REPORT NUMBER: NCAP-MGA-2015-028

NEW CAR ASSESSMENT PROGRAM (NCAP)
Frontal Barrier Impact Test

AUDI AG
2015 Audi A3 AWD 4-Dr Sedan
NHTSA No.: O20155800

MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105

Test Date: November 11, 2014

Final Report Date: January 7, 2015

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NVS-111
1200 New Jersey Ave, SE
Room W43-410
Washington, DC 20590

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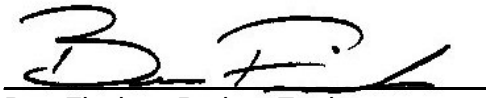
Approved by: 
Ben Fischer, Project Engineer

Approval Date: January 7, 2015

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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15. Supplementary Notes		

16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2015 Audi A3 AWD 4-Dr Sedan 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 11, 2014.

The impact velocity of the vehicle was 56.2 km/h and the ambient temperature at the barrier face at the time of impact was 20.7°C. The target vehicle post-test maximum crush was 266 located at the vehicle's 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	217	700	284
Maximum Chest	mm	63	21	52	12
Nij	N/A	1	0.45	1	0.34
Neck Tension	N	4170	1899	2620	993
Neck Compression	N	4000	637	2520	618
Left Femur Force	N	10008	2050	6805	1462
Right Femur Force	N	10008	1896	6805	1886

17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP)		*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590 Email: tis@nhtsa.dot.gov FAX: 202-493-2833	
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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 2015 Audi A3 AWD 4-Dr Sedan at a velocity of 56.2 km/h. The test was performed at MGA Research Corporation on November 11, 2014. 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. Seat belt load cells were also installed on the driver's shoulder belt and the passenger's shoulder belts to measure dummy torso section loading.

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 628 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 266 mm 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 and chest contacted the airbag. The driver's head also contacted the headrest. The driver's knees contacted the knee airbag. The passenger's visible contact points were as follows: The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the knee airbag.

The occupant data is summarized below:

ATD position	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})	217	0.45	1899	637	42	21	2050	1896
Passenger (5^{th})	284	0.34	993	618	40	12	1462	1886

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

TEST NOTES

Passenger Left Ankle X has no valid data after 82 ms.
Left Rear Seat Crossmember X has no valid data after 40 ms.
Right Rear Seat Crossmember X has no valid data after 50 ms.
Bottom of Engine X has no valid data after 35 ms.
Right Rear Seat Crossmember Z has no valid dataafter 50 ms.
Right Rear Seat Crossmember Xr has no valid data after 50 ms.
Barrier K-16 MY has no valid data after 40 ms.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20155800	Traction Control System (TCS)	Yes
Model Year	2015	Power Steering	Yes
Make	Audi	Power Window Auto-Reverse	Yes
Model	A3	Driver Frontal Airbag	Yes
Body Style	Sedan	Driver Curtain Airbag	Yes
VIN	WAUEFHFF8F1038719	Driver Head/Torso Airbag	No
Body Color	Shiraz Red Metallic	Driver Torso Airbag	No
Odometer (km/mi)	167 / 104	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.0	Driver Pelvis Airbag	No
Type/No. Cylinders	4	Driver Knee Airbag	Yes
Engine Placement	Lateral	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	AWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	Yes	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	N/A

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Audi AG
Date of Manufacture	07 14

GVWR (kg)	2075
GAWR Front (kg)	1085
GAWR Rear (kg)	1040

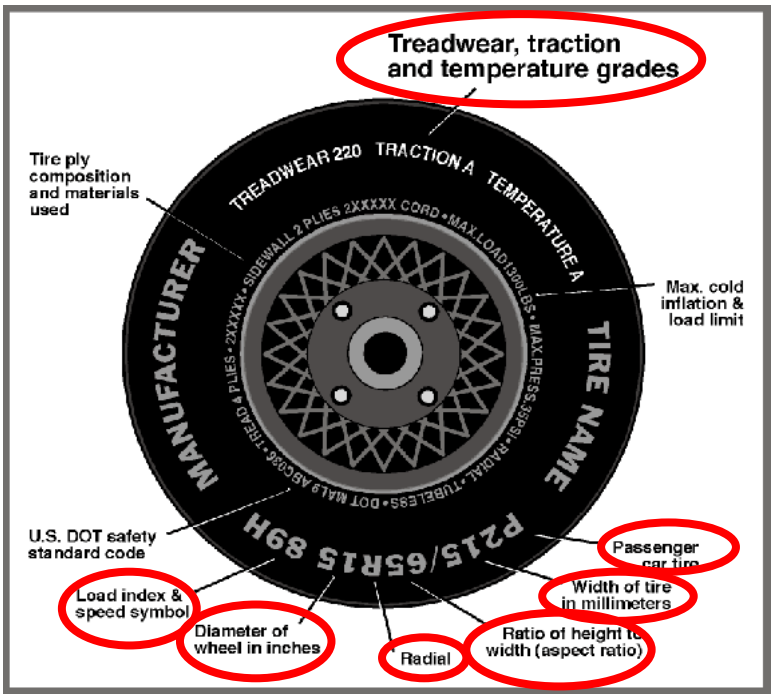
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				500
Cargo Weight (RCLW) (kg)				160

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

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	280	280
Recommended Tire Size	225/40R18	225/40R18
Tire Size on Vehicle	225/40R18	225/40R18
Tire Manufacturer	Continental	Continental
Tire Model	Procontact	Procontact
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Polyamide	1 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	92H	92H
Tire Material	Rubber	Rubber
DOT Safety Code Left	6Y5N WBNJ 2214	6Y5N WBNJ 2214
DOT Safety Code Right	6Y5N WBNJ 2214	6Y5N WBNJ 2214

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

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	446.0	326.5		470.5	459.5	
Right	kg	440.5	318.0		459.0	436.0	
Ratio	%	57.9	42.1		50.9	49.1	
Totals	kg	886.5	644.5	1531.0	929.5	895.5	1825.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1531.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	160
Calculated Test Vehicle Target Weight (TVTW)	kg	1831.6

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	692	686	682	693	1105
As Tested	mm	688	691	637	642	1289
Post Test	mm	706	714	643	638	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2626
Total Vehicle Length at Left Side	mm	4327
Total Vehicle Length at Centerline	mm	4464
Total Vehicle Length at Right Side	mm	4327
Weight of Ballast in Cargo Area	kg	85.7
Weight of Vehicle Components Removed	kg	34.0
Amount of Stoddard Solvent in Fuel Tank	L	51.1

List of components removed to meet test weight: None

List of components removed for instrumentation, data box, and equipment installation:
Cargo cover/divider, rear floor mats, jack & tools, right taillight.

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

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

TARGET VEHICLE STRUCTURAL MEASUREMENT

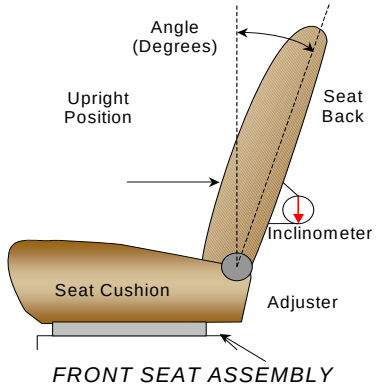
	Elements	Pre-Test (mm)
1	Total Length	4464
2	Total Width	1782
3	Bumper Top Height	564
4	Bumper Bottom Height	450
5	Longitudinal Member Top Height	554
6	Distance between Longitudinal Members	870
7	Longitudinal Member Width	84
8	Engine Top Height	812
9	Engine Bottom Height	180
10	Engine and Gearbox Width	822
11	Front Bumper-Engine Distance	277
12	Front Shock Absorber Fixing Height	854
13	Bonnet Leading Edge Height	725
14	Front Shock Absorber Fixing Width	1125
15	Front Bumper – Front Axle Distance	864
16	Front Axle – A-Pillar Distance	413
17	A-Pillar – B-Pillar Distance	1171
18	B-Pillar – Rear Axle Distance	1042
19	B-Pillar – C-Pillar Distance	744
20	Roof Sill Bottom Height	1299
21	Roof Sill Top Height	1373
22	Floor Sill Bottom Height	204
23	Floor Sill Top Height	270

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

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

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 August 2013.



	Degrees
Driver Seat Back Angle	17.7° on seatback
Passenger Seat Back Angle	19.1° on seatback

SEAT FORE/AFT POSITIONS

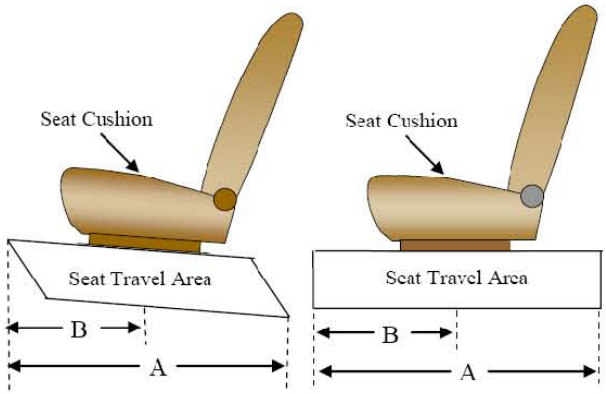
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated August 2013.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	305 mm	153 mm
Passenger Seat	216 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)	0 (1st as 0)



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

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

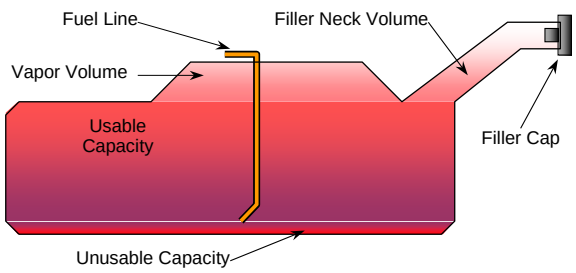
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	54.9
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	50.5 to 51.6
Actual Amount of Solvent used	51.1
1/3 of Usable Capacity	18.3

FUEL PUMP

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

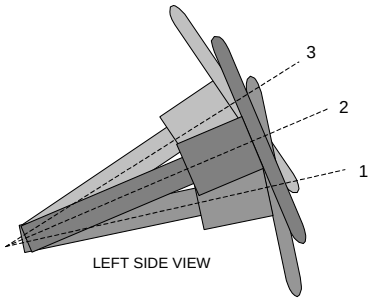
The vehicle is equipped with an electric fuel pump. At ignition "ON", the pump will work for a short time to put pressure into the system. If the engine is started, the pump works normally. The fuel pipe is on the right side.



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.



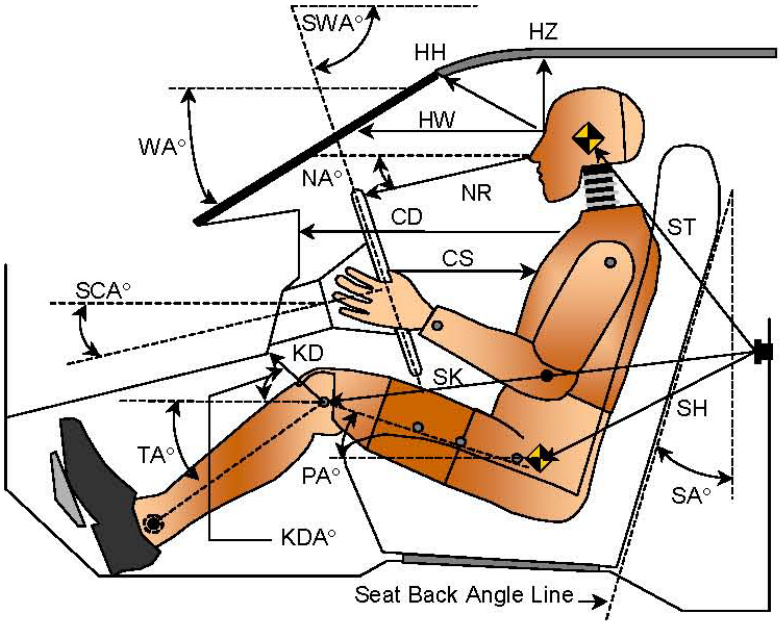
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	70.7	188
Geometric Center Position 2	68.1	160
Uppermost Position 3	65.5	132
Telescoping Steering Wheel Travel		56
Test Position	68.1	160

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

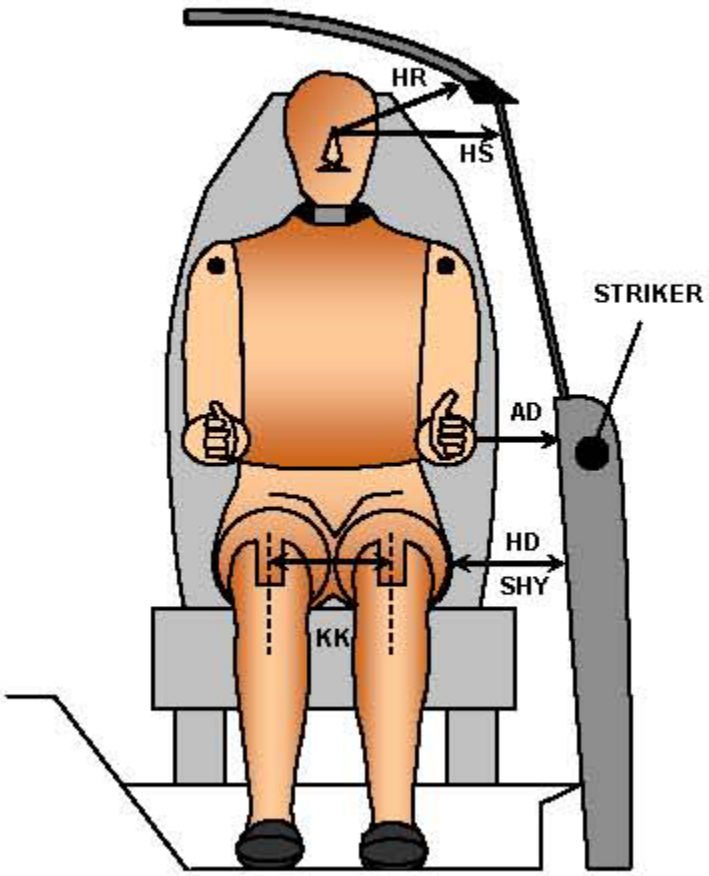


LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		22.8		
SWA°	Steering Wheel Angle		68.1		
SCA°	Steering Column Angle		21.9		
SA°	Seat Back Angle (on headrest post)		17.7		19.1
HZ	Head to Roof (Z)	158	90.0	210	90.0
HH	Head to Header	346	25.6	319	31.2
HW	Head to Windshield	617	0.0	670	0.0
NR	Nose to Rim	378	10.5		
CD	Chest to Dash	525		410	
CS	Chest to Steering Hub	308	1.6		
RA	Rim to Abdomen	204	0.0		
KDL	Left Knee to Dash	218	30.3	151	40.8
KDR	Right Knee to Dash	210	29.8	147	39.2
PA°	Pelvic Angle		22.8		21.4
TA°	Tibia Angle		37.9		46.7
SK	Striker to Knee	534	98.3	591	96.0
ST	Striker to Head	439	10.0	429	9.3
SH	Striker to H-Point	253	145.4	278	117.4

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

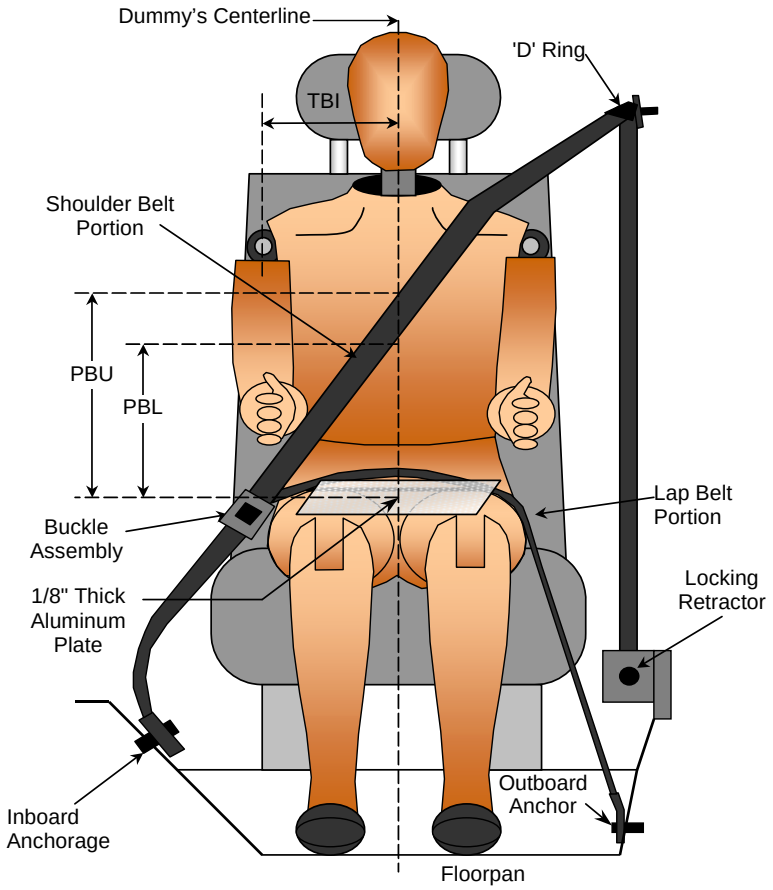


FRONT VIEW OF DUMMY

Code	Measurement Description	Driver	Passenger
		Length (mm)	
AD	Arm to Door	125	113
HD	H-Point to Door	144	177
HR	Head to Side Header	199	232
HS	Head to Side Window	317	348
KK	Knee to Knee	342	228
SHY	Striker to H-Point (Y Direction)	293	321
AA	Ankle to Ankle	339	161

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	370	320
PBL - Top surface of reference to belt lower edge	mm	300	230

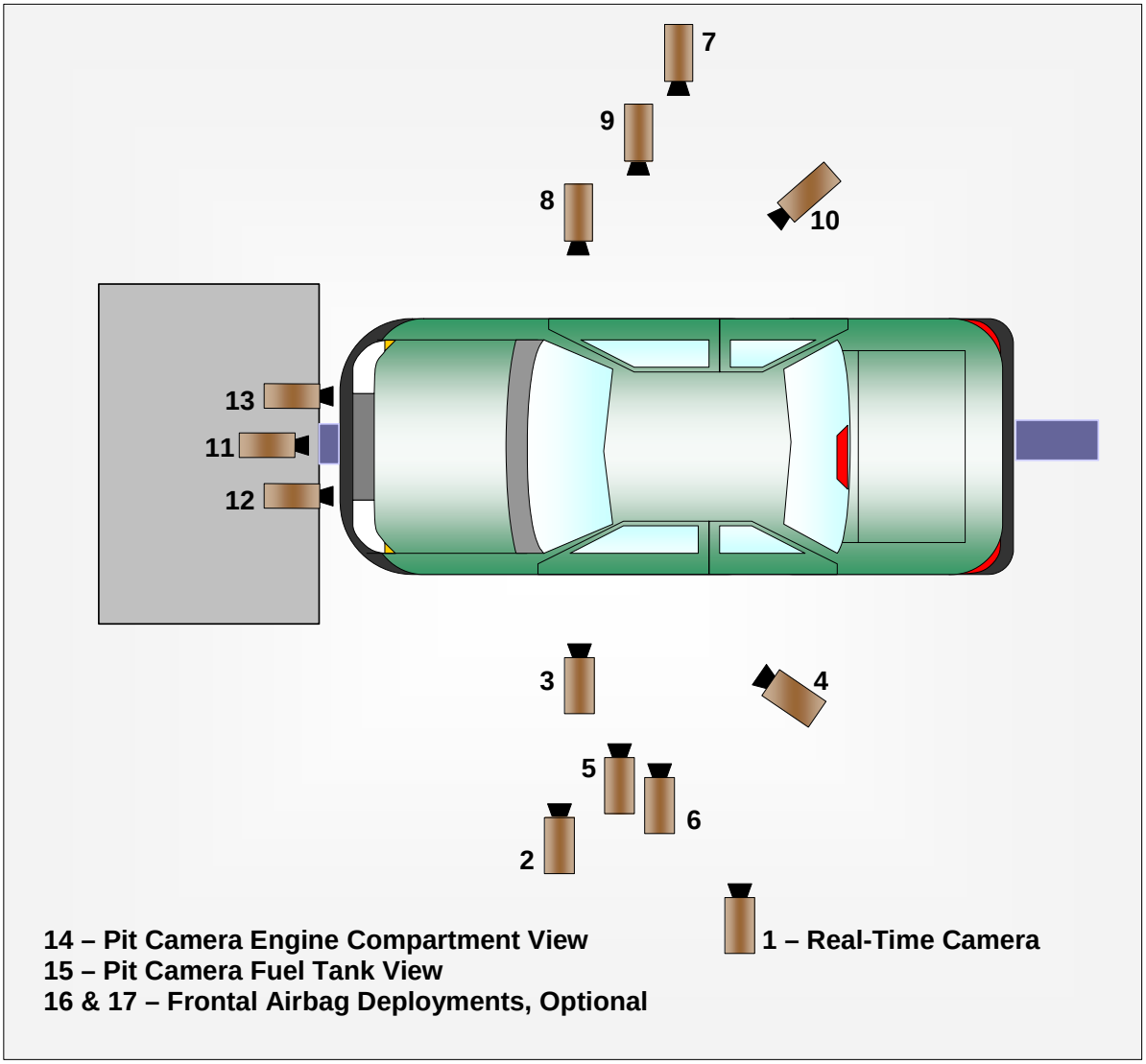
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	NR	NR
Lap Belt Length as measured on ATD	mm	NR	NR
Remainder of belt on reel	mm	NR	NR
Total Belt Length for Continuous Webbing Systems	mm	NR	NR

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

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20155800
Test Date: 11/11/2014

CAMERA POSITIONS FOR FRONTAL IMPACTS



14 – Pit Camera Engine Compartment View
15 – Pit Camera Fuel Tank View
16 & 17 – Frontal Airbag Deployments, Optional
1 – Real-Time Camera

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

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1310	-6510	-1900	35	1000
3	Left Front Half	1090	-4820	-1240	24	1000
4	Left Angle	5620	-5050	-1960	50	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	1880	6350	-1220	20	1000
8	Passenger Close-Up	1540	5970	-1900	35	1000
9	Right Front Half	1170	5000	-1250	24	1000
10	Right Angle	5640	5110	-1960	50	1000
11	Windshield	-430	0	-2810	20	1000
12	Driver Windshield	40	-450	-2030	8.5	1000
13	Passenger Windshield	40	450	-2030	8.5	1000
14	Pit Front	1130	0	3150	24	1000
15	Pit Rear	3040	0	3150	24	1000
16	Onboard Driver Side				12	1000
17	Onboard Passenger Side				12	1000
18	Real-Time Pan View					30

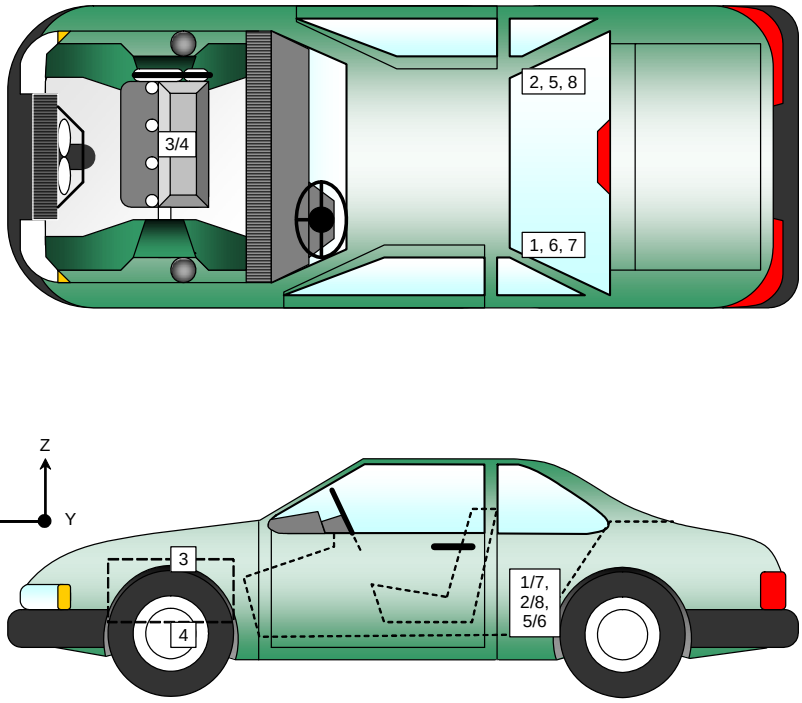
*COORDINATES:

+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: 2015 Audi A3 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20155800
Test Date: 11/11/2014



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1820	-360	-212
2	Right Rear Crossmember Accelerometer – X Direction	1830	355	-174
3	Engine Top X	3737	200	-776
4	Engine Bottom X	3770	185	-175
5	Left Rear Crossmember Accelerometer – Z Direction	1820	-360	-212
6	Right Rear Crossmember Accelerometer – Z Direction	1830	355	-174
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1820	-360	-212
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1830	355	-174

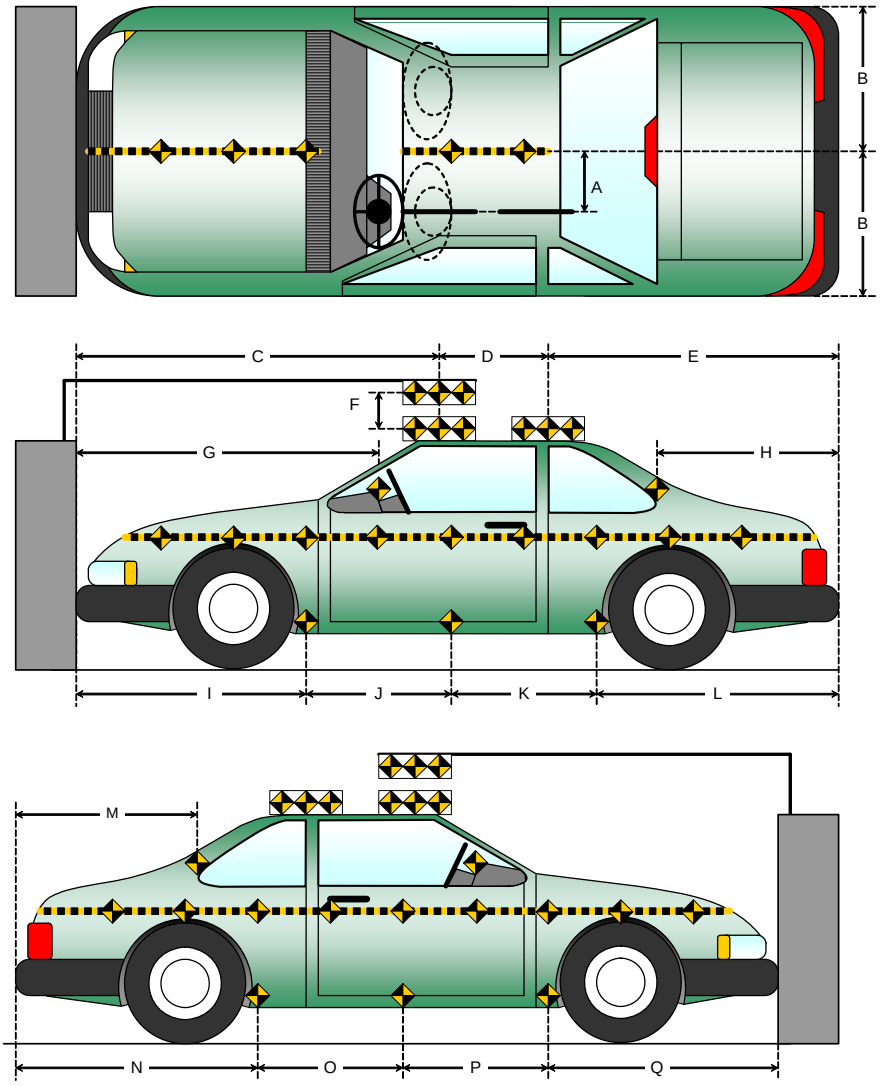
Reference Points: X - Rear Surface of Vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

Item	Value (mm)
A	350
B	891
C	2271
D	609
E	1584
F	107
G	
H	1268
I	1278
J	904
K	904
L	1378
M	1268
N	1378
O	904
P	904
Q	1278



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

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: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

INSTRUMENTATION

Driver Dummy Data Channels	46
Passenger Dummy Data Channels	46
Vehicle Structure Accelerometers	8
Barrier Channels	528
Total	628

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: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

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	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were unlocked	Doors were unlocked
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	None
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

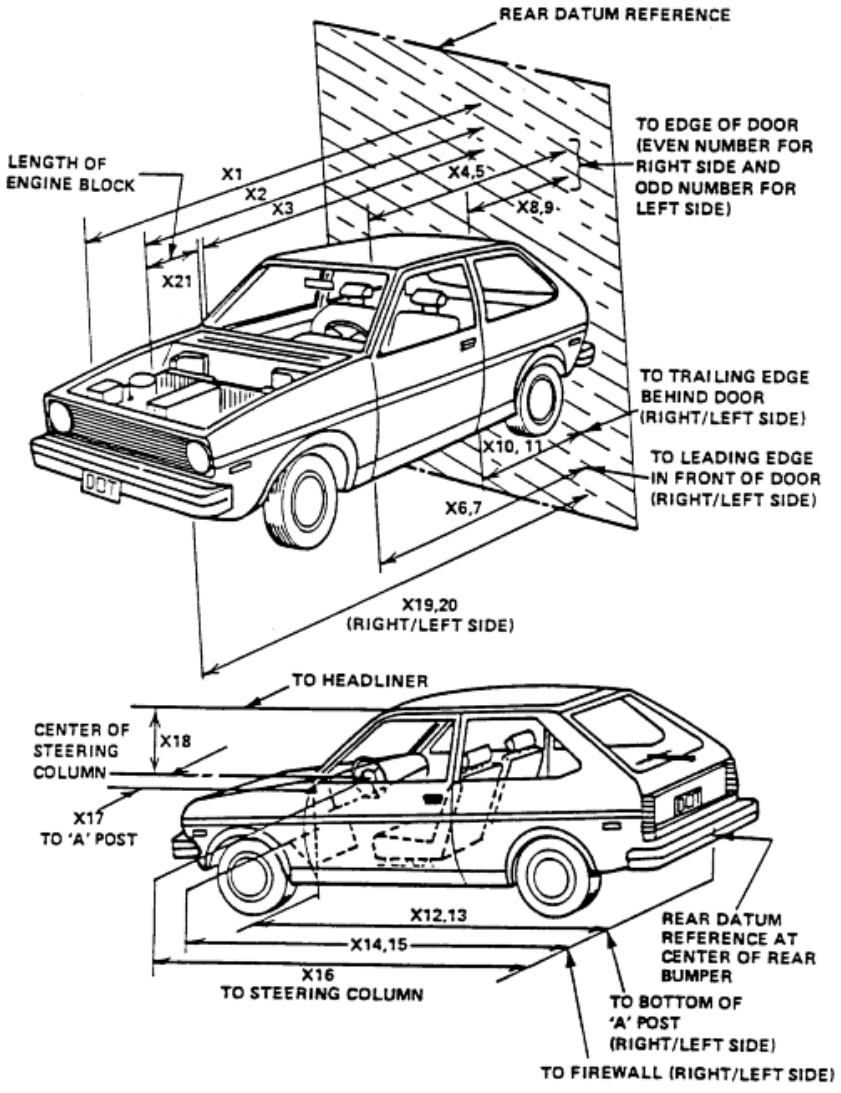
Measured Parameter	Units	Value
Left Side	mm	1059
Center	mm	974
Right Side	mm	977
Average	mm	1003

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4464	4198	266
2	RSOV to Front of Engine	mm	3779	3634	145
3	RSOV to Firewall	mm	3424	3374	50
4	RSOV to Upper Leading Edge of Right Door	mm	3048	3046	2
5	RSOV to Upper Leading Edge of Left Door	mm	3048	3045	3
6	RSOV to Lower Leading Edge of Right Door	mm	3075	3074	1
7	RSOV to Lower Leading Edge of Left Door	mm	3075	3071	4
8	RSOV to Upper Trailing Edge of Right Door	mm	1972	1970	2
9	RSOV to Upper Trailing Edge of Left Door	mm	1972	1971	1
10	RSOV to Lower Trailing Edge of Right Door	mm	2022	2022	0
11	RSOV to Lower Trailing Edge of Left Door	mm	2022	2021	1
12	RSOV to Bottom of “A” Post of Right Side	mm	3096	3096	0
13	RSOV to Bottom of “A” Post of Left Side	mm	3096	3096	0
14	RSOV to Firewall, Right Side	mm	3115	3113	2
15	RSOV to Firewall, Left Side	mm	3115	3110	5
16	RSOV to Steering Column	mm	2543	2665	-122
17	Center of Steering Column to “A” Post	mm	400	387	13
18	Center of Steering Column to Headliner	mm	380	396	-16
19	RSOV to Right Side of Front Bumper	mm	4327	4106	221
20	RSOV to Left Side of Front Bumper	mm	4327	4167	160
21	Length of Engine Block	mm	484	484	0
RD	RSOV to Right Side of Dash Panel	mm	2740	2737	3
CD	RSOV to Center of Dash Panel	mm	2765	2765	0
LD	RSOV to Left Side of Dash Panel	mm	2762	2761	1

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

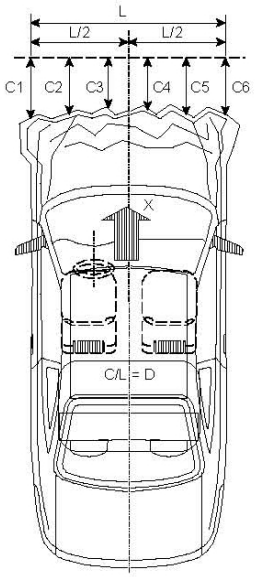
Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

VEHICLE INFORMATION

VIN: WAUEFHFF8F1038719 Wheelbase (mm): 2626
Vehicle Size Category: Sedan Test Weight (kg): 1825.0

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): 56.2
Velocity Change (km/h): 55.7
Time of Separation (msec): 103.5



CRUSH PROFILE

Collision Deformation Classification: Frontal
Midpoint of Damage: Centerline
Damage Region Length (mm): 1120
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4327	4167	160
C2	Crush zone 2 at left side	mm	4398	4182	216
C3	Crush zone 3 at left side	mm	4417	4188	229
C4	Crush zone 4 at right side	mm	4417	4157	260
C5	Crush zone 5 at right side	mm	4398	4145	253
C6	Crush zone 6 at right side	mm	4327	4106	221
L	C1 TO C6	mm	1120	1120	0

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

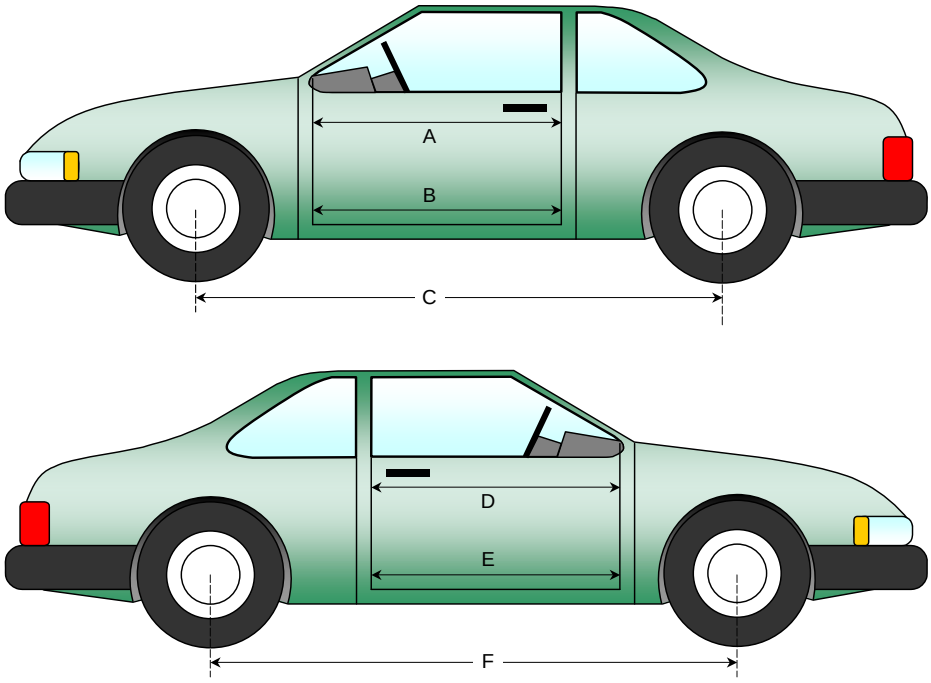
Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20155800
Test Date: 11/11/2014

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	945	945	0
B	Left Side Lower	mm	857	857	0
D	Right Side Upper	mm	945	945	0
E	Right Side Lower	mm	857	857	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2626	2600	26
F	Right Side Wheelbase	mm	2626	2558	68



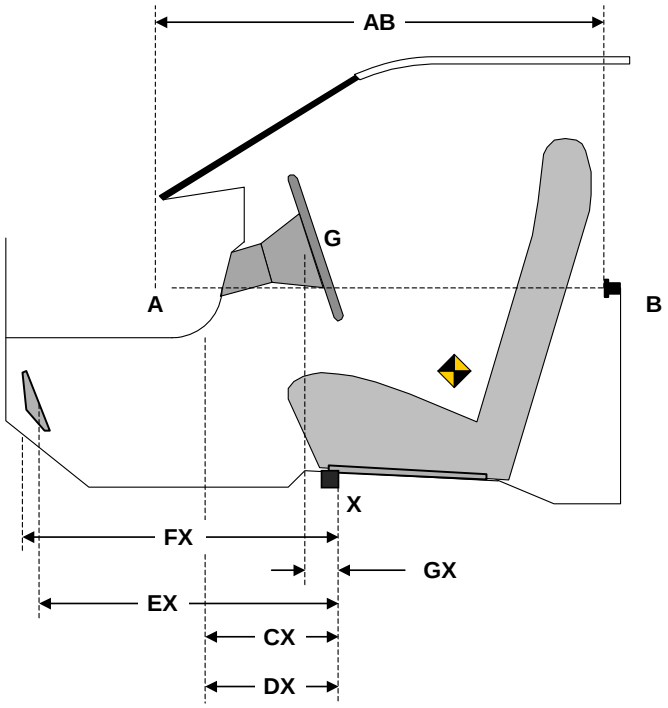
DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	778	778	0
CX	Left Knee Bolster to X	mm	271	270	1
DX	Right Knee Bolster to X	mm	266	266	0
EX	Brake Pedal to X	mm	584	545	39
FX	Foot Rest to X	mm	620	605	15
GX	Center of Steering Column Wheel Hub to X	mm	55	120	-65

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: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

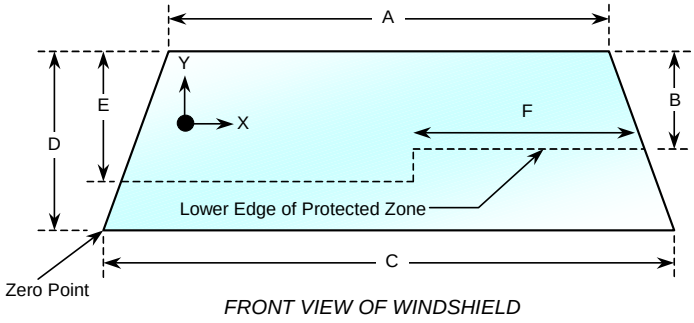
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 20.7° C.

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2090	2090	100
Right Side	2090	2090	100
Total	4180	4180	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1184
B	mm	408
C	mm	1544
D	mm	726
E	mm	434
F	mm	494

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: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

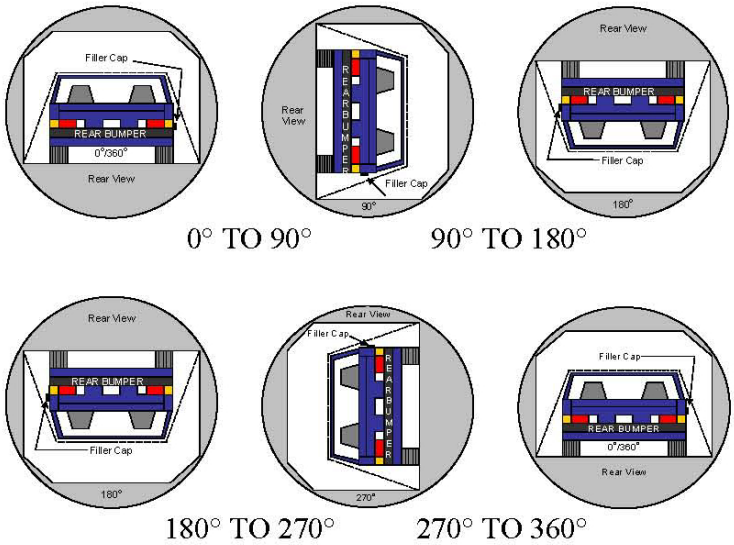
Temperature at Time of Impact: 20.7°C Test Time: 11:01 a.m.

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: 2015 Audi A3 AWD 4-Dr Sedan
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: O20155800
Test Date: 11/11/2014

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°	111	300	411
90° to 180°	111	300	411
180° to 270°	107	300	407
270° to 360°	109	300	409

FMVSS 301 SPILLAGE TABLE (units in ounces)

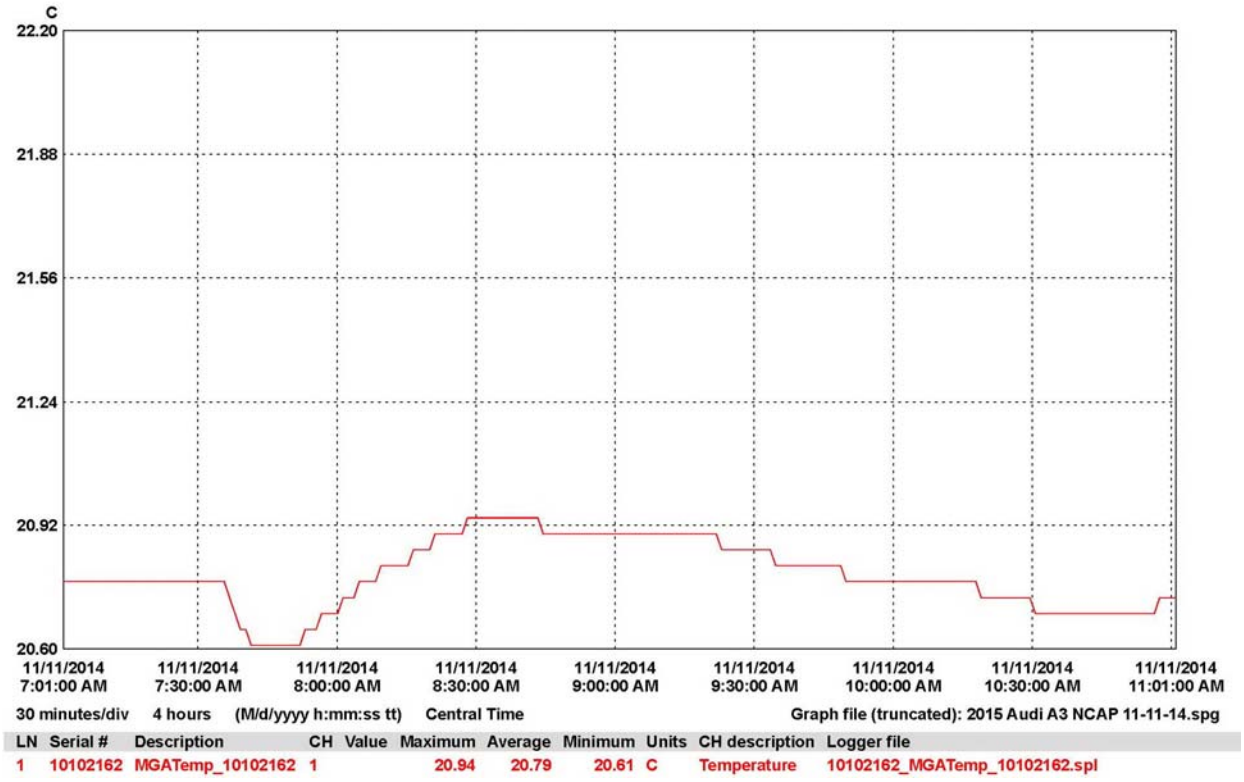
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eight Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

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

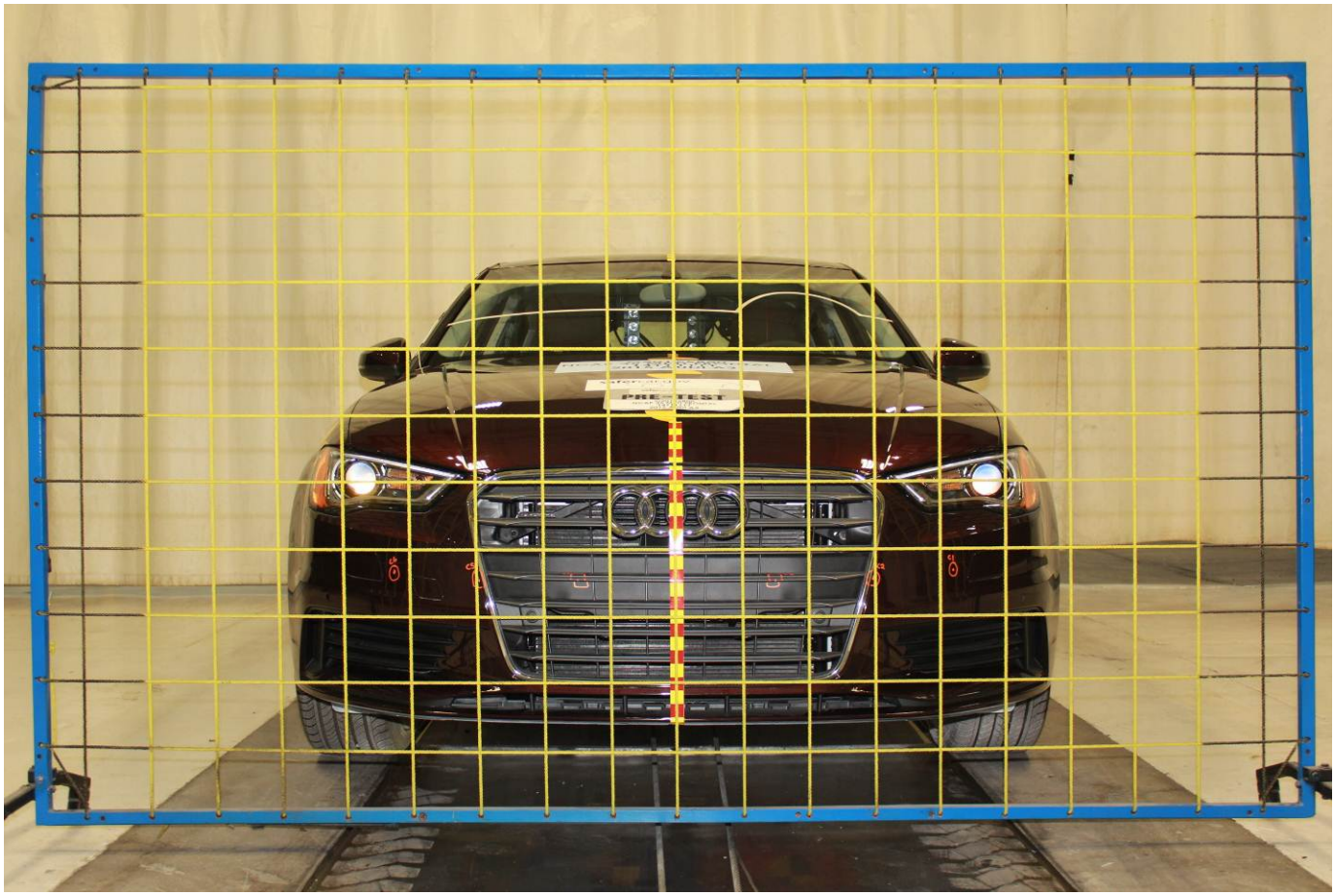
Test Vehicle: 2015 Audi A3 AWD 4-Dr Sedan NHTSA No.: O20155800
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/11/2014



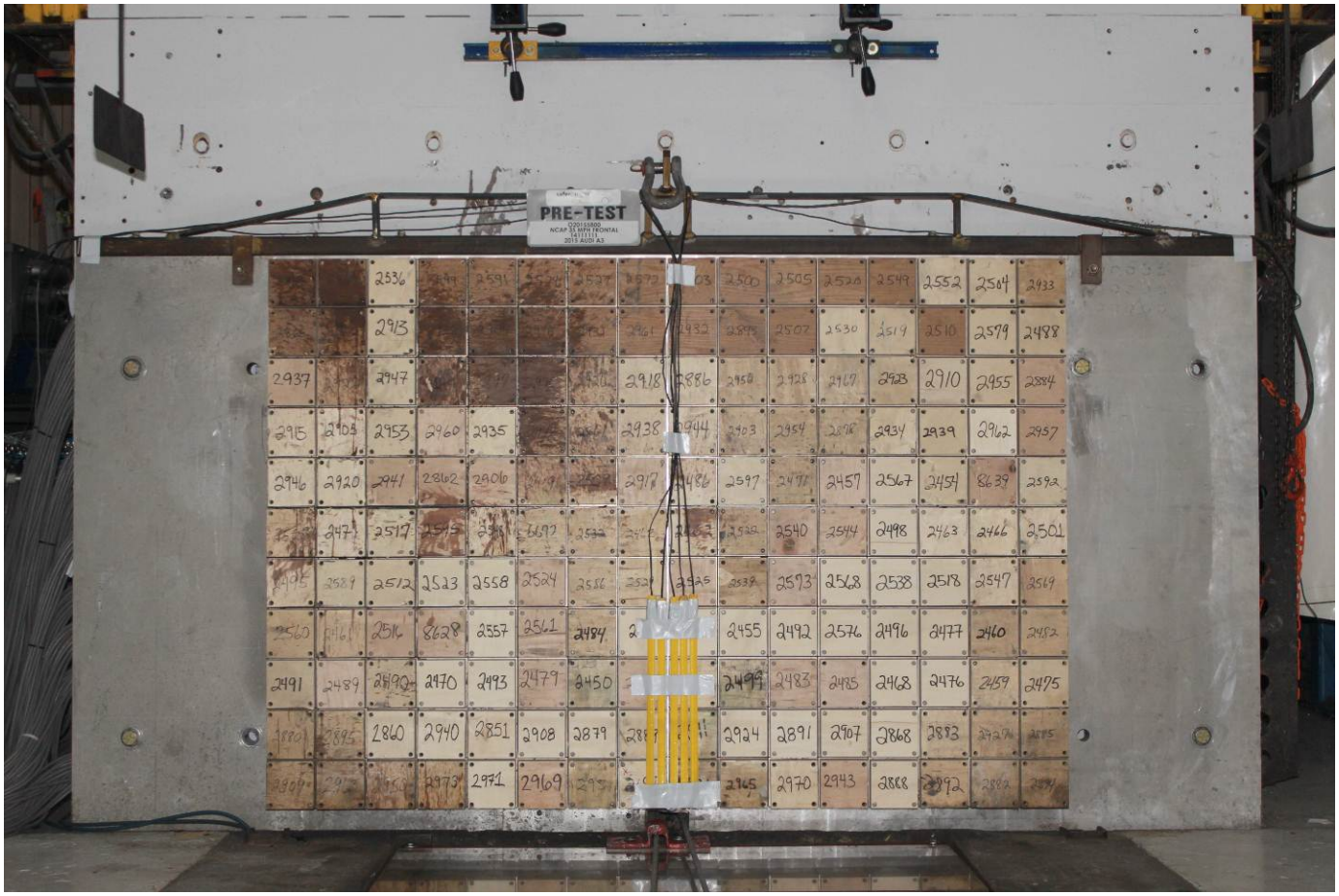
LN	Serial #	Description	CH	Value	Maximum	Average	Minimum	Units	CH description	Logger file
1	10102162	MGATemp_10102162	1		20.94	20.79	20.61	C	Temperature	10102162_MGATemp_10102162.spl

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS



Load Cell Location



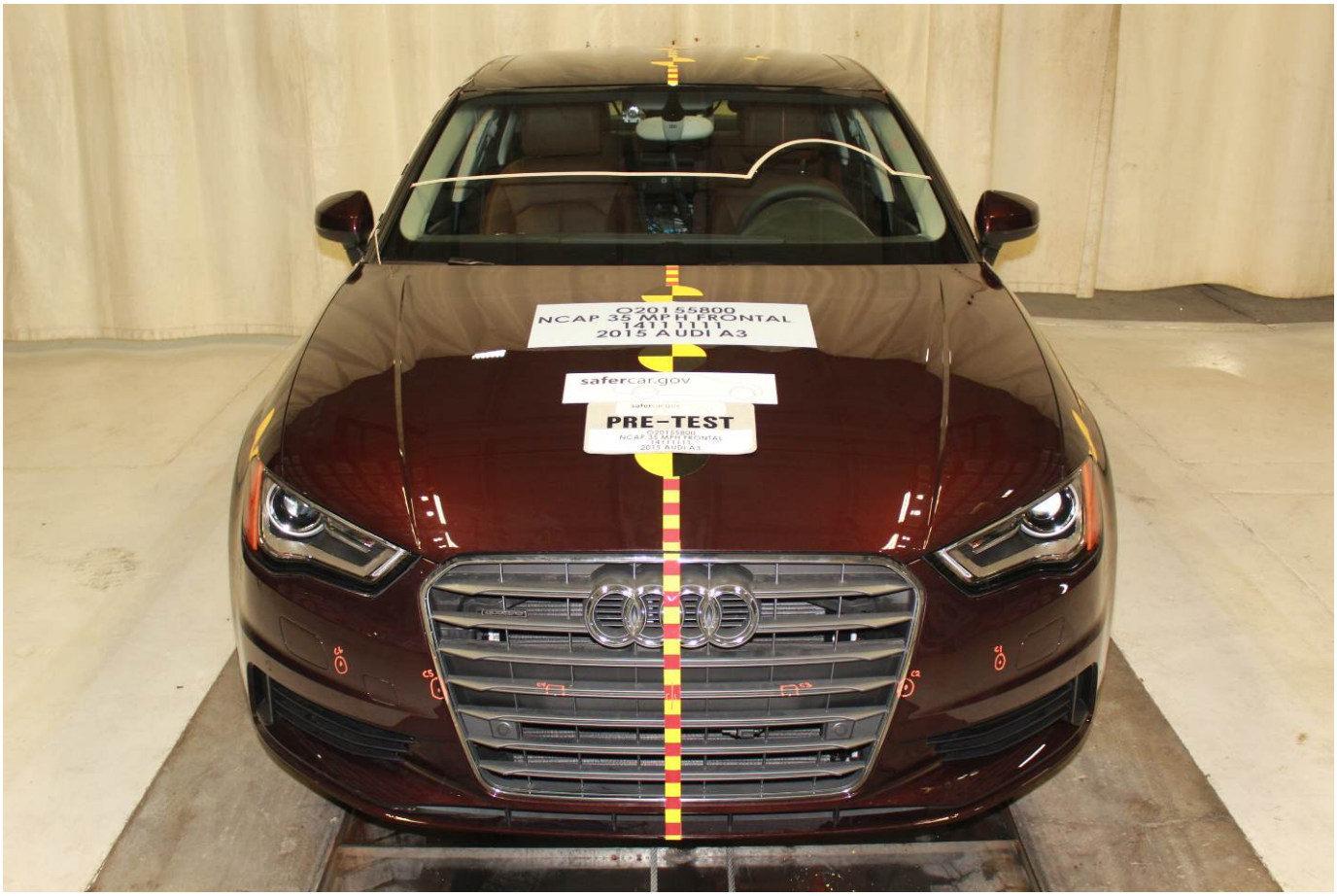
Load Cell Wall

Manufacturer's Label

Tire Placard

2015 Audi A3 Frontal As Delivered

Left Rear 3-4 View, As Received



Pre-Test Front View of Test Vehicle

Post-Test Front View of Test Vehicle

Pre-Test Left View of Test Vehicle

Post-Test Left View of Test Vehicle

Pre-Test Right View of Test Vehicle

Post-Test Right View of Test Vehicle

Pre-Test Right Front 3-4 View

Post-Test Right Front 3-4 View

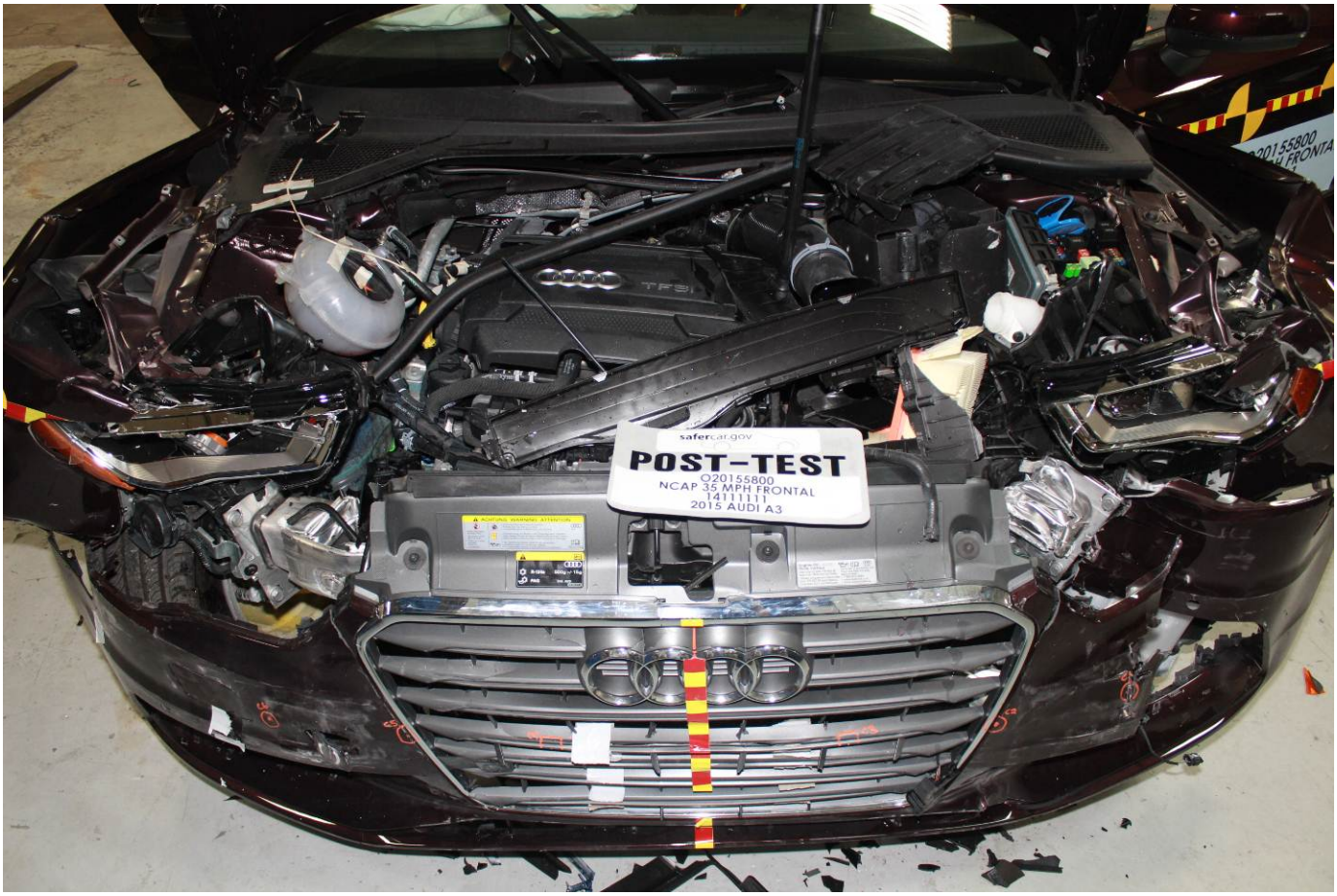
Pre-Test Left Rear 3-4 View

Post-Test Left Rear 3-4 View

Pre-Test Windshield View

Post-Test Windshield View

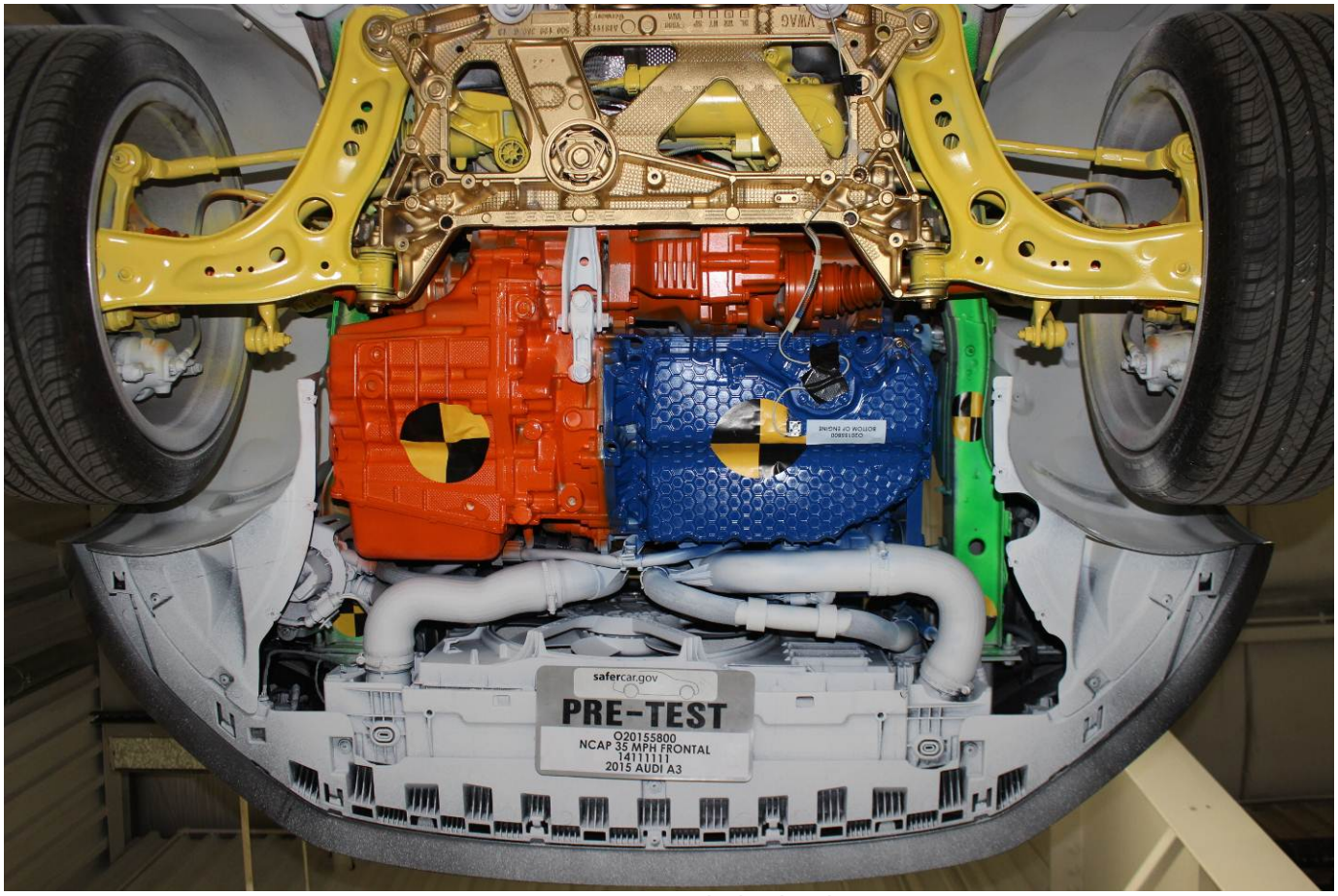
Pre-Test Engine Compartment View



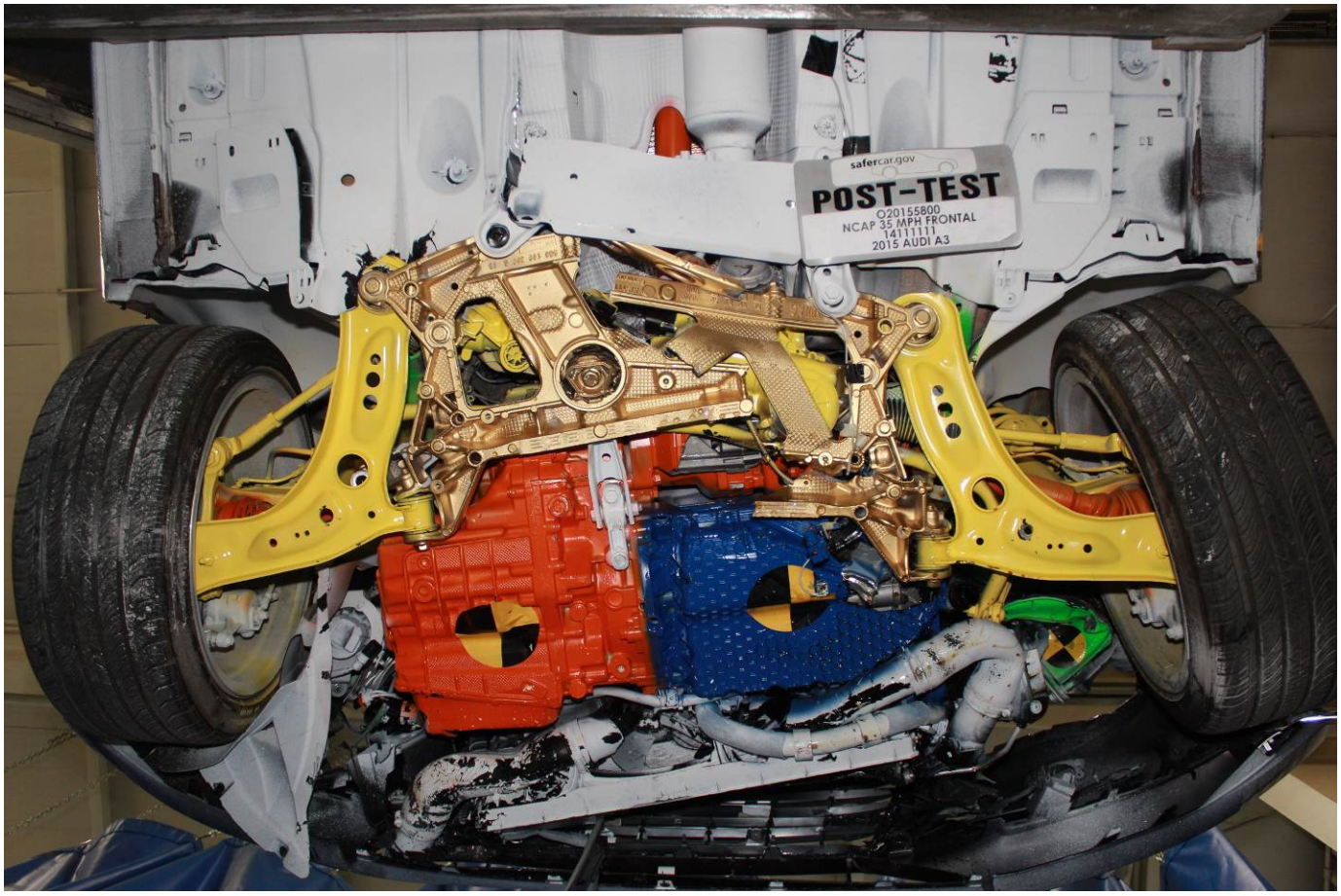
Post-Test Engine Compartment View

Pre-Test Fuel Filler Cap View

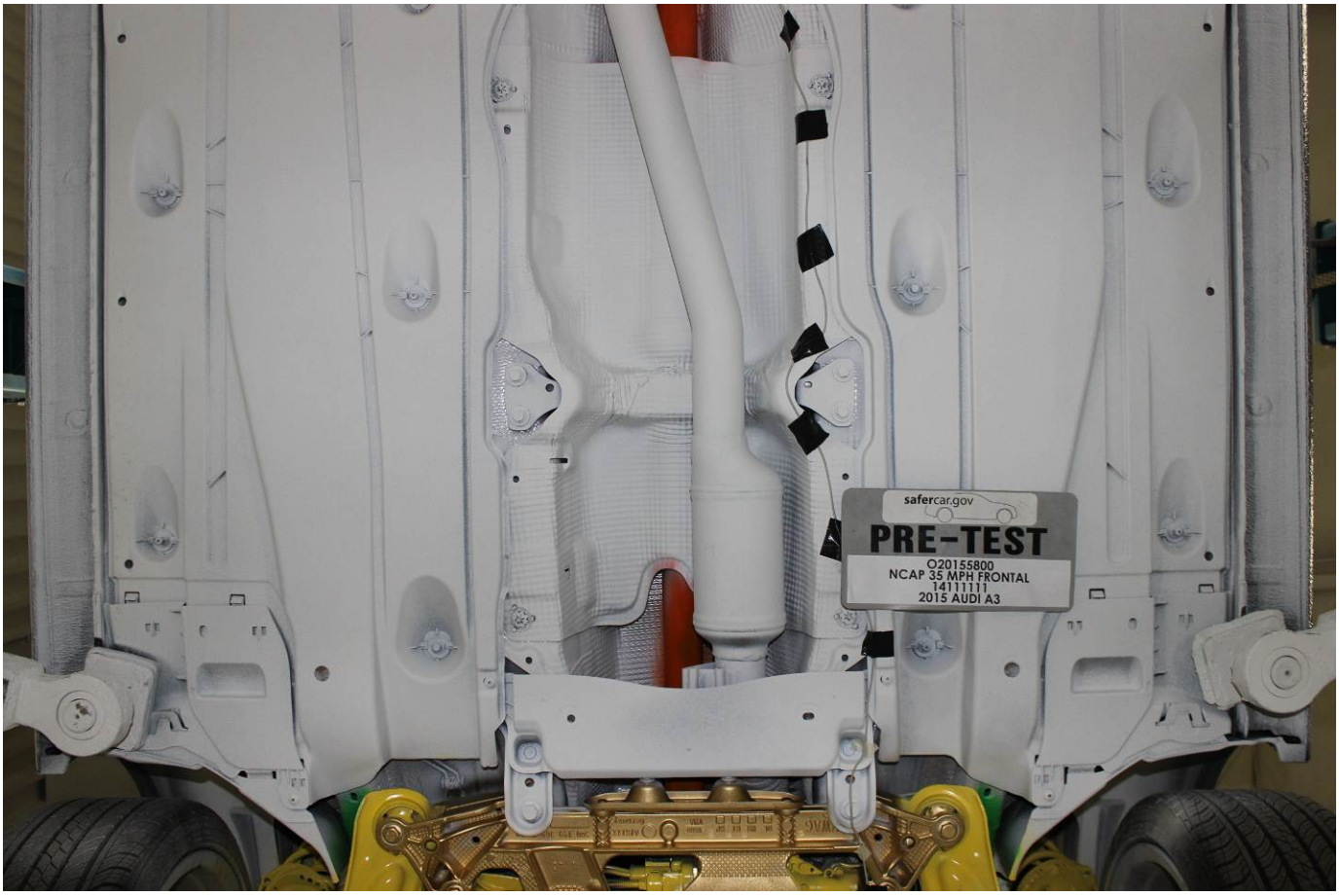
Post-Test Fuel Filler Cap View



Pre-Test Front Underbody View



Post-Test Front Underbody View

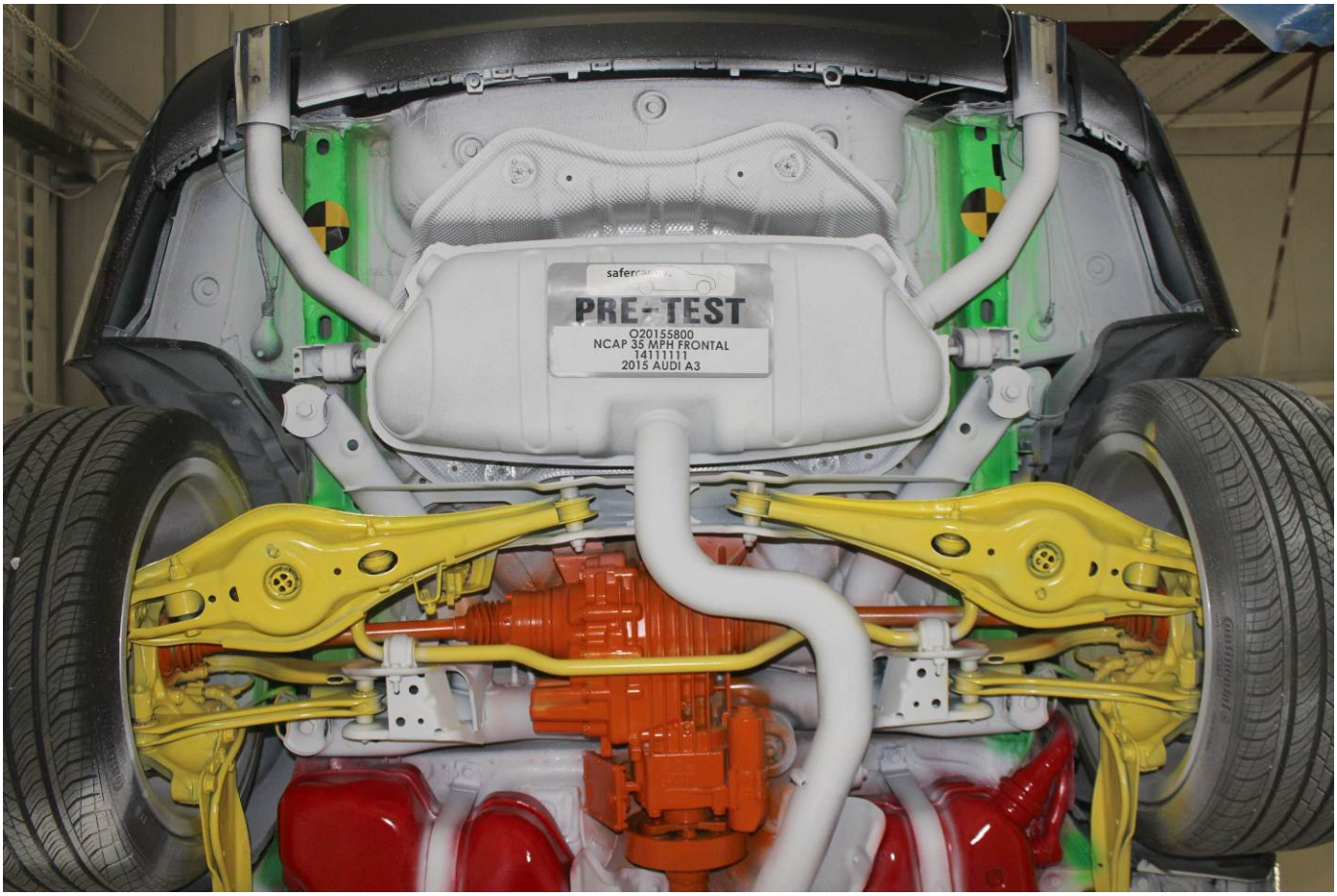


Pre-Test Mid Front Underbody View

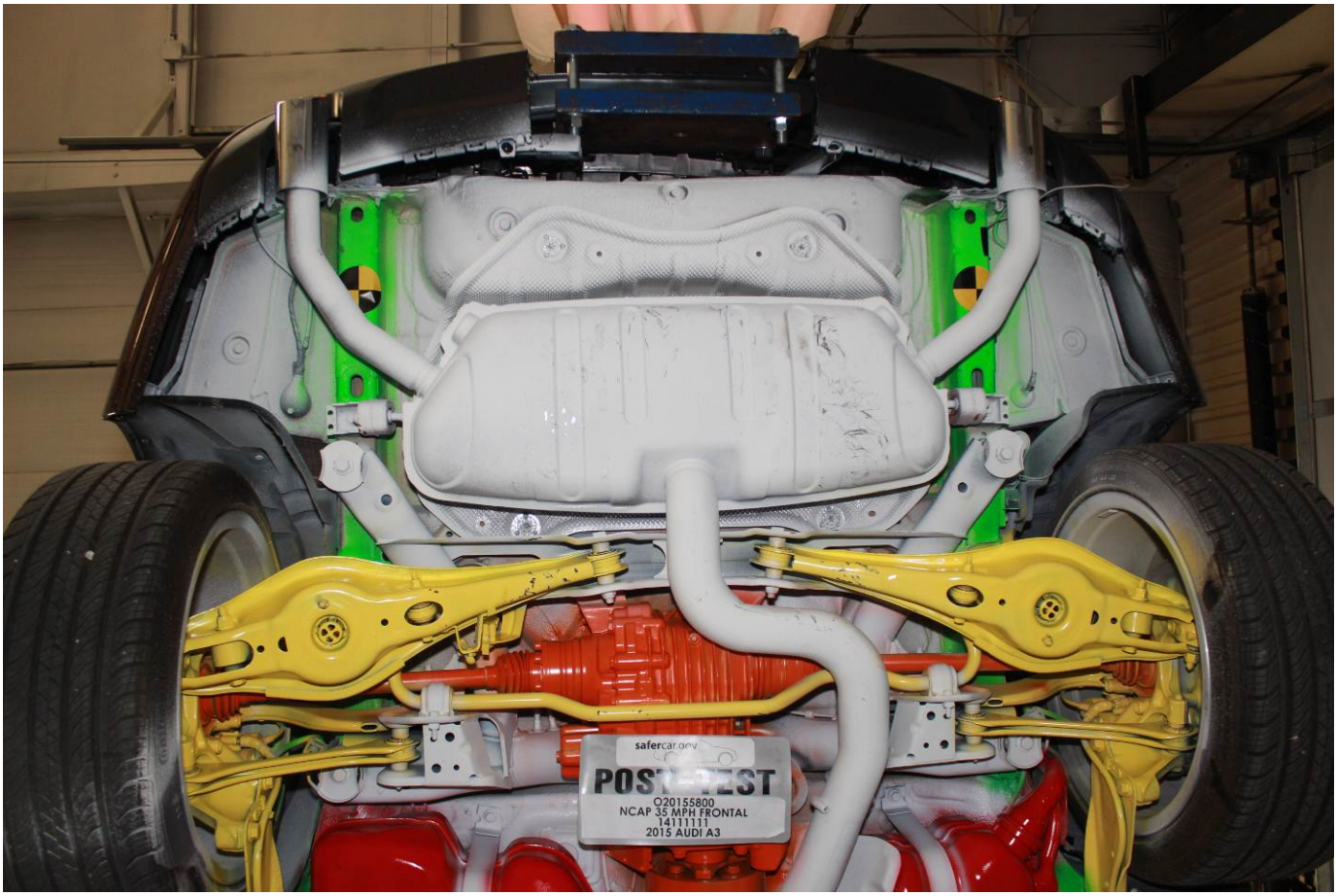
Post-Test Mid Front Underbody View

Pre-Test Mid Rear Underbody View

Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View

Pre-Test Dummy Cable Routing

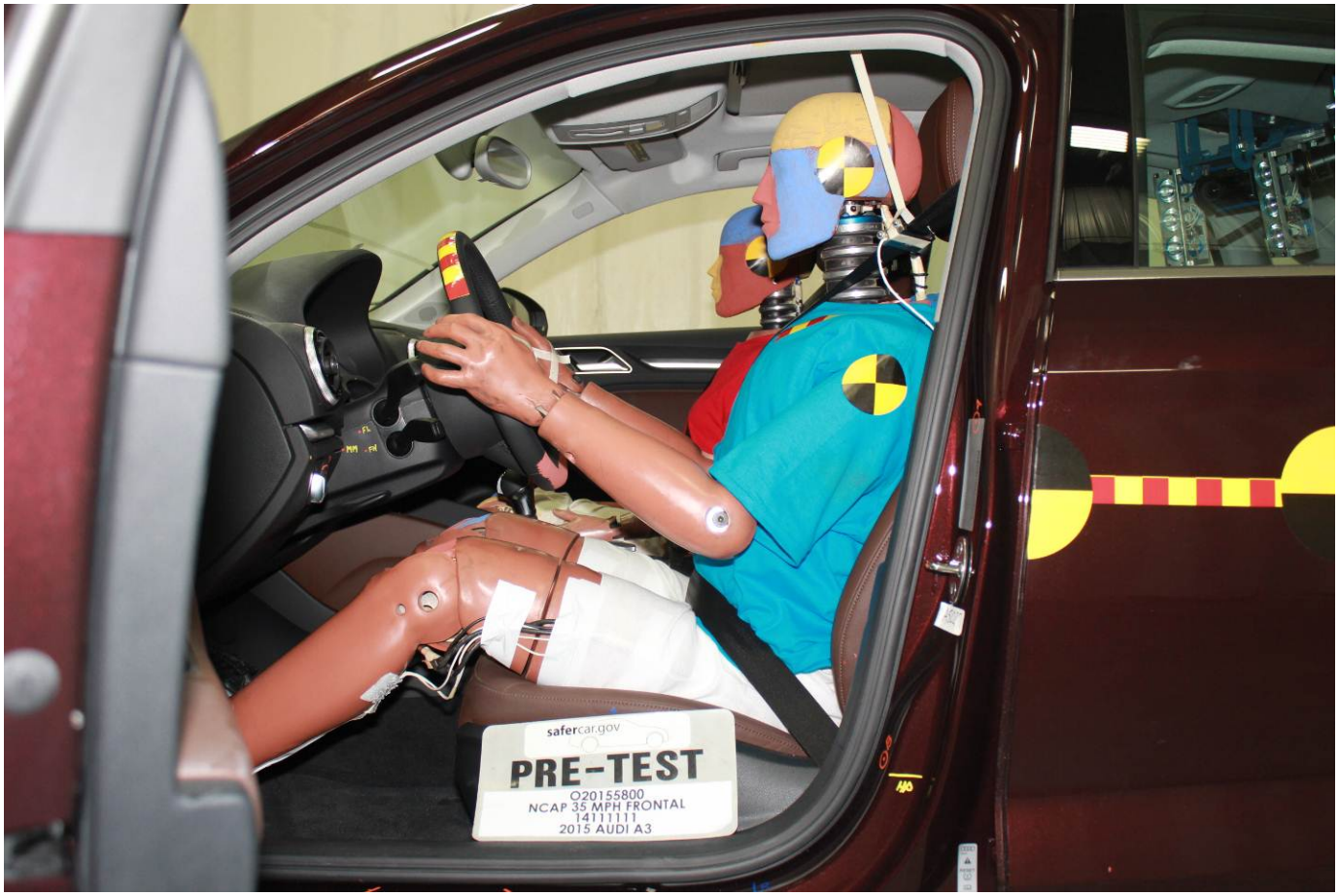
Post-Test Dummy Cable Routing

Pre-Test Driver Dummy Front View

Post-Test Driver Dummy Front View

Pre-Test Driver Dummy Window View

Post-Test Driver Dummy Window View



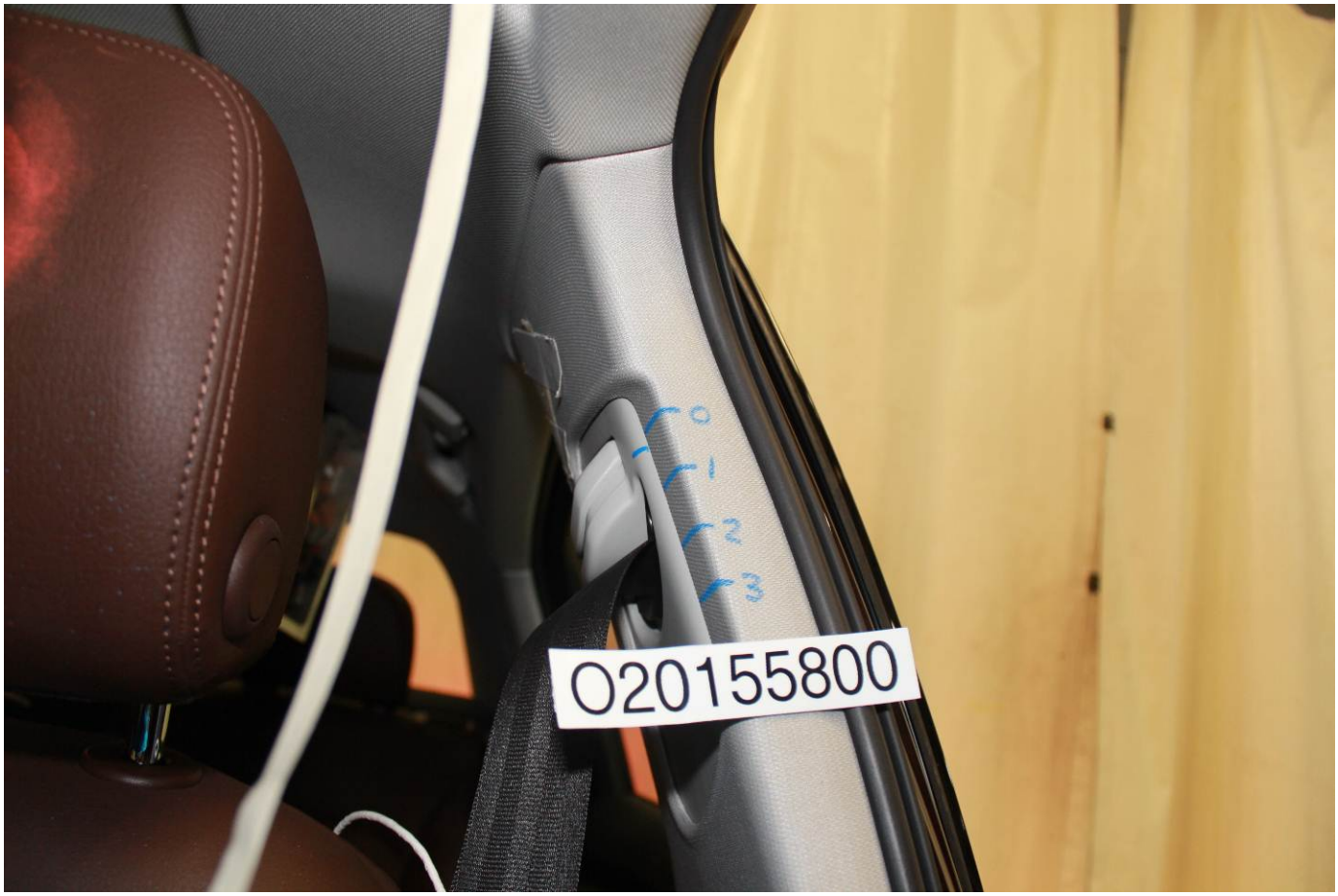
Pre-Test Driver Dummy and Vehicle Interior (Door Open)

Post-Test Driver Dummy and Vehicle Interior (Door Open)

Pre-Test Driver's Seat Fore-Aft Markings

Post-Test Driver's Seat Fore-Aft Markings

Pre-Test View of Belt Anchorage for Driver Dummy



Post-Test View of Belt Anchorage for Driver Dummy

Pre-Test Driver Dummy Feet

Post-Test Driver Dummy Feet

Pre-Test Driver's Side Knee Bolster (without dummy)

Post-Test Driver's Side Knee Bolster (without dummy)

Pre-Test Driver's Side Floorpan

Post-Test Driver's Side Floorpan

Post-Test Driver Dummy Face

Post-Test Driver Dummy Contact with Airbag

Post-Test Driver Dummy Contact with Headrest

Post-Test Driver Dummy Contact with Knee Airbag

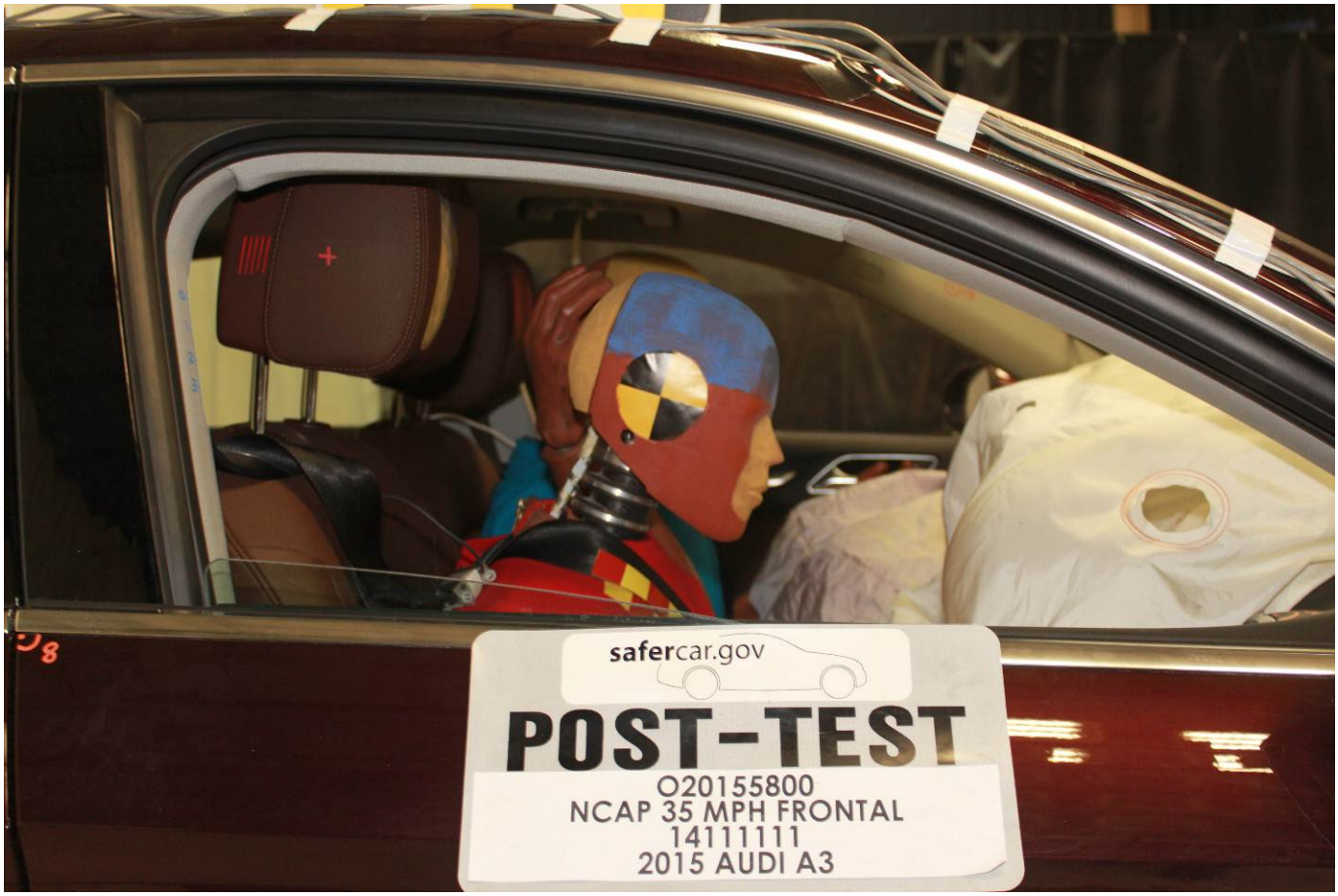
Pre-Test View of the Steering Wheel

Post-Test View of the Steering Wheel

Pre-Test Passenger Dummy Front View

Post-Test Passenger Dummy Front View

Pre-Test Passenger Dummy Window View



Post-Test Passenger Dummy Window View

Pre-Test Passenger Dummy and Vehicle Interior (Door Open)

Post-Test Passenger Dummy and Vehicle Interior (Door Open)

Pre-Test Passenger's Seat Fore-Aft Markings

Post-Test Passenger's Seat Fore-Aft Markings

Pre-Test View of Belt Anchorage for Passenger Dummy

Post-Test View of Belt Anchorage for Passenger Dummy

Pre-Test Passenger Dummy Feet

Post-Test Passenger Dummy Feet

Pre-Test Passenger's Side Knee Bolster (without dummy)

Post-Test Passenger's Side Knee Bolster (without dummy)

Pre-Test Passenger's Side Floorpan

Post-Test Passenger's Side Floorpan

Post-Test Passenger Dummy Face

Post-Test Passenger Dummy Contact with Airbag

Post-Test Passenger Dummy Contact with Headrest

Post-Test Passenger Dummy Contact with Knee Airbag

Post-Test Passenger Dummy Contact with Knee Airbag

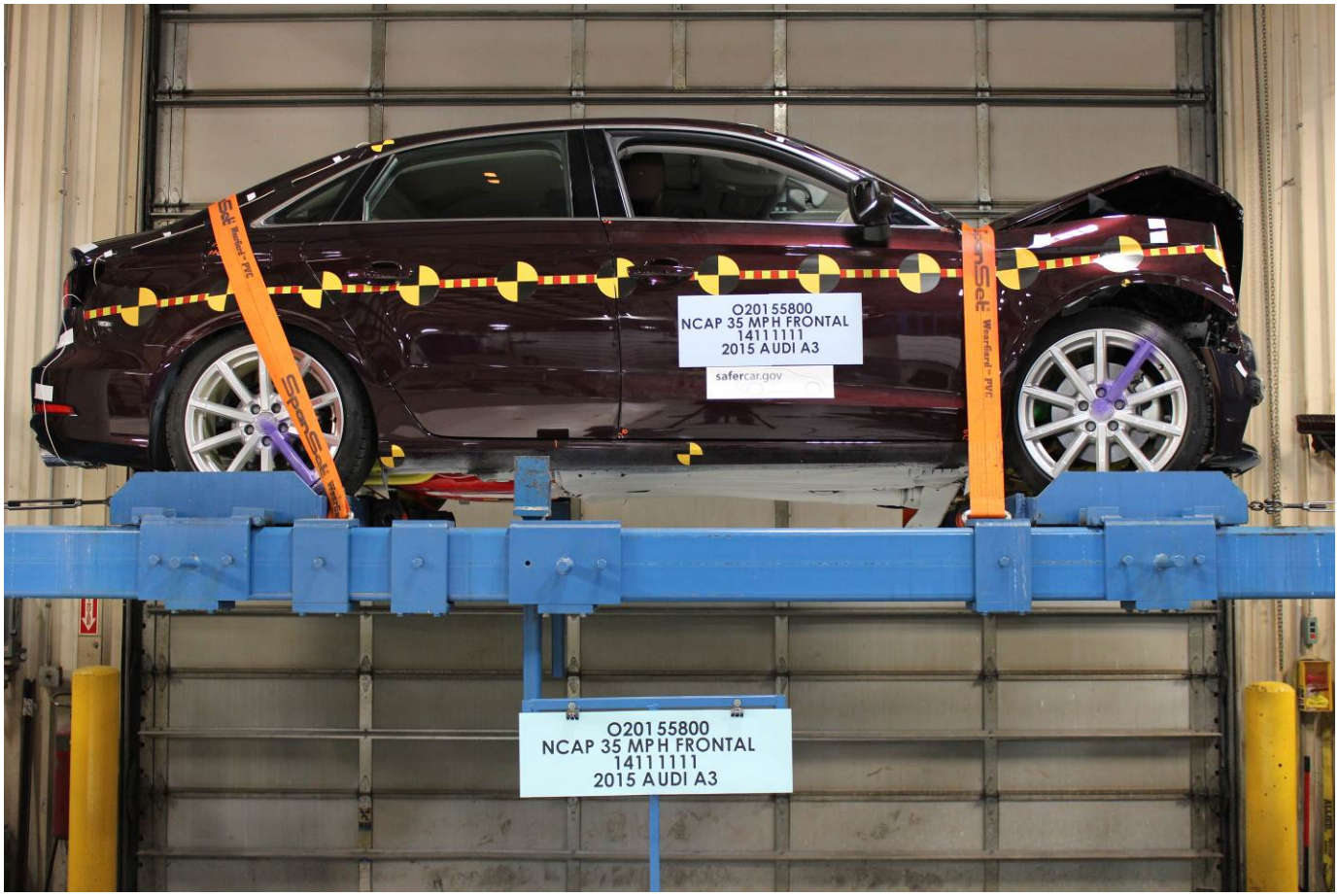
Ballast Installed in Vehicle

Ballast Installed in Vehicle

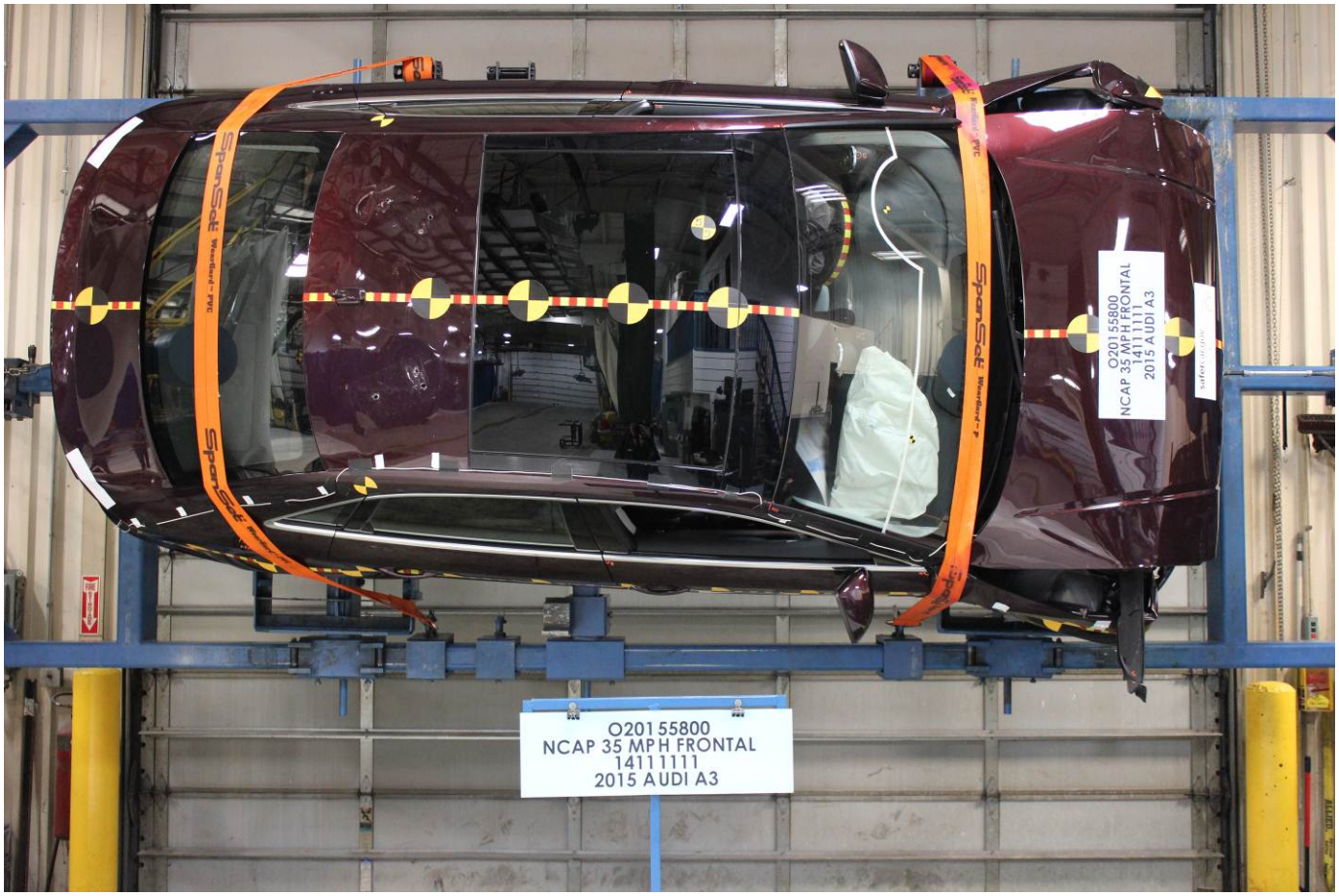
PHOTOGRAPH NOT APPLICABLE

Post-Test Stoddard Solvent Spillage Location View

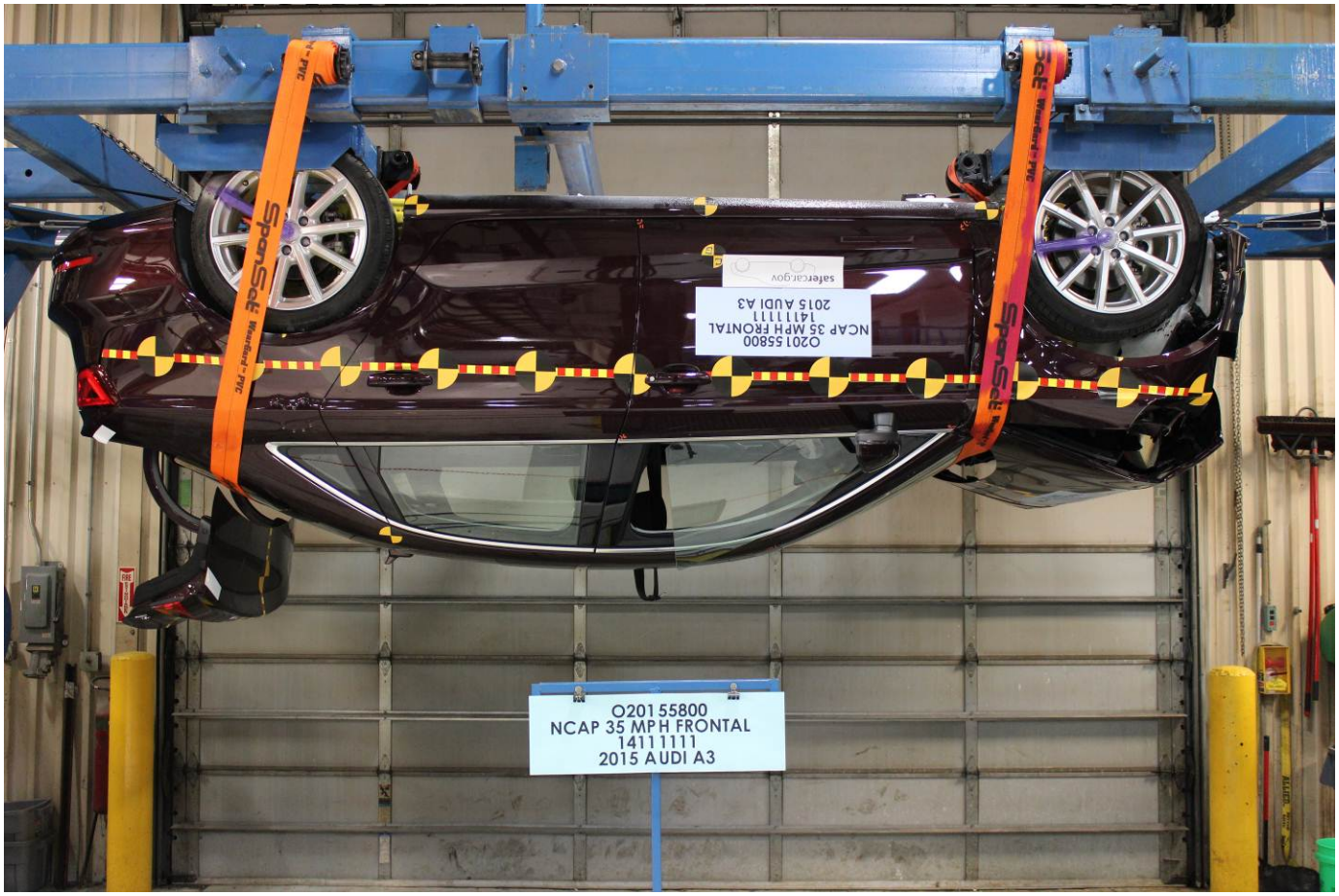
Post-Test Speed Trap Read-Out



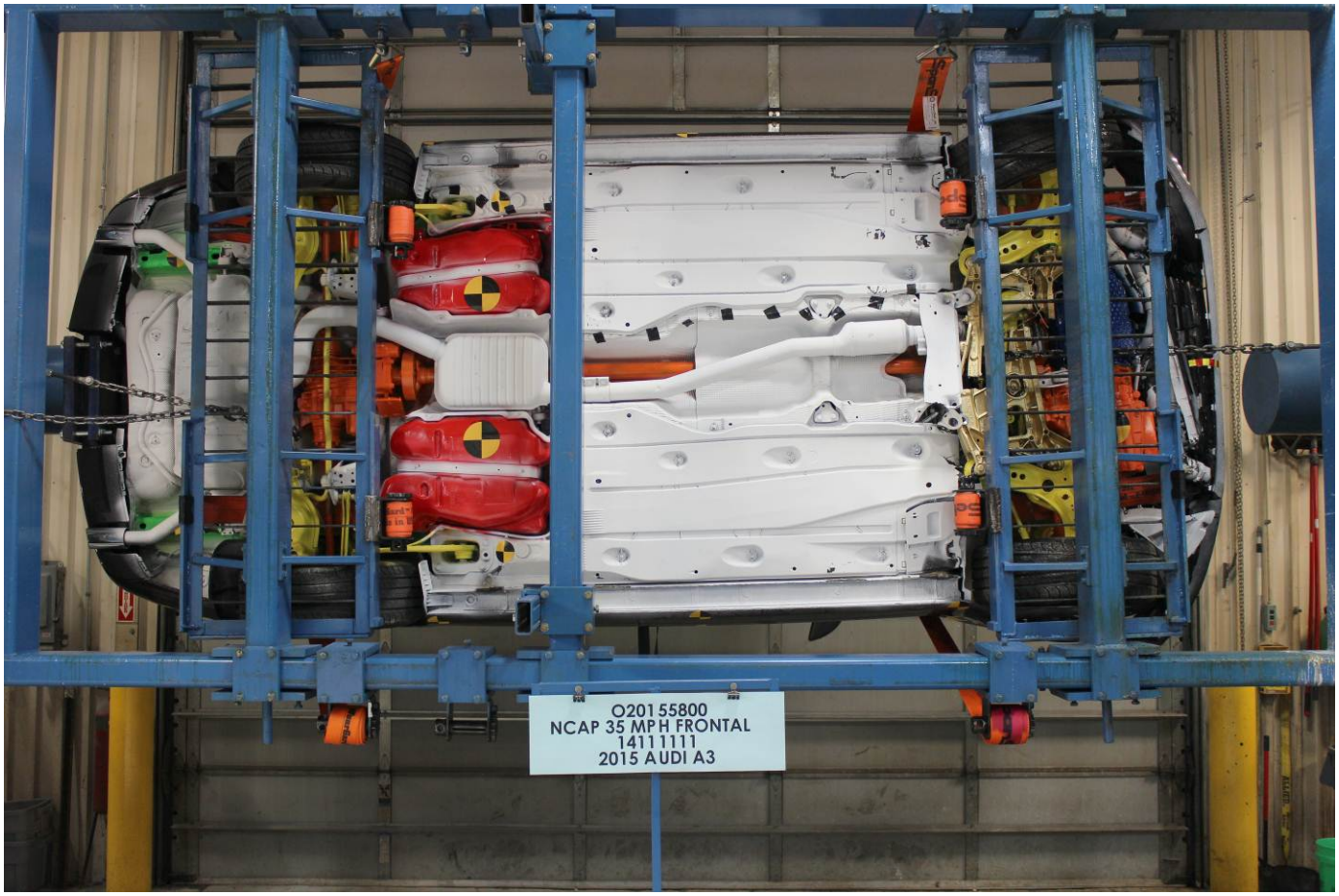
Vehicle at 0 Degree on Static Rollover Device



Vehicle at 90 Degrees on Static Rollover Device



Vehicle at 180 Degrees on Static Rollover Device



Vehicle at 270 Degrees on Static Rollover Device

Vehicle at 360 Degrees on Static Rollover Device

Ph

2015 Audi A3 Frontal Impact Event

2015 Audi A3 Sedan 2.0T quattro S tronic

Audi Truth in Engineering

STANDARD EQUIPMENT (unless replaced by options)

TECHNICAL
- 2.0L TFSI® 220 hp / 258lb-ft I4 engine
- 6-speed S tronic® transmission
- quattro® all-wheel drive system
- 17" 5-spoke-Star-design wheels, 225/45 all-season tires
- ESC (Electronic Stability Control) with secondary collision brake assist
- Disc brakes, ventilated front & solid rear discs
- ABS (Anti-lock brake system) with brake assist
- Electromechanical speed-sensitive power steering
- TPMS (tire pressure monitoring system)
- Temporary, inflatable compact spare tire

COMFORT/CONVENIENCE
- Panorama sunroof w/ retractable sunshade
- Audi xenon plus headlights w/ LED DRLs & taillights
- Rain & light sensor
- Power adjustable exterior mirrors
- 12-way power adjustable driver seat including lumbar adjustment
- 60/40 split-folding rear seat
- Leather seating surfaces
- Dual-zone automatic climate control
- 3-spoke leather-wrapped multifunction steering wheel
- Audi sound system
- AM/FM/SAT/1CD audio w/ SD card reader & aux-in
- SIRIUS® satellite radio (w/ three-month complimentary subscription)
- Preparation for mobile phone (Bluetooth®)
- Driver information system

SAFETY/SECURITY
- Driver and front passenger advanced airbag supplemental restraint system
- Driver and front passenger knee airbags
- Driver and front-passenger seat-mounted thorax side airbags
- Sideguard® inflatable curtain airbags
- Driver 3-point safety belts with automatic pretensioning and force limiters
- Front passenger 3-point safety belts with Automatic Locking Retractor (ALR), automatic pre-tensioning, and force limiters
- Rear outboard 3-point safety belts with Automatic Locking Retractor (ALR) and automatic pre-tensioning
- Rear center 3-point safety belt with Automatic Locking Retractor (ALR)
- Lower Anchors and Tethers for Children (LATCH) in rear
- Rear child safety locks
- Anti-theft vehicle alarm system

WARRANTY/MAINTENANCE
- 4 Year/50,000 mile (whichever occurs first) New Vehicle Limited Warranty*
- 12 Year Limited Warranty Against Corrosion Perforation
- 1 Year/5,000 mile (whichever occurs first) First Scheduled Maintenance Service FREE OF CHARGE
- 4 Year Roadside Assistance coverage provided by a third party supplier

*Please refer to the 2015 Audi Warranty and Maintenance Booklet for complete coverage information.

MANUFACTURER'S SUGGESTED RETAIL PRICE

2015 Audi A3 Sedan 2.0T quattro S tronic	**$32,900.00**
PACKAGES / OPTIONS	
Shiraz Red metallic	$550.00
Chestnut Brown interior	Included
Audi MMI Navigation plus package	$2,600.00
1 CD/DVD-player w/ HD radio	
Audi MMI Navigation plus w/ voice control	
Audi MMI touch	
Color driver information display	
Audi connect® w/ online services (6-month subscription)	
A3 Premium Plus model	$2,550.00
18" 10-spoke-design wheels, all-season tires	
Heated power front seats w/ 4-way lumbar	
Heated exterior mirrors	
Audi advanced key	
Aluminum window surrounds	
Aluminum interior package	
Driver Assistance package	$1,400.00
Parking system plus w/ rearview camera	
Audi side assist	
Bang & Olufsen® Sound System	$850.00
Rear side airbags	$350.00
Audi Guard all-weather floor mats	$180.00
Cargo net	$150.00
Audi first aid kit	$45.00
Front filler panel	Included
Destination Charge	$895.00
Total Price:	**$42,470.00**

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

MODEL: 8VS58L

VIN: WAUEFHFF8F1038719

DEALER: 402F11
AUDI WAUSAU
1501 MORNING GLORY LANE
WAUSAU, WI 54401
Port of Entry: HOUSTON

SHIP TO: 402F11
AUDI WAUSAU
1501 MORNING GLORY LANE
WAUSAU, WI 54401
COMM NUM: CS2591
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
27 MPG combined city/hwy
24 city
33 highway
3.7 gallons per 100 miles

SubCompact Cars range from 15 to 119 MPG. The best vehicle rates 119 MPGe.

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

Annual fuel cost **$2,100**

Fuel Economy & Greenhouse Gas Rating (tailpipe only): 7 (1 – 10 Best)

Smog Rating (tailpipe only): 9 (1 – 10 Best)

This vehicle emits 323 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 24 MPG and costs $11,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $3.60 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: GYOR, HUNGARY	
MAJOR SOURCES OF FOREIGN PARTS CONTENT:		COUNTRY OF ORIGIN: ENGINE:	HUNGARY
GERMANY:	62%	TRANSMISSION:	GERMANY
HUNGARY:	35%		

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

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 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 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

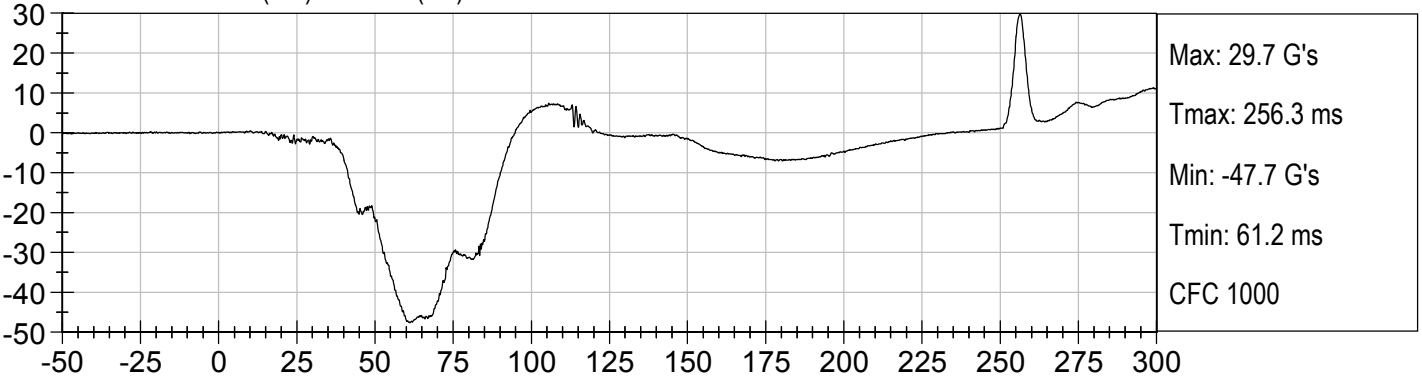
Right Rear Seat Crossmember Z

Left Rear Seat Crossmember Xr

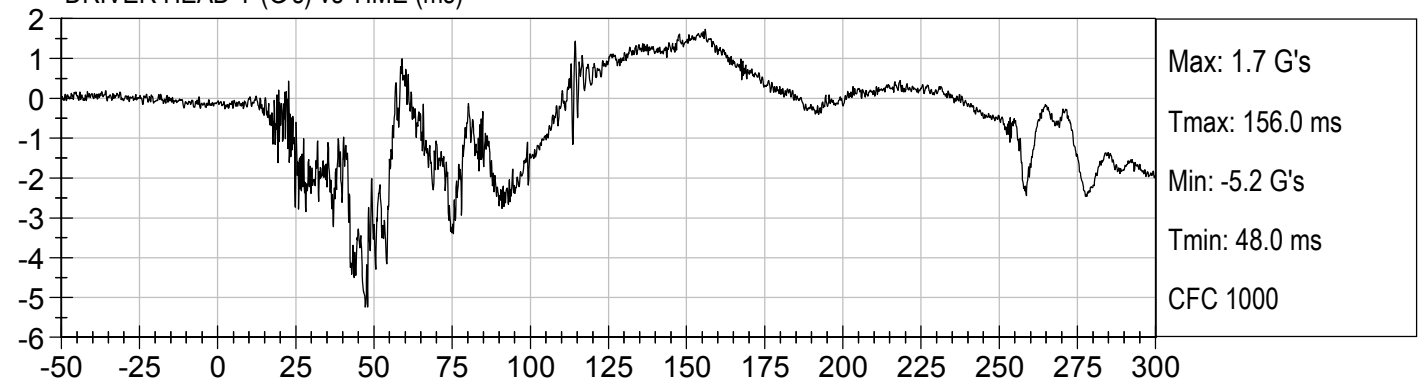
Right Rear Seat Crossmember Xr

Advanced Research Load Cell Barrier – 528 channels

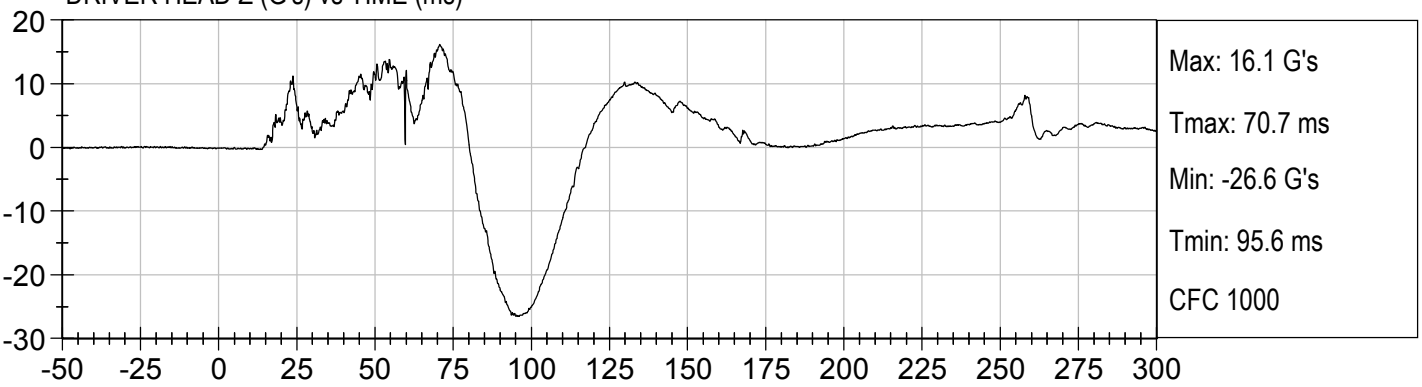
DRIVER HEAD X (G's) vs TIME (ms)



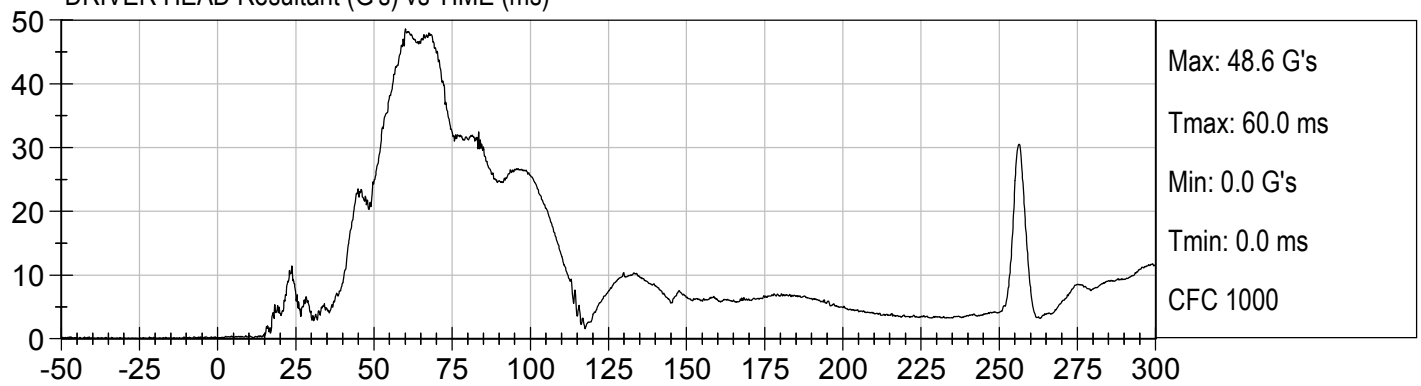
DRIVER HEAD Y (G's) vs TIME (ms)



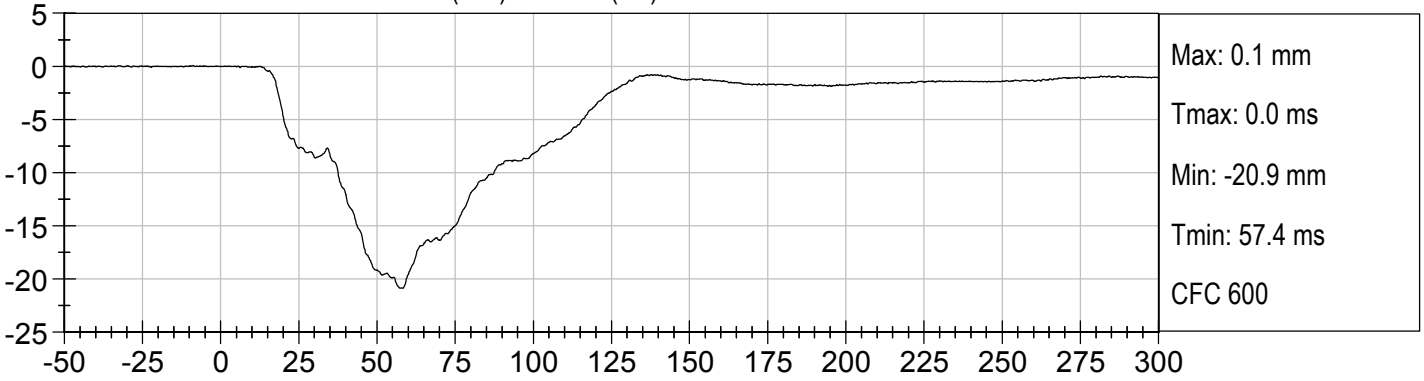
DRIVER HEAD Z (G's) vs TIME (ms)



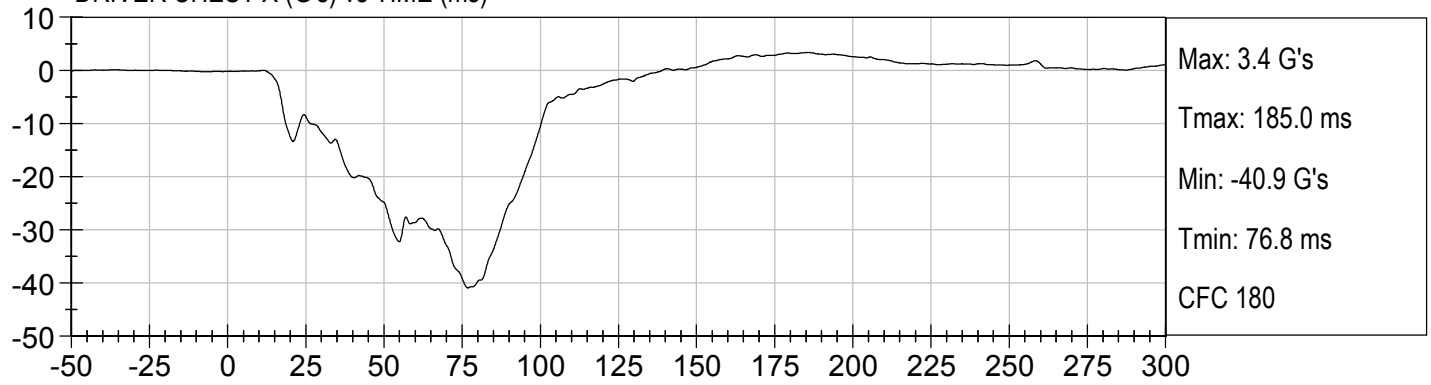
DRIVER HEAD Resultant (G's) vs TIME (ms)



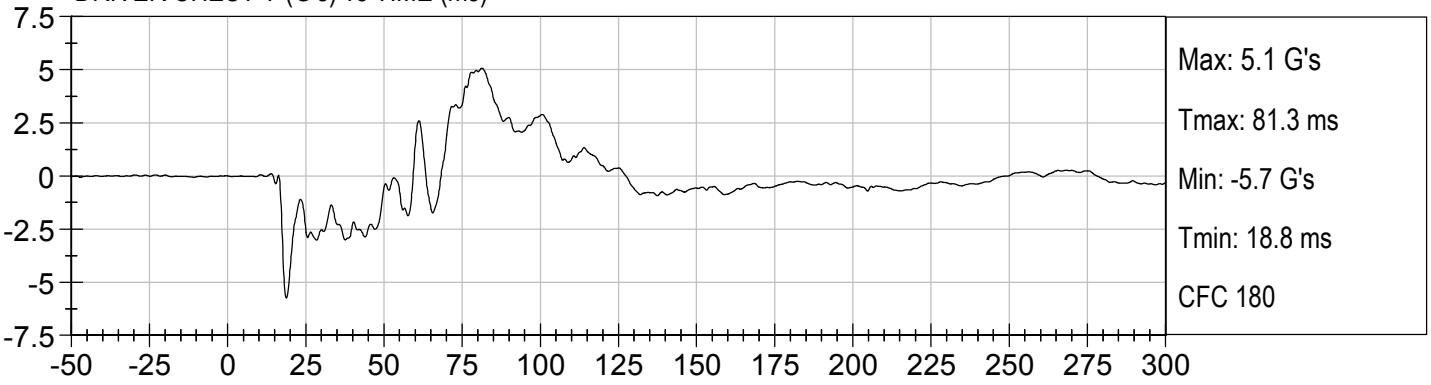
DRIVER CHEST DISPLACEMENT (mm) vs TIME (ms)



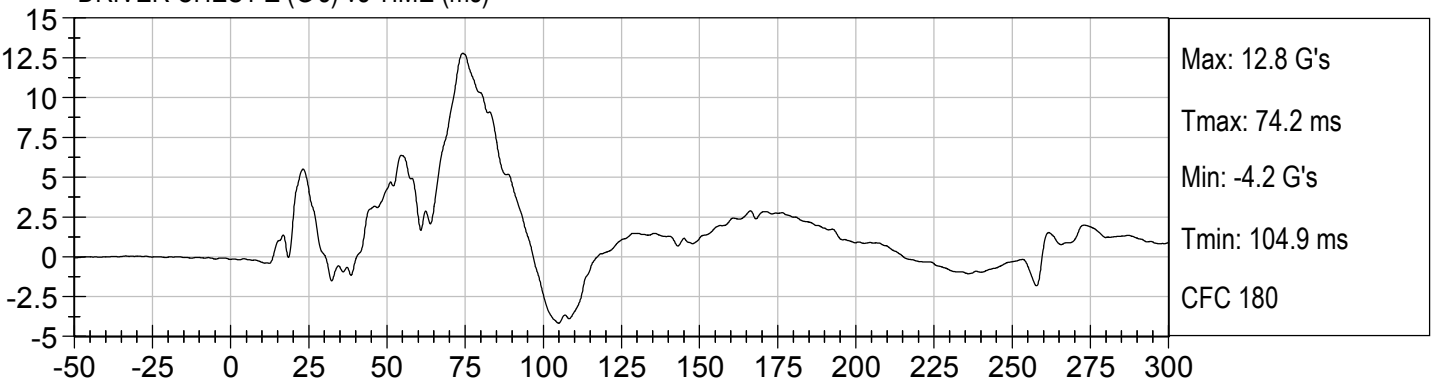
DRIVER CHEST X (G's) vs TIME (ms)



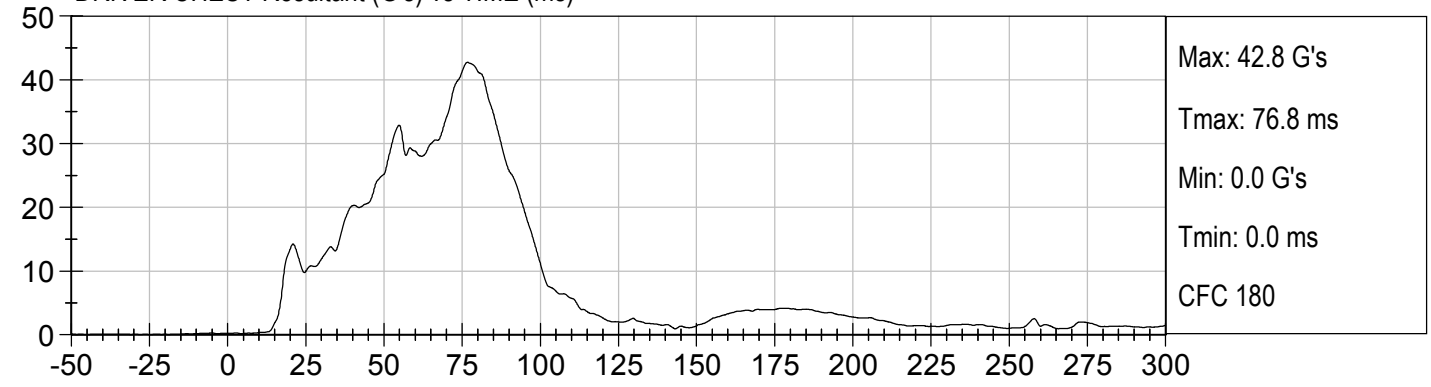
DRIVER CHEST Y (G's) vs TIME (ms)



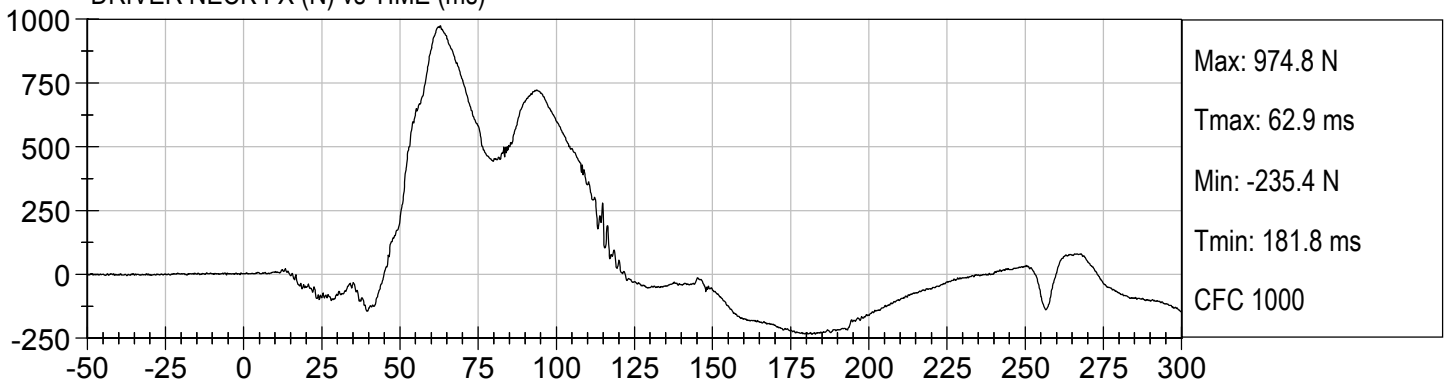
DRIVER CHEST Z (G's) vs TIME (ms)



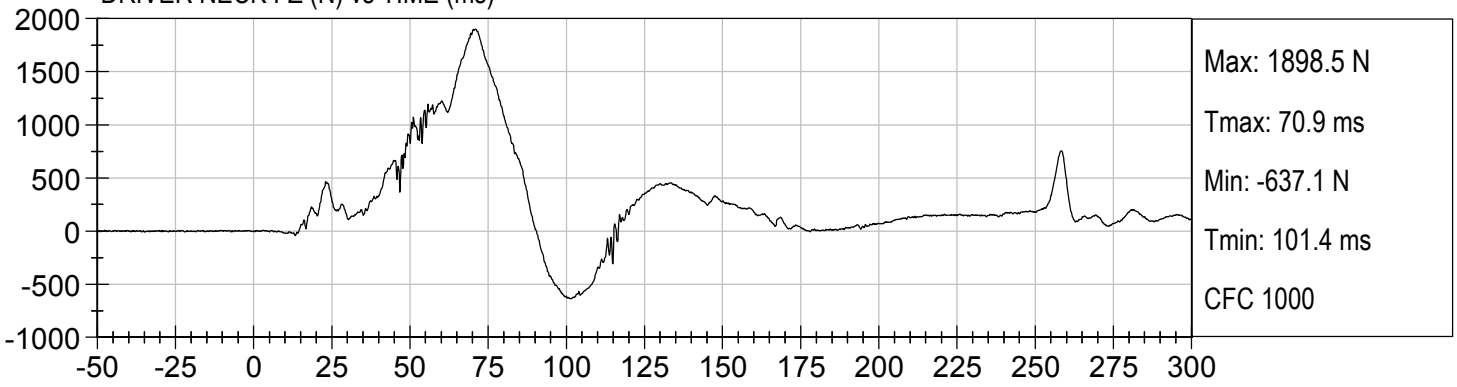
DRIVER CHEST Resultant (G's) vs TIME (ms)



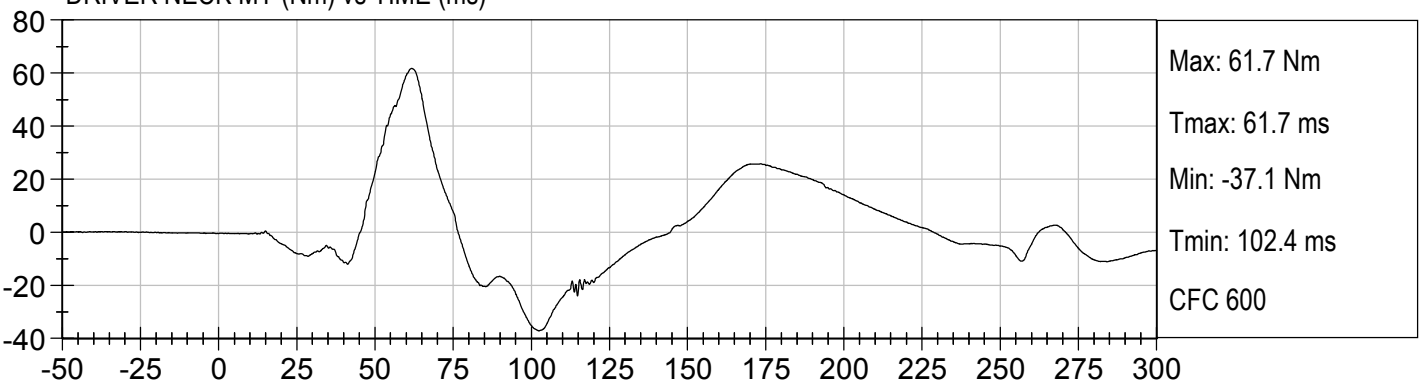
DRIVER NECK FX (N) vs TIME (ms)



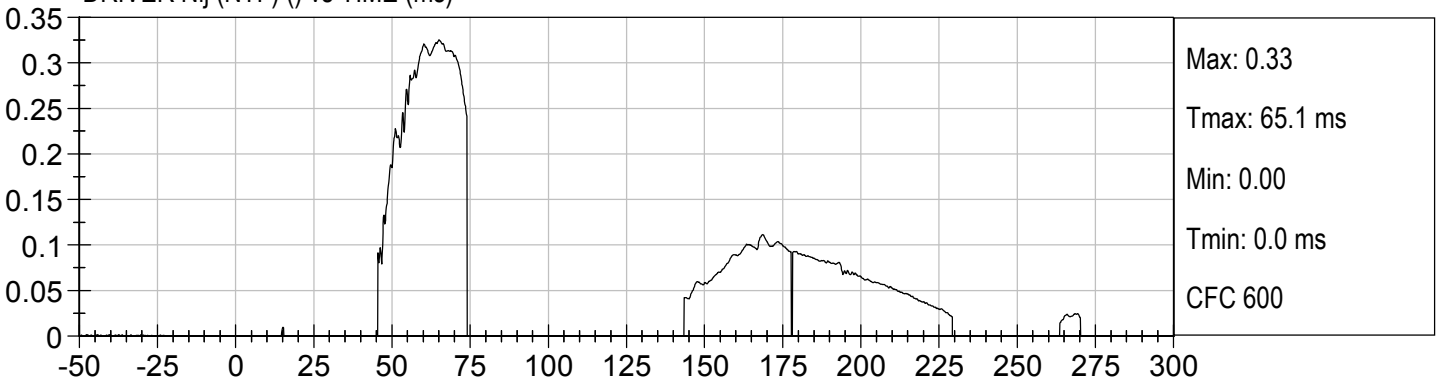
DRIVER NECK FZ (N) vs TIME (ms)



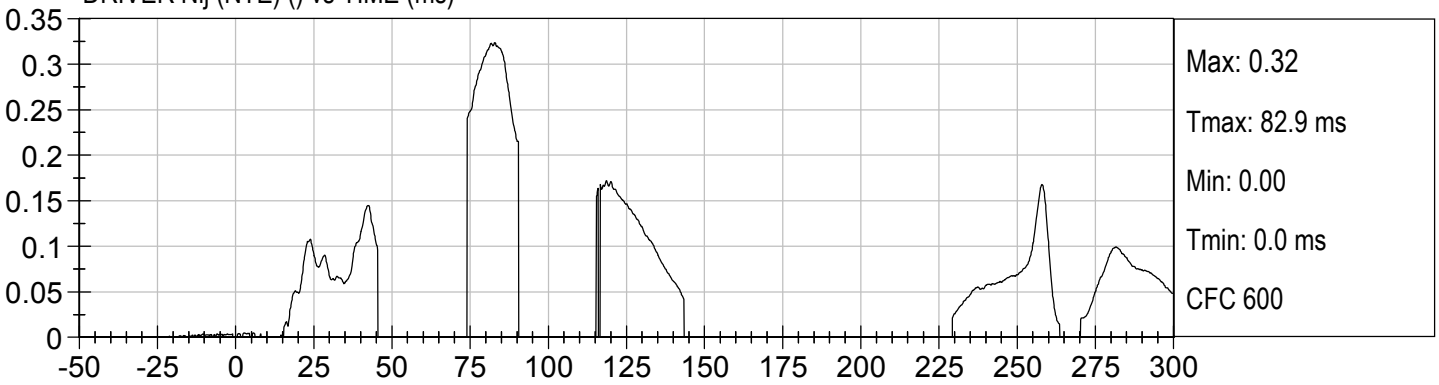
DRIVER NECK MY (Nm) vs TIME (ms)



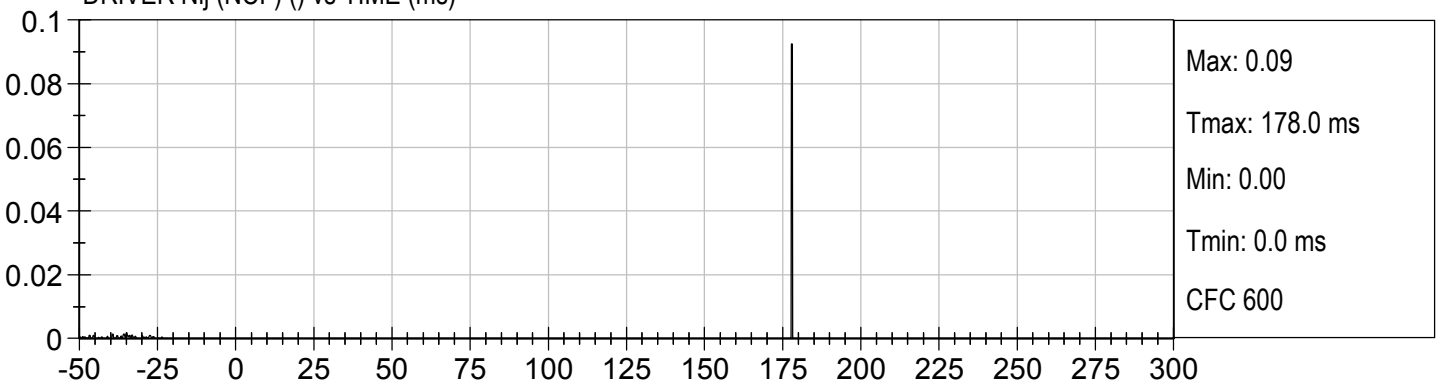
DRIVER Nij (NTF) () vs TIME (ms)



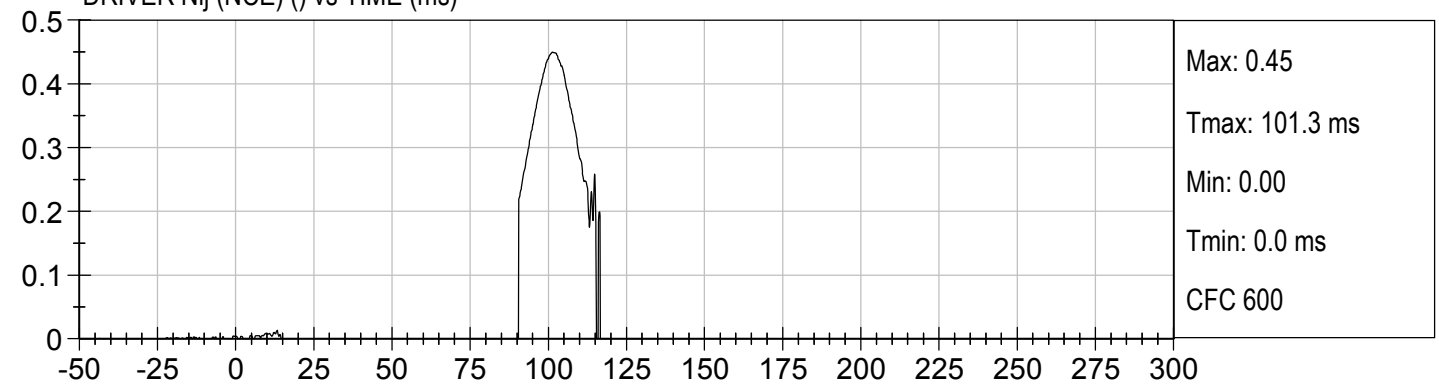
DRIVER Nij (NTE) () vs TIME (ms)



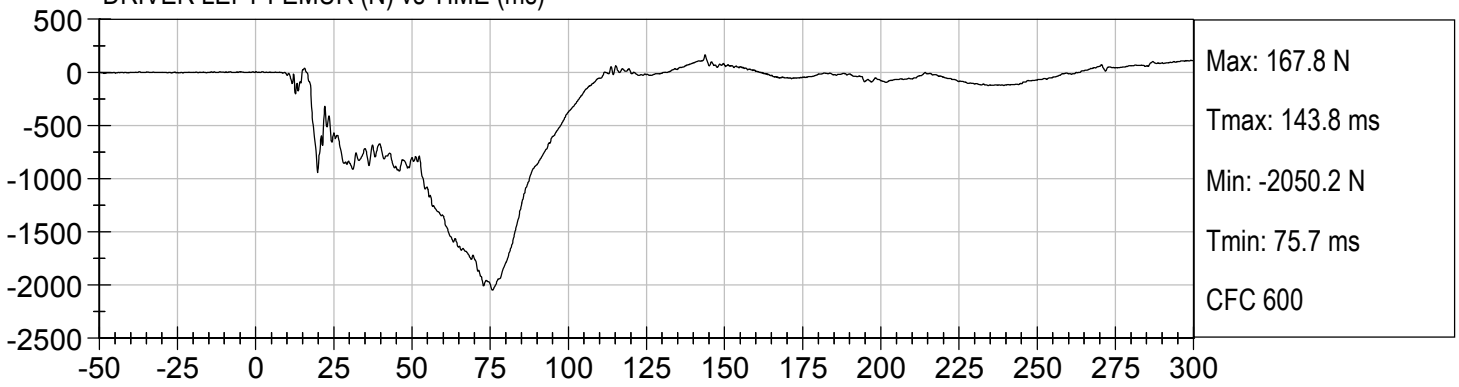
DRIVER Nij (NCF) () vs TIME (ms)



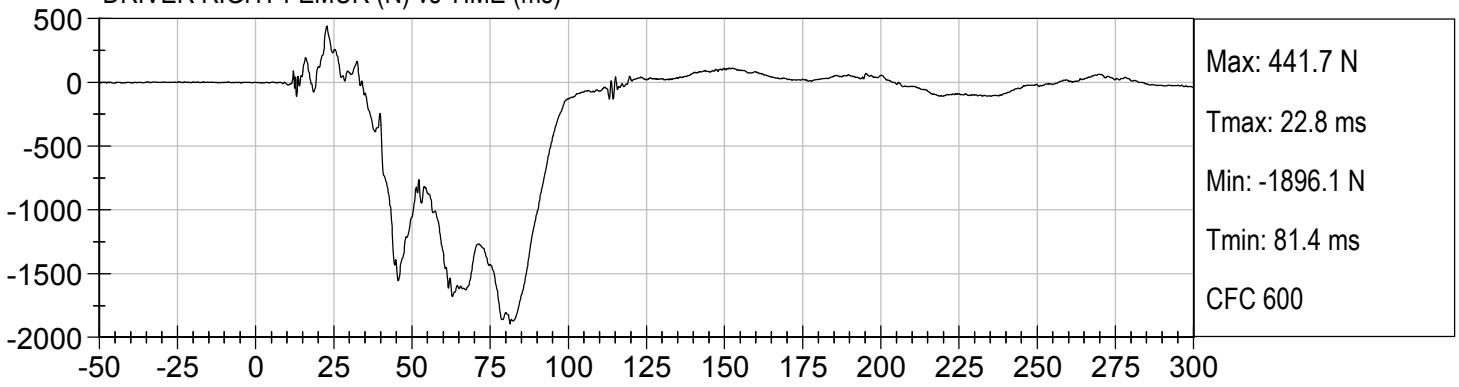
DRIVER Nij (NCE) () vs TIME (ms)



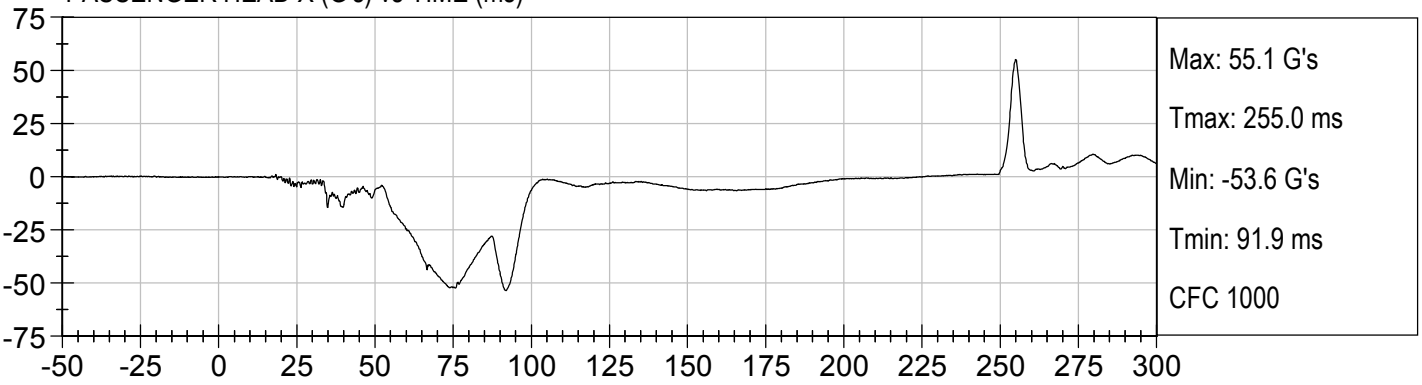
DRIVER LEFT FEMUR (N) vs TIME (ms)



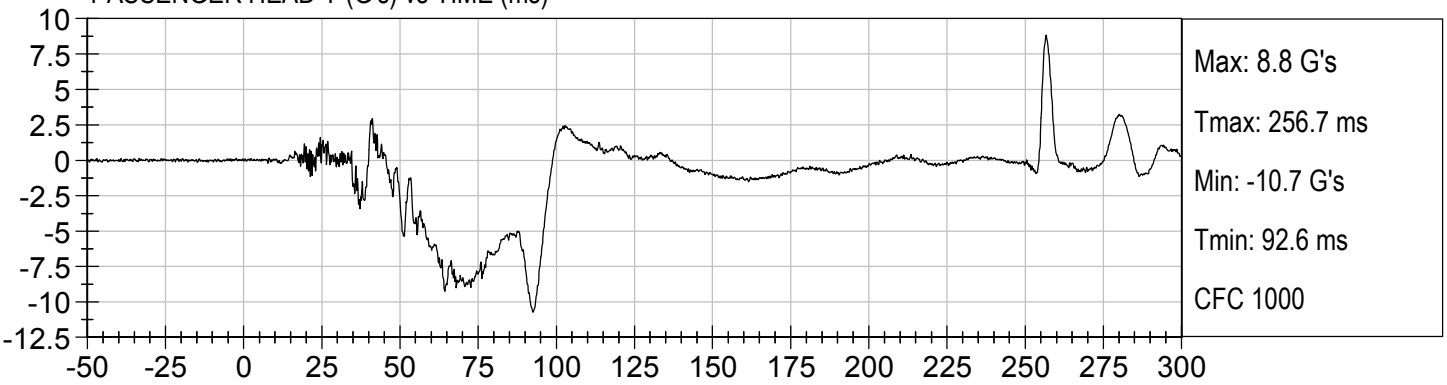
DRIVER RIGHT FEMUR (N) vs TIME (ms)



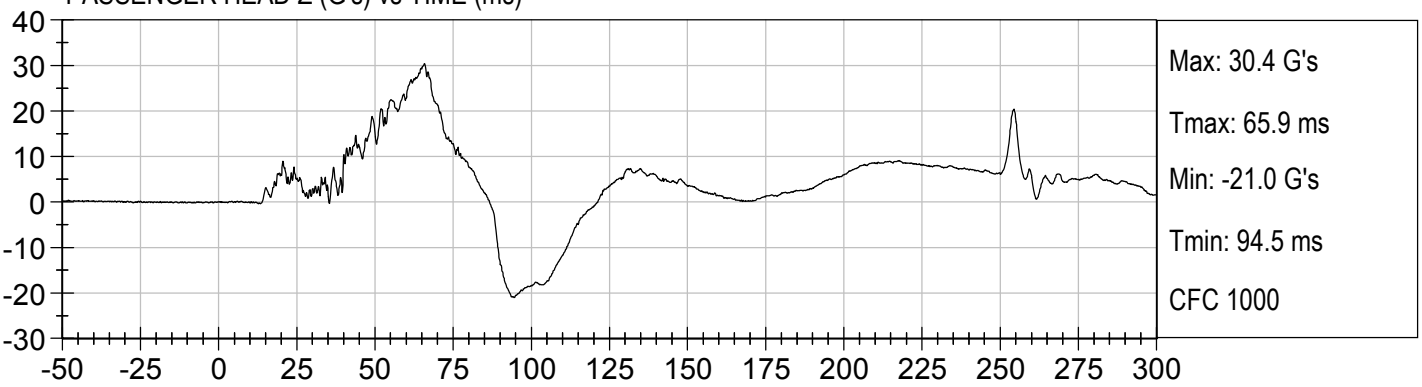
PASSENGER HEAD X (G's) vs TIME (ms)



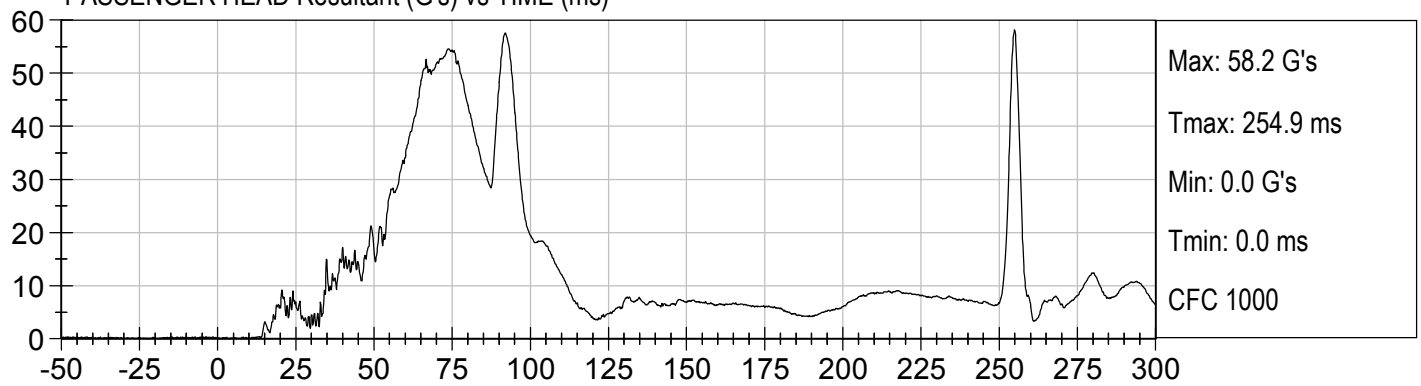
PASSENGER HEAD Y (G's) vs TIME (ms)



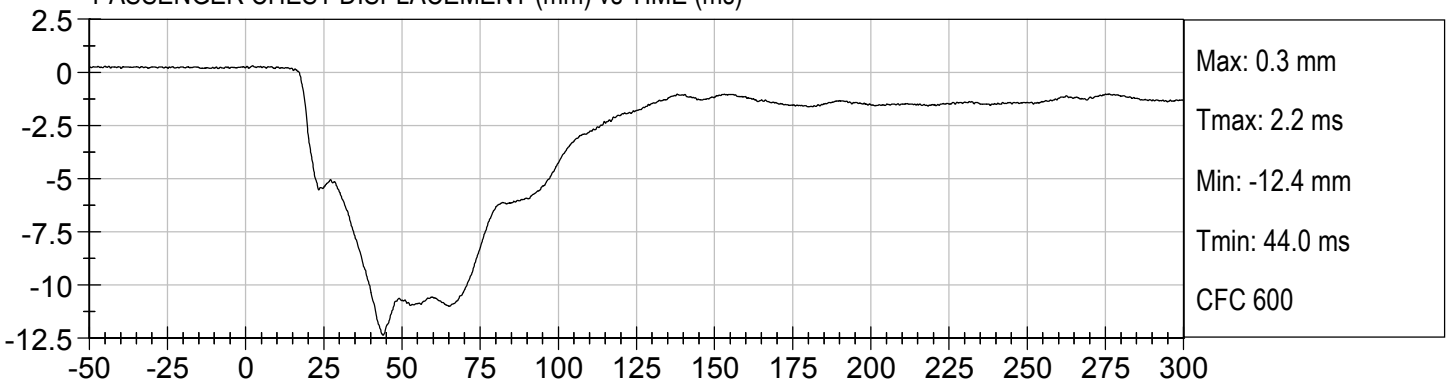
PASSENGER HEAD Z (G's) vs TIME (ms)



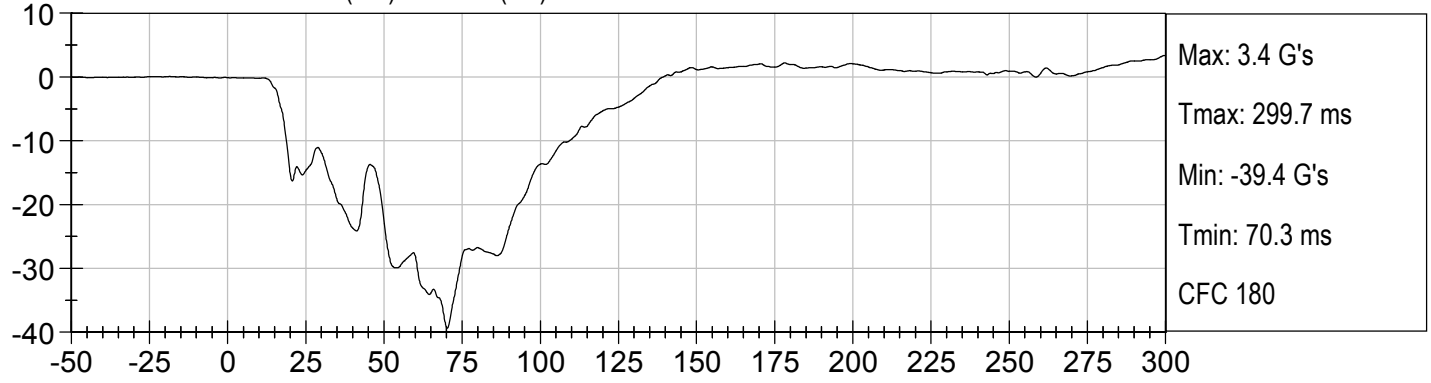
PASSENGER HEAD Resultant (G's) vs TIME (ms)



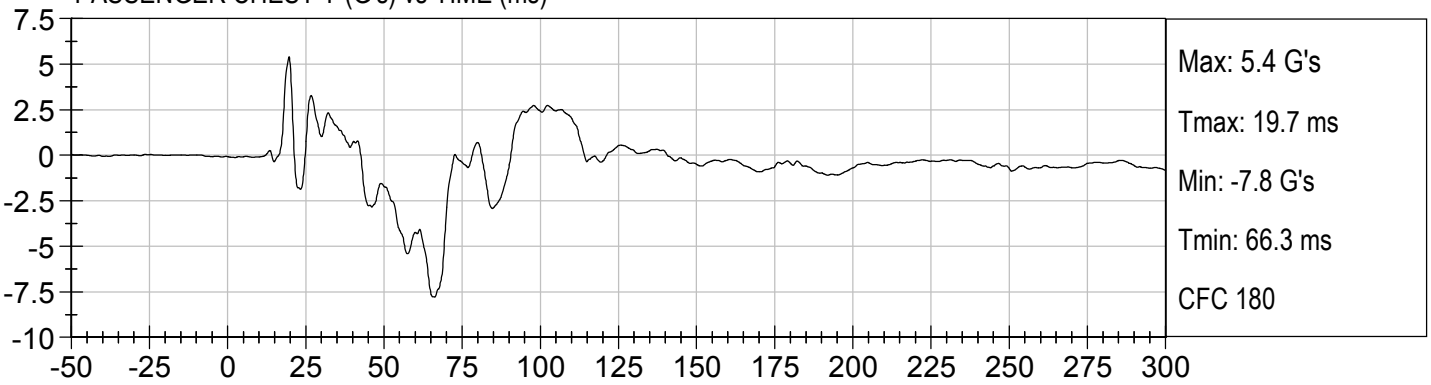
PASSENGER CHEST DISPLACEMENT (mm) vs TIME (ms)



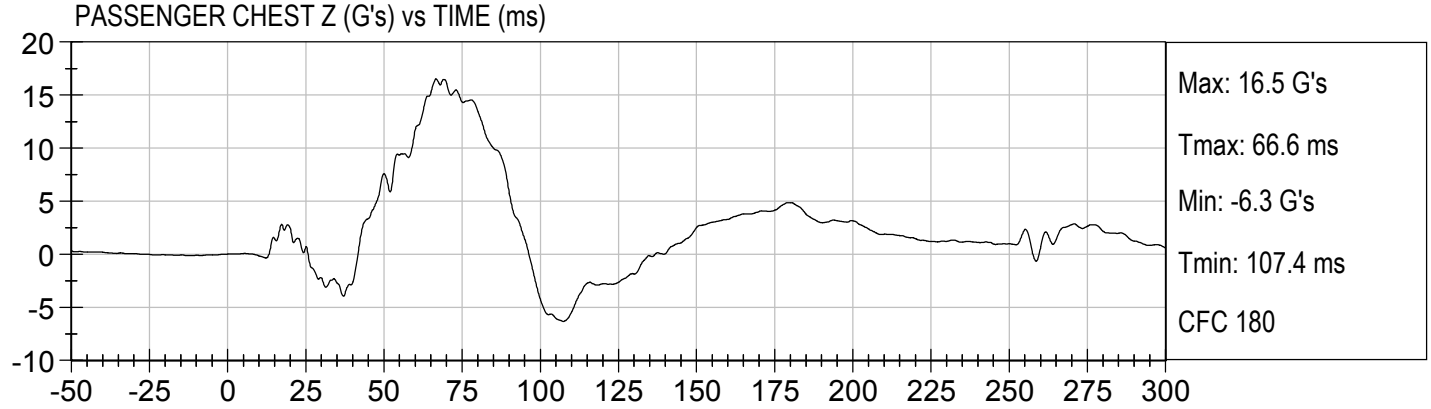
PASSENGER CHEST X (G's) vs TIME (ms)



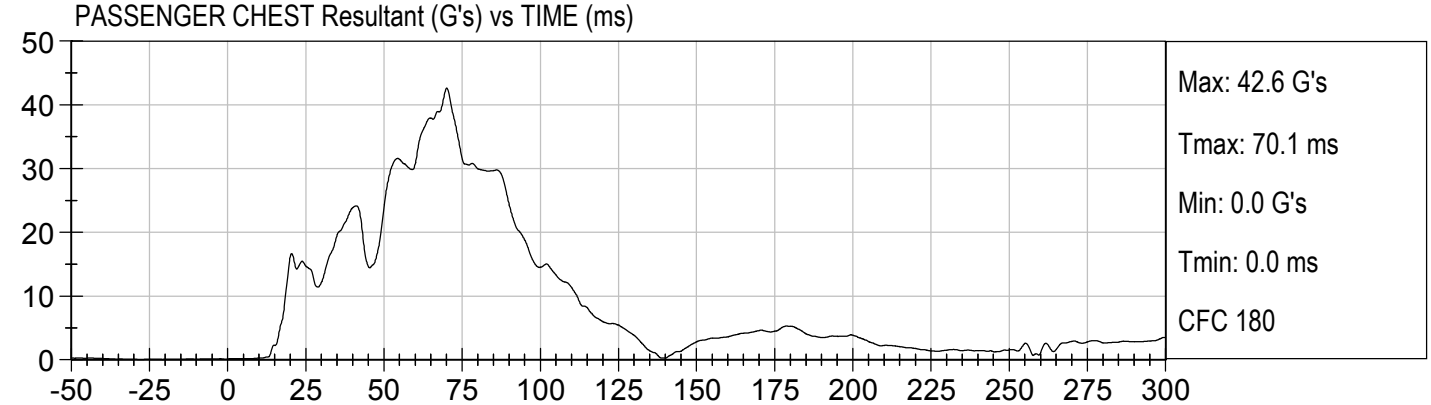
PASSENGER CHEST Y (G's) vs TIME (ms)



PASSENGER CHEST Z (G's) vs TIME (ms)

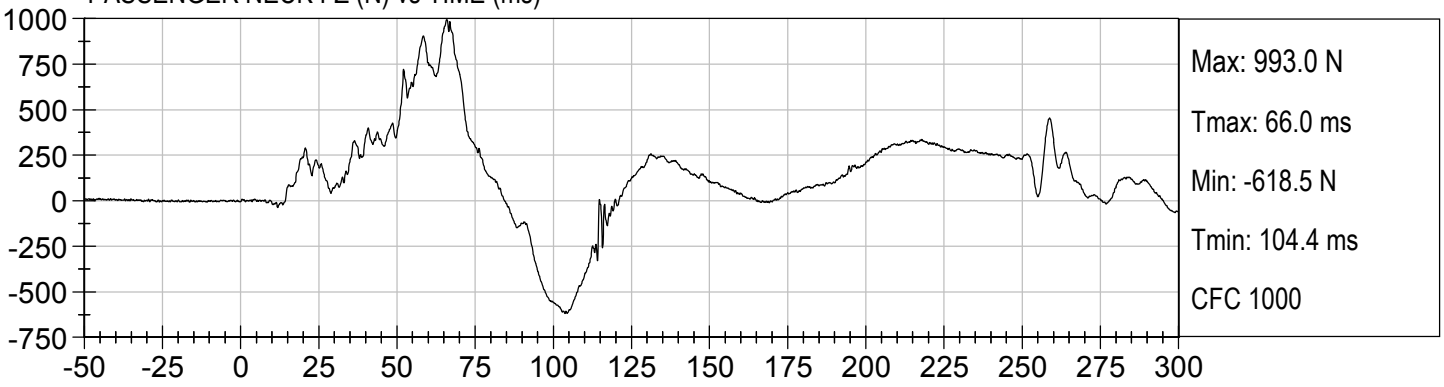


PASSENGER CHEST Resultant (G's) vs TIME (ms)

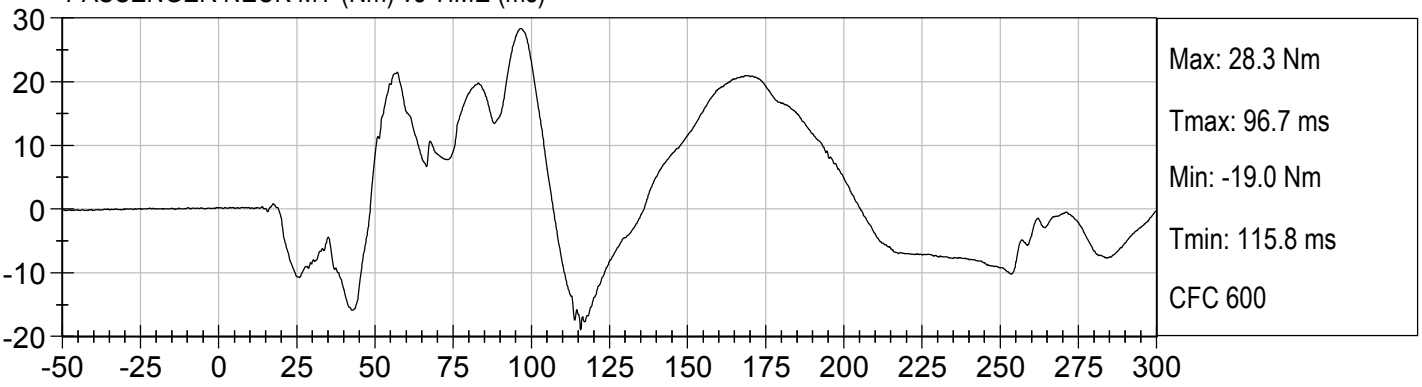


PASSENGER NECK FX (N) vs TIME (ms)

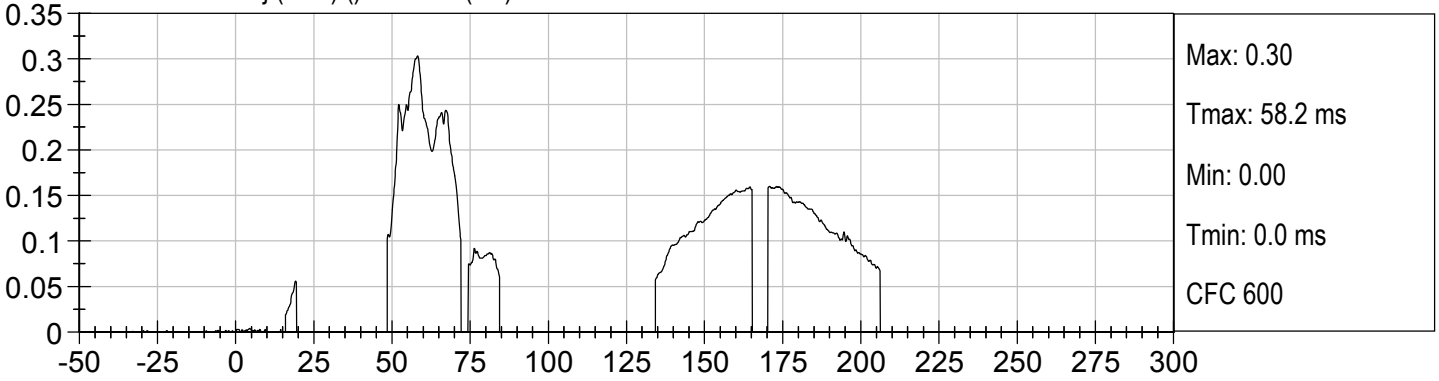
PASSENGER NECK FZ (N) vs TIME (ms)



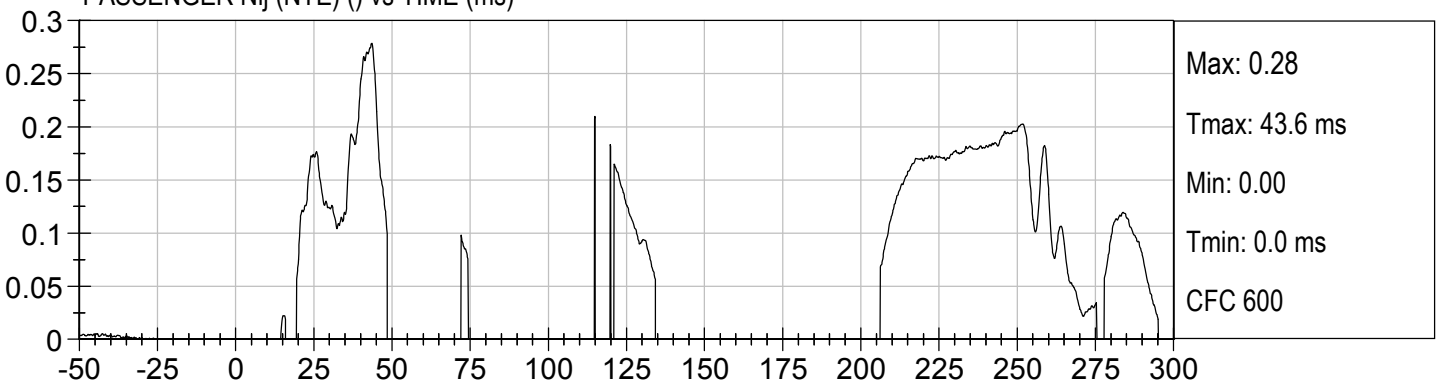
PASSENGER NECK MY (Nm) vs TIME (ms)



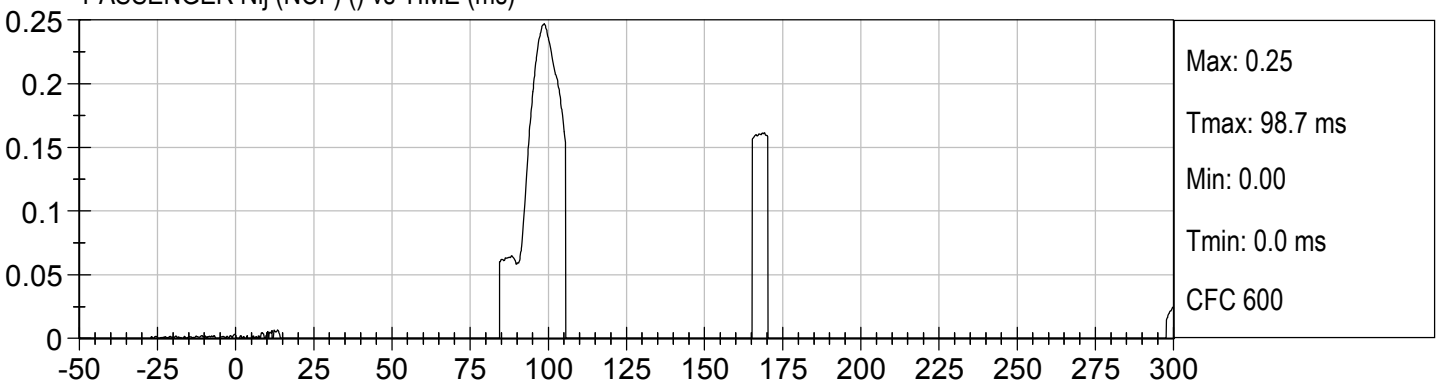
PASSENGER Nij (NTF) () vs TIME (ms)



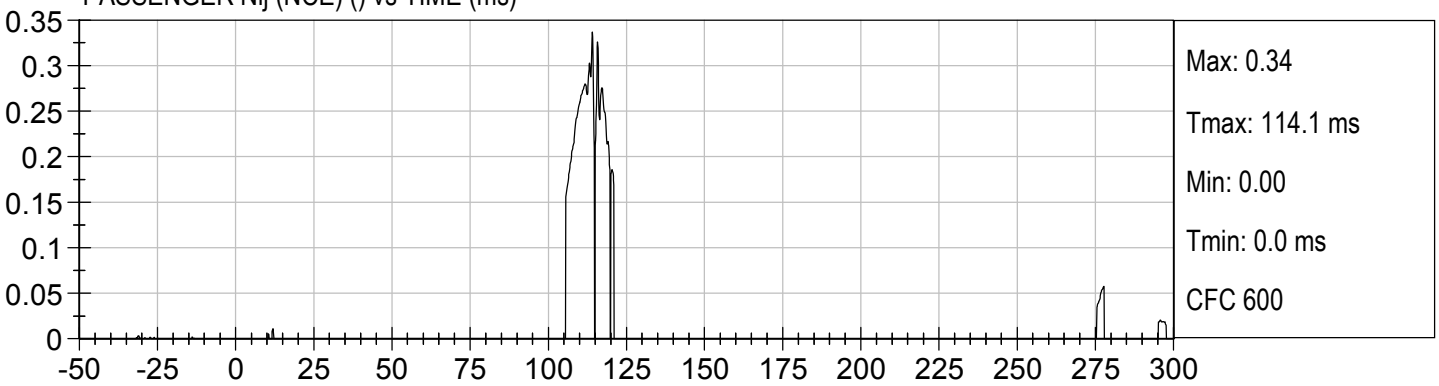
PASSENGER Nij (NTE) () vs TIME (ms)



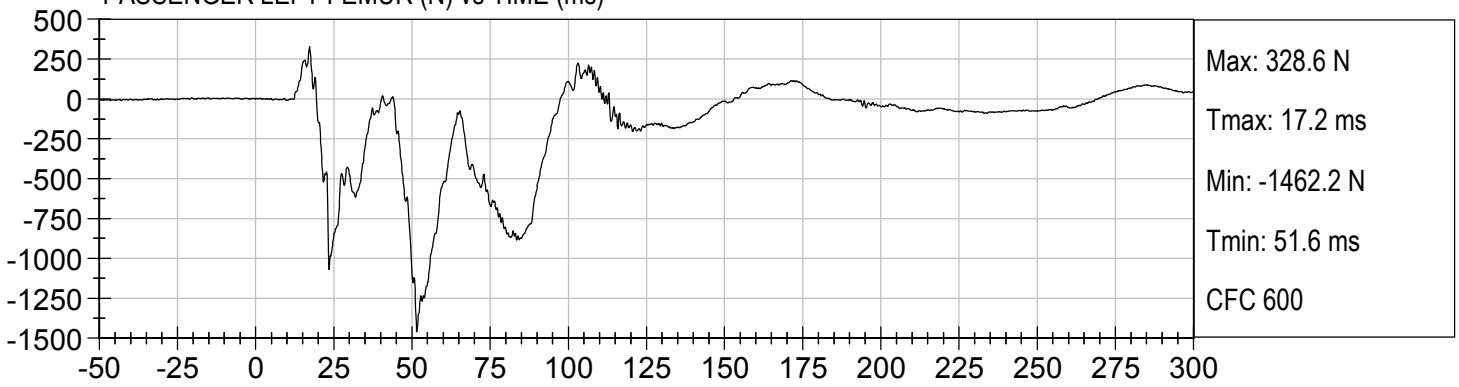
PASSENGER Nij (NCF) () vs TIME (ms)



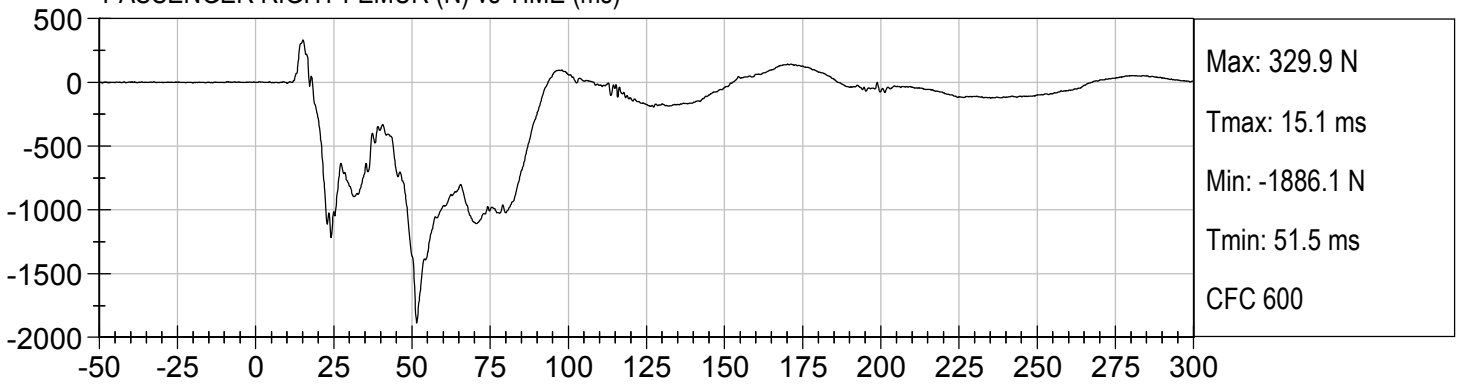
PASSENGER Nij (NCE) () vs TIME (ms)



PASSENGER LEFT FEMUR (N) vs TIME (ms)



PASSENGER RIGHT FEMUR (N) vs TIME (ms)



APPENDIX C
DUMMY 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:** D143761

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Peak Resultant Acceleration	G's	225 to 275	255	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	9.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

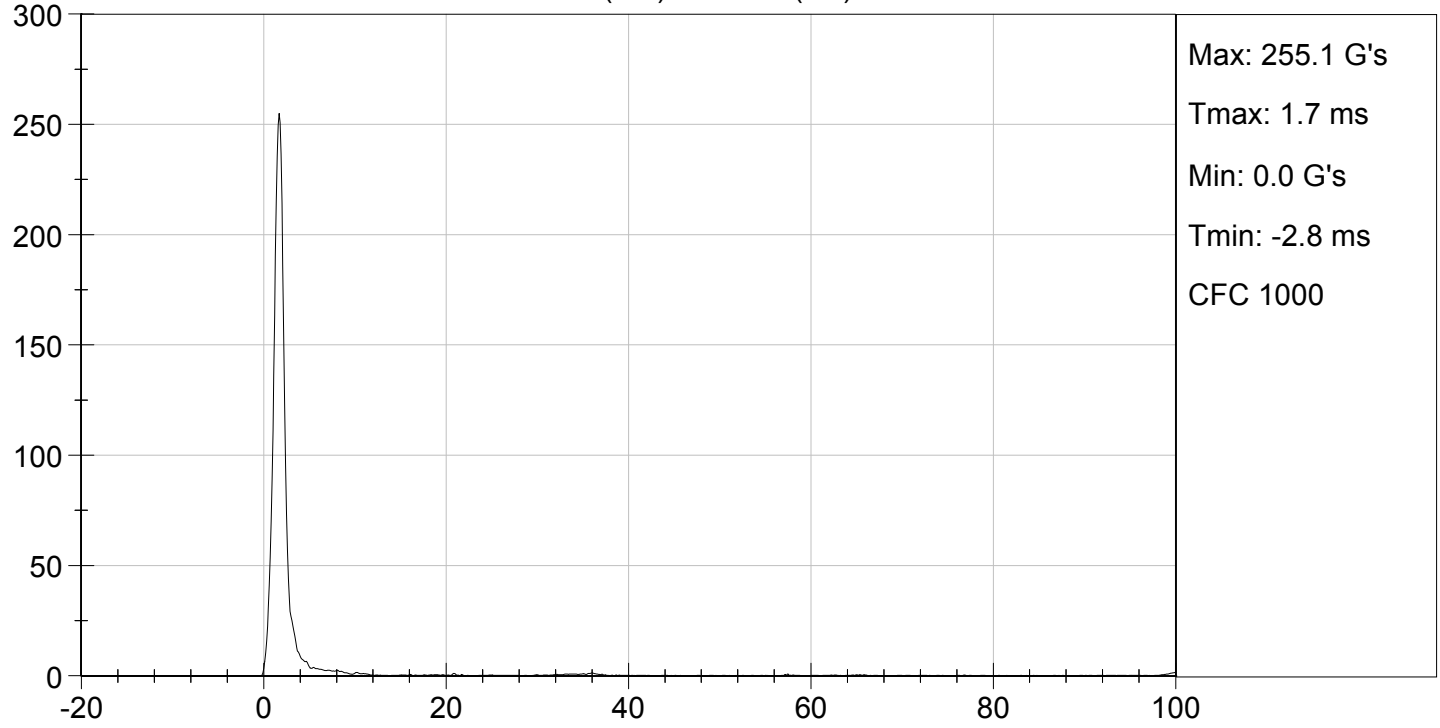
10/28/2014
Test Date

Jessica Hall
Approved By

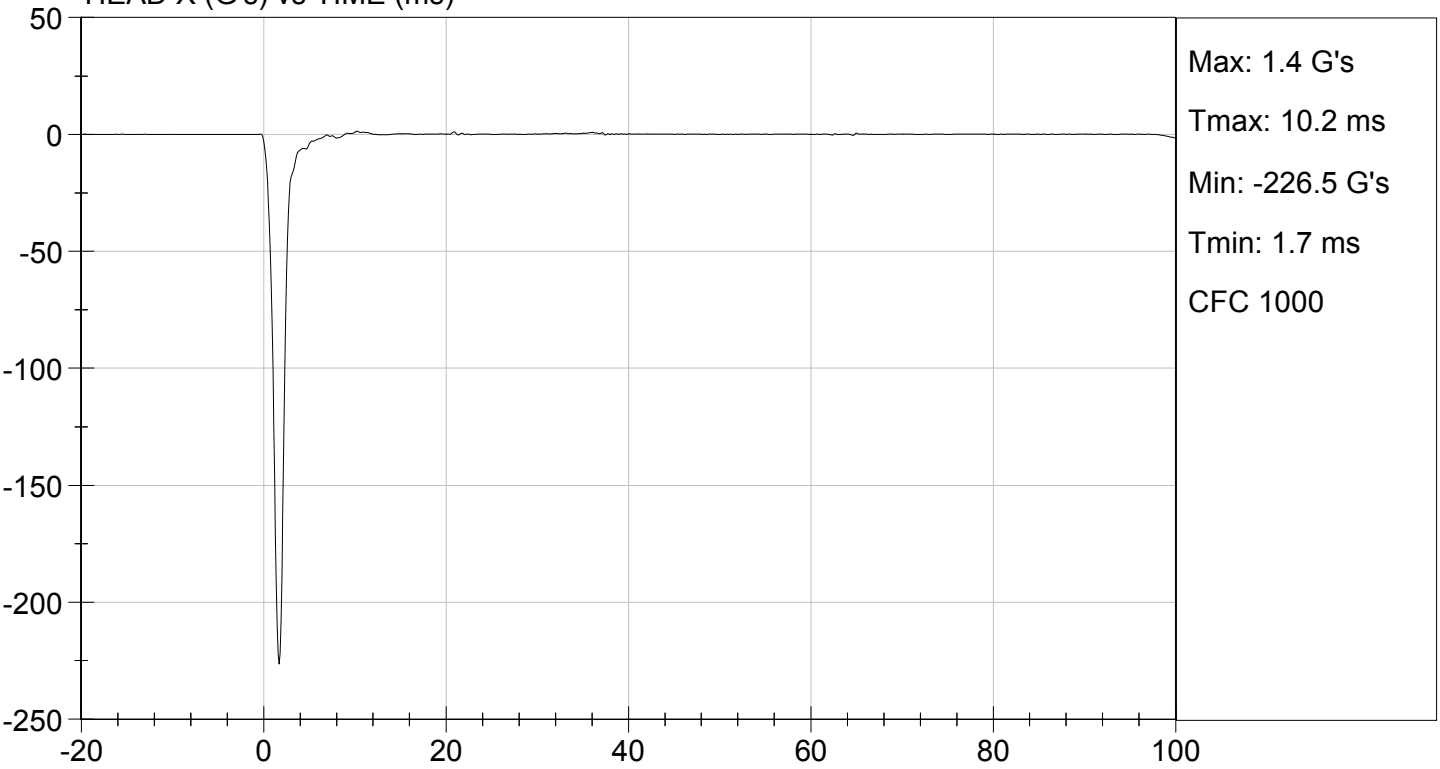
TEST DESC: HEAD DROP

TEST DATE: 10/28/2014
TEST #: D143761

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

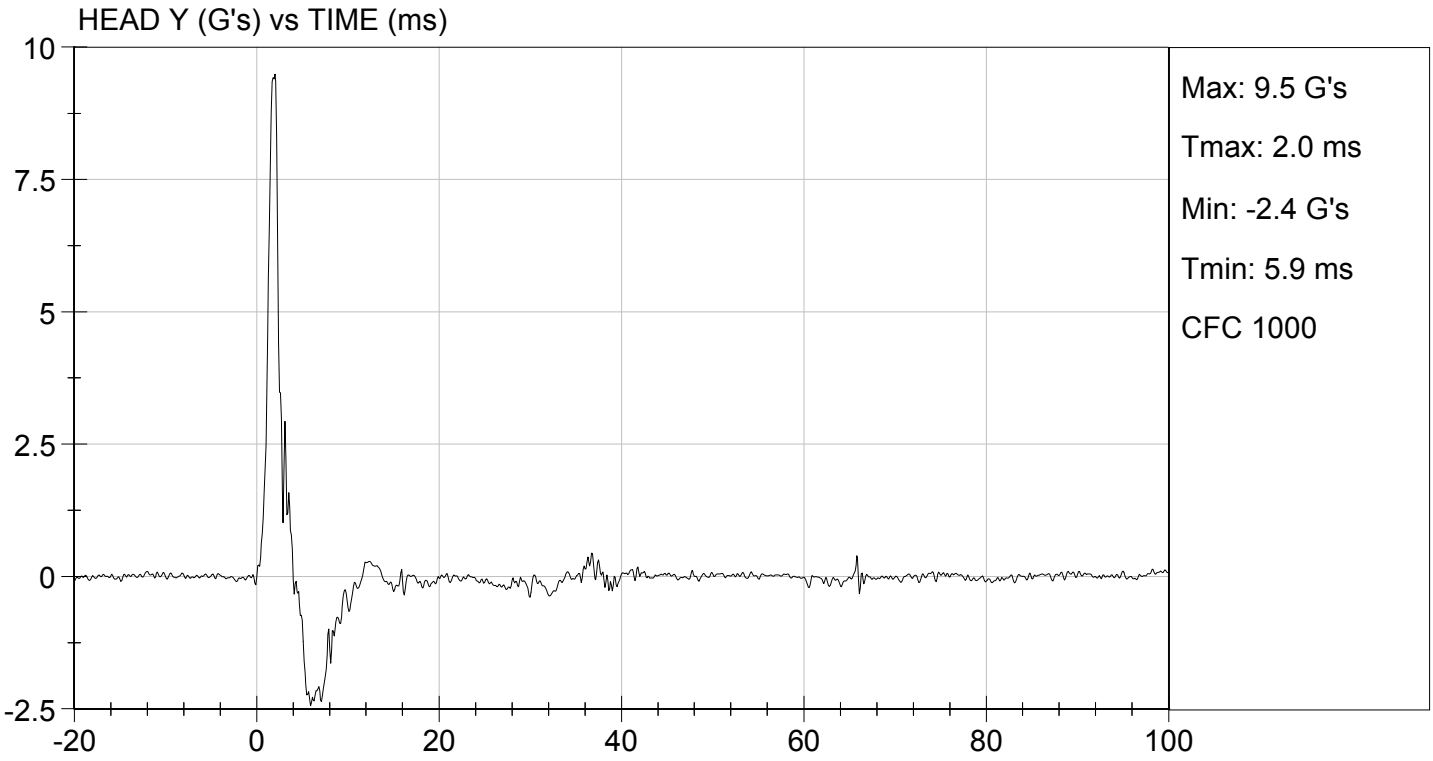


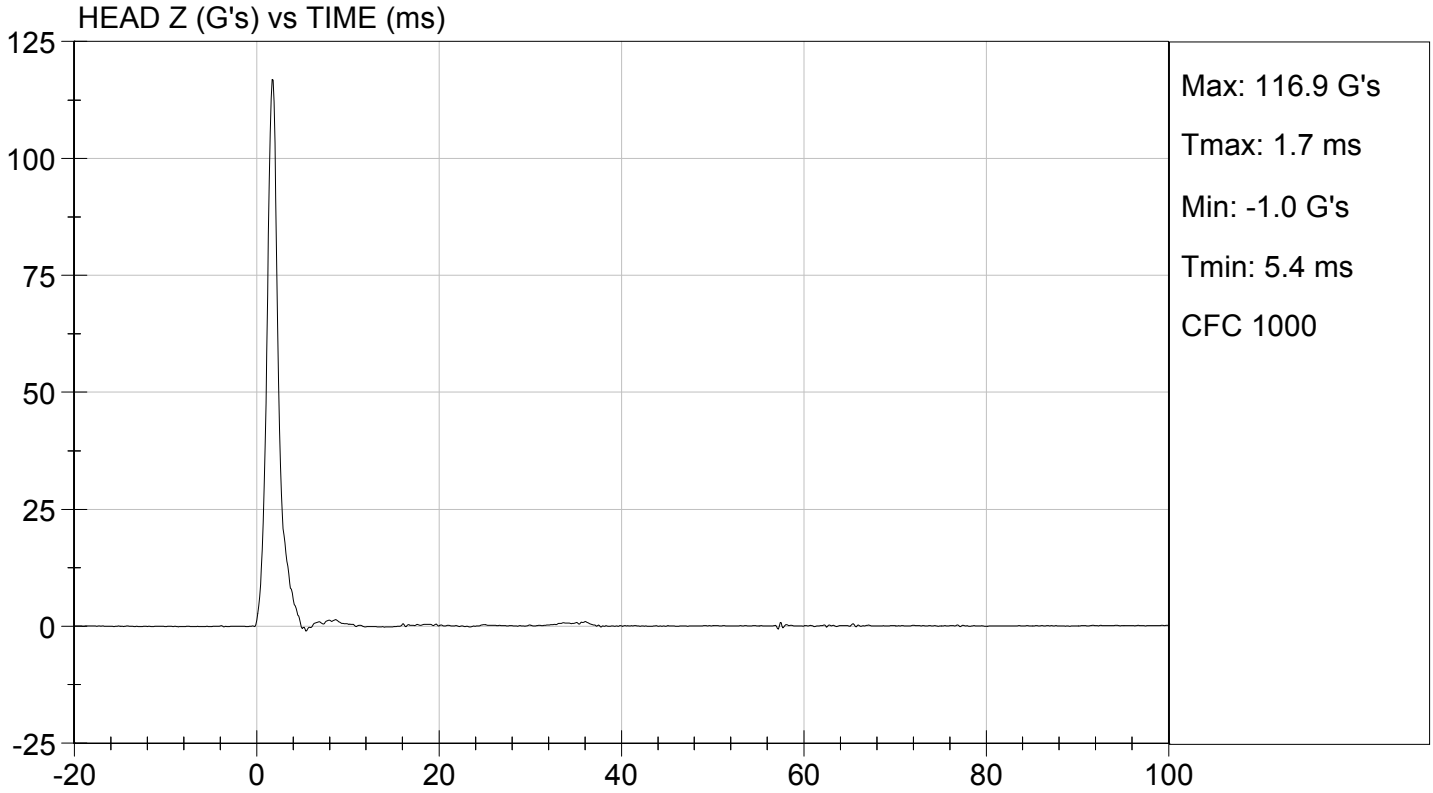
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 10/28/2014
TEST #: D143761





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D143762

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	24.31	Pass
	20 ms	G's	17.60 to 22.60	19.38	Pass
	30 ms	G's	12.50 to 18.50	14.11	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.0	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	34.2	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	64.3	Pass
	Time	ms	57.0 to 64.0	57.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	114.1	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	92.5	Pass
	Time	ms	47.0 to 58.0	48.2	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	100.6	Pass
			Overall Test Results		Pass

David Schoedel
Laboratory Technician

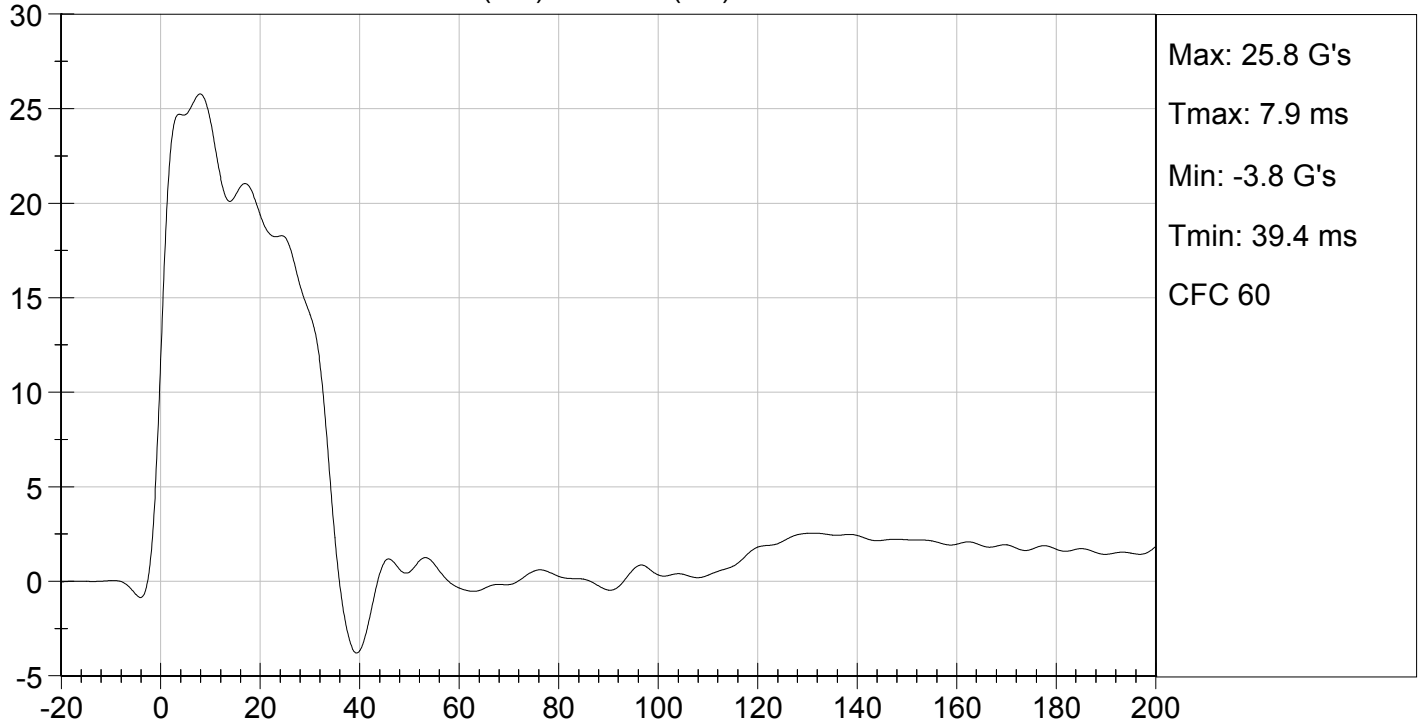
10/28/2014
Test Date

Jessica Hall
Approved By

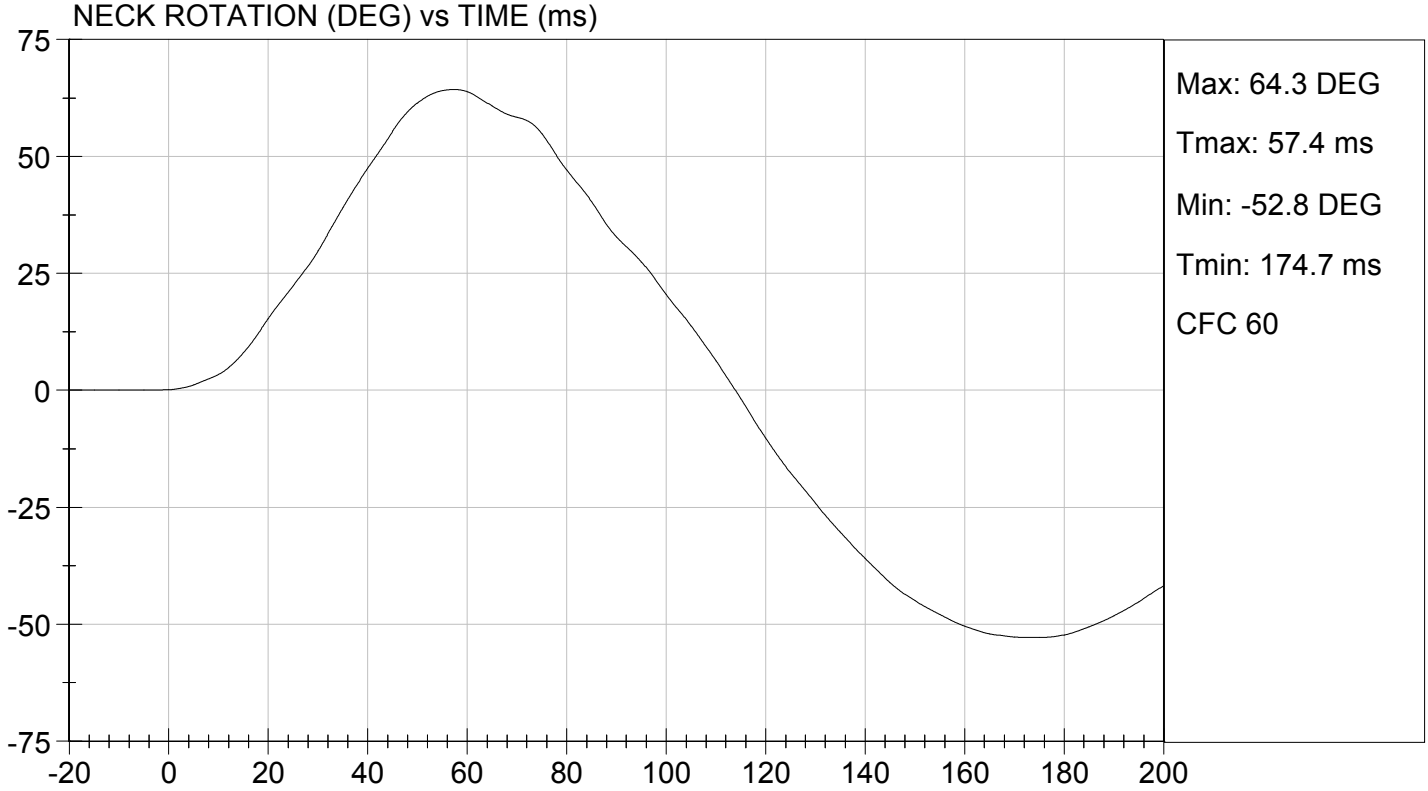
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 10/28/2014
TEST #: D143762

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



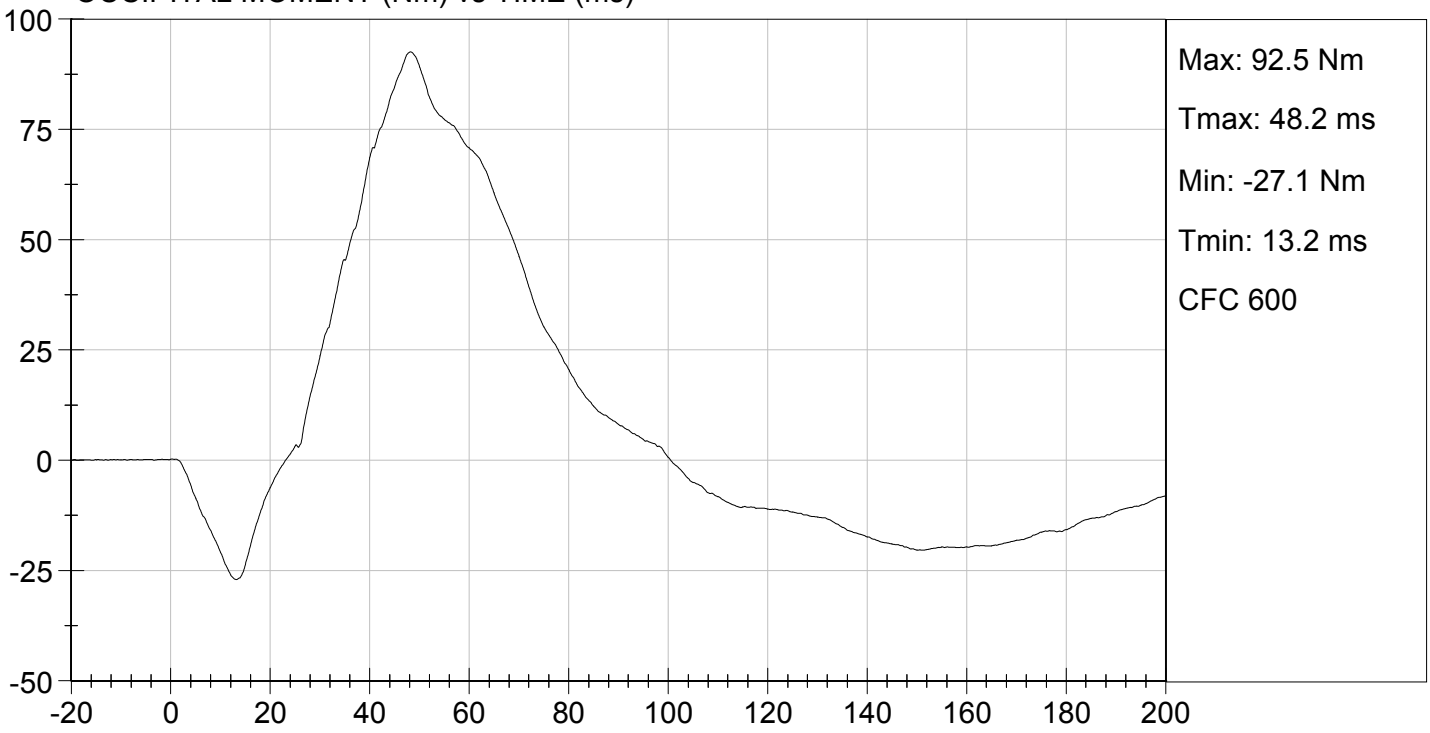
NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 10/28/2014
TEST #: D143762

OCCIPITAL MOMENT (Nm) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D143763

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.04	Pass
	20 ms	G's	14.00 to 19.00	16.34	Pass
	30 ms	G's	11.00 to 16.00	11.47	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	11.4	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	39.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	92.8	Pass
	Time	ms	72.0 to 82.0	75.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	153.1	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-60.4	Pass
	Time	ms	65.0 to 79.0	70.1	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	140.6	Pass
			Overall Test Results		Pass

David Schoedel
Laboratory Technician

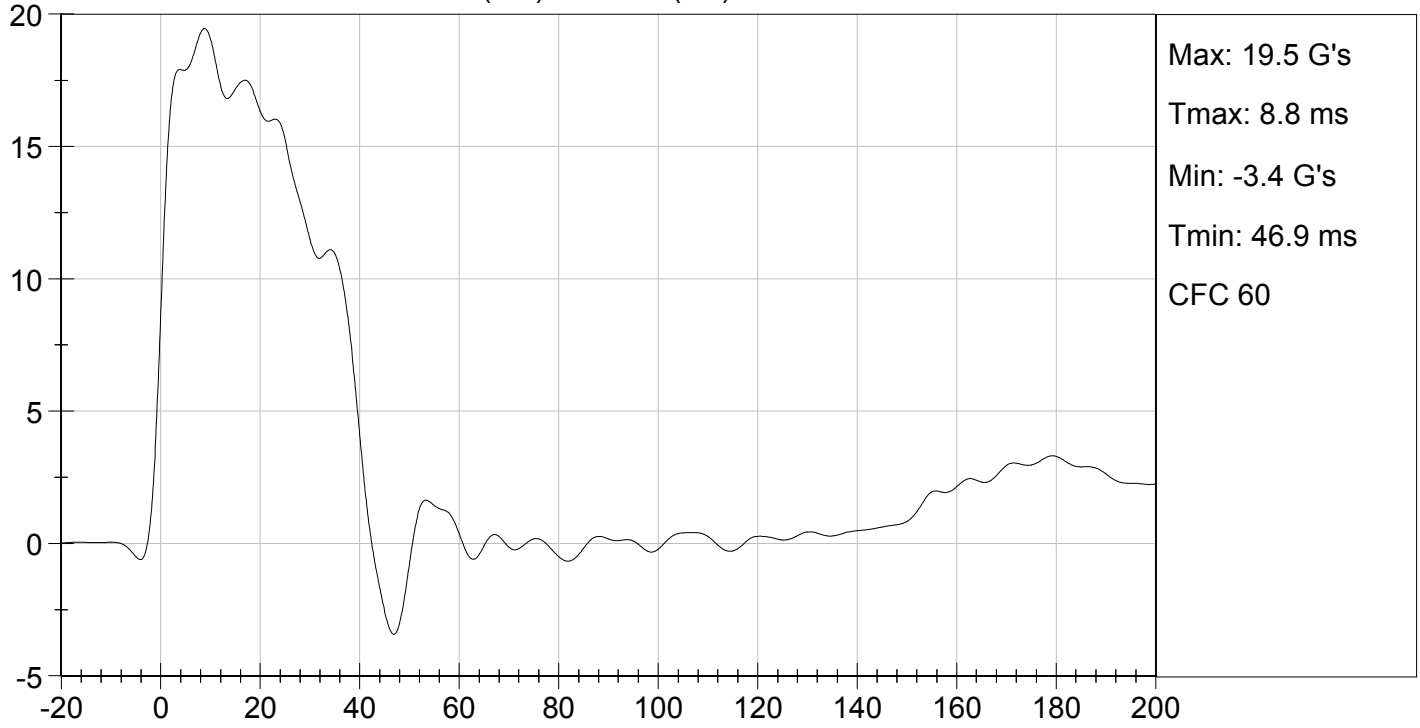
10/28/2014
Test Date

Jessica Gall
Approved By

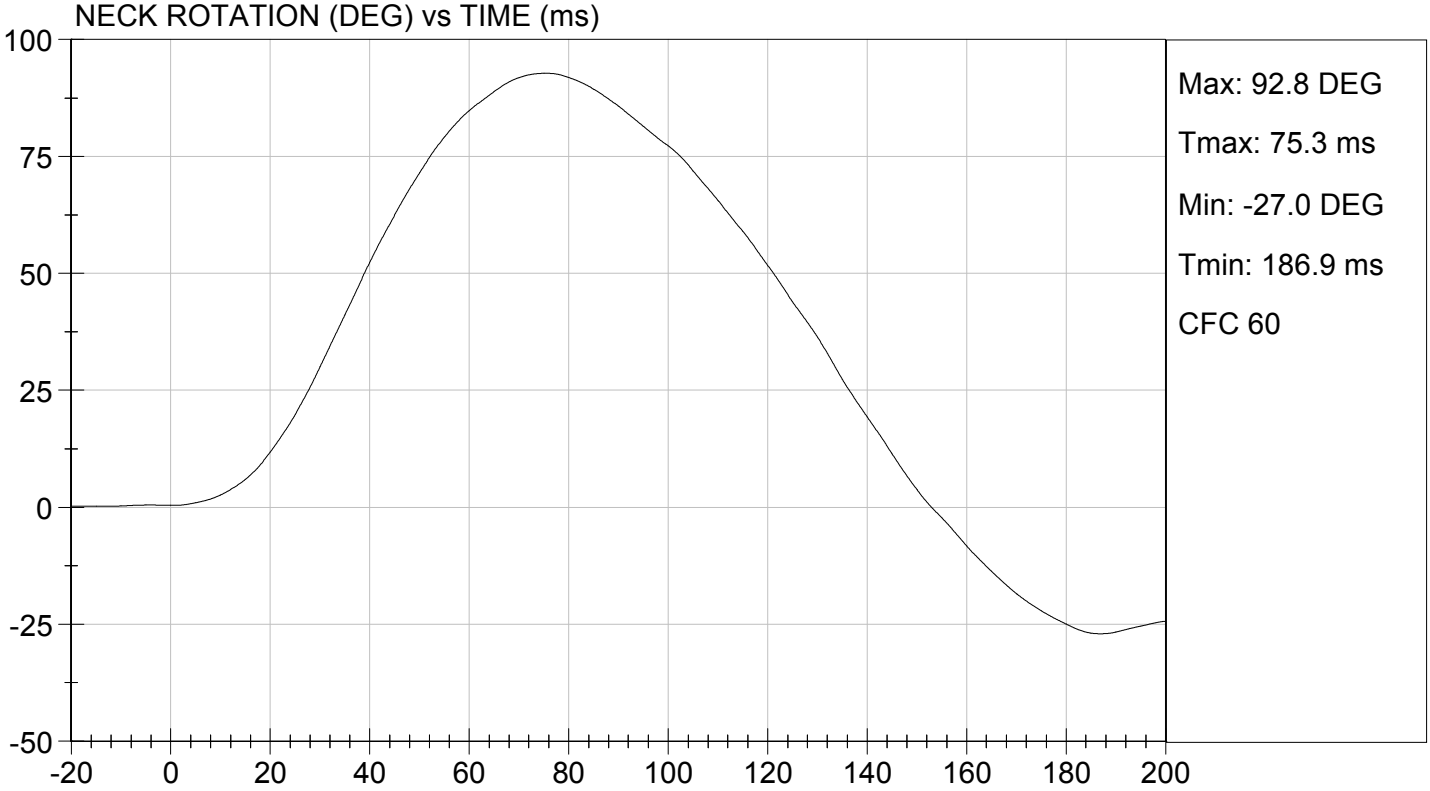
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 10/28/2014
TEST #: D143763

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

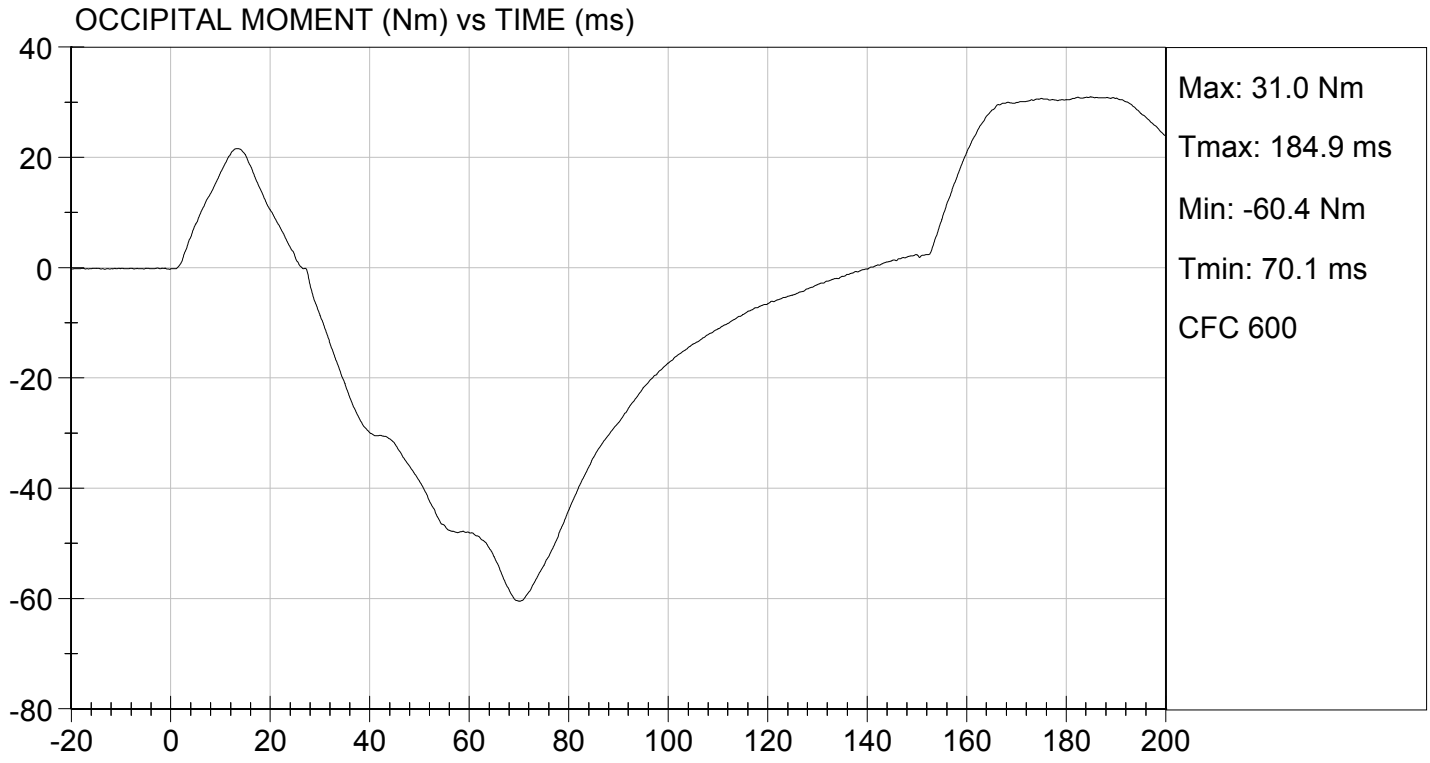


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 10/28/2014
TEST #: D143763



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D143764

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,277	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.54	Pass
Internal Hysteresis	%	69 to 85	70	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

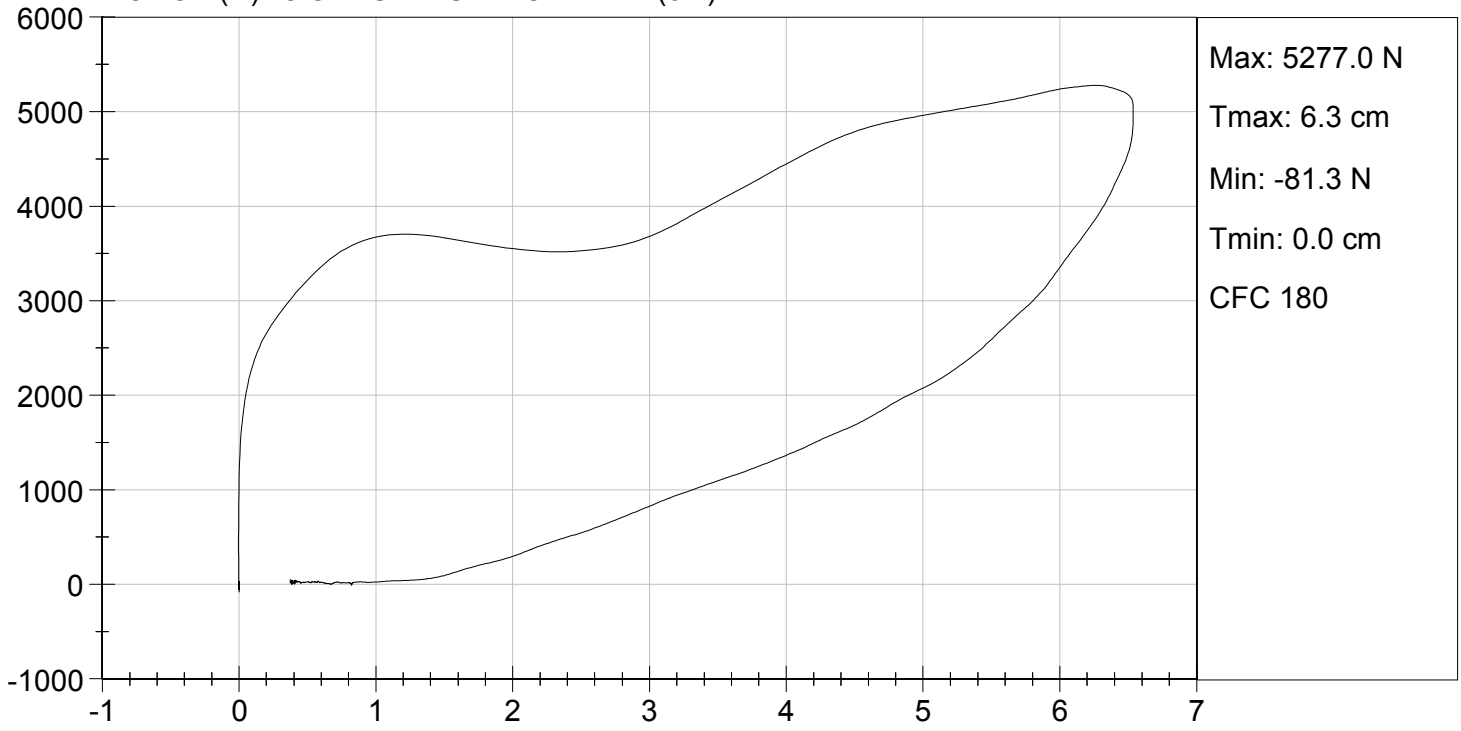
10/28/2014
Test Date

Jessica Hall
Approved By

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

TEST DATE: 10/28/2014
TEST #: D143764

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:** D143765

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	5,613	Pass
		Overall Test Results		Pass

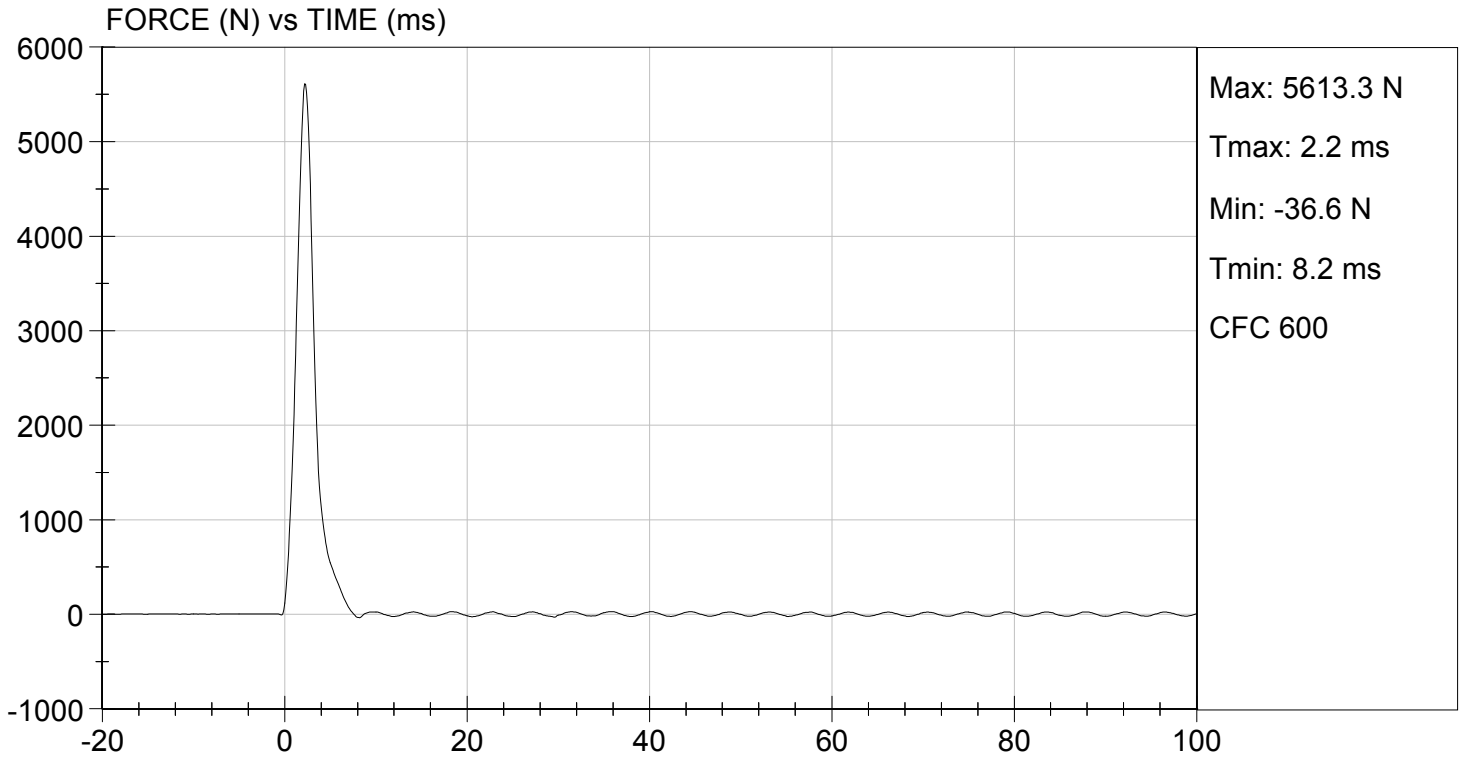
Maxime Chamberland
Laboratory Technician

10/27/2014
Test Date

Jessica Gall
Approved By

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

TEST DATE: 10/27/2014
TEST #: D143765



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D143766

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	4,875	Pass
		Overall Test Results		Pass

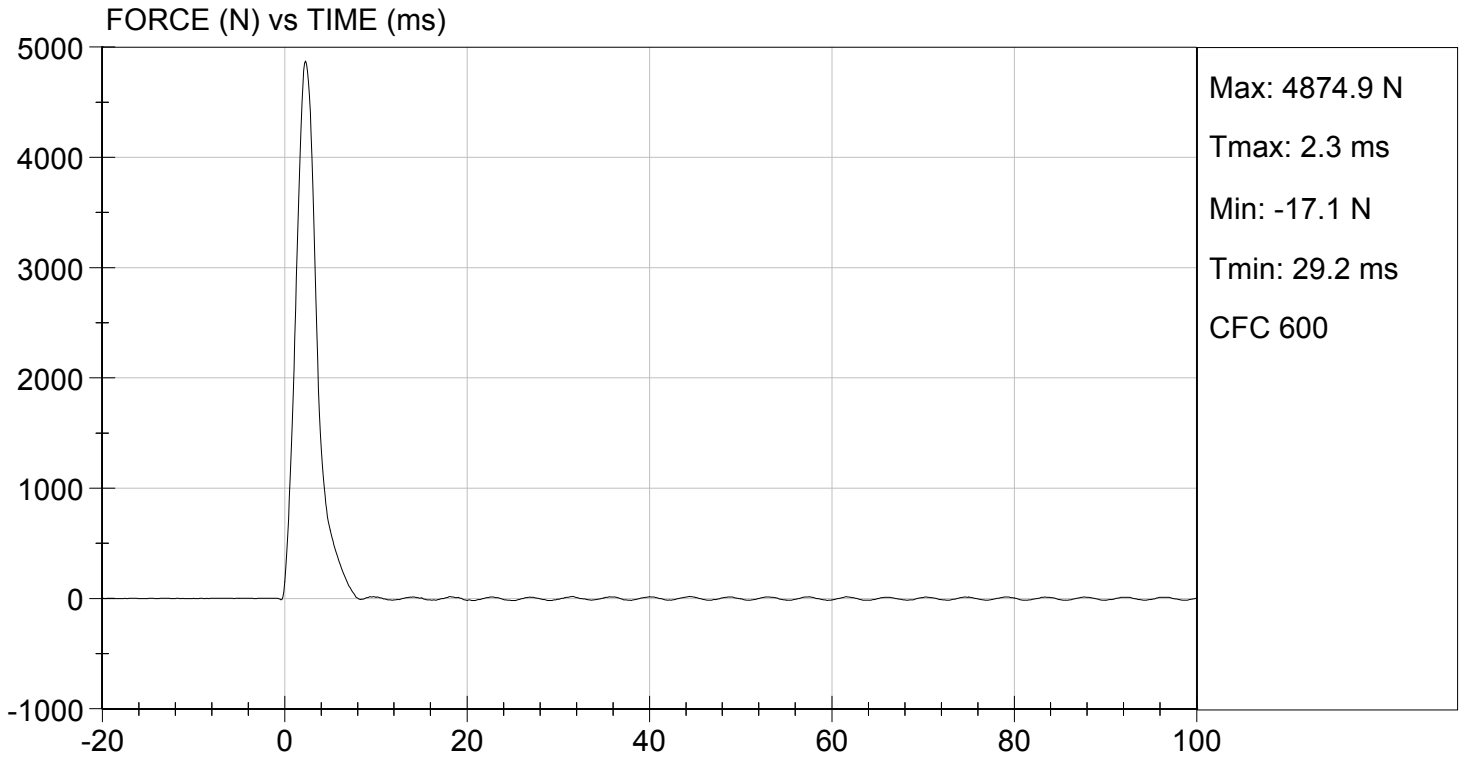
Maxime Chamberland
Laboratory Technician

10/27/2014
Test Date

Jessica Hall
Approved By

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

TEST DATE: 10/27/2014
TEST #: D143766



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D143760

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	49	49	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.1	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	59.3	67.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	44.2	46.6	Pass
		Overall Test Results			Pass

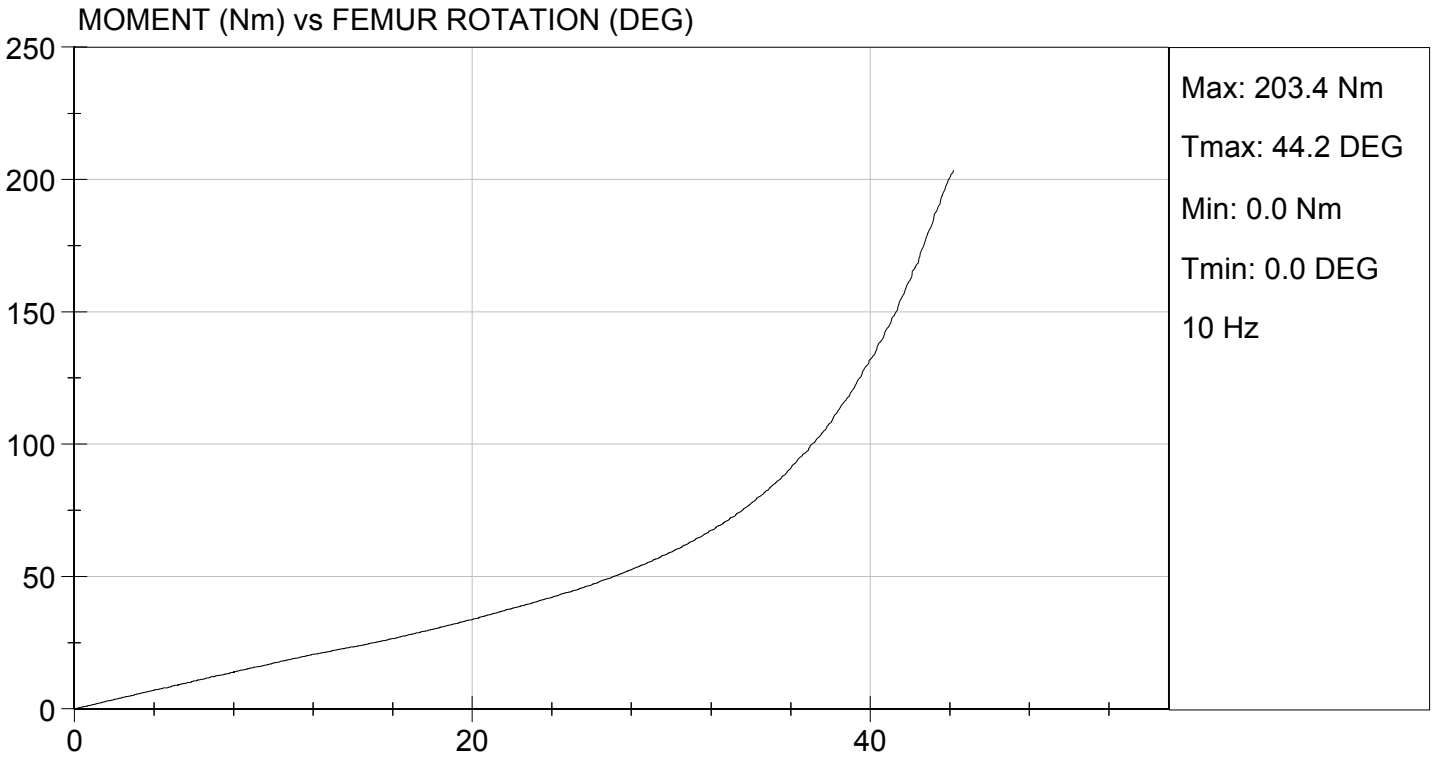
David Schoedel
Laboratory Technician

10/28/2014
Test Date

Jessica Hall
Approved By

TEST DESC: RIGHT HIP FEMUR FLEXION

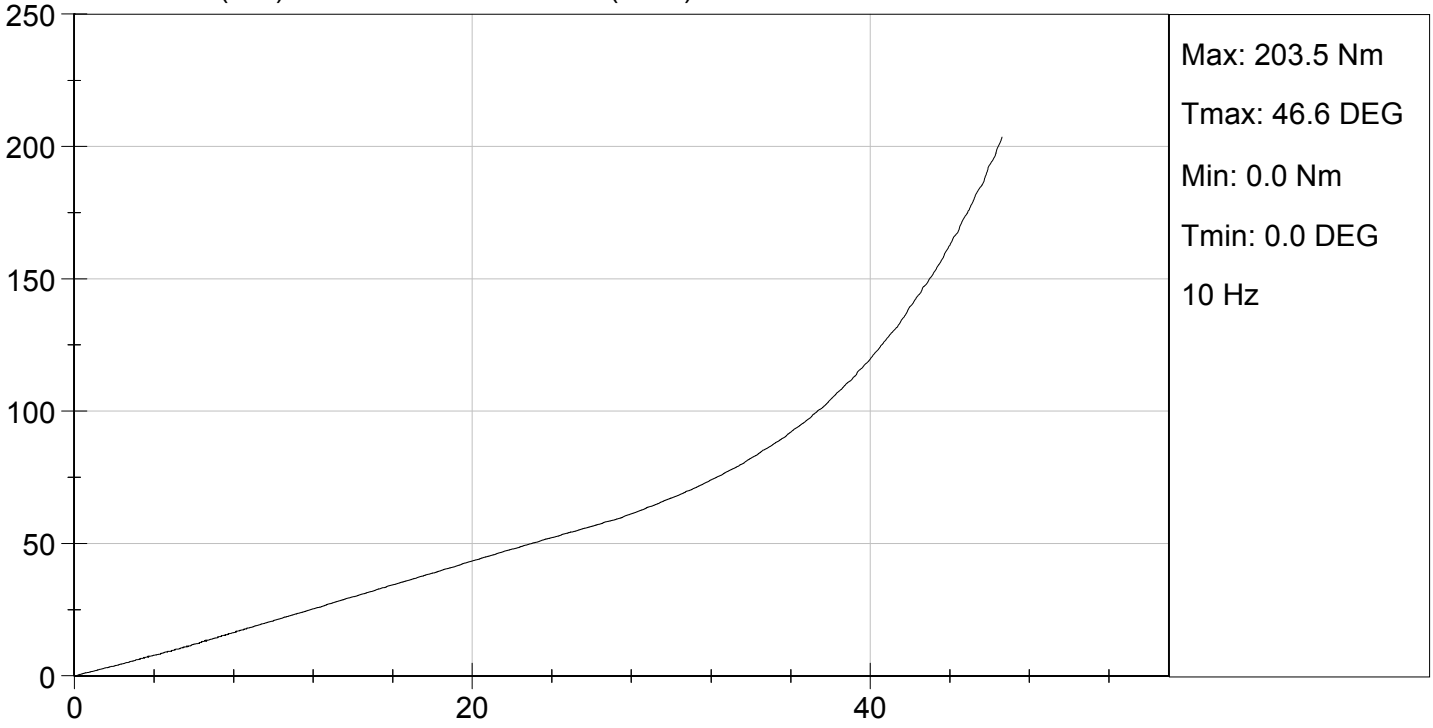
TEST DATE: 10/28/2014
TEST #: D143769



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 10/28/2014
TEST #: D143760

MOMENT (Nm) vs FEMUR ROTATION (DEG)



MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test ID:** D143961

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	34	Pass
Peak Resultant Acceleration	G's	225 to 275	243	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

David Schoedel
Laboratory Technician

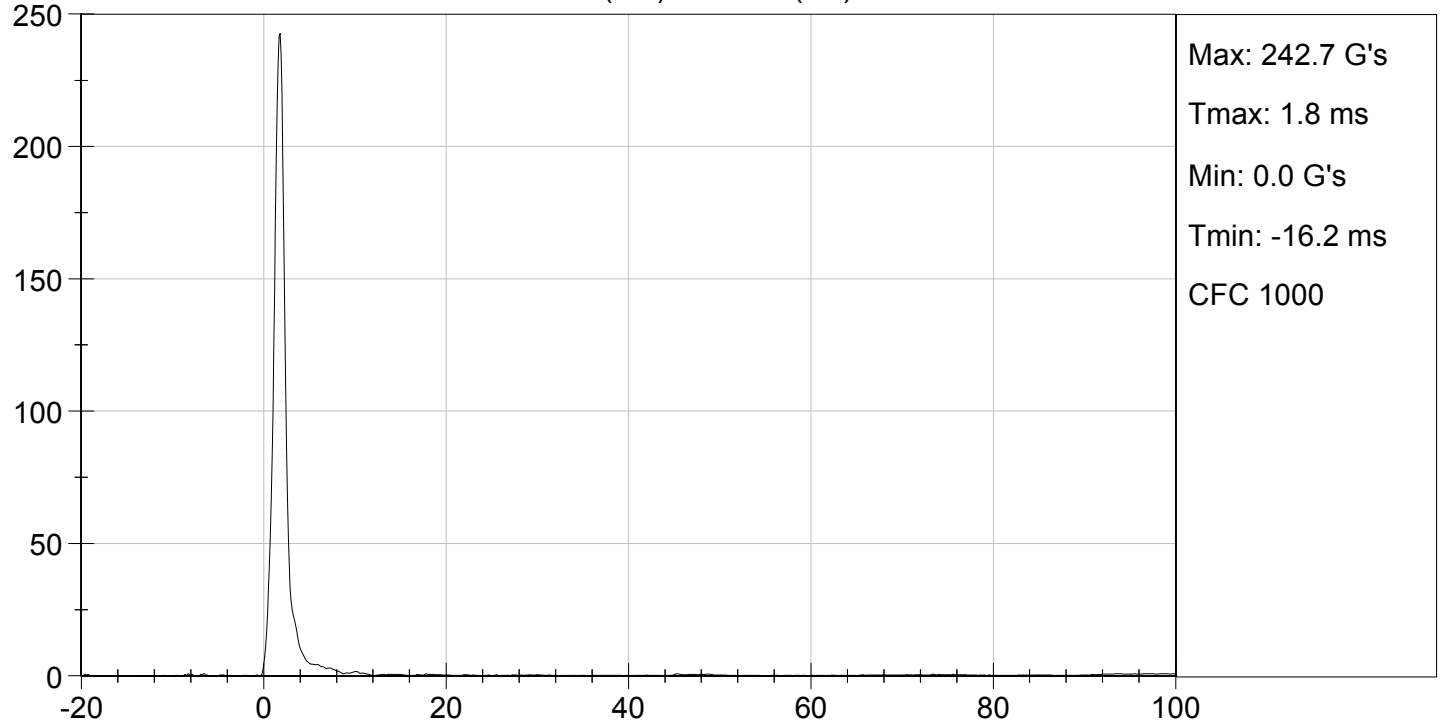
11/11/2014
Test Date

Jessica Gall
Approved By

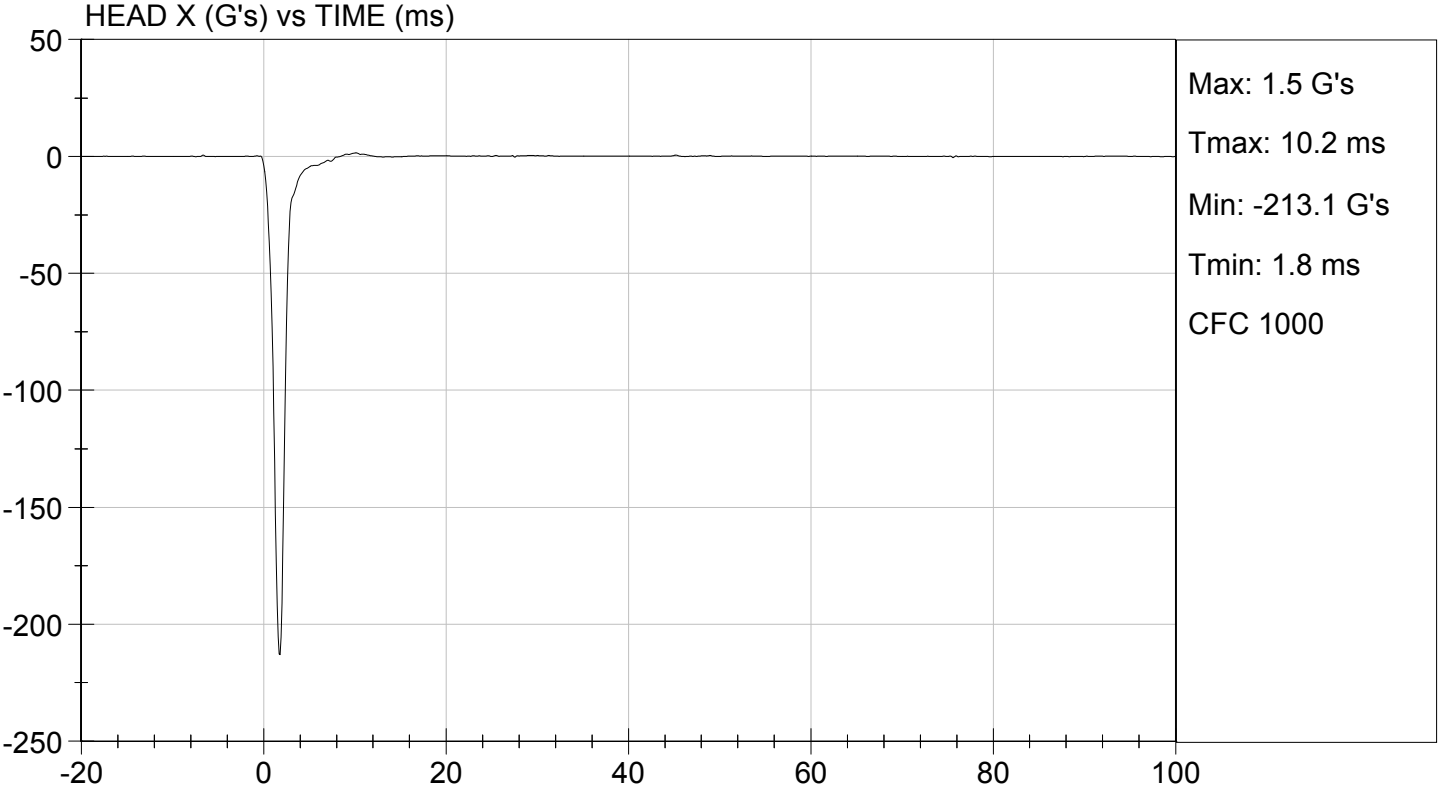
TEST DESC: HEAD DROP

TEST DATE: 11/11/2014
TEST #: D143961

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



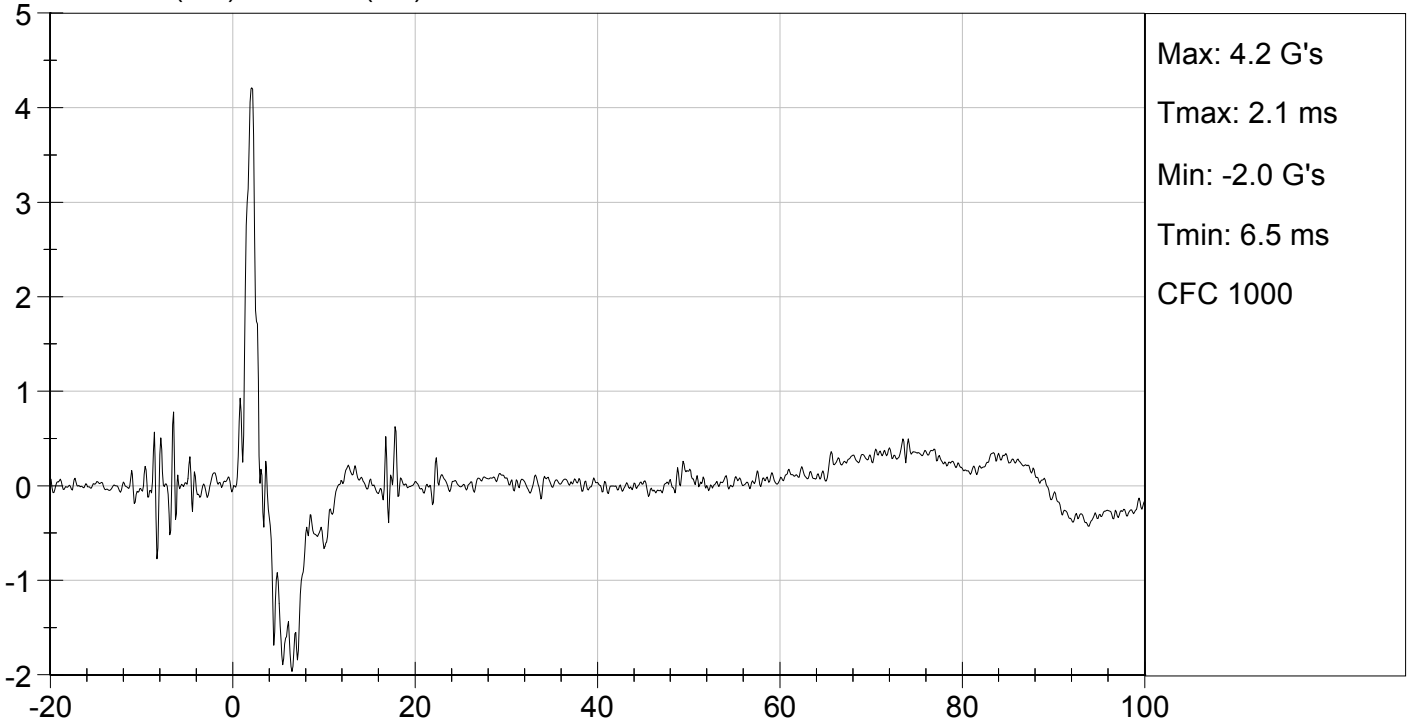
HEAD X (G's) vs TIME (ms)



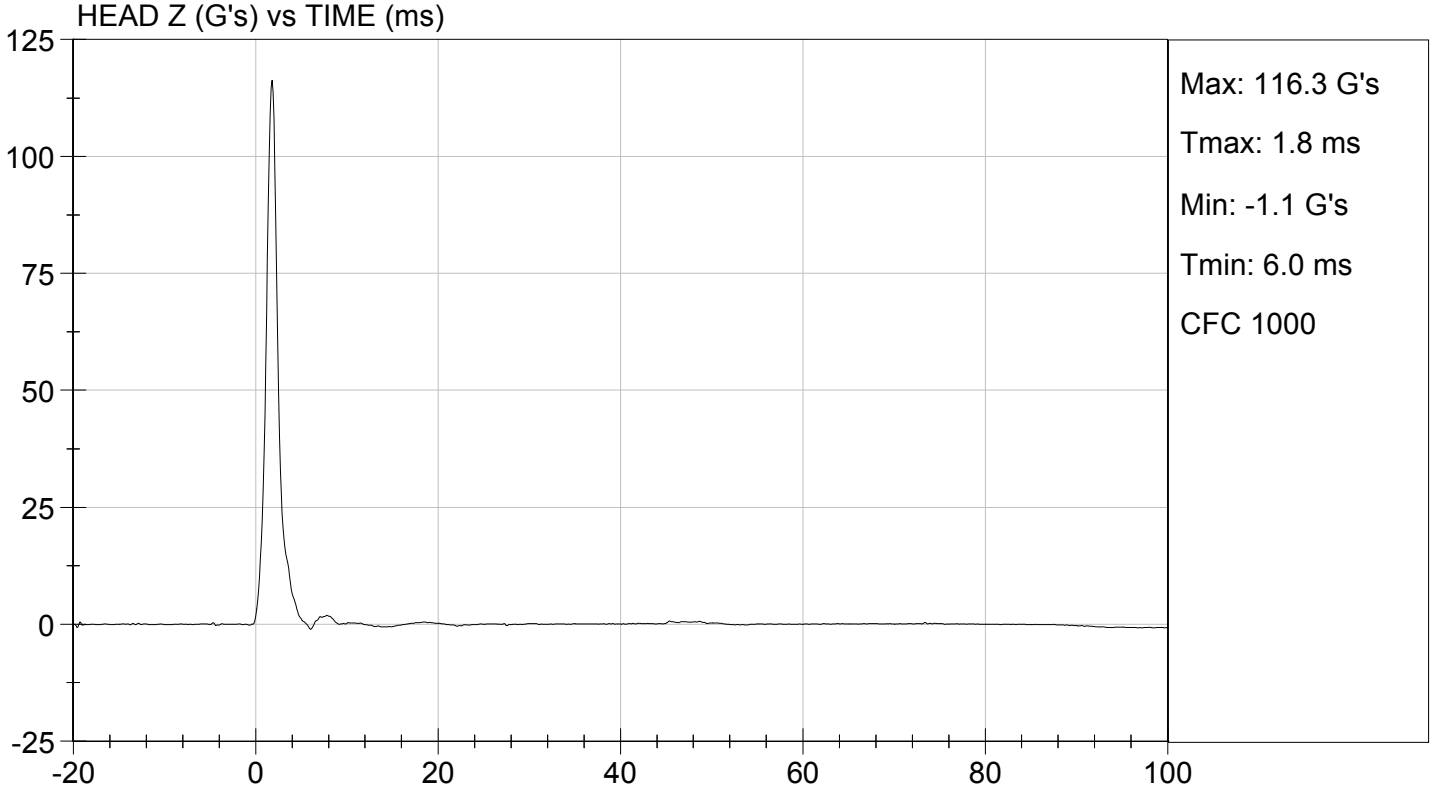
TEST DESC: HEAD DROP

TEST DATE: 11/11/2014
TEST #: D143961

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D143962

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.52	Pass
	20 ms	G's	17.60 to 22.60	19.42	Pass
	30 ms	G's	12.50 to 18.50	13.63	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	13.9	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	37.5	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	69.0	Pass
	Time	ms	57.0 to 64.0	57.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	116.9	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	95.7	Pass
	Time	ms	47.0 to 58.0	50.1	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.3	Pass
			Overall Test Results		Pass

David Schoedel
Laboratory Technician

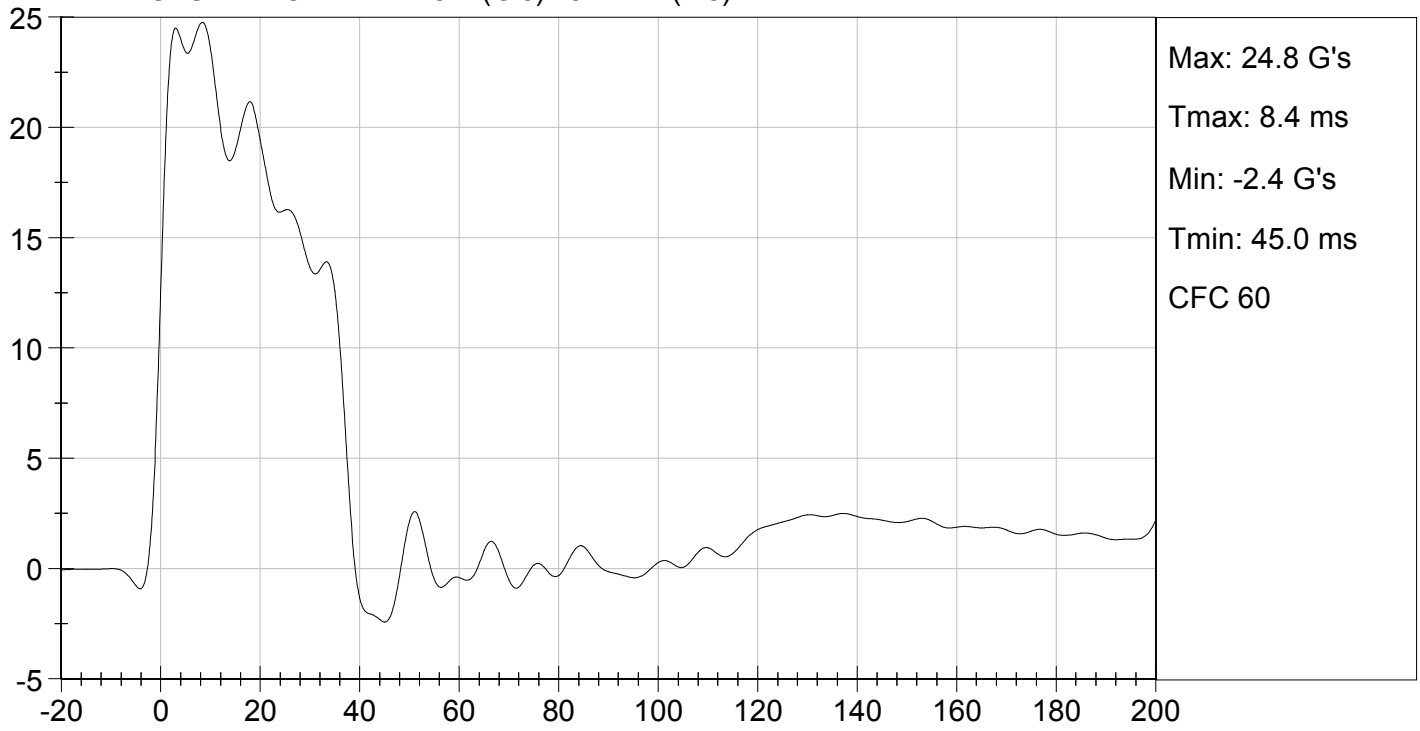
11/11/2014
Test Date

Jessica Hall
Approved By

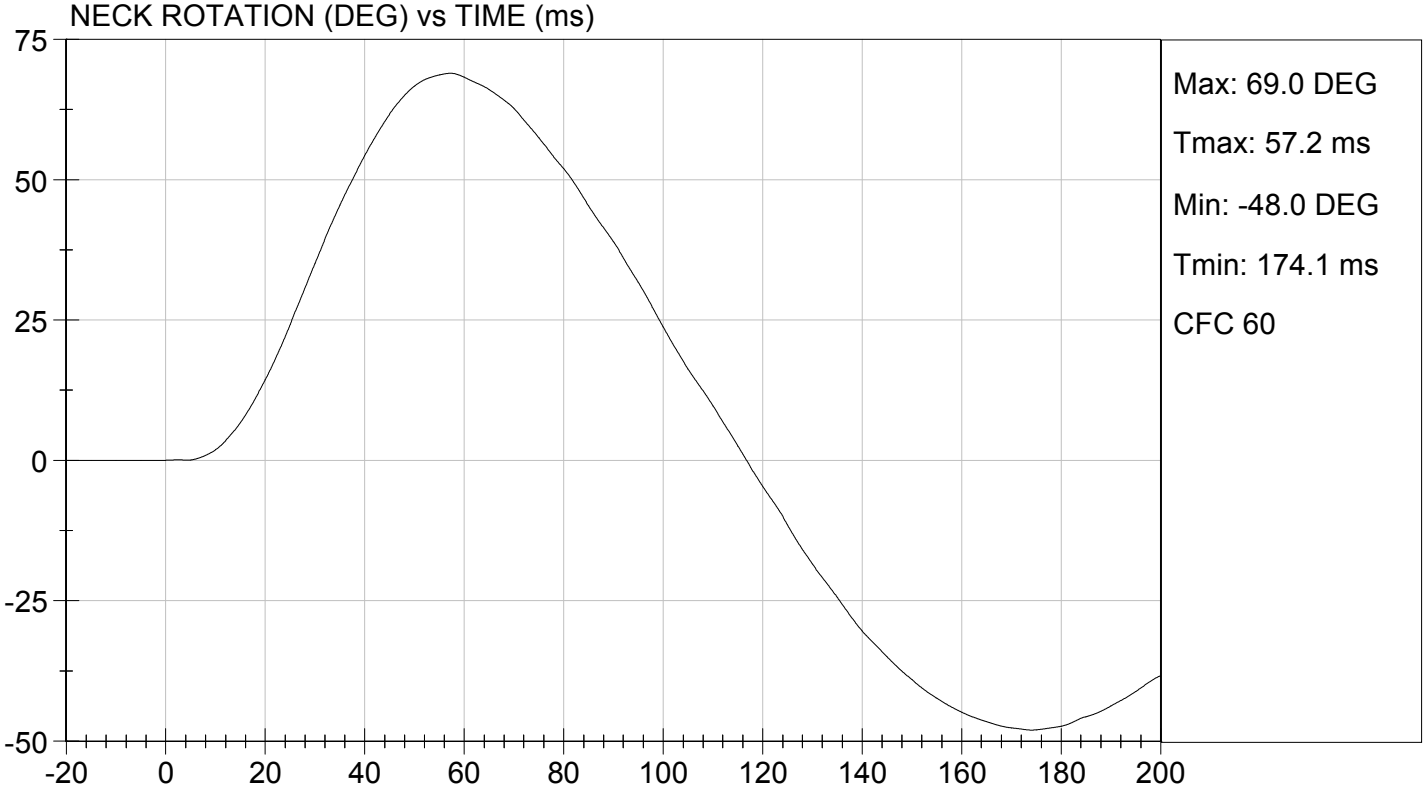
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 11/11/2014
TEST #: D143962

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

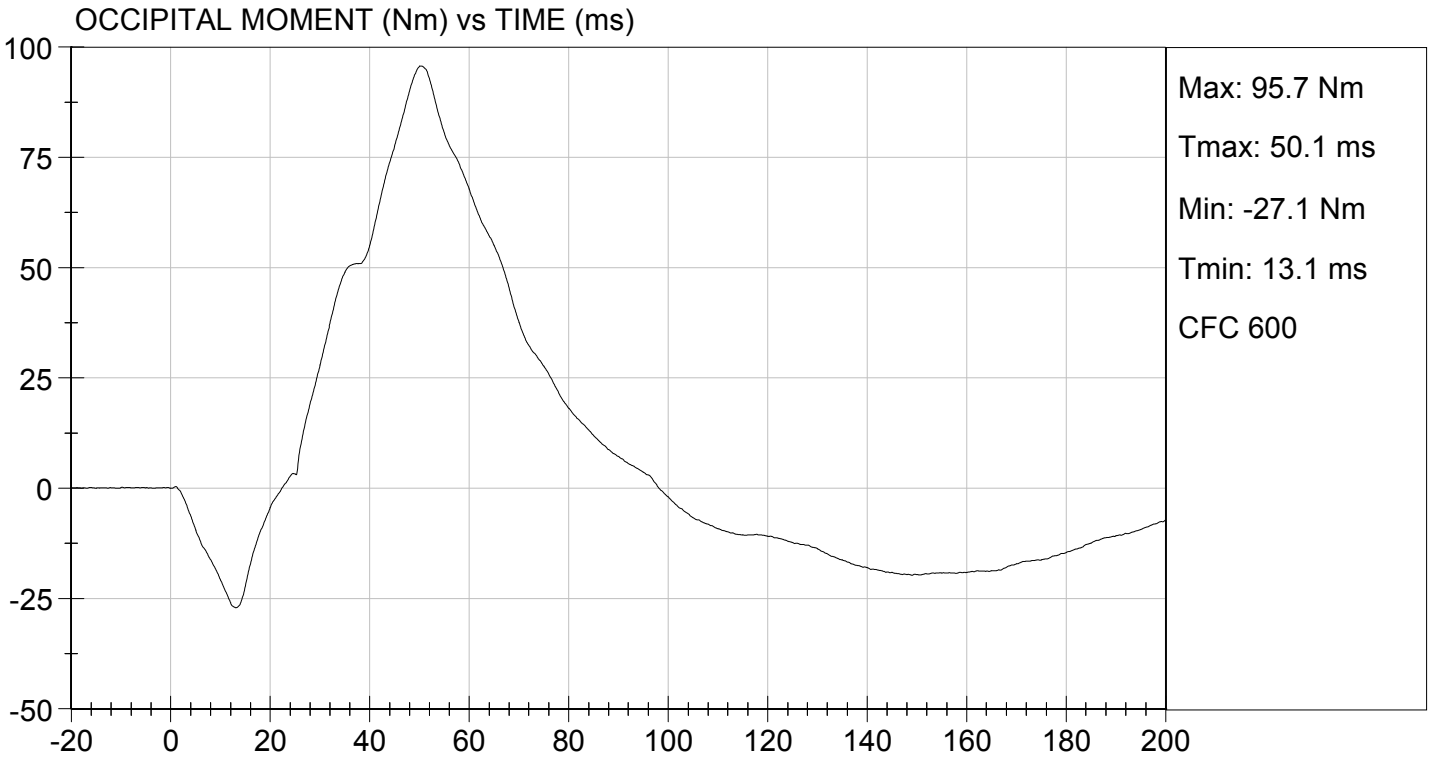


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 11/11/2014
TEST #: D143962



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D143963

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.20	Pass
	20 ms	G's	14.00 to 19.00	14.61	Pass
	30 ms	G's	11.00 to 16.00	12.20	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	42.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	90.7	Pass
	Time	ms	72.0 to 82.0	77.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	154.7	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-56.2	Pass
	Time	ms	65.0 to 79.0	72.7	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	143.4	Pass
			Overall Test Results		Pass

David Schoedel
Laboratory Technician

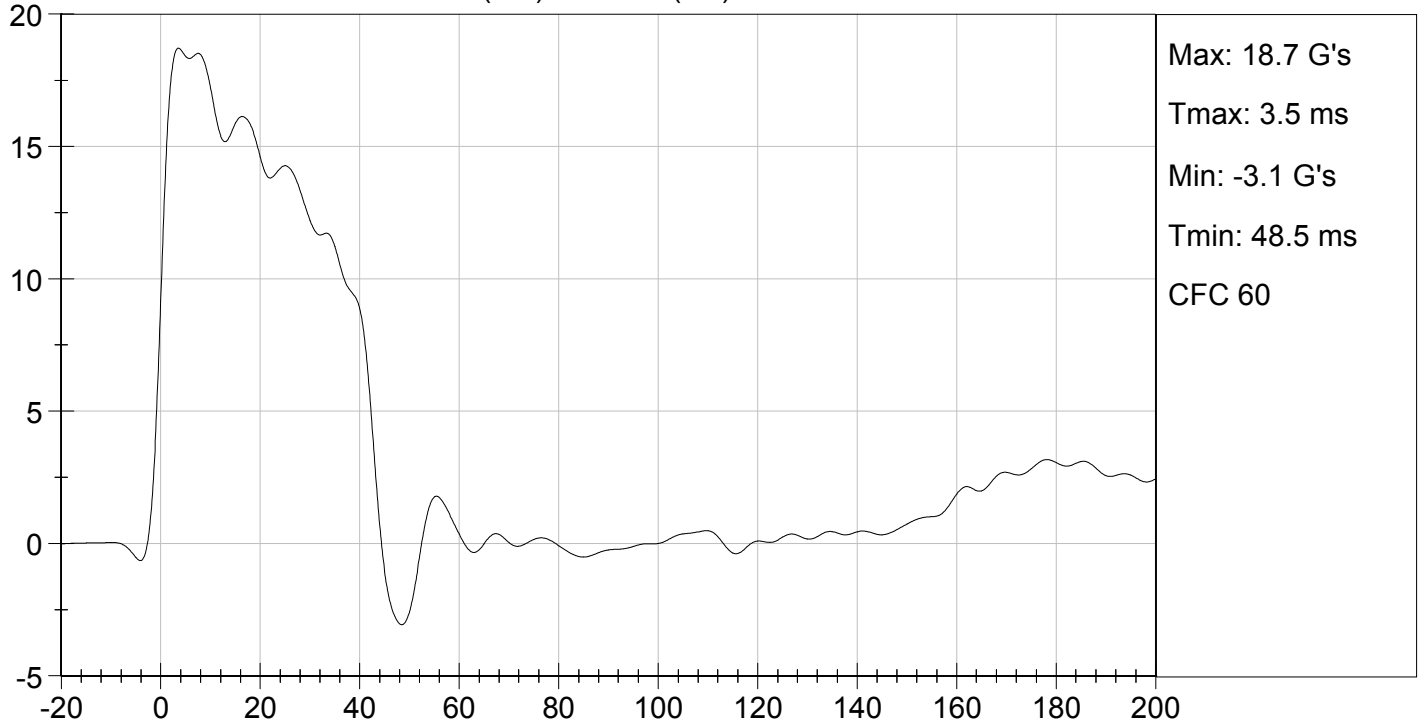
11/11/2014
Test Date

Jessica Hall
Approved By

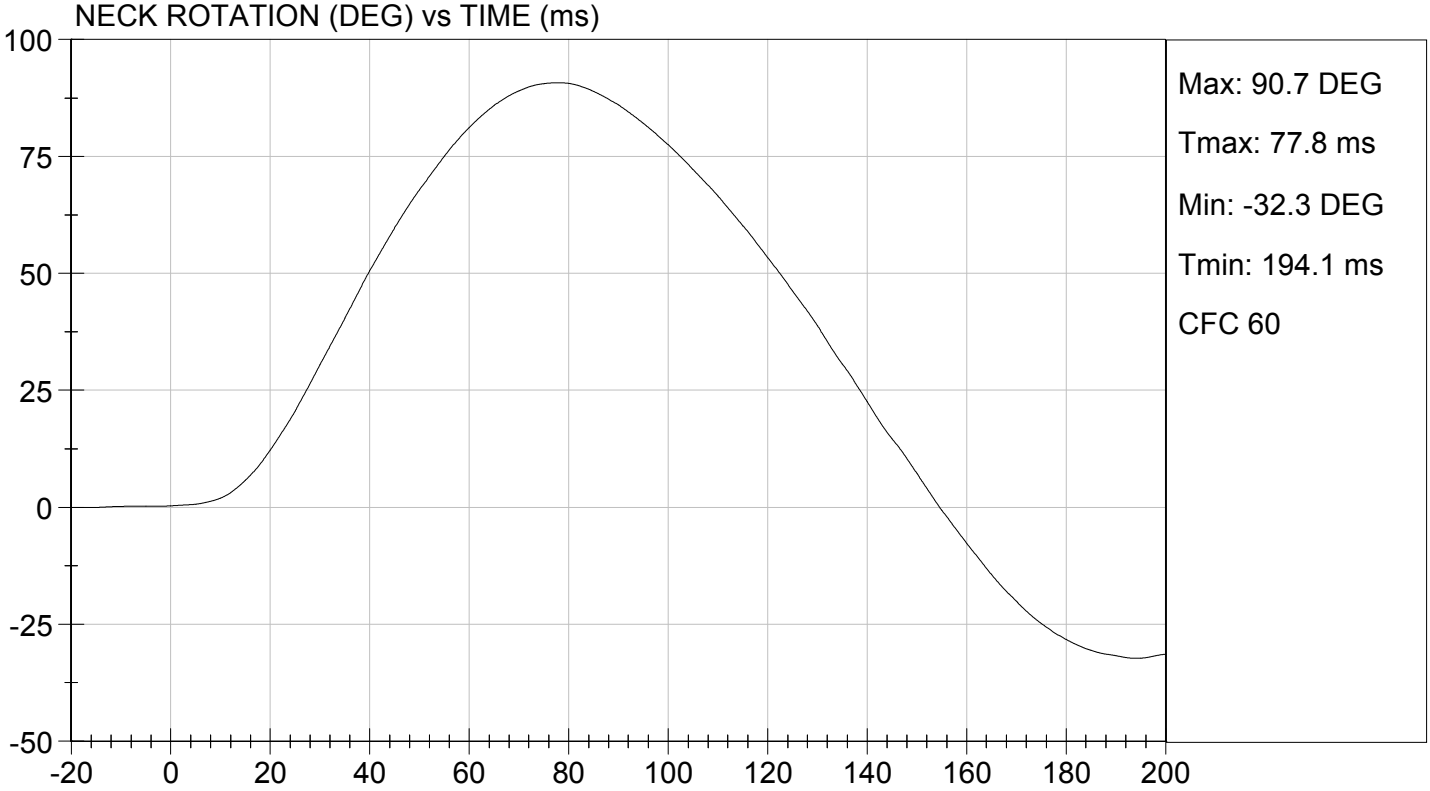
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 11/11/2014
TEST #: D143963

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

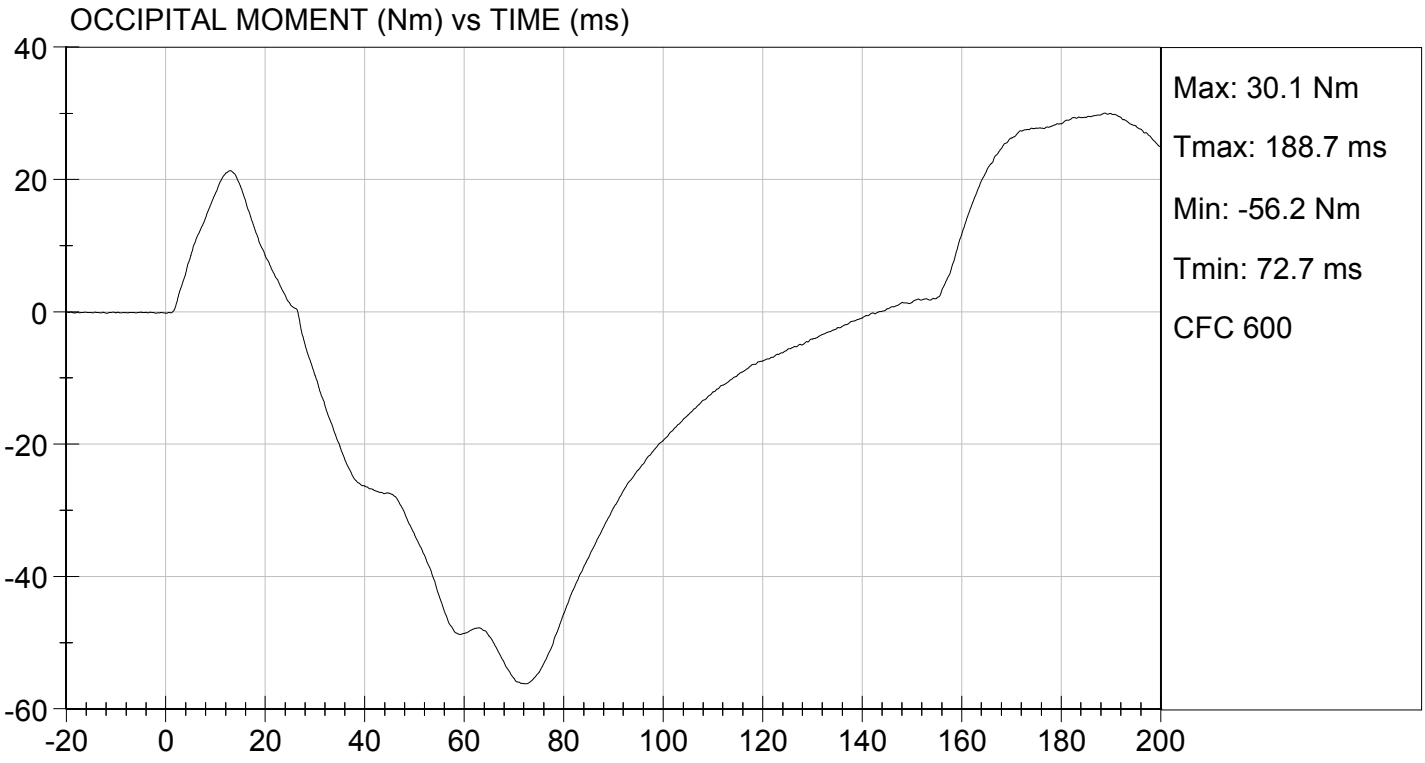


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 11/11/2014
TEST #: D143963



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D143964

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,442	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.41	Pass
Internal Hysteresis	%	69 to 85	70	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

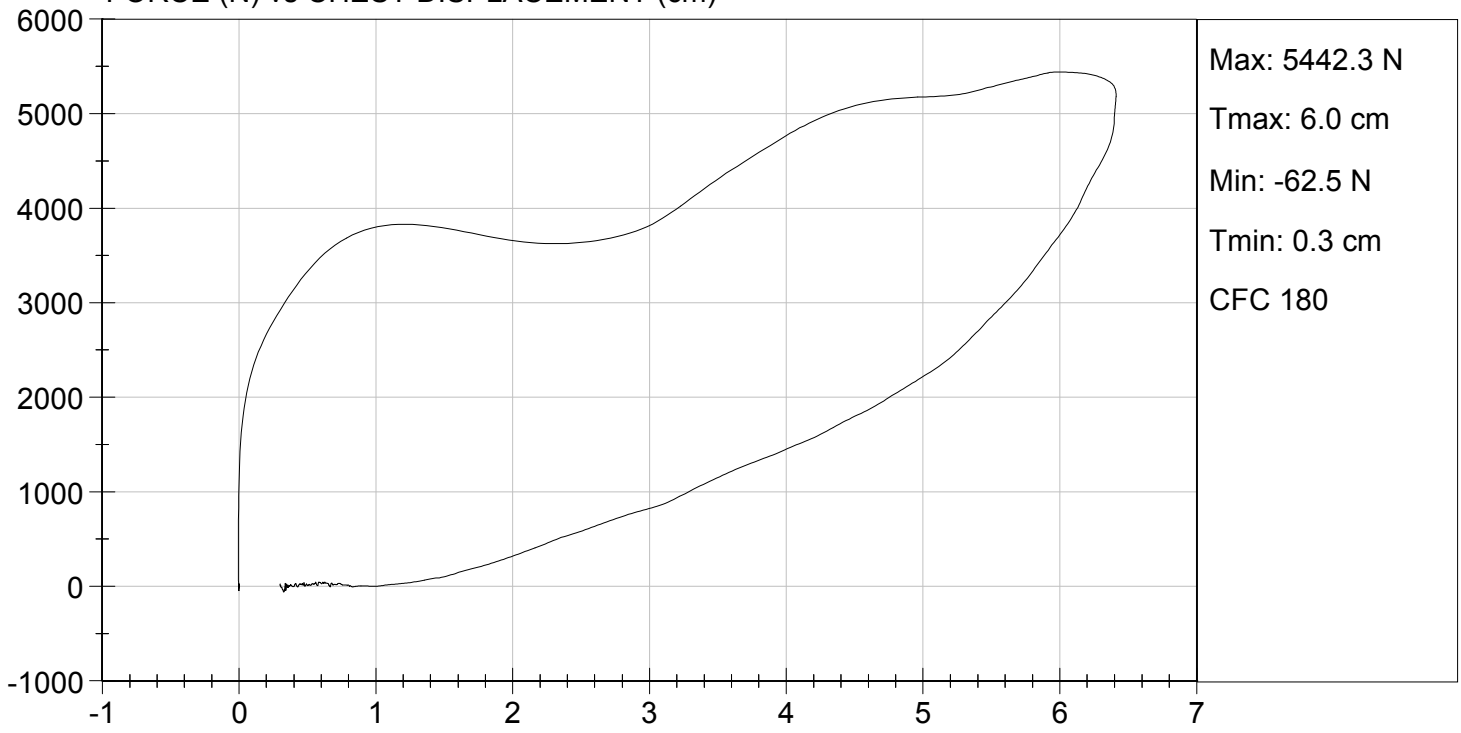
11/12/2014
Test Date

Jessica Hall
Approved By

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

TEST DATE: 11/12/2014
TEST #: D143964

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:** D143965

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	5,540	Pass
		Overall Test Results		Pass

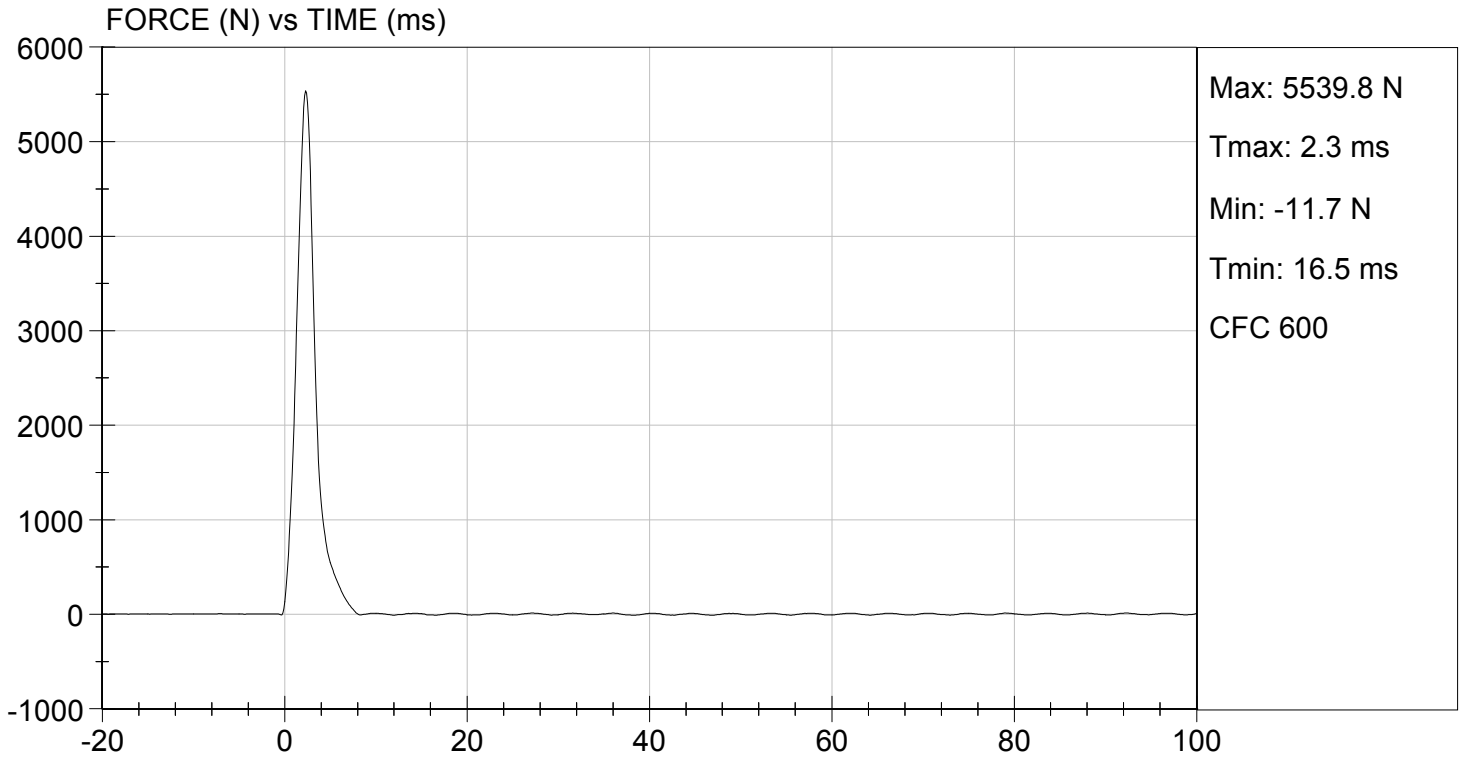
David Schoedel
Laboratory Technician

11/11/2014
Test Date

Jessica Hall
Approved By

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

TEST DATE: 11/11/2014
TEST #: D143965



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D143966

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/s	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	5,020	Pass
		Overall Test Results		Pass

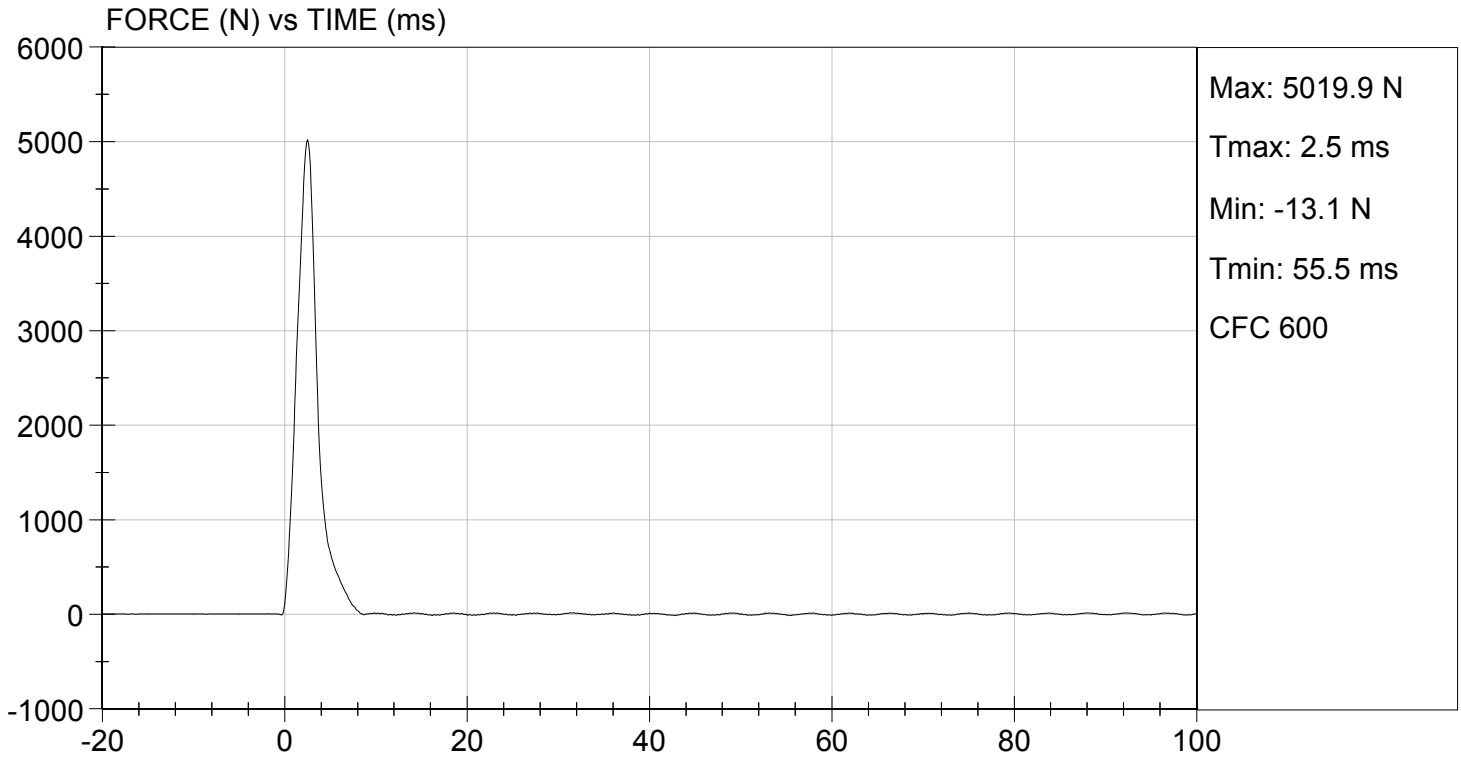
David Schoedel
Laboratory Technician

11/11/2014
Test Date

Jessica Hall
Approved By

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

TEST DATE: 11/11/2014
TEST #: D143966



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 351 **Test I.D:** D143960

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.0	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	33	33	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.3	6.3	Pass
30 Degrees	Nm	94.9 Nm Max	51.2	66.4	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	49.3	46.7	Pass
		Overall Test Results			Pass

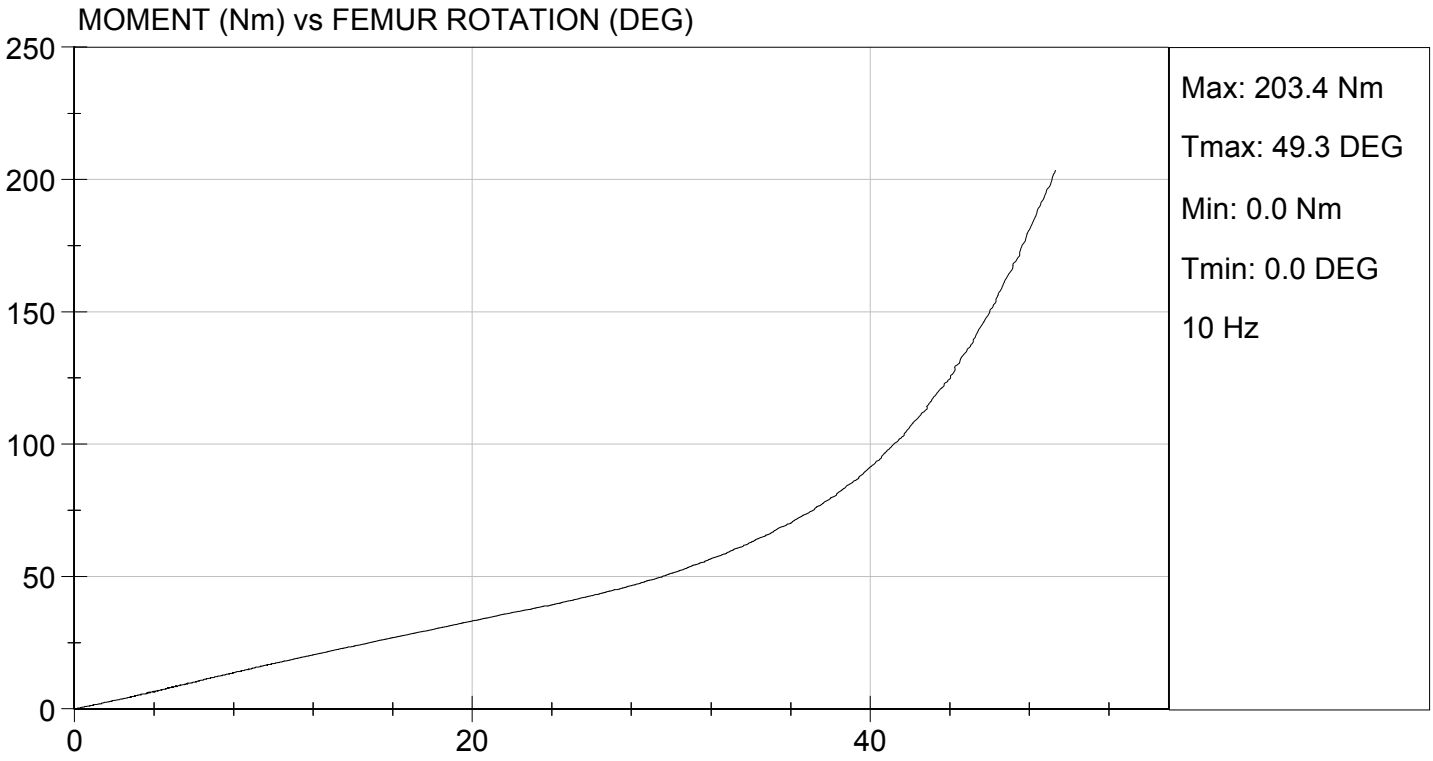
Maxime Chamberland
Laboratory Technician

11/11/2014
Test Date

Jessica Hall
Approved By

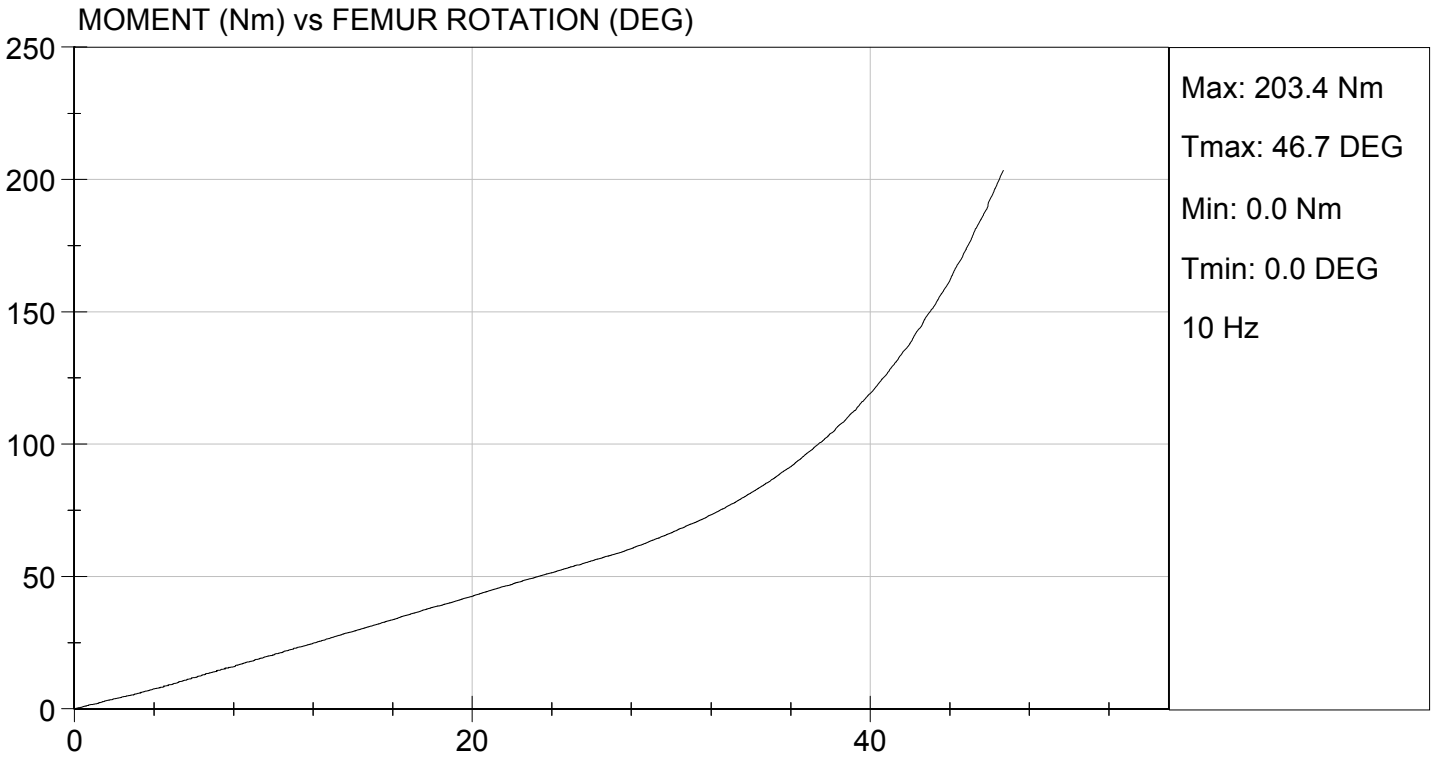
TEST DESC: RIGHT HIP FEMUR FLEXION

TEST DATE: 11/11/2014
TEST #: D143969



TEST DESC: LEFT HIP FEMUR FLEXION

TEST DATE: 11/11/2014
TEST #: D143960



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 heel	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:** D143621

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Peak Resultant Acceleration	G's	250 to 300	294	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	1.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

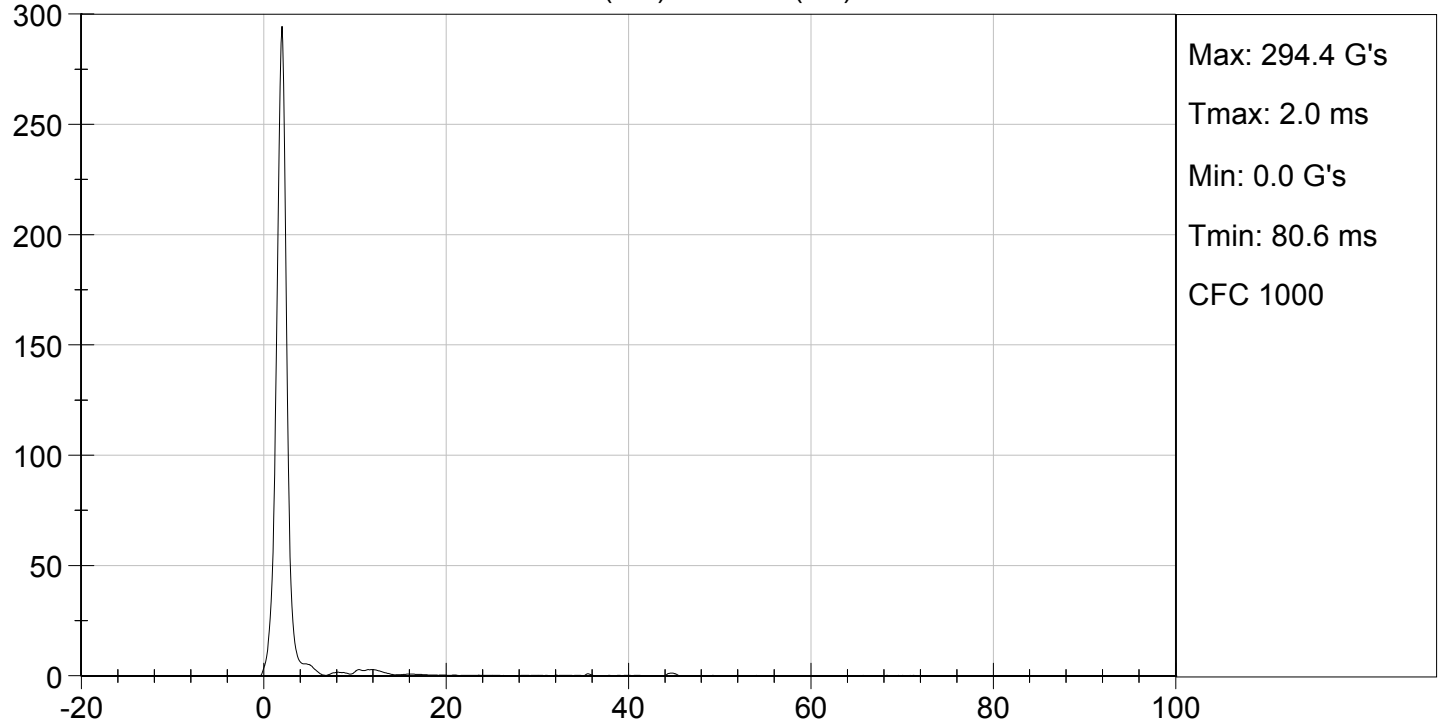
10/15/2014
Test Date

Jessica Gall
Approved By

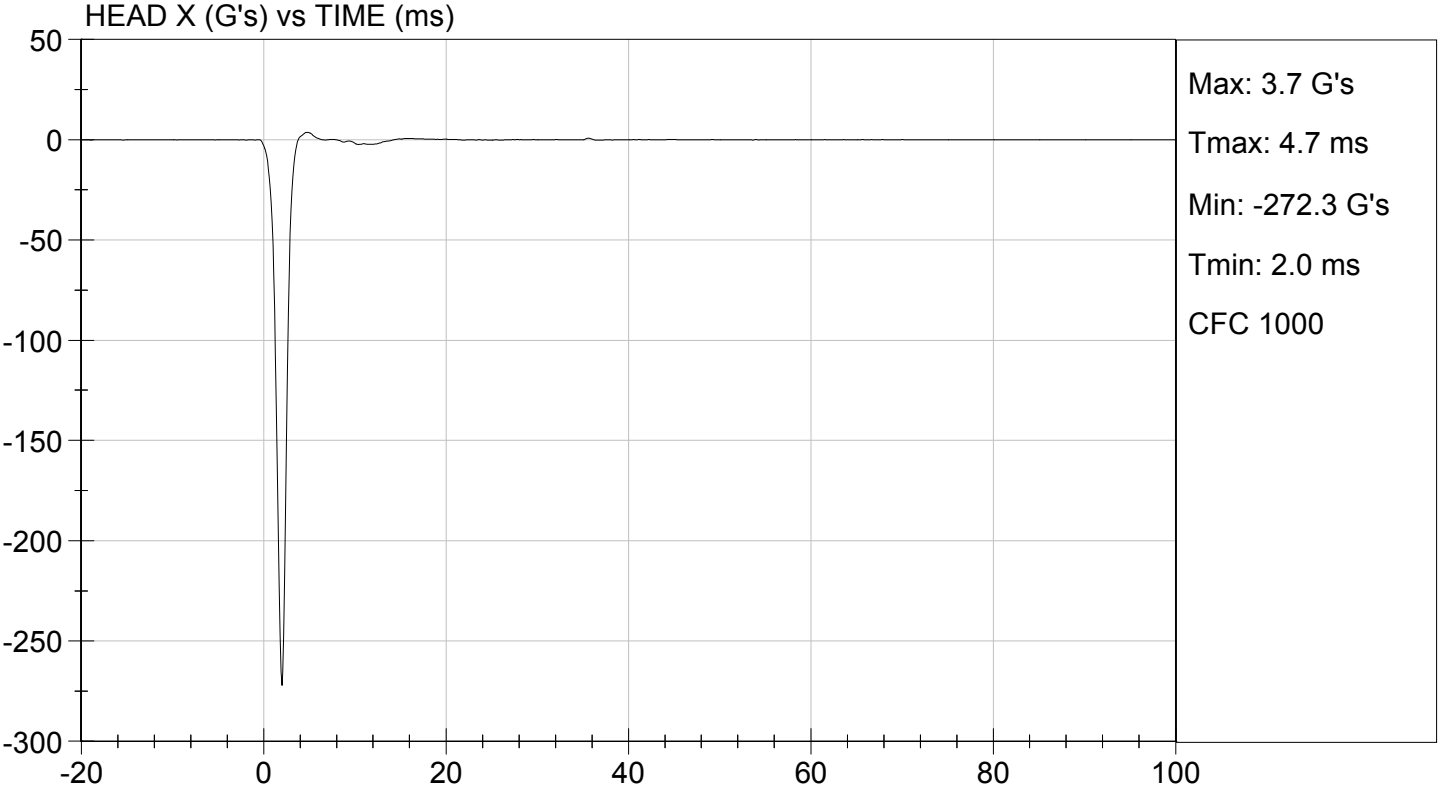
TEST DESC: HEAD DROP

TEST DATE: 10/15/2014
TEST #: D143621

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



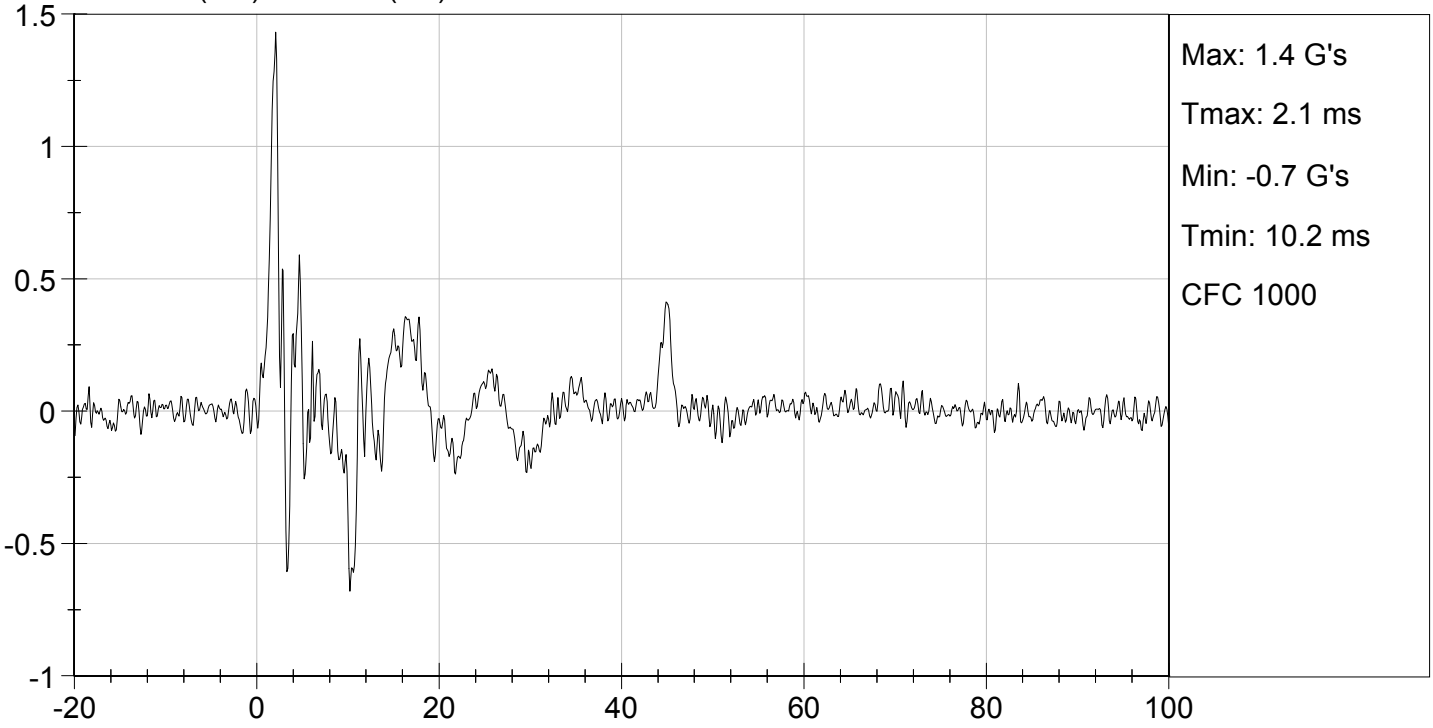
HEAD X (G's) vs TIME (ms)



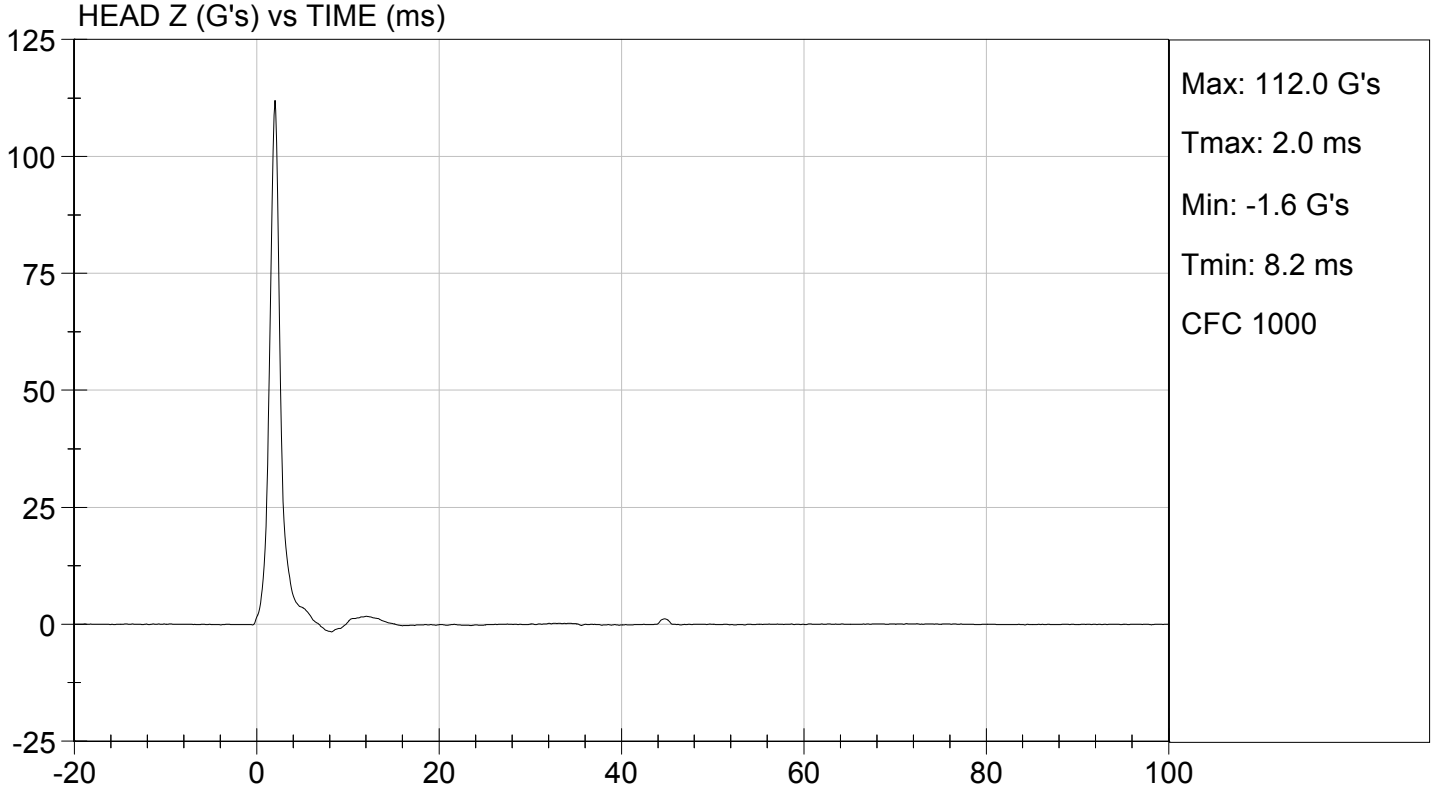
TEST DESC: HEAD DROP

TEST DATE: 10/15/2014
TEST #: D143621

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



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



MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143622

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	45	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.5	Pass
	30 ms	m/s	5.8 to 7.0	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	86	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	72	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
			Overall Results		Pass

David Schoedel
Laboratory Technician

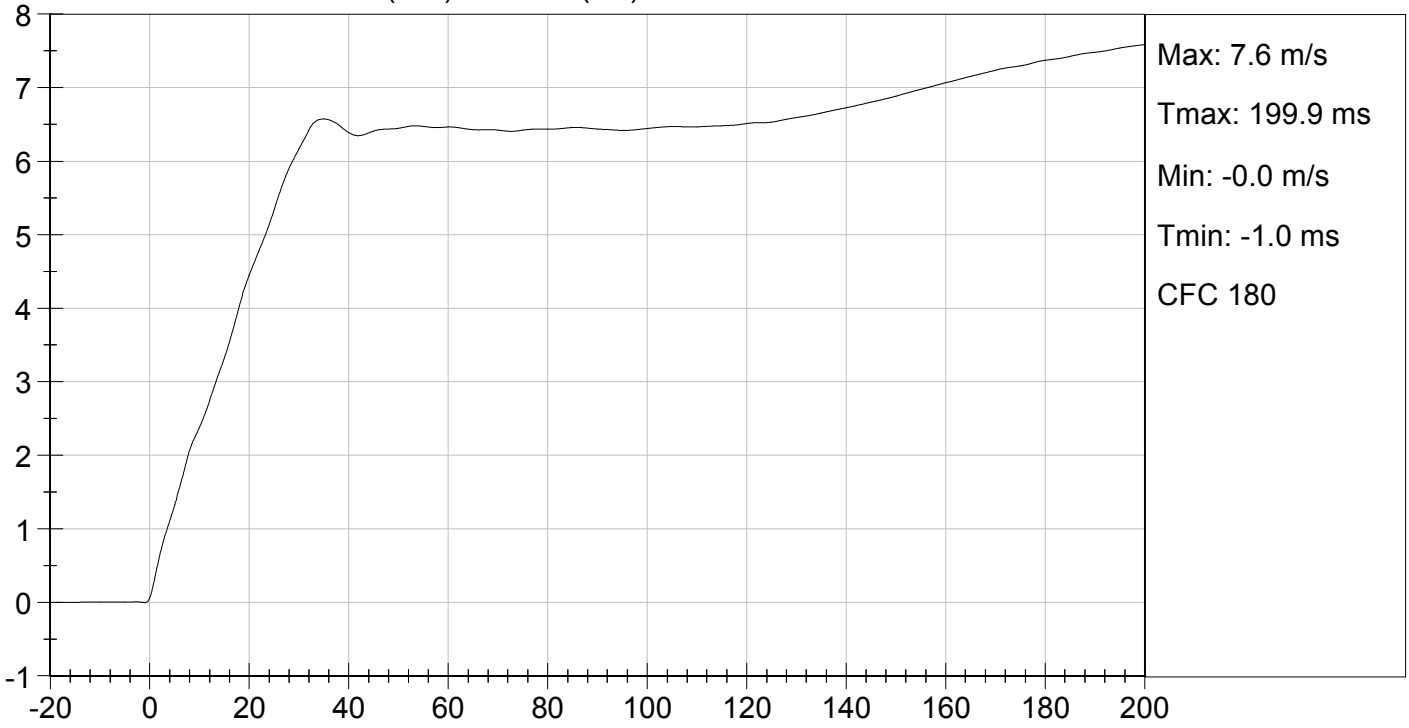
10/15/2014
Test Date

Jessica Hall
Approved By

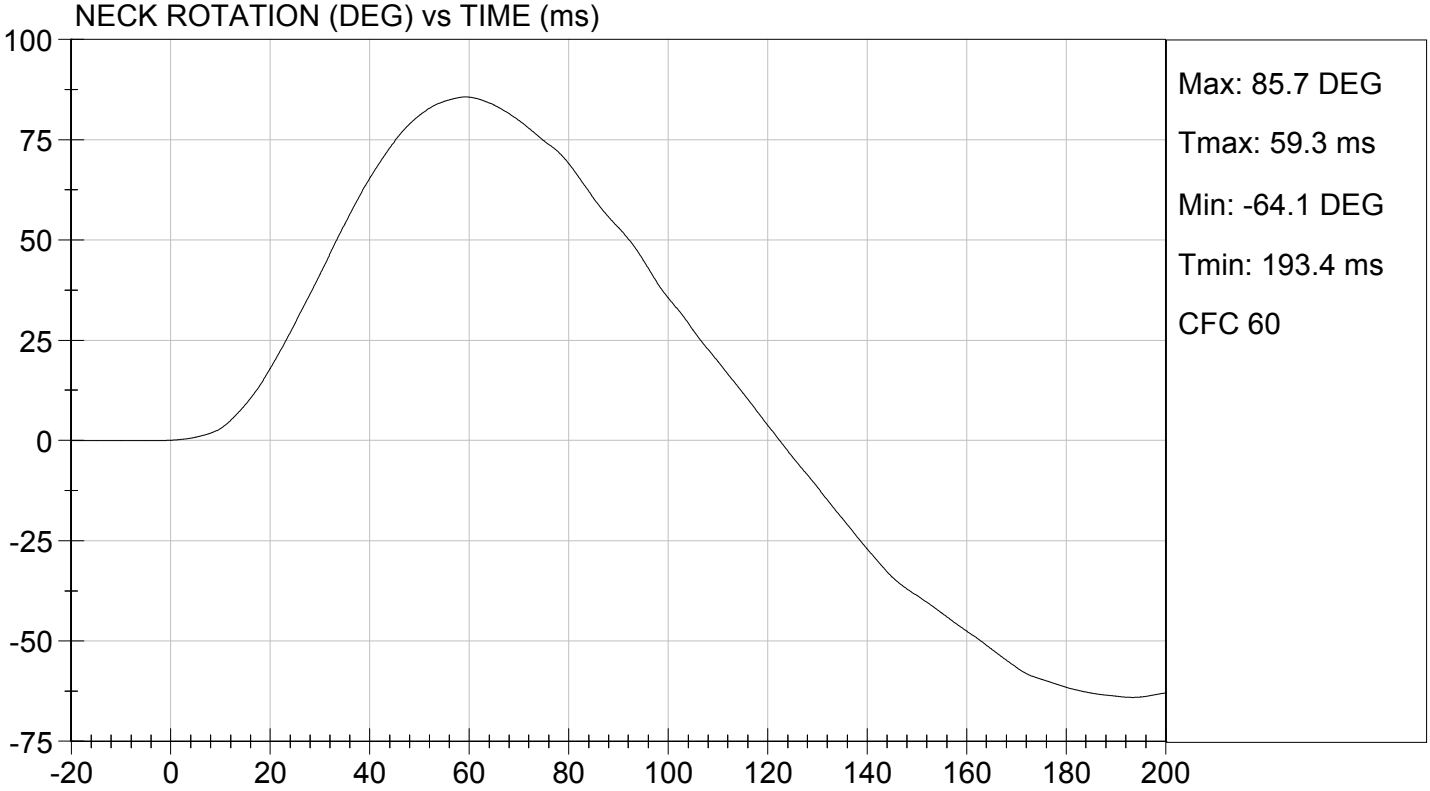
TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 10/15/2014
TEST #: D143622

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

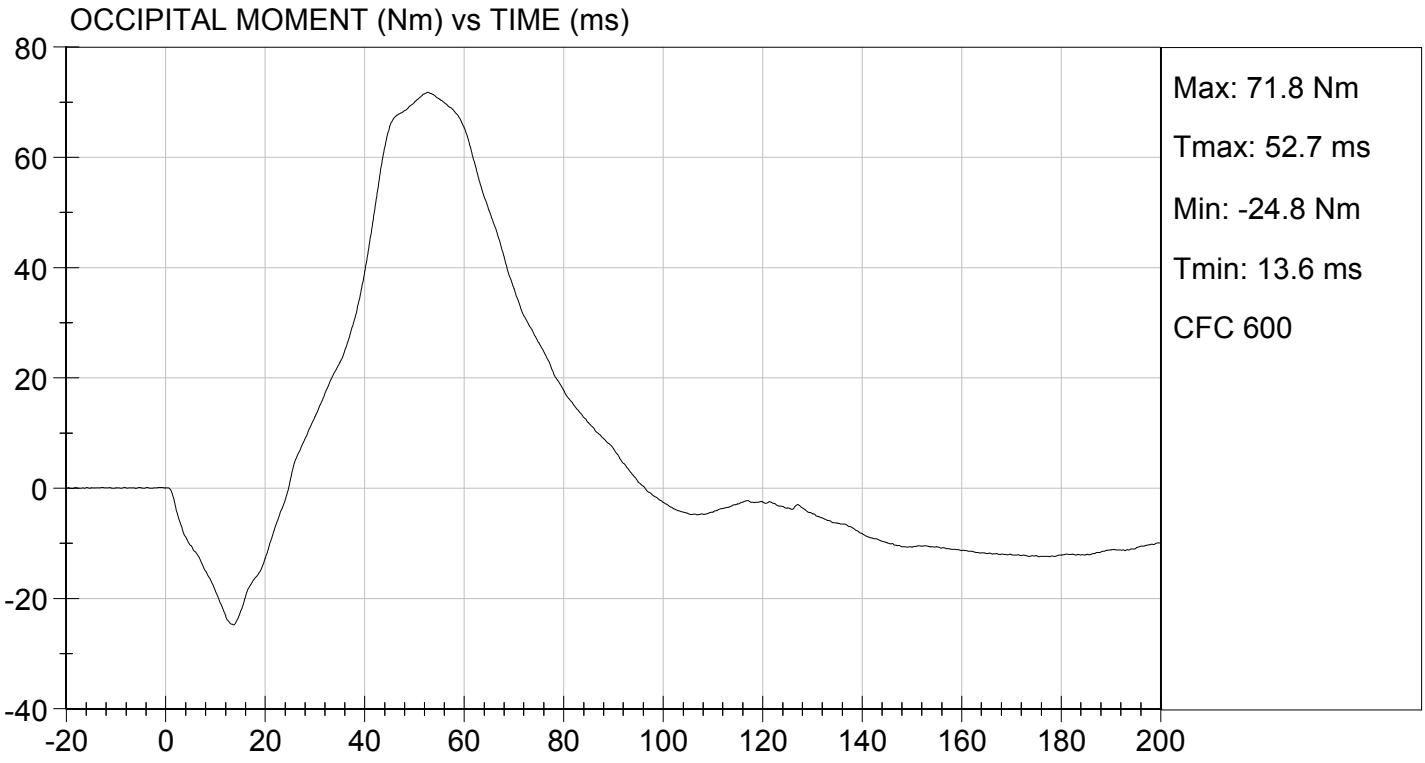


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 10/15/2014
TEST #: D143622



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143623

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	45	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-59	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	97	Pass
			Overall Results		Pass

David Schoedel
Laboratory Technician

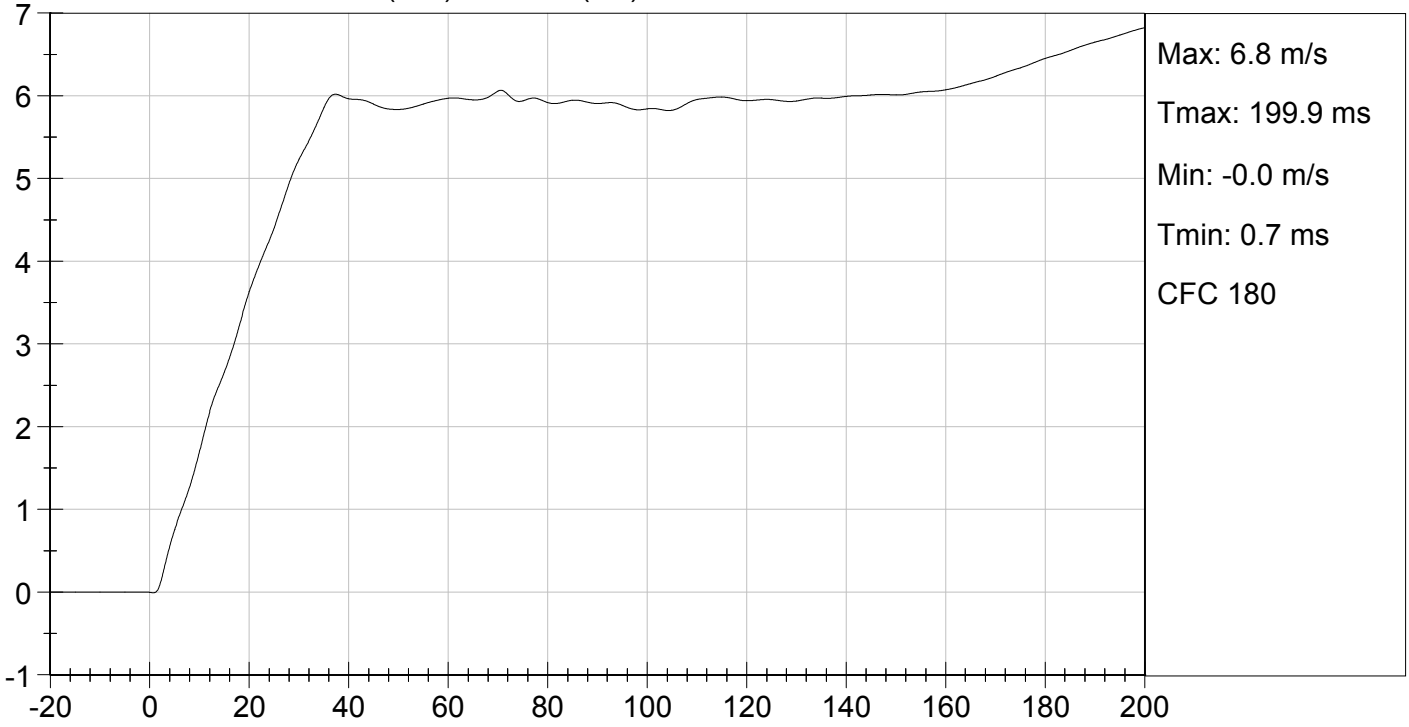
10/15/2014
Test Date

Jessica Hall
Approved By

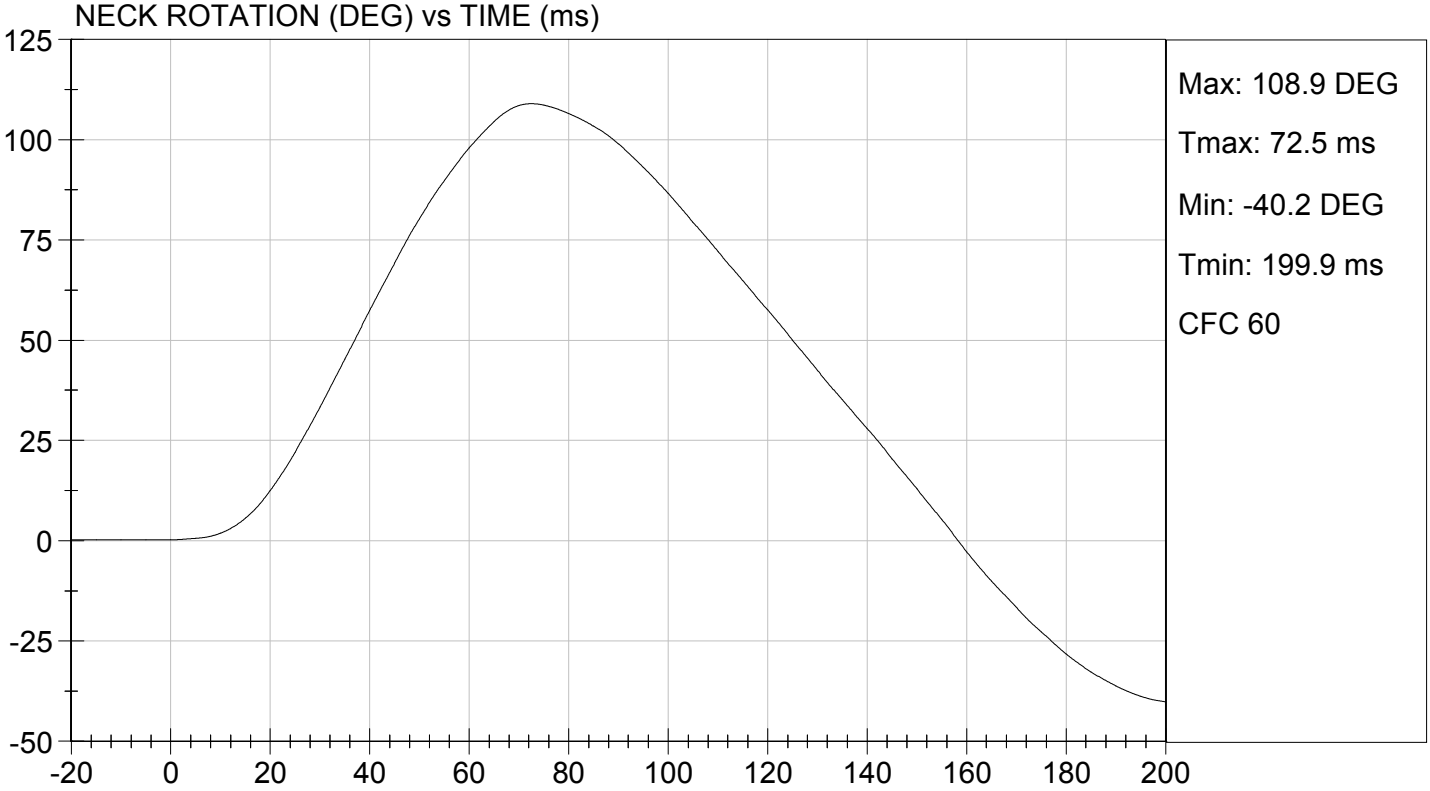
TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 10/15/2014
TEST #: D143623

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

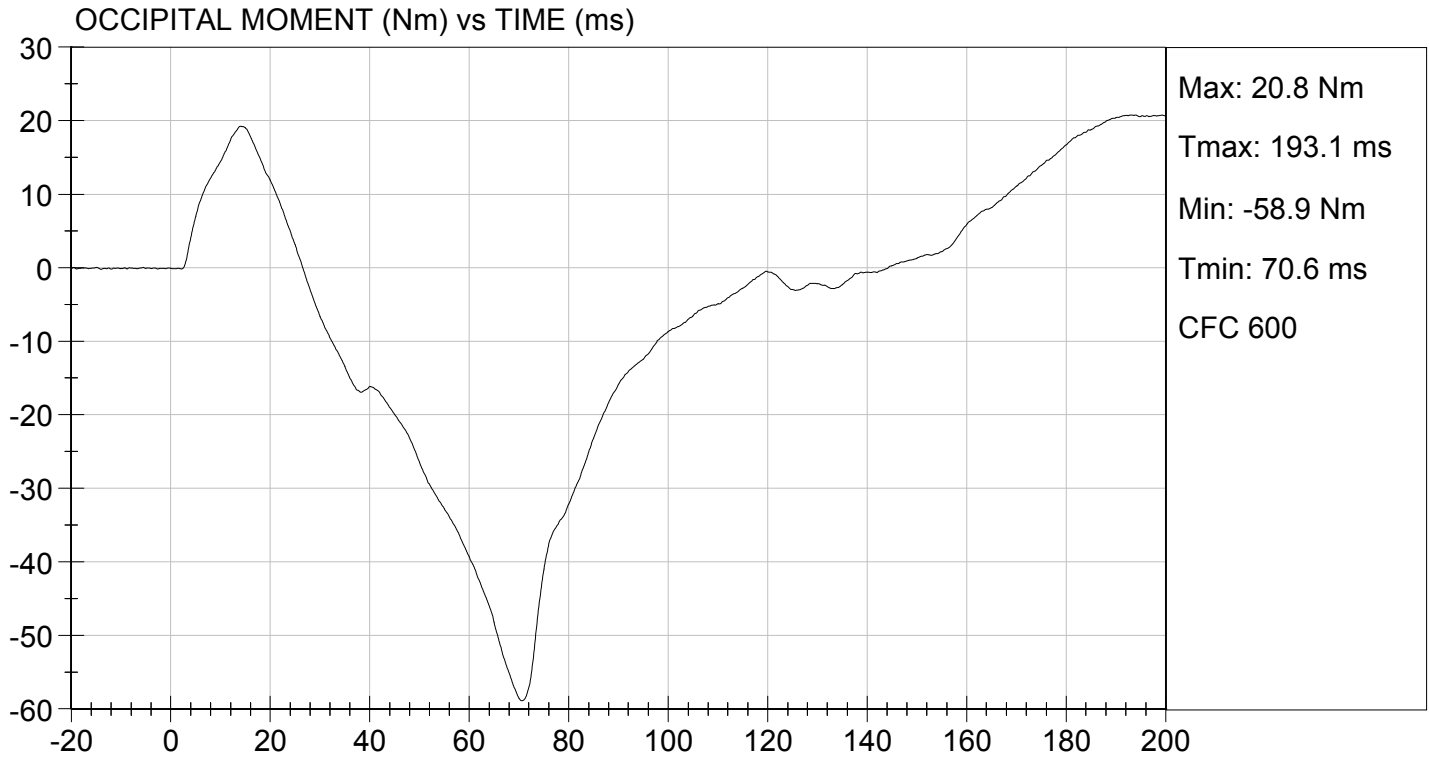


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 10/15/2014
TEST #: D143623



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143624

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.6	Pass
Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4265	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4275	Pass
		Overall Test Results		Pass

Jack Coleman
Laboratory Technician

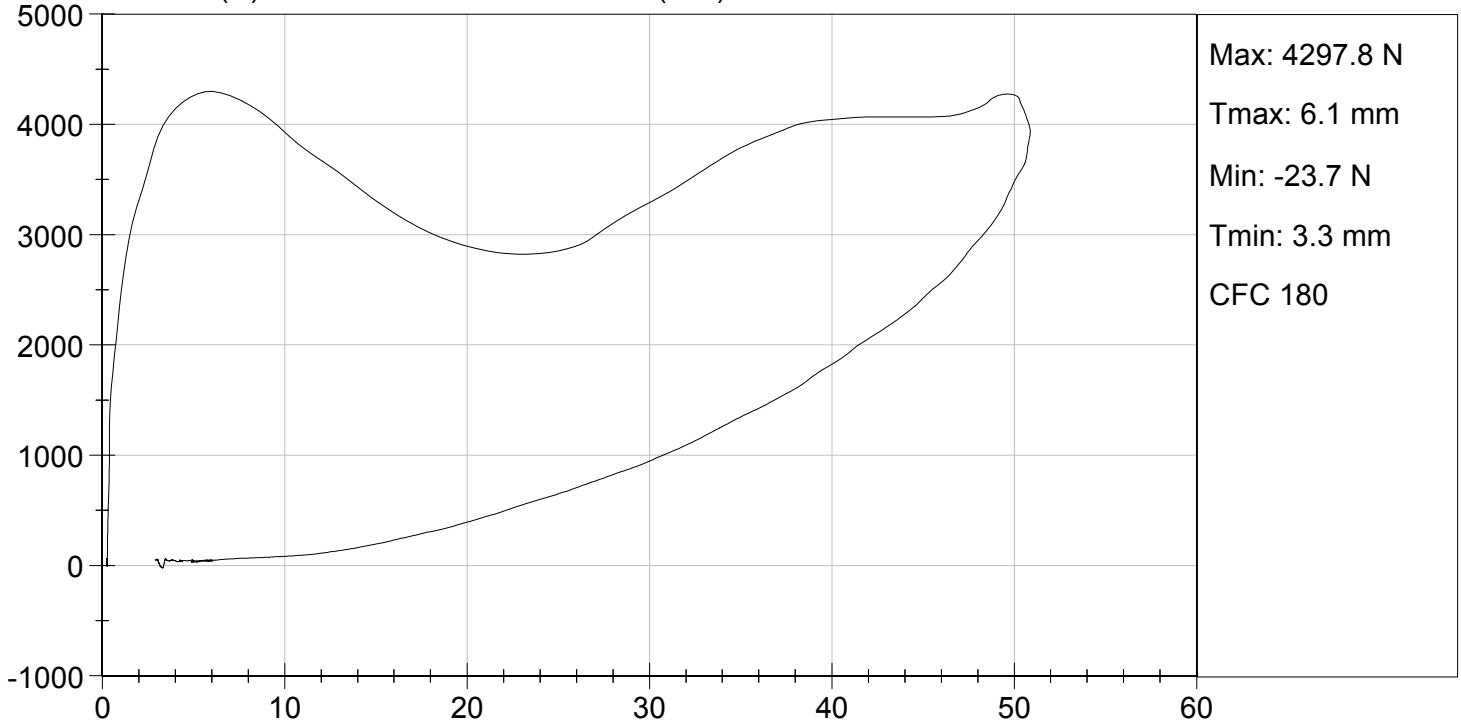
10/16/2014
Test Date

Jessica Hall
Approved By

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

TEST DATE: 10/16/2014
TEST #: D143624

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143625

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3536	Pass
		Overall Test Results		Pass

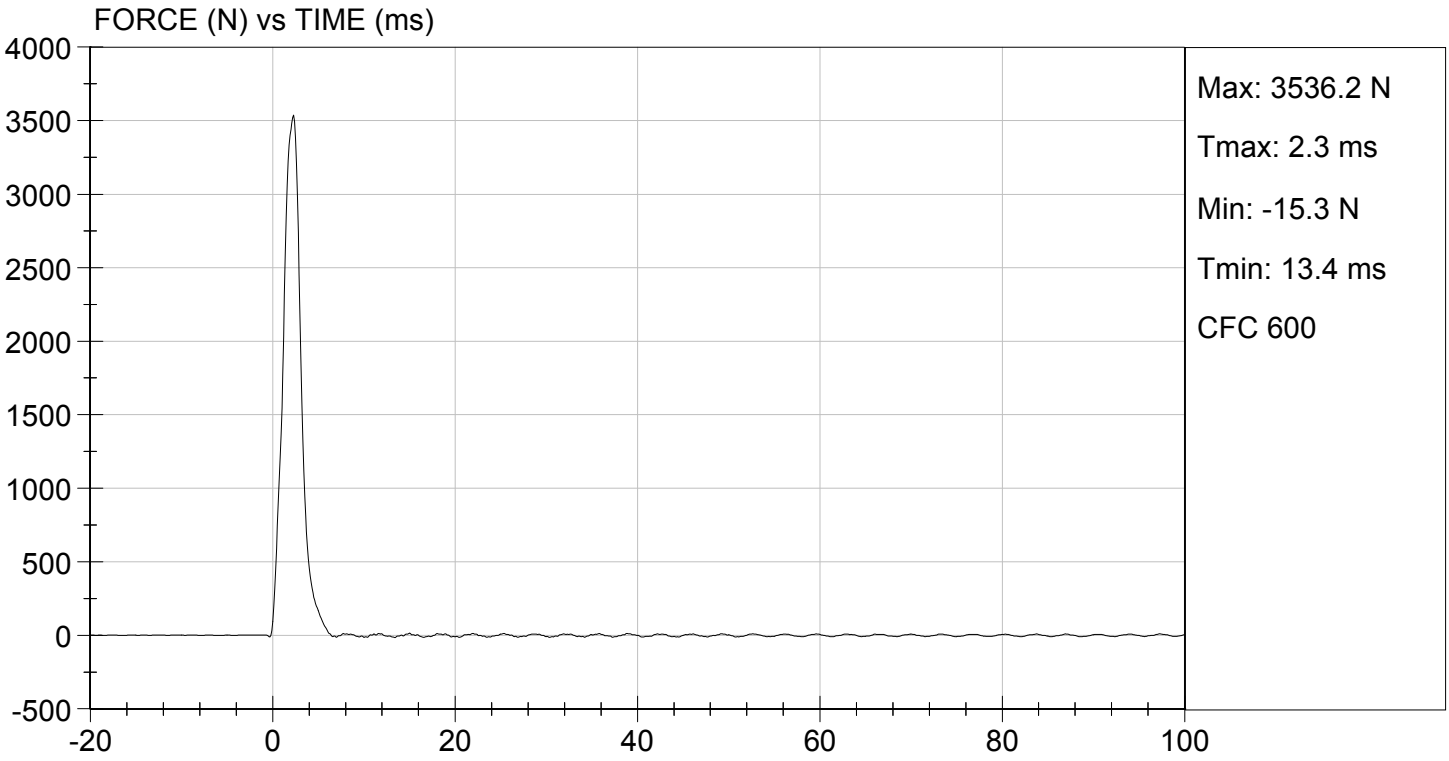
David Schoedel
Laboratory Technician

10/15/2014
Test Date

Jessica Gall
Approved By

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

TEST DATE: 10/15/2014
TEST #: D143625



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143626

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3642	Pass
		Overall Test Results		Pass

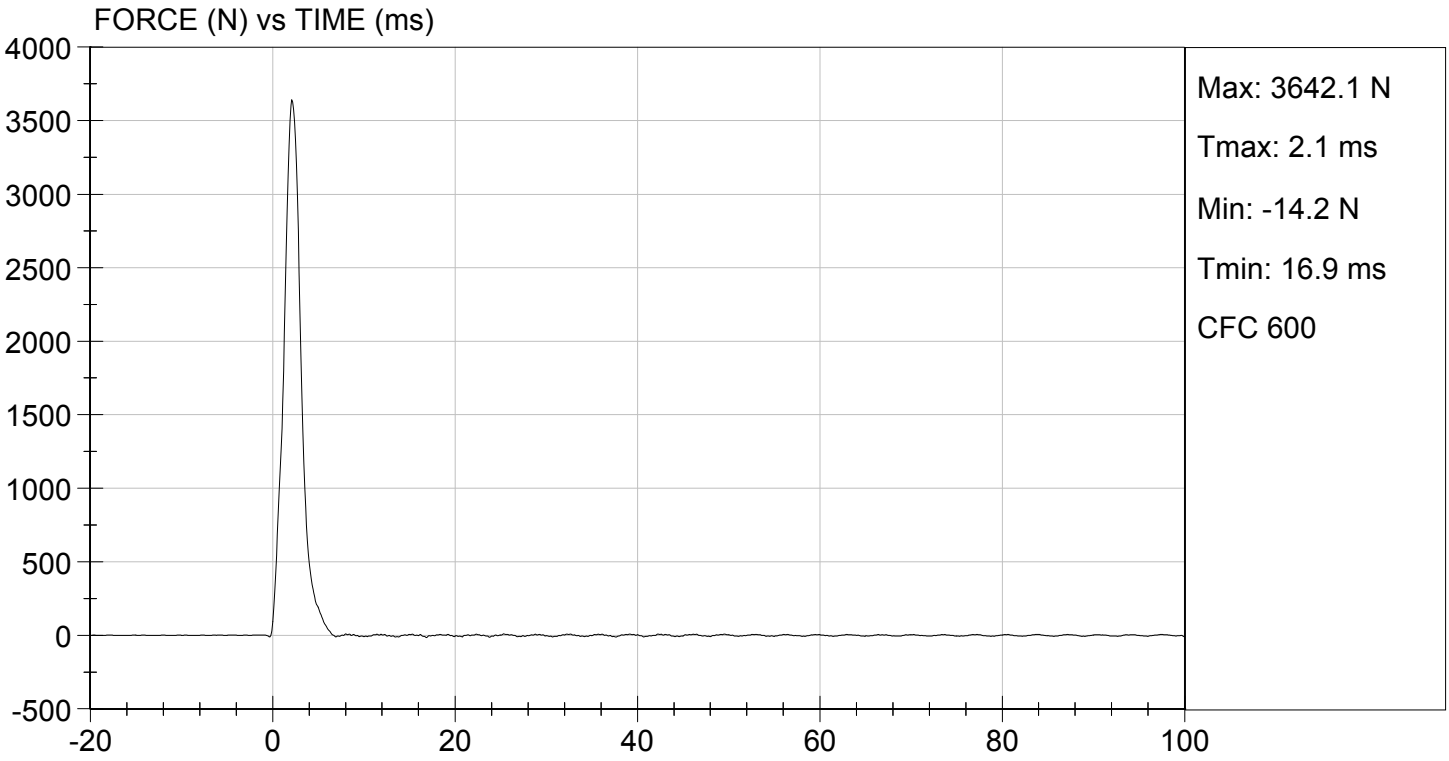
David Schoedel
Laboratory Technician

10/15/2014
Test Date

Jessica Hall
Approved By

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

TEST DATE: 10/15/2014
TEST #: D143626



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143627

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	4	Pass
Force at 45 deg	N	320 to 390	364	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
		Overall Result		Pass

David Schoedel
Laboratory Technician

10/15/2014
Test Date

Jessica Hall
Approved By

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test ID:** D143971

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	22.2	Pass
Laboratory Relative Humidity	%	10 to 70	32	Pass
Peak Resultant Acceleration	G's	250 to 300	268	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-3.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

David Schoedel
Laboratory Technician

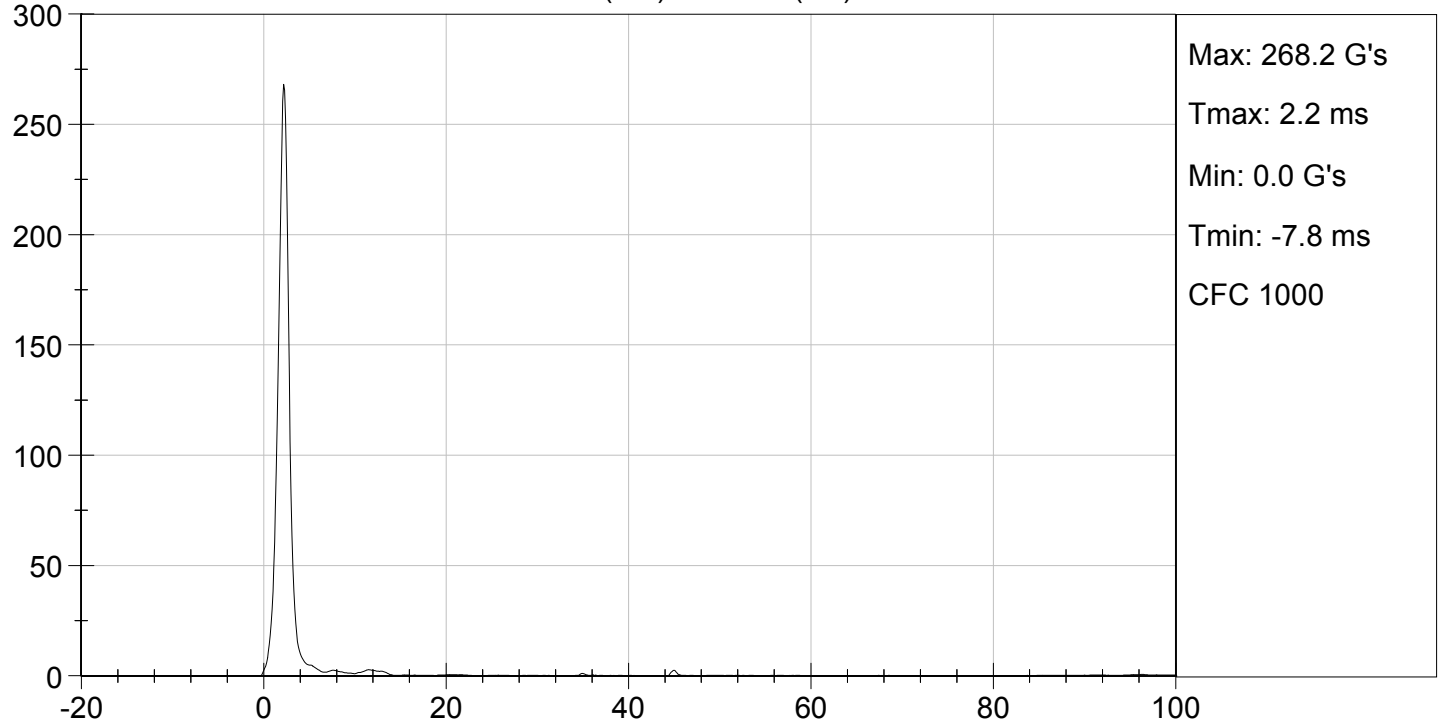
11/11/2014
Test Date

Jessica Hall
Approved By

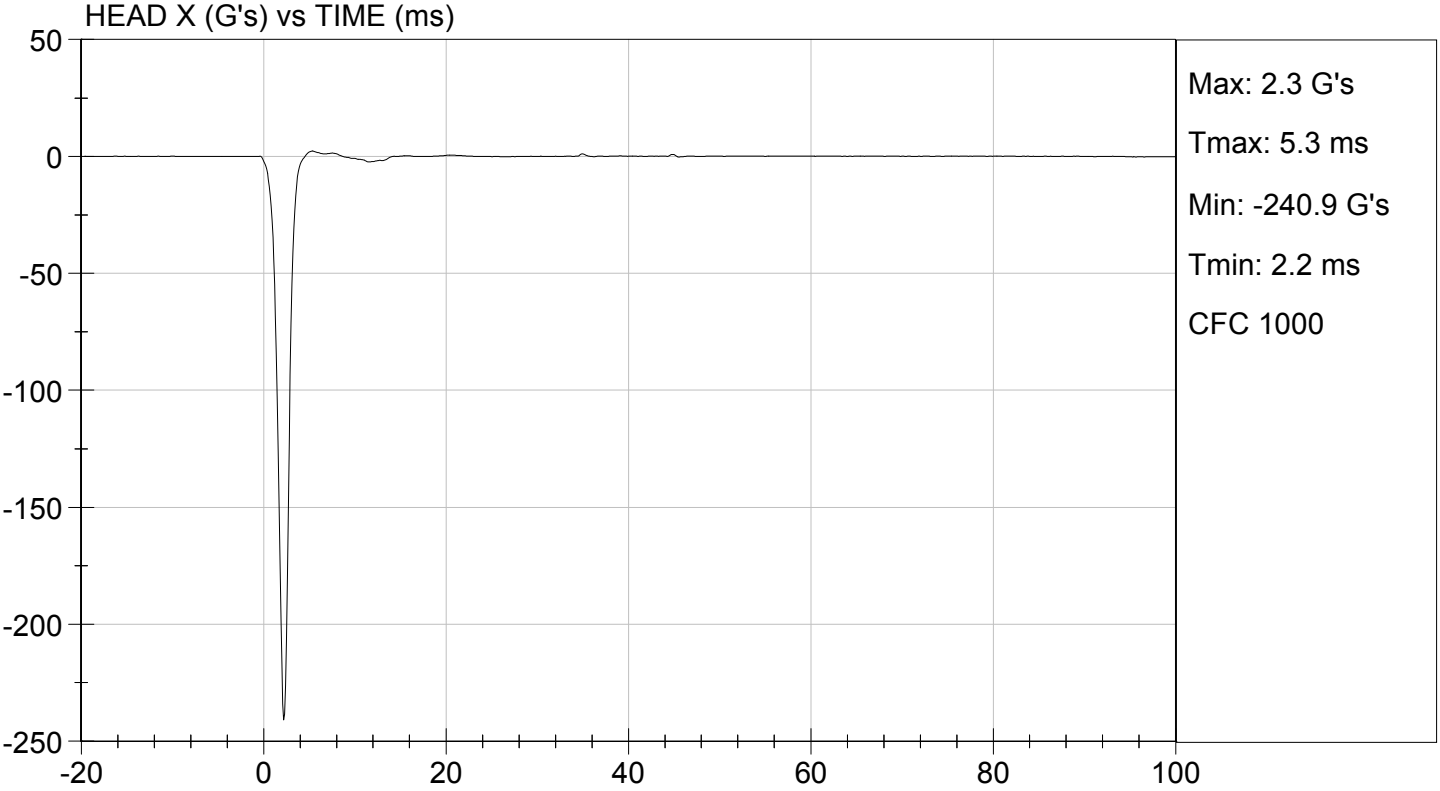
TEST DESC: HEAD DROP

TEST DATE: 11/11/2014
TEST #: D143971

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

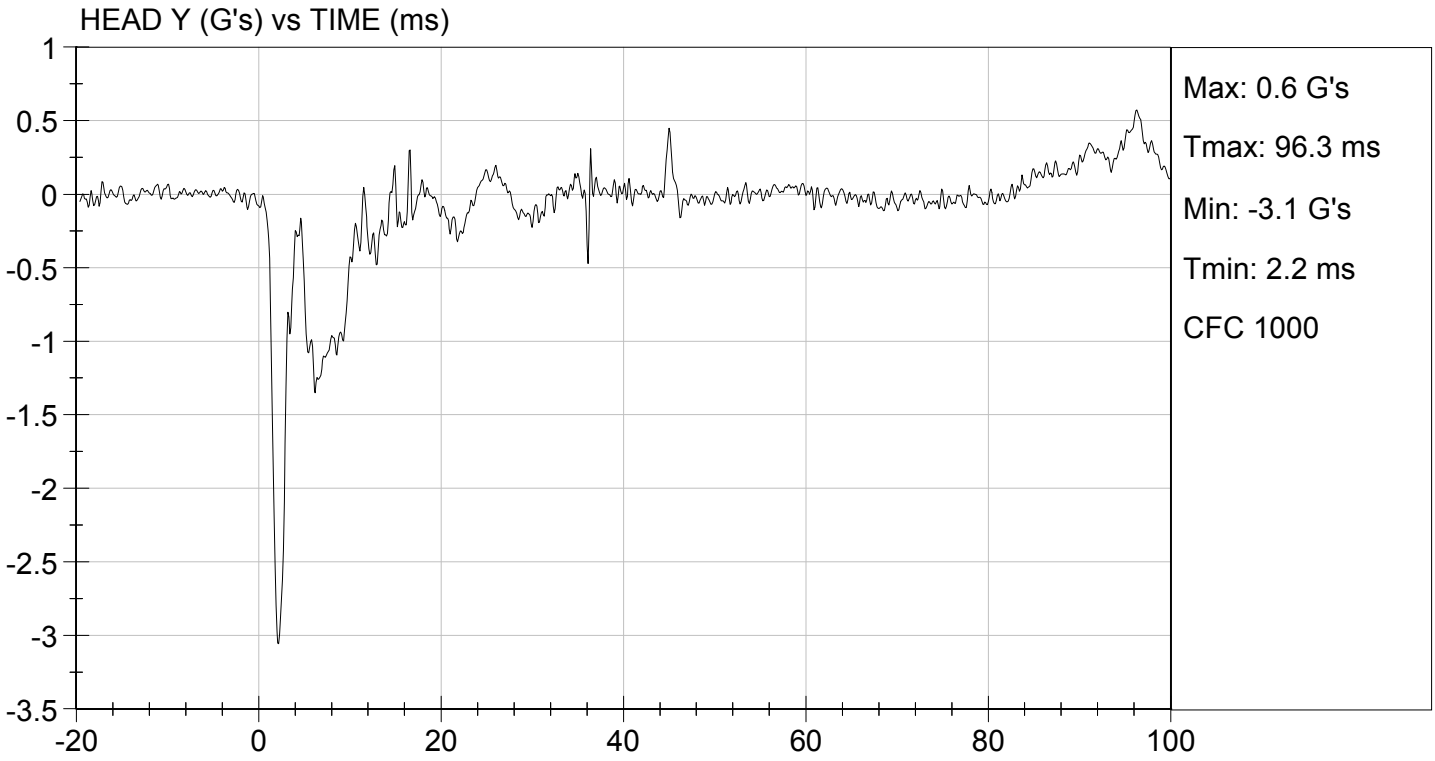


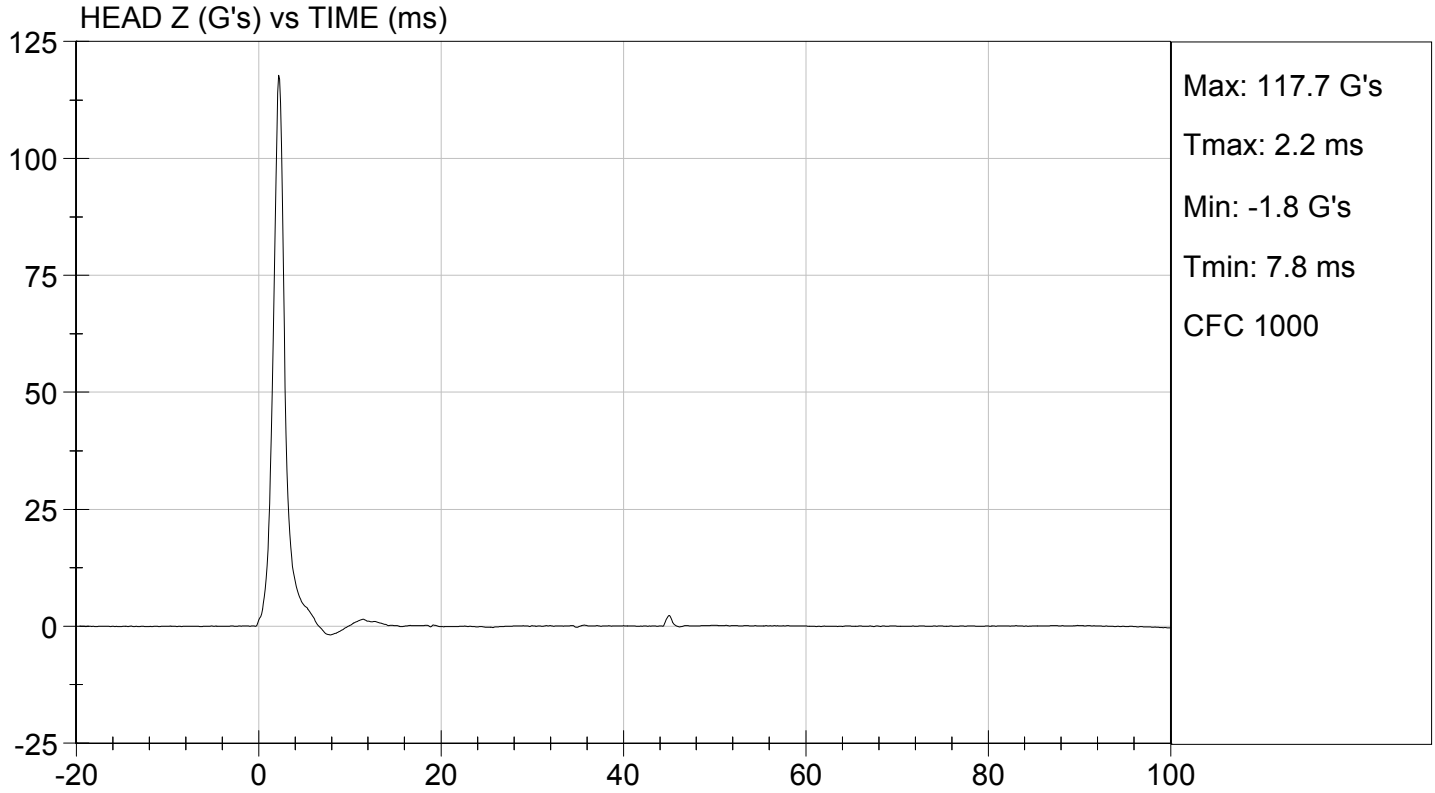
HEAD X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 11/11/2014
TEST #: D143971





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143972

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.13	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.3	Pass
	30 ms	m/s	5.8 to 7.0	5.8	Pass
D Plane Rotation	Max	deg	77 to 91	81	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	89	Pass
			Overall Results		Pass

David Schoedel
Laboratory Technician

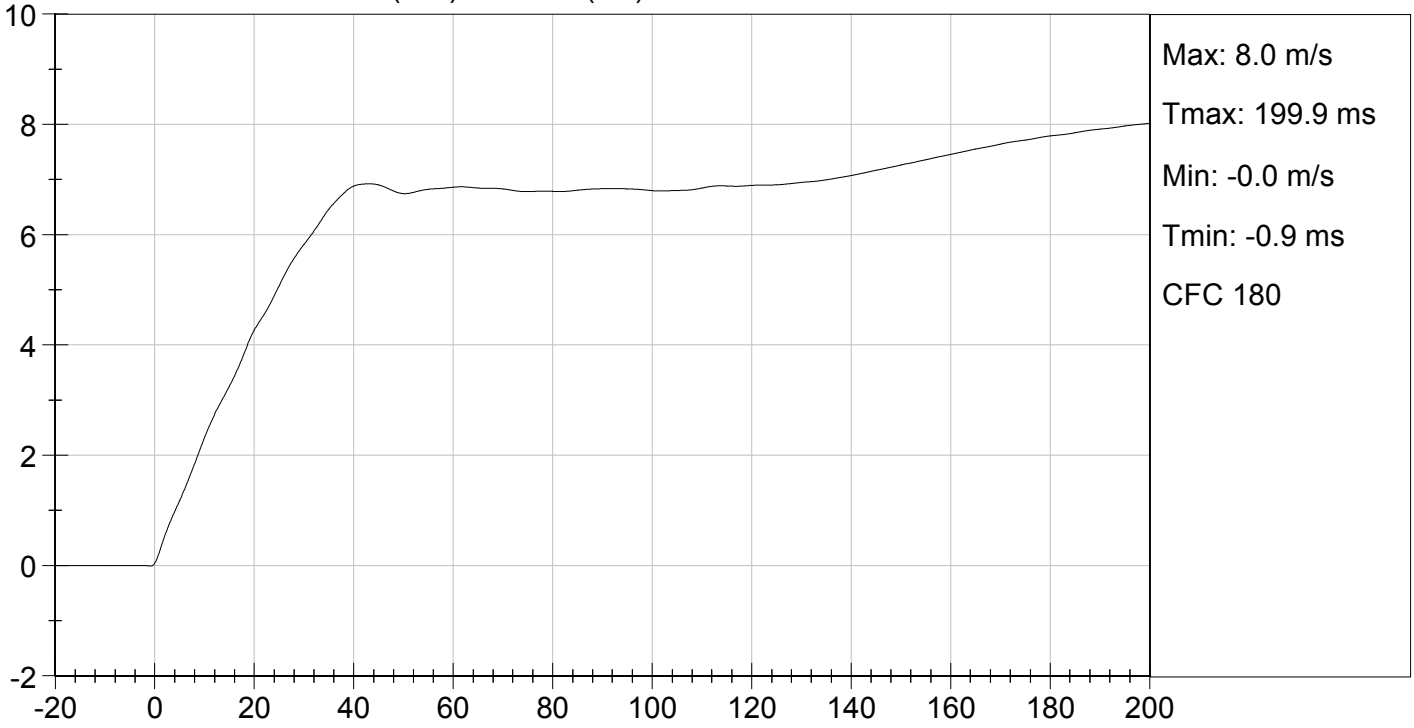
11/11/2014
Test Date

Jessica Hall
Approved By

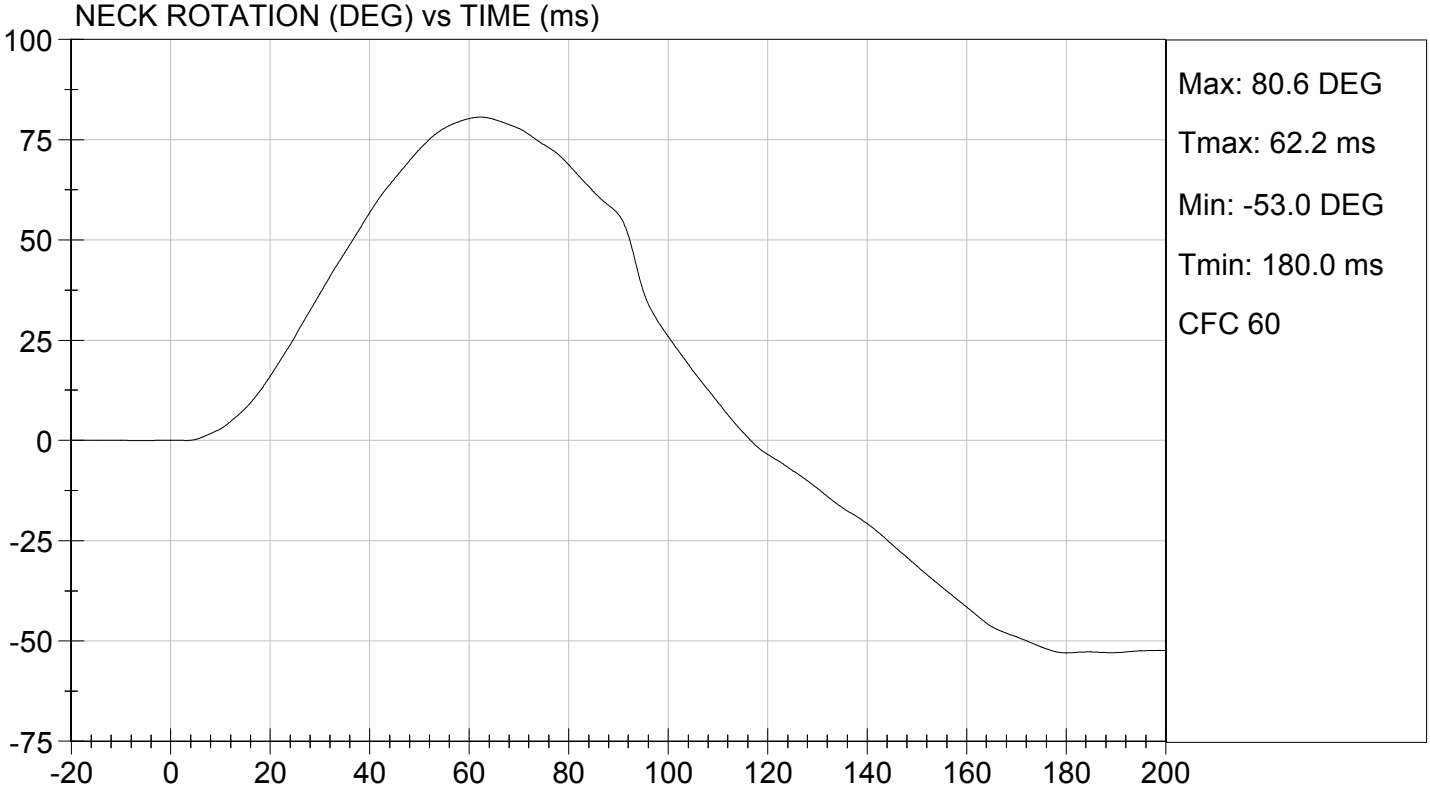
TEST DESC: NECK FLEXION
VELOCITY: 23.40 ft/s, 7.13 m/s

TEST DATE: 11/11/2014
TEST #: D143972

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



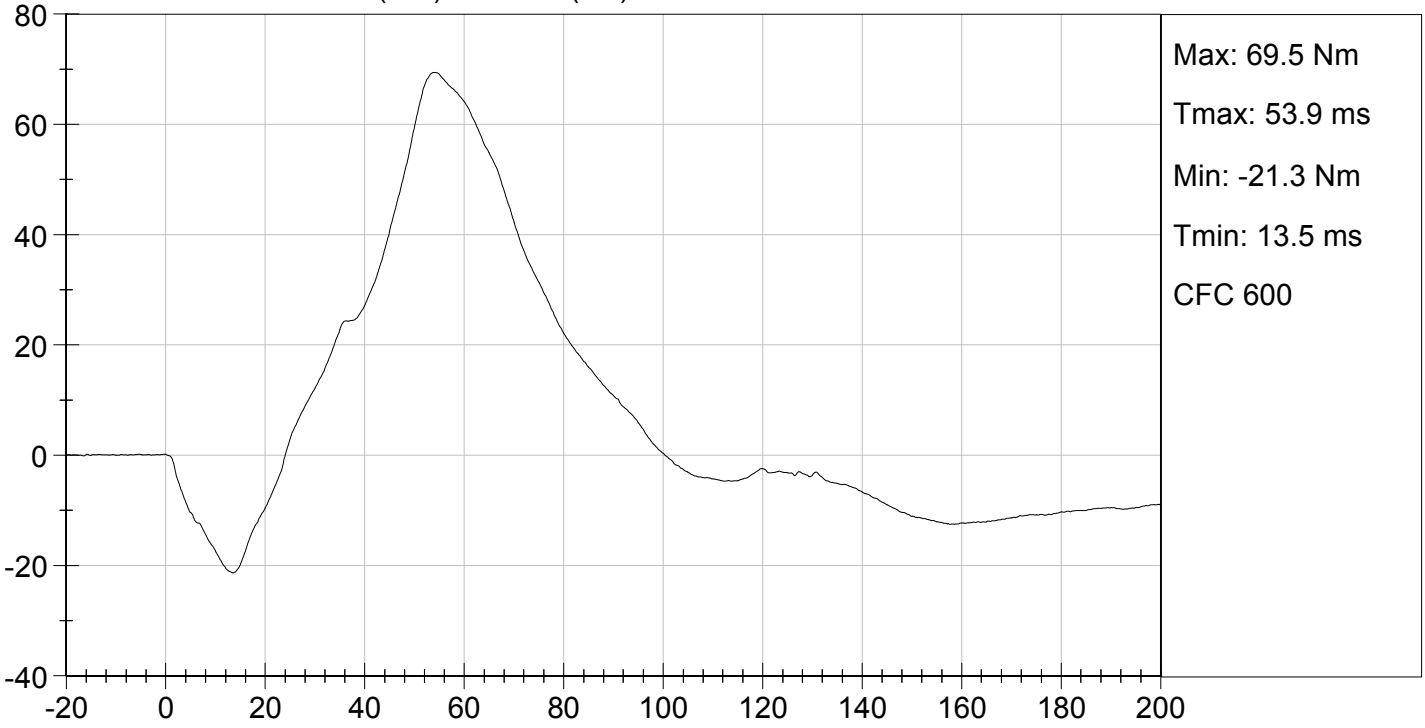
NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 11/11/2014
TEST #: D143972

OCCIPITAL MOMENT (Nm) vs TIME (ms)



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143973

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.3	Pass
	30 ms	m/s	4.6 to 5.6	4.9	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-54	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	98	Pass
			Overall Results		Pass

David Schoedel
Laboratory Technician

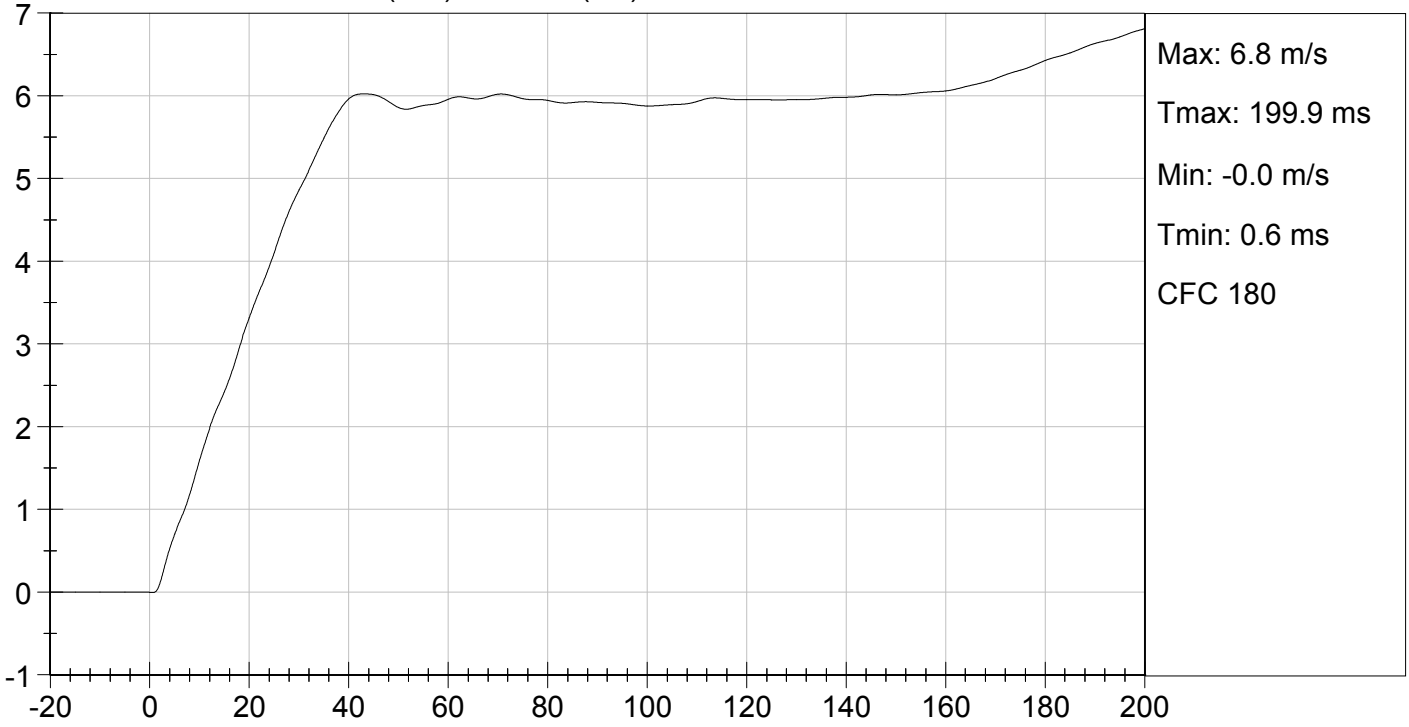
11/11/2014
Test Date

Jessica Hall
Approved By

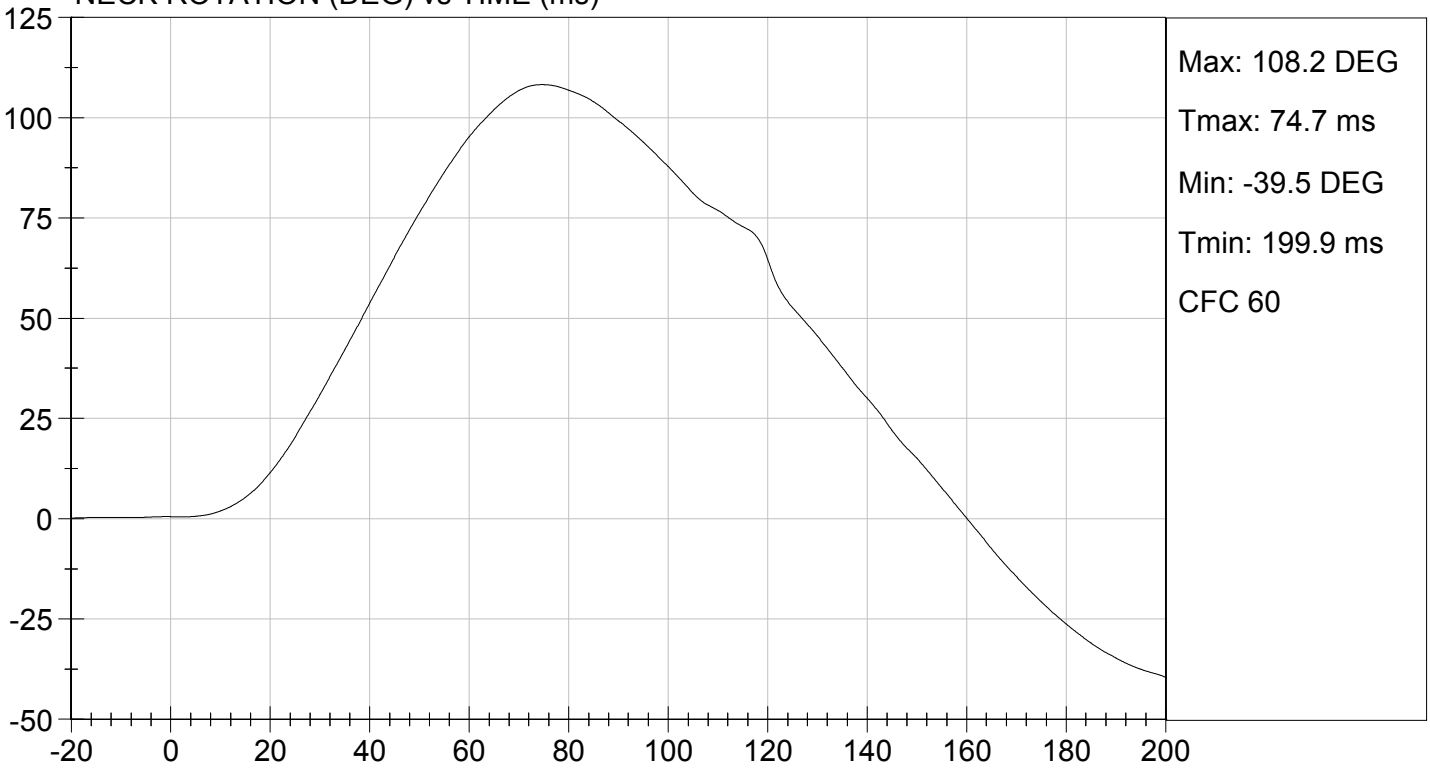
TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 11/11/2014
TEST #: D143973

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

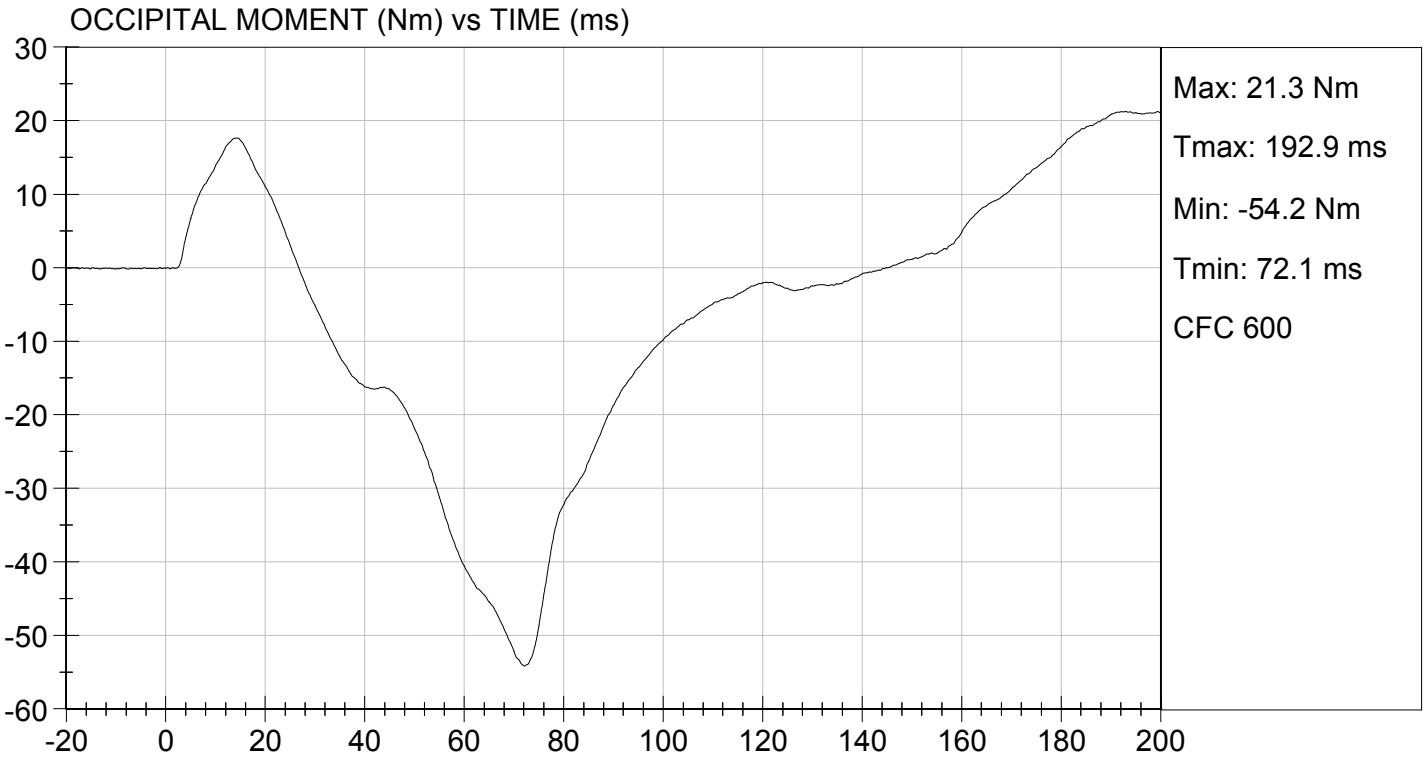


NECK ROTATION (DEG) vs TIME (ms)



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

TEST DATE: 11/11/2014
TEST #: D143973



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143974

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	50	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4217	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4340	Pass
		Overall Test Results		Pass

Maxime Chamberland
Laboratory Technician

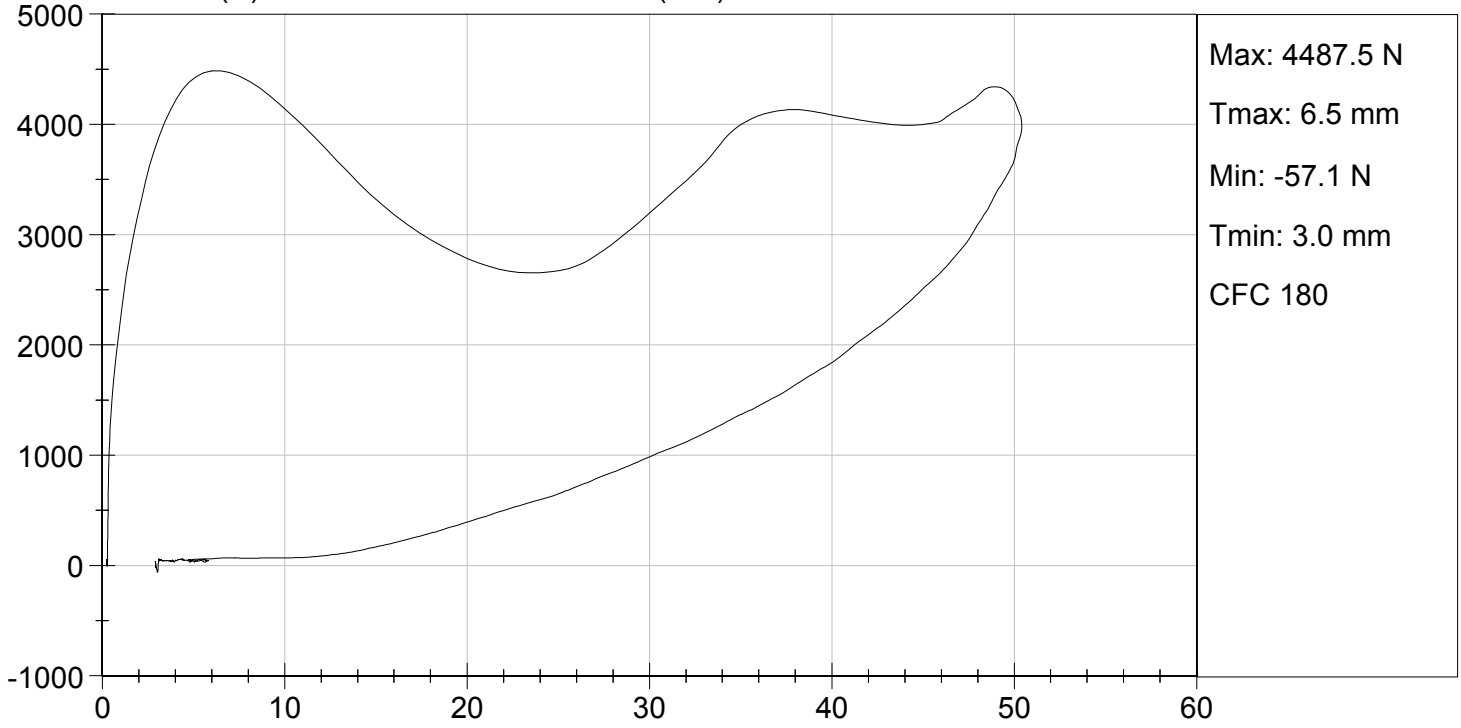
11/12/2014
Test Date

Jessica Gall
Approved By

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

TEST DATE: 11/12/2014
TEST #: D143974

FORCE (N) vs CHEST DISPLACEMENT (mm)



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143975

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3812	Pass
		Overall Test Results		Pass

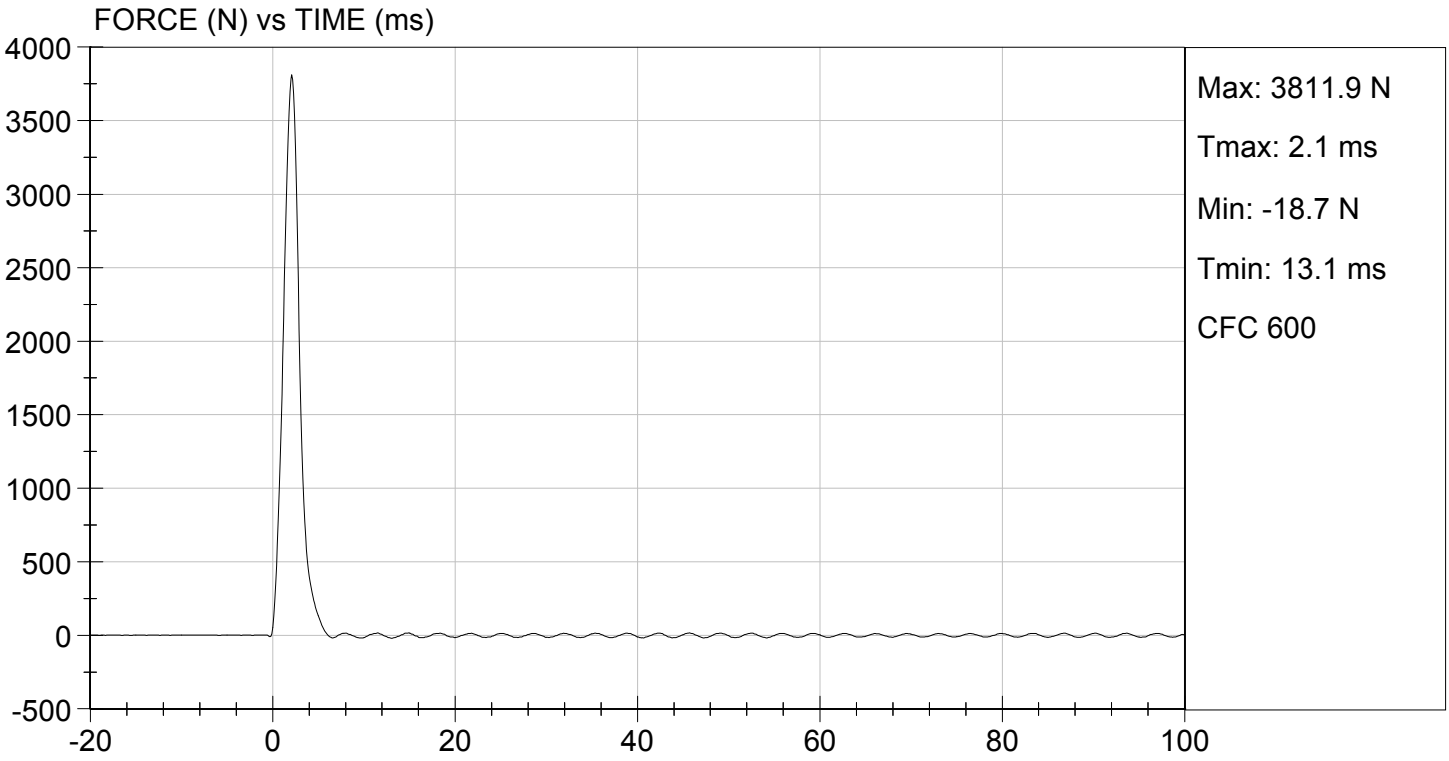
David Schoedel
Laboratory Technician

11/12/2014
Test Date

Jessica Hall
Approved By

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

TEST DATE: 11/12/2014
TEST #: D143975



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143976

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	2.07 to 2.13	2.10	Pass
Maximum Force	N	3450 to 4060	4037	Pass
		Overall Test Results		Pass

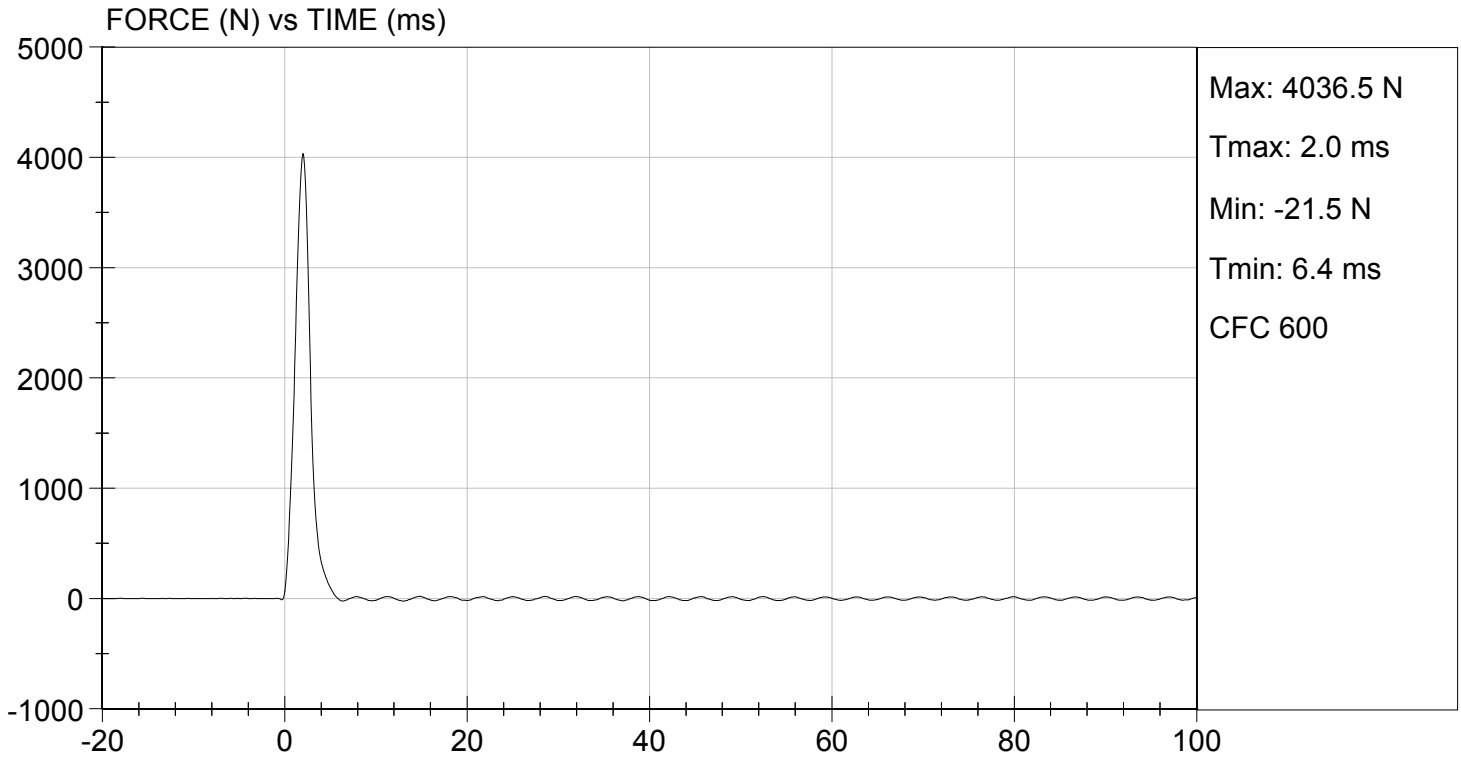
David Schoedel
Laboratory Technician

11/12/2014
Test Date

Jessica Hall
Approved By

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

TEST DATE: 11/12/2014
TEST #: D143976



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 634 **Test I.D:** D143977

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	7	Pass
Force at 45 deg	N	320 to 390	328	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.8	Pass
		Overall Result		Pass

Maxime Chamberland
Laboratory Technician

11/12/2014
Test Date

Jessica Gall
Approved By