

REPORT NUMBER: NCAP-MGA-19-055

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

**AUDI AG
2019 Audi e-tron quattro 5-Door SUV
NHTSA No.: O20195803**

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



Test Date: October 16, 2019

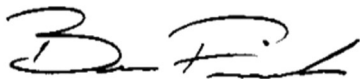
Final Report Date: December 4, 2019

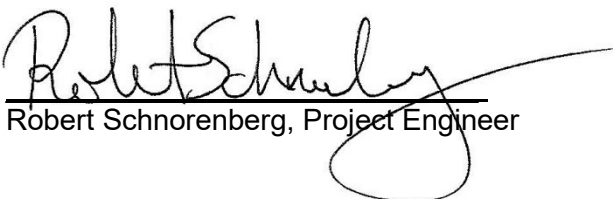
FINAL REPORT

**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590**

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Approval Date: December 4, 2019

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. NCAP-MGA-19-055	2. Government Accession No.	3. Recipient's Catalog No.																																																							
4. Title and Subtitle Final Report of New Car Assessment Program Frontal Impact Testing of a 2019 Audi e-tron quattro 5-Door SUV, NHTSA No.: O20195803		5. Report Date December 4, 2019																																																							
		6. Performing Organization Code MGA																																																							
7. Author(s) Robert Schnorenberg, Project Engineer		8. Performing Organization Report No. NCAP-MGA-19-055																																																							
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		10. Work Unit No.																																																							
		11. Contract or Grant No. DTNH22-12-D-00258																																																							
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590		13. Type of Report and Period Covered Final Test Report October 16, 2019 to December 4, 2019																																																							
		14. Sponsoring Agency Code NRM-110																																																							
15. Supplementary Notes																																																									
16. Abstract A 56.3 km/h NCAP Frontal Rigid Barrier Impact Test was conducted on a 2019 Audi e-tron quattro 5-Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and 305 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on October 16, 2019. The impact velocity of the vehicle was 56.84 km/h and the ambient temperature at the barrier face at the time of impact was 21.4°C. The target vehicle post-test maximum crush was 437 mm located at the vehicle centerline. The test vehicle's performance was as follows:																																																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <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>212</td> <td>700</td> <td>323</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>29</td> <td>52</td> <td>13</td> </tr> <tr> <td>Nij</td> <td></td> <td>1</td> <td>0.23</td> <td>1</td> <td>0.38</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>1127</td> <td>2620</td> <td>700</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>71</td> <td>2520</td> <td>298</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>610</td> <td>6805</td> <td>1087</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>1489</td> <td>6805</td> <td>1417</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)		700	212	700	323	Maximum Chest Compression	mm	63	29	52	13	Nij		1	0.23	1	0.38	Neck Tension	N	4170	1127	2620	700	Neck Compression	N	4000	71	2520	298	Left Femur Force	N	10008	610	6805	1087	Right Femur Force	N	10008	1489	6805	1417
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19. Security Classification of Report Unclassified	20. Security Classification of Page Unclassified	21. No. of Pages 209	22. Price																																																						

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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 DTNH22-12-D-00258. 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 2019 Audi e-tron quattro 5-Door SUV at a velocity of 56.84 km/h. The test was performed at MGA Research Corporation on October 16, 2019. 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 and passenger's lap and shoulder belts 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. 1659) were qualified previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 634 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 Stoddard Solvent or 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 437 mm located at 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 airbag.

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 knee airbag.

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)	212	0.23	1127	71	38	29	610	1489
Passenger (5 th)	323	0.38	700	298	39	13	1087	1417

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

TEST NOTES

Driver Lap Belt was not installed.

Passenger Lap Belt was not installed.

Barrier C-01 Fx recorded no valid data.

Barrier C-02 Fx recorded no valid data.

Barrier K-15 My recorded no valid data.

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: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20195803	Traction Control System (TCS)	Yes
Model Year	2019	Power Steering	Yes
Make	Audi	Power Window Auto-Reverse	Yes
Model	e-tron quattro	Driver Frontal Airbag	Yes
Body Style	5-Door SUV	Driver Curtain Airbag	Yes
VIN	WA1LAAGE0KB014841	Driver Head/Torso Airbag	No
Body Color	Florett Silver Metallic	Driver Torso Airbag	No
Odometer (km/mi)	21 km / 13 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)		Driver Pelvis Airbag	No
Type/No. Cylinders	Electric	Driver Knee Airbag	Yes
Engine Placement		Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	1	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	Yes	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	N/A

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

DATA FROM CERTIFICATION LABEL

Manufactured By	AUDI AG	GVWR (kg)	3165
Date of Manufacture	05/19	GAWR Front (kg)	1600
		GAWR Rear (kg)	1850

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)				480
Cargo Weight (RCLW) (kg)				136*

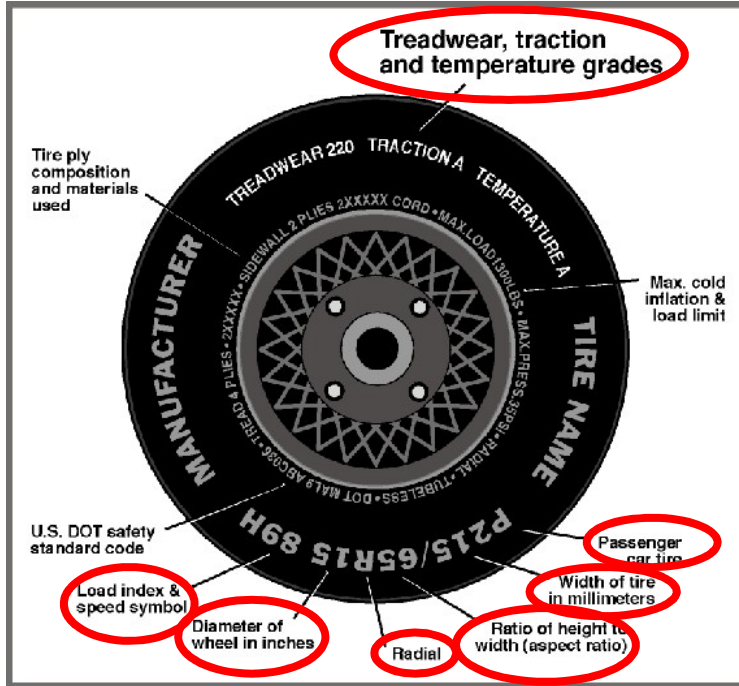
* Rated Cargo and Luggage Weight (RCLW) limited to maximum of 300 lbs (136 kg).

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	340	340
Cold Pressure (kPa)	260	280
Recommended Tire Size	255/50 R20	255/50 R20
Tire Size on Vehicle	255/50 R20	255/50 R20
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Eagle Sport	Eagle Sport
Treadwear	560	560
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	109H	109H
Tire Material	Rubber	Rubber
DOT Safety Code Left	K5N4 JK1R 0319	K5N4 JK1R 0319
DOT Safety Code Right	K5N4 JK1R 0319	K5N4 JK1R 0319

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	652.0	658.0		695.5	755.0	
Right	kg	651.5	656.5		675.5	761.0	
Ratio	%	49.8%	50.2%		47.5%	52.5%	
Totals	kg	1303.5	1314.5	2618.0	1371.0	1516.0	2887.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2618.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Test Vehicle Target Weight (TVTW)	kg	2895.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	825	829	838	839	1471
As Tested	mm	817	818	825	825	1539
Post Test	mm	N/A	N/A	818	840	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2930
Total Vehicle Length at Left Side	mm	4758
Total Vehicle Length at Centerline	mm	4901
Total Vehicle Length at Right Side	mm	4758
Weight of Ballast in Cargo Area	kg	103
Weight of Vehicle Components Removed	kg	50
Amount of Stoddard Solvent in Fuel Tank	L	N/A

List of components removed to meet test weight: None.

List of components removed for instrumentation, data box, and equipment installation: Cargo area divider / organizer / trim / carpet, jack and tools, spare tire and cover, subwoofer, underbody plastic.

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4901
2	Total Width	1946
3	Bumper Top Height	530
4	Bumper Bottom Height	400
5	Longitudinal Member Top Height	577
6	Distance between Longitudinal Members	835
7	Longitudinal Member Width	77
8	Engine Top Height	988
9	Engine Bottom Height	390
10	Engine and Gearbox Width	300
11	Front Bumper-Engine Distance	740
12	Front Shock Absorber Fixing Height	920
13	Bonnet Leading Edge Height	270
14	Front Shock Absorber Fixing Width	875
15	Front Bumper – Front Axle Distance	N/A
16	Front Axle – A-Pillar Distance	535
17	A-Pillar – B-Pillar Distance	1110
18	B-Pillar – Rear Axle Distance	1285
19	B-Pillar – C-Pillar Distance	761
20	Roof Sill Bottom Height	1470
21	Roof Sill Top Height	1575
22	Floor Sill Bottom Height	277
23	Floor Sill Top Height	460

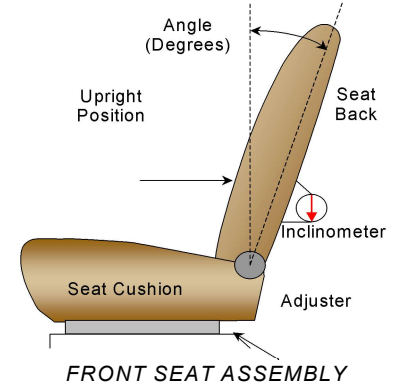
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

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 October 2015.



	Degrees
Driver Seat Back Angle	18.0° on seatback center
Passenger Seat Back Angle	19.6° on seatback center

SEAT FORE/AFT POSITIONS

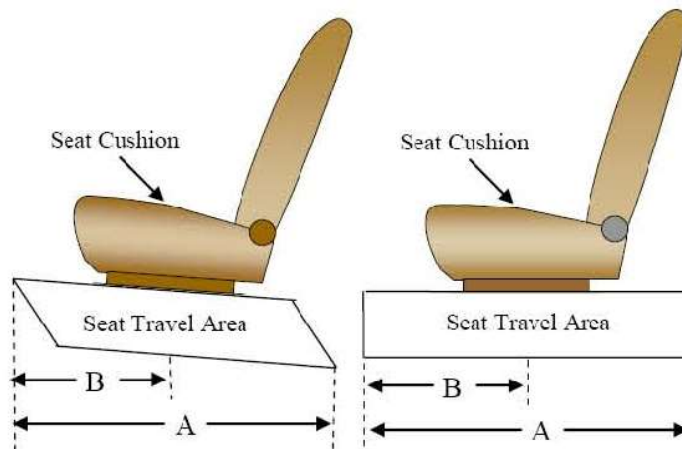
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated October 2015.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	312 mm	156 mm
Passenger Seat	245 mm	0 mm

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)	1 (1 st as 0)



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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

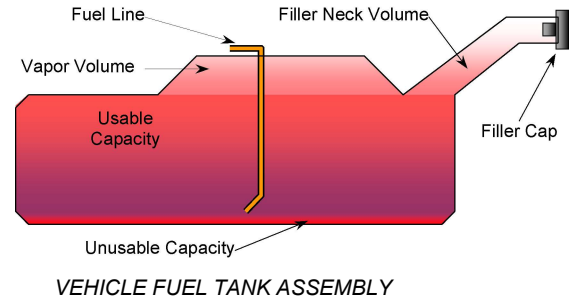
NHTSA No.: O20195803
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FUEL TANK CAPACITY DATA

	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	

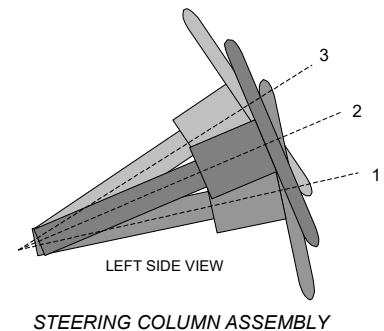
FUEL PUMP

The vehicle propulsion system is fully electric and does not contain a fuel pump.



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.



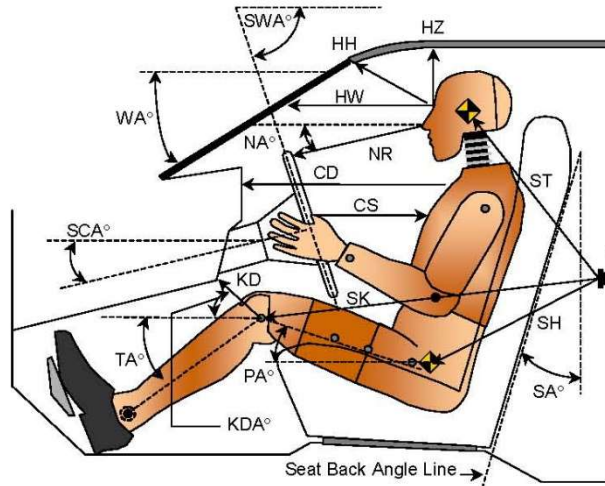
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	67.1	
Geometric Center Position 2	65.3	
Uppermost Position 3	63.4	
Telescoping Steering Wheel Travel		65
Test Position	65.3	33

**DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019



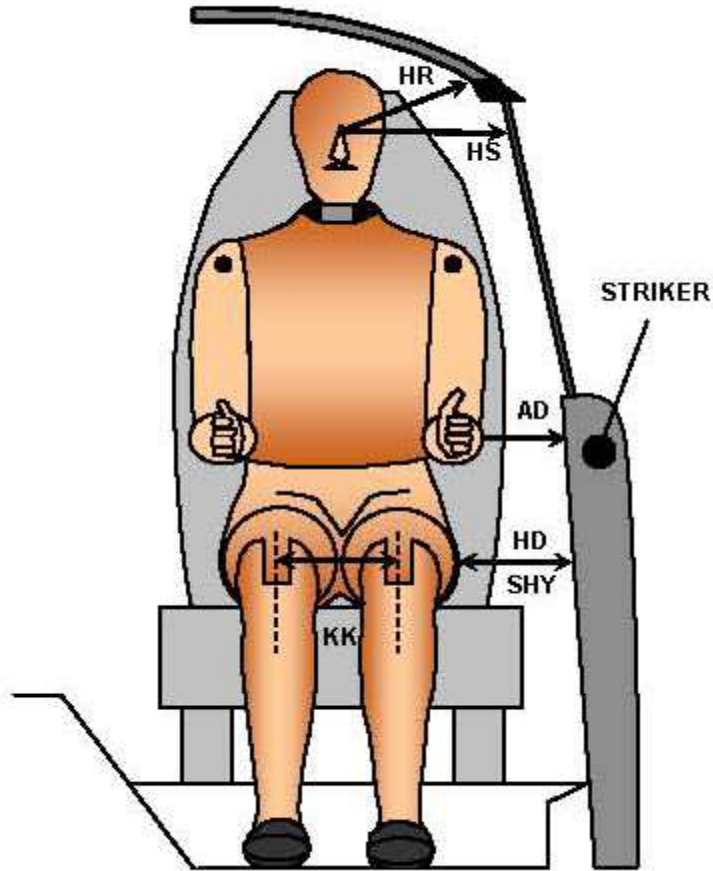
LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		25.0		
SWA°	Steering Wheel Angle		65.3		
SCA°	Steering Column Angle		24.7		
SA°	Seat Back Angle		18.0		19.6
HZ	Head to Roof (Z)	182	90	201	90
HH	Head to Header	346	24.9	310	39.6
HW	Head to Windshield	632	0	641	0
NR	Nose to Rim	355	7.6		
CD	Chest to Dash	504		339	
CS	Chest to Steering Hub	304	1.4		
RA	Rim to Abdomen	174	0		
KDL	Left Knee to Dash	224	33.6	150	86.1
KDR	Right Knee to Dash	185	35.3	162	75.8
PA°	Pelvic Angle		24.1		20.3
TA°	Tibia Angle		42.8		82.3
SK	Striker to Knee	553	115.0	636	93.1
ST	Striker to Head	511	7.3	497	16.4
SH	Striker to H-Point	230	134.1	301	107.4

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019



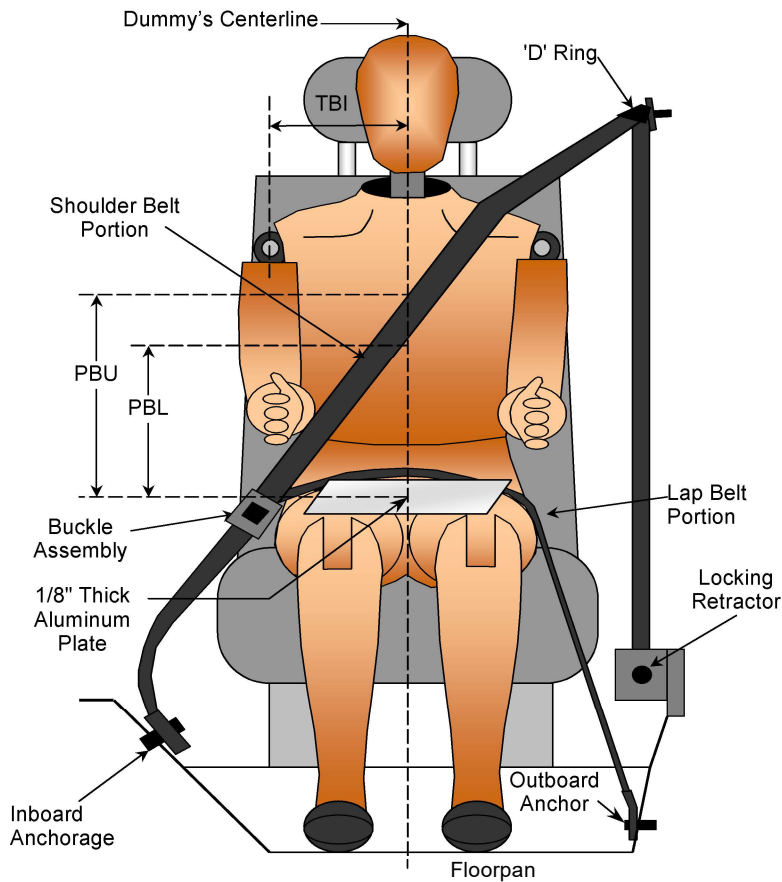
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	73	96
HD	H-Point to Door	146	175
HR	Head to Side Header	242	258
HS	Head to Side Window	374	391
KK	Knee to Knee	350	233
SHY	Striker to H-Point (Y Direction)	308	331
AA	Ankle to Ankle	340	171

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	N/A	N/A
PBL - Top surface of reference to belt lower edge	mm	N/A	N/A

BELT LENGTH DATA

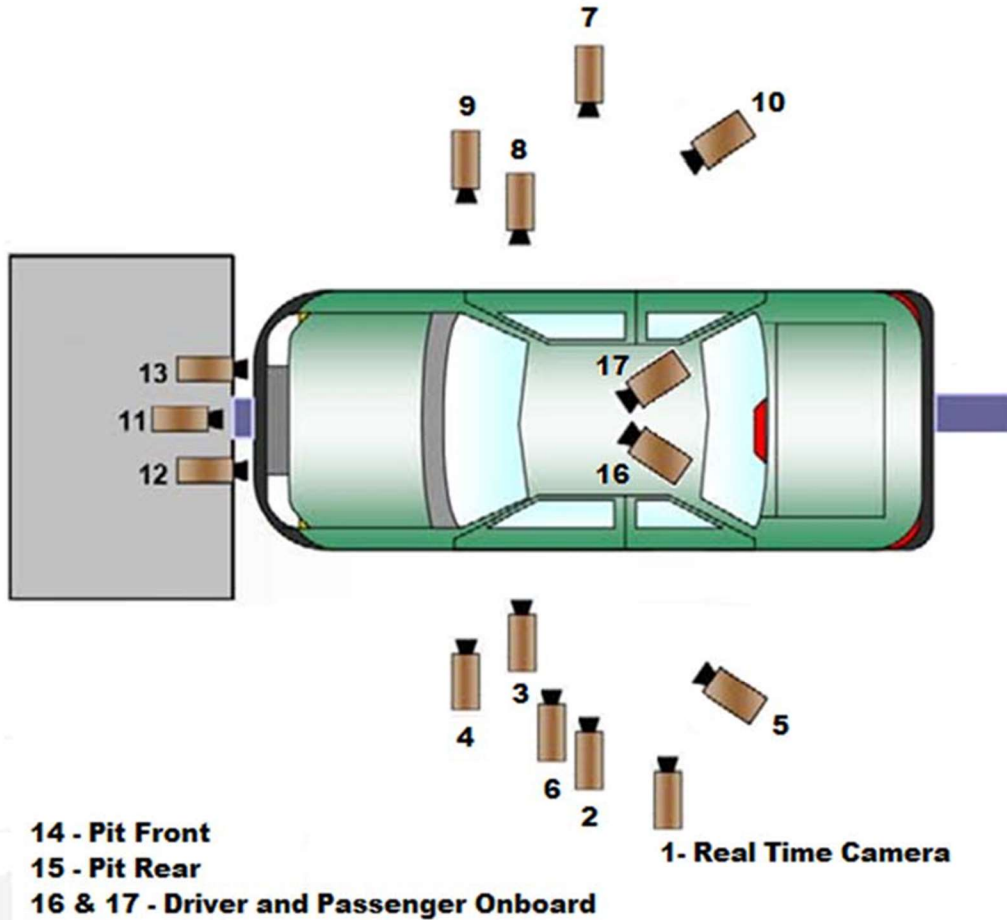
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	895	915
Lap Belt Length as measured on ATD	mm	740	805
Remainder of belt on reel	mm	785	750
Total Belt Length for Continuous Webbing Systems	mm	3130	3130

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
Test Date: 10/16/2019

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: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

CAMERA LOCATIONS

No.	Camera View	Coordinates* (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall					30
2	Left Overall	-2250	-5930	-1350	11	1000
3	Driver Close-Up	-1470	-7100	-2000	50	1000
4	Left Front Half	-1240	-5620	-1440	24	1000
5	Left Angle	-7360	-5740	-1920	75	1000
6	Steering Column	-940	-5790	-1260	50	1000
7	Right Overall	-2100	-5870	-1430	11	1000
8	Passenger Close-Up	-1480	-6940	-2000	50	1000
9	Right Front Half	-1020	-5770	-1400	24	1000
10	Right Angle	-7160	-5720	-1950	75	1000
11	Windshield	-120	0	-2310	11	1000
12	Driver Windshield	-190	-370	-2230	25	1000
13	Passenger Windshield	-190	-370	-2230	25	1000
14	Pit Front	-1000	0	3340	24	1000
15	Pit Rear	-2960	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

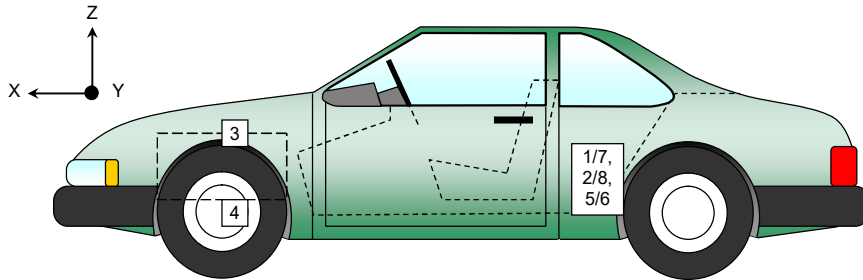
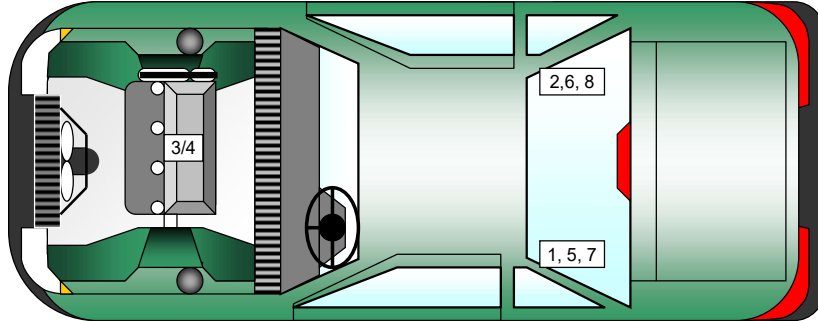
+Y = right of monorail centerline

+Z = below ground level

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
Test Date: 10/16/2019



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1955	-390	-350
2	Right Rear Crossmember Accelerometer – X Direction	1955	390	-350
3	Engine Top X	3998	62	-1000
4	Engine Bottom X	3768	-15	-390
5	Left Rear Crossmember Accelerometer – Z Direction	1955	-390	-350
6	Right Rear Crossmember Accelerometer – Z Direction	1955	390	-350
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1955	-430	-350
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1955	430	-350

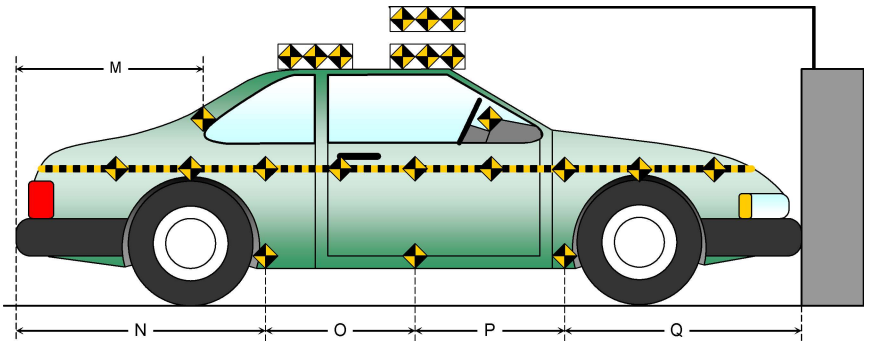
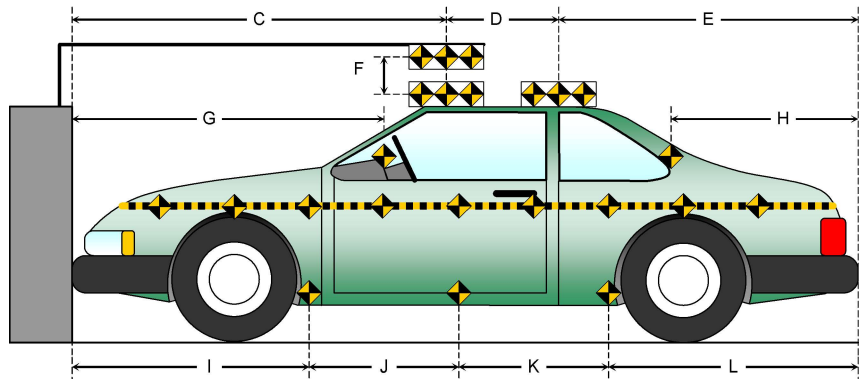
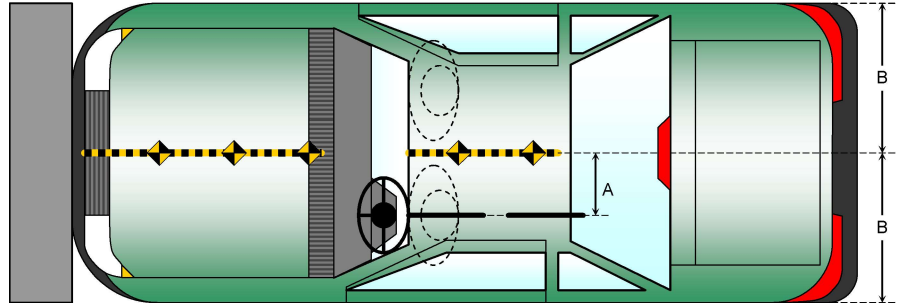
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

Item	Value (mm)
A	355
B	973
C	2320
D	610
E	1971
F	182
G	
H	822
I	1487
J	935
K	935
L	1544
M	795
N	1545
O	935
P	935
Q	1486



**DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

ADVANCED RESEARCH LOAD CELL BARRIER

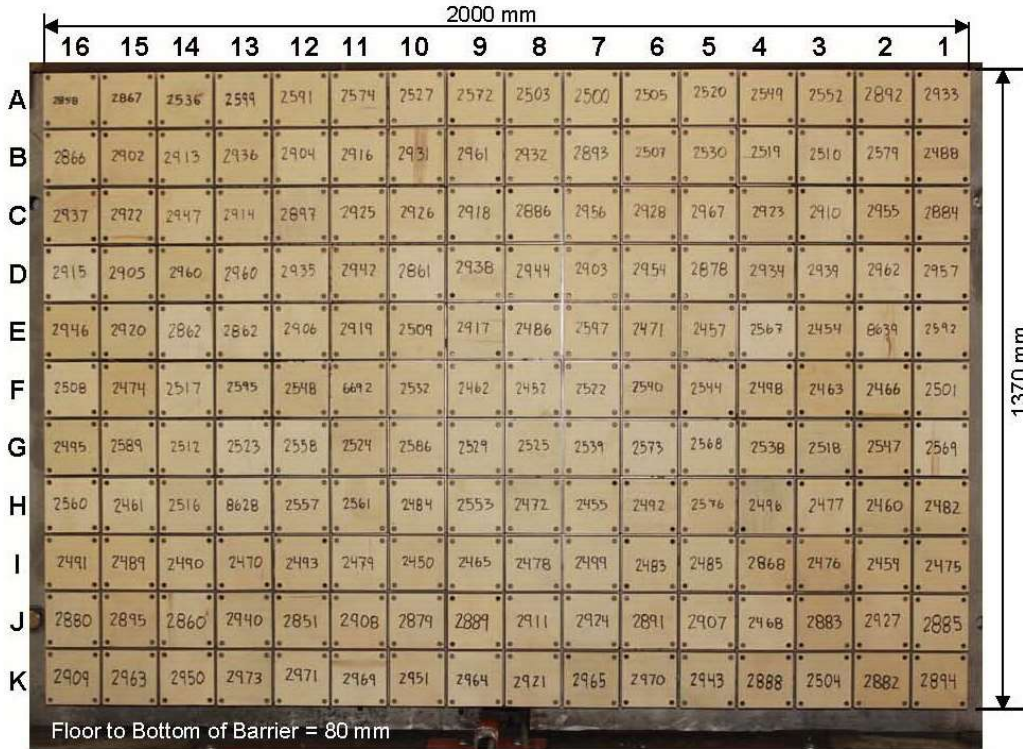


Photo for Reference Only

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: 2019 Audi e-tron quattro 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
Test Date: 10/16/2019

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Data Channels	49
Passenger Dummy Data Channels	49
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	634

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	14
Real-Time	2
Total	18

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 5% / 1659
Head Contact	Frontal Airbag, Headrest	Frontal Airbag, Headrest
Upper Torso Contact	None	None
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

DOOR OPENING, TRUNK OPENING, AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were unlocked	Doors were unlocked
Front Door Opening	Remained closed and latched; opened without tools	Remained closed and latched; opened without tools
Rear Door Opening	Remained closed and latched; opened without tools	Remained closed and latched; opened without tools
Trunk/Hatch/Tailgate Opening	Hood unlatched, tailgate unlatch caused by test-lab installed release cord	
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	None
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1160
Center	mm	1175
Right Side	mm	1080
Average	mm	1138

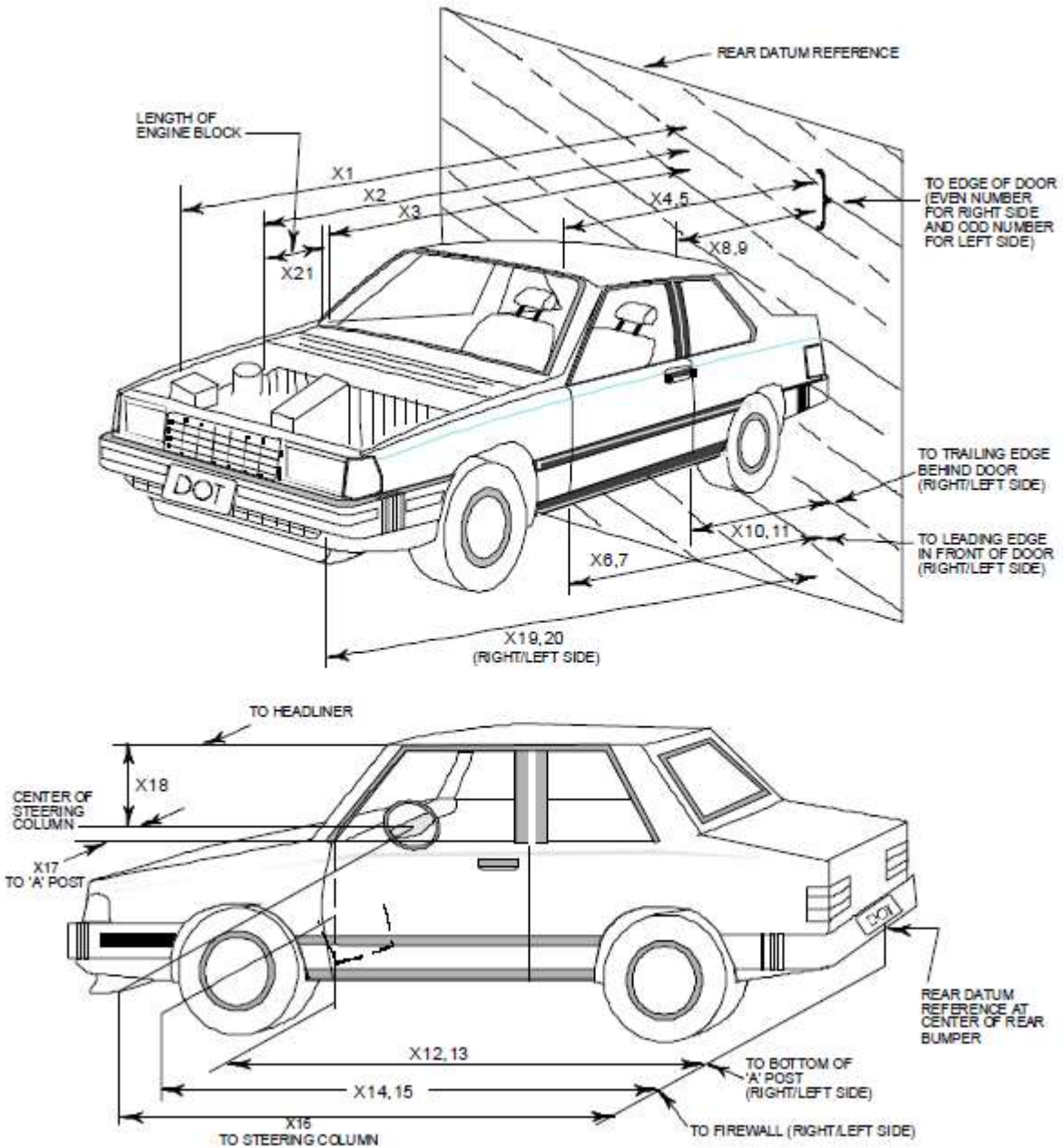
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019



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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
Test Date: 10/16/2019

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4901	4464	437
2	RSOV to Front of Engine	4104	4093	11
3	RSOV to Firewall	3552	3562	-10
4	RSOV to Upper Leading Edge of Right Door	3338	3336	2
5	RSOV to Upper Leading Edge of Left Door	3338	3338	0
6	RSOV to Lower Leading Edge of Right Door	3377	3376	1
7	RSOV to Lower Leading Edge of Left Door	3377	3375	2
8	RSOV to Upper Trailing Edge of Right Door	2252	2242	10
9	RSOV to Upper Trailing Edge of Left Door	2252	2230	22
10	RSOV to Lower Trailing Edge of Right Door	2310	2300	10
11	RSOV to Lower Trailing Edge of Left Door	2310	2300	10
12	RSOV to Bottom of "A" Post of Right Side	3402	3393	9
13	RSOV to Bottom of "A" Post of Left Side	3392	3376	16
14	RSOV to Firewall, Right Side	3592	3550	42
15	RSOV to Firewall, Left Side	3578	3581	-3
16	RSOV to Steering Column	2858	2885	-27
17	Center of Steering Column to "A" Post	350	367	-17
18	Center of Steering Column to Headliner	402	441	-39
19	RSOV to Right Side of Front Bumper	4758	4425	333
20	RSOV to Left Side of Front Bumper	4758	4388	370
21	Length of Engine Block	300	300	0
RD	RSOV to Right Side of Dash Panel	3110	3095	15
CD	RSOV to Center of Dash Panel	3032	3087	-55
LD	RSOV to Left Side of Dash Panel	3154	3149	5

All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

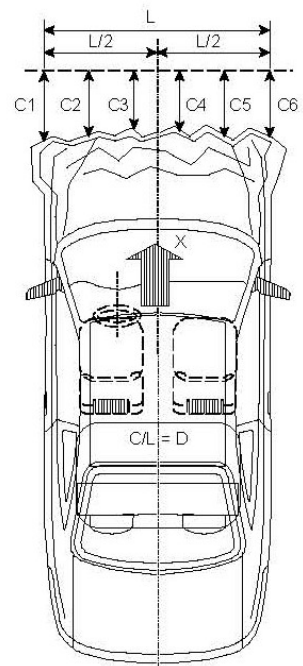
NHTSA No.: O20195803
Test Date: 10/16/2019

VEHICLE INFORMATION

VIN:	<u>WA1LAAGE0KB014841</u>	Wheelbase (mm):	<u>2930</u>
Vehicle Size Category:	<u>MPV</u>	Test Weight (kg):	<u>2887.0</u>

ACCELEROMETER DATA

Accelerometer Locations:	<u>As per Data Sheet No. 7</u>
Cal. Procedure/Interval:	<u>MGA Procedure / 6 month</u>
Integration Algorithm:	<u>Trapezoidal</u>
Linearity:	<u>> 99%</u>
Impact Velocity (km/h):	<u>56.84</u>
Velocity Change (km/h):	<u>68.7</u>
Time of Separation (msec)	<u>96</u>



CRUSH PROFILE

Collision Deformation Classification:	<u>12FDEW2</u>
Midpoint of Damage:	<u>Centerline</u>
Damage Region Length (mm):	<u>1280</u>
Impact Mode:	<u>Frontal</u>

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4758	4388	370
C2	Crush zone 2 at left side	mm	4846	4431	415
C3	Crush zone 3 at left side	mm	4866	4433	433
C4	Crush zone 4 at right side	mm	4866	4434	432
C5	Crush zone 5 at right side	mm	4846	4433	413
C6	Crush zone 6 at right side	mm	4758	4425	333
L	C1 TO C6	mm	1280	1284	-4

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

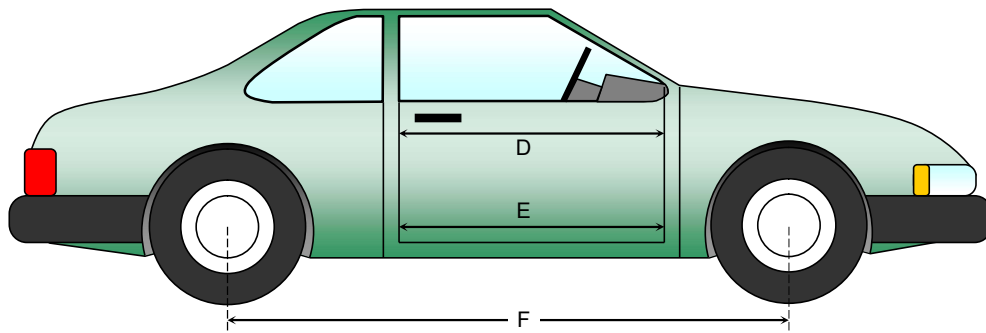
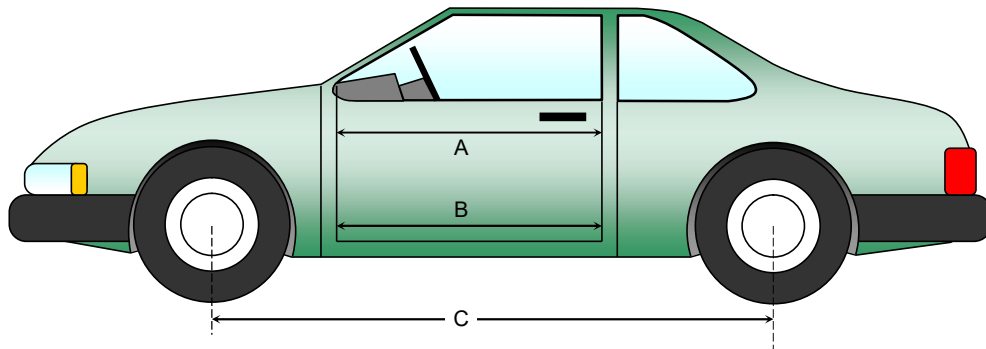
NHTSA No.: O20195803
 Test Date: 10/16/2019

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	970	970	0
B	Left Side Lower	mm	887	887	0
D	Right Side Upper	mm	970	970	0
E	Right Side Lower	mm	887	887	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2930	2795	135
F	Right Side Wheelbase	mm	2930	2820	110



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

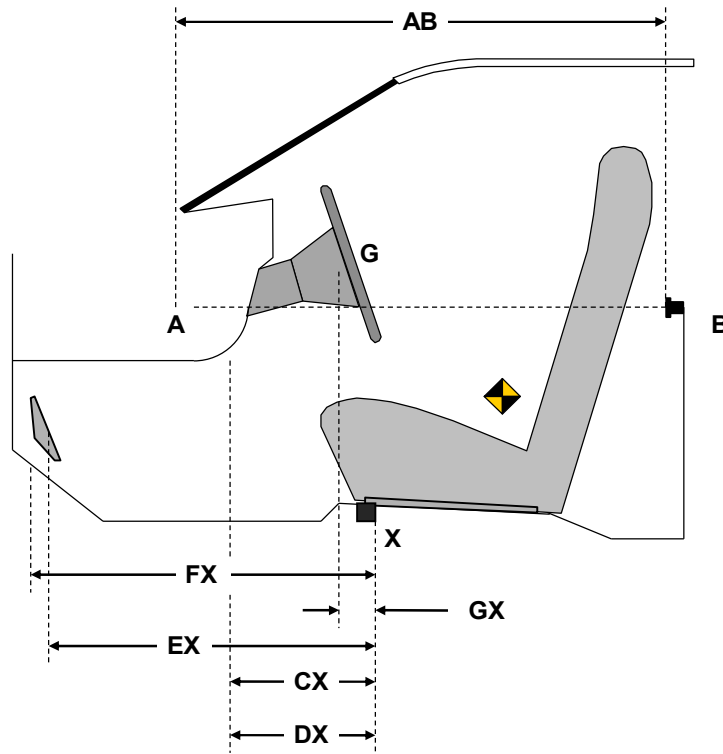
Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	785	785	0
CX	Left Knee Bolster to X	mm	255	260	-5
DX	Right Knee Bolster to X	mm	295	283	12
EX	Brake Pedal to X	mm	545	565	-20
FX	Foot Rest to X	mm	605	615	-10
GX	Center of Steering Column Wheel Hub to X	mm	50	110	-60

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

WINDSHIELD MOUNTING DETAILS

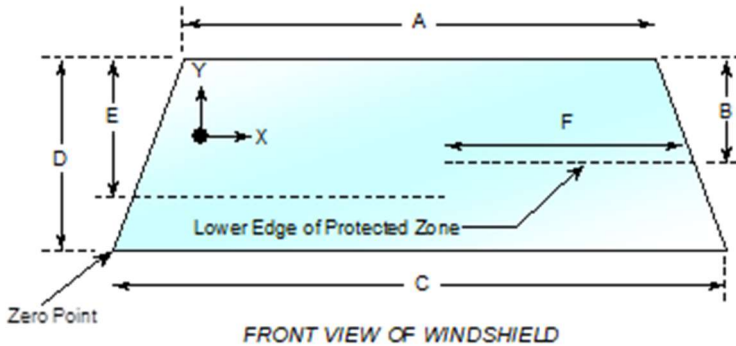
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.4°C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	1855	1855	100
Right Side	1855	1855	100
Total	3710	3710	100



Item	Units	Value
A	mm	1270
B	mm	338
C	mm	1548
D	mm	806
E	mm	412
F	mm	570

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: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

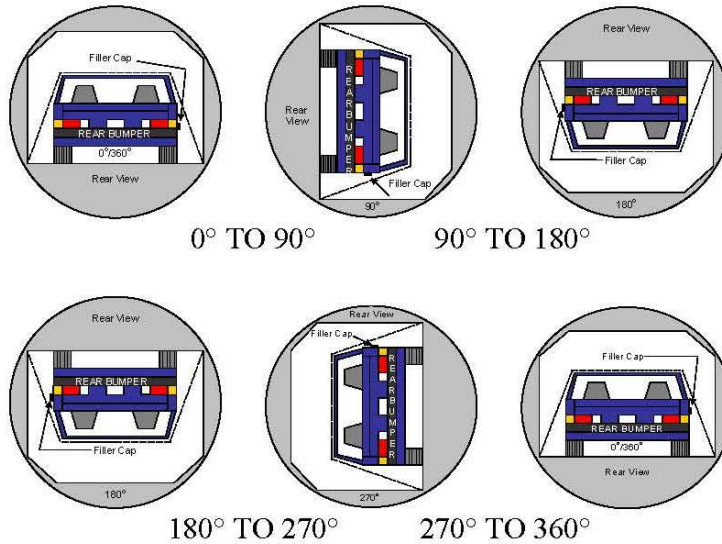
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.4°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: **None**

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: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

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°				

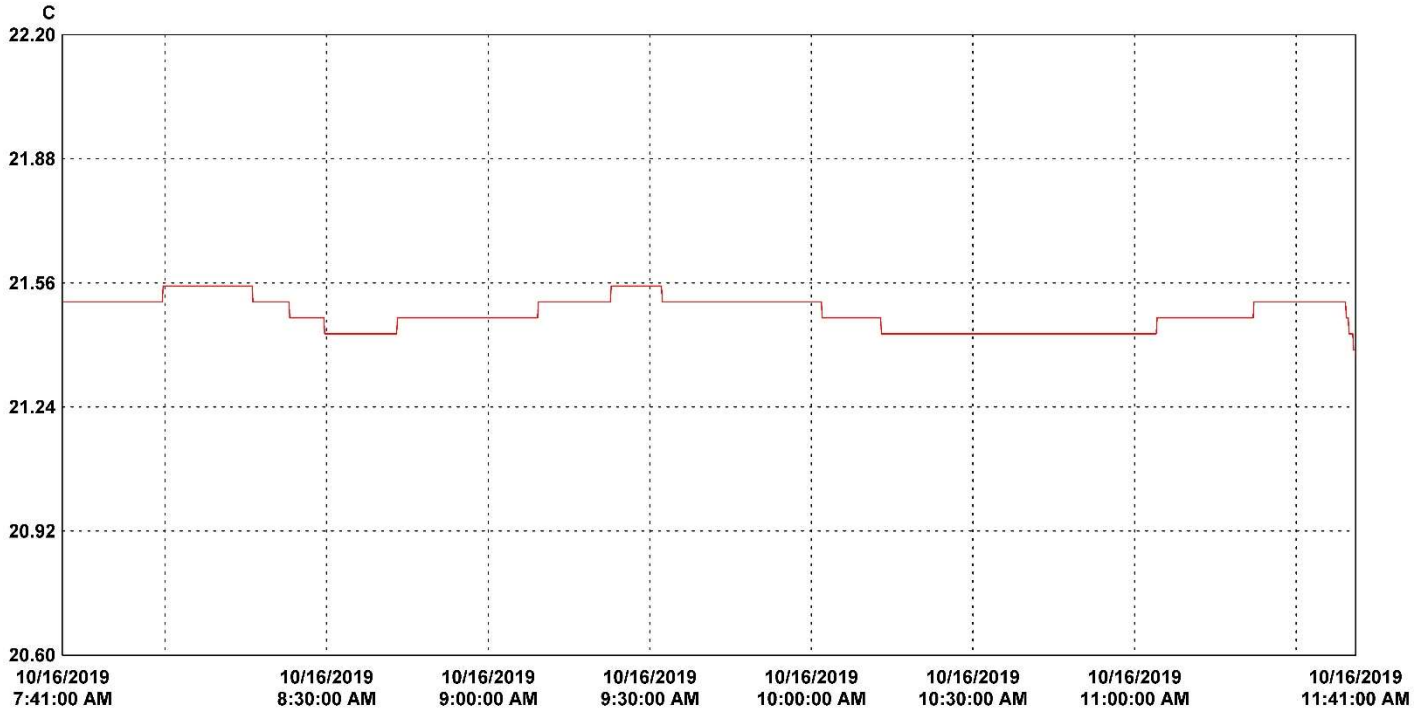
SOLVENT SPILLAGE LOCATION TABLE

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: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019



30 minutes/div 4 hours (M/d/yyyy h:mm:ss tt) Central Time Graph file (truncated): O20195803 2019 Audi e-tron 5-Door SUV NCAP.spg

LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	18352047	VSC_Prep_Room	1	21.55	21.55	21.48	21.39	C	Temperature	18352047_VSC_Prep_Room.spl

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
Test Date: 10/16/2019

ELECTRIC VEHICLE PROPULSION SYSTEM

	Units	Observations and Conclusions
Type of Electric Vehicle		Electric
Propulsion Battery Type		Lithium Ion
Nominal Voltage	V	397
Physical Location of Automatic Propulsion Battery Disconnect		Inside High Voltage Battery
Auxiliary Battery Type		12V AGM Battery

PROPULSION BATTERY SYSTEM DATA

	Units	Observations and Conclusions
Electrolyte Fluid Type		LiPF6 + EC + EMC
Electrolyte Fluid Specific Gravity	g/L	1.29
Electrolyte Fluid Kinematic Viscosity	cSt	3.19
Electrolyte Fluid Color		Clear and Colorless
Propulsion Battery Coolant Type, Color, Specific Gravity (if applicable)		G13
Location of Battery Modules		Inside Passenger Compartment
		X Outside Passenger Compartment
		The high-voltage battery is located below the occupant compartment

PROPULSION BATTERY STATE OF CHARGE

<i>For all battery types:</i>	
Voltage range corresponding to useable energy of the battery:	
Minimum State of Charge	227 V
Maximum State of Charge	459 V
95% of Maximum State of Charge	436 V
Test Voltage - No less than 95% of maximum State of Charge	428.1 V
<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: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

VEHICLE CHASSIS GROUND POINT(S) LOCATION(S)

Details of Vehicle Chassis Ground Point(s) & Location(s)	Grounded at high-voltage battery cover to vehicle chassis mounting bolt.
--	--

PROPULSION BATTERY SYSTEM

Details of Electric Energy Storage/Conversion System Test Points	Connected at + and – terminal ends of propulsion system
Additional Comments	Utilized Audi-supplied break-out harness to connect to + and – terminal ends of propulsion system

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		22600211
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		11/14/2018

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	428.1
----	---	-------

ELECTRIC ISOLATION MEASUREMENTS
PROPULSION BATTERY TO VEHICLE CHASSIS

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

V1	V	129.6
V2	V	185.4

PROPULSION BATTERY TO VEHICLE CHASSIS ACROSS RESISTOR

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

R_o	Ω	222,800
-------	---	---------

V1' Pre-Impact	V	28.5
V2' Pre-Impact	V	27.9

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

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	1,920,999
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$		
Ri2 Pre-Impact	Ω	2,136,940
Ri = The lesser of Ri1 and Ri2		
Ri Pre-Impact	Ω	1,920,999
$R_i / V_b = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$		
Ri / Vb Pre-Impact	Ω	4,487

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
POST-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING**

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		22600211
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		11/14/2018

ELECTRICAL ISOLATION MEASUREMENTS

Vb Post-Impact	V	0.9
----------------	---	-----

V1 Post-Impact	V	1.0	Impact Time	1	Minutes	4	Seconds
V2 Post-Impact	V	0.1		1	Minutes	8	Seconds
V1' Post-Impact	V	0.0		1	Minutes	20	Seconds
V2' Post-Impact	V	0.0		1	Minutes	26	Seconds

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

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	4	Seconds
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$							
Ri2 Post-Impact	Ω	Zero Volts	Impact Time	1	Minutes	8	Seconds
Ri = The lesser of Ri1 and Ri2							
Ri Post-Impact	Ω	Zero Volts	Impact Time	1	Minutes	4	Seconds
$R_i / V_b = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$							
Ri / Vb Post-Impact	Ω	Zero Volts	Impact Time	1	Minutes	4	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: 2019 Audi e-tron quattro 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
Test Date: 10/16/2019

PROPULSION BATTERY SYSTEM COMPONENTS

Describe any Propulsion Battery Module movement within the passenger compartment [Supply photographs as appropriate]:
No Movement

	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

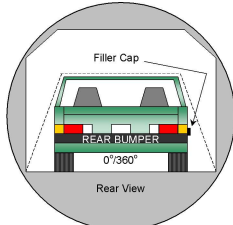
	Yes (Fail)	No
Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?		X

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

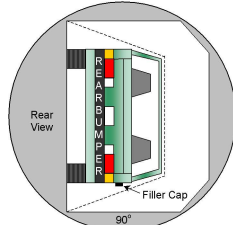
Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
Test Date: 10/16/2019

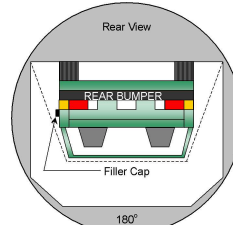
PROPULSION BATTERY SYSTEM COMPONENTS



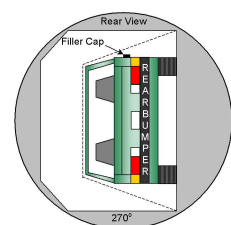
0°/360°



90°



180°



270°

PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Test Phase	Rotation Time (spec. 1-3 min)			FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
	min	sec	min	sec	min	sec	min	sec	min	sec	
0° - 90°	1	52	5	6	6	52	7	7	7	7	
90° - 180°	1	51	5	6	6	51	7	7	7	7	
180° - 270°	1	48	5	6	6	48	7	7	7	7	
270° - 360°	1	52	5	6	6	52	7	7	7	7	

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°	None	Not Applicable
90° to 180°	None	Not Applicable
180° to 270°	None	Not Applicable
270° to 360°	None	Not Applicable
Total Spillage	None	

	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: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		22600211
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		11/14/2018

ELECTRICAL ISOLATION MEASUREMENTS

Vb Post-Impact	V	0.9
----------------	---	-----

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	0.2	V	0°	min	4	sec	
	0.2		90°				2
	0.2		180°				2
	0.2		270°				2
	0.2		360°				2
V2	0.2	V	0°	min	9	sec	
	0.2		90°				2
	0.2		180°				2
	0.2		270°				2
	0.2		360°				2
V1'	0.0	V	0°	min	26	sec	
	0.0		90°				2
	0.0		180°				2
	0.0		270°				2
	0.0		360°				2
V2'	0.0	V	0°	min	42	sec	
	0.0		90°				2
	0.0		180°				2
	0.0		270°				2
	0.0		360°				2

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20195803
 Test Date: 10/16/2019

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°		min	
	Zero Volts		90°	2		4
	Zero Volts		180°	2		15
	Zero Volts		270°	2		26
	Zero Volts		360°	2		21
$Ri2 = Ro (1 + V1/V2) [(V2-V2')/V2']$						
Ri2	Zero Volts	Ω	0°		min	
	Zero Volts		90°	2		9
	Zero Volts		180°	2		20
	Zero Volts		270°	2		30
	Zero Volts		360°	2		25
Ri = The lesser of Ri1 and Ri2						
Ri	Zero Volts	Ω	0°		min	
	Zero Volts		90°	2		4
	Zero Volts		180°	2		15
	Zero Volts		270°	2		26
	Zero Volts		360°	2		21
$Ri / Vb = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$						
Ri / Vb	Zero Volts	Ω/V	0°		min	
	Zero Volts		90°	2		4
	Zero Volts		180°	2		15
	Zero Volts		270°	2		26
	Zero Volts		360°	2		21

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	

**APPENDIX A
PHOTOGRAPHS**

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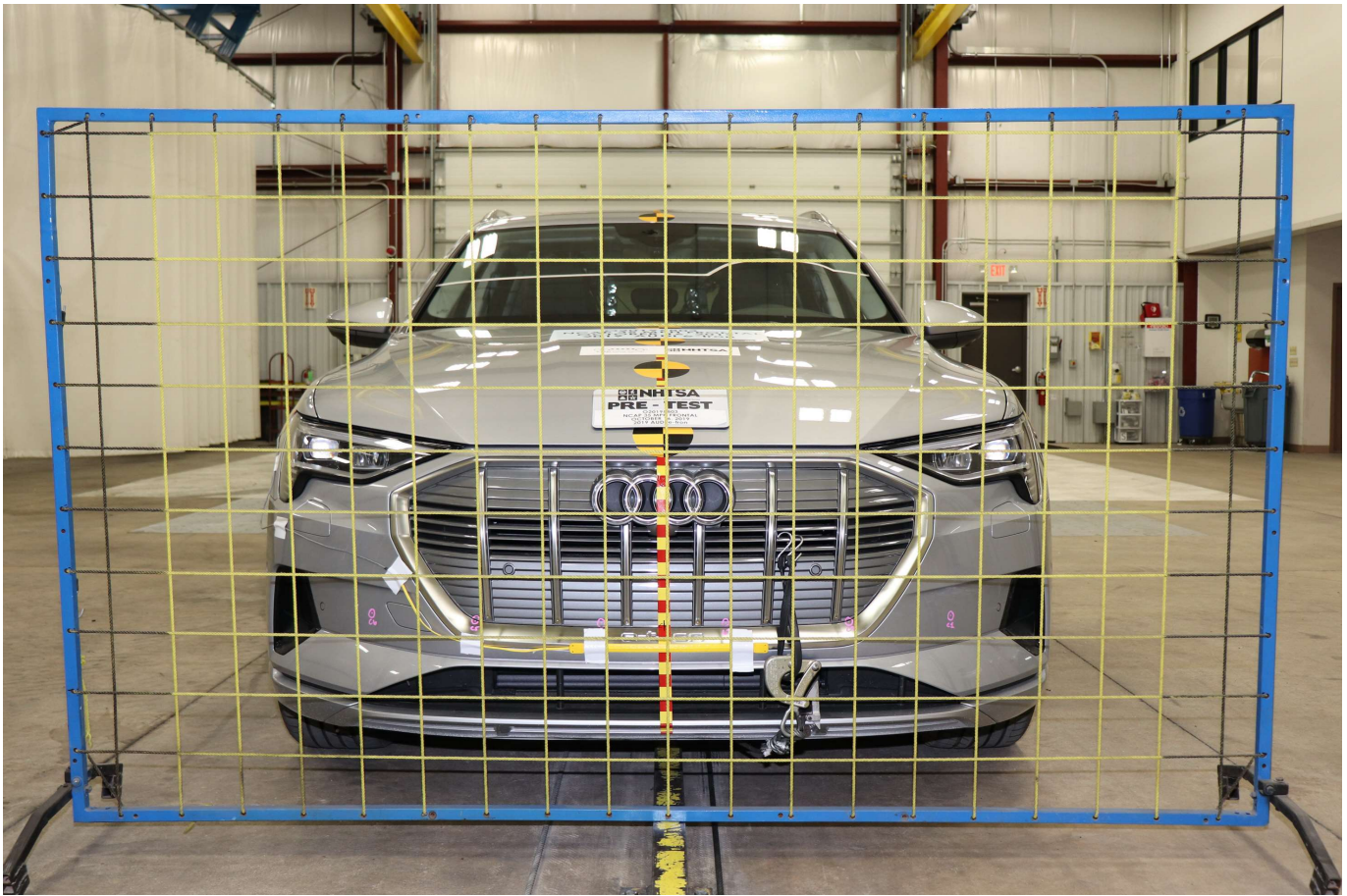


Photo No. 001 - Load Cell Location



Photo No. 002 - Pre-Test Load Cell Wall

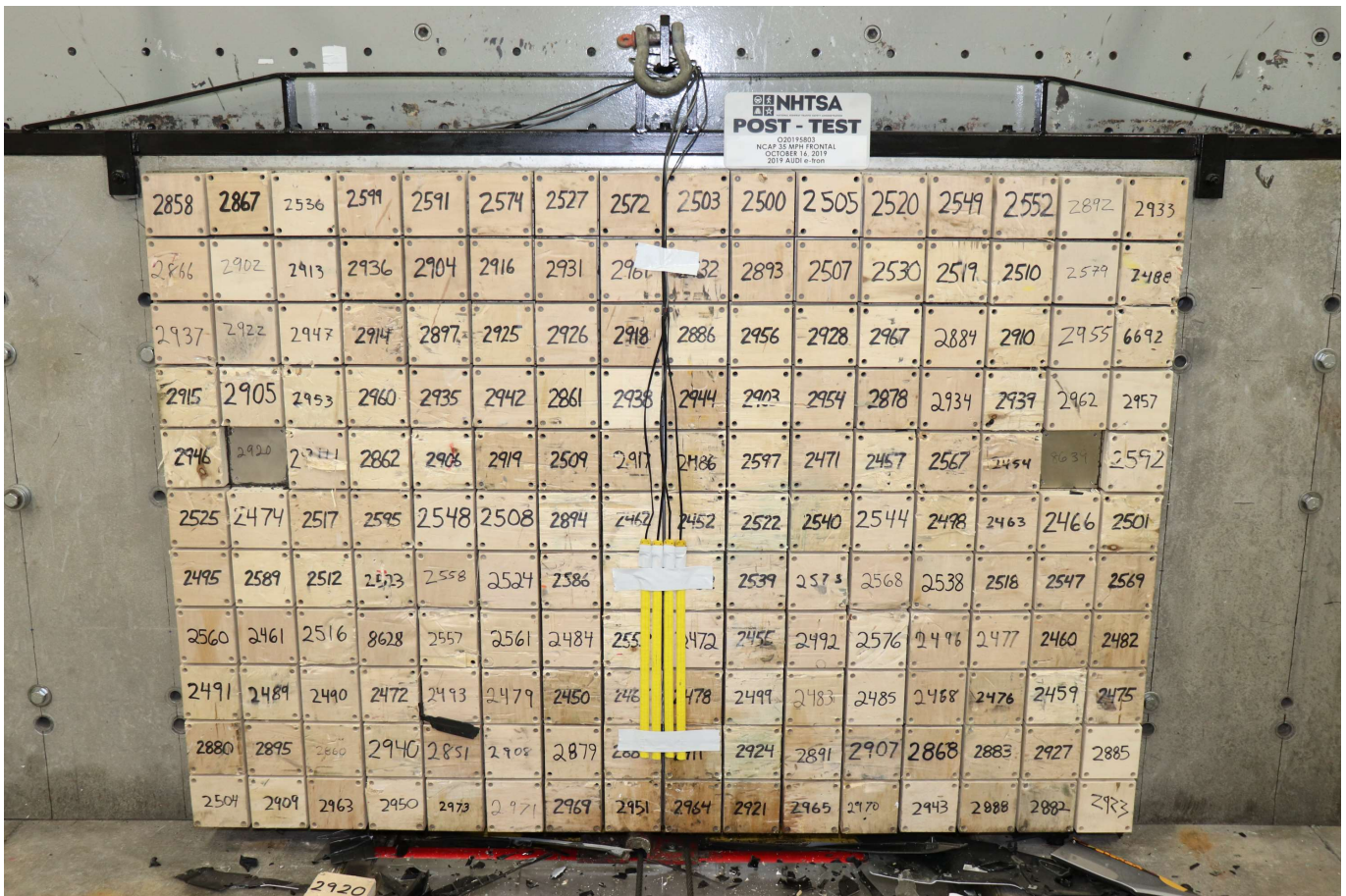


Photo No. 003 - Post-Test Load Cell Wall



Photo No. 004 - Manufacturer Label



Photo No. 005 - Tire Placard



Photo No. 006 - 2019 Audi e-tron 5-Door SUV Frontal As Delivered



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



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

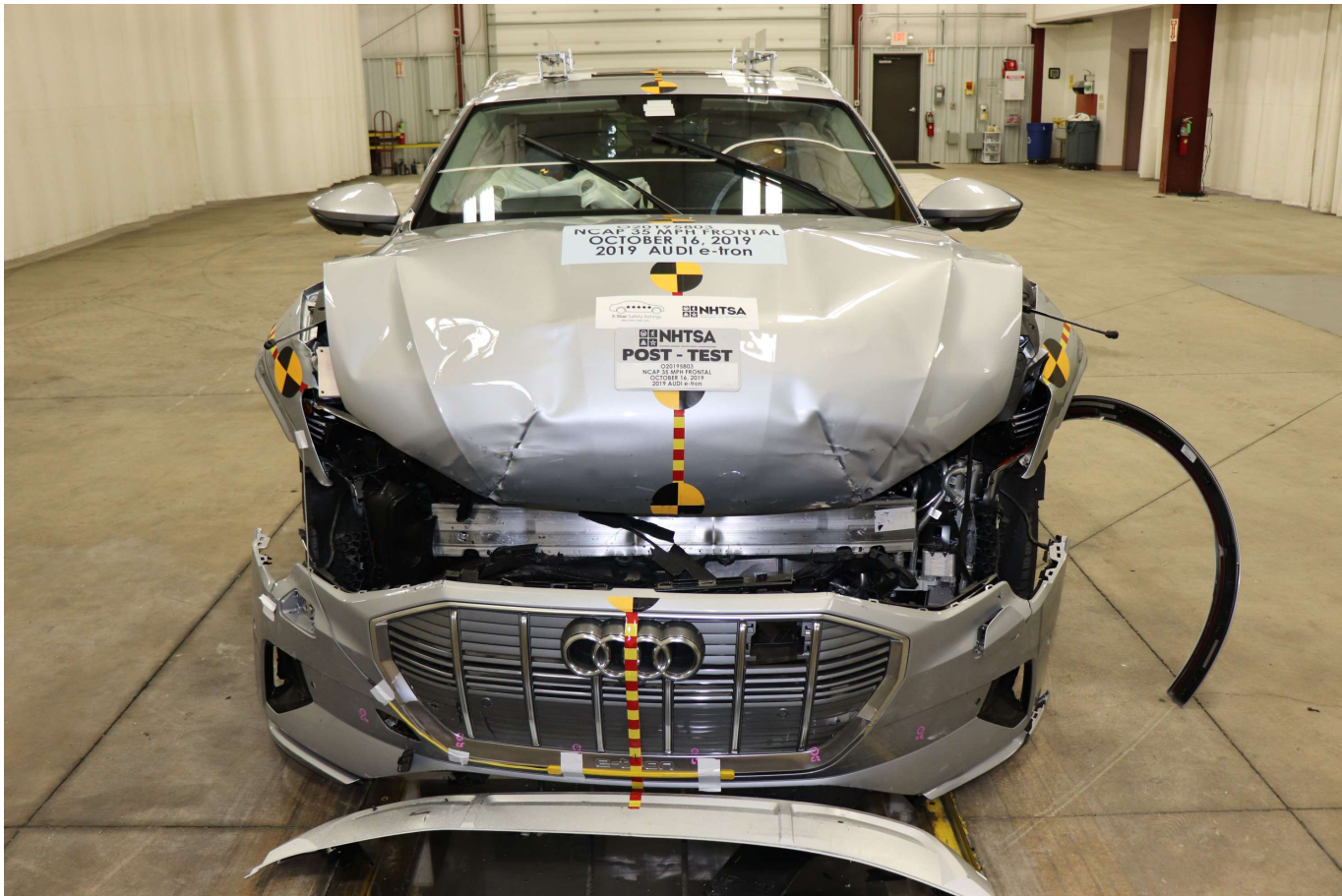


Photo No. 009 - Post-Test Front View of Test Vehicle



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



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

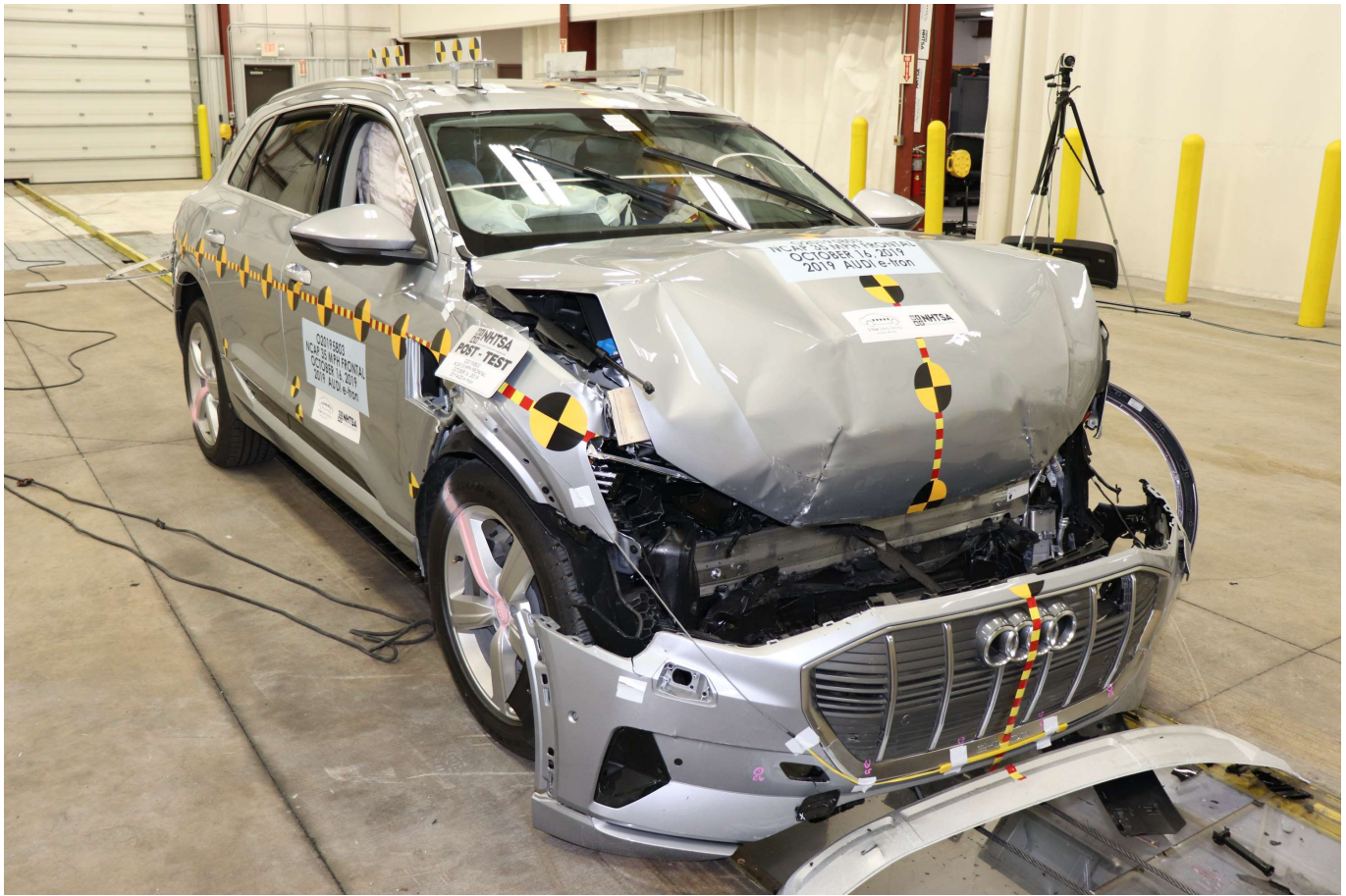


Photo No. 015 - Post-Test Right Front 3-4 View



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



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



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

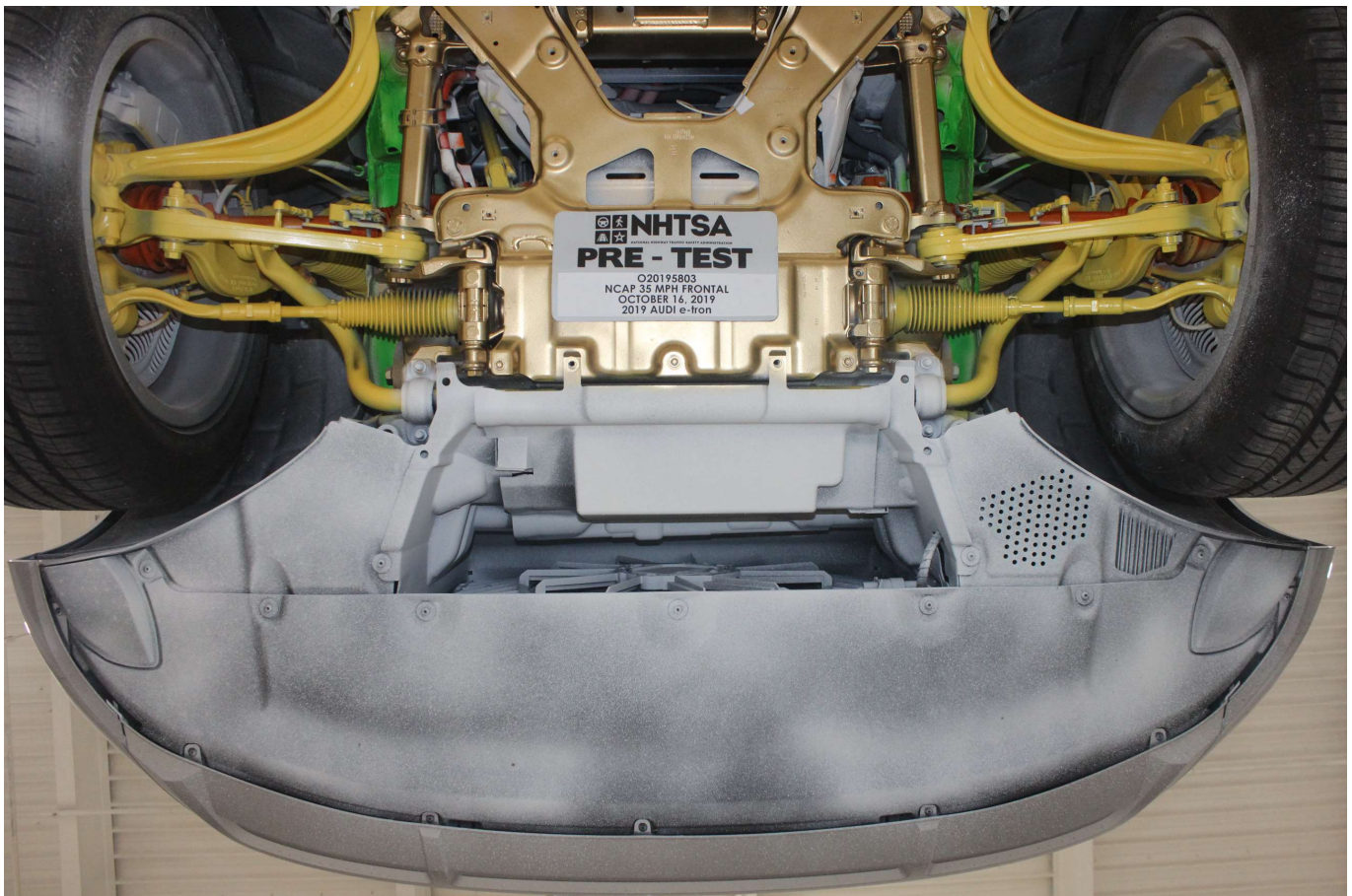


Photo No. 024 - Pre-Test Front Underbody View



Photo No. 025 - Post-Test Front Underbody View

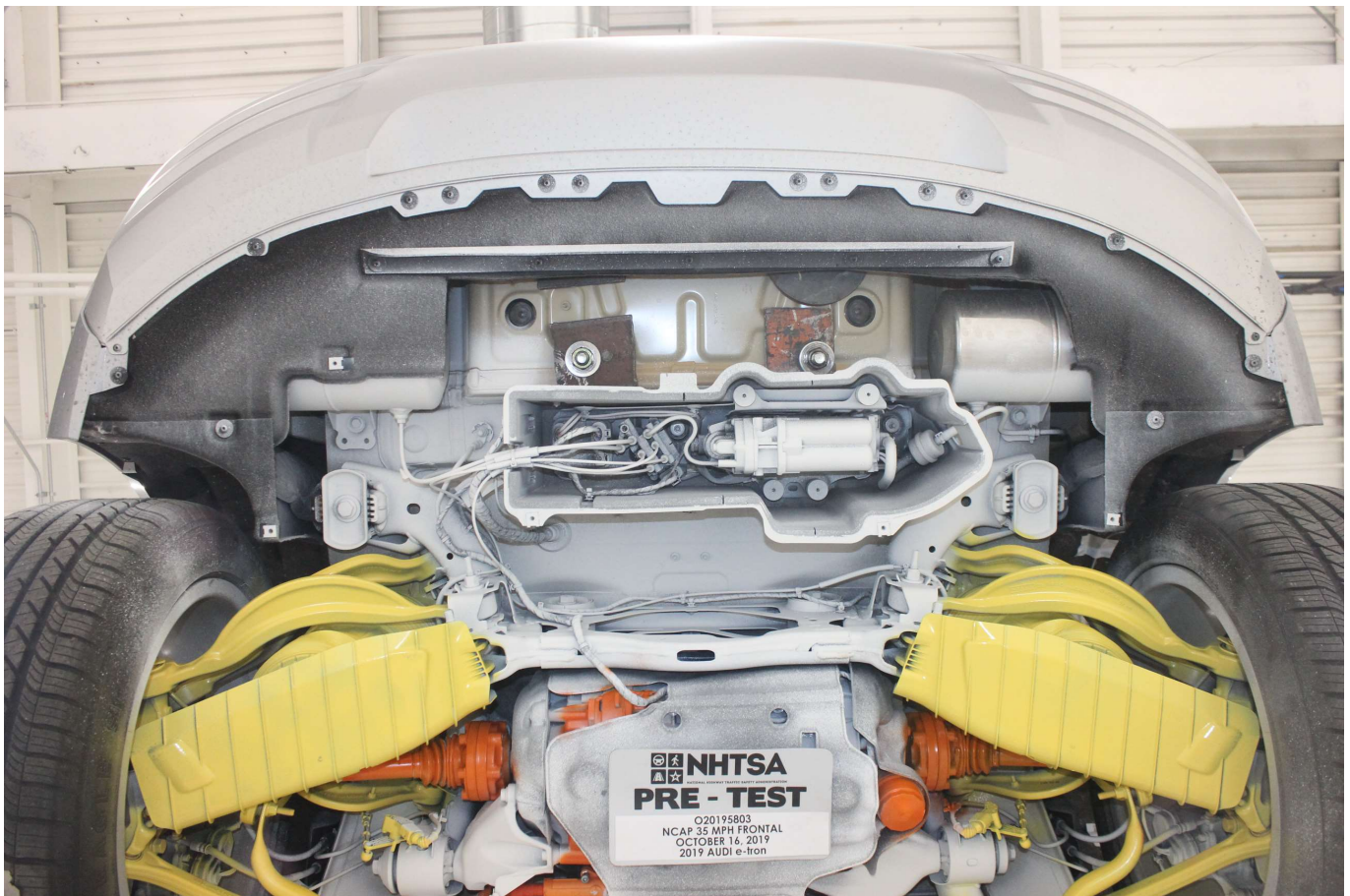


Photo No. 026 - Pre-Test Rear Underbody View

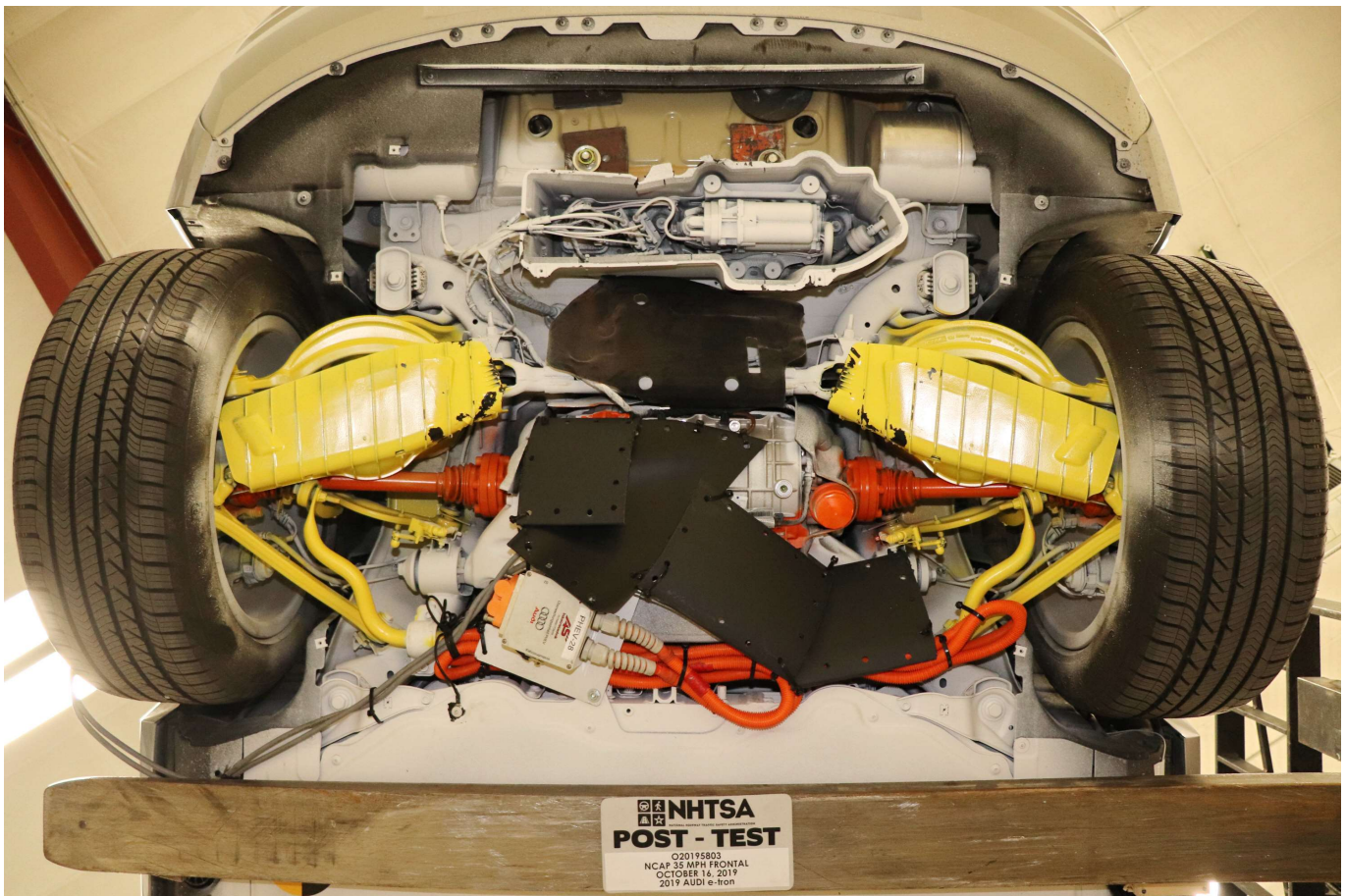


Photo No. 027 - Post-Test Rear Underbody View



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



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



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



Photo No. 037 - Post-Test Driver 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

PHOTOGRAPH NOT AVAILABLE

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 Side Knee Bolster



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



Photo No. 046 - Pre-Test Driver Side Floorpan

PHOTOGRAPH NOT AVAILABLE

Photo No. 047 - Post-Test Driver 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



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



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



Photo No. 060 - Post-Test Passenger 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

PHOTOGRAPH NOT AVAILABLE

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 Side Knee Bolster

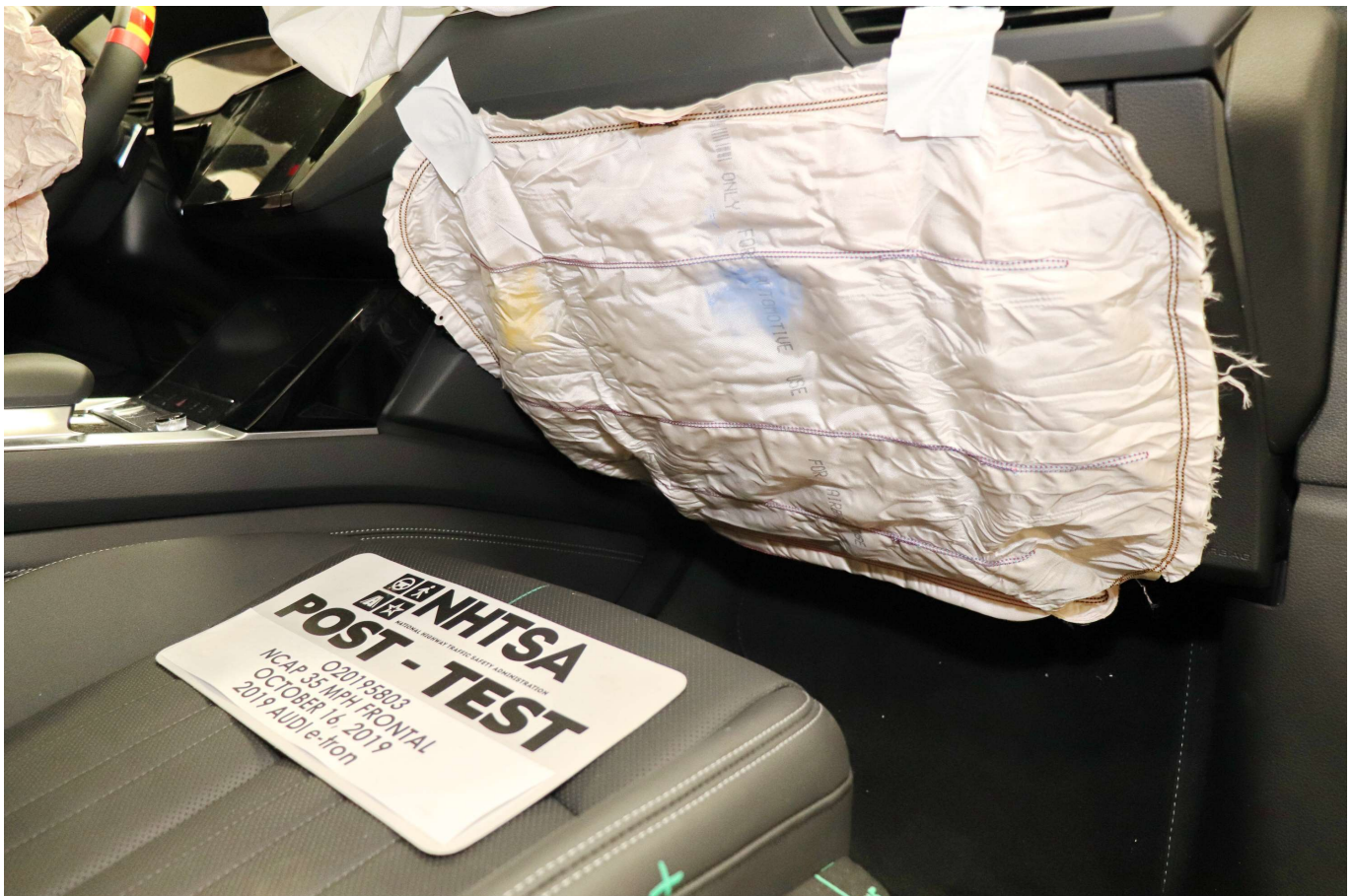


Photo No. 068 - Post-Test Passenger Side Knee Bolster



Photo No. 069 - Pre-Test Passenger Side Floorpan



Photo No. 070 - Post-Test Passenger 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 - 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 - 2019 Audi e-tron 5-Door SUV Frontal Impact Event

2019 Audi e-tron quattro



STANDARD EQUIPMENT (unless replaced by options)

- TECHNICAL**
- 95 kWh battery w/ active liquid cooling
 - Dual asynchronous electric motors w/ adjustable regenerative braking system
 - quattro® all-wheel-drive
 - 20-inch 5-Arm-design wheels w/ all-season tires
 - Space-saving spare tire
- COMFORT/TECHNOLOGY**
- Audi advanced key and power tailgate w/ handsfree release
 - Audi connect (CARF, PRIME, PLUS) w/ e-tron online services (with six-month complimentary trial)
 - Audi Navigation plus w/ MMI® touch response
 - Audi smartphone interface
 - Audi virtual cockpit plus w/ e-tron display option
 - Adaptive air suspension
 - Auto-dimming interior mirror w/ compass, and Integrated Toll Module (ITM)
 - Bang & Olufsen® sound system w/ 3D sound
 - FM / HD FM / SIRIUS Satellite Radio (with three-month complimentary subscription)
 - Four-zone automatic climate control w/ heat pump and comfort pre-conditioning
 - Garage door opener (HomeLink®)
 - Heated, auto-dimming, and power-folding exterior mirrors, with memory
 - Leather seating surfaces w/ extended interior elements in mono.pur
 - Matrix-design LED headlights w/ animation
 - Natural Burl Walnut Wood Inlays
 - Panoramic sunroof (two-piece w/ electric sunshade)
 - Power adjustable tilting & telescoping steering column
 - Twelve-way power front seats, heated and ventilated, with driver memory
 - Trailer hitch preparation (includes brake controller wiring)
 - 4-spoke multifunction steering wheel, w/ regenerative braking paddles
- SAFETY/CONVENIENCE**
- Advanced Airbag Protection System with 8 airbags
 - Anti-lock Braking System (ABS) w/ Brake Assist
 - Audi pre sense basic (preventative occupant protection)
 - Audi pre sense front
 - Audi pre sense rear
 - Child safety locks in rear doors, power
 - Electronic Stabilization Control (ESC) w/ Offroad mode
 - Electronic vehicle immobilization w/ anti-theft alarm & interior motion sensor
 - LED headlights with LED Daytime Running Lights (DRLs)
 - LED taillights with animation w/ dynamic turn signals
 - Lower Anchors and Tethers for Children (LATCH)
 - Rearview camera
 - Tire Pressure Monitoring System (TPMS)
- WARRANTY/MAINTENANCE**
- 4 Year/50,000 mile (whichever occurs first) New Vehicle Limited Warranty*
 - 8 Year/100,000 mile (whichever occurs first) High-Voltage Battery Coverage*
 - 12 Year Limited Warranty Against Corrosion Perforation
 - 1 Year/10,000 mile (whichever occurs first) First Scheduled Maintenance Service
- FREE OF CHARGE**
- 4 Year Roadside Assistance coverage provided by a third party supplier
- *Please refer to the 2019 Audi Warranty and Maintenance Booklet for complete coverage information.

MANUFACTURER'S SUGGESTED RETAIL PRICE

2019 Audi e-tron quattro	\$74,800.00
PACKAGES / OPTIONS	
Florett Silver metallic	\$595.00
Black interior	Included
Destination Charge	\$995.00
Total Price:	\$76,390.00

Fuel, license, title fees, taxes and dealer-installed accessories are not included.

MODEL: GENBAE

VIN: WA1LAAGE0KB014841

DEALER: 403A61
AUDI COLUMBUS
341 N HAMILTON RD
COLUMBUS, OH 43213
Port of Entry: DAVISVILLE

SHIP TO: 403A61
AUDI COLUMBUS
341 N HAMILTON RD
COLUMBUS, OH 43213
COMM NUM: VX6296
Transportation Method: TRUCK

GOVERNMENT 5-STAR SAFETY RATINGS

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

Frontal Crash	Driver Passenger	Not Rated
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
Side Crash	Front Seat Rear Seat	Not Rated
Based on the risk of injury in a side impact.		
Rollover		Not Rated
Based on the risk of rollover in a single-vehicle crash.		

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

EPA DOT Fuel Economy and Environment

Electric Vehicle

Fuel Economy **74 MPGe**
combined city/hwy city highway
74 73 46
MPGe

Standard Sport Utility Vehicles range from 13 to 93 MPGe. The best vehicle rates 136 MPGe.

You save \$2,500 in fuel costs over 5 years compared to the average new vehicle.

Driving Range
When fully charged, vehicle can travel about...
0 40 80 120 160 204 miles
Charge Time: 10 hours (240V)

Annual fuel cost \$900

Fuel Economy & Greenhouse Gas Rating (tailpipe only) **10**
Best

Smog Rating (tailpipe only) **10**
Best

This vehicle emits 0 grams of CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Does not include emissions from generating electricity; learn more at fuelconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$7,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$0.13 per kW-hr. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuelconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code

PARTS CONTENT INFORMATION

For Vehicles In This Carline	0%	For This Vehicle:	Final Assembly Point: BRUSSELS, BELGIUM
U.S./Canadian Parts Content:	0%	Country Of Origin:	
Major Sources Of Foreign Parts Content:			
Parts Content:	POLAND: 32%	ENGINE (MOTOR): HUNGARY	
	GERMANY: 27%	TRANSMISSION: HUNGARY	

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

Photo No. 083 - Monroney Label Photograph

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-001 - Auxiliary Power Module Warning Label

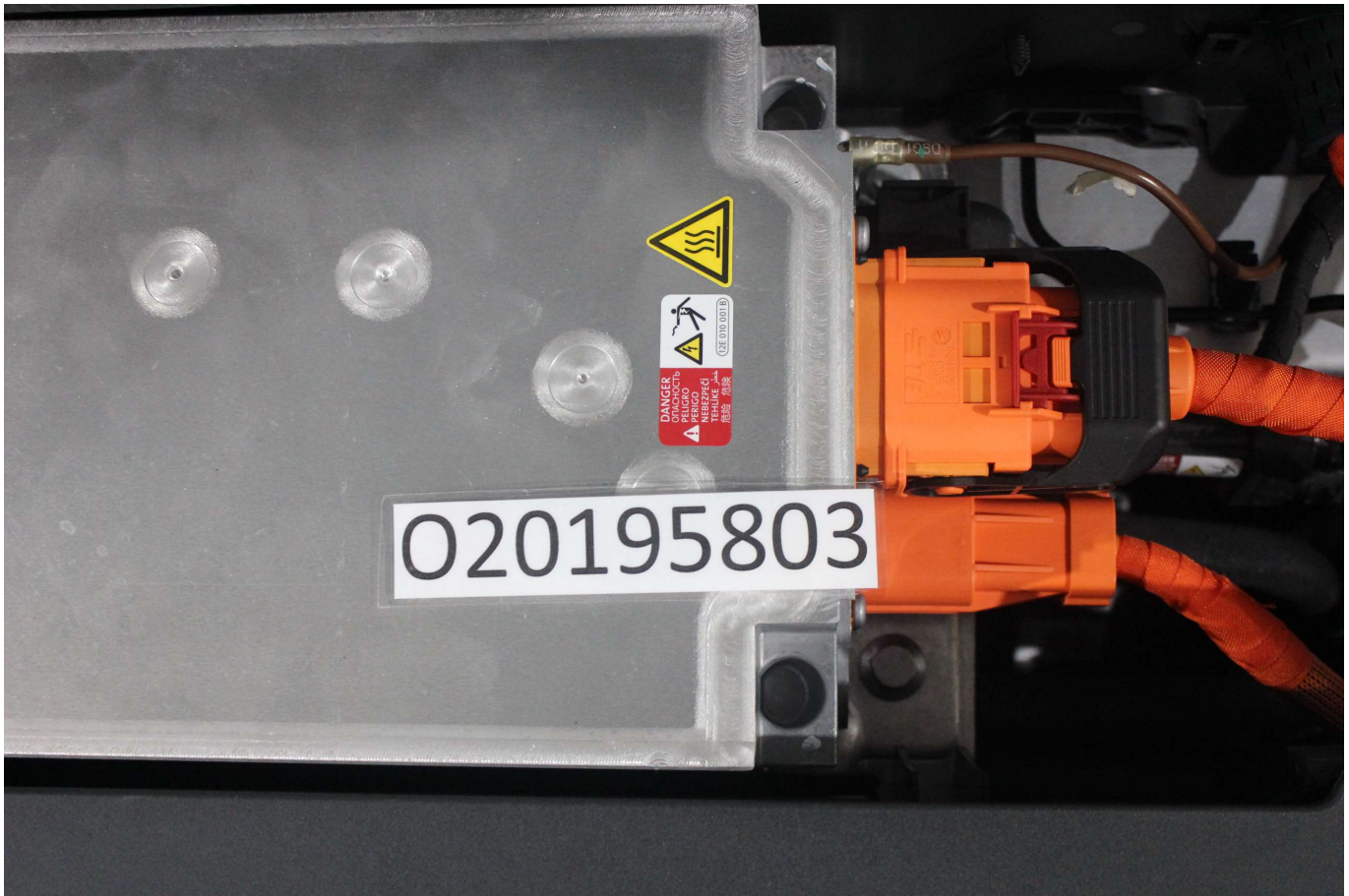


Photo No. 305-002 - Power Inverter Warning Label



Photo No. 305-003 - First Responder Warning Label

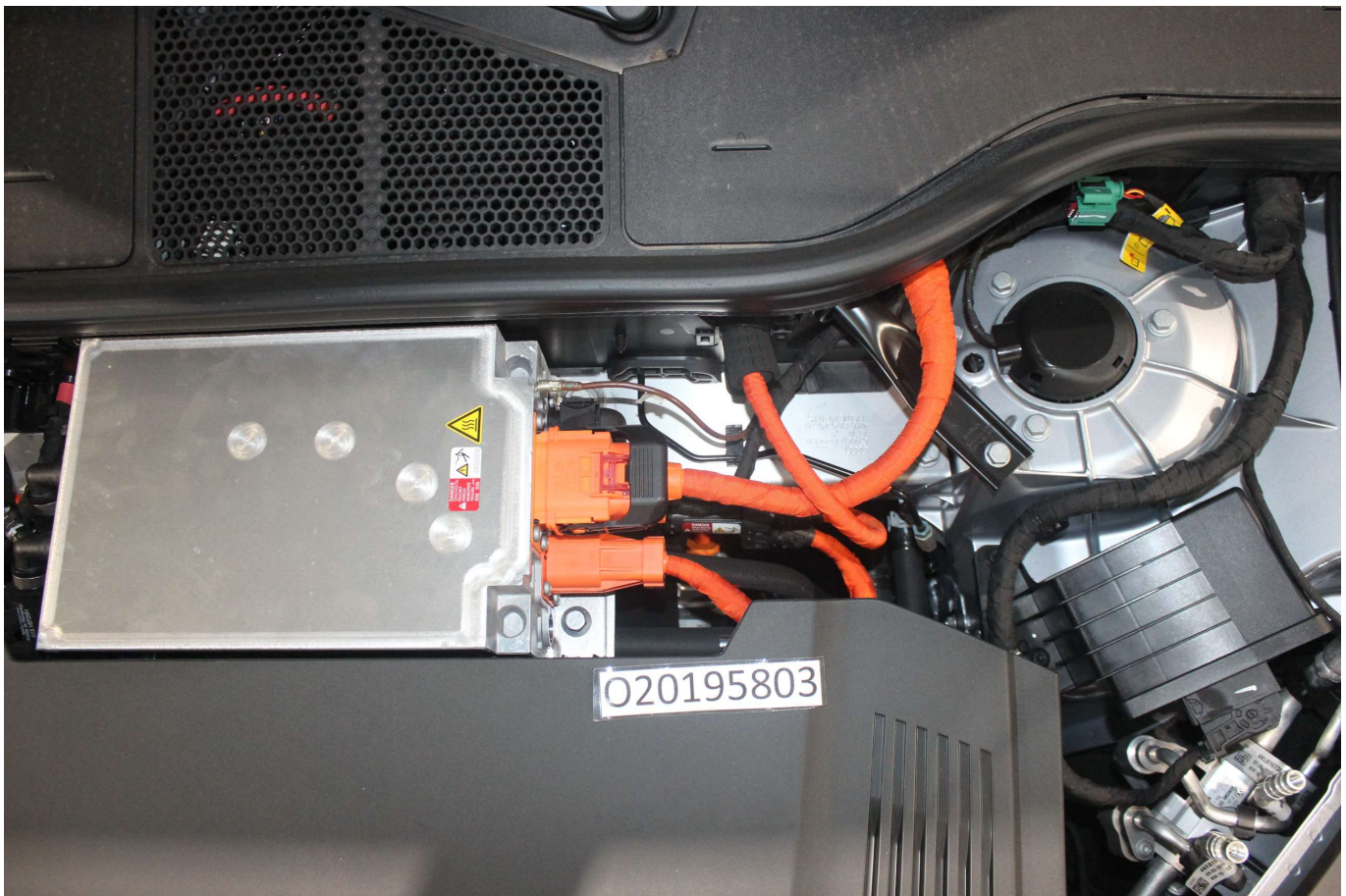


Photo No. 305-004 - First Responder Warning Location



Photo No. 305-005 - Other Vehicle Label(s) Related to Electrical Propulsion System



Photo No. 305-006 - Manual High Voltage Service Disconnect in Place

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-007 - Manual High Voltage Service Disconnect Removed

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-008 - Manual High Voltage Service Disconnect Removed



Photo No. 305-009 - Pre-Impact View of Propulsion Battery



Photo No. 305-010 - Post-Impact Front View of Propulsion Battery



Photo No. 305-011 - Post-Impact Rear View of Propulsion Battery

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-012 - Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-013 - Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-014 - Pre-Impact View of Propulsion Battery Module(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-015 - Post-Impact View of Propulsion Battery Module(s)



Photo No. 305-016 - Pre-Impact View of Electric Propulsion Drive



Photo No. 305-017 - Post-Impact View of Electric Propulsion Drive



Photo No. 305-018 - Pre-Impact View of High Voltage Interconnect(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-019 - Post-Impact View of High Voltage Interconnect(s)

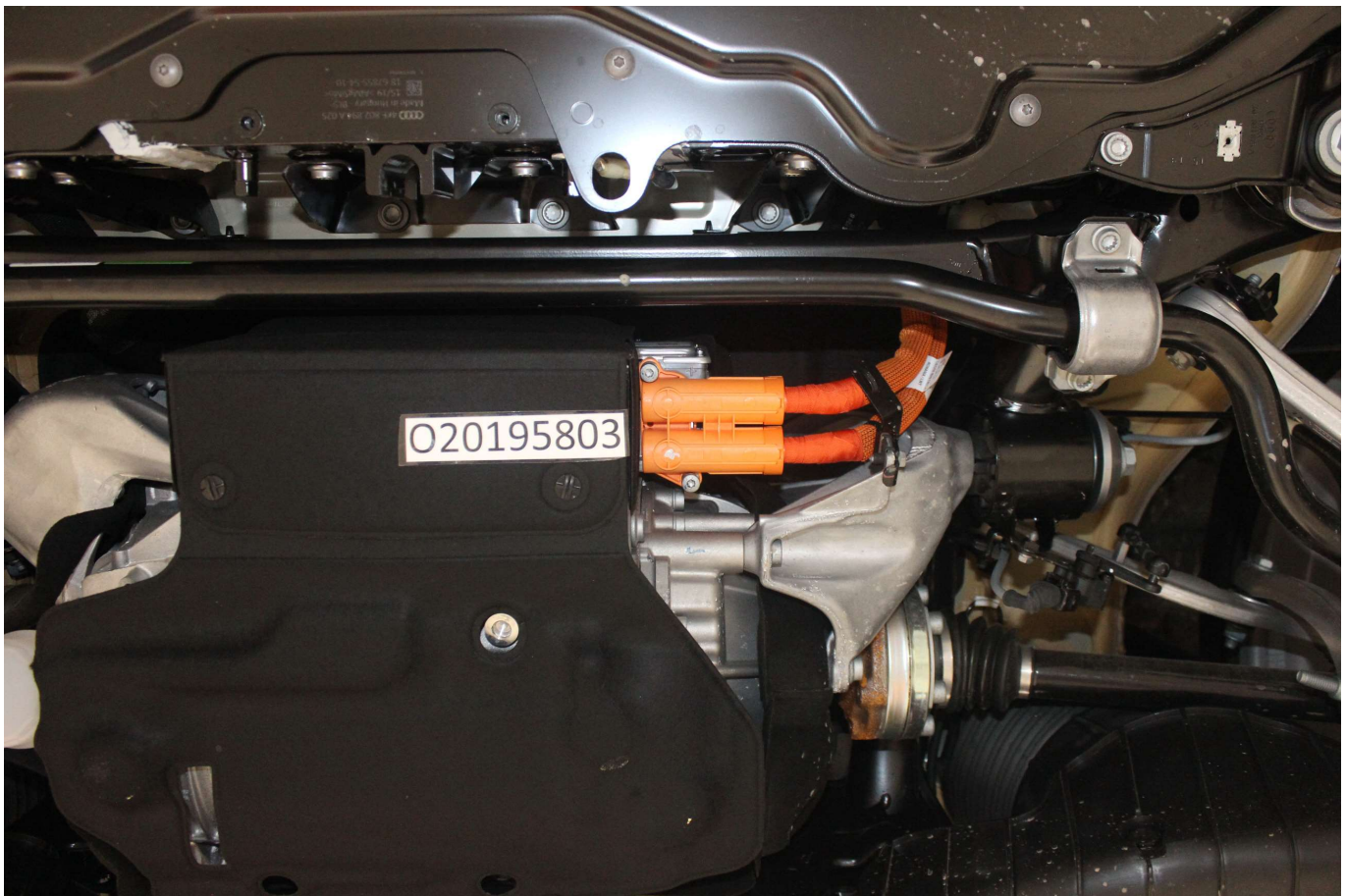


Photo No. 305-020 - Pre-Impact View of Other Visible Electric Propulsion Components



Photo No. 305-021 - Pre-Impact View of Ground Lead Attached

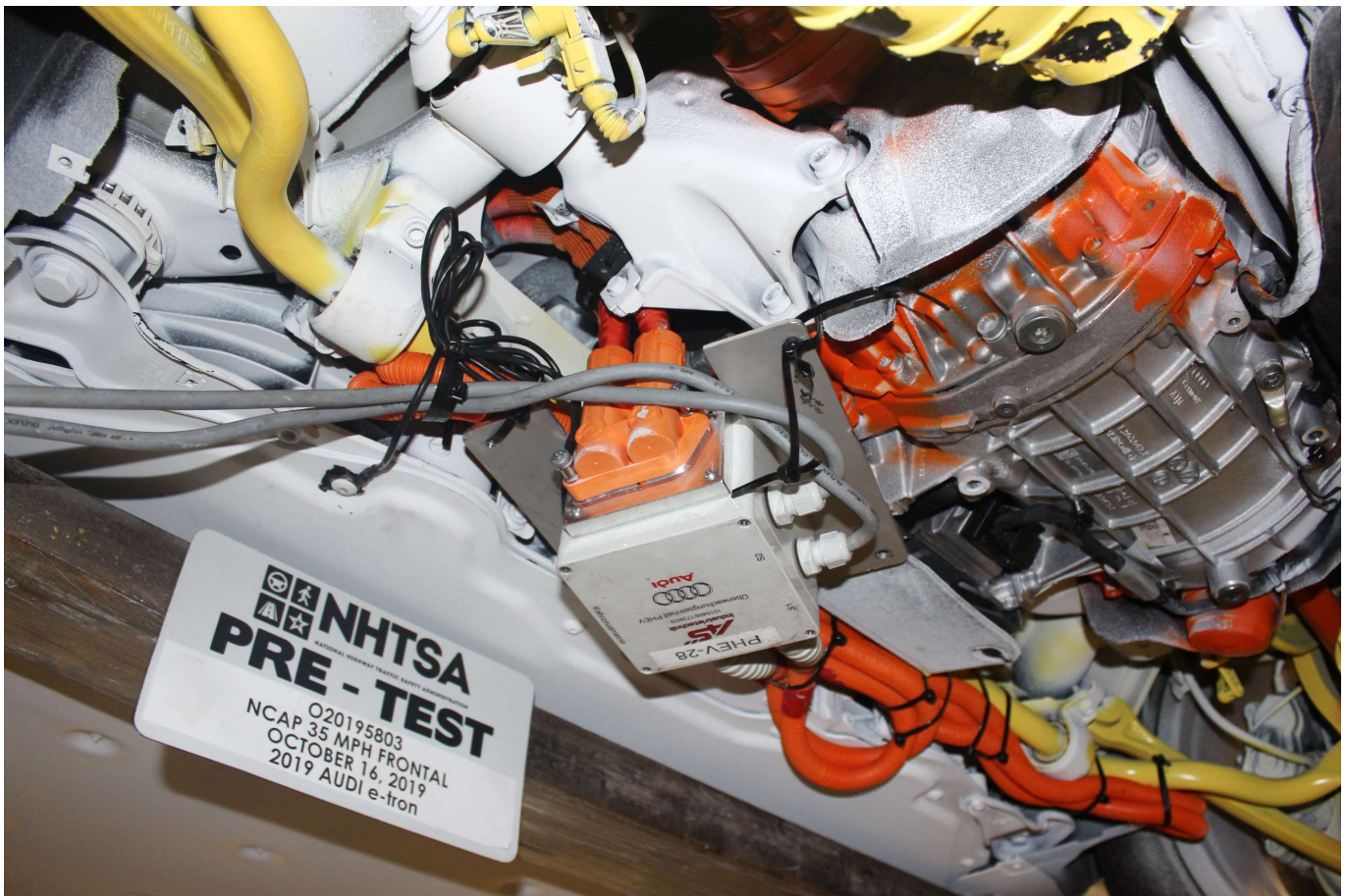


Photo No. 305-022 - Pre-Impact View of High Voltage Leads Attached

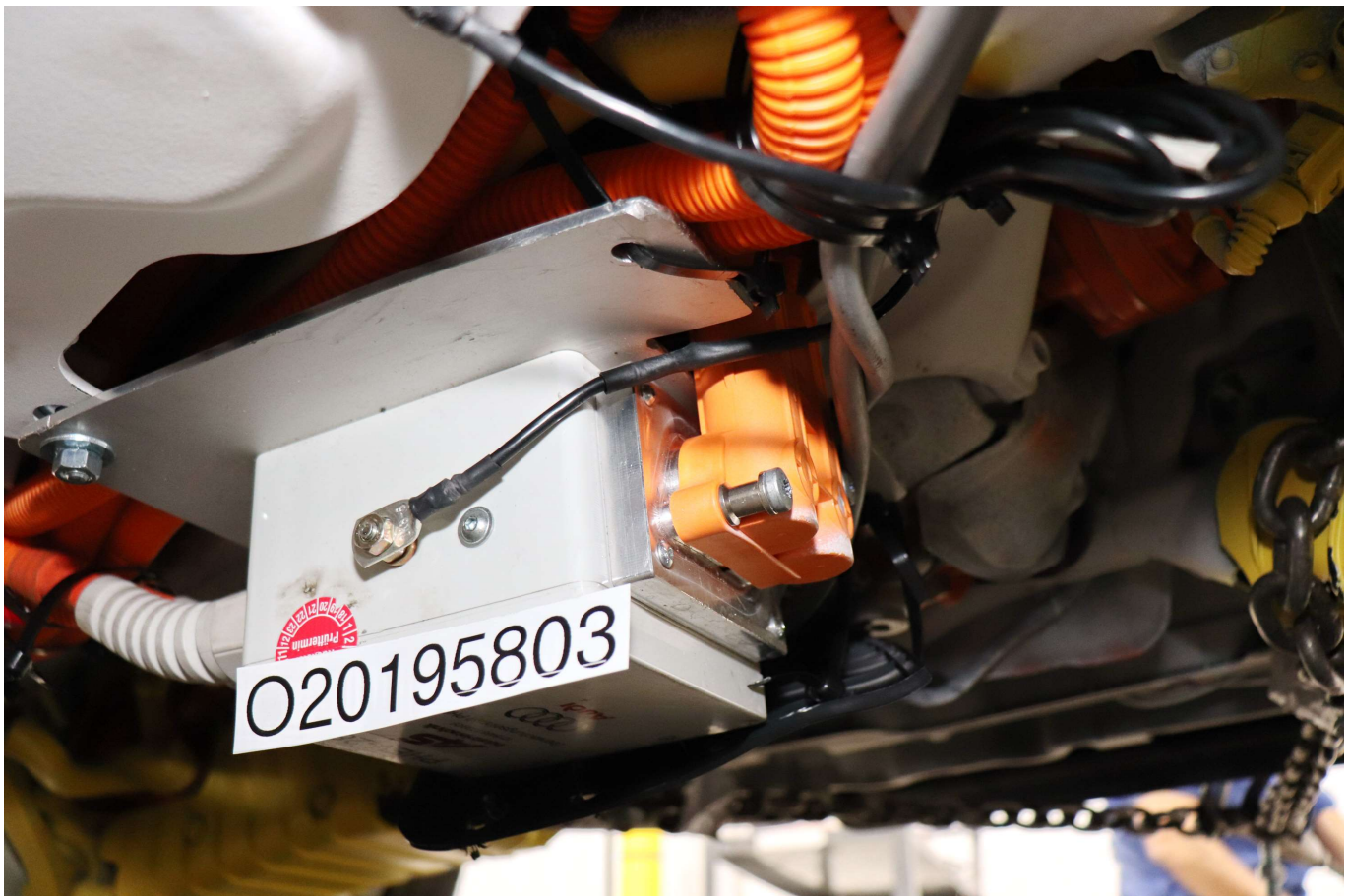


Photo No. 305-023 - Pre-Impact Close-Up View of High Voltage Leads Attached

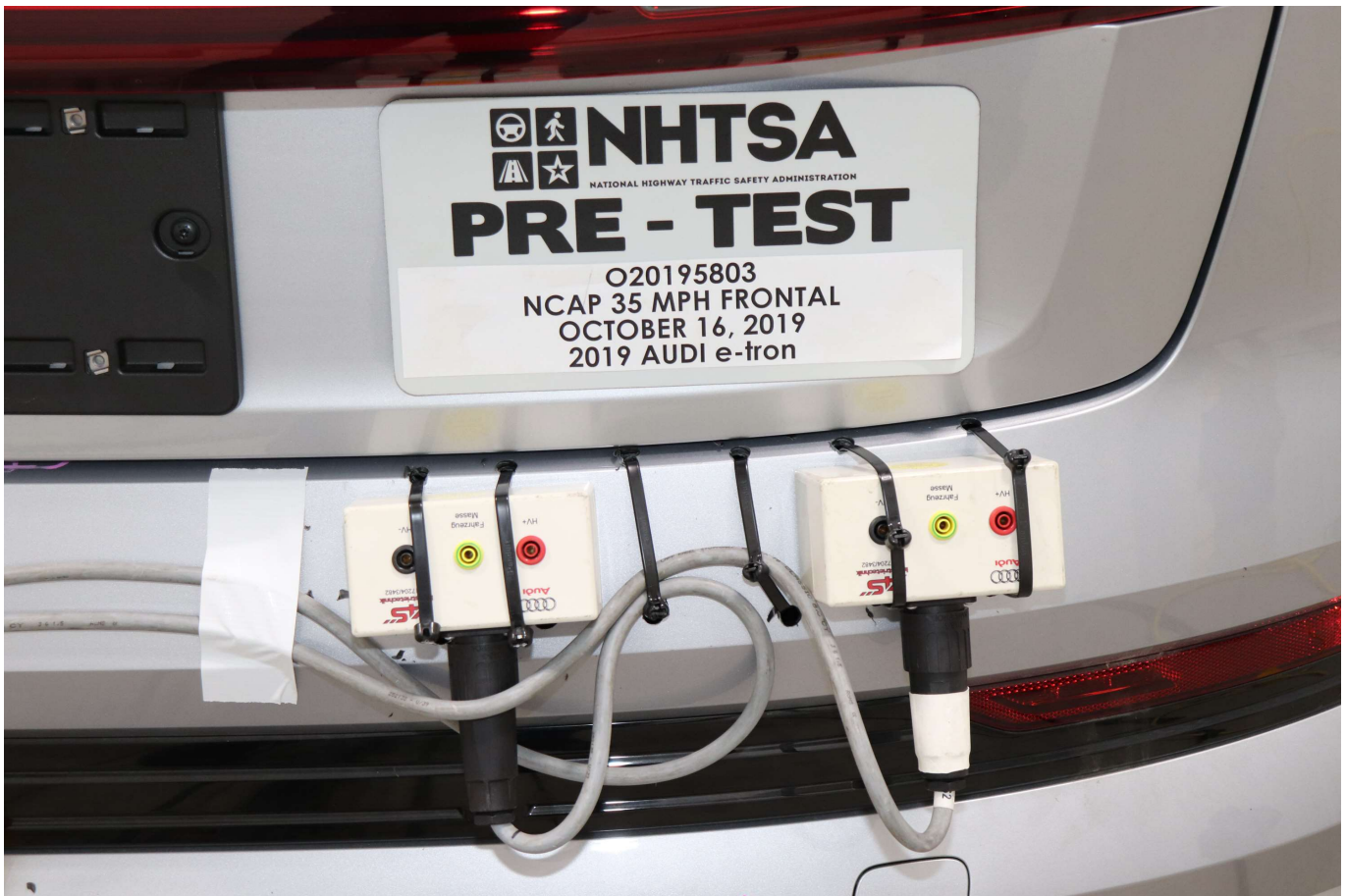


Photo No. 305-024 - Pre-Impact View of Installed Test Interface Port



Photo No. 305-025 - Post-Impact View of Installed Test Interface Port

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-026 - Pre-Impact View of Other Test Devices

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-027 - Post-Impact View of Other Test Devices



Photo No. 305-028 - FMVSS No. 305 Static Rollover at 90 Degrees



Photo No. 305-029 - FMVSS No. 305 Static Rollover at 180 Degrees



Photo No. 305-030 - FMVSS No. 305 Static Rollover at 270 Degrees



Photo No. 305-031 - FMVSS No. 305 Static Rollover at 360 Degrees



Photo No. 305-032 - Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery



Photo No. 305-033 - Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-034 - Post-Impact Propulsion System Mounting or Intrusion Failure(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-035 - Post-Impact View of Battery Component Intrusion

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-036 - Post-Impact View of Battery Module Movement or Retention Loss

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-037 - Post-Impact View of Propulsion Battery Electrolyte Spillage Location

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-038 - Post-Test View of Propulsion Battery Electrolyte Spillage Location

APPENDIX B
DUMMY RESPONSE DATA TRACES

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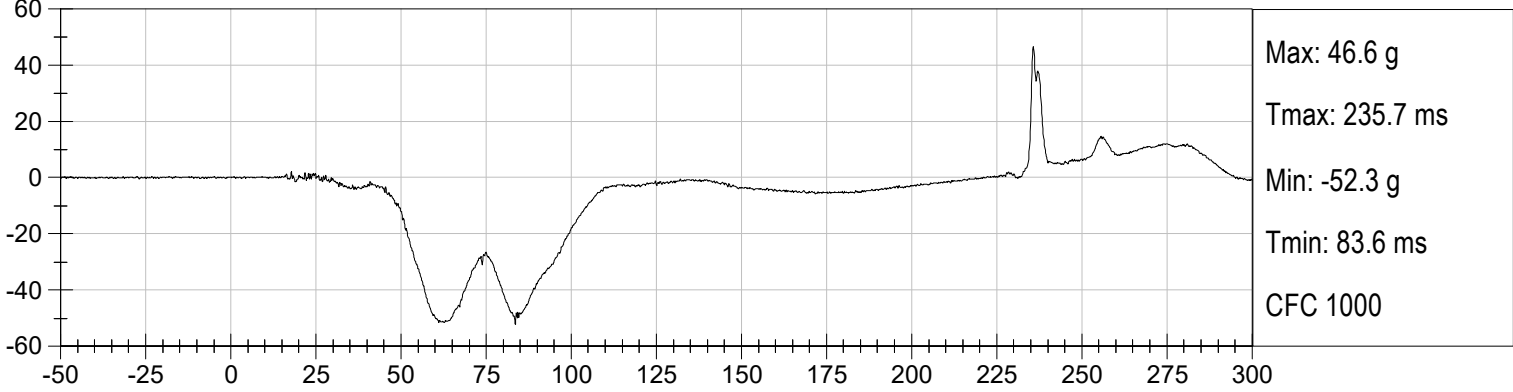
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.gov

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

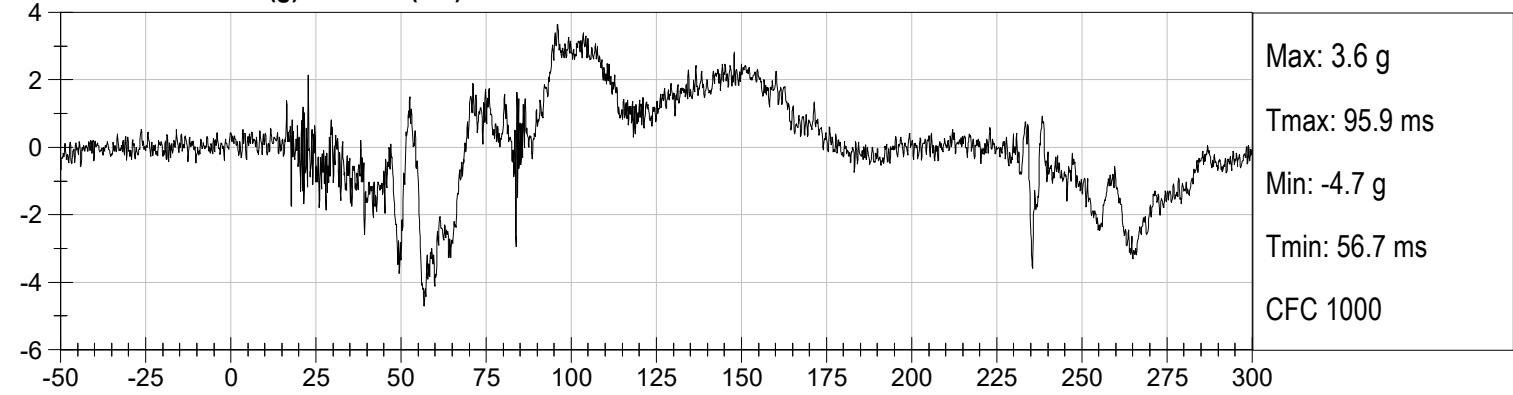
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver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

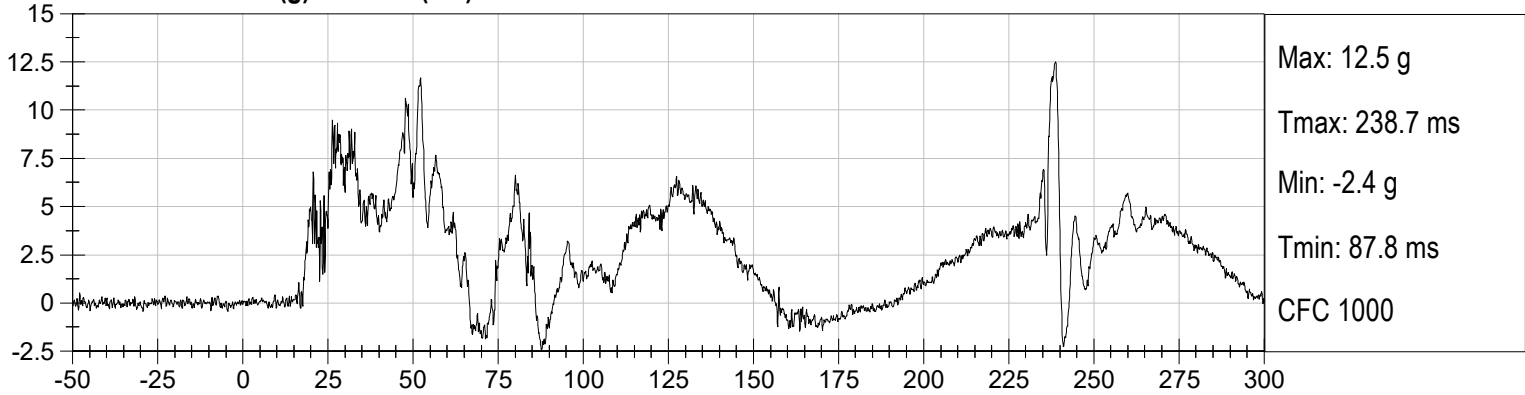
DRIVER HEAD X (g) vs Time (ms)



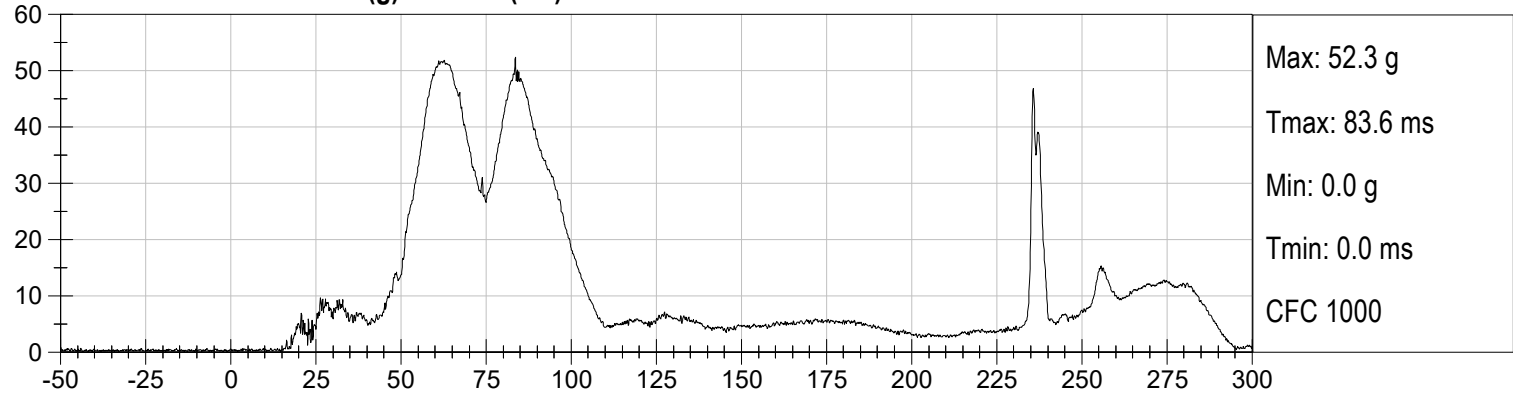
DRIVER HEAD Y (g) vs Time (ms)



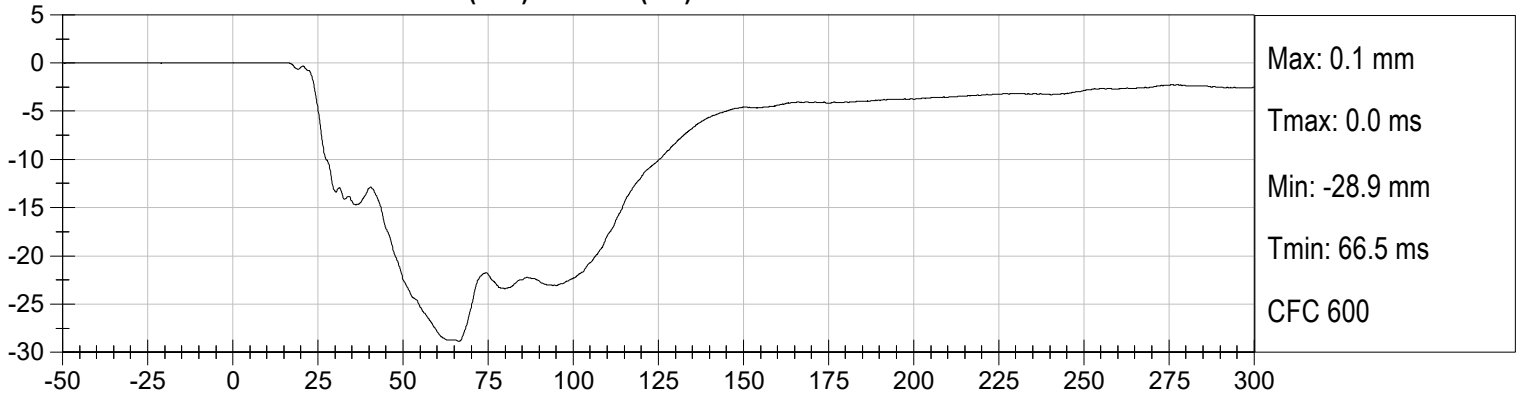
DRIVER HEAD Z (g) vs Time (ms)

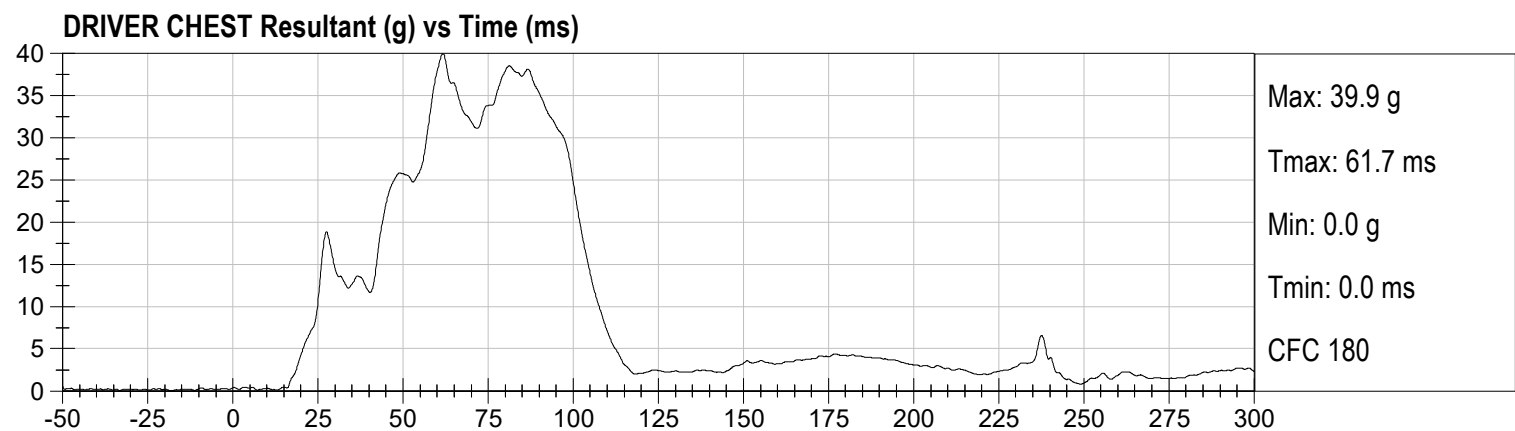
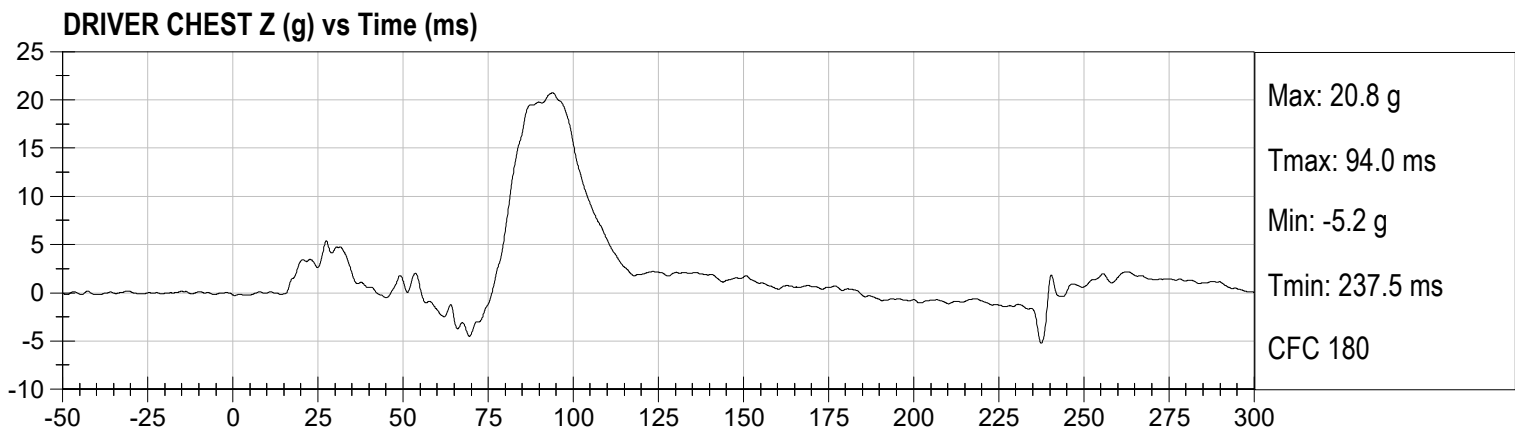
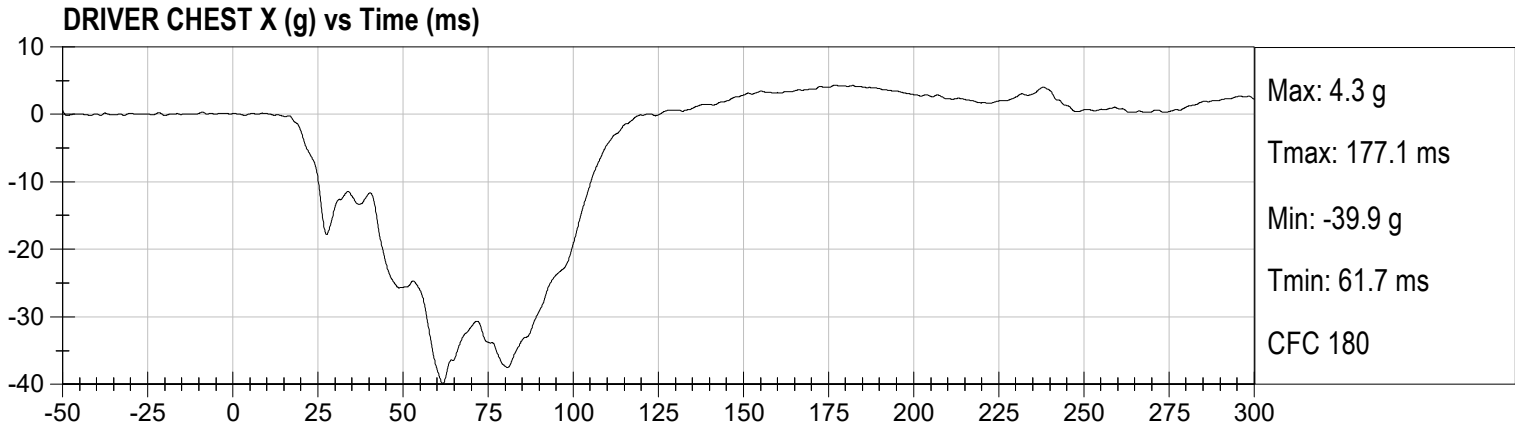


DRIVER HEAD Resultant (g) vs Time (ms)

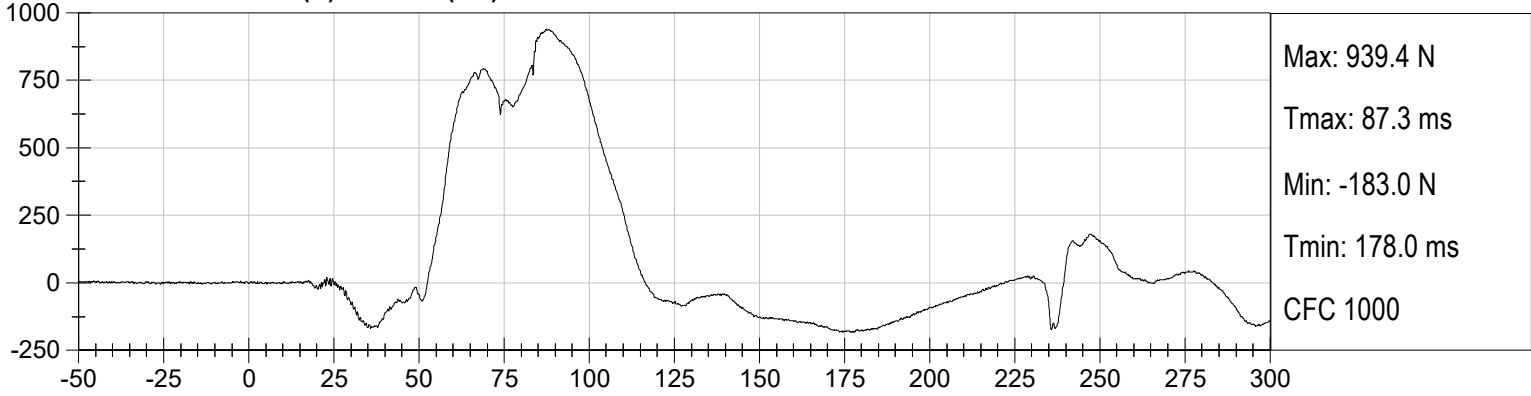


DRIVER CHEST DISPLACEMENT (mm) vs Time (ms)

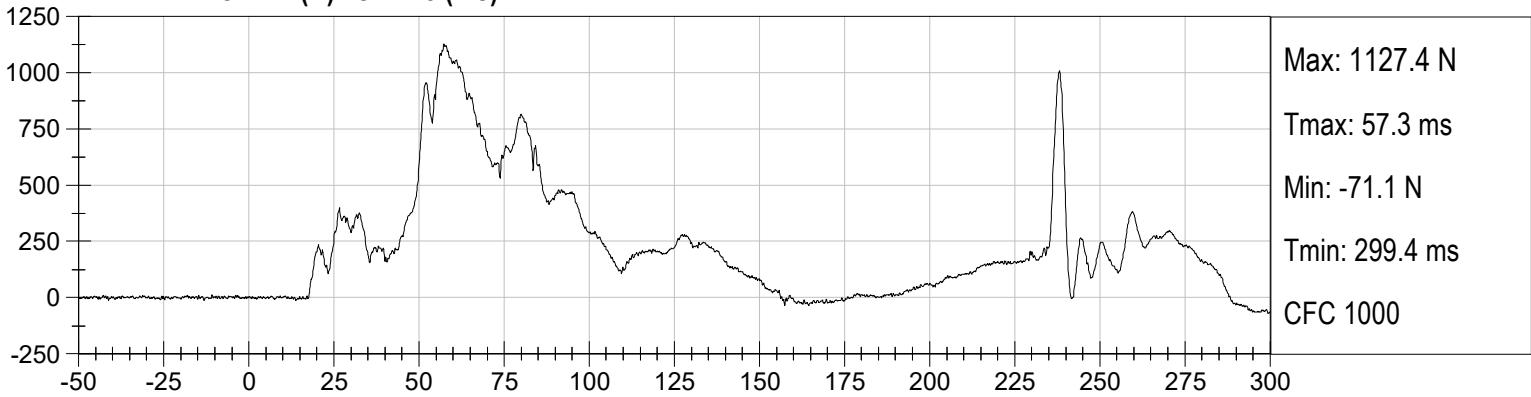




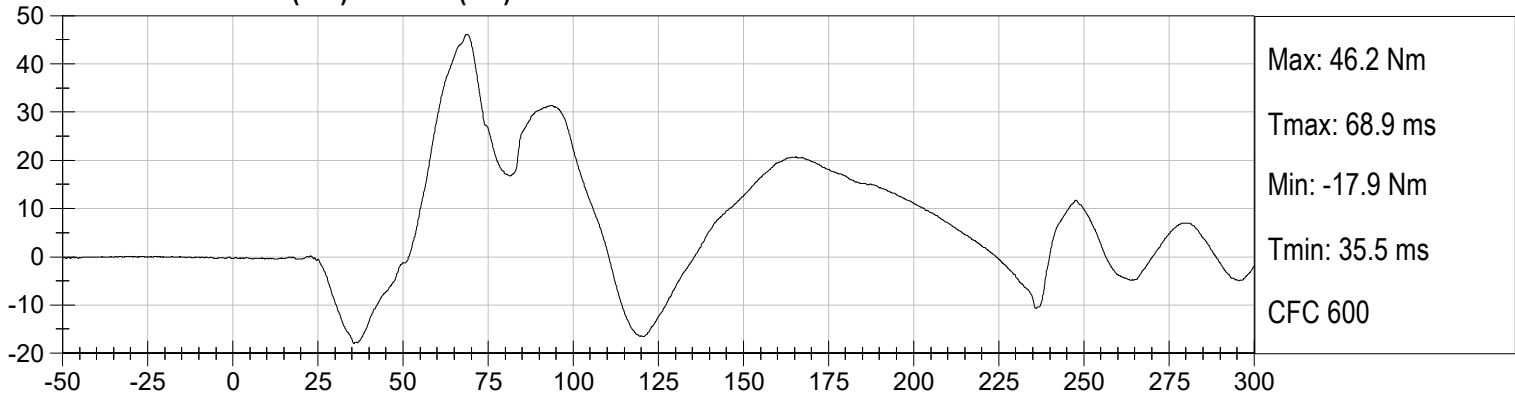
DRIVER NECK FX (N) vs Time (ms)



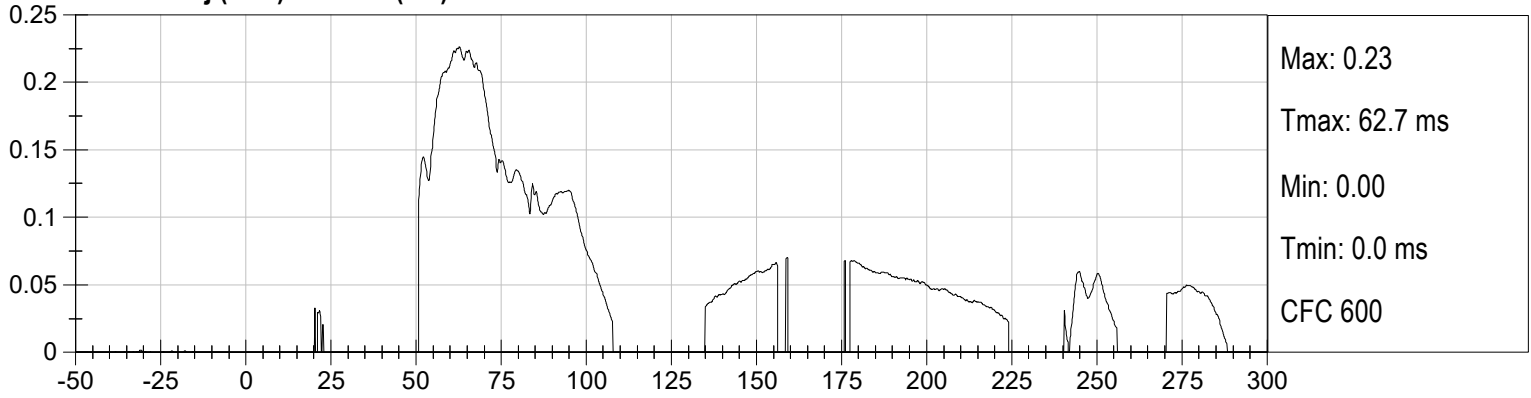
DRIVER NECK FZ (N) vs Time (ms)



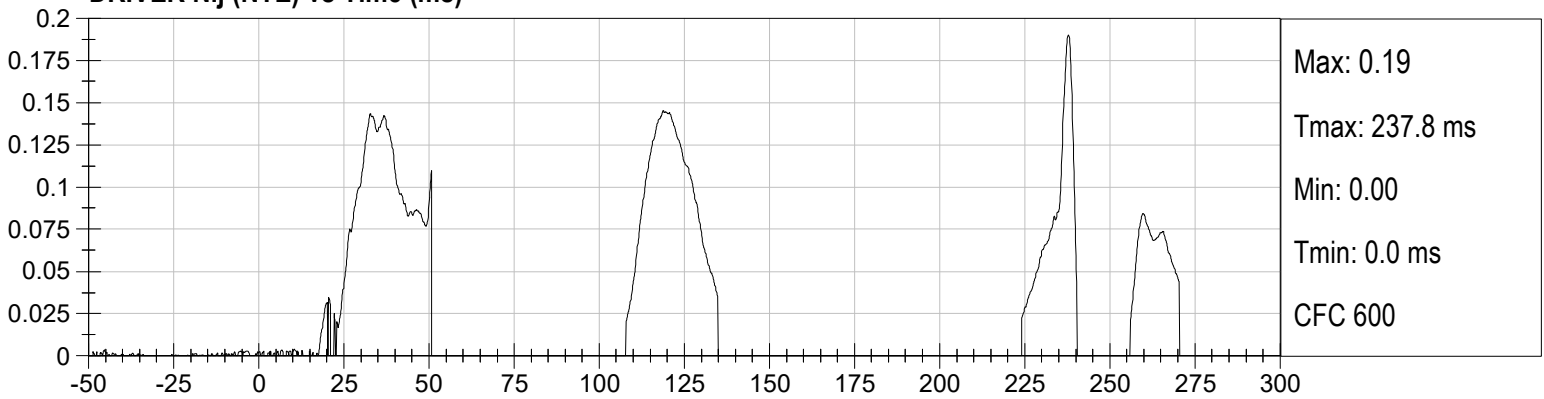
DRIVER NECK MY (Nm) vs Time (ms)



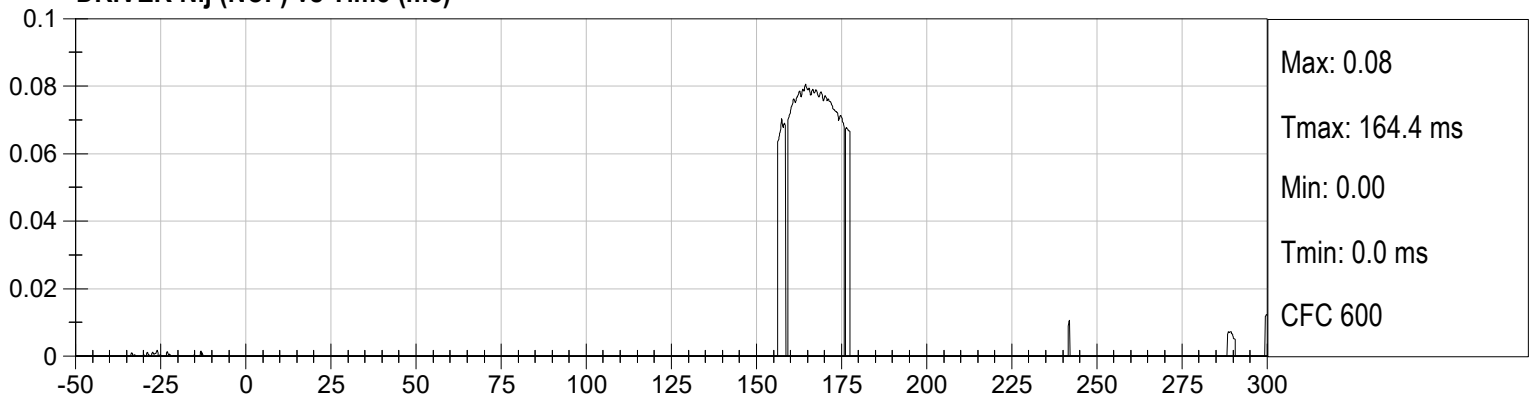
DRIVER Nij (NTF) vs Time (ms)



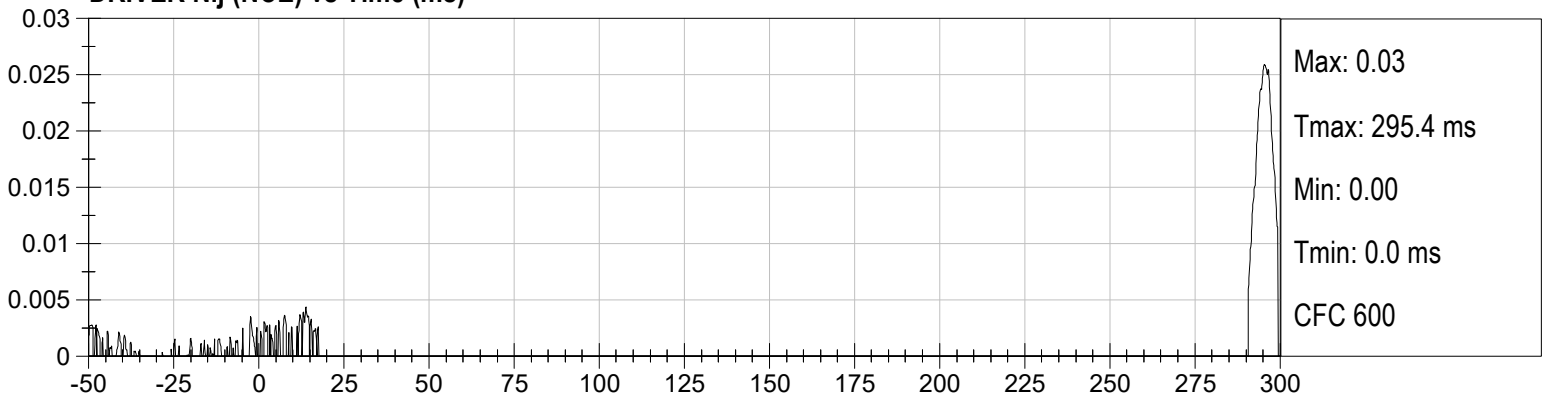
DRIVER Nij (NTE) vs Time (ms)



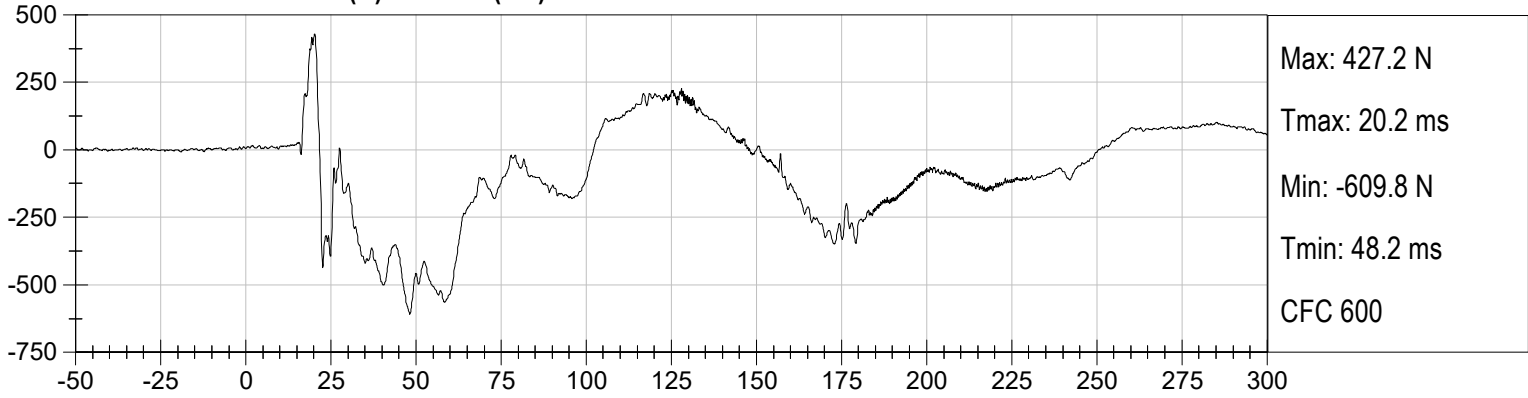
DRIVER Nij (NCF) vs Time (ms)



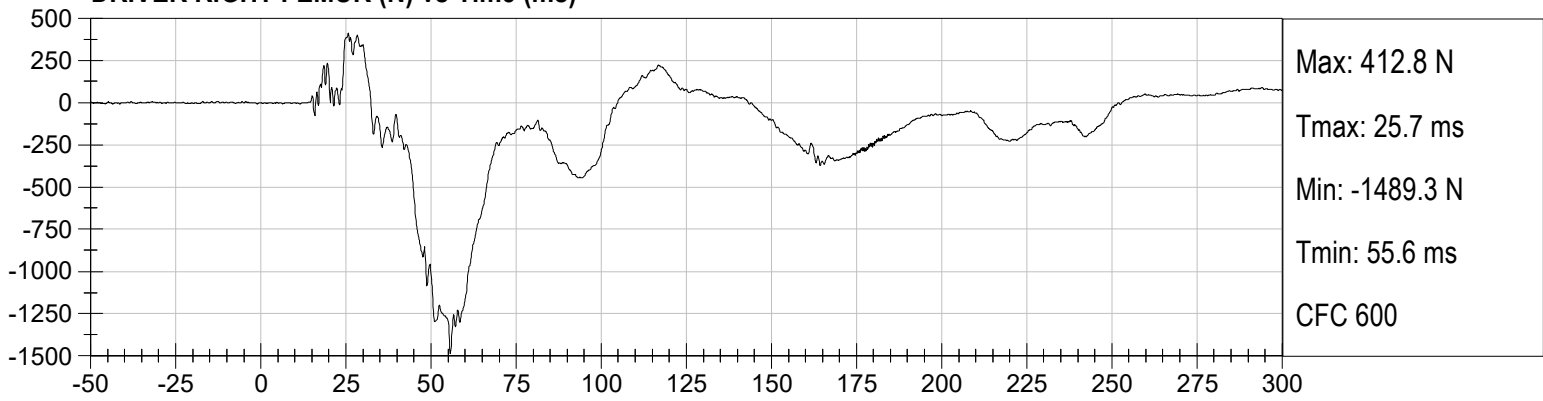
DRIVER Nij (NCE) vs Time (ms)



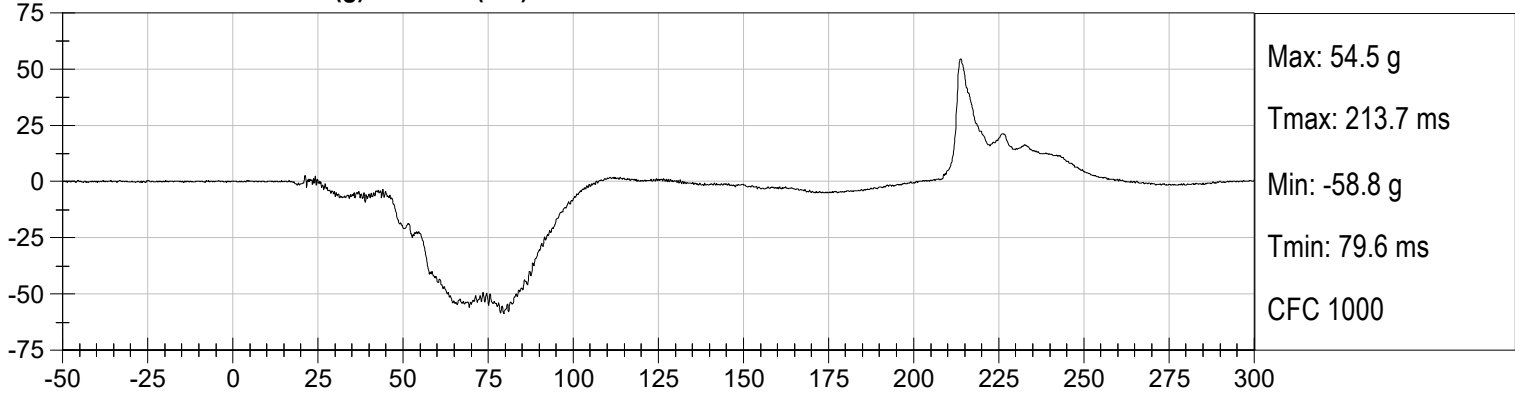
DRIVER LEFT FEMUR (N) vs Time (ms)



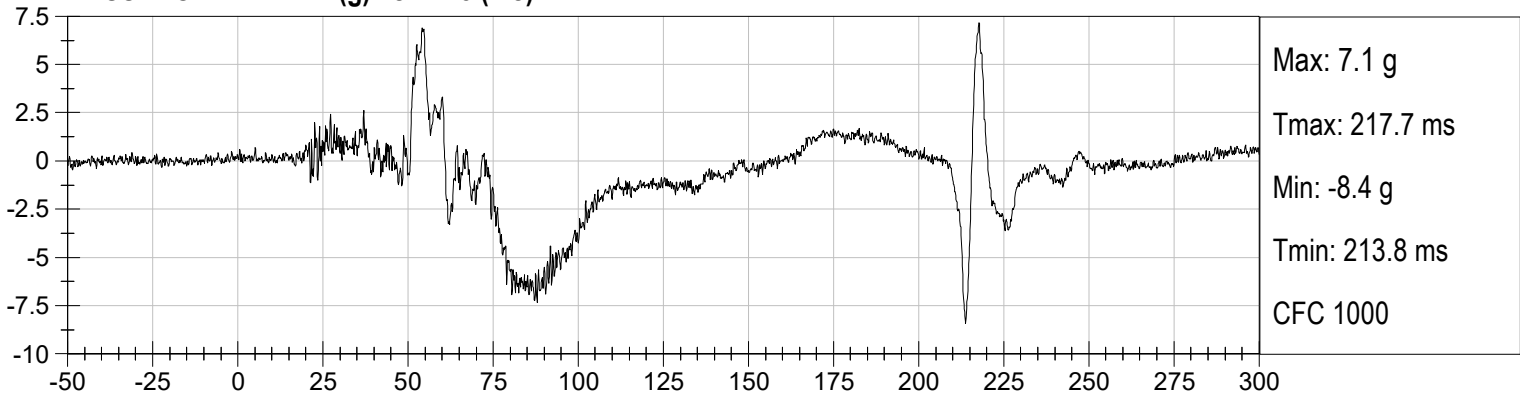
DRIVER RIGHT FEMUR (N) vs Time (ms)



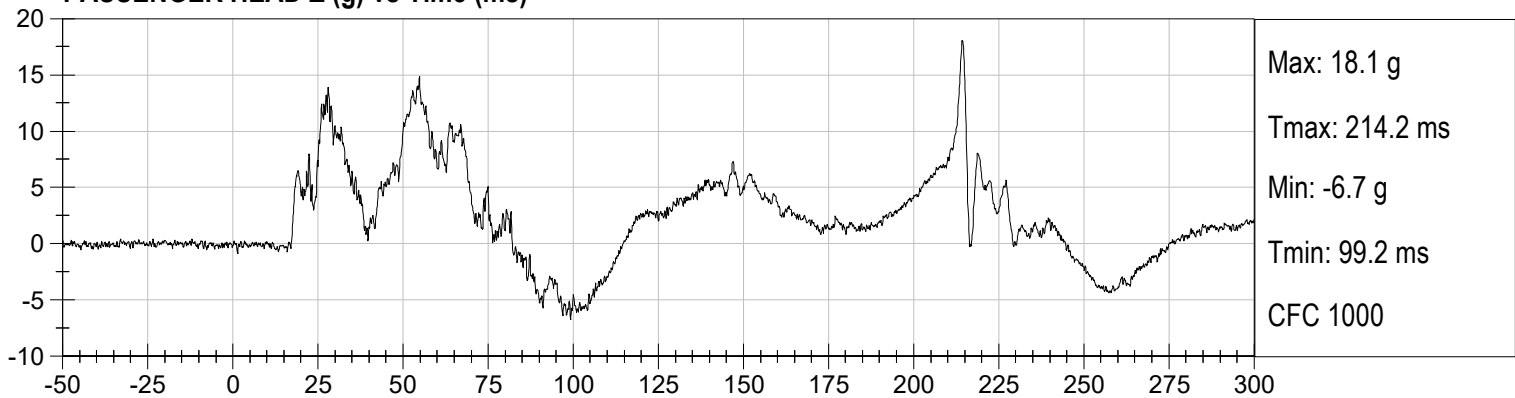
PASSENGER HEAD X (g) vs Time (ms)



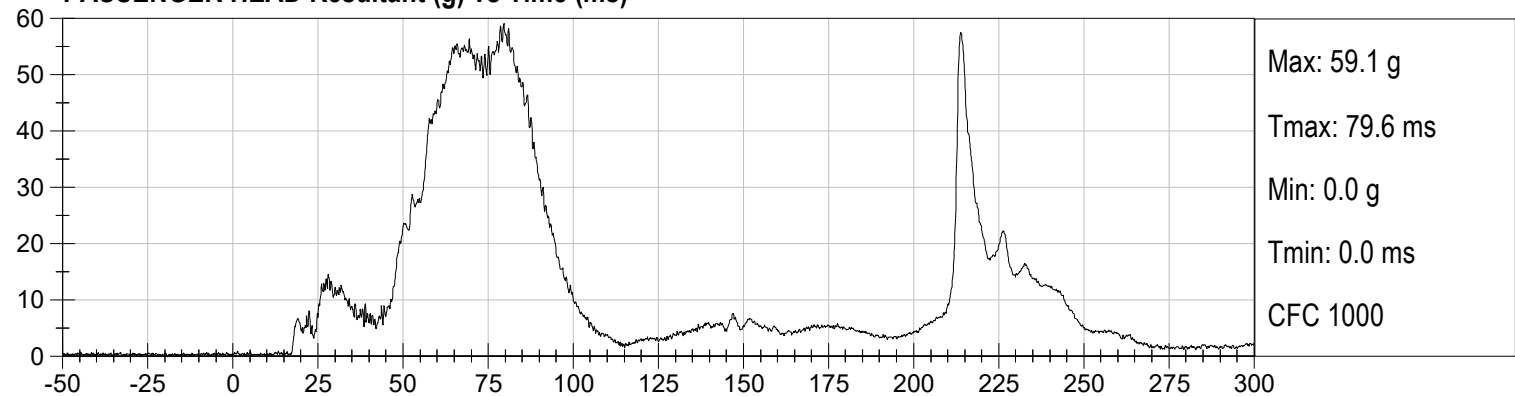
PASSENGER HEAD Y (g) vs Time (ms)



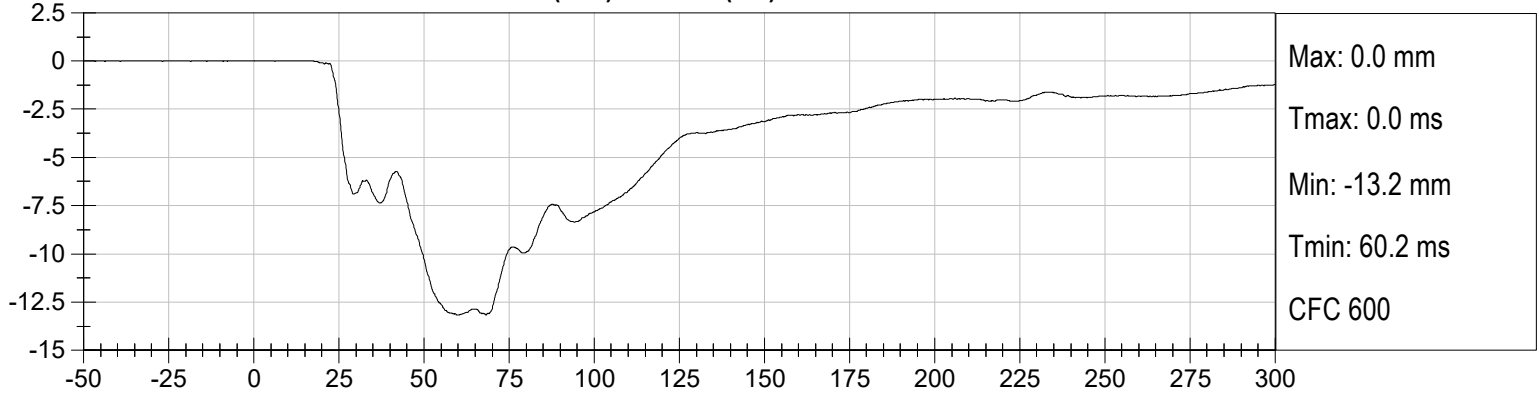
PASSENGER HEAD Z (g) vs Time (ms)



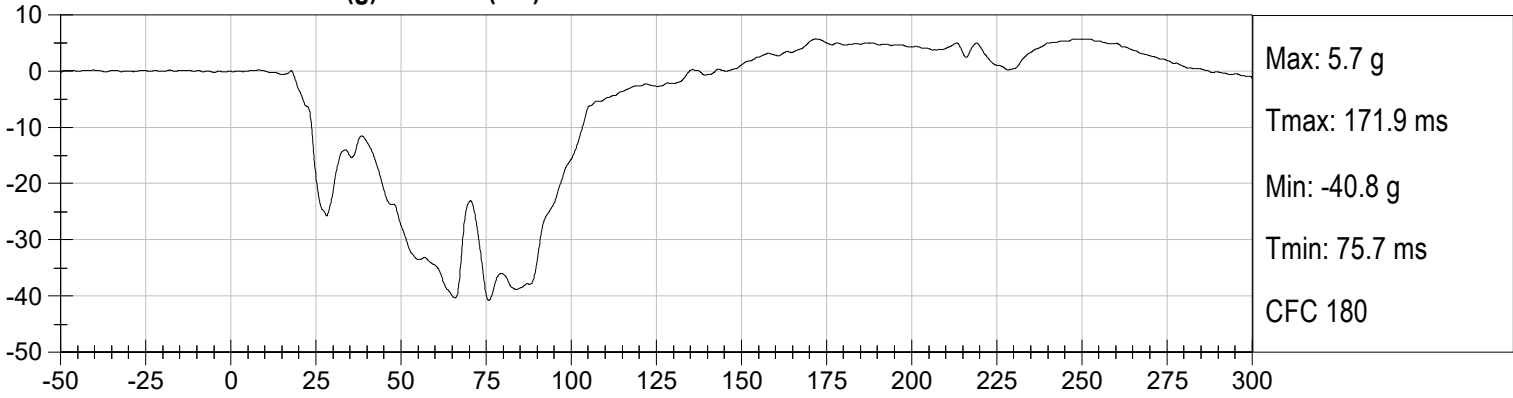
PASSENGER HEAD Resultant (g) vs Time (ms)



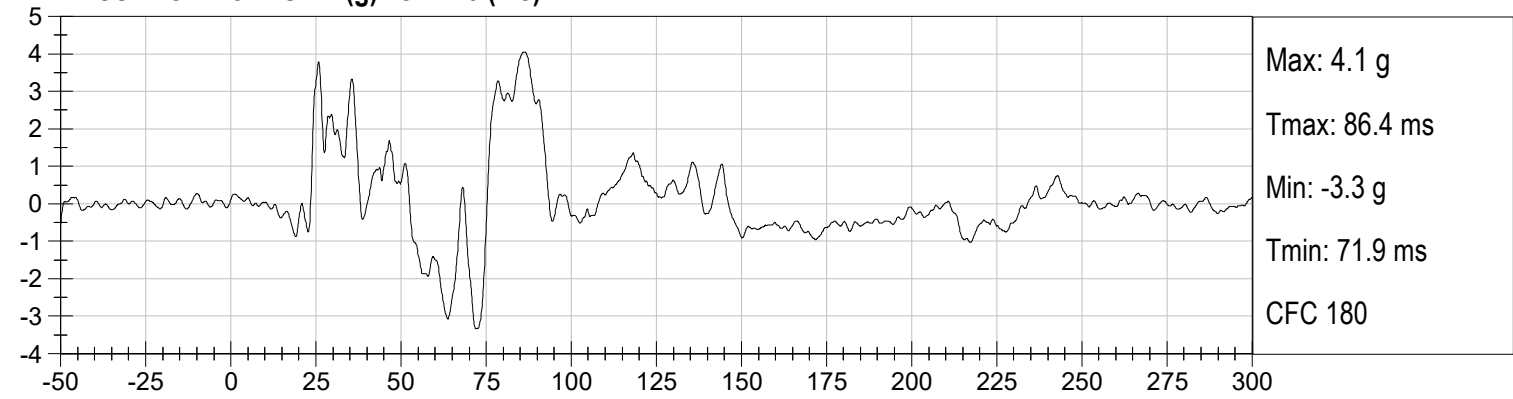
PASSENGER CHEST DISPLACEMENT (mm) vs Time (ms)



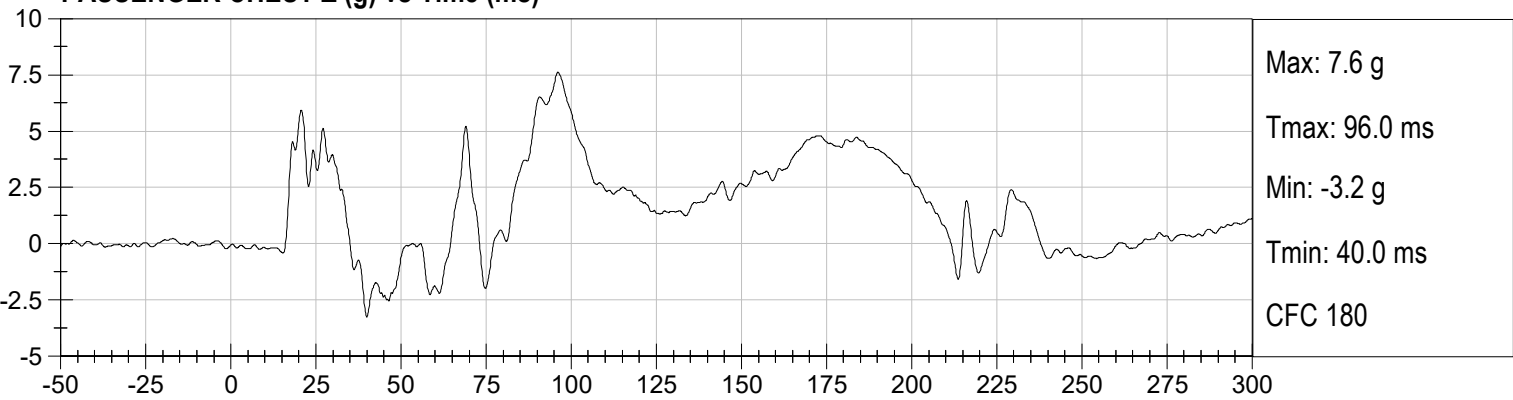
PASSENGER CHEST X (g) vs Time (ms)



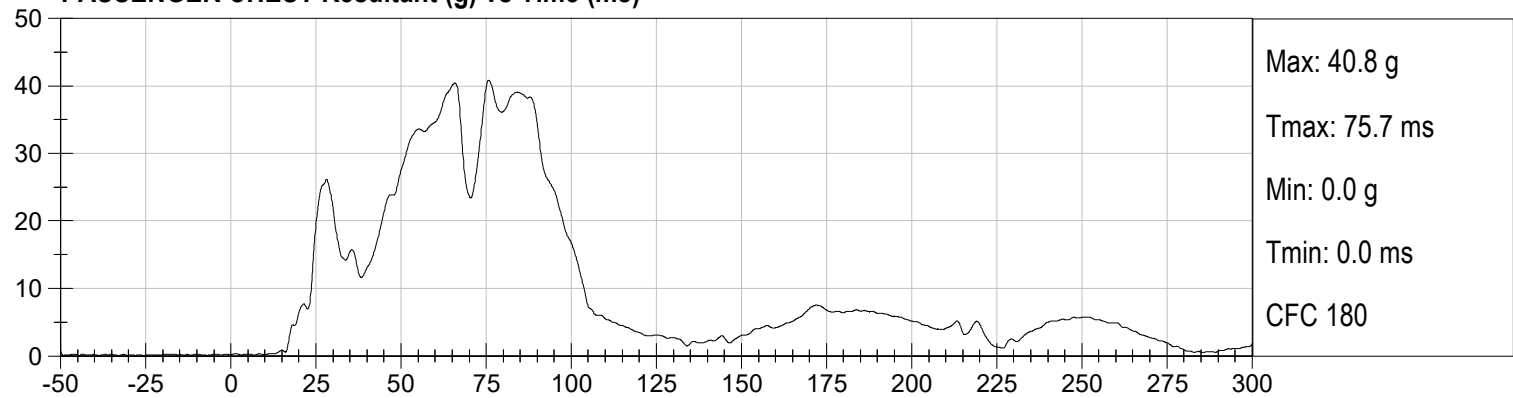
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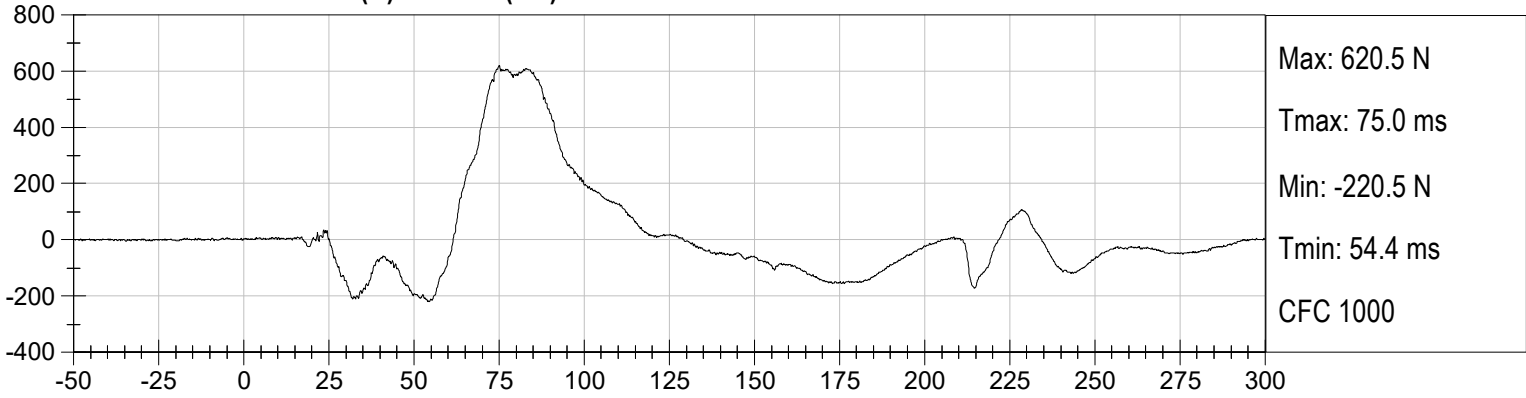
PASSENGER CHEST Z (g) vs Time (ms)



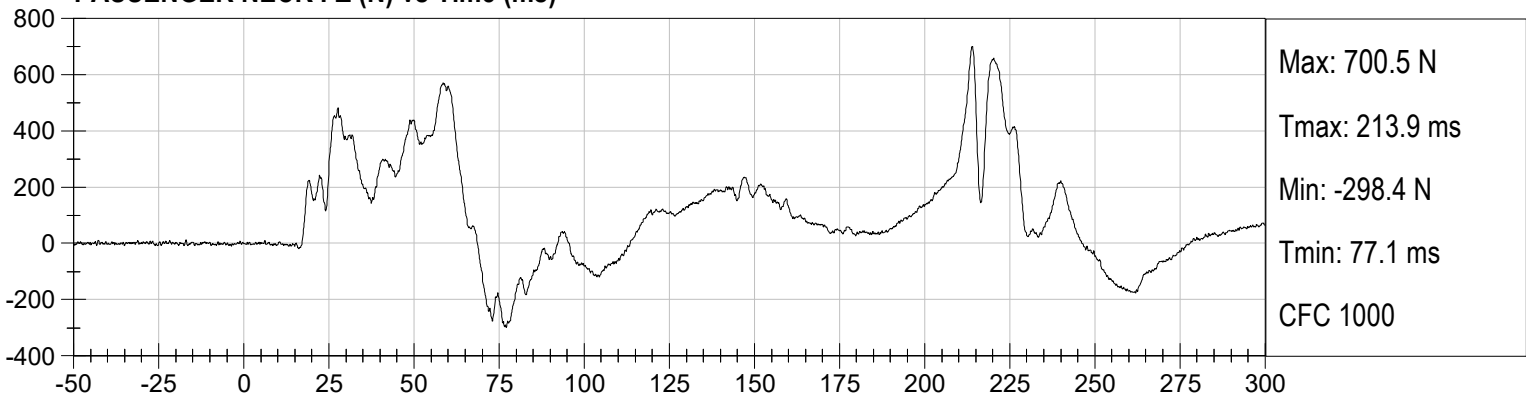
PASSENGER CHEST Resultant (g) vs Time (ms)



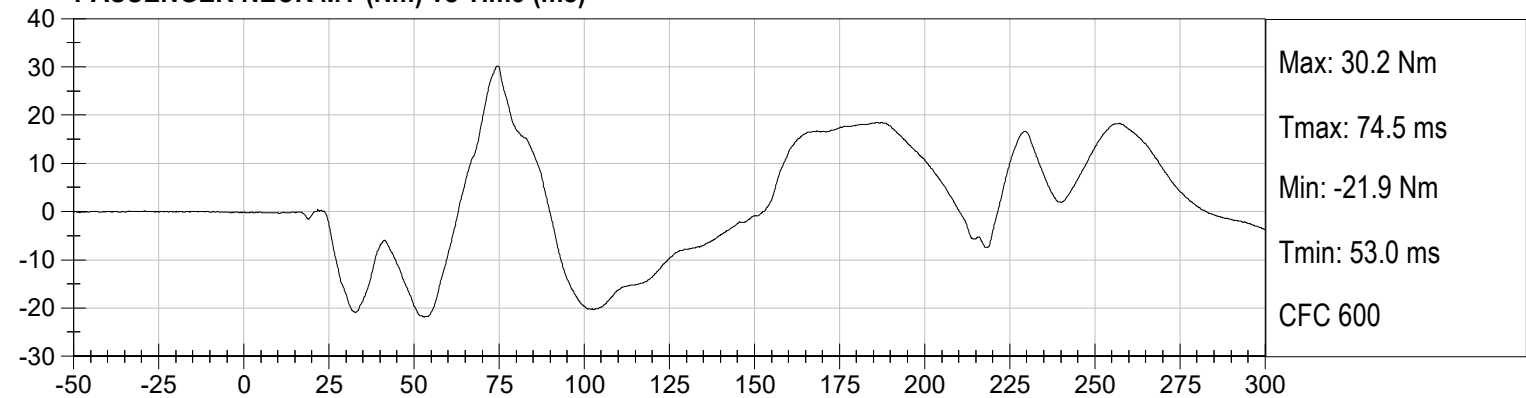
PASSENGER NECK FX (N) vs Time (ms)

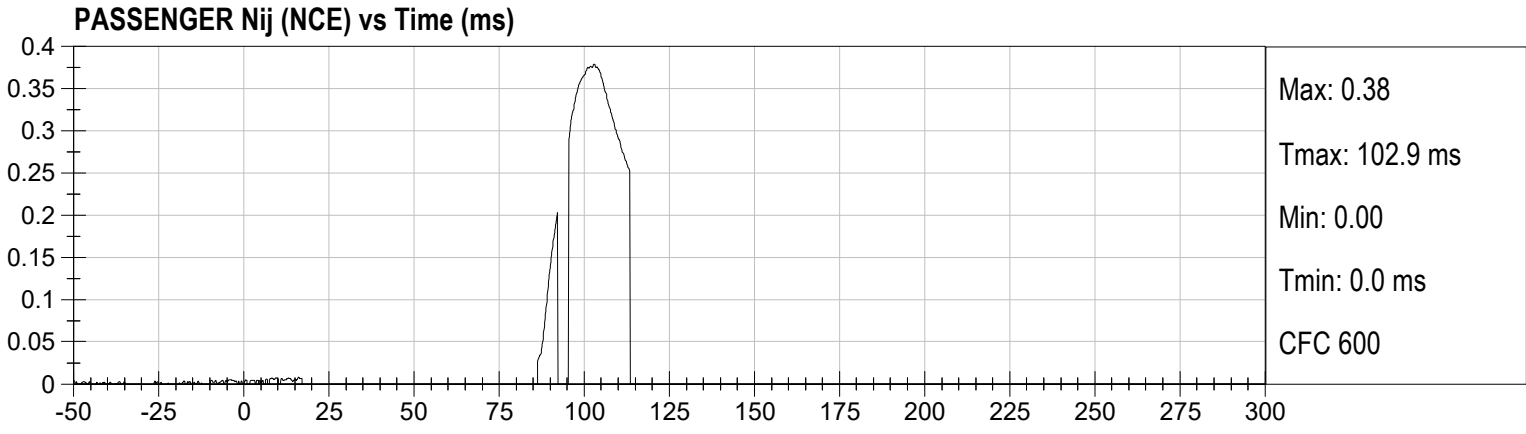
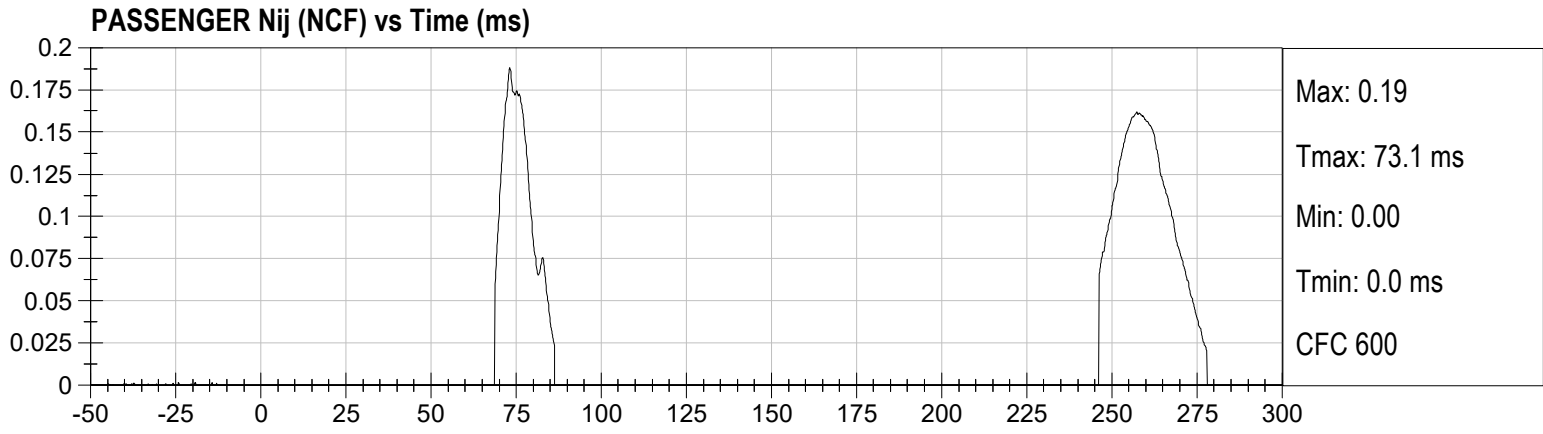
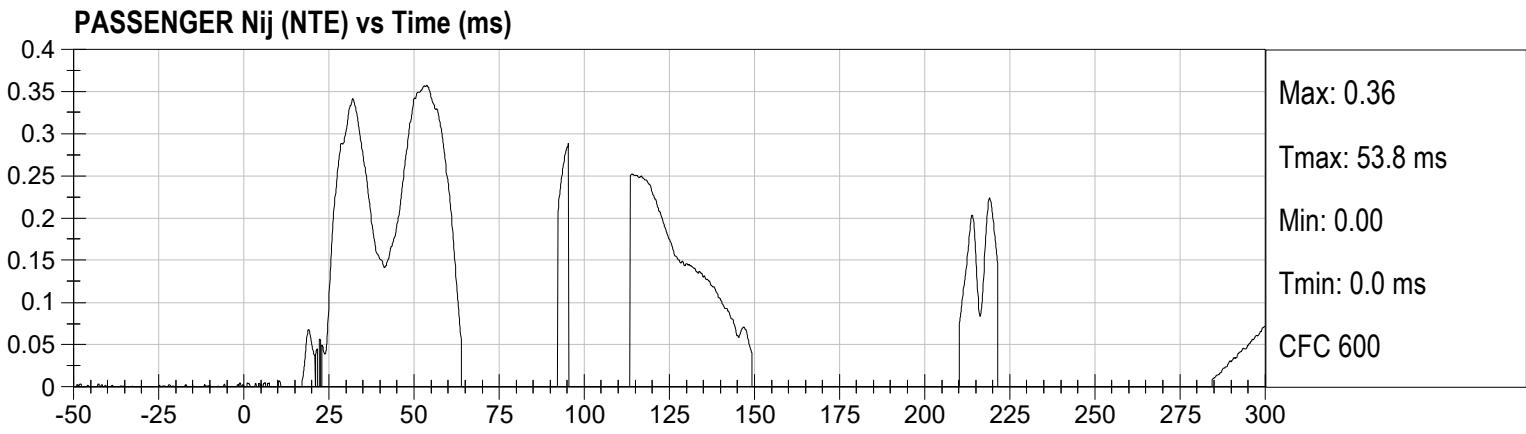
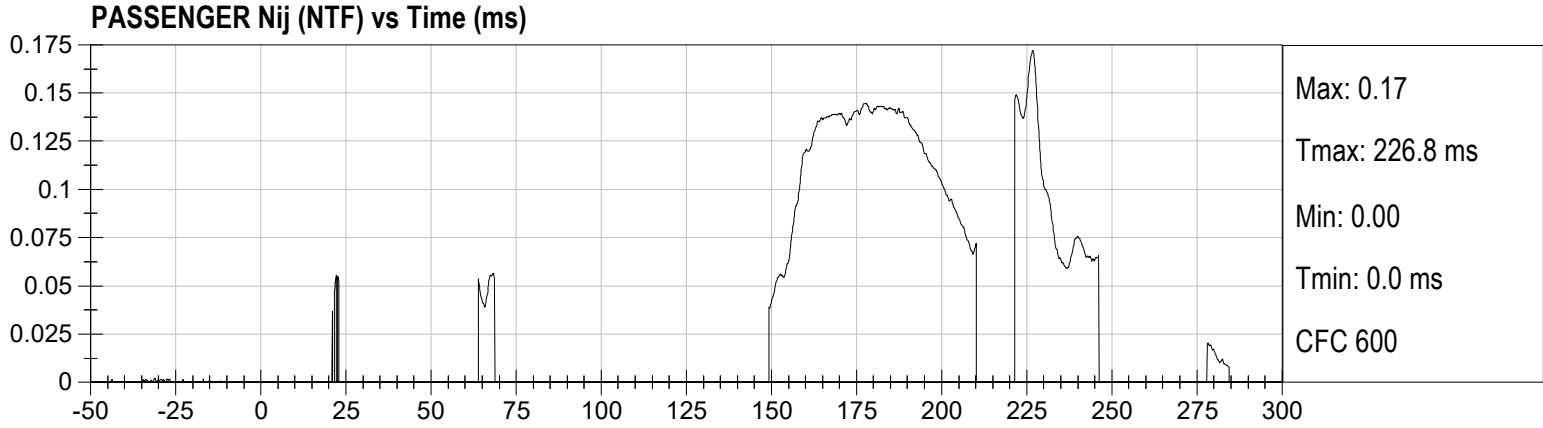


PASSENGER NECK FZ (N) vs Time (ms)

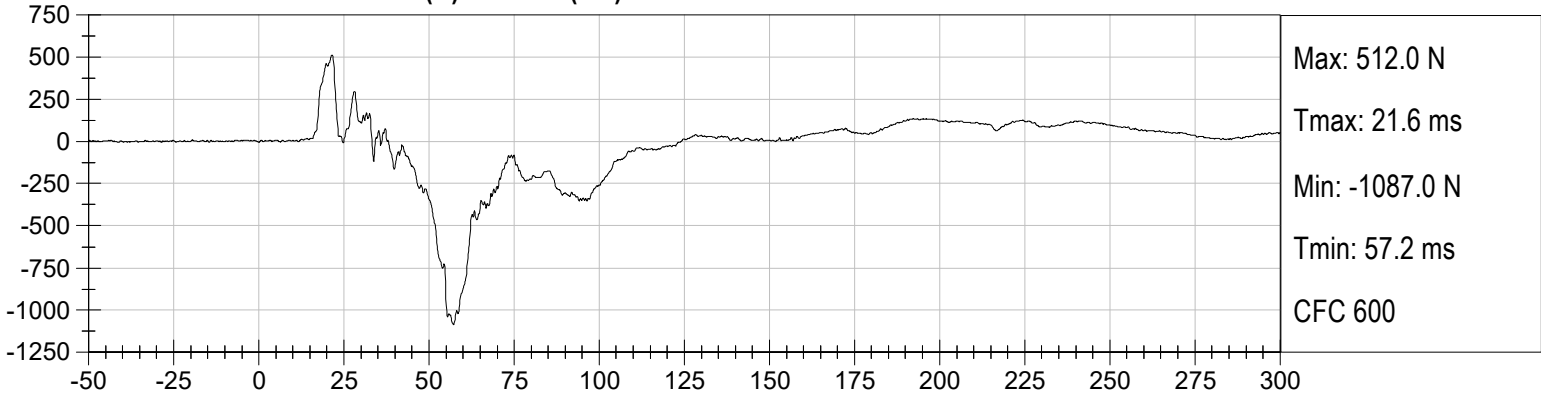


PASSENGER NECK MY (Nm) vs Time (ms)

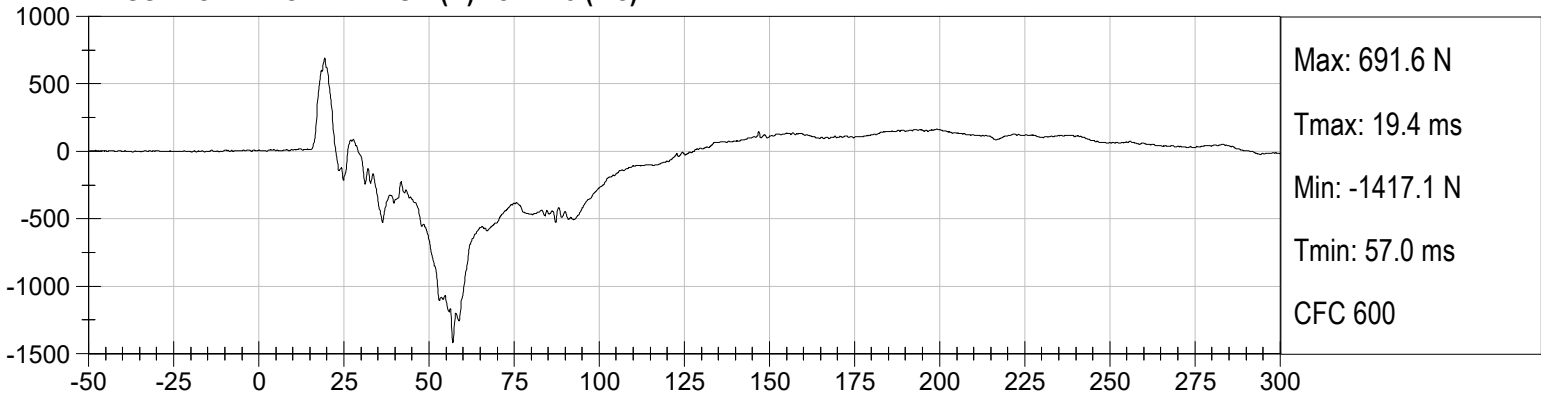




PASSENGER LEFT FEMUR (N) vs Time (ms)



PASSENGER RIGHT FEMUR (N) vs Time (ms)



APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION 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

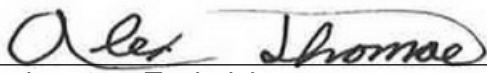
NOTE: THE H-POINT IS LOCATED 1.83 INCHES FORWARD AND 2.57 INCHES DOWN FROM THE CENTER OF THE PELVIS ANGLE REFERENCE HOLE.

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

ATD Serial No: 351

Test ID: D193011

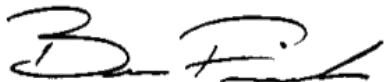
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Peak Resultant Acceleration	G's	225 to 275	229	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	5.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



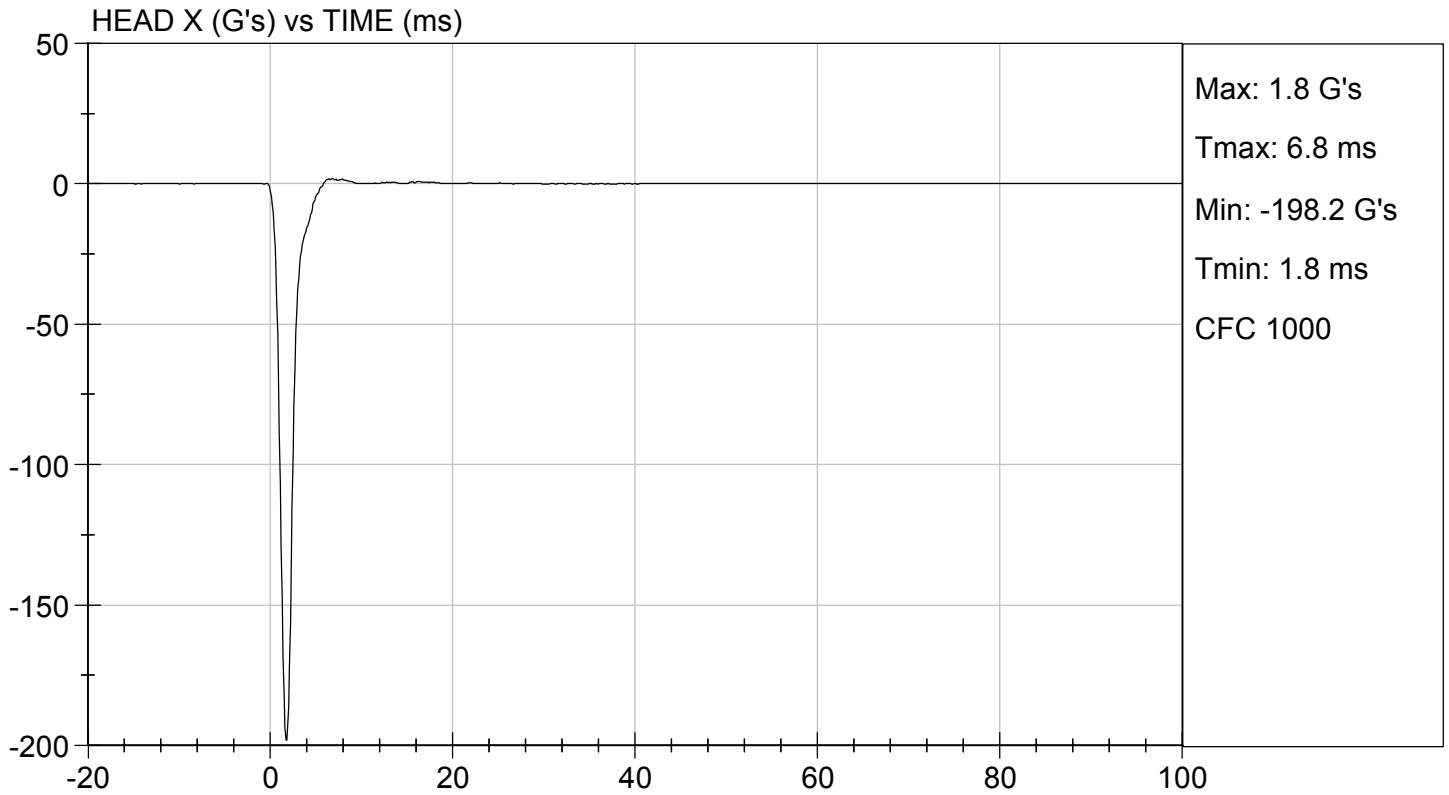
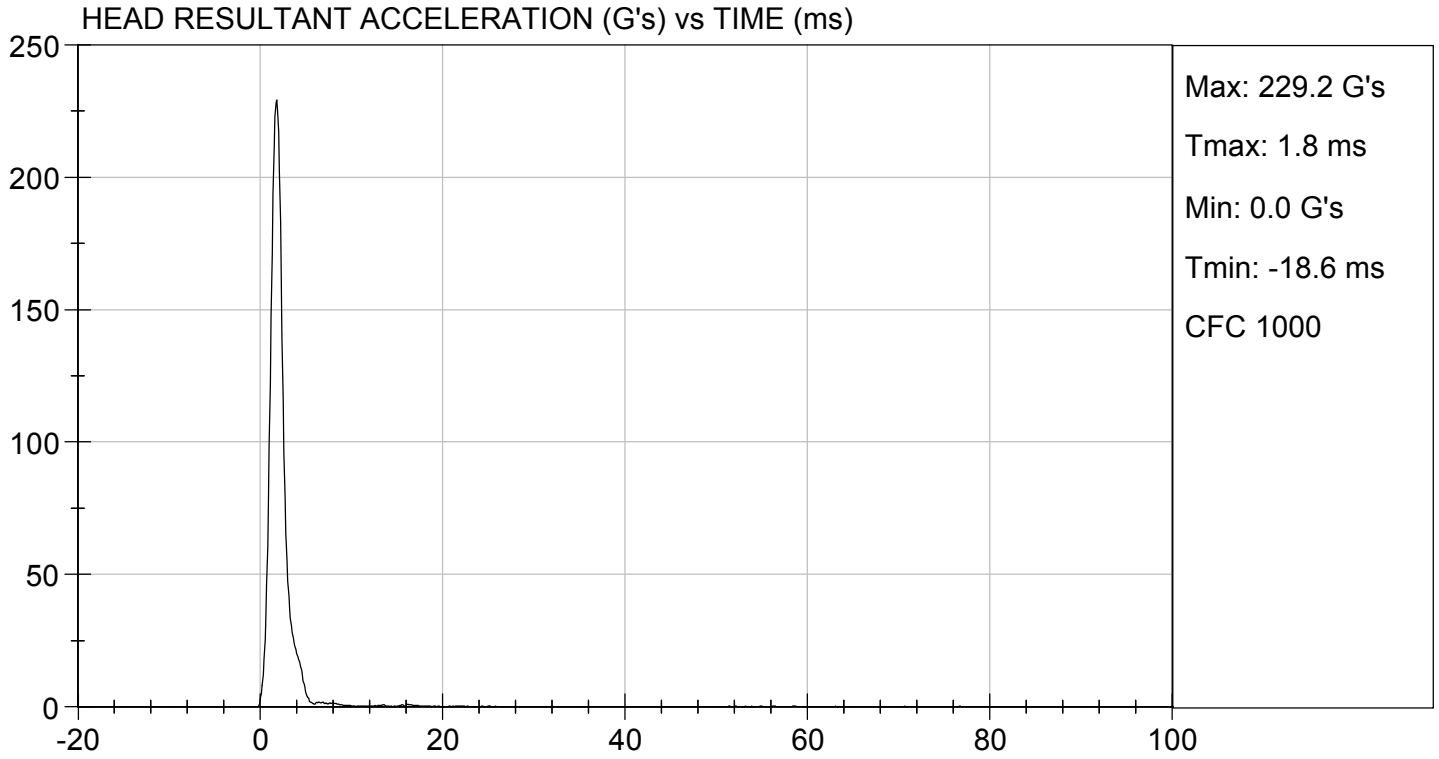
Laboratory Technician

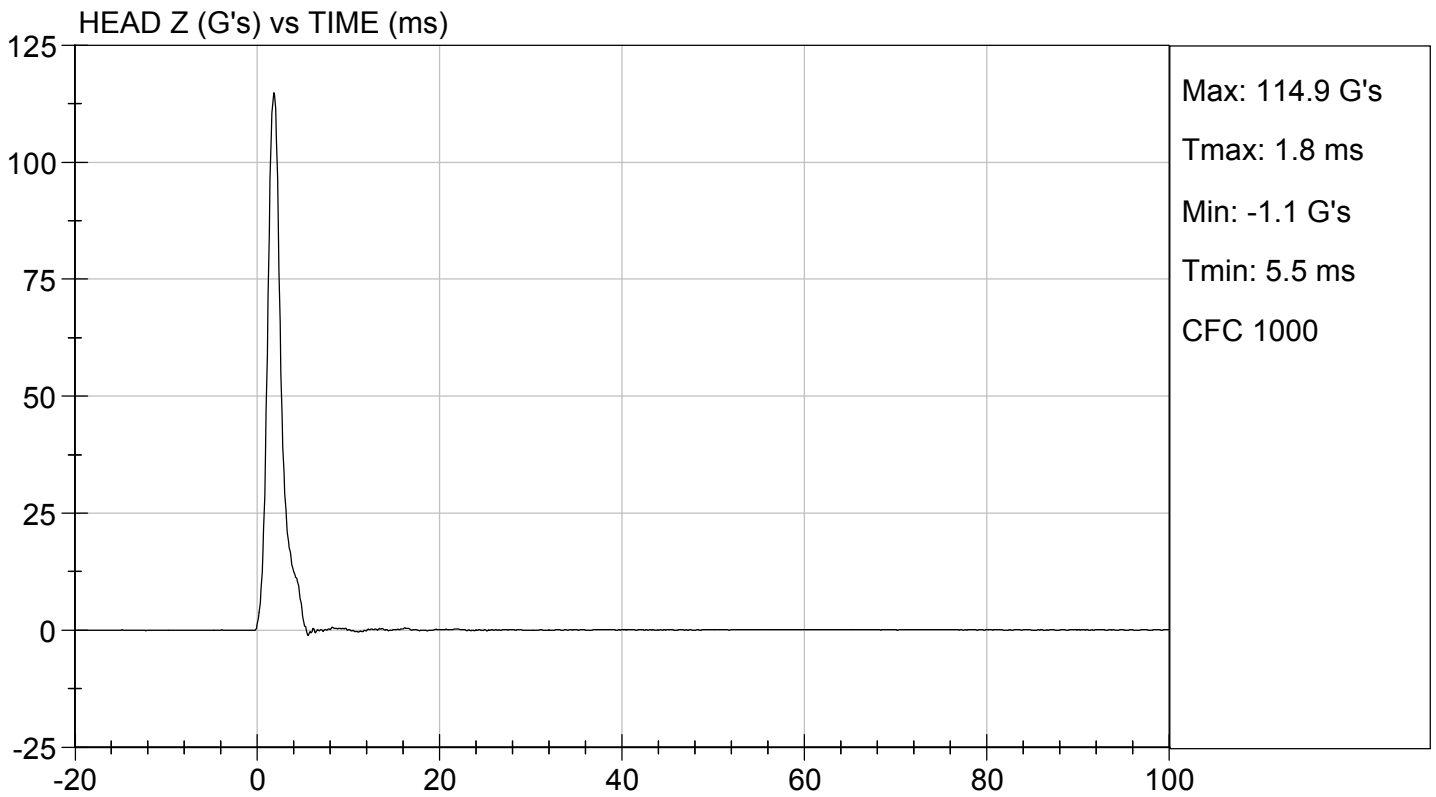
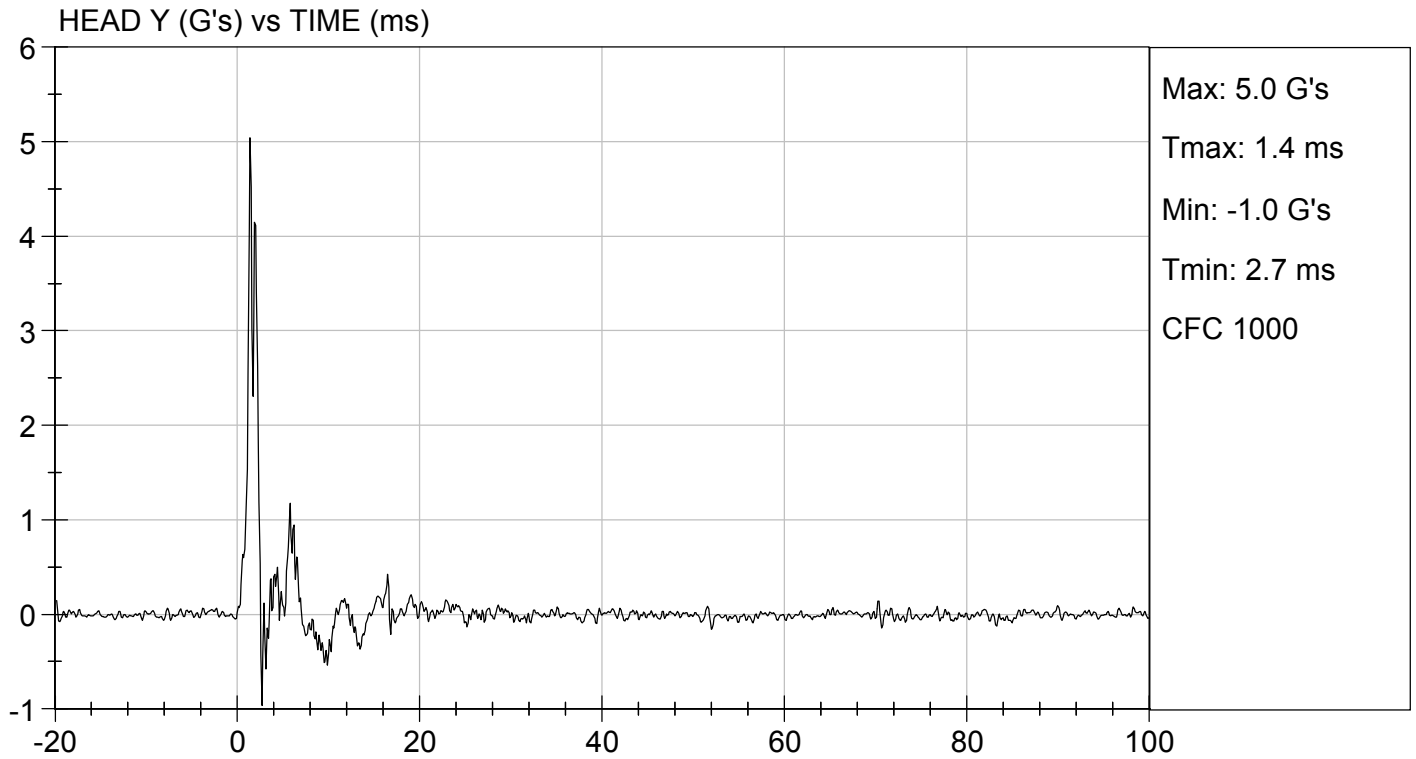
09/25/2019

Test Date



Approved By





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

ATD Serial No: 351

Test I.D: D193012

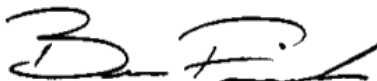
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	45	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.15	Pass
	20 ms	G's	17.60 to 22.60	20.35	Pass
	30 ms	G's	12.50 to 18.50	14.63	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.6	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	36.7	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	69.1	Pass
	Time	ms	57.0 to 64.0	57.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	115.6	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	91.0	Pass
	Time	ms	47.0 to 58.0	49.0	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	100.3	Pass
Overall Test Results					Pass



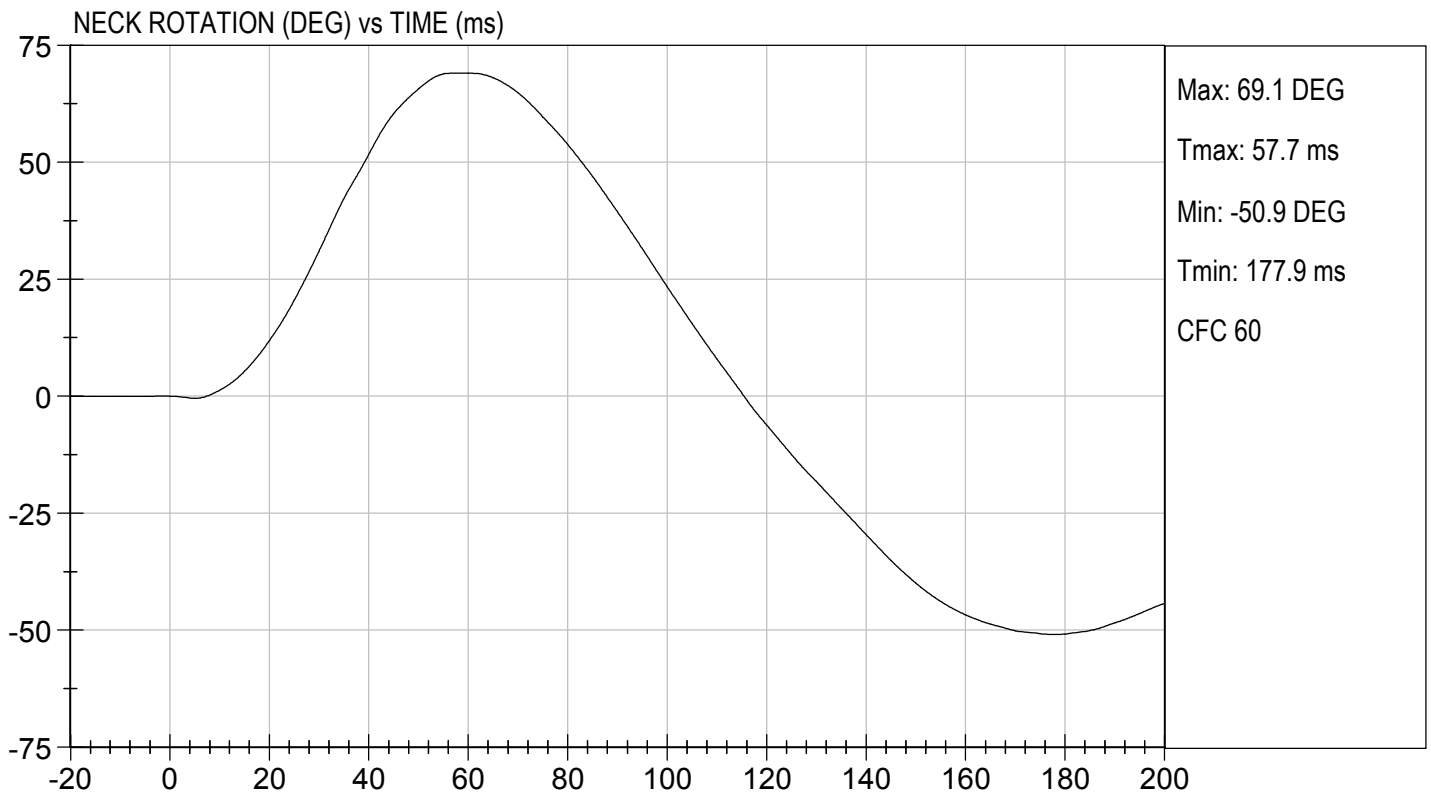
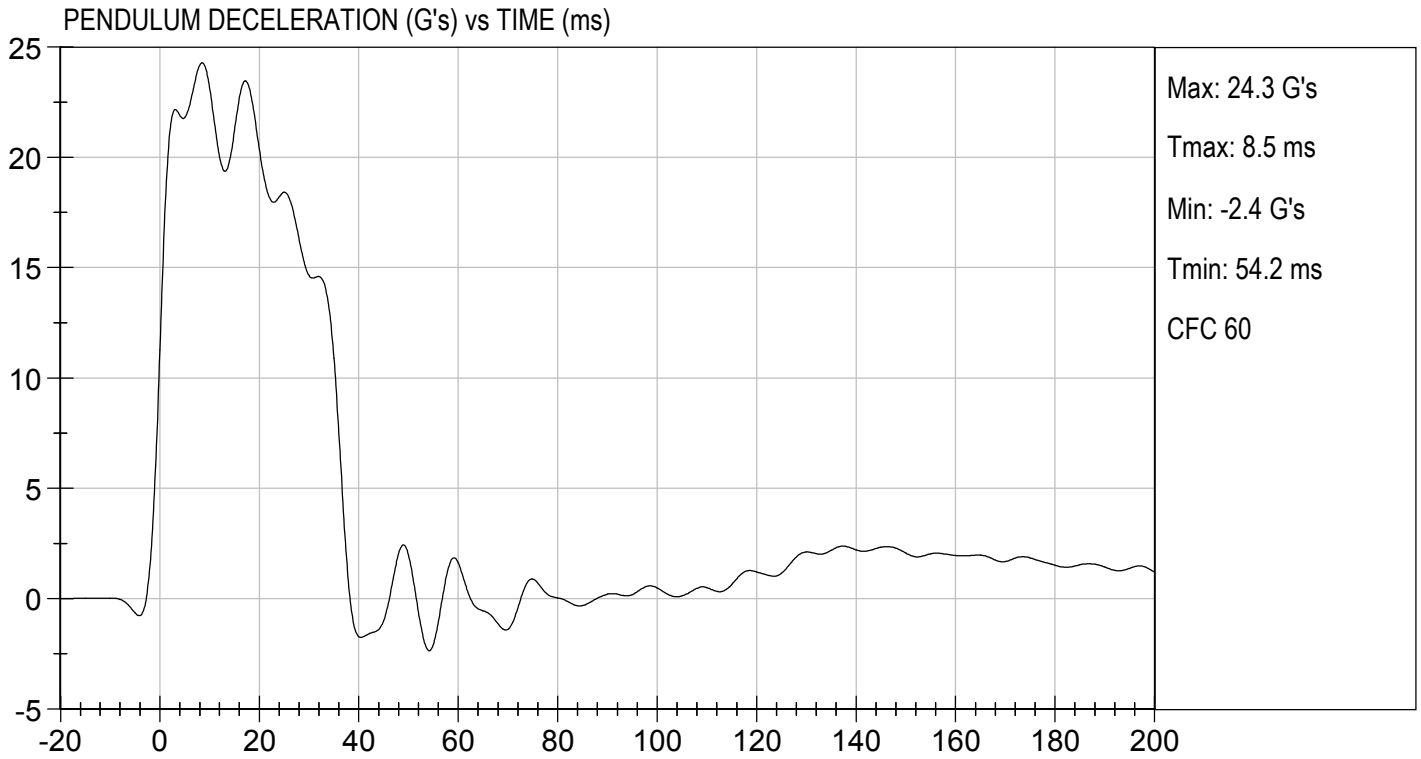
 Laboratory Technician

09/25/2019

 Test Date



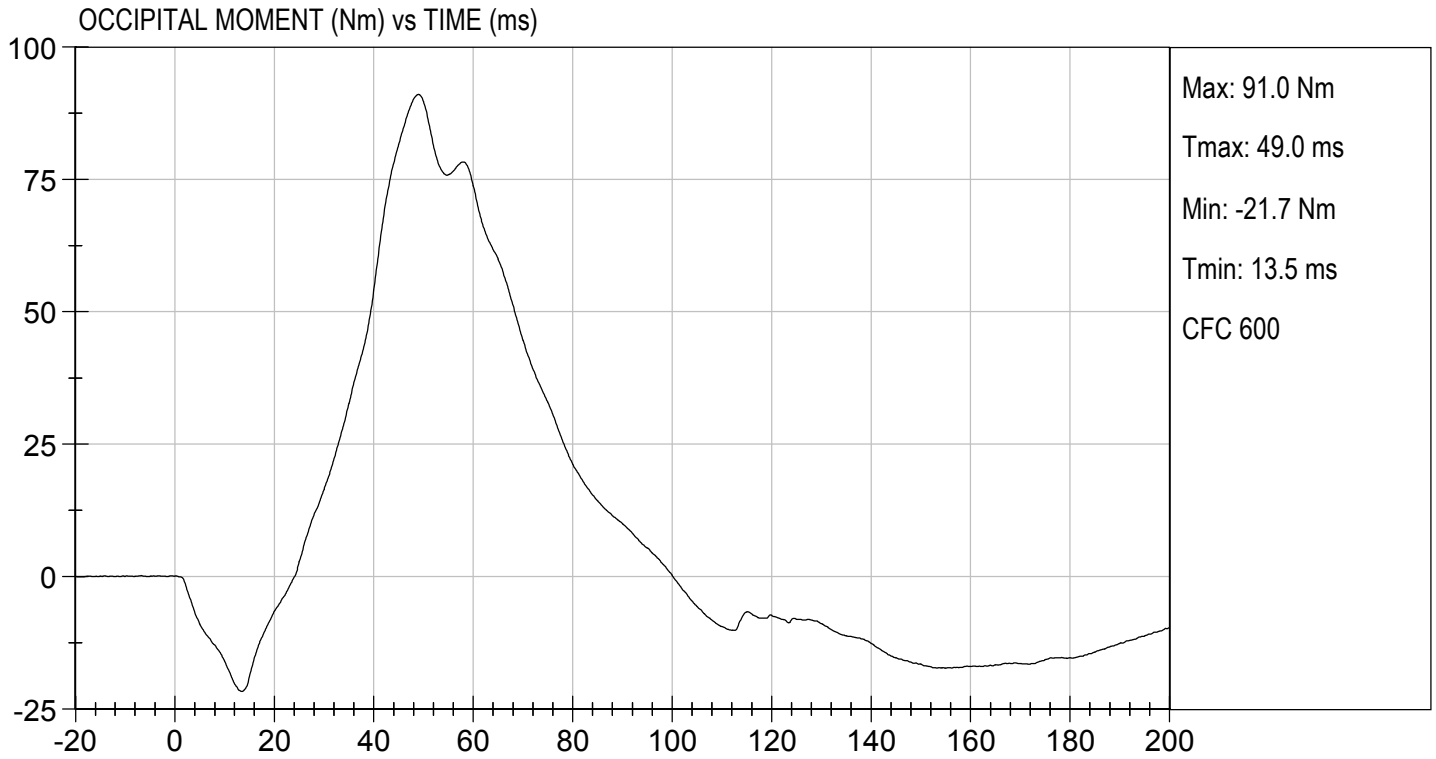
 Approved By





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

TEST DATE: 09/25/2019
TEST #: D193012



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

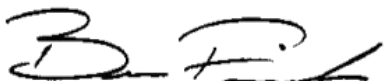
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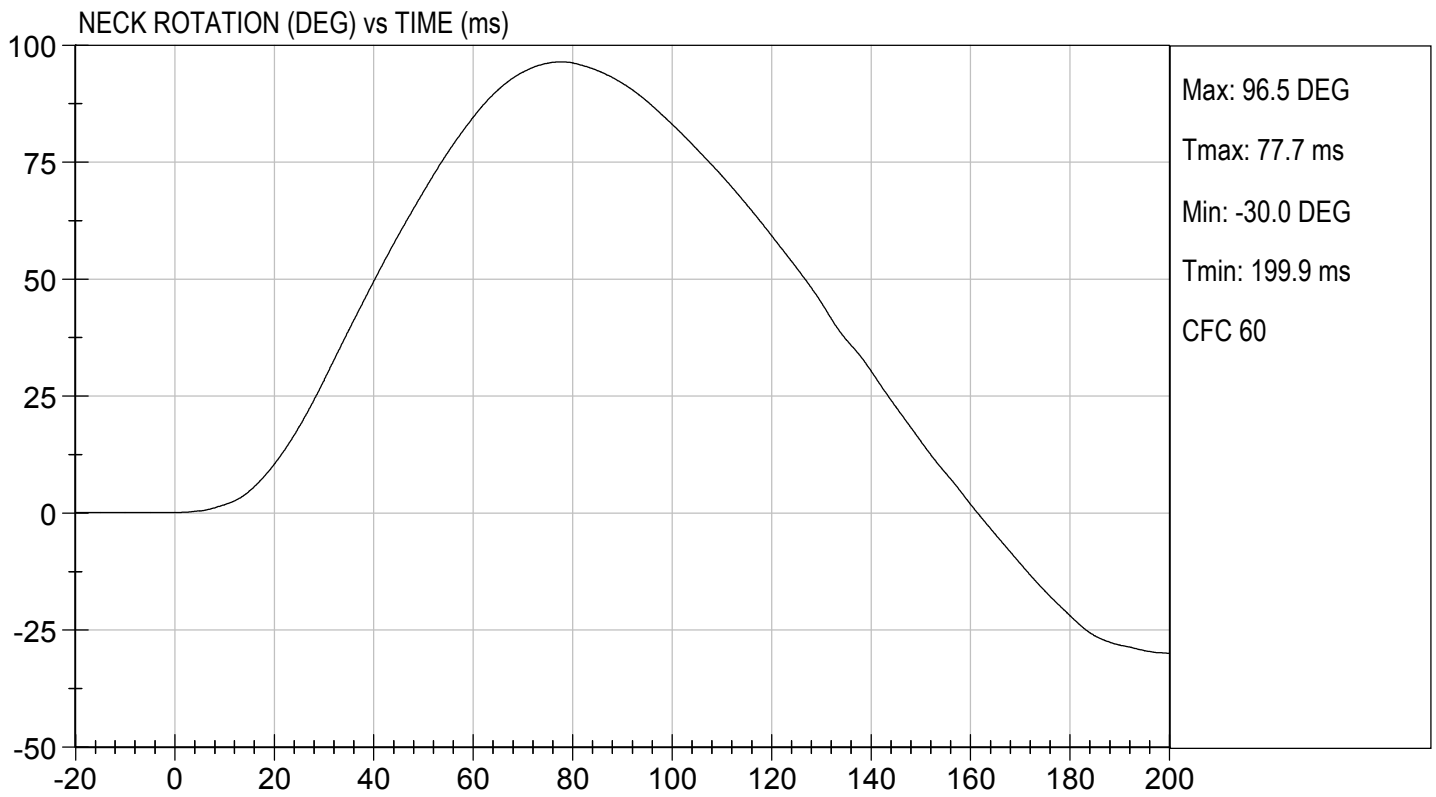
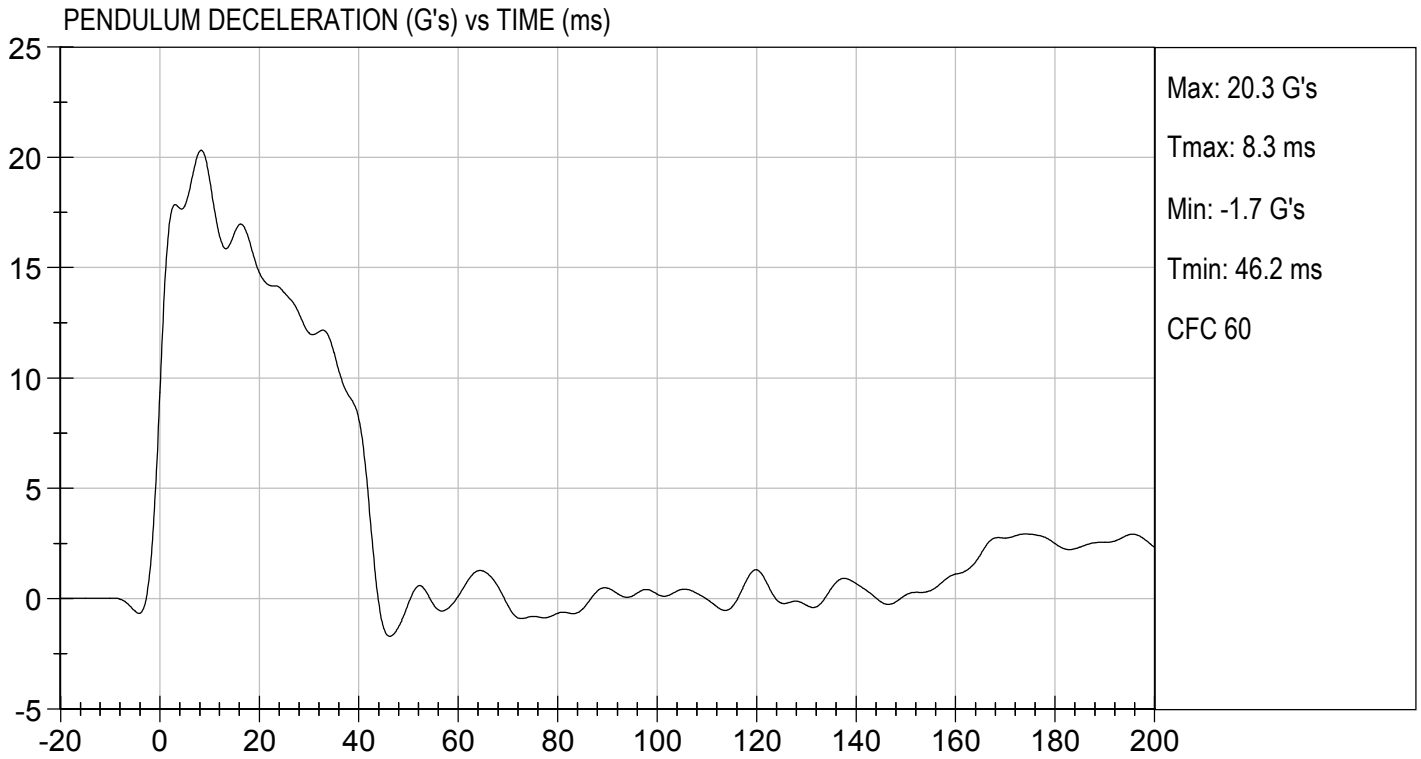
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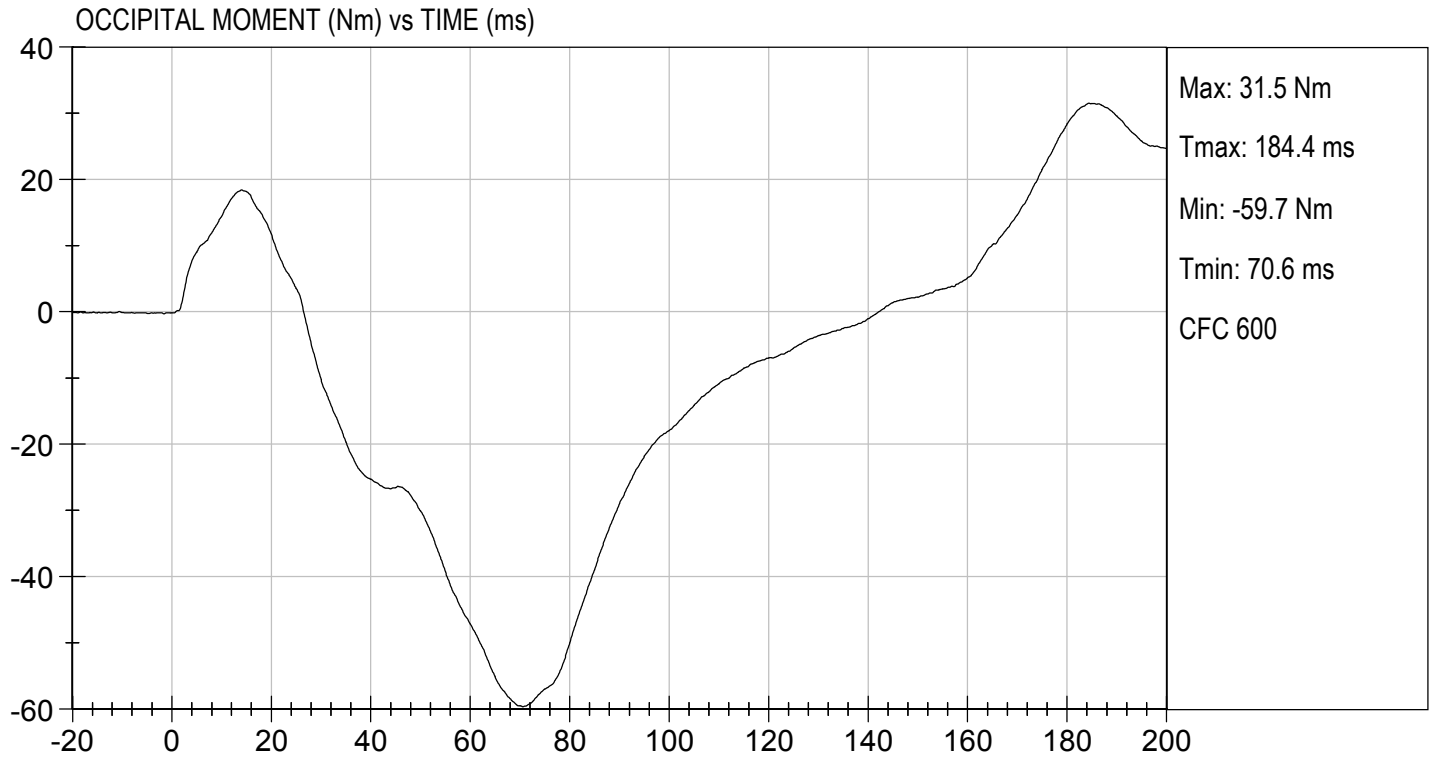
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	45	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.99	Pass
	20 ms	G's	14.00 to 19.00	14.78	Pass
	30 ms	G's	11.00 to 16.00	12.03	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.2	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	41.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.5	Pass
	Time	ms	72.0 to 82.0	77.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	161.6	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-59.7	Pass
	Time	ms	65.0 to 79.0	70.6	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	142.3	Pass
Overall Test Results					Pass


 Laboratory Technician

09/25/2019
 Test Date


 Approved By






**MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE**

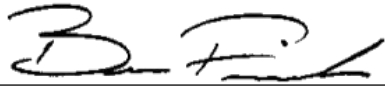
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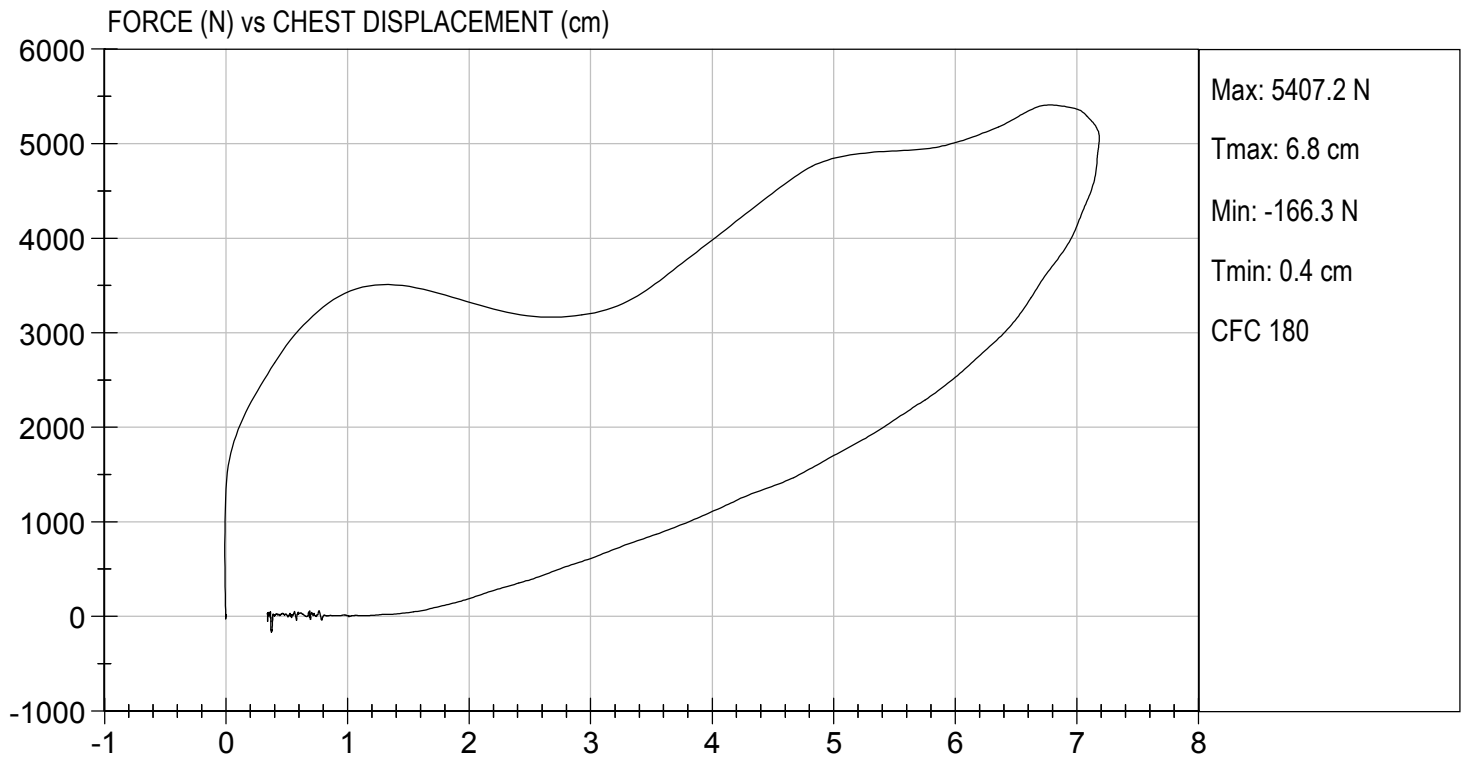
Test I.D: D193014

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,407	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	7.18	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Overall Test Results				Pass


Laboratory Technician

09/25/2019
Test Date


Approved By




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

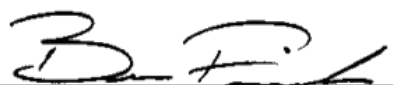
ATD Serial No: 351

Test I.D: D193015

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	45	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,410	Pass
Overall Test Results				Pass


 Laboratory Technician

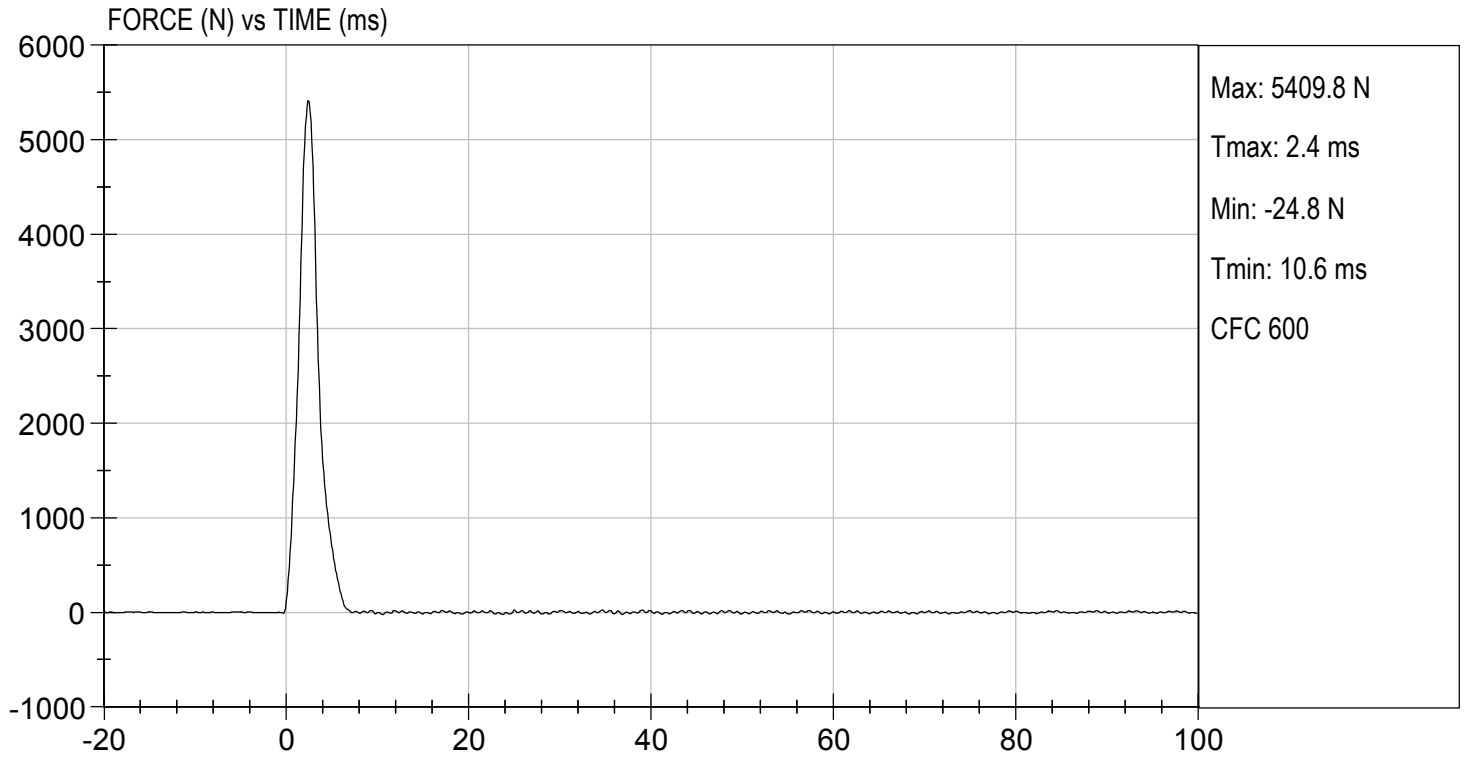
09/25/2019
 Test Date


 Approved By



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

TEST DATE: 09/25/2019
TEST #: D193015



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

ATD Serial No: 351

Test I.D: D193016

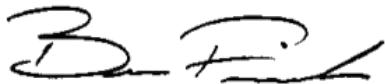
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	5,400	Pass
Overall Test Results				Pass



Laboratory Technician

09/25/2019

Test Date

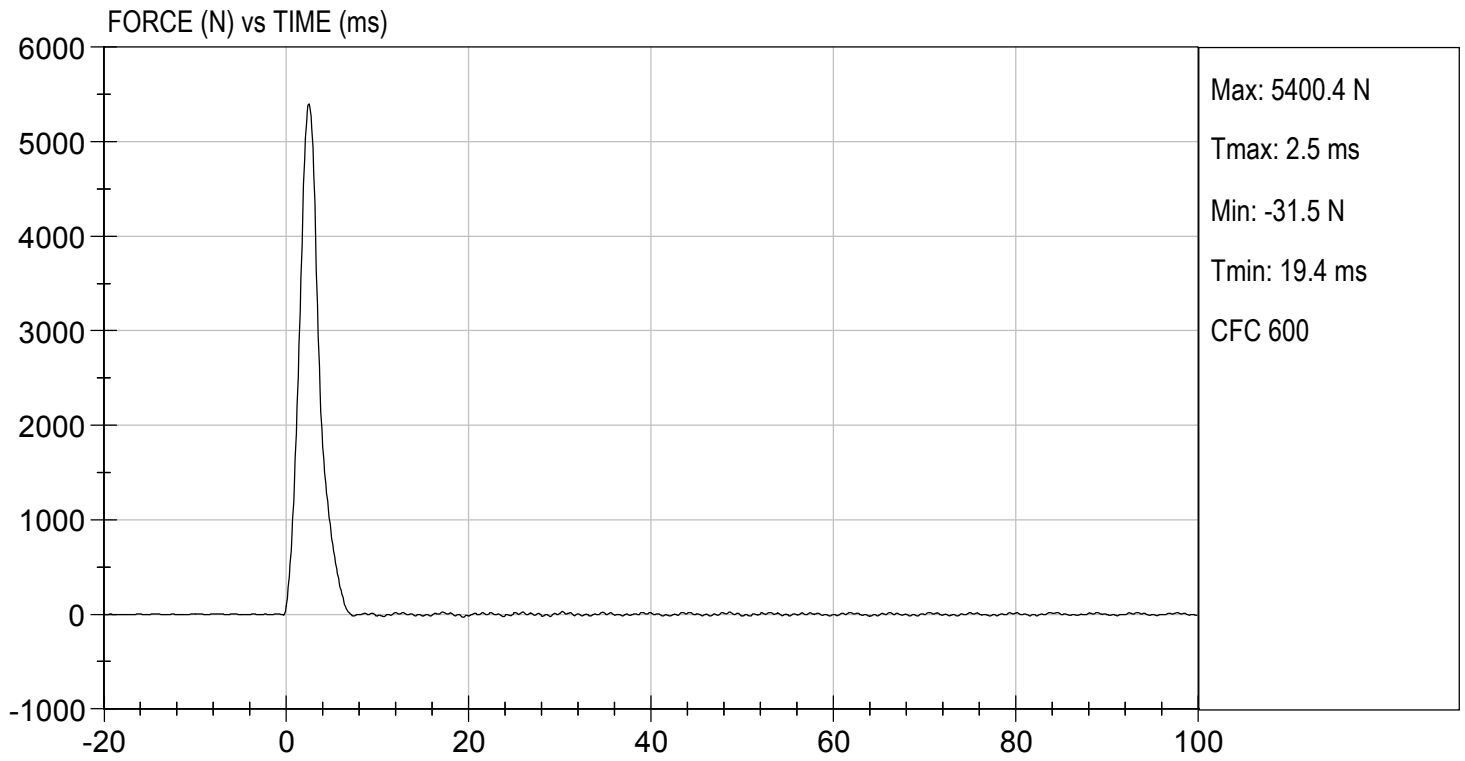


Approved By



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

TEST DATE: 09/25/2019
TEST #: D193016



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

ATD Serial No: 351

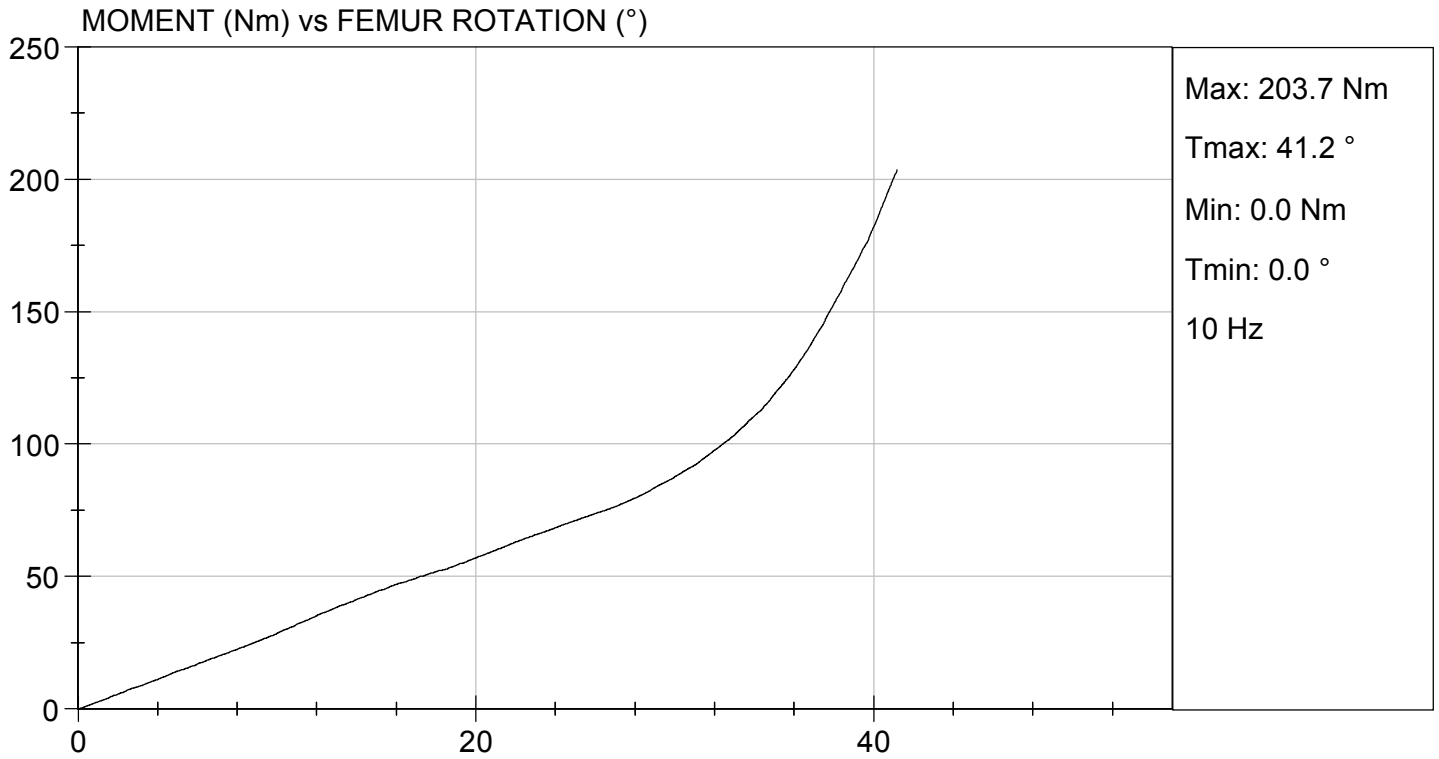
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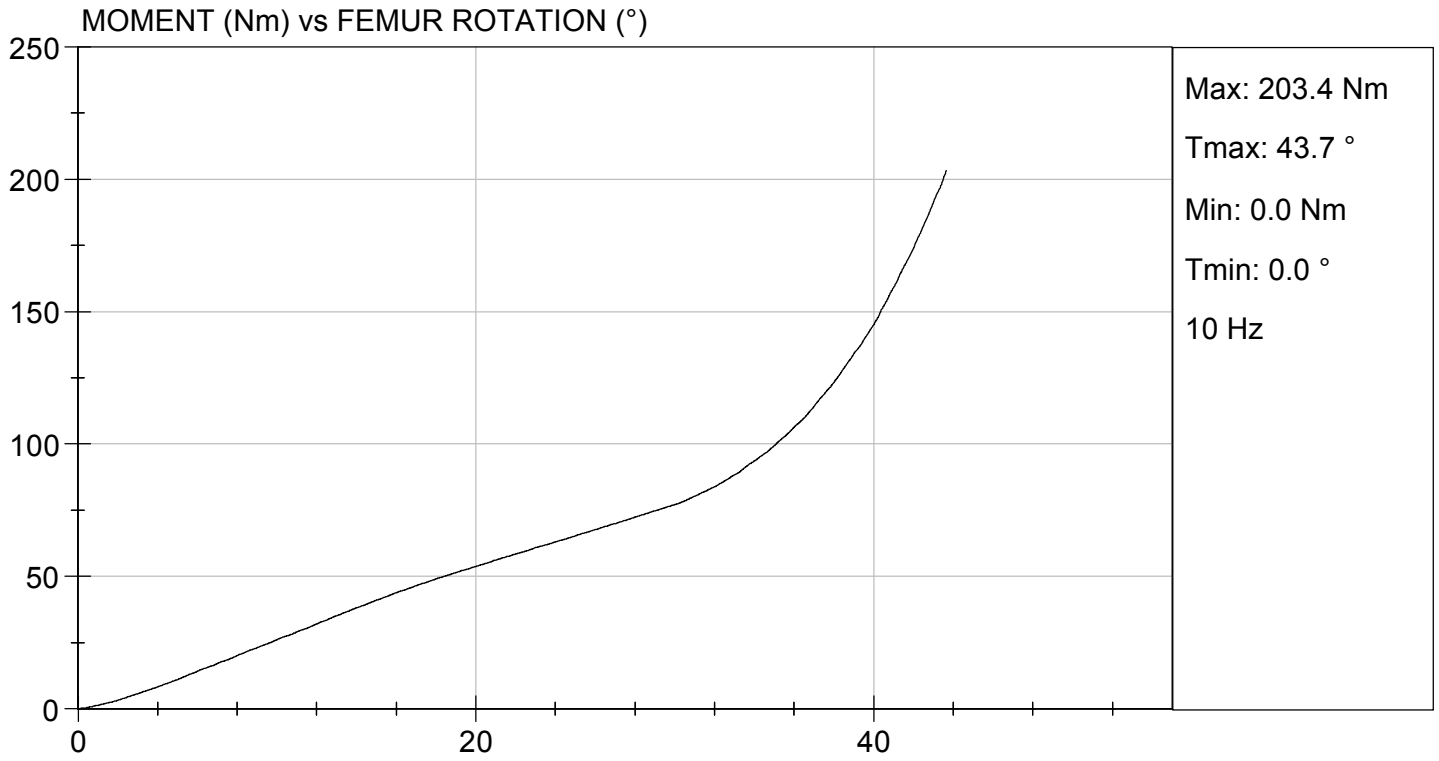
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	44	44	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.4	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	87.6	77.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	41.2	43.7	Pass
Overall Test Results					Pass

Jacob D Taylor
 Laboratory Technician

09/25/2019
 Test Date

B. F. K.
 Approved By





CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

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

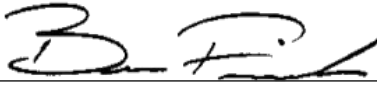
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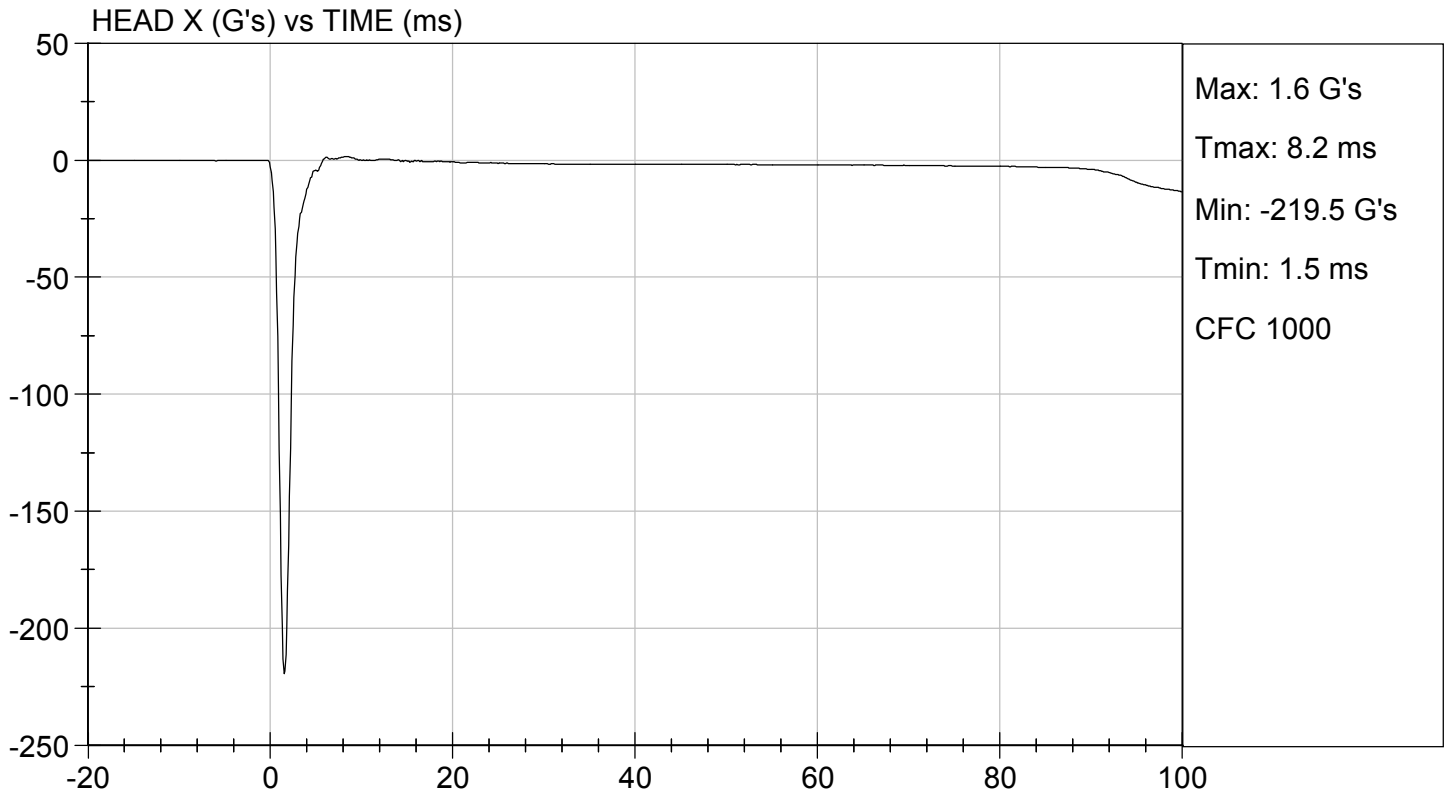
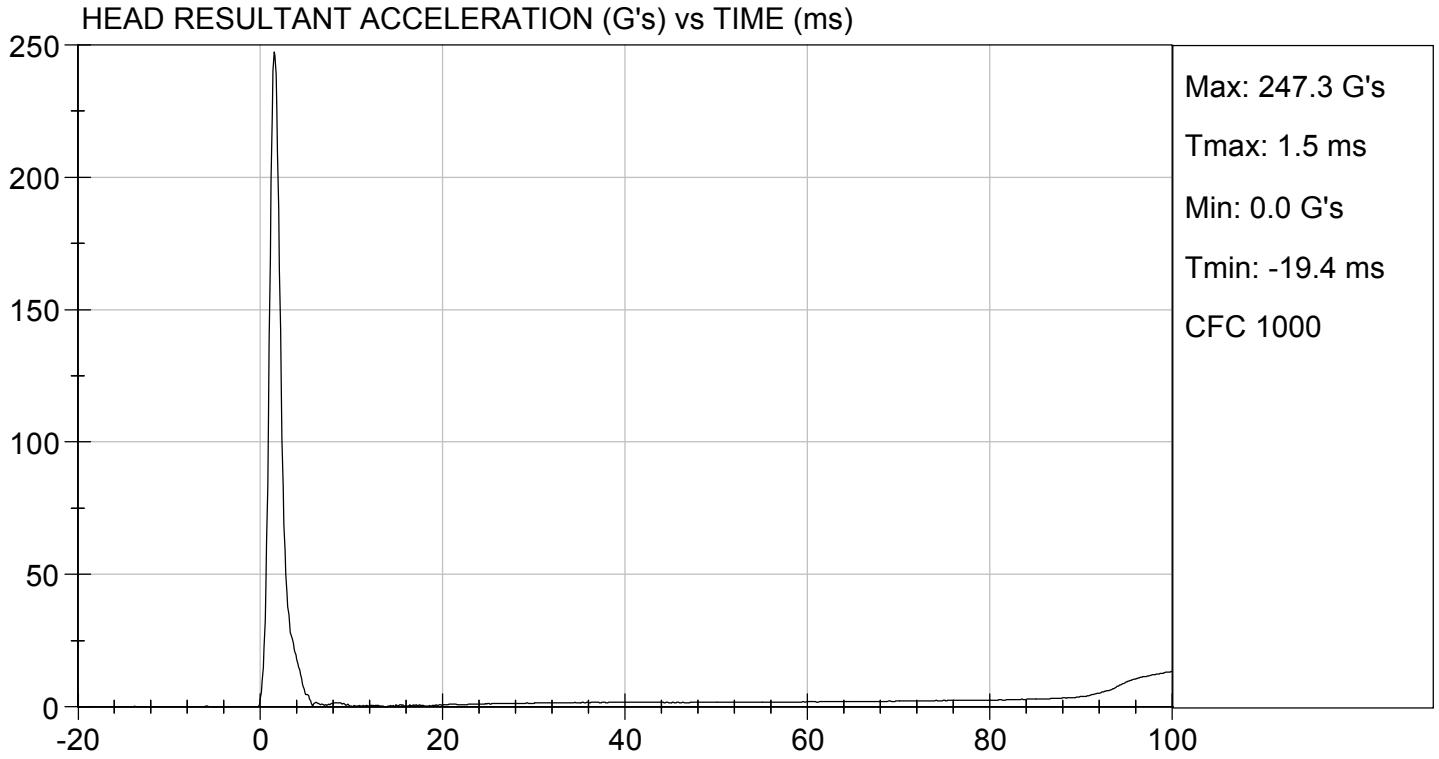
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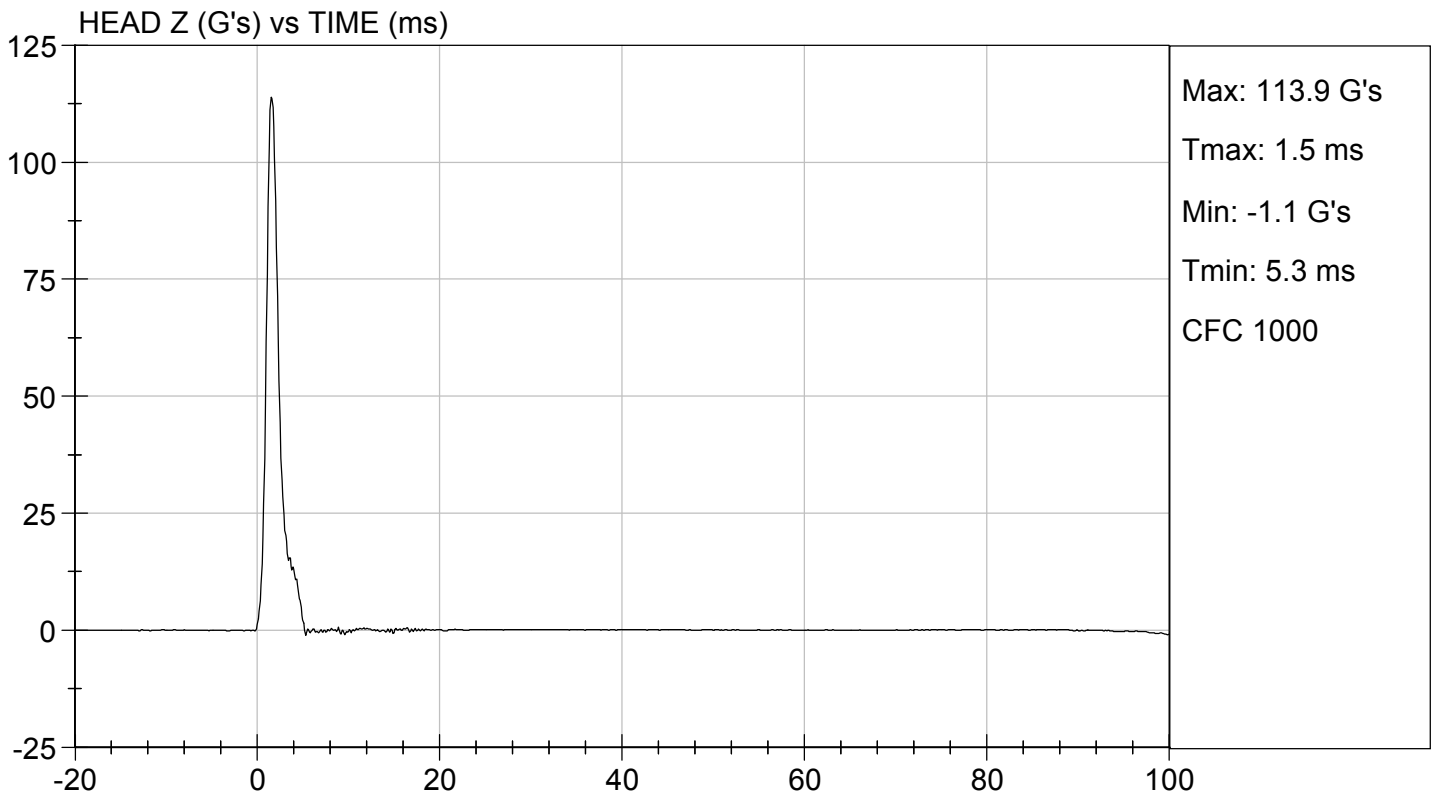
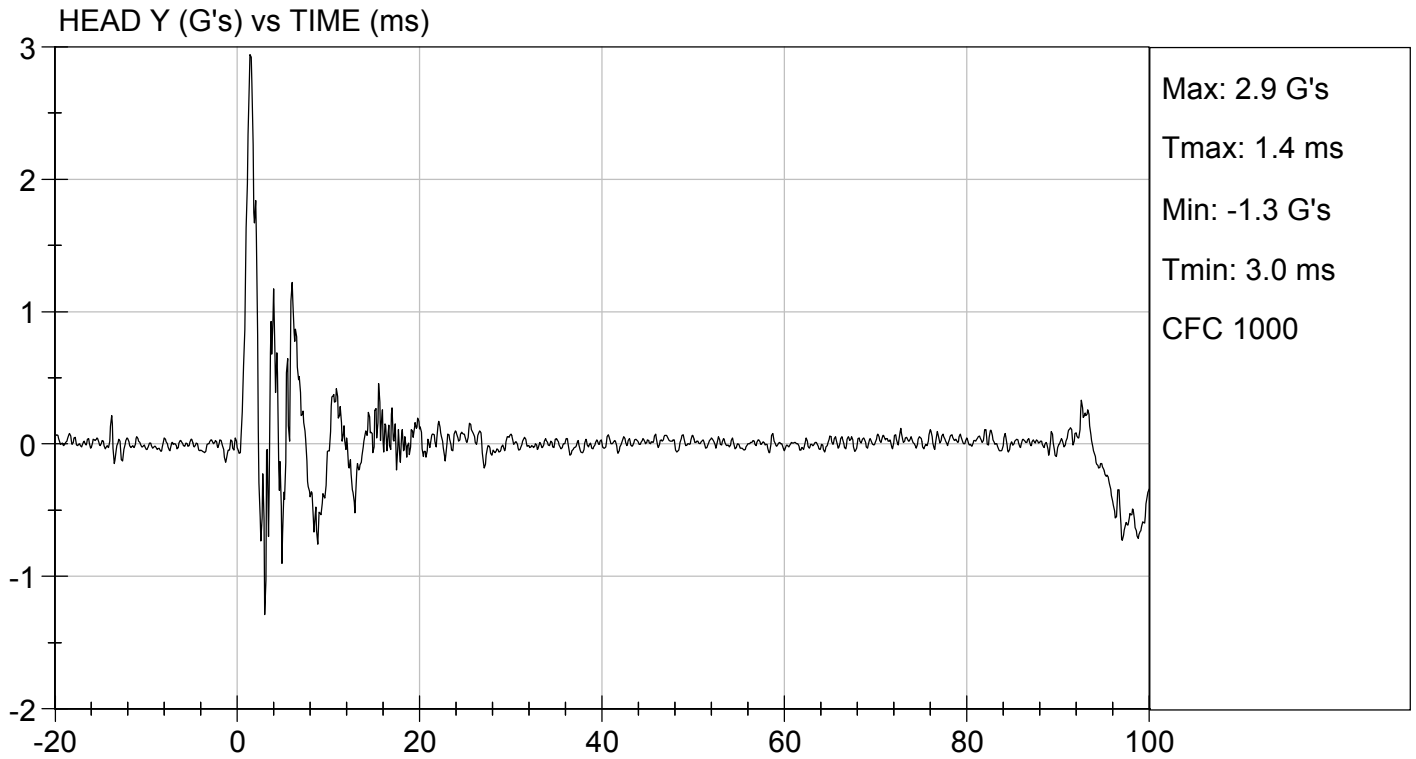
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	225 to 275	247	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	2.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


 Laboratory Technician

10/16/2019
 Test Date


 Approved By





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

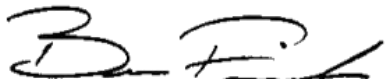
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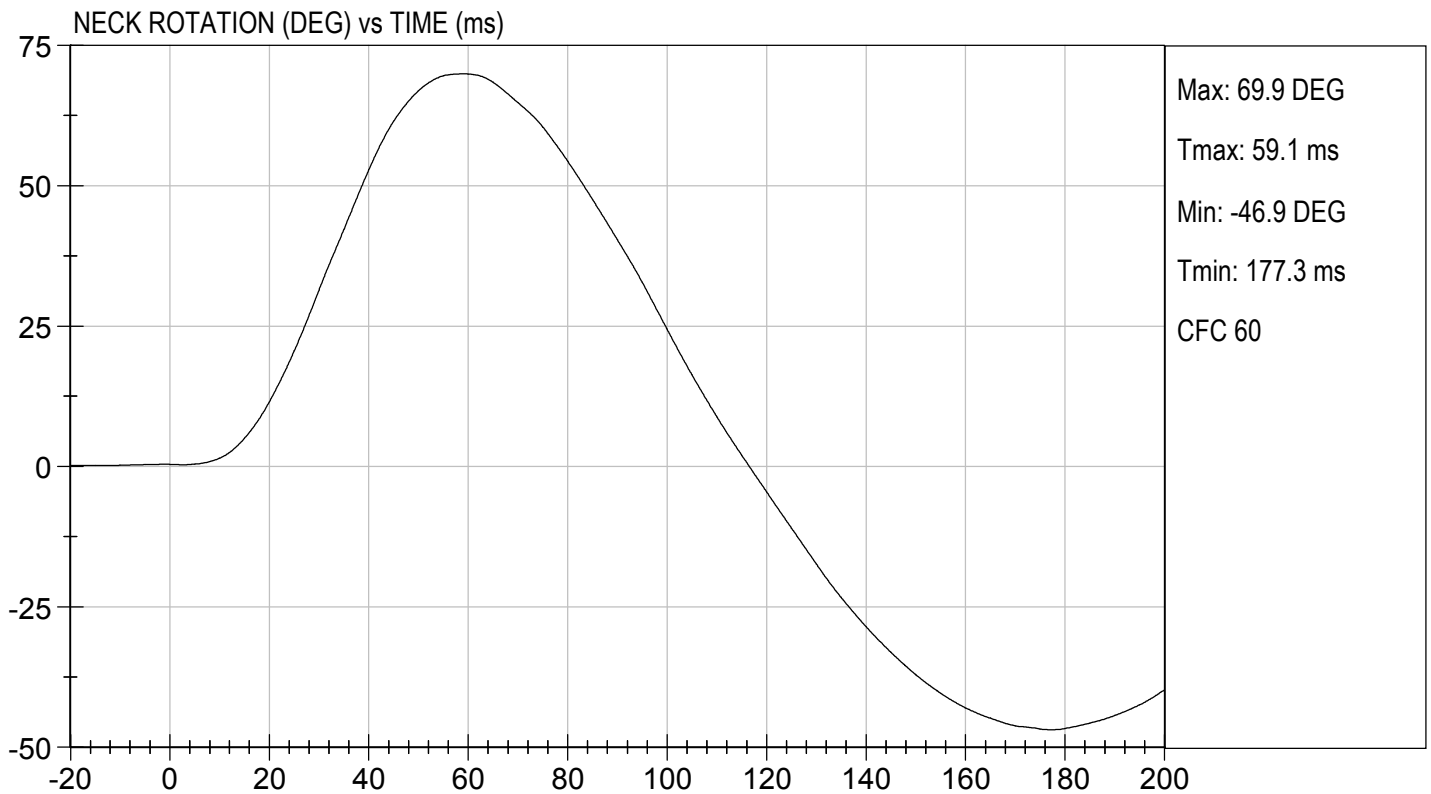
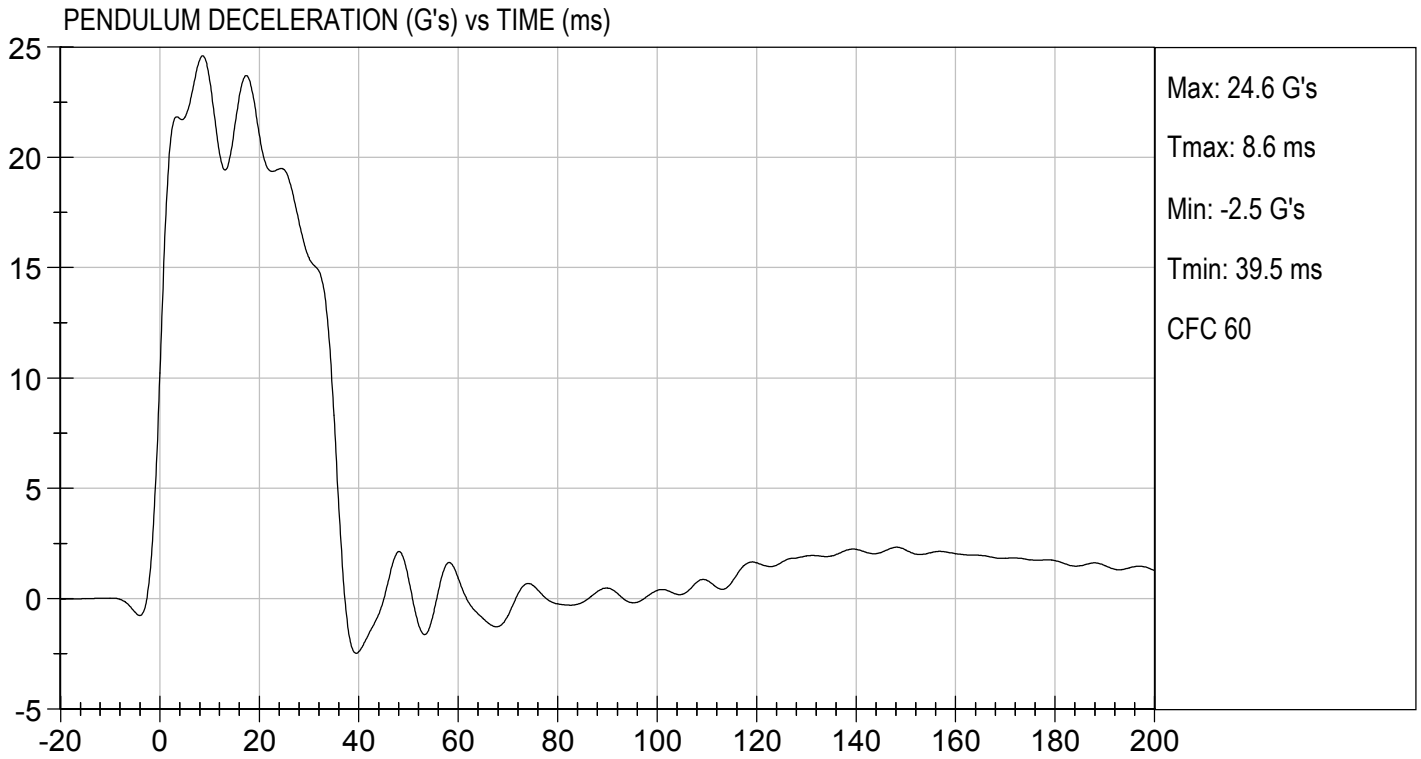
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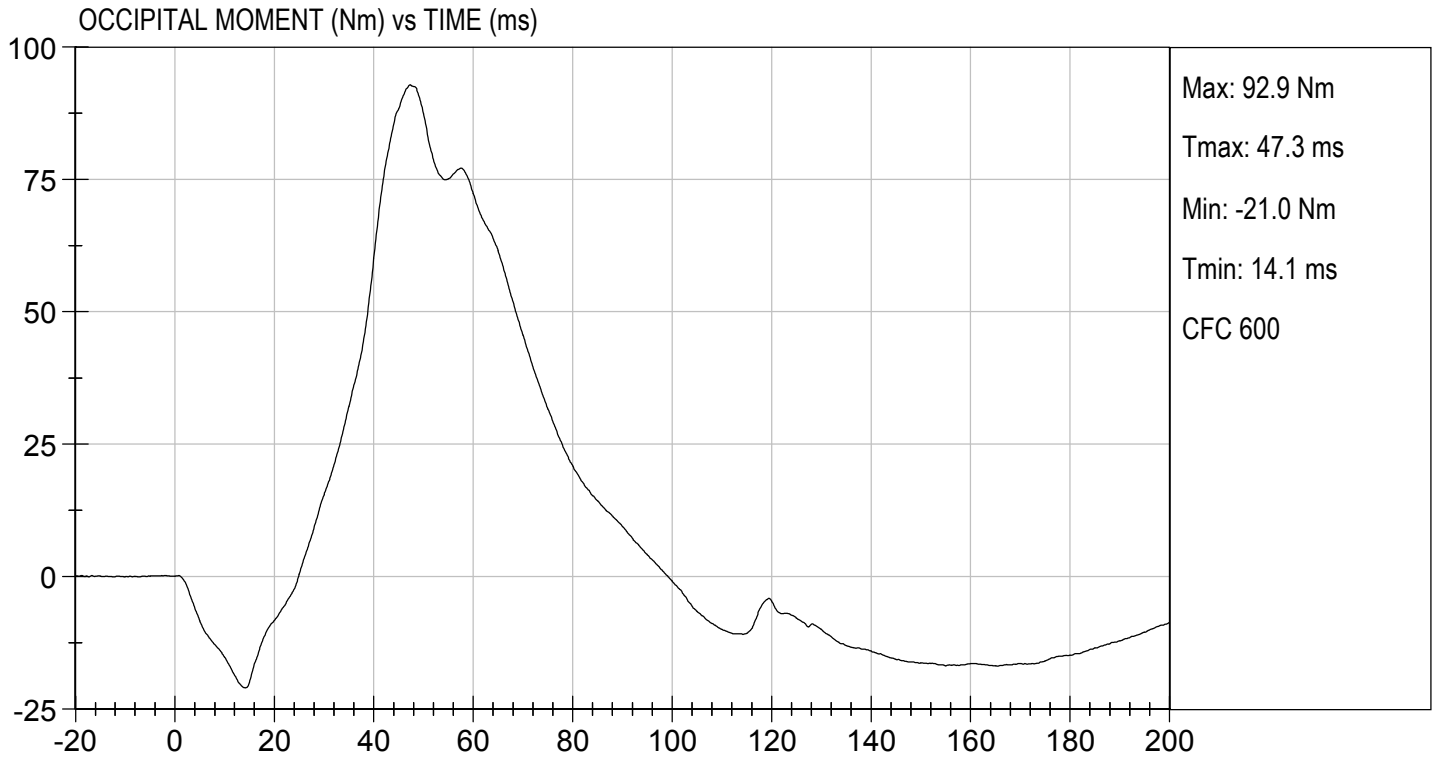
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.52	Pass
	20 ms	G's	17.60 to 22.60	21.01	Pass
	30 ms	G's	12.50 to 18.50	15.43	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.4	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	35.9	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	69.9	Pass
	Time	ms	57.0 to 64.0	59.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	116.7	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	92.9	Pass
	Time	ms	47.0 to 58.0	47.3	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	99.3	Pass
Overall Test Results					Pass


 Laboratory Technician

10/17/2019
 Test Date


 Approved By





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

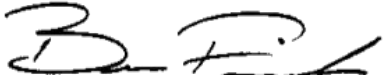
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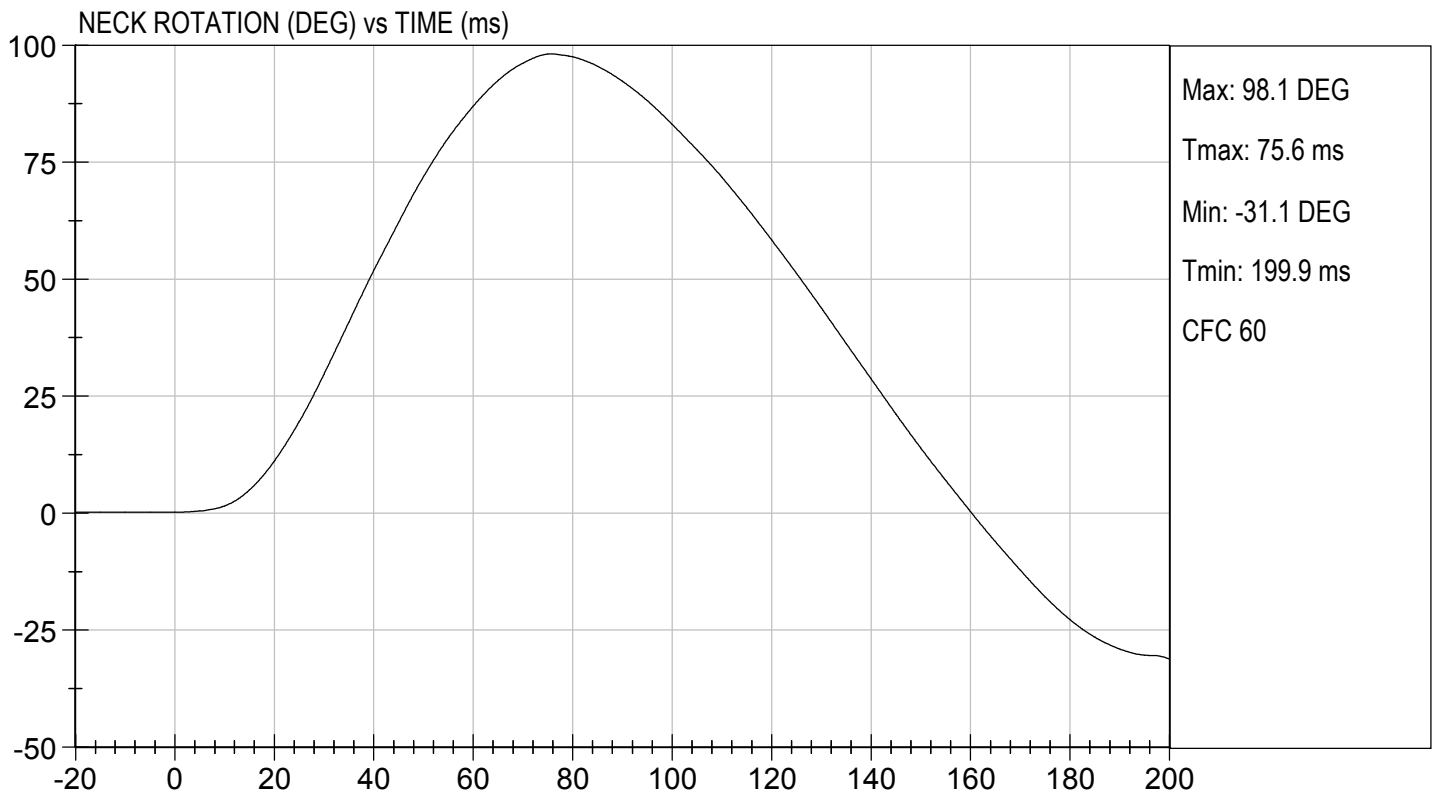
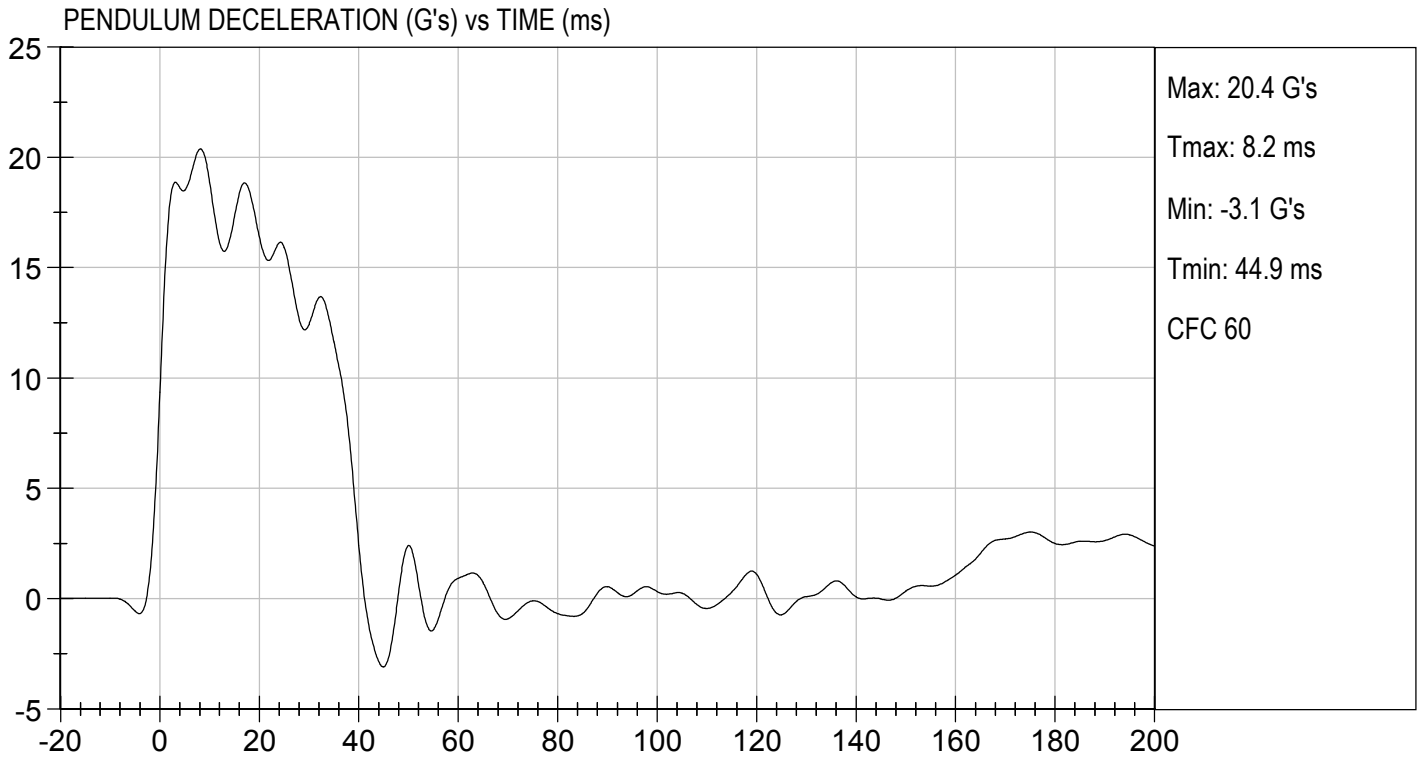
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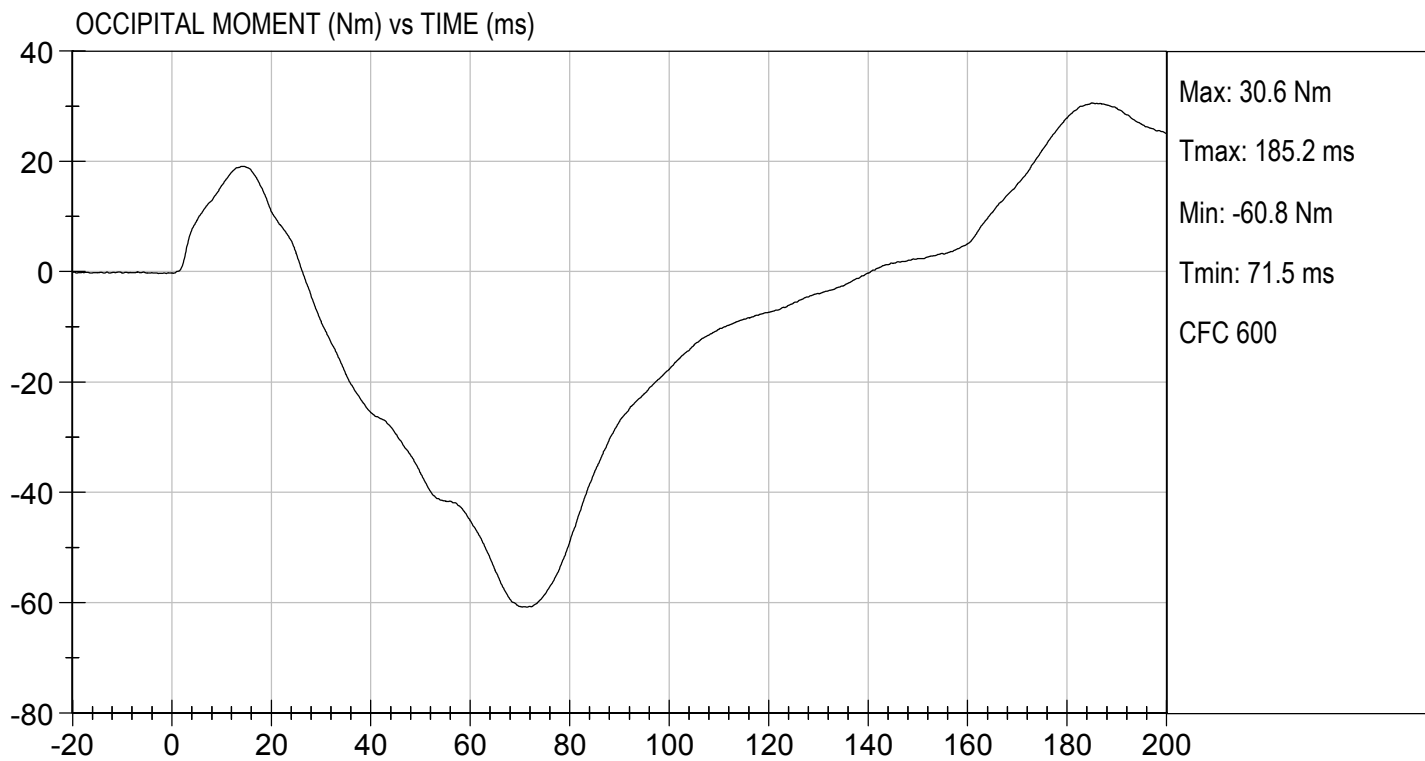
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.88	Pass
	20 ms	G's	14.00 to 19.00	16.39	Pass
	30 ms	G's	11.00 to 16.00	12.44	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.7	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.1	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	160.4	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-60.8	Pass
	Time	ms	65.0 to 79.0	71.5	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	140.7	Pass
Overall Test Results					Pass


 Laboratory Technician

10/17/2019
 Test Date


 Approved By





MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

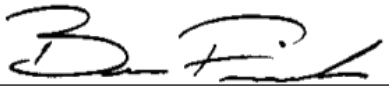
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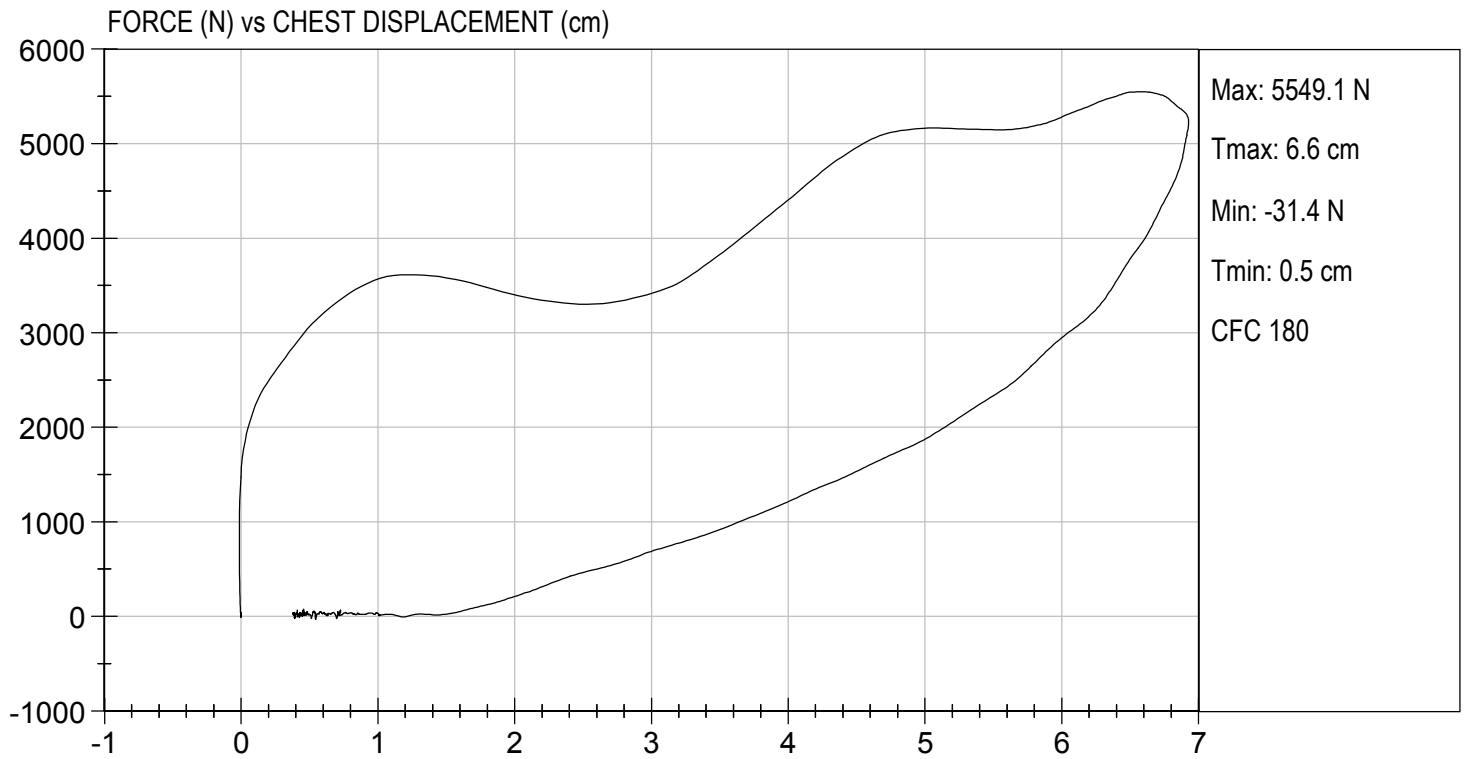
Test I.D: D193244

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/s	6.58 to 6.82	6.61	Pass
Peak Probe Force	N	5159 to 5893	5,549	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.93	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Overall Test Results				Pass


 Laboratory Technician

10/18/2019
 Test Date


 Approved By



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

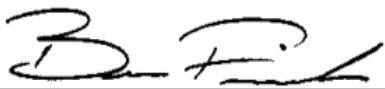
ATD Serial No: 351

Test I.D: D193245

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	4,801	Pass
Overall Test Results				Pass


 Laboratory Technician

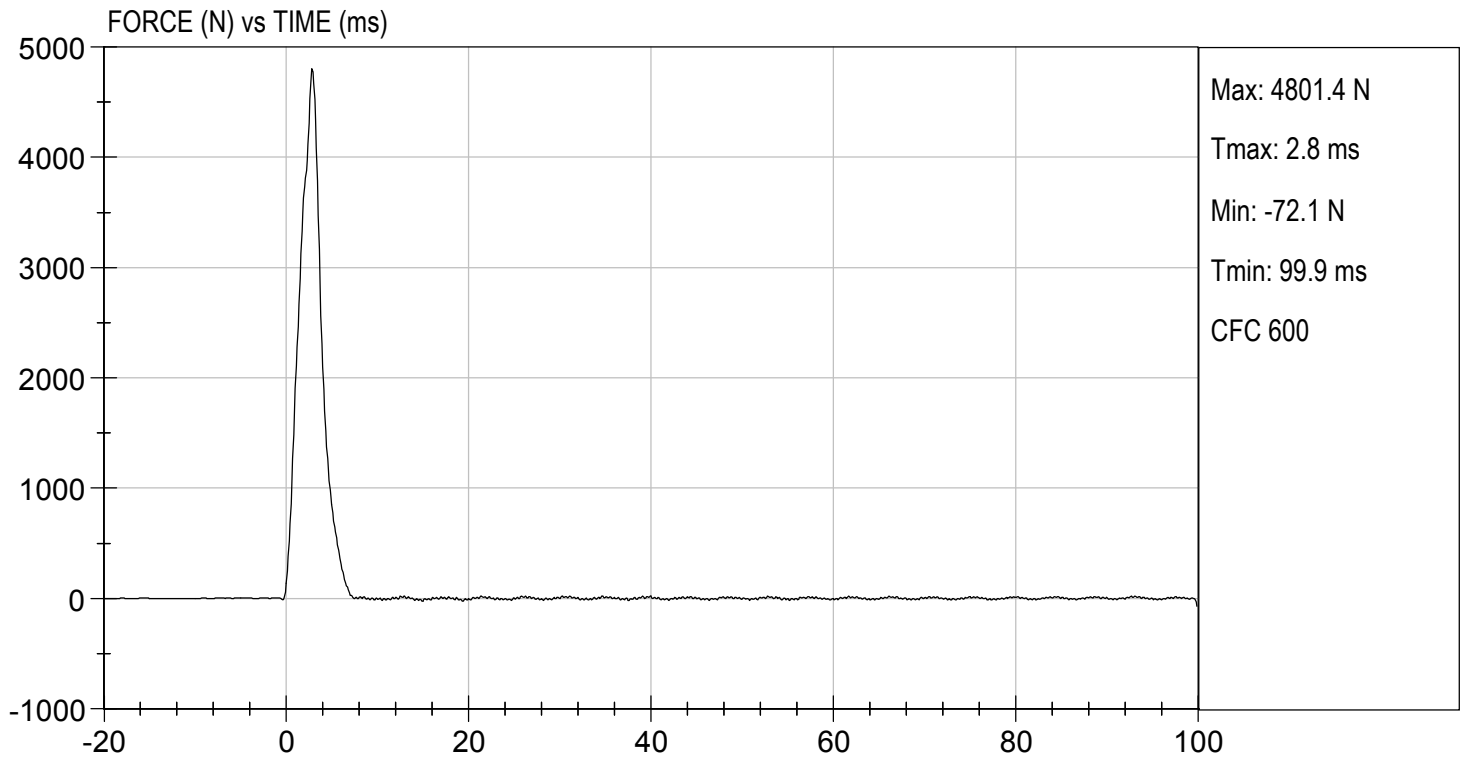
10/16/2019
 Test Date


 Approved By



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

TEST DATE: 10/16/2019
TEST #: D193245



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

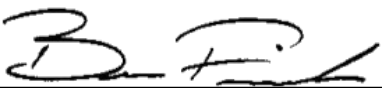
ATD Serial No: 351

Test I.D: D193246

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	5,710	Pass
Overall Test Results				Pass


 Laboratory Technician

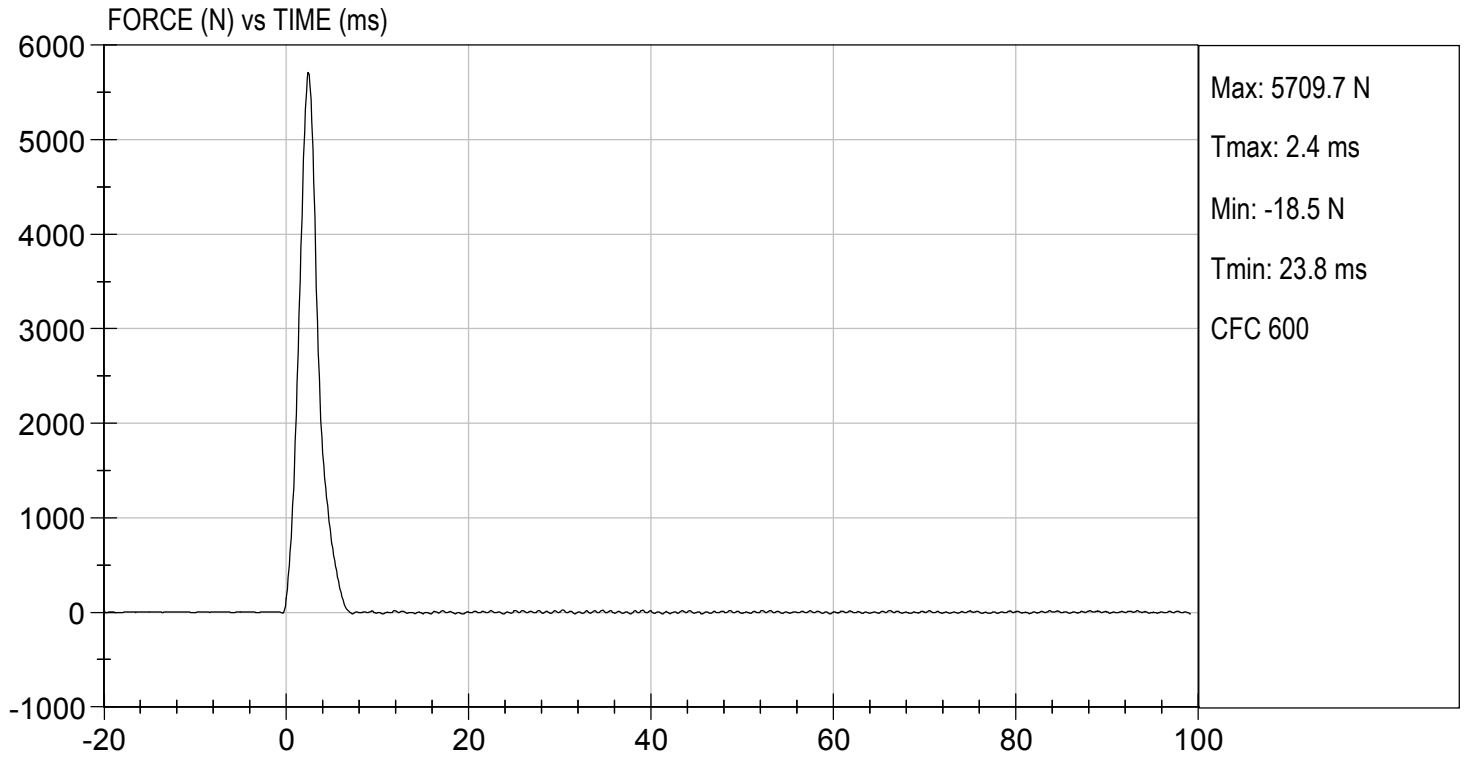
10/16/2019
 Test Date


 Approved By



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

TEST DATE: 10/16/2019
TEST #: D193246



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

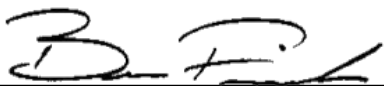
ATD Serial No: 351

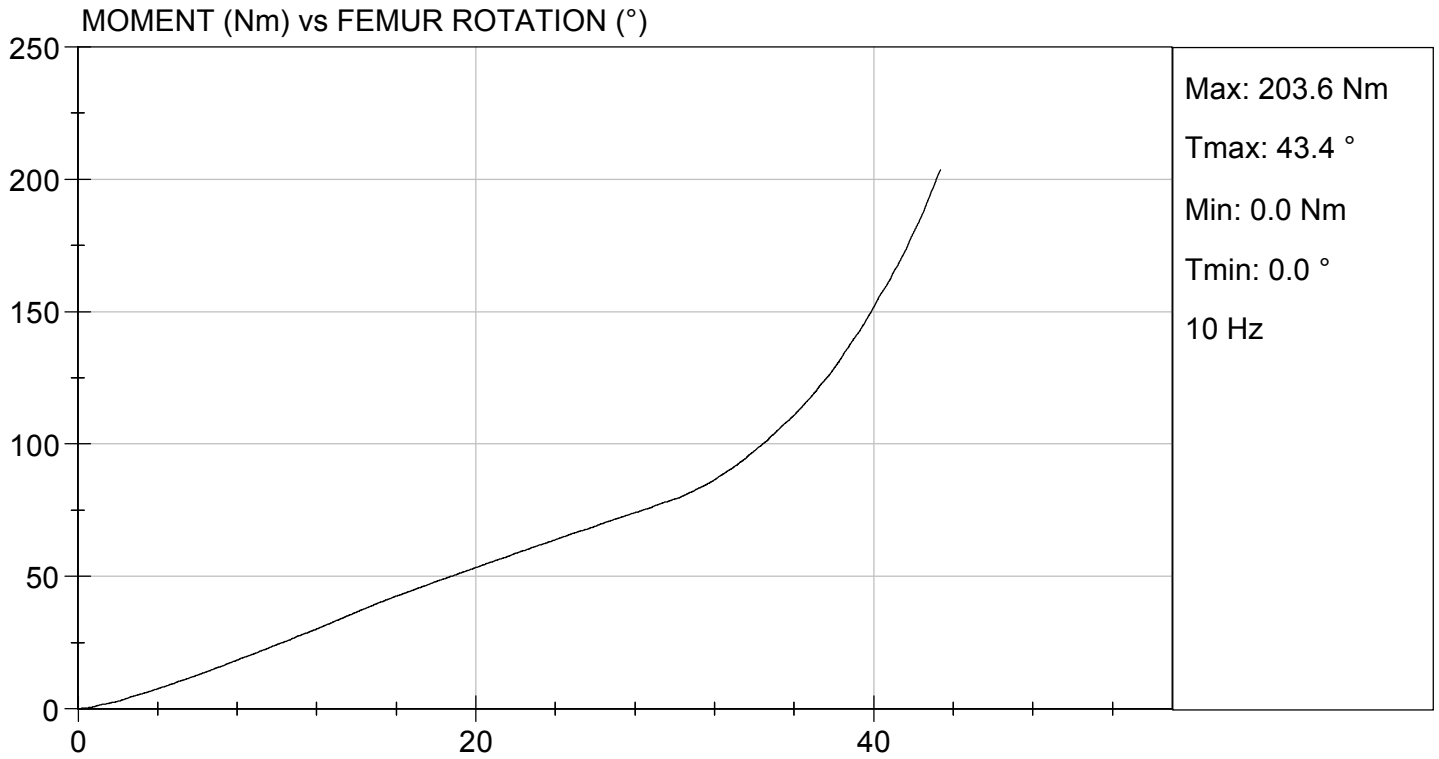
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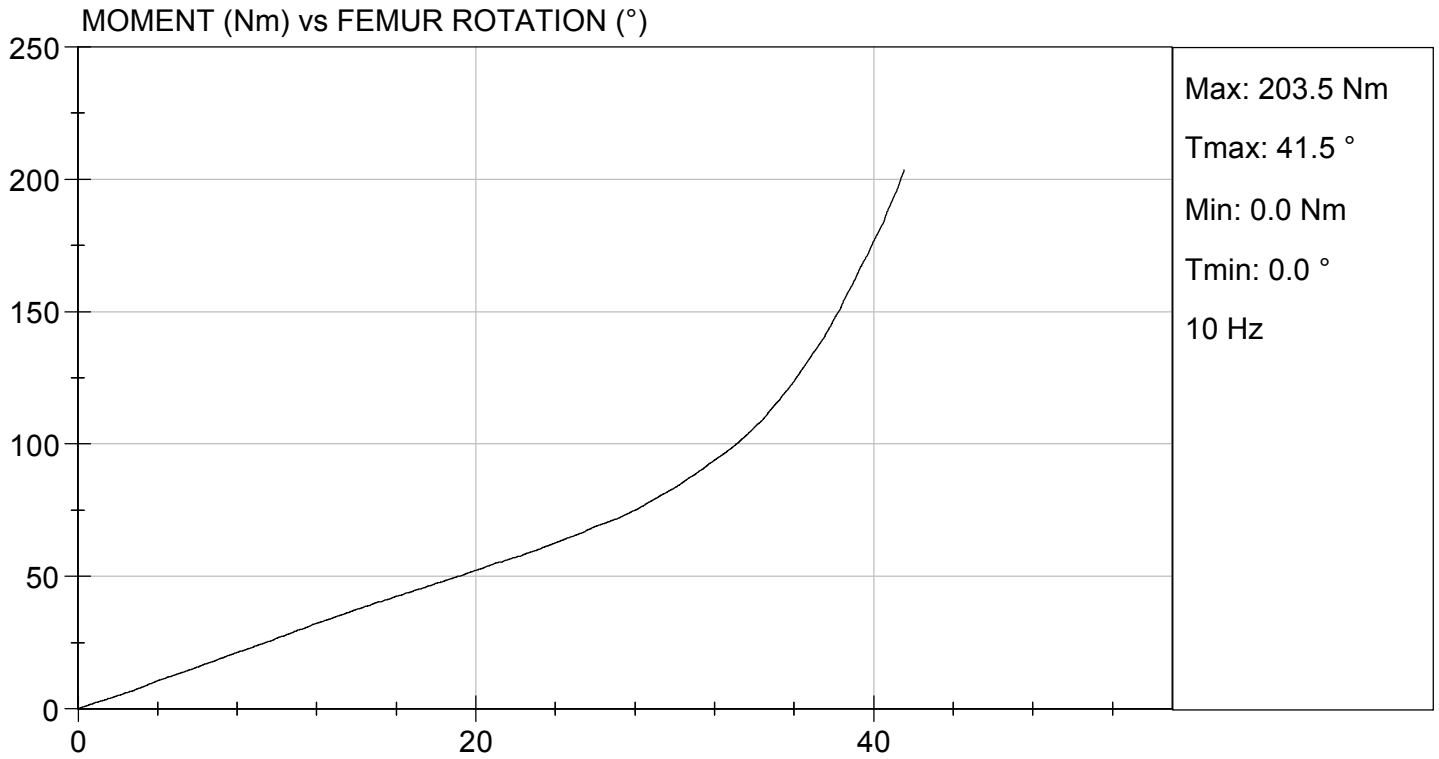
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	29	29	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.4	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	83.6	79.3	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	41.5	43.4	Pass
Overall Test Results					Pass


 Laboratory Technician

10/16/2019
 Test Date


 Approved By





CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

Hybrid III, 5th External Measurements
SN: DH1659

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	778
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	440
C	H-POINT HEIGHT	Reference	81.3-86.3	85
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	147
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	82
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	130
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	251
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45
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	285
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	189
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	543
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376	357
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	398

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
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	182
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	221
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	469
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141
T	HEAD DEPTH	Back of the head to the forehead	177.8-188	182
U	HIP BREADTH	The widest part of the hip	299.7-314.9	306
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	357
W	FOOT BREADTH	The widest part of the foot	78.8-94	83
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	542
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	865
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	785
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

Test ID: D193051

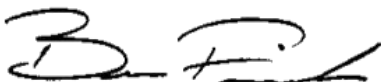
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Peak Resultant Acceleration	G's	250 to 300	290	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	2.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass



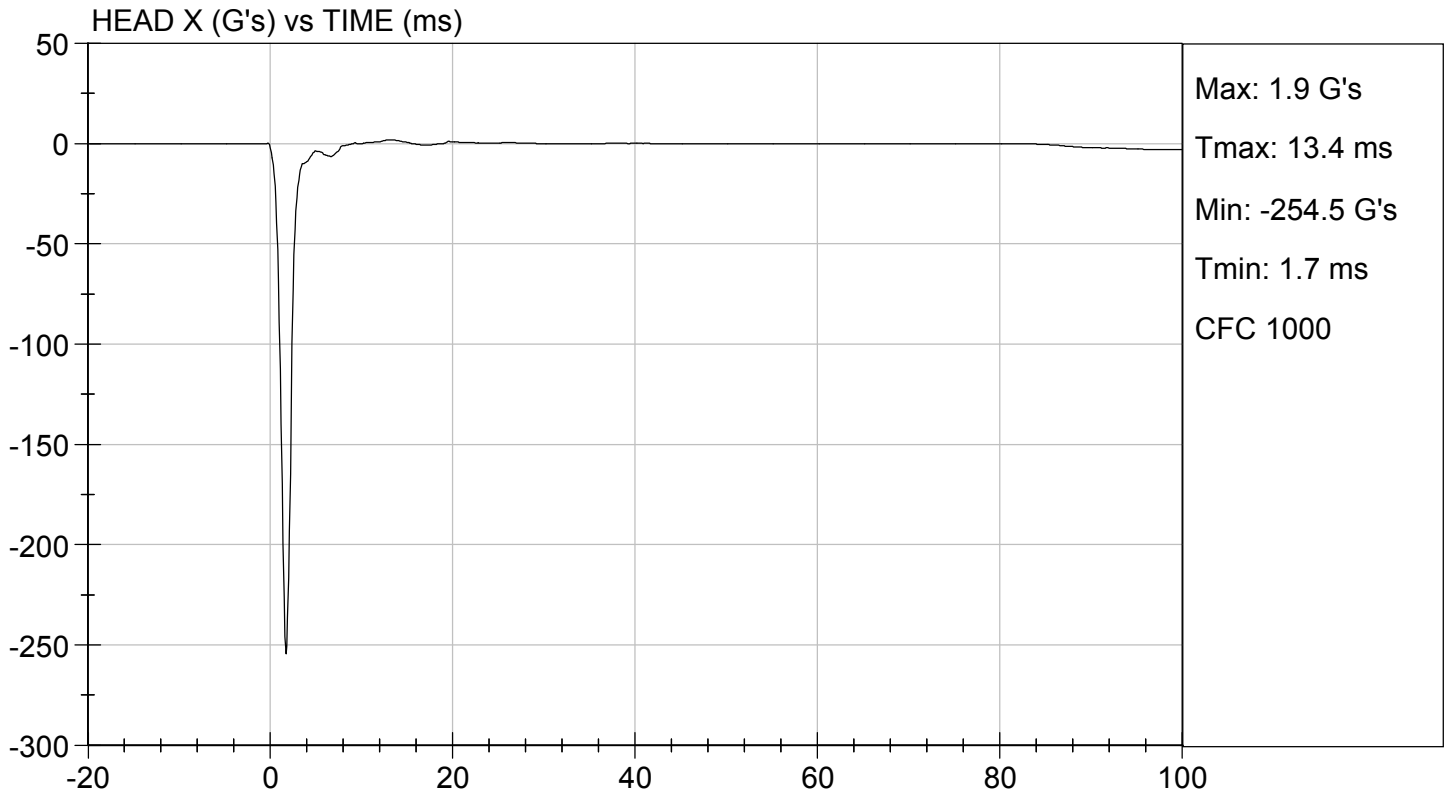
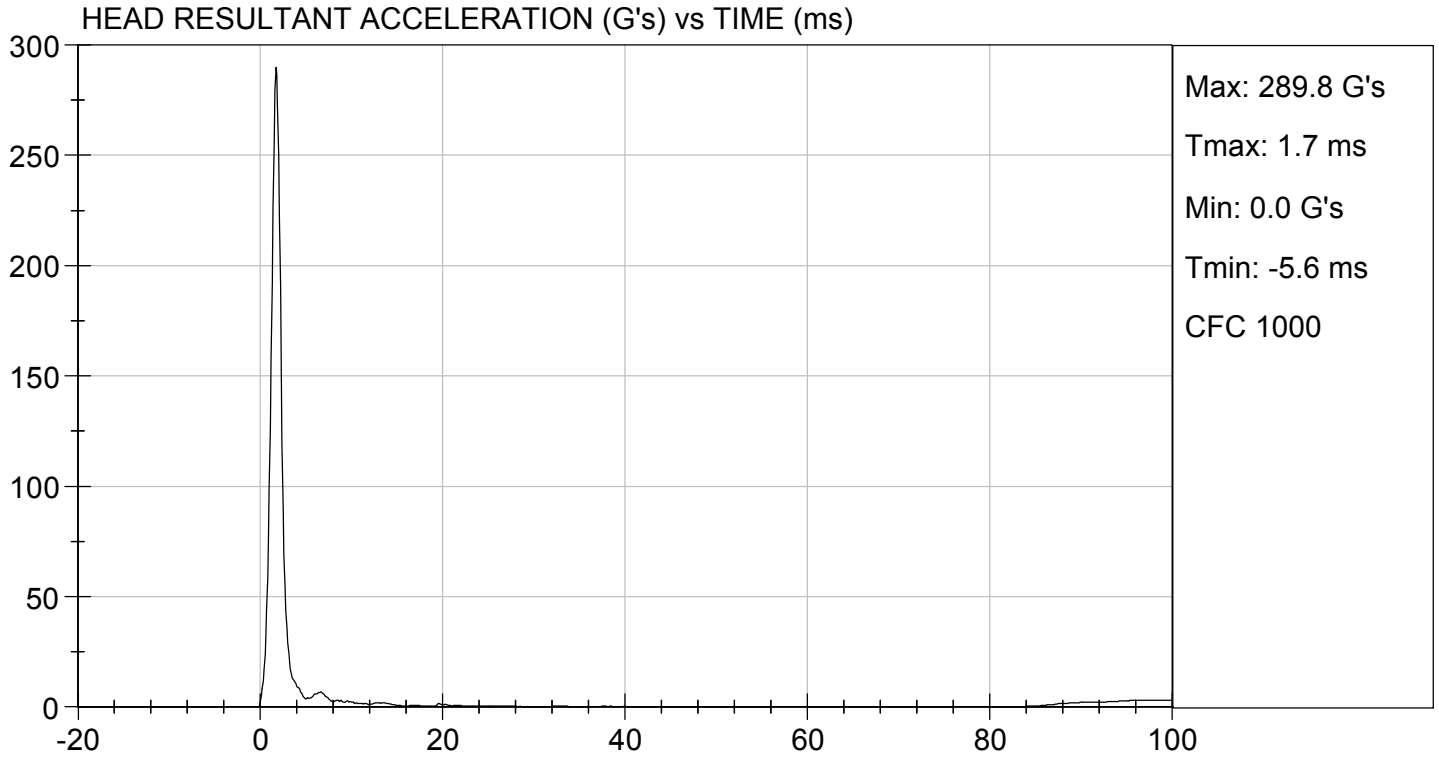
Laboratory Technician

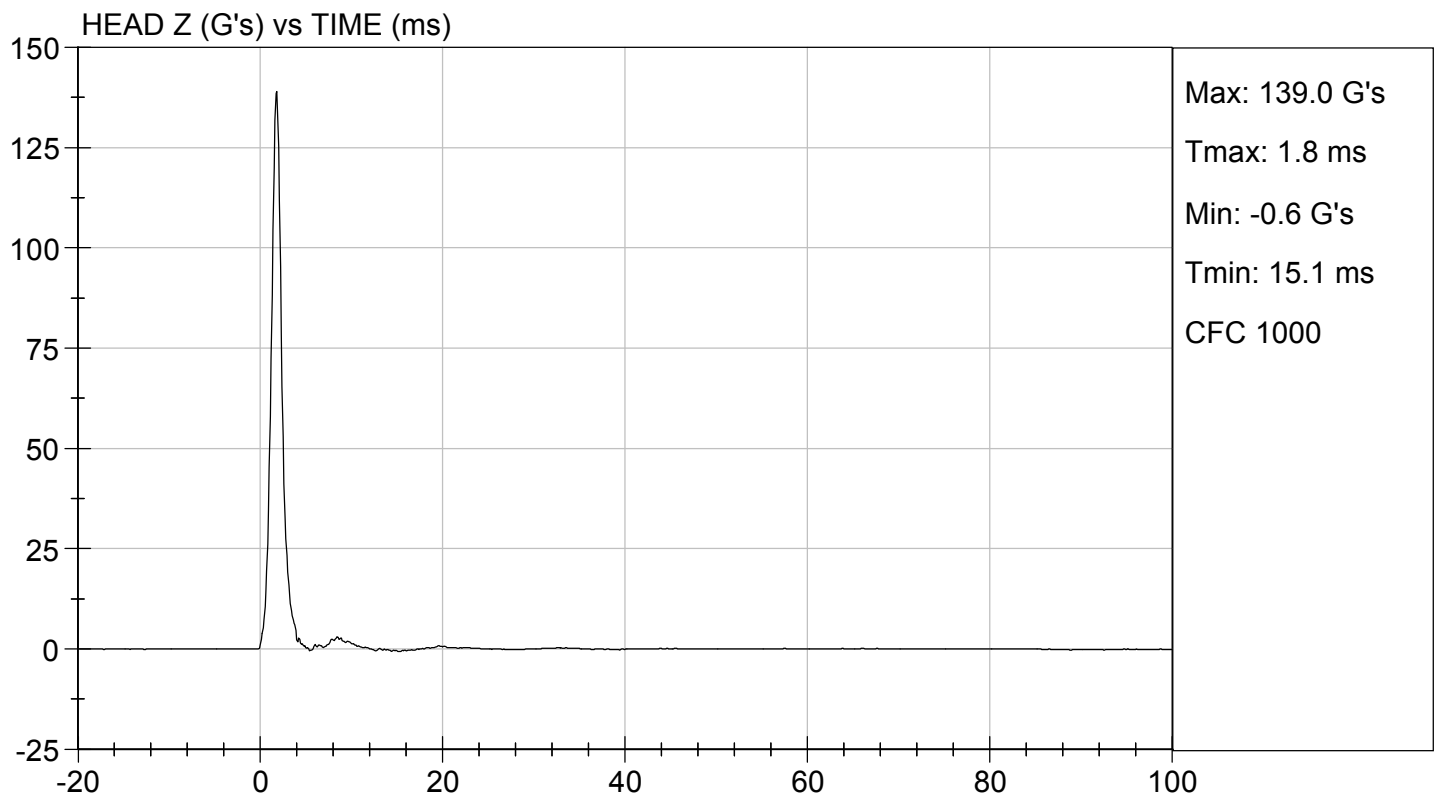
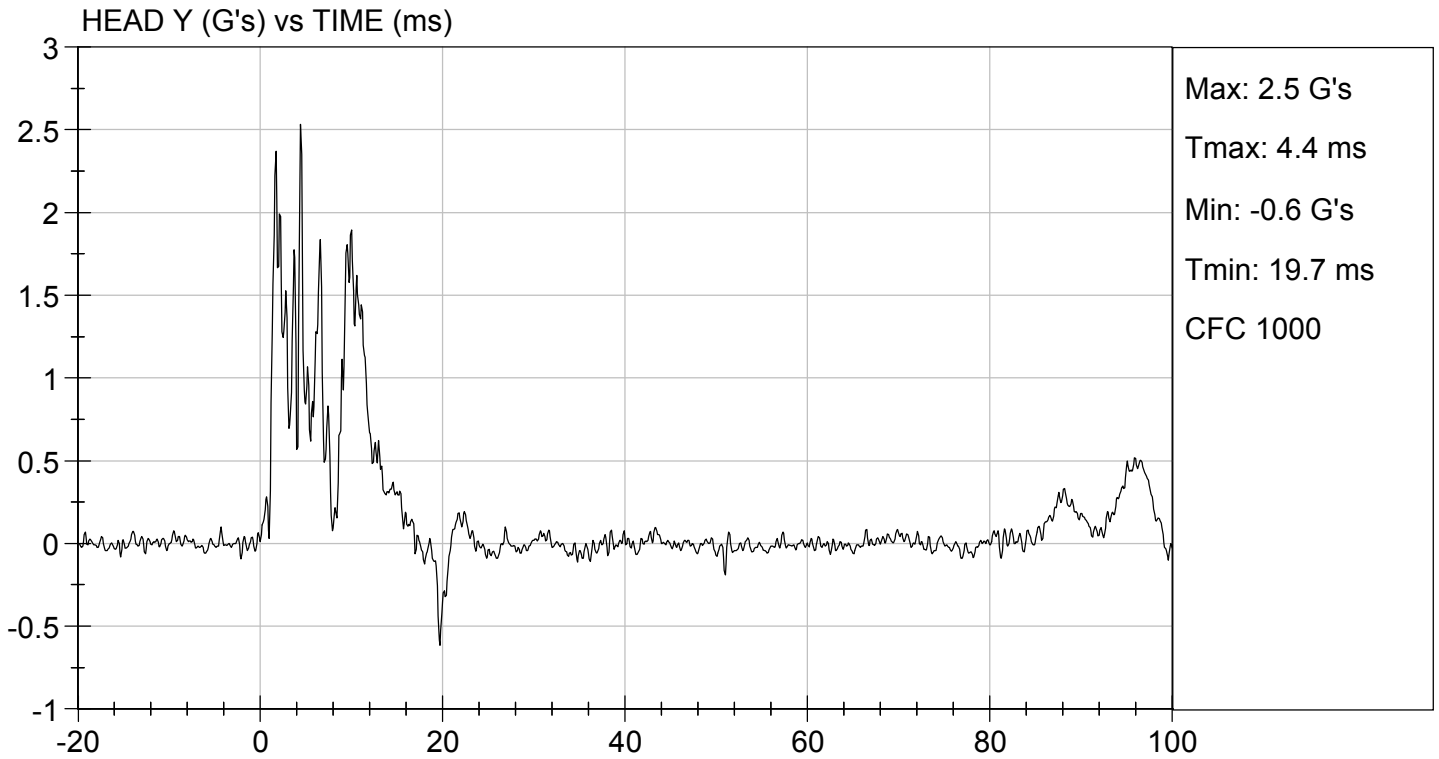
09/26/2019

Test Date



Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

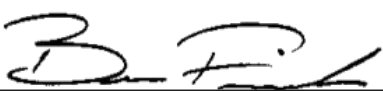
Test I.D.: D193052

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	38	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.2	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.6	Pass
D Plane Rotation	Max	deg	77 to 91	77	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	87	Pass
Overall Results					Pass

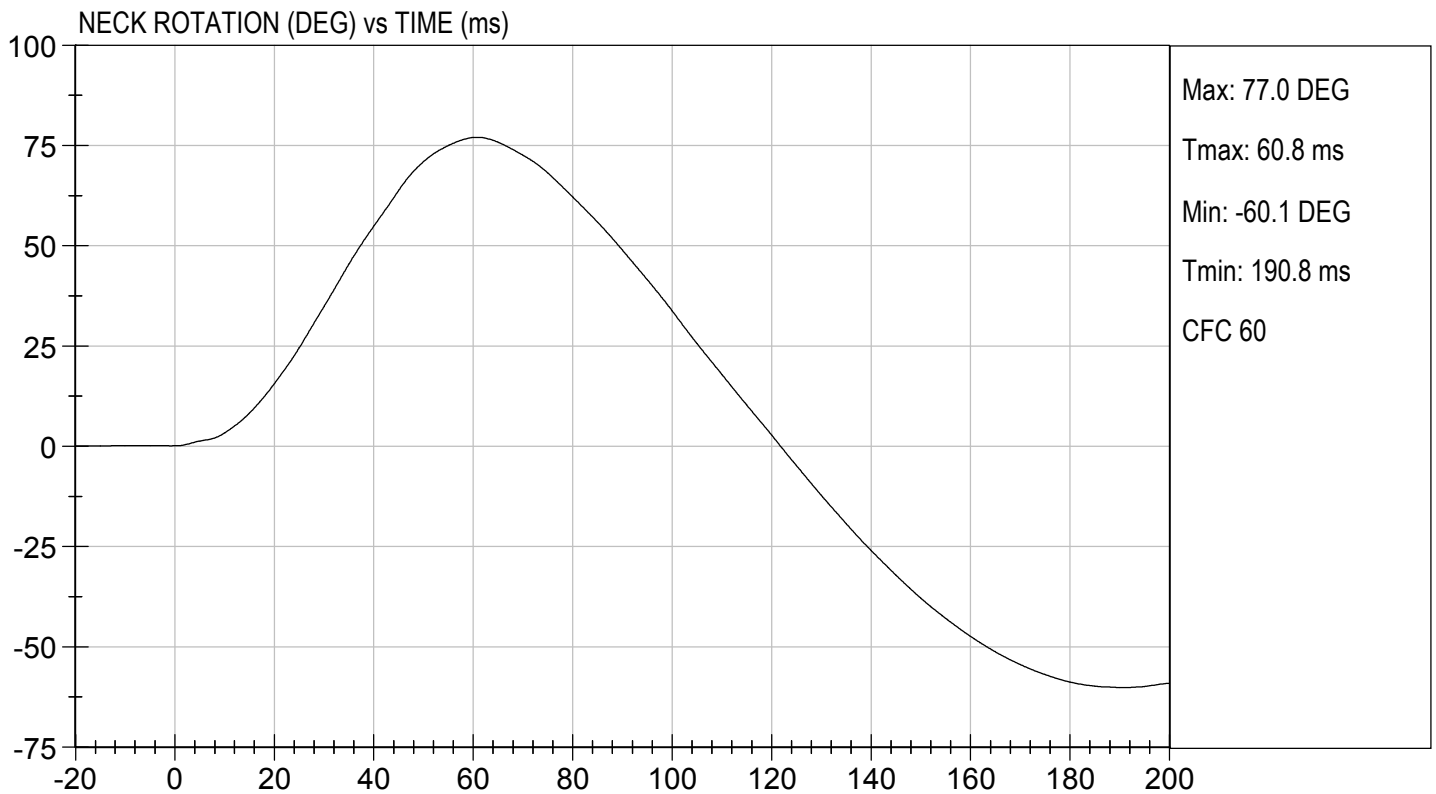
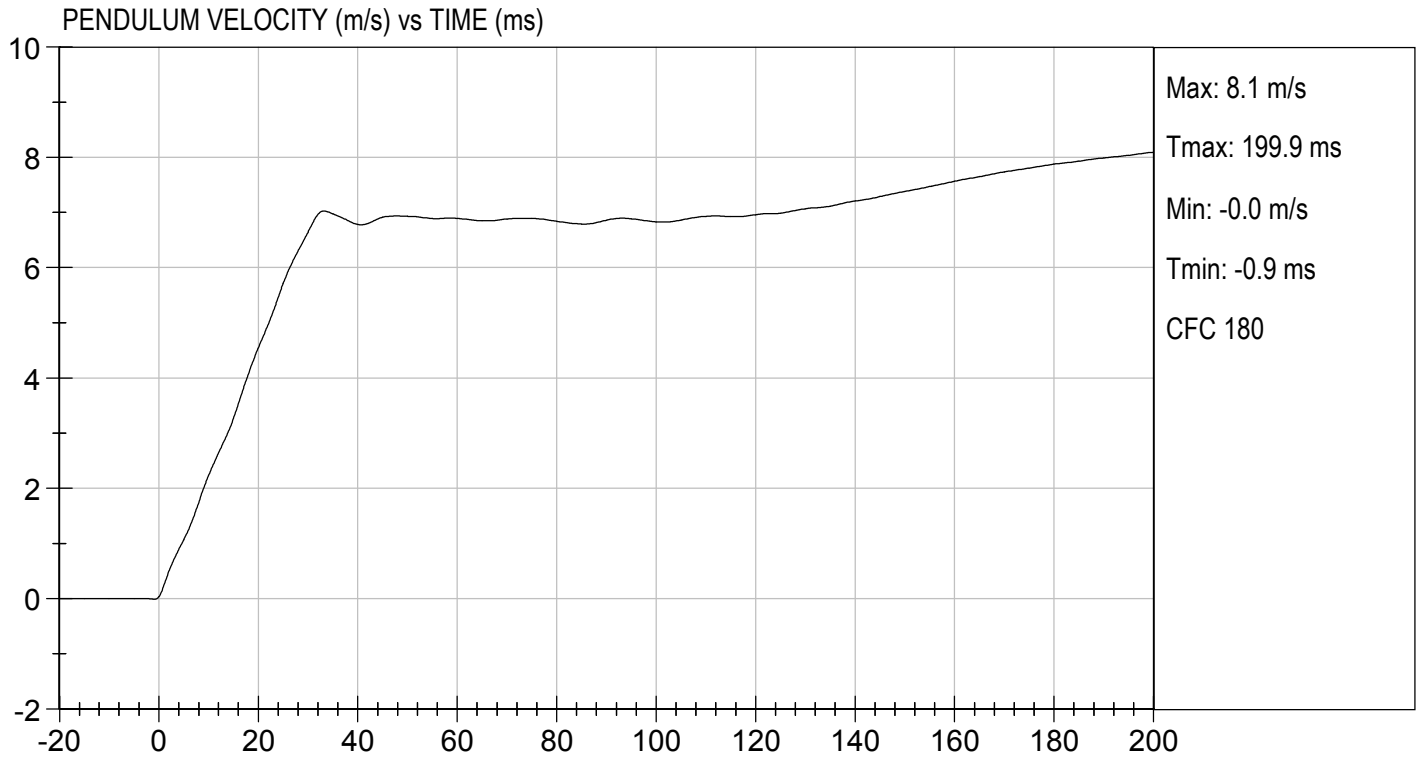


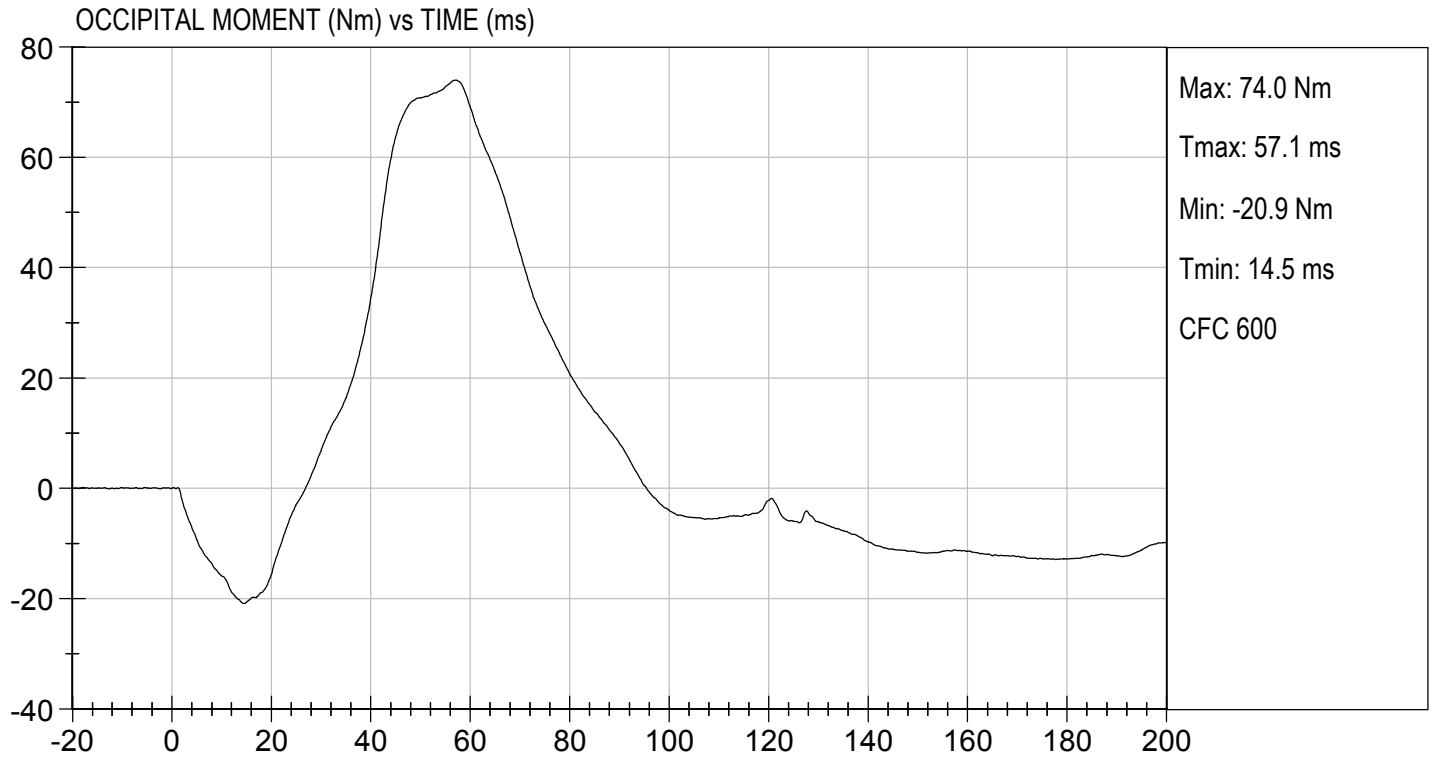
 Laboratory Technician

 09/26/2019
 Test Date



 Approved By





MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

Test I.D: D193053

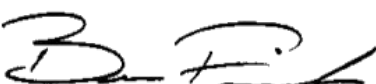
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	38	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	106	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	105	Pass
Overall Results					Pass



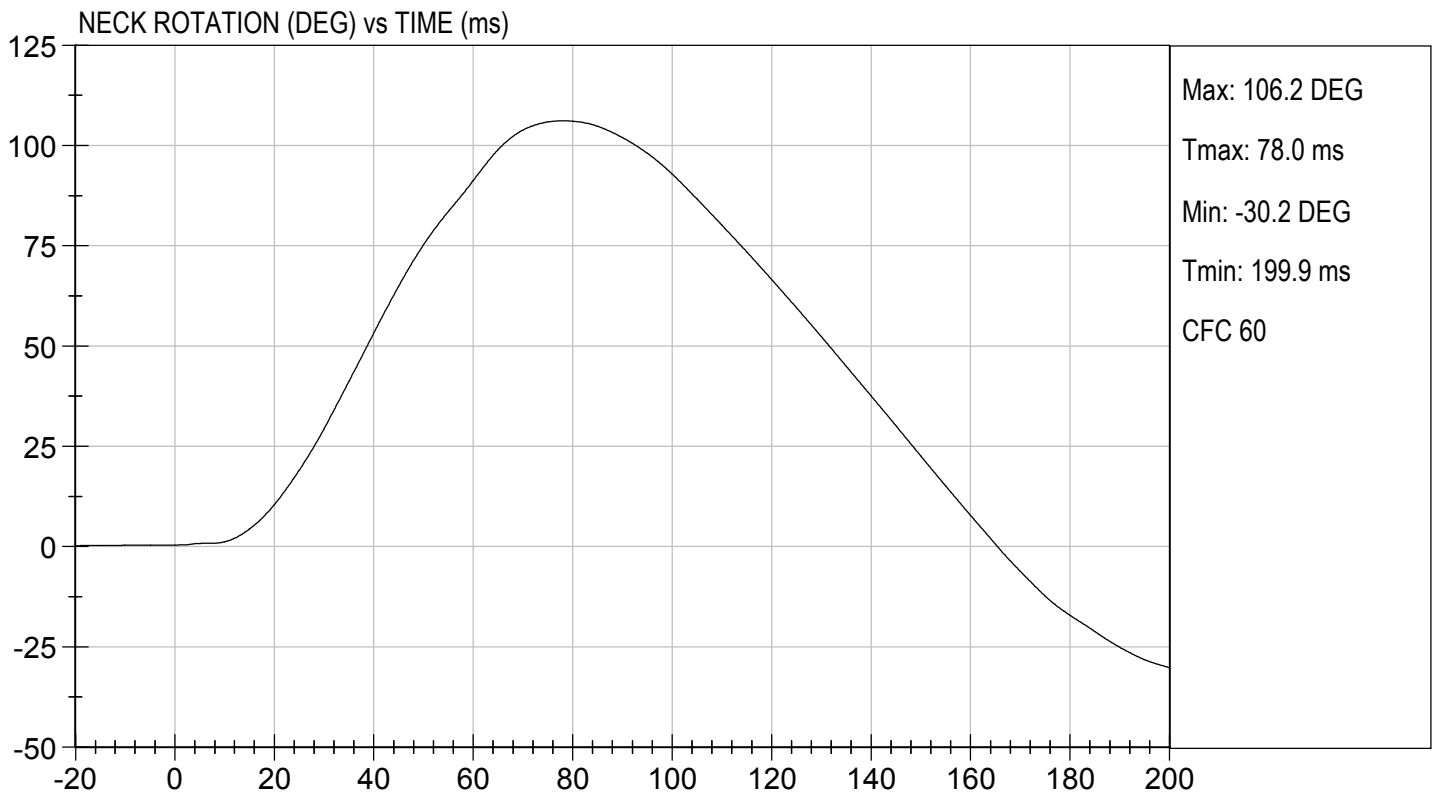
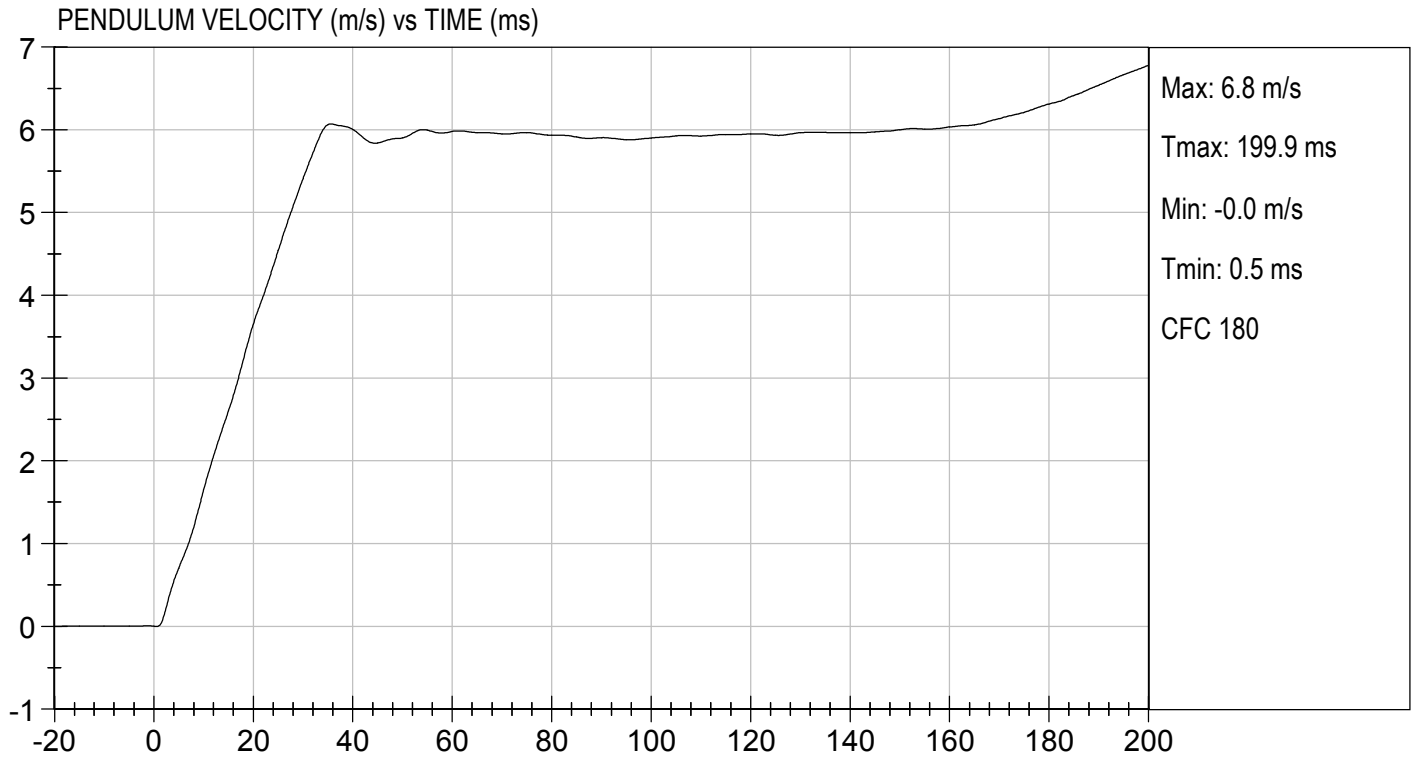
 Laboratory Technician

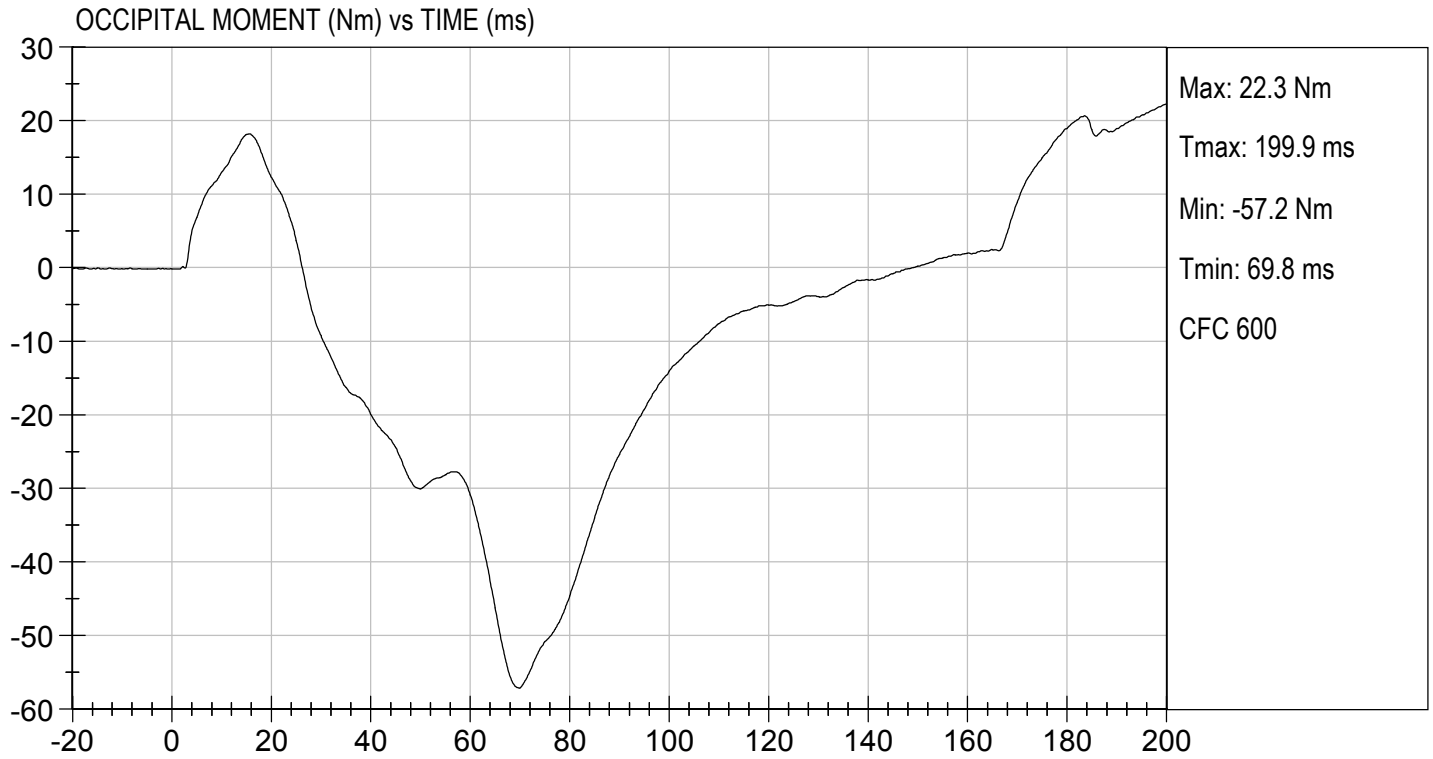
09/27/2019

 Test Date



 Approved By





MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

Test I.D: D193054

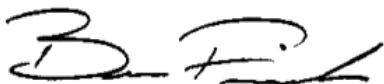
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4273	Pass
Internal Hysteresis	%	69 to 85	75	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4279	Pass
Overall Test Results				Pass



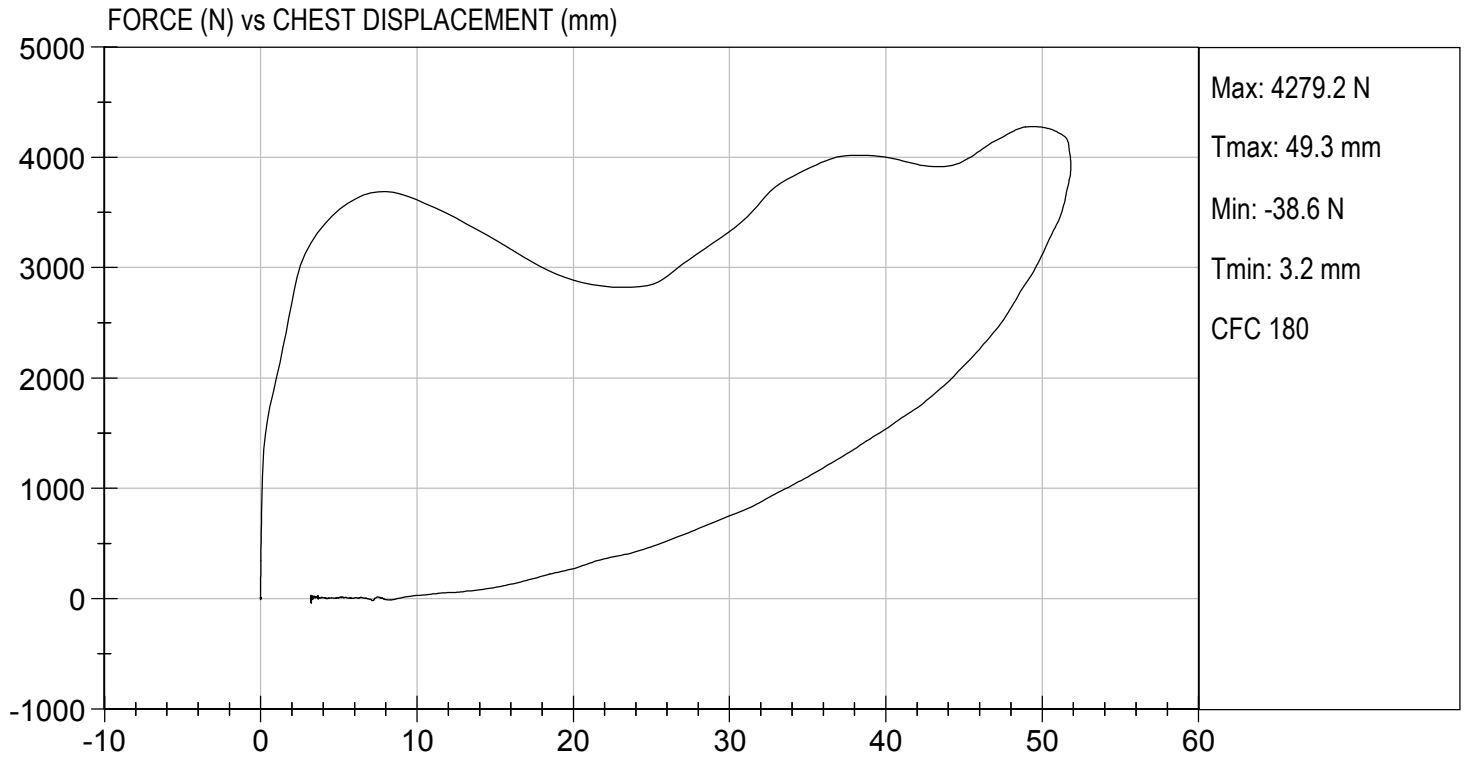
Laboratory Technician

09/25/2019

Test Date



Approved By



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

Test I.D: D193055

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3797	Pass
Overall Test Results				Pass

Jacob D Taylor
Laboratory Technician

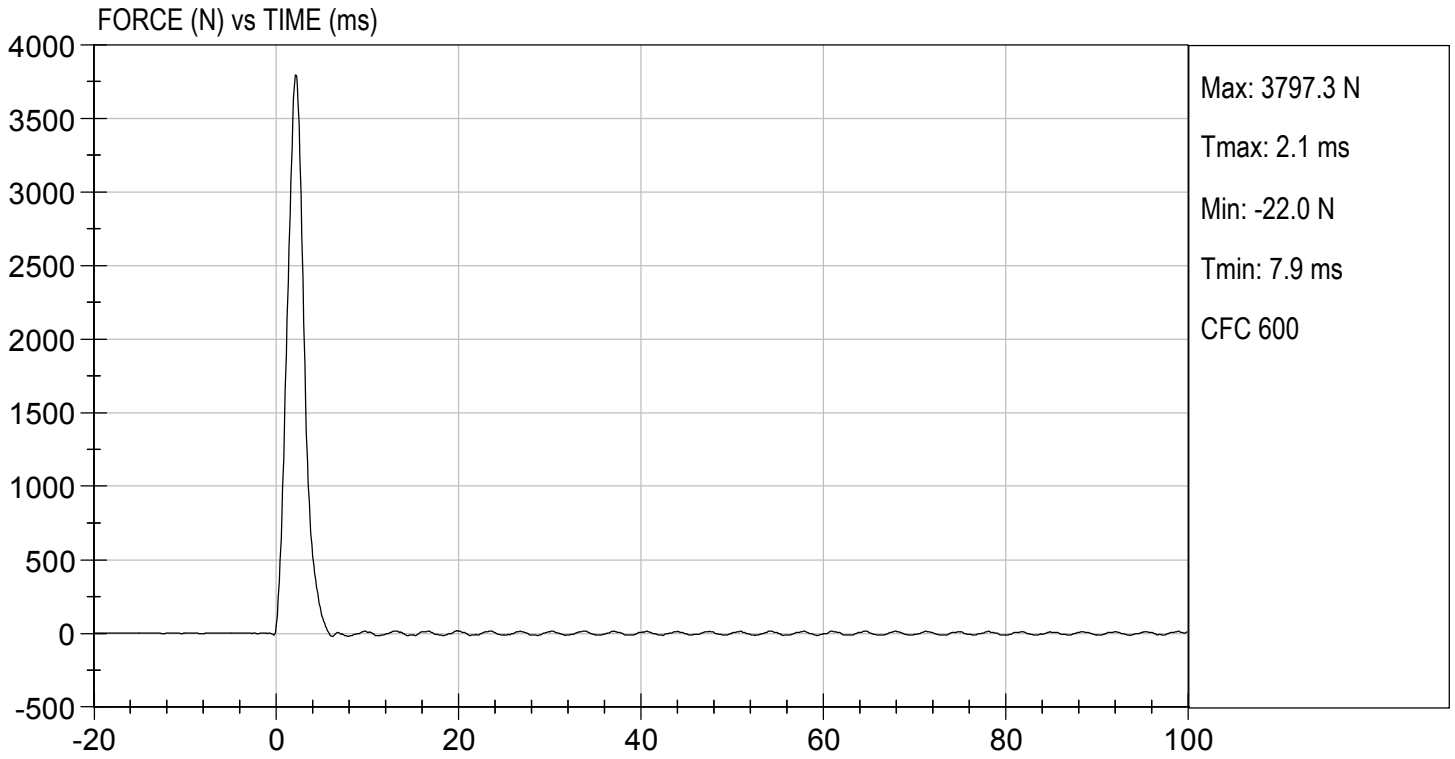
 09/26/2019
Test Date

B. F. K.
Approved By



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

TEST DATE: 09/26/2019
TEST #: D193055



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

Test I.D: D193056

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3831	Pass
Overall Test Results				Pass

Jacob D Taylor
 Laboratory Technician

09/26/2019

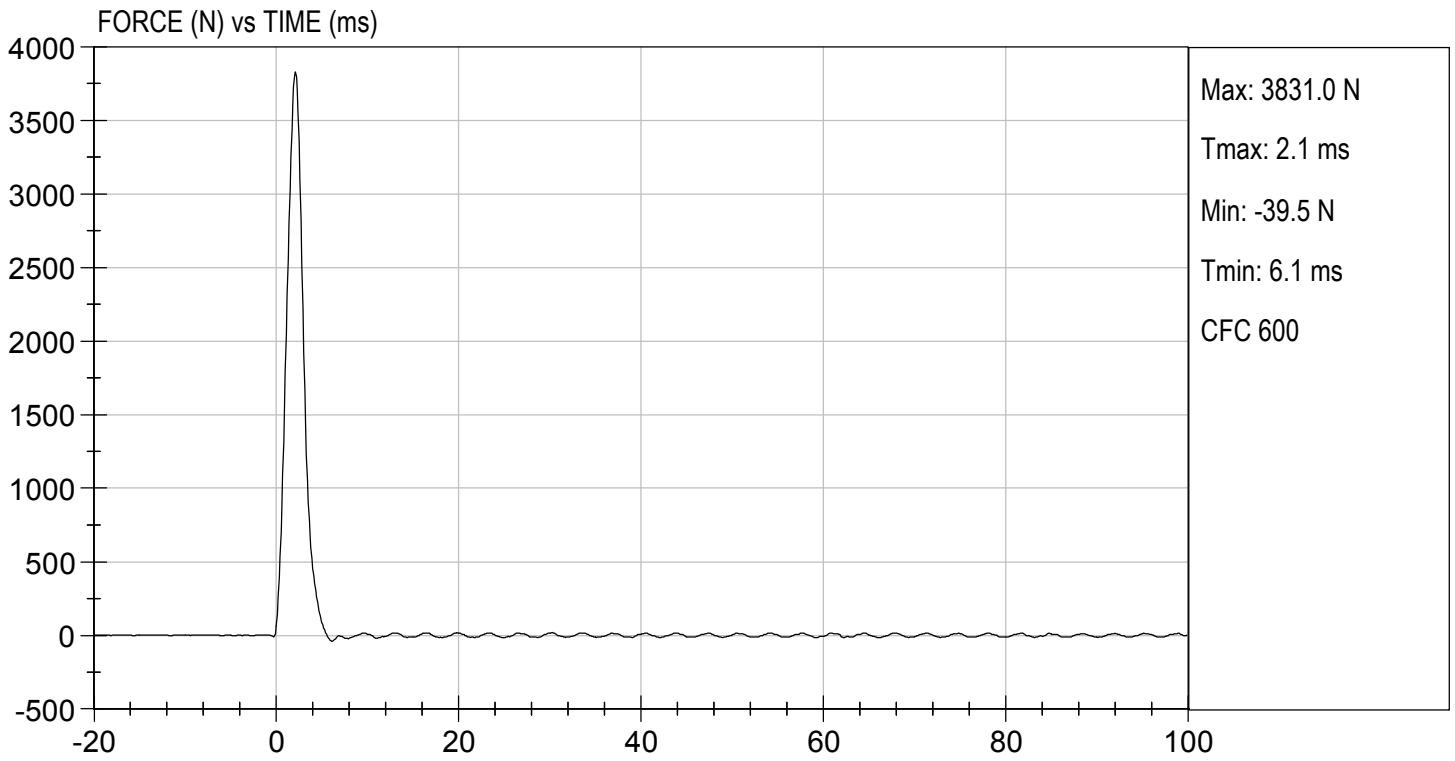
Test Date

B. F.
 Approved By



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

TEST DATE: 09/26/2019
TEST #: D193056



MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

Test I.D: D193057

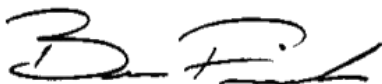
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	3	Pass
Force at 45 deg	N	320 to 390	345	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.8	Pass
Overall Result				Pass



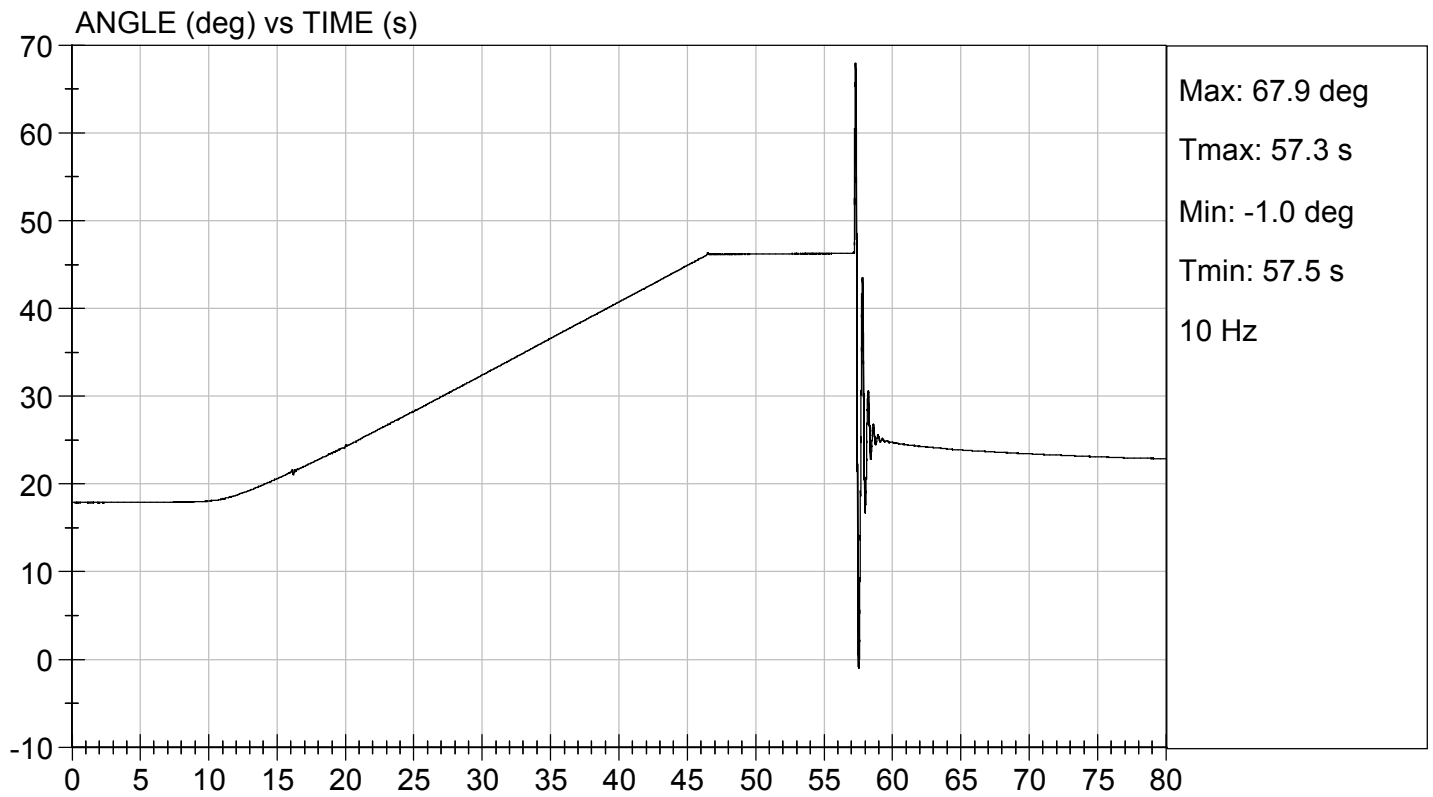
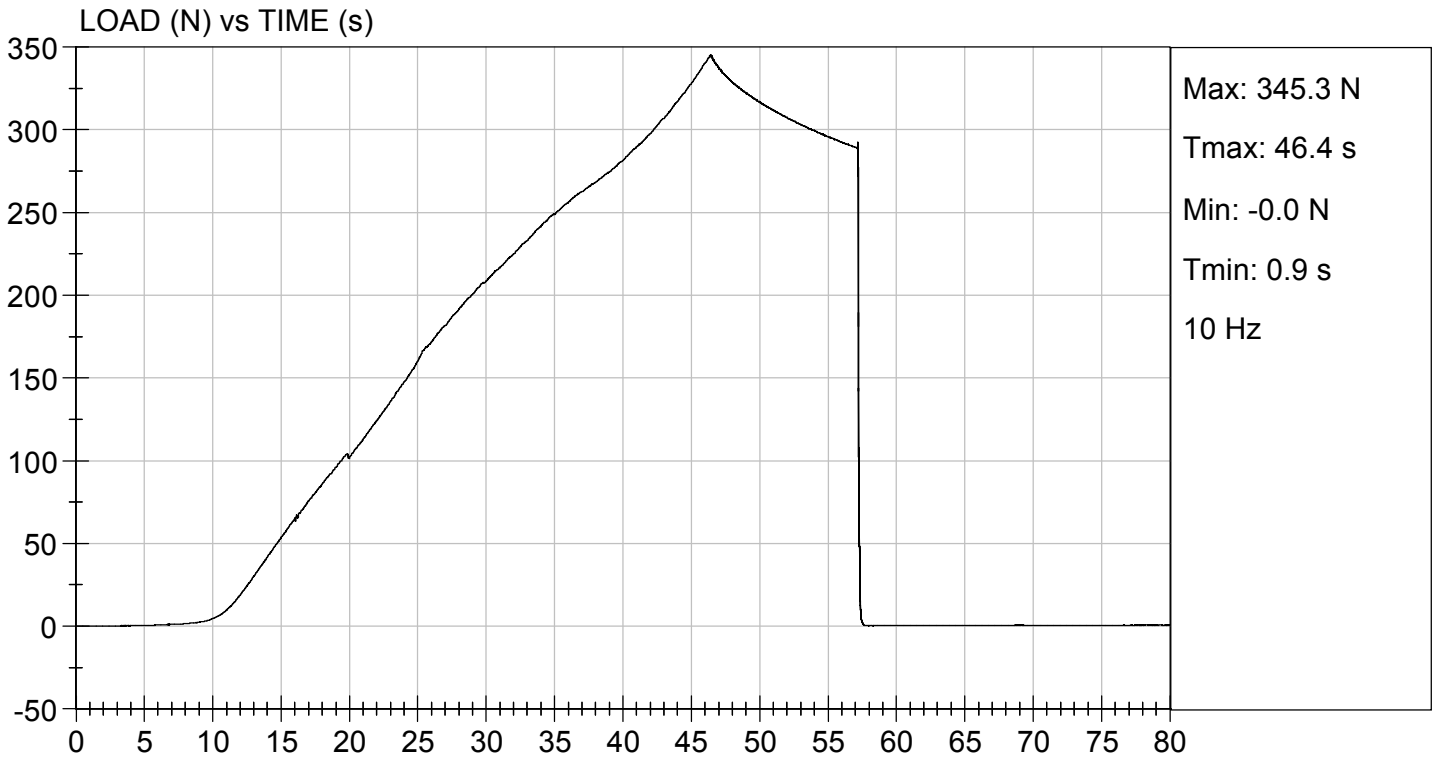
Laboratory Technician

09/26/2019

Test Date



Approved By



CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

**MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: DH1659

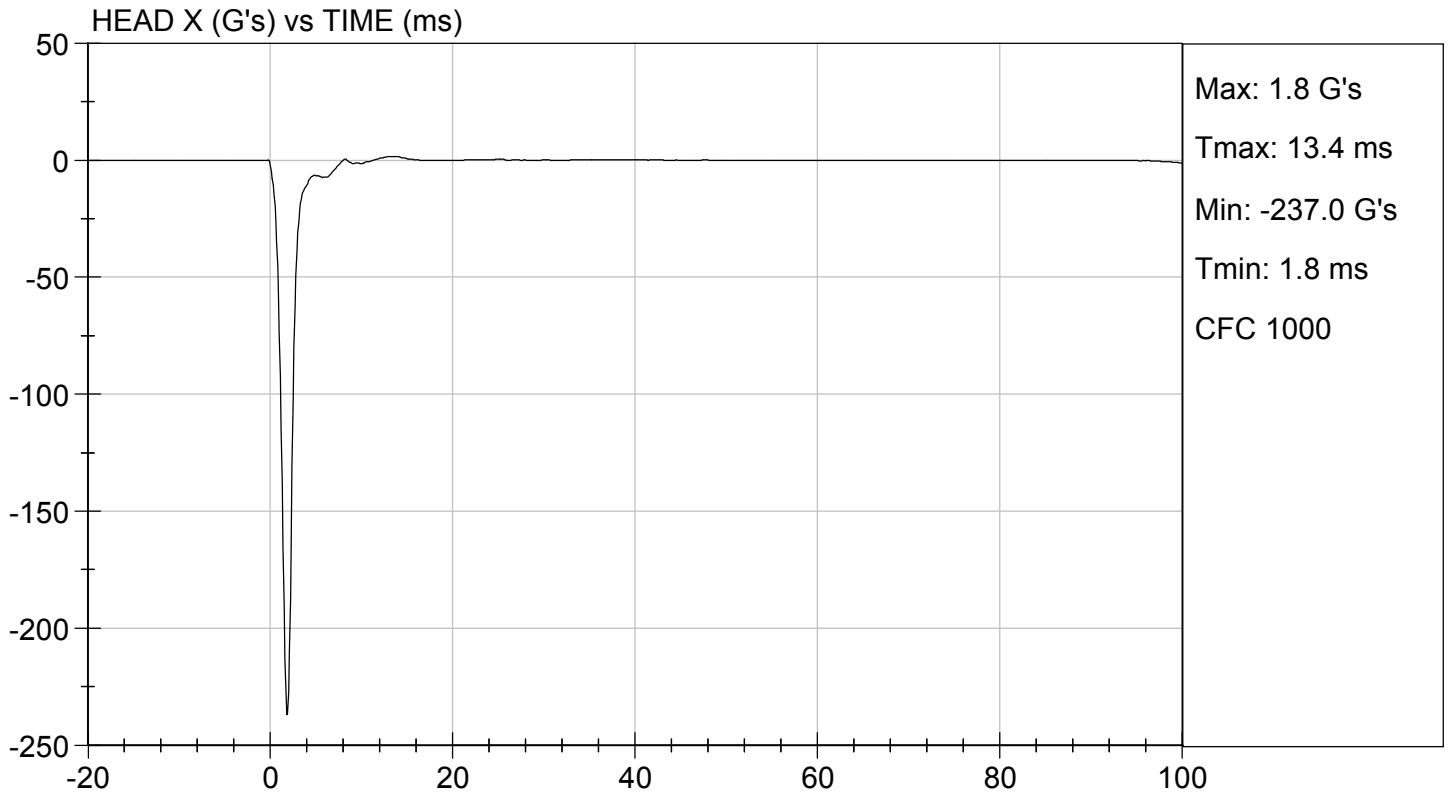
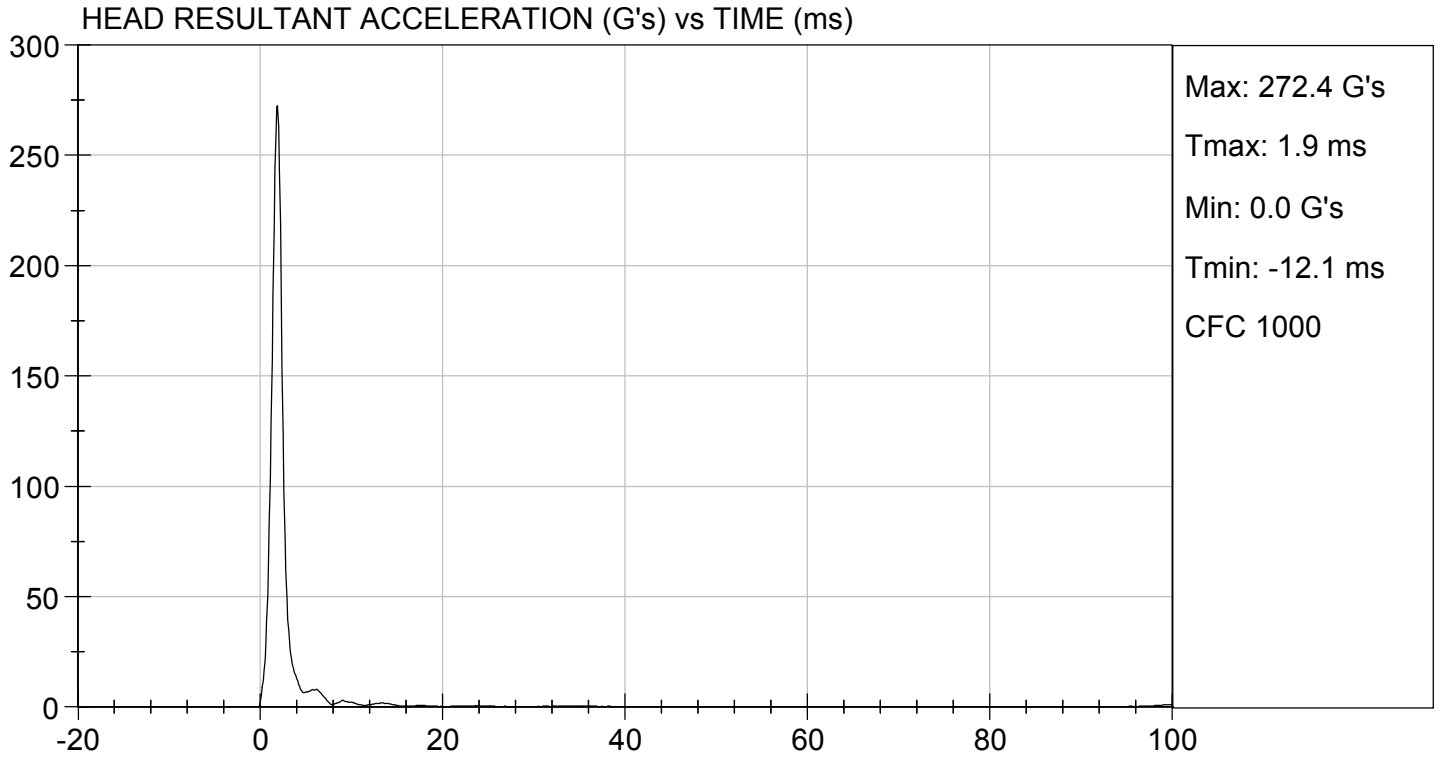
Test ID: D193251

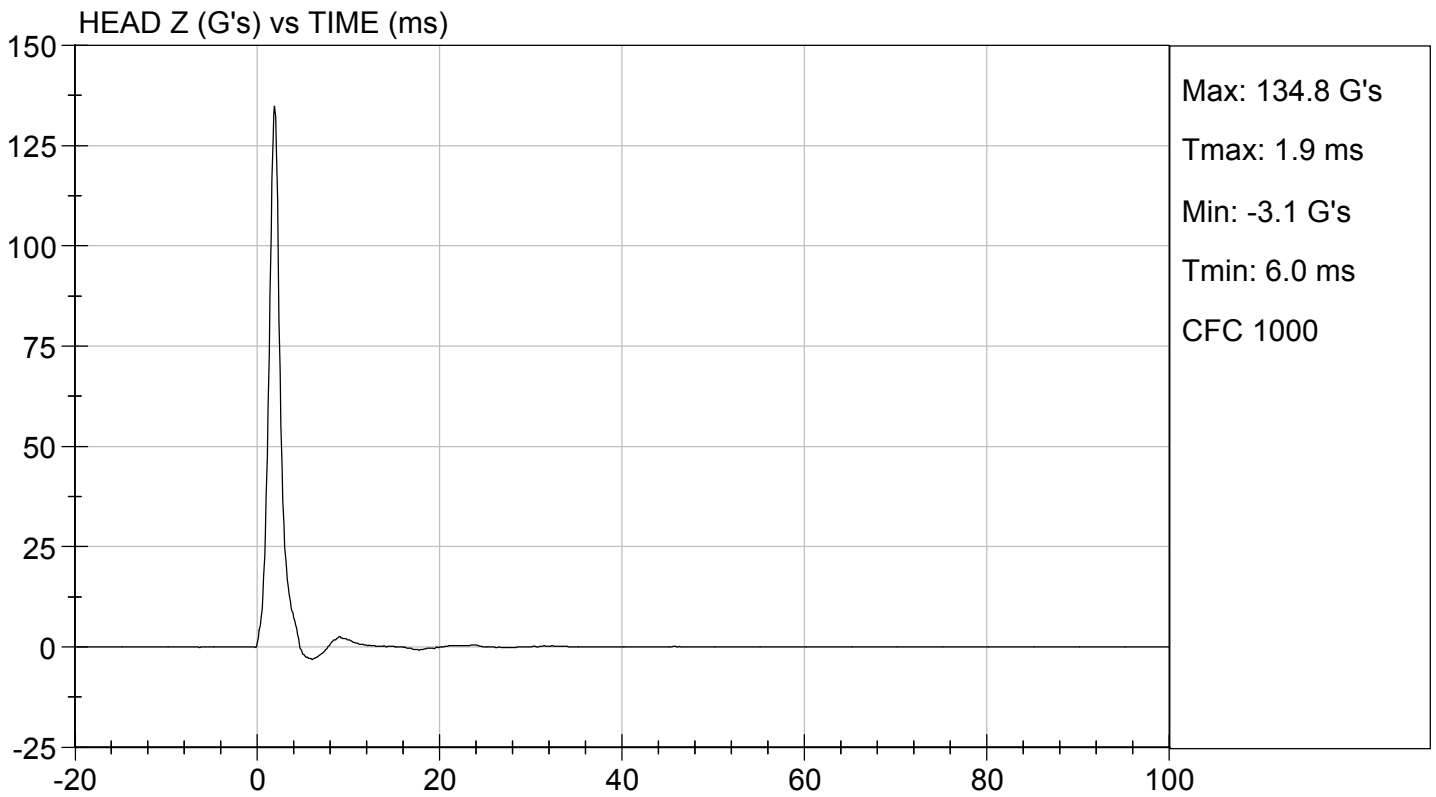
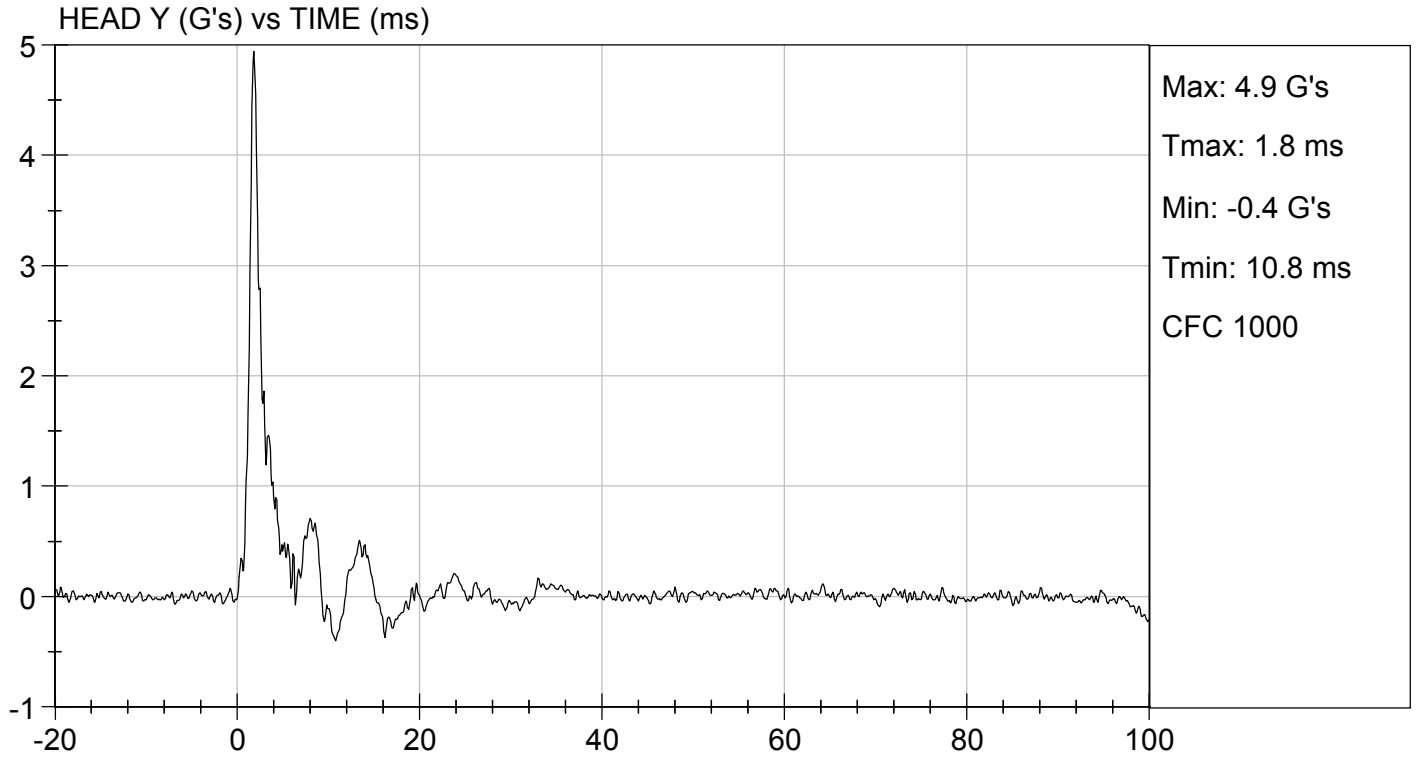
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Peak Resultant Acceleration	G's	250 to 300	272	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

Jacob D Taylor
Laboratory Technician

10/17/2019
Test Date

B. Fink
Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

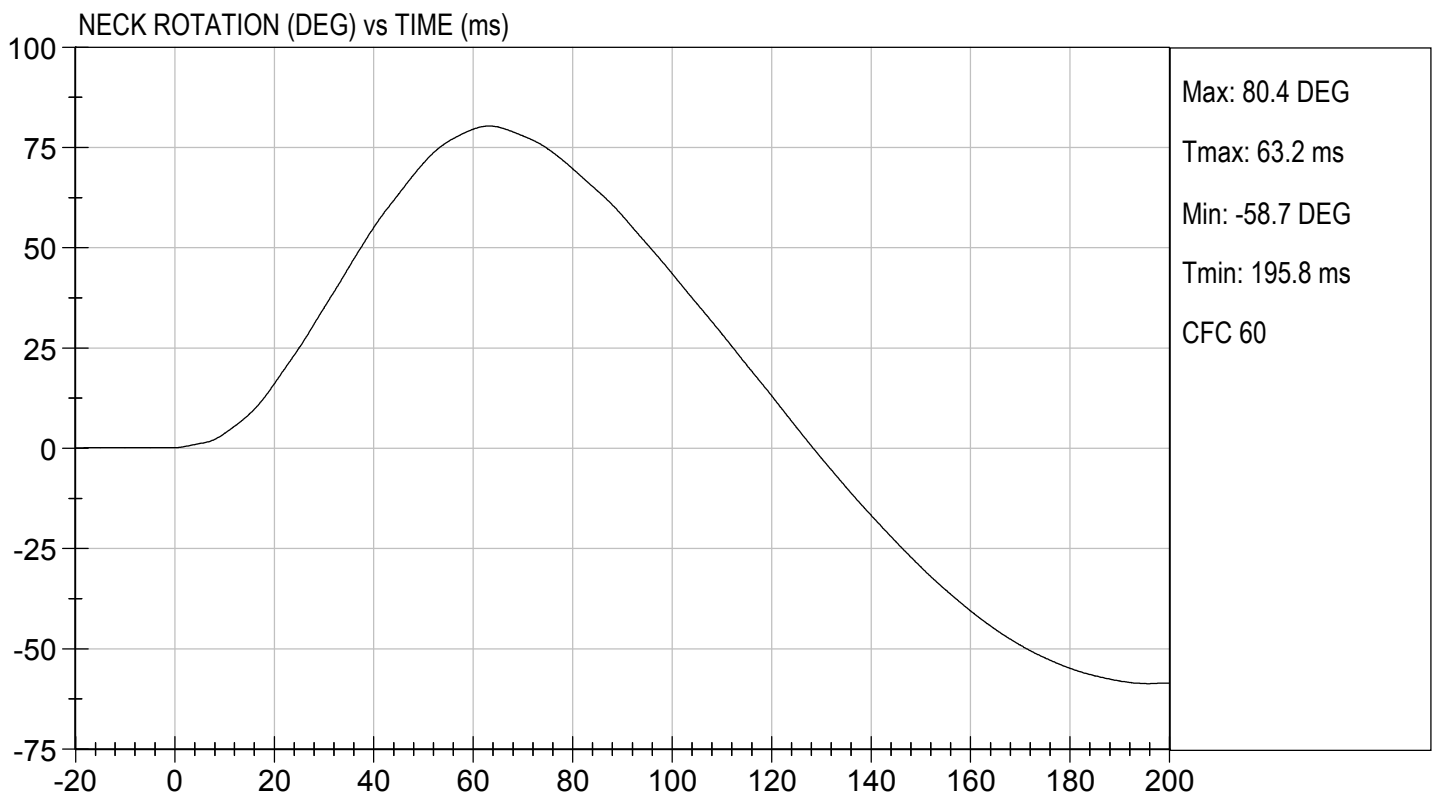
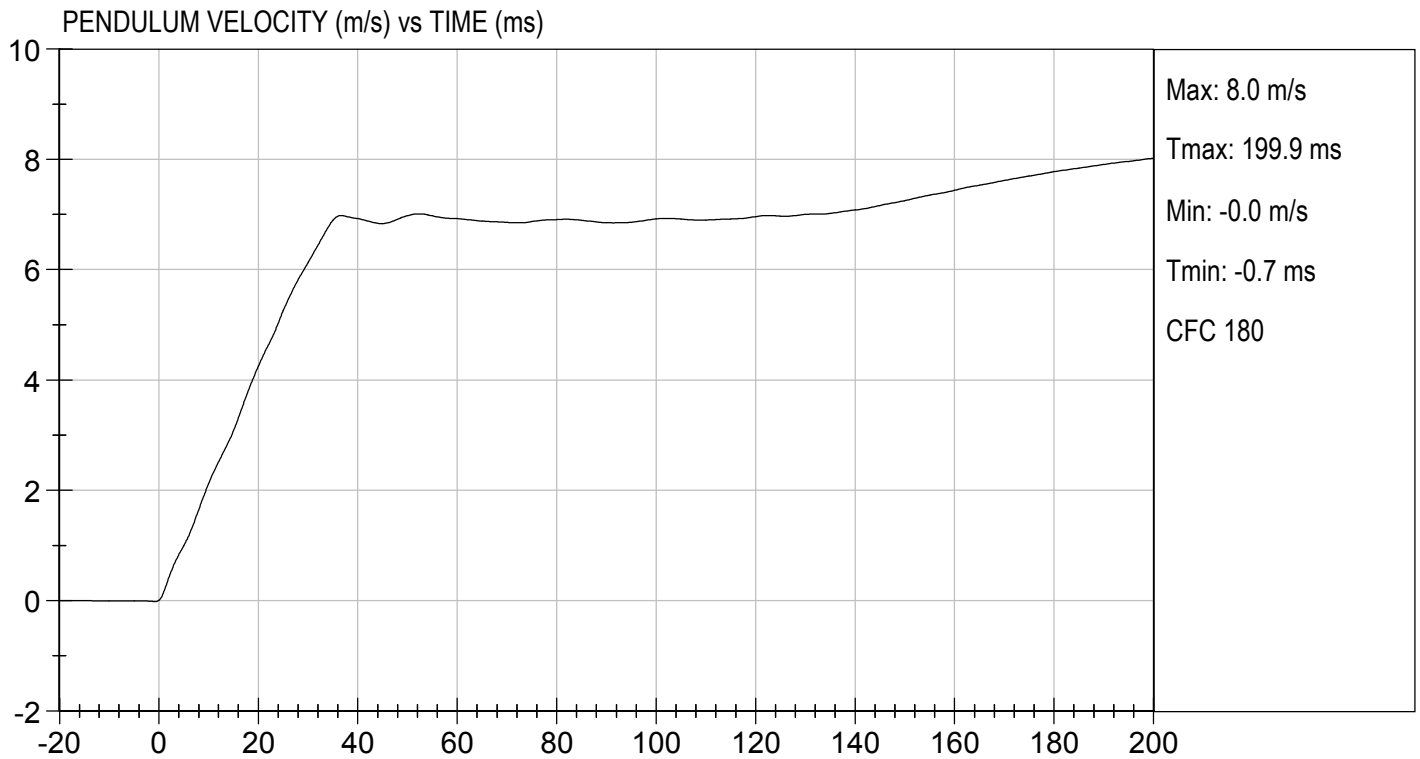
Test I.D.: D193252

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.1	Pass
	20 ms	m/s	4.0 to 5.0	4.2	Pass
	30 ms	m/s	5.8 to 7.0	6.1	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	89	Pass
Overall Results					Pass

Jacob D Taylor
Laboratory Technician

10/16/2019
Test Date

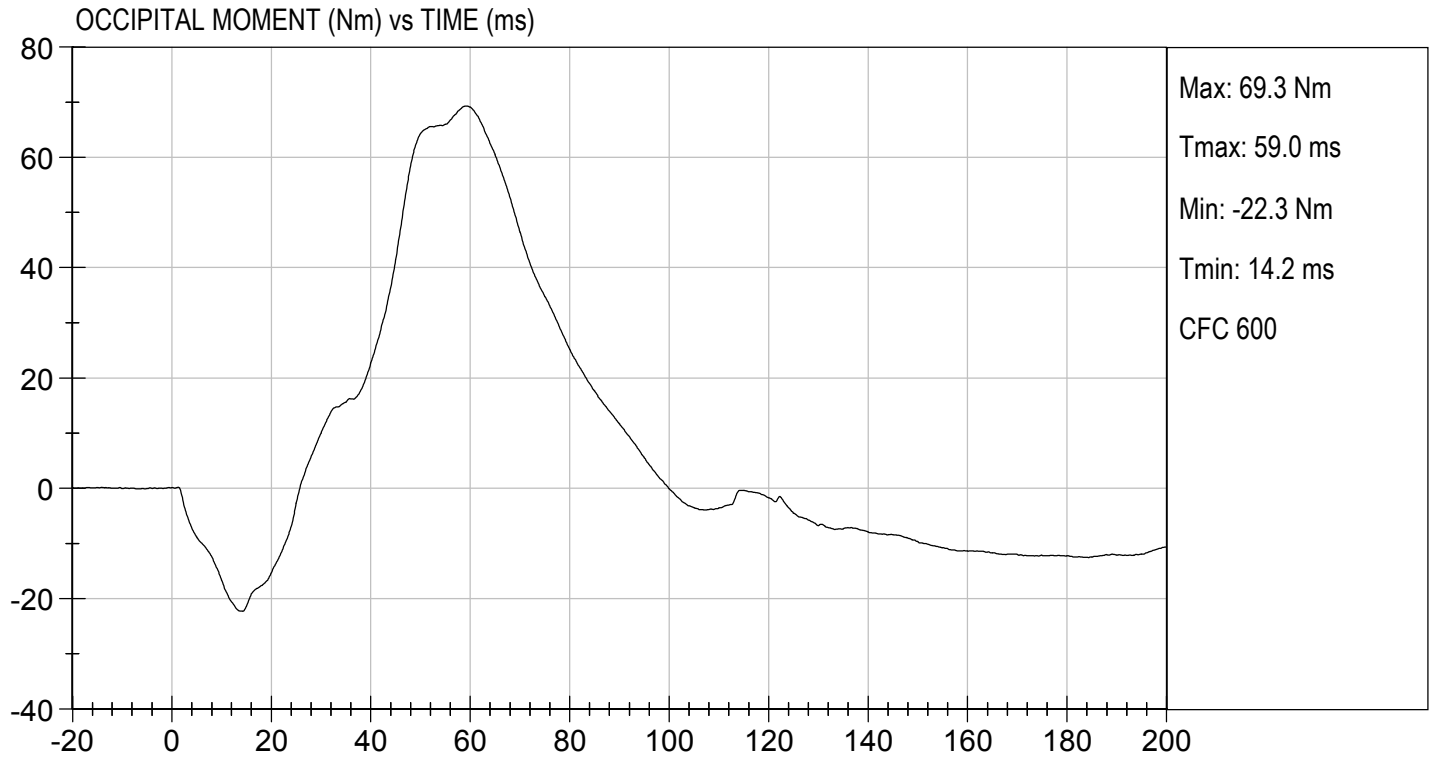
B. F. K.
Approved By





TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

TEST DATE: 10/16/2019
TEST #: D193252



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

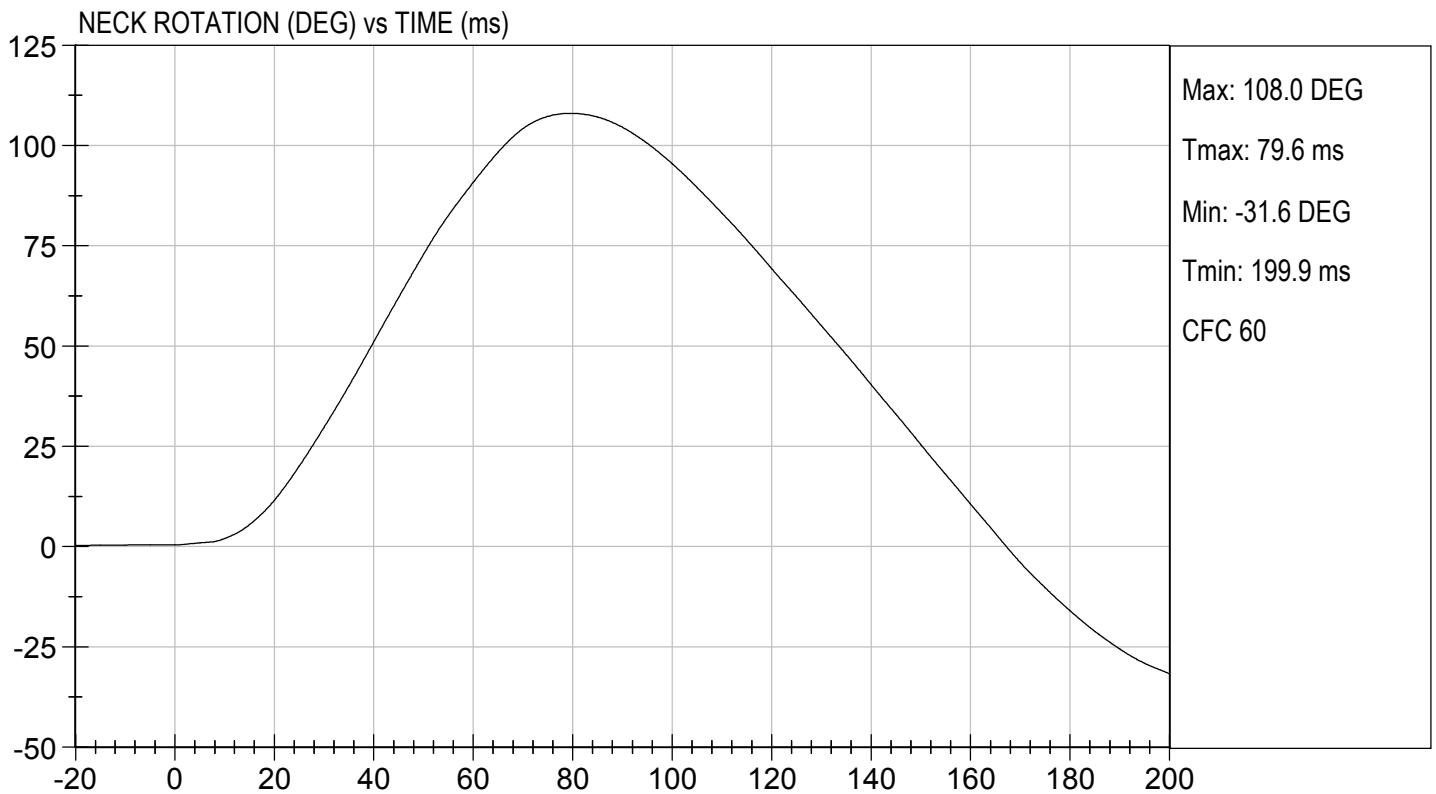
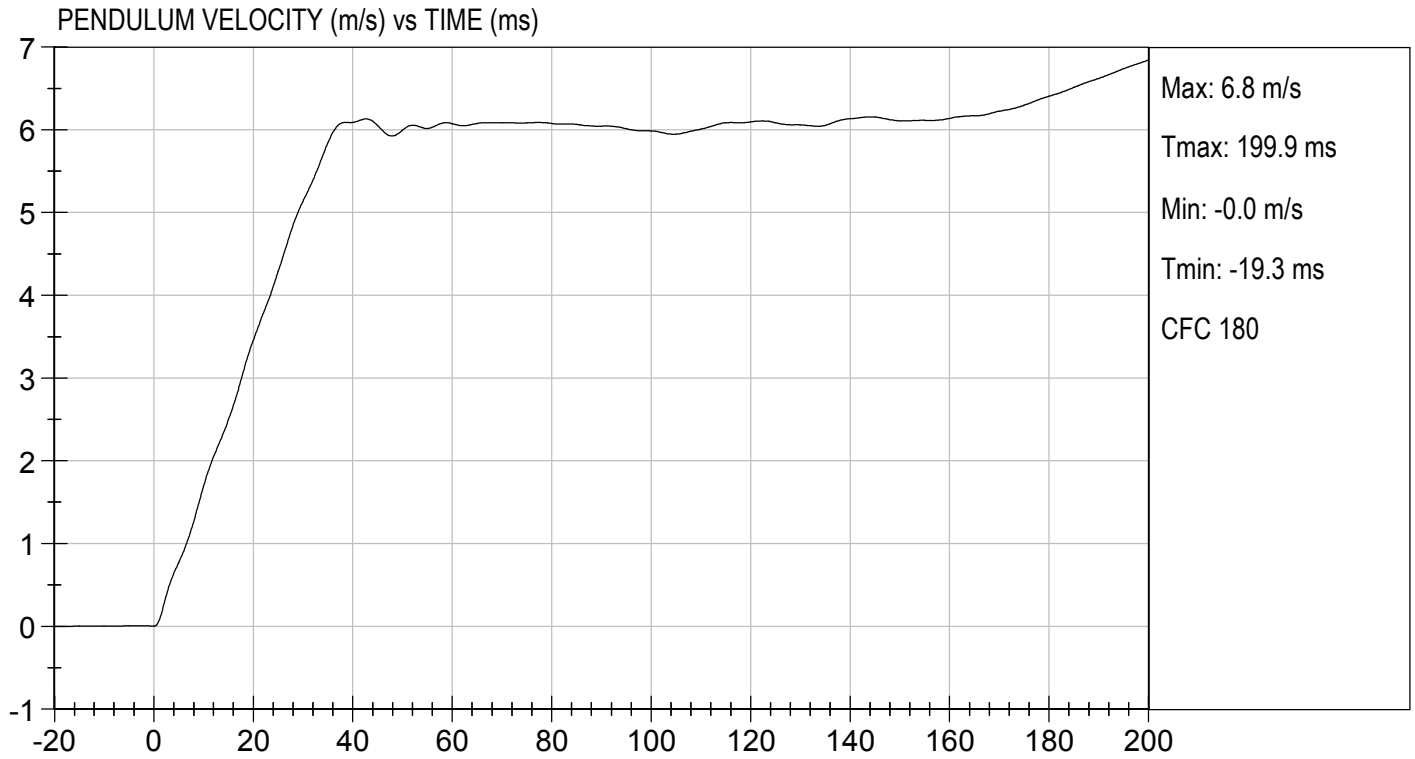
Test I.D: D193253

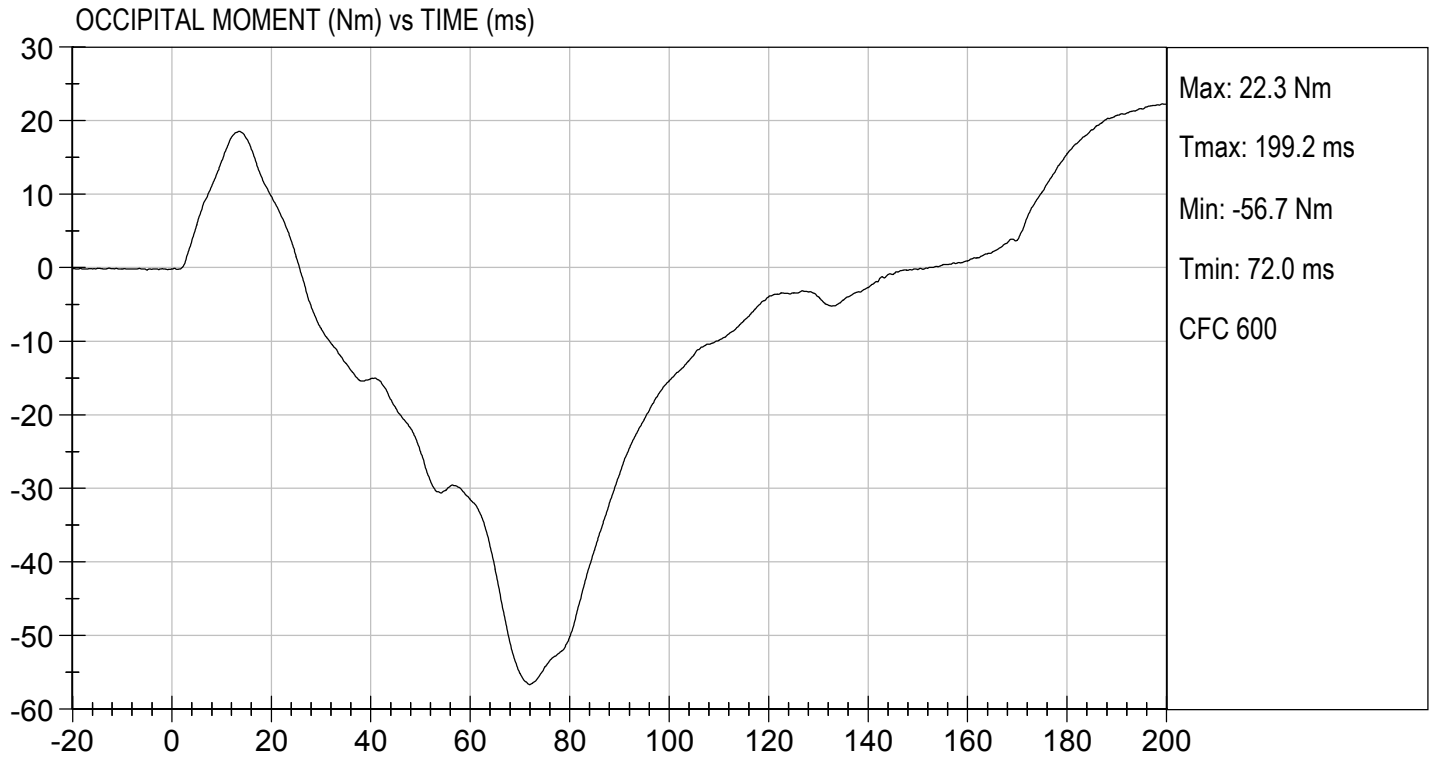
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	105	Pass
Overall Results					Pass

Jacob D Taylor
Laboratory Technician

B. F. K.
Approved By

10/16/2019
Test Date





MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

Test I.D: D193254

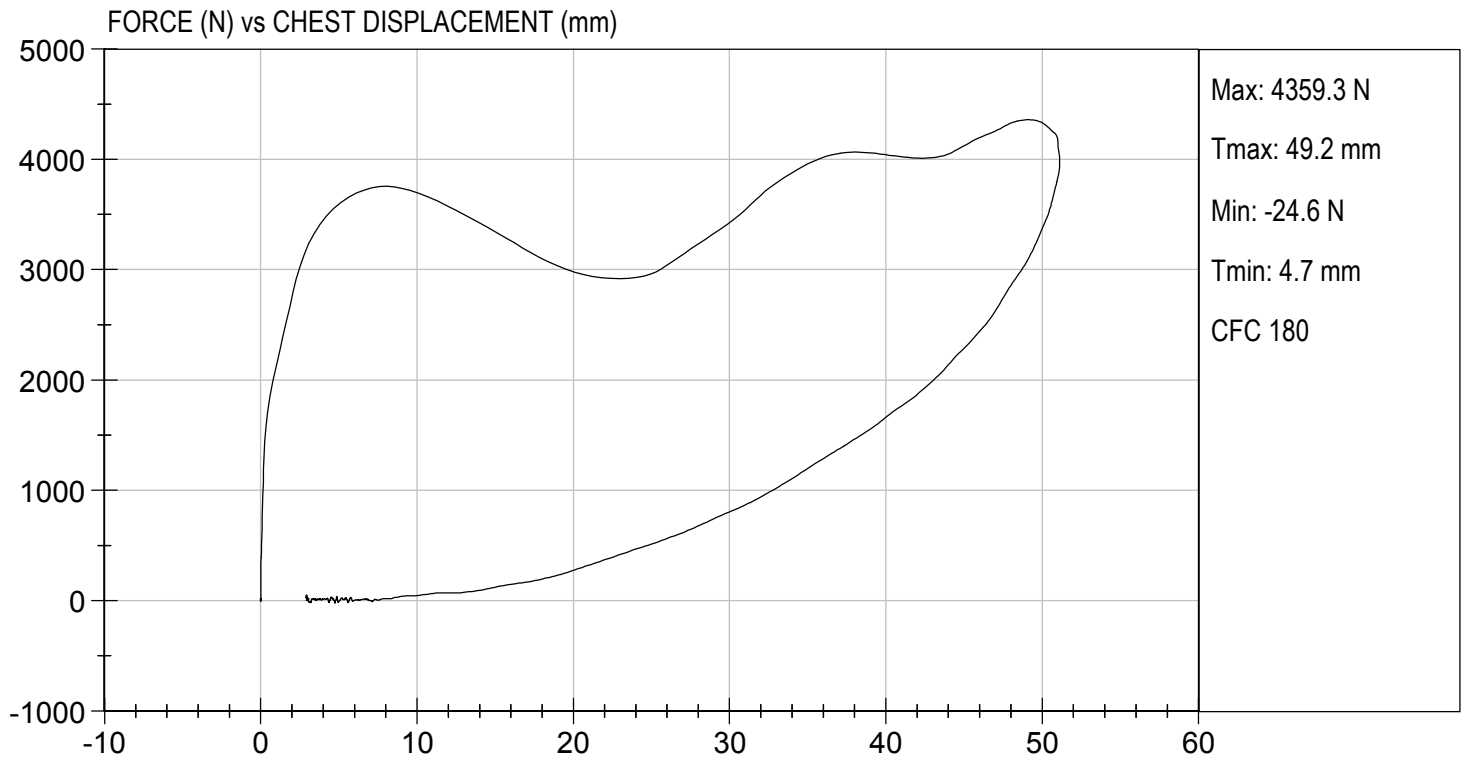
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Relative Humidity	%	10 to 70	43	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4330	Pass
Internal Hysteresis	%	69 to 85	75	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4359	Pass
Overall Test Results				Pass

Jacob D Taylor
 Laboratory Technician

10/21/2019

Test Date

B. F. K.
 Approved By



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

Test I.D: D193255

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3884	Pass
Overall Test Results				Pass

Jacob D Taylor
 Laboratory Technician

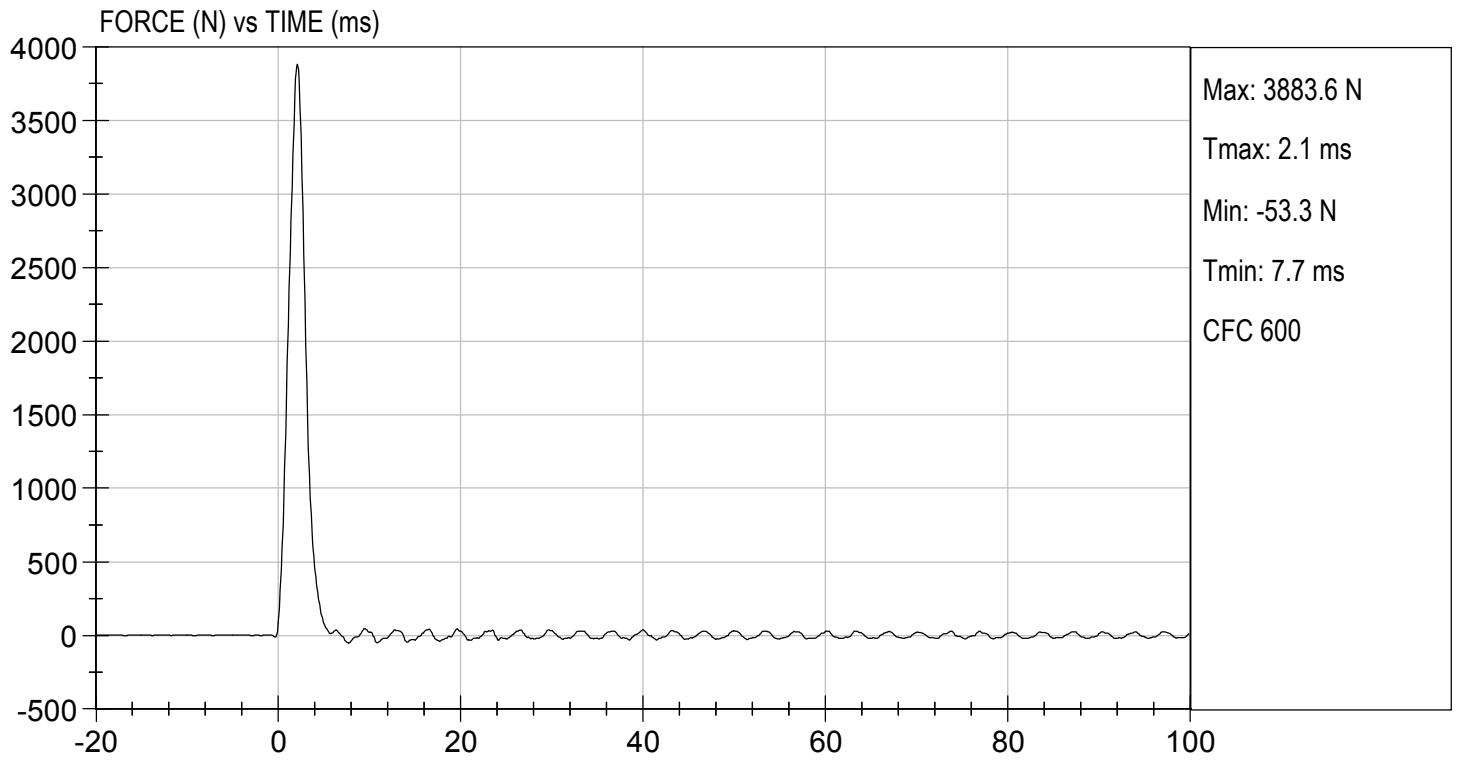
10/17/2019
 Test Date

B. F. [Signature]
 Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 7.00 ft/s, 2.13 m/s

TEST DATE: 10/17/2019
TEST #: D193255



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

Test I.D: D193256

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3873	Pass
Overall Test Results				Pass

Jacob D Taylor
Laboratory Technician

10/17/2019

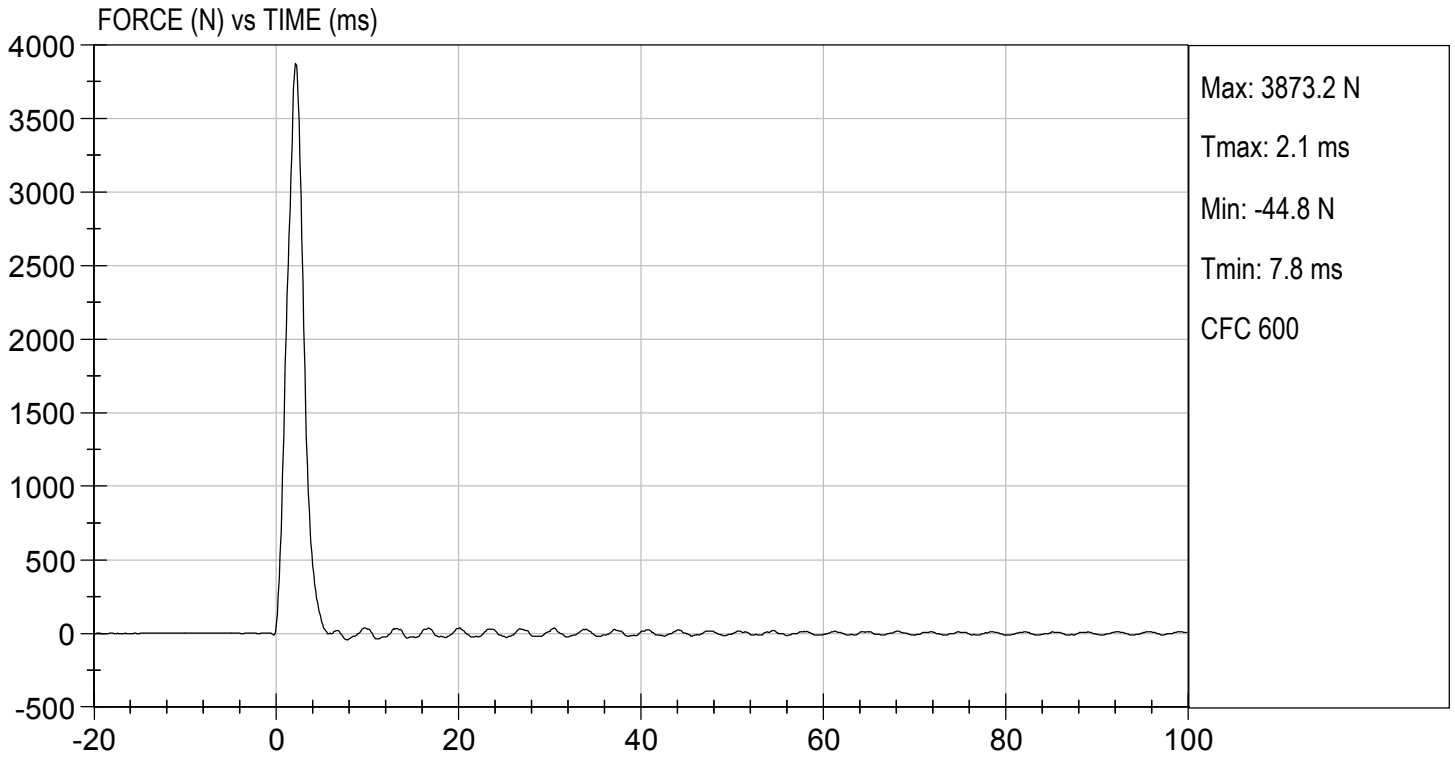
Test Date

B. F. K.
Approved By



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

TEST DATE: 10/17/2019
TEST #: D193256

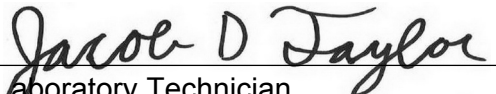


MGA RESEARCH CORPORATION
TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: DH1659

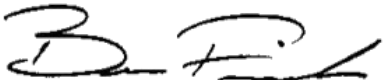
Test I.D: D193257

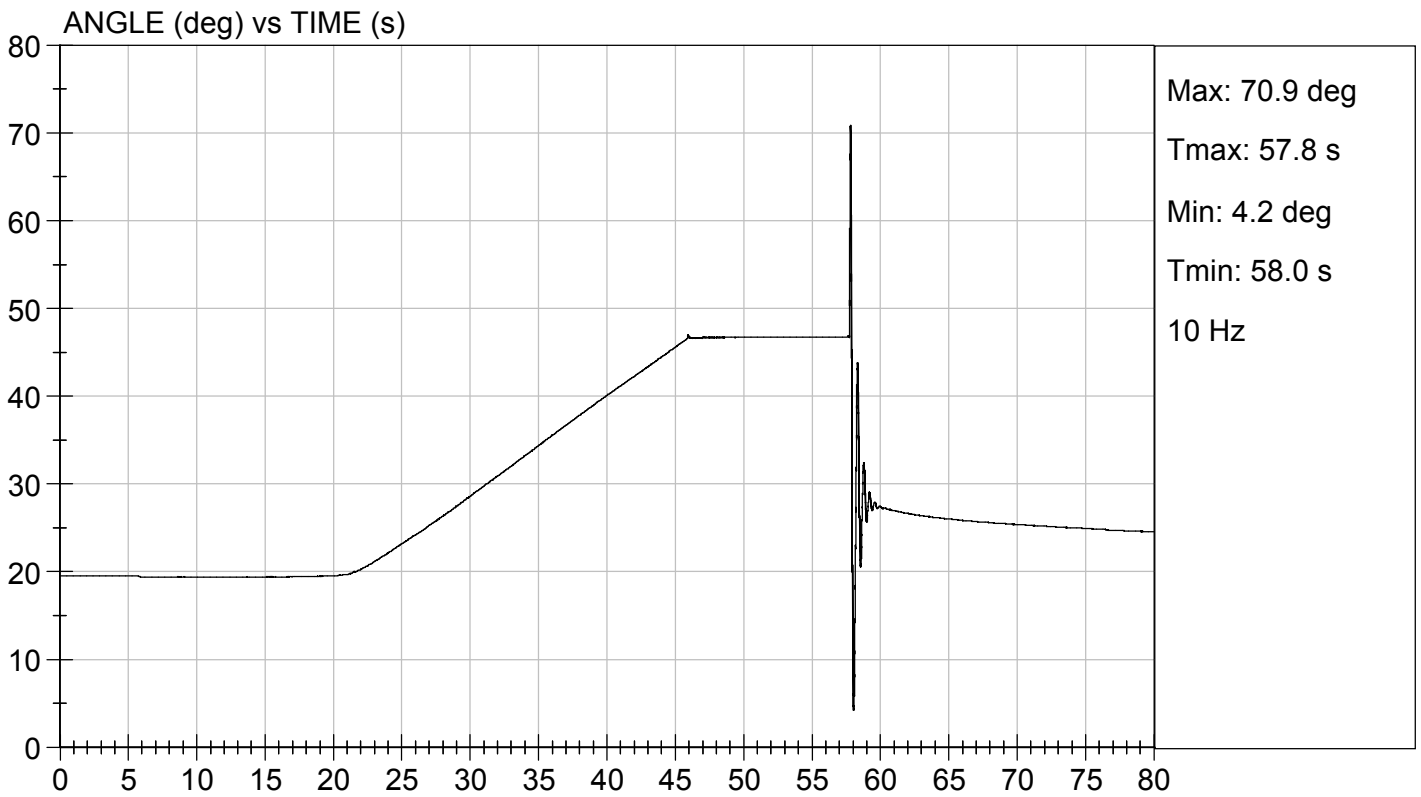
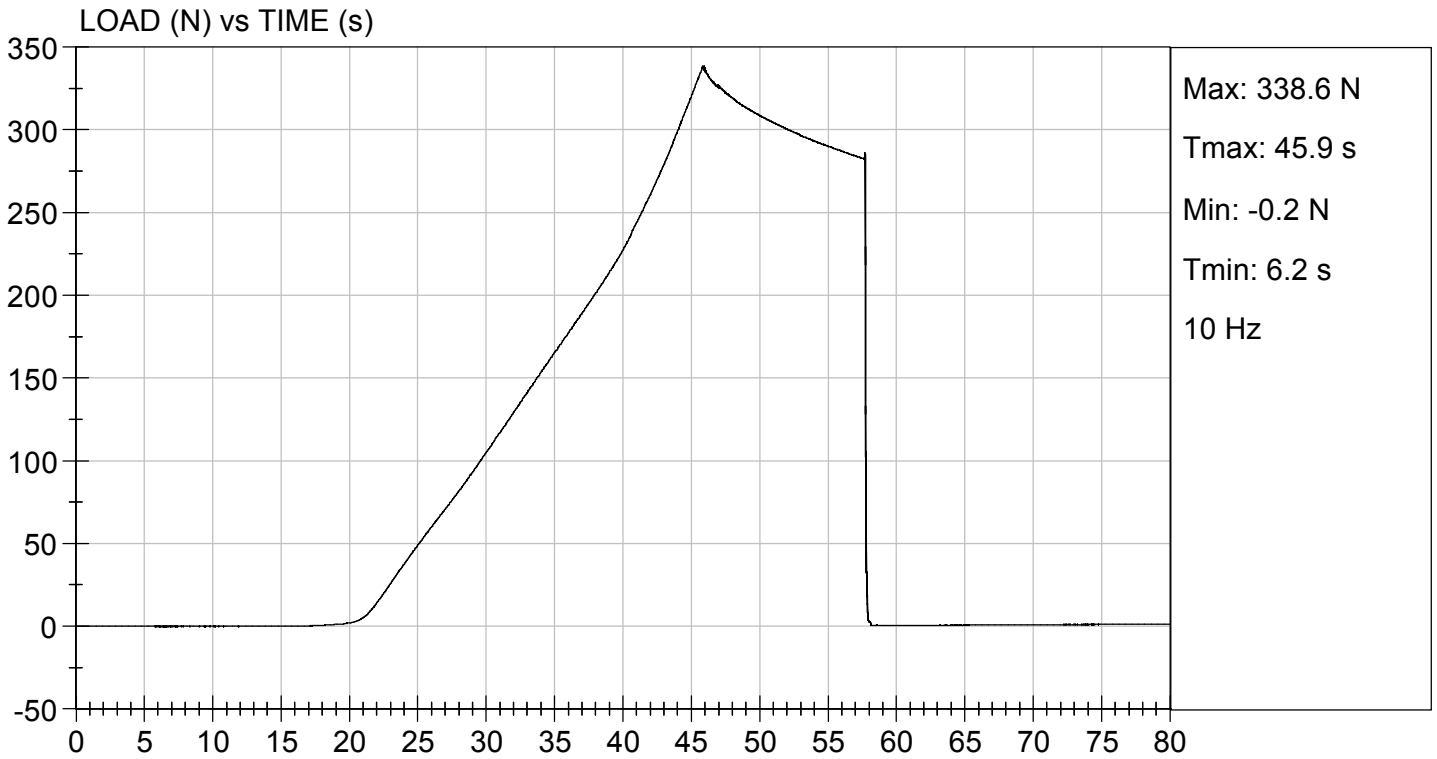
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21	Pass
Laboratory Relative Humidity	%	10 to 70	36	Pass
Initial Angle	deg	0 to 20	20	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	339	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	1.1	Pass
Overall Result				Pass


 Laboratory Technician

10/17/2019

Test Date


 Approved By



APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

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	9/12/2019	
		Y	P79743	Endevco	9/12/2019	
		Z	P79744	Endevco	9/12/2019	
	Redundant	X	P94834	Endevco	9/12/2019	
		Y	P94856	Endevco	9/12/2019	
		Z	P97412	Endevco	9/12/2019	
Head Angular Rate Sensors			X	ARS7325	DTS	7/8/2019
			Y	ARS7371	DTS	7/8/2019
			Z	ARS7391	DTS	7/8/2019
Upper Neck Load Cell			Fx, Fy, Fz Mx, My, Mz	NG174	FTSS	3/18/2019
Chest Accelerometers	Primary	X	P86792	Endevco	9/13/2019	
		Y	P86793	Endevco	9/13/2019	
		Z	P88348	Endevco	9/13/2019	
	Redundant	X	P86792	Endevco	9/13/2019	
		Y	P86793	Endevco	9/13/2019	
		Z	P88348	Endevco	9/13/2019	
Chest Potentiometer			X	351	Servo	9/13/2019
Pelvis Accelerometers			X	P95526	Endevco	9/12/2019
			Y	P96038	Endevco	9/12/2019
			Z	P97742	Endevco	9/12/2019
Femur Load Cells	Right	Primary	Z	FG121P	Denton	9/13/2019
		Redundant	Z	FG121R	Denton	9/13/2019
	Left	Primary	Z	FG122P	Denton	9/13/2019
		Redundant	Z	FG122R	Denton	9/13/2019
Tibia Load Cells	Right	Upper	Mx, My, Fz	TG405	Denton	3/18/2019
		Lower	Mx, My, Fz	AG368	Denton	3/18/2019
	Left	Upper	Mx, My, Fz	TG475	Denton	3/18/2019
		Lower	Mx, My, Fz	AG504	Denton	3/18/2019
Foot Accelerometers	Right	Rear	X	P94812	Endevco	9/12/2019
			Z	T16447	Endevco	9/12/2019
		Front	Z	P82120	Endevco	9/12/2019
	Left	Rear	X	T16468	Endevco	9/12/2019
			Z	T16496	Endevco	9/12/2019
		Front	Z	T16501	Endevco	9/12/2019
Seat Belt Load Cells			Lap			
			Shoulder		SBG157	FTSS

TABLE 2 – FRONT PASSENGER DUMMY INSTRUMENTATION

Instrument Location			Axis	Hybrid III 5 th S/N 1659		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary		X	P82304	Endevco	8/21/2019
			Y	P88172	Endevco	8/21/2019
			Z	T16400	Endevco	8/21/2019
	Redundant		X	T16403	Endevco	8/21/2019
			Y	T16406	Endevco	8/21/2019
			Z	T16413	Endevco	8/21/2019
Head Angular Rate Sensors			X	ARS7340	DTS	7/8/2019
			Y	ARS7354	DTS	7/8/2019
			Z	ARS7357	DTS	7/8/2019
Upper Neck Load Cell			Fx, Fy, Fz Mx, My, Mz	NG2256	Denton	4/19/2019
Chest Accelerometers	Primary		X	T16415	Endevco	8/21/2019
			Y	T16416	Endevco	8/21/2019
			Z	T16420	Endevco	8/21/2019
	Redundant		X	T16423	Endevco	8/21/2019
			Y	T16426	Endevco	8/21/2019
			Z	T16433	Endevco	8/21/2019
Chest Potentiometer			X	DH1659	Servo	8/21/2019
Pelvis Accelerometers			X	T16434	Endevco	8/21/2019
			Y	T16435	Endevco	8/21/2019
			Z	T16436	Endevco	8/21/2019
Femur Load Cells	Right	Primary	Z	FG126P	Denton	8/21/2019
		Redundant	Z	FG126R	Denton	8/21/2019
	Left	Primary	Z	FG127P	Denton	8/21/2019
		Redundant	Z	FG127R	Denton	8/21/2019
Tibia Load Cells	Right	Upper	Mx, My, Fz	TG467	Denton	5/9/2019
		Lower	Mx, My, Fz	AG491	Denton	5/9/2019
	Left	Upper	Mx, My, Fz	TG478	Denton	5/9/2019
		Lower	Mx, My, Fz	AG500	Denton	5/9/2019
Foot Accelerometers	Right	Rear	X	T16437	Endevco	8/20/2019
			Z	T16438	Endevco	8/20/2019
		Front	Z	T16439	Endevco	8/20/2019
	Left	Rear	X	T16441	Endevco	8/20/2019
			Z	T16444	Endevco	8/20/2019
		Front	Z	T16445	Endevco	8/20/2019
Seat Belt Load Cells			Lap			
			Shoulder		SBG272	FTSS

TABLE 3 – VEHICLE INSTRUMENTATION

Instrument Location			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember / Rear Seat Accelerometers	Left	Primary	X	PCB1314	PCB	7/17/2019
			Z	PCB1132	PCB	7/12/2019
		Redundant	X	PCB1244	PCB	7/17/2019
	Right	Primary	X	T19000	Endevco	8/28/2019
			Z	T19547	Endevco	8/28/2019
		Redundant	X	T19005	Endevco	8/28/2019
Engine Accelerometers		Top	X	T20393	Endevco	9/26/2019
		Bottom	X	T21466	Endevco	7/26/2019