

**REPORT NUMBER: NCAP-MGA-2018-016**

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

**HYUNDAI MOTOR COMPANY  
2018 Hyundai Santa Fe SE AWD 5-Door SUV  
NHTSA No.: M20184200**

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



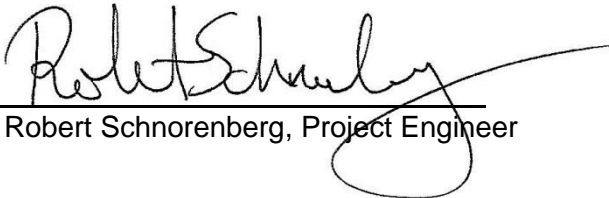
**Test Date: November 16, 2017**


**Final Report Date: December 22, 2017**

**FINAL REPORT**

**U.S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Office of Crashworthiness Standards  
Mail Code: NRM-110  
1200 New Jersey Ave, SE  
Room W43-410  
Washington, DC 20590**

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Approval Date: December 22, 2017

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-2018-016	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 2018 Hyundai Santa Fe SE AWD 5-Door SUV, NHTSA No.: M20184200		5. Report Date December 22, 2017																																																							
		6. Performing Organization Code MGA																																																							
7. Author(s) Robert Schnorenberg, Project Engineer		8. Performing Organization Report No. NCAP-MGA-2018-016																																																							
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 November 16, 2017 to December 22, 2017																																																							
		14. Sponsoring Agency Code NRM-110																																																							
15. Supplementary Notes																																																									
16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2018 Hyundai Santa Fe SE AWD 5-Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), and 301 performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on November 16, 2017.  The impact velocity of the vehicle was 55.68 km/h and the ambient temperature at the barrier face at the time of impact was 21.5°C. The target vehicle post-test maximum crush was 469mm 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" style="width: 30%;">Measurement Description</th> <th rowspan="2" style="width: 10%;">Units</th> <th colspan="2" style="width: 20%;">Driver ATD</th> <th colspan="2" style="width: 20%;">Passenger ATD</th> </tr> <tr> <th style="width: 10%;">Threshold</th> <th style="width: 10%;">Result</th> <th style="width: 10%;">Threshold</th> <th style="width: 10%;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>15</sub>)</td> <td>N/A</td> <td style="text-align: center;">700</td> <td style="text-align: center;">140</td> <td style="text-align: center;">700</td> <td style="text-align: center;">224</td> </tr> <tr> <td>Maximum Chest</td> <td>mm</td> <td style="text-align: center;">63</td> <td style="text-align: center;">28</td> <td style="text-align: center;">52</td> <td style="text-align: center;">8</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0.34</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0.53</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td style="text-align: center;">4170</td> <td style="text-align: center;">1666</td> <td style="text-align: center;">2620</td> <td style="text-align: center;">736</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td style="text-align: center;">4000</td> <td style="text-align: center;">457</td> <td style="text-align: center;">2520</td> <td style="text-align: center;">489</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td style="text-align: center;">10008</td> <td style="text-align: center;">840</td> <td style="text-align: center;">6805</td> <td style="text-align: center;">1500</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td style="text-align: center;">10008</td> <td style="text-align: center;">1416</td> <td style="text-align: center;">6805</td> <td style="text-align: center;">1172</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC <sub>15</sub> )	N/A	700	140	700	224	Maximum Chest	mm	63	28	52	8	Nij	N/A	1	0.34	1	0.53	Neck Tension	N	4170	1666	2620	736	Neck Compression	N	4000	457	2520	489	Left Femur Force	N	10008	840	6805	1500	Right Femur Force	N	10008	1416	6805	1172
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19. Security Classification of Report Unclassified	20. Security Classification of Page Unclassified	21. No. of Pages  168		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 Frontal NCAP Laboratory Test Procedure.

### **SUMMARY**

A load cell barrier consisting of 176 load cells was impacted by a 2018 Hyundai Santa Fe SE AWD 5-Door SUV at a velocity of 55.68 km/h. The test was performed at MGA Research Corporation on November 16, 2017. Pre-test and post-test photographs of the vehicle and dummies can be found in Appendix A.

Two (2) real-time cameras and fourteen (14) 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 50<sup>th</sup> percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5<sup>th</sup> percentile female test device (ATD) was placed in the right-front passenger seating position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure.

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.

The driver (position 1) ATD (Serial No. 351) and the right-front passenger (position 2) ATD (Serial No. 138) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 630 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 leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 469mm 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 contact 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 glove box.

The occupant data is summarized below:

ATD position	HIC <sub>15</sub>	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 <sup>th</sup> )	140	0.34	1666	457	43	28	840	1416
Passenger (5 <sup>th</sup> )	224	0.53	736	489	47	8	1500	1172

The test data can be found on the NHTSA website at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov).

### TEST NOTES

Top of Engine X recorded no valid data after 50ms.  
 Barrier K-16 My recorded no valid data.  
 Barrier F-01 Fx recorded no valid data.  
 Barrier F-01 My recorded no valid data.  
 Barrier F-01 Mz recorded no valid data.  
 Barrier C-04 Fx recorded no valid data.  
 Barrier C-04 My recorded no valid data.  
 Barrier C-04 Mz 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: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	M20184200	Traction Control System (TCS)	Yes
Model Year	2018	Power Steering	Yes
Make	Hyundai	Power Window Auto-Reverse	Yes
Model	Santa Fe SE	Driver Frontal Airbag	Yes
Body Style	5-Door SUV	Driver Curtain Airbag	Yes
VIN	KM8SMDHF2JU267031	Driver Head/Torso Airbag	No
Body Color	Iron Frost	Driver Torso Airbag	No
Odometer (km/mi)	71km / 44mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	3.3 L	Driver Pelvis Airbag	No
Type/No. Cylinders	V6	Driver Knee Airbag	Yes
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	AWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	N/A

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

**DATA FROM CERTIFICATION LABEL**

Manufactured By	HYUNDAI MOTOR COMPANY	GVWR (kg)	2550
Date of Manufacture	05/17	GAWR Front (kg)	1390
		GAWR Rear (kg)	1395

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

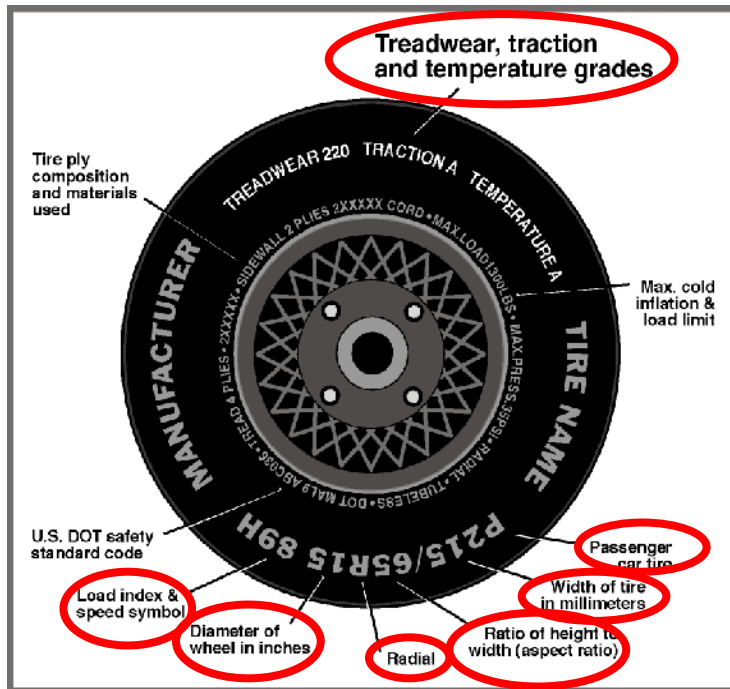
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contoured	Contoured	
Designated Seating Capacity (DSC)	2	3	2	7
Capacity Weight (VCW) (kg)				588
Cargo Weight (RCLW) (kg)				112

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

**VEHICLE TIRE INFORMATION**



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	235/60R18	235/60R18
Tire Size on Vehicle	235/60R18	235/60R18
Tire Manufacturer	Kumho	Kumho
Tire Model	Crugen	Crugen
Treadwear	440	440
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Steel, 2 Polyester, 1 Nylon	2 Steel, 2 Polyester, 1 Nylon
Load Index/Speed Symbol	103H	103H
Tire Material	Rubber	Rubber
DOT Safety Code Left	27CM YANH 2117	27CM YANH 2117
DOT Safety Code Right	27CM YANH 2117	27CM YANH 2117

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
Test Date: 11/16/2017

**TEST VEHICLE WEIGHTS**

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	534.0	424.0		563.0	527.0	
Right	kg	529.5	409.0		550.5	501.0	
Ratio	%	56.1%	43.9%		52.0%	48.0%	
Totals	kg	1063.5	833.0	1896.5	1113.5	1028.0	2141.5

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1896.5
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	112
Calculated Test Vehicle Target Weight (TVTW)	kg	2149.5

**TEST VEHICLE ATTITUDES AND CG**

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	788	790	793	797	1232
As Tested	mm	783	782	768	767	1347
Post Test	mm	780	780	768	773	

**GENERAL TEST VEHICLE DATA**

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2806
Total Vehicle Length at Left Side	mm	4730
Total Vehicle Length at Centerline	mm	4905
Total Vehicle Length at Right Side	mm	4730
Weight of Ballast in Cargo Area	kg	62
Weight of Vehicle Components Removed	kg	51
Amount of Stoddard Solvent in Fuel Tank	L	66.2

List of components removed to meet test weight: None.

List of components removed for instrumentation, data box, and equipment installation: Cargo area carpet and trim, jack and tool kit, third row seats and carpet, right rear tail light, left and right front underbody plastic.

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

**TARGET VEHICLE STRUCTURAL MEASUREMENT**

	Elements	Pre-Test (mm)
1	Total Length	4905
2	Total Width	1884
3	Bumper Top Height	582
4	Bumper Bottom Height	470
5	Longitudinal Member Top Height	576
6	Distance between Longitudinal Members	945
7	Longitudinal Member Width	70
8	Engine Top Height	942
9	Engine Bottom Height	222
10	Engine and Gearbox Width	850
11	Front Bumper-Engine Distance	400
12	Front Shock Absorber Fixing Height	960
13	Bonnet Leading Edge Height	892
14	Front Shock Absorber Fixing Width	1126
15	Front Bumper – Front Axle Distance	994
16	Front Axle – A-Pillar Distance	526
17	A-Pillar – B-Pillar Distance	1038
18	B-Pillar – Rear Axle Distance	1235
19	B-Pillar – C-Pillar Distance	722
20	Roof Sill Bottom Height	1570
21	Roof Sill Top Height	1665
22	Floor Sill Bottom Height	341
23	Floor Sill Top Height	445

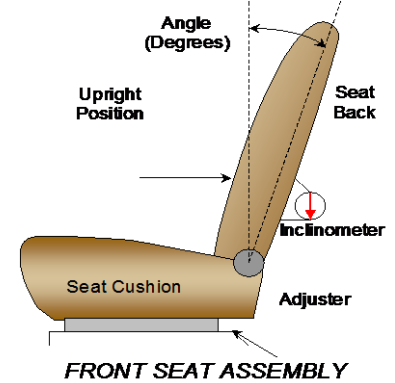
**DATA SHEET NO. 2**  
**SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

**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	-11.8° on outboard headrest post
Passenger Seat Back Angle	-18.4° on outboard headrest post

**SEAT FORE/AFT POSITIONS**

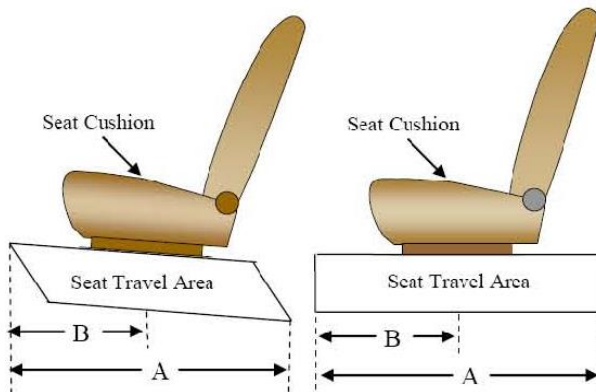
The driver and passenger seat fore/aft positions are adjusted following Appendix F, “Driver & Passenger Dummy Seating & Positioning Procedures” in the NCAP Test Procedure dated October 2015.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	297 mm	149 mm
Passenger Seat	240 mm / 25 detents (1st as 1)	0 mm / 0th detent (1st as 0)

**SEAT BELT UPPER ANCHORAGES**

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

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



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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
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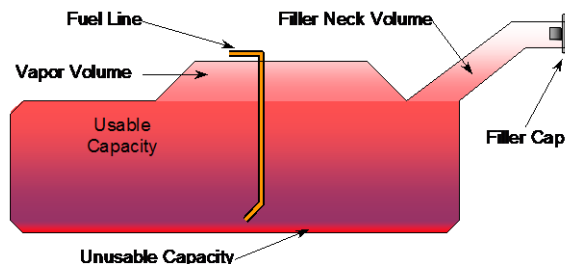
**FUEL TANK CAPACITY DATA**

	Liters
Usable Capacity of "Standard Tank"	71.0
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	65.3 to 66.7
Actual Amount of Solvent used	66.2
1/3 of Usable Capacity	23.7

**FUEL PUMP**

Describe the fuel pump type, its behavior, and the location of the fuel filler pipe.

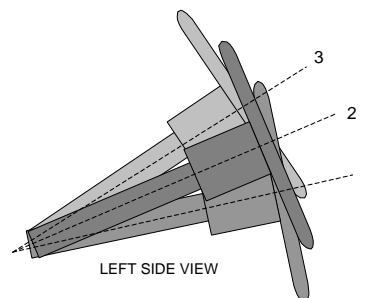
The vehicle is equipped with an electronic fuel pump. The fuel pump runs when the ignition is in the "ON" position. The filler neck is located on the driver's side.



**VEHICLE FUEL TANK ASSEMBLY**

**STEERING COLUMN ADJUSTMENT**

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. 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 ASSEMBLY**

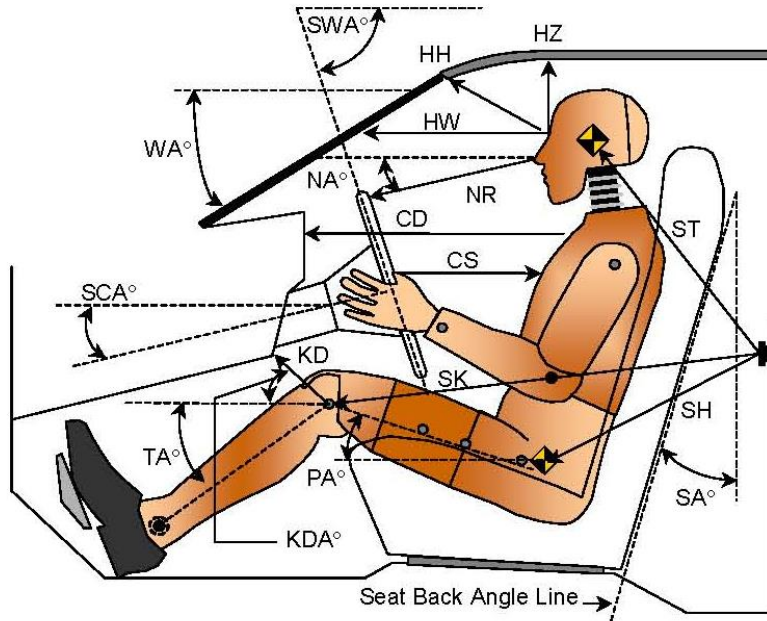
**STEERING COLUMN POSITION**

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	67.6	129
Geometric Center Position 2	65.4	149
Uppermost Position 3	63.2	169
Telescoping Steering Wheel Travel		40
Test Position	65.4	149

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017



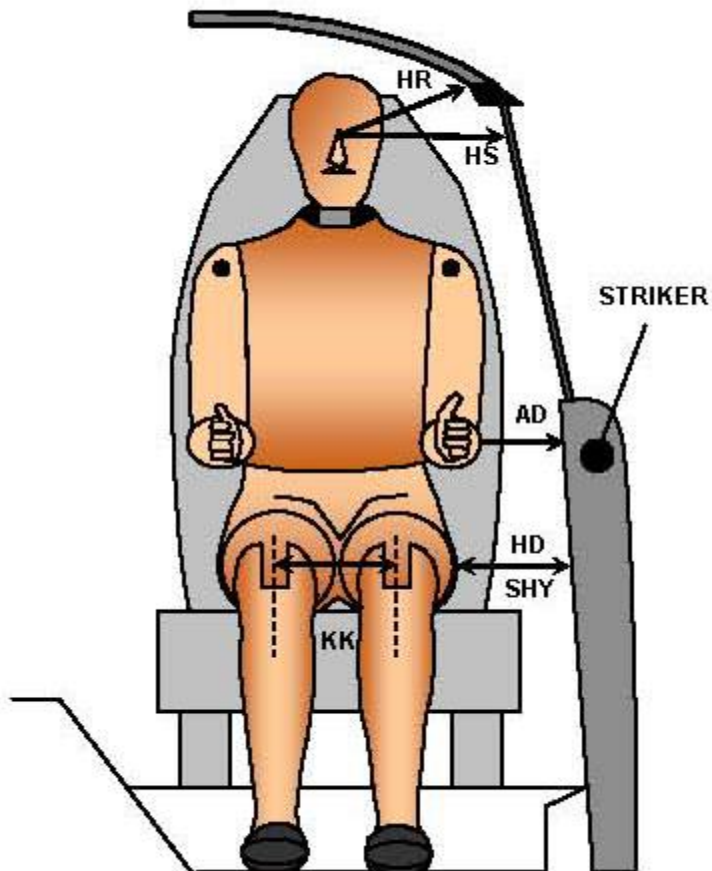
**LEFT SIDE VIEW**

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		24.8		
SWA°	Steering Wheel Angle		65.4		
SCA°	Steering Column Angle		24.6		
SA°	Seat Back Angle		-11.8		-18.4
HZ	Head to Roof (Z)	202	90	241	90
HH	Head to Header	359	34.5	315	48.9
HW	Head to Windshield	664	0	714	0
NR	Nose to Rim	397	12.7		
CD	Chest to Dash	537		394	
CS	Chest to Steering Hub	327	0.7		
RA	Rim to Abdomen	195	0		
KDL	Left Knee to Dash	158	27.7	88	30.9
KDR	Right Knee to Dash	140	36.5	90	32.1
PA°	Pelvic Angle		24.2		20.4
TA°	Tibia Angle		51.3		52.1
SK	Striker to Knee	577	105.4	696	106.3
ST	Striker to Head	429	13.3	403	39.9
SH	Striker to H-Point	312	142.2	430	124.4

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017



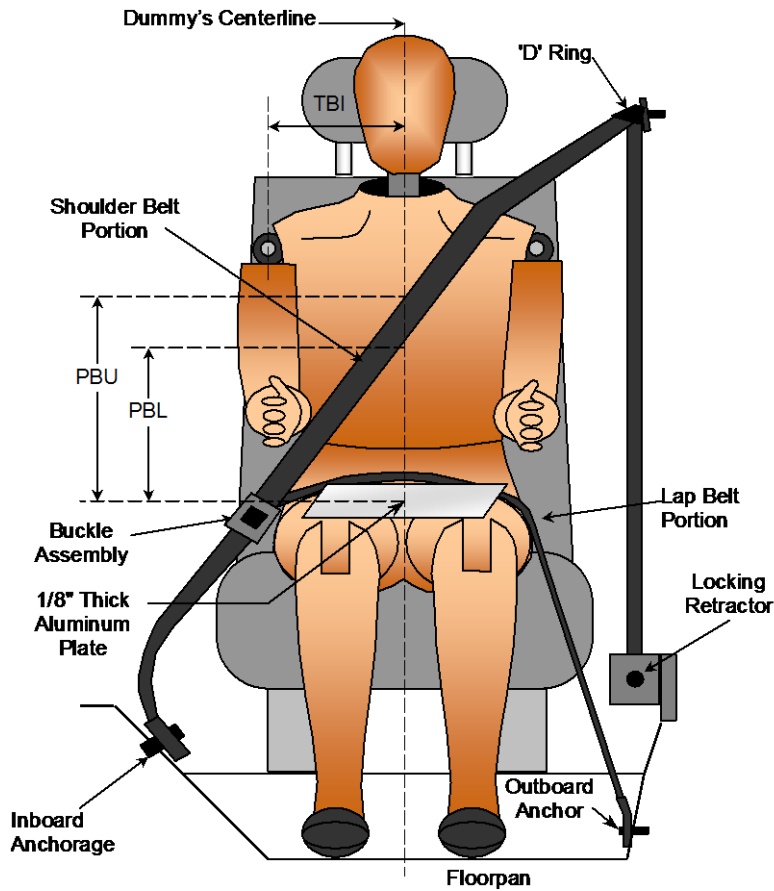
**FRONT VIEW OF DUMMY**

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	133	103
HD	H-Point to Door	169	198
HR	Head to Side Header	222	287
HS	Head to Side Window	345	375
KK	Knee to Knee	361	226
SHY	Striker to H-Point (Y Direction)	303	319
AA	Ankle to Ankle	363	166

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017



**FRONT VIEW OF DUMMY**

**SEAT BELT POSITIONING MEASUREMENTS**

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	365	355
PBL - Top surface of reference to belt lower edge	mm	285	270

**BELT LENGTH DATA**

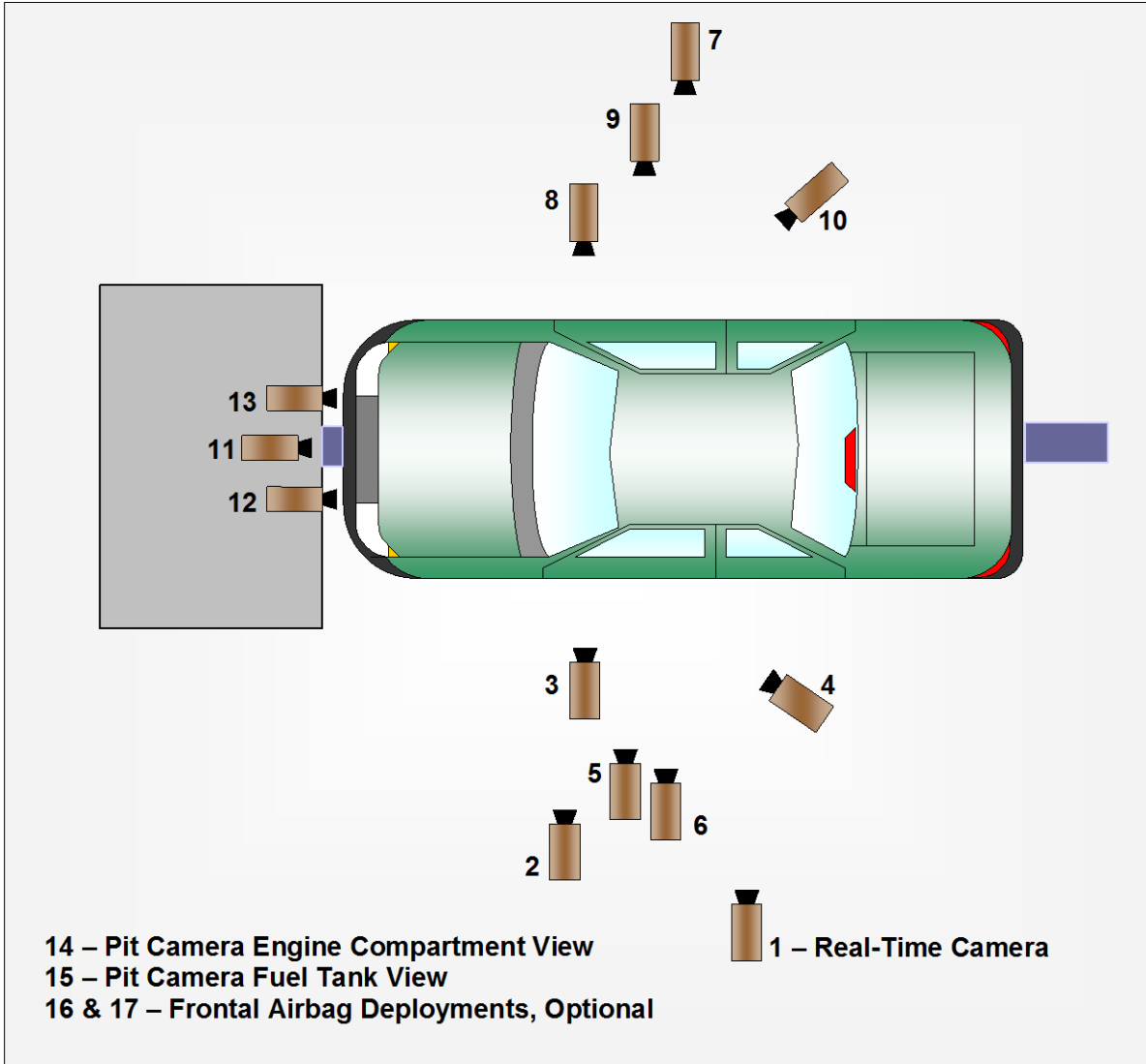
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	880	945
Lap Belt Length as measured on ATD	mm	805	740
Remainder of belt on reel	mm	895	895
Total Belt Length for Continuous Webbing Systems	mm	3330	3330

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
Test Date: 11/16/2017

**CAMERA POSITIONS FOR FRONTAL IMPACTS**



**DATA SHEET NO. 6 (CONTINUED)  
CAMERA LOCATIONS AND DATA**

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

**CAMERA LOCATIONS**

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	-1690	-6590	-2040	50	1000
3	Left Front Half	-1170	-5690	-1280	24	1000
4	Left Angle	-6750	-5690	-2040	75	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2240	6010	-1470	16	1000
8	Passenger Close-Up	-1530	6500	-2140	50	1000
9	Right Front Half	-1090	5600	-1400	24	1000
10	Right Angle	-6770	4860	-2130	75	1000
11	Windshield	150	0	-2310	11	1000
12	Driver Windshield	-280	-370	-2230	25	1000
13	Passenger Windshield	-280	370	-2230	25	1000
14	Pit Front	-990	0	3340	24	1000
15	Pit Rear	-3160	0	3340	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

**\*COORDINATES:**

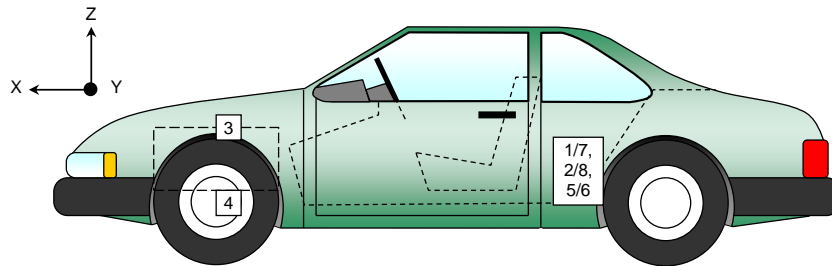
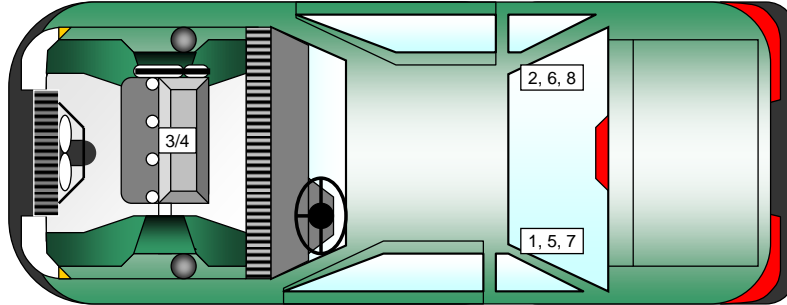
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 5 & 6 were not used for this test.

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017



**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1978	-330	-356
2	Right Rear Crossmember Accelerometer – X Direction	1978	330	-356
3	Engine Top X	4054	32	-951
4	Engine Bottom X	4110	45	-312
5	Left Rear Crossmember Accelerometer – Z Direction	1978	-330	-356
6	Right Rear Crossmember Accelerometer – Z Direction	1978	330	-356
7	Left Rear Crossmember Accelerometer Redundant – X Direction	2003	-330	-356
8	Right Rear Crossmember Accelerometer Redundant – X Direction	2003	330	-356

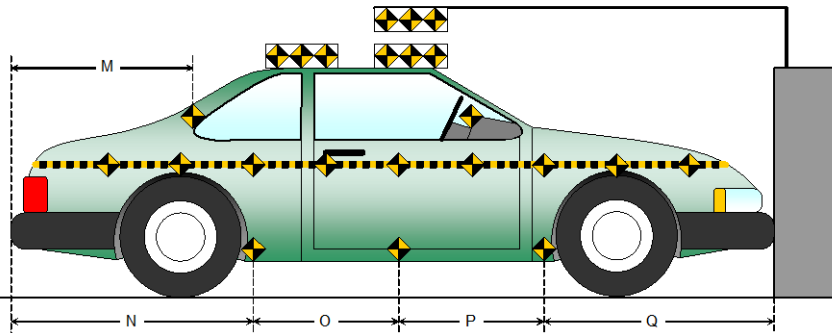
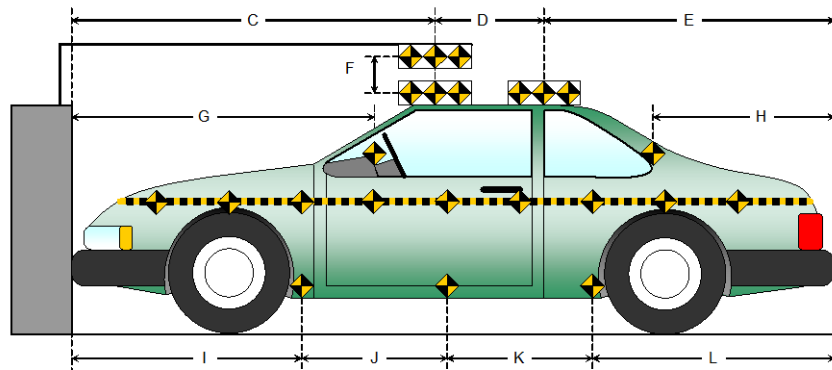
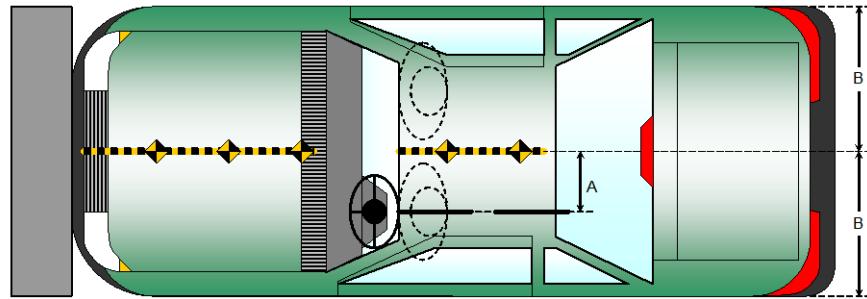
Reference Points: X - Rear Surface of Vehicle (+ forward)  
 Y - Vehicle Centerline (+ to right)  
 Z - Ground Plane (+ down)

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

Item	Value (mm)
A	387
B	942
C	2383
D	615
E	1907
F	185
G	
H	1576
I	1520
J	880
K	880
L	1625
M	1576
N	1625
O	880
P	880
Q	1520



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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

**Advanced Research Load Cell Barrier**

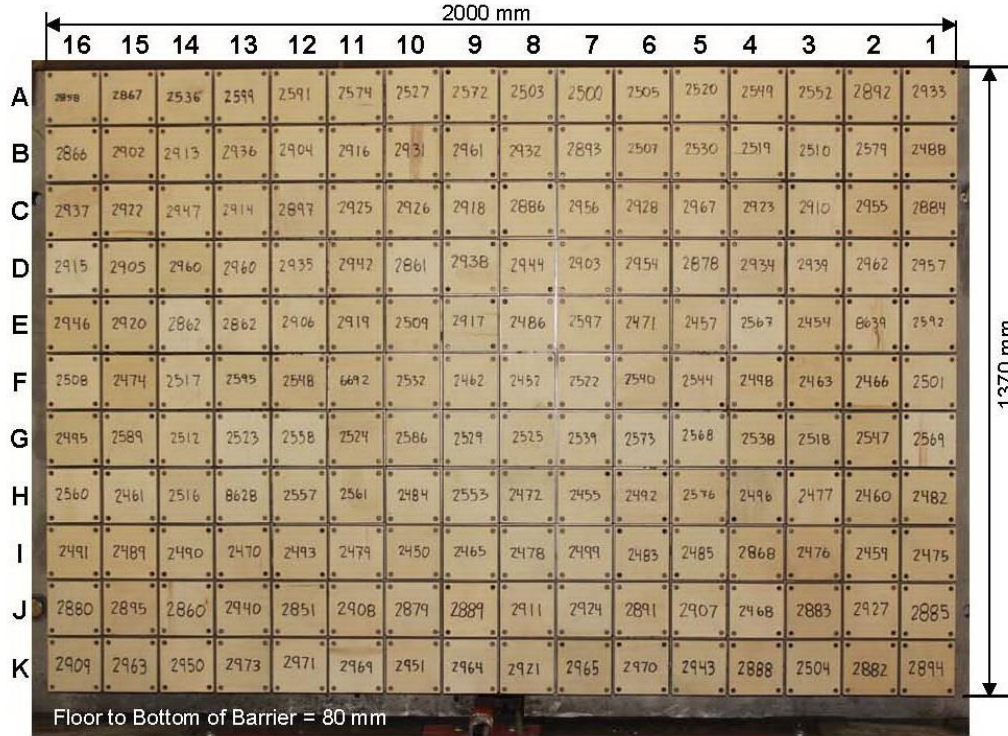


Photo for Reference Only

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: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
Test Date: 11/16/2017

**INSTRUMENTATION**

Driver Dummy Data Channels	47
Passenger Dummy Data Channels	47
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	630

**CAMERA COVERAGE**

High-Speed Vehicle Onboard	2
High-Speed Offboard	12
Real-Time	2
Total	16

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

**TEST DUMMY INFORMATION AND CONTACT LOCATIONS**

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 5% / 138
Head Contact	Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Glove Box
Right Knee Contact	Knee Airbag	Glove Box

**DOOR OPENING AND SEAT TRACK INFORMATION**

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were locked	Doors were locked
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

**POST TEST STRUCTURAL OBSERVATIONS**

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Cracked
Window Damage	None
Other Notable Effects	None

**VEHICLE REBOUND FROM BARRIER**

Measured Parameter	Units	Value
Left Side	mm	2165
Center	mm	2147
Right Side	mm	2154
Average	mm	2155

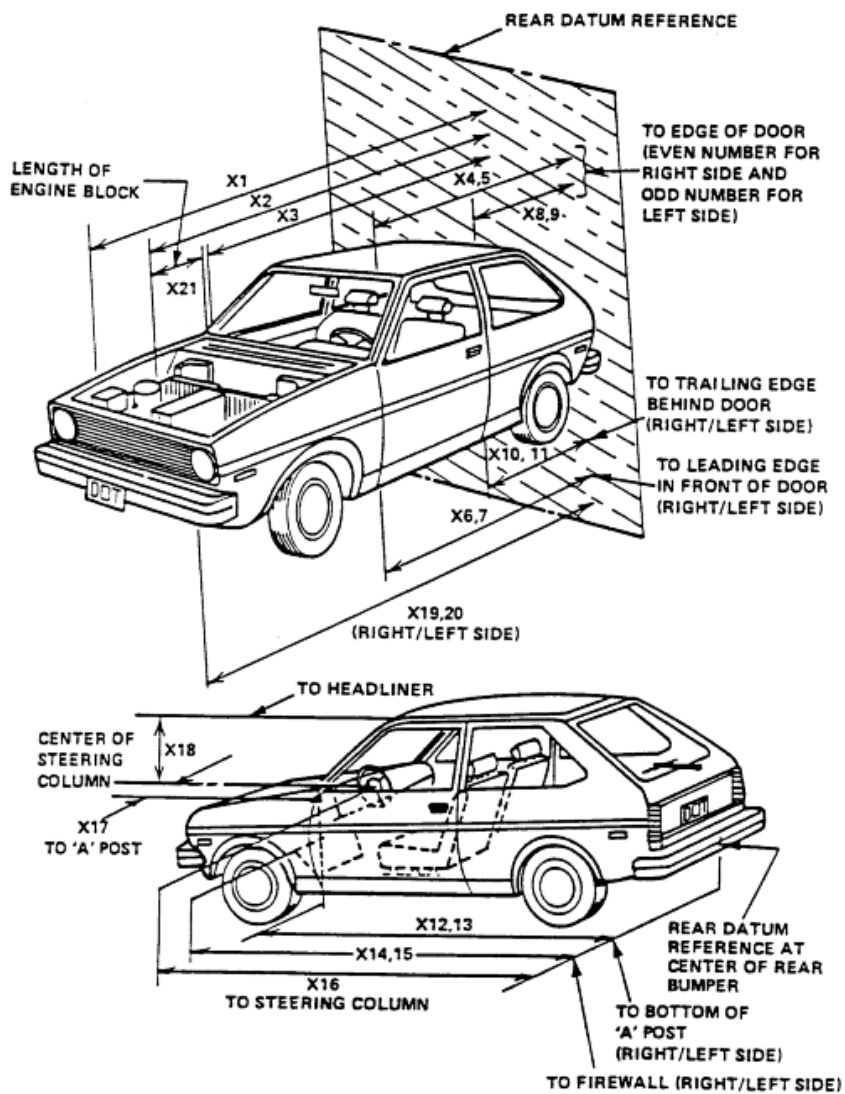
**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Curtain Side Airbag	Yes	No	Yes	No
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

## DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017



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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
Test Date: 11/16/2017

**RSOV (Rear Surface of Vehicle)**

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4905	4436	469
2	RSOV to Front of Engine	mm	4410	4109	301
3	RSOV to Firewall	mm	3895	3815	80
4	RSOV to Upper Leading Edge of Right Door	mm	3376	3382	-6
5	RSOV to Upper Leading Edge of Left Door	mm	3376	3383	-7
6	RSOV to Lower Leading Edge of Right Door	mm	3370	3377	-7
7	RSOV to Lower Leading Edge of Left Door	mm	3370	3375	-5
8	RSOV to Upper Trailing Edge of Right Door	mm	2330	2331	-1
9	RSOV to Upper Trailing Edge of Left Door	mm	2330	2330	0
10	RSOV to Lower Trailing Edge of Right Door	mm	2344	2346	-2
11	RSOV to Lower Trailing Edge of Left Door	mm	2344	2344	0
12	RSOV to Bottom of "A" Post of Right Side	mm	3310	3330	-20
13	RSOV to Bottom of "A" Post of Left Side	mm	3310	3307	3
14	RSOV to Firewall, Right Side	mm	3958	3890	68
15	RSOV to Firewall, Left Side	mm	3961	3911	50
16	RSOV to Steering Column	mm	2960	3009	-49
17	Center of Steering Column to "A" Post	mm	385	387	-2
18	Center of Steering Column to Headliner	mm	452	485	-33
19	RSOV to Right Side of Front Bumper	mm	4730	4338	392
20	RSOV to Left Side of Front Bumper	mm	4730	4262	468
21	Length of Engine Block	mm	650	650	0
RD	RSOV to Right Side of Dash Panel	mm	3132	3114	18
CD	RSOV to Center of Dash Panel	mm	3185	3186	-1
LD	RSOV to Left Side of Dash Panel	mm	3130	3118	12

**DATA SHEET NO. 13**  
**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
Test Date: 11/16/2017

**VEHICLE INFORMATION**

VIN: KM8SMDHF2JU267031 Wheelbase (mm): 2806  
Vehicle Size Category: MPV Test Weight (kg): 2141.5

**ACCELEROMETER DATA**

Accelerometer Locations: As per measurements on Page 15

Cal. Procedure/Interval: MGA procedure / 6 month

Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 55.68

Velocity Change (km/h): 60.9

Time of Separation (msec): 92

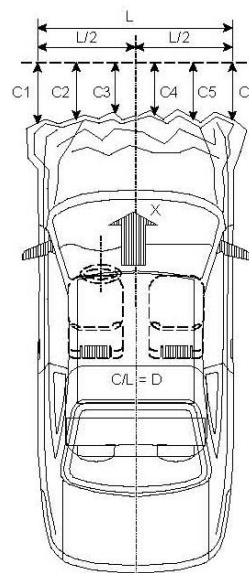
**CRUSH PROFILE**

Collision Deformation Classification: 12FDEW2

Midpoint of Damage: Centerline

Damage Region Length (mm): 1260

Impact Mode: Frontal



No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4730	4262	468
C2	Crush zone 2 at left side	mm	4816	4369	447
C3	Crush zone 3 at left side	mm	4852	4396	456
C4	Crush zone 4 at right side	mm	4852	4388	464
C5	Crush zone 5 at right side	mm	4816	4360	456
C6	Crush zone 6 at right side	mm	4730	4338	392
L	C1 TO C6	mm	1260	1267	-7

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

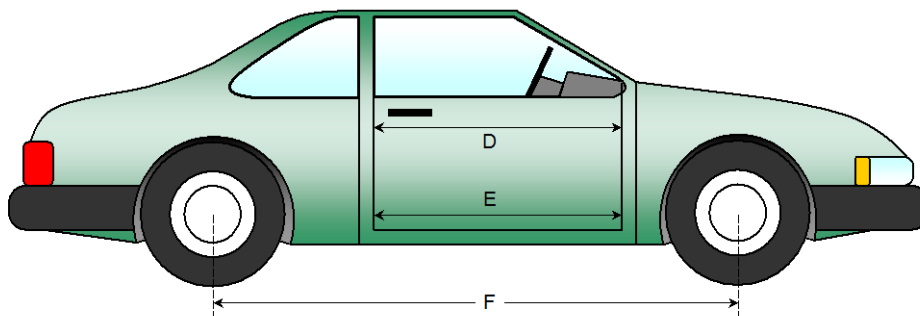
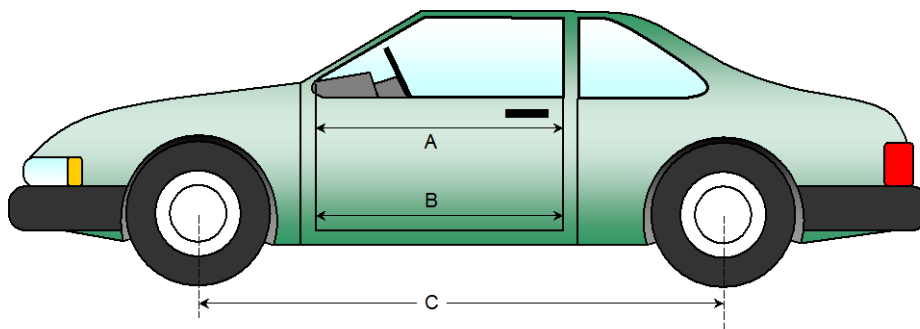
NHTSA No.: M20184200  
 Test Date: 11/16/2017

**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	970	970	0
B	Left Side Lower	mm	885	885	0
D	Right Side Upper	mm	970	970	0
E	Right Side Lower	mm	880	880	0

**WHEELBASE MEASUREMENTS**

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2806	2772	34
F	Right Side Wheelbase	mm	2806	2788	18



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

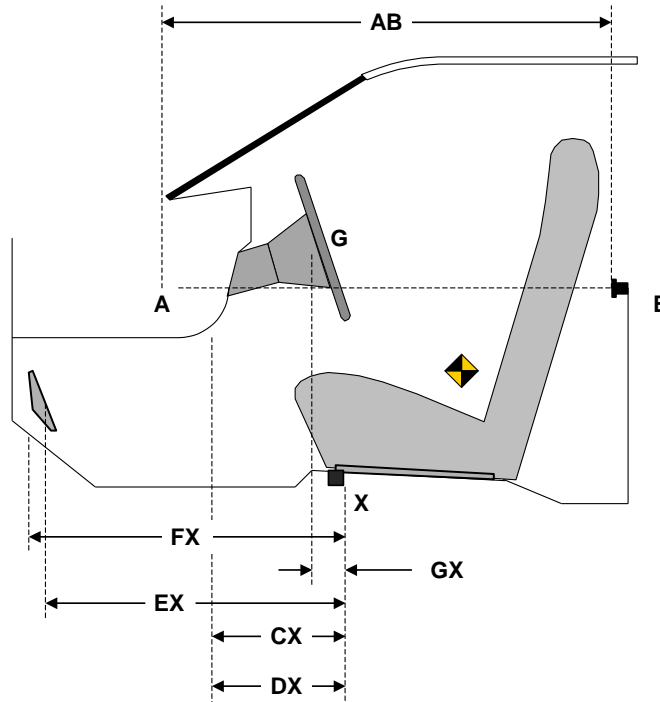
Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

**DRIVER COMPARTMENT INTRUSION**

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	785	782	3
CX	Left Knee Bolster to X	mm	282	314	-32
DX	Right Knee Bolster to X	mm	305	320	-15
EX	Brake Pedal to X	mm	530	496	34
FX	Foot Rest to X	mm	509	518	-9
GX	Center of Steering Column Wheel Hub to X	mm	71	113	-42

X = Front of Seat Track (stationary)



**DRIVER COMPARTMENT**

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

**Windshield Mounting Details:**

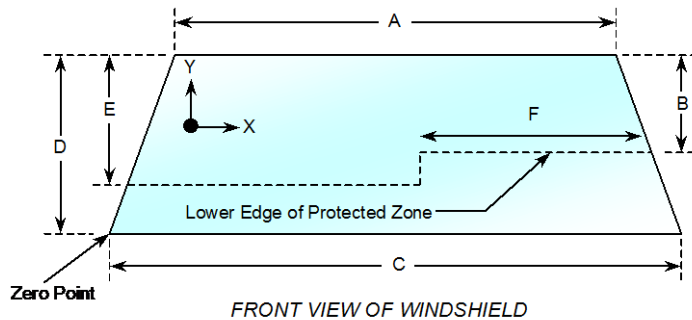
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21.5° C.

**WINDSHIELD PERIPHERY MEASUREMENTS**

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2229	2229	100.0
Right Side	2229	2229	100.0
Total	4458	4458	100.0



Item	Units	Value
A	mm	1244
B	mm	515
C	mm	1454
D	mm	880
E	mm	500
F	mm	438

**AREA OF PROTECTED ZONE FAILURES - NONE**

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. 15 (CONTINUED)**  
**SUMMARY OF FMVSS 212, FMVSS 219 (PARTIAL), AND 301 DATA**

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
Test Date: 11/16/2017

**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Temperature at Time of Impact: 21.5°C

Test Time: 10:42 a.m.

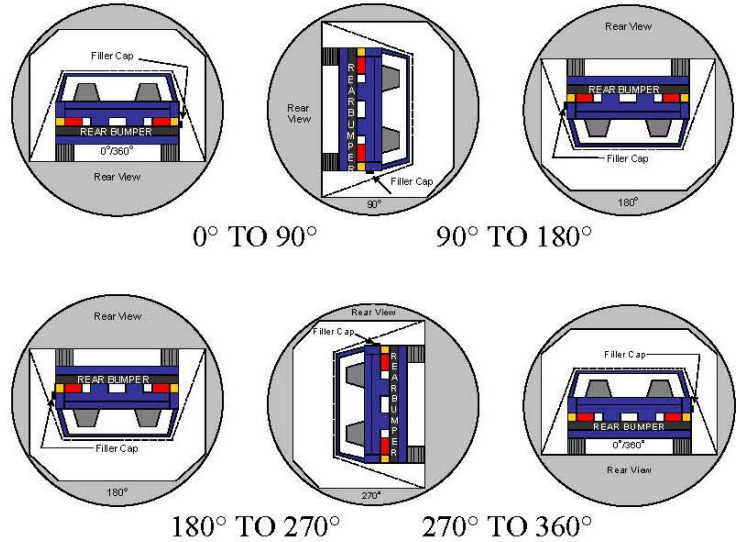
- A. From impact until vehicle motion ceases:   0   oz.  
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases:   0   oz.  
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes:   0   oz.  
(Maximum allowable = 1 oz./minute)
- D. Spillage: None

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

Test Vehicle: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017

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°	94	300	394
90° to 180°	93	300	393
180° to 270°	82	300	382
270° to 360°	86	300	386

**FMVSS 301 SPILLAGE TABLE (units in ounces)**

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

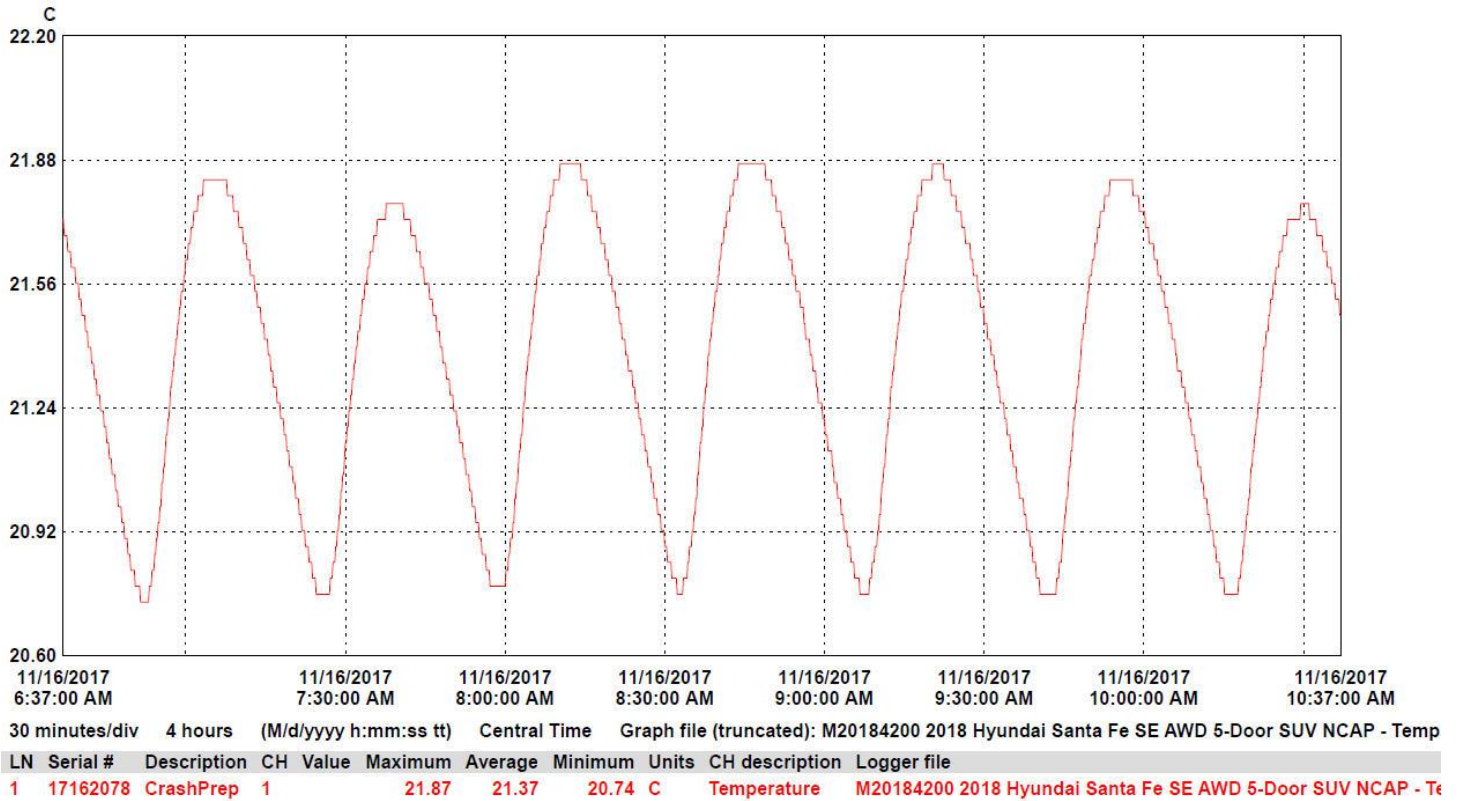
**SOLVENT SPILLAGE LOCATION TABLE**

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: 2018 Hyundai Santa Fe SE AWD 5-Door SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20184200  
 Test Date: 11/16/2017



**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 - 2018 Hyundai Santa Fe SE AWD 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

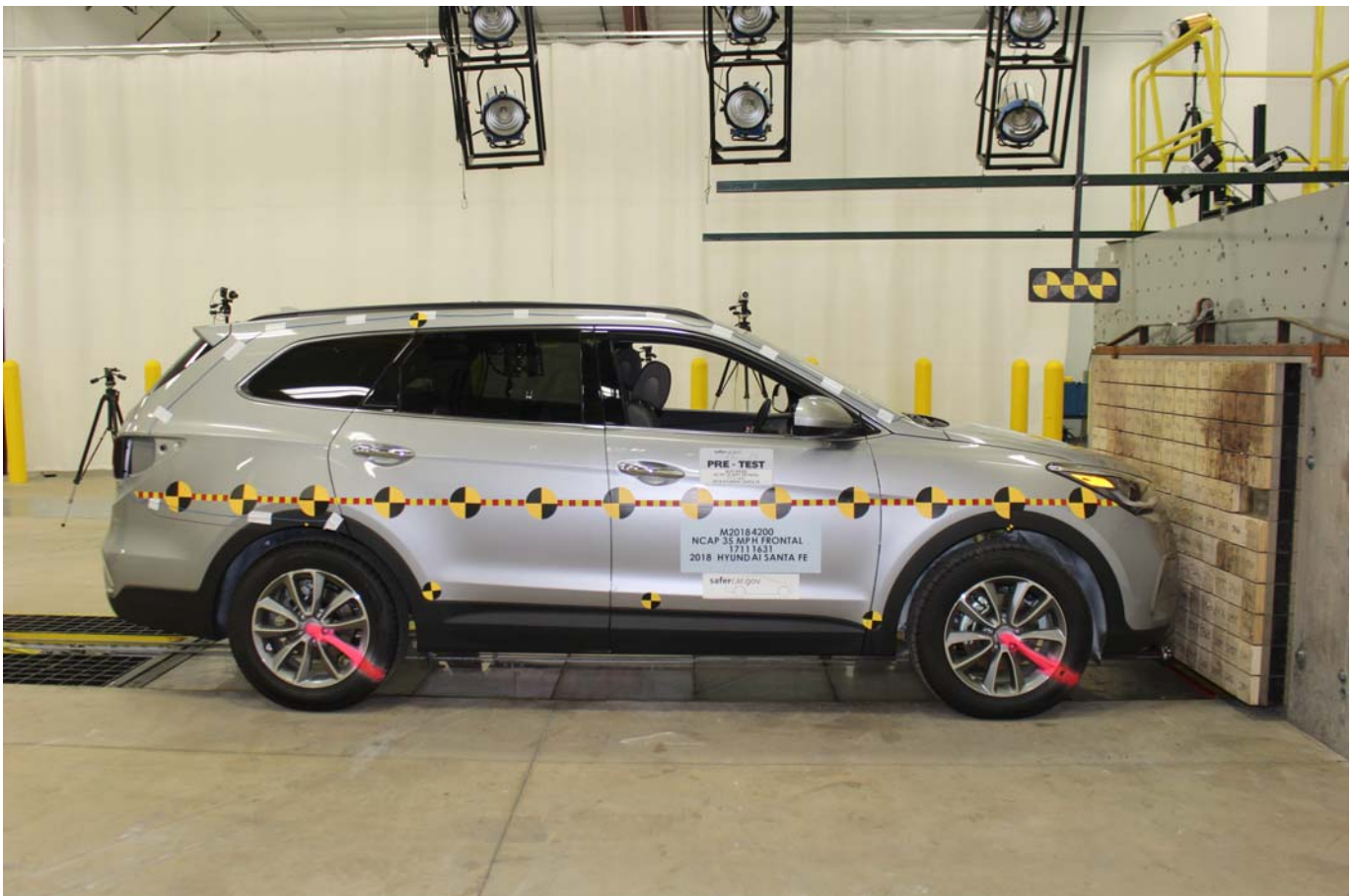


Photo No. 012 - Pre-Test Right View of Test Vehicle



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



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

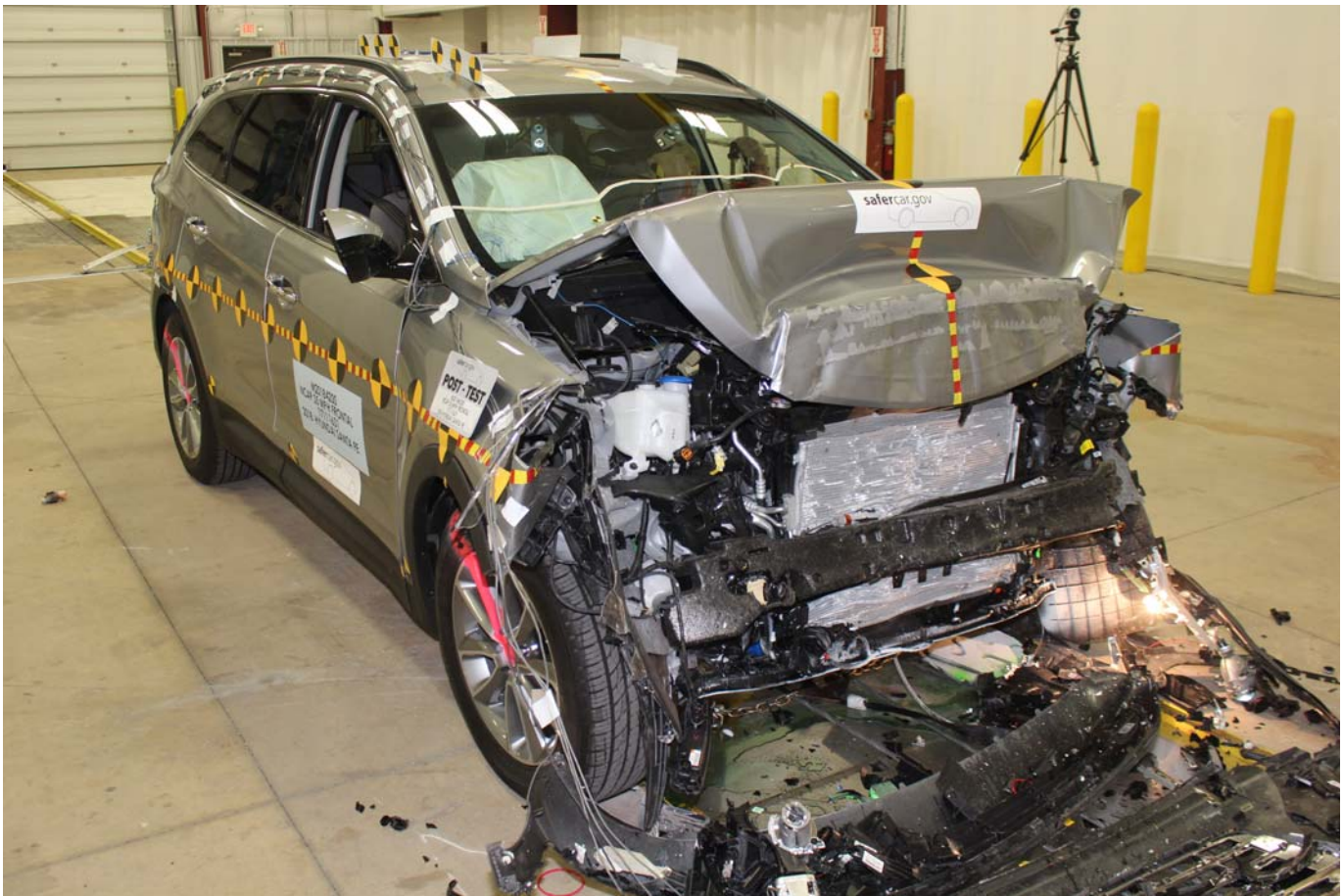


Photo No. 015 - Post-Test Right Front 3-4 View



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

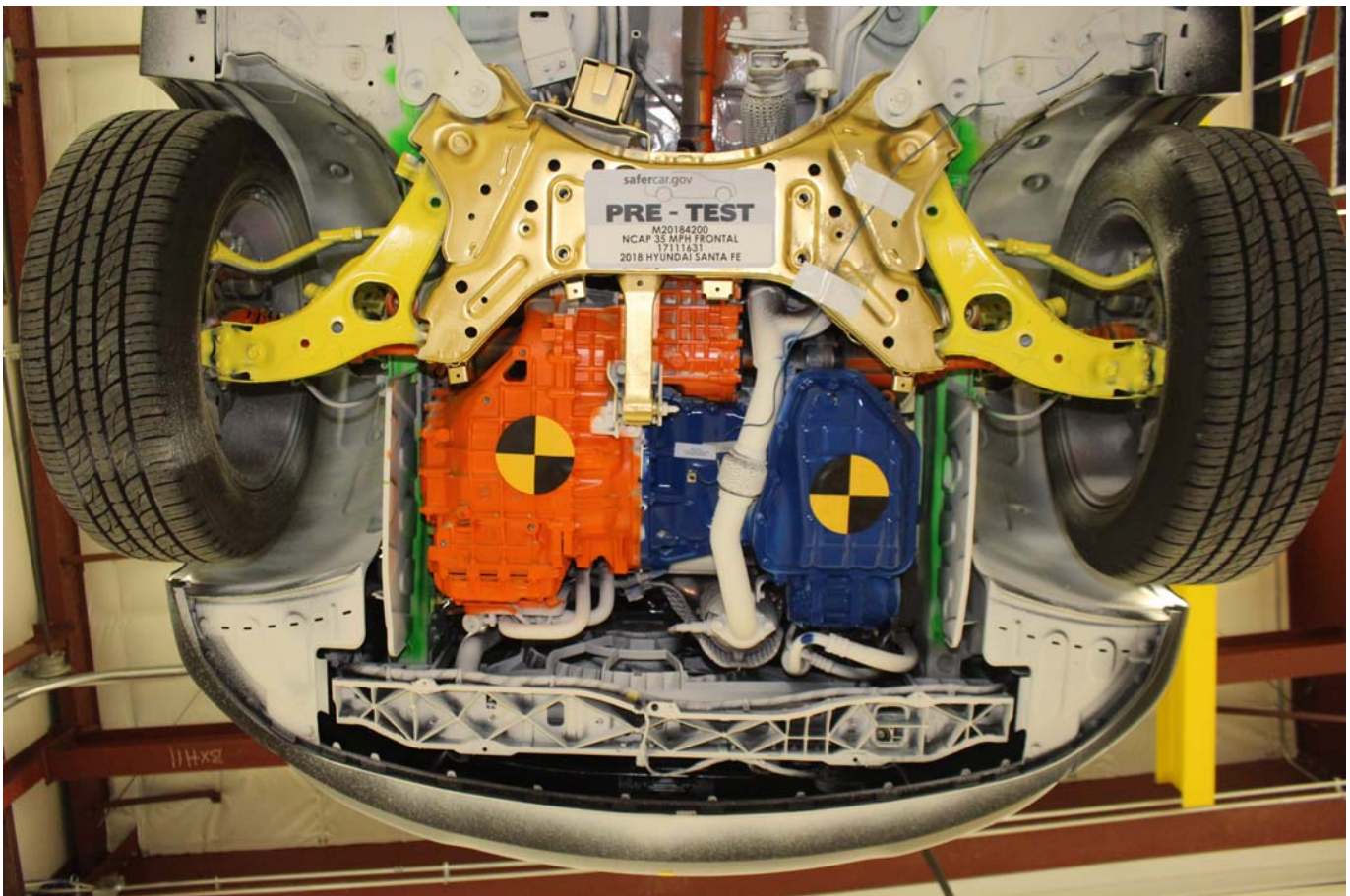


Photo No. 024 - Pre-Test Front Underbody View

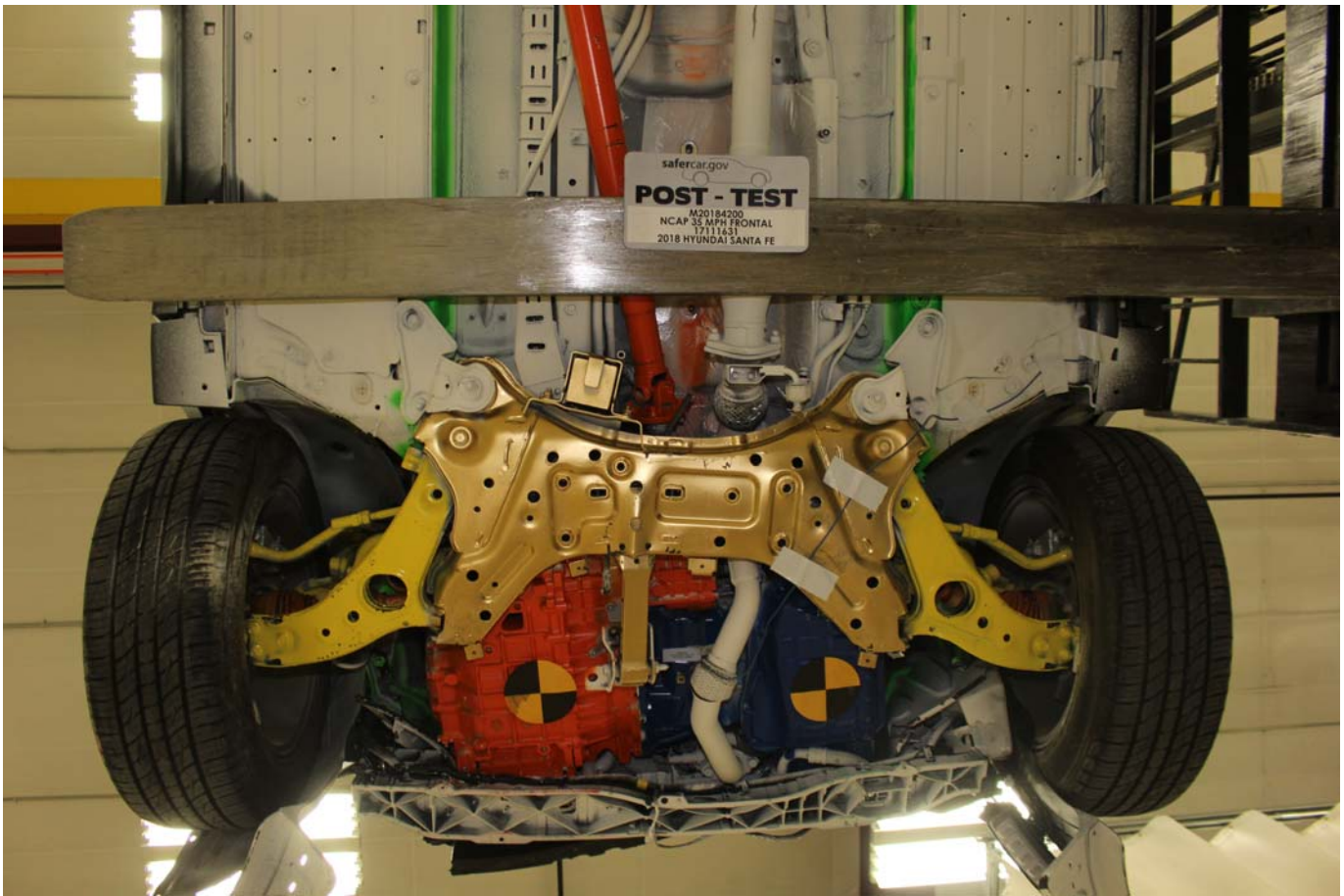


Photo No. 025 - Post-Test Front Underbody View

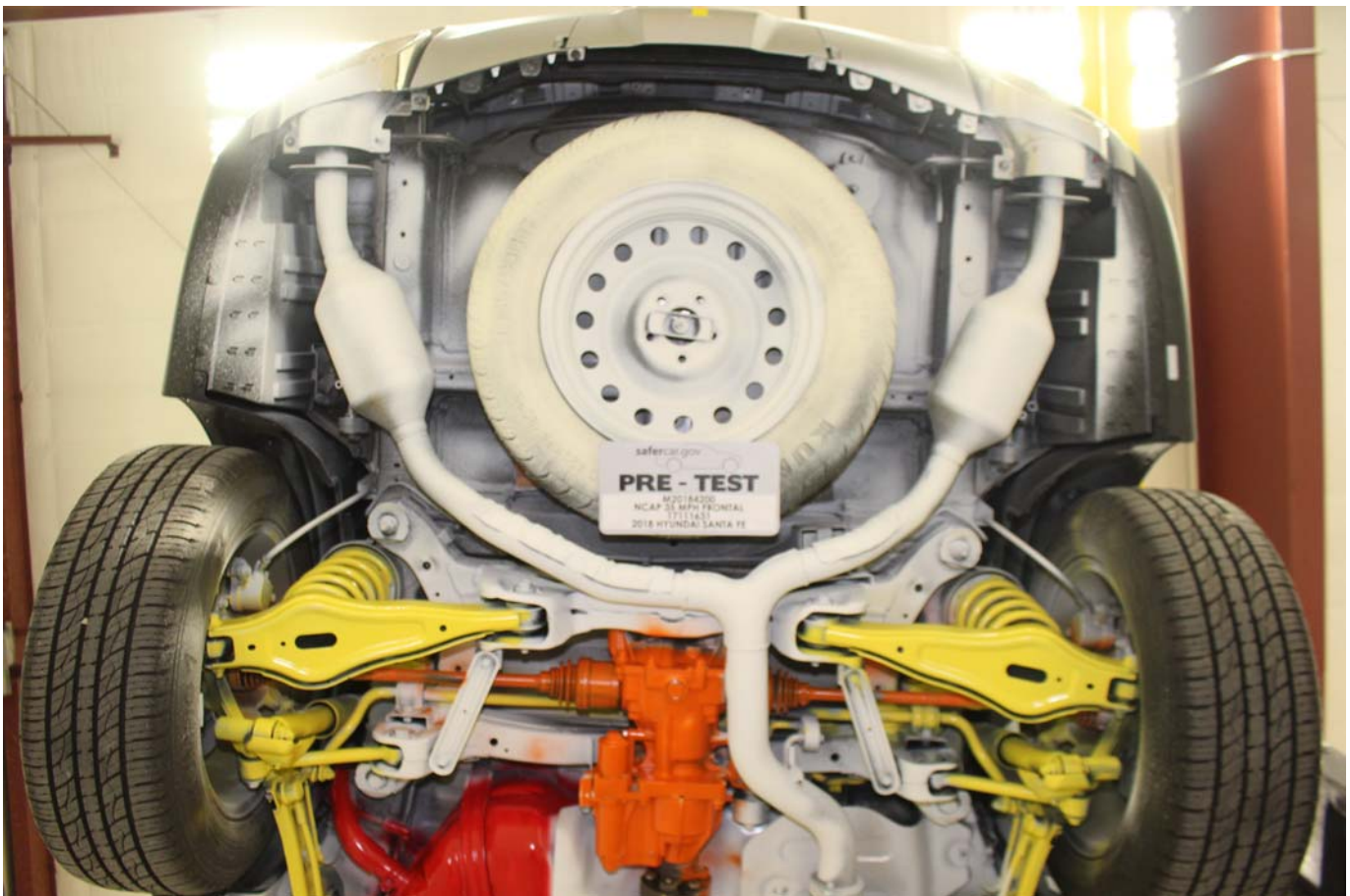


Photo No. 026 - Pre-Test Rear Underbody View

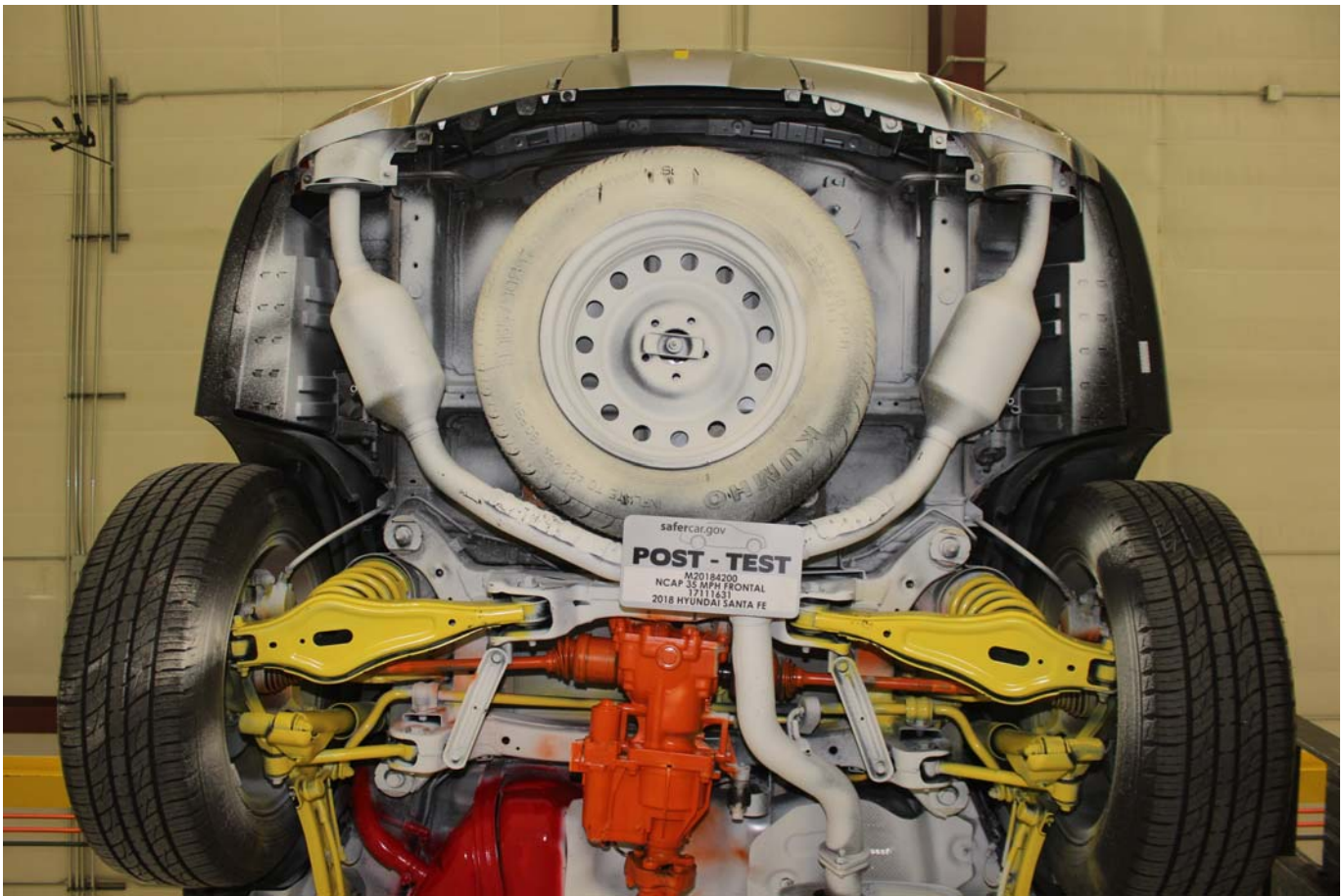


Photo No. 027 - Post-Test Rear Underbody View



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 (Door Open)



Photo No. 035 - Post-Test Driver Dummy and Vehicle Interior (Door Open)



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 Driver Dummy Feet



Photo No. 041 - Post-Test Driver Dummy Feet



Photo No. 042 - Pre-Test Driver Side Knee Bolster (without dummy)



Photo No. 043 - Post-Test Driver Side Knee Bolster (without dummy)



Photo No. 044 - Pre-Test Driver Side Floorpan



Photo No. 045 - Post-Test Driver Side Floorpan



Photo No. 046 - Post-Test Driver Dummy Face



Photo No. 047 - Post-Test Driver Dummy Contact with Airbag



Photo No. 048 - Post-Test Driver Dummy Contact with Headrest



Photo No. 049 - Pre-Test View of the Steering Wheel

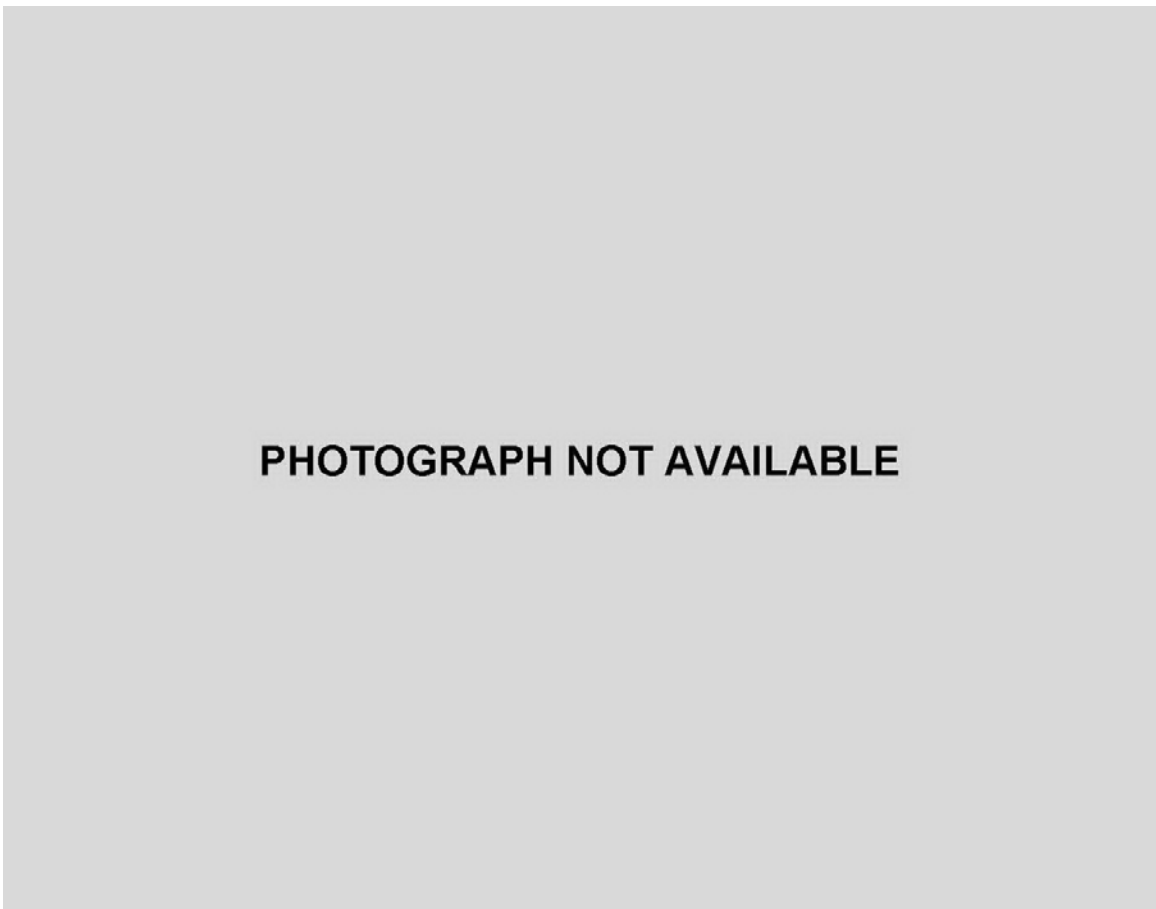


Photo No. 050 - Post-Test View of the Steering Wheel



Photo No. 051 - Pre-Test Passenger Dummy Front View



Photo No. 052 - Post-Test Passenger Dummy Front View



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



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



Photo No. 055 - Pre-Test Passenger Dummy and Vehicle Interior (Door Open)



Photo No. 056 - Post-Test Passenger Dummy and Vehicle Interior (Door Open)



Photo No. 057 - Pre-Test Passenger Seat Fore-Aft Markings



Photo No. 058 - Post-Test Passenger Seat Fore-Aft Markings



Photo No. 059 - Pre-Test View of Belt Anchorage for Passenger Dummy



Photo No. 060 - Post-Test View of Belt Anchorage for Passenger Dummy



Photo No. 061 - Pre-Test Passenger Dummy Feet



Photo No. 062 - Post-Test Passenger Dummy Feet



Photo No. 063 - Pre-Test Passenger Side Knee Bolster (without dummy)



Photo No. 064 - Post-Test Passenger Side Knee Bolster (without dummy)



Photo No. 065 - Pre-Test Passenger Side Floorpan



Photo No. 066 - Post-Test Passenger Side Floorpan



Photo No. 067 - Post-Test Passenger Dummy Face



Photo No. 068 - Post-Test Passenger Dummy Contact with Airbag



Photo No. 069 - Post-Test Passenger Dummy Contact with Headrest

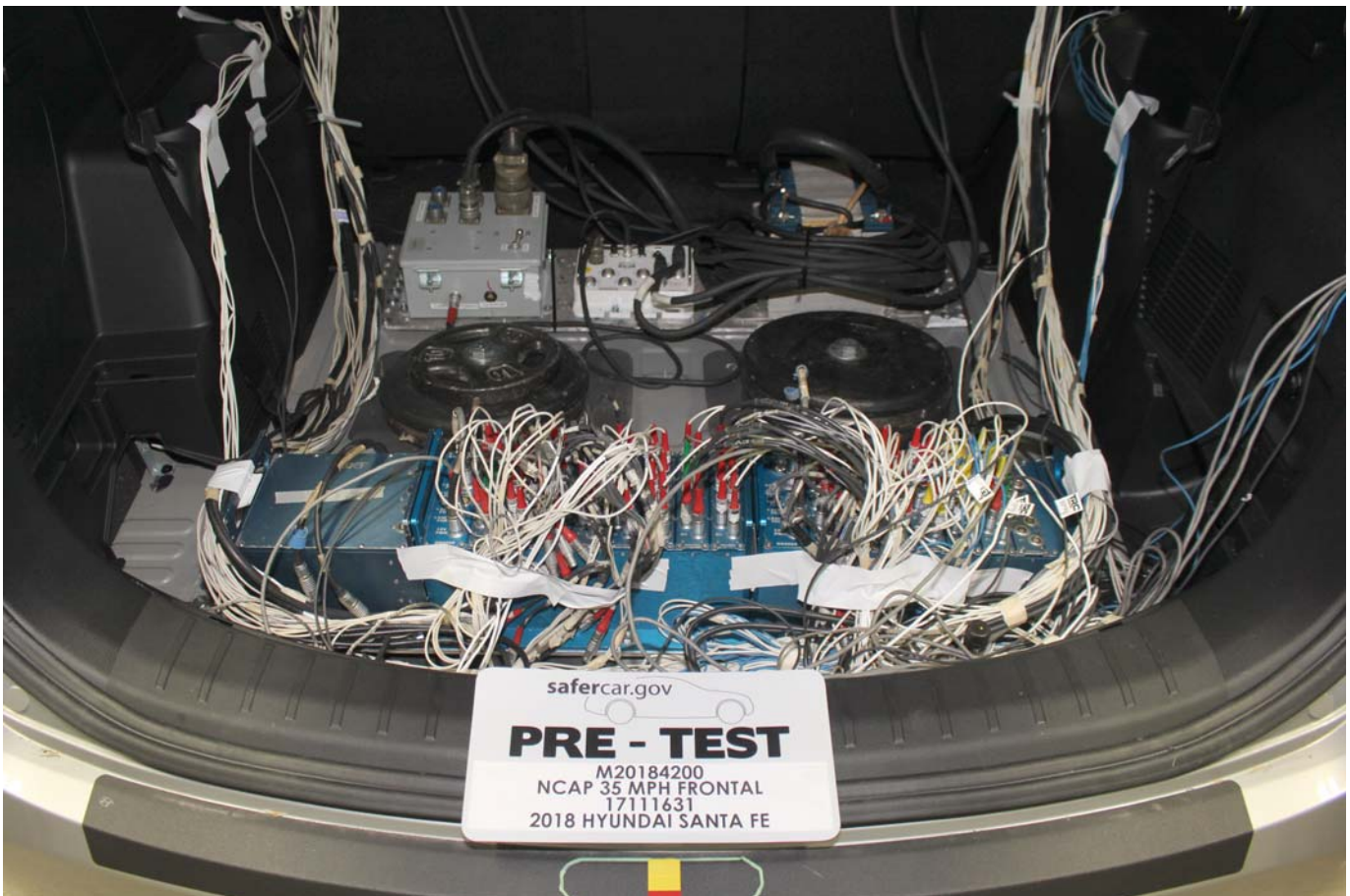


Photo No. 070 - Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

Photo No. 071 - Post-Test Stoddard Solvent Spillage Location View



Photo No. 072 - Post-Test Speed Trap Read-Out

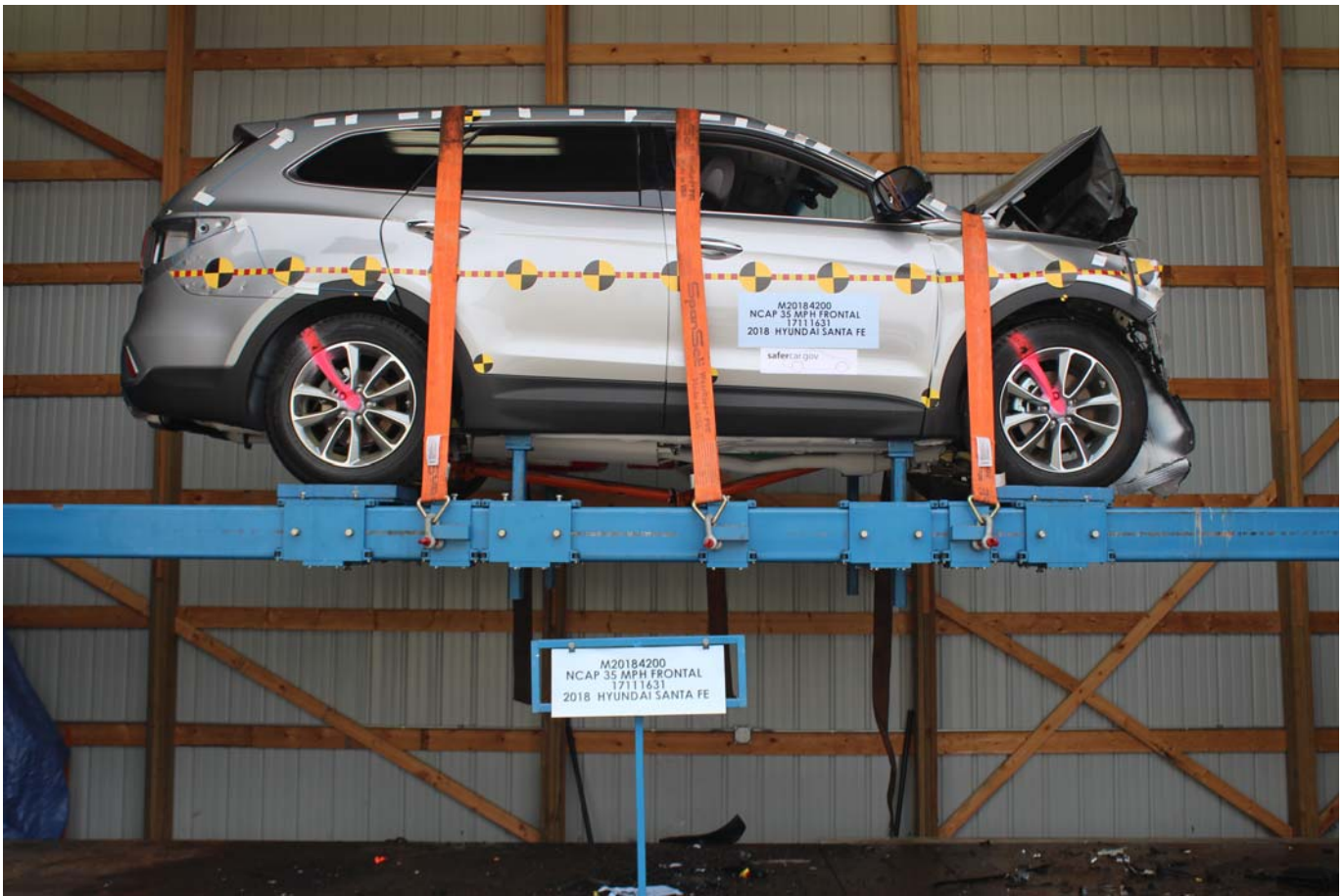


Photo No. 073 - Vehicle at 0 Degree on Static Rollover Device



Photo No. 074 - Vehicle at 90 Degrees on Static Rollover Device



Photo No. 075 - Vehicle at 180 Degrees on Static Rollover Device



Photo No. 076 - Vehicle at 270 Degrees on Static Rollover Device



Photo No. 077 - Vehicle at 360 Degrees on Static Rollover Device



Photo No. 078 - 2018 Hyundai Santa Fe SE AWD 5-Door SUV Frontal Impact Event



2018 SANTA FE SE AWD

Link® Connected Services 3-years Standard (enrollment Required)



**SOLD TO:** W1014  
BOUCHER HYUNDAI  
1583 EAST MORELAND BOULEVARD  
WAUKESHA WI 53186

**SHIPPED TO:** W1014

**VIN:** KM8SMDFH2JU267031  
**MODEL:** J0412A65  
**ENGINE:** G6DHA857925  
**PORT OF ENTRY:** PT  
**EXTERIOR COLOR:** IRON FROST  
**INTERIOR/SEAT COLOR:** GRAY/GRAY  
**TRANSPORT:** TRUCK  
**ACCESSORY WEIGHT:** 14 lbs / 7 kgs.  
**EMISSIONS:** This vehicle is certified to meet emission requirements in all 50 states

**GOVERNMENT 5-STAR SAFETY RATING**

This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.

Source: National Highway Traffic Safety Administration (NHTSA).  
www.safercar.gov or 1-888-327-4236

43 mi.

**STANDARD FEATURES:**

**AMERICA'S BEST WARRANTY**  
5-year/60,000-mile New Vehicle Warranty\*  
10-year/100,000-mile Powertrain Warranty\*  
7-year/Unlimited-mile Anti-perforation Warranty\*  
5-year/Unlimited-mile Roadside Assistance  
\*Limited warranties, see dealer for details

**ADVANCED SAFETY TECHNOLOGY**  
Vehicle Stability Management (VSM) w/ Traction Control  
ABS w/ Electronic Brake-Force Distribution & Brake Assist  
Downhill Brake Control & Hillstart Assist Control  
Front, Front Side Impact, Side-Curtain & Driver's Knee Airbag  
Tire Pressure Monitoring System & Rearview Camera

**POWERTRAIN TECHNOLOGY**  
3.3L Gasoline Direct Injection (GDI) V6 Engine  
290 Horsepower @ 6,400 rpm / 252 ft-lb Torque @ 5,200 rpm  
6-Speed Automatic Transmission w/ SHIFTRONIC®  
Active Cornering Control AWD w/ AWD Lock; Drive Mode Select

**EXTERIOR**  
18" Alloy Wheels & 235/60R18 Tires; Roof Side Rails  
LED Daytime Running Lights/Headlight Accents  
Rear Window Wiper, Bodycolor Rear Spoiler w/ LED Brake Lights  
Automatic On/Off Headlights; Windshield Wiper De-Icer  
Heated Dual Power Side Mirrors w/ Driver Blind Spot Mirror  
Unique 5-Bar Front Grille  
Solar Front Glass & Privacy Rear Glass  
Trailer Prep Package & Chrome-Tipped Dual-Outlet Exhaust

**COMFORT & CONVENIENCE**  
7-inch Display Audio w/ Android Auto(TM) & Apple CarPlay(TM)  
Remote Keyless Entry System w/ Alarm & Illuminated Ignition  
YES Essentials® Stain Resistant Cloth Seats  
40/20/40 Split-Folding, Sliding Rear Seats; 50/50 Split 3rd-Row  
Dual Automatic Temperature Ctrl w/CleanAir Ionizer; RR Vents  
Bluetooth®; Steering Wheel Audio, Cruise & Phone Controls  
AM/FM/HD Radio/SiriusXM®/CD/MP3 w/ iPod®/USB/Aux Input Jacks  
SiriusXM® w/ 90 Day Trial; Not Available in AK & HI  
Power Door/Liftgate Locks & Windows w/ Front Auto-Down/Up  
Power Driver Seat w/Lumbar Support; Multi-Information Display  
Blue Link® Connected Services 3-years Standard (enrollment req)  
Full Tank of Fuel

**Manufacturer's Suggested Retail Price:** \$32,600.00

**INCLUDED:**

**ADDED FEATURES:**

- \*Carpeted Floor Mats \$150.00
- \*Cargo Net \$50.00
- \*Composite Cargo Tray \$100.00
- \*First Aid Kit \$30.00
- \*Rear Bumper Applique \$70.00

Inland Freight & Handling: \$950.00  
**Total Price:** \$33,950.00

**EPA DOT Fuel Economy and Environment** Gasoline Vehicle

**Fuel Economy**  
20 MPG combined city/hwy  
18 city  
24 highway  
5.0 gallons per 100 miles

**You spend \$2,250 more in fuel costs over 5 years compared to the average new vehicle.**

**Annual fuel cost \$1,800**

**Fuel Economy & Greenhouse Gas Rating (tailpipe only)**  
1 4 10 Best

**Smog Rating (tailpipe only)**  
1 3 10 Best

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 \$6,750 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.40 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

**fueleconomy.gov**  
Calculate personalized estimates and compare vehicles

Smartphone QR Code

Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline license and title fees state and local taxes and dealer installed options and accessories are not included in the manufacturer's suggested retail price. This label has been affixed to this vehicle by Hyundai Motor America, pursuant to the requirements of 15 U.S.C. 1221 et seq. which prohibits its removal or alteration prior to delivery to the ultimate purchaser.

**PART CONTENT INFORMATION FOR VEHICLE IN THIS CARLINE:**  
U.S./CANADIAN PARTS CONTENT: 2 %  
MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA: 93 %

Note: Parts content does not include final assembly, distribution, or other non-parts costs.

**FOR THIS VEHICLE:**  
FINAL ASSEMBLY POINT: ULSAN, KOREA  
COUNTRY OF ORIGIN:  
ENGINE: KOREA  
TRANSMISSION: KOREA

222 A 1728GTURAN 203

Photo No. 079 - Monroney Label Photograph

**APPENDIX B**  
**DUMMY RESPONSE DATA TRACES**

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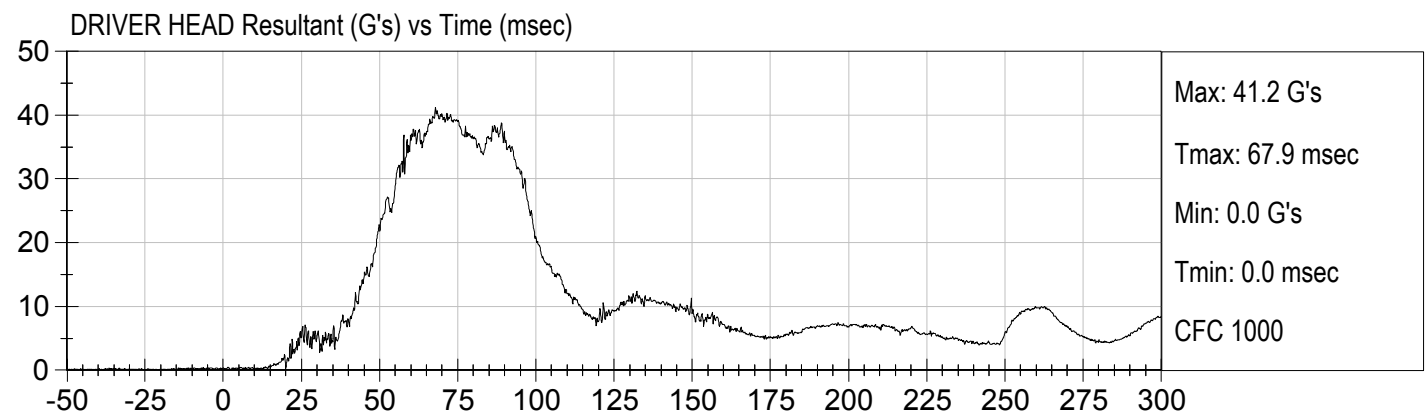
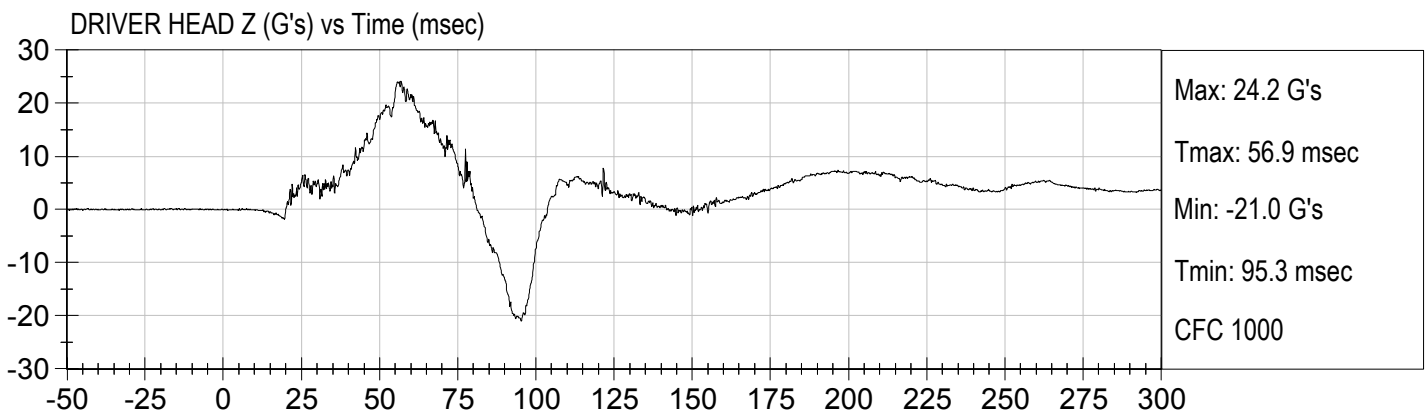
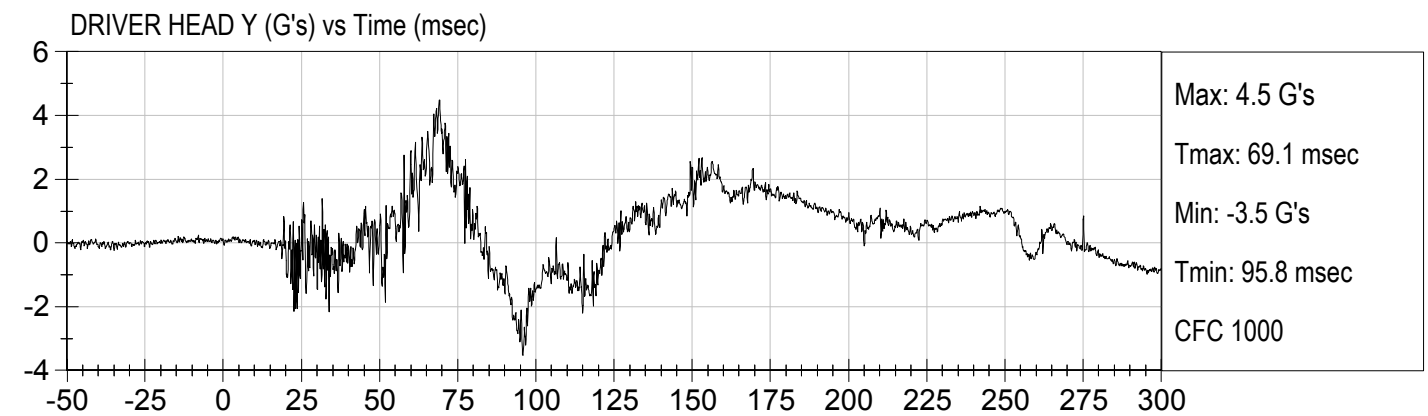
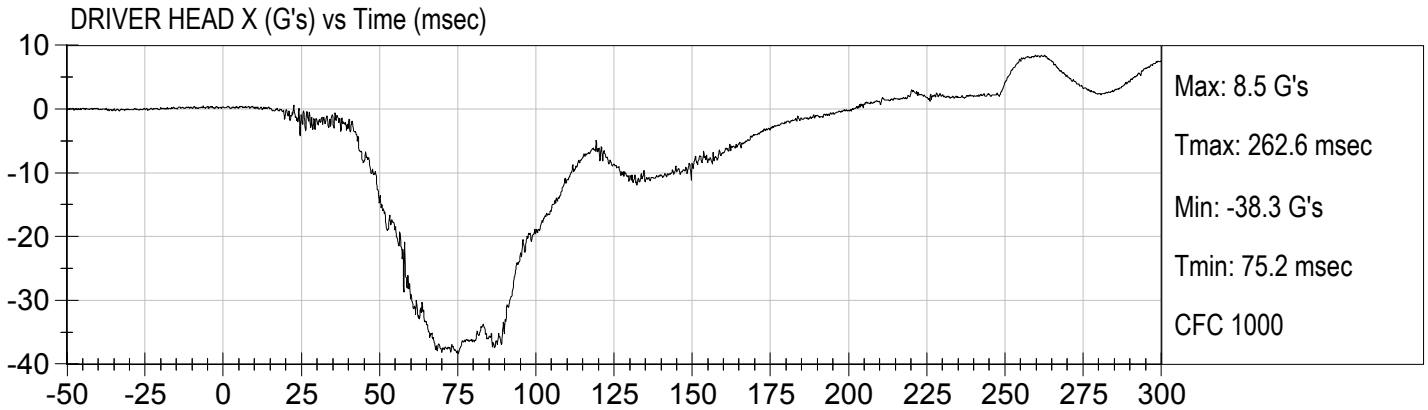
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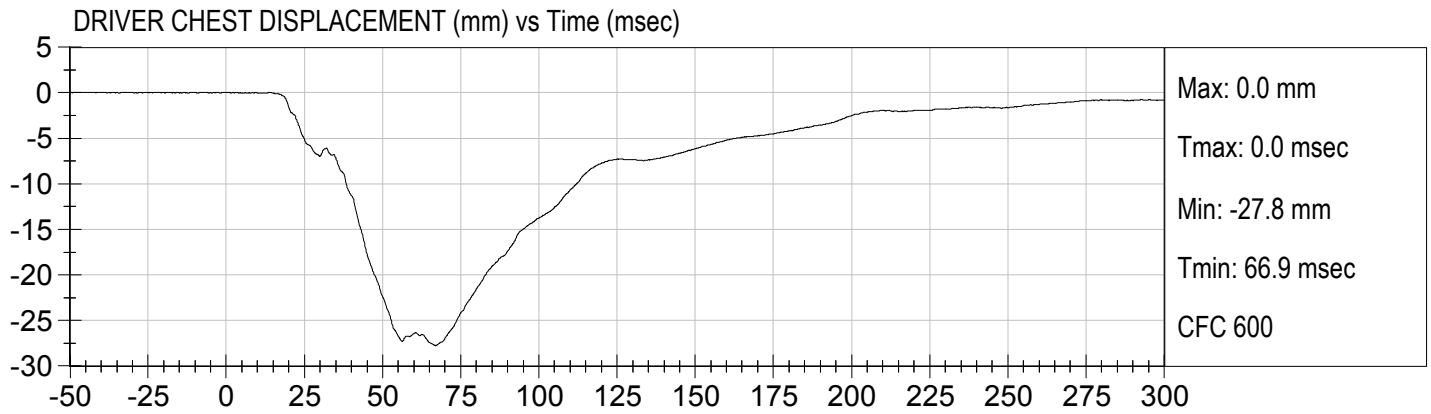
**The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)**

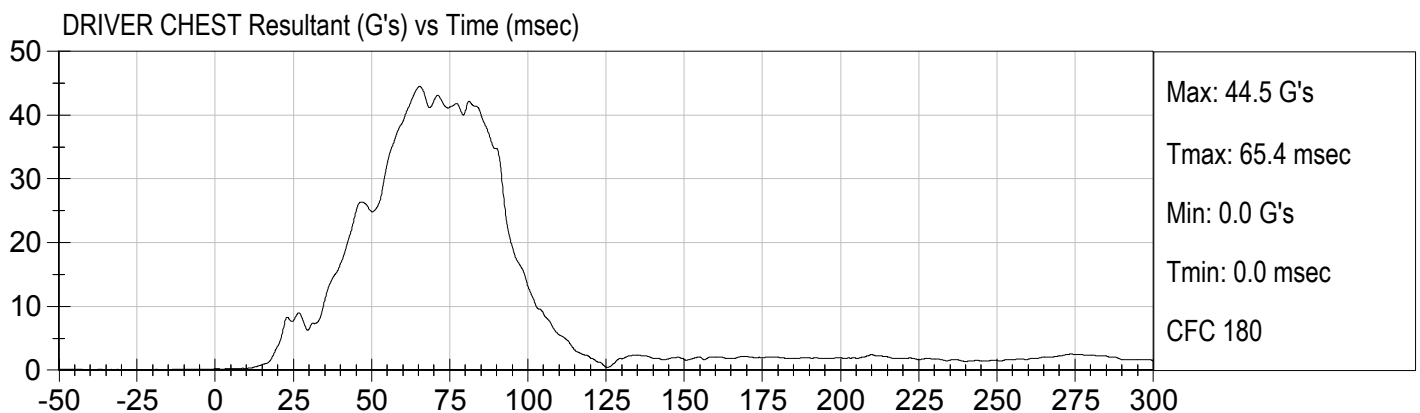
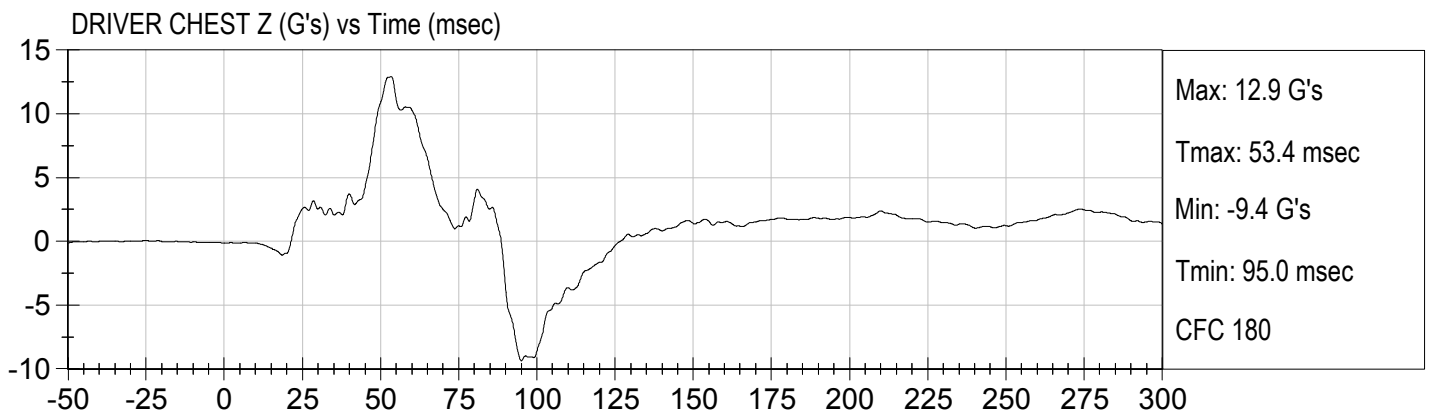
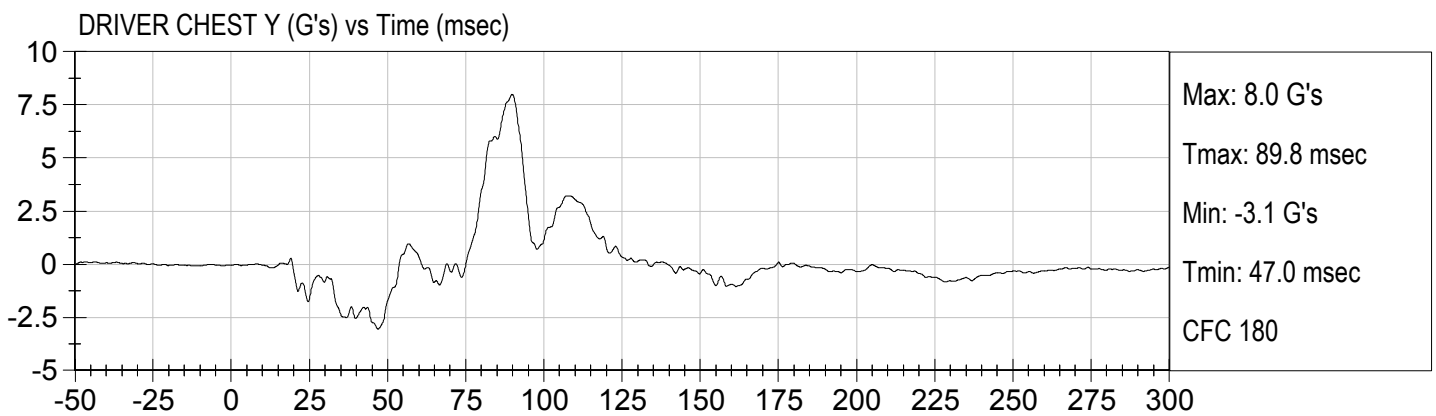
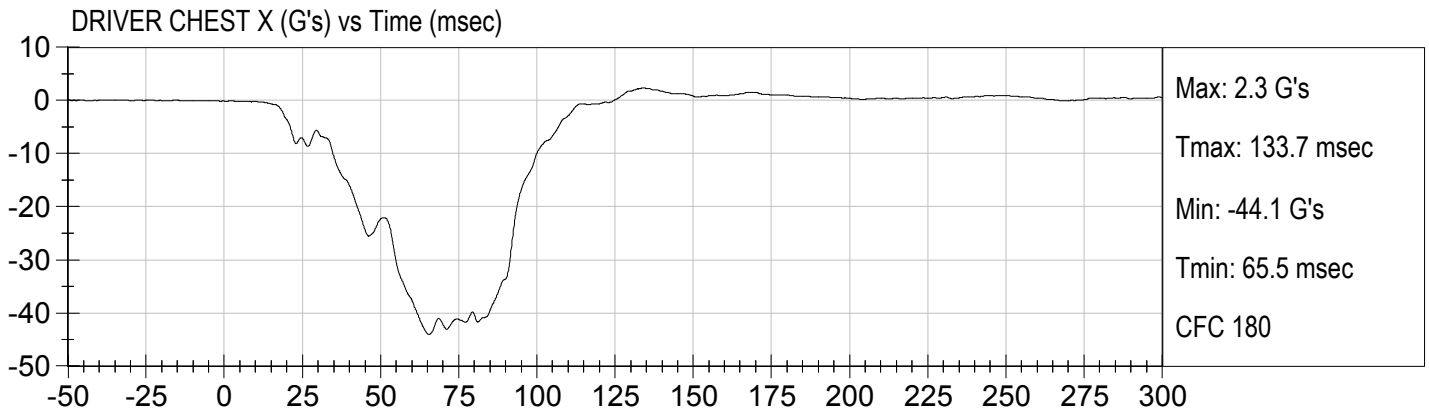
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 Driver Upper Neck Moment X  
 Driver Upper Neck Moment Z  
 Driver Chest X Redundant  
 Driver Chest Y Redundant  
 Driver Chest Z Redundant  
 Driver Pelvis X  
 Driver Pelvis Y  
 Driver Pelvis Z  
 Driver Left Femur Redundant  
 Driver Right Femur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

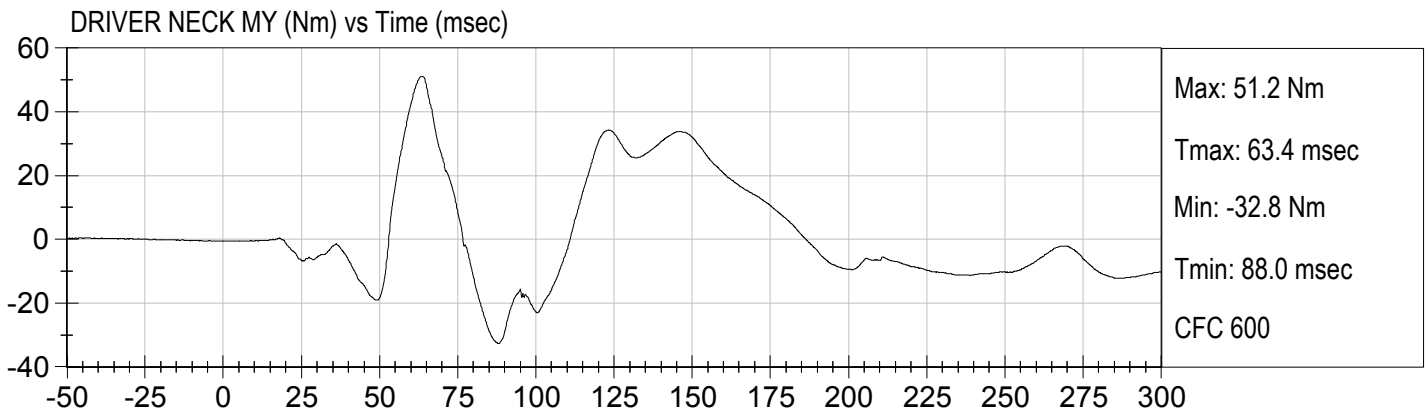
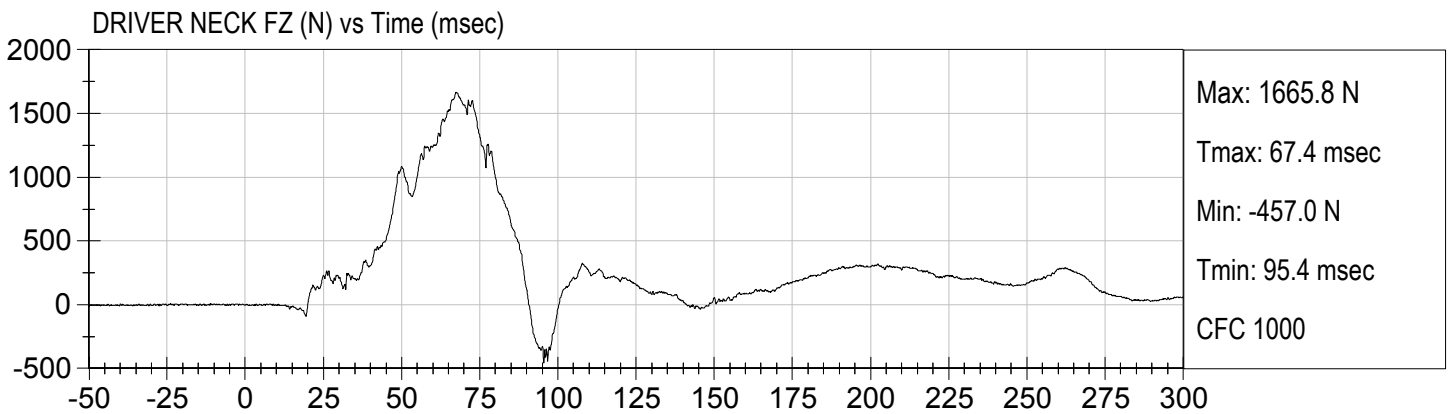
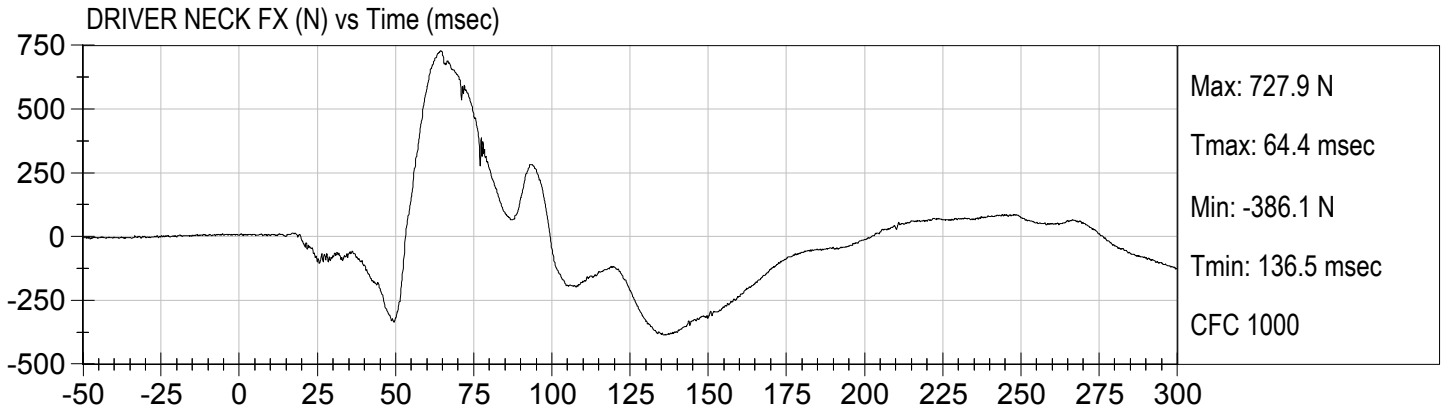
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Driver Right Lower Tibia Moment X  
Driver Right Lower Tibia Moment Y  
Driver Right Lower Tibia Force Z  
Driver Left Foot Fore Z  
Driver Left Foot Aft X  
Driver Left Foot Aft Z  
Driver Right Foot Fore Z  
Driver Right Foot Aft X  
Driver Right 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  
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Passenger Chest Y Redundant  
Passenger Chest Z Redundant  
Passenger Pelvis X  
Passenger Pelvis Y

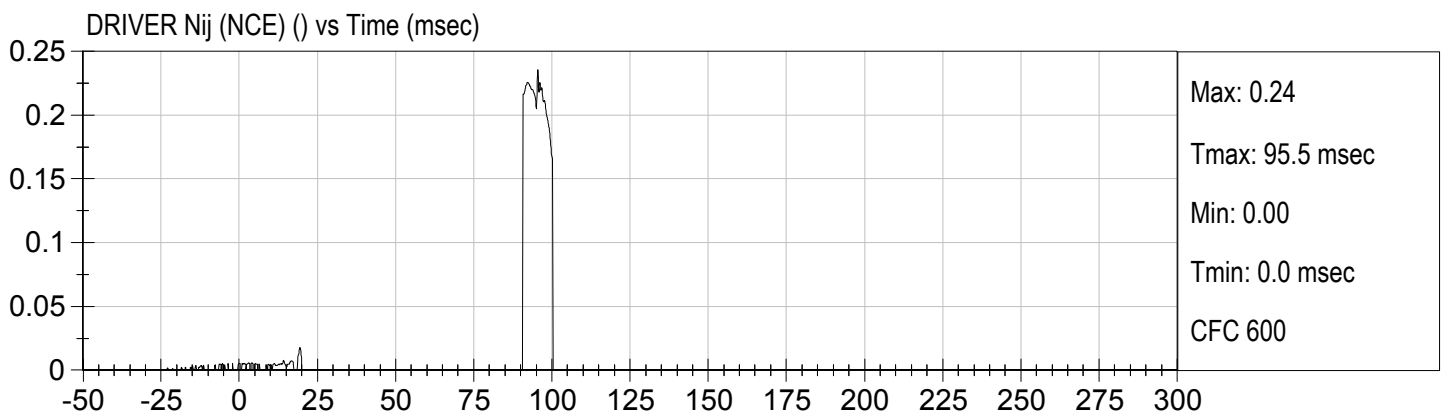
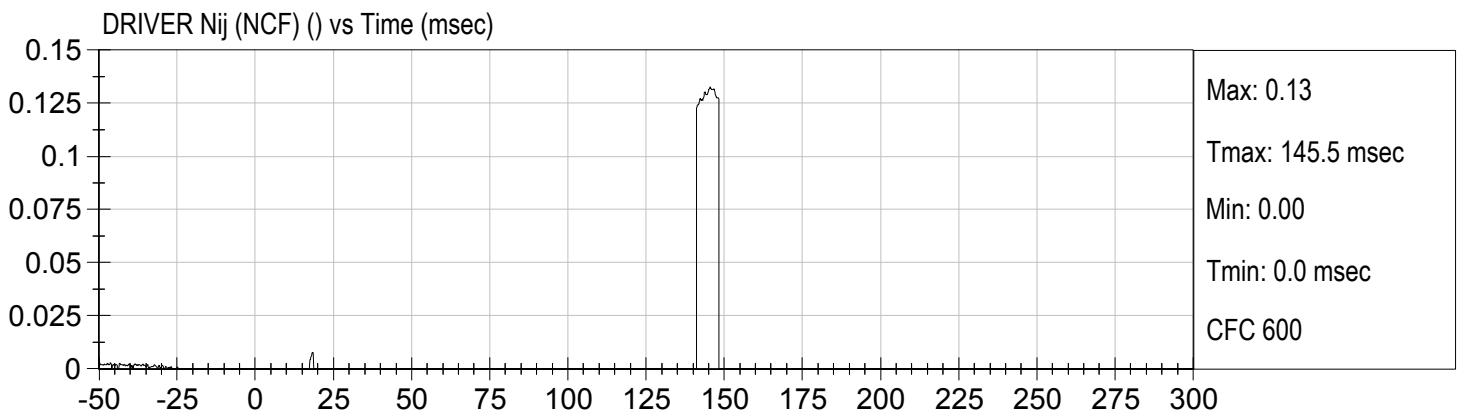
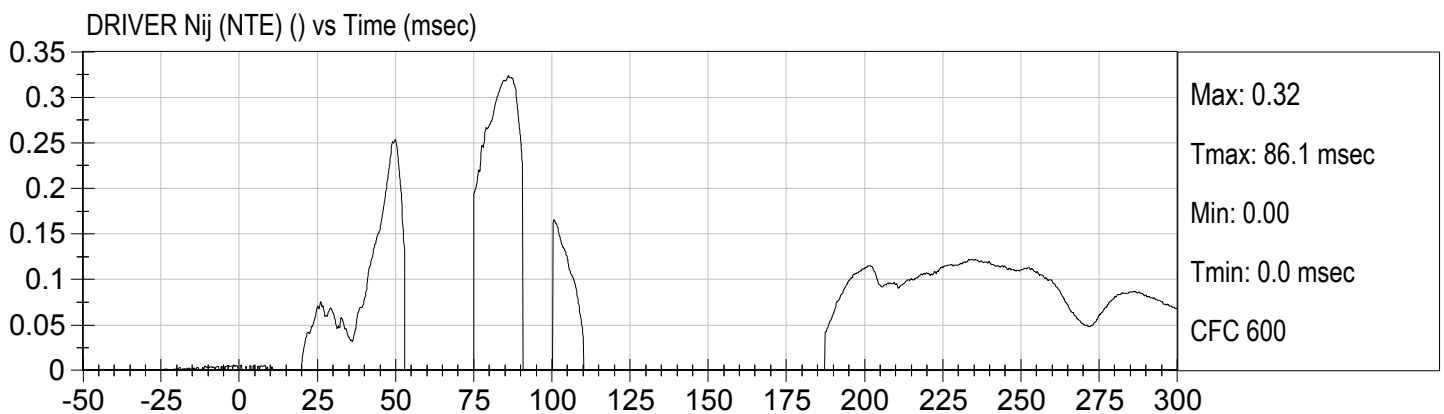
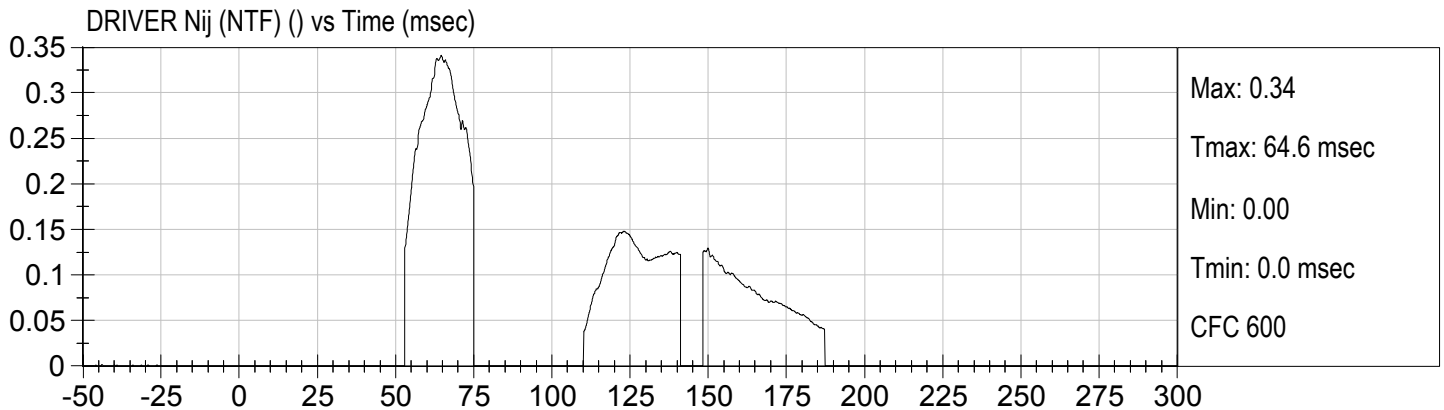
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Passenger Left Lower Tibia Moment X  
Passenger Left Lower Tibia Moment Y  
Passenger Left Lower Tibia Force Z  
Passenger Right Upper Tibia Moment X  
Passenger Right Upper Tibia Moment Y  
Passenger Right Upper Tibia Force Z  
Passenger Right Lower 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  
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Left Rear Seat Crossmember Xr  
Right Rear Seat Crossmember Xr  
Advanced Research Load Cell Barrier – 528 channels

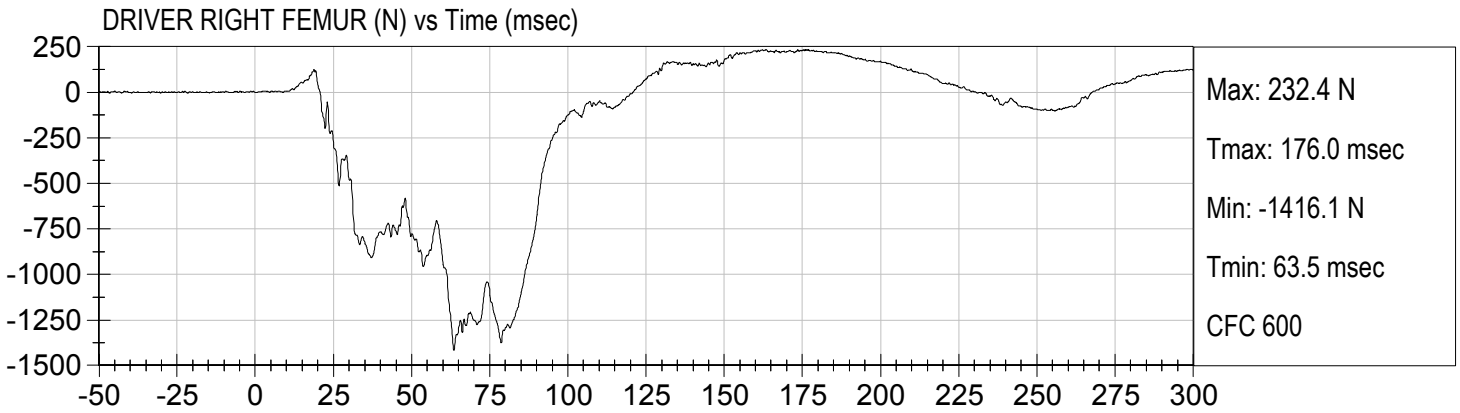
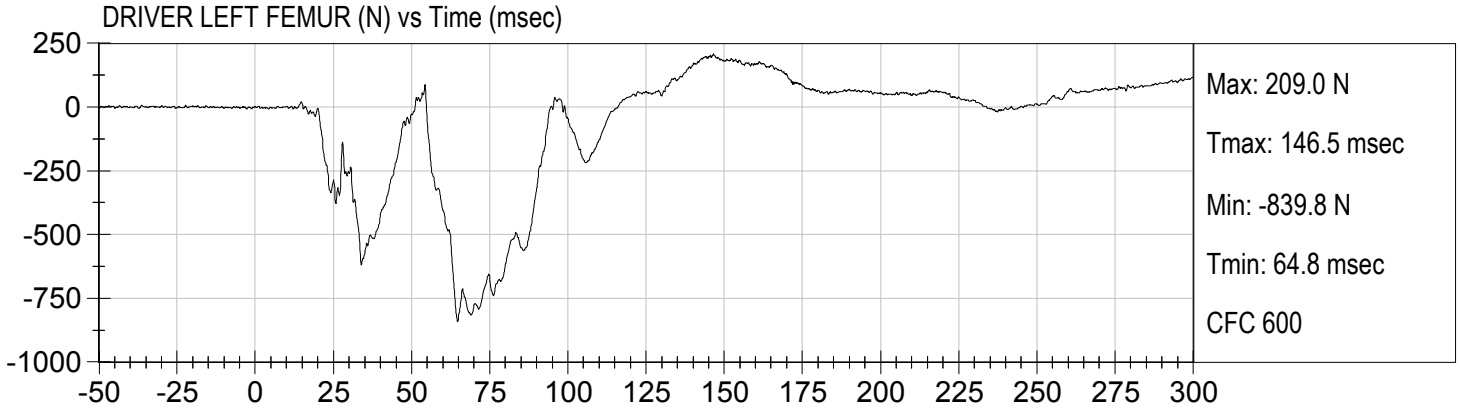


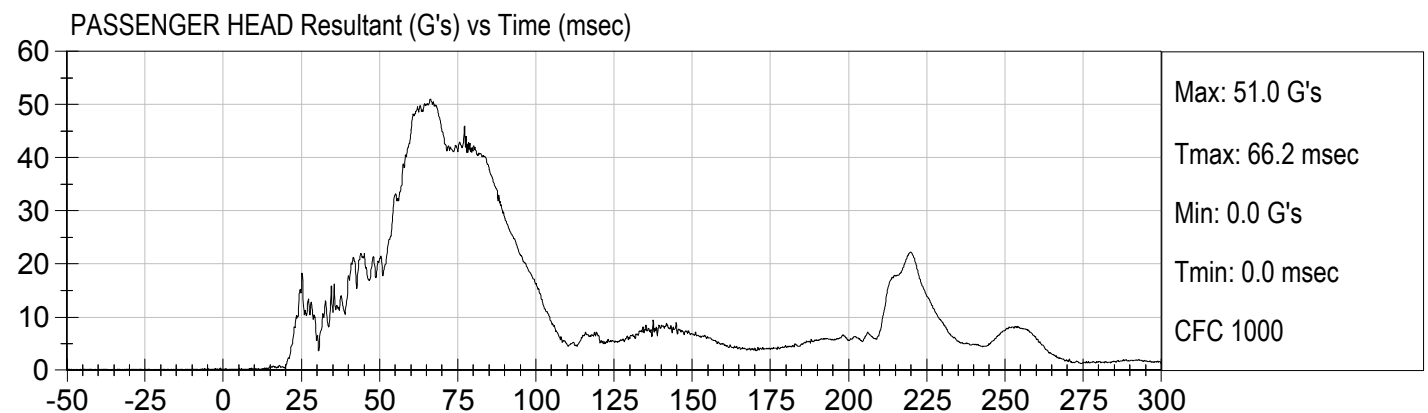
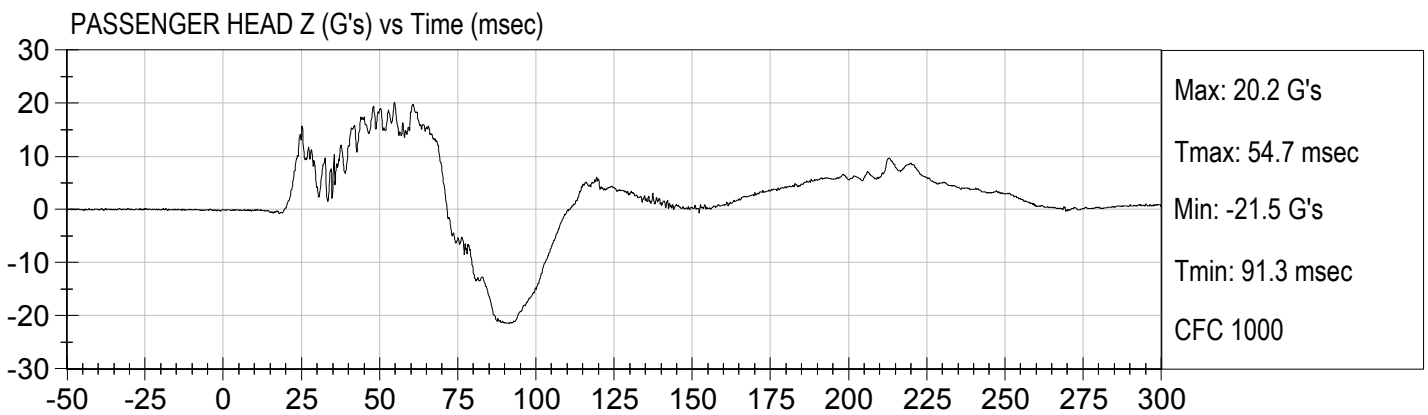
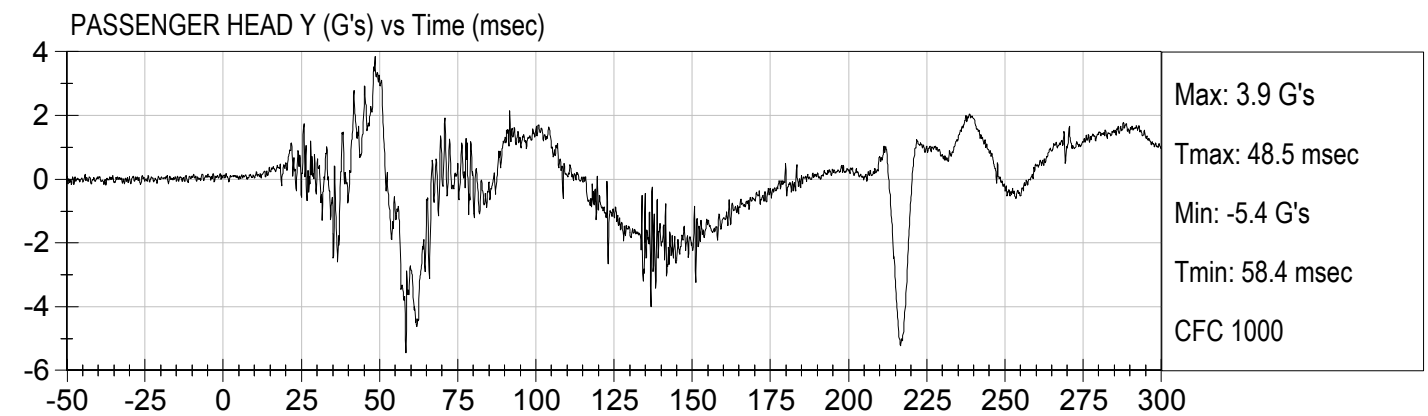
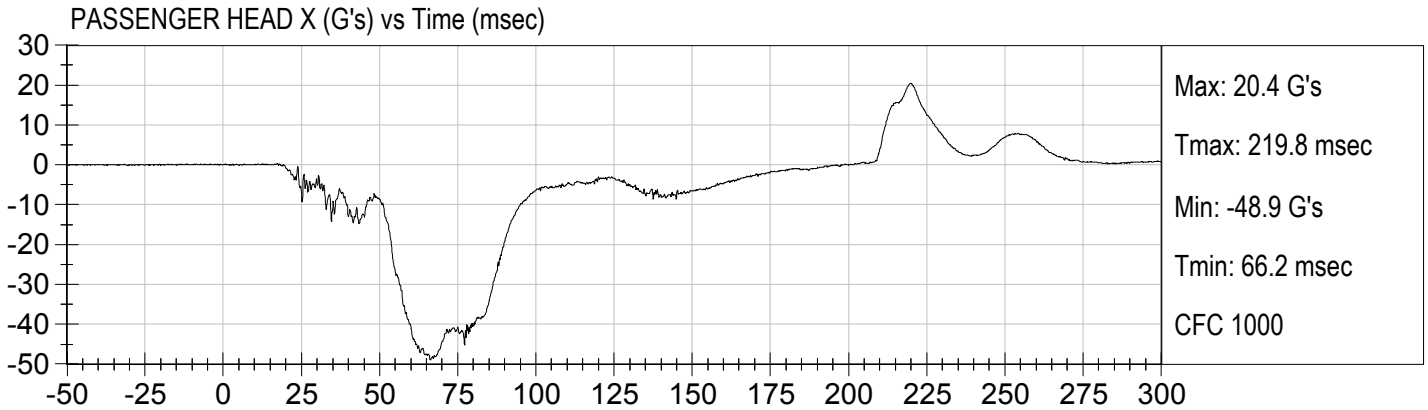


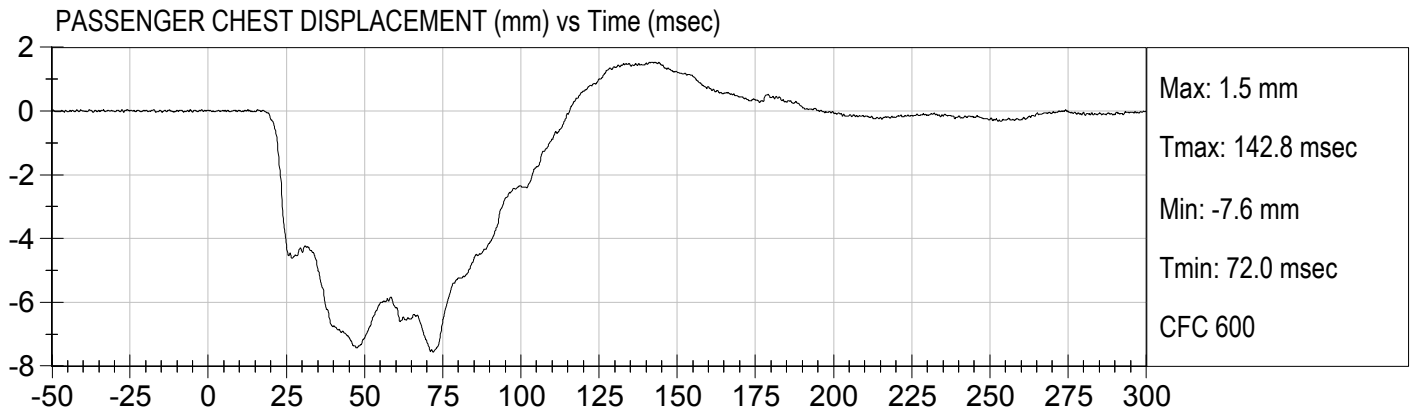


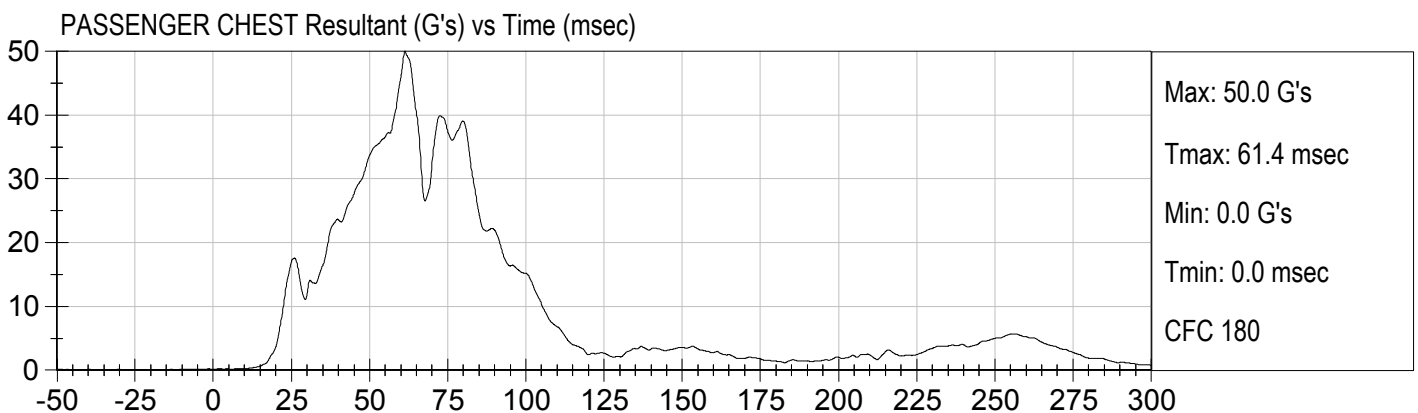
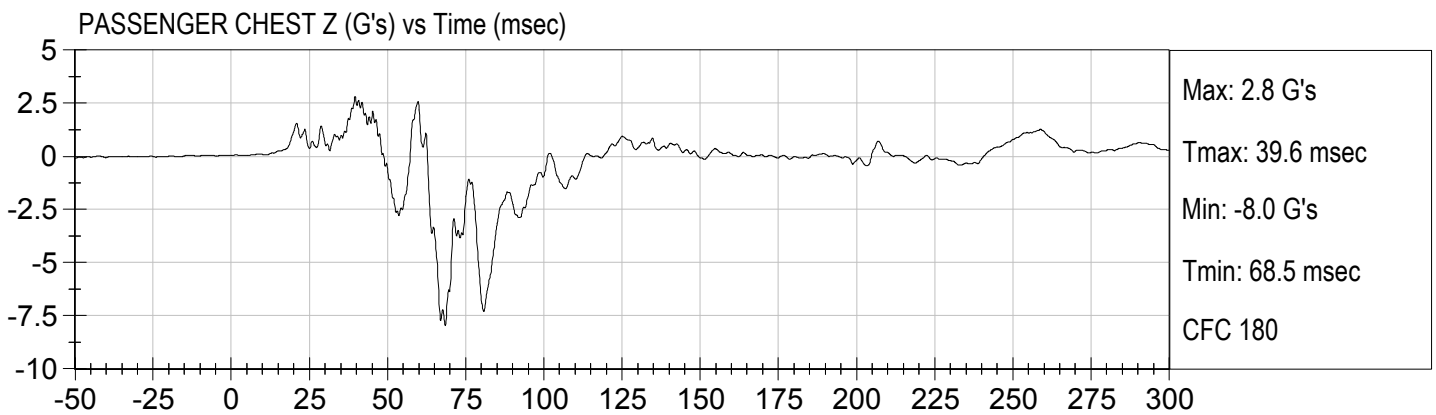
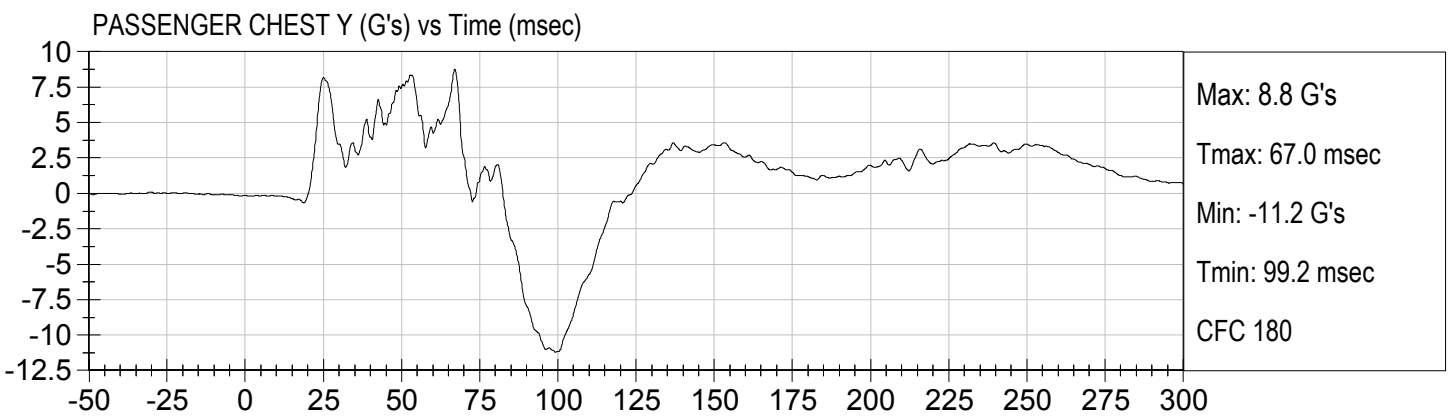
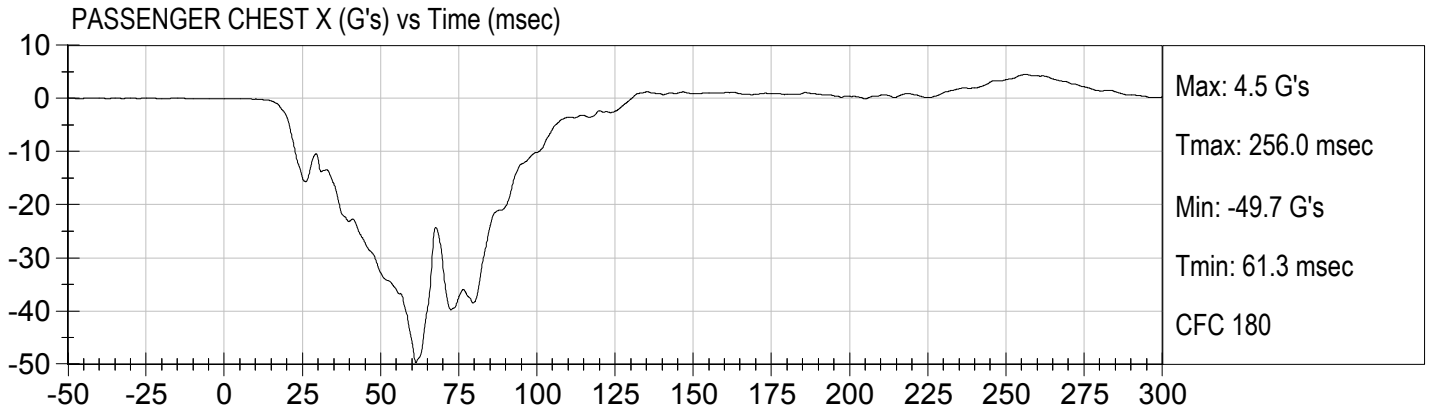


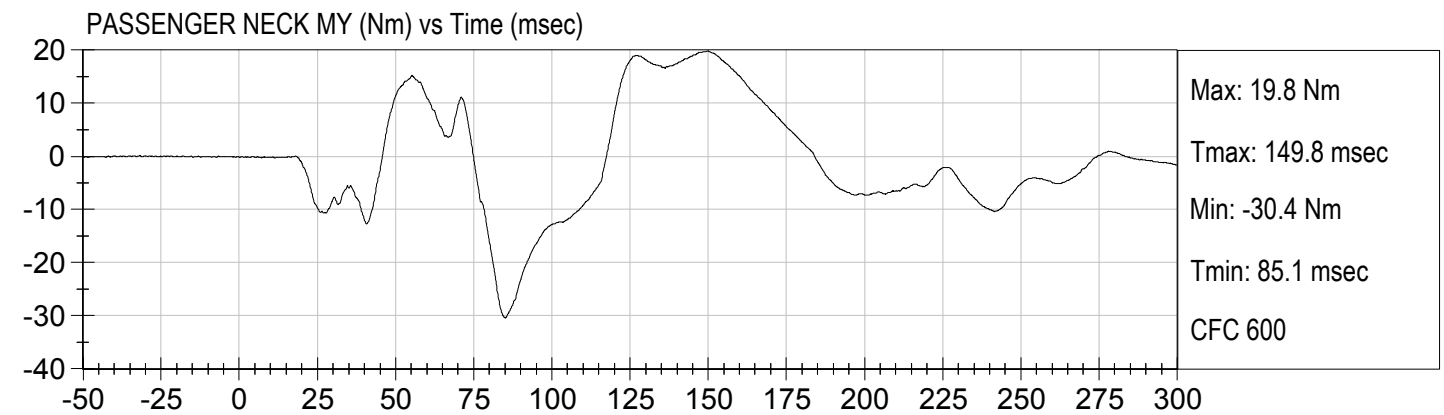
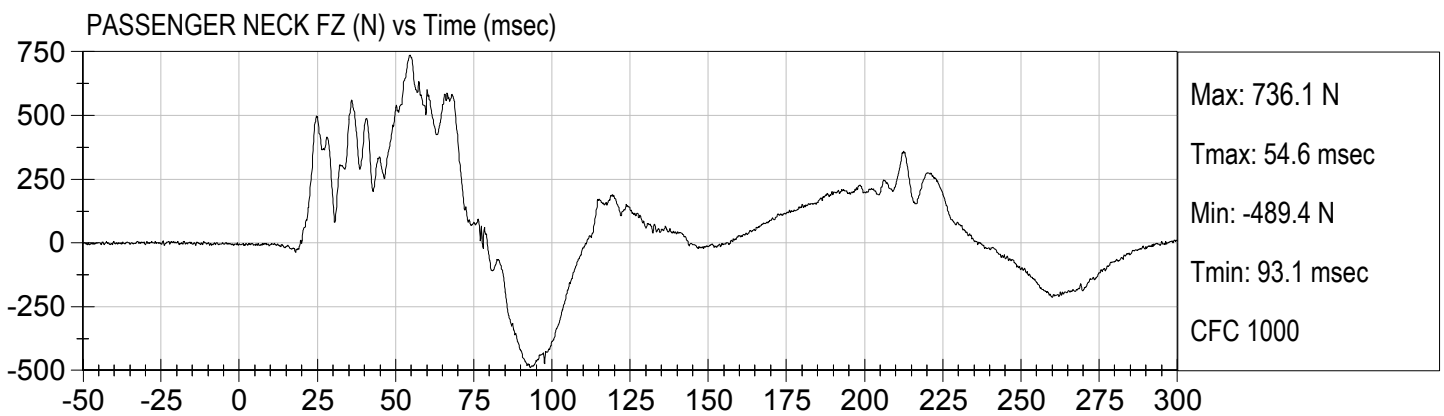
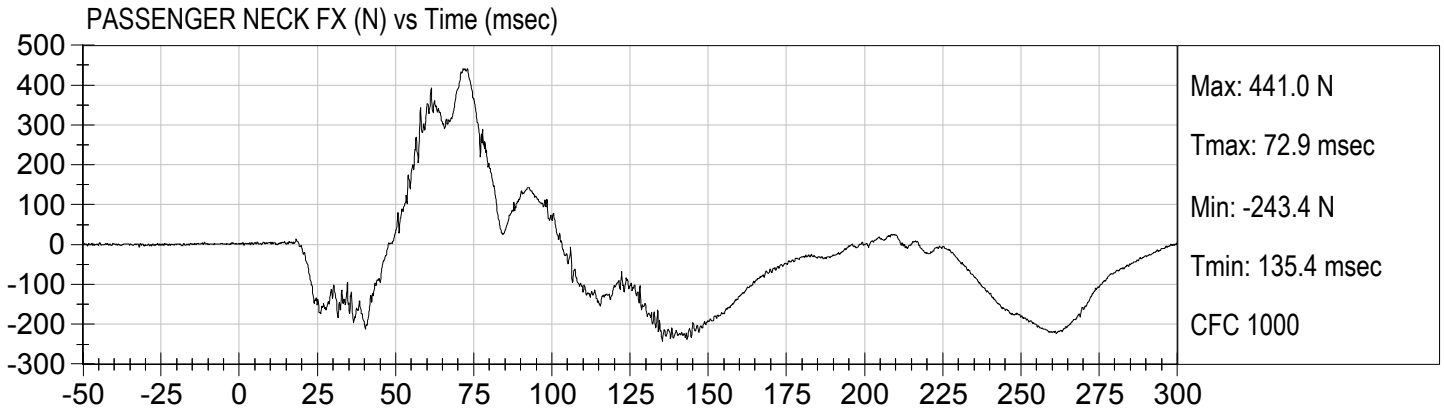


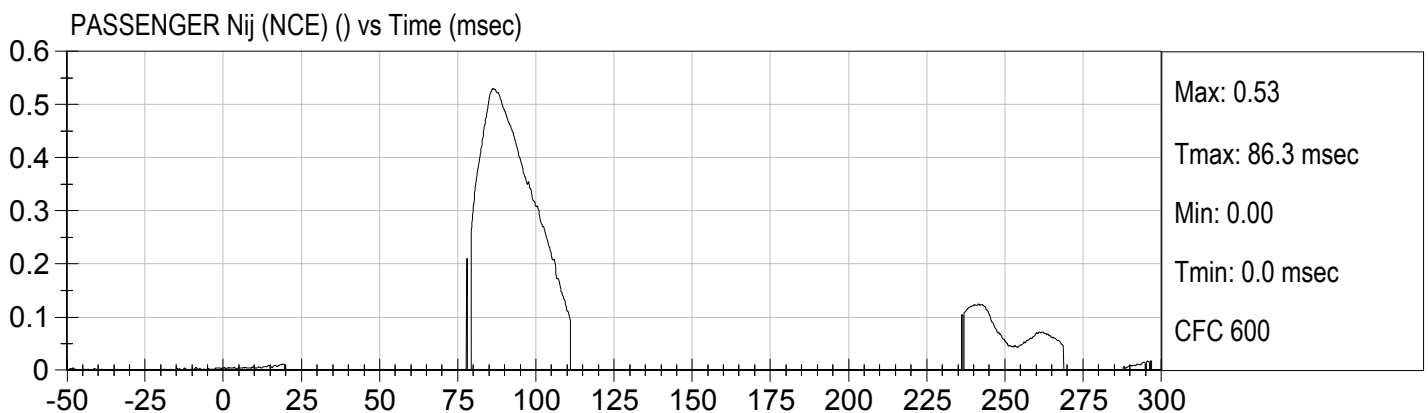
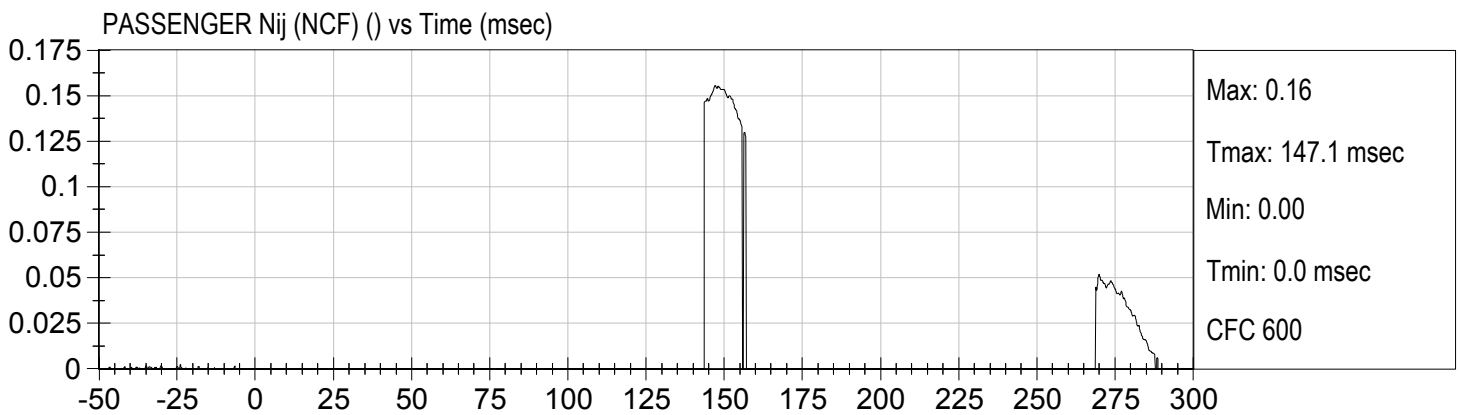
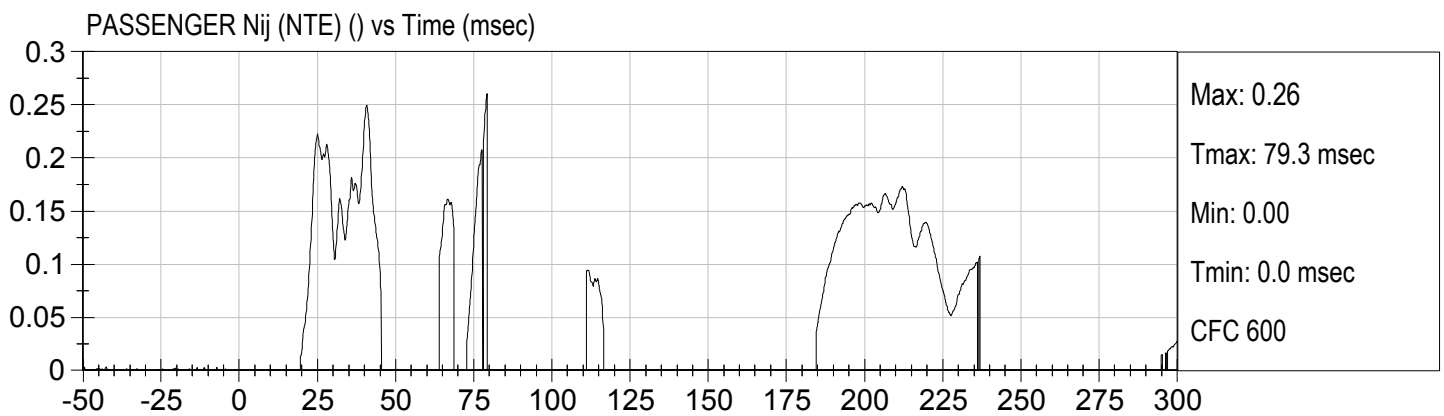
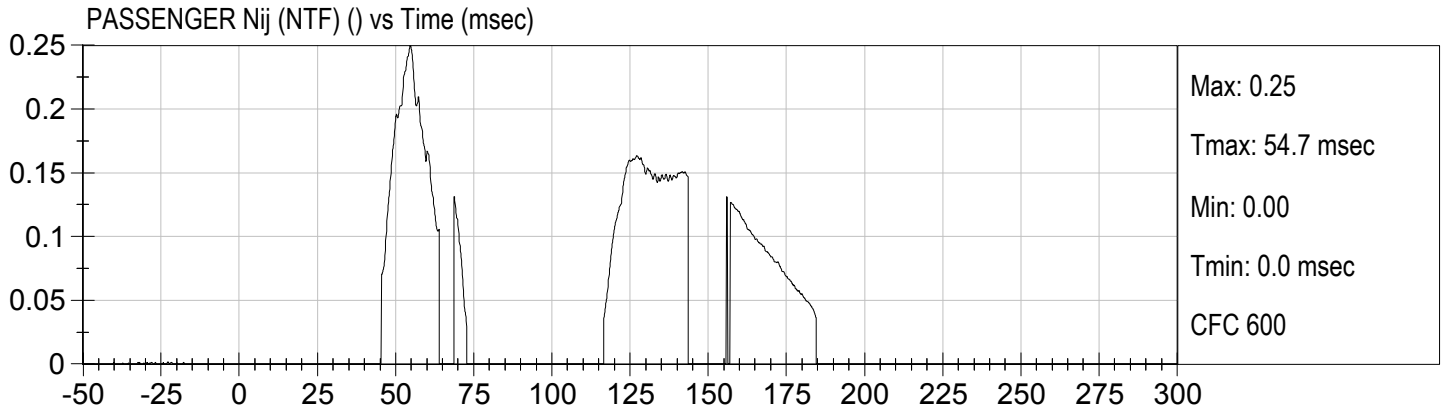


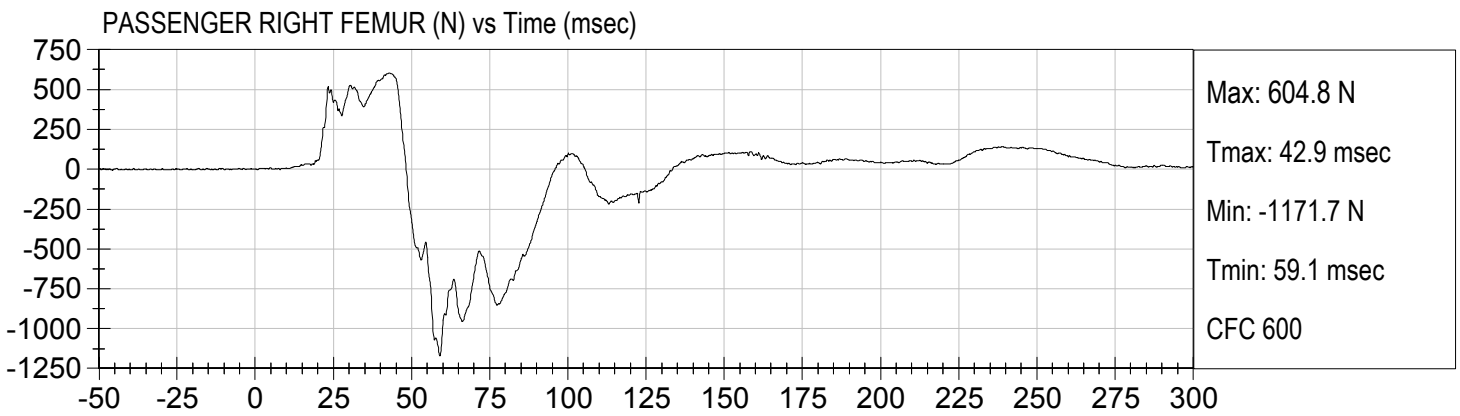
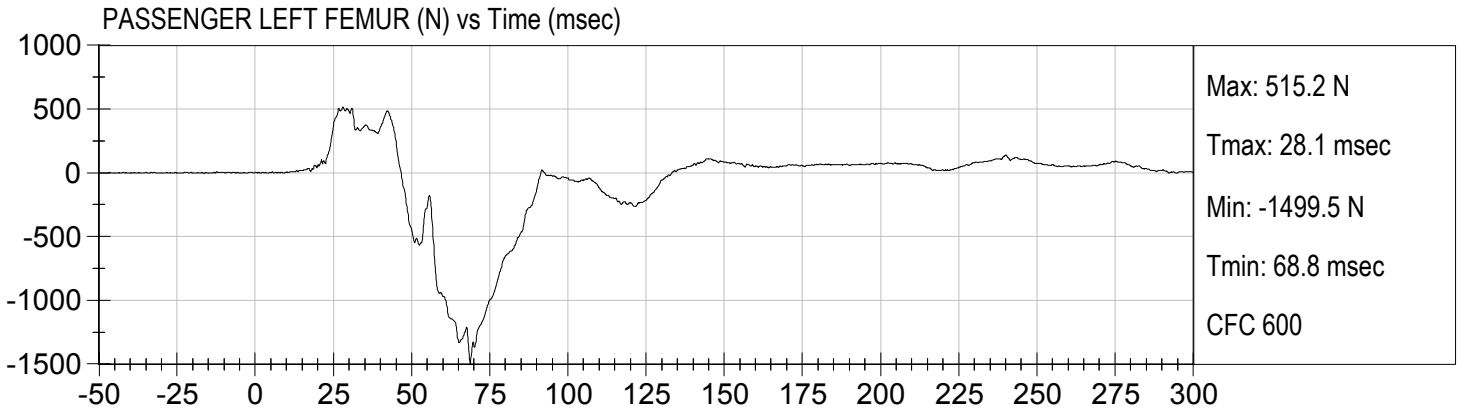












**APPENDIX C**  
**DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA**

**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

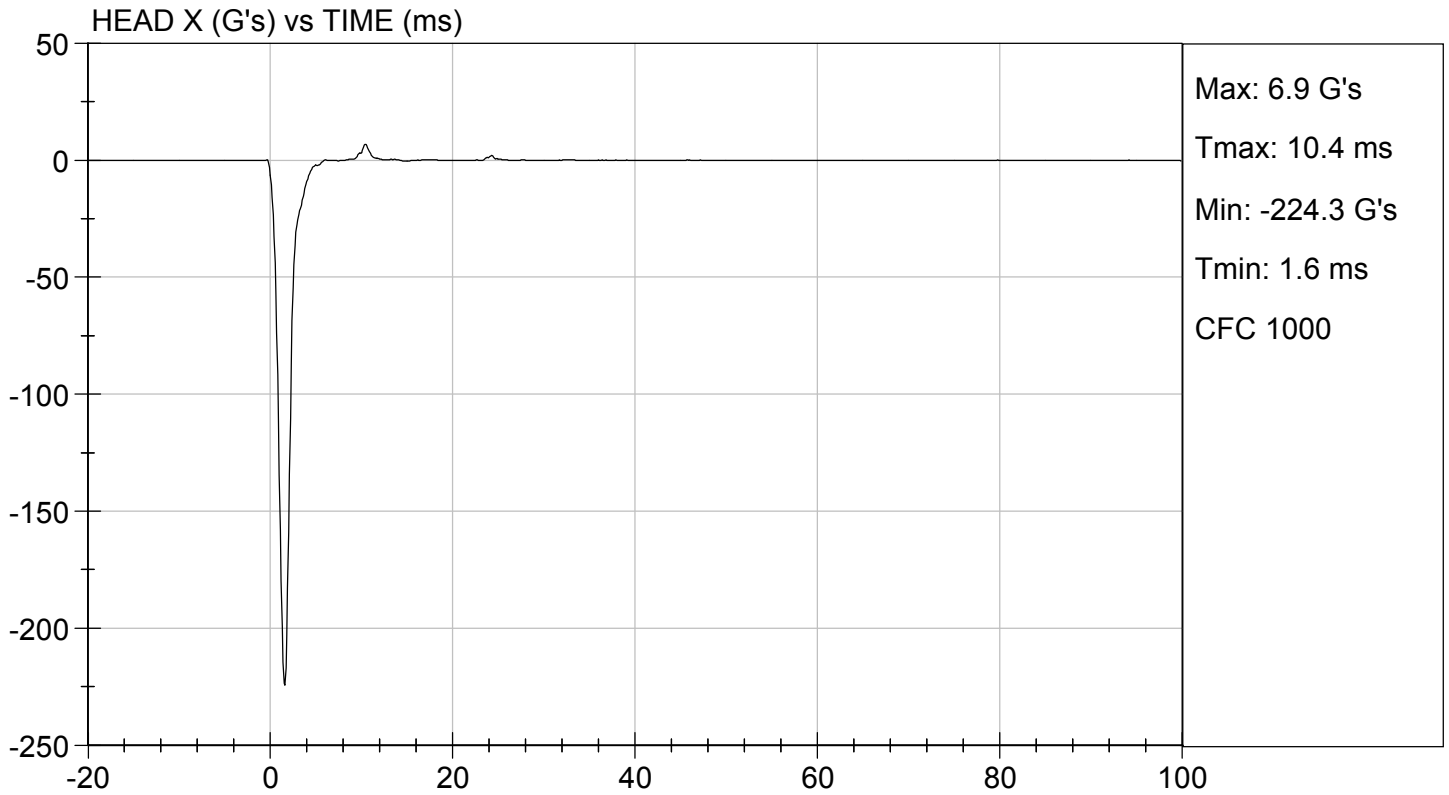
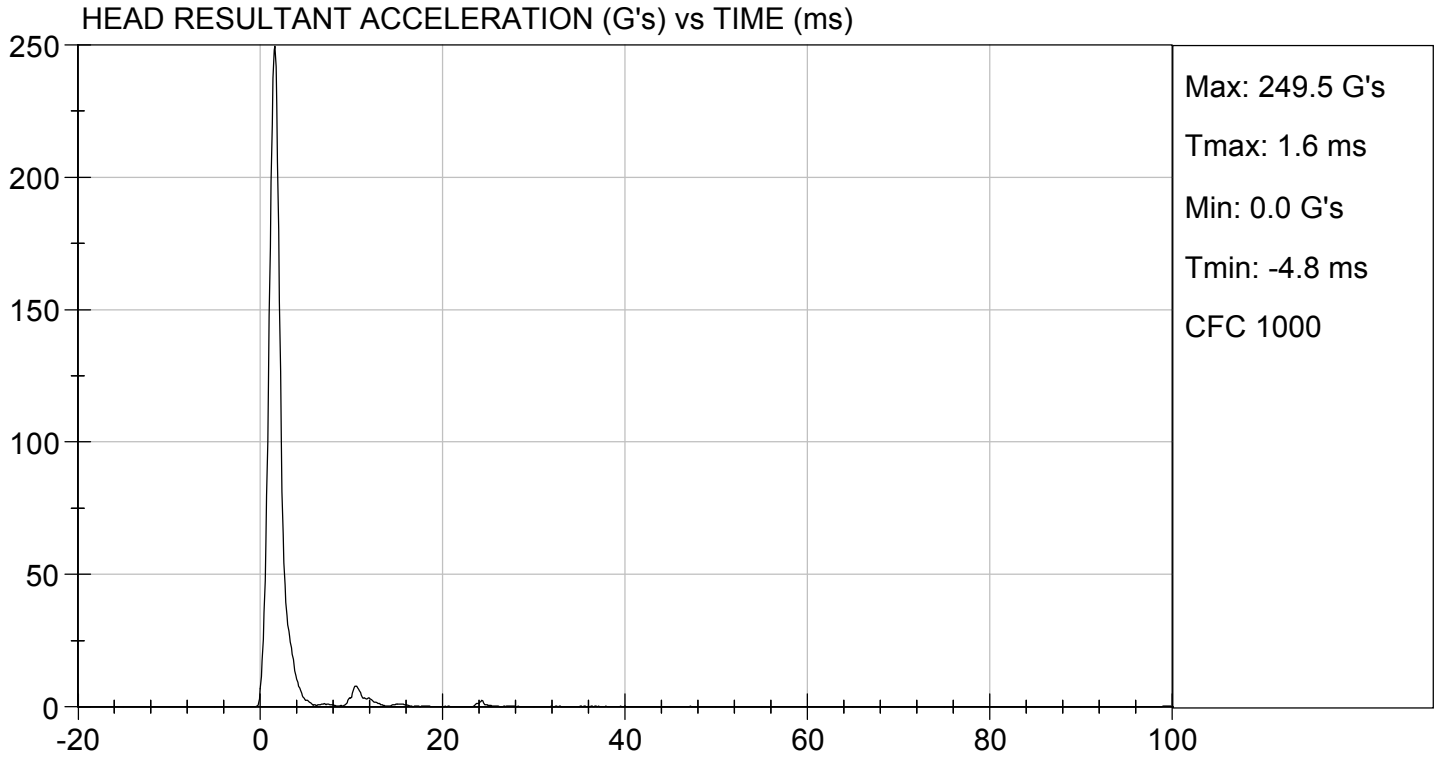
Test ID: D173191

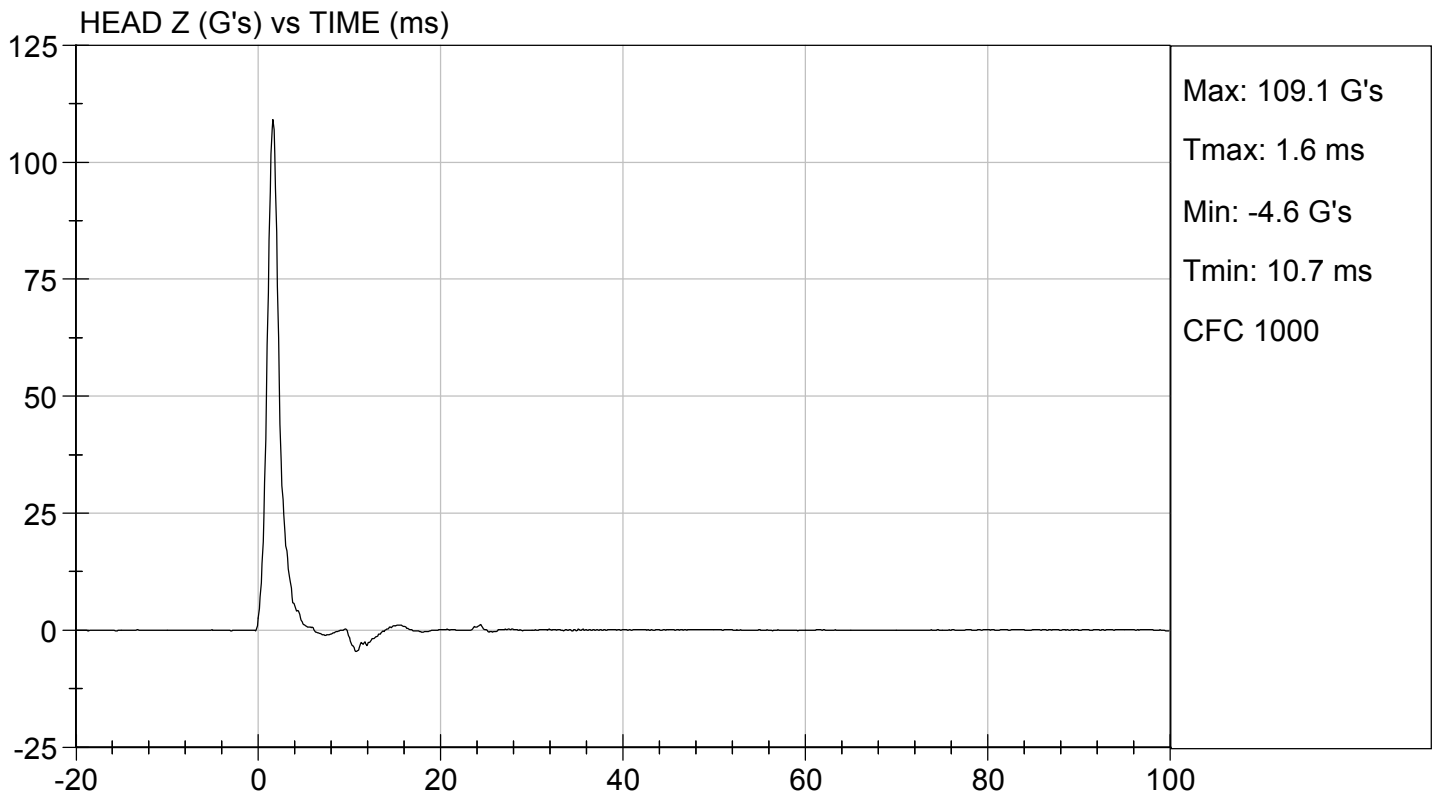
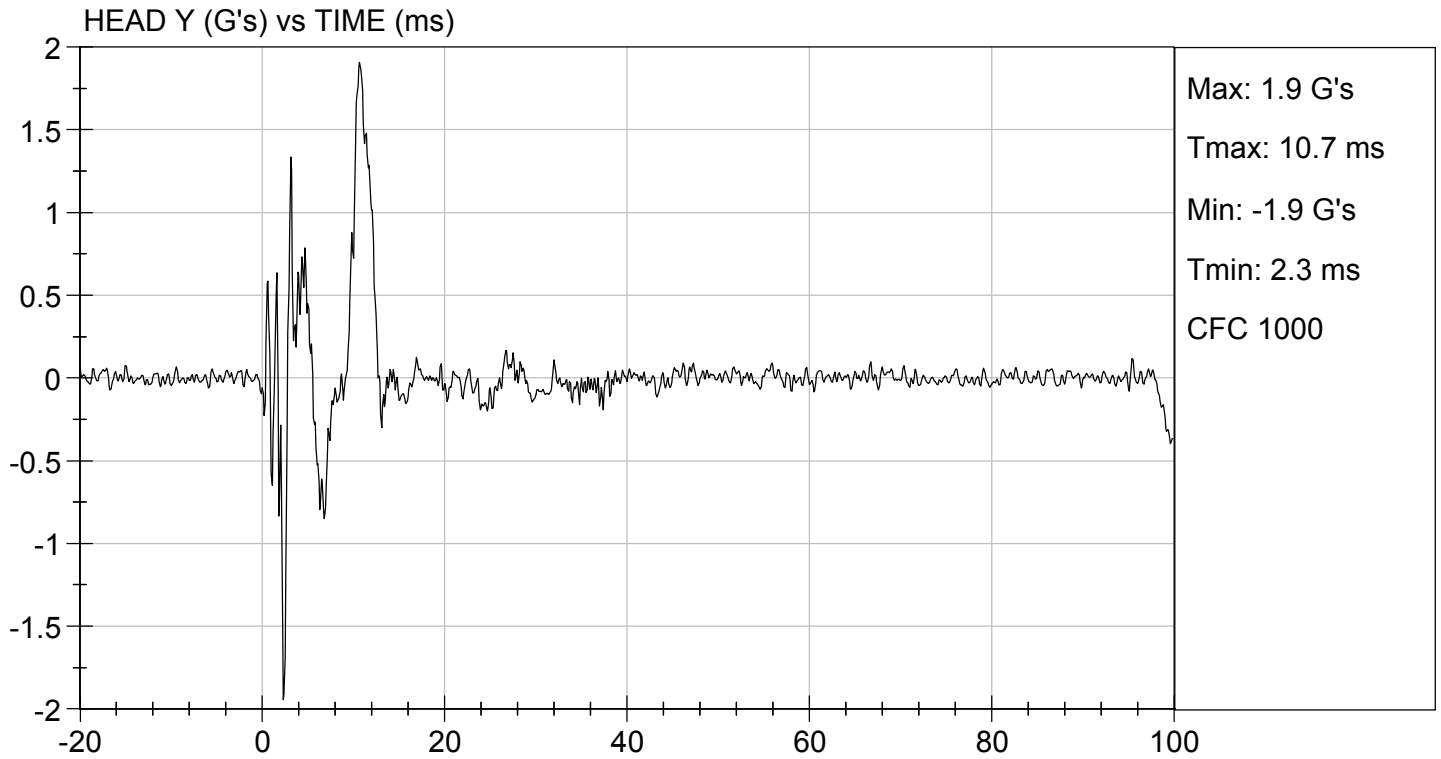
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Peak Resultant Acceleration	G's	225 to 275	249	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-1.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

*Danielle Redinlaugh*  
Laboratory Technician

11/02/2017  
Test Date

*Robert Schaub*  
Approved By






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

**ATD Serial No:** 351

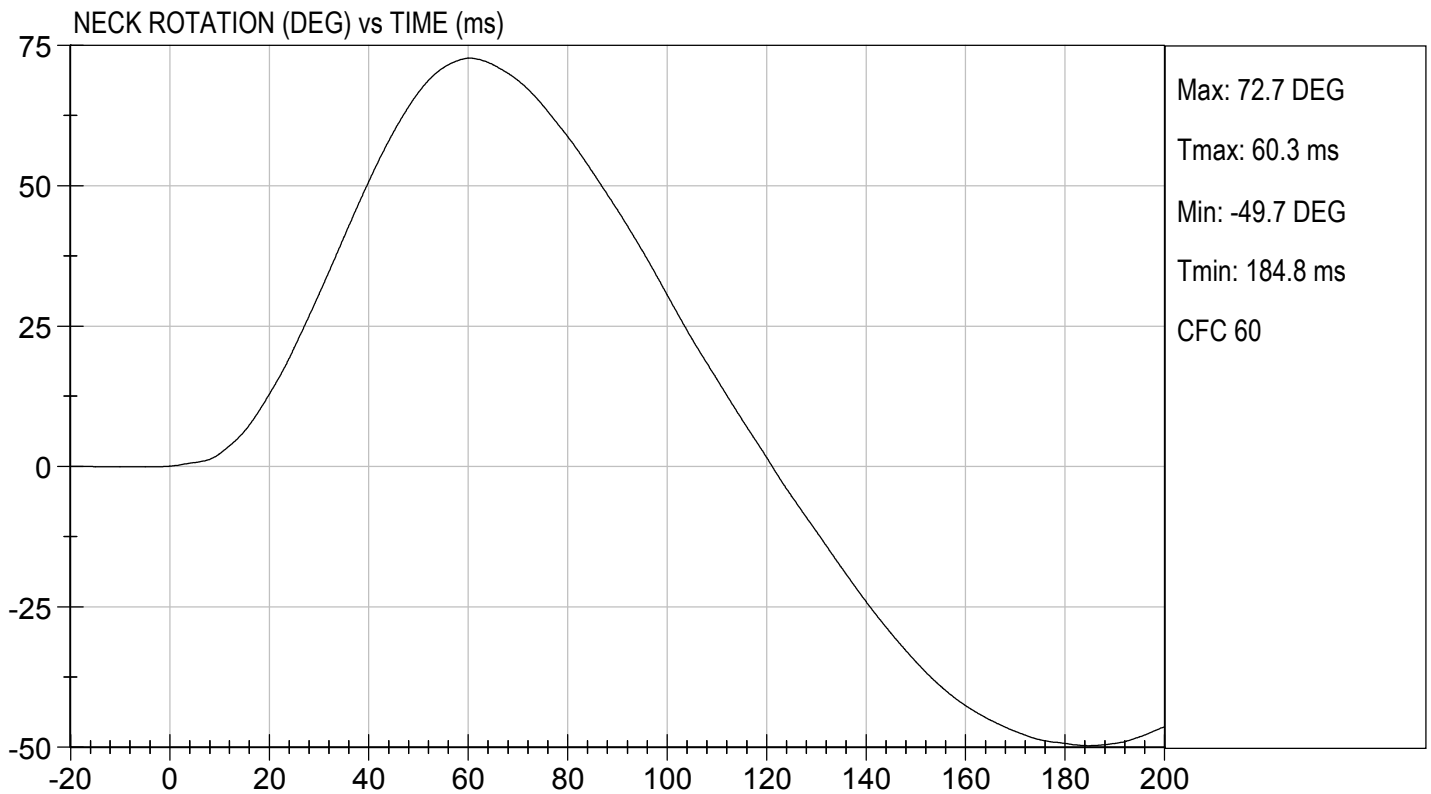
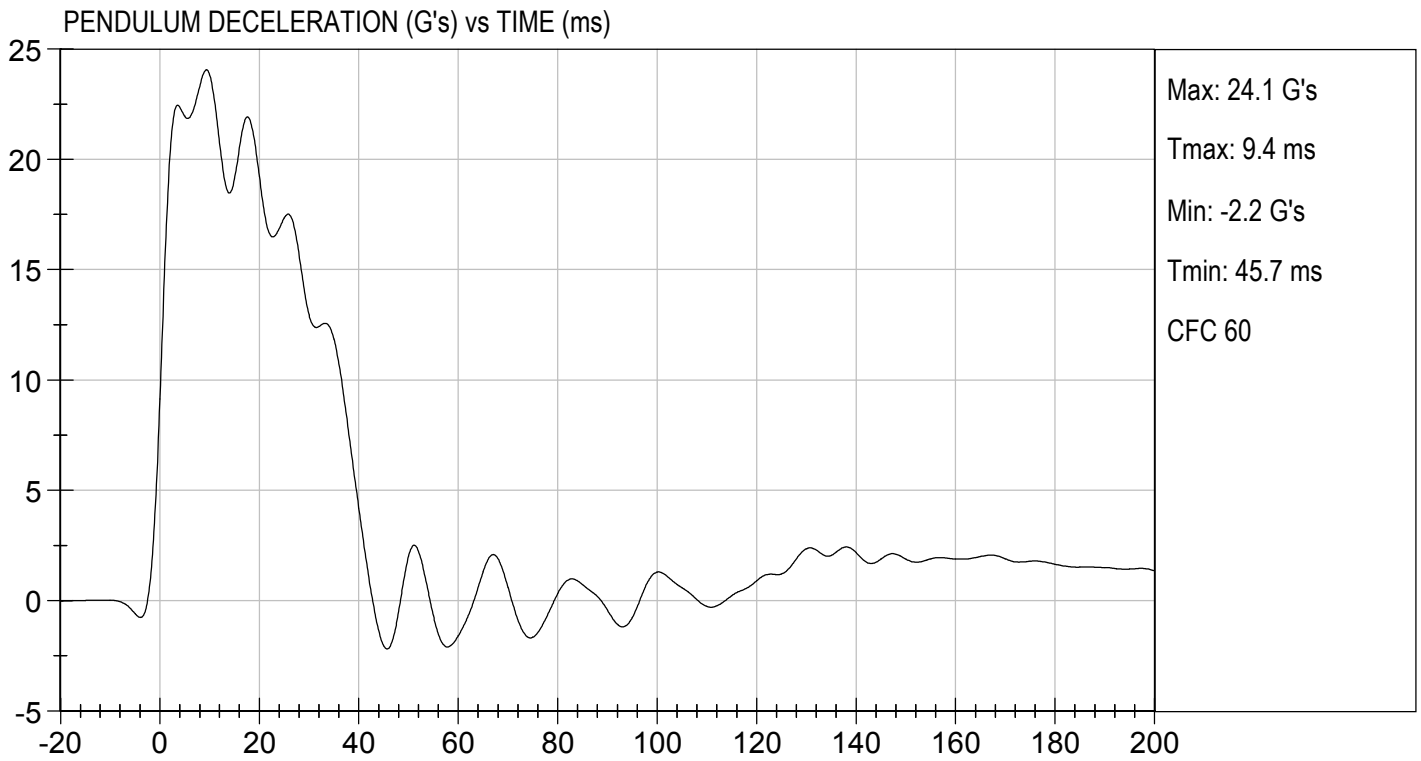
**Test I.D.:** D173192

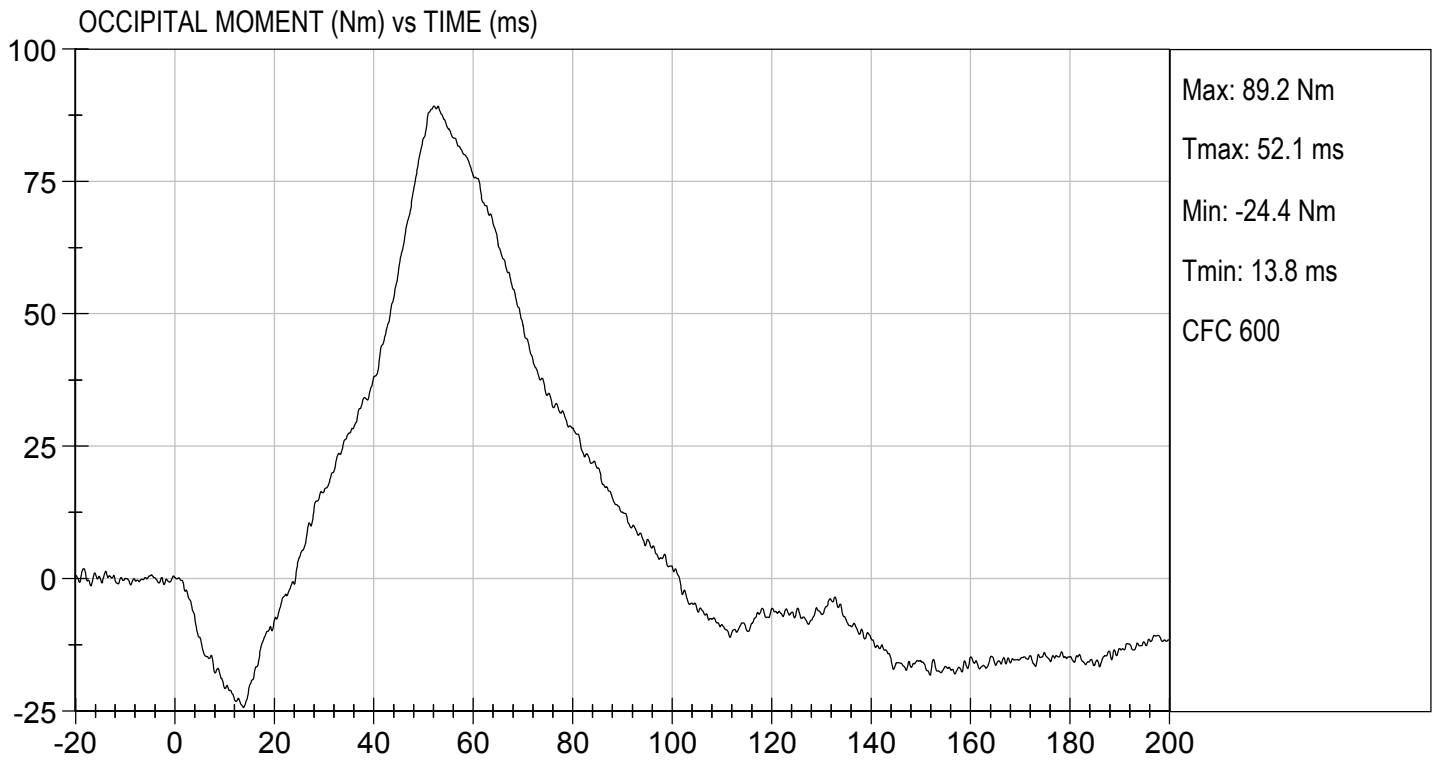
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	33	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.84	Pass
	20 ms	G's	17.60 to 22.60	19.23	Pass
	30 ms	G's	12.50 to 18.50	12.94	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	12.9	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	39.6	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	72.7	Pass
	Time	ms	57.0 to 64.0	60.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	121.3	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.2	Pass
	Time	ms	47.0 to 58.0	52.1	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	101.6	Pass
<b>Overall Test Results</b>					<b>Pass</b>

  
Laboratory Technician

11/03/2017  
Test Date

  
Approved By





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

ATD Serial No: 351

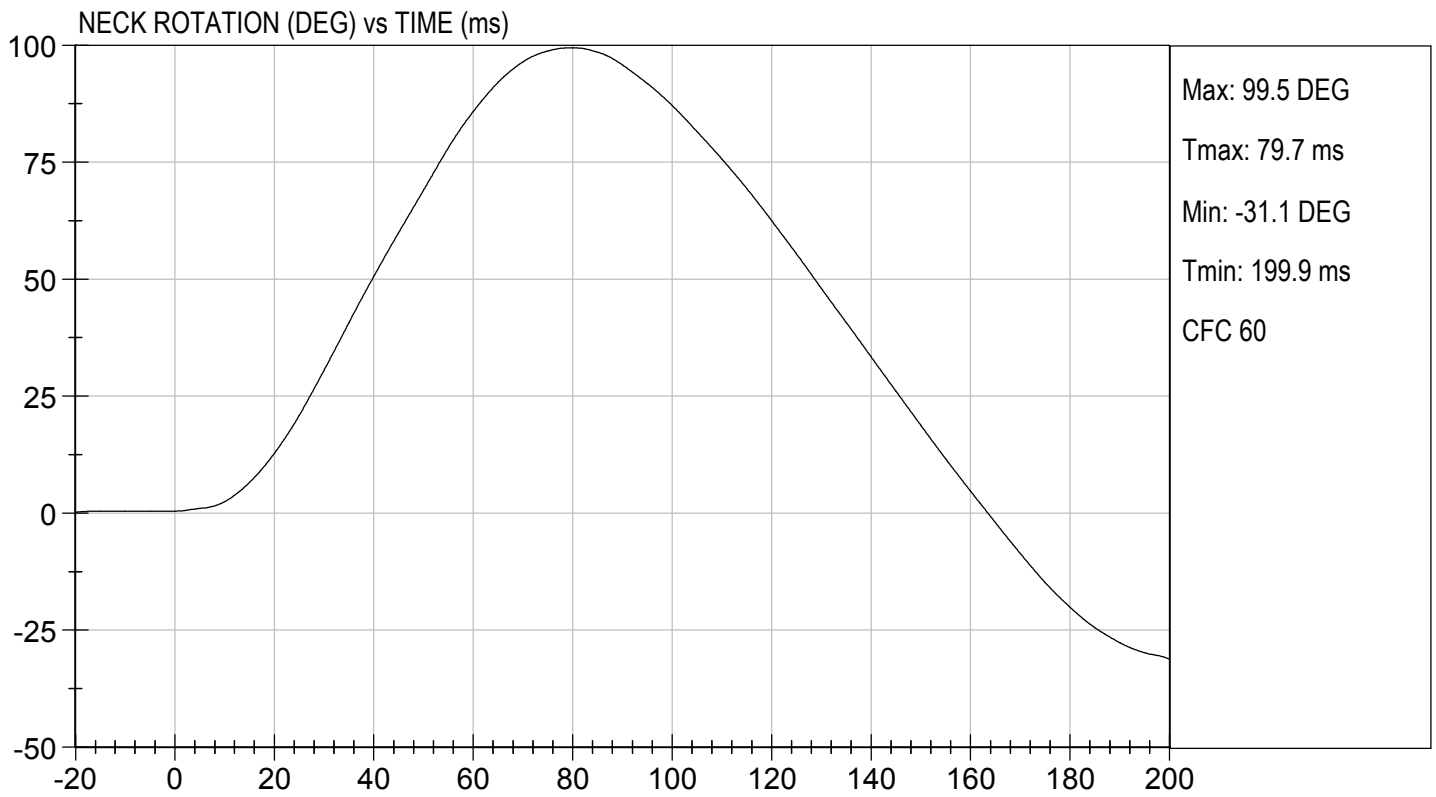
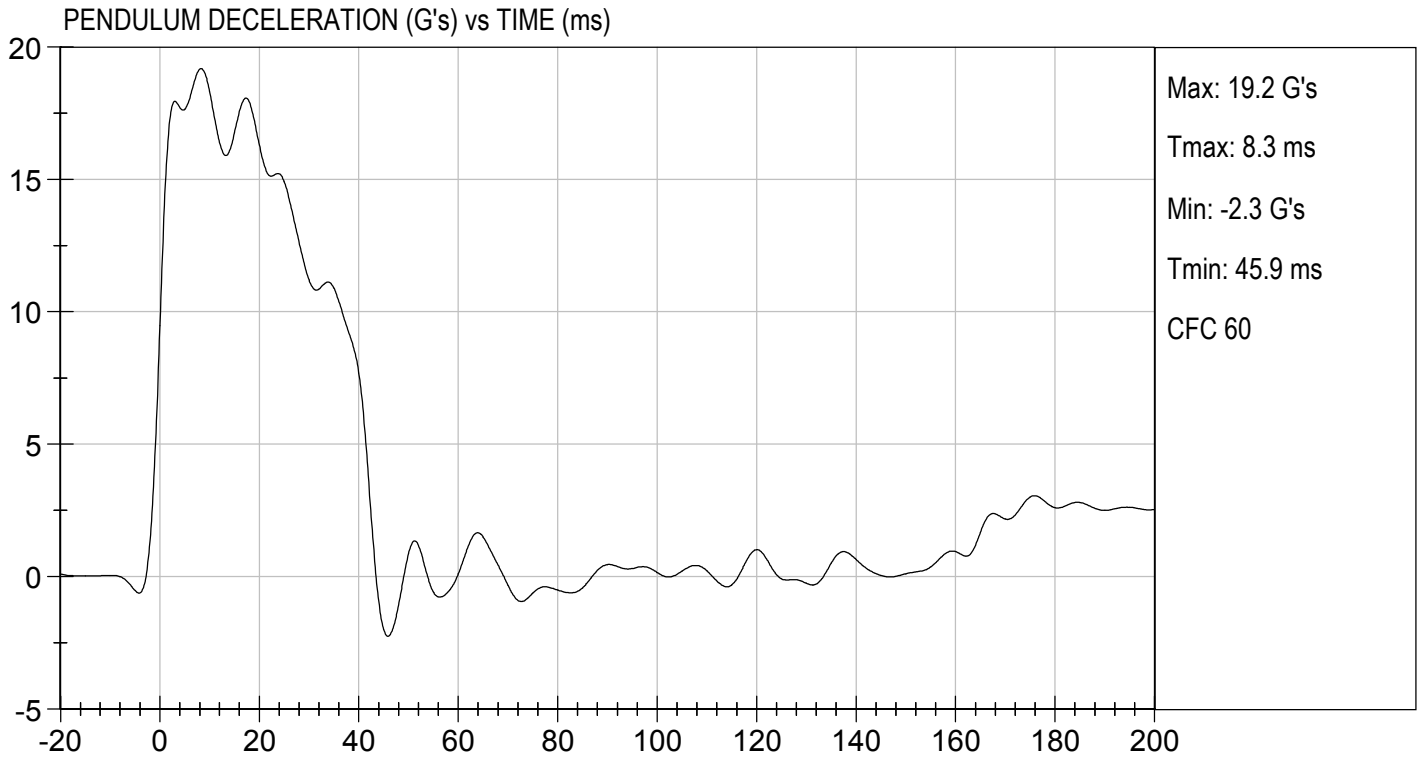
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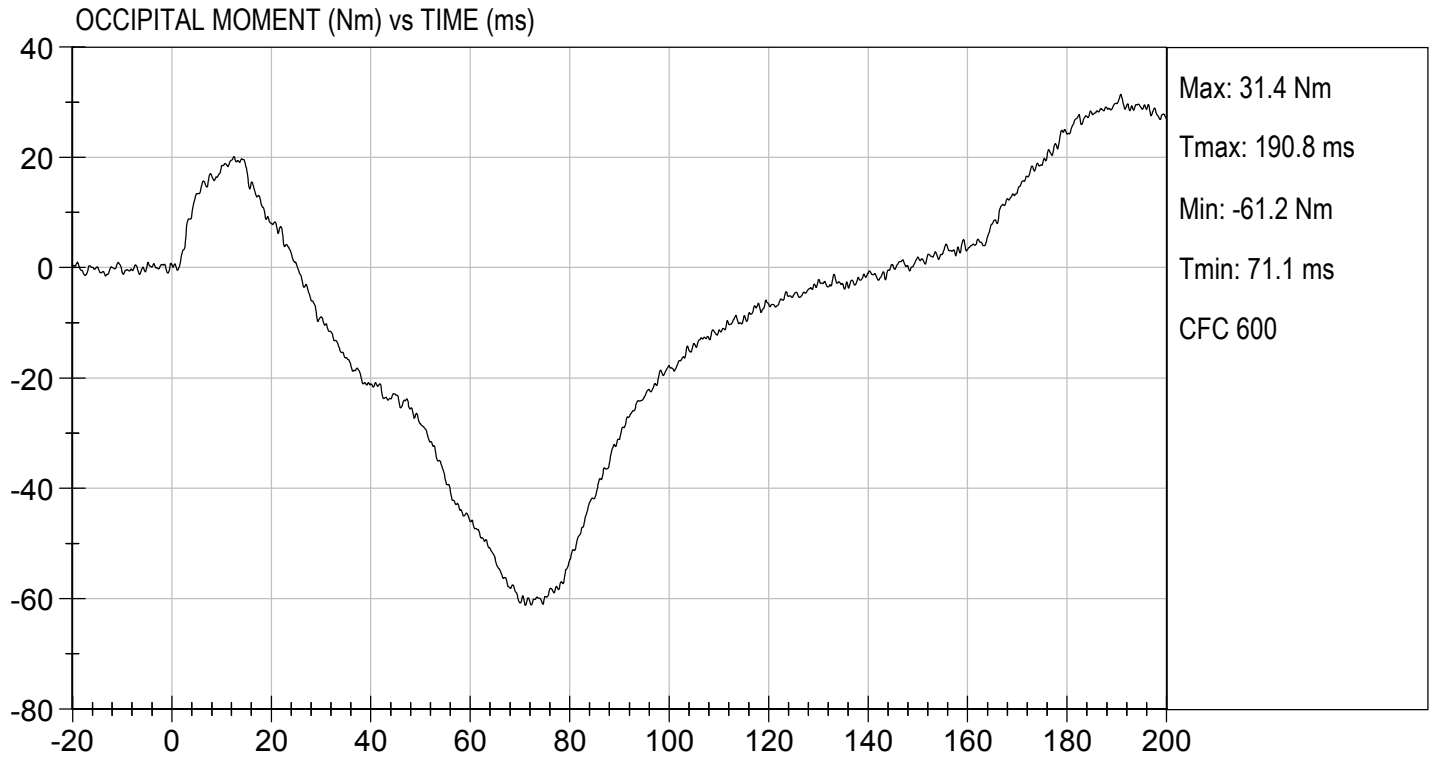
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	33	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	18.32	Pass
	20 ms	G's	14.00 to 19.00	16.30	Pass
	30 ms	G's	11.00 to 16.00	11.19	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	11.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	41.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.5	Pass
	Time	ms	72.0 to 82.0	79.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	163.7	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-61.2	Pass
	Time	ms	65.0 to 79.0	71.1	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.7	Pass
Overall Test Results					Pass

*Danielle Redinlaugh*  
 Laboratory Technician

11/03/2017  
 Test Date

*Robert Schaub*  
 Approved By






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

ATD Serial No: 351

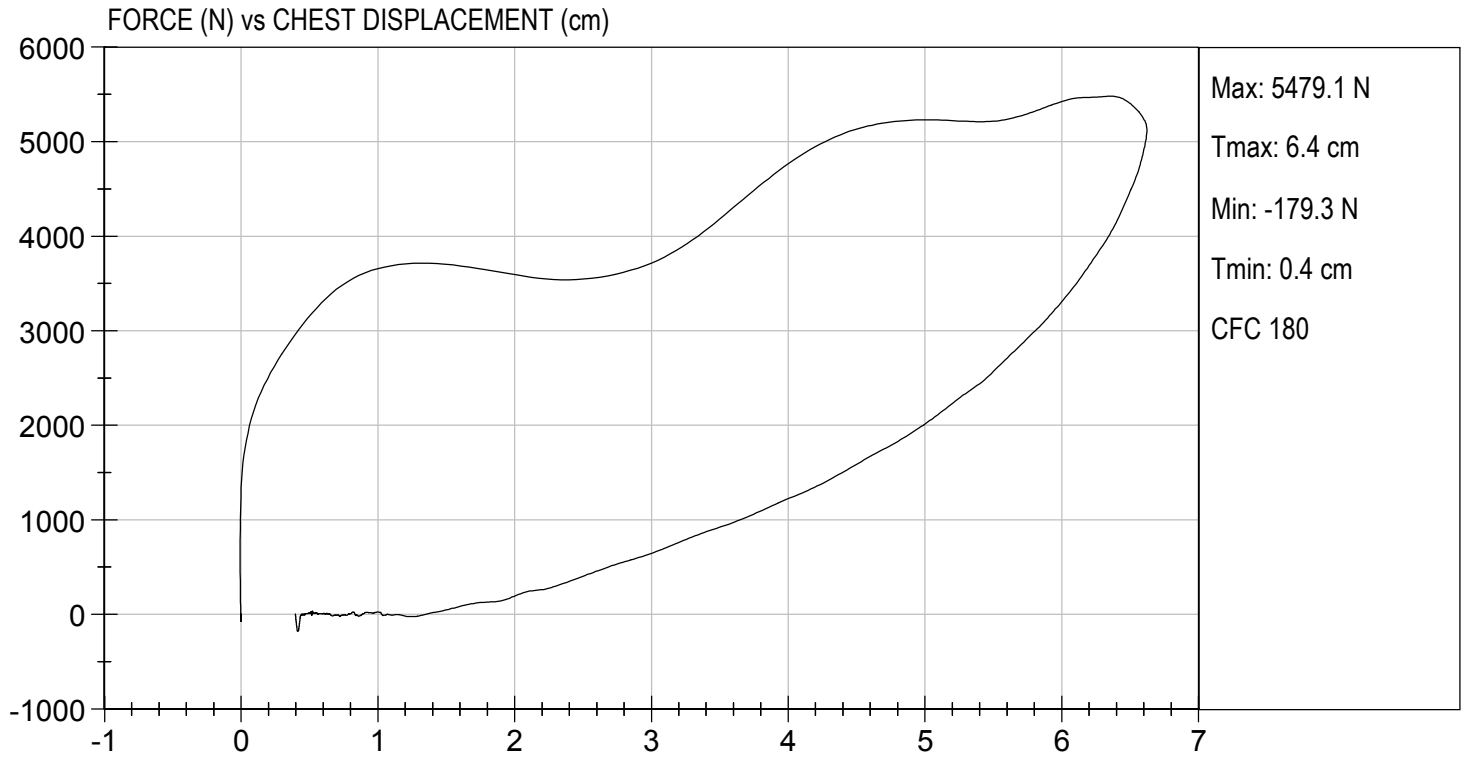
Test I.D: D173194

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,479	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.62	Pass
Internal Hysteresis	%	69 to 85	71	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

11/02/2017  
 Test Date

  
 Approved By



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

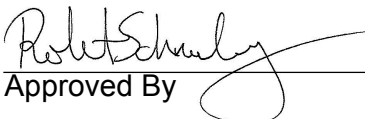
**ATD Serial No:** 351

**Test I.D:** D173195

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	5,003	Pass
Overall Test Results				Pass

  
 Laboratory Technician

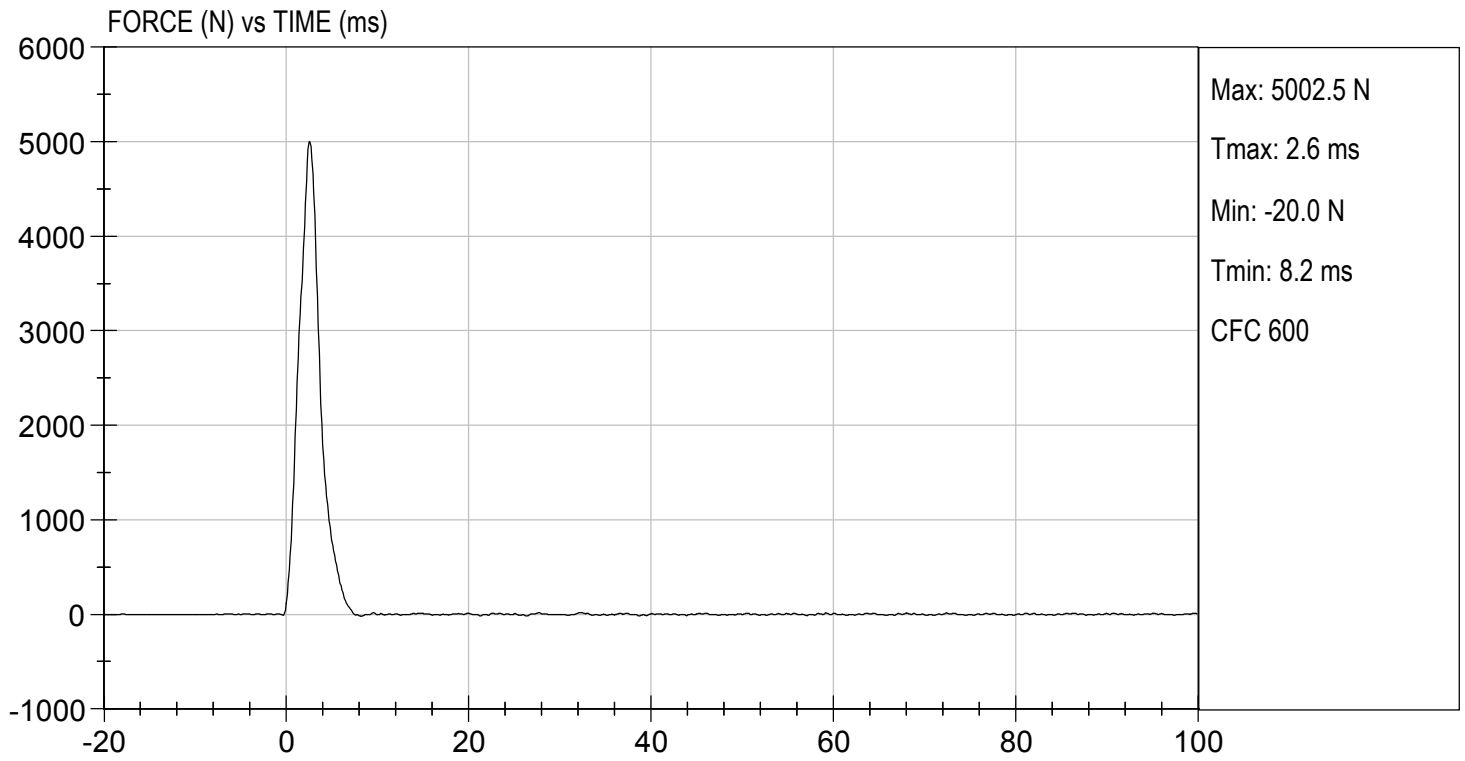
11/02/2017  
 Test Date

  
 Approved By



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

TEST DATE: 11/02/2017  
TEST #: D173195



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

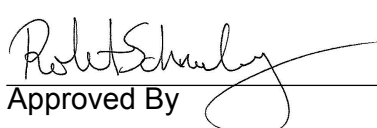
**ATD Serial No:** 351

**Test I.D:** D173196

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22	Pass
Laboratory Relative Humidity	%	10 to 70	27	Pass
Probe Velocity	m/s	2.07 to 2.13	2.07	Pass
Peak Probe Force	N	4715 to 5782	5,164	Pass
Overall Test Results				Pass

  
 Laboratory Technician

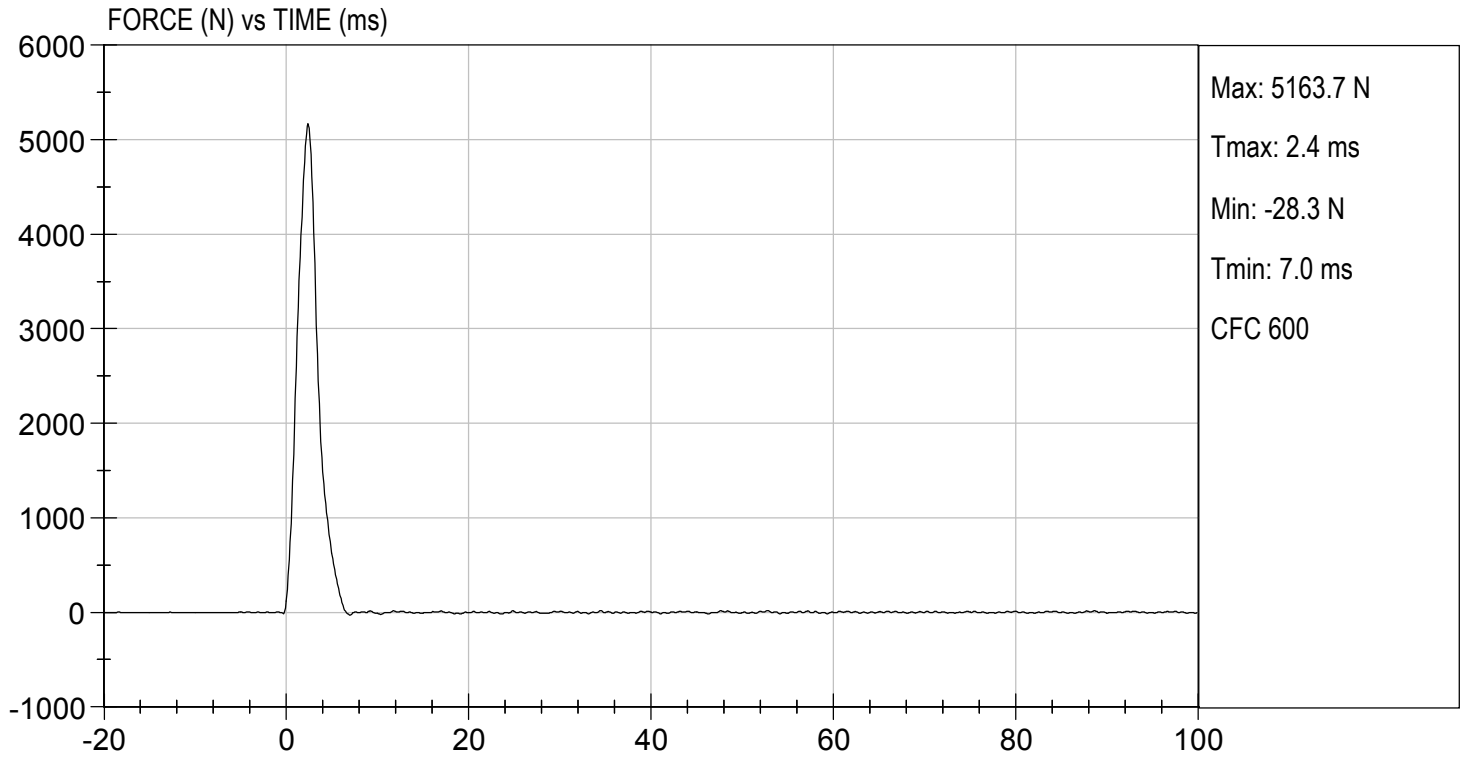
11/02/2017  
 Test Date

  
 Approved By



TEST DESC: LEFT KNEE  
VELOCITY: 6.78 ft/s, 2.07 m/s

TEST DATE: 11/02/2017  
TEST #: D173196

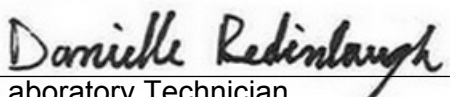


**MGA RESEARCH CORPORATION**  
**HIP-FEMUR FLEXION TEST**  
**HYBRID III 50TH PERCENTILE MALE**

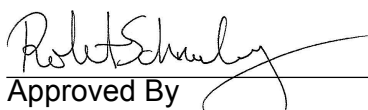
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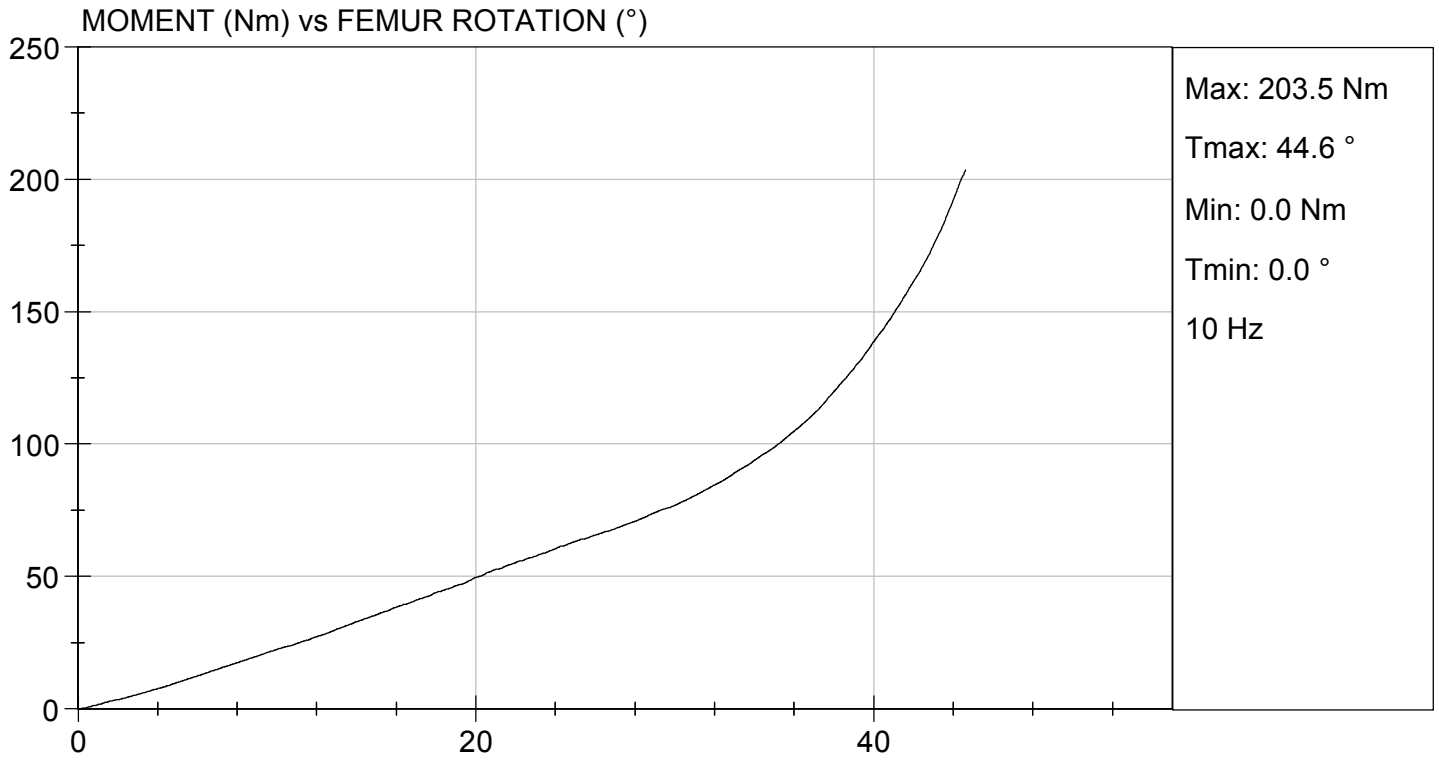
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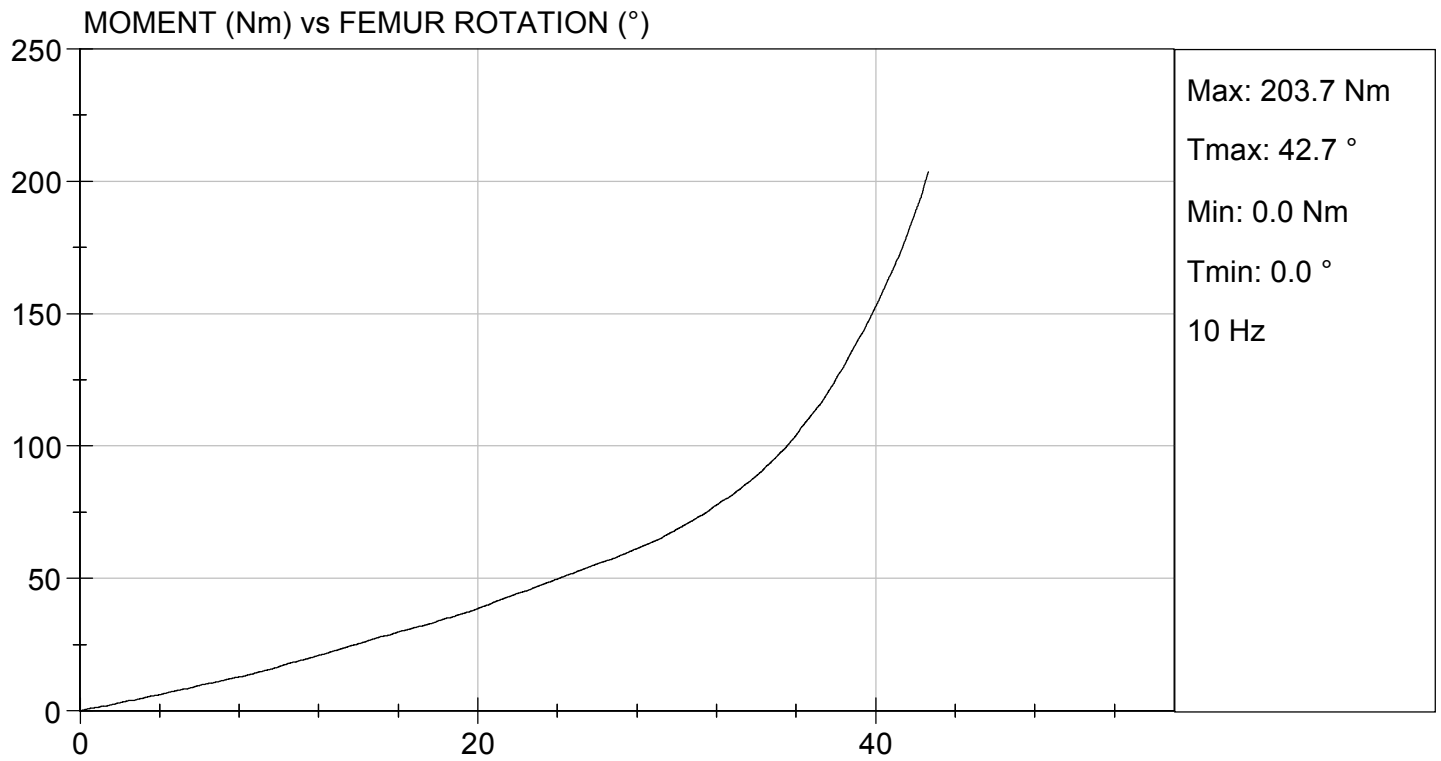
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22	22	Pass
Laboratory Relative Humidity	%	10 to 70	26	26	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.5	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	76.9	68.6	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.6	42.7	Pass
Overall Test Results					Pass

  
 \_\_\_\_\_  
 Laboratory Technician

11/02/2017  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By





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

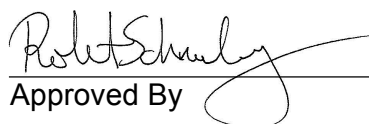
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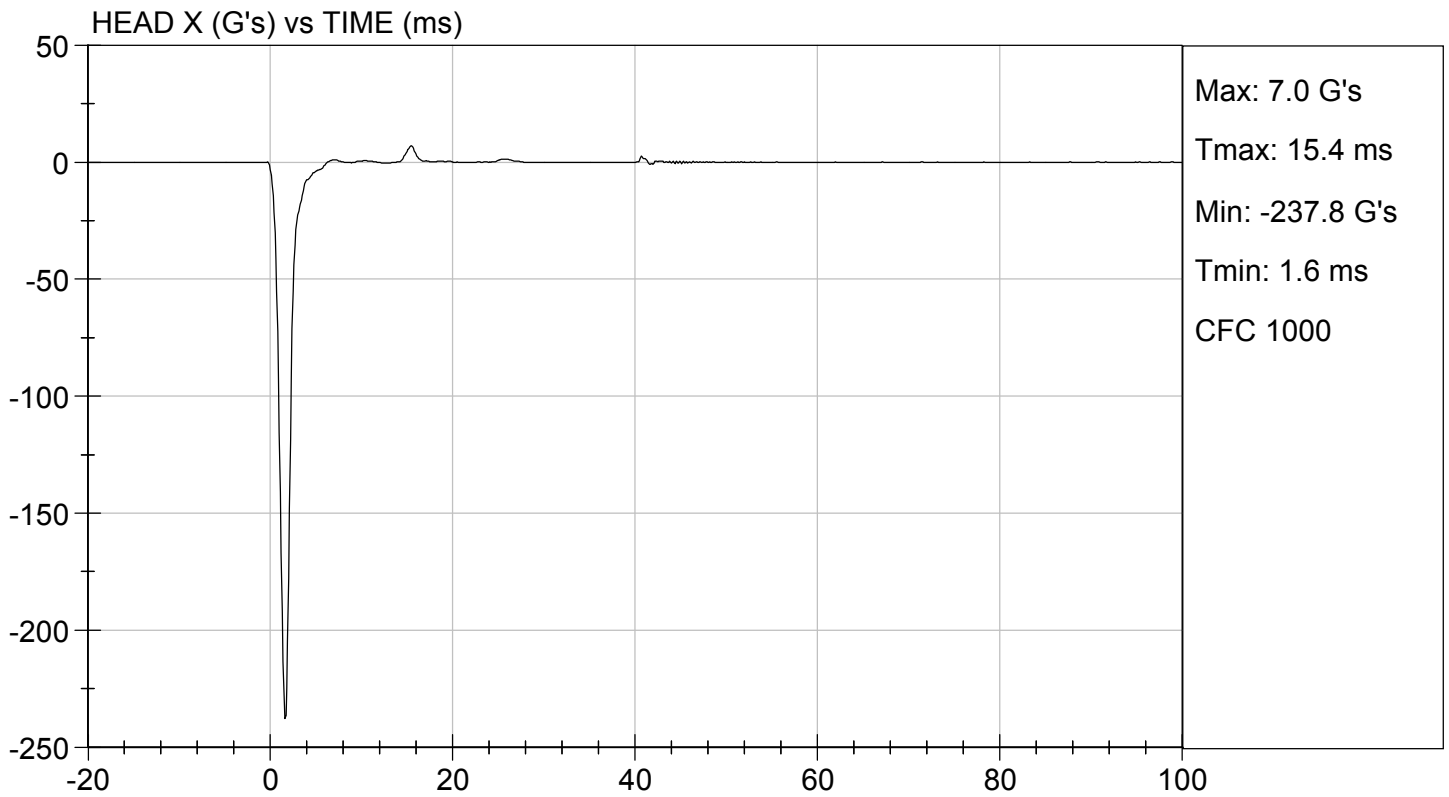
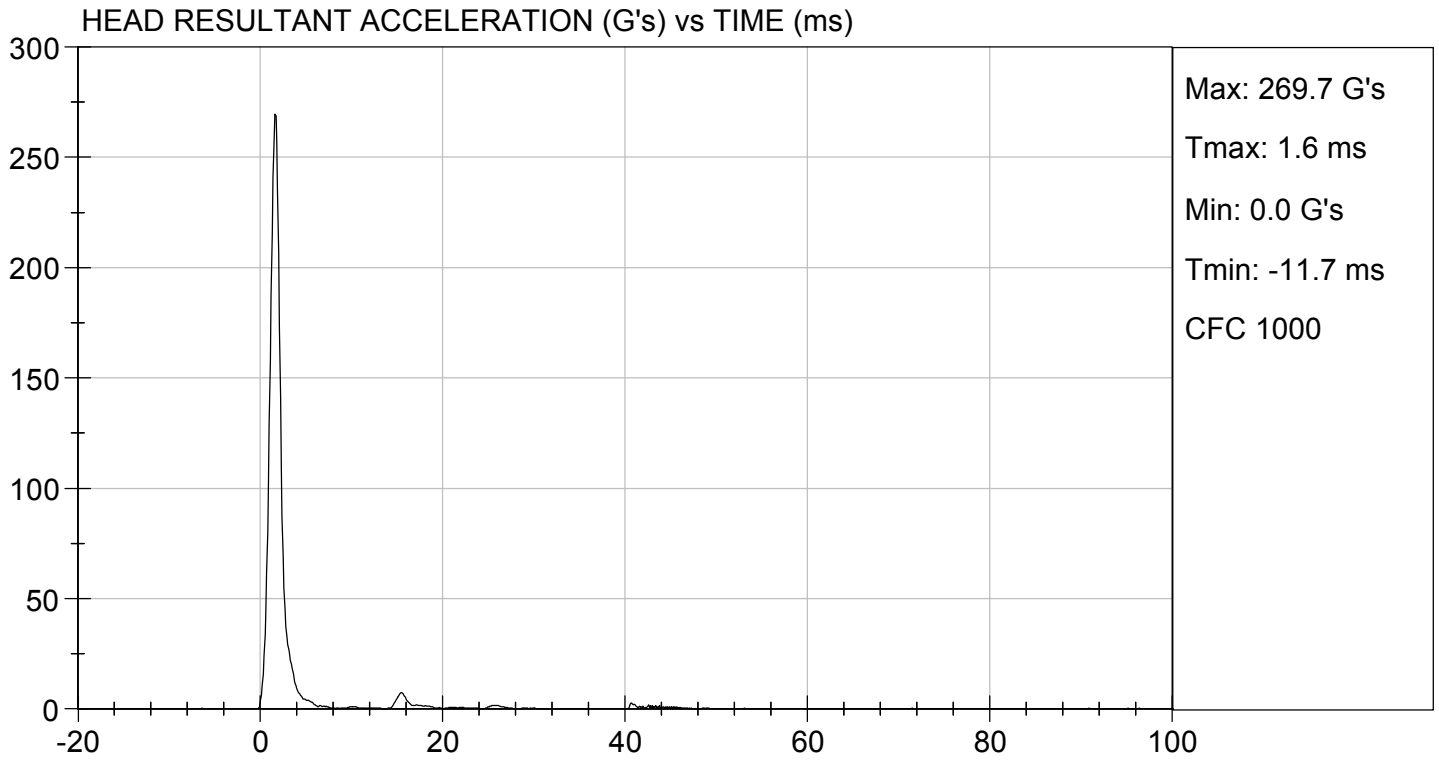
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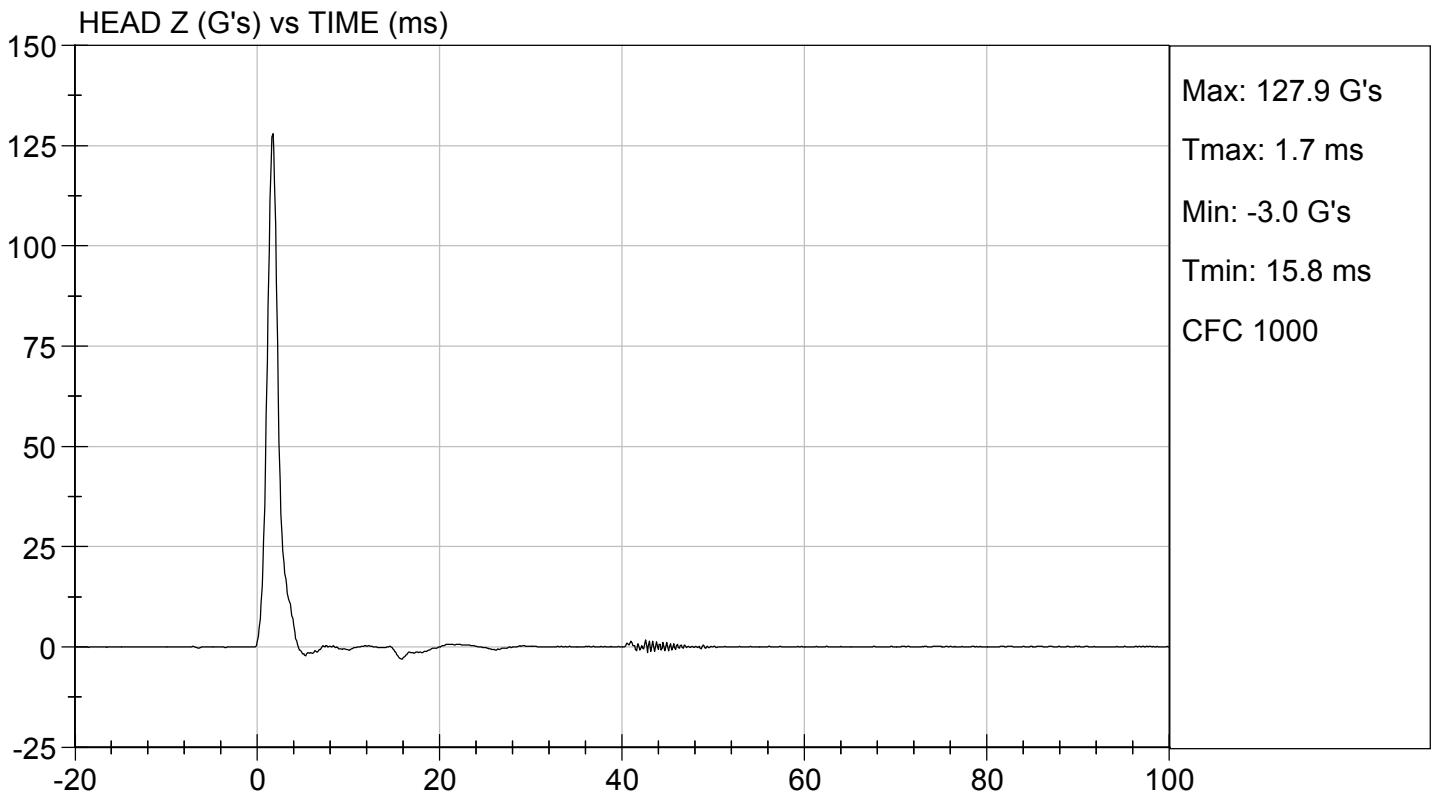
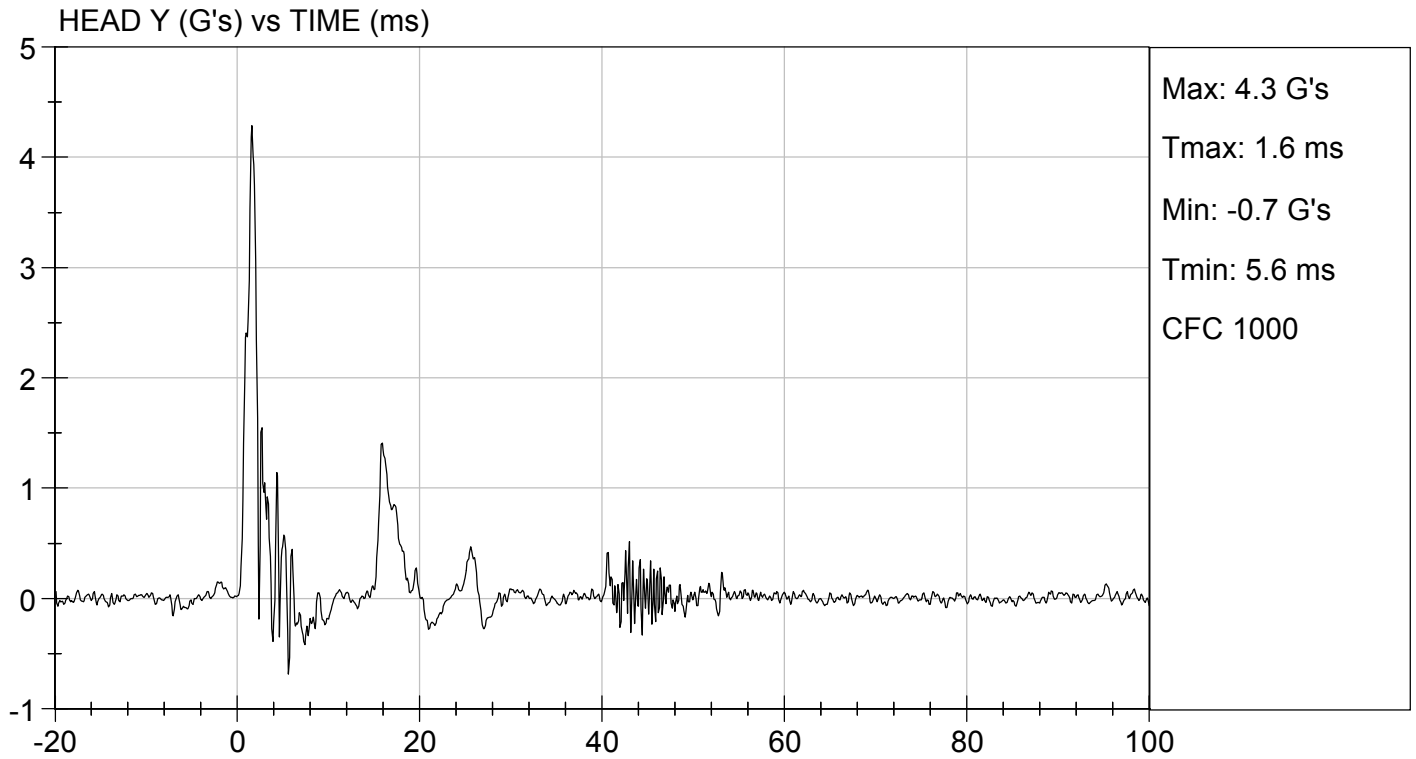
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Peak Resultant Acceleration	G's	225 to 275	270	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	4.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

  
 Laboratory Technician

11/16/2017  
 Test Date

  
 Approved By





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

**ATD Serial No:** 351

**Test I.D:** D173342

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	25.63	Pass
	20 ms	G's	17.60 to 22.60	21.18	Pass
	30 ms	G's	12.50 to 18.50	15.41	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	15.3	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	34.9	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	76.9	Pass
	Time	ms	57.0 to 64.0	60.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	121.4	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	91.9	Pass
	Time	ms	47.0 to 58.0	48.6	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.0	Pass
<b>Overall Test Results</b>					<b>Pass</b>

*Emily Fliess*

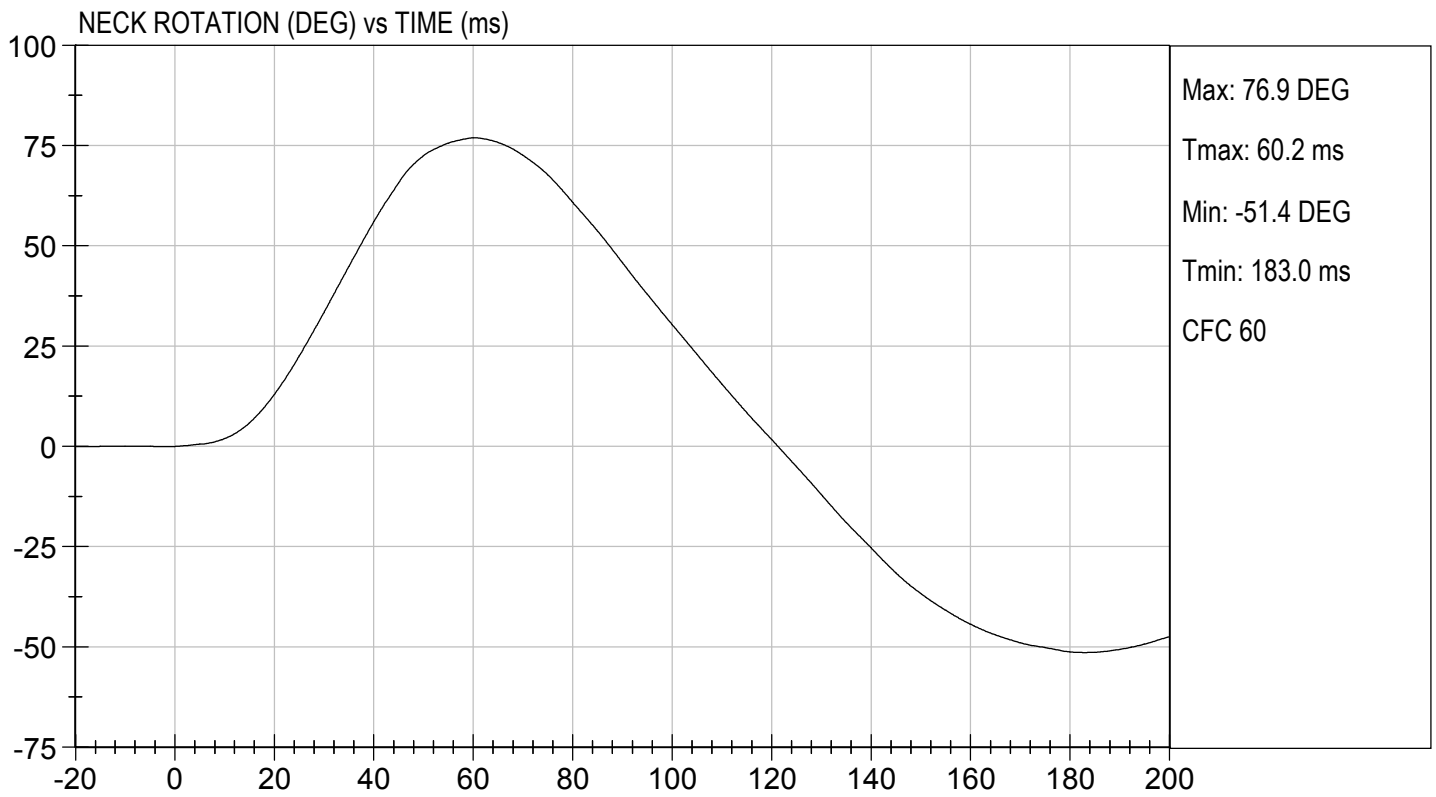
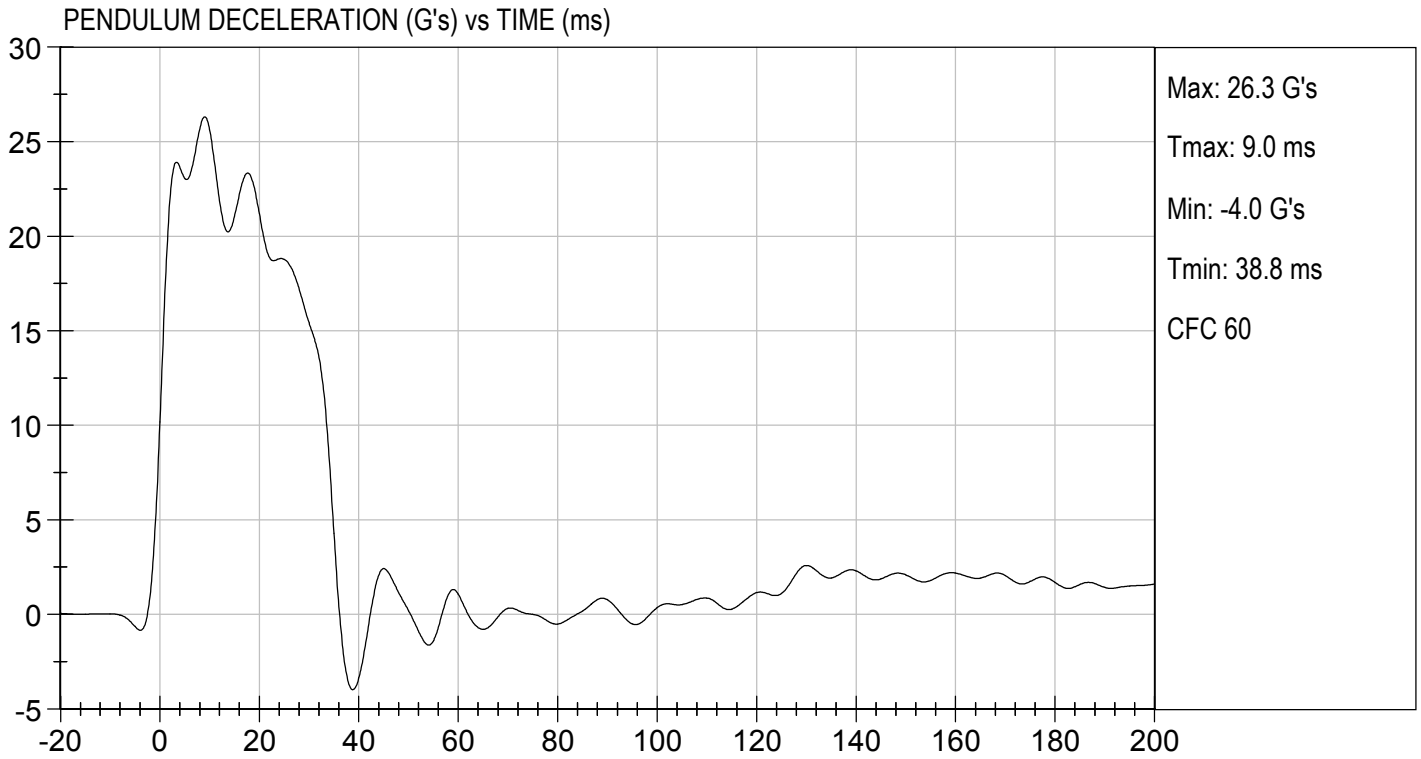
Laboratory Technician

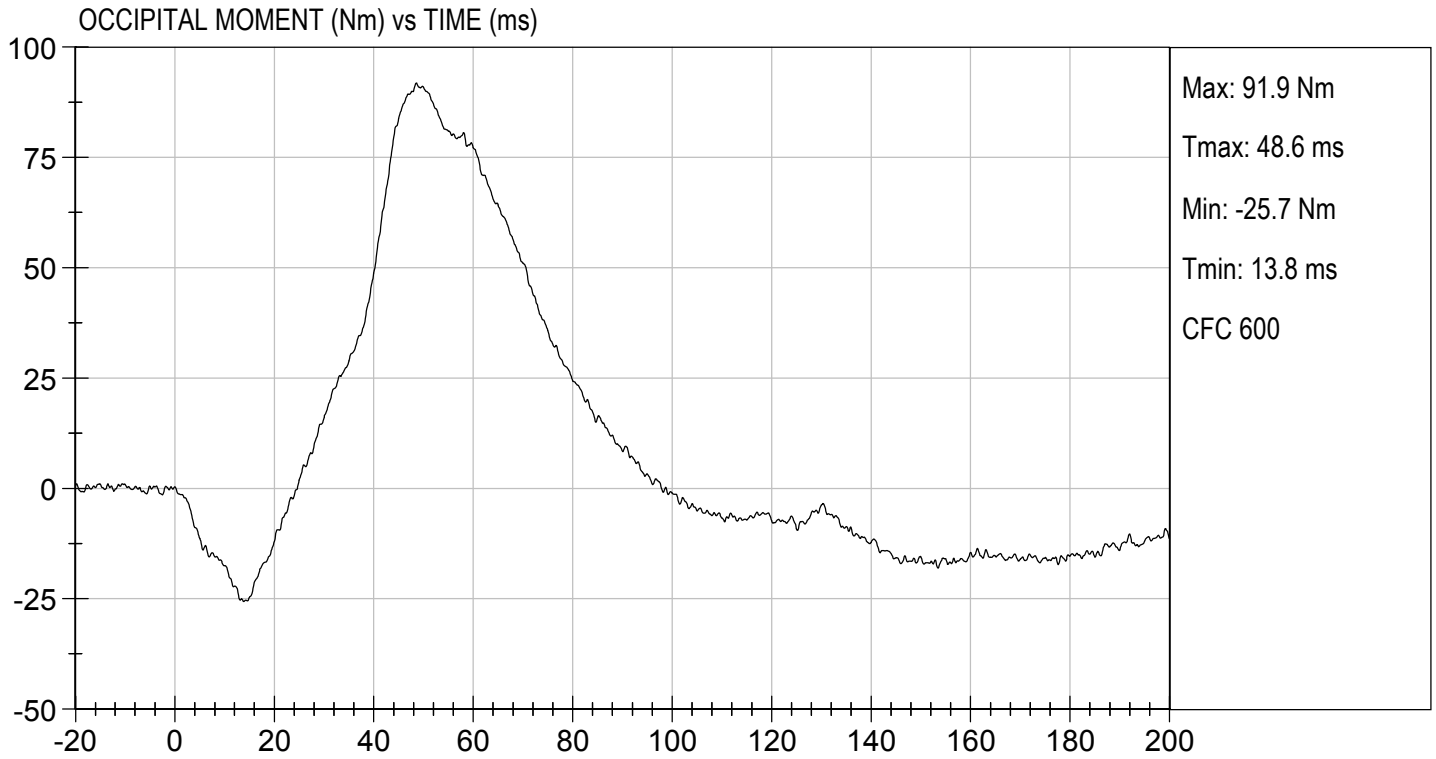
11/17/2017

Test Date

*Robert Schaub*

Approved By





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

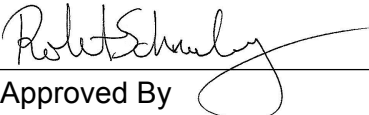
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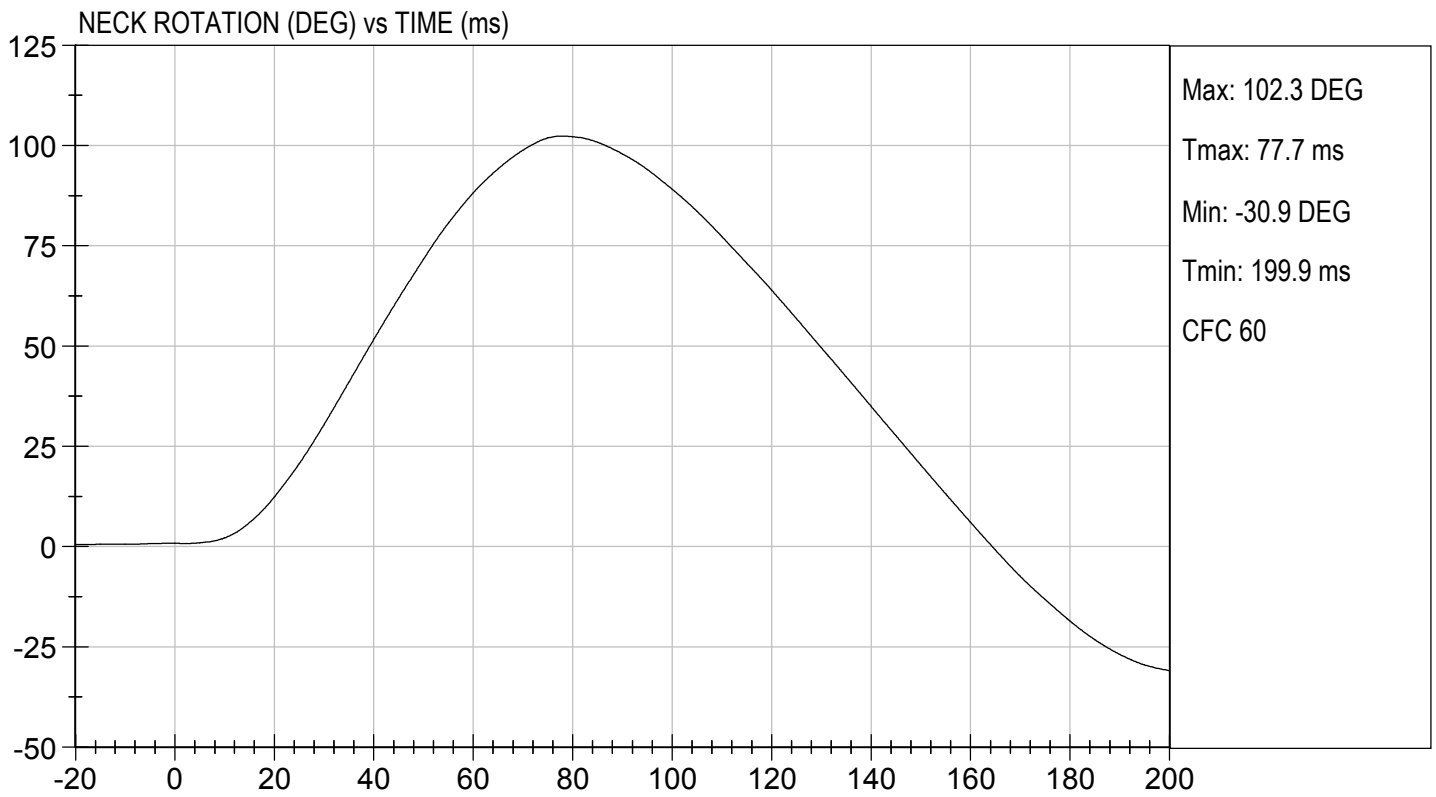
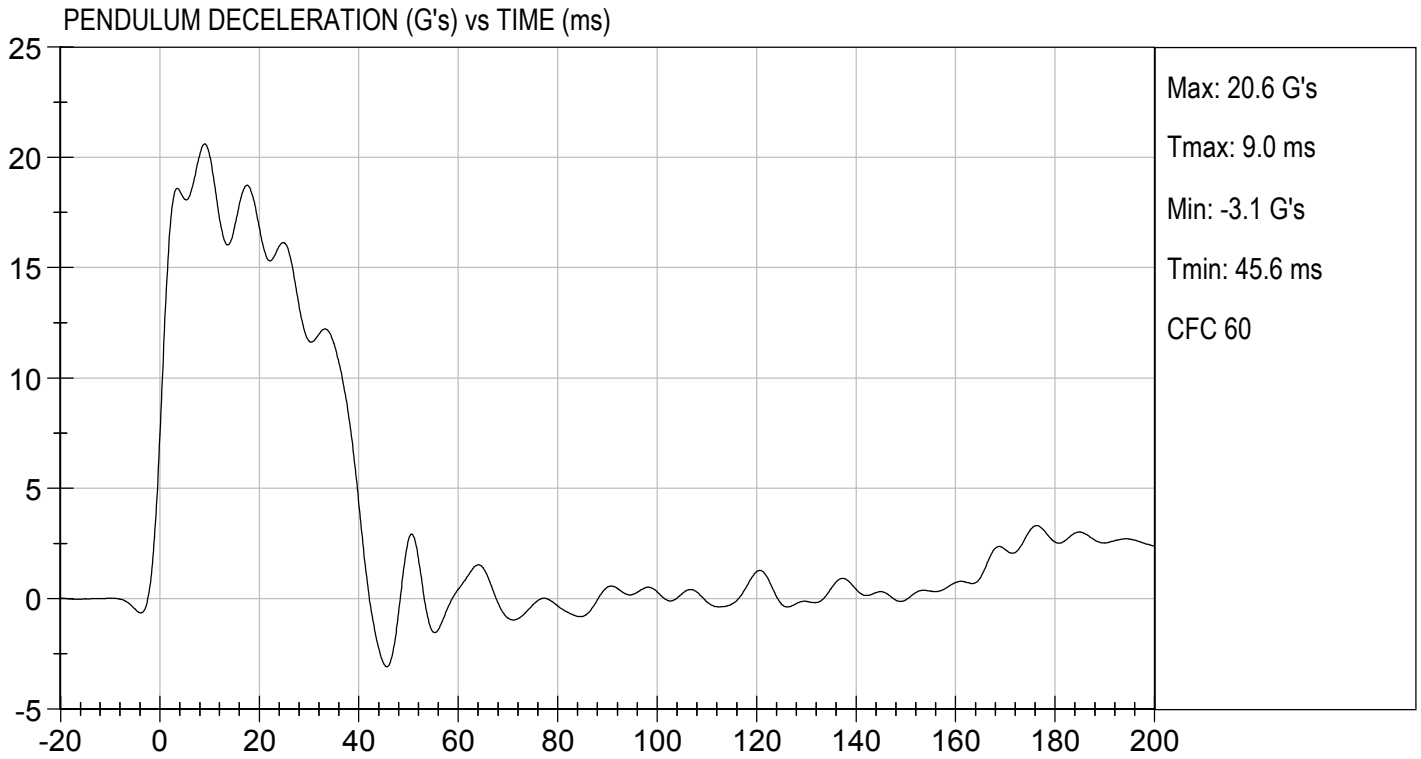
Test I.D.: D173343

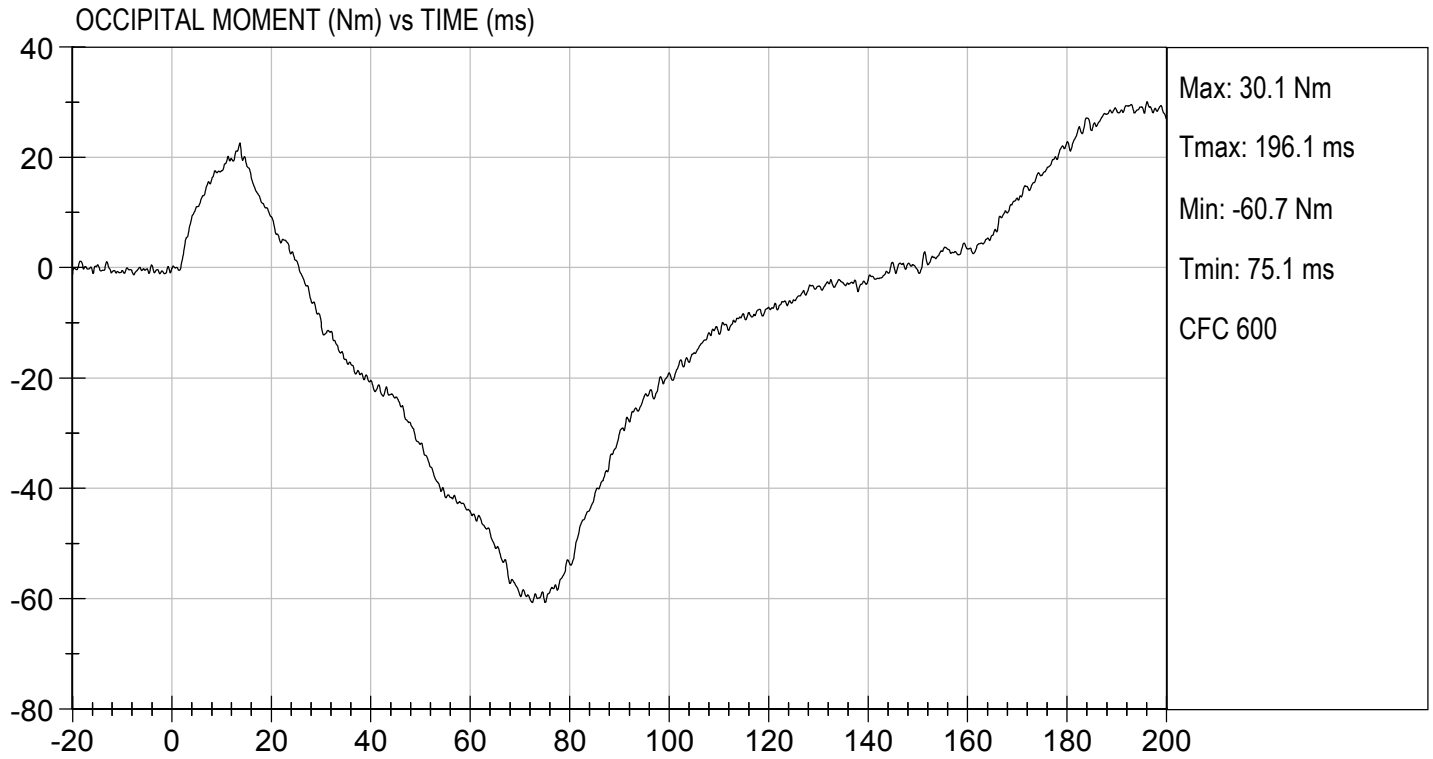
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.95 to 6.19	5.98	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	20.10	Pass
	20 ms	G's	14.00 to 19.00	16.80	Pass
	30 ms	G's	11.00 to 16.00	11.67	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	39.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	102.3	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	164.5	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-60.7	Pass
	Time	ms	65.0 to 79.0	75.1	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.7	Pass
Overall Test Results					Pass

  
 Laboratory Technician

11/17/2017  
 Test Date

  
 Approved By



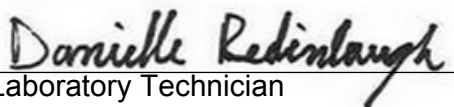


**MGA RESEARCH CORPORATION**  
**THORAX IMPACT**  
**HYBRID III 50TH PERCENTILE MALE**

**ATD Serial No:** 351

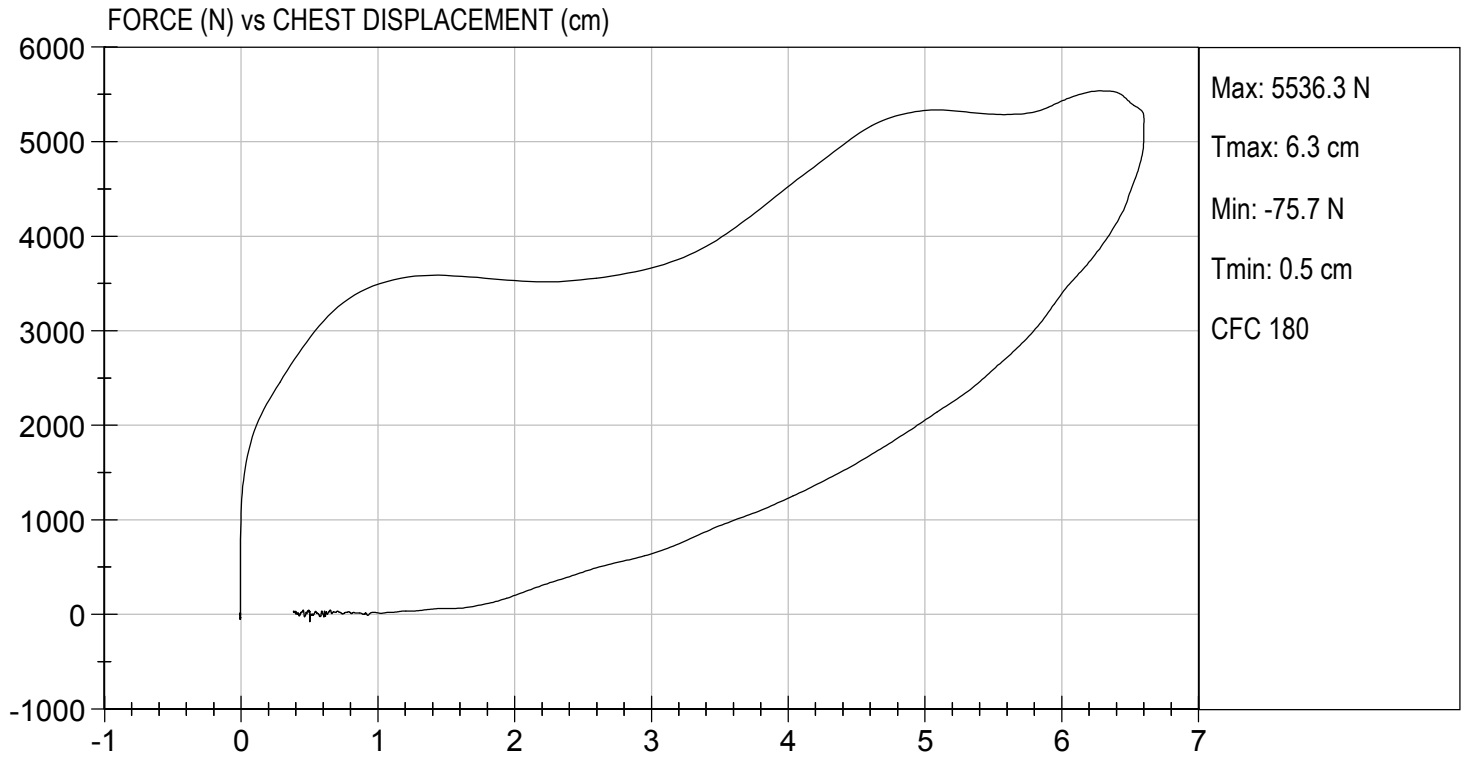
**Test I.D:** D173344

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	33	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,536	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.60	Pass
Internal Hysteresis	%	69 to 85	71	Pass
<b>Overall Test Results</b>				<b>Pass</b>

  
 Laboratory Technician

11/17/2017  
 Test Date

  
 Approved By



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

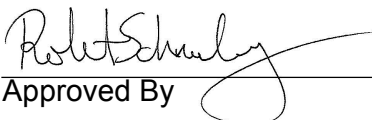
**ATD Serial No:** 531

**Test I.D:** D173345

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Probe Velocity	m/s	2.07 to 2.13	2.07	Pass
Peak Probe Force	N	4715 to 5782	5,583	Pass
Overall Test Results				Pass

  
 Laboratory Technician

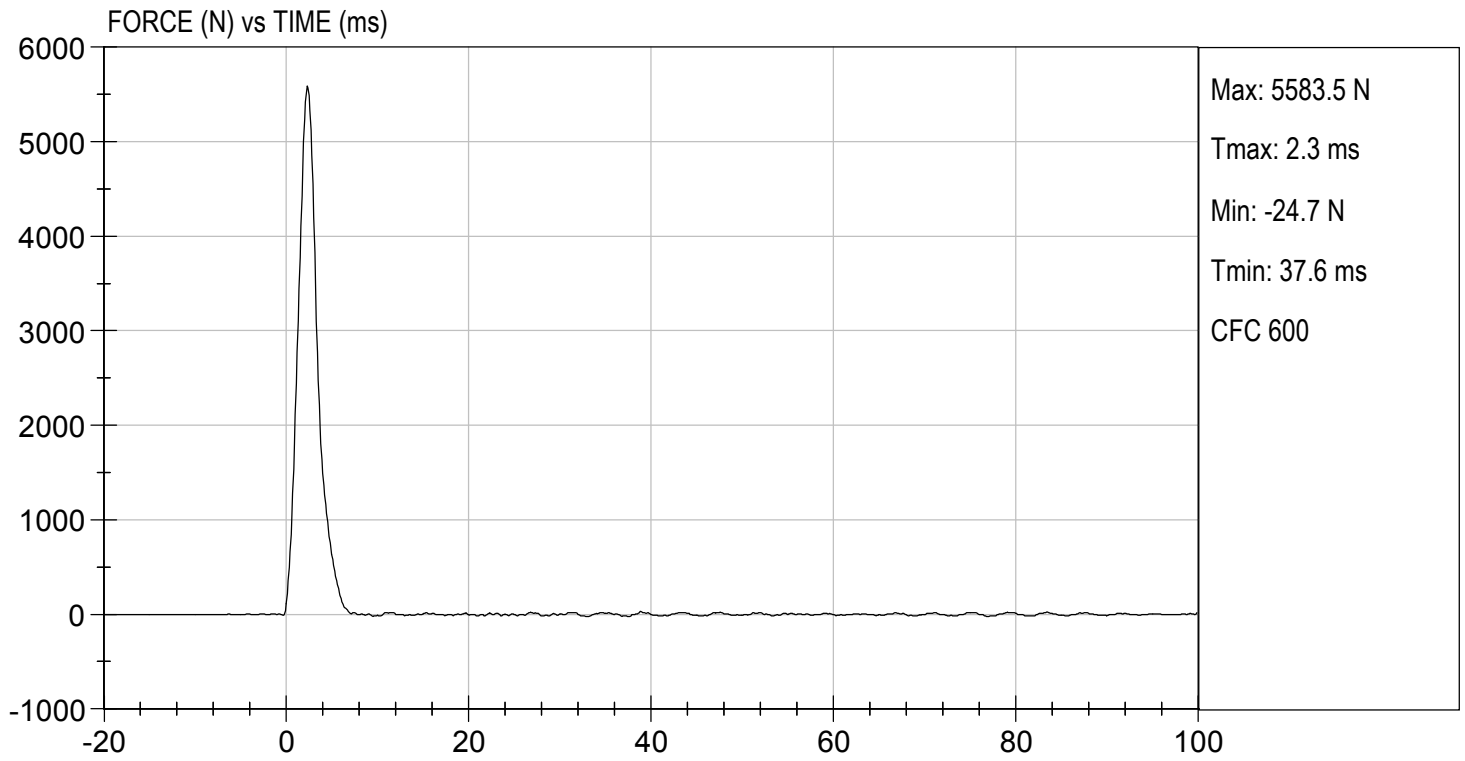
11/16/2017  
 Test Date

  
 Approved By



TEST DESC: RIGHT KNEE  
VELOCITY: 6.78 ft/s, 2.07 m/s

TEST DATE: 11/16/2017  
TEST #: D173345



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

**ATD Serial No:** 531

**Test I.D:** D173346

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	5,061	Pass
Overall Test Results				Pass

  
 Laboratory Technician

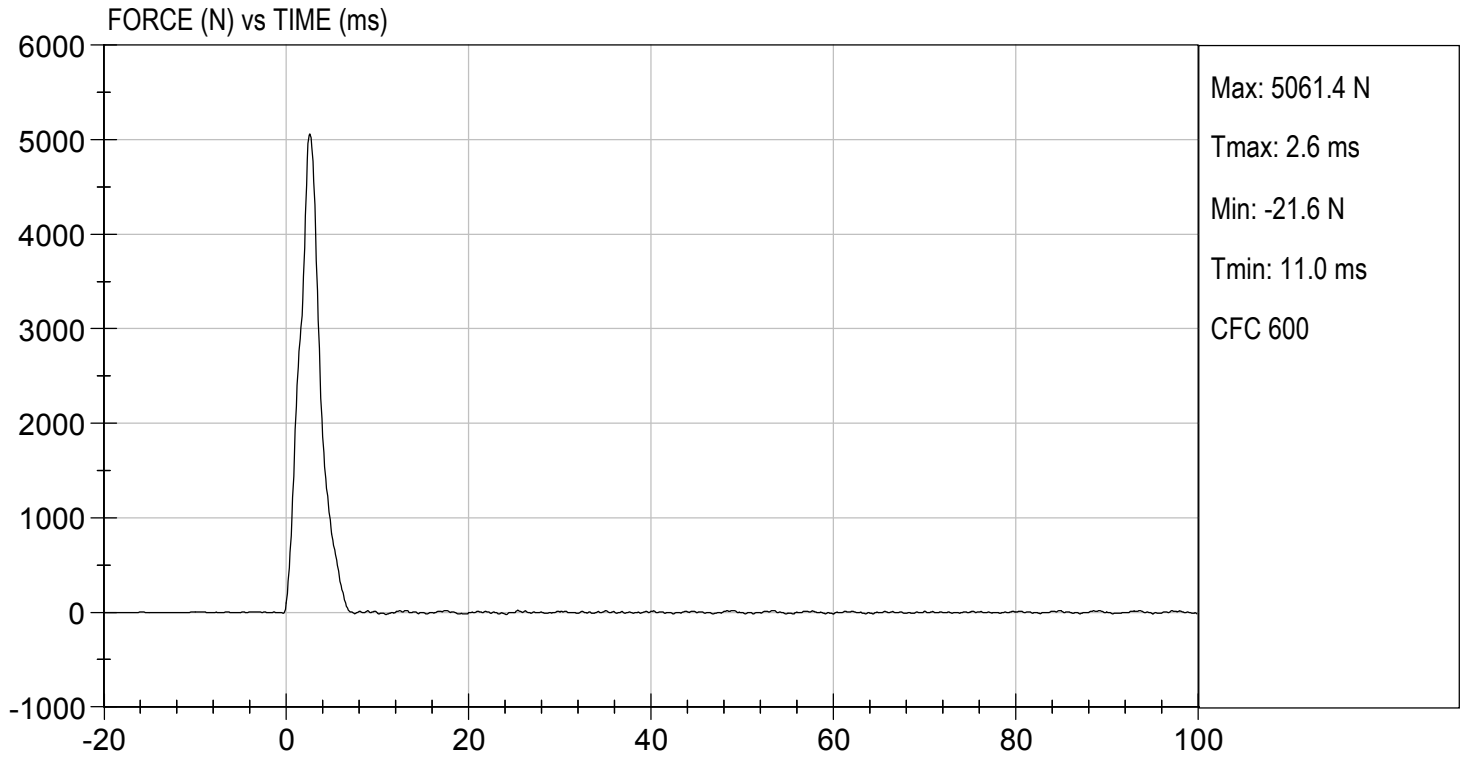
11/16/2017  
 Test Date

  
 Approved By



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

TEST DATE: 11/16/2017  
TEST #: D173346



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

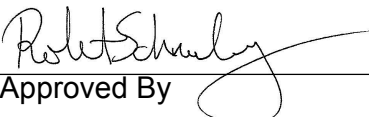
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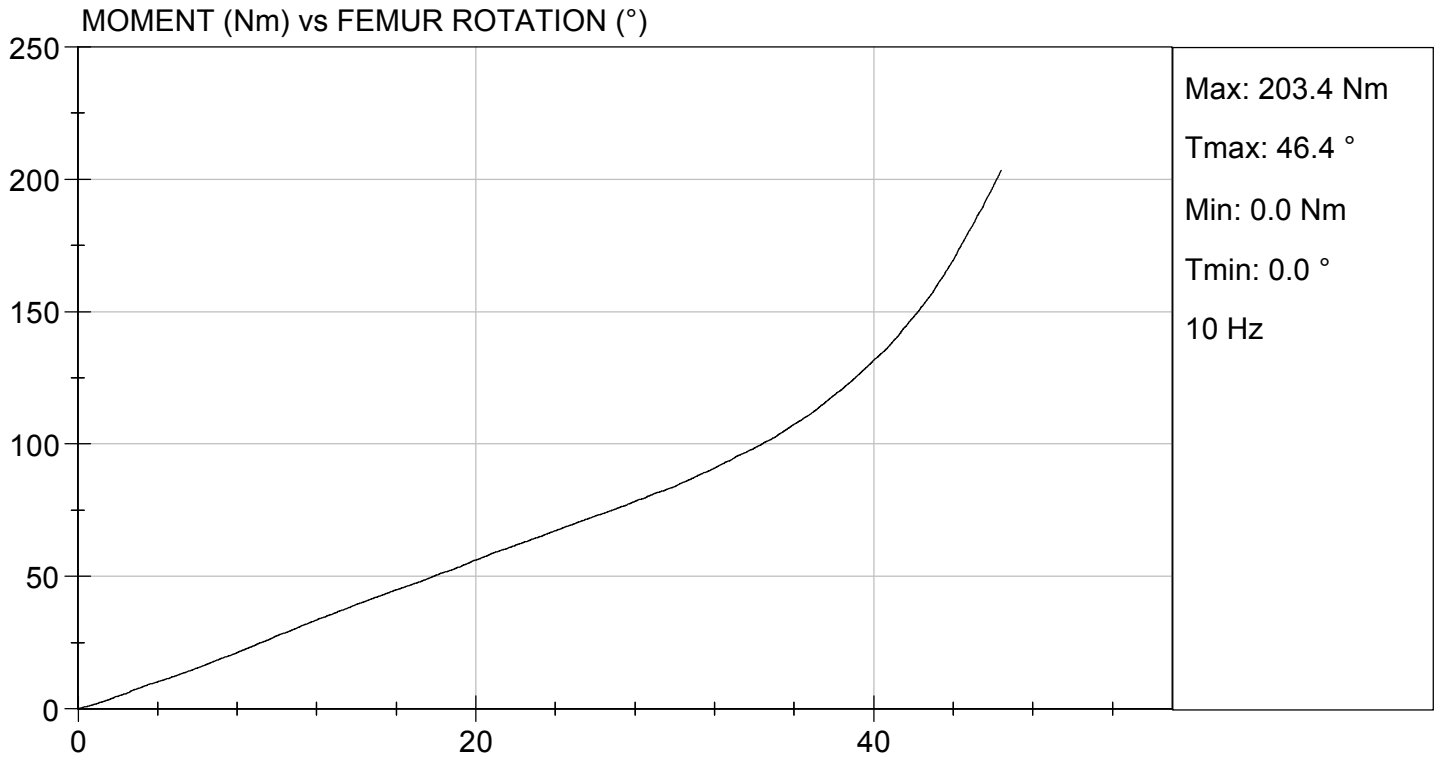
**Test I.D.:** D173340

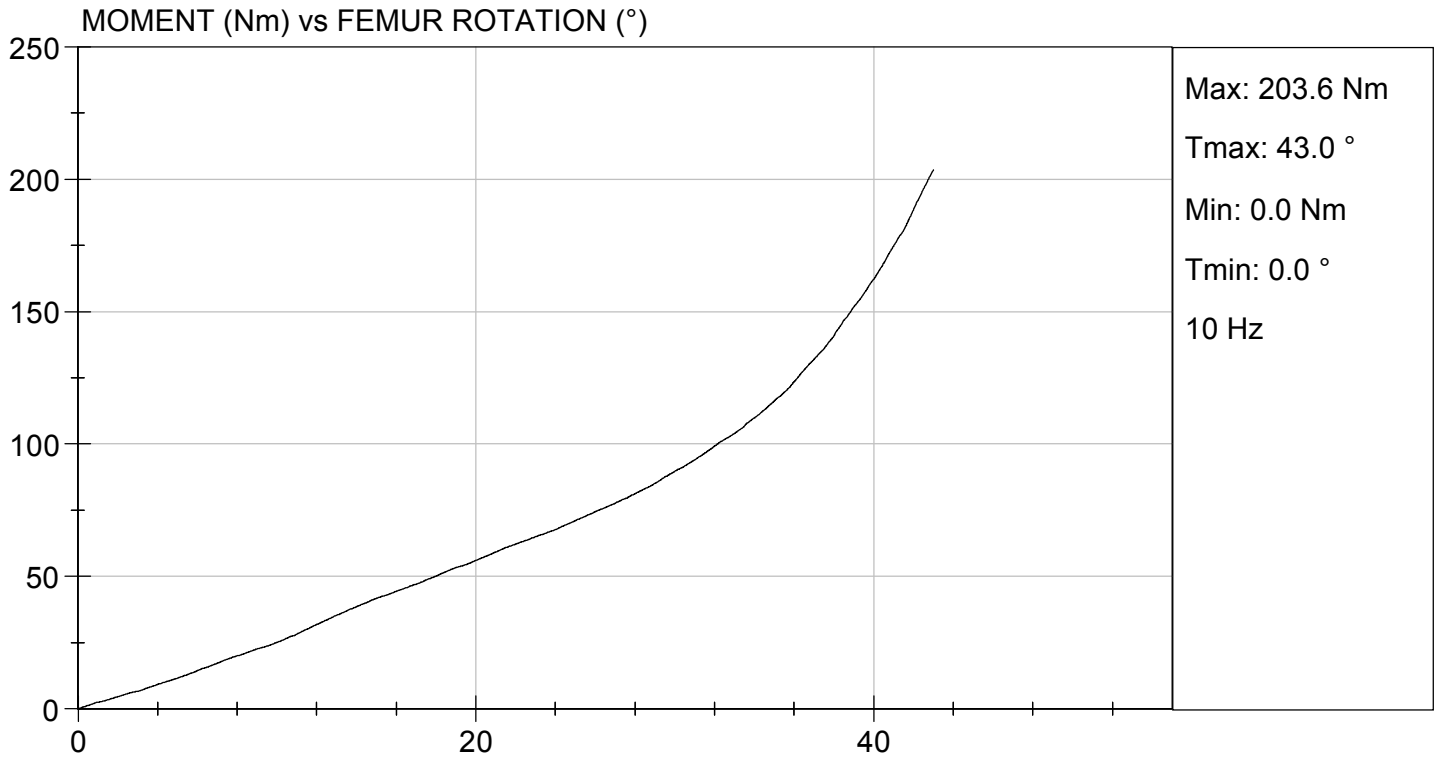
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.9	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	34	34	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.5	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	84.0	89.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	46.4	43.0	Pass
Overall Test Results					Pass

  
 Laboratory Technician

11/16/2017  
 Test Date

  
 Approved By





**Hybrid III, 5<sup>th</sup> External Measurements**  
**SN: 138**

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	785.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	456.8
C	H-POINT HEIGHT	Reference	81.3-86.3	84.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	146.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	78.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	127.5
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	249.6
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
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	280.2
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	201.9
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	526.7
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.3
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	398.0

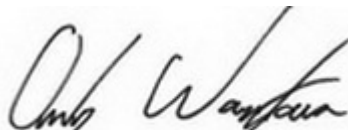
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	430.5
HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	184.6
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	221.0
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	472.6
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.9
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	184.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	307.4
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	360.5
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	85.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	546.2
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	875.1
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	785.4
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.4
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.1

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

**ATD Serial No:** 138

**Test ID:** D173001

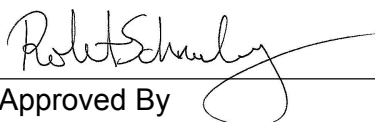
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Peak Resultant Acceleration	G's	250 to 300	251	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-2.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
<b>Overall Test Results</b>				<b>Pass</b>



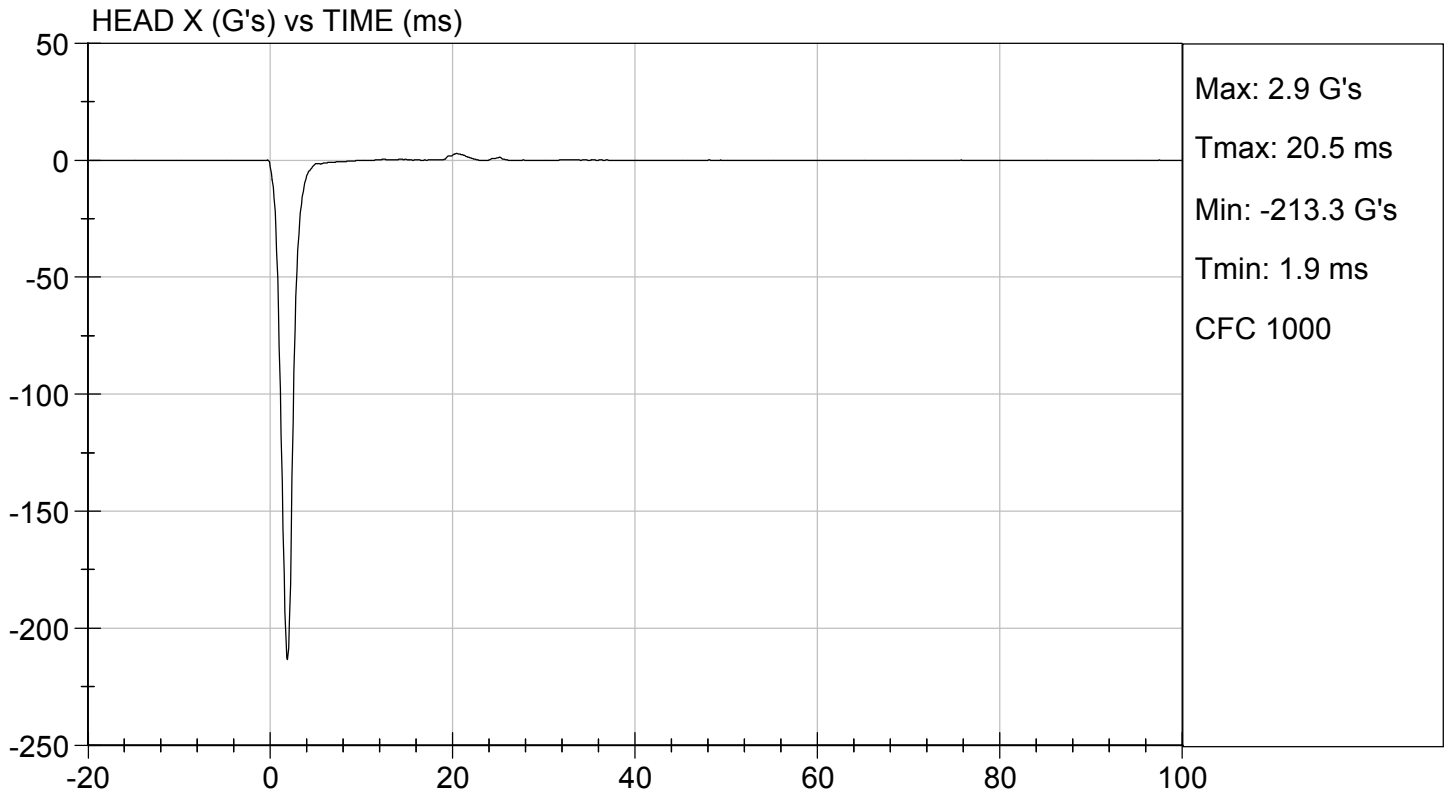
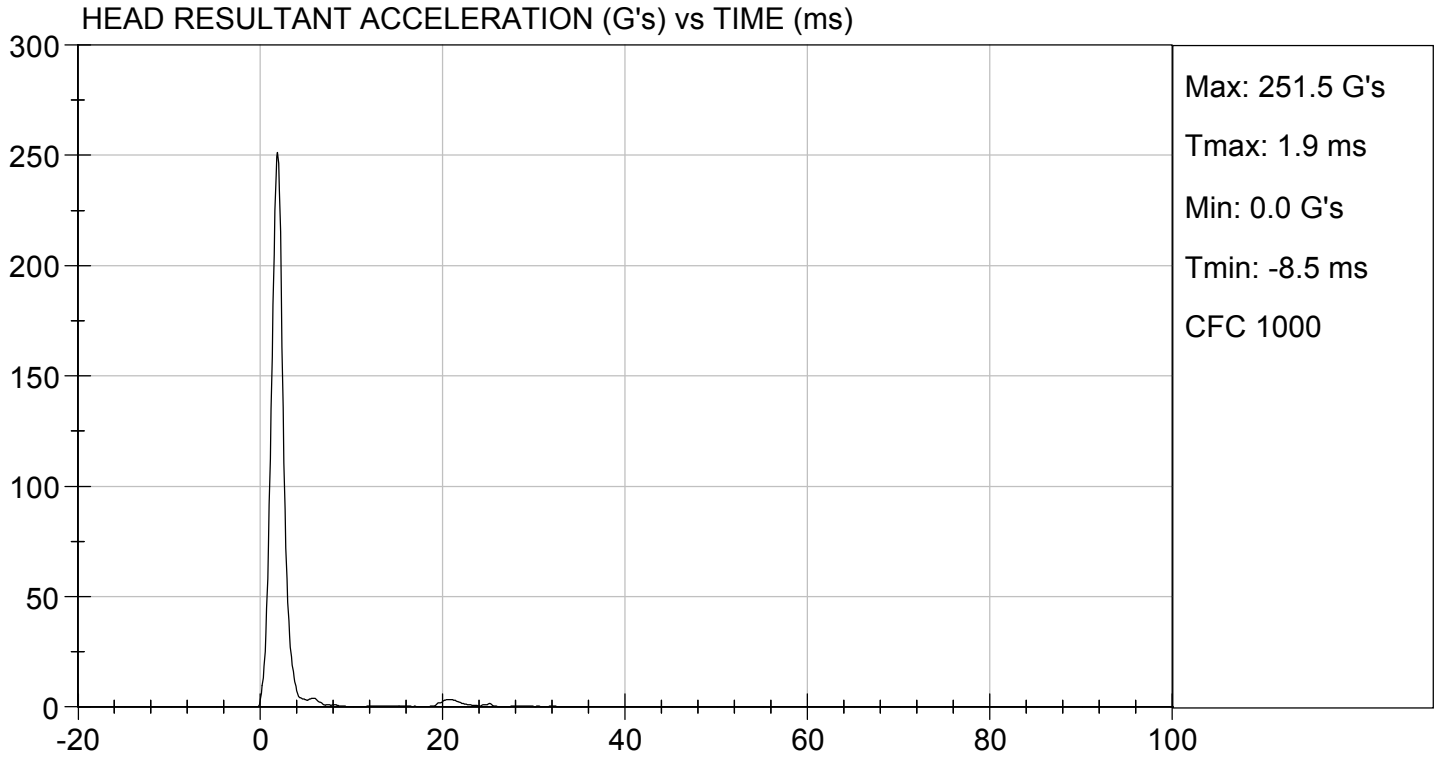
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Laboratory Technician

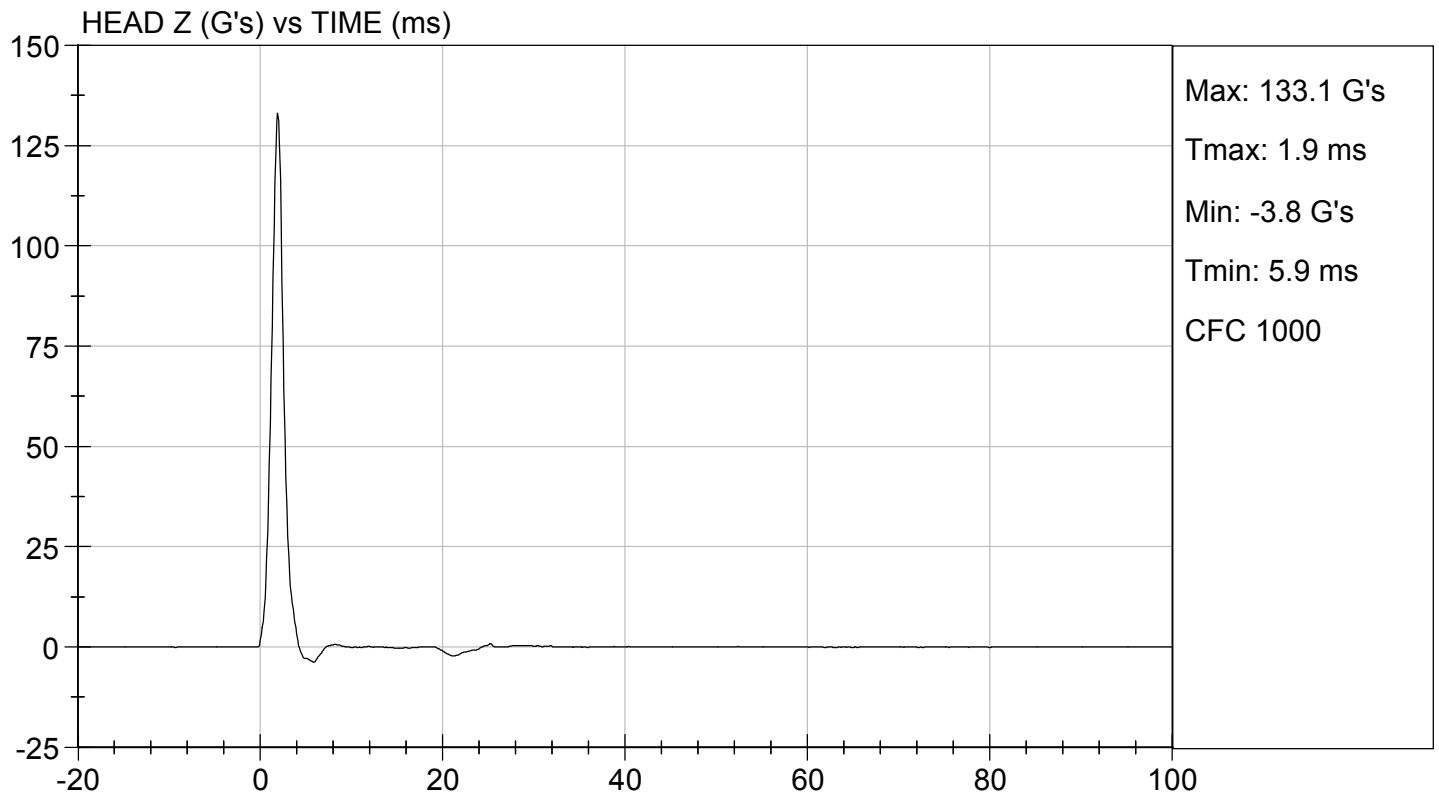
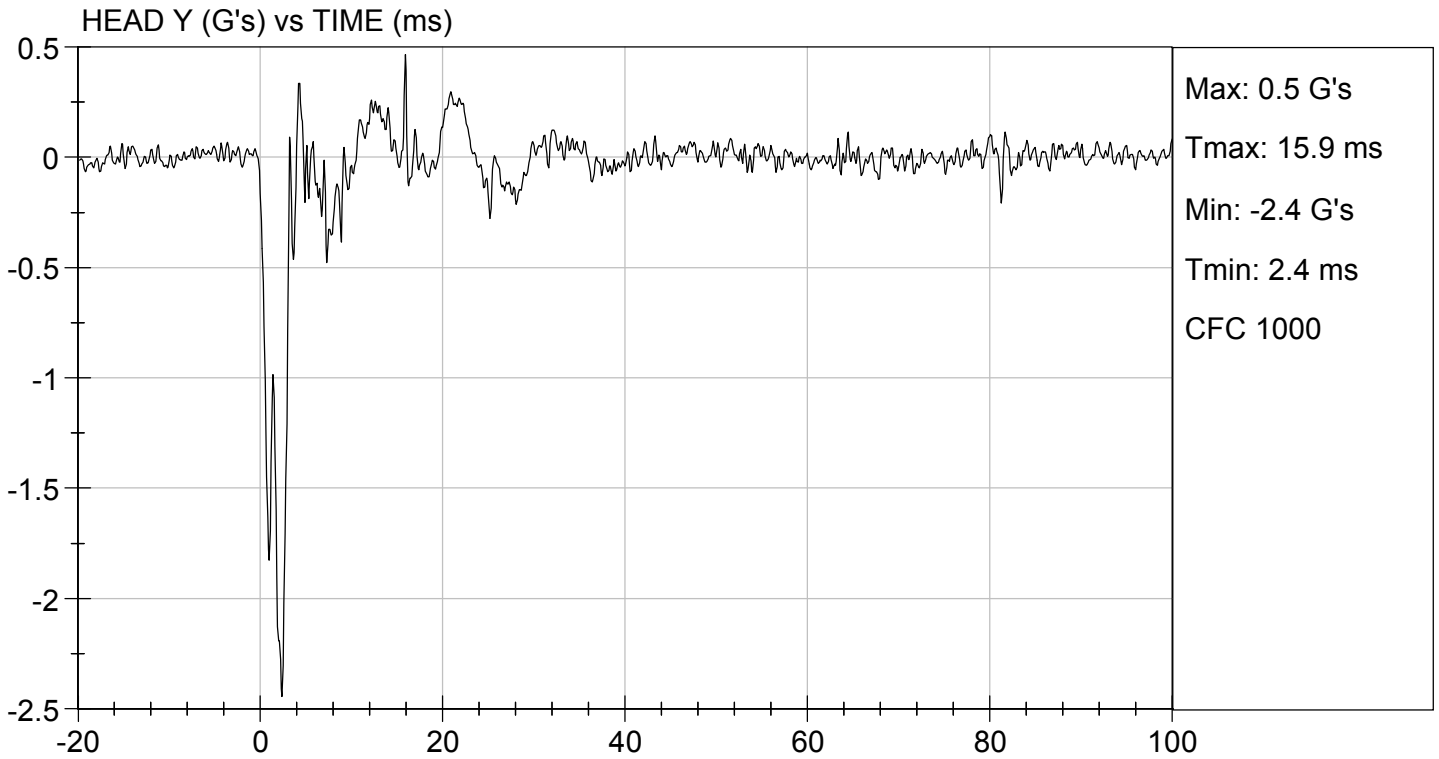
10/19/2017

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Test Date



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Approved By





**MGA RESEARCH CORPORATION**

**NECK FLEXION TEST**

**HYBRID III 5TH PERCENTILE**

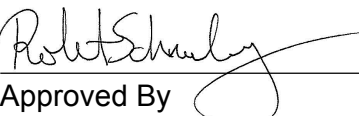
ATD Serial No: 138

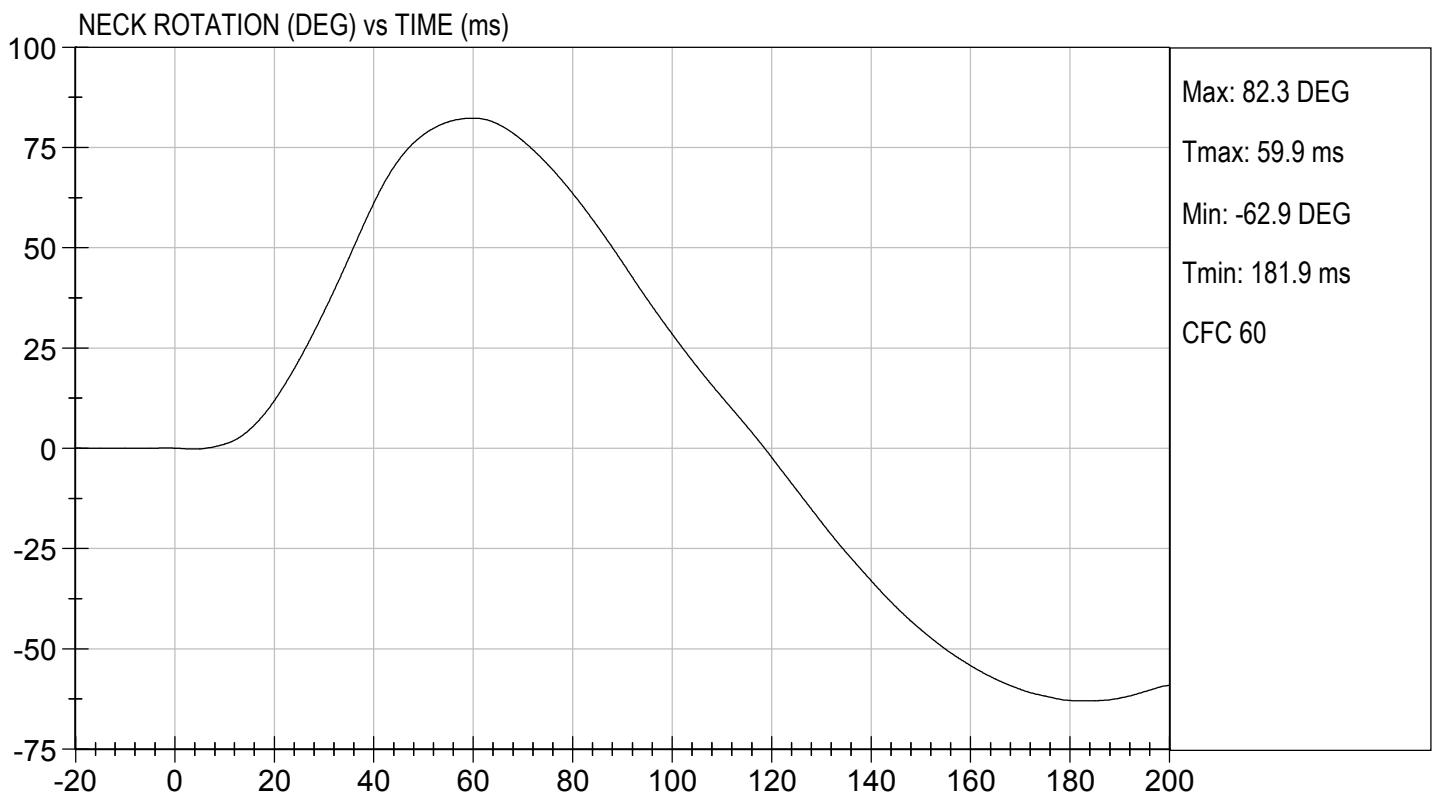
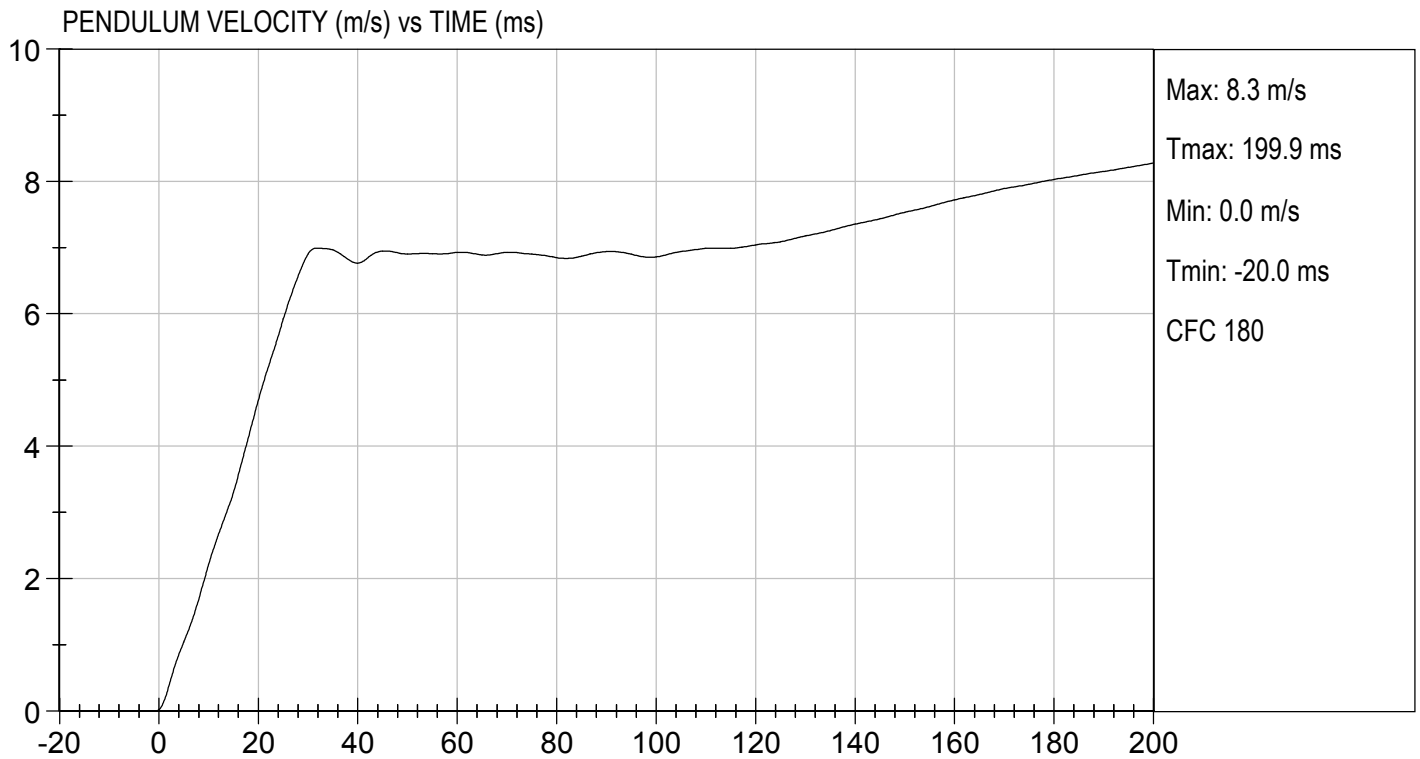
Test I.D.: D173002

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	37	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	4.7	Pass
	30 ms	m/s	5.8 to 7.0	6.9	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	72	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	84	Pass
Overall Results					Pass

  
 \_\_\_\_\_  
 Laboratory Technician

10/19/2017  
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 Test Date

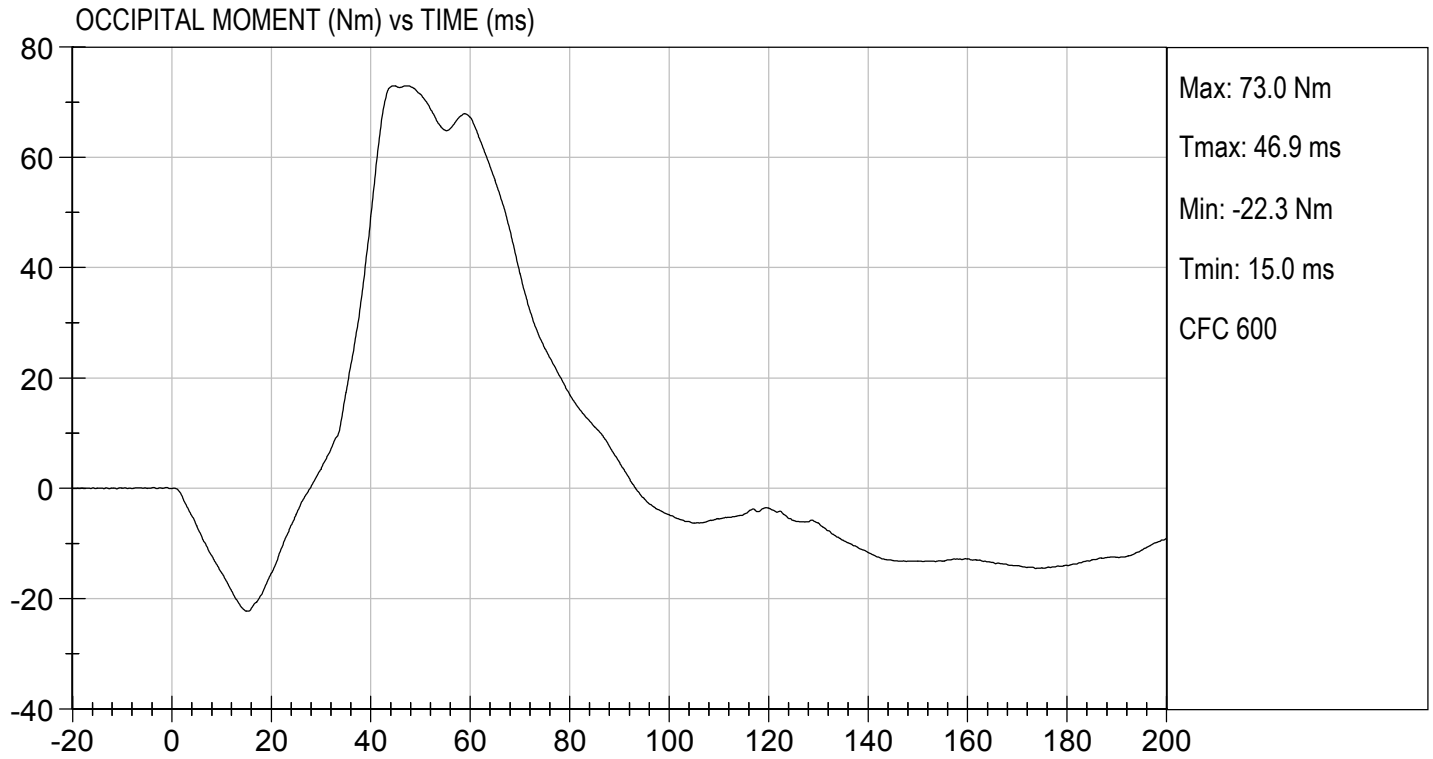
  
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 Approved By





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

TEST DATE: 10/19/2017  
TEST #: D173002

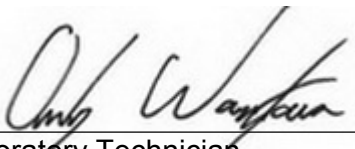


**MGA RESEARCH CORPORATION**  
**NECK EXTENSION TEST**  
**HYBRID III 5TH PERCENTILE**

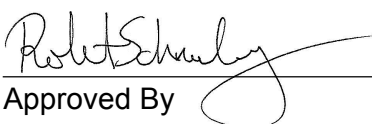
ATD Serial No: 138

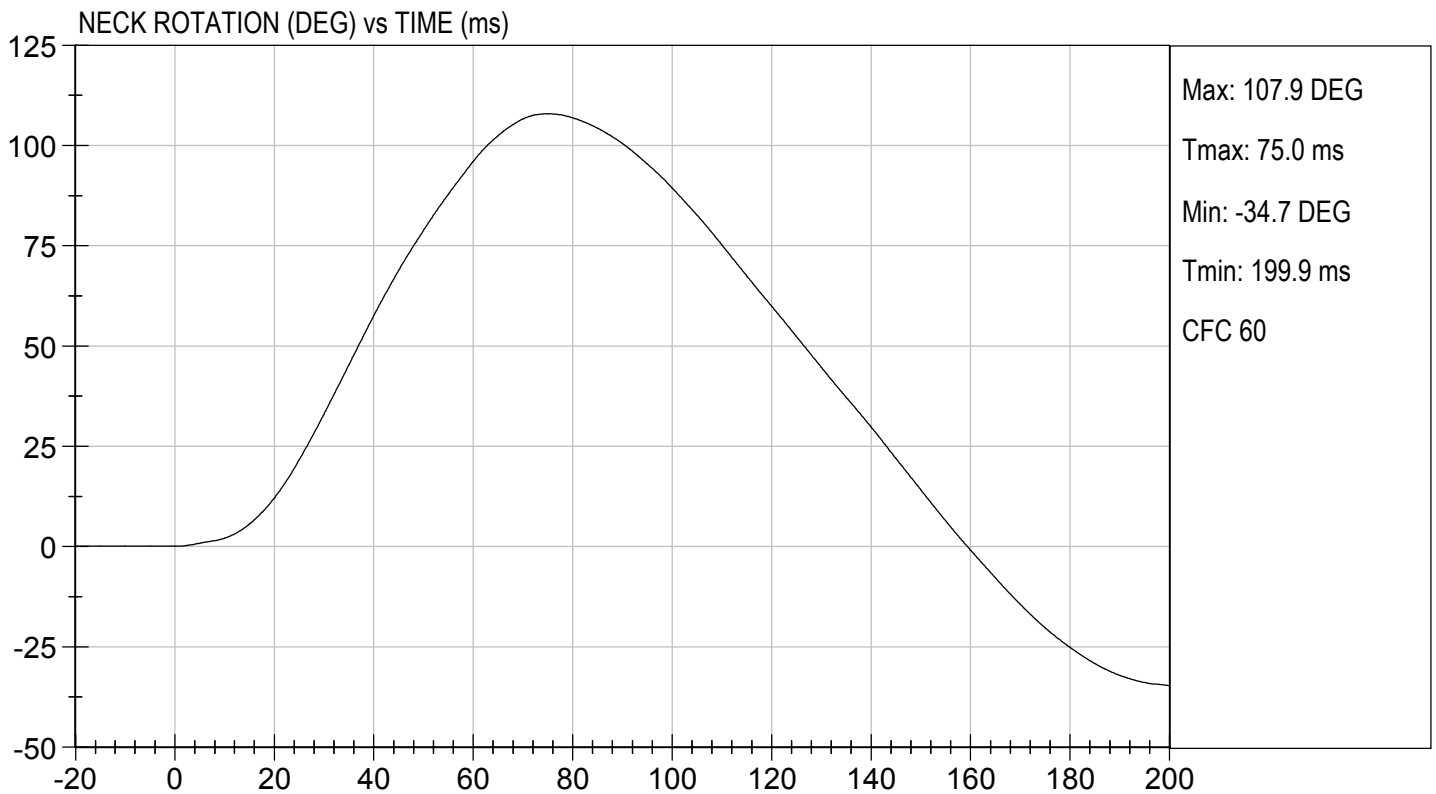
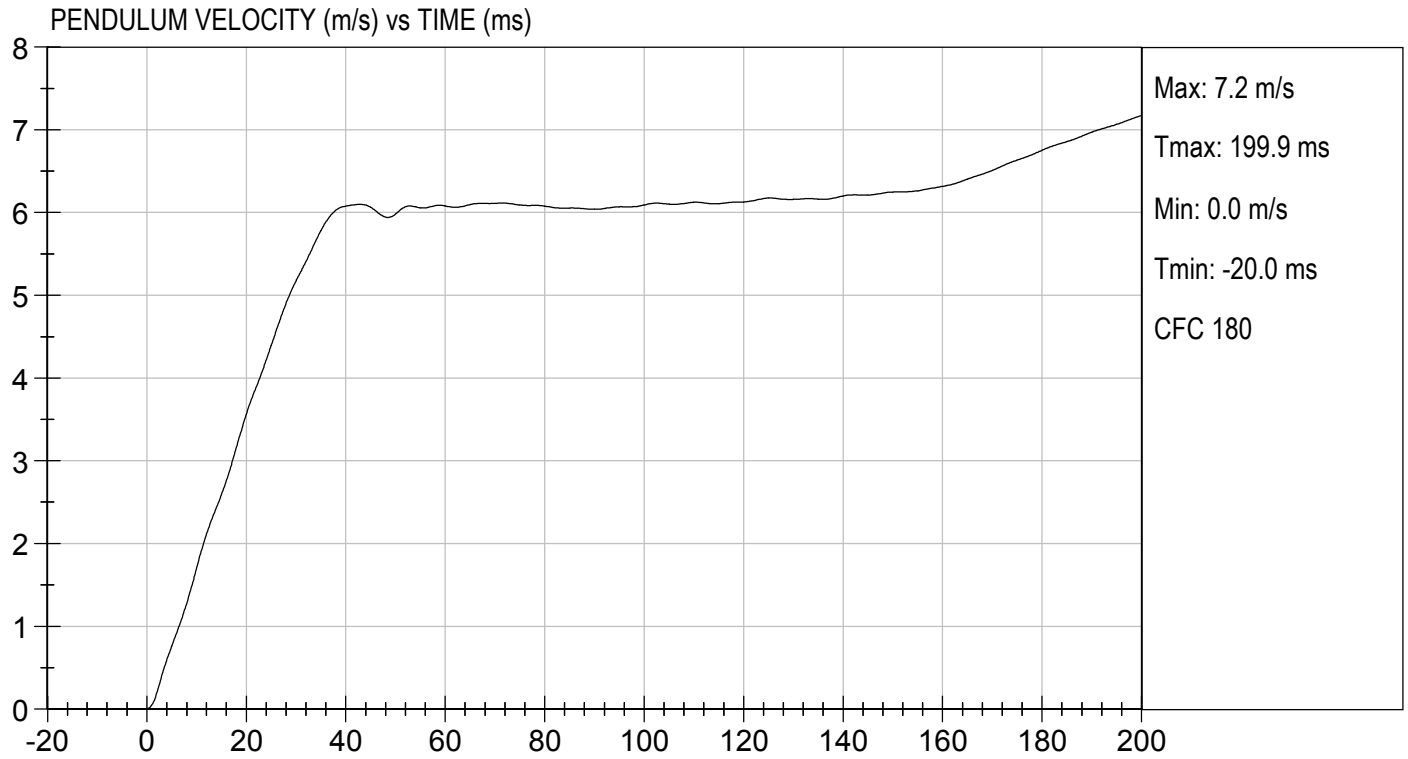
Test I.D: D173003

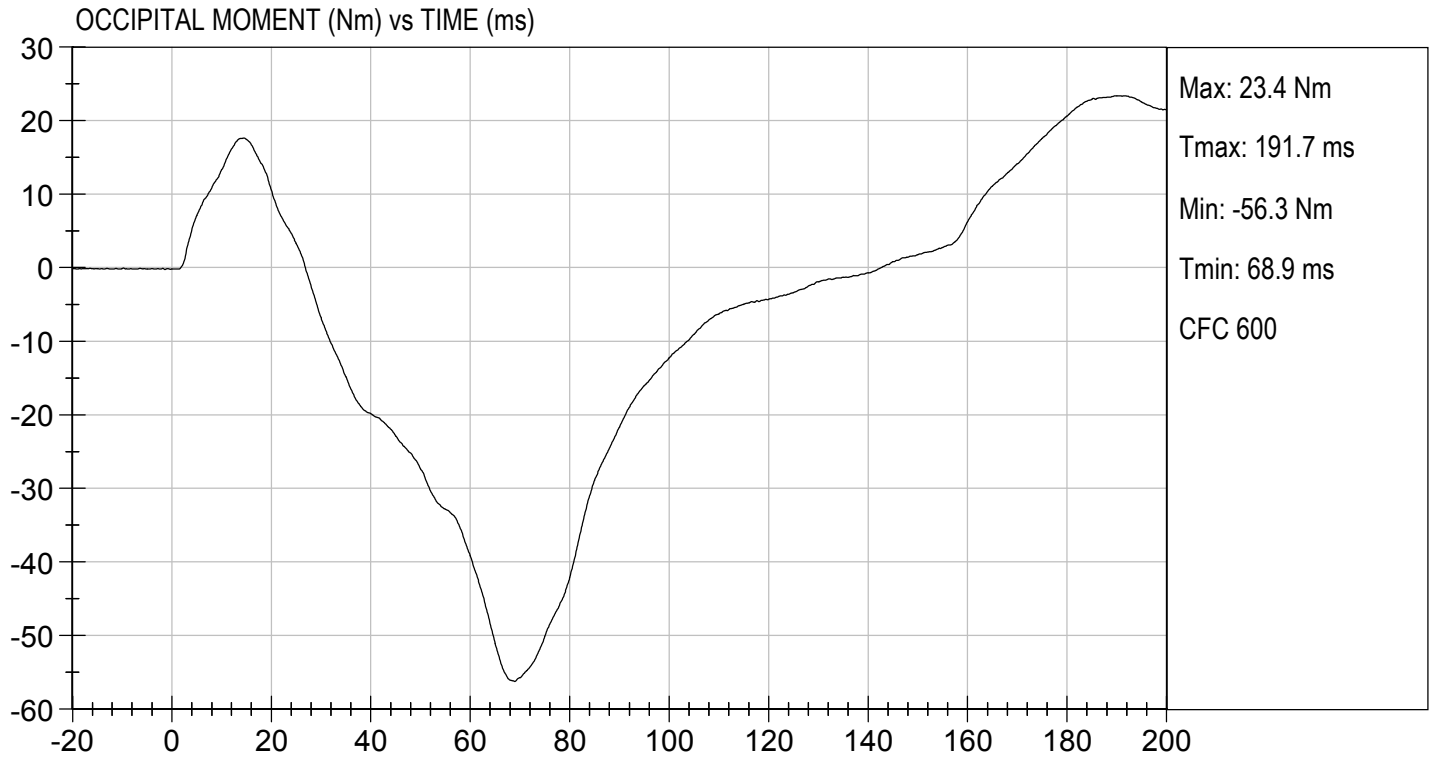
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	37	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
Overall Results					Pass

  
 Laboratory Technician

10/19/2017  
 Test Date

  
 Approved By



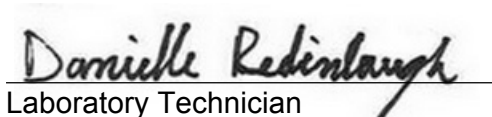


**MGA RESEARCH CORPORATION**  
**THORAX IMPACT**  
**HYBRID III 5TH PERCENTILE**


ATD Serial No: 138

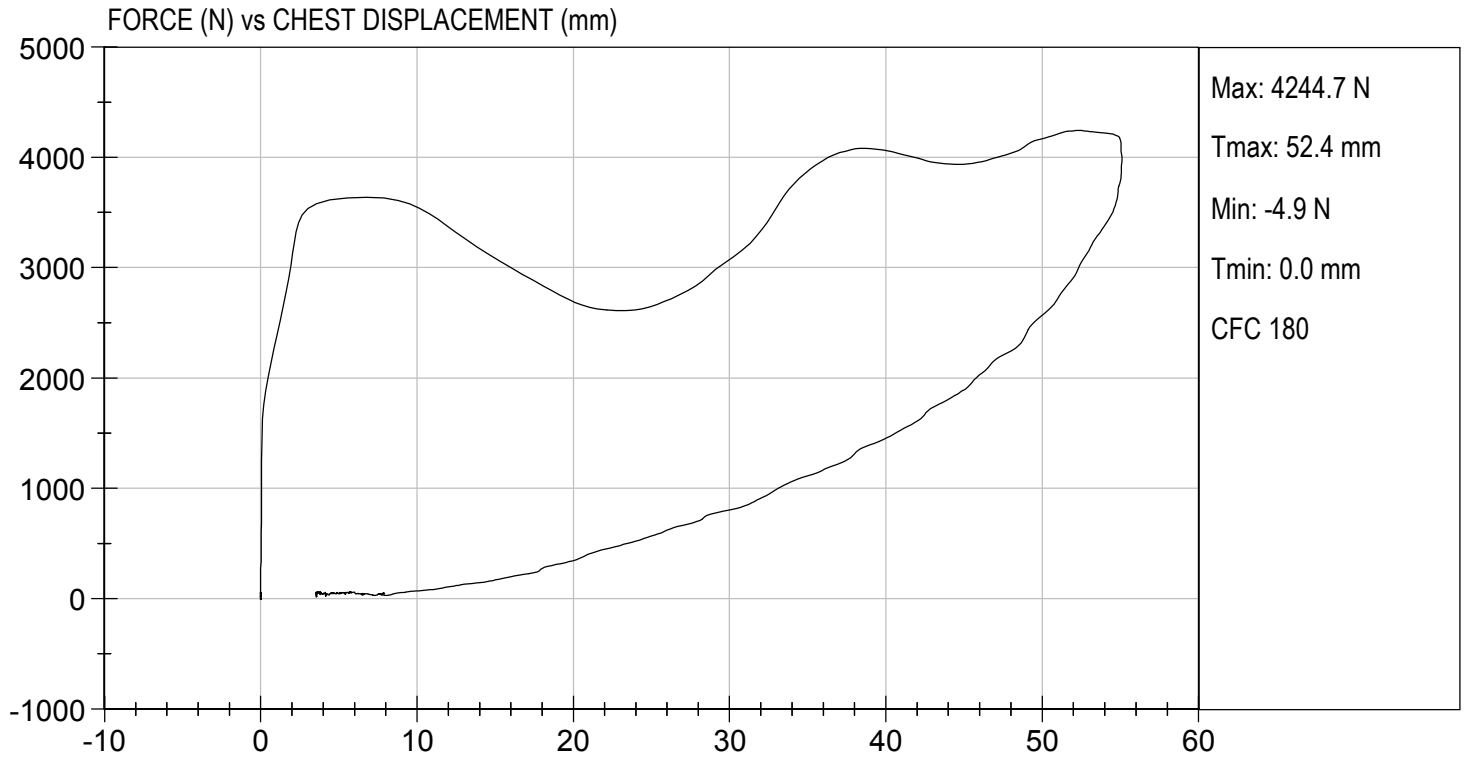
Test I.D: D173004

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	39	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	55	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4245	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4167	Pass
Overall Test Results				Pass

  
 Laboratory Technician

10/20/2017  
 Test Date

  
 Approved By



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

**ATD Serial No:** 138

**Test I.D:** D173005

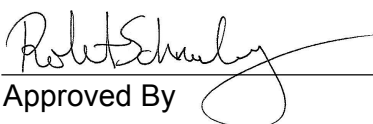
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3668	Pass
Overall Test Results				Pass



\_\_\_\_\_  
Laboratory Technician

10/19/2017

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Test Date

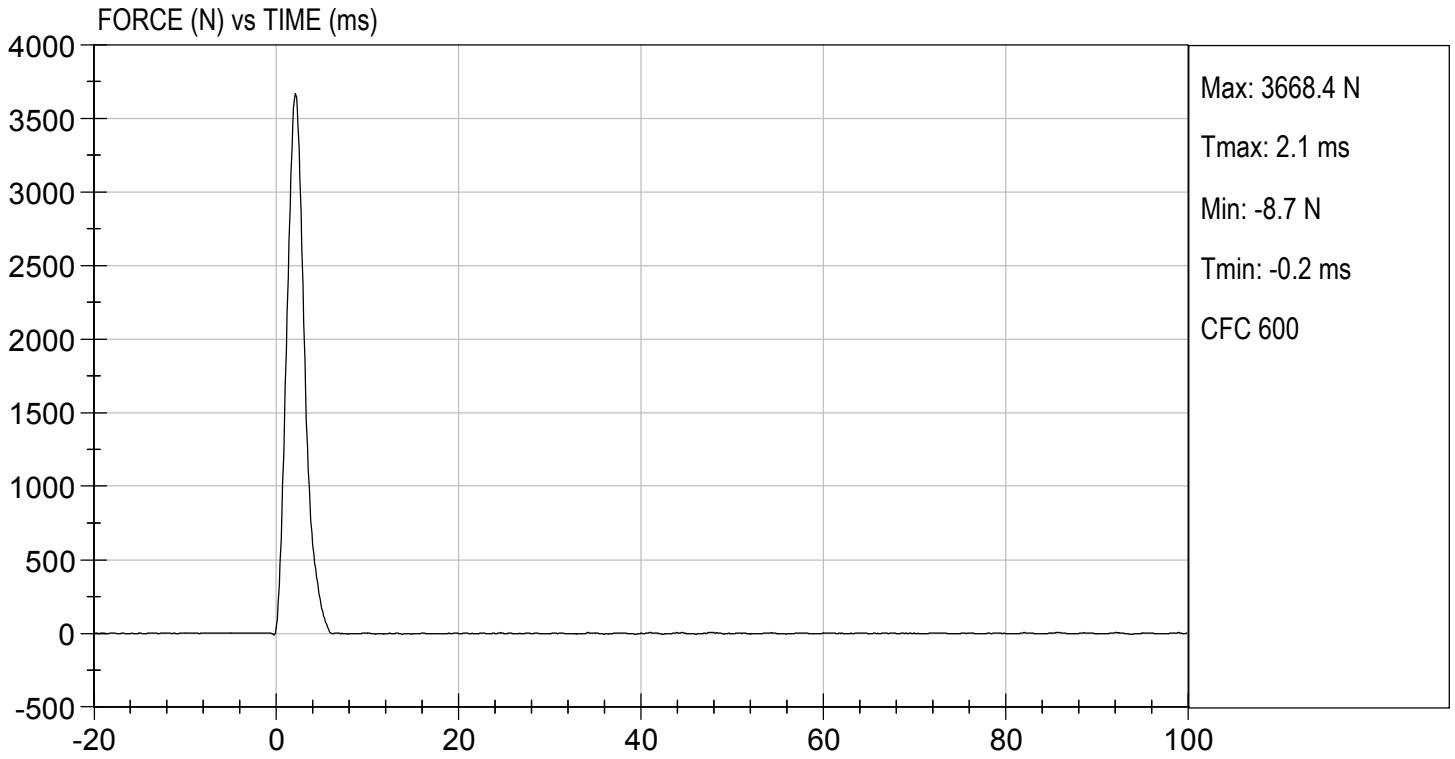


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Approved By



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

TEST DATE: 10/19/2017  
TEST #: D173005



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

**ATD Serial No:** 138

**Test I.D:** D173006

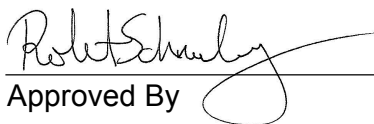
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3771	Pass
Overall Test Results				Pass



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 Laboratory Technician

10/19/2017

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 Test Date

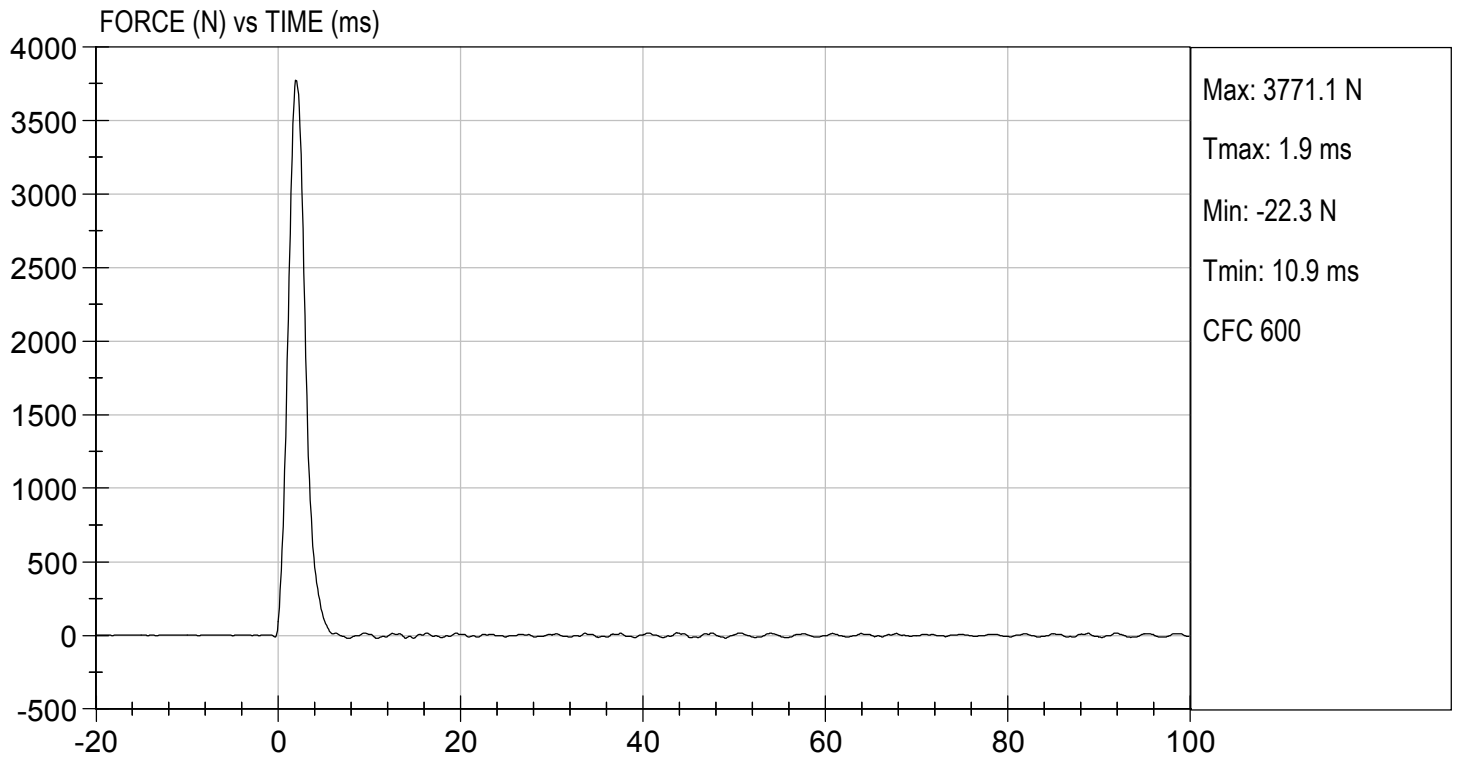


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 Approved By



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

TEST DATE: 10/19/2017  
TEST #: D173006



**MGA RESEARCH CORPORATION**  
**TORSO FLEXION TEST**  
**HYBRID III 5TH PERCENTILE**

**ATD Serial No:** 138

**Test I.D:** D173007

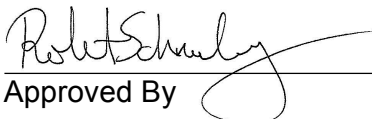
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	377	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
<b>Overall Result</b>				<b>Pass</b>



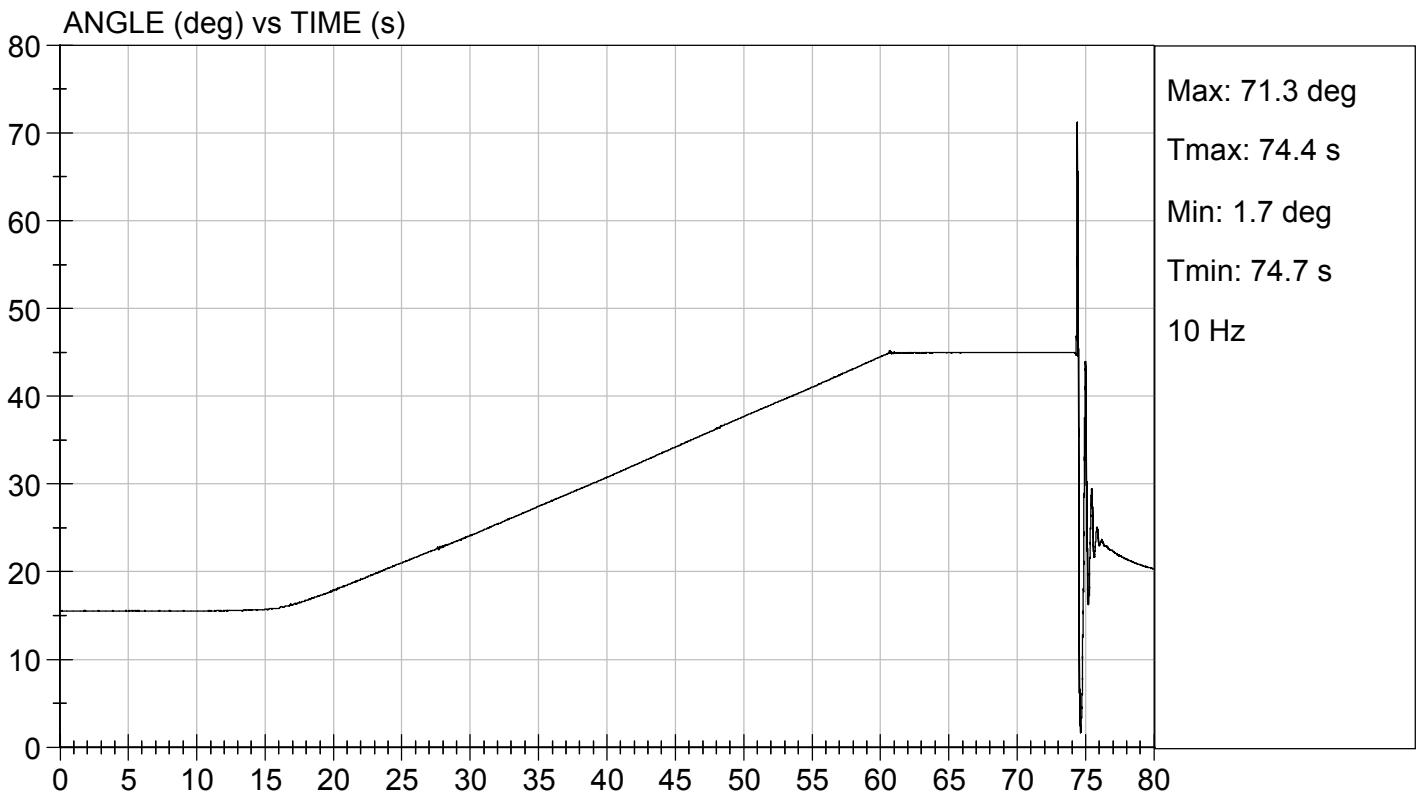
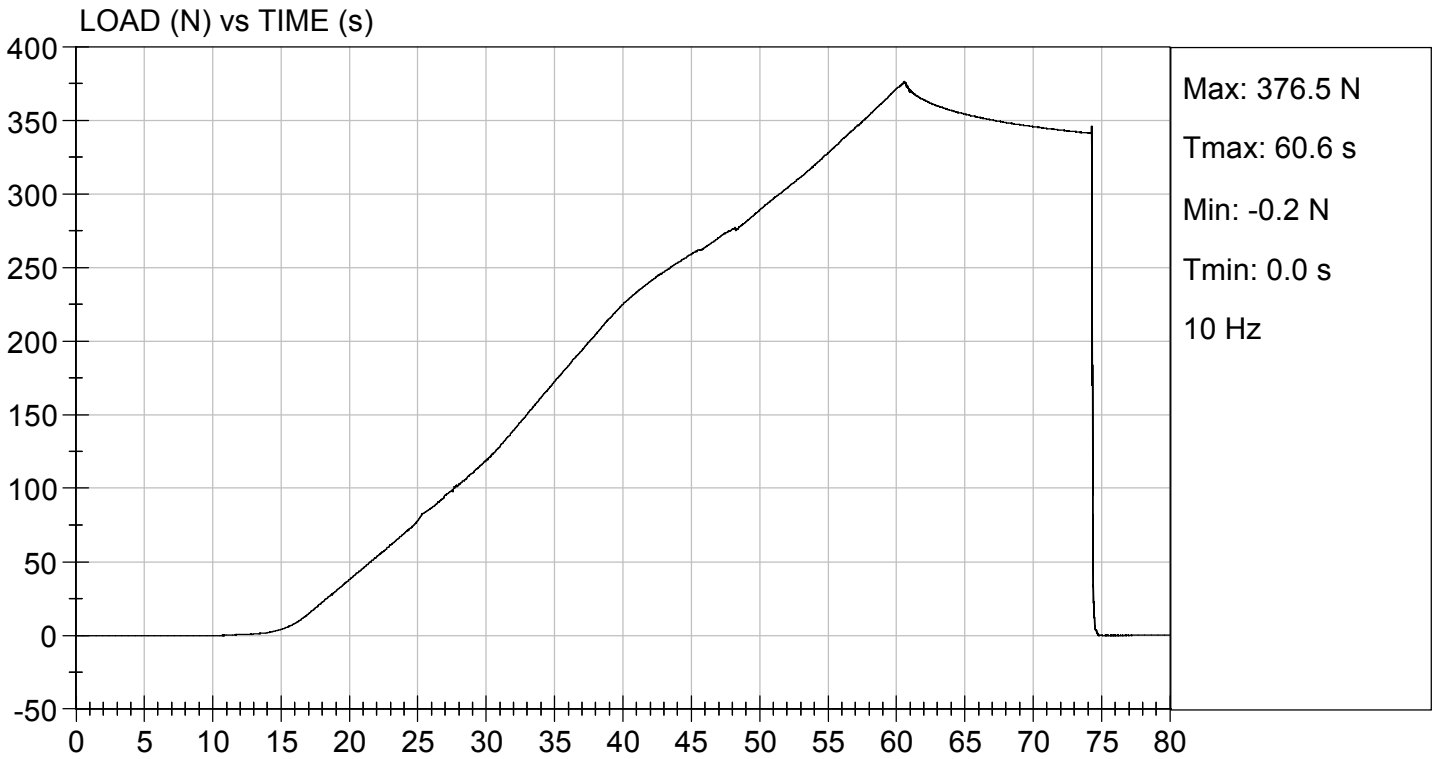
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Laboratory Technician

10/19/2017

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Test Date



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Approved By



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

**ATD Serial No:** 138

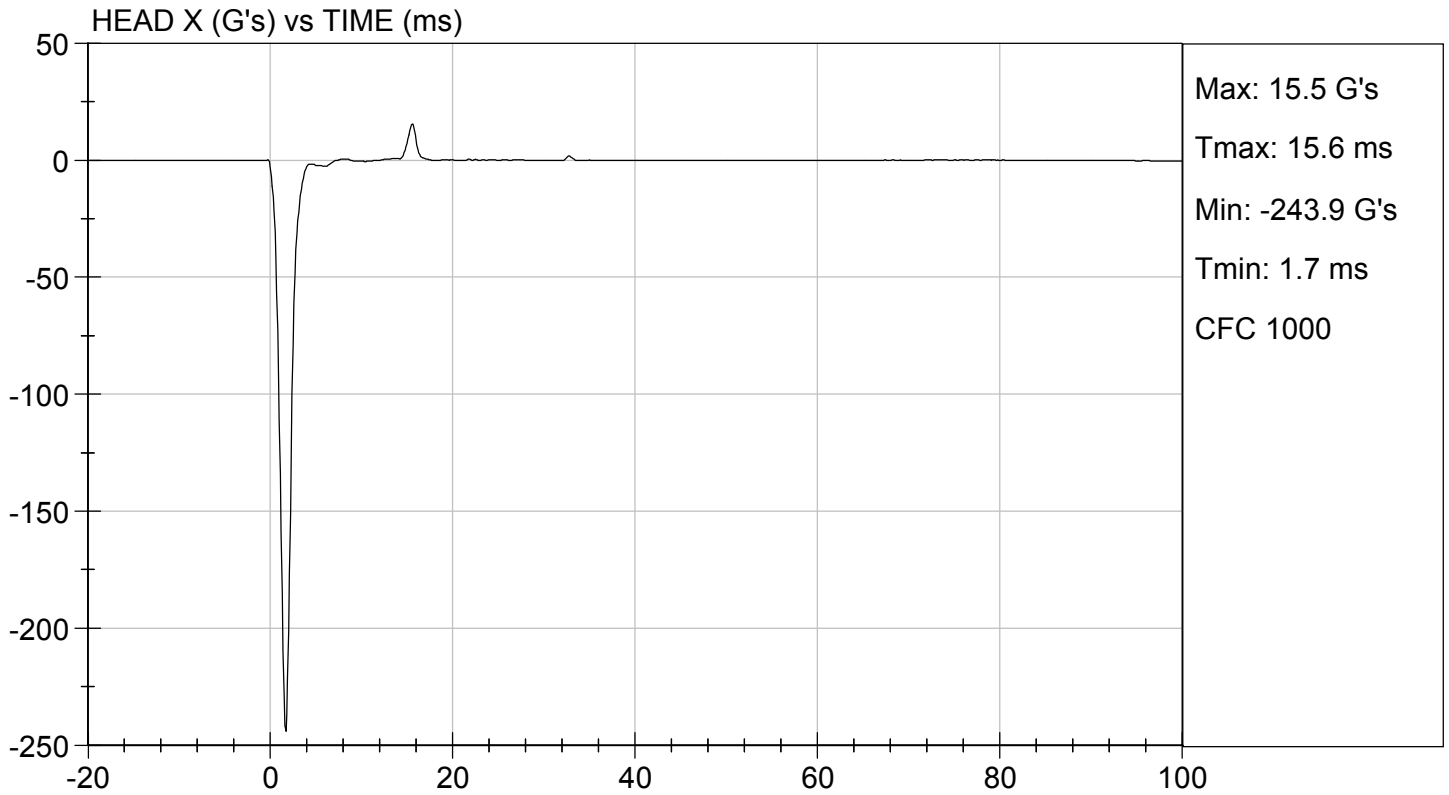
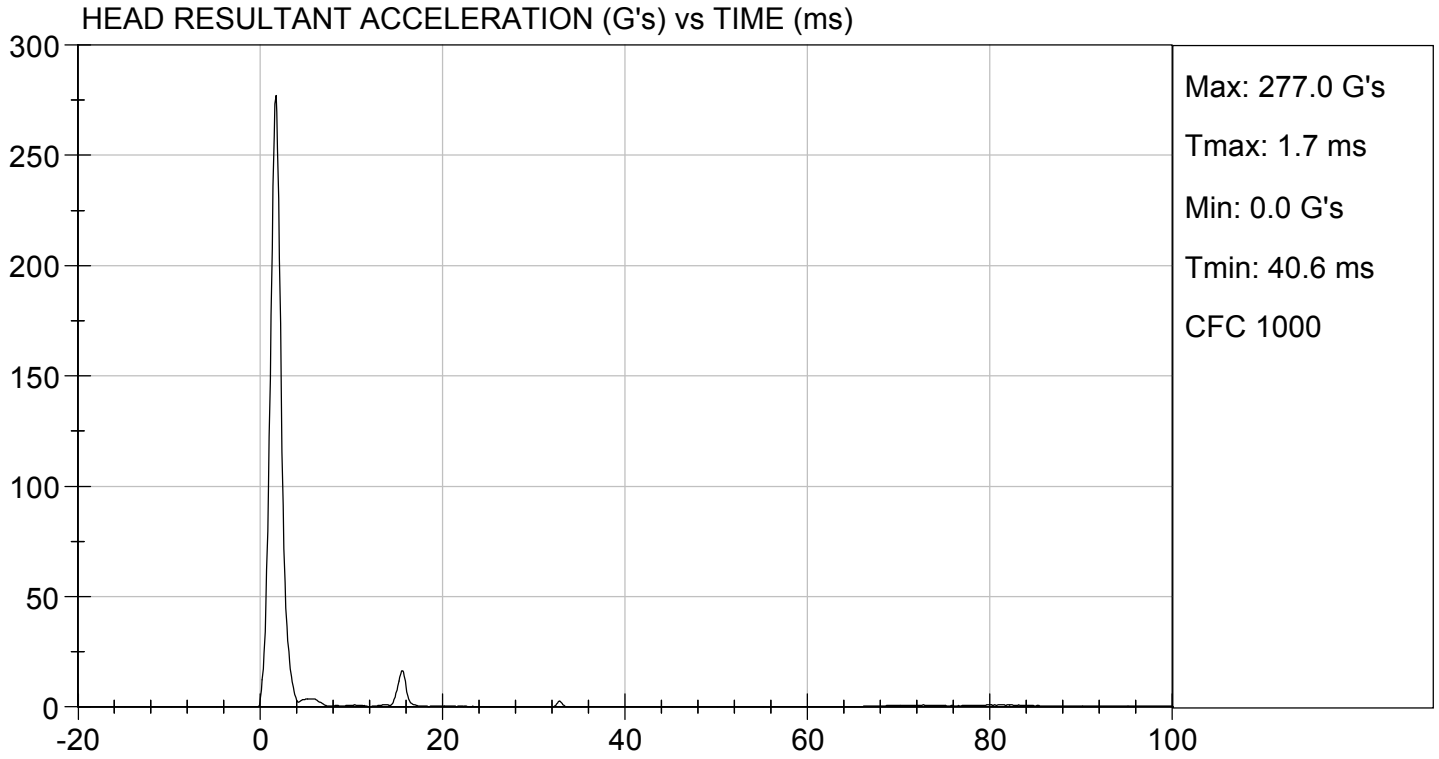
**Test ID:** D173351

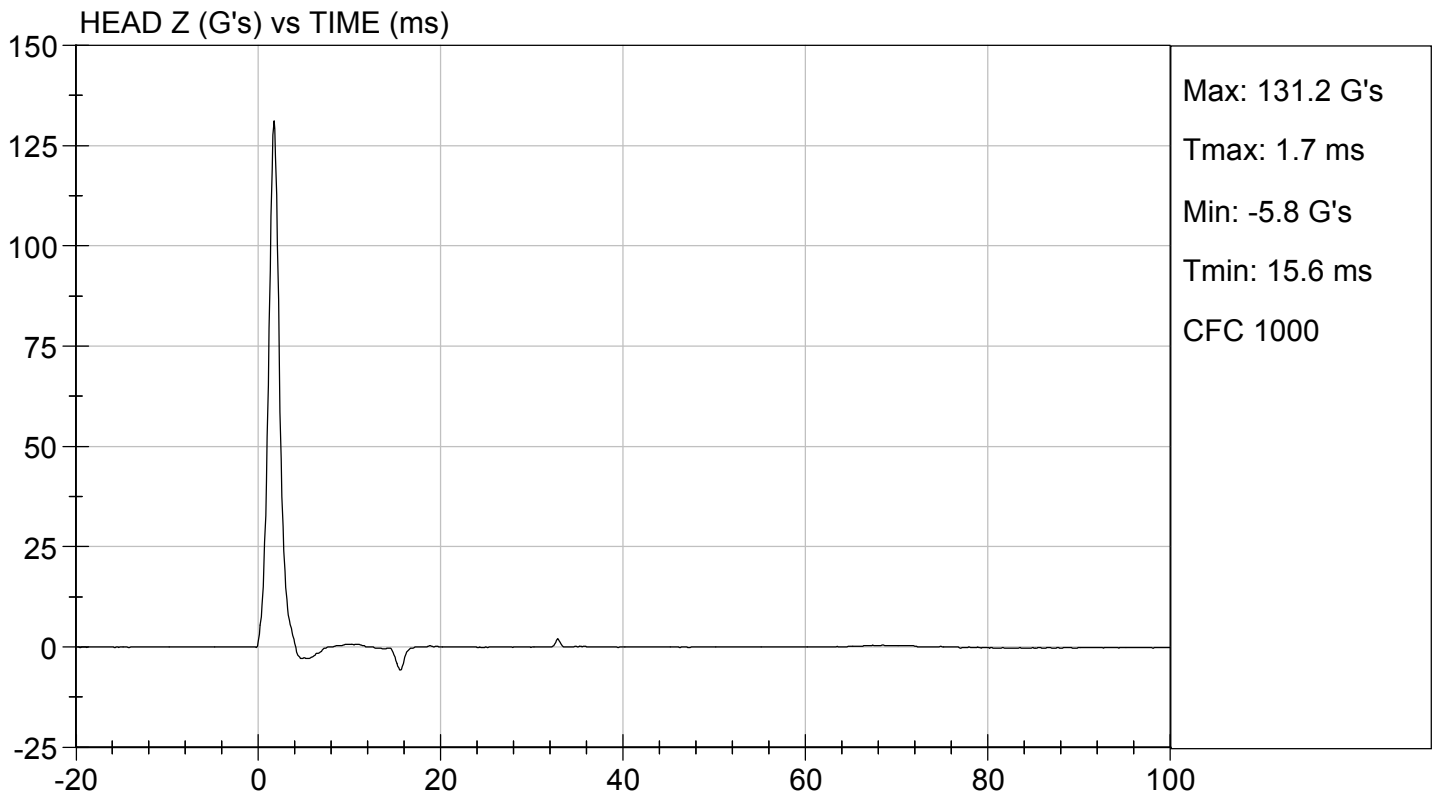
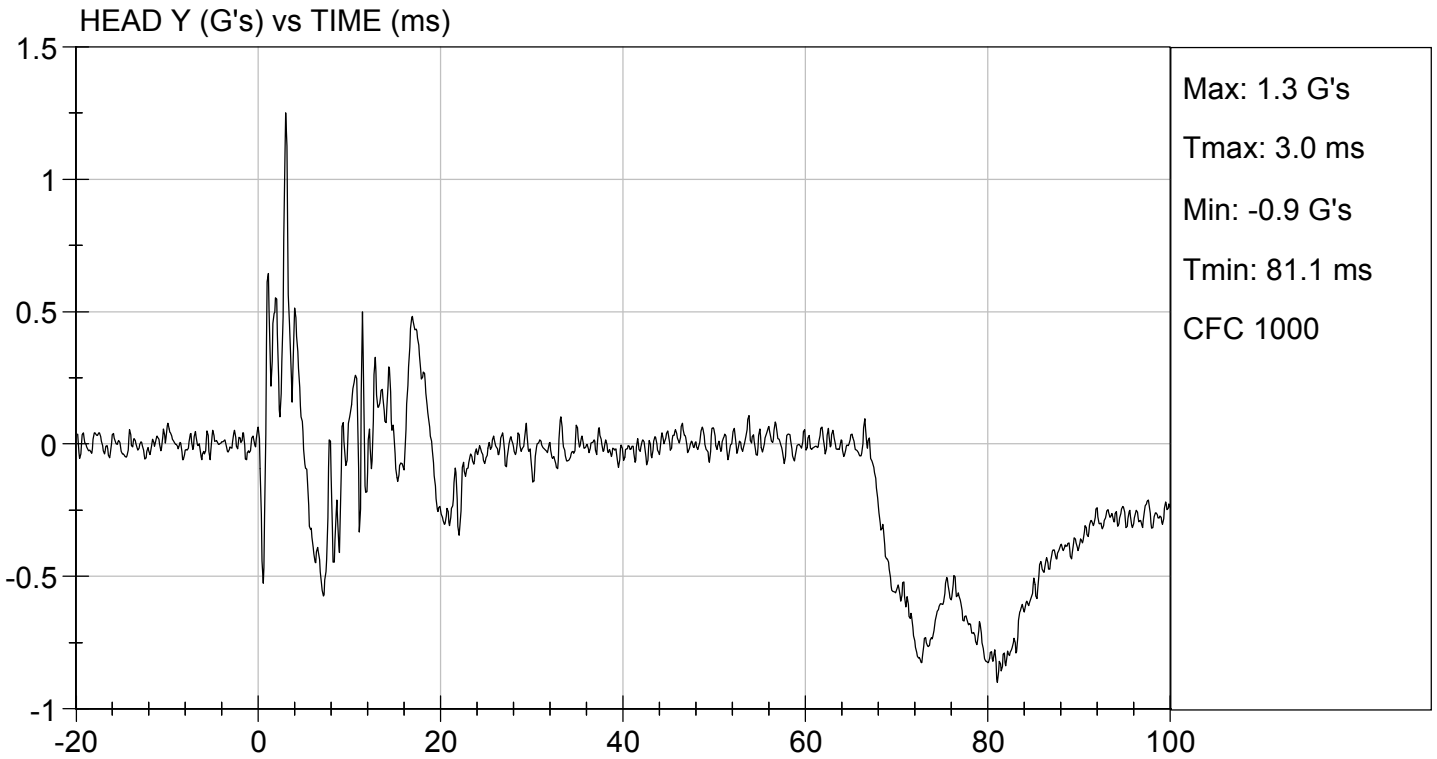
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Peak Resultant Acceleration	G's	250 to 300	277	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	1.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
<b>Overall Test Results</b>				<b>Pass</b>

*Danielle Redinlaugh*  
Laboratory Technician

11/17/2017  
Test Date

*Robert Schaub*  
Approved By





**MGA RESEARCH CORPORATION**

**NECK FLEXION TEST**

**HYBRID III 5TH PERCENTILE**

ATD Serial No: 138

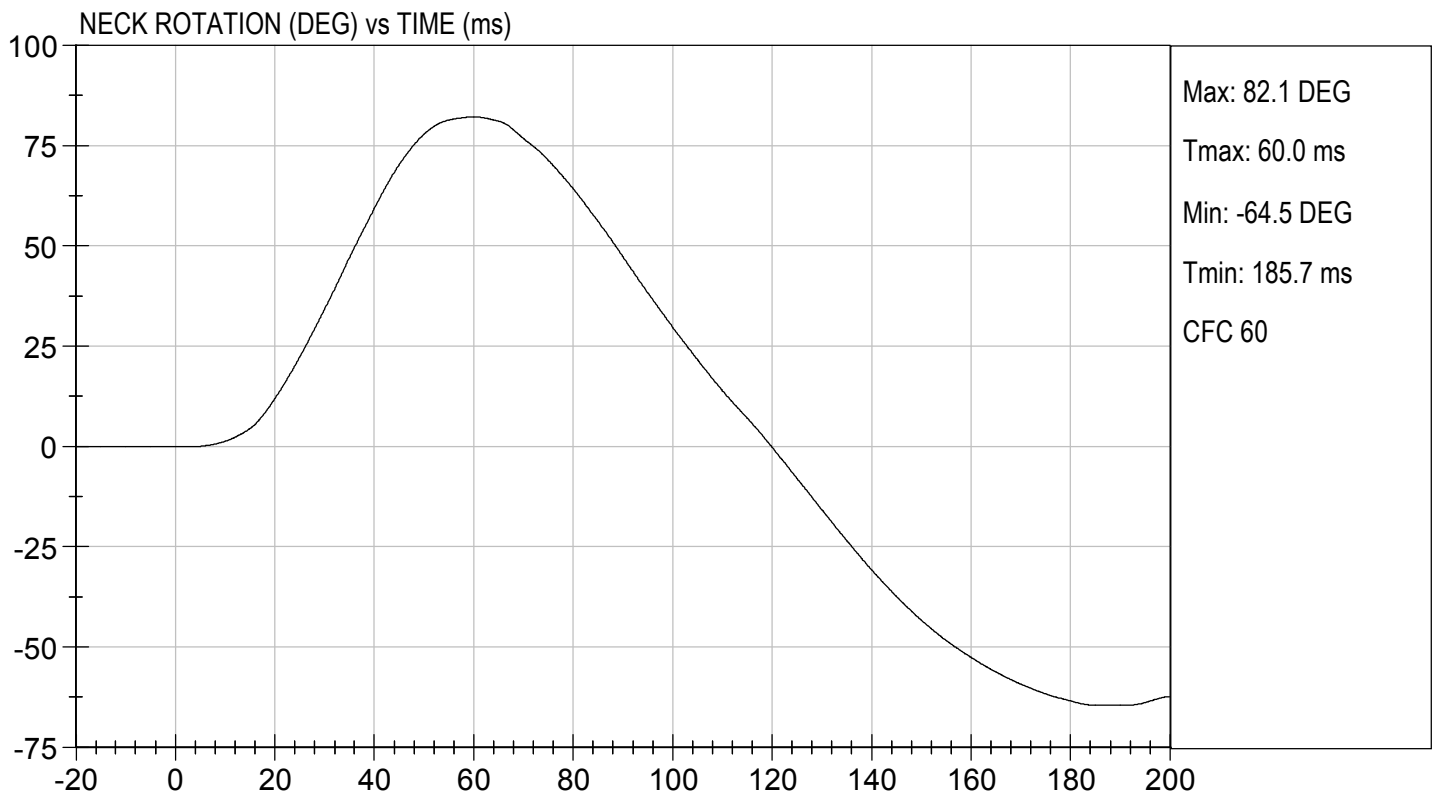
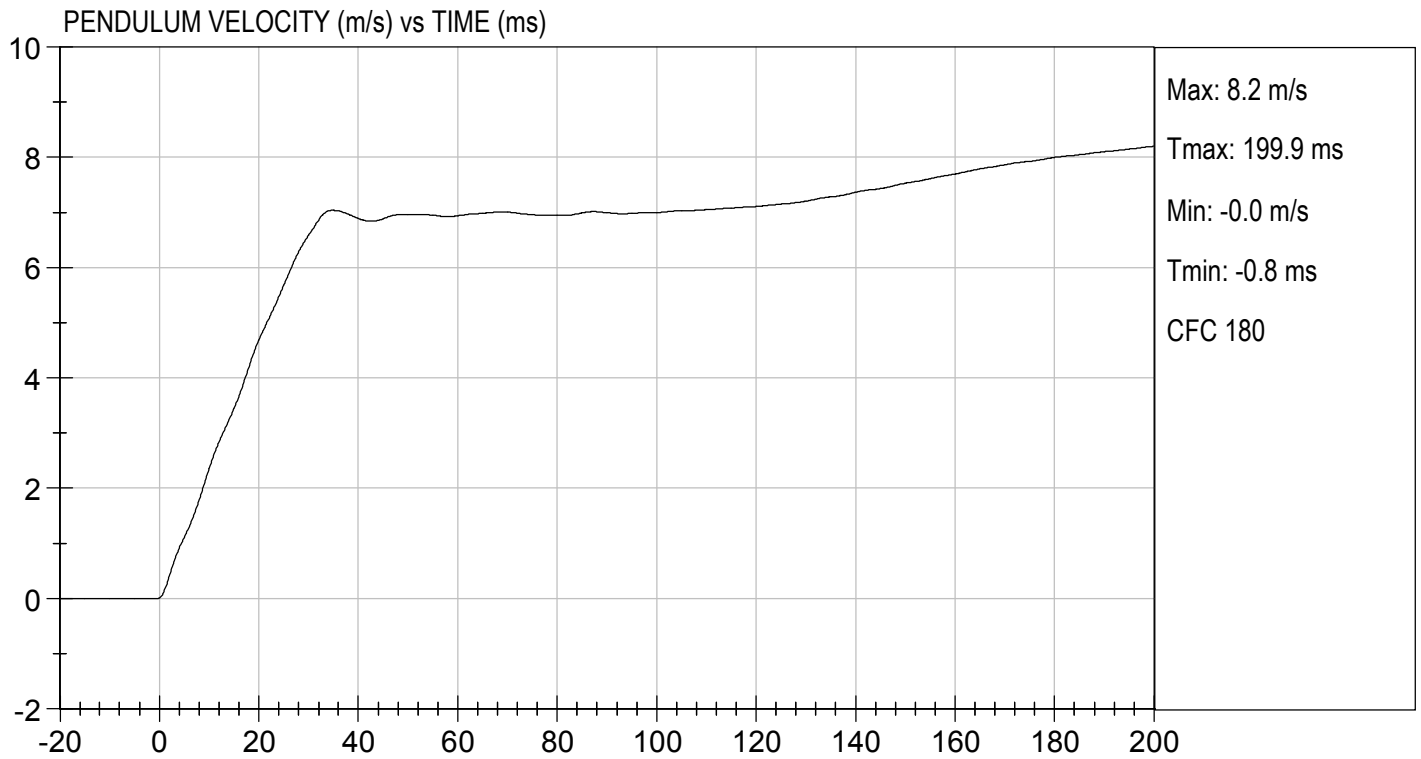
Test I.D.: D173352

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	32	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.7	Pass
	30 ms	m/s	5.8 to 7.0	6.6	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	72	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
Overall Results					Pass

*Danielle Redinlaugh*  
Laboratory Technician

11/17/2017  
Test Date

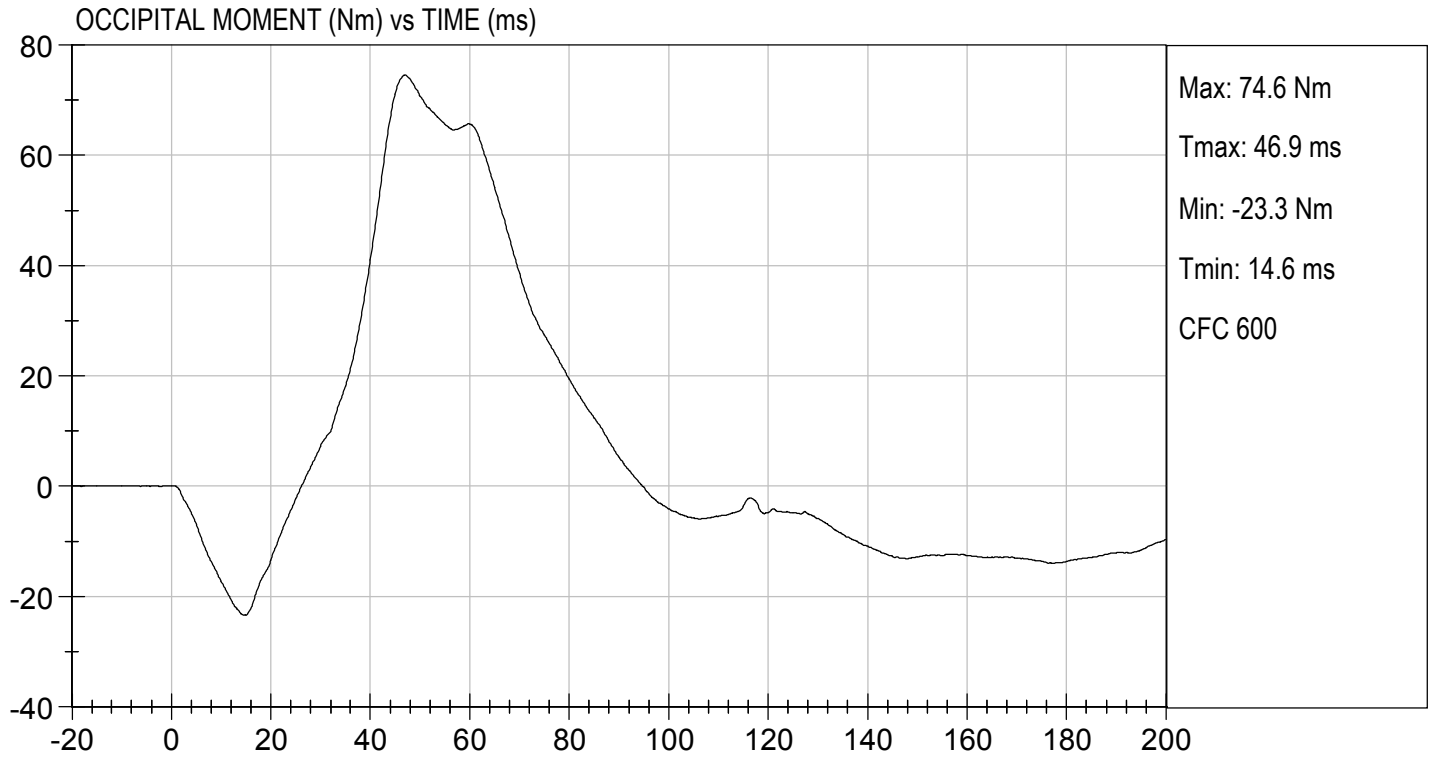
*Robert Schaub*  
Approved By





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

TEST DATE: 11/17/2017  
TEST #: D173352

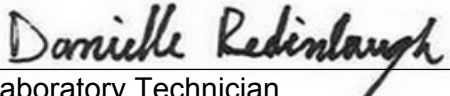


**MGA RESEARCH CORPORATION**  
**NECK EXTENSION TEST**  
**HYBRID III 5TH PERCENTILE**

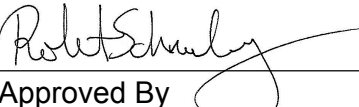
ATD Serial No: 138

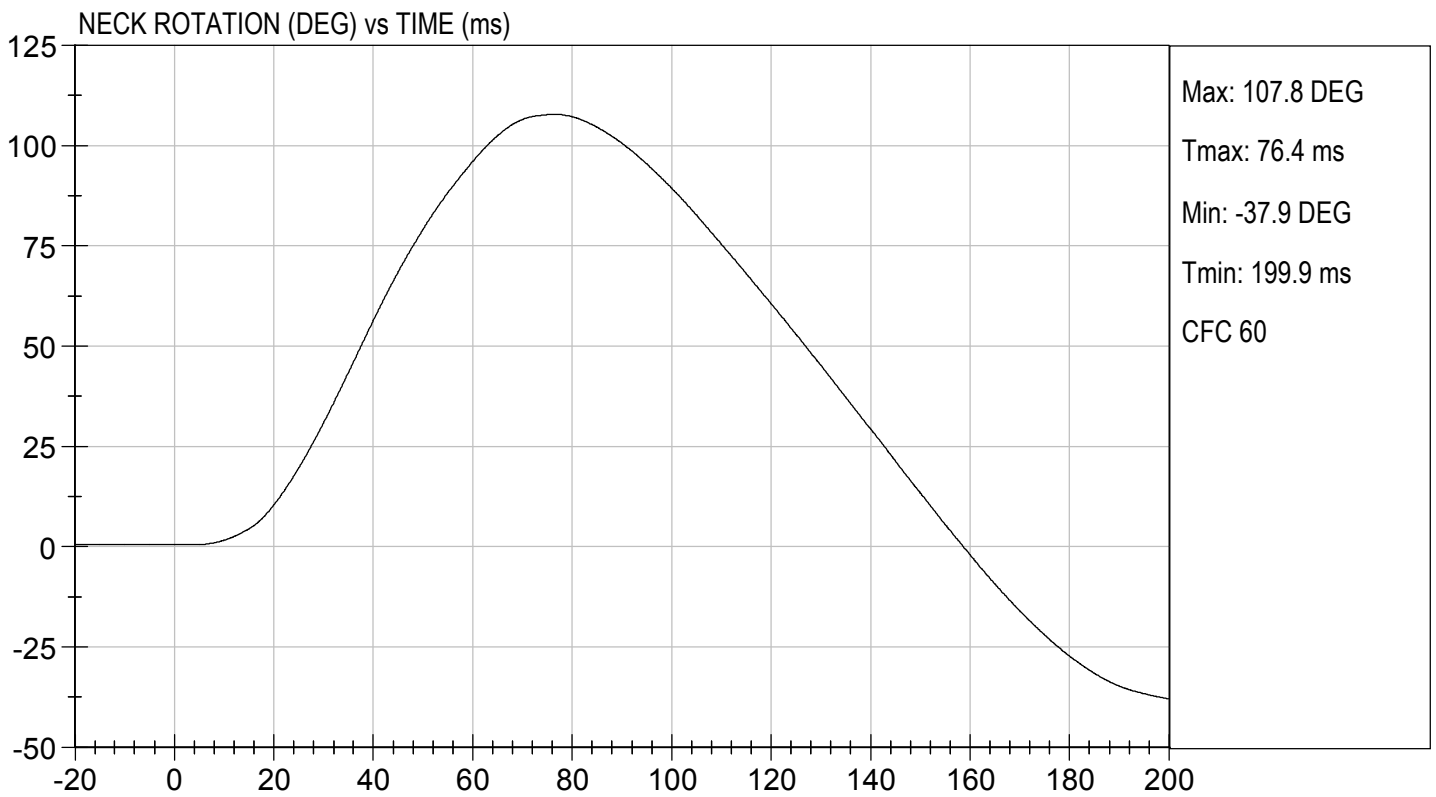
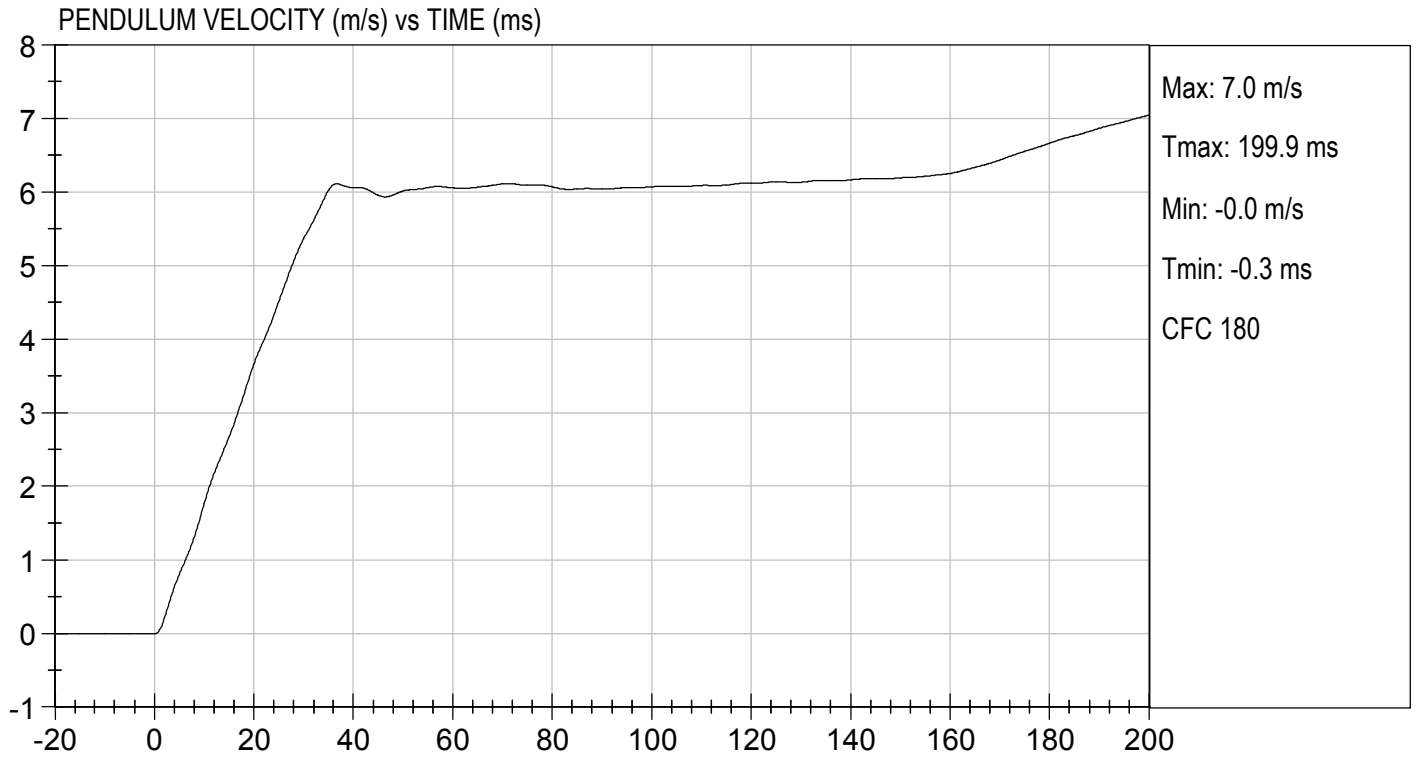
Test I.D.: D173353

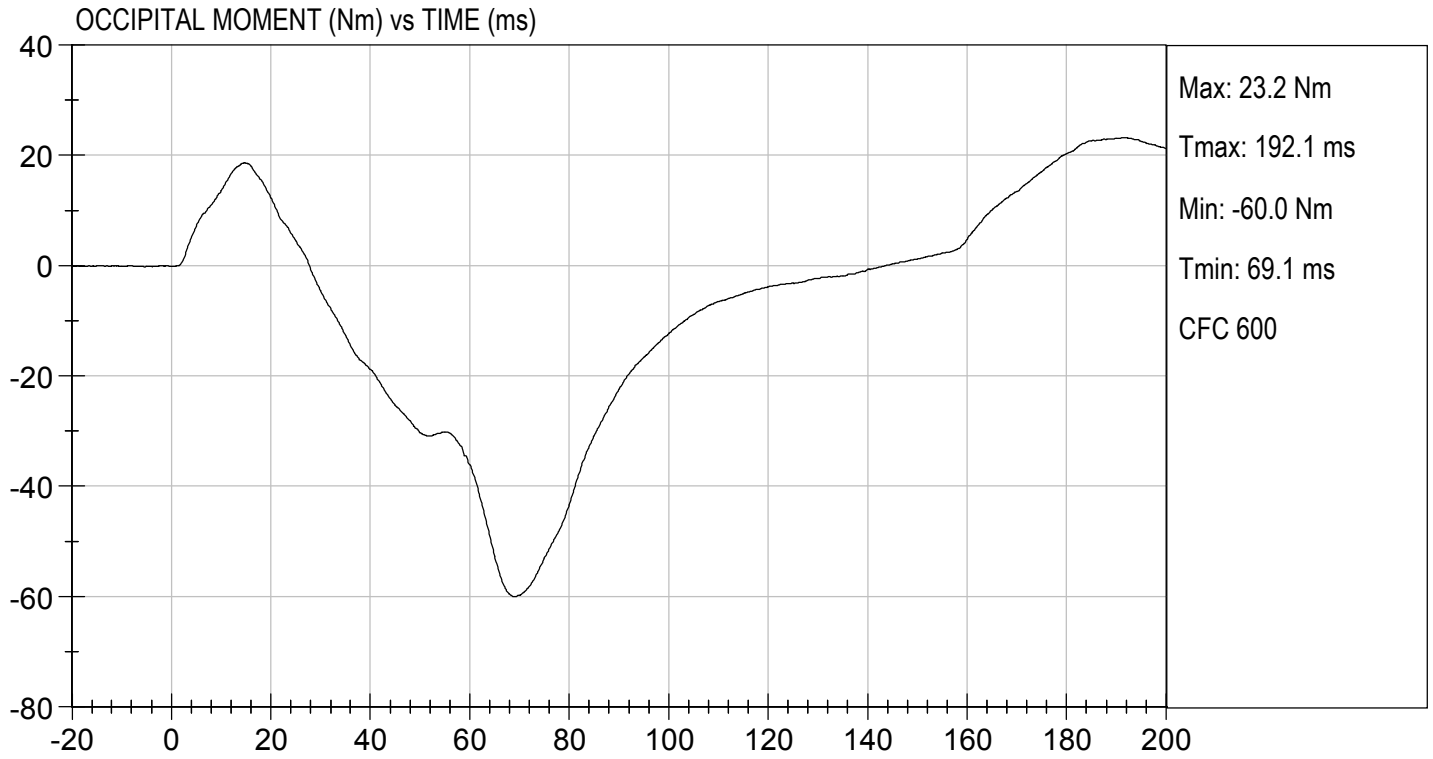
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	32	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.16	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-60	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	102	Pass
Overall Results					Pass

  
 \_\_\_\_\_  
 Laboratory Technician

11/17/2017  
 \_\_\_\_\_  
 Test Date

  
 \_\_\_\_\_  
 Approved By





**MGA RESEARCH CORPORATION**  
**THORAX IMPACT**  
**HYBRID III 5TH PERCENTILE**

ATD Serial No: 138

Test I.D: D173354

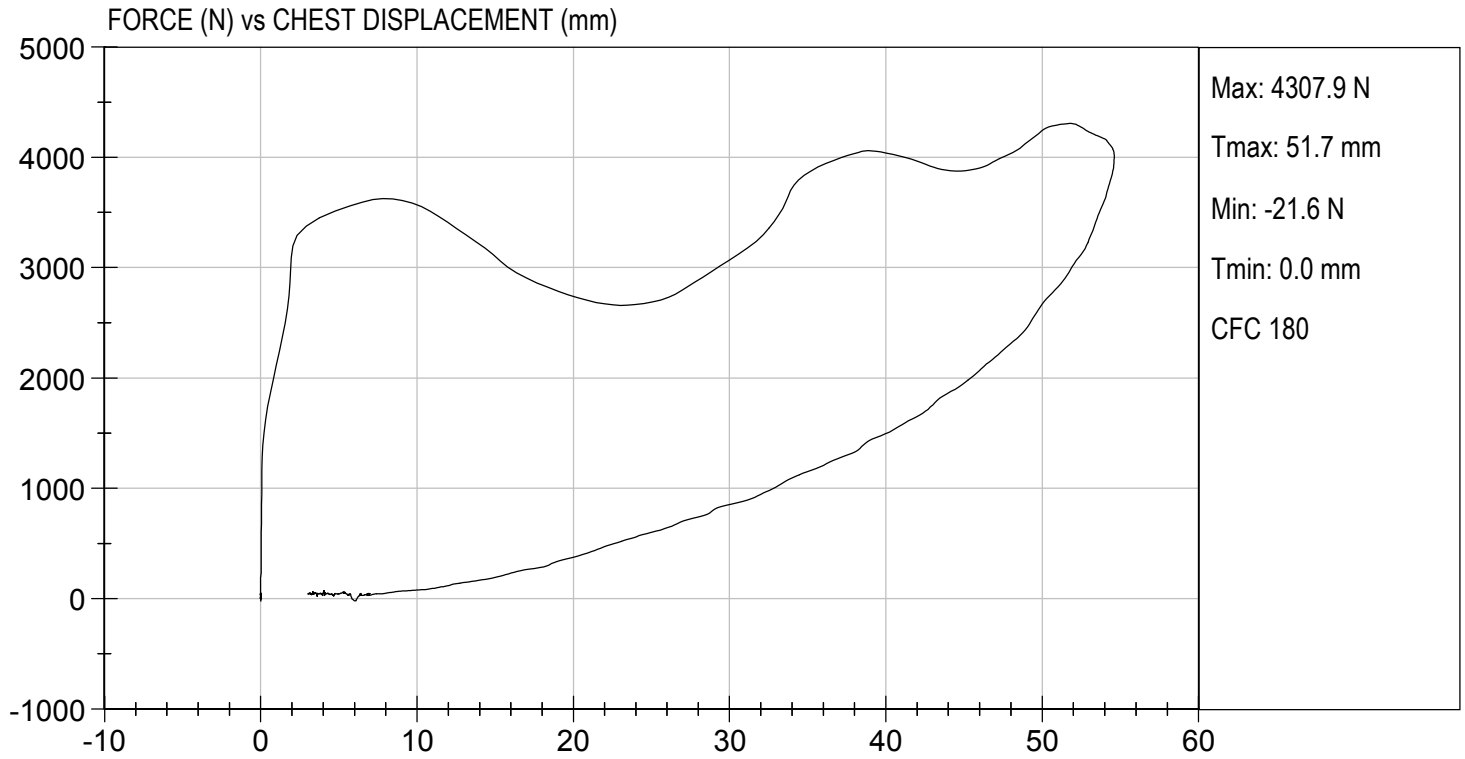
Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Relative Humidity	%	10 to 70	33	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	55	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4308	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4239	Pass
Overall Test Results				Pass

*Danielle Redinlaugh*  
 Laboratory Technician

11/17/2017

Test Date

*Robert Schaub*  
 Approved By



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

**ATD Serial No:** 138

**Test I.D:** D173355

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3482	Pass
Overall Test Results				Pass

*Danielle Redinlaugh*  
Laboratory Technician

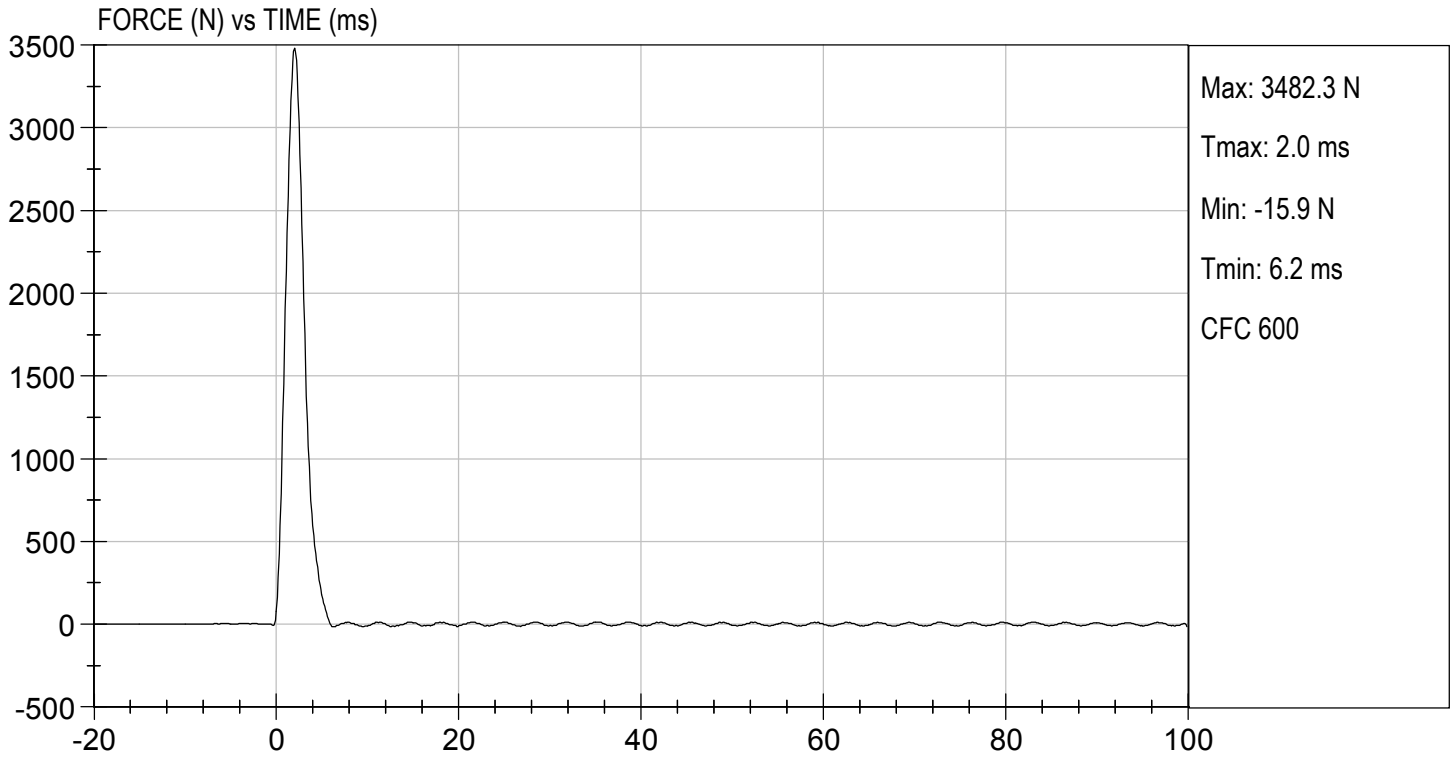
11/17/2017  
Test Date

*Robert Schaub*  
Approved By



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

TEST DATE: 11/17/2017  
TEST #: D173355



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

ATD Serial No: 138

Test I.D: D173356

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Probe Speed	m/s	2.07 to 2.13	2.11	Pass
Maximum Force	N	3450 to 4060	3680	Pass
Overall Test Results				Pass

*Danielle Redinlaugh*  
 Laboratory Technician

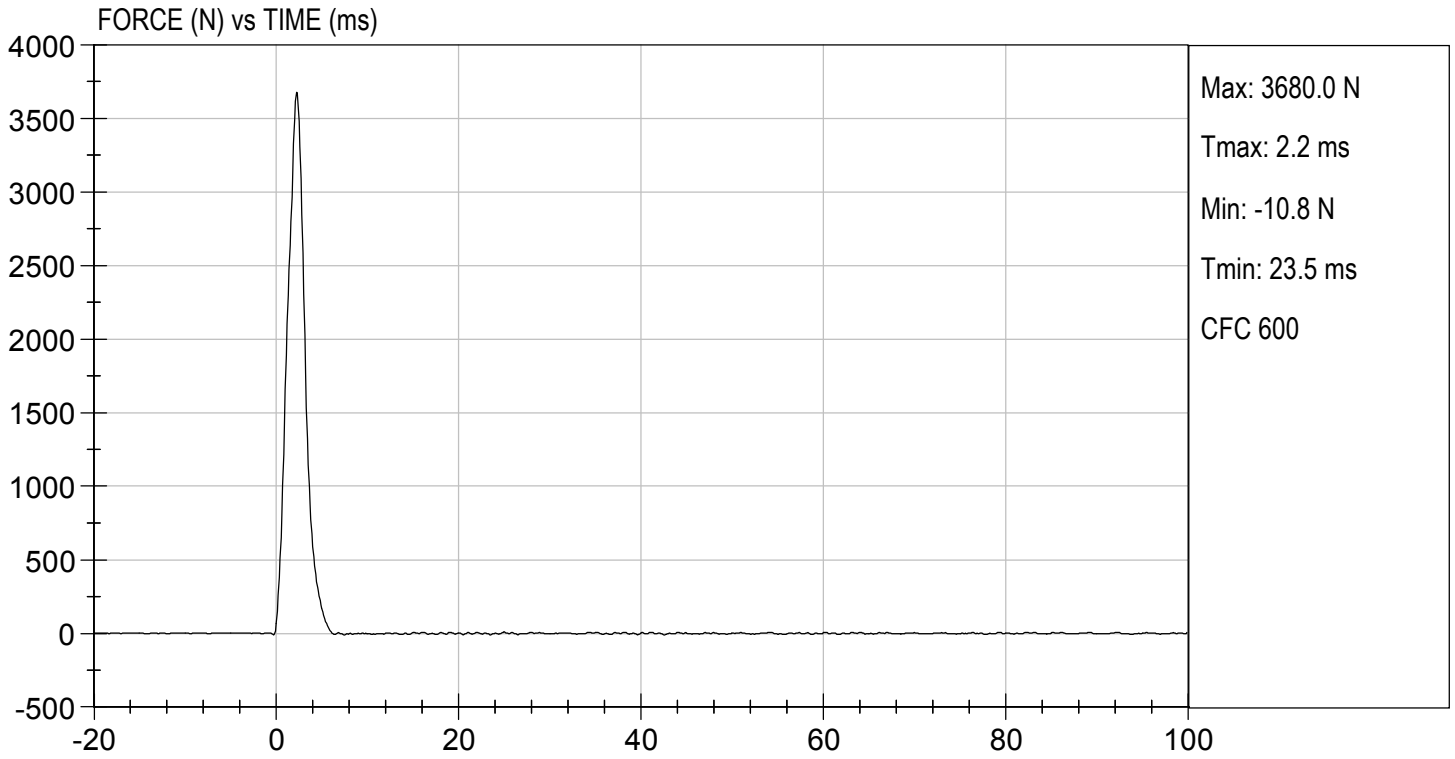
11/17/2017  
 Test Date

*Robert Schaub*  
 Approved By



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

TEST DATE: 11/17/2017  
TEST #: D173356

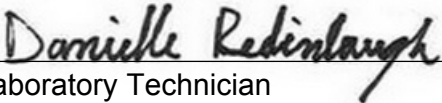


**MGA RESEARCH CORPORATION**  
**TORSO FLEXION TEST**  
**HYBRID III 5TH PERCENTILE**

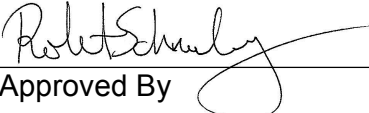
ATD Serial No: 138

Test I.D: D173357

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	34	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	385	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.8	Pass
<b>Overall Result</b>				<b>Pass</b>

  
 Laboratory Technician

11/17/2017  
 Test Date

  
 Approved By

