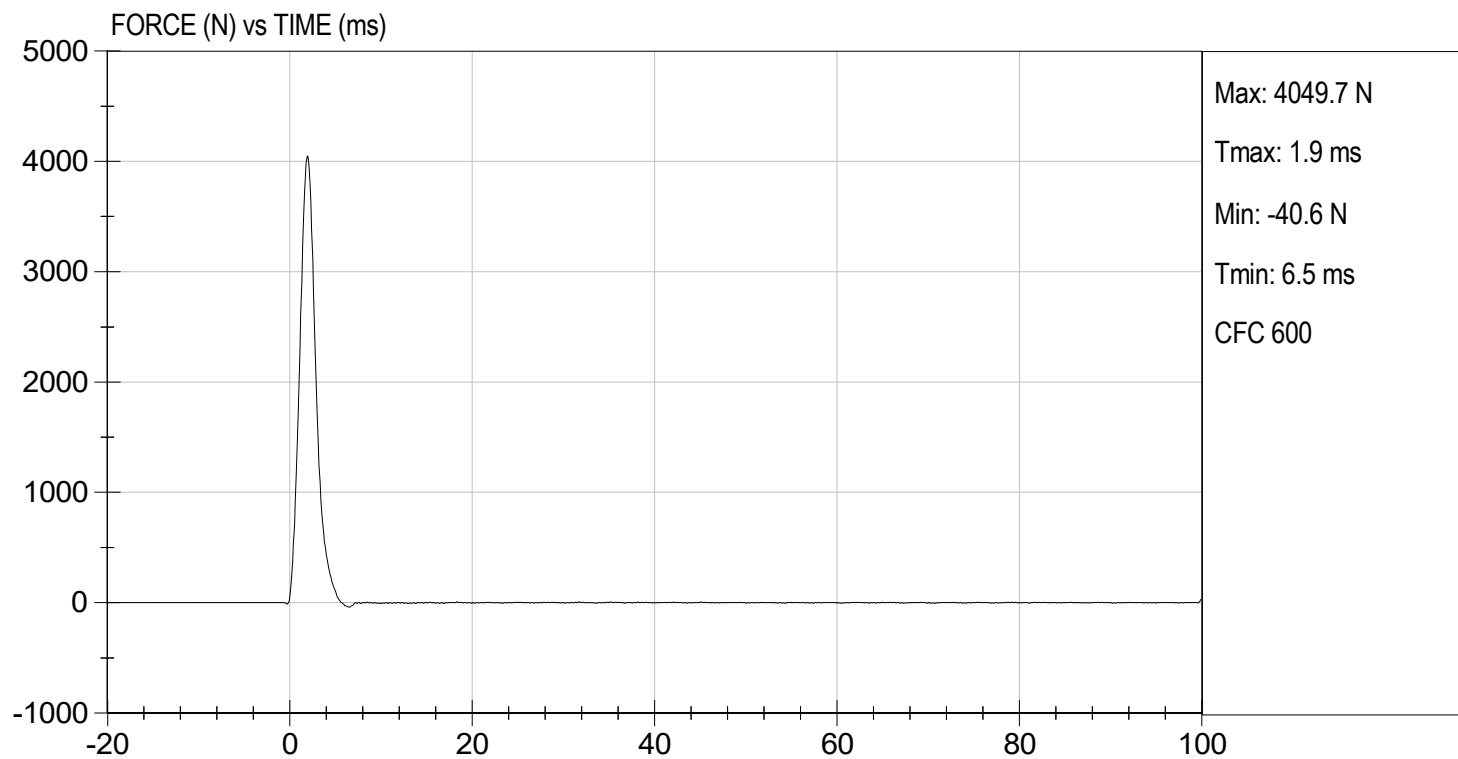
10/27/2023
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.94 ft/s, 2.12 m/s

TEST DATE: 10/27/2023
TEST #: D232925



MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 142

Test I.D: D232926

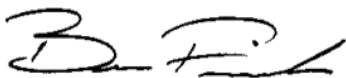
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	4054	Pass
Overall Test Results				Pass



Laboratory Technician

10/27/2023

Test Date

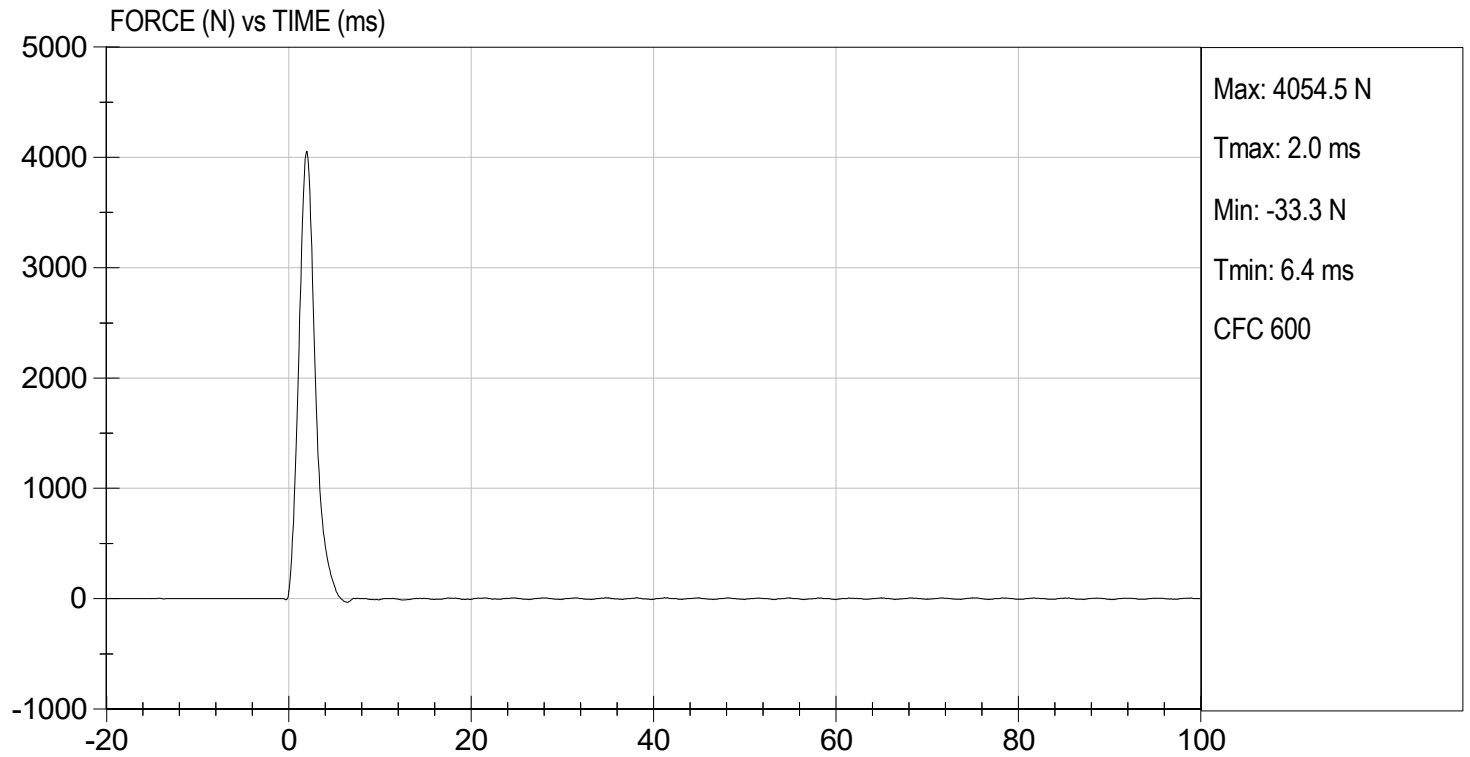


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.92 ft/s, 2.11 m/s

TEST DATE: 10/27/2023
TEST #: D232926



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142

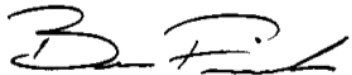
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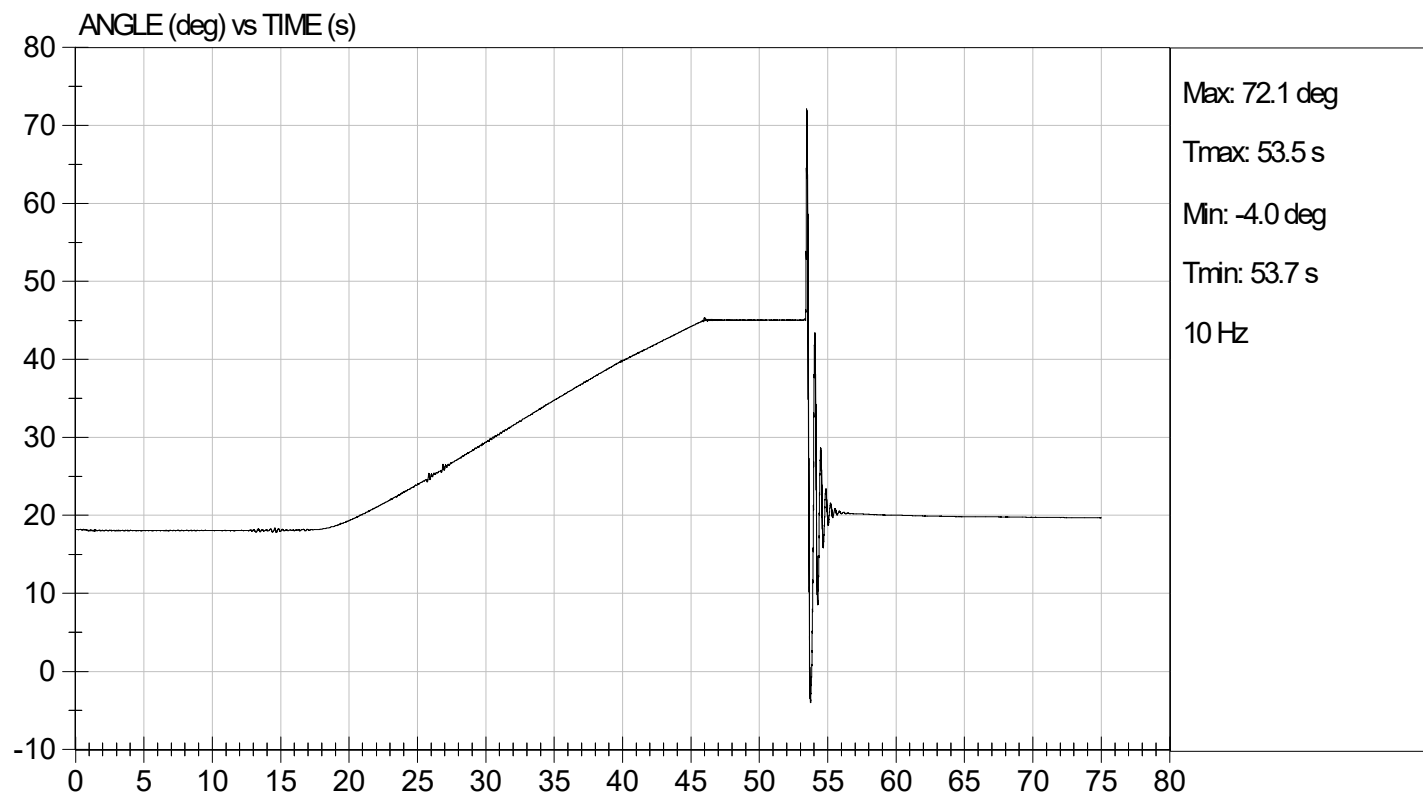
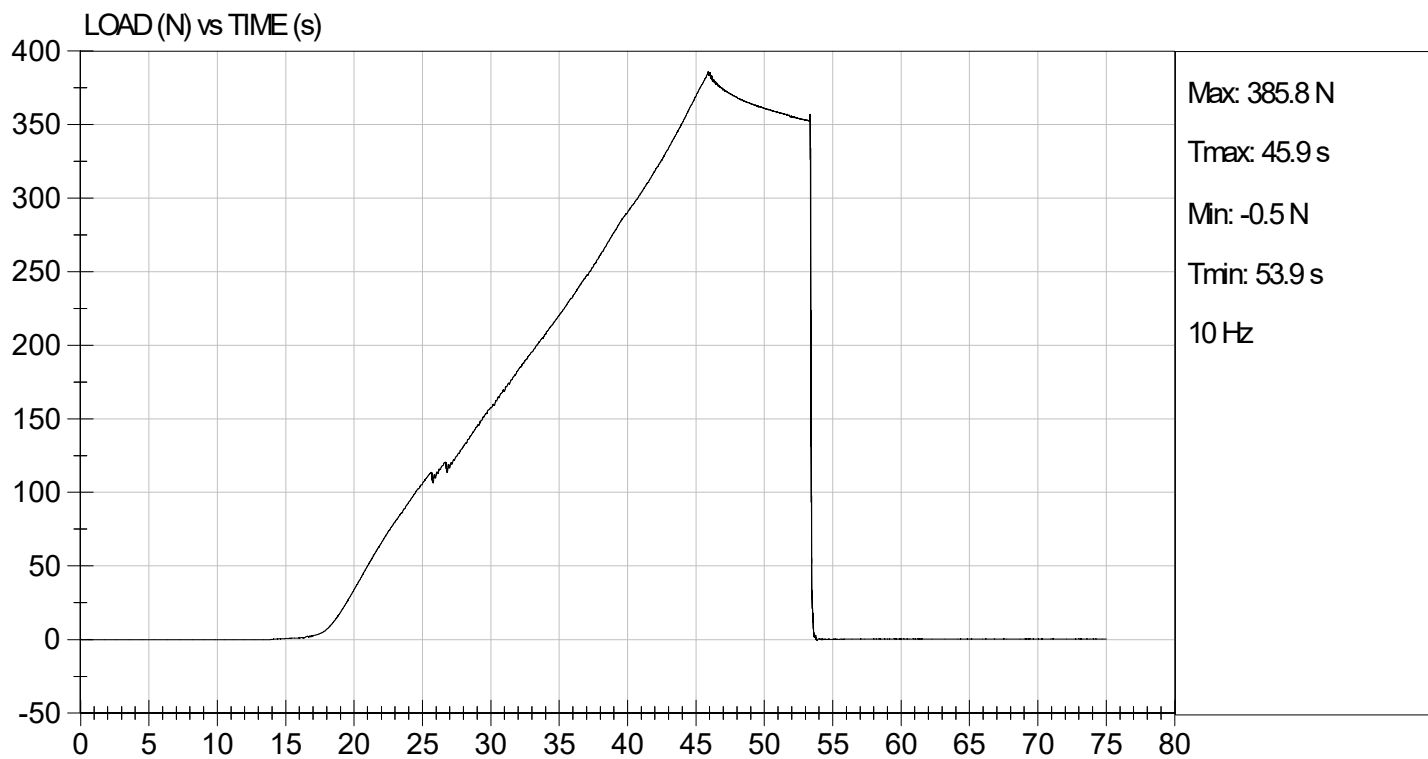
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	2	Pass
Force at 45 deg	N	320 to 390	386	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	1.0	Pass
Overall Result			Pass	


Laboratory Technician

10/27/2023

Test Date


Approved By



QUALIFICATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

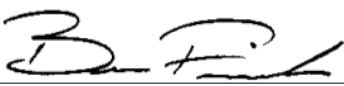
ATD Serial No: 142

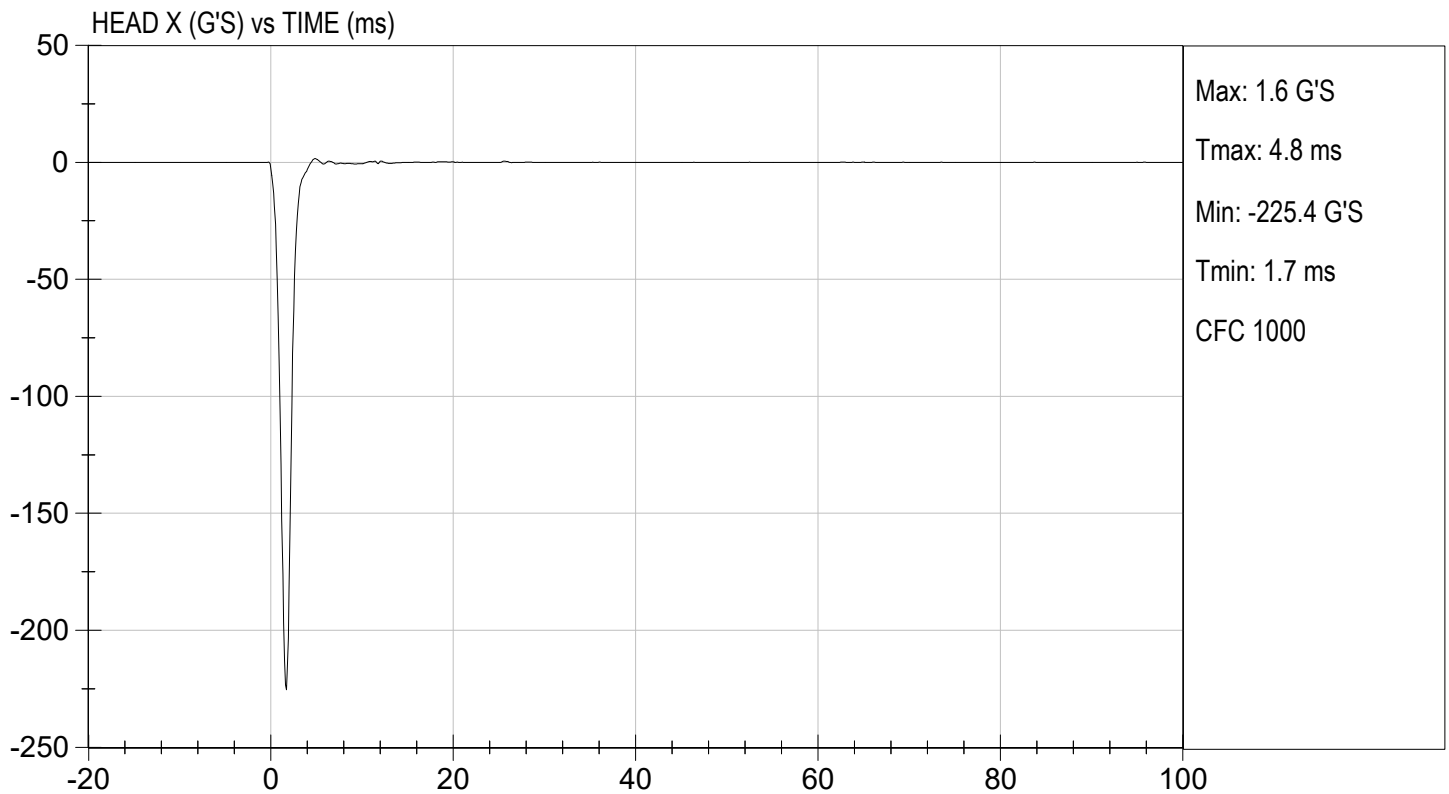
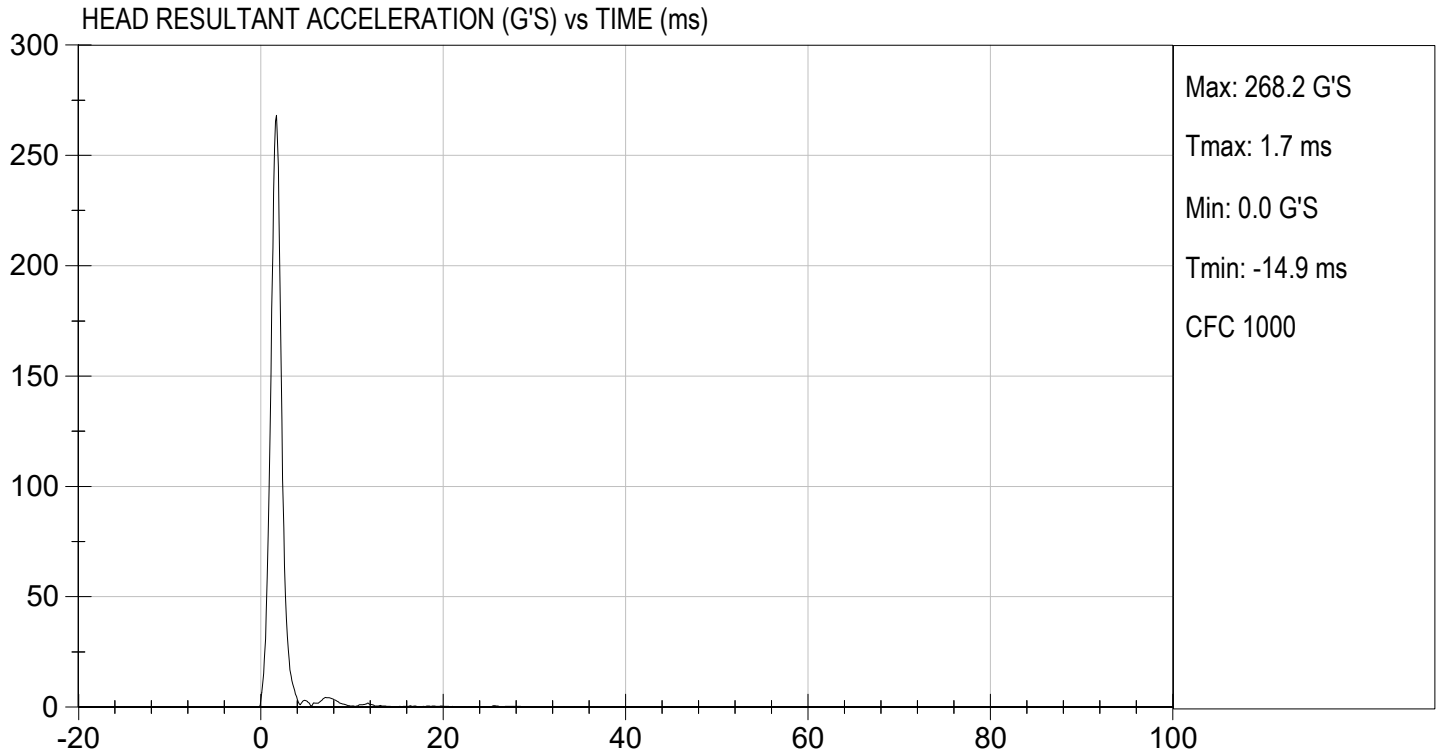
Test ID: D233041

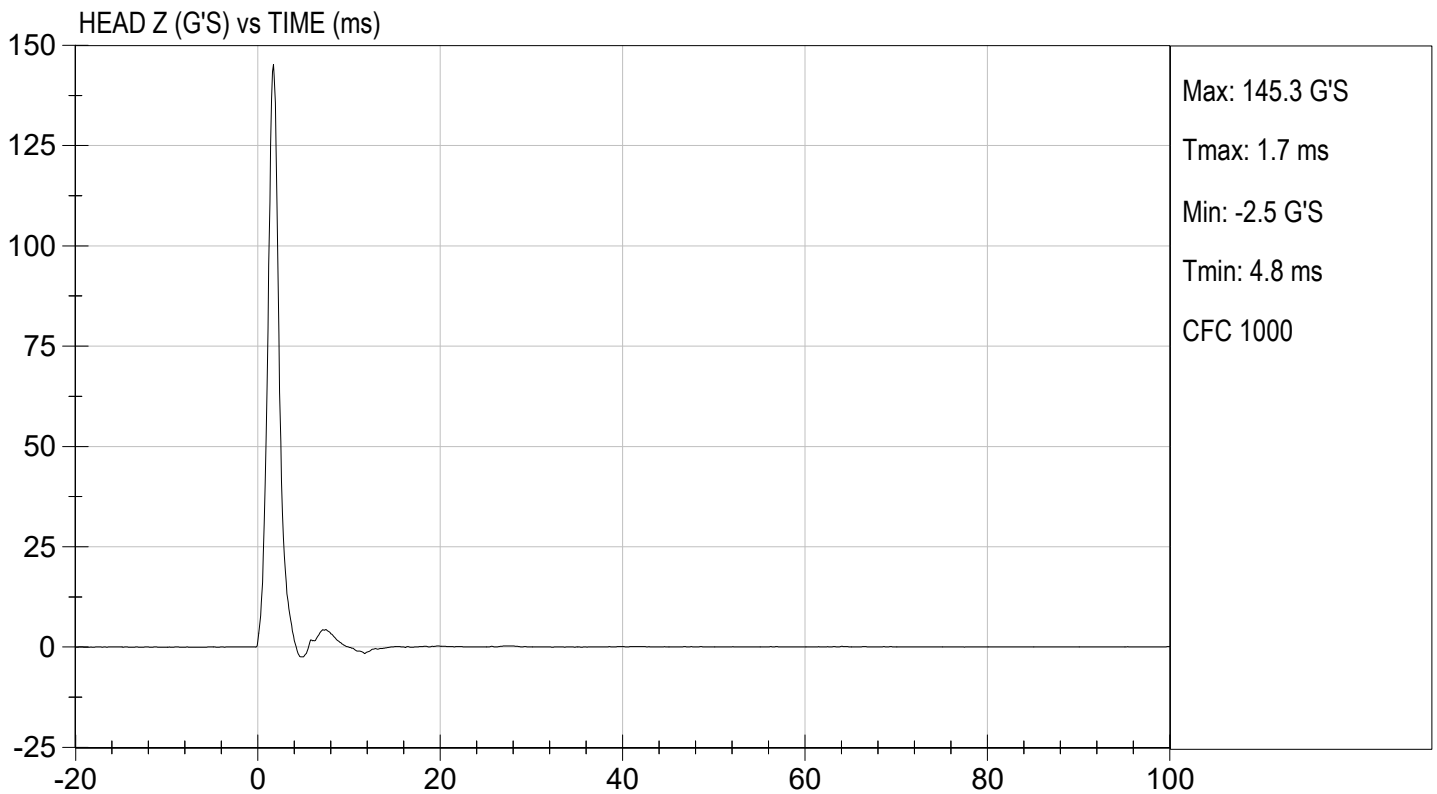
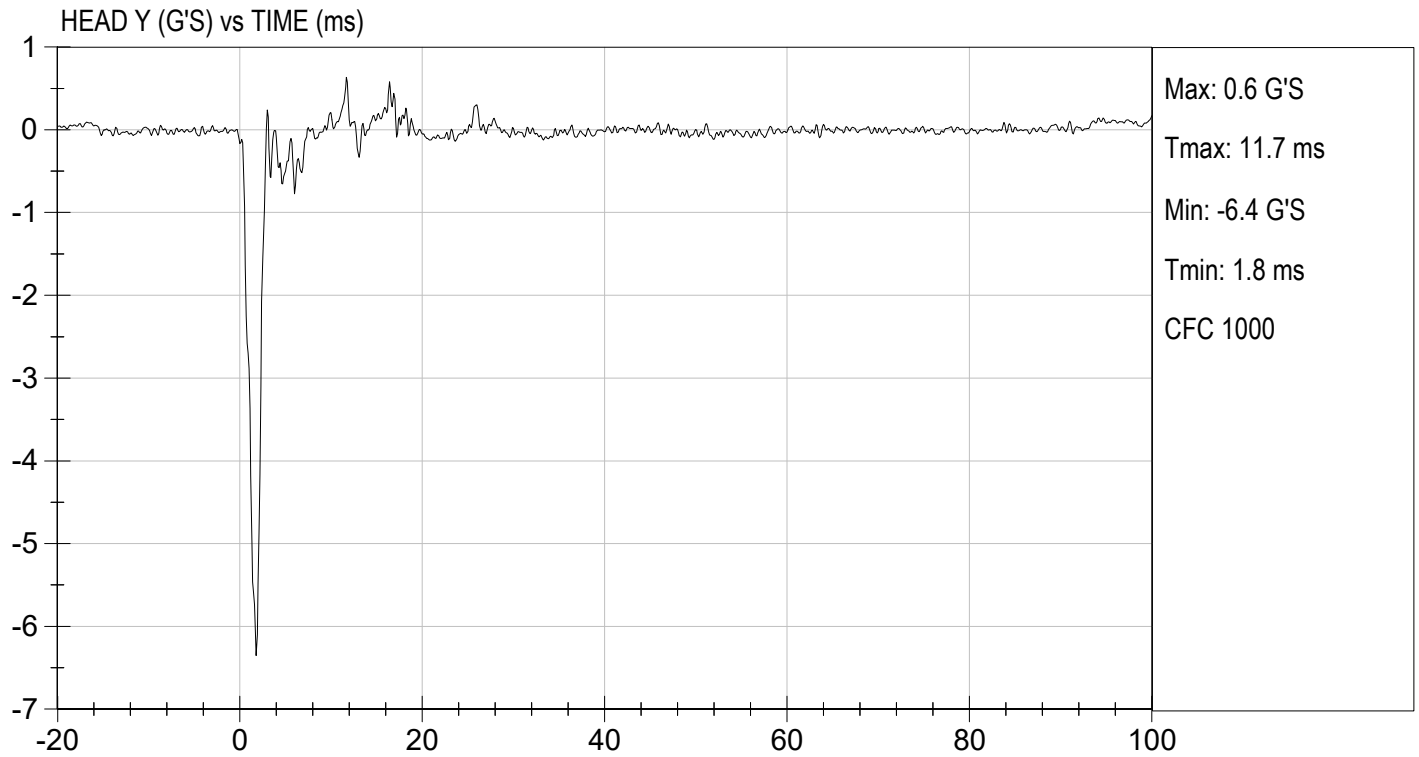
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Peak Resultant Acceleration	G's	250 to 300	268	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-6.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results			Pass	


Laboratory Technician

11/09/2023
Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

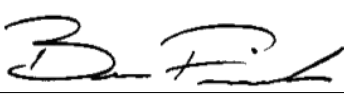
ATD Serial No: 142

Test I.D: D233042

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	35	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.9	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	74	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	82	Pass
Overall Results					Pass


 Laboratory Technician

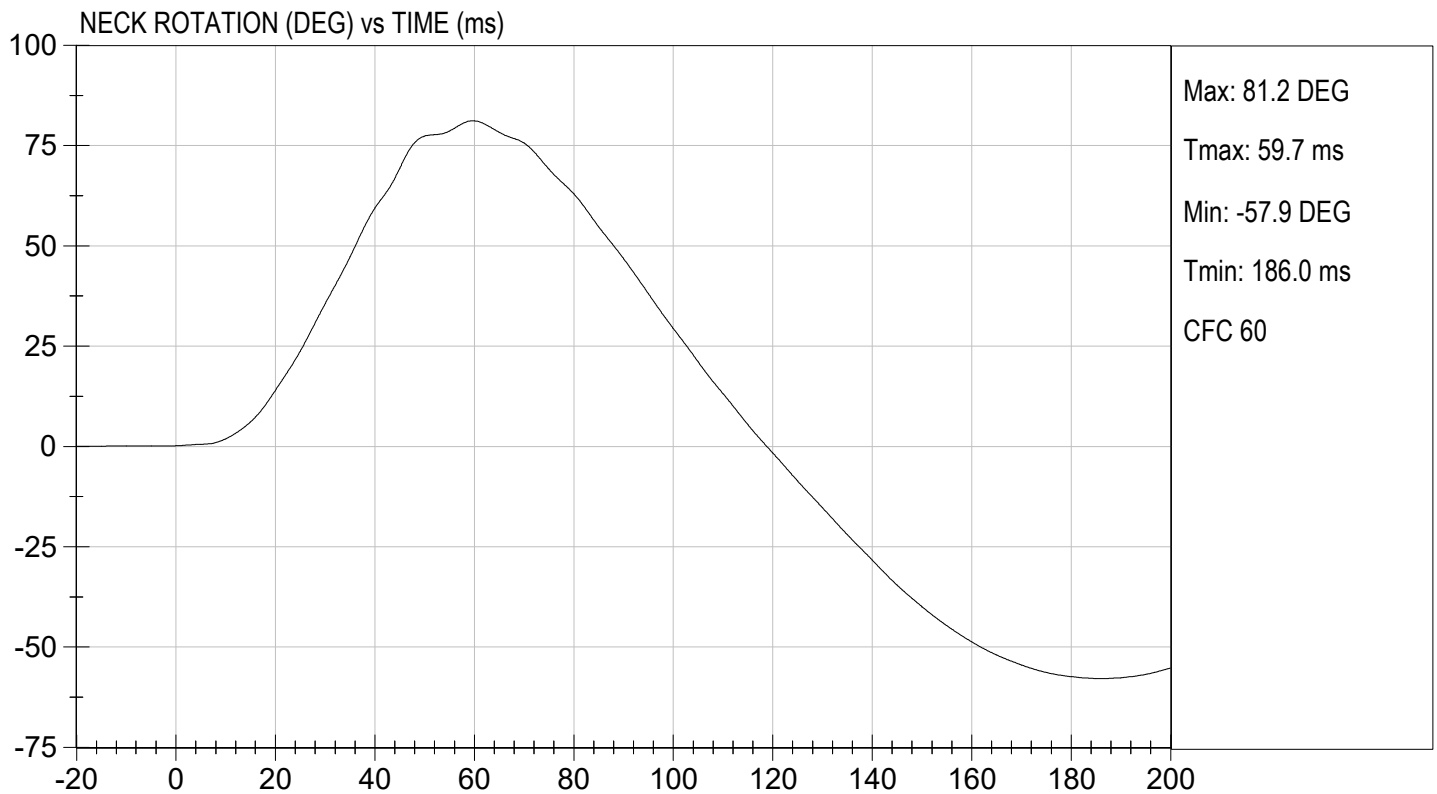
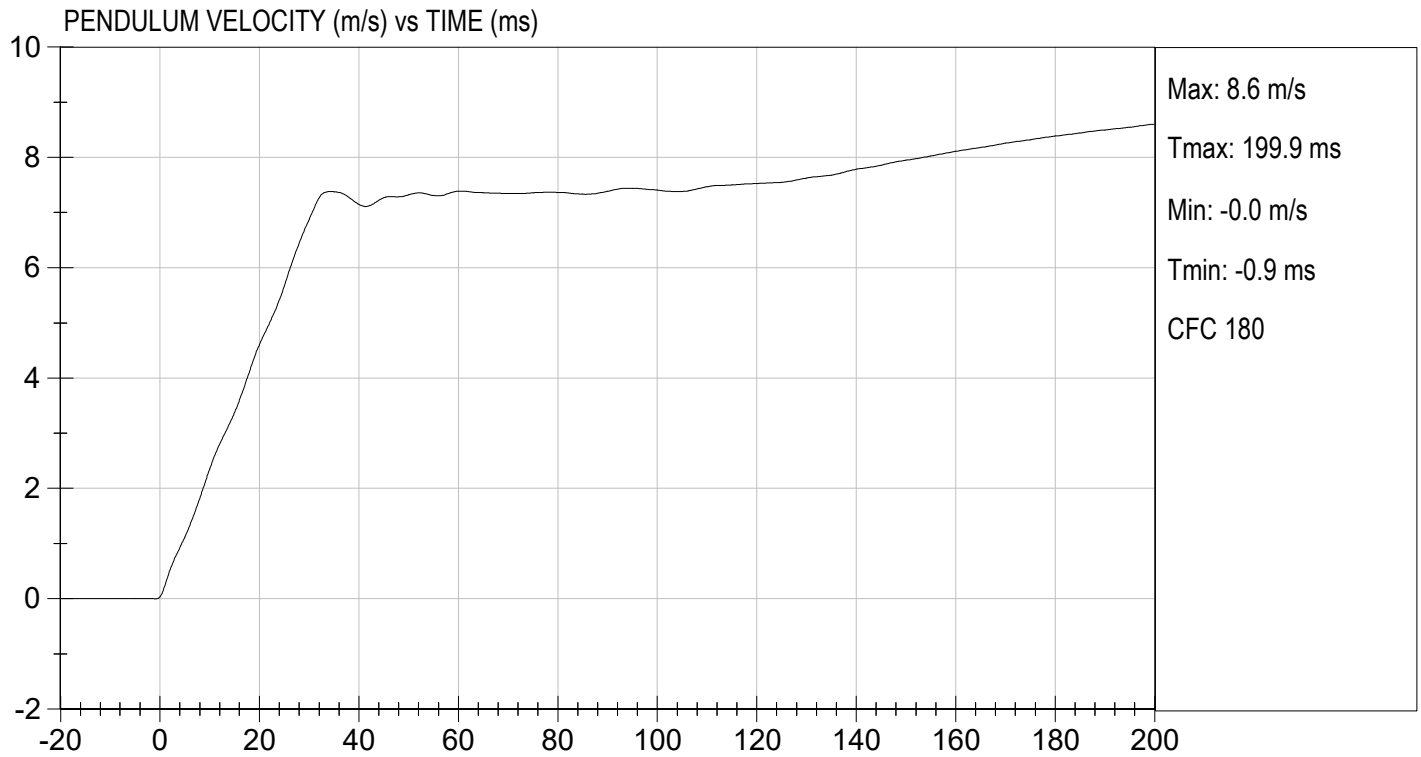
11/09/2023
 Test Date


 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

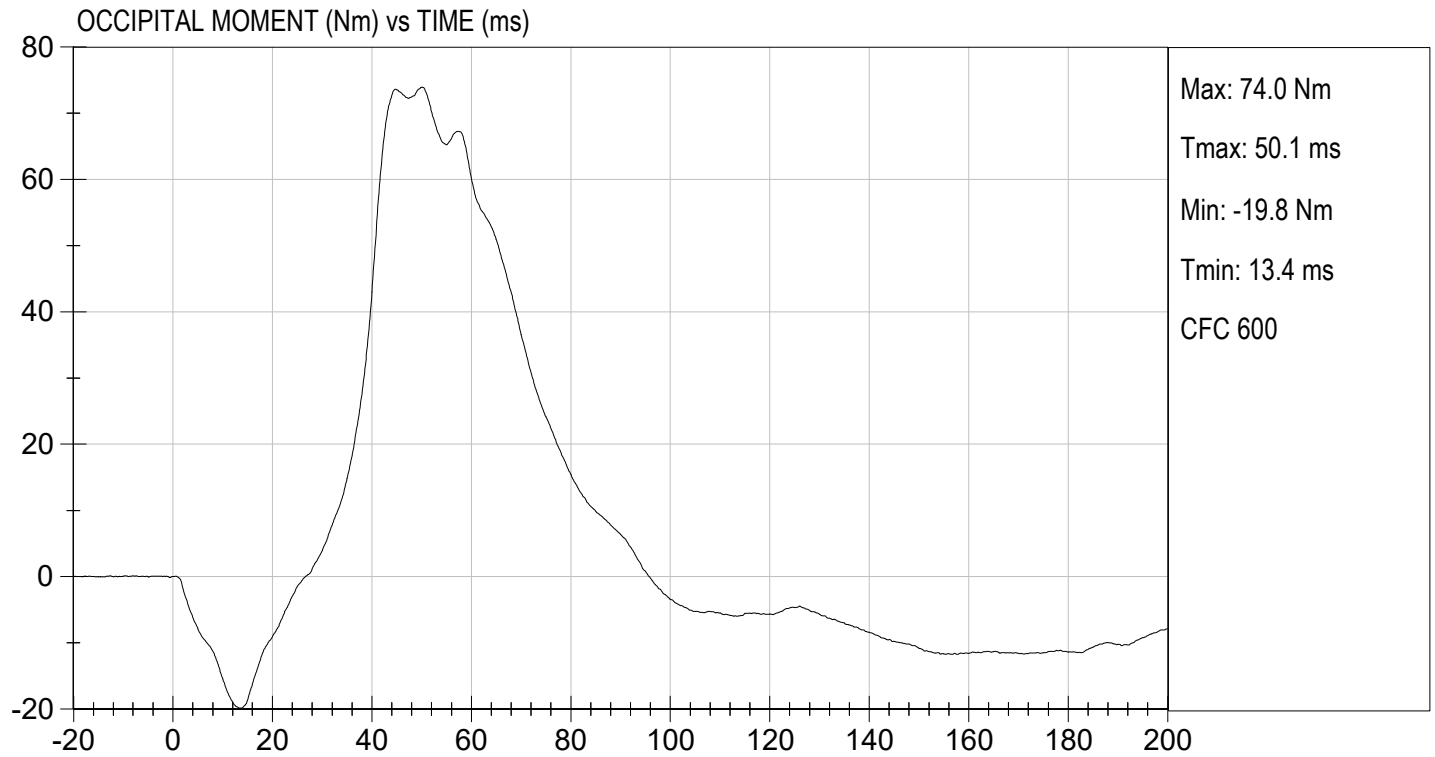
TEST DATE: 11/09/2023
TEST #: D233042





TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 11/09/2023
TEST #: D233042



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

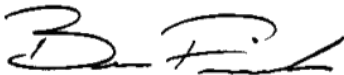
ATD Serial No: 142

Test I.D: D233043

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	35	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass


 Laboratory Technician

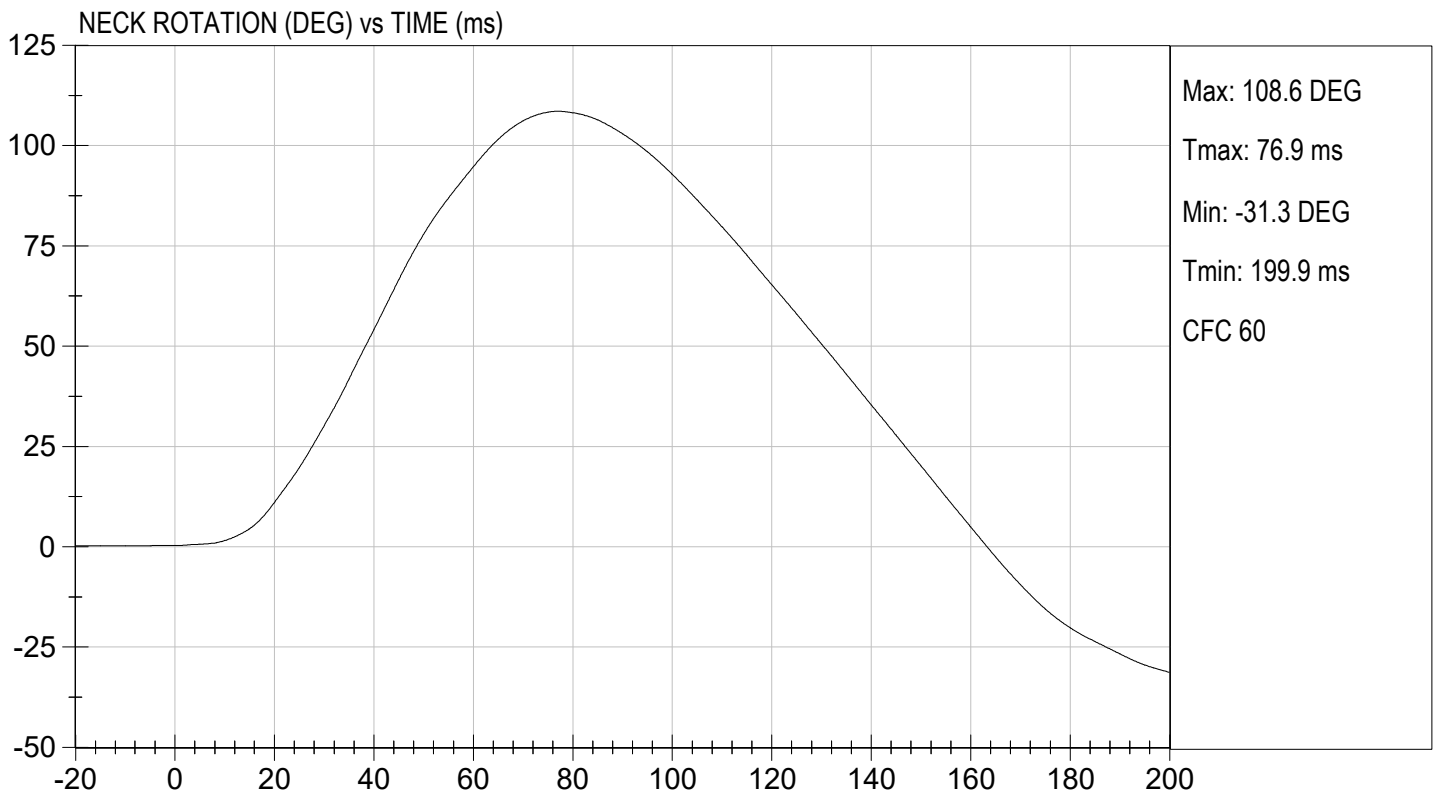
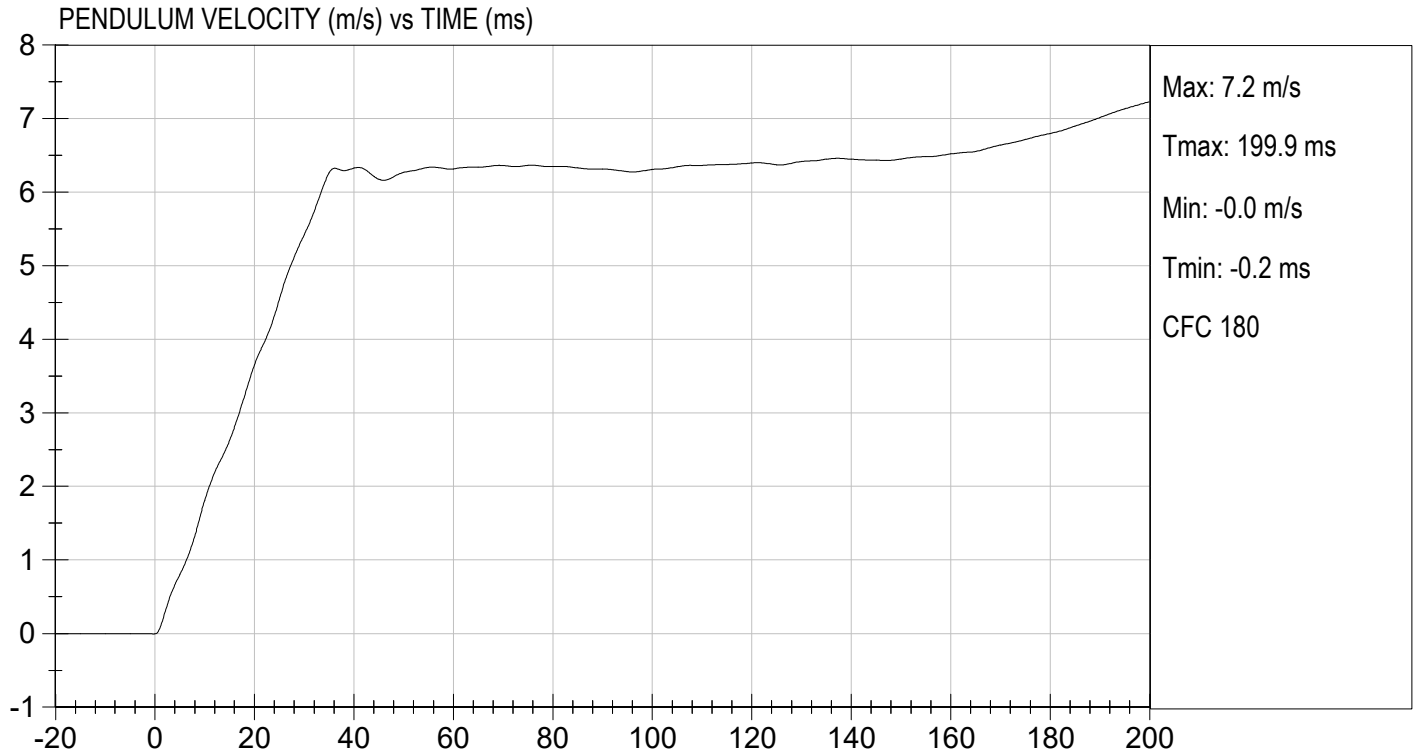
11/09/2023
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

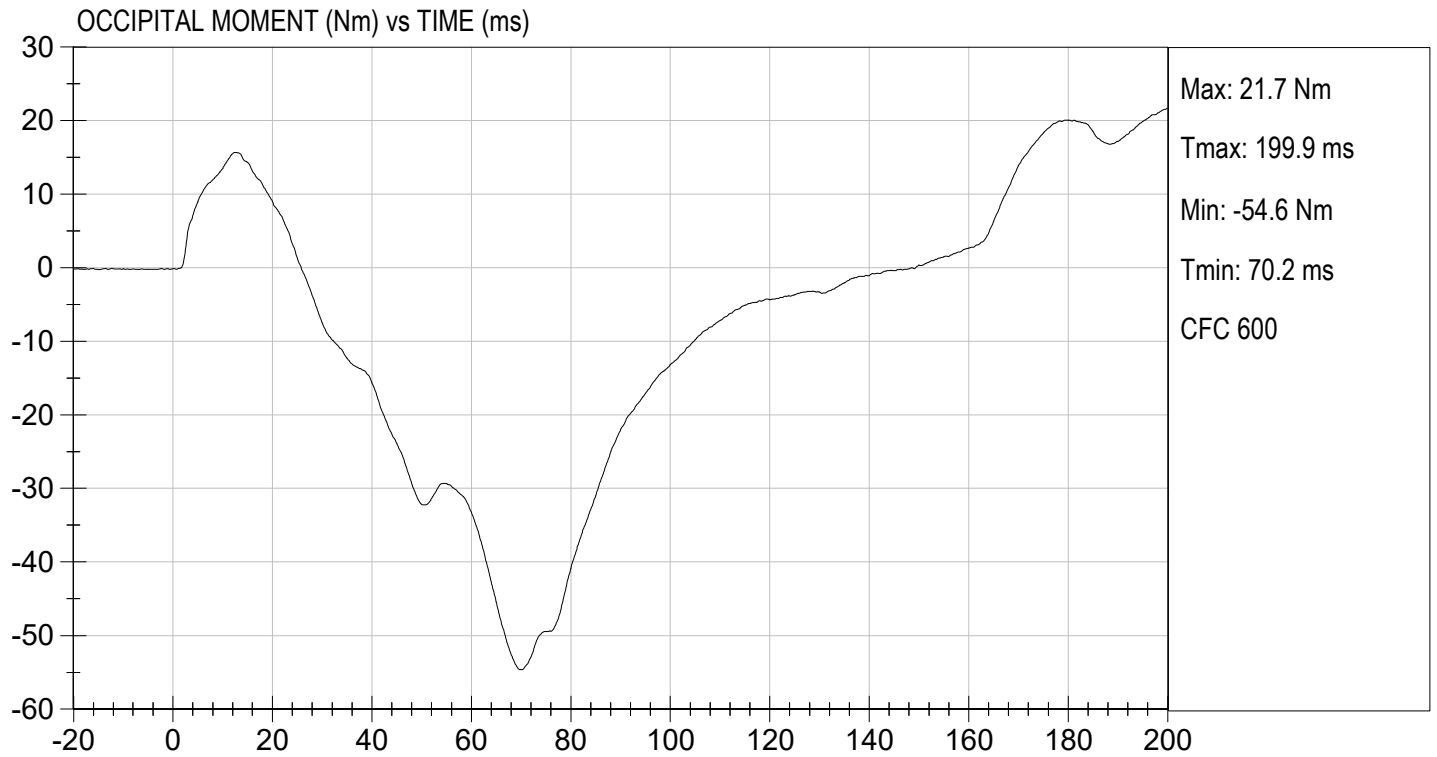
TEST DATE: 11/09/2023
TEST #: D233043





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 11/09/2023
TEST #: D233043



MGA RESEARCH CORPORATION**THORAX IMPACT****HYBRID III 5TH PERCENTILE**ATD Serial No: 142Test I.D: D233044

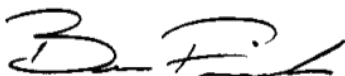
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	37	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4191	Pass
Internal Hysteresis	%	69 to 85	74	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4342	Pass
Overall Test Results				Pass



Laboratory Technician

11/09/2023

Test Date

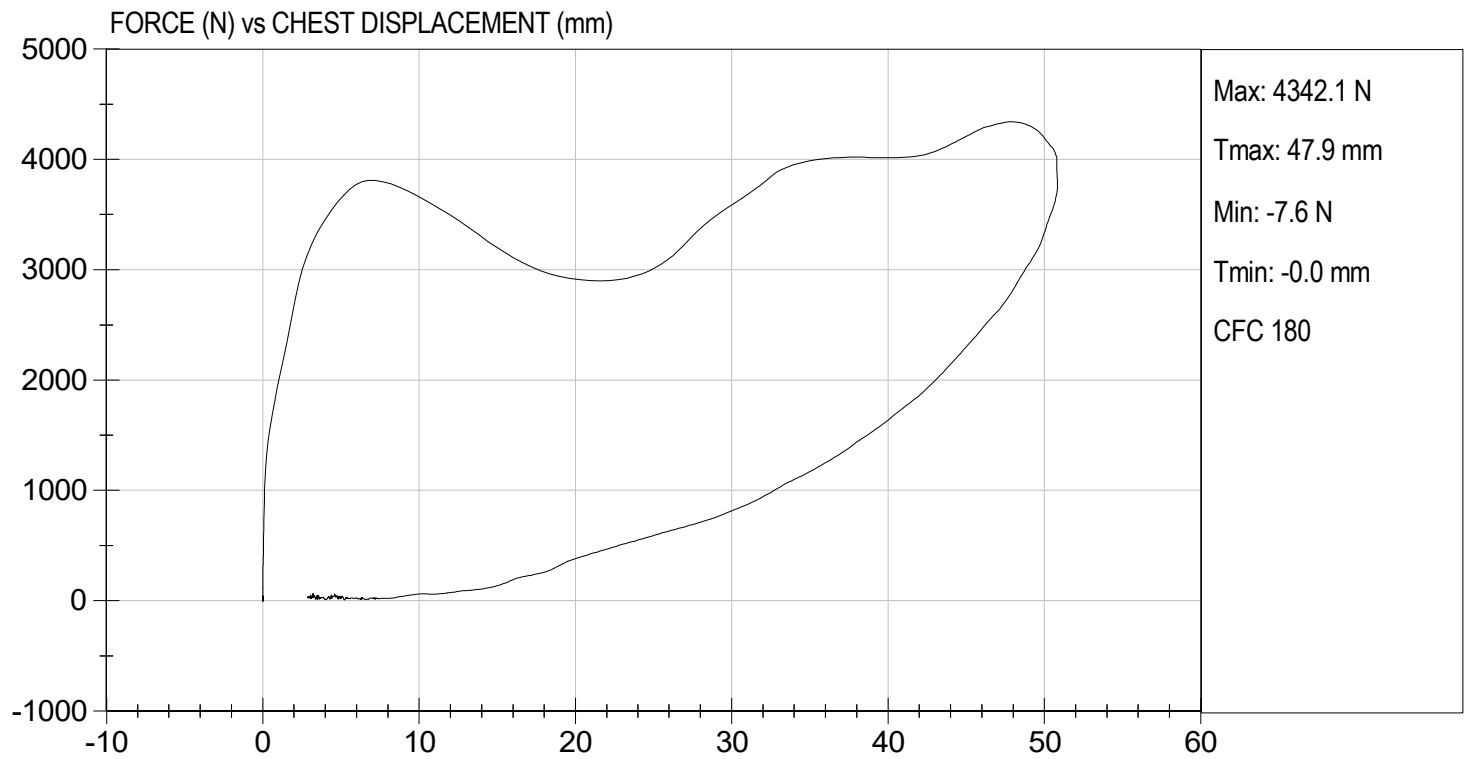


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 11/09/2023
TEST #: D233044



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142

Test I.D: D233045

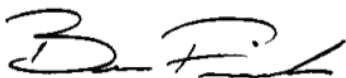
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3831	Pass
Overall Test Results				Pass



Laboratory Technician

11/09/2023

Test Date

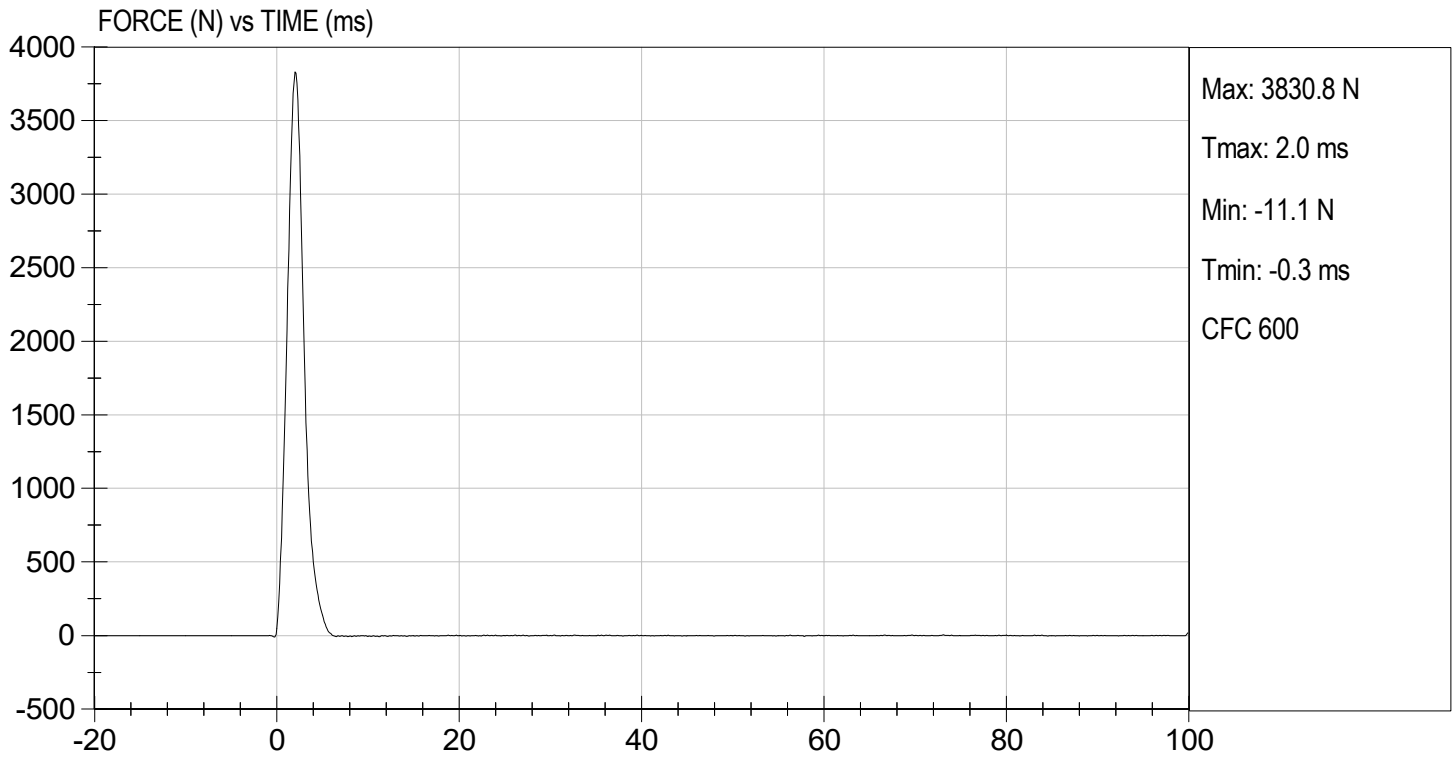


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.92 ft/s, 2.11 m/s

TEST DATE: 11/09/2023
TEST #: D233045



MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 142

Test I.D: D233046

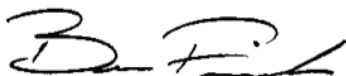
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3905	Pass
Overall Test Results				Pass



Laboratory Technician

11/09/2023

Test Date

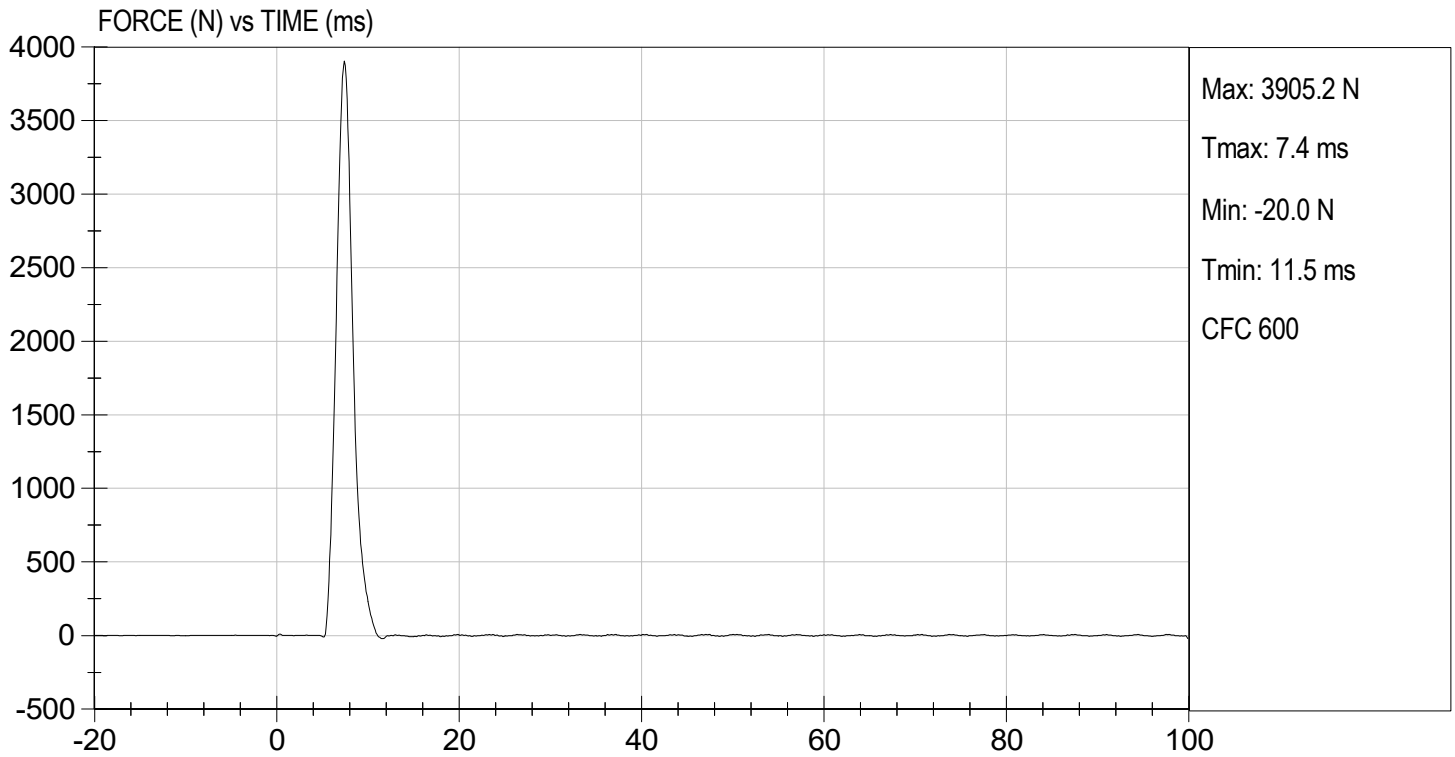


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.86 ft/s, 2.09 m/s

TEST DATE: 11/09/2023
TEST #: D233046



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 142

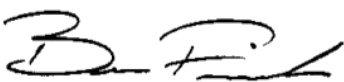
Test I.D: D233047

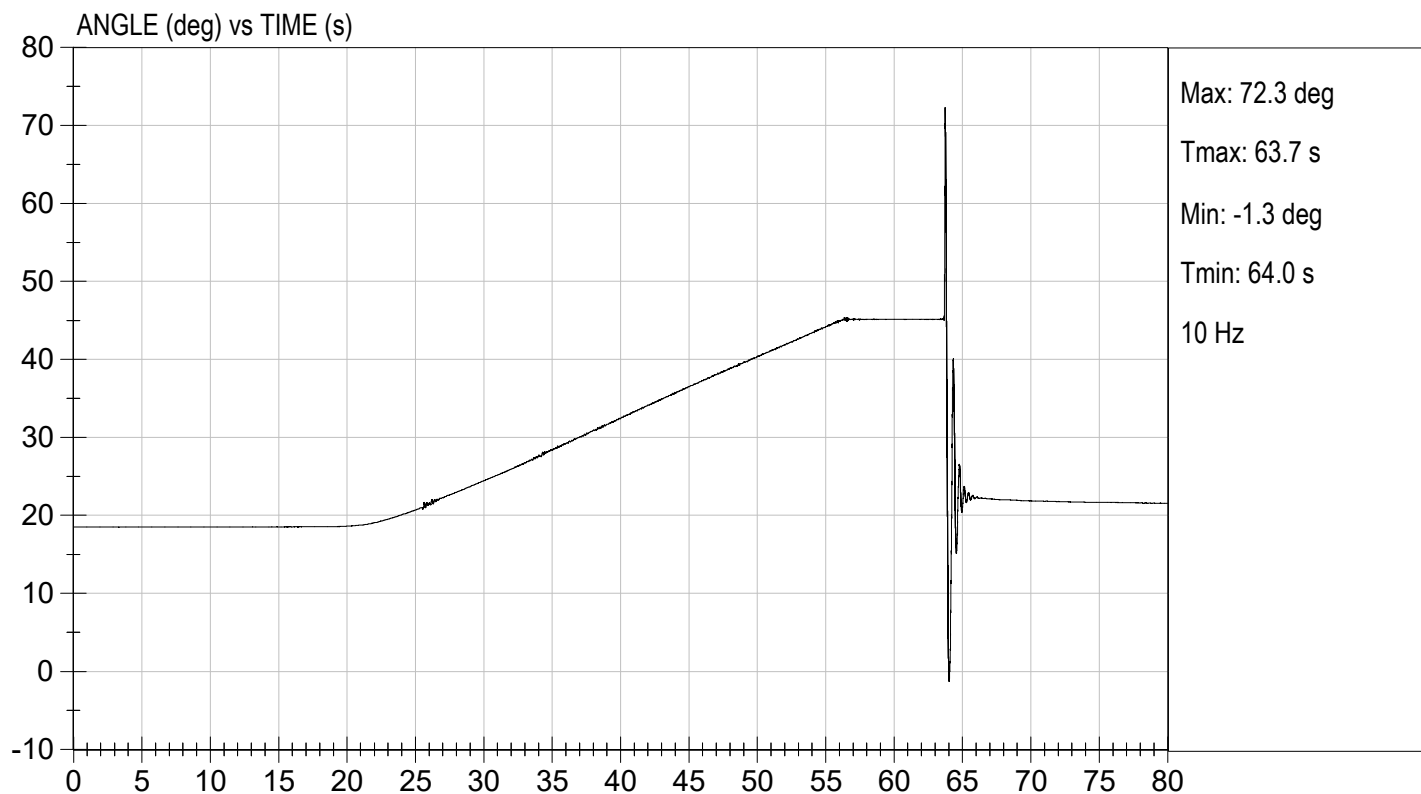
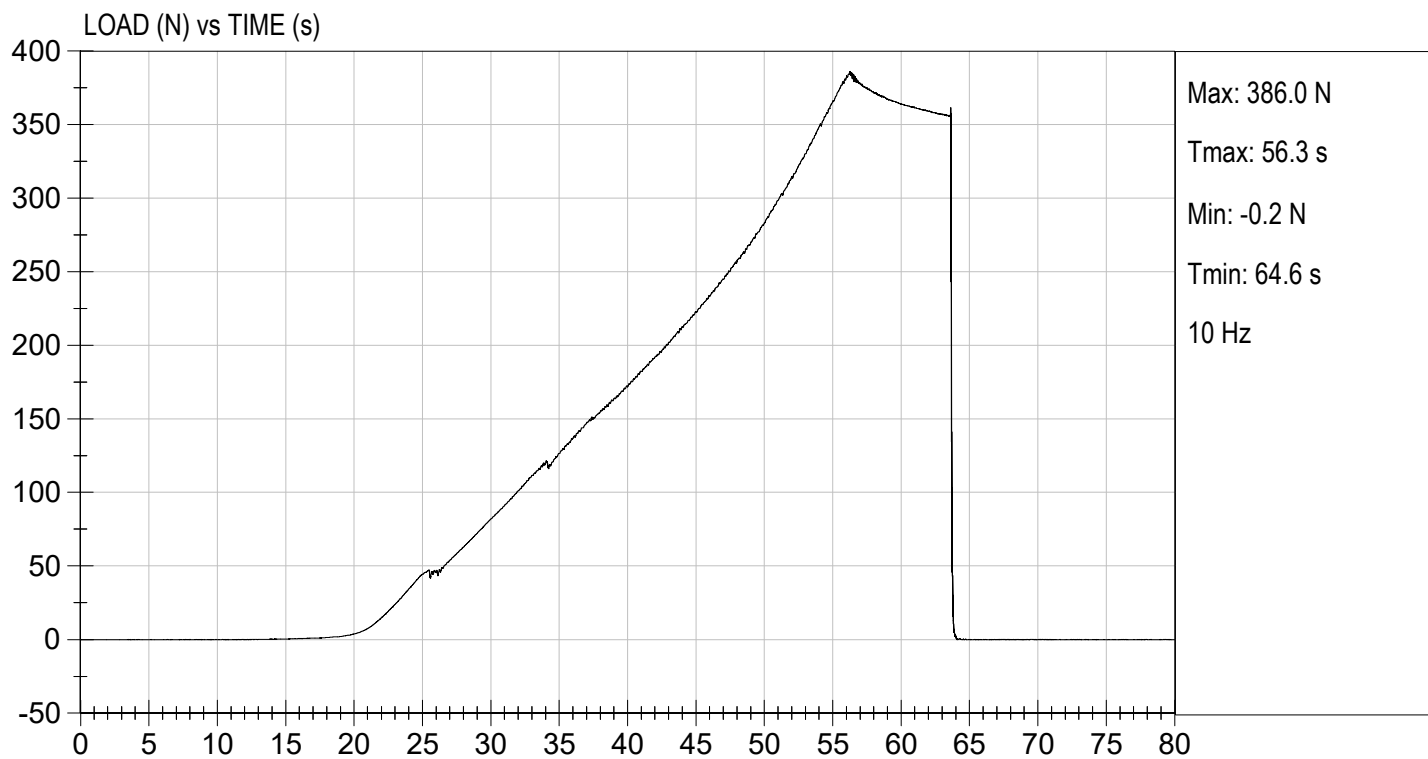
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	37	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	386	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.8	Pass
Overall Result			Pass	


Laboratory Technician

11/09/2023

Test Date


Approved By



APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

TABLE 1 – DRIVER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 50 th S/N 351		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary		X	P79741	Endevco	06/16/2023
			Y	P79743	Endevco	06/16/2023
			Z	P79744	Endevco	06/16/2023
	Redundant		X	P94834	Endevco	06/16/2023
			Y	P94856	Endevco	06/16/2023
			Z	P97412	Endevco	06/16/2023
Head Angular Rate Sensors			X	ARS7502	DTS	04/07/2023
			Y	ARS7524	DTS	04/07/2023
			Z	ARS7547	DTS	04/07/2023
Upper Neck Load Cell		Fx, Fy, Fz Mx, My, Mz	NG1911	Denton	06/23/2023	
Chest Accelerometers	Primary		X	P86792	Endevco	06/16/2023
			Y	P88348	Endevco	06/16/2023
			Z	P86793	Endevco	06/16/2023
	Redundant		X	P88666	Endevco	06/16/2023
			Y	P94109	Endevco	06/16/2023
			Z	P88667	Endevco	06/16/2023
Chest Potentiometer		X	351	Humanetics	06/16/2023	
Pelvis Accelerometers			X	P95526	Endevco	06/16/2023
			Y	P96038	Endevco	06/16/2023
			Z	P97742	Endevco	06/16/2023
Femur Load Cells	Right	Primary	Z	FG121P	Denton	06/19/2023
		Redundant	Z	FG121R	Denton	06/19/2023
	Left	Primary	Z	FG122P	Denton	06/19/2023
		Redundant	Z	FG122R	Denton	06/19/2023
Tibia Load Cells	Right	Upper	Mx, My, Fz	TG467	Denton	12/21/2022
		Lower	Mx, My, Fz	AG491	Denton	12/21/2022
	Left	Upper	Mx, My, Fz	TG478	Denton	12/21/2022
		Lower	Mx, My, Fz	AG500	Denton	12/21/2022
Foot Accelerometers	Right	Rear	X	T22486	Endevco	06/16/2023
			Z	P97382	Endevco	06/16/2023
		Front	Z	P82120	Endevco	06/16/2023
	Left	Rear	X	T16468	Endevco	06/16/2023
			Z	T32154	Endevco	06/12/2023
		Front	Z	T32190	Endevco	06/12/2023
Seat Belt Load Cells		Lap		SBG161	FTSS	08/22/2023
		Shoulder		SBG157	FTSS	08/22/2023

TABLE 2 – FRONT PASSENGER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 5 th S/N 142		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary		X	P94799	Endevco	10/27/2023
			Y	P94800	Endevco	10/27/2023
			Z	P94801	Endevco	10/27/2023
	Redundant		X	P94802	Endevco	10/27/2023
			Y	P94803	Endevco	10/27/2023
			Z	P97377	Endevco	10/27/2023
Head Angular Rate Sensors			X	ARS7413	DTS	04/07/2023
			Y	ARS7421	DTS	04/07/2023
			Z	ARS7423	DTS	04/07/2023
Upper Neck Load Cell		Fx, Fy, Fz Mx, My, Mz	NG1915	Denton	02/22/2023	
Chest Accelerometers	Primary		X	P88719	Endevco	10/27/2023
			Y	P94785	Endevco	10/27/2023
			Z	P94793	Endevco	10/27/2023
	Redundant		X	P95322	Endevco	10/27/2023
			Y	P95370	Endevco	10/27/2023
			Z	T30901	Endevco	10/27/2023
Chest Potentiometer		X	142	Humanetics	10/27/2023	
Pelvis Accelerometers			X	P82646	Endevco	10/27/2023
			Y	P94798	Endevco	10/30/2023
			Z	P97705	Endevco	10/27/2023
Femur Load Cells	Right	Primary	Z	FG126P	Denton	10/27/2023
		Redundant	Z	FG126R	Denton	10/27/2023
	Left	Primary	Z	FG127P	Denton	10/27/2023
		Redundant	Z	FG127R	Denton	10/27/2023
Tibia Load Cells	Right	Upper	Mx, My, Fz	TG405	Denton	02/22/2023
		Lower	Mx, My, Fz	AG368	Denton	02/22/2023
	Left	Upper	Mx, My, Fz	TG475	Denton	02/22/2023
		Lower	Mx, My, Fz	AG504	Denton	02/22/2023
Foot Accelerometers	Right	Rear	X	P94795	Endevco	10/27/2023
			Z	P94796	Endevco	10/27/2023
		Front	Z	P94797	Endevco	10/30/2023
	Left	Rear	X	P83167	Endevco	10/30/2023
			Z	P83168	Endevco	10/27/2023
		Front	Z	P83169	Endevco	10/30/2023
Seat Belt Load Cells		Lap				
		Shoulder		SBG272	FTSS	08/22/2023

TABLE 3 – VEHICLE INSTRUMENTATION

Instrument Location			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember / Rear Seat Accelerometers	Left	Primary	X	T30592	Endevco	09/06/2023
			Z	T35261	Endevco	10/20/2023
		Redundant	X	A340627	MSI	10/20/2023
	Right	Primary	X	T33146	Endevco	11/06/2023
			Z	T34158	Endevco	11/03/2023
		Redundant	X	T33473	Endevco	11/06/2023
Engine Accelerometers		Top	X	A356216	MSI	06/07/2023
		Bottom	X	T34057	Endevco	10/23/2023