

REPORT NUMBER: NCAP-MGA-2010-001

**NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST**

**TOYOTA MOTOR CORPORATION
2010 TOYOTA PRIUS III
NHTSA NUMBER: MA5105**

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**



Test Date: August 13, 2009

Final Report Date: September 14, 2009

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVENUE, SE, ROOM W43-410
WASHINGTON, D.C. 20590**

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Date: 9/14/2009

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16. Abstract A frontal barrier impact was conducted on a 2010 Toyota Prius III at MGA Research Corporation on August 13, 2009. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.3 km/h. The ambient temperature at the barrier face at the time of impact was 21 degrees Celsius. The vehicle's maximum post test static crush is 454 mm located at the vehicle's centerline. The test vehicle is equipped with a 3-point continuous belt system and an airbag in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows: <table border="1" style="width: 100%; margin-top: 10px; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>Measurement Description</u></th> <th style="text-align: left;"><u>Units</u></th> <th style="text-align: left;"><u>Threshold</u></th> <th style="text-align: left;"><u>Driver ATD</u></th> <th style="text-align: left;"><u>Pass. ATD</u></th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>392</td> <td>307</td> </tr> <tr> <td>Max. Thorax Accel. (3ms Clip)</td> <td>G's</td> <td>60</td> <td>47</td> <td>48</td> </tr> <tr> <td>Left Femur Force</td> <td>Newton</td> <td>10009</td> <td>-2542</td> <td>-2638</td> </tr> <tr> <td>Right Femur Force</td> <td>Newton</td> <td>10009</td> <td>-2893</td> <td>-2457</td> </tr> </tbody> </table>				<u>Measurement Description</u>	<u>Units</u>	<u>Threshold</u>	<u>Driver ATD</u>	<u>Pass. ATD</u>	Head Injury Criteria (HIC ₃₆)	N/A	1000	392	307	Max. Thorax Accel. (3ms Clip)	G's	60	47	48	Left Femur Force	Newton	10009	-2542	-2638	Right Femur Force	Newton	10009	-2893	-2457
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 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 DTNH22-06-D-00028. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact in excess of the current 48.3 kph requirements.

SUMMARY

A load cell barrier was impacted by a 2010 Toyota Prius III at a velocity of 56.3 kph. The test was performed at MGA Research Corporation on August 13, 2009. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera and fourteen 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.

Two Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometer, upper neck transducers, right/left femur load cells, and lower leg instrumentation. The driver (position 1) ATD (Serial No. 066) and right-front passenger (position 2) ATD (Serial No. 065) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 102 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy head, chest, and femur 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 454 mm and both the driver and passenger side door remained closed and latched during the impact event and were operable after the impact.

The driver's head and chest contacted the airbag. The driver's head also contacted the headrest. The driver's knees contacted the knee bag. The passenger's head and chest contacted the airbag. The passenger's head also contacted the side header. The passenger's knees contacted the glove box.

The occupant data is summarized below:

ATD position	HIC	T ¹	T ²	Clip (g)	T ¹	T ²	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver	392	53.6	89.6	47	71.1	74.8	-19	-2542	-2893
Passenger	307	61.8	97.8	48	68.9	73.4	-21	-2638	-2457

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

TEST NOTES

There was no valid data collected for:
Right Rear Seat Crossmember Z after 40 msec.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
CRASH TEST SUMMARY

Test Vehicle: 2010 Toyota Prius III
Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
Test Date: 8/13/2009

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)	None	None
Seat Back Failure	None	None
Glazing Damage	None	

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	2790
Center	mm	2795
Right Side	mm	2875
Average	mm	2820

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	910	920
Lap belt length as measured on ATD	mm	900	962
Remainder of belt on reel	mm	750	725
Total belt length for continuous webbing systems	mm	2560	2607

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

TEST VEHICLE INFORMATION

Manufacturer	Toyota
Model	Prius III
Body Style	5-Dr Hatchback
NHTSA No.	MA5105
VIN	JTDKN3DU9A1017206
Color	Black
Delivery Date	7/20/2009
Odometer Reading (mile)	35
Dealer	West Herr Toyota
Transmission	Automatic
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	1.8
Engine Placement	Lateral
Automatic Door Lock (ADL)	Yes
Owners Manual Details Instructions on Disabling ADLs	Yes
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	Yes
Driver Knee Airbag	Yes
Passenger Side Curtain Airbag	Yes
Passenger Side Torso Airbag	Yes
Passenger Knee Airbag	No
Force Limiter	Yes
Pretensioner	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Anti-lock Brakes	Yes
Traction Control	Yes
All Wheel Drive	No
Power Seats	No

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation
Date of Manufacture	05/09

GVWR (kg)	1805
GAWR Front (kg)	1030
GAWR Rear (kg)	987

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				370
Cargo Wt. (RCLW) (kg)				30

DATA SHEET NO. 2... (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	430.9	288.5		463.6	349.3	
Right	kg	413.2	272.6		446.3	327.5	
Ratio	%	60.1	39.9		57.3	42.7	
Totals	kg	844.1	561.1	1405.2	909.9	676.8	1586.7

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1405.2
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	30
Calculated Vehicle Target Weight (TVTW)	kg	1591.2

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	673	674	673	687	1077
As Tested	mm	658	663	656	658	1150
Post Test	mm	649	681	645	665	

Vehicle Wheelbase (mm): 2696

Weight of Ballast secured in trunk (kg): 13.2

Vehicle Components Removed: Trunk carpet, right rear tail light, spare tire, jack & tools, trunk compartments

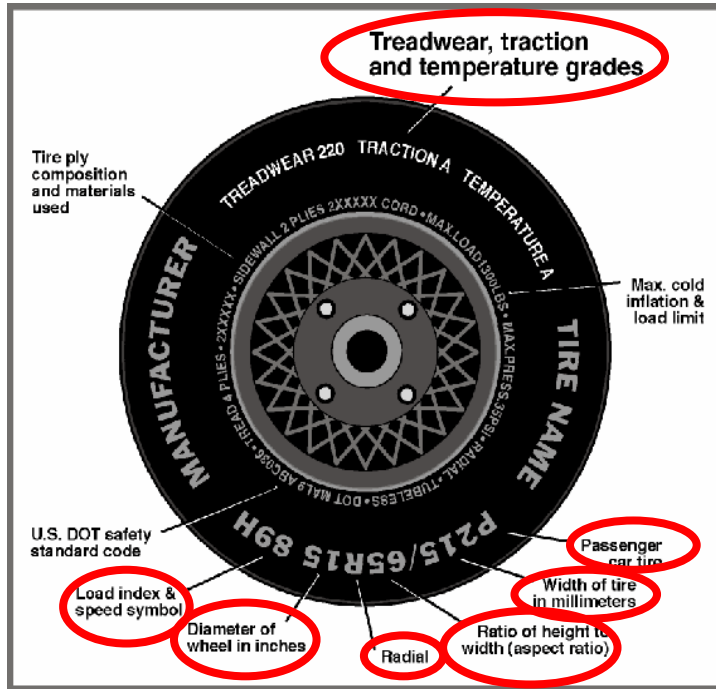
Ballast weight does not include instrumentation and data acquisition system.

DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009



DATA FROM TIRE AND TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	240	230
Recommended Tire Size	P195/65R15	P195/65R15
Tire Size on Vehicle	P195/65R15	P195/65R15
Tire Manufacturer	Yokohama	Yokohama
Tire Name	AVID	AVID
Tire Type	P	P
Tire Width (mm)	195	195
Ratio of Height to Width (aspect ratio)	65	65
Radial	R	R
Wheel Diameter	15	15
Load Index & Speed Symbol	89S	89S
Treadwear	320	320
Traction Grade	B	B
Temperature Grade	B	B

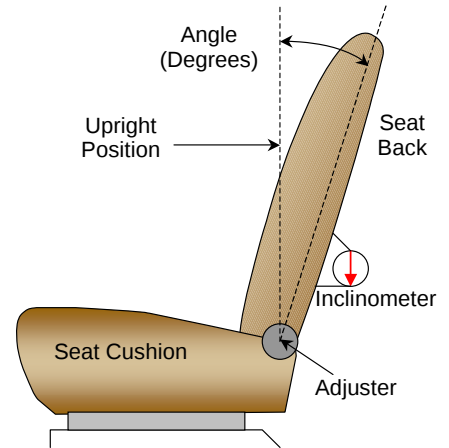
DATA SHEET NO. 4
TEST VEHICLE INFORMATION

Test Vehicle: 2010 Toyota Prius III
Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
Test Date: 8/13/2009

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: For the driver seat, set seat back in the 2nd detent (forward-most detent defined as 0). For the passenger seat, set seat back in the 4th detent (forward-most detent defined as 0). Measure on headrest post.



FRONT SEAT ASSEMBLY

Driver seat back angle: 1.5° on headrest post

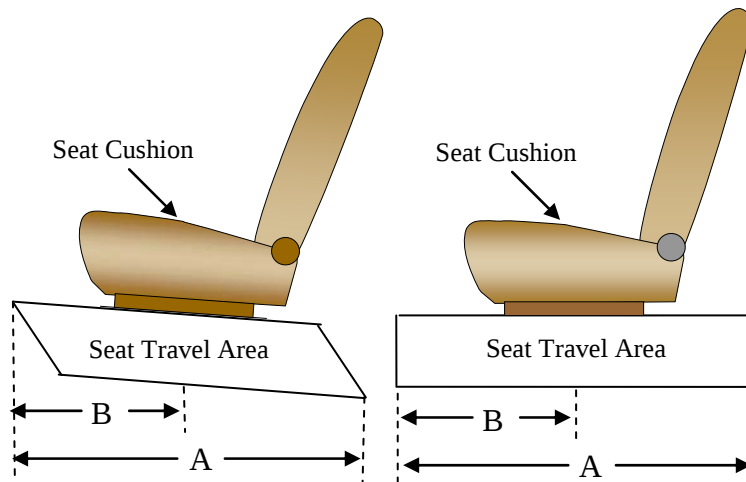
Passenger seat back angle: 1.4° on headrest post

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	26 detents	11 th detent (forward-most as 0)
Passenger Seat	26 detents	13 th detent (forward-most as 0)

ADJUSTABLE D-RING POSITION

The driver and passenger D-rings were placed in the upper-most position.



DATA SHEET NO. 4...(CONTINUED)

TEST VEHICLE INFORMATION

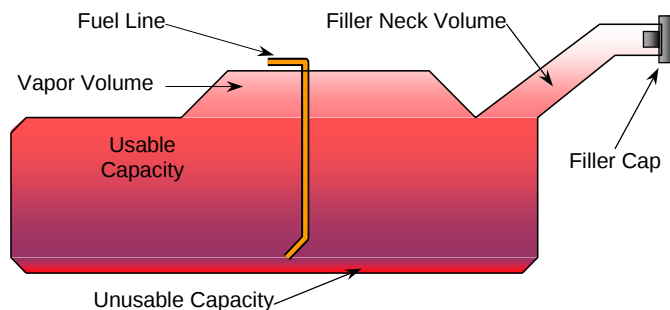
Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	45.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	41.4 to 42.3
Actual Amount of Solvent used	41.5
1/3 of Usable Capacity	15.0

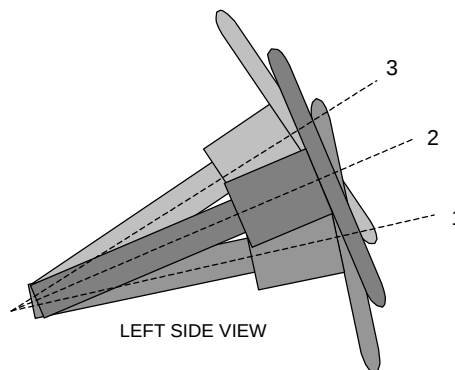
The test vehicle is equipped with an electric fuel pump. The condition under which the fuel pump will pump fuel is that ignition is on.



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 POSITIONS

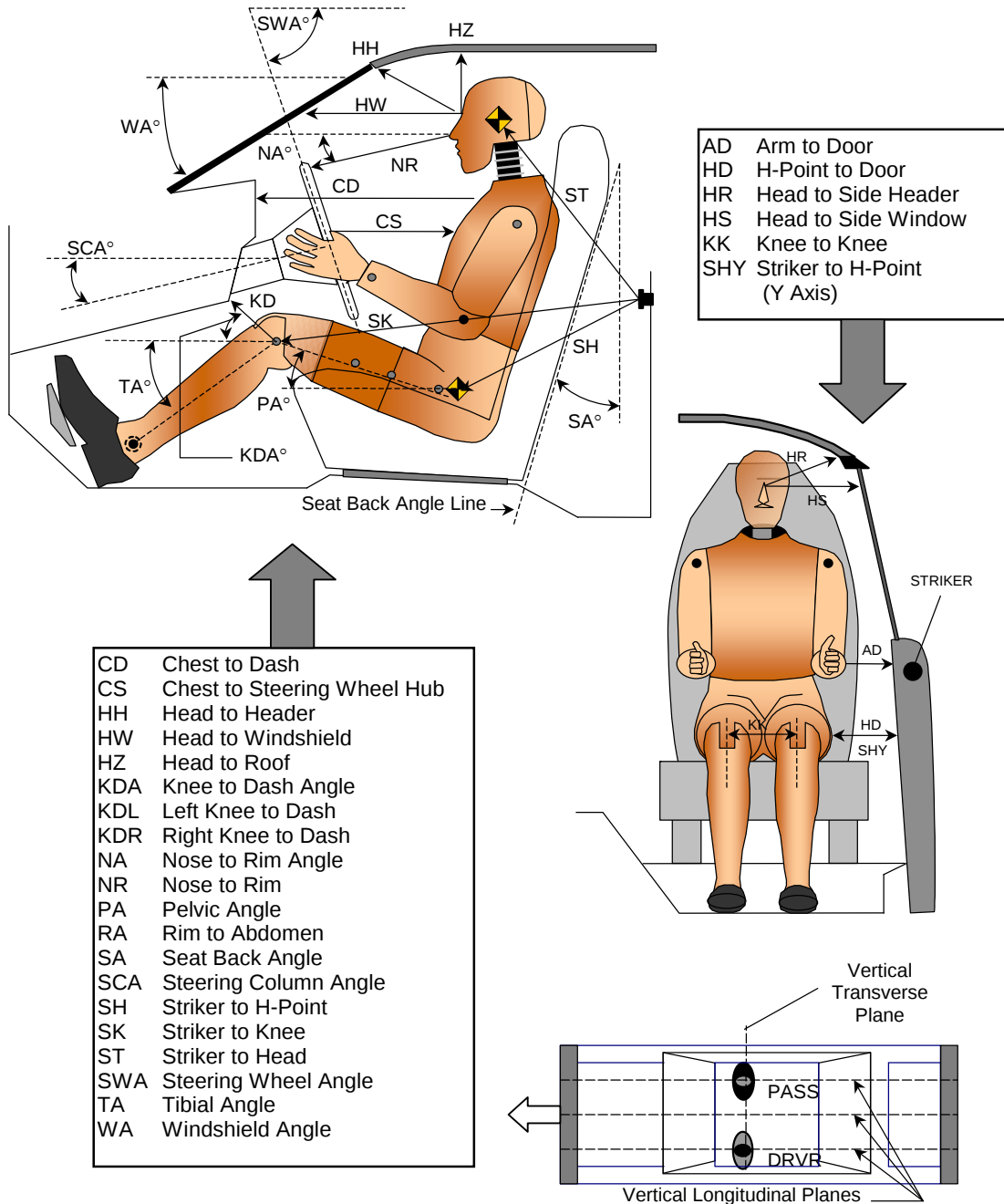
	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1	95	64.6
Geometric center position No. 2	115	66.1
Uppermost position No. 3	135	67.6

DATA SHEET NO. 5 **DUMMY POSITIONING IN VEHICLE**

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 5... (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

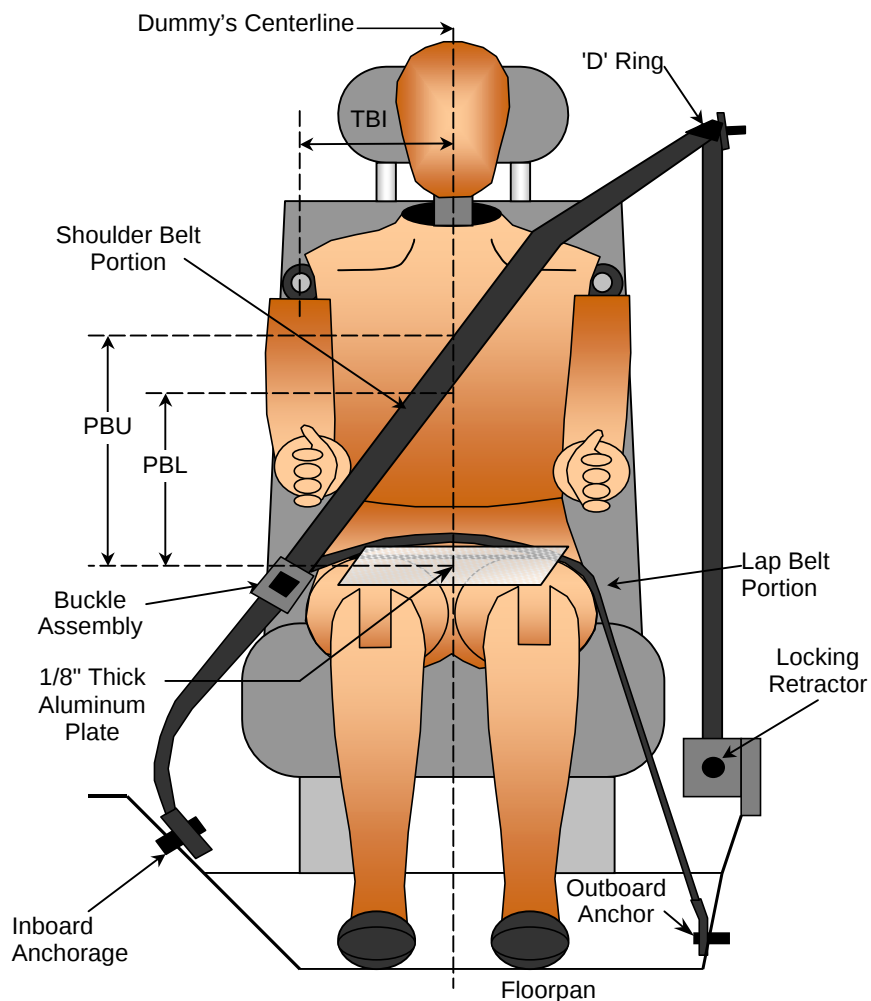
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		20.6		
SWA	Steering Wheel Angle		66.1		
SCA	Steering Column Angle		25.4		
SA	Seat Back Angle (headrest post)		1.5		1.4
HZ	Head to Roof (Z)	180	90	141	90
HH	Head to Header	333	20.2	314	15.9
HW	Head to Windshield	755	0	634	0
HR	Head to Side Header (Y)	237		213	
NR	Nose to Rim	403	15.5		
CD	Chest to Dash	805		481	
CS	Chest to Steering Hub	327	2.5		
RA	Rim to Abdomen	209	0		
KDL	Left Knee to Dash	136	38.2	122	
KDR	Right Knee to Dash	140		132	30.8
PA	Pelvic Angle		24.5		20.7
TA	Tibia Angle		51.8		46.2
KK	Knee to Knee (Y)	312		276	
SK	Striker to Knee	620	95.8	608	96.5
ST	Striker to Head	456	12.4	483	13.6
SH	Striker to H-Point	300	133.0	262	130.7
SHY	Striker to H-Point (Y)	260		265	
HS	Head to Side Window	325		320	
HD	H-Point to Door (Y)	142		138	
AD	Arm to Door (Y)	116		113	
AA	Ankle to Ankle	335		205	

DATA SHEET NO. 6 **SEAT BELT POSITIONING DATA**

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	375	375
PBL - To surface of reference to belt lower edge	mm	300	300

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

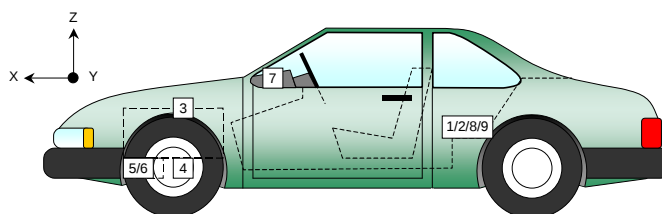
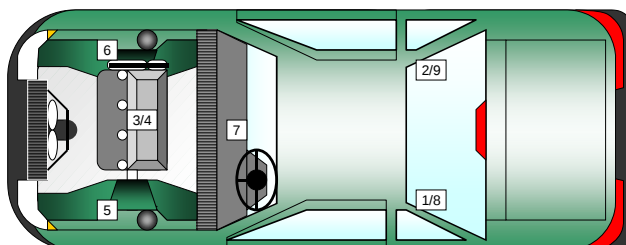
Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1671	-370	-305
2	Right Rear X-Member X	1671	370	-305
3	Engine Top X	3792	0	-765
4	Engine Bottom X	3742	0	-283
5	Left Brake Caliper X	3641	-672	239
6	Right Brake Caliper X	3641	672	-238
7	Instrument Panel X			
8	Left Rear X-Member Z	1671	-370	-305
9	Right Rear X-Member Z	1671	370	-305

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



DATA SHEET NO. 8

SUMMARY OF FMVSS 212 AND FMVSS 219 (Partial) DATA

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

Windshield Mounting Details:

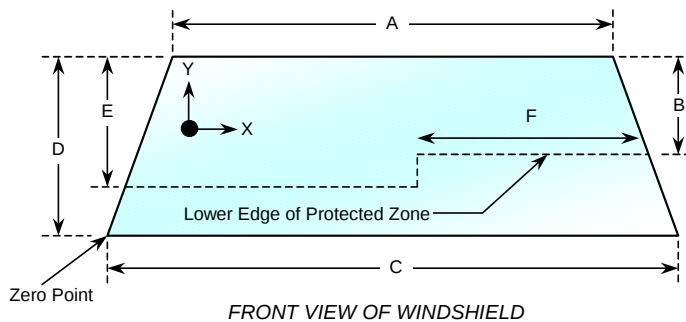
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

The standard requires that the post-test retention measurement be a minimum of 75 percent of the pretest 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°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2172	2172	100
Right Side	2172	2172	100
Total	4344	4344	100



Item	Units	Value
A	mm	1186
B	mm	595
C	mm	1432
D	mm	863
E	mm	605
F	mm	551

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. 9
SUMMARY OF FMVSS 301 DATA

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

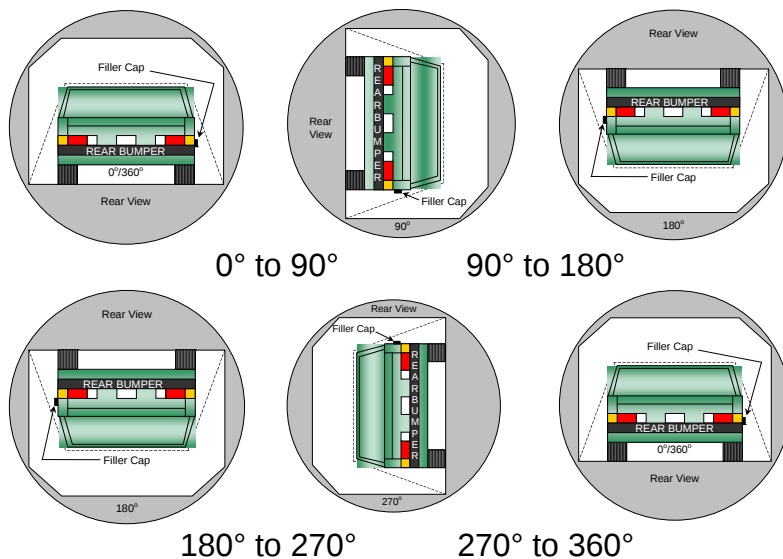
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 10:25 am

Stoddard Solvent Spillage Measurements

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

FMVSS 301 STATIC ROLLOVER DATA



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 locations:

None

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	118	300	0
90° to 180°	117	300	0
180° to 270°	108	300	0
270° to 360°	121	300	0

DATA SHEET NO. 10
VEHICLE MEASUREMENTS

Test Vehicle: 2010 Toyota Prius III
Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
Test Date: 8/13/2009

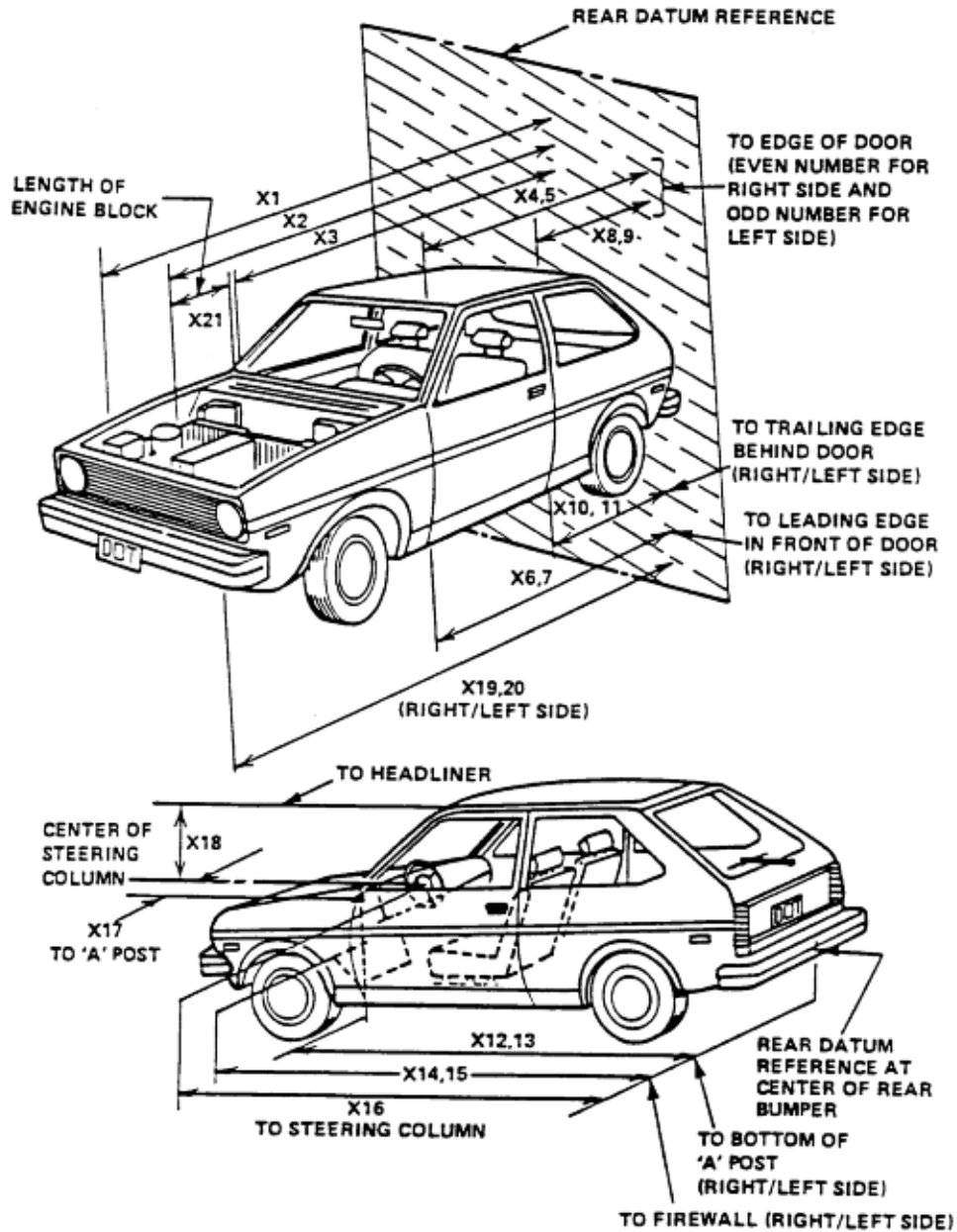
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4454	4000	454
2	RSOV to front of engine	mm	3893	3815	78
3	RSOV to firewall centerline	mm	3321	3311	10
4	RSOV to leading edge of right door	mm	3072	3085	-13
5	RSOV to leading edge of left door	mm	3072	3089	-17
6	RSOV to lower leading edge of right door	mm	3029	3018	11
7	RSOV to lower leading edge of left door	mm	3037	3031	6
8	RSOV to upper leading edge of right door	mm	1980	2000	-20
9	RSOV to upper leading edge of left door	mm	1981	1999	-18
10	RSOV to lower trailing edge of right door	mm	1971	1962	9
11	RSOV to lower trailing edge of left door	mm	1973	1961	12
12	RSOV to bottom of right 'A' pillar	mm	2920	2911	9
13	RSOV to bottom of left 'A' pillar	mm	2968	2950	18
14	RSOV to firewall on right side	mm	3301	3284	17
15	RSOV to firewall on left side	mm	3309	3279	30
16	RSOV to steering column	mm	2622	2697	-75
17	Center of steering column to left 'A' pillar	mm	383	444	-61
18	Center of steering column to headlining	mm	412	475	-63
19	RSOV to right side of front bumper	mm	4350	3919	431
20	RSOV to left side of front bumper	mm	4351	3920	431
21	Length of engine block	mm	500	500	0
RD	RSOV to right side of dash panel	mm	2791	2807	-16
CD	RSOV to center of dash panel	mm	2818	2860	-42
LD	RSOV to left side of dash panel	mm	2793	2807	-14

DATA SHEET NO. 10... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009



DATA SHEET NO. 10... (continued)**VEHICLE MEASUREMENTS**

Test Vehicle: 2010 Toyota Prius III
Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
Test Date: 8/13/2009

Target Vehicle Structural Measurement

	Elements	Pre-Test (mm)
1	Total Length	4454
2	Total Width	1746
3	Bumper Top Height	584
4	Bumper Bottom Height	421
5	Longitudinal Member Top Height	539
6	Distance between Longitudinal Members	1066
7	Longitudinal Member Width	57
8	Engine Top Height	877
9	Engine Bottom Height	171
10	Engine and gearbox width	868
11	Front bumper-engine distance	381
12	Front shock absorber fixing height	865
13	Bonnet leading edge height	790
14	Front shock absorber fixing width	1158
15	Front bumper – front axle distance	905
16	Front axle – a pillar distance	435
17	A-pillar – B-pillar distance	1115
18	B-Pillar – rear axle distance	1146
19	B-pillar – C-pillar distance	748
20	Roof sill bottom height	1369
21	Roof sill top height	1490
22	Floor sill bottom height	199
23	Floor sill top height	342

DATA SHEET NO. 11
CAMERA LOCATIONS

Test Vehicle: 2010 Toyota Prius III
Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
Test Date: 8/13/2009

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	1060	-5200	-1060	24	1000
3	Steering Column Top	845	-5630	-1310	25	1000
4	Steering Column Bottom	830	-5570	-850	25	1000
5	Driver Close-up	1470	-6430	-1450	35	1000
6	Driver Angle	5260	-5110	-1830	50	1000
7	On board Driver Side					
8	On board Passenger Side					
9	Right Overall	2000	6660	-1220	20	1000
10	Right Passenger Half	1090	5160	-1060	24	1000
11	Right Close-up	1520	6340	-1390	35	1000
12	Right Angle	5380	4990	-1875	50	1000
13	Windshield	-285	0	-2860	12.5	1000
14	Top Driver	-135	-470	-2180	24	1000
15	Top Passenger	-110	420	-2180	24	1000
16	Pit Front	1250	0	3150	24	1000
17	Pit Rear	3020	0	3150	24	1000

***COORDINATES:**

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

Cameras 7 & 8 were not used for this test.

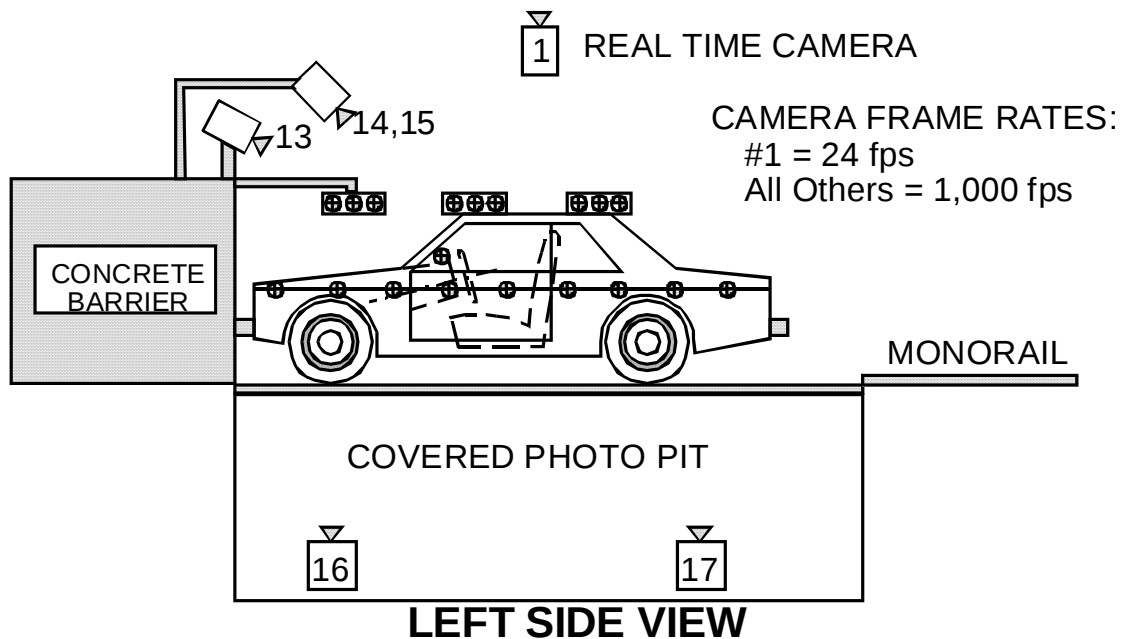
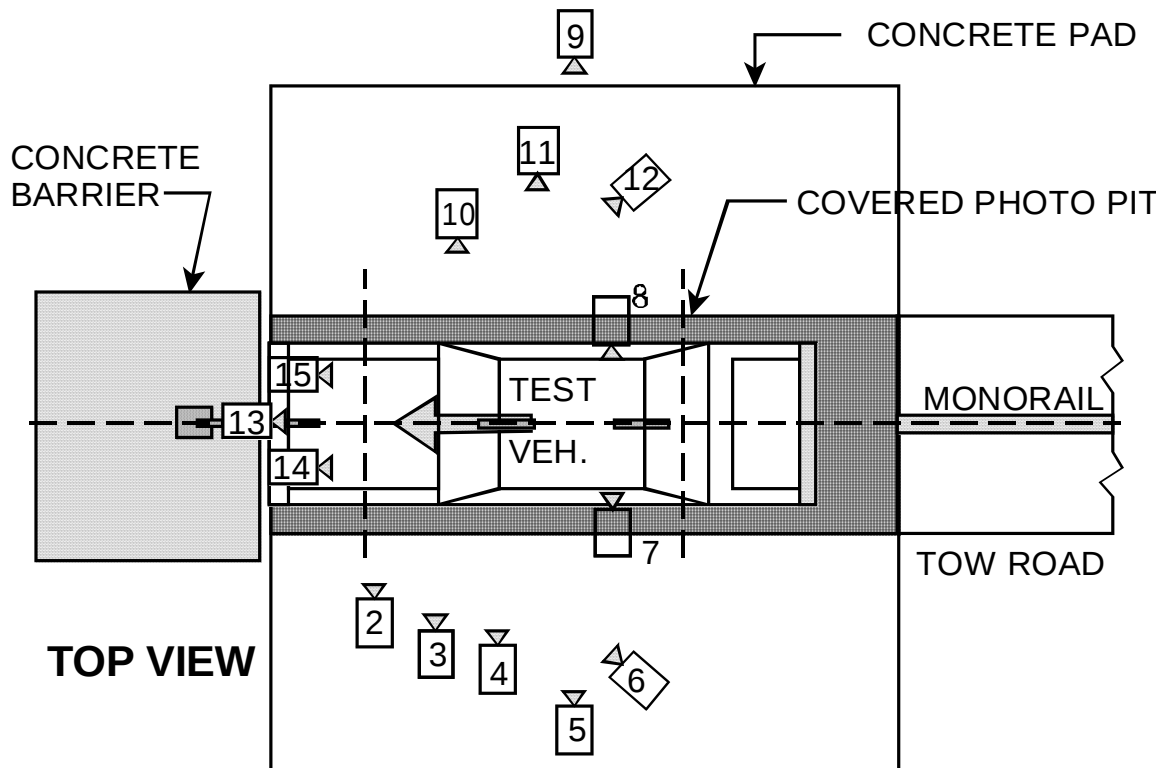
DATA SHEET NO. 11... (continued)

CAMERA LOCATIONS

Test Vehicle: 2010 Toyota Prius III
Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
Test Date: 8/13/2009

CAMERA POSITIONS FOR FRONTAL IMPACTS

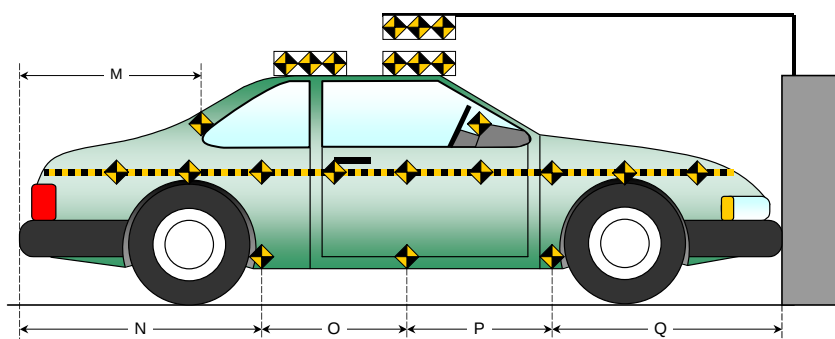
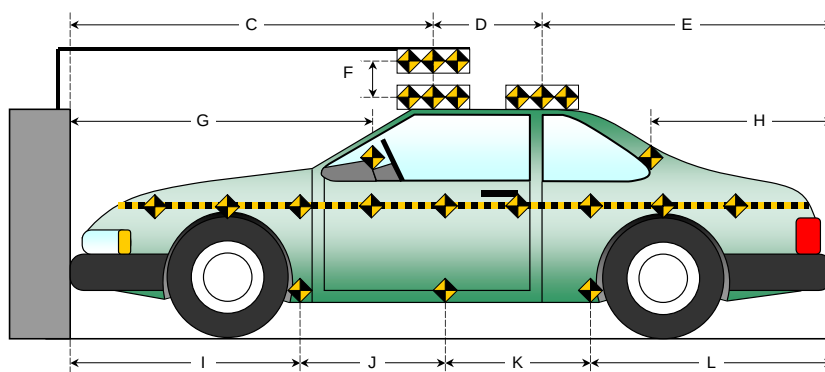
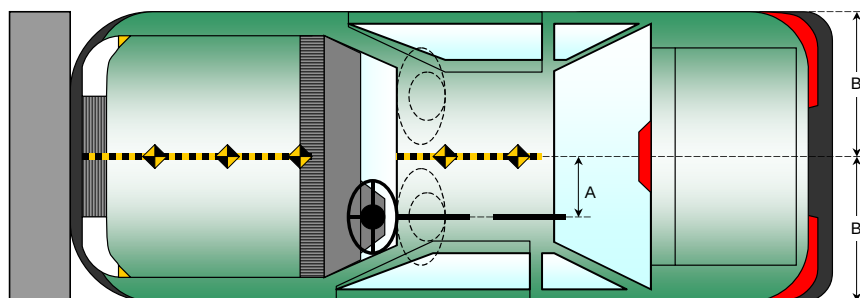


DATA SHEET NO. 12
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

Item	Value
A	355
B	873
C	2252
D	610
E	1592
F	60
G	
H	721
I	1323
J	934
K	931
L	1266
M	719
N	1266
O	929
P	930
Q	1329



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

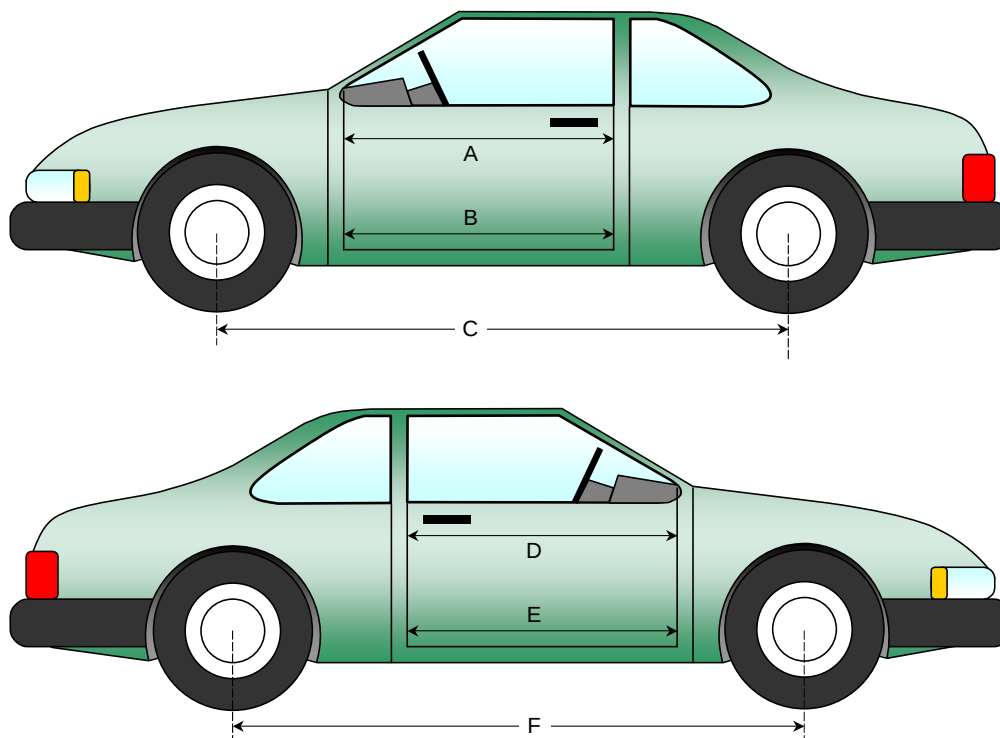
NHTSA No.: MA5105
 Test Date: 8/13/2009

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	905	899	6
B	Left Side Lower	mm	880	879	1
D	Right Side Upper	mm	887	886	1
E	Right Side Lower	mm	905	905	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2696	2601	95
F	Right Side Wheelbase	mm	2696	2704	-8



DATA SHEET NO. 13... (continued)
VEHICLE INTRUSION MEASUREMENTS

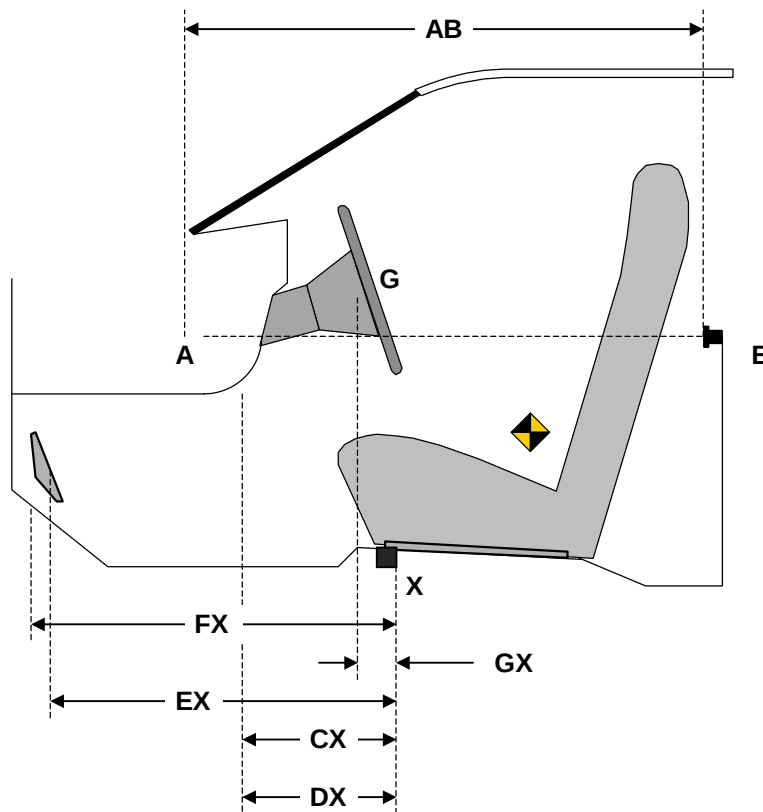
Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	851	850	1
CX	Left Knee Bolster to X	mm	244	278	-34
DX	Right Knee Bolster to X	mm	245	282	-37
EX	Brake Pedal to X	mm	547	550	-3
FX	Foot Rest to X	mm	526	520	6
GX	Center of Steering Column Wheel Hub to X	mm	71	148	-77

X = Front of Seat Track (stationary)

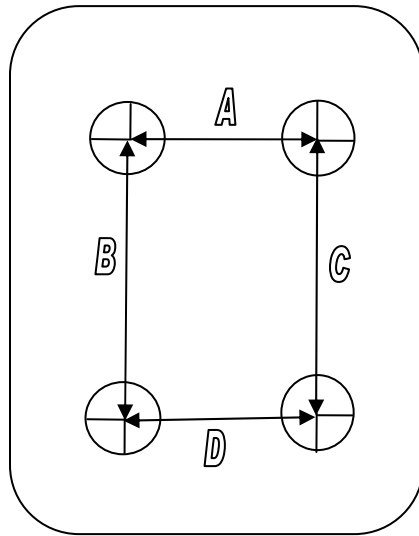


DRIVER COMPARTMENT

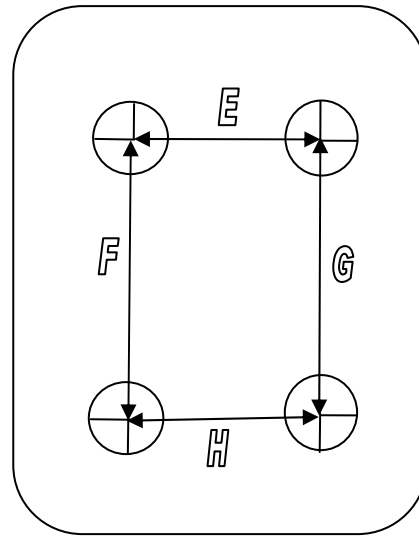
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VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	347	347	0
B	347	347	0
C	347	347	0
D	347	347	0
E	347	347	0
F	347	347	0
G	347	347	0
H	347	347	0

DATA SHEET NO. 14

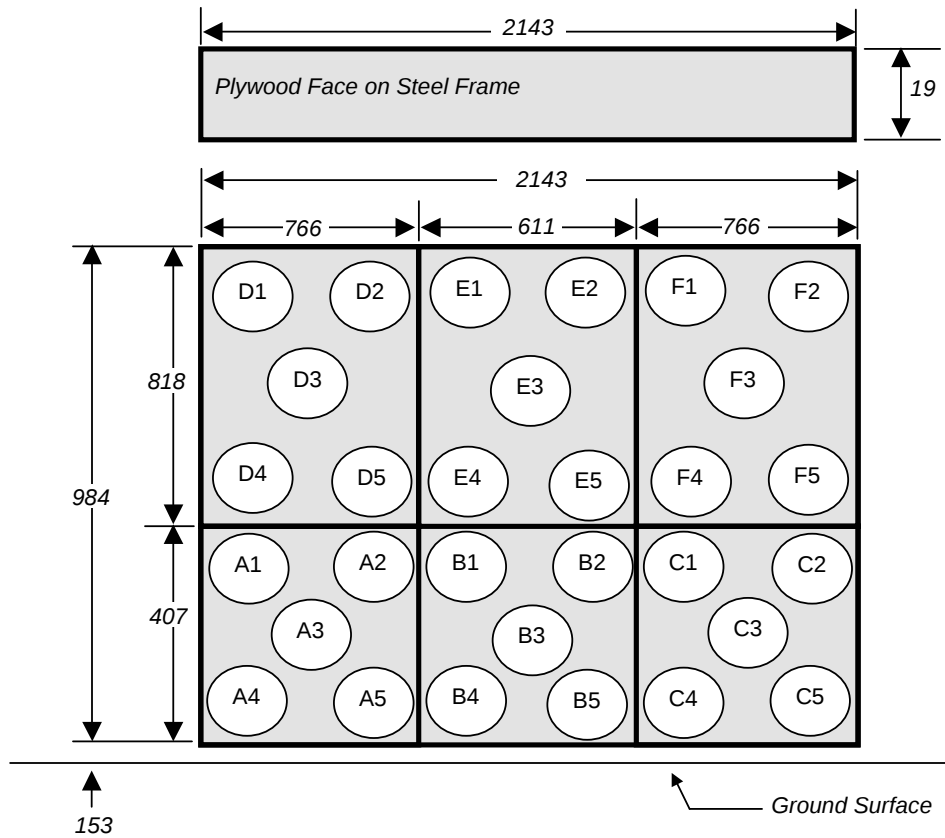
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

30 Load Cell Rigid Barrier

Load Cell Locations on Fixed Barrier



Group 4 D1-D5	Group 5 E1-E5	Group 6 F1-F5
Group 1 A1-A5	Group 2 B1-B5	Group 3 C1-C5

6 Groups of 5 Load Cells Each

DATA SHEET NO. 15
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2010 Toyota Prius III
 Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
 Test Date: 8/13/2009

VEHICLE INFORMATION

VIN: JTDKN3DU9A1017206 Wheelbase (mm): 2696
 Vehicle Size Category: Sedan Test Weight (kg): 1586.7

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 12
 Cal. Procedure/Interval: MGA procedure / 6 month
 Integration Algorithm: Trapezoidal Linearity: > 99%
 Impact Velocity (km/h): 56.3
 Velocity Change (km/h): 65.6 Time of Separation (msec): 79

CRUSH PROFILE

Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
 Damage Region Length (mm): 1165 Impact Mode: Frontal

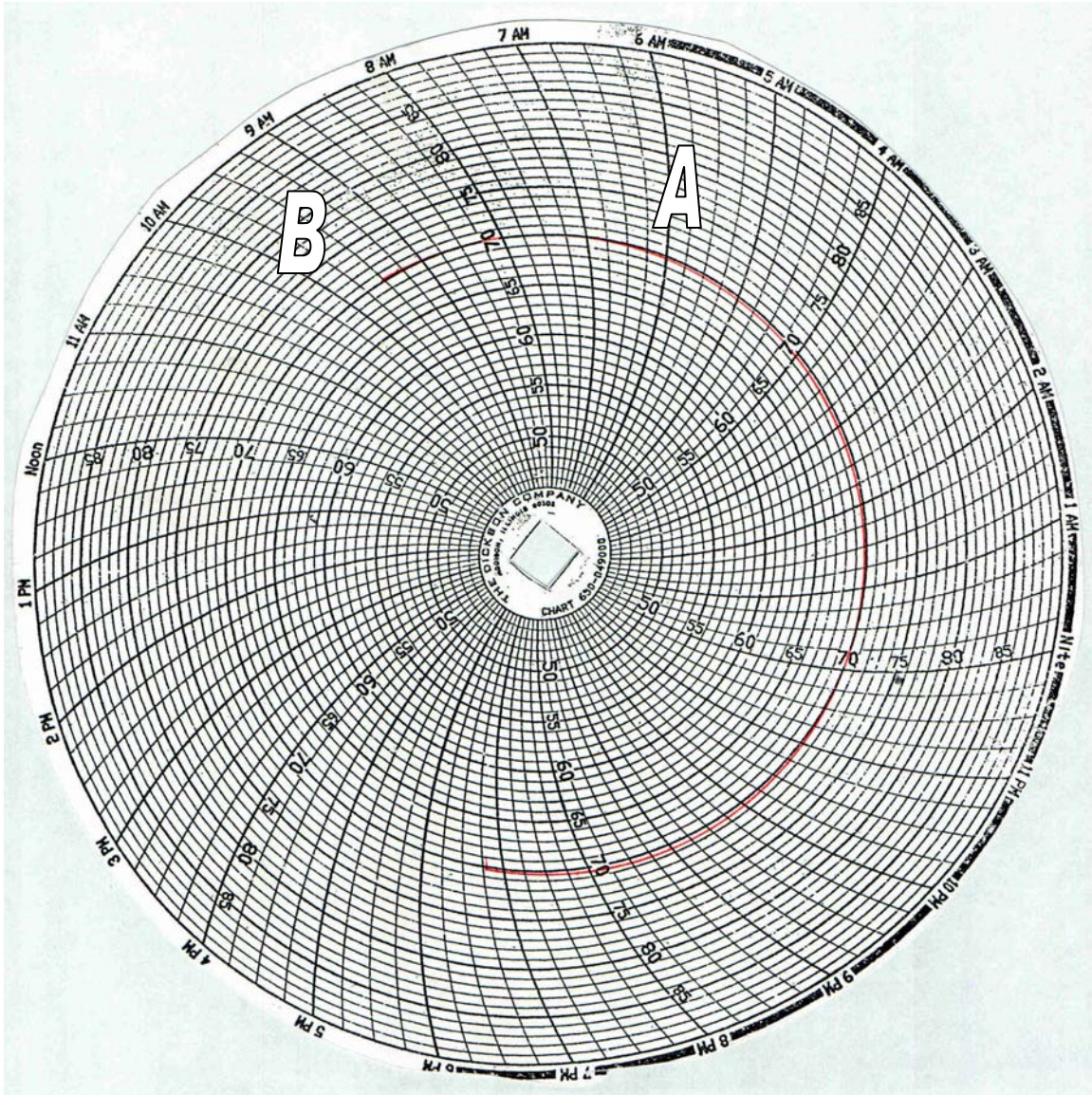
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4351	3920	431
C2	Crush zone 2 at left side	mm	4392	3951	441
C3	Crush zone 3 at left side	mm	4422	3971	451
C4	Crush zone 4 at right side	mm	4422	3969	453
C5	Crush zone 5 at right side	mm	4393	3946	447
C6	Crush zone 6 at right side	mm	4350	3919	431
L	C1 TO C6	mm	1165	1162	3

DATA SHEET NO. 16

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2010 Toyota Prius III
Test Program: 35mph Frontal Impact

NHTSA No.: MA5105
Test Date: 8/13/2009



A = Dummies installed in vehicle at 6:00 am

B = Test conducted at 10:25 am

APPENDIX A
PHOTOGRAPHS

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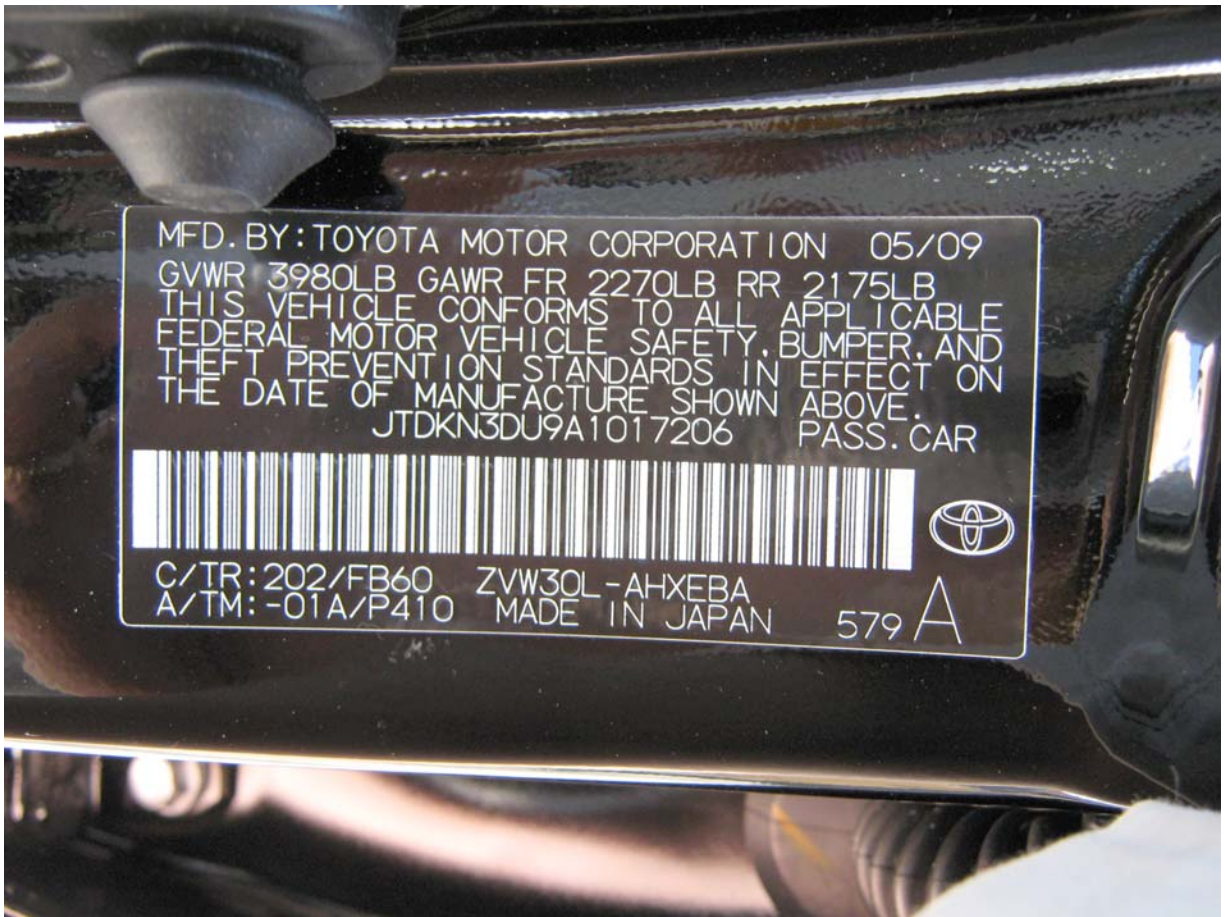
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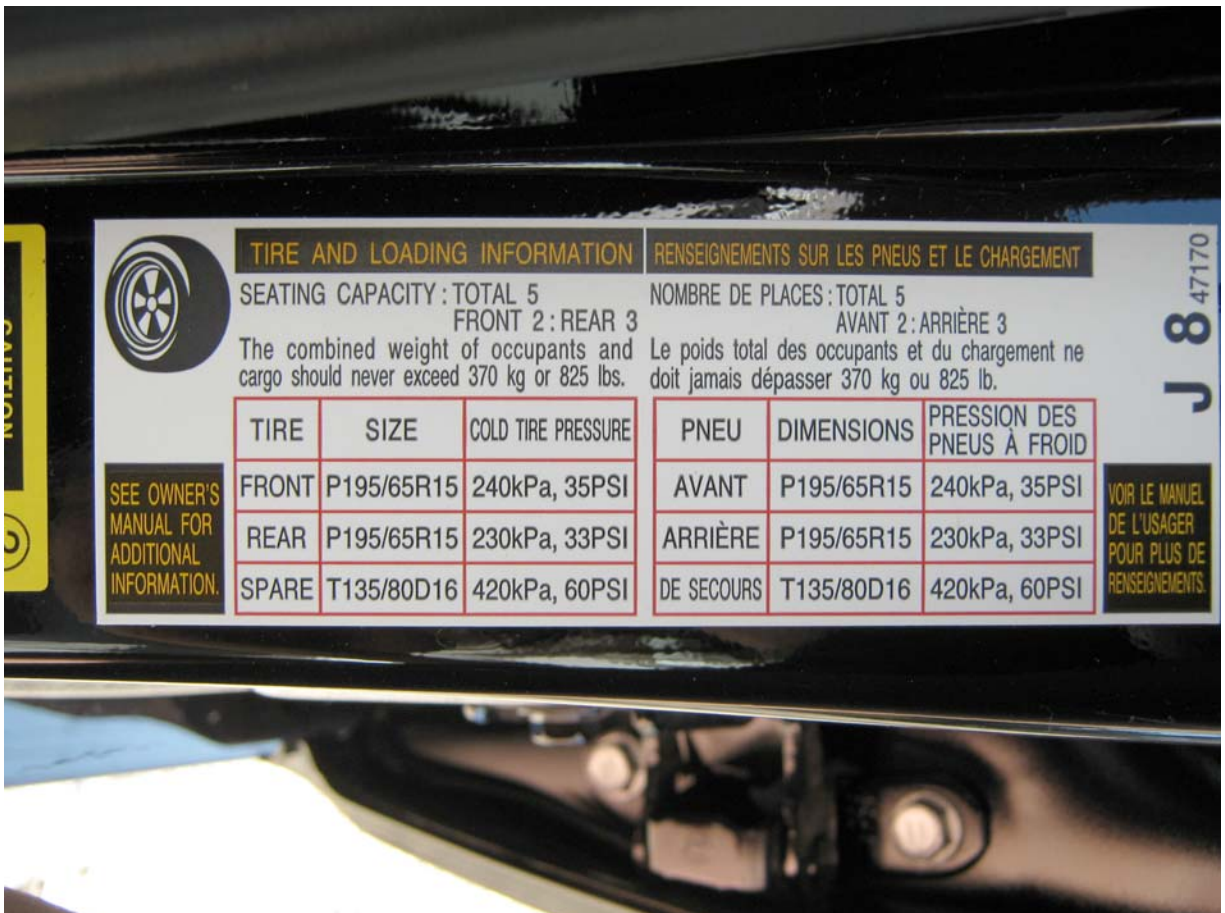
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Load Cell Location



Manufacturer's Label



Tire Placard



Right Front $\frac{3}{4}$ View, As Received



Left Rear $\frac{3}{4}$ View, As Received



Pre-Test Front View



Post-Test Front View



Pre-Test Left Side View



Post-Test Left Side View



Pre-Test Right Side View



Post-Test Right Side View



Pre-Test Right Front 3/4 View



Post-Test Right Front 3/4 View



Pre-Test Left Rear $\frac{3}{4}$ View



Post-Test Left Rear $\frac{3}{4}$ View



Pre-Test Left Side 3/4 View of Doors



Post-Test Left Side 3/4 View of Doors After Impact



Pre-Test Right Side $\frac{3}{4}$ View of Doors



Post-Test Right Side $\frac{3}{4}$ View of Doors After Impact



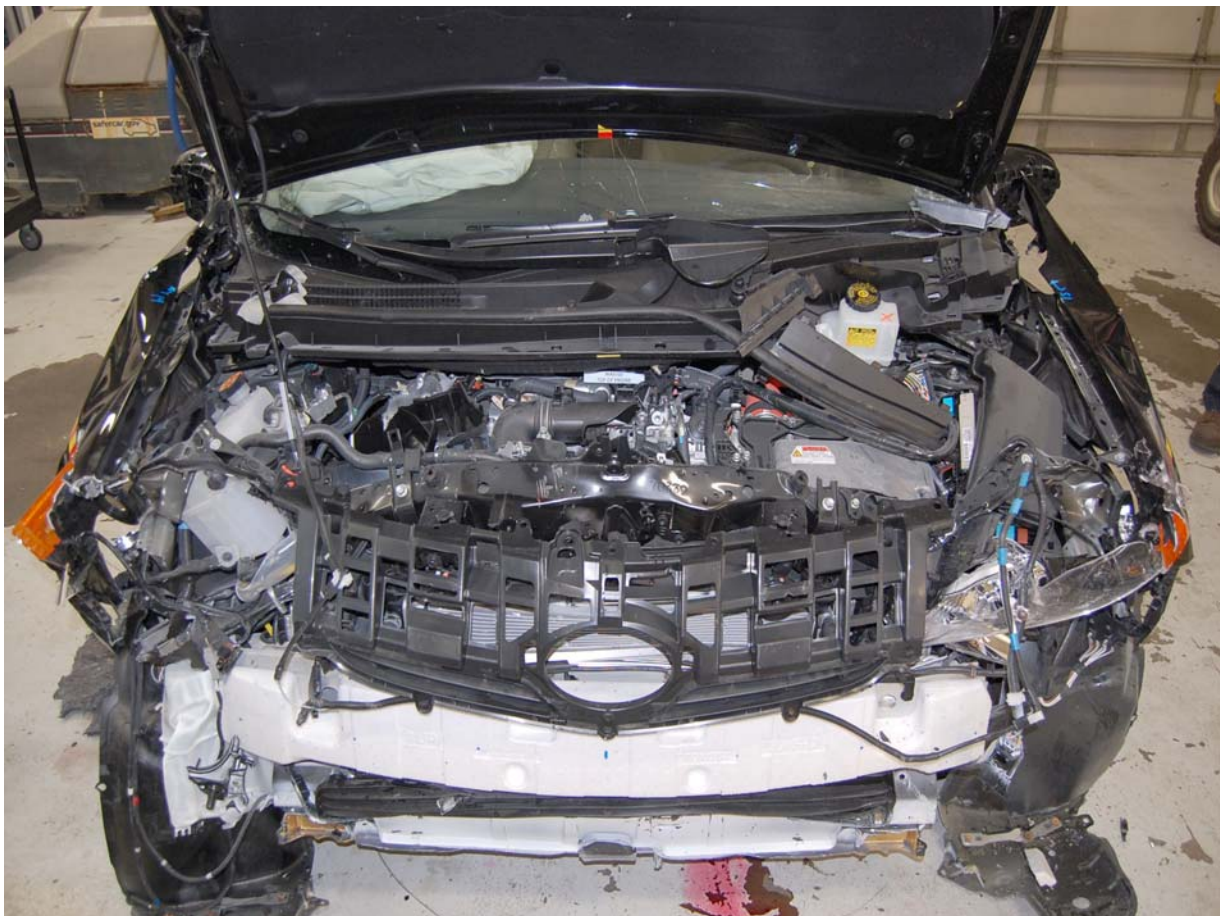
Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



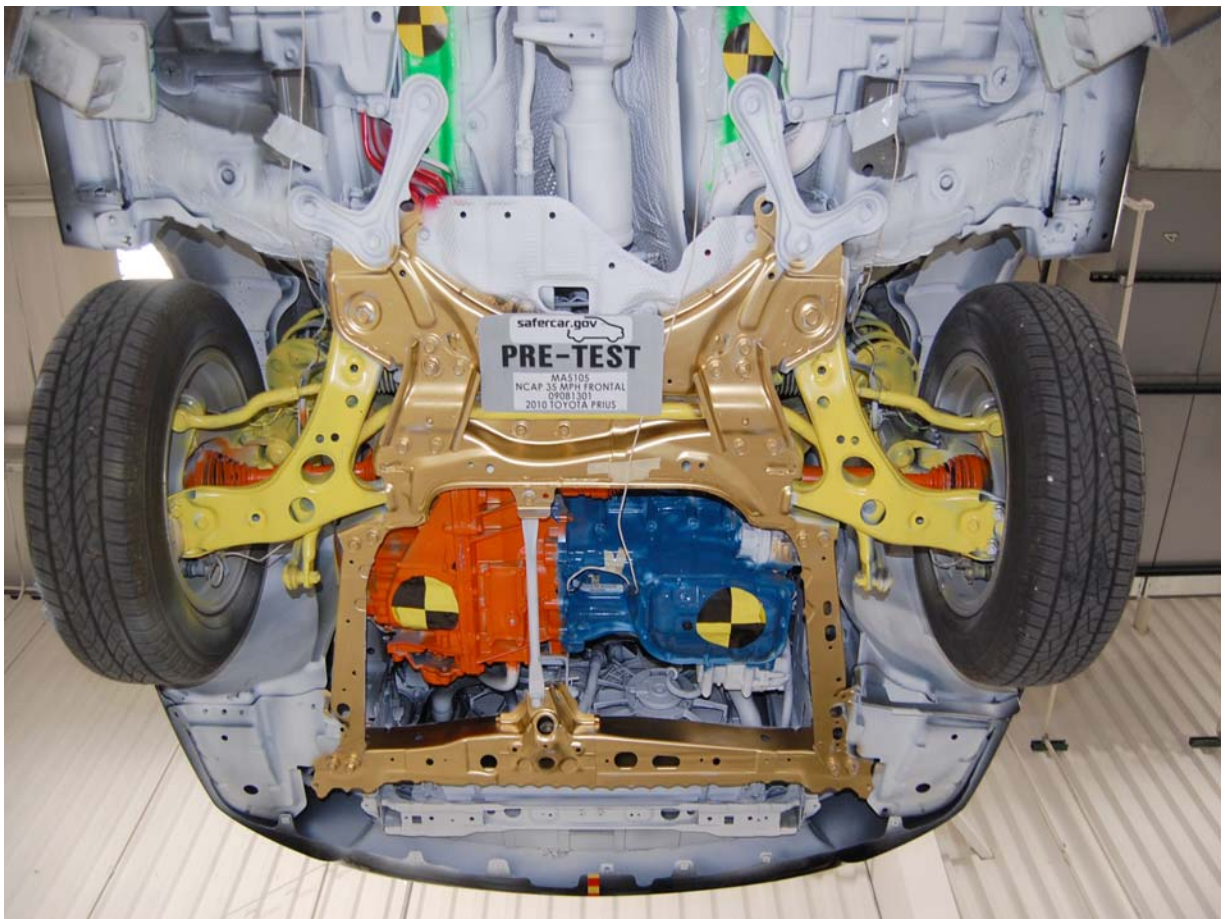
Post-Test Engine Compartment View



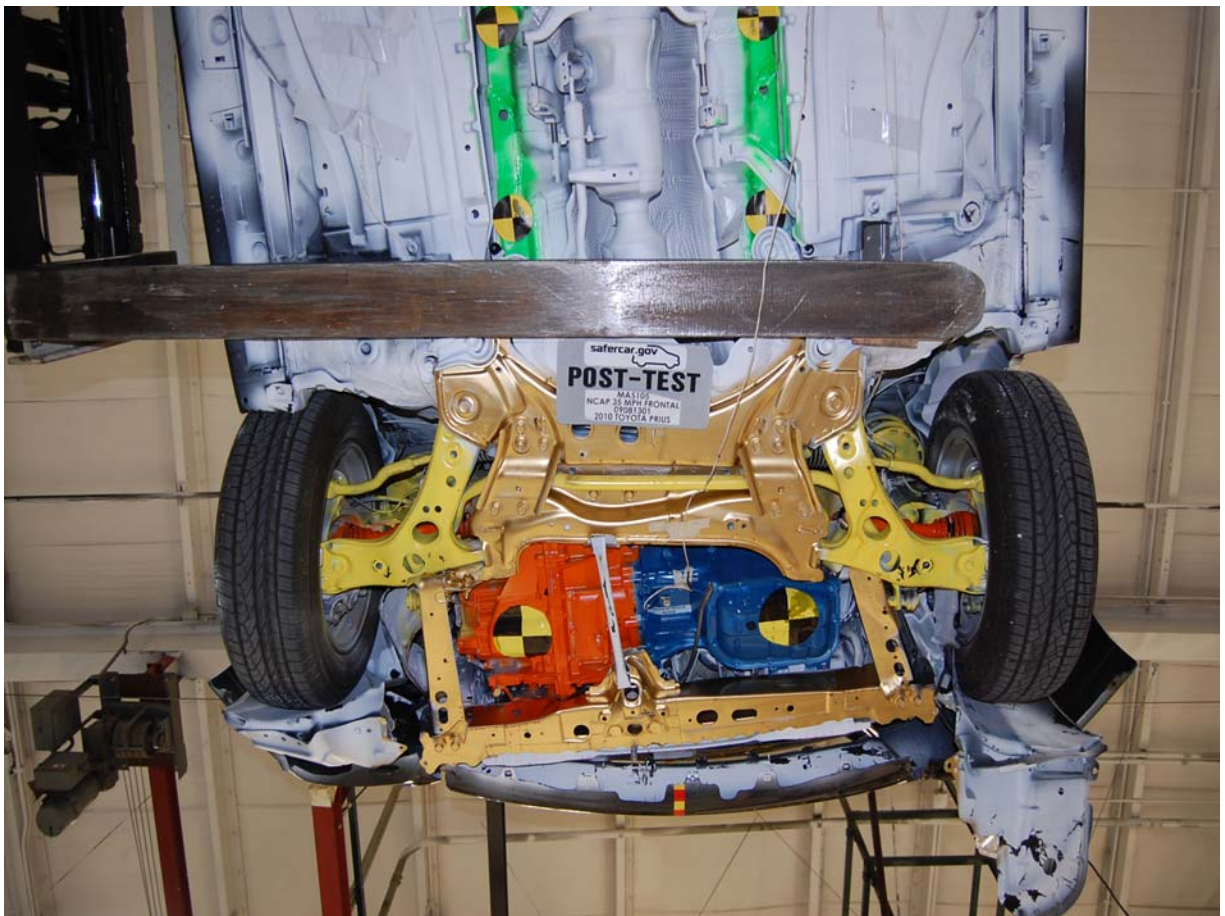
Pre-Test Fuel Cap View



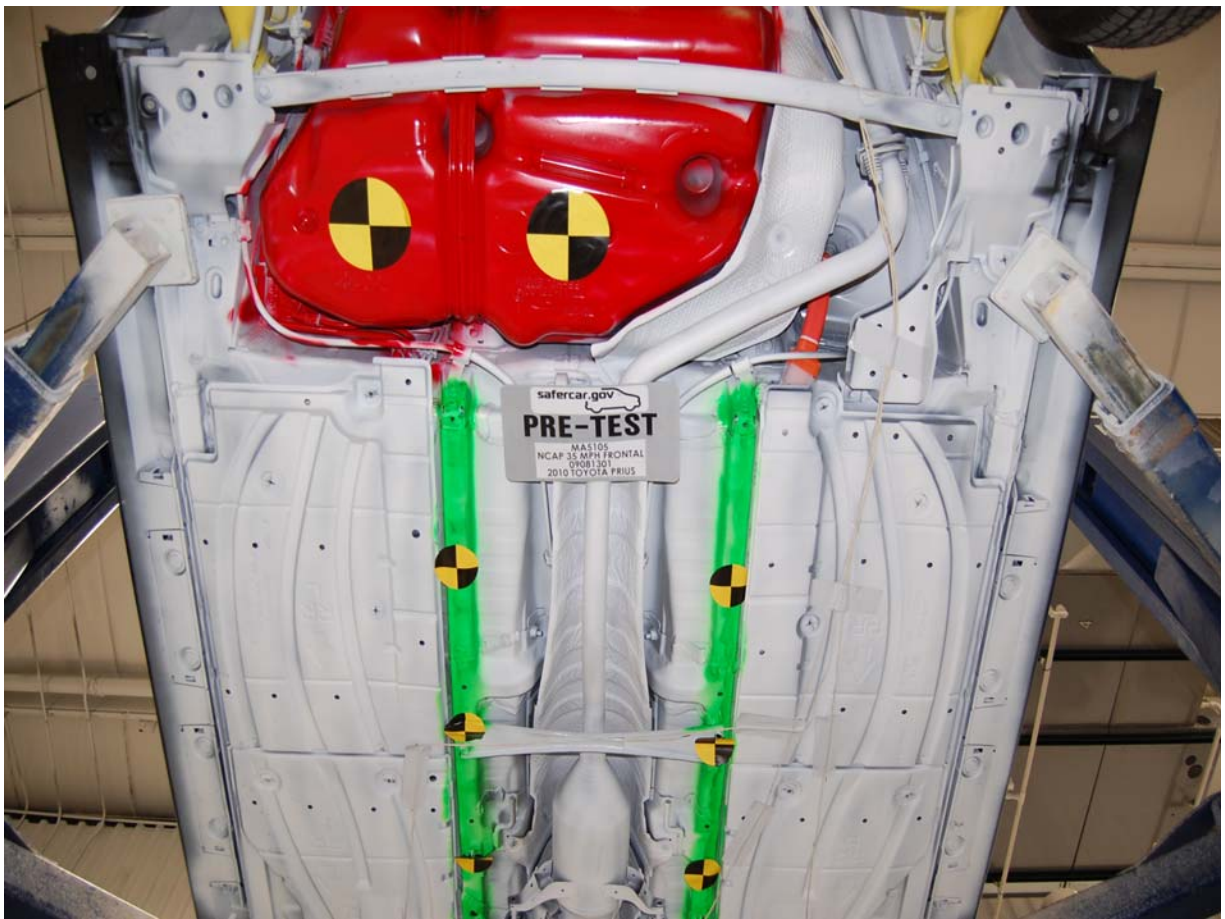
Post-Test Fuel Cap View



Pre-Test Front Underbody View



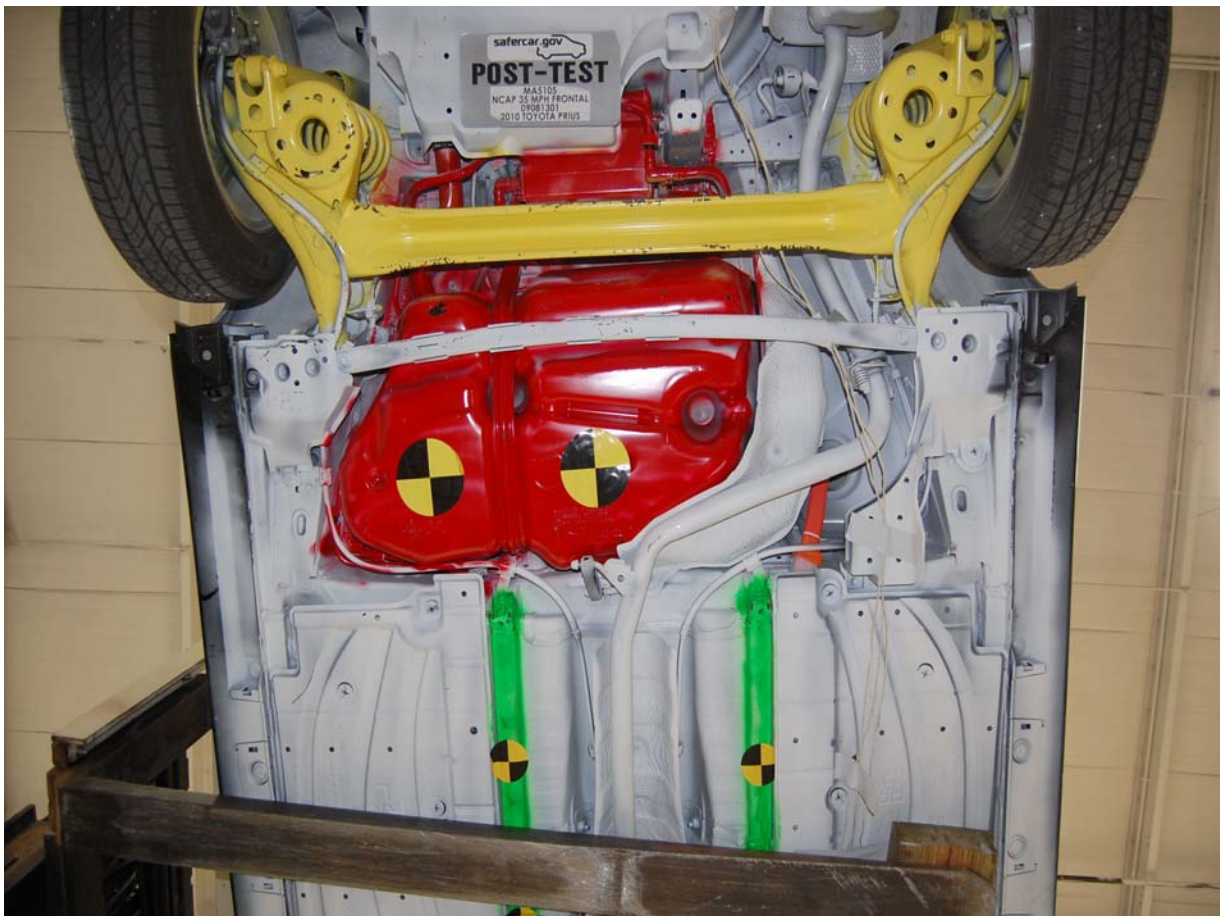
Post-Test Front Underbody View



Pre-Test Mid Underbody View



Post-Test Mid Front Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Driver Dummy Front View (Head Position)



Post-Test Driver Dummy Front View (Head Position)



Pre-Test Driver Dummy (Through Window)



Post-Test Driver Dummy (Through Window)



Pre-Test Driver Dummy (Door Open)



Post-Test Driver Dummy (Door Open)



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



Pre-Test Driver Side Knee Bolster



Post-Test Driver Side Knee Bolster



Pre-Test Driver Side Floor Pan



Post-Test Driver Side Floor Pan



Post-Test Driver Dummy Head Contact



Post-Test Driver Dummy Knee Contact View



Post-Test Driver Dummy Airbag Contact



Pre-Test Passenger Dummy Front View (Head Position)



Post-Test Passenger Dummy Front View (Head Position)



Pre-Test Passenger Dummy (Through Window)



Post-Test Passenger Dummy (Through Window)



Pre-Test Passenger Dummy (Door Open)



Post-Test Passenger Dummy (Door Open)



Pre-Test Passenger Dummy Feet



Post-Test Passenger Dummy Feet



Pre-Test Passenger Side Glove Box



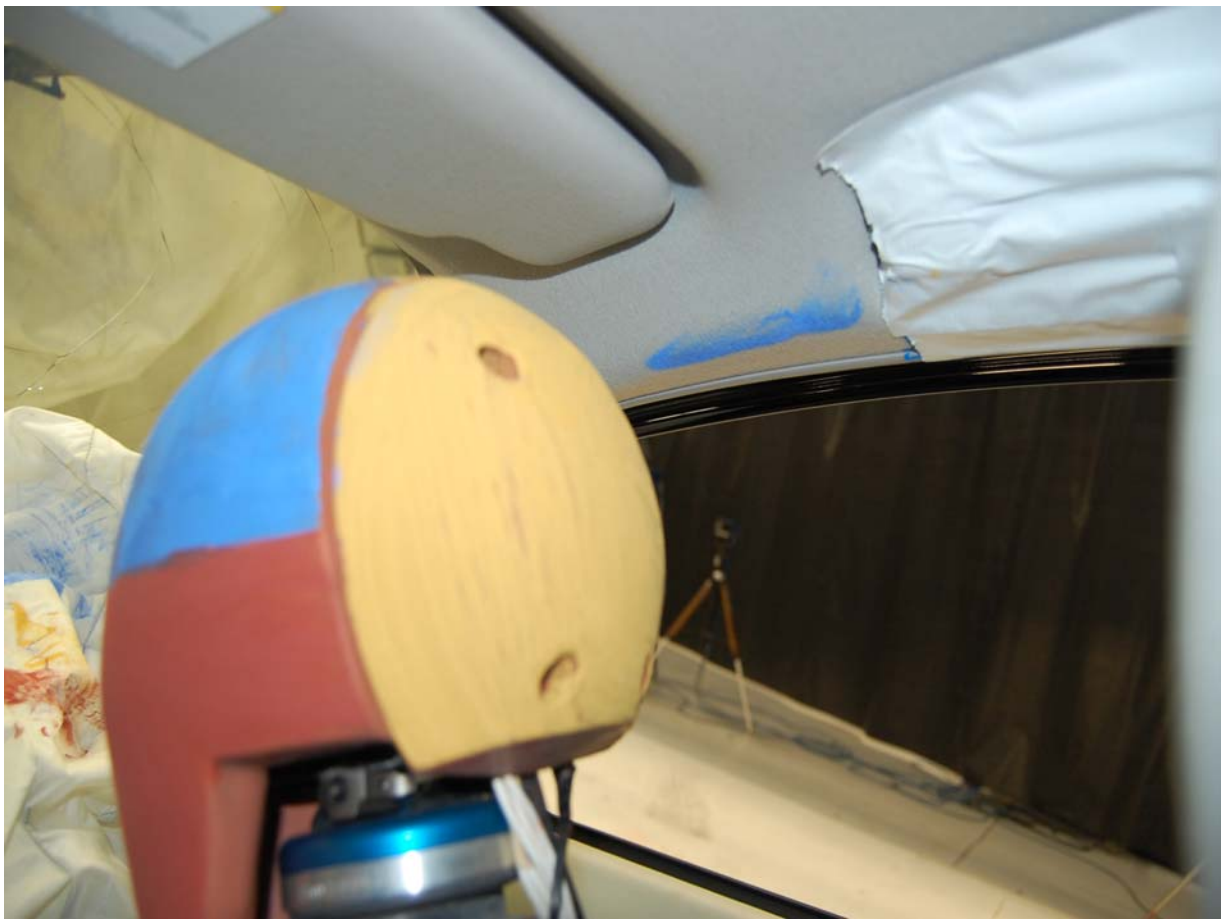
Post-Test Passenger Side Glove Box



Pre-Test Passenger Side Floor Pan



Post-Test Passenger Side Floor Pan



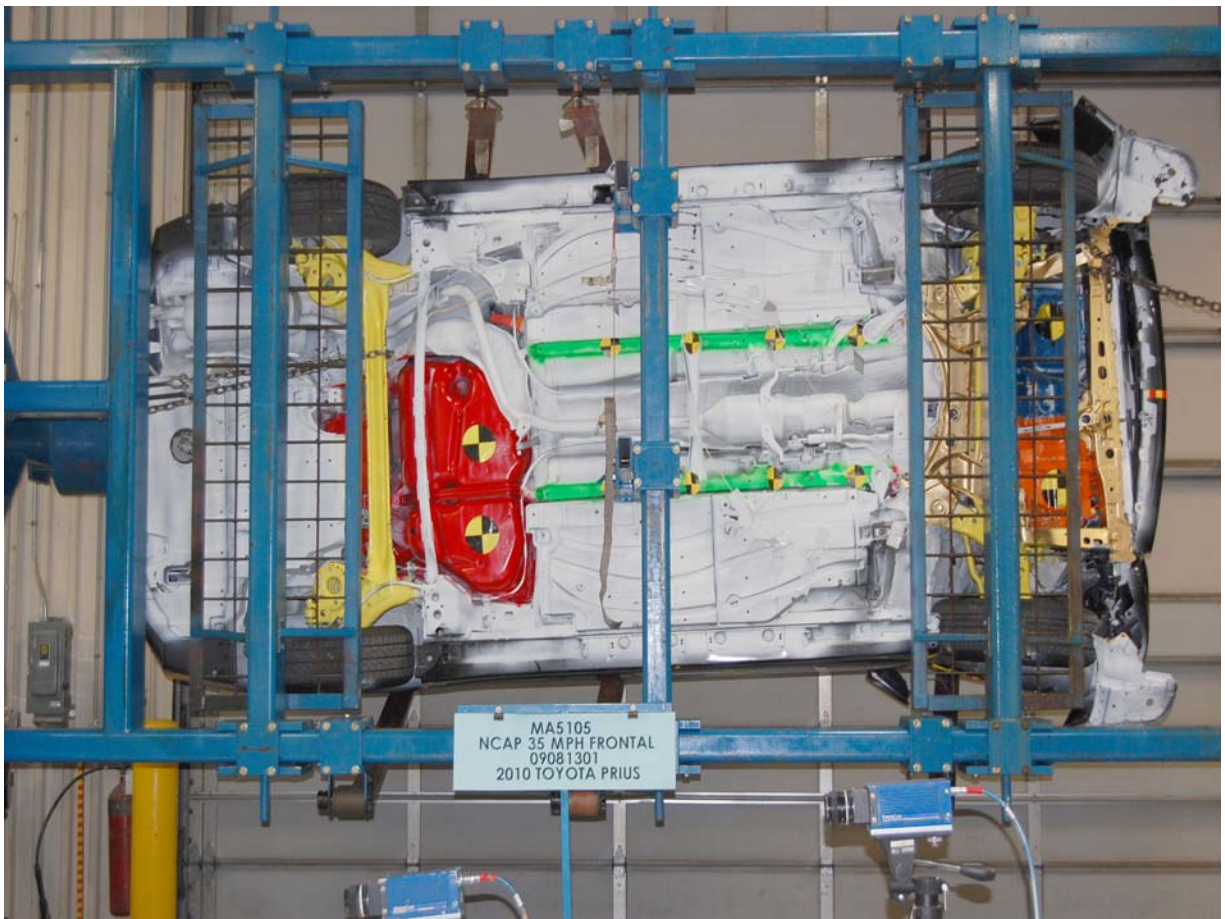
Post-Test Passenger Dummy Head Contact



Post-Test Passenger Dummy Knee Contact



Post-Test Passenger Dummy Airbag Contact



Rollover 90 Degrees



Rollover 180 Degrees



Rollover 270 Degrees



Rollover 360 Degrees



Vehicle Impact

APPENDIX B
DUMMY RESPONSE DATA TRACES

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The following 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 X

Driver Upper Neck Force Y

Driver Upper Neck Force Z

Driver Upper Neck Moment X

Driver Upper Neck Moment Y

Driver Upper Neck Moment Z

Driver Chest X Redundant

Driver Chest Y Redundant

Driver Chest Z Redundant

Driver Chest Displacement

Driver Pelvis X

Driver Pelvis Y

Driver Pelvis Z

Driver Lap Belt Force

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

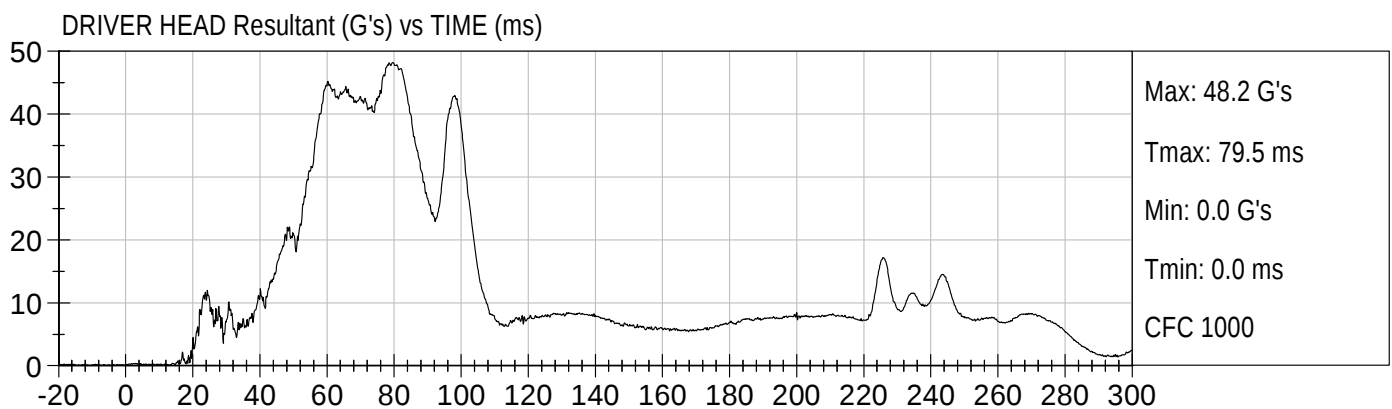
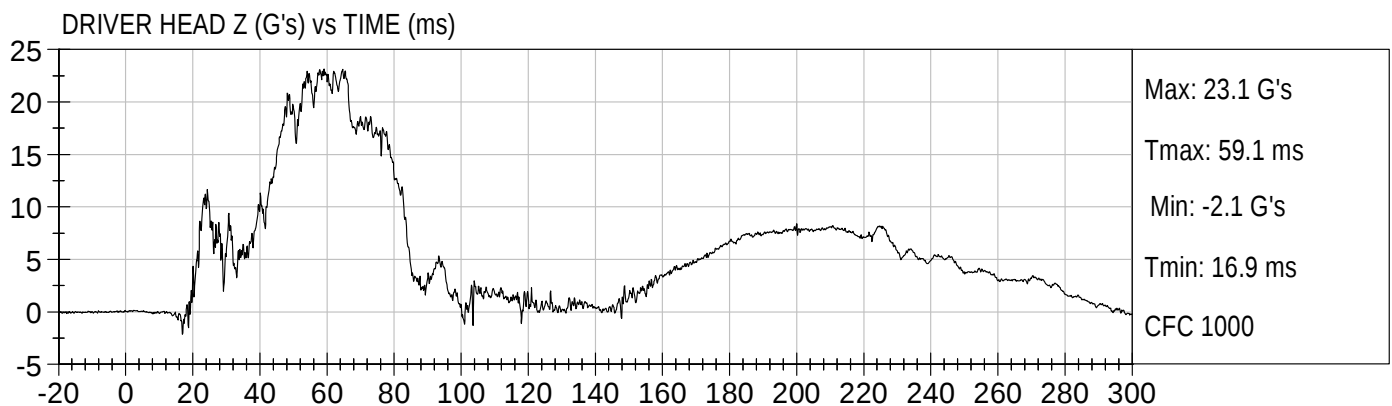
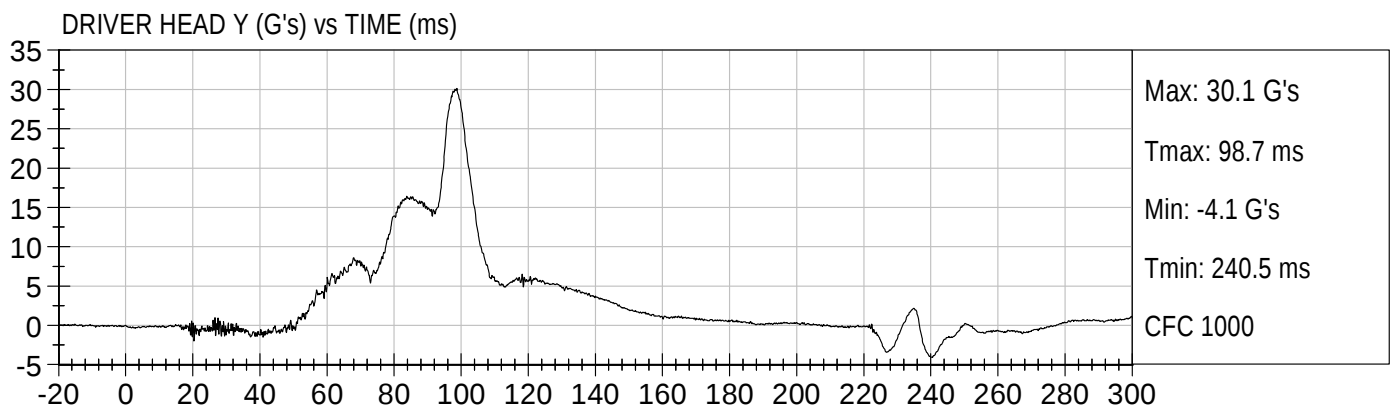
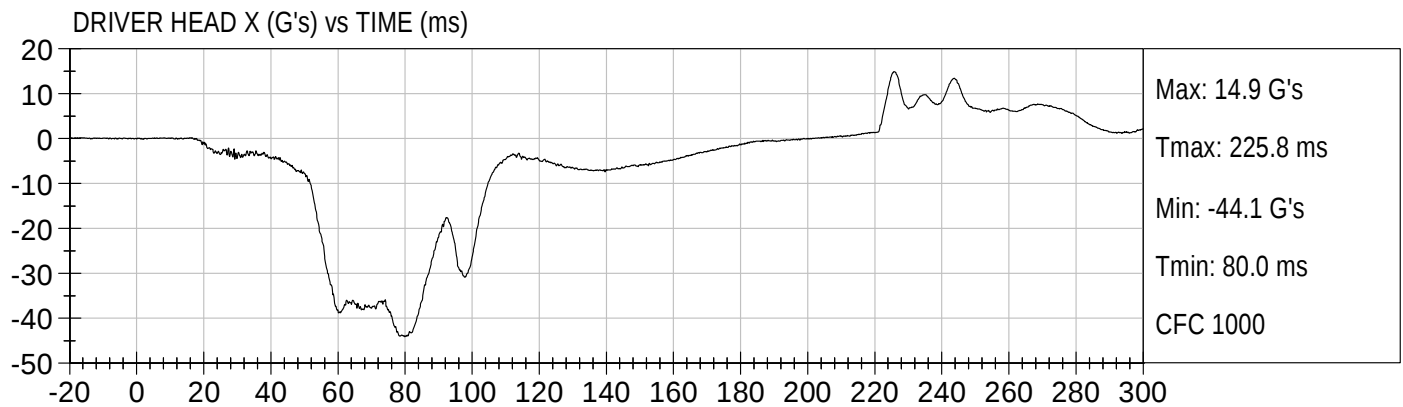
Driver Right Upper Tibia Moment X

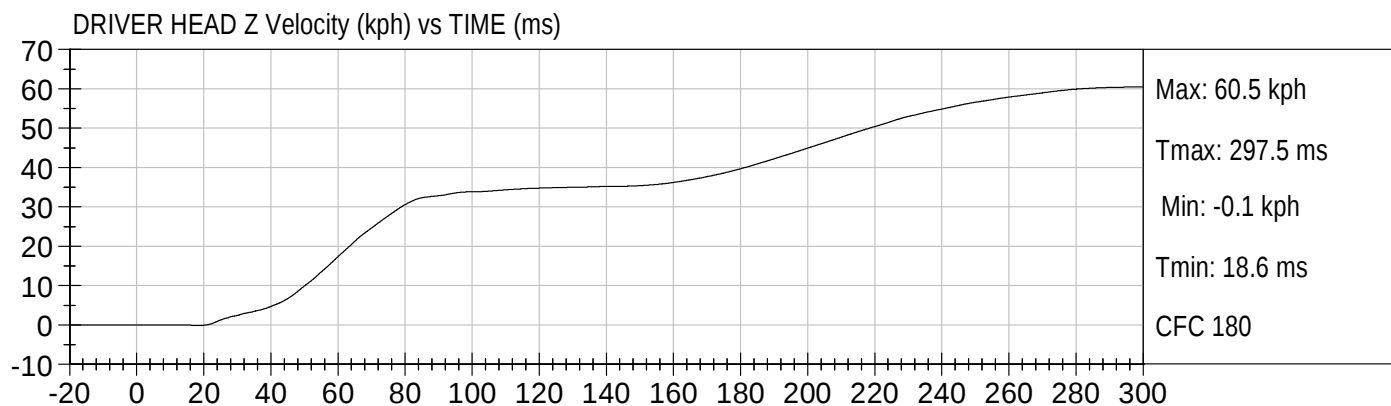
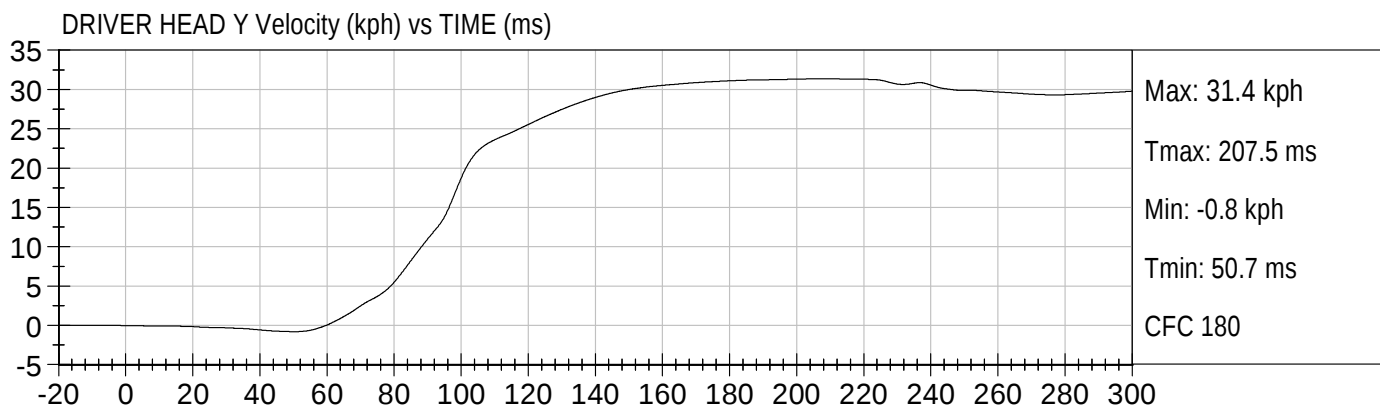
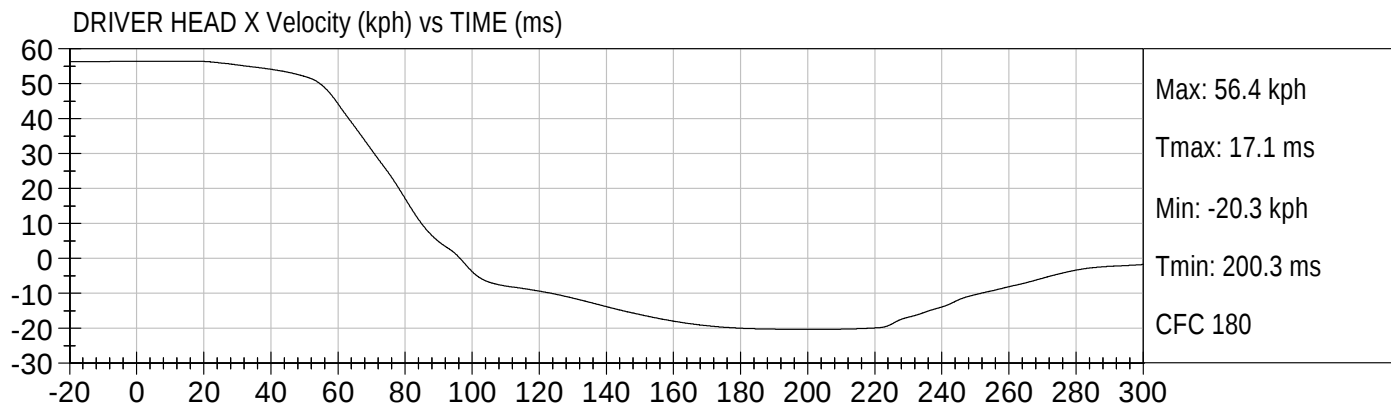
Driver Right Upper Tibia Moment Y

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
Passenger Head X Redundant
Passenger Head Y Redundant
Passenger Head Z Redundant
Passenger Upper Neck Force X
Passenger Upper Neck Force Y
Passenger Upper Neck Force Z
Passenger Upper Neck Moment X
Passenger Upper Neck Moment Y
Passenger Upper Neck Moment Z
Passenger Chest X Redundant
Passenger Chest Y Redundant
Passenger Chest Z Redundant
Passenger Chest Displacement
Passenger Pelvis X
Passenger Pelvis Y
Passenger Pelvis Z
Passenger Lap Belt Force
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

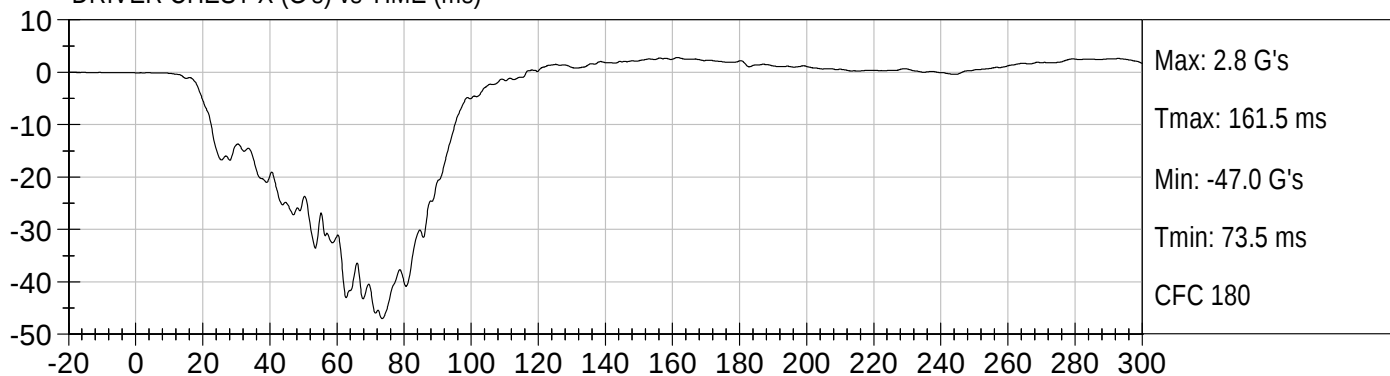
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Vehicle Engine Top X
Vehicle Engine Bottom X
Vehicle Left Brake Caliper X
Vehicle Right Brake Caliper X
Barrier Force – Upper Left
Barrier Force – Upper Center
Barrier Force – Upper Right
Barrier Force – Lower Left
Barrier Force – Lower Center
Barrier Force – Lower Right



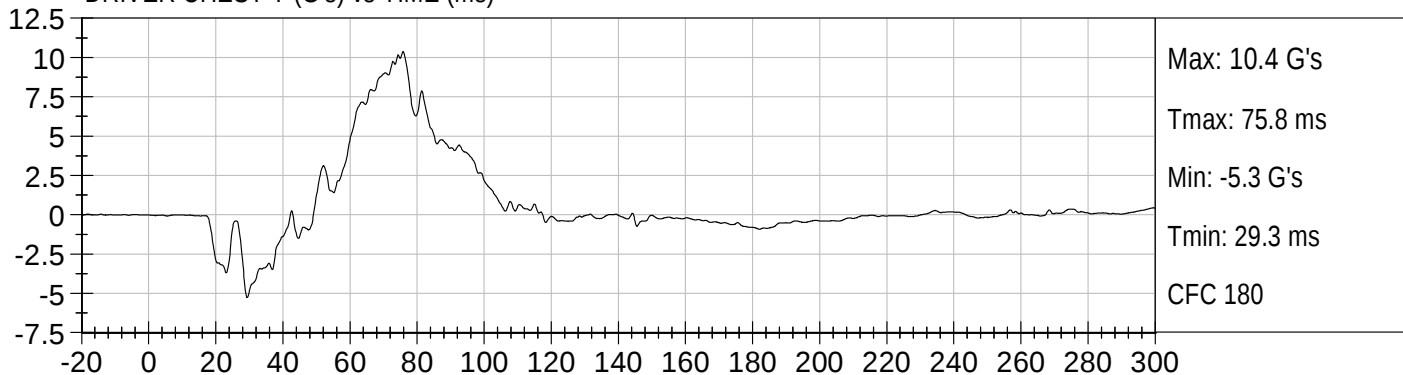




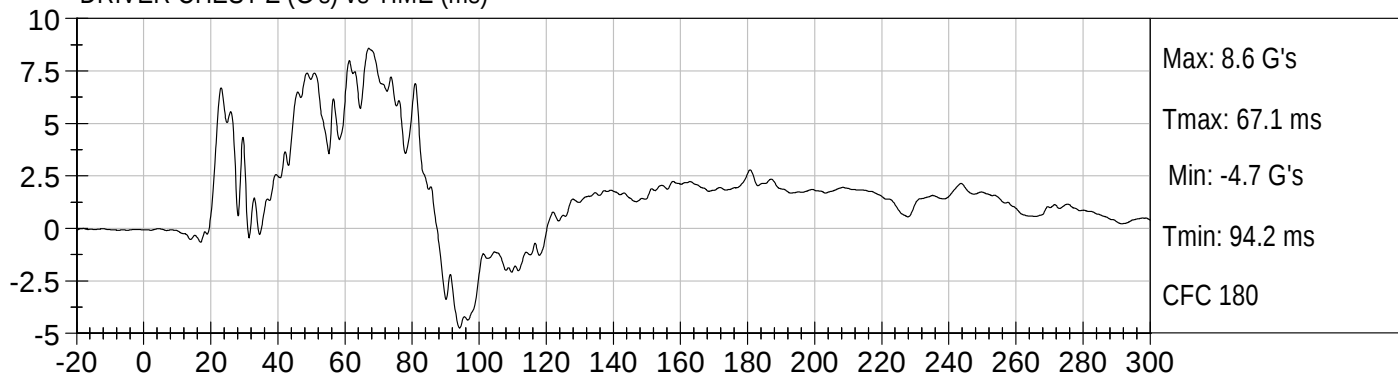
DRIVER CHEST X (G's) vs TIME (ms)



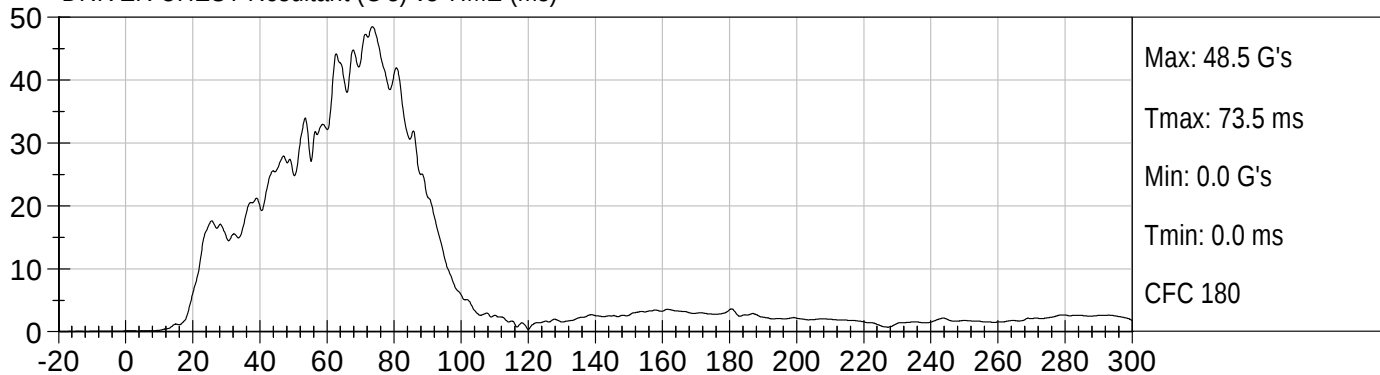
DRIVER CHEST Y (G's) vs TIME (ms)

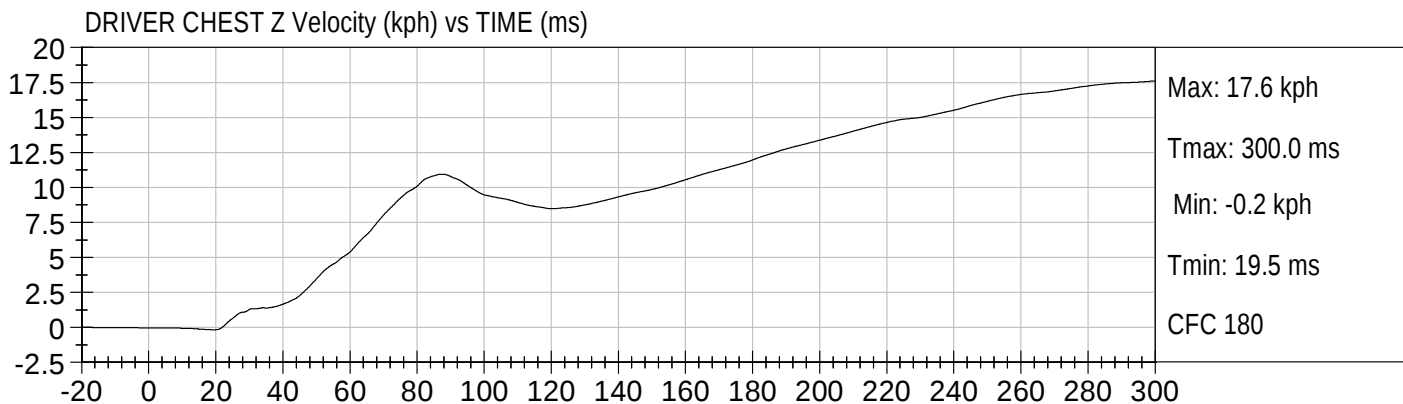
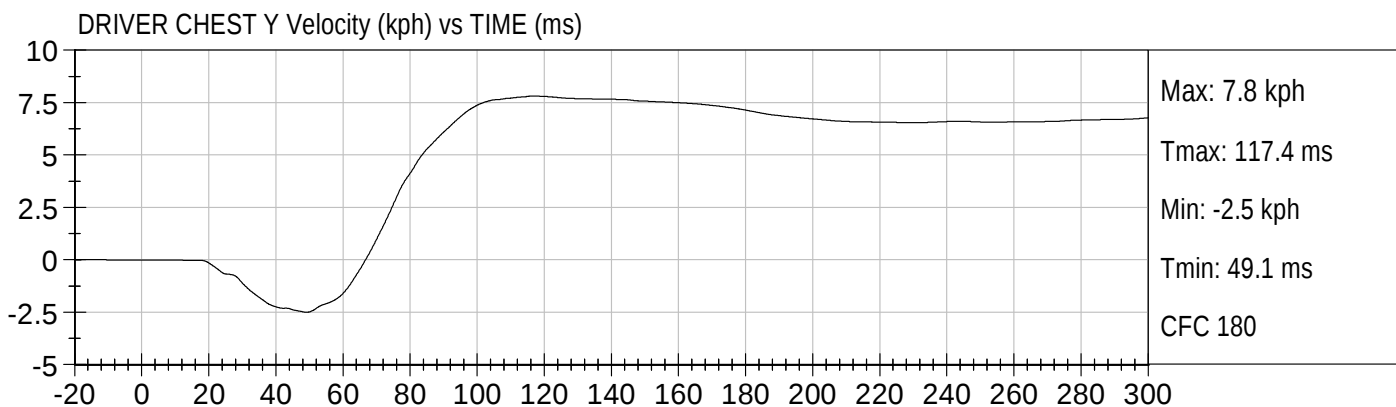
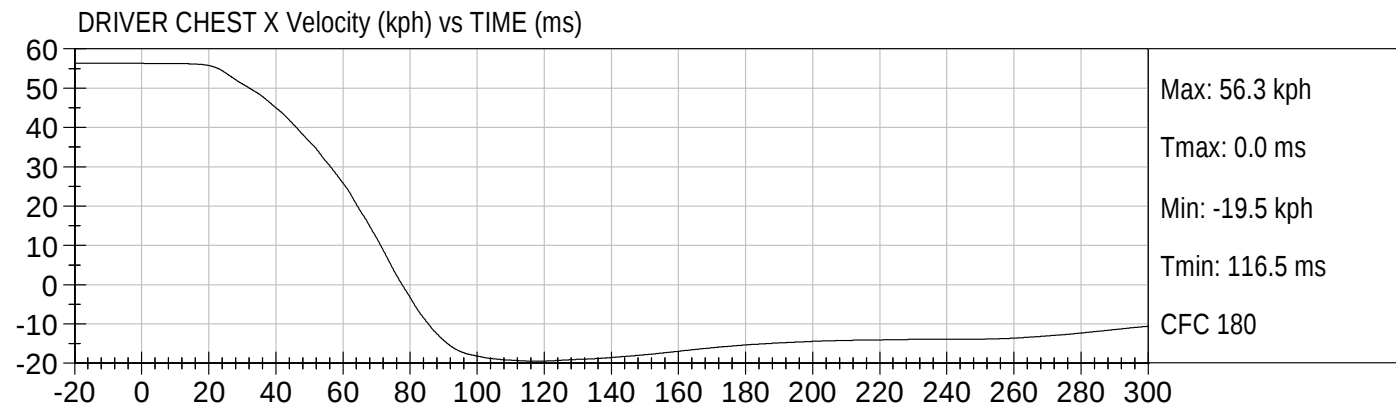


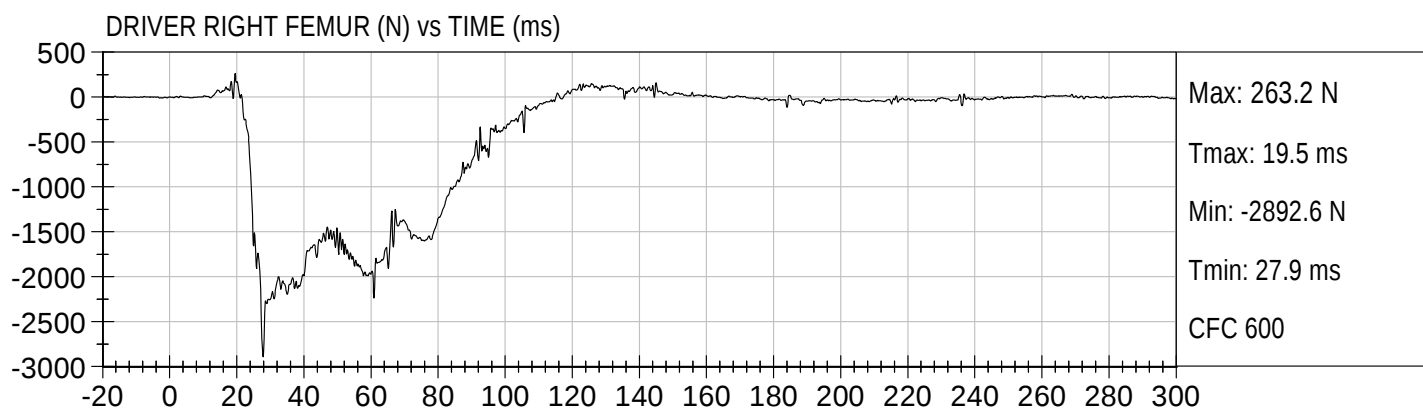
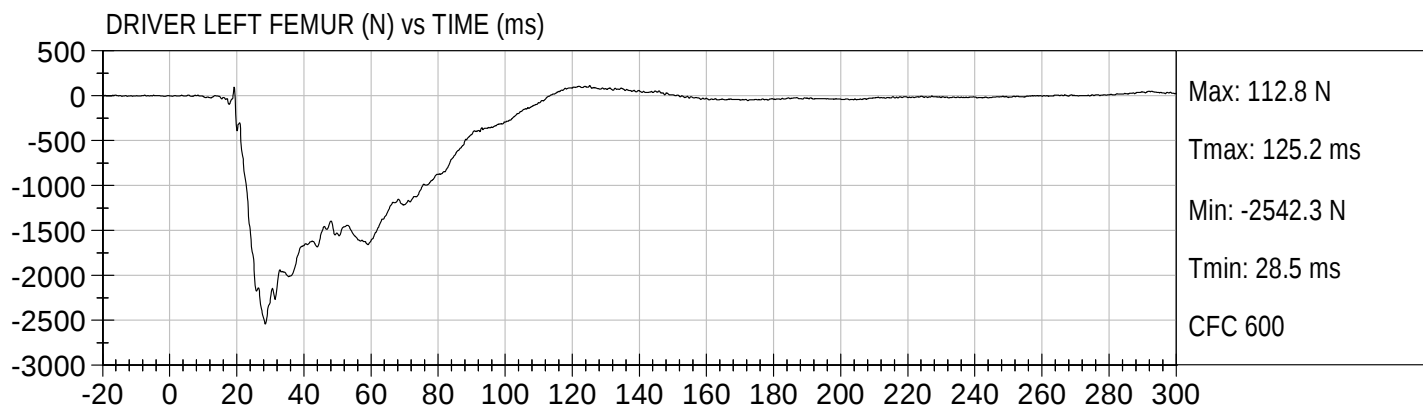
DRIVER CHEST Z (G's) vs TIME (ms)

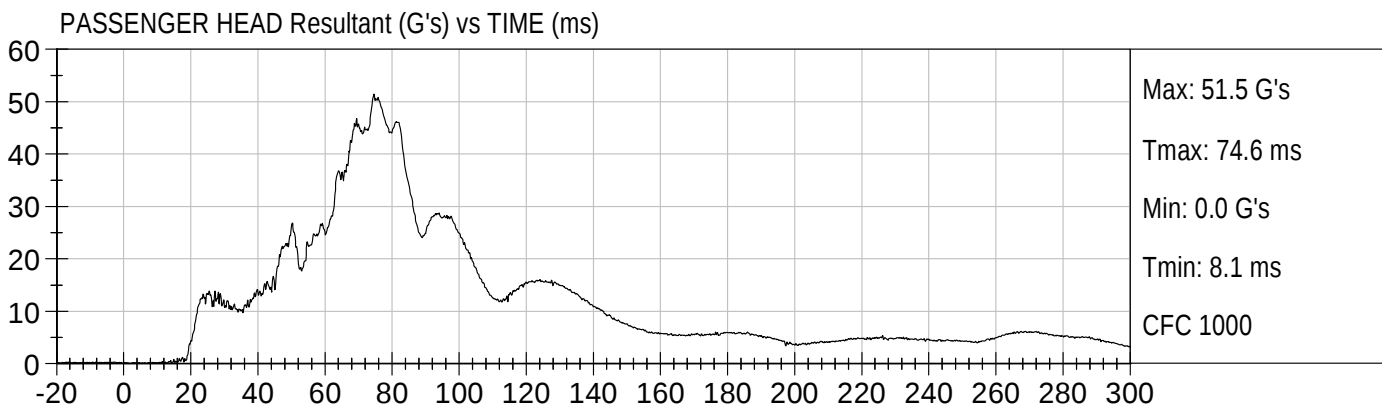
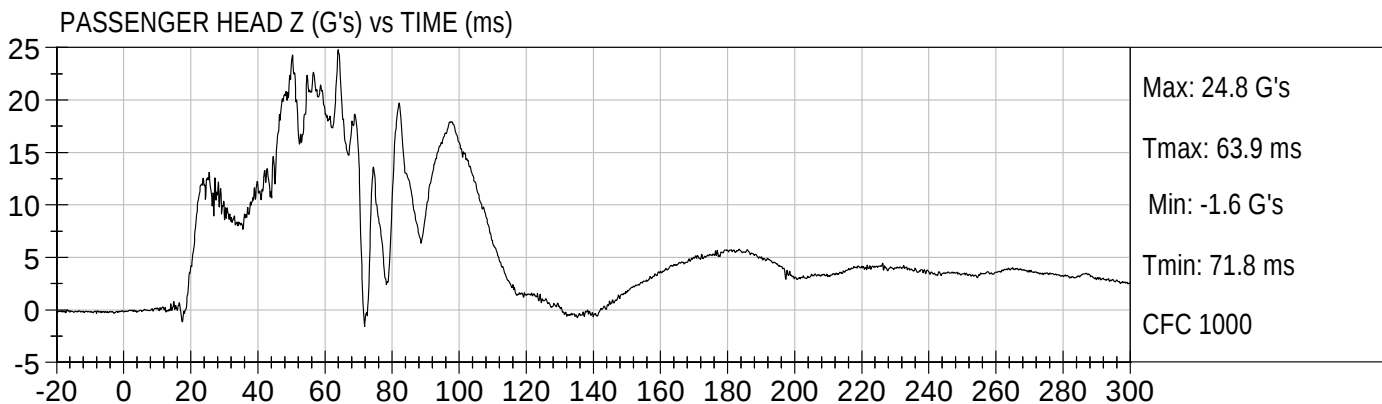
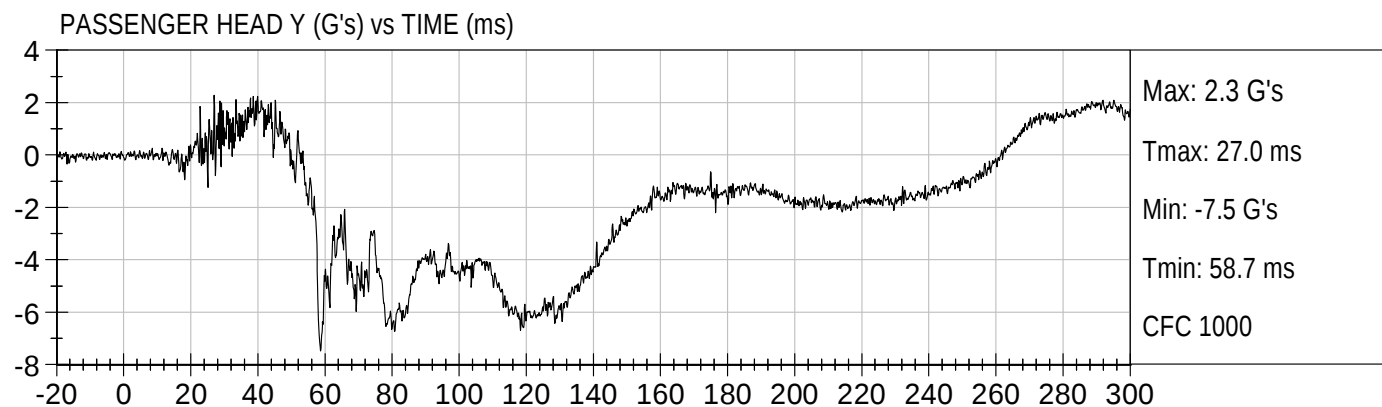
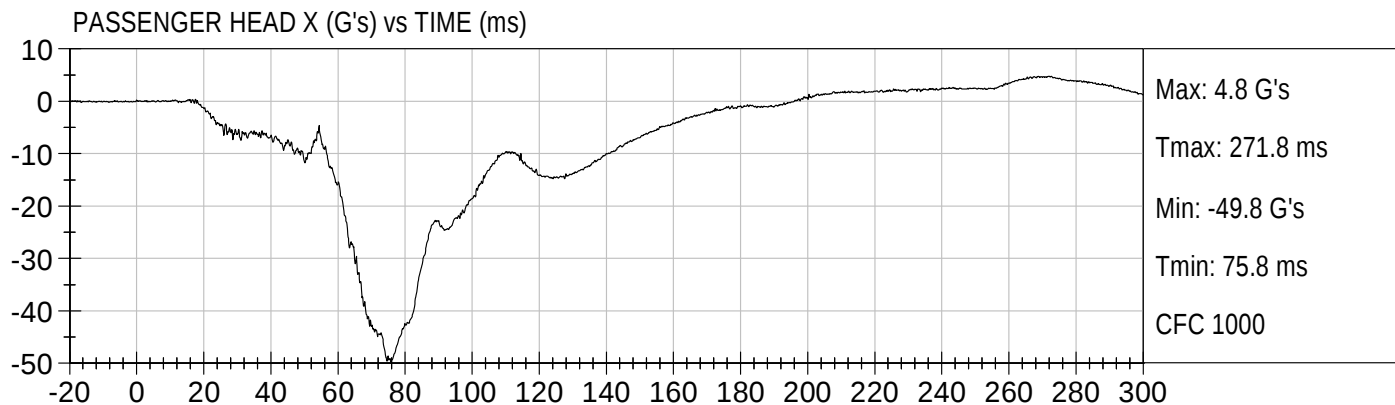


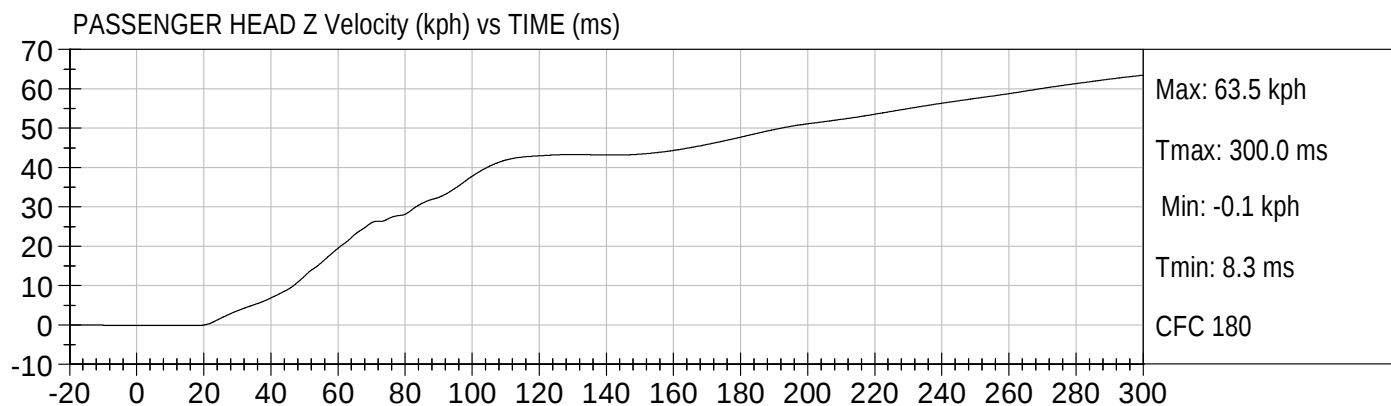
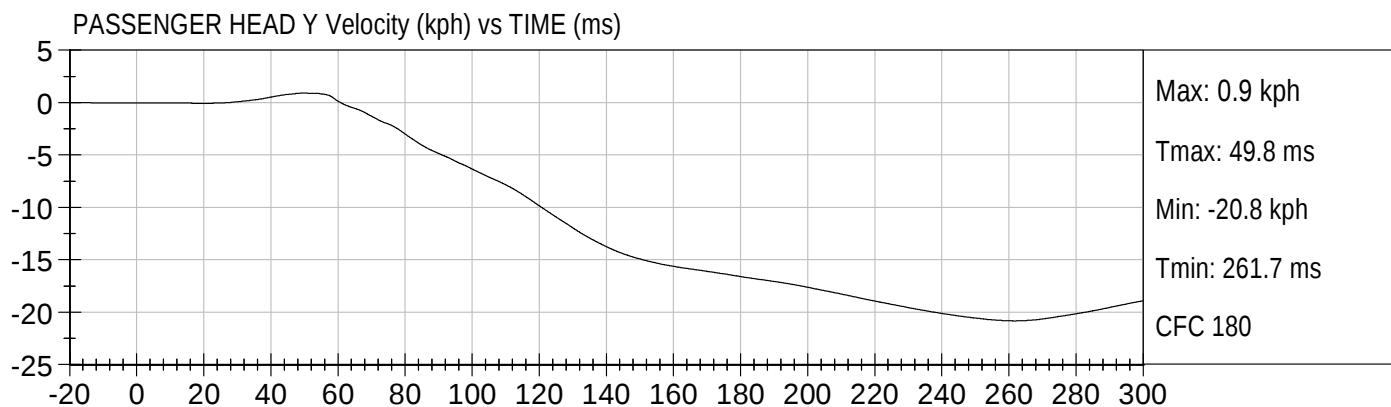
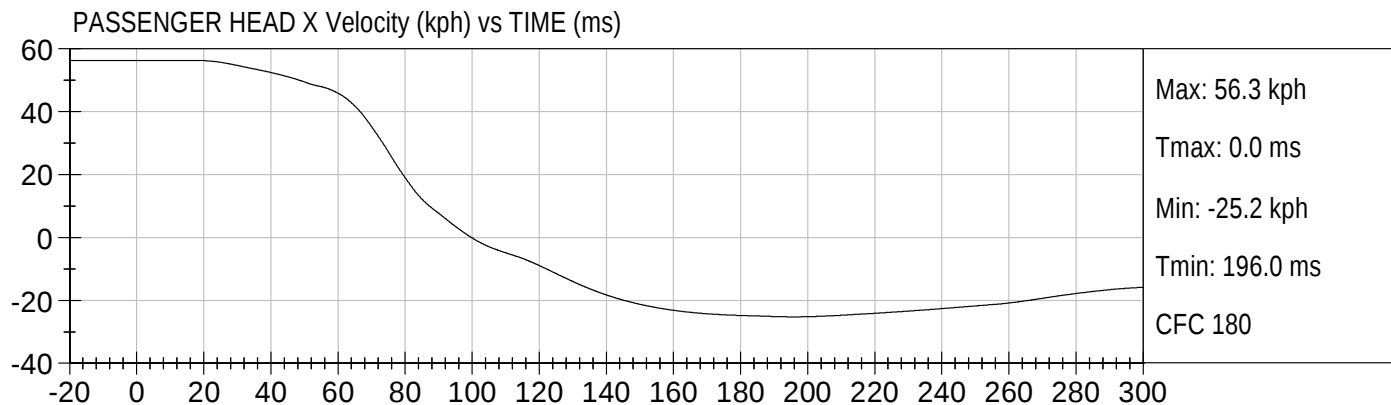
DRIVER CHEST Resultant (G's) vs TIME (ms)





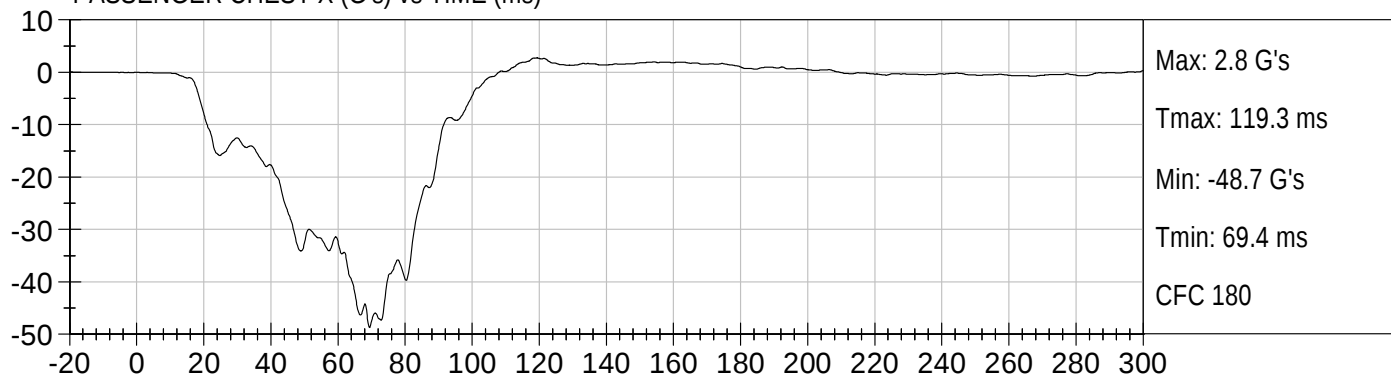




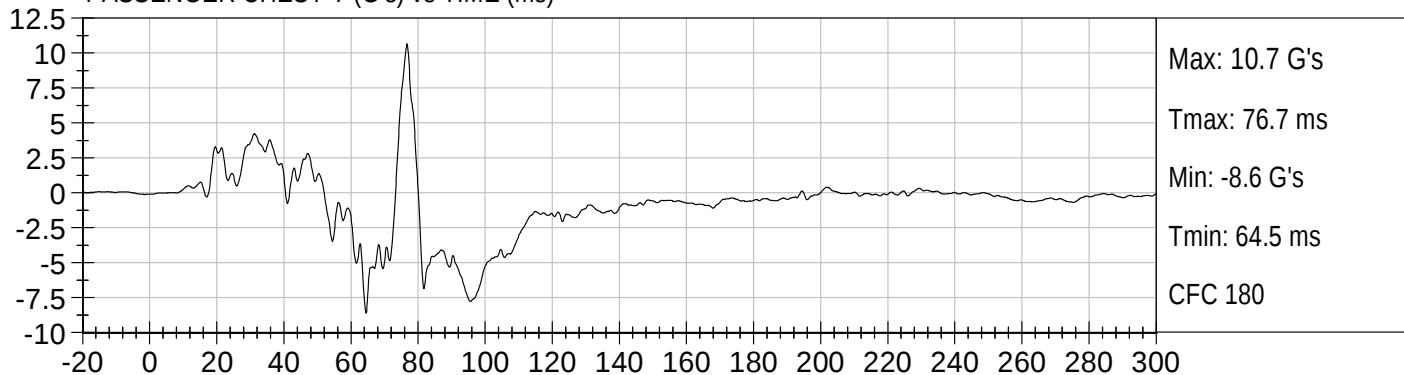




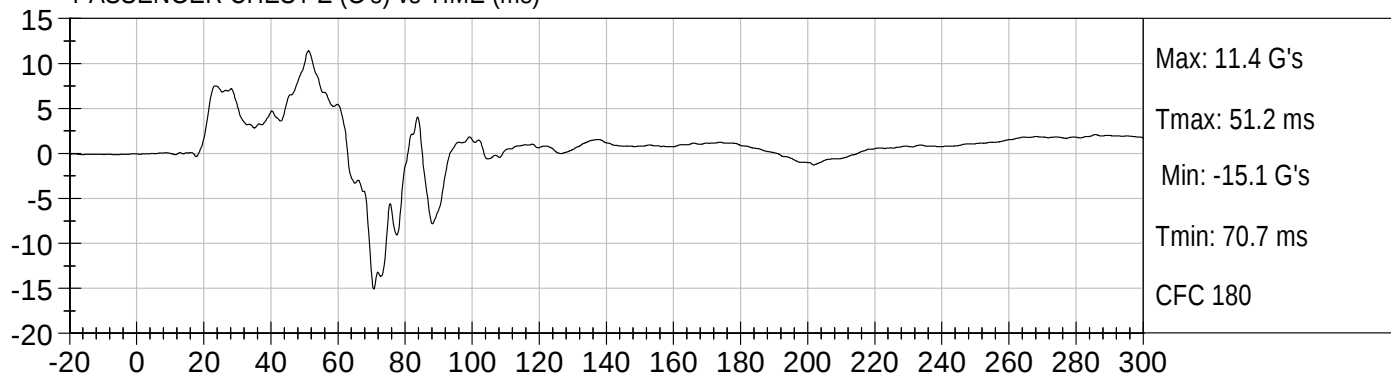
PASSENGER CHEST X (G's) vs TIME (ms)



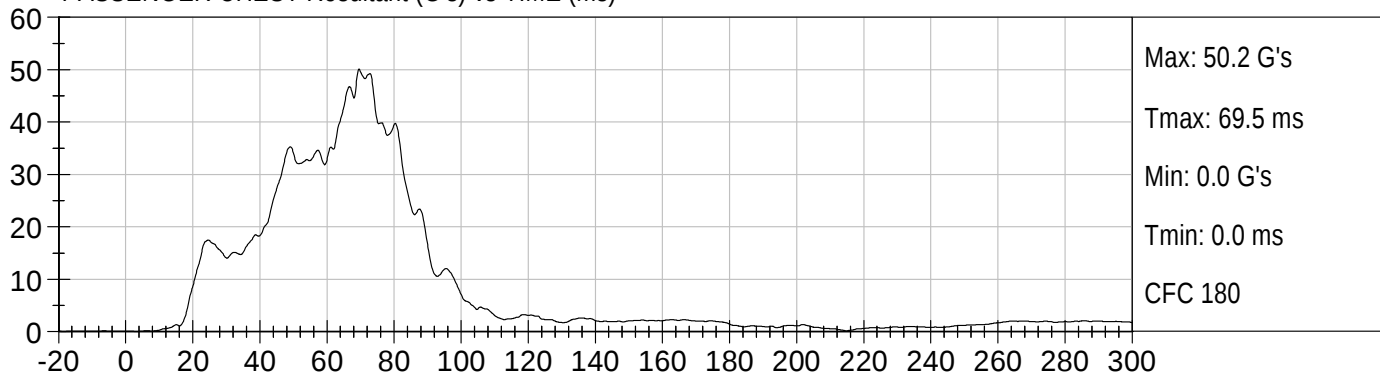
PASSENGER CHEST Y (G's) vs TIME (ms)

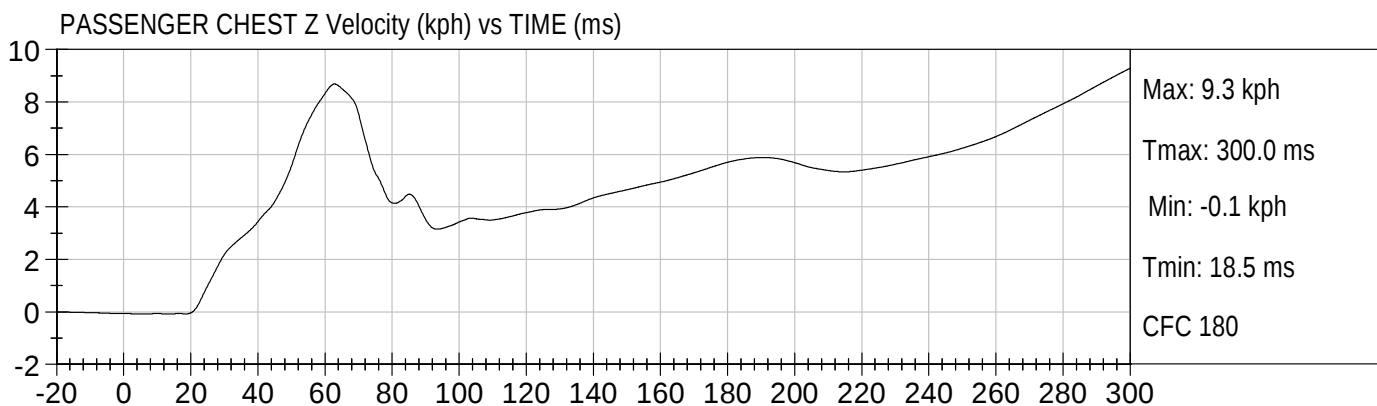
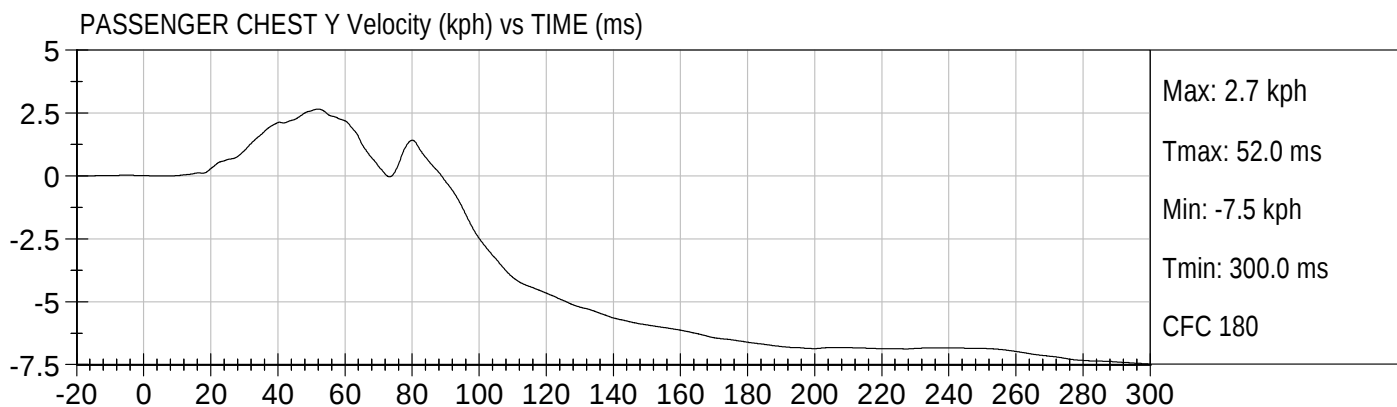
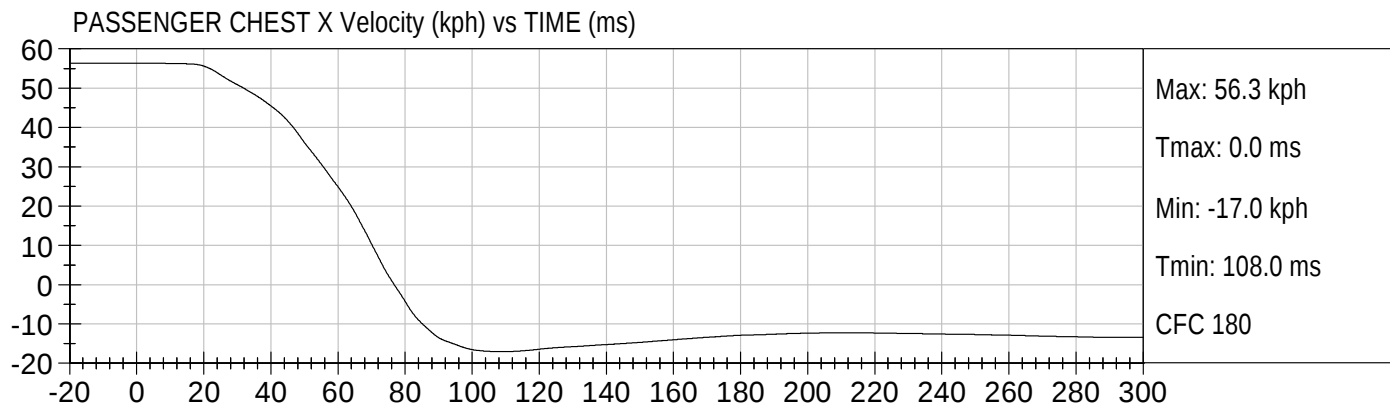


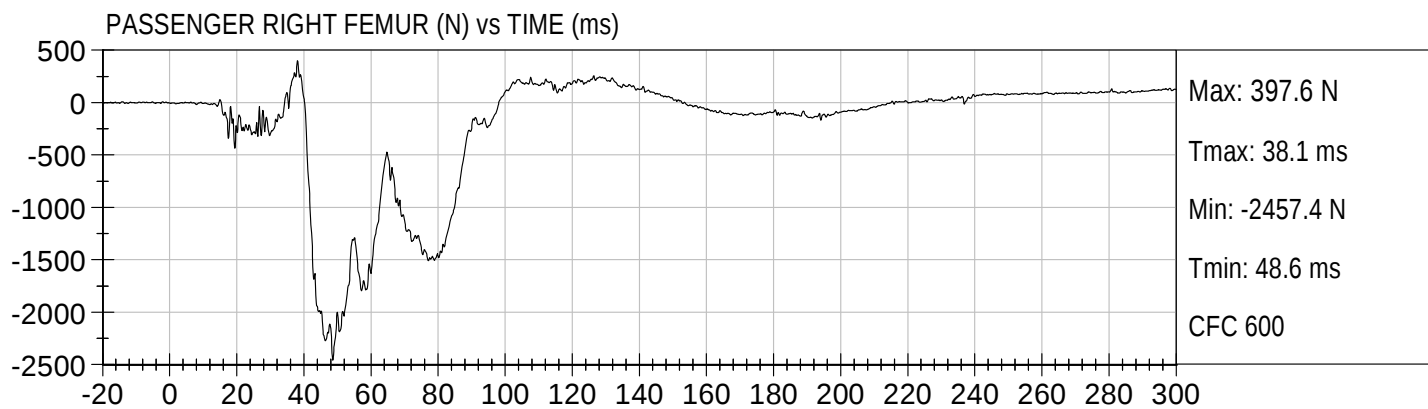
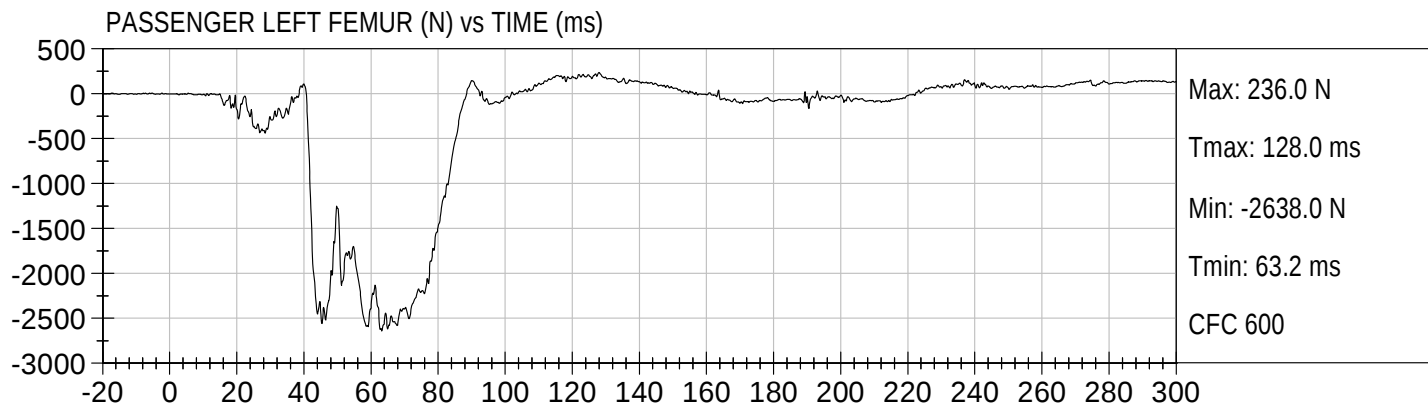
PASSENGER CHEST Z (G's) vs TIME (ms)



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







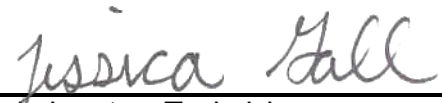
APPENDIX C
DUMMY CALIBRATION DATA

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

ATD Serial No: 066

Test ID: D091641

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Peak Resultant Acceleration	G's	225 - 275	229	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

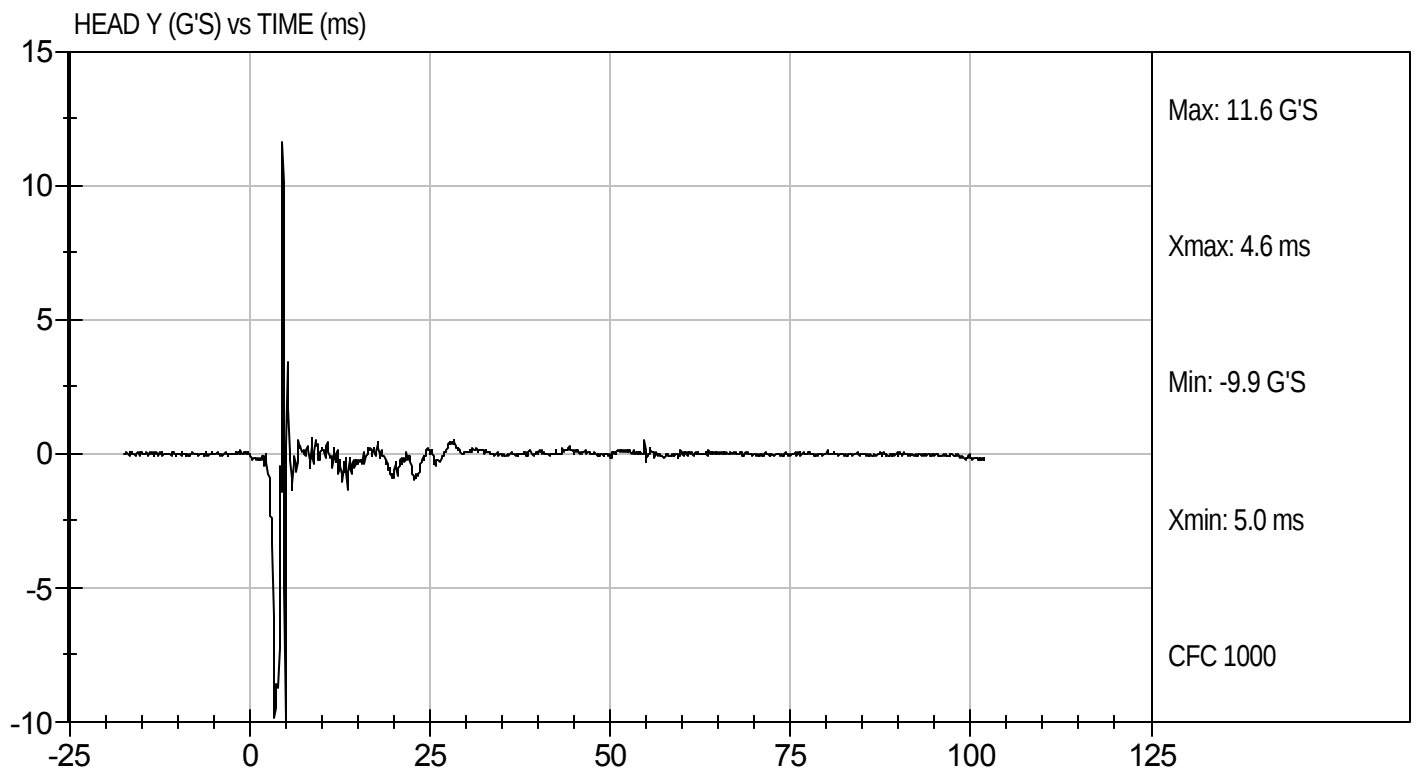
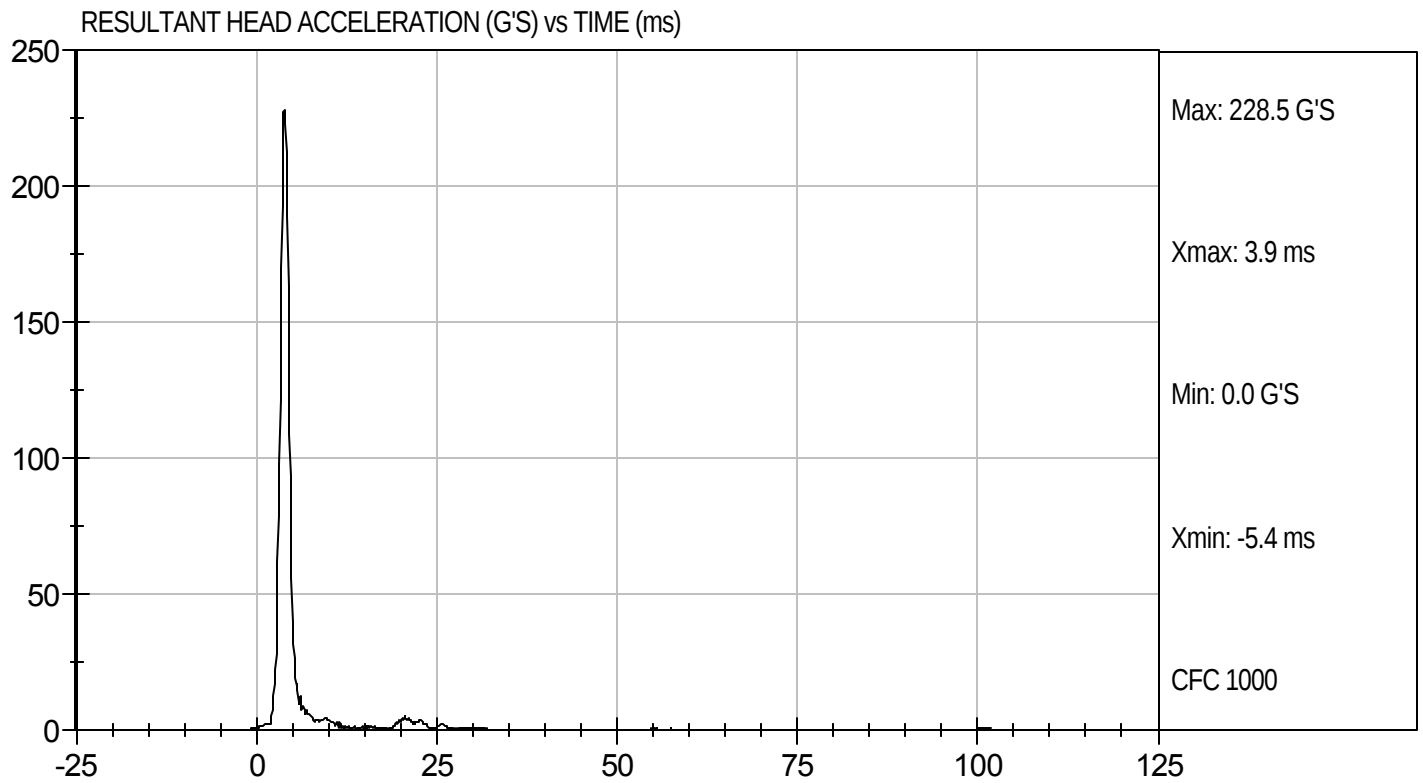
6/30/09
Test Date


Approved By



Test Desc: Head Drop
Component ID: D091641

Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s



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

ATD Serial No: 066

Test I.D: D091642

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	48	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.18	Pass
	20 msec	G's	17.60 to 22.60	19.84	Pass
	30 msec	G's	12.50 to 18.50	13.93	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	13.90	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	34.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.2	Pass
	Time	msec	57.0 to 64.0	57.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.2	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	103.4	Pass
	Time	msec	47.0 to 58.0	47.7	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.8	Pass
Overall Test Results					Pass


 Laboratory Technician

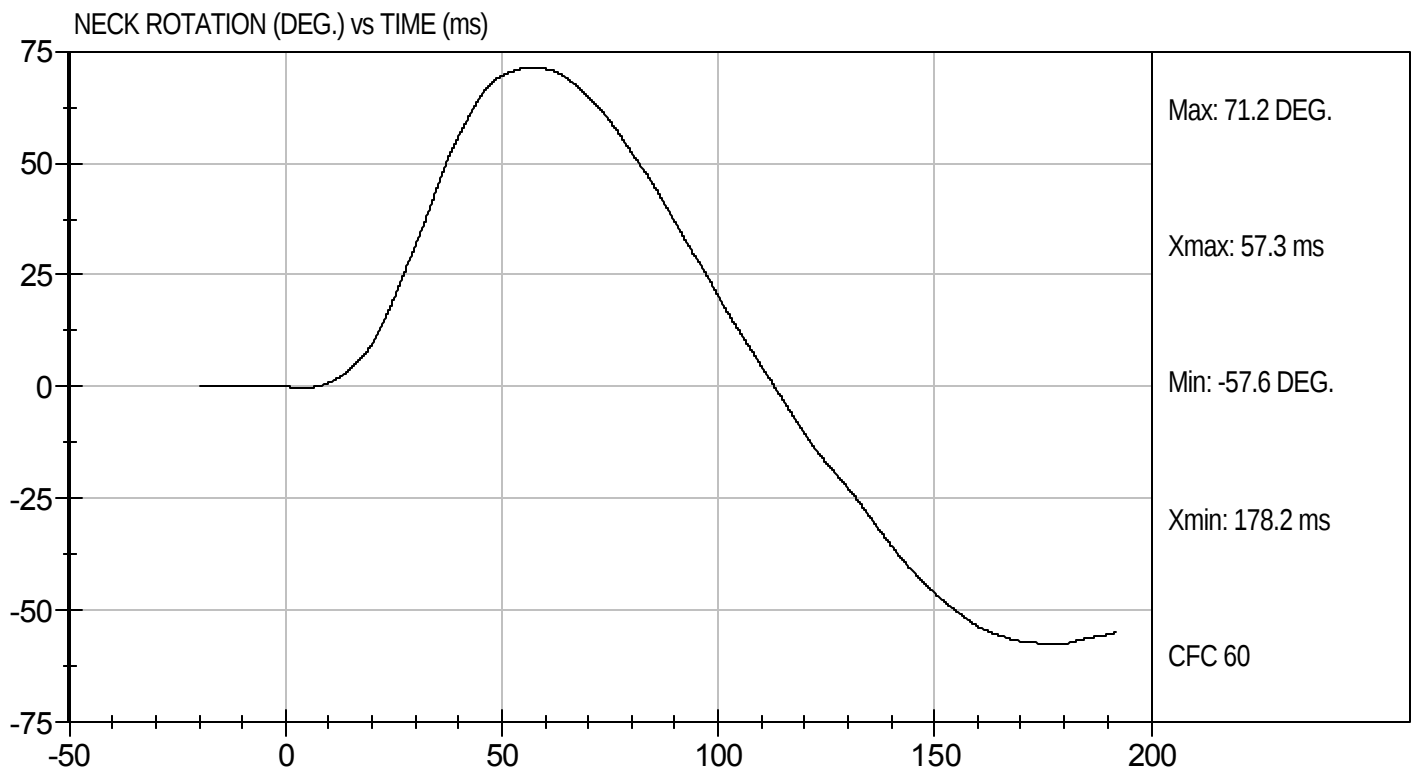
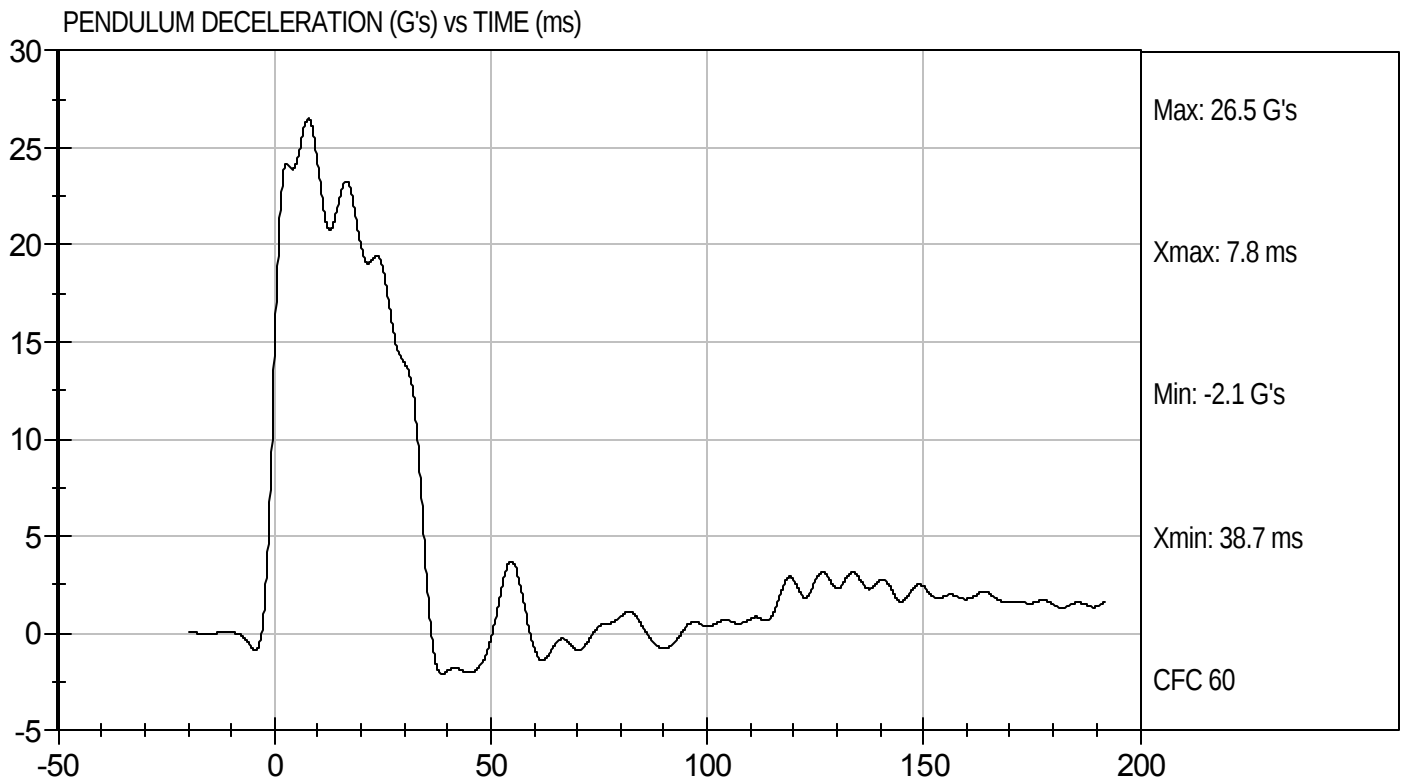
6/30/09
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D091642

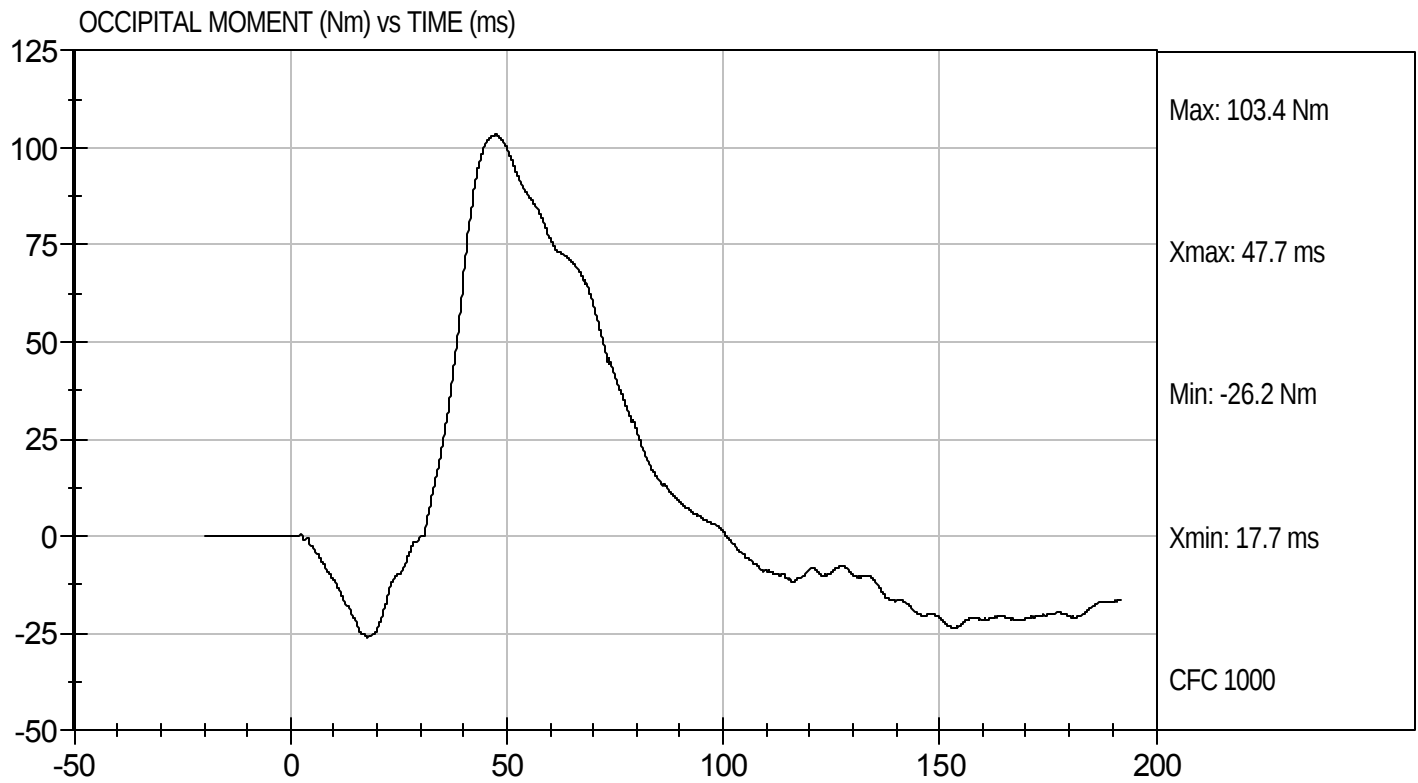
Test Date: 6/30/09
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D091642

Test Date: 6/30/09
Velocity: 23.15 ft/s, 7.06 m/s



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

ATD Serial No: 066

Test I.D: D091643

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	48	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.52	Pass
	20 msec	G's	14.00 to 19.00	17.44	Pass
	30 msec	G's	11.00 to 16.00	15.27	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	15.23	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.9	Pass
	Time	msec	72.0 to 82.0	77.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	156.0	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-68.1	Pass
	Time	msec	65.0 to 79.0	68.2	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	146.0	Pass
Overall Test Results					Pass


 Laboratory Technician

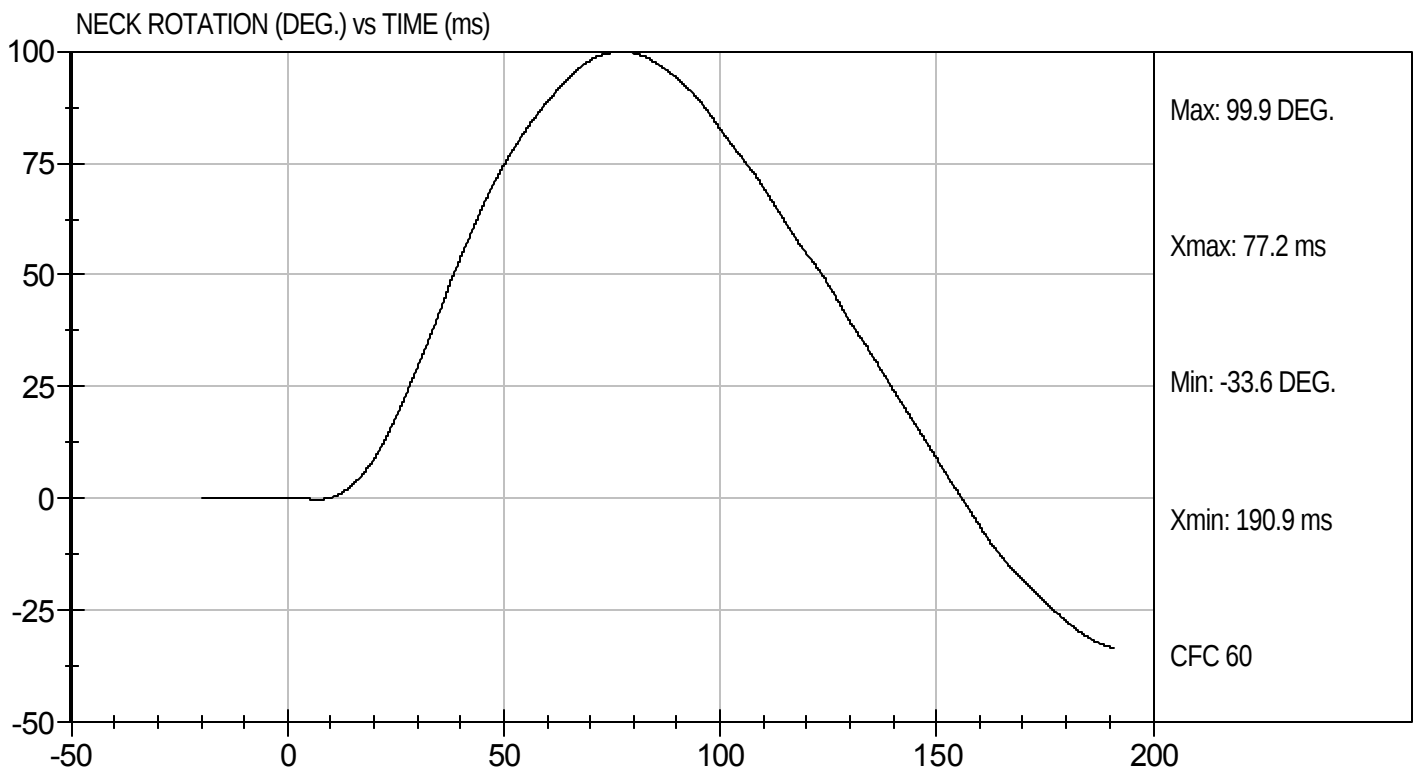
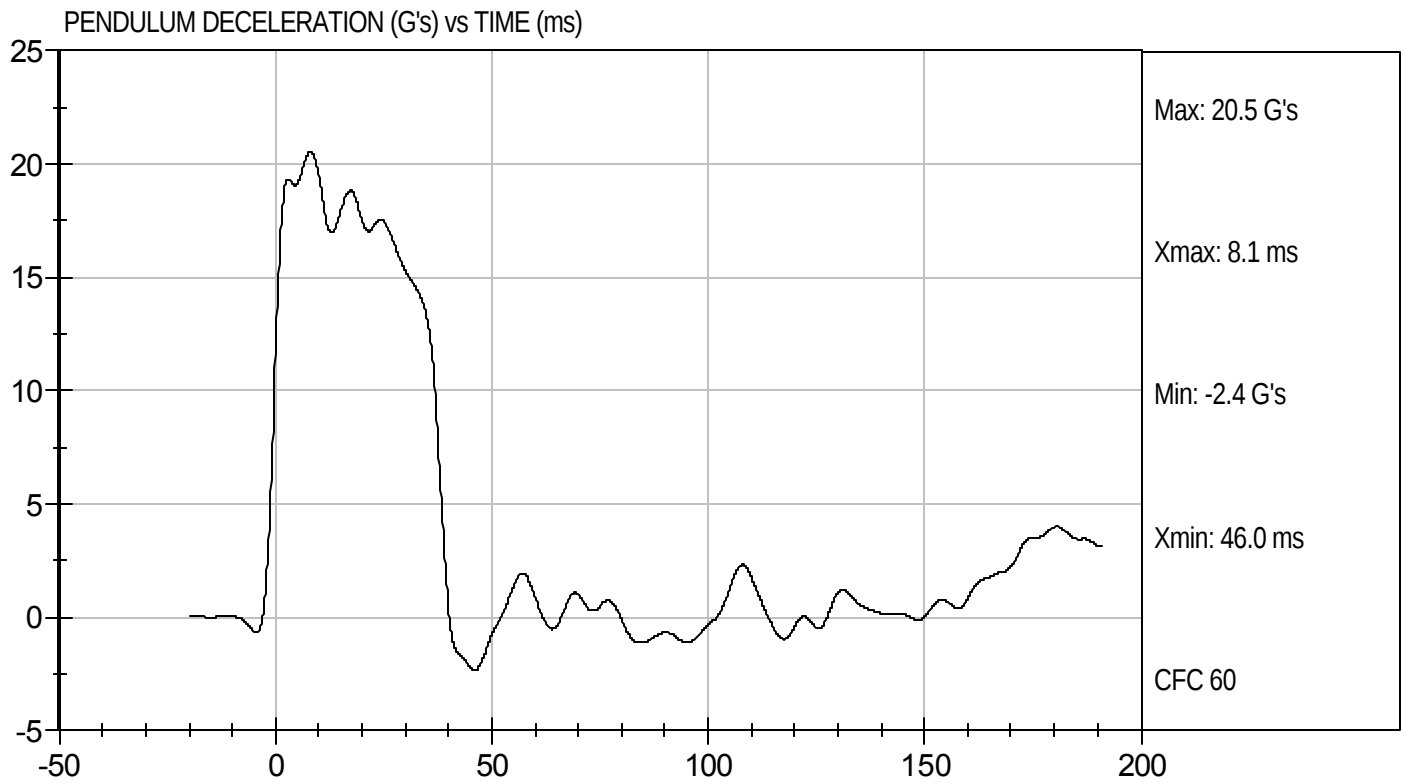
6/30/09
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D091643

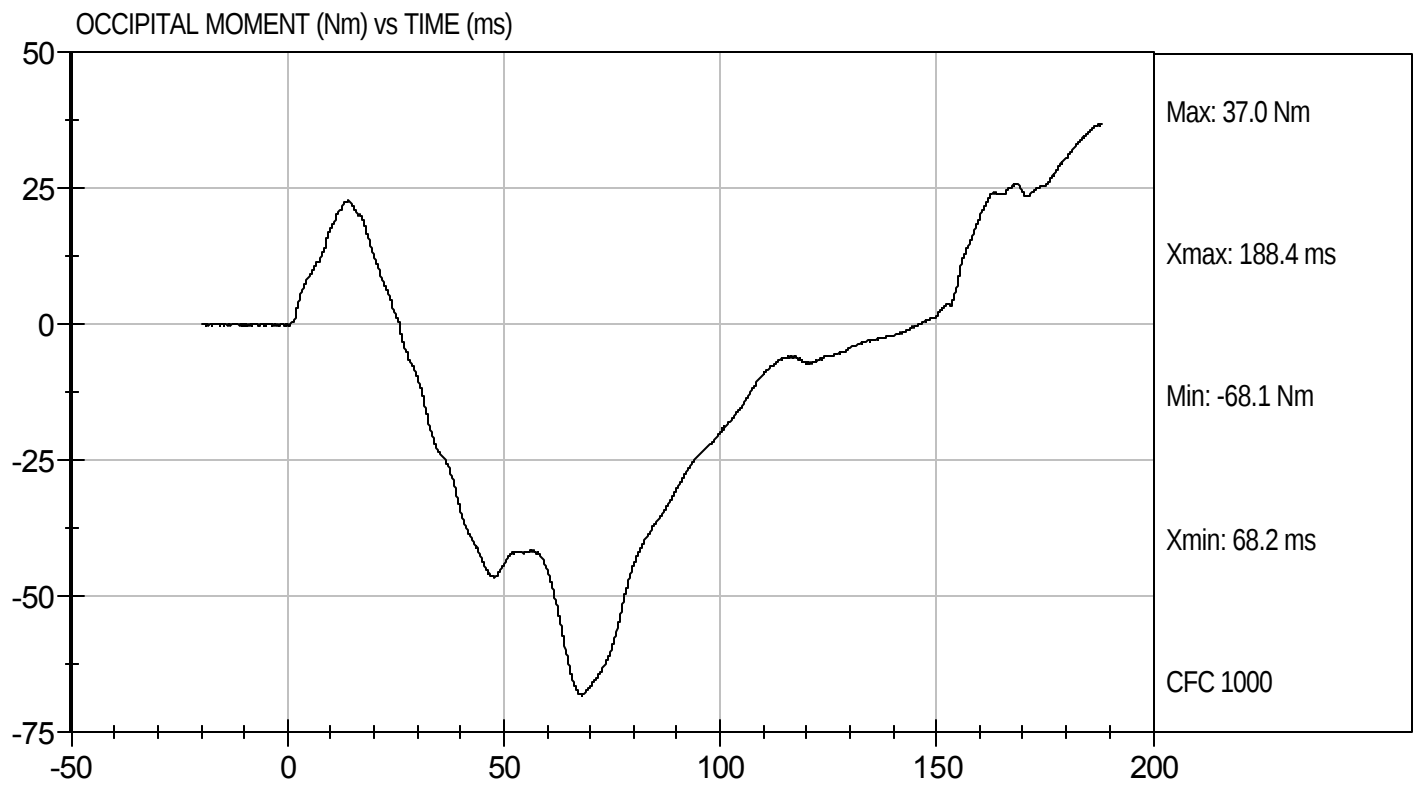
Test Date: 6/30/09
Velocity: 20.20 ft/s, 6.16 m/s





Test Desc: Neck Extension
Component ID: D091643

Test Date: 6/30/09
Velocity: 20.20 ft/s, 6.16 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D091644

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
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,415	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.52	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

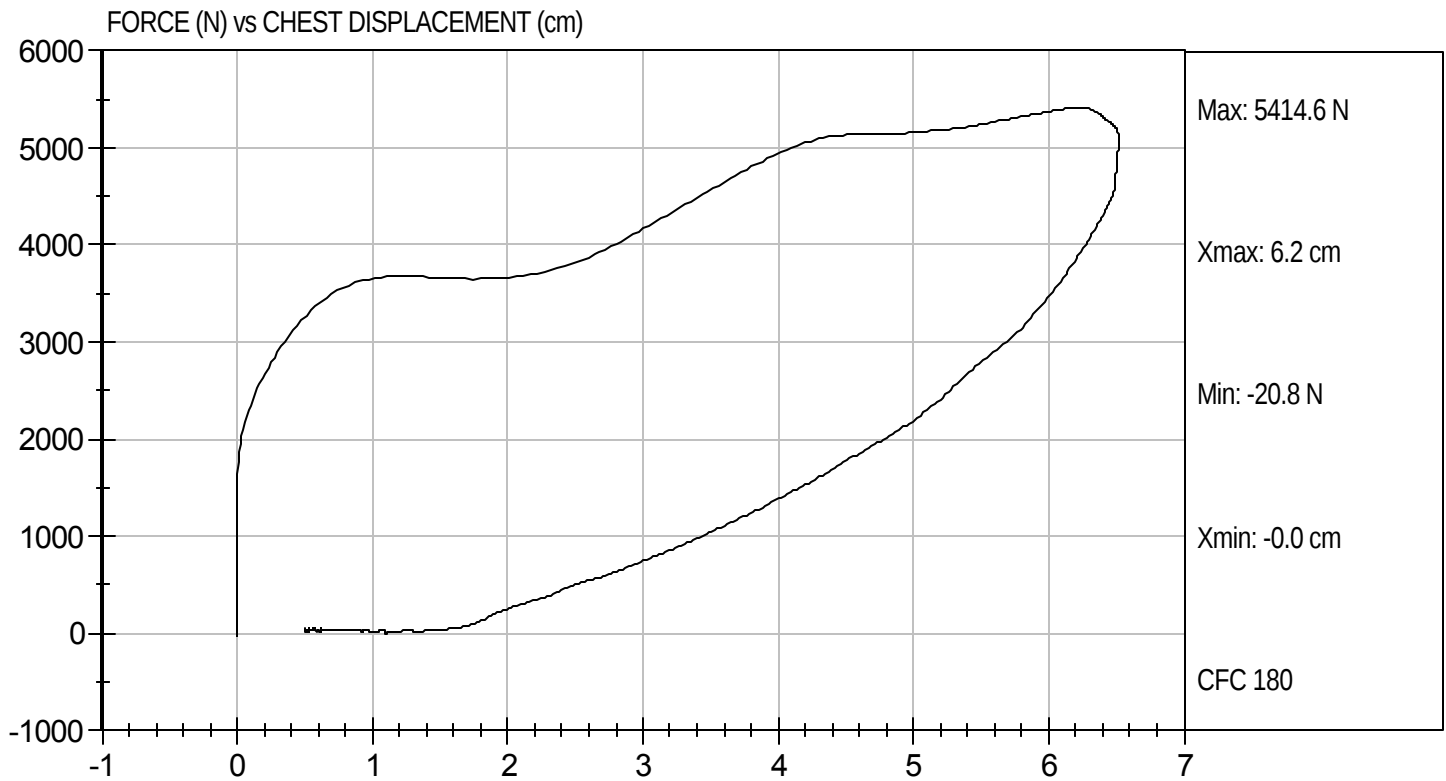
7/1/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D091644

Test Date: 7/1/09
Velocity: 21.93 ft/s, 6.68 m/s



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

ATD Serial No: 066

Test I.D: D091645

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,430	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

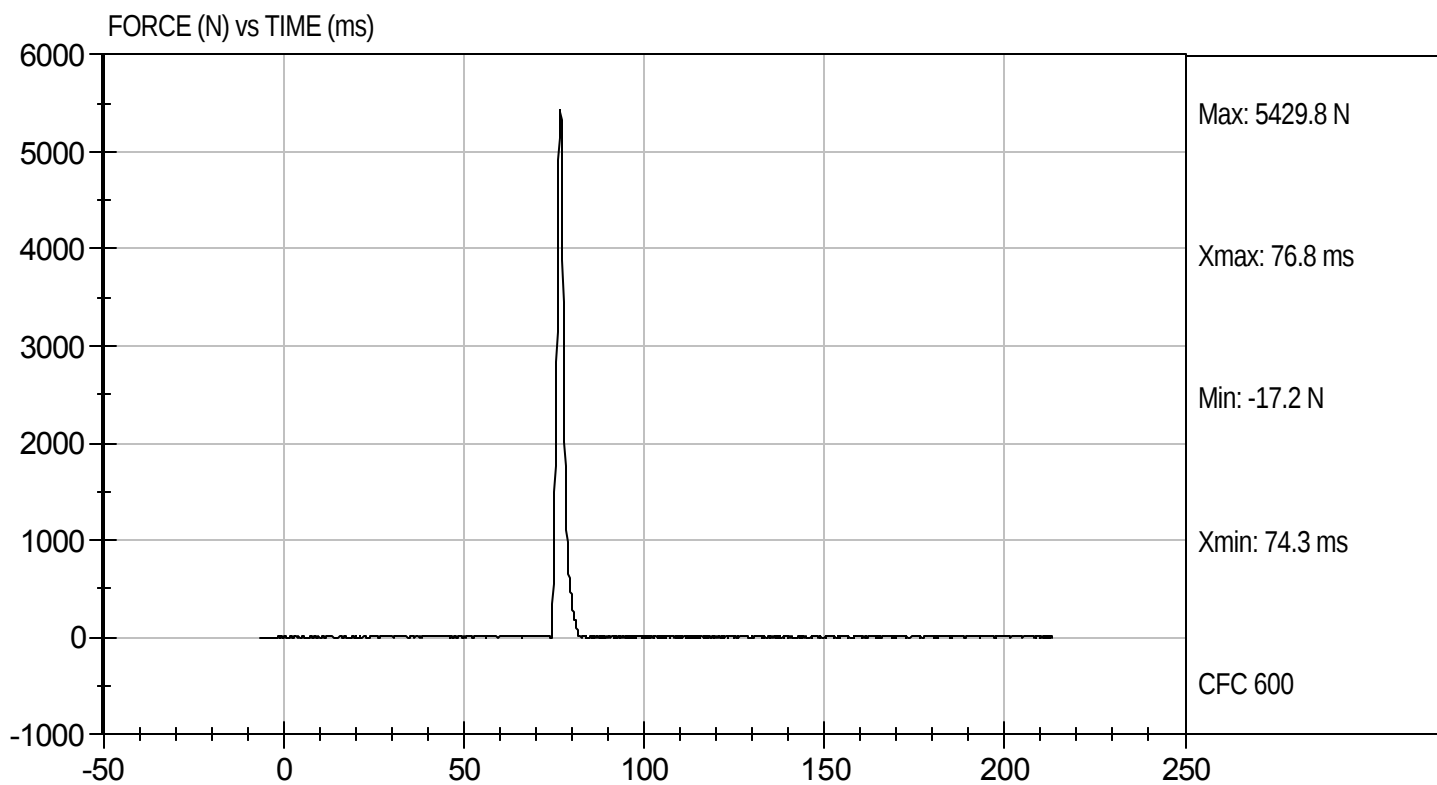
6/30/09
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D091645

Test Date: 6/30/09
Velocity: 6.97 ft/s, 2.12 m/s

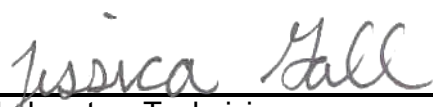


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D091646

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,073	Pass
Overall Test Results				Pass



Laboratory Technician

6/30/09

Test Date

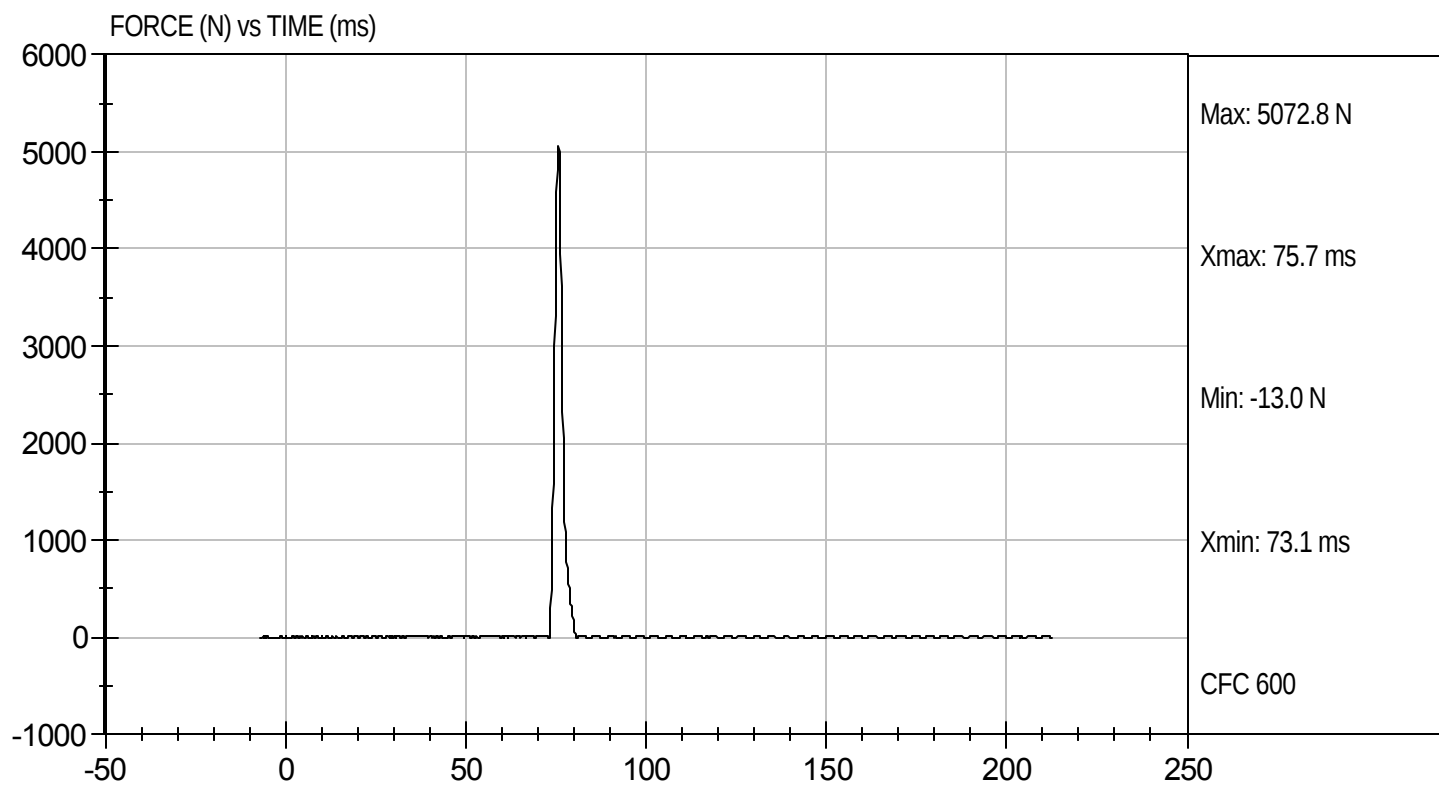


Approved By



Test Desc: Left Knee
Component ID: D091646

Test Date: 6/30/09
Velocity: 6.97 ft/s, 2.12 m/s



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

ATD Serial No: 066

Test I.D: D091640

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.2	22.2	Pass
Laboratory Relative Humidity	%	10 to 70	44	44	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	80.9	88.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	41	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

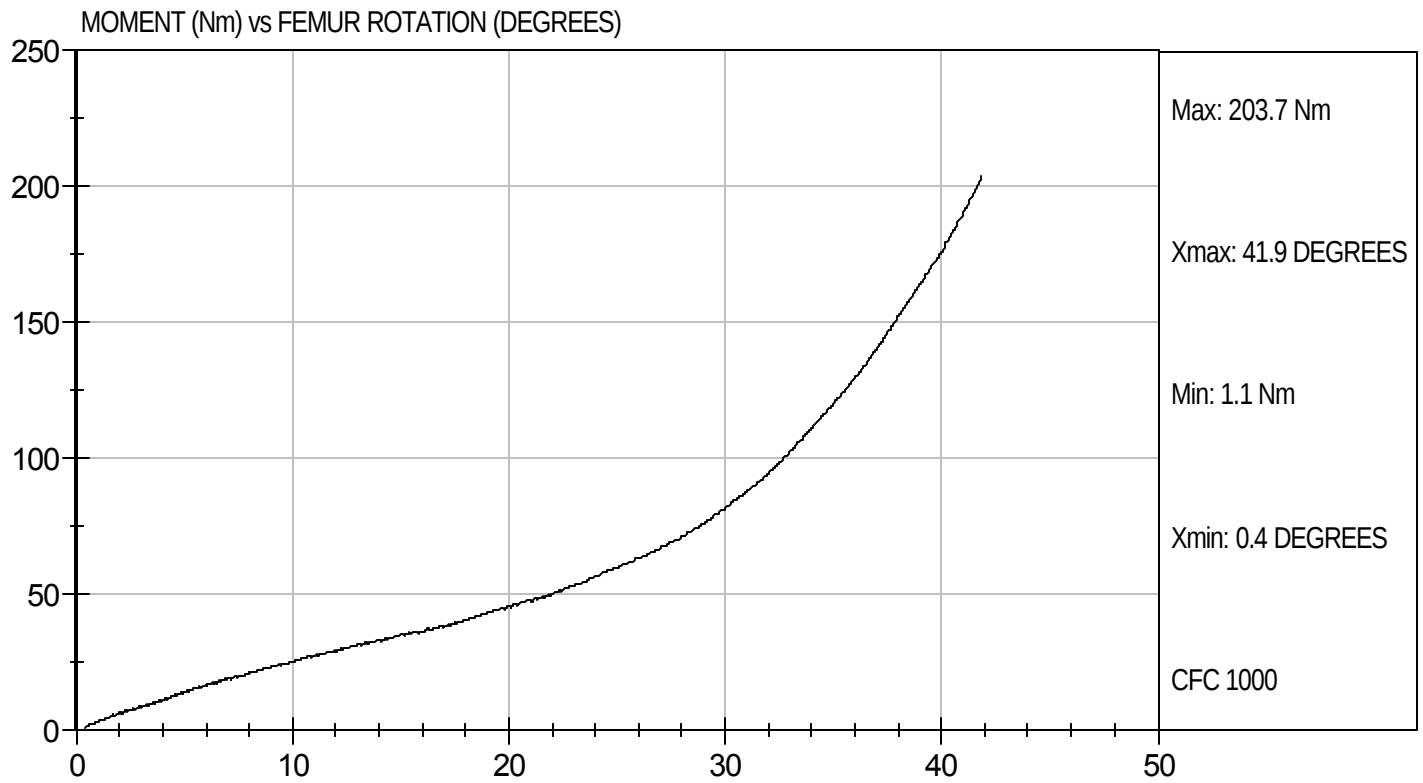
6/30/09
Test Date

David Winkelbauer
Approved By



Test Desc: Hip Femur Flexion
Component ID: D091649

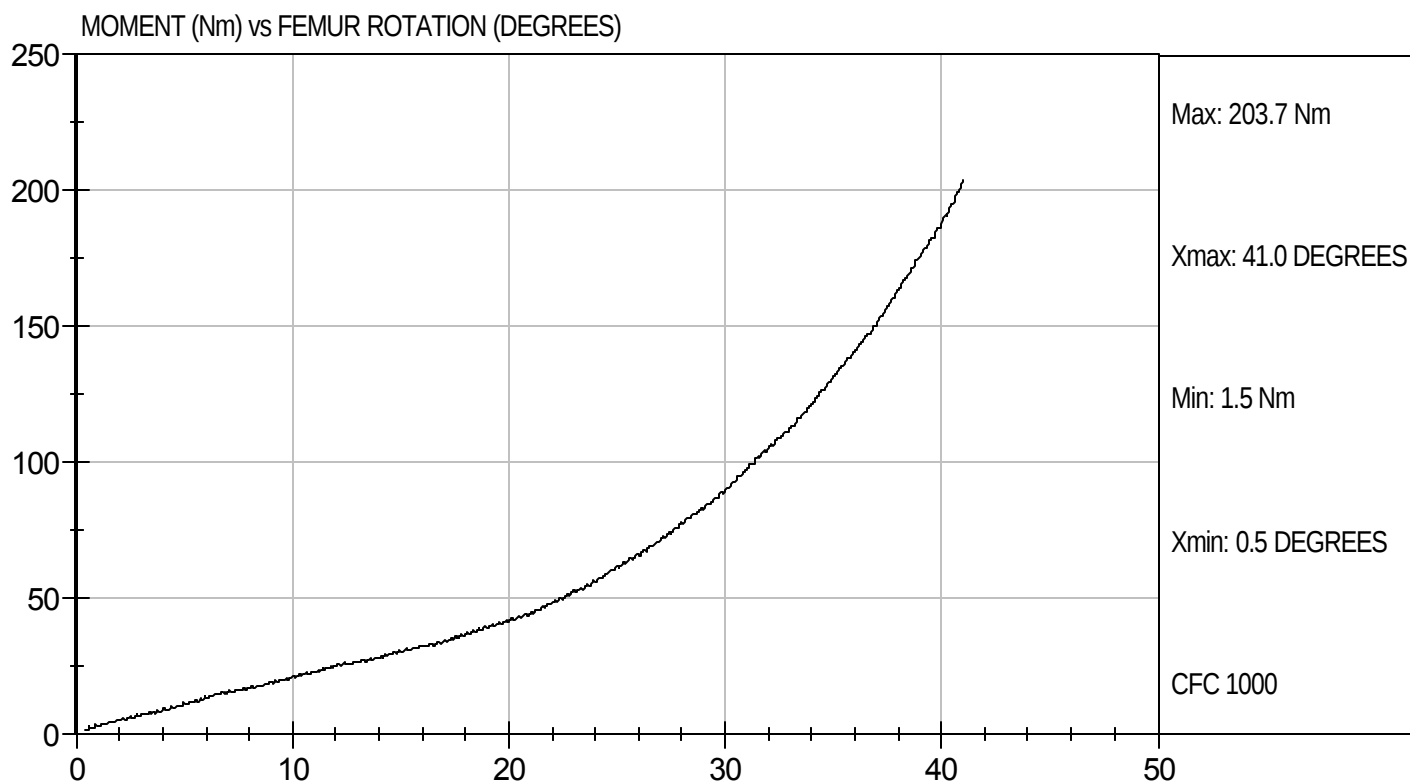
Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D091640

Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s

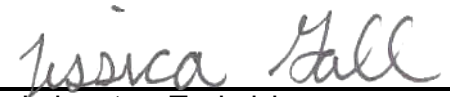


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test ID: D091631

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Peak Resultant Acceleration	G's	225 - 275	229	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	9.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

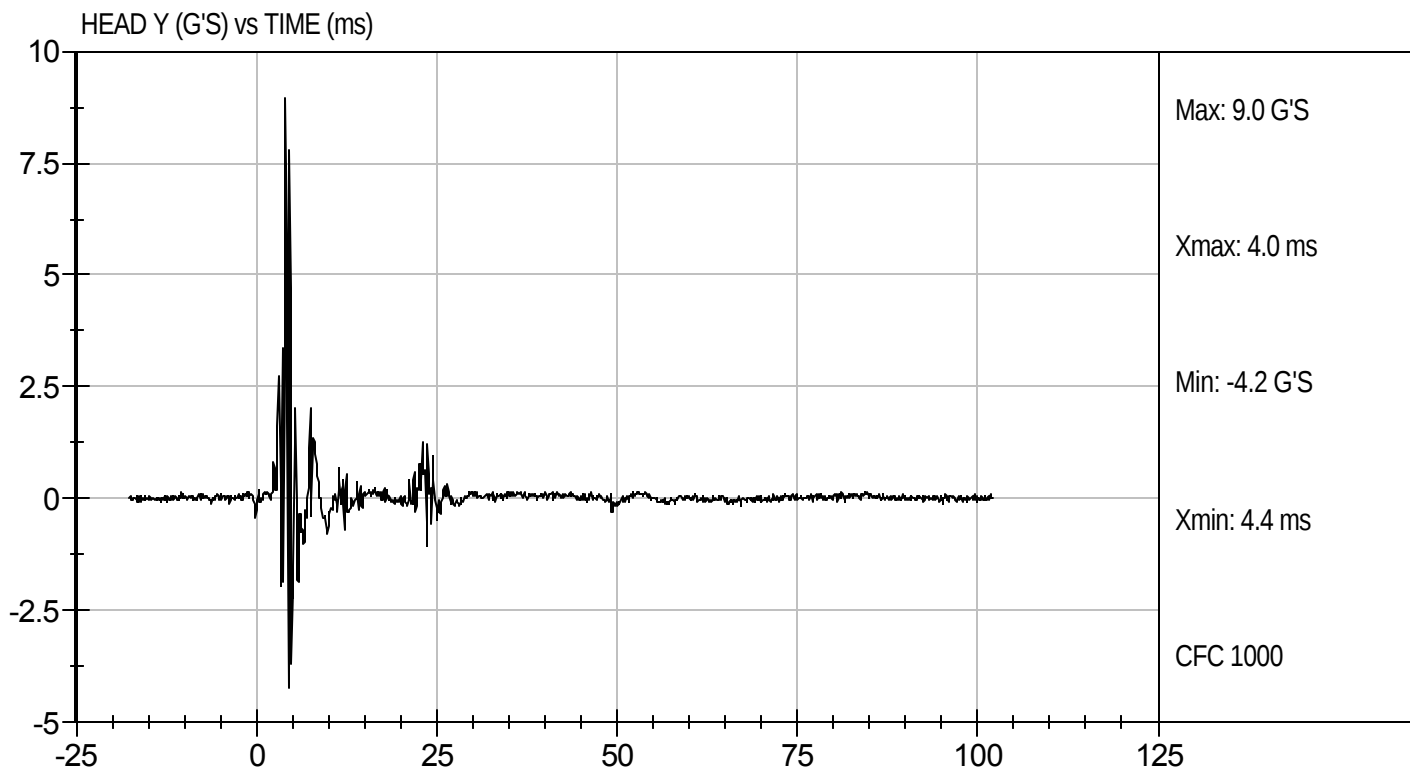
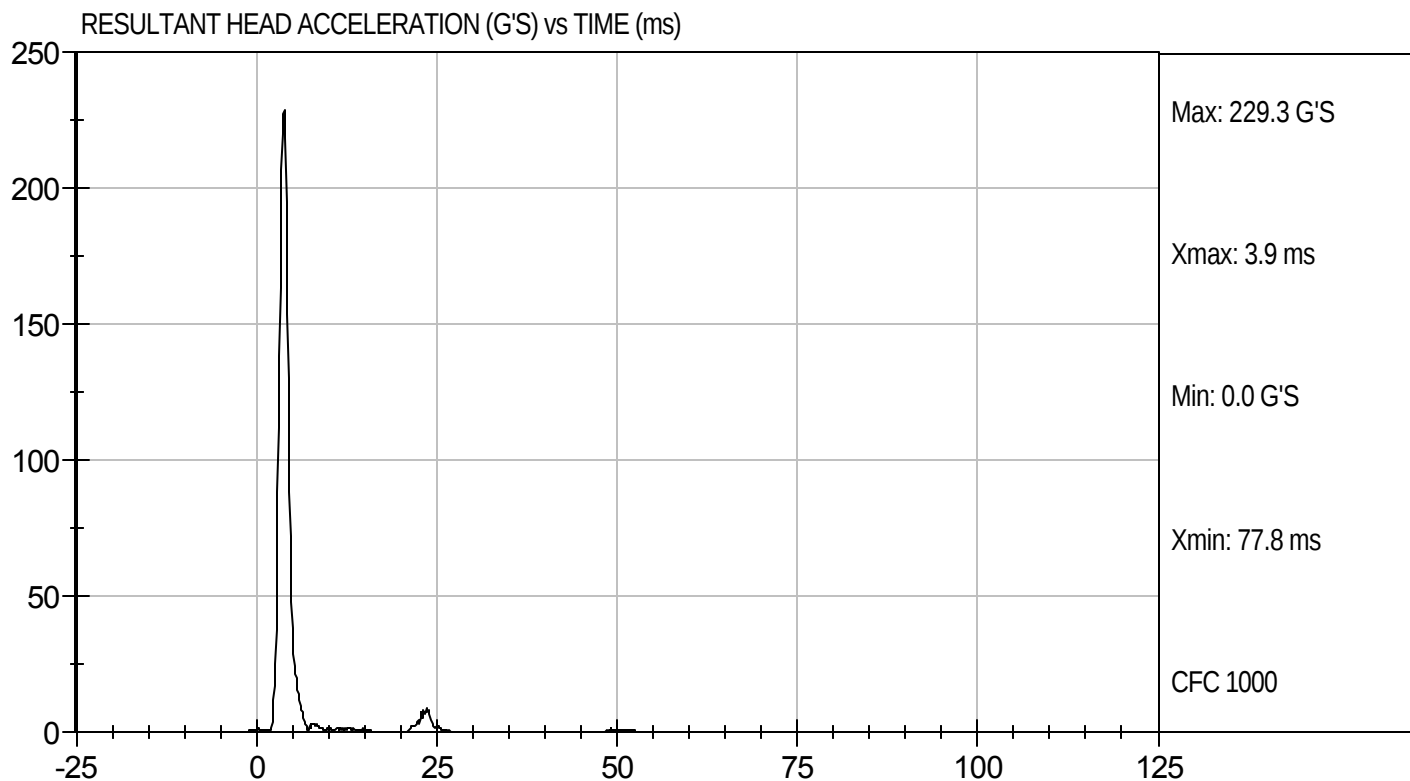
6/30/09
Test Date


Approved By



Test Desc: Head Drop
Component ID: D091631

Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s

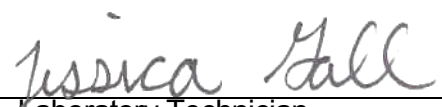


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D091632

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	48	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.58	Pass
	20 msec	G's	17.60 to 22.60	20.96	Pass
	30 msec	G's	12.50 to 18.50	14.55	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.47	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	34.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	68.2	Pass
	Time	msec	57.0 to 64.0	57.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.5	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	97.6	Pass
	Time	msec	47.0 to 58.0	47.4	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	98.0	Pass
Overall Test Results					Pass


 Laboratory Technician

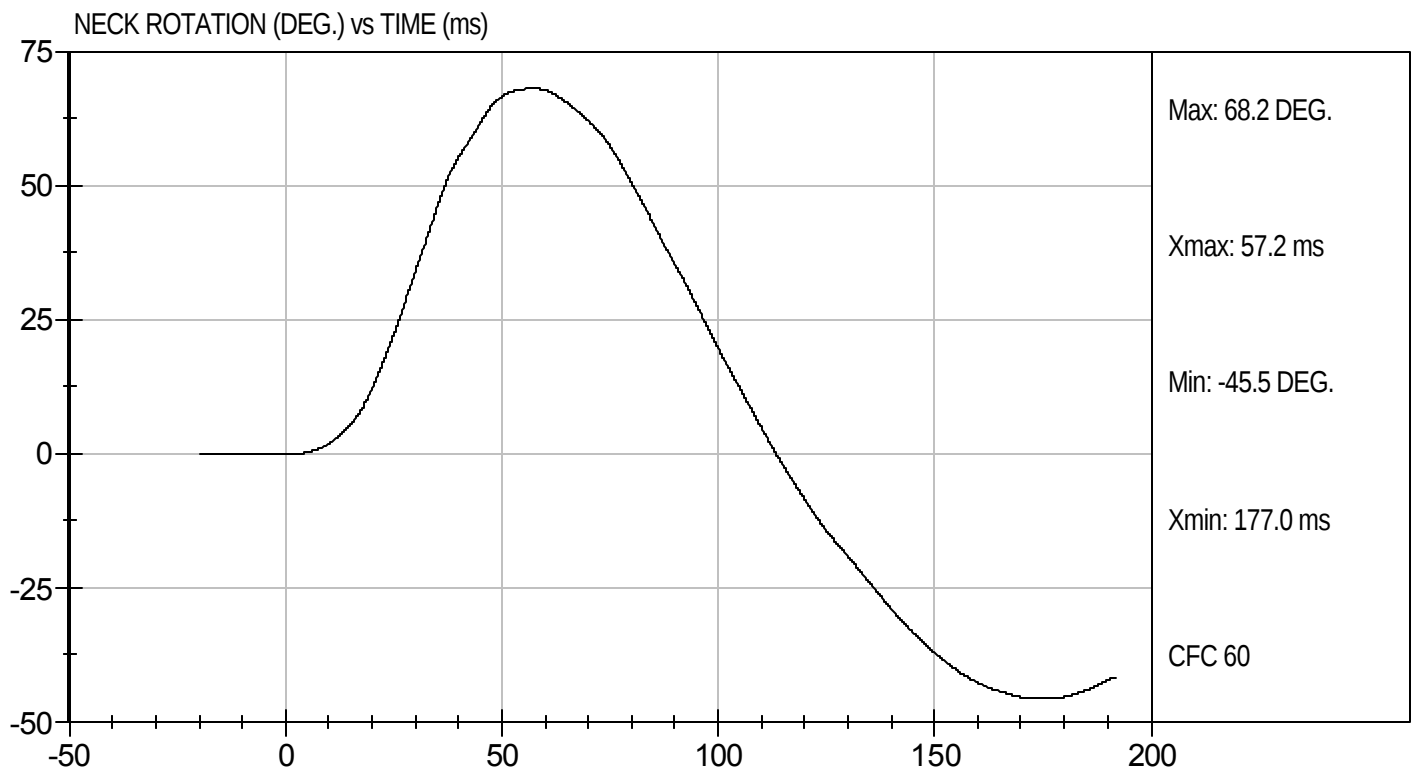
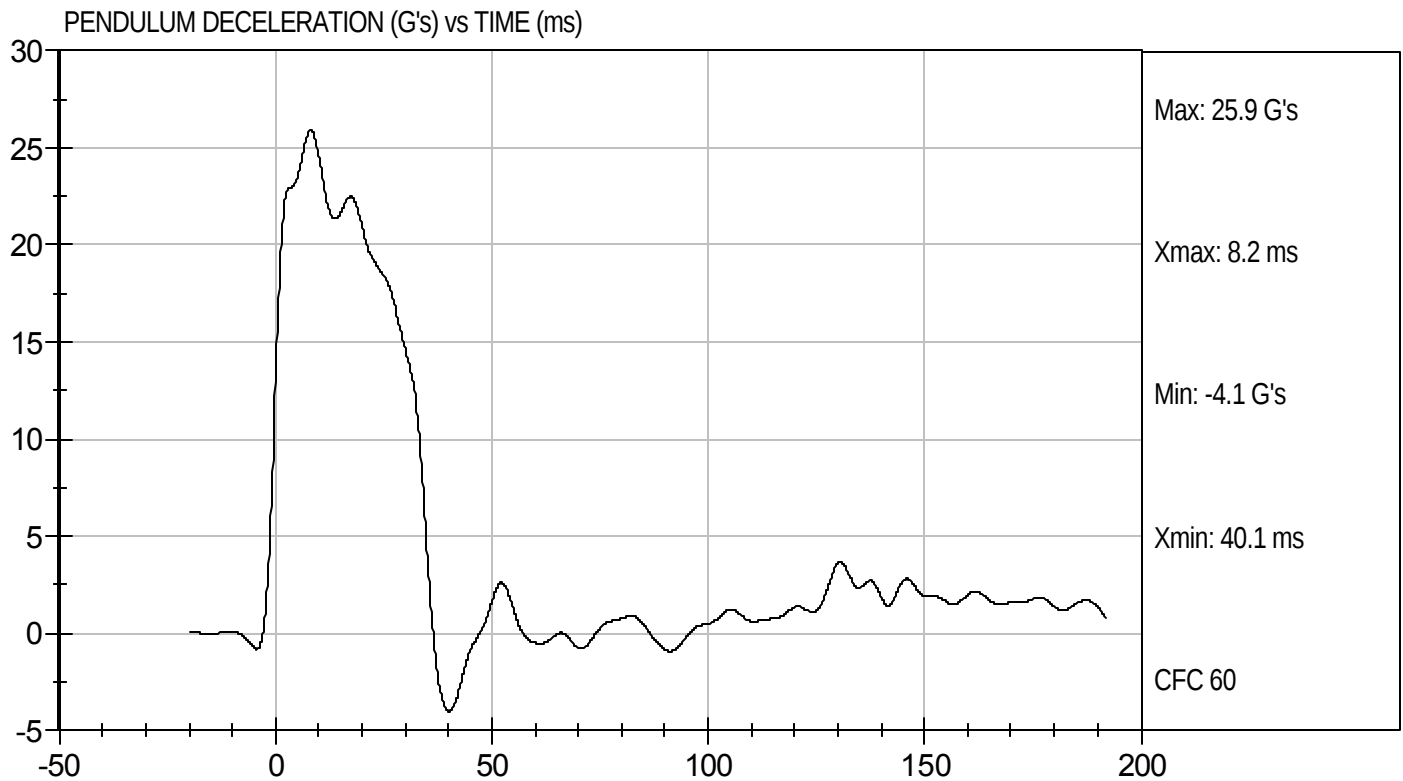
6/30/09
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D091632

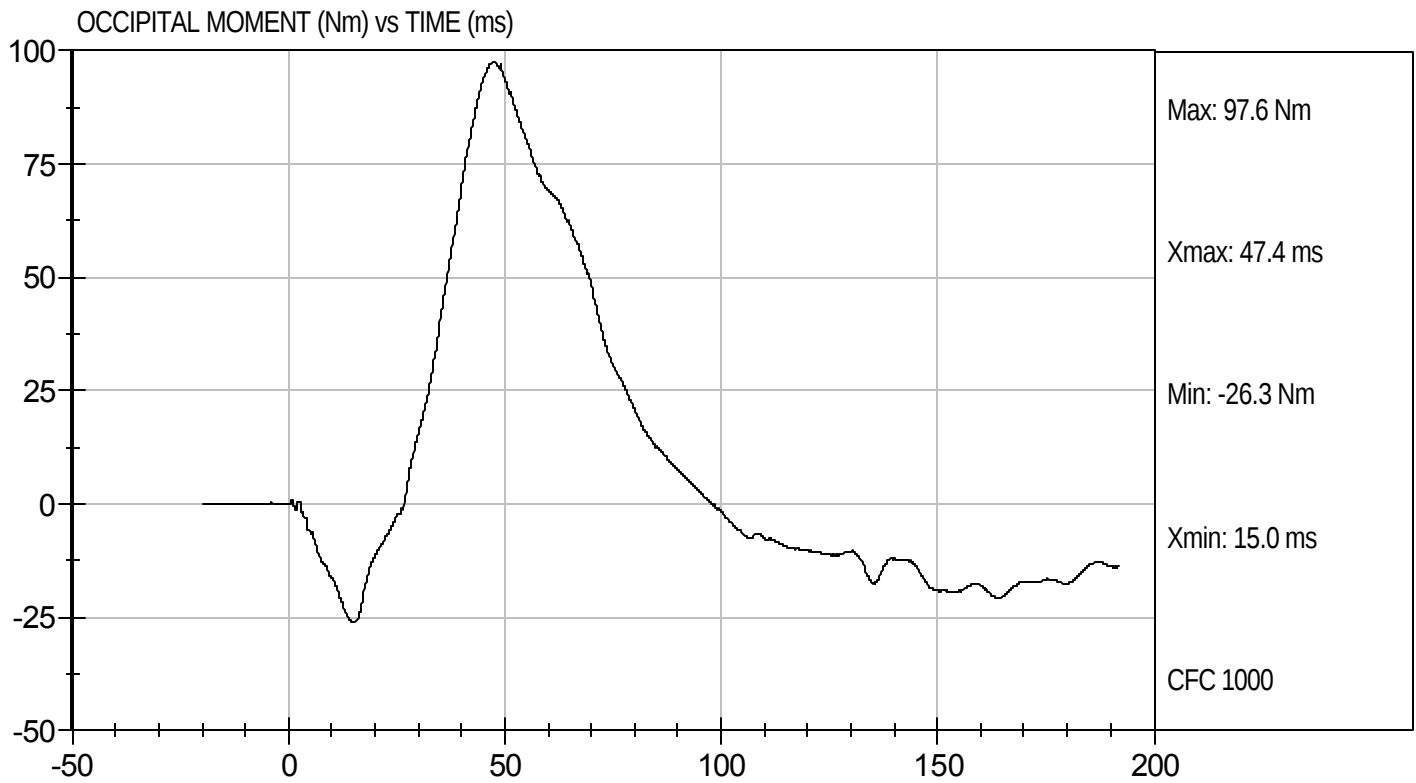
Test Date: 6/30/09
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D091632

Test Date: 6/30/09
Velocity: 23.15 ft/s, 7.06 m/s

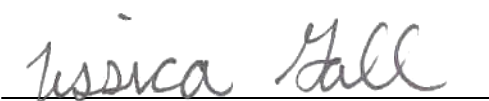


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D091633

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	48	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.09	Pass
	20 msec	G's	14.00 to 19.00	16.23	Pass
	30 msec	G's	11.00 to 16.00	14.67	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	14.61	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.9	Pass
	Time	msec	72.0 to 82.0	76.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	158.5	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-68.0	Pass
	Time	msec	65.0 to 79.0	70.5	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	143.5	Pass
Overall Test Results					Pass


 Laboratory Technician

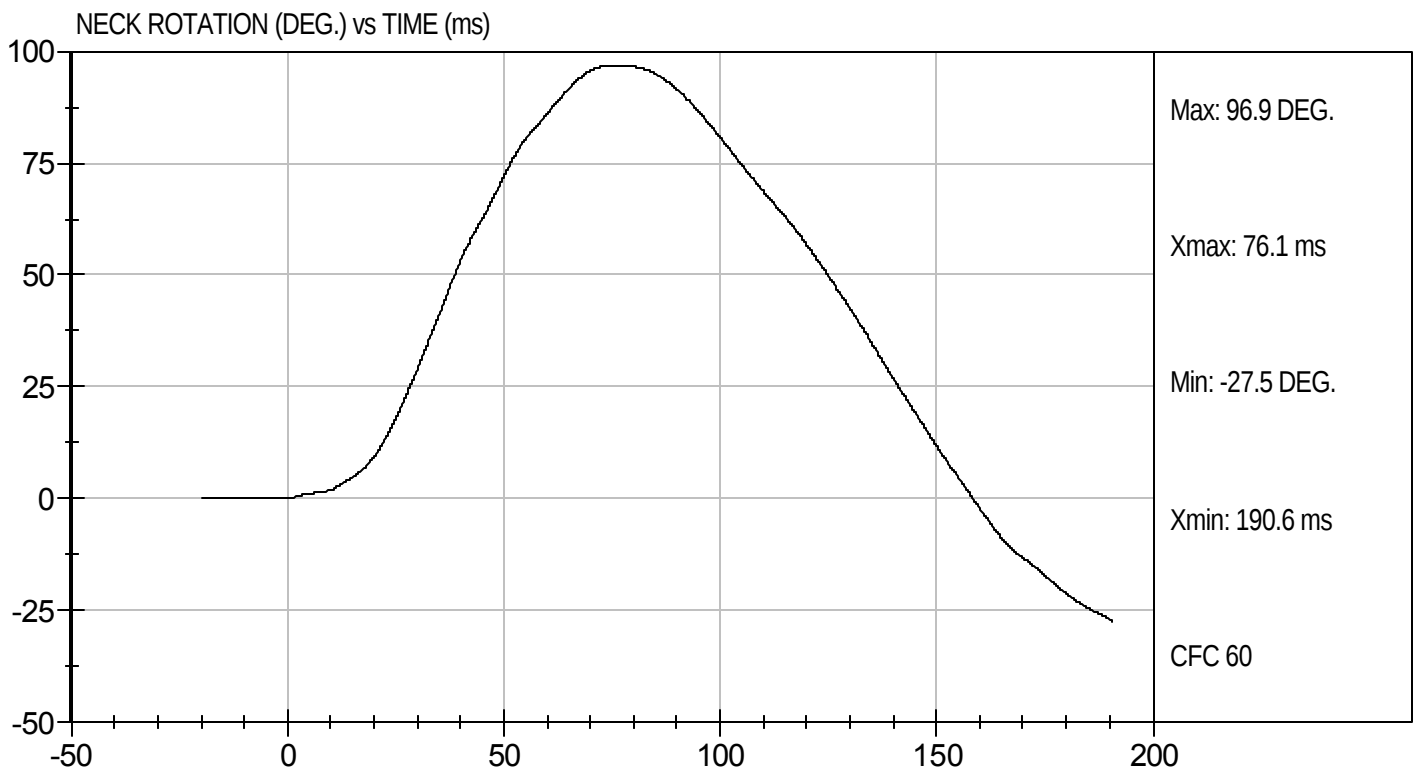
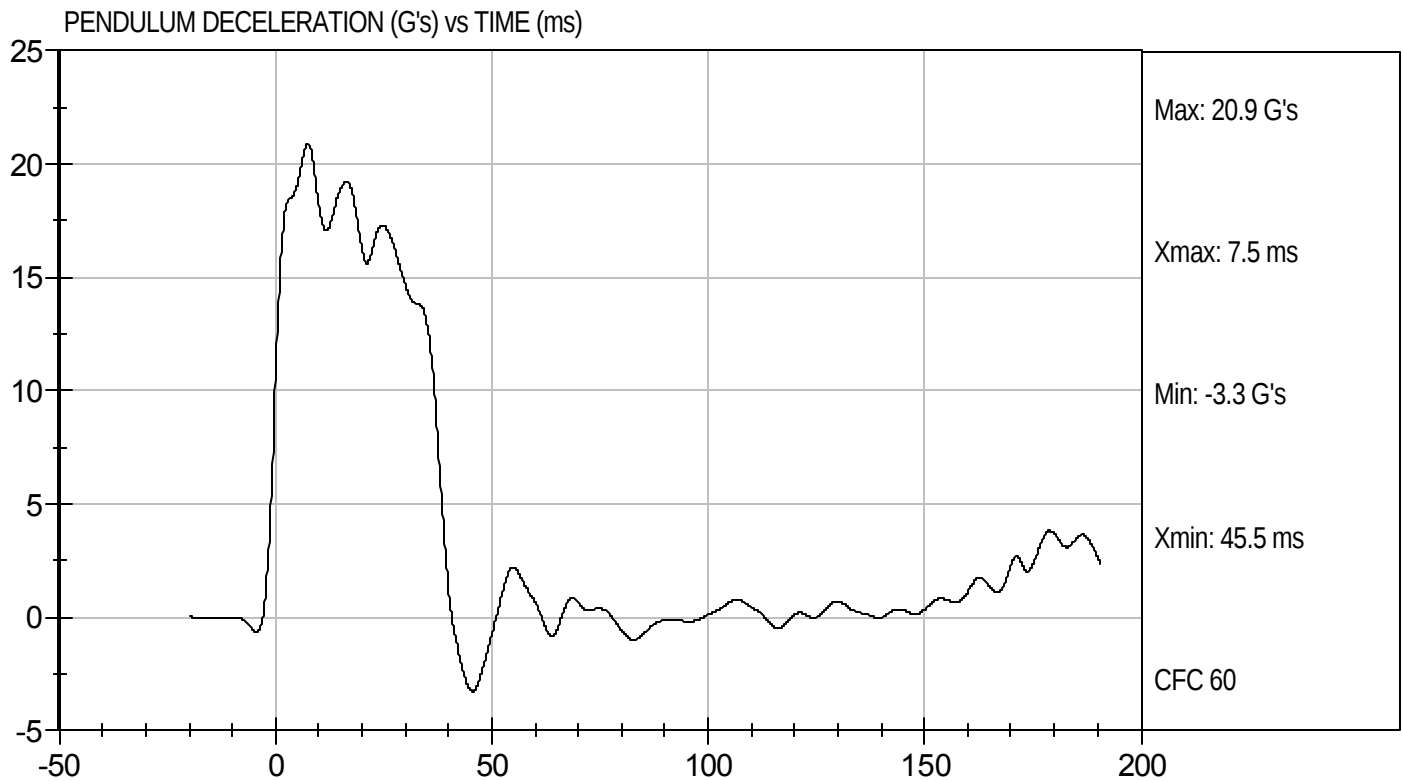
6/30/09
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D091633

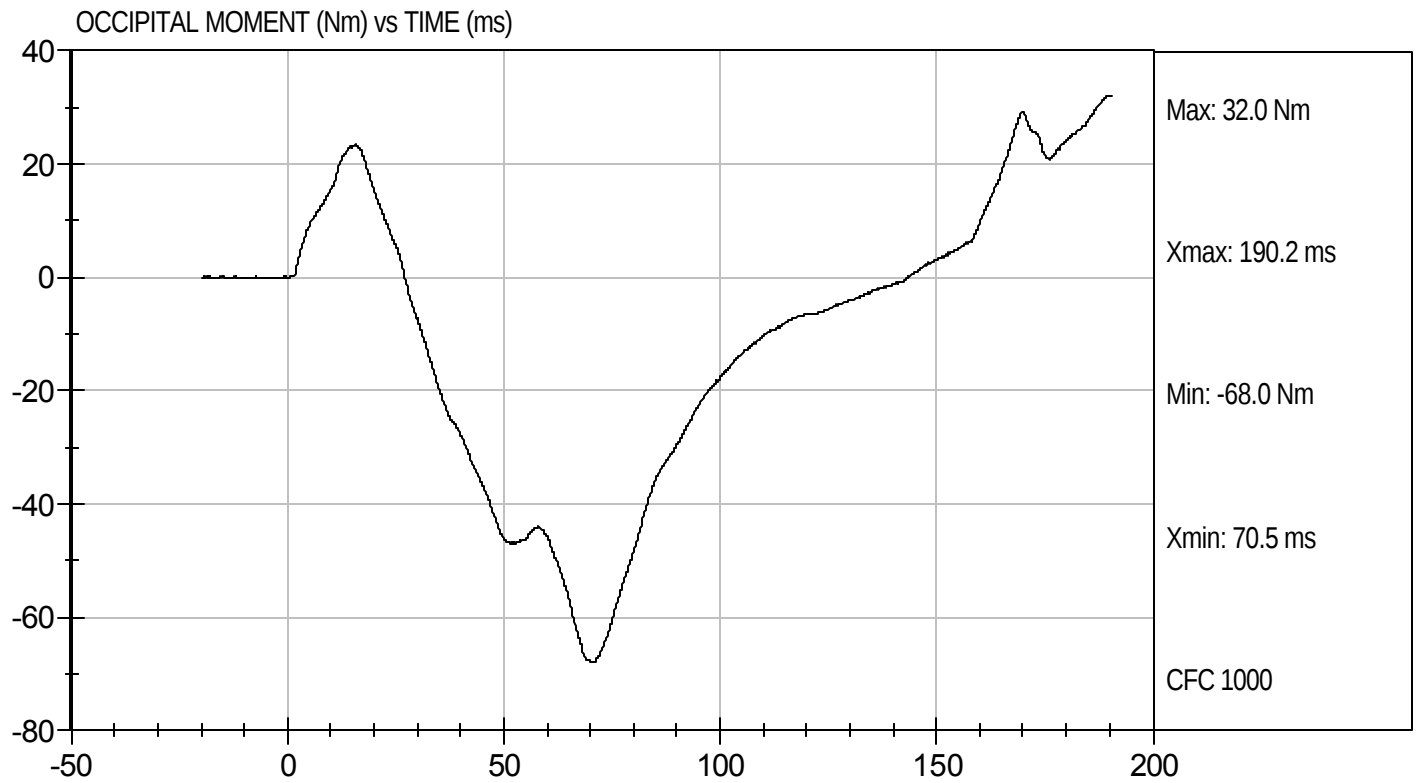
Test Date: 6/30/09
Velocity: 20.20 ft/s, 6.16 m/s





Test Desc: Neck Extension
Component ID: D091633

Test Date: 6/30/09
Velocity: 20.20 ft/s, 6.16 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D091634

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
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,392	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.89	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

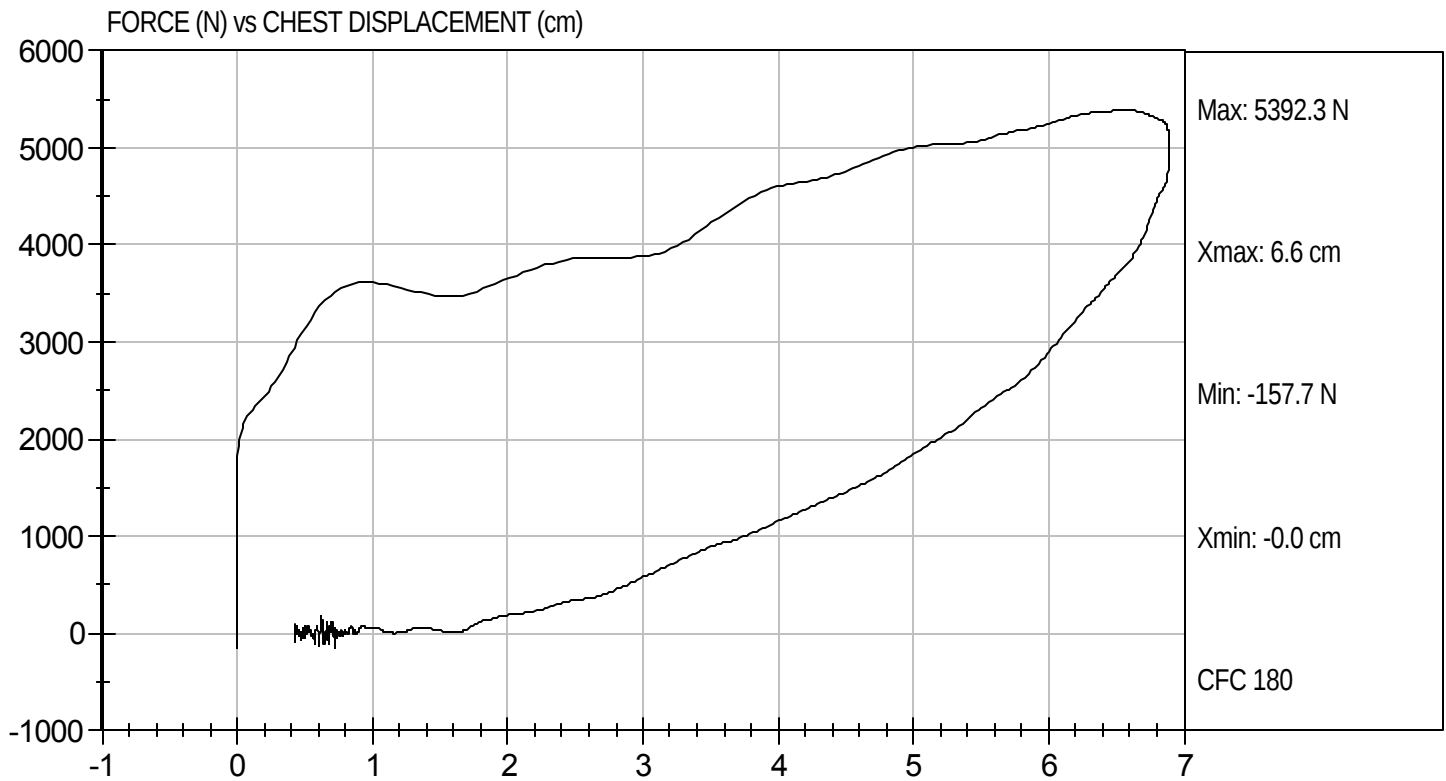
7/1/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D091634

Test Date: 7/1/09
Velocity: 21.93 ft/s, 6.68 m/s

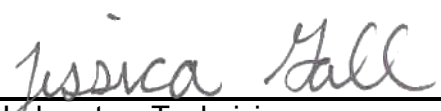


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D091635

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.07	Pass
Peak Probe Force	Newtons	4715 to 5782	5,328	Pass
Overall Test Results				Pass



Laboratory Technician

6/30/09
Test Date

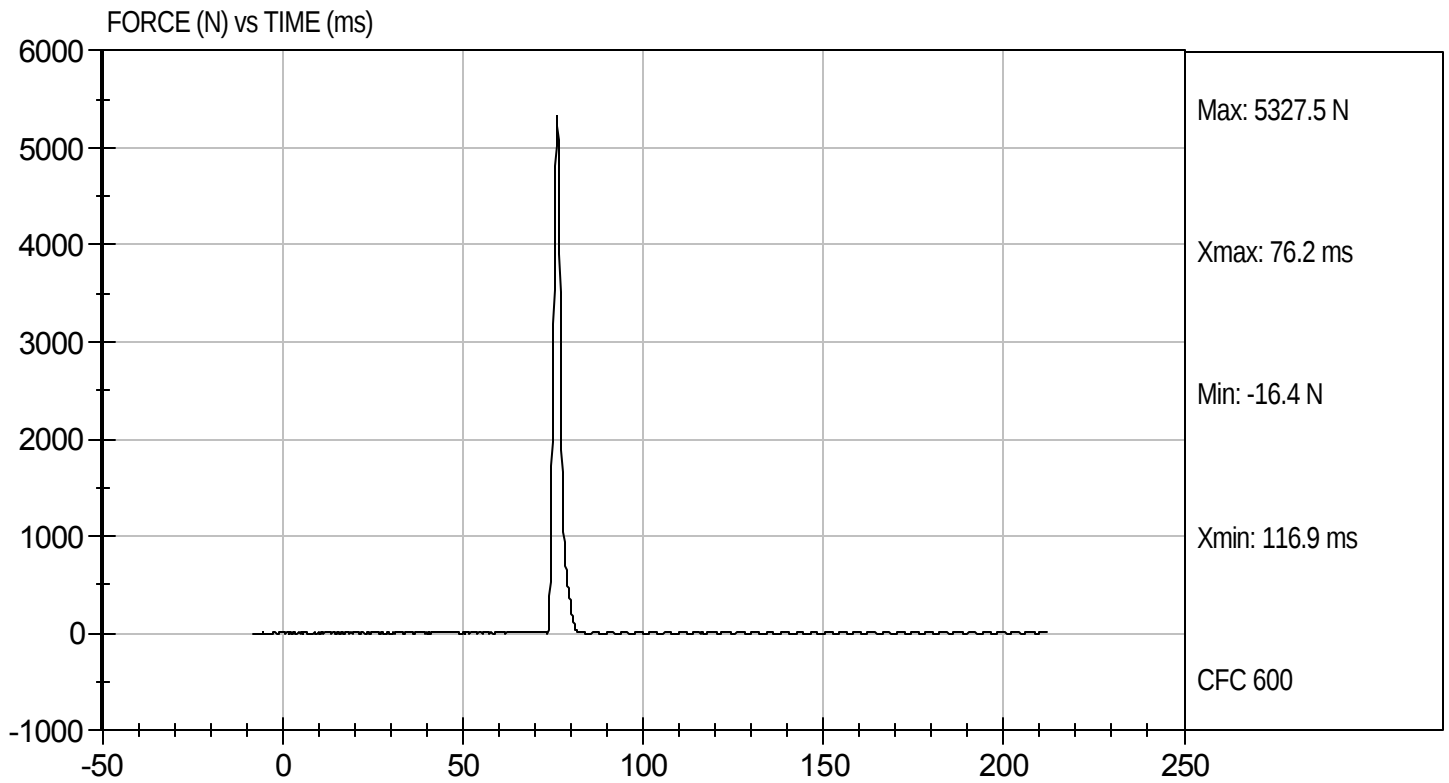


Approved By



Test Desc: Right Knee
Component ID: D091635

Test Date: 6/30/09
Velocity: 6.80 ft/s, 2.07 m/s

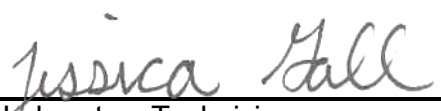


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D091636

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,452	Pass
Overall Test Results				Pass



Laboratory Technician

6/30/09

Test Date

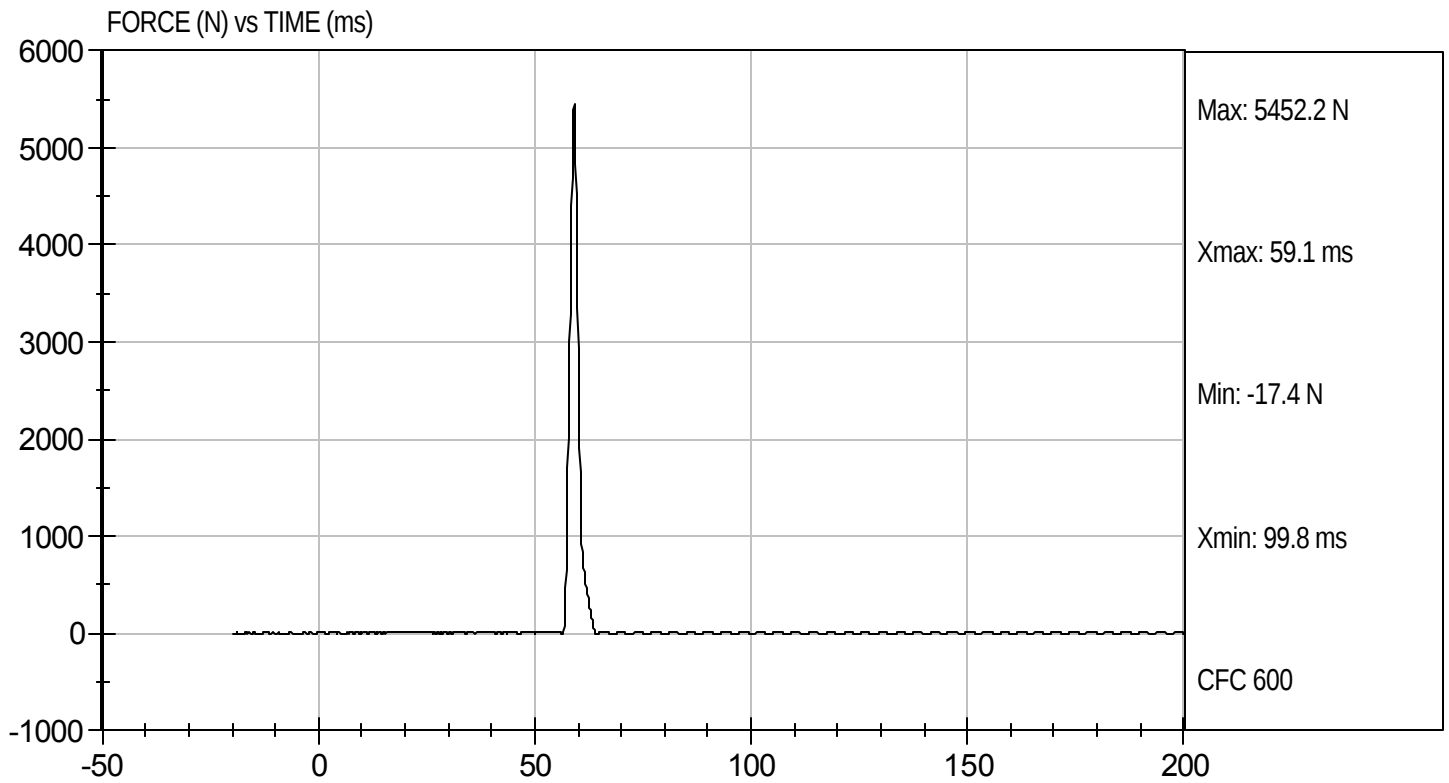


Approved By



Test Desc: Left Knee
Component ID: D091636

Test Date: 6/30/09
Velocity: 6.86 ft/s, 2.09 m/s



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

ATD Serial No: 065

Test I.D: D091630

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.9	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	50	50	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	59.4	57.3	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	43	42	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

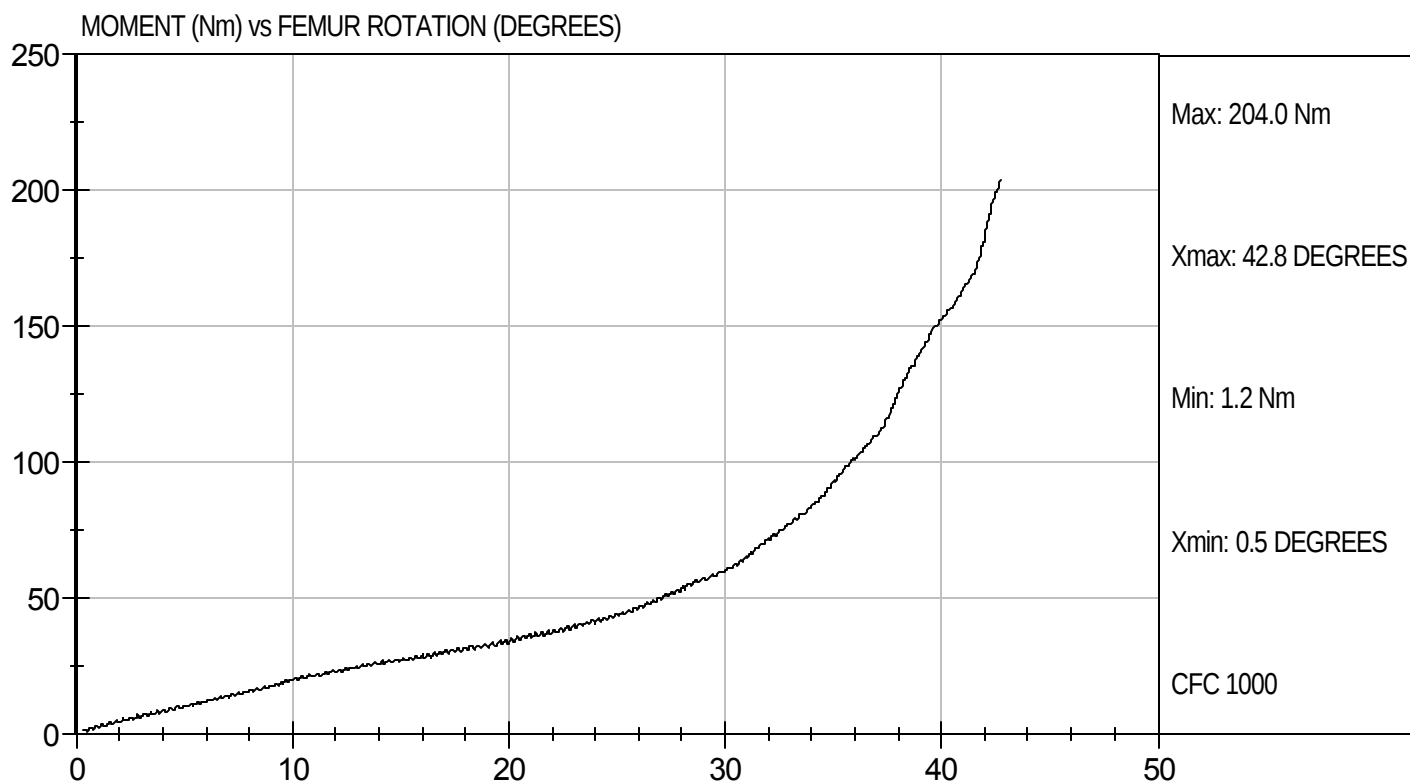
6/30/09
Test Date

David Winkelbauer
Approved By



Test Desc: Hip Femur Flexion
Component ID: D091639

Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D091630

Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s

