REPORT NUMBER: T8001-MGA-2008-005

VEHICLE TO DEFORMABLE BARRIER CRASH TESTS IN SUPPORT OF NHTSA OFFSET FRONTAL PROGRAM

LEFT 50% OFFSET DEFORMABLE BARRIER IMPACT
PDB BARRIER
TEST DATE: FEBRUARY 15, 2008
ORDER NUMBER: DTRTV-T8001

2008 SATURN OUTLOOK FWD XE (R80175)

PREPARED BY:
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FINAL REPORT SUBMITTED:
AUGUST 22, 2008

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION / RITA
VOLPE NATIONAL TRANSPORTATION SYSTEM CENTER
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Technical Report Documentation Page

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16. Abstract A 50% frontal offset barrier impact was conducted on a 2008 Saturn Outlook FWD XE, NHTSA No. R80175, at MGA Research Corporation on February 15, 2008. This test was conducted in accordance with Volpe Order No. DTRTV-T8001 for the evaluation of vehicle and occupant responses. The impact velocity was 59.9 km/h. The ambient temperature at the barrier face at the time of impact was 21 degrees Celsius. The vehicle's maximum static crush was 393 mm located to the left of the vehicle's centerline. The driver's 15 millisecond Head Injury Criteria (HIC) was 125. The driver's chest maximum resultant acceleration with three milliseconds minimum duration was 28.5 g. The driver's maximum chest deflection was -20 millimeters. The driver's left and right femur maximum axial compressive forces were -2901 N and -395 N, respectively. The left rear passenger's 15 millisecond Head Injury Criteria (HIC) was 392. The left rear passenger's chest maximum resultant acceleration with three milliseconds minimum duration was 35.8 g.			
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SECTION 1
PURPOSE AND TEST PROCEDURE

PURPOSE

This 60.0 km/h (target speed) Left 50% Offset Deformable Barrier test was conducted for the Volpe National Transportation Systems Center (VNTSC) / RITA by MGA Research Corporation.

The purpose of this testing was to evaluate and compare vehicle and occupant responses during 50% frontal offset vehicle to deformable barrier crash tests. For this test, the subject vehicle was a 2008 Saturn Outlook FWD XE with one (1) 50th percentile dummy in the front seating position and one 10-year-old dummy in the left rear seating position. The deformable barrier used for this test was the PDB barrier.

TEST PROCEDURE

This test was conducted in accordance with VNTSC's instructions for a 50% offset vehicle to deformable barrier crash test. Data was obtained relative to FMVSS 208, "Occupant Crash Protection" performance, FMVSS 212, "Windshield Retention"; FMVSS 219, "Windshield Zone Intrusion"; and FMVSS 301, "Fuel System Integrity," performance.

The test vehicle, a 2008 Saturn Outlook FWD XE, was instrumented with twelve (12) accelerometers to measure longitudinal axis accelerations, four (4) accelerometers to measure lateral axis accelerations, and six (6) accelerometers to measure vertical axis accelerations. The driver's primary and secondary airbag signals were monitored with inductive pickups. The vehicle impacted a 50% left offset deformable barrier. The vehicle's specified impact velocity range was 59.2 to 60.8 km/h.

The test vehicle contained one (1) Part 572E 50th percentile adult male Hybrid III anthropomorphic test device (dummy) with Thor-Lx legs in the driver position. A Hybrid III 10-Year-Old dummy was placed in the left rear seating position. The 50th percentile dummy was positioned in the left front outboard designated seating position according to a procedure provided by the COTR. The seating procedure is included as Appendix D. The driver dummy was restrained with a 3-point seat belt and a front airbag. The left rear passenger dummy was in the Graco Highback Turbobooster child seat and restrained with the Type II seat belt.

The Hybrid III 50th dummy was instrumented with an array of twelve (12) accelerometers in the head, and six (6) accelerometers in the chest, oriented to measure longitudinal, lateral, and vertical accelerations. The dummy was also instrumented with 6-channel upper and lower neck moment and force load cells, left and right femur load cells to measure axial forces, a chest deflection potentiometer, and knee displacement potentiometers. The dummy was equipped with Thor-Lx legs, which included upper and lower tibia load cells to measure forces and moments, longitudinal and lateral tibia accelerometers, three (3) foot accelerometers on each foot to measure accelerations in three (3) axes and three (3) rotary potentiometers at each ankle to measure foot rotations about three (3) axes.

TEST PROCEDURE (CONTINUED)

The Hybrid III 10-Year-Old child dummy was instrumented with tri-axial accelerometers in the head, chest, and pelvis oriented to measure longitudinal, lateral, and vertical accelerations. The dummy was also instrumented with 6-channel upper and lower neck moment and force load cells, left and right shoulder load cells, upper and lower sternum X accelerometers, upper and lower spine X accelerometers, 6-channel lumbar moment and force load cells, right/left upper and right/left lower asis load cells.

The vehicle impacted a deformable barrier instrumented with 90 load cells to measure longitudinal forces.

The 235 data channels were digitally sampled and recorded at 10,000 samples per second and processed per SAE J211 March 1995.

The crash event was recorded by one (1) real-time panning motion picture camera and thirteen (13) high-speed digital motion picture cameras. The pre-test and post-test conditions were recorded by one (1) real-time motion picture camera.

The left 50% offset deformable barrier crash test summary data and all occupant, camera, vehicle, and deformable barrier face measurements are presented in Section 2.0. Appendix A contains the still photographs. Appendix B contains the dummy, vehicle, and barrier data plots. Appendix C contains the dummy verification data. Appendix D contains customer provided seating procedure. Appendix E contains the barrier certification. Appendix F contains an INSIA report that was the basis for the Structural Measurements presented in Data Sheet 10 (page 30) of this report.

SECTION 2

LEFT 50% OFFSET DEFORMABLE BARRIER IMPACT SUMMARY

This 60.0 km/h (target speed) left 50% offset deformable barrier crash test was conducted by MGA Research Corporation on February 15, 2008.

The test vehicle, a 2008 Saturn Outlook FWD XE, NHTSA Number R80175, was equipped with a 3.6 L, 6-cylinder lateral engine, automatic transmission, power steering, power brakes, and front airbags. The vehicle's test weight was 2408.2 kg. The vehicle's impact speed was 59.9 km/h. The vehicle sustained 393 mm of static crush during the impact.

The occupant injury assessment values are summarized on the following page.

TEST NOTES

There was no valid data collected for:

Left Brake Caliper X after 100 msec.
Driver Seat Track X after 50 msec.
Gas Pedal X, Y, Z after 220 msec.

CMM Reference: Rear Bumper Top @ Center
+X Forward
+Y Left
+Z Up

.

SECTION 2 (CONTINUED)

LEFT 50% OFFSET DEFORMABLE BARRIER IMPACT SUMMARY

OCCUPANT INJURY ASSESSMENT VALUES

Injury Criteria		Limit	Driver
HIC 36		1000	252
	T1 (msec)		94.7
	T2 (msec)		130.7
HIC 15		700	125
	T1 (msec)		98.7
	T2 (msec)		113.7
Upper Neck Tension (N)		4170	877
Upper Neck Compression (N)		4000	-88
Neck Injury (NIJ) N_{te}		1.0	0.2
Neck Injury (NIJ) N_{tf}		1.0	0.2
Neck Injury (NIJ) N_{ce}		1.0	0.1
Neck Injury (NIJ) N_{cf}		1.0	0.0
Clip (g)		60	28
Chest Displacement (mm)		63	-20
Left Femur (N)		9,040	-2901
Right Femur (N)		9,040	-395
Left Upper Tibia Index		0.91	0.40
Right Upper Tibia Index		0.91	0.36
Left Lower Tibia Index		0.91	0.55
Right Lower Tibia Index		0.91	0.44
Left Upper Tibia Force (N)		-5600	-1737
Right Upper Tibia Force (N)		-5600	-1019
Left Lower Tibia Force (N)		-5200	-2196
Right Lower Tibia Force (N)		-5200	-1583
Left Inversion (degrees)		-35	-15.9
Left Eversion (degrees)		35	36.1
Left Plantarflexion (degrees)			-20.8
Left Dorsiflexion (degrees)		35	N/A
Left External Rotation (degrees)			-10.8
Left Internal Rotation (degrees)			3.9
Right Inversion (degrees)		35	27.7
Right Eversion (degrees)		-35	-10.1
Right Plantarflexion (degrees)			-23.2
Right Dorsiflexion (degrees)		35	2.7
Right External Rotation (degrees)			7.8
Right Internal Rotation (degrees)			-4.2
Left Knee Shear (mm)		-15	0.0
Right Knee Shear (mm)		-15	-0.3

SECTION 2 (CONTINUED)

LEFT 50% OFFSET DEFORMABLE BARRIER IMPACT SUMMARY

OCCUPANT INJURY ASSESSMENT VALUES (CONTINUED)

Injury Criteria		Left Rear Passenger
HIC 36		776
	T1 (msec)	84.8
	T2 (msec)	120.8
HIC 15		392
	T1 (msec)	92.9
	T2 (msec)	107.9
Upper Neck Tension (N)		2552
Upper Neck Compression (N)		-441
Clip (g)		36

DATA SHEET 1

CRASH VEHICLE SUMMARY

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

Description	Value
Test Time	1:23 p.m.
Temperature	21°C
Vehicle Year/ Make / Model / Body Style	2008 Saturn Outlook FWD XE
Vehicle Test Weight	2408.2 kg
Vehicle / Barrier Impact Angle	0°
Vehicle / Barrier Impact Accuracy	2 mm up / 5 mm left
Impact Velocity	59.9 km/h
Maximum Static Crush	393 mm to the left of the vehicle's C/L
Deformable Barrier	PDB
Number of Data Channels	235
Number of Real-Time Cameras	1
Number of High-Speed Cameras	13

Dummies	Driver	Left Rear Passenger
Type/Serial No.	HIII / 202	HIII 10YO / D001
Type Lower Legs	Thor-Lx	
Serial Numbers of Legs	37R / 36L	
Restraint System	3-Point Seatbelt Front Airbag	Type II Belts Graco Highback Turbobooster

DATA SHEET 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

TEST VEHICLE INFORMATION

Manufacturer	Saturn
Model	Outlook
Body Style	FWD XE
NHTSA No.	R80175
VIN	5GZER137X8J190730
Color	Cocoa
Delivery Date	12/27/2007
Odometer Reading (mile)	41
Dealer	Boucher Fleet Group
Transmission	Automatic
Final Drive	Front
Number of Cylinders	6
Engine Displacement (L)	3.6
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
Rear Passenger Side Curtain Airbag	Yes
Rear Passenger Side Torso 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	General Motors Corporation
Date of Manufacture	11/07

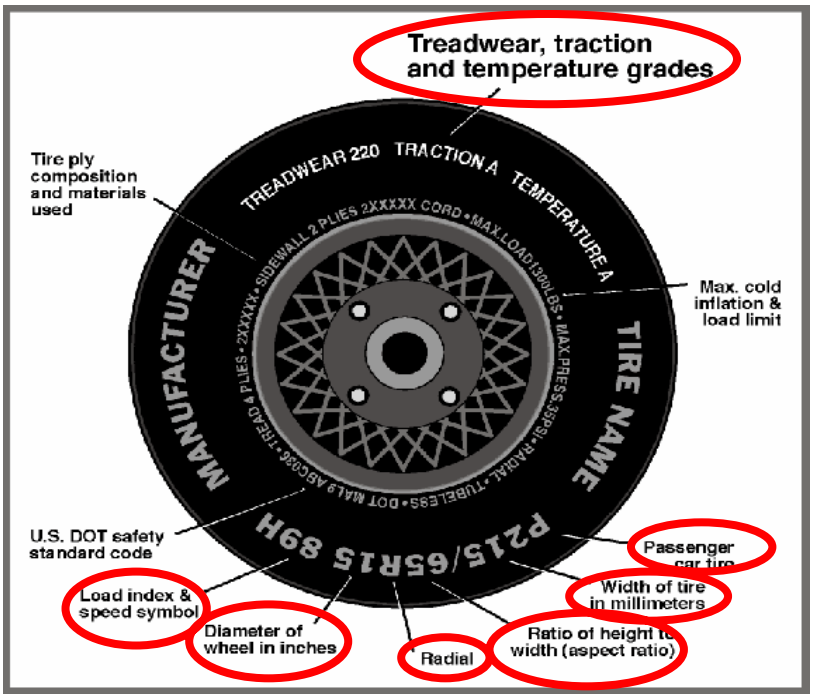
GVWR (kg)	2908
GAWR Front (kg)	1450
GAWR Rear (kg)	1600

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	Split Bench	
Number of Occupants	2	3	3	8
Capacity Wt. (VCW) (kg)				768
Cargo Wt. (RCLW) (kg)				136

DATA SHEET 2 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	240	240
Recommended Tire Size	P255/65R18	P255/65R18
Tire Size on Vehicle	P255/65R18	P255/65R18
Tire Manufacturer	Goodyear	Goodyear
Tire Name	FORTERA	FORTERA
Tire Type	Passenger	Passenger
Tire Width (mm)	255	255
Ratio of Height to Width (aspect ratio)	65	65
Radial	R	R
Wheel Diameter	18	18
Load Index & Speed Symbol	109S	109S
Treadwear	540	540
Traction Grade	A	A
Temperature Grade	B	B

DATA SHEET 2 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	589.2	472.2		632.8	580.6	
Right	kg	601.5	459.0		640.0	554.8	
Ratio	%	56.1	43.9		52.9	47.1	
Totals	kg	1190.7	931.2	2121.9	1272.8	1135.4	2408.2

Note: As tested weight reflects the removal of the right front dummy.

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2121.9
Weight of 2 P572E ATDs & 1 10-Year-Old	kg	191.4
Rated Cargo/Luggage Weight (RCLW)	kg	136
Calculated Vehicle Target Weight (TVTW)	kg	2449.3

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	864	863	883	887	1328
As Tested	mm	842	843	861	863	1426
Post Test	mm	870	843	863	860	

Vehicle Wheelbase (mm): 3025

Weight of Ballast secured in cargo area (kg): 0

Vehicle Components Removed: Third row seats, jack, and rear carpet

Ballast weight does not include instrumentation and data acquisition system.

DATA SHEET 2 (CONTINUED)

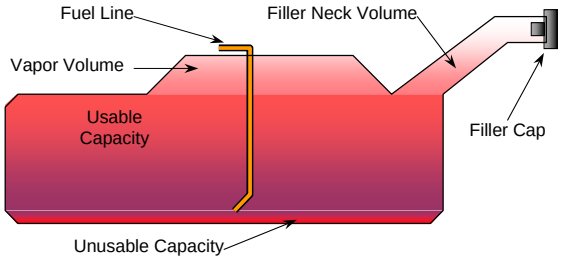
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	82.1
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	75.5 to 77.2
Actual Amount of Solvent used	76.1
1/3 of Usable Capacity	27.4

The test vehicle is equipped with an electric fuel pump. Pump will run when the engine is running. Also, it will run briefly when the ignition key is turned to the "on" position without starting the engine.



VEHICLE FUEL TANK ASSEMBLY

BELT LENGTH DATA

Measurement Description	Units	Driver	Left Rear Passenger
Shoulder belt length as measured on ATD	mm	840	700
Lap belt length as measured on ATD	mm	700	890
Remainder of belt on reel	mm	1580	1510
Total belt length for continuous webbing systems	mm	3120	3100

SEAT TRACK INFORMATION

Description	Driver	Left Rear Passenger
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

DATA SHEET 3

POST IMPACT DATA

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

DOOR OPENING AND GLAZING DAMAGE

Description	Left Side	Right Side
Locked/Unlocked Doors	Doors were unlocked	Doors were unlocked
Front Door Opening	Door remained closed and latched; Door did not open	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
Glazing Damage	None	

DUMMY CONTACT POINTS

Description	Driver	Left Rear Passenger
Head Contact	Airbag	Child seat, C-Pillar
Chest Contact	Airbag	Chin to Chest
Abdomen Contact	None	None
Left Knee Contact	Knee Bolster	None
Right Knee Contact	Knee Bolster	None

LEFT REAR (P4) CRS POST-TEST INSPECTION

Location	Damage	Remarks
Cracks on CRS	None	
Fabric Tears on CRS	None	
Vehicle Seat Structure	None	
Vehicle Seat Fabric Tears	None	
Child Dummy	None	10-Year-Old

DATA SHEET 4

TEST VEHICLE INFORMATION

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

NORMAL DESIGN RIDING POSITION

Driver seat back angle: 0.9° at headrest post

Left Rear Passenger seat back angle: full forward position

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Left Front Seat	24 detents	7th detent (Rewardmost as 0)
Left Rear Seat	10 detents	Rearwardmost

ADJUSTABLE D-RING POSITION

The driver D-ring was set at the uppermost position.

STEERING COLUMN POSITION

	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1	0	67.0
Geometric center position No. 2	25	69.8
Uppermost position No. 3	50	72.5

ADJUSTABLE PEDALS

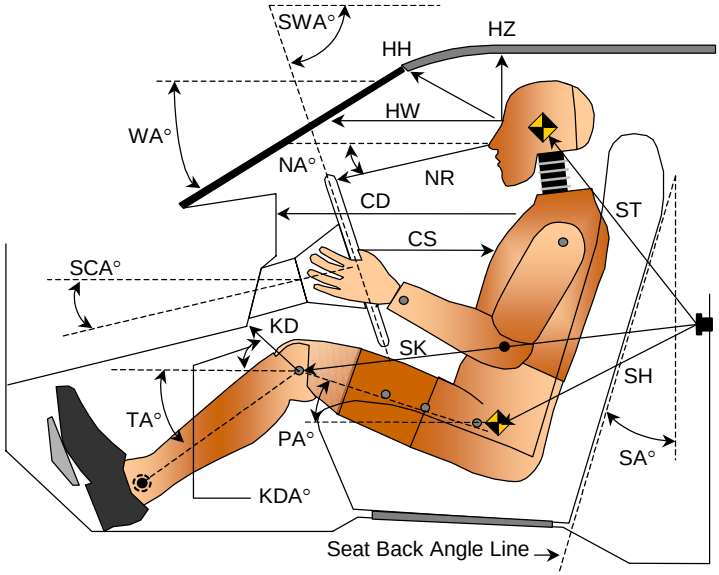
The pedals were set at the full forward position.

DATA SHEET 5

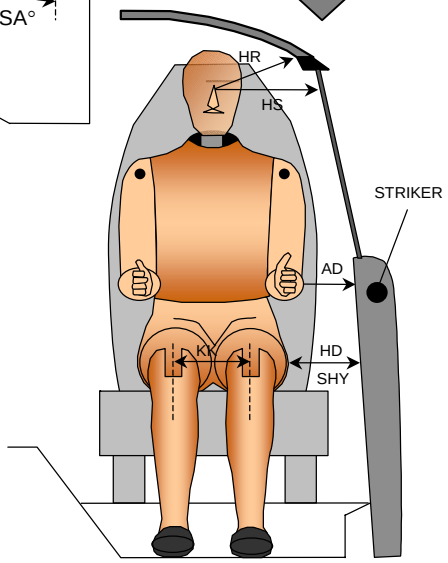
DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

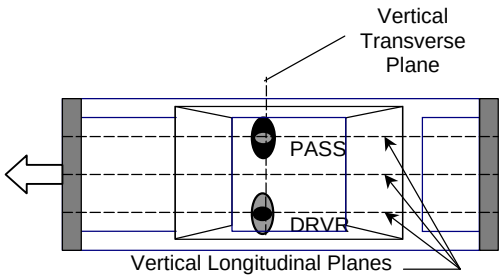
DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



AD	Arm to Door
HD	H-Point to Door
HR	Head to Side Header
HS	Head to Side Window
KK	Knee to Knee
SHY	Striker to H-Point (Y Axis)



CD	Chest to Dash
CS	Chest to Steering Wheel Hub
HH	Head to Header
HW	Head to Windshield
HZ	Head to Roof
KDA	Knee to Dash Angle
KDL	Left Knee to Dash
KDR	Right Knee to Dash
NA	Nose to Rim Angle
NR	Nose to Rim
PA	Pelvic Angle
RA	Rim to Abdomen
SA	Seat Back Angle
SCA	Steering Column Angle
SH	Striker to H-Point
SK	Striker to Knee
ST	Striker to Head
SWA	Steering Wheel Angle
TA	Tibial Angle
WA	Windshield Angle



DATA SHEET 5 (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

TEST DUMMY POSITION MEASUREMENTS

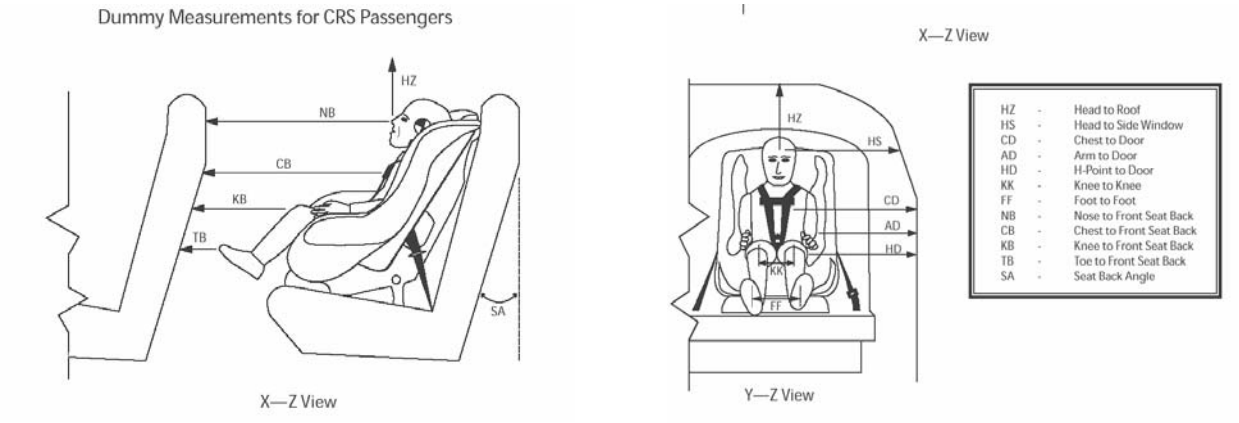
Code	Measurement Description	Driver	
		Length (mm)	Angle (°)
WA	Windshield Angle		30.3
SWA	Steering Wheel Angle		69.8
SCA	Steering Column Angle		19.7
SA	Seat Back Angle (headrest post)		0.9
HZ	Head to Roof (Z)	241	90
HH	Head to Header	498	16.9
HW	Head to Windshield	804	0
HR	Head to Side Header (Y)	253	
NR	Nose to Rim	460	12.2
CD	Chest to Dash	652	
CS	Chest to Steering Hub	396	8.8
RA	Rim to Abdomen	263	0
KDL	Left Knee to Dash	189	22.8
KDR	Right Knee to Dash	180	
PA	Pelvic Angle		22.7
TA	Tibia Angle		42.3
KK	Knee to Knee (Y)	290	
SAN	Striker to Ankle	918	
SK	Striker to Knee	554	
ST	Striker to Head	620	
SH	Striker to H-Point	158	
SHY	Striker to H-Point (Y)	291	
HS	Head to Side Window	339	
HD	H-Point to Door (Y)	182	
AD	Arm to Door (Y)	150	
AA	Ankle to Ankle	265	

DATA SHEET 5 (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

Child Restraint System (Position 4)	Graco Highback Turbobooster (Forward Facing)
Dummy Type / Serial Number	Hybrid III 10-Year-Old / D001



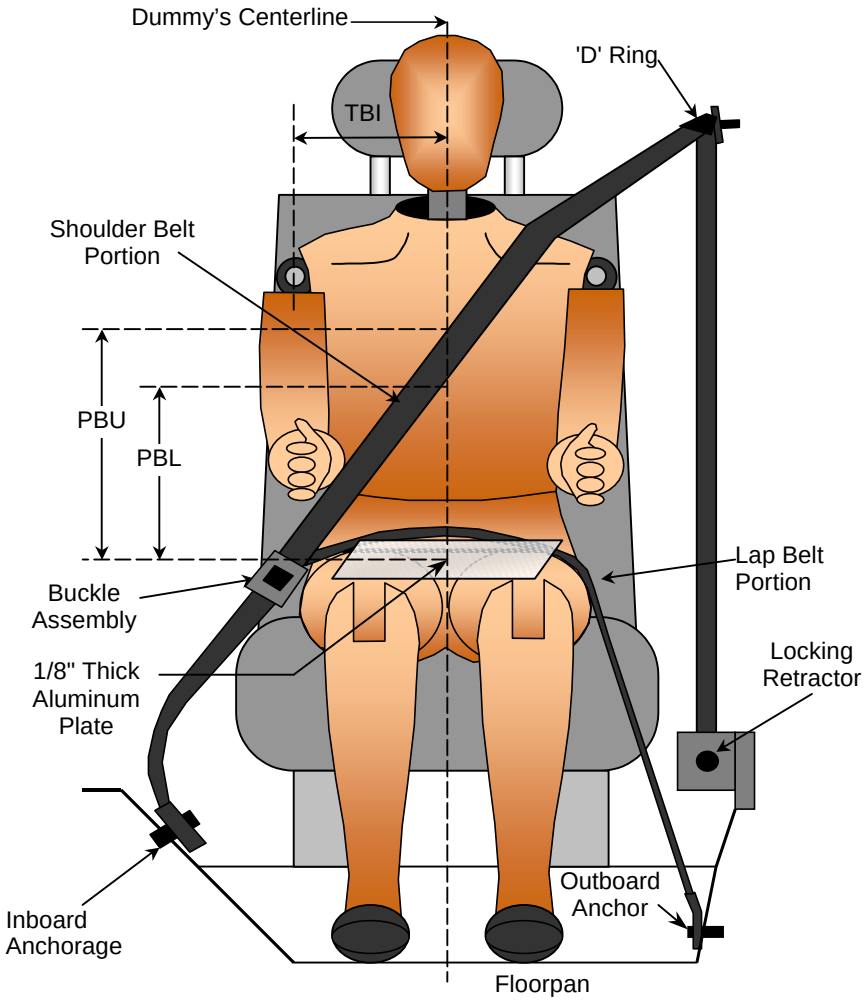
Measurement	Pre-Test (mm)	Post-Test (mm) *
	P4 CRS	P4 CRS
SA (deg)	16.9	
HS	368	
CD	379	
AD	213	
HD	275	
HZ	266	
NB	457	
CB	461	
KK	159	
FF	189	
KB - LEFT	187	
KB – RIGHT	178	
TB - LEFT	15	
TB - RIGHT	19	
Seat Top to Door	140	
Seat Bottom to Door	104	

All dimensions in mm (unless noted)
P4 – 2nd Row Left Rear Passenger (Forward Facing)
* Child dummy was removed before post-test measurements were taken.

DATA SHEET 5 (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver
PBU - Top surface of reference to belt upper edge	mm	345
PBL - Top surface of reference to belt lower edge	mm	270

DATA SHEET 5 (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

	Driver			Left Rear Passenger		
	X	Y	Z	X	Y	Z
Head CG	2601	-483	-852	1707	-492	-849
Striker	2597	-865	-232	1603	-878	-326
Left Knee	3150	-562	-263	2110	-518	-467
Right Knee	3158	-337	-277			
Tip of Nose	2720	-402	-807	1806	-438	-811
H-Point	2748	-574	-190	1849	-556	-359
Left Ankle	3488	-557	-12			
Right Ankle	3483	-292	-13			
Left Heel	3480	-546	114			
Right Heel	3482	-257	117			
Right Toe	3698	-252	-124	2384	-342	-155
Left Toe	3718	-504	-109	2386	-535	-158
Left Shoulder Bolt				1675	-525	-657
Right Shoulder Bolt				1680	-321	-652
Seat Belt Anchor				1694	-732	79
Left Child Seat Bolt				1780	-646	-253
Right Child Seat Bolt				1784	-234	-240

DATA SHEET 6

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

Accelerometer Location	Measurements (mm)		
	X	Y	Z
Left Rear Seat Crossmember X	2158	-425	475
Left Rear Seat Crossmember Y			
Right Rear Seat Crossmember X	2134	383	475
Right Rear Seat Crossmember Y			
Vehicle Center of Gravity X	2684	26	409
Vehicle Center of Gravity Y			
Vehicle Center of Gravity Z			
Top of Engine Block X	4468	33	870
Bottom of Engine Block X	4281	82	260
Left Disc Brake Caliper X	4220	-755	297
Right Disc Brake Caliper X	4220	755	297
Instrument Panel X	3583	0	1242
Left Side Driver Mid Seat Track X	2498	-652	4532
Accelerator Pedal X (at midfoot)	3661	-272	610
Accelerator Pedal Y (at midfoot)			
Accelerator Pedal Z (at midfoot)			
Brake Pedal X (at midfoot)	3747	-405	668
Brake Pedal Y (at midfoot)			
Brake Pedal Z (at midfoot)			
Footrest X	3603	-672	645
Footrest Y			
Footrest Z			

Reference is on the following page.

DATA SHEET 6 (CONTINUED)

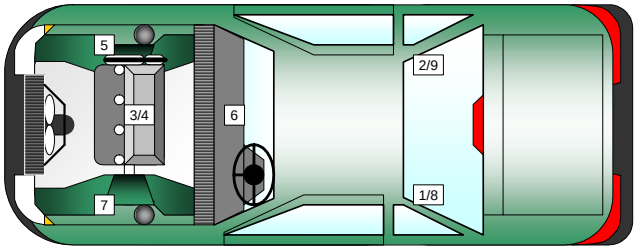
VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

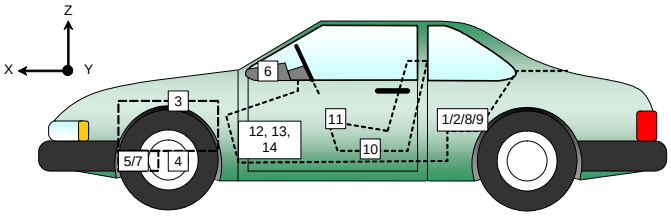
Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

Reference Points: X - Rear Surface of Vehicle (+ forward)

Y - Vehicle Centerline (+ to right)

Z - Ground Plane (+ up)





DATA SHEET 6 (CONTINUED)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

Location Number	Description	Maximum Values (g's)			
		Positive	Time, ms	Negative	Time, ms
1	Left Rear Seat Cross Member X	1.9	181.0	-24.9	84.0
2	Right Rear Seat Cross Member X	1.0	208.0	-23.7	83.4
3	Top of Engine Block X	4.4	105.2	-34.2	43.3
4	Bottom of Engine Block X	2.6	87.2	-31.9	37.4
5	Disc Brake Caliper @ Right Side X	4.4	138.2	-5.8	96.1
6	Instrument Panel X	2.1	181.3	-31.5	99.7
7	Disc Brake Caliper @ Left Side X	(1)	(1)	(1)	(1)
8	Left Rear Seat Cross Member Y	9.0	64.2	-5.1	25.1
9	Right Rear Seat Cross Member Y	11.3	64.7	-2.7	112.6
10	Left Side Driver Mid Seat Track X	(2)	(2)	(2)	(2)
11	Vehicle Center of Gravity X	1.3	204.1	-25.9	83.3
	Vehicle Center of Gravity Y	7.2	65.1	-6.2	113.3
	Vehicle Center of Gravity Z	6.6	62.9	-6.6	106.7
	Vehicle Center of Gravity Resultant	26.2	63.9		
12	Accel Pedal Heel Location X	(3)	(3)	(3)	(3)
	Accel Pedal Heel Location Y	(3)	(3)	(3)	(3)
	Accel Pedal Heel Location Z	(3)	(3)	(3)	(3)
	Accel Pedal Heel Location Resultant	(3)	(3)		
13	Brake Pedal Heel Location X	5.5	70.6	-31.4	81.5
	Brake Pedal Heel Location Y	19.0	64.9	-7.3	107.9
	Brake Pedal Heel Location Z	14.1	68.4	-11.6	114.8
	Brake Pedal Heel Location Resultant	36.2	81.8		
14	Outside Footrest X	3.9	300.0	-24.3	94.7
	Outside Footrest Y	14.1	64.6	-10.6	109.9
	Outside Footrest Z	11.1	70.8	-12.9	112.1
	Outside Footrest Resultant	24.7	94.1		

(1) No valid data after 100 msec.
(2) No valid data after 50 msec.
(3) No valid data after 220 msec.

DATA SHEET 7
DUMMY INJURY CRITERIA VALUES

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

		Maximum Value			
		Driver			
Description	Unit	Positive	Time, ms	Negative	Time, ms
Head X	G	6.0	291.9	-31.3	101.9
Head Y	G	29.2	136.7	-1.2	49.5
Head Z	G	21.3	116.0	-0.9	20.0
Head Resultant	G	38.6	106.5		
Head (FT) Y	G	23.2	127.9	-1.8	269.5
Head (FT) Z	G	18.2	119.5	-1.3	188.6
Head (LT) X	G	6.1	289.9	-29.8	103.0
Head (LT) Z	G	22.8	117.2	-0.9	20.7
Head (TP) X	G	9.2	284.9	-39.8	102.8
Head (TP) Y	G	31.9	138.8	-3.3	244.4
Head Redundant X	G	5.9	291.5	-32.0	101.6
Head Redundant Y	G	28.9	136.8	-1.5	48.7
Head Redundant Z	G	21.1	117.1	-0.9	20.1
Head Resultant Redundant	G	40.2	106.9		
Upper Neck Fx	N	310.2	125.1	-322.5	66.2
Upper Neck Fy	N	307.8	141.7	-38.6	241.0
Upper Neck Fz	N	876.6	116.2	-88.3	143.8
Upper Neck F Resultant	N	924.2	116.2		
Upper Neck Mx	N-m	21.4	163.8	-19.8	108.4
Upper Neck My	N-m	16.4	106.3	-15.4	299.7
Upper Neck Mz	N-m	13.6	195.8	-27.0	137.3
Upper Neck M Resultant	N-m	33.2	137.1		
Lower Neck Fx	N	297.9	268.9	-108.8	136.6
Lower Neck Fy	N	642.4	132.8	-83.8	253.7
Lower Neck Fz	N	1355.3	116.6	-65.7	19.9
Lower Neck F Resultant	N	1423.6	116.2		
Lower Neck Mx	N-m	69.6	134.7	-13.7	239.7
Lower Neck My	N-m	21.6	172.3	-84.5	116.6
Lower Neck Mz	N-m	29.1	58.9	-5.1	259.3
Lower Neck M Resultant	N-m	94.5	119.0		
Chest X	G	3.0	287.7	-24.2	77.4
Chest Y	G	14.1	115.7	-3.5	41.9
Chest Z	G	13.1	114.4	-6.4	78.5
Chest Resultant	G	28.9	117.7		
Chest Redundant X	G	2.8	287.3	-23.8	77.9
Chest Redundant Y	G	14.0	115.7	-3.5	41.9
Chest Redundant Z	G	12.8	114.4	-6.9	77.7
Chest Resultant Redundant	G	28.9	117.8		
Chest Displacement	mm			-20.3	118.7

DATA SHEET 7 (CONTINUED)

DUMMY INJURY CRITERIA VALUES

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

		Maximum Value			
		Driver			
Description	Unit	Positive	Time, ms	Negative	Time, ms
Pelvis X	G	1.8	142.0	-39.7	76.4
Pelvis Y	G	11.9	107.7	-6.2	31.3
Pelvis Z	G	3.3	291.3	-22.7	79.5
Pelvis Resultant	G	45.0	76.5		
Right Femur	N	1131.0	67.9	-394.5	133.6
Left Femur	N	632.5	62.8	-2901.2	76.5
Right Knee Shear	mm	0.8	116.4	-0.3	154.5
Left Knee Shear	mm	0.9	114.9	0.0	0.0
Right Upper Tibia Fx	N	490.4	67.0	-88.4	123.8
Right Upper Tibia Fy	N	188.8	118.1	-210.2	86.0
Right Upper Tibia Fz	N	268.9	45.1	-1018.6	79.5
Right Upper Tibia F Resultant	N	1019.6	79.5		
Right Upper Tibia Mx	N-m	24.2	163.7	-30.8	87.1
Right Upper Tibia My	N-m	22.3	123.5	-78.2	68.2
Right Lower Tibia Fx	N	95.3	211.6	-563.3	67.4
Right Lower Tibia Fy	N	262.1	88.2	-77.0	166.5
Right Lower Tibia Fz	N	159.8	226.6	-1583.1	70.8
Right Lower Tibia F Resultant	N	1626.1	70.7		
Right Lower Tibia Mx	N-m	26.5	118.4	-21.9	90.9
Right Lower Tibia My	N-m	13.4	123.4	-65.1	67.1
Right Tibia Mid Shaft X	G	7.1	123.4	-54.6	66.8
Right Tibia Mid Shaft Y	G	18.4	86.3	-10.7	116.0
Rt Dorsi/Plantar Flexion	Deg	2.7	78.7	-23.2	249.0
Rt Inversion/Eversion	Deg	27.7	120.3	-10.1	262.8
Rt Internal/External	Deg	7.8	300.0	-4.2	97.0
Right Foot X – Front	G	16.8	46.4	-86.1	64.3
Right Foot Y – Front	G	17.6	60.2	-20.3	115.6
Right Foot Z – Front	G	20.0	59.2	-60.3	45.1
Right Foot - Front Resultant	G	87.6	64.4		
Left Upper Tibia Fx	N	475.7	81.0	-97.5	92.8
Left Upper Tibia Fy	N	266.4	121.4	-154.0	81.7
Left Upper Tibia Fz	N	97.8	291.1	-1737.1	90.0
Left Upper Tibia F Resultant	N	1737.9	90.0		
Left Upper Tibia Mx	N-m	28.4	120.3	-25.3	38.5
Left Upper Tibia My	N-m	17.0	119.4	-104.1	81.3
Left Lower Tibia Fx	N	101.9	119.6	-579.0	80.9
Left Lower Tibia Fy	N	262.5	85.6	-59.7	158.1
Left Lower Tibia Fz	N	146.0	190.2	-2195.9	89.8
Left Lower Tibia F Resultant	N	2205.2	89.8		

DATA SHEET 7 (CONTINUED)

DUMMY INJURY CRITERIA VALUES

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

		Maximum Value			
		Driver			
Description	Unit	Positive	Time, ms	Negative	Time, ms
Left Lower Tibia Mx	N-m	61.8	121.1	-18.0	32.4
Left Lower Tibia My	N-m	4.9	280.4	-76.8	81.7
Left Tibia Mid Shaft X	G	6.9	118.4	-51.7	59.9
Left Tibia Mid Shaft Y	G	16.1	81.1	-9.4	41.1
Lt Dorsi/Plantar Flexion	Deg	-4.4	108.6	-20.8	204.6
Lt Inversion/Eversion	Deg	36.1	125.5	-15.9	235.2
Lt Internal/External	Deg	3.9	241.4	-10.8	153.3
Left Foot X – Front	G	6.6	37.6	-60.9	62.3
Left Foot Y – Front	G	11.3	21.0	-30.2	53.2
Left Foot Z – Front	G	13.1	20.9	-29.5	65.4
Left Foot – Front Resultant	G	64.8	62.2		
Lap Belt Load	N	4445.4	73.4		
Shoulder Belt Load	N	4412.3	62.4		

		Maximum Value			
		Left Rear Passenger			
Description	Unit	Positive	Time, ms	Negative	Time, ms
Head X	G	60.4	233.6	-42.3	118.7
Head Y	G	4.1	238.6	-8.8	228.8
Head Z	G	59.3	99.0	-7.4	267.7
Head Resultant	G	68.0	233.9		
Upper Neck Fx	N	28.8	205.8	-927.6	118.0
Upper Neck Fy	N	92.2	160.7	-145.6	300.0
Upper Neck Fz	N	2552.1	118.0	-441.4	236.5
Upper Neck F Resultant	N	2717.2	118.0		
Upper Neck Mx	N-m	11.3	263.1	-8.5	105.6
Upper Neck My	N-m	25.3	264.5	-43.5	79.6
Upper Neck Mz	N-m	4.9	121.9	-9.2	276.6
Upper Neck M Resultant	N-m	43.6	79.6		
Lower Neck Fx	N	213.8	265.0	-2597.6	118.9
Lower Neck Fy	N	63.5	184.6	-404.0	97.6
Lower Neck Fz	N	1968.4	79.6	-325.7	238.0
Lower Neck F Resultant	N	2628.2	118.9		
Lower Neck Mx	N-m	17.7	172.6	-33.0	98.5
Lower Neck My	N-m	241.6	118.3	-10.4	210.1
Lower Neck Mz	N-m	21.7	122.4	-18.7	297.1
Lower Neck M Resultant	N-m	243.4	118.2		

DATA SHEET 7 (CONTINUED)

DUMMY INJURY CRITERIA VALUES

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

		Maximum Value			
		Left Rear Passenger			
Description	Unit	Positive	Time, ms	Negative	Time, ms
Right Shoulder Fx	N	110.1	81.8	-109.2	112.1
Right Shoulder Fz	N	307.1	111.3	-29.7	237.5
Left Shoulder Fx	N	211.9	203.4	-2600.6	99.9
Left Shoulder Fz	N	1023.8	94.0	-75.3	155.9
Chest X	G	11.1	249.2	-37.7	77.9
Chest Y	G	6.0	115.9	-5.8	86.7
Chest Z	G	12.3	234.3	-10.9	143.8
Chest Resultant	G	38.5	77.9		
Chest Displacement	mm			-27.0	103.8
Upper Sternum X	G	14.8	246.8	-57.3	92.6
Lower Sternum X	G	18.0	92.4	-46.7	66.1
Upper Spine X	G	12.6	249.1	-39.8	77.9
Lower Spine X	G	10.2	249.7	-37.0	77.8
Lumbar Fx	N	1299.8	122.0	-376.6	232.6
Lumbar Fy	N	17.2	26.3	-579.6	111.6
Lumbar Fz	N	580.7	174.2	-474.3	62.1
Lumbar F Resultant	N	1394.8	122.0		
Lumbar Mx	N-m	11.7	165.8	-87.0	110.2
Lumbar My	N-m	25.1	75.5	-60.7	121.1
Lumbar Mz	N-m	37.4	105.1	-14.2	282.1
Lumbar M Resultant	N-m	99.0	110.2		
Pelvis X	G	12.5	138.3	-27.7	68.0
Pelvis Y	G	18.9	112.2	-4.0	142.3
Pelvis Z	G	14.3	233.5	-20.0	80.1
Pelvis Resultant	G	34.3	80.1		
Right Upper Asis Fx	N	115.4	80.4	-164.4	129.1
Right Lower Asis Fx	N	504.7	95.5	-2.2	0.0
Left Upper Asis Fx	N	116.3	227.8	-78.6	160.6
Left Lower Asis Fx	N	224.9	75.3	-7.7	280.8
Shoulder Belt Load	N	6075.0	99.0		
Lap Belt Load	N	2743.9	74.9		

DATA SHEET 8

SUMMARY OF FMVSS 212/ 219 (PARTIAL) DATA

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

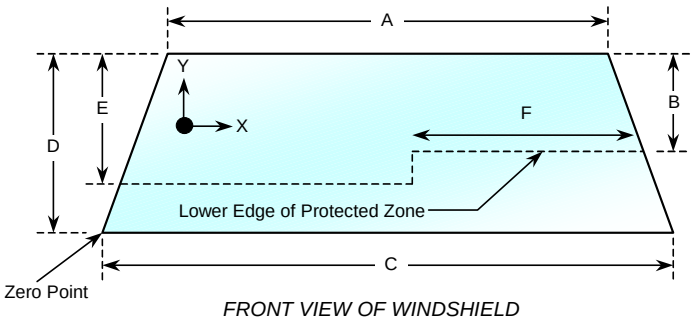
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2350	2350	100
Right Side	2350	2350	100
Total	4700	4700	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1320
B	mm	559
C	mm	1680
D	mm	850
E	mm	573
F	mm	486

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 9

FMVSS 301 FUEL SYSTEM INTEGRITY DATA

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

Temperature at Time of Impact: 21° C Test Time: 1:23 pm

Stoddard Solvent Spillage Measurements

A. From impact until vehicle motion ceases: 0 oz.
(Maximum Allowable = 1 ounce)

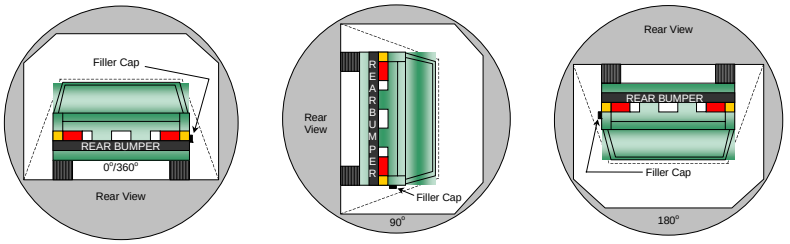
B. For the 5 minute period after motion ceases: 0 oz.
(Maximum Allowable = 5 ounces)

C. For the following 25 minutes: 0 oz.
(Maximum Allowable = 1 oz. /minute)

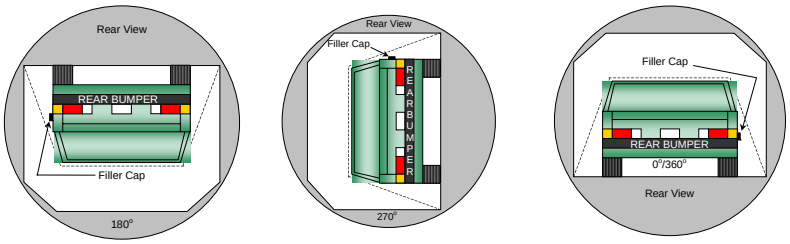
D. Spillage: None

FMVSS 301 STATIC ROLLOVER DATA

NOT PERFORMED



0° to 90° 90° to 180°



180° to 270° 270° to 360°

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).

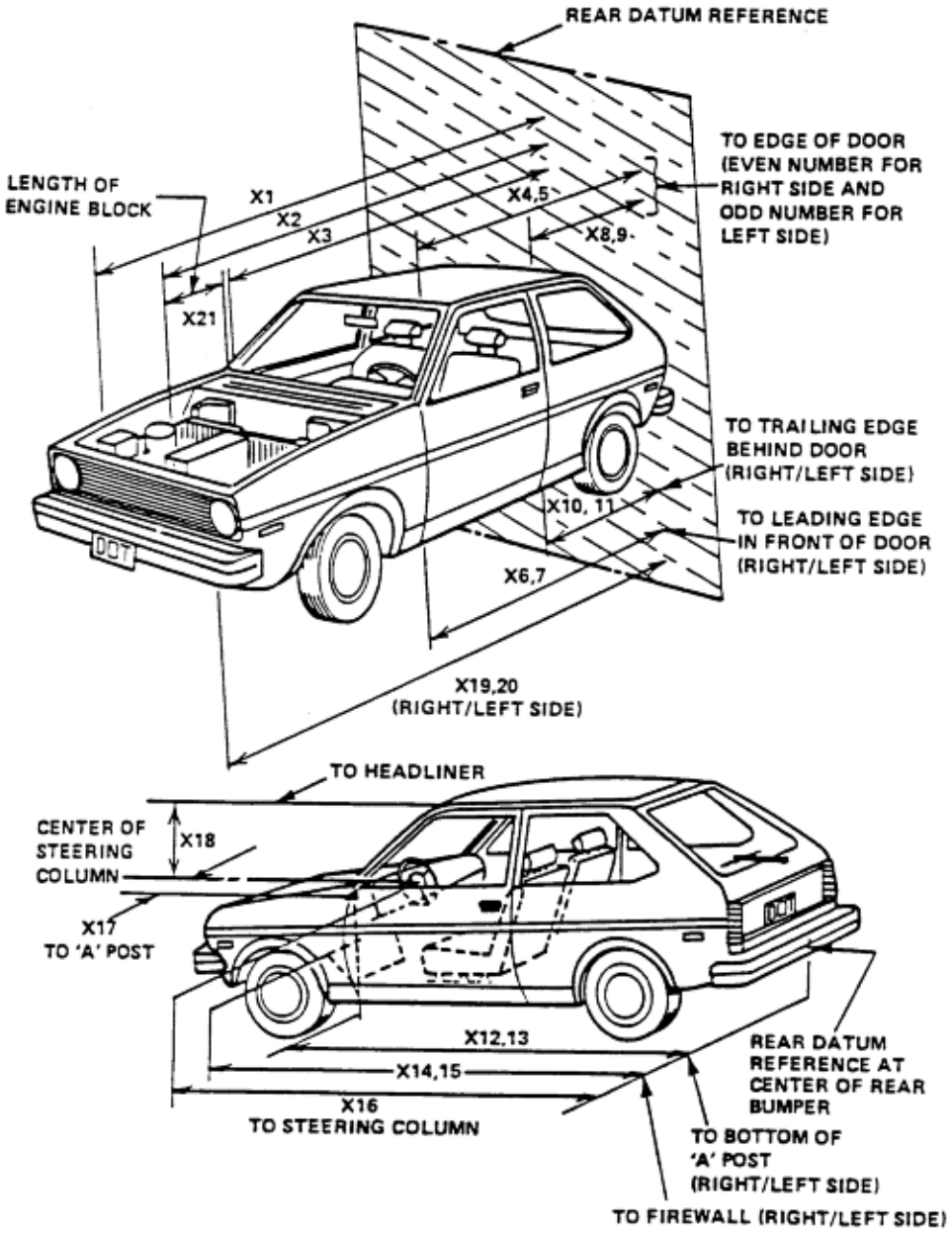
3. Details of Stoddard Solvent spillage locations:

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	N/A		
90° to 180°	N/A		
180° to 270°	N/A		
270° to 360°	N/A		

DATA SHEET 10

TEST VEHICLE MEASUREMENTS

Test Vehicle:	2008 Saturn Outlook FWD XE	NHTSA No.:	R80175
Test Program:	Left 50% Offset Deformable Barrier	Test Date:	2/15/2008



DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

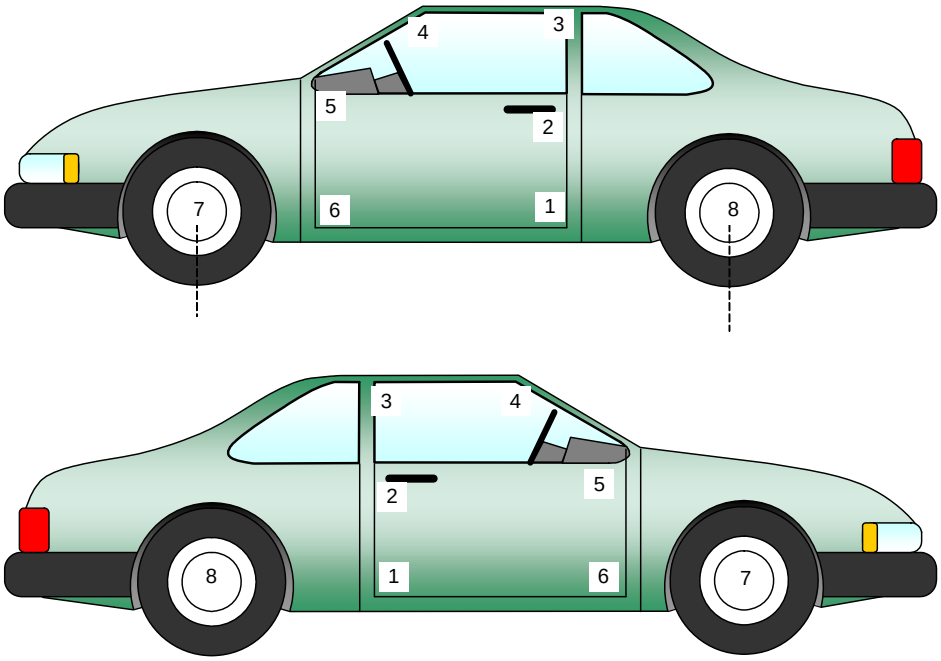
Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

No.	Measurement Description	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
1	Total length of vehicle at centerline	5051	4659	392
2	RSOV to front of engine	4486	4444	42
3	RSOV to firewall centerline	4171	4154	17
4	RSOV to leading edge of right door	3561	3558	3
5	RSOV to leading edge of left door	3561	3558	3
6	RSOV to lower leading edge of right door	3551	3555	-4
7	RSOV to lower leading edge of left door	3561	3550	11
8	RSOV to upper leading edge of right door	2470	2469	1
9	RSOV to upper leading edge of left door	2470	2462	8
10	RSOV to lower trailing edge of right door	2481	2484	-3
11	RSOV to lower trailing edge of left door	2481	2485	-4
12	RSOV to bottom of right 'A' pillar	3498	3498	0
13	RSOV to bottom of left 'A' pillar	3500	3485	15
14	RSOV to firewall on right side	4138	4133	5
15	RSOV to firewall on left side	4137	4106	31
16	RSOV to steering column	3073	3136	-63
17	Center of steering column to left 'A' pillar	440	458	-18
18	Center of steering column to headlining	480	503	-23
19	RSOV to right side of front bumper	4889	4956	-67
20	RSOV to left side of front bumper	4889	4821	68
21	Length of engine block	440	440	0
RD	RSOV to right side of dash panel	3375	3370	5
CD	RSOV to center of dash panel	3295	3291	4
LD	RSOV to left side of dash panel	3373	3368	5

DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008



LEFT FRONT

Point Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
1	2786	-832	58	2789	-834	57	3	2	1
2	2563	-818	-622	2568	-822	-623	5	4	1
3	2551	-640	-1044	2558	-645	-1045	7	5	1
4	3040	-667	-981	3047	-672	-985	7	5	4
5	3492	-771	-701	3498	-776	-705	6	5	4
6	3421	-825	105	3424	-826	103	3	1	2
7	4126	-922	215	4044	-959	226	-82	37	-11
8	1106	-955	235	1112	-960	233	6	5	2

RIGHT FRONT

Point Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
1	2782	838	54	2781	837	55	-1	1	-1
2	2563	834	-595	2563	833	-594	0	1	-1
3	2548	646	-1048	2548	645	-1048	0	1	0
4	3136	695	-942	3136	694	-943	0	1	1
5	3484	783	-713	3484	779	-713	0	4	0
6	3447	836	97	3444	836	94	-3	0	3
7	4123	935	211	4138	950	218	15	-15	-7
8	1107	955	225	1106	953	235	-1	2	-10

DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

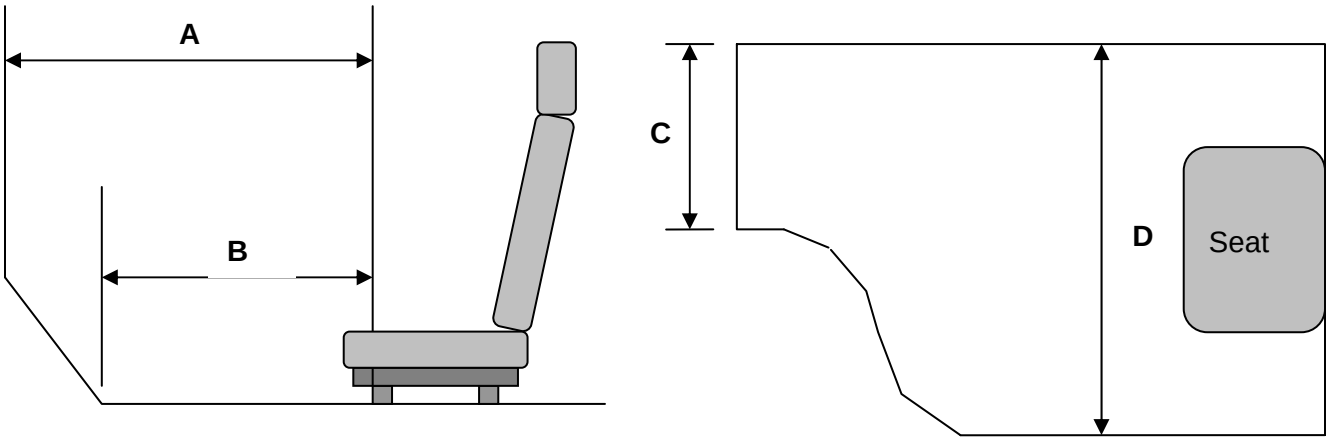
Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

	Elements	Pre-Test (mm)
1	Total Length	5051
2	Total Width	2050
3	Bumper Top Height	655
4	Bumper Bottom Height	479
5	Longitudinal Member Top Height	640
6	Distance between Longitudinal Members	1064
7	Longitudinal Member Width	66
8	Engine Top Height	1060
9	Engine Bottom Height	259
10	Engine and gearbox width	767
11	Front bumper-engine distance	440
12	Front shock absorber fixing height	1048
13	Bonnet leading edge height	971
14	Front shock absorber fixing width	1293
15	Front bumper – front axle distance	957
16	Front axle – a pillar distance	495
17	A-pillar – B-pillar distance	1115
18	B-Pillar – rear axle distance	1411
19	B-pillar – C-pillar distance	990
20	Roof sill bottom height	1597
21	Roof sill top height	1720
22	Floor sill bottom height	325
23	Floor sill top height	462

DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008



DRIVER

Measurements	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
A	681	675	6
B	615	605	10
C	492	484	8
D	534	528	6

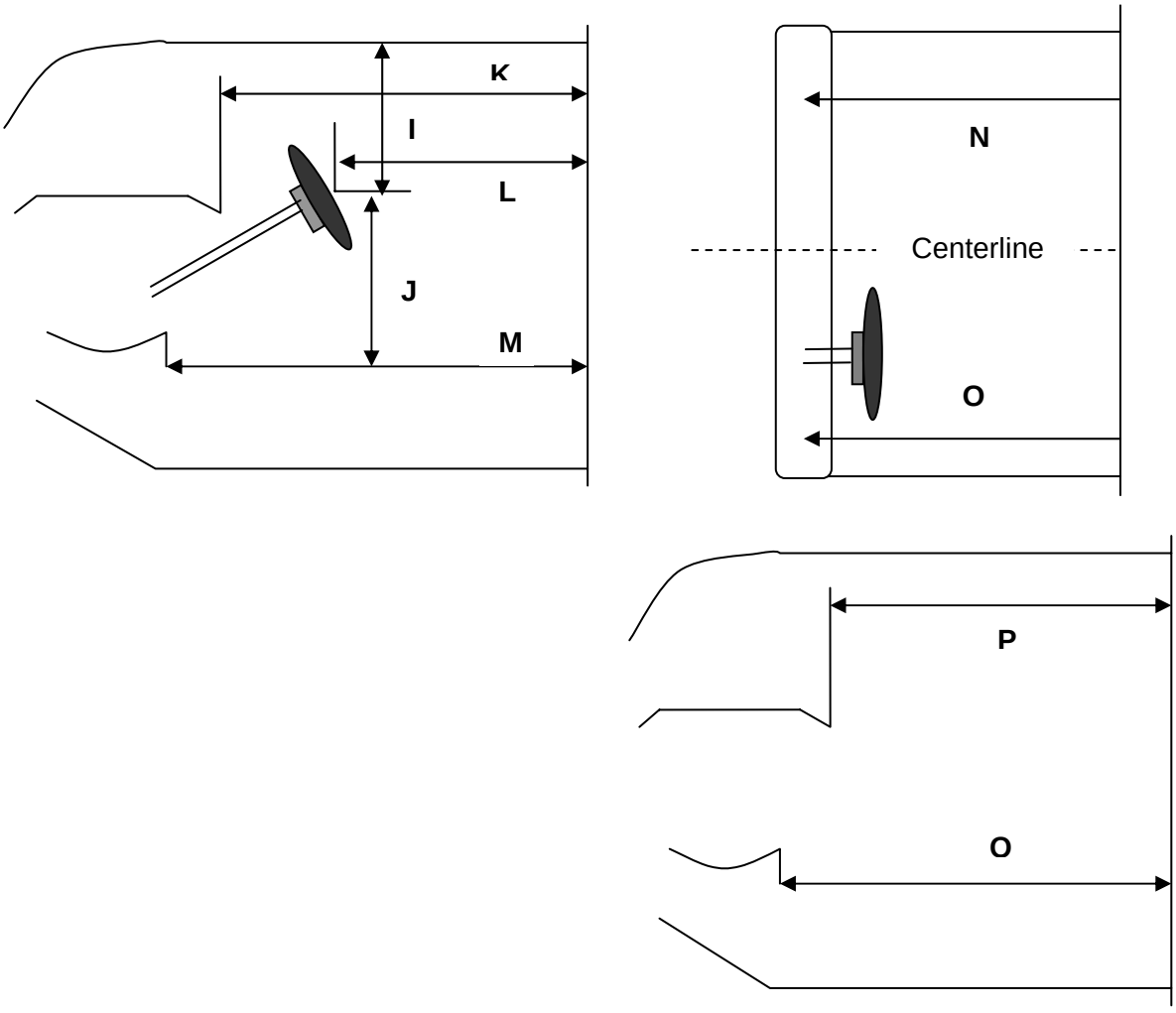
LEFT FRONT PASSENGER

Measurements	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
A	689	689	0
B	585	586	-1
C	413	412	1
D	547	546	1

DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008



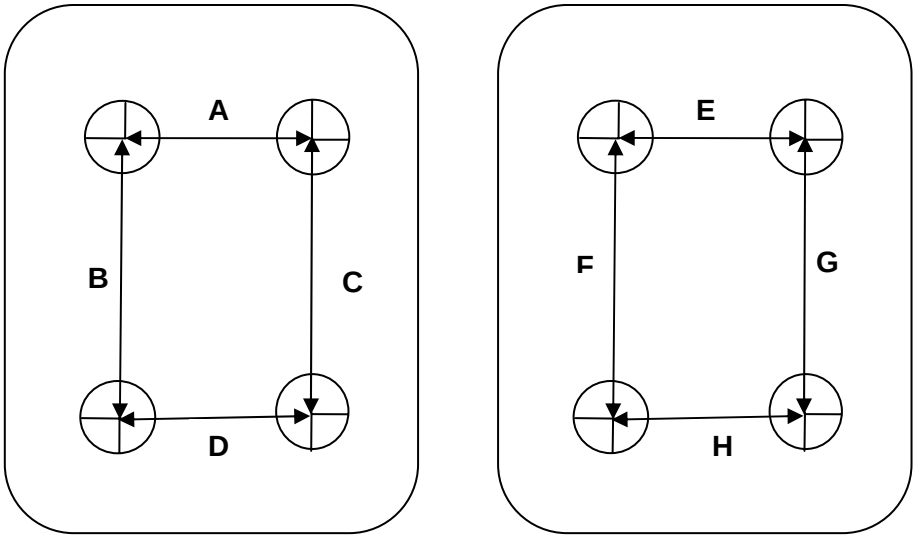
Measurements	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
I	480	503	-23
J	650	632	18
K	1683	1683	0
L	1440	1456	-16
M	1692	1686	6
N	2111	2108	3
O	2098	2091	7
P= K (PASS)	1693	1693	0
Q= M (PASS)	1674	1674	0

Measurements from C-Pillar Belt Anchorage

DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008



Driver Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
A	157	156	1
B	255	253	2
C	250	247	3
D	162	162	0
E	159	159	0
F	234	234	0
G	244	244	0
H	166	166	0

DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

	Points	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
		X	Y	Z	X	Y	Z	X	Y	Z
Lower Bumper Beam	1	4932	-608	22	4870	-542	-103	-62	-66	125
	2	5015	-372	44	4683	-383	-4	-332	11	48
	3	5074	-124	42	4652	-185	8	-422	61	34
	4	5074	124	42	4776	5	-4	-298	119	46
	5	5012	374	43	4901	228	5	-111	146	38
	6	4930	605	21	4994	455	-18	64	150	39
Upper Bumper Beam	1	4928	-619	-75	4842	-575	-187	-86	-44	112
	2	5015	-371	-66	4662	-377	-111	-353	6	45
	3	5072	-124	-64	4631	-181	-100	-441	57	36
	4	5071	123	-65	4761	11	-105	-310	112	40
	5	5014	371	-67	4892	227	-105	-122	144	38
	6	4927	617	-76	4992	469	-114	65	148	38
Upper Radiator Support	1	4431	-721	-475	4311	-741	-515	-120	20	40
	2	4734	-413	-436	4474	-398	-409	-260	-15	27
	3	4767	-145	-427	4521	-162	-428	-246	17	1
	4	4766	146	-430	4632	103	-445	-134	43	15
	5	4731	413	-434	4682	364	-458	-49	49	24
	6	4427	715	-475	4427	709	-477	0	6	2
Front of Hood	1	4428	-813	-507	4419	-828	-670	-9	15	163
	2	4927	-486	-400	4714	-486	-314	-213	0	86
	3	4990	-165	-402	4783	-172	-303	-207	7	99
	4	4988	163	-403	4850	147	-316	-138	16	87
	5	4924	485	-401	4867	461	-397	-57	24	4
	6	4428	808	-508	4436	799	-573	8	9	65

Reference Photos on the Following Page

DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

Test Vehicle:	2008 Saturn Outlook FWD XE	NHTSA No.:	R80175
Test Program:	Left 50% Offset Deformable Barrier	Test Date:	2/15/2008



Lower Bumper Beam / Upper Bumper Beam / Front of Hood



Upper Radiator Support

DATA SHEET 10 (CONTINUED)

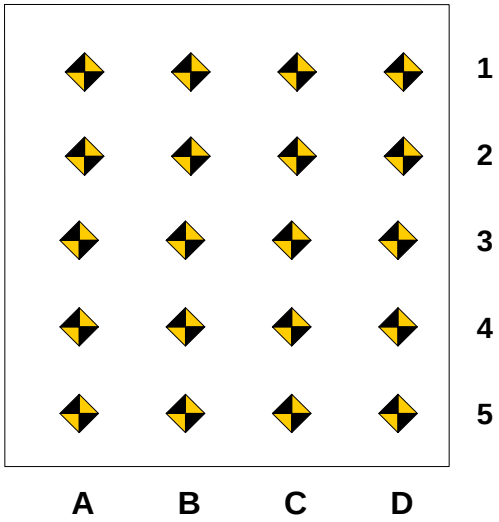
TEST VEHICLE MEASUREMENTS

Test Vehicle: 2008 Saturn Outlook FWD XE
Test Program: Left 50% Offset Deformable Barrier
NHTSA No.: R80175
Test Date: 2/15/2008

Columns A through D are evenly spaced.

Rows 1 and 2 are on the toe kick portion of the floor pan. Rows 3, 4, and 5 are located on the most level portion of the floor pan.

Row 3 will be at the intersection of the toe kick and the level sections of the floor pan.



DRIVER'S SIDE TOE PAN FLOOR BOARD

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	3704	-626	21	3704	-624	16	0	-2	5
B1	3762	-503	26	3760	-500	21	-2	-3	5
C1	3775	-379	24	3774	-376	19	-1	-3	5
D1	3778	-252	24	3779	-251	21	1	-1	3
A2	3690	-628	80	3690	-626	75	0	-2	5
B2	3713	-502	79	3714	-499	76	1	-3	3
C2	3707	-378	80	3707	-375	77	0	-3	3
D2	3719	-256	81	3720	-251	79	1	-5	2
A3	3619	-623	131	3622	-621	128	3	-2	3
B3	3612	-503	137	3613	-501	135	1	-2	2
C3	3594	-378	138	3596	-375	136	2	-3	2
D3	3620	-255	137	3621	-251	135	1	-4	2
A4	3516	-631	148	3518	-629	146	2	-2	2
B4	3518	-509	153	3520	-507	151	2	-2	2
C4	3519	-383	145	3520	-381	144	1	-2	1
D4	3520	-259	151	3521	-257	150	1	-2	1
A5	3411	-631	151	3413	-629	148	2	-2	3
B5	3412	-508	152	3413	-505	150	1	-3	2
C5	3419	-383	155	3421	-381	153	2	-2	2
D5	3415	-258	151	3416	-256	150	1	-2	1
Brake Pedal	3611	-406	-71	3610	-406	-73	-1	0	2
IP Left	3339	-553	-444	3341	-553	-447	2	0	3
IP Right	3335	-254	-435	3337	-254	-437	2	0	2
Steering Column	3130	-403	-558	3157	-408	-532	27	5	-26
Front Outboard Bolt	2986	-625	98	2991	-627	97	5	2	1

DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

Driver's Side Toe Pan Floor Board
Additional Measurements

Points	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
1	3697	-652	-64	3699	-652	-69	2	0	5
2	3751	-575	-55	3746	-573	-61	-5	-2	6
3	3797	-494	-32	3790	-489	-40	-7	-5	8
4	3801	-376	-16	3804	-374	-19	3	-2	3
5	3804	-253	-10	3805	-253	-13	1	0	3
6	3798	-130	-10	3797	-130	-20	-1	0	10
7	3679	-675	-50	3679	-674	-53	0	-1	3
8	3666	-685	-6	3666	-683	-8	0	-2	2
9	3678	-660	38	3678	-658	33	0	-2	5
10	3722	-572	61	3722	-568	55	0	-4	6
11	3745	-438	43	3746	-437	39	1	-1	4
12	3745	-315	54	3743	-312	49	-2	-3	5
13	3744	-189	51	3742	-187	46	-2	-2	5
14	3770	-128	22	3765	-128	12	-5	0	10
15	3650	-697	61	3651	-695	56	1	-2	5
16	3652	-670	109	3653	-669	104	1	-1	5
17	3656	-562	118	3658	-560	114	2	-2	4
18	3655	-442	110	3657	-440	107	2	-2	3
19	3659	-316	113	3660	-314	111	1	-2	2
20	3666	-190	112	3666	-189	108	0	-1	4
21	3706	-128	81	3704	-128	74	-2	0	7
22	3622	-698	125	3624	-696	122	2	-2	3
23	3575	-665	136	3578	-663	131	3	-2	5
24	3568	-560	148	3570	-557	145	3	-3	3
25	3562	-435	140	3564	-433	138	2	-2	2
26	3562	-327	147	3563	325	145	1	-2	2
27	3570	-191	148	3570	-189	145	0	-2	3
28	3614	-127	138	3614	-124	134	0	-3	4
29	3526	-705	135	3528	-704	131	2	-1	4
30	3469	-671	135	3471	-671	132	2	0	3
31	3462	-567	150	3463	-564	147	1	-3	3
32	3468	-445	148	3470	-443	145	2	-2	3
33	3469	-323	151	3470	-321	148	1	-2	3
34	3472	-196	151	3474	-194	149	2	-2	2
35	3519	-133	157	3520	-132	155	1	-1	2
36	3413	-713	133	3415	-712	130	2	-1	3
37	3404	-131	156	3404	-131	154	0	0	2
38	3280	-723	131	3283	-722	128	3	-1	3
39	3282	-623	152	3285	-622	149	3	-1	3
40	3282	-500	153	3285	-499	151	3	-1	2

DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

Driver's Side Toe Pan Floor Board
Additional Measurements (Continued)

Points	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
41	3281	-375	153	3283	-373	151	2	-2	2
42	3282	-253	155	3282	-252	154	0	-1	1
43	3284	-126	155	3284	-124	156	0	-2	-1
44	3162	-723	132	3165	-722	130	3	-1	2
45	3163	-625	153	3165	-625	151	2	0	2
46	3163	-500	152	3165	-498	150	2	-2	2
47	3162	-377	152	3164	-375	150	2	-2	2
48	3162	-253	148	3163	-253	148	1	0	0
49	3160	-126	153	3161	-126	152	1	0	1
50	3034	-722	130	3038	-722	128	4	0	2
51	3041	-626	143	3043	-625	141	2	-1	2
52	3043	-500	142	3044	-500	139	1	0	3
53	3047	-379	143	3048	-378	142	1	-1	1
54	3041	-253	142	3042	-252	142	1	-1	0
55	3047	-127	140	3048	-126	140	1	-1	0
56	3702	-327	-137	3702	-327	-138	0	0	1
57	3636	-405	-94	3630	-397	-93	-6	-8	-1
58	3596	-405	-41	3595	-407	-44	-1	2	3
59	3746	-254	-100	3747	-254	-101	1	0	1
60	3697	-246	-62	3700	-246	-64	3	0	2
61	3616	-261	34	3617	-262	33	1	1	1
62	3675	-641	-70	3680	-642	-68	5	1	-2
63	3685	-574	-62	3692	-575	-62	7	1	0
64	3569	-579	53	3582	-576	61	13	-3	-8
65	3560	-660	44	3569	-657	50	9	-3	-6
66	3654	-664	-55	3659	-665	-52	5	1	-3

DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

Test Vehicle:	2008 Saturn Outlook FWD XE	NHTSA No.:	R80175
Test Program:	Left 50% Offset Deformable Barrier	Test Date:	2/15/2008

Driver's Side Toe Pan Floor Board



DATA SHEET 10 (CONTINUED)

TEST VEHICLE MEASUREMENTS

Test Vehicle:	2008 Saturn Outlook FWD XE	NHTSA No.:	R80175
Test Program:	Left 50% Offset Deformable Barrier	Test Date:	2/15/2008

Driver's Side Toe Pan Floor Board





DATA SHEET 10 (CONTINUED)

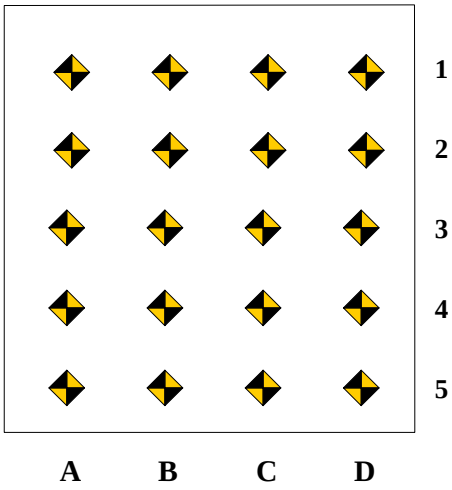
TEST VEHICLE MEASUREMENTS

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

Columns A through D are evenly spaced.

Rows 1 and 2 are on the toe kick portion of the floor pan. Rows 3, 4, and 5 are located on the most level portion of the floor pan.

Row 3 will be at the intersection of the toe kick and the level sections of the floor pan.



PASSENGER'S SIDE TOE PAN FLOOR BOARD

Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	X	Y	Z	X	Y	Z	X	Y	Z
A1	3773	255	22	3773	252	28	0	3	-6
B1	3774	378	22	3773	375	25	-1	3	-3
C1	3768	507	22	3766	503	23	-2	4	-1
D1	3706	628	23	3703	624	34	-3	4	-11
A2	3700	258	79	3699	255	84	-1	3	-5
B2	3707	382	80	3706	379	82	-1	3	-2
C2	3703	503	75	3701	501	78	-2	2	-3
D2	3693	632	75	3691	629	76	-2	3	-1
A3	3620	258	127	3618	255	130	-2	3	-3
B3	3593	380	138	3591	377	141	-2	3	-3
C3	3608	506	131	3606	503	133	-2	3	-2
D3	3618	626	125	3617	623	127	-1	3	-2
A4	3521	261	152	3519	257	154	-2	4	-2
B4	3521	385	148	3519	381	151	-2	4	-3
C4	3514	511	146	3514	509	149	0	2	-3
D4	3517	634	147	3517	632	151	0	2	-4
A5	3416	261	151	3416	258	153	0	2	-2
B5	3420	383	153	3419	381	156	-1	2	-3
C5	3412	510	146	3410	506	150	-2	4	-4
D5	3410	633	148	3409	630	149	-1	3	-1
Front Outboard Bolt	3987	636	92	3985	633	94	-2	3	-2
IP Left	3355	259	-512	3354	255	-512	-1	4	0
IP Right	3355	562	-509	3356	558	-508	1	4	-1

DATA SHEET 11

PHOTOGRAPHIC DATA

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

No.	Camera View	Location (mm) *			Lens (mm)	Angle (deg)	Shutter (µs)	Speed (fps)
		X	Y	Z				
1	Left Front Half	385	-5250	1170	24	4.8	325	1000
2	Left SWC Bottom	755	-6900	1185	50	3.7	275	1000
3	Left Angle 2	5365	-5180	2060	50	7.4	175	1000
4	Left Overall	1690	-7040	1180	19	3.8	1000	1000
5	Right Front Half	405	5090	1195	24	4.8	300	1000
6	Onboard Driver Side				6.5		1000	1000
7	Onboard Driver Angle				8		1000	1000
8	Onboard Passenger Side				8	11.8	1000	1000
9	Windshield	-2530	0	2770	12.5	31.9	280	1000
10	Overhead Closeup	-20	0	4440	50	90	700	1000
11	Overhead Overall	725	0	4630	14	90	750	1000
12	Pit Front	5	0	-3150	24	90	750	1000
13	Pit Rear	2165	0	-3150	24	90	750	1000
14	Real-Time Camera				13			24

*COORDINATES:

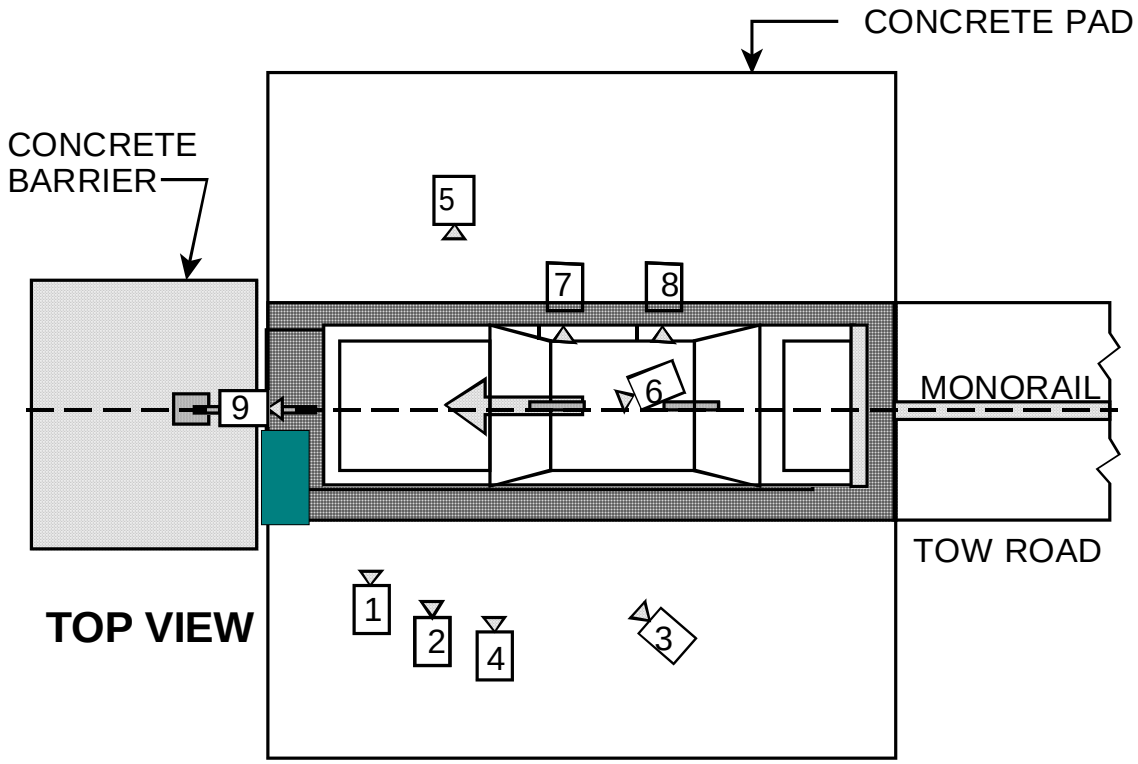
+X = forward of impact plane
+Y = right of monorail centerline
+Z = above ground level

DATA SHEET 11 (CONTINUED)

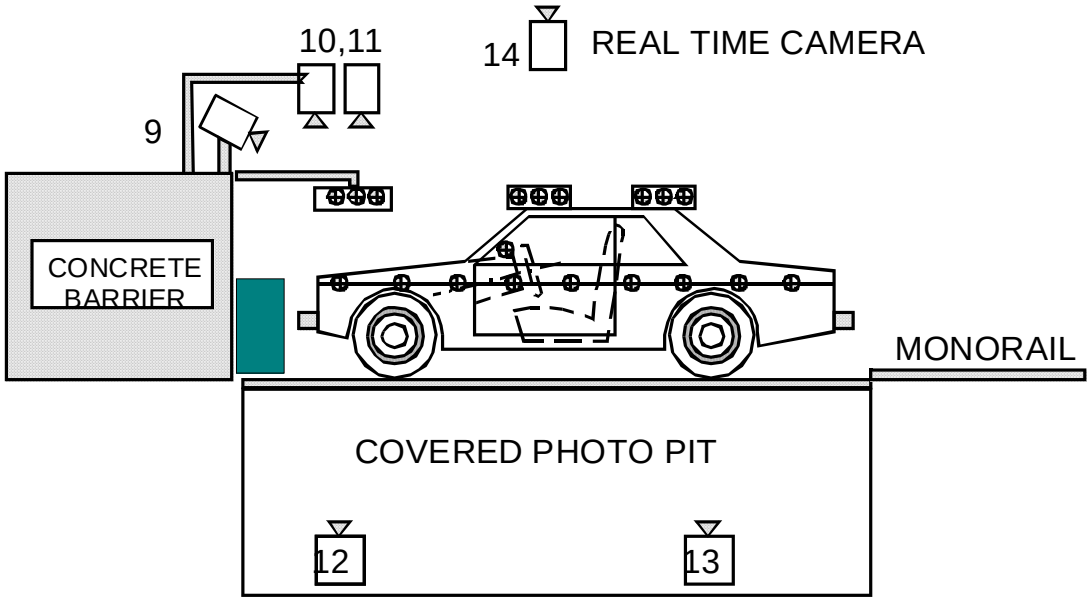
PHOTOGRAPHIC DATA

Test Vehicle:	2008 Saturn Outlook FWD XE	NHTSA No.:	R80175
Test Program:	Left 50% Offset Deformable Barrier	Test Date:	2/15/2008

CAMERA POSITIONS FOR FRONTAL IMPACTS



TOP VIEW



LEFT SIDE VIEW

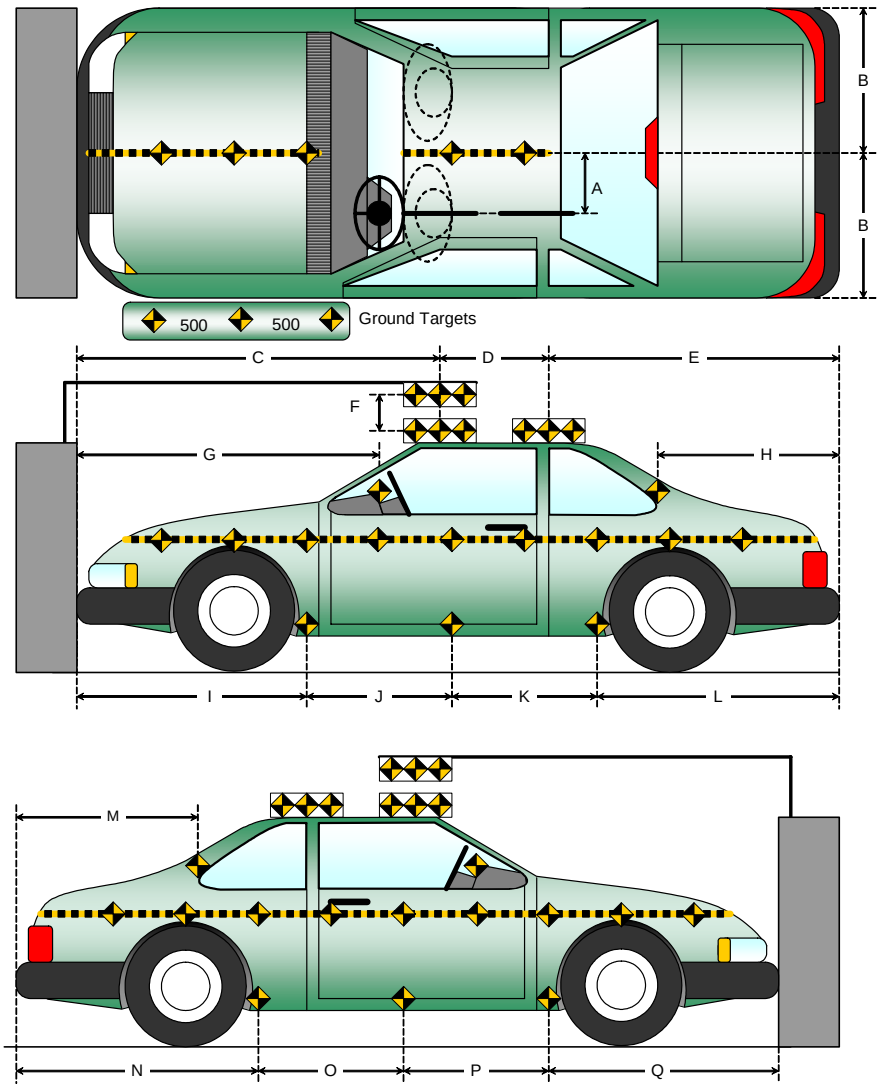
DATA SHEET 12

VEHICLE REFERENCE PHOTO TARGET LOCATIONS

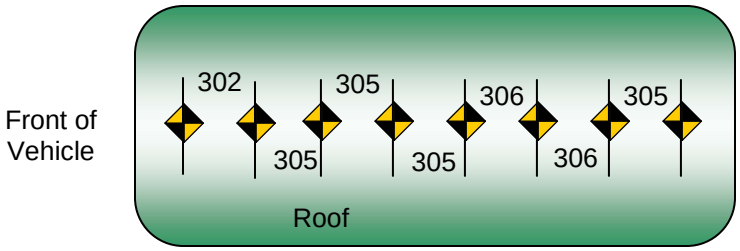
Test Vehicle: 2008 Saturn Outlook FWD XE
Test Program: Left 50% Offset Deformable Barrier
NHTSA No.: R80175
Test Date: 2/15/2008

Measurement from roof to overhead cameras: 2860 mm

Item	Value
A	410
B	1025
C	2510
D	915
E	1626
F	
G	
H	1446
I	1470
J	1018
K	1018
L	1545
M	1419
N	1549
O	1019
P	1019
Q	1464



Distance between left rear door targets: 200 mm
Overhead camera to ground: 4630 mm
Measurement of roof targets:



DATA SHEET 13

POST TEST AIR BAG DATA

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

Air Bag Data	Driver
Number of Vent Holes	2
Size of Vent Holes	30 mm diameter
Shape of Vent Holes	Round
Total Vent Area	1413 mm^2
Length of Deflated Airbag (if square)	
Width of Deflated Airbag (if square)	
Diameter of Deflated Airbag (if round)	610 mm
Is Airbag Tethered?	Yes
Length of Tethers	240 mm

Driver Airbag Part Numbers: MCAS2750670
AB7219Z305710099
0166511
15777219

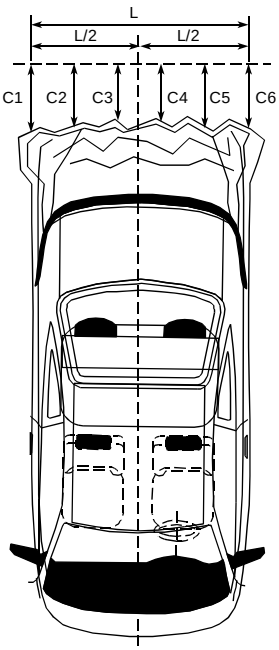
DATA SHEET 14

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

CRUSH DEPTH DIMENSIONS

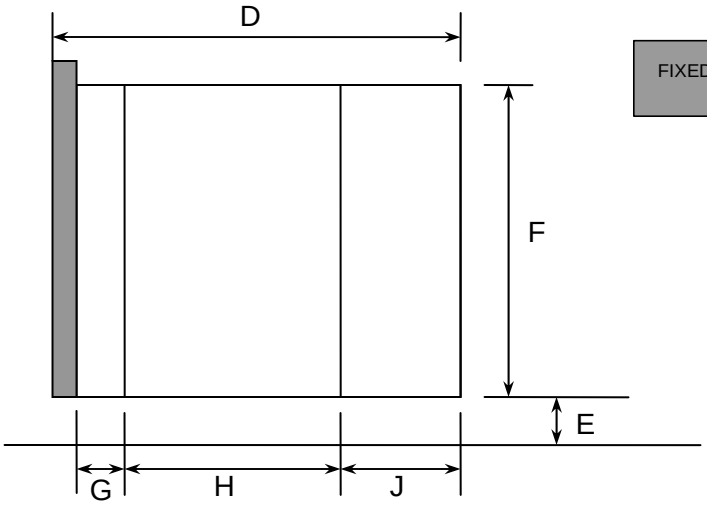
No.	Measurement Description	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
C1	Crush zone 1 at left side	4889	4821	68
C2	Crush zone 2 at left side	4969	4663	306
C3	Crush zone 3 at left side	5024	4631	393
C4	Crush zone 4 at right side	5026	4777	249
C5	Crush zone 5 at right side	4969	4891	78
C6	Crush zone 6 at right side	4889	4956	-67
L	C1 TO C6	1288	1056	232

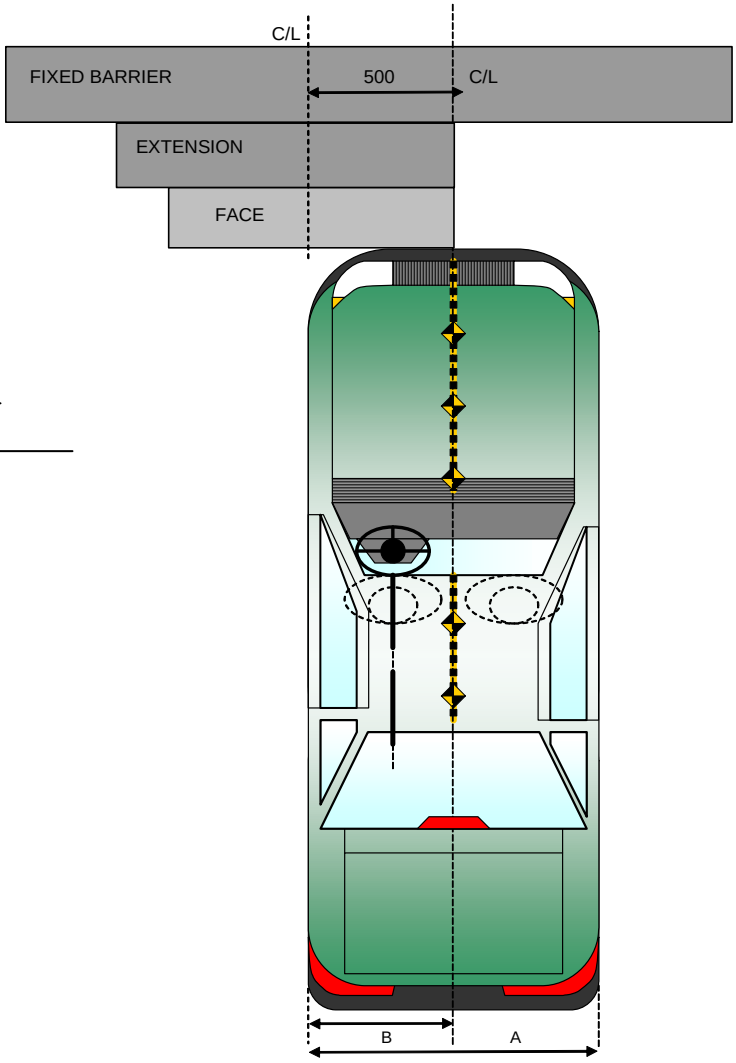


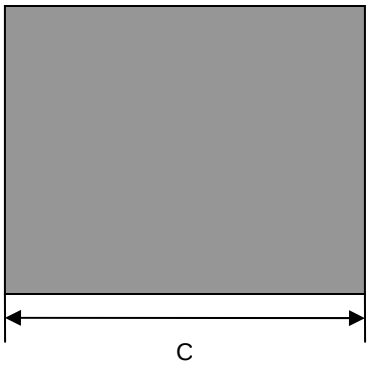
DATA SHEET 15

OFFSET BARRIER AND VEHICLE ORIENTATION

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008





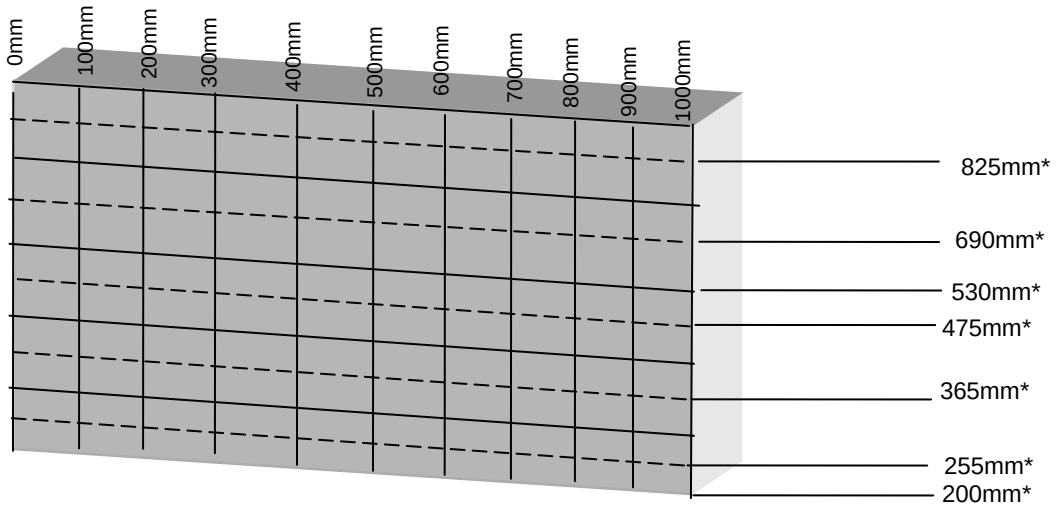


Location	Description	Measurement (mm)
A	Total Vehicle Width	2050
B	50% Overlap Distance	1025
C	Deformable Face Width	1000
D	Single Stage Honeycomb Depth	800
E	Lower Edge Height From Ground	199
F	Deformable Barrier Honeycomb Height	700
G	Constant Rear Deformable Core	90
H	Progressive Rear Deformable Core	450
J	Constant Front Deformable Core	250

DATA SHEET 16

DEFORMABLE BARRIER HONEYCOMB CRUSH

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008



*Measurement to Ground

	Points (mm)	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
255 mm	0	795	664	131
	100	795	690	105
	200	795	605	190
	300	795	509	286
	400	796	410	386
	500	797	352	445
	600	796	335	461
	700	796	351	445
	800	796	342	454
	900	796	323	473
	1000	795	292	503
365 mm	0	794	649	145
	100	796	701	95
	200	796	622	174
	300	796	525	271
	400	796	443	353
	500	796	382	414
	600	796	358	438
	700	796	377	419
	800	796	386	410
	900	796	383	413
	1000	796	362	434

DATA SHEET 16 (CONTINUED)

DEFORMABLE BARRIER HONEYCOMB CRUSH

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

	Points (mm)	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
475 mm	0	796	642	154
	100	796	700	96
	200	796	639	157
	300	796	538	258
	400	796	440	356
	500	796	190	606
	600	797	262	535
	700	797	300	497
	800	797	307	490
	900	796	303	493
	1000	796	234	562
530 mm	0	796	644	152
	100	796	699	97
	200	796	646	150
	300	796	547	249
	400	796	118	678
	500	797	202	595
	600	797	280	517
	700	797	315	482
	800	797	319	478
	900	796	311	485
	1000	797	229	568
690 mm	0	796	663	133
	100	796	706	90
	200	797	663	134
	300	797	563	234
	400	797	323	474
	500	797	365	432
	600	797	377	420
	700	797	389	408
	800	797	385	412
	900	797	381	416
	1000	797	344	453
825 mm	0	797	704	93
	100	797	718	79
	200	797	639	158
	300	797	582	215
	400	797	545	252
	500	797	490	307
	600	797	490	307
	700	797	495	302
	800	797	493	304
	900	797	454	343
	1000	797	376	421

DATA SHEET 17

DEFORMABLE BARRIER LOAD CELL LOCATIONS

Test Vehicle: 2008 Saturn Outlook FWD XE NHTSA No.: R80175
Test Program: Left 50% Offset Deformable Barrier Test Date: 2/15/2008

Row One	1	11	21	31	41	51	61	71	81
	2	12	22	32	42	52	62	72	82
	3	13	23	33	43	53	63	73	83
	4	14	24	34	44	54	64	74	84
	5	15	25	35	45	55	65	75	85
	6	16	26	36	46	56	66	76	86
	7	17	27	37	47	57	67	77	87
	8	18	28	38	48	58	68	78	88
	9	19	29	39	49	59	69	79	89
Row Ten	10	20	30	40	50	60	70	80	90

Track C/L

90 Load Cells
10 Rows
9 Columns

Front View

Load Cells measure 123 mm square and have a 1.5 mm gap.
Distance from LCB to ground measures 125 mm

APPENDIX A

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Manufacturer's Label



Tire Placard



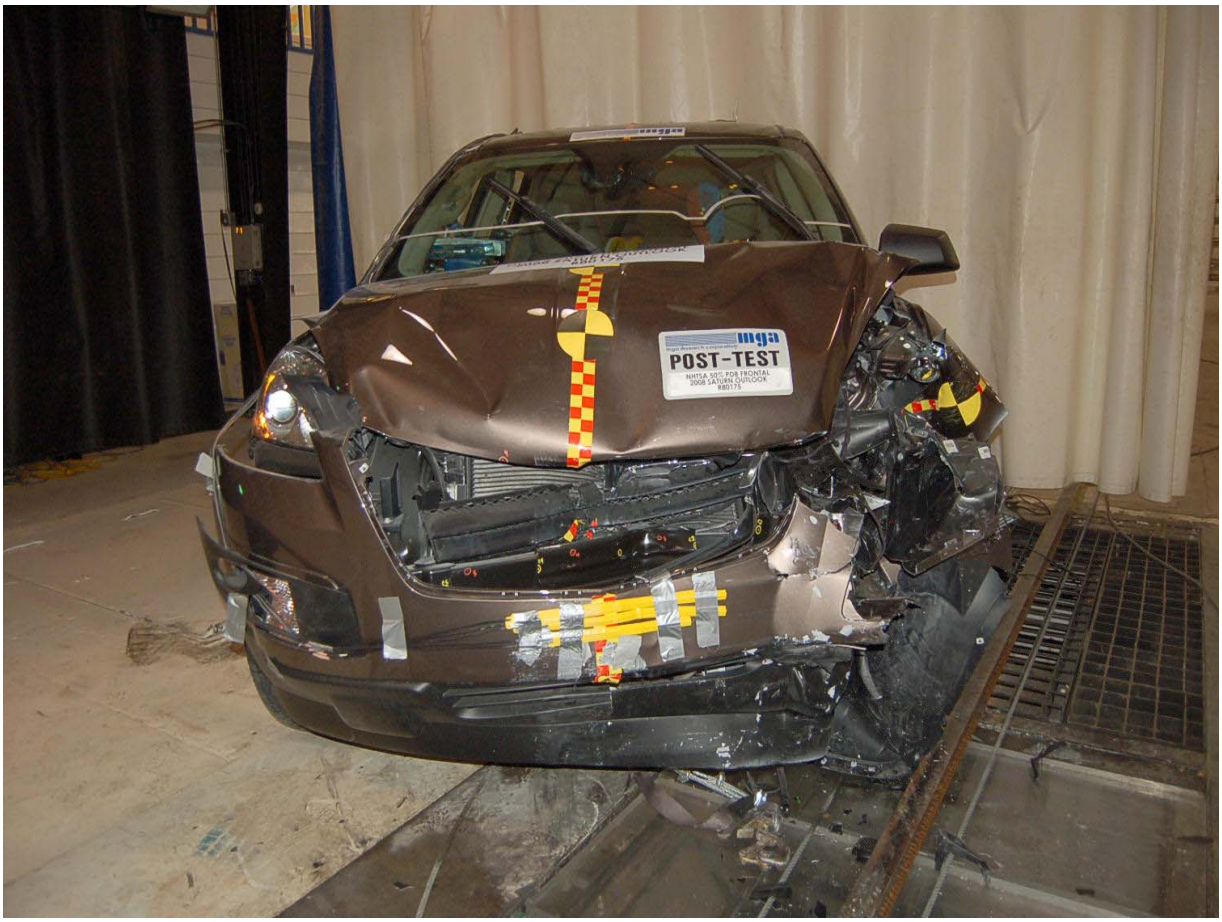
Left Front ¾ View, As Received



Right Rear ¾ 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 ¾ View



Post-Test Right Front ¾ View



Pre-Test Left Front ¾ View



Post-Test Left Front ¾ View



Pre-Test Left Rear ¾ View



Post-Test Left Rear ¾ View



Pre-Test Left Side ¾ View of Doors



Post-Test Left Side ¾ View of Doors After Impact



Post-Test Right Side ¾ View of Doors After Impact



Pre-Test Windshield View


Post-Test Windshield View



Pre-Test Engine Compartment View



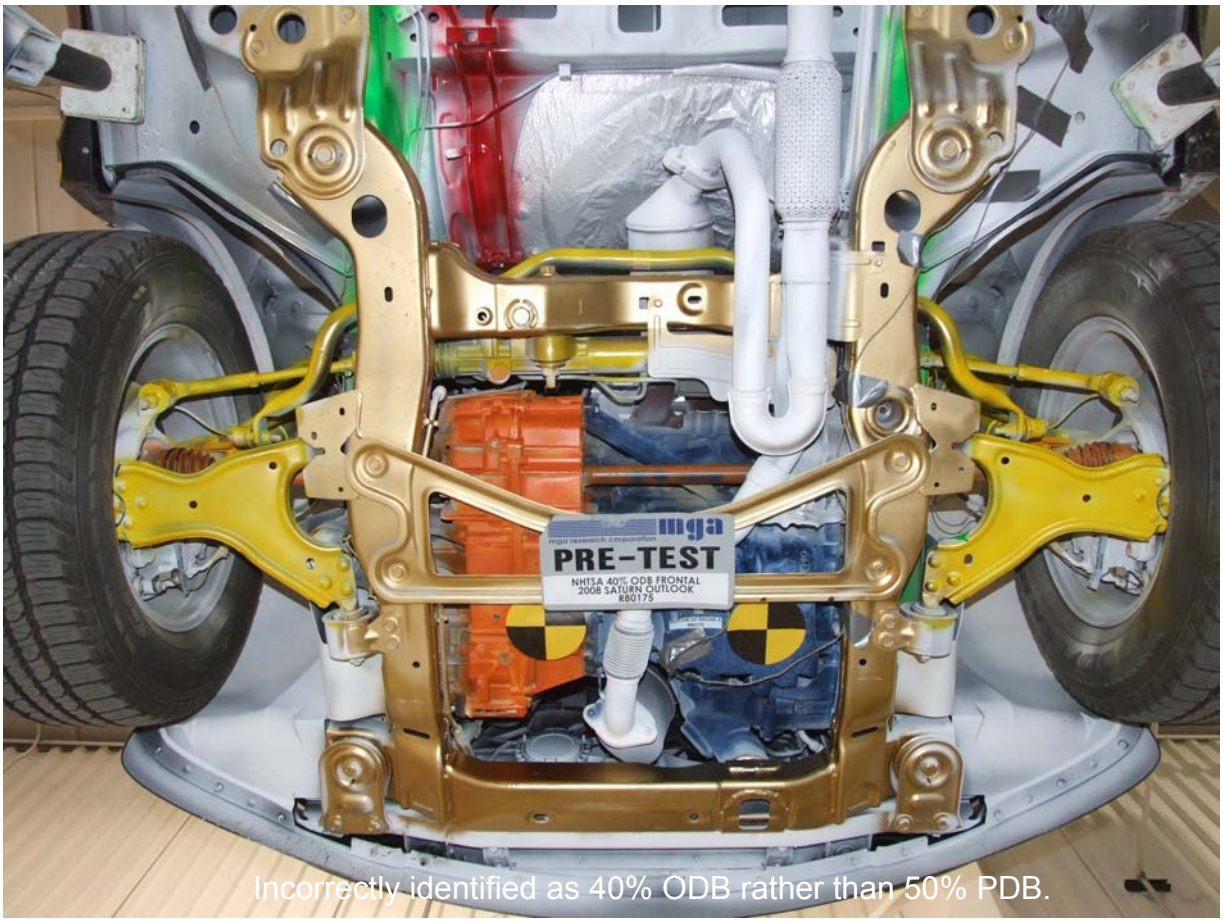
Post-Test Engine Compartment View



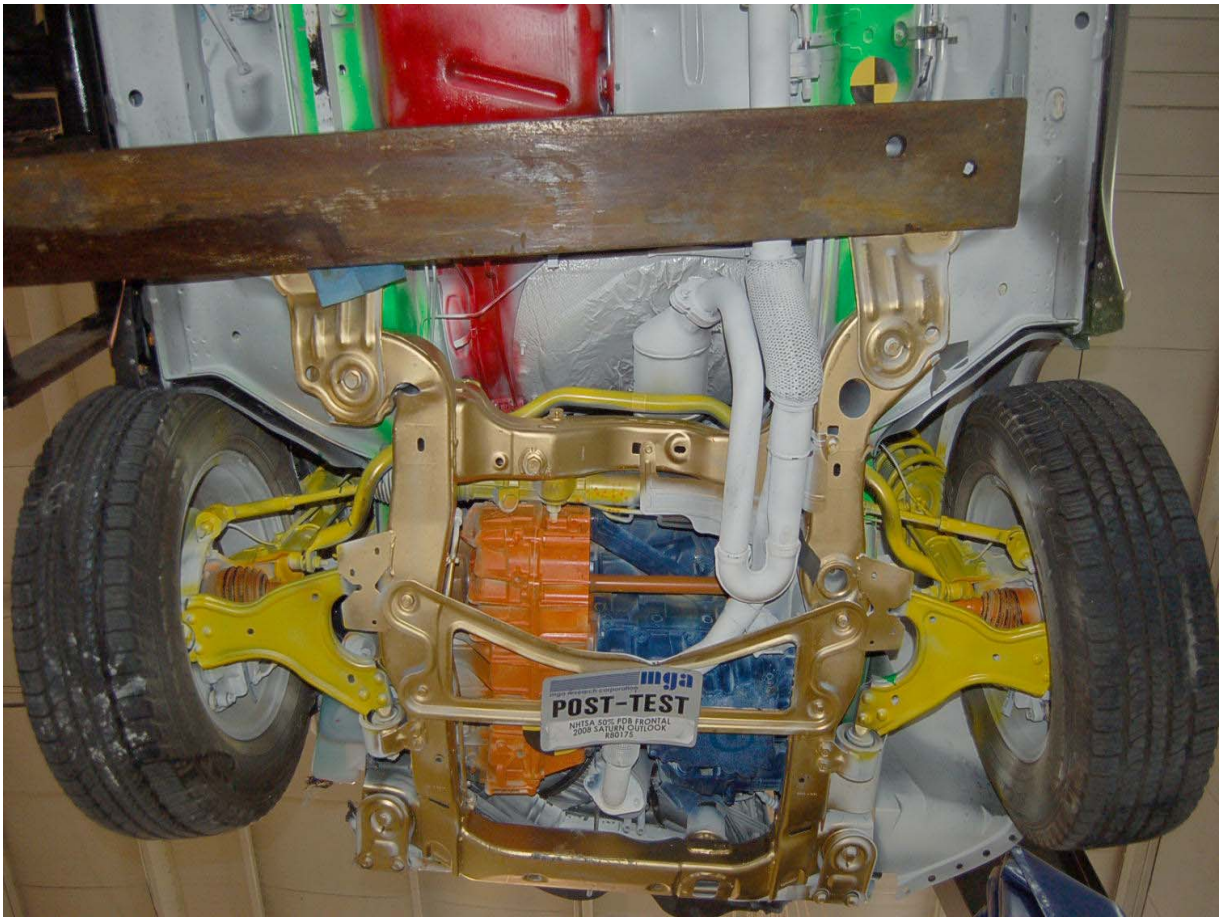
Pre-Test Fuel Cap View



Post-Test Fuel Cap View



Pre-Test Front Underbody View



Post-Test Front Underbody View



Incorrectly identified as 40% ODB rather than 50% PDB.

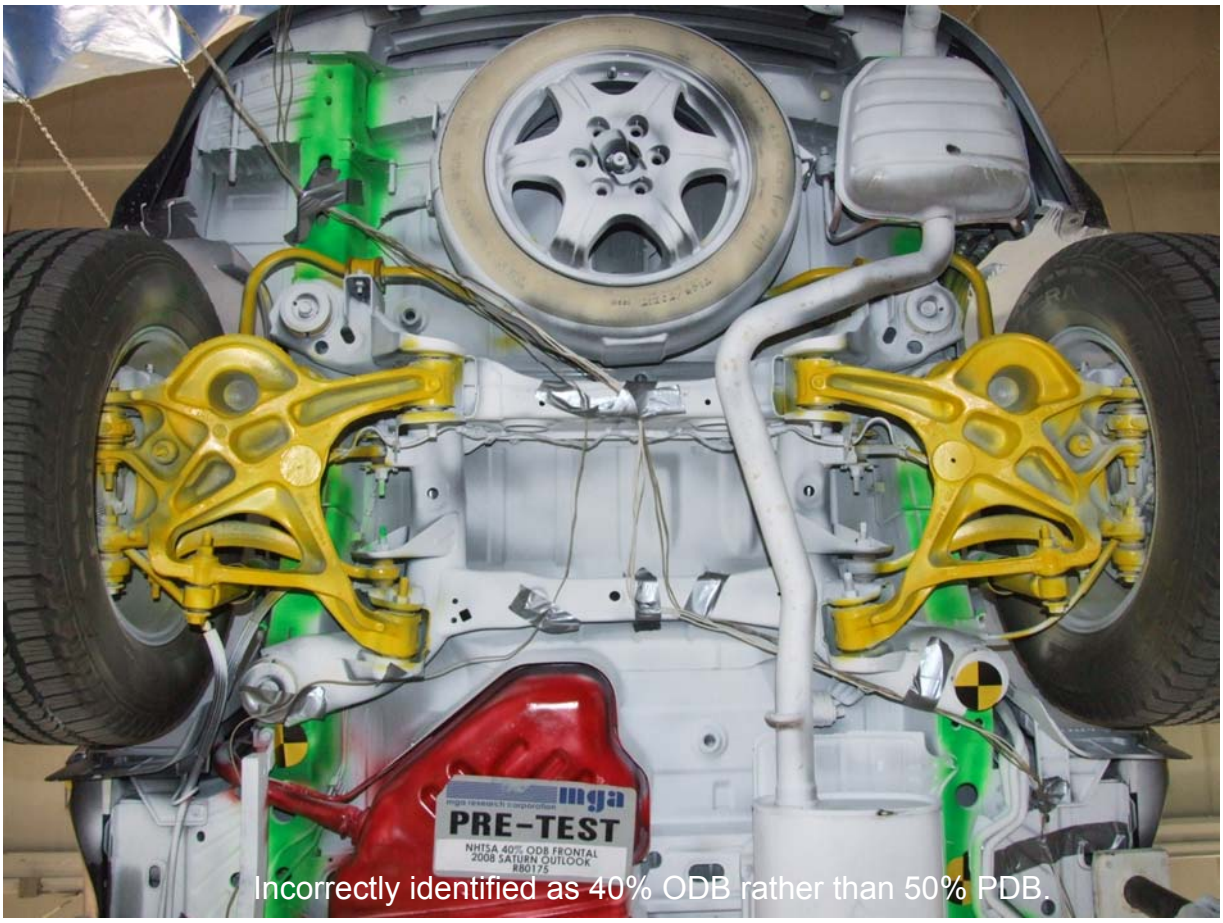
Pre-Test Mid Underbody View



Post-Test Mid Underbody View

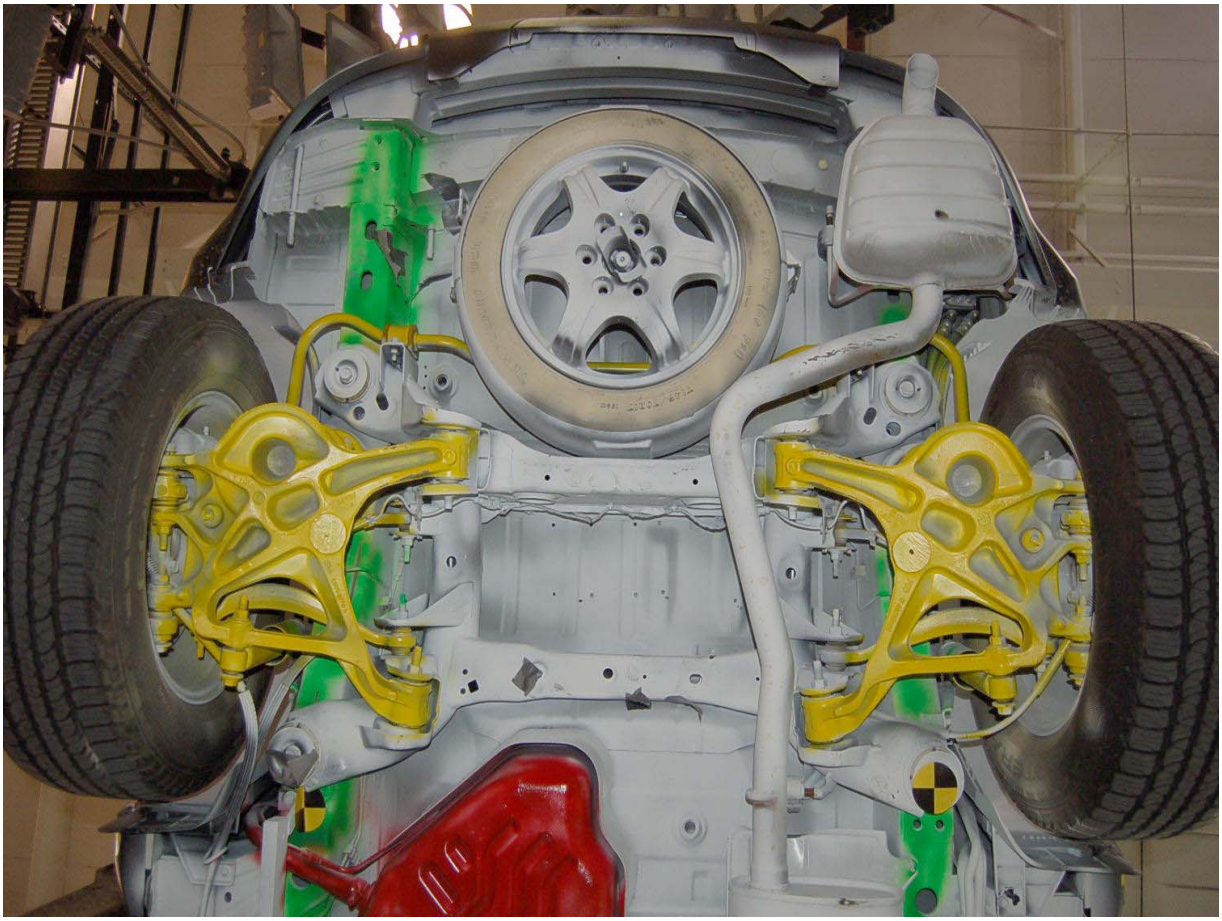


Pre-Test Mid Rear Underbody View



Incorrectly identified as 40% ODB rather than 50% PDB.

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)



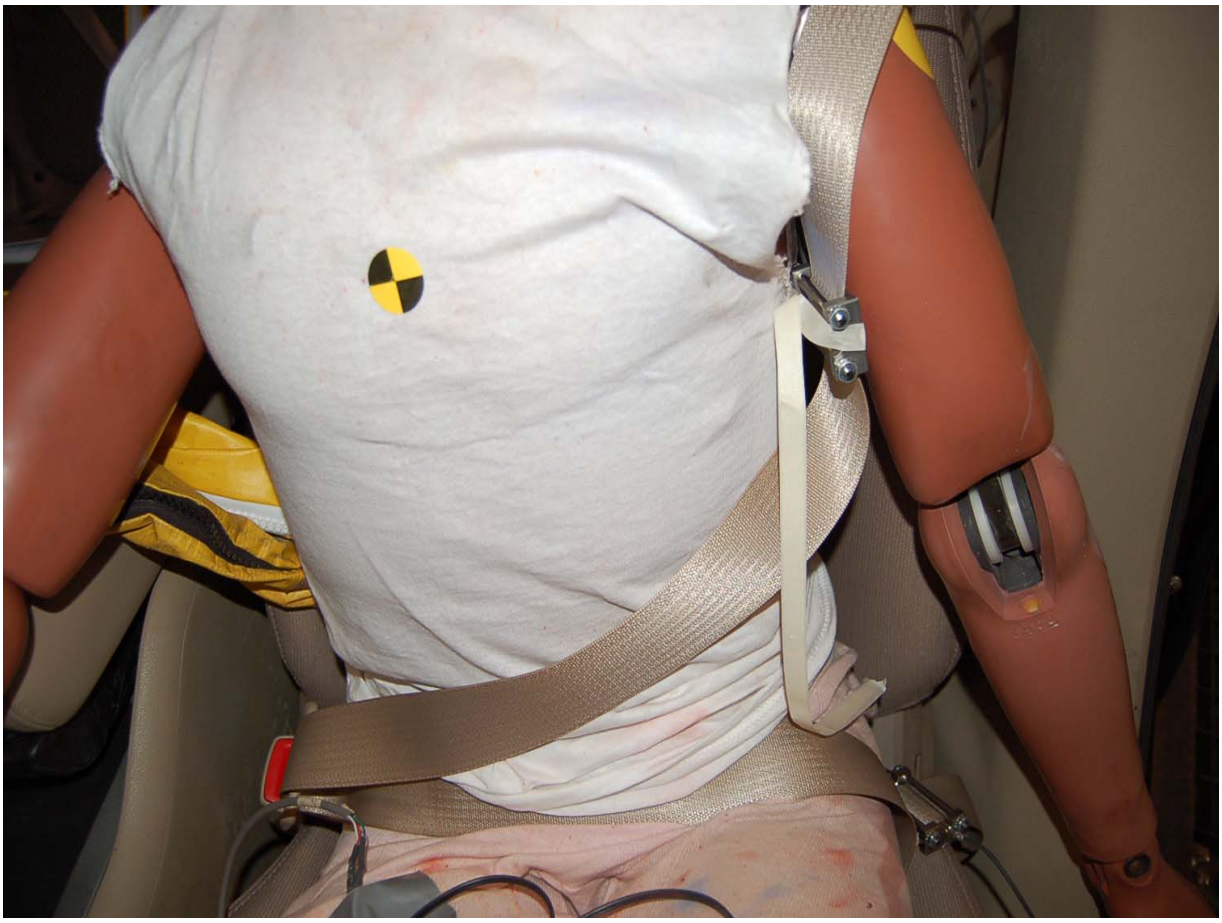
Pre-Test Driver Dummy (Door Open)



Post-Test Driver Dummy (Door Open)



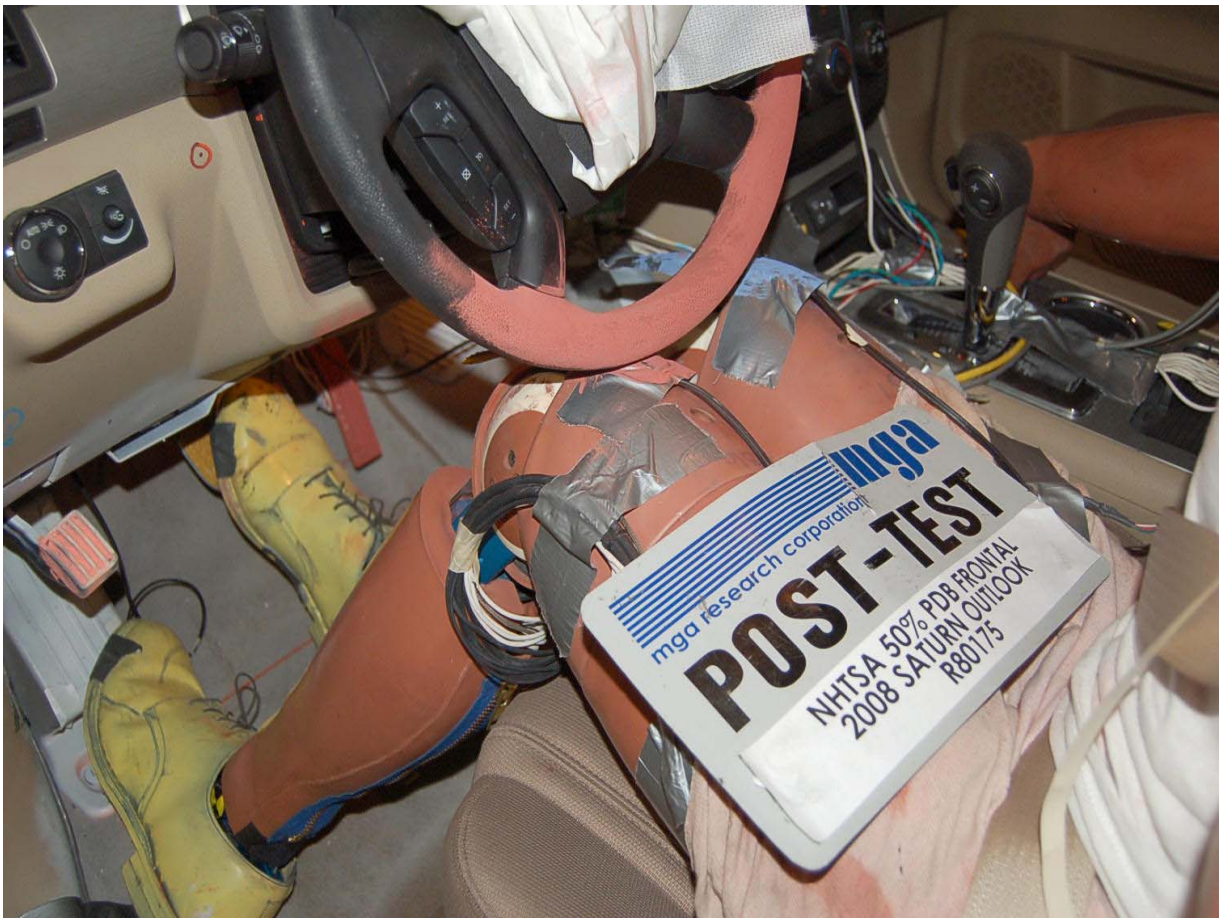
Pre-Test Driver Dummy Abdomen View Close-Up



Post-Test Driver Dummy Abdomen View Close-Up



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



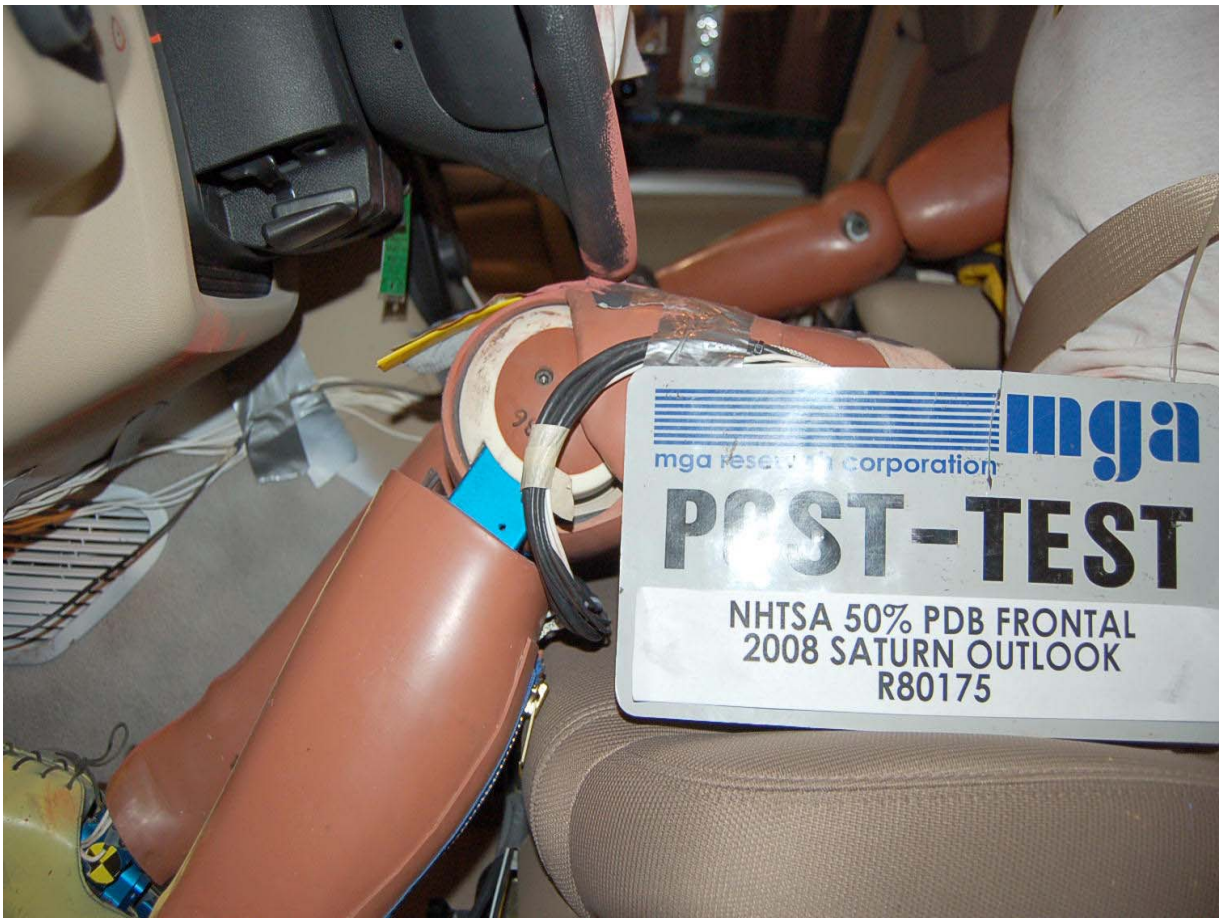
Pre-Test Driver Dummy Foot/Leg Close-Up



Post-Test Driver Dummy Foot/Leg Close-Up



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 (headrest)



Post-Test Driver Dummy Knee Contact



Post-Test Driver Dummy Airbag Contact



Pre-Test Left Rear Passenger Dummy (Through Window)



Post-Test Left Rear Passenger Dummy (Through Window)



Pre-Test Left Rear Passenger Dummy (Door Open)



Post-Test Left Rear Passenger Dummy (Door Open)



Pre-Test Left Rear Passenger Dummy Leg Position View



Post-Test Left Rear Passenger Dummy Leg Position View



Pre-Test Left Rear Passenger Dummy Feet Position View



Post-Test Left Rear Passenger Dummy Feet Position View



Pre-Test Left Rear Passenger Dummy Right Side View


Post-Test Left Rear Passenger Dummy Right Side View



Post-Test Left Rear Passenger Dummy Head Contact View



Post-Test Left Rear Passenger Dummy Foot Contact View



Pre-Test Offset Deformable Barrier Front View



Post-Test Offset Deformable Barrier Front View



Pre-Test Offset Deformable Barrier Left Side View



Post-Test Offset Deformable Barrier Left Side View



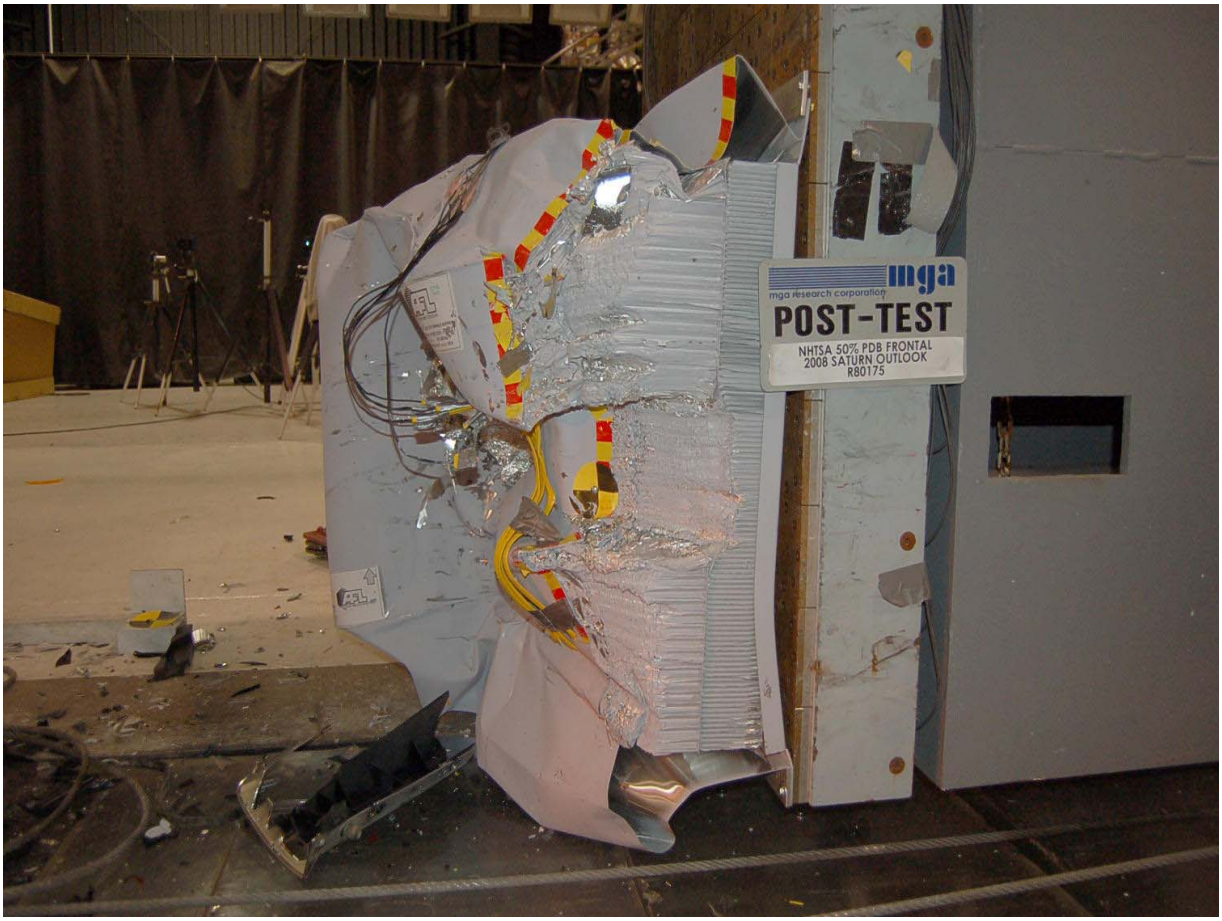
Pre-Test Offset Deformable Barrier Left Side ¾ View



Post-Test Offset Deformable Barrier Left Side ¾ View



Pre-Test Offset Deformable Barrier Right Side View



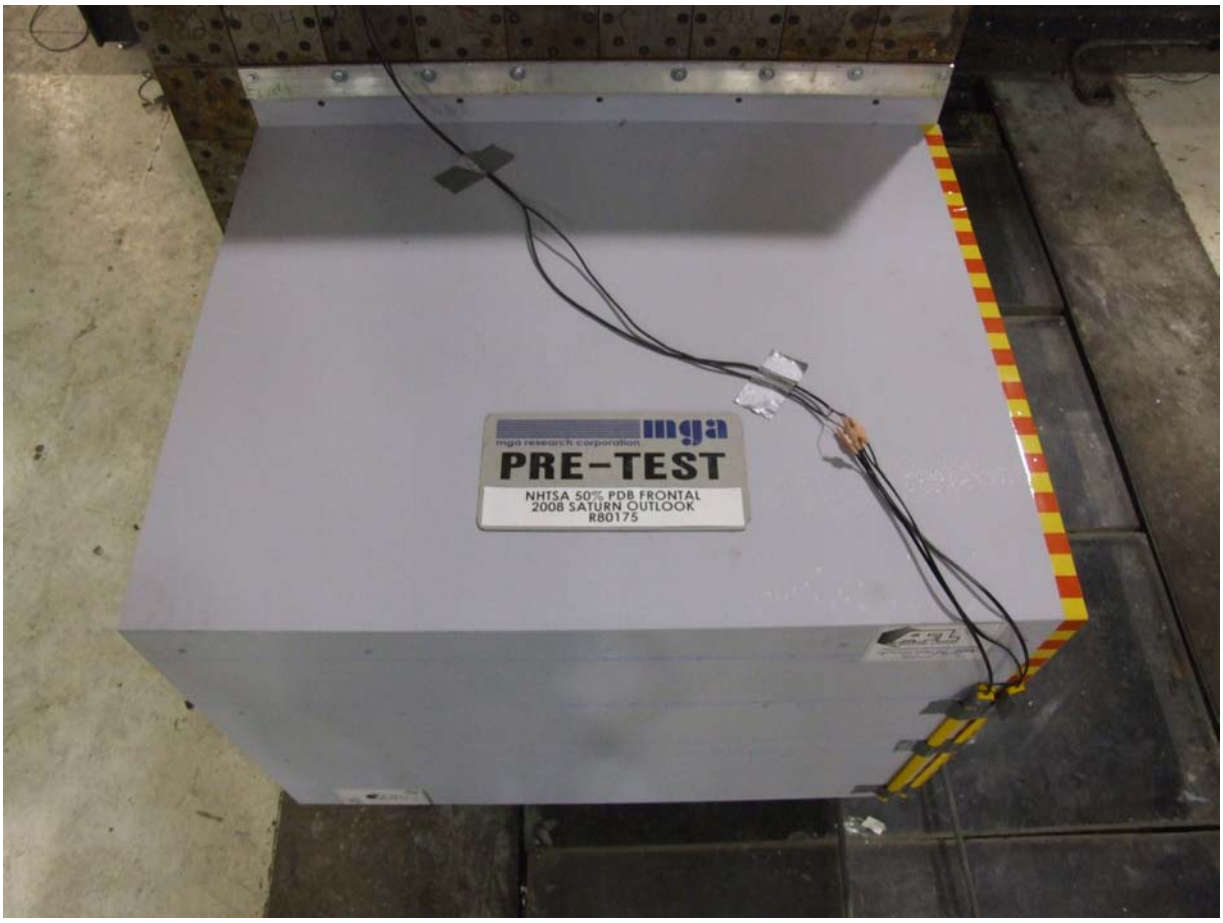
Post-Test Offset Deformable Barrier Right Side View



Pre-Test Offset Deformable Barrier Right Side ¾ View



Post-Test Offset Deformable Barrier Right Side ¾ View



Pre-Test Offset Deformable Barrier Overhead View



Post-Test Offset Deformable Barrier Overhead View



Vehicle Impact



Pre-Test Left Side A Pillar (Frontal View)



Post-Test Left Side A Pillar (Frontal View)



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Left Side A Pillar (¾ Frontal View)



Post-Test Left Side A Pillar (¾ Frontal View)



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Left Side A Pillar



Post-Test Left Side A Pillar



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Left Side B Pillar (Side View)



Post-Test Left Side B Pillar (Side View)

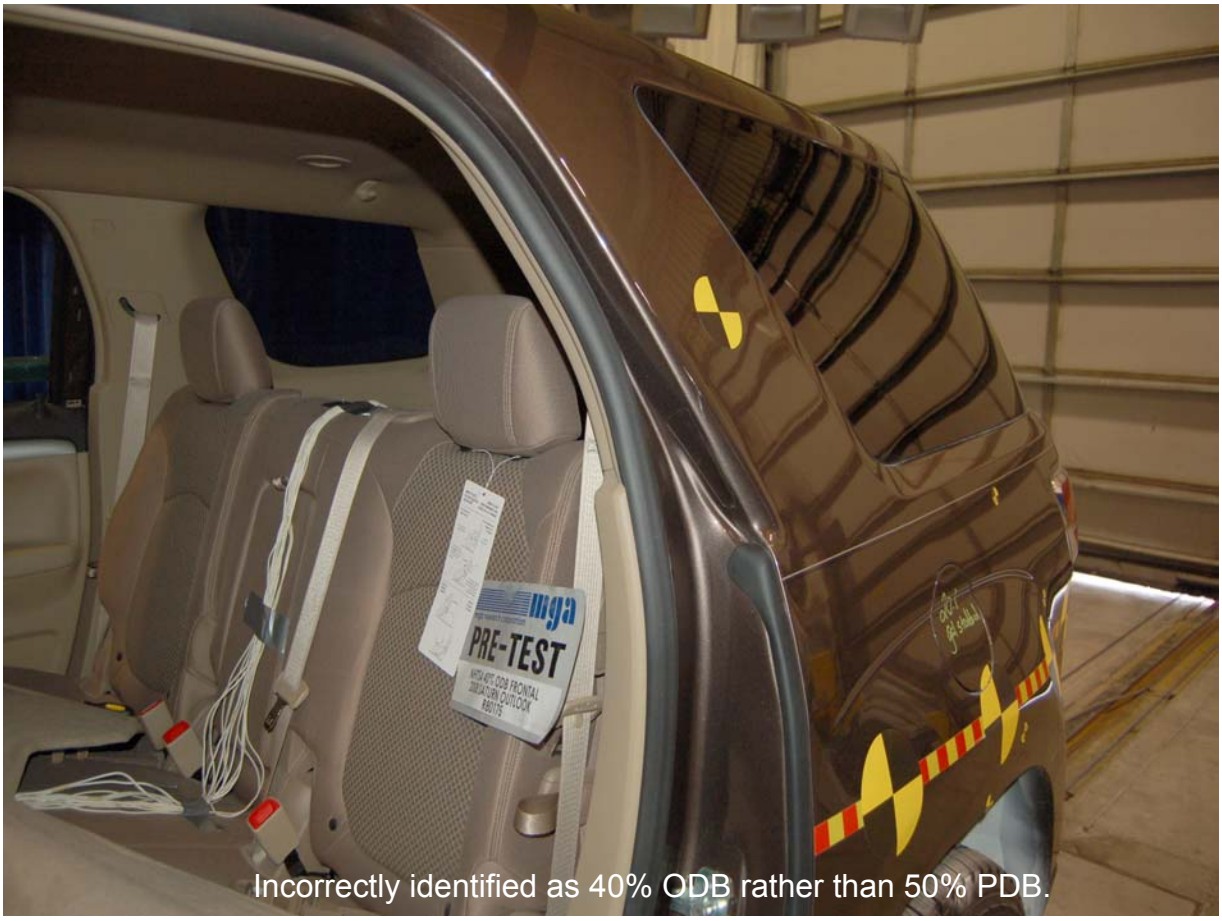


Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Left Side B Pillar



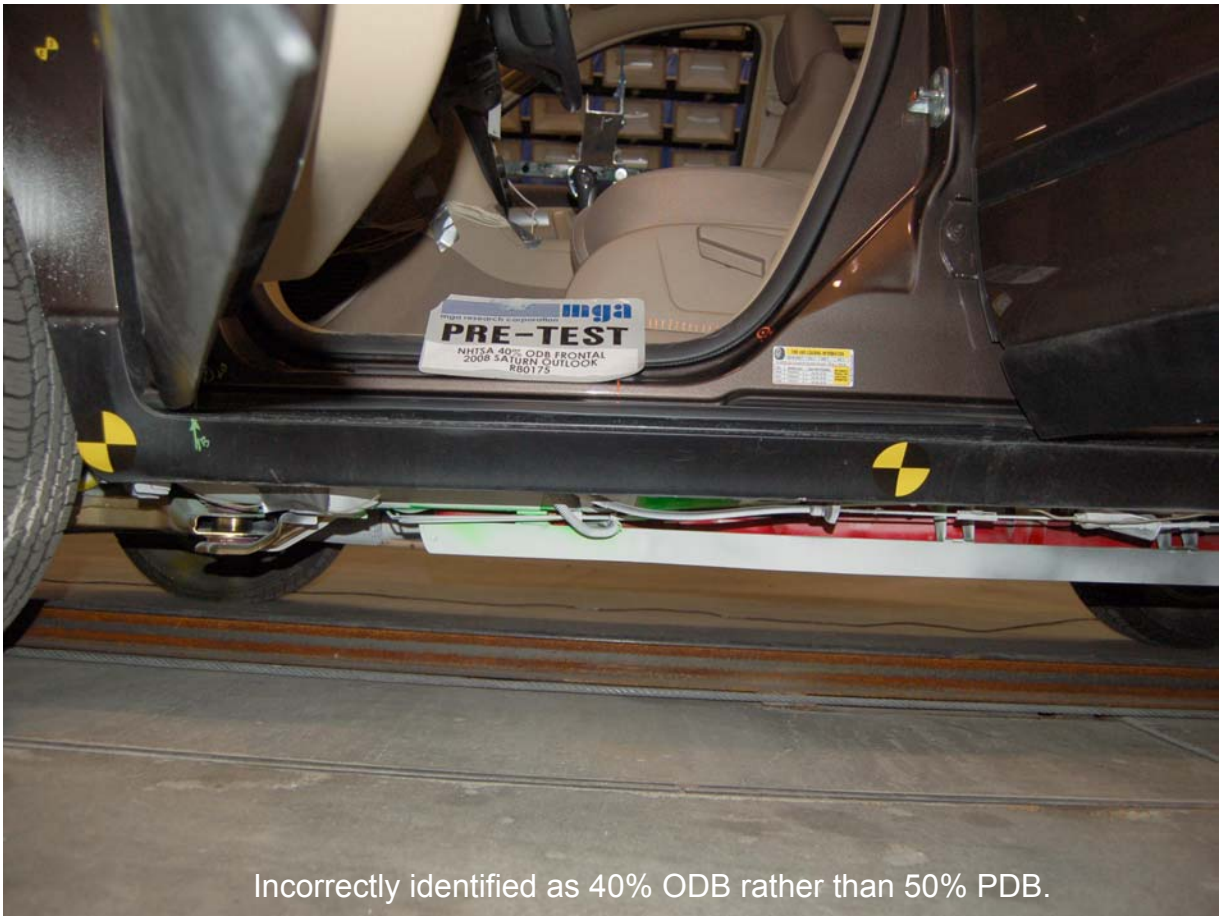
Post-Test Left Side B Pillar



Pre-Test Left Side C Pillar

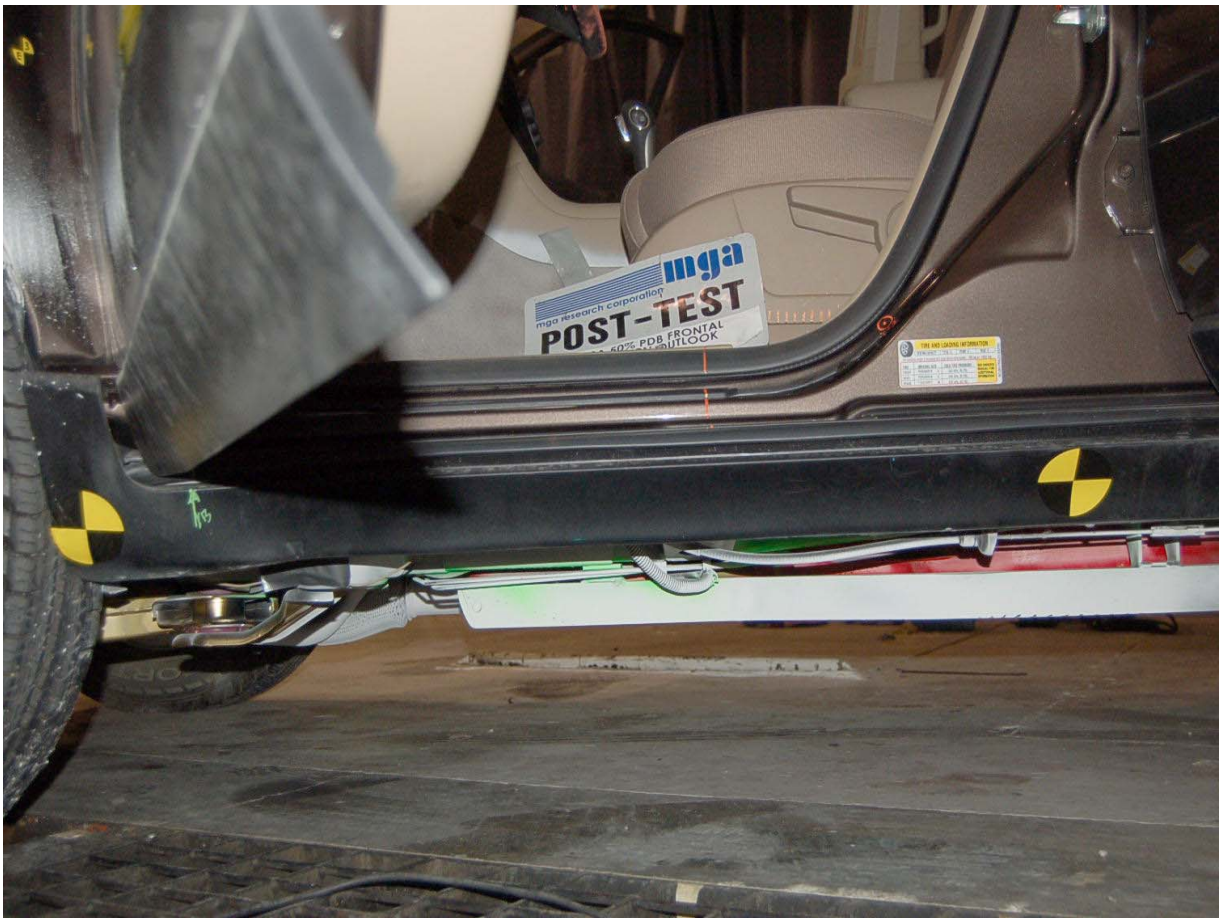


Post-Test Left Side C Pillar



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Left Side Sill Front Half View



Post-Test Left Side Sill Front Half View



Pre-Test Left Side Sill Rear Half View



Post-Test Left Side Sill Rear Half View



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Right Side A Pillar



Post-Test Right Side A Pillar



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Right Side B Pillar



Post-Test Right Side B Pillar



Pre-Test Right Side C Pillar



Post-Test Right Side C Pillar



Pre-Test Right Side Sill Front Half View



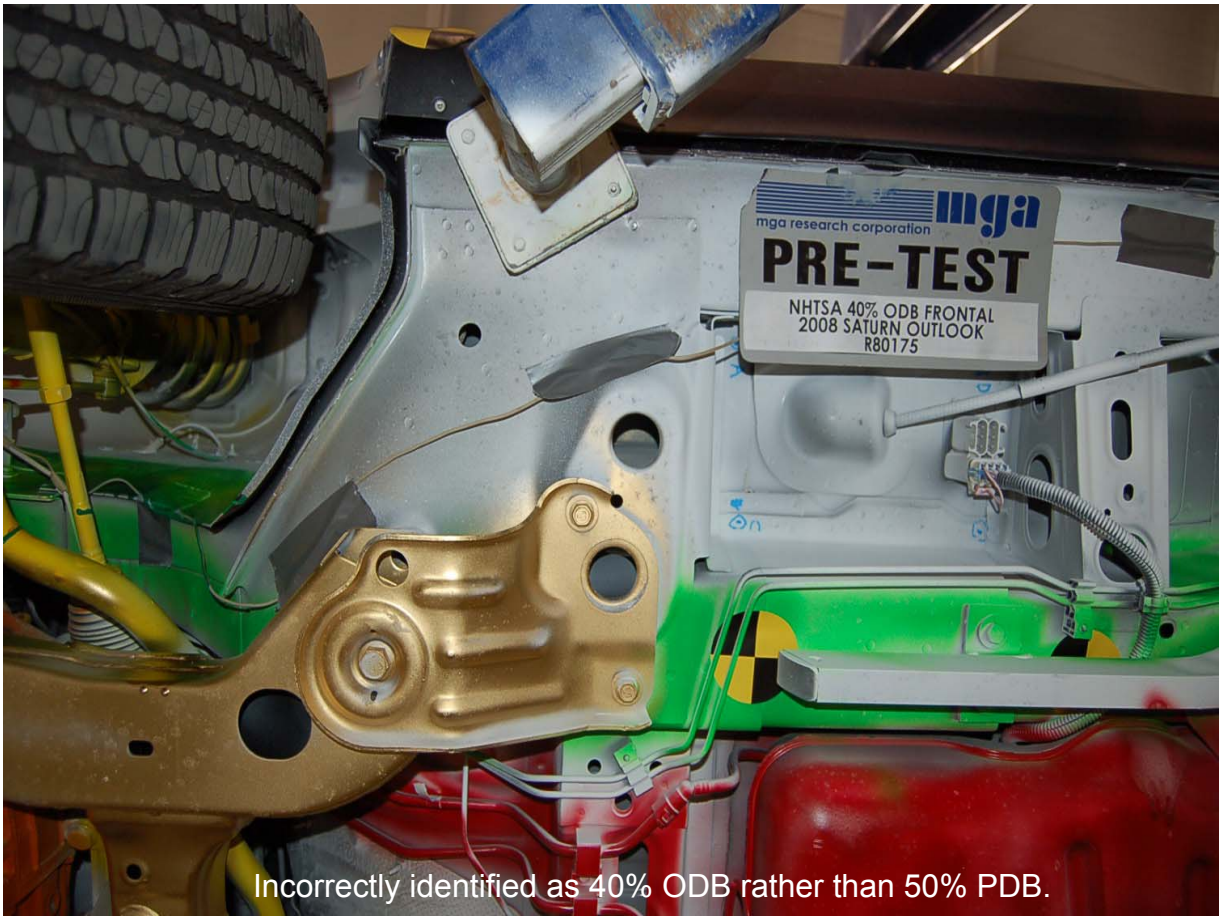
Post-Test Right Side Sill Front Half View



Pre-Test Right Side Sill Rear Half View



Post-Test Right Side Sill Rear Half View



Pre-Test Left Side Rocker View

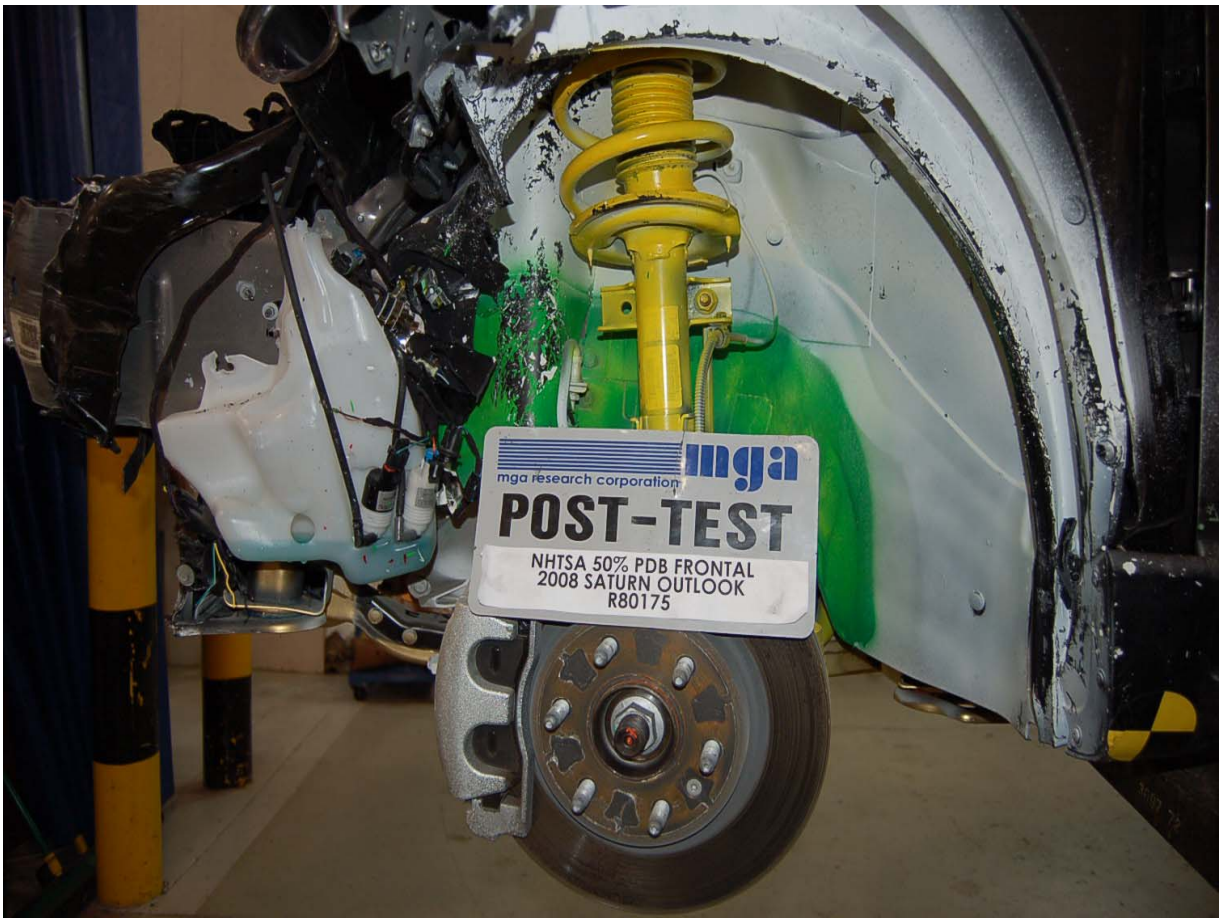


Post-Test Left Side Rocker View



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Left Front Wheel Well



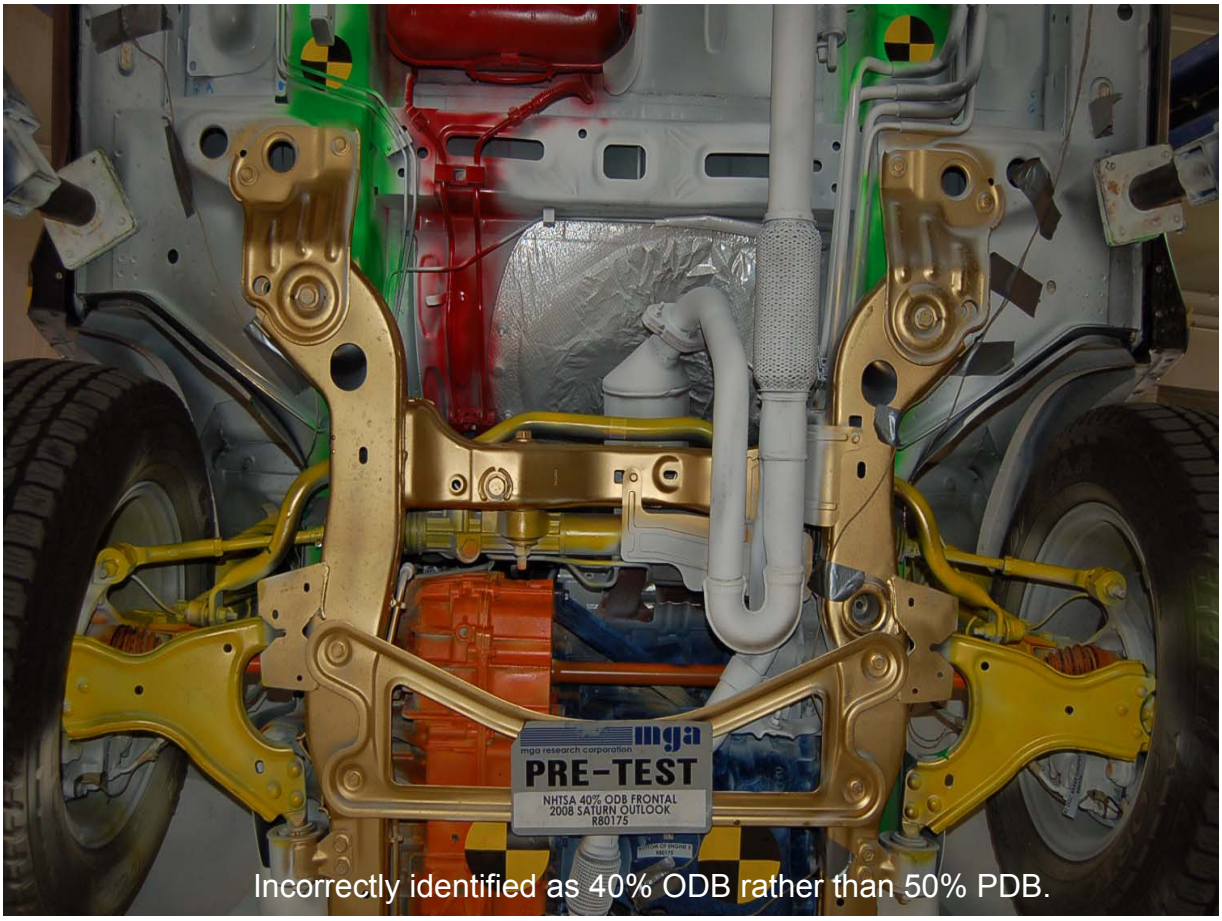
Post-Test Left Front Wheel Well



Pre-Test Left Front Shotgun



Post-Test Left Front Shotgun



Incorrectly identified as 40% ODB rather than 50% PDB.

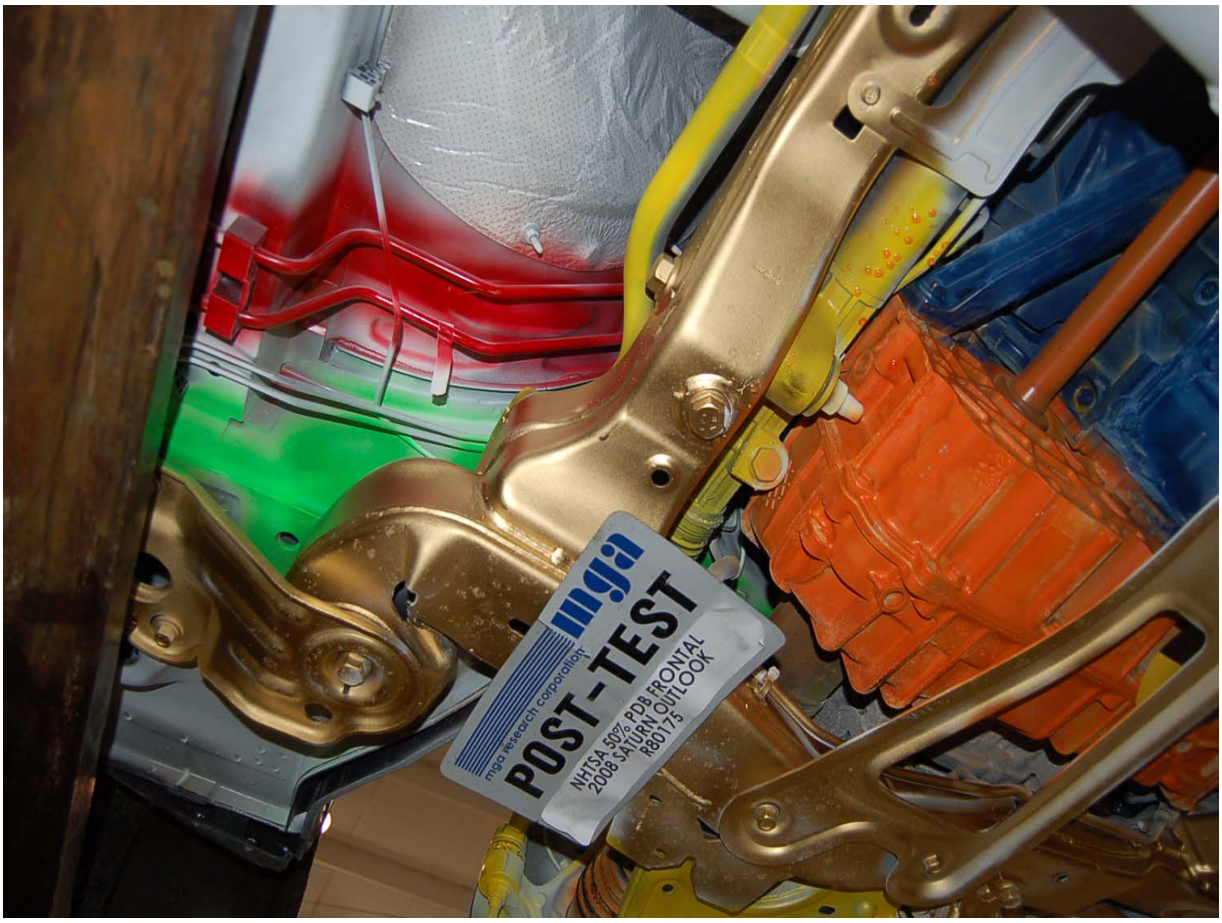
Pre-Test Steering Rack View



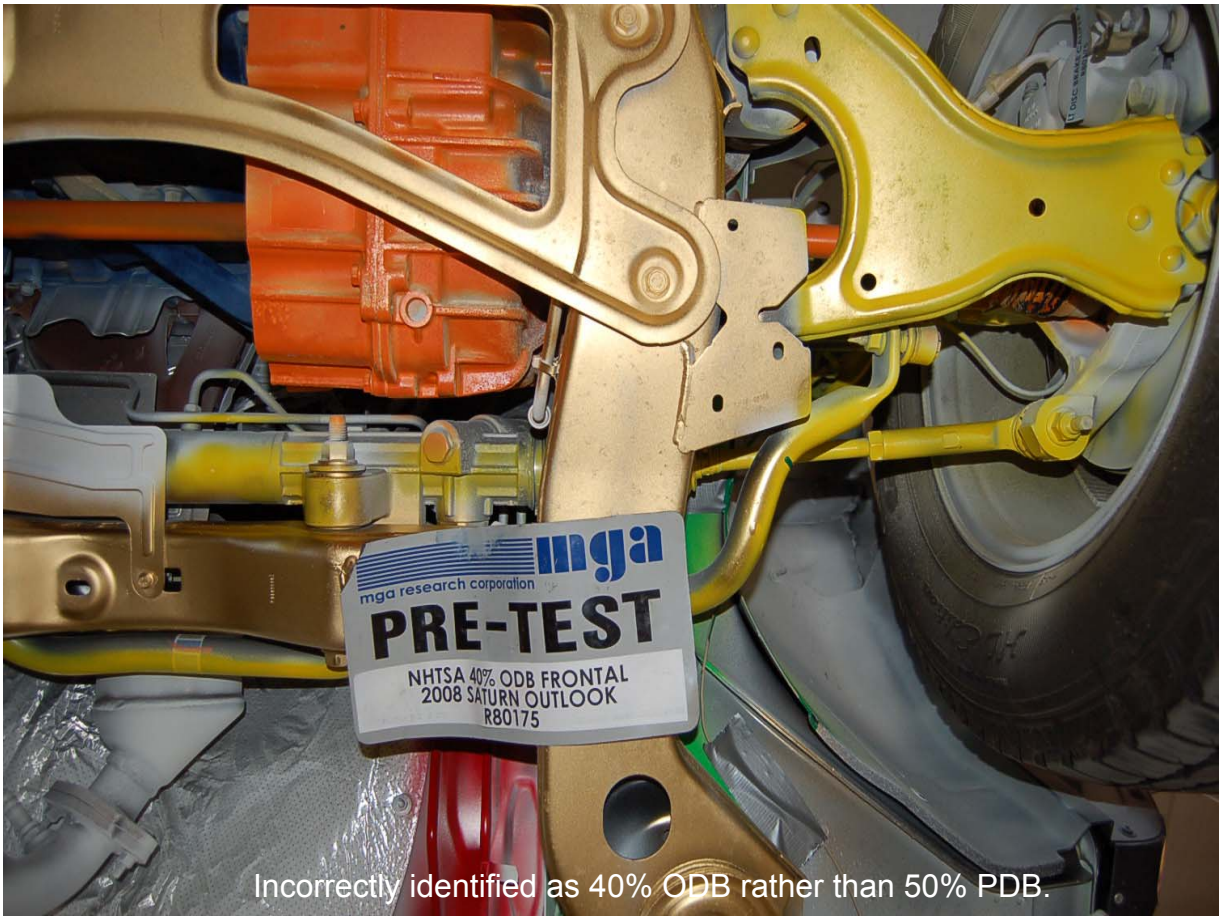
Post-Test Steering Rack View



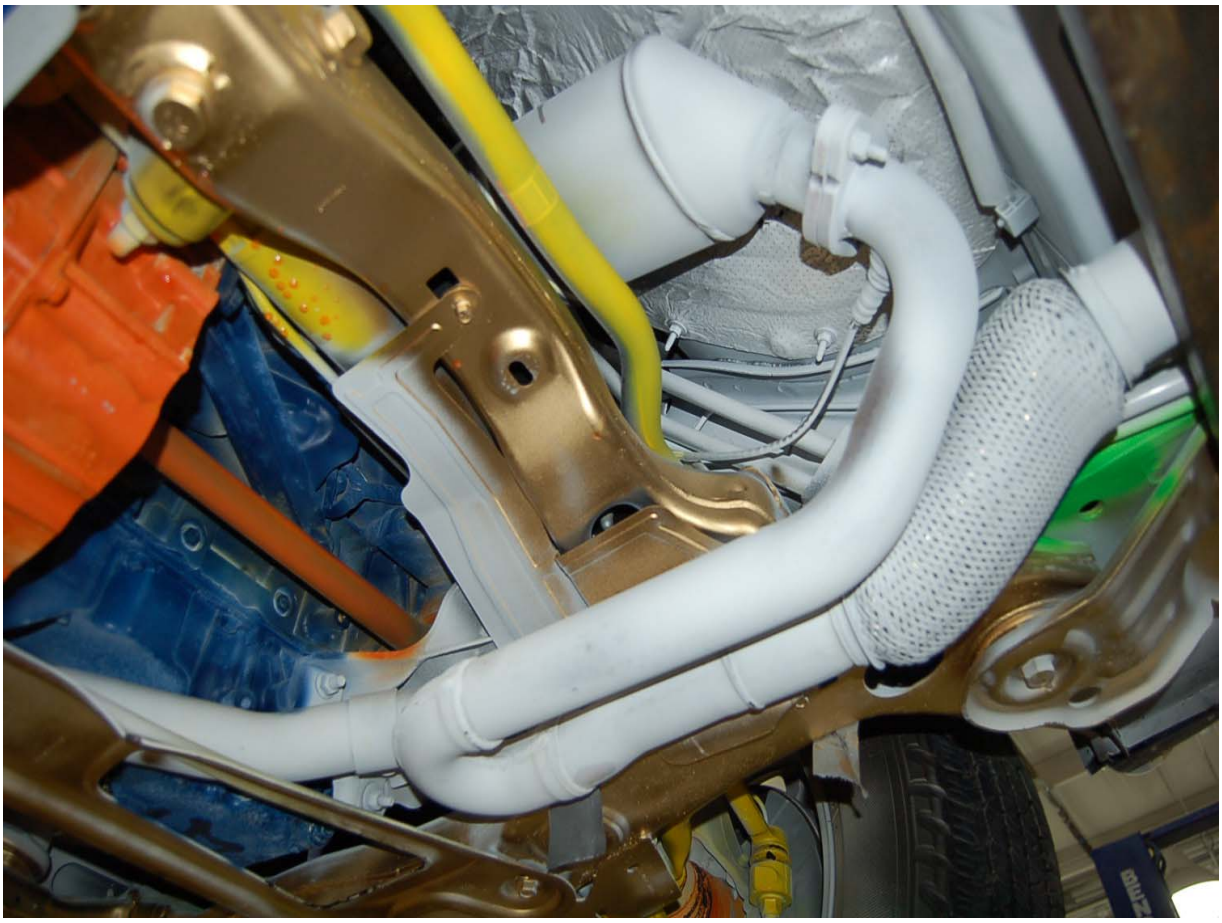
Pre-Test Steering Rack ¾ Left Side View

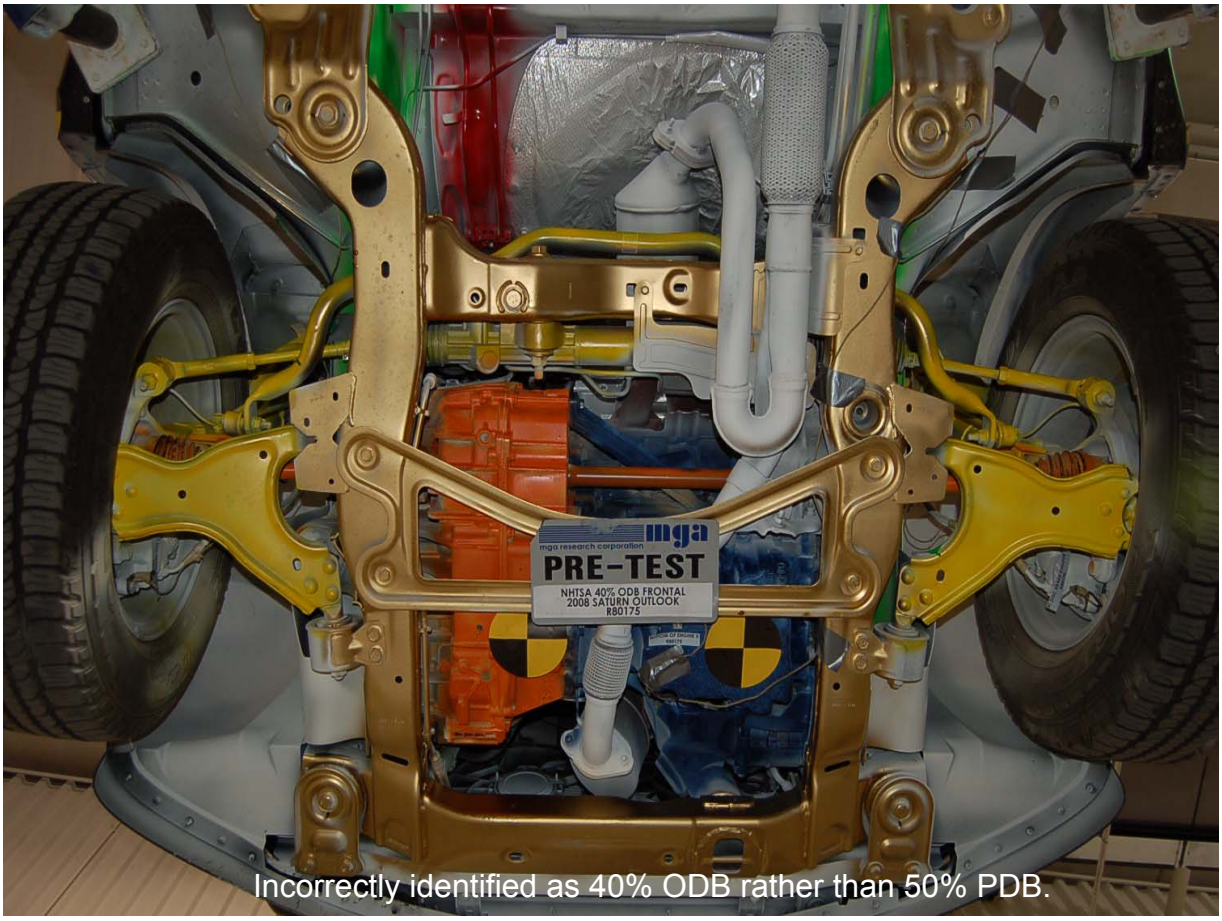


Post-Test Steering Rack ¾ Left Side View



Pre-Test Steering Rack ¾ Right Side View


Post-Test Steering Rack ¾ Right Side View

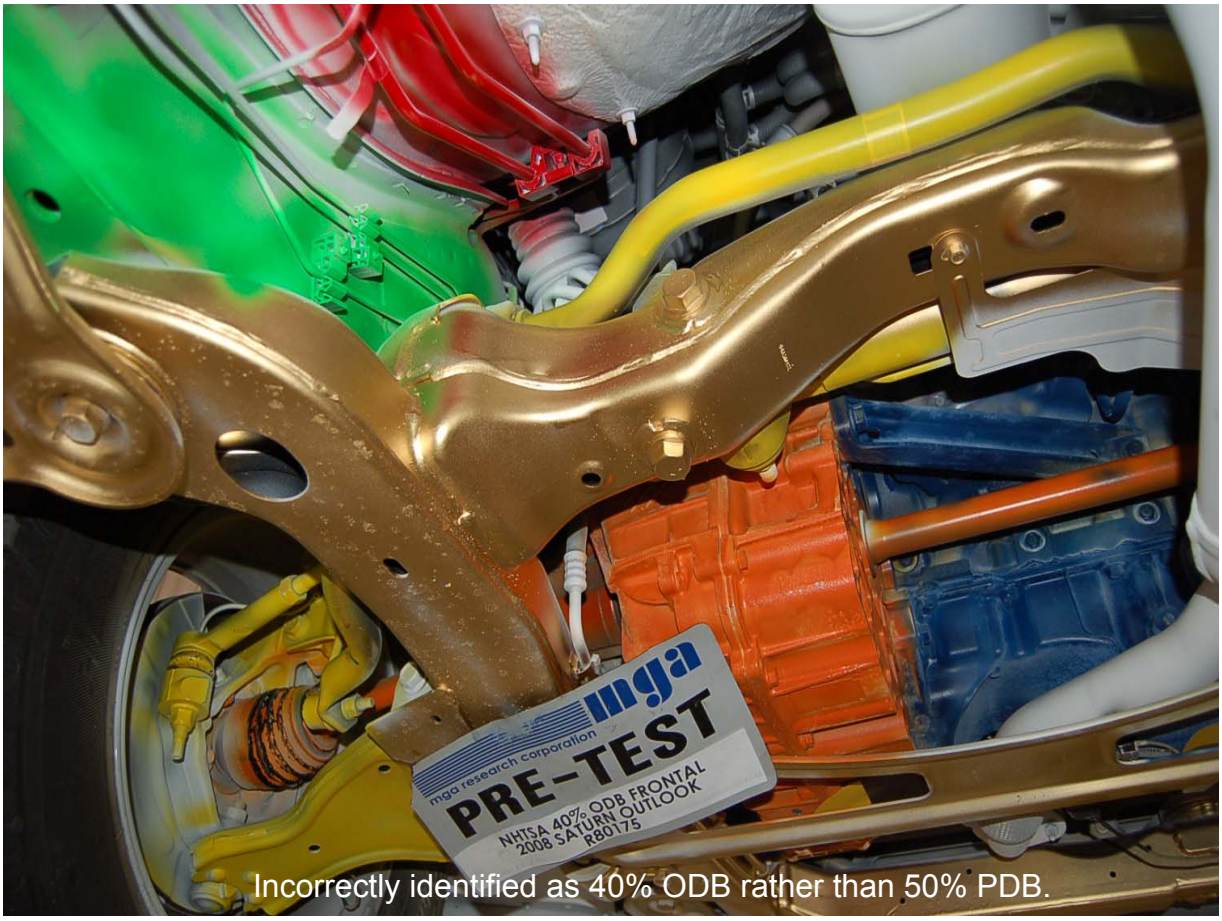


Incorrectly identified as 40% ODB rather than 50% PDB.

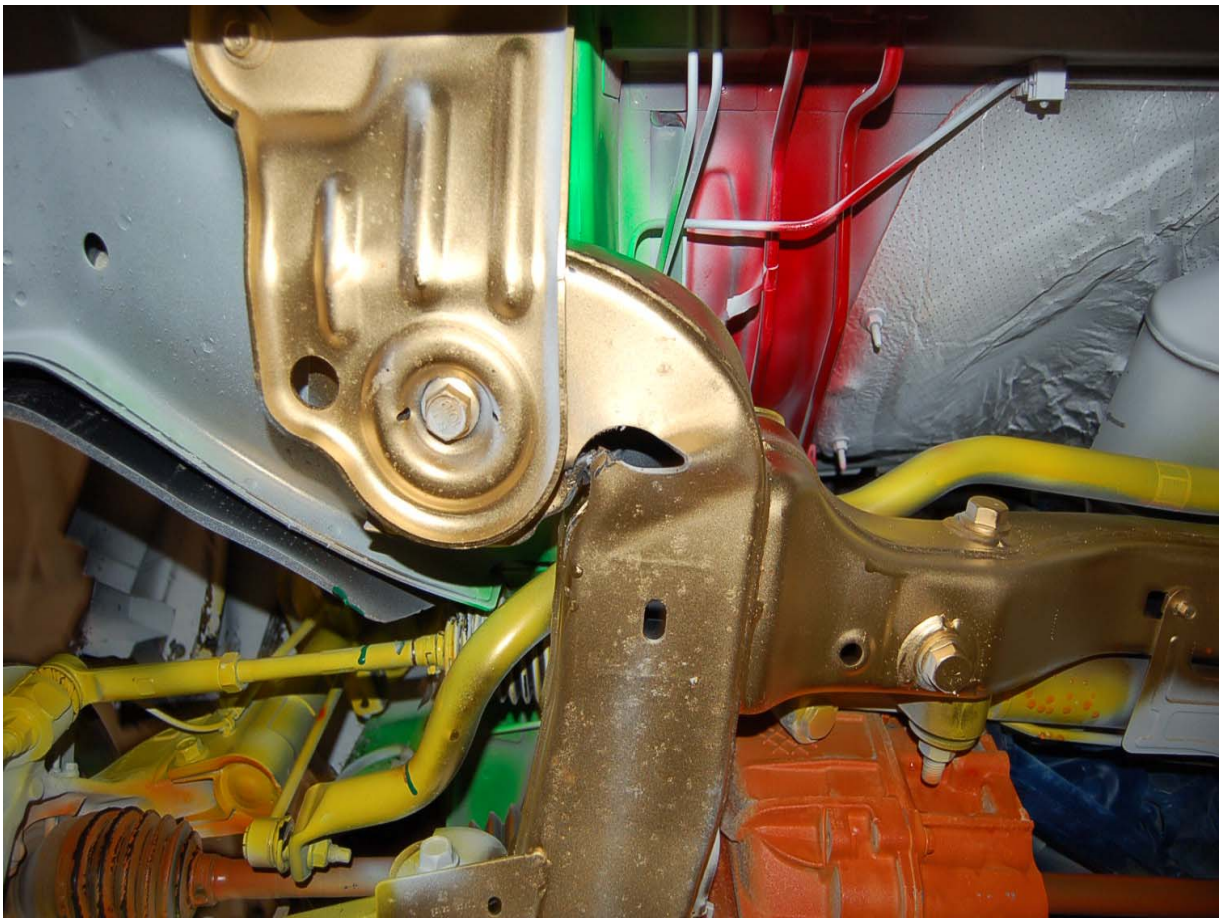
Pre-Test Sway Bar View

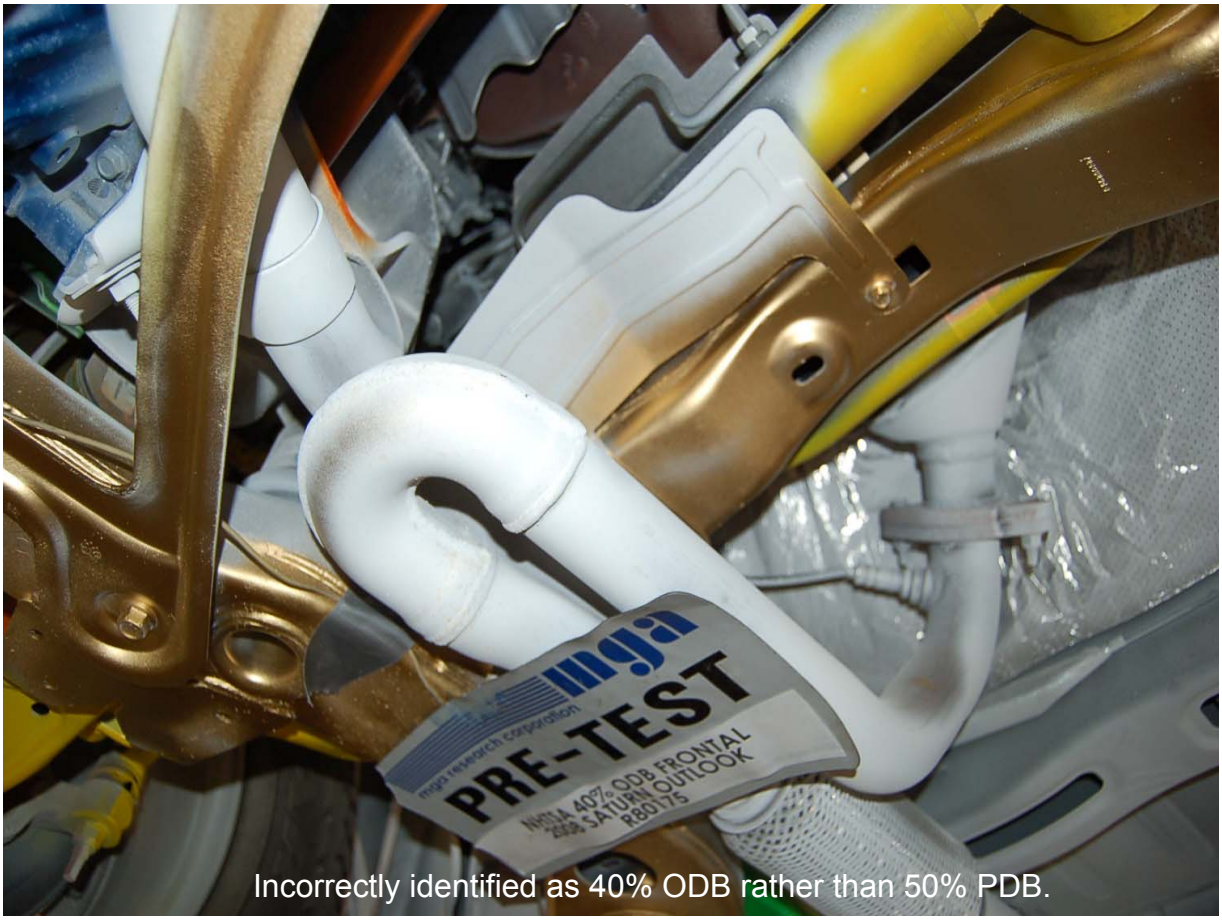


Post-Test Sway Bar View



Pre-Test Sway Bar Left Side View


Post-Test Sway Bar Left Side View

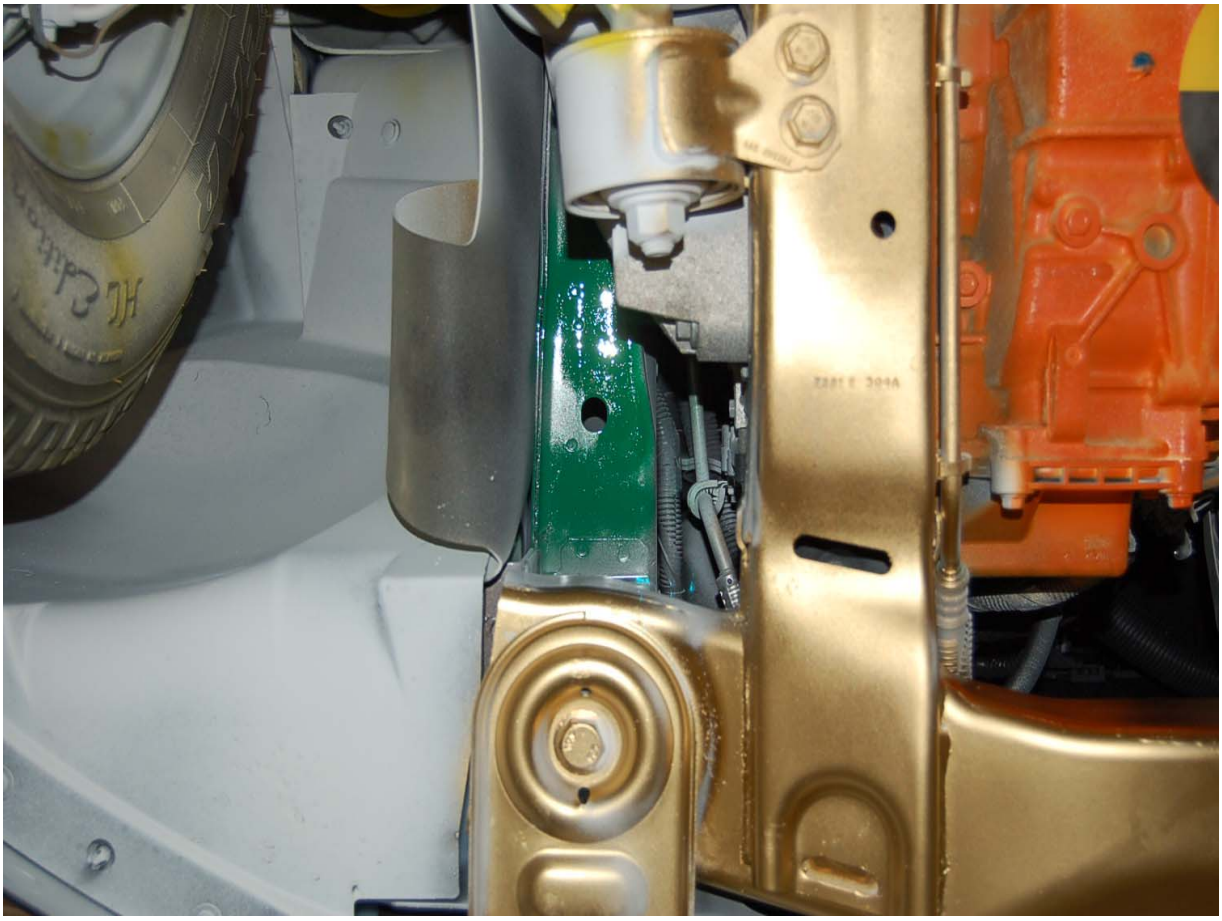


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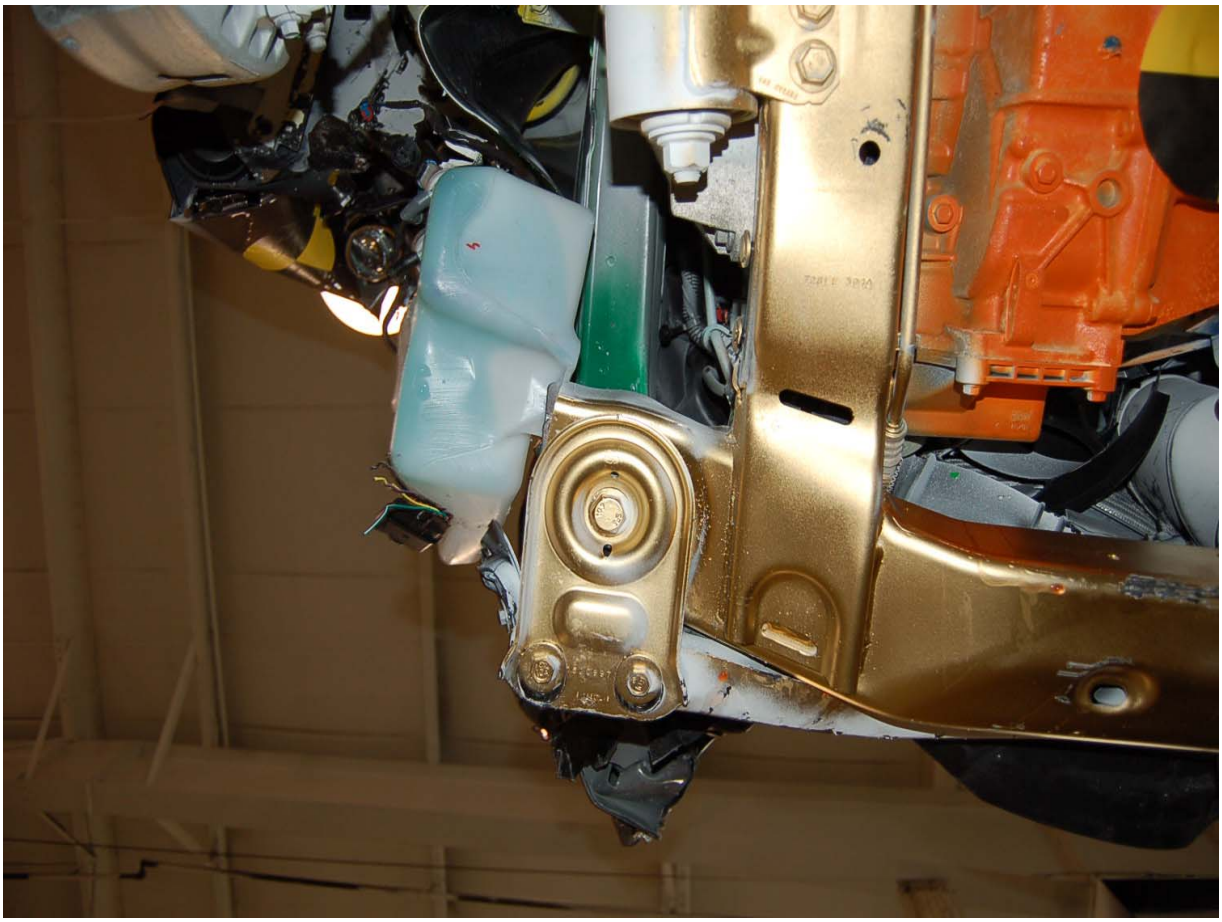
Pre-Test Sway Bar Right Side View



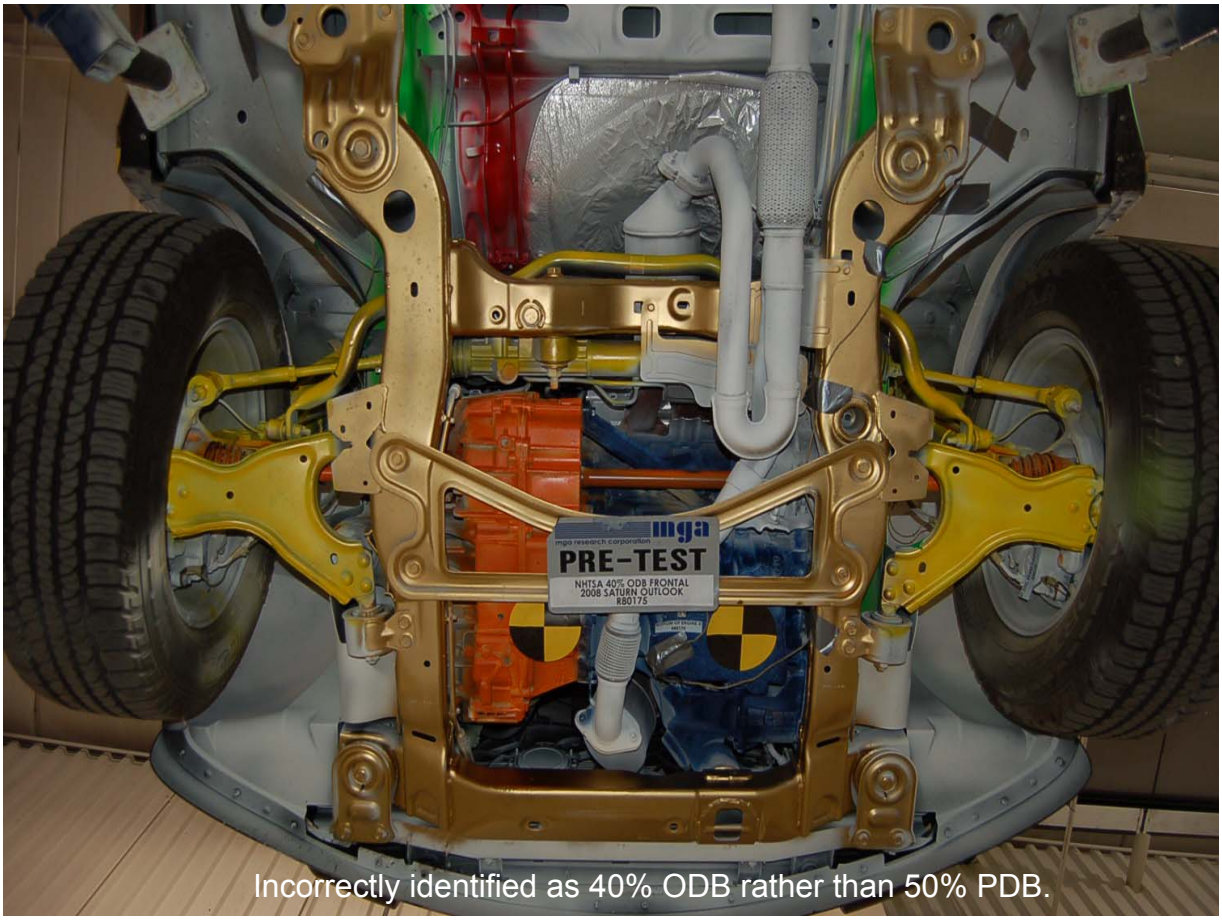
Post-Test Sway Bar Right Side View



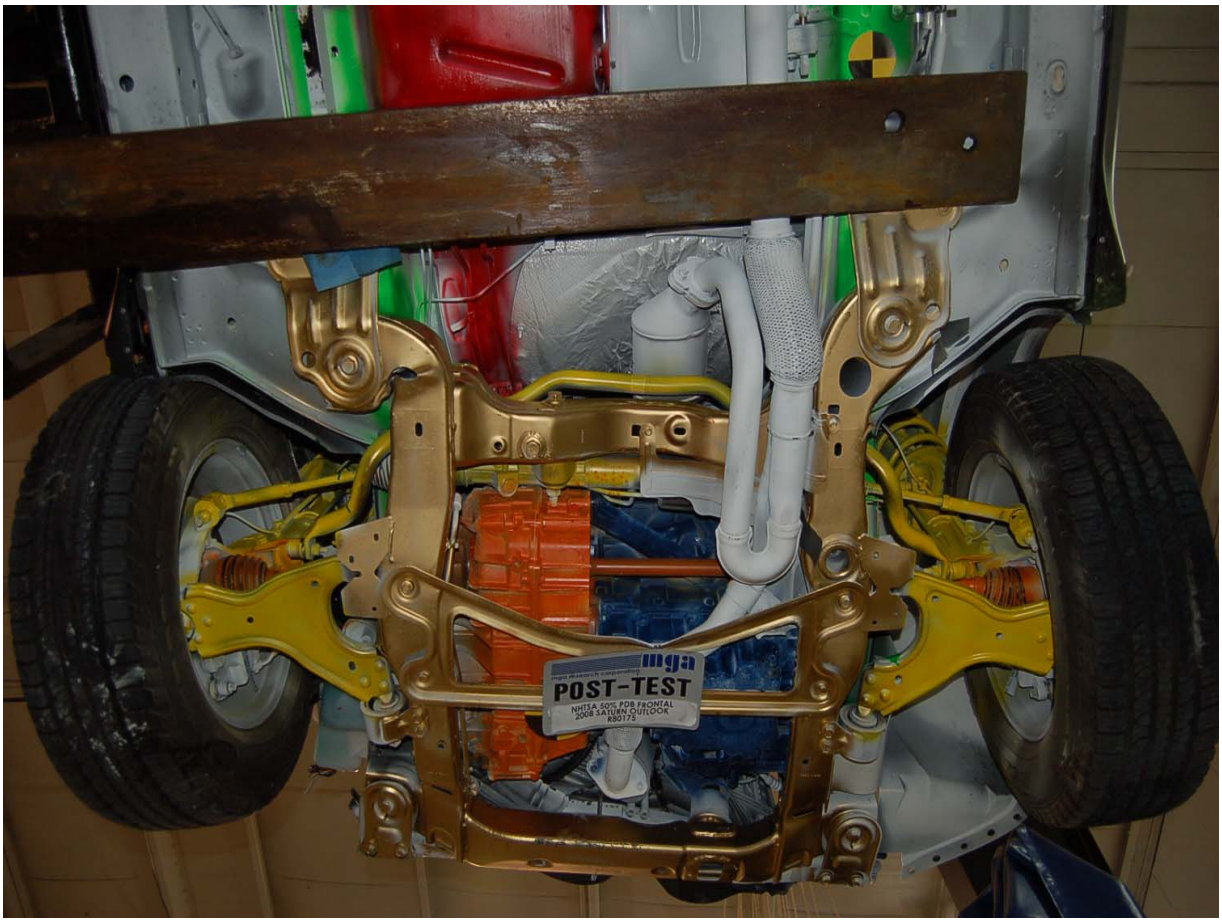
Pre-Test Bumper to Rail Attachment View



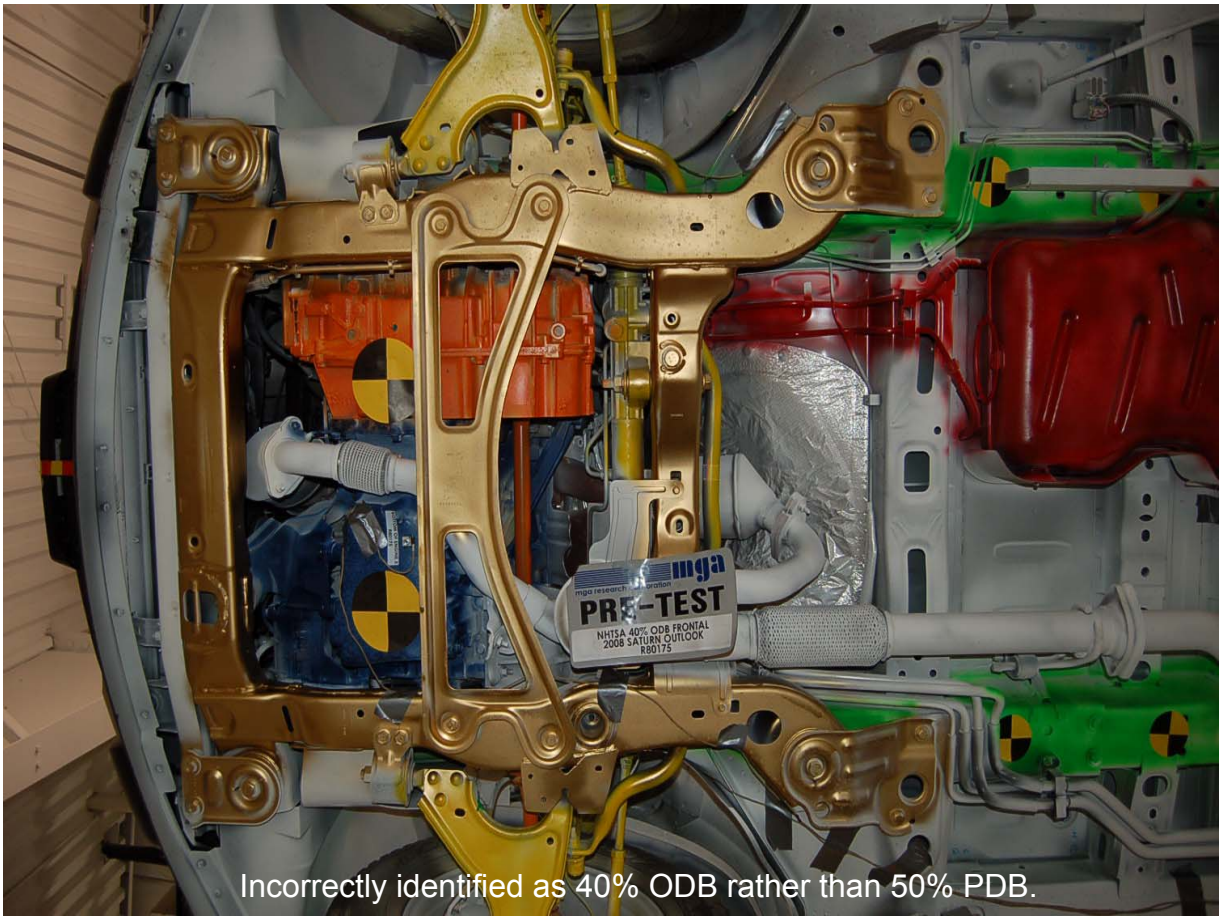
Post-Test Bumper to Rail Attachment View



Pre-Test Front Underbody



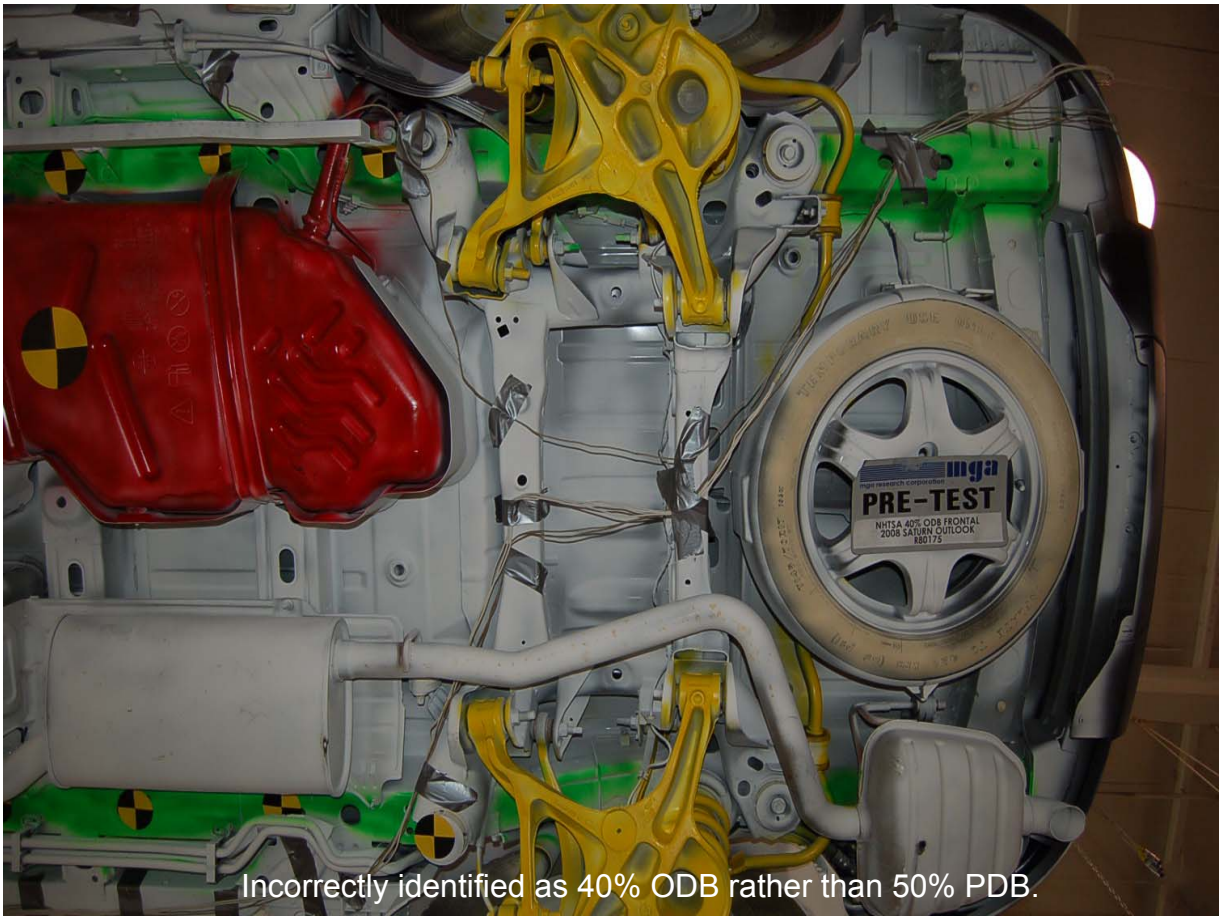
Post-Test Front Underbody



Pre-Test Front Underbody Perpendicular View



Pre-Test Mid Underbody Perpendicular View



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Rear Underbody Perpendicular View

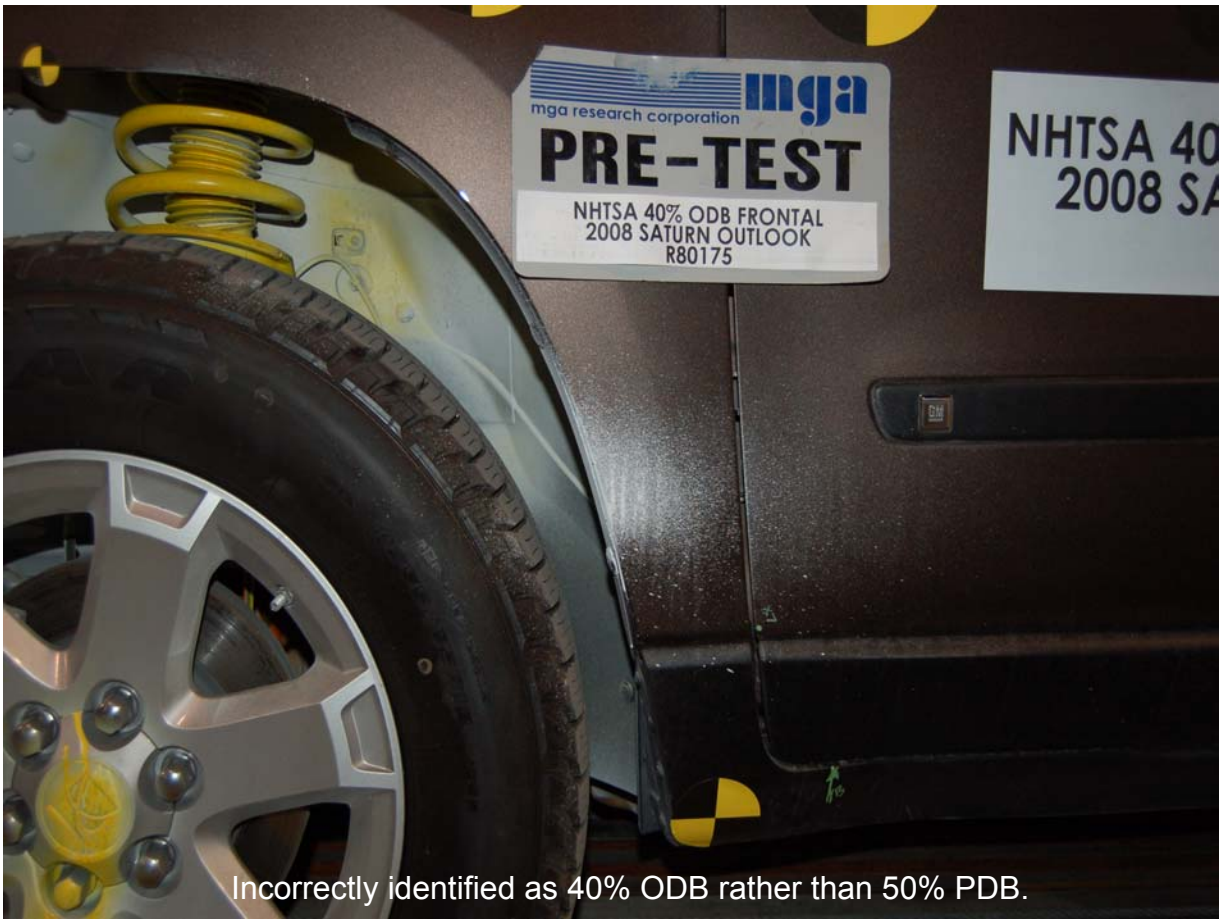


Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Left Front Wheel Contact View



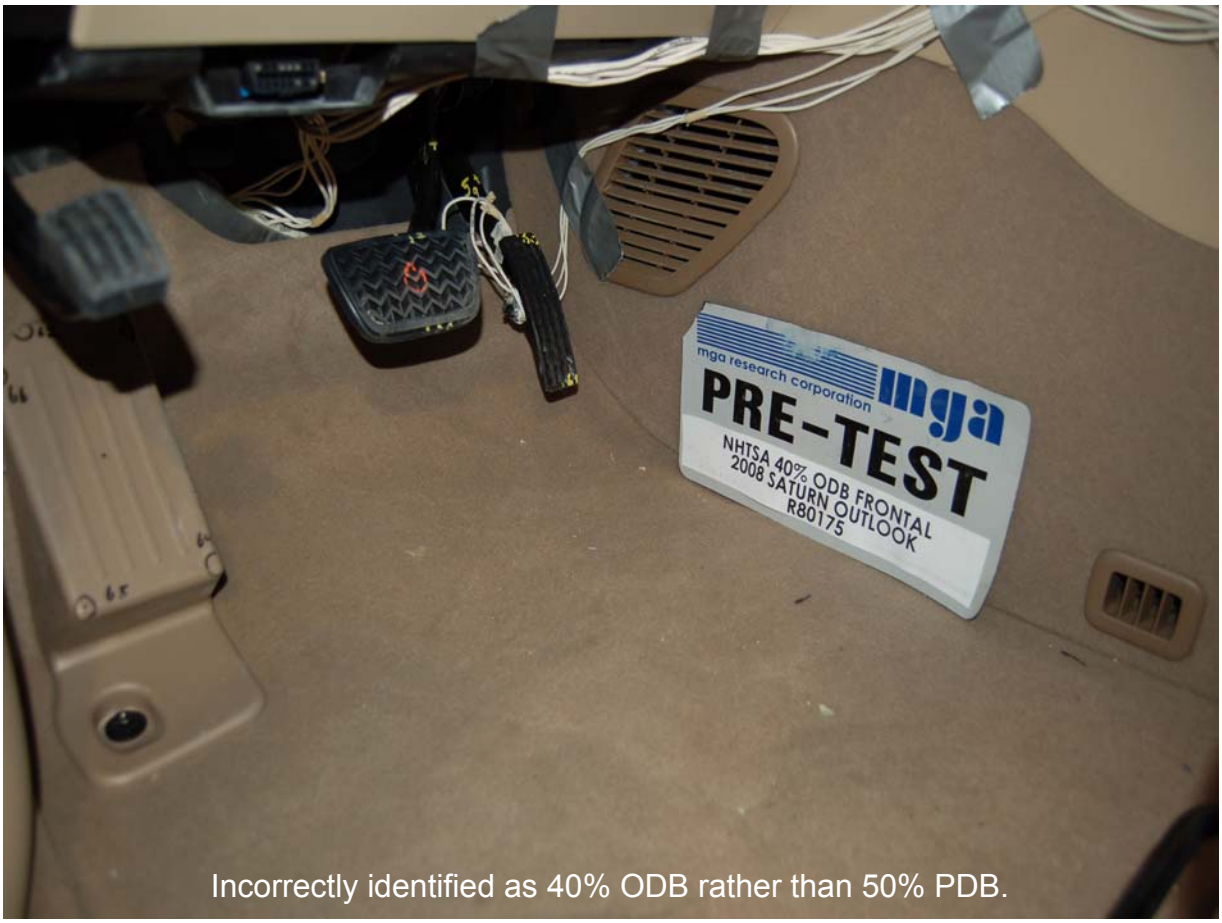
Post-Test Left Front Wheel Contact View



Pre-Test Left Front Wheel Contact Close Up View

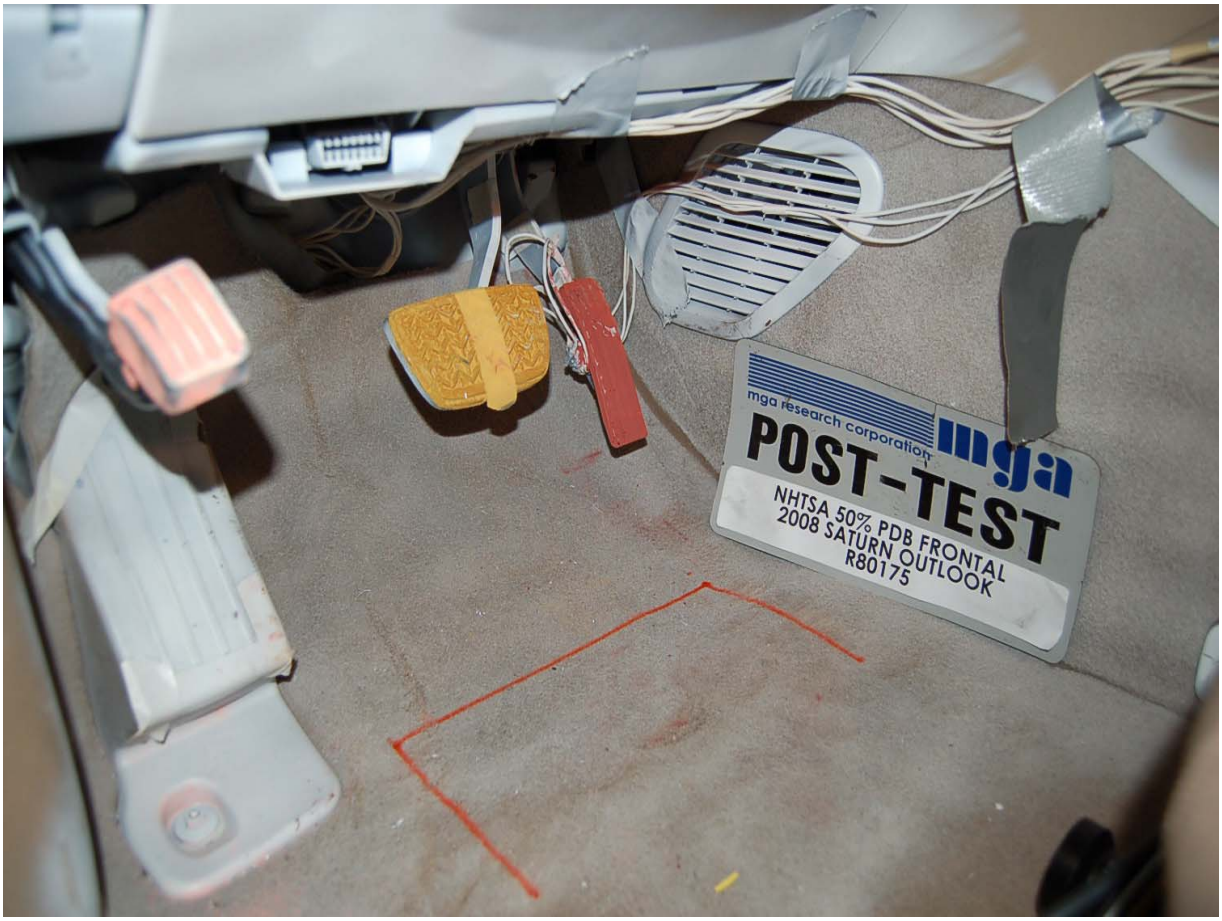


Post-Test Left Front Wheel Contact Close Up View

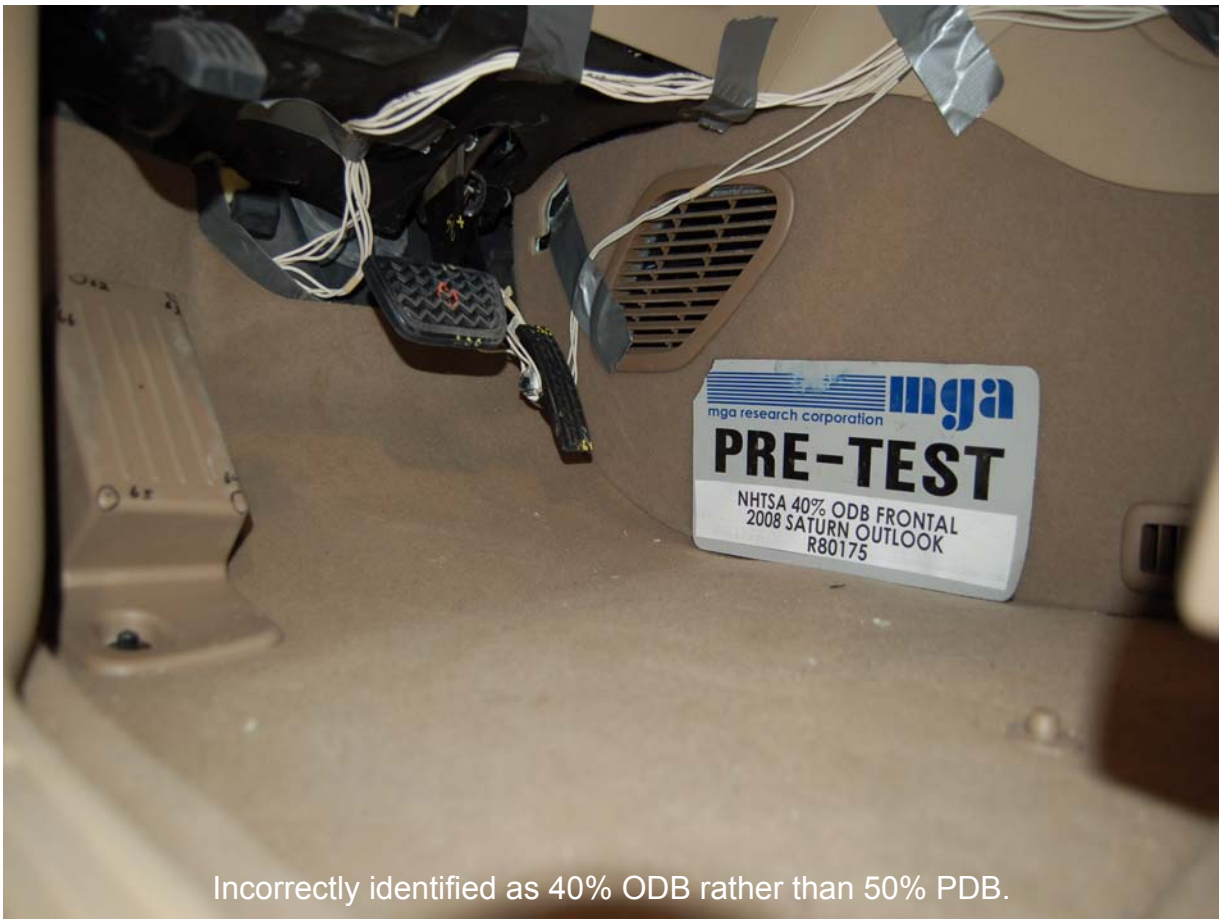


Incorrectly identified as 40% ODB rather than 50% PDB.

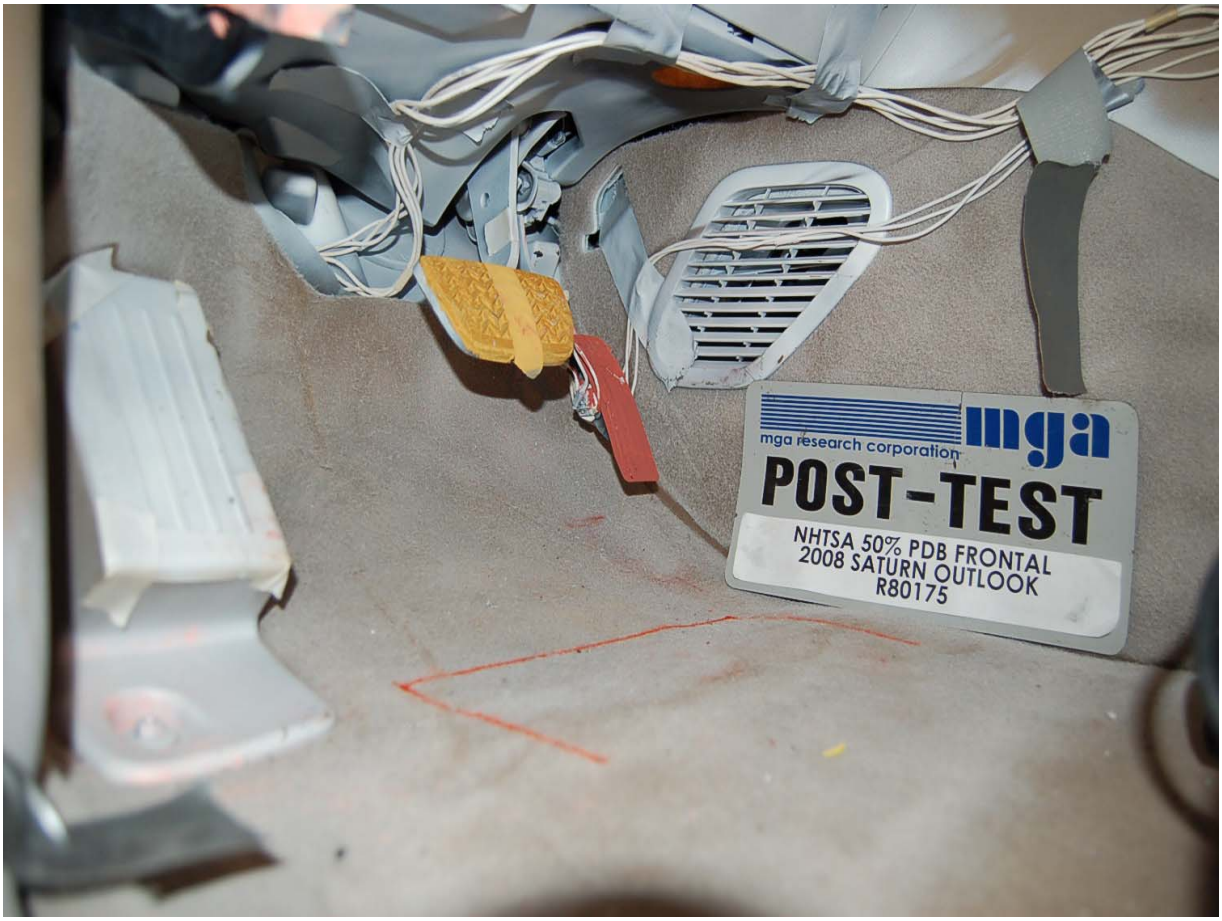
Pre-Test Over Toepan/ Floorpan Left of Seat, Seat Cushion Height



Post-Test Over Toepan/ Floorpan Left of Seat, Seat Cushion Height



Pre-Test Over Toepan/ Floorpan Left of Seat, Sill Height



Post-Test Over Toepan/ Floorpan Left of Seat, Sill Height



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Over Toepan/ Floorpan Center of Seat, Seat Cushion Height

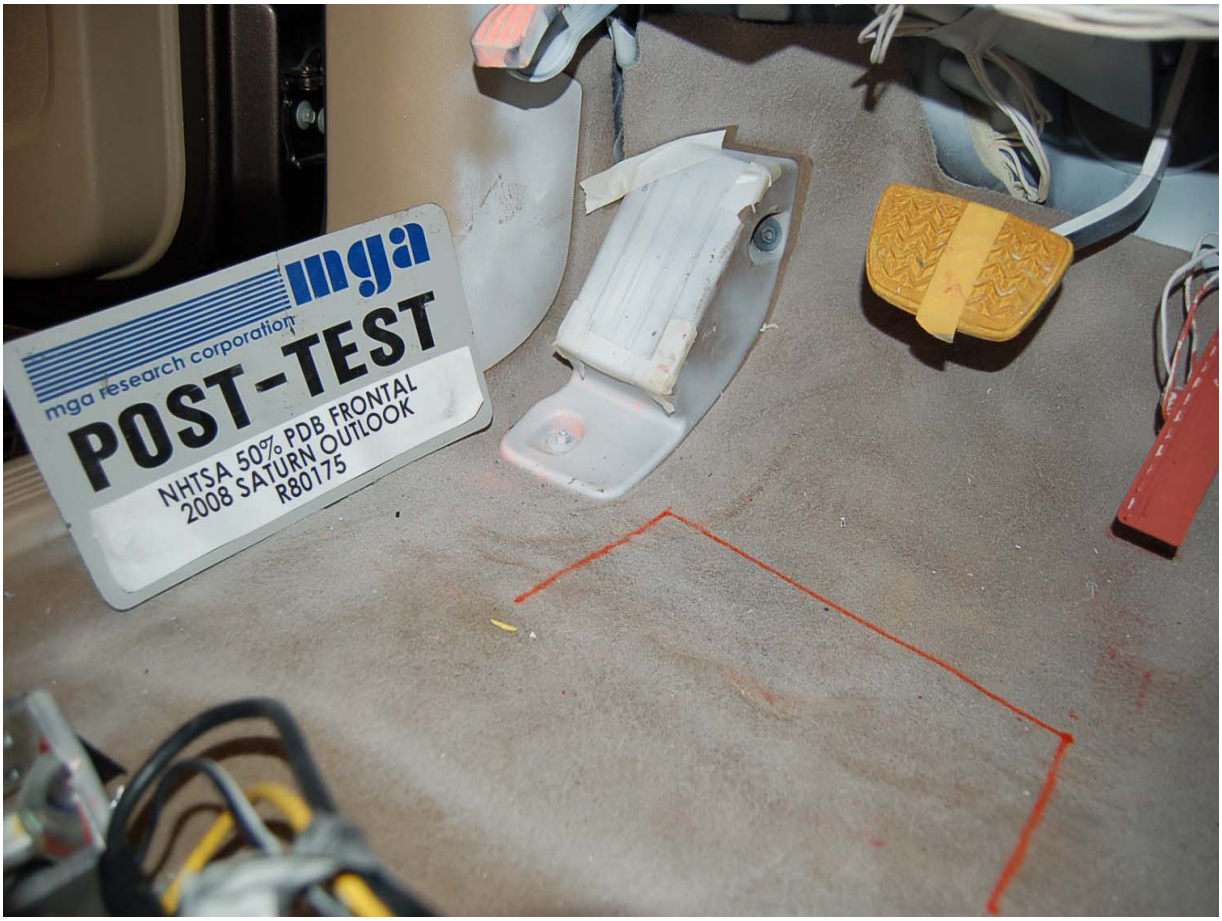


Post-Test Over Toepan/ Floorpan Center of Seat, Seat Cushion Height



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Over Toepan/ Floorpan Right of Seat, Seat Cushion Height

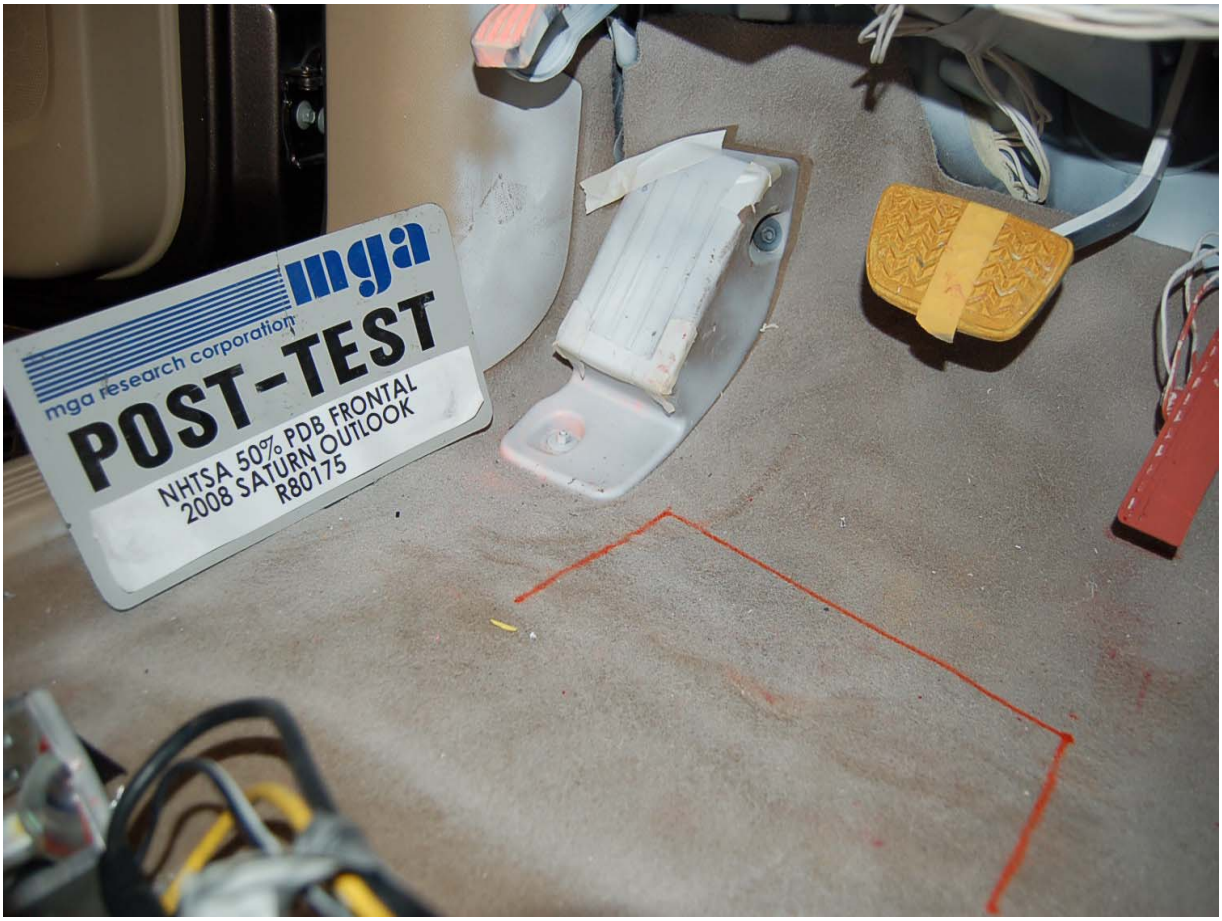


Post-Test Over Toepan/ Floorpan Right of Seat, Seat Cushion Height



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Over Toepan/ Floorpan Right of Seat, Sill Height



Post-Test Over Toepan/ Floorpan Right of Seat, Sill Height



Pre-Test Footrest Seat Cushion Height


Post-Test Footrest Seat Cushion Height



Pre-Test Footrest Seat Sill Height

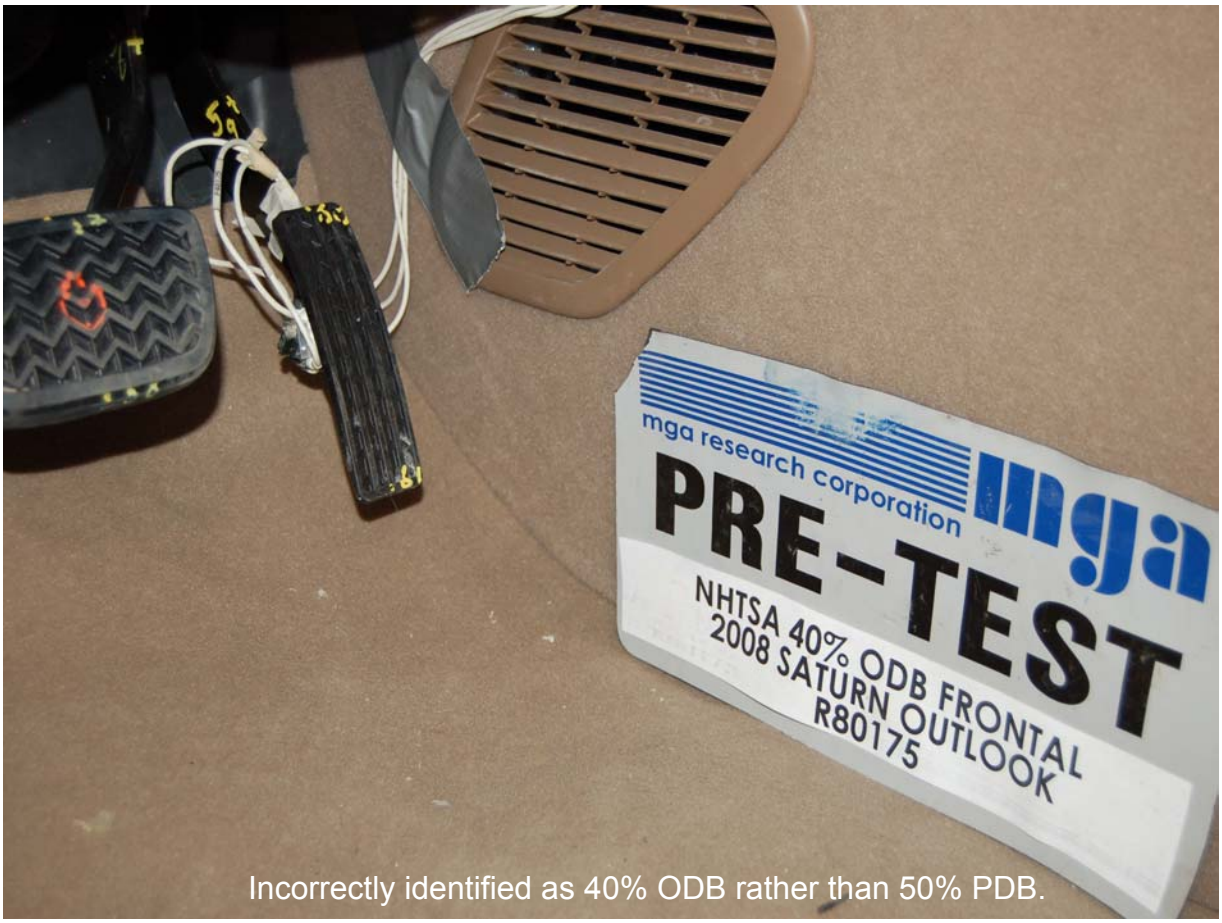

Post-Test Footrest Seat Sill Height



Pre-Test Accelerometer Pedal Close Up

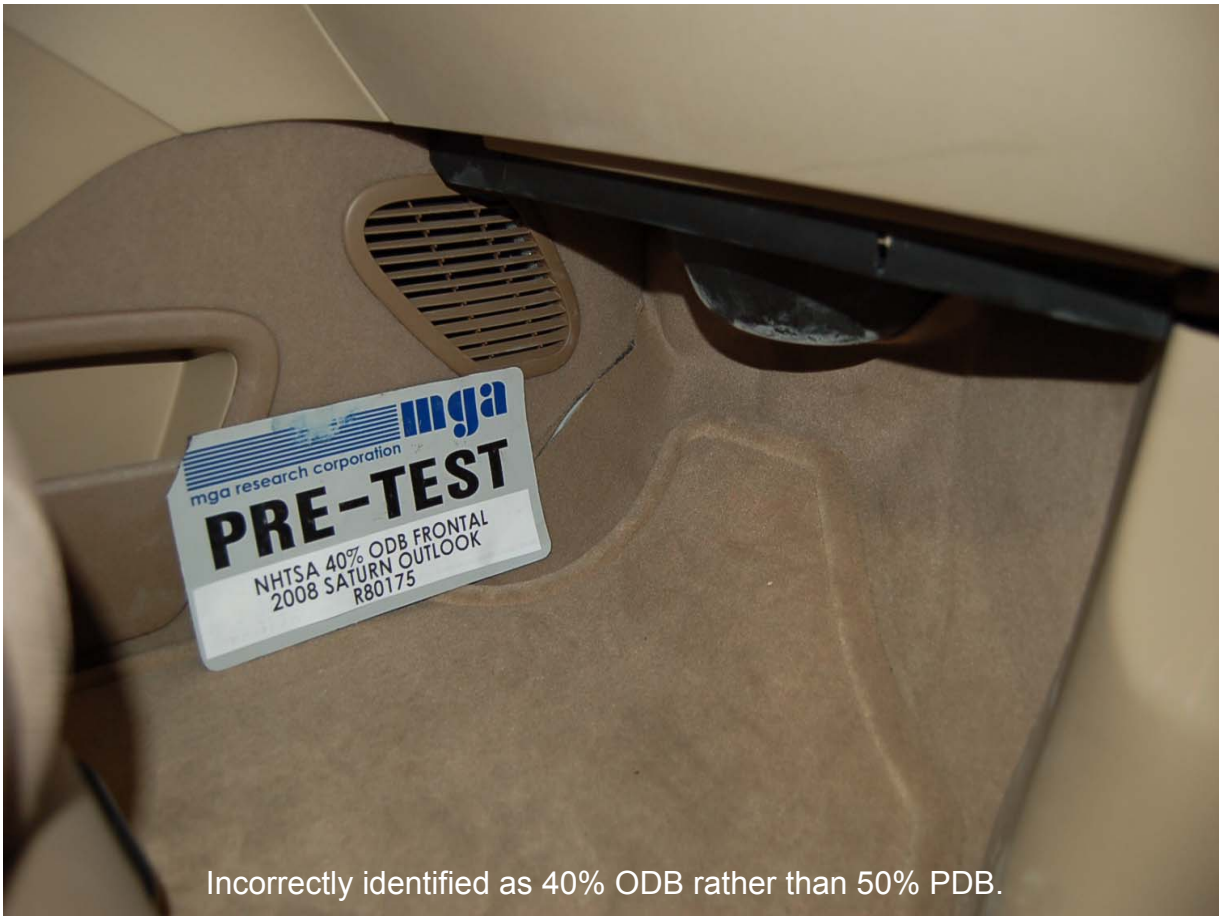


Post-Test Accelerometer Pedal Close Up



Incorrectly identified as 40% ODB rather than 50% PDB.

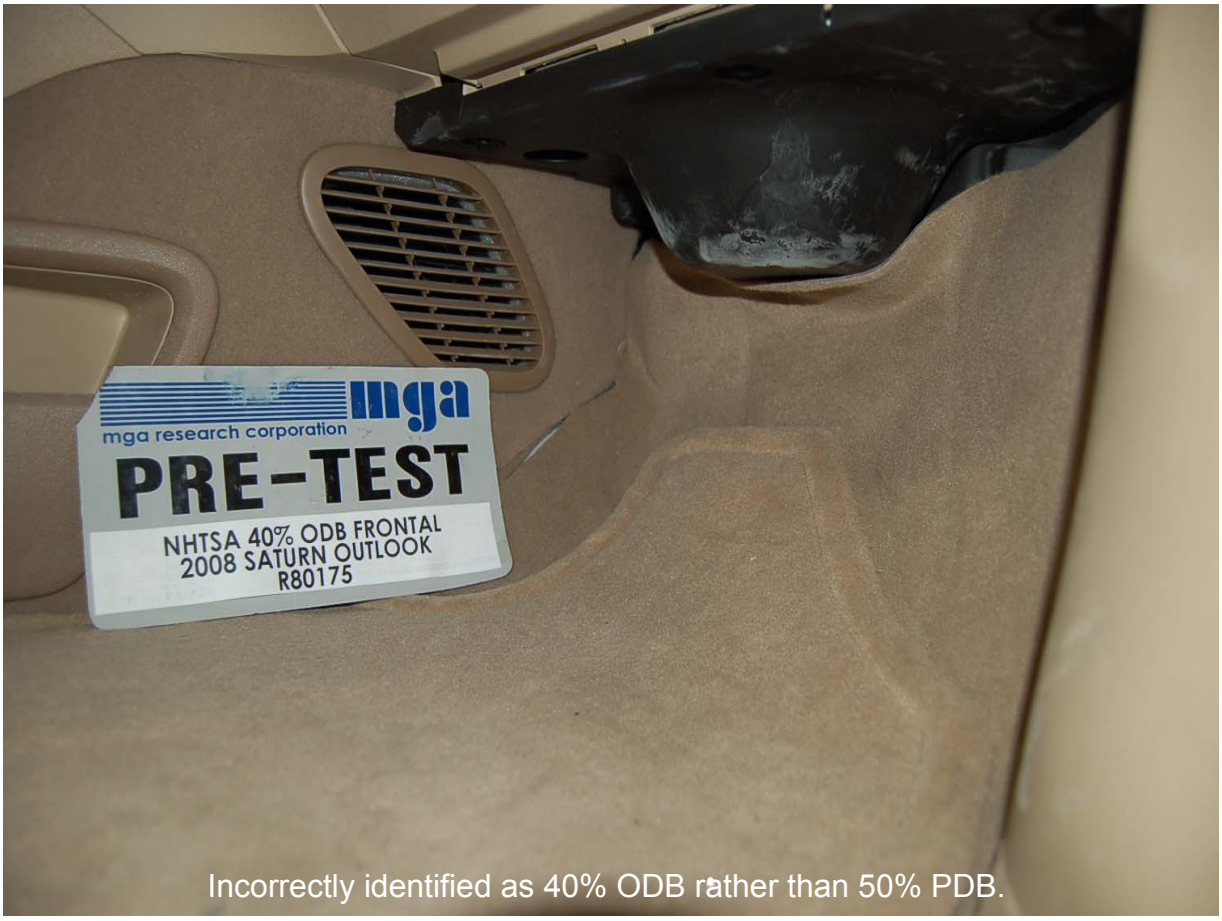
Pre-Test Accelerometer Pedal



Pre-Test Right Side Floorplan, Right of Seat, Seat Cushion Height



Post-Test Right Side Floorplan, Right of Seat, Seat Cushion Height



Incorrectly identified as 40% ODB rather than 50% PDB.

Pre-Test Right Side Floorplan, Right of Seat, Sill Cushion Height



Post-Test Right Side Floorplan, Right of Seat, Sill Cushion Height



Pre-Test Right Side Floorplan, Center of Seat, Seat Cushion Height



Post-Test Right Side Floorplan, Center of Seat, Seat Cushion Height

APPENDIX B

DUMMY, VEHICLE AND BARRIER DATA PLOTS

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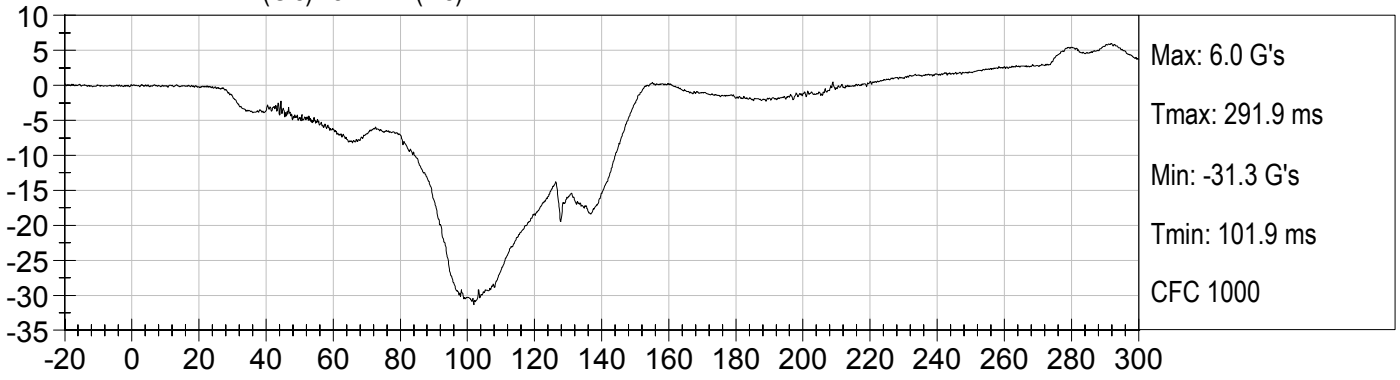
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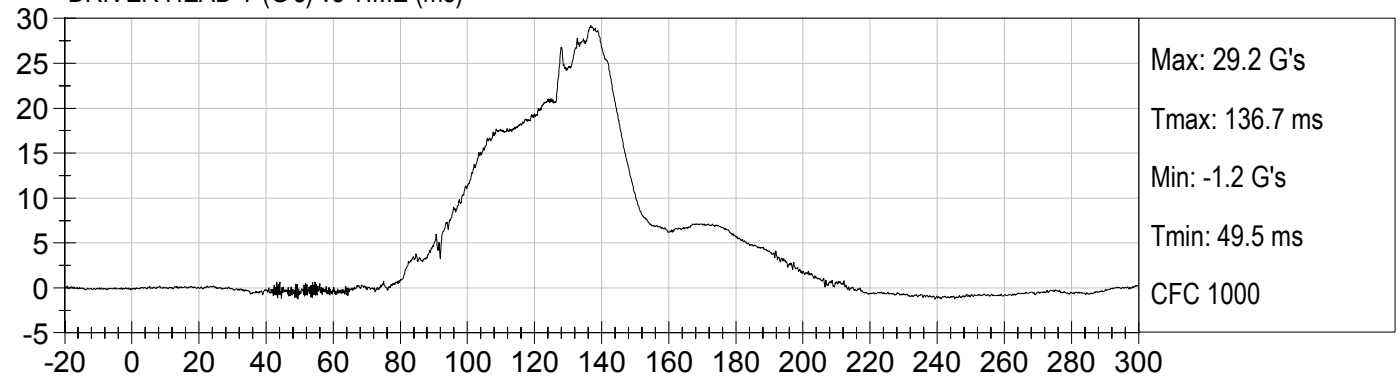
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2008 SATURN OUTLOOK R80175

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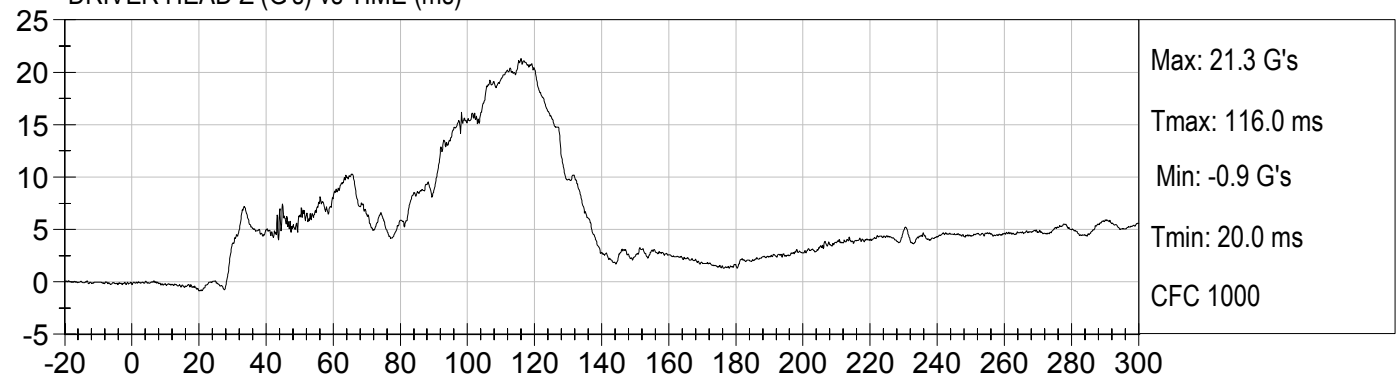
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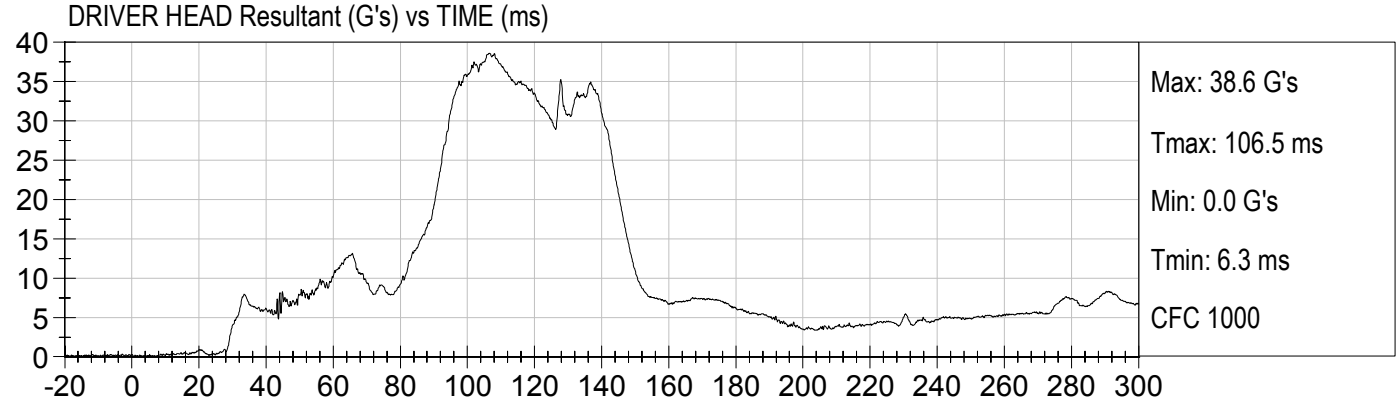
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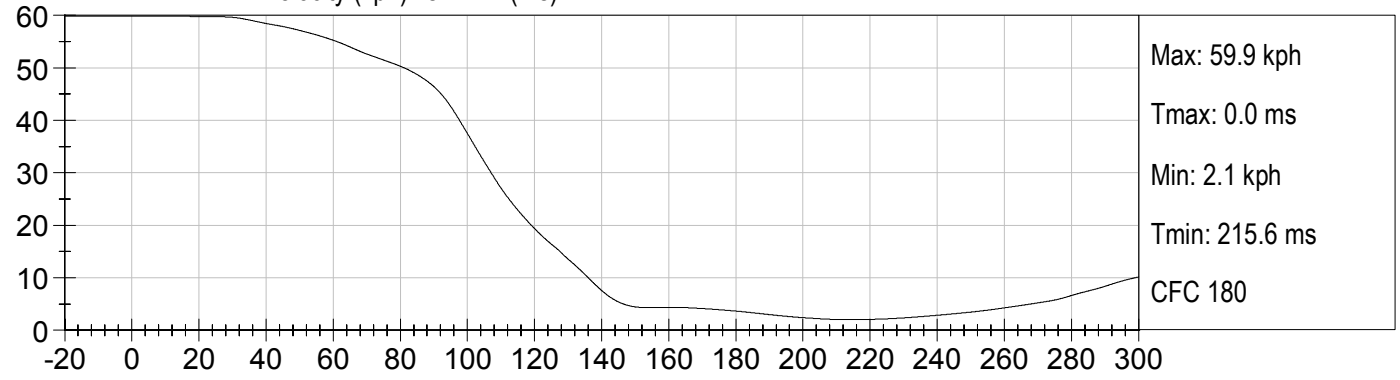
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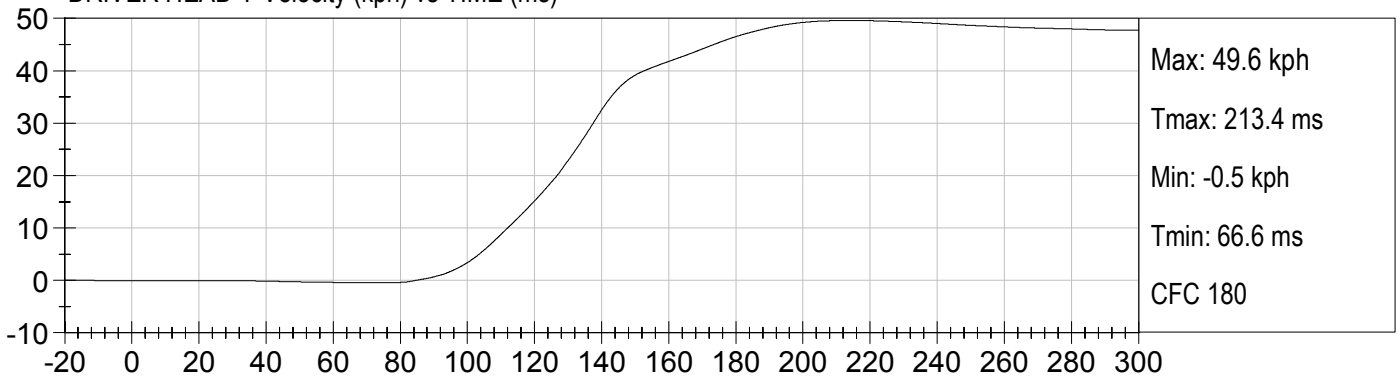
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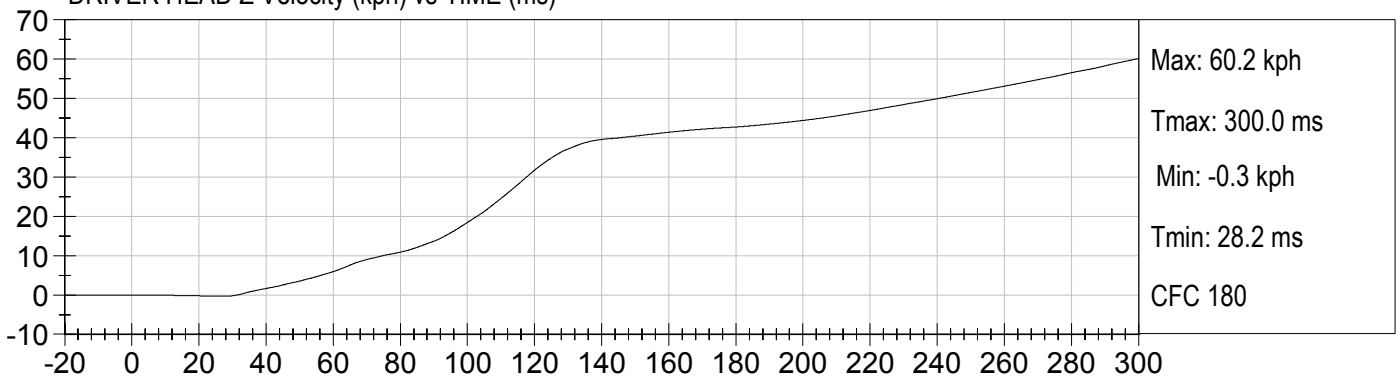
DRIVER HEAD X Velocity (kph) vs TIME (ms)



DRIVER HEAD Y Velocity (kph) vs TIME (ms)



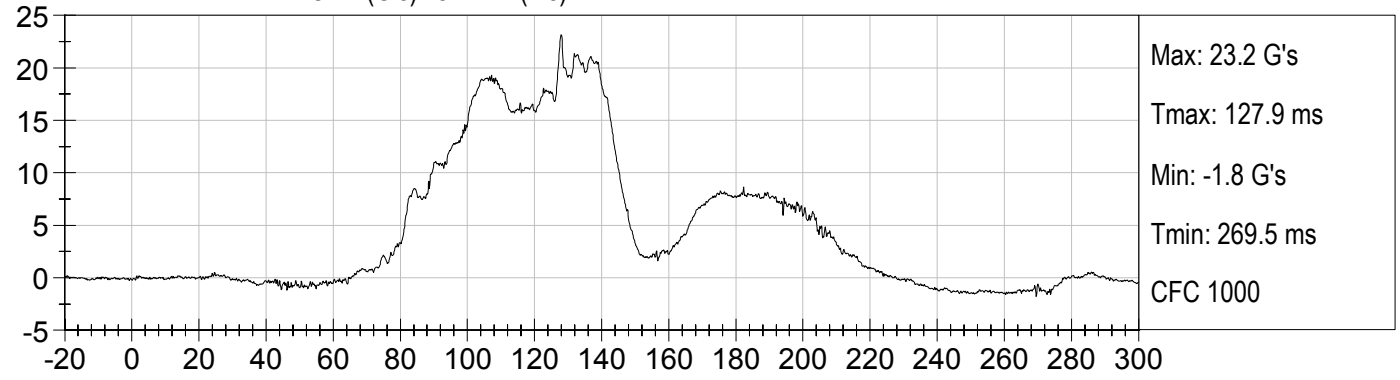
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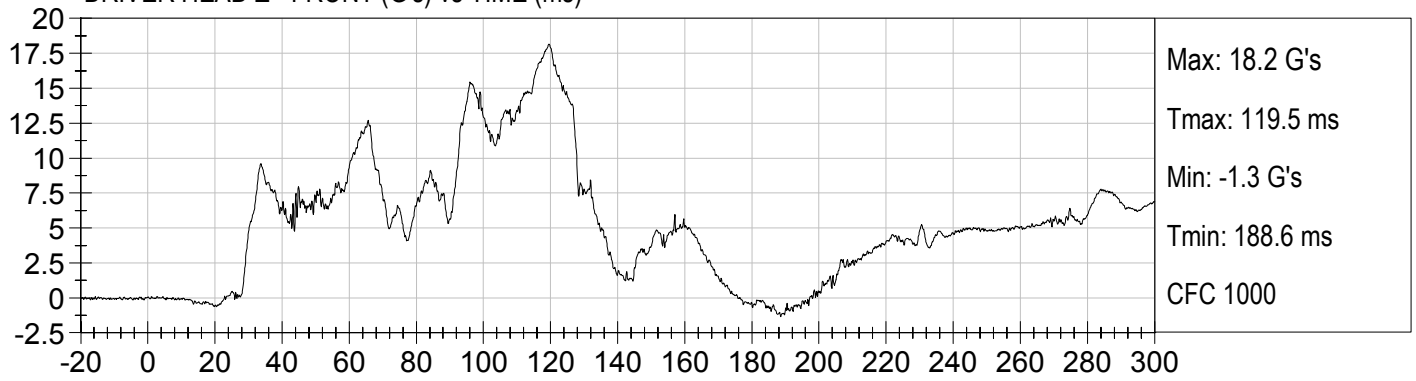
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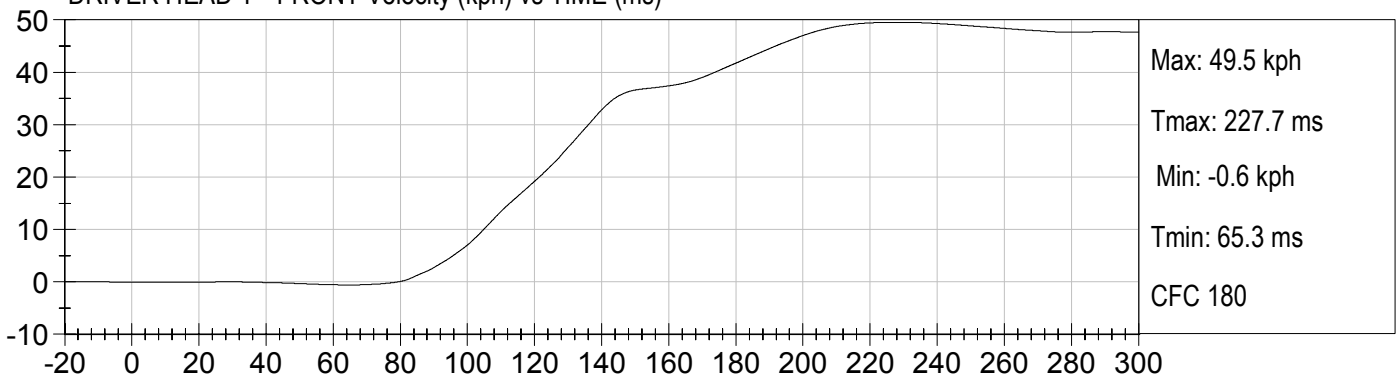
DRIVER HEAD Y - FRONT (G's) vs TIME (ms)



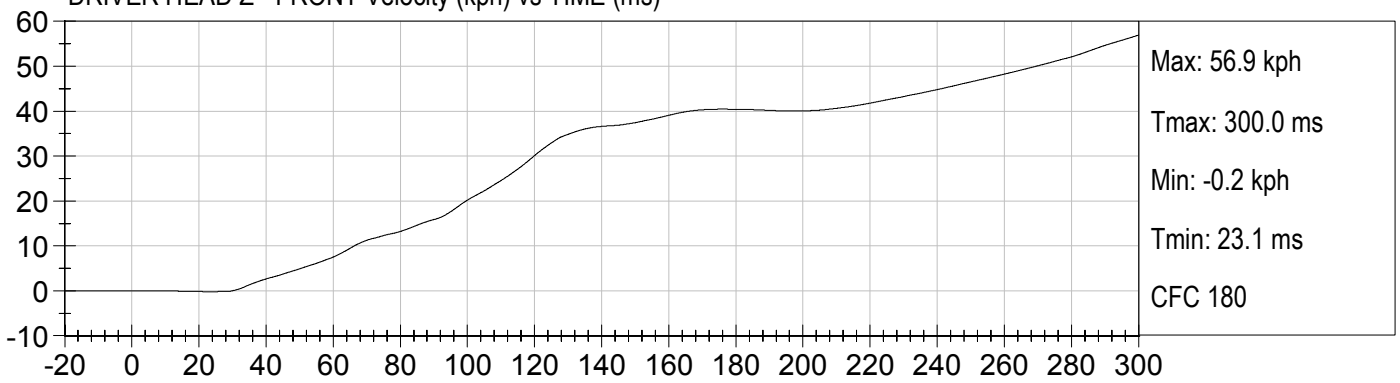
DRIVER HEAD Z - FRONT (G's) vs TIME (ms)



DRIVER HEAD Y - FRONT Velocity (kph) vs TIME (ms)



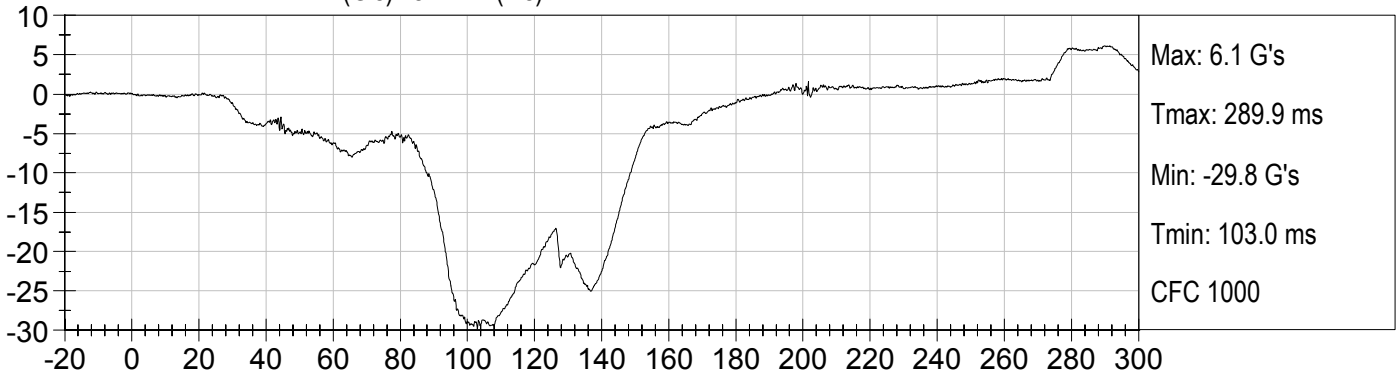
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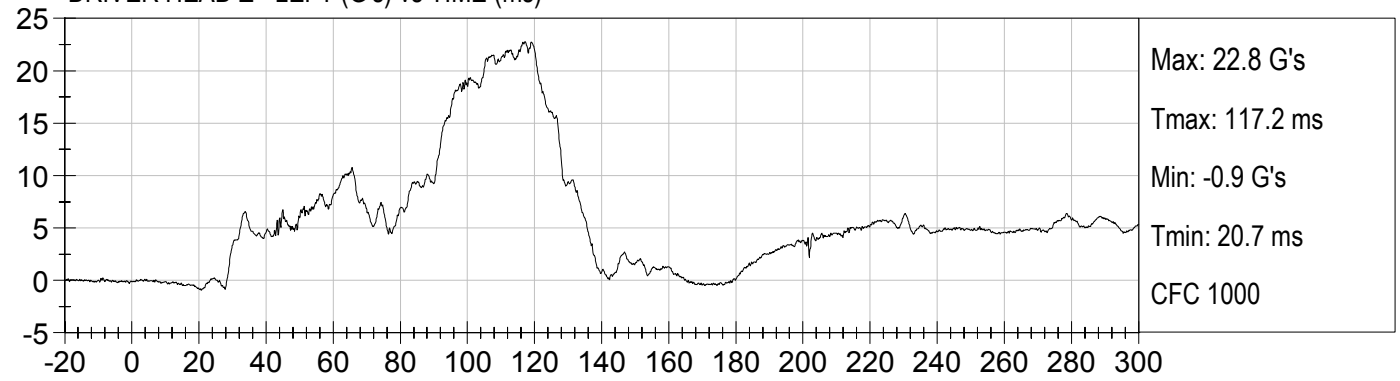
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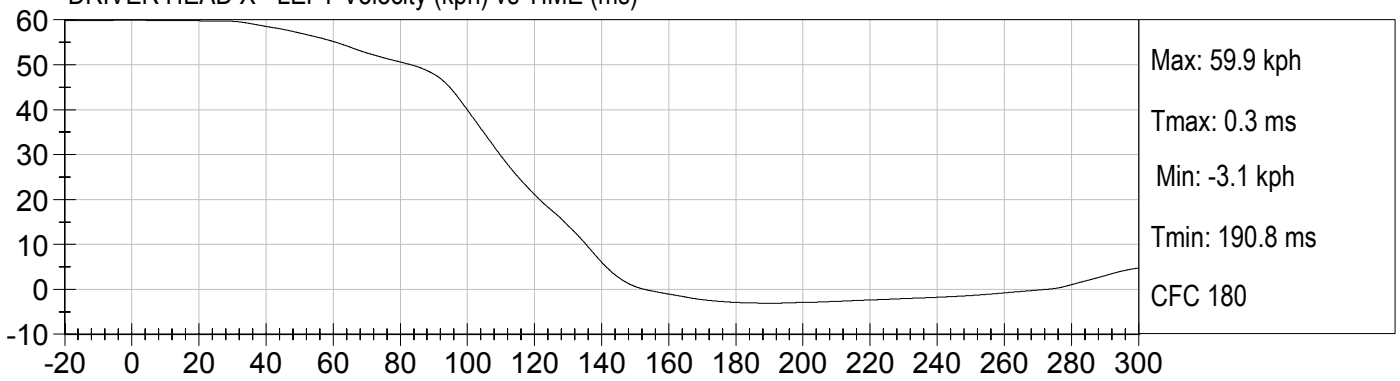
DRIVER HEAD X - LEFT (G's) vs TIME (ms)



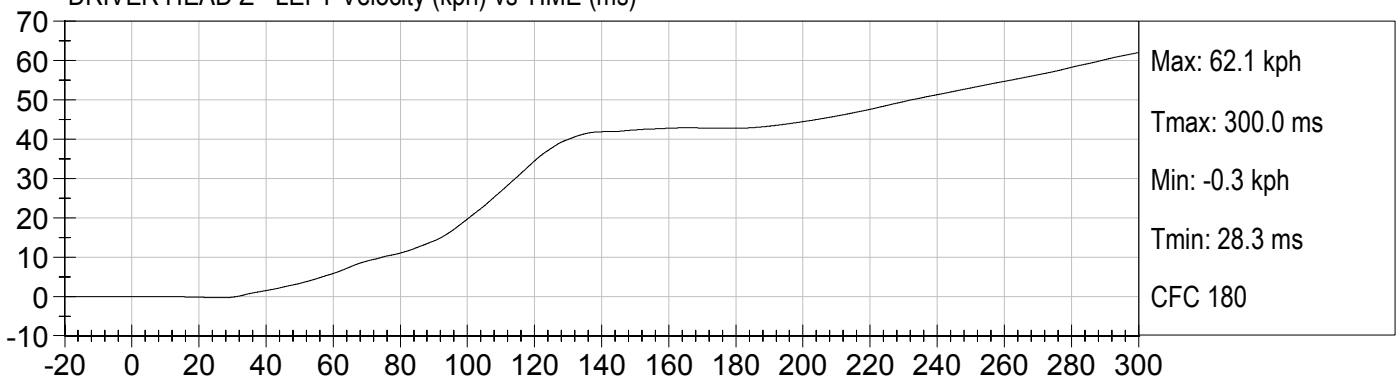
DRIVER HEAD Z - LEFT (G's) vs TIME (ms)



DRIVER HEAD X - LEFT Velocity (kph) vs TIME (ms)



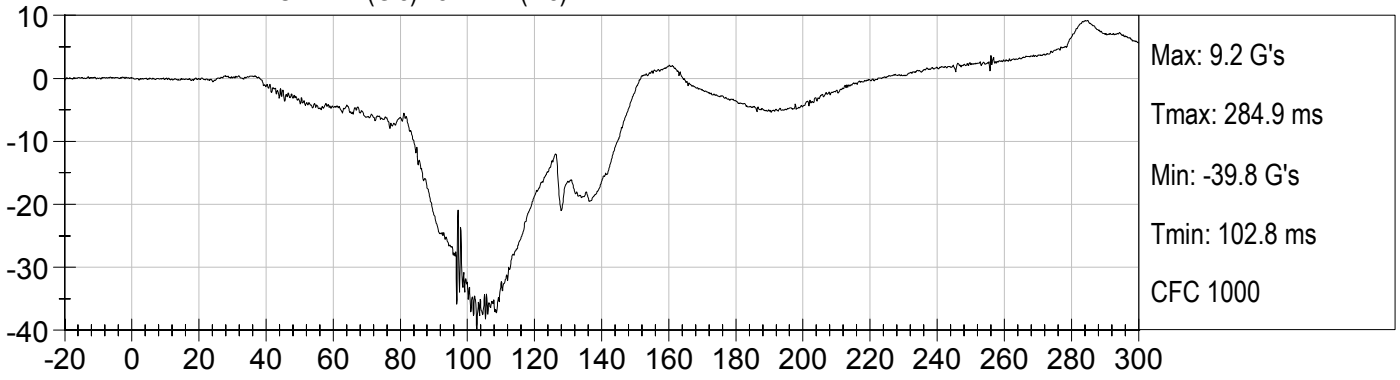
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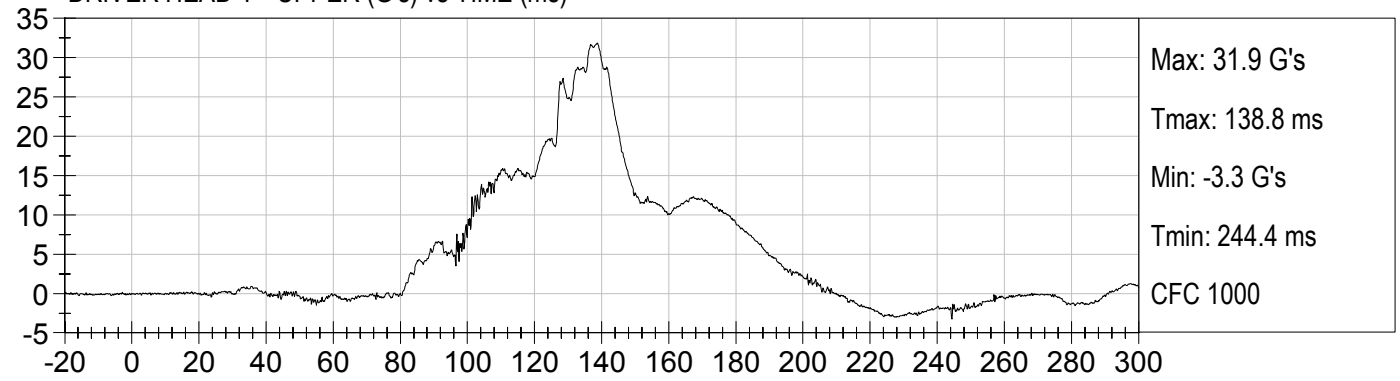
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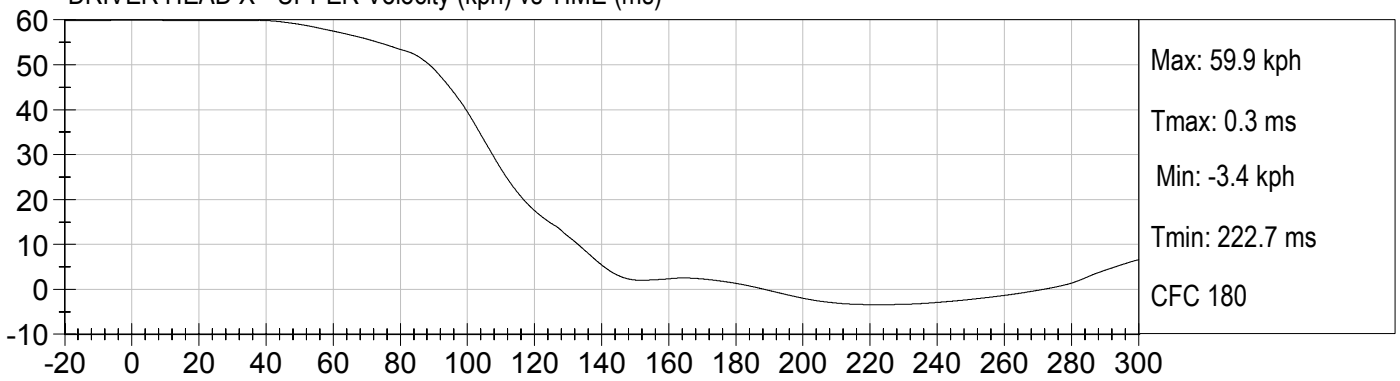
DRIVER HEAD X - UPPER (G's) vs TIME (ms)



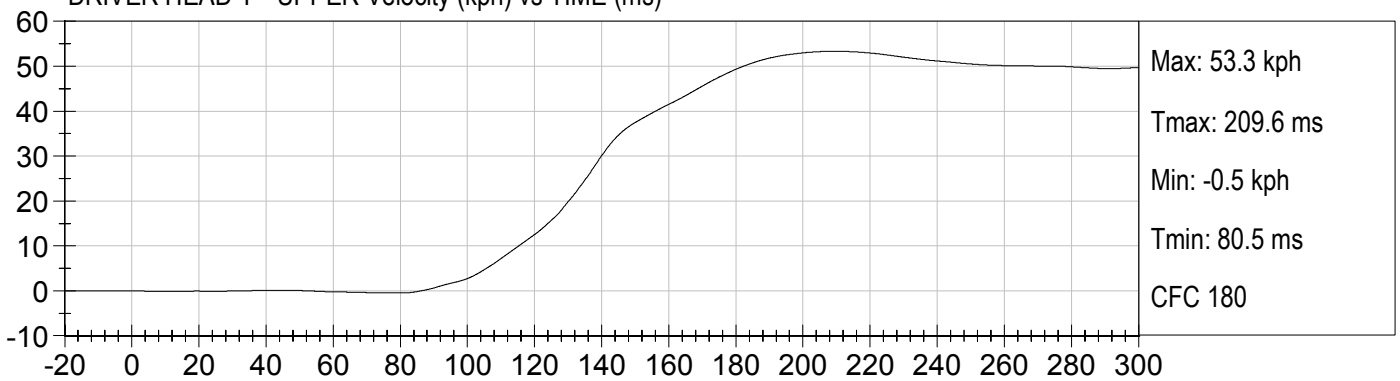
DRIVER HEAD Y - UPPER (G's) vs TIME (ms)



DRIVER HEAD X - UPPER Velocity (kph) vs TIME (ms)



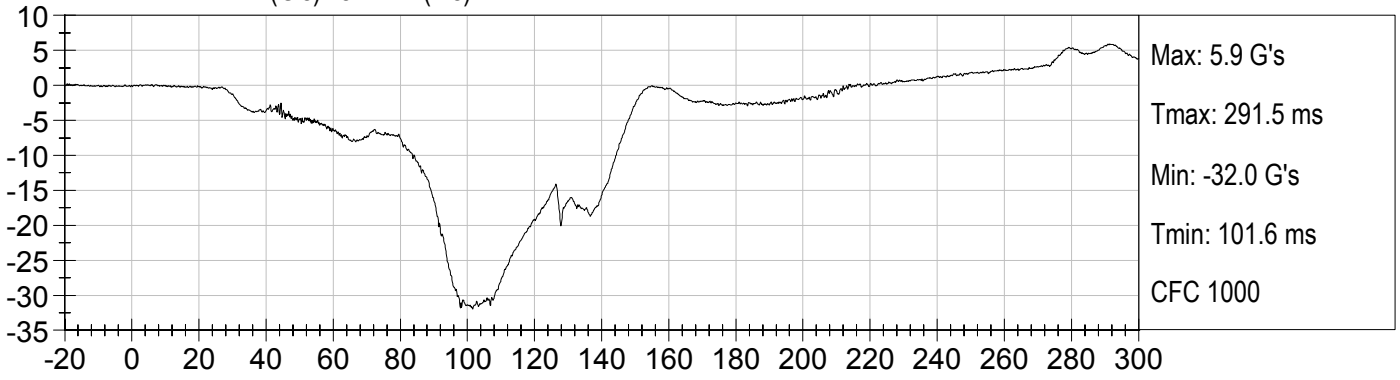
DRIVER HEAD Y - UPPER Velocity (kph) vs TIME (ms)



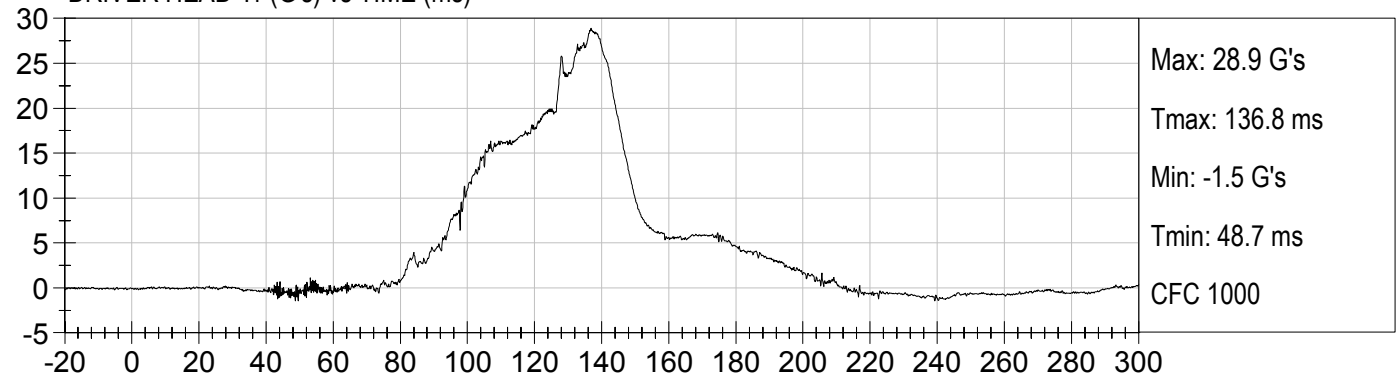
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

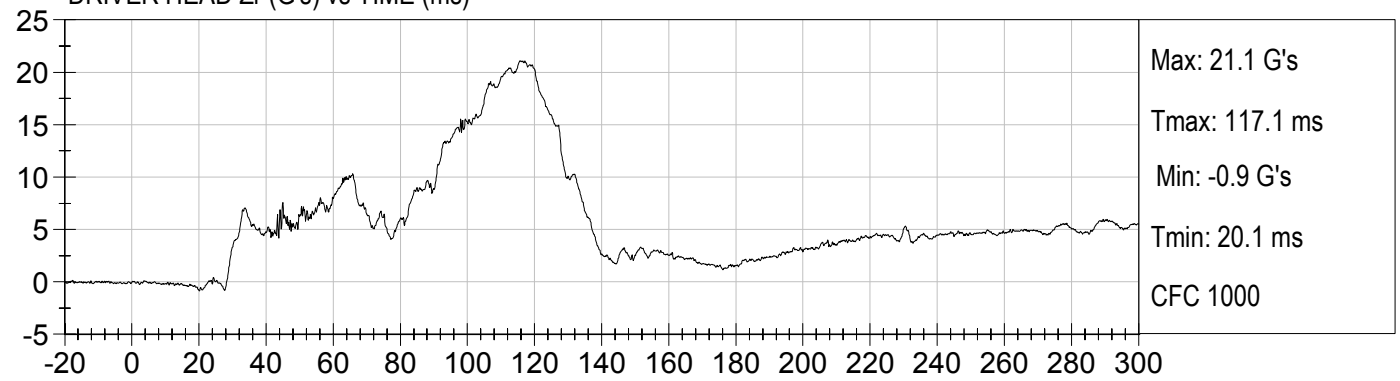
DRIVER HEAD Xr (G's) vs TIME (ms)



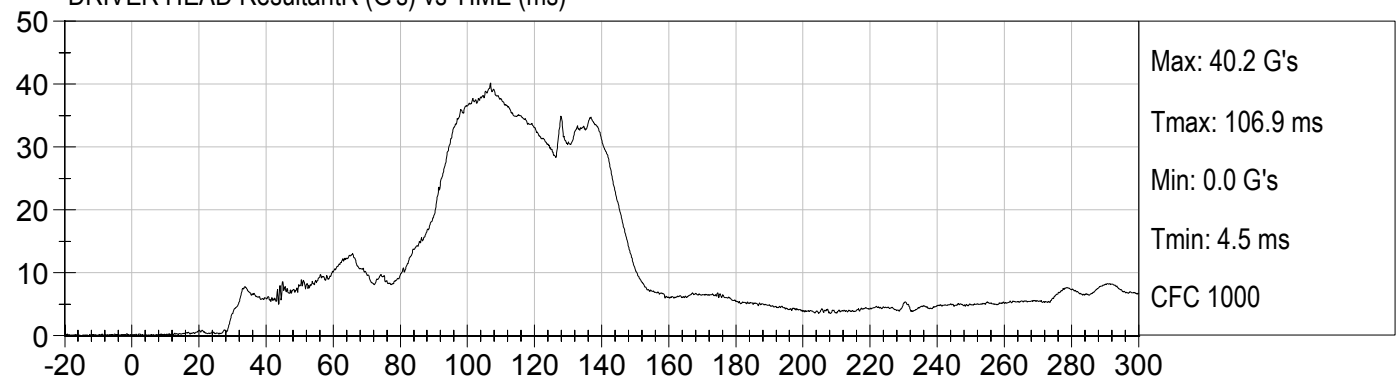
DRIVER HEAD Yr (G's) vs TIME (ms)



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



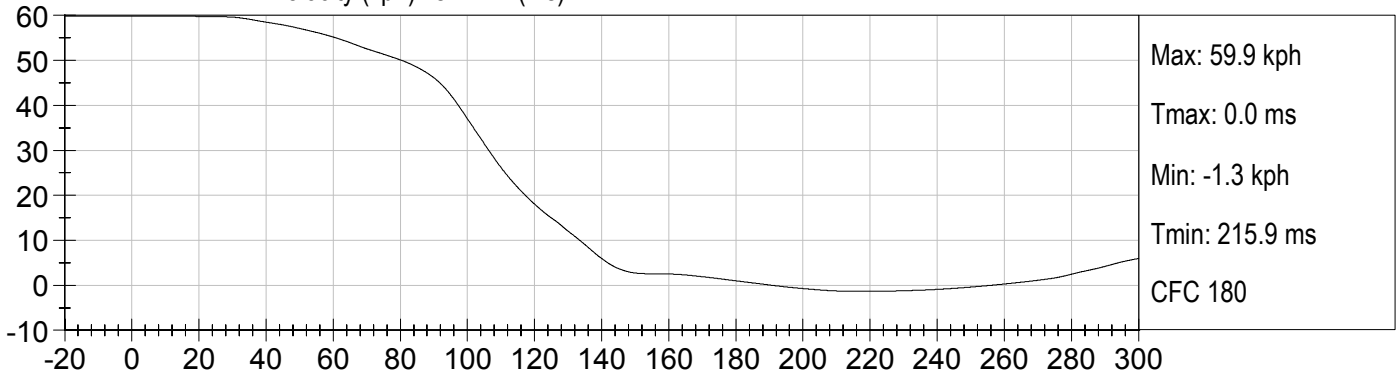
DRIVER HEAD ResultantR (G's) vs TIME (ms)



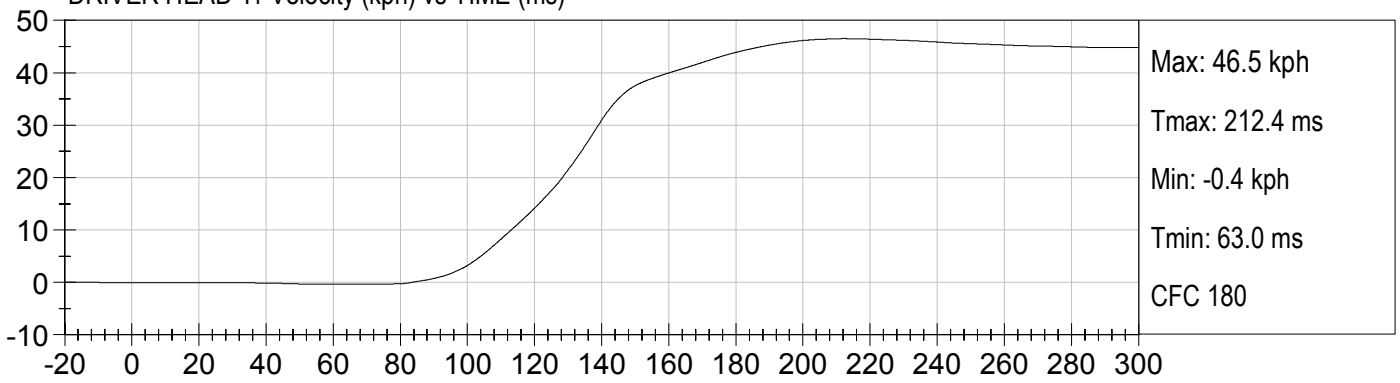
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

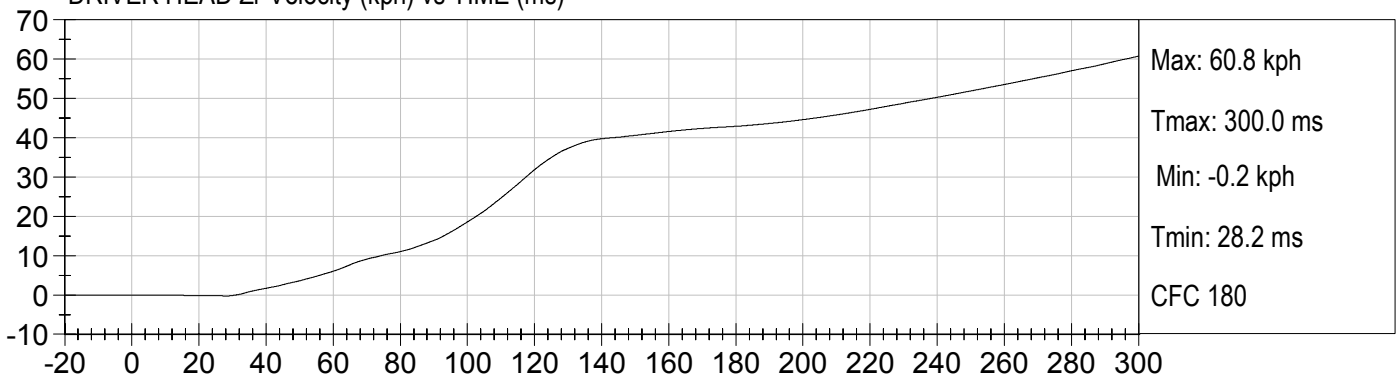
DRIVER HEAD Xr Velocity (kph) vs TIME (ms)



DRIVER HEAD Yr Velocity (kph) vs TIME (ms)



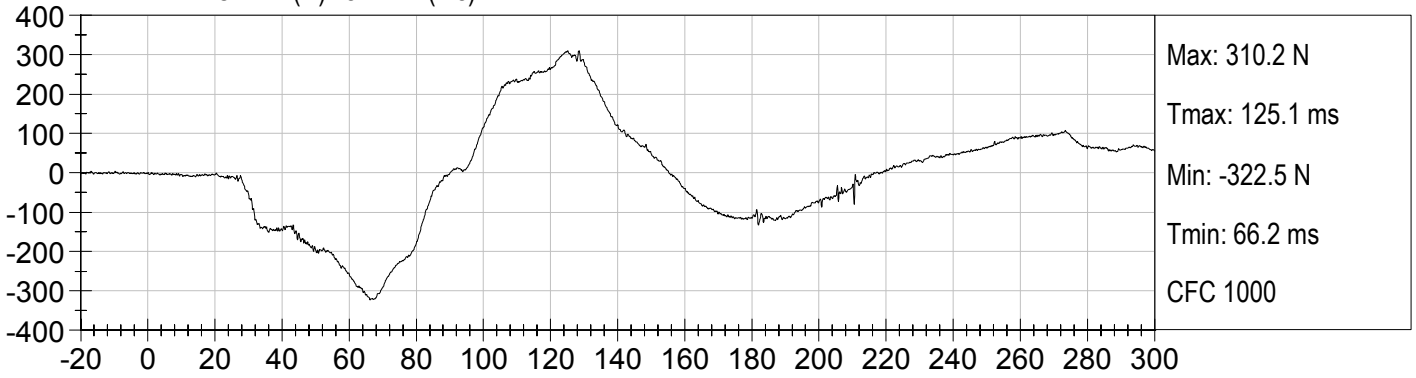
DRIVER HEAD Zr Velocity (kph) vs TIME (ms)



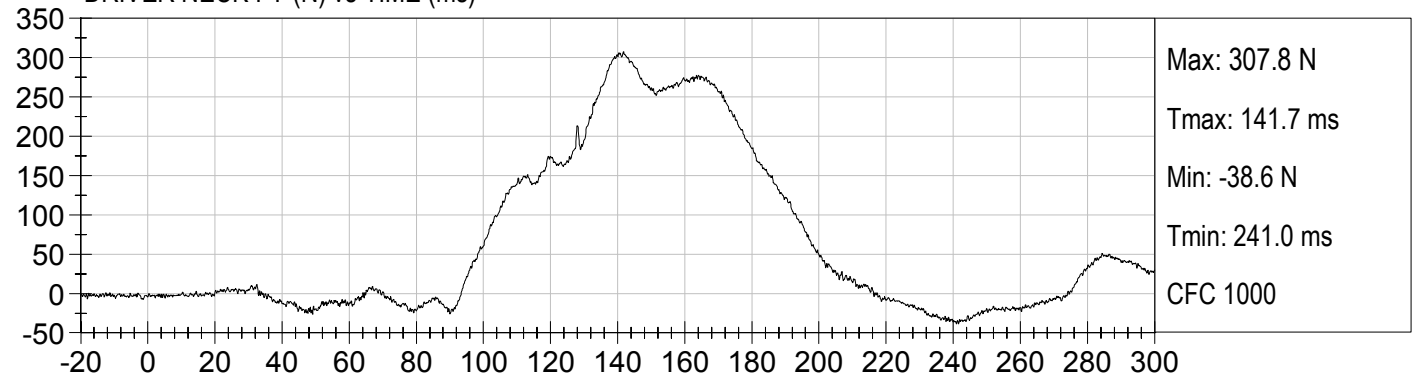
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

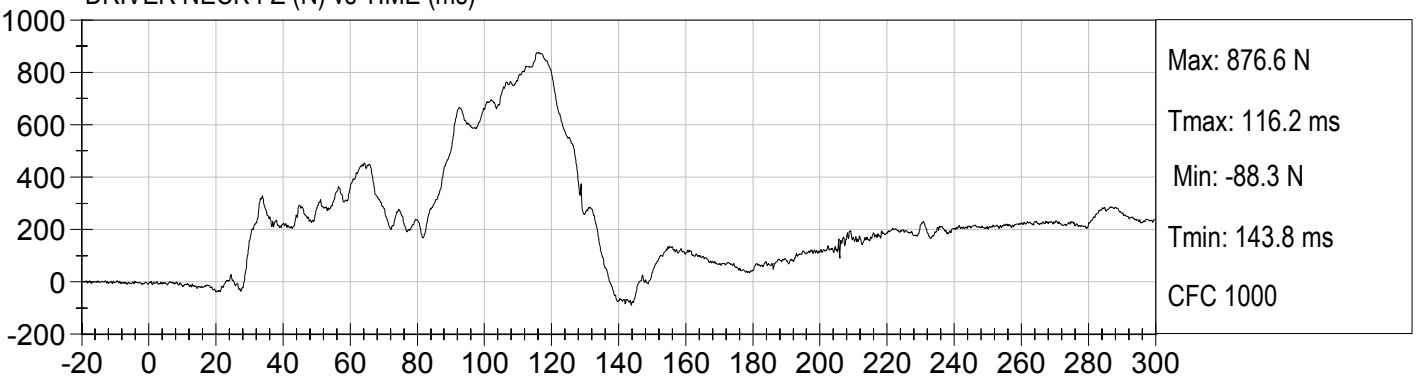
DRIVER NECK FX (N) vs TIME (ms)



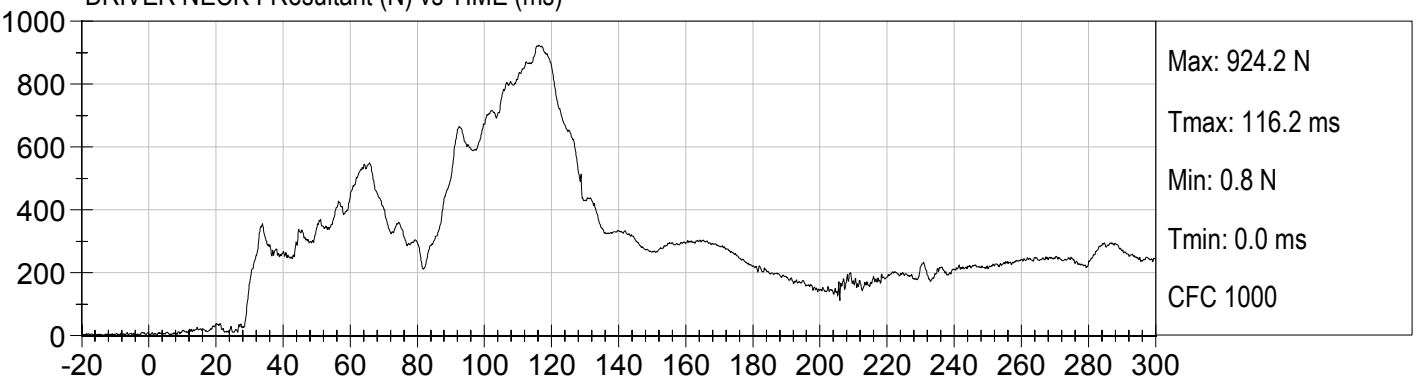
DRIVER NECK FY (N) vs TIME (ms)



DRIVER NECK FZ (N) vs TIME (ms)



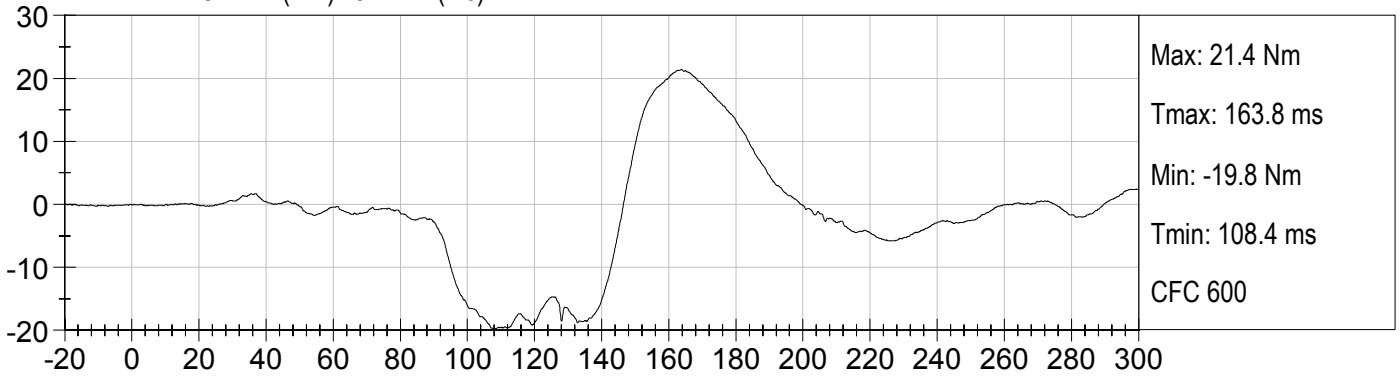
DRIVER NECK FResultant (N) vs TIME (ms)



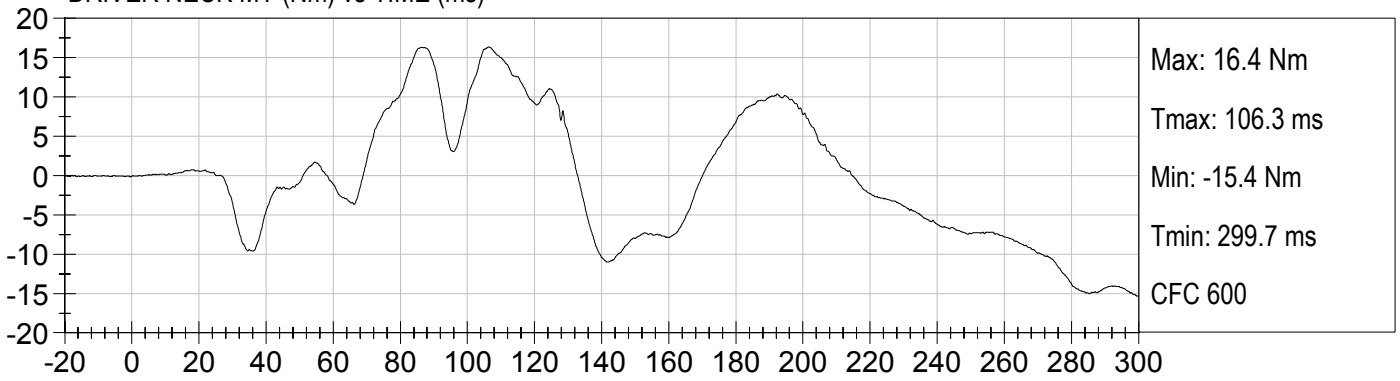
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

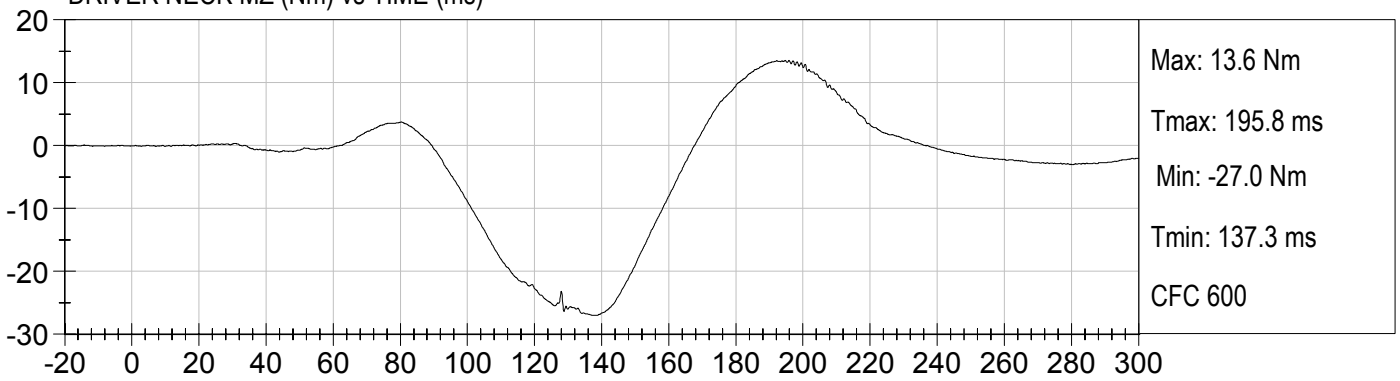
DRIVER NECK MX (Nm) vs TIME (ms)



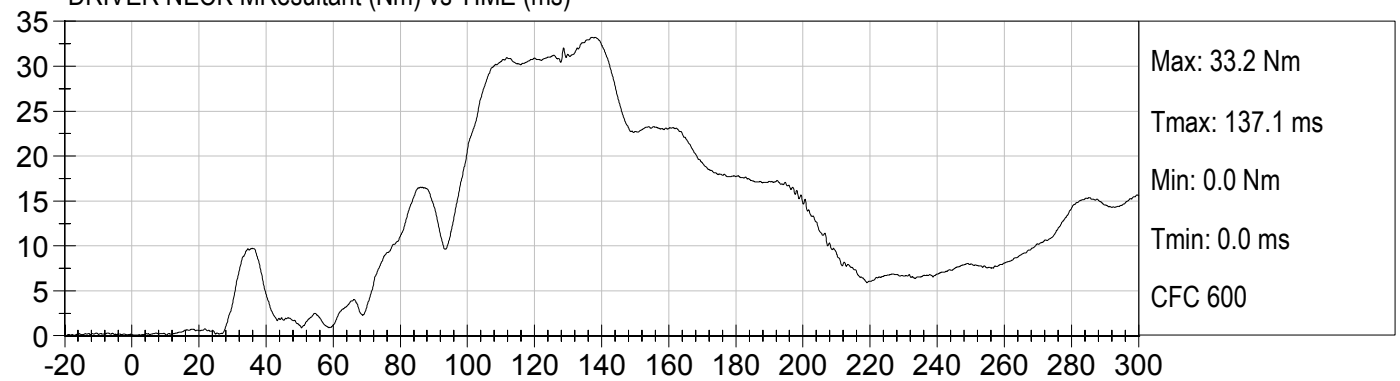
DRIVER NECK MY (Nm) vs TIME (ms)



DRIVER NECK MZ (Nm) vs TIME (ms)



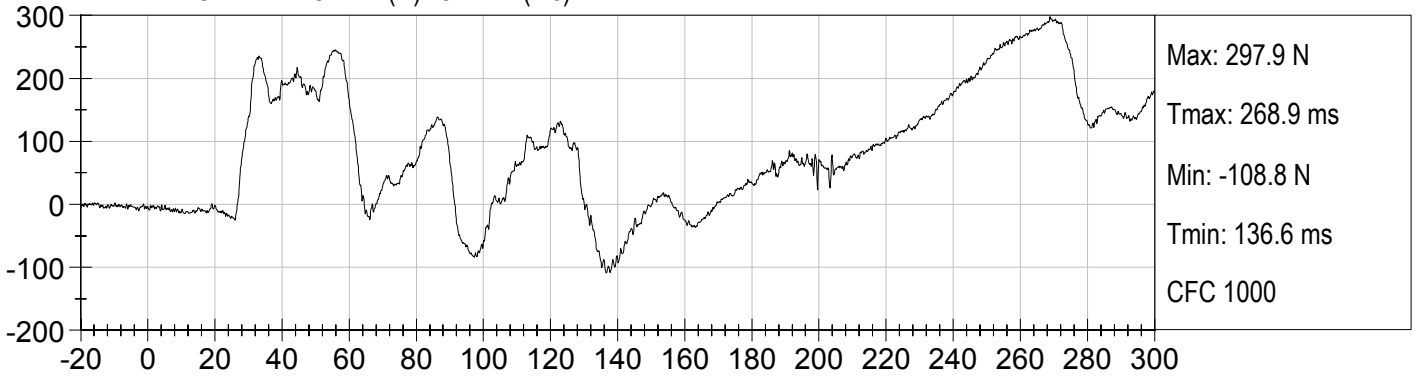
DRIVER NECK MResultant (Nm) vs TIME (ms)



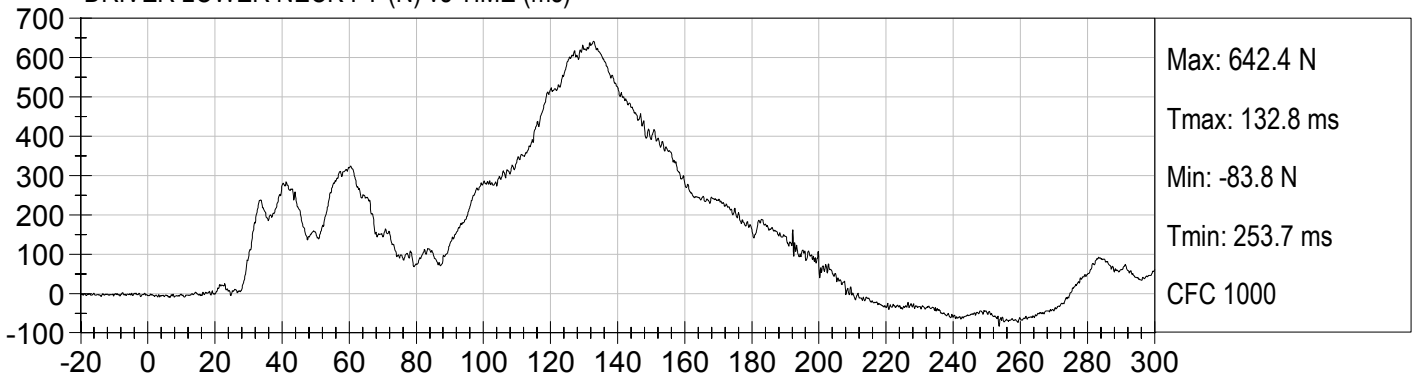
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

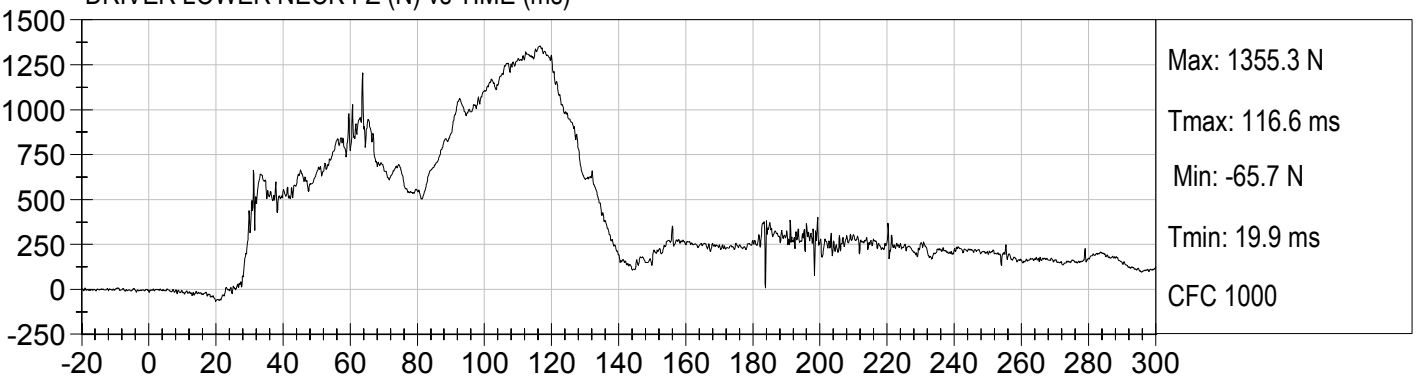
DRIVER LOWER NECK FX (N) vs TIME (ms)



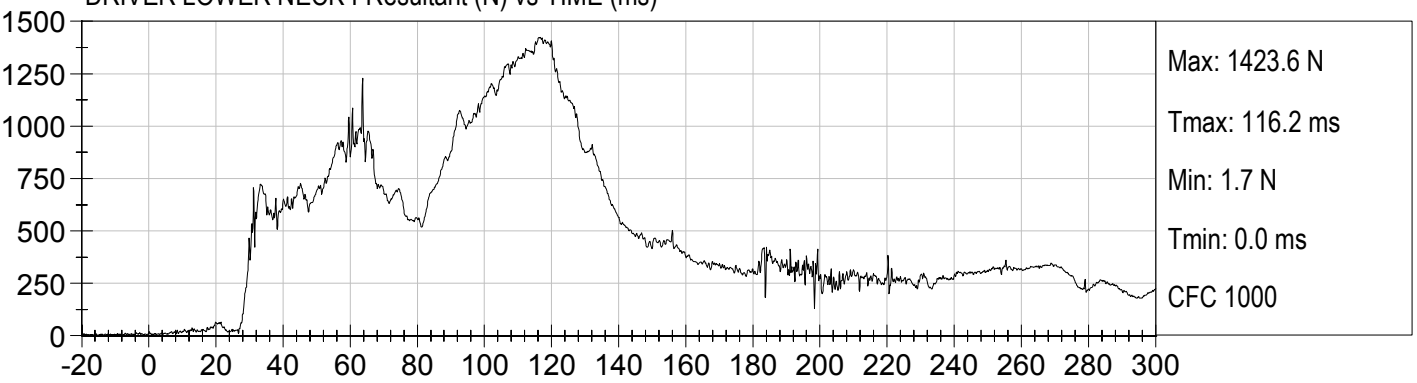
DRIVER LOWER NECK FY (N) vs TIME (ms)



DRIVER LOWER NECK FZ (N) vs TIME (ms)



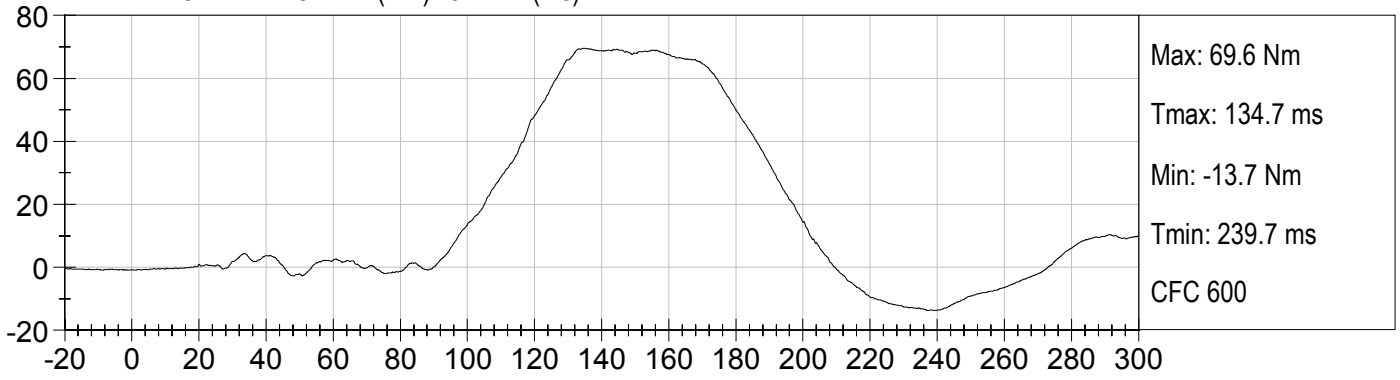
DRIVER LOWER NECK FResultant (N) vs TIME (ms)



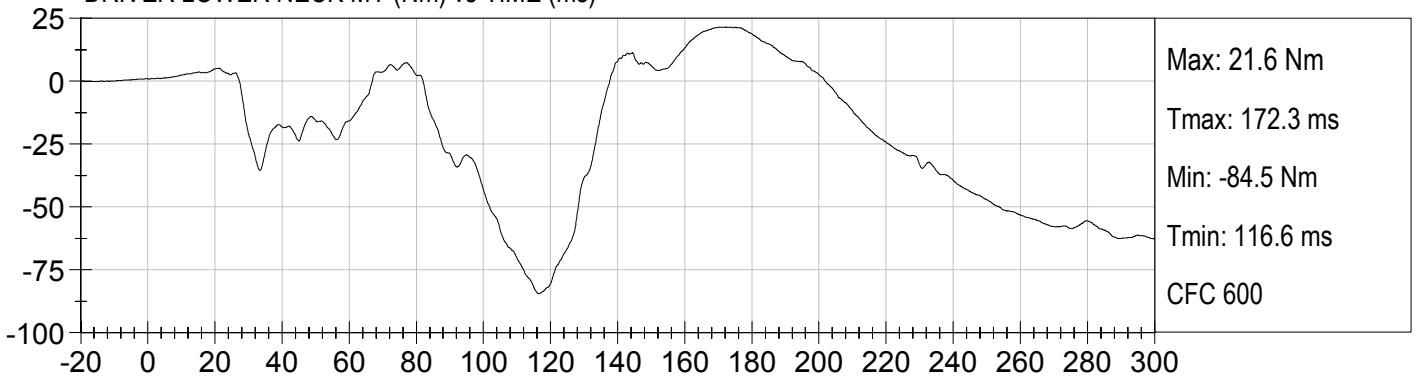
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

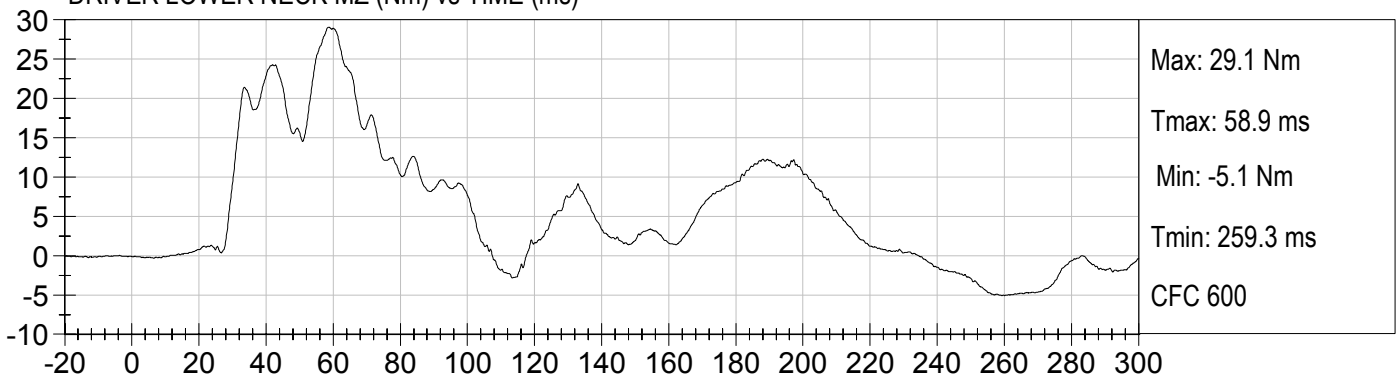
DRIVER LOWER NECK MX (Nm) vs TIME (ms)



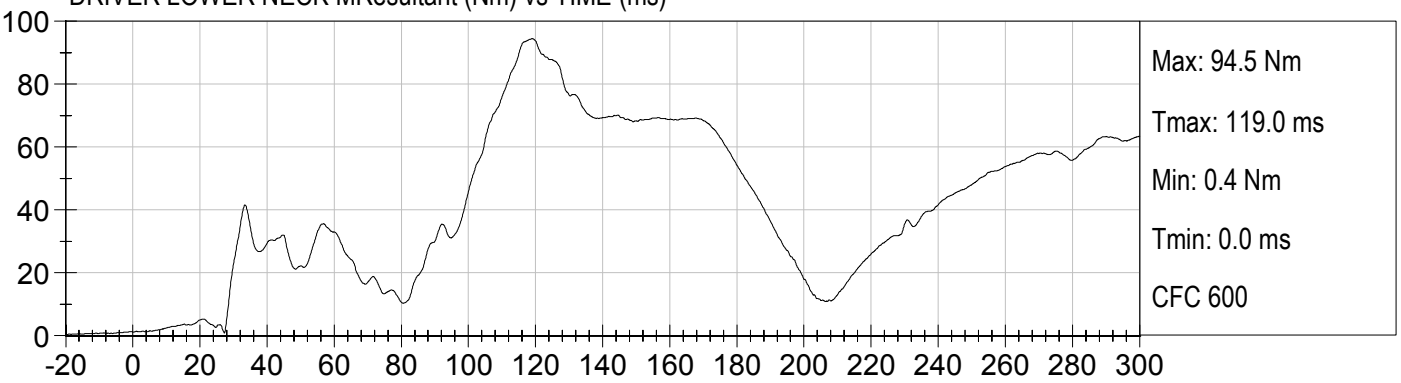
DRIVER LOWER NECK MY (Nm) vs TIME (ms)



DRIVER LOWER NECK MZ (Nm) vs TIME (ms)



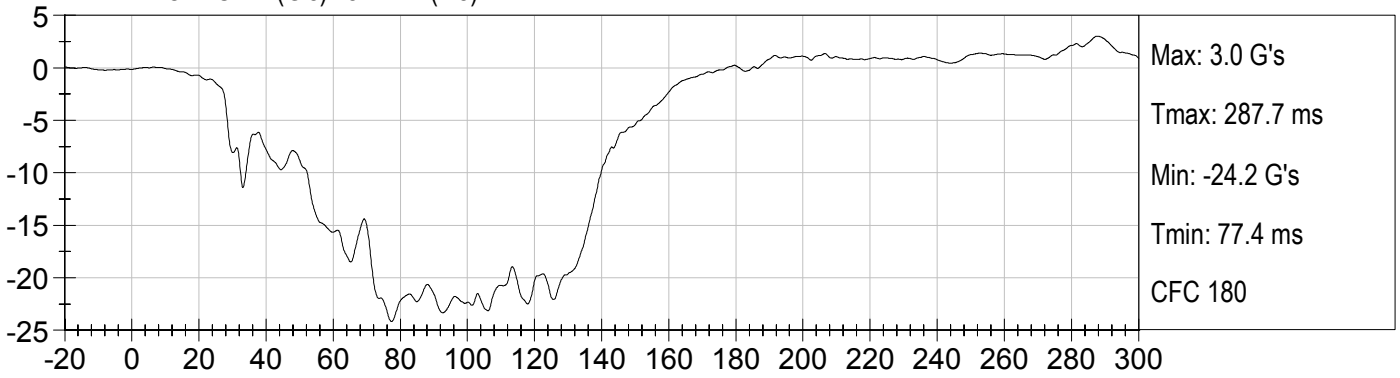
DRIVER LOWER NECK MResultant (Nm) vs TIME (ms)



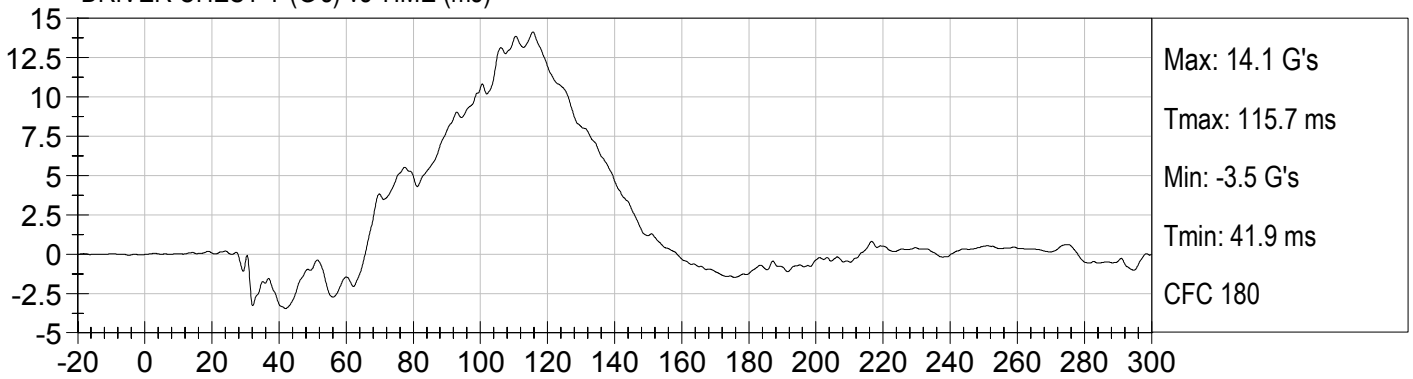
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

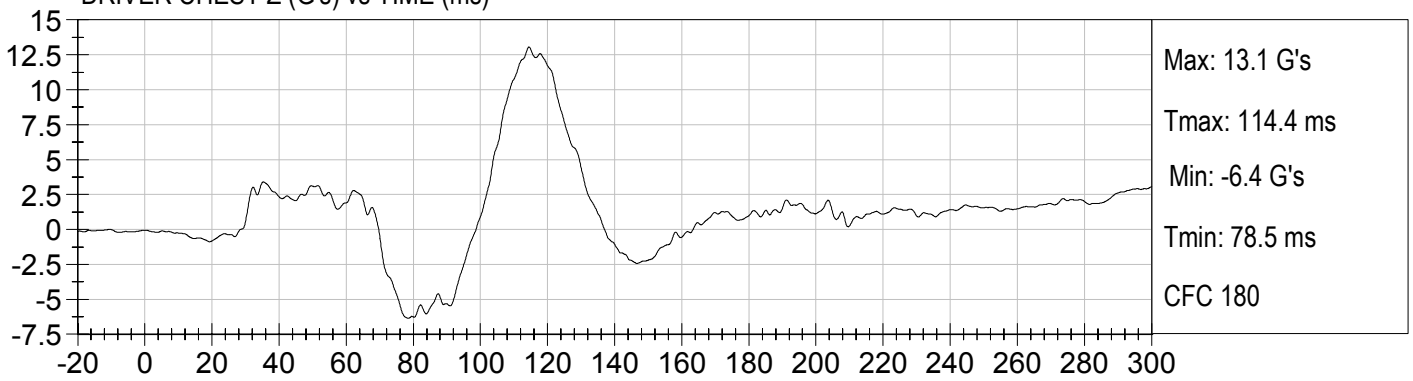
DRIVER CHEST X (G's) vs TIME (ms)



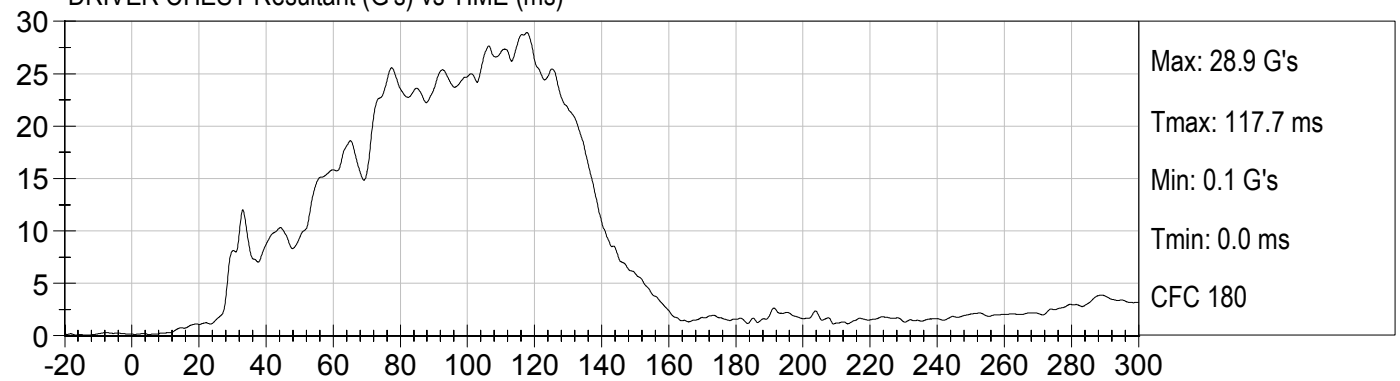
DRIVER CHEST Y (G's) vs TIME (ms)



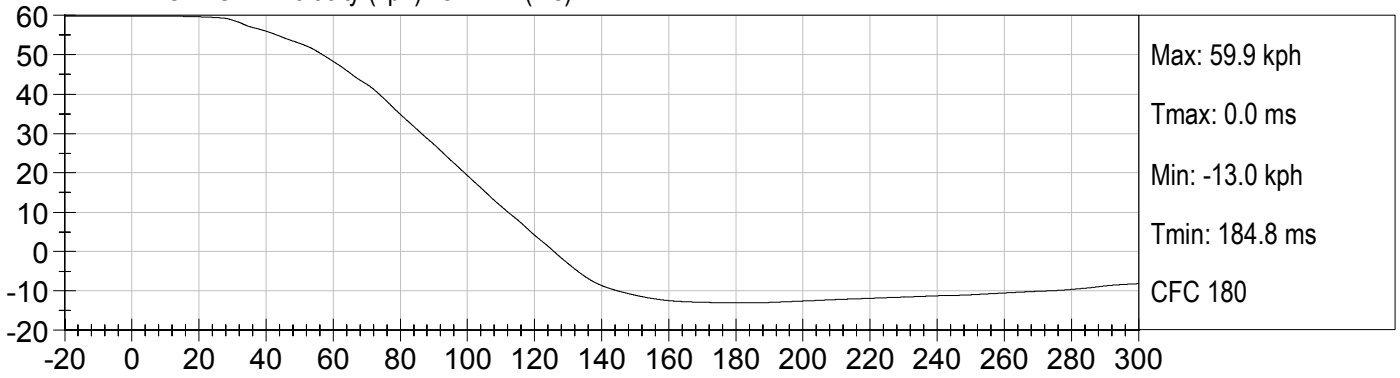
DRIVER CHEST Z (G's) vs TIME (ms)



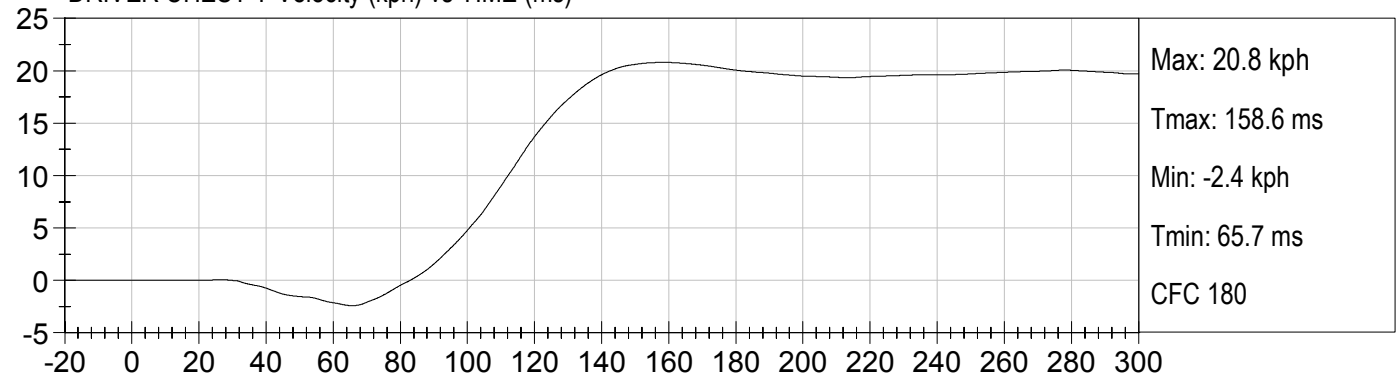
DRIVER CHEST Resultant (G's) vs TIME (ms)



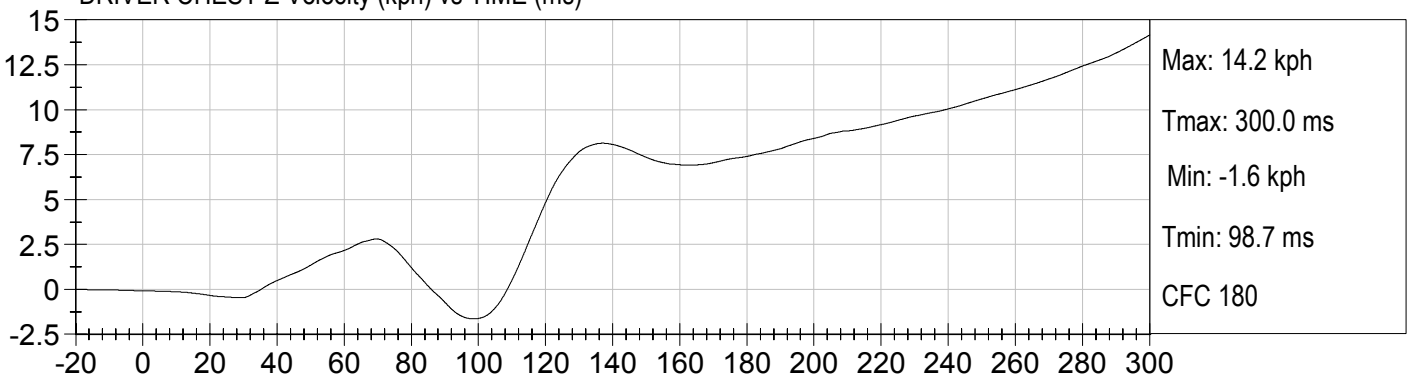
DRIVER CHEST X Velocity (kph) vs TIME (ms)



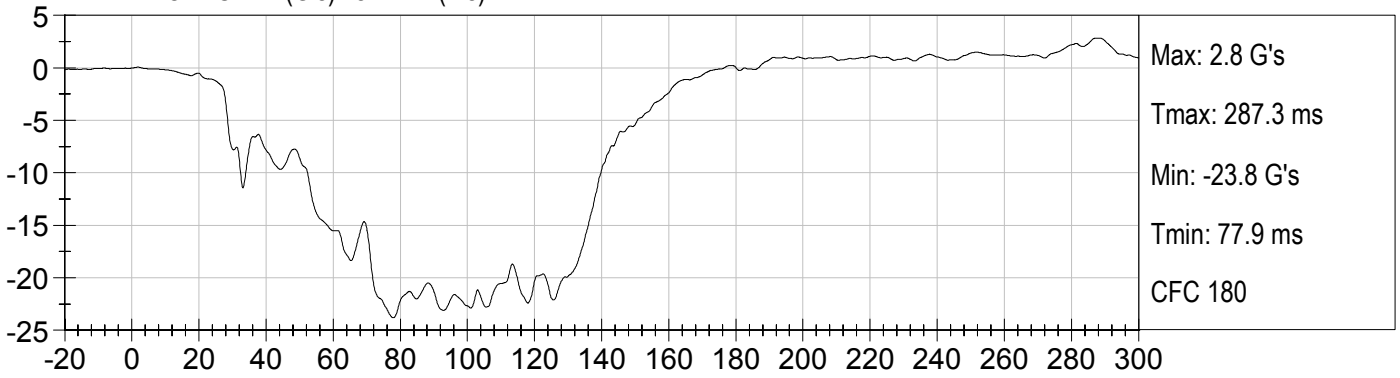
DRIVER CHEST Y Velocity (kph) vs TIME (ms)



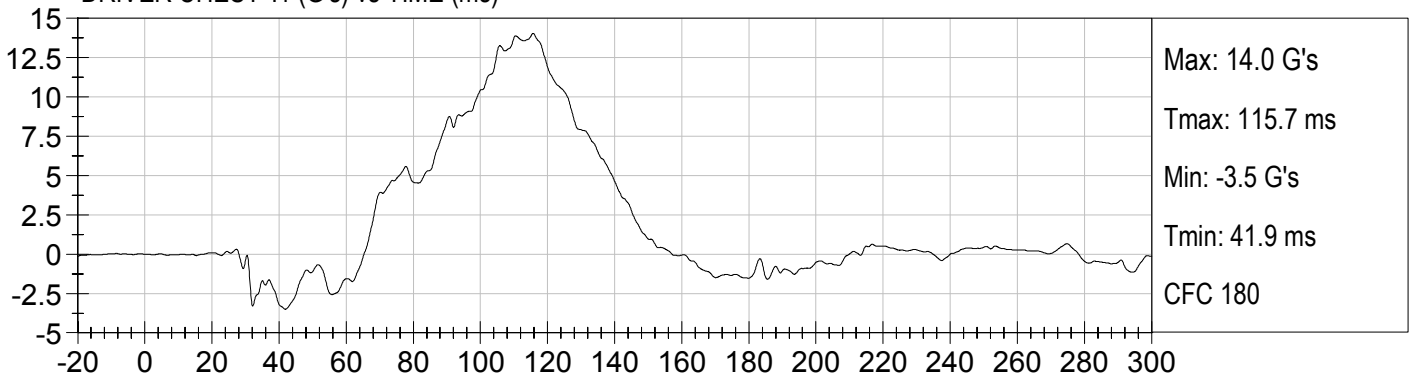
DRIVER CHEST Z Velocity (kph) vs TIME (ms)



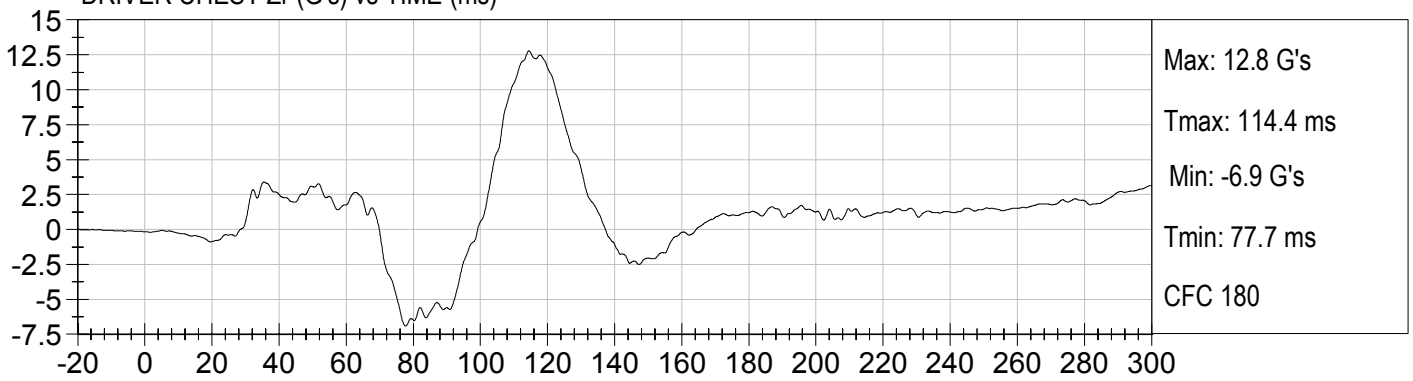
DRIVER CHEST Xr (G's) vs TIME (ms)



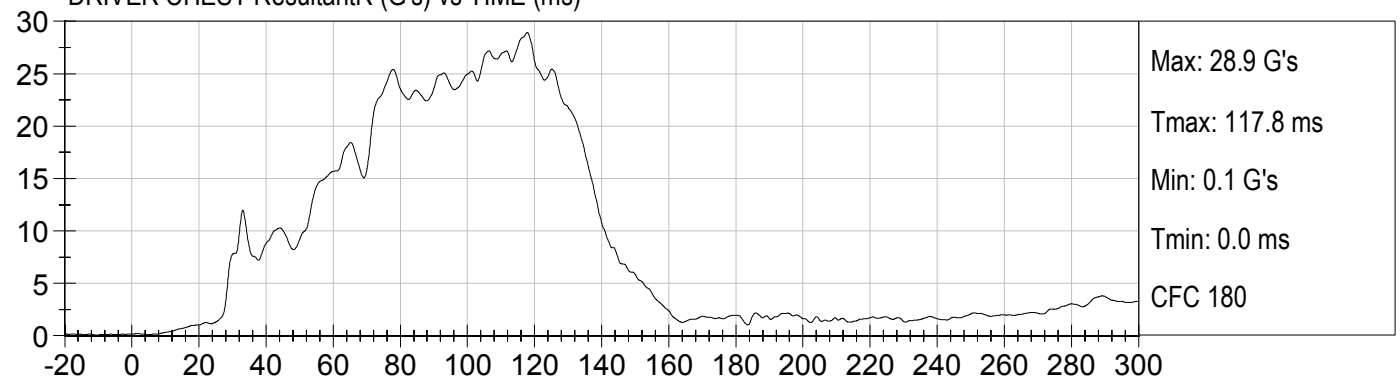
DRIVER CHEST Yr (G's) vs TIME (ms)



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



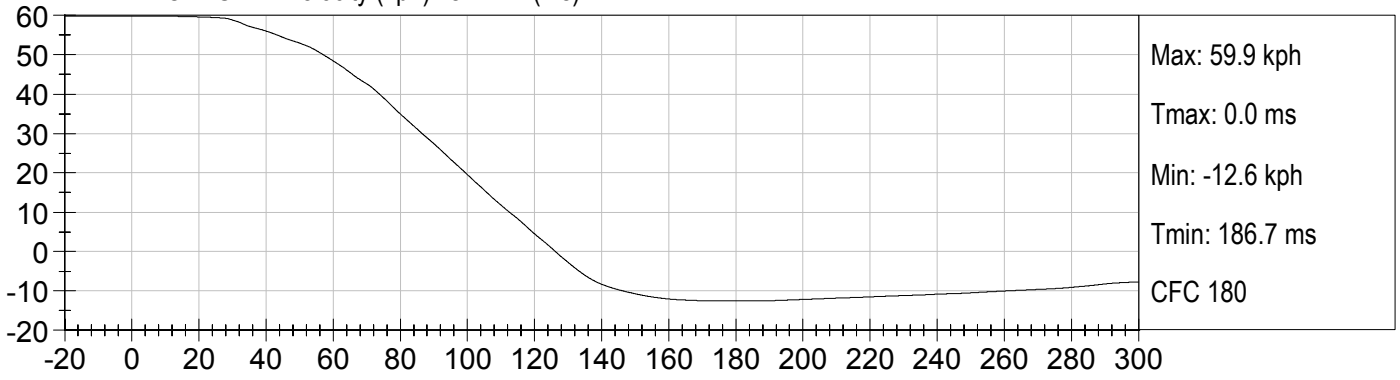
DRIVER CHEST ResultantR (G's) vs TIME (ms)



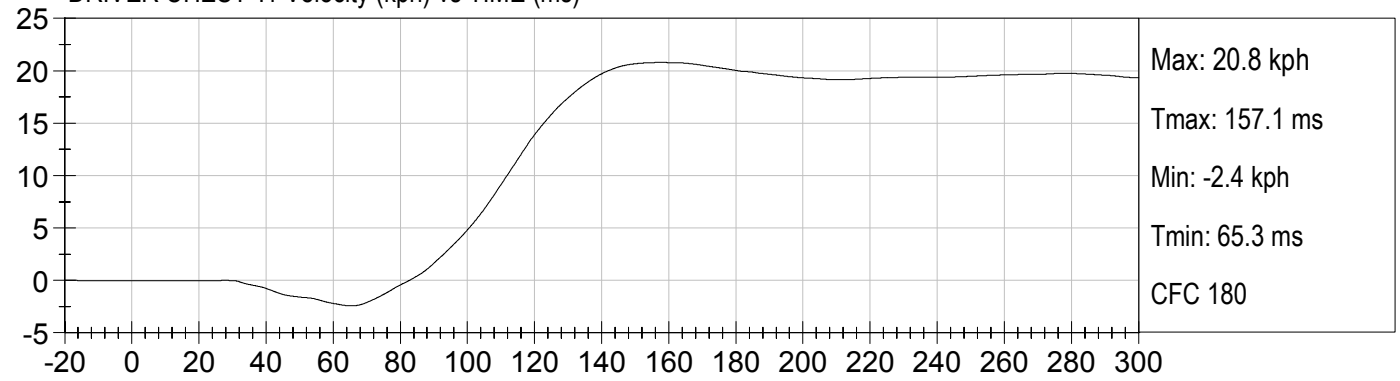
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

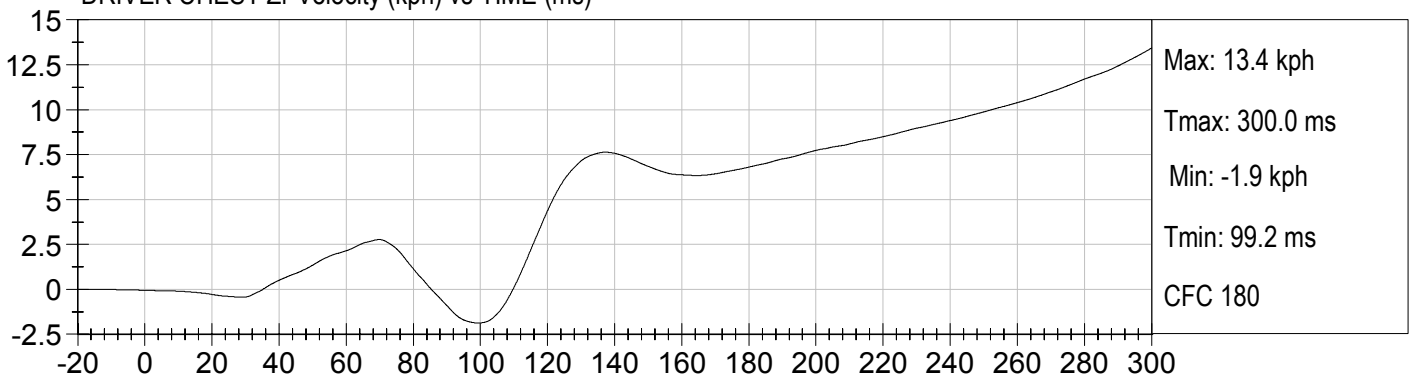
DRIVER CHEST Xr Velocity (kph) vs TIME (ms)



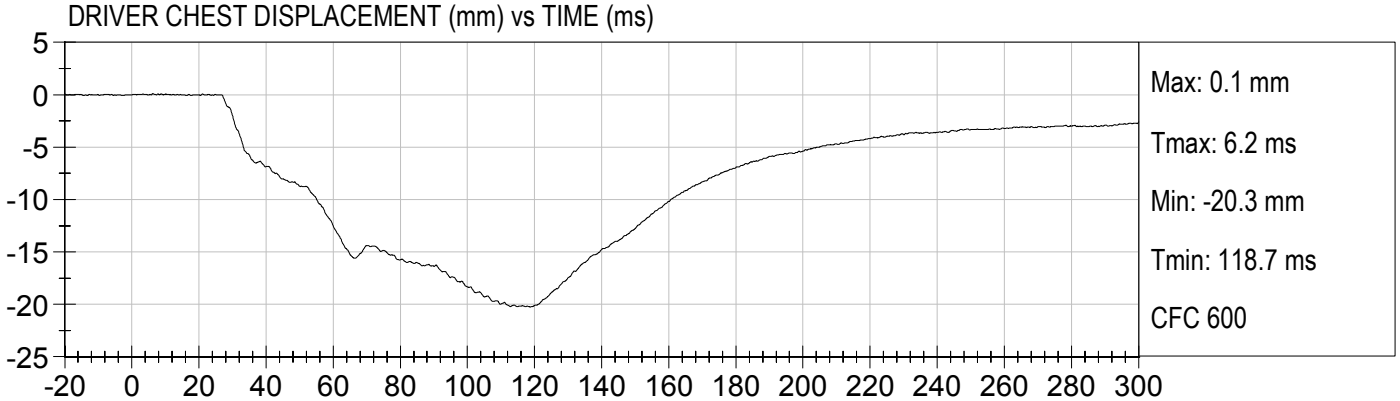
DRIVER CHEST Yr Velocity (kph) vs TIME (ms)



DRIVER CHEST Zr Velocity (kph) vs TIME (ms)



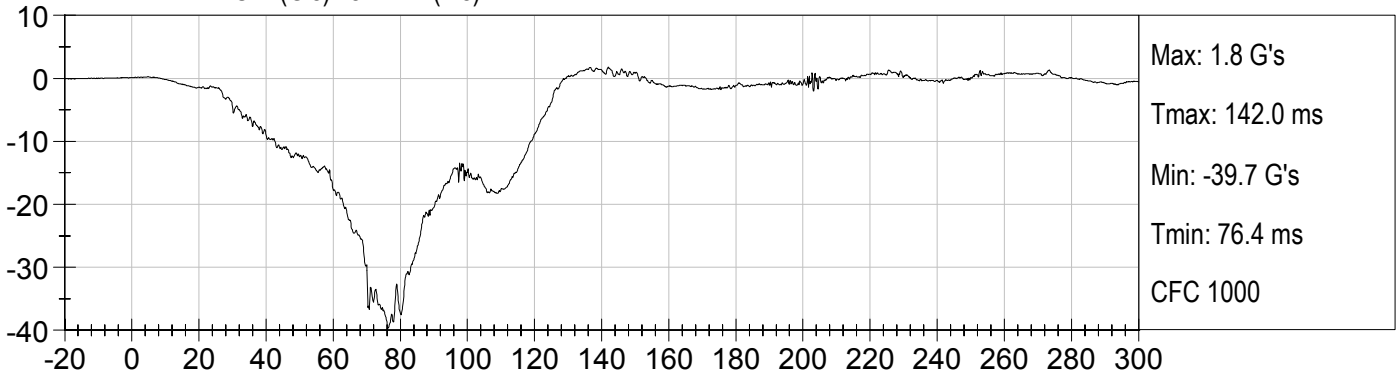
DRIVER CHEST DISPLACEMENT (mm) vs TIME (ms)



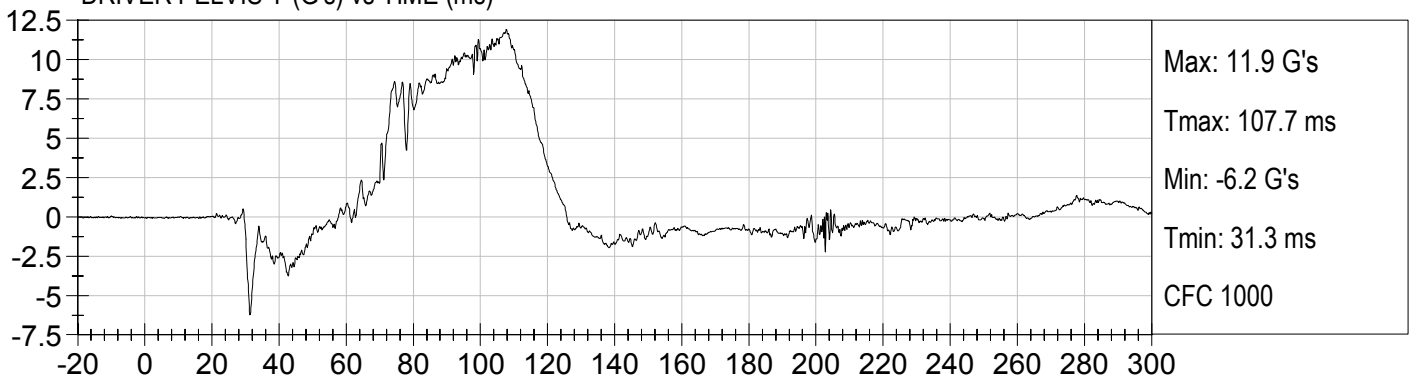
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

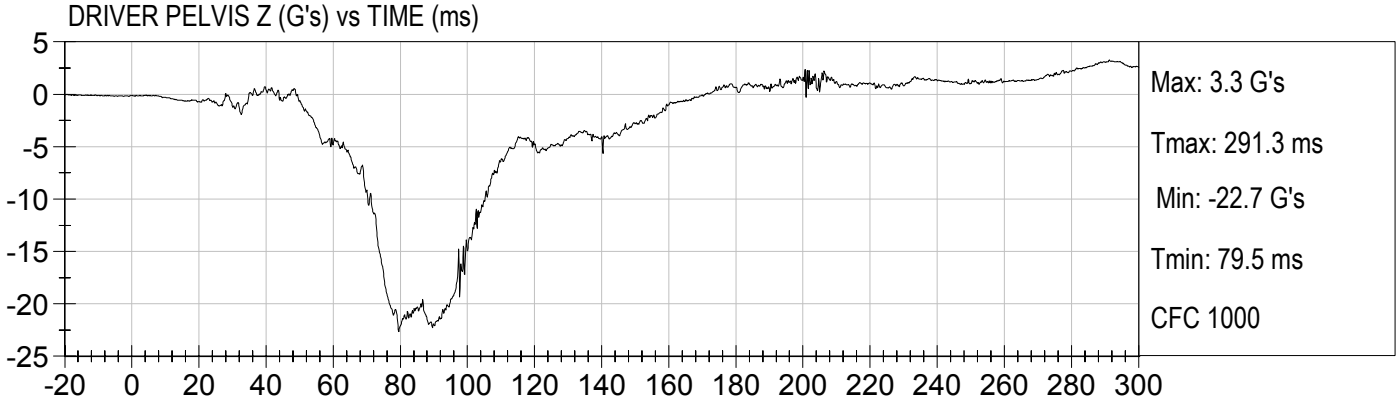
DRIVER PELVIS X (G's) vs TIME (ms)



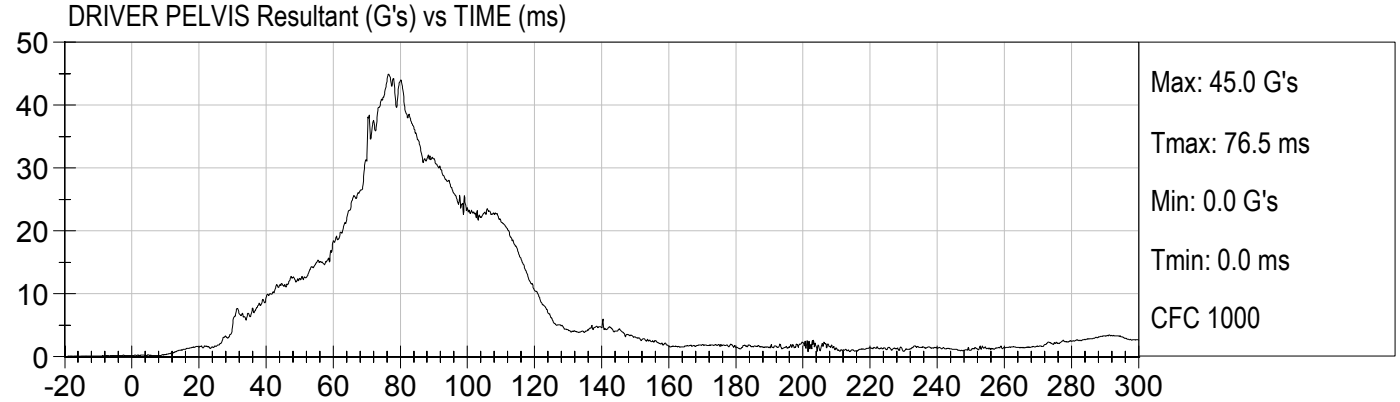
DRIVER PELVIS Y (G's) vs TIME (ms)



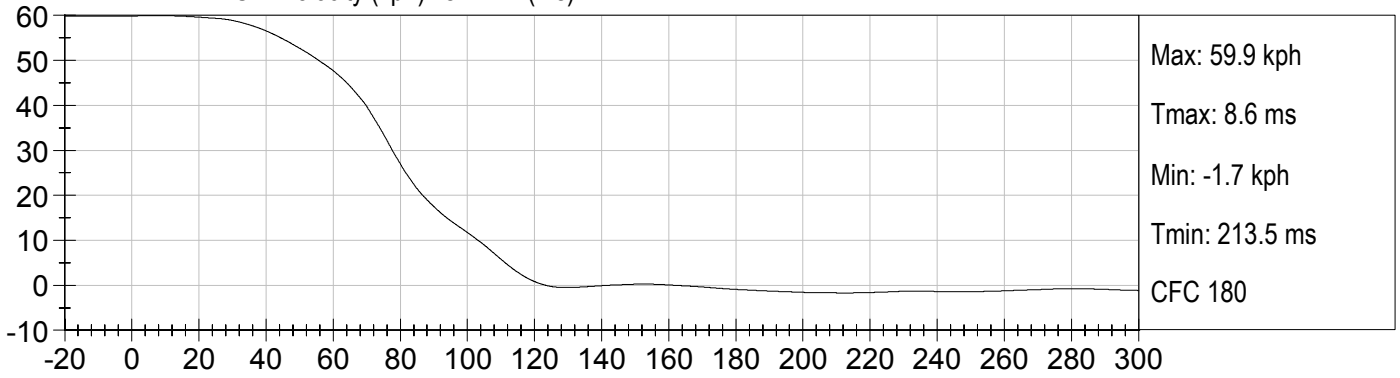
DRIVER PELVIS Z (G's) vs TIME (ms)



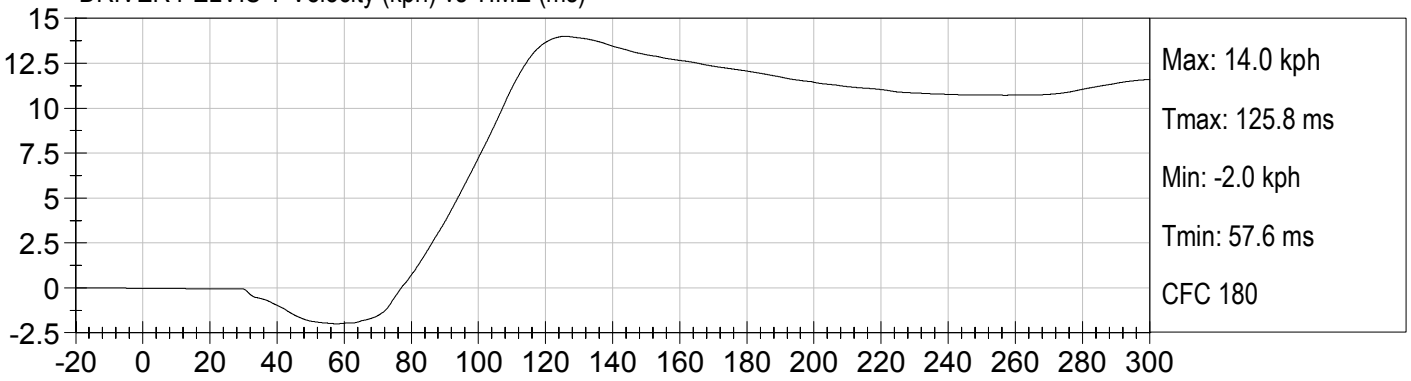
DRIVER PELVIS Resultant (G's) vs TIME (ms)



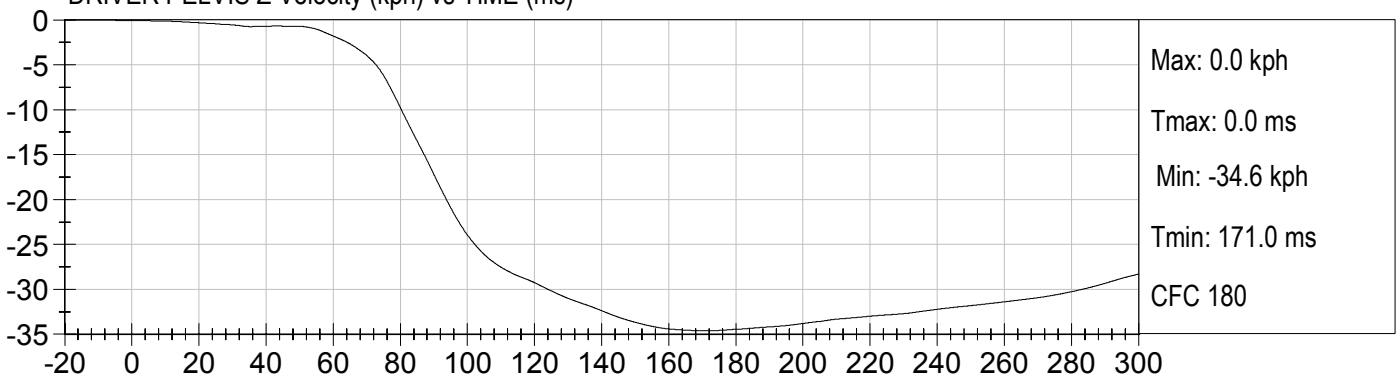
DRIVER PELVIS X Velocity (kph) vs TIME (ms)



DRIVER PELVIS Y Velocity (kph) vs TIME (ms)



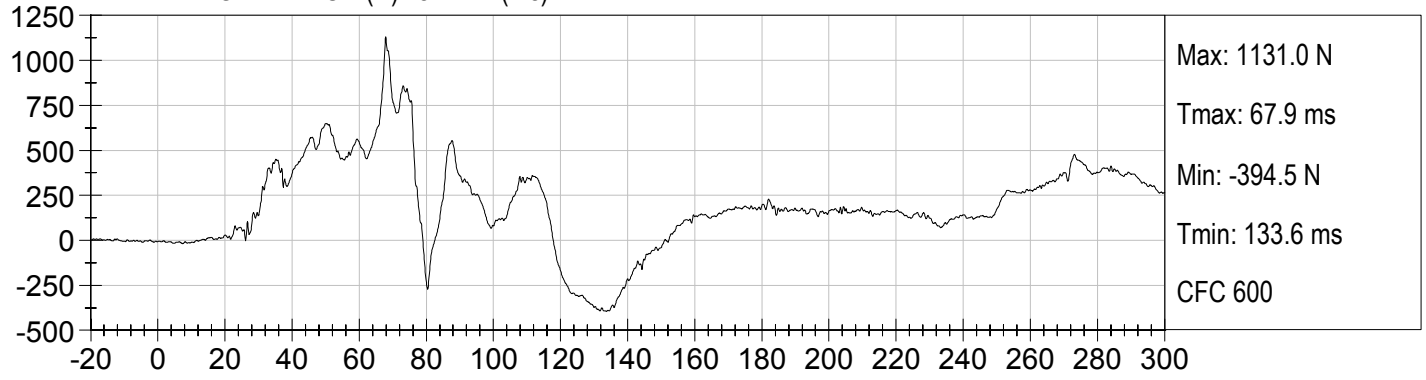
DRIVER PELVIS Z Velocity (kph) vs TIME (ms)



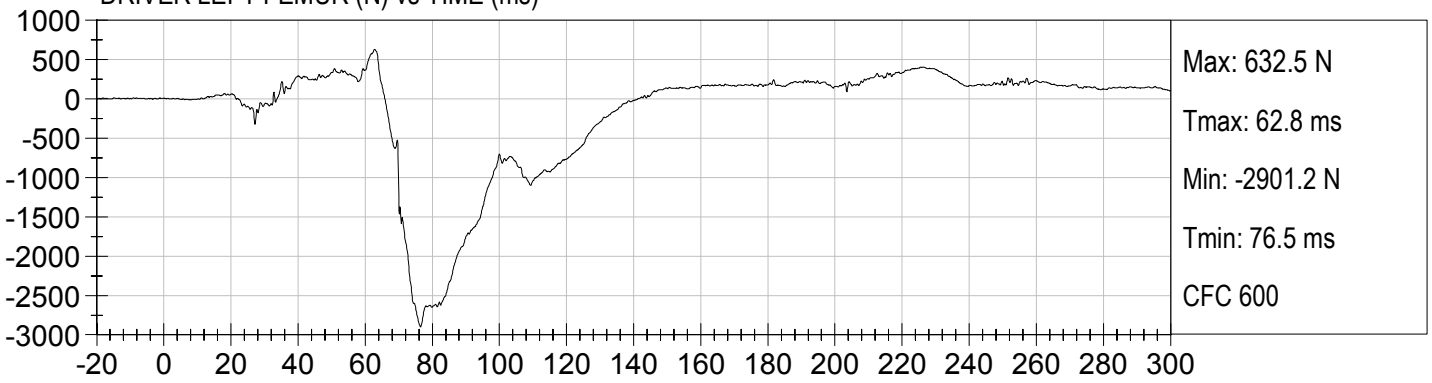
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

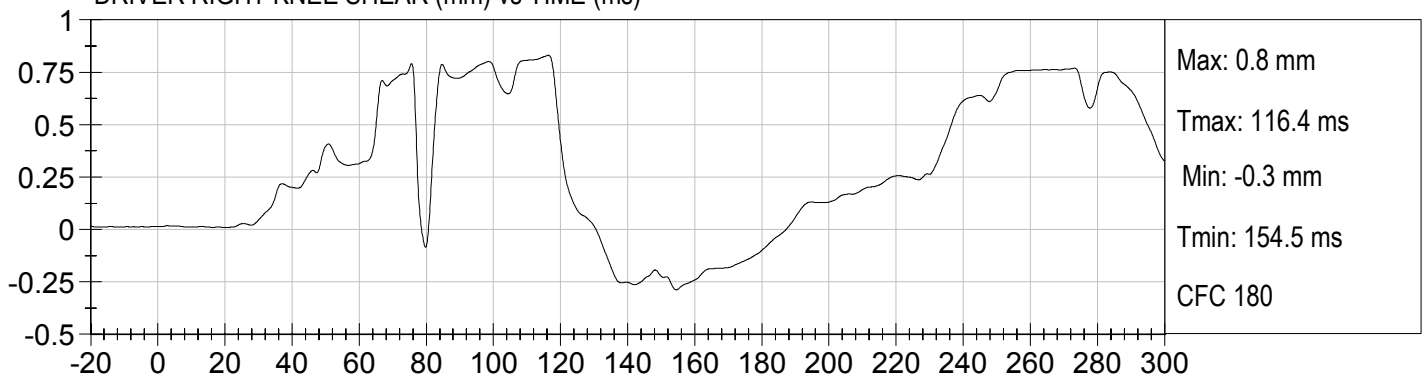
DRIVER RIGHT FEMUR (N) vs TIME (ms)



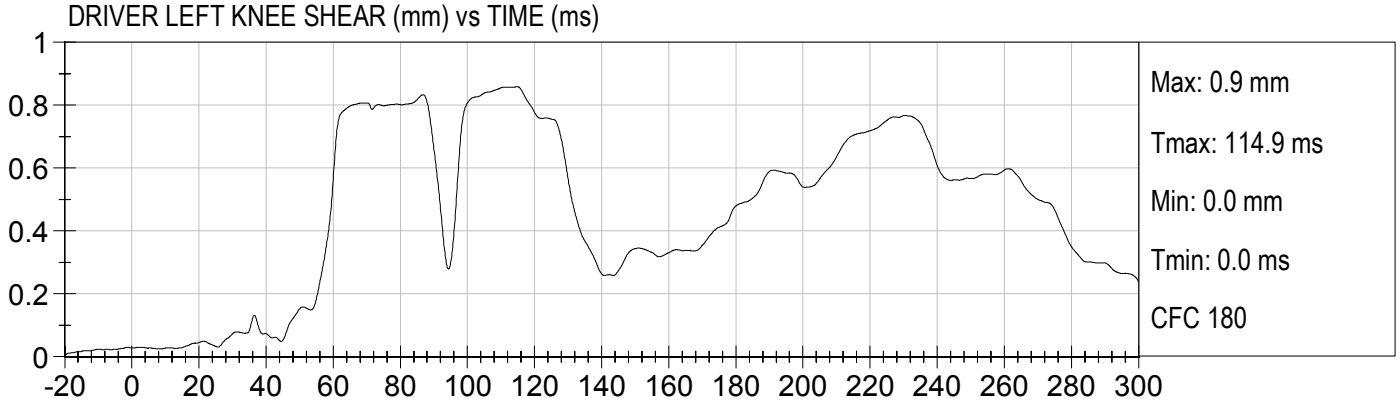
DRIVER LEFT FEMUR (N) vs TIME (ms)



DRIVER RIGHT KNEE SHEAR (mm) vs TIME (ms)



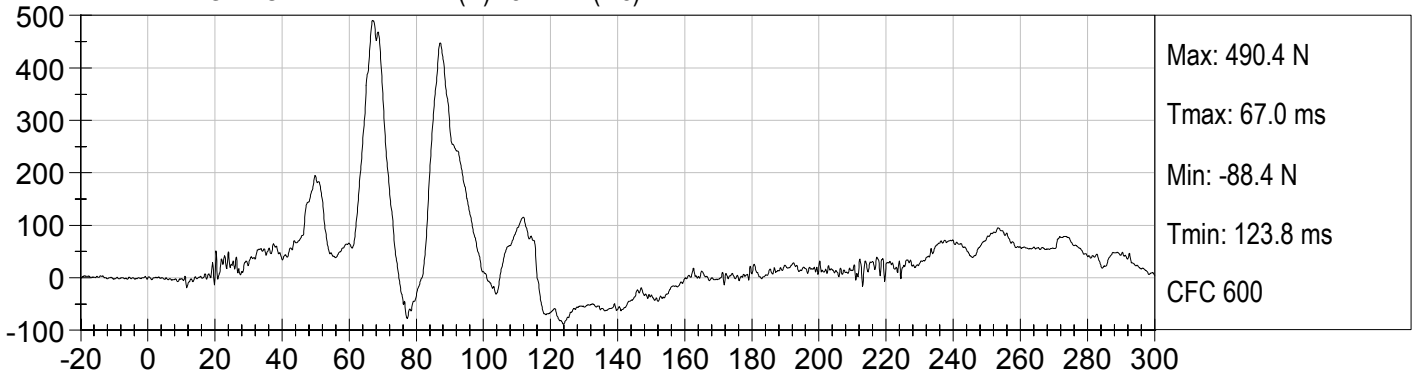
DRIVER LEFT KNEE SHEAR (mm) vs TIME (ms)



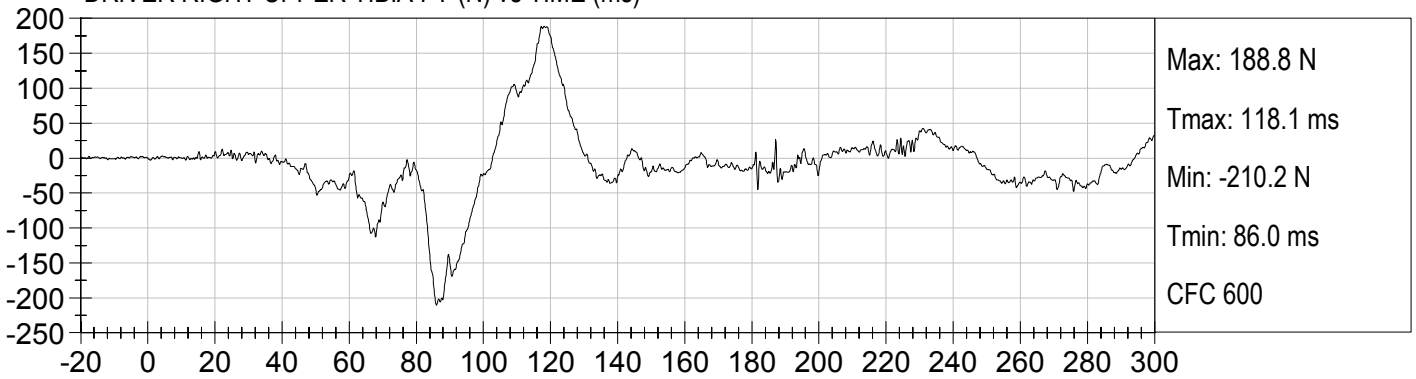
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

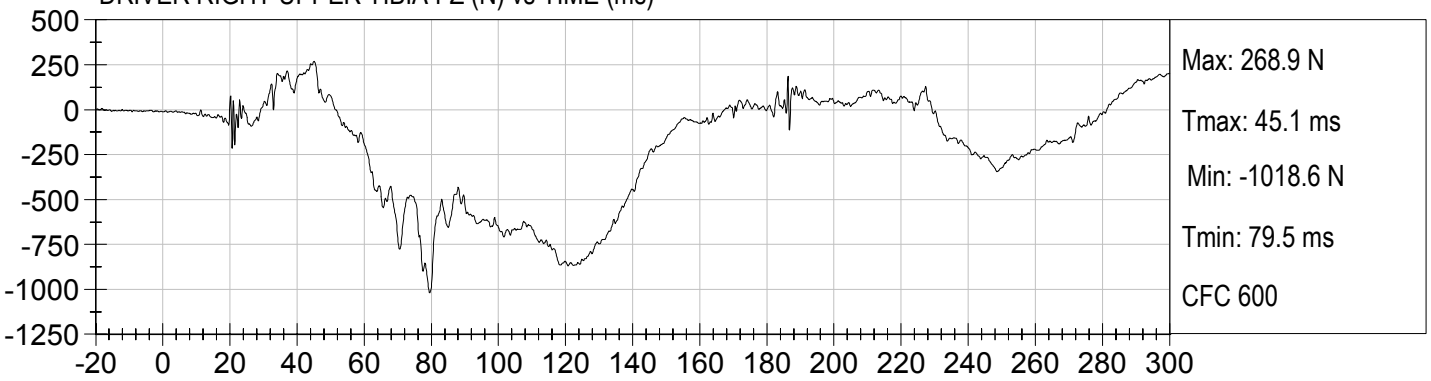
DRIVER RIGHT UPPER TIBIA FX (N) vs TIME (ms)



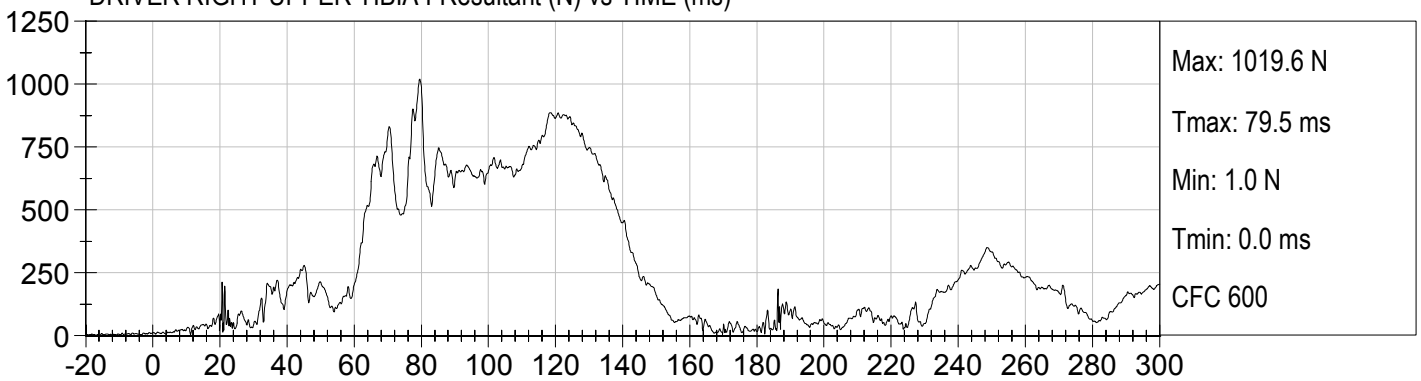
DRIVER RIGHT UPPER TIBIA FY (N) vs TIME (ms)



DRIVER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)

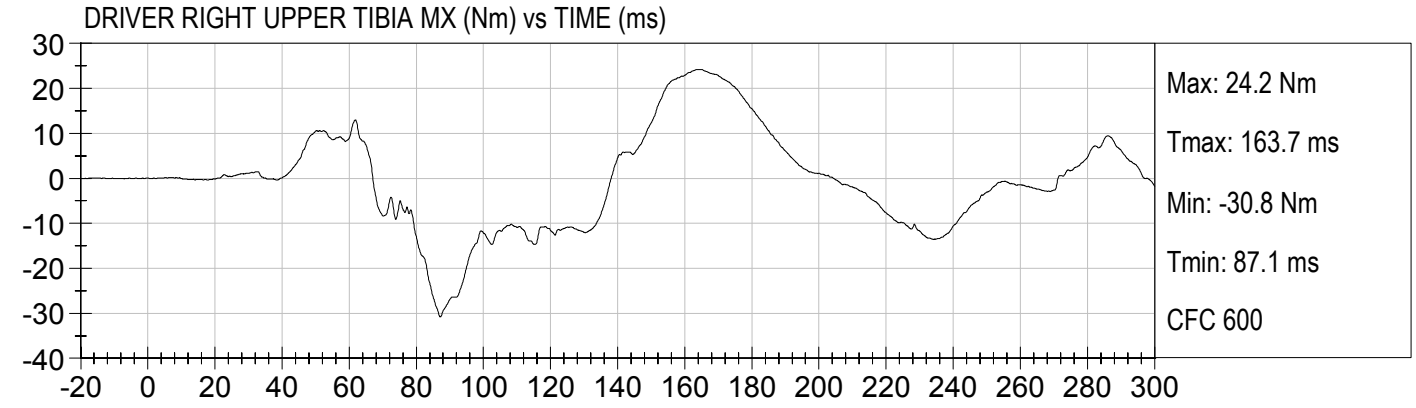


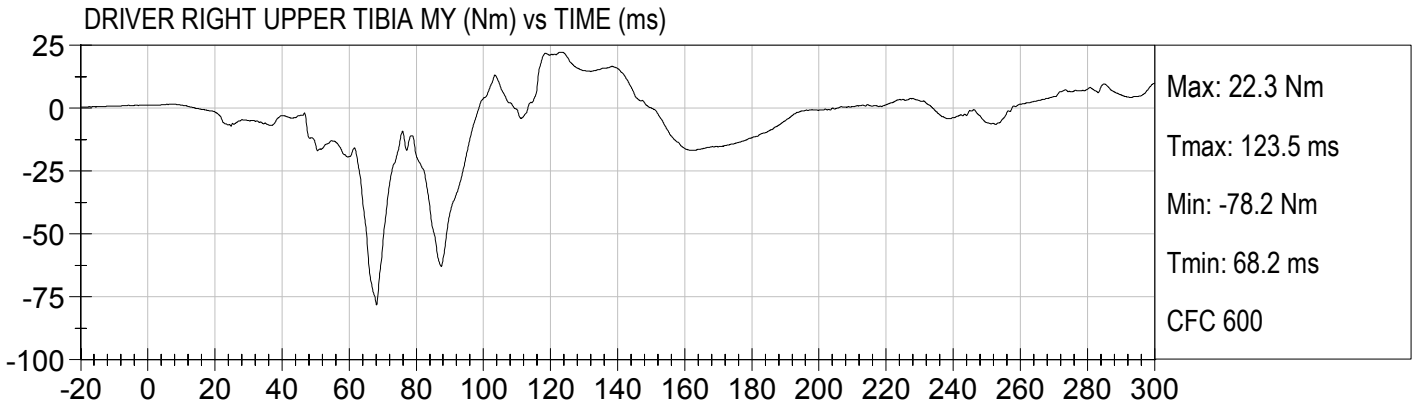
DRIVER RIGHT UPPER TIBIA FResultant (N) vs TIME (ms)



NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

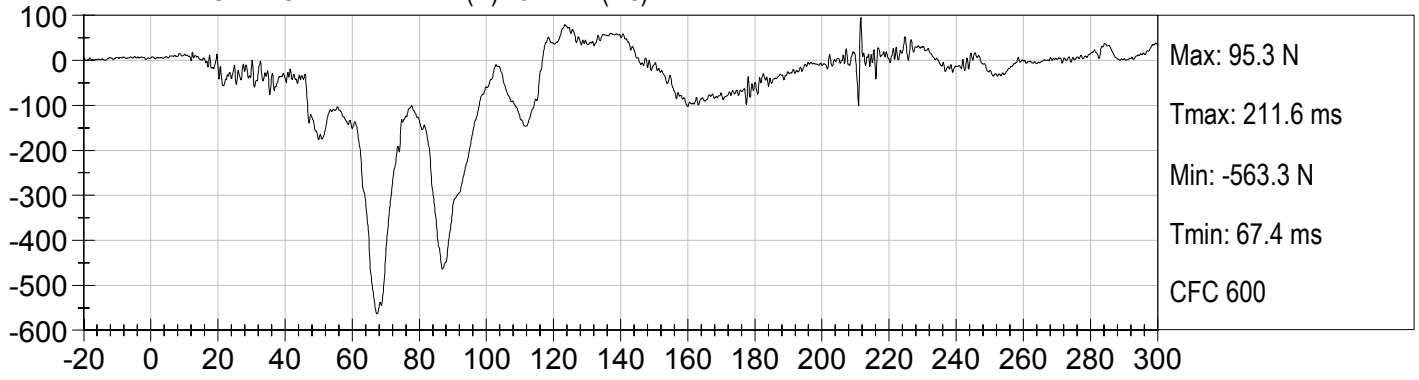




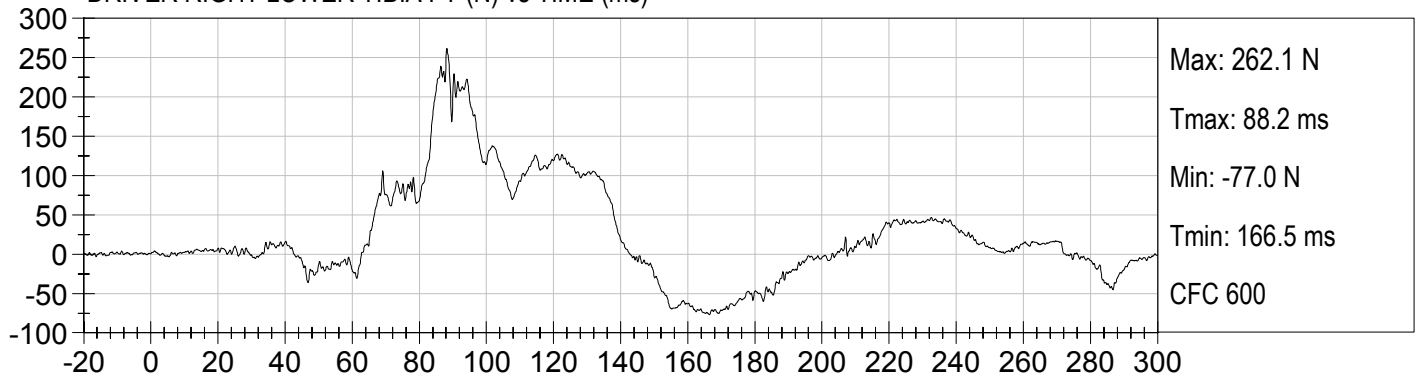
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

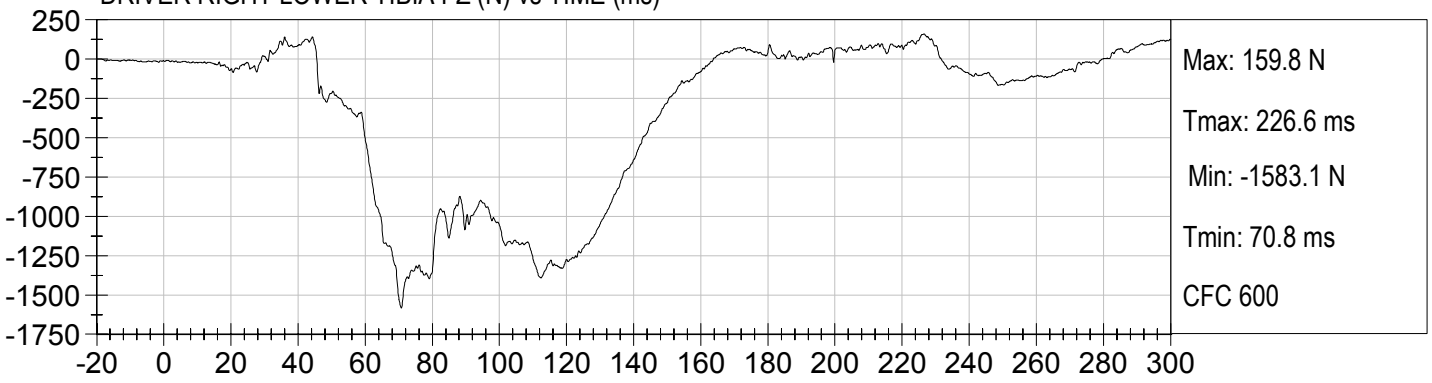
DRIVER RIGHT LOWER TIBIA FX (N) vs TIME (ms)



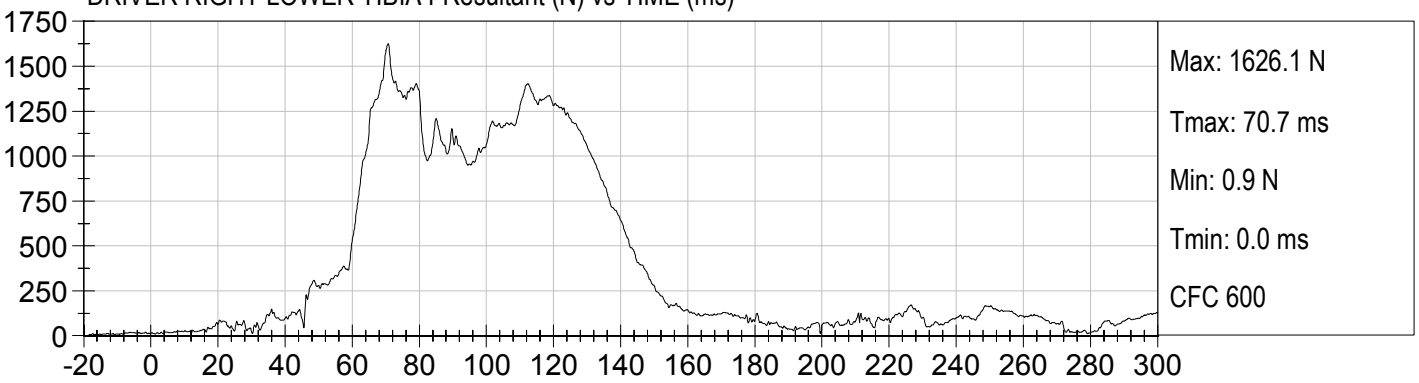
DRIVER RIGHT LOWER TIBIA FY (N) vs TIME (ms)



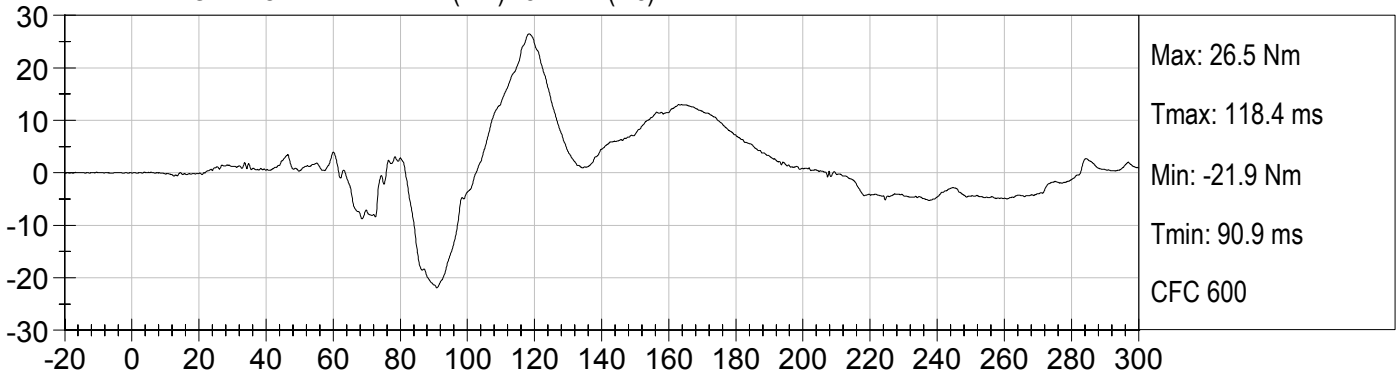
DRIVER RIGHT LOWER TIBIA FZ (N) vs TIME (ms)



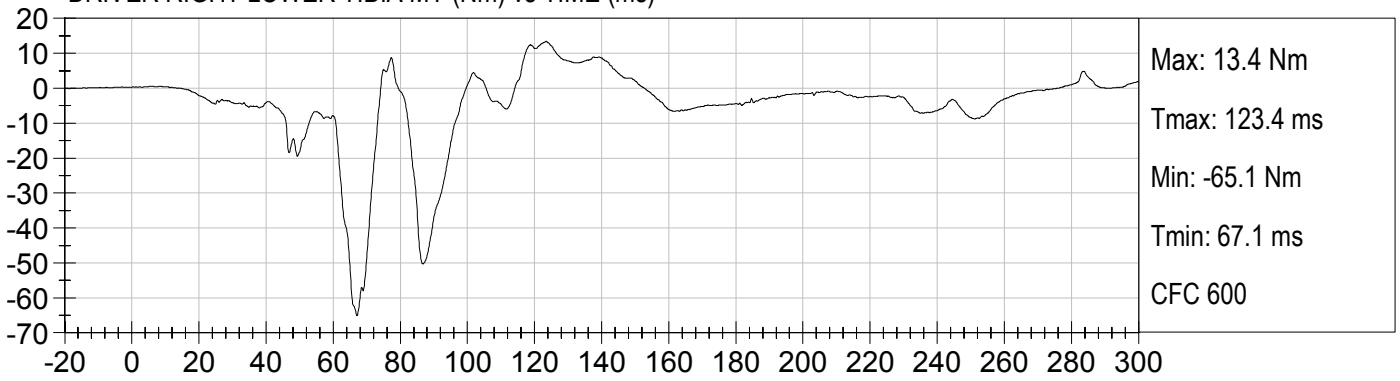
DRIVER RIGHT LOWER TIBIA FResultant (N) vs TIME (ms)



DRIVER RIGHT LOWER TIBIA MX (Nm) vs TIME (ms)



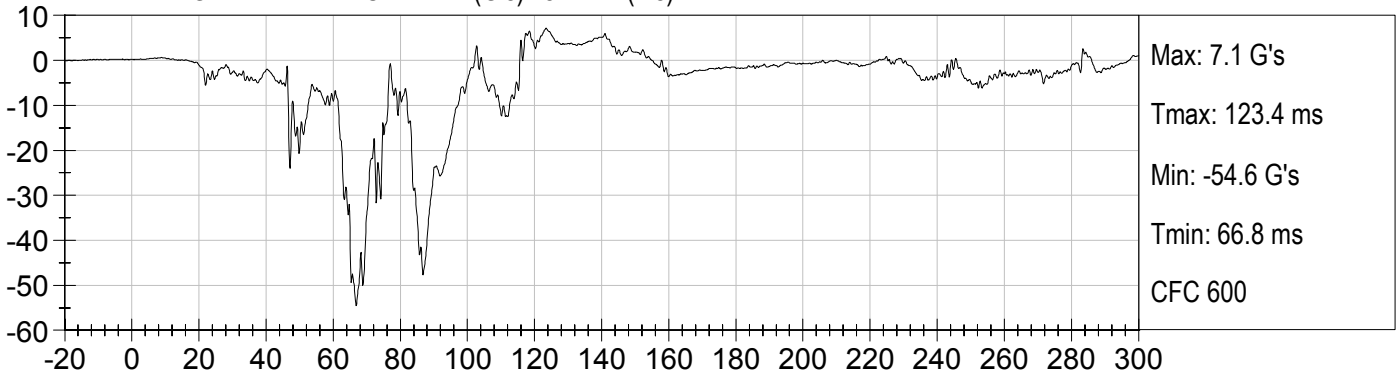
DRIVER RIGHT LOWER TIBIA MY (Nm) vs TIME (ms)



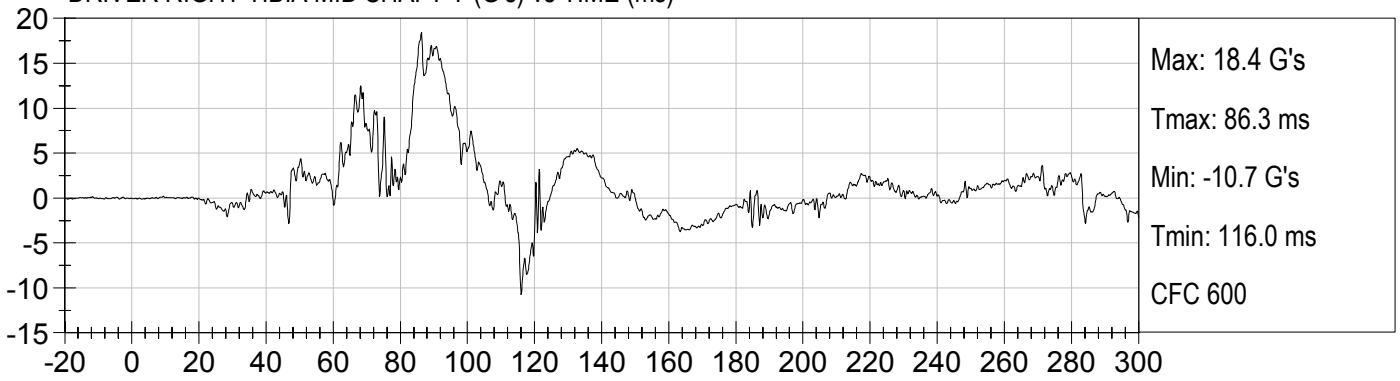
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

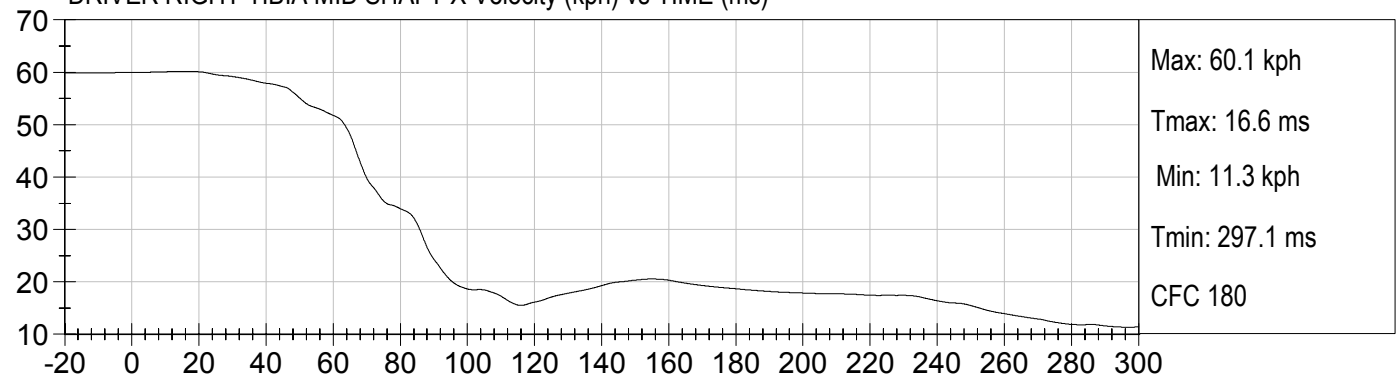
DRIVER RIGHT TIBIA MID SHAFT X (G's) vs TIME (ms)



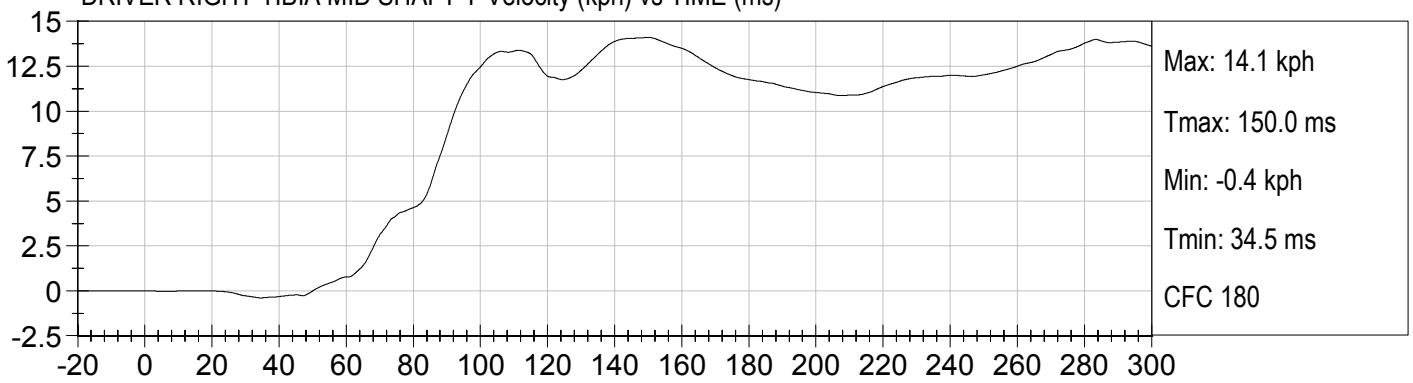
DRIVER RIGHT TIBIA MID SHAFT Y (G's) vs TIME (ms)



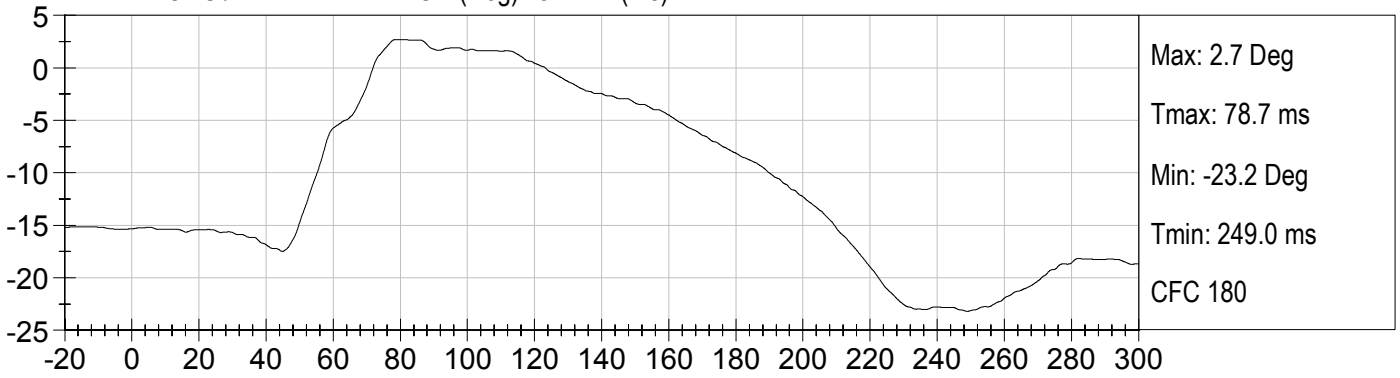
DRIVER RIGHT TIBIA MID SHAFT X Velocity (kph) vs TIME (ms)



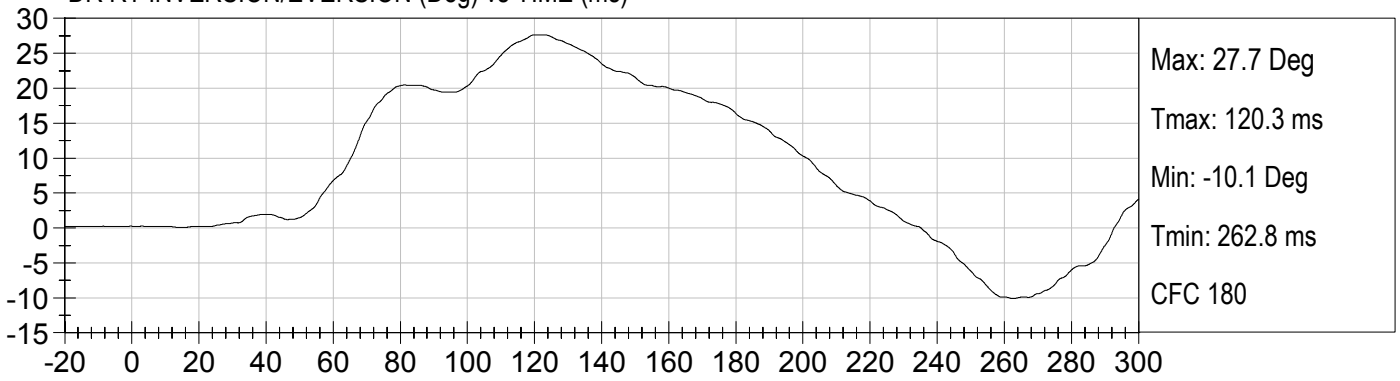
DRIVER RIGHT TIBIA MID SHAFT Y Velocity (kph) vs TIME (ms)



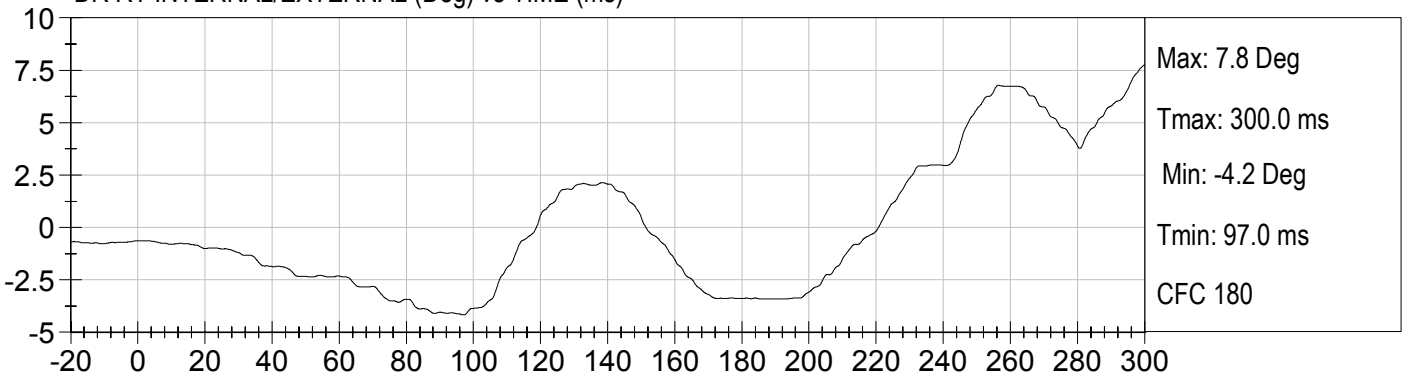
DR RT DORSI/PLANTAR FLEXION (Deg) vs TIME (ms)



DR RT INVERSION/EVERSION (Deg) vs TIME (ms)



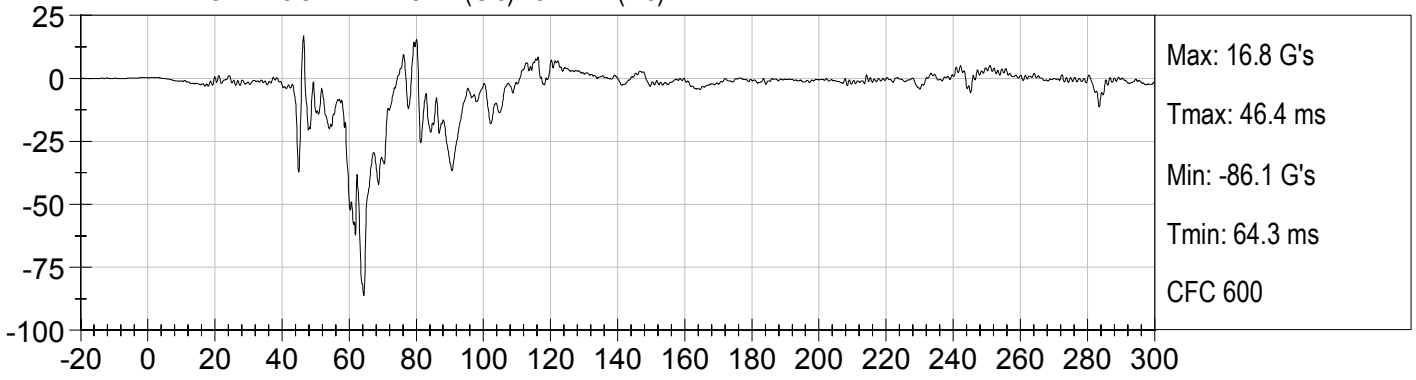
DR RT INTERNAL/EXTERNAL (Deg) vs TIME (ms)



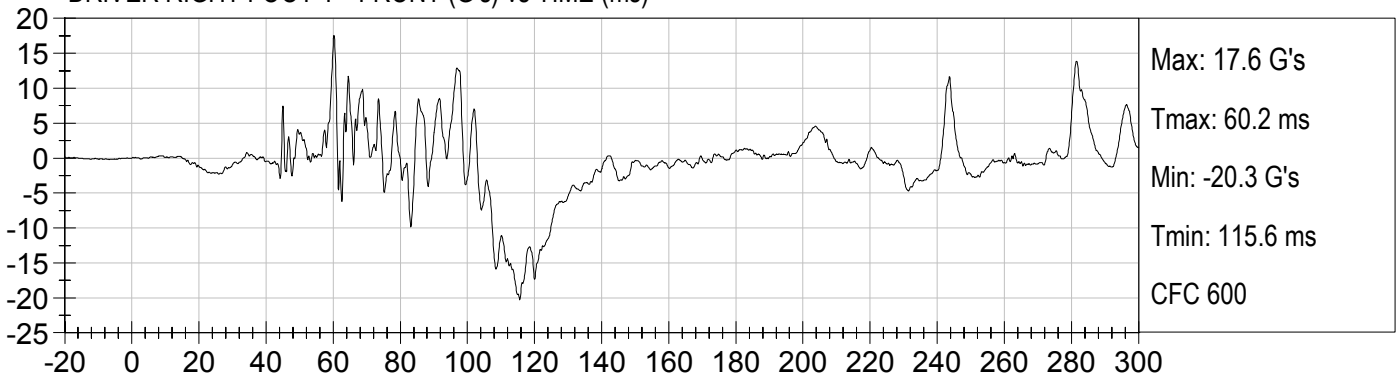
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

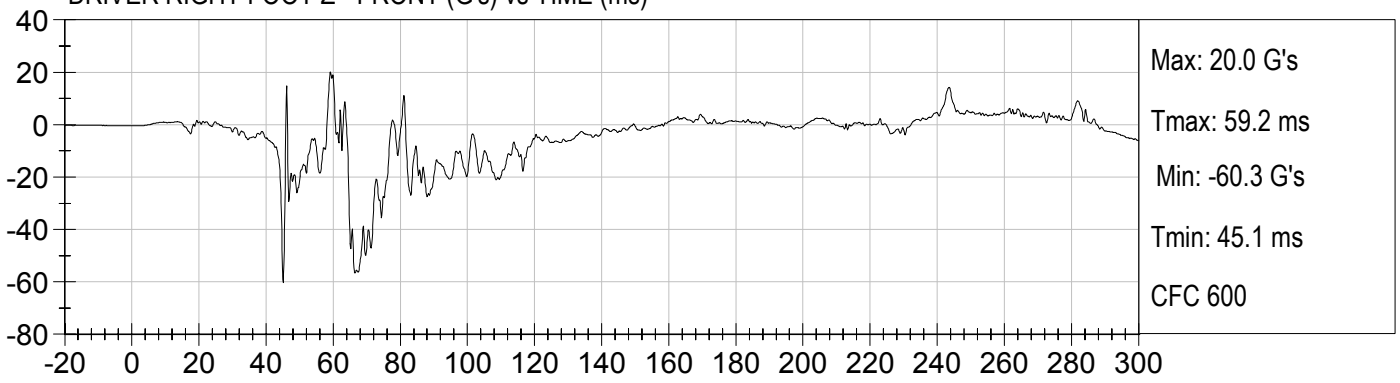
DRIVER RIGHT FOOT X - FRONT (G's) vs TIME (ms)



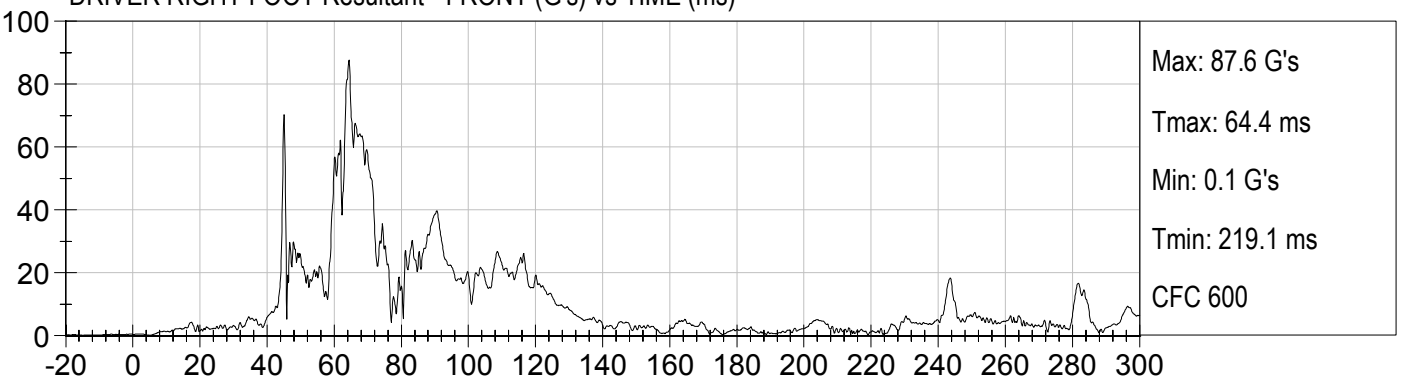
DRIVER RIGHT FOOT Y - FRONT (G's) vs TIME (ms)

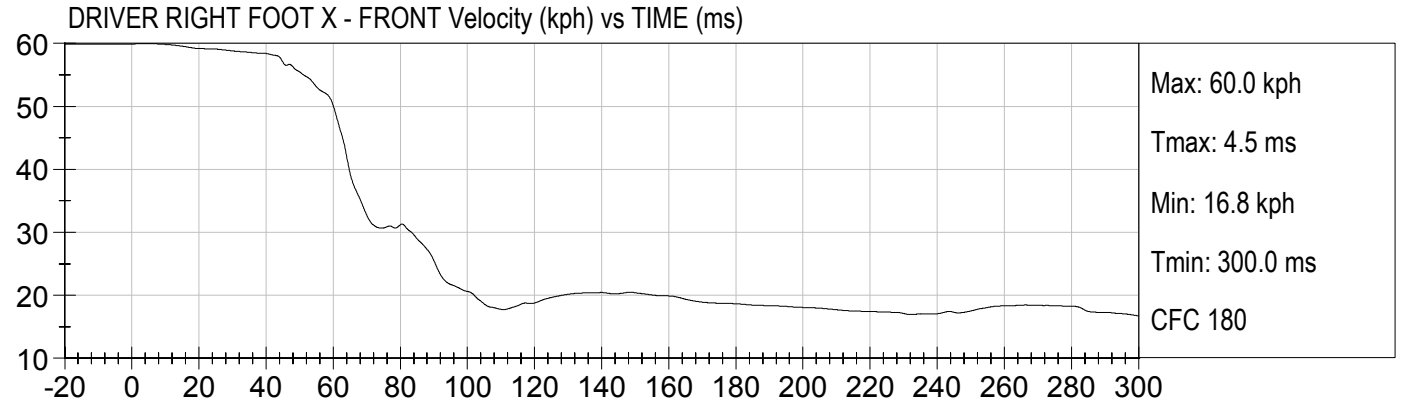


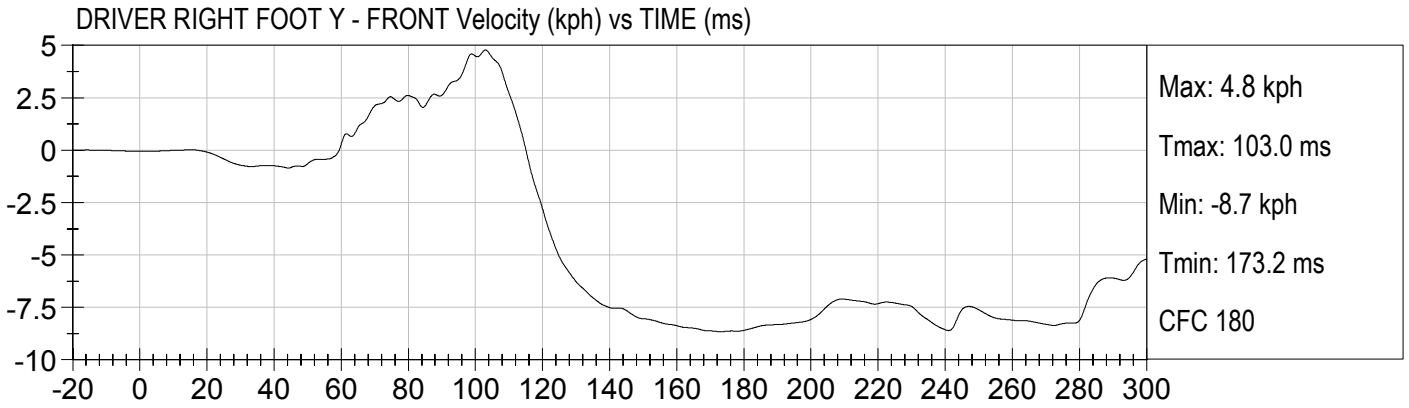
DRIVER RIGHT FOOT Z - FRONT (G's) vs TIME (ms)

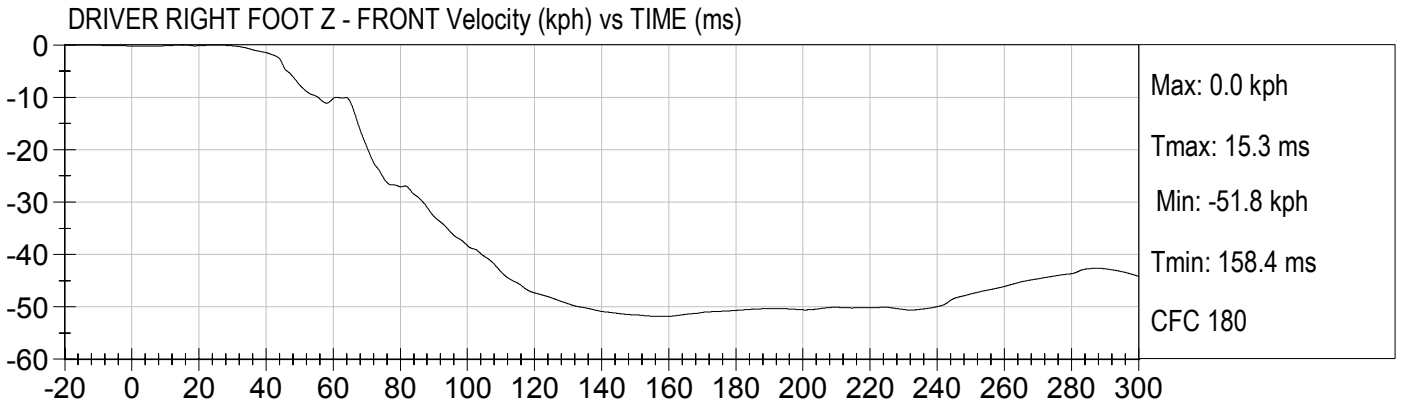


DRIVER RIGHT FOOT Resultant - FRONT (G's) vs TIME (ms)

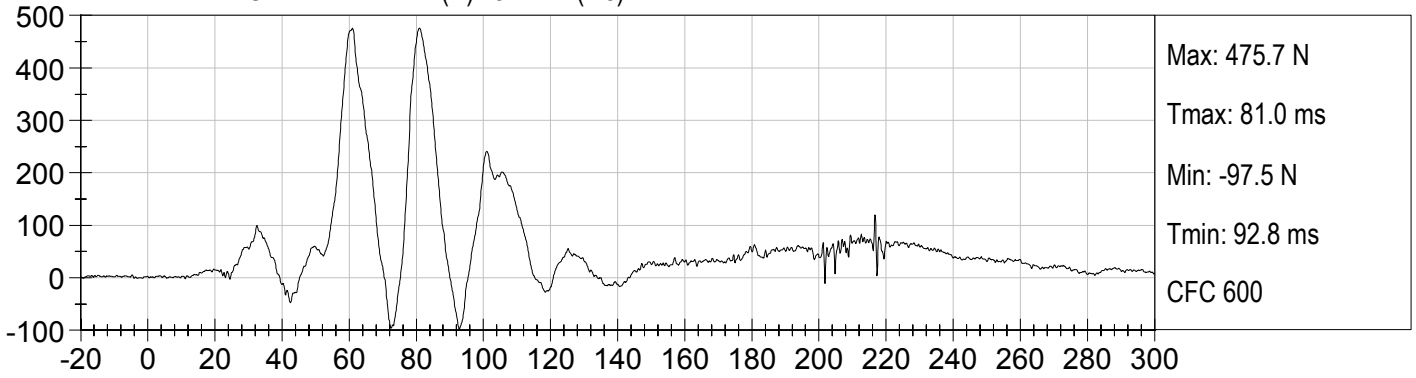



DRIVER RIGHT FOOT X - FRONT Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 60.0 kph
Tmax: 4.5 ms
Min: 16.8 kph
Tmin: 300.0 ms
CFC 180

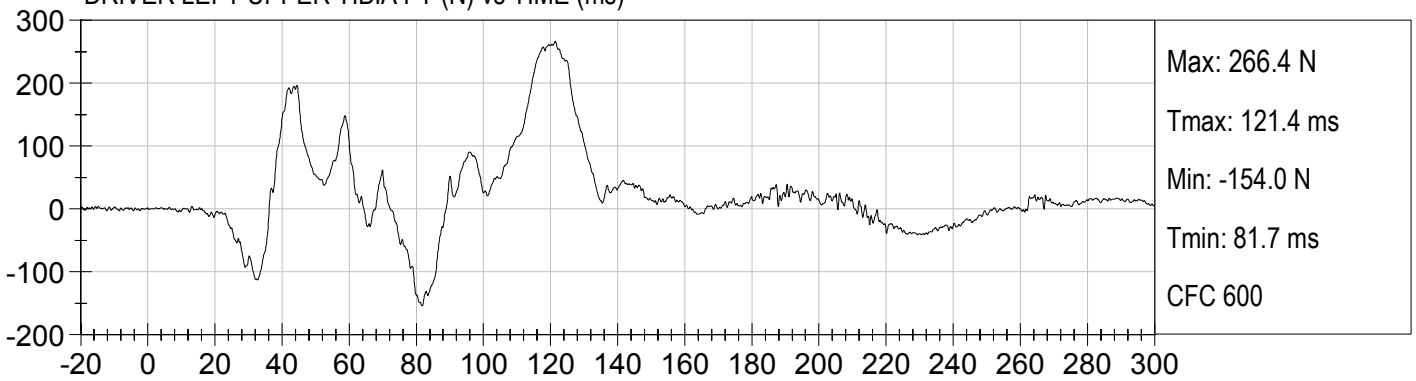

DRIVER RIGHT FOOT Y - FRONT Velocity (kph) vs TIME (ms)
5
2.5
0
-2.5
-5
-7.5
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 4.8 kph
Tmax: 103.0 ms
Min: -8.7 kph
Tmin: 173.2 ms
CFC 180


DRIVER RIGHT FOOT Z - FRONT Velocity (kph) vs TIME (ms)
0
-10
-20
-30
-40
-50
-60
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.0 kph
Tmax: 15.3 ms
Min: -51.8 kph
Tmin: 158.4 ms
CFC 180

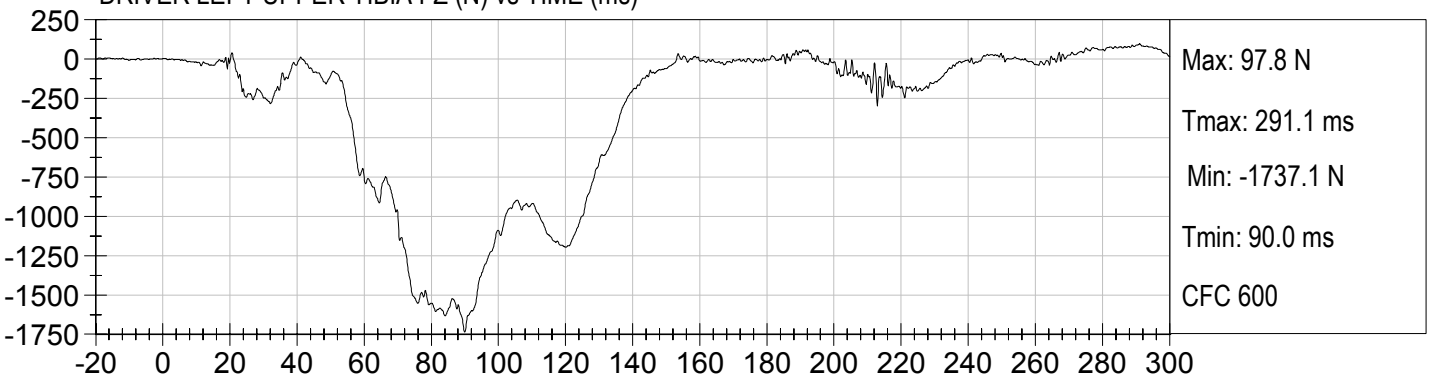
DRIVER LEFT UPPER TIBIA FX (N) vs TIME (ms)



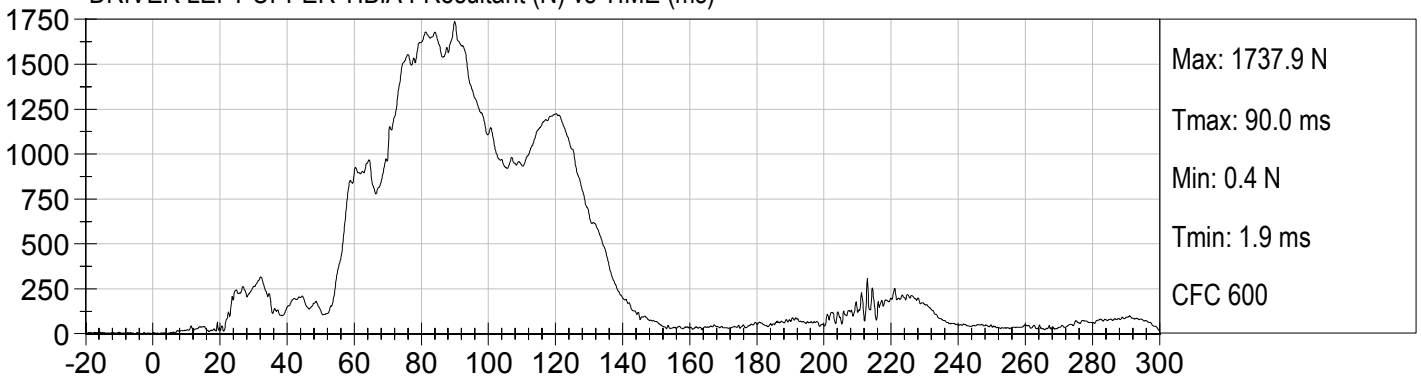
DRIVER LEFT UPPER TIBIA FY (N) vs TIME (ms)



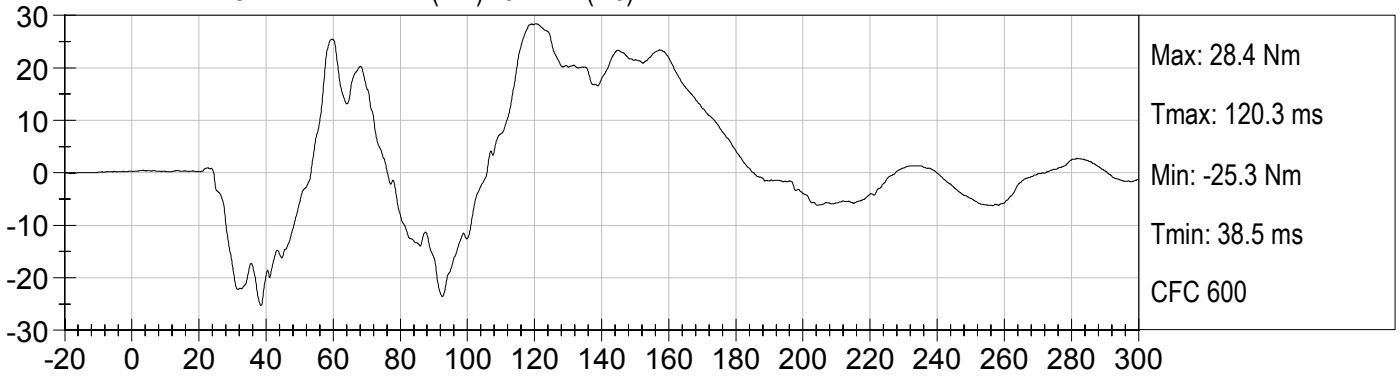
DRIVER LEFT UPPER TIBIA FZ (N) vs TIME (ms)



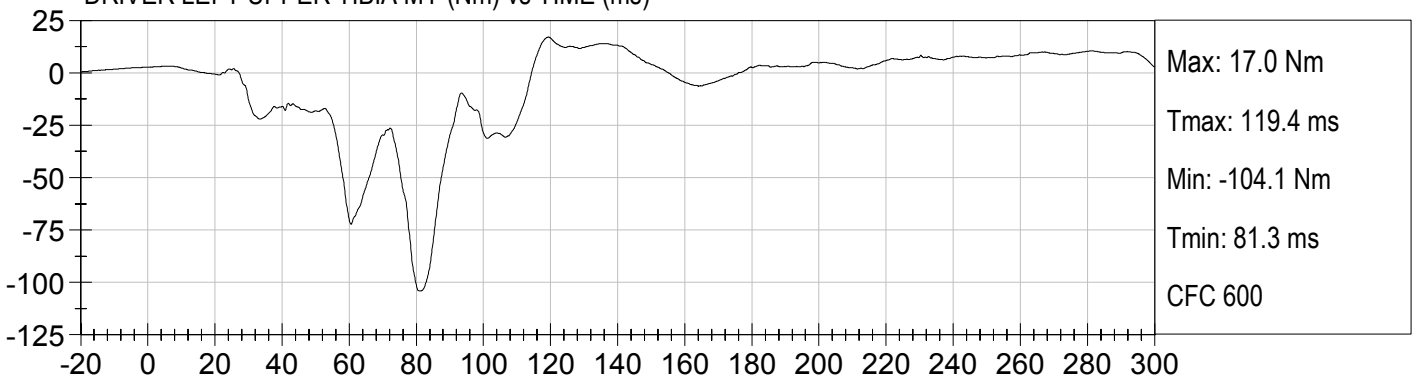
DRIVER LEFT UPPER TIBIA FResultant (N) vs TIME (ms)



DRIVER LEFT UPPER TIBIA MX (Nm) vs TIME (ms)



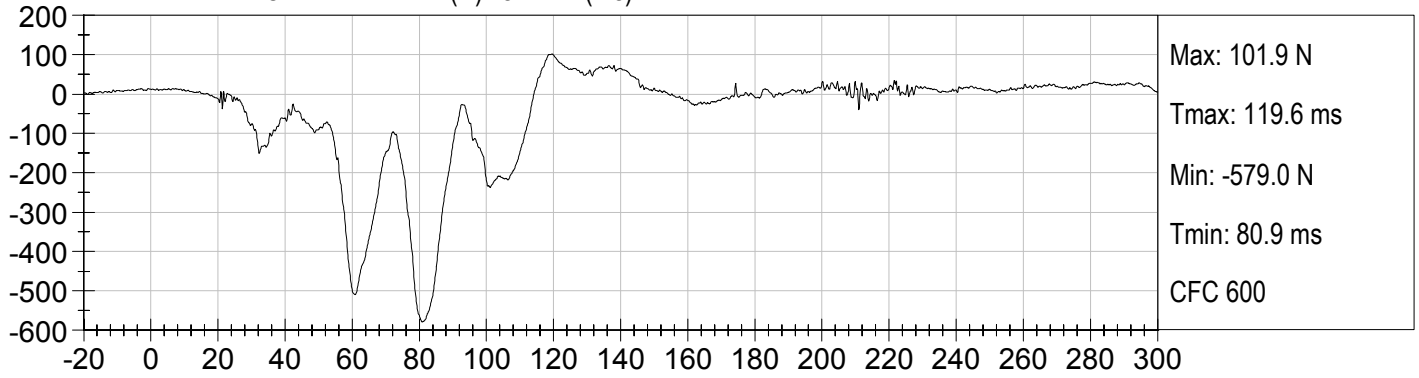
DRIVER LEFT UPPER TIBIA MY (Nm) vs TIME (ms)



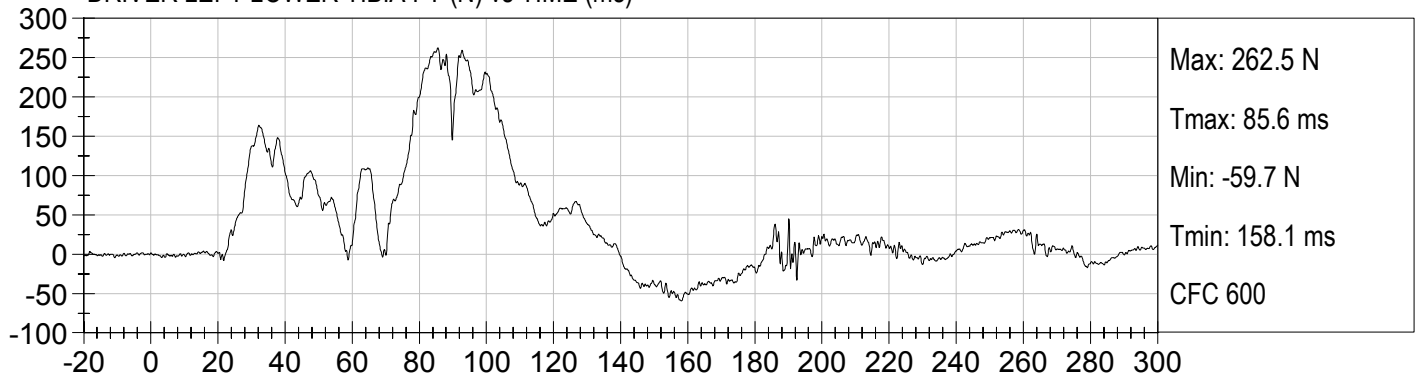
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

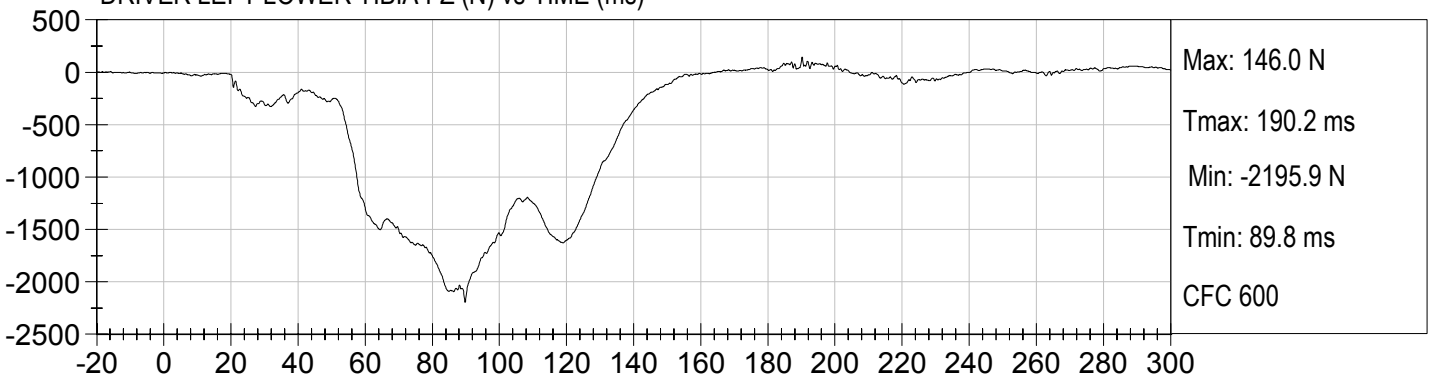
DRIVER LEFT LOWER TIBIA FX (N) vs TIME (ms)



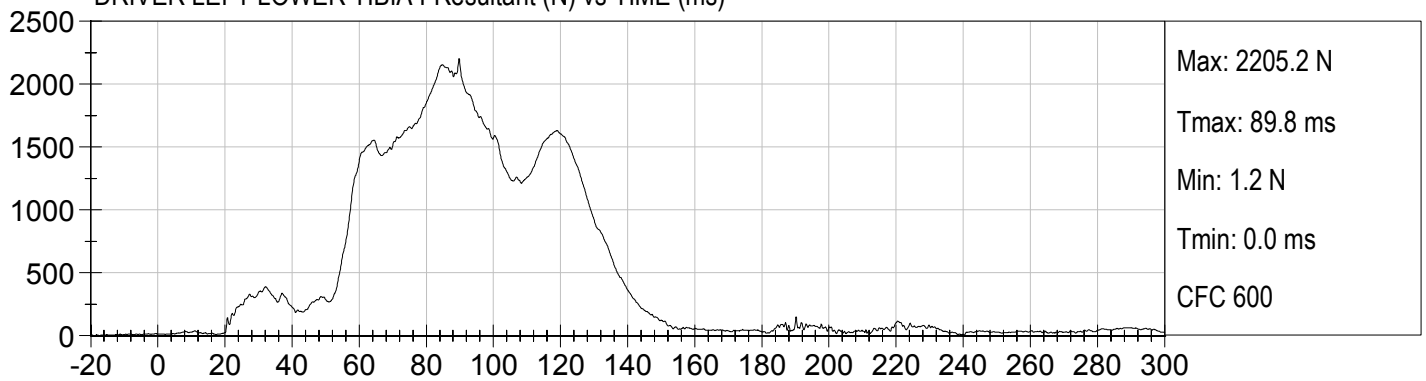
DRIVER LEFT LOWER TIBIA FY (N) vs TIME (ms)



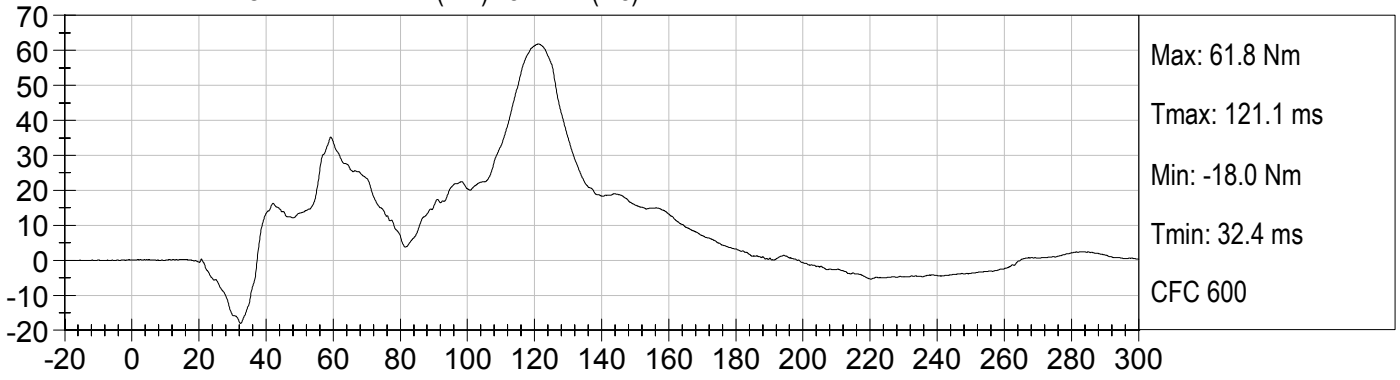
DRIVER LEFT LOWER TIBIA FZ (N) vs TIME (ms)



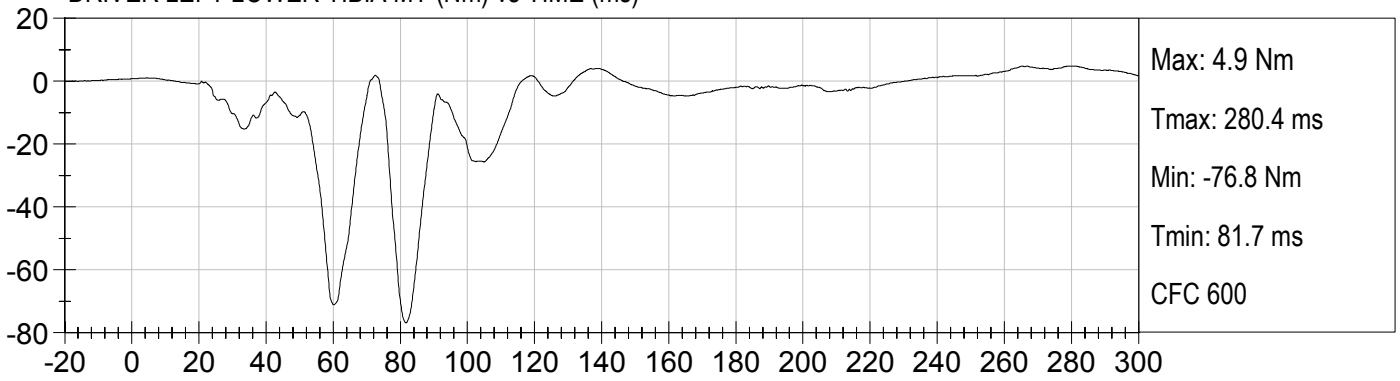
DRIVER LEFT LOWER TIBIA FResultant (N) vs TIME (ms)



DRIVER LEFT LOWER TIBIA MX (Nm) vs TIME (ms)



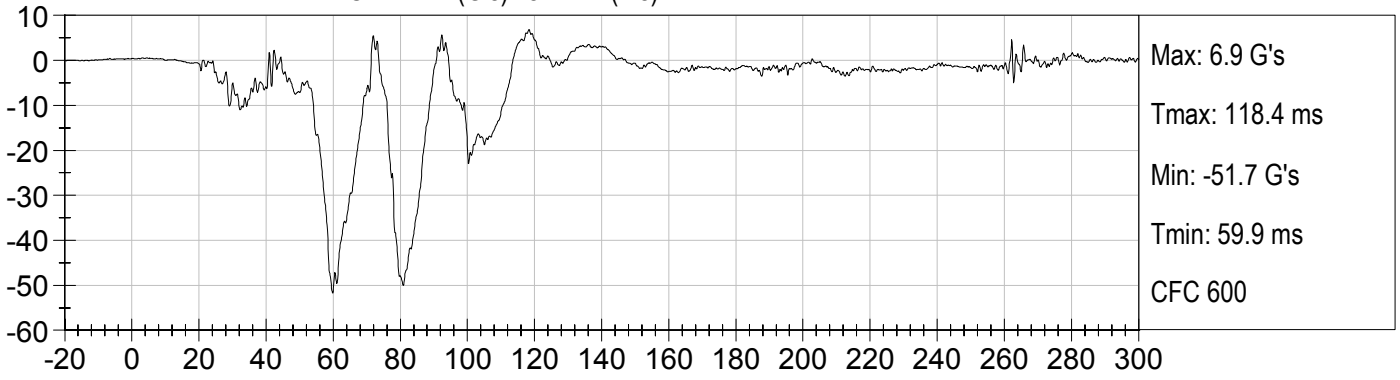
DRIVER LEFT LOWER TIBIA MY (Nm) vs TIME (ms)



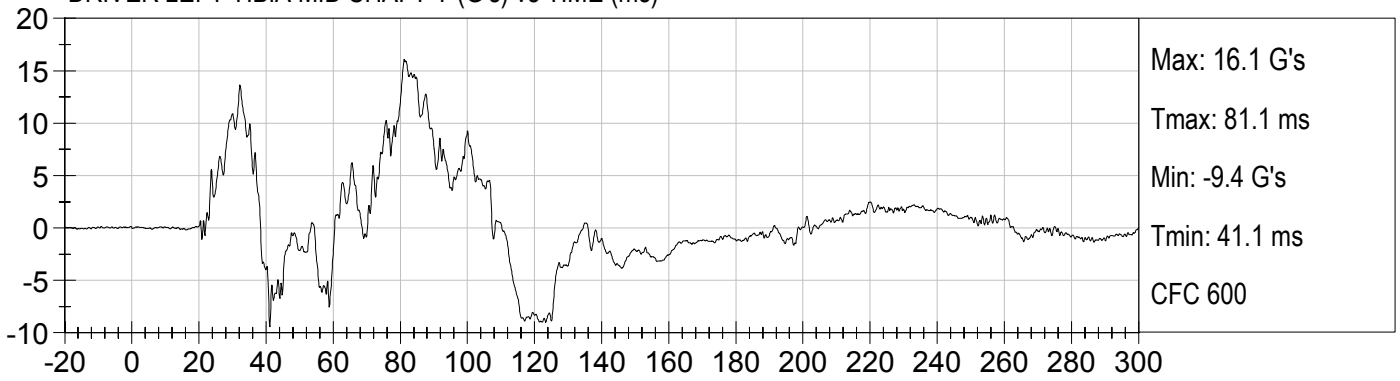
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

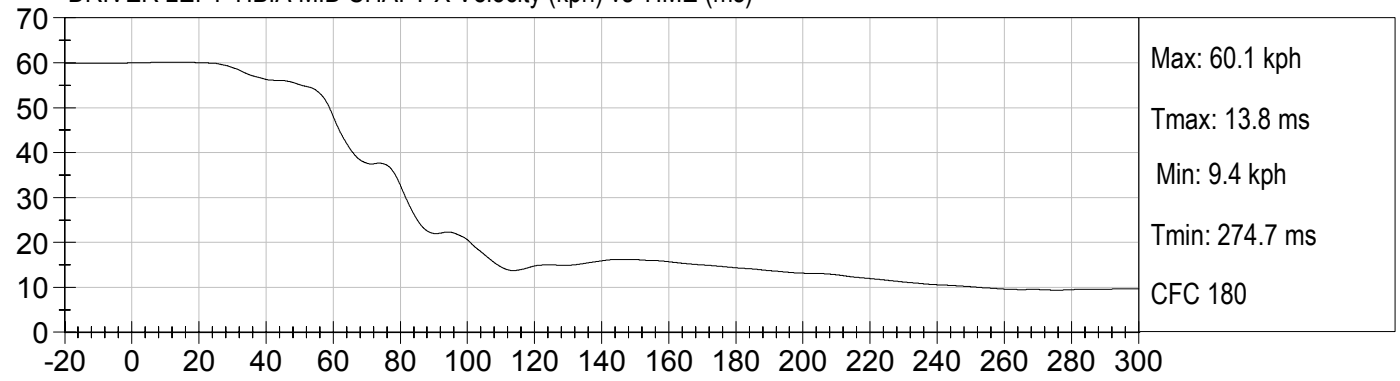
DRIVER LEFT TIBIA MID SHAFT X (G's) vs TIME (ms)



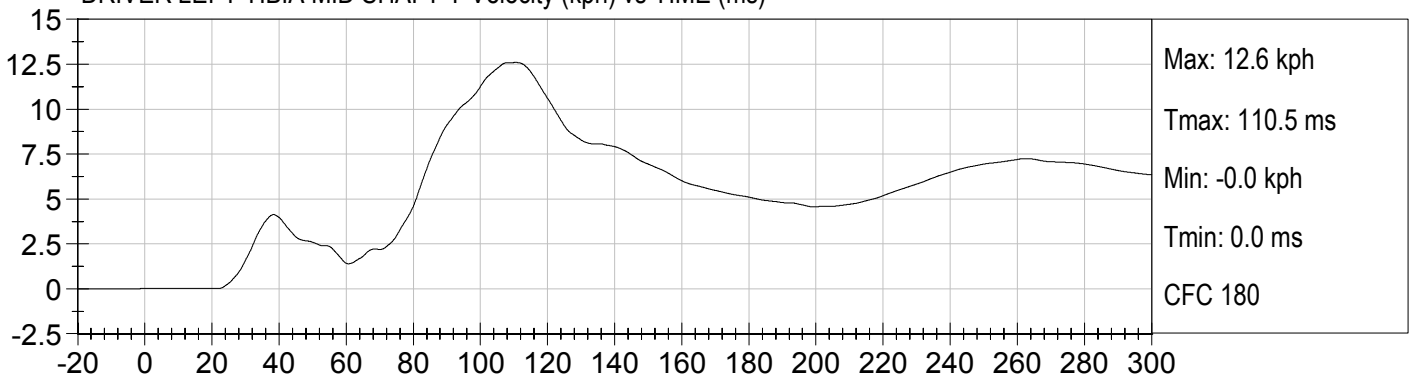
DRIVER LEFT TIBIA MID SHAFT Y (G's) vs TIME (ms)



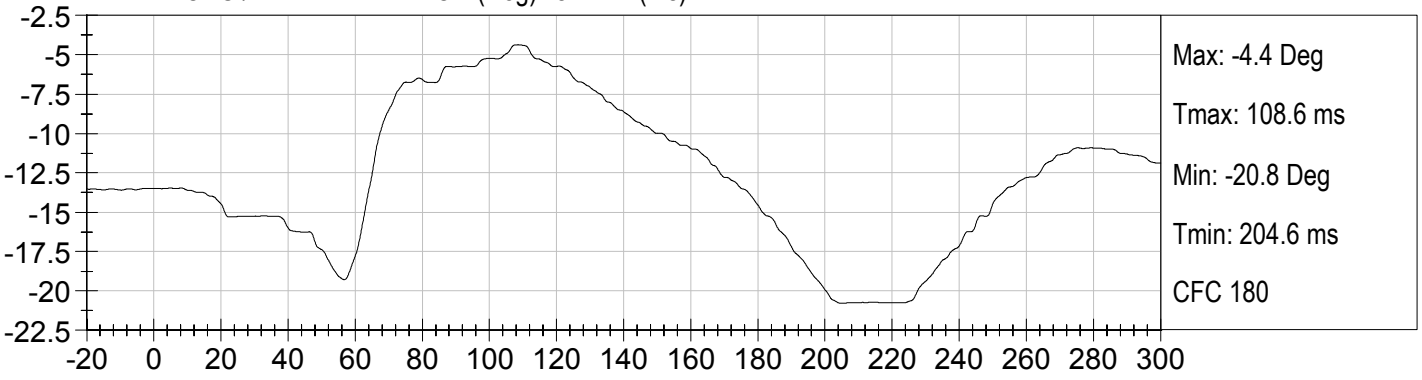
DRIVER LEFT TIBIA MID SHAFT X Velocity (kph) vs TIME (ms)



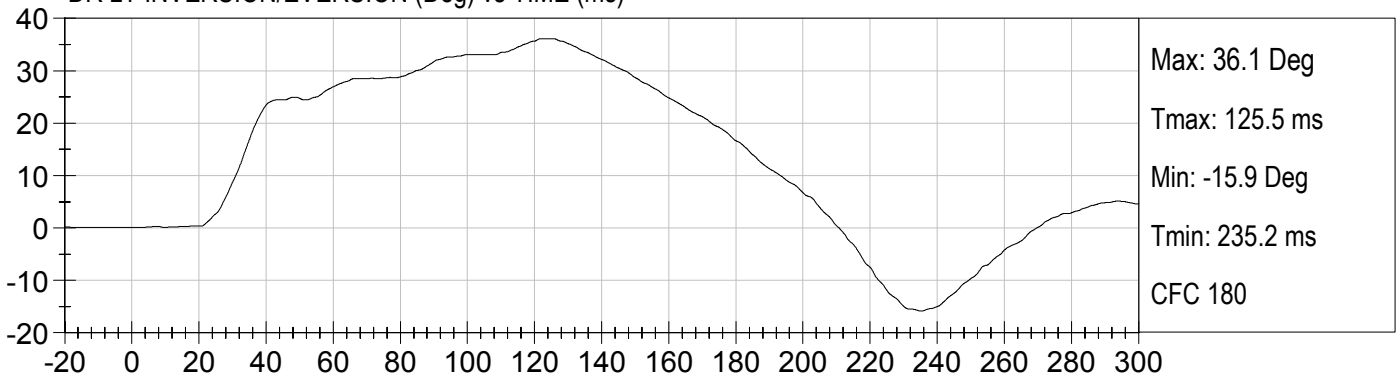
DRIVER LEFT TIBIA MID SHAFT Y Velocity (kph) vs TIME (ms)



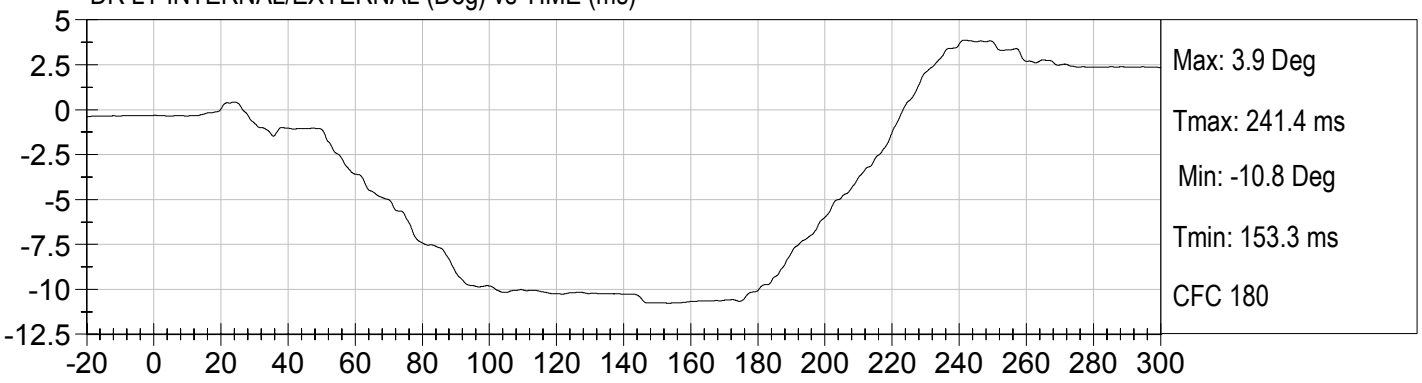
DR LT DORSI/PLANTAR FLEXION (Deg) vs TIME (ms)



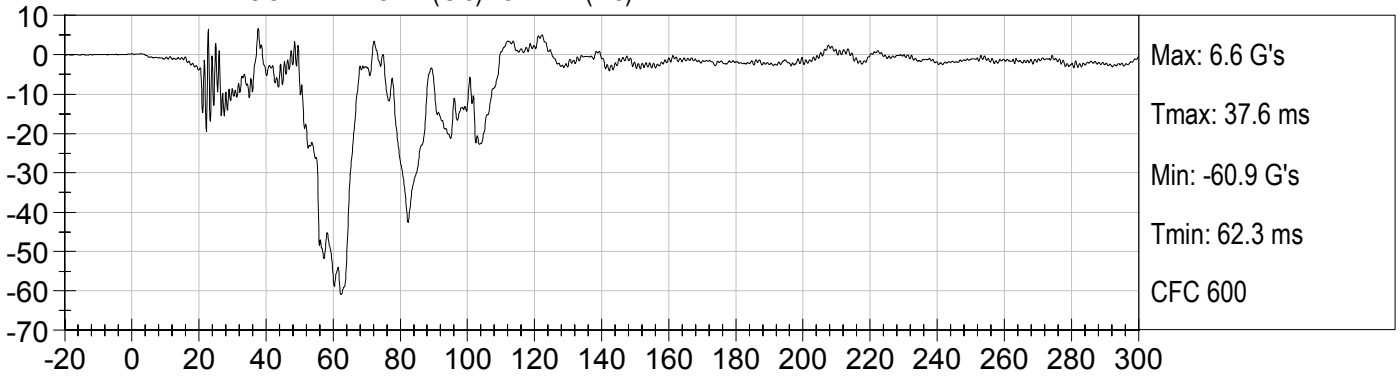
DR LT INVERSION/EVERSION (Deg) vs TIME (ms)



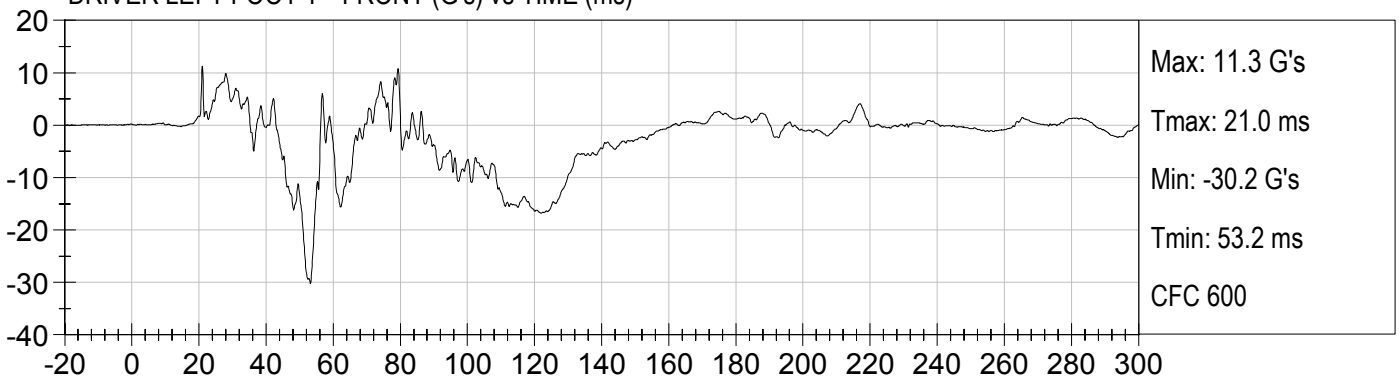
DR LT INTERNAL/EXTERNAL (Deg) vs TIME (ms)



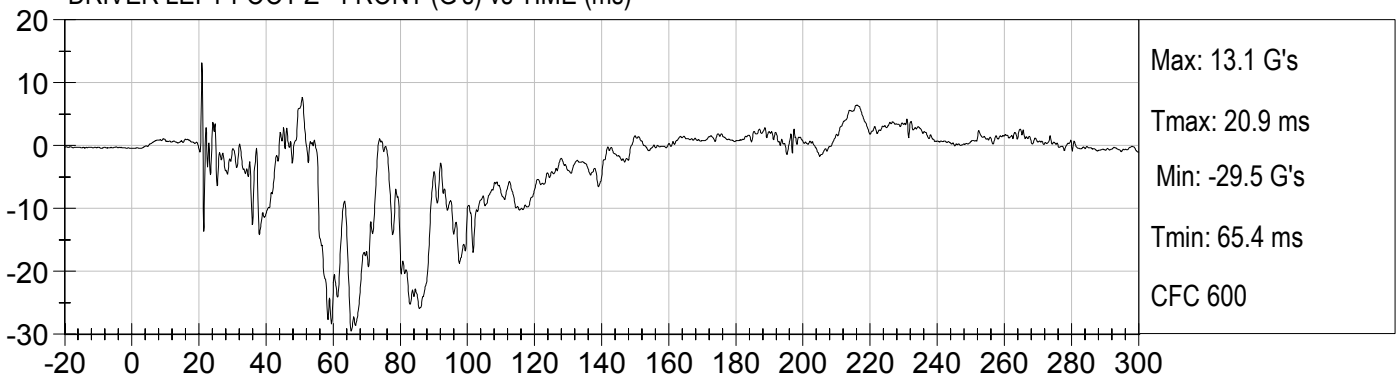
DRIVER LEFT FOOT X - FRONT (G's) vs TIME (ms)



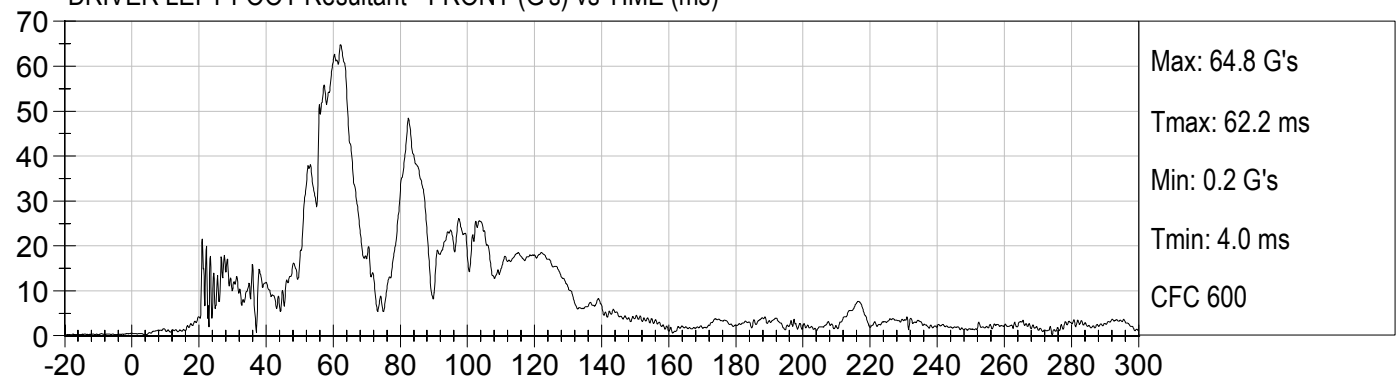
DRIVER LEFT FOOT Y - FRONT (G's) vs TIME (ms)



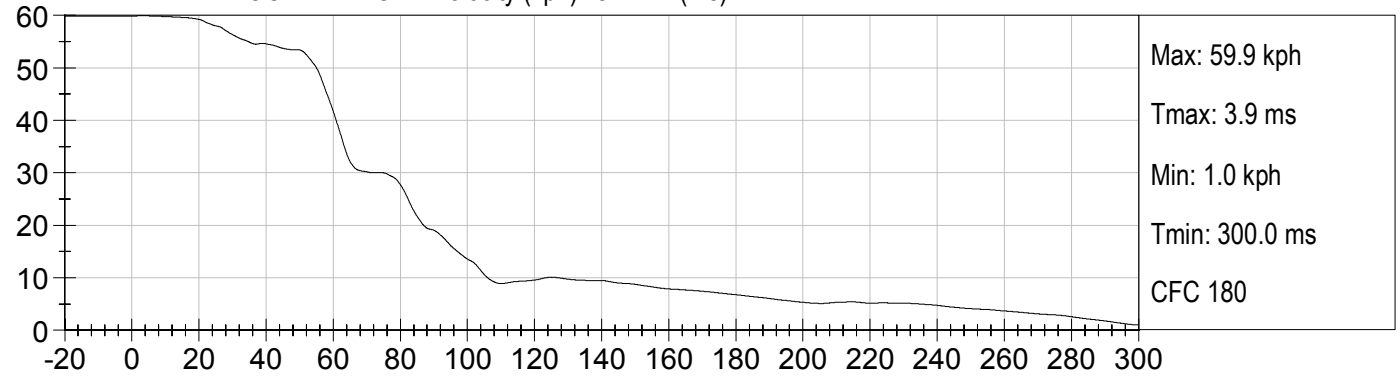
DRIVER LEFT FOOT Z - FRONT (G's) vs TIME (ms)



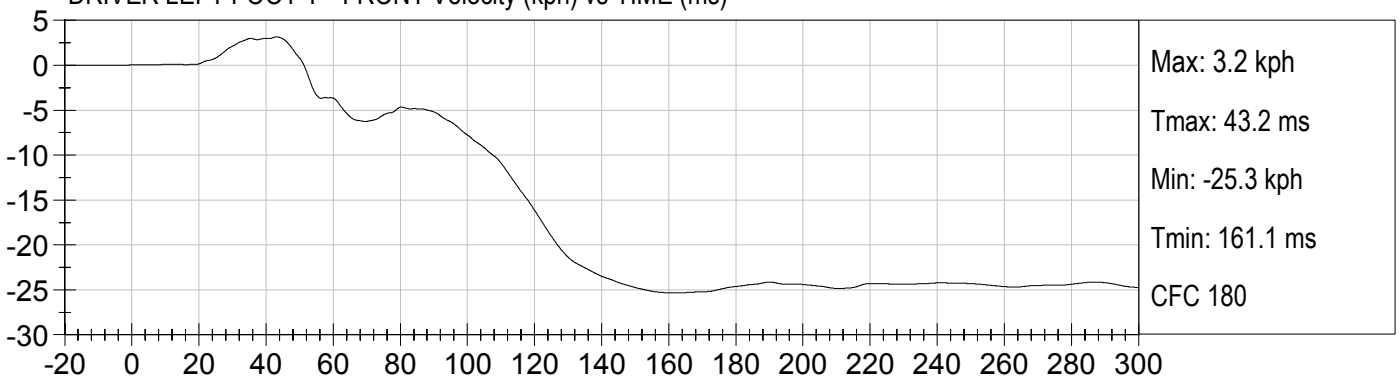
DRIVER LEFT FOOT Resultant - FRONT (G's) vs TIME (ms)



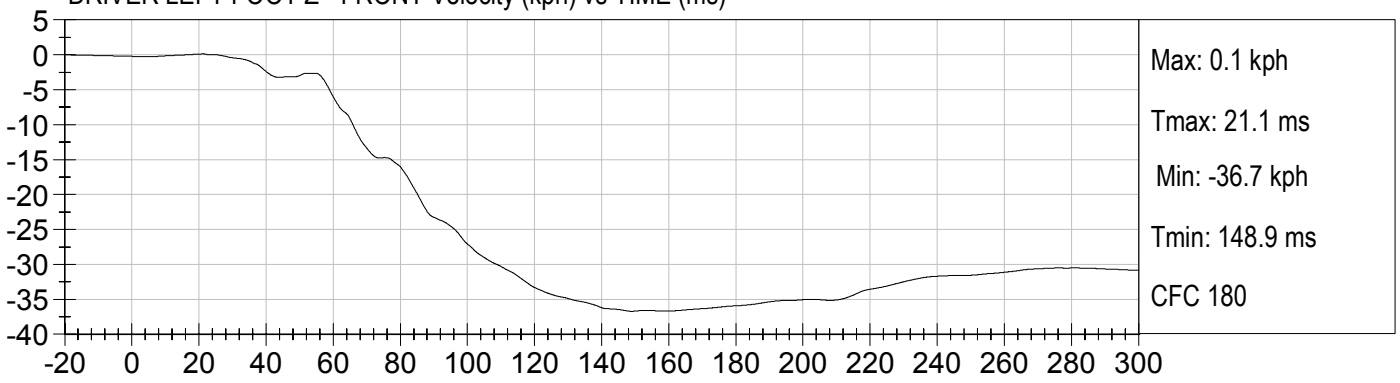
DRIVER LEFT FOOT X - FRONT Velocity (kph) vs TIME (ms)



DRIVER LEFT FOOT Y - FRONT Velocity (kph) vs TIME (ms)



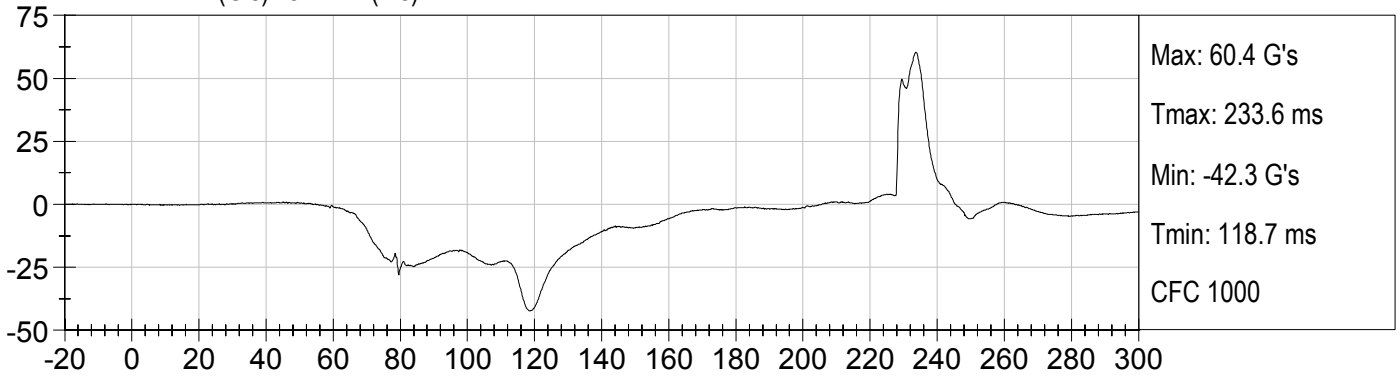
DRIVER LEFT FOOT Z - FRONT Velocity (kph) vs TIME (ms)



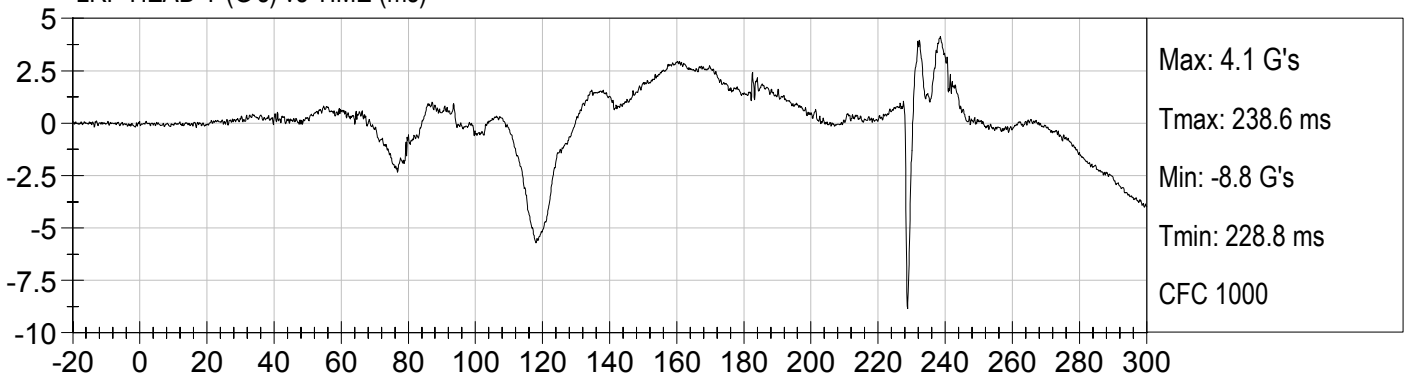
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

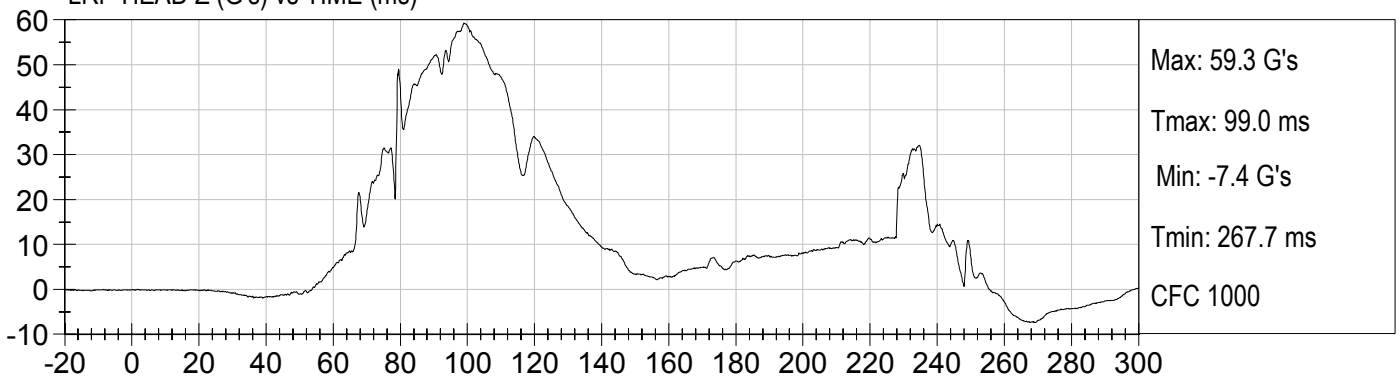
LRP HEAD X (G's) vs TIME (ms)



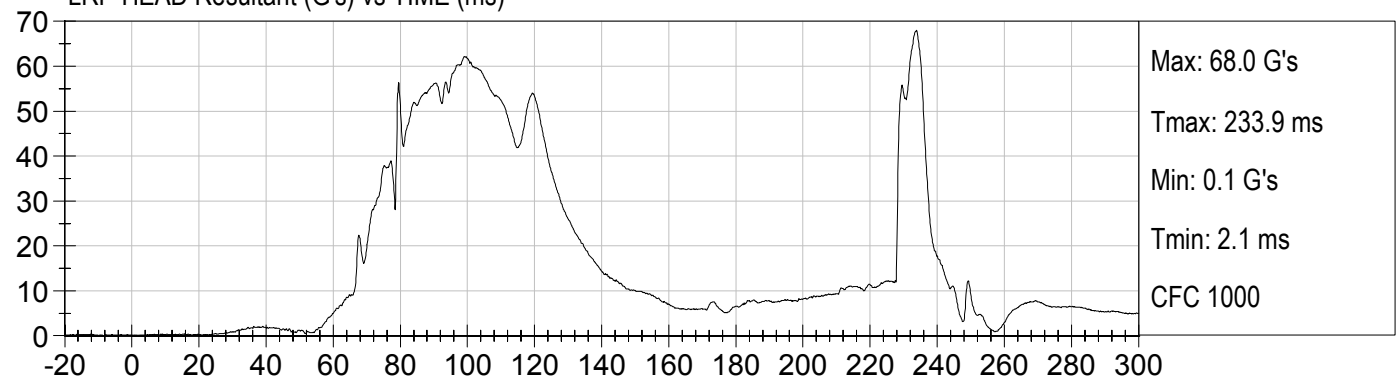
LRP HEAD Y (G's) vs TIME (ms)

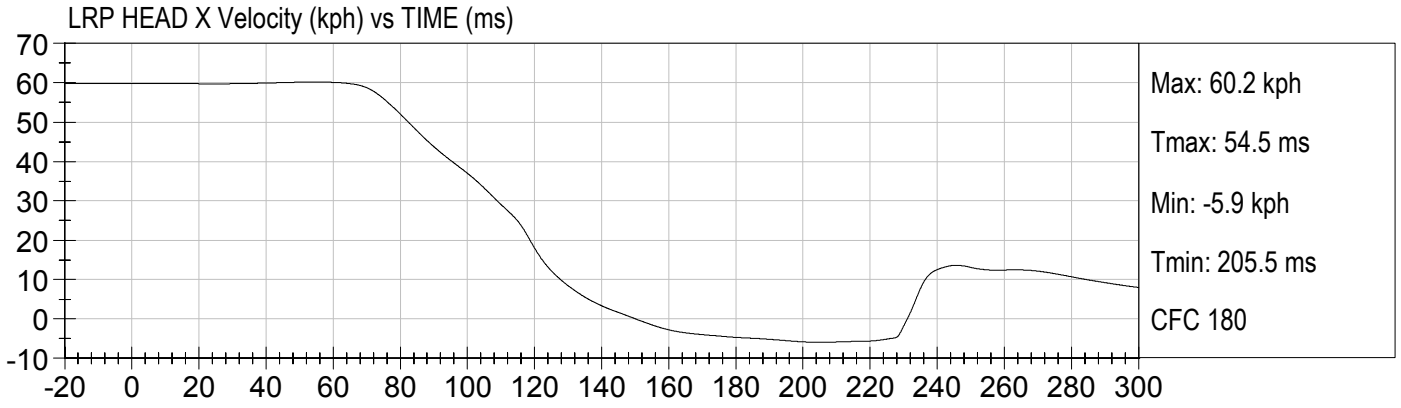


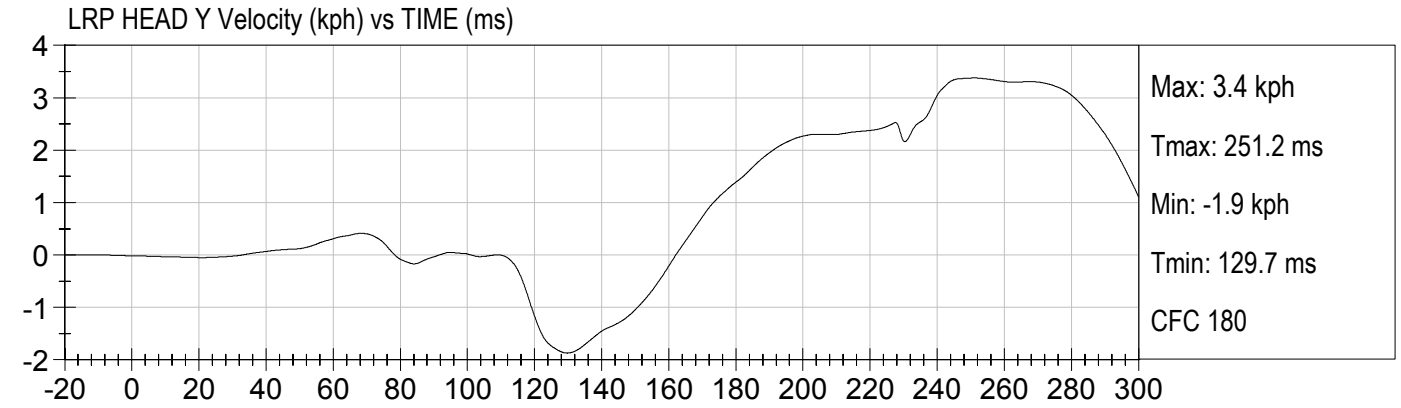
LRP HEAD Z (G's) vs TIME (ms)

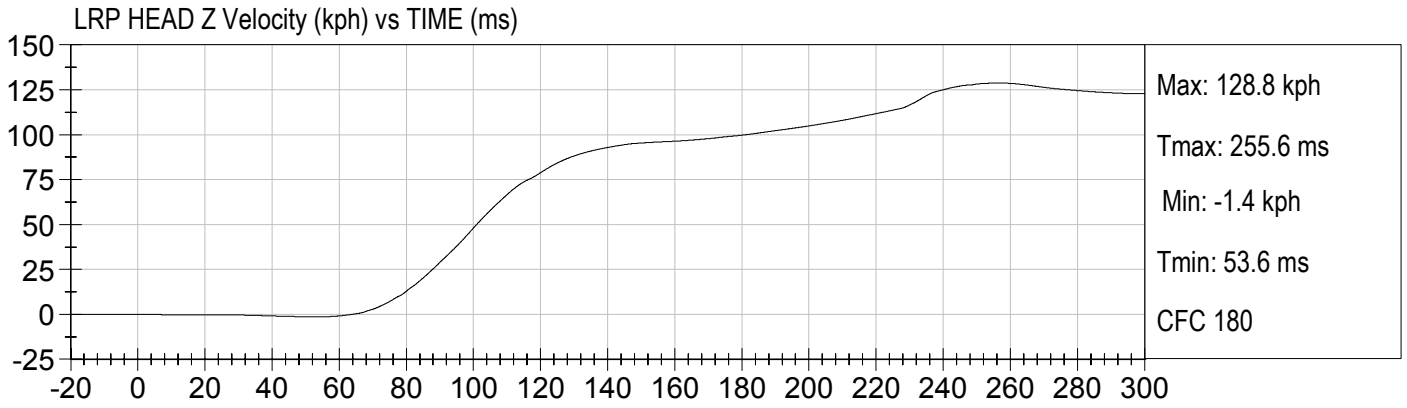


LRP HEAD Resultant (G's) vs TIME (ms)




LRP HEAD X Velocity (kph) vs TIME (ms)
70
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 60.2 kph
Tmax: 54.5 ms
Min: -5.9 kph
Tmin: 205.5 ms
CFC 180

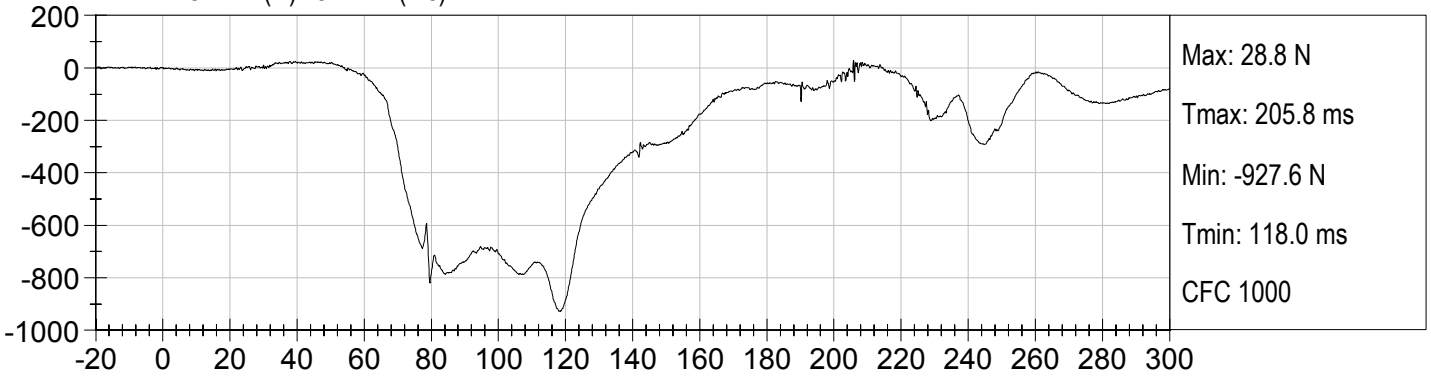

LRP HEAD Y Velocity (kph) vs TIME (ms)
4
3
2
1
0
-1
-2
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 3.4 kph
Tmax: 251.2 ms
Min: -1.9 kph
Tmin: 129.7 ms
CFC 180


LRP HEAD Z Velocity (kph) vs TIME (ms)
150
125
100
75
50
25
0
-25
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 128.8 kph
Tmax: 255.6 ms
Min: -1.4 kph
Tmin: 53.6 ms
CFC 180

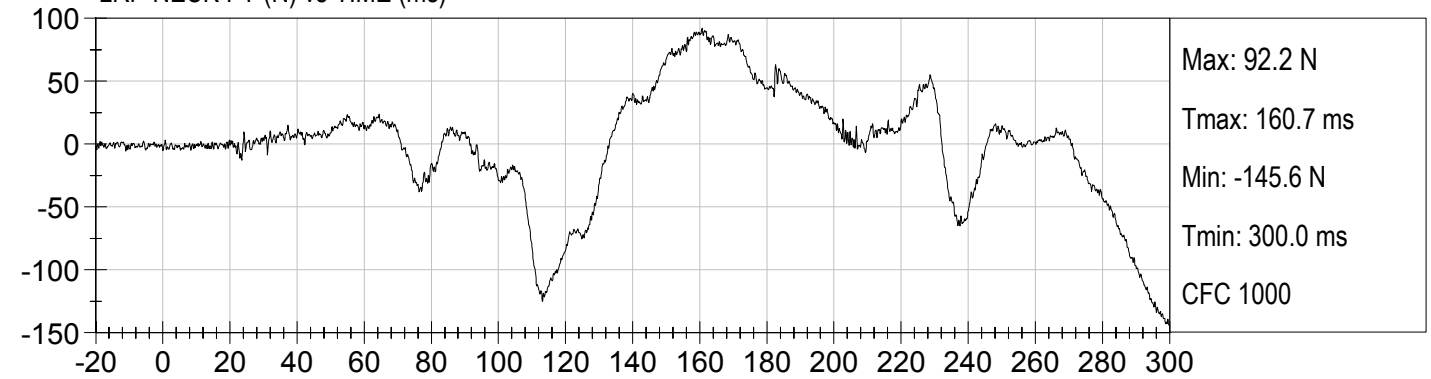
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

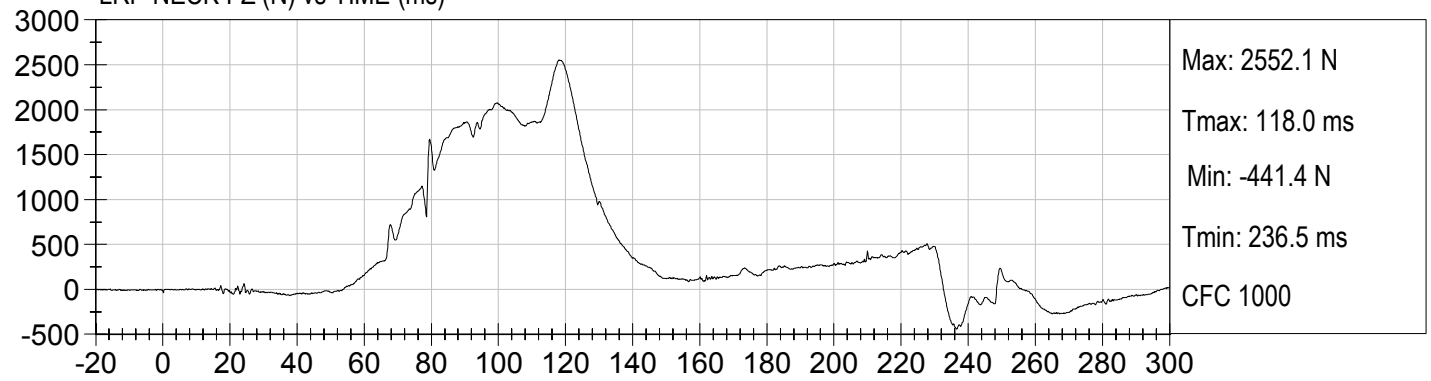
LRP NECK FX (N) vs TIME (ms)



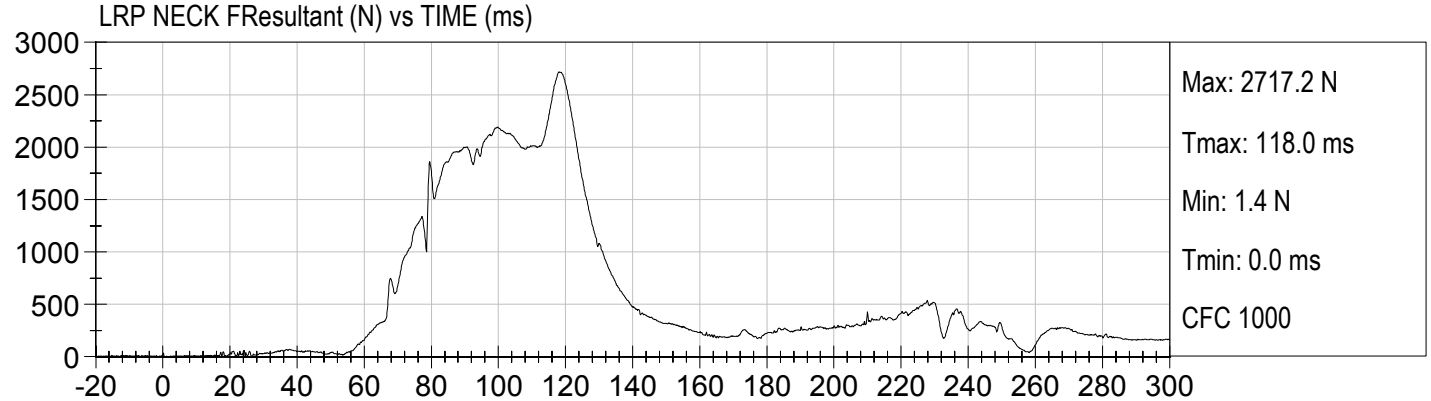
LRP NECK FY (N) vs TIME (ms)



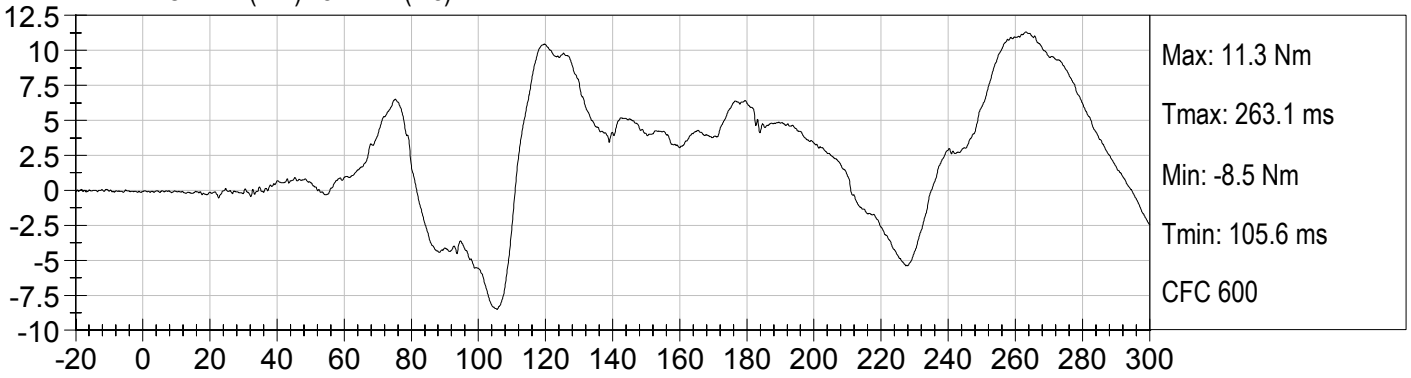
LRP NECK FZ (N) vs TIME (ms)



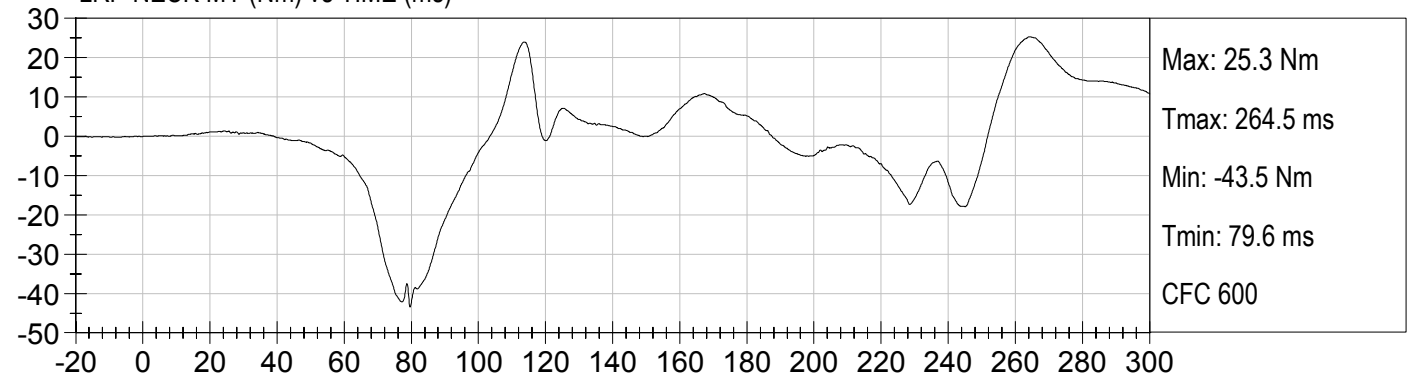
LRP NECK FResultant (N) vs TIME (ms)



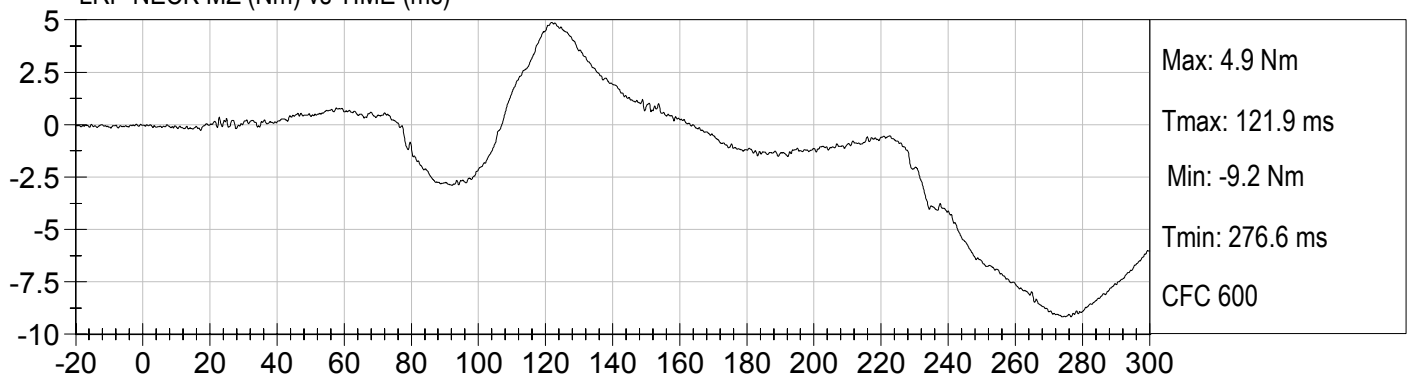
LRP NECK MX (Nm) vs TIME (ms)



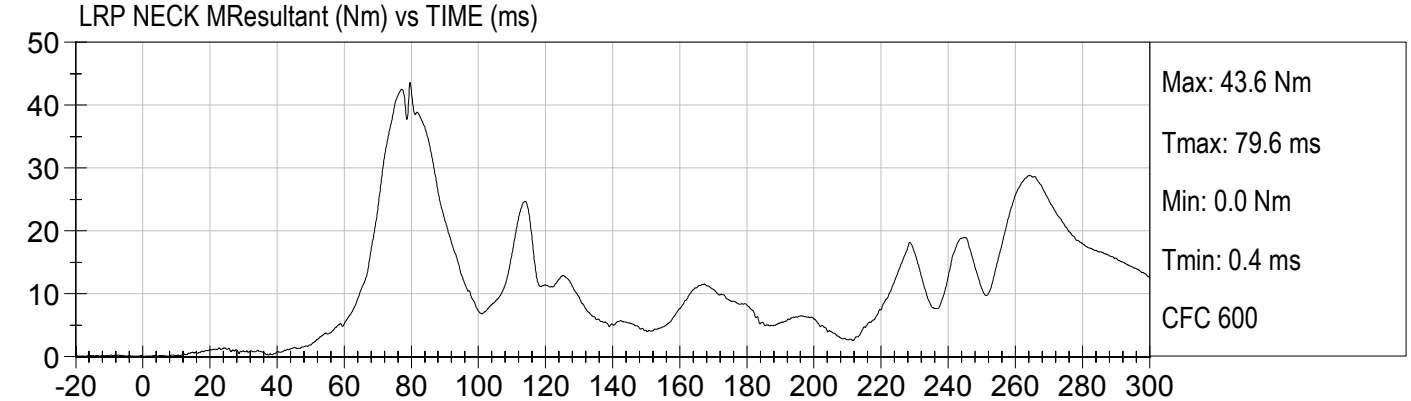
LRP NECK MY (Nm) vs TIME (ms)



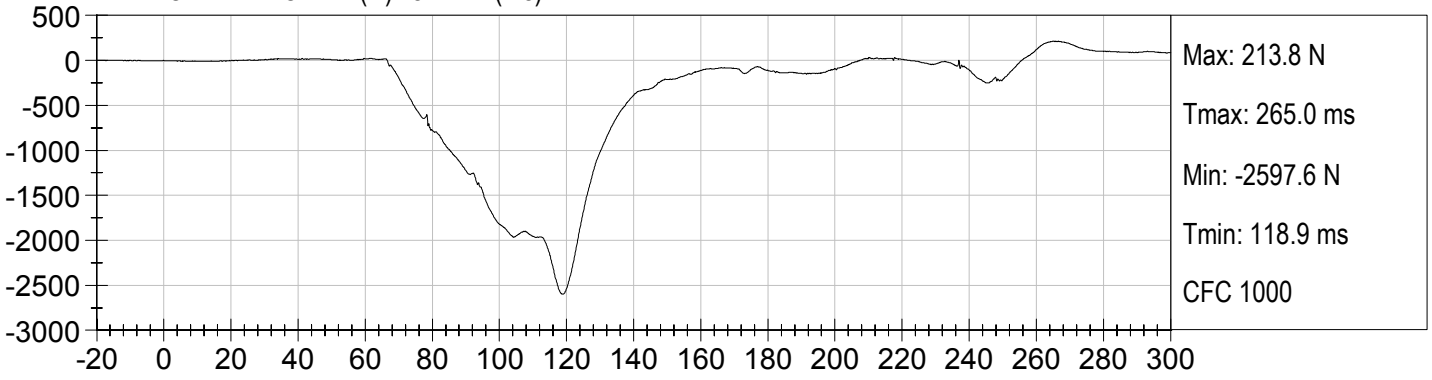
LRP NECK MZ (Nm) vs TIME (ms)



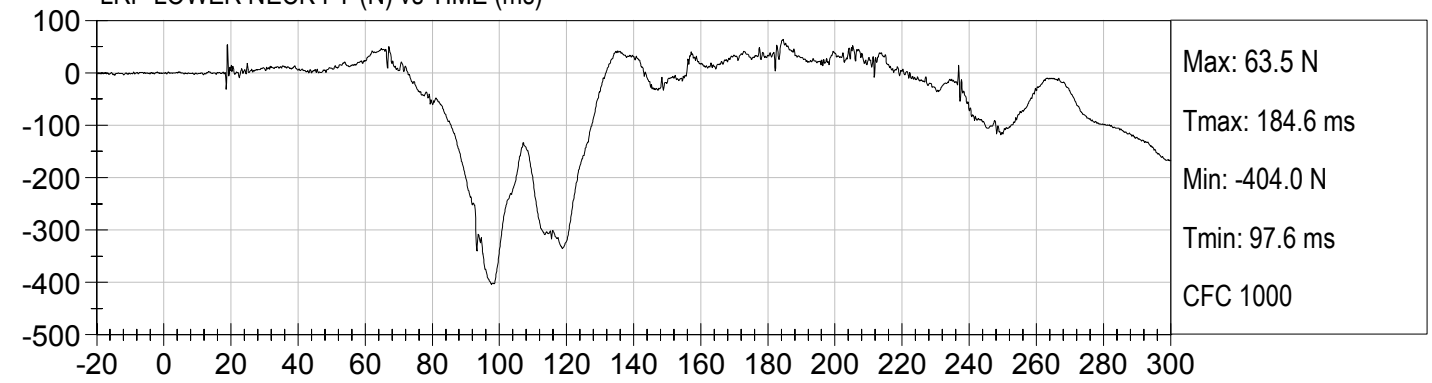
LRP NECK MResultant (Nm) vs TIME (ms)



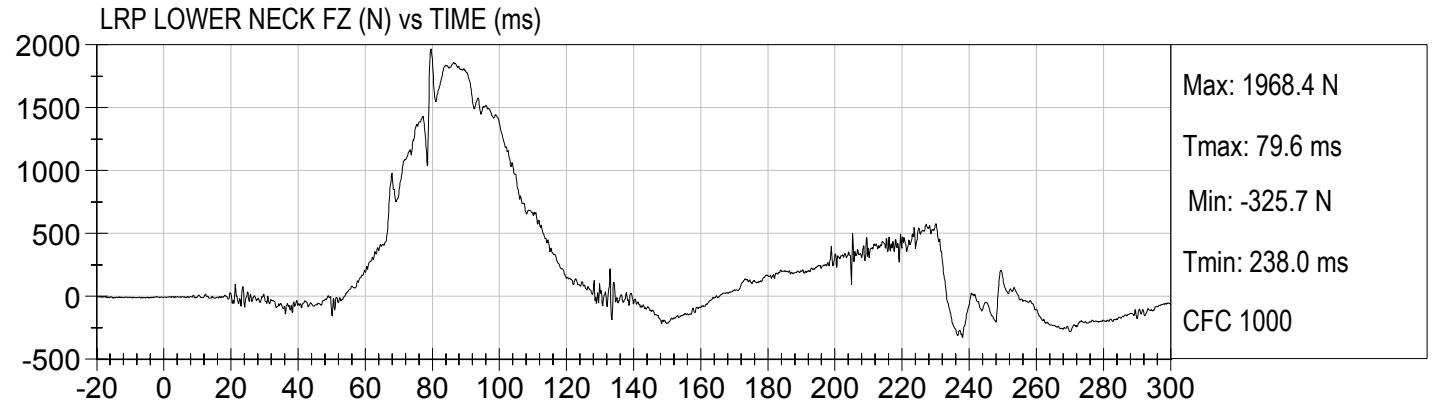
LRP LOWER NECK FX (N) vs TIME (ms)



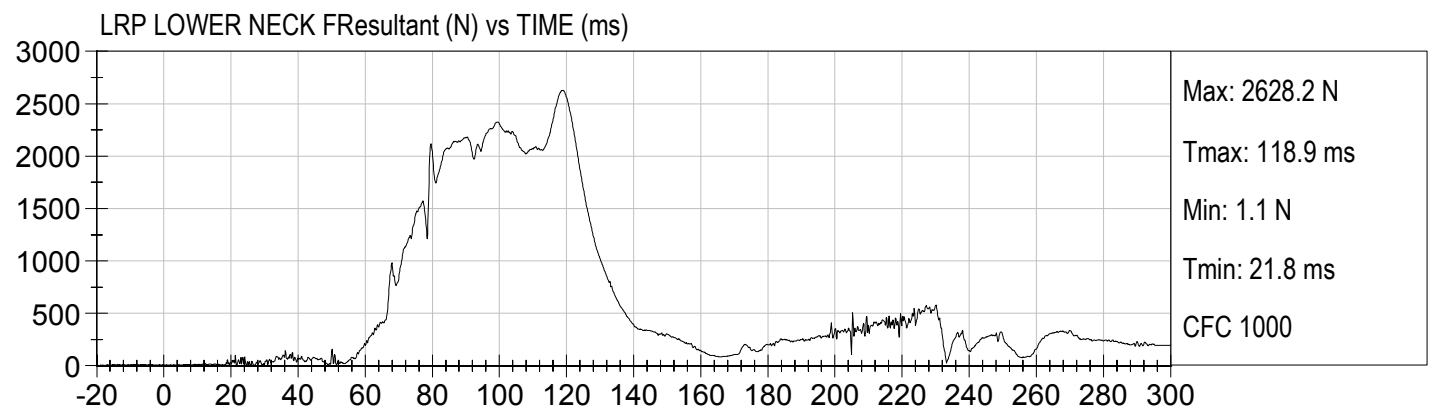
LRP LOWER NECK FY (N) vs TIME (ms)



LRP LOWER NECK FZ (N) vs TIME (ms)



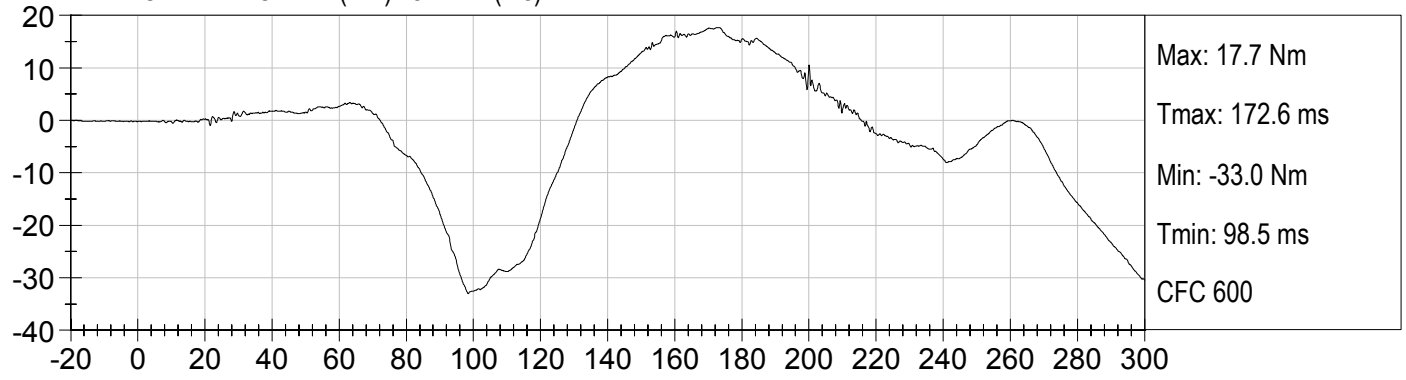
LRP LOWER NECK FResultant (N) vs TIME (ms)



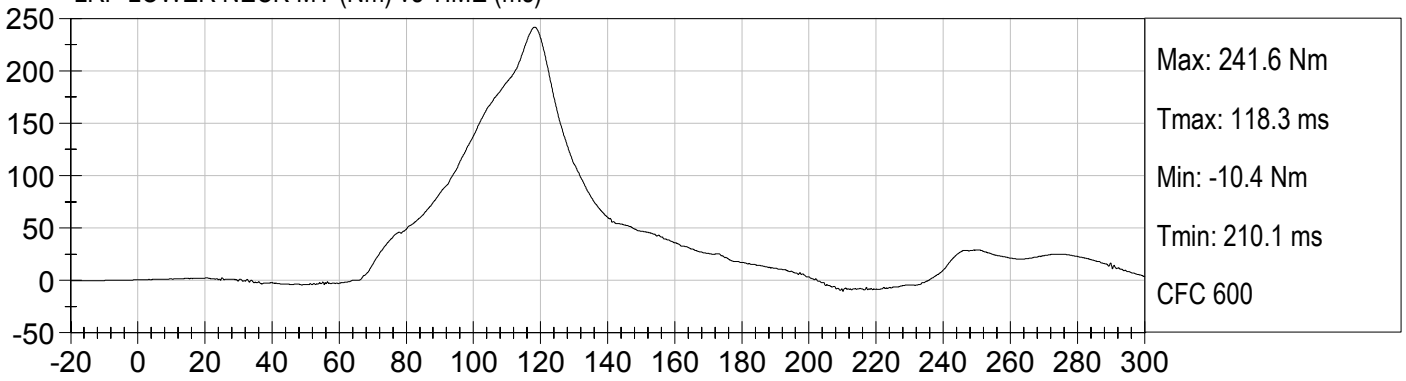
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

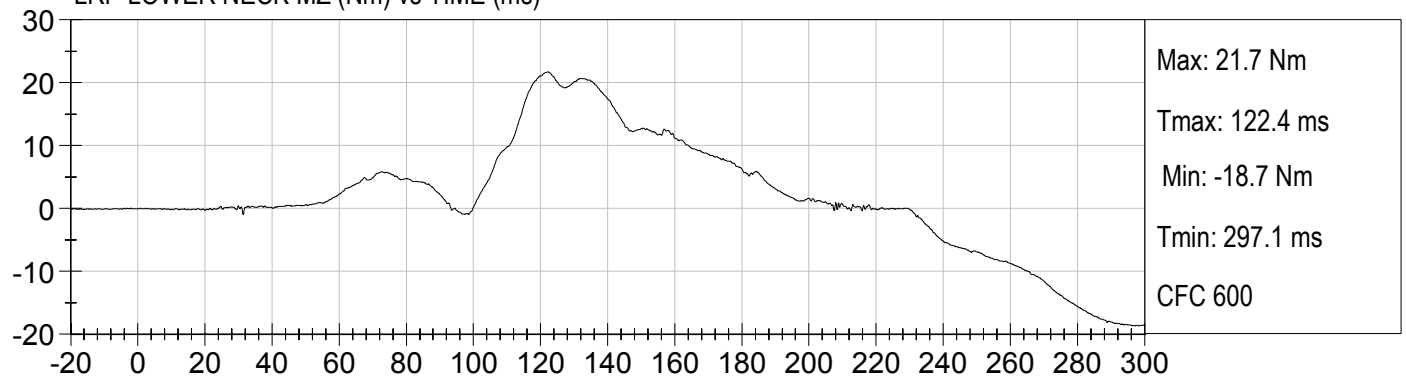
LRP LOWER NECK MX (Nm) vs TIME (ms)



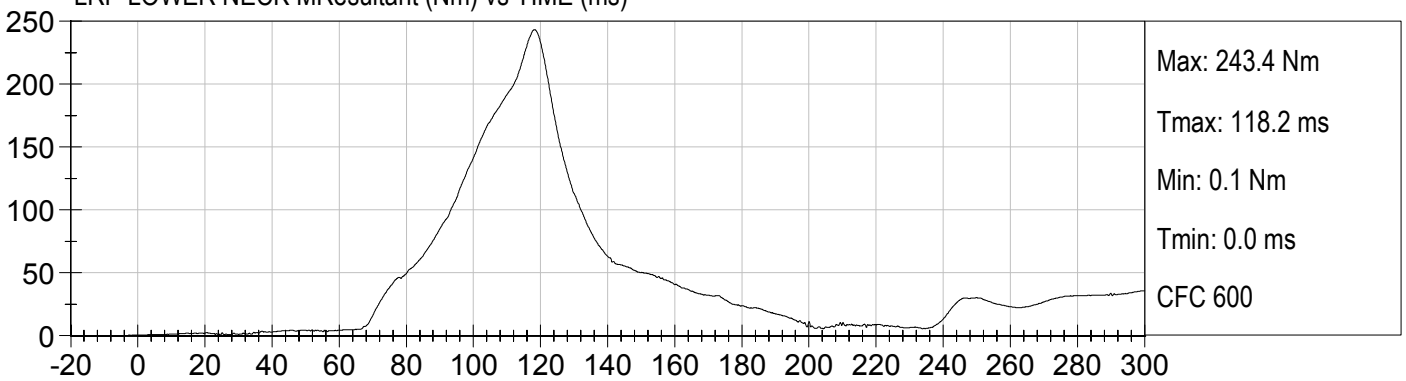
LRP LOWER NECK MY (Nm) vs TIME (ms)



LRP LOWER NECK MZ (Nm) vs TIME (ms)



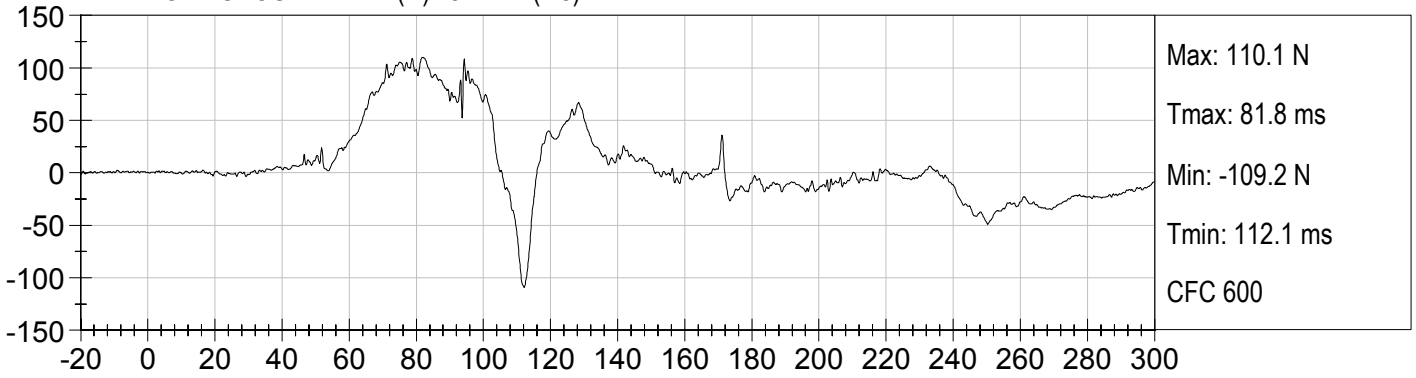
LRP LOWER NECK MResultant (Nm) vs TIME (ms)



NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

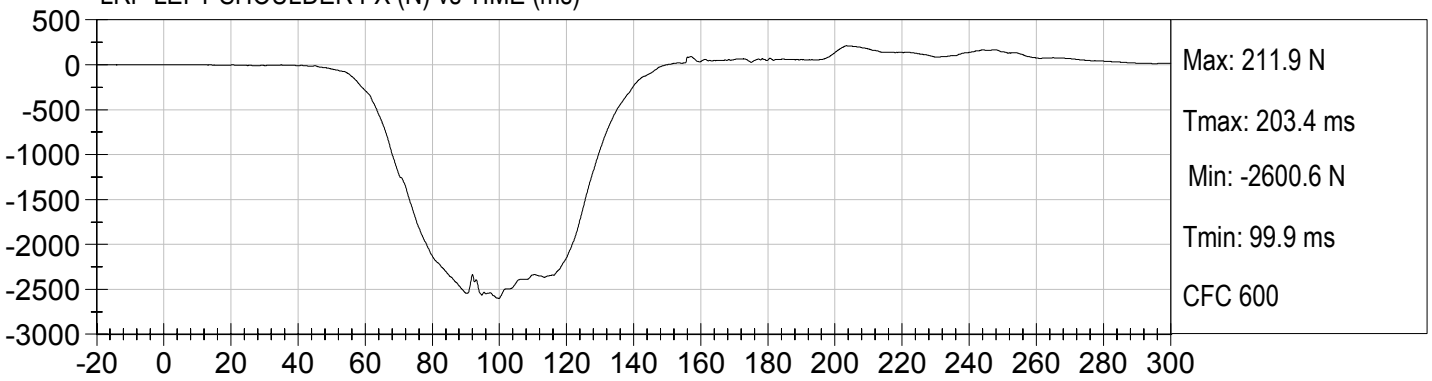
LRP RIGHT SHOULDER FX (N) vs TIME (ms)



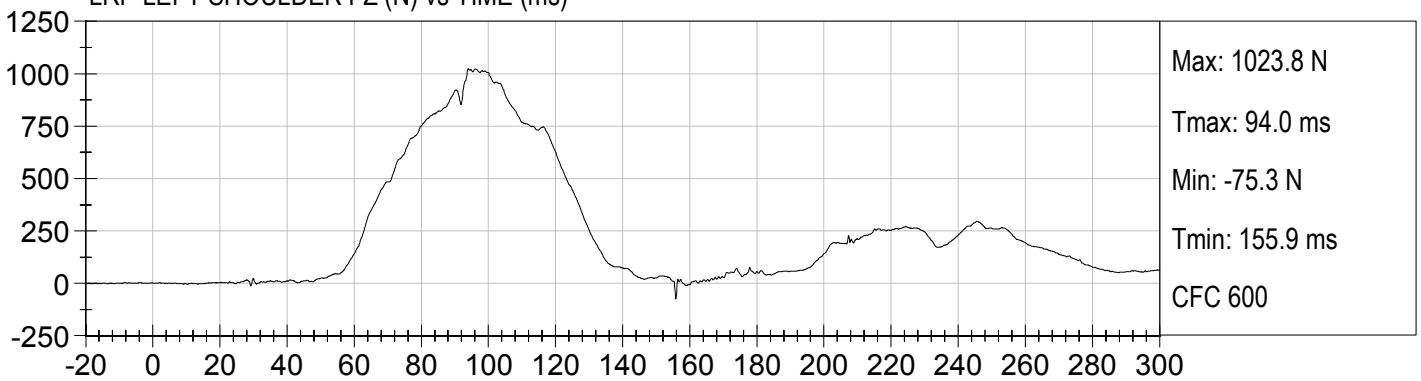
LRP RIGHT SHOULDER FZ (N) vs TIME (ms)



LRP LEFT SHOULDER FX (N) vs TIME (ms)



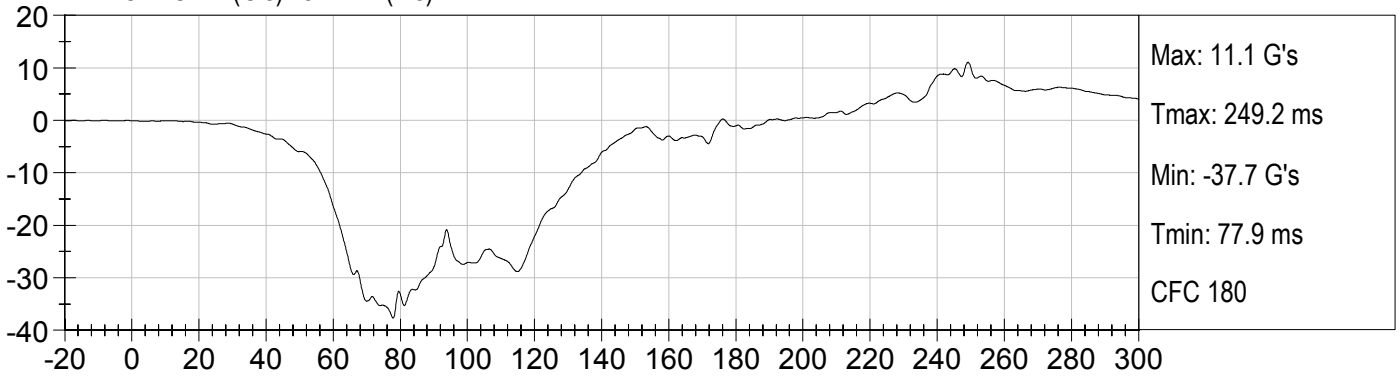
LRP LEFT SHOULDER FZ (N) vs TIME (ms)



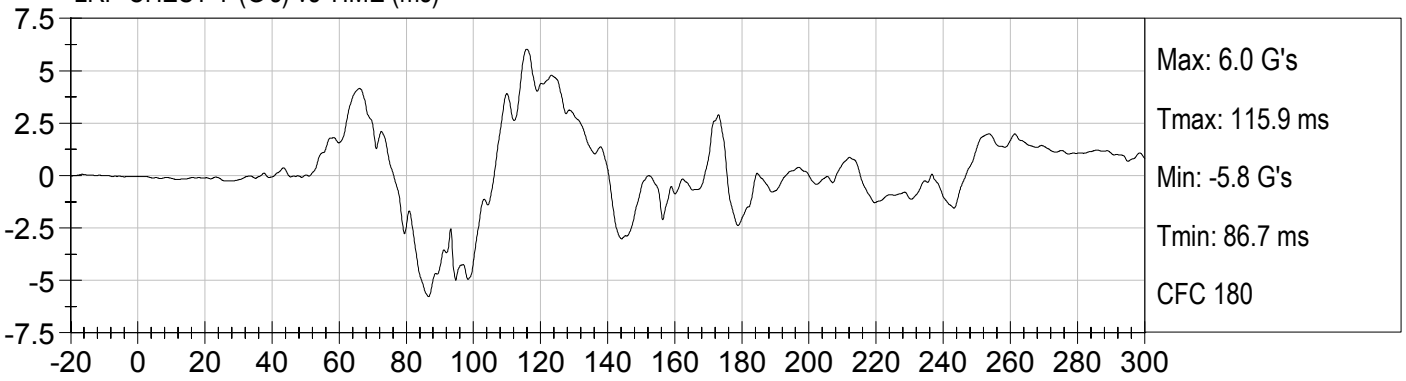
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

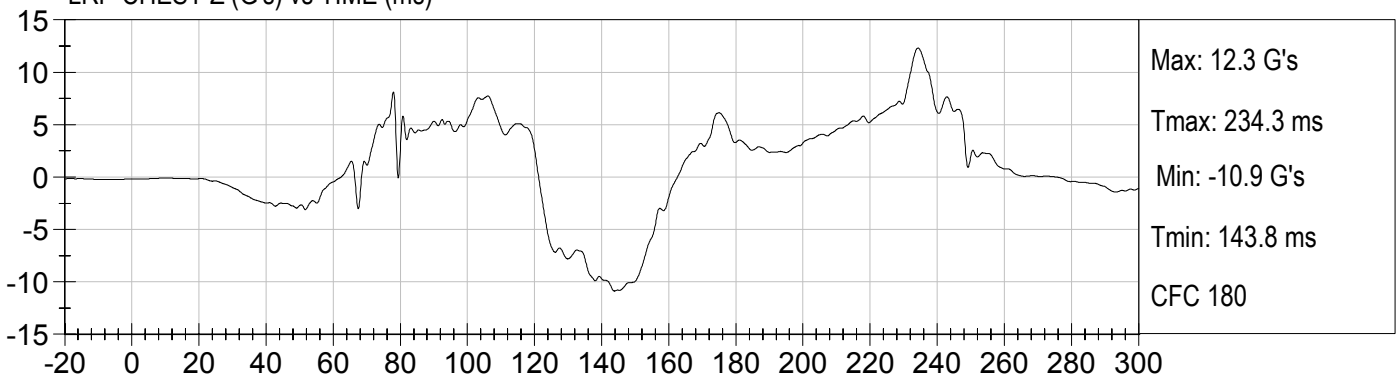
LRP CHEST X (G's) vs TIME (ms)



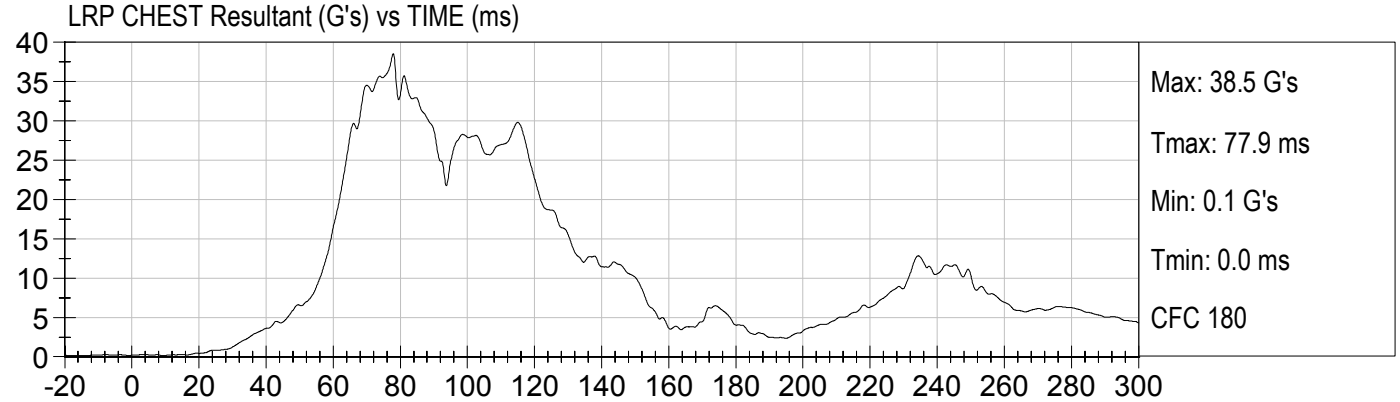
LRP CHEST Y (G's) vs TIME (ms)



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



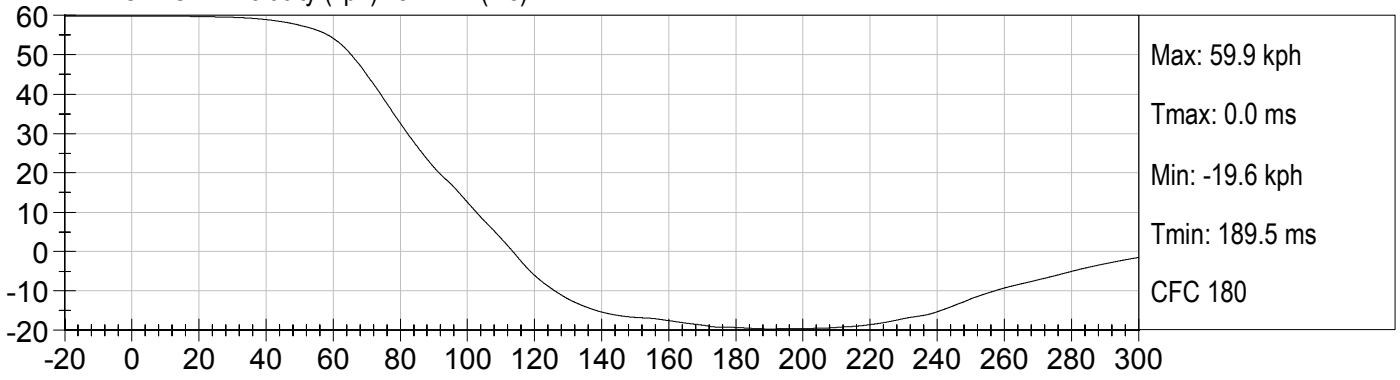
LRP CHEST Resultant (G's) vs TIME (ms)



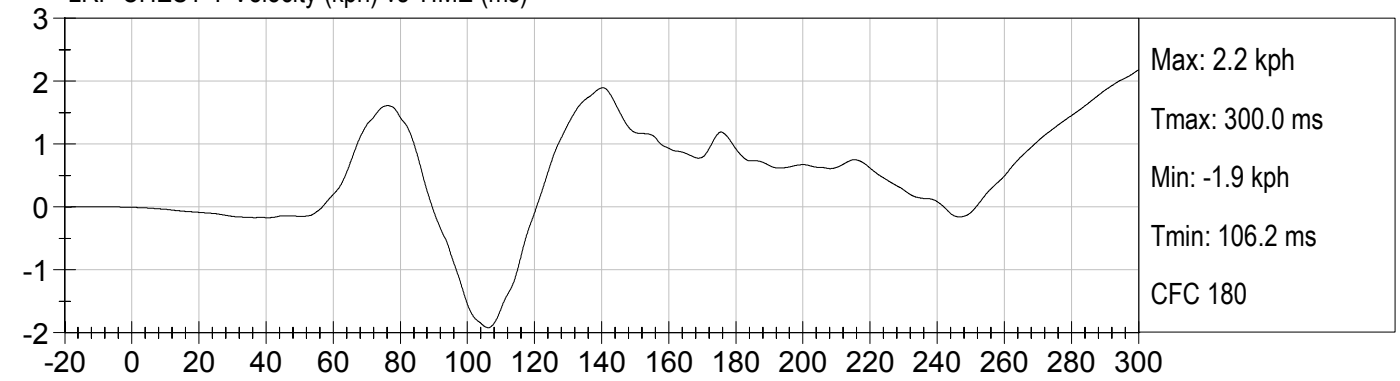
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

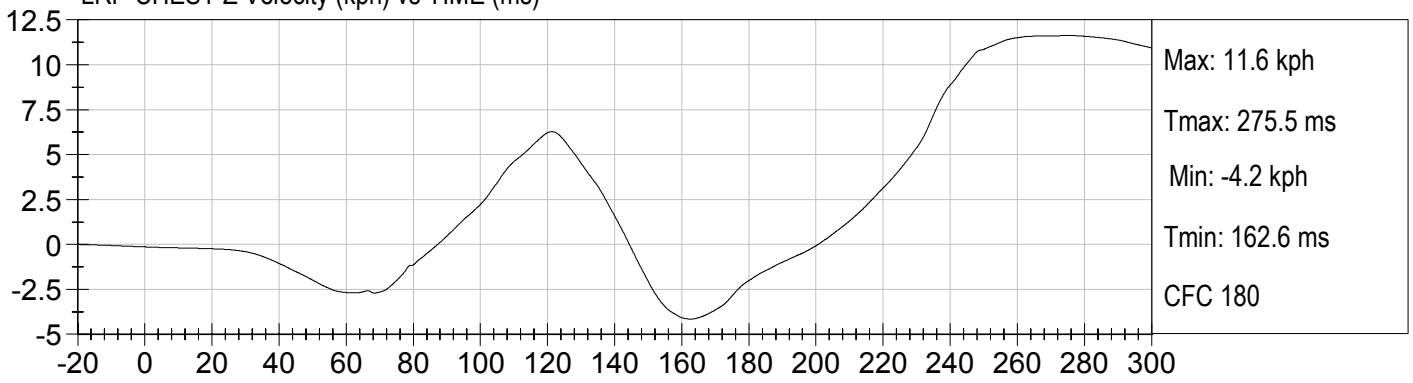
LRP CHEST X Velocity (kph) vs TIME (ms)



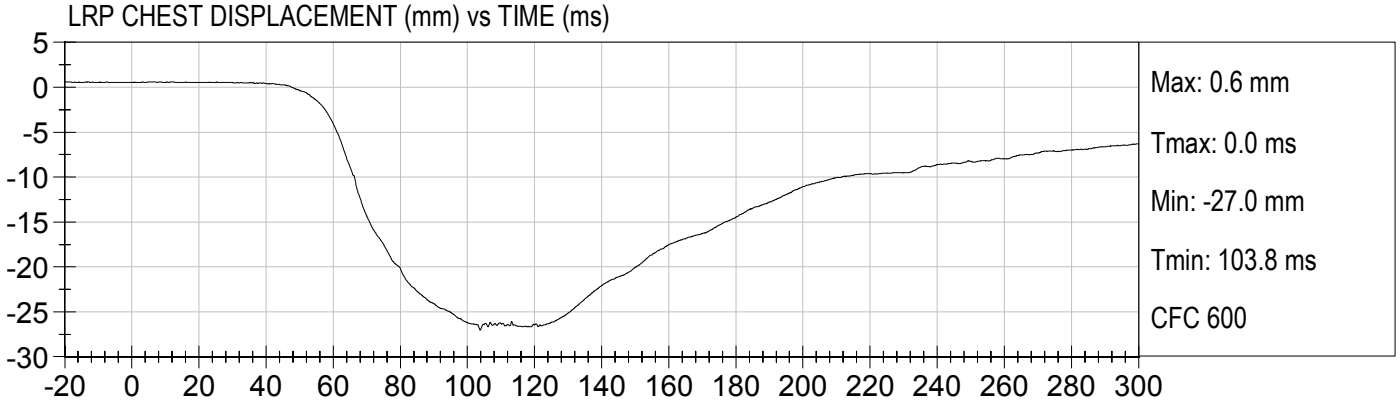
LRP CHEST Y Velocity (kph) vs TIME (ms)



LRP CHEST Z Velocity (kph) vs TIME (ms)



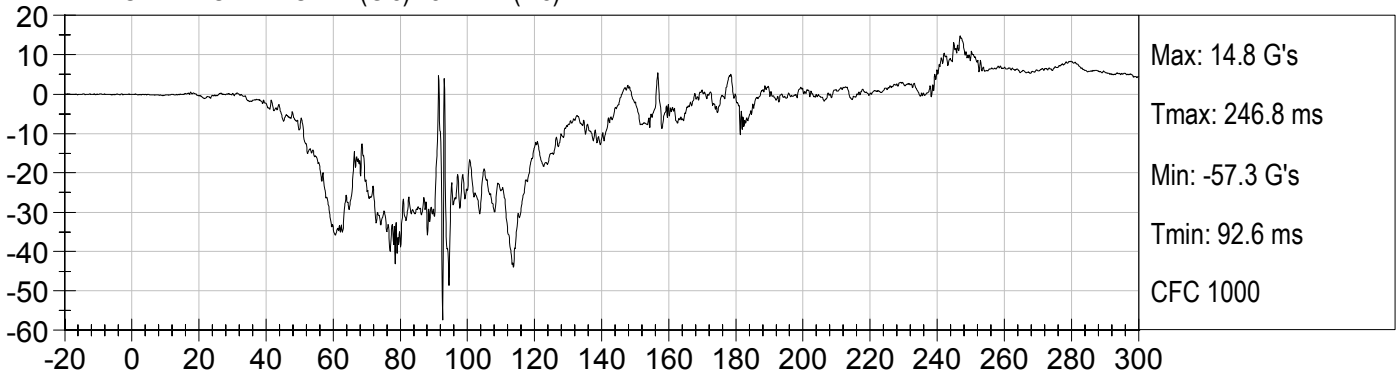
LRP CHEST DISPLACEMENT (mm) vs TIME (ms)



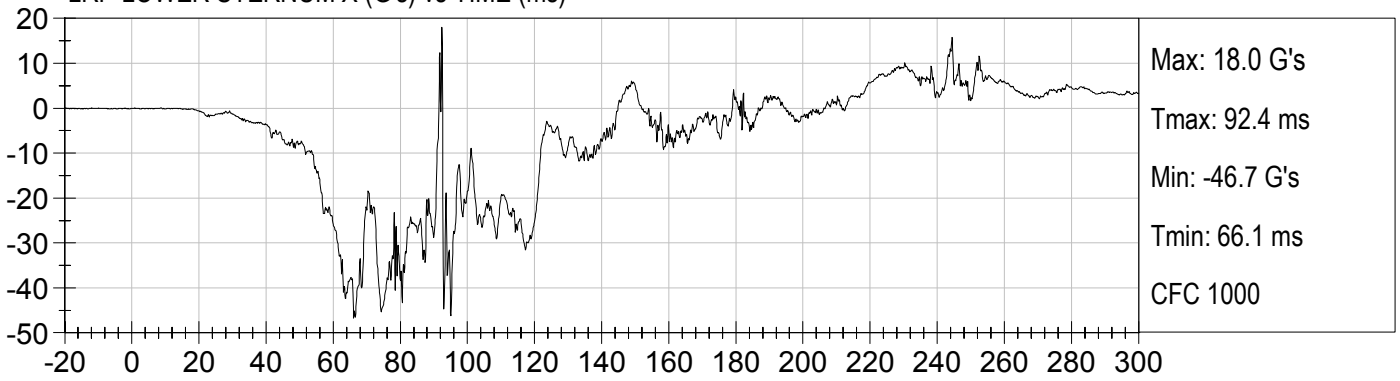
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

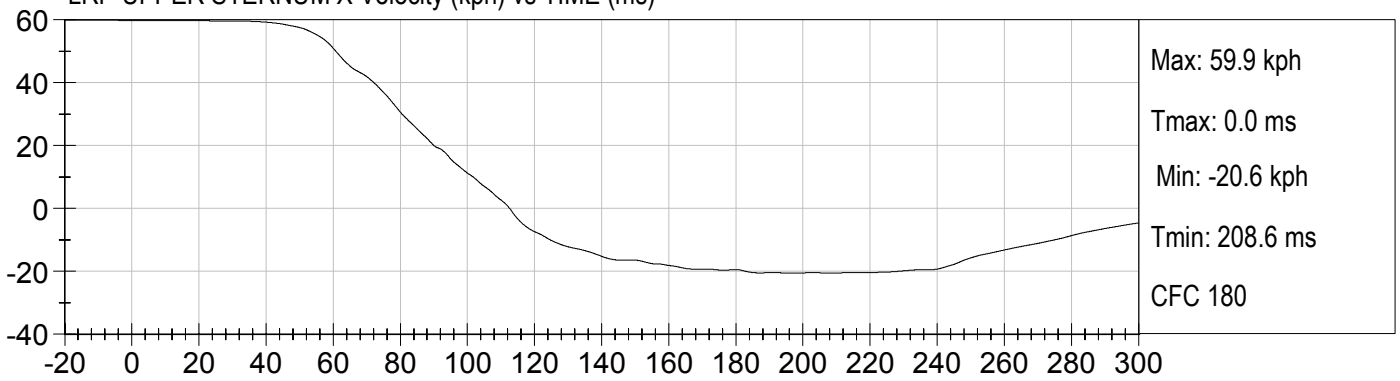
LRP UPPER STERNUM X (G's) vs TIME (ms)



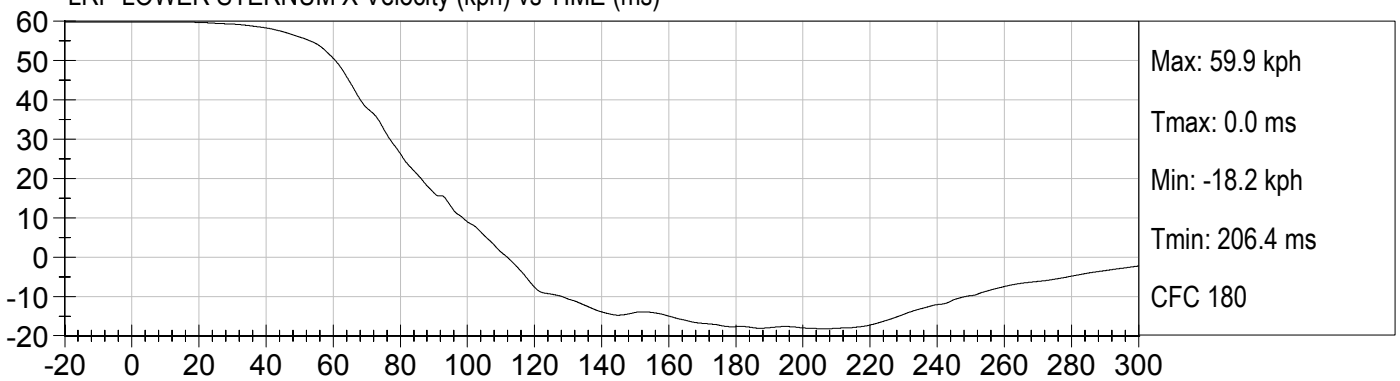
LRP LOWER STERNUM X (G's) vs TIME (ms)



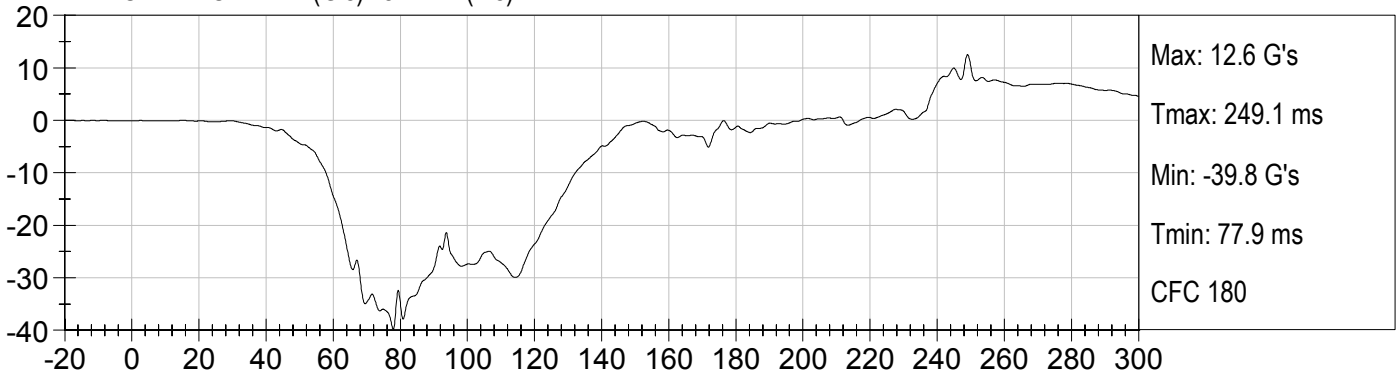
LRP UPPER STERNUM X Velocity (kph) vs TIME (ms)



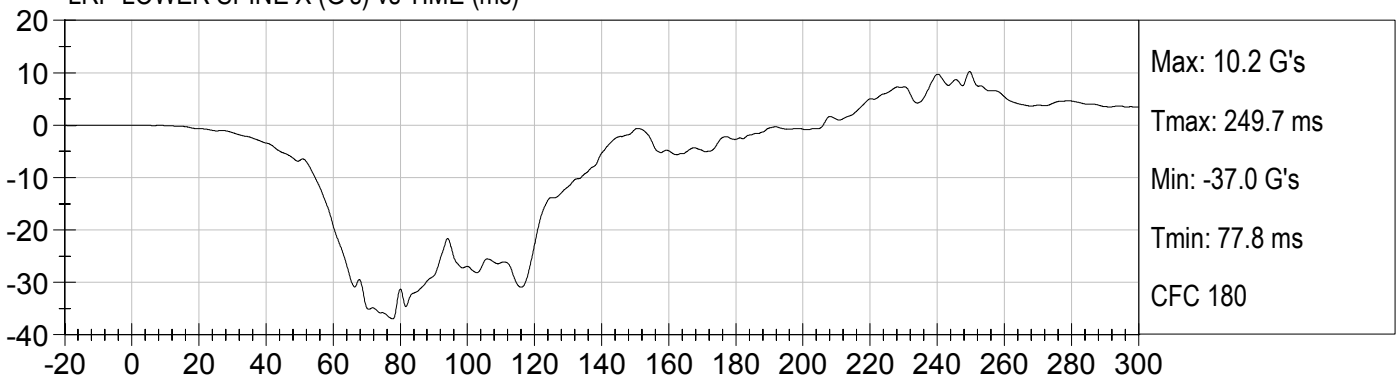
LRP LOWER STERNUM X Velocity (kph) vs TIME (ms)



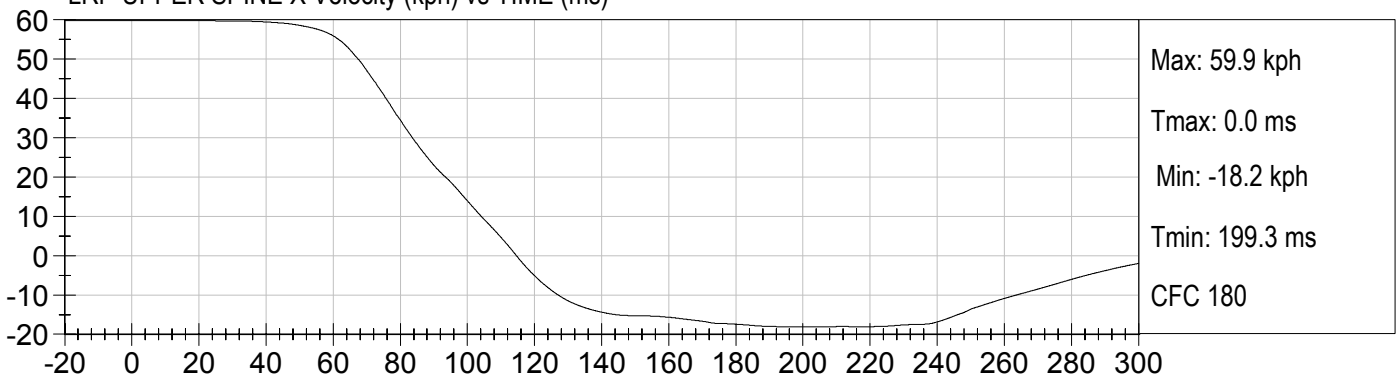
LRP UPPER SPINE X (G's) vs TIME (ms)



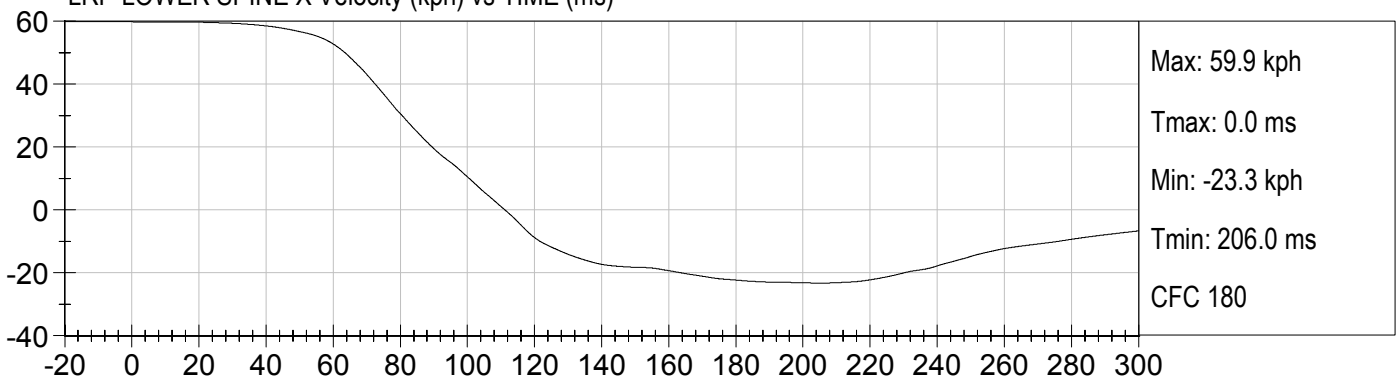
LRP LOWER SPINE X (G's) vs TIME (ms)



LRP UPPER SPINE X Velocity (kph) vs TIME (ms)



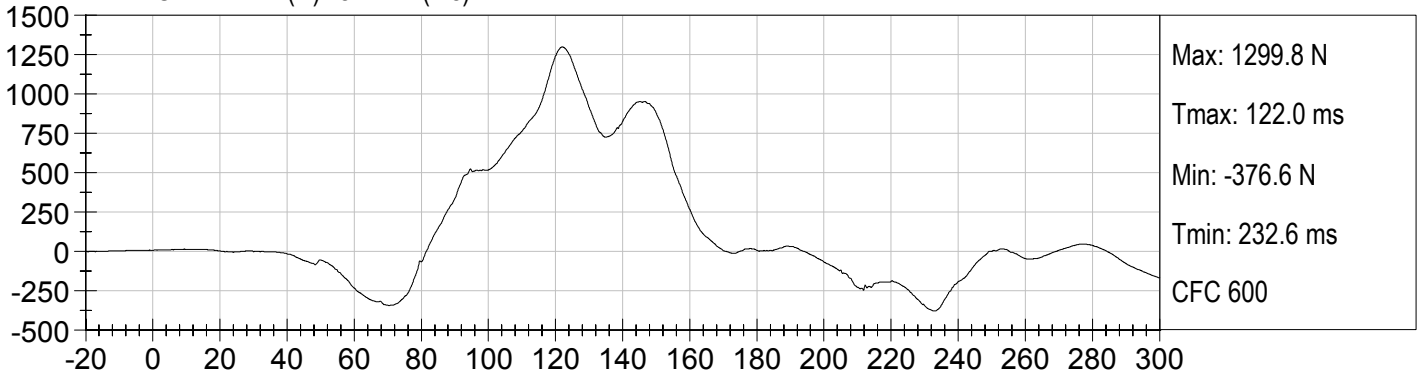
LRP LOWER SPINE X Velocity (kph) vs TIME (ms)



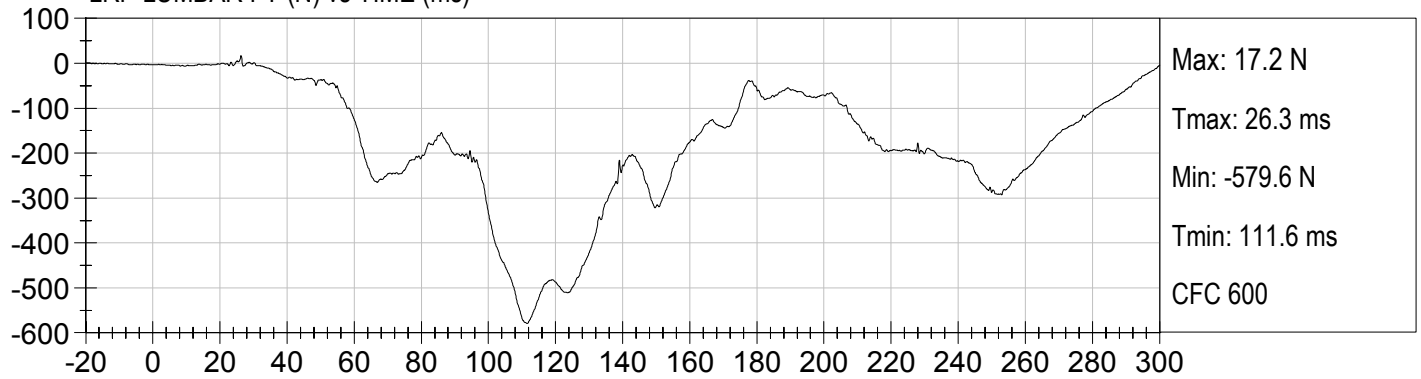
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

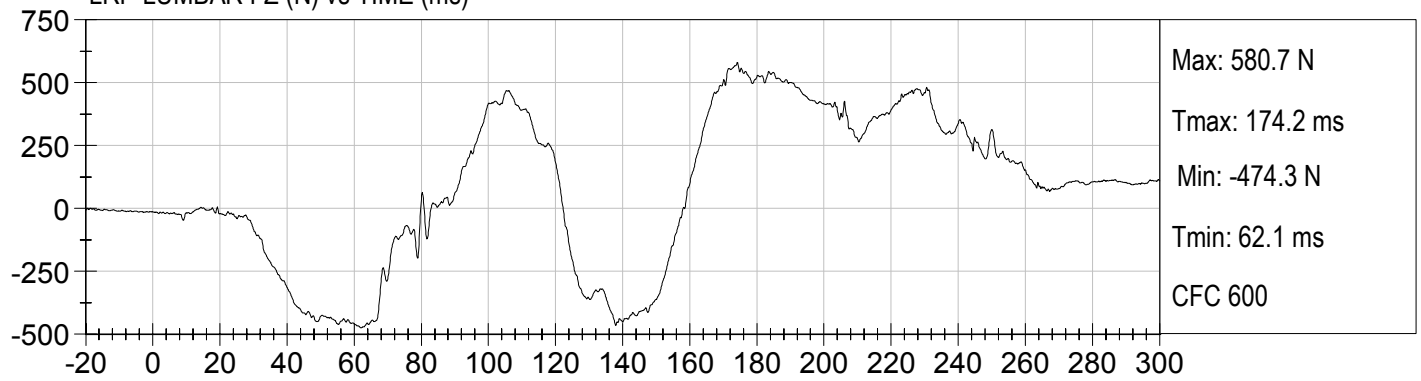
LRP LUMBAR FX (N) vs TIME (ms)



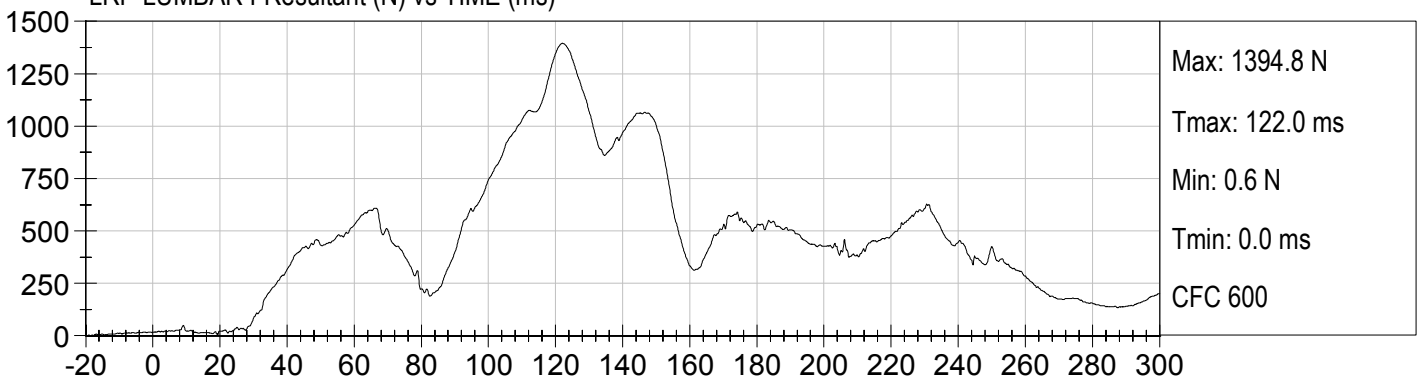
LRP LUMBAR FY (N) vs TIME (ms)



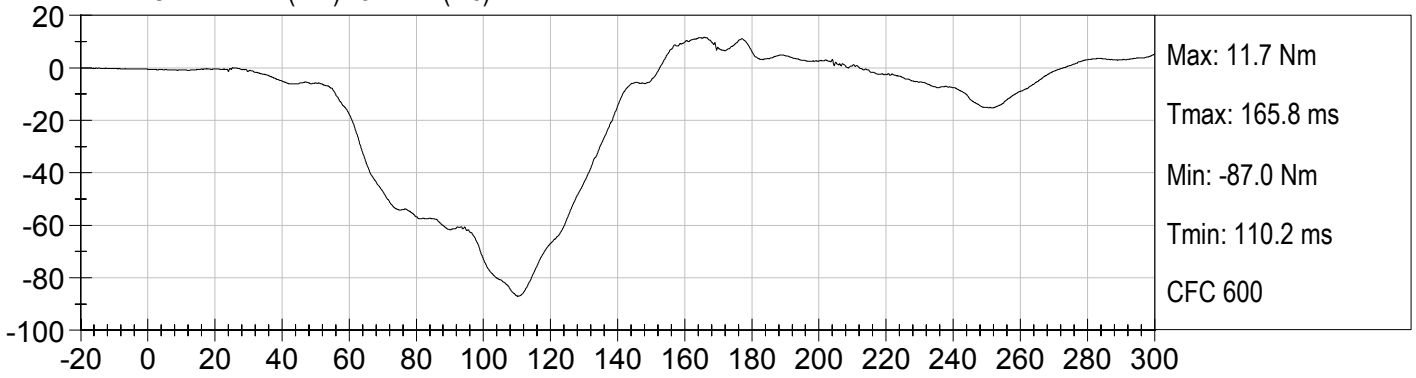
LRP LUMBAR FZ (N) vs TIME (ms)



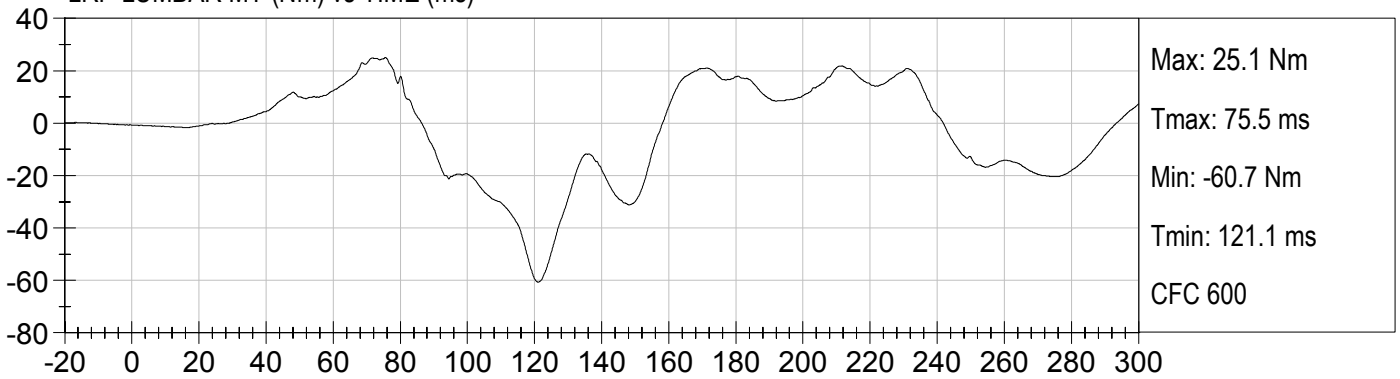
LRP LUMBAR FResultant (N) vs TIME (ms)



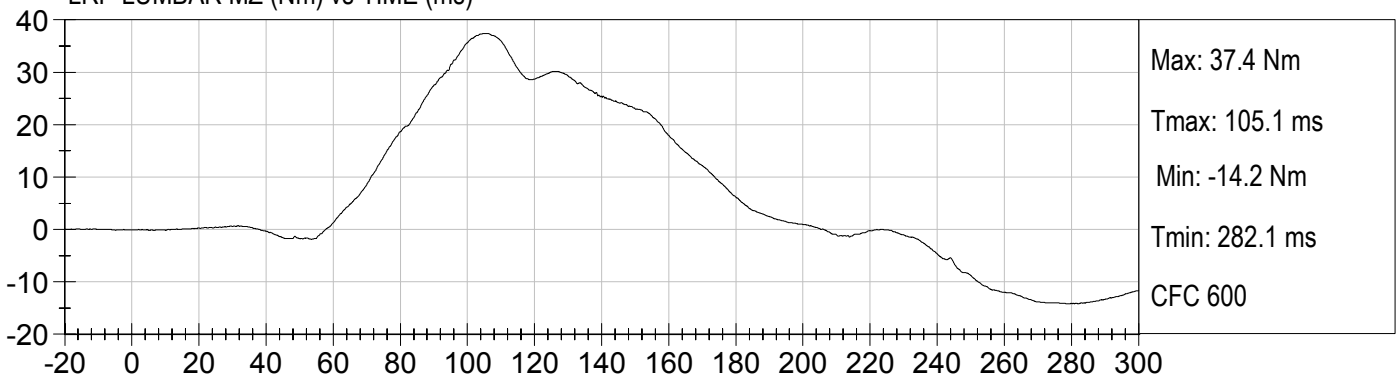
LRP LUMBAR MX (Nm) vs TIME (ms)



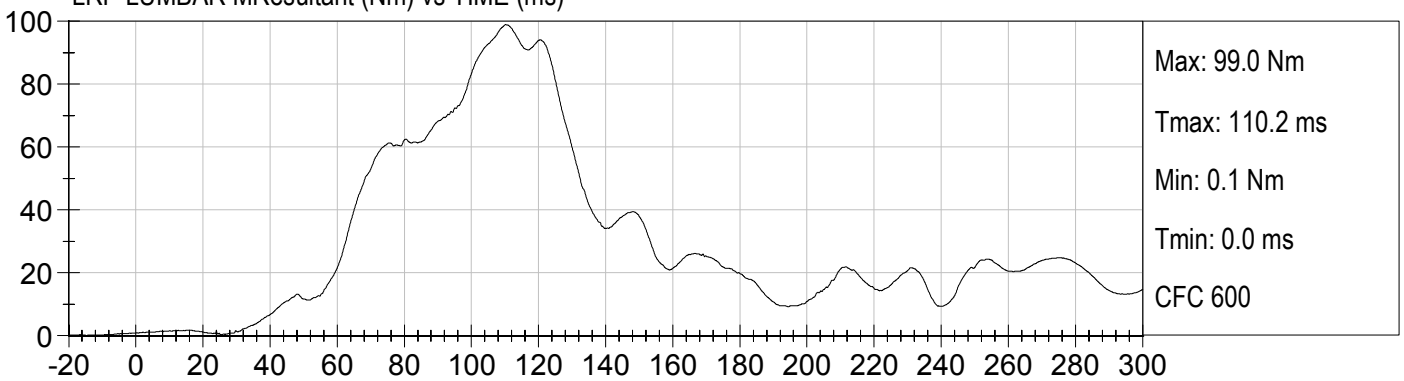
LRP LUMBAR MY (Nm) vs TIME (ms)



LRP LUMBAR MZ (Nm) vs TIME (ms)



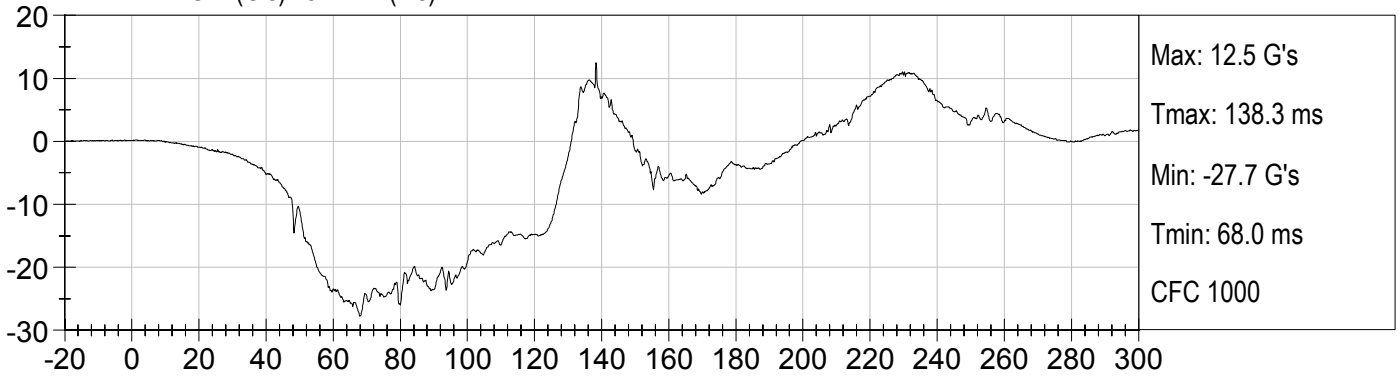
LRP LUMBAR MResultant (Nm) vs TIME (ms)



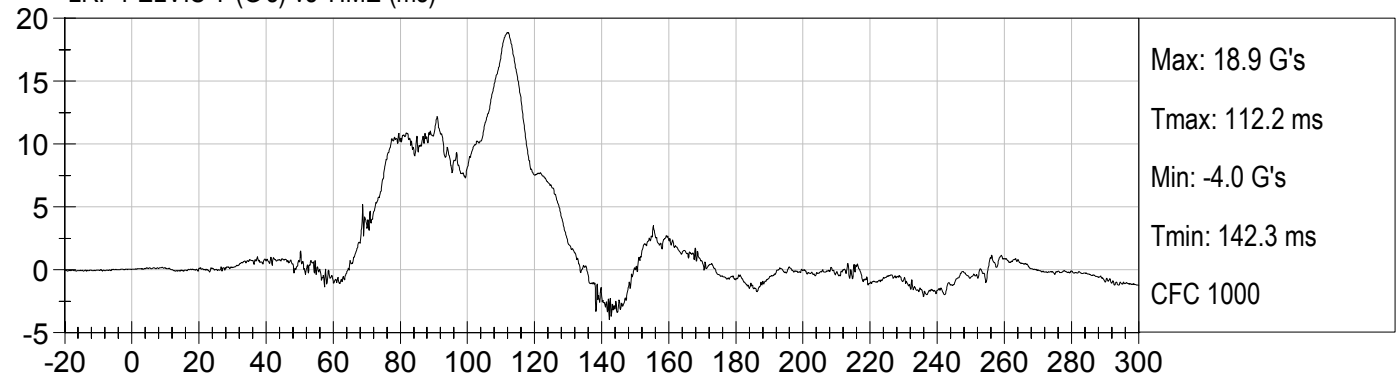
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

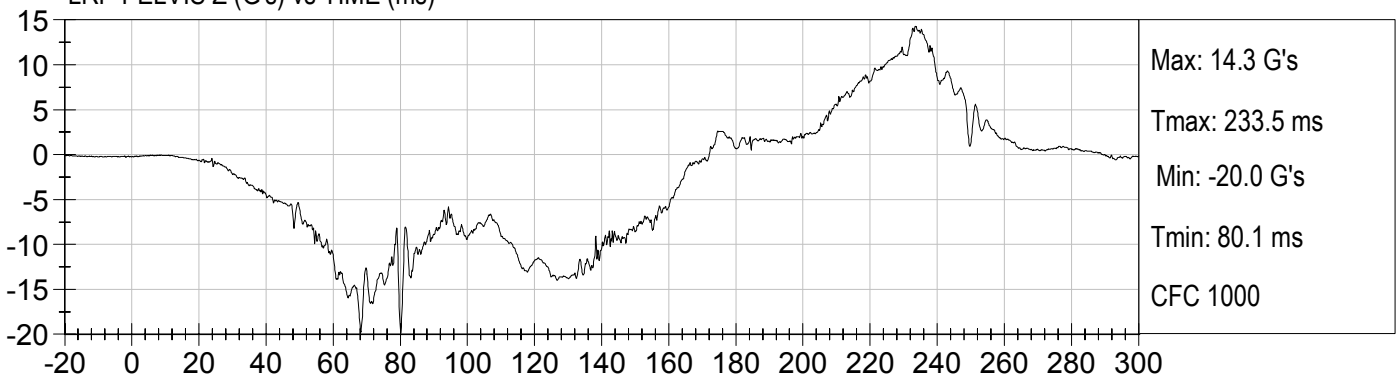
LRP PELVIS X (G's) vs TIME (ms)



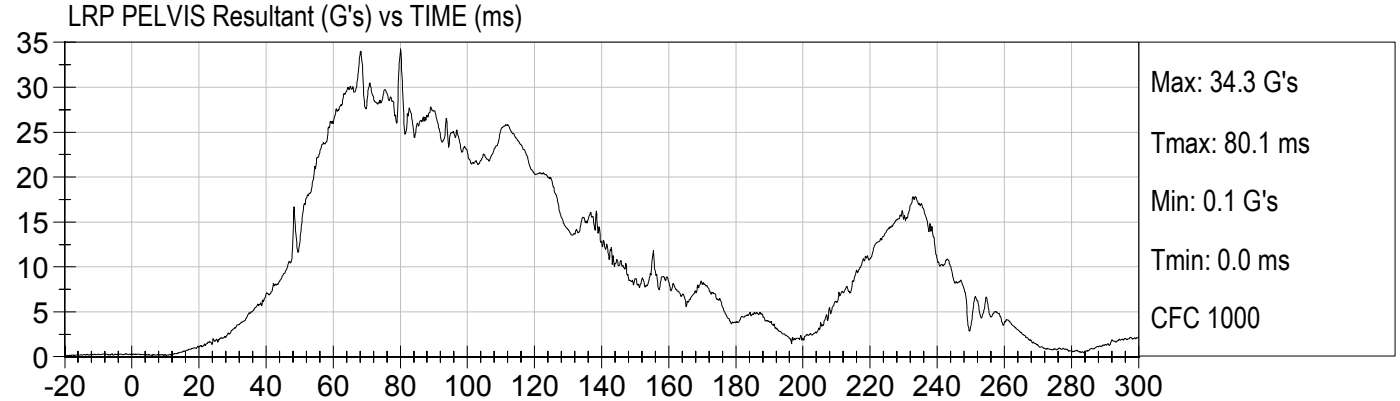
LRP PELVIS Y (G's) vs TIME (ms)



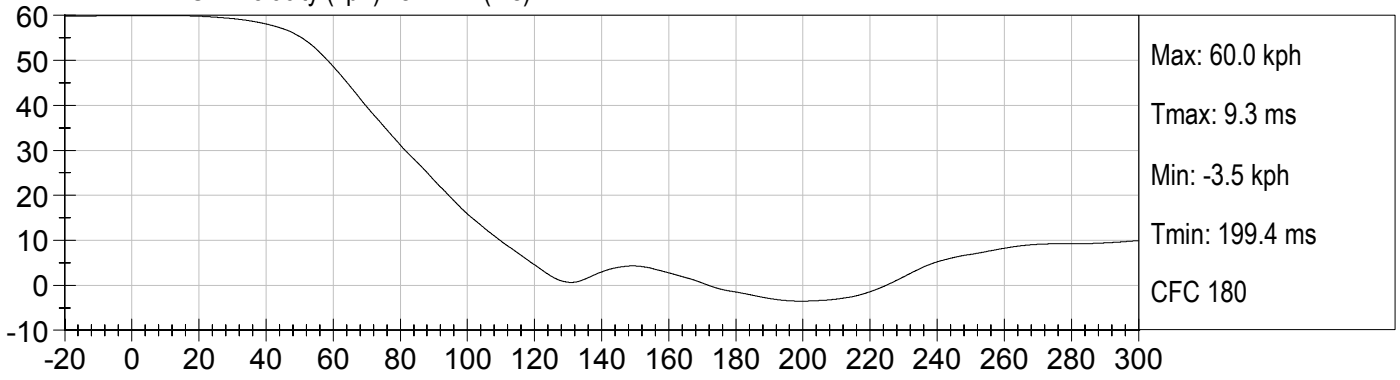
LRP PELVIS Z (G's) vs TIME (ms)



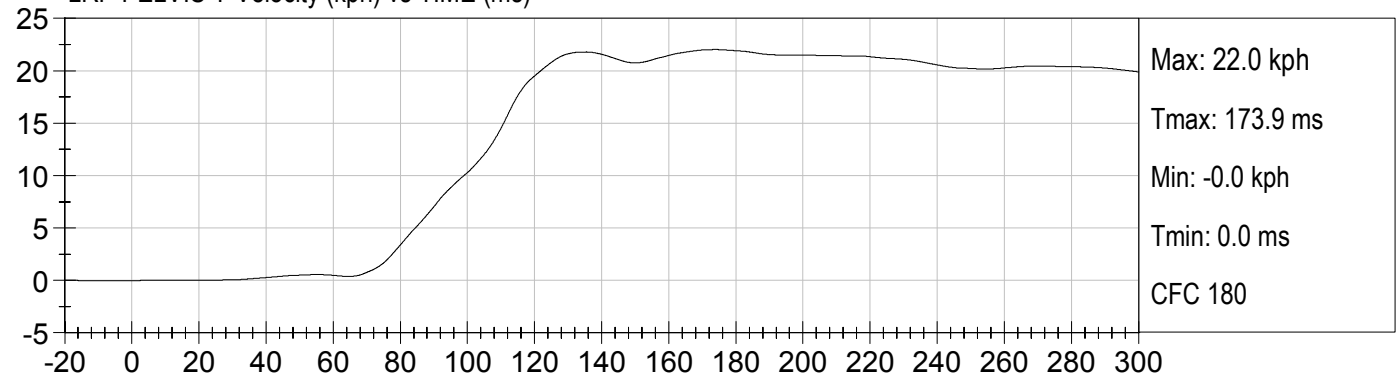
LRP PELVIS Resultant (G's) vs TIME (ms)



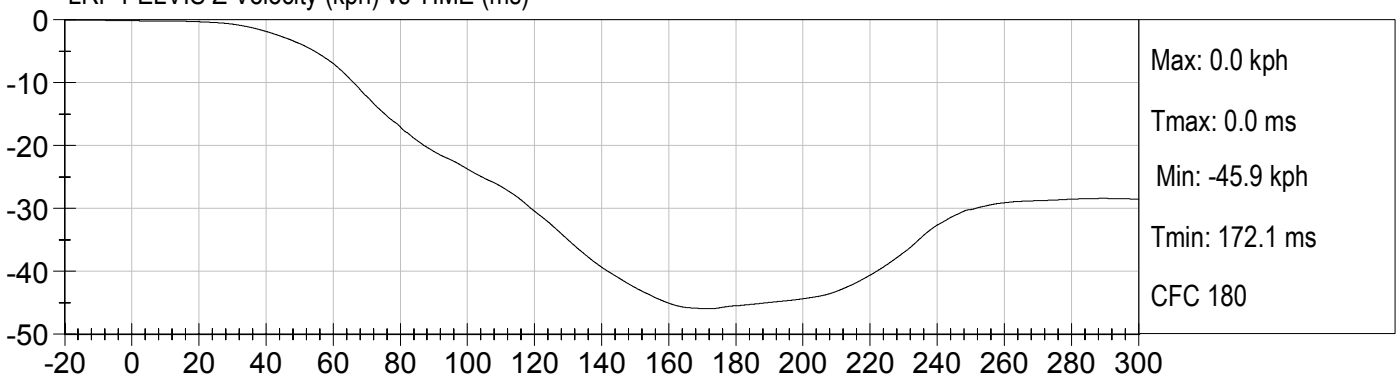
LRP PELVIS X Velocity (kph) vs TIME (ms)



LRP PELVIS Y Velocity (kph) vs TIME (ms)



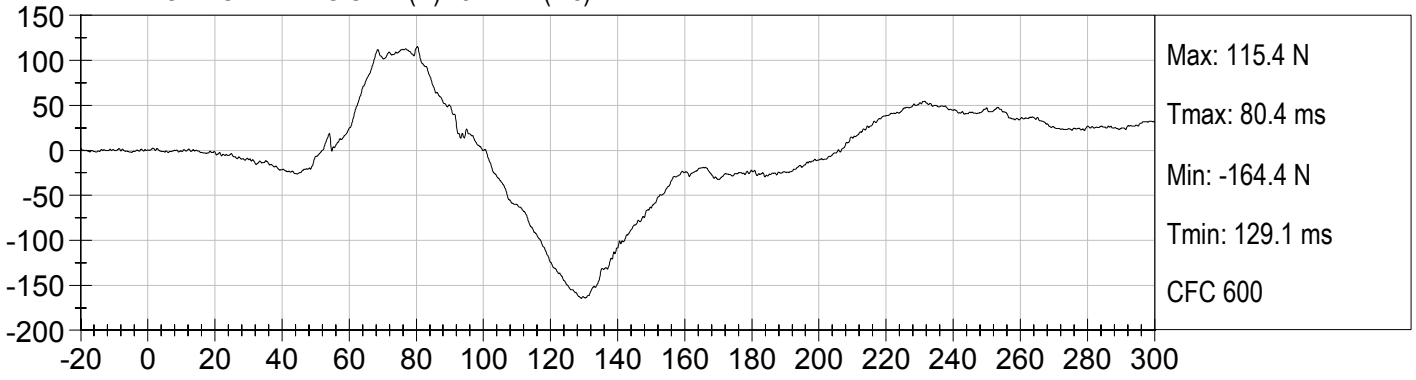
LRP PELVIS Z Velocity (kph) vs TIME (ms)



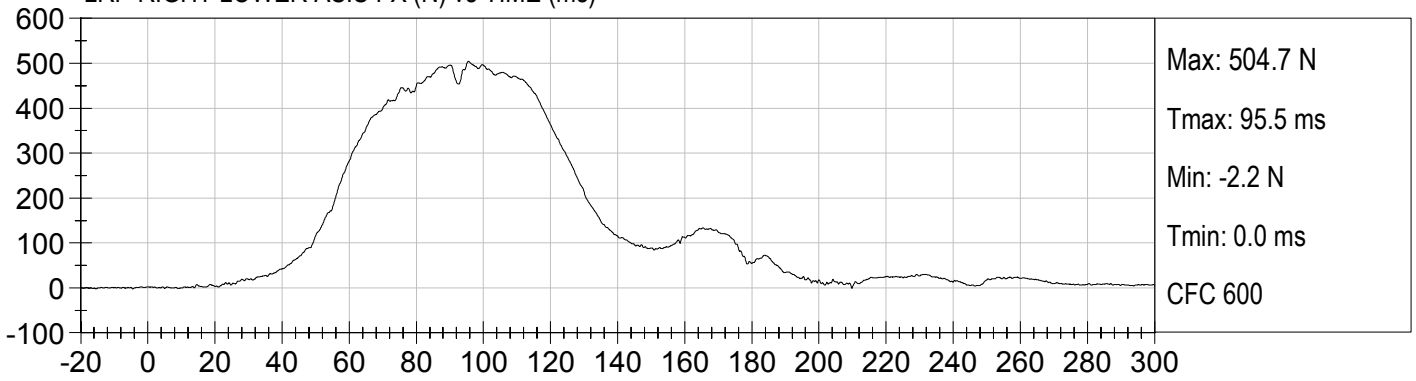
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

LRP RIGHT UPPER ASIS FX (N) vs TIME (ms)



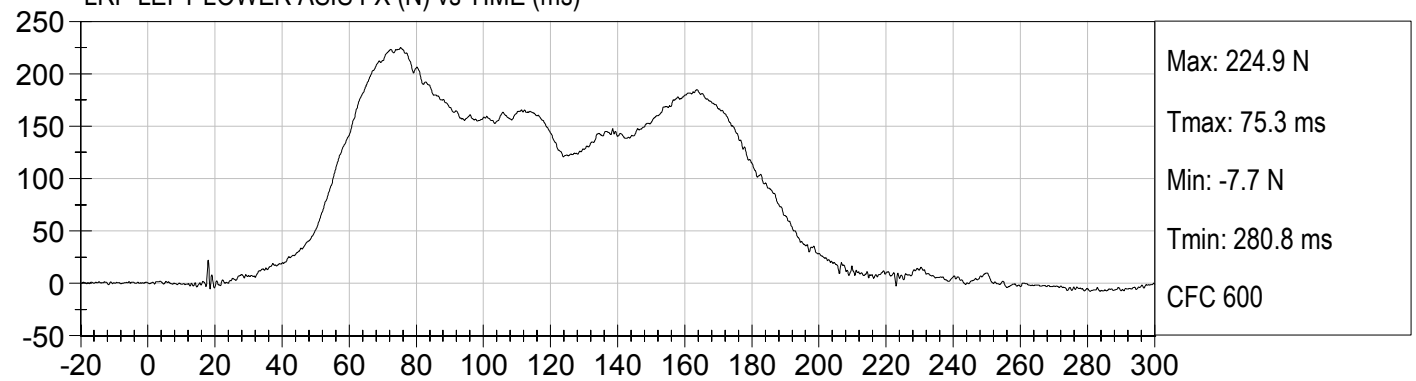
LRP RIGHT LOWER ASIS FX (N) vs TIME (ms)



LRP LEFT UPPER ASIS FX (N) vs TIME (ms)



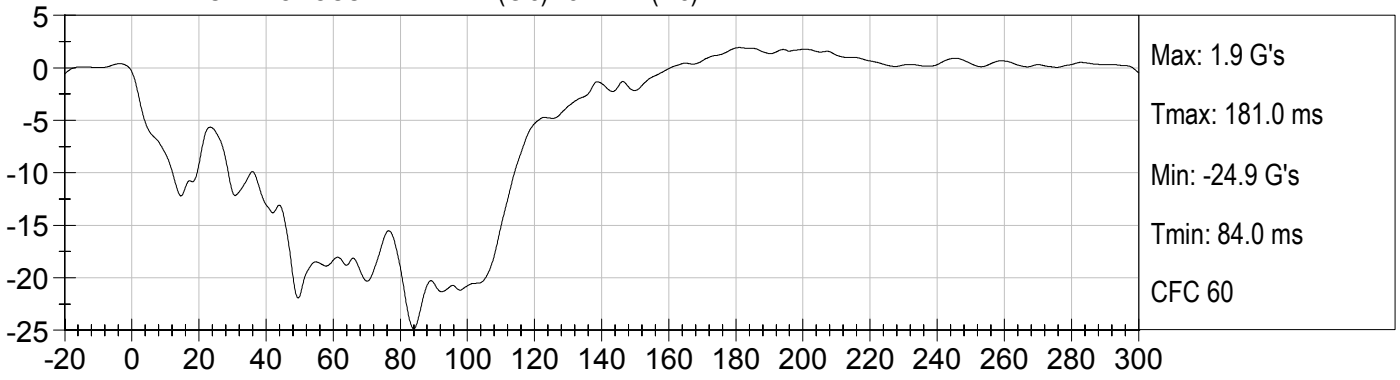
LRP LEFT LOWER ASIS FX (N) vs TIME (ms)



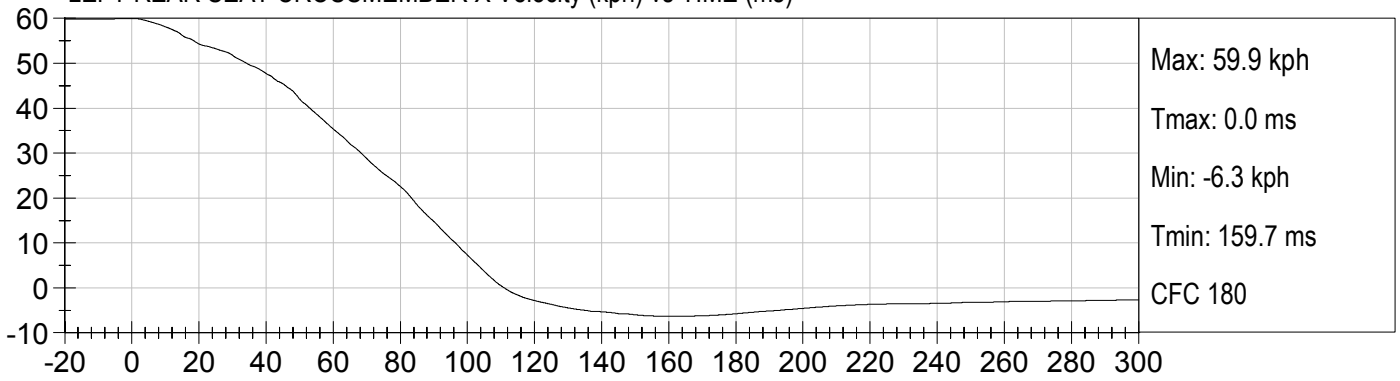
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

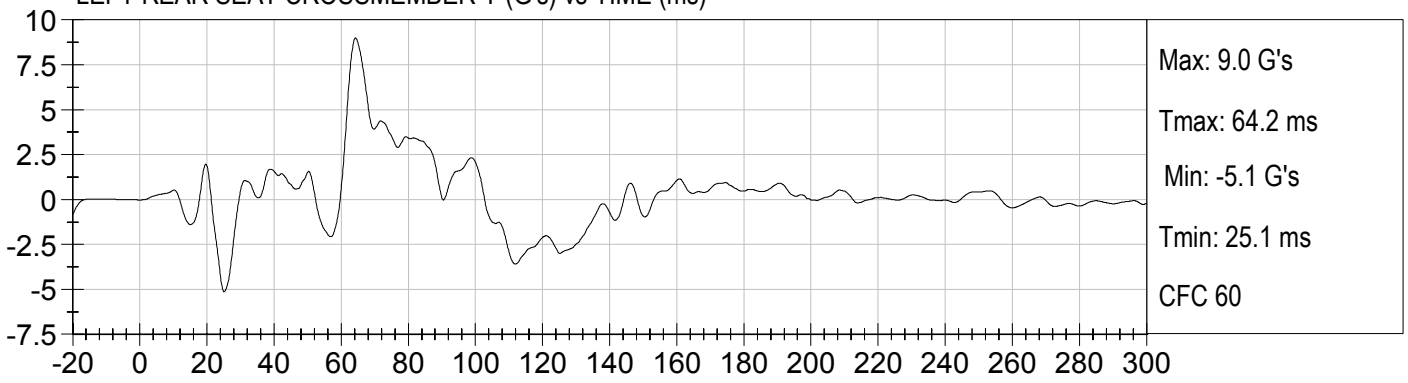
LEFT REAR SEAT CROSSMEMBER X (G's) vs TIME (ms)



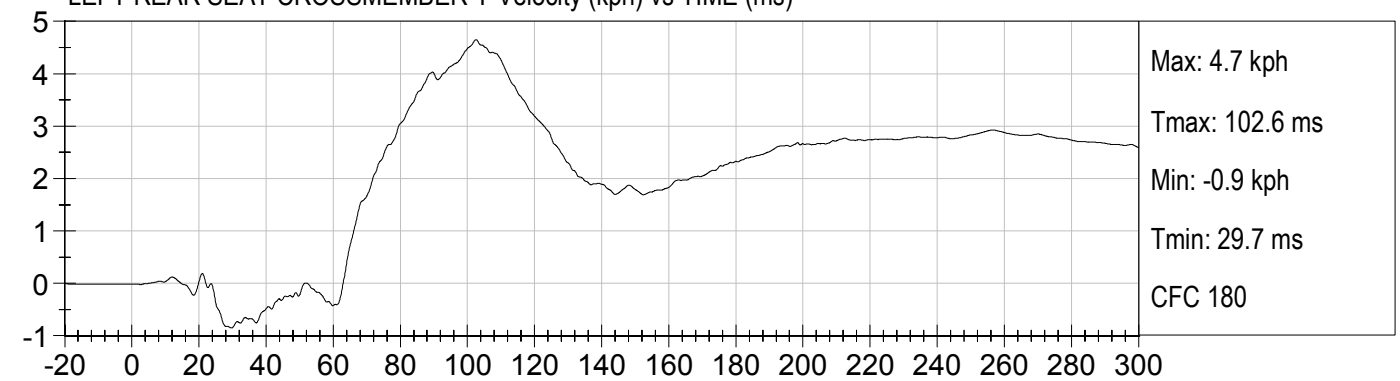
LEFT REAR SEAT CROSSMEMBER X Velocity (kph) vs TIME (ms)



LEFT REAR SEAT CROSSMEMBER Y (G's) vs TIME (ms)



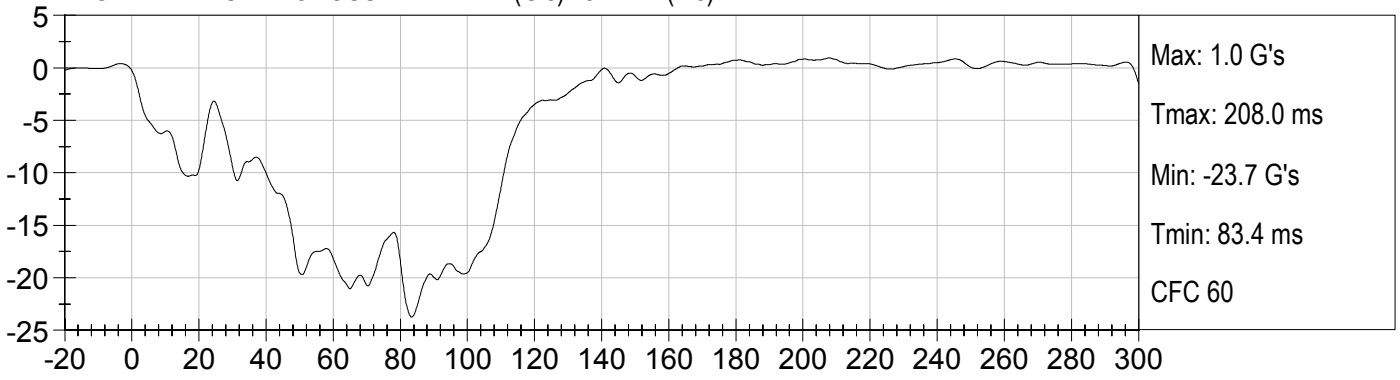
LEFT REAR SEAT CROSSMEMBER Y Velocity (kph) vs TIME (ms)



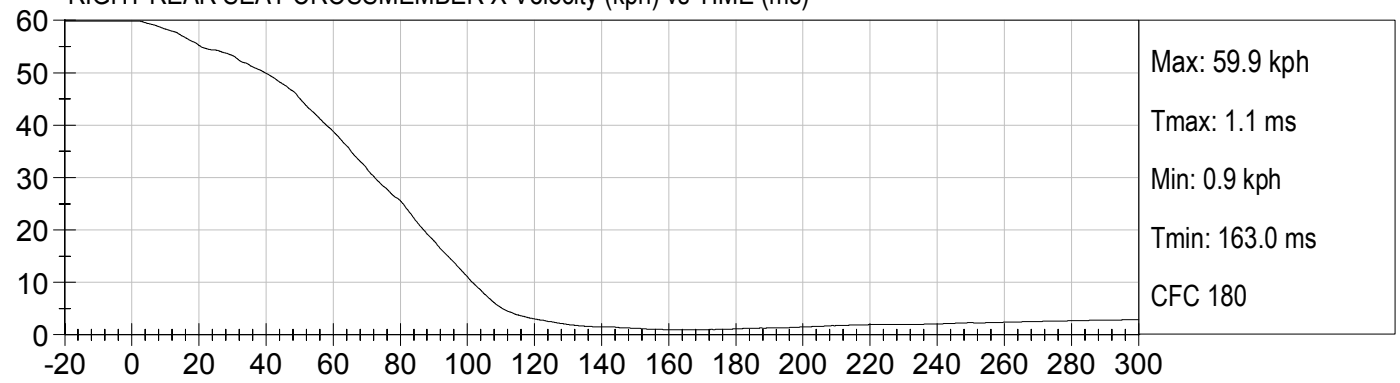
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

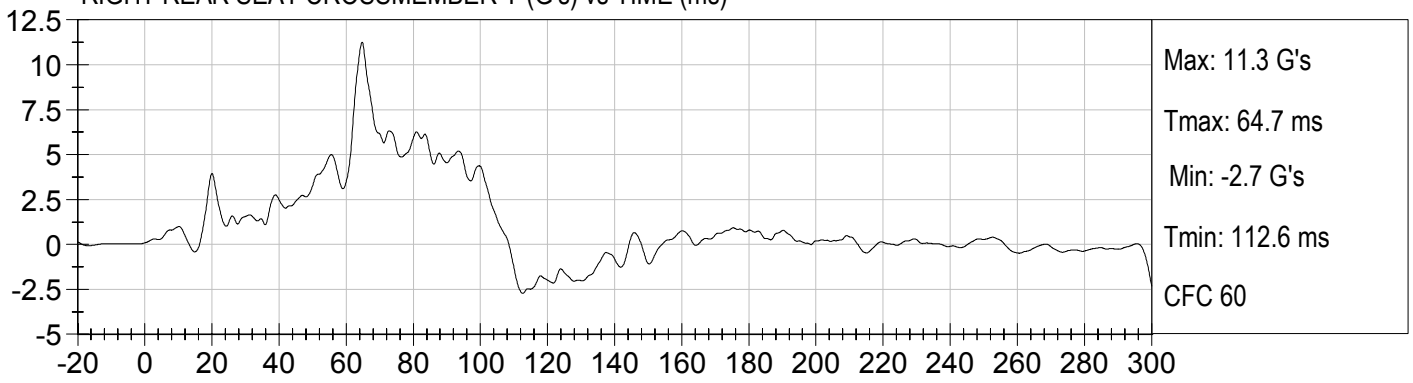
RIGHT REAR SEAT CROSSMEMBER X (G's) vs TIME (ms)



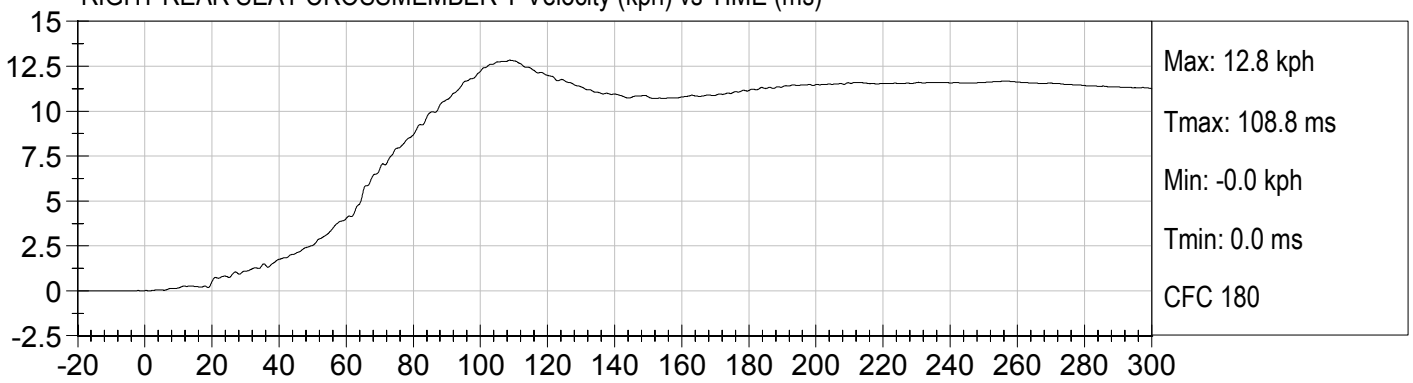
RIGHT REAR SEAT CROSSMEMBER X Velocity (kph) vs TIME (ms)



RIGHT REAR SEAT CROSSMEMBER Y (G's) vs TIME (ms)



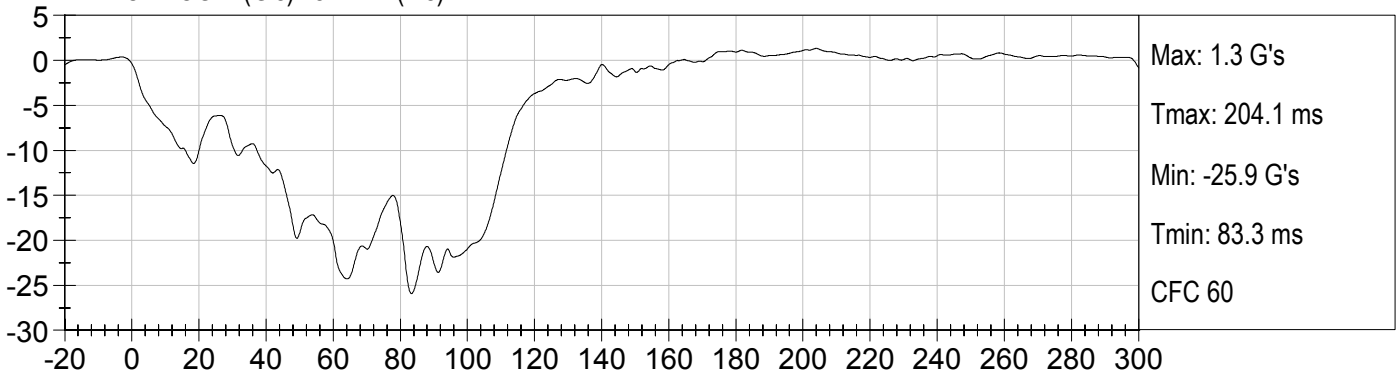
RIGHT REAR SEAT CROSSMEMBER Y Velocity (kph) vs TIME (ms)



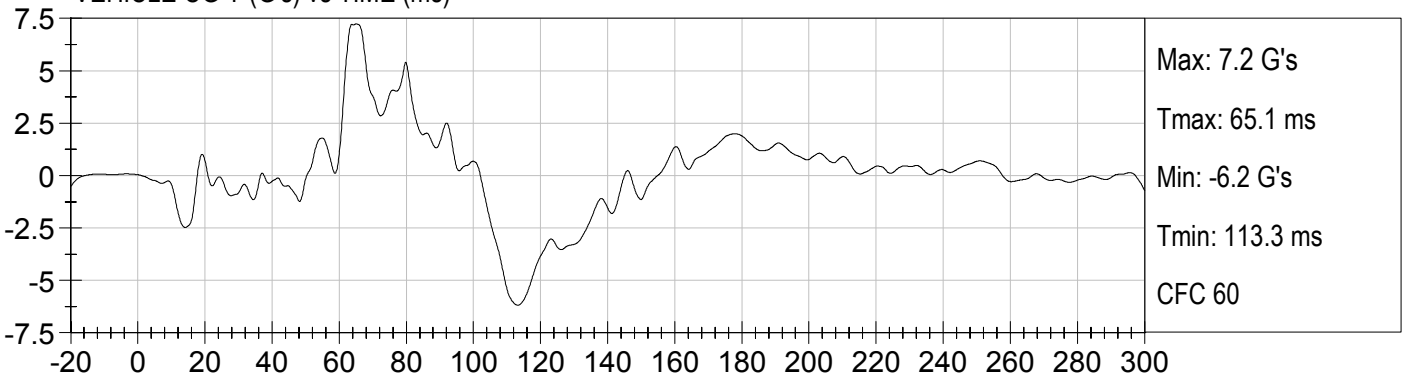
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

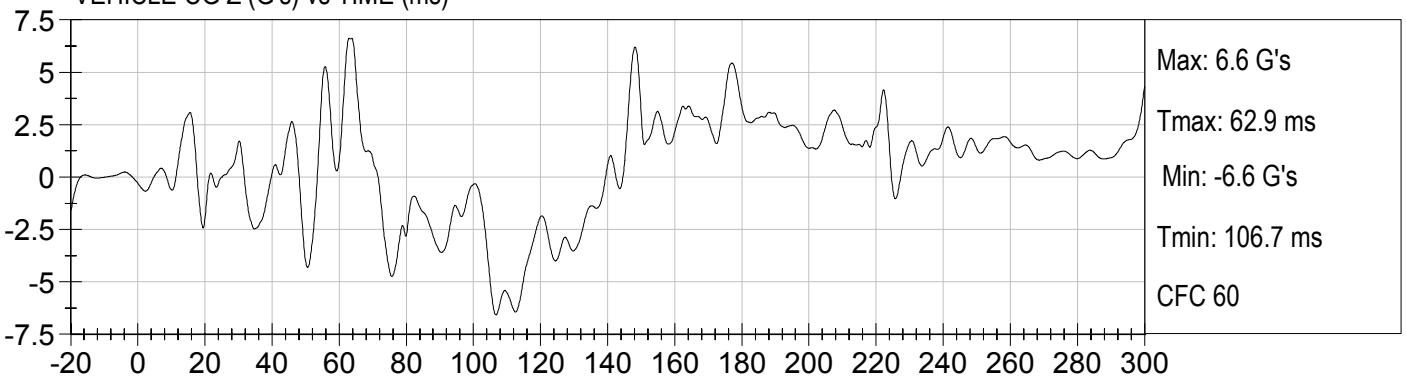
VEHICLE CG X (G's) vs TIME (ms)



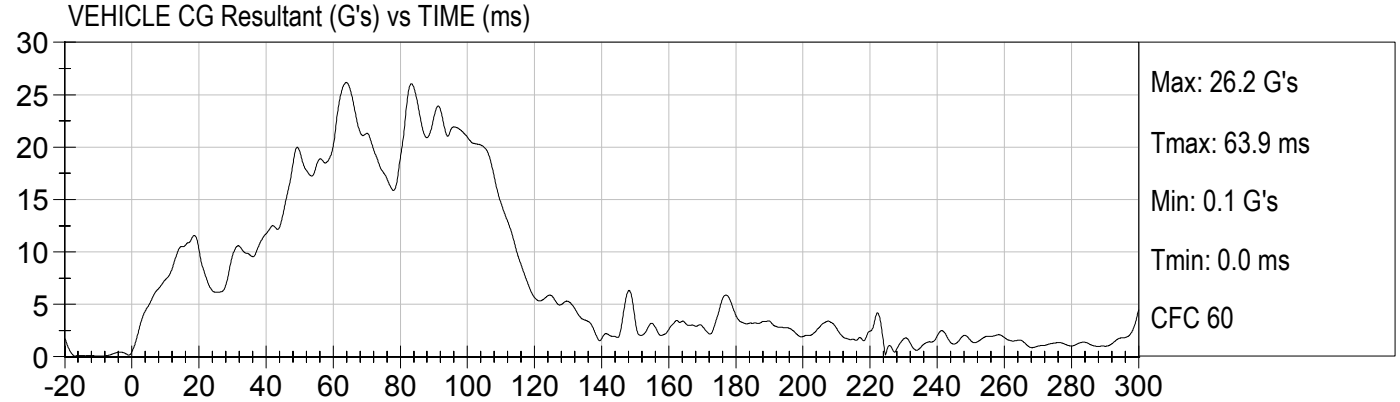
VEHICLE CG Y (G's) vs TIME (ms)

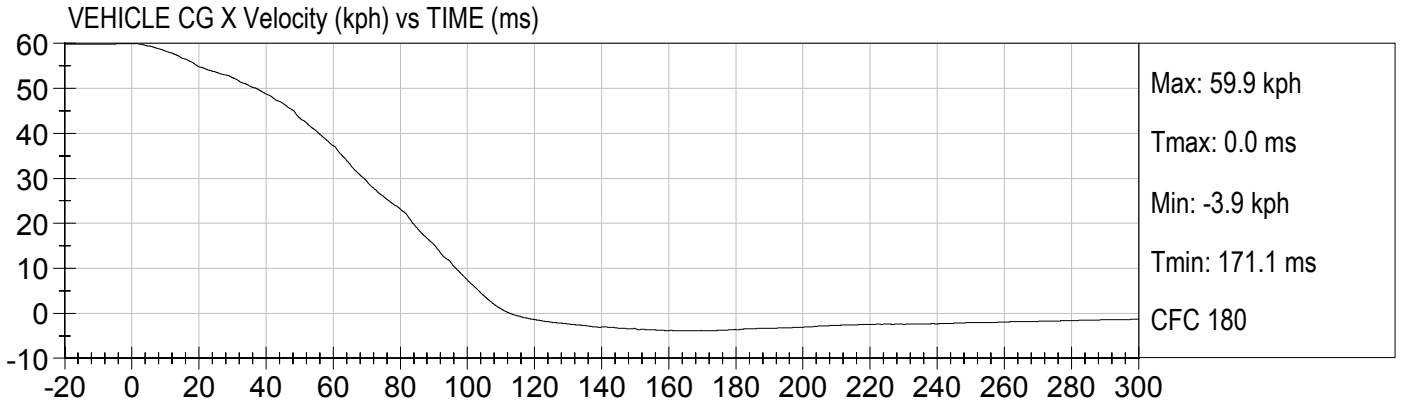


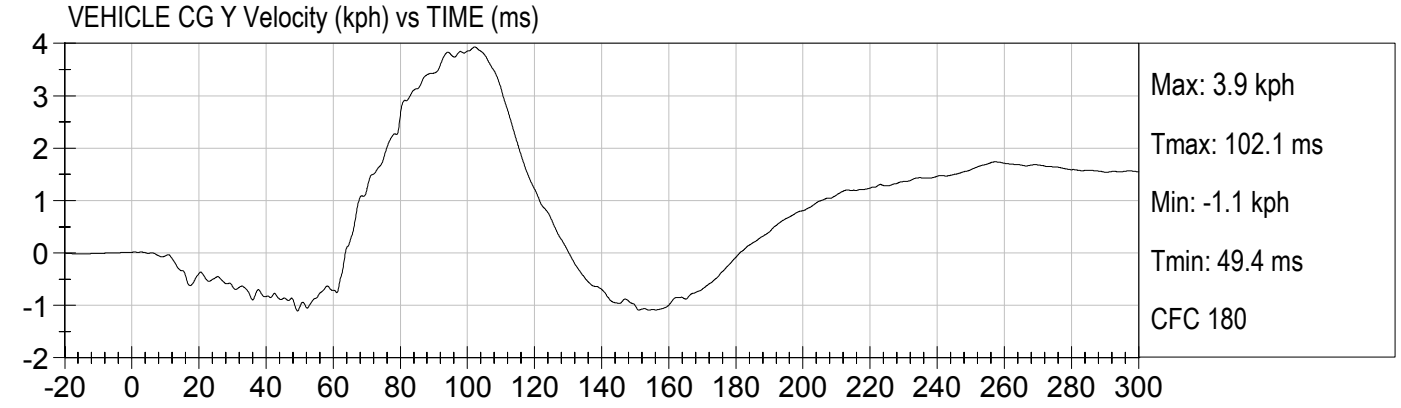
VEHICLE CG Z (G's) vs TIME (ms)

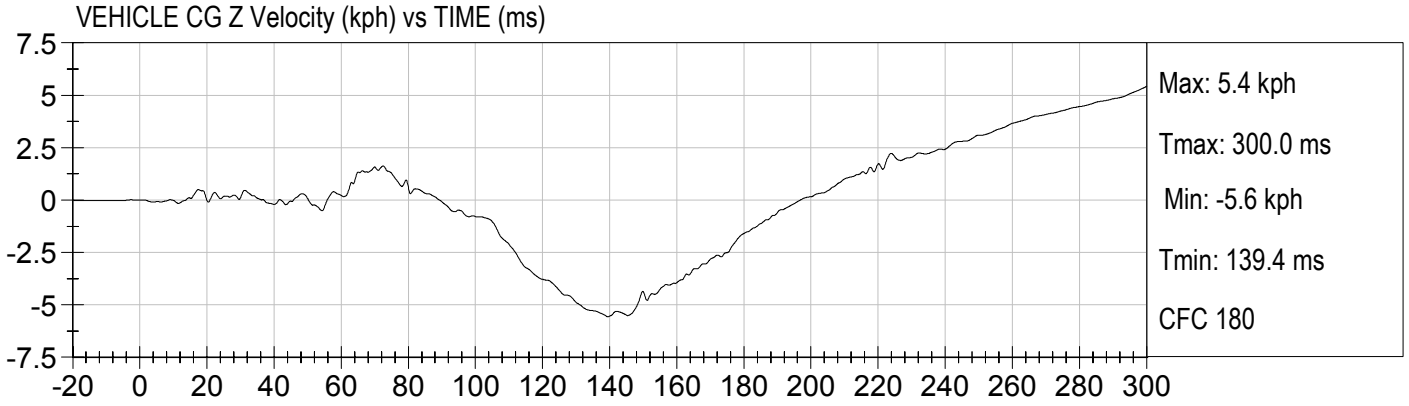


VEHICLE CG Resultant (G's) vs TIME (ms)




VEHICLE CG X Velocity (kph) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 59.9 kph
Tmax: 0.0 ms
Min: -3.9 kph
Tmin: 171.1 ms
CFC 180

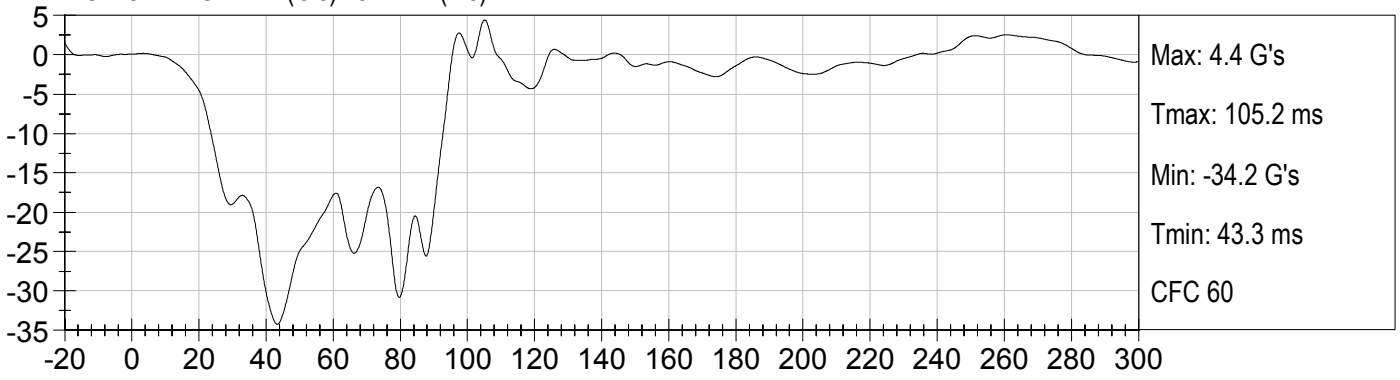

VEHICLE CG Y Velocity (kph) vs TIME (ms)
4
3
2
1
0
-1
-2
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 3.9 kph
Tmax: 102.1 ms
Min: -1.1 kph
Tmin: 49.4 ms
CFC 180


VEHICLE CG Z Velocity (kph) vs TIME (ms)
7.5
5
2.5
0
-2.5
-5
-7.5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 5.4 kph
Tmax: 300.0 ms
Min: -5.6 kph
Tmin: 139.4 ms
CFC 180

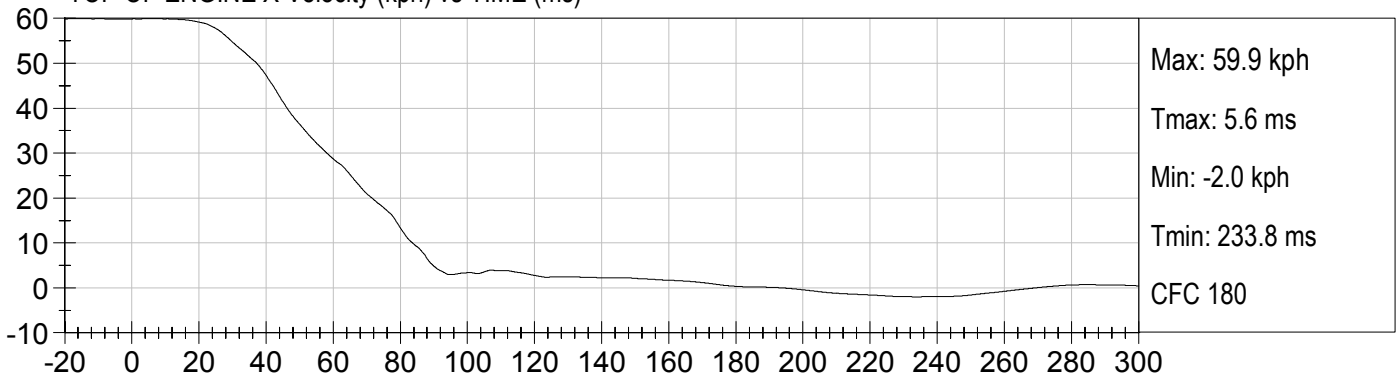
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

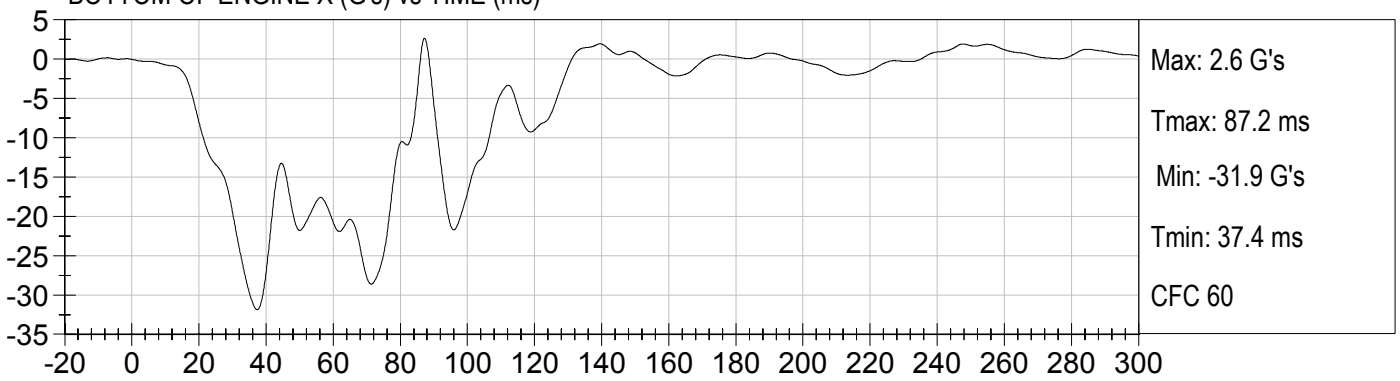
TOP OF ENGINE X (G's) vs TIME (ms)



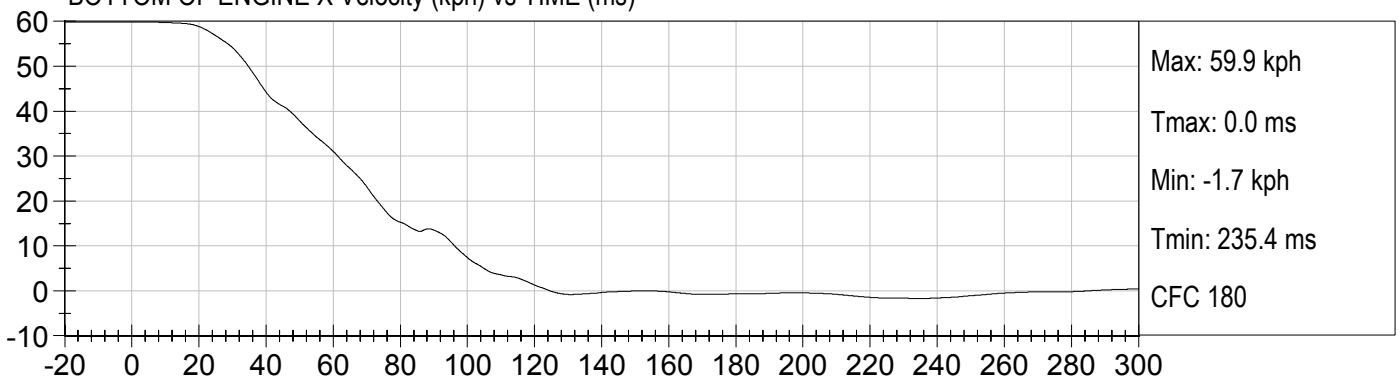
TOP OF ENGINE X Velocity (kph) vs TIME (ms)



BOTTOM OF ENGINE X (G's) vs TIME (ms)



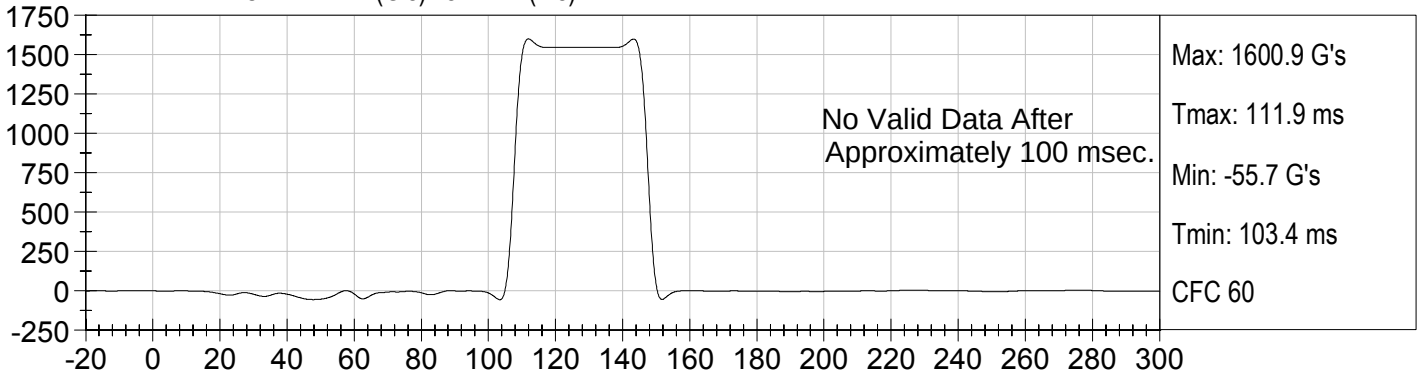
BOTTOM OF ENGINE X Velocity (kph) vs TIME (ms)



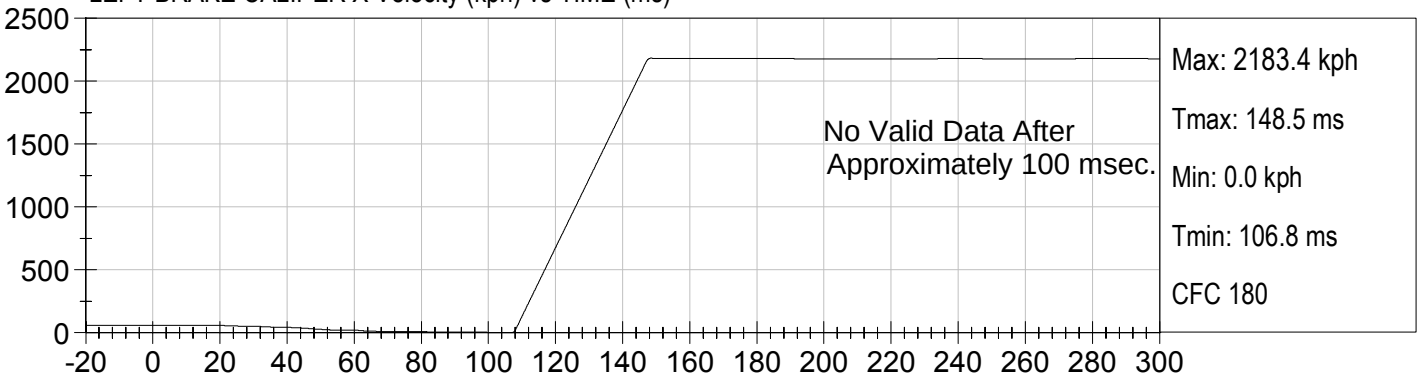
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

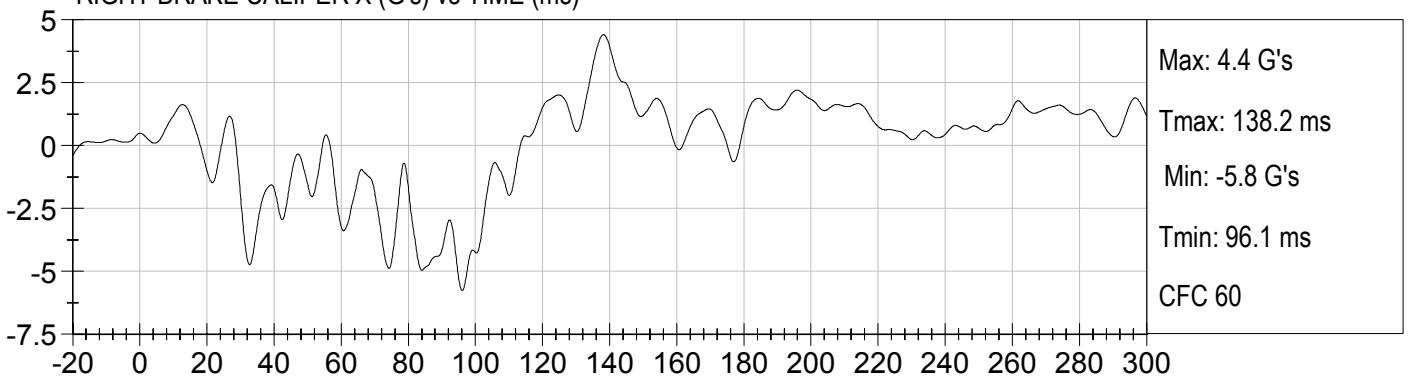
LEFT BRAKE CALIPER X (G's) vs TIME (ms)



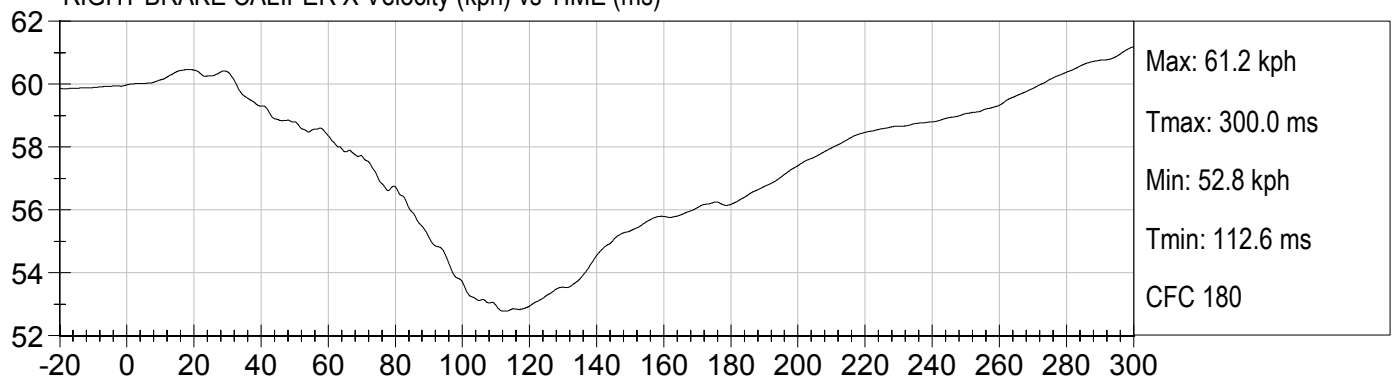
LEFT BRAKE CALIPER X Velocity (kph) vs TIME (ms)



RIGHT BRAKE CALIPER X (G's) vs TIME (ms)



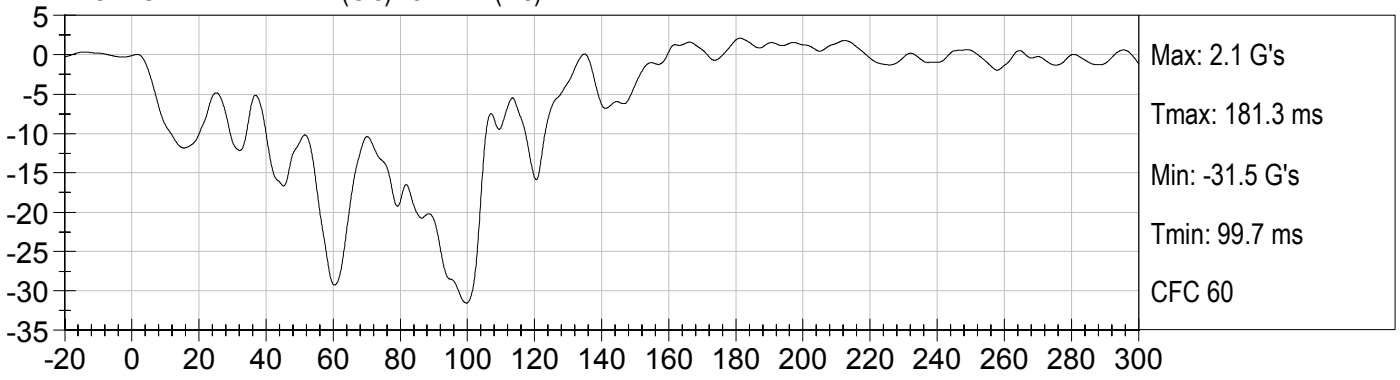
RIGHT BRAKE CALIPER X Velocity (kph) vs TIME (ms)



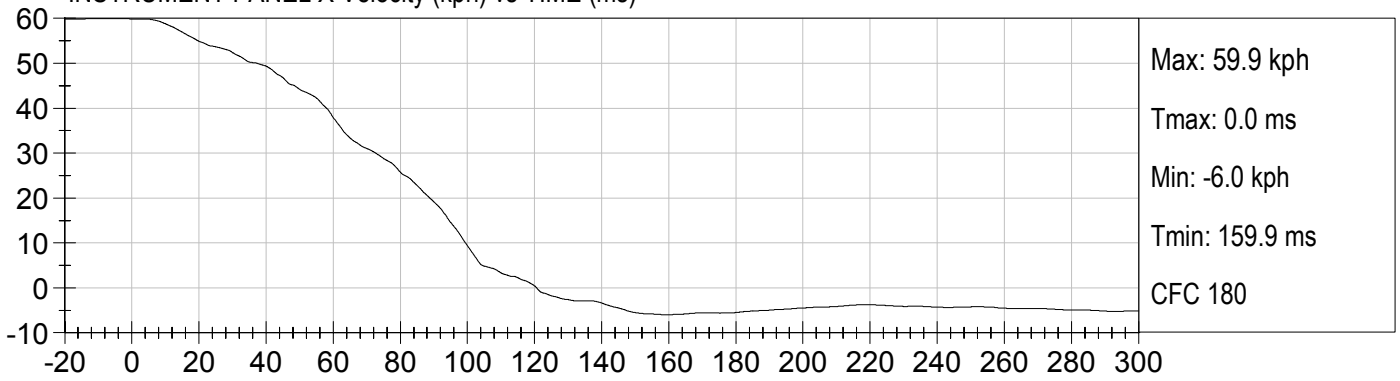
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

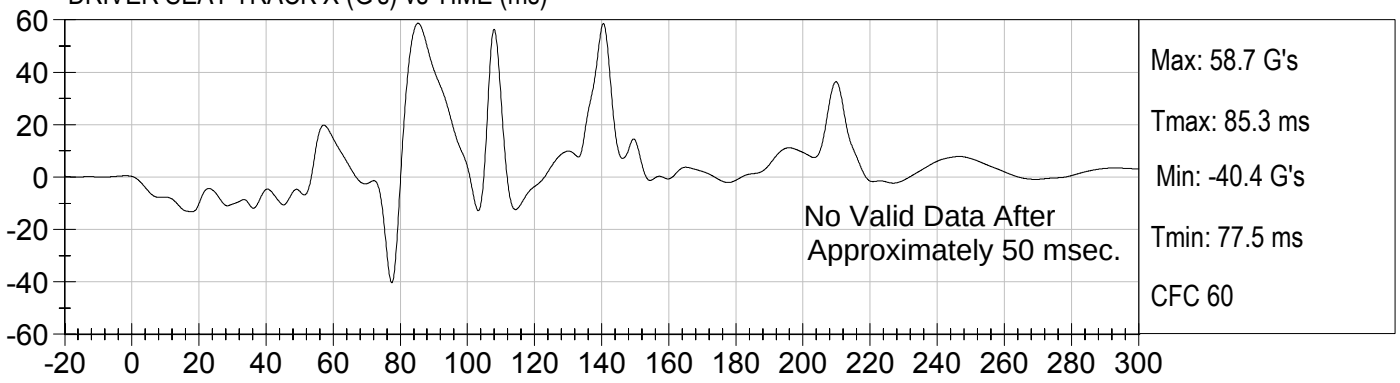
INSTRUMENT PANEL X (G's) vs TIME (ms)



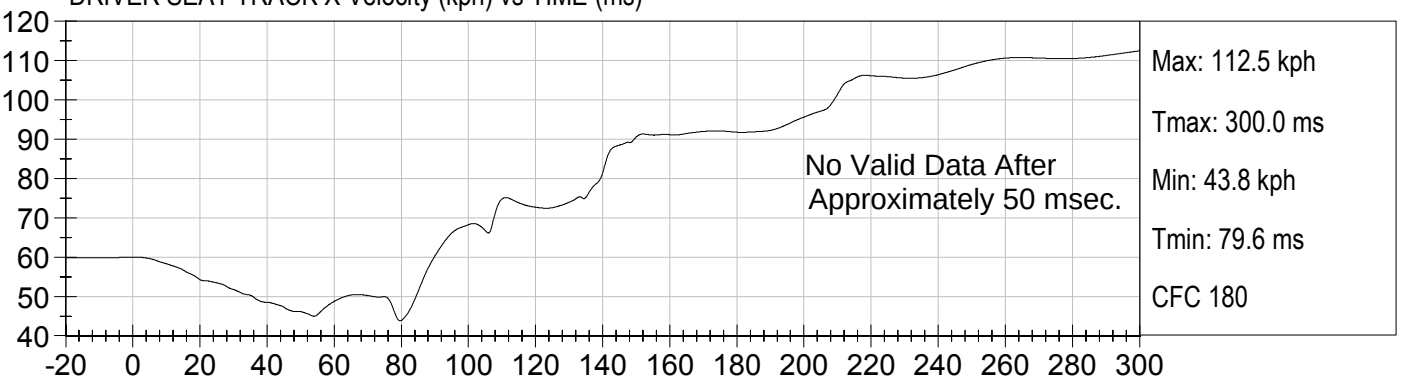
INSTRUMENT PANEL X Velocity (kph) vs TIME (ms)



DRIVER SEAT TRACK X (G's) vs TIME (ms)



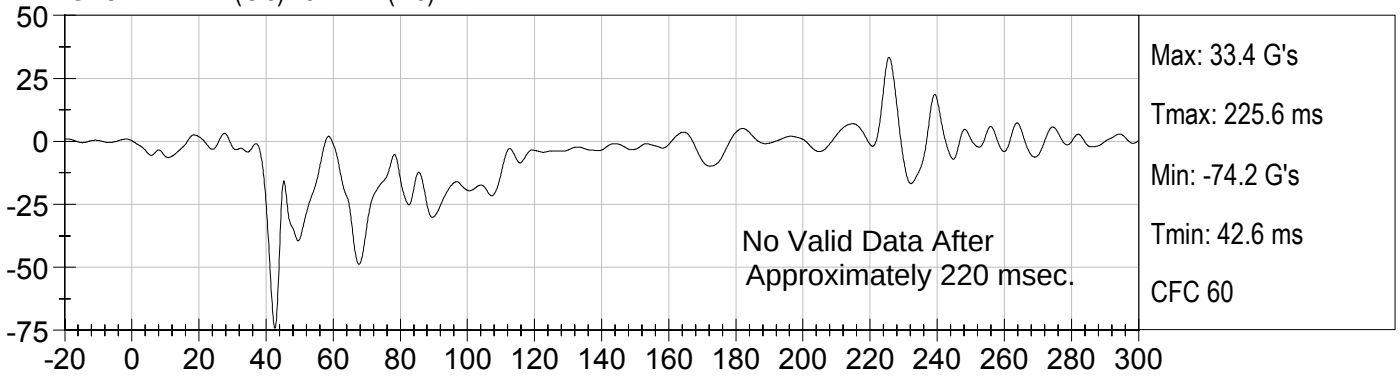
DRIVER SEAT TRACK X Velocity (kph) vs TIME (ms)



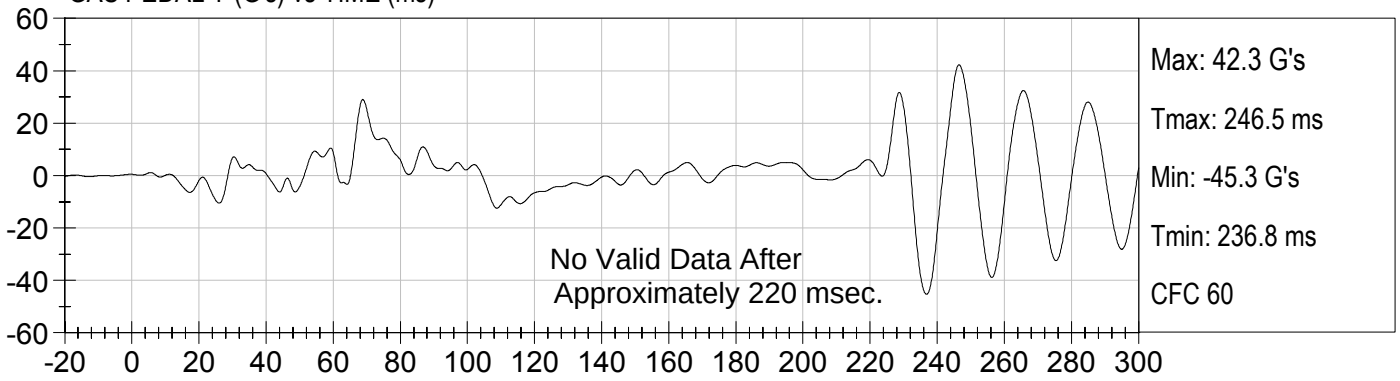
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

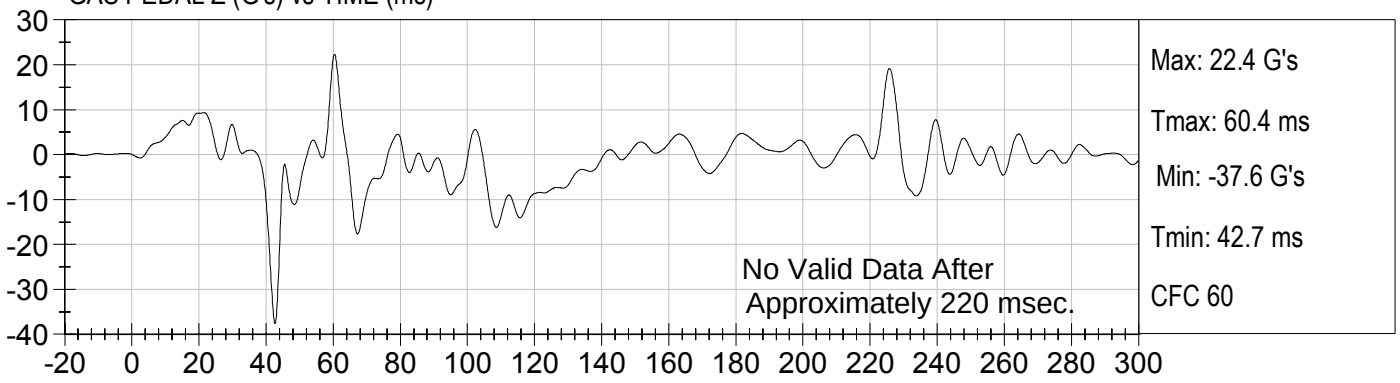
GAS PEDAL X (G's) vs TIME (ms)



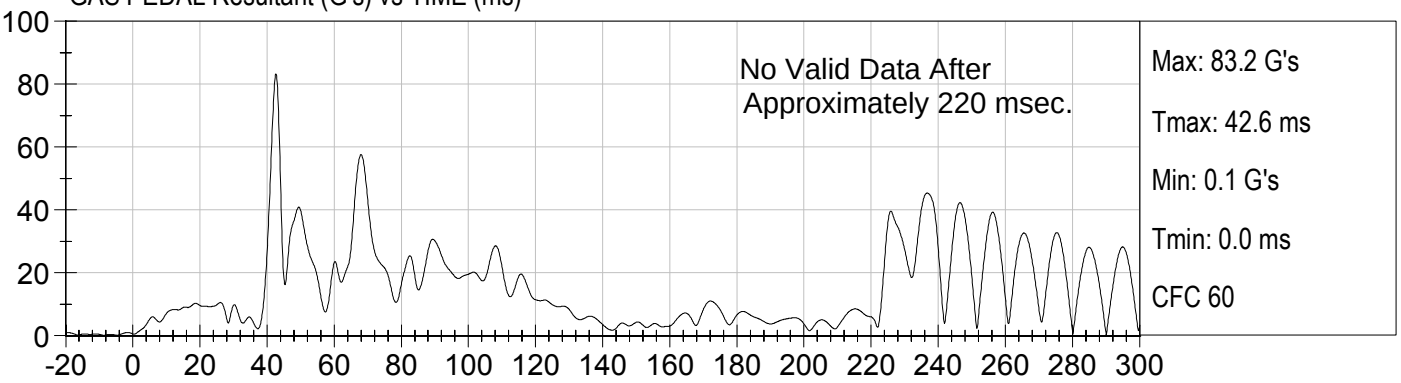
GAS PEDAL Y (G's) vs TIME (ms)



GAS PEDAL Z (G's) vs TIME (ms)

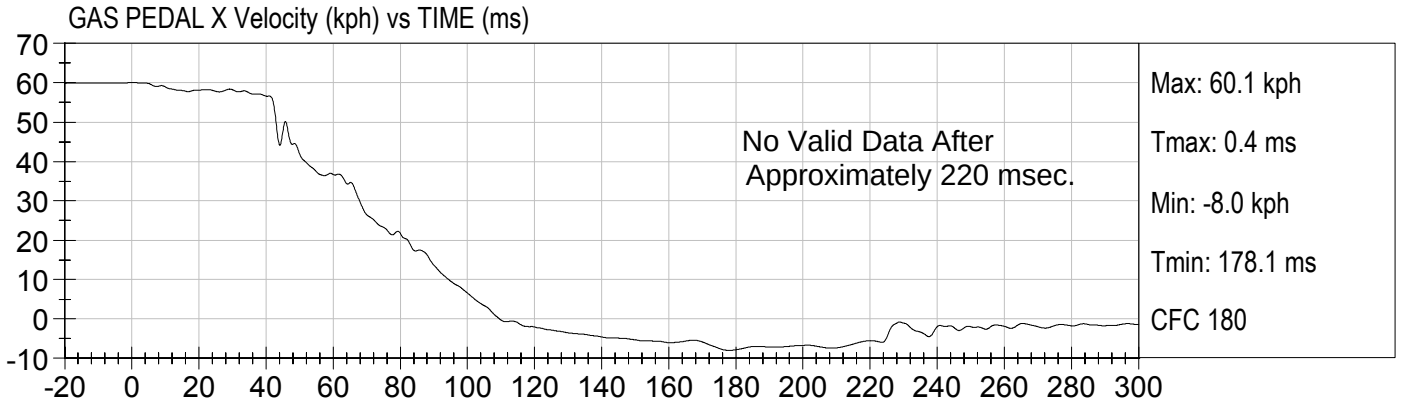


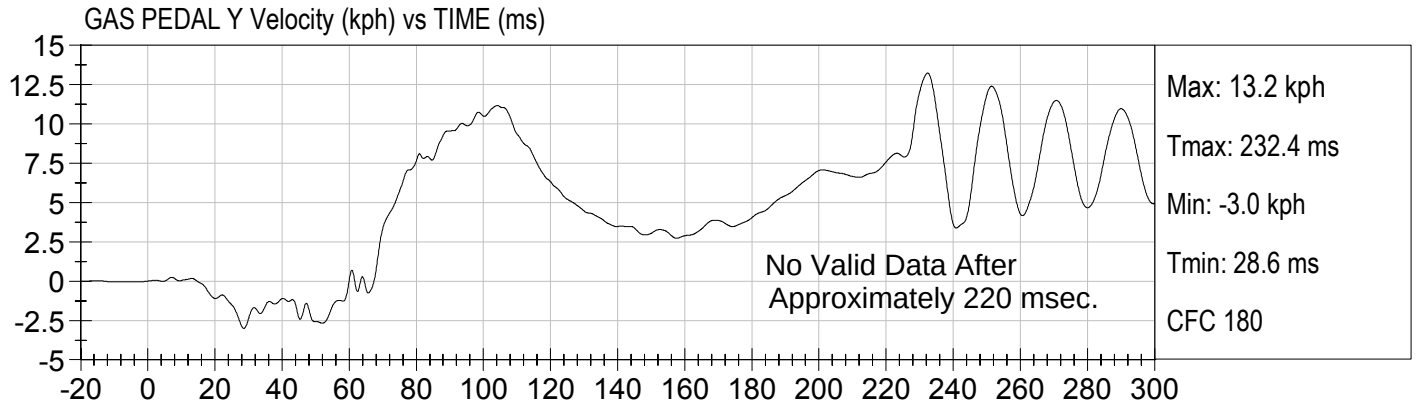
GAS PEDAL Resultant (G's) vs TIME (ms)

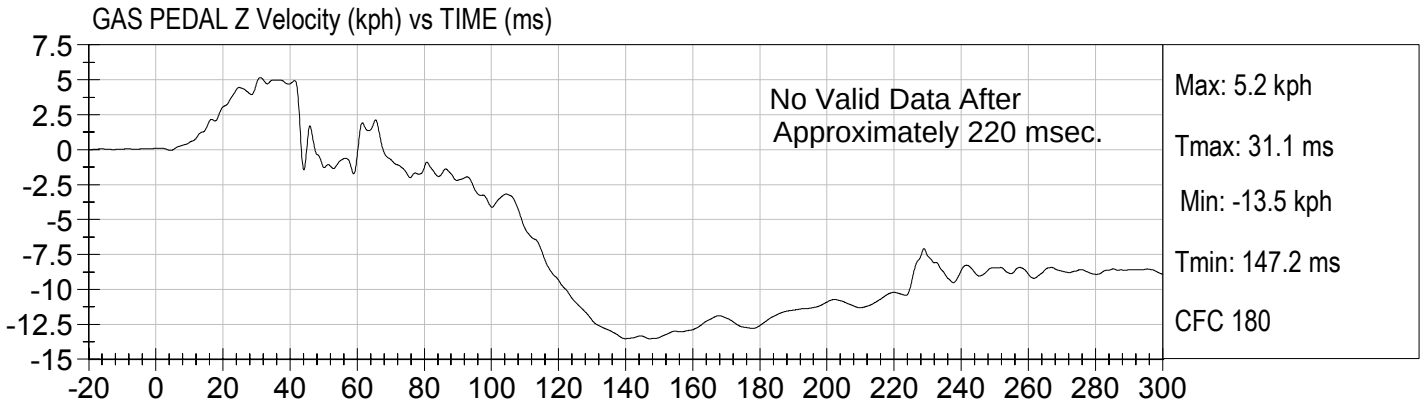


NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)



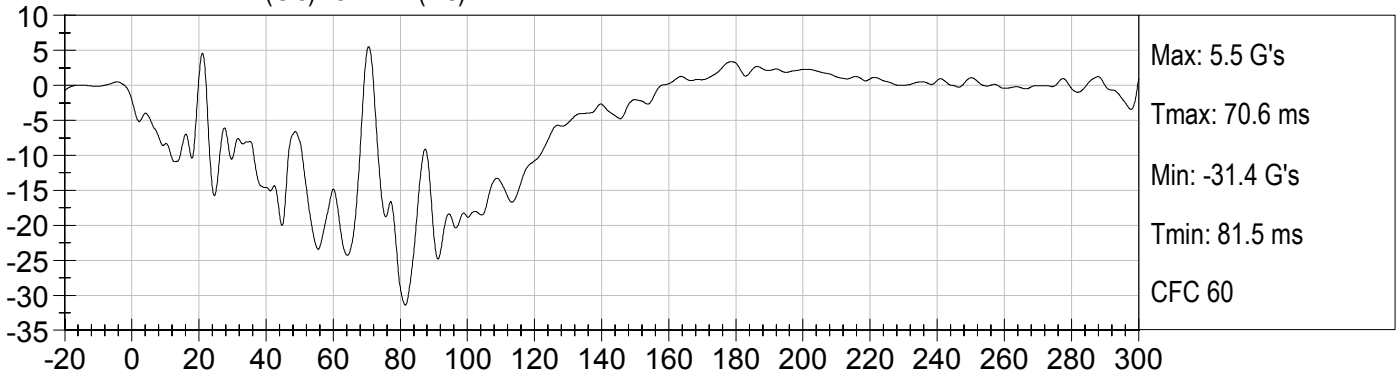




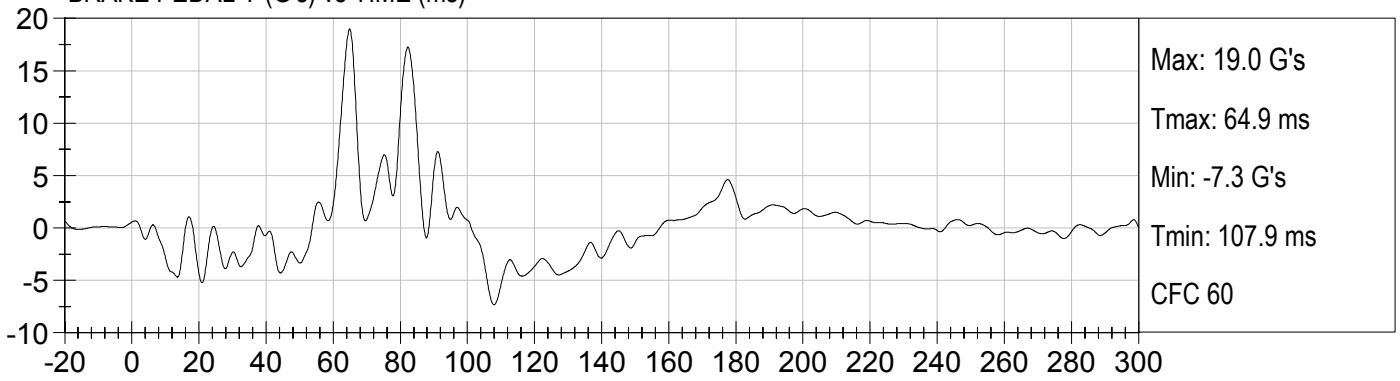
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

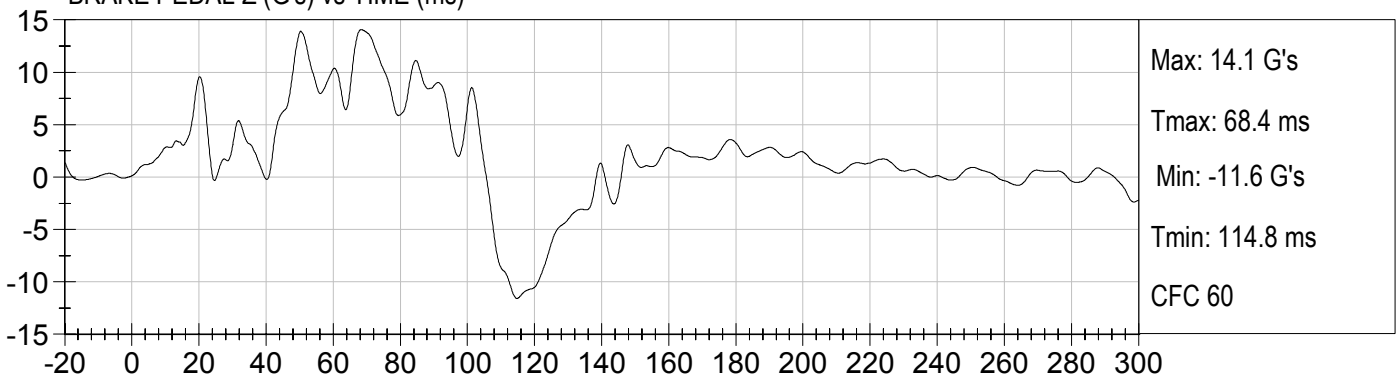
BRAKE PEDAL X (G's) vs TIME (ms)



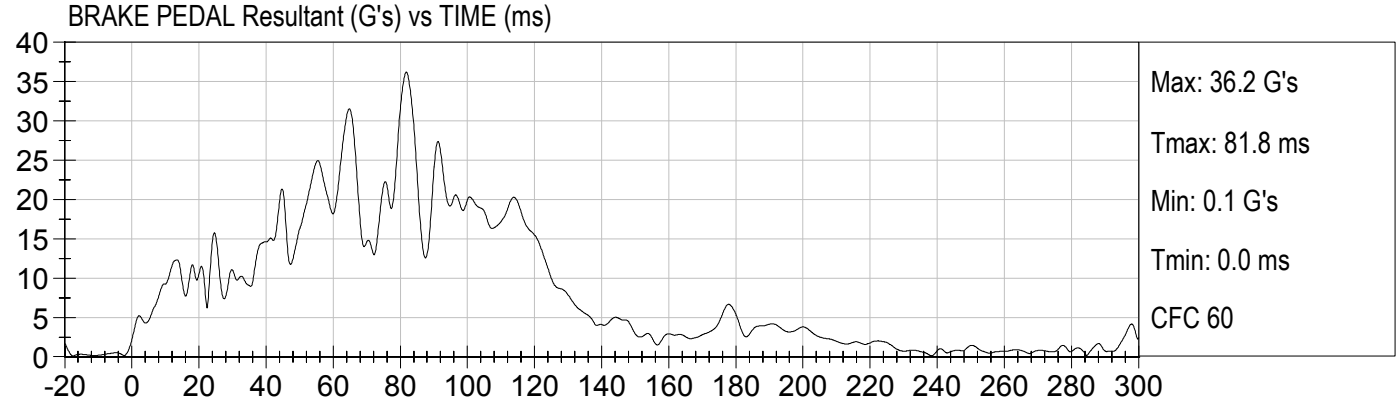
BRAKE PEDAL Y (G's) vs TIME (ms)



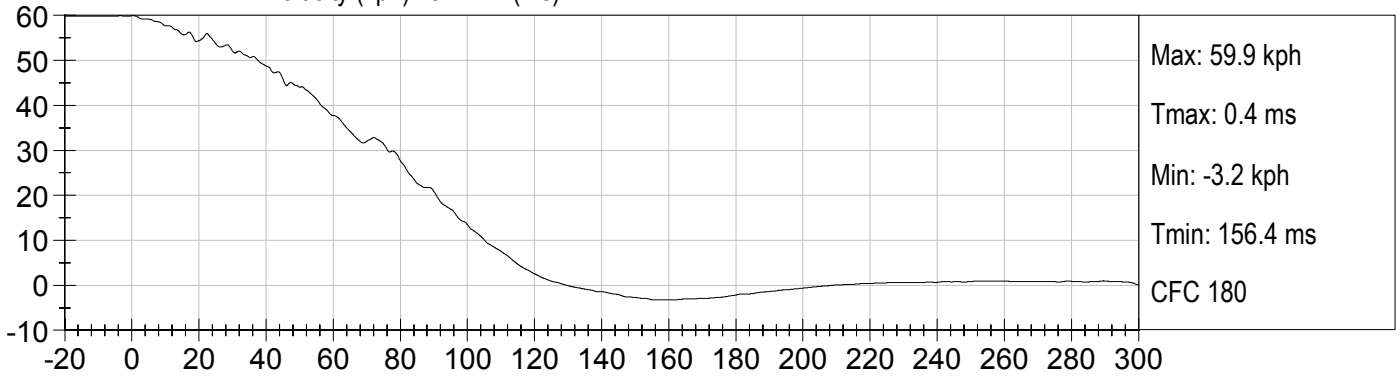
BRAKE PEDAL Z (G's) vs TIME (ms)



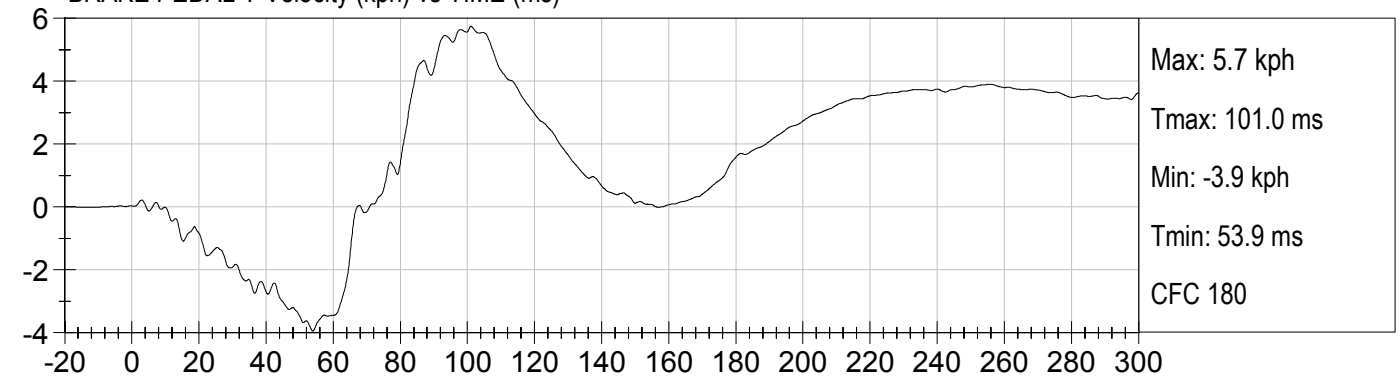
BRAKE PEDAL Resultant (G's) vs TIME (ms)



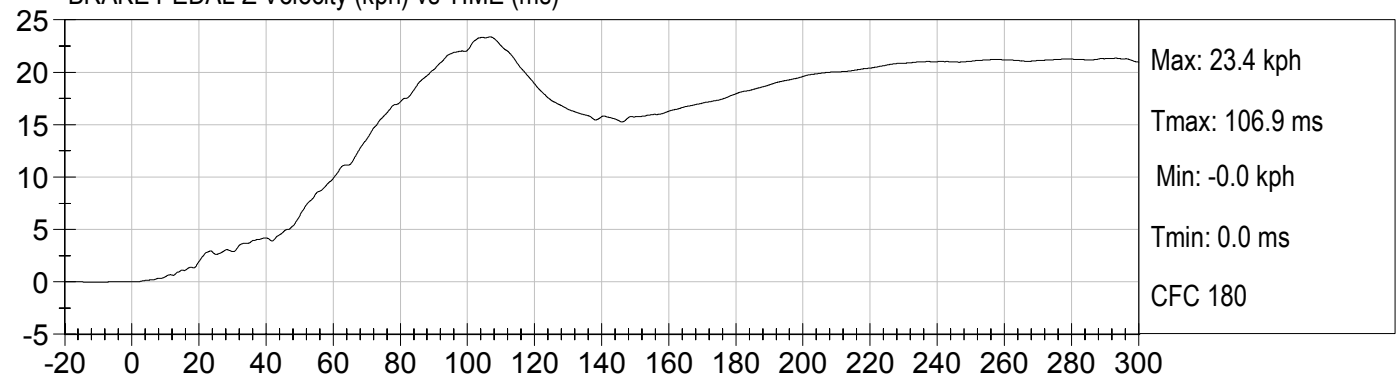
BRAKE PEDAL X Velocity (kph) vs TIME (ms)



BRAKE PEDAL Y Velocity (kph) vs TIME (ms)

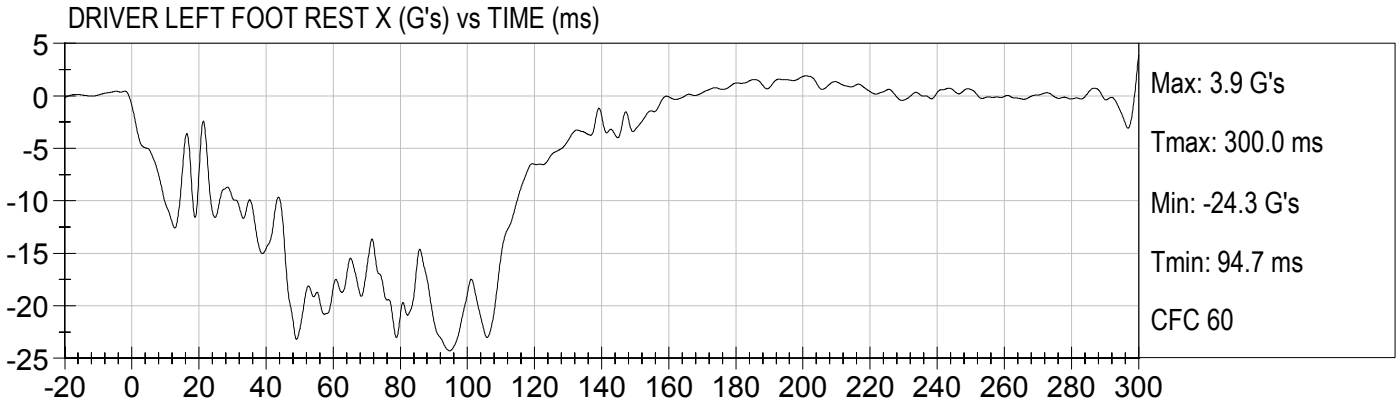


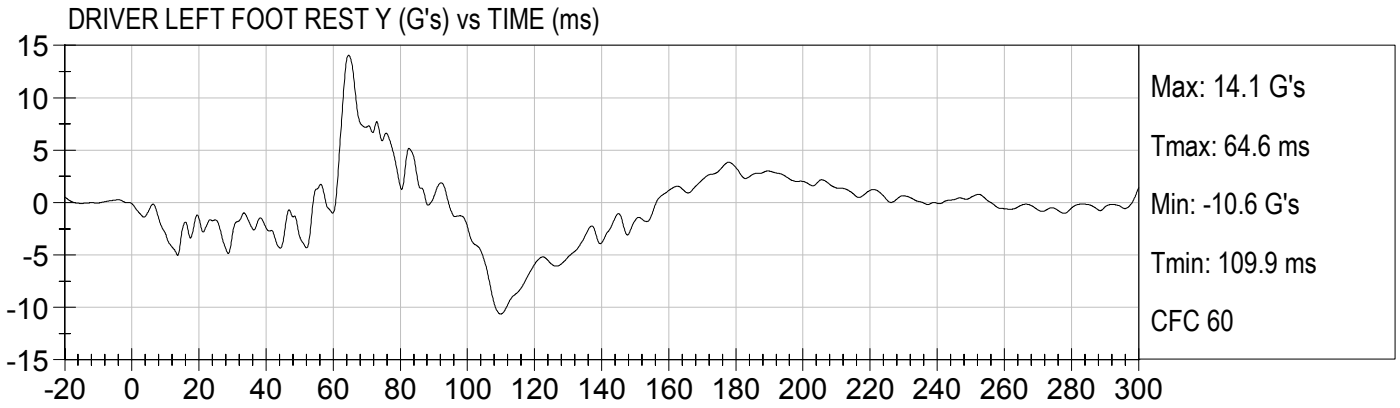
BRAKE PEDAL Z Velocity (kph) vs TIME (ms)

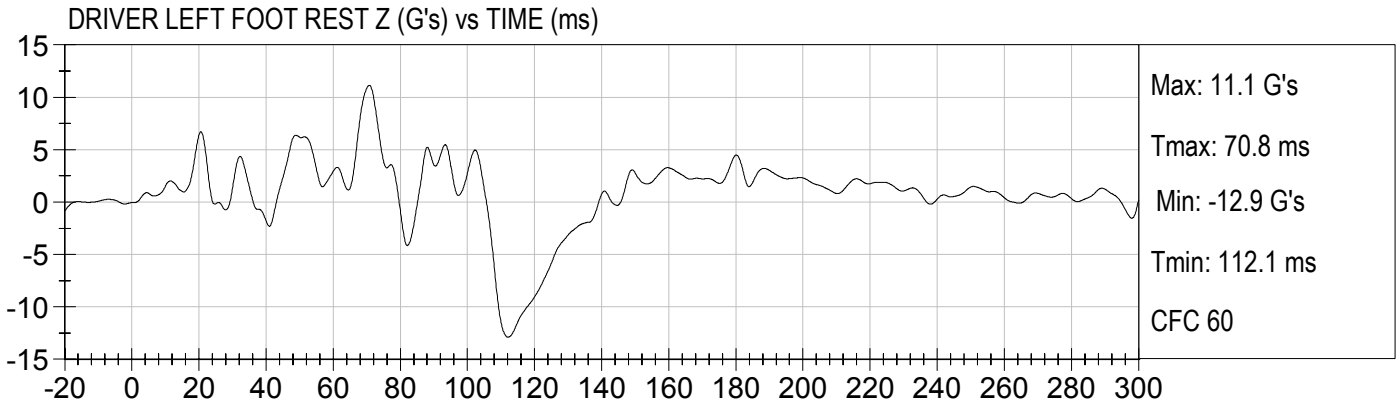


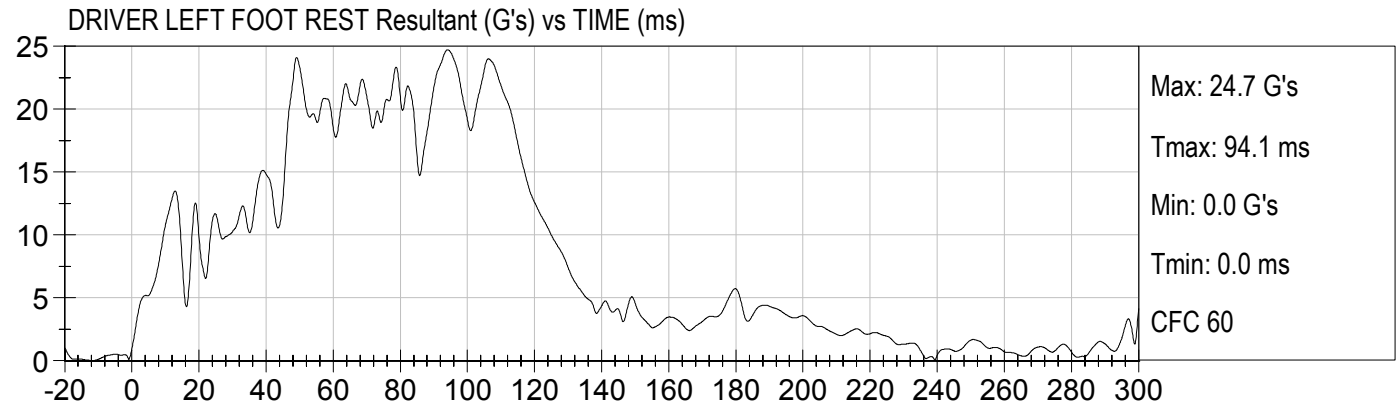
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

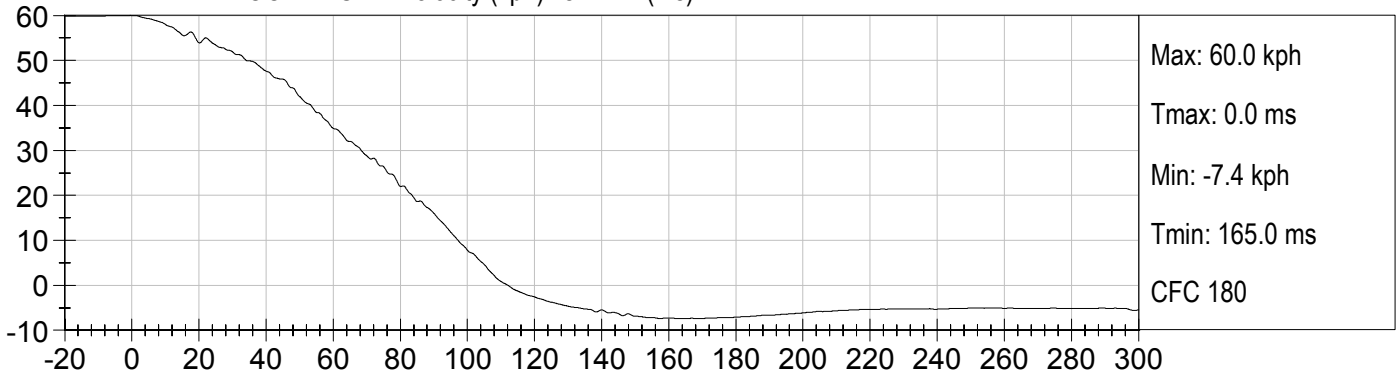




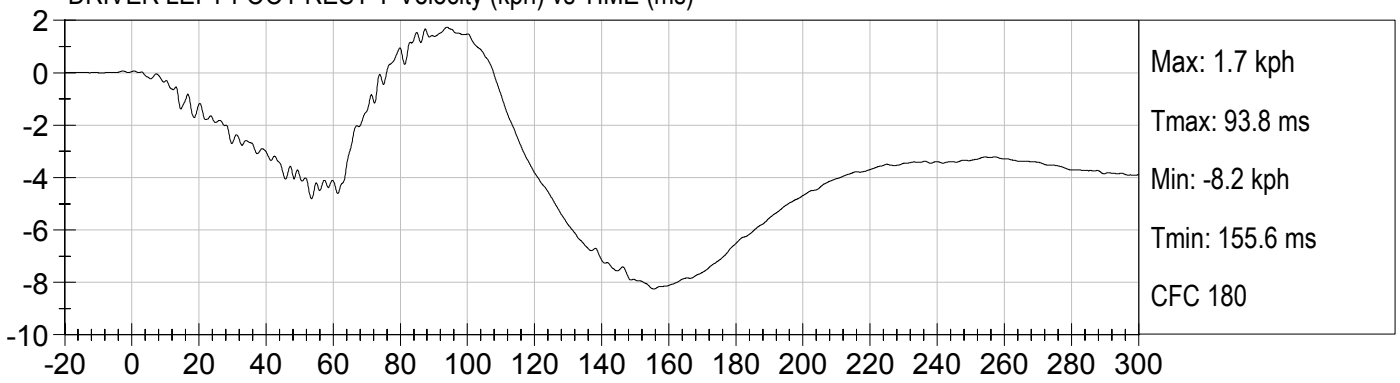




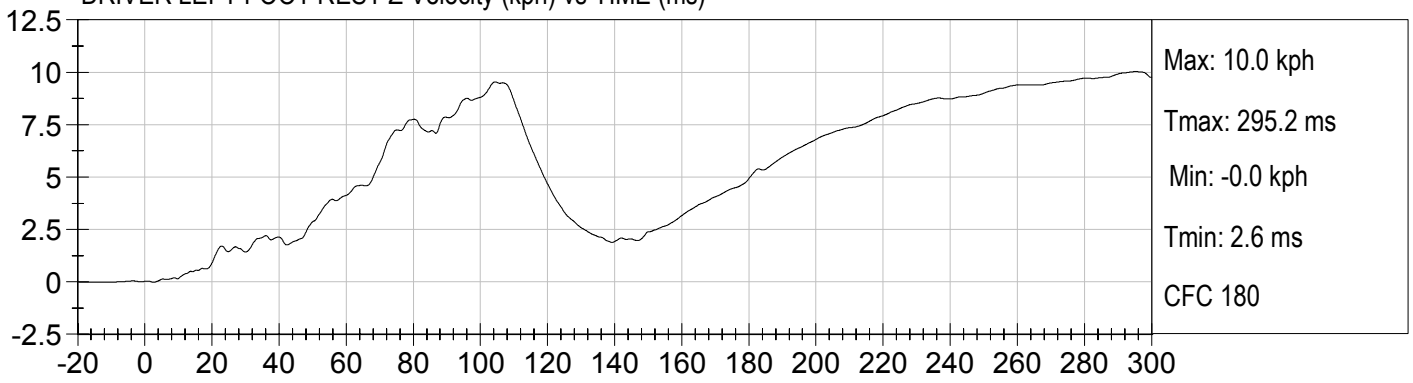
DRIVER LEFT FOOT REST X Velocity (kph) vs TIME (ms)



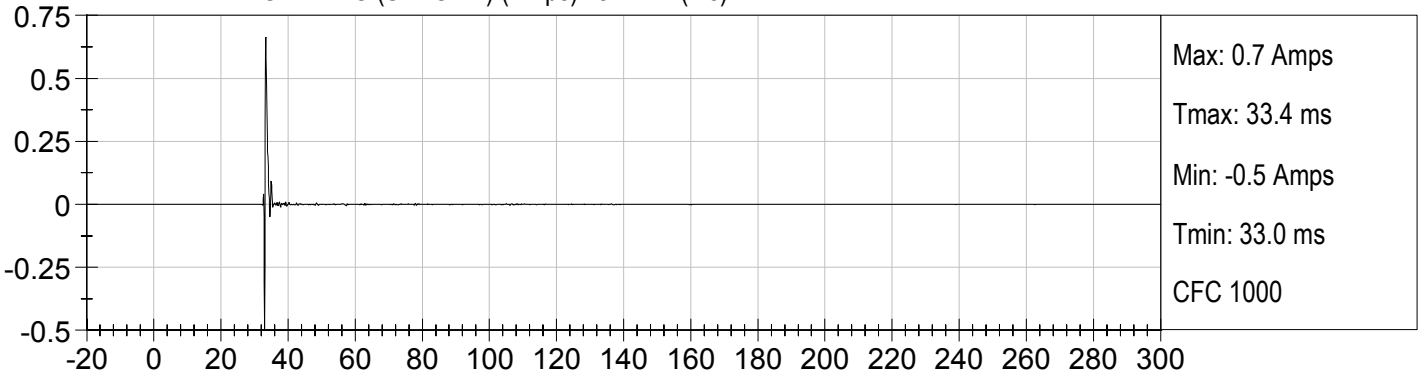
DRIVER LEFT FOOT REST Y Velocity (kph) vs TIME (ms)



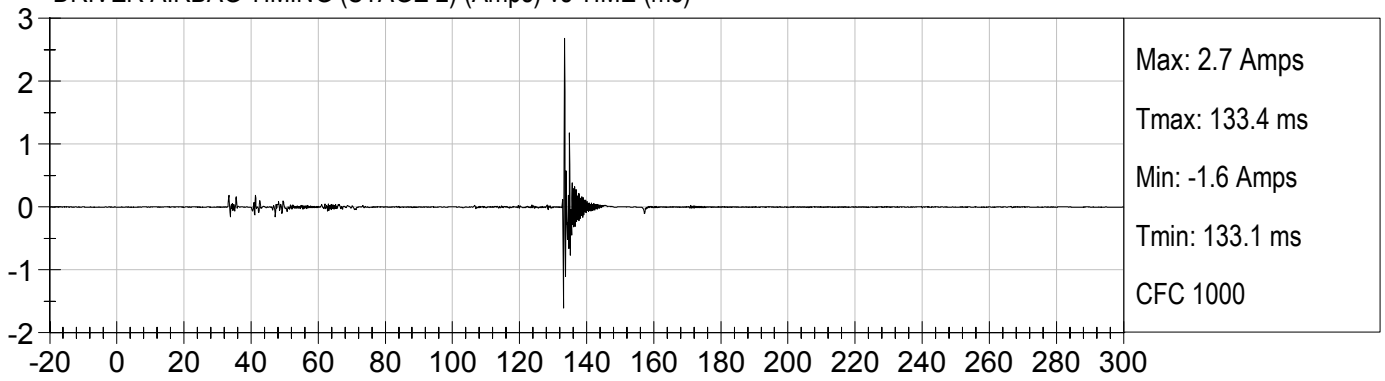
DRIVER LEFT FOOT REST Z Velocity (kph) vs TIME (ms)



DRIVER AIRBAG TIMING (STAGE 1) (Amps) vs TIME (ms)



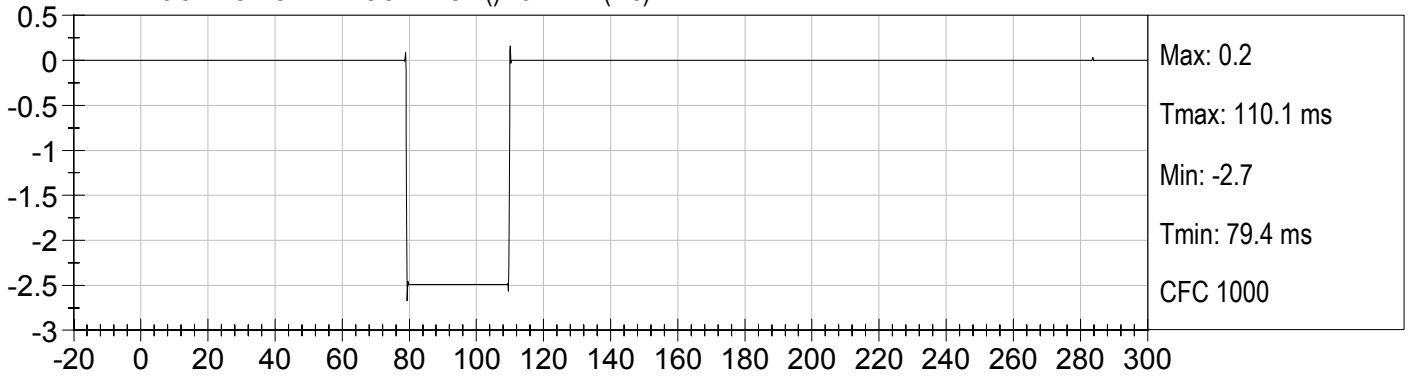
DRIVER AIRBAG TIMING (STAGE 2) (Amps) vs TIME (ms)



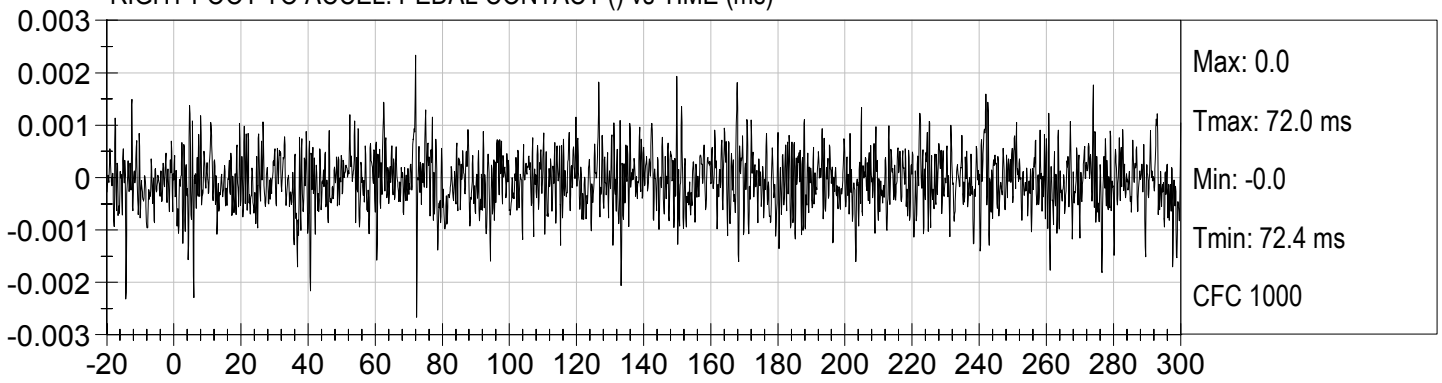
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

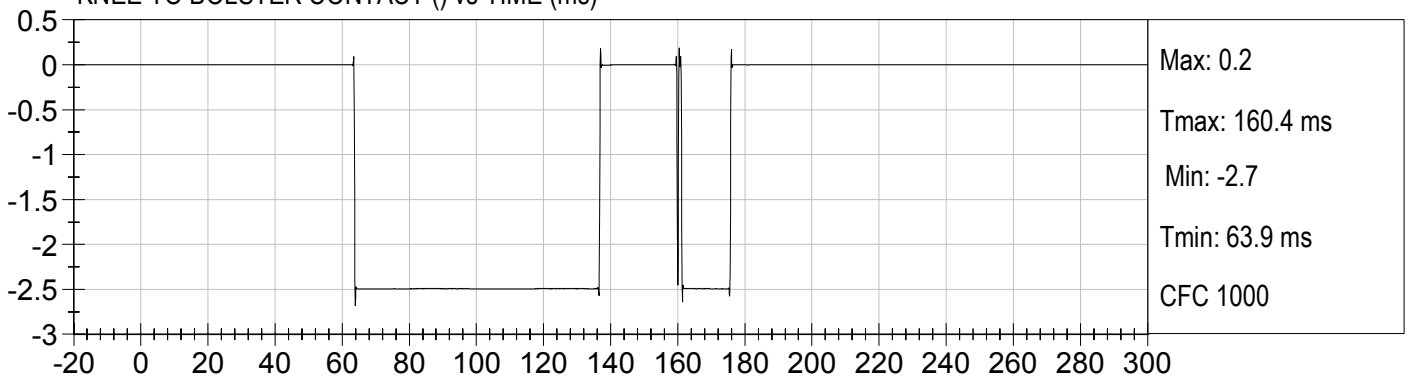
LEFT FOOT TO TOEPAN CONTACT () vs TIME (ms)



RIGHT FOOT TO ACCEL. PEDAL CONTACT () vs TIME (ms)



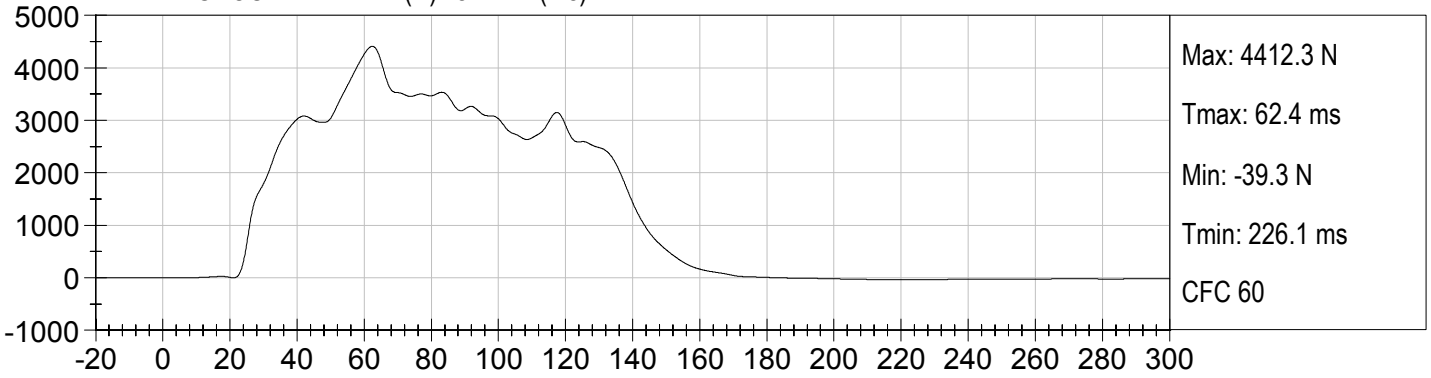
KNEE TO BOLSTER CONTACT () vs TIME (ms)



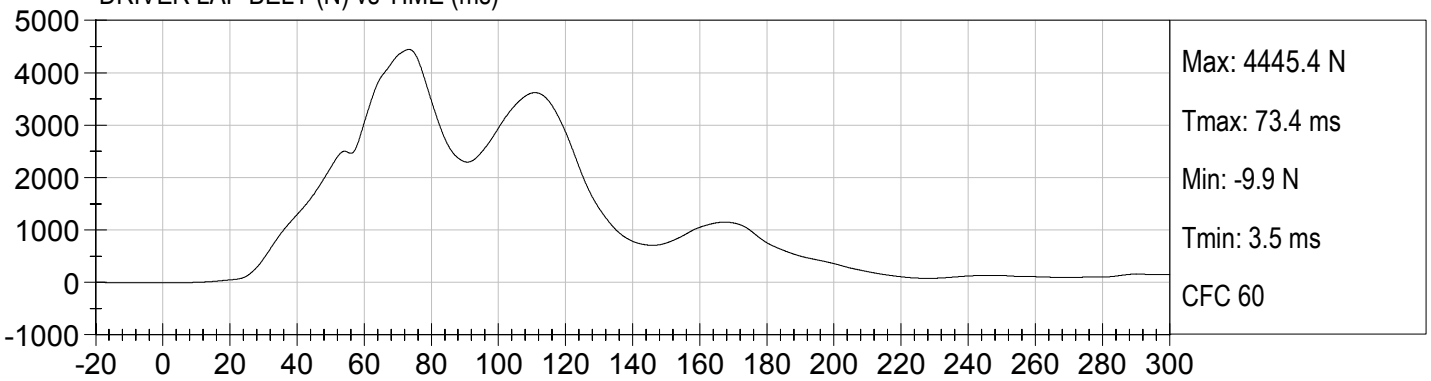
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

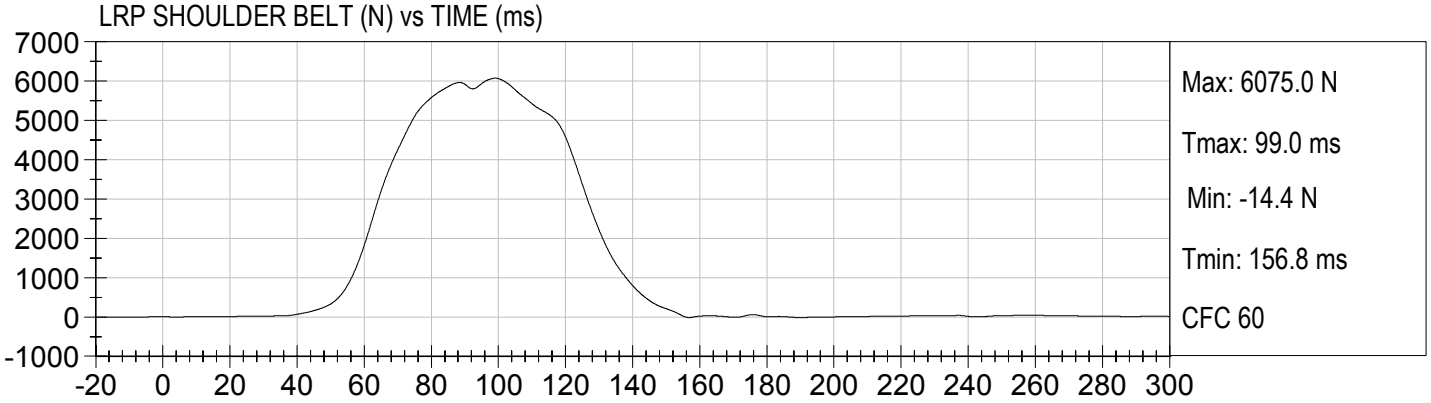
DRIVER SHOULDER BELT (N) vs TIME (ms)



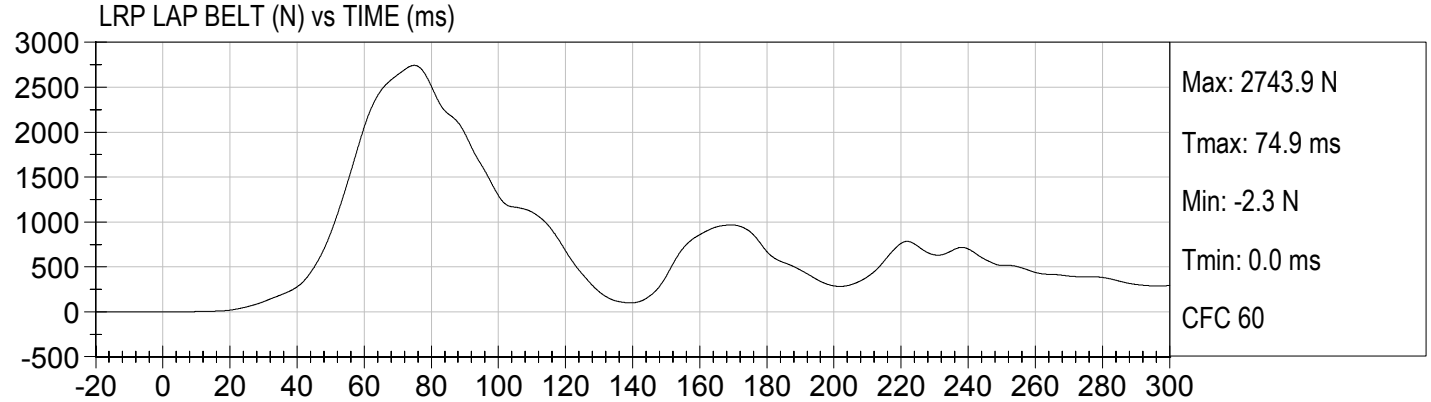
DRIVER LAP BELT (N) vs TIME (ms)



LRP SHOULDER BELT (N) vs TIME (ms)



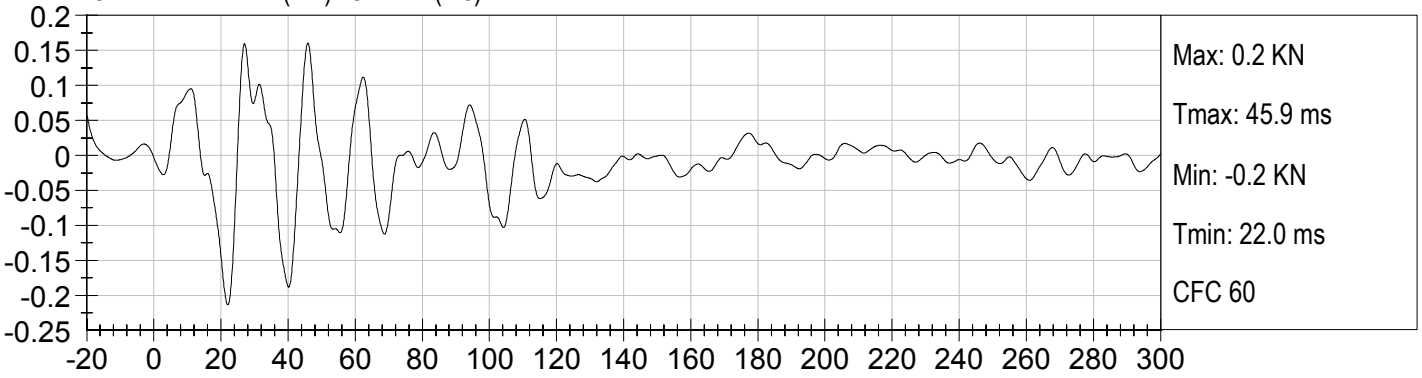
LRP LAP BELT (N) vs TIME (ms)



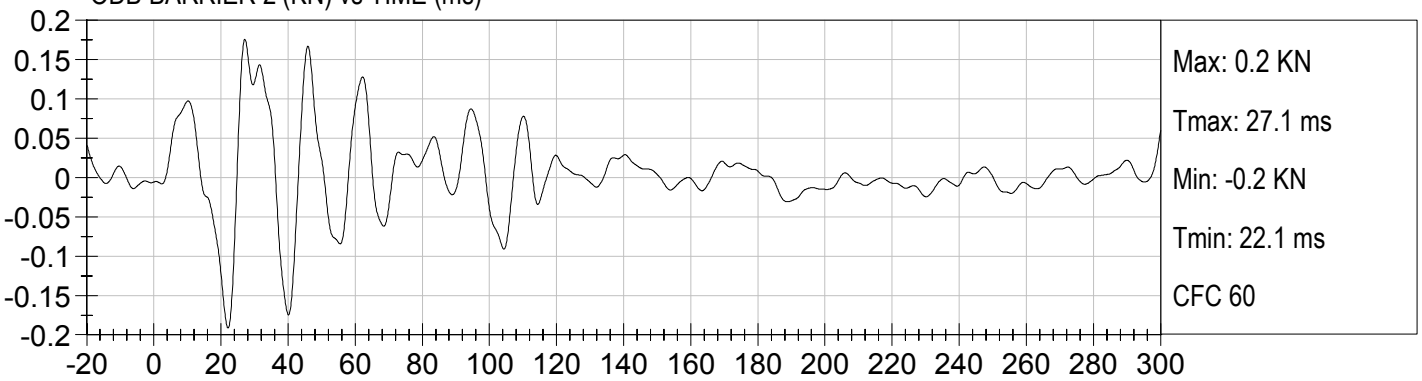
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

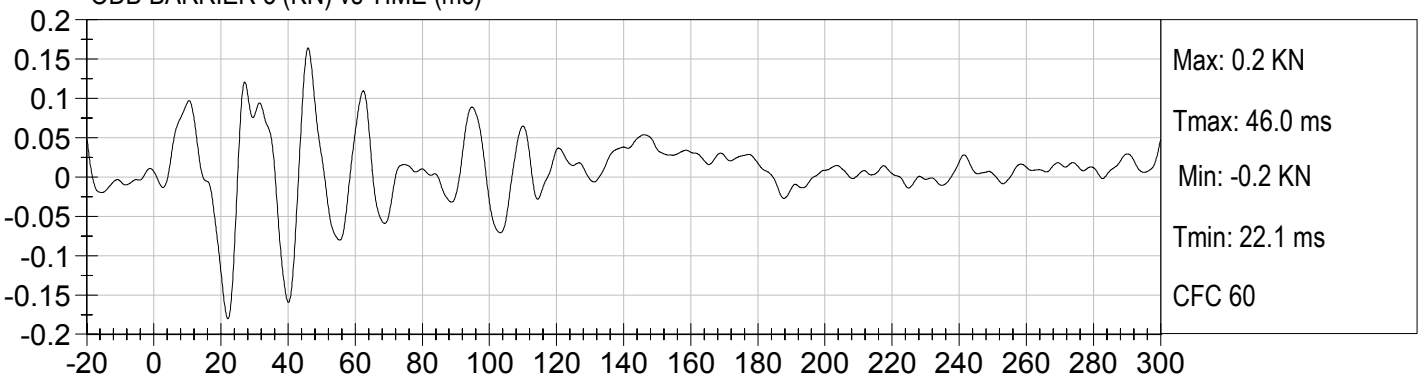
ODB BARRIER 1 (KN) vs TIME (ms)



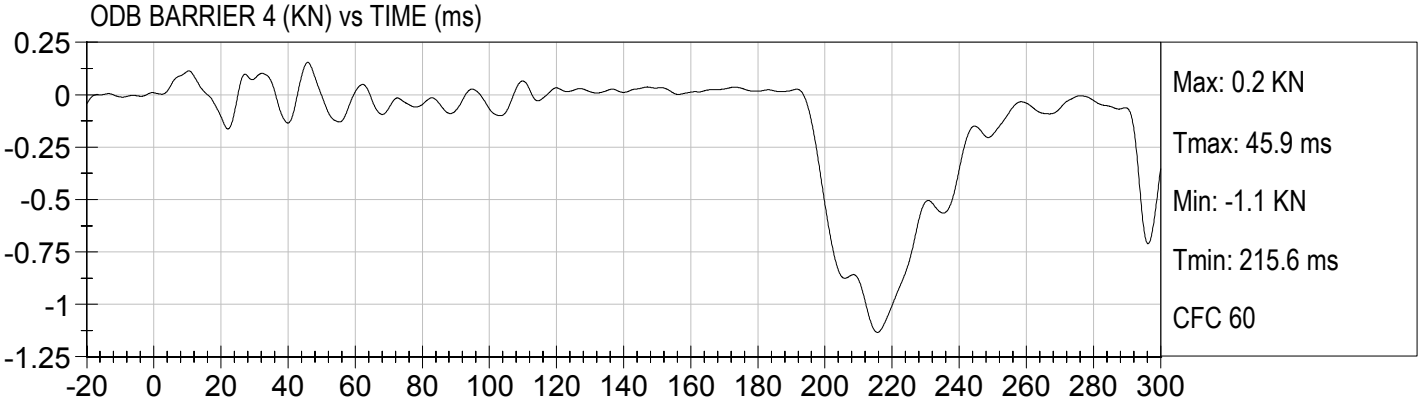
ODB BARRIER 2 (KN) vs TIME (ms)



ODB BARRIER 3 (KN) vs TIME (ms)



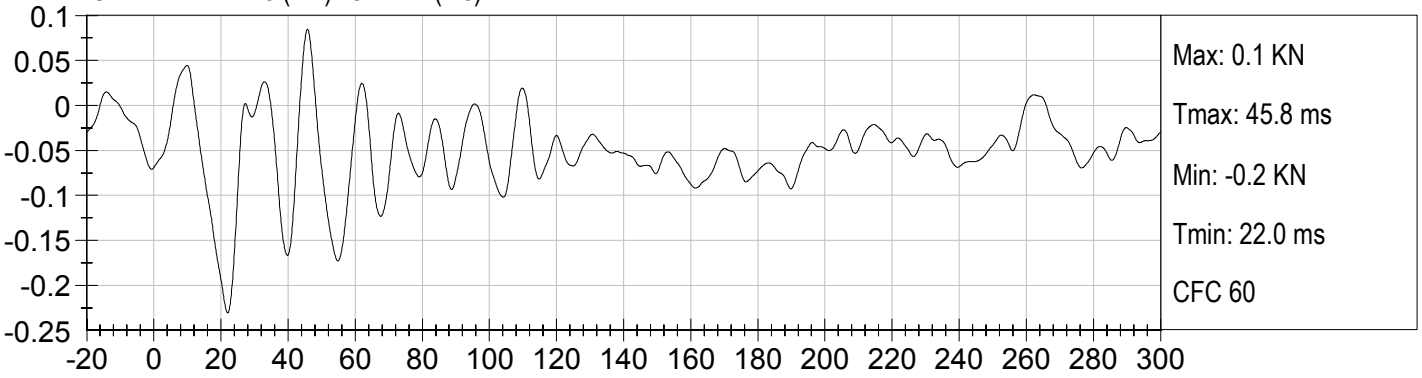
ODB BARRIER 4 (KN) vs TIME (ms)



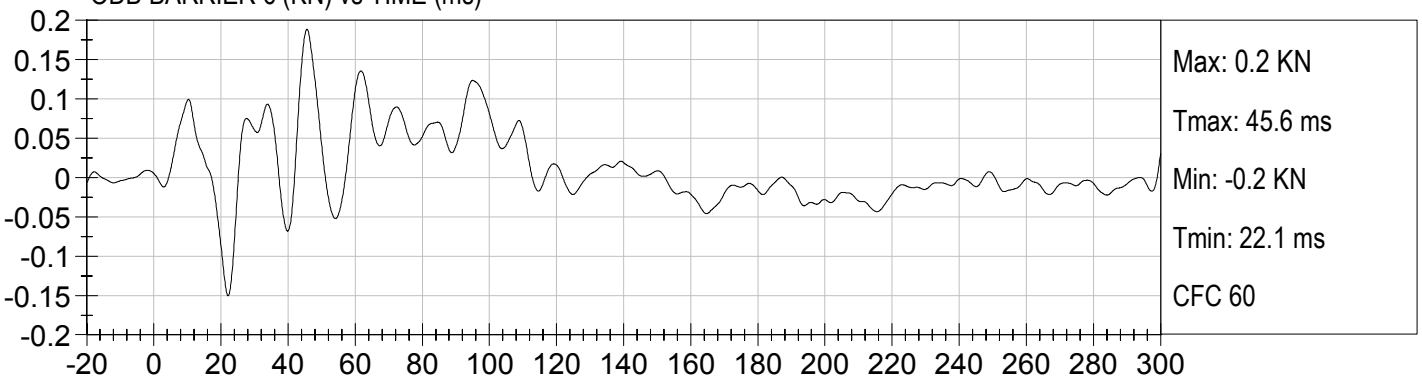
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

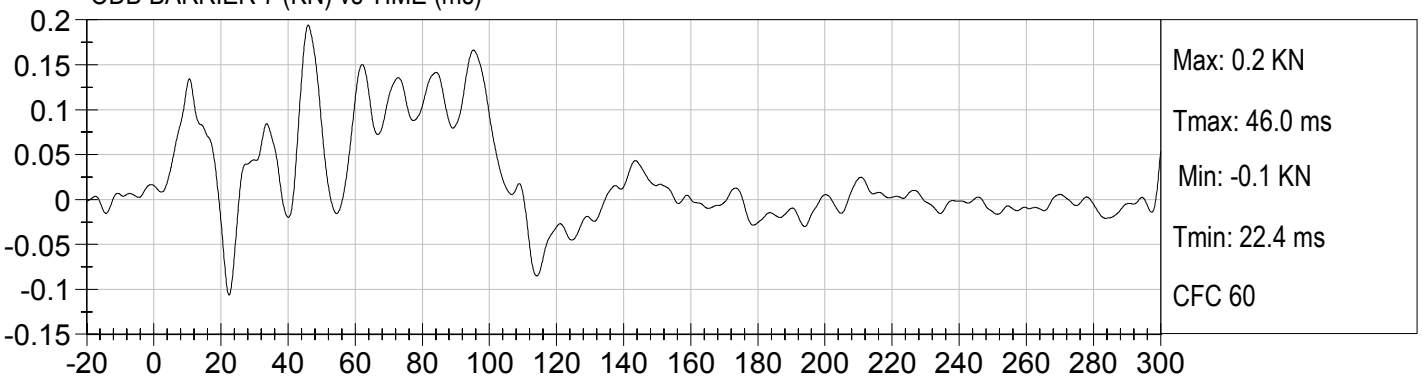
ODB BARRIER 5 (KN) vs TIME (ms)



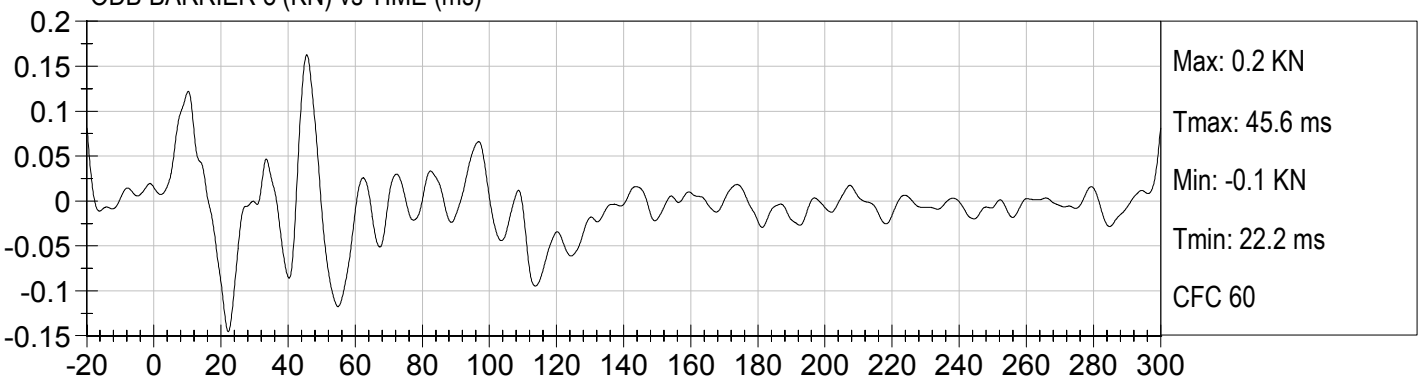
ODB BARRIER 6 (KN) vs TIME (ms)



ODB BARRIER 7 (KN) vs TIME (ms)



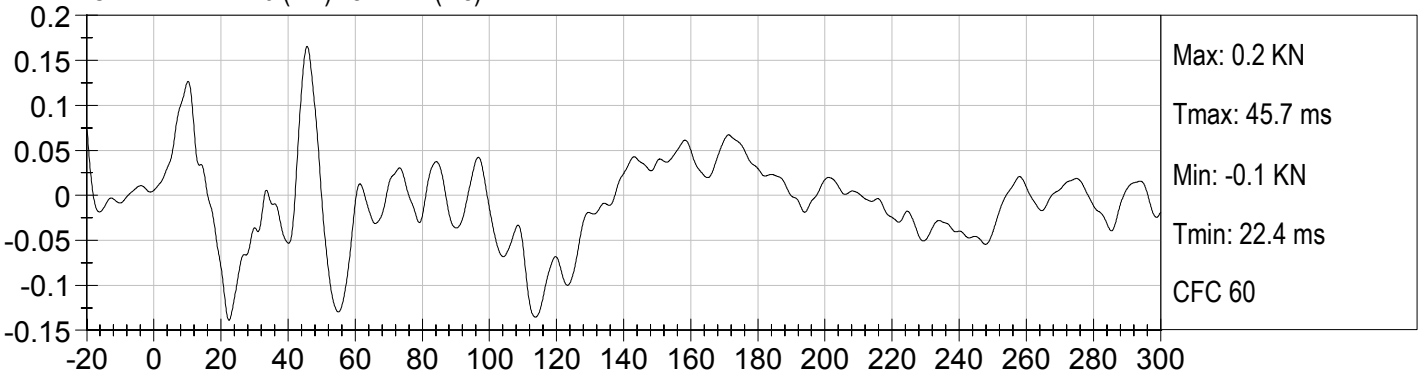
ODB BARRIER 8 (KN) vs TIME (ms)



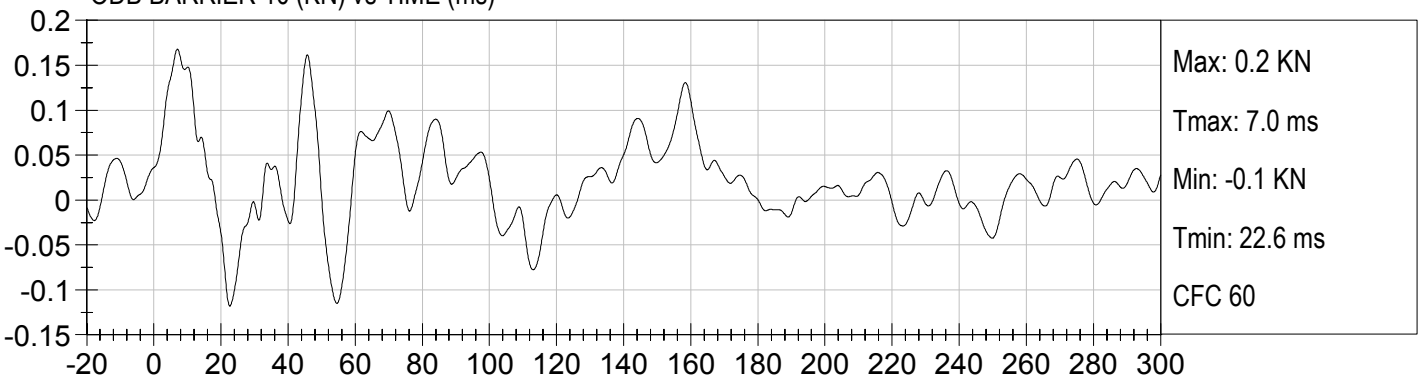
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

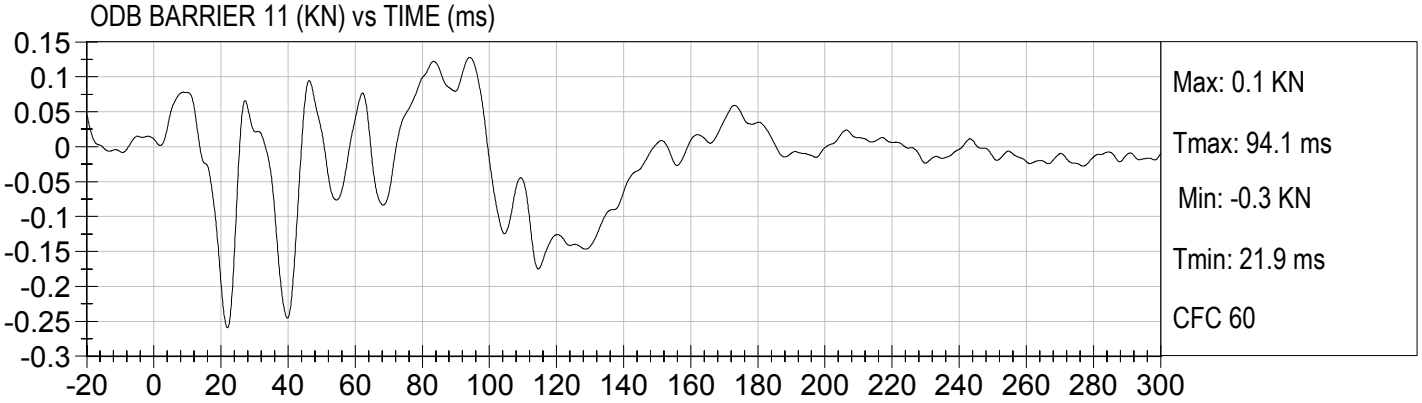
ODB BARRIER 9 (KN) vs TIME (ms)



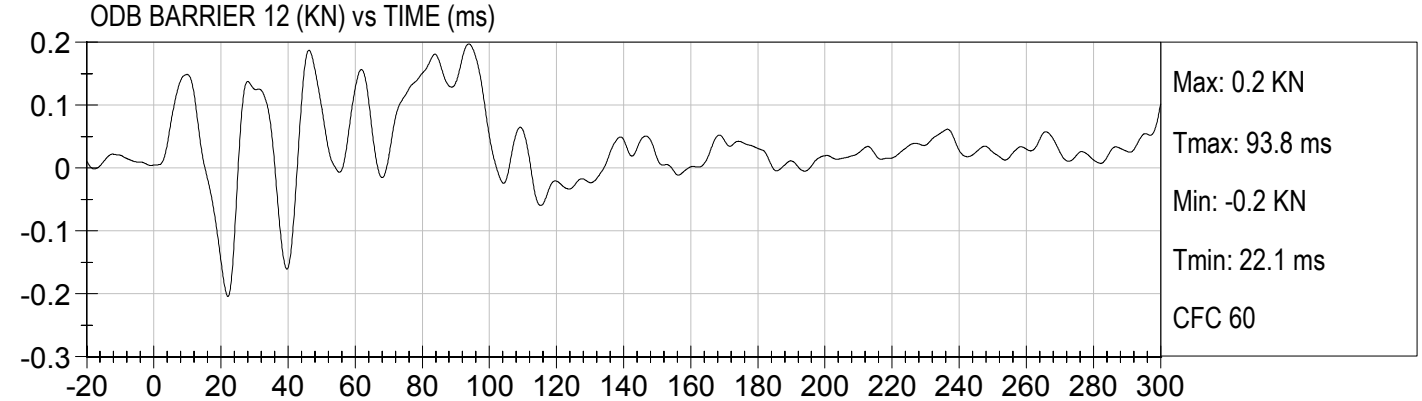
ODB BARRIER 10 (KN) vs TIME (ms)



ODB BARRIER 11 (KN) vs TIME (ms)



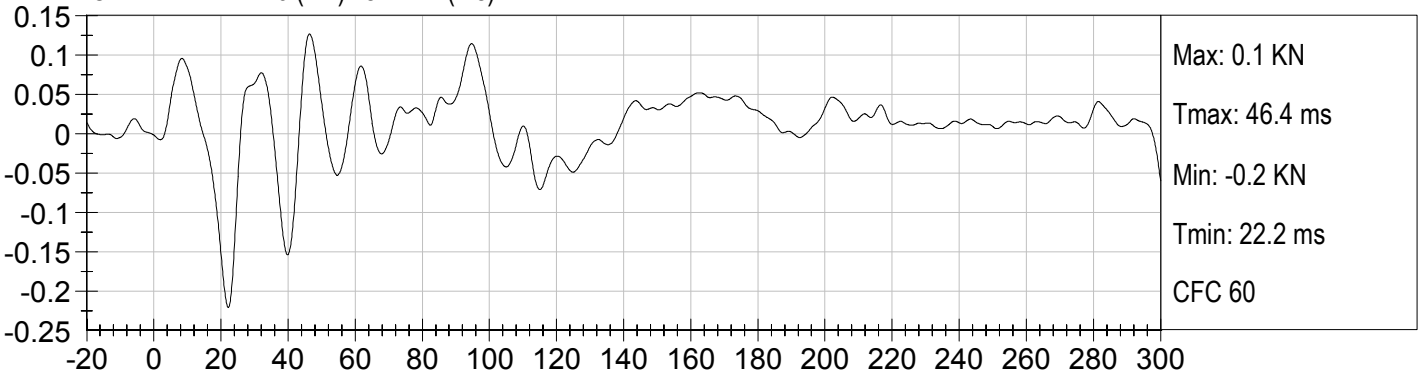
ODB BARRIER 12 (KN) vs TIME (ms)



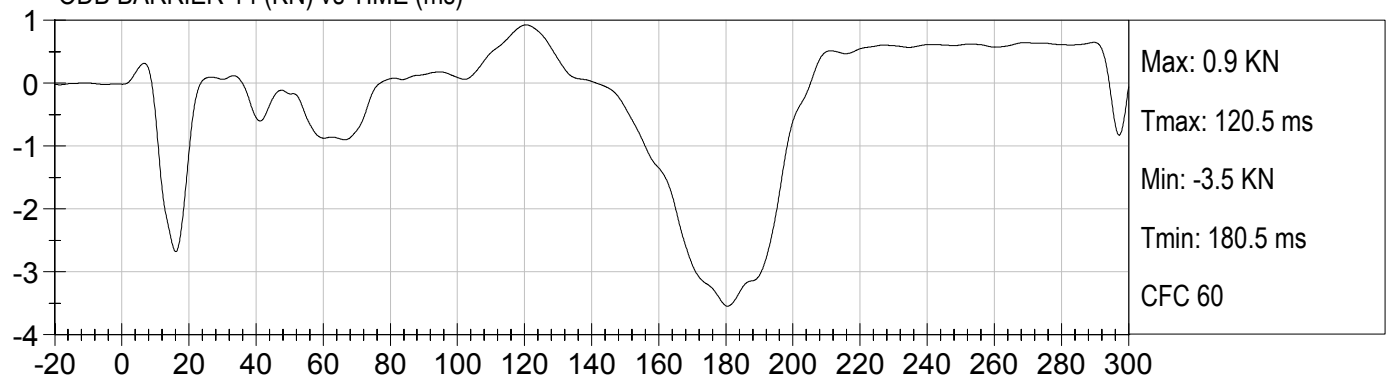
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

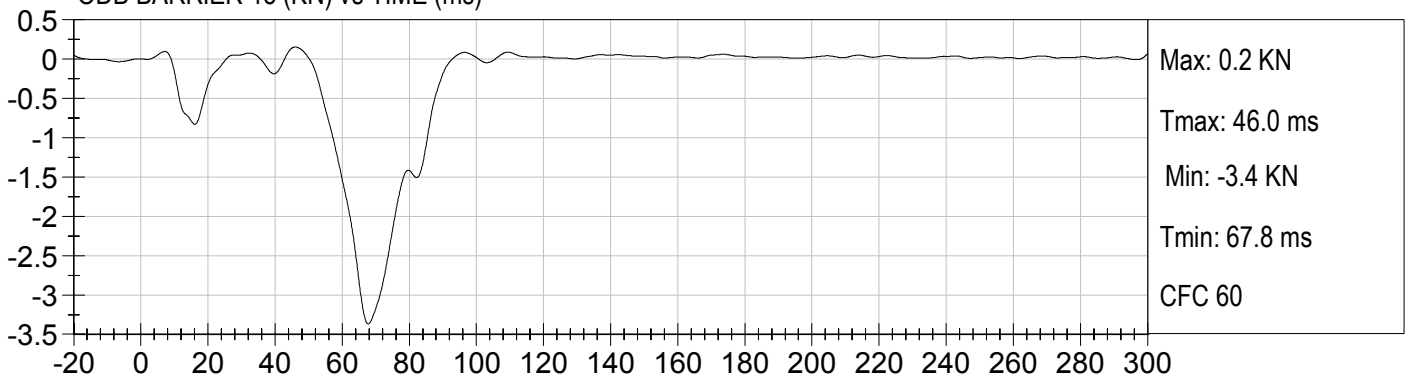
ODB BARRIER 13 (KN) vs TIME (ms)



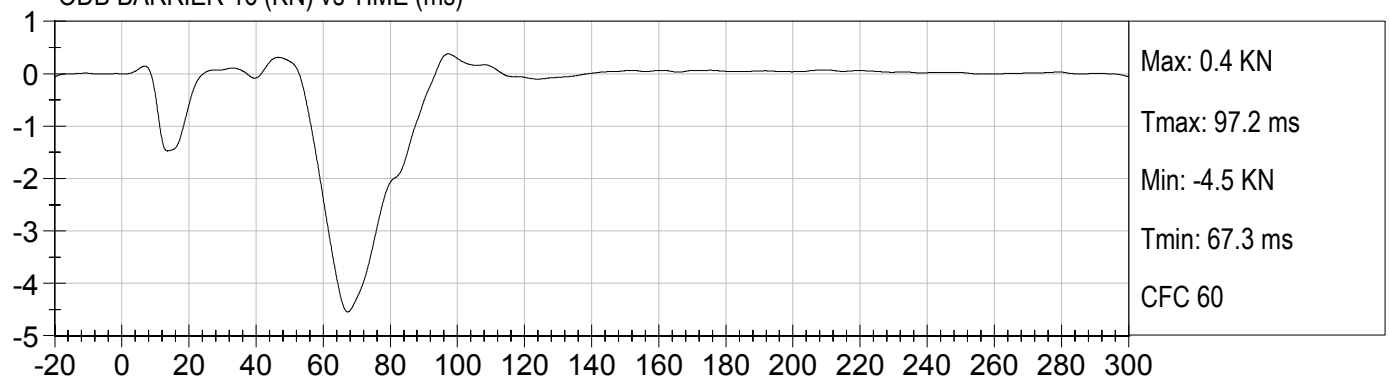
ODB BARRIER 14 (KN) vs TIME (ms)



ODB BARRIER 15 (KN) vs TIME (ms)



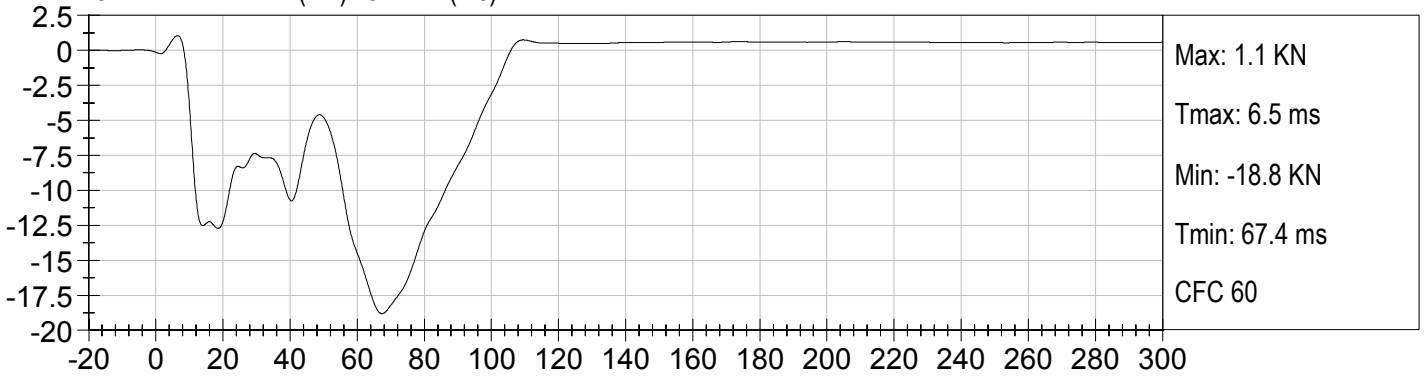
ODB BARRIER 16 (KN) vs TIME (ms)



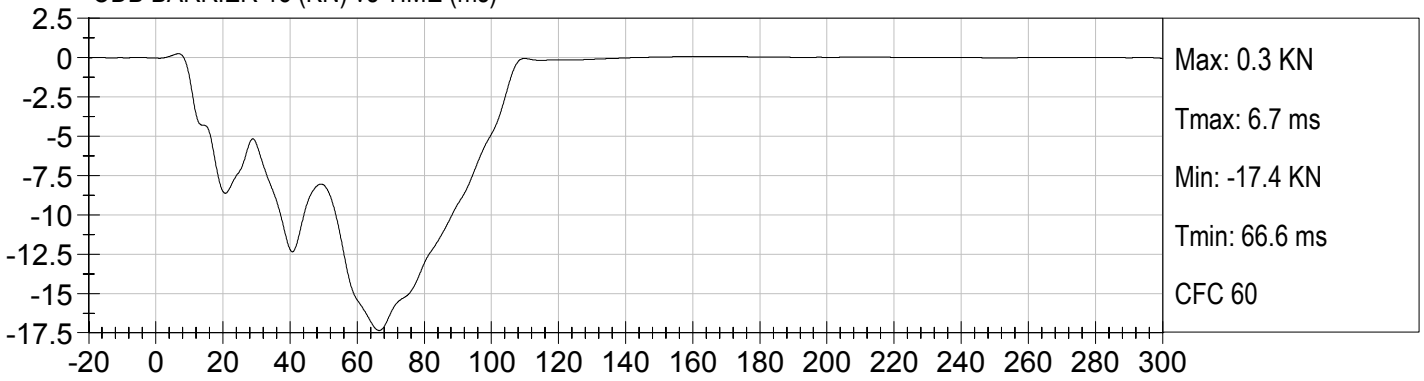
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

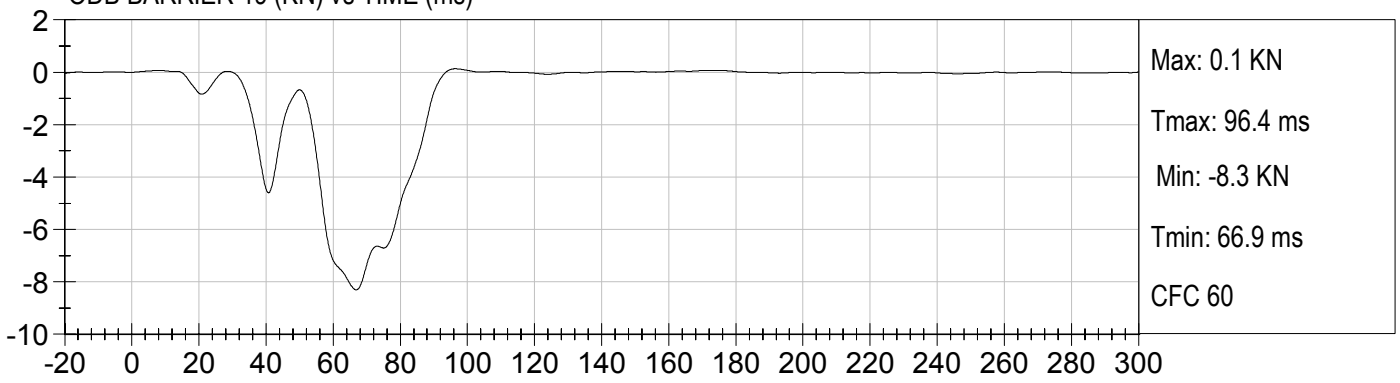
ODB BARRIER 17 (KN) vs TIME (ms)



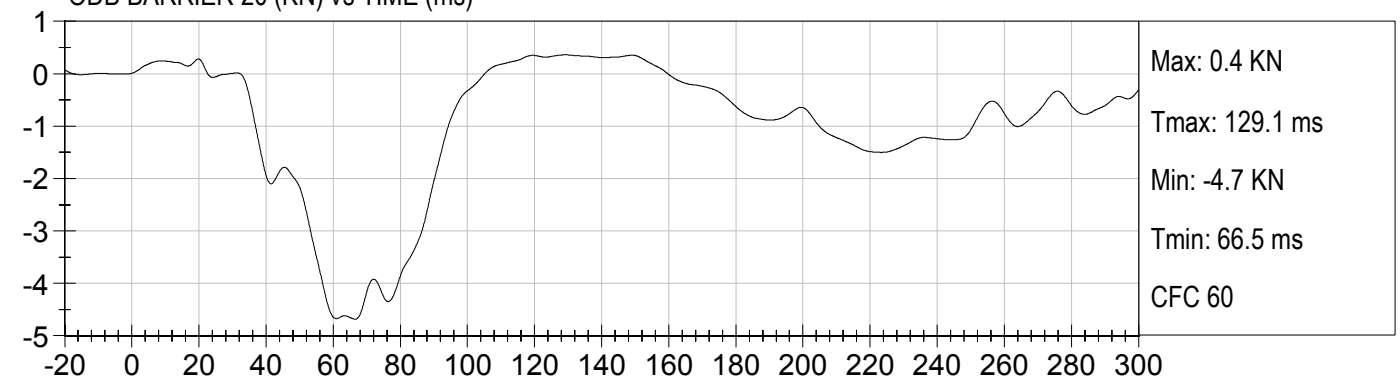
ODB BARRIER 18 (KN) vs TIME (ms)



ODB BARRIER 19 (KN) vs TIME (ms)



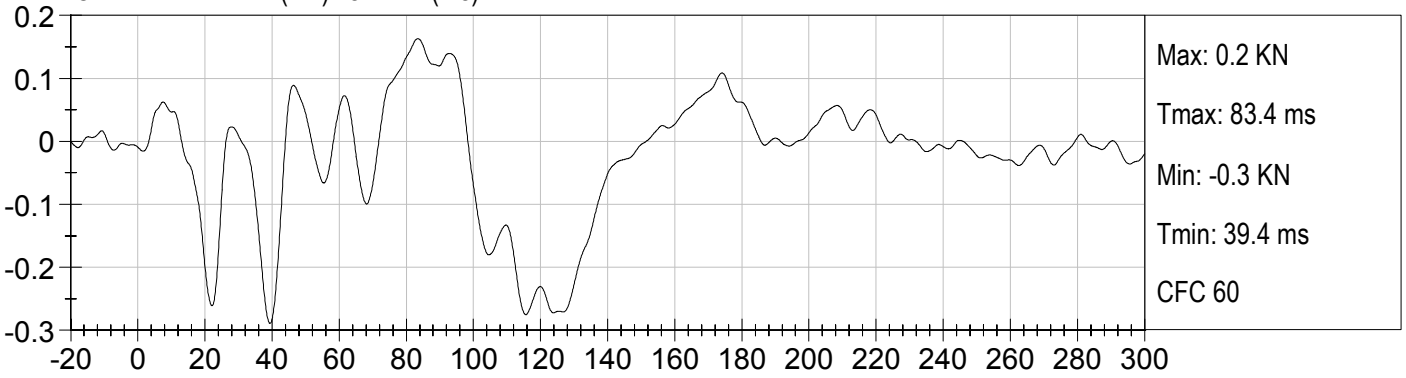
ODB BARRIER 20 (KN) vs TIME (ms)



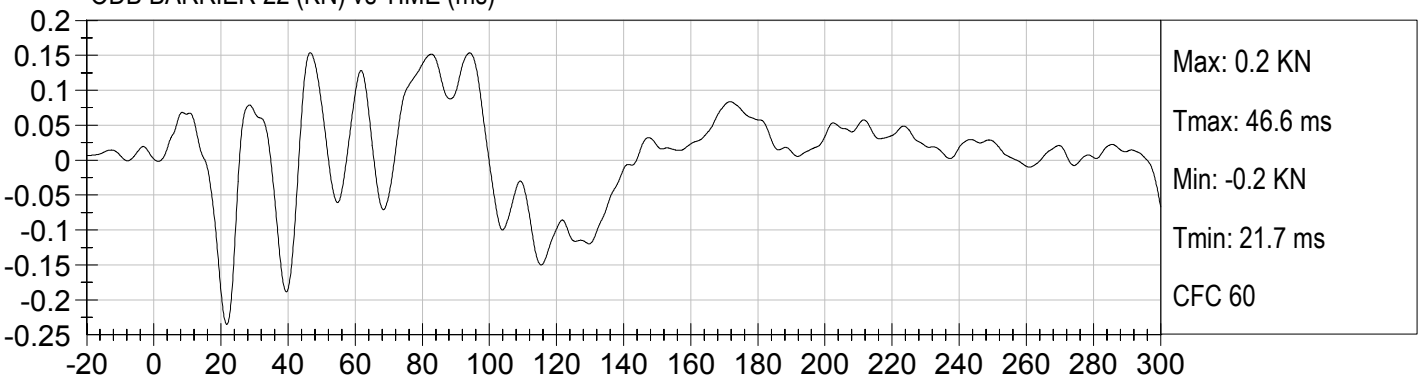
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

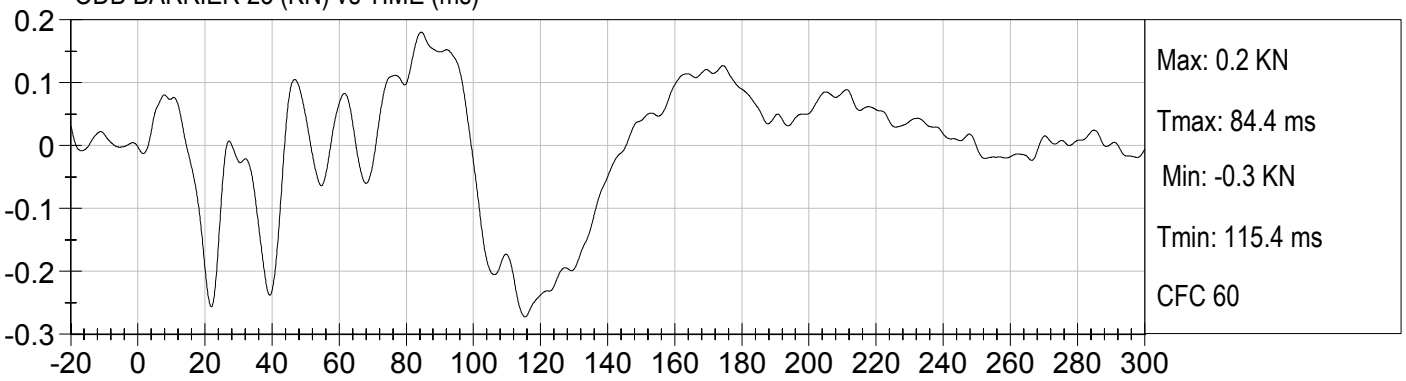
ODB BARRIER 21 (KN) vs TIME (ms)



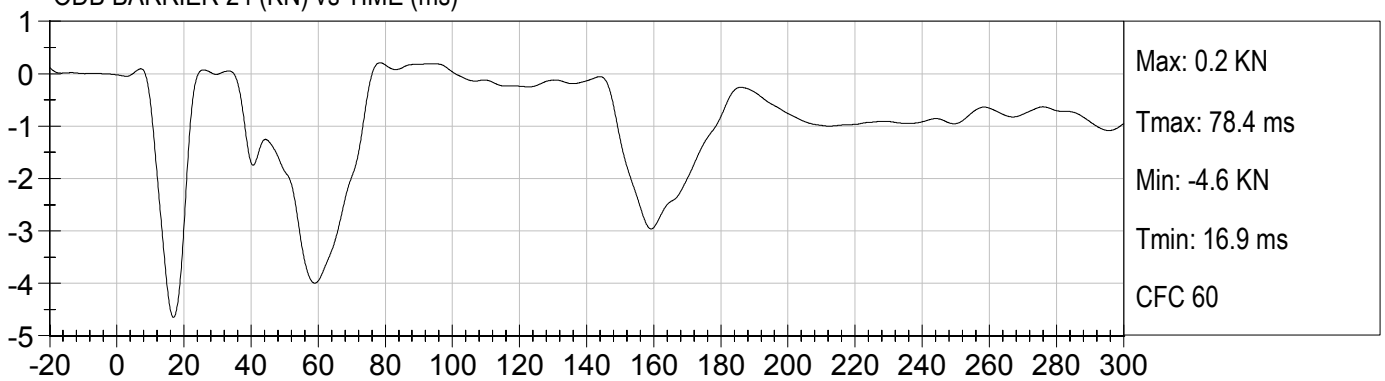
ODB BARRIER 22 (KN) vs TIME (ms)



ODB BARRIER 23 (KN) vs TIME (ms)



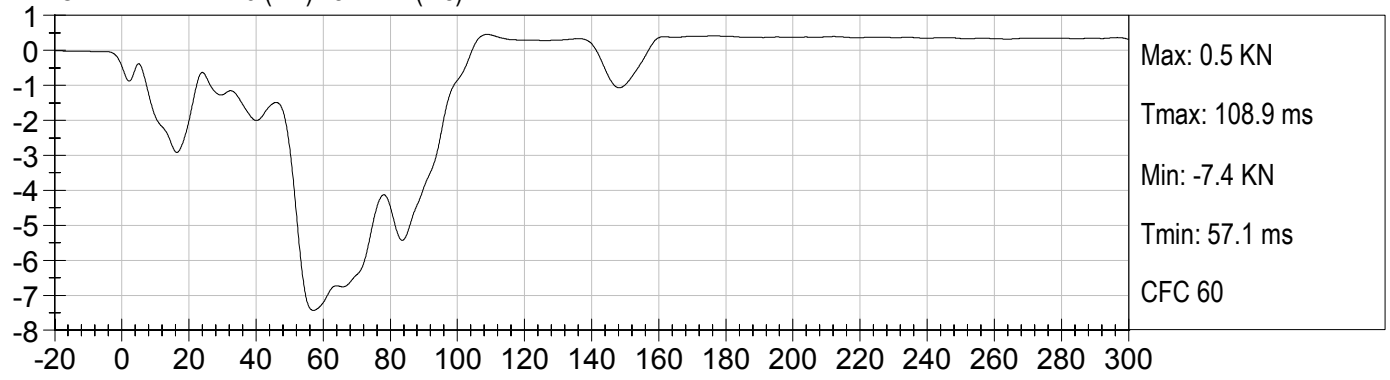
ODB BARRIER 24 (KN) vs TIME (ms)



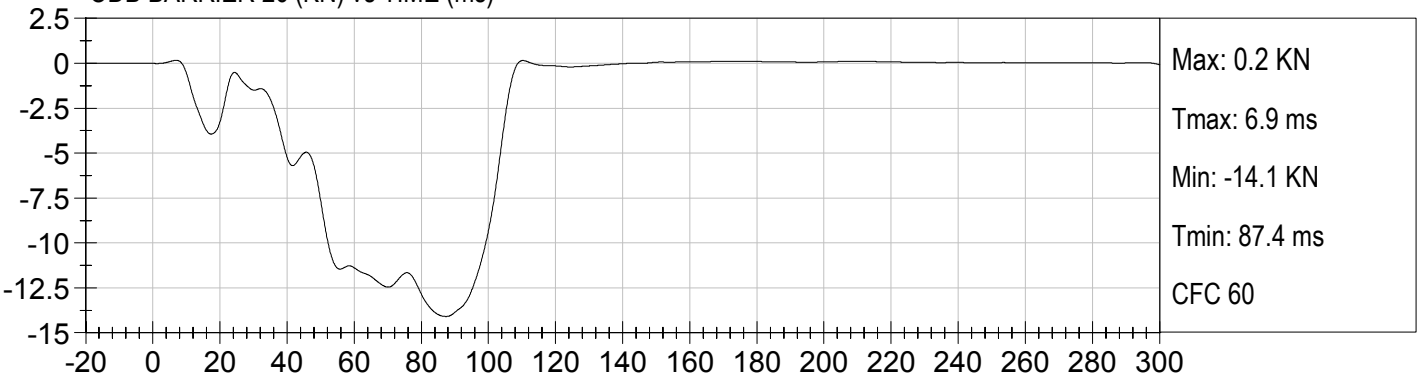
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

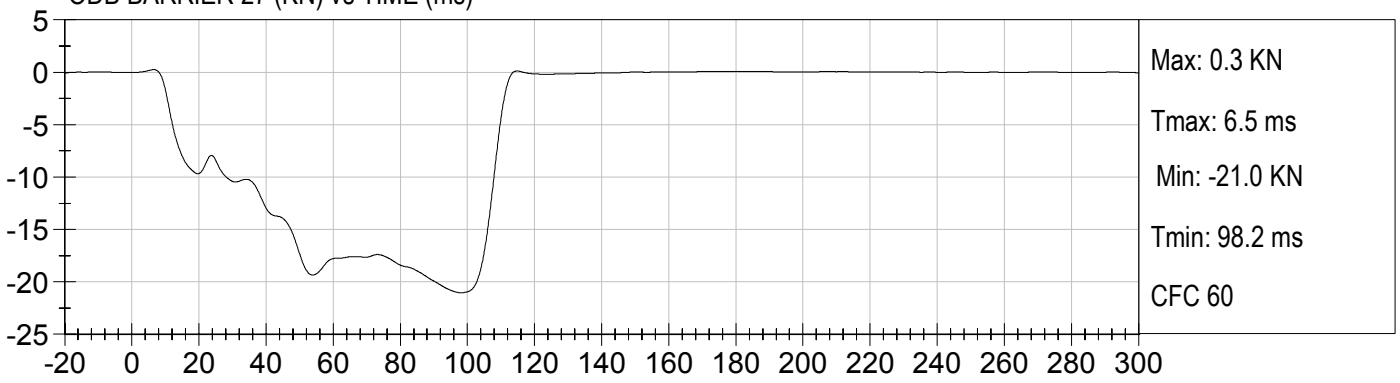
ODB BARRIER 25 (KN) vs TIME (ms)



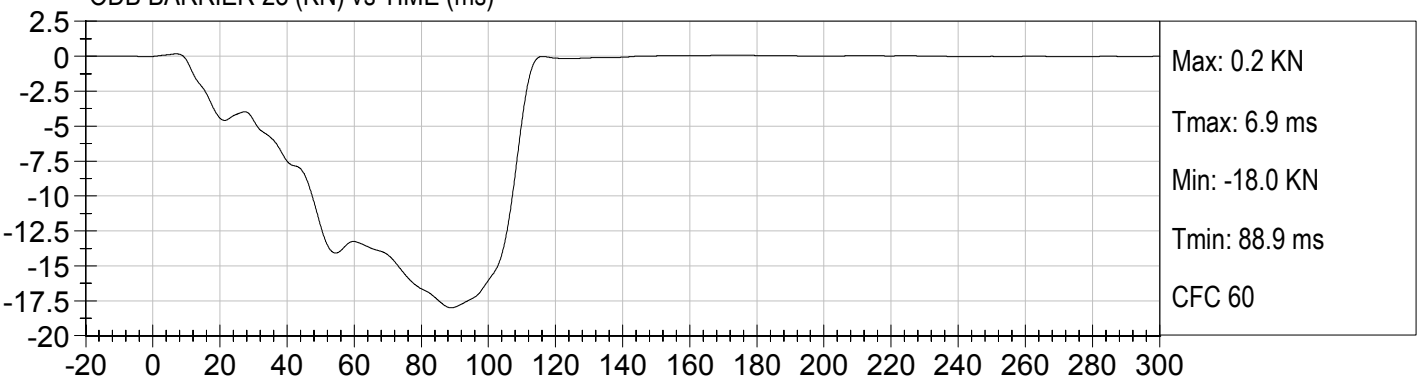
ODB BARRIER 26 (KN) vs TIME (ms)



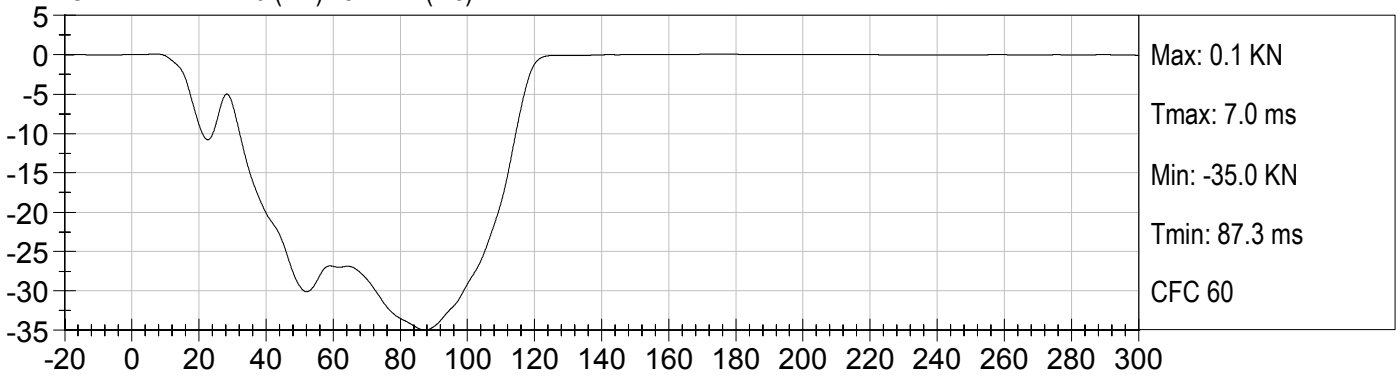
ODB BARRIER 27 (KN) vs TIME (ms)



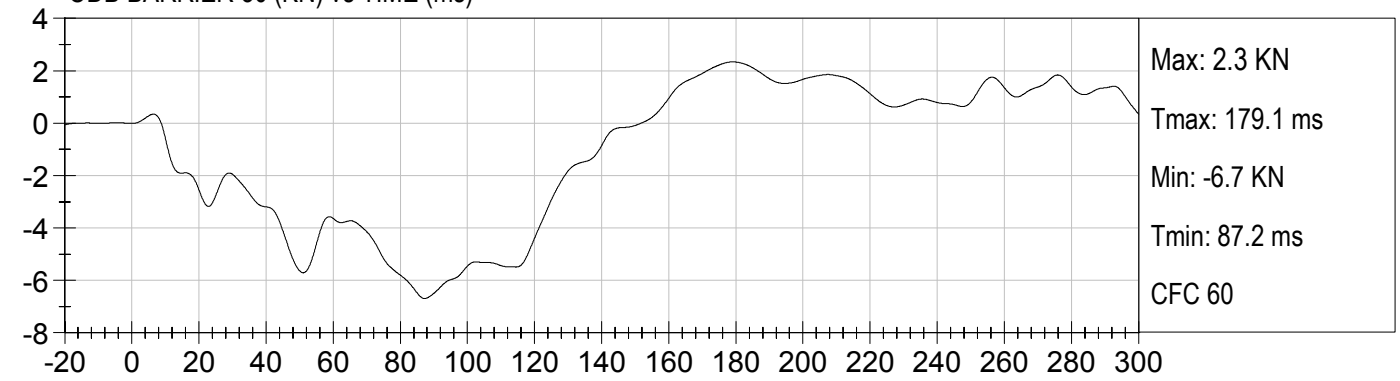
ODB BARRIER 28 (KN) vs TIME (ms)



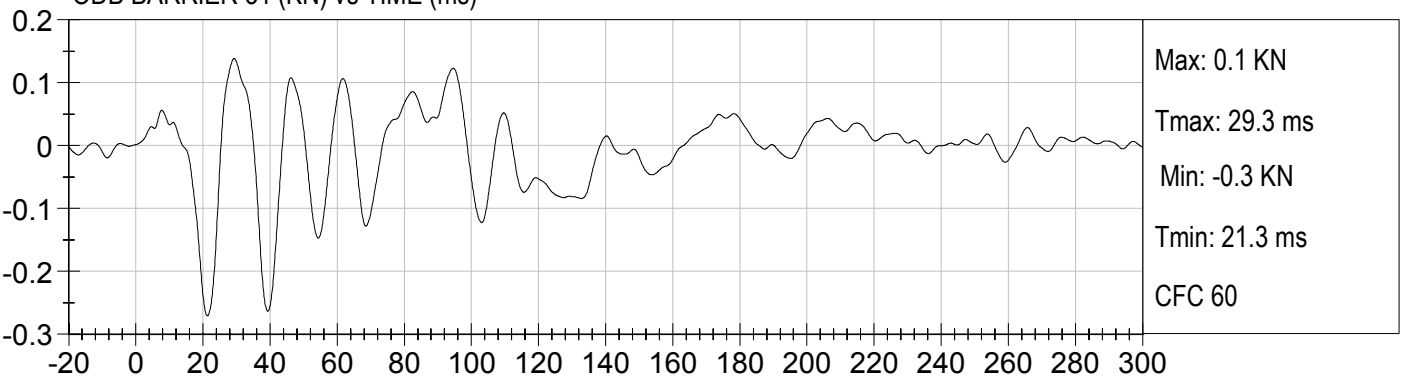
ODB BARRIER 29 (KN) vs TIME (ms)



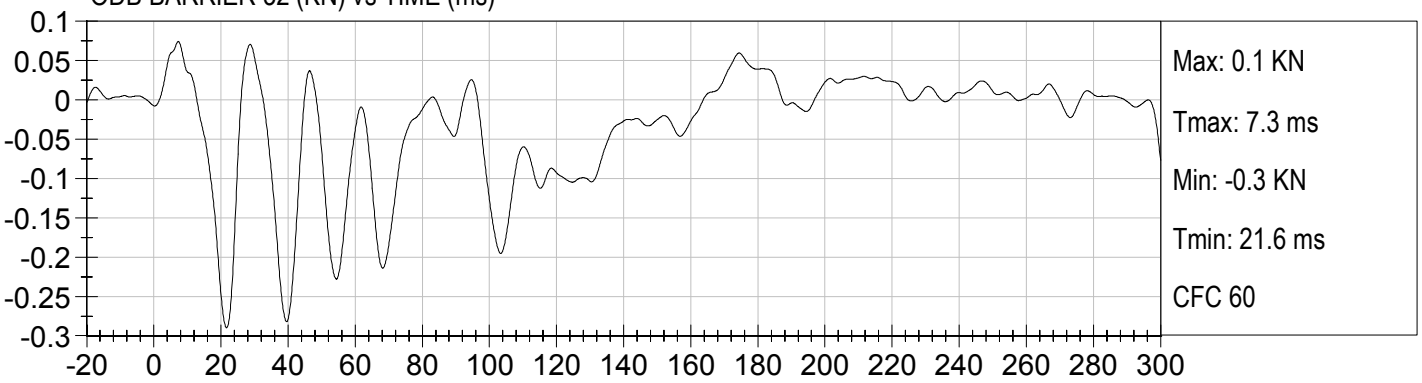
ODB BARRIER 30 (KN) vs TIME (ms)



ODB BARRIER 31 (KN) vs TIME (ms)



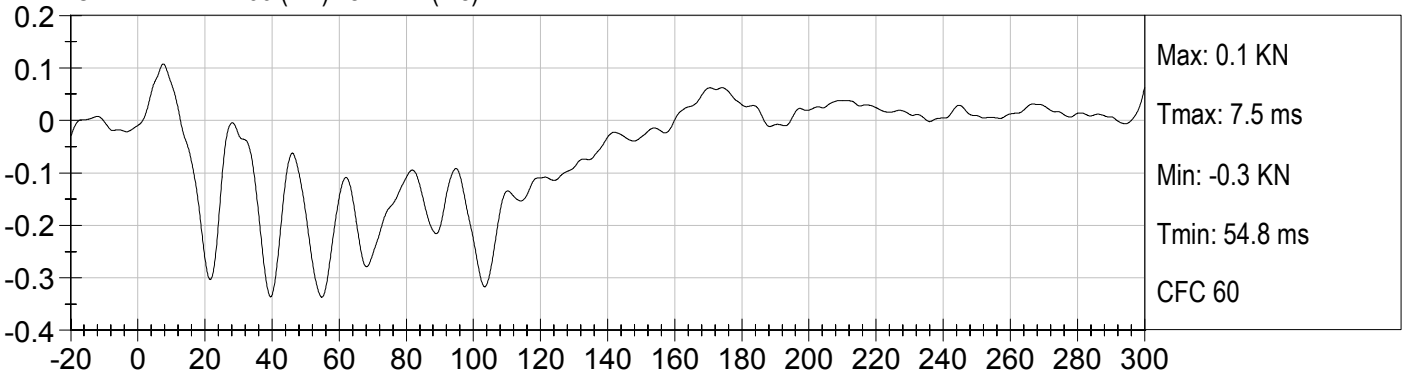
ODB BARRIER 32 (KN) vs TIME (ms)



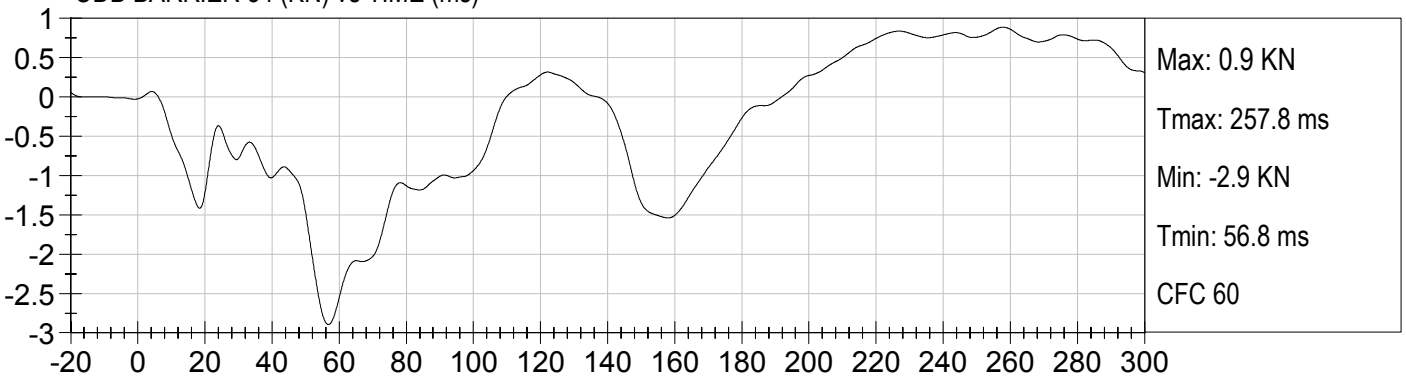
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

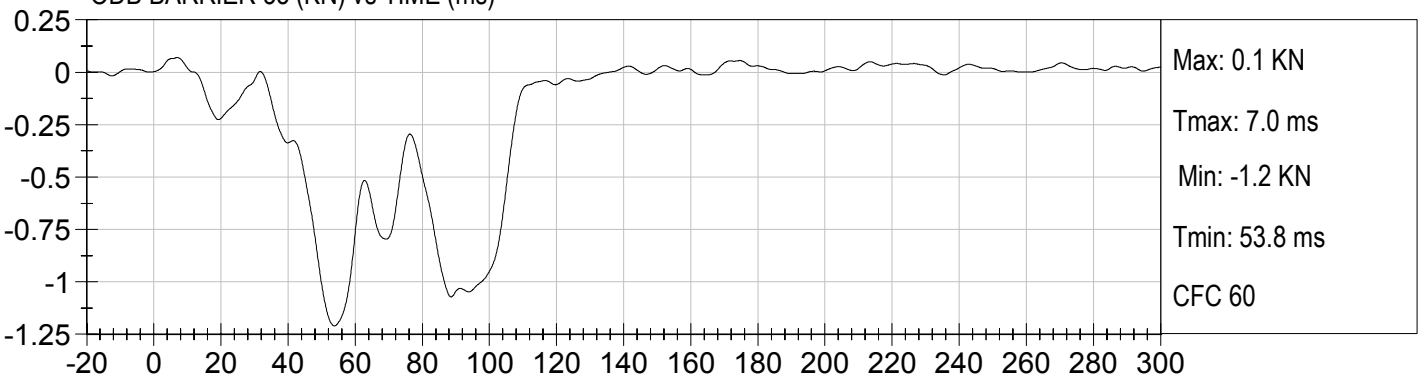
ODB BARRIER 33 (KN) vs TIME (ms)



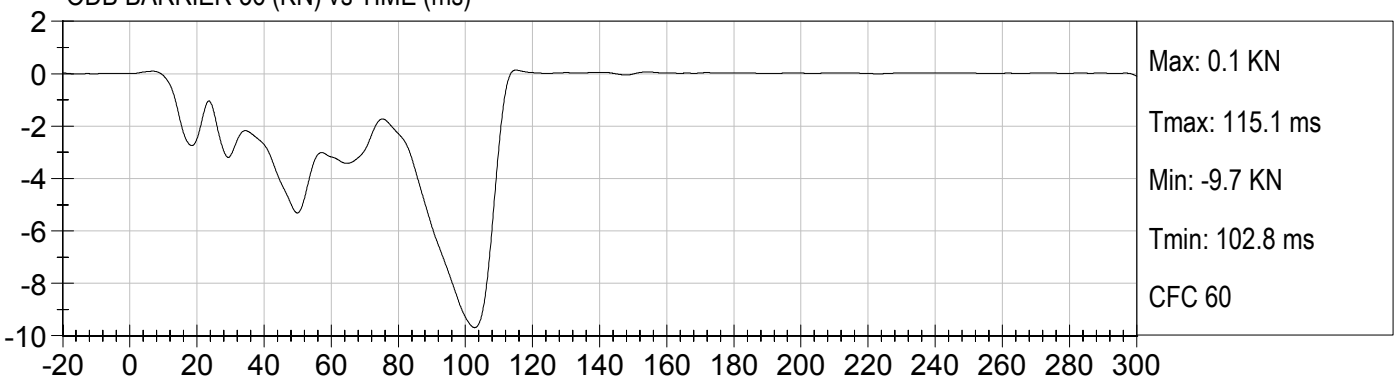
ODB BARRIER 34 (KN) vs TIME (ms)



ODB BARRIER 35 (KN) vs TIME (ms)



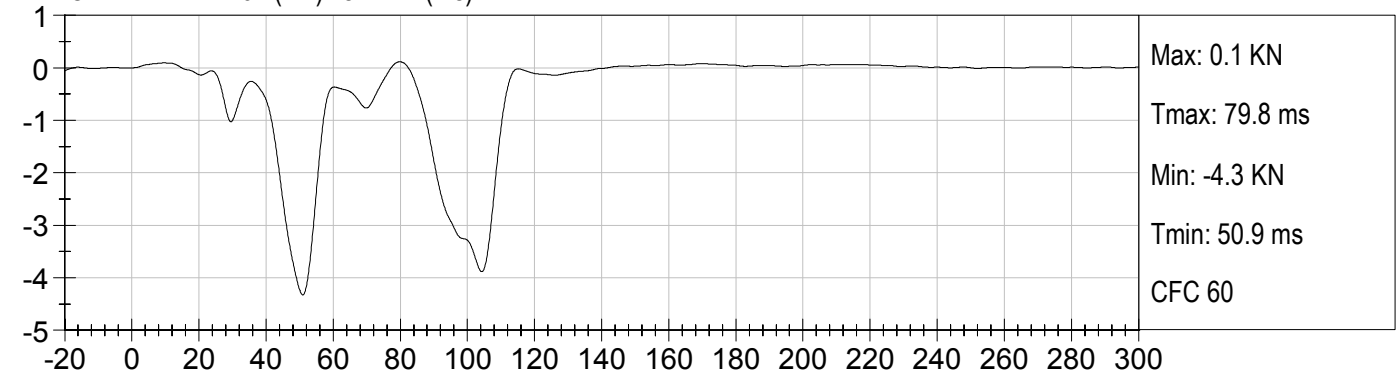
ODB BARRIER 36 (KN) vs TIME (ms)



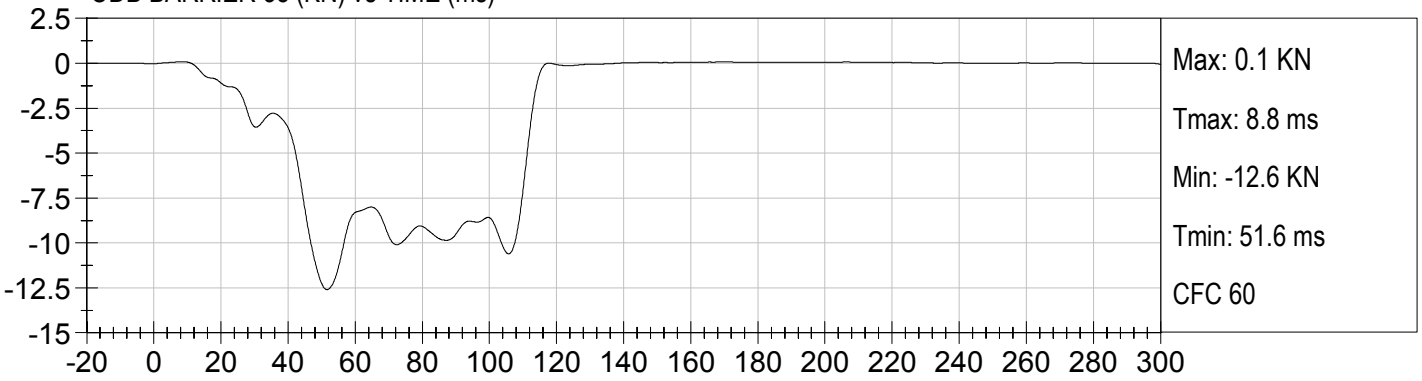
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

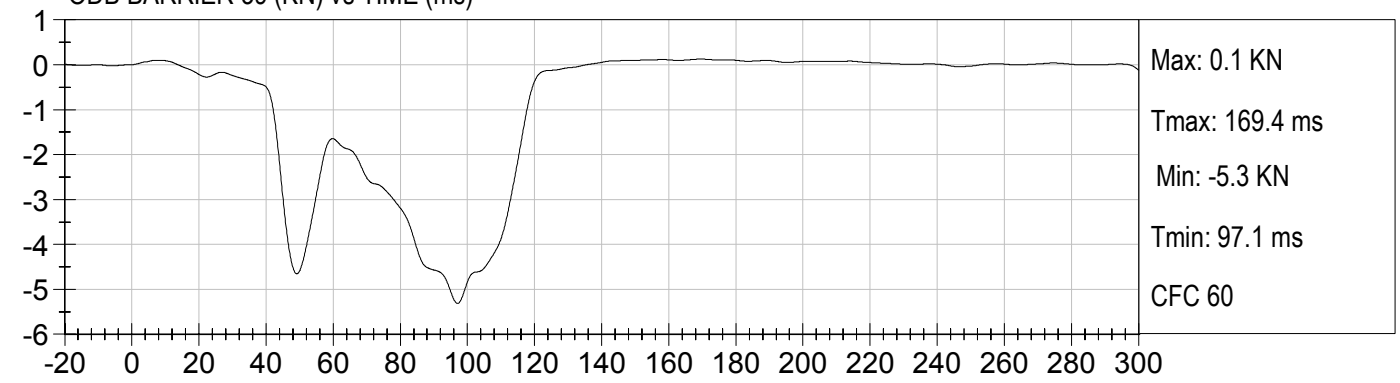
ODB BARRIER 37 (KN) vs TIME (ms)



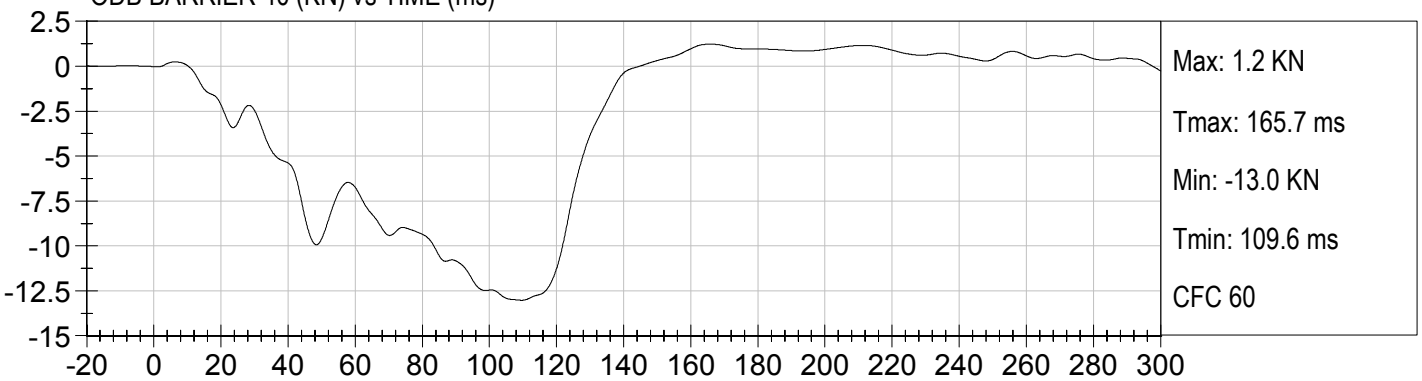
ODB BARRIER 38 (KN) vs TIME (ms)



ODB BARRIER 39 (KN) vs TIME (ms)



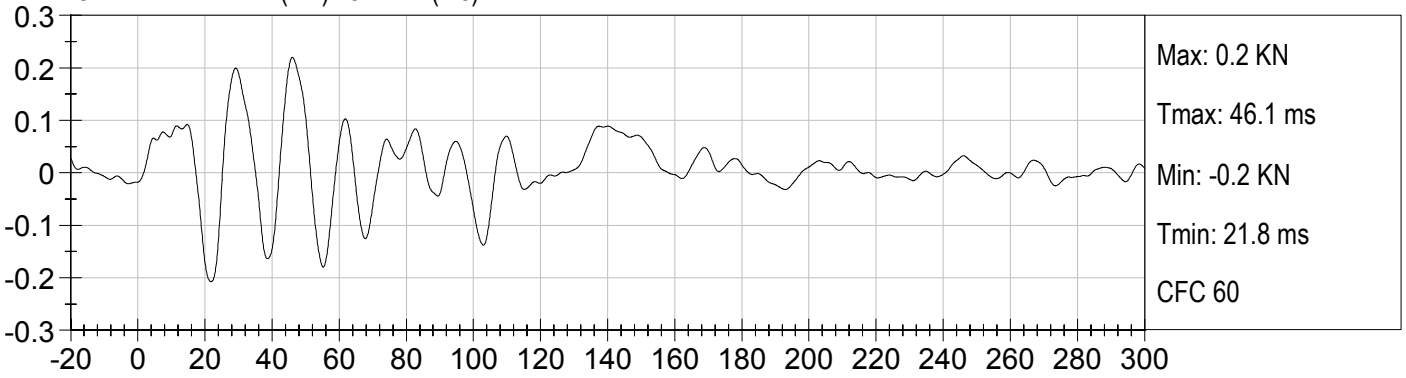
ODB BARRIER 40 (KN) vs TIME (ms)



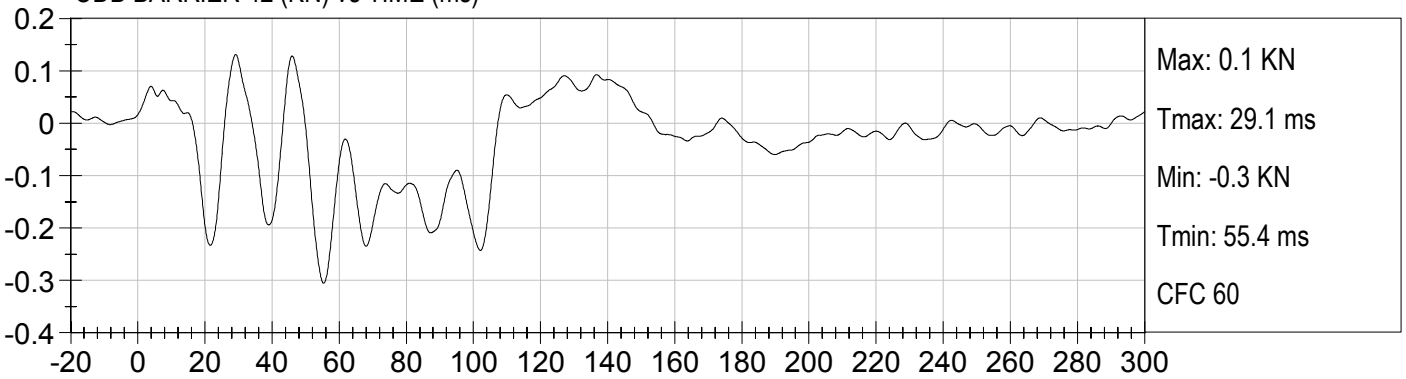
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

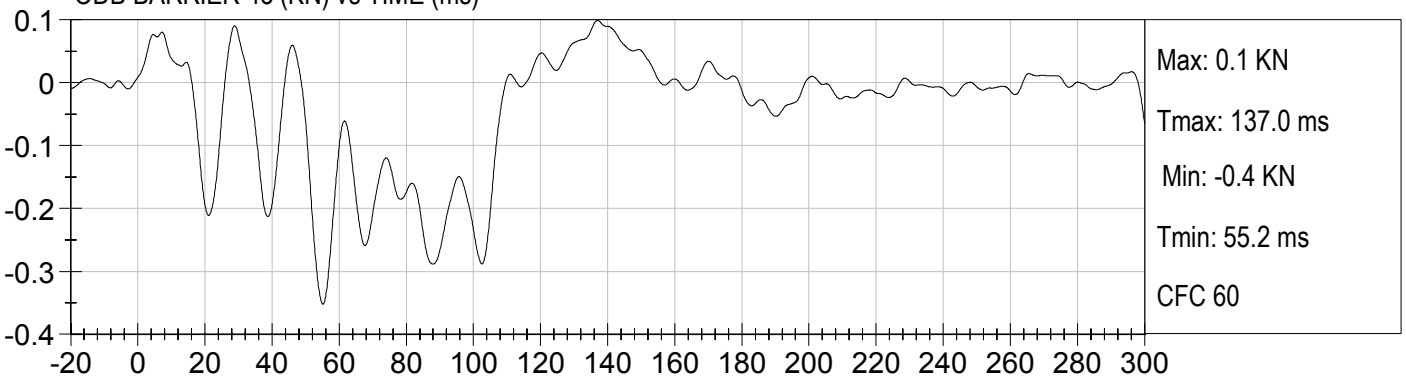
ODB BARRIER 41 (KN) vs TIME (ms)



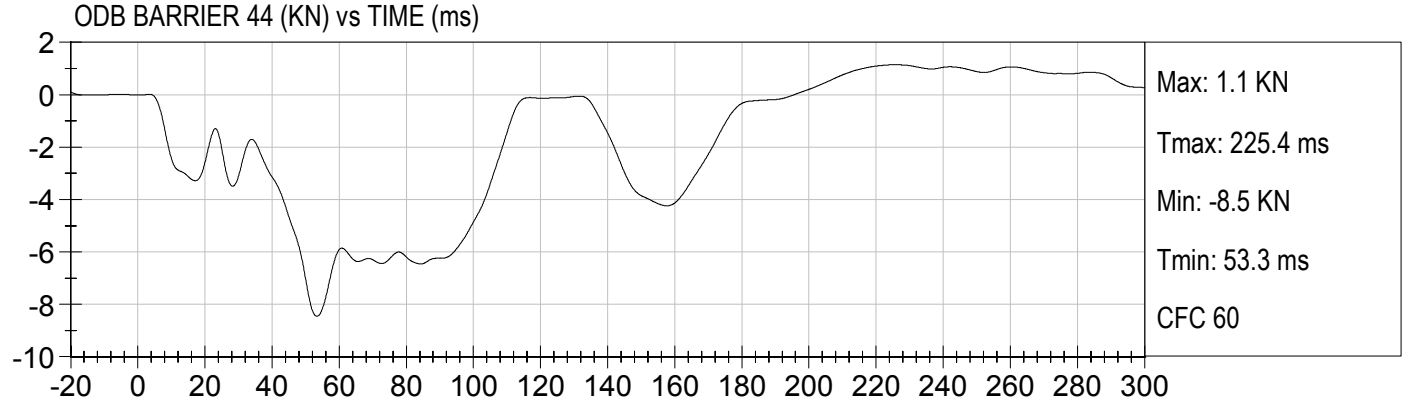
ODB BARRIER 42 (KN) vs TIME (ms)



ODB BARRIER 43 (KN) vs TIME (ms)



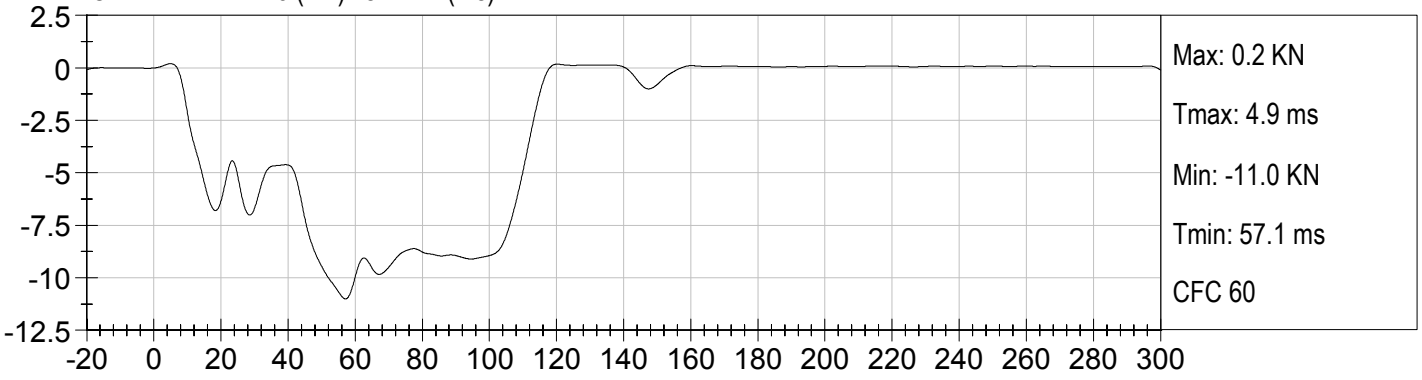
ODB BARRIER 44 (KN) vs TIME (ms)



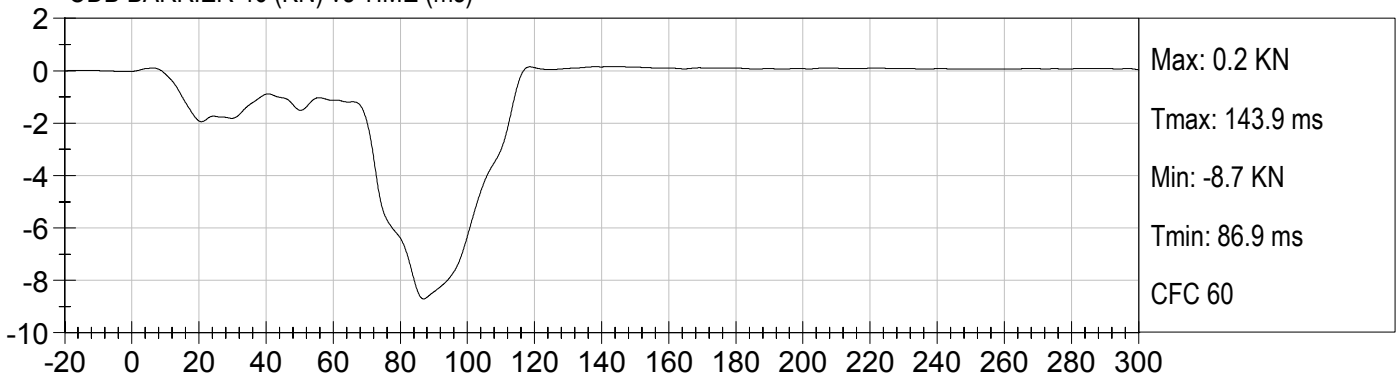
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

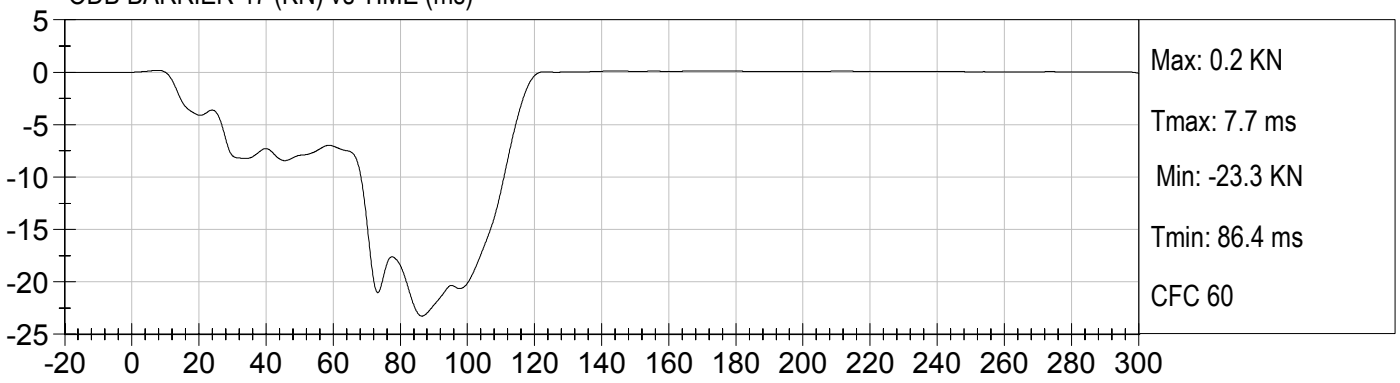
ODB BARRIER 45 (KN) vs TIME (ms)



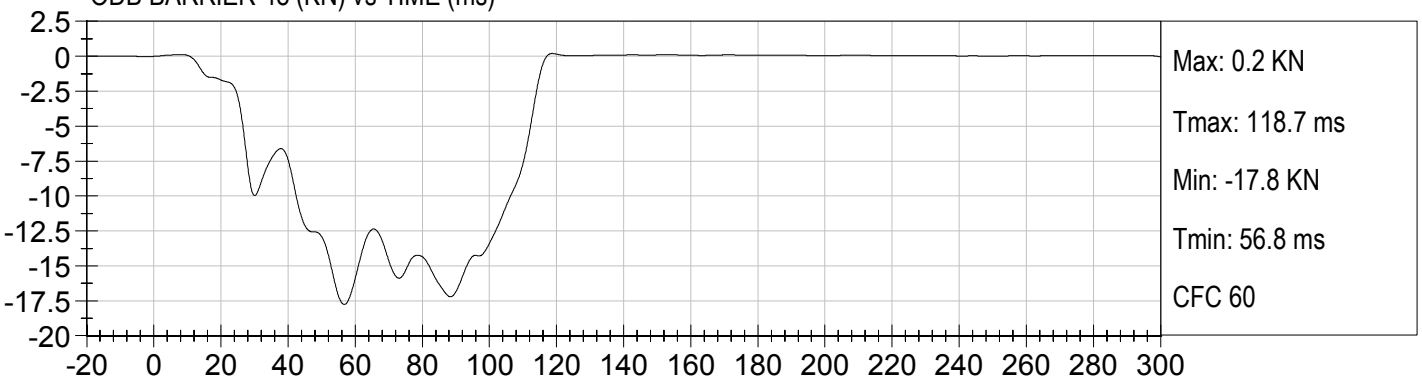
ODB BARRIER 46 (KN) vs TIME (ms)



ODB BARRIER 47 (KN) vs TIME (ms)



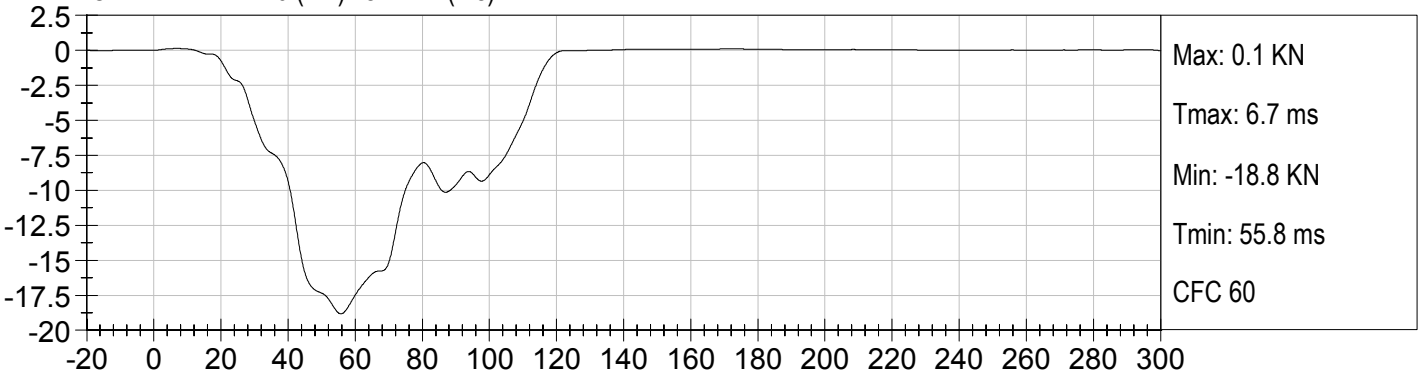
ODB BARRIER 48 (KN) vs TIME (ms)



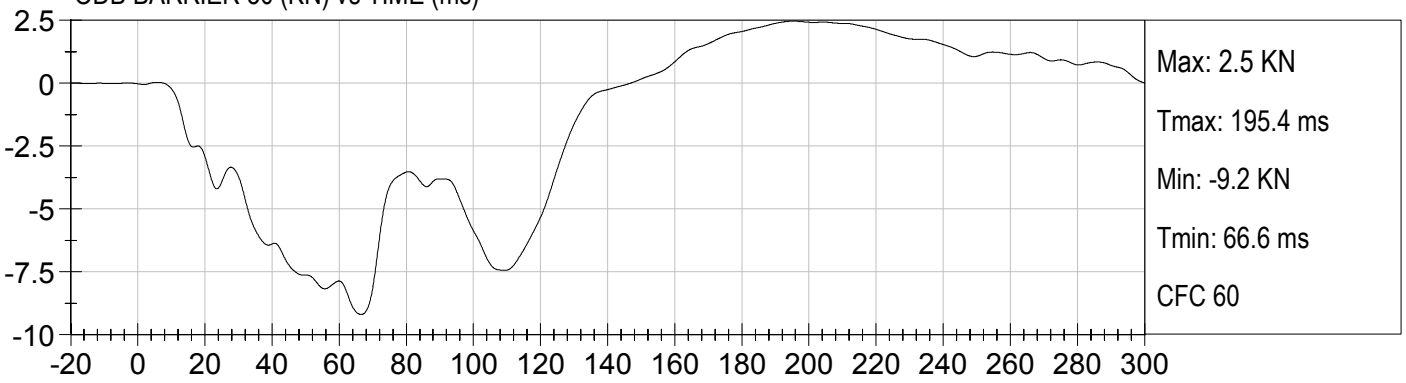
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

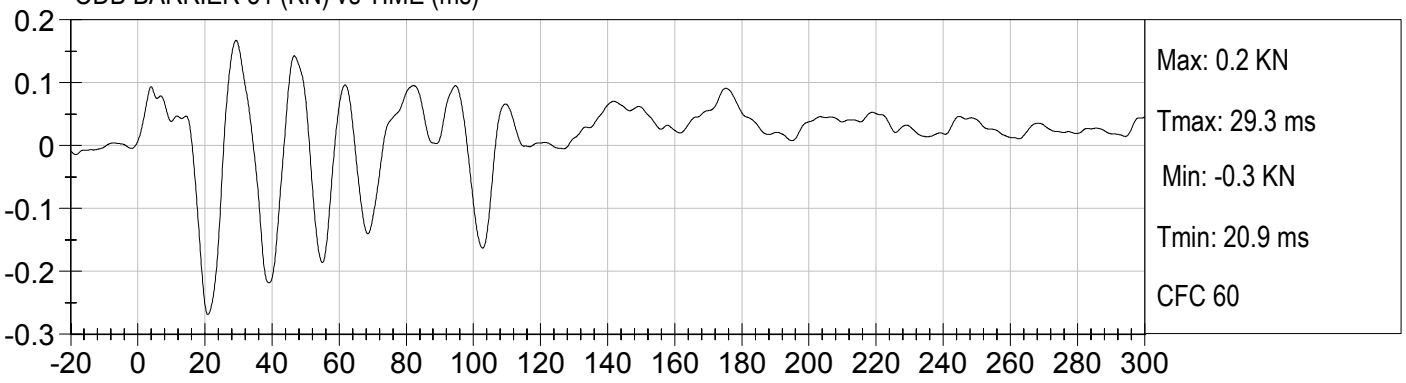
ODB BARRIER 49 (KN) vs TIME (ms)



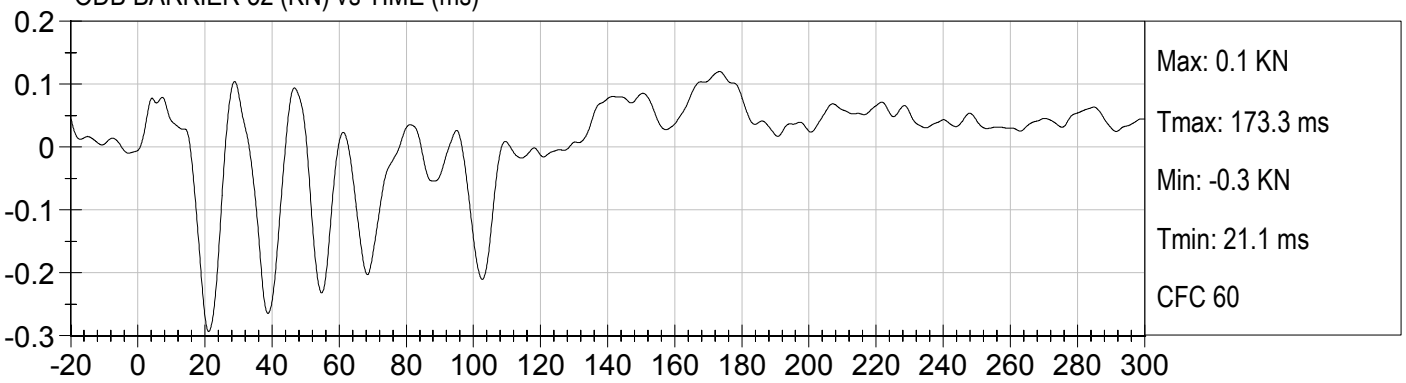
ODB BARRIER 50 (KN) vs TIME (ms)



ODB BARRIER 51 (KN) vs TIME (ms)



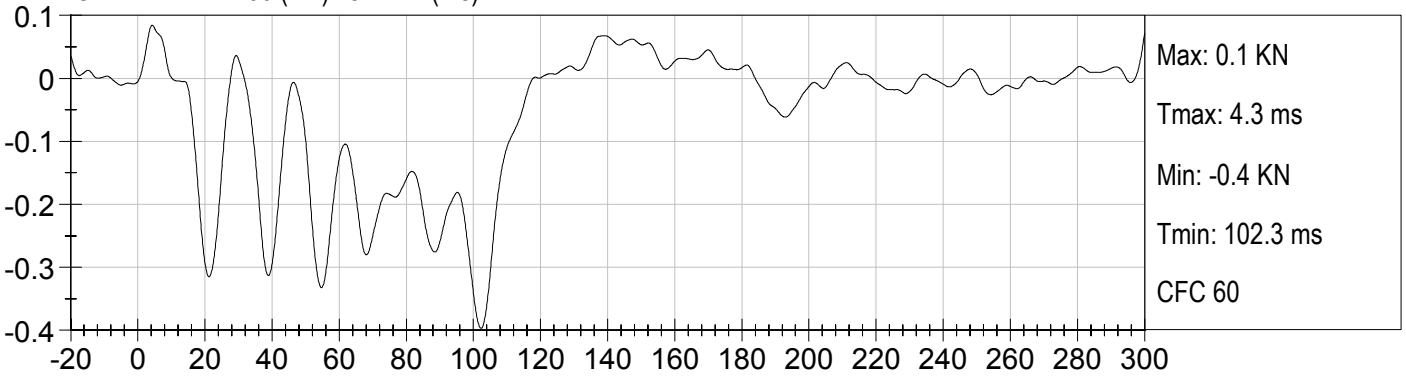
ODB BARRIER 52 (KN) vs TIME (ms)



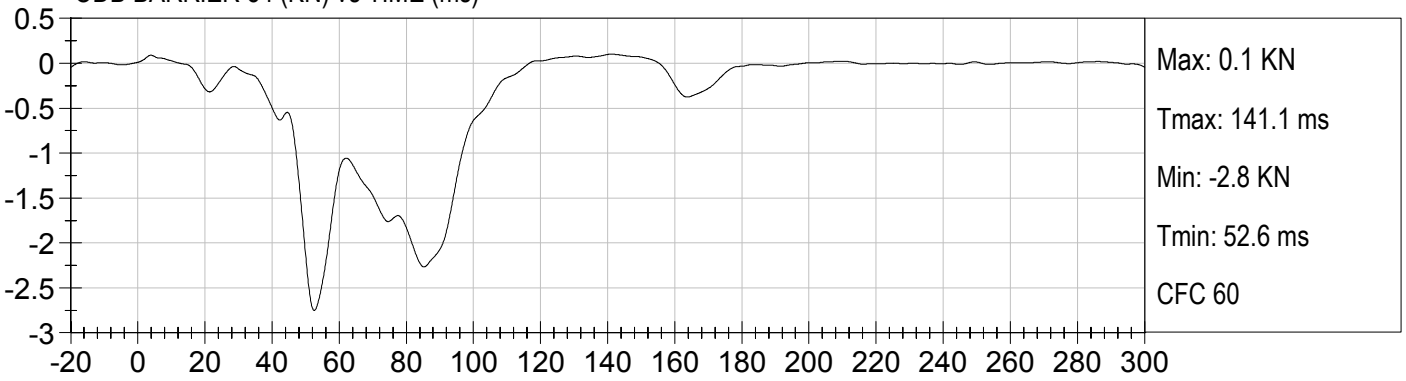
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

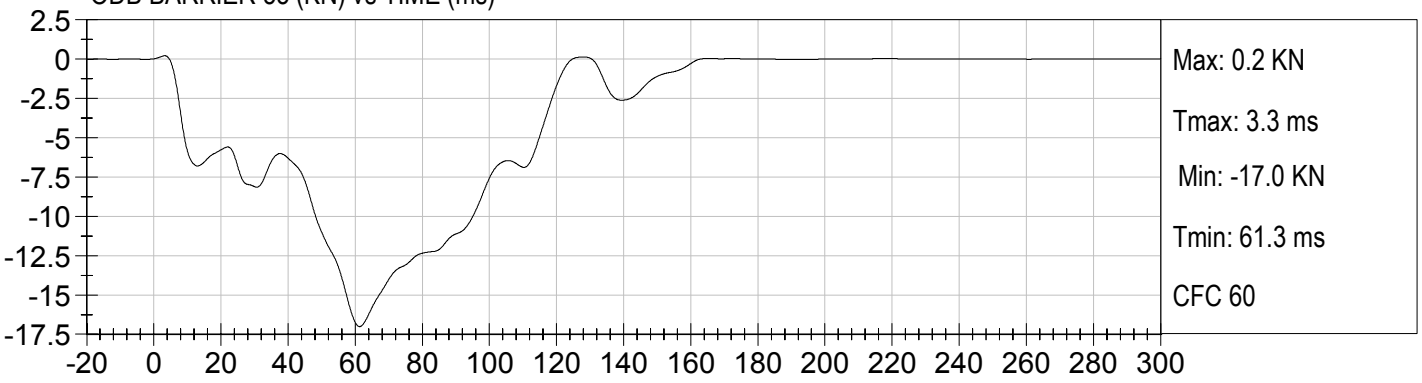
ODB BARRIER 53 (KN) vs TIME (ms)



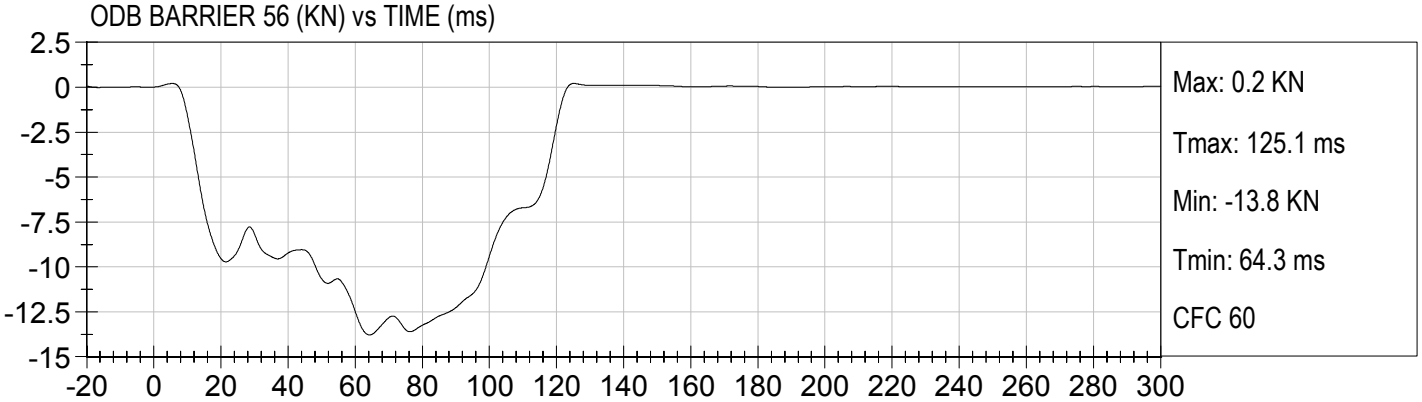
ODB BARRIER 54 (KN) vs TIME (ms)



ODB BARRIER 55 (KN) vs TIME (ms)

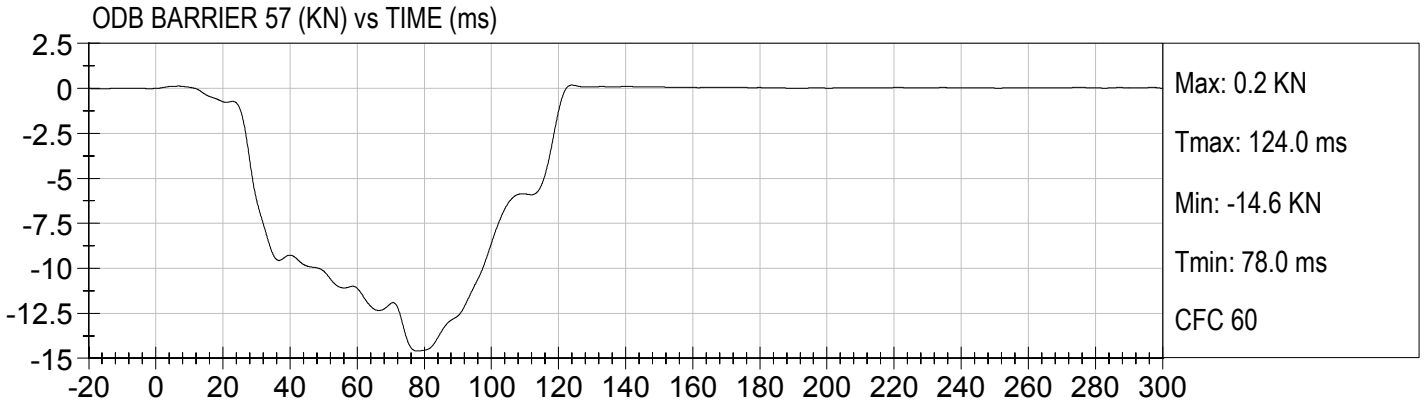


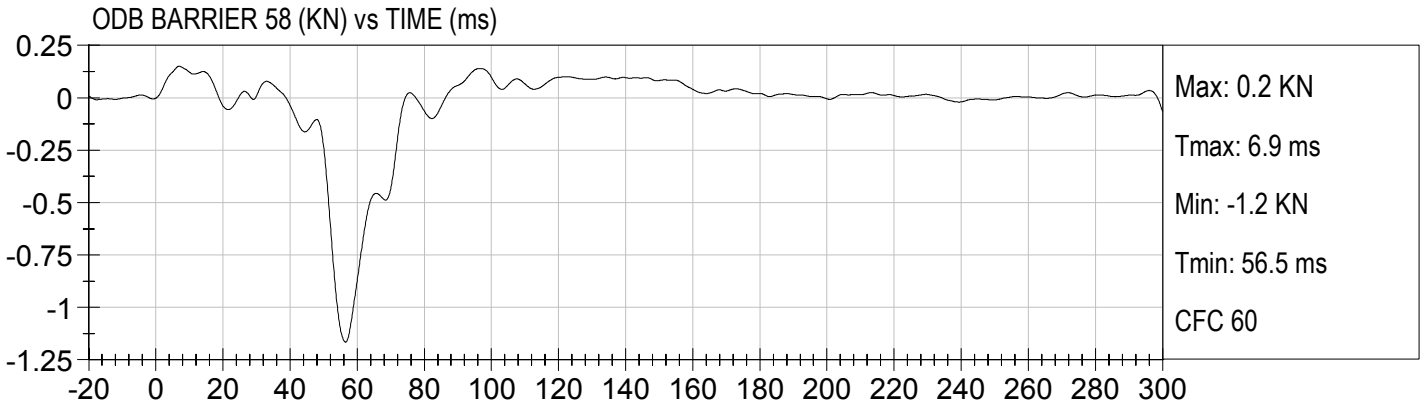
ODB BARRIER 56 (KN) vs TIME (ms)

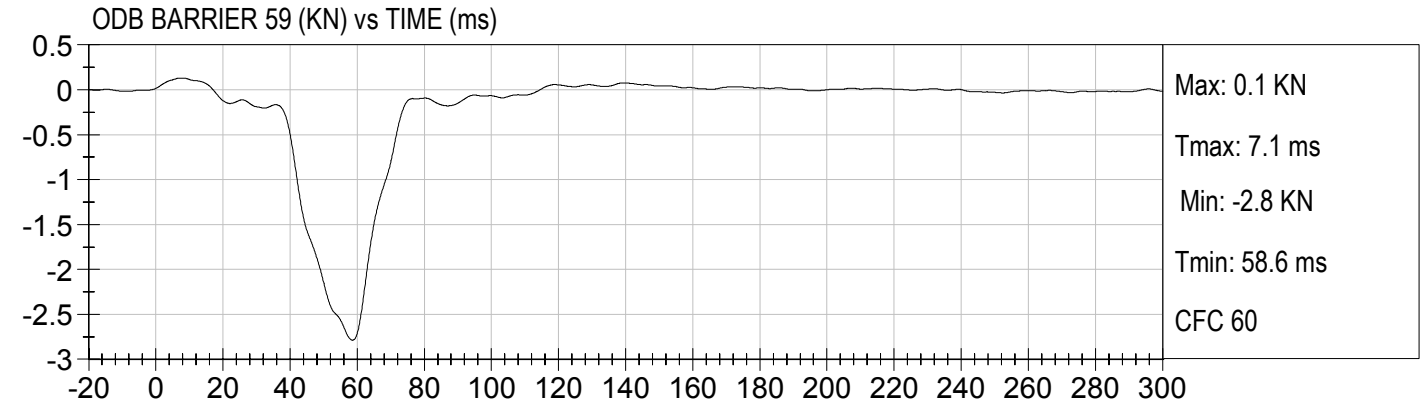


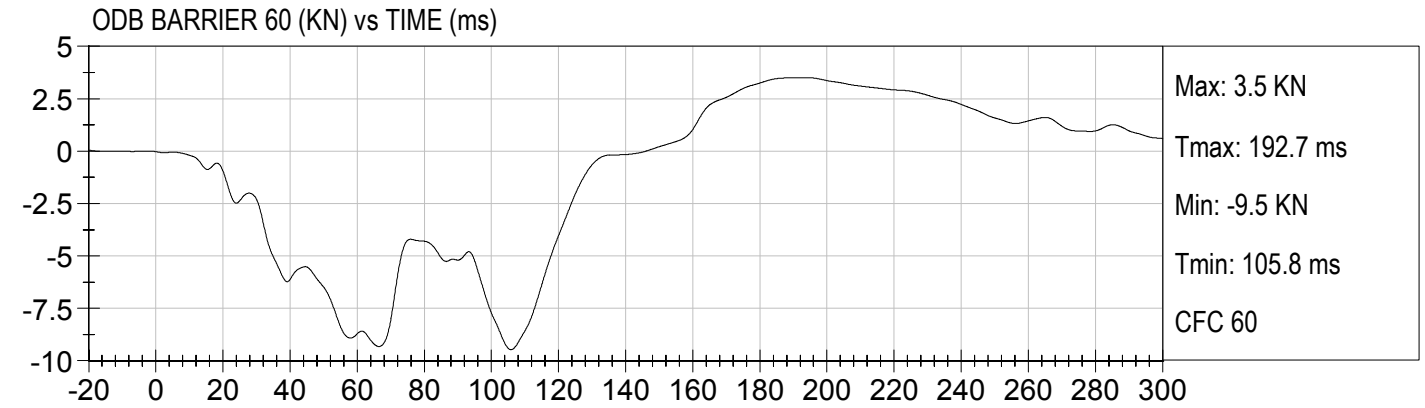
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)





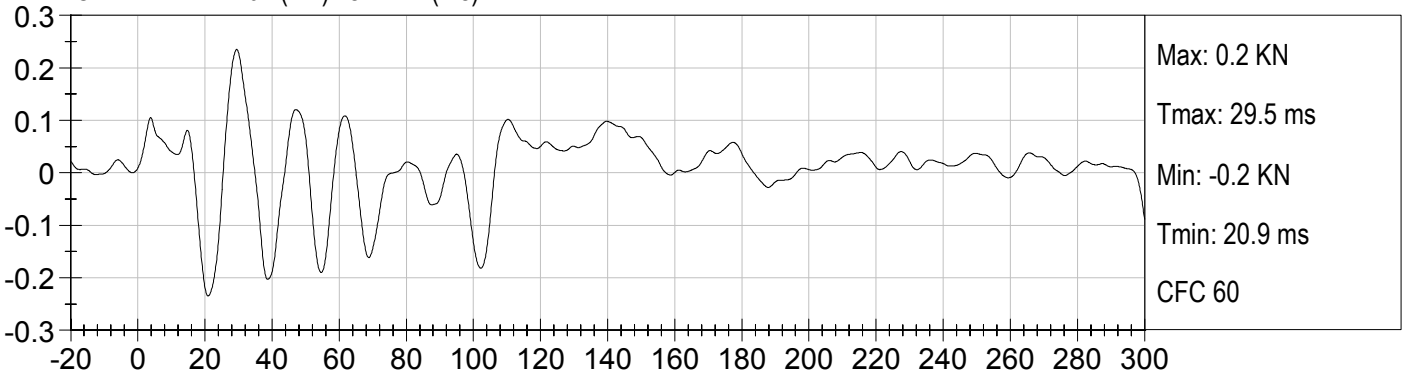




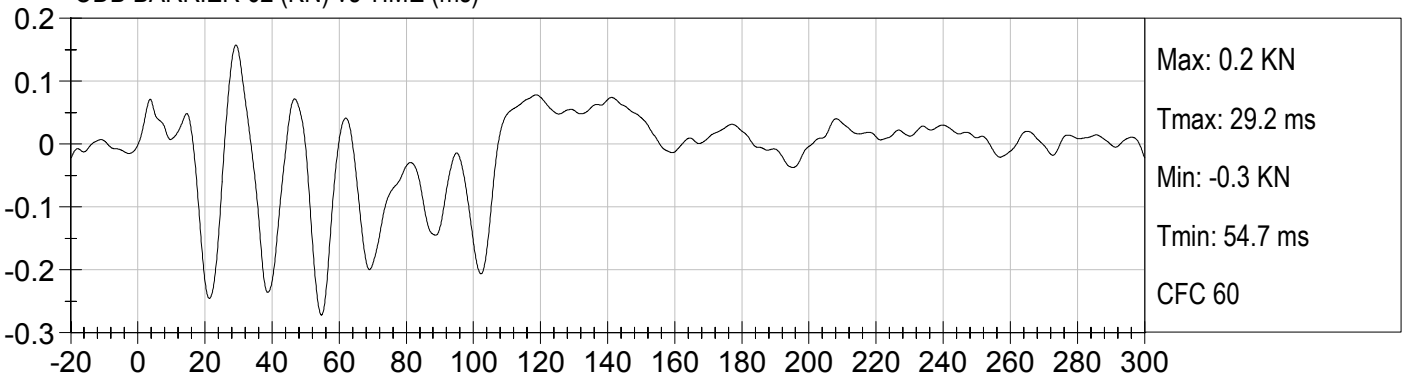
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

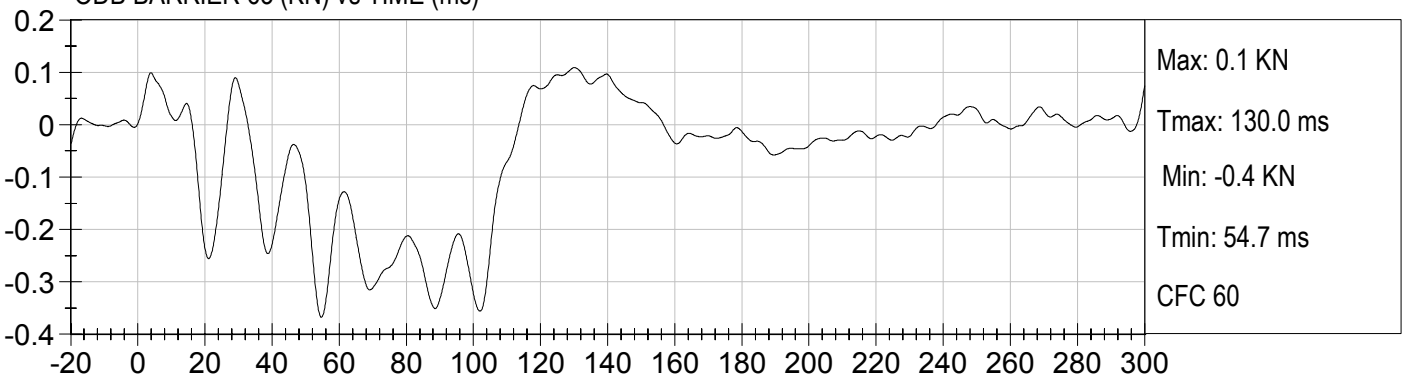
ODB BARRIER 61 (KN) vs TIME (ms)



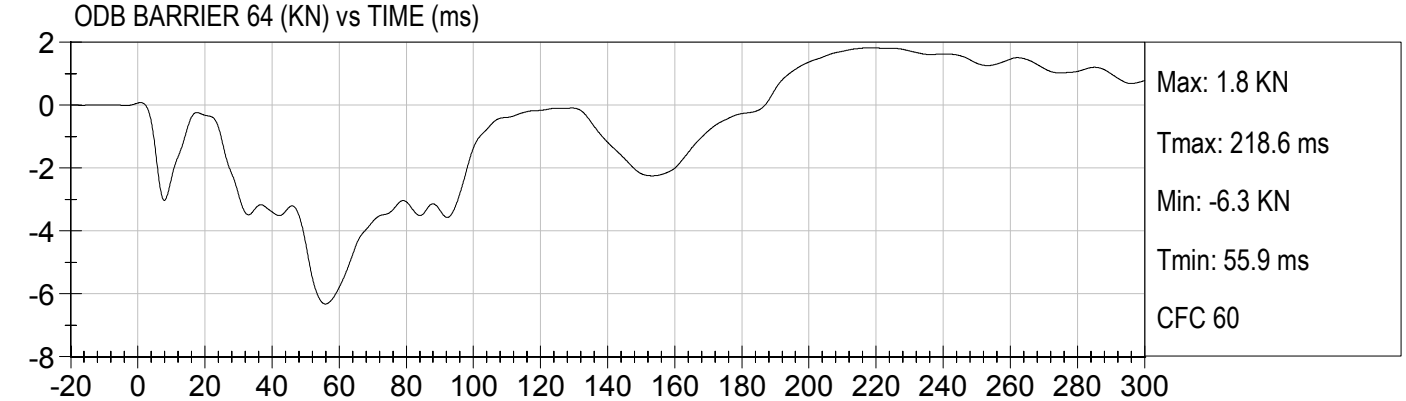
ODB BARRIER 62 (KN) vs TIME (ms)



ODB BARRIER 63 (KN) vs TIME (ms)



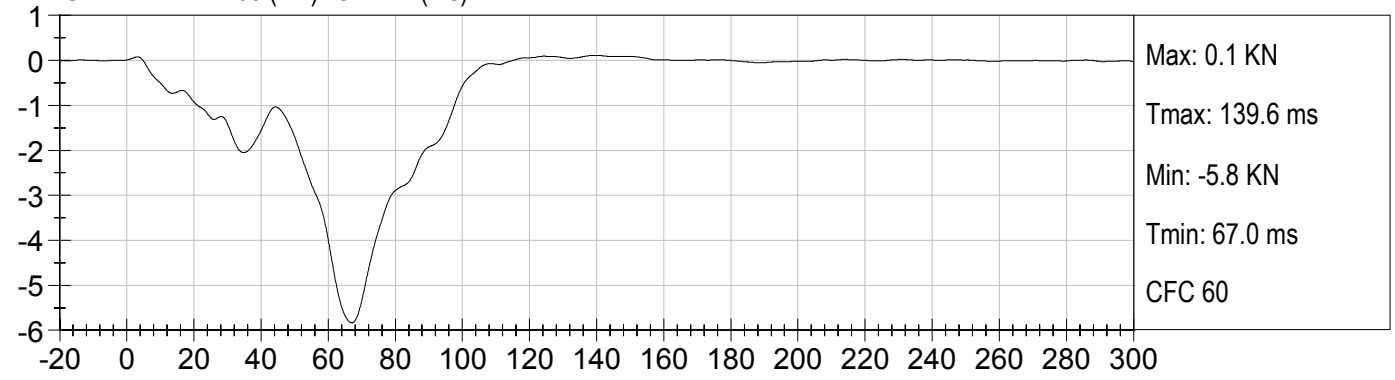
ODB BARRIER 64 (KN) vs TIME (ms)



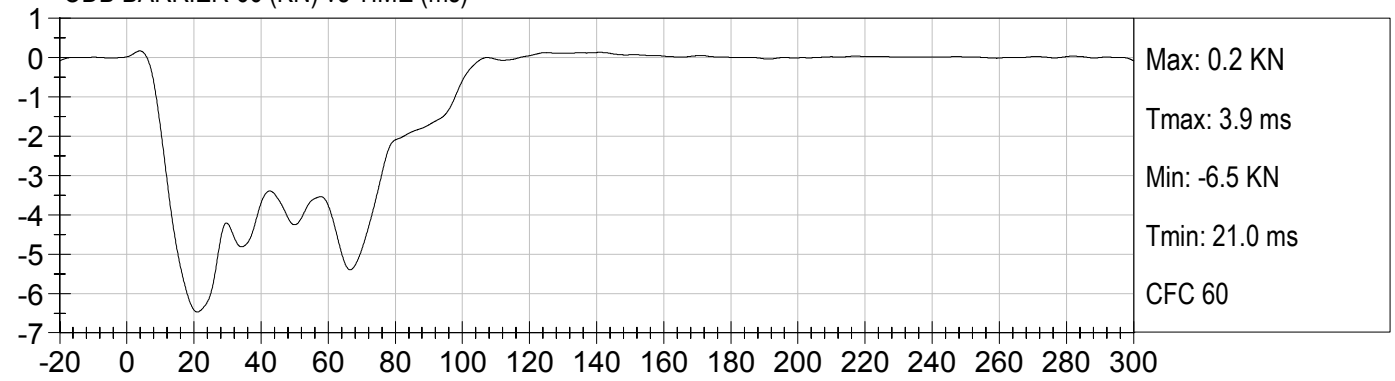
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

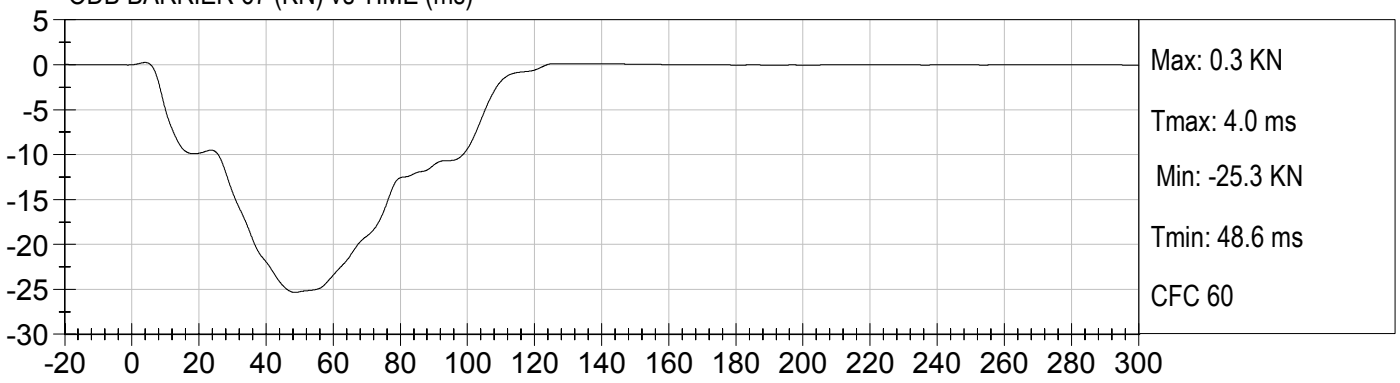
ODB BARRIER 65 (KN) vs TIME (ms)



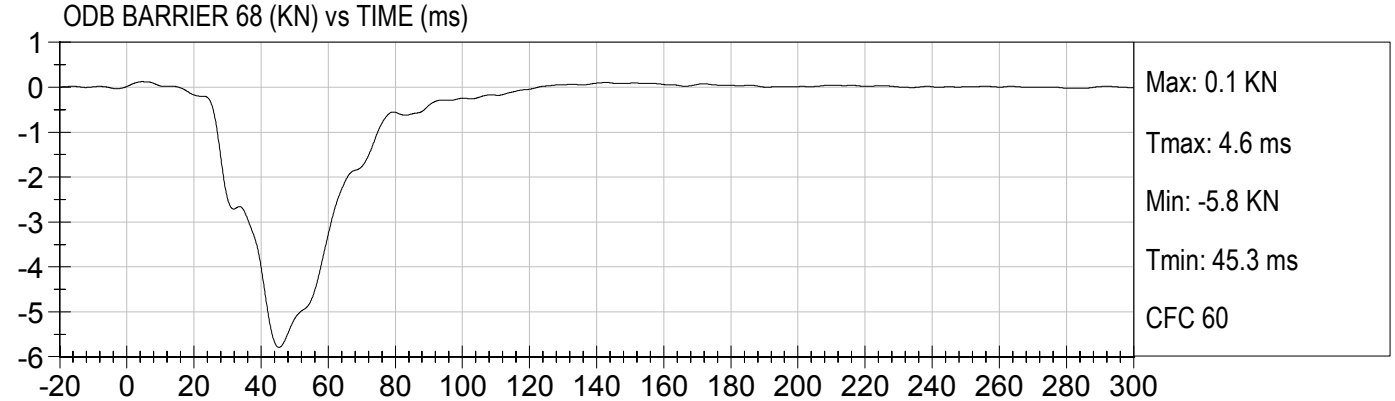
ODB BARRIER 66 (KN) vs TIME (ms)



ODB BARRIER 67 (KN) vs TIME (ms)



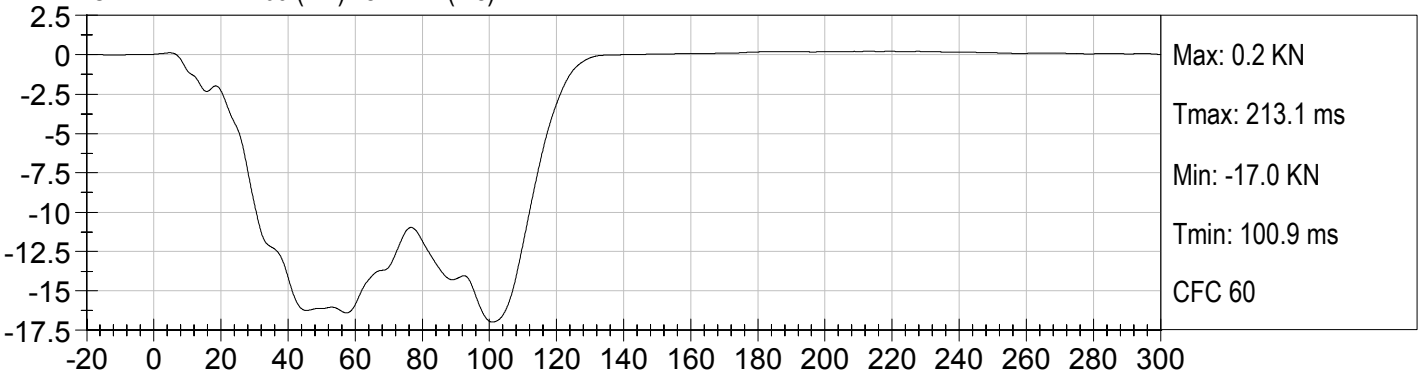
ODB BARRIER 68 (KN) vs TIME (ms)



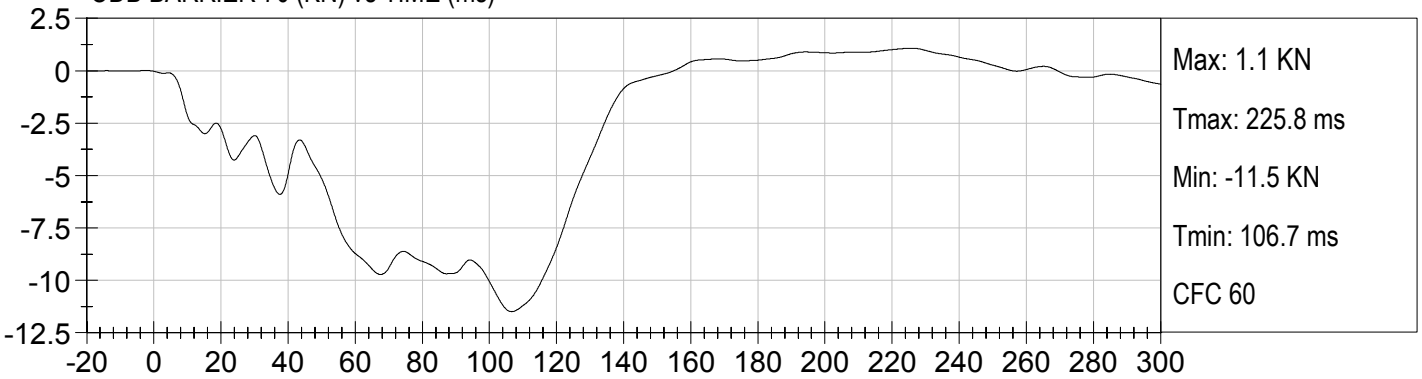
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

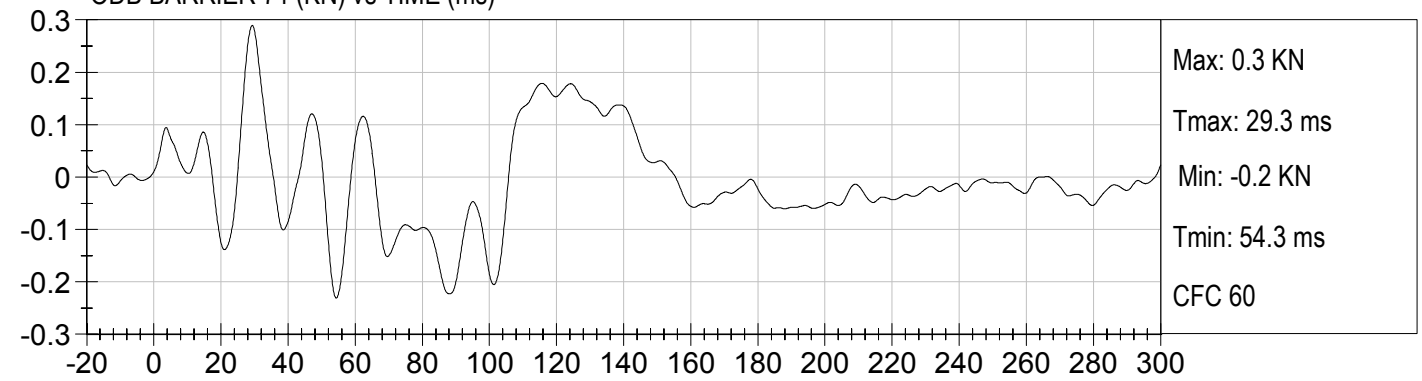
ODB BARRIER 69 (KN) vs TIME (ms)



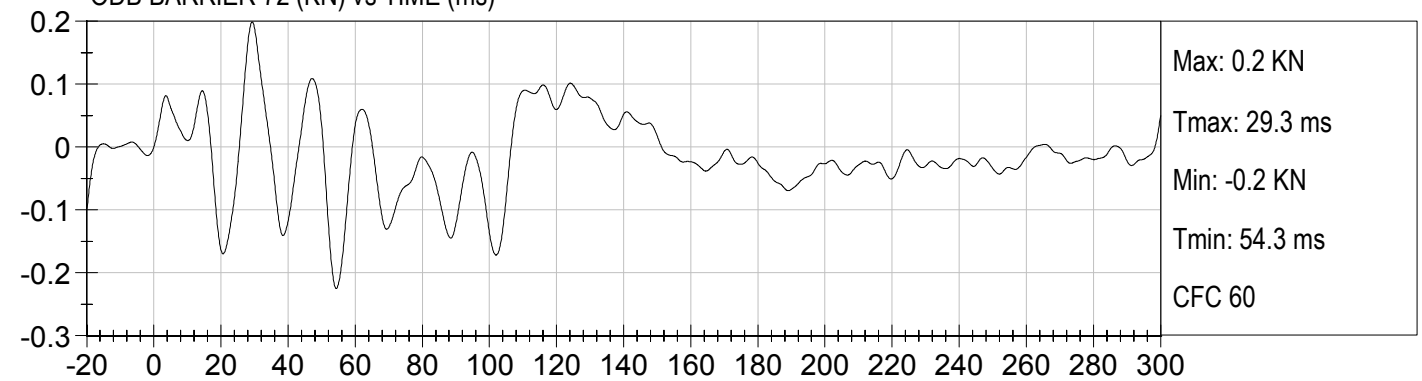
ODB BARRIER 70 (KN) vs TIME (ms)



ODB BARRIER 71 (KN) vs TIME (ms)



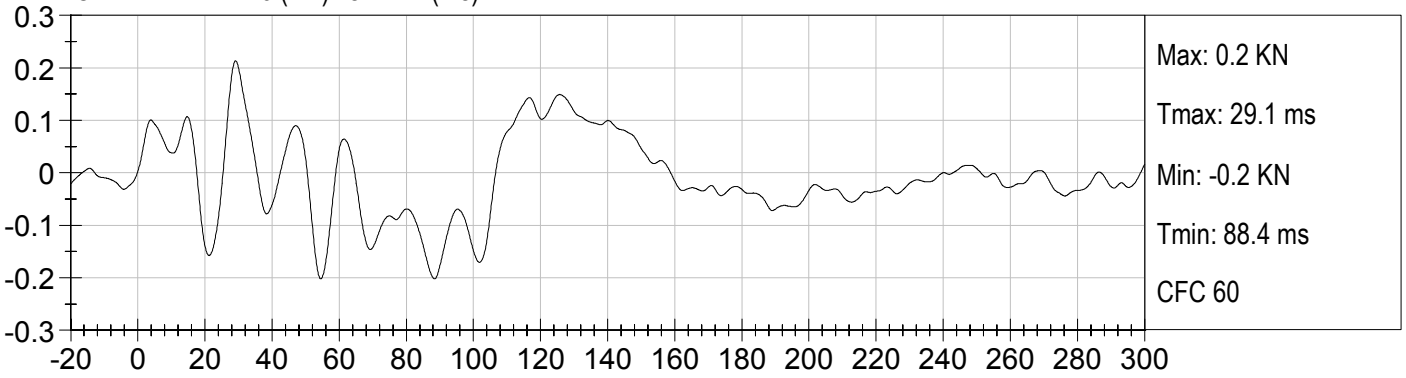
ODB BARRIER 72 (KN) vs TIME (ms)



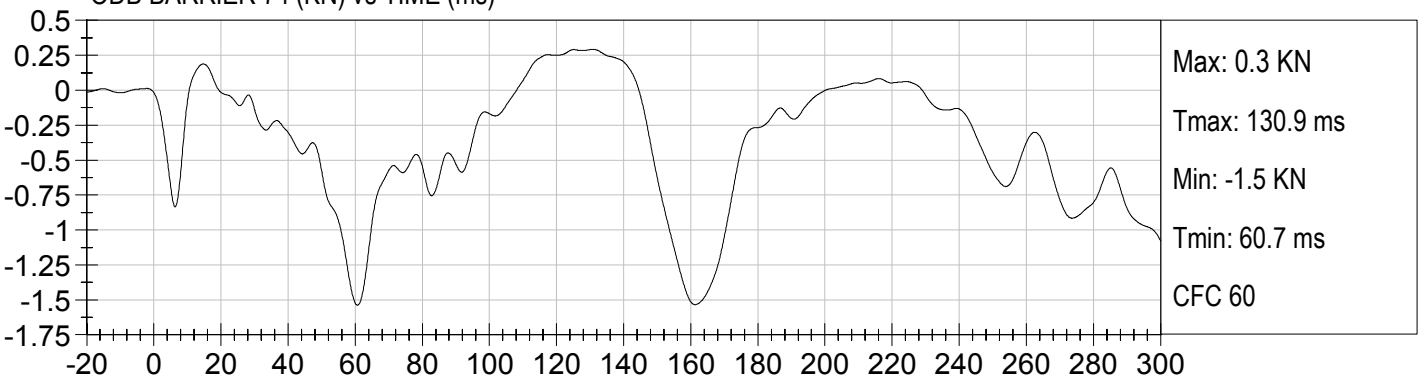
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

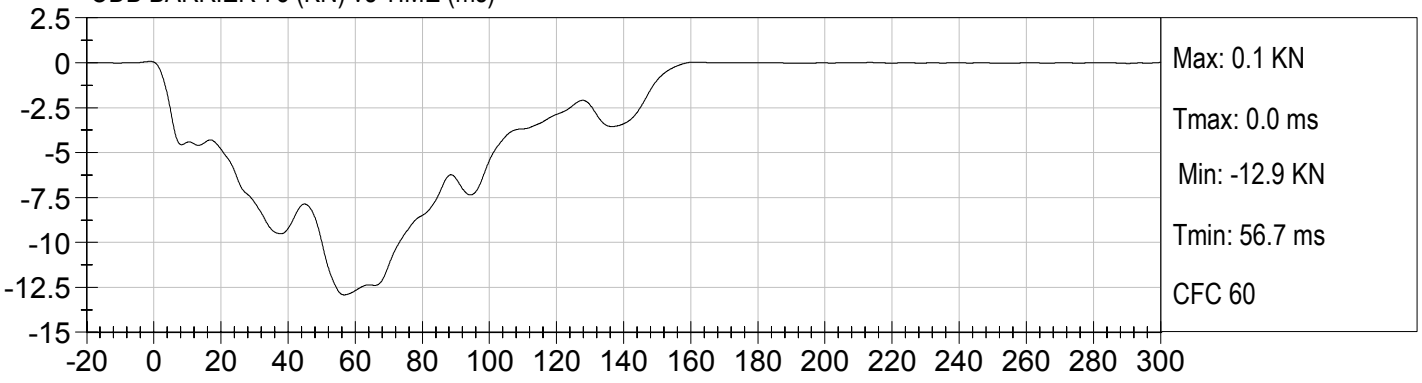
ODB BARRIER 73 (KN) vs TIME (ms)



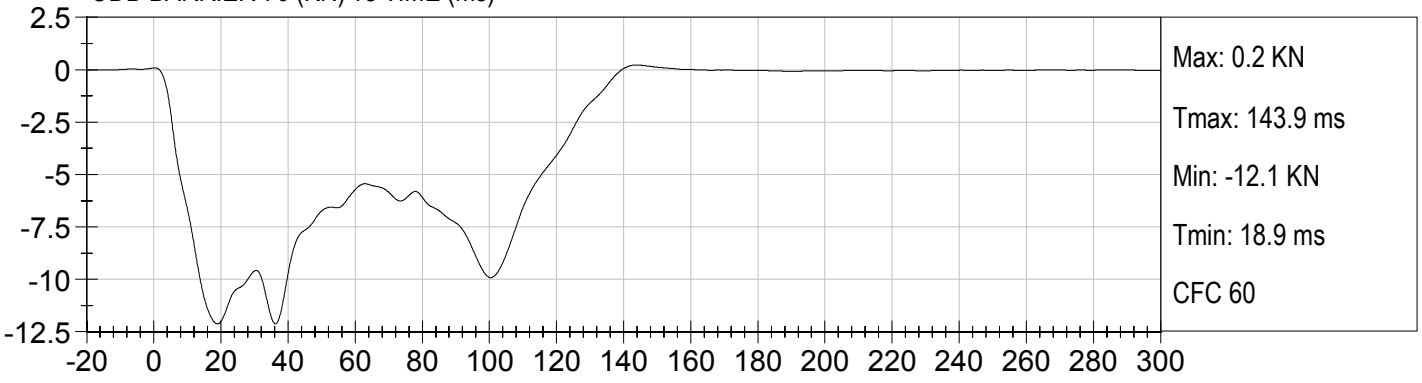
ODB BARRIER 74 (KN) vs TIME (ms)



ODB BARRIER 75 (KN) vs TIME (ms)



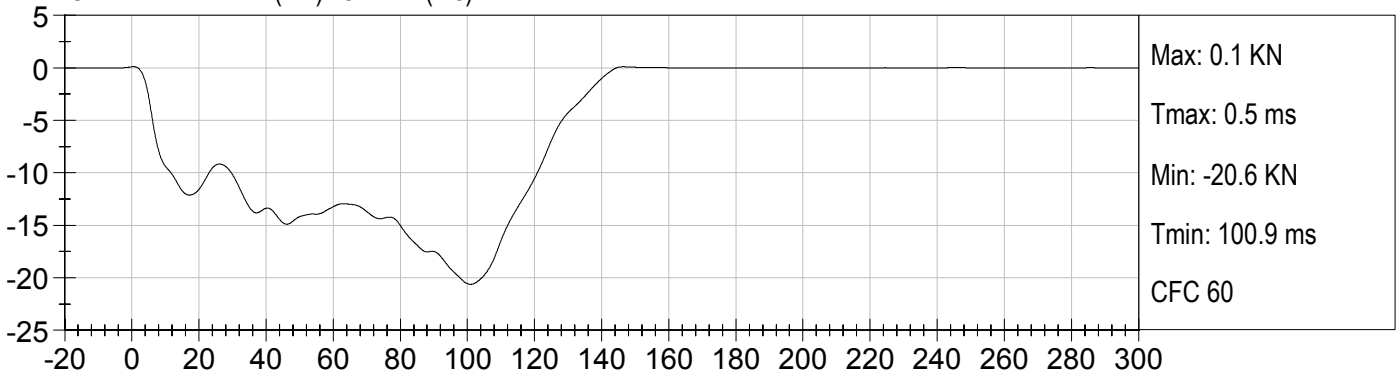
ODB BARRIER 76 (KN) vs TIME (ms)



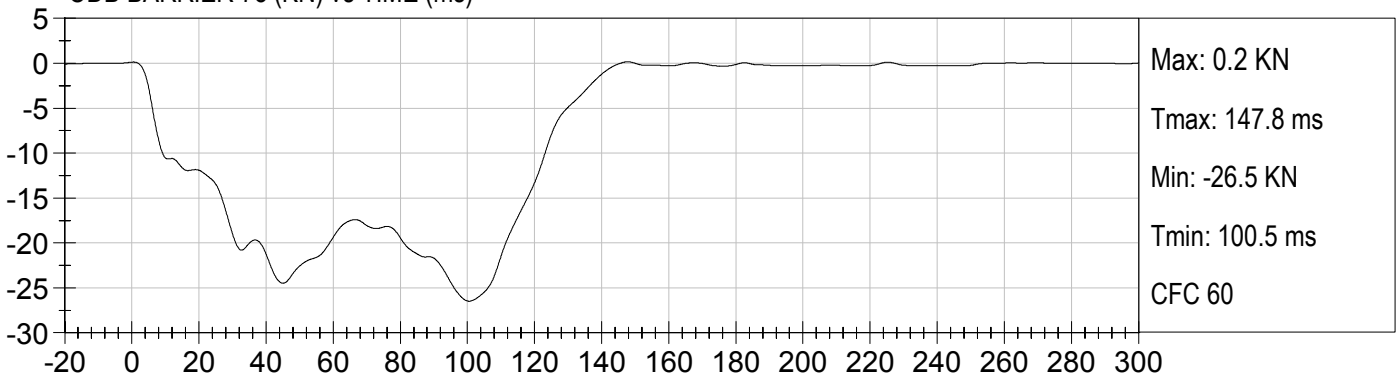
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

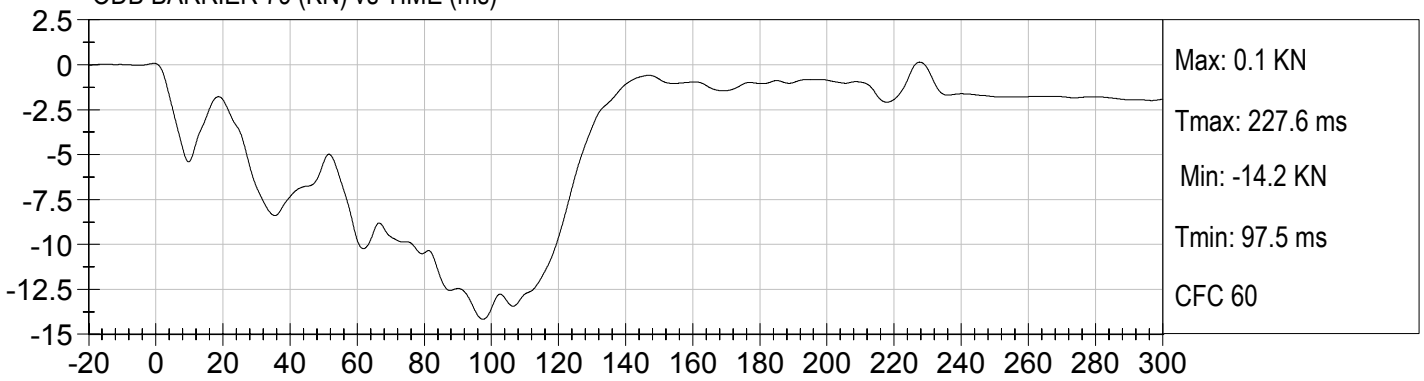
ODB BARRIER 77 (KN) vs TIME (ms)



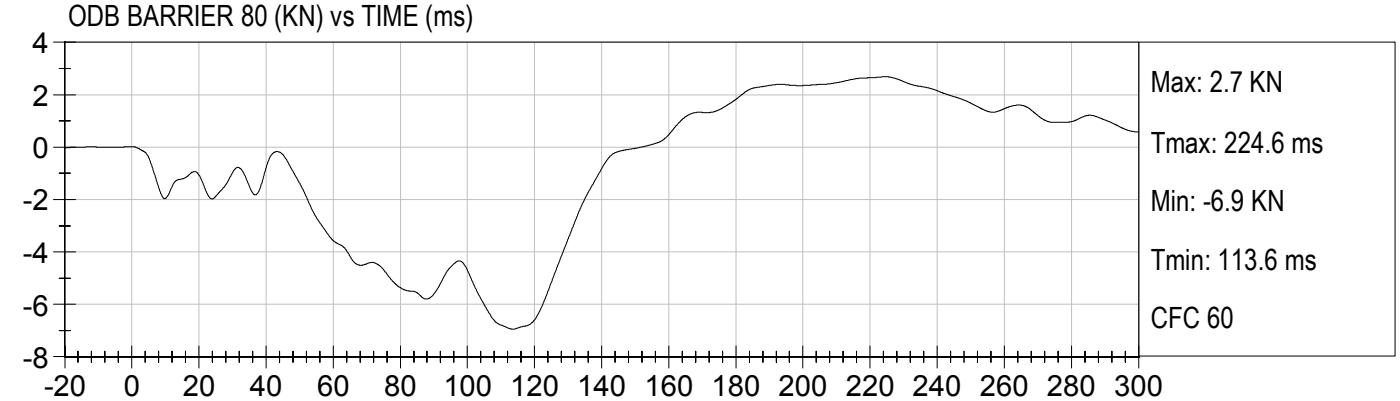
ODB BARRIER 78 (KN) vs TIME (ms)



ODB BARRIER 79 (KN) vs TIME (ms)



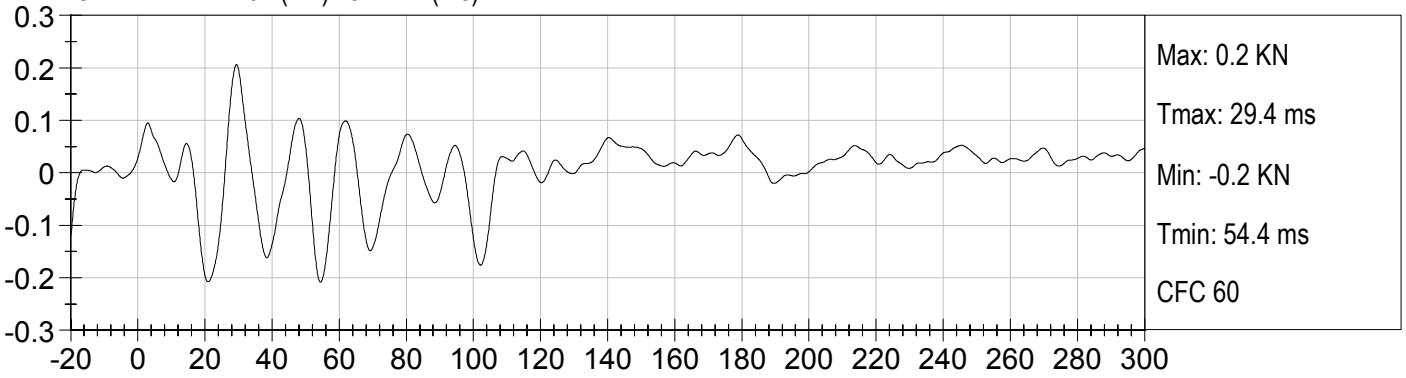
ODB BARRIER 80 (KN) vs TIME (ms)



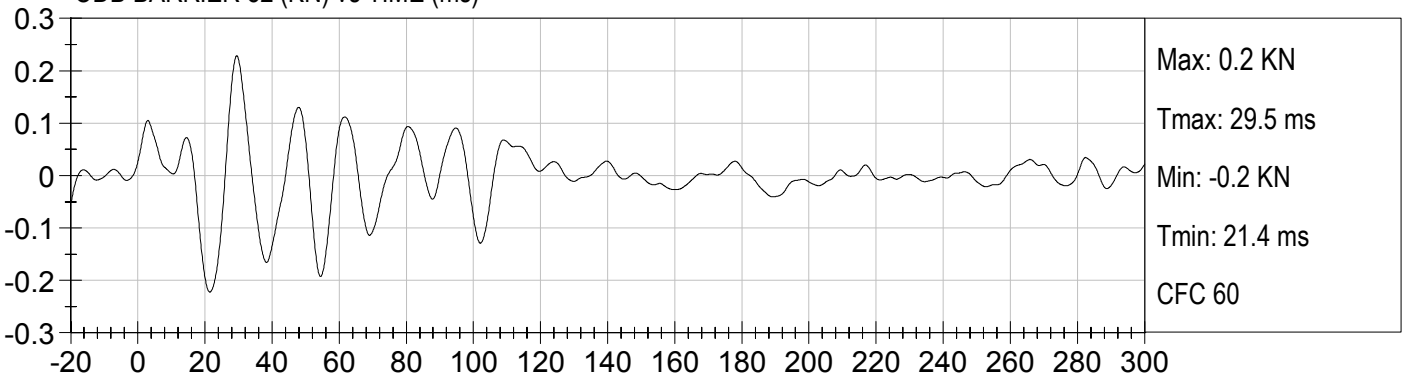
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

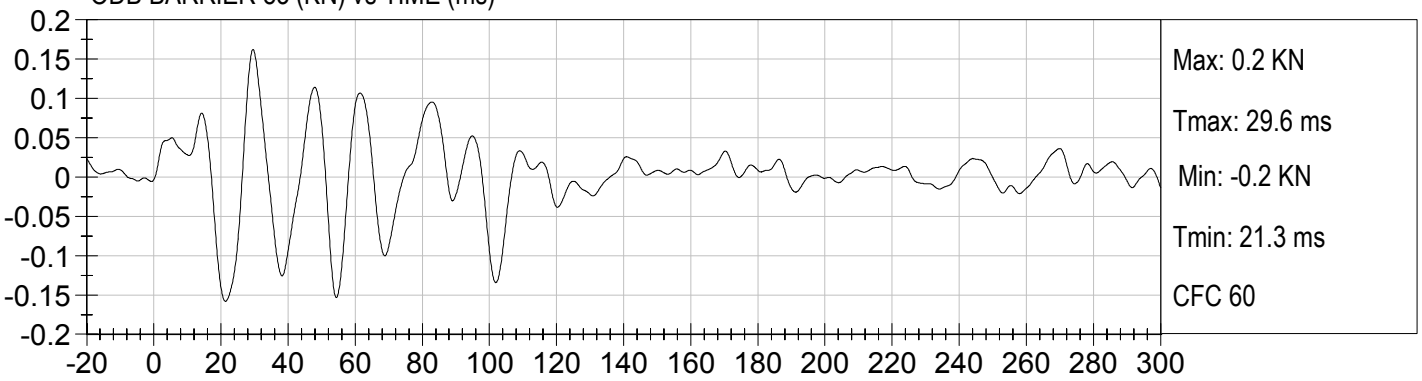
ODB BARRIER 81 (KN) vs TIME (ms)



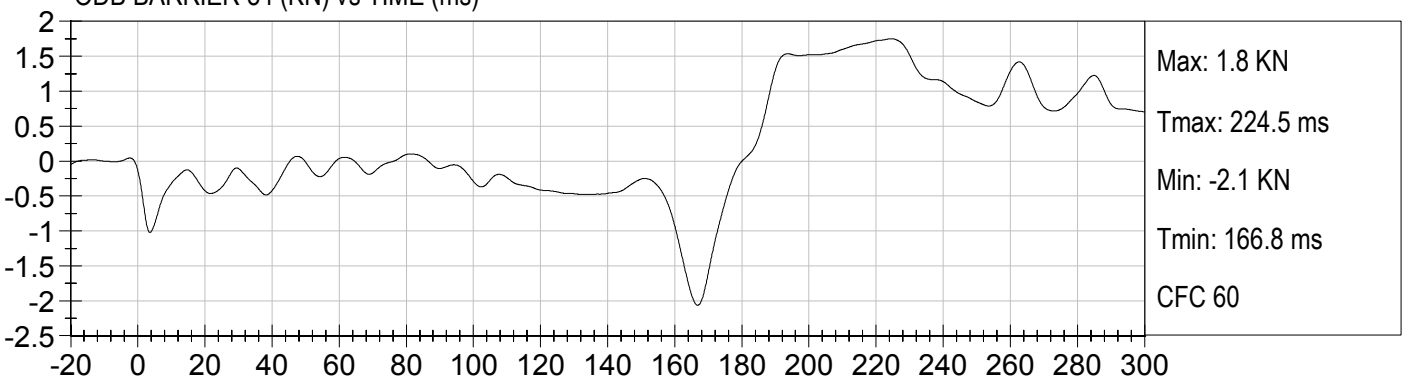
ODB BARRIER 82 (KN) vs TIME (ms)



ODB BARRIER 83 (KN) vs TIME (ms)



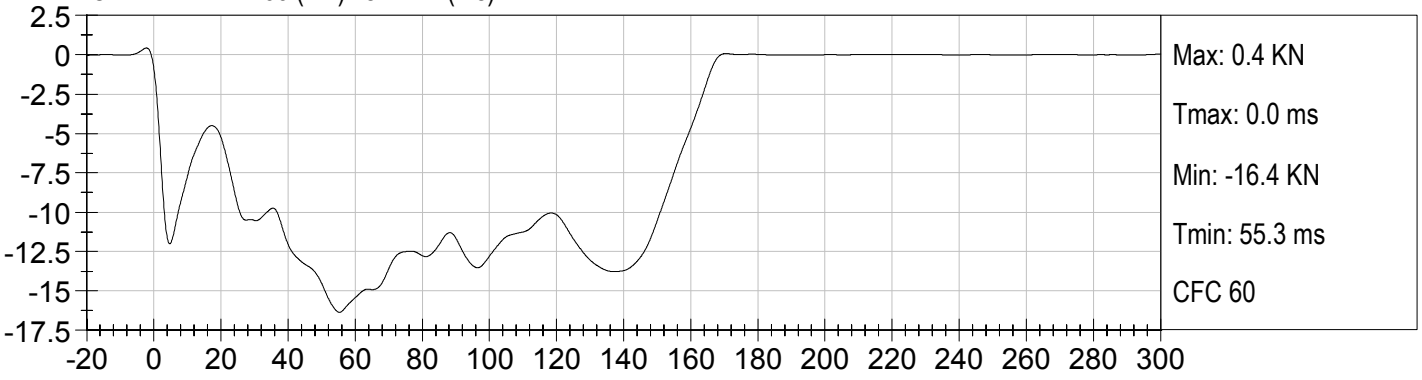
ODB BARRIER 84 (KN) vs TIME (ms)



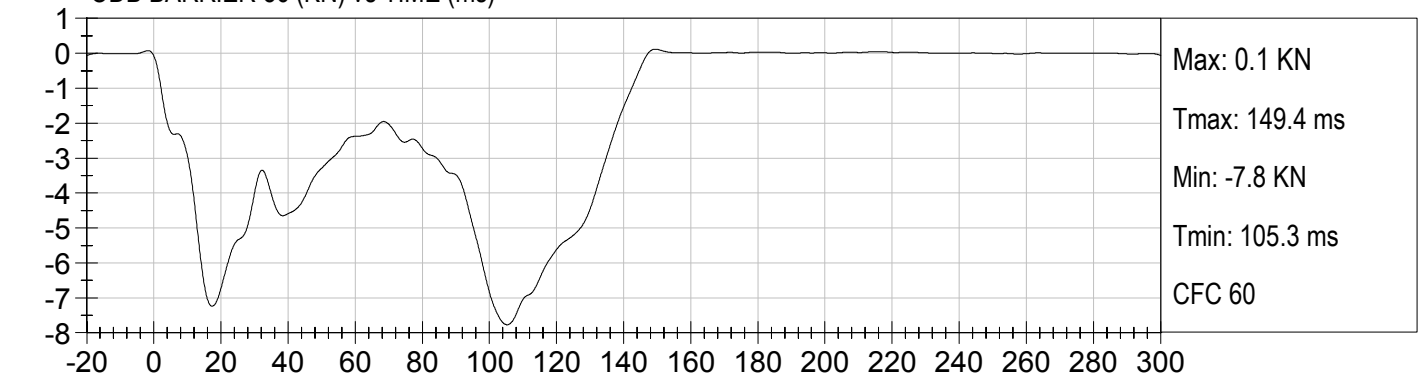
NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)

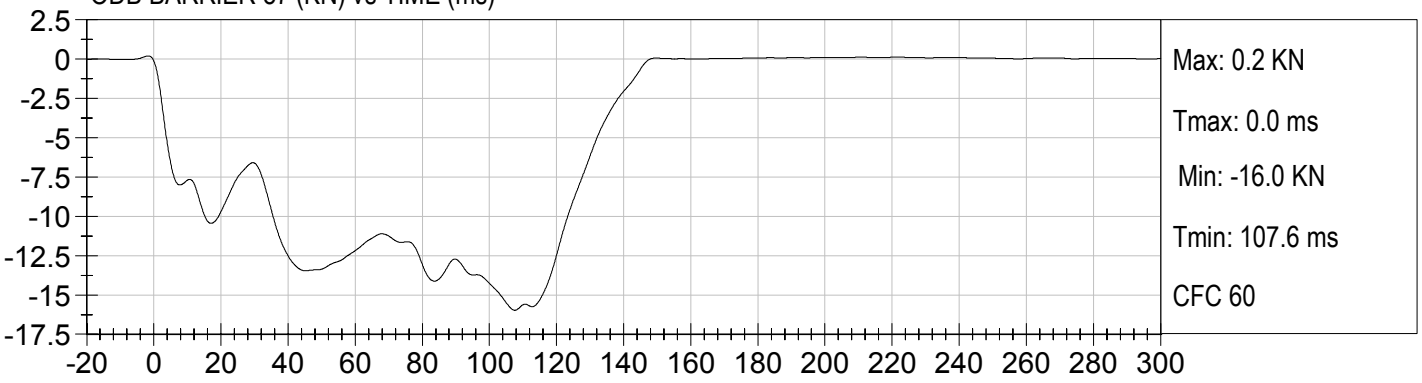
ODB BARRIER 85 (KN) vs TIME (ms)



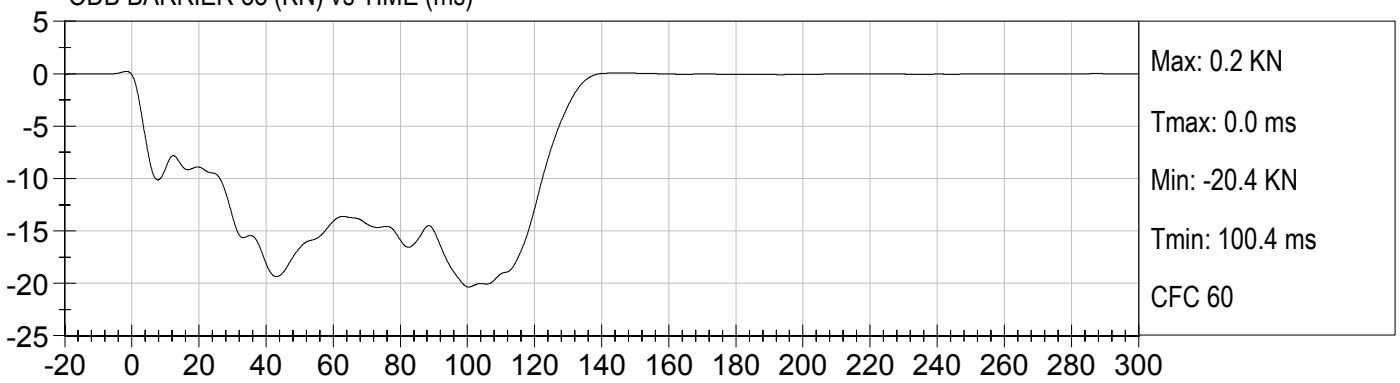
ODB BARRIER 86 (KN) vs TIME (ms)



ODB BARRIER 87 (KN) vs TIME (ms)

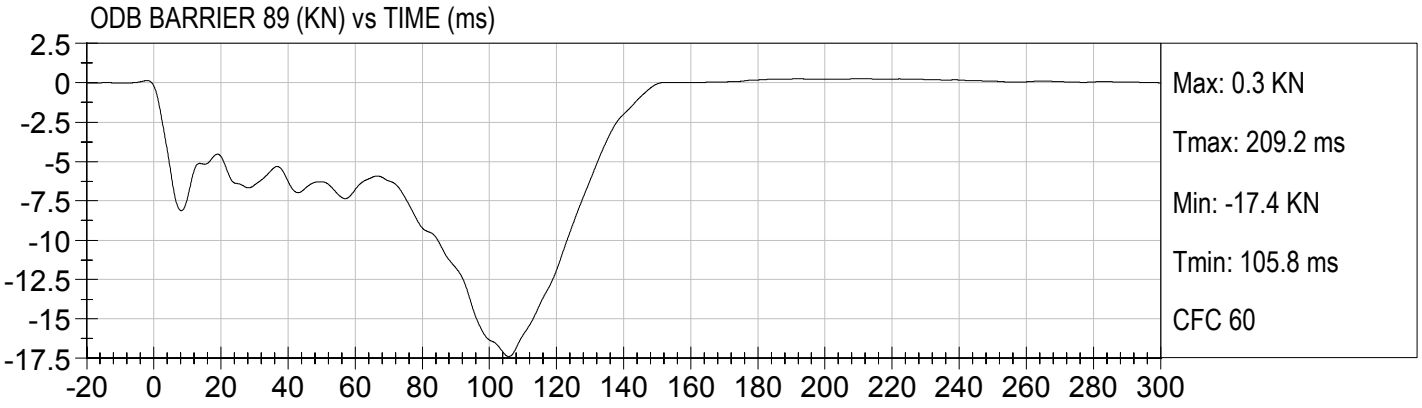


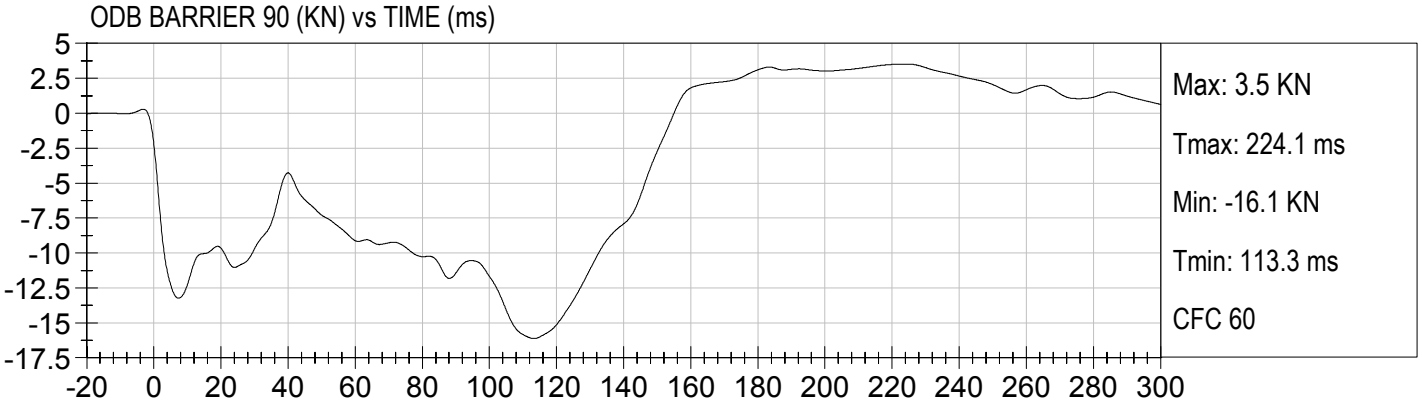
ODB BARRIER 88 (KN) vs TIME (ms)



NHTSA 50% OFFSET PDB FRONTAL
2008 SATURN OUTLOOK R80175

Test Date: 02/15/2008
Speed: 37.2 mph (59.9 km/h)





APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

MGA RESEARCH CORPORATION

HEAD DROP TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 202 **Test ID:** D08001

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Peak Resultant Acceleration	G's	225 - 275	248	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-5.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
		Overall Test Results		Pass

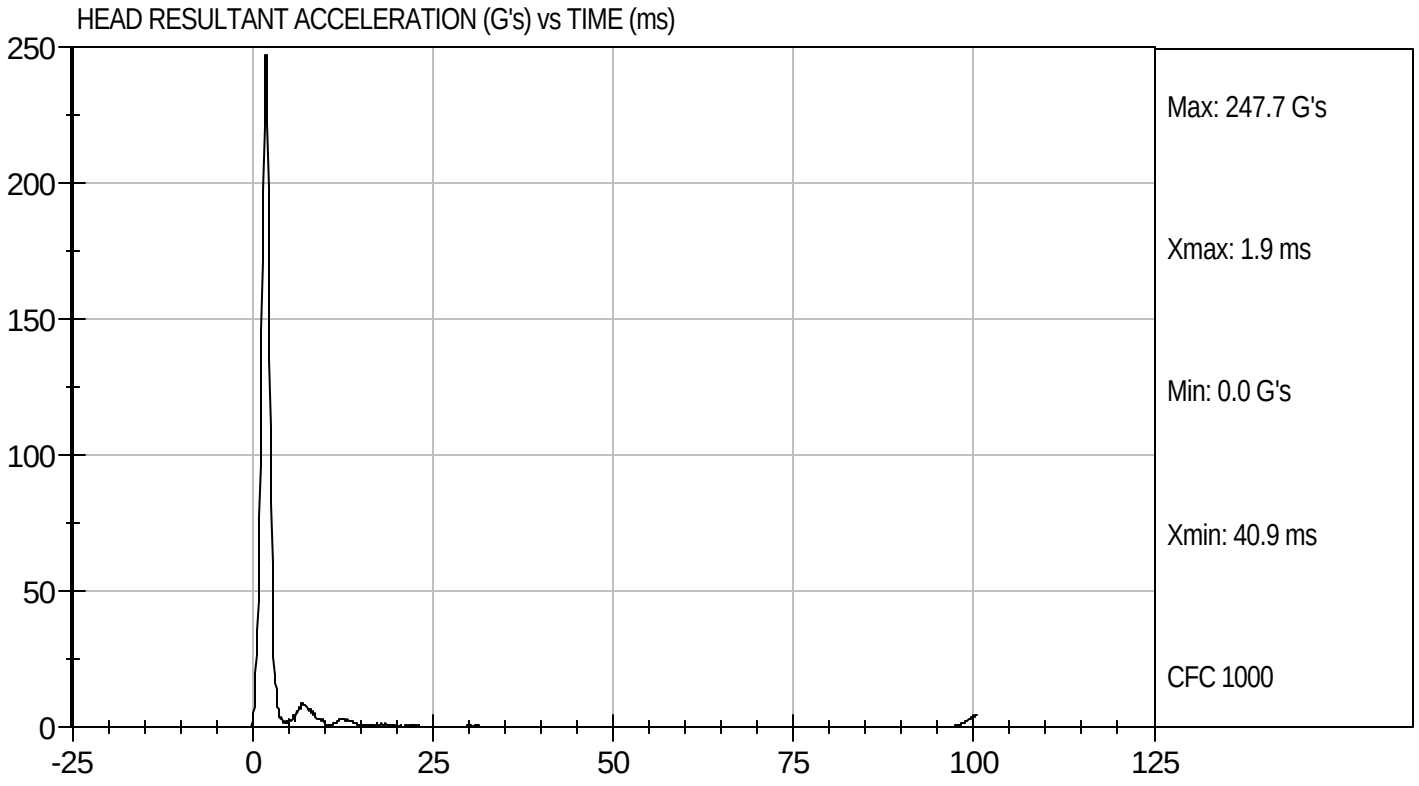
Laboratory Technician

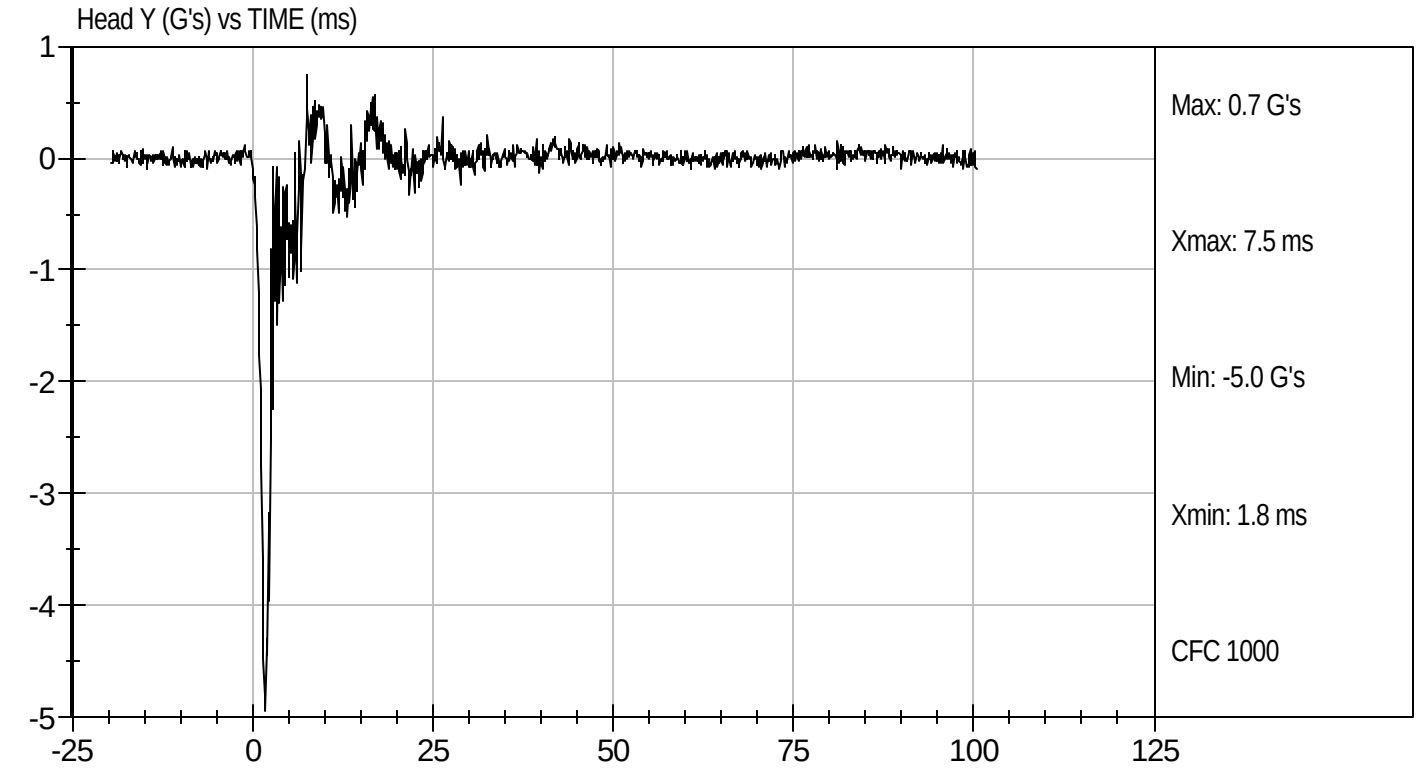
1/4/08
Test Date

David Winkelbauer
Approved By

Test Desc: Head Drop
Component ID: D08001

Test Date: 1/4/08
Velocity: 0 ft/s, 0.00 m/s





MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 202 **Test I.D:** D08002

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity		%	10 to 70	18	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.26	Pass
	20 msec	G's	17.60 to 22.60	18.01	Pass
	30 msec	G's	12.50 to 18.50	13.88	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	13.84	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	36.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	68.7	Pass
	Time	msec	57.0 to 64.0	57.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.1	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	96.9	Pass
	Time	msec	47.0 to 58.0	49.7	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	97.6	Pass
			Overall Test Results		Pass

Laboratory Technician

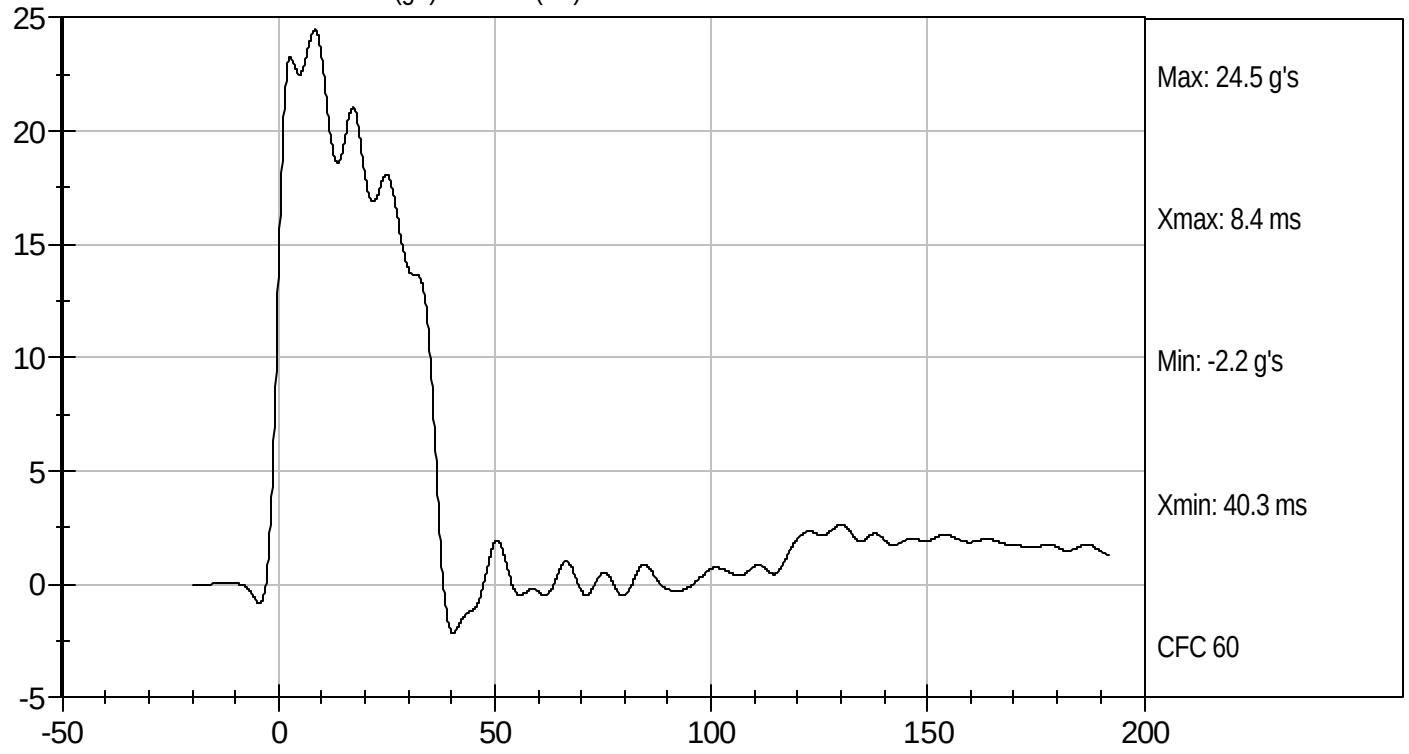
1/4/08
Test Date

David Winkelbauer
Approved By

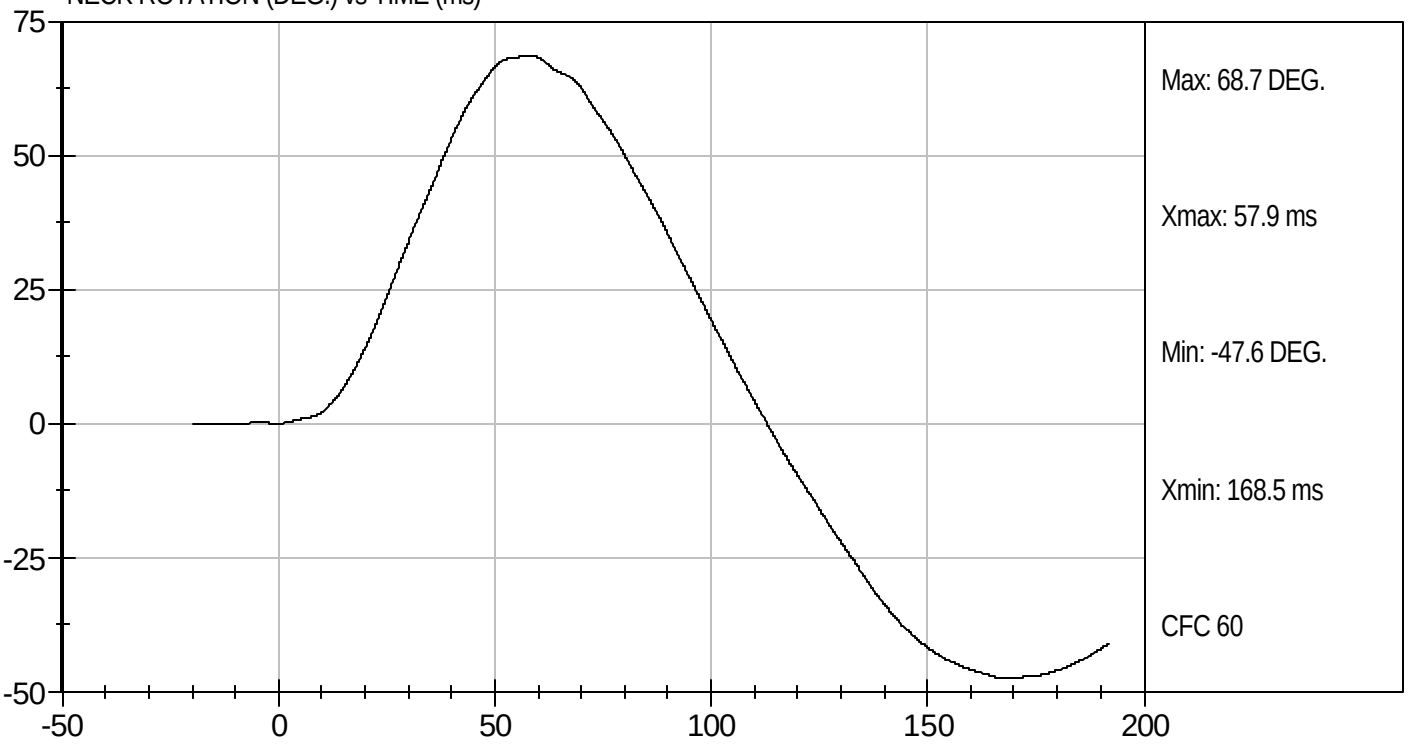
Test Desc: Neck Flexion
Component ID: D08002

Test Date: 1/4/08
Velocity: 23.14 ft/s, 7.05 m/s

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

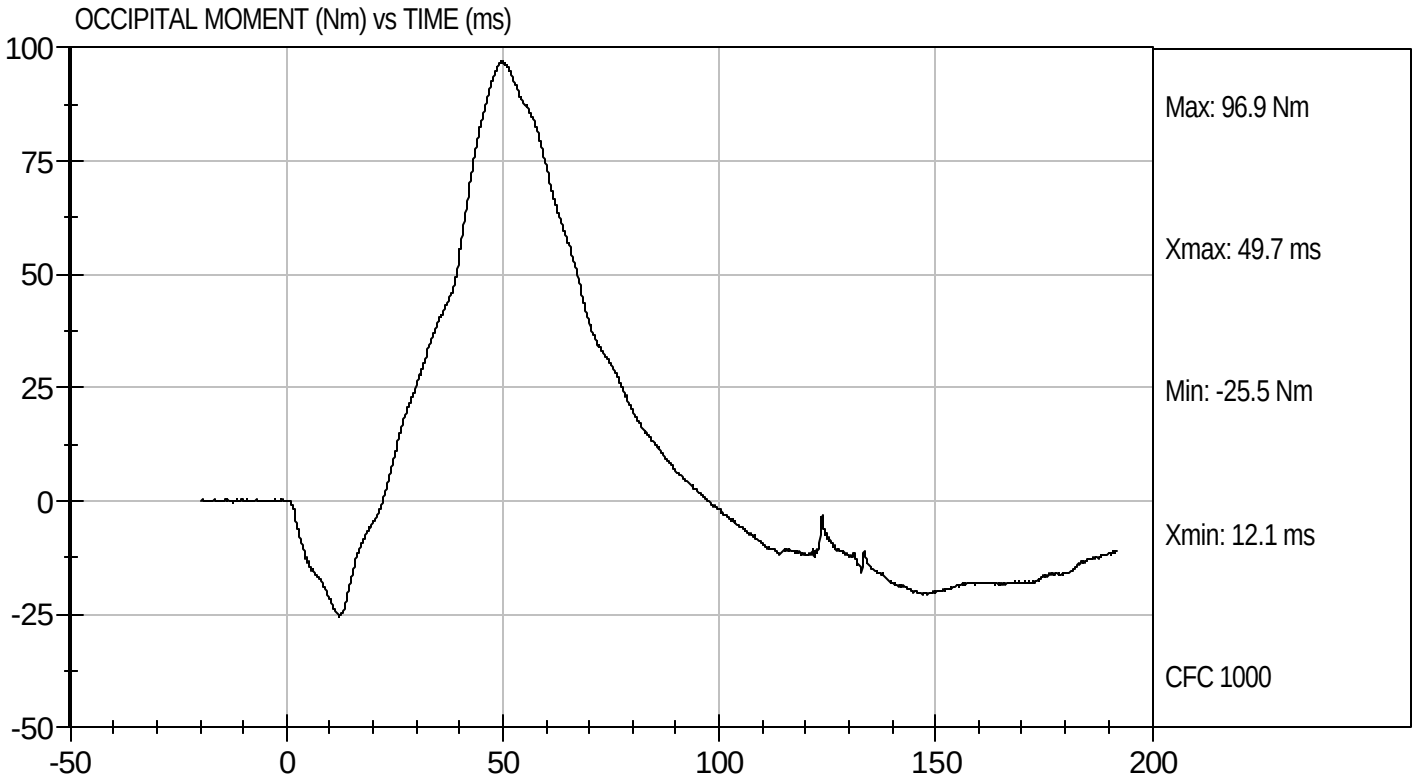


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Flexion
Component ID: D08002

Test Date: 1/4/08
Velocity: 23.14 ft/s, 7.05 m/s



MGA RESEARCH CORPORATION

NECK EXTENSION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 202 **Test I.D:** D08003

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity		%	10 to 70	18	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	17.98	Pass
	20 msec	G's	14.00 to 19.00	16.18	Pass
	30 msec	G's	11.00 to 16.00	12.89	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	12.88	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	93.5	Pass
	Time	msec	72.0 to 82.0	77.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	155.1	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-64.4	Pass
	Time	msec	65.0 to 79.0	69.8	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	140.0	Pass
			Overall Test Results		Pass

Laboratory Technician

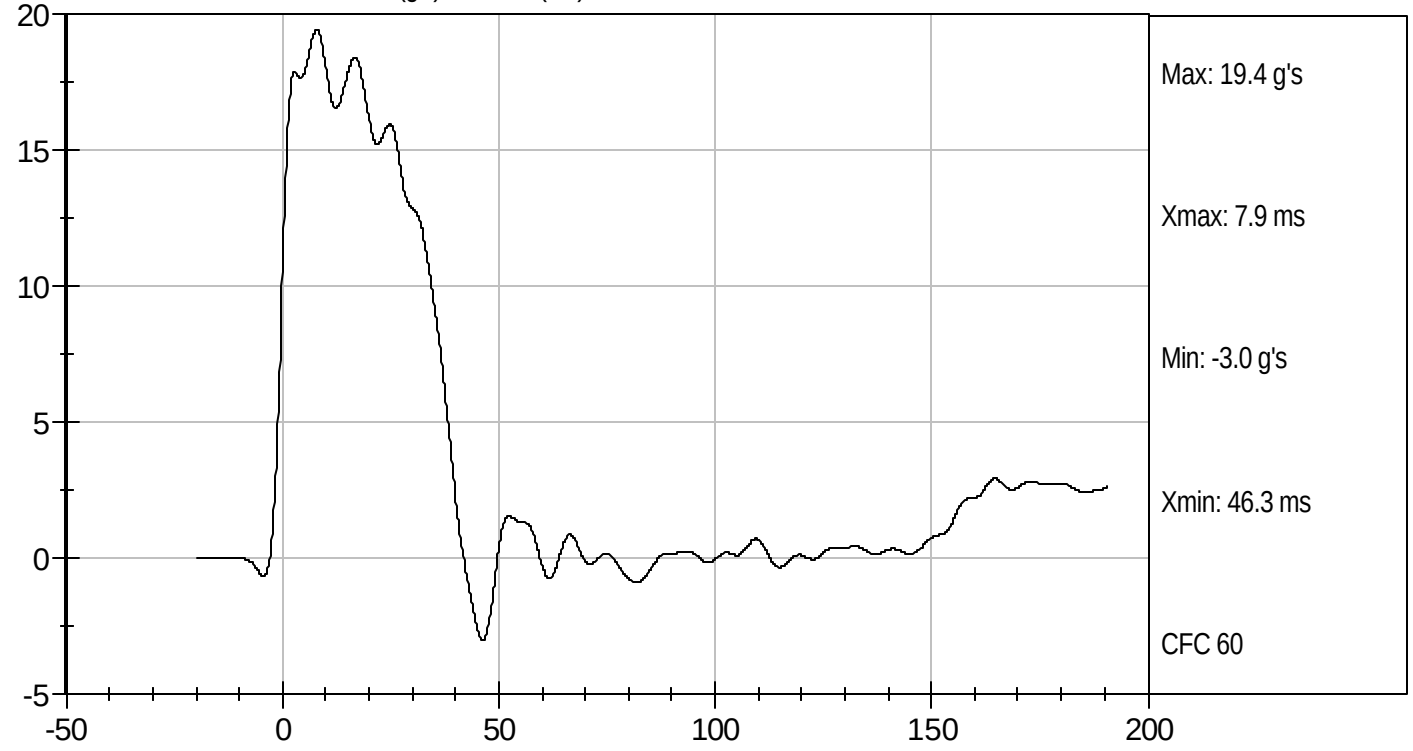
1/4/08
Test Date

David Winkelbauer
Approved By

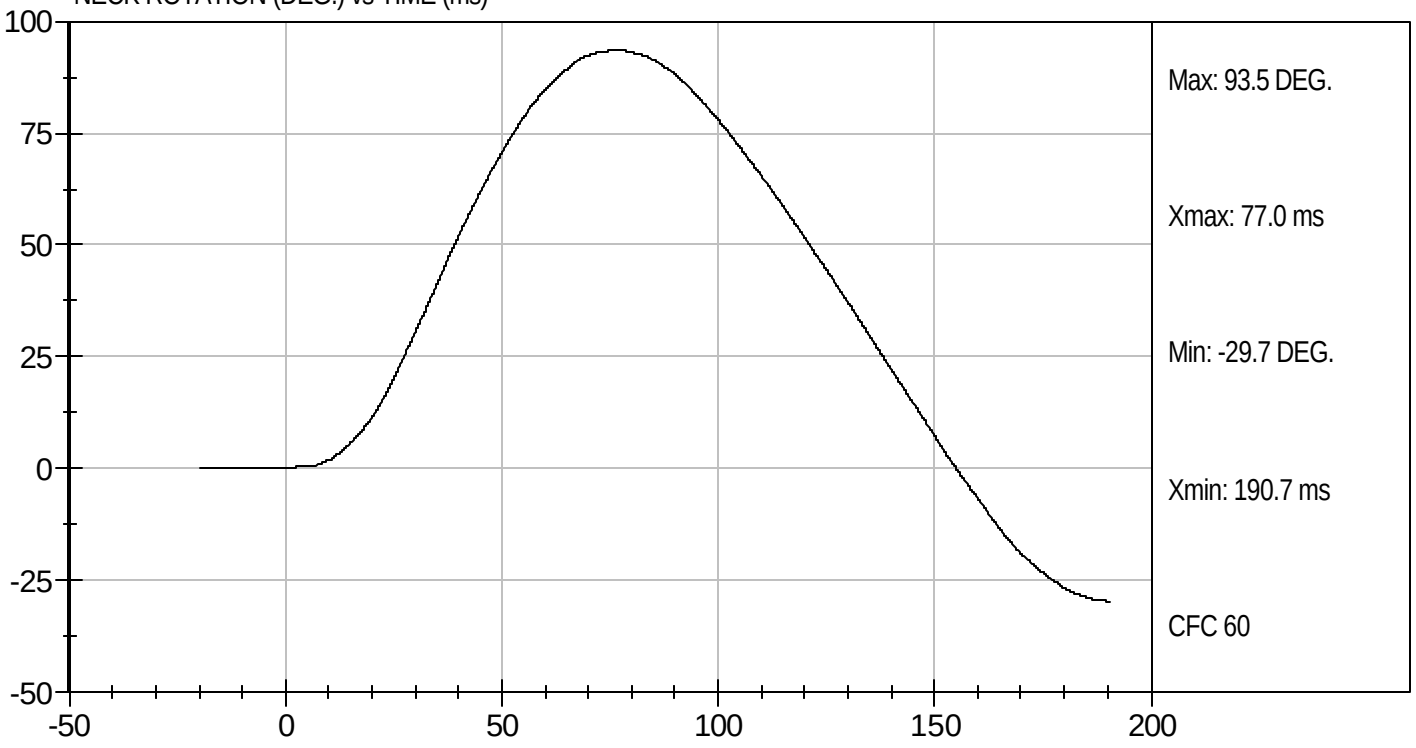
Test Desc: Neck Extension
Component ID: D08003

Test Date: 1/4/08
Velocity: 20.08 ft/s, 6.12 m/s

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

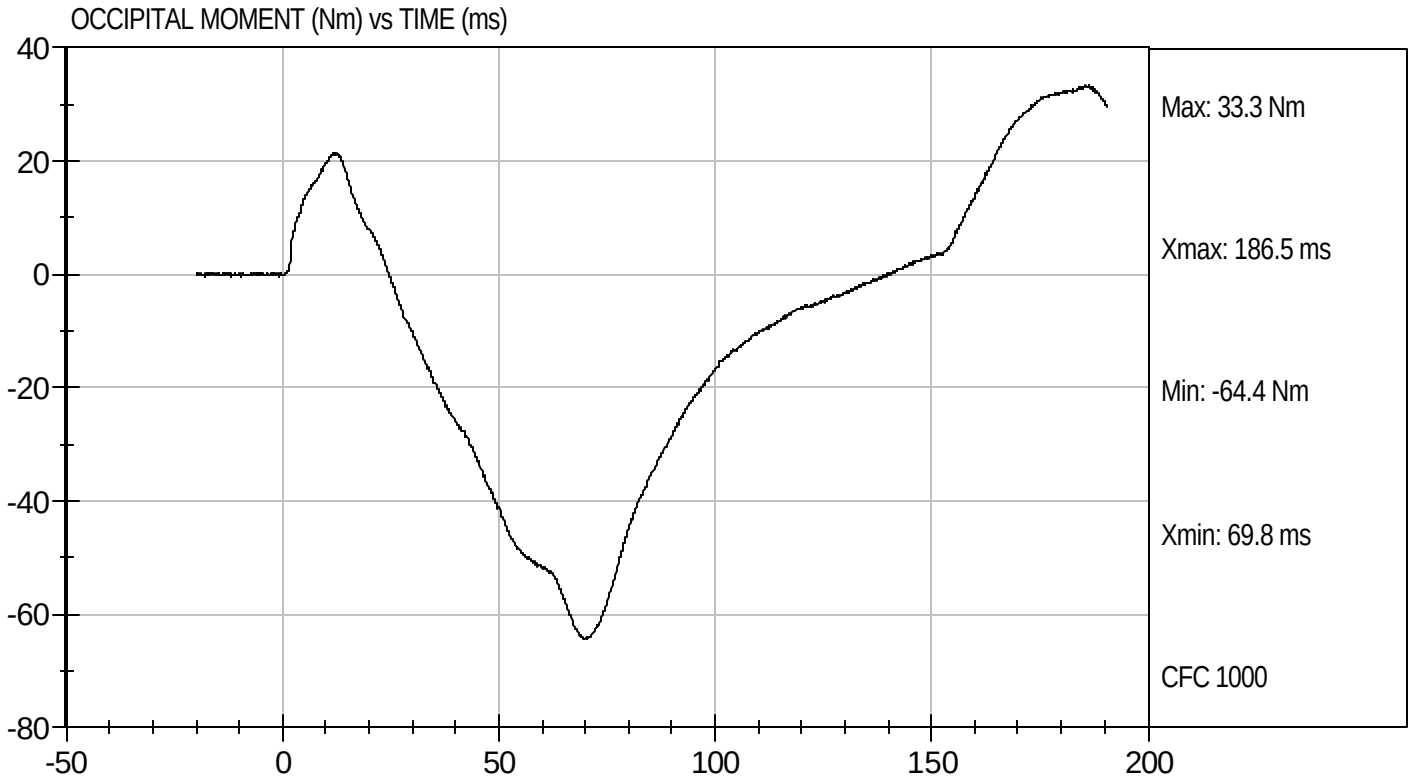


NECK ROTATION (DEG.) vs TIME (ms)



Test Desc: Neck Extension
Component ID: D08003

Test Date: 1/4/08
Velocity: 20.08 ft/s, 6.12 m/s



MGA RESEARCH CORPORATION

THORAX IMPACT

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 202 **Test I.D:** D08004

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,418	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.68	Pass
Internal Hysteresis	%	69 to 85	69	Pass
		Overall Test Results		Pass

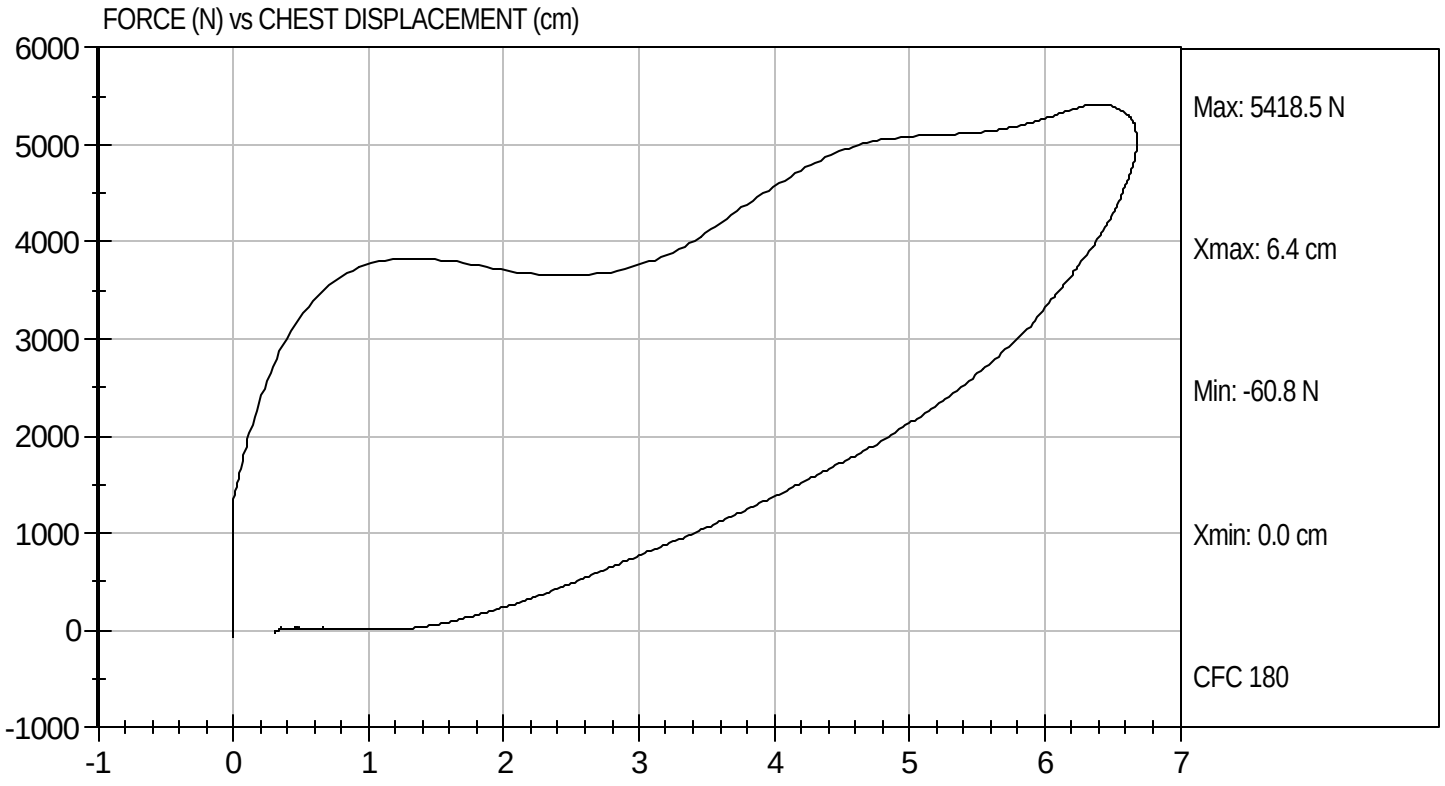
Laboratory Technician

1/7/08
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D08004

Test Date: 1/7/08
Velocity: 21.92 ft/s, 6.68 m/s



MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 202 **Test I.D:** D08005

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	5,165	Pass
		Overall Test Results		Pass

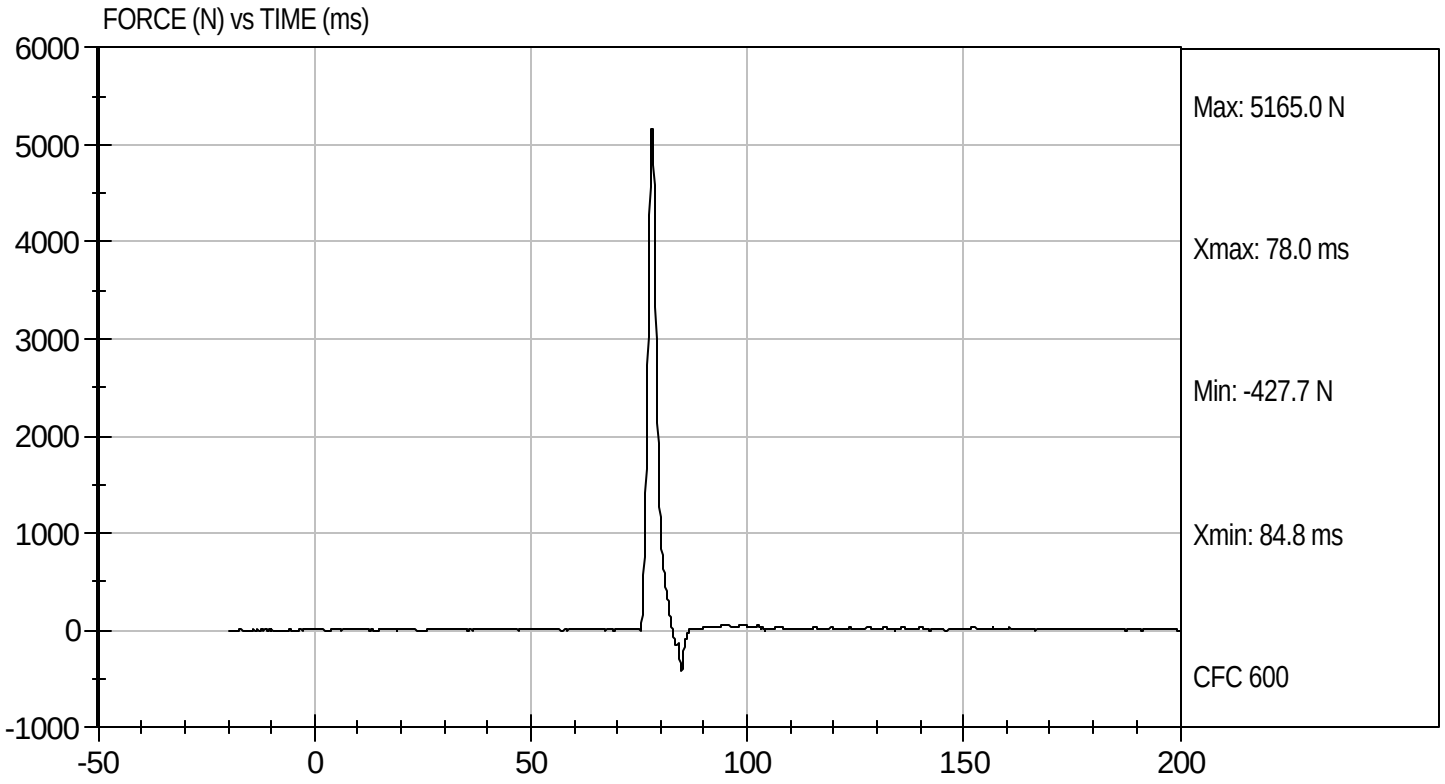
Laboratory Technician

1/7/08
Test Date

David Winkelbauer
Approved By

Test Desc: Right Knee
Component ID: D08005

Test Date: 1/7/08
Velocity: 6.83 ft/s, 2.08 m/s



MGA RESEARCH CORPORATION

LEFT KNEE IMPACT TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 202 **Test I.D:** D08006

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	4,862	Pass
		Overall Test Results		Pass

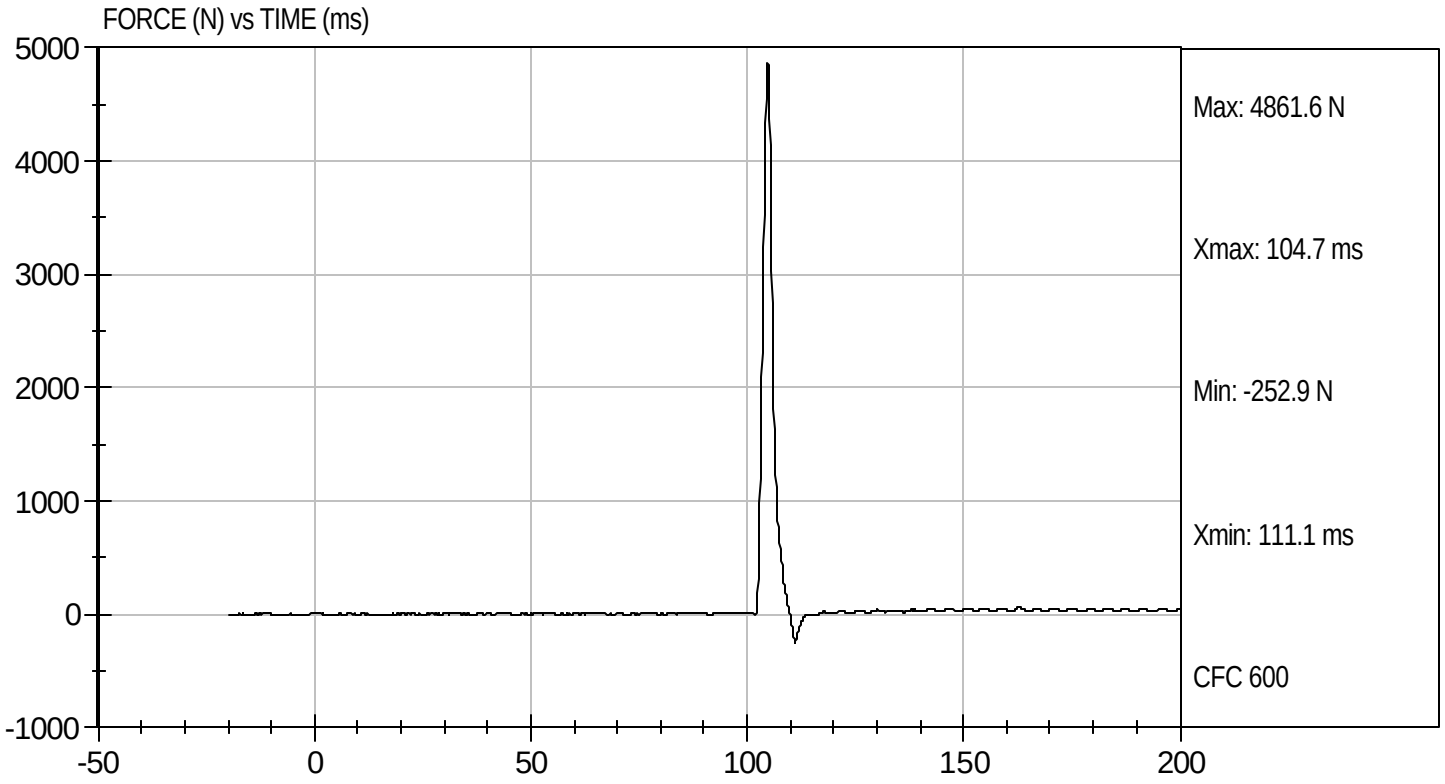
Laboratory Technician

1/7/08
Test Date

David Winkelbauer
Approved By

Test Desc: Left Knee
Component ID: D08006

Test Date: 1/7/08
Velocity: 6.83 ft/s, 2.08 m/s



MGA RESEARCH CORPORATION

HIP-FEMUR FLEXION TEST

HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 202 **Test I.D:** D08000

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	18	18	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	83.1	77.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	41	42	Pass
		Overall Test Results			Pass

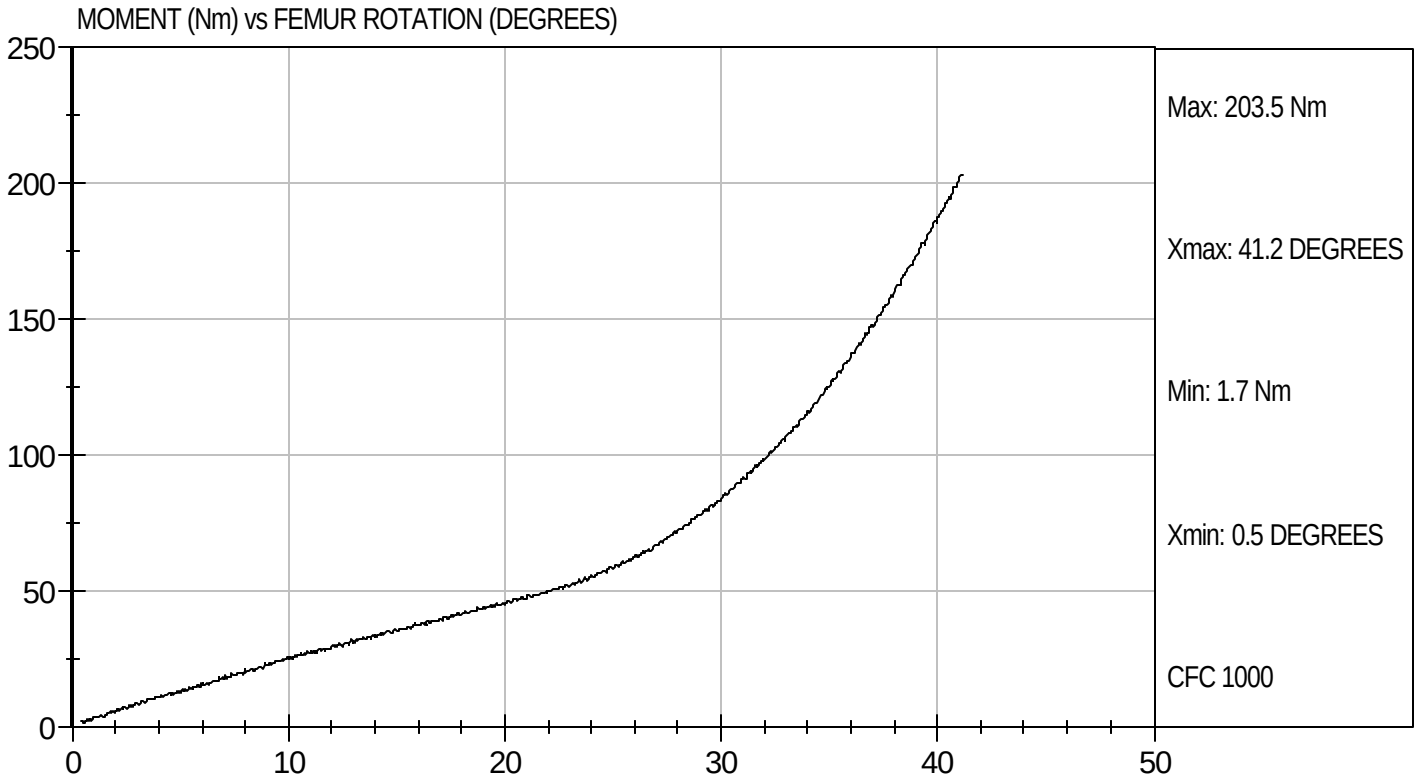
Laboratory Technician

1/4/08
Test Date

David Winkelbauer
Approved By

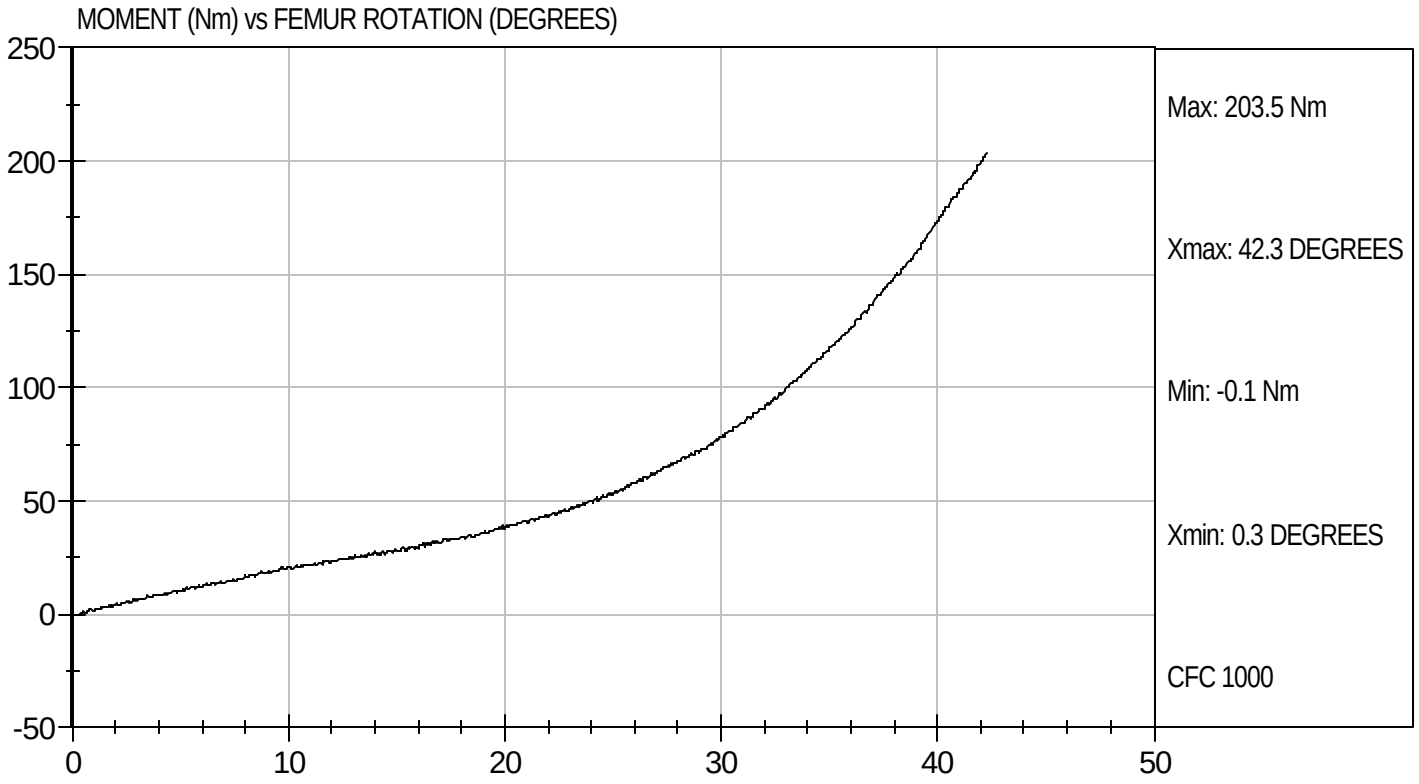
Test Desc: Hip Femur Flexion
Component ID: D08009

Test Date: 1/4/08
Velocity: 0 ft/s, 0.00 m/s



Test Desc: Hip Femur Flexion
Component ID: D08000

Test Date: 1/4/08
Velocity: 0 ft/s, 0.00 m/s



CERTIFICATION DATA

Thor-Lx Legs #036 & #037

Installed in Hybrid III 50th Percentile Male Dummy #202

Test Performer: Vehicle Research and Test Center
Test Type: Dorsiflexion/Ball of Foot
Test Name: LX0036_19DEC07_DORSI_02
Test Date: 12/19/2007

Test Parameter:	Specification:	Test Results:	Pass/Fail:	Notes:
Velocity (M/Sec)	(4.9 - 5.1)	4.97	Pass	
Temperature (ºC)	(20.6 - 22.2)	22.2	Pass	
Relative Humidity (%)	(N/A)	27	Pass	
Peak Tibia Compressive Load (N)	(2956 - 3613)	3259.632	Pass	Channel LTIBFZ
Peak Ankle Resistive Moment (N-m)	(77.1 - 94.2)	77.124	Pass	Channel ANKLE MOMENT
Peak Ankle Y-axis Rotation (º)	(32.7 - 39.9)	35.293	Pass	Channel ANKRY

Test Performer: Vehicle Research and Test Center
Test Type: Heel of Foot
Test Name: LX0036_20DEC07_HEEL_03
Test Date: 12/20/2007

Test Parameter:	Specification:	Test Results:	Pass/Fail:	Notes:
Velocity (M/Sec)	(3.9 - 4.1)	3.98	Pass	
Temperature (ºC)	(20.6 - 22.2)	22.2	Pass	
Relative Humidity (%)	(N/A)	37	Pass	
Peak Tibia Compressive Load (N)	(2738 - 3346)	2755.950	Pass	Channel LTIBFZ

Test Performer: Vehicle Research and Test Center
Test Type: Eversion
Test Name: LX0036_19DEC07_EVER_01
Test Date: 12/19/2007

Test Parameter:	Specification:	Test Results:	Pass/Fail:	Notes:
Velocity (M/Sec)	(1.9 - 2.1)	1.98	Pass	
Temperature (ºC)	(20.6 - 22.2)	22.2	Pass	
Relative Humidity (%)	(N/A)	25	Pass	
Peak Tibia Compressive Load (N)	(552 - 675)	617.374	Pass	Channel LTIBFZ
Peak Ankle Resistive Moment (N-m)	(36.3 - 44.4)	40.916	Pass	Channel ANKLE MOMENT
Peak Ankle X-axis Rotation (º)	(-30.3 - -37.0)	-33.917	Pass	Channel ANKRX

Test Performer: Vehicle Research and Test Center
Test Type: Inversion
Test Name: LX0036_19DEC07_INVER_01
Test Date: 12/19/2007

Test Parameter:	Specification:	Test Results:	Pass/Fail:	Notes:
Velocity (M/Sec)	(1.9 - 2.1)	2.00	Pass	
Temperature (ºC)	(20.6 - 22.2)	22.1	Pass	
Relative Humidity (%)	(N/A)	25	Pass	
Peak Tibia Compressive Load (N)	(552 - 675)	640.921	Pass	Channel LTIBFZ
Peak Ankle Resistive Moment (N-m)	(-36.3 - -44.4)	-40.060	Pass	Channel ANKLE MOMENT
Peak Ankle X-axis Rotation (º)	(30.3 - 37.0)	32.901	Pass	Channel ANKRX

Test Performer: Vehicle Research and Test Center
Test Type: Dorsiflexion/Ball of Foot
Test Name: LX0037_12DEC07_DORSI_01
Test Date: 12/26/2007

Test Parameter:	Specification:	Test Results:	Pass/Fail:	Notes:
Velocity (M/Sec)	(4.9 - 5.1)	5.04	Pass	
Temperature (ºC)	(20.6 - 22.2)	22.2	Pass	
Relative Humidity (%)	(N/A)	33	Pass	
Peak Tibia Compressive Load (N)	(2956 - 3613)	3289.176	Pass	Channel LTIBFZ
Peak Ankle Resistive Moment (N-m)	(77.1 - 94.2)	84.367	Pass	Channel ANKLE MOMENT
Peak Ankle Y-axis Rotation (º)	(32.7 - 39.9)	33.943	Pass	Channel ANKRY

Test Performer: Vehicle Research and Test Center
Test Type: Heel of Foot
Test Name: LX0037_14DEC07_HEEL_01
Test Date: 12/14/2007

Test Parameter:	Specification:	Test Results:	Pass/Fail:	Notes:
Velocity (M/Sec)	(3.9 - 4.1)	3.90	Pass	
Temperature (ºC)	(20.6 - 22.2)	22.2	Pass	
Relative Humidity (%)	(N/A)	28	Pass	
Peak Tibia Compressive Load (N)	(2738 - 3346)	2982.207	Pass	Channel LTIBFZ

Test Performer: Vehicle Research and Test Center
Test Type: Eversion
Test Name: LX0037_13DEC07_EVER_01
Test Date: 12/13/2007

Test Parameter:	Specification:	Test Results:	Pass/Fail:	Notes:
Velocity (M/Sec)	(1.9 - 2.1)	2.01	Pass	
Temperature (ºC)	(20.6 - 22.2)	22.2	Pass	
Relative Humidity (%)	(N/A)	33	Pass	
Peak Tibia Compressive Load (N)	(552 - 675)	687.630	Fail	Channel LTIBFZ
Peak Ankle Resistive Moment (N-m)	(-36.3 - -44.4)	-42.357	Pass	Channel ANKLE MOMENT
Peak Ankle X-axis Rotation (º)	(30.3 - 37.0)	31.428	Pass	Channel ANKRX

Test Performer: Vehicle Research and Test Center
Test Type: Inversion
Test Name: LX0037_13DEC07_INVER_01
Test Date: 12/13/2007

Test Parameter:	Specification:	Test Results:	Pass/Fail:	Notes:
Velocity (M/Sec)	(1.9 - 2.1)	2.00	Pass	
Temperature (ºC)	(20.6 - 22.2)	22.2	Pass	
Relative Humidity (%)	(N/A)	33	Pass	
Peak Tibia Compressive Load (N)	(552 - 675)	631.205	Pass	Channel LTIBFZ
Peak Ankle Resistive Moment (N-m)	(36.3 - 44.4)	40.369	Pass	Channel ANKLE MOMENT
Peak Ankle X-axis Rotation (º)	(-30.3 - -37.0)	-34.108	Pass	Channel ANKRX

Transportation Research Center Inc.

Front Head Drop
HIII 10YO Serial No. D001 Certification No. 14-1
Test Date: 6/12/2007

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 ºC	21.2 ºC	Yes
Relative Humidity	10 - 70 %	53 %	Yes
Peak Head Resultant Acceleration	250 - 300 g	270.3 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	9.1 g	Yes
Is Acceleration Curve Unimodal	Yes	Yes	Yes

Test meets specifications.

Comments:

Technician

Approved

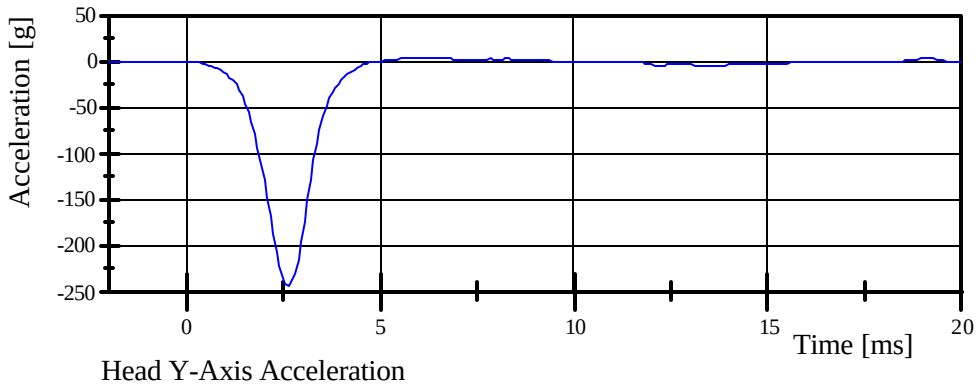
Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

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Transportation Research Center Inc.

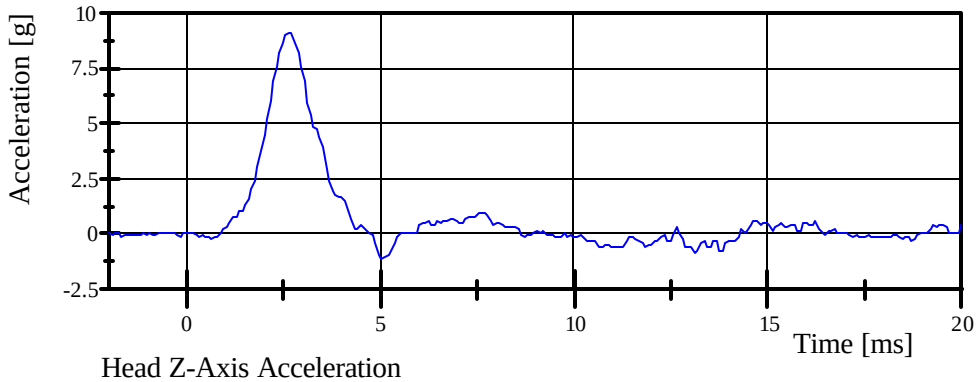
Front Head Drop
HIII 10YO Serial No. D001 Certification No. 14-1
Test Date: 6/12/2007

Head X-Axis Acceleration



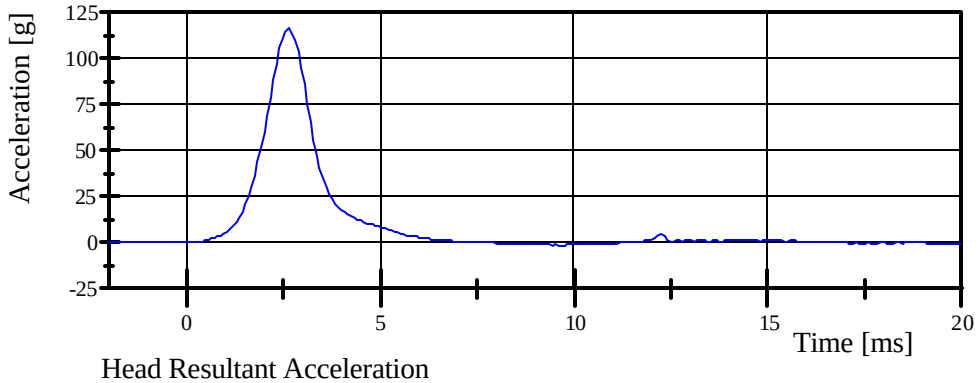
Filter Class: CFC_1000
Max: 4.4 g at 5.9 ms
Min: -243.9 g at 2.6 ms

Head Y-Axis Acceleration



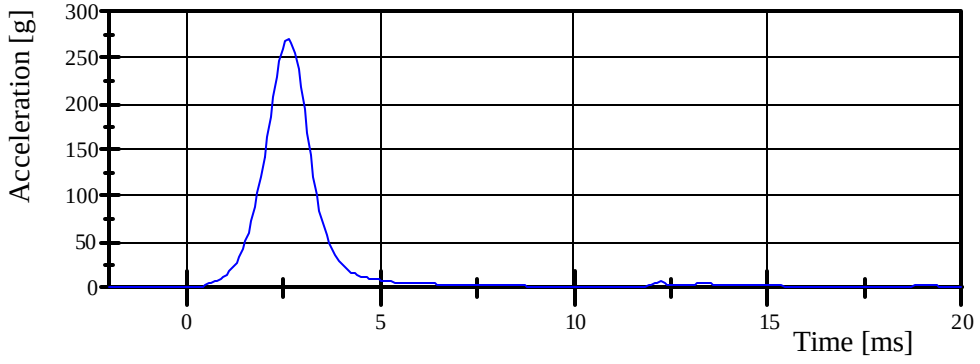
Filter Class: CFC_1000
Max: 9.1 g at 2.6 ms
Min: -1.1 g at 5.0 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 116.1 g at 2.6 ms
Min: -1.3 g at 9.6 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 270.3 g at 2.6 ms
Min: 0.0 g at -1.6 ms

Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

06.12.2007 12:52:49 732

Transportation Research Center Inc.

Neck Flexion
HIII 10YO Serial No. D001 Certification No. 14-2
Test Date: 6/13/2007

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	21.1 ºC	Yes
Relative Humidity	10 - 70 %	52 %	Yes
Pendulum Impact Velocity	5.98 - 6.22 m/s	6.073 m/s	Yes
Pendulum Integrated Velocity at 10ms	(-1.64) - (-2.04) m/s	-1.648 m/s	Yes
Pendulum Integrated Velocity at 20ms	(-3.04) - (-4.04) m/s	-3.189 m/s	Yes
Pendulum Integrated Velocity at 30ms	(-4.45) - (-5.65) m/s	-4.692 m/s	Yes
Total Head D-Plane Rotation	(-76.0) - (-90.0) º	-82.31 º	Yes
Total Neck Occipital Condyles Moment Between -74º and -88º Rotation	50.0 - 62.0 Nm	52.09 Nm	Yes
Neck Occipital Condyles Moment Decay to 10 Nm	86.0 - 105.0 ms	100.64 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

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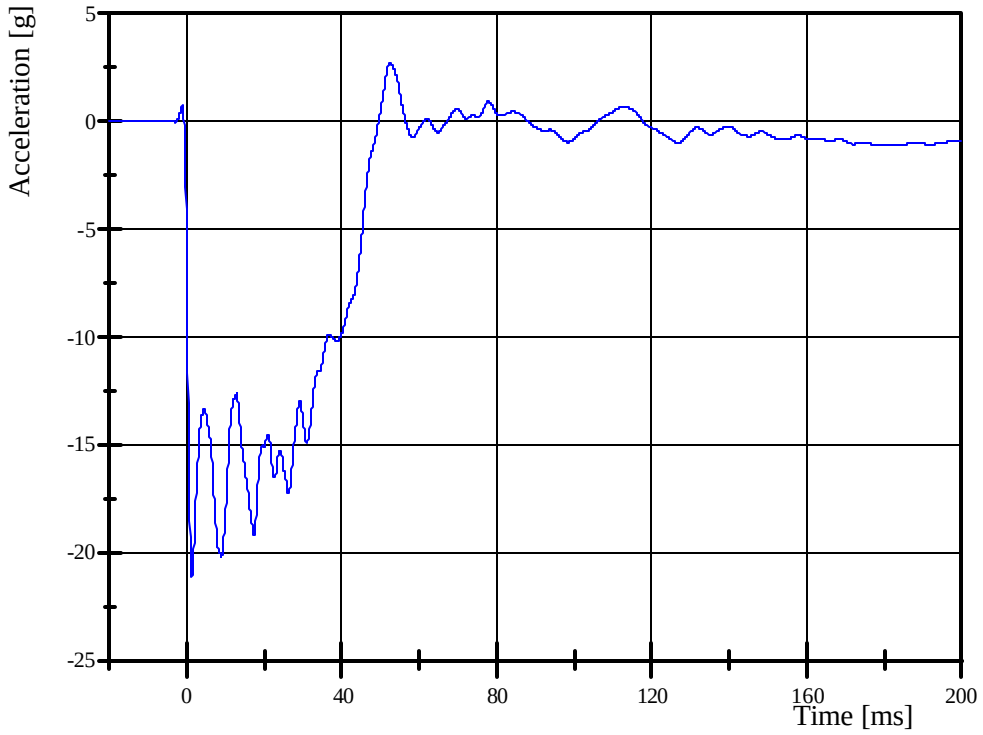
Transportation Research Center Inc.

Neck Flexion

HIII 10YO Serial No. D001 Certification No. 14-2

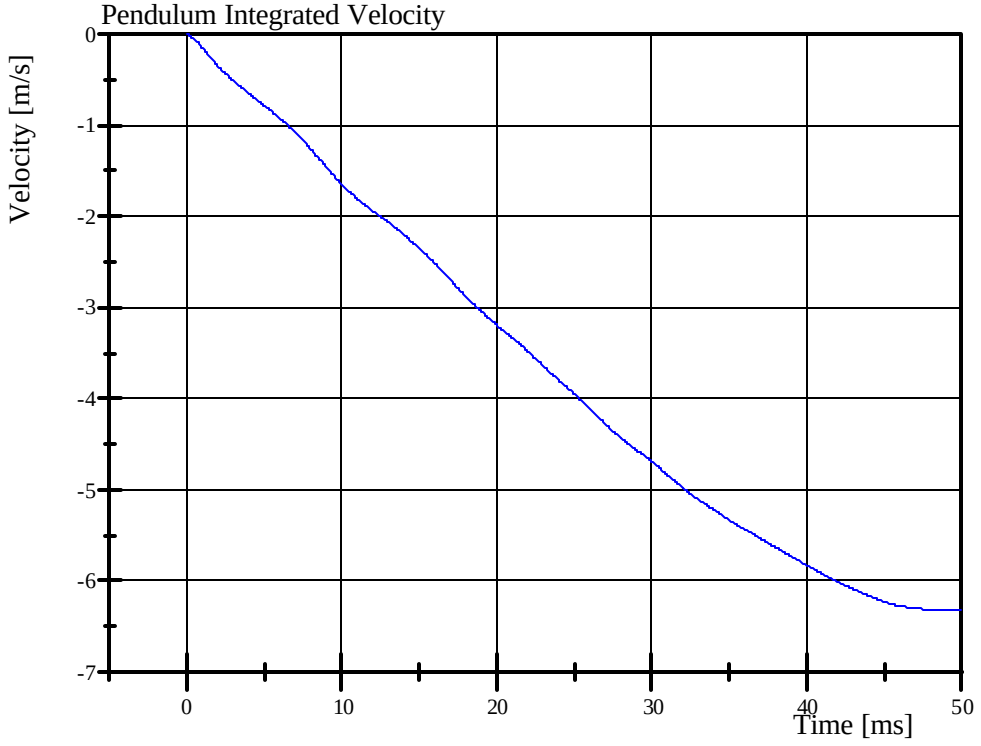
Test Date: 6/13/2007

Pendulum Acceleration



Filter Class: CFC_180
Max: 2.7 g at 52.6 ms
Min: -21.2 g at 1.3 ms

Pendulum Integrated Velocity



Filter Class: CFC_180
Max: 0.0 m/s at 0.0 ms
Min: -6.3 m/s at 49.5 ms

Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

06.13.2007 14:49:30 1176

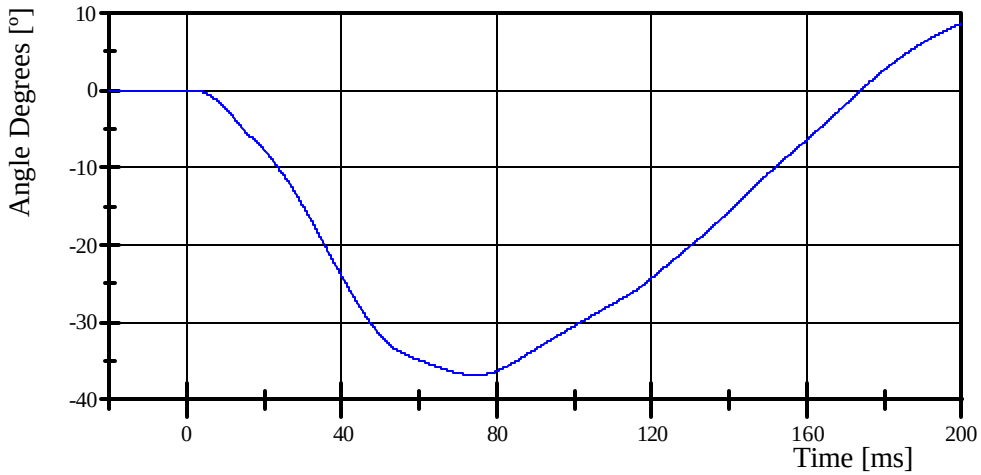
Transportation Research Center Inc.

Neck Flexion

HIII 10YO Serial No. D001 Certification No. 14-2

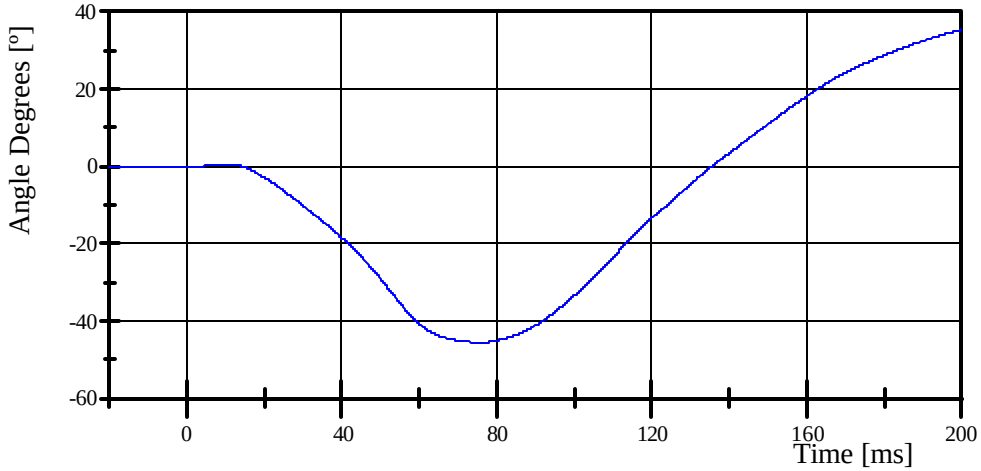
Test Date: 6/13/2007

Pot Rotation at the Base of Neck



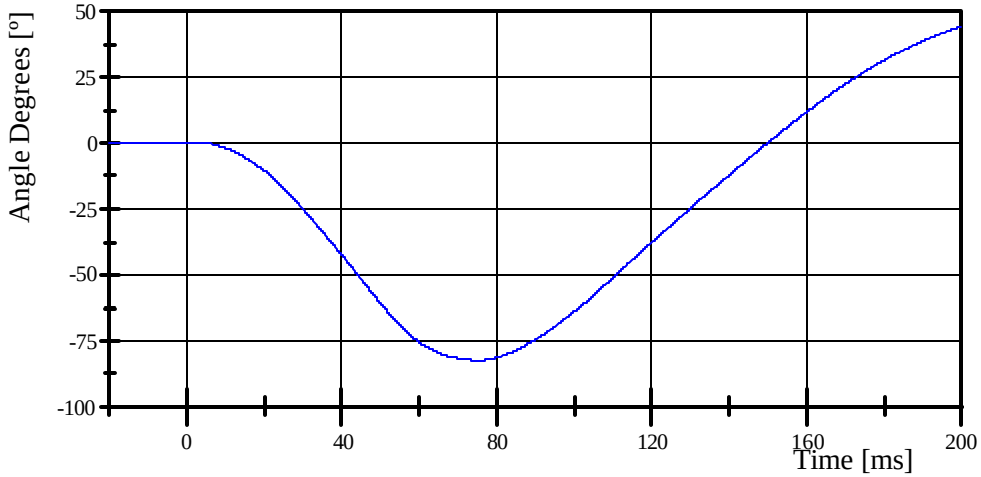
Filter Class: CFC_60
Max: 8.7 ° at 200.0 ms
Min: -36.8 ° at 74.3 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 35.4 ° at 200.0 ms
Min: -45.6 ° at 75.7 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 44.1 ° at 200.0 ms
Min: -82.3 ° at 75.3 ms

Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

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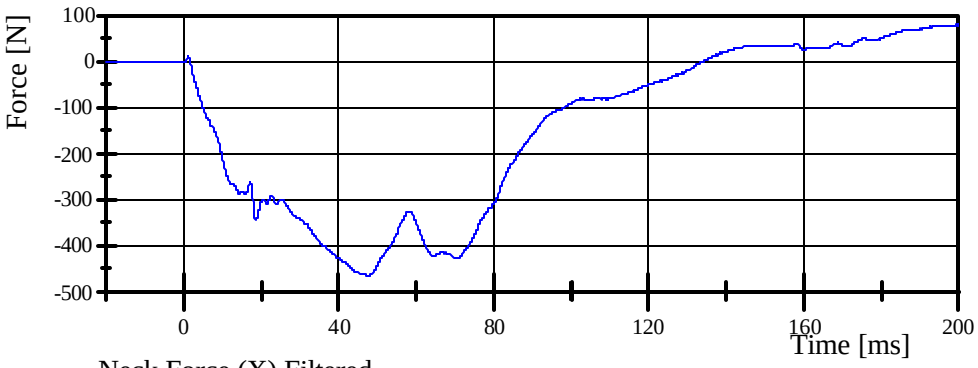
Transportation Research Center Inc.

Neck Flexion

HIII 10YO Serial No. D001 Certification No. 14-2

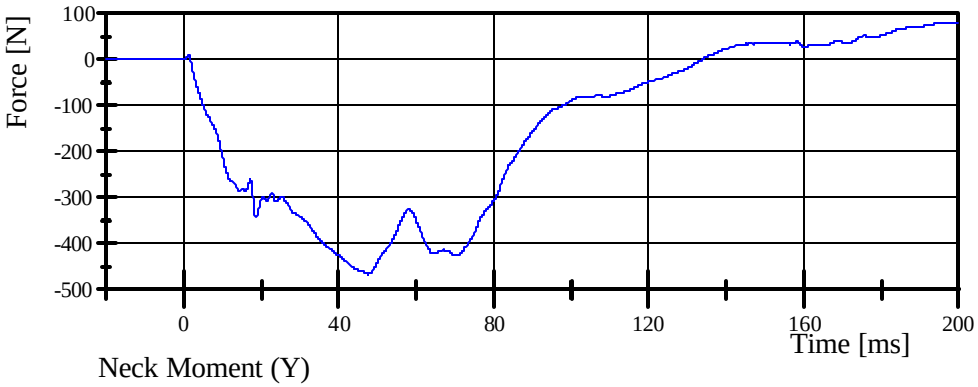
Test Date: 6/13/2007

Neck Force (X)



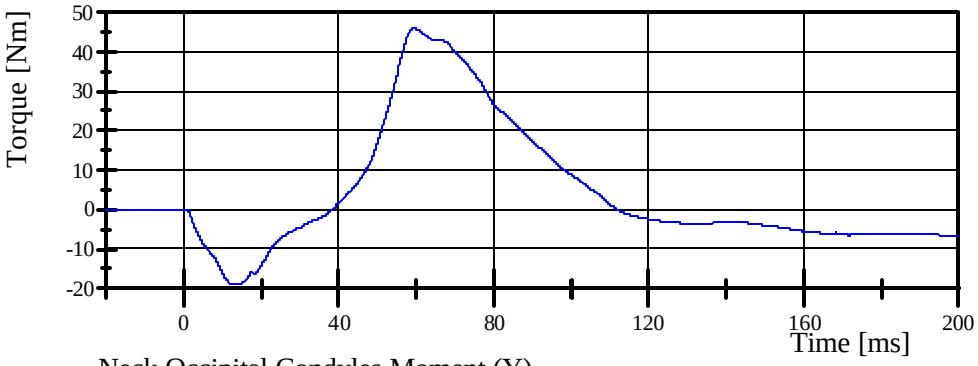
Filter Class: CFC_1000
Max: 80.1 N at 199.8 ms
Min: -467.0 N at 47.6 ms

Neck Force (X) Filtered



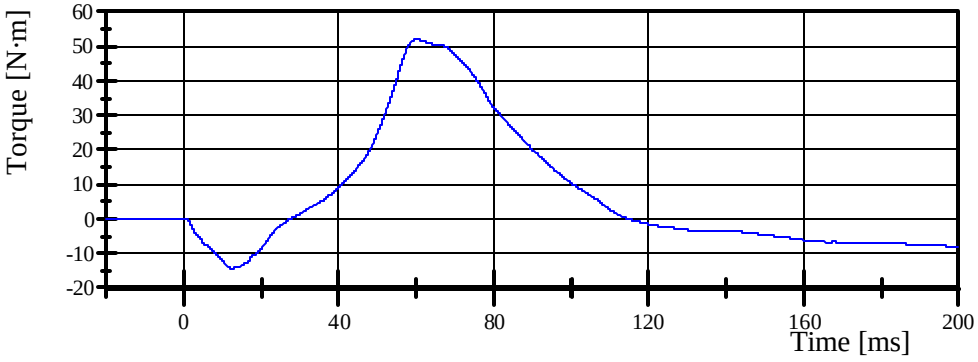
Filter Class: CFC_600
Max: 79.9 N at 200.0 ms
Min: -466.7 N at 47.5 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 45.9 Nm at 59.6 ms
Min: -19.1 Nm at 14.1 ms

Neck Occipital Condyles Moment (Y)



Filter Class: CFC_600
Max: 52.1 N·m at 60.2 ms
Min: -14.3 N·m at 12.8 ms

Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

06.13.2007 14:49:31 1176

Transportation Research Center Inc.

Neck Extension
HIII 10YO Serial No. D001 Certification No. 14-1
Test Date: 6/13/2007

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	21.3 ºC	Yes
Relative Humidity	10 - 70 %	53 %	Yes
Pendulum Impact Velocity	4.91 - 5.15 m/s	5.018 m/s	Yes
Pendulum Integrated Velocity at 10ms	1.49 - 1.89 m/s	1.789 m/s	Yes
Pendulum Integrated Velocity at 20ms	2.88 - 3.68 m/s	3.403 m/s	Yes
Pendulum Integrated Velocity at 30ms	4.20 - 5.20 m/s	4.899 m/s	Yes
Total Head D-Plane Rotation	96.0 - 115.0 º	103.19 º	Yes
Total Neck Occipital Condyles Moment Between 99º and 114º Rotation	(-37.0) - (-46.0) Nm	-43.33 Nm	Yes
Neck Occipital Condyles Moment Decay to -10 Nm	100.0 - 116.0 ms	107.36 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

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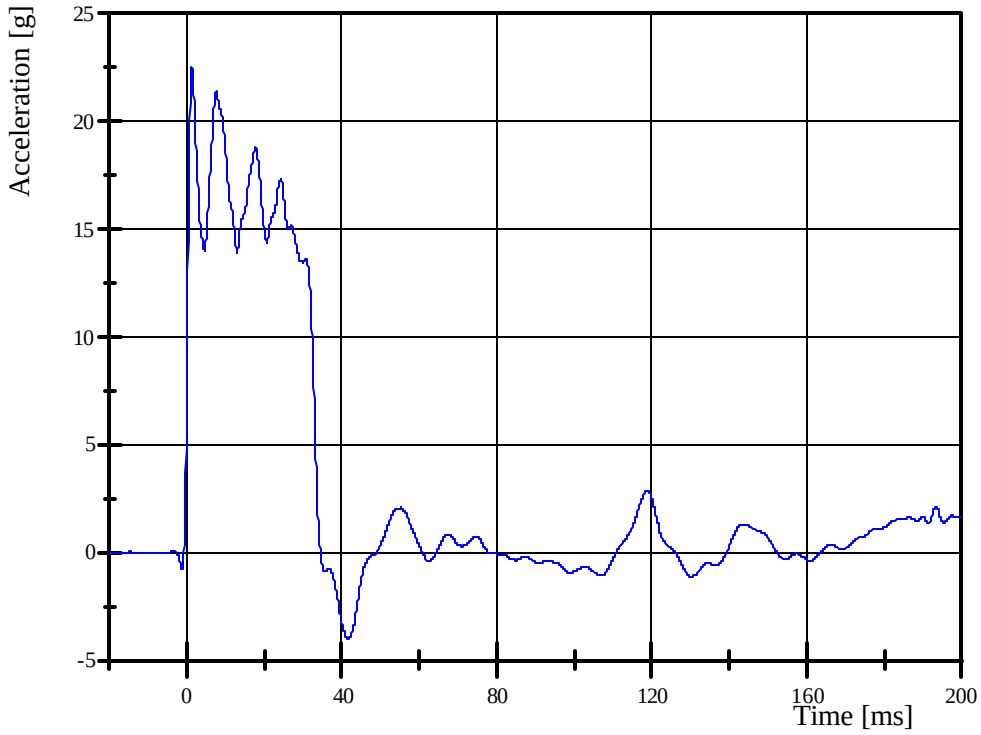
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Neck Extension

HIII 10YO Serial No. D001 Certification No. 14-1

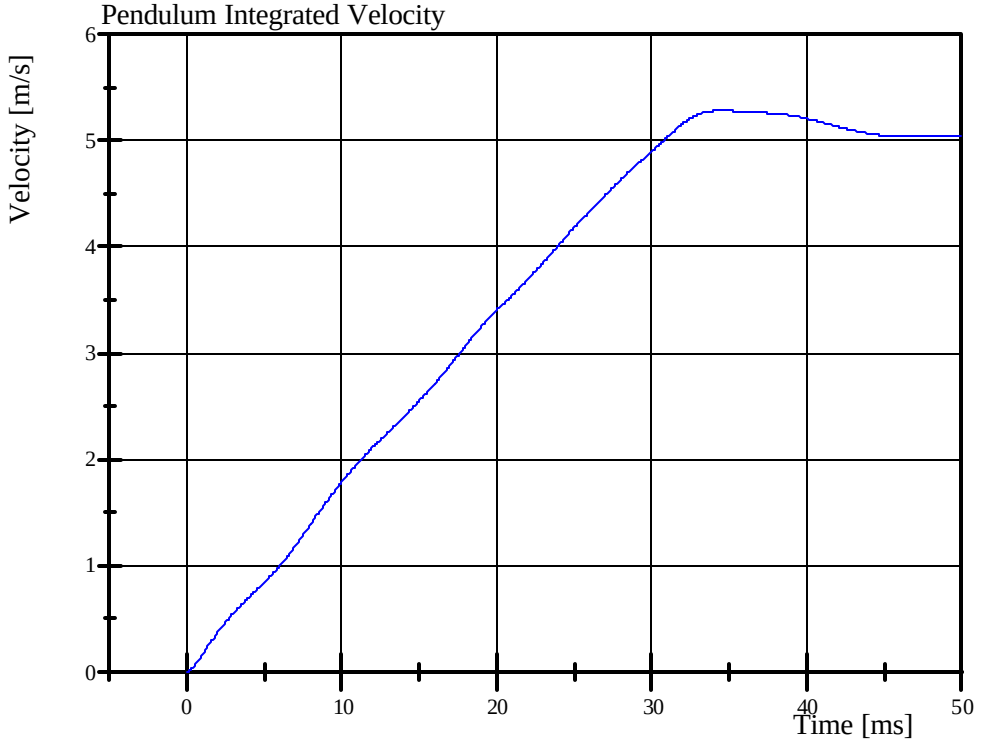
Test Date: 6/13/2007

Pendulum Acceleration



Filter Class: CFC_180
Max: 22.5 g at 1.2 ms
Min: -4.0 g at 41.5 ms

Pendulum Integrated Velocity



Filter Class: CFC_180
Max: 5.3 m/s at 34.5 ms
Min: 0.0 m/s at 0.0 ms

Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

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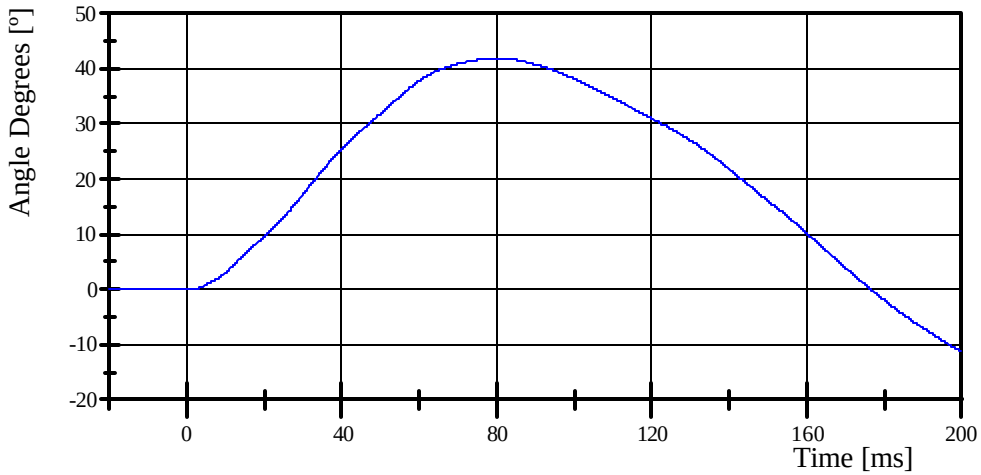
Transportation Research Center Inc.

Neck Extension

HIII 10YO Serial No. D001 Certification No. 14-1

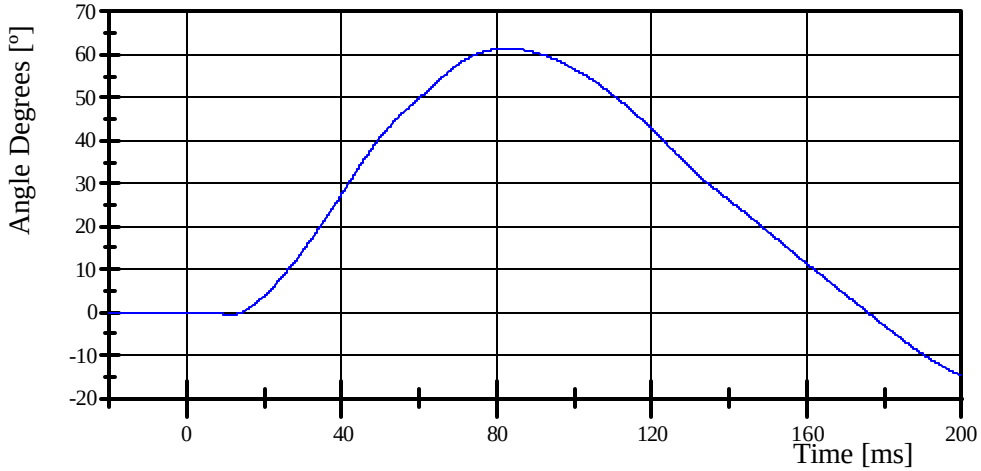
Test Date: 6/13/2007

Pot Rotation at the Base of Neck



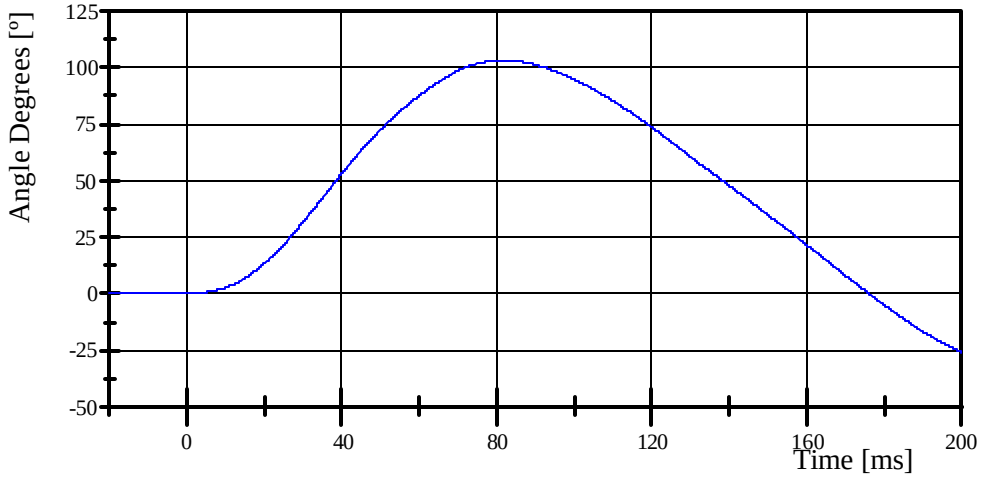
Filter Class: CFC_60
Max: 41.8 ° at 80.1 ms
Min: -11.2 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 61.4 ° at 83.0 ms
Min: -14.7 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 103.2 ° at 81.8 ms
Min: -25.9 ° at 200.0 ms

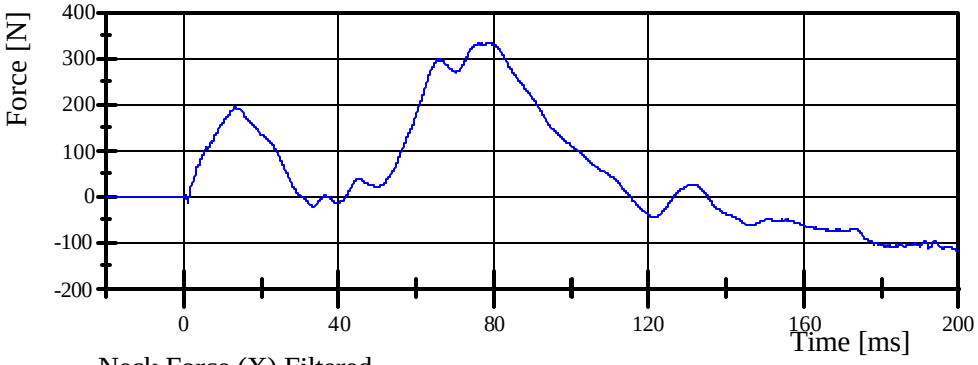
Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

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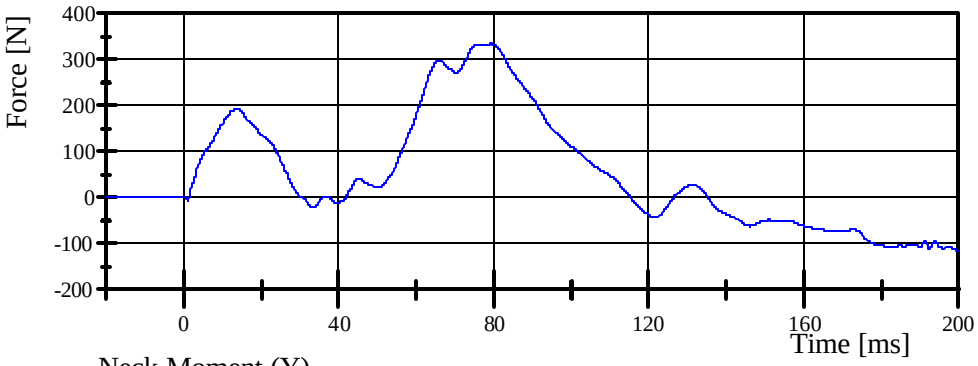
Neck Extension
HIII 10YO Serial No. D001 Certification No. 14-1
Test Date: 6/13/2007

Neck Force (X)



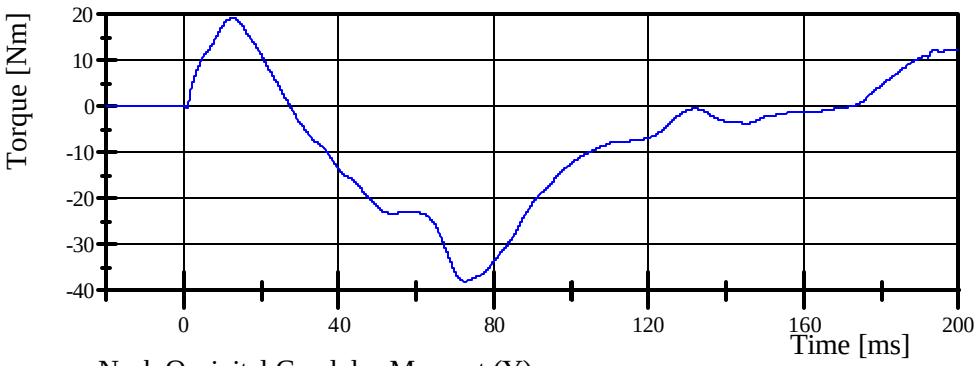
Filter Class: CFC_1000
Max: 333.9 N at 79.3 ms
Min: -118.3 N at 200.0 ms

Neck Force (X) Filtered



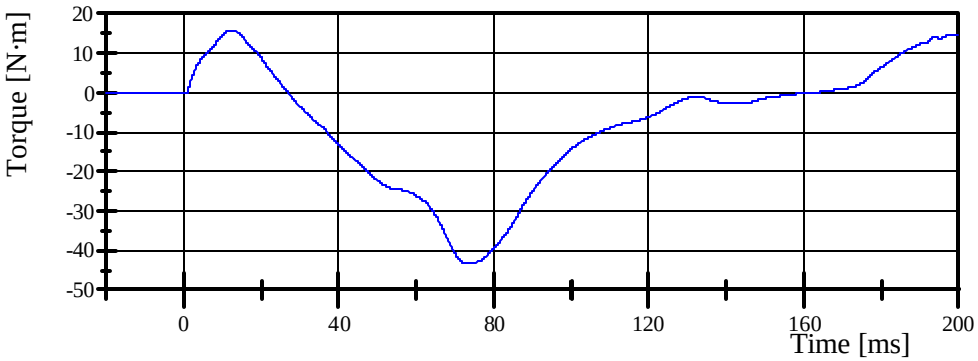
Filter Class: CFC_600
Max: 333.5 N at 79.3 ms
Min: -118.2 N at 200.0 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 19.3 Nm at 13.0 ms
Min: -38.0 Nm at 72.6 ms

Neck Occipital Condyles Moment (Y)



Filter Class: CFC_600
Max: 15.9 N·m at 12.3 ms
Min: -43.3 N·m at 73.4 ms

Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

06.13.2007 15:23:29 1295

Transportation Research Center Inc.

Front Thorax
HIII 10YO Serial No. D001 Certification No. 14-2
Test Date: 6/13/2007

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	21.0 ºC	Yes
Relative Humidity	10 - 70 %	55 %	Yes
Probe Velocity	5.88 - 6.12 m/s	5.946 m/s	Yes
Probe Force Peak Between 37.0 mm and 46.0 mm Chest Deflection	(-2,000) - (-2,450) N	-2,255.5 N	Yes
Probe Force Peak Between 20.0 mm and 40.5 mm Chest Deflection	>= (-2,450) N	-2,218.4 N	Yes
Maximum Chest Compression	(-37) - (-46) mm	-45.6 mm	Yes
Internal Hysteresis	69 - 85 %	79.2 %	Yes

Test meets specifications.

Comments:

Technician

Approved

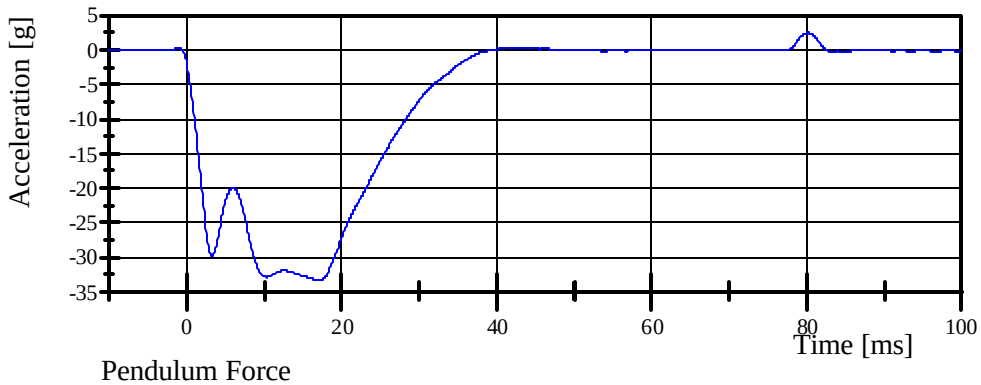
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with Polarity in accordance with J211

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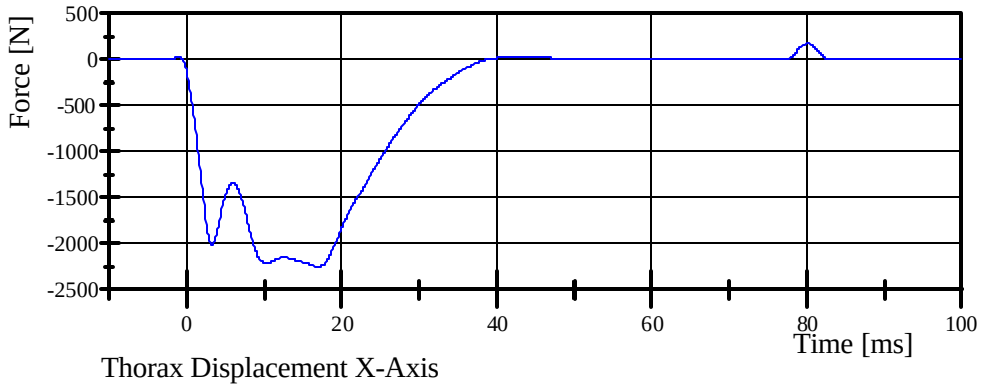
Front Thorax
HIII 10YO Serial No. D001 Certification No. 14-2
Test Date: 6/13/2007

Pendulum Acceleration



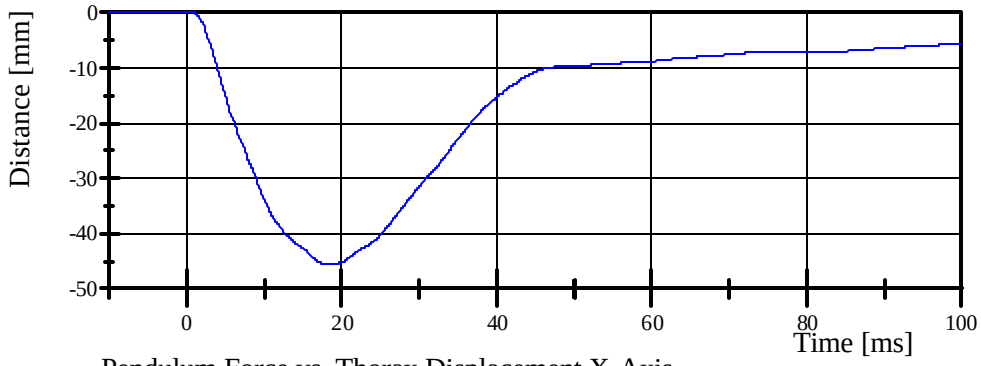
Filter Class: CFC_180
Max: 2.5 g at 80.2 ms
Min: -33.4 g at 17.0 ms

Pendulum Force



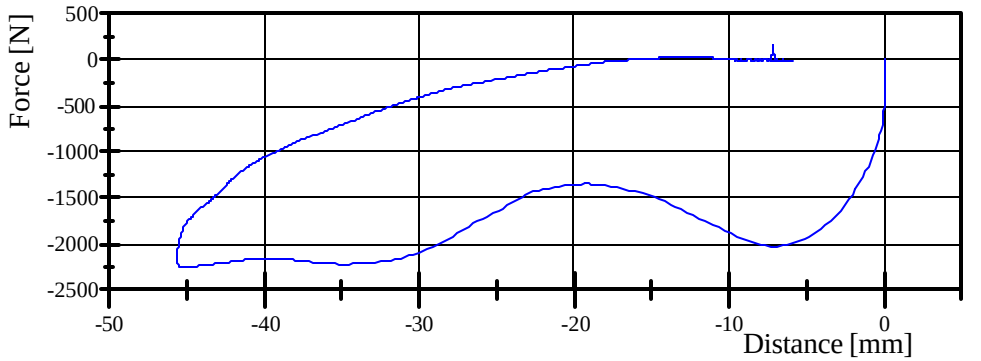
Filter Class: CFC_180
Max: 169.5 N at 80.2 ms
Min: -2,255.5 N at 17.0 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -5.9 ms
Min: -45.6 mm at 18.5 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 169.5 N at -7.2 mm
Min: -2,255.5 N at -45.1 mm

Specification Source: CFR49 Part 572 Subpart T
with Polarity in accordance with J211

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POST-TEST DUMMY INSPECTION

Position:	Driver
Dummy:	Hybrid III 50th Percentile Male with Thor-Lx Legs
Serial Number:	#202 (Right Leg #037; Left Leg #036)
Inspected By:	Jessica Gall
Date:	February 15, 2008
Comments:	No Damage.

Position:	Left Rear Passenger
Dummy:	Hybrid III 10 year old
Serial Number:	#D001
Inspected By:	Jessica Gall
Date:	February 15, 2008
Comments:	No Damage.

APPENDIX D

CUSTOMER PROVIDED SEATING PROCEDURE

CONTROL LOG

50th Percentile Male Dummy - Driver side

Rev. No.	Date	Description
00	1/16/2008	Original release by VRTC
01	1/22/2008	Modified left foot placement to avoid pedals (modified step 30 and 35)

A.2 50th Percentile Male Dummy - Driver side

__1. Position the seat's adjustable lumbar supports so that the lumbar supports are in the lowest, retracted or deflated adjustment positions.
__ N/A – No lumbar adjustment

__2. Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position.
__ N/A – No additional support adjustment

__3. Position an adjustable leg support system in its rearmost position
__N/A – No adjustable leg support system

__4. Mark a point (seat cushion reference point) on the side of the seat cushion that is between 150 mm and 250 mm from the front edge of the seat cushion.

__5. Draw a line (seat cushion reference line) through the seat cushion reference point.

__6. Use only the controls that primarily move the seat in the fore-aft direction to move the seat cushion reference point to the rearmost position.

__7. If the seat cushion adjusts fore-aft, independent of the seat back, use only the controls that primarily move the seat cushion in the fore-aft direction to move the seat cushion reference point to the rearmost position.
__ N/A – No independent fore-aft seat cushion adjustment

__8. Use any part of any control, other than the parts just used for fore-aft positioning, to determine the range of angles of the seat cushion reference line and to set the seat cushion reference line at the mid-angle.
Maximum angle _____
Minimum angle _____
Mid-angle _____

__9. If the seat and/or seat cushion height is adjustable, use any part of any control other than the parts which primarily move the seat or seat cushion fore-aft, to put the seat cushion reference point in its lowest position with the seat cushion reference line angle at the mid-angle found in 8.
__N/A – No seat height adjustment

__10. Use only the controls that primarily move the seat in the fore-aft direction to verify the seat is in the rearmost position.

__11. Place seat back at angle specified by the manufacturer. If angle is not provided, place seat back at 25 degrees from vertical.
__ N/A – No seat back angle adjustment
Manufacturer's design seat back angle _____

__12. Is the seat a bucket seat?
__Yes, go to 13 and skip 14
__No, go to 14 and skip 13

__13. Bucket seats:
Locate and mark for future reference the longitudinal centerline of the seat cushion. The intersection of the vertical longitudinal plane that passes through the SgRP and the seat cushion upper surface determines the longitudinal centerline of a bucket seat cushion.

__14. Bench seats
Locate and mark for future reference the longitudinal line on the seat cushion that marks the intersection of the vertical longitudinal plane through the centerline of the steering wheel and the seat cushion upper surface.

__15. Head Restraint Position
__N/A Vehicle contains automatic head restraints.
__N/A, there is no head restraint adjustment
__Adjust the head restraint to its highest position.

__16. Place any adjustable seat belt anchorages at the vehicle manufacturer's nominal design position for a 50th percentile adult male occupant
__N/A – No adjustable upper seat belt anchorage
Manufacturer's specified anchorage position. _____
Tested anchorage position _____

__17. Place adjustable pedals in the full forward position (towards the front of the vehicle.)
__N/A – the pedals are not adjustable.

__18 Locate and mark the right heel point (RHP) on the carpet.
Flat accelerator pedals: Extend a line through the axis of symmetry (that is closest to the vertical plane) of the accelerator pedal. The RHP is the intersection of that line with the floorpan.
Curved accelerator pedals: Construct a line in the side view tangent to the accelerator pedal such that the distance from the contact point on the pedal to the floorpan, along the tangent line, is 200 mm. The RHP is at the intersection of this tangent line and the floorpan

__19 Locate a longitudinal line L1 and a transverse line T1 on the floorpan through the RHP. Locate a Left Heel Point (LHP) point on the line T1 that is to the left of the seat centerline at the same distance from the seat centerline as the RHP. Locate a longitudinal line L2 through the LHP.

__20. Set the steering wheel hub at the geometric center of the full range of driving positions including any telescoping positions as determined in data sheet 14.3.

__21. Verify that the seat is in the rearmost seat track position and full down height adjustment with the seat cushion at the mid-angle with the seat back at the manufacturer's nominal seat back angle or as determined in step 11

__22 With the seat in the rearmost, full down, mid-angle position, determine the H-point using SAE J826 and the FMVSS 208 leg and thigh dimensions. Record the measurements.

__23. Place the dummy in the seat such that the midsagittal plane is coincident with the longitudinal seat cushion markings and the upper torso resting against the seat back.

__24. Rest the thighs on the seat cushion.

__25. Set the distance between the outboard knee clevis flange surfaces at 10.6 inches.
__measured distance (10.6 inches)

__26. Set the heels of the feet on the floor pan.

__27. Position the H-point of the dummy within 0.5 inch of the vertical dimension and 0.5 inch of the horizontal dimension of a point 0.25 inch below the H-point determined in step 22
Measure the pelvic angle with respect to the horizontal using the pelvic angle gage.
Adjust the dummy position until these three measurements are within the specifications.
____horizontal inches from the point 0.25 below the determined H-point (0.5 inch max.)
____vertical inches from the point 0.25 below the determined H-point (0.5 inch max.)
____pelvic angle (20^{o} to 25^{o})
The H-point and pelvic angle are not adjusted after this step.

__28. Set the left and right feet in the neutral position (longitudinal centerline of foot in the same plane as the lower leg/thigh, foot Y angle at -15 degrees +/- 2 degrees to lower leg), as determined by the output of the potentiometers at the ankle.

__29. Without moving the seat, and while keeping the right thigh and leg in the same vertical plane, set the right foot heel on Line L1. If the vehicle interior prevents the heel from reaching L1, place the heel as close to L1 as possible, while maintaining a clearance of 0.25" from the vehicle interior.

__30 Without moving the seat, and while keeping the left thigh and leg in the same vertical plane, move the left foot laterally to the left **until any of the following occurs first**:
- The right edge of the foot is clear of the brake or clutch pedal by 0.25" laterally or
- The left edge of the shoe contacts the vehicle interior

__31. Place a 100 N +0, -5N weight (e.g. 100 N shot bag), no larger than 4" x 4", on each knee-thigh area. The weight should be centered on the assembly-hole on the top of the knee.

__32. Raise the heels off the floor pan so that the seat can be moved forward.

__33. Using only the control that primarily moves the seat in the fore-aft direction, move the seat forward and rest the rearmost point of the right foot heel on the floor pan such that:
- the heel is on the line L1
- the foot is in the same plane as the lower leg/thigh, foot at -15 degrees +/- 2 degrees (about the Y- axis) to lower leg,

- foot is contacting the accelerator pedal
- the thighs are resting on the seat cushion
- the thigh, leg and foot are in the same vertical plane

__33.1 If the heel is unable to reach line L1 because the foot contacts the vehicle interior, place the foot as close to the line L1 as possible while maintaining a gap of no more than 5 mm between the shoe and the vehicle interior.

__33.2 If the left foot contacts the brake or clutch pedals or the vehicle interior, then stop the forward movement of the left foot, raising the left knee off the seat cushion if needed. The pedals should not be depressed.

__34. If the right foot does not reach the accelerator pedal, move the adjustable pedal until it contacts the foot. Locate a new heel point. Repeat steps 18 – 33 to re-position the seat. If the pedals are not adjustable, place the heel at the point closest to the pedal, in the same longitudinal vertical plane as the line L1.

__N/A – the accelerator pedal is not adjustable
__N/A – the accelerator pedal did not need to be moved.

__35. Verify that the left thigh and leg are in a vertical longitudinal plane, the foot in the neutral position (longitudinal centerline of foot in the same plane as the lower leg/thigh, foot at -15 degrees +/- 2 degrees (Y-axis) to lower leg), the heel on the floor pan. Place the heel on the line L2, unless the left edge of the shoe contacts the vehicle, preventing the heel from reaching Line L2. If there is overlap with the pedal, move the leg to the left until a lateral clearance of 0.25” from the pedal is attained, unless the left edge of the shoe contacts the vehicle. If the left edge of the shoe contacts the vehicle interior, maintain a clearance of 0.25” from the vehicle interior.

__36. Remove the leg weights.

__37. Verify that the right foot is in the neutral position, at the lateral location determined in step 30, and is contacting the accelerator pedal. If the foot is not contacting the accelerator pedal, move the seat forward to rest the right foot on the accelerator pedal, keeping the foot in the neutral position

__38. While holding the thighs in place, push with a 50 lb force on a 3 inch diameter area of the chest that is centered 5" (127mm) vertically below the chin on the midsaggital plane of the dummy.

__39.1 Fasten the seat belt around the dummy.

__39.2 Remove all slack from the lap belt portion.

__39.3 Pull the upper torso webbing out of the retractor and allow it to retract; repeat this four times.

__39.4 Apply a 2 to 4 pound tension load to the lap belt.
____pound load applied

__39.5 Is the belt system equipped with a tension-relieving device?
__Yes, continue
__No, go to 40

__39.6 Introduce the maximum amount of slack into the upper torso belt that is recommended by the vehicle manufacturer in the vehicle owner’s manual..

__40. Place the upper arms adjacent to the torso with the centerline as close to a vertical plane as possible.

__41. Adjust the head level within ± 0.5 degrees using the seat back adjustment. Check the head angle after pushing on the chest with a 50 lb force on a 3 inch diameter area of the chest that is centered 5" (127mm) vertically below the chin on the midsaggital plane of the dummy, while holding the thighs in place, and releasing.

__42 No seat back adjustment. Adjust the neck bracket to achieve head level within ± 0.5 degrees Record neck bracket setting. _____

__43. Maintaining the head alignment as determined above, place the right hand with the palm in contact with the steering wheel at the rim’s horizontal centerline and with the thumb over the steering wheel.

__44. Maintaining the head alignment as determined above place the left hand with the palm in contact with the steering wheel at the rim’s horizontal centerline and with the thumb over the steering wheel.

__45. If the hands don't reach the steering wheel at the horizontal centerline, maintaining the head alignment place them at symmetric location on the wheel, below the horizontal centerline.

__46. Tape the thumb of each hand to the steering wheel by using masking tape with a width of 0.25 inch. The length of the tape shall only be enough to go around the thumb and steering wheel one time.

__47 Verify that the feet are in the neutral position (+/- 2 deg), and at lateral locations determined in step 30 (right foot) and step 35 (left foot), and the head is level (+/- 0.5 deg). Adjust and repeat until the feet position and angles and head angles are within their ranges.

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

Memorandum

Vehicle Research and Test Center P.O. Box B37
East Liberty, Ohio 43319
(937) 666-4511

Subject: VRTC Seating Procedure for FMVSS 213-Type Booster Seat Testing with the Hybrid III 6 Year Old & 10 Year Old Child Dummies

OCT 24 2007

From: Joseph N. Kanianthra, Ph.D.
Associate Administrator for
Vehicle Safety Research

To: Docket NHTSA-2005-21245

Thru: Anthony M. Cooke
Chief Counsel

VRTC Seating Procedure for Hybrid III 6 Year Old Child Dummy for Testing Belt Positioning Booster Seats

VRTC Use the following procedure to position the dummy in the belt positioning booster seat:

10/24/07

a) Place the booster seat on the FMVSS 213 bench seat such that it is centered between the lap belt anchor positions and the booster is pushed rearward until the intersection of the booster's back and bottom contacts the intersection of the FMVSS 213 bench seat's back and base cushions.
b) Place the dummy in the booster seat so that the mid-sagittal line of the dummy is coincident with the centerline of the booster.
c) Measure the X and Z locations of the left and right shoulder pivots. Position the dummy so that the difference between the X and Z values for these two points is less than or equal to 1 cm (see Figure 1).
d) As illustrated in Figure 2 of this section, calculate the H-point location of the dummy relative to the FMVSS 213 seat Z point (see Figure 1B in FMVSS 213) by
    a. Measuring the X and Z coordinates of the knee pivot (X_{KP} and Z_{KP}) and head center of gravity (X_{CG} and Z_{CG}).
    b. Mathematically locating the intersection point of two circles using the knee pivot and head center of gravity as the centers and the known dummy anthropometric lengths as radii. The equations for calculating the H-point are as follows:

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$$X_{HP} = X_{CG} + \frac{A(X_{KP} - X_{CG})}{B} + \frac{\sqrt{473^2 - A^2}(Z_{KP} - Z_{CG})}{B}$$

$$Z_{HP} = Z_{CG} + \frac{A(Z_{KP} - Z_{CG})}{B} - \frac{\sqrt{473^2 - A^2}(X_{KP} - X_{CG})}{B}$$

Where:

$$A = \frac{(473^2 - 238^2 + B^2)}{2B}$$

$$B = \sqrt{(X_{KP} - X_{CG})^2 + (Z_{KP} - Z_{CG})^2}$$

e) Use the H-point location and head center of gravity location to determine the torso angle relative to vertical. This angle is calculated using

$$\text{Torso Angle} = \arctan\left(\frac{X_{HP} - X_{CG}}{Z_{CG} - Z_{HP}}\right)\left(\frac{180}{\pi}\right)$$

f) Adjust the dummy until the torso angle is 14 ± 0.5 degrees from vertical.

g) Secure the dummy and booster with belt restraint, following booster manufacturer's instructions for routing the shoulder and lap belts. Apply standard FMVSS 213 belt tensions.

h) Locate the shoulder belt such that its outboard edge is inside of the outer edge of the chest jacket (see Figure 3). If it is not feasible to get the outboard edge of the belt inside the outer edge of the chest jacket, document the closest distance from the belt to the chest jacket that is obtainable.

i) The straight line distance from the bottom of the dummy's chin to the center of the shoulder belt/middle of the sternum along the dummy's mid-sagittal line should be 15.5 ± 0.5 cm (see Figure 4). Measure and document the intersection of the dummy's mid-sagittal line and vertical center of shoulder belt's width.

j) Measure and document the angle of the shoulder belt relative to horizontal. The shoulder belt angle should be $50^{\circ} \pm 10^{\circ}$. If it is not feasible to achieve the specified shoulder belt angle while following the manufacturer's instructions for belt routing, document angle that is obtainable.

k) Locate the lap belt such that the top of the belt is 2.54 cm or more below the top rim of the pelvis molded skin at the dummy's mid-sagittal line (Figure 4). If it is not feasible to locate the lap belt at least 2.54 cm below the top of the pelvis while following the manufacturer's instructions for belt routing, position belt as low as possible on pelvis.

l) Measure and document the intersection of the dummy's mid-sagittal line and center of lap belt width.

m) Put upper arms as close as possible to, and in alignment with, the upper torso on sides and bend at elbows such that the hands are resting on the booster seat cushion if possible; otherwise bend lower arm perpendicular to upper arm and have hands pointed forward.

n) Level the top of the dummy's head $\pm$ 1° off of horizontal.
o) Document final H-point, Head CG, and Knee Pivot coordinates in addition to the torso angle.

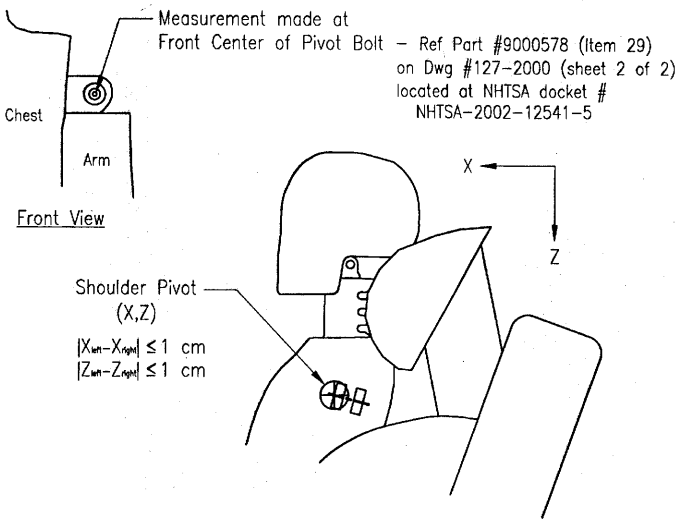


Figure 1. Shoulder Pivot Bolt Alignment

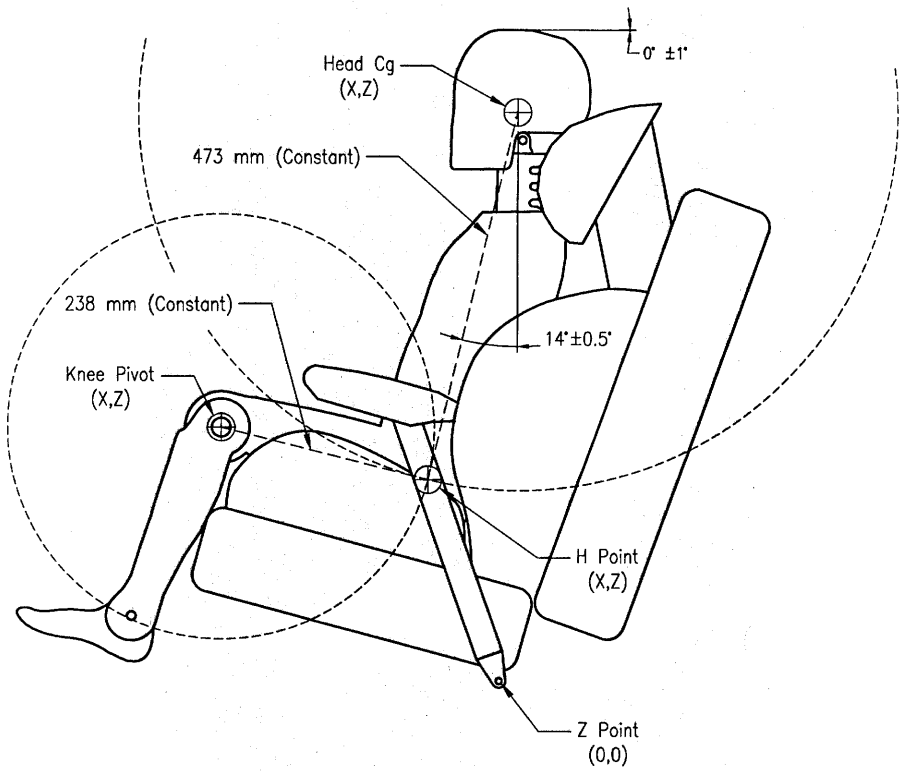


Figure 2. Locating the H-Point so that HIII-6C Torso Angle is 14 $\pm$ 0.5 Degrees from Vertical

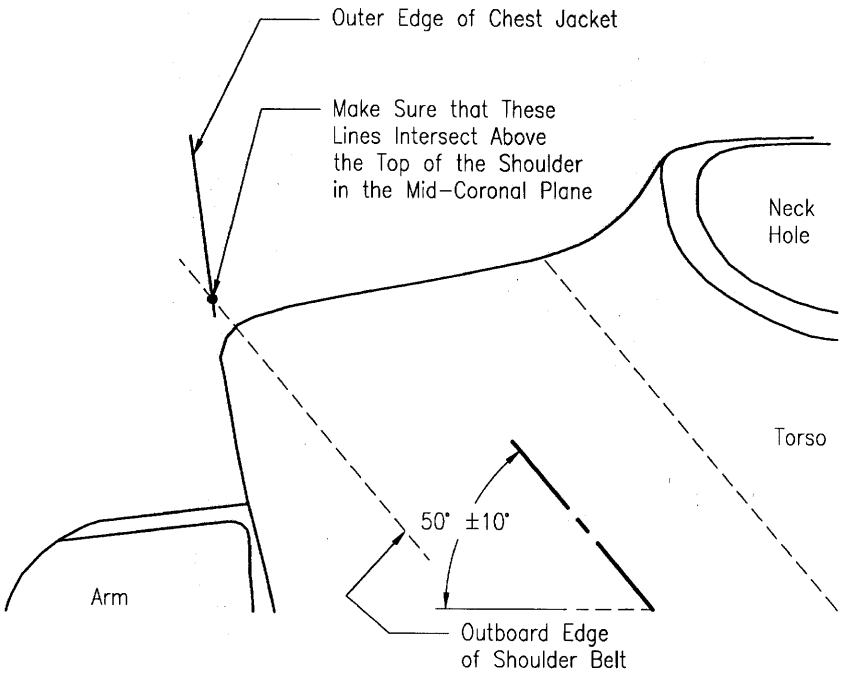


Figure 3. Shoulder Belt Placement

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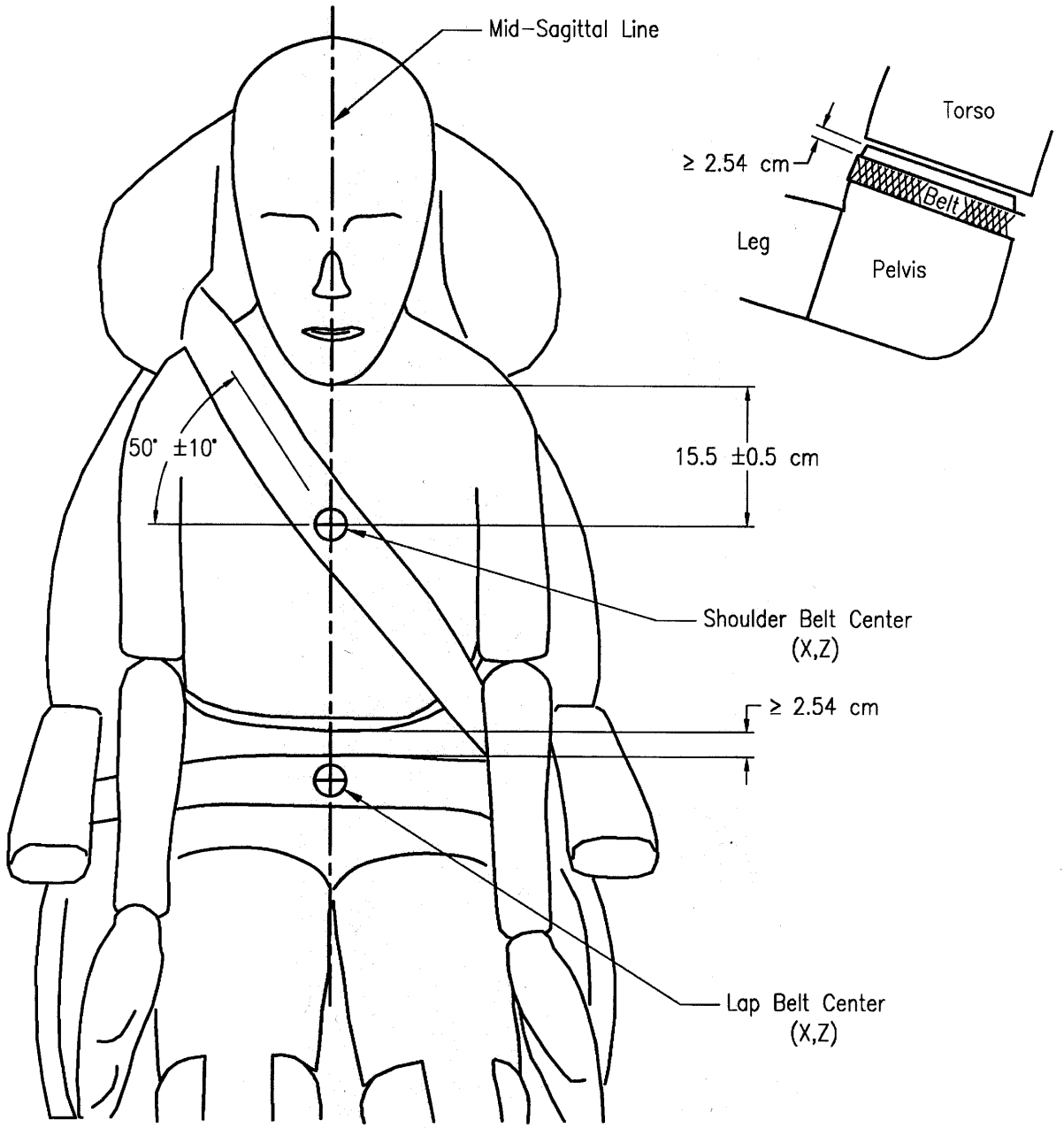


Figure 4. Overall Belt Placement for HIII-6C Dummy

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VRTC Seating Procedure for Hybrid III 10 Year Old Child Dummy for Testing Belt Positioning Booster Seats

Use the following procedure to position the dummy in the belt positioning booster seat:

a) Set the dummy's neck angle at the SP-16 setting (Figure 5a). See also Figure 20 of PADI (NHTSA-2005-21247-8) for more detail.
b) Set the dummy's lumbar angle at the SP-12 setting ("SP" means standard posture), see Figure 5b. This is done by aligning the notch on the lumbar adjustment bracket with the SP-12 notch on the lumbar attachment. See also Figure 45 of PADI for more detail.
c) Place the booster seat on the FMVSS 213 bench seat such that it is centered between the lap belt anchor positions and the booster is pushed rearward until the intersection of the booster's back and bottom contacts the intersection of the FMVSS 213 bench seat's back and base cushions.
d) Place the dummy in the booster seat so that the mid-sagittal line of the dummy is coincident with the centerline of the booster.
e) Measure the X and Z locations of the left and right shoulder pivots. Position the dummy so that the difference between the X and Z values for these two points is less than or equal to 1 cm (see Figure 6).
f) As illustrated in Figure 7 of this section, calculate the H-point location of the dummy relative to the FMVSS 213 seat Z point (see Figure 1B in FMVSS 213) by
    1. Measuring the X and Z coordinates of the knee pivot (X_{KP} and Z_{KP}) and head center of gravity (X_{CG} and Z_{CG}).
    2. Mathematically locating the intersection point of two circles using the knee pivot and head center of gravity as the centers and the known dummy anthropometric lengths as radii. The equations for calculating the H-point are as follows:

$$X_{HP} = X_{CG} + \frac{A(X_{KP} - X_{CG})}{B} + \frac{\sqrt{527^2 - A^2}(Z_{KP} - Z_{CG})}{B}$$

$$Z_{HP} = Z_{CG} + \frac{A(Z_{KP} - Z_{CG})}{B} - \frac{\sqrt{527^2 - A^2}(X_{KP} - X_{CG})}{B}$$

Where:

$$A = \frac{(527^2 - 288^2 + B^2)}{2B}$$

$$B = \sqrt{(X_{KP} - X_{CG})^2 + (Z_{KP} - Z_{CG})^2}$$

g) Use the H-point location and head center of gravity location to determine the torso angle relative to vertical. This angle is calculated using

$$\text{Torso Angle} = \arctan\left(\frac{X_{HP} - X_{CG}}{Z_{CG} - Z_{HP}}\right)\left(\frac{180}{\pi}\right)$$

h) Adjust the dummy until the torso angle is 14 ± 0.5 degrees from vertical.
i) Secure the dummy and booster with belt restraint, following booster manufacturer's instructions for routing the shoulder and lap belts. Apply standard FMVSS 213 belt tensions.
j) Locate the shoulder belt such that its outboard edge is inside of the outer edge of the chest jacket (see Figure 8). If it is not feasible to get the outboard edge of the belt inside the outer edge of the chest jacket, document the closest distance from the belt to the chest jacket that is obtainable.
k) The straight line distance from the bottom of the dummy's chin to the center of the shoulder belt/middle of the sternum along the dummy's mid-sagittal line should be 16 ± 0.5 cm (see Figure 9). Measure and document the intersection of the dummy's mid-sagittal line and vertical center of shoulder belt's width.
l) Measure and document the angle of the shoulder belt relative to horizontal. The shoulder belt angle should be $50^{\circ} \pm 10^{\circ}$. If it is not feasible to achieve the specified shoulder belt angle while following the manufacturer's instructions for belt routing, document angle that is obtainable.
m) Locate the lap belt such that the top of the belt is 2.54 cm or more below the top rim of the pelvis molded skin at the dummy's mid-sagittal line (Figure 9). If it is not feasible to locate the lap belt at least 2.54 cm below the top of the pelvis while following the manufacturer's instructions for belt routing, position belt as low as possible on pelvis.
n) Measure and document the intersection of the dummy's mid-sagittal line and center of lap belt width.
o) Put upper arms as close as possible to, and in alignment with, the upper torso on sides and bend at elbows such that the hands are resting on the booster seat cushion if possible; otherwise bend lower arm perpendicular to upper arm and have hands pointed forward.
p) Level dummy's head $\pm 1^{\circ}$ off of horizontal.
q) Document final H-point, Head CG, and Knee Pivot coordinates in addition to the torso angle.

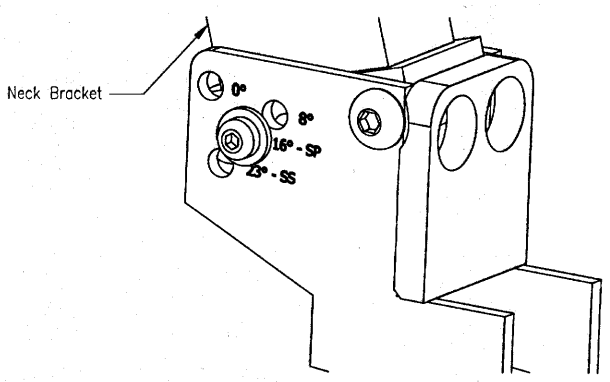


Figure 5a. Neck Angle Setting is SP-16 Degrees

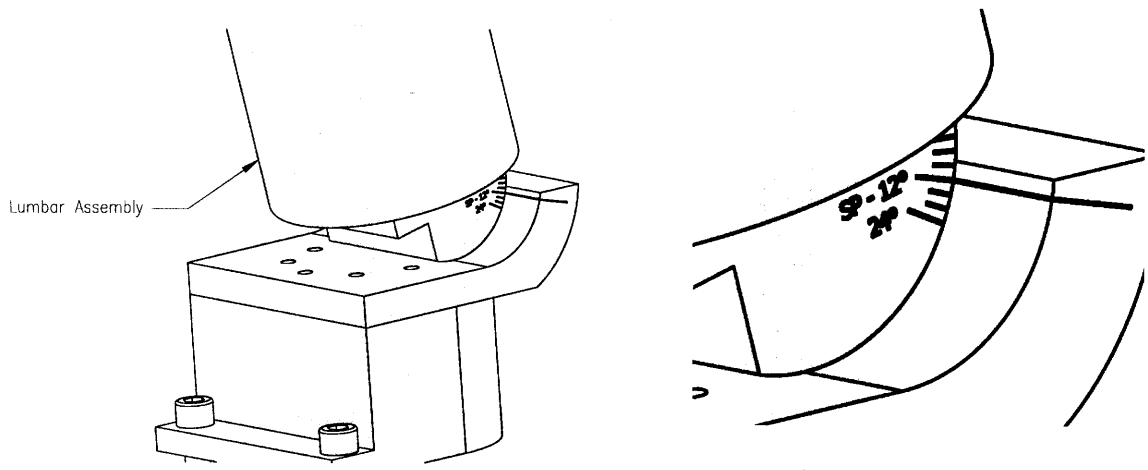


Figure 5b. Lumbar Angle Setting is SP-12 Degrees

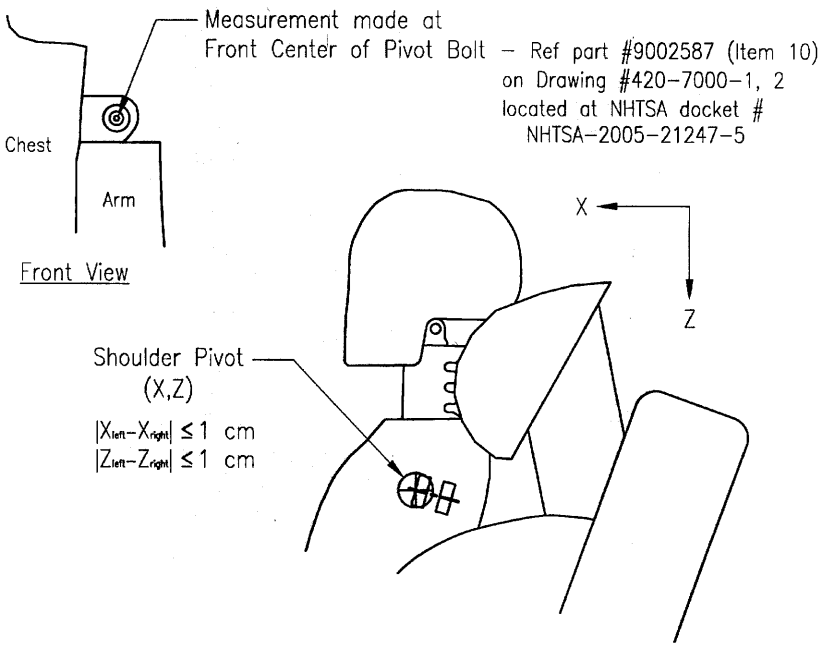


Figure 6. Shoulder Pivot Bolt Alignment

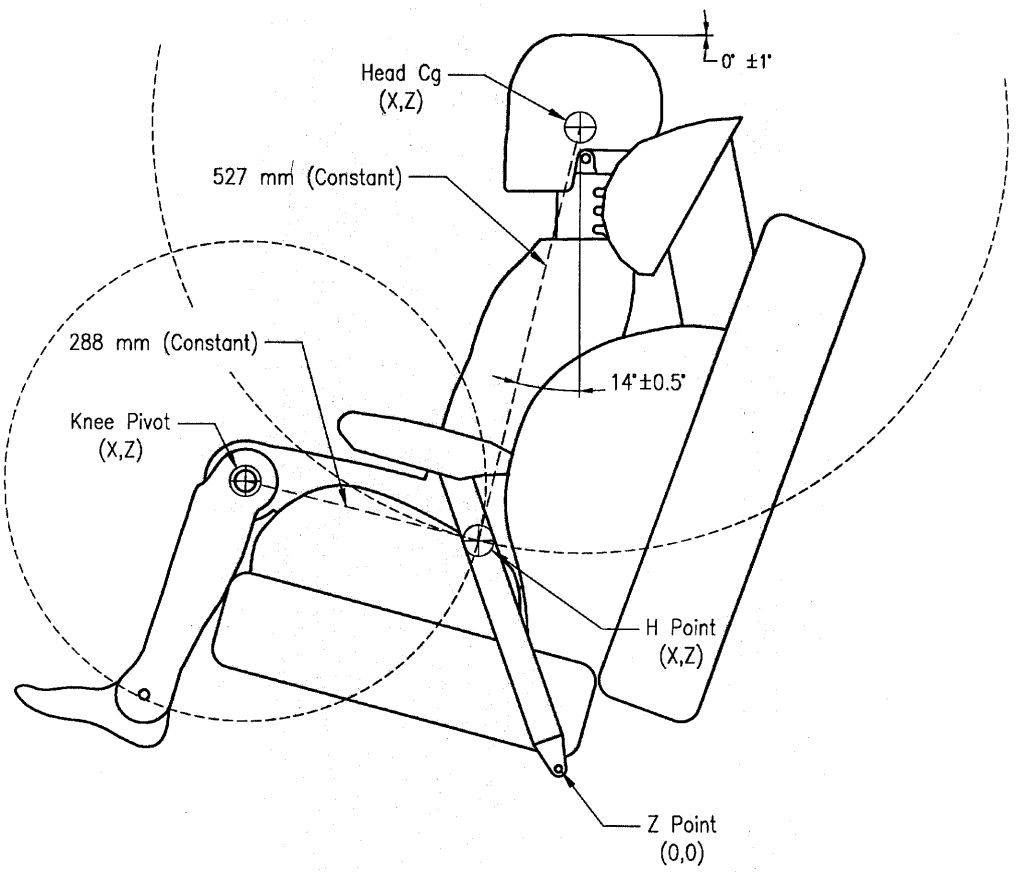


Figure 7. Locating the H-Point so that HIII-10C Torso Angle is 14 ± 0.5 Degrees from Vertical

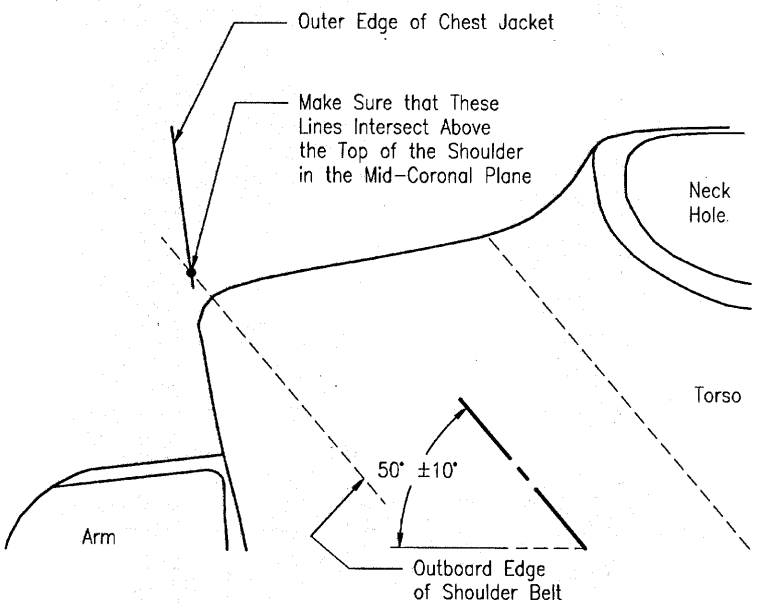


Figure 8. Shoulder Belt Placement

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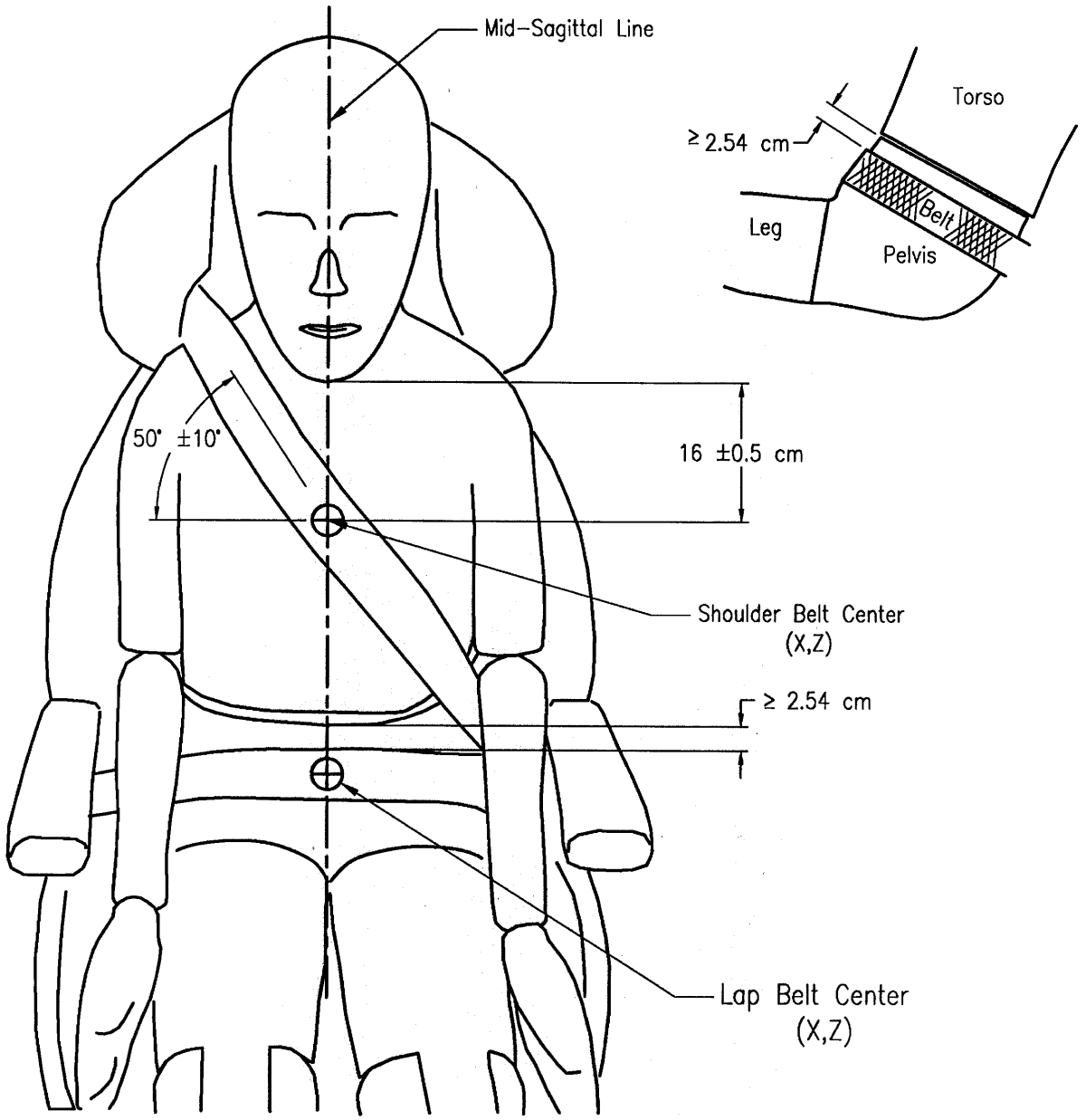


Figure 9. Overall Belt Placement for HIII-10C Dummy

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VRTC DUMMY SETUP SHEET

Dummy S/N _____ Test Date _____ Test No. _____

DUMMY CONFIGURATION

Lumbar Angle Setting (10YO only) ____ Neck Angle Setting (10YO only) ____

DUMMY ALIGNMENT

Dummy/Booster Centerline Coincident (check when confirmed) □

Left Shoulder Pivot Bolt: X _____ Z _____
Right Shoulder Pivot Bolt: X _____ Z _____

BELT PLACEMENT

Belt routed per manufacturer instructions (check when confirmed) □

Shoulder Belt Tension _____ lbs
Lap Belt Tension _____ lbs

Outside edge of shoulder belt inside outer edge of chest jacket (circle one)? Yes / No
If "No", what is distance from outside edge of belt to outer edge of chest jacket (along top of shoulder)? _____ mm

Intersection of mid-sagittal plane and center of shoulder belt: X____ Y____ Z____
Shoulder belt angle relative to horizontal (50 ± 10 degrees): _____ deg

Top edge of lap belt ≥ 2.54 cm from pelvis rim (circle one)? Yes / No
If "No", is belt positioned as low as possible (check when confirmed) □

Intersection of mid-sagittal plane and center of lap belt: X____ Y____ Z____

DUMMY POSTURE

Arms positioned correctly (check when confirmed) □

Head is level (0 ± 1 degree): _____ deg

Head Center of Gravity (outboard side): X_____ Y_____ Z_____
H-Point (outboard side): X_____ Y_____ Z_____
Knee Pivot (outboard side): X_____ Y_____ Z_____

Torso Angle (14 ± 0.5 degrees): _____ deg

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APPENDIX E

BARRIER CERTIFICATION

DECLARATION DE CONFORMITE / STATEMENT OF CONFORMITY

(NF L 00-015C)

Client / Customer :

MGA RESEARCH Corp
5000, Warren road
WI
53105 BURLINGTON
USA

Contact : M. David WINKELBAUER

N° Déclaration **DC 2007-11-199**
Statement N°

N° Contrat : Your Purchase order N°: 03-08-0119
Order N°

N°	Code	Désignation	Qté
1	PROD101XT	Progressive Deformable Barrier for frontal offset test PDB-XT	7.000
2		**Informations Tracabilité / Qualité**	
	QUAL1	N° de lot / Batch Number: CP0801003	
	QUAL1	N° de lot / Batch Number: CP0801004	
	QUAL1	N° de lot / Batch Number: CP0801006	
	QUAL1	N° de lot / Batch Number: CP0801007	
	QUAL1	N° de lot / Batch Number: CP0801009	
	QUAL1	N° de lot / Batch Number: CP0801012	
	QUAL1	N° de lot / Batch Number: CP0801011	
3		**Informations d'expédition**	
	BL	Bon de livraison N° / Delivery Note N° : BL 2007-11-199	

Nous déclarons que la fourniture citée est conforme aux exigences du contrat et que, après vérifications et essais, elle répond en tout point, aux exigences et règlements applicables, sauf exceptions, réserves ou dérogations énumérées dans la présente déclaration de conformité.

We hereby declare, barring exceptions, reservations, or exemptions listed in this statement of conformity, that the listed supplies comply with the contract requirements and that, after completion of testing and verification, they completely satisfy all specified requirements, and applicable standards and regulations.

Responsable Qualité Fournisseur / Supplier Quality Manager **Date : 17 janvier 2008**

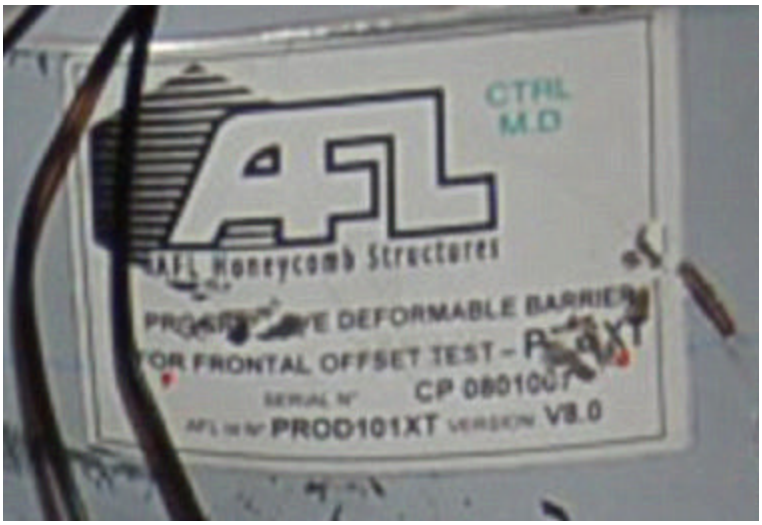
Nom et fonction / Name and title : Karine LAIGNEL **Signature :**

1419, Route de Viroy
BP 60120 - 45201 MONTARGIS - FRANCE
Tél : 02 38 89 14 00
Fax : 02 38 89 12 30
Email : contact@afl-honeycomb.com

Sarl au capital de 240 000 euros - Siret 417 624 947 00012 TVA Intracommunautaire FR 58 417 624 947 - Naf 2022

Barrier: Progressive Deformable Barrier for Frontal Offset Test PDB-XT
Batch Number: CP0801007





APPENDIX F

INSIA REPORT ON STRUCTURAL MEASUREMENTS

STRUCTURAL SURVEY OF CARS. MEASUREMENT METHODOLOGY OF THE MAIN RESISTANT ELEMENTS IN THE CAR BODY

APARICIO IZQUIERDO, FRANCISCO
PÁEZ AYUSO, FRANCISCO JAVIER

INSIA
Carretera de Valencia, km. 7
Campus Sur de la Universidad Politécnica de Madrid
28031 – MADRID – (SPAIN)

March, 1999

REPORT DOCUMENTATION PAGE
Title: *STRUCTURAL SURVEY OF CARS. MEASUREMENT METHODOLOGY OF THE MAIN RESISTANT ELEMENTS IN THE CAR BODY*
Author(s): Aparicio Izquierdo, Francisco Páez Ayuso, Francisco Javier
Performing Organisation name and address: INSIA – University Institute for Automobile Research Carretera de Valencia, Km. 7 – Campus Sur de la Universidad Politécnica de Madrid 28031 – Madrid – Spain
Suplementary notes: Under contract to: THE EUROPEAN COMMUNITY Project: "Improvement of Crash Compatibility between Cars" Contract Nº: RO – 97 – SC.1064
Abstract: The main aim of this working package -*Structural Survey of Cars*- is the reduction of incompatibilities, both structural and geometric, between passenger vehicles and their potential collision partners. The understanding of these incompatibilities needs a previous step for the knowledge of the existing car fleet. Firstly, it is necessary to select the main resistant elements in the car body. These elements have to be chosen from the point of view of the sort of collision that we want to study, that is to say, frontal and side impacts. Detailed measurements have been taken from exterior and interior elements, spread to a total number of 74 models selected from the main vehicle manufacturers at Spain. All of them are being sold this year. Using the information available from the previous measurements in vehicles, the geometric characteristics of the main resistant elements involved in the geometric compatibility between cars will be defined. This report shows the methodology followed to get these measurements.
Subject terms: Crash compatibility, geometric compatibility, resistant elements, measure methodology
Date: March, 1999

1.- METHODOLOGY.

Detailed measurements have been taken from exterior and interior elements. Using the information available from the previous measurements in vehicles, the geometric characteristics of the main resistant elements involved in the geometric compatibility between cars have been defined. These elements are presented in the following figures, and have been divided in two main groups according to the vehicle zones studied in this project.

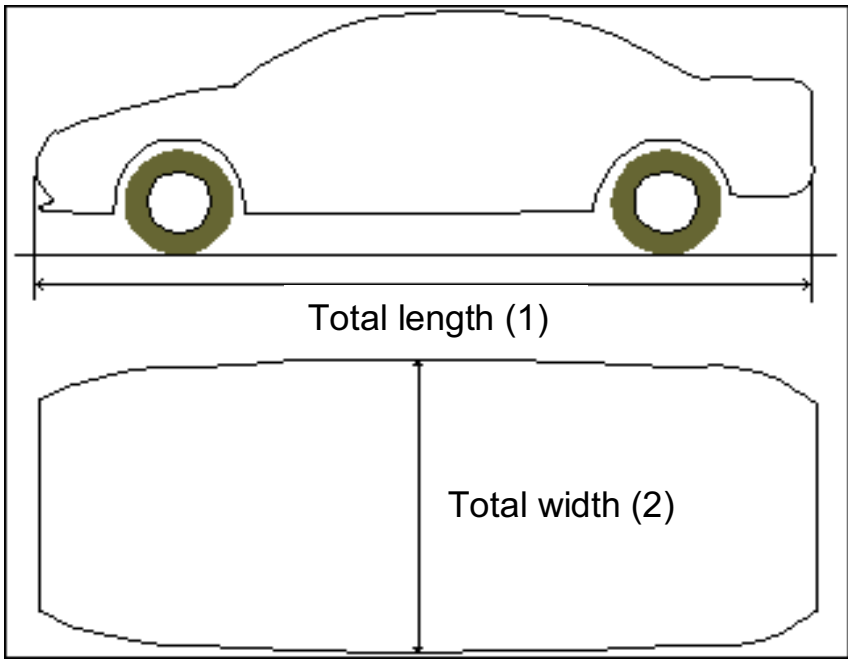


Figure 1.- Definition of the main resistant elements. General dimensions.

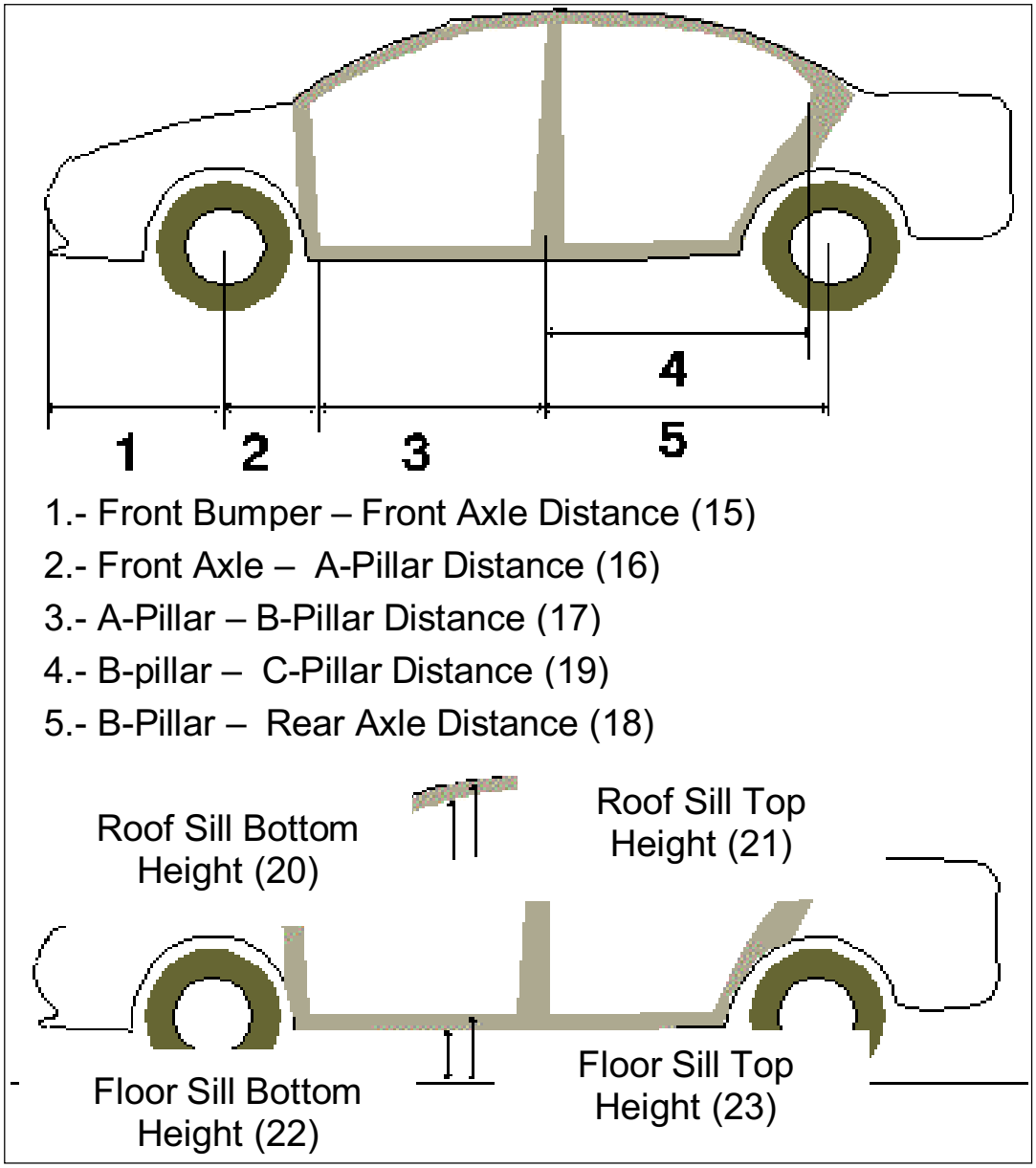


Figure 2.- Definition of the main resistant elements. Side elements.

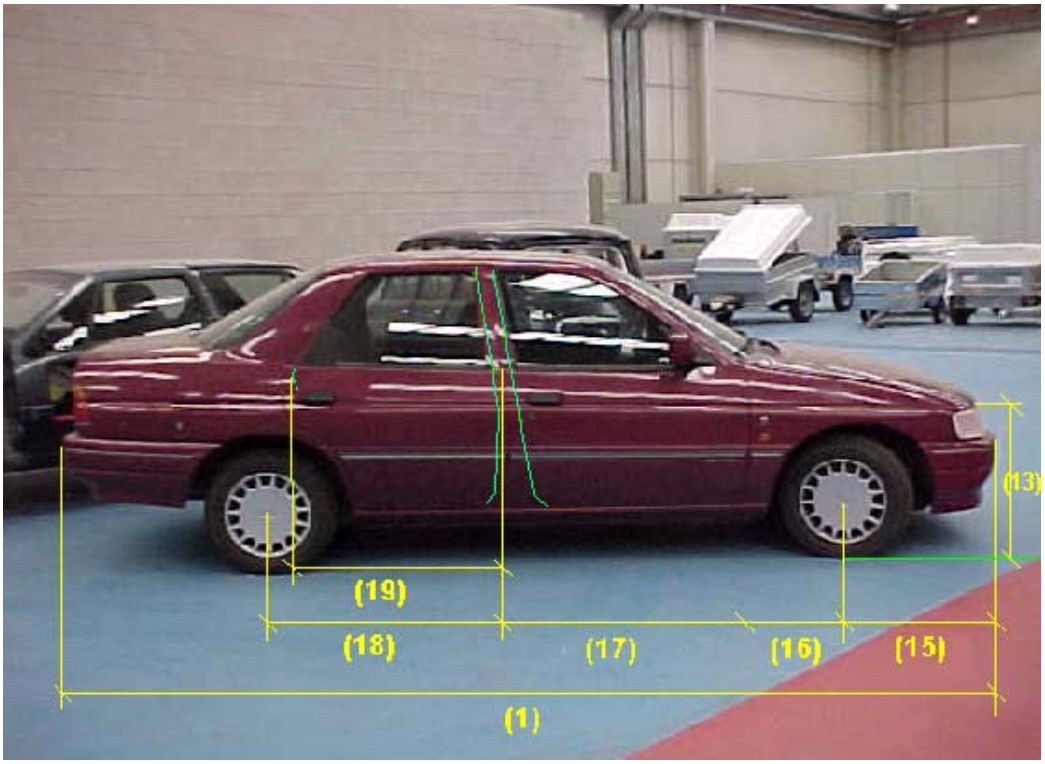


Figure 3.- Measurements of the side resistant elements (outer).

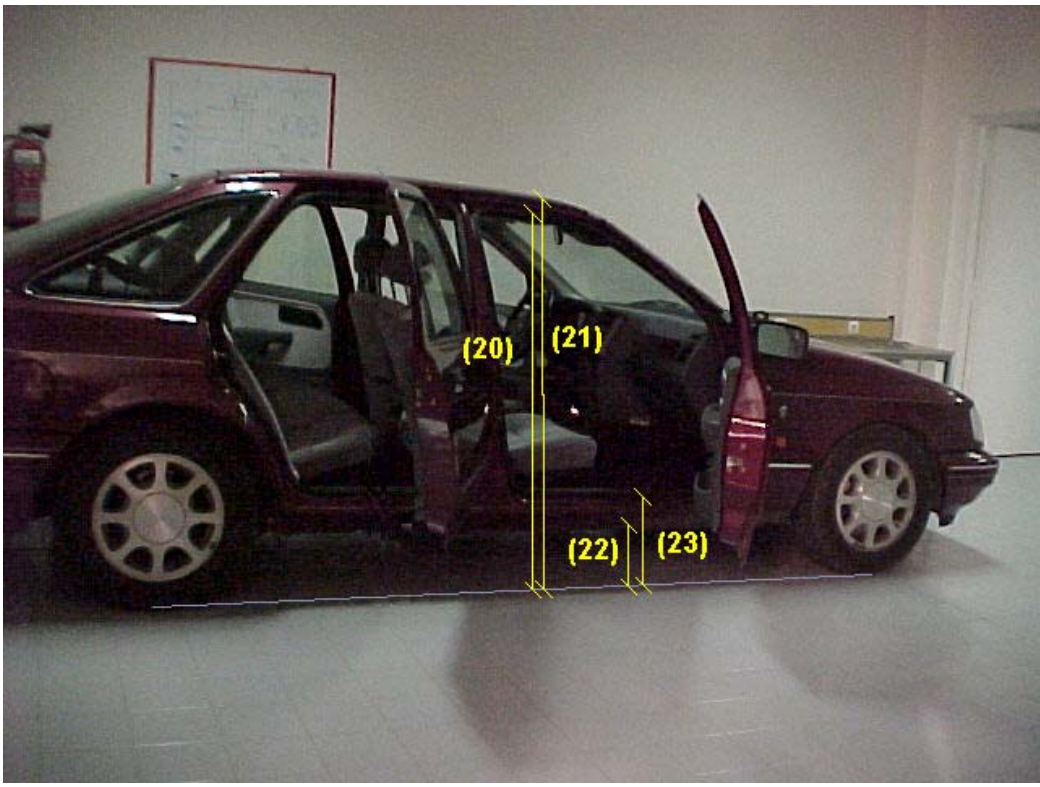


Figure 4.- Measurements of the side resistant elements (inner).

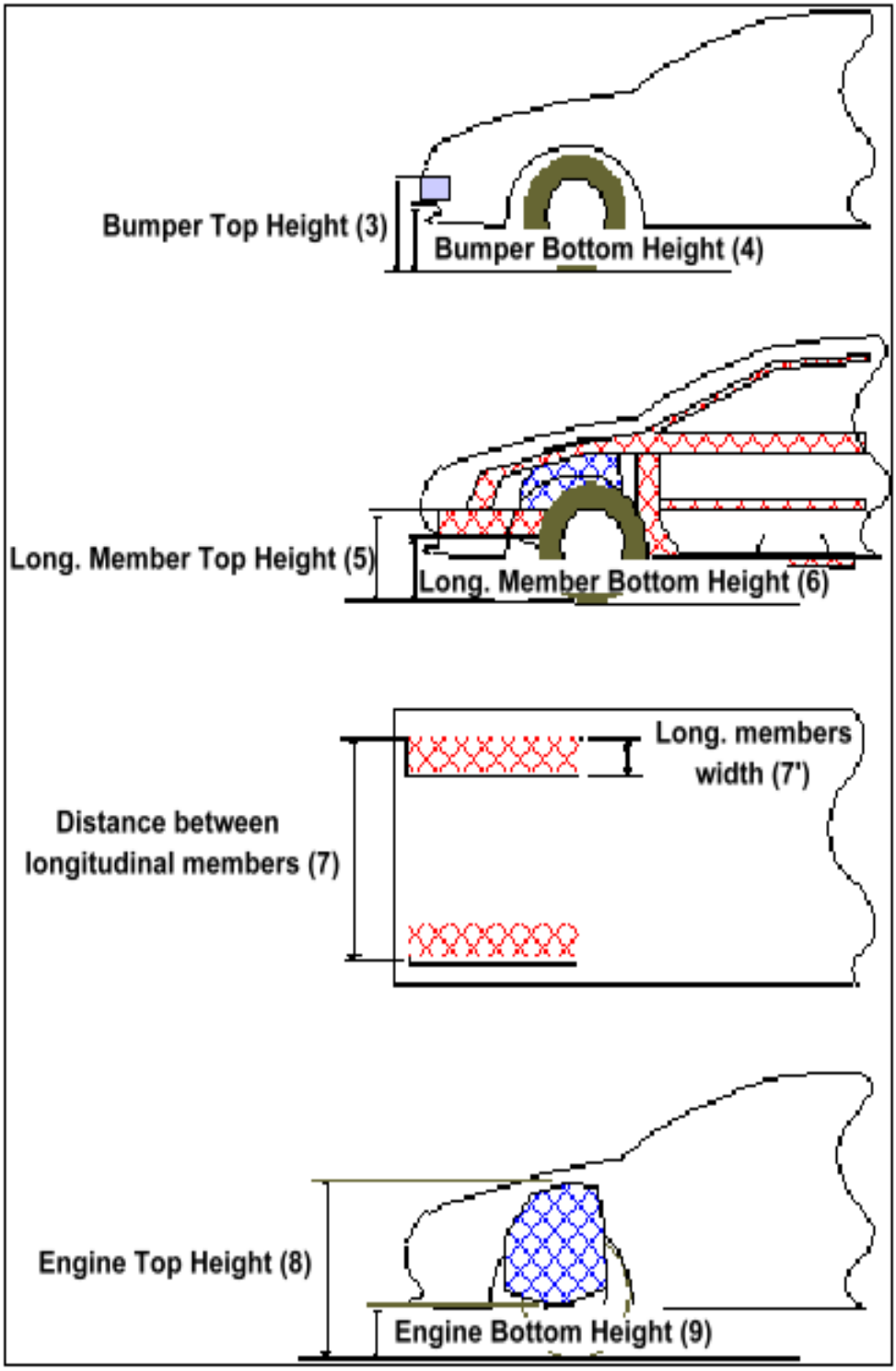


Figure 5.- Definition of the main resistant elements. Front elements.

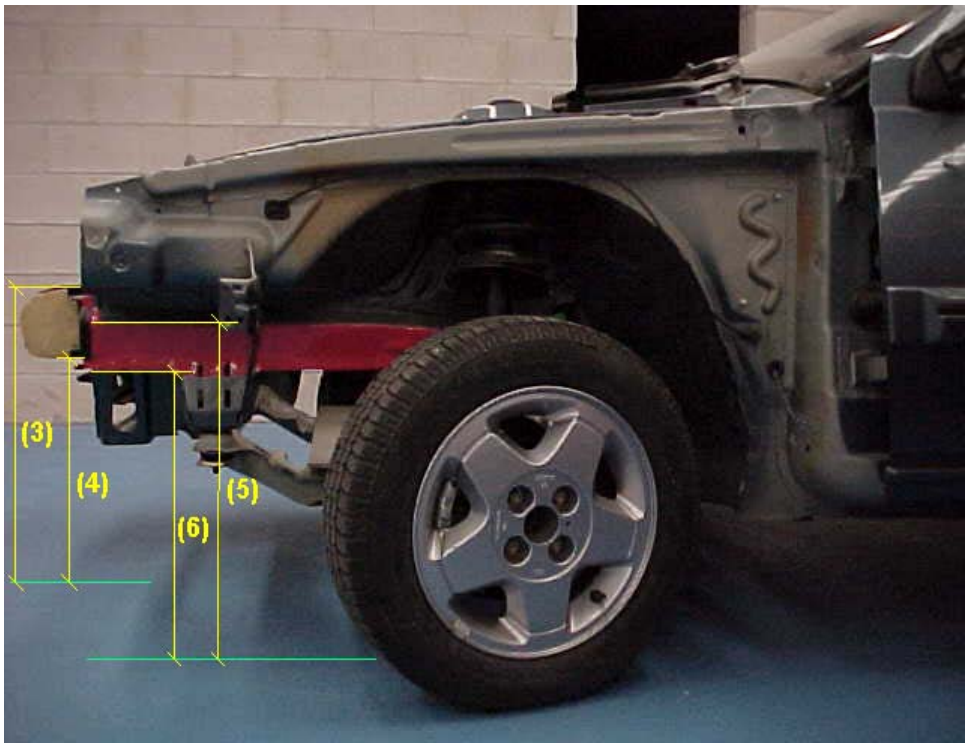


Figure 6.- Measurements of the main resistant elements. Front elements 1.

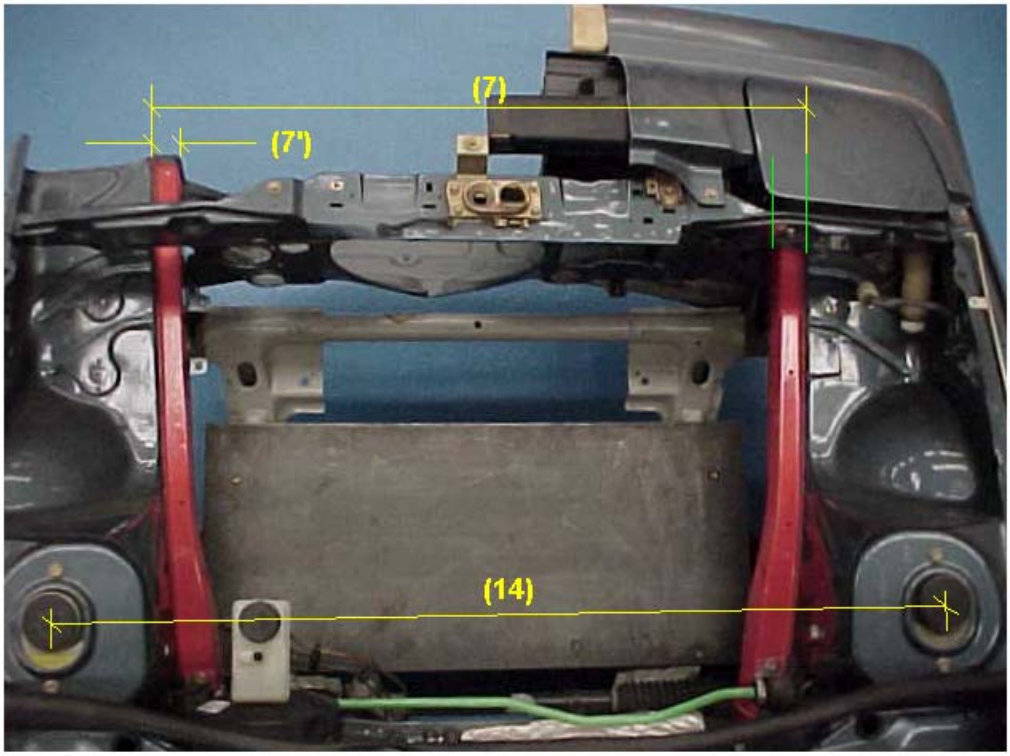


Figure 7.- Measurements of the main resistant elements. Front elements 2.

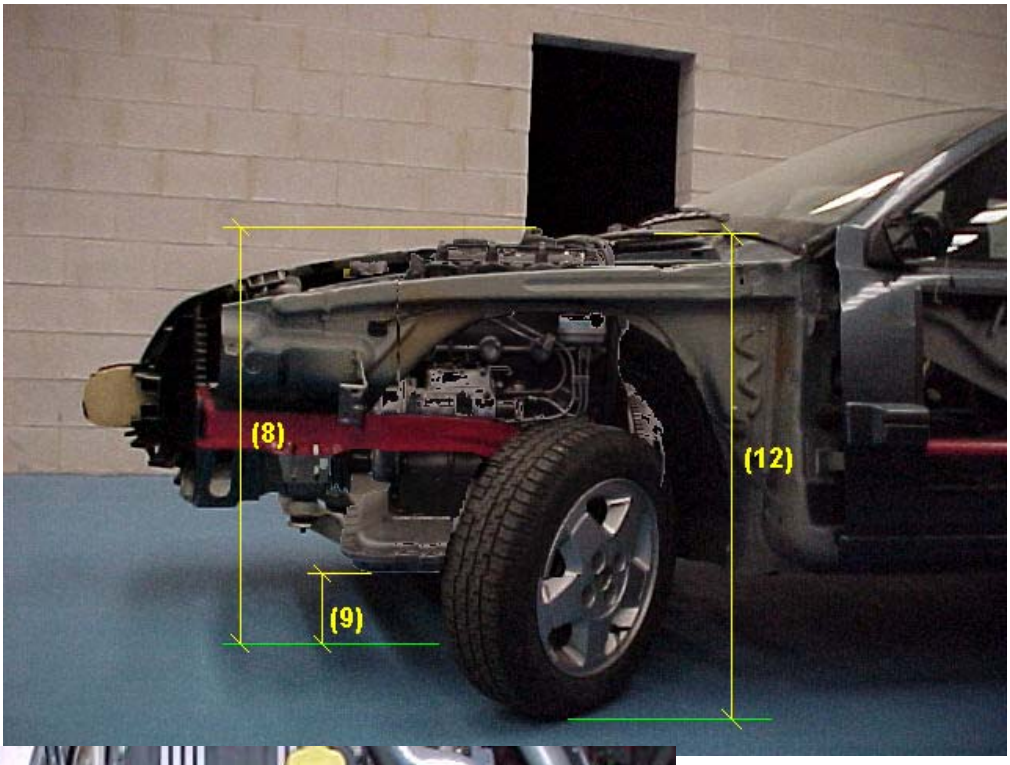


Figure 8.- Measurements of the main resistant elements. Front elements 3.

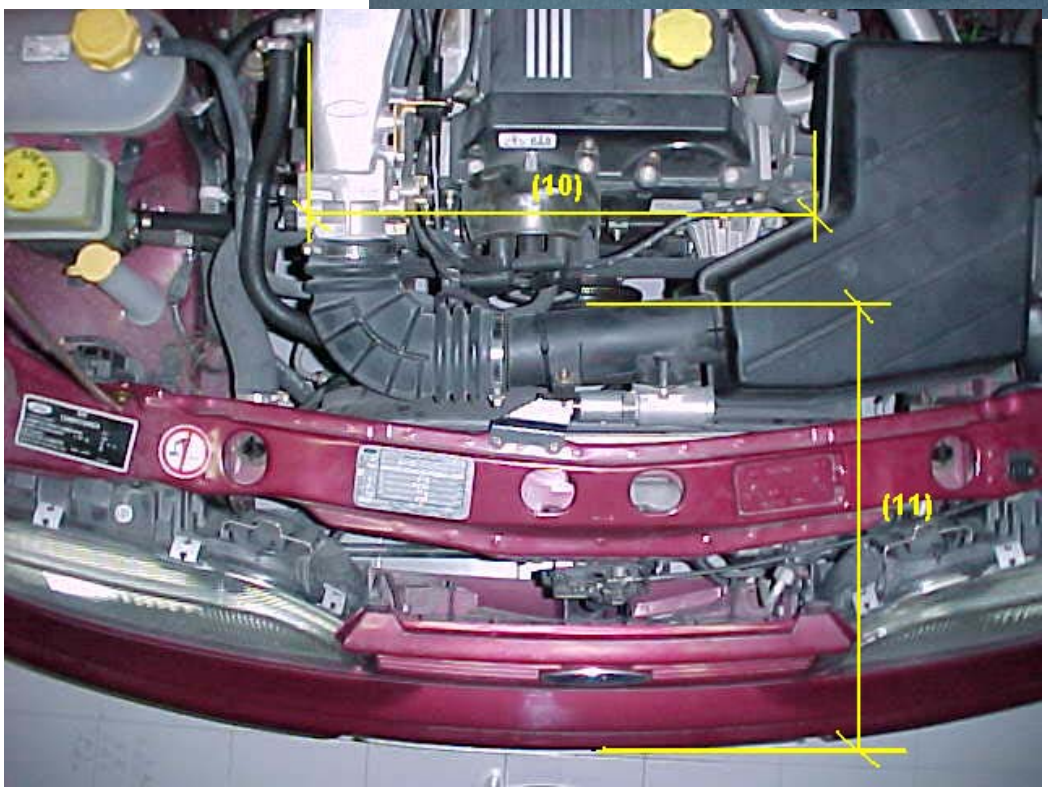


Figure 9.- Definition of the main resistant elements. Front elements (Longitudinal engine).

The procedure considered to measure these elements is described as follows, where it is indicated the location of these ones in the Excel Sheet (SURVEY.XLS) into brackets:

FRONT ELEMENTS

• **Total Length –(1)- (Side & Front Sheets - C column)**: distance between the point in the front bumper further on and the point in the rear bumper further back.

• **Weight (Side & Front Sheets - D column)**: mass, including an average driver weight (70 kg), and the fuel tank mass (at half-capacity).

• **Total Width –(2)- (Side & Front Sheets - E column)**: distance between the outer side points in a transverse plane of the vehicle (middle plane between the front and rear axles).

• **Bumper bottom height –(4)- (Front Sheet G column)**: distance between the ground and the lowest point on the front bumper, being a resistant member (aerodynamic elements under the front bumper are not considered).

• **Bumper top height –(3)- (Front Sheet H column)**: distance between the ground and the highest point on the front bumper, being a resistant member (aerodynamic elements are not considered).

• **Longitudinal member top height –(5)- (Front Sheet I column)**: distance between the ground and the highest point on the longitudinal members, measured approximately in the front bumper-longitudinal member joint (when accessible).

• **Longitudinal member bottom height –(6)- (Front Sheet J column)**: distance between the ground and the lowest point on the longitudinal members, measured approximately in the front bumper-longitudinal member joint.

• **Distance between longitudinal members (Front Sheet K column)**: transverse distance between extreme points in longitudinal members, measured approximately in the front bumper-longitudinal member joint.

Depending on the accessibility of these members, the extreme points are the inner points (I) or the outer points (O).

• **Longitudinal member width -7'- (Front Sheet L column)**: width of one of the longitudinal members, measured approximately in the front bumper-longitudinal member joint.

• **Engine top height (8) (Front Sheet N column)**: distance between the ground and the highest point on the engine that can be a resistant member in case of accident (usually, the highest point on the head, or the highest point of the inlet or exhaust manifolds).

• **Engine bottom height (9) (Front Sheet M column)**: distance between the ground and the lowest point on the engine (usually, the lowest point on the crankcase).

• **Engine and Gearbox width (10) (Front Sheet O & P columns)**:

- Transverse *configuration engine*: distance between extreme points in the gearbox-cylinder block unit or others resistant members attached to the cylinder block unit, i.e. fan belts (from a front point of view).

- *Longitudinal configuration engine*: distance between extreme points in the cylinder block unit (from a front point of view).

• **Front bumper - Engine distance (11) (Front Sheet Q column)**: distance between the point in the front bumper further on and the point in the engine further on that is a resistant element, i.e. the further on point of the exhaust manifold placed in the front of the engine.

• **Front shock absorber fixing width (14) (Front Sheet R column)**: transverse distance between the front shock absorber - body car joints.

• **Front shock absorber fixing height (12) (Front Sheet S column)**: distance between the ground and the front shock absorber-body car joint.

• **Bonnet leading edge height (Front Sheet T column)**: distance between the ground and the bonnet edge further on.

SIDE ELEMENTS

• **Front bumper - Front axle distance (15) (Side Sheet G column)**: distance between the point in the front bumper further on and the middle point in the front tyre-road contact patch.

• **Front axle - A Pillar distance (16) (Side Sheet H column)**: distance between the middle point in the front tyre-road contact patch and the point in the A-pillar further back.

• **A Pillar - B Pillar distance (17) (Side Sheet I column)**: distance between the point in the A-pillar further back and the middle point in the B-pillar.

• **B Pillar - C Pillar distance (19) (Side Sheet J column)**: distance between the middle point in the B-pillar and the point in the C-pillar further back (only 4/5-door vehicles).

• **B Pillar - Rear axle distance (18) (Side Sheet K column)**: distance between the middle point in the B-pillar and the middle point in the rear tyre-road contact patch.

• **Roof sill bottom height (20) (Side Sheet L column)**: distance between the ground and the lowest point on the roof sill, measured in the front door middle point.

• **Roof sill top height (21) (Side Sheet M column)**: distance between the ground and the highest point on the roof sill (usually located in the sill-roof joint), measured in the front door middle point.

• **Floor sill bottom height (22) (Side Sheet N column)**: distance between the ground and the lowest point on the floor sill, measured in the front door middle point.

• **Floor sill top height (23) (Side Sheet O column)**: distance between the ground and the highest point on the floor sill, measured in the front door middle point.

NOTE

- N/A: dimension not available.