REPORT NUMBER: NCAP-MGA-2018-013

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

AUDI AG
2018 Audi Q7 2.0T AWD 5-Door SUV
NHTSA No.: O20185809

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: November 2, 2017

Final Report Date: December 11, 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 11, 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

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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
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15. Supplementary Notes		

16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2018 Audi Q7 2.0T 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 2, 2017.

The impact velocity of the vehicle was 56.21 km/h and the ambient temperature at the barrier face at the time of impact was 20.8°C. The target vehicle post-test maximum crush was 556mm located to the left of the vehicle centerline. The test vehicle's performance was as follows:

Measurement Description	Units	Driver ATD		Passenger ATD	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})	N/A	700	99	700	102
Maximum Chest	mm	63	28	52	18
Nij	N/A	1	0.25	1	0.44
Neck Tension	N	4170	828	2620	526
Neck Compression	N	4000	166	2520	169
Left Femur Force	N	10008	273	6805	206
Right Femur Force	N	10008	205	6805	130

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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 Audi Q7 2.0T AWD 5-Door SUV at a velocity of 56.21 km/h. The test was performed at MGA Research Corporation on November 2, 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 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th percentile female test device (ATD) was placed in the right-front passenger seating position according to dummy placement instructions specified in the 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. 634) 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 556mm to the left of the vehicle centerline and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver's head contacted the airbag. The driver's head also contacted the headrest. The 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_{15}	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50^{th})	99	0.25	828	166	36	28	273	205
Passenger (5^{th})	102	0.44	526	169	36	18	206	130

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

TEST NOTES

Driver Lap Belt load cell was not installed.
Passenger Lap Belt load cell was not installed.
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.
Barrier A-11 MZ recorded questionable data.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20185809	Traction Control System (TCS)	Yes
Model Year	2018	Power Steering	Yes
Make	Audi	Power Window Auto-Reverse	Yes
Model	Q7 2.0T	Driver Frontal Airbag	Yes
Body Style	5-Door SUV	Driver Curtain Airbag	Yes
VIN	WA1AHAF79JD010375	Driver Head/Torso Airbag	No
Body Color	Ink Blue Metallic	Driver Torso Airbag	No
Odometer (km/mi)	129km / 80mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.0 L	Driver Pelvis Airbag	No
Type/No. Cylinders	I4	Driver Knee Airbag	No
Engine Placement	Longitudinal	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	8	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	Yes	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	AUDI AG
Date of Manufacture	08/17

GVWR (kg)	2920
GAWR Front (kg)	1390
GAWR Rear (kg)	1710

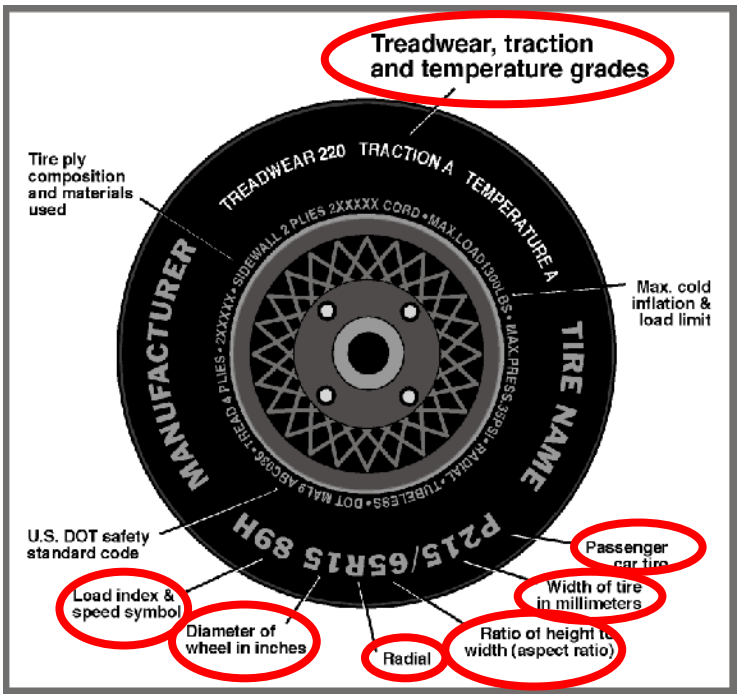
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contoured	Contoured	
Designated Seating Capacity (DSC)	2	3	2	7
Capacity Weight (VCW) (kg)				600
Cargo Weight (RCLW) (kg)				124

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

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	220	240
Recommended Tire Size	255/60R18	255/60R18
Tire Size on Vehicle	255/60R18	255/60R18
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Eagle Sport	Eagle Sport
Treadwear	560	560
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Rayon	2 Rayon
Tire Plies Body	2 Steel, 2 Rayon, 1 Polyamide	2 Steel, 2 Rayon, 1 Polyamide
Load Index/Speed Symbol	108H	108H
Tire Material	Rubber	Rubber
DOT Safety Code Left	NEYP JJ1R 3017	NEYP JJ1R 5116
DOT Safety Code Right	NEYP JJ1R 5016	NEYP JJ1R 4816

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

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	567.0	487.0		589.0	594.0	
Right	kg	577.0	494.5		596.5	602.5	
Ratio	%	53.8%	46.2%		49.8%	50.2%	
Totals	kg	1144.0	981.5	2125.5	1185.5	1196.5	2382.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2125.5
Weight of 1 P572E ATD & 1 P572O ATD	kg	141
Rated Cargo/Luggage Weight (RCLW)	kg	124
Calculated Test Vehicle Target Weight (TVTW)	kg	2390.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	822	822	850	851	1382
As Tested	mm	823	820	825	826	1503
Post Test	mm	835	890	827	823	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2992
Total Vehicle Length at Left Side	mm	4845
Total Vehicle Length at Centerline	mm	5040
Total Vehicle Length at Right Side	mm	4845
Weight of Ballast in Cargo Area	kg	47
Weight of Vehicle Components Removed	kg	20
Amount of Stoddard Solvent in Fuel Tank	L	78.7

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, 2nd row floor mats, repair kit, subwoofer, underbody plastic, rear sill trim.

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

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

TARGET VEHICLE STRUCTURAL MEASUREMENT

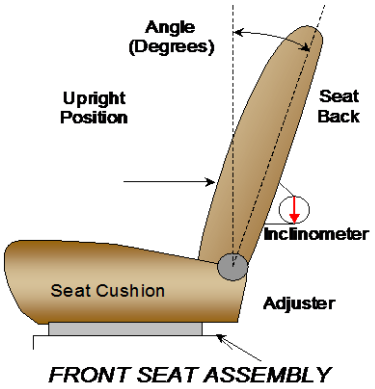
	Elements	Pre-Test (mm)
1	Total Length	5040
2	Total Width	1956
3	Bumper Top Height	620
4	Bumper Bottom Height	500
5	Longitudinal Member Top Height	638
6	Distance between Longitudinal Members	821
7	Longitudinal Member Width	81
8	Engine Top Height	903
9	Engine Bottom Height	271
10	Engine and Gearbox Width	400
11	Front Bumper-Engine Distance	358
12	Front Shock Absorber Fixing Height	957
13	Bonnet Leading Edge Height	959
14	Front Shock Absorber Fixing Width	935
15	Front Bumper – Front Axle Distance	958
16	Front Axle – A-Pillar Distance	455
17	A-Pillar – B-Pillar Distance	1232
18	B-Pillar – Rear Axle Distance	1314
19	B-Pillar – C-Pillar Distance	870
20	Roof Sill Bottom Height	1617
21	Roof Sill Top Height	1677
22	Floor Sill Bottom Height	295
23	Floor Sill Top Height	434

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

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

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	19.5° on seat back center
Passenger Seat Back Angle	18.4° on seat back center

SEAT FORE/AFT POSITIONS

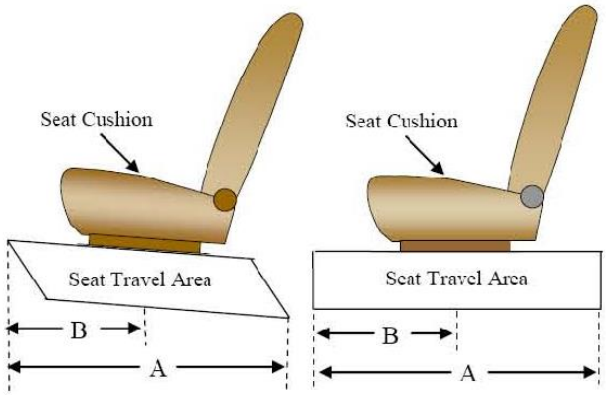
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated October 2015.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	310 mm	155 mm
Passenger Seat	250 mm	0 mm

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 (1st as 1)	0 (1st as 0)
Passenger Seat	4 (1st as 1)	1 (1st as 0)



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

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

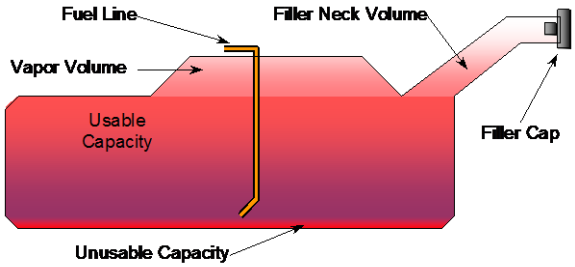
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	84.8
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	78.0 to 79.5
Actual Amount of Solvent used	78.7
1/3 of Usable Capacity	28.3

FUEL PUMP

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

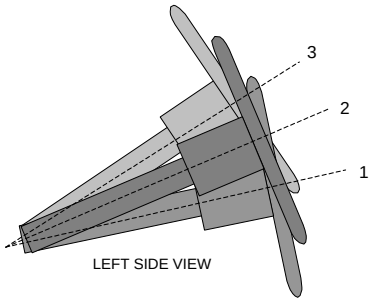
The vehicle is equipped with an electronic fuel pump. The fuel pump runs for a short time after ingnition is switched on. If the engine is started the pump works normally. The filler neck is located on the passenger's side.



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.



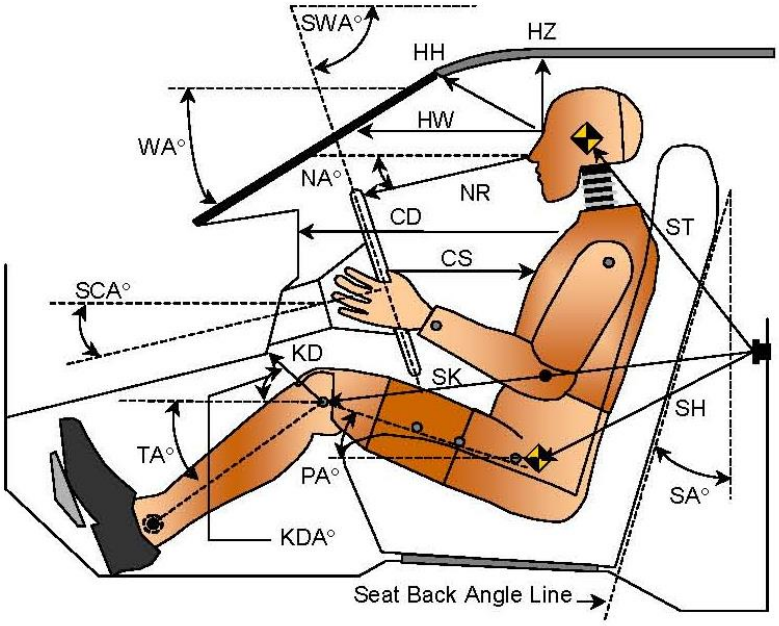
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	68.3	97
Geometric Center Position 2	66.6	131
Uppermost Position 3	64.8	164
Telescoping Steering Wheel Travel		67
Test Position	66.6	131

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20185809
Test Date: 11/2/2017

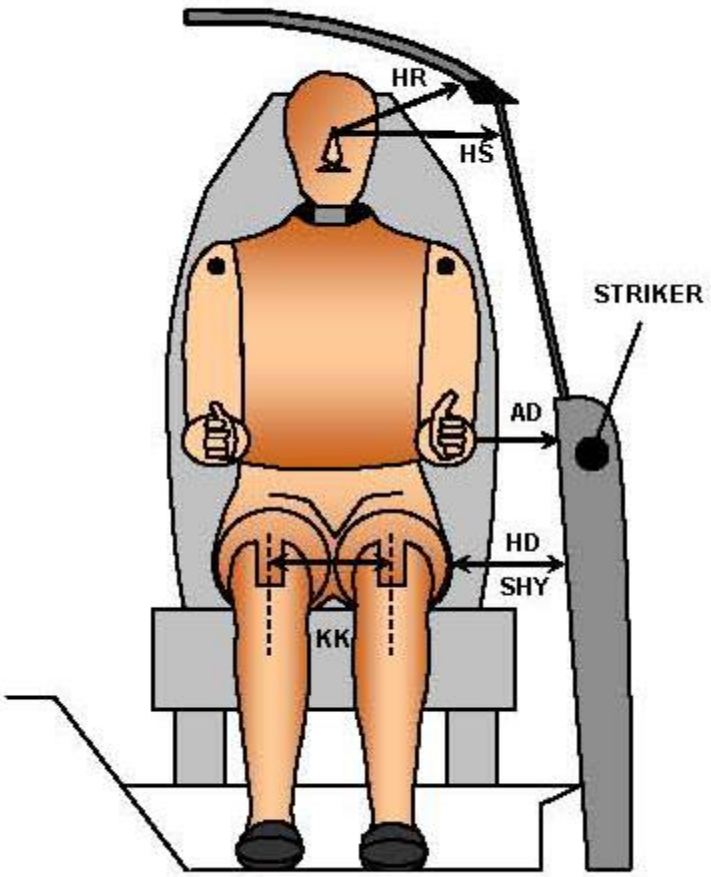


LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.4		
SWA°	Steering Wheel Angle		66.6		
SCA°	Steering Column Angle		23.4		
SA°	Seat Back Angle		19.5		18.4
HZ	Head to Roof (Z)	218	90	208	90
HH	Head to Header	350	34.0	305	38.5
HW	Head to Windshield	699	0	662	0
NR	Nose to Rim	366	11.5		
CD	Chest to Dash	508		361	
CS	Chest to Steering Hub	308	3.3		
RA	Rim to Abdomen	186	0		
KDL	Left Knee to Dash	163	43.5	93	32.2
KDR	Right Knee to Dash	171	36.9	103	31.5
PA°	Pelvic Angle		24.7		21.9
TA°	Tibia Angle		40.6		51.9
SK	Striker to Knee	566	93.4	649	93.2
ST	Striker to Head	509	11.2	517	25.6
SH	Striker to H-Point	257	131.2	359	103.6

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

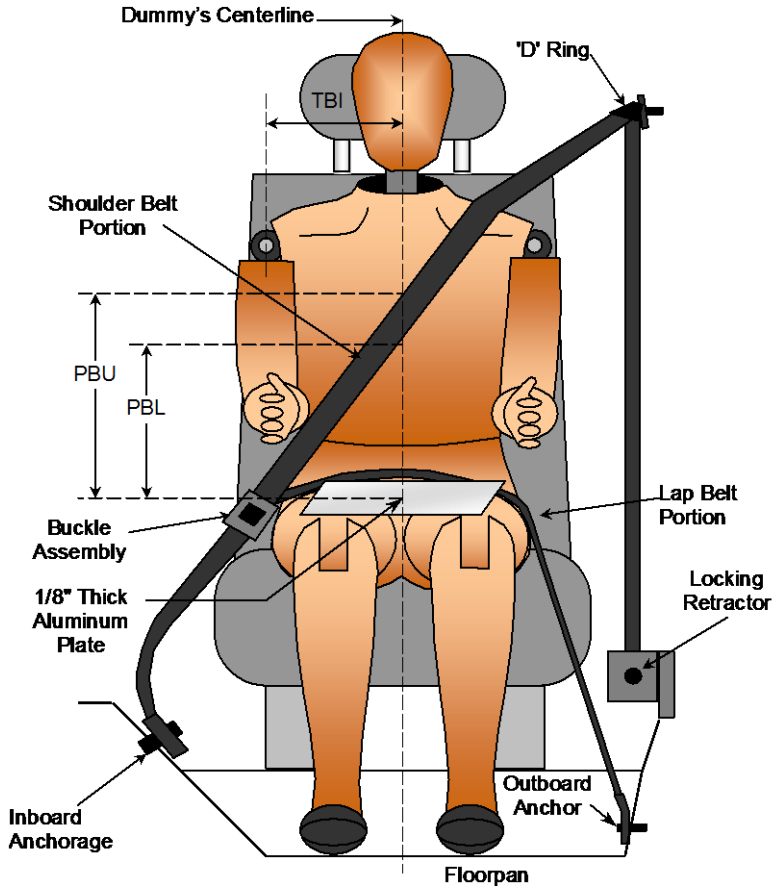


FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	131	110
HD	H-Point to Door	148	240
HR	Head to Side Header	258	259
HS	Head to Side Window	364	374
KK	Knee to Knee	370	226
SHY	Striker to H-Point (Y Direction)	289	340
AA	Ankle to Ankle	380	167

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	355	300
PBL - Top surface of reference to belt lower edge	mm	285	230

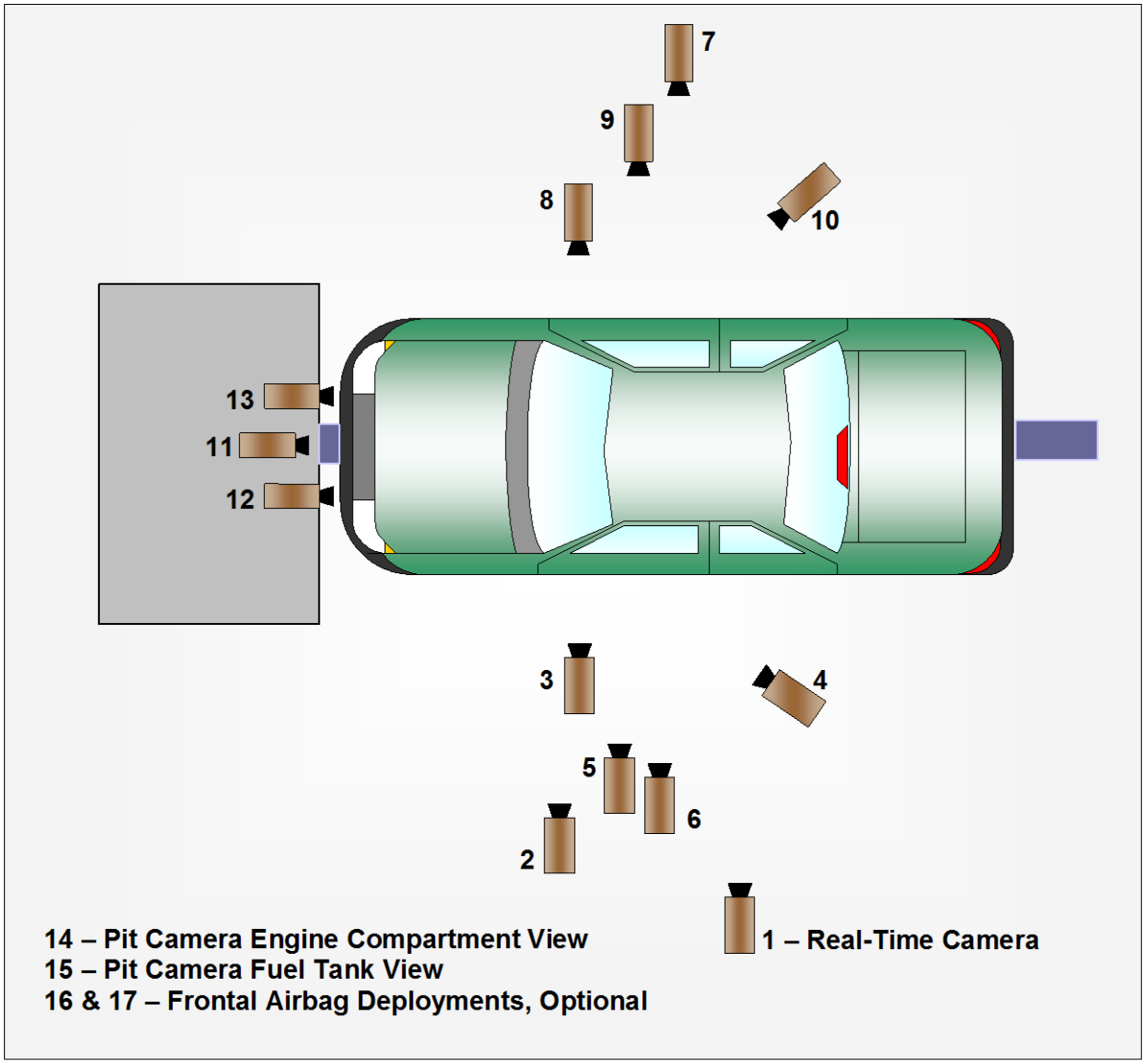
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	890	930
Lap Belt Length as measured on ATD	mm	800	900
Remainder of belt on reel	mm	830	690
Total Belt Length for Continuous Webbing Systems	mm	3320	3300

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

Test Vehicle:	2018 Audi Q7 2.0T AWD 5-Door SUV	NHTSA No.:	O20185809
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/2/2017

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	-1660	-6460	-1690	50	1000
3	Left Front Half	-1280	-5730	-1280	24	1000
4	Left Angle	-6720	-5050	-2050	75	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2020	5550	-1390	16	1000
8	Passenger Close-Up	-1620	6600	-1750	50	1000
9	Right Front Half	-980	5530	-1220	24	1000
10	Right Angle	-6760	6080	-1990	75	1000
11	Windshield	170	0	-2310	11	1000
12	Driver Windshield	280	-370	-2230	25	1000
13	Passenger Windshield	280	370	-2230	25	1000
14	Pit Front	-1010	0	3340	24	1000
15	Pit Rear	-3110	0	3340	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

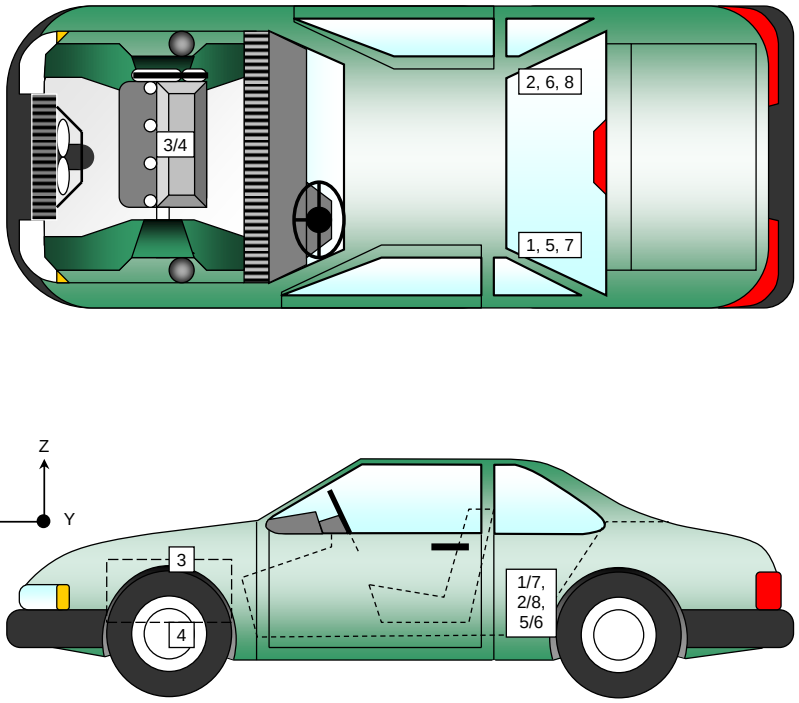
*COORDINATES:

+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 Audi Q7 2.0T AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20185809
Test Date: 11/2/2017



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	2136	-425	-328
2	Right Rear Crossmember Accelerometer – X Direction	2136	425	-342
3	Engine Top X	4310	0	-867
4	Engine Bottom X	4374	-30	-262
5	Left Rear Crossmember Accelerometer – Z Direction	2136	-425	-328
6	Right Rear Crossmember Accelerometer – Z Direction	2136	425	-342
7	Left Rear Crossmember Accelerometer Redundant – X Direction	2161	-425	-328
8	Right Rear Crossmember Accelerometer Redundant – X Direction	2161	425	-342

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

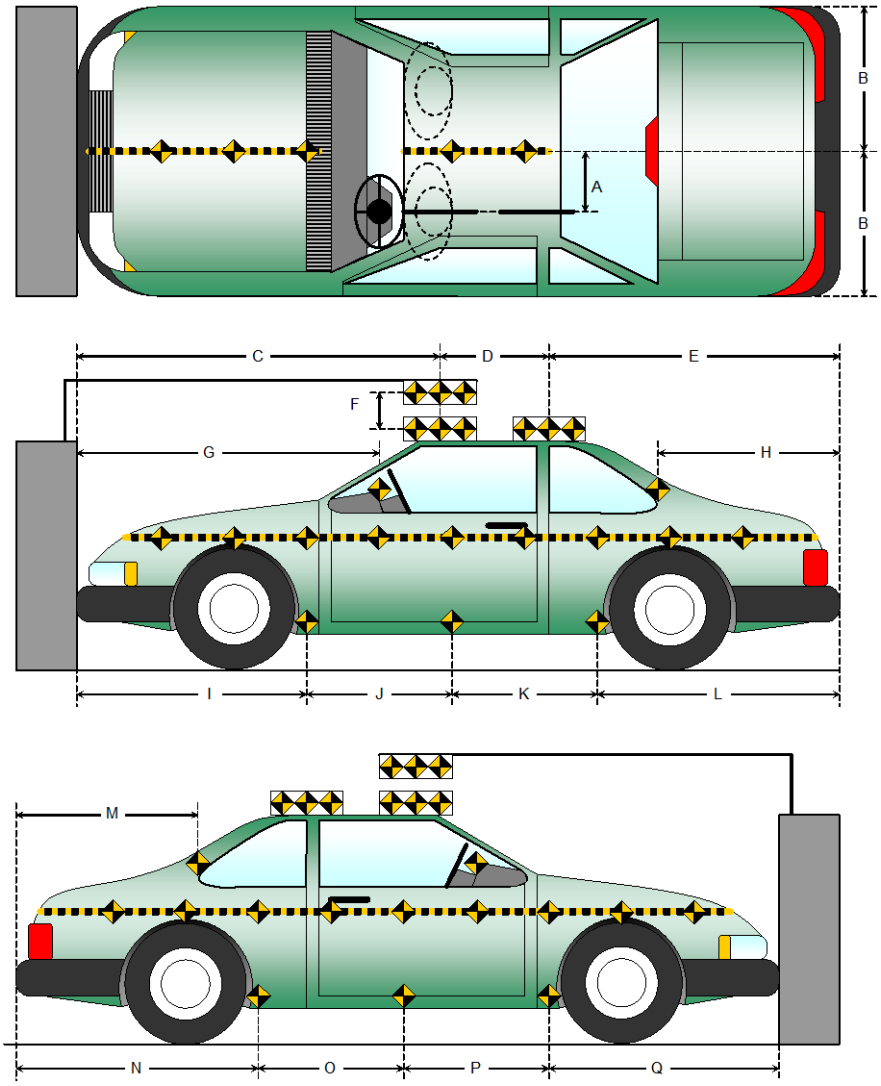
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20185809
Test Date: 11/2/2017

Item	Value (mm)
A	400
B	978
C	2450
D	612
E	1978
F	161
G	
H	1431
I	1411
J	1047
K	1047
L	1535
M	1431
N	1535
O	1047
P	1047
Q	1411



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

Advanced Research Load Cell Barrier

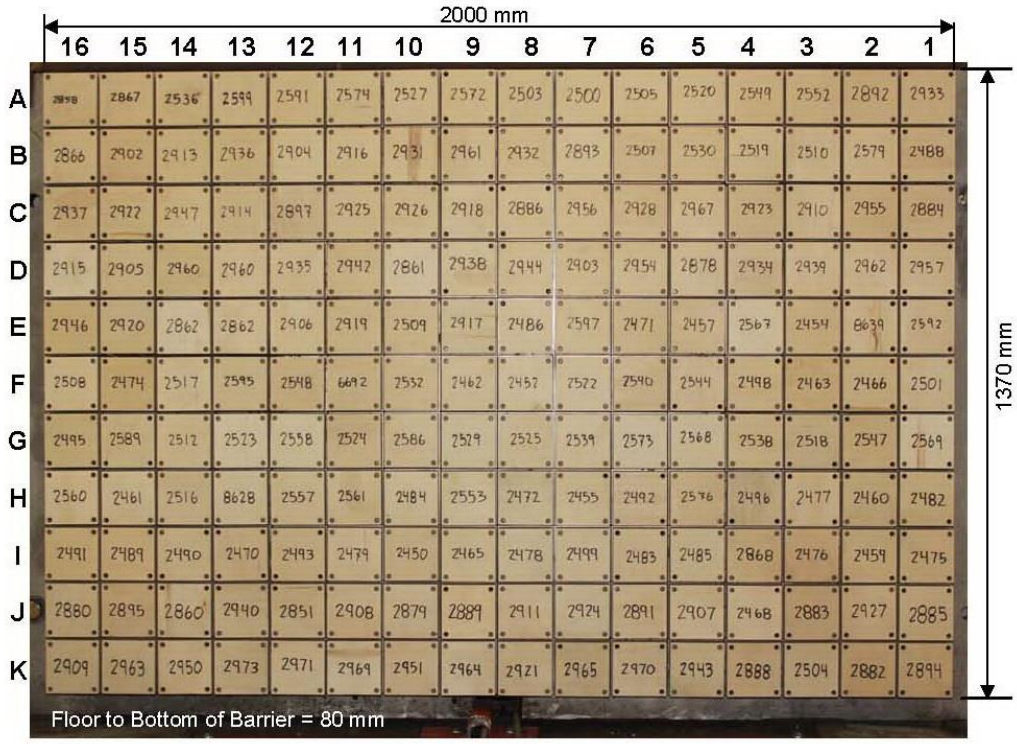


Photo for Reference Only

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 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

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 Audi Q7 2.0T AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20185809
Test Date: 11/2/2017

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 351	HIII 5% / 634
Head Contact	Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	None	Glove Box
Right Knee Contact	None	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

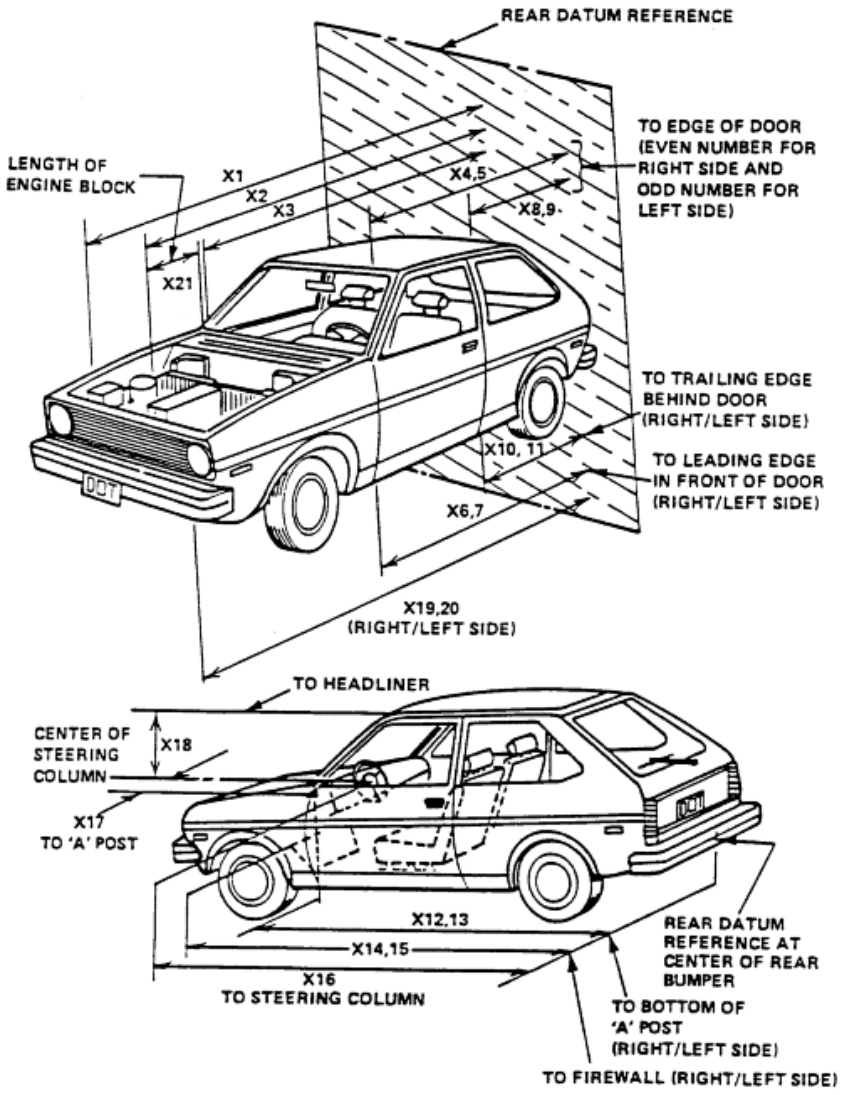
Measured Parameter	Units	Value
Left Side	mm	1112
Center	mm	1148
Right Side	mm	1111
Average	mm	1124

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	Yes	Yes	Yes
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Knee Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2018 Audi Q7 2.0T AWD 5-Door SUV	NHTSA No.:	O20185809
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/2/2017



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	5040	4502	538
2	RSOV to Front of Engine	mm	4541	4247	294
3	RSOV to Firewall	mm	3779	3722	57
4	RSOV to Upper Leading Edge of Right Door	mm	3454	3445	9
5	RSOV to Upper Leading Edge of Left Door	mm	3454	3447	7
6	RSOV to Lower Leading Edge of Right Door	mm	3472	3463	9
7	RSOV to Lower Leading Edge of Left Door	mm	3472	3474	-2
8	RSOV to Upper Trailing Edge of Right Door	mm	2337	2320	17
9	RSOV to Upper Trailing Edge of Left Door	mm	2337	2329	8
10	RSOV to Lower Trailing Edge of Right Door	mm	2386	2372	14
11	RSOV to Lower Trailing Edge of Left Door	mm	2386	2379	7
12	RSOV to Bottom of “A” Post of Right Side	mm	3464	3473	-9
13	RSOV to Bottom of “A” Post of Left Side	mm	3478	3482	-4
14	RSOV to Firewall, Right Side	mm	3562	3555	7
15	RSOV to Firewall, Left Side	mm	3572	3558	14
16	RSOV to Steering Column	mm	2960	3008	-48
17	Center of Steering Column to “A” Post	mm	379	389	-10
18	Center of Steering Column to Headliner	mm	428	474	-46
19	RSOV to Right Side of Front Bumper	mm	4845	4494	351
20	RSOV to Left Side of Front Bumper	mm	4845	4511	334
21	Length of Engine Block	mm	406	406	0
RD	RSOV to Right Side of Dash Panel	mm	3170	3168	2
CD	RSOV to Center of Dash Panel	mm	3203	3149	54
LD	RSOV to Left Side of Dash Panel	mm	3182	3180	2

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

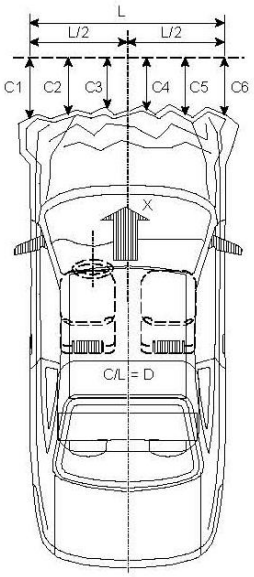
Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20185809
Test Date: 11/2/2017

VEHICLE INFORMATION

VIN: WA1AHAF79JD010375
Wheelbase (mm): 2992
Vehicle Size Category: MPV
Test Weight (kg): 2382.0

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): 56.21
Velocity Change (km/h): 61.7
Time of Separation (msec): 90



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
Midpoint of Damage: Centerline
Damage Region Length (mm): 1622
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4845	4511	334
C2	Crush zone 2 at left side	mm	4992	4452	540
C3	Crush zone 3 at left side	mm	5011	4455	556
C4	Crush zone 4 at right side	mm	5011	4468	543
C5	Crush zone 5 at right side	mm	4992	4473	519
C6	Crush zone 6 at right side	mm	4845	4494	351
L	C1 TO C6	mm	1622	1626	-4

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

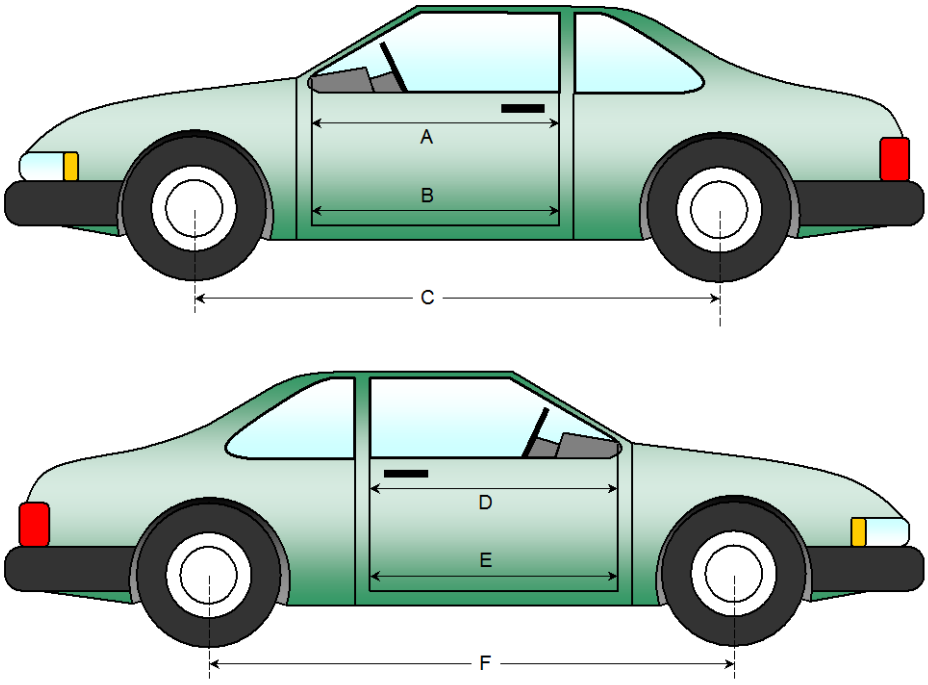
Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20185809
Test Date: 11/2/2017

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1006	1006	0
B	Left Side Lower	mm	924	924	0
D	Right Side Upper	mm	1006	1006	0
E	Right Side Lower	mm	924	924	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2992	2963	29
F	Right Side Wheelbase	mm	2992	2977	15



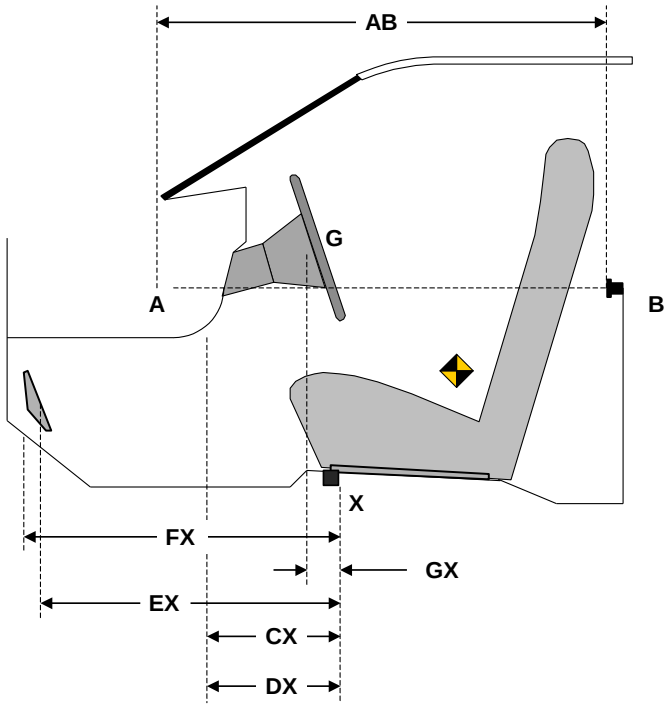
DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2018 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	724	724	0
CX	Left Knee Bolster to X	mm	220	223	-3
DX	Right Knee Bolster to X	mm	229	228	1
EX	Brake Pedal to X	mm	546	552	-6
FX	Foot Rest to X	mm	599	596	3
GX	Center of Steering Column Wheel Hub to X	mm	48	123	-75

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 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

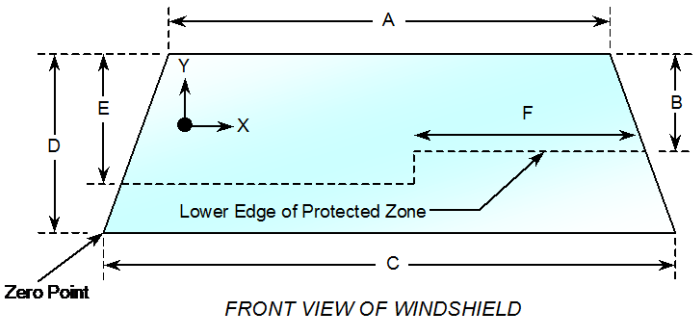
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 20.8° C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2247	2247	100.0
Right Side	2247	2247	100.0
Total	4494	4494	100.0



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1284
B	mm	430
C	mm	1590
D	mm	810
E	mm	512
F	mm	594

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 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

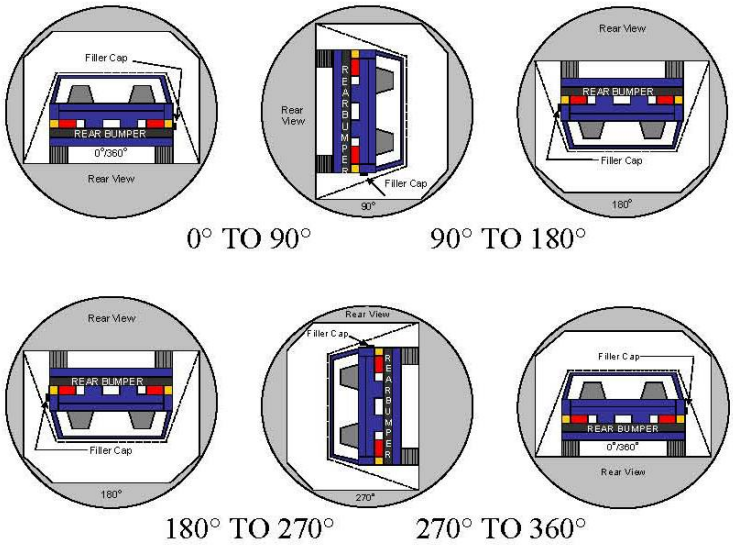
Temperature at Time of Impact: 20.8°C Test Time: 11:05 a.m.

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 Audi Q7 2.0T AWD 5-Door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20185809
Test Date: 11/2/2017

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°	90	300	390
90° to 180°	89	300	389
180° to 270°	91	300	391
270° to 360°	90	300	390

FMVSS 301 SPILLAGE TABLE (units in ounces)

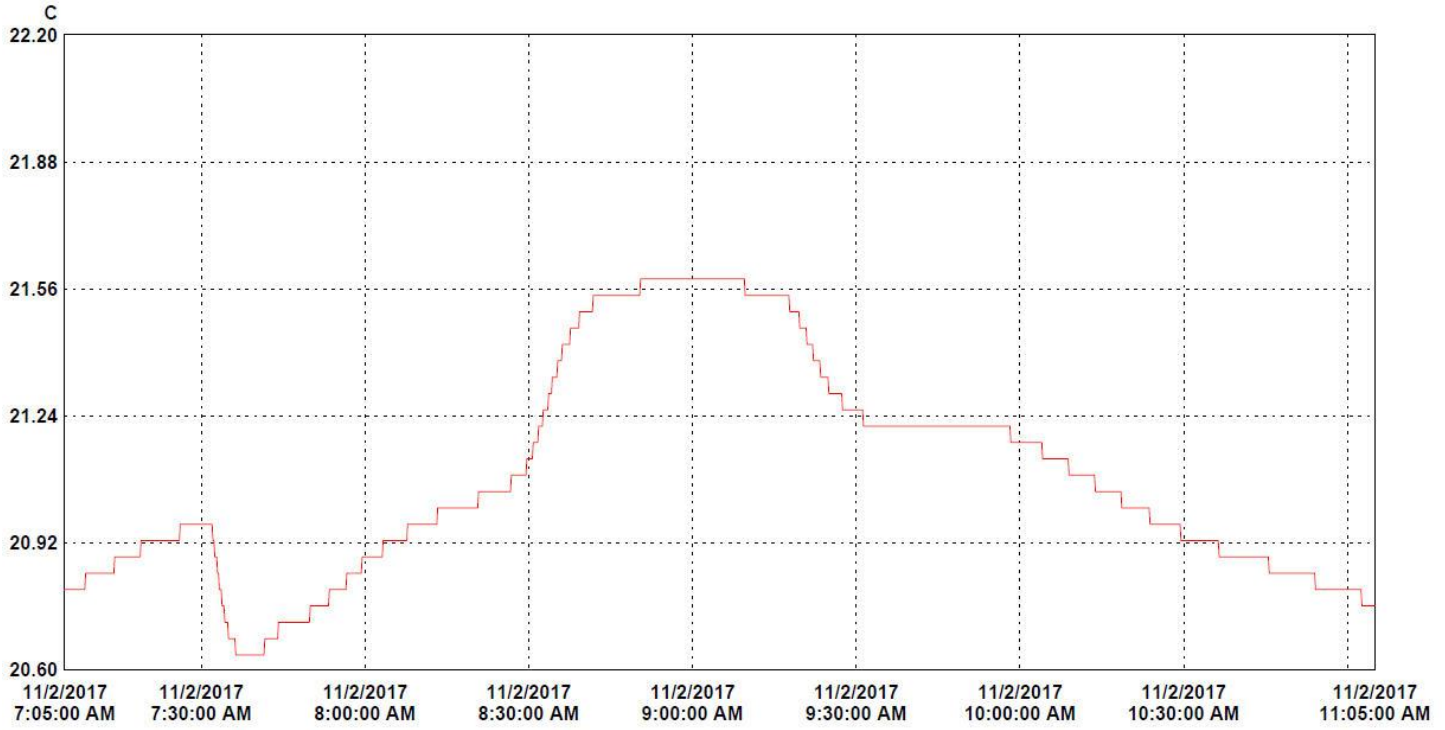
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

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 Audi Q7 2.0T AWD 5-Door SUV NHTSA No.: O20185809
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/2/2017



LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	17012040	CrashPrep	1		21.58	21.09	20.64	C	Temperature	O20185809 2018 Audi Q7 2.0T AWD 5-Door SUV NCAP - Temp

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Photo No. 001 - Load Cell Location

Photo No. 002 - Pre-Test Load Cell Wall

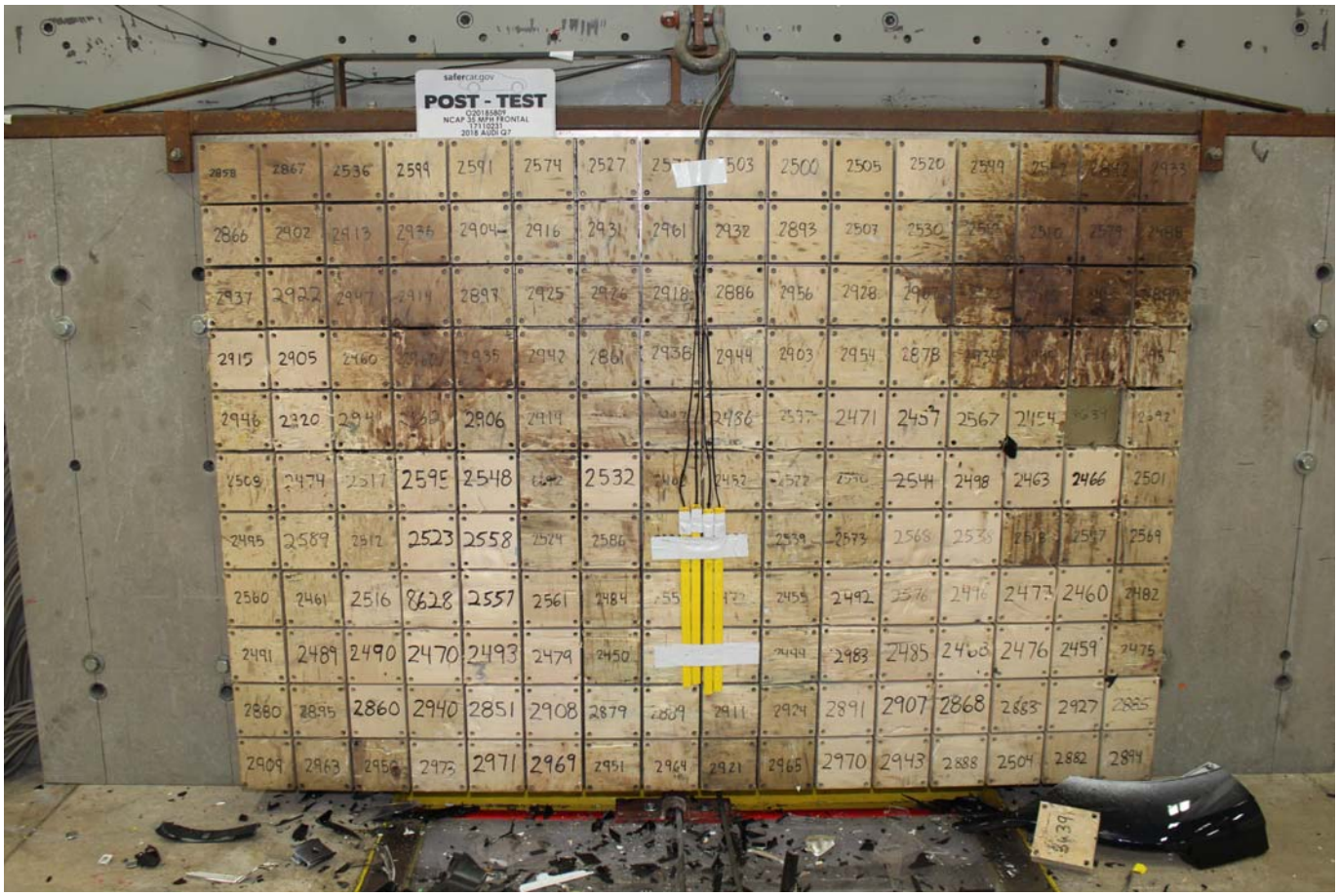


Photo No. 003 - Post-Test Load Cell Wall

Photo No. 004 - Manufacturer Label

Photo No. 005 - Tire Placard


Photo No. 006 - 2018 Audi Q7 2.0T 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

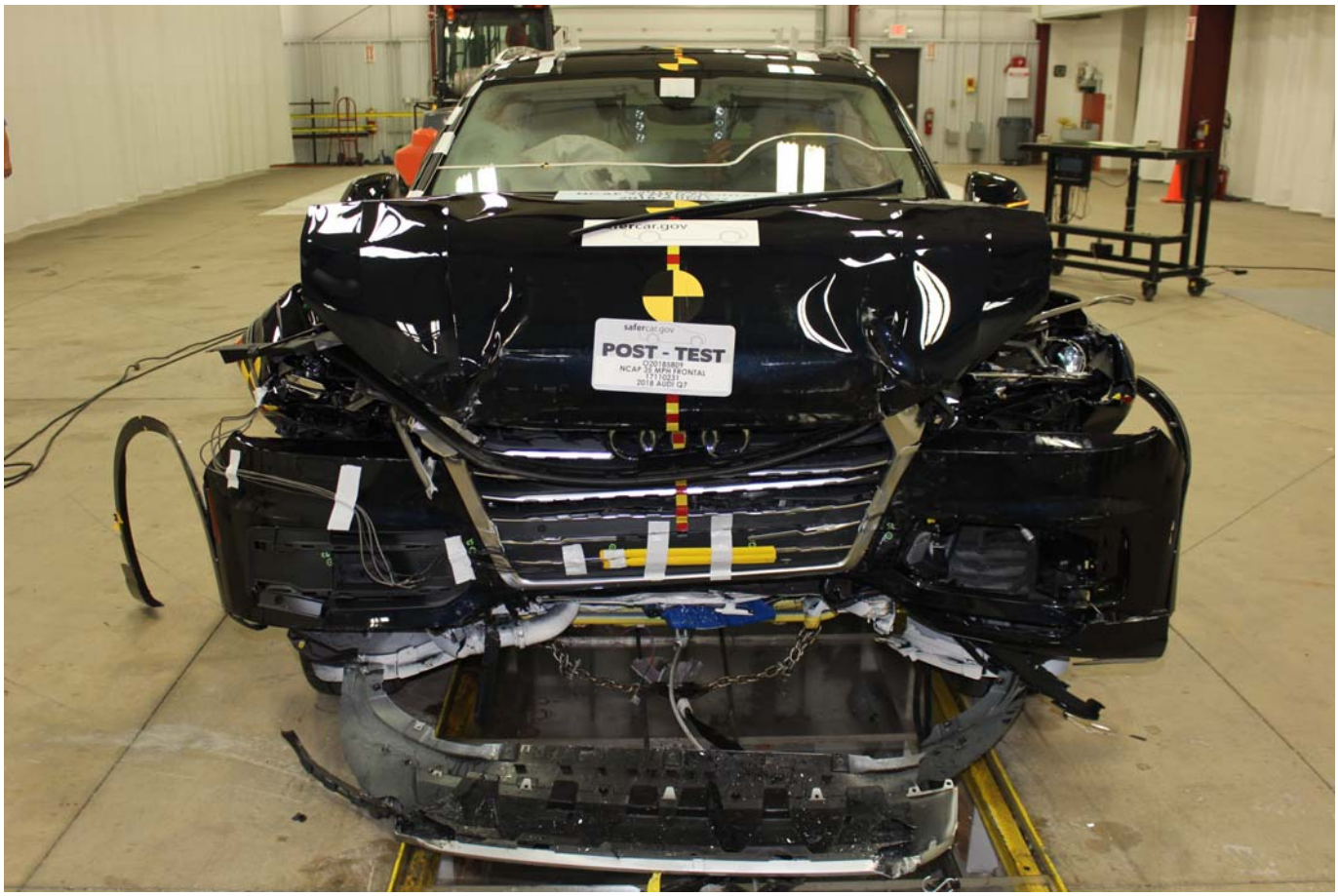


Photo No. 009 - Post-Test Front View of Test Vehicle

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

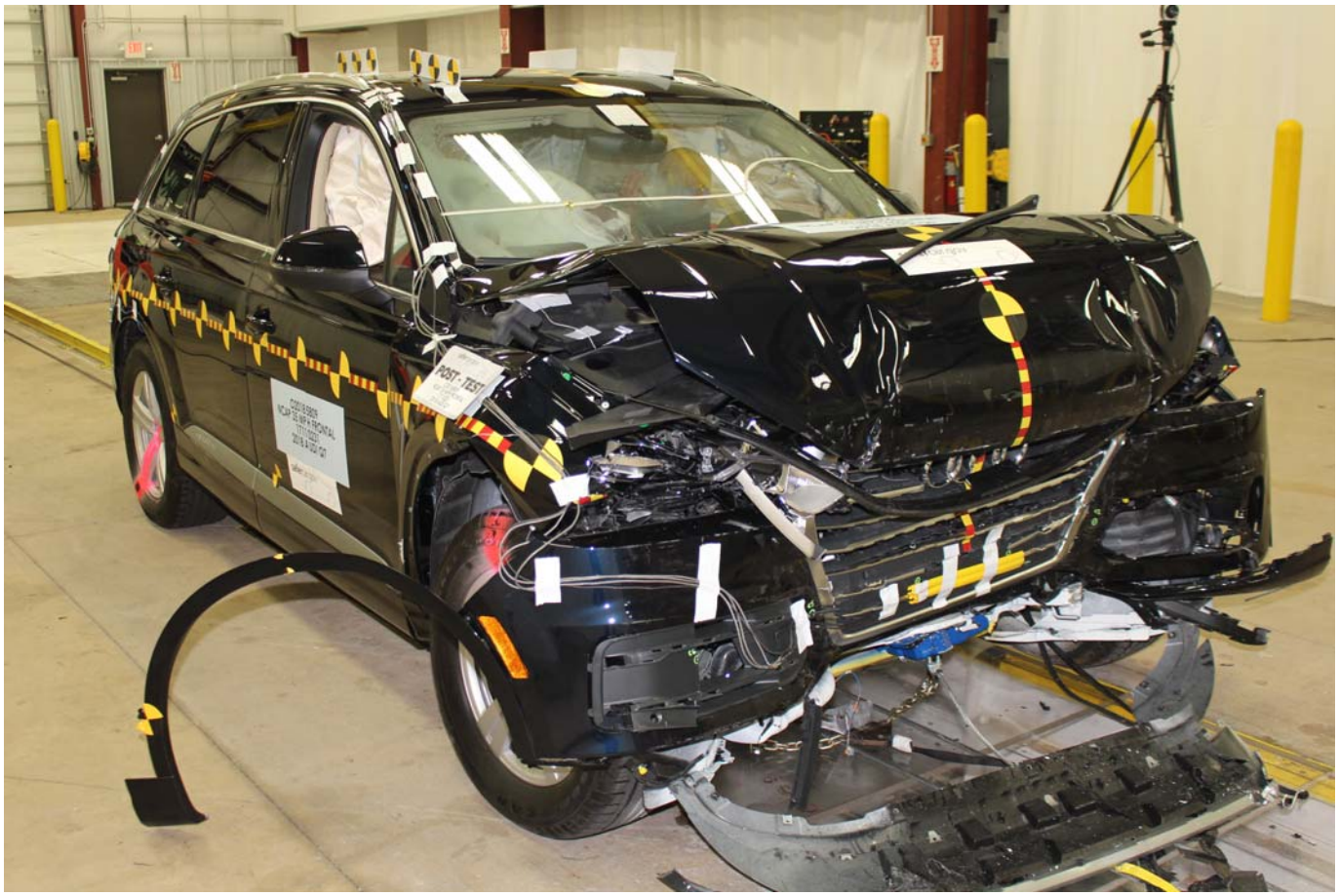


Photo No. 015 - Post-Test Right Front 3-4 View

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

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

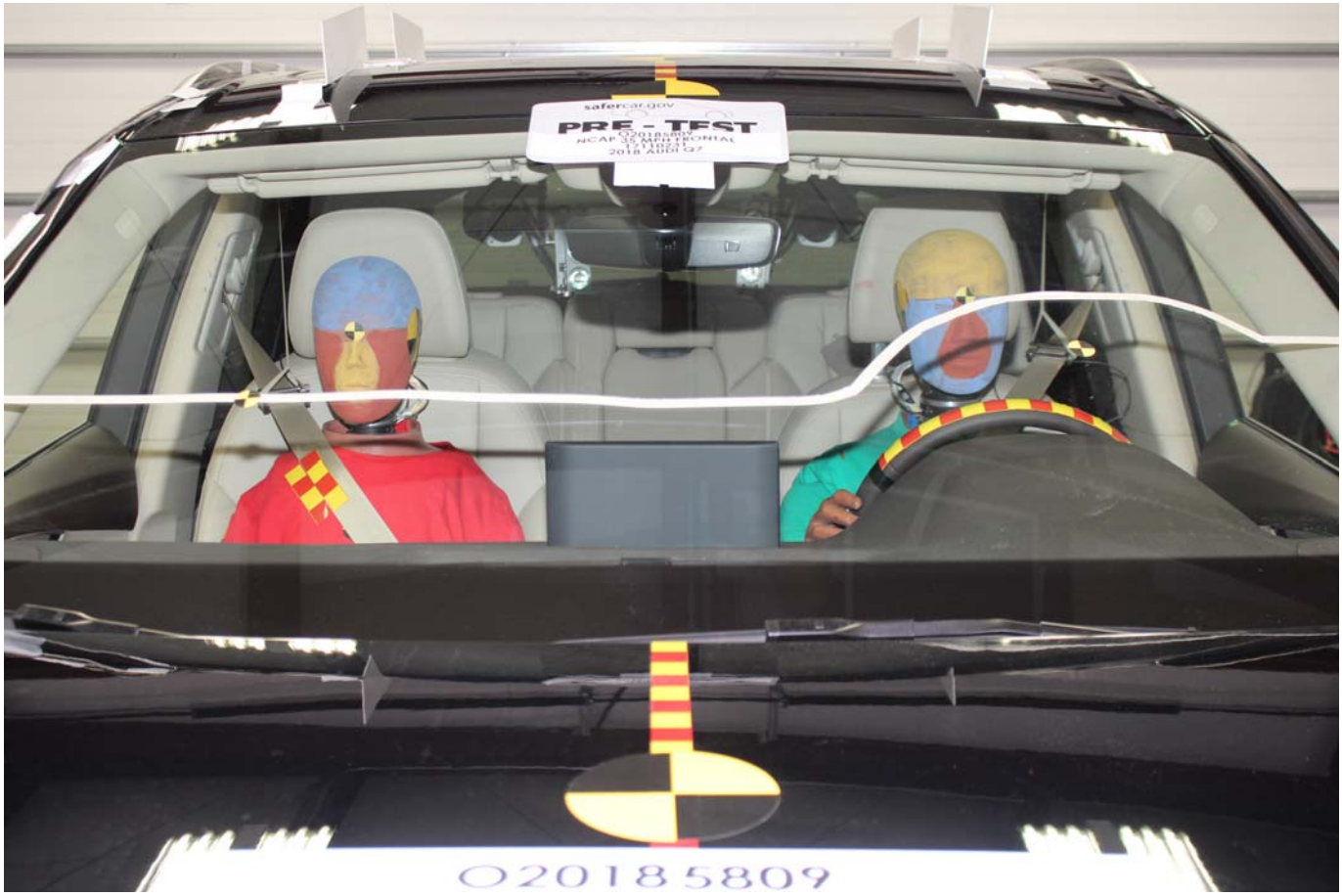


Photo No. 018 - Pre-Test Windshield View

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

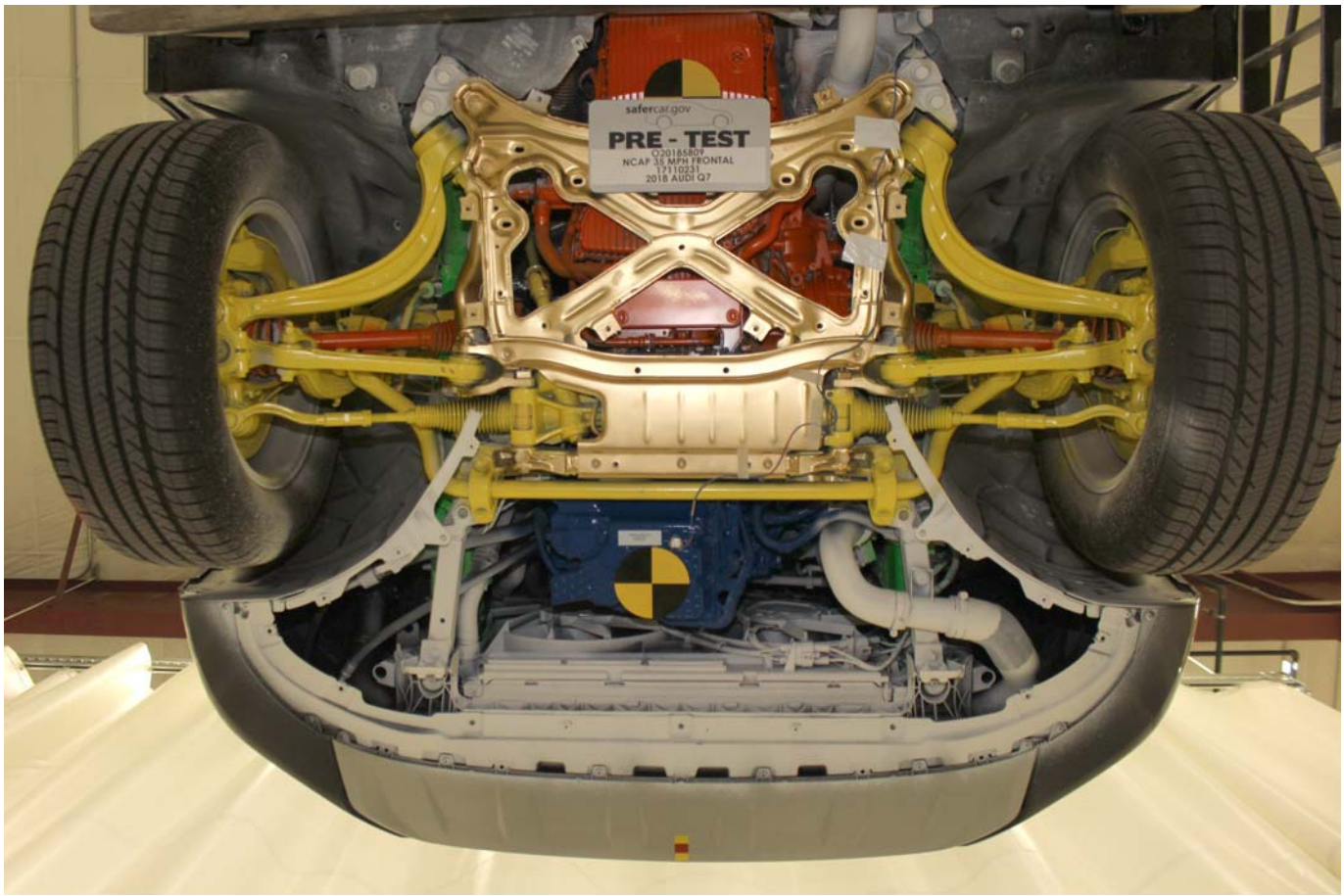


Photo No. 024 - Pre-Test Front Underbody View

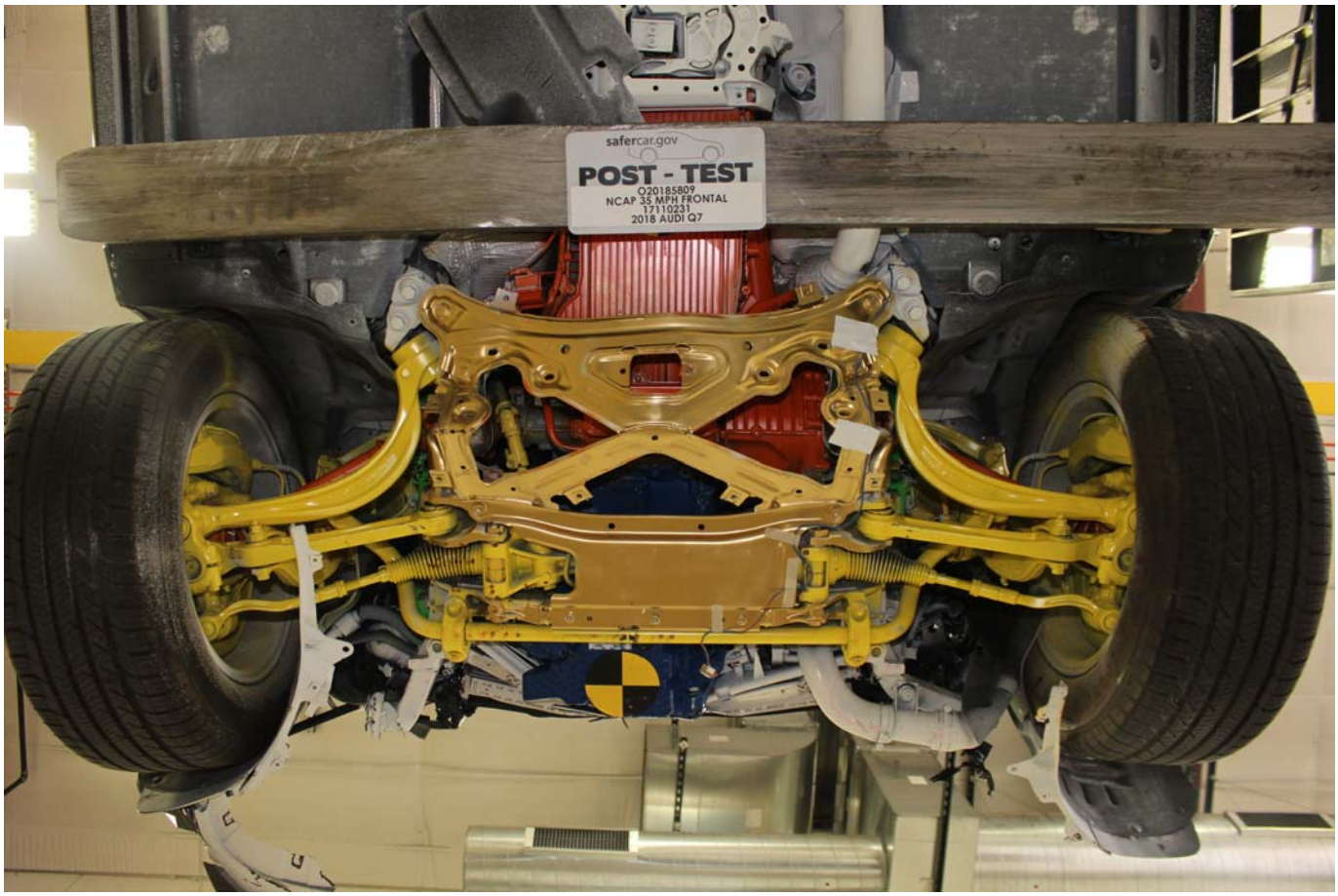


Photo No. 025 - Post-Test Front Underbody View

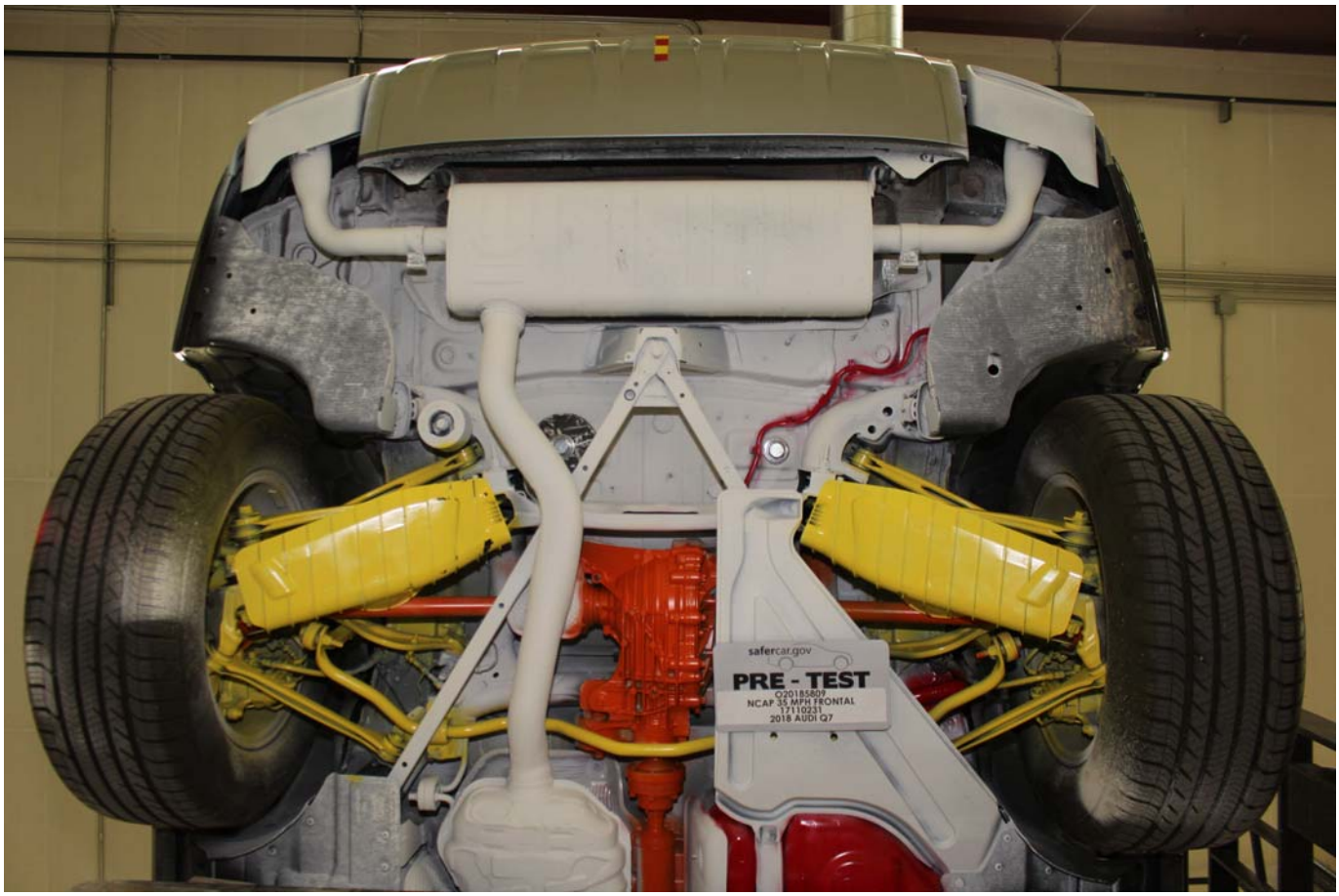


Photo No. 026 - Pre-Test Rear Underbody View

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

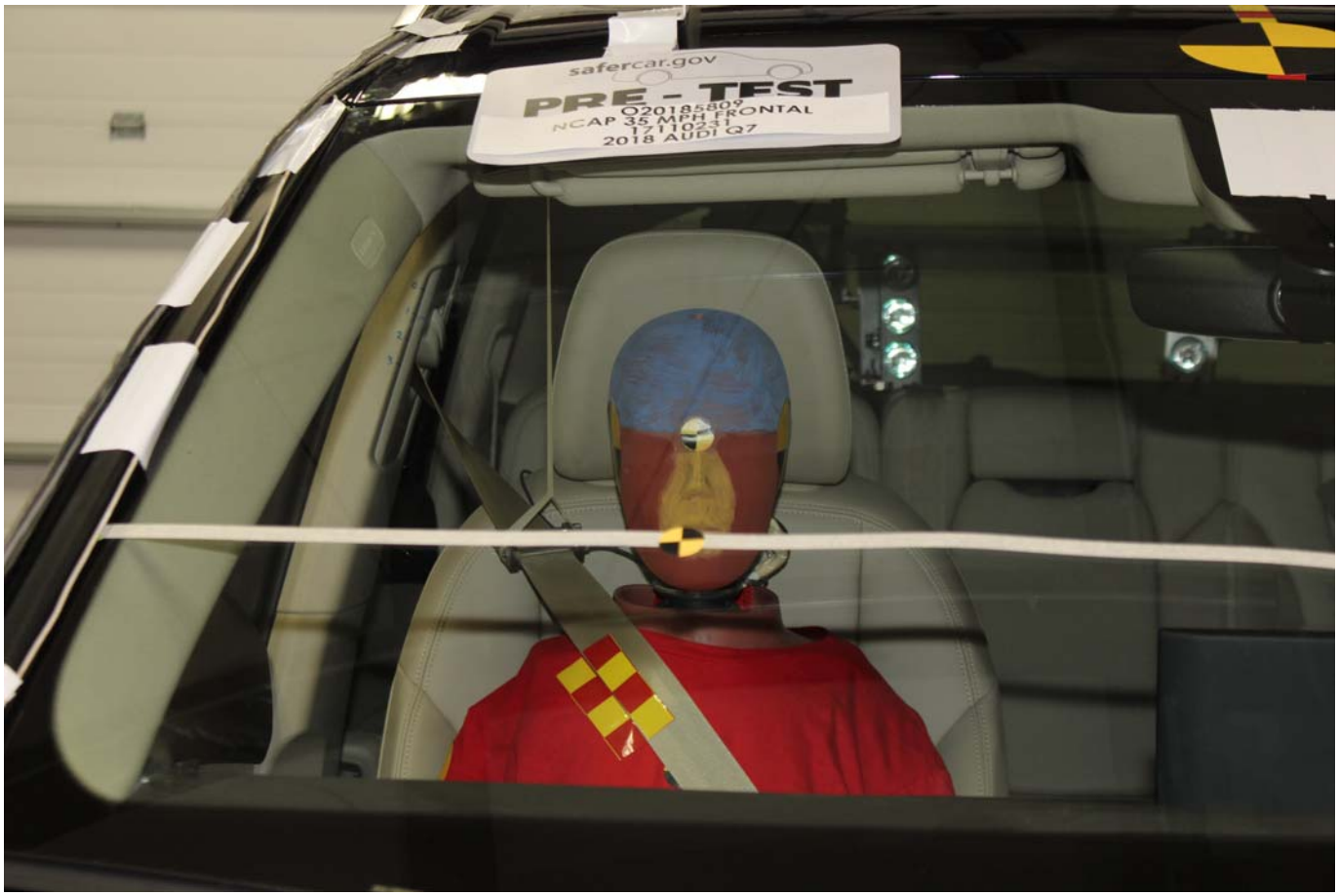


Photo No. 051 - Pre-Test Passenger Dummy Front View

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

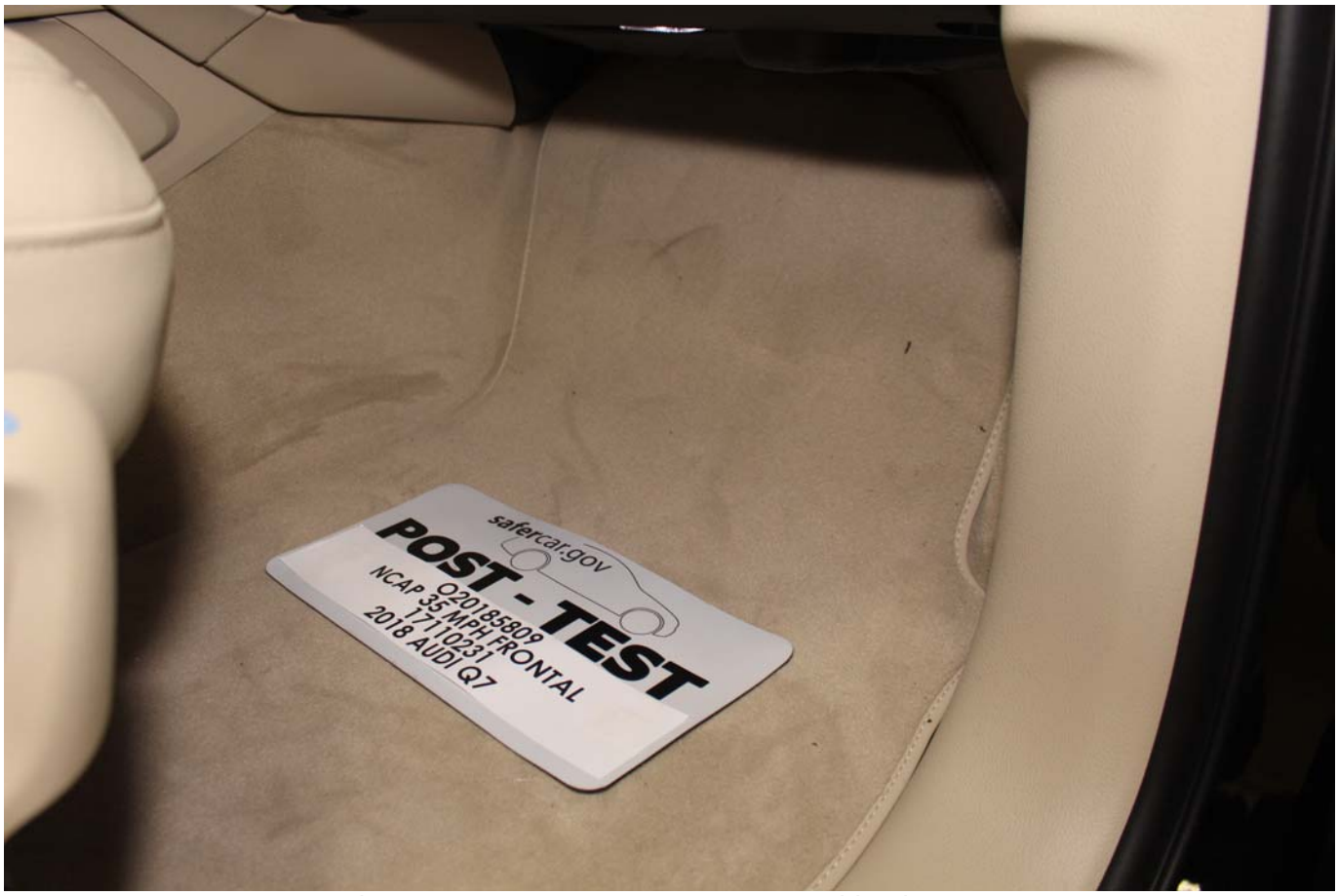


Photo No. 066 - Post-Test Passenger Side Floorpan

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

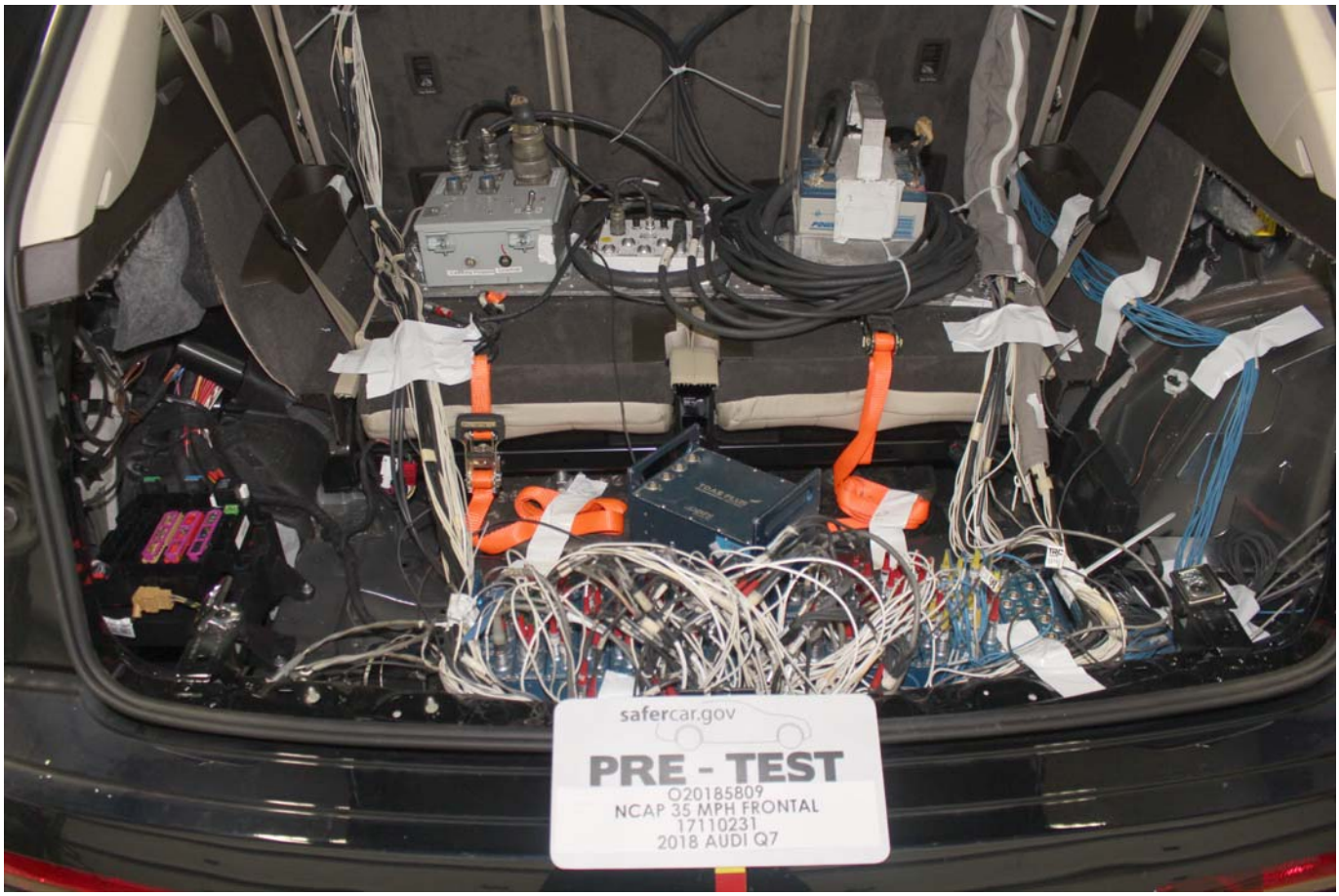


Photo No. 070 - Ballast Installed in Vehicle

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

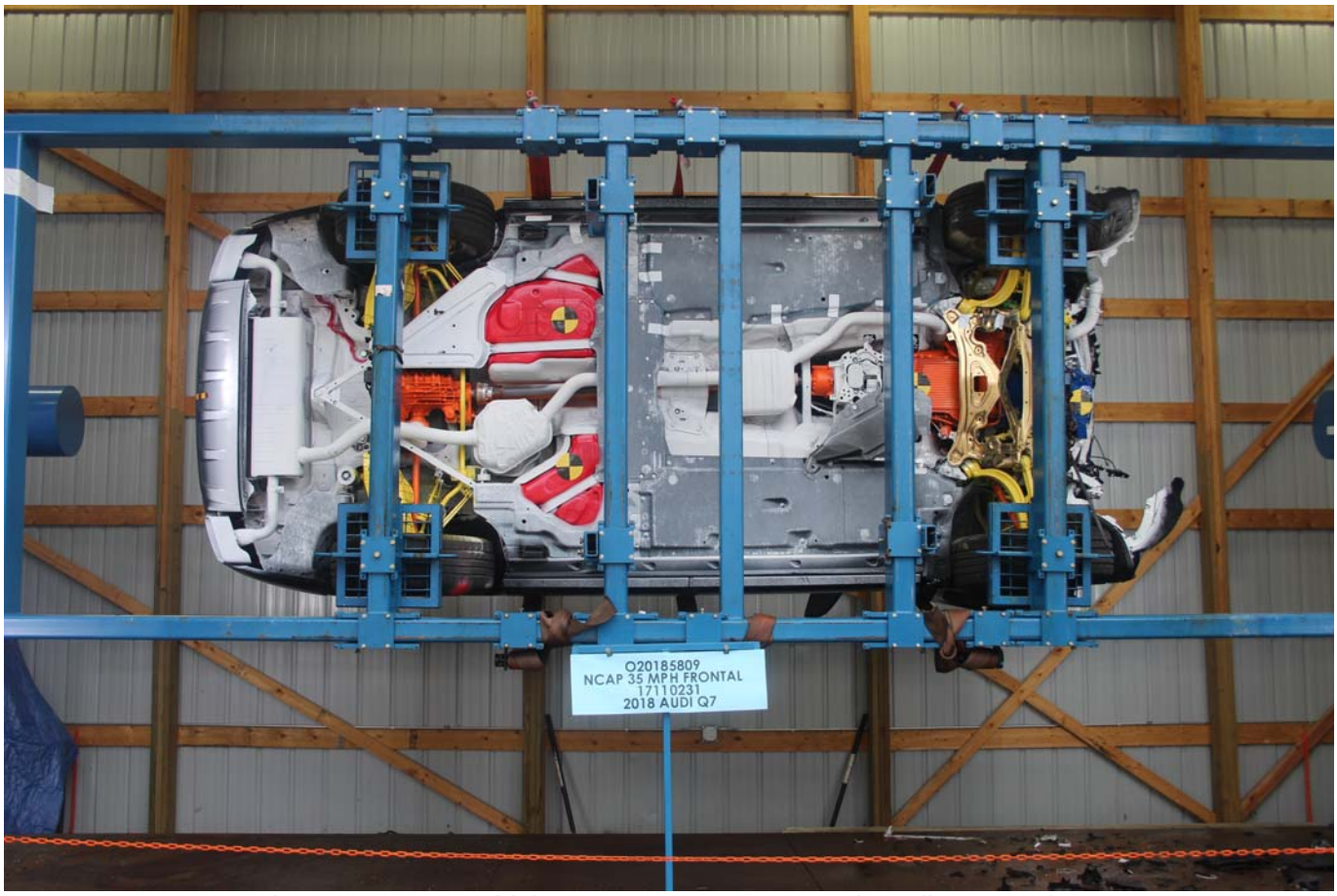


Photo No. 076 - Vehicle at 270 Degrees on Static Rollover Device

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

Photo No. 078 - 2018 Audi Q7 2.0T AWD 5-Door SUV Frontal Impact Event

2018 Audi Q7 2.0T quattro Tiptronic

STANDARD EQUIPMENT (unless replaced by options)

TECHNICAL
- 2.0L TFSI® 252hp / 273lb-ft I4 engine
- 8-speed Tiptronic® transmission
- quattro® all-wheel drive system
- 18" 5-arm-design wheels, 255/60 all-season tires
- Energy recuperation system w/ start-stop

COMFORT/TECHNOLOGY
- Audi advanced key
- Alu-optic roof rails
- Auto dimming interior mirror with compass
- Garage door opener (HomeLink®)
- Heated, 8-way power front seats w/ driver memory and 4-way lumbar adjustment
- Heated exterior mirrors, power-folding with memory
- Inlays - Upper: Silver finish / Lower: Terra brown walnut
- Leather seating surfaces
- MMI® Radio with Audi sound system
- Panoramic sunroof (2-panel) with electric sunshade
- Power-folding 3rd row (includes LATCH for all 2nd & 3rd row seats)
- Power tailgate
- Preparation for mobile phone (Bluetooth®)
- Rain & light sensor
- SiriusXM® All Access service (w/ 3-month trial subscription)
- Three-zone automatic climate control
- Trailer hitch preparation (includes brake controller wiring)
- USB Audi music interface, AM/FM/SAT/HD radio
- Xenon plus headlights
- 3-spoke leather-wrapped multifunction steering wheel w/ shift paddles
- 7 passenger seating

SAFETY/CONVENIENCE
- Advanced Airbag Protection System with 6 airbags
- Anti-lock Braking System (ABS) w/ Brake Assist
- Audi pre sense basic (preventative occupant protection)
- Audi pre sense city (low speed collision assist)
- Child safety locks in rear doors, power
- Electronic Stabilization Control (ESC) w/ Offroad mode
- Electronic vehicle immobilization w/ anti-theft alarm
- LED Daytime Running Lights (DRLs)
- LED taillights
- Lower Anchors and Tethers for CHildren (LATCH)
- Rearview camera
- Tire Pressure Monitoring System (TPMS)

WARRANTY/MAINTENANCE
- 4 Year/50,000 mile (whichever occurs first) New Vehicle Limited Warranty*
- 12 Year Limited Warranty Against Corrosion Perforation
- 1 Year/10,000 mile (whichever occurs first) First Scheduled Maintenance Service FREE OF CHARGE
- 4 Years Roadside Assistance coverage provided by a third party supplier

*Please refer to the 2018 Audi Warranty and Maintenance Booklet for complete coverage information.

MANUFACTURER'S SUGGESTED RETAIL PRICE

2018 Audi Q7 2.0T quattro Tiptronic	**$49,900.00**
PACKAGES / OPTIONS	
Ink Blue metallic	$575.00
Pistachio Beige interior	Included
Audi Beam - Rings	$250.00
Destination Charge	$975.00
Total Price:	**$51,700.00**

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

MODEL: 4MB5H1

VIN: WA1AHAF79JD010375

DEALER: 408C53
AUDI DANBURY
25 SUGAR HOLLOW RD
DANBURY, CT 06810
Port of Entry: DAVISVILLE

SHIP TO: 408C53
AUDI DANBURY
25 SUGAR HOLLOW RD
DANBURY, CT 06810
COMM NUM: PM2951
Transportation Method: TRUCK

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score		**Not Rated**

Based on the combined ratings of frontal, side and rollover.
Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash	Driver	**Not Rated**
	Passenger	**Not Rated**

Based on the risk of injury in a frontal impact.
Should ONLY be compared to other vehicles of similar size and weight.

Side Crash	Front Seat	**Not Rated**
	Rear Seat	**Not Rated**

Based on the risk of injury in a side impact.

Rollover	**Not Rated**

Based on the risk of rollover in a single-vehicle crash.

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

EPA DOT Fuel Economy and Environment — Gasoline Vehicle

Fuel Economy
21 MPG
combined city/hwy
19 city
25 highway

Standard Sport Utility Vehicles range from 12 to 93 MPG. The best vehicle rates 136 MPGe.

4.8 gallons per 100 miles

You **spend $3,250** more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost $2,000

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

Smog Rating (tailpipe only): 3 (1 – 10 Best)

This vehicle emits 415 grams of CO_2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at fueleconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs $6,750 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $2.80 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™

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:	FOR THIS VEHICLE:
U.S./CANADIAN PARTS CONTENT:	1% FINAL ASSEMBLY POINT: BRATISLAVA, SLOVAKIA
MAJOR SOURCES OF FOREIGN	COUNTRY OF ORIGIN: ENGINE: HUNGARY
PARTS CONTENT: GERMANY: 39%	TRANSMISSION: GERMANY
SLOVAKIA: 33%	

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

Photo No. 079 - Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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

Driver Head X Redundant

Driver Head Y Redundant

Driver Head Z Redundant

Driver Head Angular Velocity X

Driver Head Angular Velocity Y

Driver Head Angular Velocity Z

Driver Upper Neck Force Y

Driver Upper Neck Moment X

Driver Upper Neck Moment Z

Driver Chest X Redundant

Driver Chest Y Redundant

Driver Chest Z Redundant

Driver Pelvis X

Driver Pelvis Y

Driver Pelvis Z

Driver Left Femur Redundant

Driver Right Femur Redundant

Driver Left Upper Tibia Moment X

Driver Left Upper Tibia Moment Y

Driver Left Upper Tibia Force Z

Driver Left Lower Tibia Moment X

Driver Left Lower Tibia Moment Y

Driver Left Lower Tibia Force Z

Driver Right Upper Tibia Moment X

Driver Right Upper Tibia Moment Y

Driver Right Upper Tibia Force Z

Driver Right Lower Tibia Moment X

Driver Right Lower Tibia Moment Y

Driver Right Lower Tibia Force Z

Driver Left Foot Fore Z

Driver Left Foot Aft X

Driver Left Foot Aft Z

Driver Right Foot Fore Z

Driver Right Foot Aft X

Driver Right Foot Aft Z

Driver Lap Belt Force

Driver Shoulder Belt Force

Passenger Head X Redundant

Passenger Head Y Redundant

Passenger Head Z Redundant

Passenger Head Angular Velocity X

Passenger Head Angular Velocity Y

Passenger Head Angular Velocity Z

Passenger Upper Neck Force Y

Passenger Upper Neck Moment X

Passenger Upper Neck Moment Z

Passenger Chest X Redundant

Passenger Chest Y Redundant

Passenger Chest Z Redundant

Passenger Pelvis X

Passenger Pelvis Y

Passenger Pelvis Z

Passenger Left Femur Redundant

Passenger Right Femur Redundant

Passenger Left Upper Tibia Moment X

Passenger Left Upper Tibia Moment Y

Passenger Left Upper Tibia Force Z

Passenger Left Lower Tibia Moment X

Passenger Left Lower Tibia Moment Y

Passenger Left Lower Tibia Force Z

Passenger Right Upper Tibia Moment X

Passenger Right Upper Tibia Moment Y

Passenger Right Upper Tibia Force Z

Passenger Right Lower Tibia Moment X

Passenger Right Lower Tibia Moment Y

Passenger Right Lower Tibia Force Z

Passenger Left Foot Fore Z

Passenger Left Foot Aft X

Passenger Left Foot Aft Z

Passenger Right Foot Fore Z

Passenger Right Foot Aft X

Passenger Right Foot Aft Z

Passenger Lap Belt Force

Passenger Shoulder Belt Force

Left Rear Seat Crossmember X

Right Rear Seat Crossmember X

Vehicle Engine Top X

Vehicle Engine Bottom X

Left Rear Seat Crossmember Z

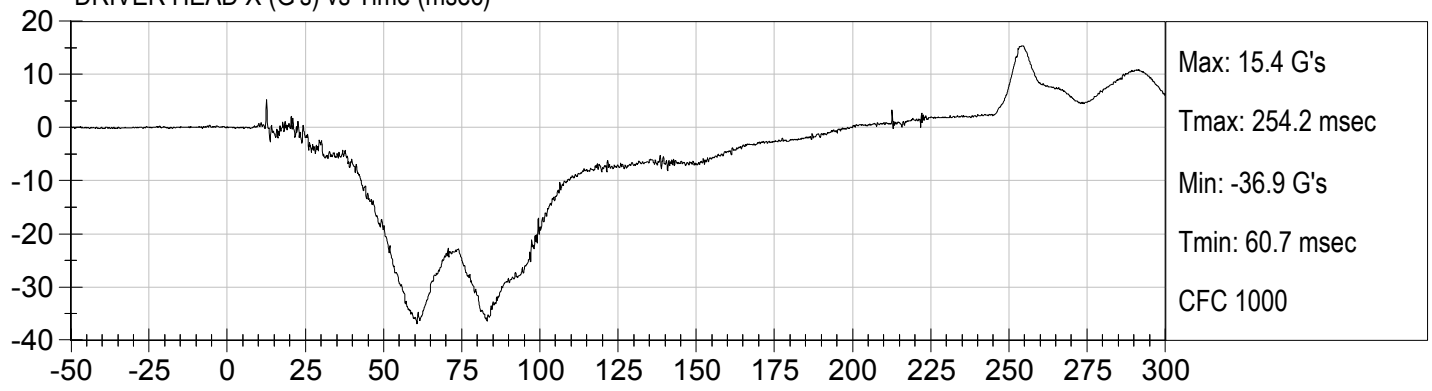
Right Rear Seat Crossmember Z

Left Rear Seat Crossmember Xr

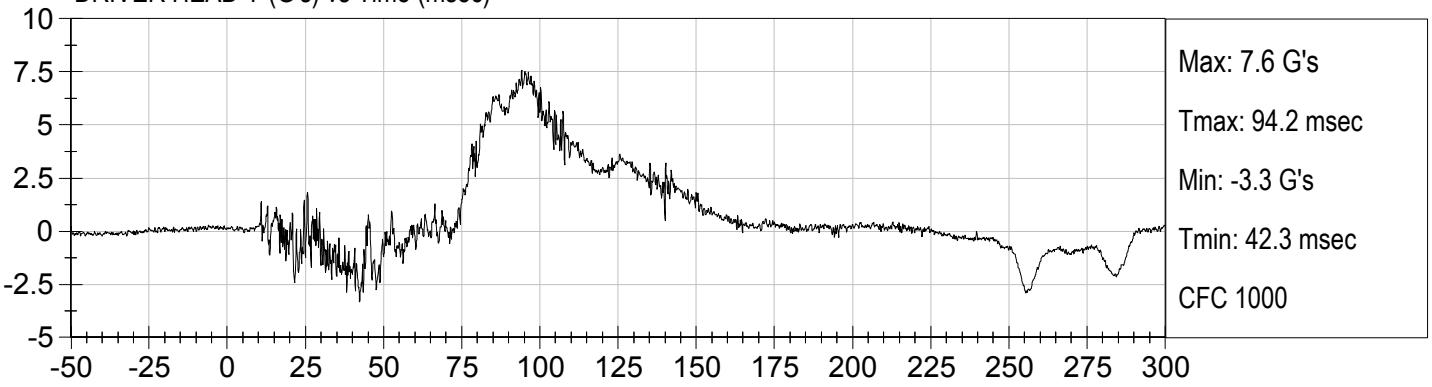
Right Rear Seat Crossmember Xr

Advanced Research Load Cell Barrier – 528 channels

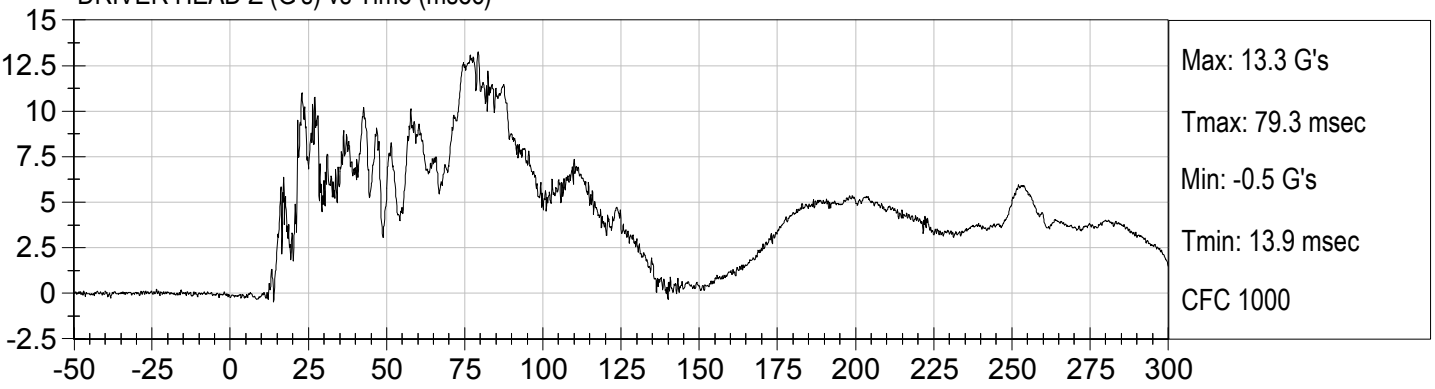
DRIVER HEAD X (G's) vs Time (msec)



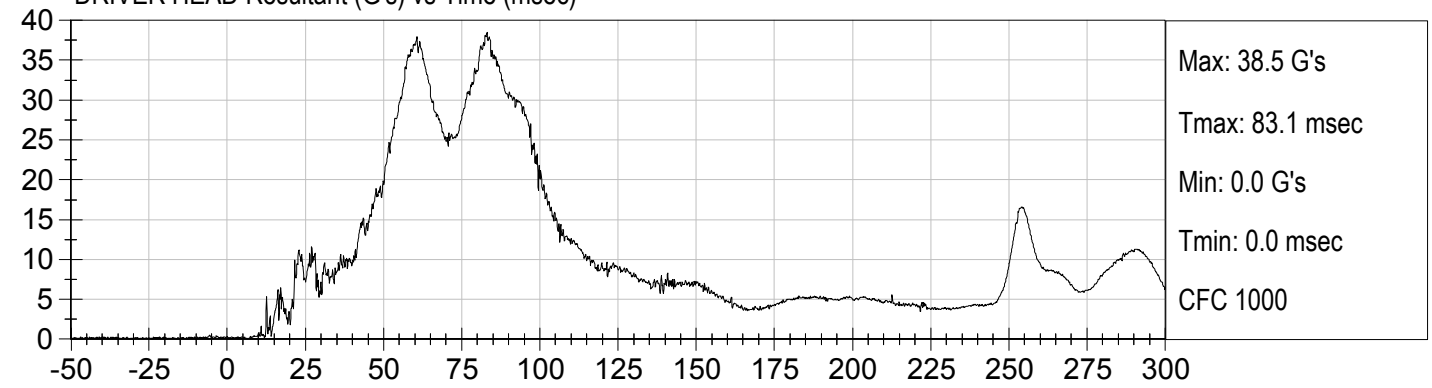
DRIVER HEAD Y (G's) vs Time (msec)

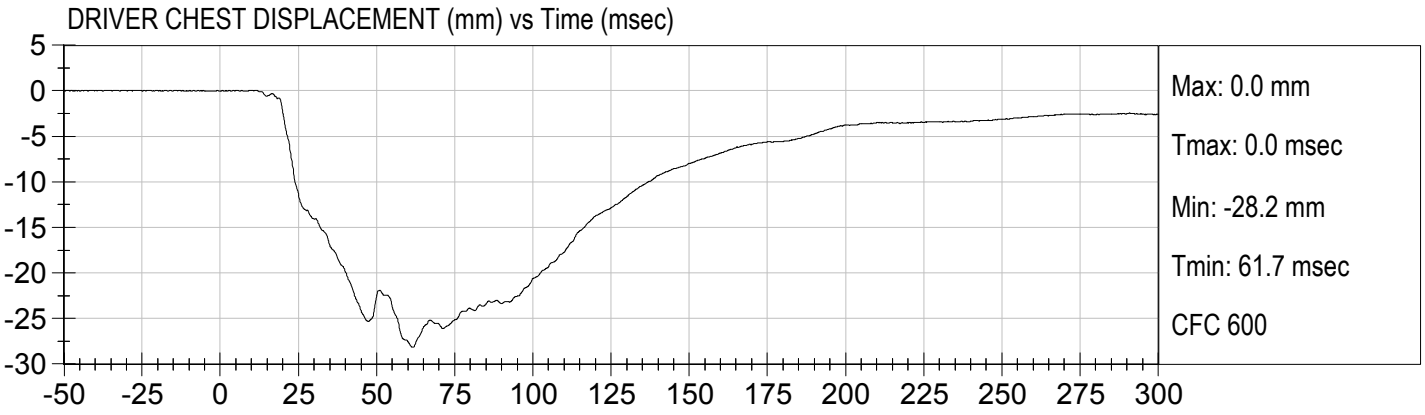


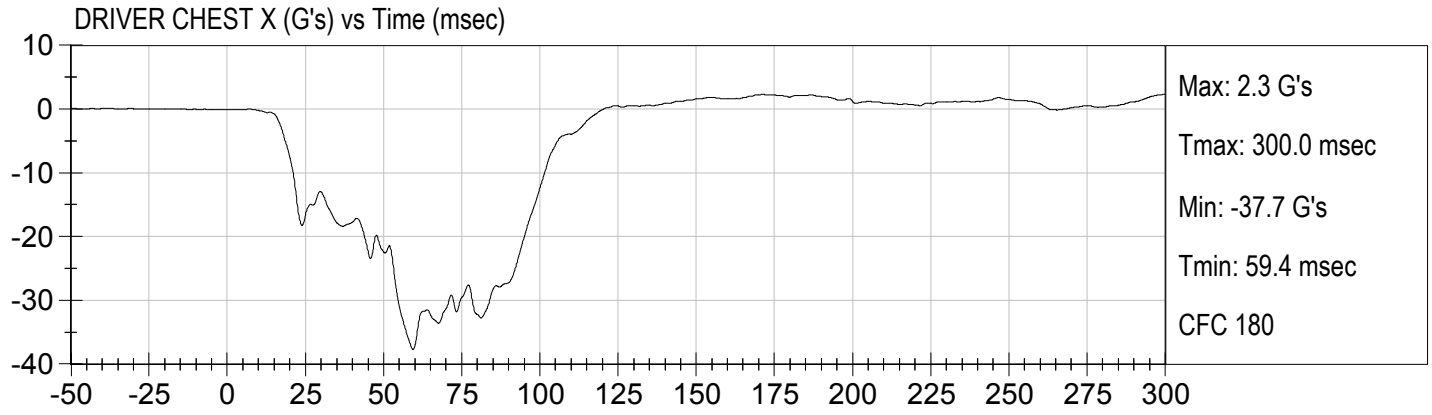
DRIVER HEAD Z (G's) vs Time (msec)

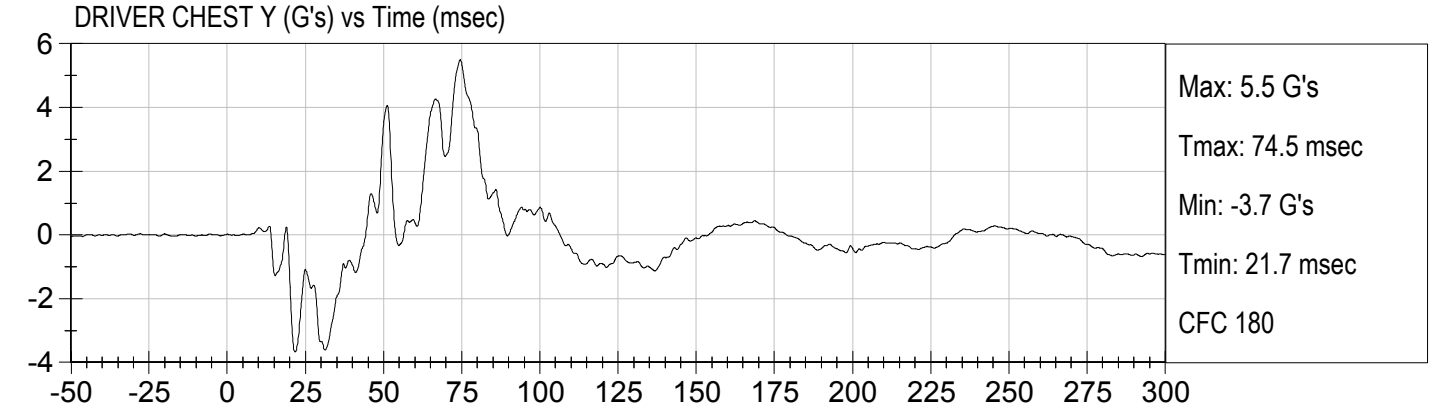


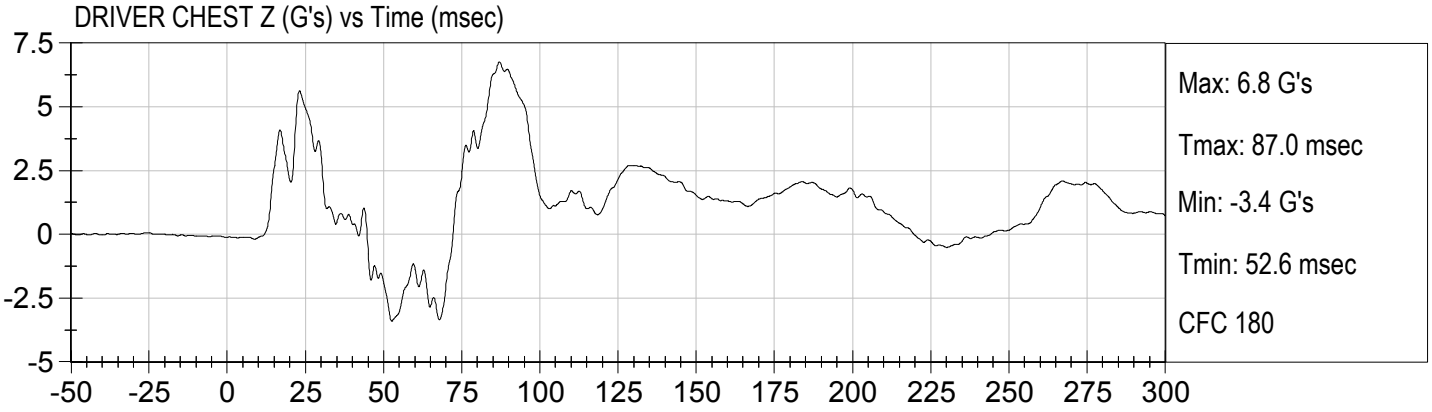
DRIVER HEAD Resultant (G's) vs Time (msec)

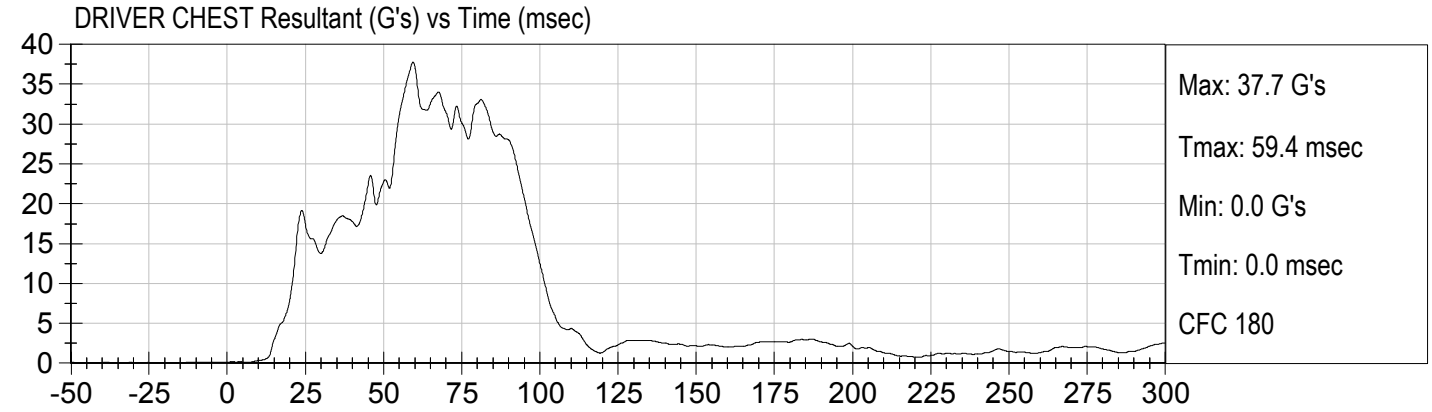



DRIVER CHEST DISPLACEMENT (mm) vs Time (msec)
5
0
-5
-10
-15
-20
-25
-30
-50
-25
0
25
50
75
100
125
150
175
200
225
250
275
300
Max: 0.0 mm
Tmax: 0.0 msec
Min: -28.2 mm
Tmin: 61.7 msec
CFC 600

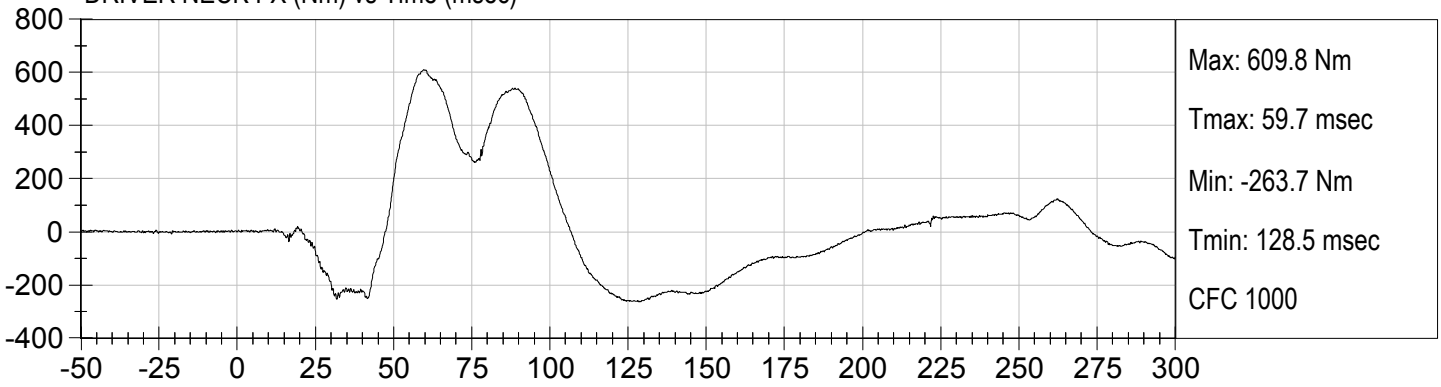

DRIVER CHEST X (G's) vs Time (msec)
10
0
-10
-20
-30
-40
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 2.3 G's
Tmax: 300.0 msec
Min: -37.7 G's
Tmin: 59.4 msec
CFC 180


DRIVER CHEST Y (G's) vs Time (msec)
6
4
2
0
-2
-4
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 5.5 G's
Tmax: 74.5 msec
Min: -3.7 G's
Tmin: 21.7 msec
CFC 180

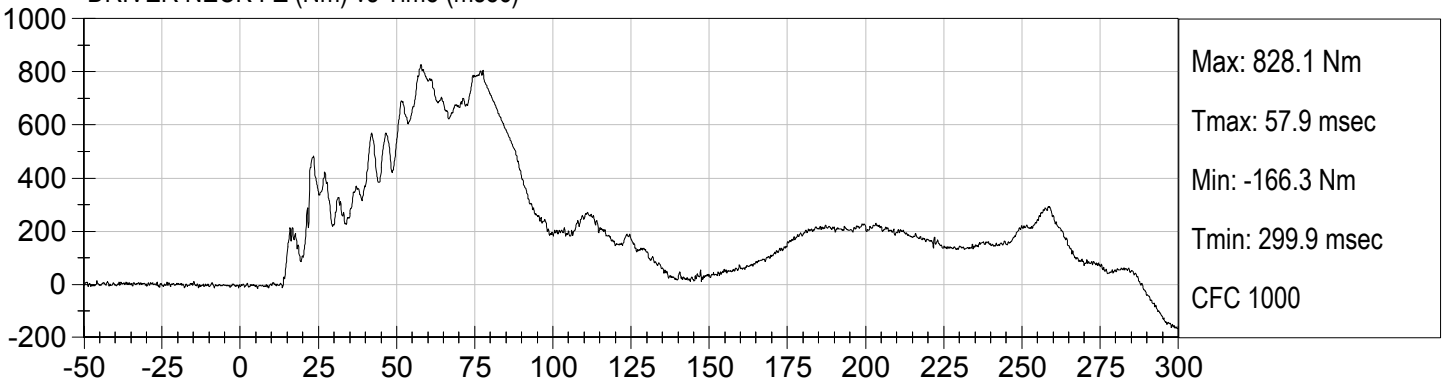

DRIVER CHEST Z (G's) vs Time (msec)
7.5
5
2.5
0
-2.5
-5
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 6.8 G's
Tmax: 87.0 msec
Min: -3.4 G's
Tmin: 52.6 msec
CFC 180


DRIVER CHEST Resultant (G's) vs Time (msec)
40
35
30
25
20
15
10
5
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 37.7 G's
Tmax: 59.4 msec
Min: 0.0 G's
Tmin: 0.0 msec
CFC 180

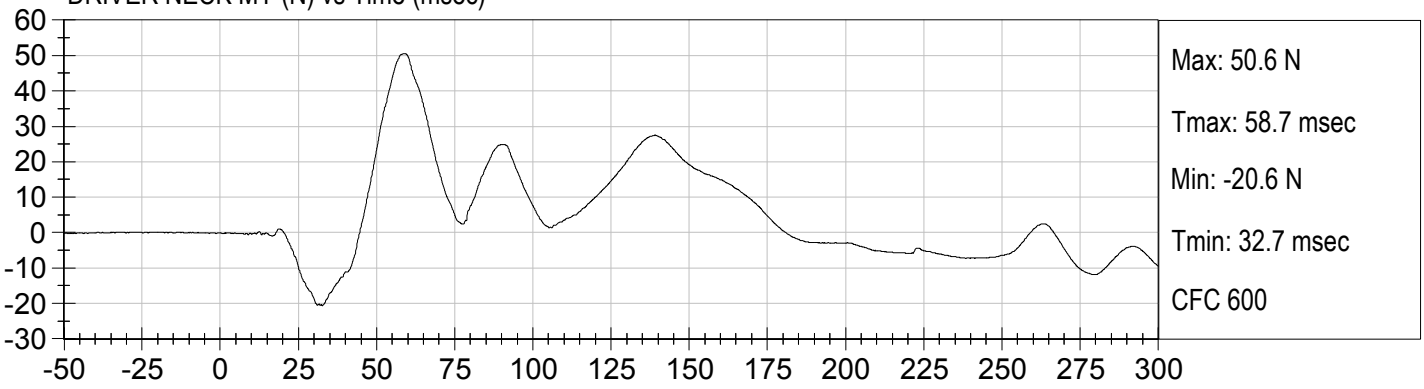
DRIVER NECK FX (Nm) vs Time (msec)

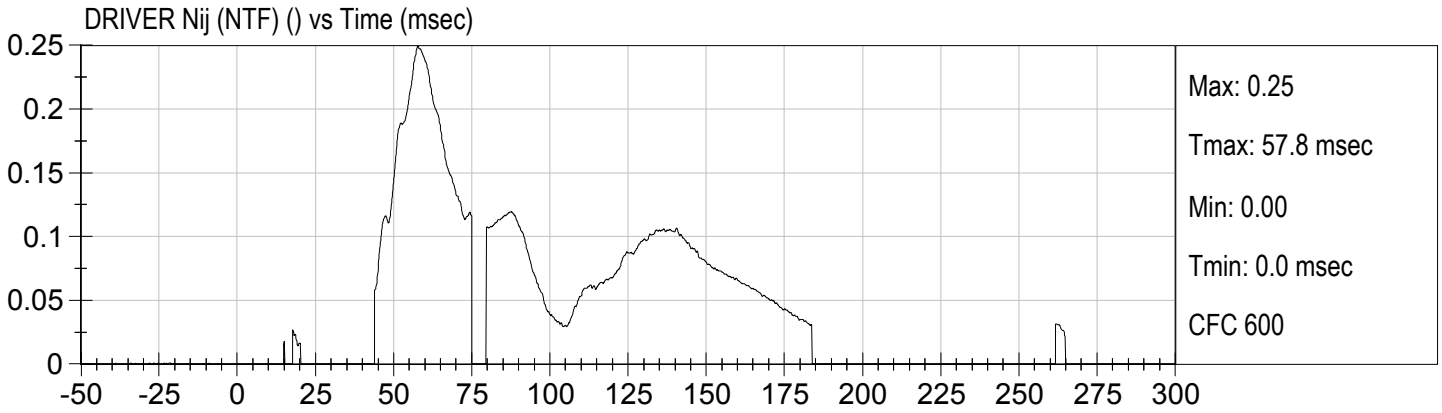


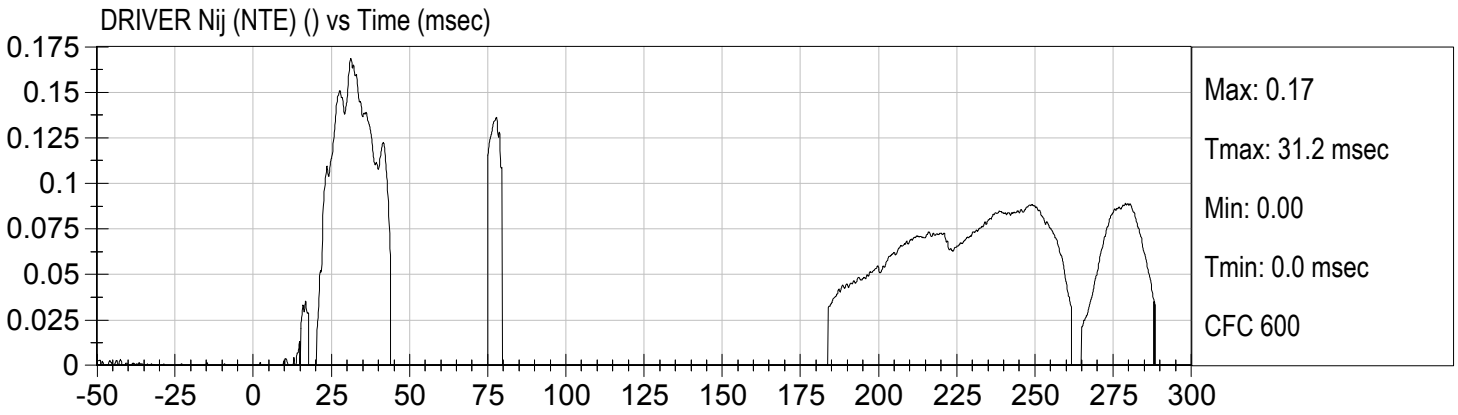
DRIVER NECK FZ (Nm) vs Time (msec)

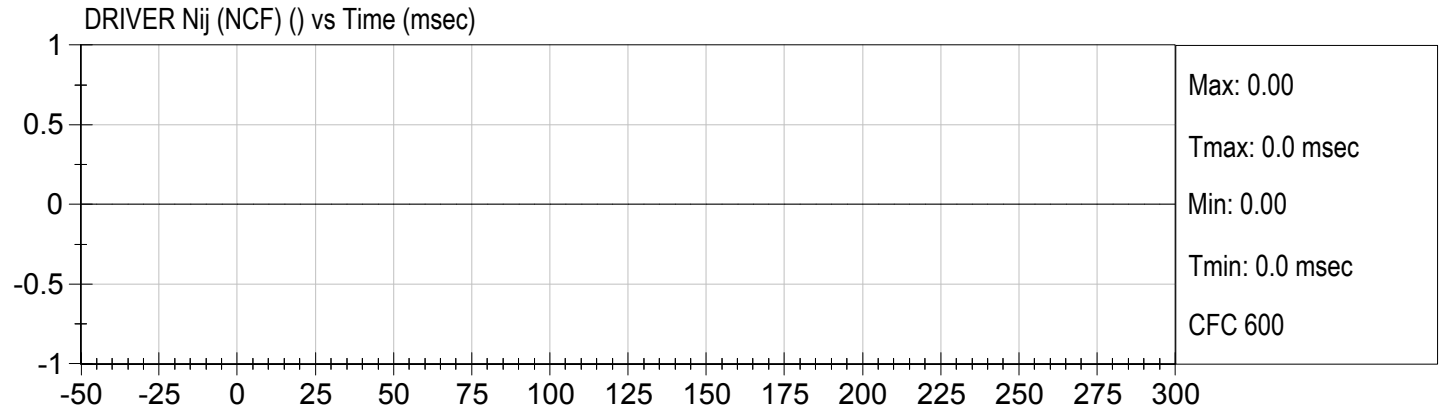


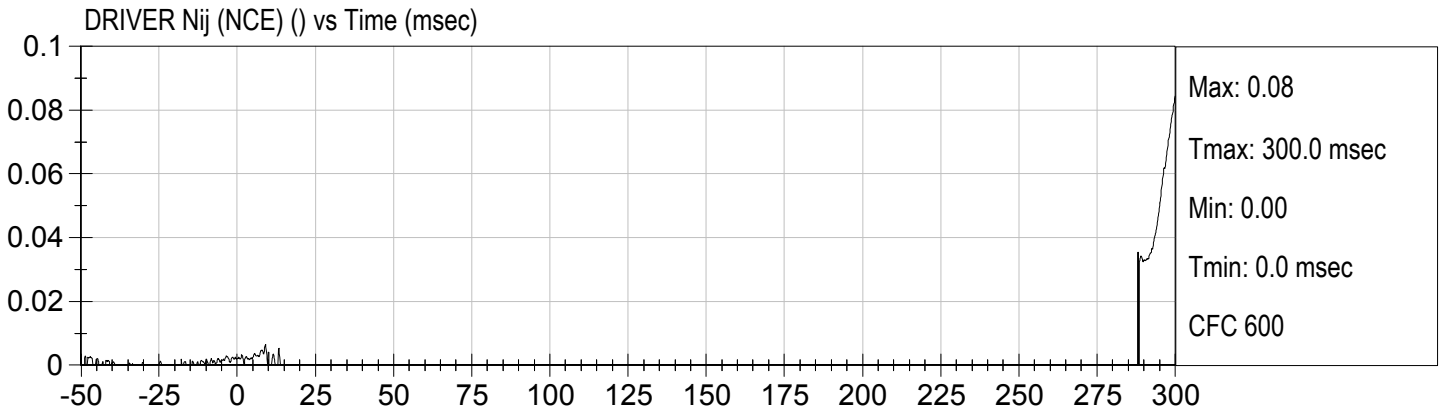
DRIVER NECK MY (N) vs Time (msec)



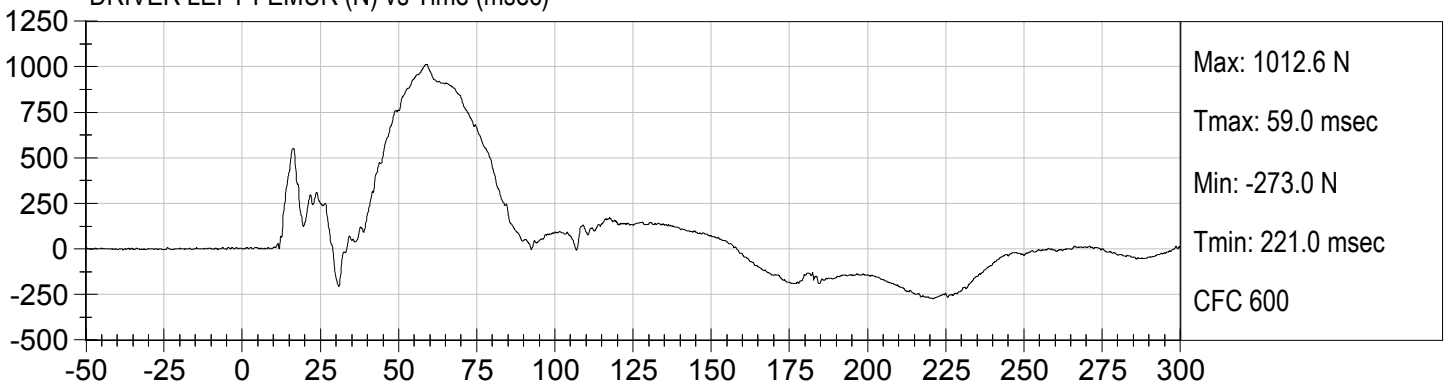

DRIVER Nij (NTF) () vs Time (msec)
0.25
0.2
0.15
0.1
0.05
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.25
Tmax: 57.8 msec
Min: 0.00
Tmin: 0.0 msec
CFC 600


DRIVER Nij (NTE) () vs Time (msec)
0.175
0.15
0.125
0.1
0.075
0.05
0.025
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.17
Tmax: 31.2 msec
Min: 0.00
Tmin: 0.0 msec
CFC 600


DRIVER Nij (NCF) () vs Time (msec)
1
0.5
0
-0.5
-1
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.00
Tmax: 0.0 msec
Min: 0.00
Tmin: 0.0 msec
CFC 600

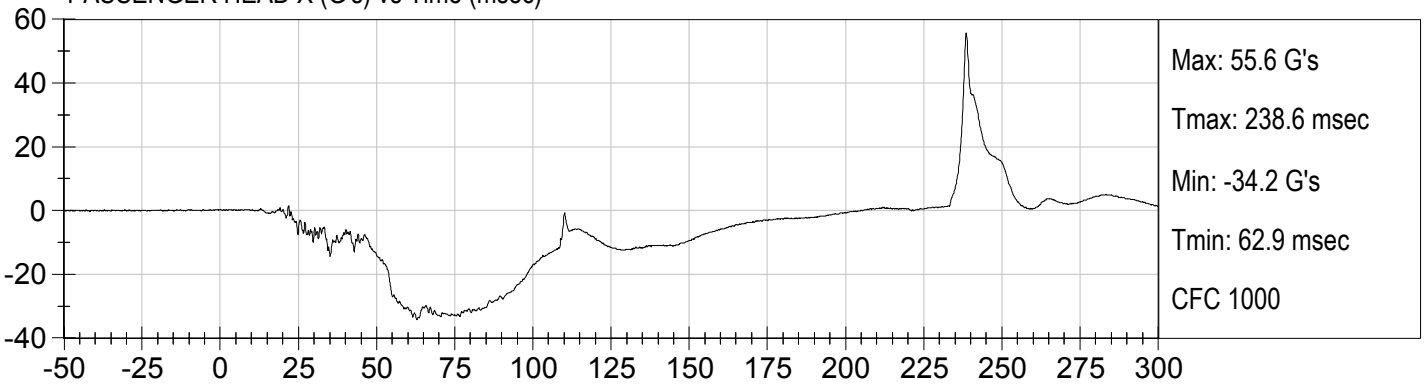

DRIVER Nij (NCE) () vs Time (msec)
0.1
0.08
0.06
0.04
0.02
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.08
Tmax: 300.0 msec
Min: 0.00
Tmin: 0.0 msec
CFC 600

DRIVER LEFT FEMUR (N) vs Time (msec)

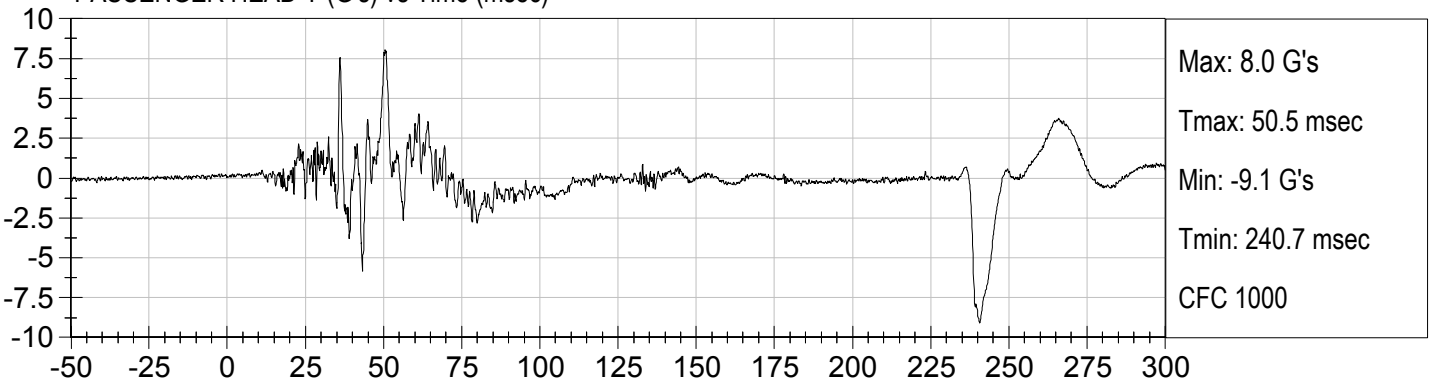


DRIVER RIGHT FEMUR (N) vs Time (msec)

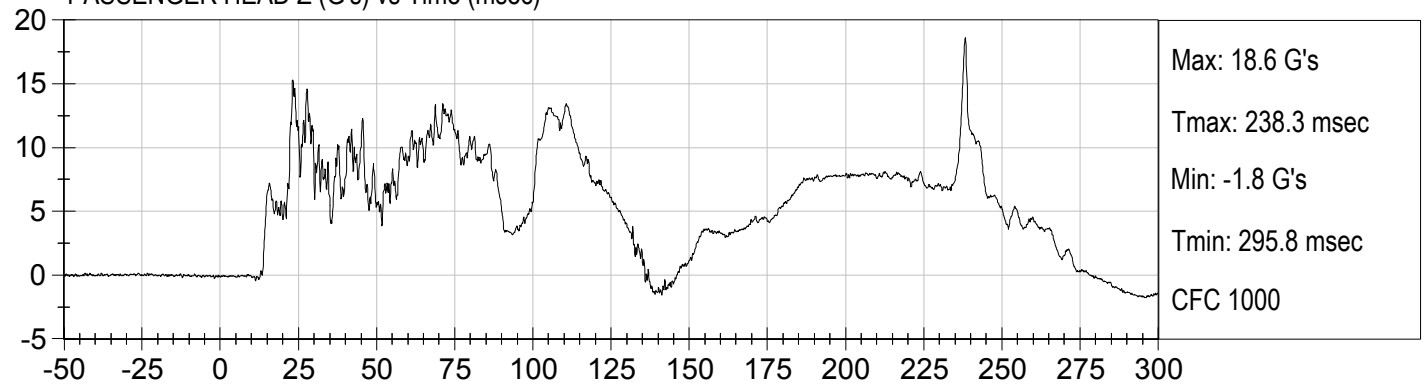
PASSENGER HEAD X (G's) vs Time (msec)



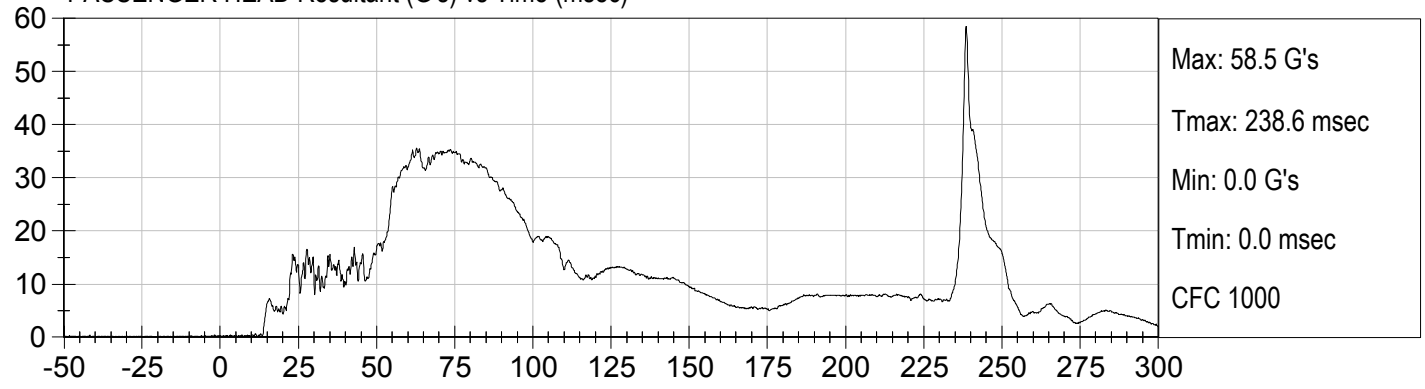
PASSENGER HEAD Y (G's) vs Time (msec)



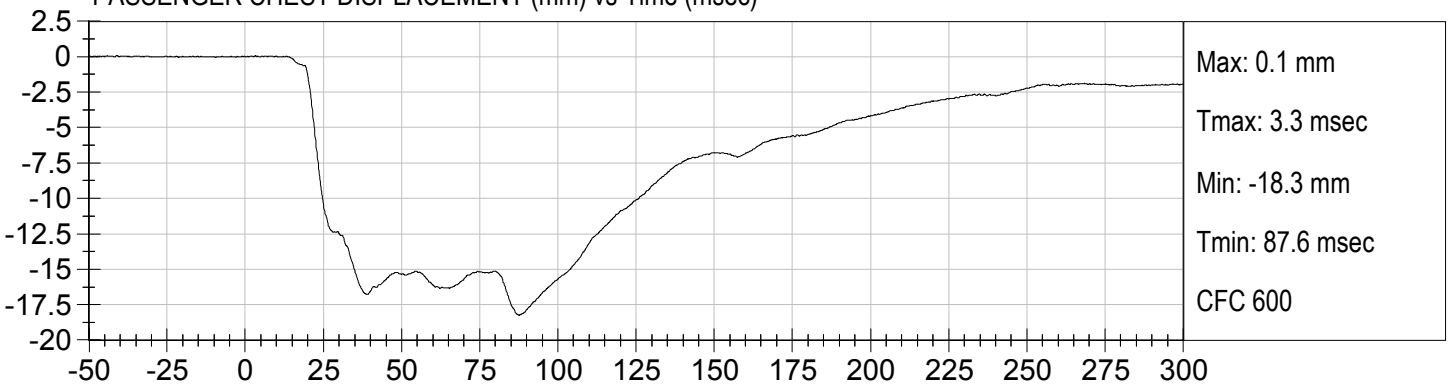
PASSENGER HEAD Z (G's) vs Time (msec)



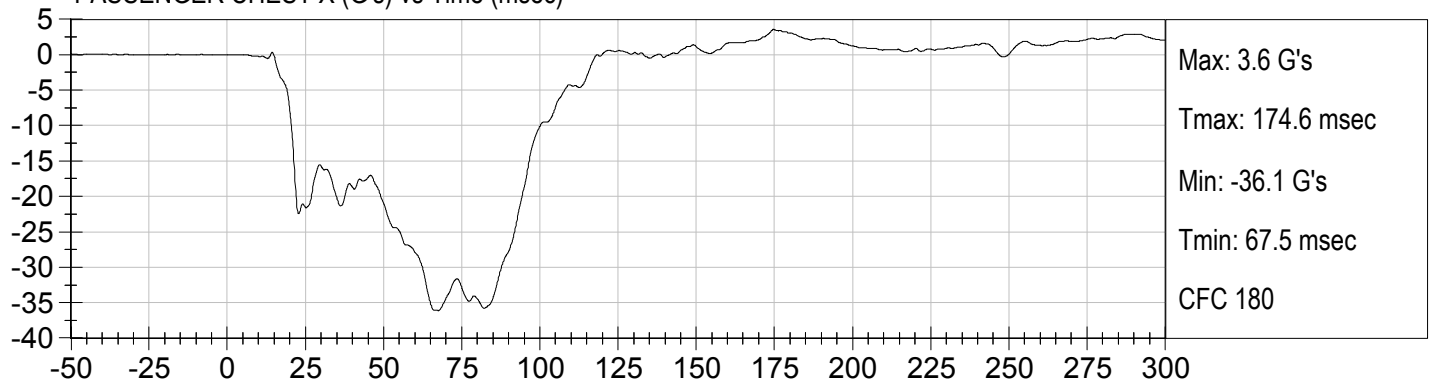
PASSENGER HEAD Resultant (G's) vs Time (msec)



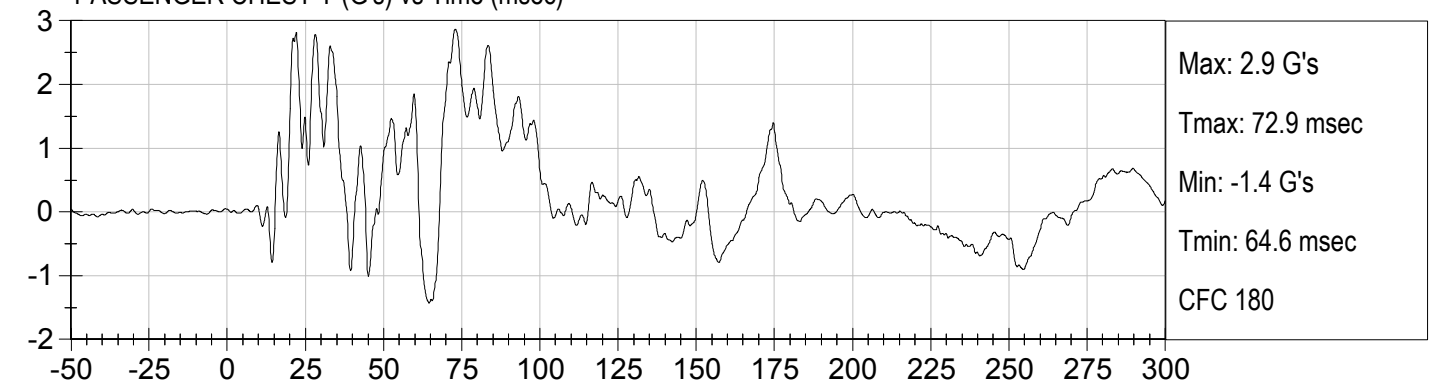
PASSENGER CHEST DISPLACEMENT (mm) vs Time (msec)



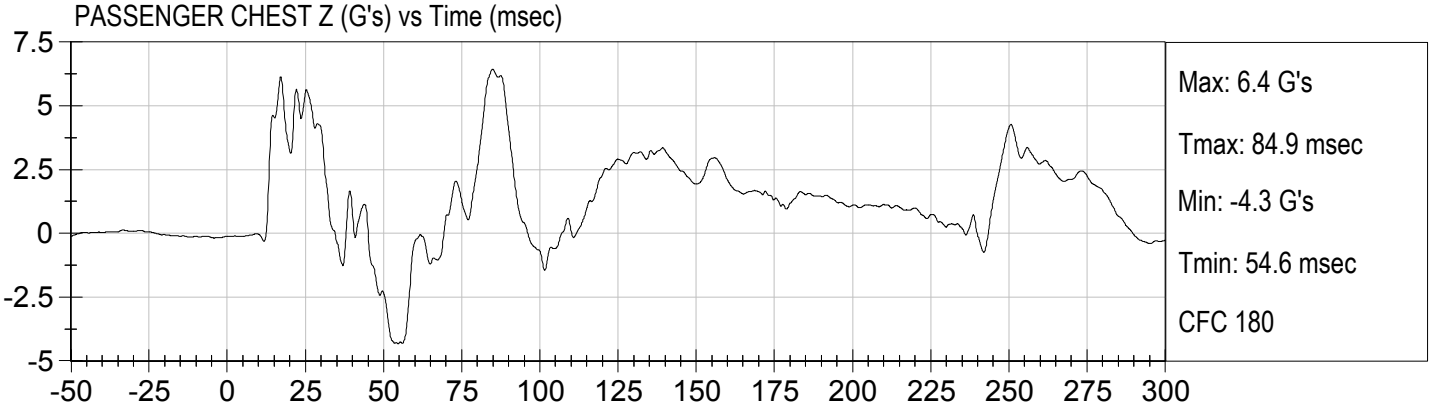
PASSENGER CHEST X (G's) vs Time (msec)



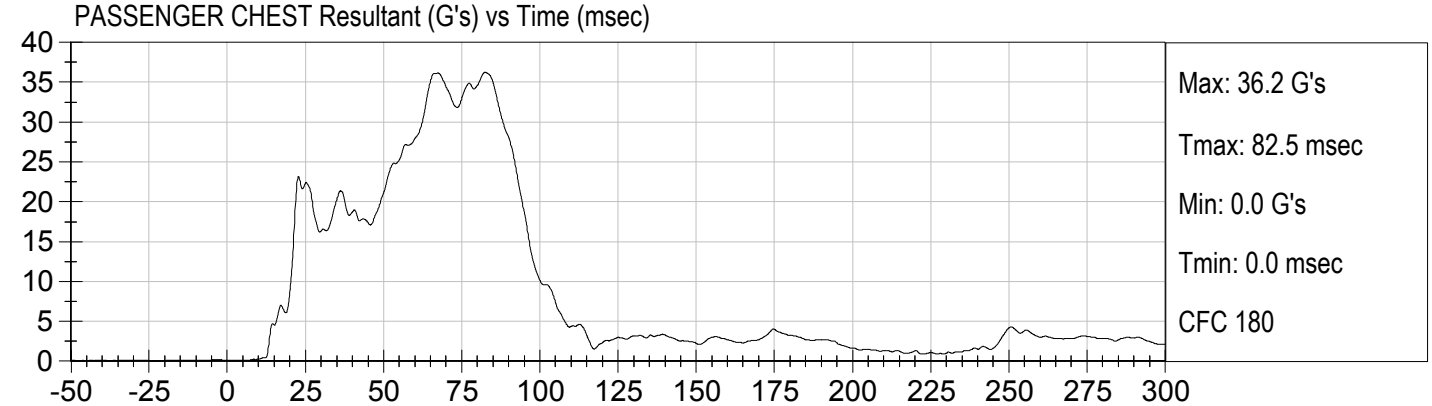
PASSENGER CHEST Y (G's) vs Time (msec)



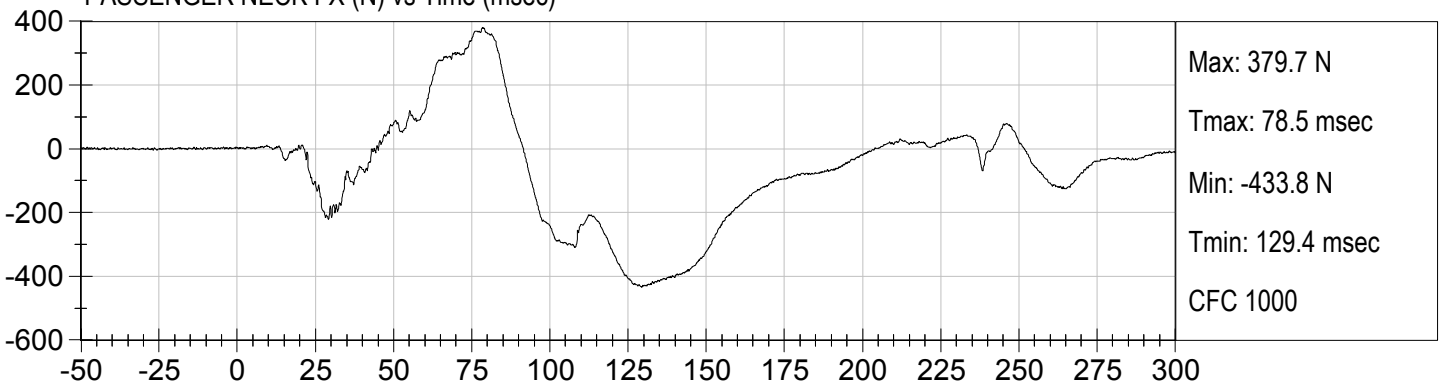
PASSENGER CHEST Z (G's) vs Time (msec)



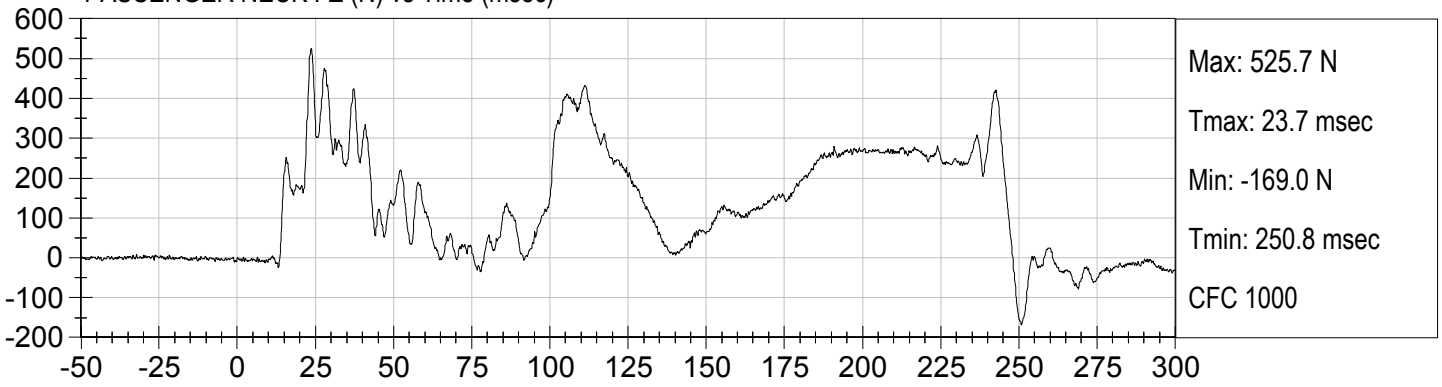
PASSENGER CHEST Resultant (G's) vs Time (msec)



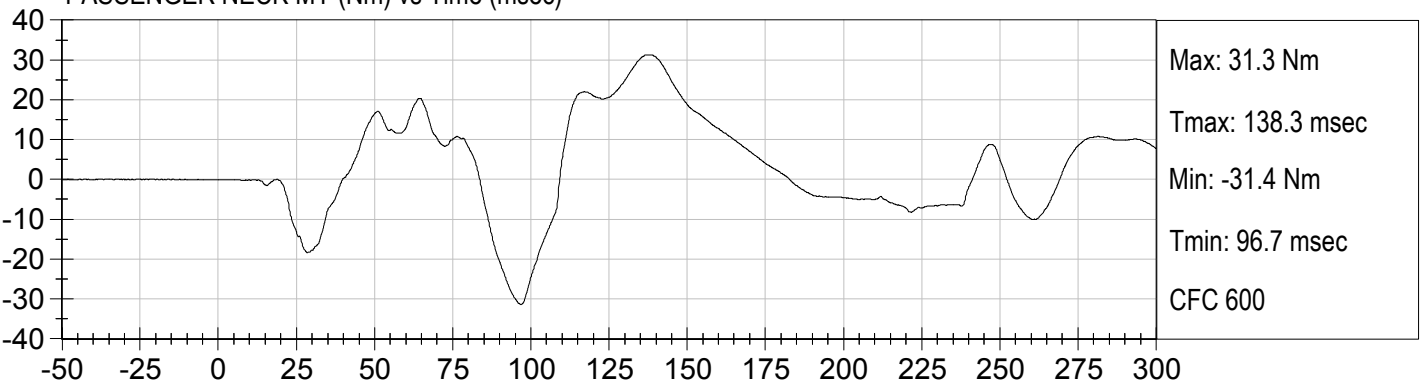
PASSENGER NECK FX (N) vs Time (msec)

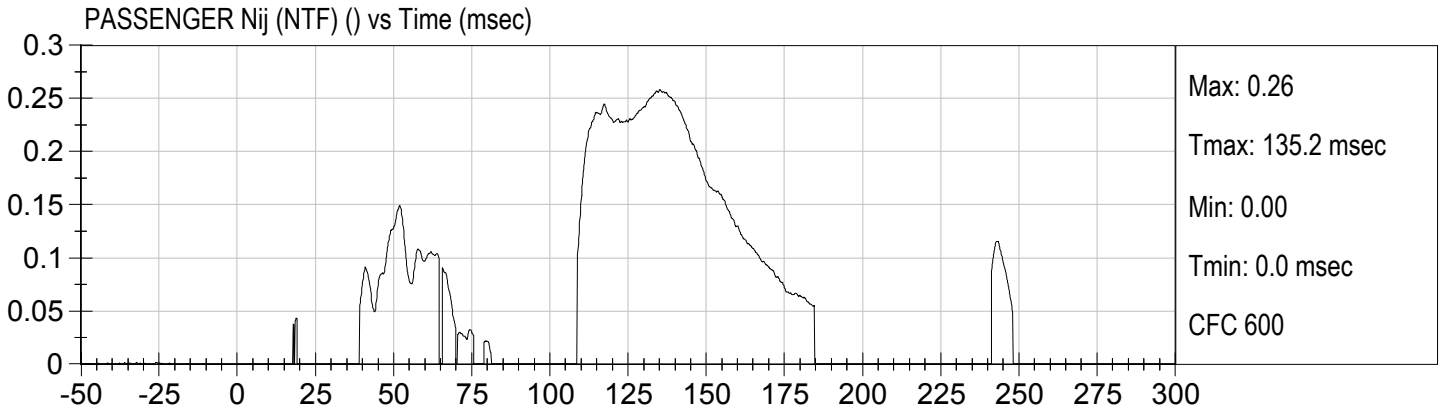


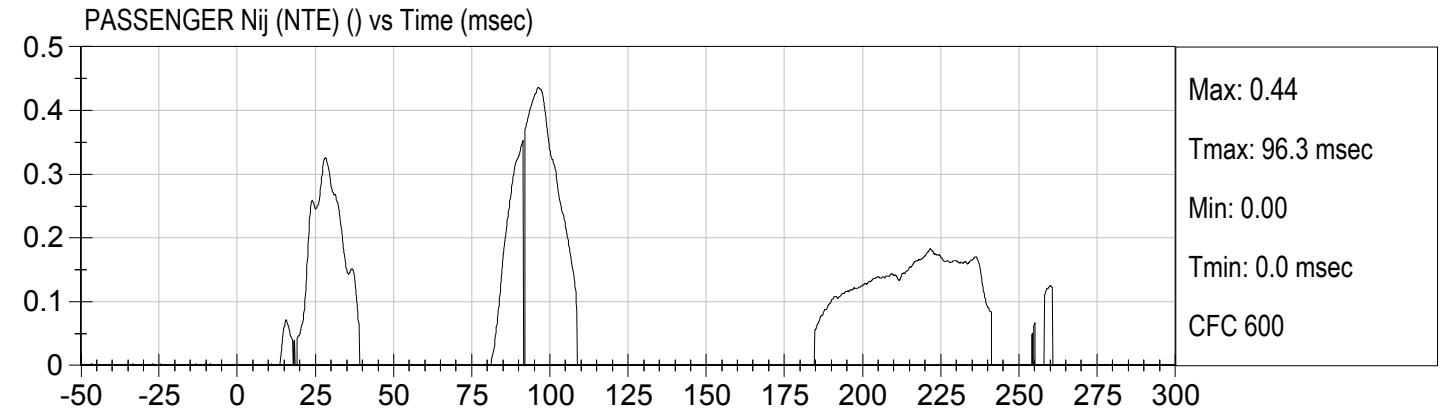
PASSENGER NECK FZ (N) vs Time (msec)

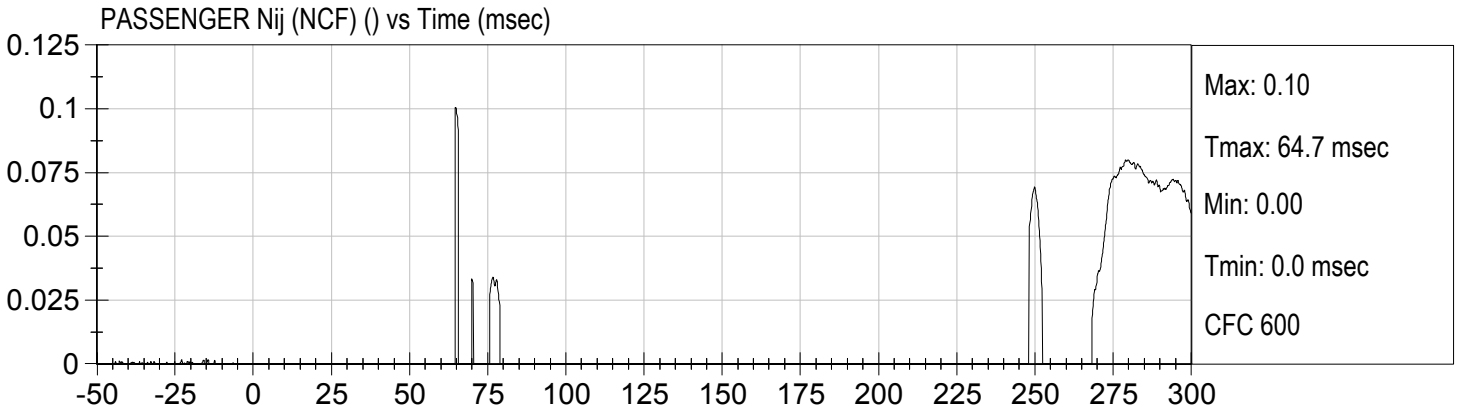


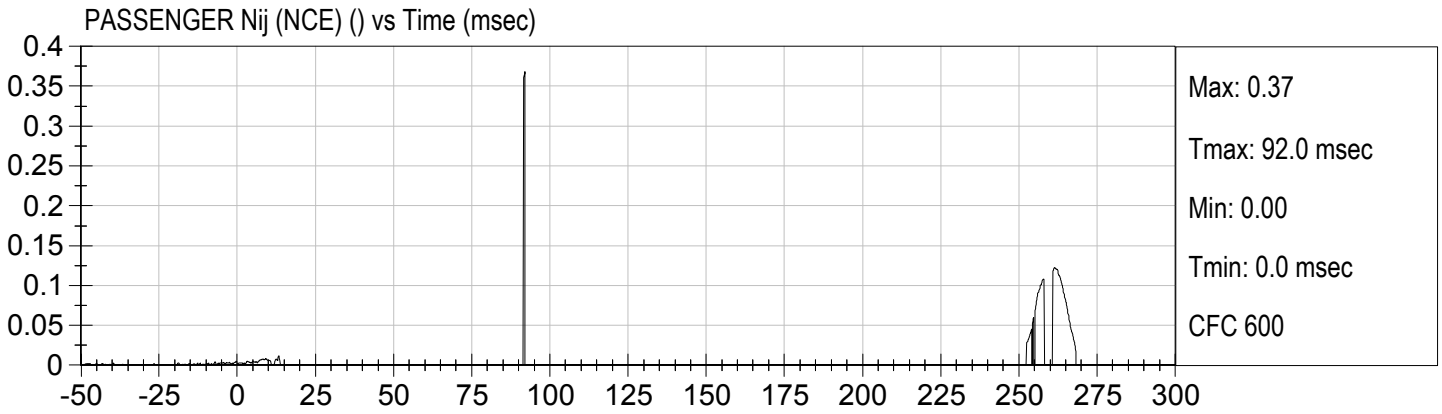
PASSENGER NECK MY (Nm) vs Time (msec)




PASSENGER Nij (NTF) () vs Time (msec)
0.3
0.25
0.2
0.15
0.1
0.05
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.26
Tmax: 135.2 msec
Min: 0.00
Tmin: 0.0 msec
CFC 600


PASSENGER Nij (NTE) () vs Time (msec)
0.5
0.4
0.3
0.2
0.1
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.44
Tmax: 96.3 msec
Min: 0.00
Tmin: 0.0 msec
CFC 600


PASSENGER Nij (NCF) () vs Time (msec)
0.125
0.1
0.075
0.05
0.025
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.10
Tmax: 64.7 msec
Min: 0.00
Tmin: 0.0 msec
CFC 600


PASSENGER Nij (NCE) () vs Time (msec)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Max: 0.37
Tmax: 92.0 msec
Min: 0.00
Tmin: 0.0 msec
CFC 600

PASSENGER LEFT FEMUR (N) vs Time (msec)

PASSENGER RIGHT FEMUR (N) vs Time (msec)

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:** D173011

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	225 to 275	258	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
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

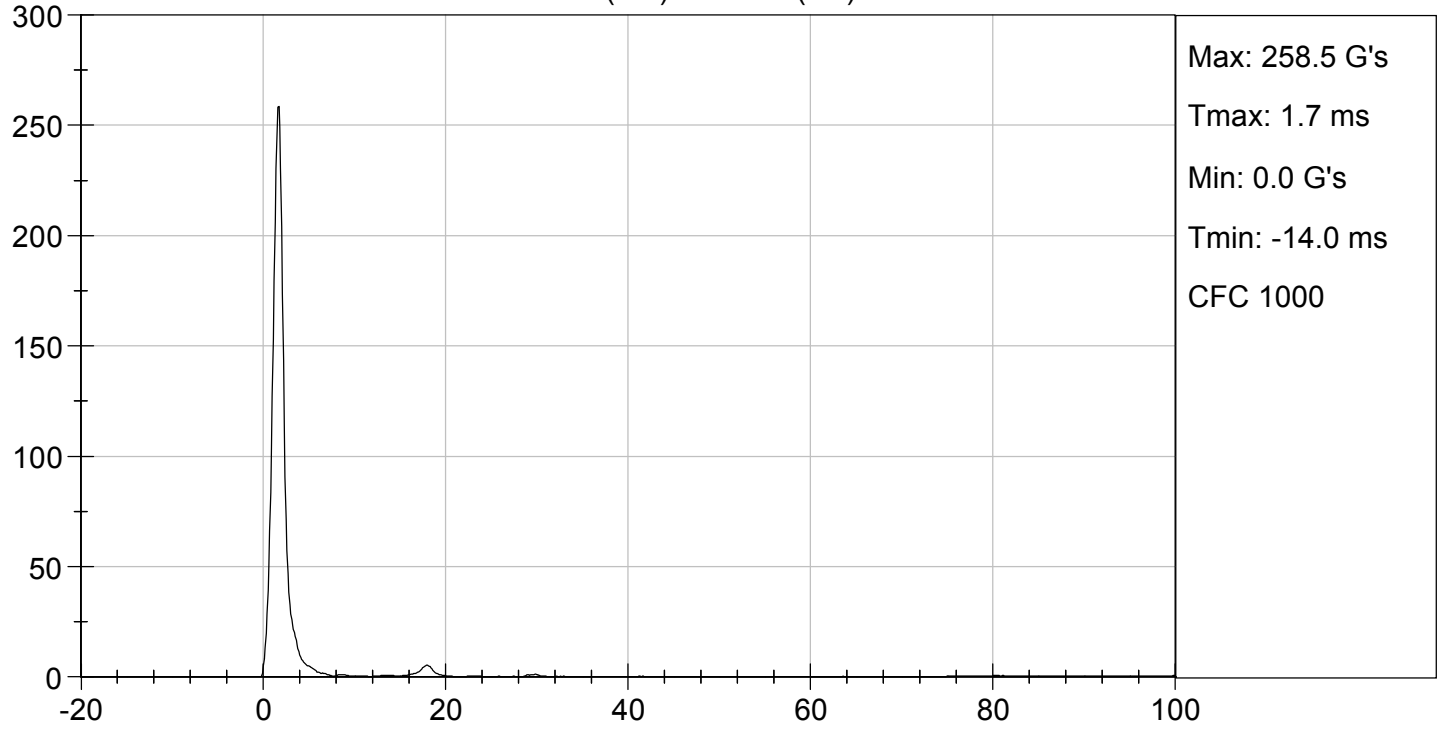
10/19/2017
Test Date

Robert Schmidt
Approved By

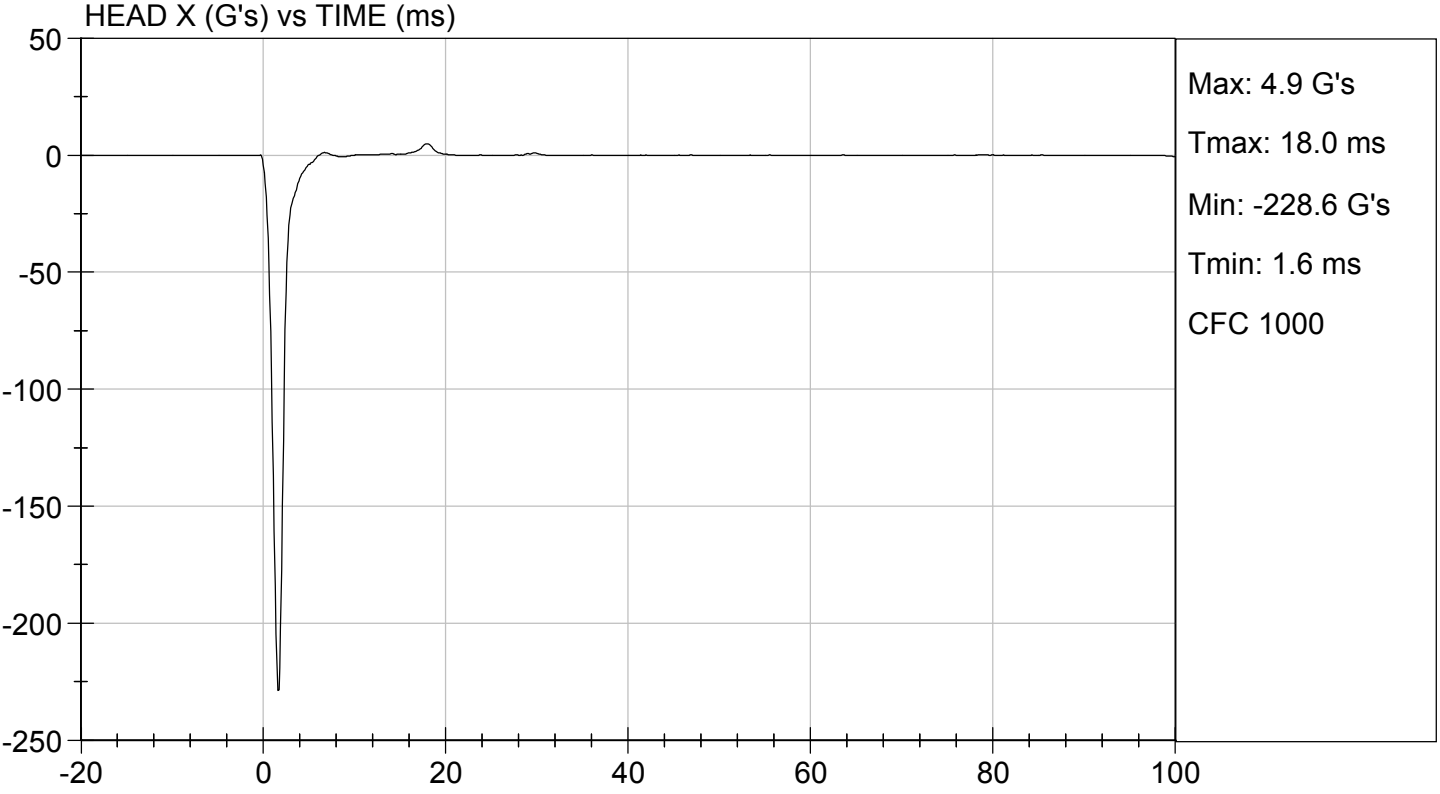
TEST DESC: HEAD DROP

TEST DATE: 10/19/2017
TEST #: D173011

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)

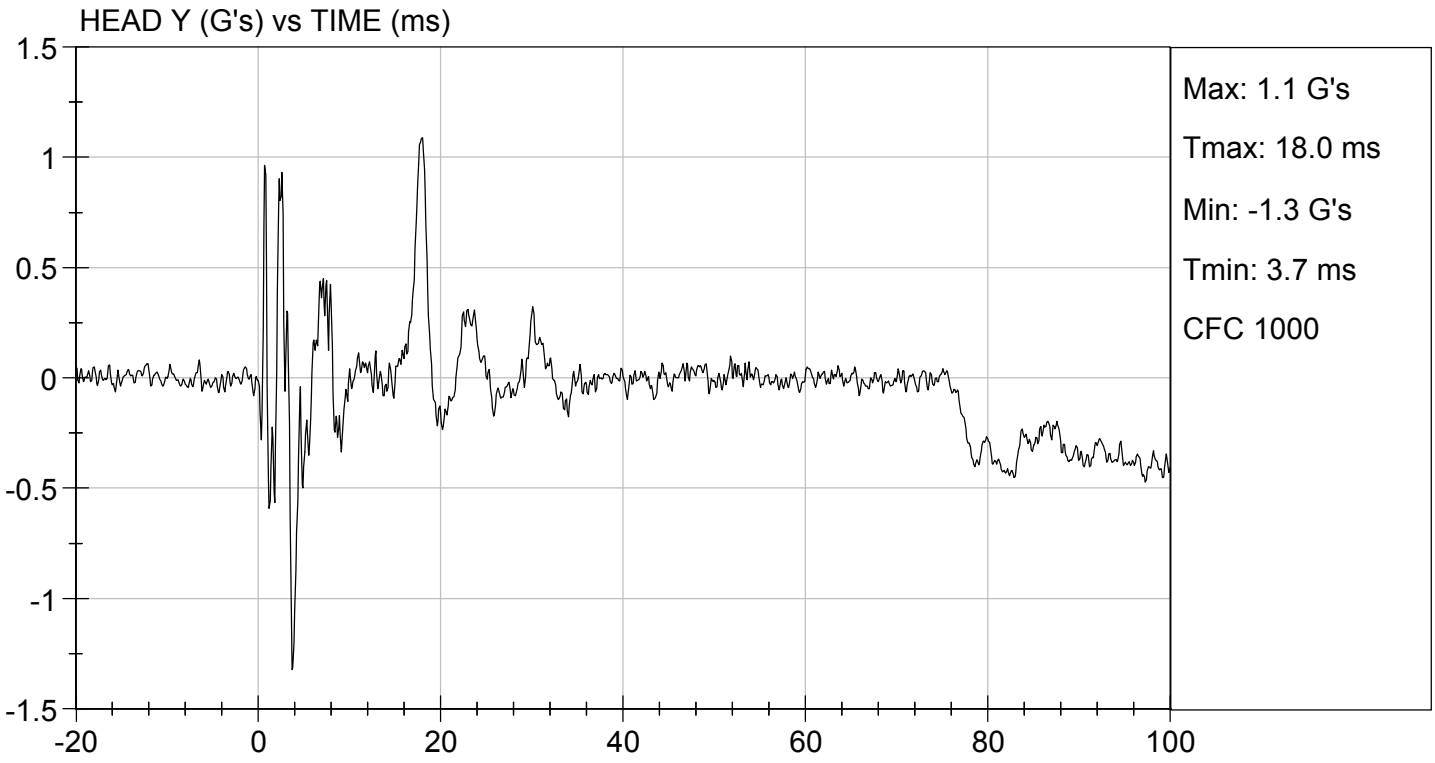


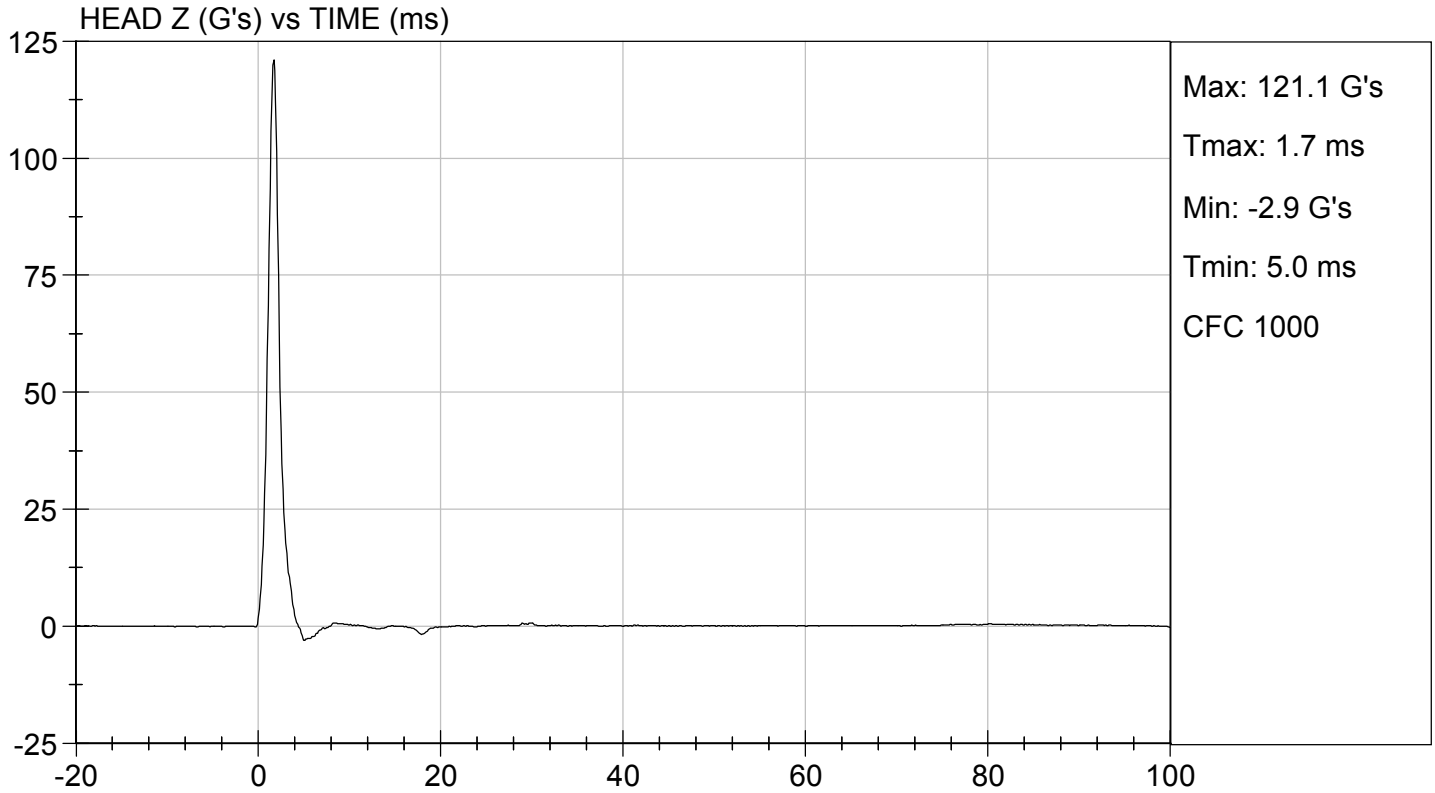
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 10/19/2017
TEST #: D173011





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D173012

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	32	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.56	Pass
	20 ms	G's	17.60 to 22.60	19.69	Pass
	30 ms	G's	12.50 to 18.50	13.74	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.7	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	39.1	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	76.3	Pass
	Time	ms	57.0 to 64.0	62.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	123.9	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	88.3	Pass
	Time	ms	47.0 to 58.0	53.4	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	101.7	Pass
			Overall Test Results		Pass

Danielle Redenbaugh

Laboratory Technician

10/19/2017

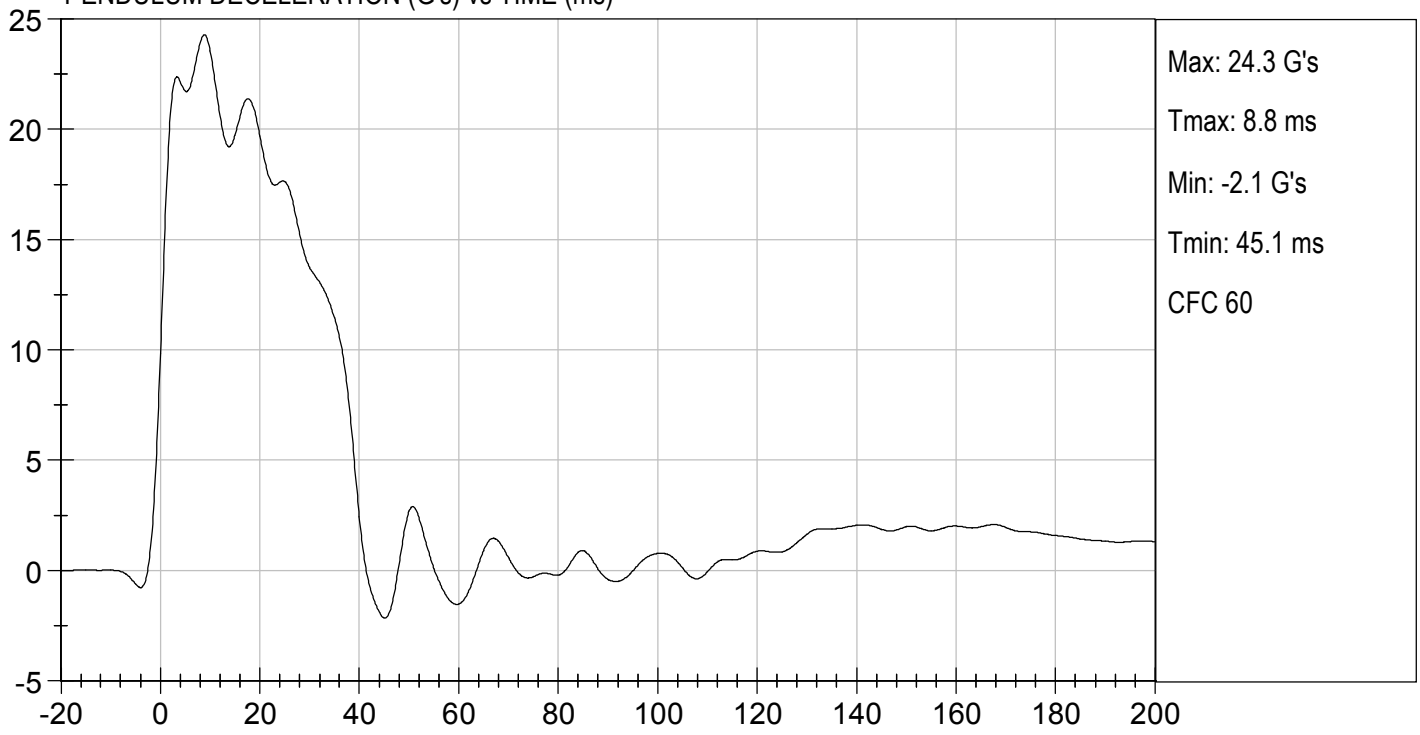
Test Date

Approved By

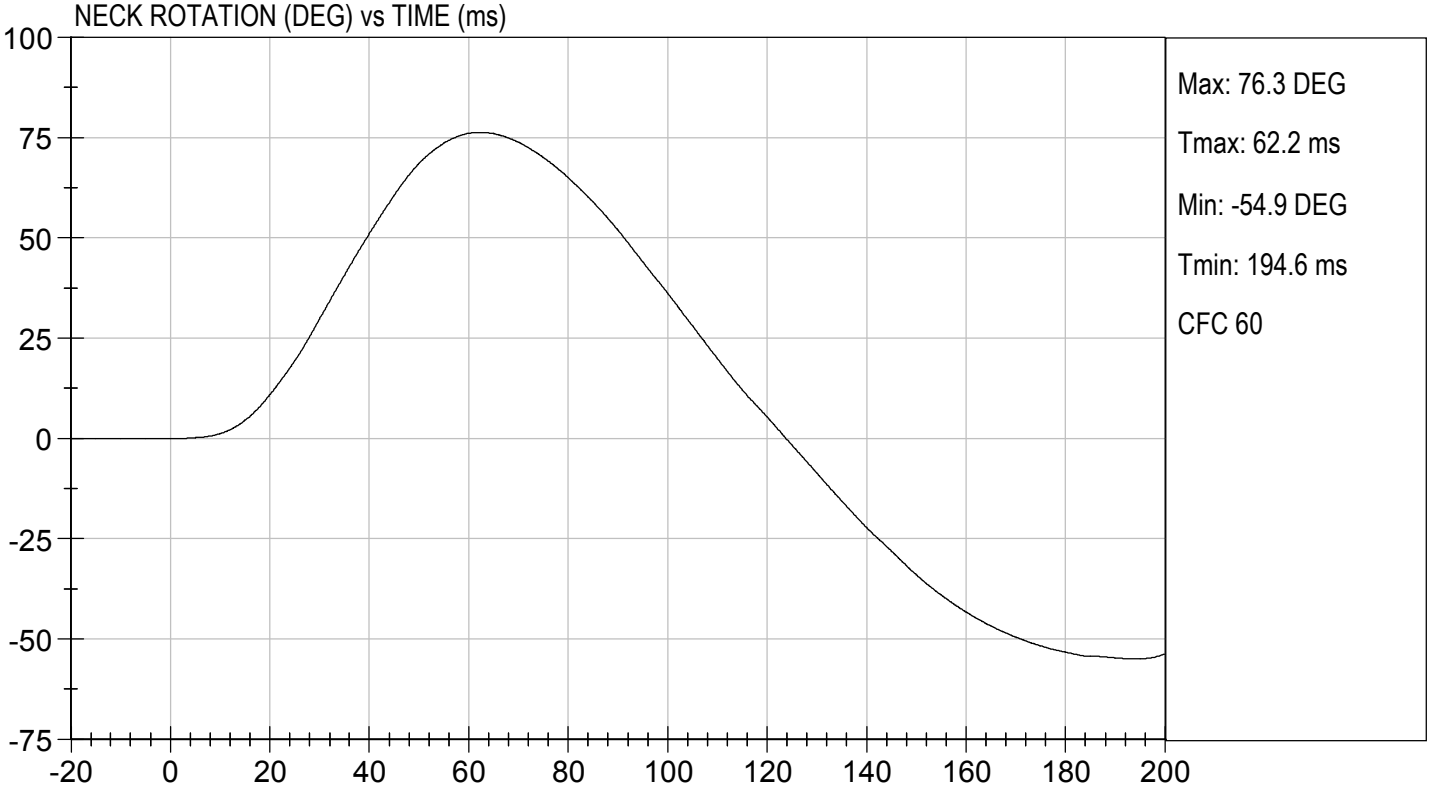
TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 10/19/2017
TEST #: D173012

PENDULUM DECELERATION (G's) vs TIME (ms)

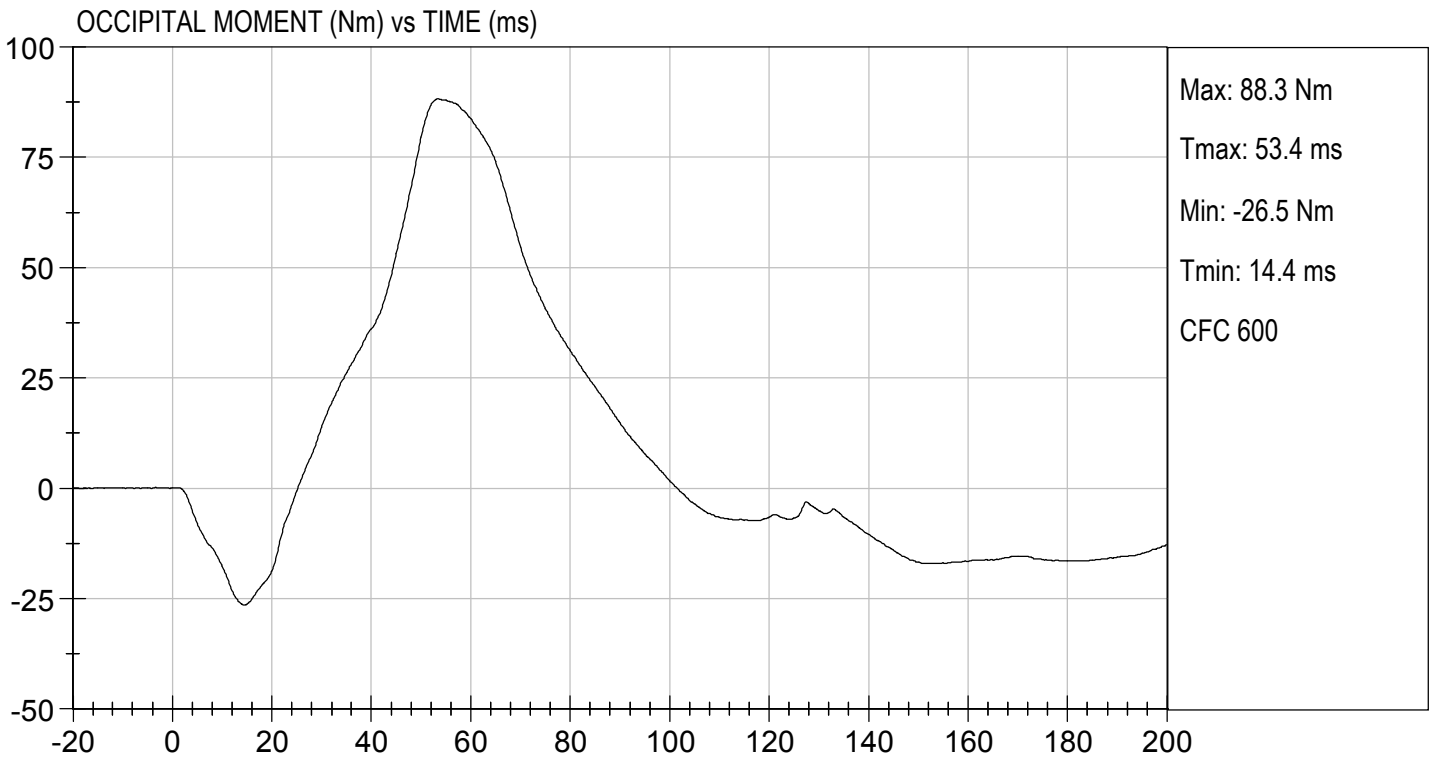


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 10/19/2017
TEST #: D173012



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D173013

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	32	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.63	Pass
	20 ms	G's	14.00 to 19.00	15.32	Pass
	30 ms	G's	11.00 to 16.00	13.03	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	13.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	42.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.9	Pass
	Time	ms	72.0 to 82.0	81.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	165.8	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-57.8	Pass
	Time	ms	65.0 to 79.0	74.1	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	147.2	Pass
			Overall Test Results		Pass

Laboratory Technician

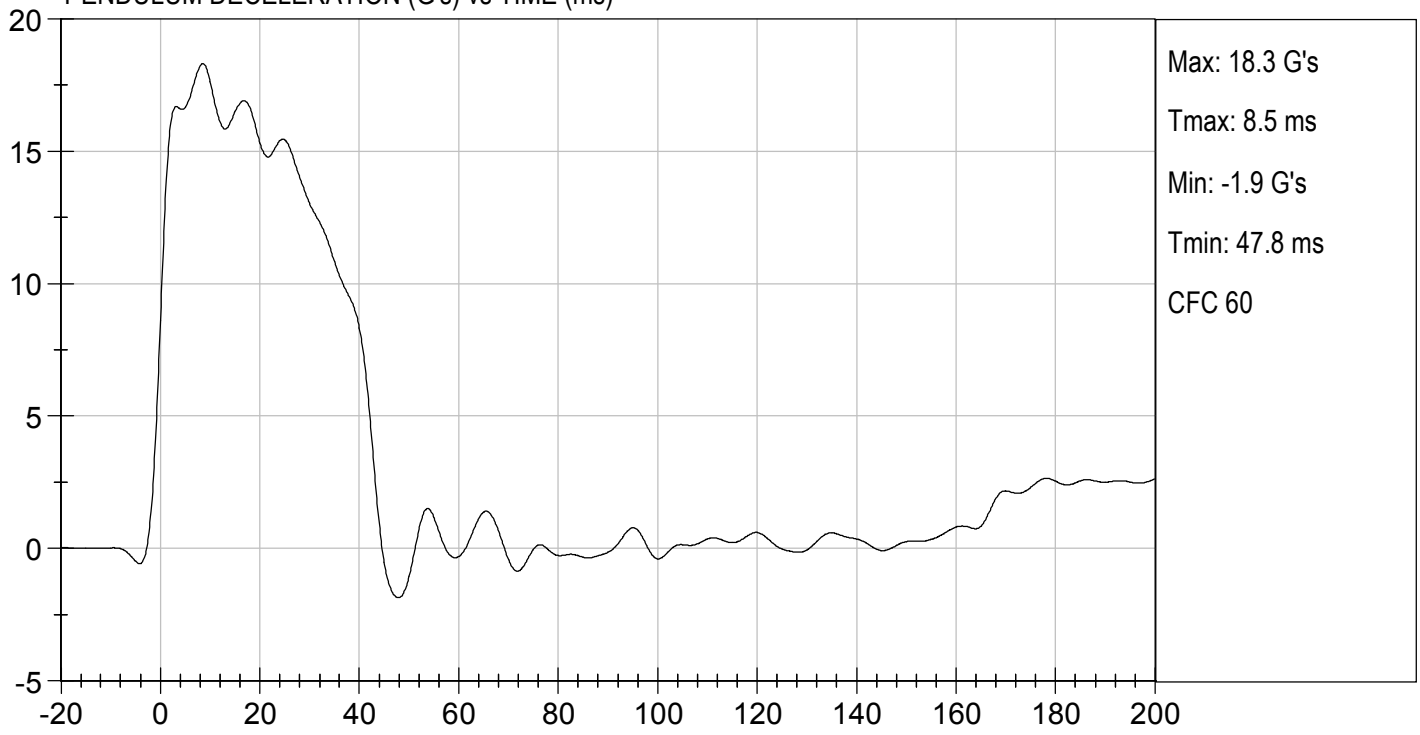
10/20/2017
Test Date

Approved By

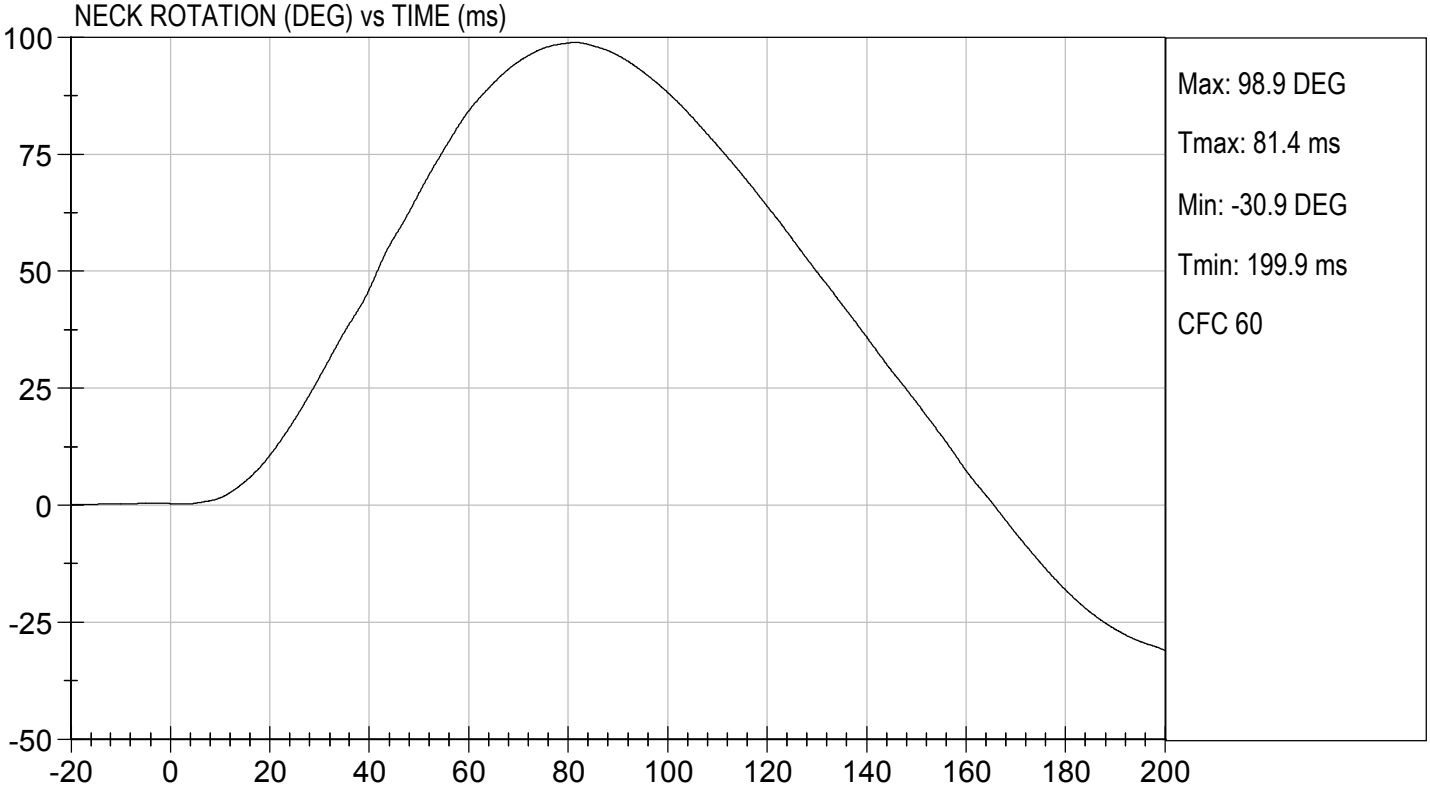
TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 10/20/2017
TEST #: D173013

PENDULUM DECELERATION (G's) vs TIME (ms)

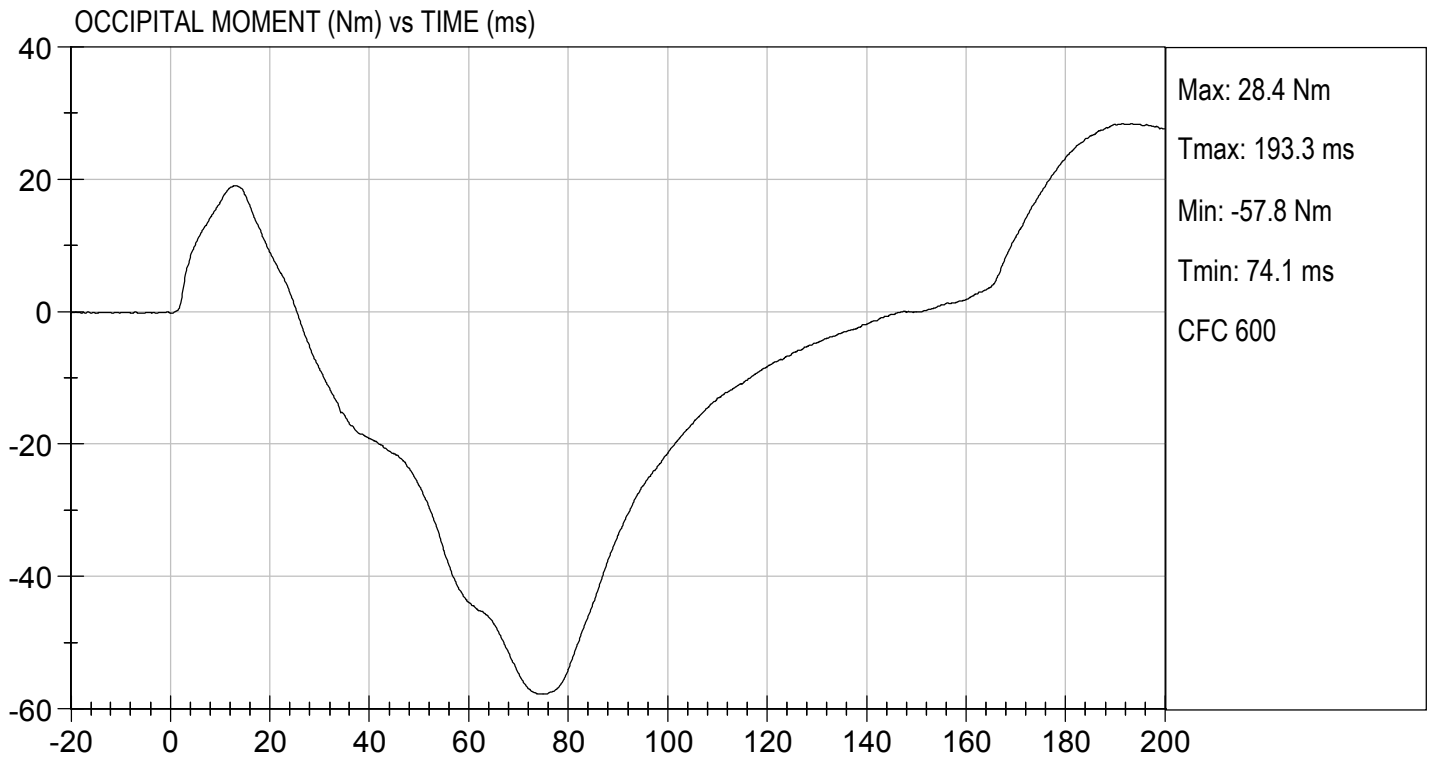


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 10/20/2017
TEST #: D173013



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D173014

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,382	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.88	Pass
Internal Hysteresis	%	69 to 85	70	Pass
		Overall Test Results		Pass

Laboratory Technician

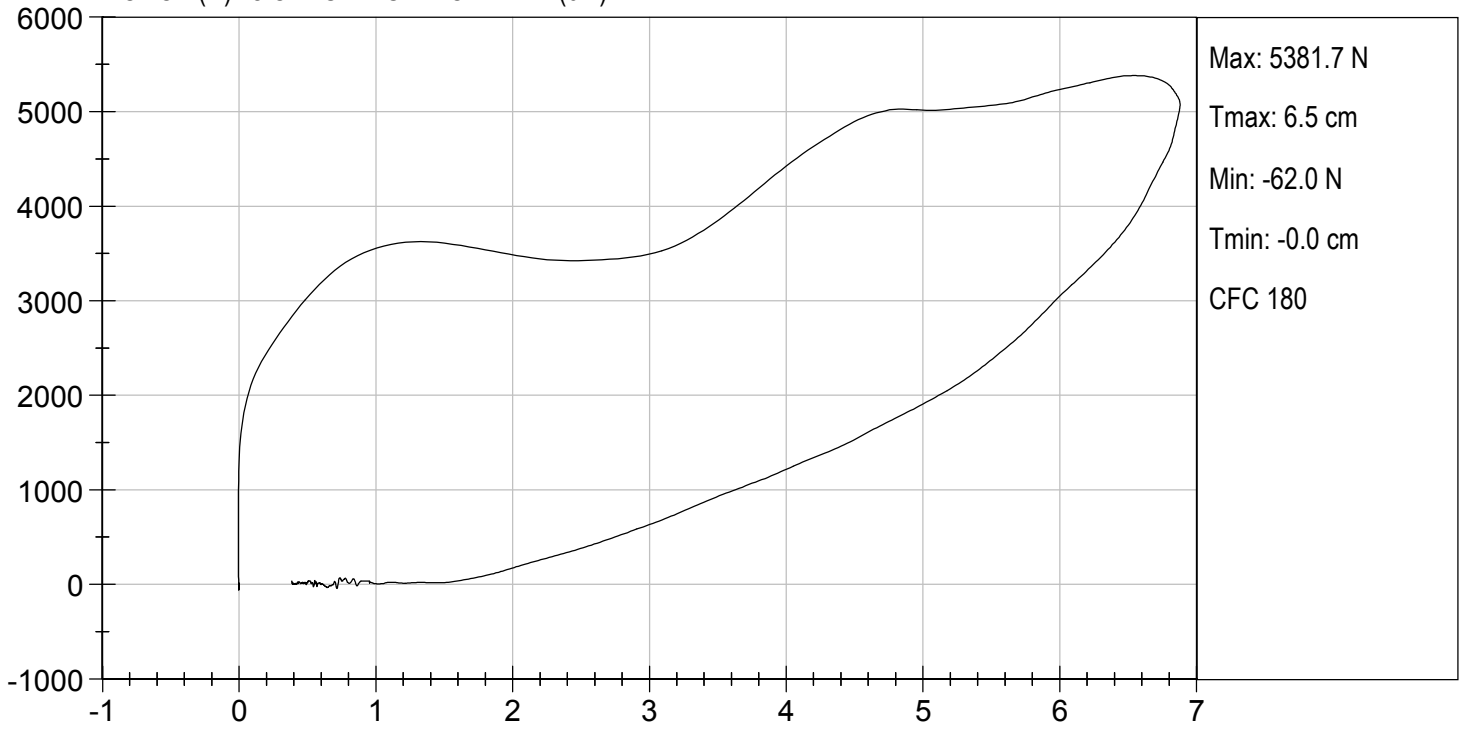
10/20/2017
Test Date

Approved By

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

TEST DATE: 10/20/2017
TEST #: D173014

FORCE (N) vs CHEST DISPLACEMENT (cm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D173015

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	32	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	5,289	Pass
		Overall Test Results		Pass

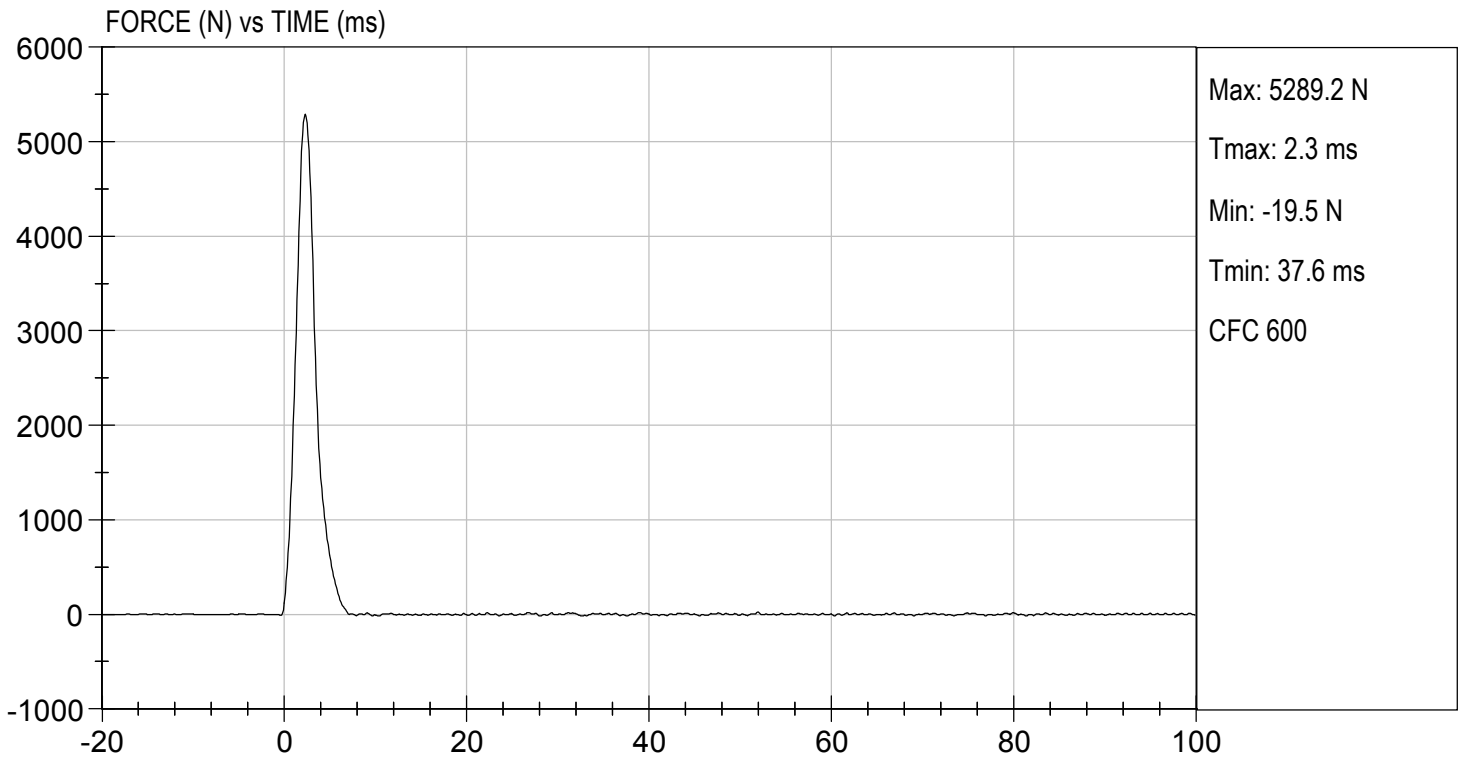
Laboratory Technician

10/19/2017
Test Date

Approved By

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

TEST DATE: 10/19/2017
TEST #: D173015



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D173016

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	32	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	5,010	Pass
		Overall Test Results		Pass

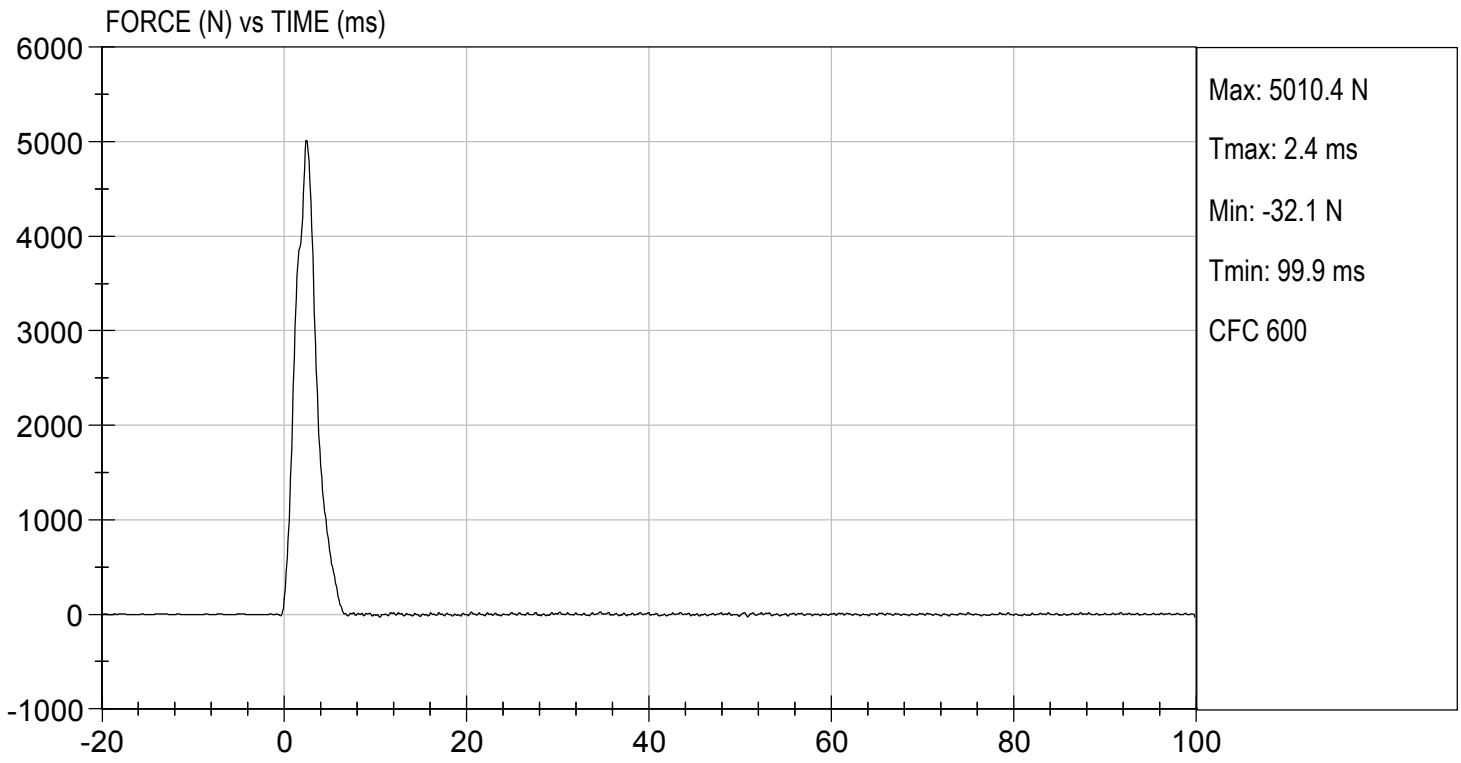
Laboratory Technician

10/19/2017
Test Date

Approved By

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

TEST DATE: 10/19/2017
TEST #: D173016



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D173010

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.9	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	37	37	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.5	6.4	Pass
30 Degrees	Nm	94.9 Nm Max	63.5	69.0	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	49.3	42.7	Pass
		Overall Test Results			Pass

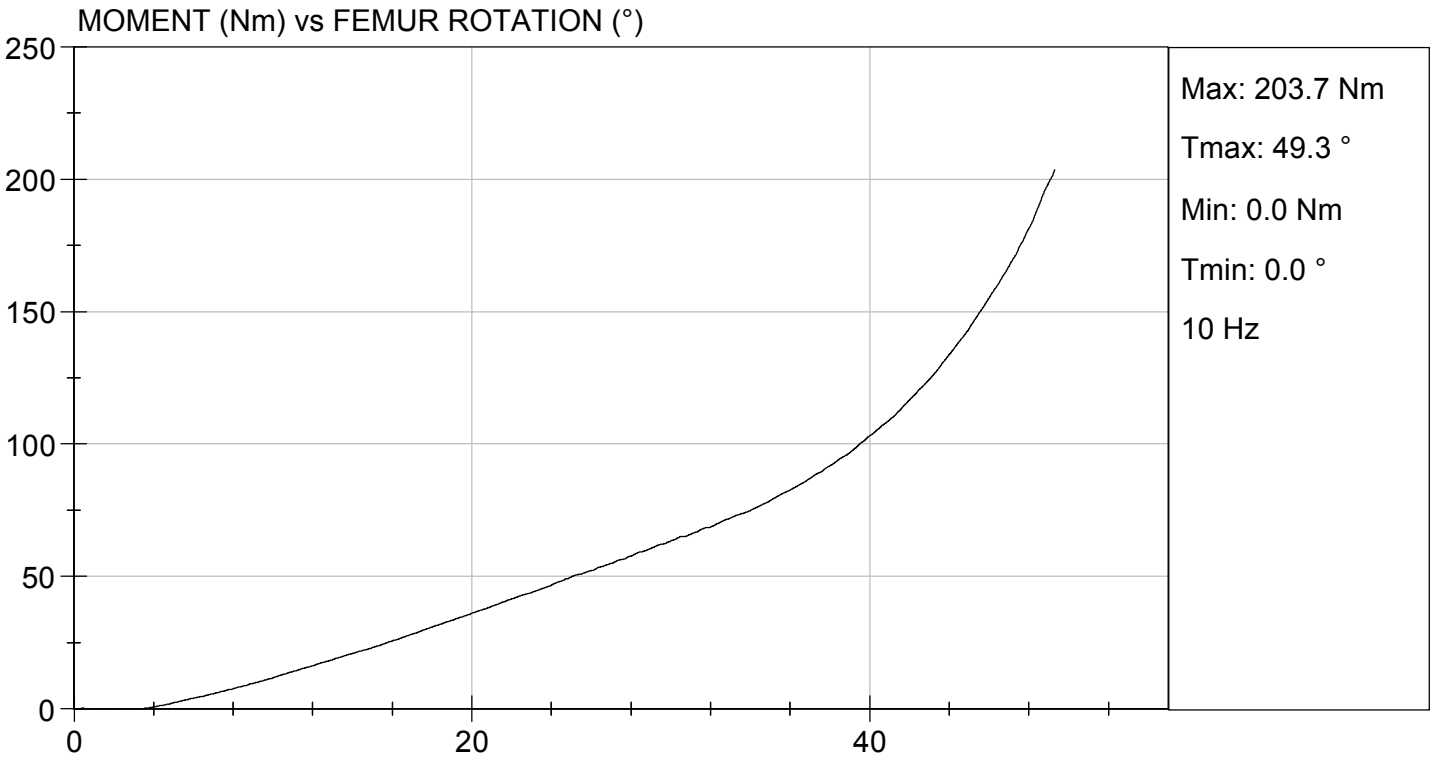
Laboratory Technician

10/19/2017
Test Date

Approved By

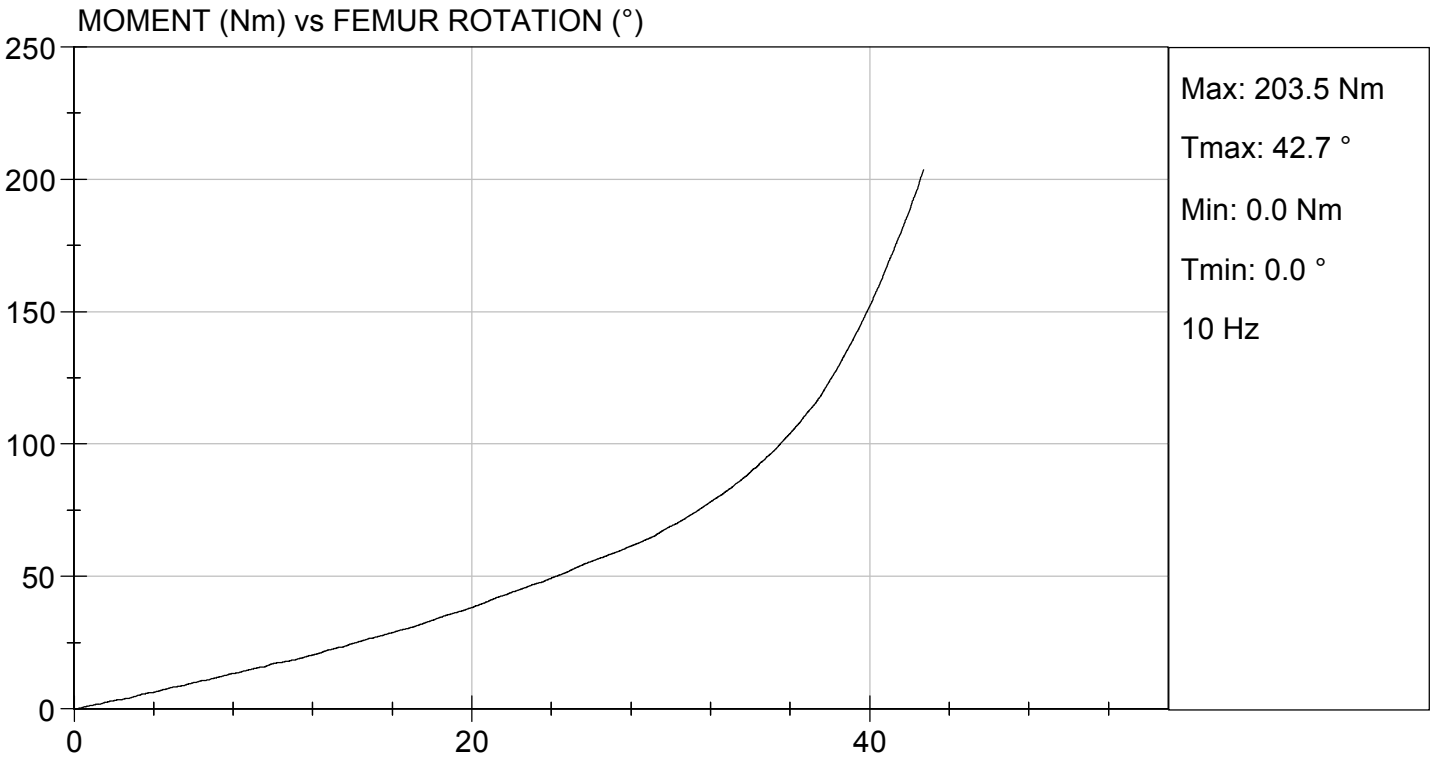
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 10/19/2017
TEST #: D173019



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 10/19/2017
TEST #: D173010



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 Redenbaugh
Laboratory Technician

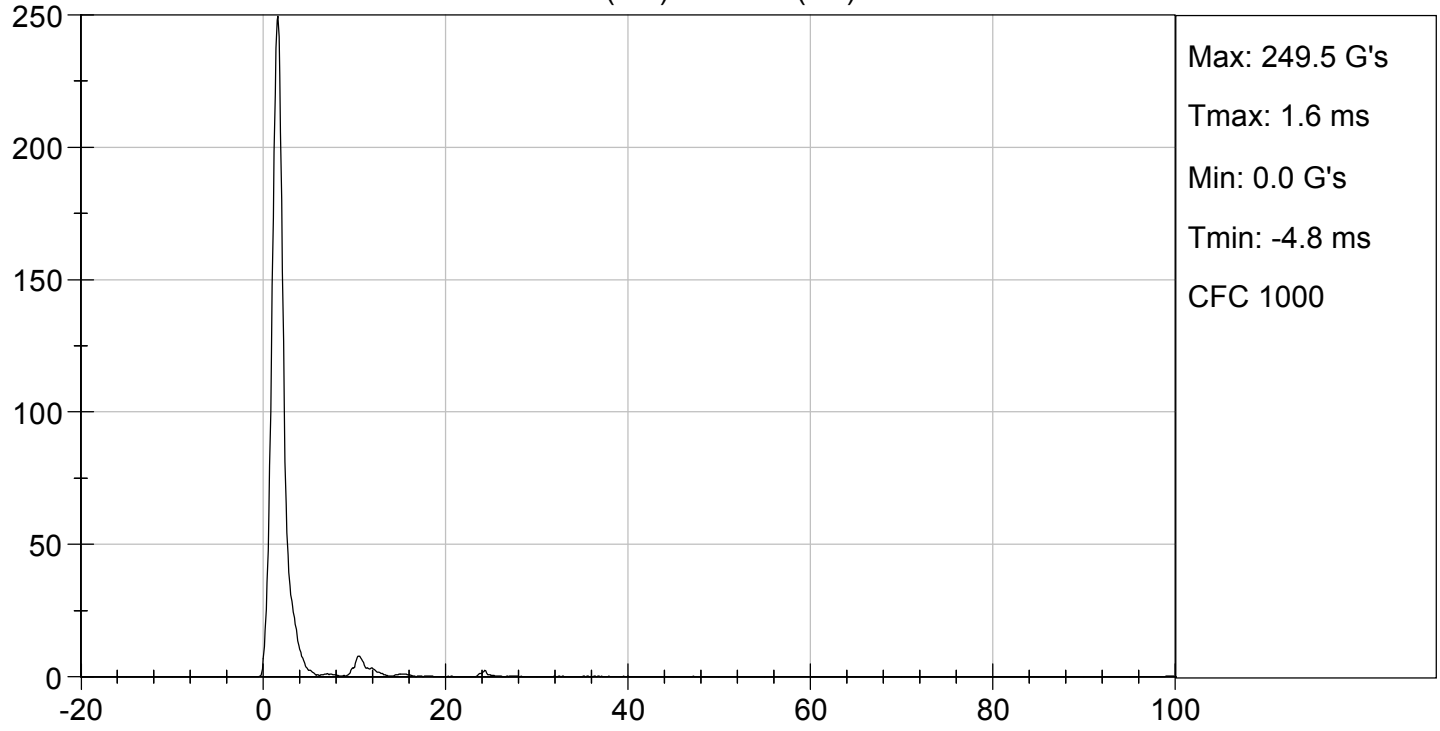
11/02/2017
Test Date

Robert Schmidt
Approved By

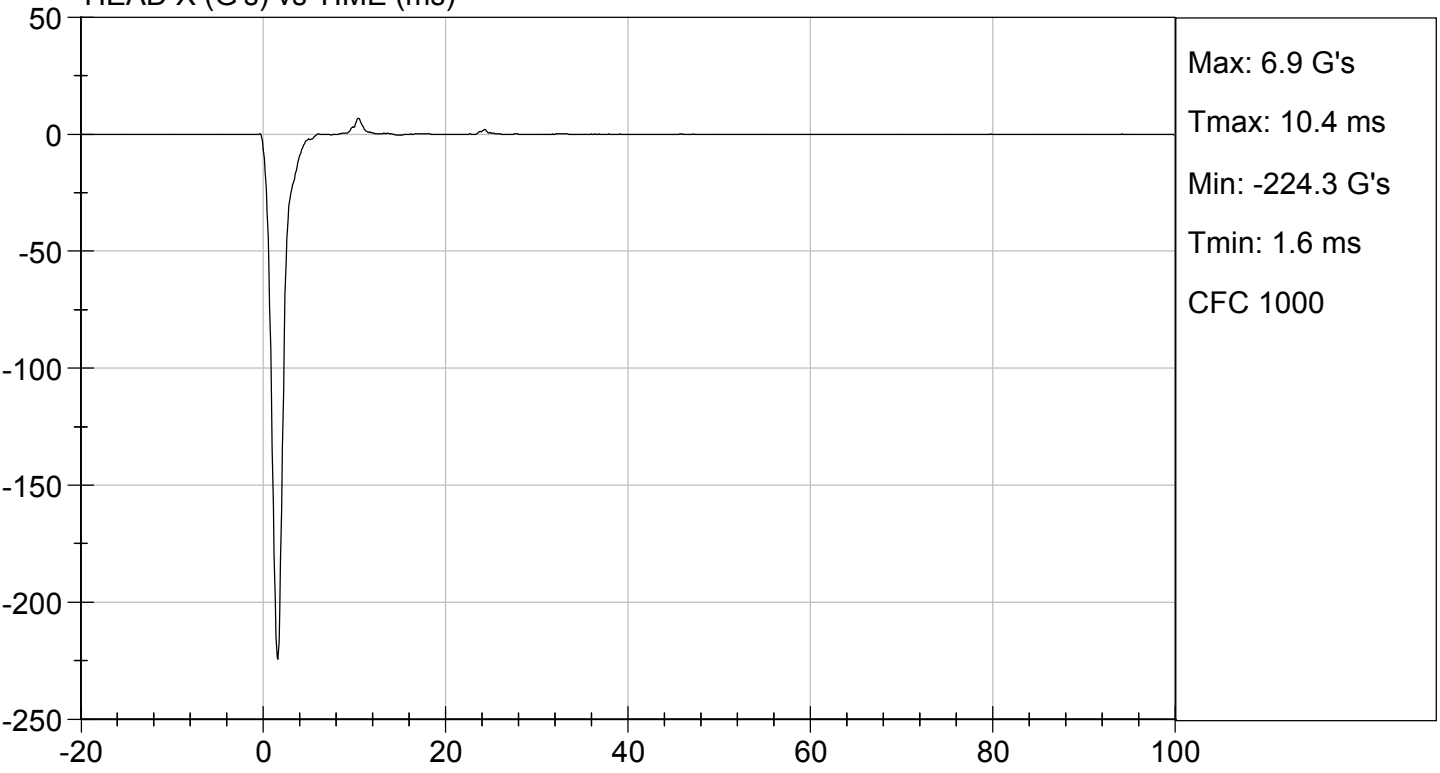
TEST DESC: HEAD DROP

TEST DATE: 11/02/2017
TEST #: D173191

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)

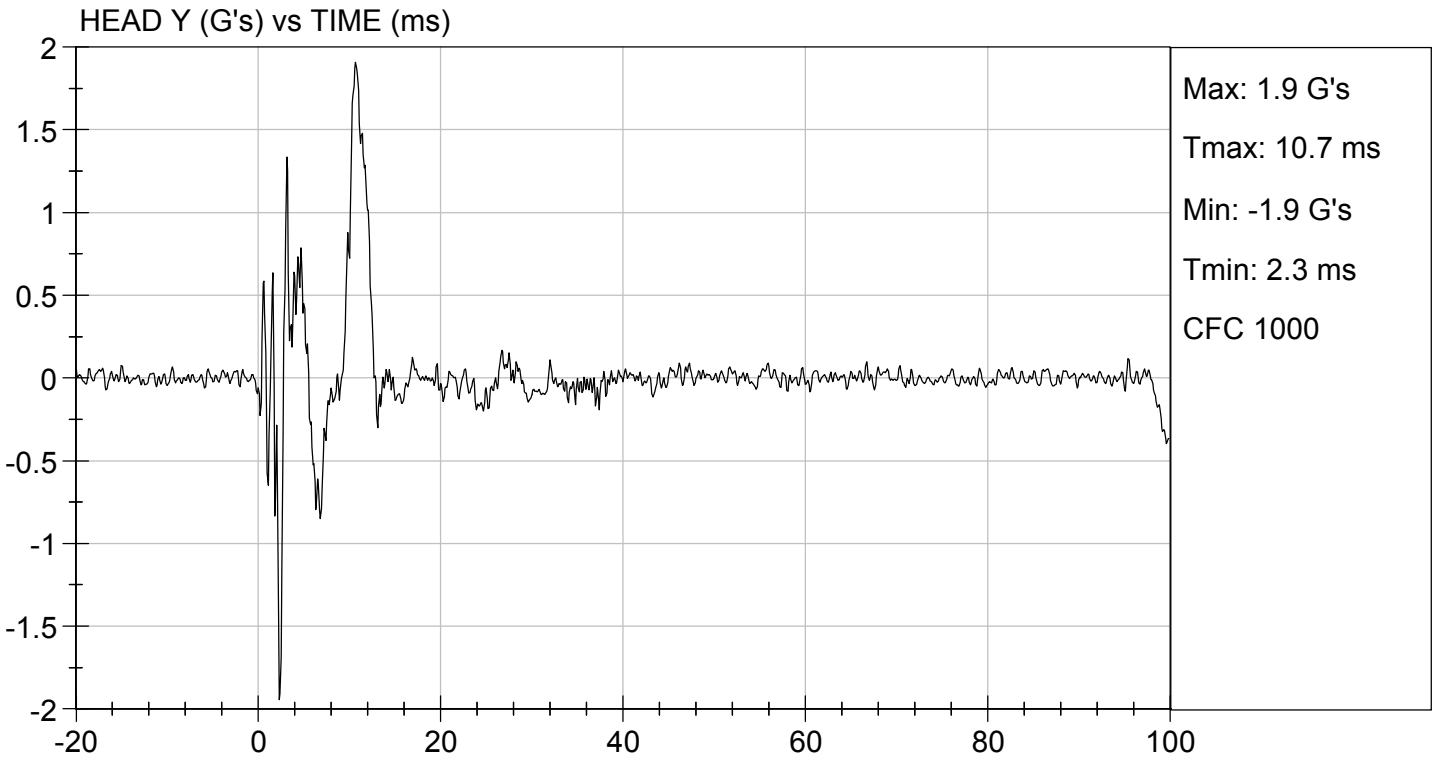


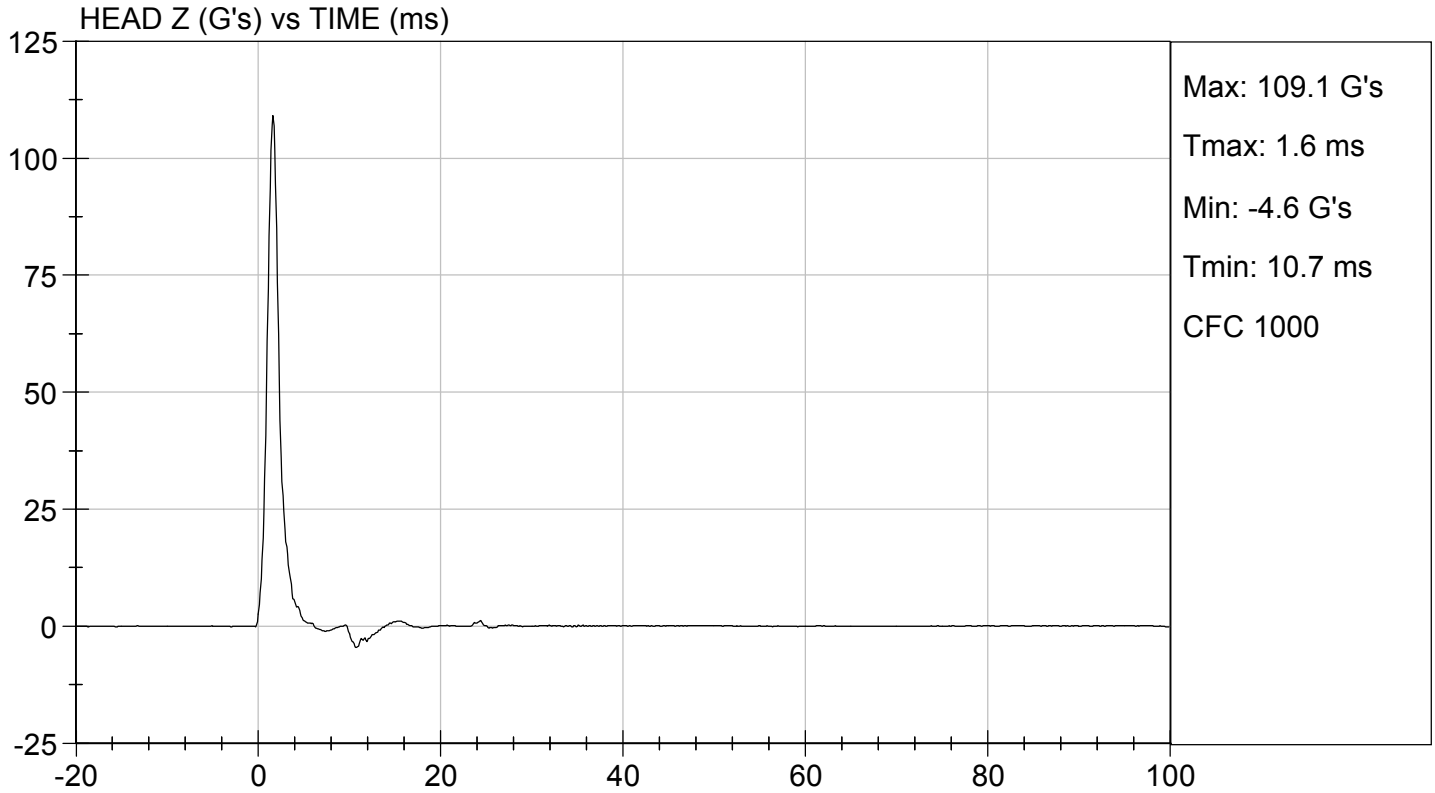
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 11/02/2017
TEST #: D173191





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
			Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

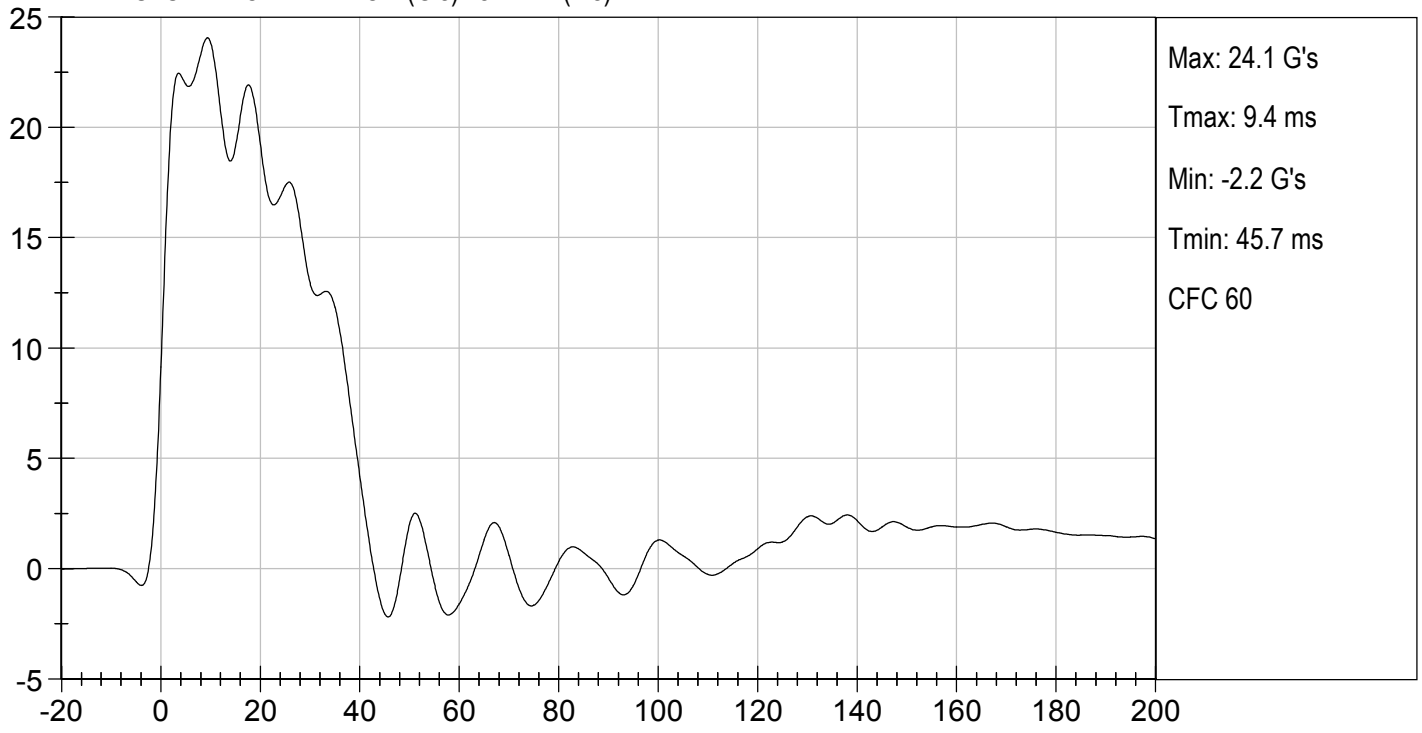
11/03/2017
Test Date

Robert Schmidt
Approved By

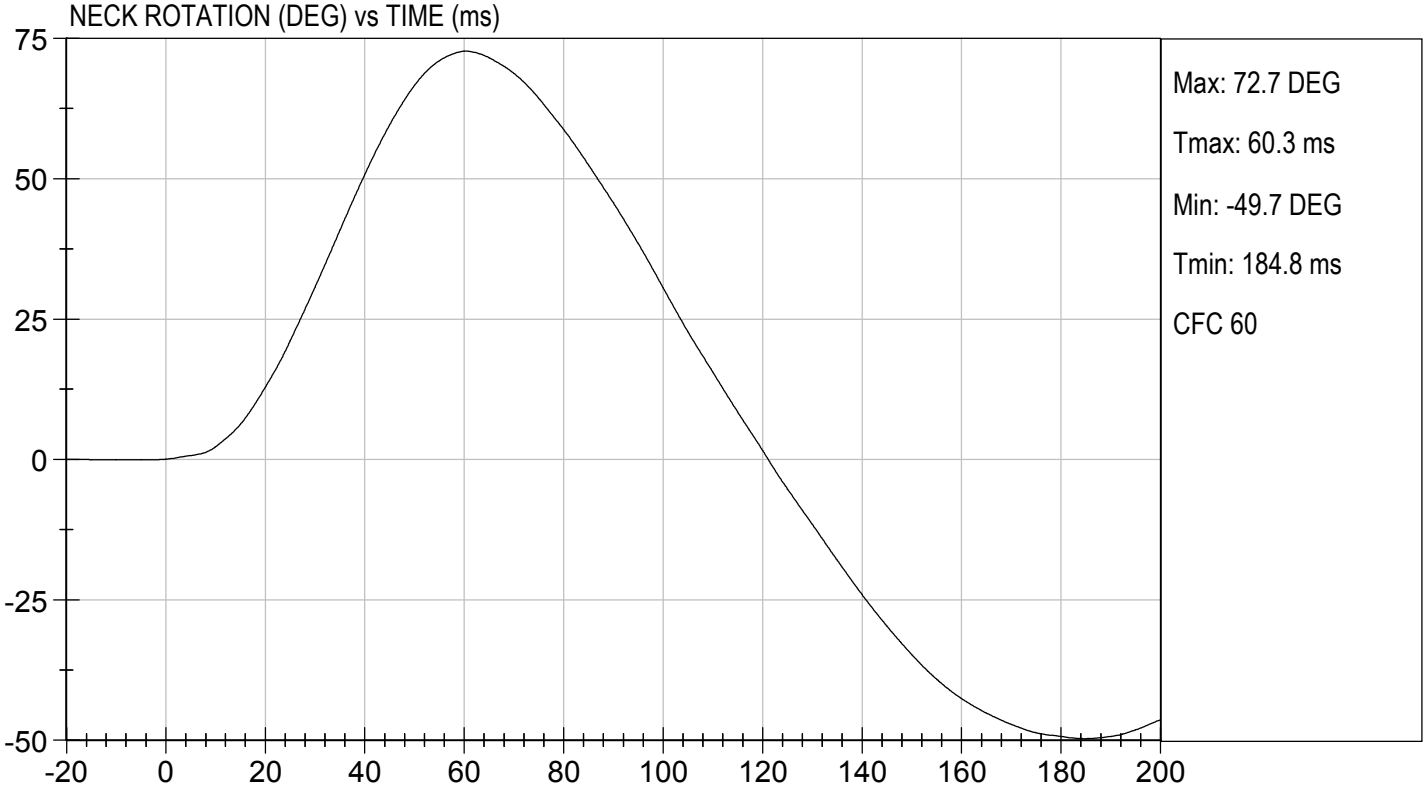
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 11/03/2017
TEST #: D173192

PENDULUM DECELERATION (G's) vs TIME (ms)

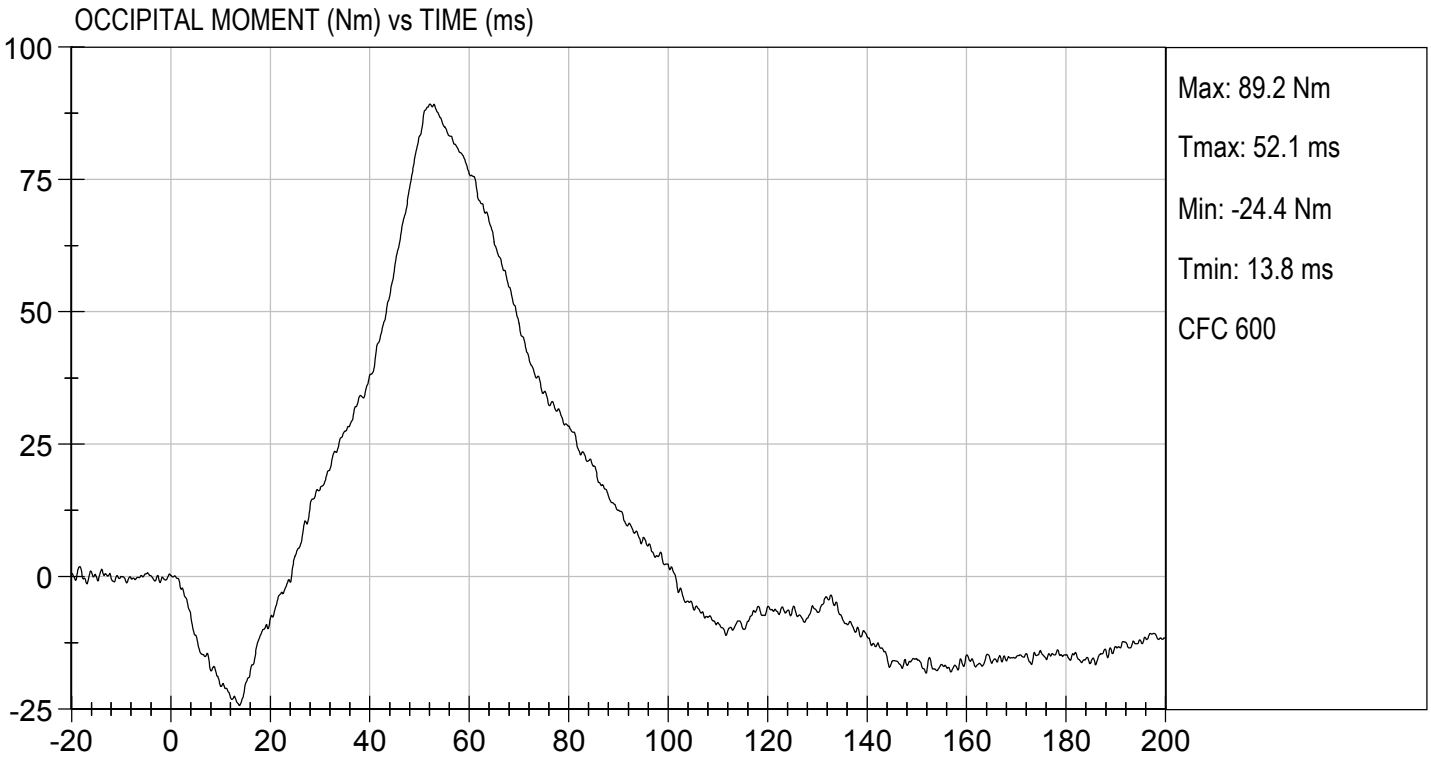


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 11/03/2017
TEST #: D173192



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D173193

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 Redinbaugh
Laboratory Technician

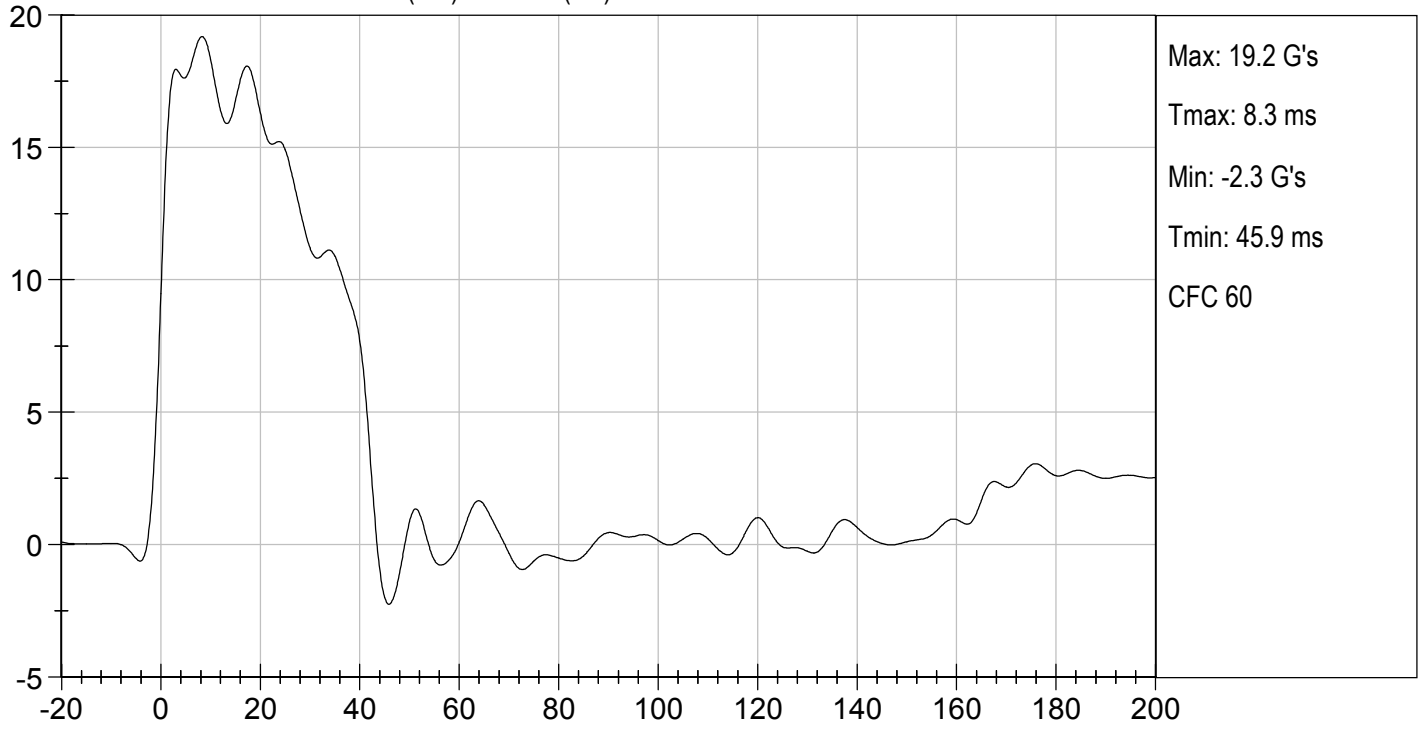
11/03/2017
Test Date

Robert Schmidt
Approved By

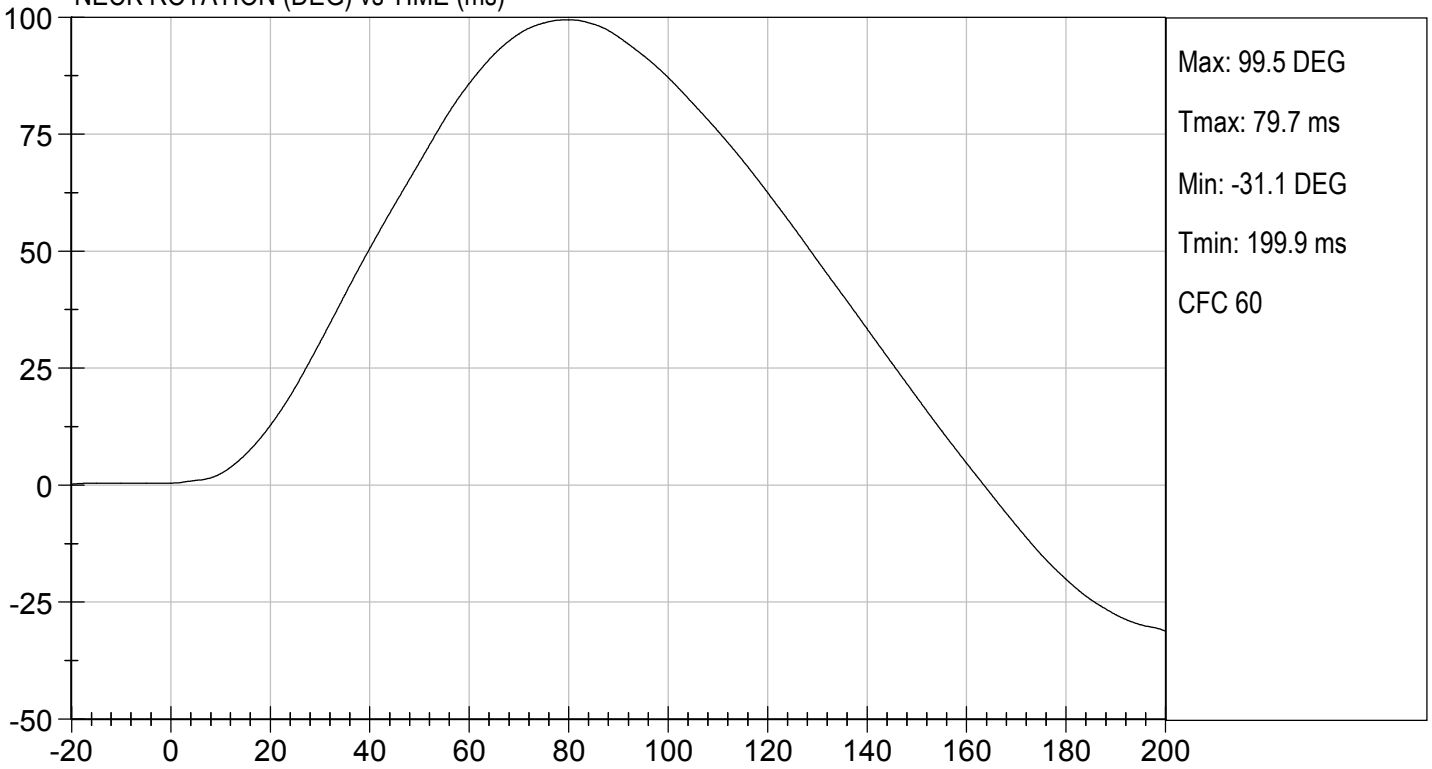
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 11/03/2017
TEST #: D173193

PENDULUM DECELERATION (G's) vs TIME (ms)

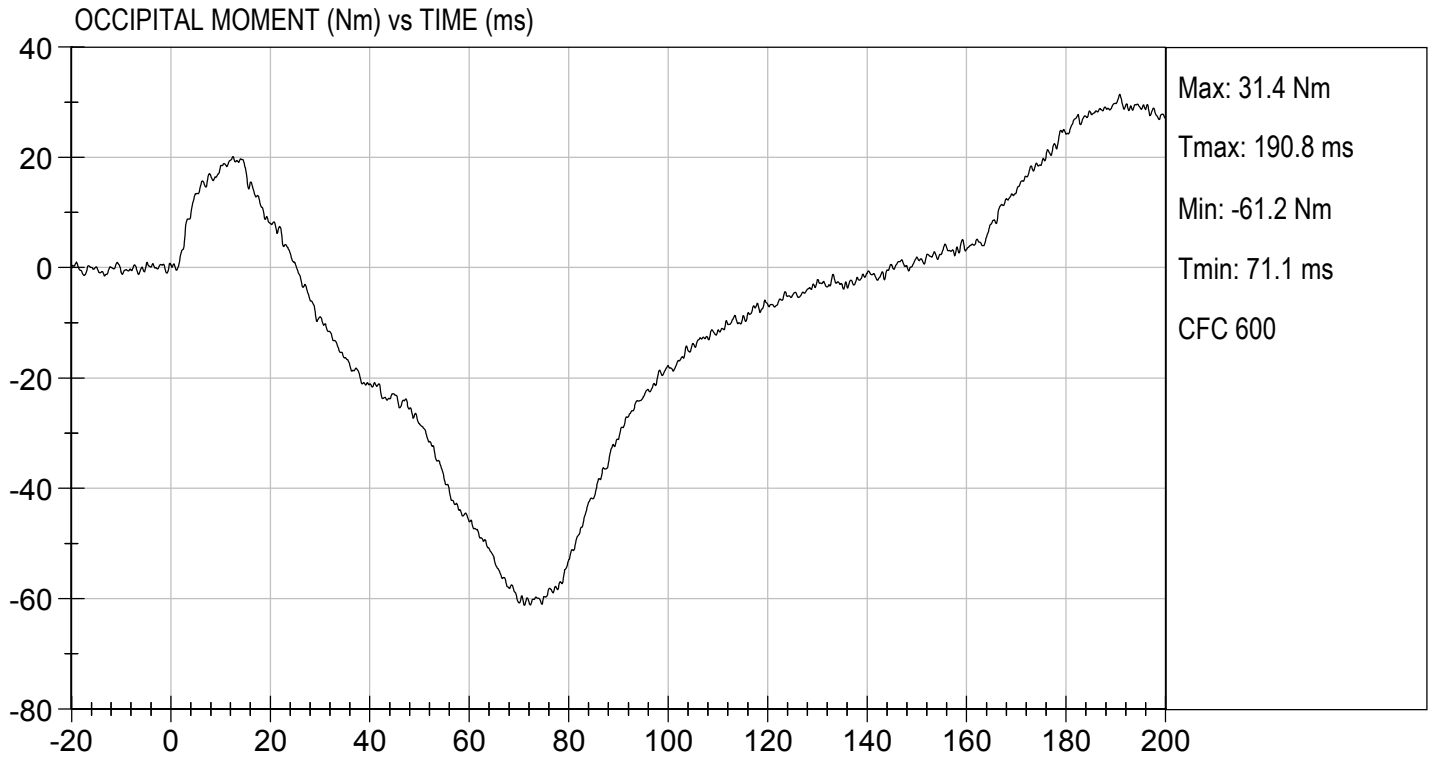


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 11/03/2017
TEST #: D173193



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
		Overall Test Results		Pass

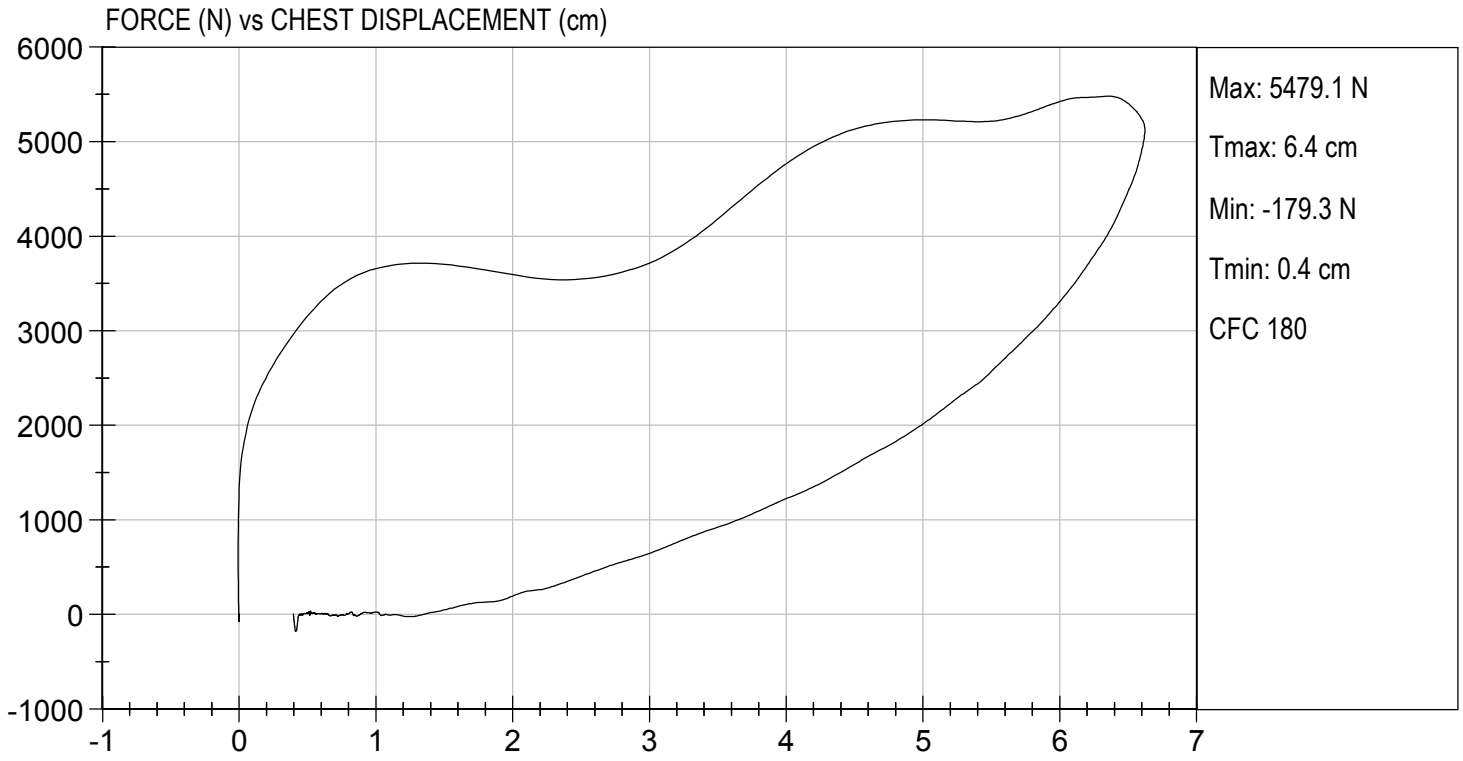
Danielle Redinbaugh
Laboratory Technician

11/02/2017
Test Date

Robert Schmidt
Approved By

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

TEST DATE: 11/02/2017
TEST #: D173194



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

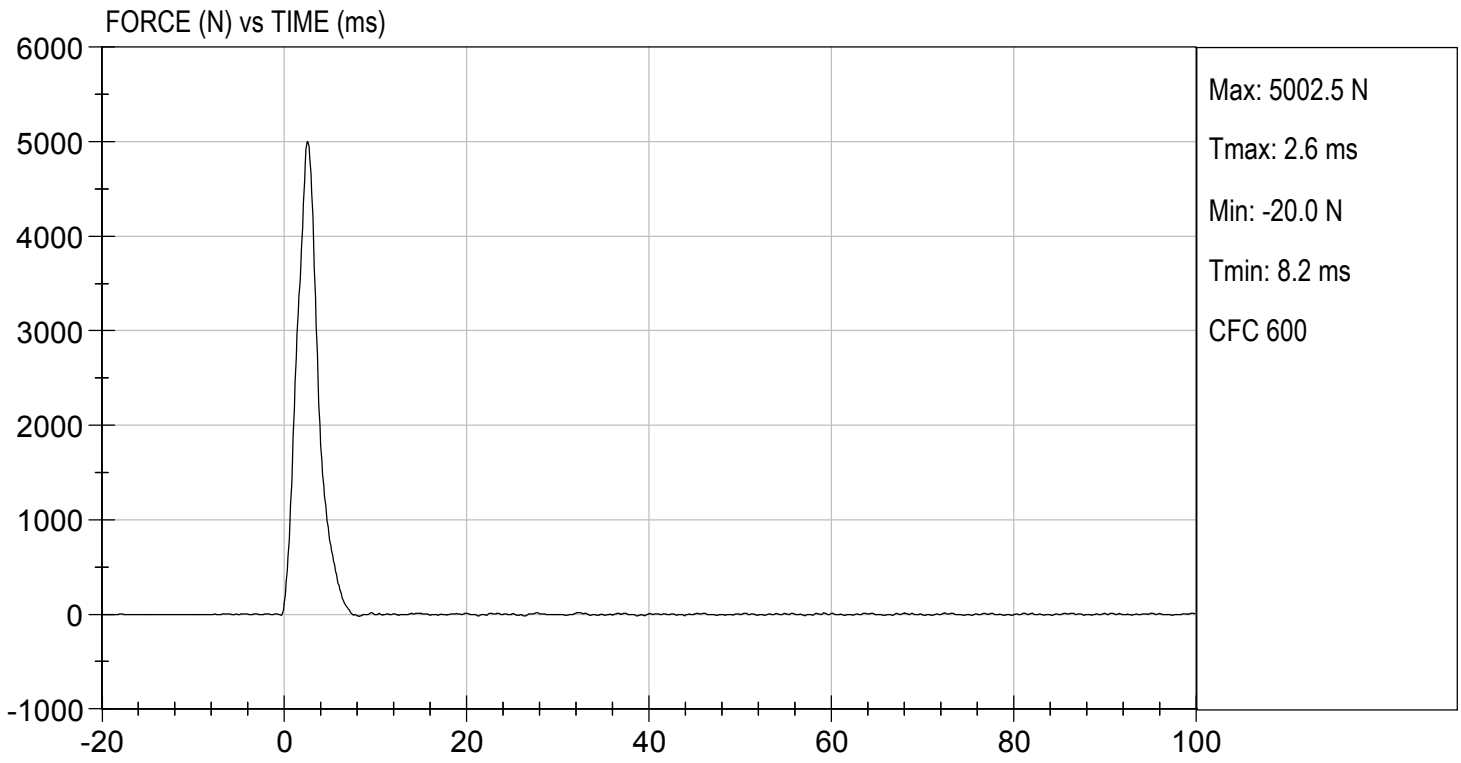
Emily Fliess
Laboratory Technician

11/02/2017
Test Date

Robert Schmidt
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

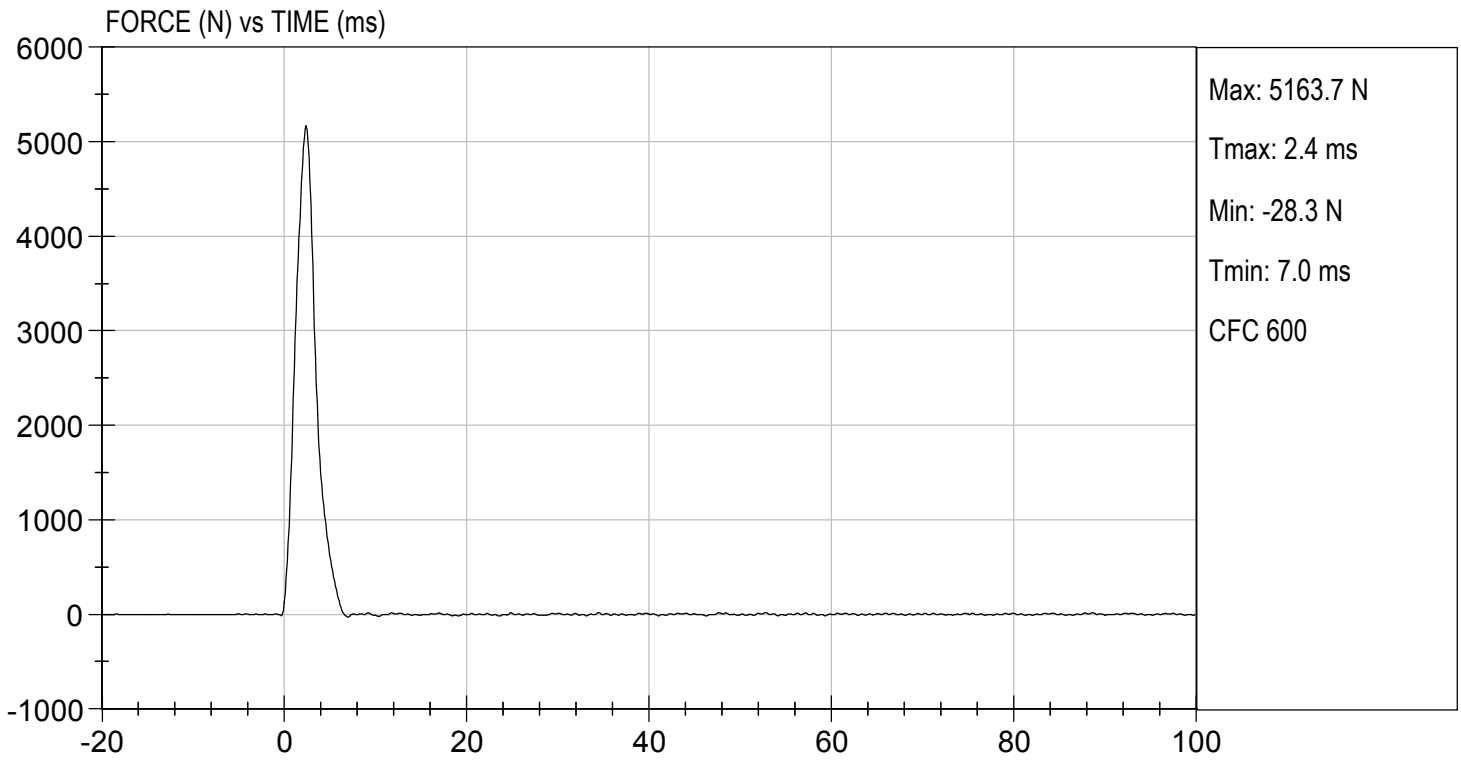
Emily Fliess
Laboratory Technician

11/02/2017
Test Date

Robert Schmidt
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

ATD Serial No: 351 **Test I.D:** D173190

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

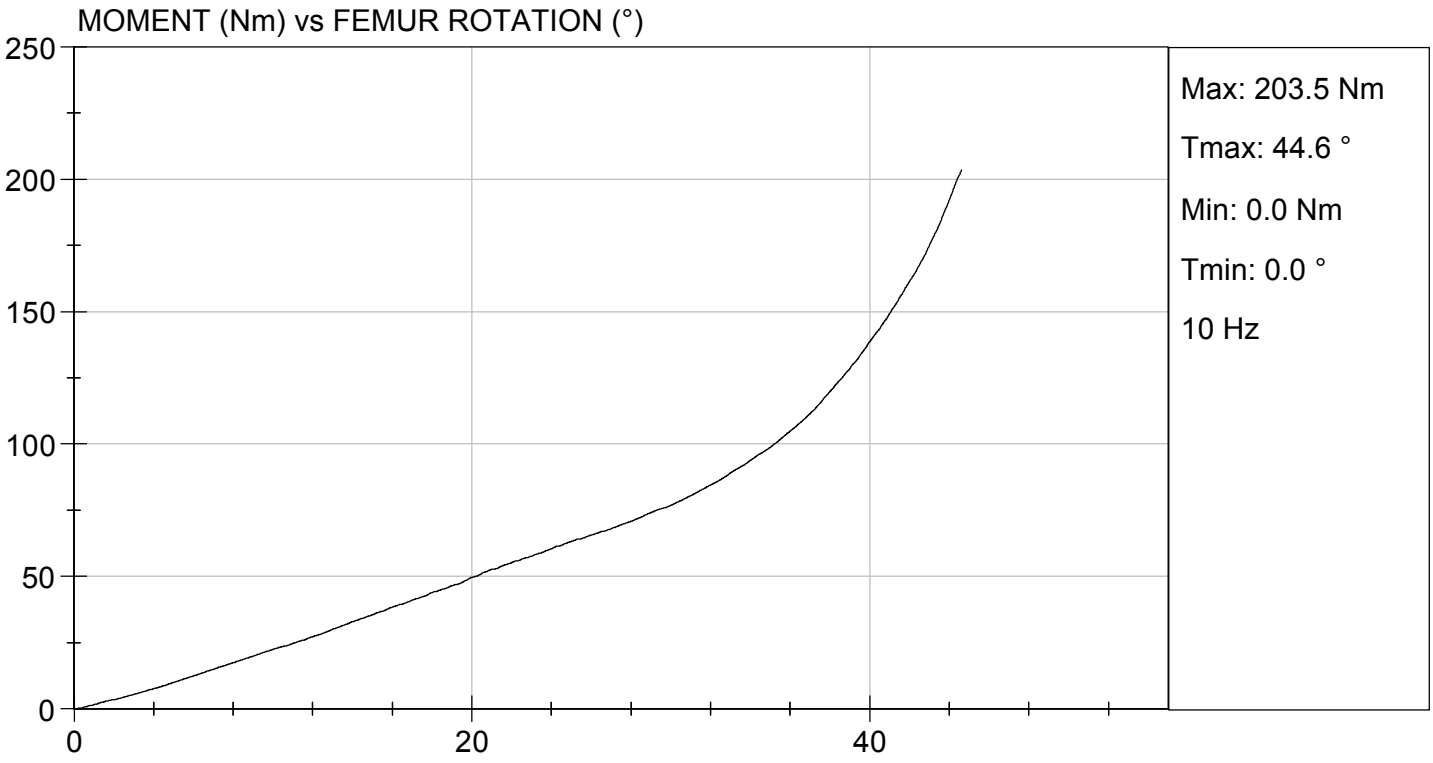
Danielle Redinbaugh
Laboratory Technician

11/02/2017
Test Date

Robert Schmidt
Approved By

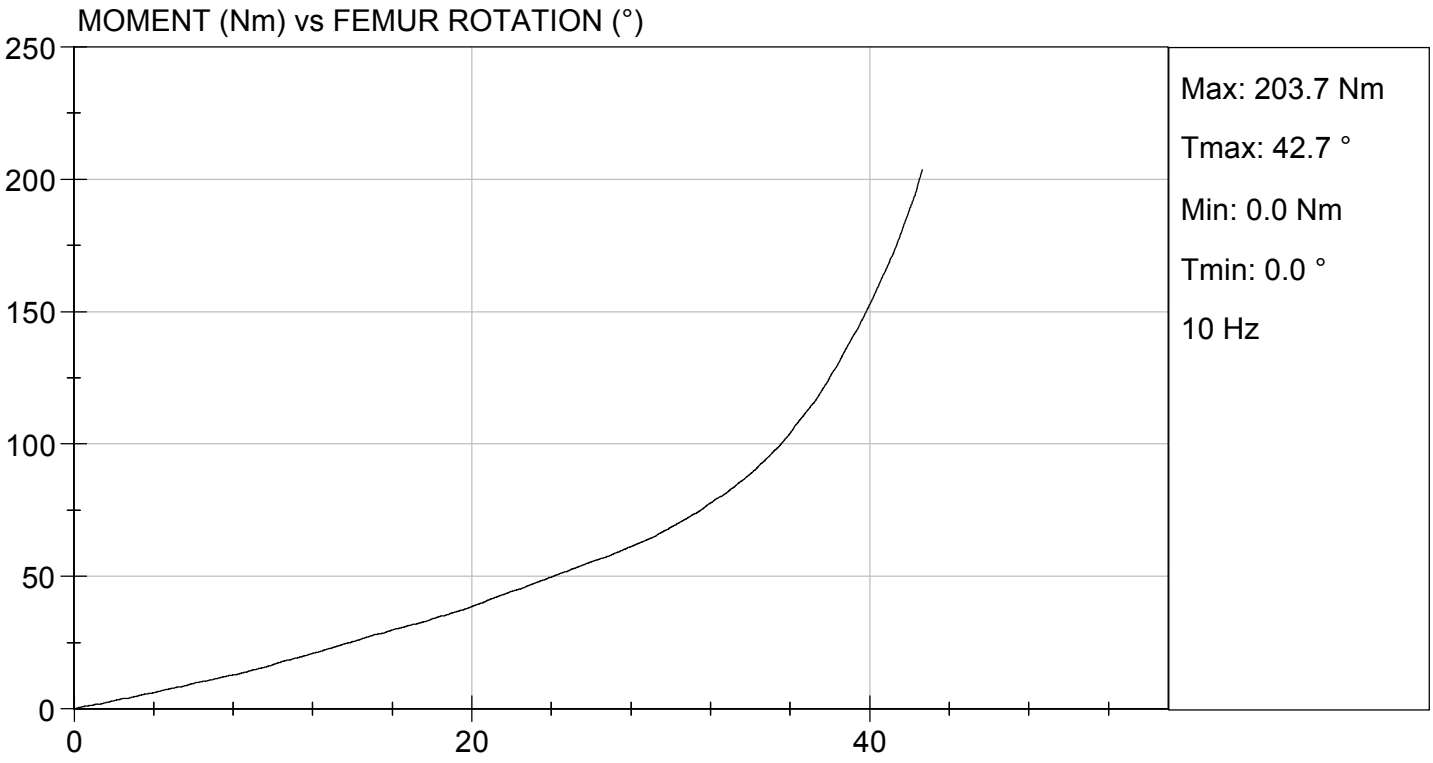
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 11/02/2017
TEST #: D173199



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 11/02/2017
TEST #: D173190



Hybrid III, 5th External Measurements
SN: 634

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	784.6
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	449.0
C	H-POINT HEIGHT	Reference	81.3-86.3	85.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.0
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	79.2
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	125.6
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	253.4
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	277.8
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	197.5
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	541.4
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.1
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	400.4
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	428.6

HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	181.6
P	FOOT LENGTH	Tip of toe to rear of heal	218.5-233.7	224.7
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	482.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	139.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	179.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	306.1
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	355.5
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	90.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. “T”	528.3-548.7	540.6
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	868.7
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	786.8
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: 634 **Test ID:** D173091

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Peak Resultant Acceleration	G's	250 to 300	280	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	3.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

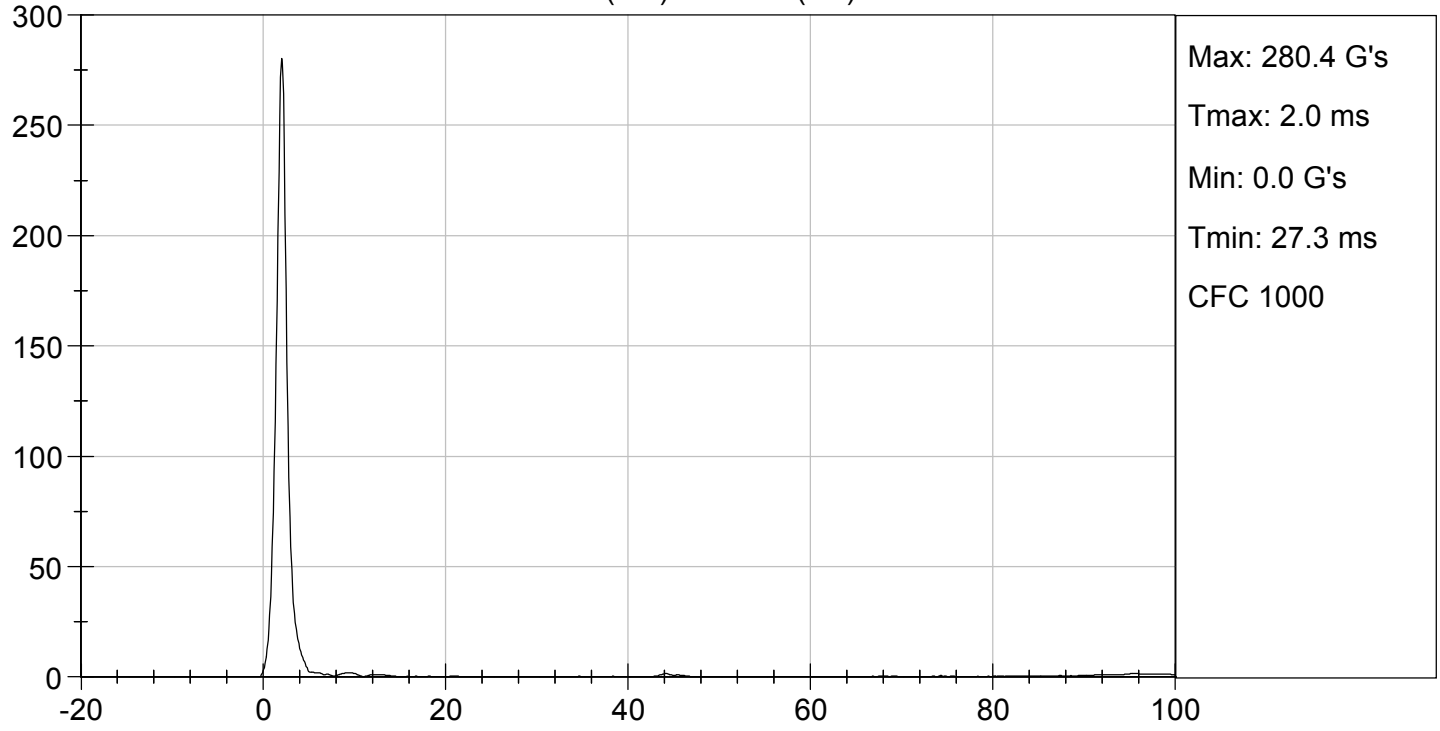
10/25/2017
Test Date

Robert Schmidt
Approved By

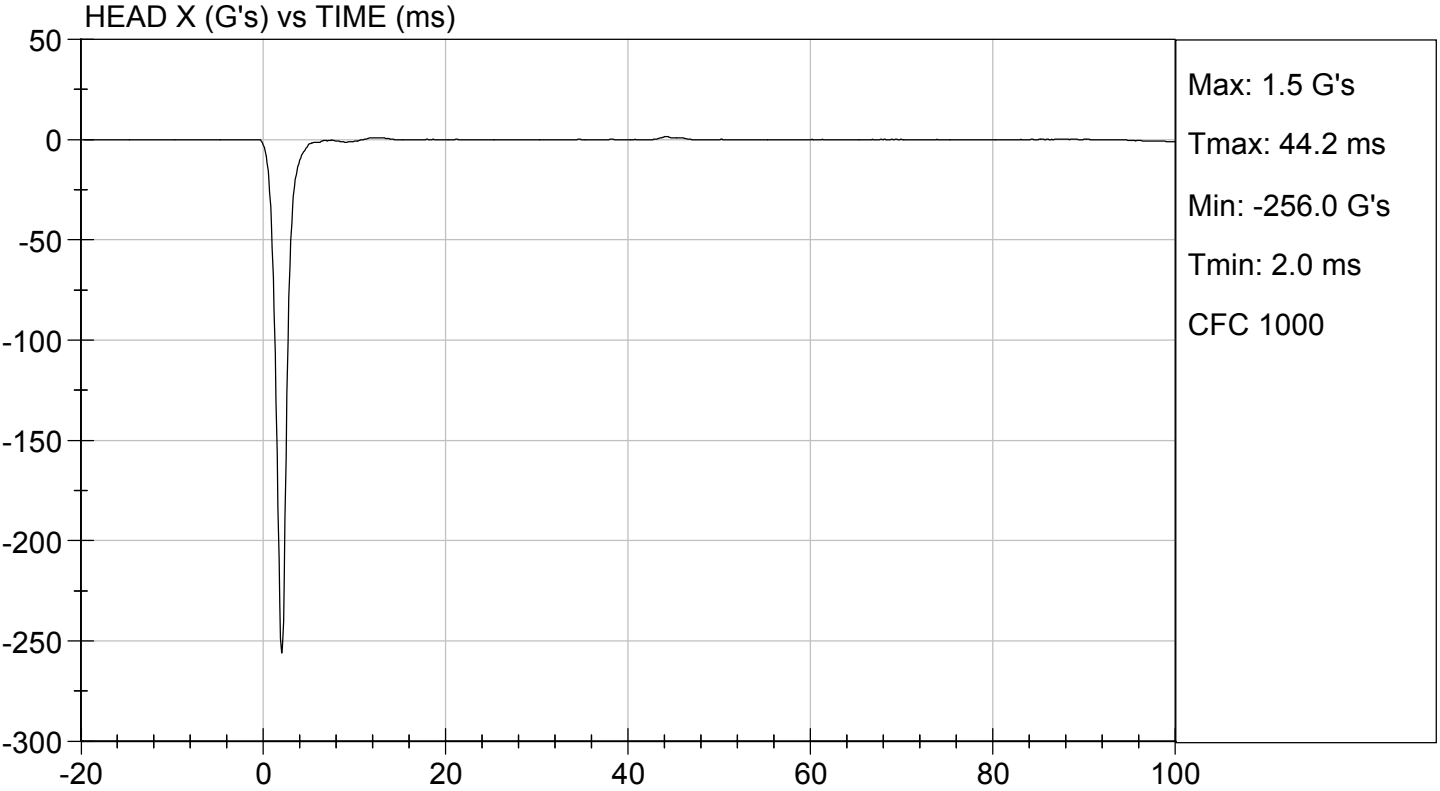
TEST DESC: HEAD DROP

TEST DATE: 10/25/2017
TEST #: D173091

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)

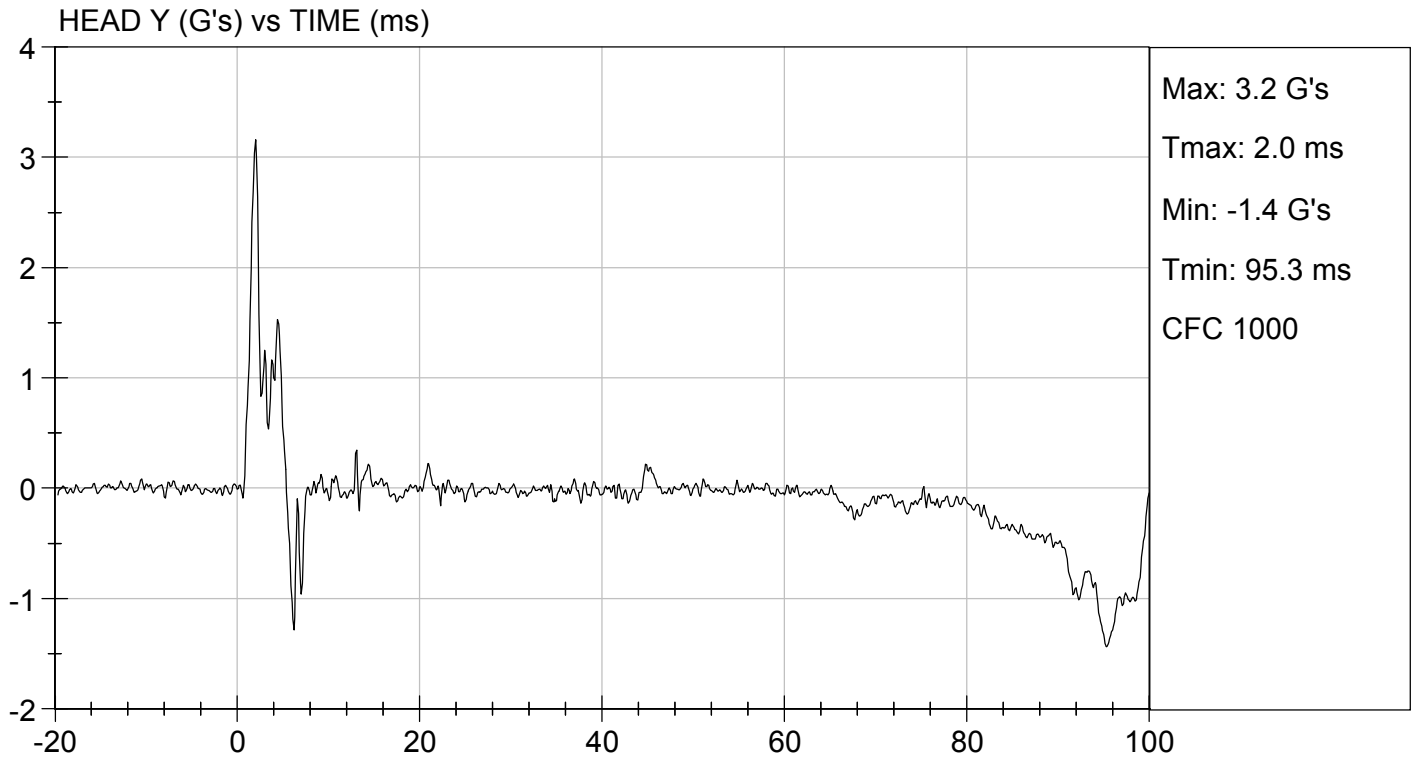


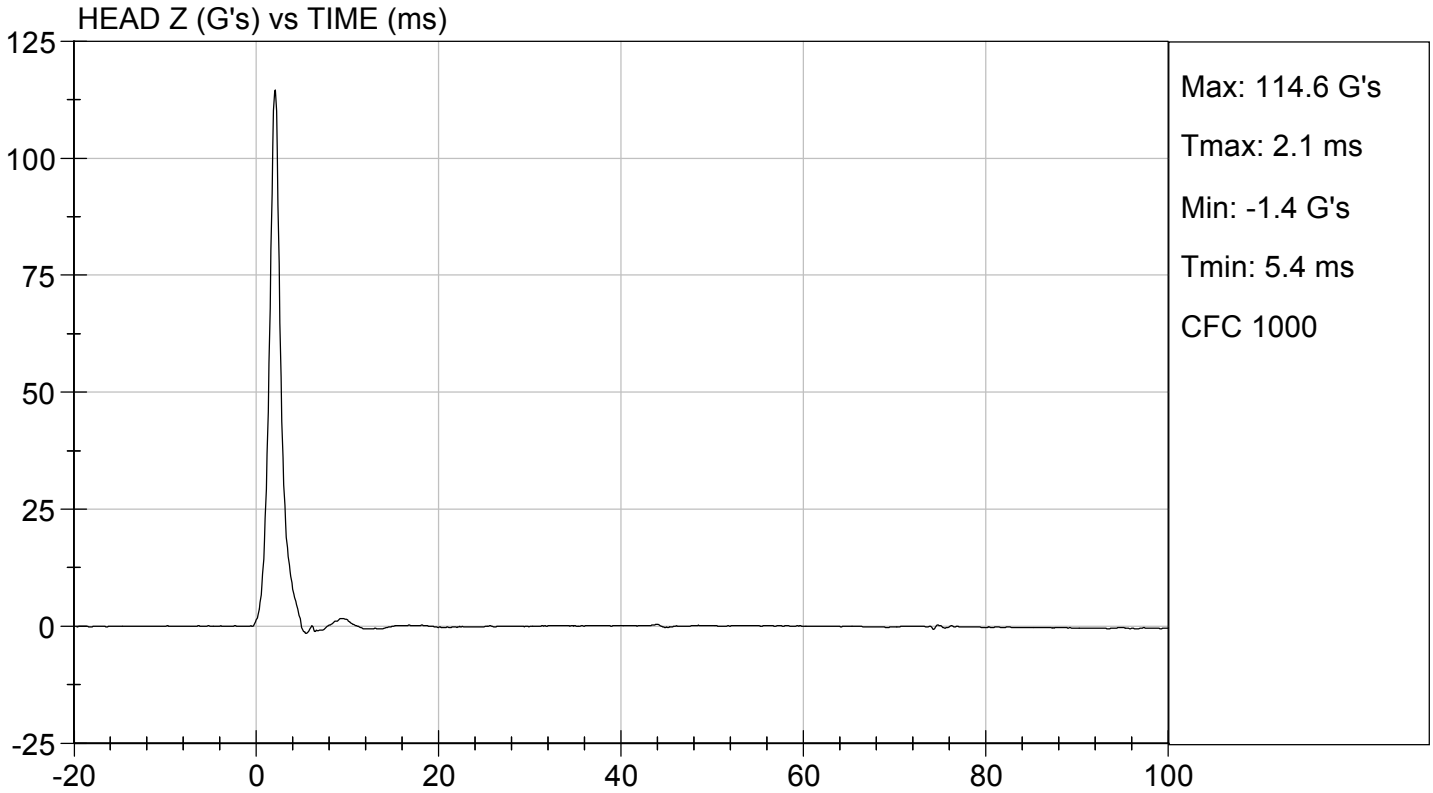
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 10/25/2017
TEST #: D173091





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173092

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.9	Pass
	30 ms	m/s	5.8 to 7.0	7.0	Pass
D Plane Rotation	Max	deg	77 to 91	86	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	87	Pass
			Overall Results		Pass

Danielle Redinbaugh
Laboratory Technician

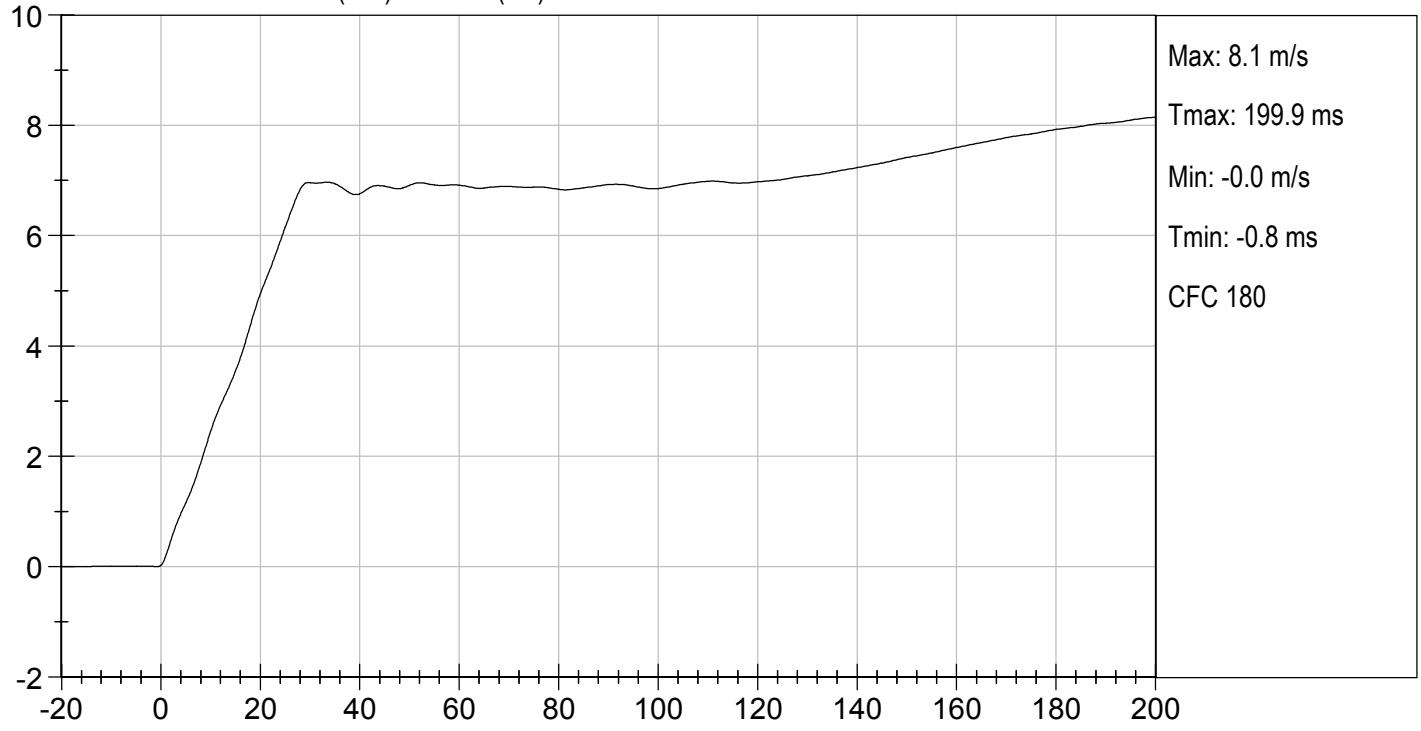
10/25/2017
Test Date

Robert Schmidt
Approved By

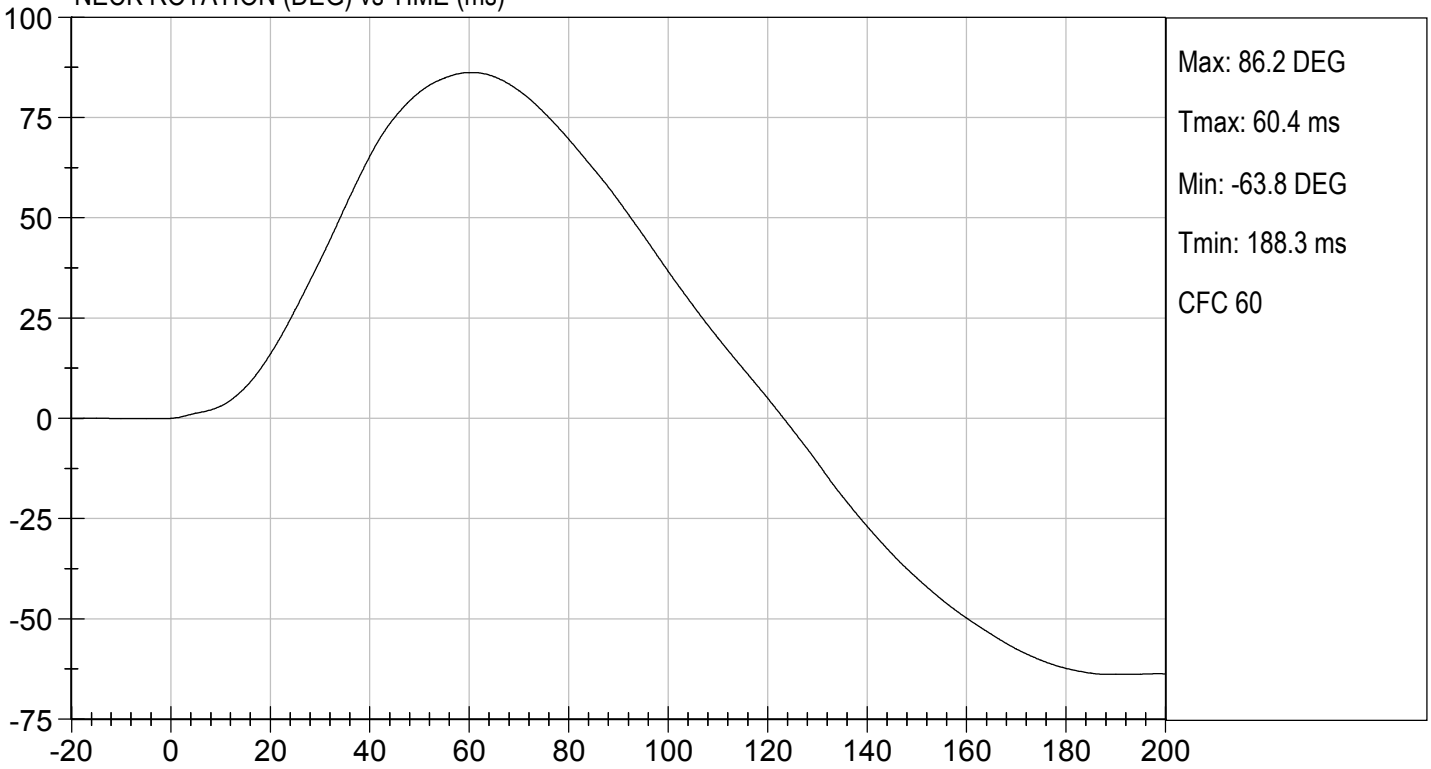
TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

TEST DATE: 10/25/2017
TEST #: D173092

PENDULUM VELOCITY (m/s) vs TIME (ms)

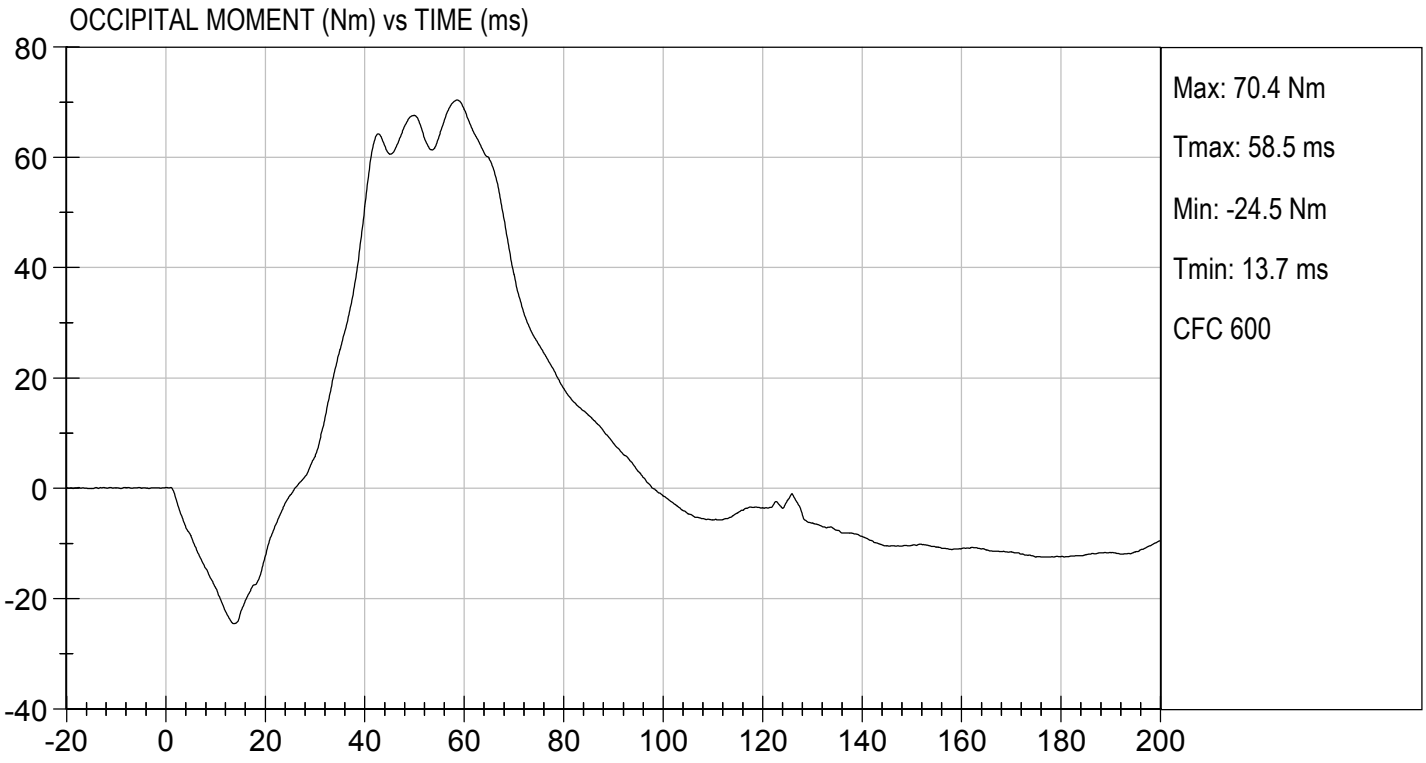


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 10/25/2017
TEST #: D173092



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173093

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	31	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.7	Pass
	30 ms	m/s	4.6 to 5.6	5.3	Pass
D Plane Rotation	Max	deg	99 to 114	111	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-55	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	104	Pass
			Overall Results		Pass

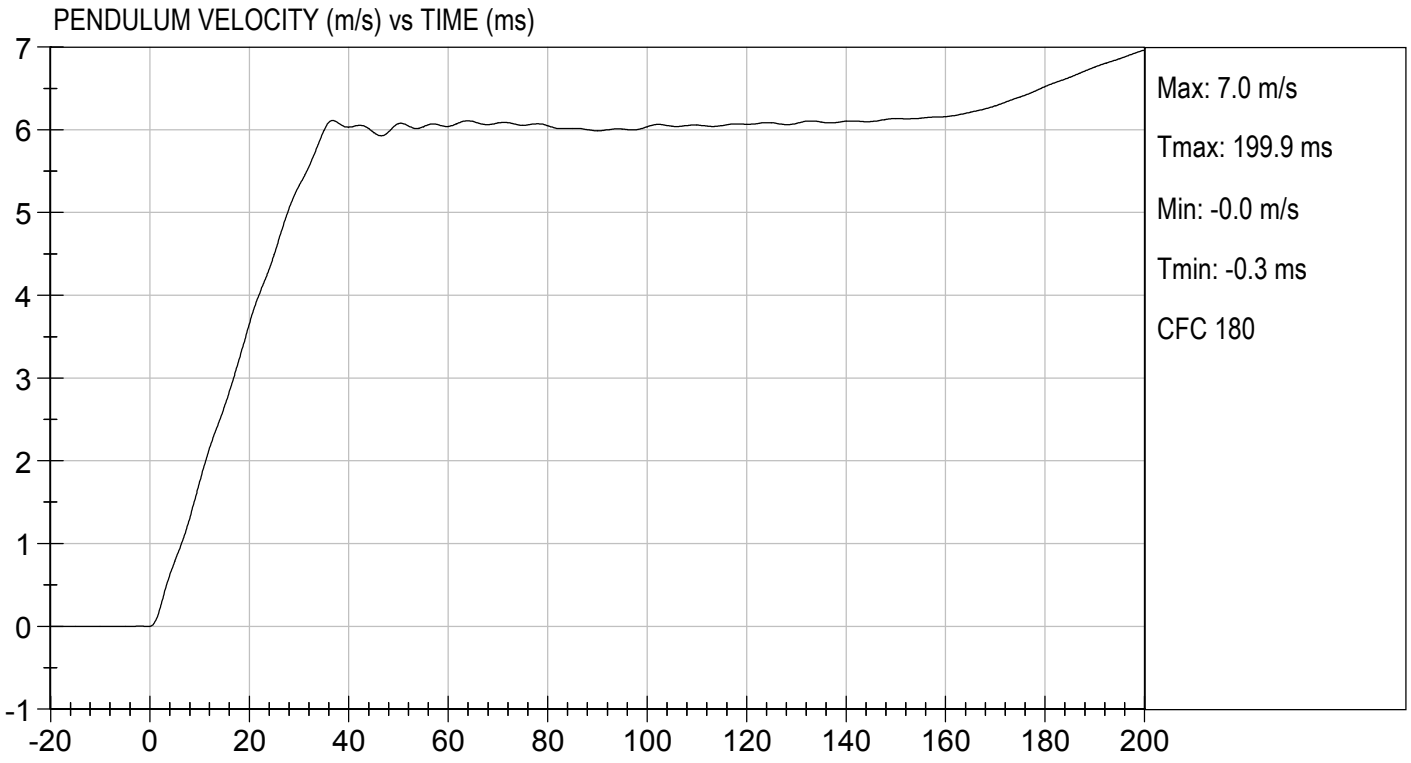
Danielle Redinbaugh
Laboratory Technician

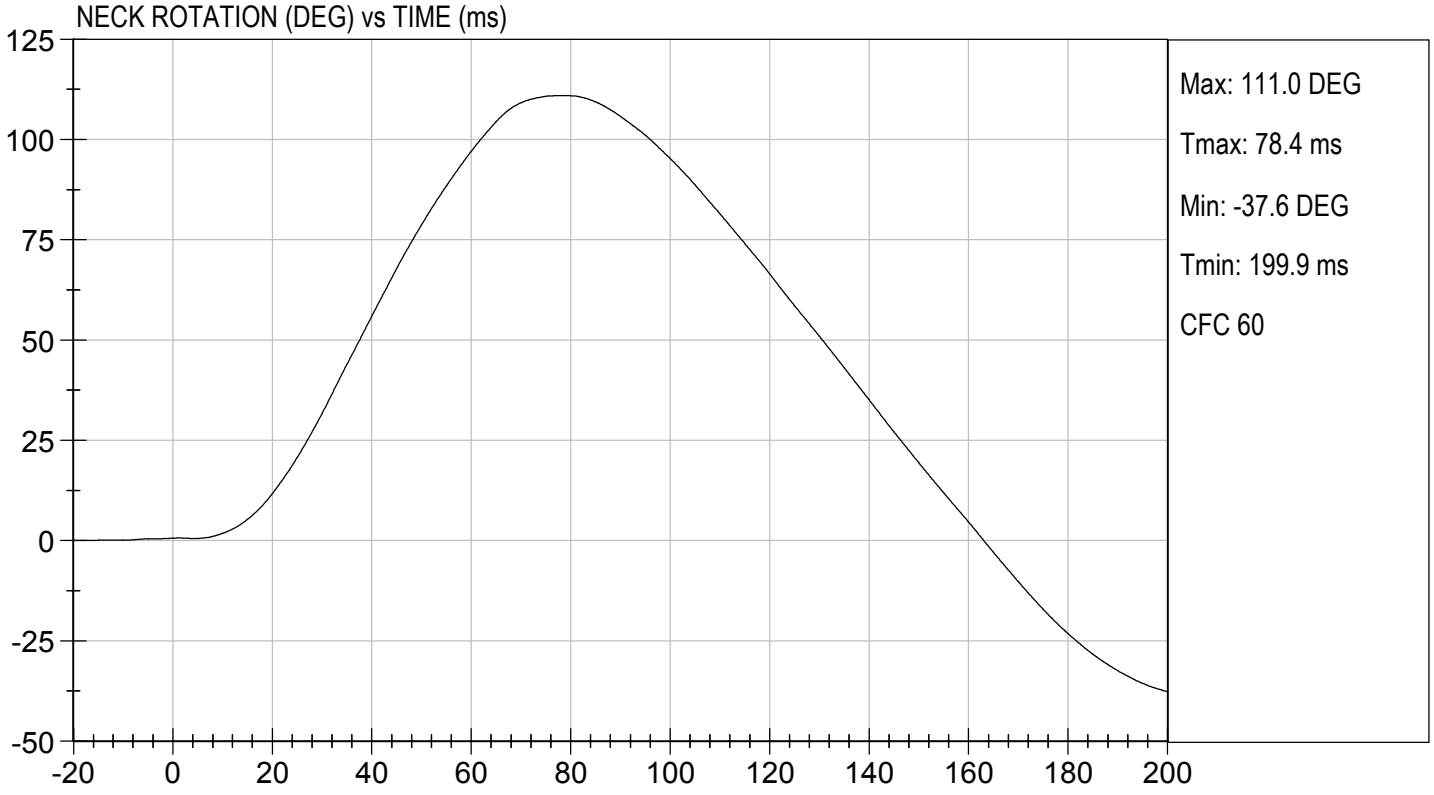
10/25/2017
Test Date

Robert Schnabel
Approved By

TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

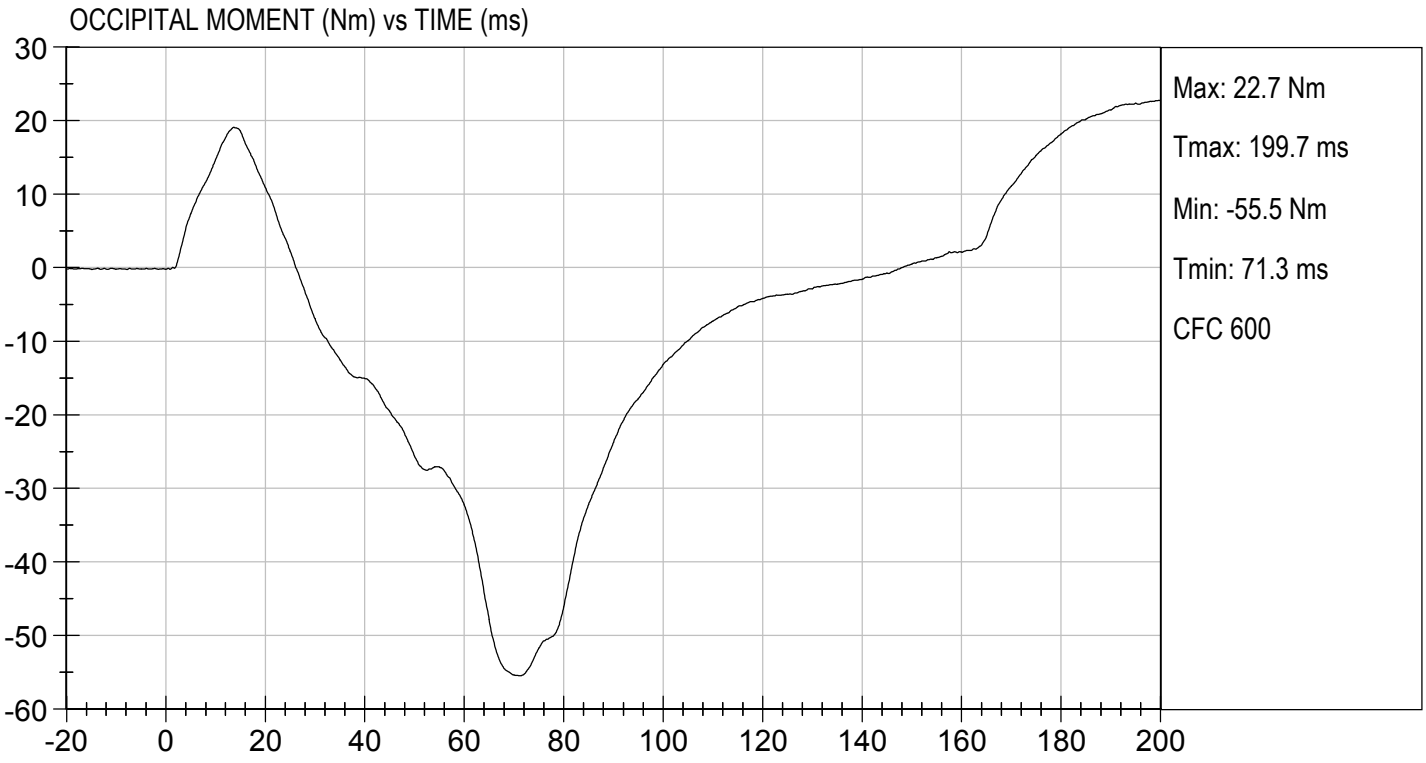
TEST DATE: 10/25/2017
TEST #: D173093





TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 10/25/2017
TEST #: D173093



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173094

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Relative Humidity	%	10 to 70	30	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4376	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4347	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

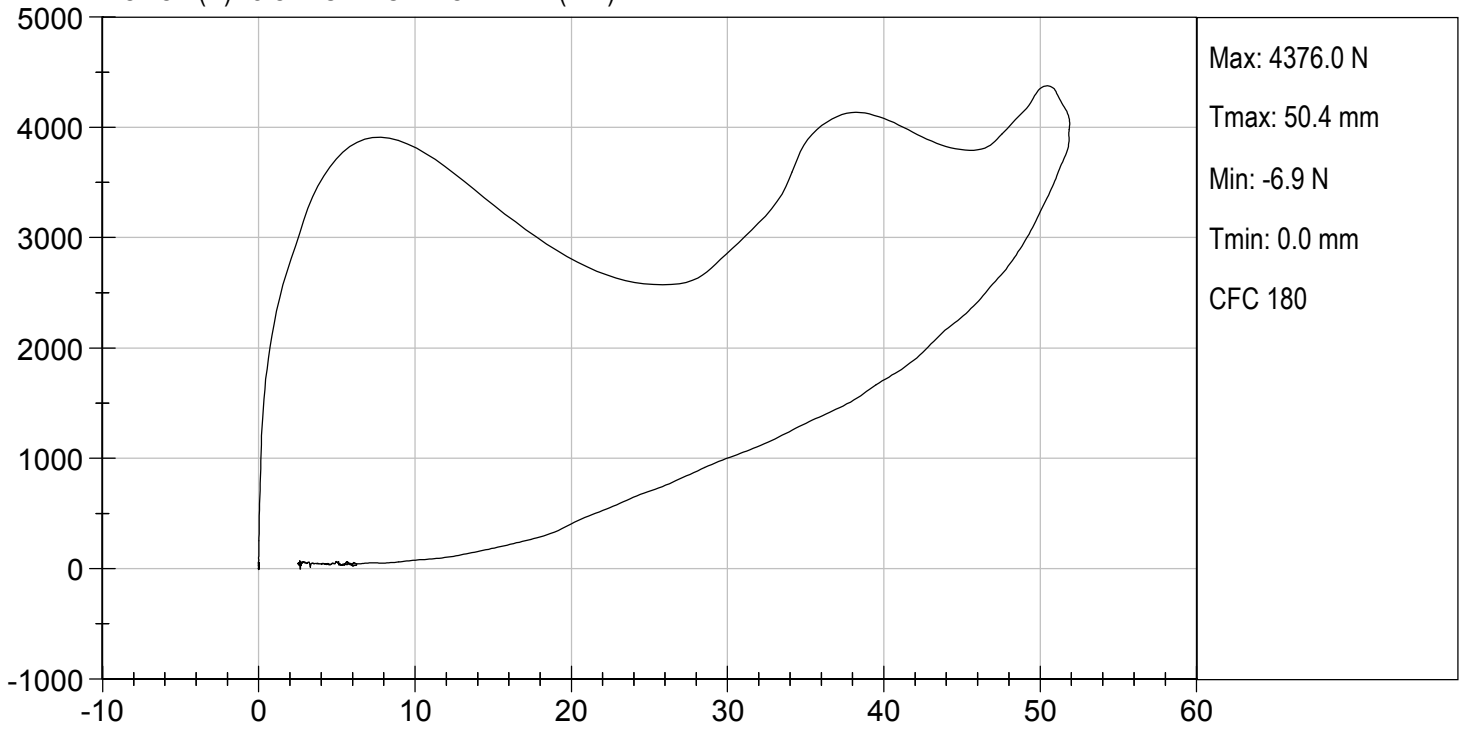
10/27/2017
Test Date

Robert Schmidt
Approved By

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

TEST DATE: 10/27/2017
TEST #: D173094

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173095

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3932	Pass
		Overall Test Results		Pass

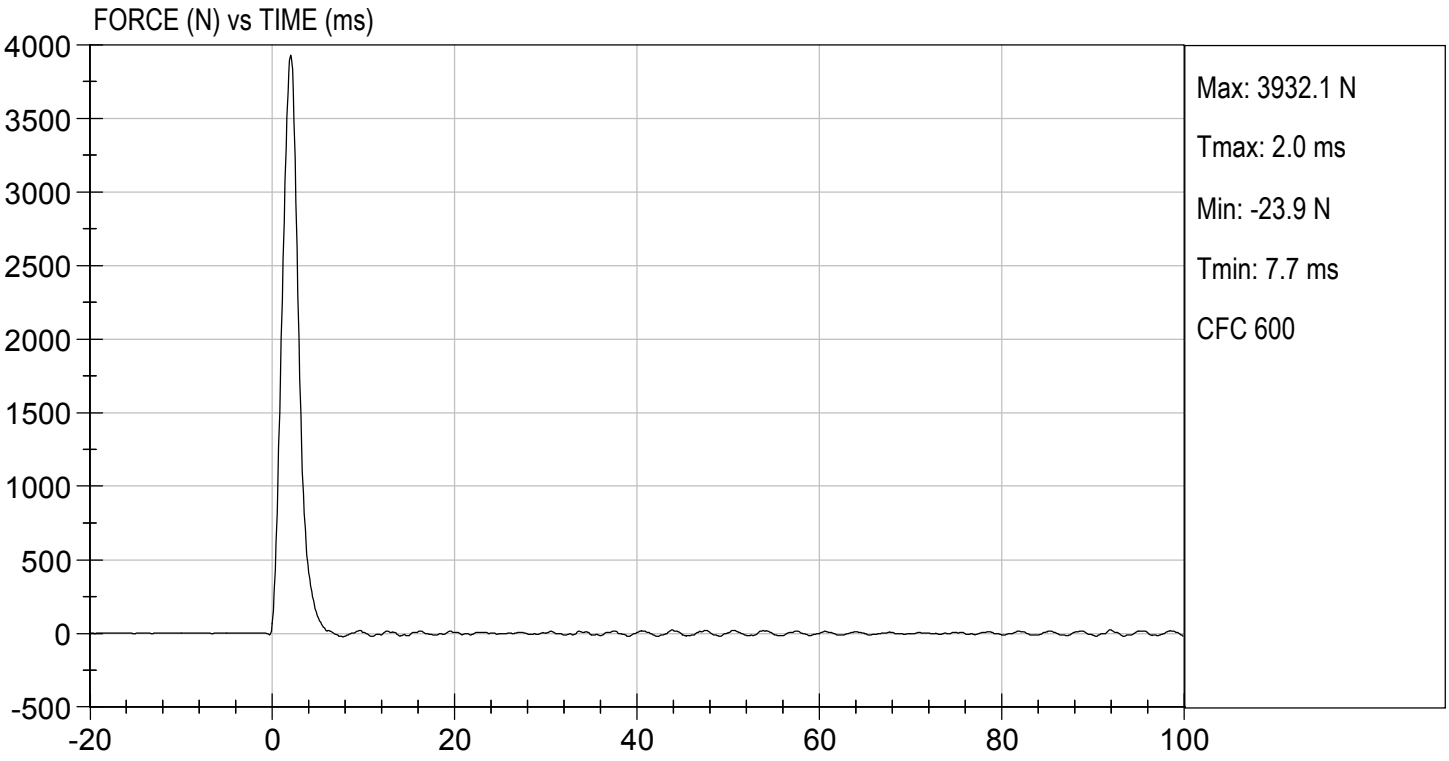
Danielle Redinbaugh
Laboratory Technician

10/25/2017
Test Date

Approved By

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

TEST DATE: 10/25/2017
TEST #: D173095



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173096

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	N	3450 to 4060	3541	Pass
		Overall Test Results		Pass

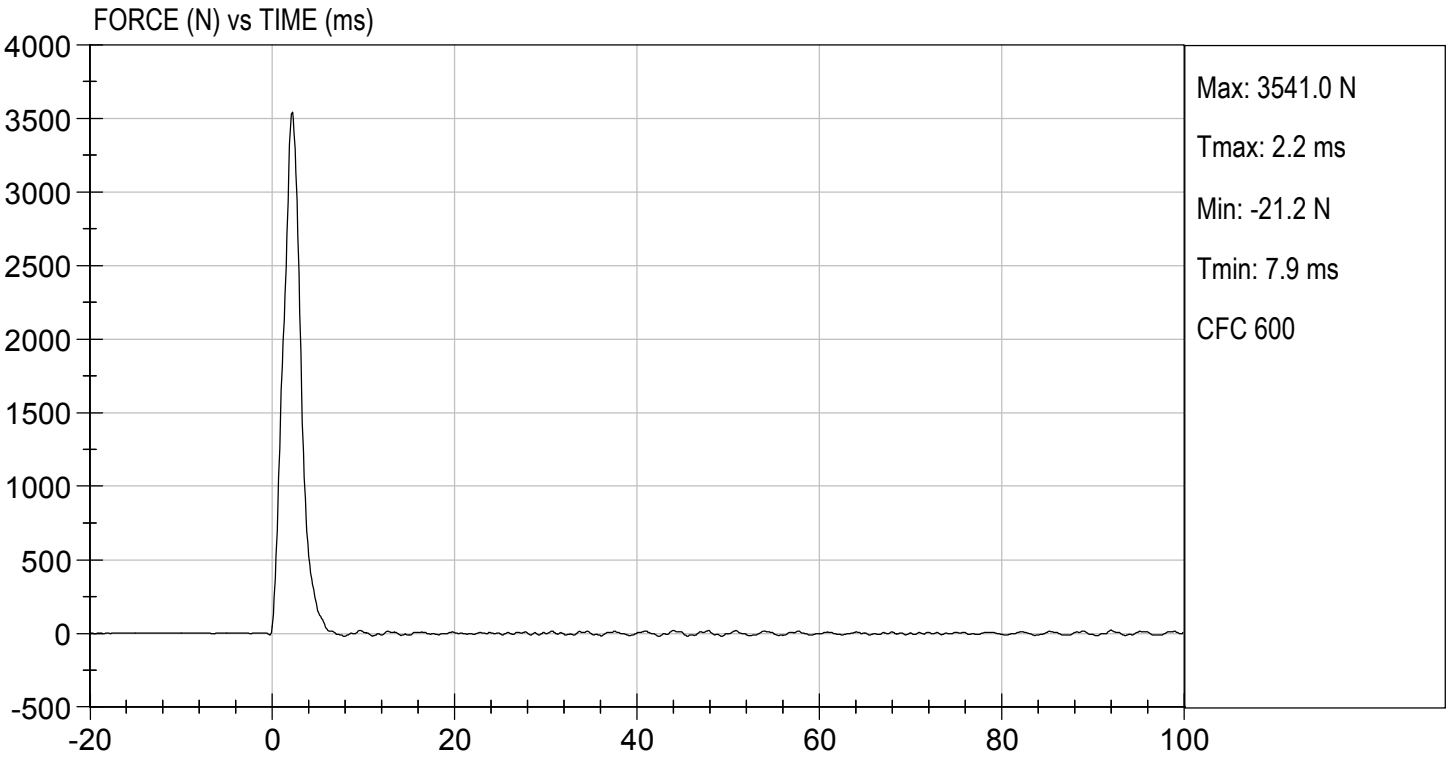
Danielle Redinbaugh
Laboratory Technician

10/25/2017
Test Date

Robert Schmidt
Approved By

TEST DESC: LEFT KNEE
VELOCITY: 6.80 ft/s, 2.07 m/s

TEST DATE: 10/25/2017
TEST #: D173096



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173097

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	372	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	1.1	Pass
		Overall Result		Pass

Danielle Redinbaugh
Laboratory Technician

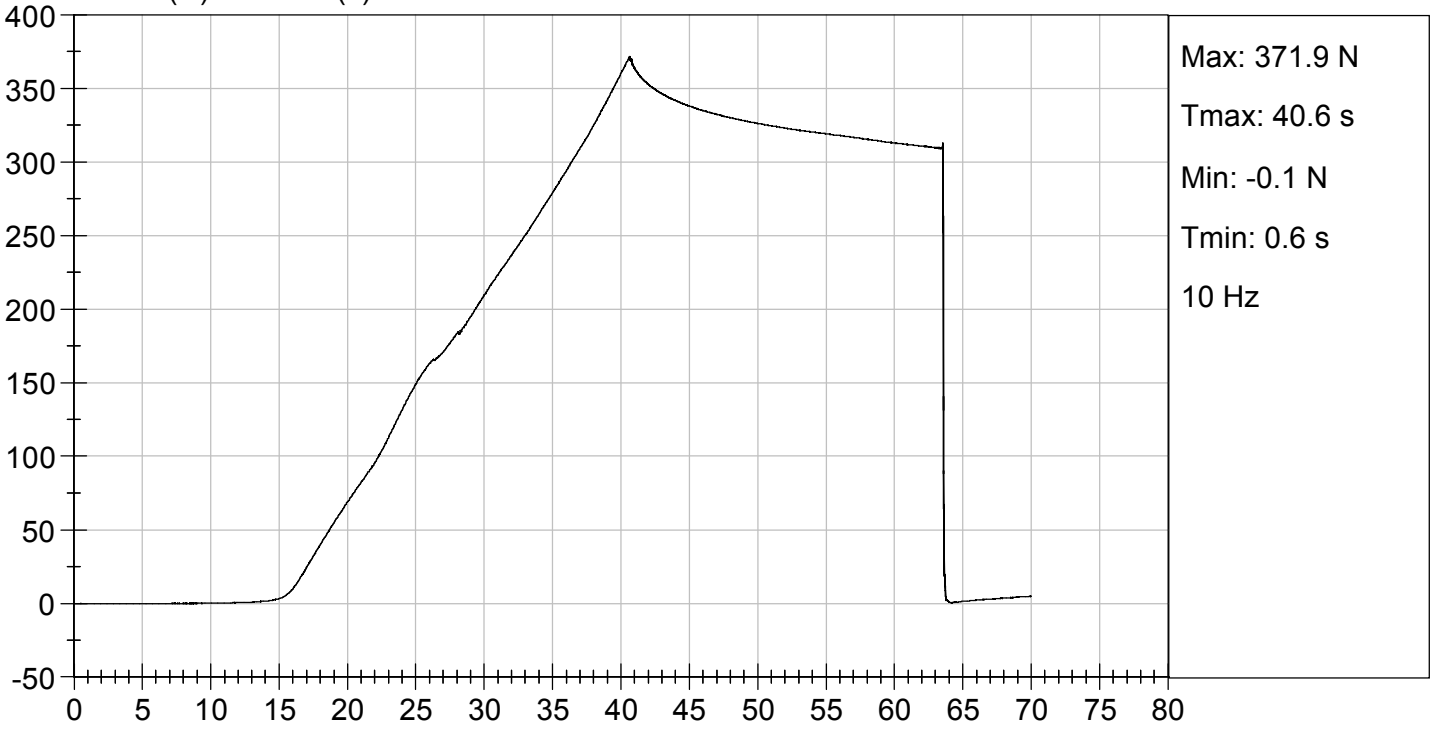
10/25/2017
Test Date

Robert Schmidt
Approved By

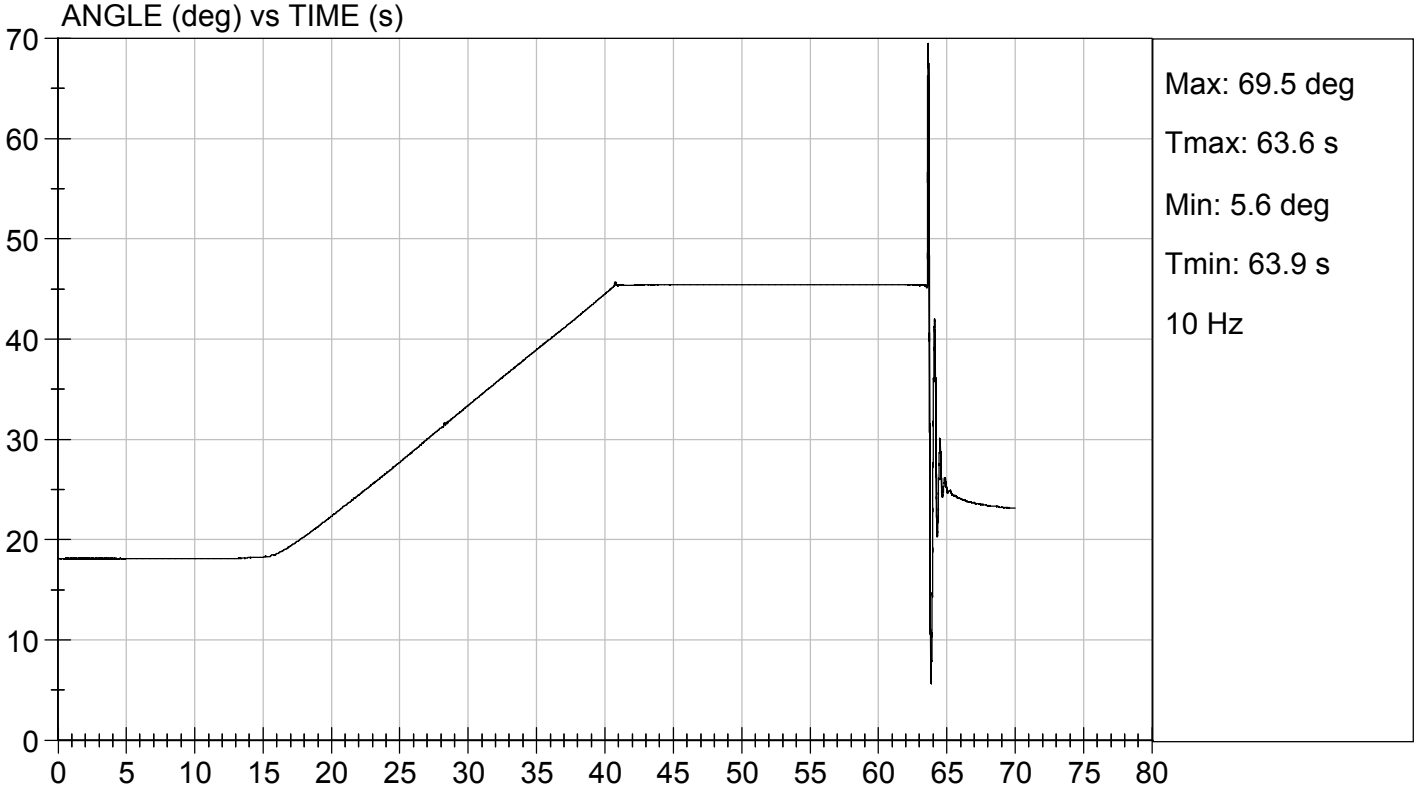
TEST DESC: LUMBAR FLEXION

TEST DATE: 10/25/2017
TEST #: D173097

LOAD (N) vs TIME (s)



ANGLE (deg) vs TIME (s)



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test ID:** D173201

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	250 to 300	281	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-4.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

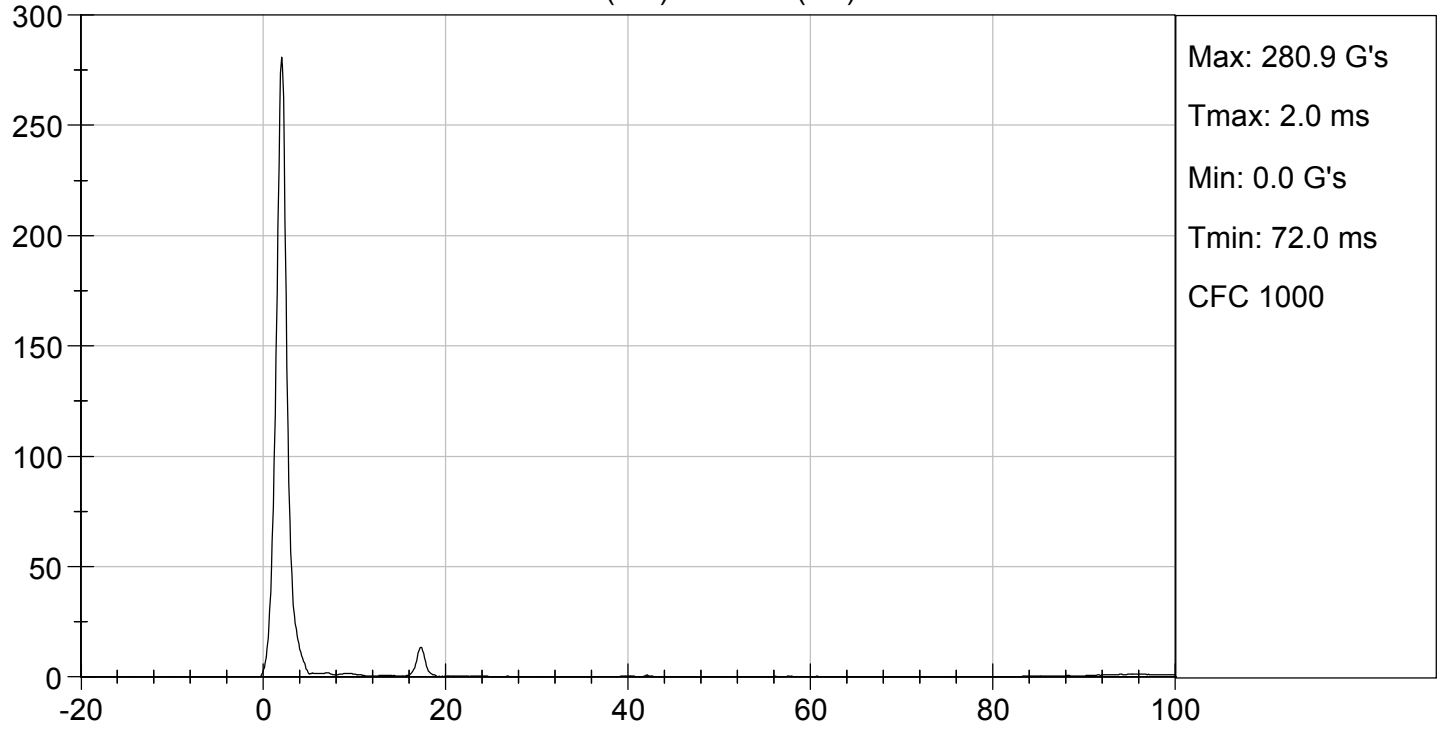
11/02/2017
Test Date

Robert Schmidt
Approved By

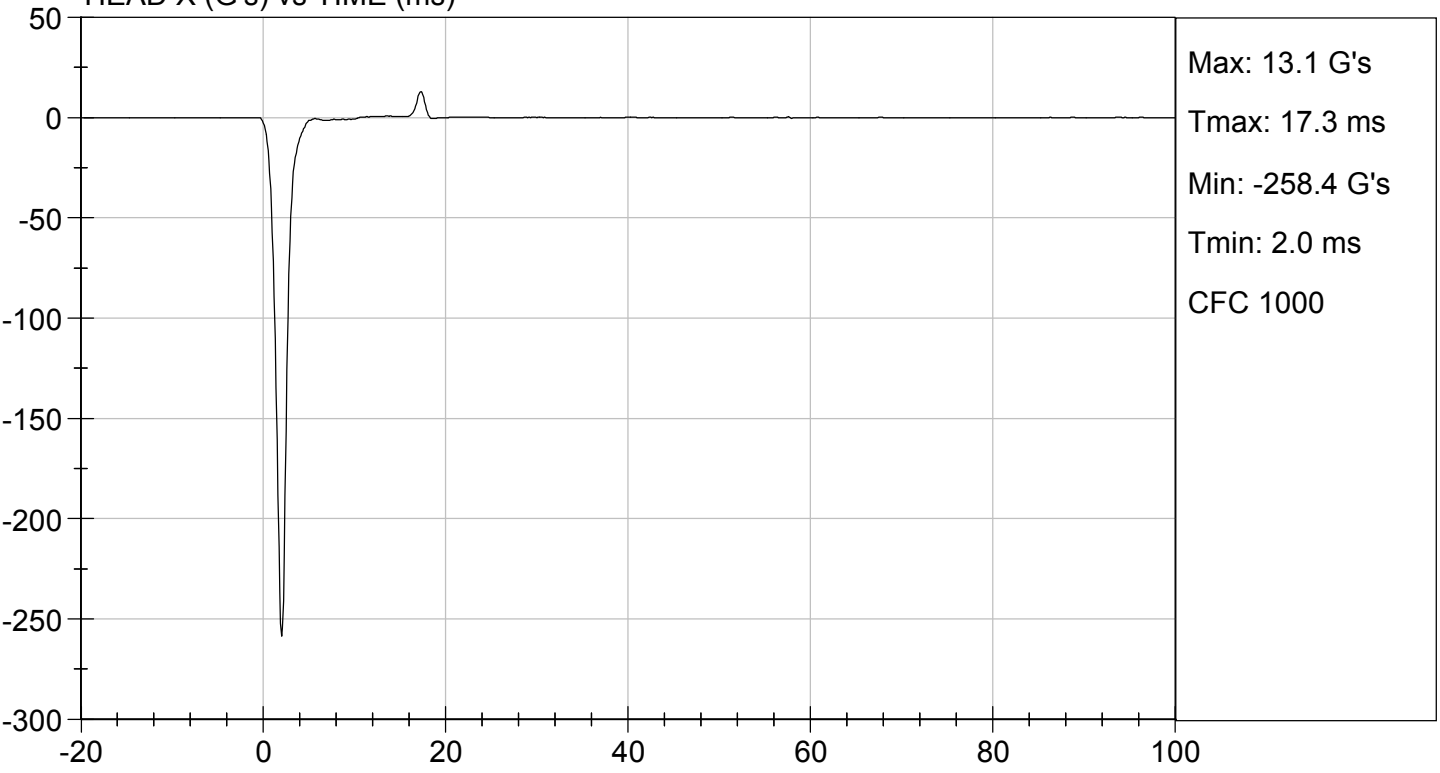
TEST DESC: HEAD DROP

TEST DATE: 11/02/2017
TEST #: D173201

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)

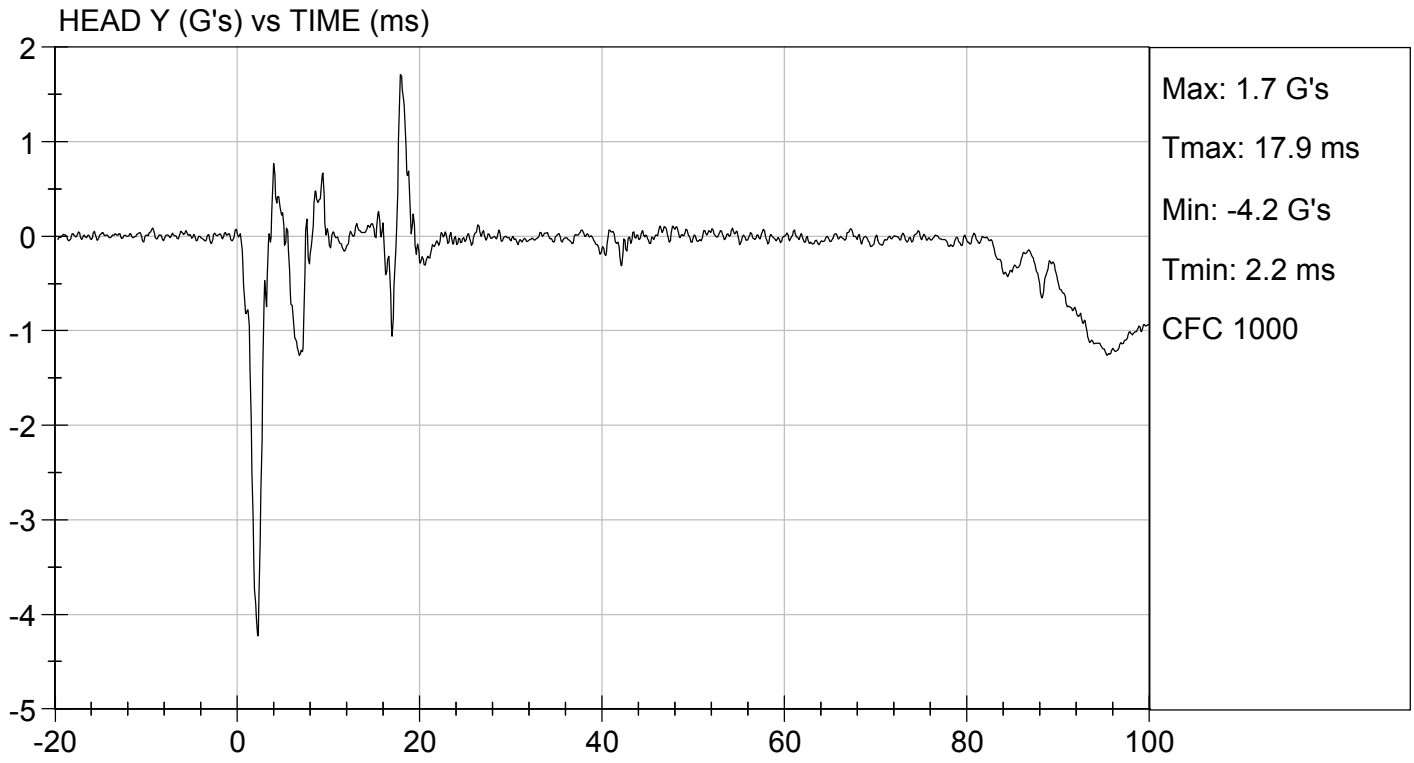


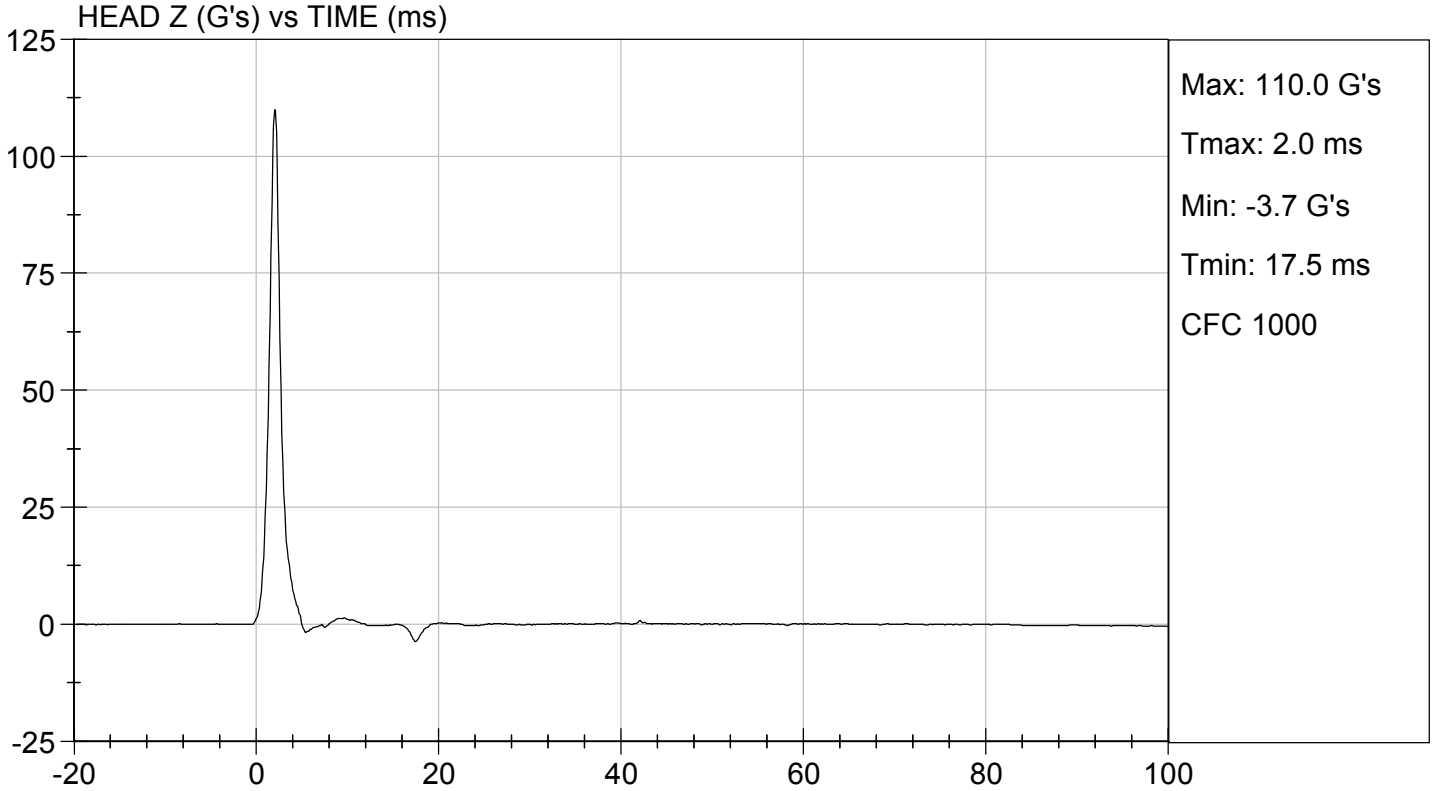
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 11/02/2017
TEST #: D173201





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173202A

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 Speed		m/s	6.89 to 7.13	7.07	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.7	Pass
D Plane Rotation	Max	deg	77 to 91	86	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	86	Pass
			Overall Results		Pass

Danielle Redinbaugh
Laboratory Technician

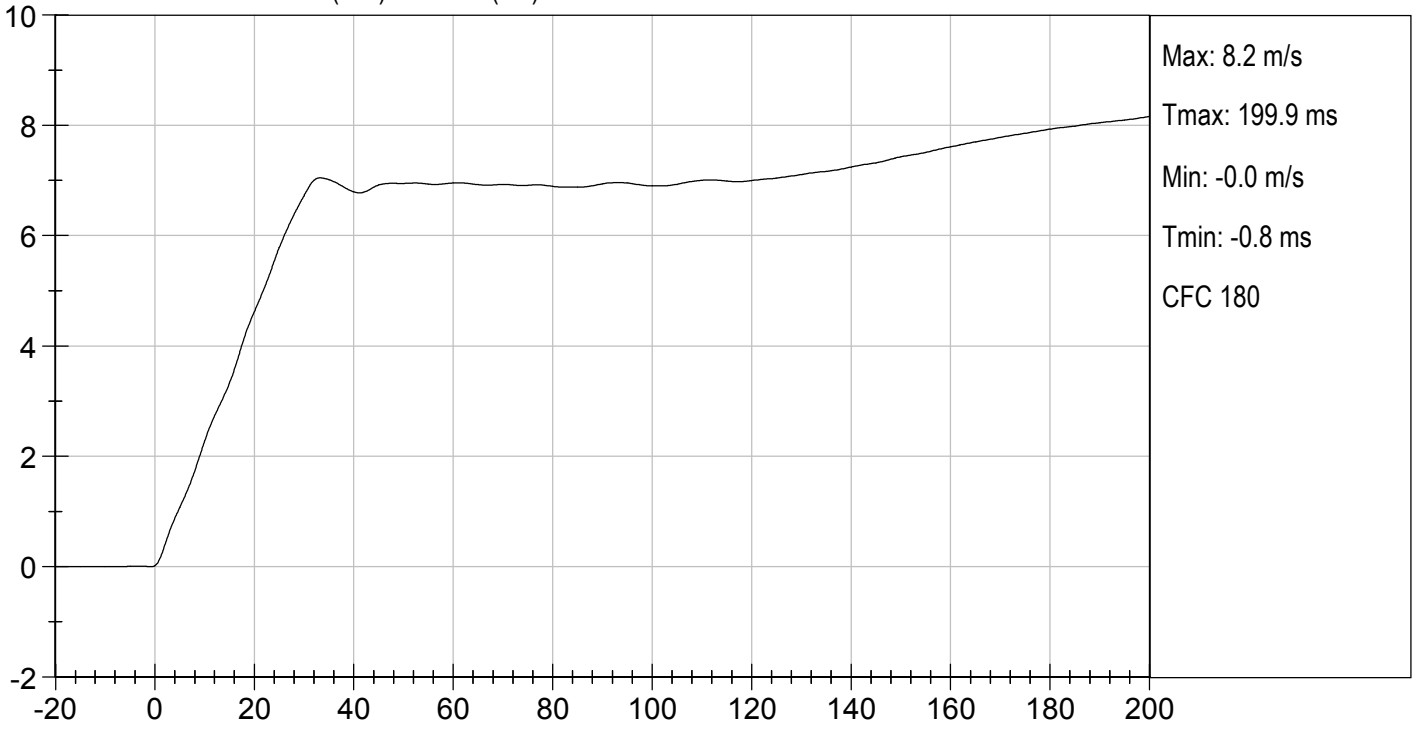
11/03/2017
Test Date

Robert Schmidt
Approved By

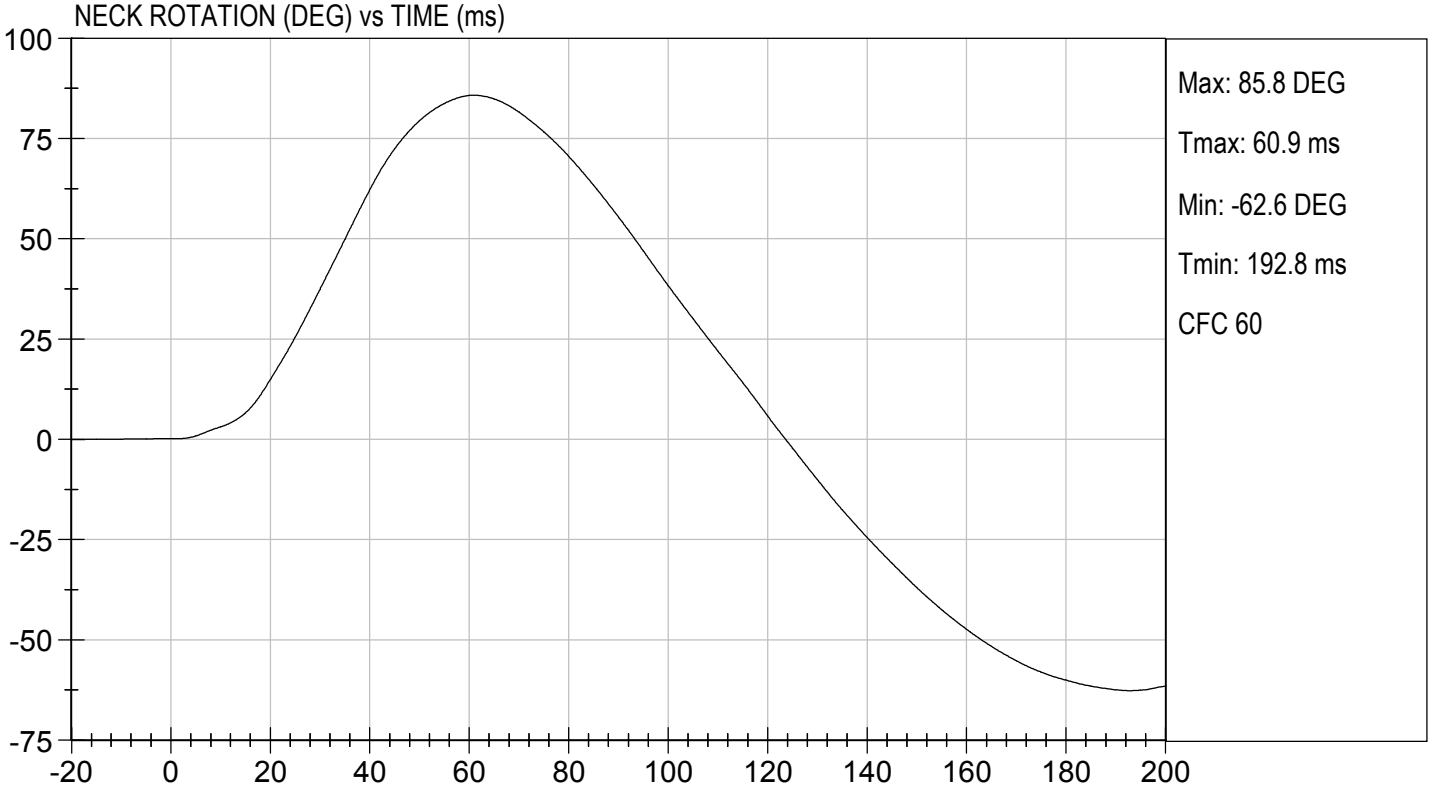
TEST DESC: NECK FLEXION
VELOCITY: 23.20 ft/s, 7.07 m/s

TEST DATE: 11/03/2017
TEST #: D173202A

PENDULUM VELOCITY (m/s) vs TIME (ms)

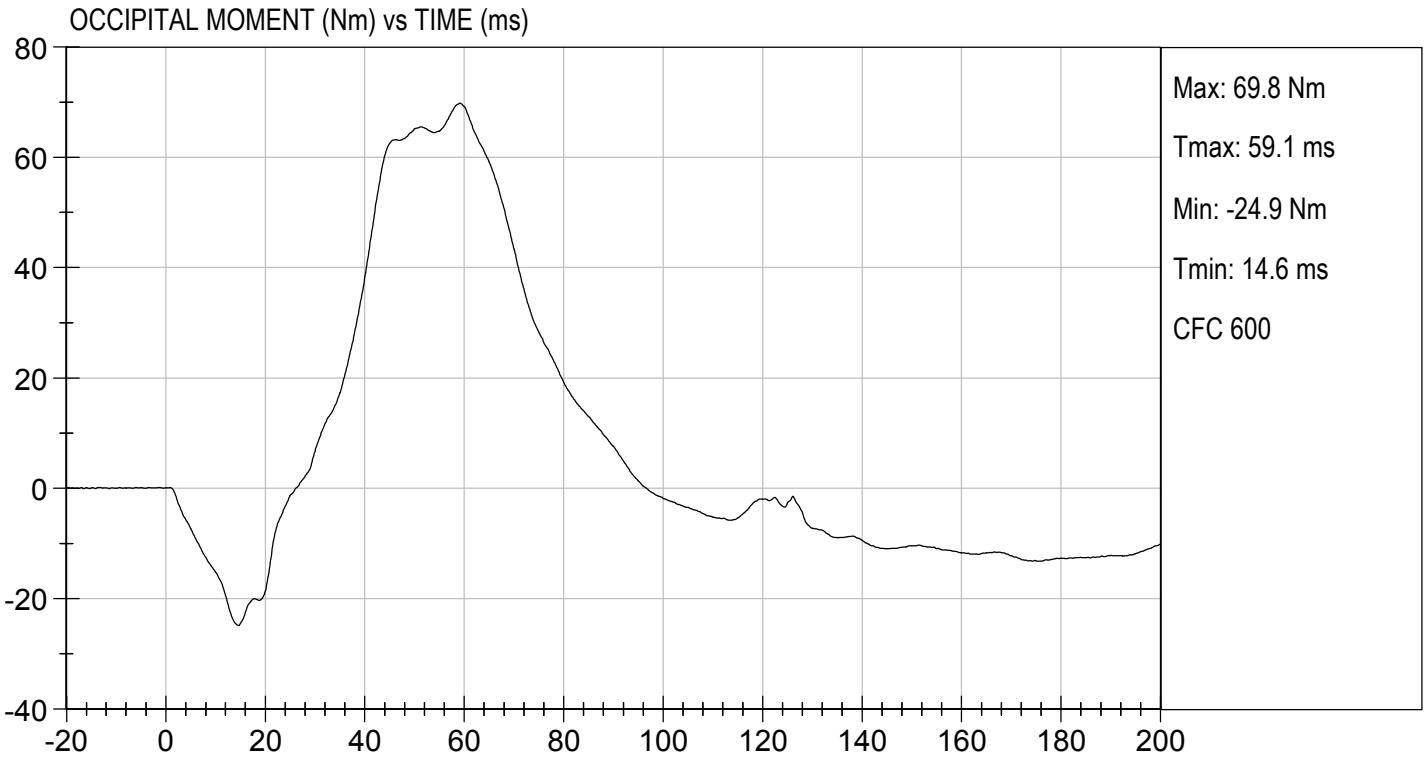


NECK ROTATION (DEG) vs TIME (ms)



TEST DESC: NECK FLEXION
VELOCITY: 23.20 ft/s, 7.07 m/s

TEST DATE: 11/03/2017
TEST #: D173202A



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173203

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 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	111	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

Danielle Redinbaugh
Laboratory Technician

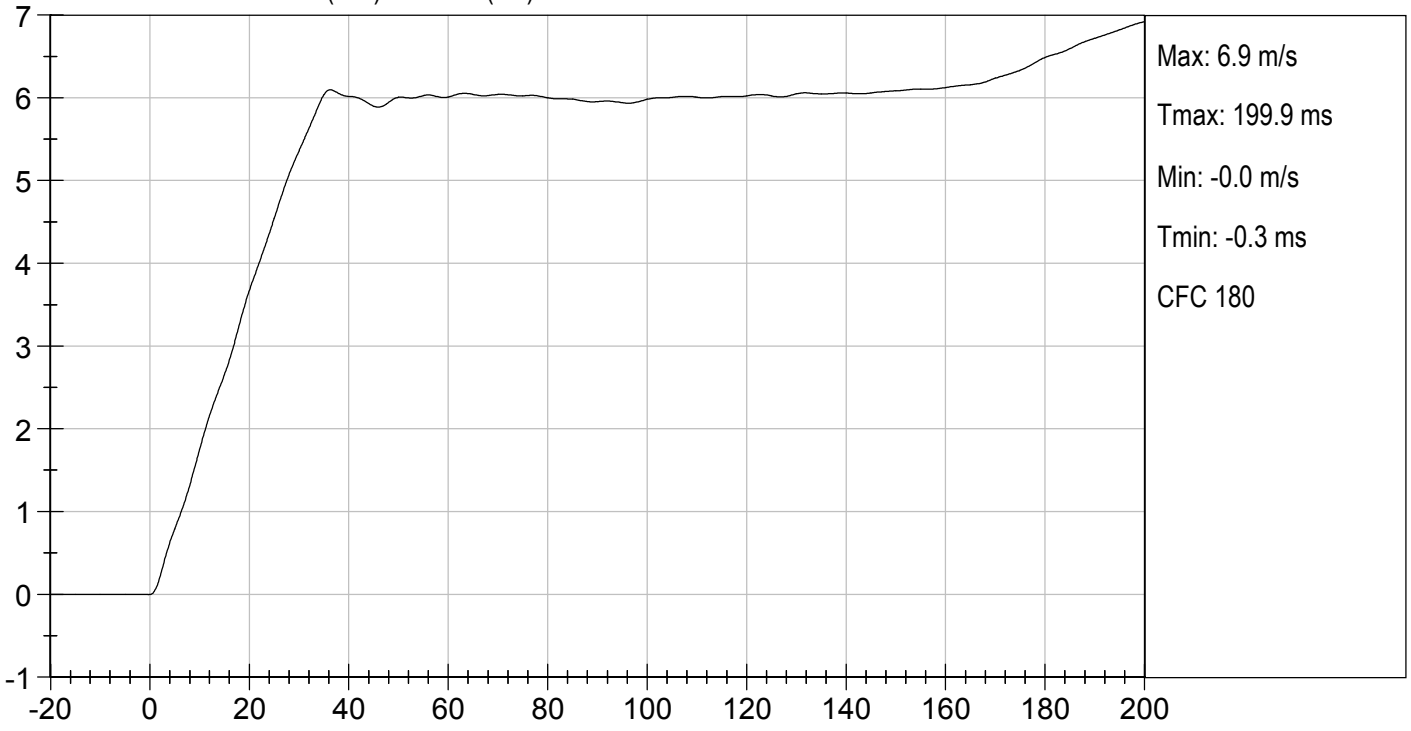
11/03/2017
Test Date

Robert Schmidt
Approved By

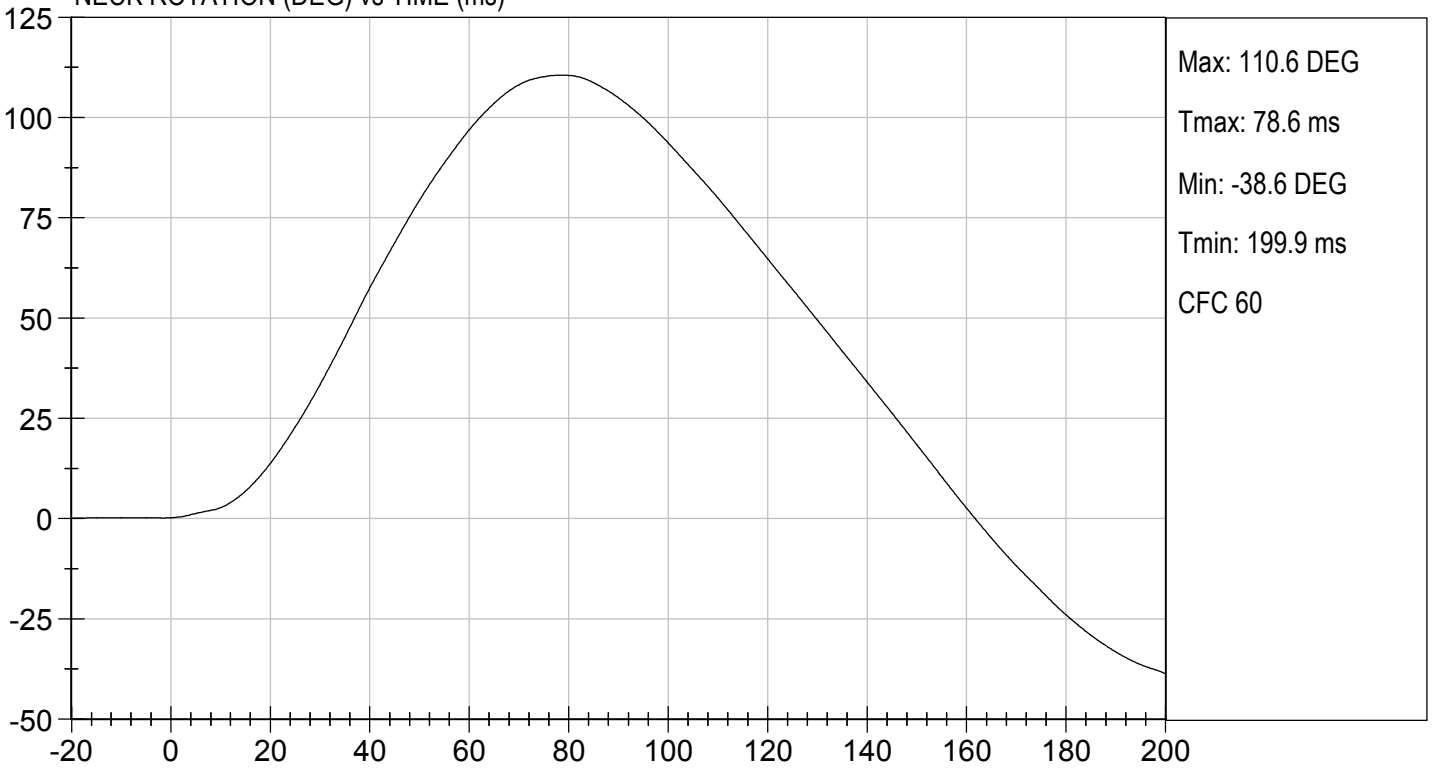
TEST DESC: NECK EXTENSION
VELOCITY: 20.22 ft/s, 6.16 m/s

TEST DATE: 11/03/2017
TEST #: D173203

PENDULUM VELOCITY (m/s) vs TIME (ms)

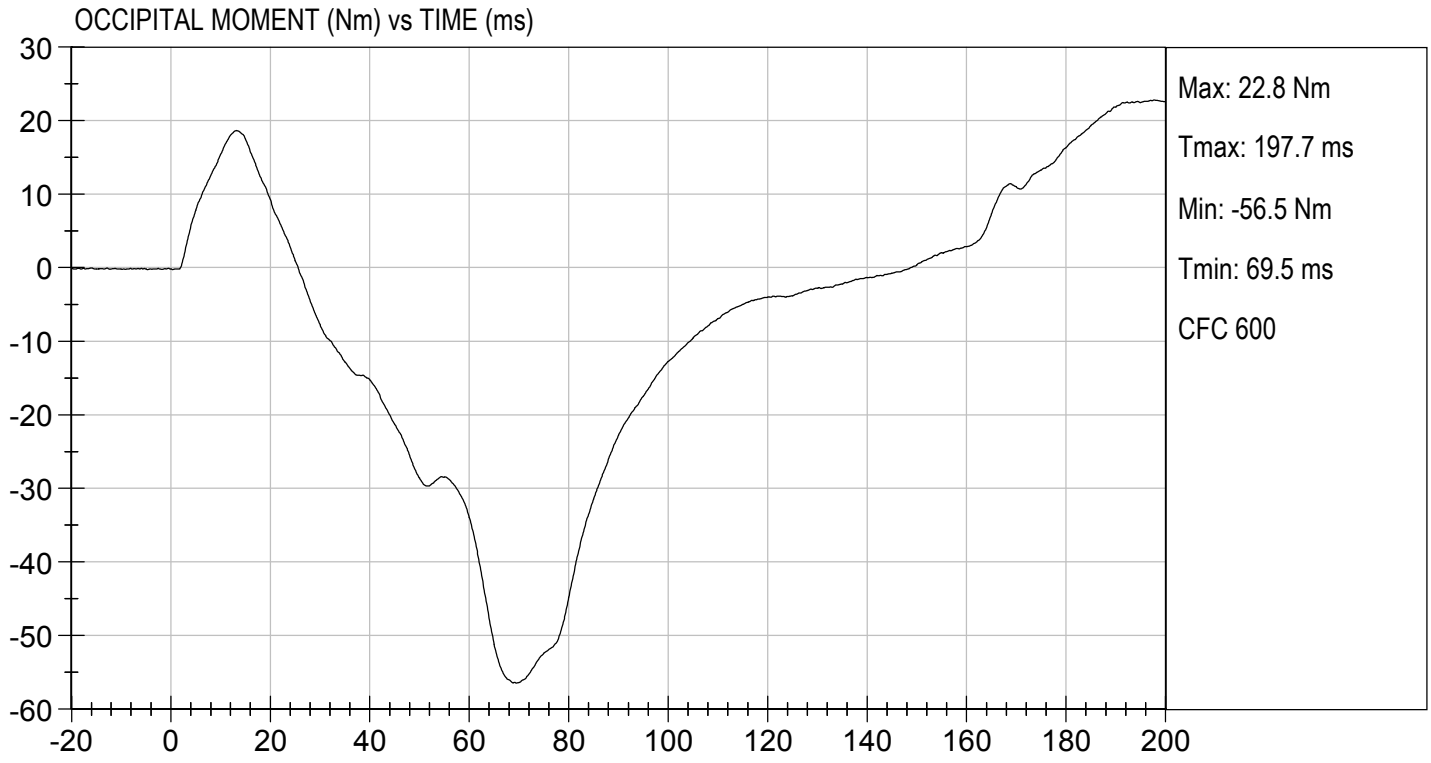


NECK ROTATION (DEG) vs TIME (ms)



TEST DESC: NECK EXTENSION
VELOCITY: 20.22 ft/s, 6.16 m/s

TEST DATE: 11/03/2017
TEST #: D173203



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173204

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Relative Humidity	%	10 to 70	27	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4129	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4114	Pass
		Overall Test Results		Pass

Danielle Redinbaugh
Laboratory Technician

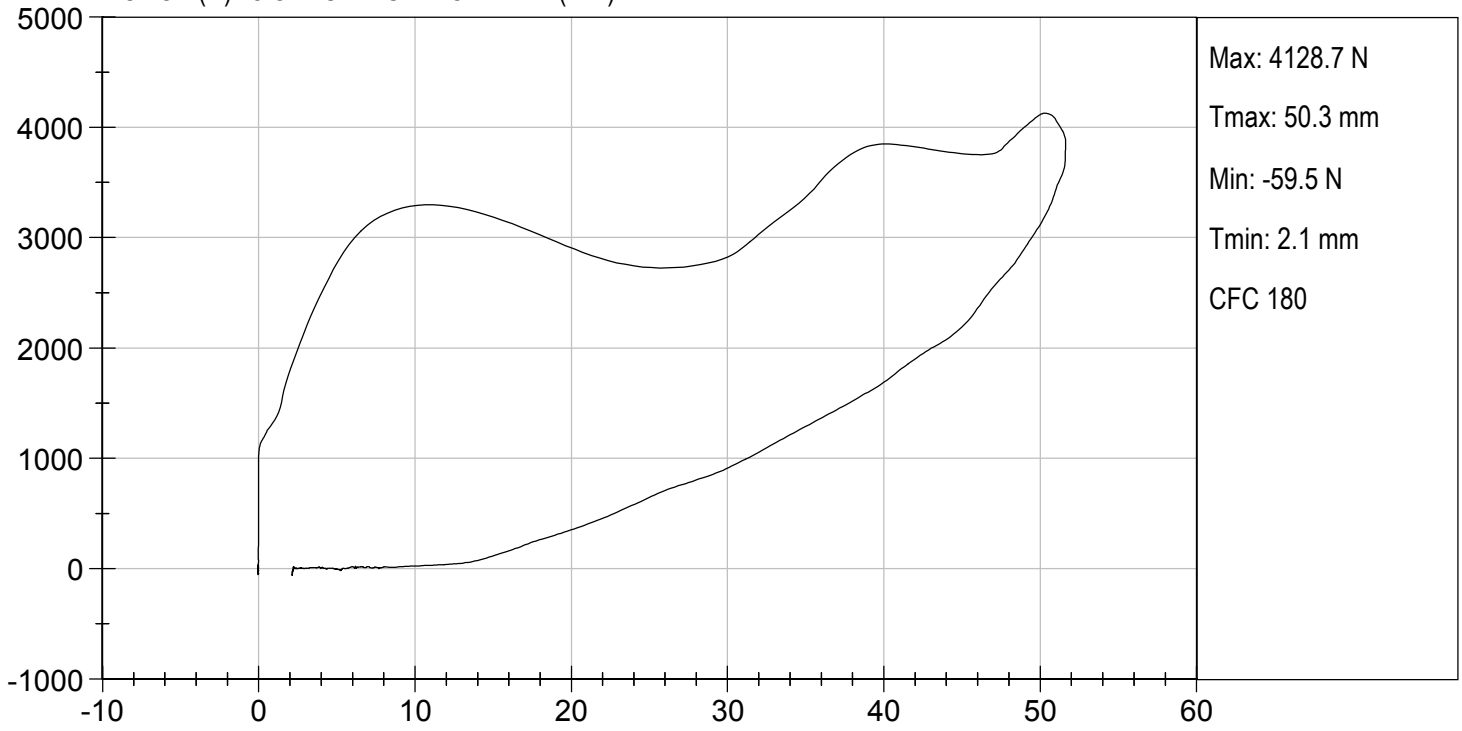
11/03/2017
Test Date

Robert Schmidt
Approved By

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

TEST DATE: 11/03/2017
TEST #: D173204

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173205

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 Speed	m/s	2.07 to 2.13	2.10	Pass
Maximum Force	N	3450 to 4060	3805	Pass
		Overall Test Results		Pass

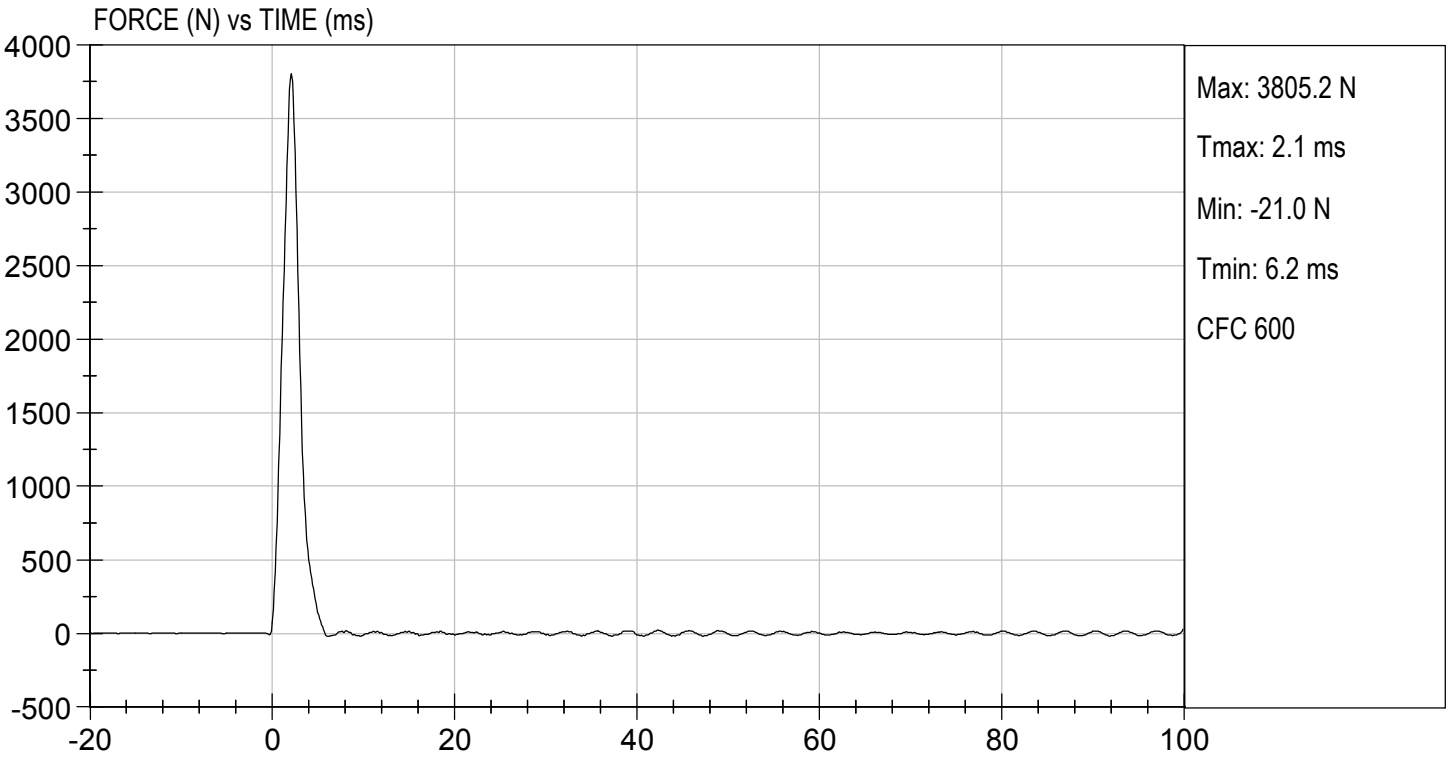
Danielle Redinbaugh
Laboratory Technician

11/03/2017
Test Date

Robert Schmidt
Approved By

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

TEST DATE: 11/03/2017
TEST #: D173205



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173206

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 Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	N	3450 to 4060	3696	Pass
		Overall Test Results		Pass

Danielle Redinbaugh

Laboratory Technician

11/03/2017

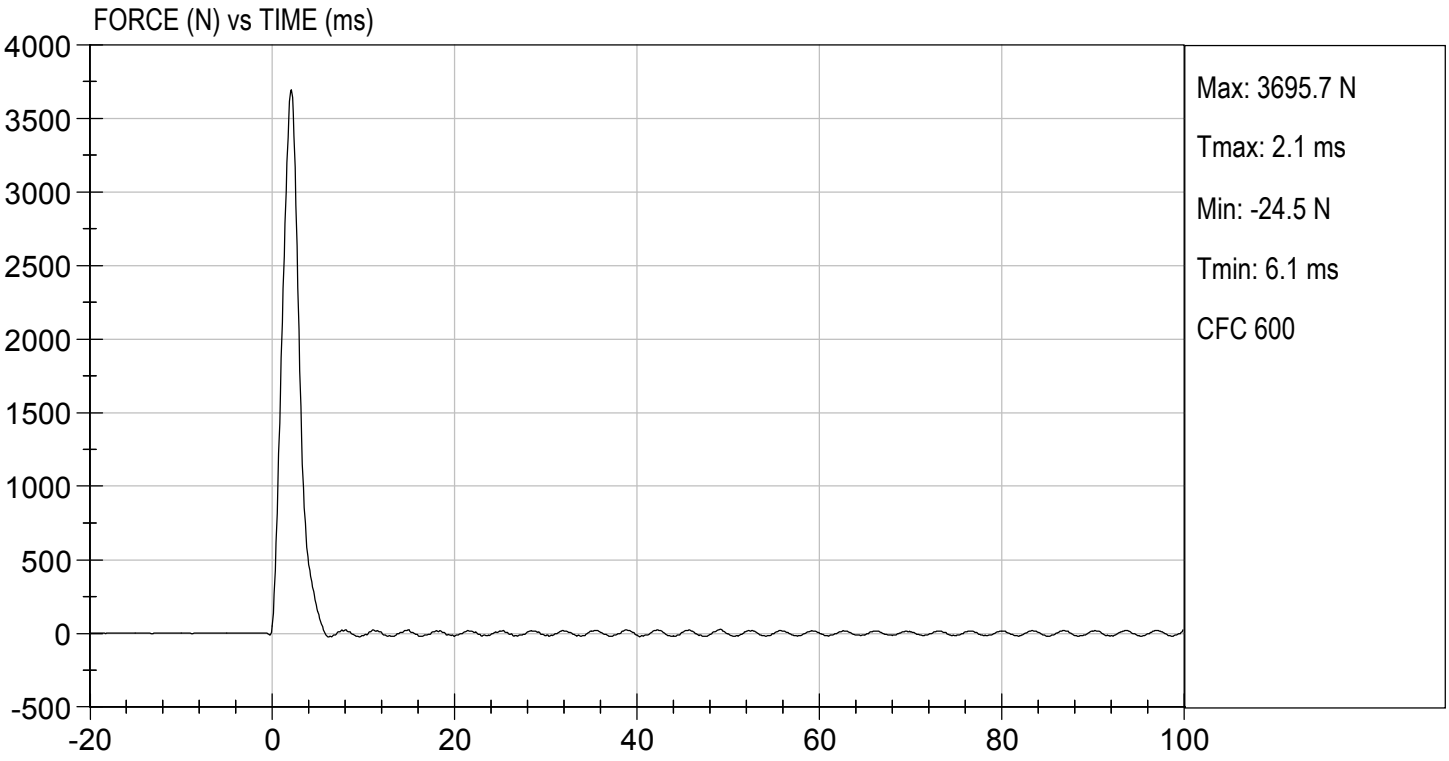
Test Date

Robert Schmalz

Approved By

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

TEST DATE: 11/03/2017
TEST #: D173206



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D173207

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
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	5	Pass
Force at 45 deg	N	320 to 390	379	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
		Overall Result		Pass

Danielle Redenbaugh
Laboratory Technician

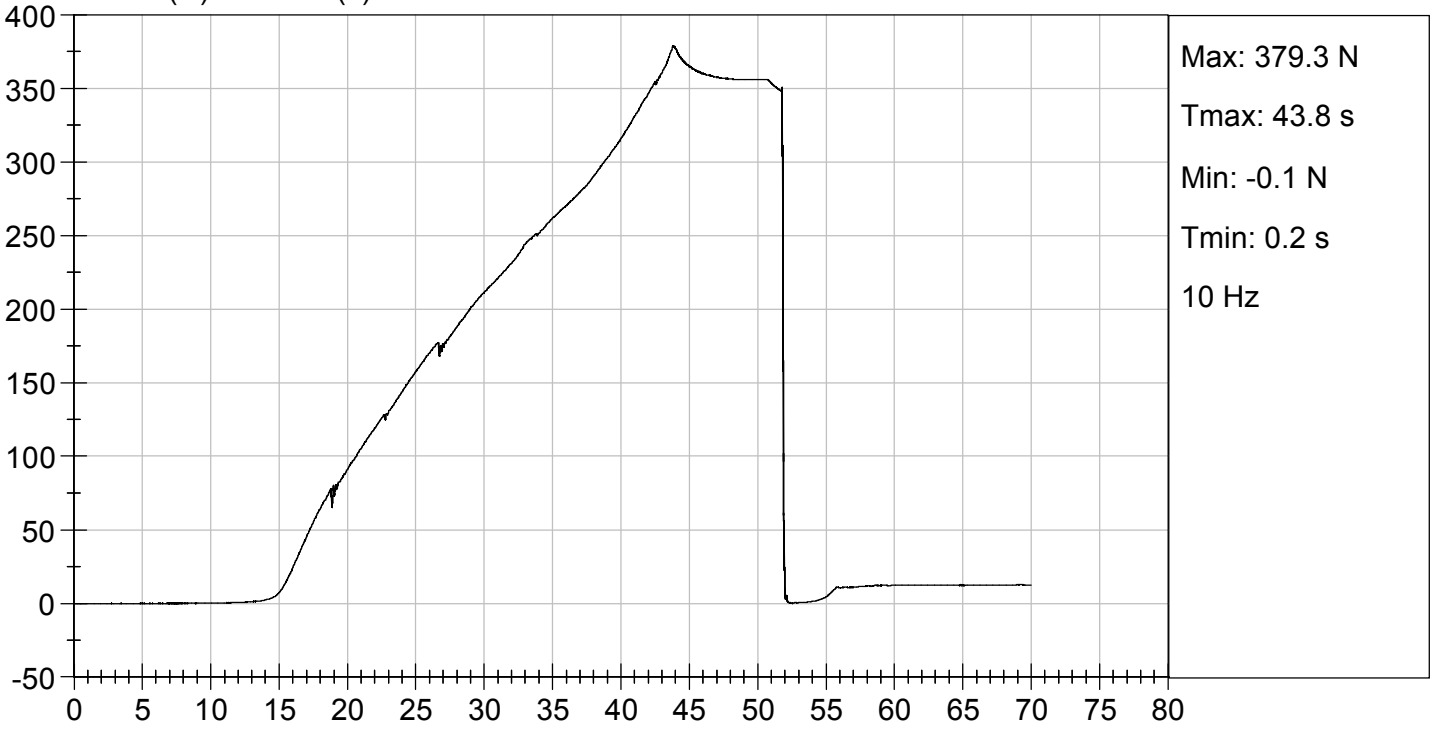
11/02/2017
Test Date

Robert Schmidt
Approved By

TEST DESC: LUMBAR FLEXION

TEST DATE: 11/02/2017
TEST #: D173207

LOAD (N) vs TIME (s)



ANGLE (deg) vs TIME (s)