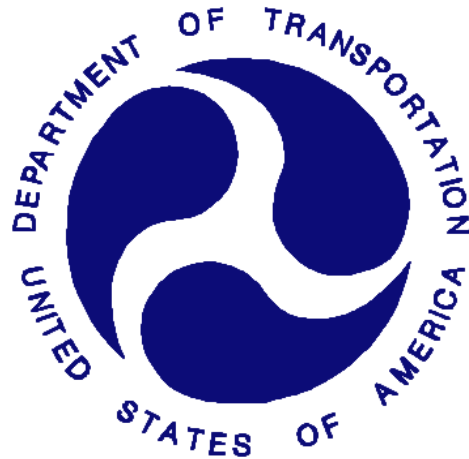


REPORT NUMBER: NCAP-MGA-2014-005

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

**KIA MOTORS MANUFACTURING GEORGIA, INC.
2014 KIA Sorento LX AWD SUV
NHTSA No.: O20144200**

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



Test Date: July 11, 2013

Final Report Date: August 30, 2013

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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Prepared by: 
Donna Janovicz, Project Manager

Approved by: 
Ben Fischer, Project Engineer

Approval Date: August 30, 2013

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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15. Supplementary Notes																																																							
16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2014 KIA Sorento LX AWD SUV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on July 11, 2013. The impact velocity was 56.4 km/h and the ambient temperature at the barrier face at the time of impact was 21.9°C. The target vehicle post-test maximum crush was 540 mm located at the vehicle's centerline. The test vehicle's performance was as follows:																																																							
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Threshold</th> <th rowspan="2">Driver ATD</th> <th rowspan="2">Passenger ATD</th> </tr> <tr> <th>50th</th> <th>5th</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>700</td> <td>200</td> <td>280</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>52</td> <td>15</td> <td>9</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>1</td> <td>0.29</td> <td>0.25</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>2620</td> <td>1108</td> <td>602</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>2520</td> <td>256</td> <td>229</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>2048</td> <td>1483</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>6805</td> <td>2071</td> <td>1221</td> </tr> </tbody> </table>						Measurement Description	Units	Threshold		Driver ATD	Passenger ATD	50 th	5 th	Head Injury Criteria (HIC ₁₅)	N/A	700	700	200	280	Maximum Chest Compression	mm	63	52	15	9	Nij	N/A	1	1	0.29	0.25	Neck Tension	N	4170	2620	1108	602	Neck Compression	N	4000	2520	256	229	Left Femur Force	N	10008	6805	2048	1483	Right Femur Force	N	10008	6805	2071	1221
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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 2014 KIA Sorento LX AWD SUV at a velocity of 56.4 km/h. The test was performed at MGA Research Corporation on July 11, 2013. 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 and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading.

The driver (position 1) ATD (Serial No. 036) and the right-front passenger (position 2) ATD (Serial No. 138) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 628 channels of data were recorded on an on-board 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 540 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 bolster. 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 glove box.

The occupant data is summarized below:

ATD position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	200	0.29	1108	256	40	15	2048	2071
Passenger (5 th)	280	0.25	602	229	39	9	1483	1221

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

TEST NOTES

None.

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

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20144200	Traction Control System (TCS)	Yes
Model Year	2014	Power Steering	Yes
Make	KIA	Power Window Auto-Reverse	Yes
Model	Sorento	Driver Frontal Airbag	Yes
Body Style	SUV	Driver Curtain Airbag	Yes
VIN	5XYKTC A60EG462807	Driver Head/Torso Airbag	No
Body Color	Satin Metal	Driver Torso Airbag	No
Odometer (km/mi)	150 / 93	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.4	Driver Pelvis Airbag	No
Type/No. Cylinders	4	Driver Knee Airbag	No
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	All-Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof/T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	N/A

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

DATA FROM CERTIFICATION LABEL

Manufactured By	KIA MOTORS MANUFACTURING GEORGIA, INC.	GVWR (kg)	2260
		GAWR Front (kg)	1350
Date of Manufacture	APR/24/13	GAWR Rear (kg)	1395

VEHICLE SEATING AND WEIGHT CAPACITY DATA

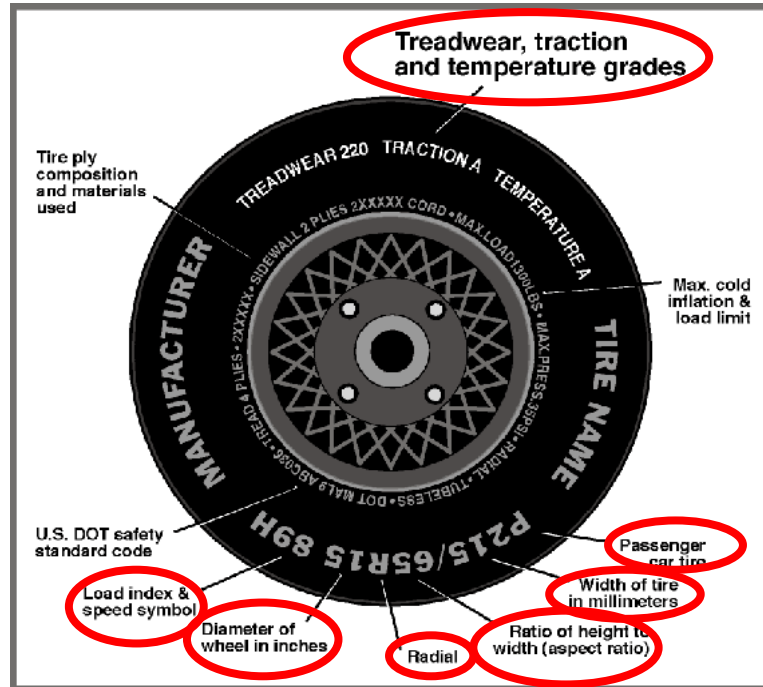
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Designated Seating Capacity (DSC)	2	3		5
Capacity Weight (VCW) (kg)				420
Cargo Weight (RCLW) (kg)				80

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

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	P235/65R17	P235/65R17
Tire Size on Vehicle	P235/65R17	P235/65R17
Tire Manufacturer	KUMHO	KUMHO
Tire Model	Solus KL21	Solus KL21
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1
Load Index/Speed Symbol	103T	103T
Tire Material	Rubber	Rubber
DOT Safety Code Left	H2B9 YPL9 0813	H2B9 YPL9 0813
DOT Safety Code Right	H2B9 YPL9 0813	H2B9 YPL9 0813

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

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	490.8	386.5		525.3	473.6	
Right	kg	477.6	367.0		496.2	441.8	
Ratio	%	56.2	43.8		52.7	47.3	
Totals	kg	968.4	753.5	1721.9	1021.5	915.4	1936.9

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1721.9
Weight of 1 P572E ATD & 1 P572O ATD	kg	140.6
Rated Cargo/Luggage Weight (RCLW)	kg	80
Calculated Vehicle Target Weight (TVTW)	kg	1942.5

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	777	786	794	789	1182
As Tested	mm	776	777	758	762	1276
Post Test	mm	777	778	772	753	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2700
Total Vehicle Length at Left Side	mm	4425
Total Vehicle Length at Centerline	mm	4689
Total Vehicle Length at Right Side	mm	4425
Weight of Ballast in Cargo Area	kg	61.7
Weight of Vehicle Components Removed	kg	19.5
Amount of Stoddard Solvent in Fuel Tank	L	63.2

List of components removed to meet test weight: Cargo carpet, cargo divider, jack and tool kit, rear sill plastic, LF & RF underbody plastic, LR & RR floor mats, and right taillight.

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

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4689
2	Total Width	1860
3	Bumper Top Height	574
4	Bumper Bottom Height	473
5	Longitudinal Member Top Height	569
6	Distance between Longitudinal Members	936
7	Longitudinal Member Width	66
8	Engine Top Height	857
9	Engine Bottom Height	240
10	Engine and Gearbox Width	834
11	Front Bumper-Engine Distance	255
12	Front Shock Absorber Fixing Height	955
13	Bonnet Leading Edge Height	964
14	Front Shock Absorber Fixing Width	1235
15	Front Bumper – Front Axle Distance	945
16	Front Axle – A-Pillar Distance	490
17	A-Pillar – B-Pillar Distance	1079
18	B-Pillar – Rear Axle Distance	1150
19	B-Pillar – C-Pillar Distance	678
20	Roof Sill Bottom Height	1521
21	Roof Sill Top Height	1651
22	Floor Sill Bottom Height	260
23	Floor Sill Top Height	525

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

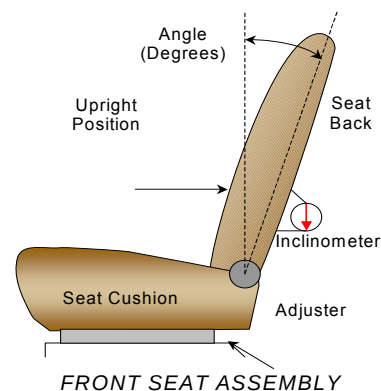
Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

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 September 2012.

	Degrees
Driver Seat Back Angle	-4.1° on headrest post
Passenger Seat Back Angle	-5.6° on headrest post



SEAT FORE/AFT POSITIONS

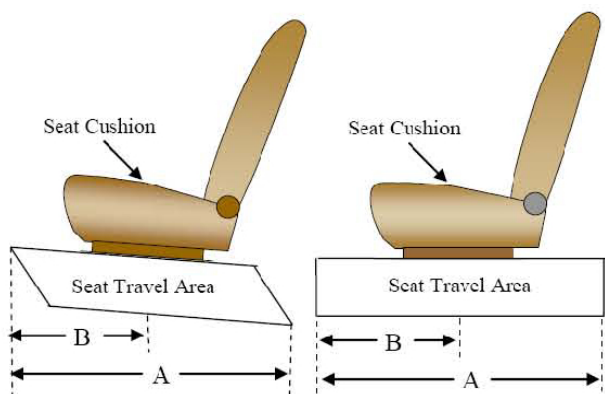
The driver and passenger seat fore/aft positions are adjusted following Appendix F, "Driver & Passenger Dummy Seating & Positioning Procedures" in the NCAP Test Procedure dated September 2012.

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	24 Detents (1 st as 0)	11 th Detent (1 st as 0)
Passenger Seat	22 Detents (1 st as 0)	0 Detent (1 st as 0)

SEAT BELT UPPER ANCHORAGES

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

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



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

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

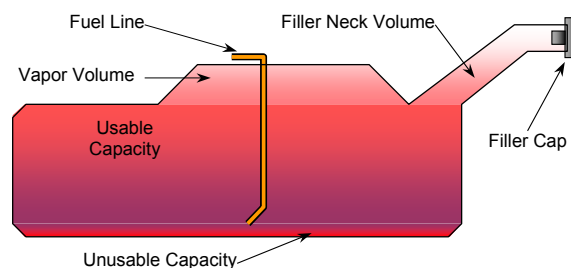
FUEL TANK CAPACITY DATA

	Liters
Usable Capacity of "Standard Tank"	68.0
Usable Capacity of "Optional Tank"	
92-94% of Usable Capacity	62.6 to 63.9
Actual Amount of Solvent used	63.2
1/3 of Usable Capacity	22.7

FUEL PUMP

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

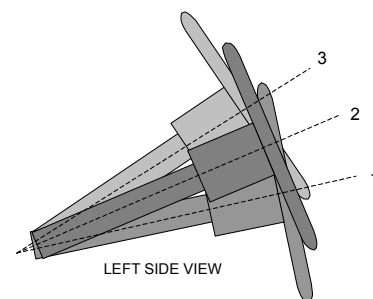
The vehicle is equipped with an electric fuel pump. Fuel pump will pump fuel when key is in "ON" position. The fuel pipe is on the left side.



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.



LEFT SIDE VIEW

STEERING COLUMN ASSEMBLY

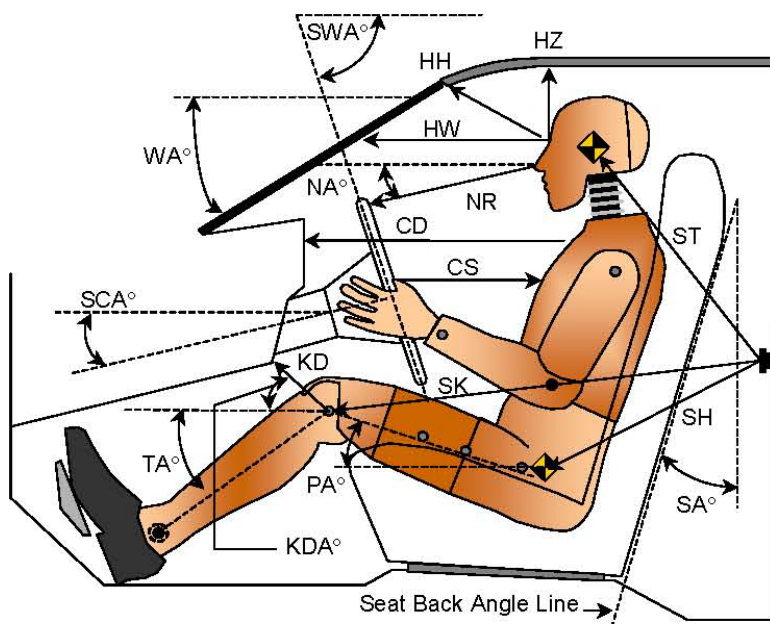
STEERING COLUMN POSITION

	Degrees	Fore/Aft Position (mm)
Lowermost Position 1	64.2	197
Geometric Center Position 2	62.5	177
Uppermost Position 3	60.8	157
Telescoping Steering Wheel Travel		40
Test Position	62.8	177

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 KIA Sorento LX AWD SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
Test Date: 07/11/2013



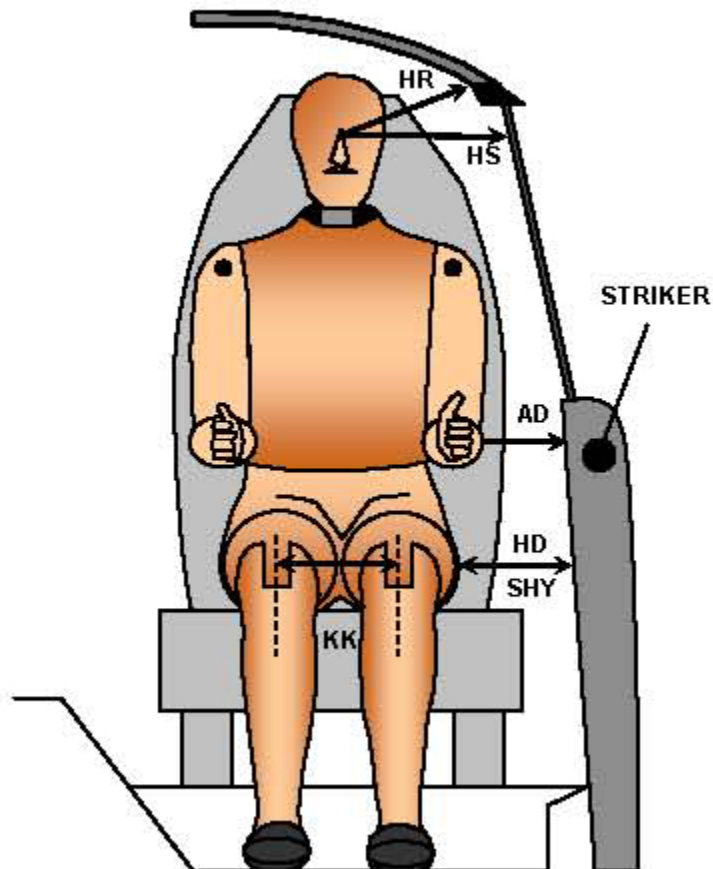
LEFT SIDE VIEW

Code	Measurement Description	Driver S/N 036		Passenger S/N 138	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.4		
SWA°	Steering Wheel Angle		62.8		
SCA°	Steering Column Angle		27.2		
SA°	Seat Back Angle (on headrest post)		-4.1		-5.6
HZ	Head to Roof (Z)	188	90.0	243	90.0
HH	Head to Header	318	23.7	291	46.1
HW	Head to Windshield	582	0.0	672	0.0
NR	Nose to Rim	398	8.2		
CD	Chest to Dash	525		408	
CS	Chest to Steering Hub	319	4.5		
RA	Rim to Abdomen	185	0.0		
KDL	Left Knee to Dash	164	20.0	102	28.9
KDR	Right Knee to Dash	146	23.1	111	31.9
PA°	Pelvic Angle		21.1		20.4
TA°	Tibia Angle		51.0		50.2
SK	Striker to Knee	593	98.4	679	101.6
ST	Striker to Head	463	16.4	420	35.1
SH	Striker to H-Point	302	132.5	405	120.5

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013



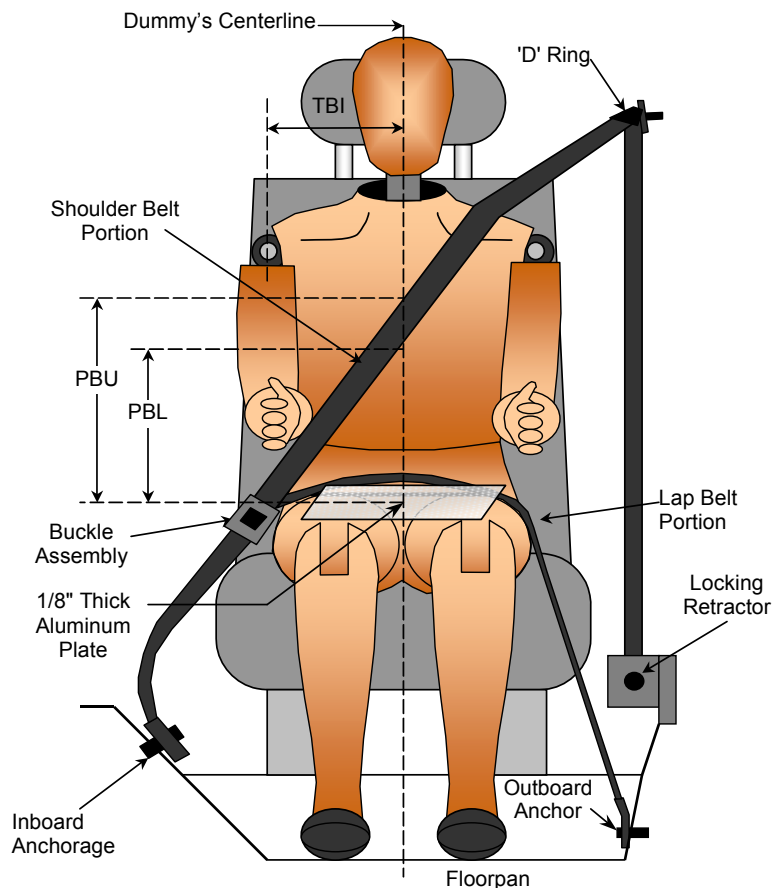
FRONT VIEW OF DUMMY

Code	Measurement Description	Driver S/N 036	Passenger S/N 138
		Length (mm)	
AD	Arm to Door	64	112
HD	H-Point to Door	152	197
HR	Head to Side Header	220	278
HS	Head to Side Window	330	369
KK	Knee to Knee	363	229
SHY	Striker to H-Point (Y Direction)	294	303
AA	Ankle to Ankle	376	169

DATA SHEET NO. 5 SEAT BELT POSITIONING DATA

Test Vehicle: 2014 KIA Sorento LX AWD SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
Test Date: 07/11/2013



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	385	360
PBL - Top surface of reference to belt lower edge	mm	315	285

BELT LENGTH DATA

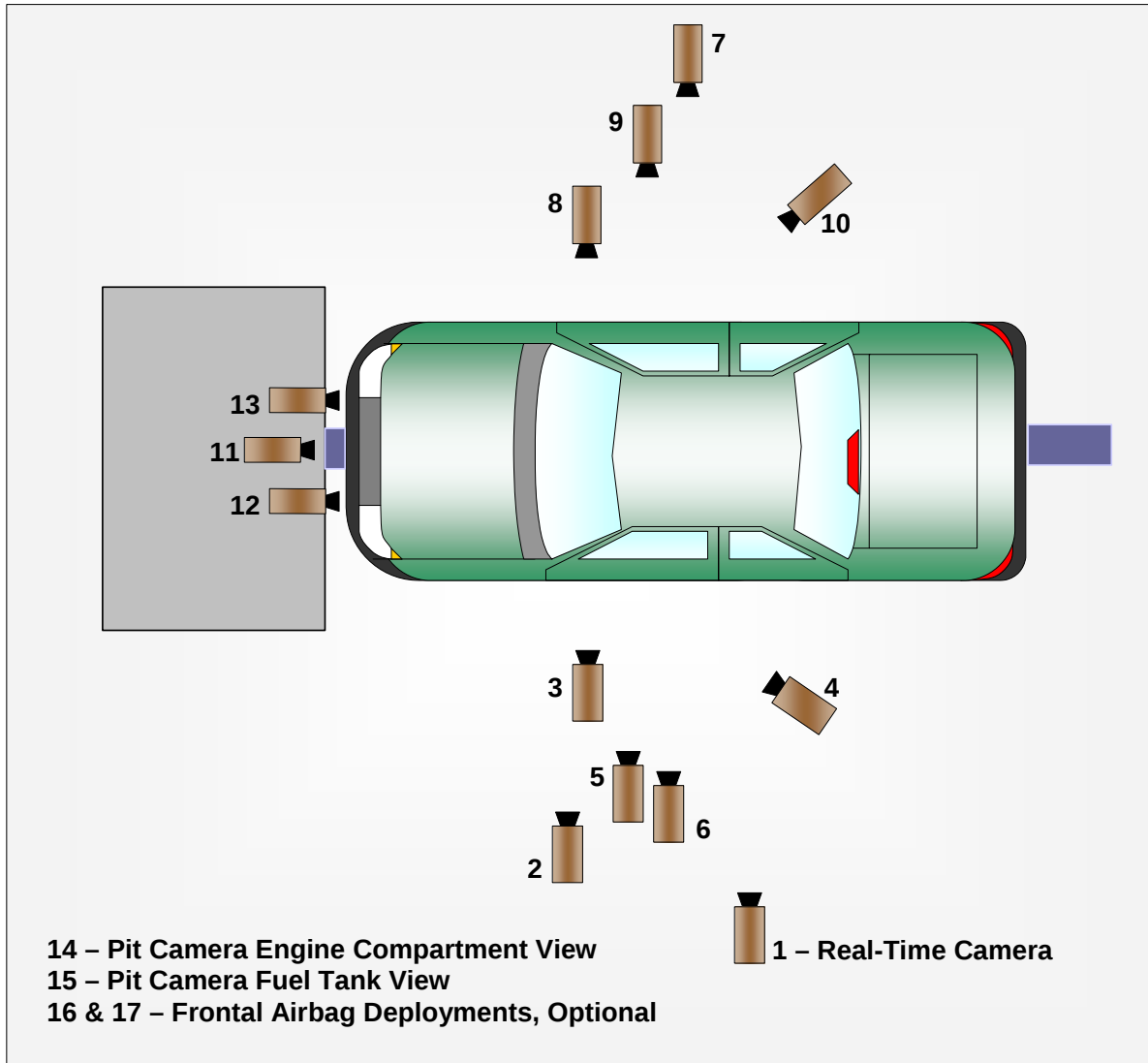
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as measured on ATD	mm	860	935
Lap Belt Length as measured on ATD	mm	625	660
Remainder of belt on reel	mm	1610	1500
Total Belt Length for Continuous Webbing Systems	mm	3095	3095

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

Test Vehicle: 2014 KIA Sorento LX AWD SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
Test Date: 07/11/2013

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

CAMERA LOCATIONS

No.	Camera View	Coordinates (mm)			Lens (mm)	Speed (fps)
		X*	Y*	Z*		
1	Real-Time Left Overall					30
2	Driver Close-Up	1390	-6230	-1780	35	1000
3	Left Front Half	1160	-5170	-1130	24	1000
4	Left Angle	5390	-4810	-1940	50	1000
5	Steering Column - Top	730	-5380	-1230	24	1000
6	Steering Column - Bottom	660	-5360	-830	24	1000
7	Right Overall	2420	6710	-1070	20	1000
8	Passenger Close-Up	1650	6850	-1820	35	1000
9	Right Front Half	1180	5210	-1070	24	1000
10	Right Angle	5680	4530	-1920	50	1000
11	Windshield	-260	0	-2860	24	1000
12	Driver Windshield	-30	-360	-2270	8.5	1000
13	Passenger Windshield	-30	360	-2270	8.5	1000
14	Pit Front	1060	0	3150	24	1000
15	Pit Rear	2980	0	3150	24	1000
16	Onboard Driver Side (optional)					
17	Onboard Passenger Side (optional)					
18	Real-Time Pan View					30

***COORDINATES:**

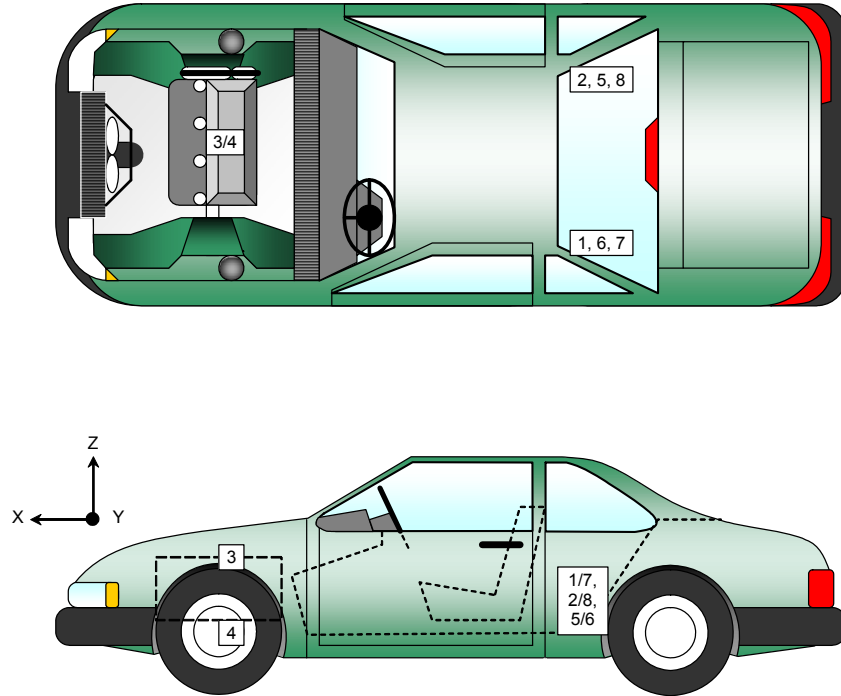
- +X = forward of impact plane
- +Y = right of monorail centerline
- +Z = below ground level

Cameras 16 & 17 were not used for this test.

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

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Crossmember Accelerometer – X Direction	1852	-495	-364
2	Right Rear Crossmember Accelerometer – X Direction	1856	428	-373
3	Engine Top X	3957	17	-870
4	Engine Bottom X	3987	21	-322
5	Left Rear Crossmember Accelerometer – Z Direction	1852	-495	-364
6	Right Rear Crossmember Accelerometer – Z Direction	1856	428	-373
7	Left Rear Crossmember Accelerometer Redundant – X Direction	1852	-495	-364
8	Right Rear Crossmember Accelerometer Redundant – X Direction	1856	428	-373

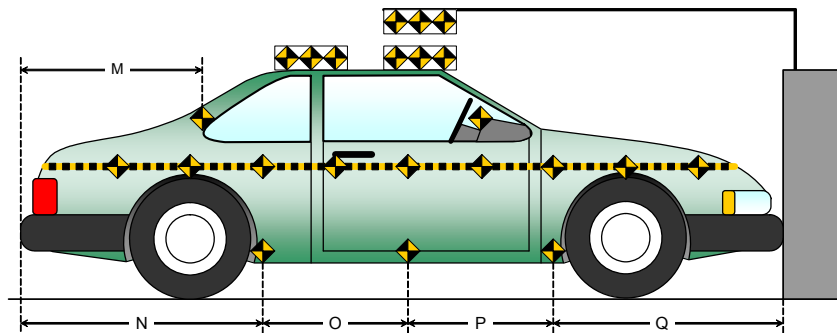
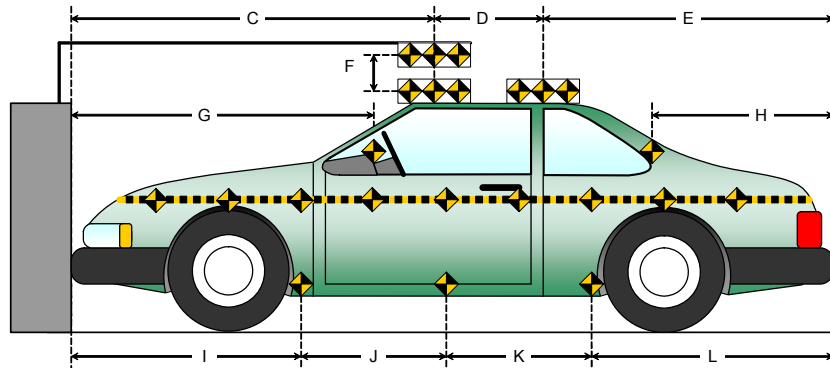
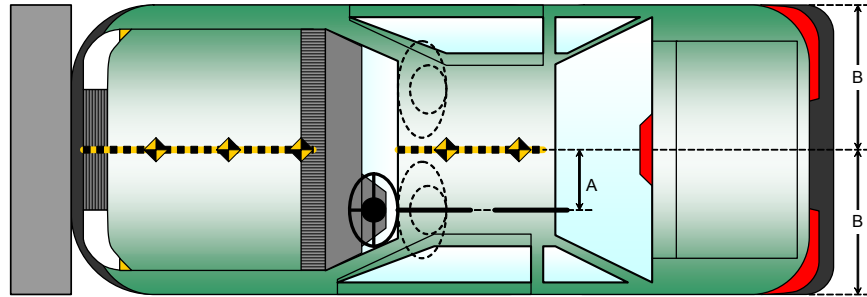
Reference Points: X - Rear Surface of Vehicle (+ forward)
 Y - Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: Q20144200
 Test Date: 07/11/2013

Item	Value (mm)
A	380
B	930
C	2330
D	670
E	1689
F	40
G	
H	1331
I	1423
J	878
K	878
L	1510
M	1331
N	1510
O	878
P	878
Q	1423



Test Vehicle: 2014 KIA Sorento LX AWD SUV
Test Program: NCAP Frontal Barrier Impact Test

Advanced Research Load Cell Barrier



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: 2014 KIA Sorento LX AWD SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
Test Date: 07/11/2013

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	0
High-Speed Offboard	14
Real-Time	2
Total	16

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

Test Vehicle: 2014 KIA Sorento LX AWD SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
Test Date: 07/11/2013

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50% / 036	HIII 5% / 138
Head Contact	Airbag, Headrest	Airbag, Headrest
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

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

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	990
Center	mm	925
Right Side	mm	980
Average	mm	965

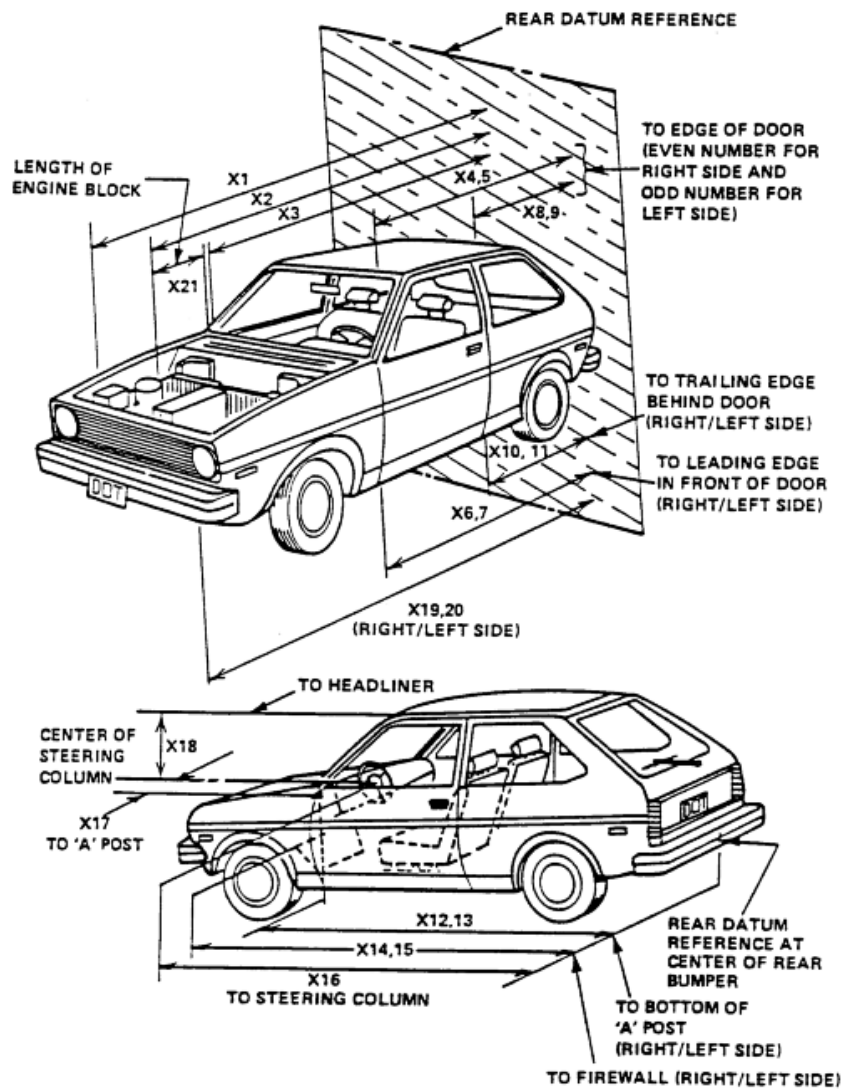
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Left Front (Driver) P1		Right Front (Passenger) P2	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	Yes	Yes	Yes
Curtain Side Airbag	Yes	No	Yes	No
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Knee Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	

DATA SHEET NO. 12 VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 KIA Sorento LX AWD SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
Test Date: 07/11/2013



DATA SHEET NO. 12 (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

RSOV (Rear Surface of Vehicle)

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	mm	4689	4149	540
2	RSOV to Front of Engine	mm	4201	4002	199
3	RSOV to Firewall	mm	3681	3696	-15
4	RSOV to Upper Leading Edge of Right Door	mm	3189	3201	-12
5	RSOV to Upper Leading Edge of Left Door	mm	3189	3195	-6
6	RSOV to Lower Leading Edge of Right Door	mm	3170	3181	-11
7	RSOV to Lower Leading Edge of Left Door	mm	3170	3164	6
8	RSOV to Upper Trailing Edge of Right Door	mm	2130	2149	-19
9	RSOV to Upper Trailing Edge of Left Door	mm	2130	2151	-21
10	RSOV to Lower Trailing Edge of Right Door	mm	2157	2169	-12
11	RSOV to Lower Trailing Edge of Left Door	mm	2157	2159	-2
12	RSOV to Bottom of "A" Post of Right Side	mm	3185	3183	2
13	RSOV to Bottom of "A" Post of Left Side	mm	3185	3177	8
14	RSOV to Firewall, Right Side	mm	3733	3702	31
15	RSOV to Firewall, Left Side	mm	3733	3724	9
16	RSOV to Steering Column	mm	2726	2756	-30
17	Center of Steering Column to "A" Post	mm	402	413	-11
18	Center of Steering Column to Headliner	mm	440	475	-35
19	RSOV to Right Side of Front Bumper	mm	4425	4134	291
20	RSOV to Left Side of Front Bumper	mm	4425	4099	326
21	Length of Engine Block	mm	528	528	0
RD	RSOV to Right Side of Dash Panel	mm	2955	2947	8
CD	RSOV to Center of Dash Panel	mm	3004	3006	-2
LD	RSOV to Left Side of Dash Panel	mm	2960	2958	2

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2014 KIA Sorento LX AWD SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
Test Date: 07/11/2013

VEHICLE INFORMATION

VIN: 5XYKTCA60EG462807 Wheelbase (mm): 2700
Vehicle Size Category: MPV Test Weight (kg): 1936.9

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 15

Cal. Procedure/Interval: MGA procedure / 6 month

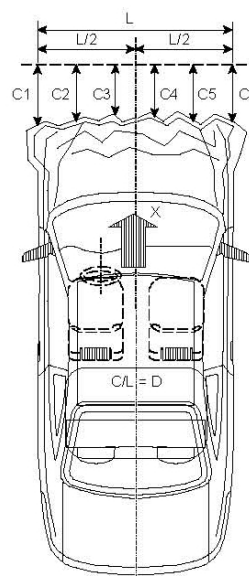
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.4

Velocity Change (km/h): 65.1

Time of Separation (msec): 113.7



CRUSH PROFILE

Collision Deformation Classification: Frontal

Midpoint of Damage: Centerline

Damage Region Length (mm): 1548

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4425	4099	326
C2	Crush zone 2 at left side	mm	4584	4115	469
C3	Crush zone 3 at left side	mm	4651	4140	511
C4	Crush zone 4 at right side	mm	4651	4138	513
C5	Crush zone 5 at right side	mm	4584	4122	462
C6	Crush zone 6 at right side	mm	4425	4134	291
L	C1 TO C6	mm	1548	1573	-25

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2014 KIA Sorento LX AWD SUV
Test Program: NCAP Frontal Barrier Impact Test

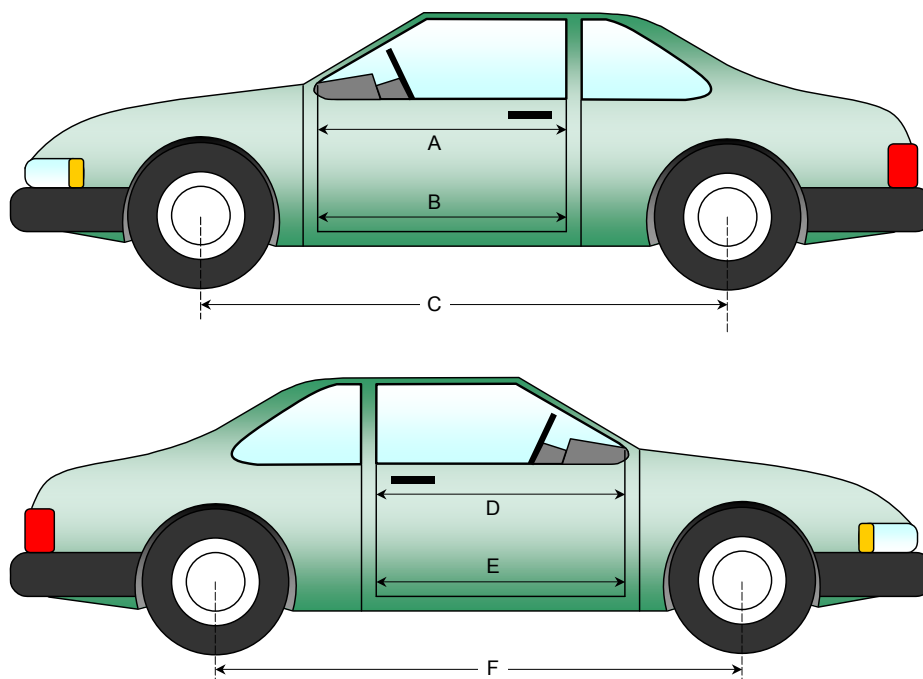
NHTSA No.: O20144200
Test Date: 07/11/2013

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	955	951	4
B	Left Side Lower	mm	876	875	1
D	Right Side Upper	mm	955	951	4
E	Right Side Lower	mm	876	877	-1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2700	2661	39
F	Right Side Wheelbase	mm	2700	2621	79



DATA SHEET NO. 14 (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

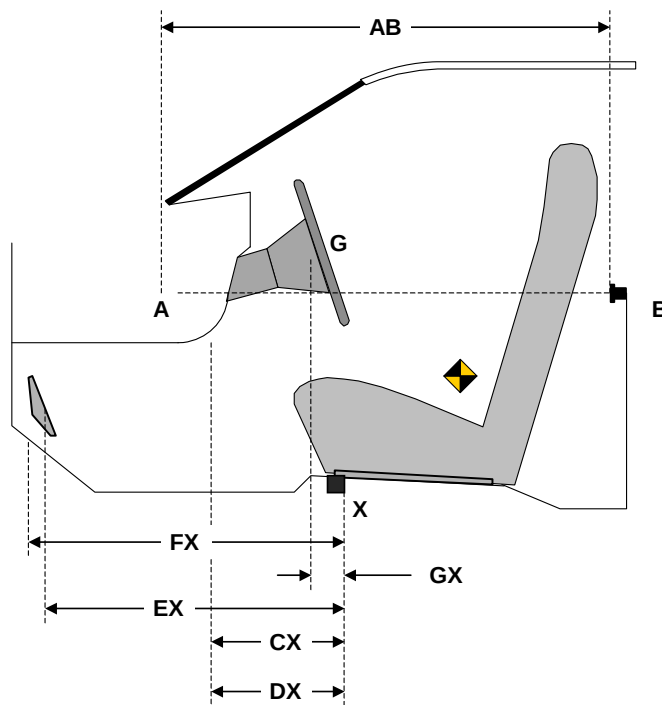
Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	748	748	0
CX	Left Knee Bolster to X	mm	225	263	-38
DX	Right Knee Bolster to X	mm	209	240	-31
EX	Brake Pedal to X	mm	508	531	-23
FX	Foot Rest to X	mm	487	493	-6
GX	Center of Steering Column Wheel Hub to X	mm	15	80	-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: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

Windshield Mounting Details:

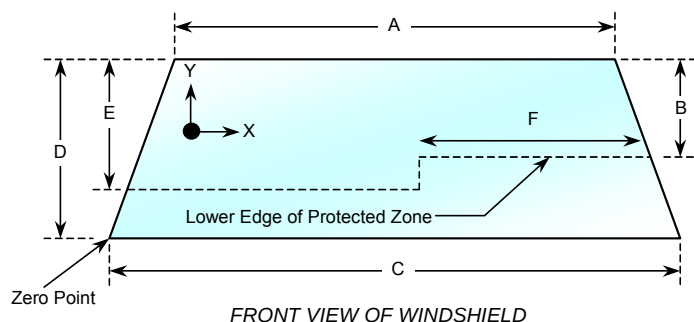
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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

Temperature of windshield molding during test: 21.9°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2110	2110	100
Right Side	2110	2110	100
Total	4220	4220	100



Item	Units	Value
A	mm	1190
B	mm	540
C	mm	1508
D	mm	761
E	mm	532
F	mm	530

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: 2014 KIA Sorento LX AWD SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
Test Date: 07/11/2013

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.9°C Test Time: 3:42 p.m.

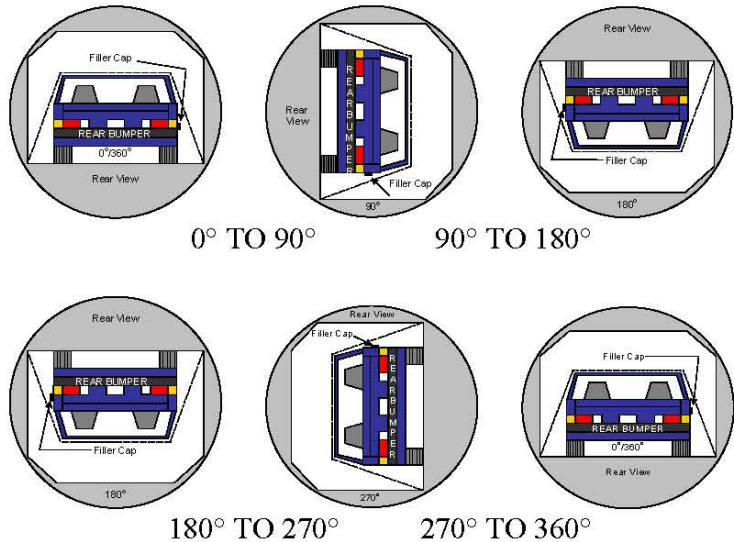
- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)
- D. Spillage: None

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

Test Vehicle: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013

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°	116	300	416
90° to 180°	111	300	411
180° to 270°	107	300	407
270° to 360°	112	300	412

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

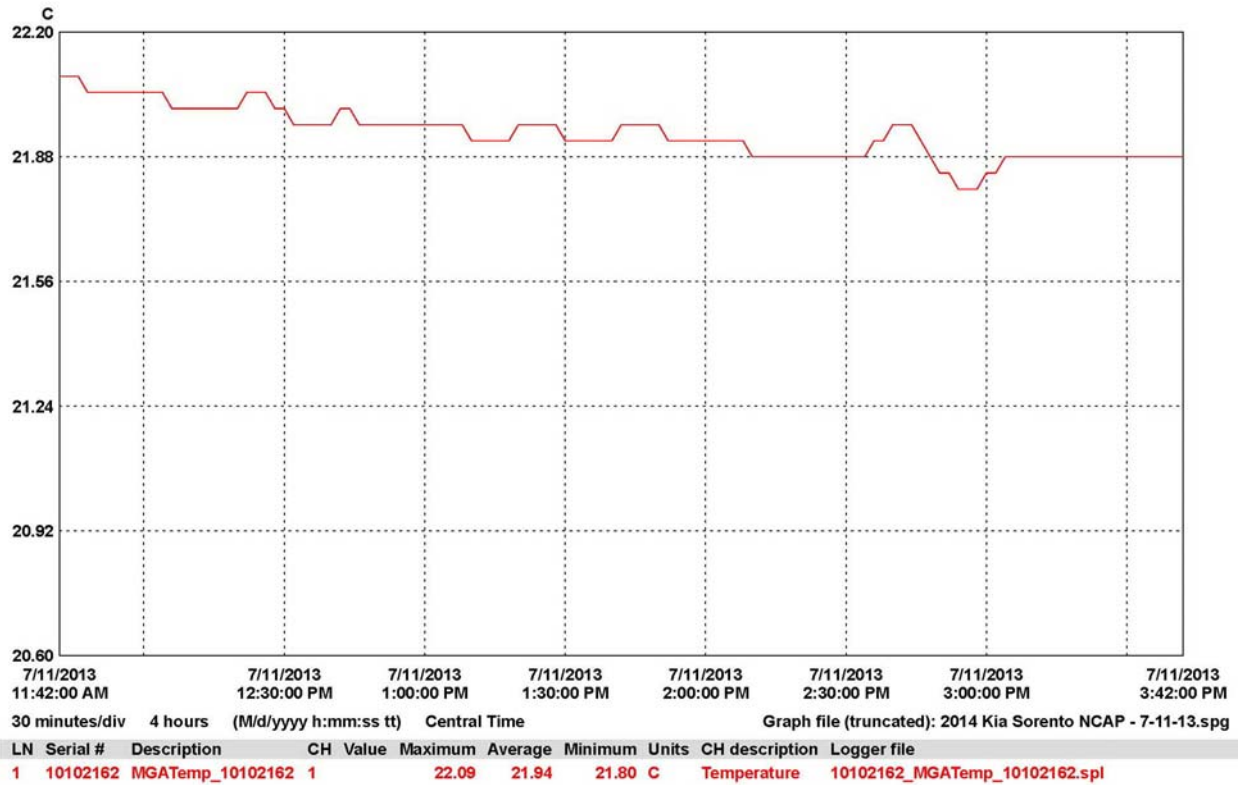
SOLVENT SPILLAGE LOCATION TABLE

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: 2014 KIA Sorento LX AWD SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20144200
 Test Date: 07/11/2013



APPENDIX A
PHOTOGRAPHS

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Load Cell Location



Load Cell Wall



Manufacturer's Label



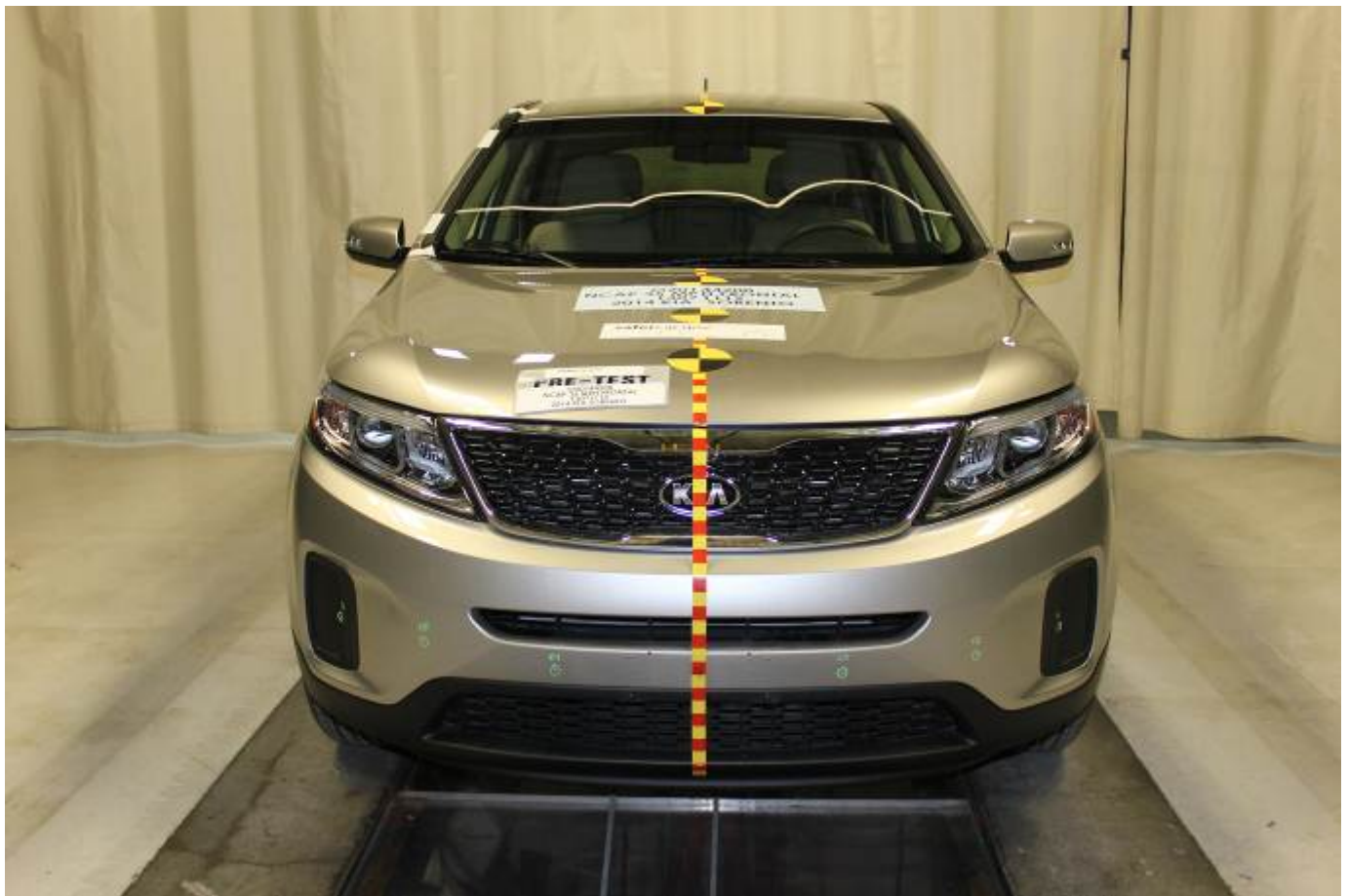
Tire Placard



2014 KIA Sorento LX AWD 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



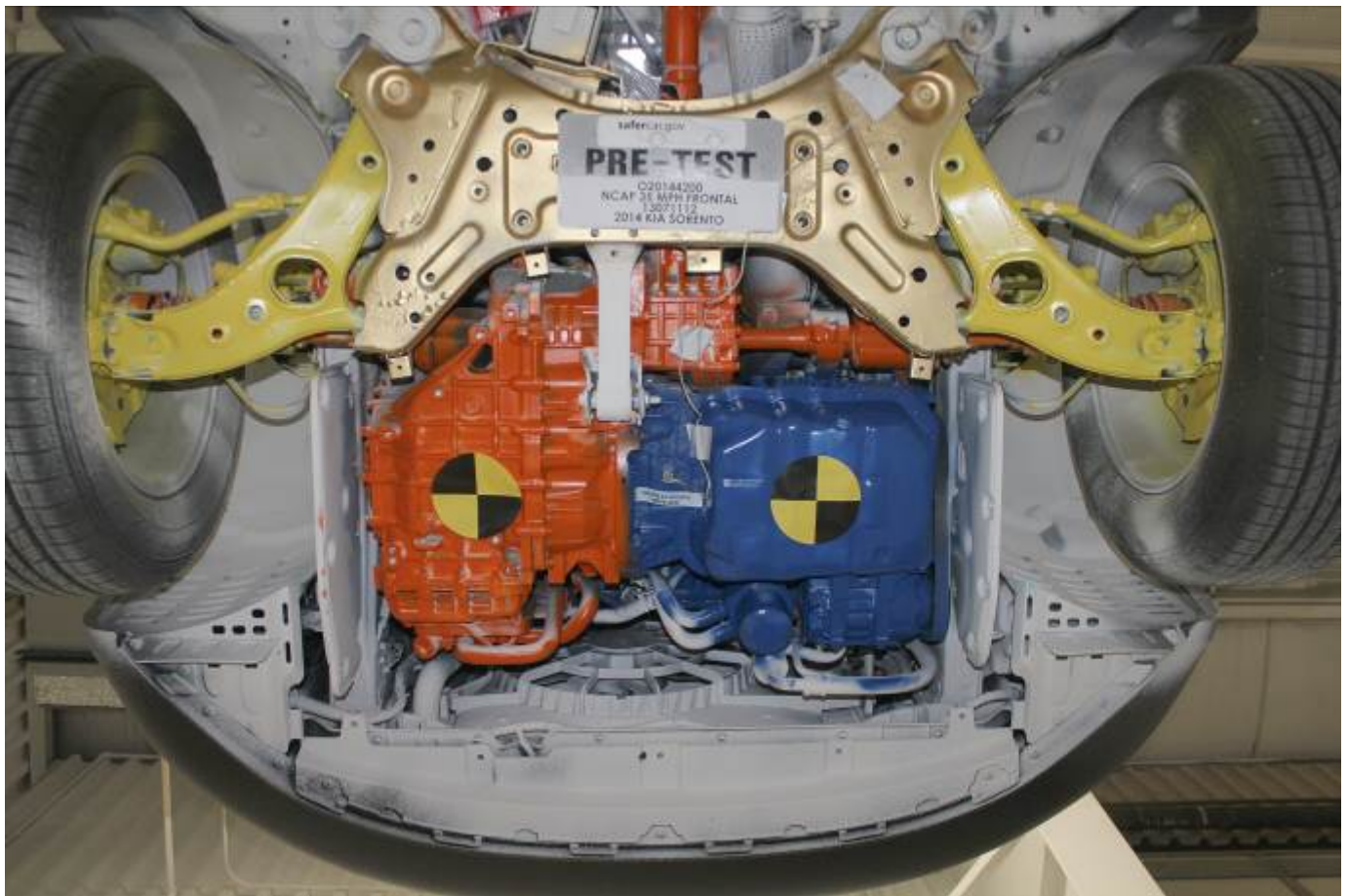
Post-Test Engine Compartment View



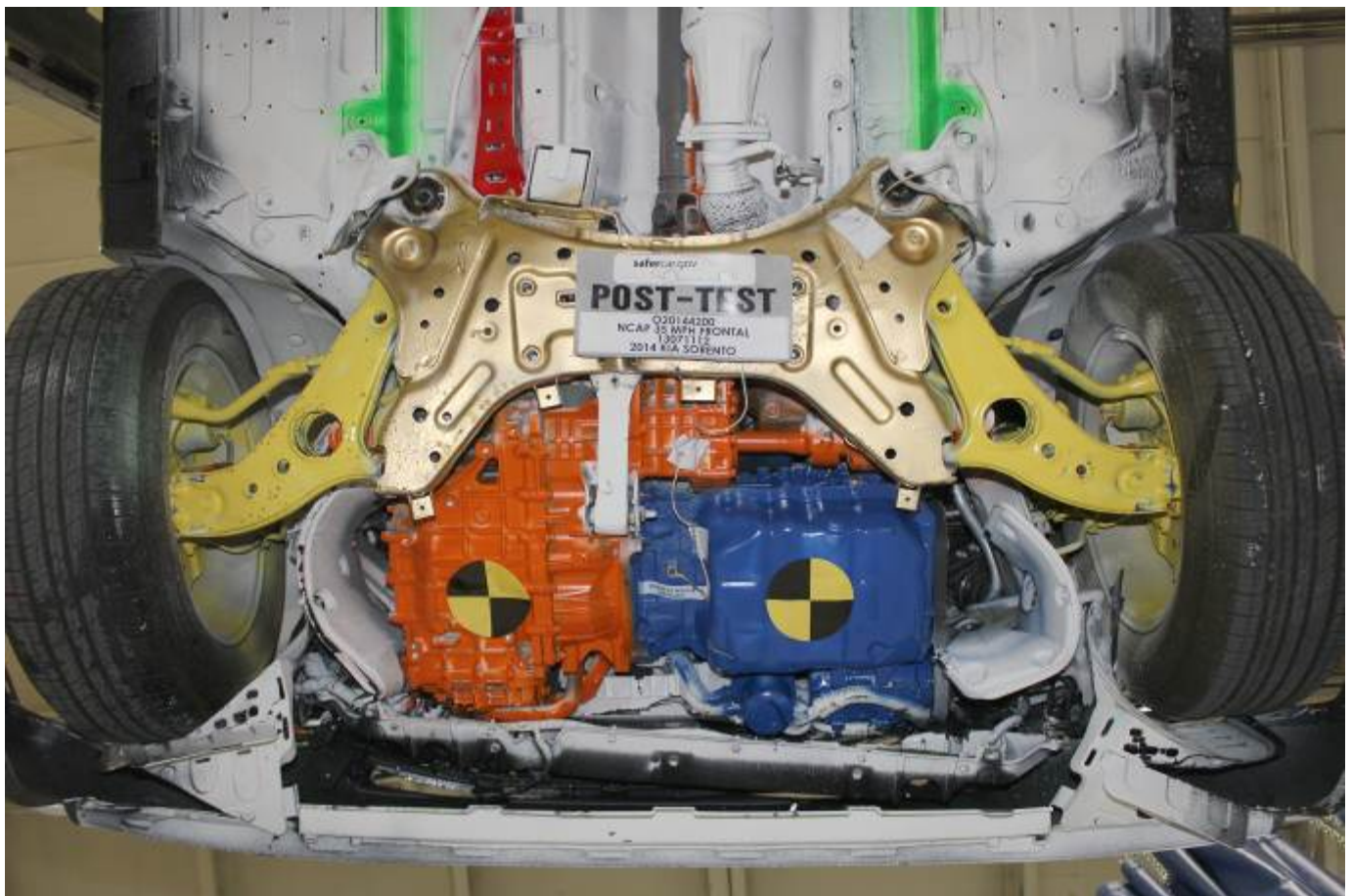
Pre-Test Fuel Filler Cap View



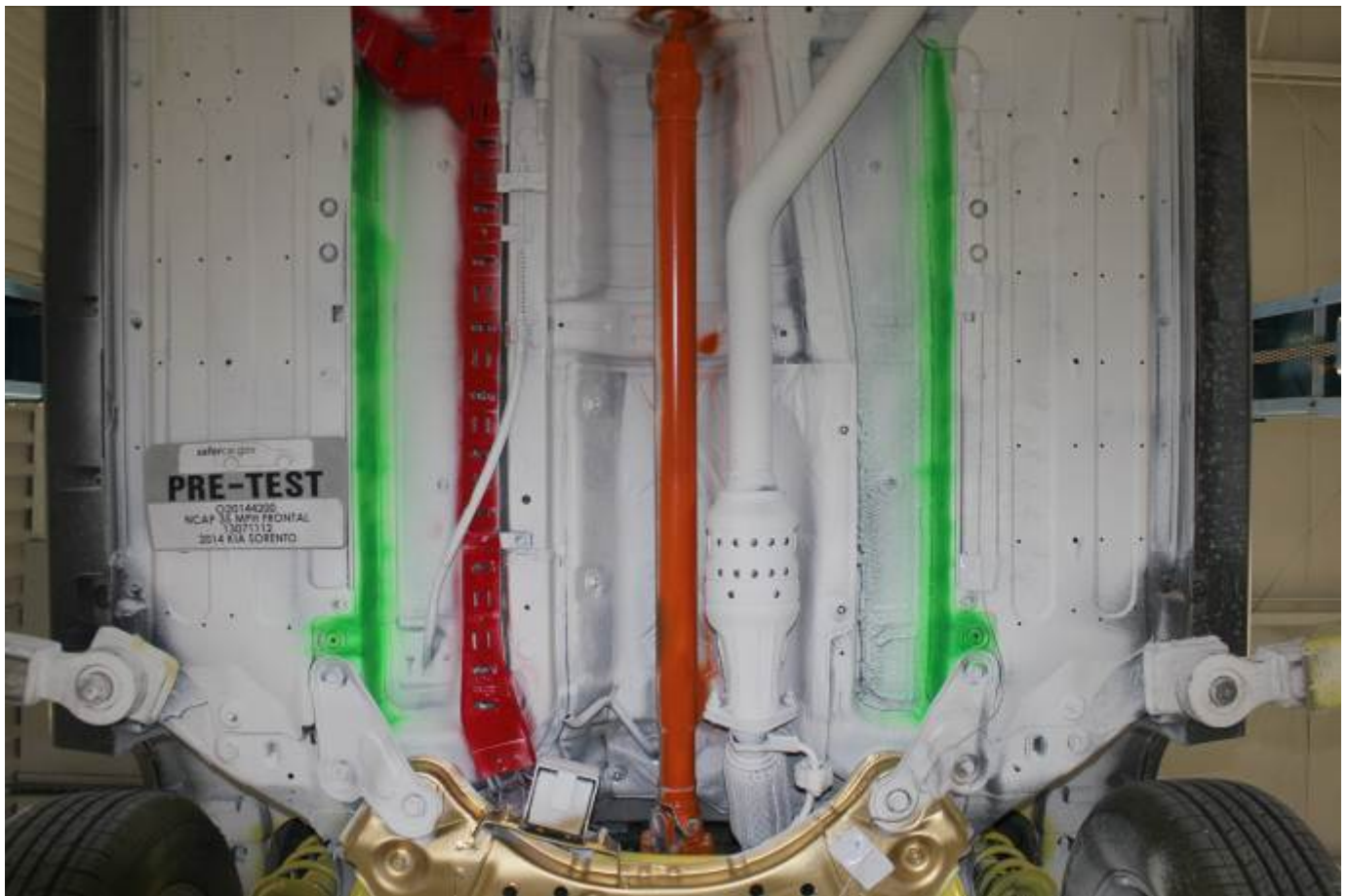
Post-Test Fuel Filler Cap View



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



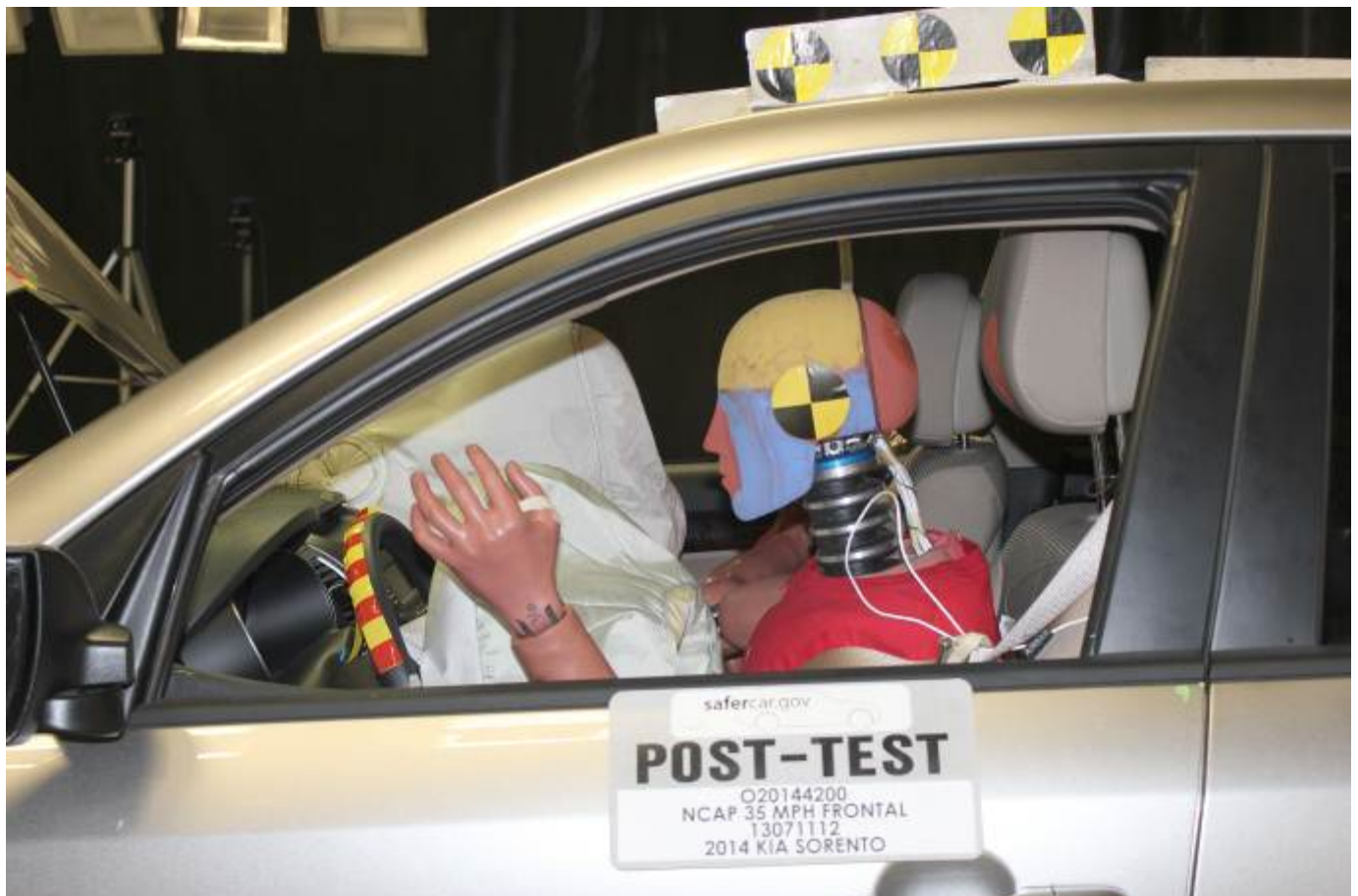
Pre-Test Driver Dummy Front View



Post-Test Driver Dummy Front View



Pre-Test Driver Dummy Window View



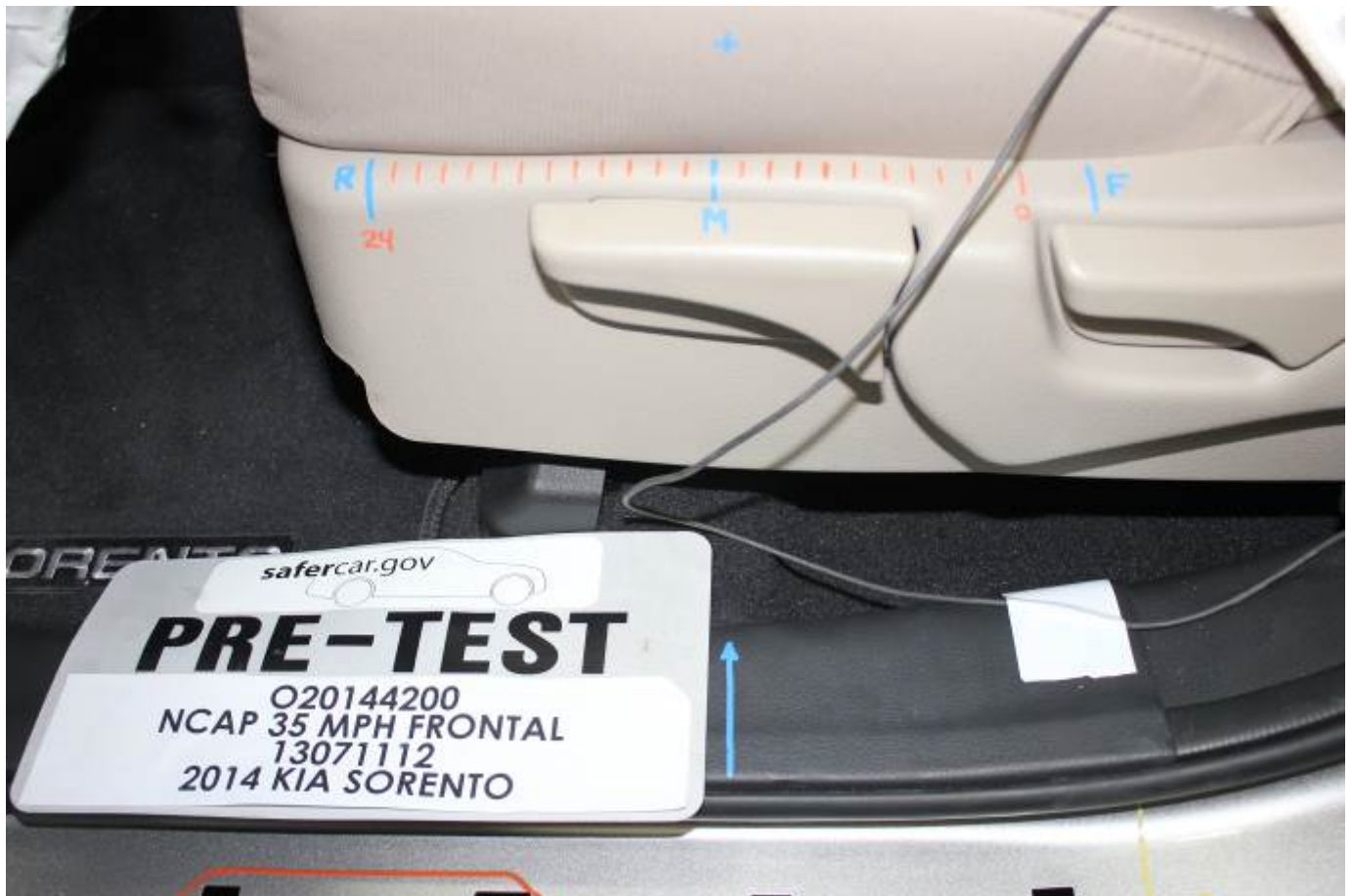
Post-Test Driver Dummy Window View



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 Bolster



Post-Test Driver Dummy Contact with Knee Bolster



Pre-Test View of the Steering Wheel



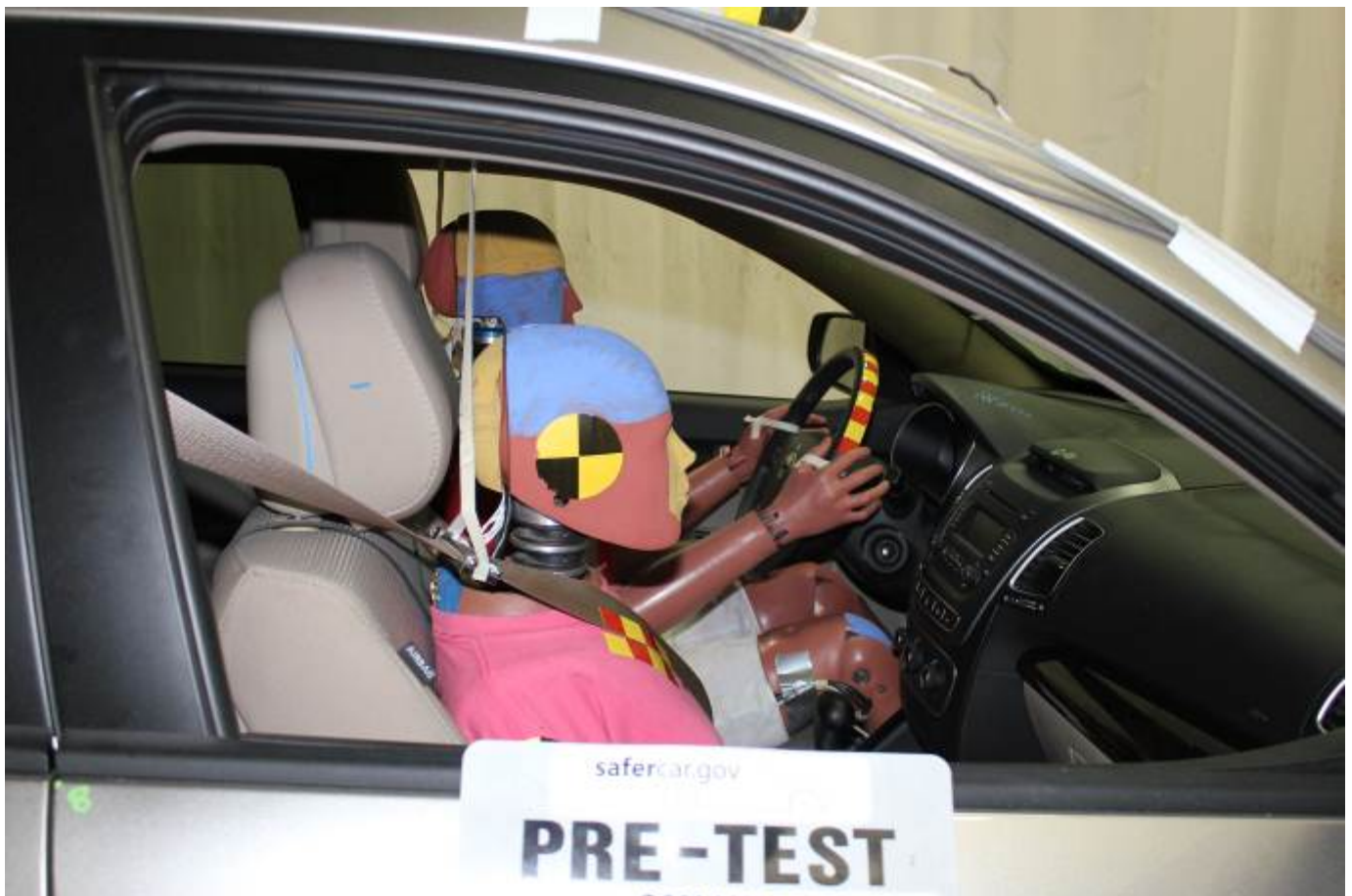
Post-Test View of the Steering Wheel



Pre-Test Passenger Dummy Front View



Post-Test Passenger Dummy Front View



Pre-Test Passenger Dummy Window View



Post-Test Passenger Dummy Window View



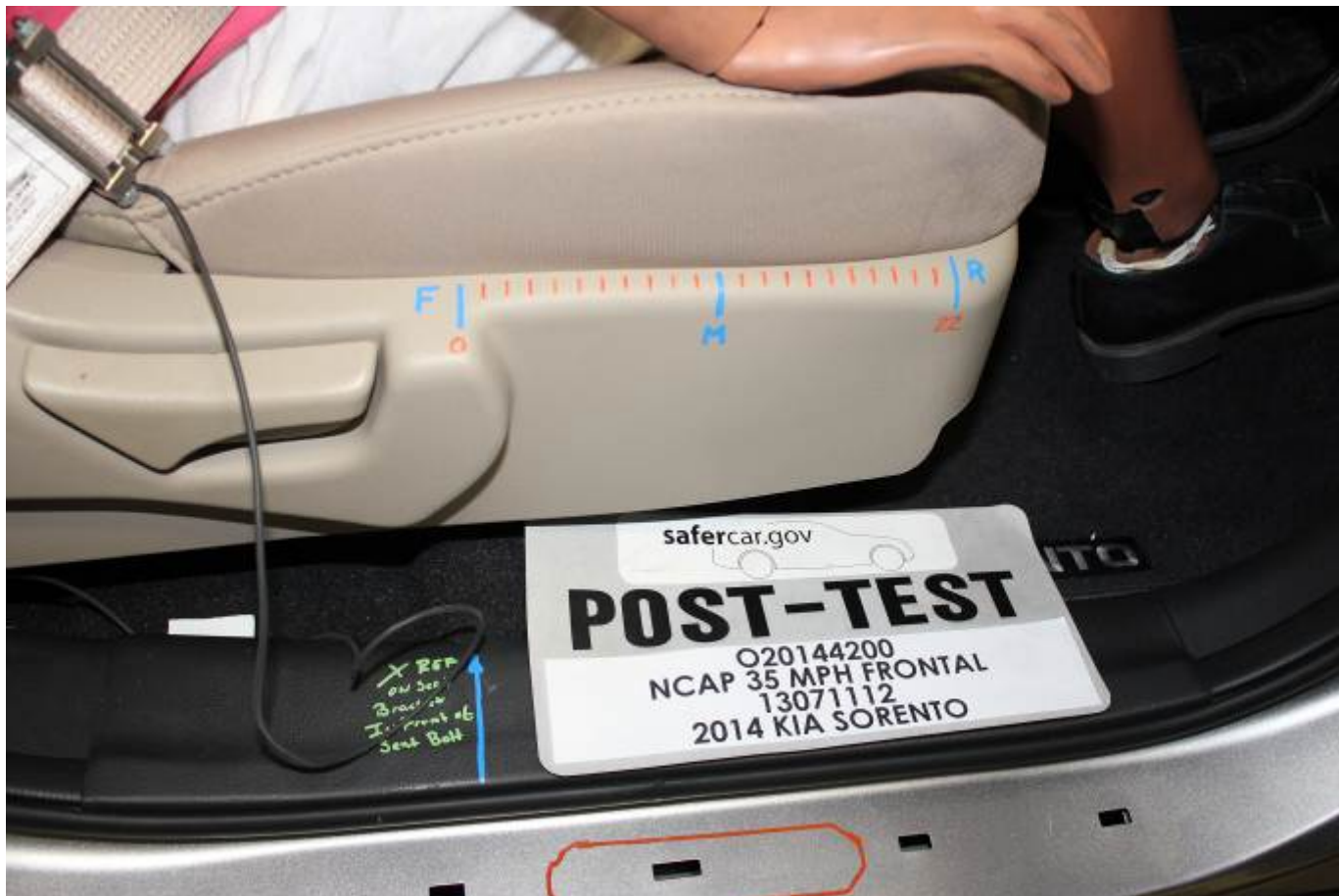
Pre-Test Passenger Dummy and Vehicle Interior (Door Open)



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



Pre-Test Passenger's Seat Fore-Aft Markings





Post-Test 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



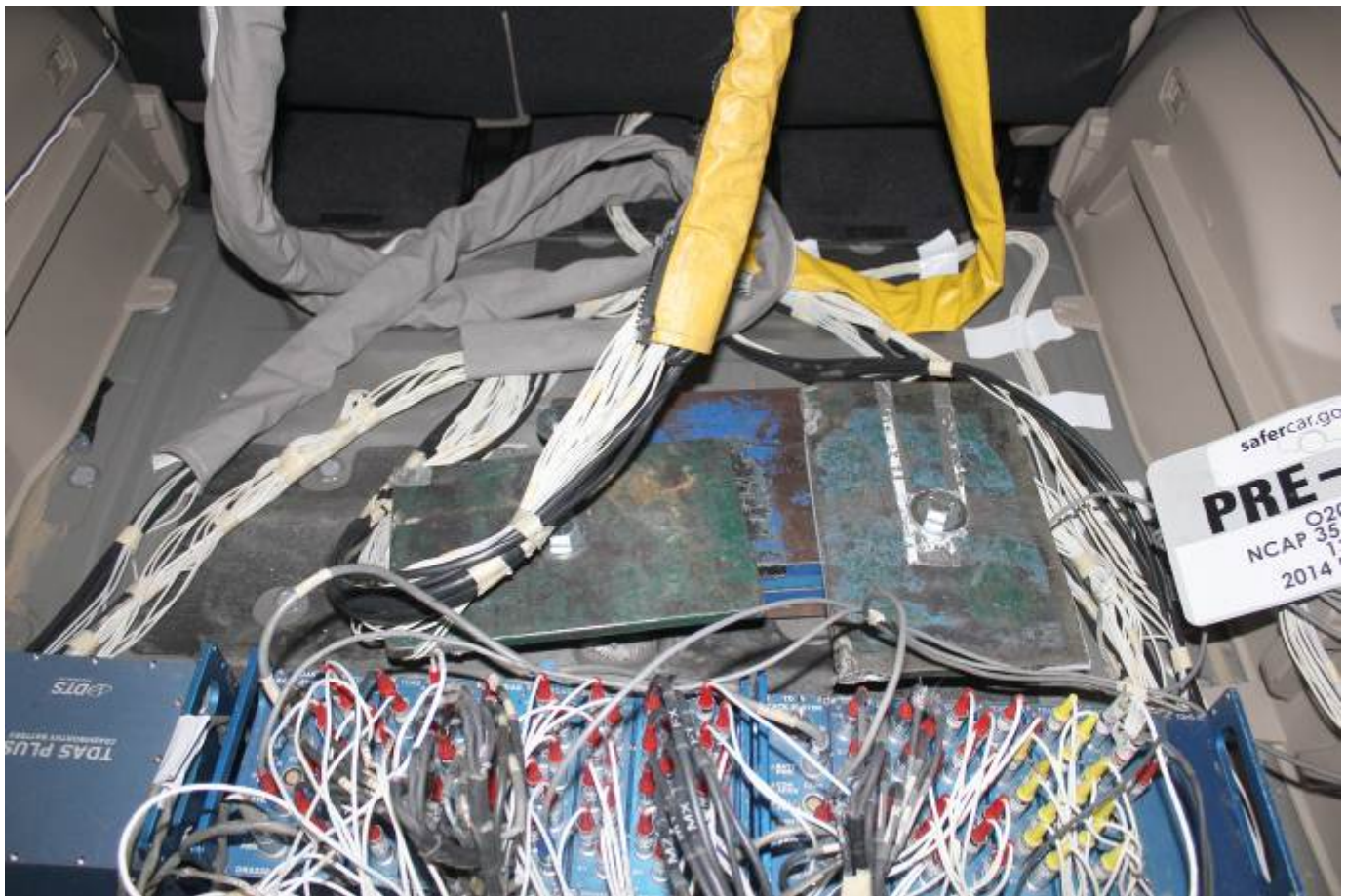
Post-Test Passenger Dummy Contact with Airbag



Post-Test Passenger Dummy Contact with Headrest



Post-Test Passenger Dummy Contact with Glove Box



Ballast Installed in Vehicle

PHOTOGRAPH NOT APPLICABLE

Post-Test Stoddard Solvent Spillage Location View



Post-Test Speed Trap Read-Out



Vehicle at 0° on Static Rollover Device



Vehicle at 90° on Static Rollover Device



Vehicle at 180° on Static Rollover Device



Vehicle at 270° on Static Rollover Device



Vehicle at 360° on Static Rollover Device



2014 KIA Sorento LX AWD Frontal Impact Event

2014 KIA SORENTO LX AWD MODEL / OPTION CODE: 73422 / 010 EXTERIOR / INTERIOR: SATIN METAL/BEIGE VEHICLE ID NUMBER: SKYKTCAR0EG482807 ENGINE NUMBER: G4KJDK96 PORT OF ENTRY: WEST POINT MODE OF TRANSPORT: TRUCK	SOLD TO: IL060 GROSSINGER KIA 6750 N. LINCOLN AVENUE LINCOLNWOOD IL 60712 SHIP TO: IL060	kia.com 
STANDARD FEATURES	MANUFACTURER'S SUGGESTED RETAIL PRICE	EPA Fuel Economy and Environment Gasoline Vehicle
MECHANICAL 2.4 L Gas Direct Injection (GDI) 4-cyl Engine 5-Speed Automatic Transmission w/ Sportmatic Independent Front and Rear Suspension All Wheel Drive w/ Locking Center Differential Alloy Wheels	ADDITIONAL INSTALLED EQUIPMENT: (In addition to or in place of standard features) Carpeted Floor Mats	Fuel Economy  4.8 gallons per 100 miles You spend \$1000 more in fuel costs over 5 years compared to the average new vehicle.
SAFETY Dual Front Advanced Airbags Front Seat-Mounted Side Airbags Side Curtain Airbags (1st & 2nd Row) Front Active Headrests Lower Anchors and Tethers for Children (LATCH) Anti-Lock Braking System (ABS) Traction Control System (TCS) Electronic Stability Control (ESC) Hill-start Assist Control (HAC) Tire Pressure Monitoring System (TPMS)	MSRP INCLUDING OPTIONS \$26,015.00 MEANS PRICE AND HANDLING \$850.00 MSRP INCLUDING OPTIONS AND HANDLING \$26,865.00	Annual fuel cost \$2500 Fuel Economy & Greenhouse Gas Rating (5) Best Smog Rating (5) Best fuel economy.gov Calculate personalized estimates and compare vehicles.
INTERIOR Air Conditioning Power Windows, Door Locks & Outside Mirrors AM/FM/CD/MP3 Audio System SIRIUS/XM Satellite Radio w/free 3-mo. subscription* USB/Auxiliary Input Jacks BLUETOOTH® WIRELESS TECHNOLOGY 40/20/40 Split Folding 2nd Row Seats YES Essentials Seat Fabric Material Rear Center Armrest with Cupholders Remote Keyless Entry Cruise Control Steering Wheel Controls (Bluetooth/Audio/Cruise) Tilt and Telescopic Steering Column Dual Illuminated Visor Vanity Mirrors COMINDER® Indicator	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 Side Crash Front seat Not Rated, Rear seat Not Rated Rollover Not Rated	PARTS CONTENT INFORMATION FOR VEHICLES IN THIS CAR LINE U.S./CANADIAN PARTS CONTENT: 62% MAJOR SOURCES OF FOREIGN PARTS: KOREA: 48% NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS. FOR THIS VEHICLE FINAL ASSEMBLY POINT: USA COUNTRY OF ORIGIN ENGINE: USA TRANSMISSION: USA
EXTERIOR Privacy Glass Heated Outside Mirrors w/ Turn Signal Indicators	WARRANTY 10 Year/100,000 Mile Limited Powertrain Warranty 5 Year/60,000 Mile Limited Basic Warranty 5 Year/60,000 Mile Roadside Assistance *Ask dealer for details	Star ratings range from 1 to 5 stars (*****), with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA) www.safercar.gov or 1-888-327-4226 Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. License and title fees, state and local taxes and other dealer installed options and accessories are included in the manufacturer's suggested retail price.

Monroney Label

APPENDIX B
DUMMY RESPONSE DATA TRACES

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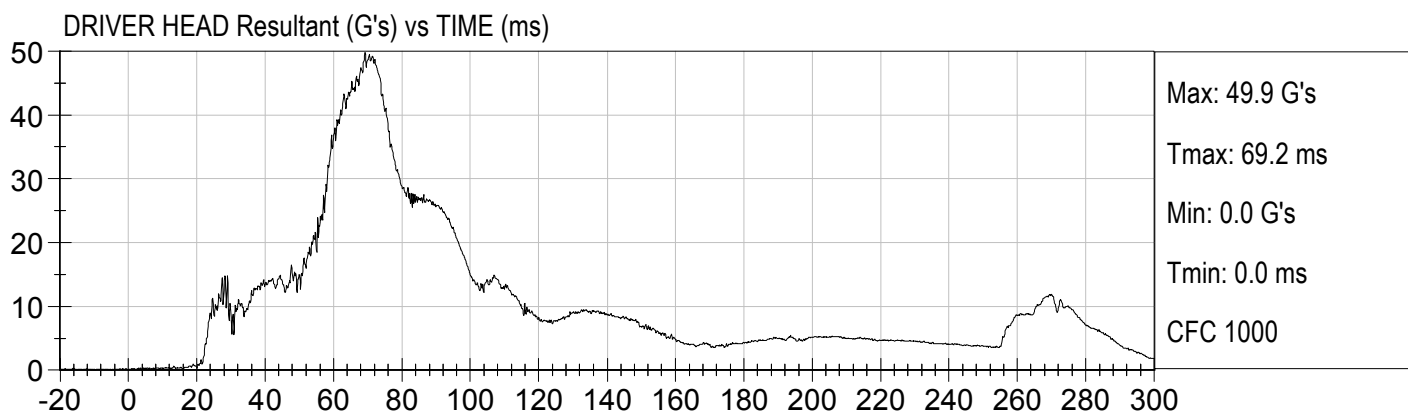
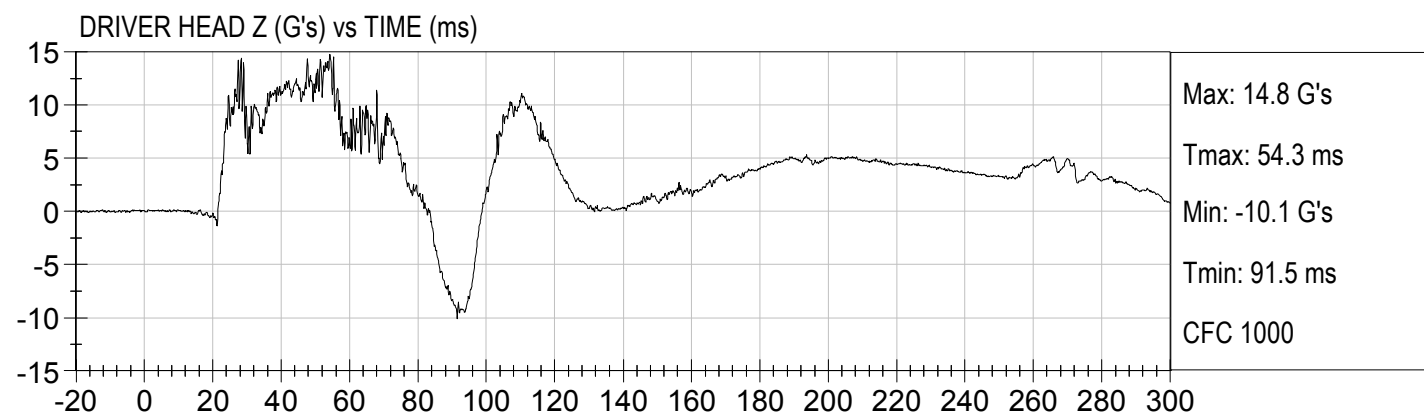
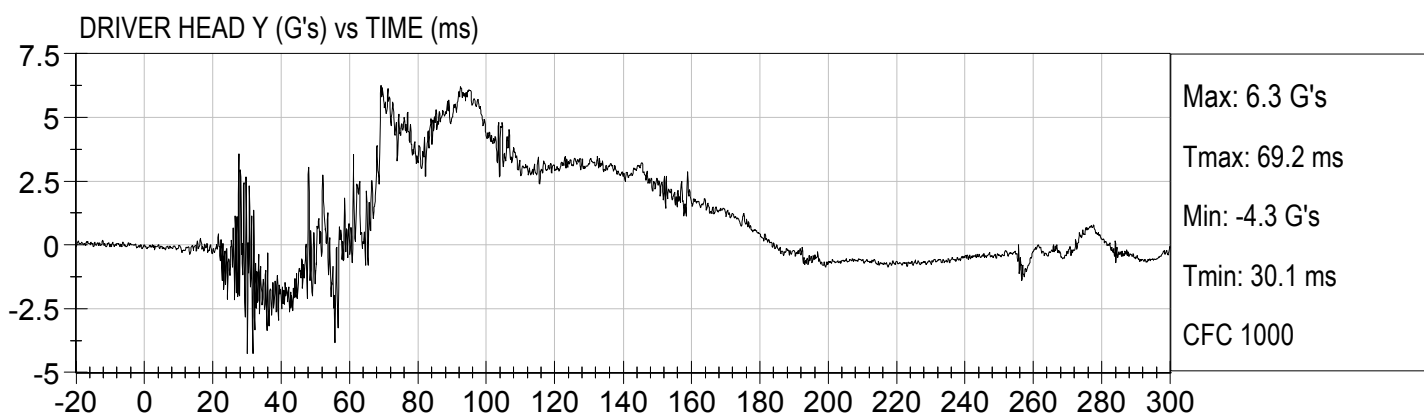
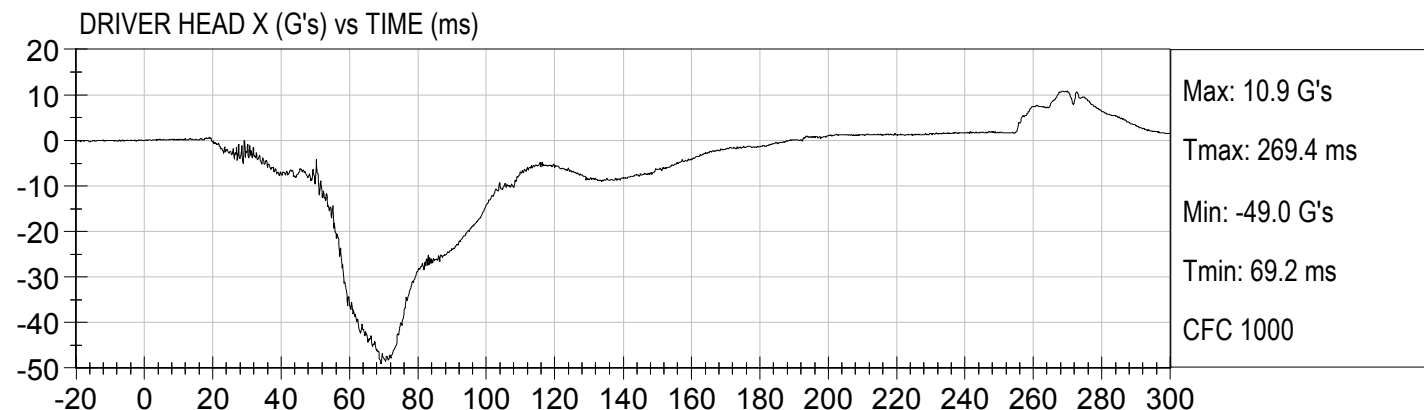
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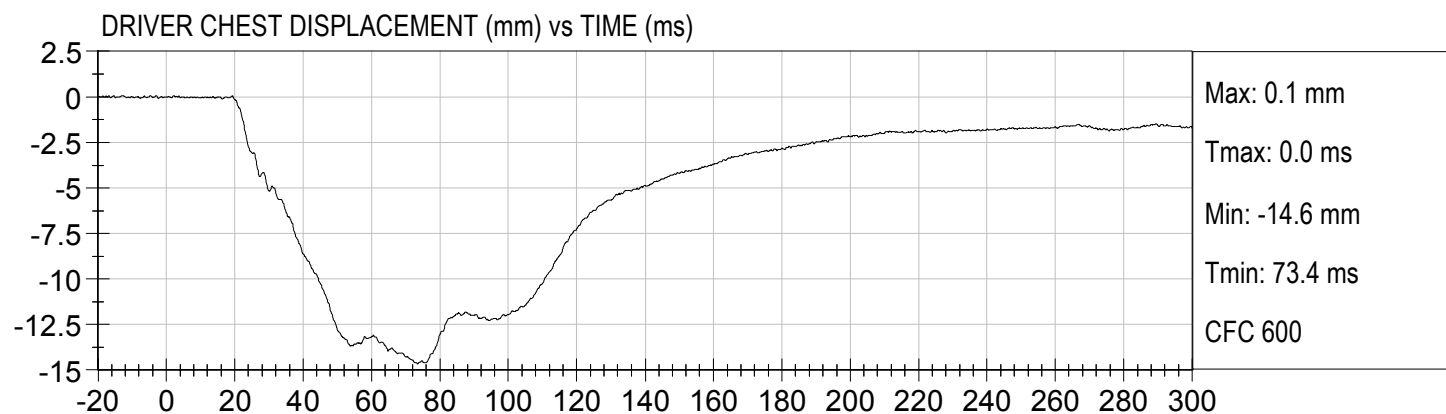
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

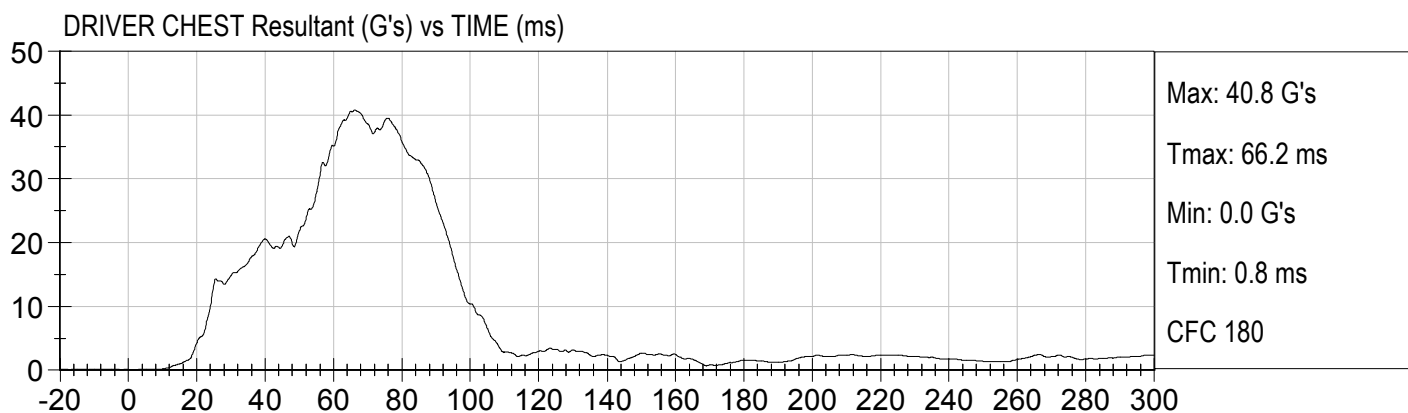
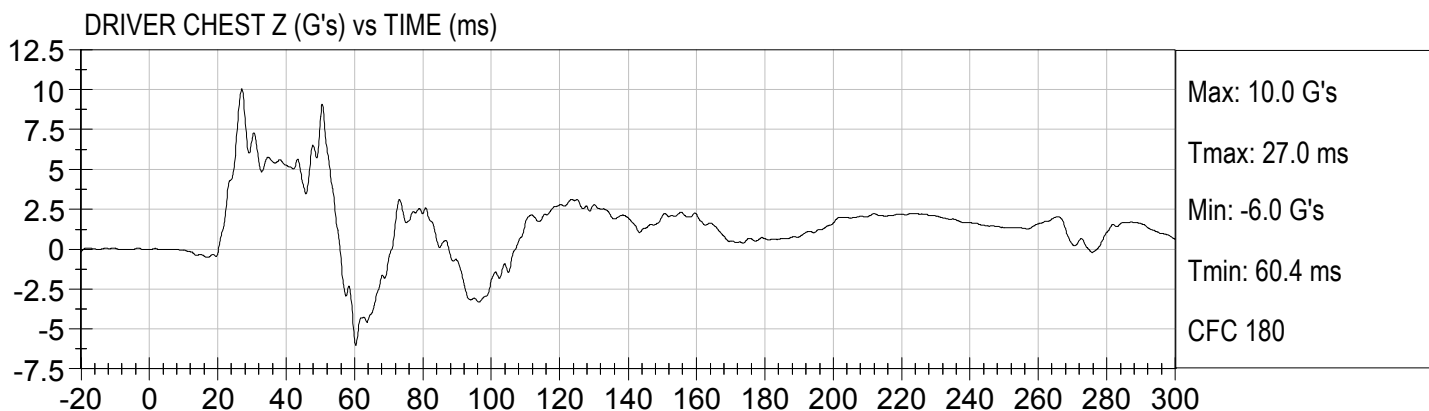
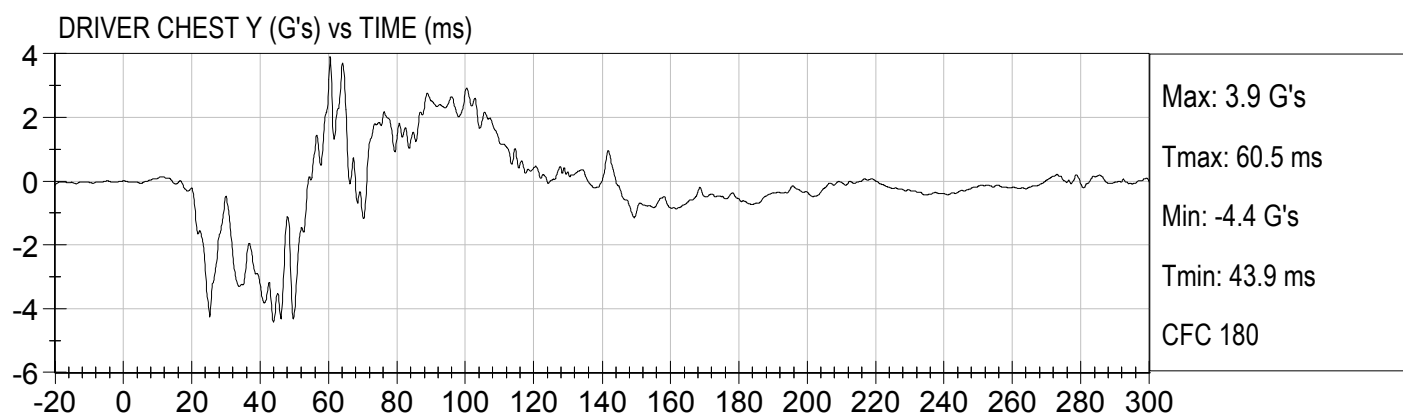
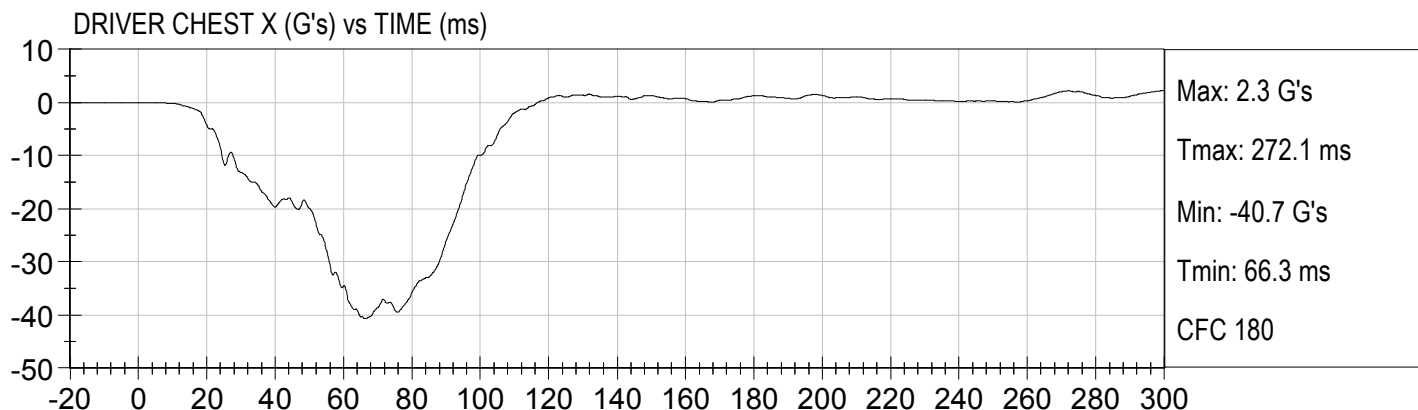
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 Driver Head Y Redundant
 Driver Head Z Redundant
 Driver Upper Neck Force Y
 Driver Upper Neck Moment X
 Driver Upper Neck Moment Z
 Driver Chest X Redundant
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 Driver Chest Z Redundant
 Driver Pelvis X
 Driver Pelvis Y
 Driver Pelvis Z
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 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

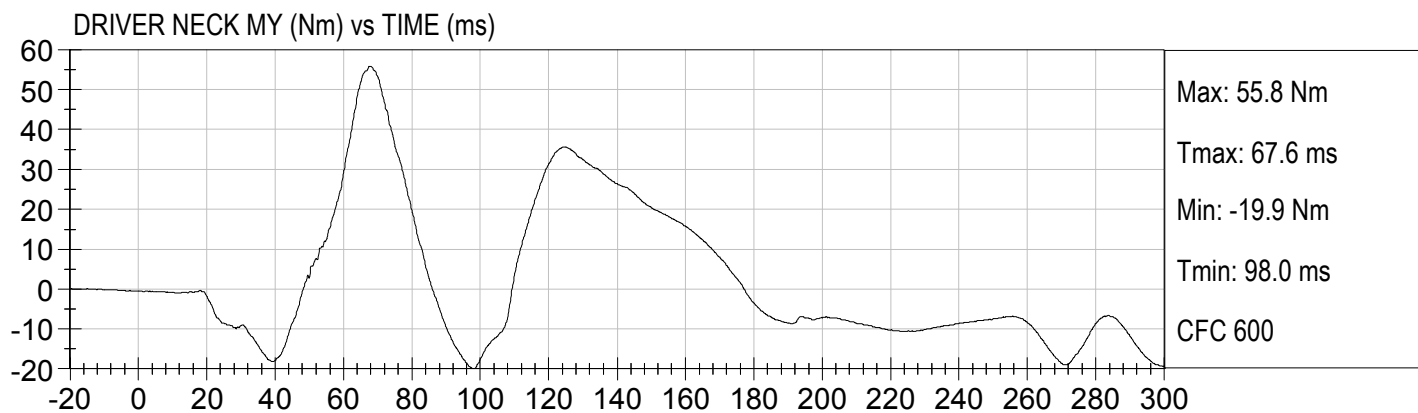
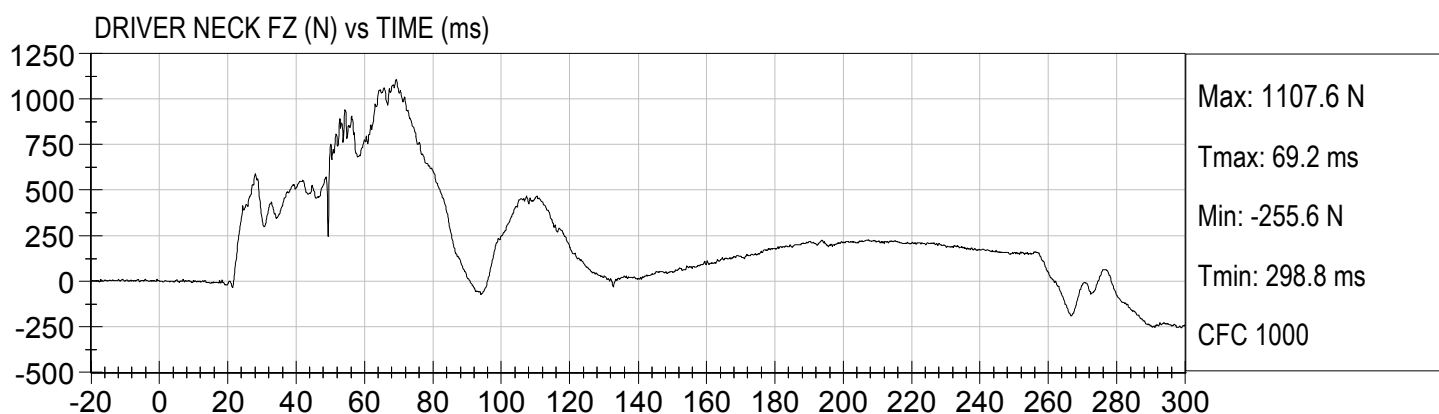
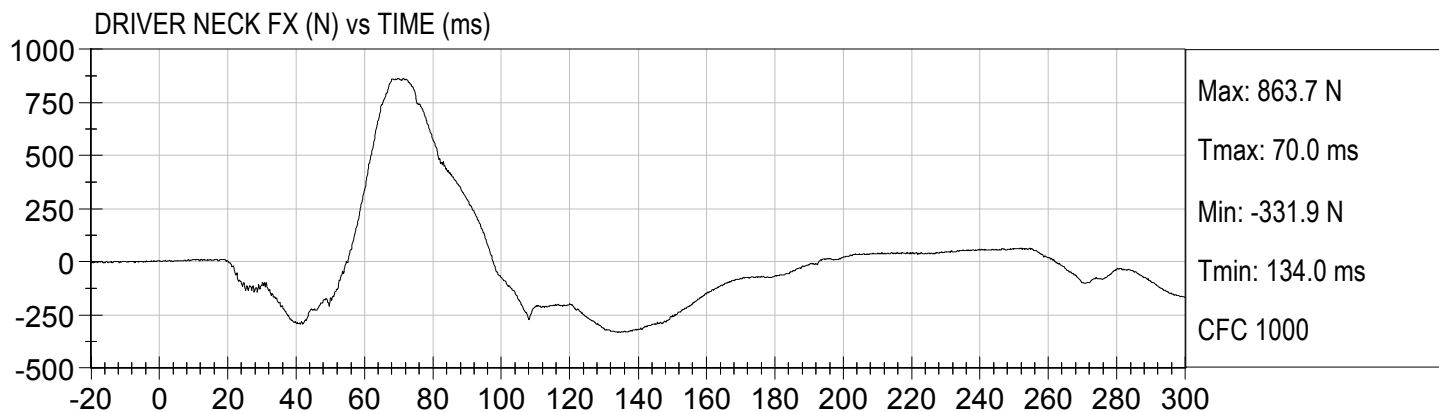
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Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot 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
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Passenger Pelvis Y
Passenger Pelvis Z
Passenger Left Femur Redundant
Passenger Right Femur Redundant
Passenger Left Upper Tibia Moment X

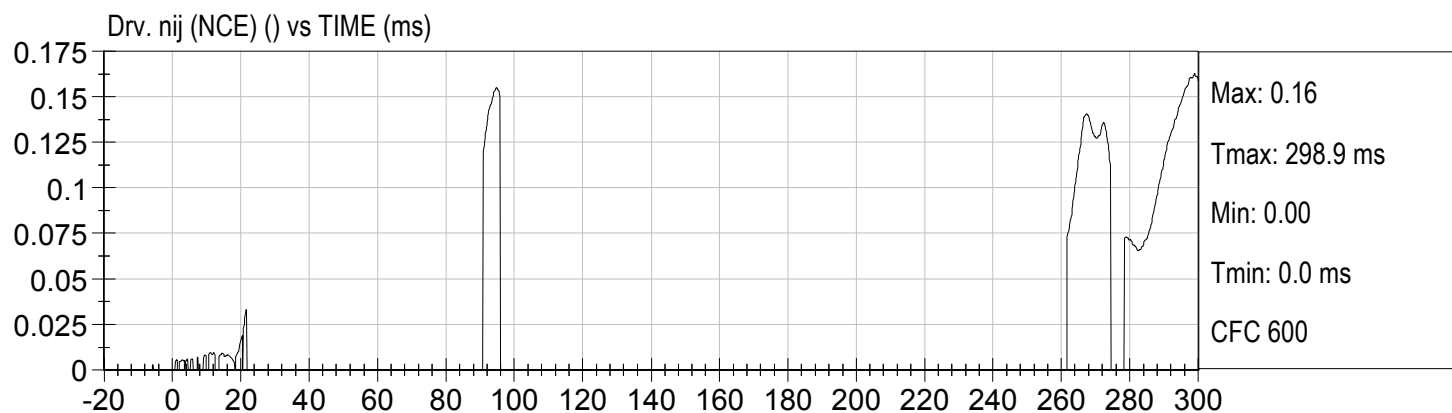
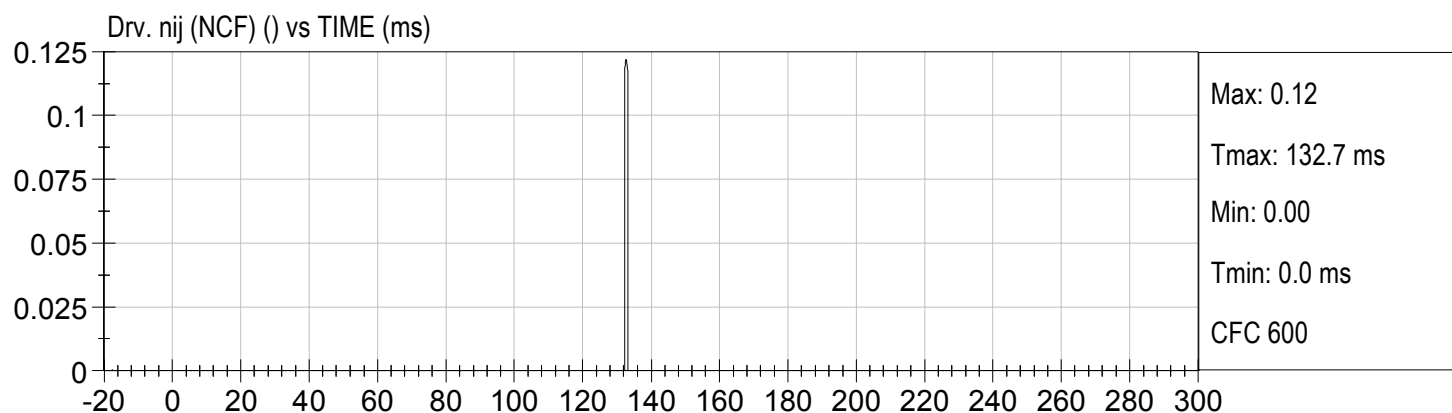
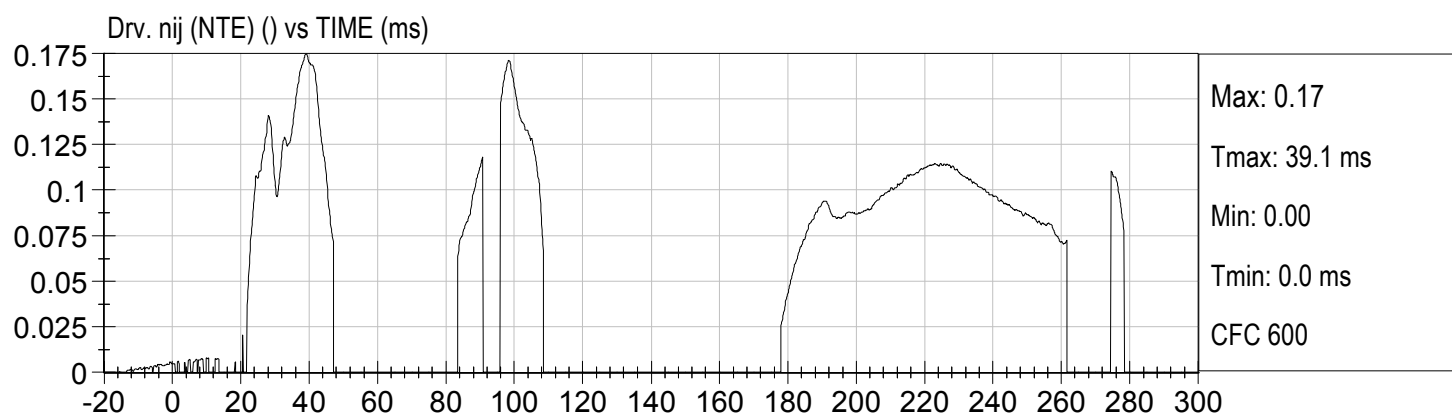
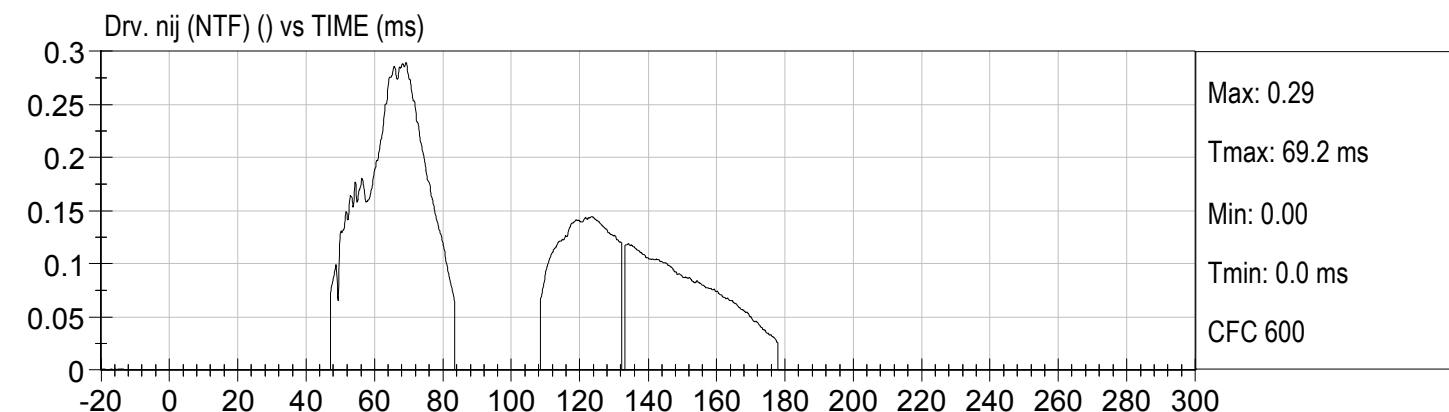
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right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

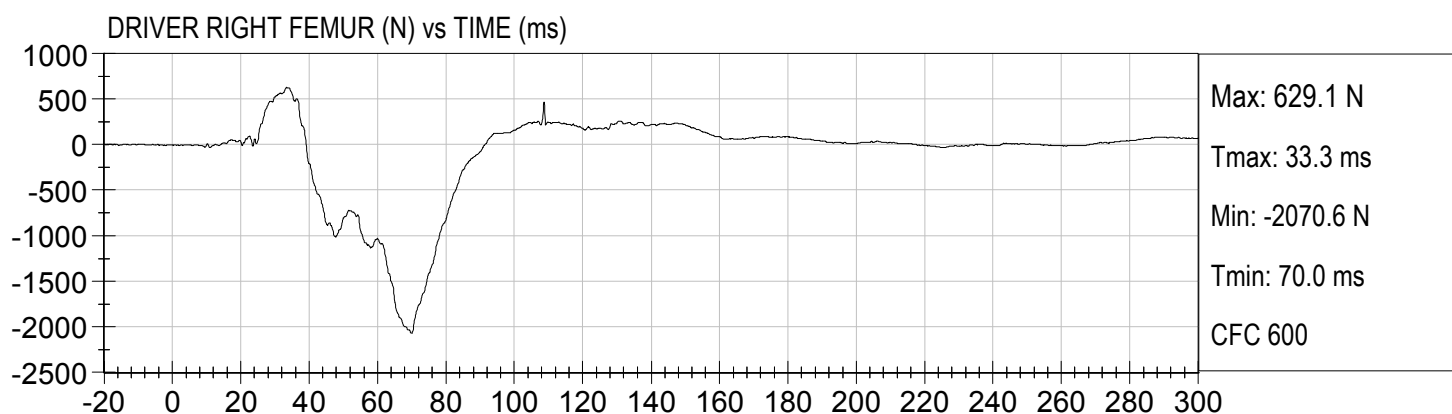
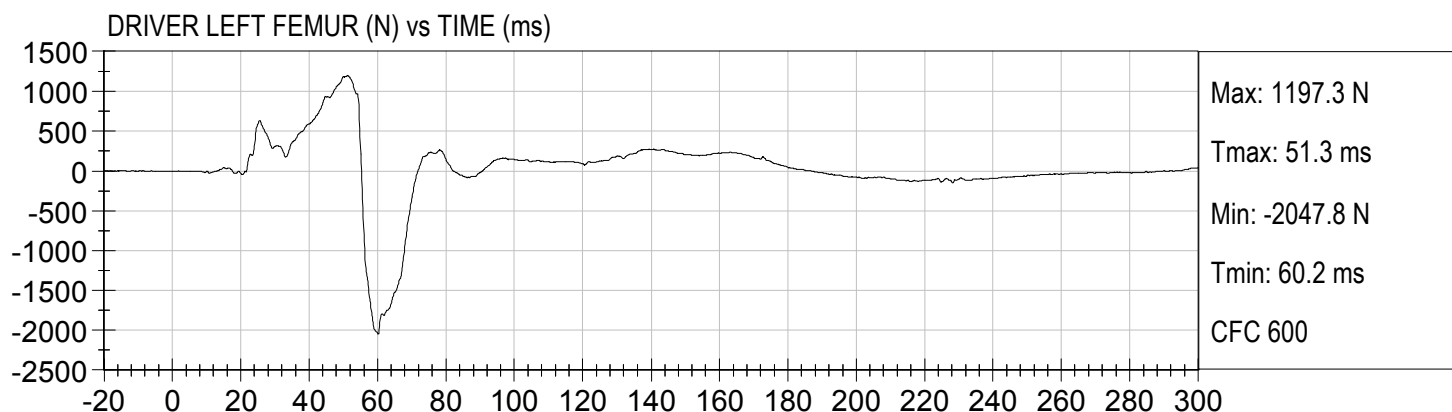


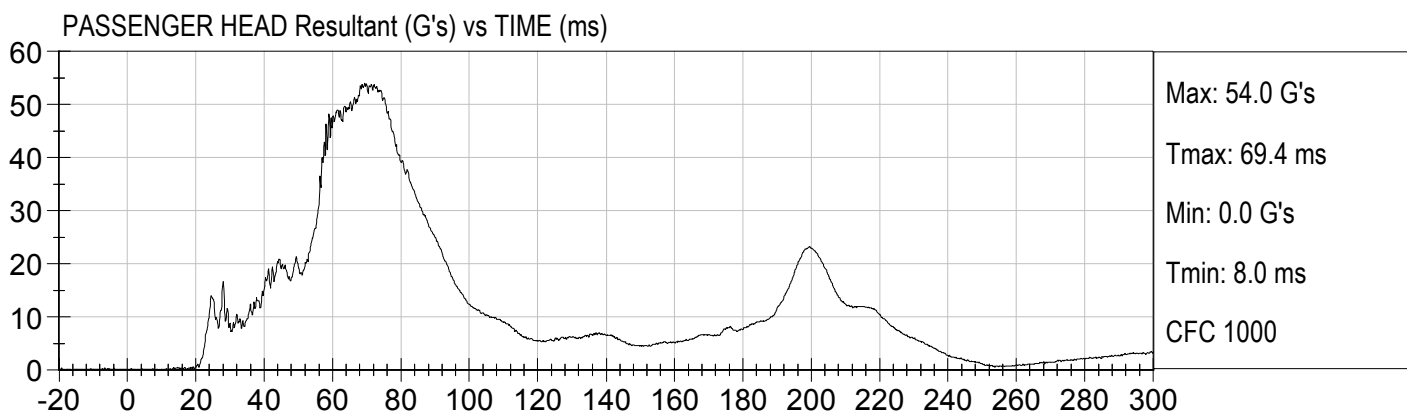
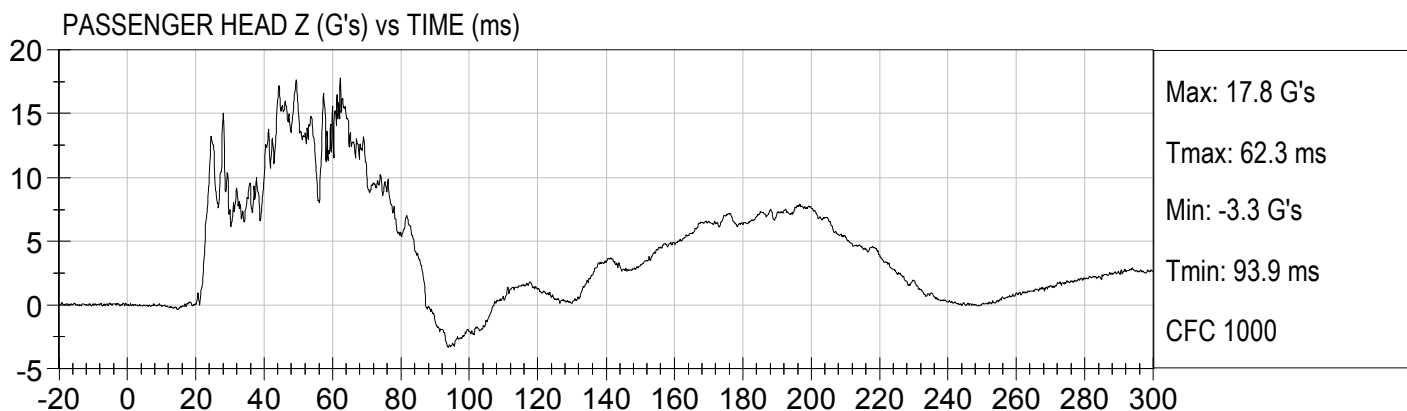
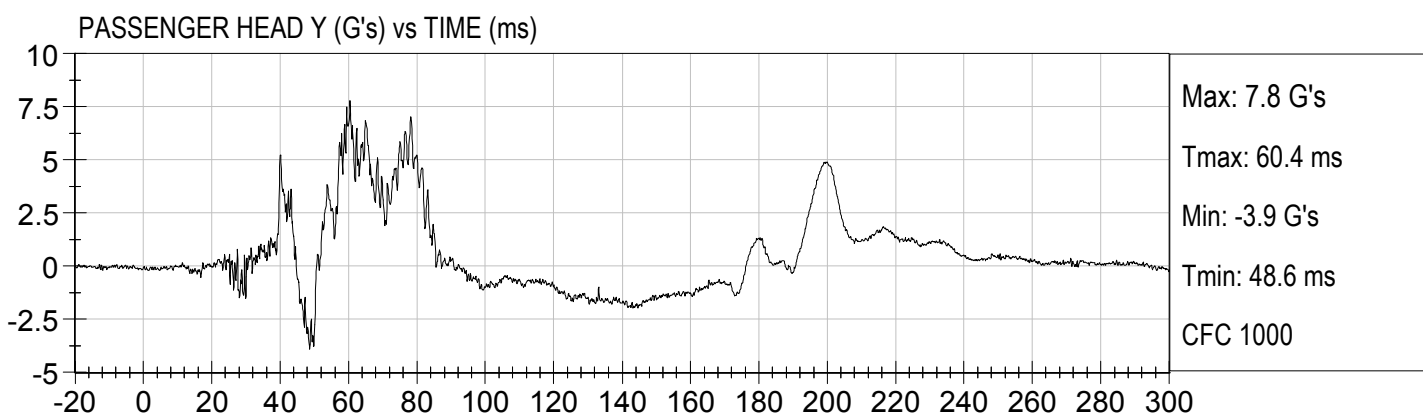
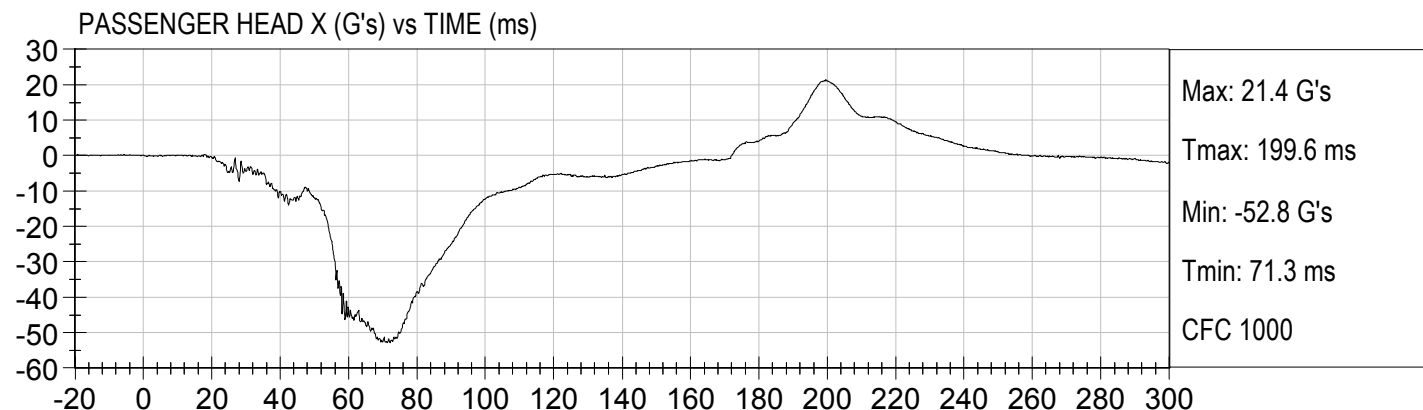


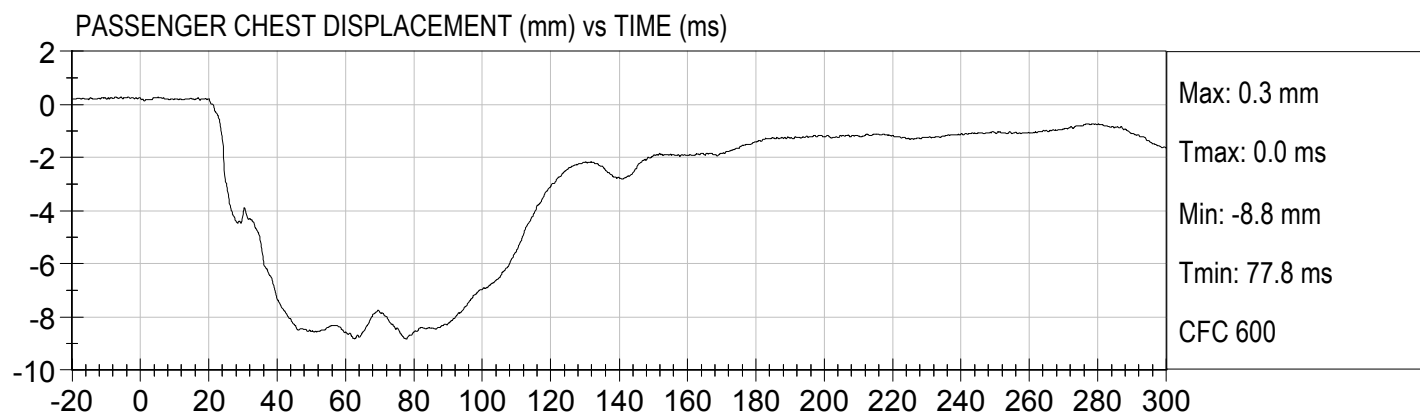


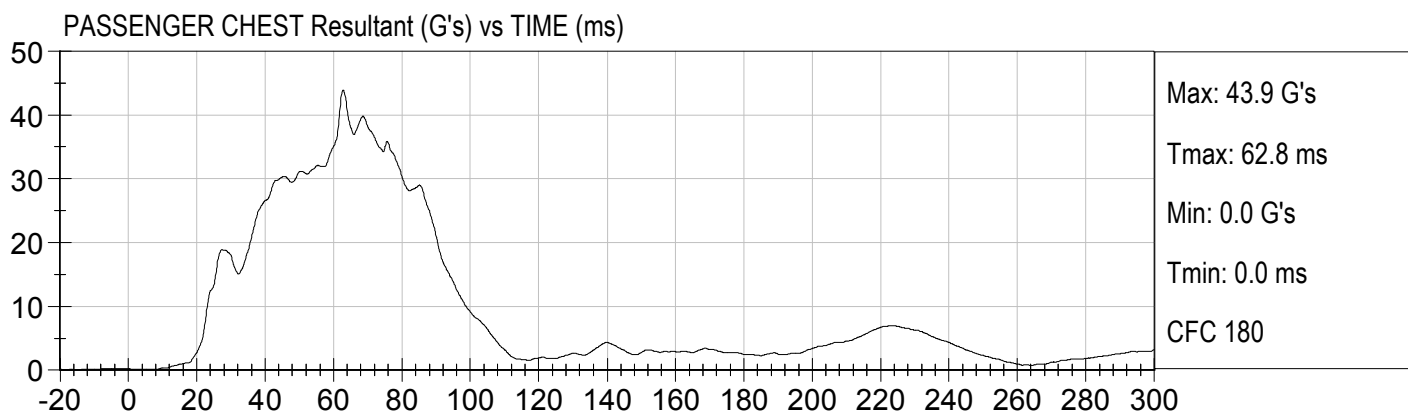
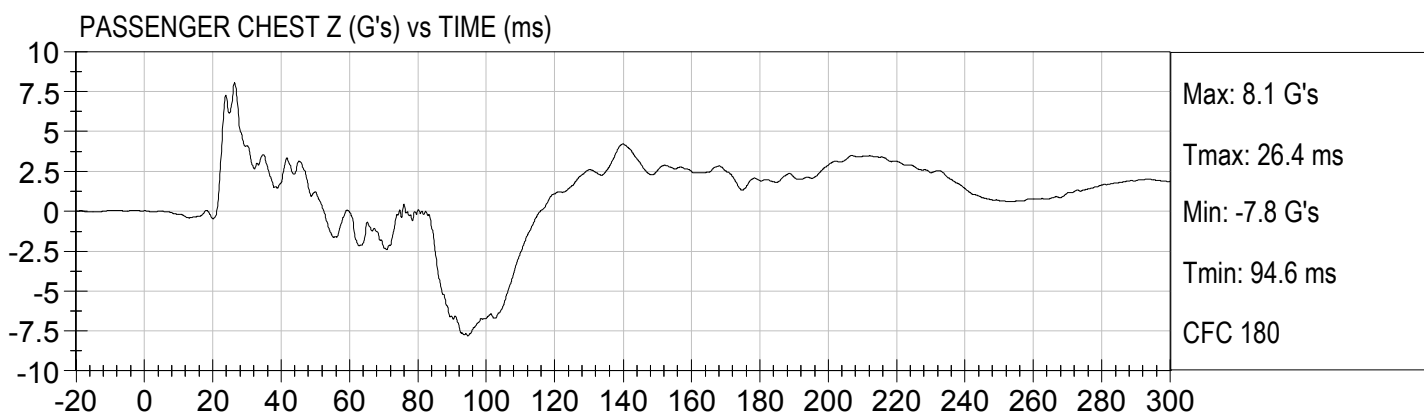
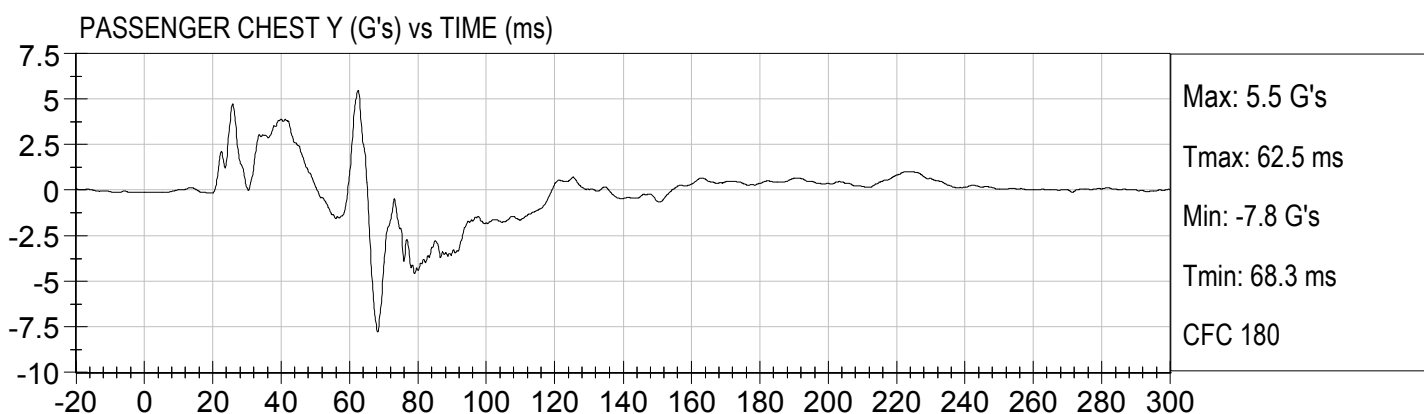
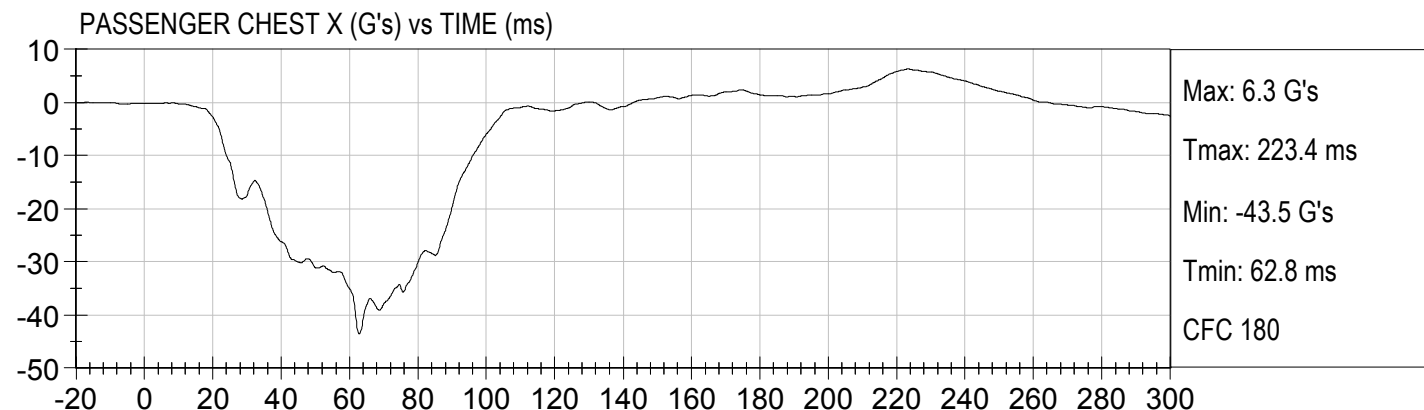


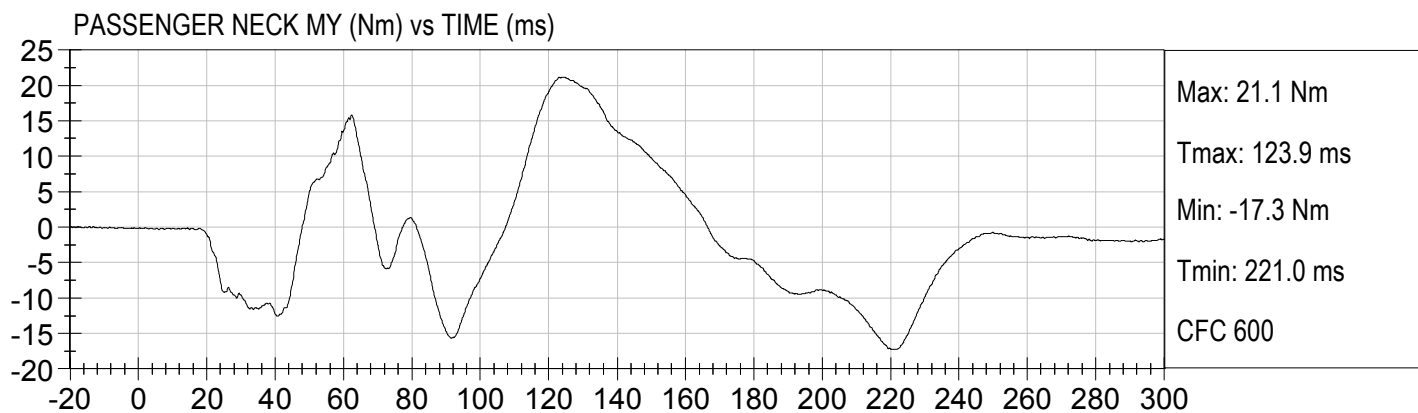
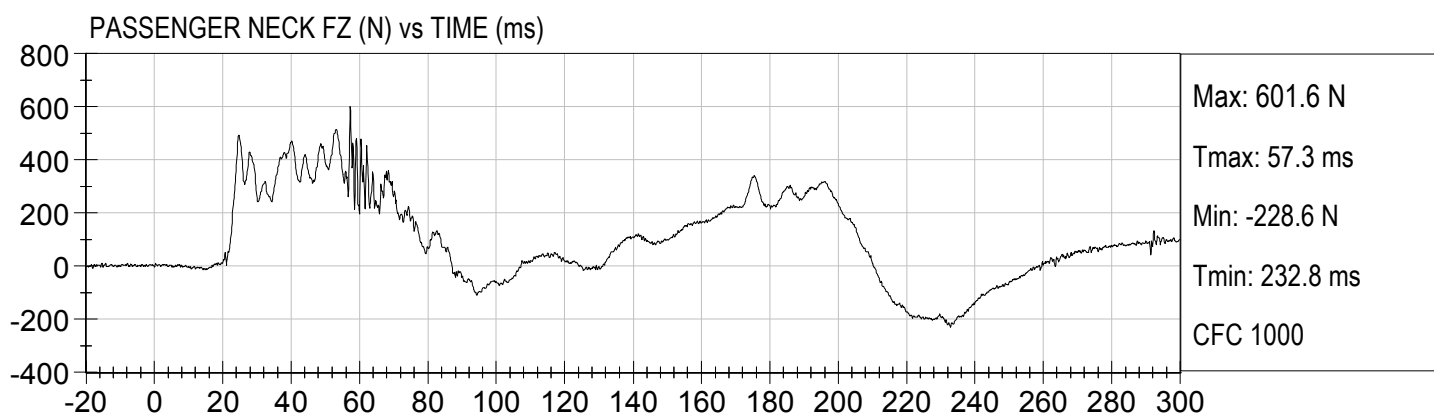
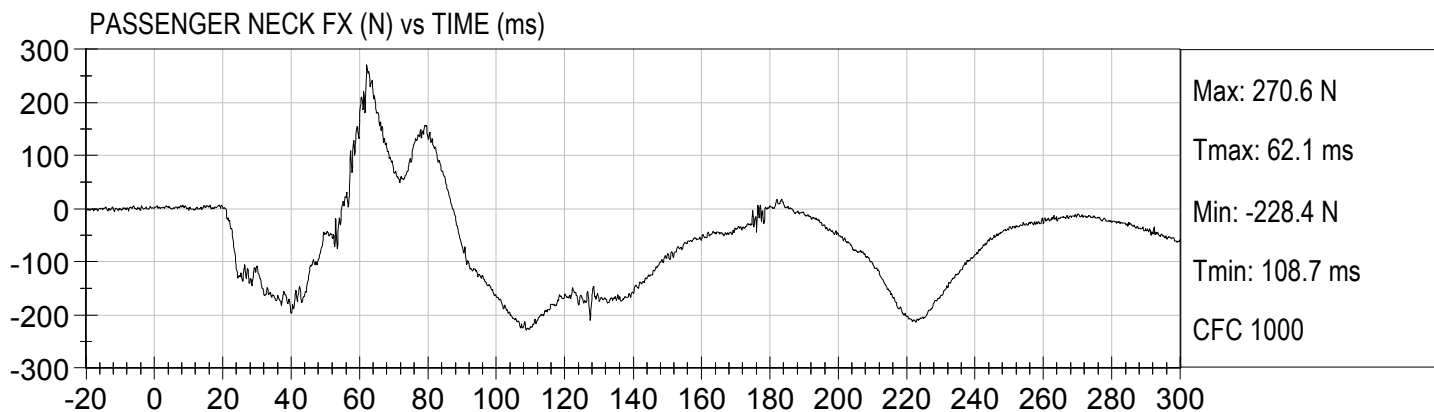


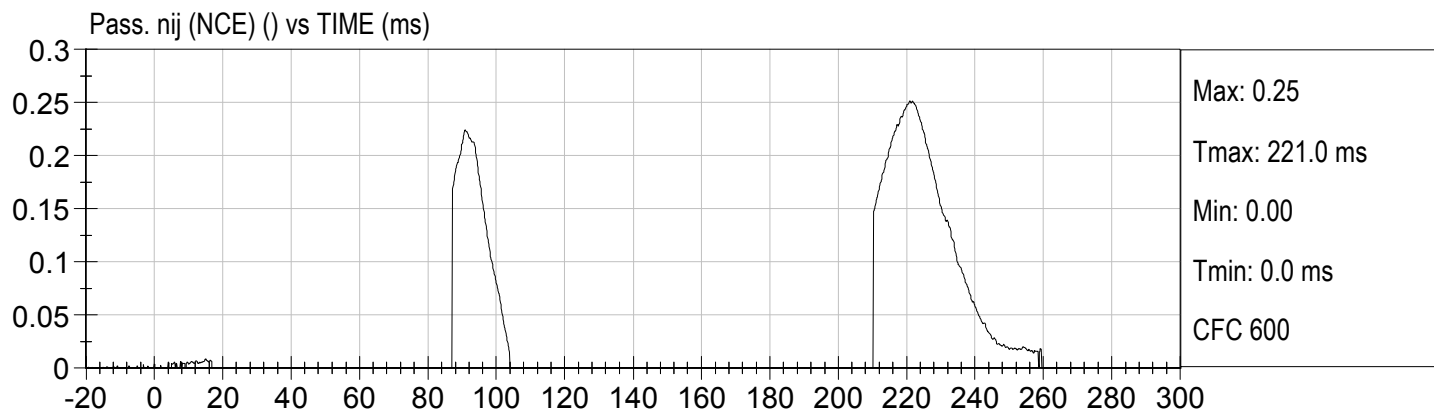
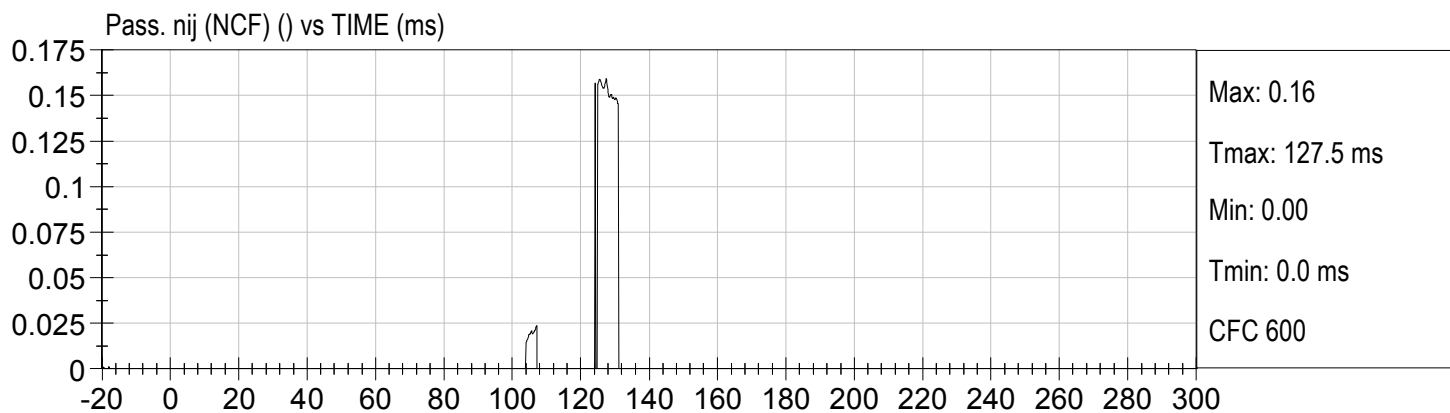
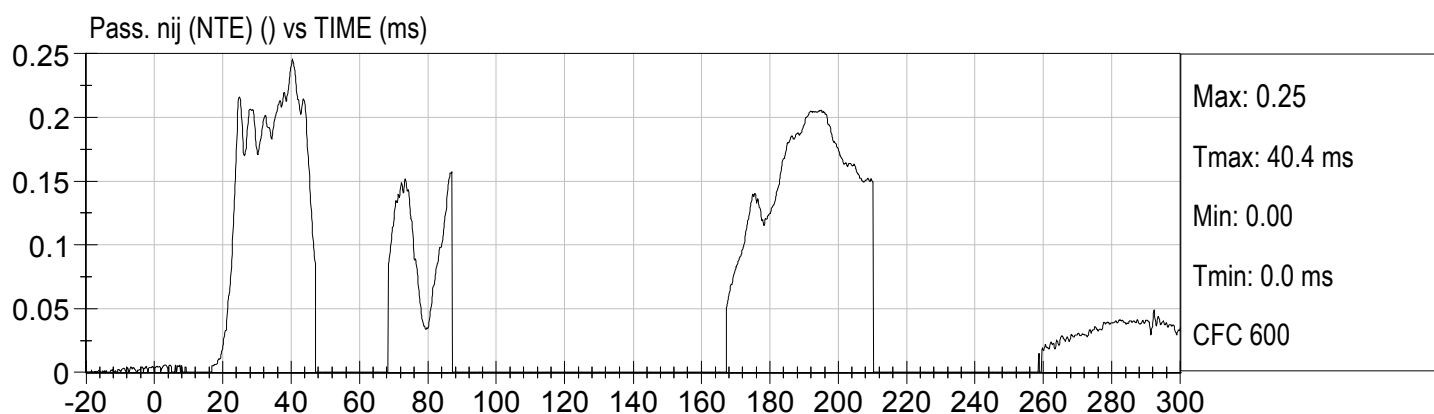
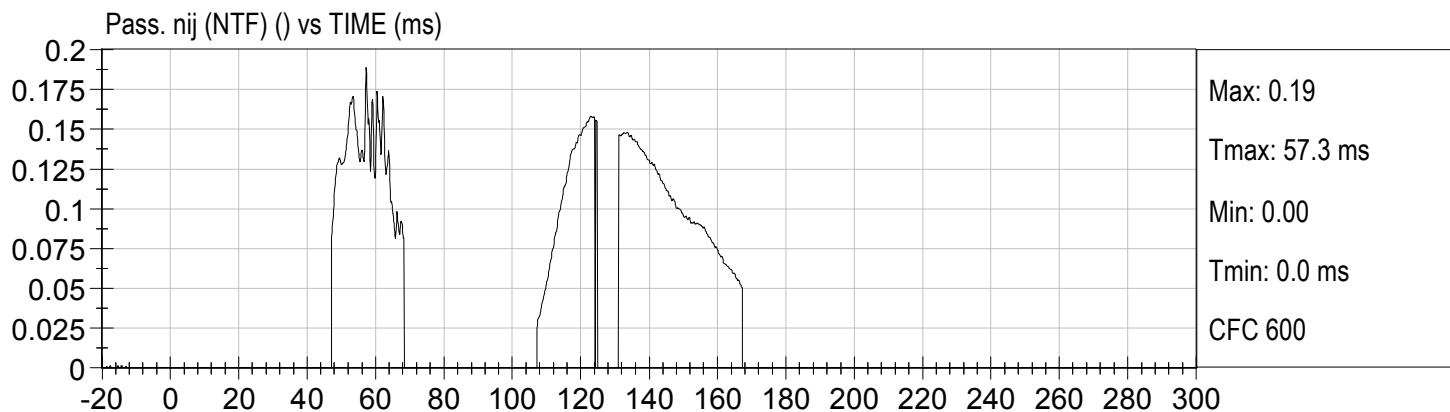


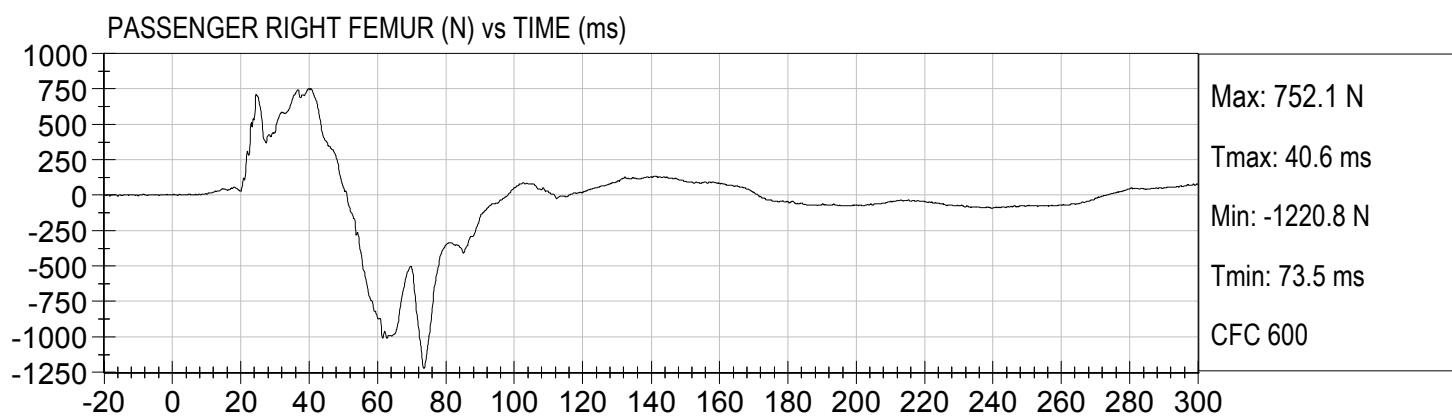
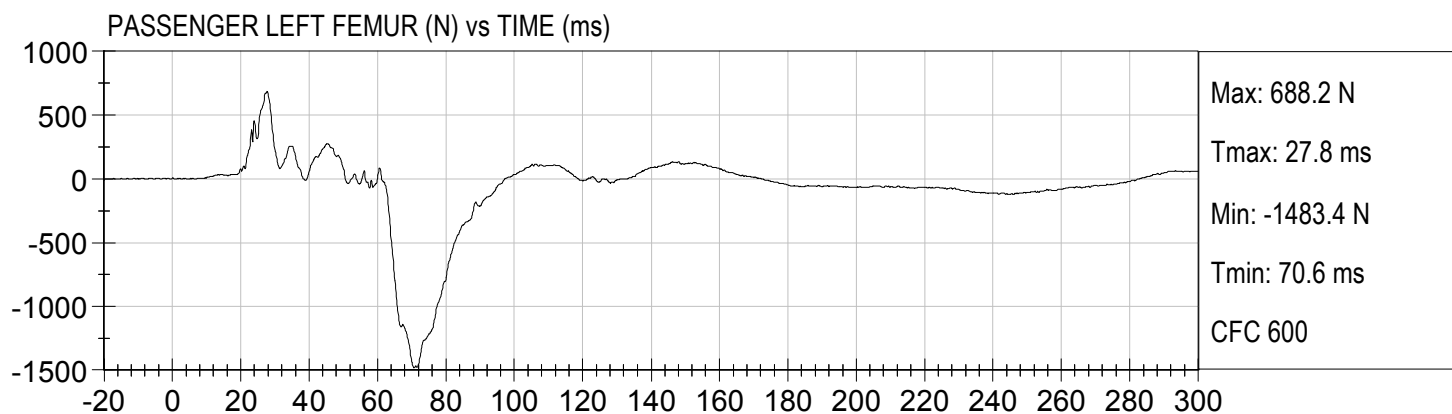












APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

Hybrid III, 50th External Measurements
SN: 036

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	34.7
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	5.4
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	3.3-3.7	3.6
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	5.5-6.1	5.8
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	11.5
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	13.0
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	7.5-8.3	7.9
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	17.3
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	17.9

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	8.8
P	FOOT LENGTH	Tip of toe to rear of heel	9.9-10.5	10.0
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	16.3-17.2	16.4
W	FOOT BREADTH	The widest part of the foot	3.6-4.2	4.1
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 16.9-17.1 in. above seat surface	38.2-39.4	38.4
Z	WAIST CIRCUMFERENCE	Measured 8.9-9.1 in. above seat surface	32.9-34.1	34.0
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: 036

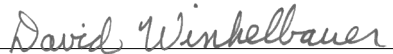
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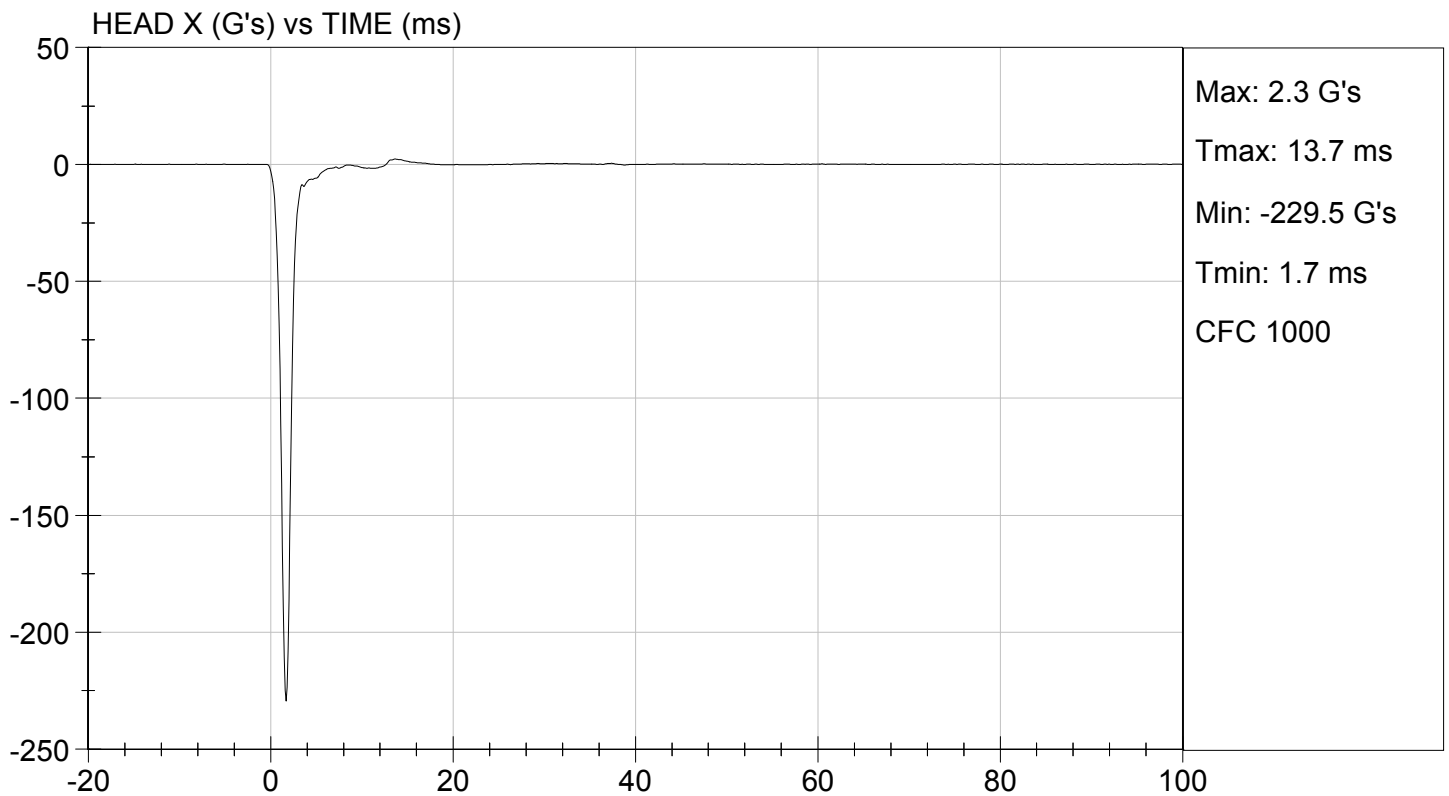
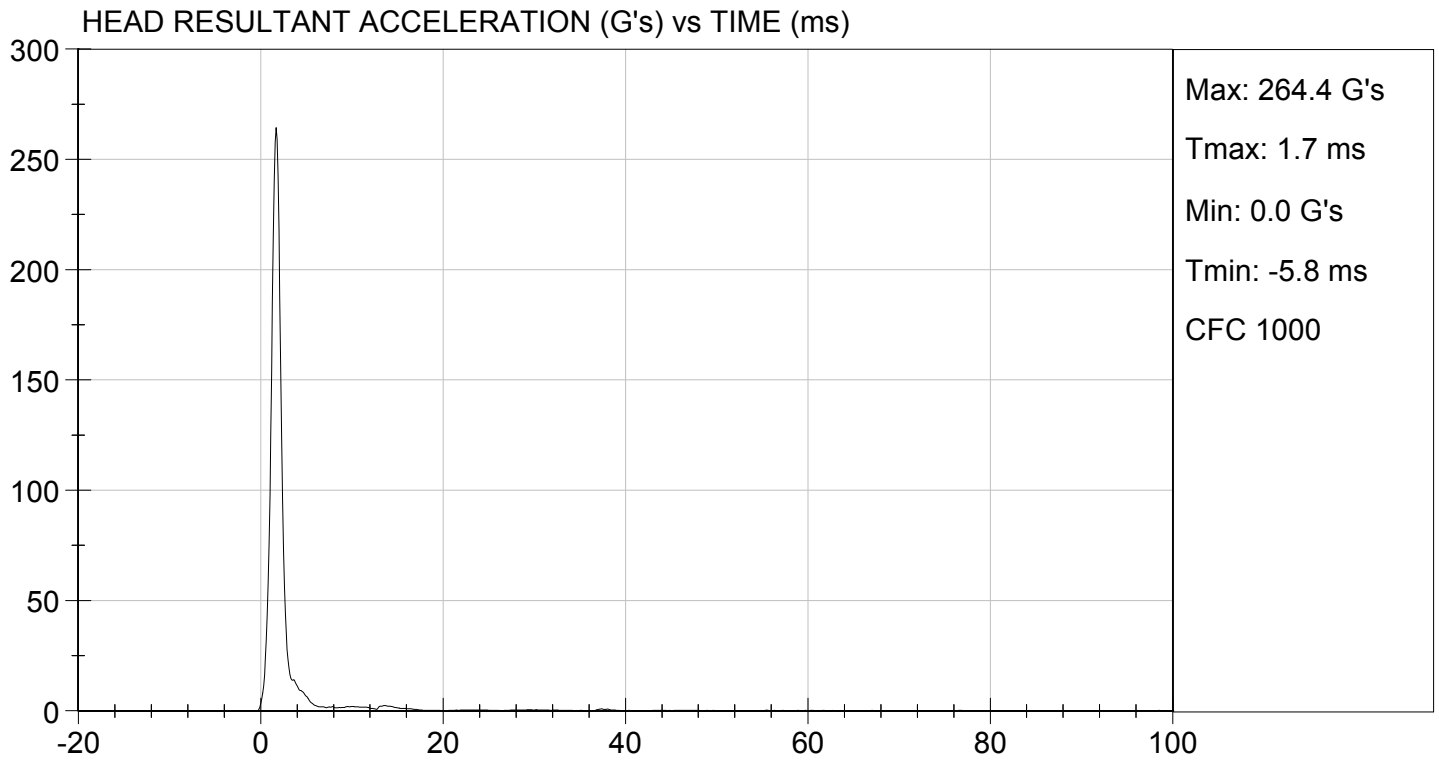
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	55	Pass
Peak Resultant Acceleration	G's	225 to 275	264	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	8.1	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

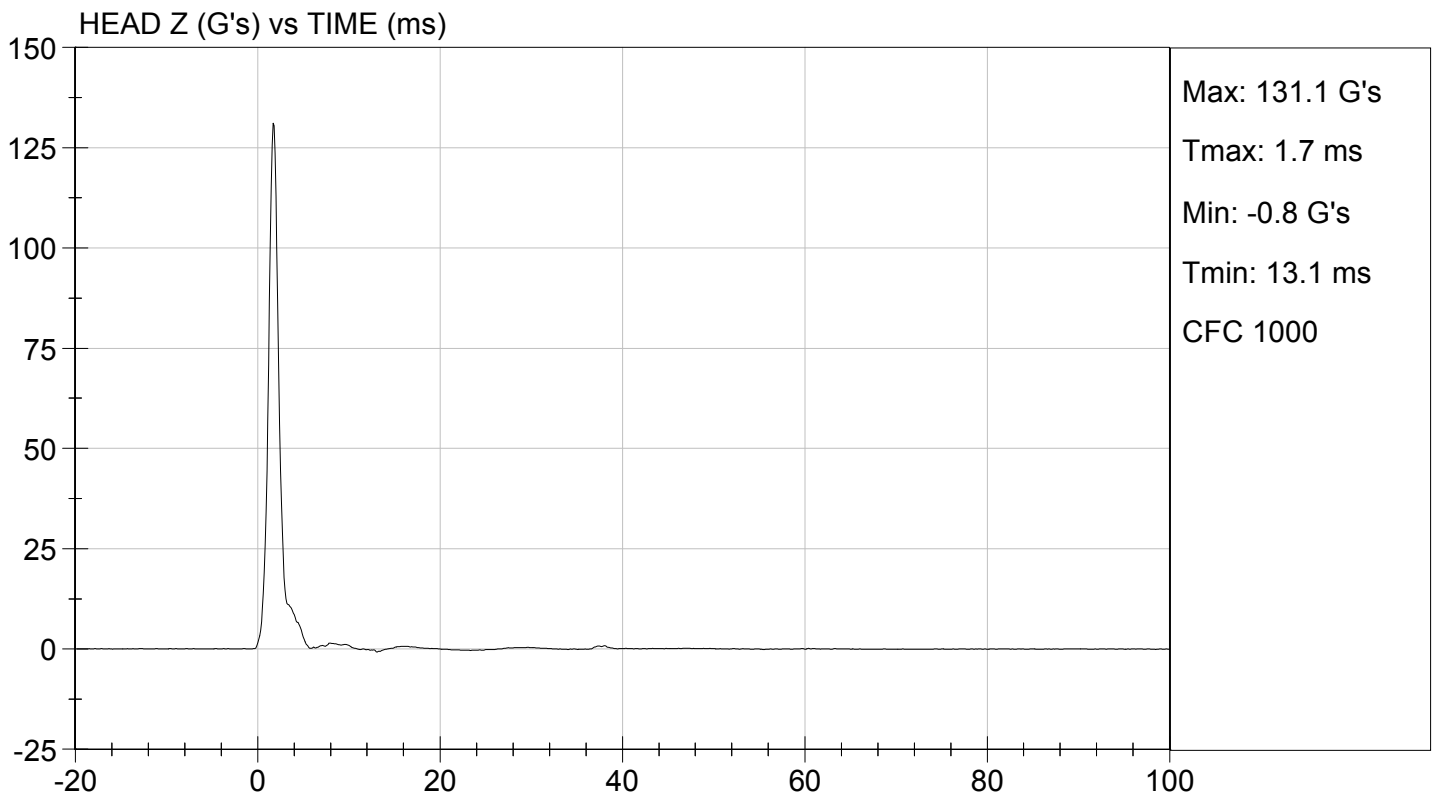
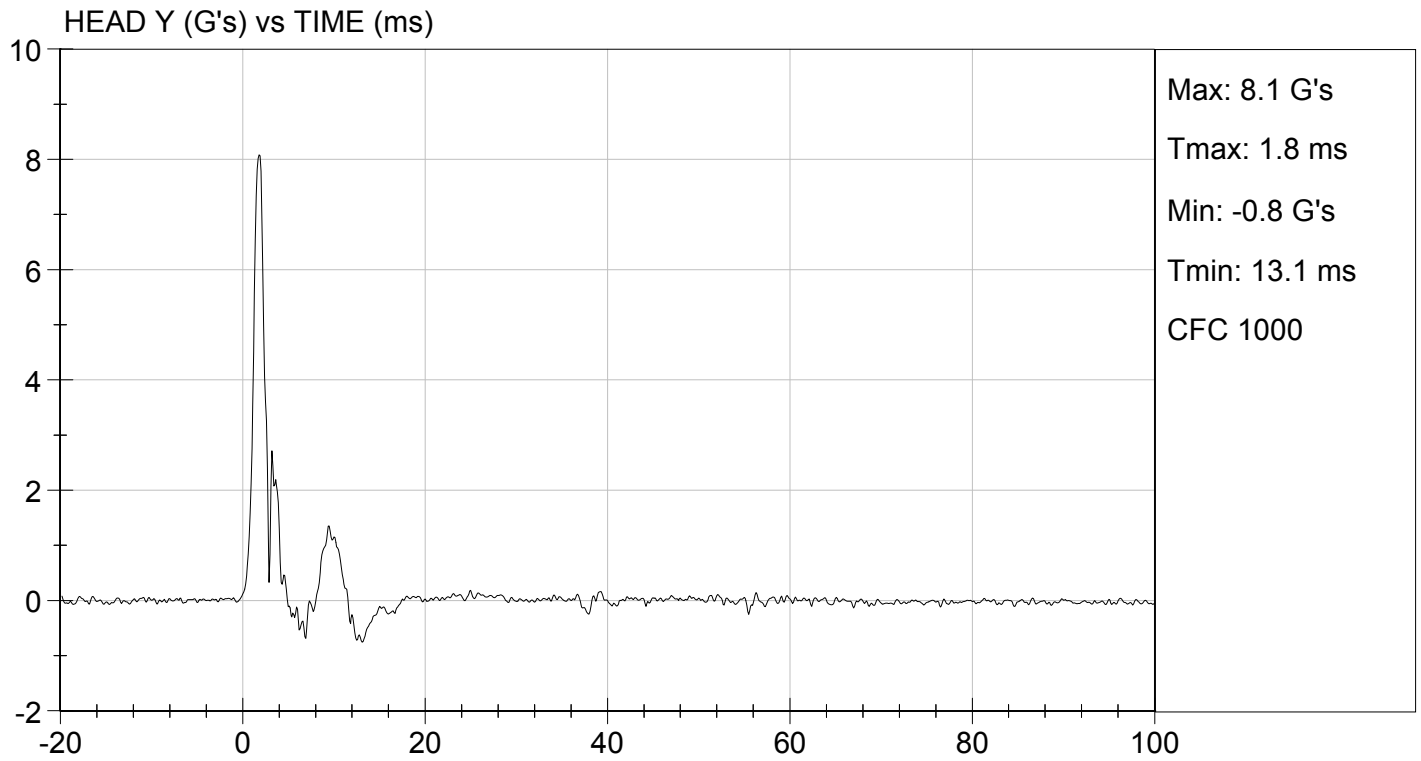

Laboratory Technician

07/08/2013

Test Date


Approved By





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

ATD Serial No: 036

Test I.D: D132192

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	50	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.07	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.64	Pass
	20 ms	G's	17.60 to 22.60	18.35	Pass
	30 ms	G's	12.50 to 18.50	14.22	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	14.2	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	36.0	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	71.0	Pass
	Time	ms	57.0 to 64.0	59.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	118.6	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	89.5	Pass
	Time	ms	47.0 to 58.0	50.0	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	98.4	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

07/08/2013

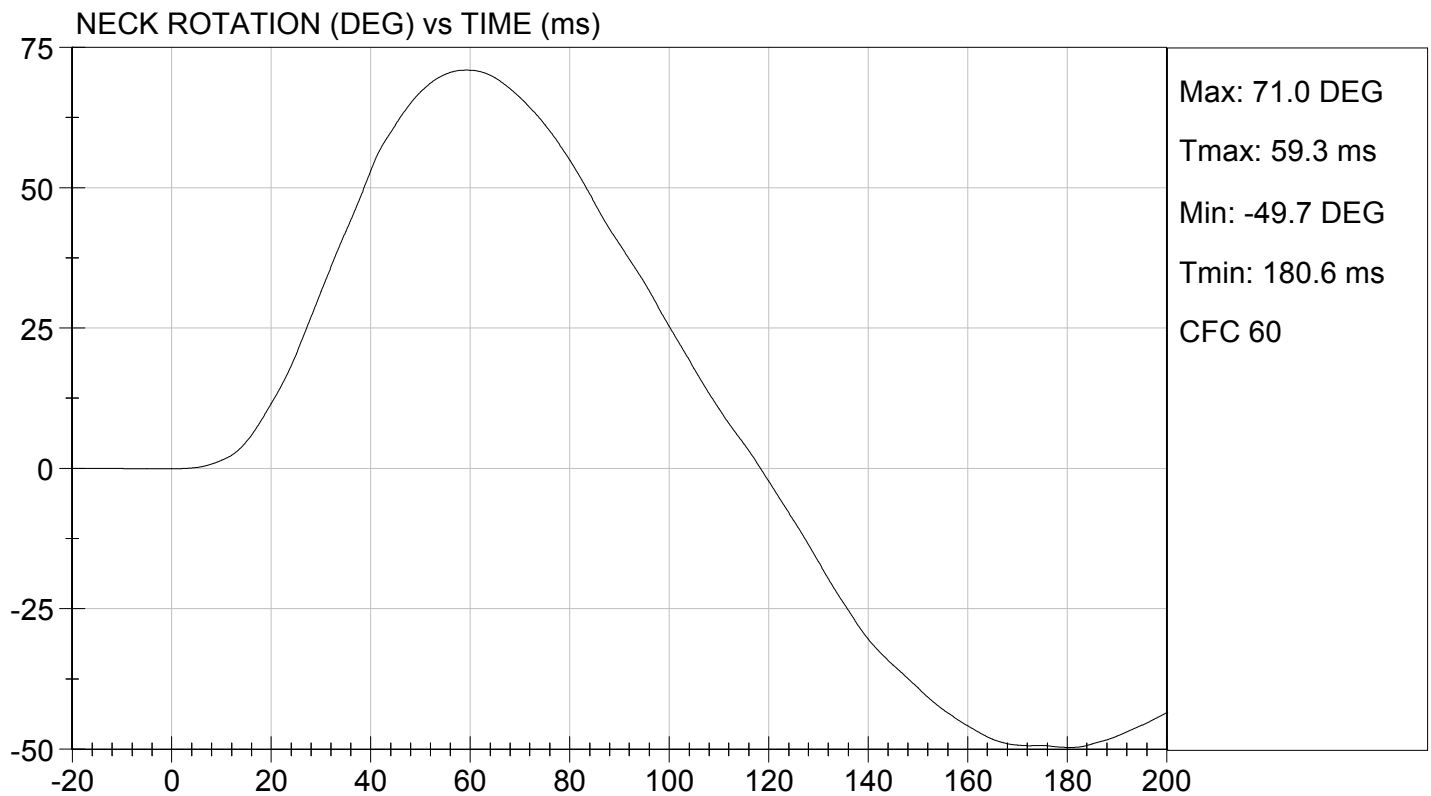
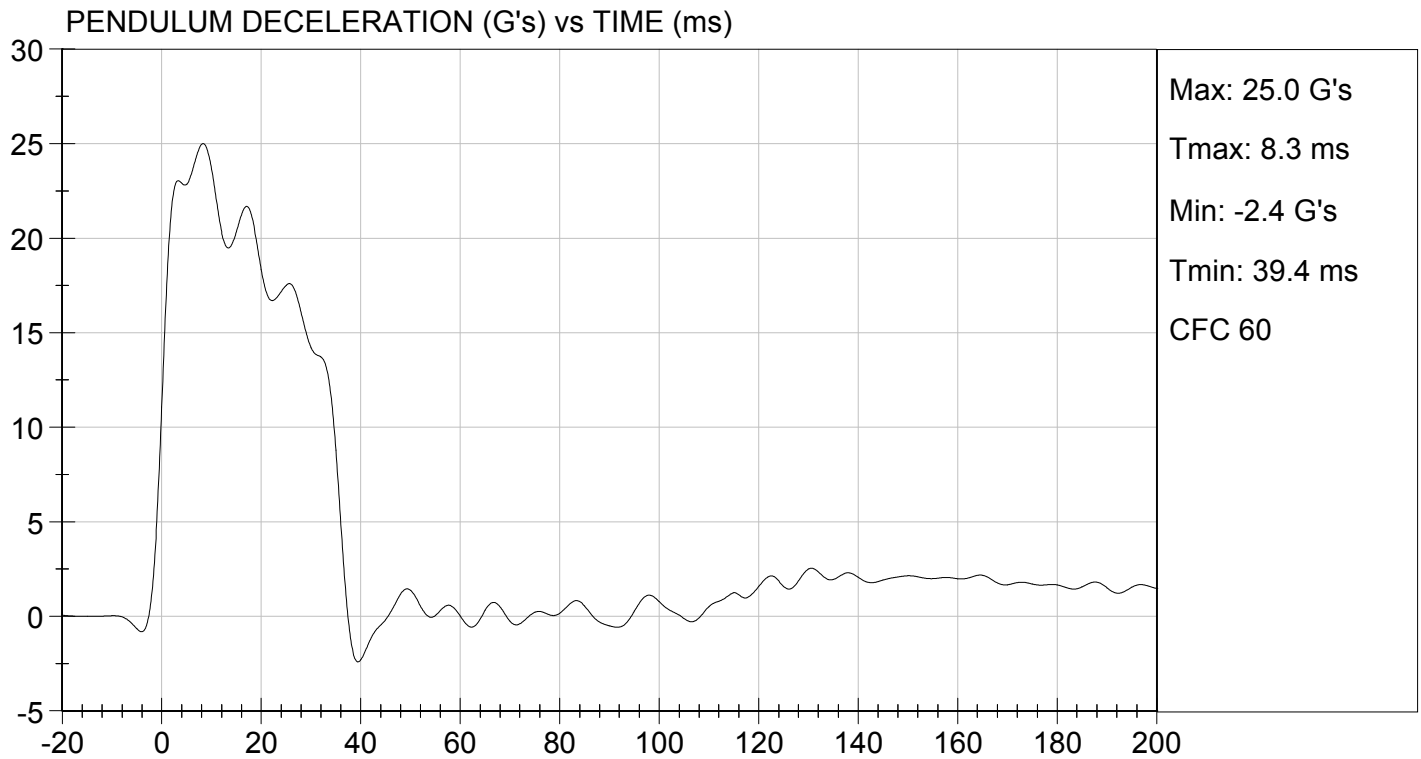
Test Date

David Winkelbauer
Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.21 ft/s, 7.07 m/s

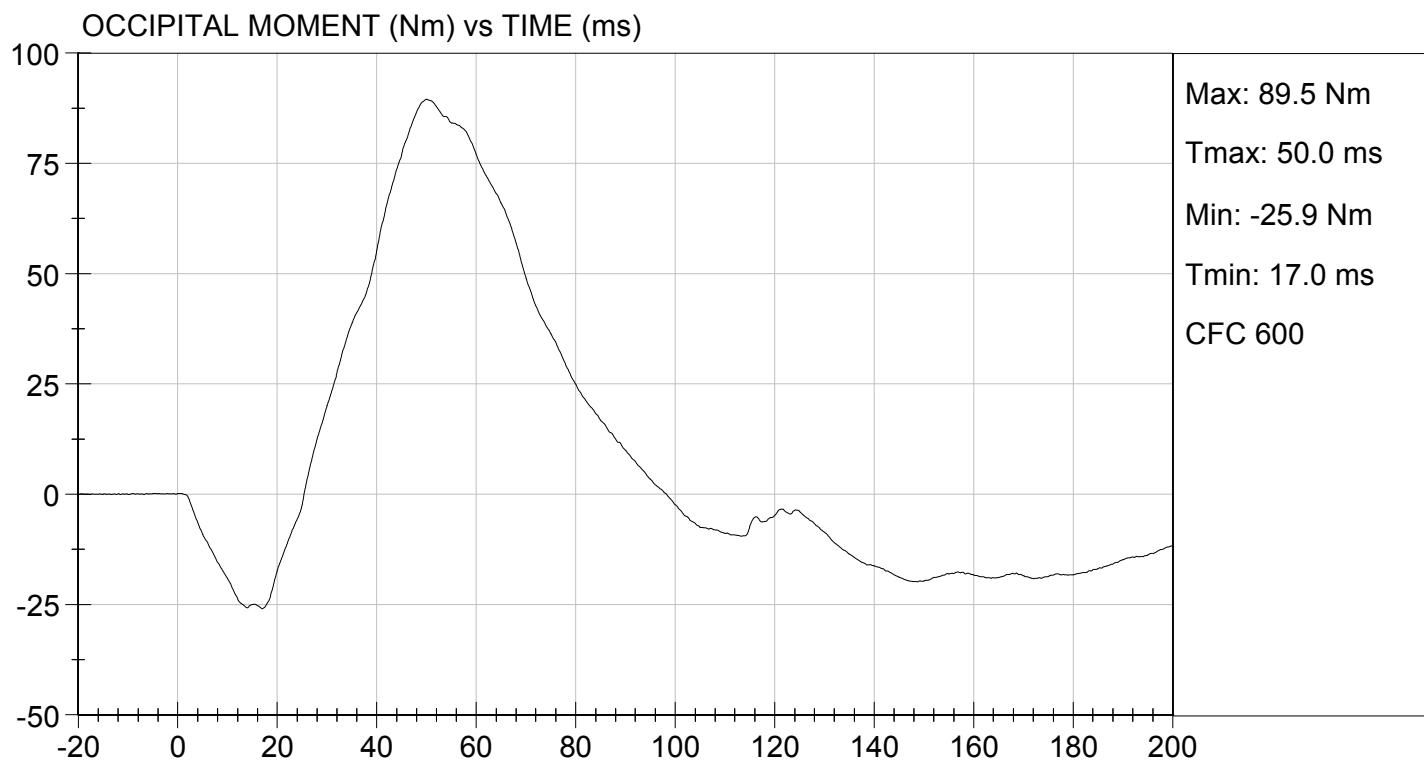
TEST DATE: 07/08/2013
TEST #: D132192





TEST DESC: NECK FLEXION
VELOCITY: 23.21 ft/s, 7.07 m/s

TEST DATE: 07/08/2013
TEST #: D132192

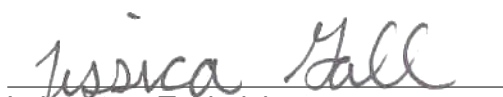


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

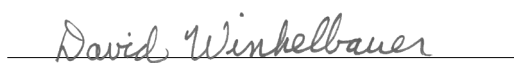
Test I.D: D132193

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	50	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	17.90	Pass
	20 ms	G's	14.00 to 19.00	15.83	Pass
	30 ms	G's	11.00 to 16.00	12.47	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	12.5	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	40.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.9	Pass
	Time	ms	72.0 to 82.0	77.7	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	158.6	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-66.2	Pass
	Time	ms	65.0 to 79.0	72.2	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	144.1	Pass
Overall Test Results					Pass


Laboratory Technician

07/08/2013

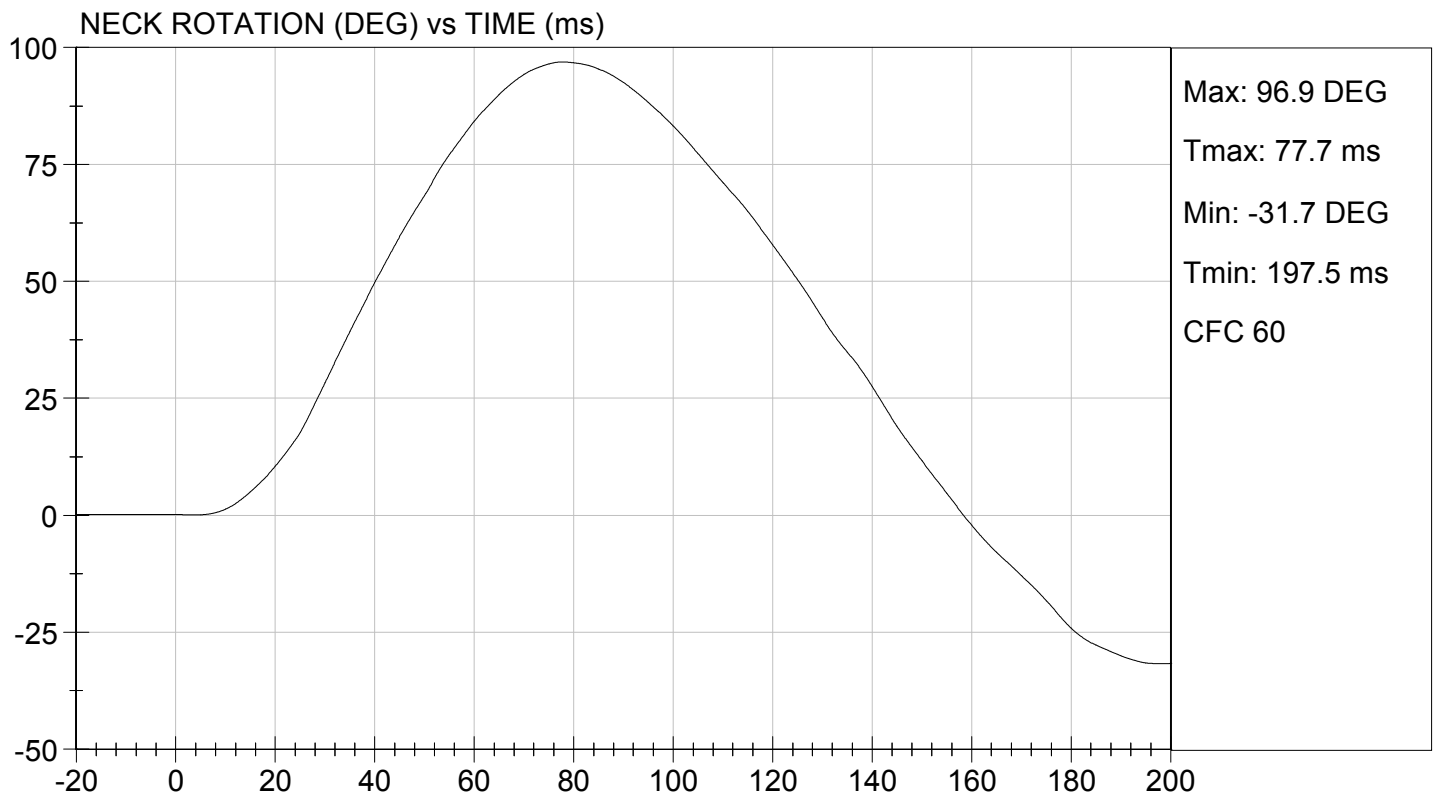
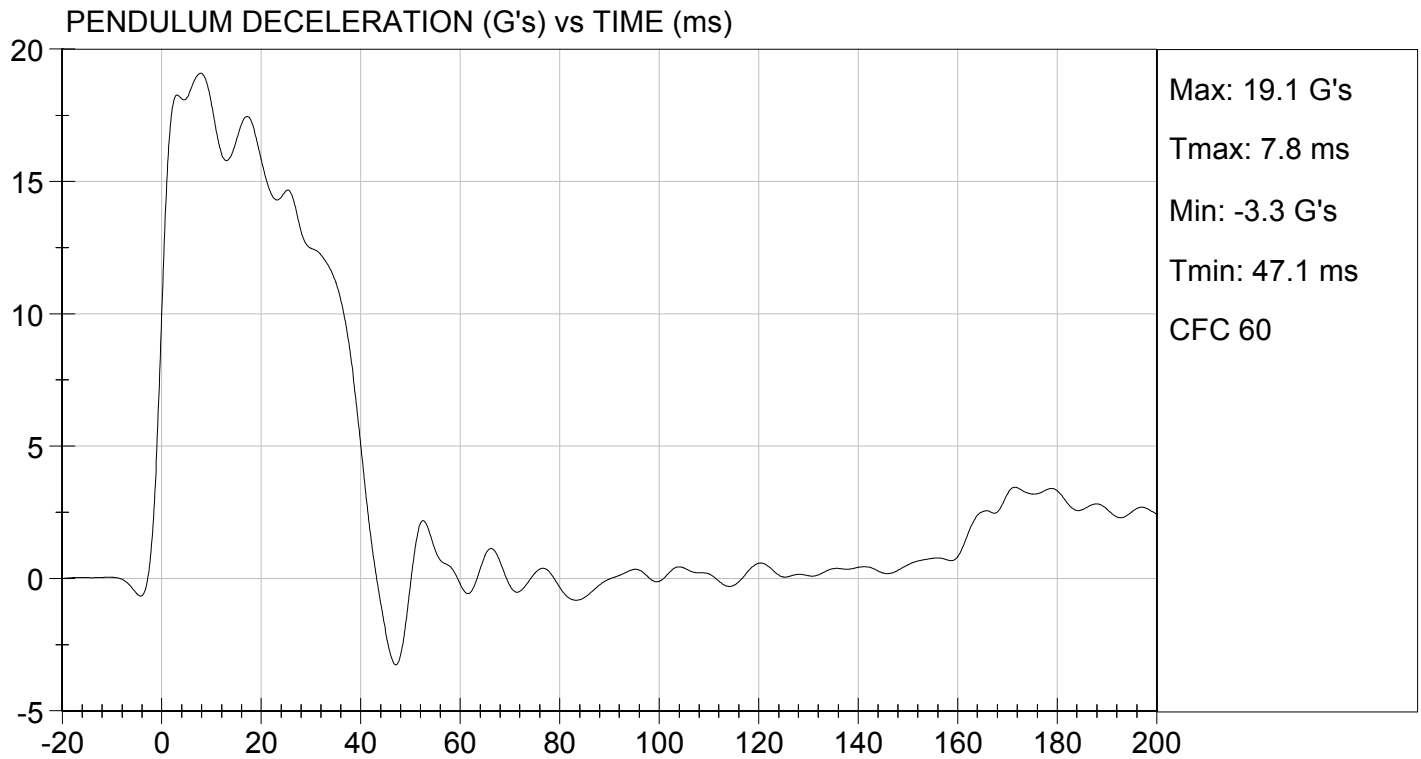
Test Date


Approved By



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

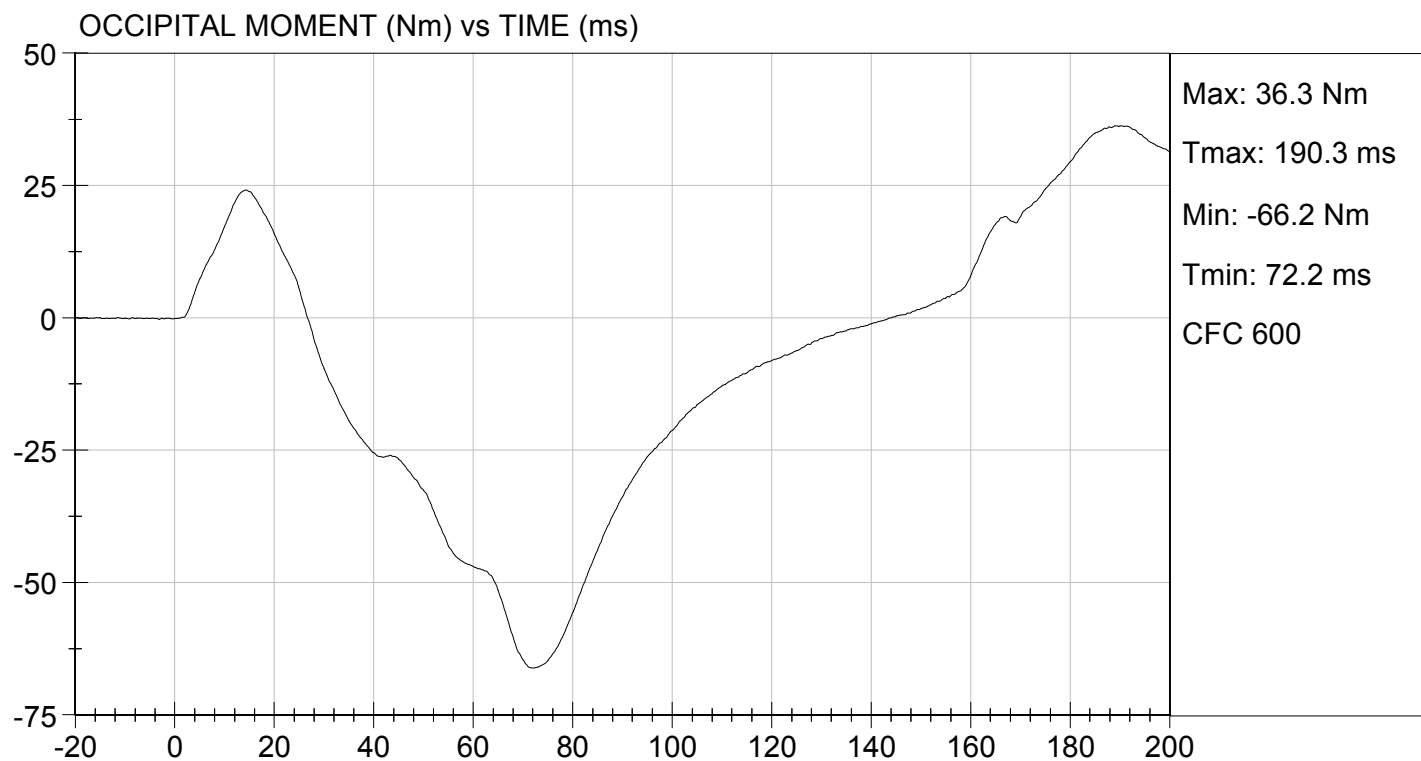
TEST DATE: 07/08/2013
TEST #: D132193





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

TEST DATE: 07/08/2013
TEST #: D132193



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D132194

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,193	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.60	Pass
Internal Hysteresis	%	69 to 85	71	Pass
			Overall Test Results	Pass


Laboratory Technician

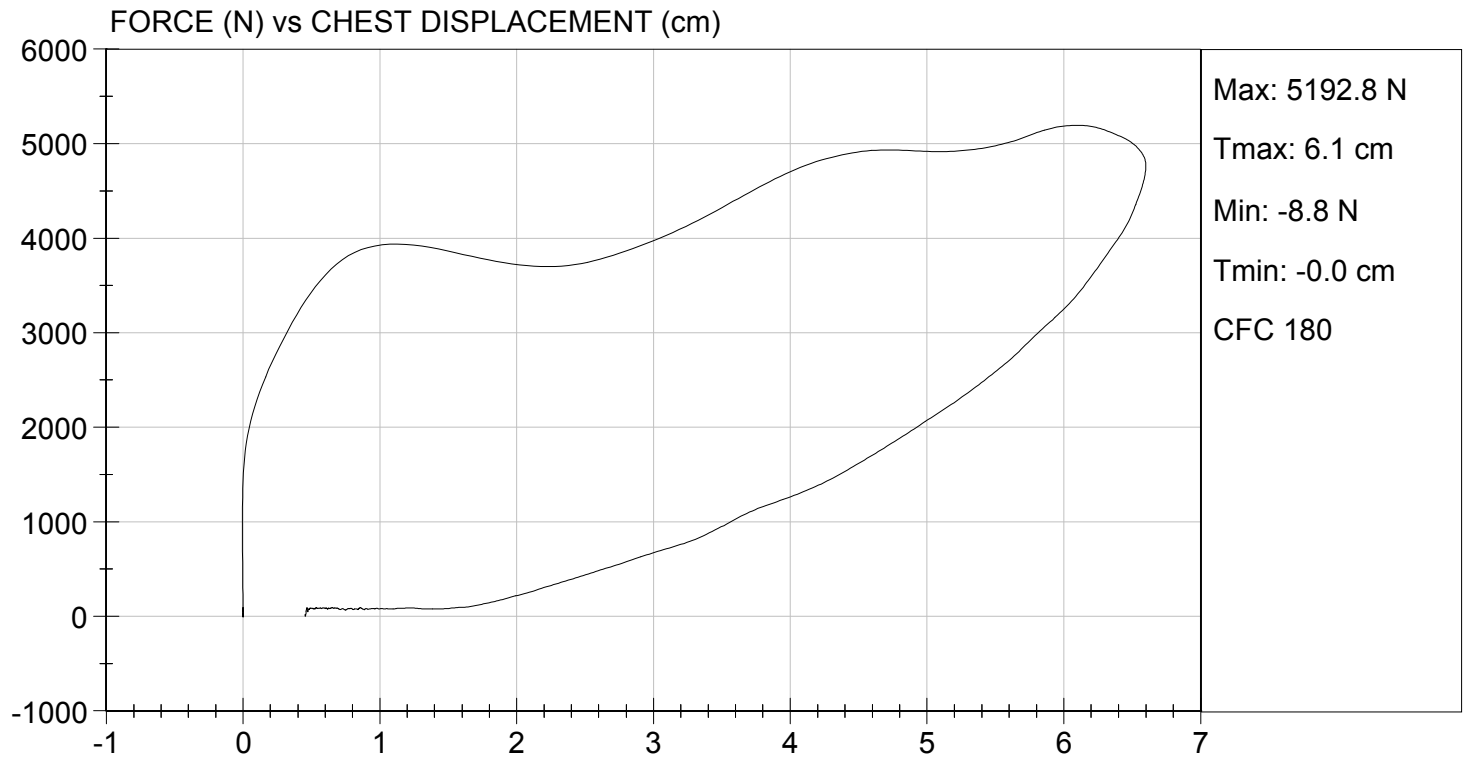
07/09/2013
Test Date


Approved By



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

TEST DATE: 07/09/2013
TEST #: D132194



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

ATD Serial No: 036

Test I.D: D132195

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	58	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	5,071	Pass
Overall Test Results				Pass


Laboratory Technician

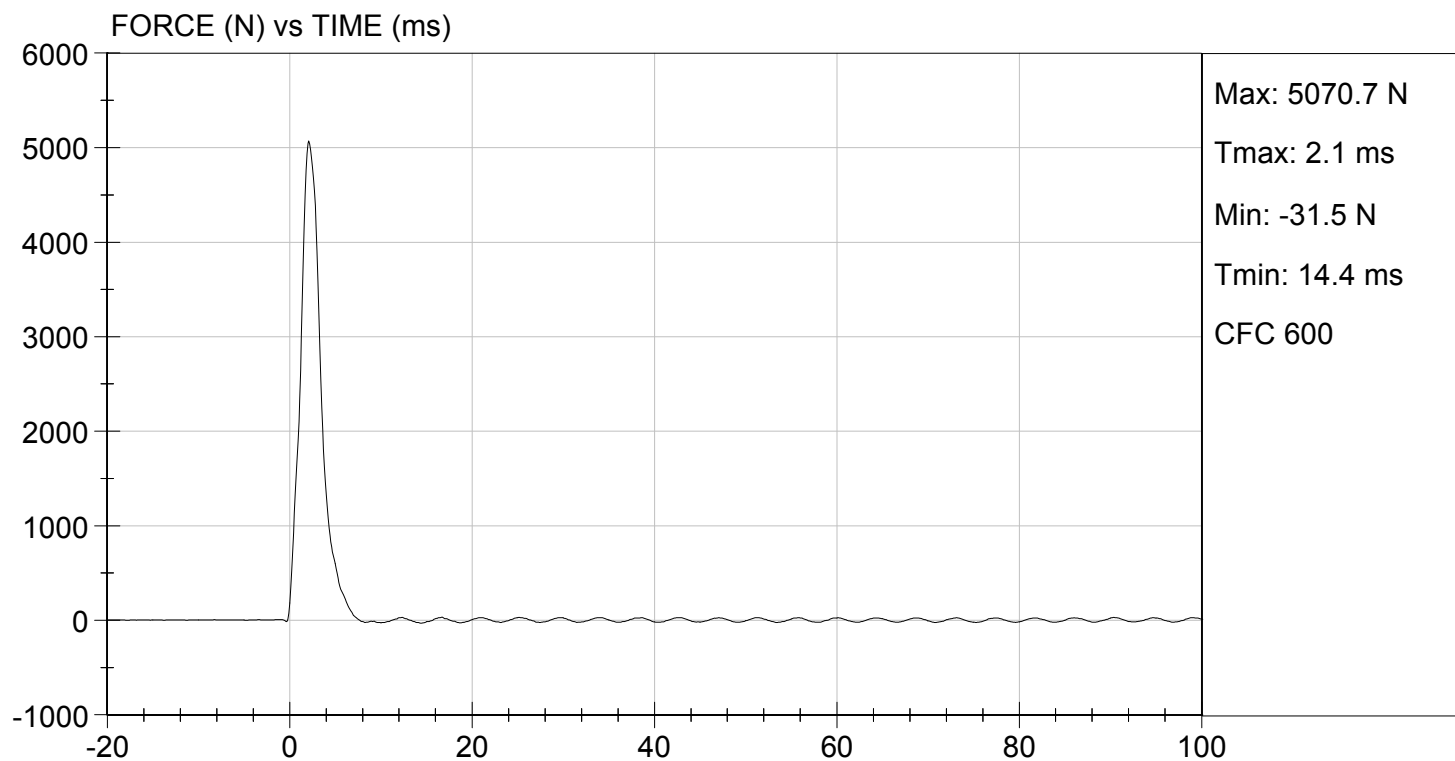
07/08/2013
Test Date


Approved By



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

TEST DATE: 07/08/2013
TEST #: D132195



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

ATD Serial No: 036

Test I.D: D132196

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	58	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	N	4715 to 5782	5,312	Pass
Overall Test Results				Pass


Laboratory Technician

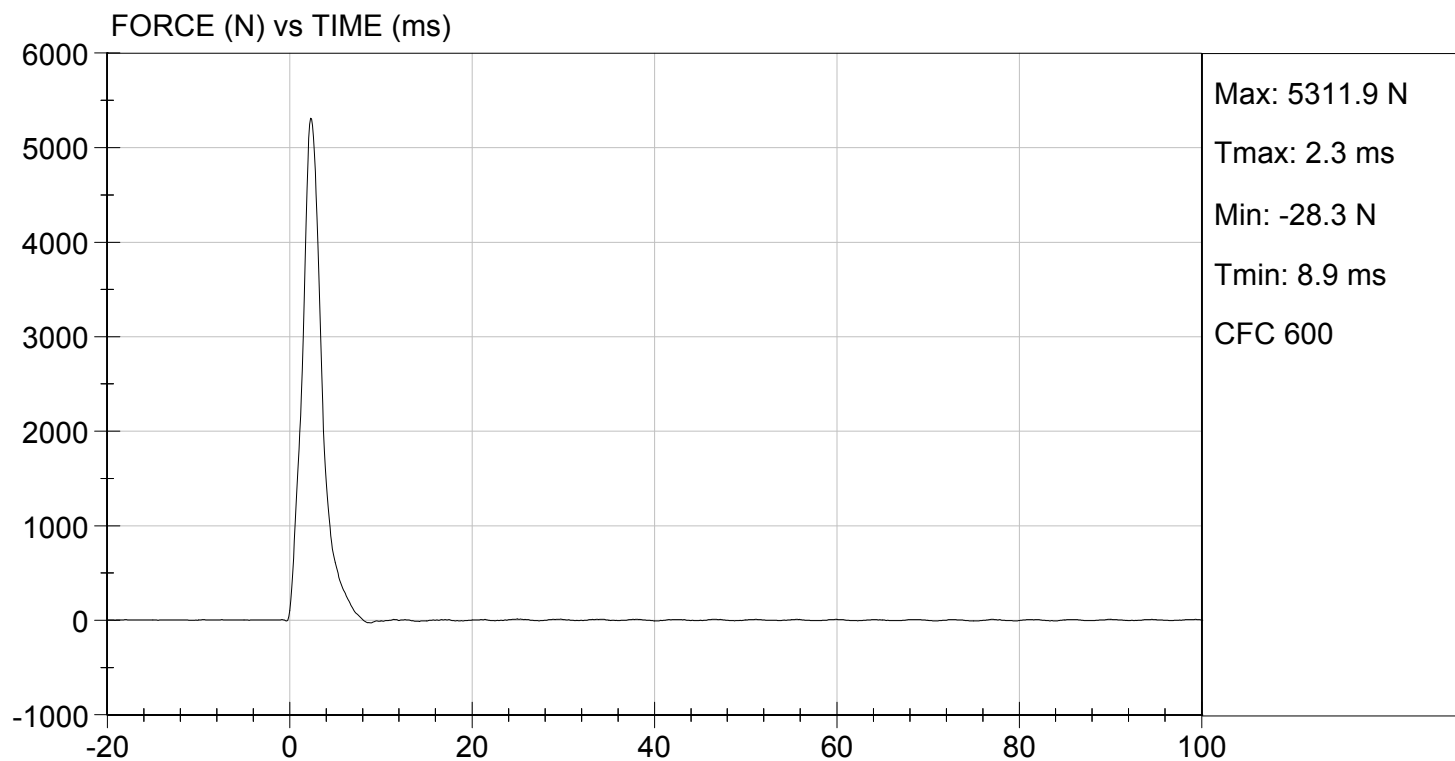
07/08/2013
Test Date


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.83 ft/s, 2.08 m/s

TEST DATE: 07/08/2013
TEST #: D132196



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

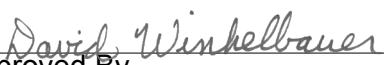
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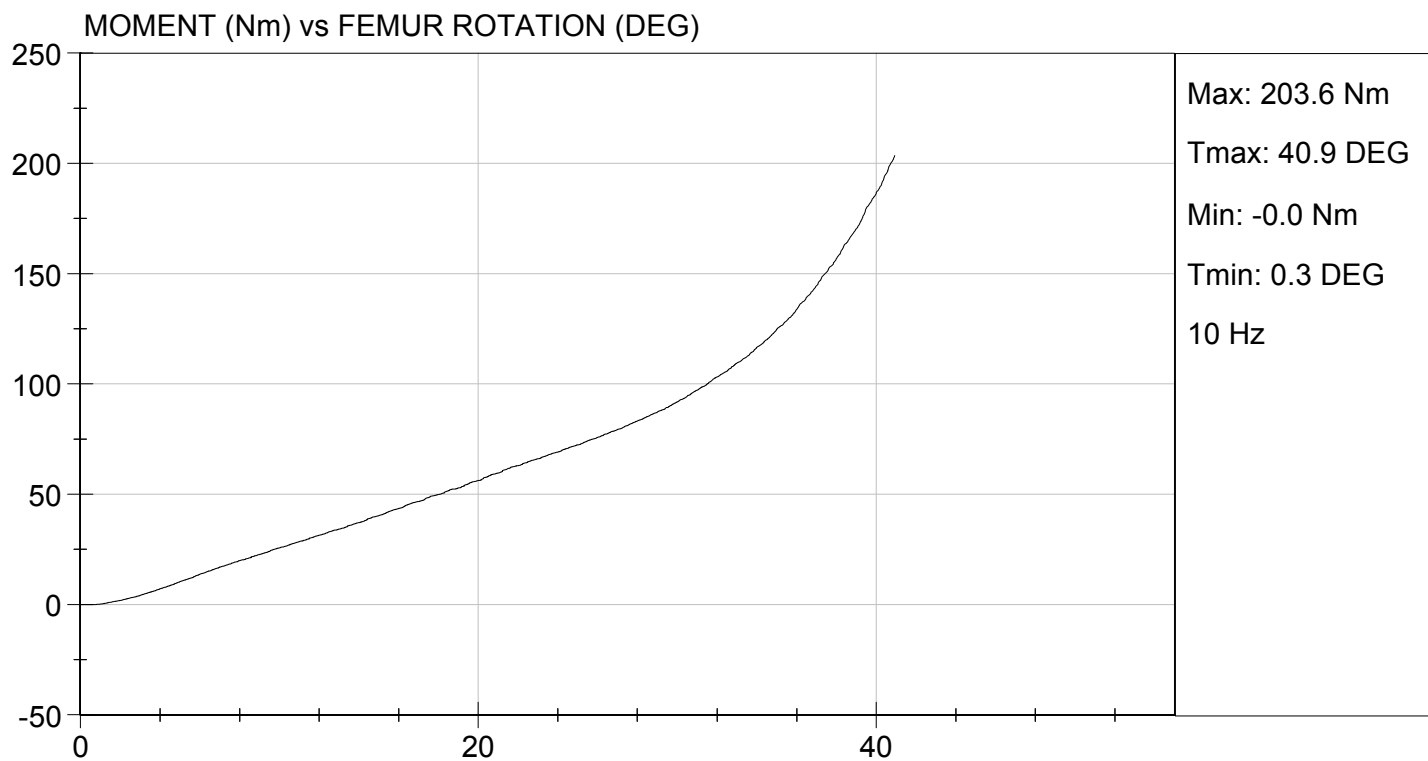
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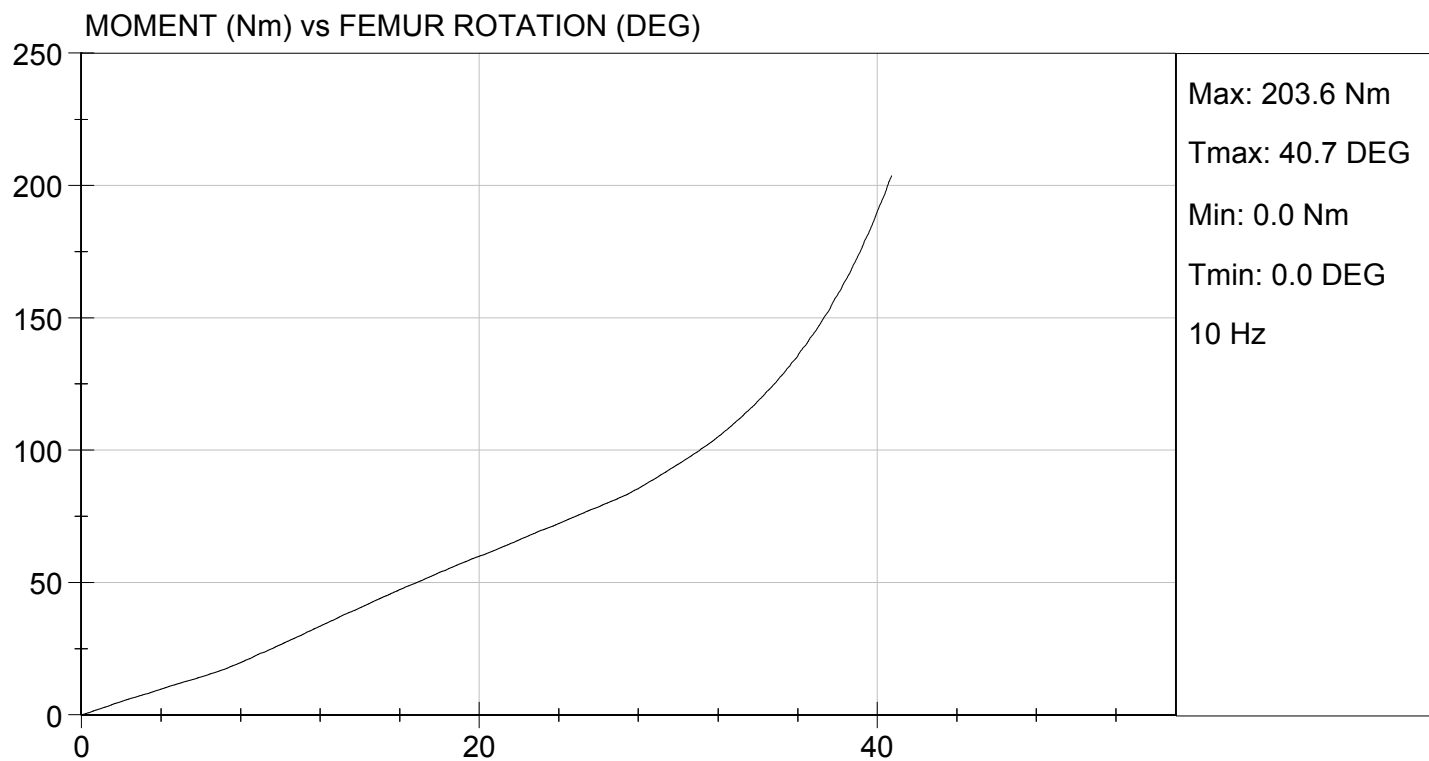
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.9	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	53	53	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.1	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	91.9	94.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	40.9	40.7	Pass
Overall Test Results					Pass


 Laboratory Technician

07/08/2013
 Test Date


 Approved By





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

ATD Serial No: 036

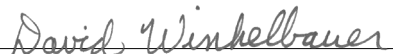
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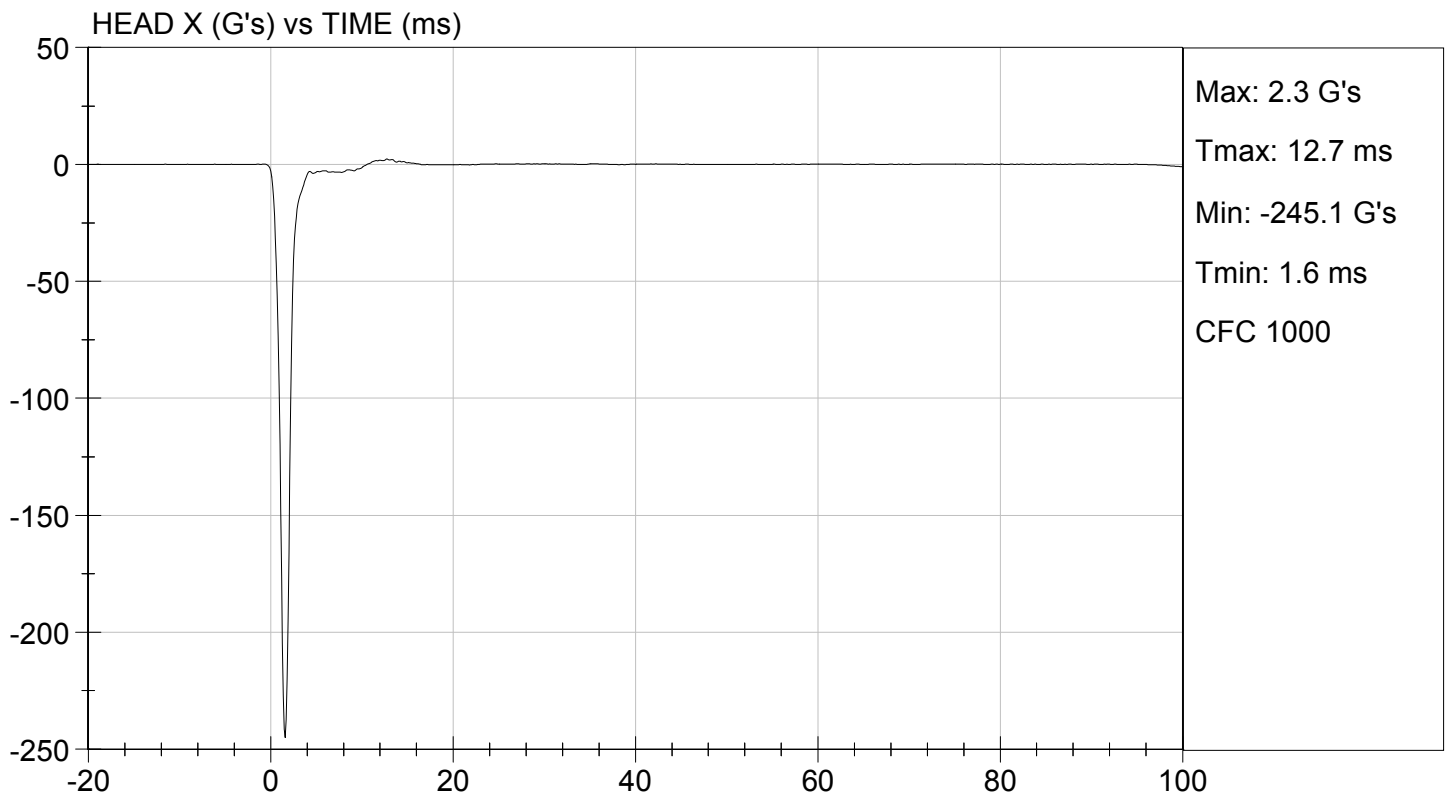
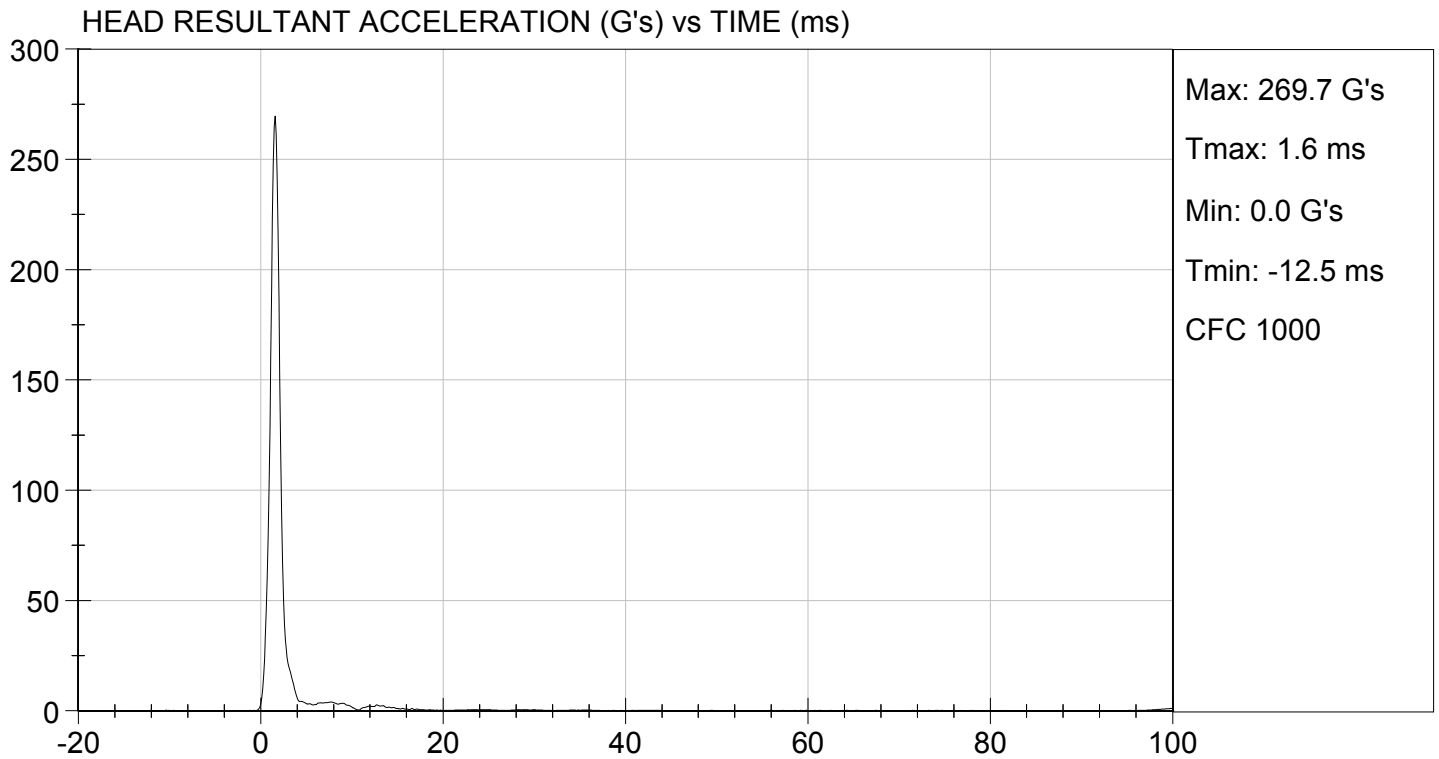
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Peak Resultant Acceleration	G's	225 to 275	270	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	2.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

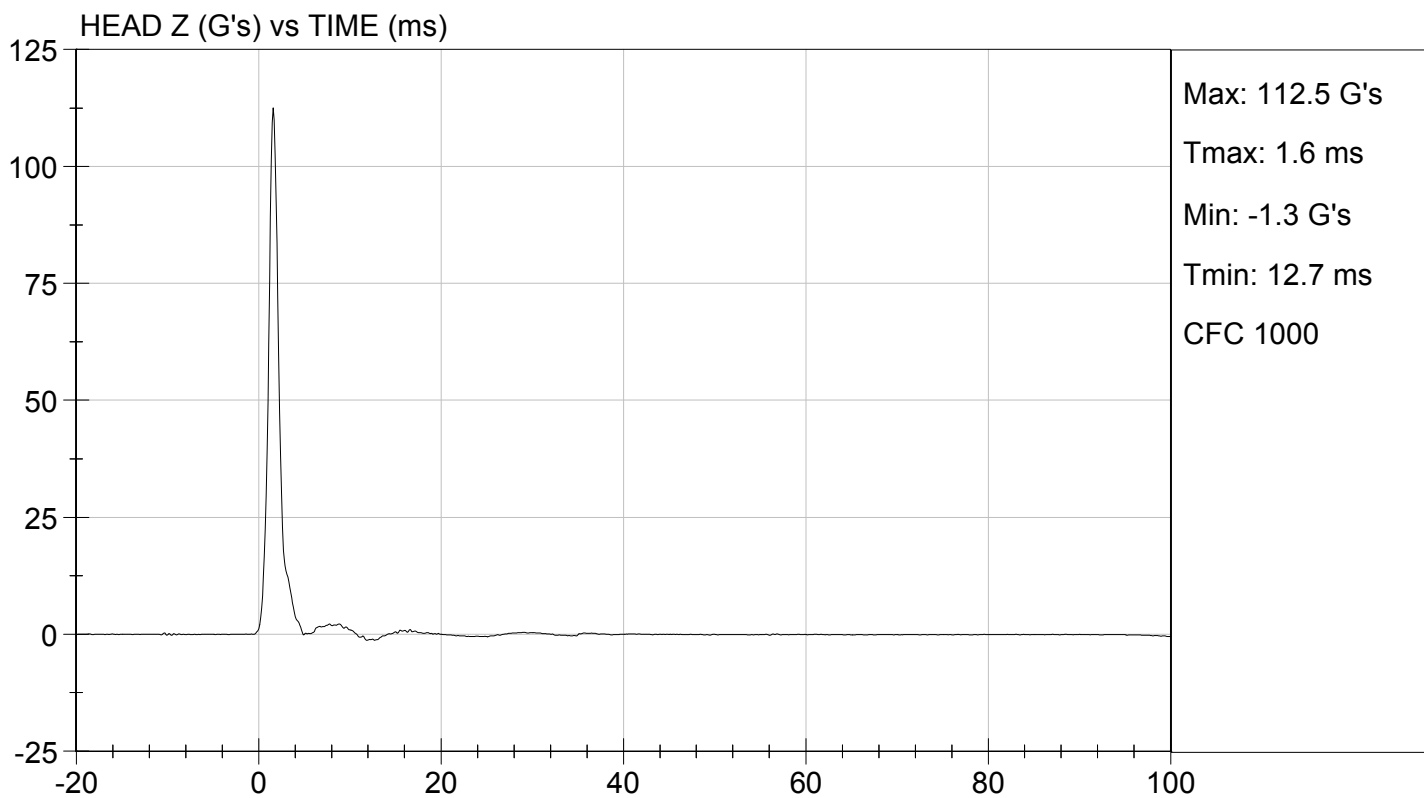
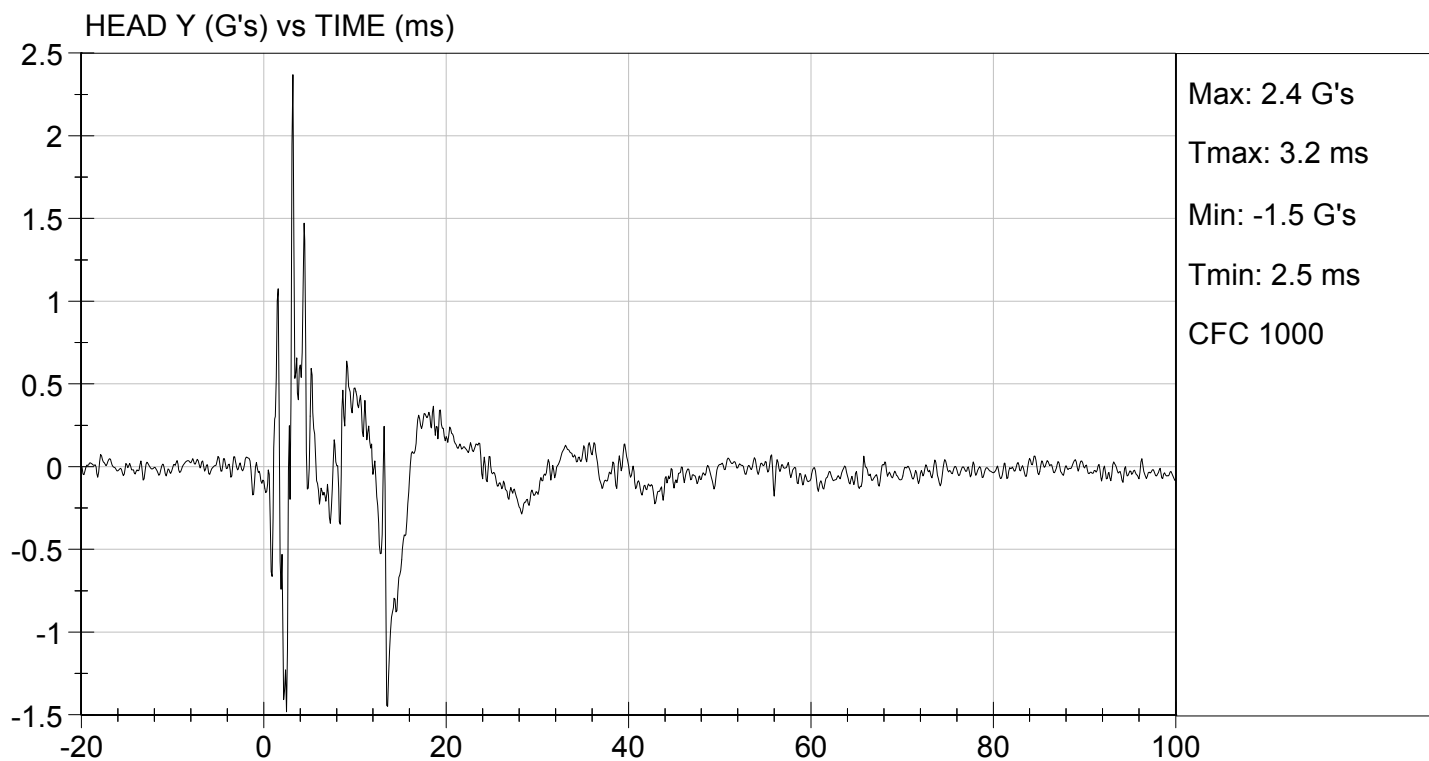

Laboratory Technician

07/12/2013

Test Date


Approved By





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

ATD Serial No: 036

Test I.D: D132252

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	51	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 ms	G's	22.50 to 27.50	23.01	Pass
	20 ms	G's	17.60 to 22.60	18.50	Pass
	30 ms	G's	12.50 to 18.50	12.91	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 29.0	12.8	Pass
Deceleration Decay Time to Cross 5 G's		ms	34.0 to 42.0	37.6	Pass
Maximum "D" Plane Rotation	Maximum	Deg	64.0 to 78.0	69.5	Pass
	Time	ms	57.0 to 64.0	58.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	113.0 to 128.0	117.4	Pass
Moment About Occipital Condyle	Maximum	Nm	88.1 to 108.5	95.1	Pass
	Time	ms	47.0 to 58.0	51.4	Pass
Positive Moment Decay Time To Zero Crossing		ms	97.0 to 107.0	97.8	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

07/11/2013

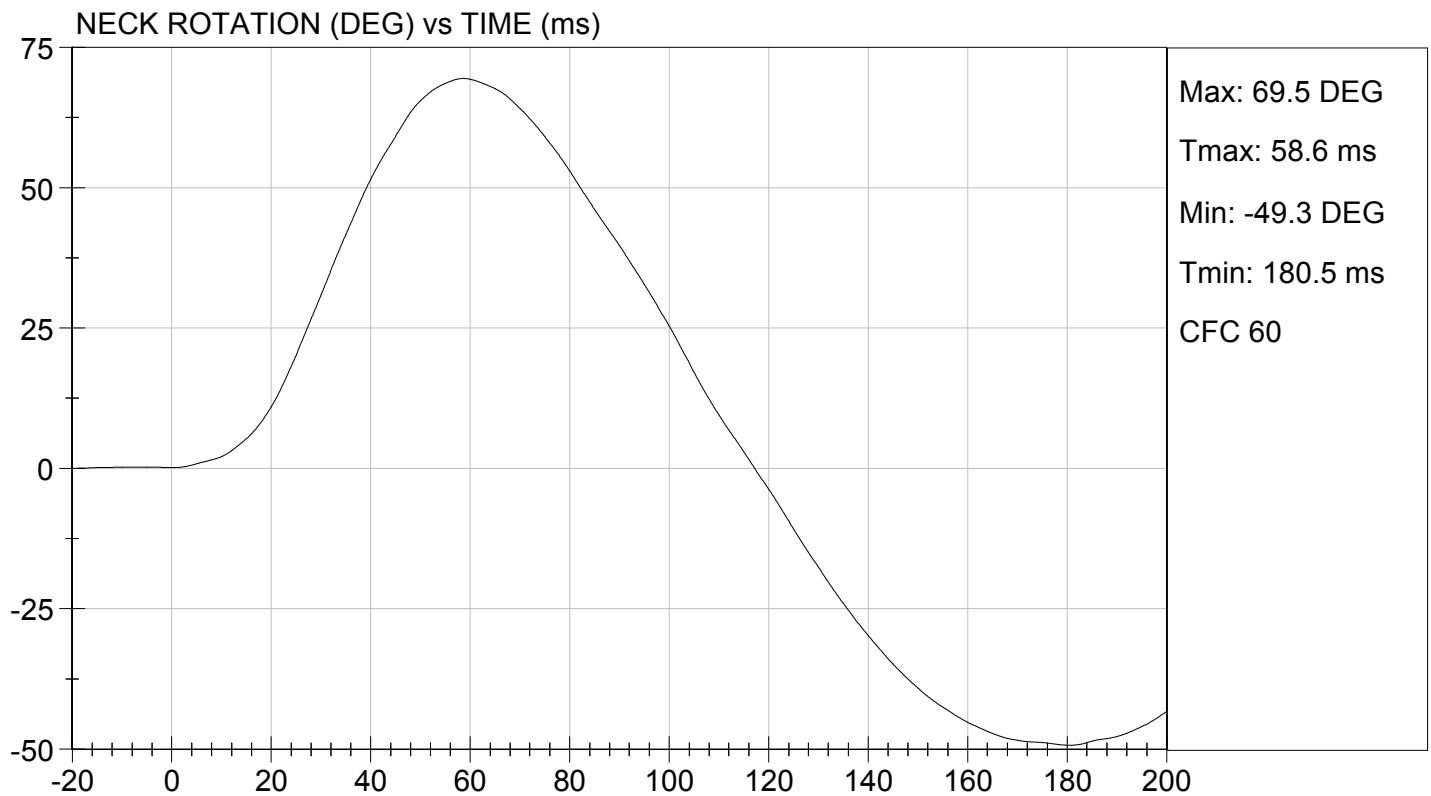
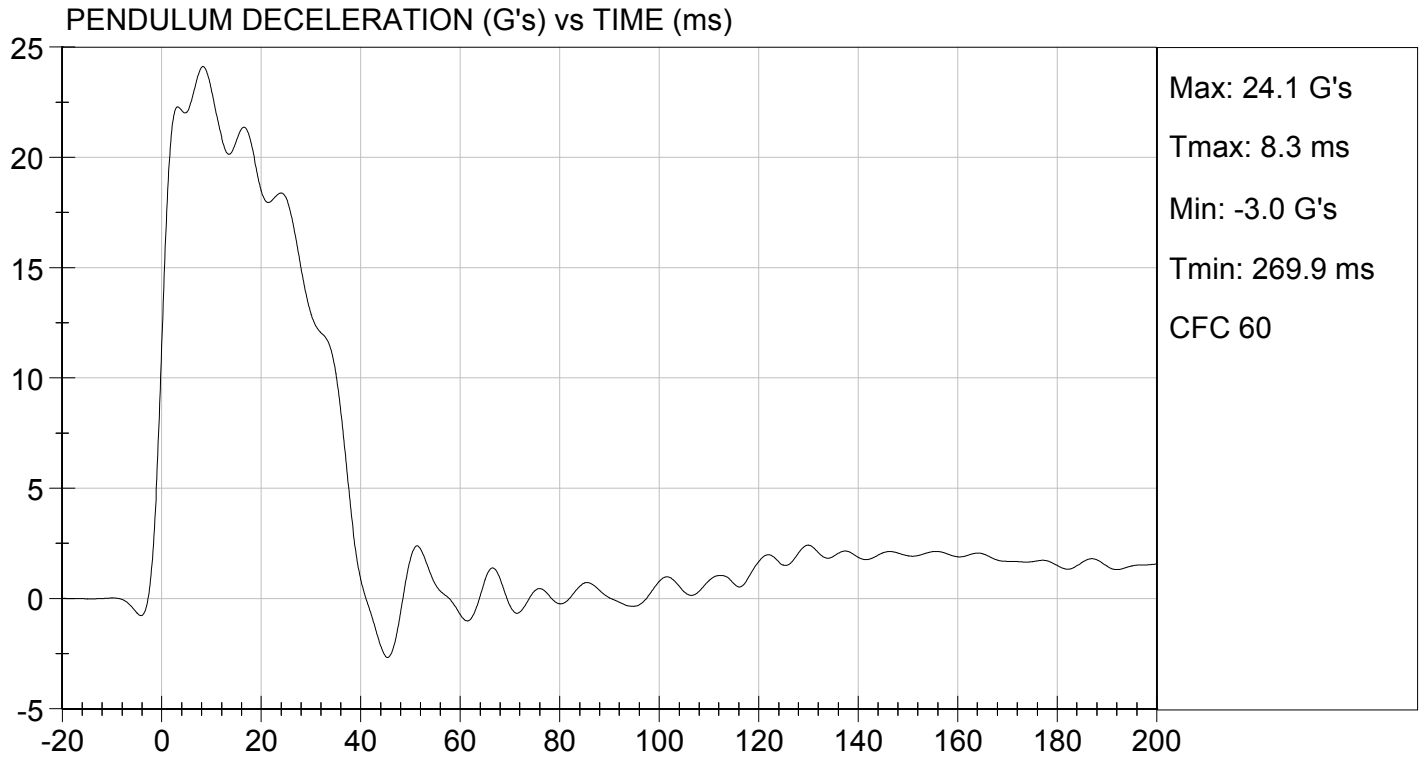
Test Date

David Winkelbauer
Approved By



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

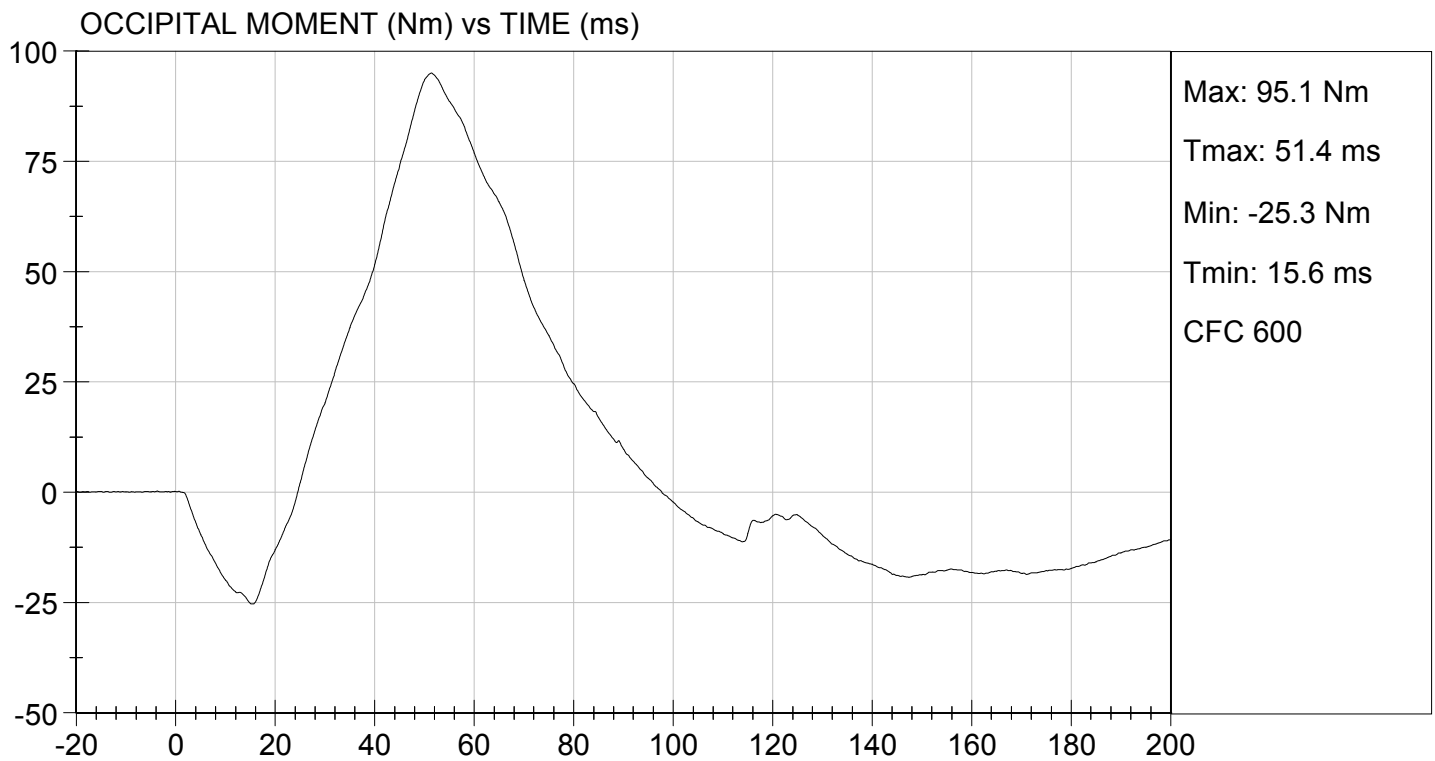
TEST DATE: 07/11/2013
TEST #: D132252





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

TEST DATE: 07/11/2013
TEST #: D132252



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

ATD Serial No: 036

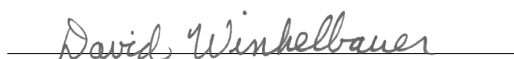
Test I.D: D13225

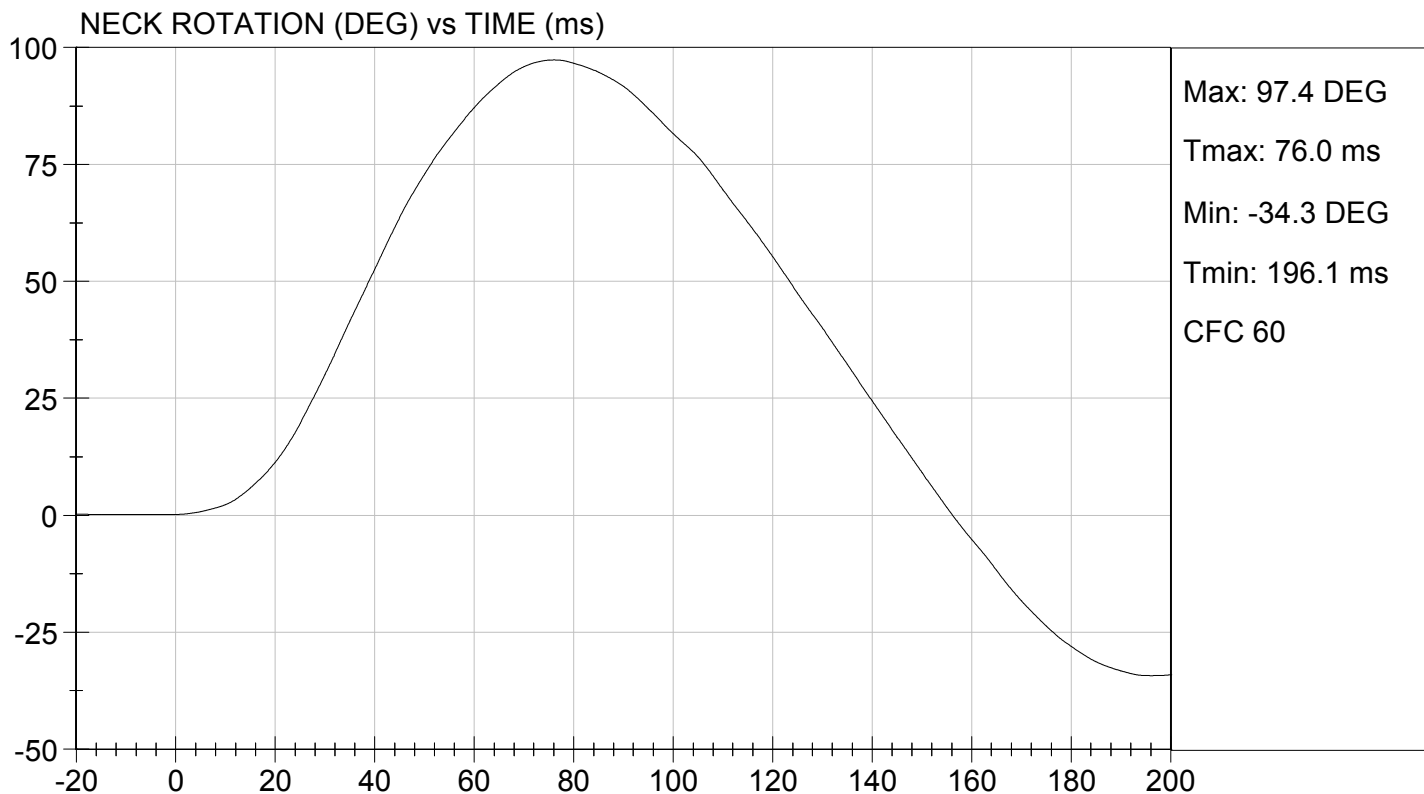
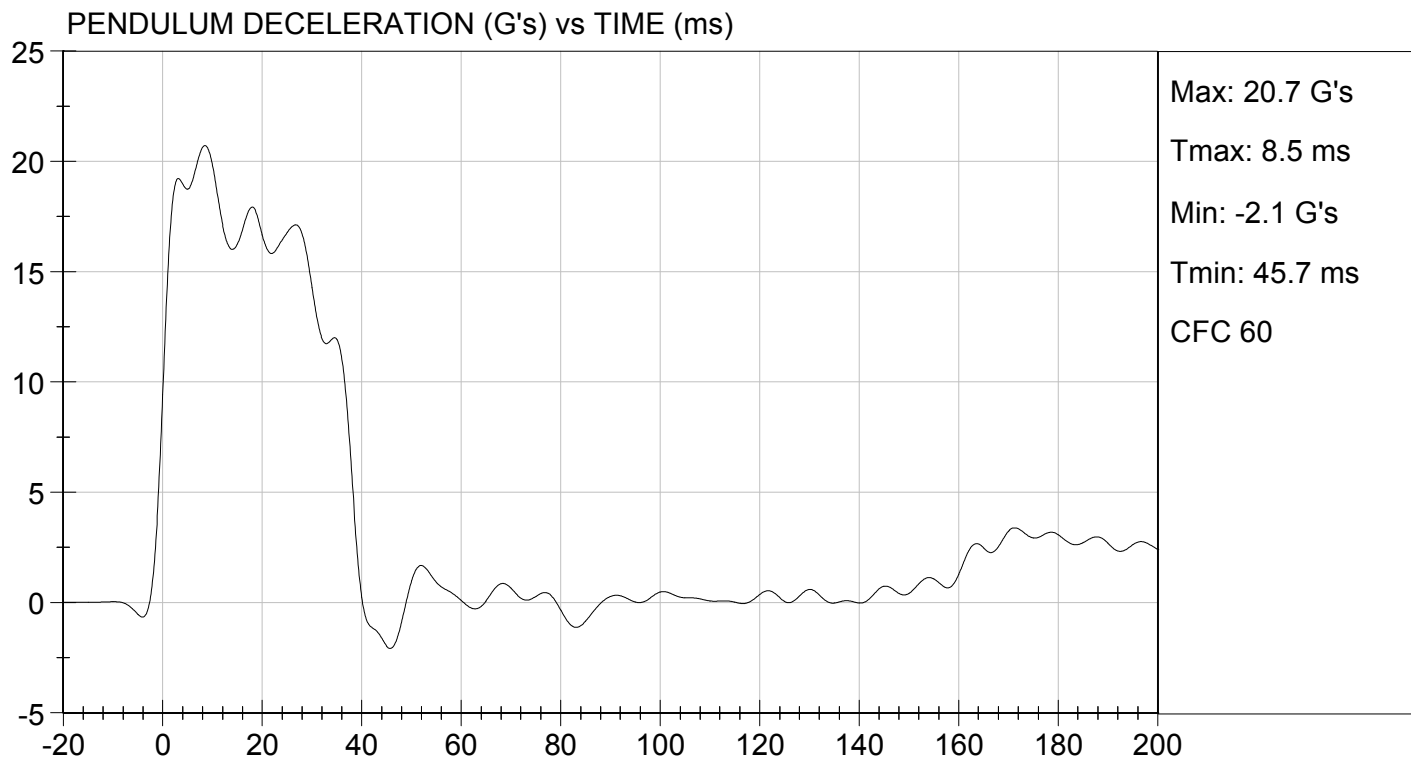
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.13	Pass
Pendulum Deceleration	10 ms	G's	17.20 to 21.20	19.79	Pass
	20 ms	G's	14.00 to 19.00	16.67	Pass
	30 ms	G's	11.00 to 16.00	14.26	Pass
Peak Pendulum Deceleration After 30 ms		G's	<= 22.0	14.1	Pass
Deceleration Decay Time to Cross 5 G's		ms	38.0 to 46.0	38.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	97.4	Pass
	Time	ms	72.0 to 82.0	76.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		ms	147.0 to 174.0	156.3	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to -79.9	-68.2	Pass
	Time	ms	65.0 to 79.0	70.0	Pass
Negative Moment Decay Time To Zero Crossing		ms	120.0 to 148.0	143.0	Pass
Overall Test Results					Pass


Laboratory Technician

07/11/2013

Test Date

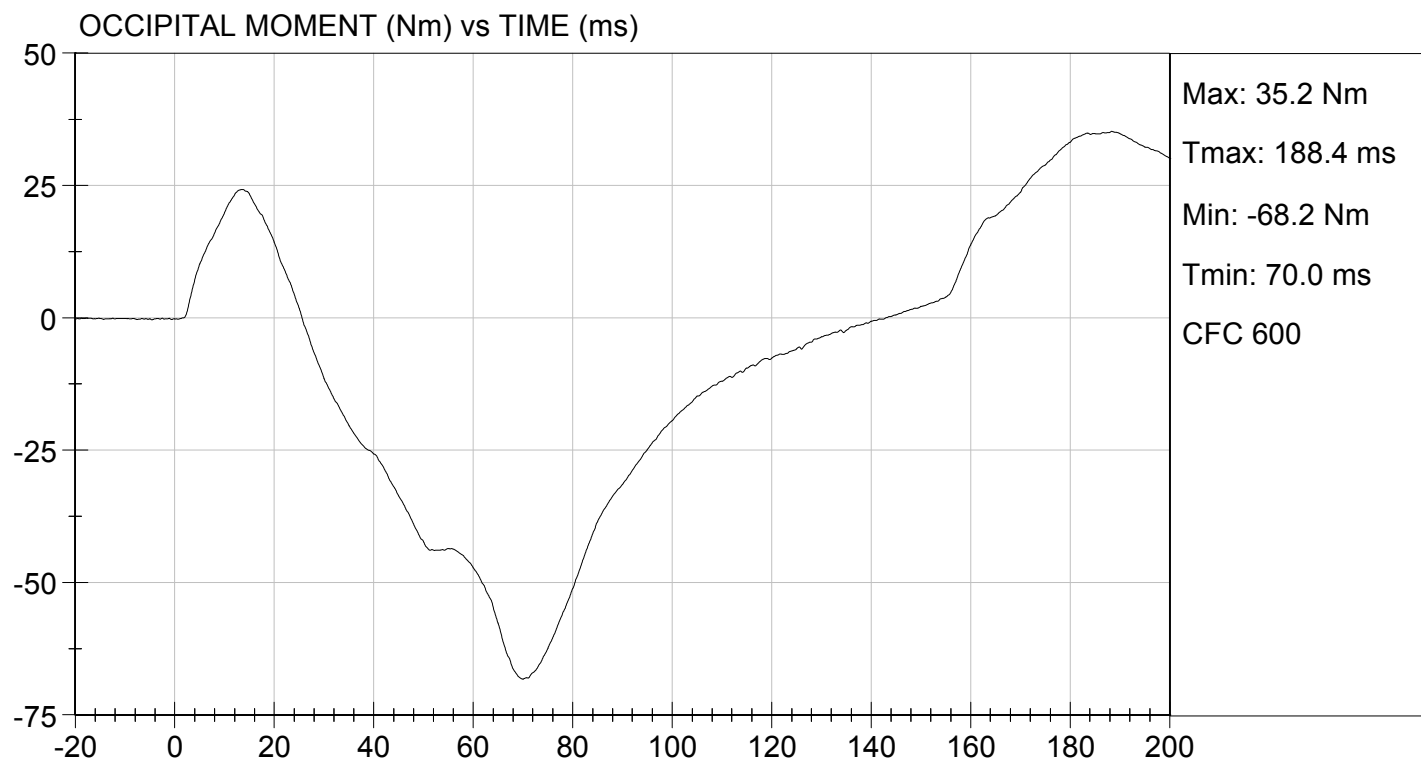

Approved By





TEST DESC: NECK EXTENSION
VELOCITY: 20.12 ft/s, 6.13 m/s

TEST DATE: 07/11/2013
TEST #: D13225



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 036

Test I.D: D132254

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,309	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.42	Pass
Internal Hysteresis	%	69 to 85	73	Pass
			Overall Test Results	Pass


Laboratory Technician

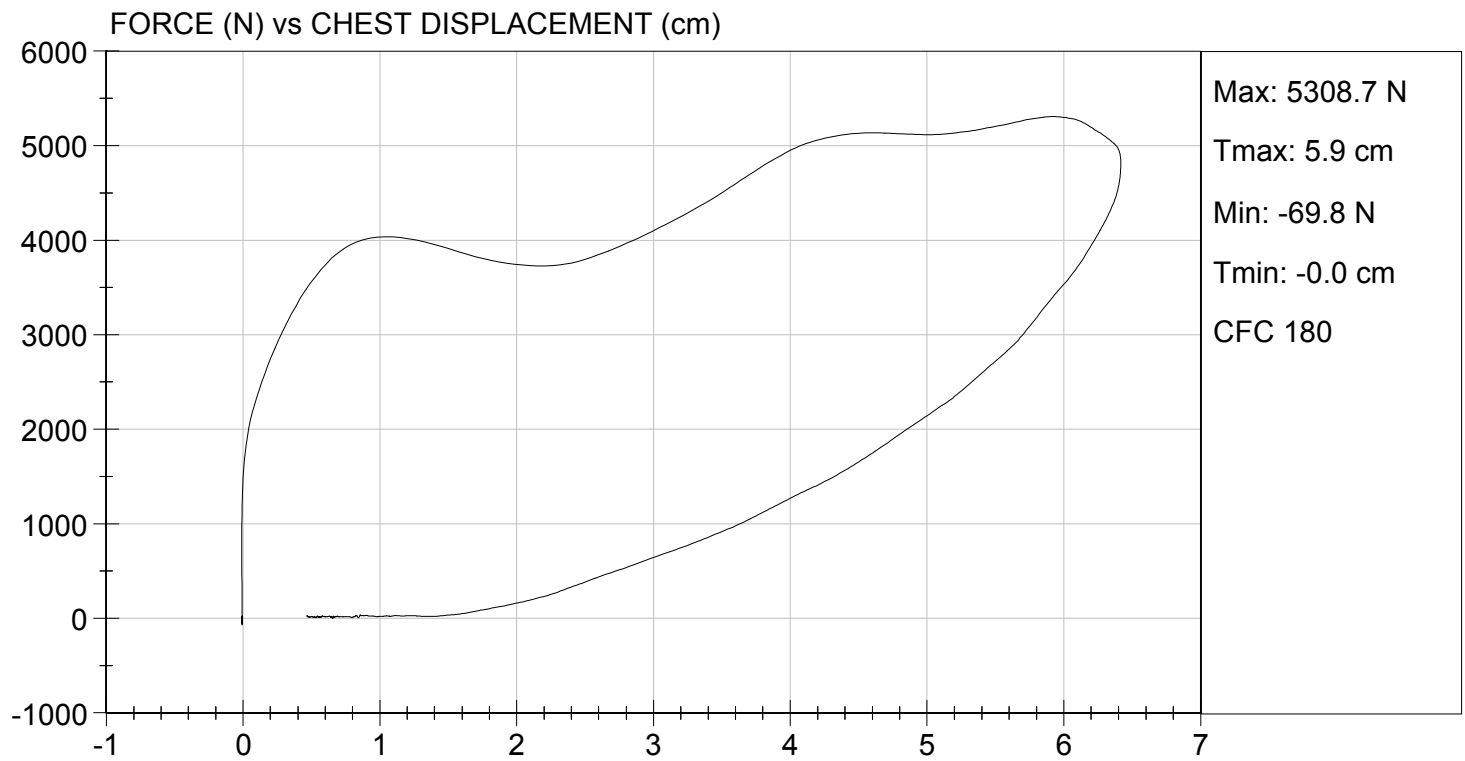
07/12/2013
Test Date


Approved By



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

TEST DATE: 07/12/2013
TEST #: D132254



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

ATD Serial No: 036

Test I.D: D132255

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	N	4715 to 5782	5,548	Pass
Overall Test Results				Pass


Laboratory Technician

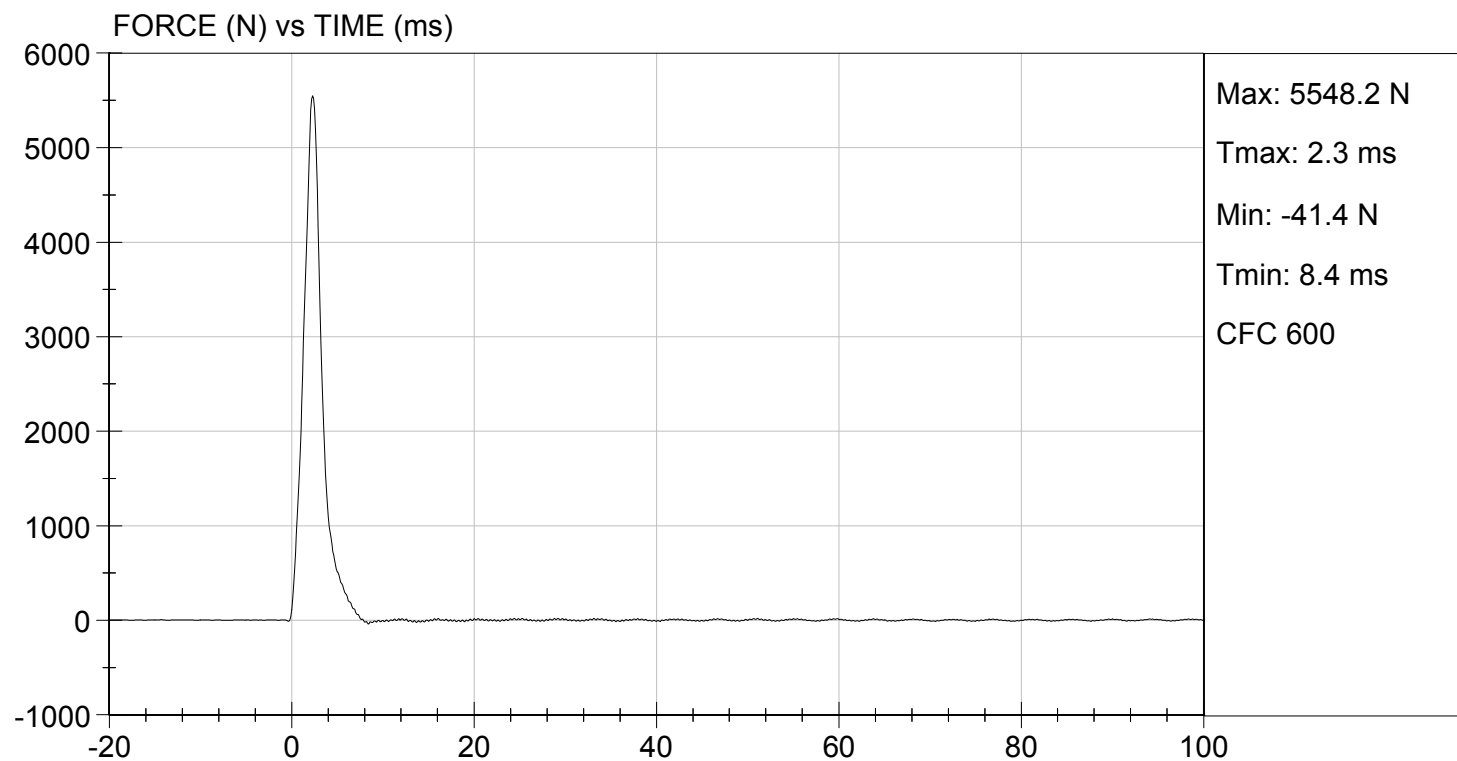
07/11/2013
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.82 ft/s, 2.08 m/s

TEST DATE: 07/11/2013
TEST #: D132255



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

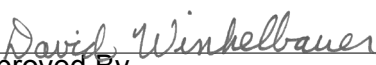
ATD Serial No: 036

Test I.D: D132256

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Velocity	m/s	2.07 to 2.13	2.12	Pass
Peak Probe Force	N	4715 to 5782	4,733	Pass
			Overall Test Results	Pass


Laboratory Technician

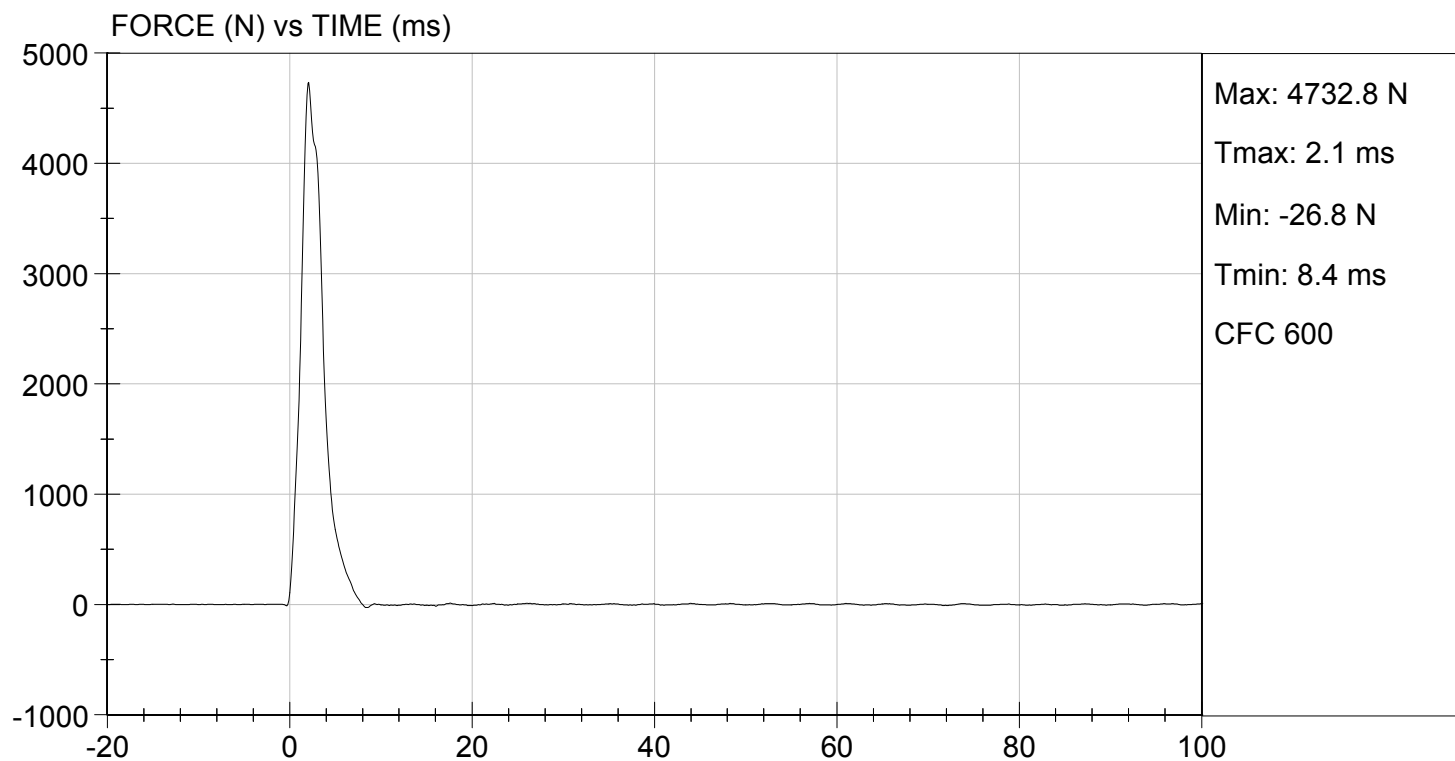
07/11/2013
Test Date


Approved By



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

TEST DATE: 07/11/2013
TEST #: D132256



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

ATD Serial No: 036

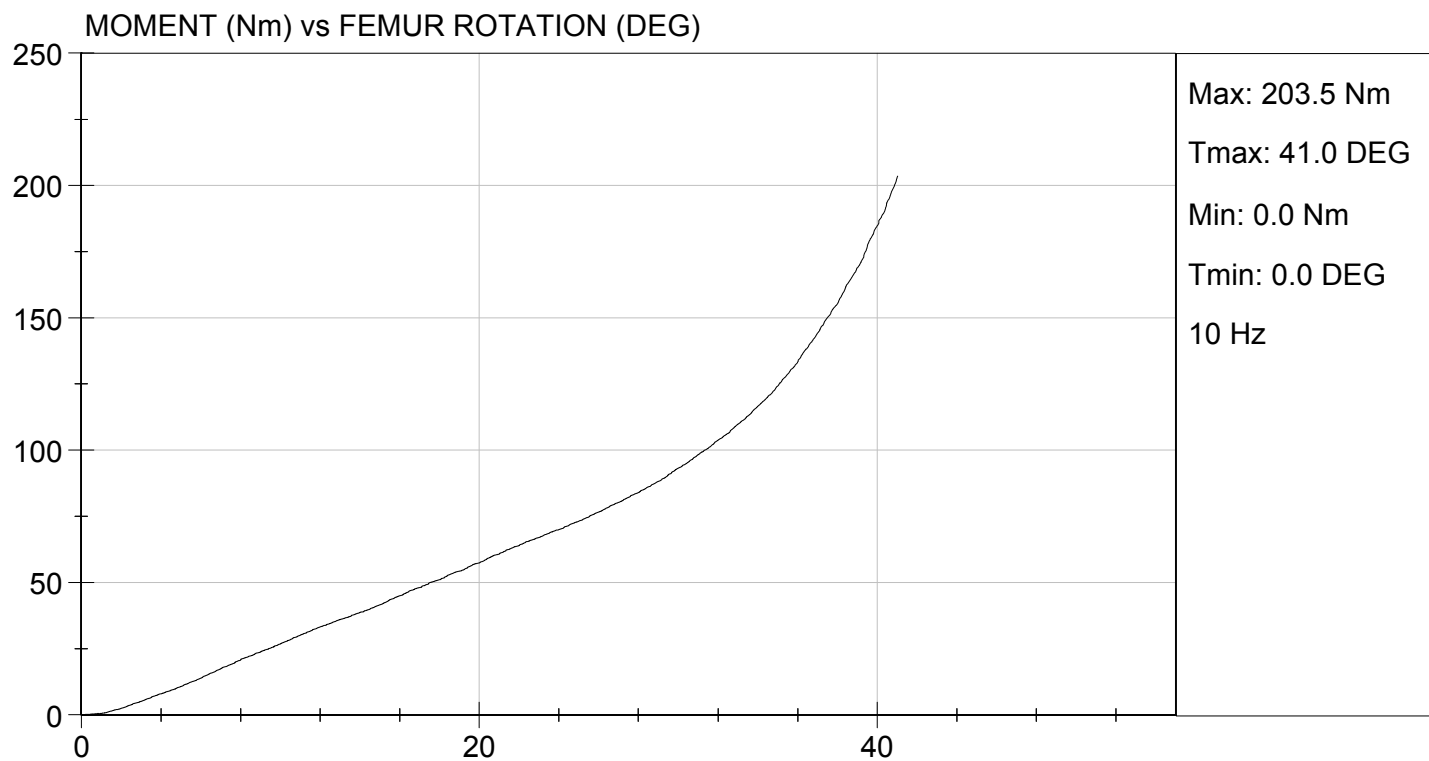
Test I.D: D132250

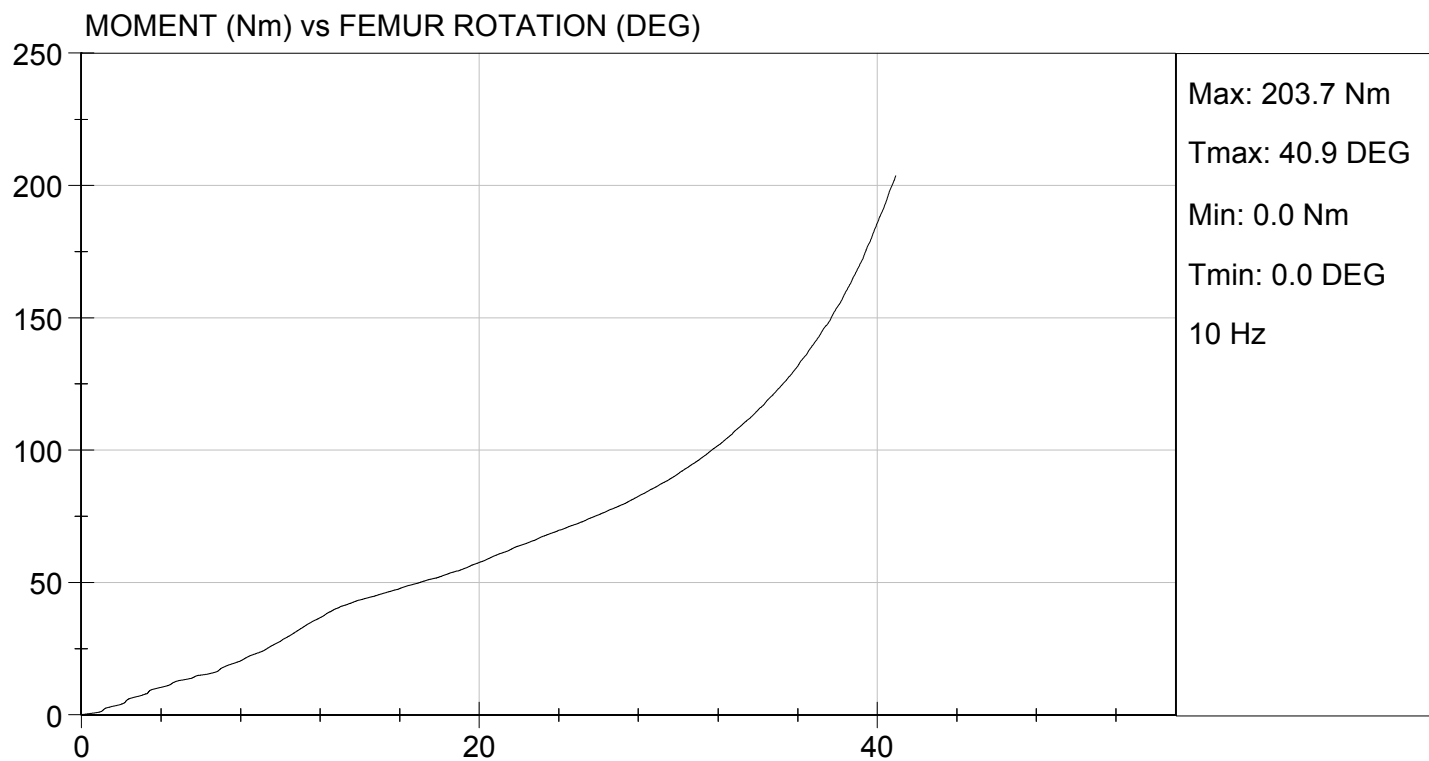
Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	44	44	Pass
Rotation Rate	deg/s	5.0 to 10.0	6.1	6.2	Pass
30 Degrees	Nm	94.9 Nm Max	93.2	91.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40.0 to 50.0 Degree Max Rotation	41.0	40.9	Pass
Overall Test Results					Pass


 Laboratory Technician

07/11/2013
 Test Date


 Approved By





Hybrid III, 5th External Measurements
SN: 138

HYBRID III, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	785.1
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	456.8
C	H-POINT HEIGHT	Reference	81.3-86.3	84.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	146.2
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	78.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	127.5
G	BACK OF ELBOW TO WRIST PIVOT	back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	249.6
H	HEAD BACK TO BACKLINE	Back of Skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO- ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	280.2
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	201.9
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	526.7
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	362.3
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	398.0
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414-439.4	430.5

HYBRID III, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	184.6
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	221.0
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	472.6
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.9
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	184.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	307.4
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	360.5
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	85.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	546.2
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	875.1
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	785.4
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.4
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.1

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

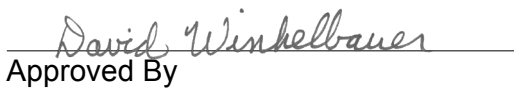
Test ID: D132201

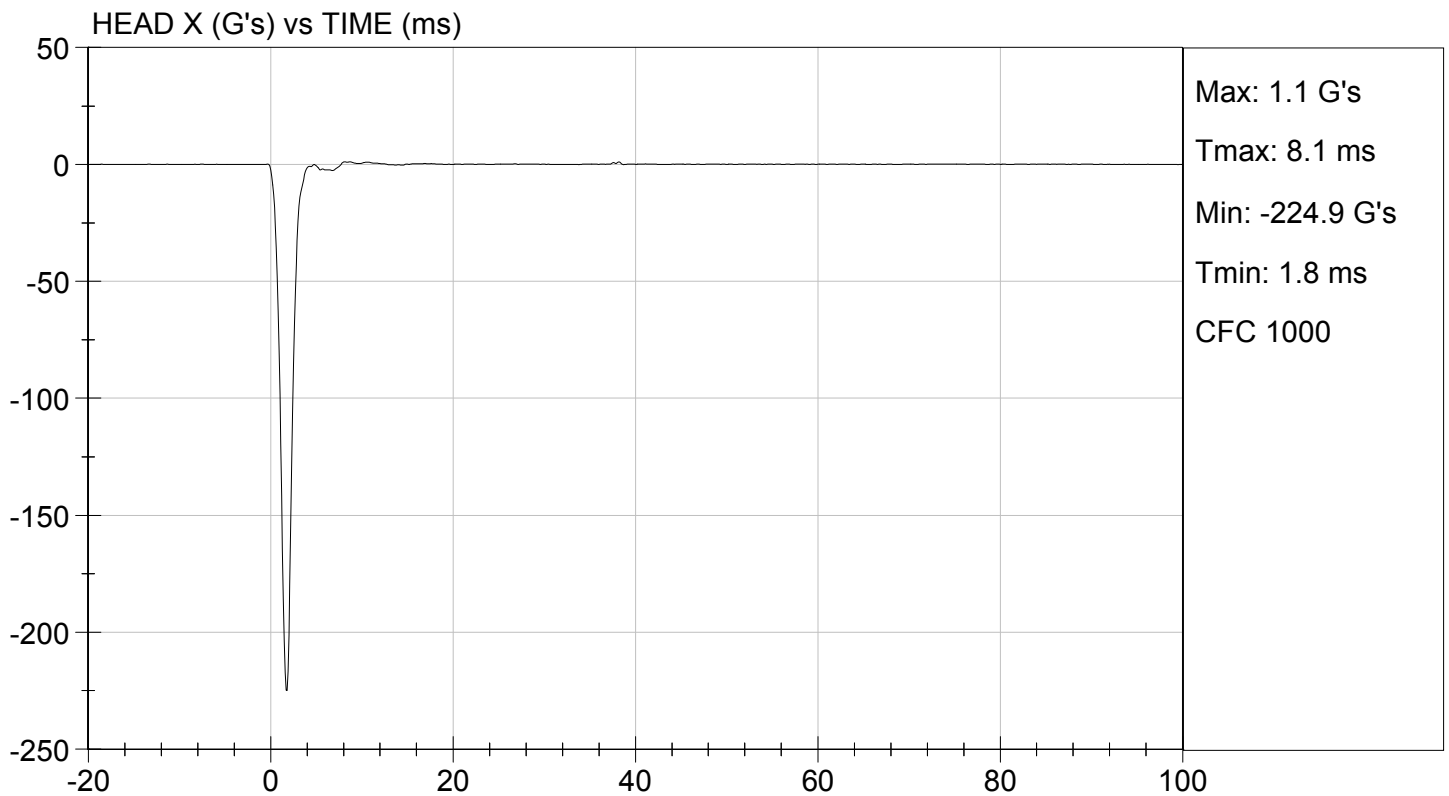
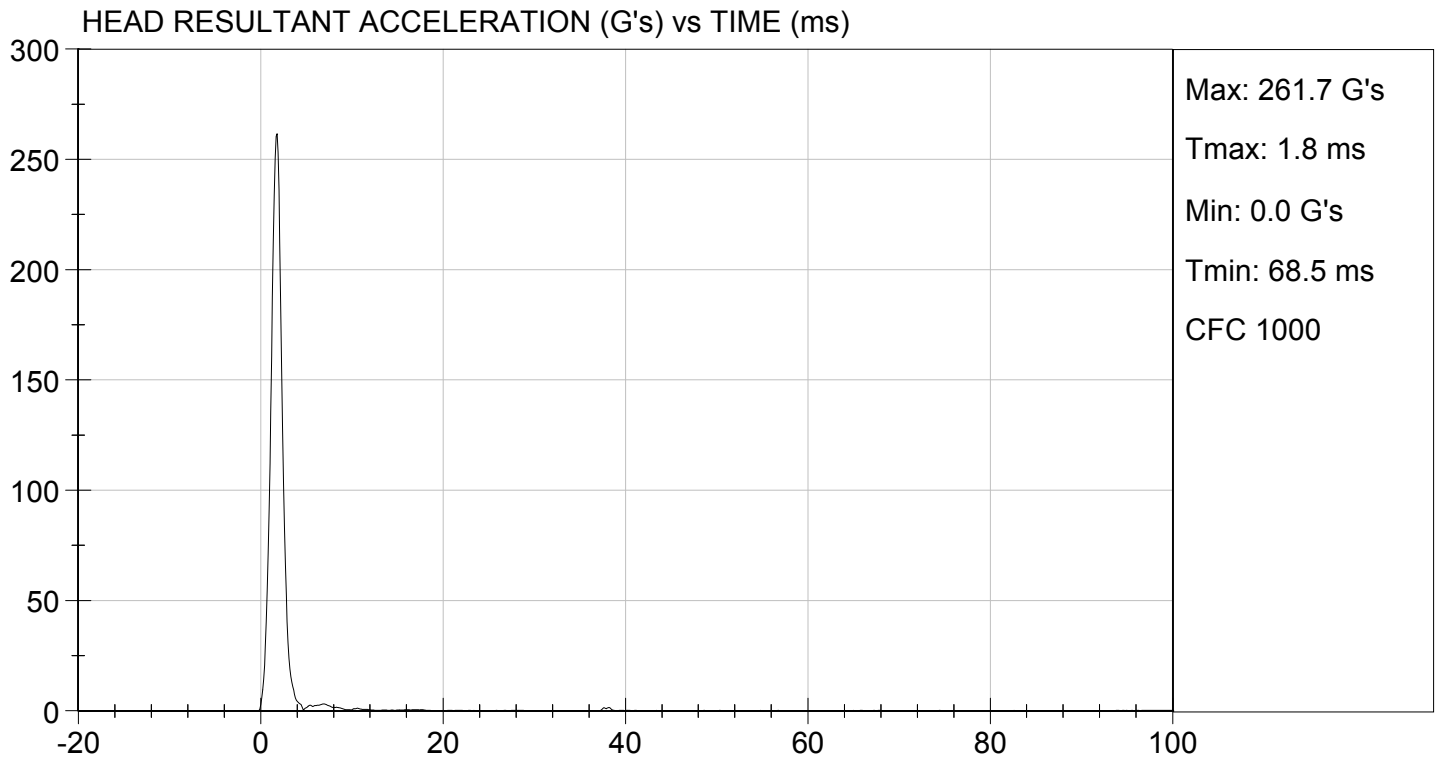
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Peak Resultant Acceleration	G's	250 to 300	262	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-11.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

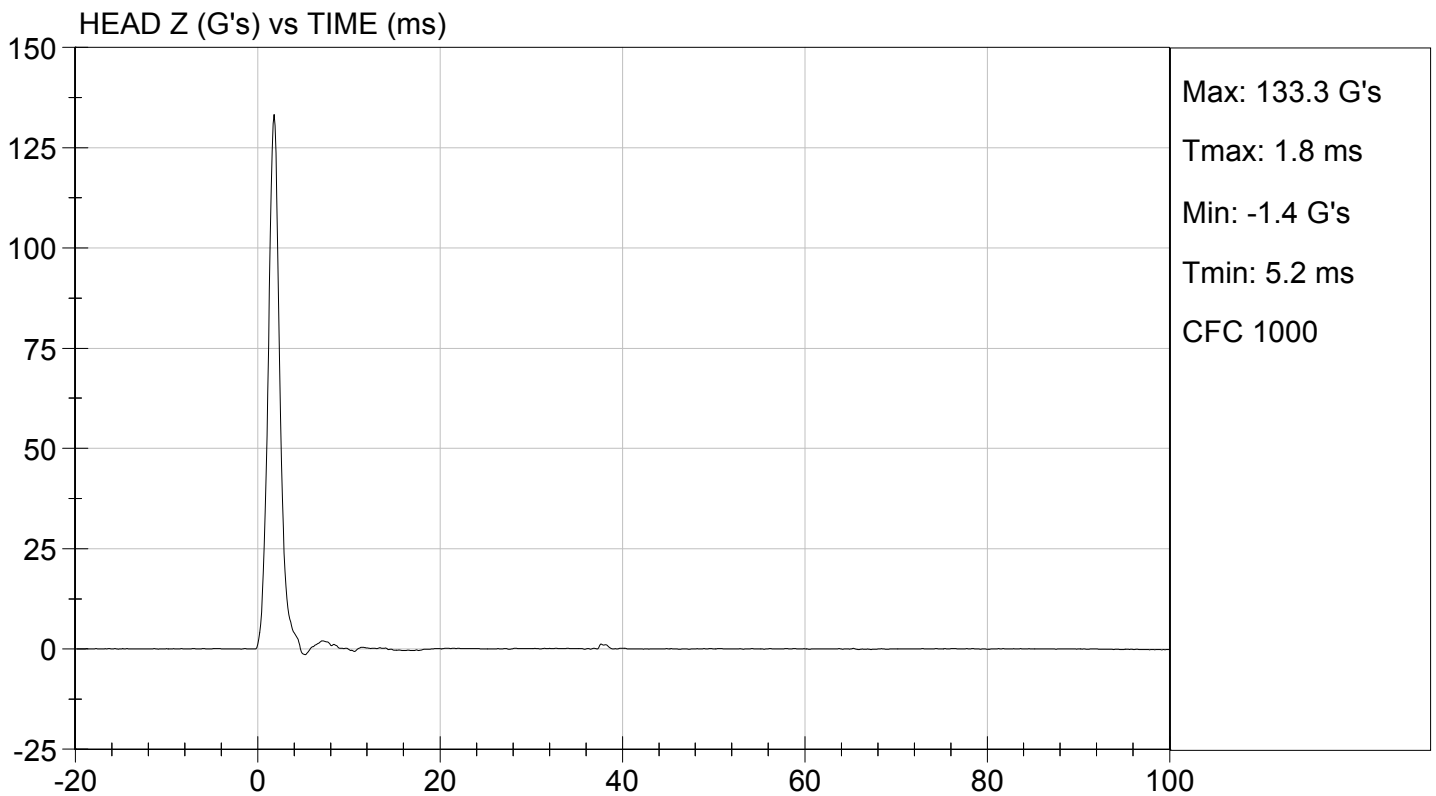
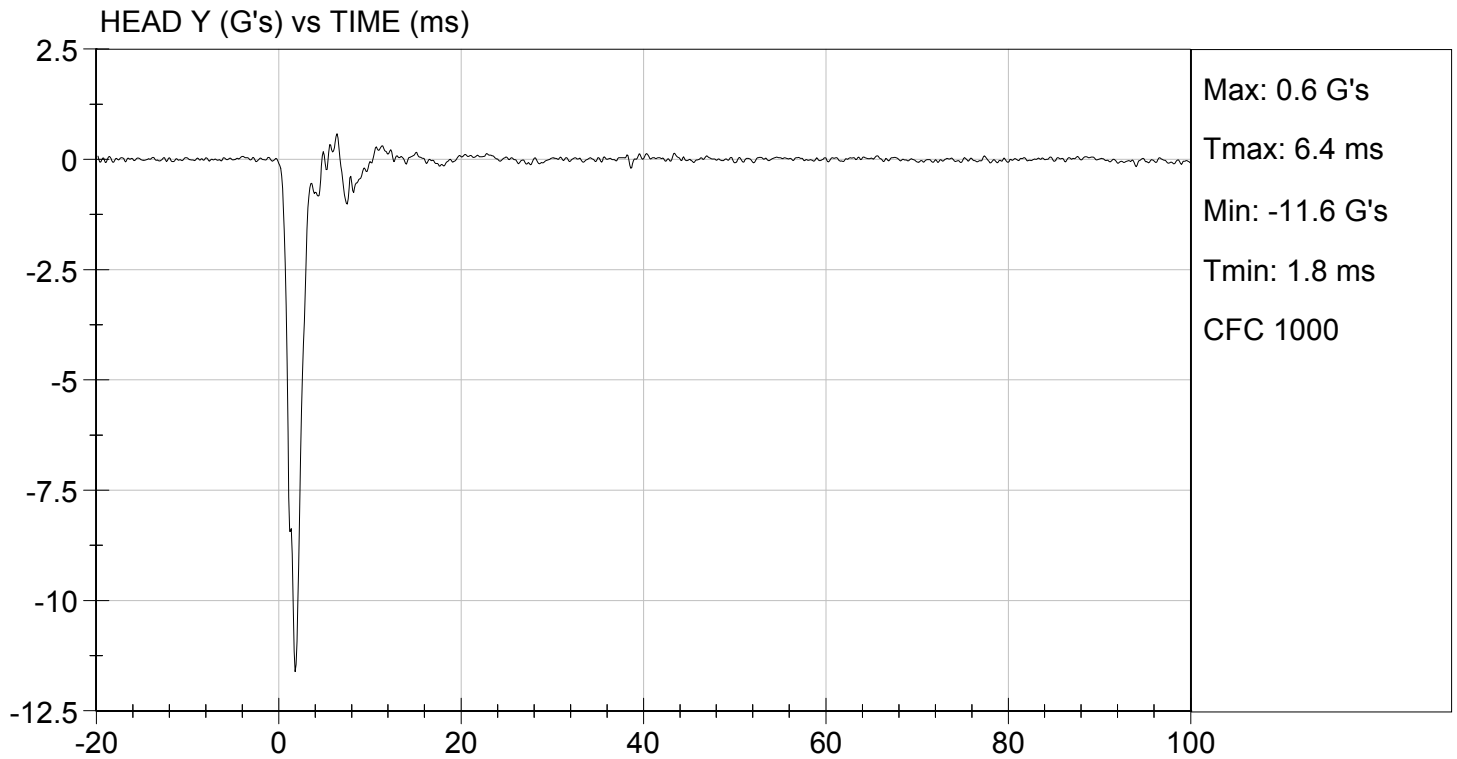

Laboratory Technician

07/08/2013

Test Date


Approved By





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D132202

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	50	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.05	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.4	Pass
D Plane Rotation	Max	deg	77 to 91	84	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	70	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
Overall Results					Pass

Jessica Gall
 Laboratory Technician

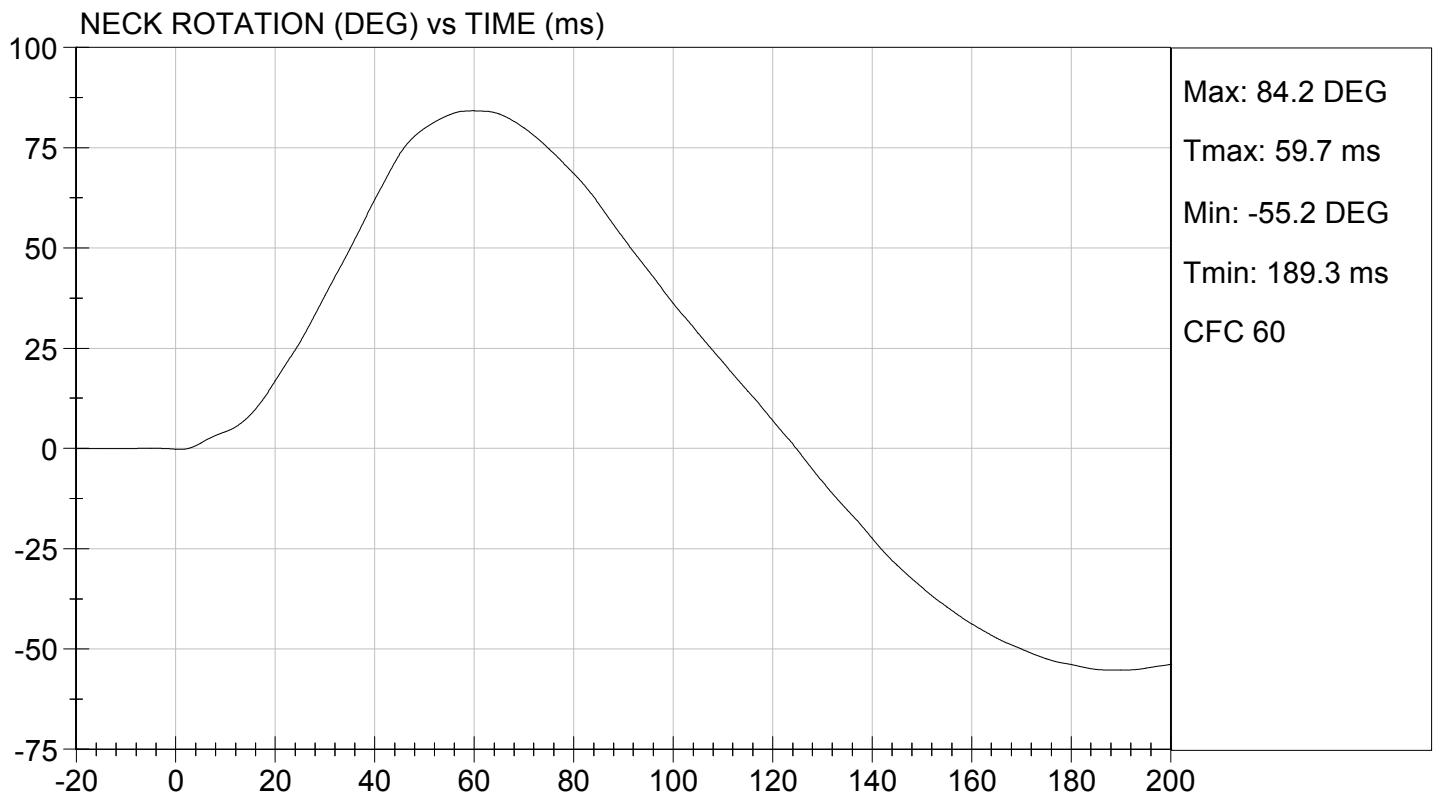
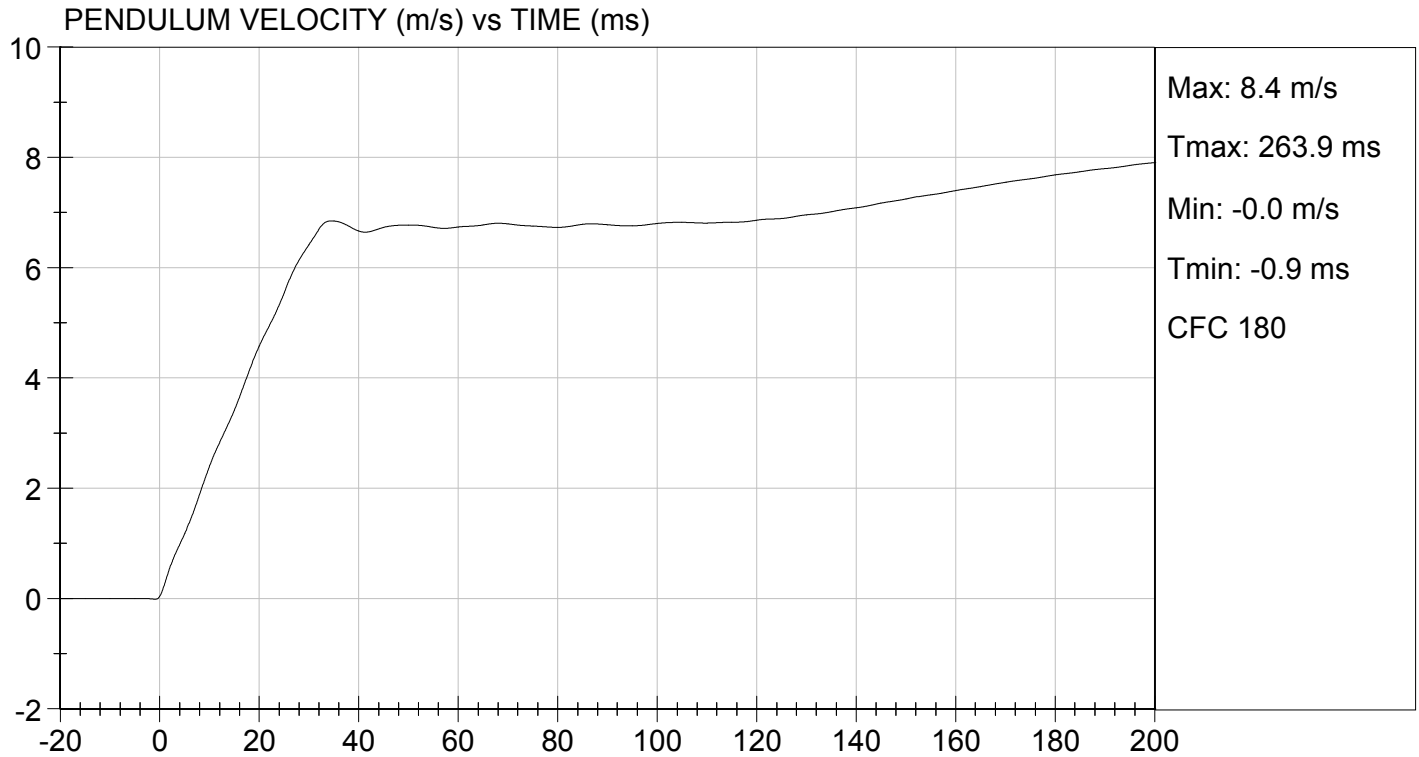
07/08/2013
 Test Date

David Winkelbauer
 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

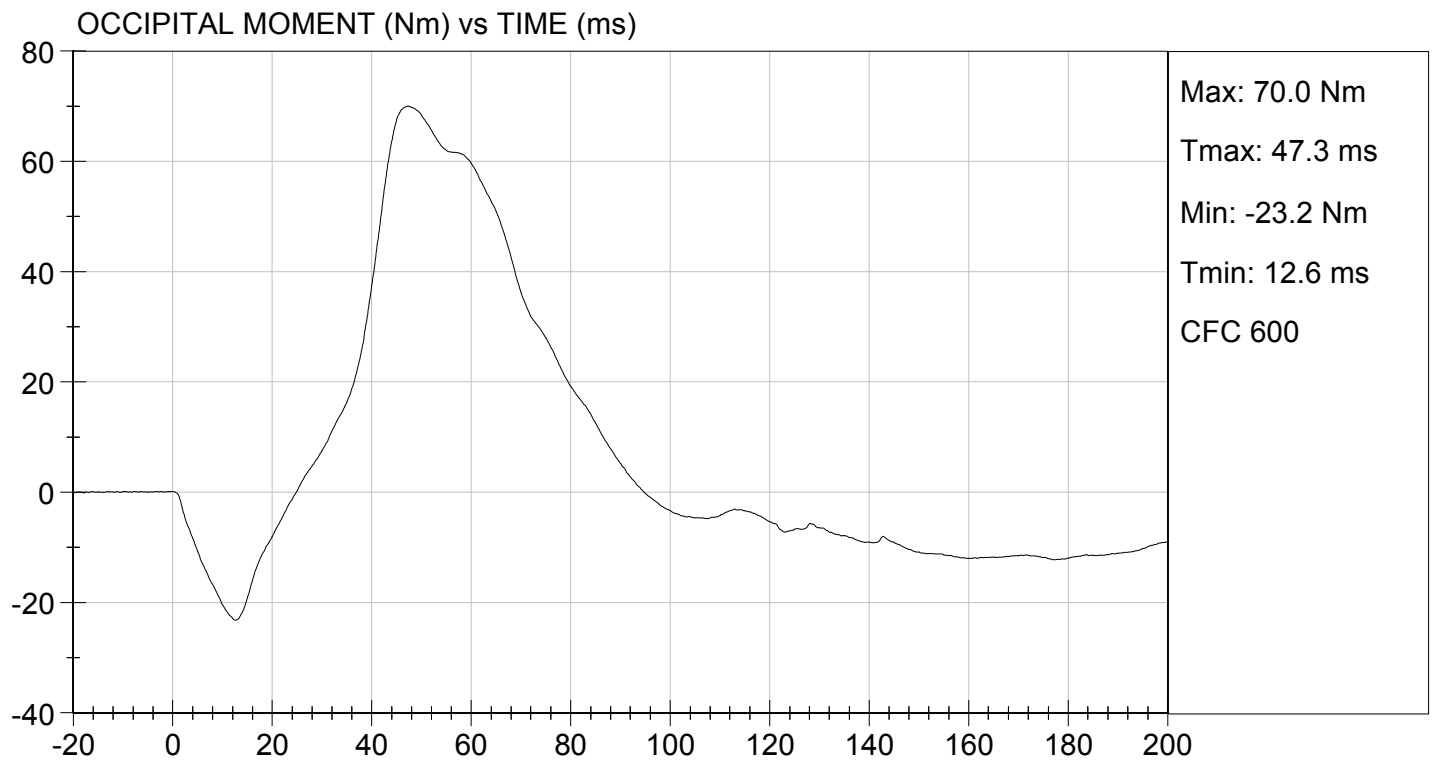
TEST DATE: 07/08/2013
TEST #: D132202





TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

TEST DATE: 07/08/2013
TEST #: D132202



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D132203

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	50	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.4	Pass
	30 ms	m/s	4.6 to 5.6	4.9	Pass
D Plane Rotation	Max	deg	99 to 114	107	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	100	Pass
Overall Results					Pass

Jessica Gall
Laboratory Technician

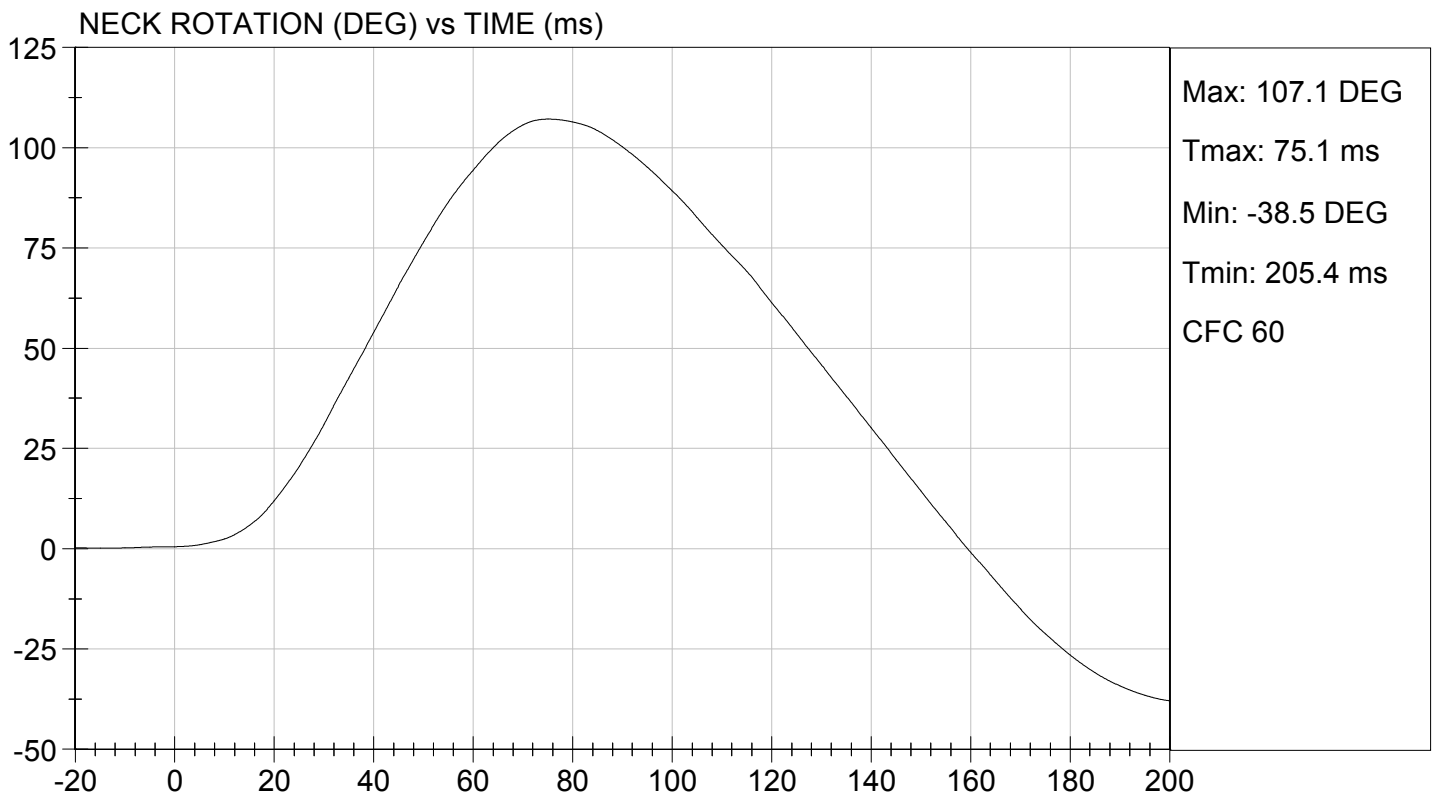
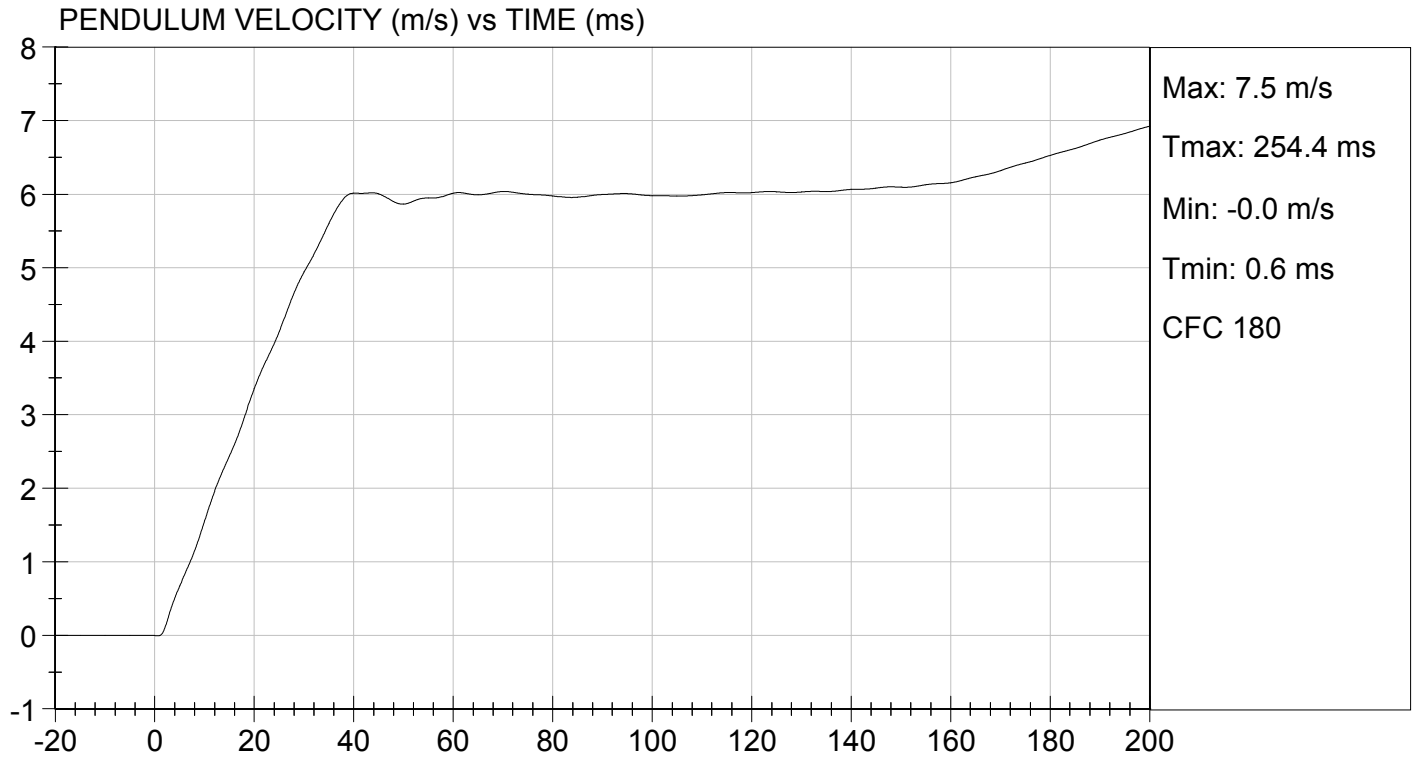
07/08/2013
Test Date

David Winkelbauer
Approved By



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

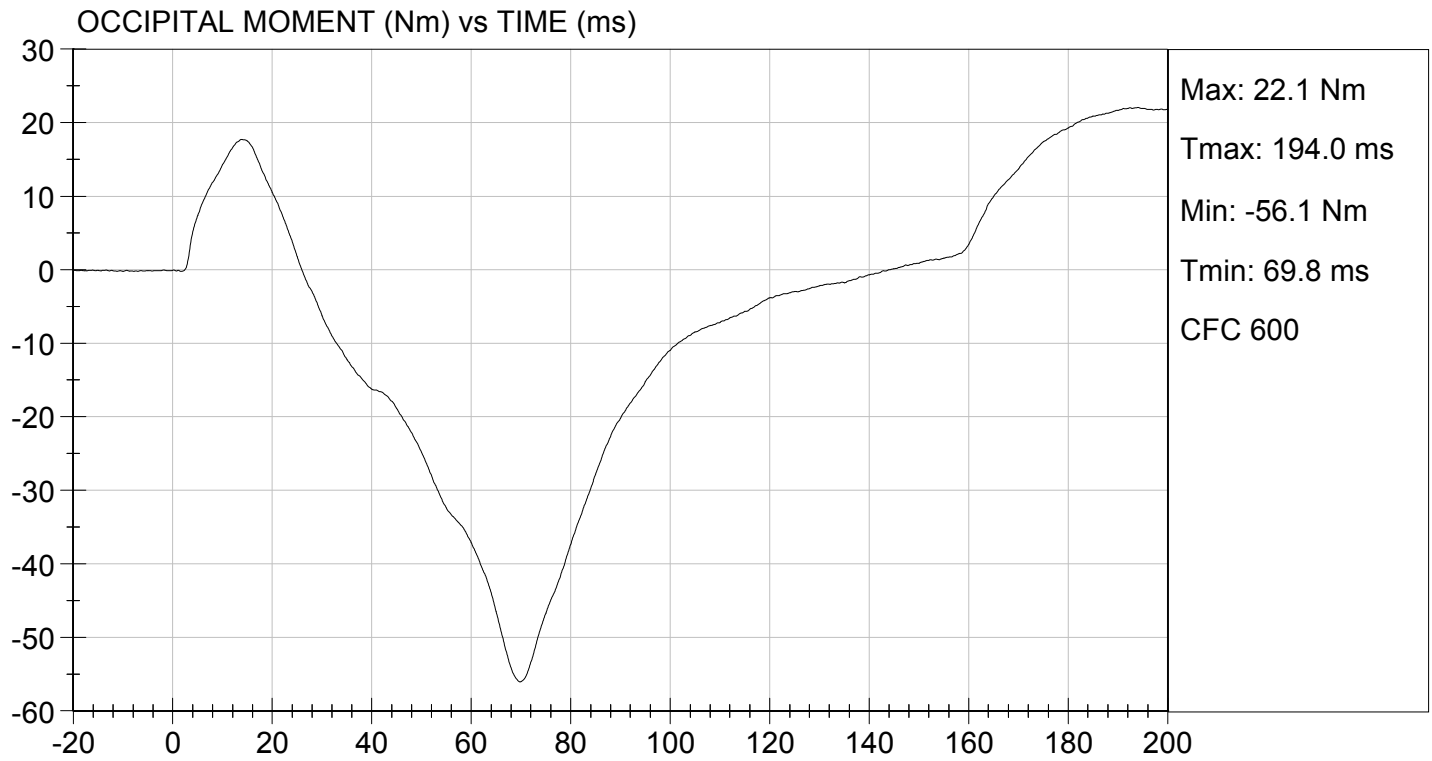
TEST DATE: 07/08/2013
TEST #: D132203





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

TEST DATE: 07/08/2013
TEST #: D132203



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

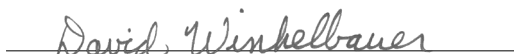
Test I.D: D132204

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	55	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	54	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4084	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4084	Pass
Overall Test Results				Pass


Laboratory Technician

07/09/2013

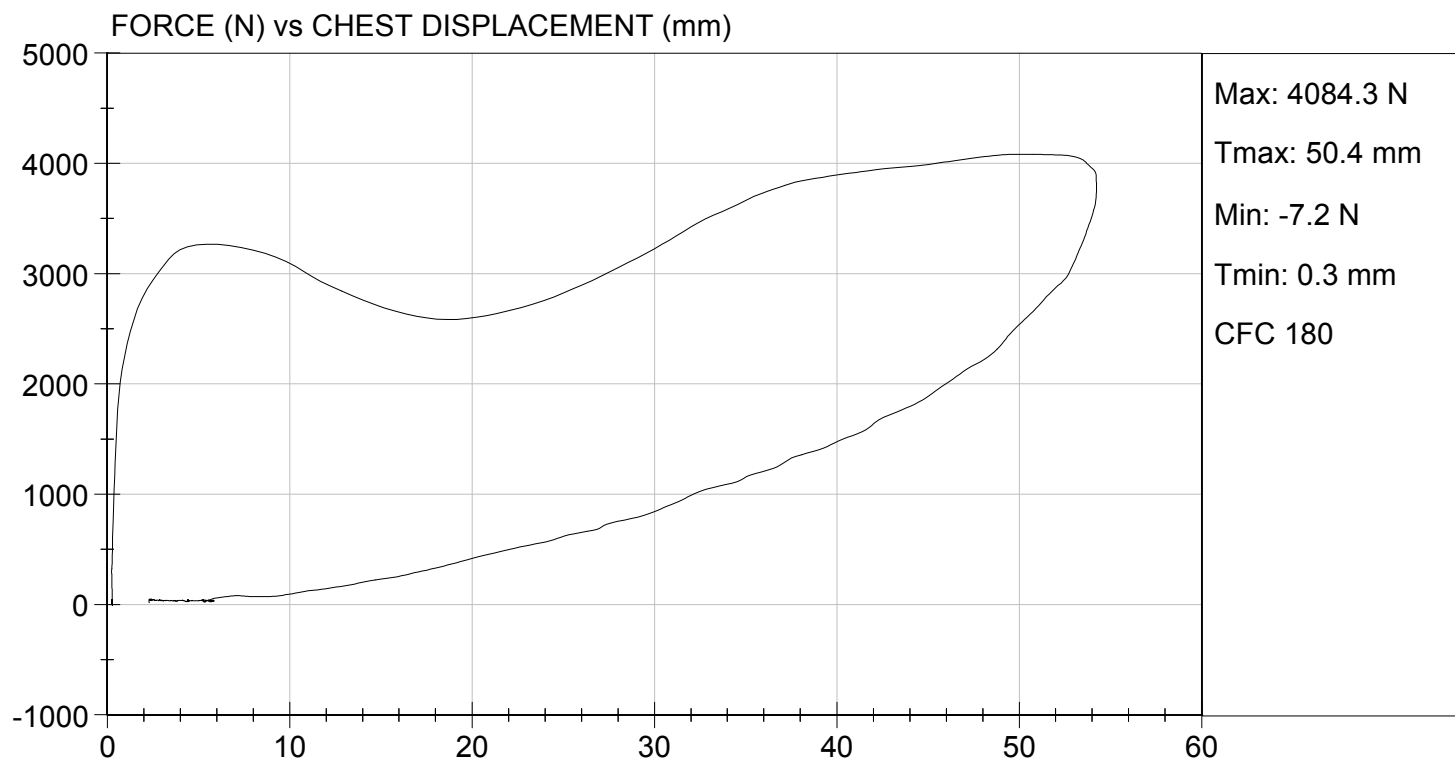
Test Date


Approved By



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

TEST DATE: 07/09/2013
TEST #: D132204



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D132205

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3781	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

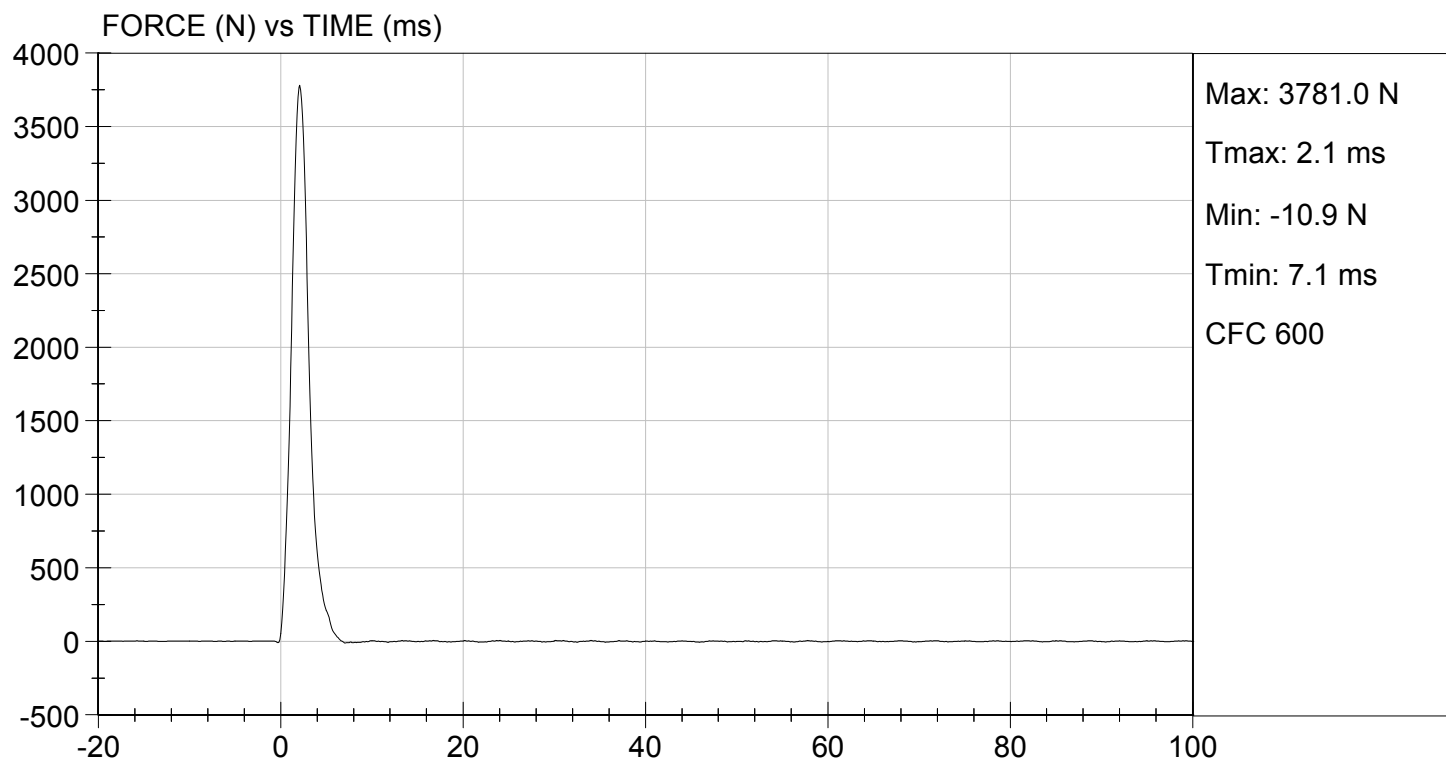
07/08/2013
Test Date

David Winkelbauer
Approved By



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

TEST DATE: 07/08/2013
TEST #: D132205



MGA RESEARCH CORPORATION

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

ATD Serial No: 138

Test I.D: D132206

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3797	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

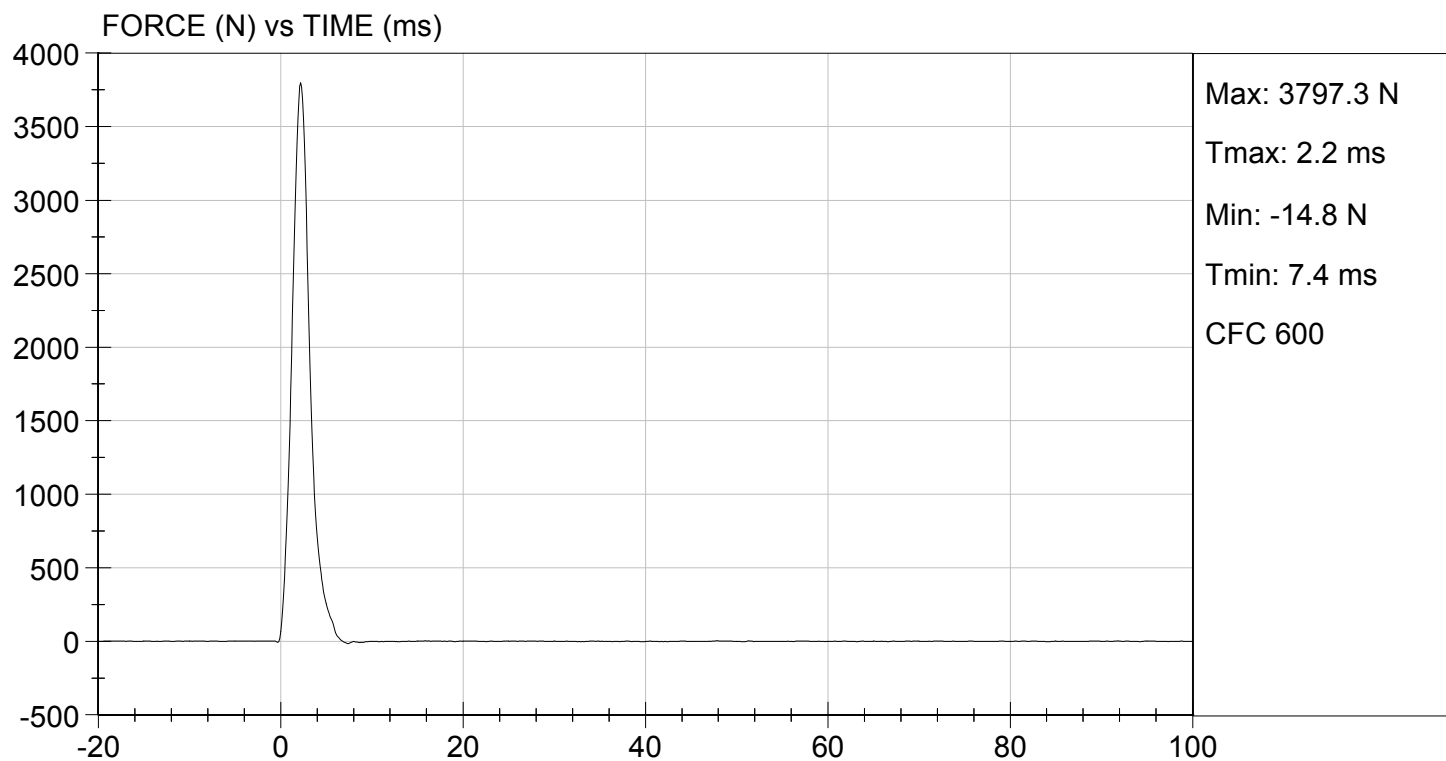
07/08/2013
Test Date

David Winkelbauer
Approved By



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

TEST DATE: 07/08/2013
TEST #: D132206



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

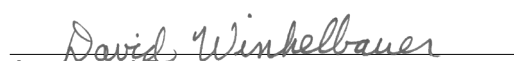
Test I.D: D132207

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	1	Pass
Force at 45 deg	N	320 to 390	376	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass


Laboratory Technician

07/08/2013

Test Date


Approved By

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test ID: D132261

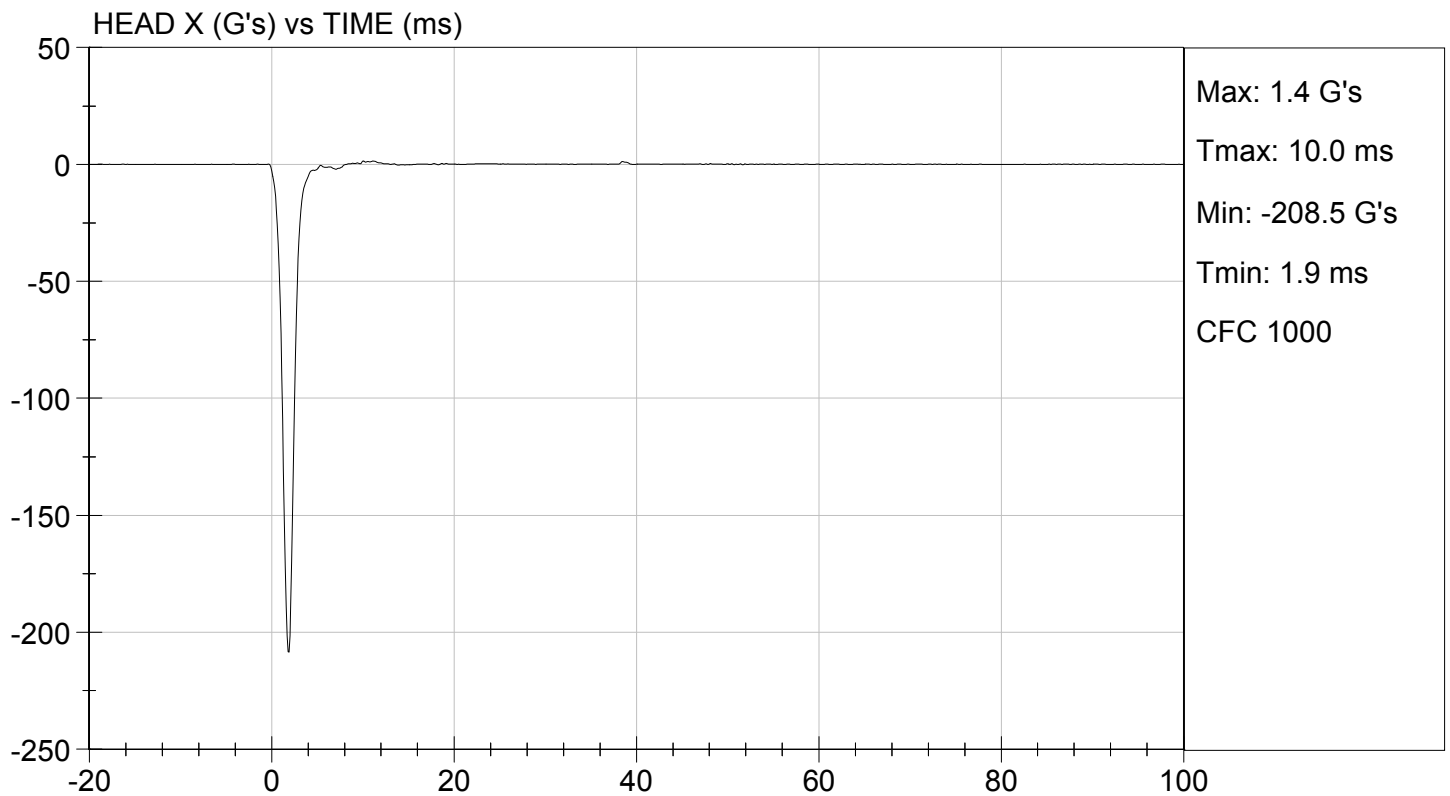
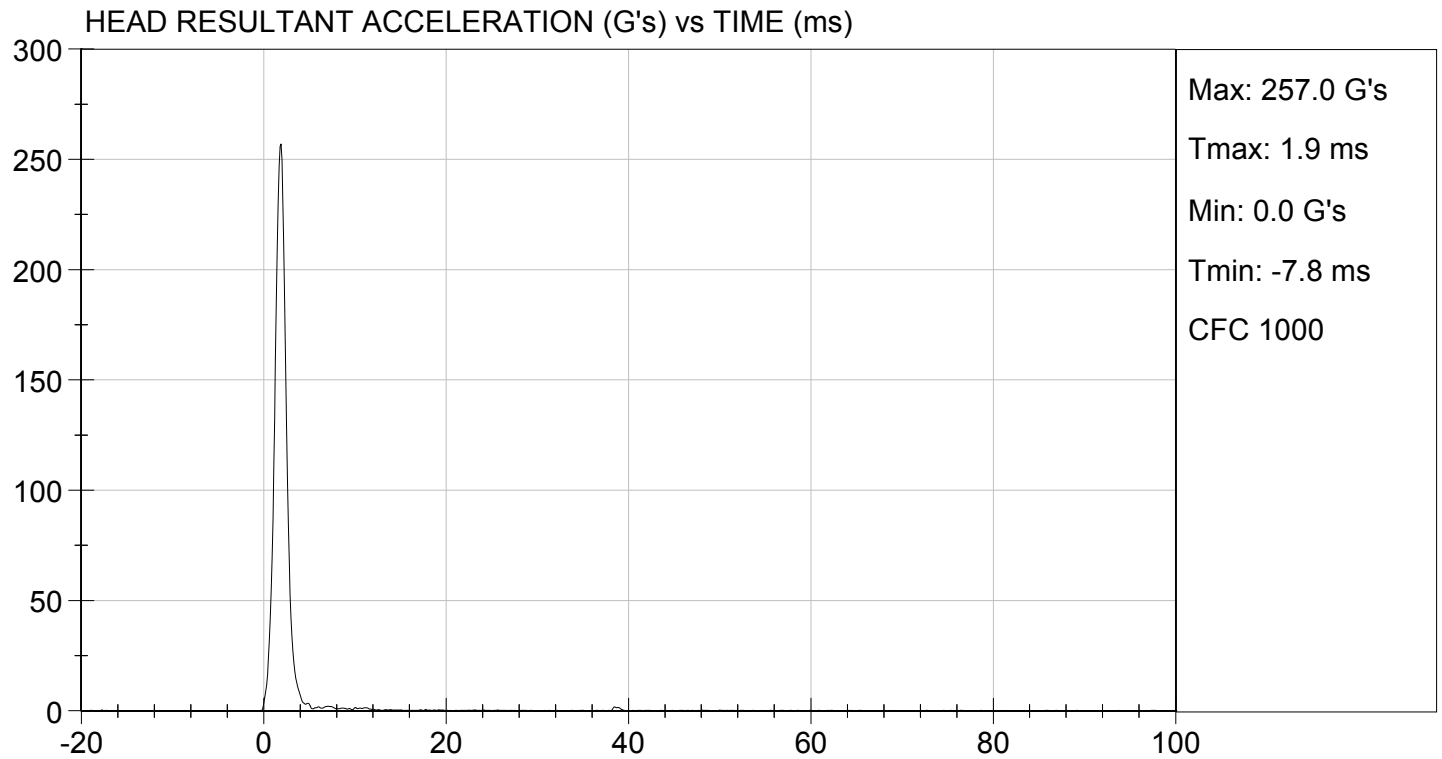
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Peak Resultant Acceleration	G's	250 to 300	257	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	11.4	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass

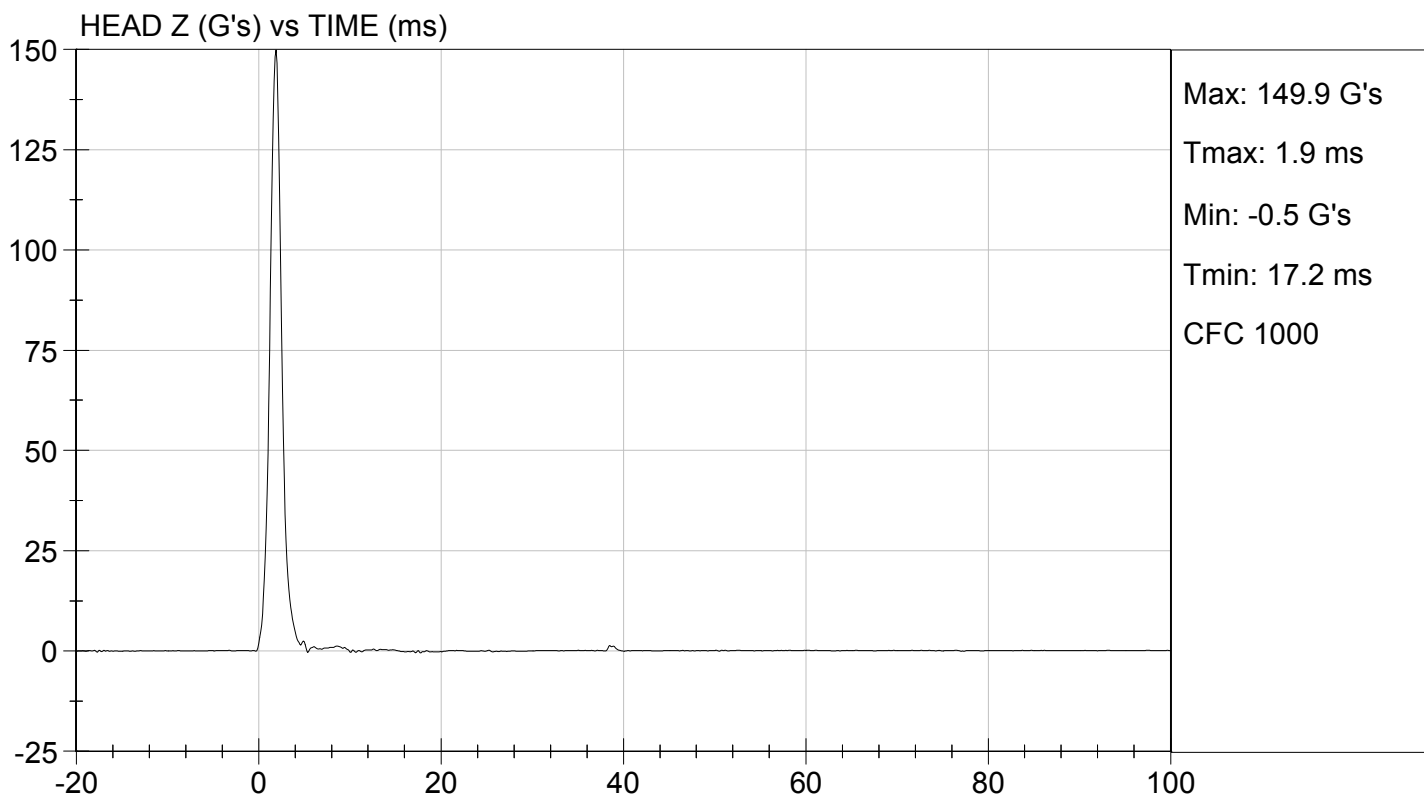
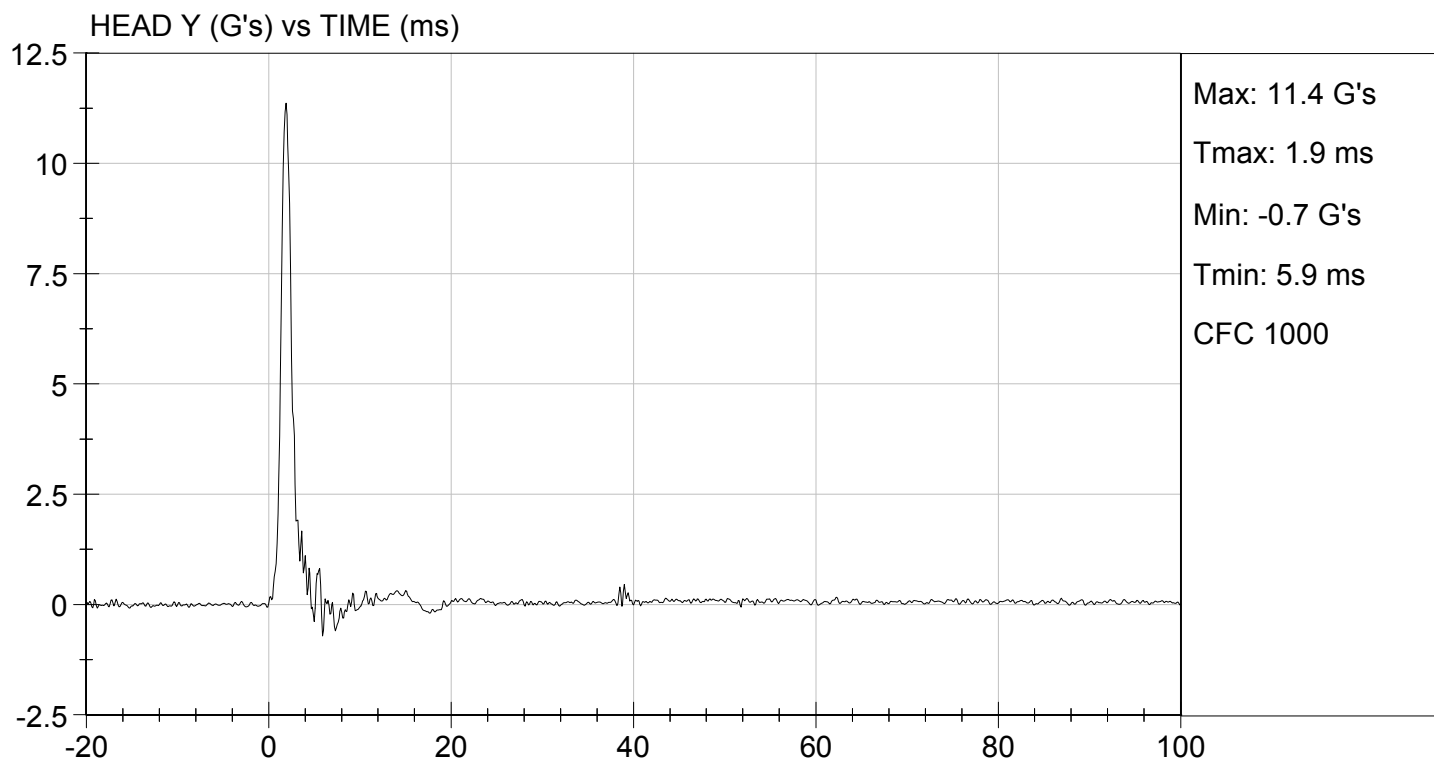

Laboratory Technician

07/12/2013

Test Date


Approved By





MGA RESEARCH CORPORATION

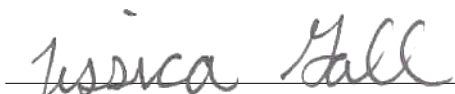
NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D132262

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	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	2.5	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	79	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	73	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	90	Pass
Overall Results					Pass


Laboratory Technician

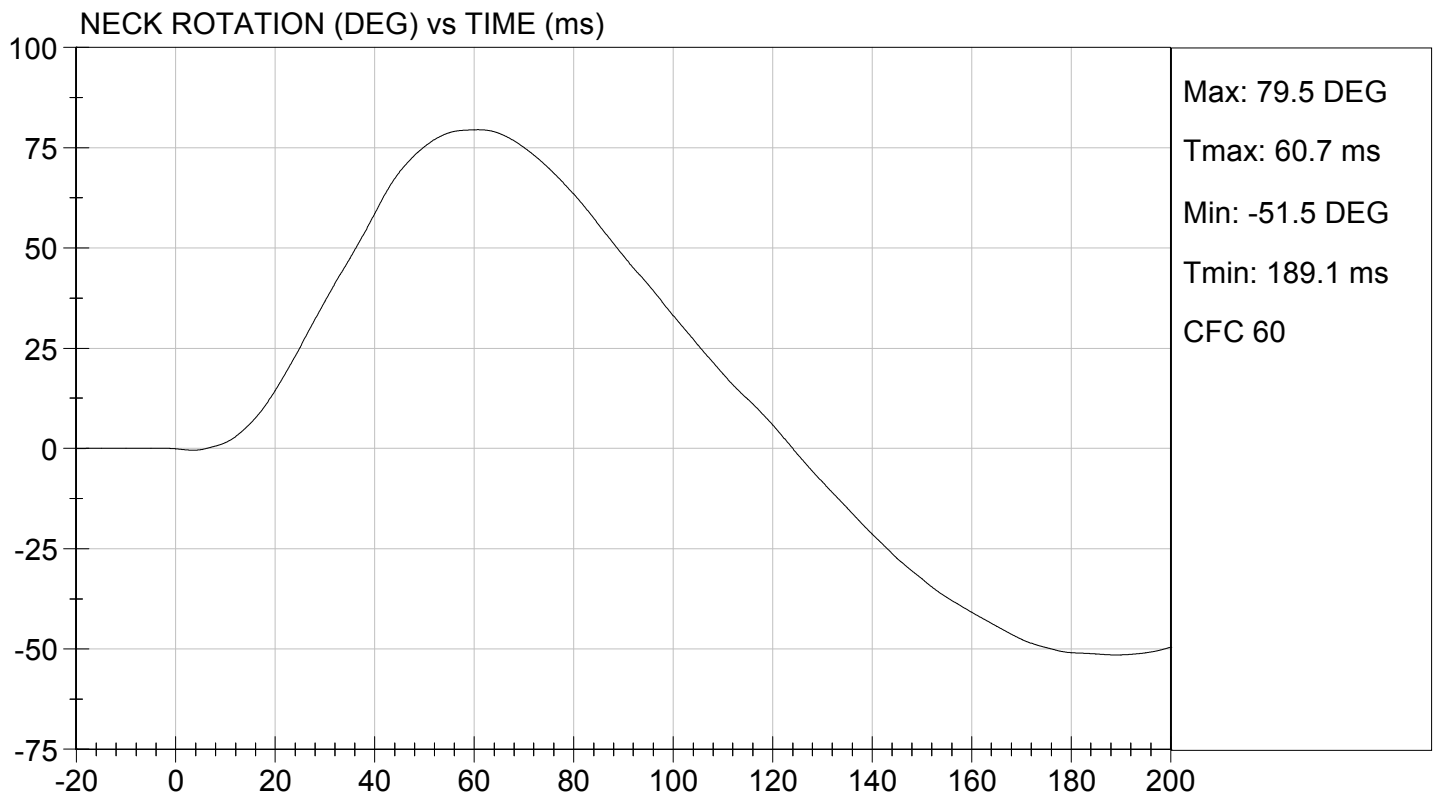
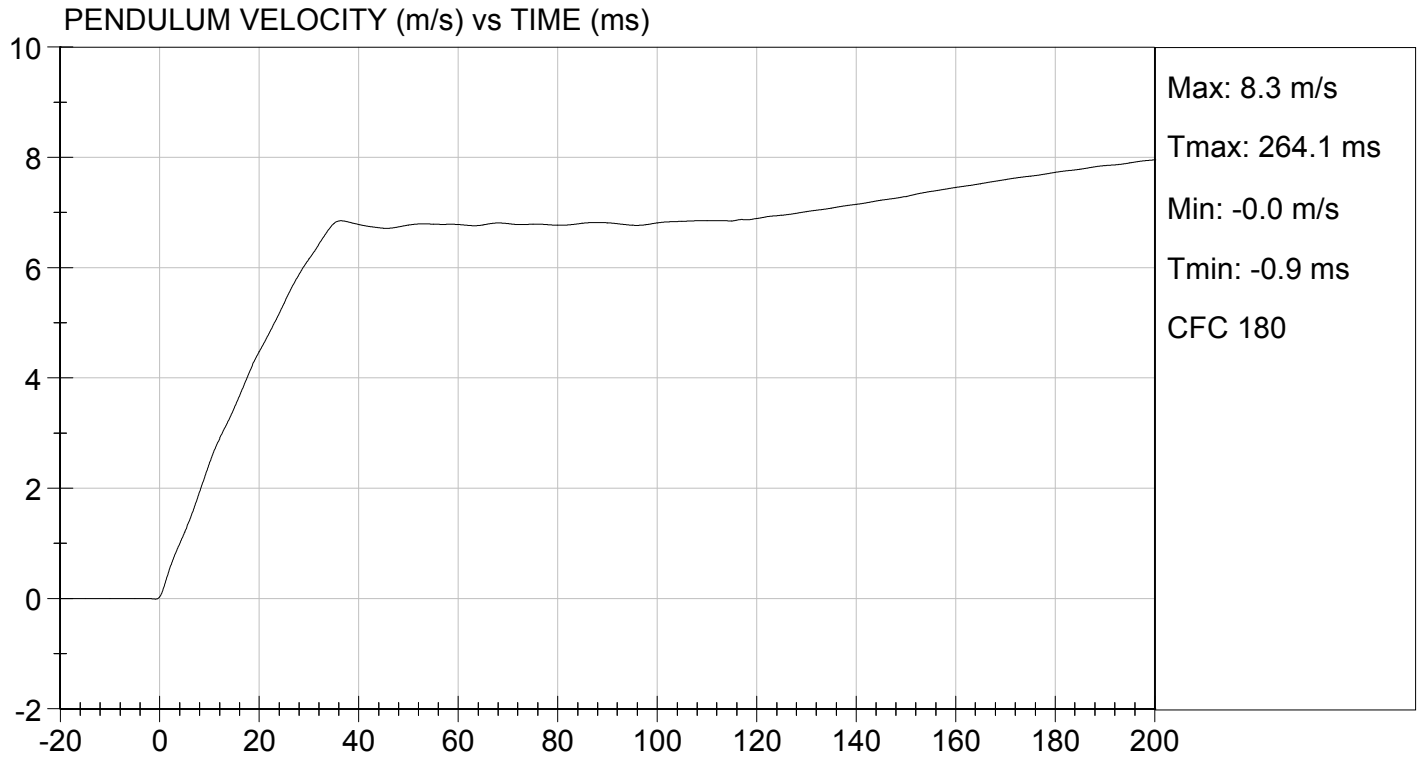
07/11/2013
Test Date


Approved By



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

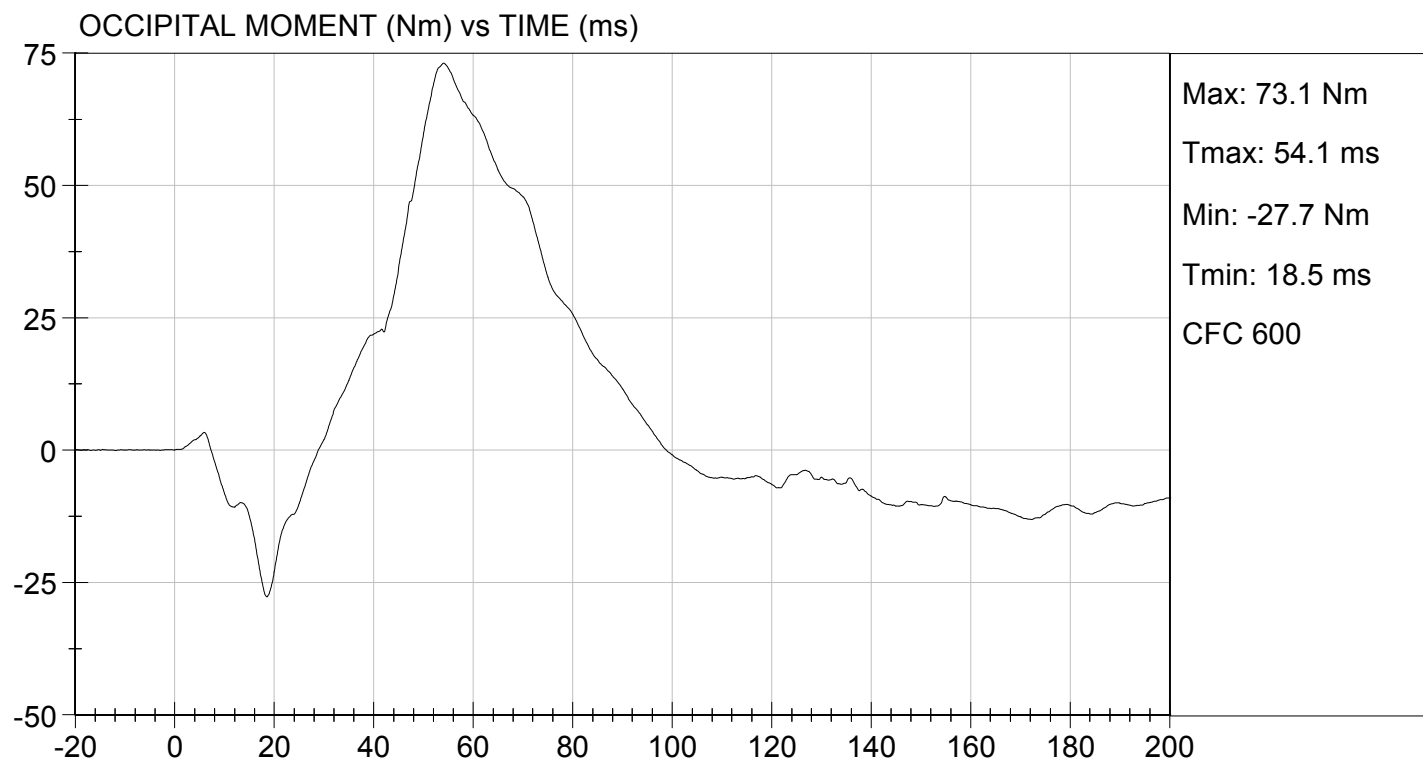
TEST DATE: 07/11/2013
TEST #: D131262





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

TEST DATE: 07/11/2013
TEST #: D131262



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D132263

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	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	1.5	Pass
	20 ms	m/s	3.1 to 3.9	3.2	Pass
	30 ms	m/s	4.6 to 5.6	4.7	Pass
D Plane Rotation	Max	deg	99 to 114	105	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	103	Pass
Overall Results					Pass

Jessica Gall
Laboratory Technician

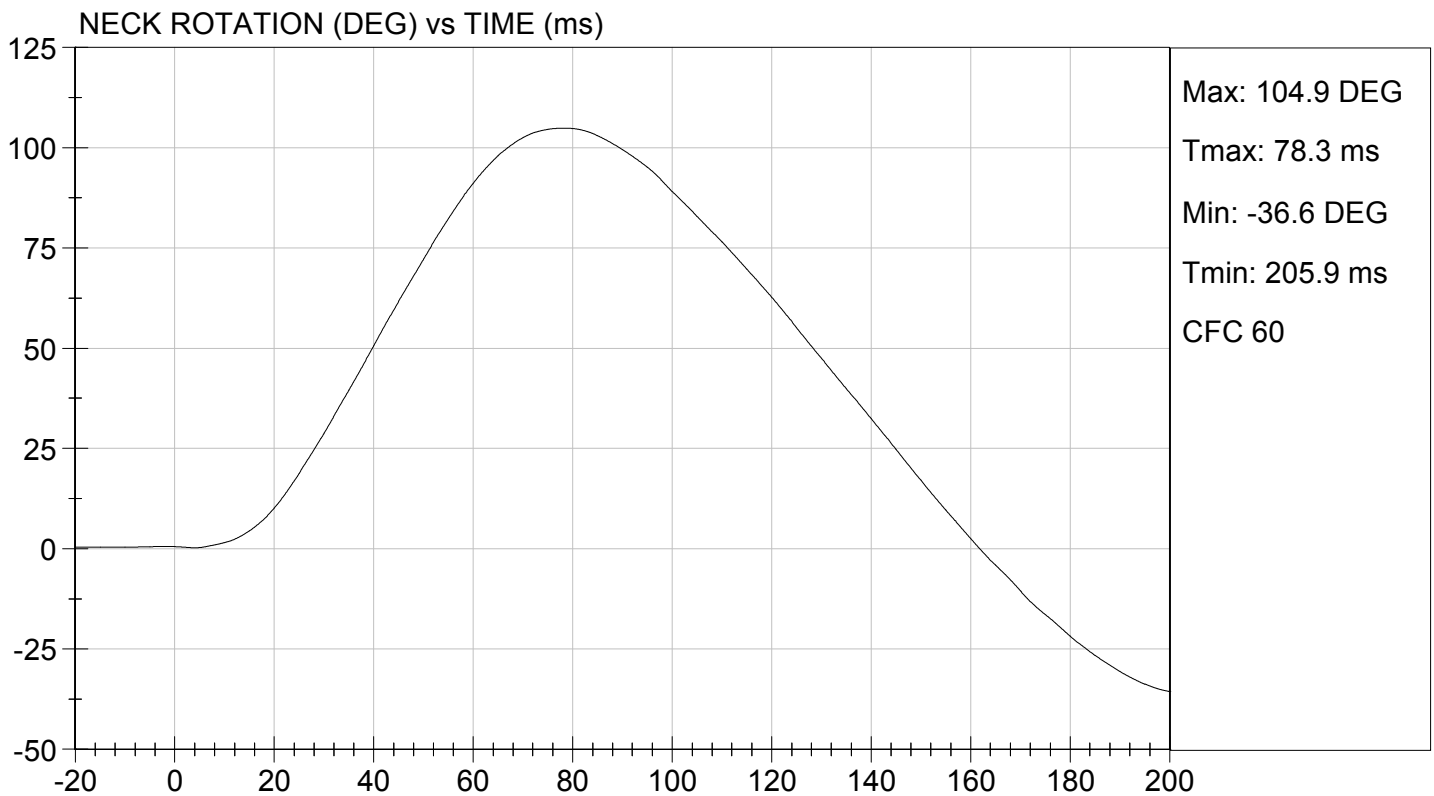
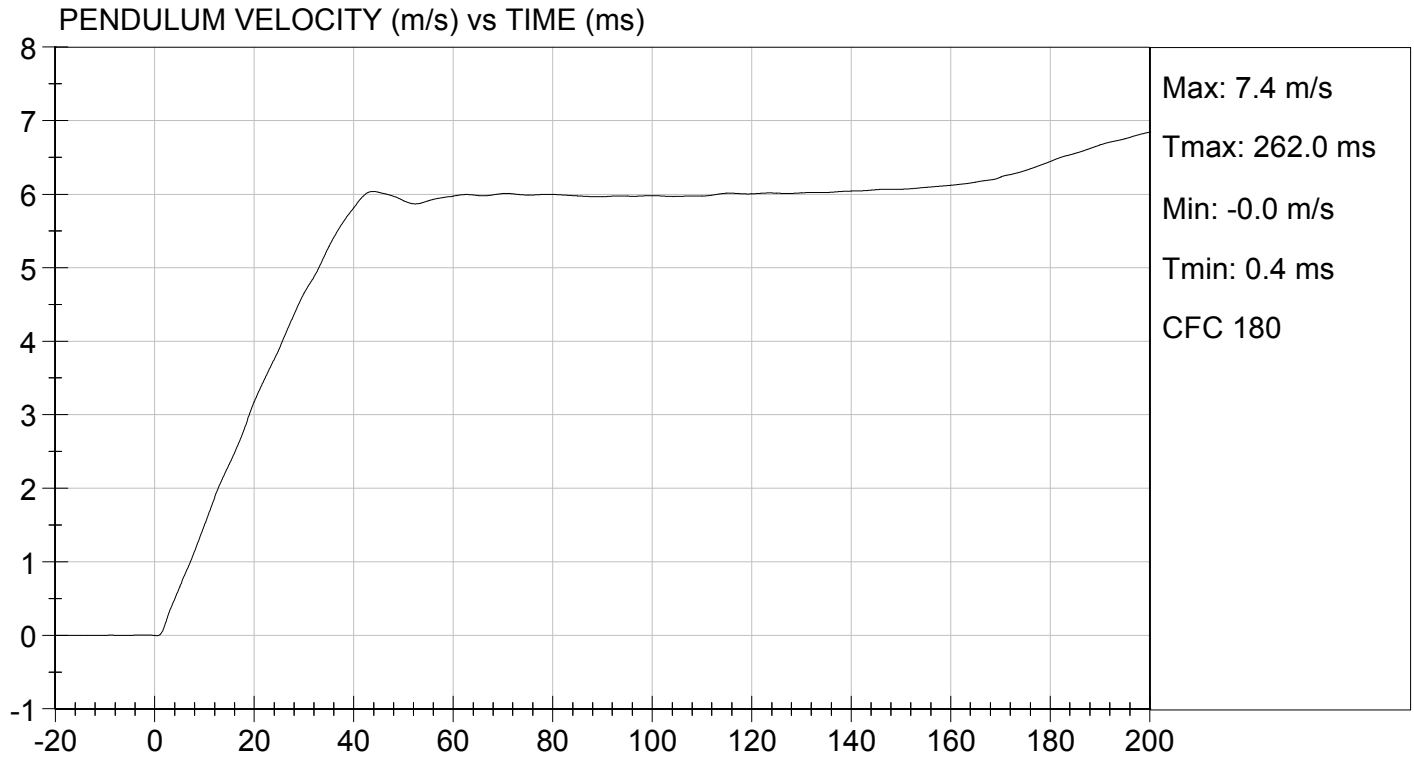
07/11/2013
Test Date

David Winkelbauer
Approved By



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

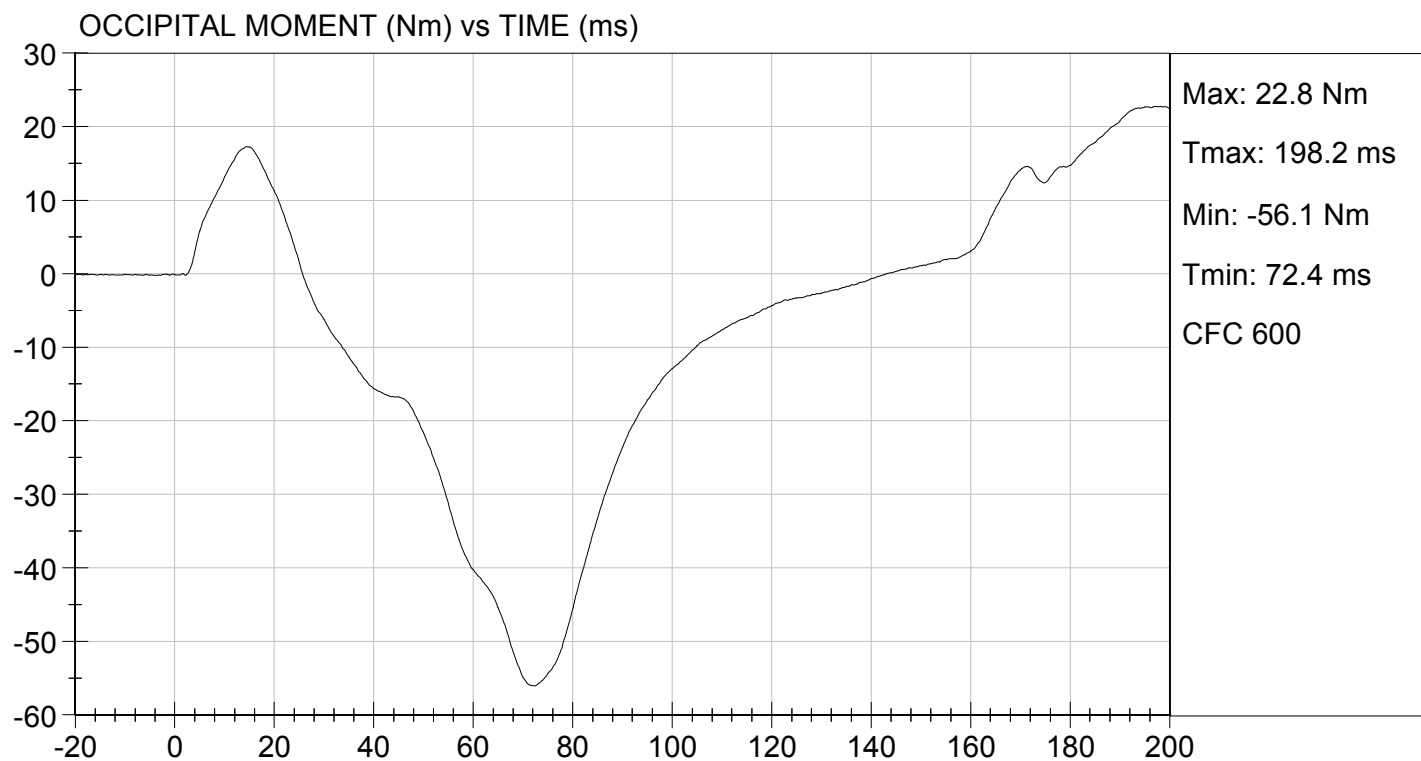
TEST DATE: 07/11/2013
TEST #: D131263





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

TEST DATE: 07/11/2013
TEST #: D131263

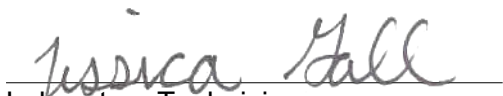


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 138

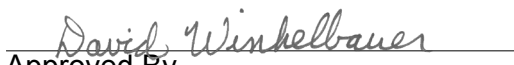
Test I.D: D132264

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	46	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	55	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4103	Pass
Internal Hysteresis	%	69 to 85	74	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4070	Pass
Overall Test Results				Pass


Laboratory Technician

07/12/2013

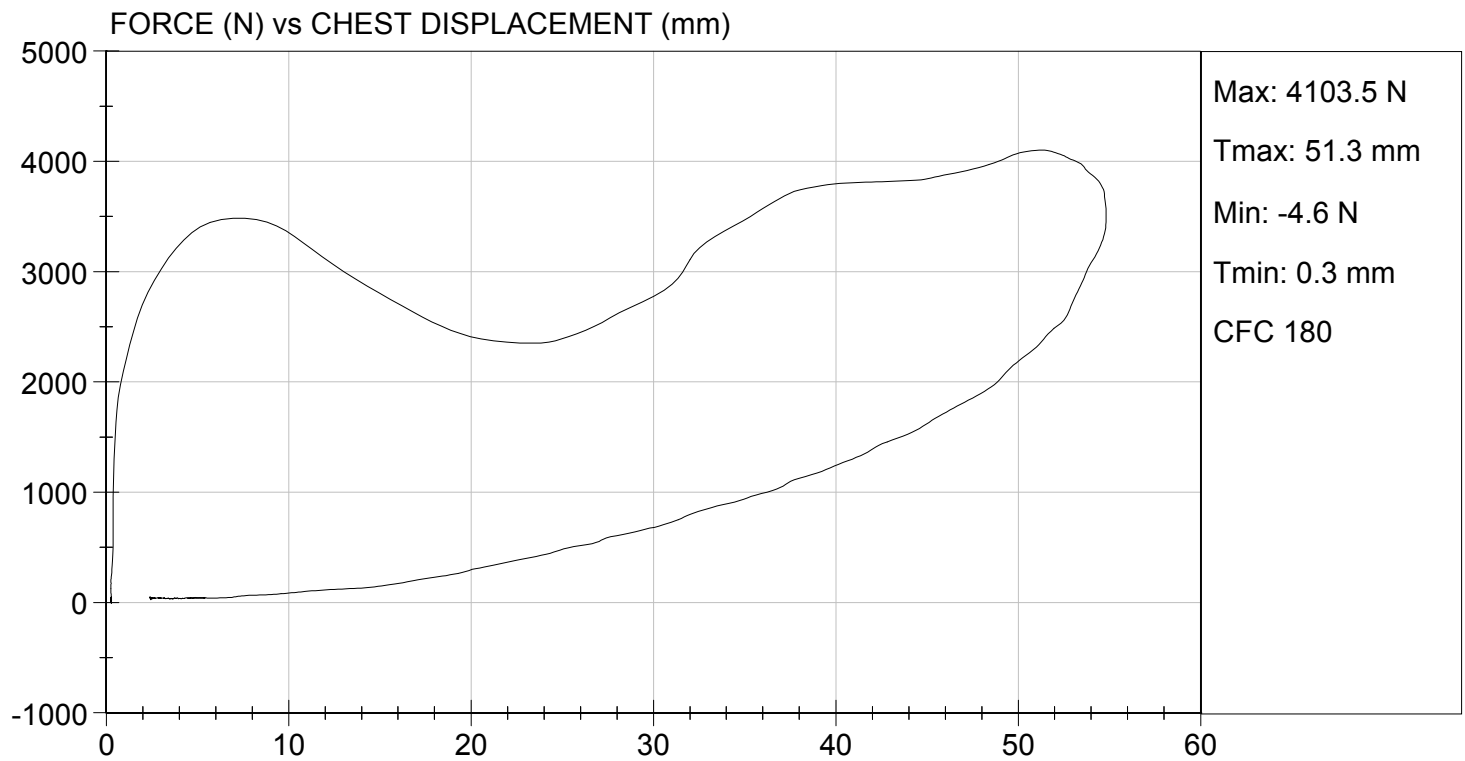
Test Date


Approved By



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

TEST DATE: 07/12/2013
TEST #: D132264



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

Test I.D: D132265

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3625	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

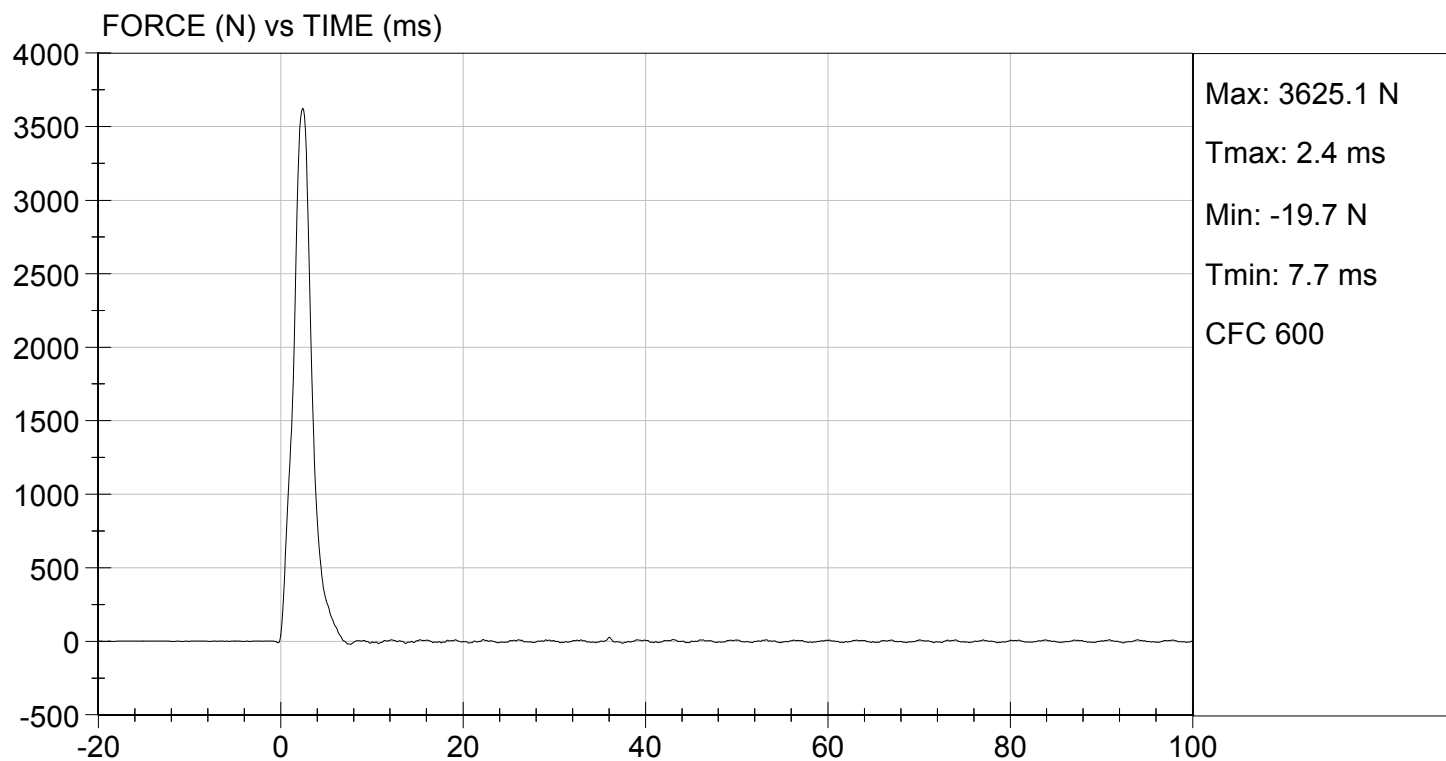
07/11/2013
Test Date

David Winkelbauer
Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.95 ft/s, 2.12 m/s

TEST DATE: 07/11/2013
TEST #: D132265



MGA RESEARCH CORPORATION

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

ATD Serial No: 138

Test I.D: D132266

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3634	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

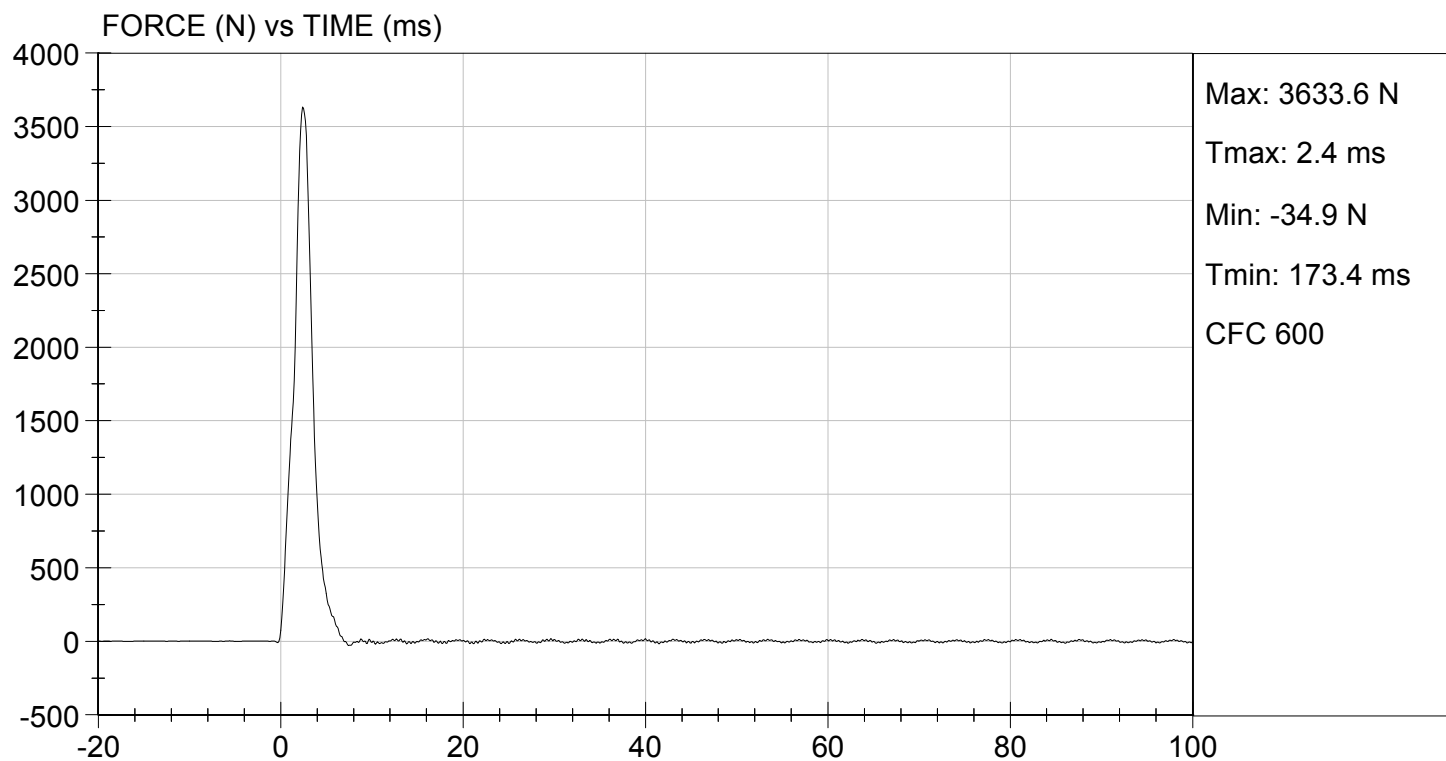
07/11/2013
Test Date

David Winkelbauer
Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.96 ft/s, 2.12 m/s

TEST DATE: 07/11/2013
TEST #: D132266



MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 138

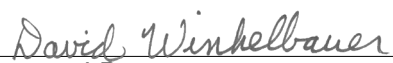
Test I.D: D132267

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	52	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	2	Pass
Force at 45 deg	N	320 to 390	381	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.7	Pass
Overall Result				Pass


Laboratory Technician

07/11/2013

Test Date


Approved By