REPORT NUMBER: 201-MGA-2009-001

SAFETY COMPLIANCE TESTING FOR FMVSS 201
RIGID POLE SIDE IMPACT TEST

GENERAL MOTORS CORPORATION
2009 CHEVROLET MALIBU 1LS
NHTSA NUMBER: C90110

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

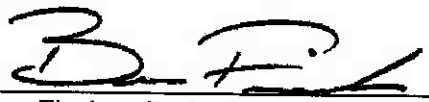
TEST DATE: March 11, 2009

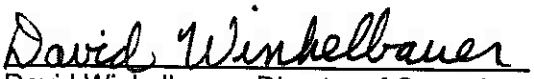
REPORT DATE: June 12, 2009

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVENUE, SE
WASHINGTON, D.C. 20590

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-06-C-00030.

Prepared by:  Date: June 12, 2009
Ben Fischer, Project Engineer

Reviewed by:  Date: June 12, 2009
David Winkelbauer, Director of Operations

FINAL REPORT ACCEPTED BY:

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COTR, Side Impact

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Date of Acceptance

Technical Report Documentation Page

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15. Supplementary Notes

16. Abstract

A rigid pole side impact test was conducted on a 2009 Chevrolet Malibu 1LS in accordance with FMVSS 201, "Occupant Protection in Interior Impact", S6.2(b)(3) and the Office of Vehicle Safety Compliance Test Procedure No. TP-201P-02 "Rigid Pole Side Impact Test". The test was conducted at MGA Research Corporation in Burlington, Wisconsin on March 11, 2009.

The impact velocity of the vehicle was 28.5 kph, and the ambient temperature at the struck side (driver's) of the target vehicle at the time of impact was 21°C. The post-test maximum crush was 329 mm at level 3. The test vehicle's occupant performance is as follows:

	REQUIREMENT	DRIVER
HIC	≤ 1000	367

The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.

17. Key Words Compliance Testing Rigid Pole Side Impact Test FMVSS 201	*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Adm. Technical Ref. Division, (NPO-230) 1200 New Jersey Avenue, SE Washington, D.C. 20590

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Form DOT F17007.7 (8-72)

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SECTION 1
PURPOSE AND TEST PROCEDURE

1.1 PURPOSE

This rigid pole side impact test is conducted as part of the FY' 2009 test program sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract No. DTNH22-06-C-00030. The purpose of this test was to evaluate occupant protection in interior impact in a 2009 Chevrolet Malibu 1LS manufactured by General Motors Corporation.

1.2 TEST PROCEDURE

The rigid pole side impact test was conducted in accordance with the current National Highway Traffic Safety Administration (NHTSA), Office of Vehicle Safety Compliance (OVSC), laboratory test procedure TP-201P-02, dated October 21, 2001 and the corresponding MGA Research Corporation Test Procedure MGA-NHTSA8. The procedures for receiving, inspection, testing, and reporting of test results are described in the test procedures and are not repeated in this report.

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

SECTION 2
SUMMARY OF RIGID POLE SIDE IMPACT TEST

2.1 SUMMARY OF RIGID POLE SIDE IMPACT TEST

A rigid pole side impact test was performed on a 2009 Chevrolet Malibu 1LS. The subject vehicle was towed into a rigid pole at a velocity of 28.5 km/h. The specified impact velocity range is from 27.2 to 28.8 km/h. The test vehicle was positioned 90° to the line of forward motion. The weight of the vehicle as tested was 1702.7 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on March 11, 2009.

One (1) real-time motion picture camera and eleven (11) high-speed motion picture cameras were used to document the impact event. Camera locations and pertinent camera information are documented in the data sheets. Pre- and post-test photographs of the vehicle and SID/HIII can be found in Appendix A. One SID/HIII was placed in the left front outboard designated seating position according to instructions specified in the TP-201P-02 dated October 21, 2001. The SID/HIII was instrumented in the following locations:

- Head Center of Gravity (CG) tri-axial accelerometers (X, Y, and Z axis)
- Upper Neck 6 channel load cell (X, Y, Z force and moment)
- Left Upper Rib (LUR) uni-axial accelerometer (Y-axis primary and redundant)
- Left Lower Rib (LLR) uni-axial accelerometer (Y-axis primary and redundant)
- Lower Thoracic Spine (T12) uni-axial accelerometer (Y-axis primary and redundant)
- Pelvic (PEV) section uni-axial accelerometer (Y-axis primary and redundant)

The test vehicle was instrumented with eighteen (18) structural accelerometers. All data channels were recorded with a fully self contained on-board DTS TDAS Pro. The data was digitally sampled at 10,000 samples per second and processed per Section 12.2 of the OVSC Test Procedure.

2.2 GENERAL COMMENTS

The test vehicle sustained a maximum static crush of 329 mm at level 3, at the vertical impact line. The driver SID/HIII, Serial No. 036, was calibrated just prior to this test. The SID/HIII's injury criteria are summarized as follows:

Measurements	Units	Driver
HIC		367
TTI*	G's	54.3
Pelvis*	G's	53.2
Neck Force X*	N	-265
Neck Force Y*	N	599
Neck Force Z*	N	447
Neck Moment X*	Nm	-96.3
Neck Moment Y*	Nm	15.2
Neck Moment Z*	Nm	21.6

* For Information Purposes Only

Test summaries and post-test observations are presented in Section 3. The vehicle, camera, and occupant measurements are presented in Section 4. Appendix A contains the still photograph prints. Appendix B contains the SID/HIII and vehicle data traces. Appendix C contains the SID/HIII's configuration and performance verification data. Appendix D contains the calibration information data.

TEST NOTES

The following channels were not used in this test:

Driver Door Lower
Driver Door Mid
Driver Door Upper

There was no valid data collected for:

Left B-Post @ Sill Y after 20 msec
Driver Seat track Y after 20 msec

SECTION 3

SIDE IMPACT DUMMY (SID/HIII) AND VEHICLE TEST DATA

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P
NHTSA No. C90110
Test Date: March 11, 2009

CONVERSION FACTORS USED IN THIS REPORT*

Quantity	Typical Application	English Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	mile/h	km/h	1.609
Length or Distance	Measurements	in	mm	25.4
Volume	Small Fluids	oz	mL	29.573
Pressure	Tire Pressure	lbf/in^2	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	°F	°C	=(tf -32)/1.8
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf/ft	Nm	1.355

*Based on the Recommended Practice in SAE J916, May 85

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P

NHTSA No. C90110
Test Date: March 11, 2009

TEST VEHICLE INFORMATION

Make	Chevrolet
Model	Malibu
Body Style	Sedan
NHTSA No.	C90110
VIN	1G1ZG57B89F132286
Color	Summit White
Delivery Date	2/6/2009
Odometer Reading (mile)	73
Dealer	Reichert Chevrolet
Transmission	Automatic
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	2.4
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Yes
Power Windows	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Disc Brakes, Front	Yes
Disc Brakes, Rear	Yes
Anti-lock Brakes	Yes
AM/FM/CD	Yes
Anti-theft System	No
Cruise Control	No

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors Corporation
Date of Manufacture	08/08

GVWR (kg)	1990
GAWR Front (kg)	1038
GAWR Rear (kg)	952

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	210	210
Cold Pressure (kPa)	210	210
Recommended Tire Size	P215/55R17	P215/55R17
Tire Size on Vehicle	P215/55R17	P215/55R17
Tire Manufacturer	Firestone	Firestone

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number Of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				416
Cargo Wt. (RCLW) (kg)				76

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Chevrolet Malibu 1LS NHTSA No. C90110
Test Program: FMVSS 201P Test Date: March 11, 2009

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	460.9	320.7		499.4	368.3	
Right	kg	459.5	313.9		484.4	350.6	
Ratio	%	59.2	40.8		57.8	42.2	
Totals	kg	920.4	634.6	1555.0	983.8	718.9	1702.7

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1555.0
Weight of SID/HIII Side Impact Dummy	kg	80.7
Rated Cargo/Luggage Weight (RCLW)	kg	76
Calculated Vehicle Target Weight (TVTW)	kg	1711.7

TEST VEHICLE ATTITUDES

	Units	As Delivered	Fully Loaded	Ready For Test
Right Front	mm	711	710	810
Left Front	mm	714	706	806
Right Rear	mm	721	699	807
Left Rear	mm	724	692	800
Right Door Sill Angle	deg	0.5 ND	0.0	0.2 ND
Left Door Sill Angle	deg	0.4 ND	0.1 NU	0.3 ND
Front Bumper Angle	deg	0.3 RD	0.0	0.0
Rear Bumper Angle	deg	0.5 RD	0.2 RD	0.2 RD

ND = NOSE DOWN, NU = NOSE UP, BD = BACK DOWN, LD = LEFT DOWN, RD = RIGHT DOWN, RU = RIGHT UP

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2855
Total Vehicle Length at Left Side	mm	4106
Total Vehicle Length at Centerline	mm	4856
Total Vehicle Length at Right Side	mm	4106
Total Vehicle Width at B-Post	mm	1785
Weight of Ballast in Cargo Area	kg	0
Amount of Stoddard Solvent in Fuel Tank	liters	57.2

DATA SHEET NO. 1... (Continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P
NHTSA No. C90110
Test Date: March 11, 2009

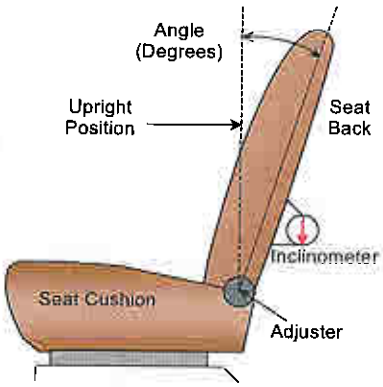
TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Target Impact Point Aft of Front Axle	mm	1380
Actual Impact Point Aft of Front Axle	mm	1380

NORMAL DESIGN RIDING POSITION

The driver's seat back is positioned to the manufacturer's designated angle. The procedure for the seat is as follows: With the seat in the mid fore-aft track position, the driver's seat back angle is at 19 degrees when measured on the plastic seat back (4.2 degrees on headrest post).

Initial driver seat back angle: 4.2 degrees on head rest post
Final driver seat back angle: 0.4 degrees on head rest post



FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONS

Initial Seat position: 10th notch (forward-most as 0)
Final Seat position: 8th notch (forward-most as 0)

SEAT BELT UPPER ANCHORAGE

The test vehicle is equipped with adjustable "D" ring anchorage for the driver's seat position. The driver's "D" ring anchorage was placed in the uppermost position.

DATA SHEET NO. 1... (continued)

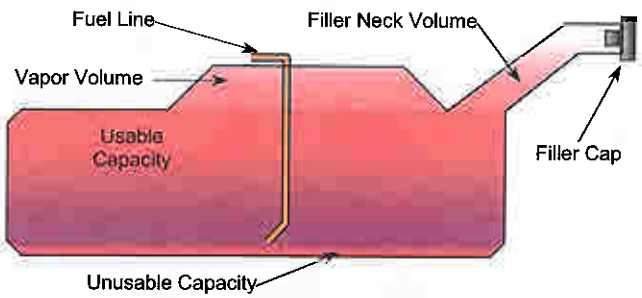
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Chevrolet Malibu 1LS NHTSA No. C90110
Test Program: FMVSS 201P Test Date: March 11, 2009

FUEL TANK CAPACITY DATA

The "Usable Capacity" of the standard equipment fuel tank is: 61.7 liters
The "Usable Capacity" of any optional equipment fuel tank is: N/A liters
92-94% of "Usable Capacity" for certification to FMVSS 301 requirements: 56.7 – 58.0 liters
Actual amount of Stoddard solvent added to vehicle for certification test 57.2 liters

The vehicle is equipped with electric fuel pump. The engine control module (ECM) enables the fuel pump relay when the ignition switch is turned ON. The ECM will disable the fuel pump relay within 2 seconds unless the ECM detects ignition reference pulses. The ECM continues to enable the fuel pump relay as long as ignition reference pulses are detected. The ECM disables the fuel pump relay within 2 seconds if ignition reference pulses cease to be detected and the ignition remains ON.

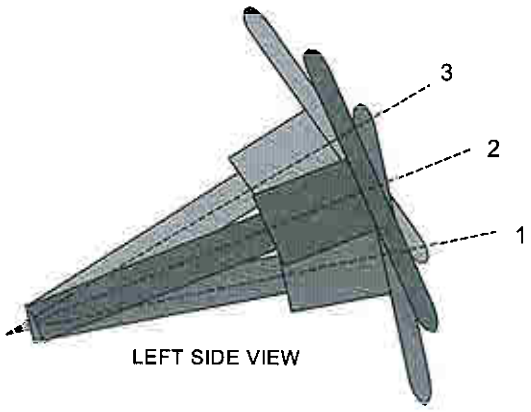


VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes, when it is moved through its full range of motion.

The steering column was placed in the mid position at 68.2 degrees.



STEERING COLUMN ASSEMBLY

DATA SHEET NO. 2

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P

NHTSA No. C90110
Test Date: March 11, 2009

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	460.9	320.7		499.4	368.3	
Right	kg	459.5	313.9		484.4	350.6	
Weight Ratio	%	59.2	40.8		57.8	42.2	
Totals	kg	920.4	634.6	1555.0	983.8	718.9	1702.7

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measured Parameter	Units	Maximum Crush	Above Ground
Level 1	Sill Top Height	mm	264	270
Level 2	Occupant H-Point	mm	291	445
Level 3	Mid Door	mm	329	642
Level 4	Window Sill	mm	281	958
Level 5	Window Top	mm	107	1372
N/A	Maximum Penetration	mm	329	642

INSTRUMENTATION

SID/HIII Instrumentation	17
Vehicle Structure Accelerometers	18
Total	35

HIGH SPEED CAMERAS

Onboard Vehicle	3
Offboard Vehicle	8
Total	11

IMPACT POINT DATA

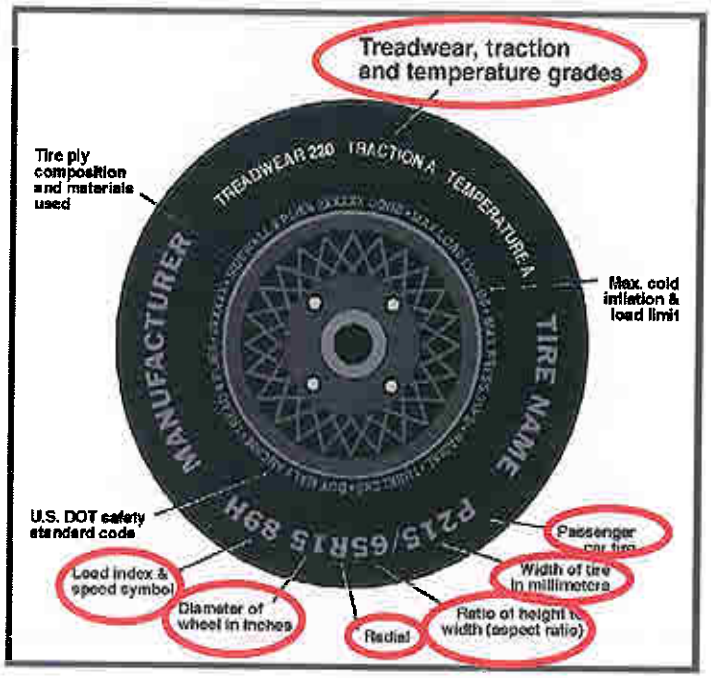
Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 38	0 forward

DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2009 Chevrolet Malibu 1LS NHTSA No. C90110
Test Program: FMVSS 201P Test Date: March 11, 2009

Vehicle Year	2009	Vehicle Make	Chevrolet
VIN	1G1ZG57B89F132286	Vehicle Model	Malibu 1LS



	Front	Rear
Tire Manufacturer	Firestone	Firestone
Tire Name	FR710	FR710
Tire Type	P	P
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	55	55
Radial	R	R
Wheel Diameter	17	17
Load Index & Speed Symbol	93S	93S
Treadwear	560	560
Traction Grade	A	A
Temperature Grade	B	B

DATA SHEET NO. 4

POST TEST OBSERVATIONS

Test Vehicle: 2009 Chevrolet Malibu 1LS NHTSA No. C90110
Test Program: FMVSS 201P Test Date: March 11, 2009

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front Seating Position
Dummy Type / Serial No.	SID/HIII / 036
Head Contact	Curtain Airbag, Headrest, Headliner
Upper Torso Contact	Side Airbag
Lower Torso Contact	Door Panel
Left Knee Contact	Door Panel
Right Knee Contact	Left Knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Left Side Door Opening	Door remained closed and latched	Door remained closed and latched
Right Side Door Opening	Door remained closed and latched	Door remained closed and latched
Seat Movement	0	0
Seat Back Failure	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No failures
Sill Separation	None
Windshield Damage	Cracked
Window Damage	Left side windows down for test
Other Notable Effects	None

AIRBAG DEPLOYMENT

	Driver
Front	No
Side	Yes
Curtain	Yes

ARMREST LOCATION AND SEAT CRUSH

	Driver
Front Armrest (from bottom of window)	285
Front Seat Back Crush	144
Front Seat Cushion Crush	77

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 5

SID/HIII INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P

NHTSA No. C90110
Test Date: March 11, 2009

THORAX AND PELVIS PEAK ACCELERATIONS (FIR 100 Filtered)

Location	Axis	Units	Driver			
			Max	Time	Min	Time
Upper Rib (LUR)	Y	G's	56.5	40	-10.0	110
Upper Rib (LUR) (R)	Y	G's	57.0	40	-9.7	110
Lower Rib (LLR)	Y	G's	50.2	42	-12.6	79
Lower Rib (LLR) (R)	Y	G's	50.9	41	-12.1	79
Lower Spine (T_{12})	Y	G's	52.0	45	-7.7	85
Lower Spine (T_{12}) (R)	Y	G's	52.1	45	-7.9	86
Pelvis (PEV)	Y	G's	53.2	45	-7.8	89
Pelvis (PEV) (R)	Y	G's	53.1	45	-7.8	87

THORACIC TRAUMA INDEX (TTI) AND PELVIC ACCELERATION (FIR 100 Filtered)

Location	Driver			
	LUR	T_{12}	TTI(g)	PEV(g)
Rib, Spine, and Pelvis	56.5	52.0	54.3	53.2
Rib, Spine, and Pelvis (R)	57.0	52.1	54.6	53.1

UPPER NECK FORCES AND MOMENTS (SAE CLASS 1000/600 Filtered)

Location	Axis	Units	Driver			
			Max	Time	Min	Time
Neck Force	X	N	89	166	-265	52
Neck Force	Y	N	599	56	-357	149
Neck Force	Z	N	447	47	-73	60
Neck Moment	X	Nm	9.0	297	-96.3	55
Neck Moment	Y	Nm	15.2	67	-11.8	47
Neck Moment	Z	Nm	21.6	233	-9.9	141

HEAD CG PEAK ACCELERATIONS (SAE CLASS 1000 Filtered)

Location	Axis	Units	Driver			
			Max	Time	Min	Time
Head CG	X	G's	6.2	192	-8.8	74
Head CG	Y	G's	68.4	56	-9.9	163
Head CG	Z	G's	10.4	27	-8.0	59
Head CG Resultant		G's	68.7	56		

HEAD INJURY CRITERIA (SAE CLASS 1000 Filtered)

Location	Driver		
	HIC	T1	T2
Head CG Resultant	367	46.3	67.0

Positive Acceleration Polarities: (Conforms to SAE J211)
Longitudinal (X) = + Forward
Lateral (Y) = + Right
Vertical (Z) = + Down

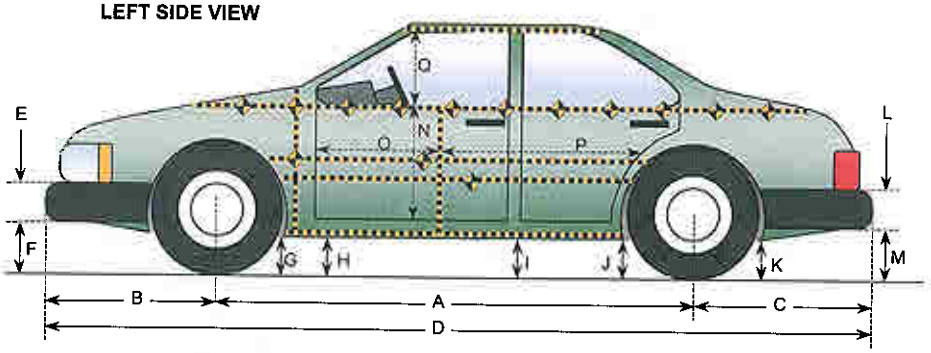
DATA SHEET NO. 6

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P

NHTSA No. C90110
Test Date: March 11, 2009

LEFT SIDE VIEW



All Measurements in mm

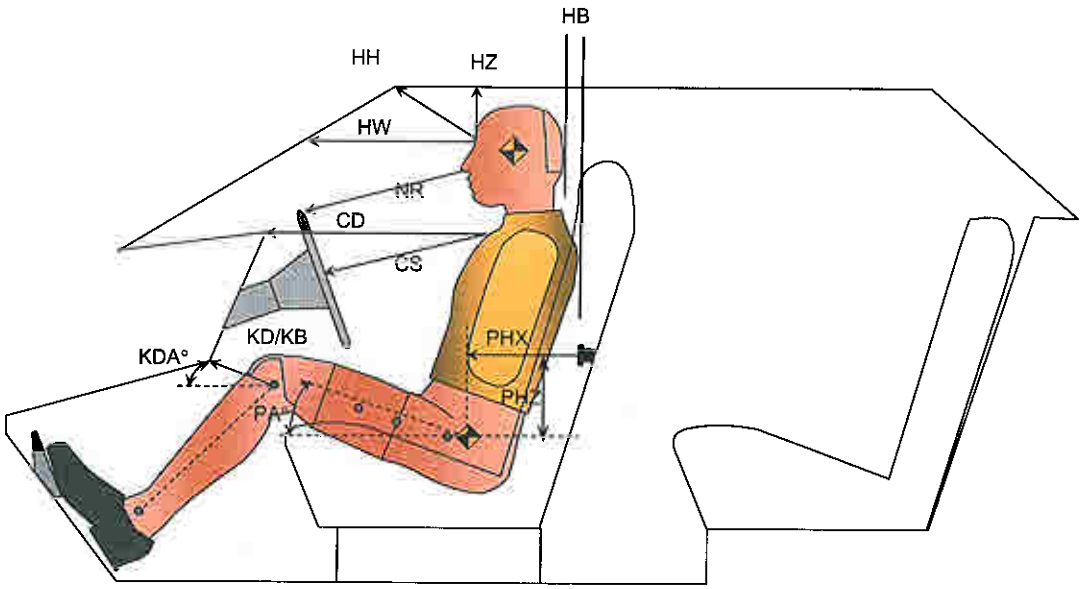
Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2855	2761	94
B	Front Axle to FSOV	999	1045	-46
C	Rear Axle to RSOV	1002	1030	-28
D	Total Length at Centerline	4856	4836	20
E	Front Bumper Thickness	75	75	0
F	Front Bumper Bottom to Ground	367	435	-68
G	Sill Height at Front Wheel Well	283	288	-5
H	Sill Height at Front Door Leading Edge	270	270	0
I	Sill Height at "B" Pillar	286	262	24
J1	Sill Height at Rear Wheel Well	287	310	-23
J2	Pinch Weld Height at Rear Wheel Well	287	303	-16
K	Sill Height Aft of Rear Wheel Well	295	293	2
L	Rear Bumper Thickness	294	294	0
M	Rear Bumper Bottom to Ground	292	380	-88
N	Sill Height to Window Bottom Sill	727	728	-1
O	Front Door Leading Edge to Impact CL	952	859	93
P	Rear Door Trailing Edge to Impact CL	1167	1111	56
Q	Front Window Opening	372	338	34
R	Right Side Length	4106	4115	-9
S	Left Side Length	4106	4025	81
T	Vehicle Width at "B" Post	1785	1441	344

DATA SHEET NO. 7

SID/HIII LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P

NHTSA No. C90110
Test Date: March 11, 2009



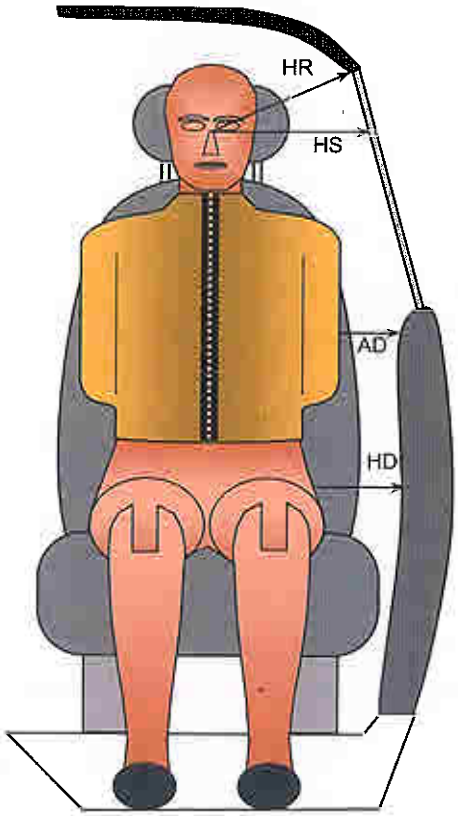
Driver Code	Measurement Description	Driver	
		Length (mm)	Angle (°)
HH	Head to Header	294	
HW	Head to Windshield	531	
HZ	Head to Roof	121	
NR	Nose to Rim	370	
CD	Chest to Dash	462	
CS	Chest to Steering Wheel	287	
KDL	Left Knee to Dash	131	28.2
KDR	Right Knee to Dash	112	31.1
PA	Pelvic Angle		24.1
PHX	H-Point to Striker (X-Axis)	230	
PHZ	H-Point to Striker (Z-Axis)	153	
HB	Head to Seatback Clearance	52	

DATA SHEET NO. 8

SID/HIII LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P

NHTSA No. C90110
Test Date: March 11, 2009



FRONT VIEW OF DUMMY

Code	Measurement Description	Units	Driver
HR	Head to Side Header	mm	176
HS	Head to Side Window	mm	304
AD	Arm to Door	mm	113
HD	H-Point to Door	mm	151

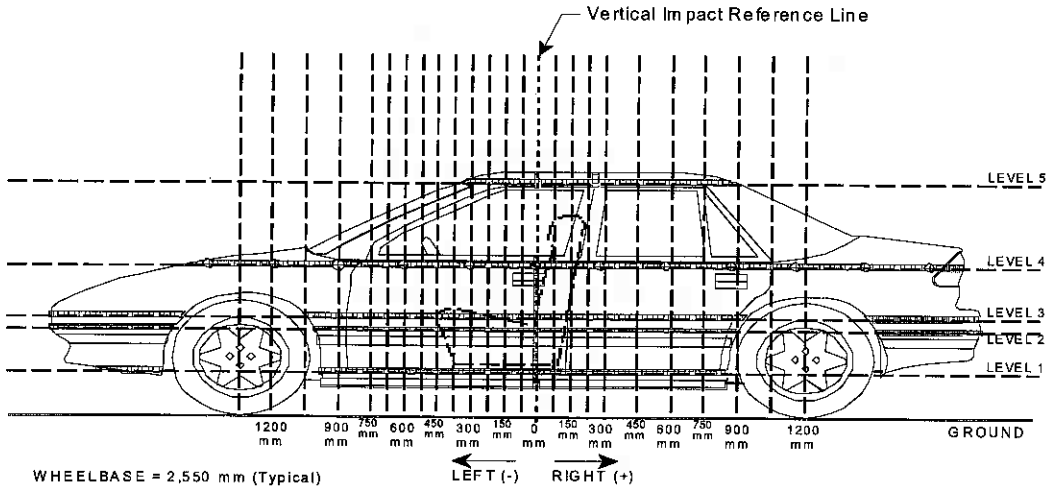
DATA SHEET NO. 9

VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P

NHTSA No. C90110
Test Date: March 11, 2009

PRETEST AND POST TEST EXTERIOR PROFILE MEASUREMENTS



LEFT SIDE VIEW

Measurements are taken with vehicle in the as tested condition.
Measurements along the vertical 0 mm.

Level	Measurement Description	Units	Height Above Ground
5	Window	mm	1372
4	Window Sill	mm	958
3	Mid Door	mm	642
2	Occupant H-Point	mm	445
1	Sill Top	mm	270

DATA SHEET NO. 10

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2009 Chevrolet Malibu 1LS NHTSA No. C90110
Test Program: FMVSS 201P Test Date: March 11, 2009

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1800				322					323					1	
-1650				306					306					0	
-1500				292					294					2	
-1350				287					289					2	
-1200				280					282					2	
-1050			210	278				213	279				3	1	
-900	252	229	215	277		258	235	222	279		6	6	7	2	
-825	252	229	215	278		264	246	234	288		12	17	19	10	
-750	251	229	215	278		272	256	257	295		21	27	42	17	
-675	250	228	215	281		282	268	286	315		32	40	71	34	
-600	250	228	215	278		293	283	315	342		43	55	100	64	
-525	250	228	214	277		306	301	342	370		56	73	128	93	
-450	248	228	214	277		318	323	369	397		70	95	155	120	
-375	248	220	214	278		333	350	396	424		85	130	182	146	
-300	247	228	214	277	506	353	376	420	451	559	106	148	206	174	53
-225	247	228	213	277	499	396	411	450	485	570	149	183	237	208	71
-150	247	228	213	278	500	437	457	479	507	574	190	229	266	229	74
-75	247	228	213	278	500	492	498	520	539	594	245	270	307	261	94
-0	245	227	213	280	503	509	518	542	561	610	264	291	329	281	107
75	245	227	212	280	505	473	490	510	529	603	228	263	298	249	98
150	245	227	212	280	507	436	452	455	482	605	191	225	243	202	98
300	245	228	214	286	510	370	374	362	440	592	125	146	148	154	82
450	244	228	215	289	513	321	340	332	421	578	77	112	117	132	65
600	243	228	216	293	518	277	303	301	398	565	34	75	85	105	47
750	242	229	218	296	521	236	268	273	375	552	-6	39	55	79	31
900	240	230	221	301	528	194	231	244	353	542	-46	1	23	52	14
1050	240	218	223	306	541	154	200	220	333	546	-86	-18	-3	27	5
1200			211	313				215	313				4	0	
1350				322					297					-25	
1500				333					347					14	
1650				343					356					13	
1800				354					364					10	
2100				384					380					4	
2250				398					395					-3	

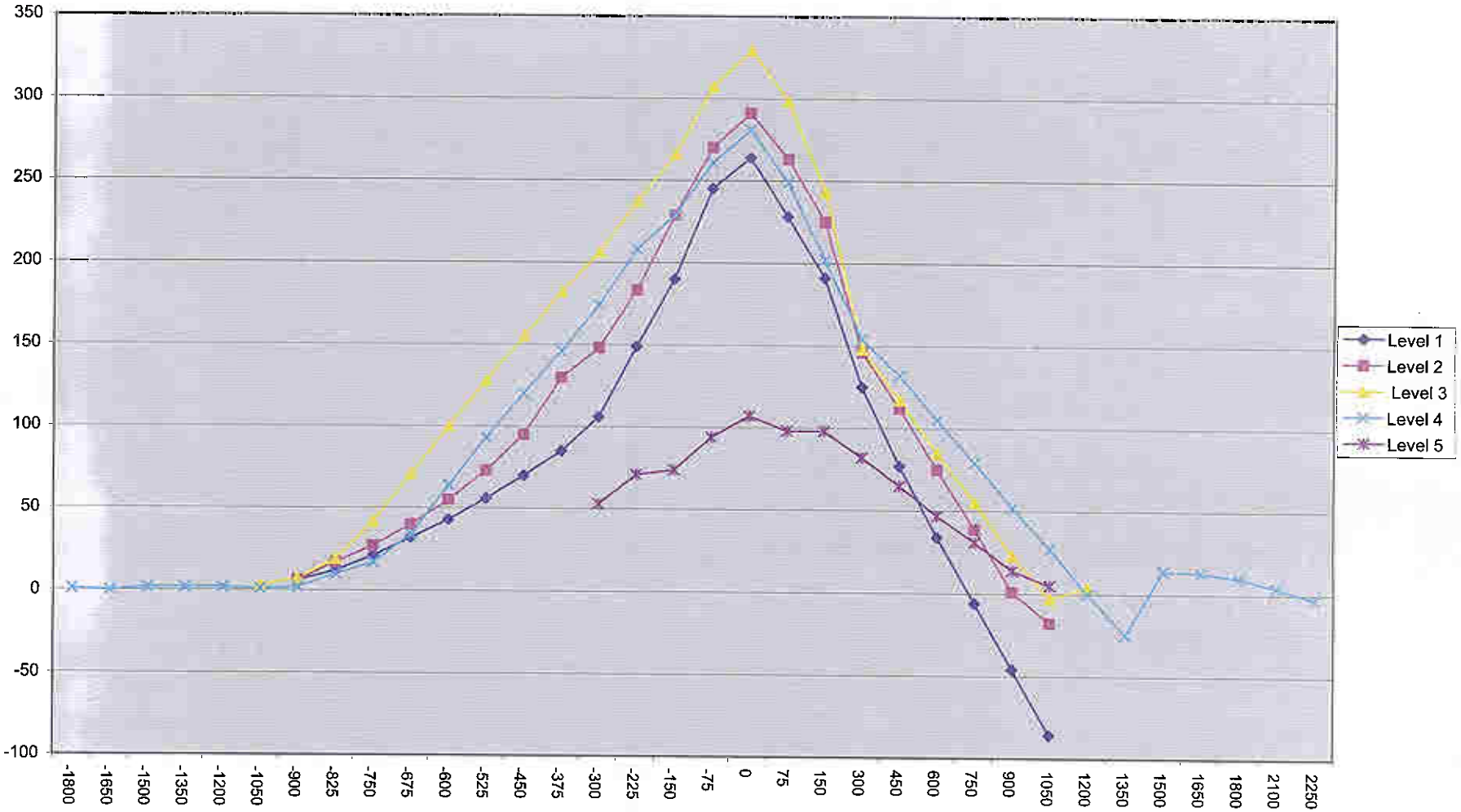
Reference plane is parallel to test vehicle longitudinal centerline Units = mm

Given dimensions = Reference plane to car body

DATA SHEET NO. 10... (continued)

VEHICLE EXTERIOR CRUSH PROFILES

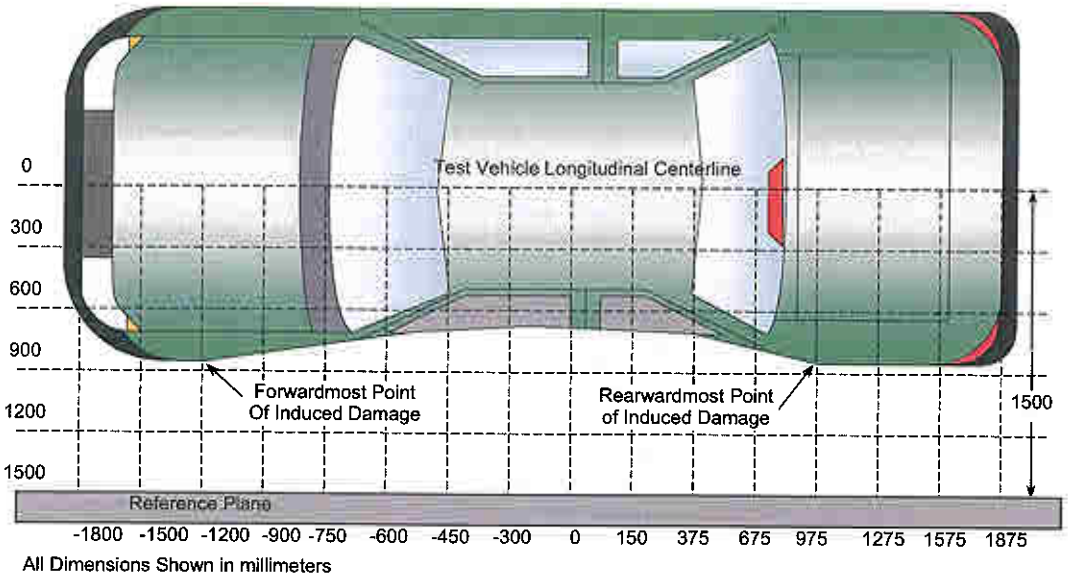
Test Vehicle: 2009 Chevrolet Malibu 1LS NHTSA No. C90110
Test Program: FMVSS 201P Test Date: March 11, 2009



DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P
NHTSA No. C90110
Test Date: March 11, 2009



TOP VIEW

Damage Profile Distances

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2250	4	398	395	-3
2	1490	4	333	344	11
3	690	4	294	386	92
4	-170	3	277	468	191
5	-1015	4	278	279	1
6	-1800	4	322	323	1

Reference plane is parallel to test vehicle longitudinal centerline

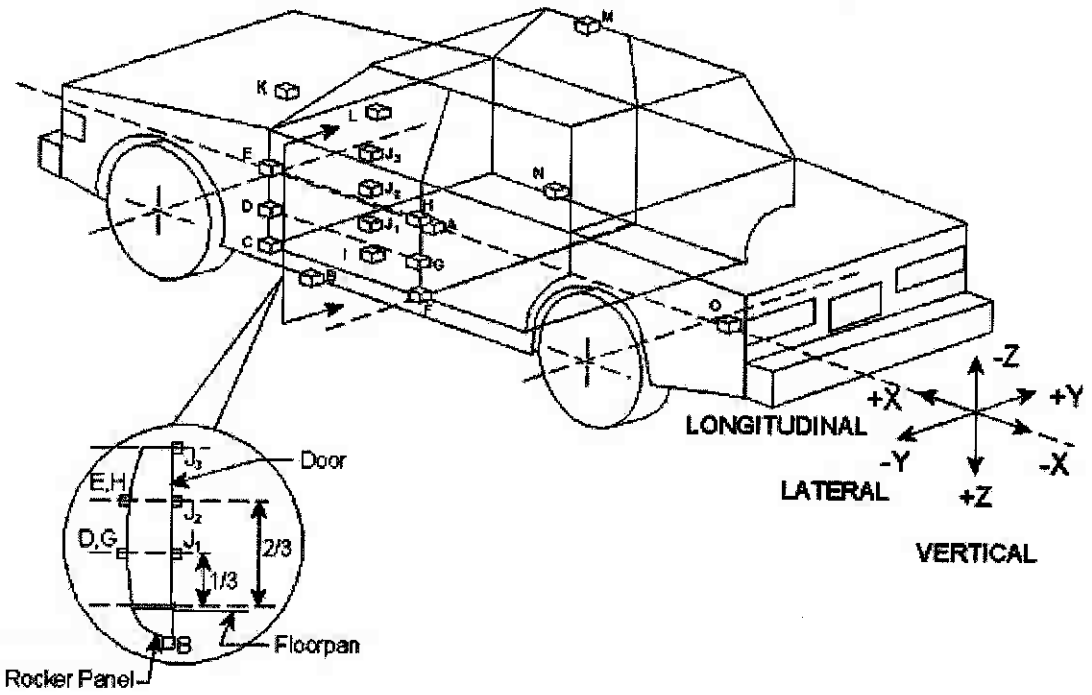
Given dimensions = Reference plane to car body

DATA SHEET NO. 12

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P

NHTSA No. C90110
Test Date: March 11, 2009



No.	Location
A	Vehicle CG
B	Left Floor Sill
C	A Pillar Sill
D	A Pillar Low
E	A Pillar Mid
F	B Pillar Sill
G	B Pillar Low
H	B Pillar Mid
I	Driver Seat

No.	Location
J1	Driver Door Lower / Knee
J2	Driver Door Mid / Pelvis
J3	Driver Door Upper / Rib
K	Engine
L	Firewall
M	Right Roof
N	Right Floor Sill
O	Rear Deck

DATA SHEET NO. 12... (continued)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2009 Chevrolet Malibu 1LS NHTSA No. C90110
Test Program: FMVSS 201P Test Date: March 11, 2009

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

Loc. No.	Accelerometer Location	Peak Values (G's)				
		Axis	Max	Time	Min	Time
A	Vehicle CG	X	1.6	66	-3.1	18
		Y	20.3	39	-0.6	5
		Z	7.0	53	-3.9	28
		RES	20.6	39		
B	Left Floor	Y	22.1	15	-3.0	23
C	A Pillar Sill	Y	17.4	57	-16.1	23
D	A Pillar Low	Y	27.6	15	-15.5	25
E	A Pillar Mid	Y	28.2	54	-6.0	57
F	B Pillar Sill	Y	*	*	*	*
G	B Pillar Low	Y	69.9	15	-24.5	21
H	B Pillar Mid	Y	81.1	16	-2.5	202
I	Driver Seat	Y	**	**	**	**
J1	Driver Door Lower / Knee	Y				
J2	Driver Door Mid / Pelvis	Y				
J3	Driver Door Upper / Rib	Y				
K	Engine	X	3.7	100	-3.7	47
		Y	12.7	83	-2.3	193
L	Firewall	Y	10.5	50	-1.0	269
M	Right Roof	Y	22.7	46	-1.3	273
N	Right Floor Sill	Y	12.4	15	-0.5	215
O	Rear Deck	X	2.6	35	-1.5	83
		Y	13.3	41	-1.2	181

Positive Acceleration Polarities: Longitudinal (X) = + Forward
(Conforms to SAE J211) Lateral (Y) = + Right
Vertical (Z) = + Down

* No Valid Data Collected after 20 msec

** No Valid Data Collected after 20 msec

DATA SHEET NO. 12... (continued)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2009 Chevrolet Malibu 1LS NHTSA No. C90110
Test Program: FMVSS 201P Test Date: March 11, 2009

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

Loc. No.	Accelerometer Location	Measurements (mm)			
		Axis	Pre-Test	Post-Test	Difference
A	Vehicle CG	X	3222	3218	-4
		Y	0	10	10
		Z	358	364	-6
B	Left Floor Sill	X	3071	2956	-115
		Y	-745	-646	99
		Z	247	255	-8
C	A Pillar Sill	X	3364	3265	-99
		Y	-745	-704	41
		Z	235	244	-9
D	A Pillar Low	X	3307	3290	-17
		Y	-720	-712	8
		Z	493	508	-15
E	A Pillar Mid	X	3364	3295	-69
		Y	-794	-742	52
		Z	715	738	-23
F	B Pillar Sill	X	2292	2271	-21
		Y	-742	-561	181
		Z	250	233	-17
G	B Pillar Low	X	2263	2266	3
		Y	-698	-585	113
		Z	431	422	9
H	B Pillar Mid	X	2218	2247	29
		Y	-717	-591	126
		Z	779	809	-30
I	Driver Seat	X	2452	2443	-9
		Y	-575	-510	65
		Z	320	328	-8
J1	Driver Door Lower / Knee				
J2	Driver Door Mid / Pelvis				
J3	Driver Door Upper / Rib				
K	Engine	X	3966	3972	6
		Y	100	142	42
		Z	778	782	-4
L	Firewall	X	3765	3780	15
		Y	0	8	8
		Z	863	863	-0
M	Right Roof	X	2257	2279	22
		Y	582	570	-12
		Z	1448	1472	-24
N	Right Floor	X	2643	2635	-8
		Y	745	770	25
		Z	582	254	328
O	Rear Deck	X	997	999	2
		Y	0	0	0
		Z	587	587	-0

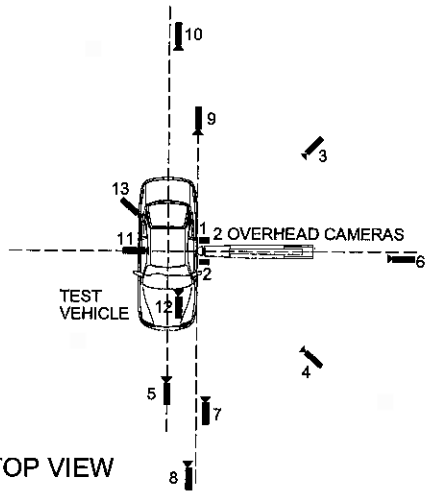
Ref. Points: X-Rear of Vehicle (+ forward); Y-Vehicle Centerline (+ to right); Z-Ground Plane (+ down)

DATA SHEET NO. 13

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P

NHTSA No. C90110
Test Date: March 11, 2009



TOP VIEW

No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Overall	380	0	5050	14	1000
2	Overhead Close-Up	25	-120	5050	50	1000
3	Left Side 45° Rearward Pole View	-2385	3985	1220	20	1000
4	Right Side 45° Forward Pole View	-2285	-3895	1190	20	1000
5	Real Time				13	24
6*	Left Side Rear Pole View					
7	Front Ground Level Vehicle/Pole Impact	280	-1200	1500	35	1000
8	Front Ground Level Vehicle Roof Targets and Vehicle/Pole Impact	35	-1595	1245	24	1000
9	Rear Ground Level Vehicle/Pole Impact	-75	1715	1310	24	1000
10	Rear Ground Level	260	1220	1590	35	1000
11	Test Vehicle Onboard Driver Side View				8	1000
12	Test Vehicle Onboard Driver Front View				12.5	1000
13	Test Vehicle Onboard Driver ¾ Rear View				8	1000

Reference Points X - + Forward of Impact
Y - + Right of Impact
Z - + Ground Plane Down

* Camera 6 was not used for this test.

DATA SHEET NO. 14

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Vehicle: 2009 Chevrolet Malibu 1LS NHTSA No. C90110
Test Program: FMVSS 201P Test Date: March 11, 2009

Test Time: 10:30 AM Temperature at Time of Impact: 21°C

Stoddard Solvent Spillage Measurements

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

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

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

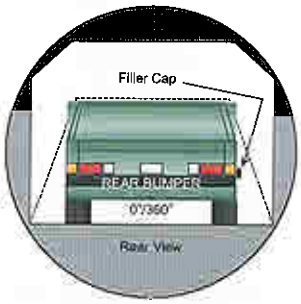
D. Spillage Details: None

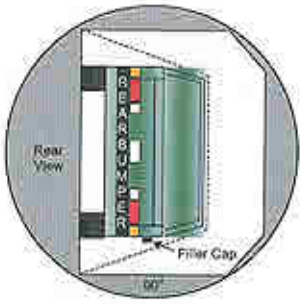
DATA SHEET NO. 15

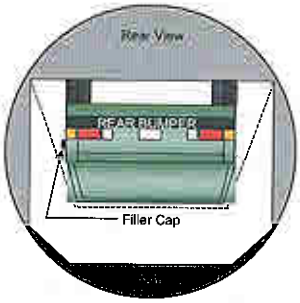
FMVSS 301 STATIC ROLLOVER DATA SHEET

Test Vehicle: 2009 Chevrolet Malibu 1LS
Test Program: FMVSS 201P

NHTSA No. C90110
Test Date: March 11, 2009

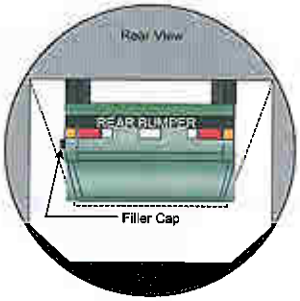


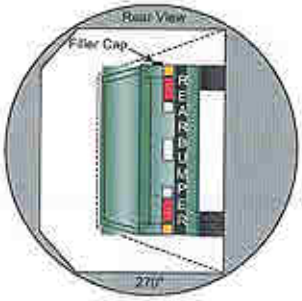


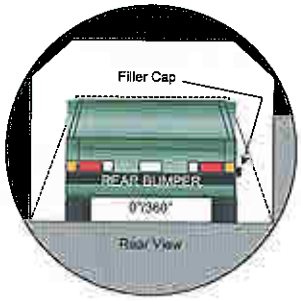


0° to 90°

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: None

Rollover Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	120	300	0
90° to 180°	117	300	0
180° to 270°	114	300	0
270° to 360°	120	300	0

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Pre-Test Front View of Test Vehicle

Post-Test Front View of Test Vehicle

Pre-Test Rear View of Test Vehicle

Post-Test Rear View of Test Vehicle

Pre-Test Left Side View of Test Vehicle

Post-Test Left Side View of Test Vehicle

Pre-Test Right Side View of Test Vehicle

Post-Test Right Side View of Test Vehicle

Pre-Test Left Rear Three-Quarter View

Post-Test Left Rear Three-Quarter View

Pre-Test Left Front Three-Quarter View

Post-Test Left Front Three-Quarter View

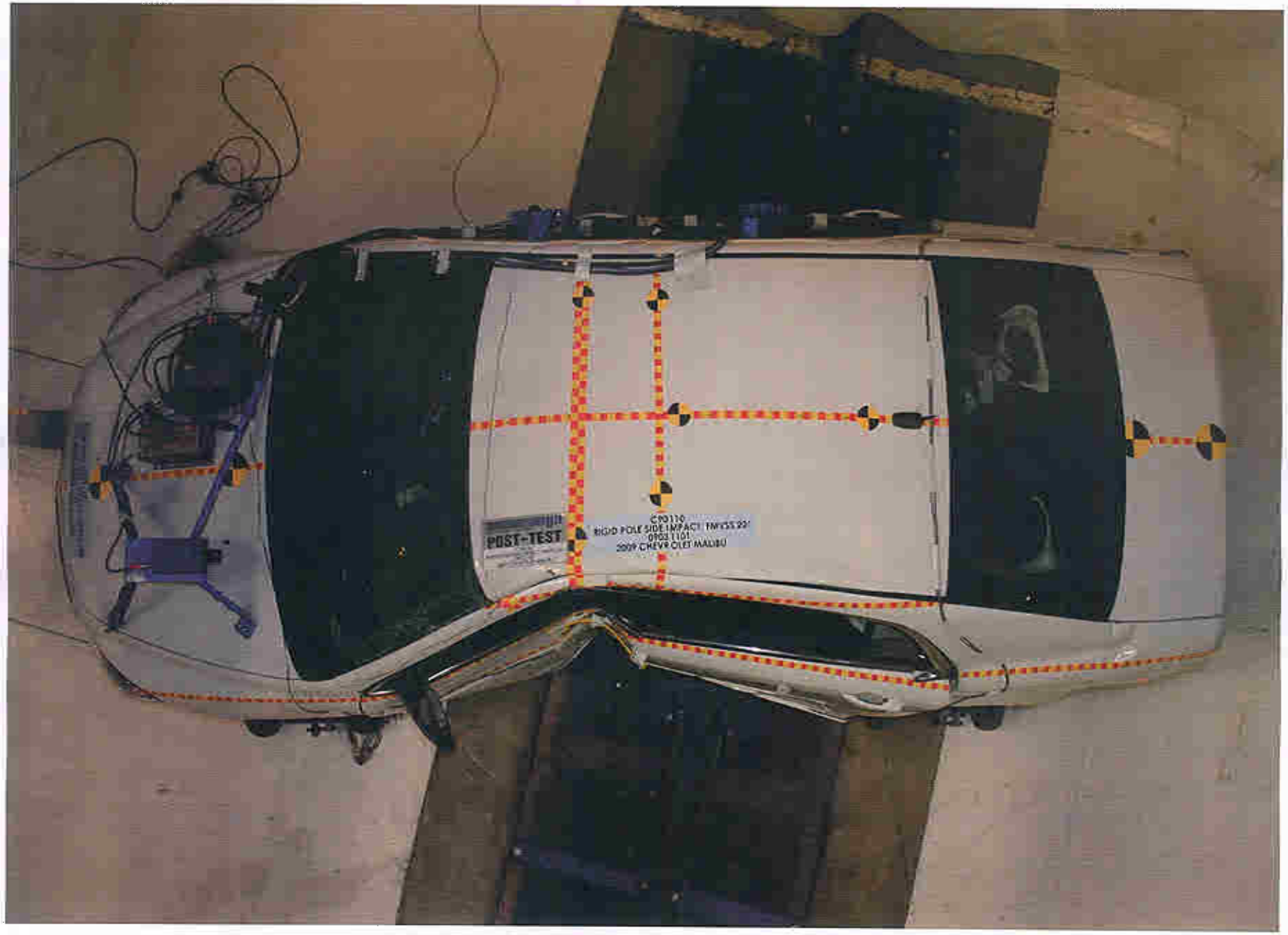
Pre-Test Right Rear Three-Quarter View

Post-Test Right Rear Three-Quarter View

Pre-Test Right Front Three-Quarter View

Post-Test Right Front Three-Quarter View

Pre-Test Overhead View of Test Vehicle

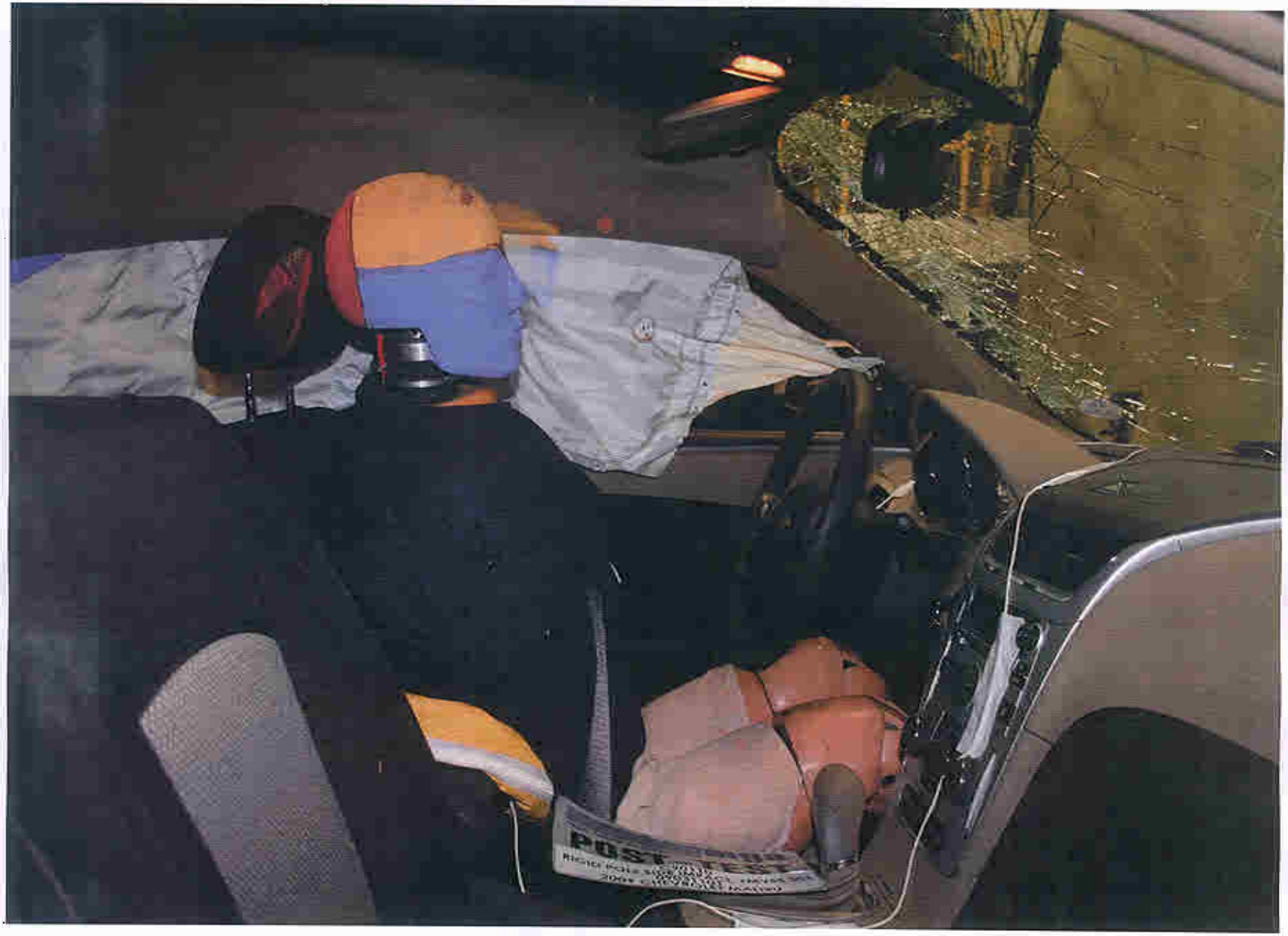


Post-Test Overhead View of Test Vehicle

Pre-Test Overhead View of Test Vehicle (Closeup)

Post-Test Overhead View of Test Vehicle (Closeup)

Pre-Test Driver Dummy Right Side View



Post-Test Driver Dummy Right Side View

Pre-Test Driver Dummy Left Side View

Post-Test Driver Dummy Left Side View

Pre-Test Driver Dummy Left Side View (Door Open)

Pre-Test Driver Dummy Shoulder and Door Top View

Post-Test Driver Dummy Head Contact (CAB)

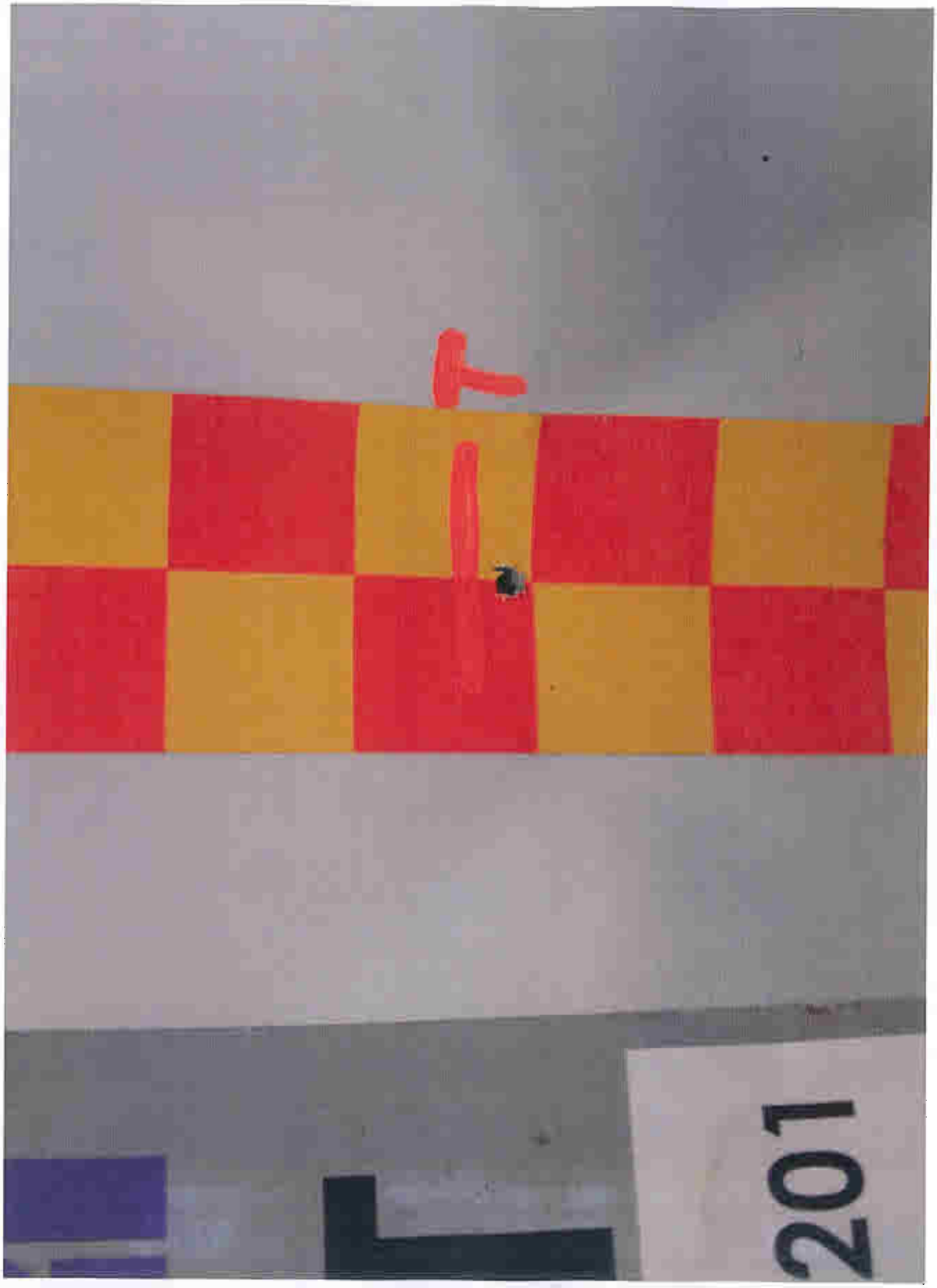
Post-Test Driver Dummy Head Contact (Headrest)

Post-Test Driver Dummy Head Contact

Post-Test Driver Dummy Upper Thorax Contact

Post-Test Driver Dummy Lower Thorax Contact

Post-Test Driver Dummy Contact



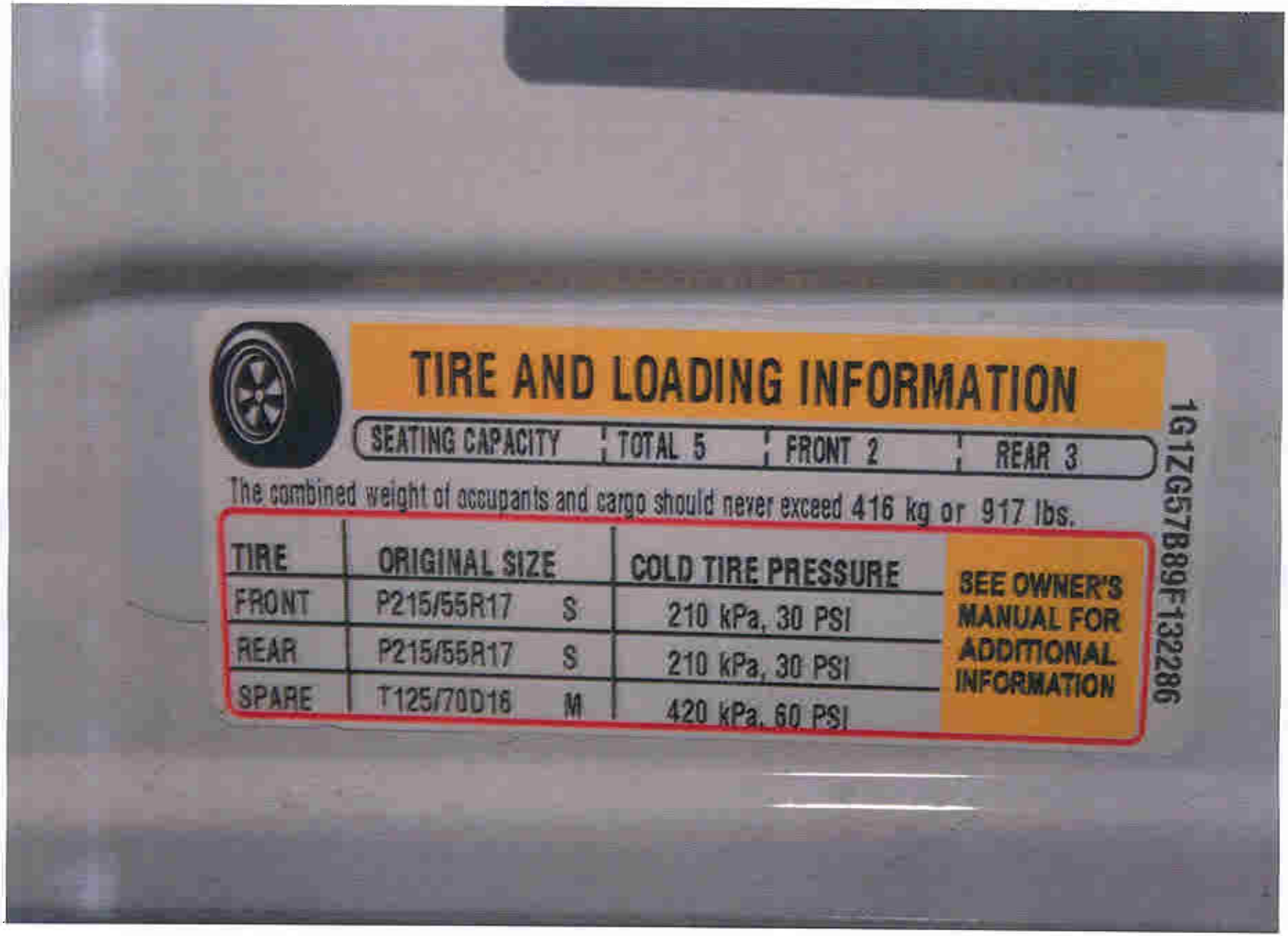
Post-Test Impact Point on Vehicle

Pre-Test Impact Zone Close-up View

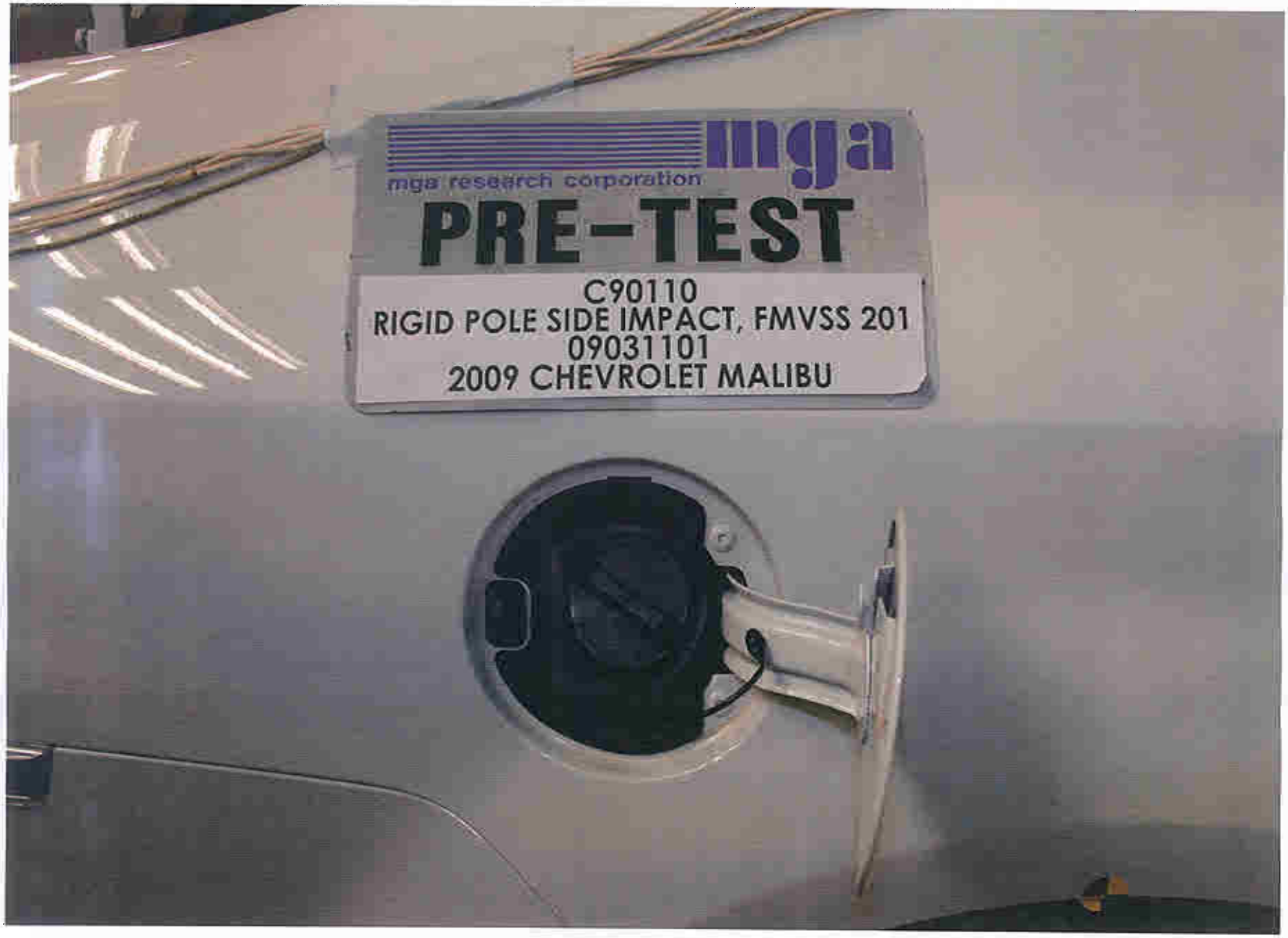
Post-Test Impact Zone Close-up View

Vehicle Impact

Vehicle Certification Label



Tire Placard



Pre-Test Fuel Filler Cap

Post-Test Fuel Filler Cap

Pre-Test Left Front Wheel Dolly

Post-Test Left Front Wheel Dolly

Pre-Test Left Rear Wheel Dolly

Post-Test Left Rear Wheel Dolly

Pre-Test Right Front Wheel Dolly

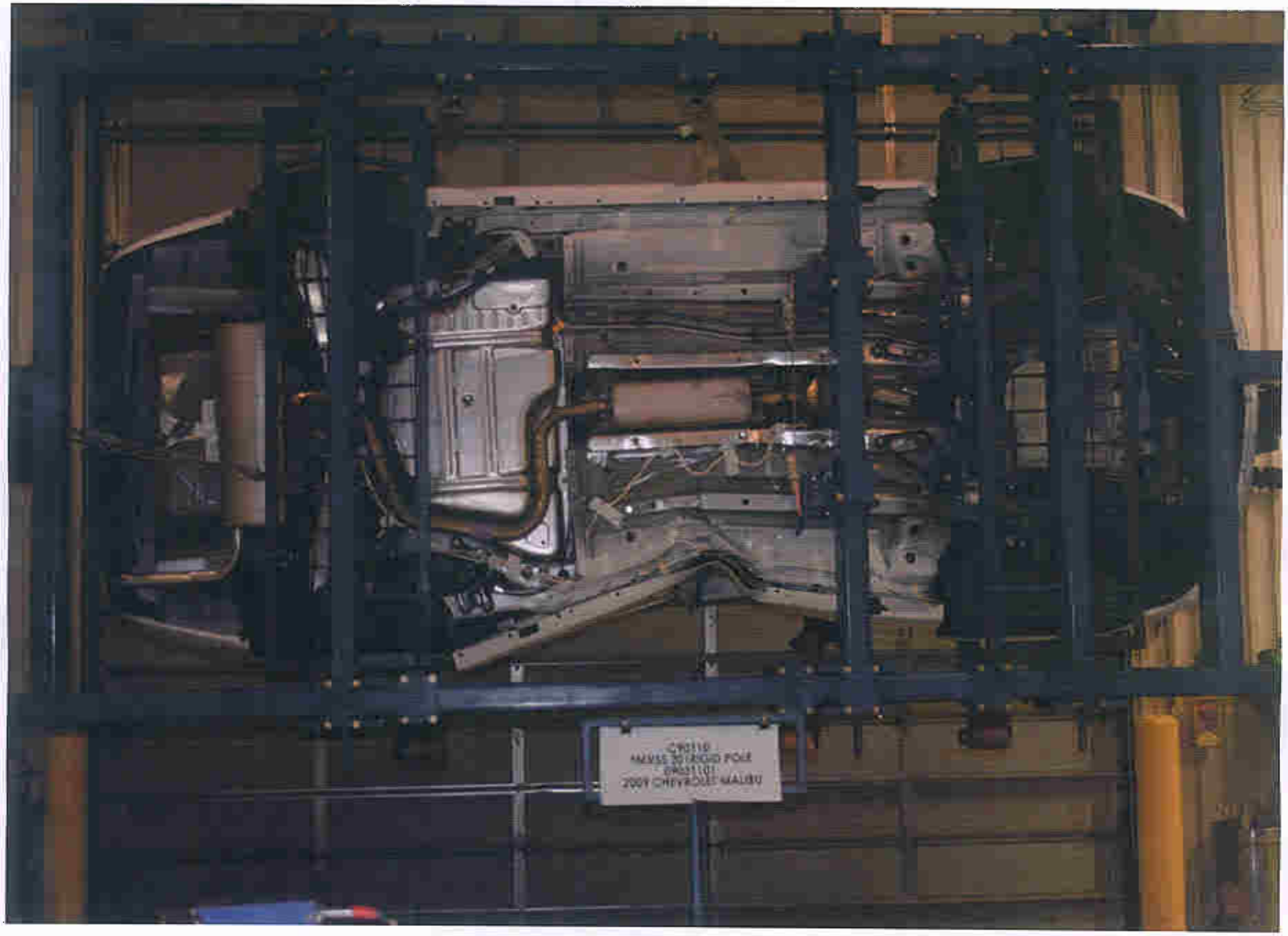
Post-Test Right Front Wheel Dolly

Pre-Test Right Rear Wheel Dolly

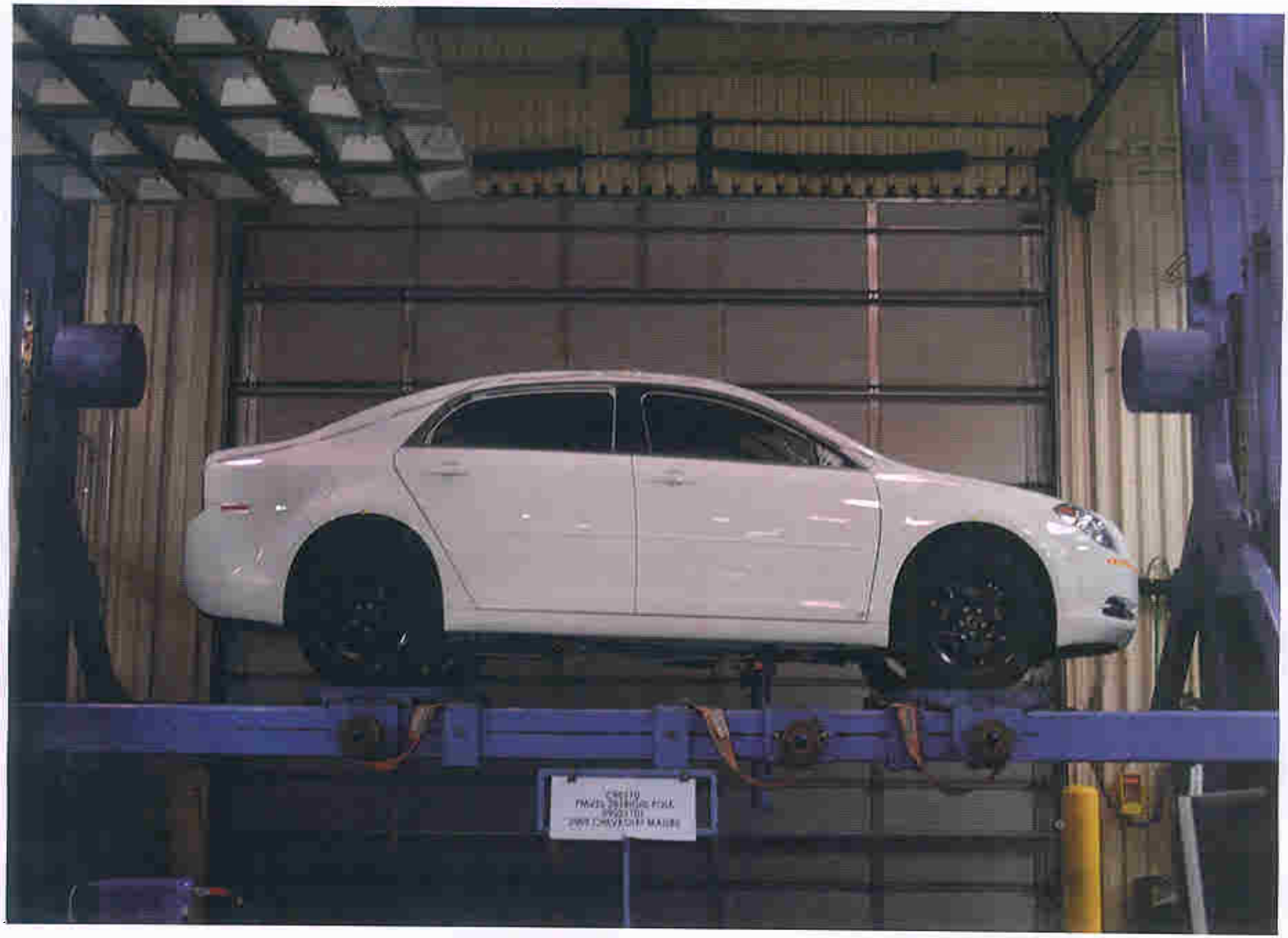
Post-Test Right Rear Wheel Dolly

Rollover 90 Degrees

Rollover 180 Degrees



Rollover 270 Degrees



Rollover 360 Degrees

APPENDIX B

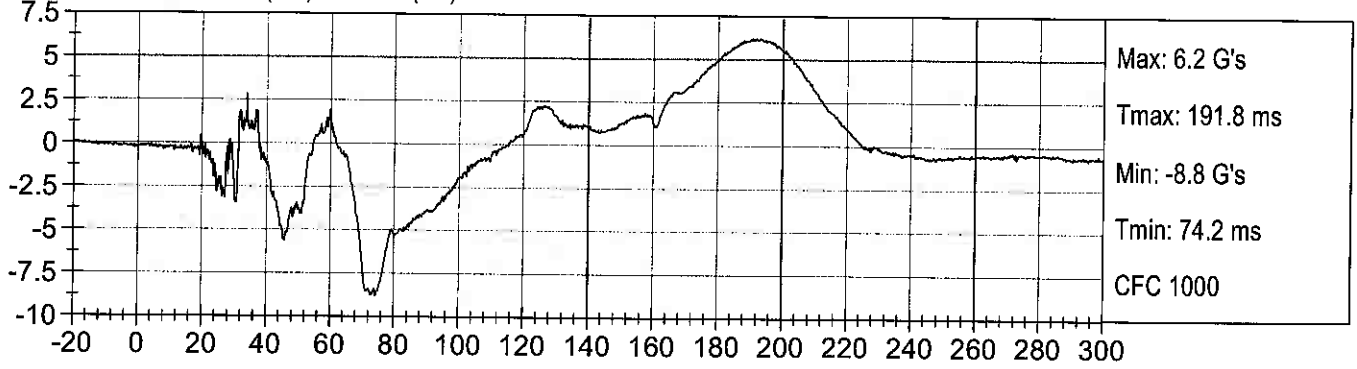
SID/HIII AND VEHICLE RESPONSE DATA

TABLE OF DATA PLOTS

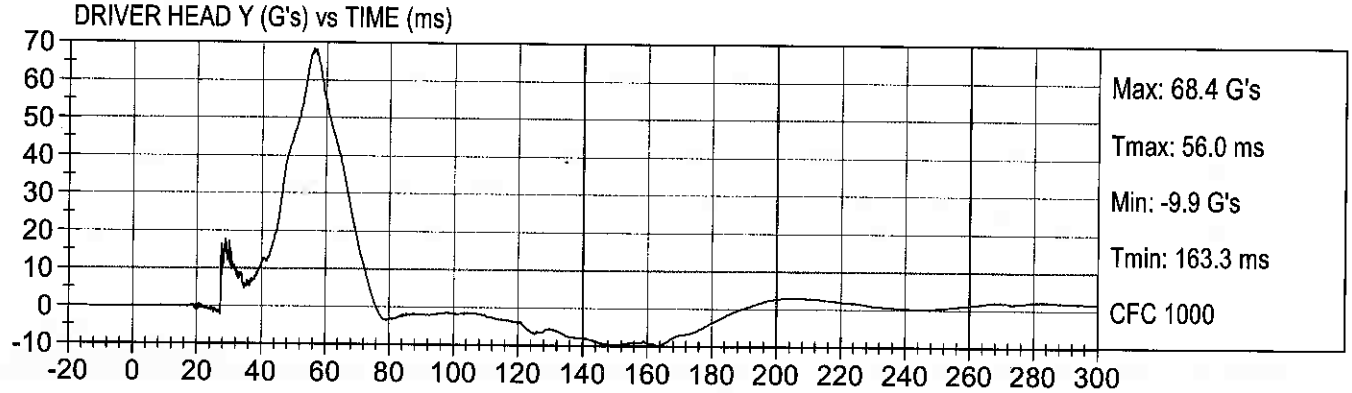
FMVSS 201 RIGID POLE
2009 CHEVROLET MALIBU C90110

Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

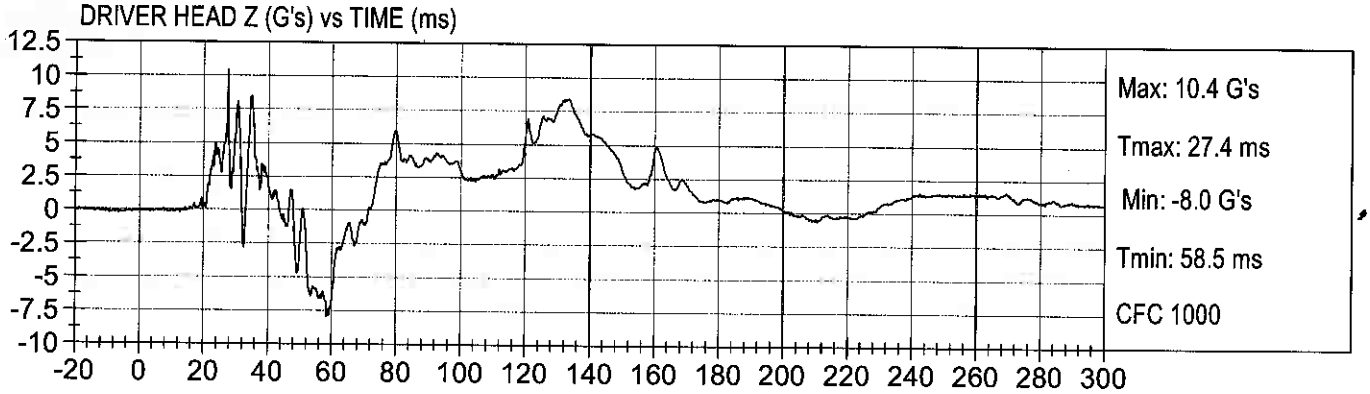
DRIVER HEAD X (G's) vs TIME (ms)



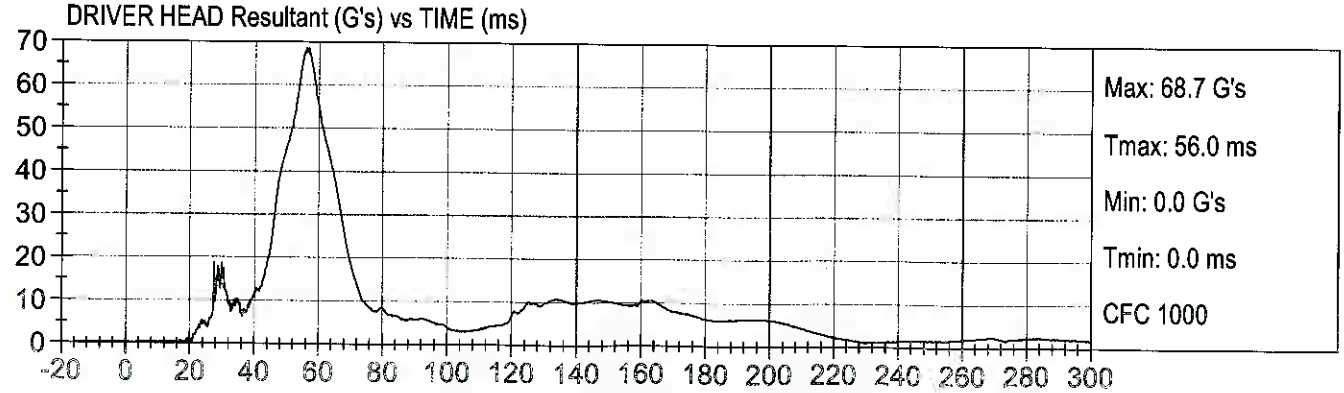
DRIVER HEAD Y (G's) vs TIME (ms)



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

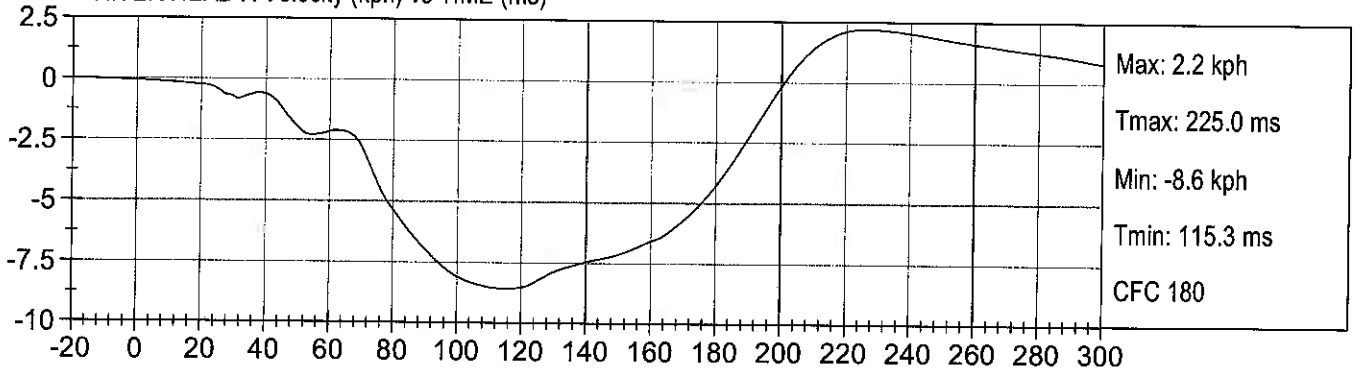


DRIVER HEAD Resultant (G's) vs TIME (ms)

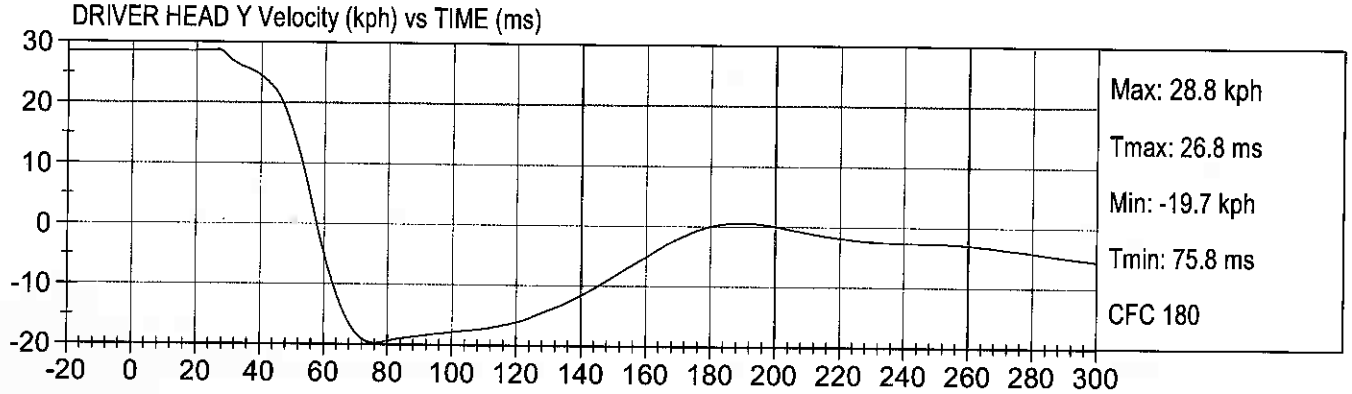


FMVSS 201 RIGID POLE 2009 CHEVROLET MALIBU	C90110	Test Date: 03/11/2009 Speed: 17.7 mph (28.5 km/h)

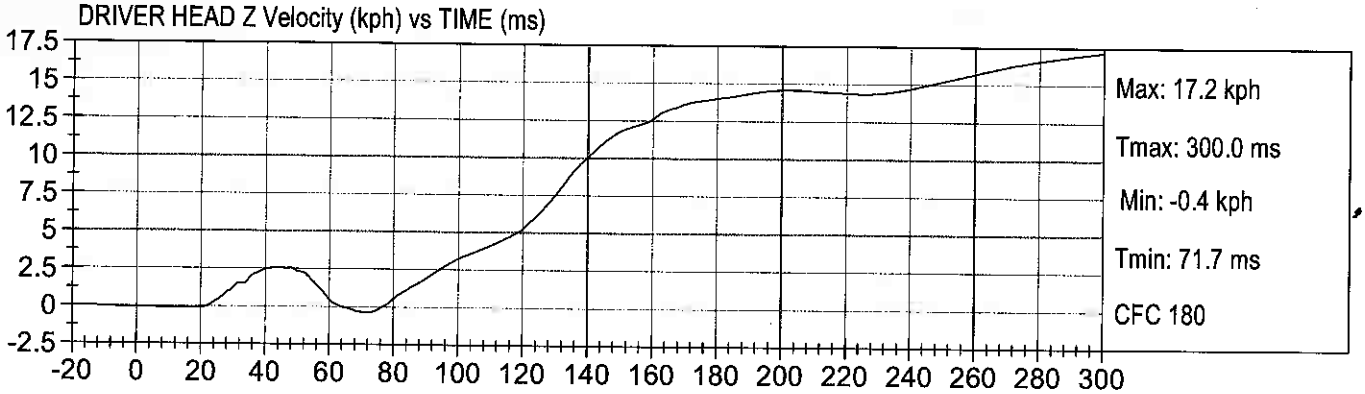
DRIVER HEAD X Velocity (kph) vs TIME (ms)



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

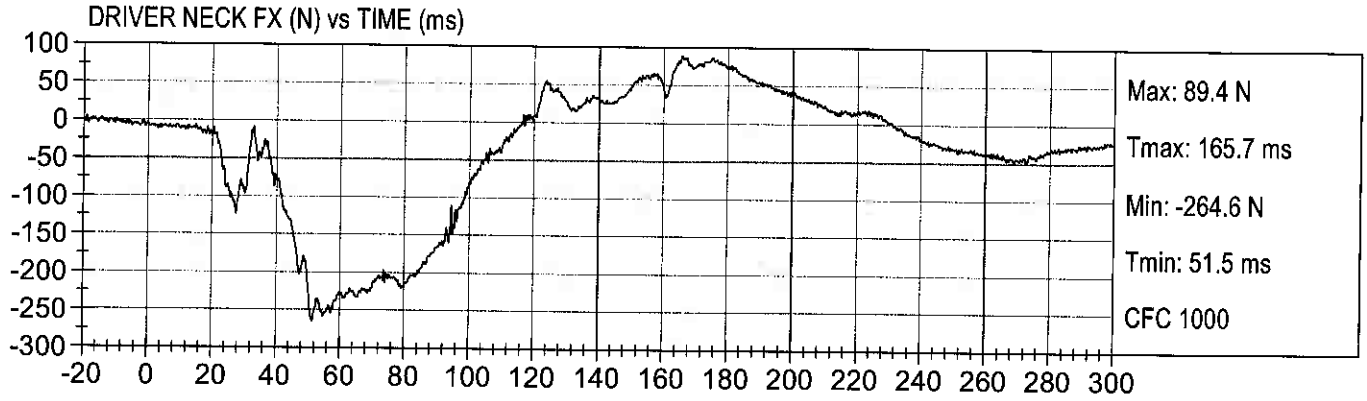


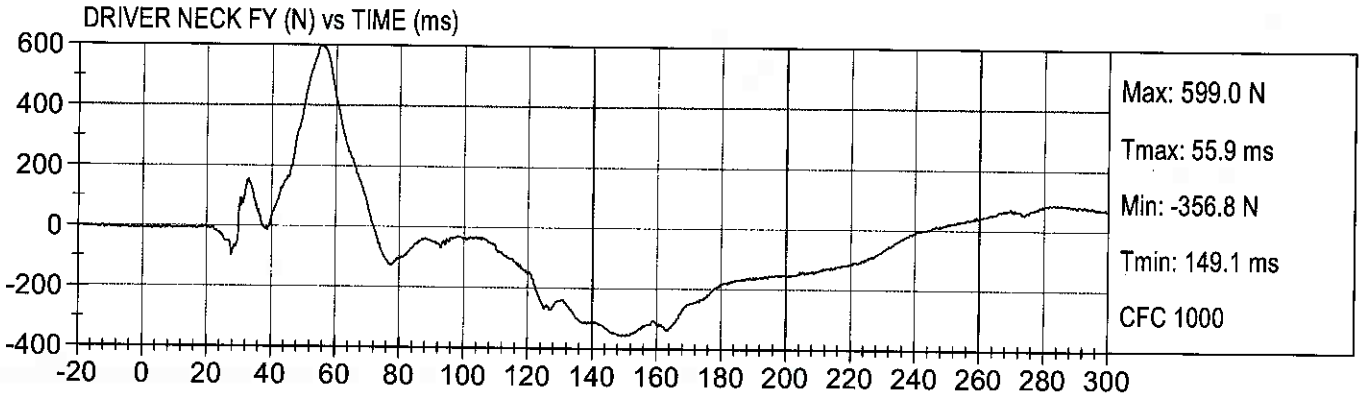
DRIVER HEAD Z Velocity (kph) vs TIME (ms)

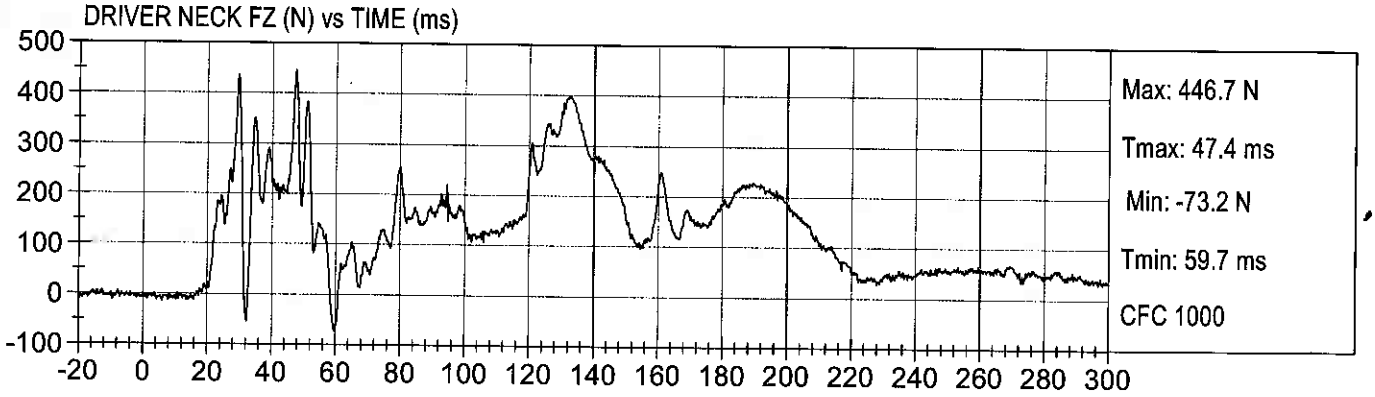


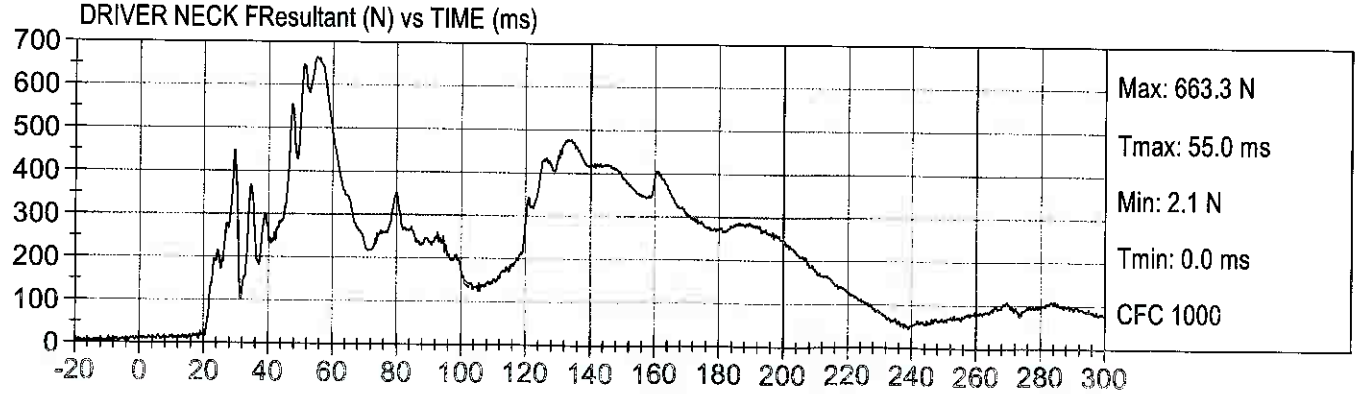
FMVSS 201 RIGID POLE
2009 CHEVROLET MALIBU C90110

Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)









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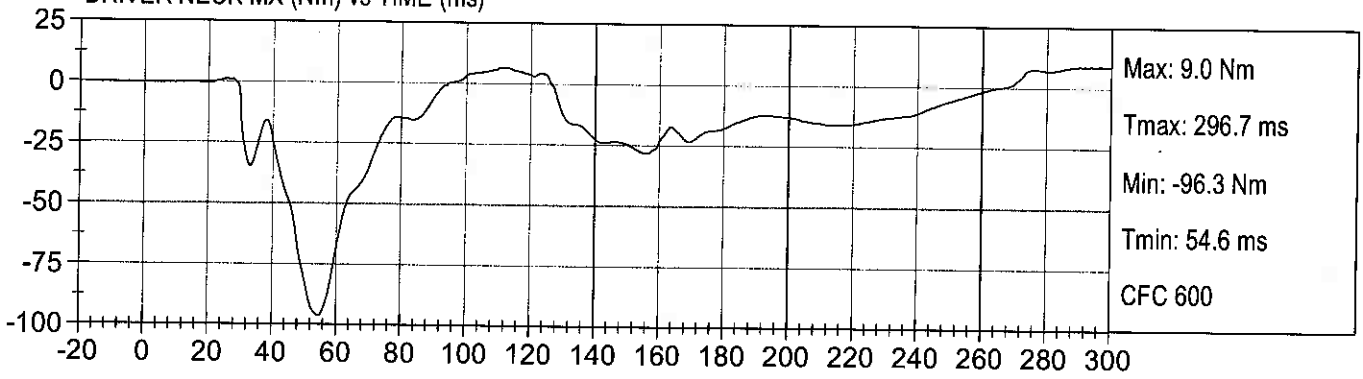
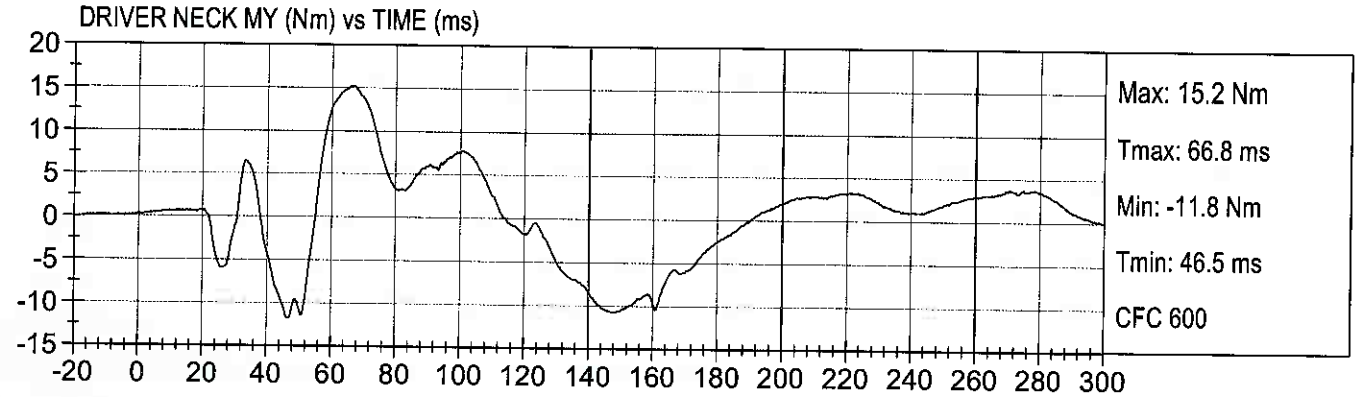
Speed: 17.7 mph (28.5 km/h)

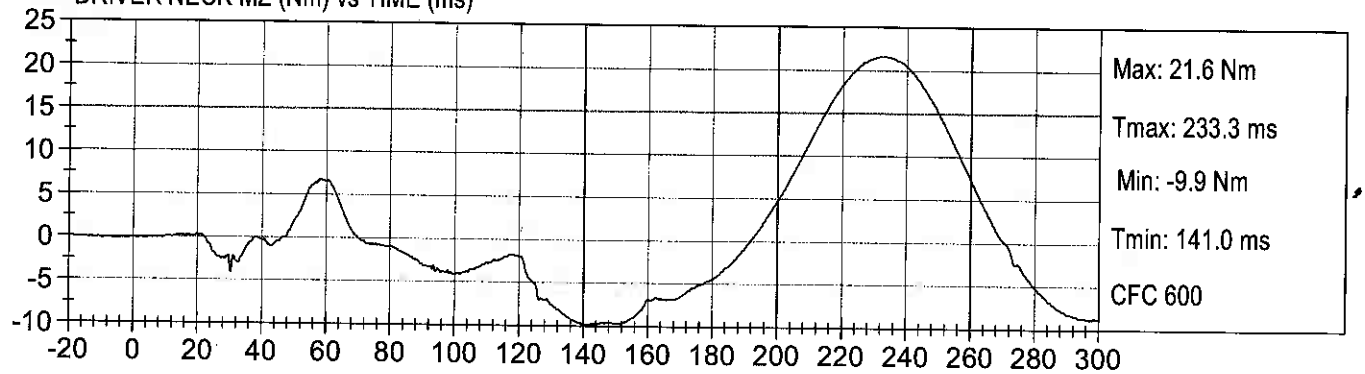
DRIVER NECK MX (Nm) vs TIME (ms)



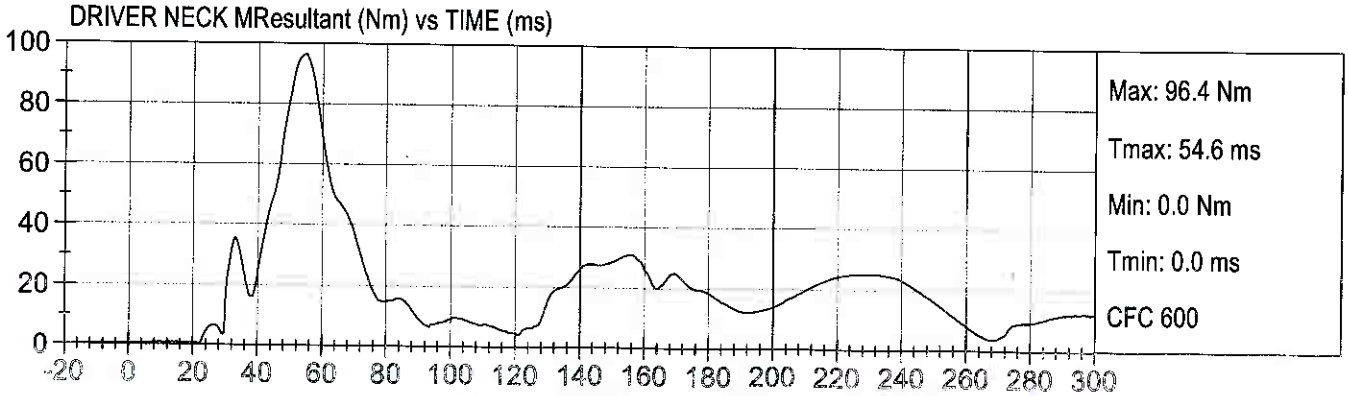
DRIVER NECK MY (Nm) vs TIME (ms)



DRIVER NECK MZ (Nm) vs TIME (ms)



DRIVER NECK MResultant (Nm) vs TIME (ms)



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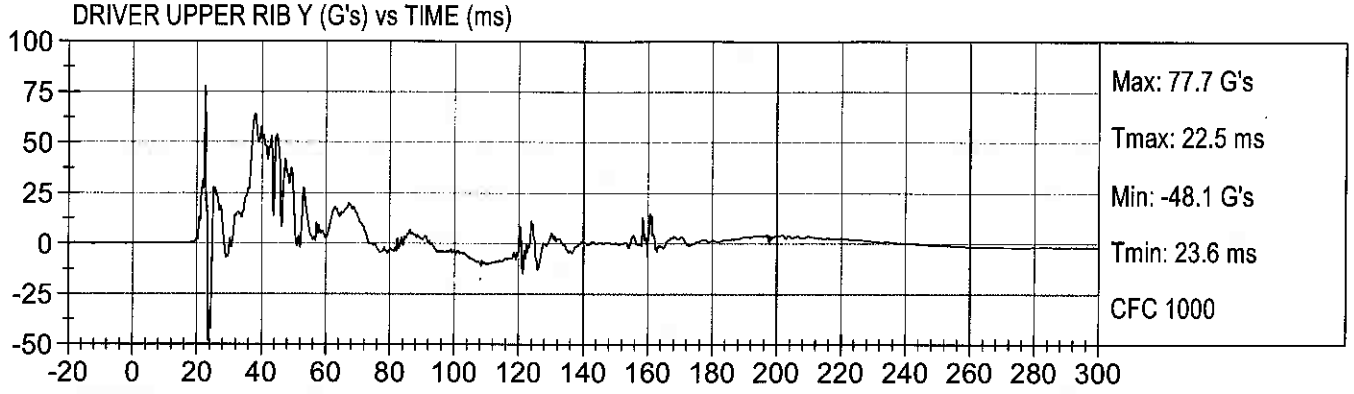
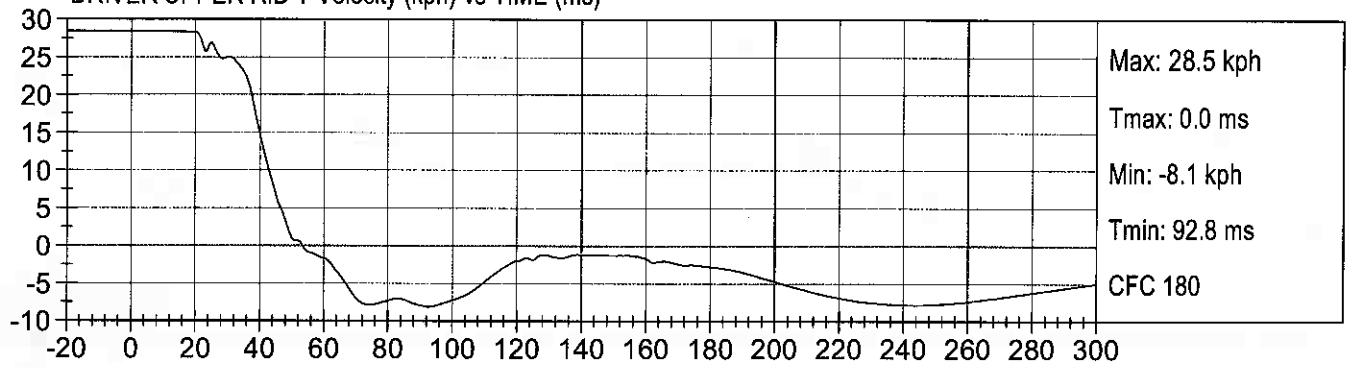
Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

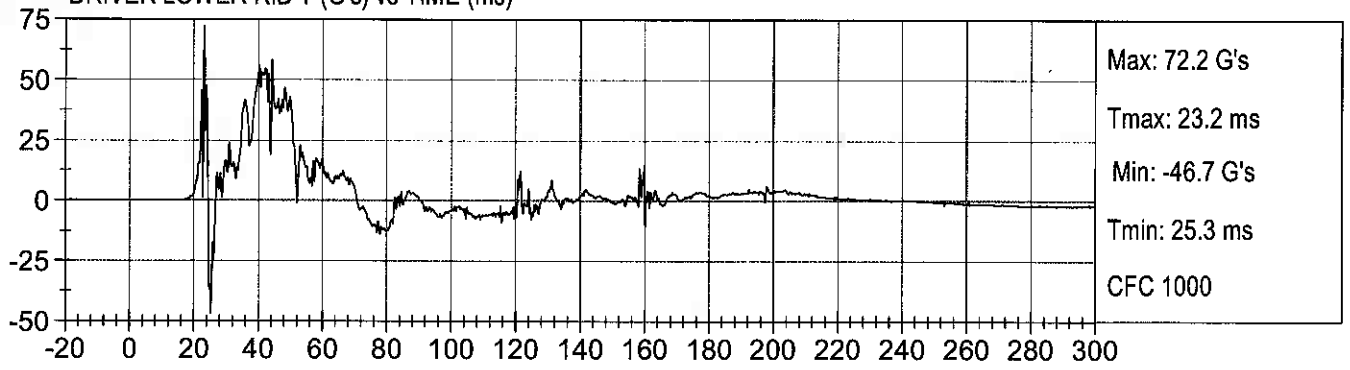
DRIVER UPPER RIB Y (G's) vs TIME (ms)



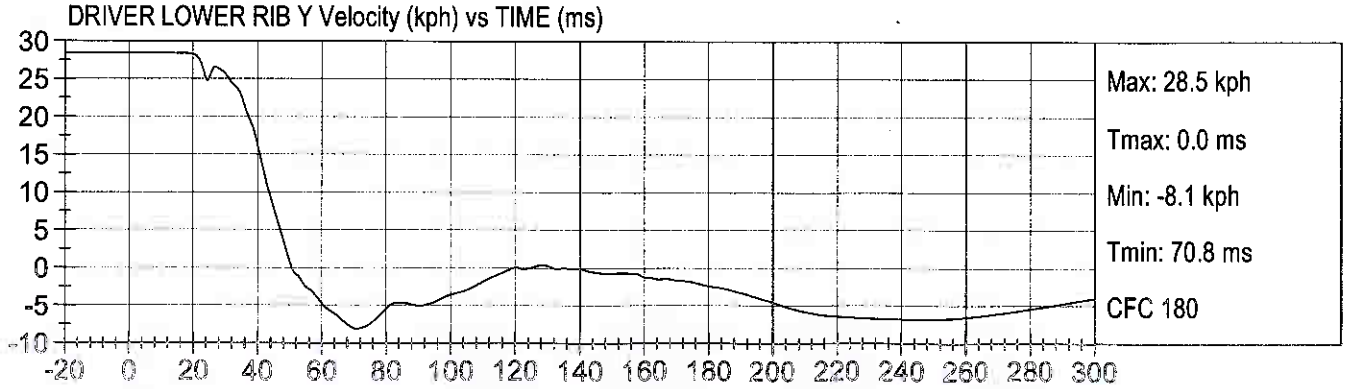
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)



DRIVER LOWER RIB Y (G's) vs TIME (ms)



DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



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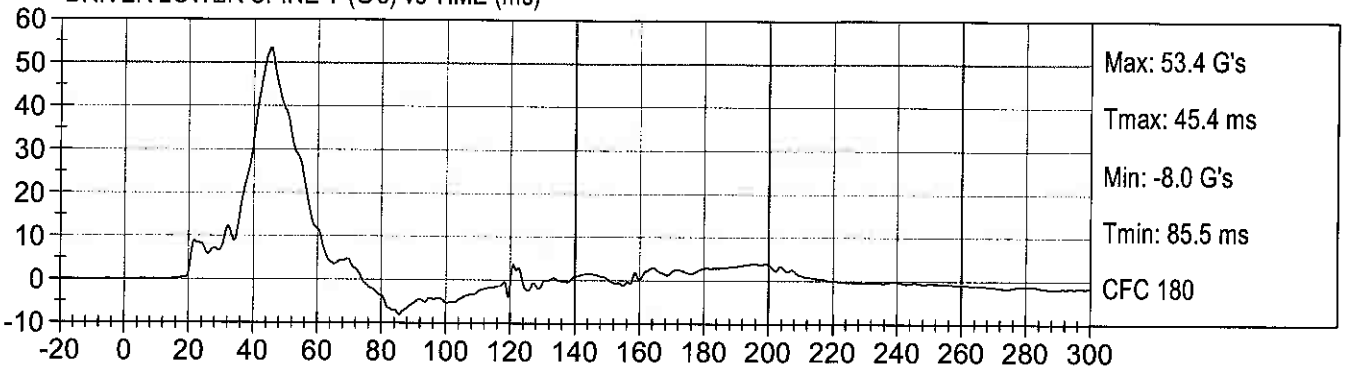
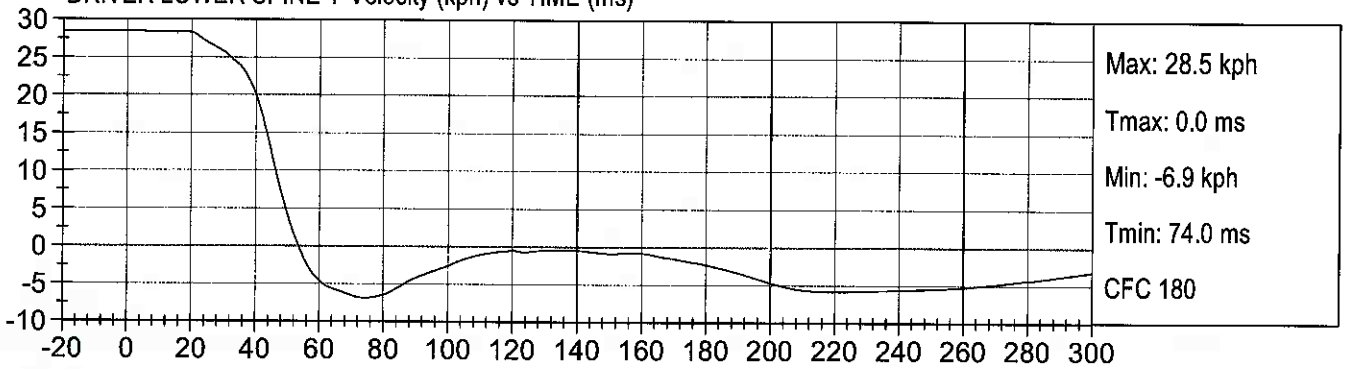
Speed: 17.7 mph (28.5 km/h)

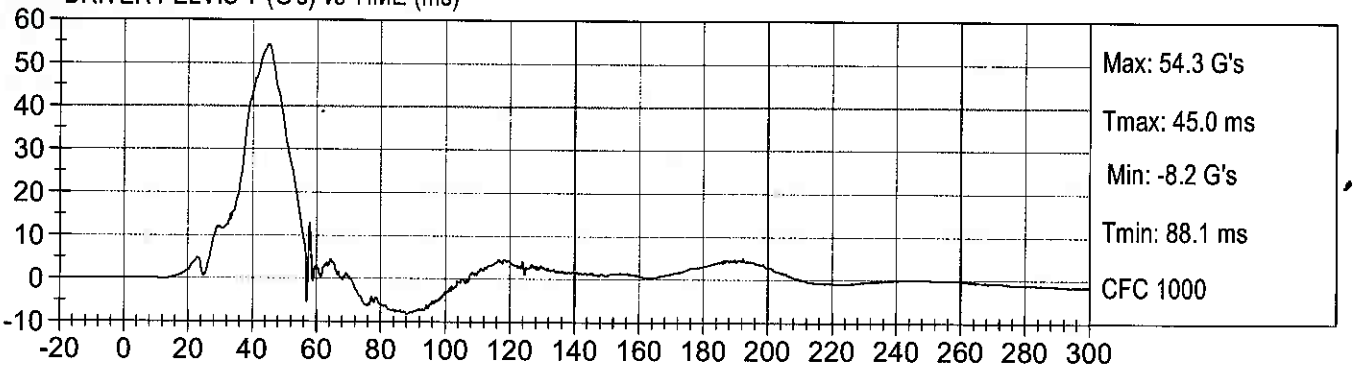
DRIVER LOWER SPINE Y (G's) vs TIME (ms)



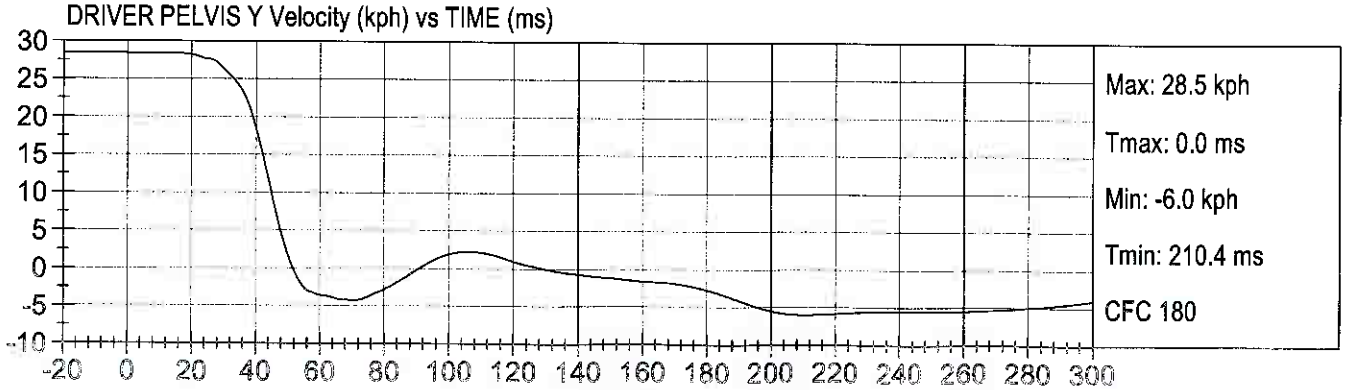
DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)



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



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



FMVSS 201 RIGID POLE
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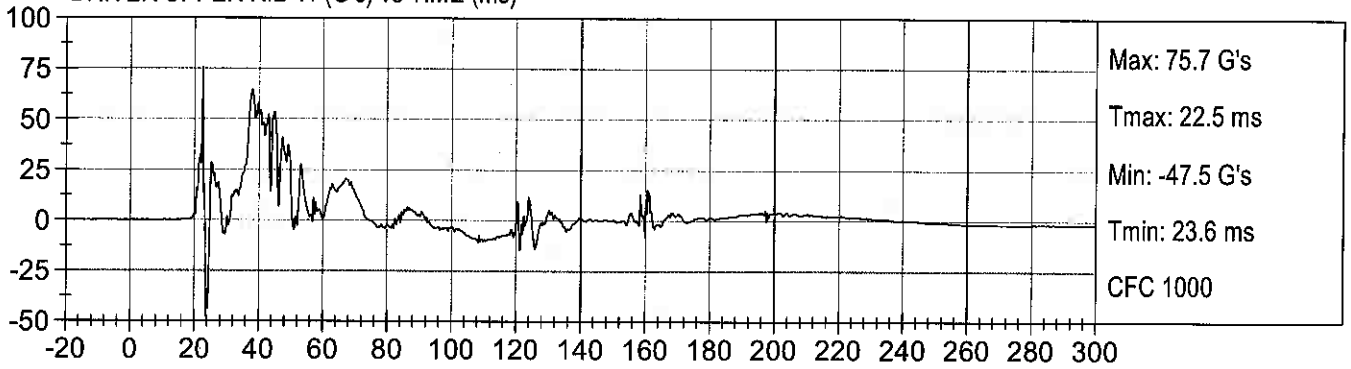
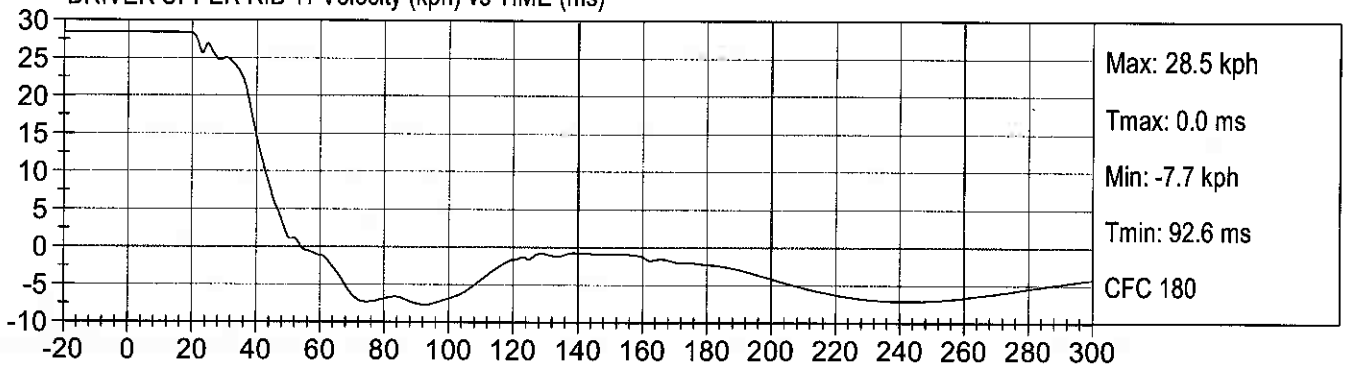
Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

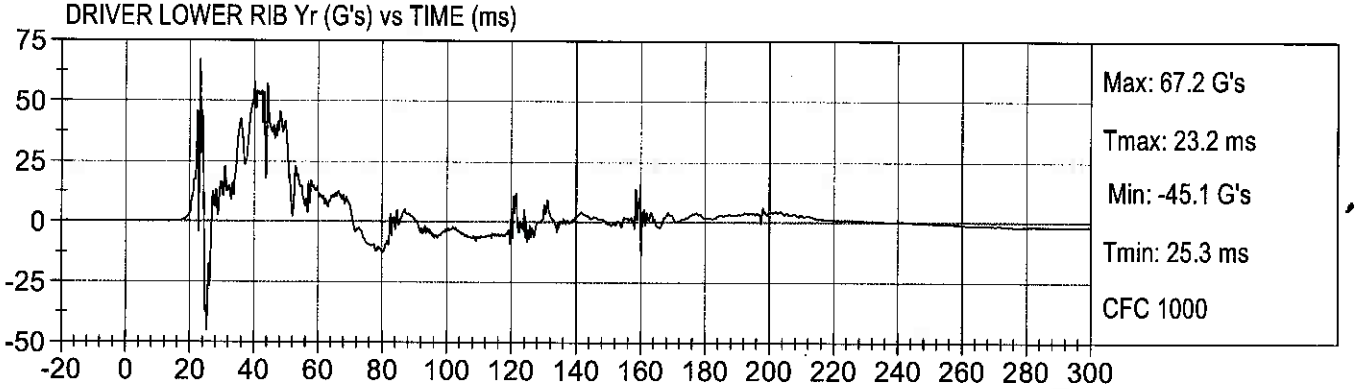
DRIVER UPPER RIB Yr (G's) vs TIME (ms)



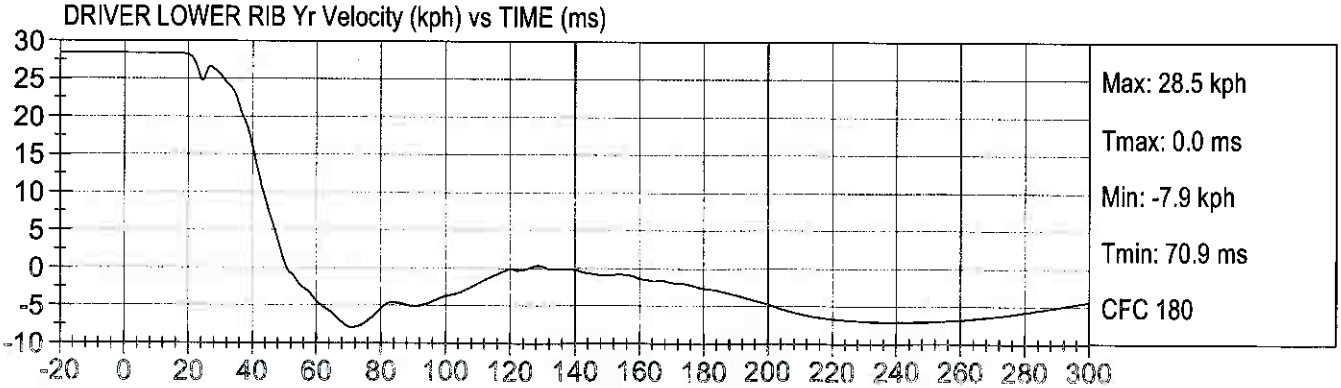
DRIVER UPPER RIB Yr Velocity (kph) vs TIME (ms)



DRIVER LOWER RIB Yr (G's) vs TIME (ms)



DRIVER LOWER RIB Yr Velocity (kph) vs TIME (ms)



FMVSS 201 RIGID POLE
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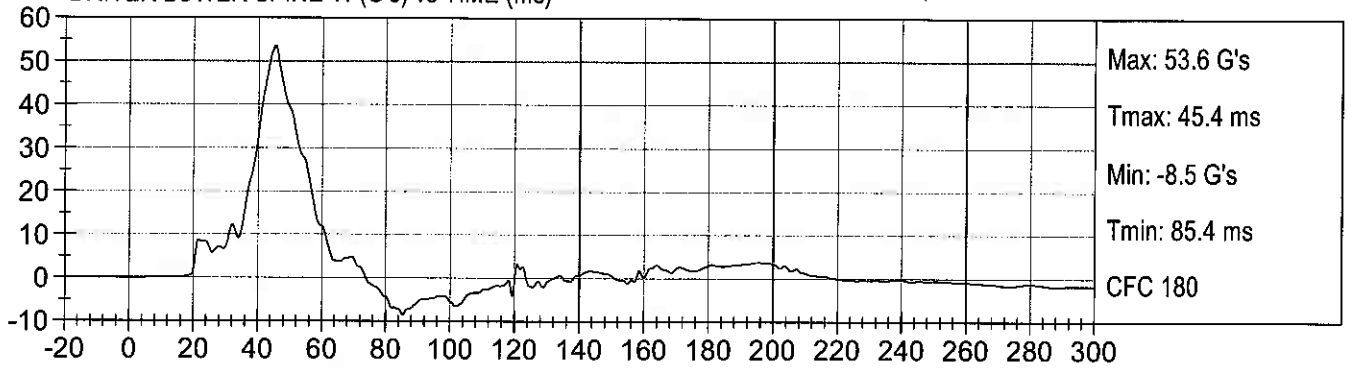
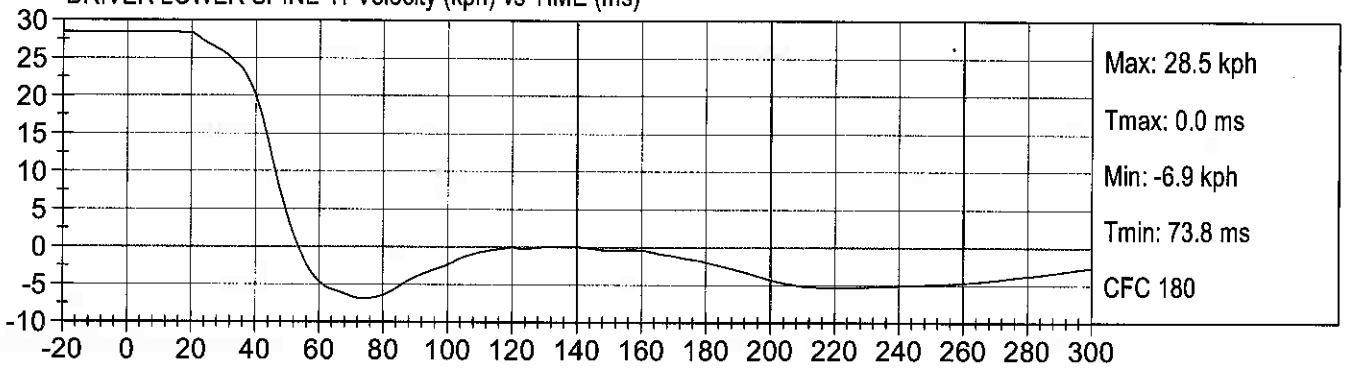
Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

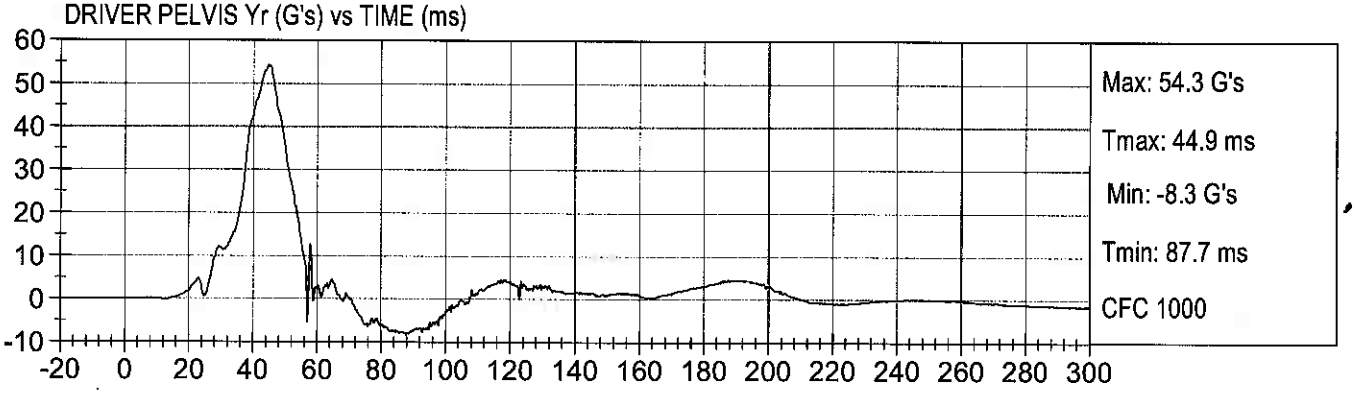
DRIVER LOWER SPINE Yr (G's) vs TIME (ms)



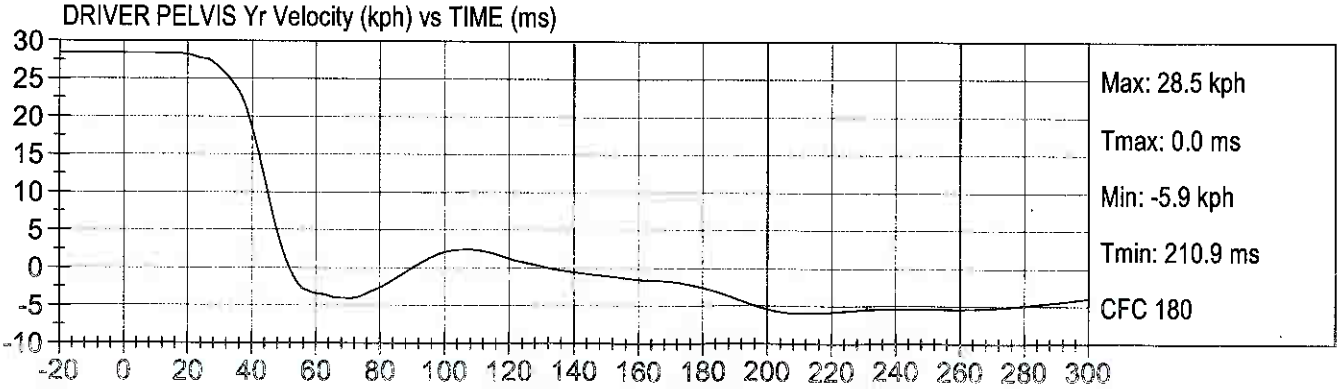
DRIVER LOWER SPINE Yr Velocity (kph) vs TIME (ms)



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



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



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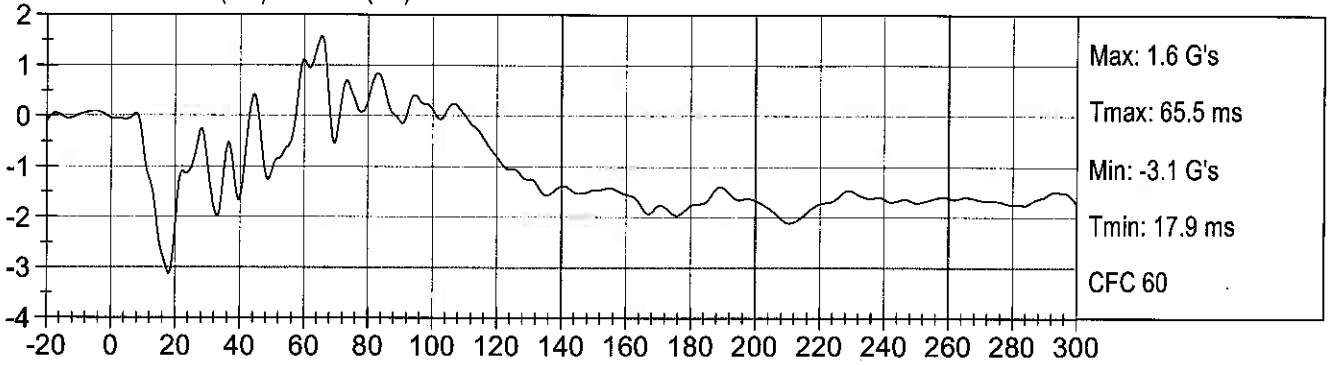
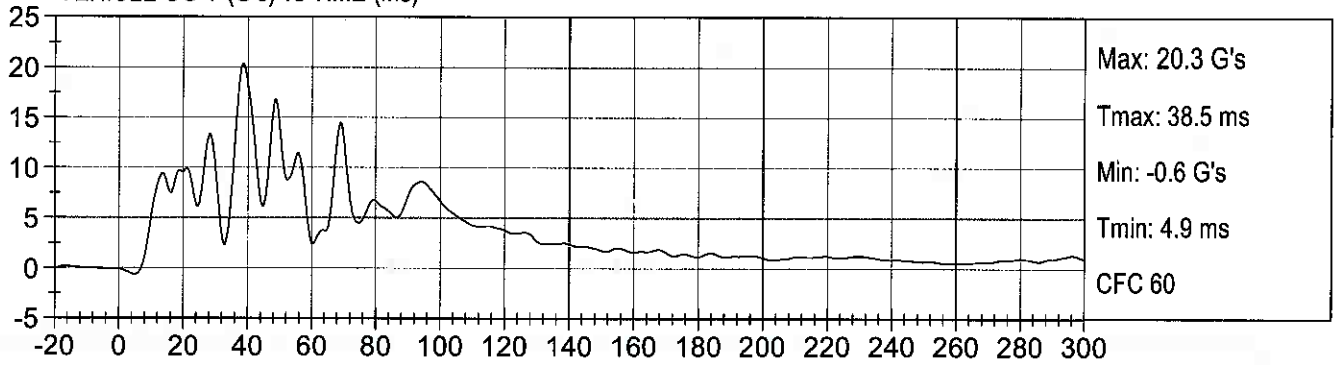
Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

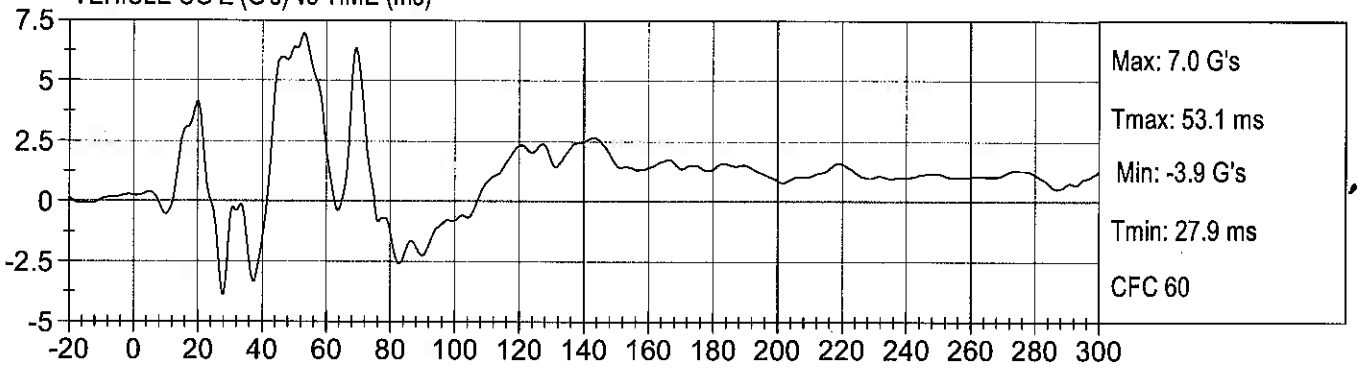
VEHICLE CG X (G's) vs TIME (ms)



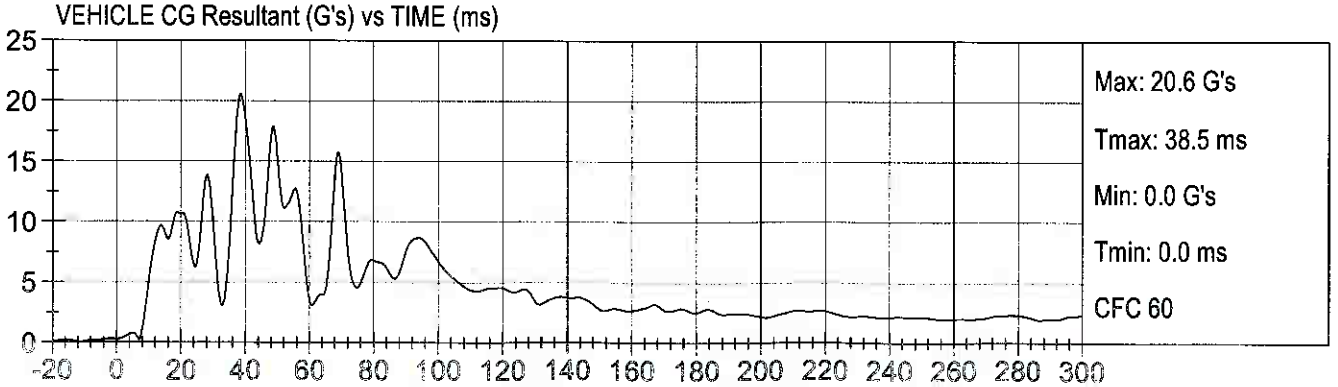
VEHICLE CG Y (G's) vs TIME (ms)



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



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



FMVSS 201 RIGID POLE
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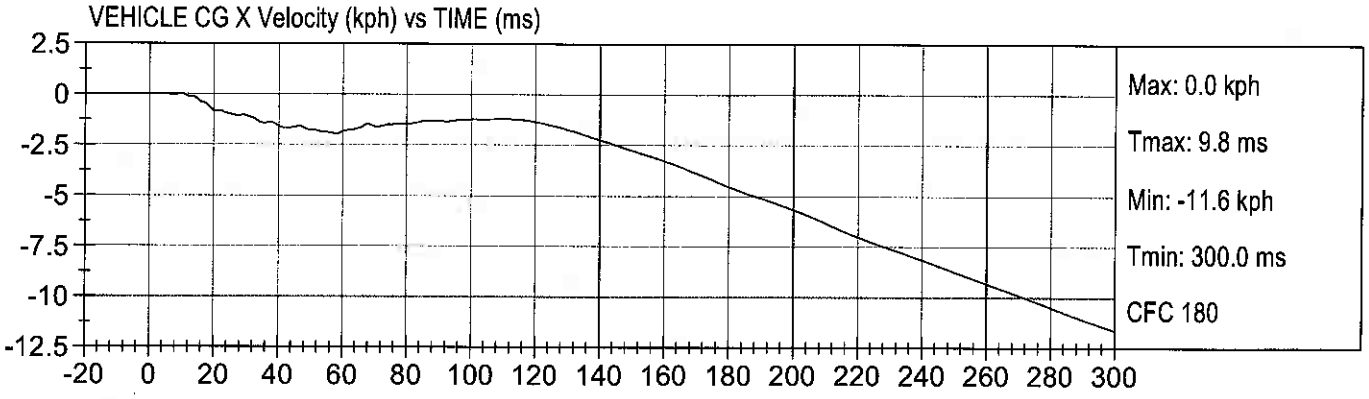
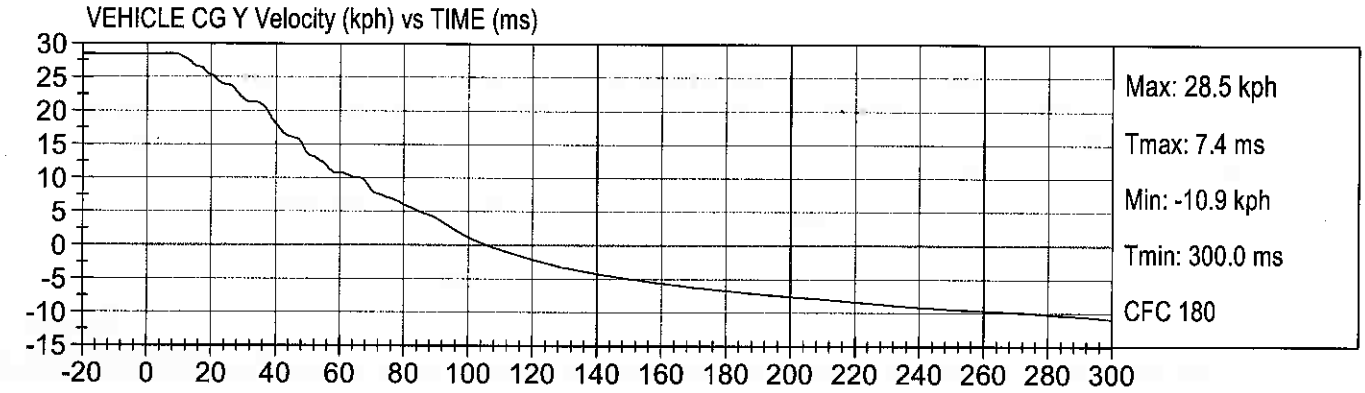
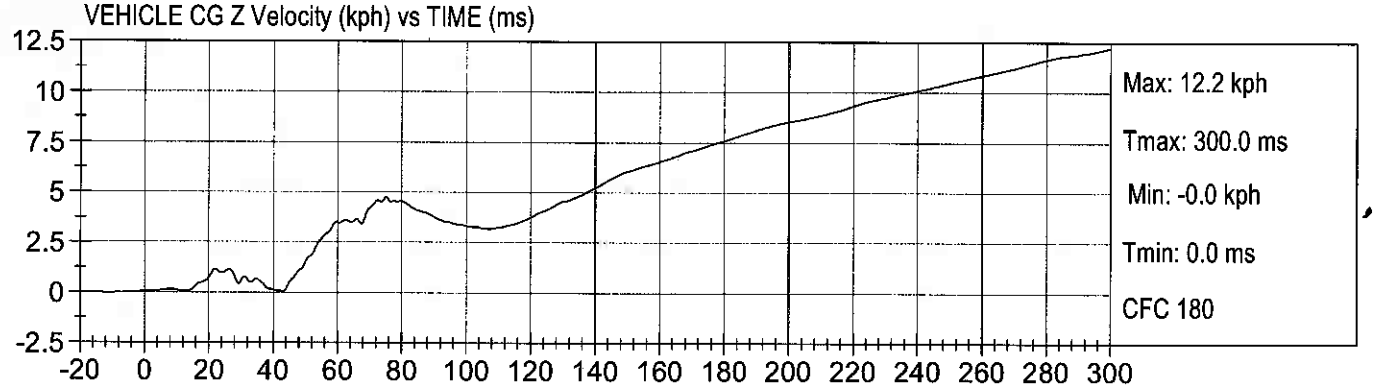
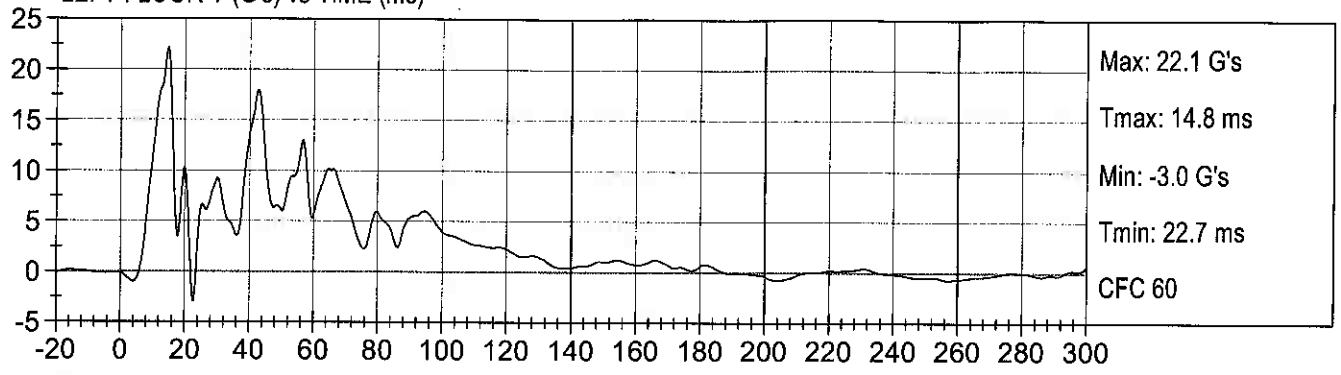
Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)



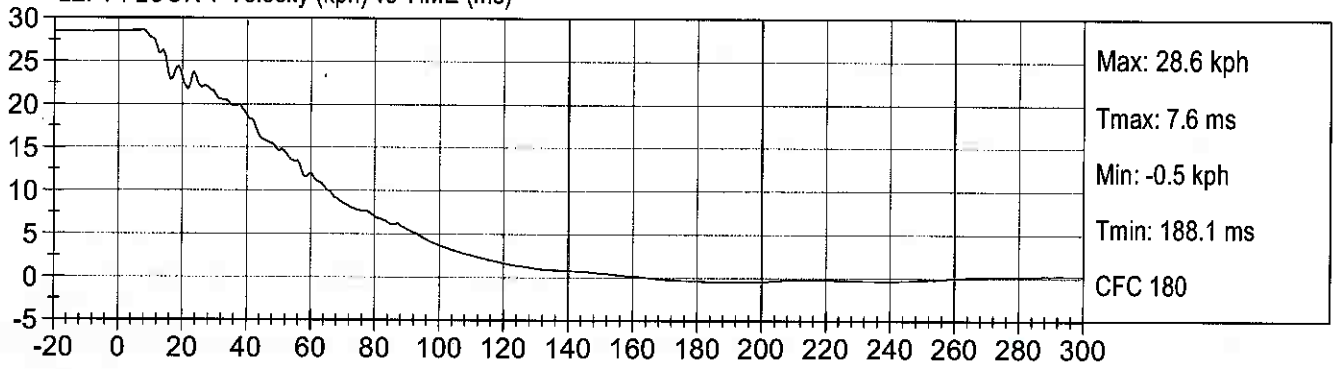




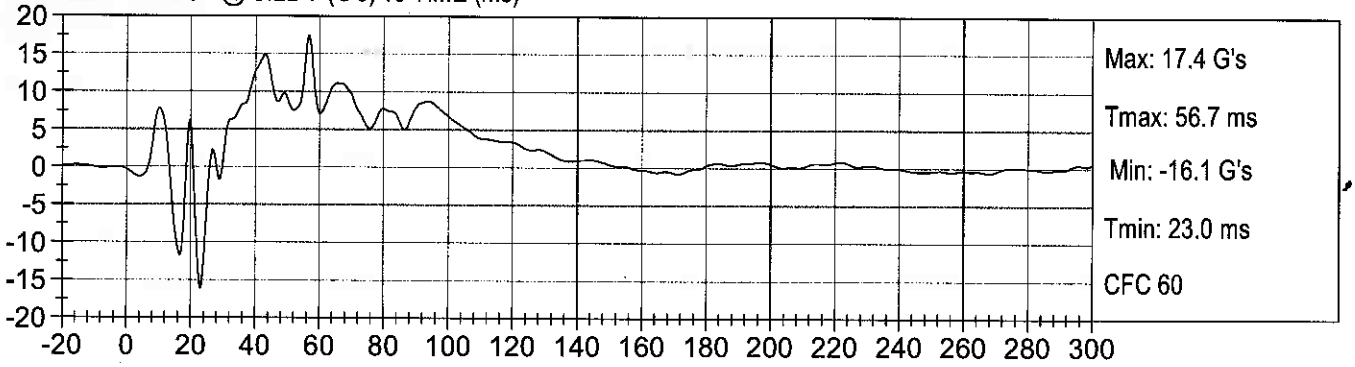
LEFT FLOOR Y (G's) vs TIME (ms)



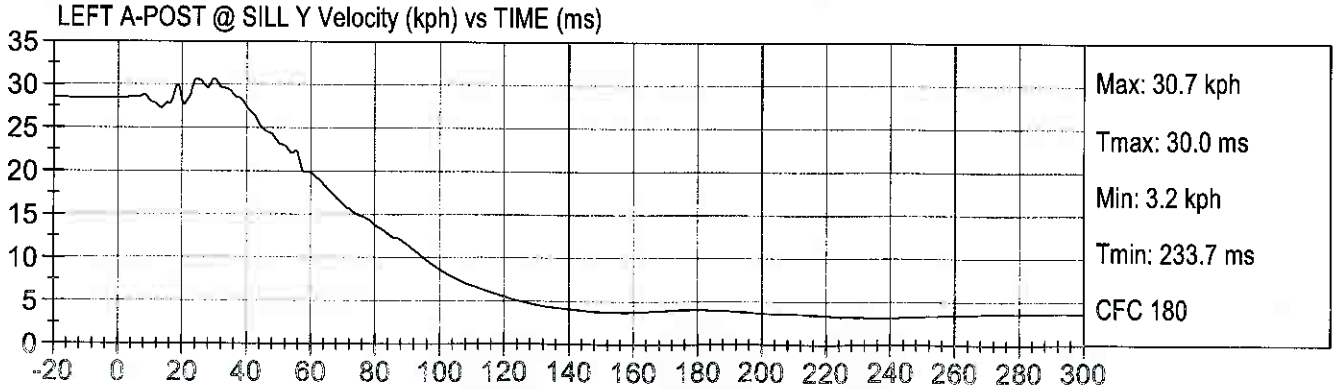
LEFT FLOOR Y Velocity (kph) vs TIME (ms)



LEFT A-POST @ SILL Y (G's) vs TIME (ms)



LEFT A-POST @ SILL Y Velocity (kph) vs TIME (ms)



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2009 CHEVROLET MALIBU C90110

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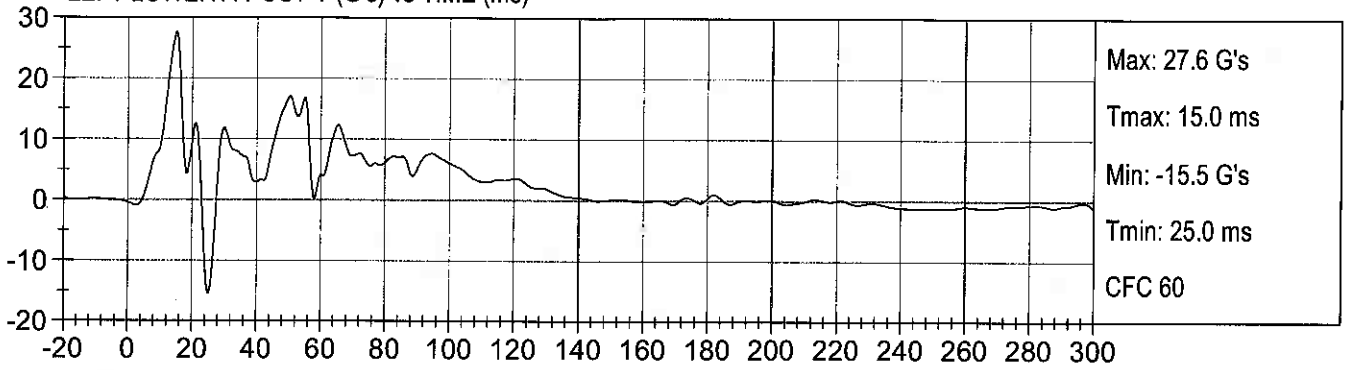
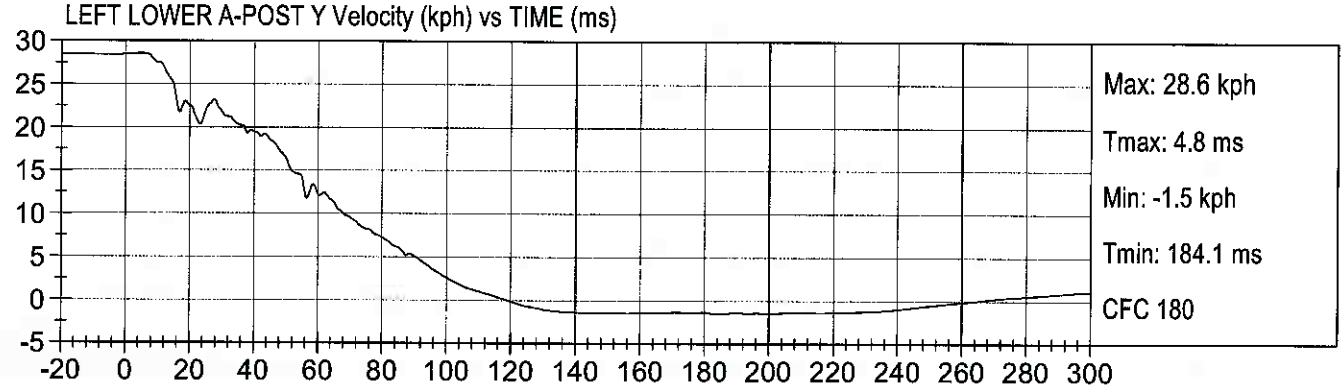
Speed: 17.7 mph (28.5 km/h)

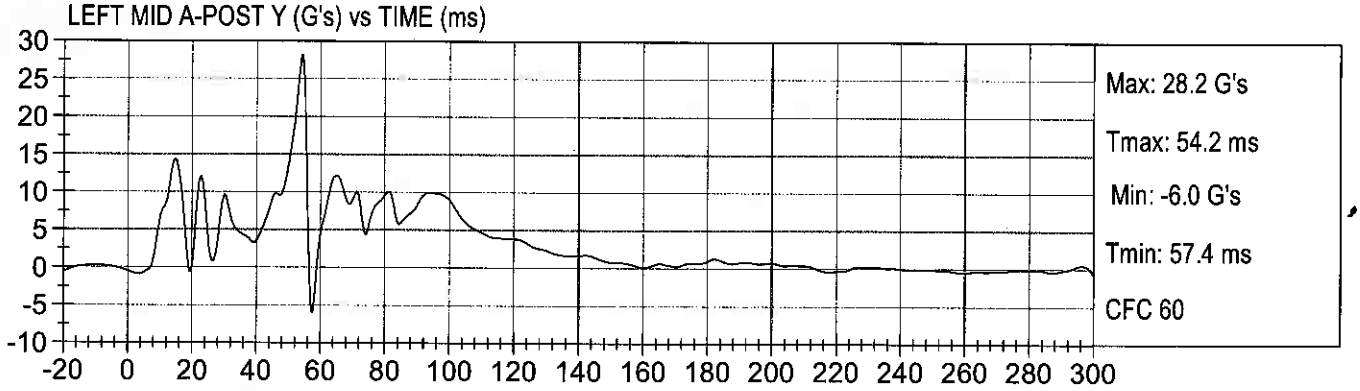
LEFT LOWER A-POST Y (G's) vs TIME (ms)



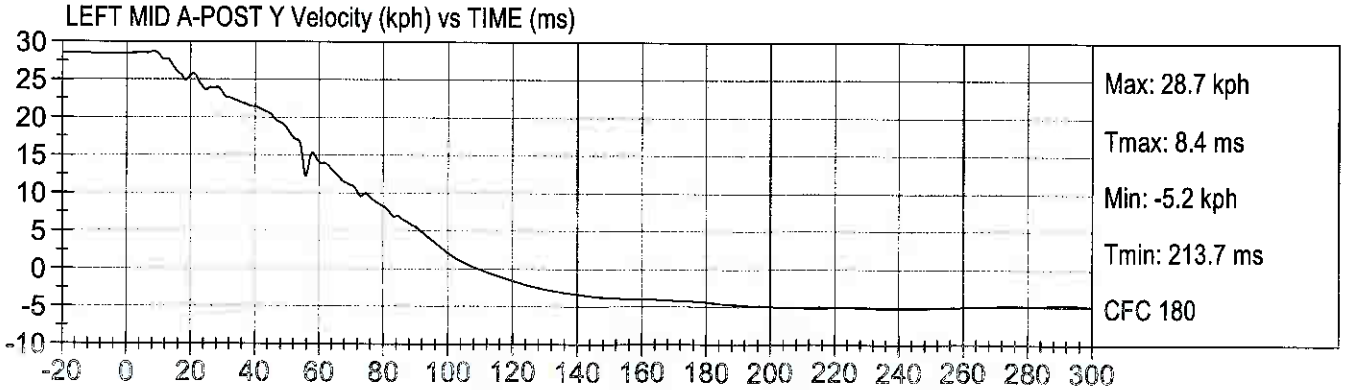
LEFT LOWER A-POST Y Velocity (kph) vs TIME (ms)



LEFT MID A-POST Y (G's) vs TIME (ms)



LEFT MID A-POST Y Velocity (kph) vs TIME (ms)



FMVSS 201 RIGID POLE
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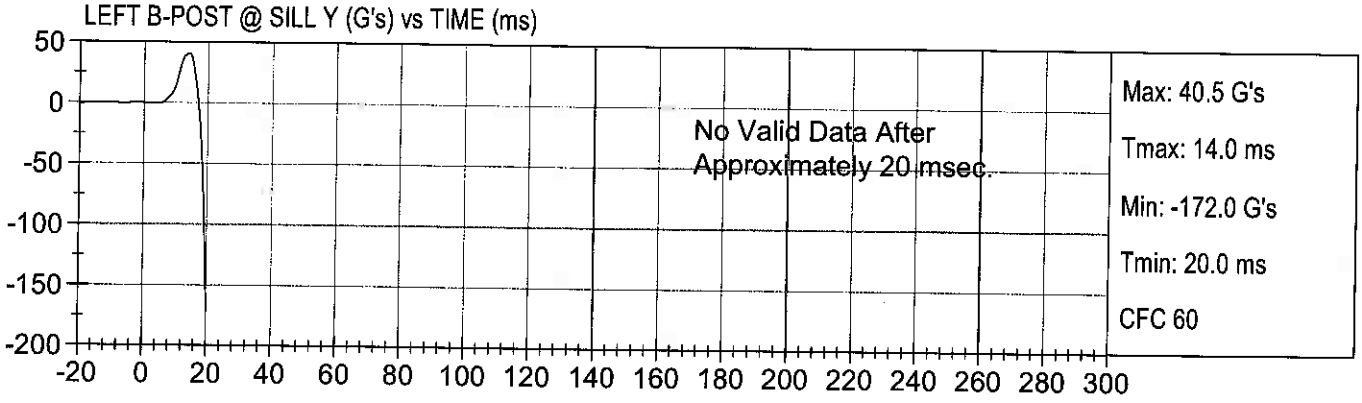
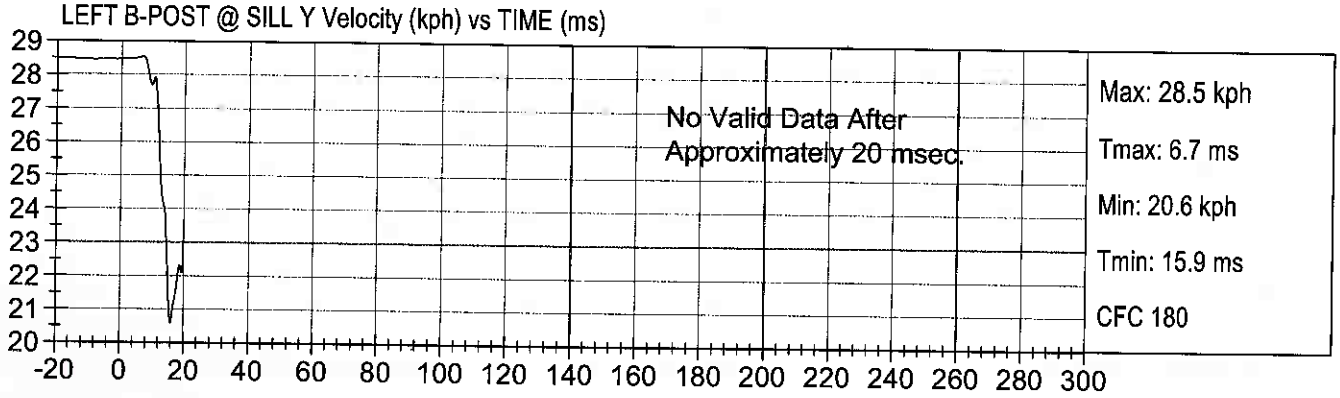
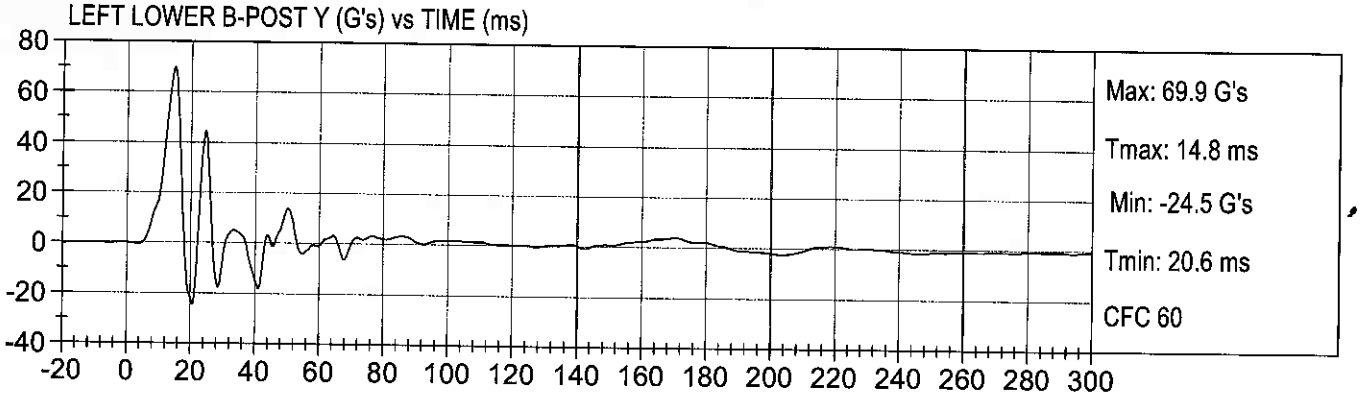
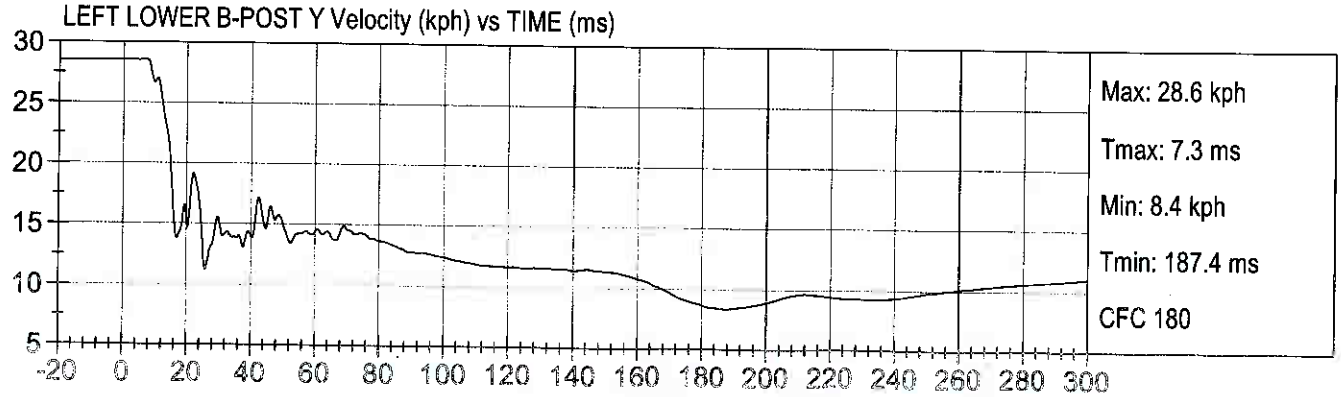
Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)









FMVSS 201 RIGID POLE
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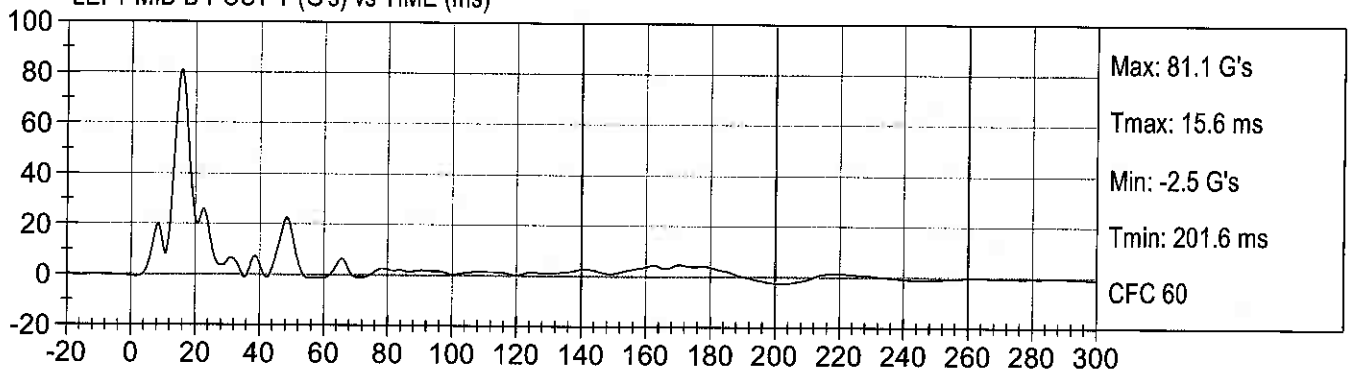
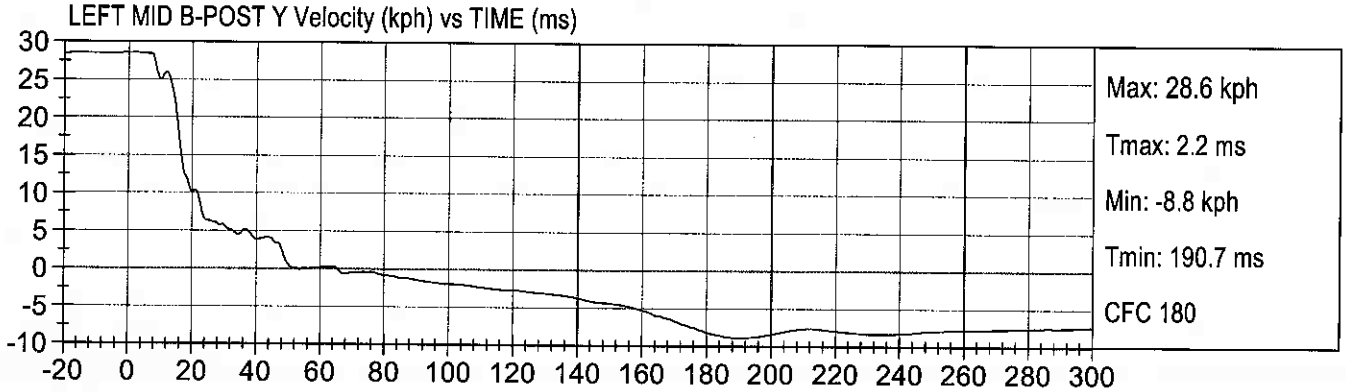
Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

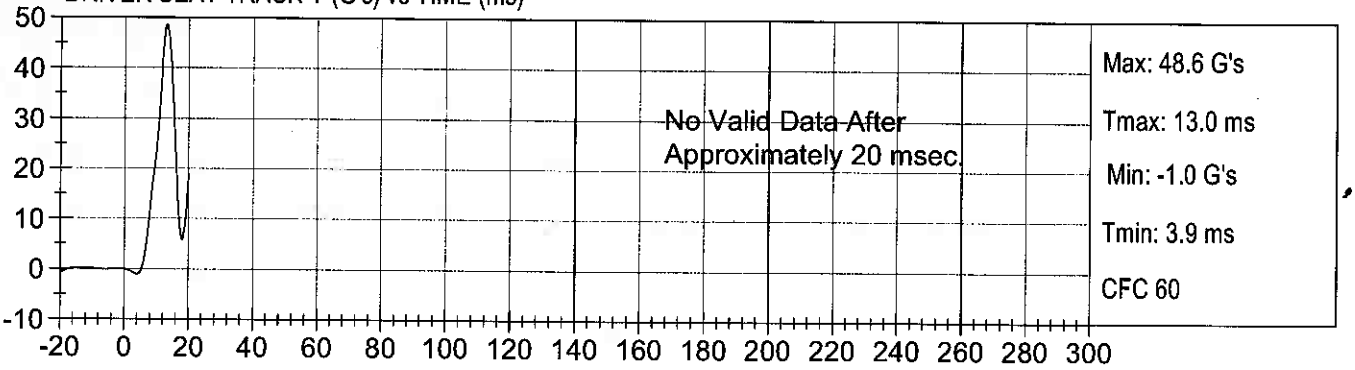
LEFT MID B-POST Y (G's) vs TIME (ms)



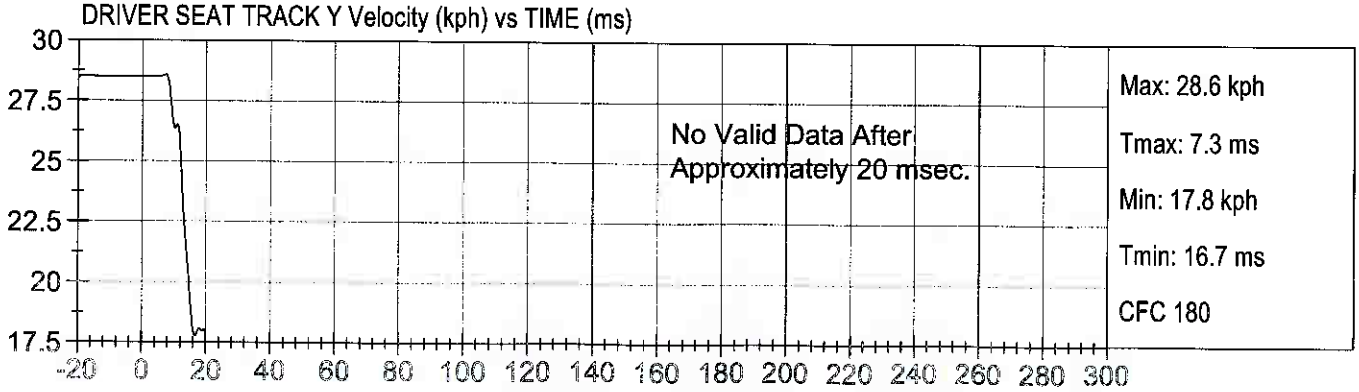
LEFT MID B-POST Y Velocity (kph) vs TIME (ms)



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



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



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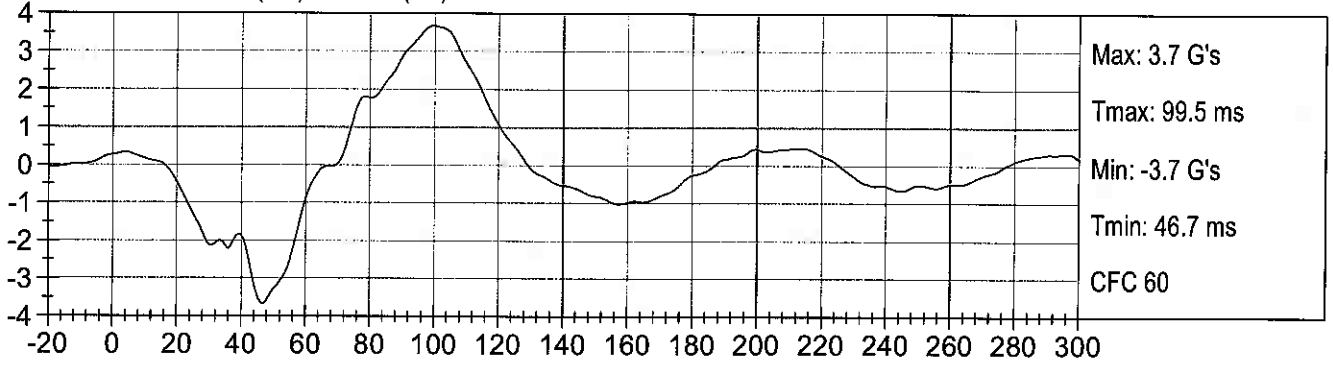
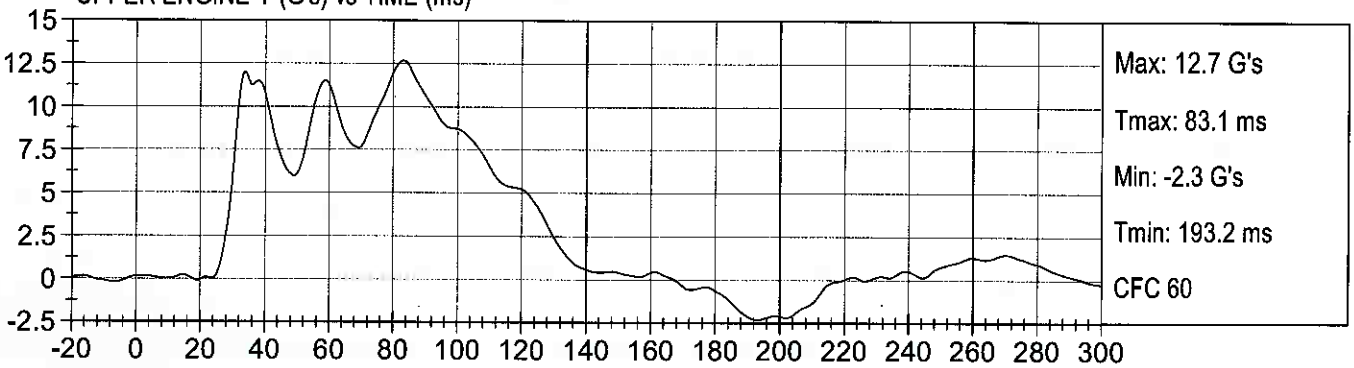
Speed: 17.7 mph (28.5 km/h)

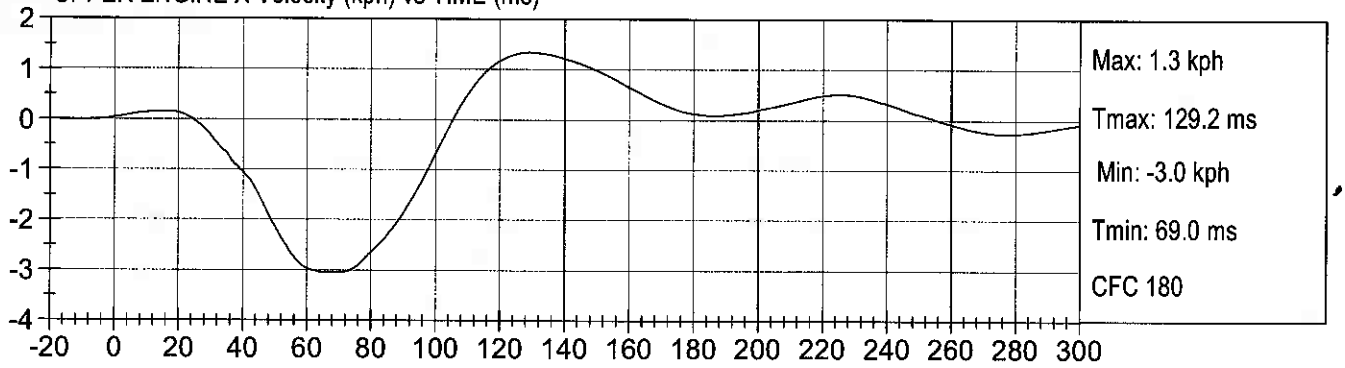
UPPER ENGINE X (G's) vs TIME (ms)



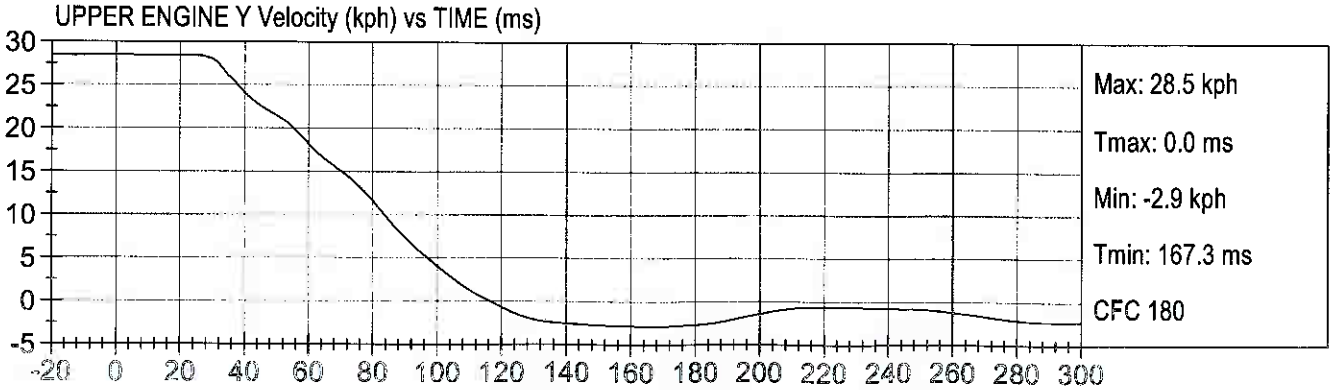
UPPER ENGINE Y (G's) vs TIME (ms)



UPPER ENGINE X Velocity (kph) vs TIME (ms)



UPPER ENGINE Y Velocity (kph) vs TIME (ms)



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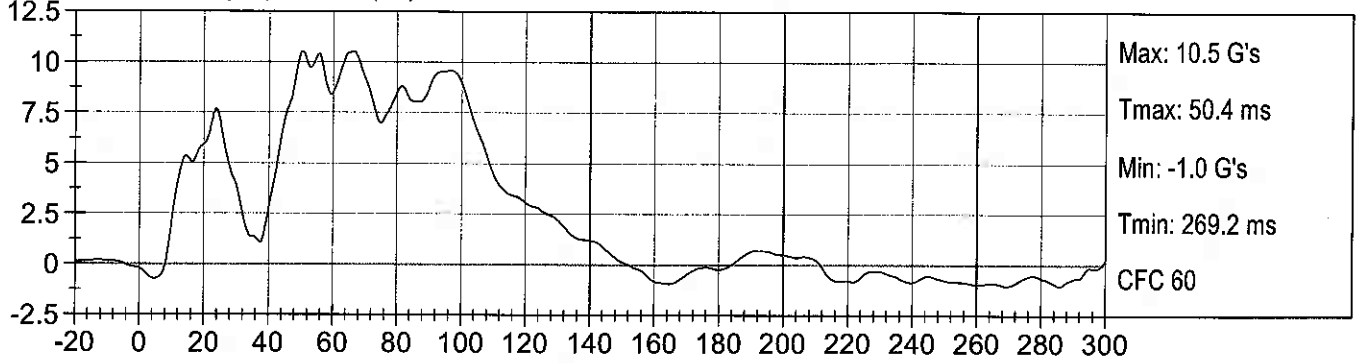
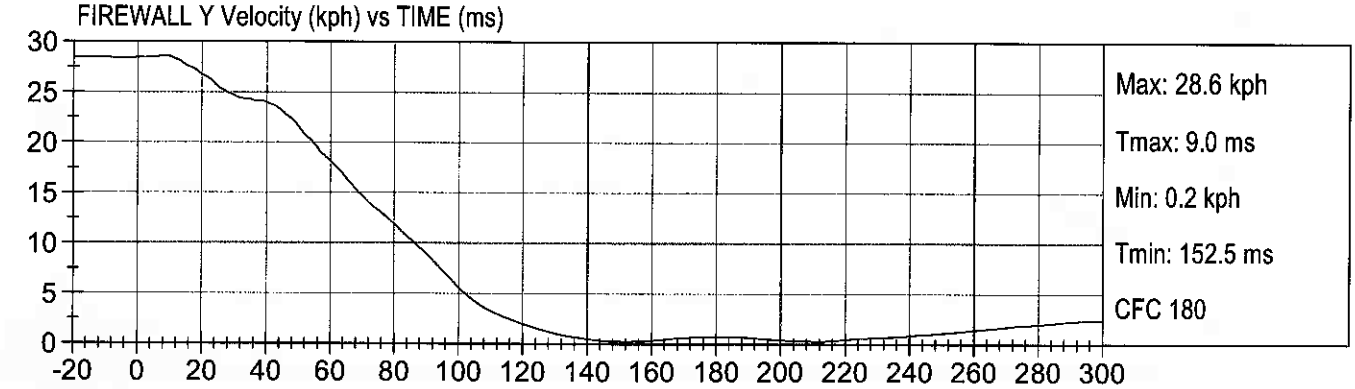
Speed: 17.7 mph (28.5 km/h)

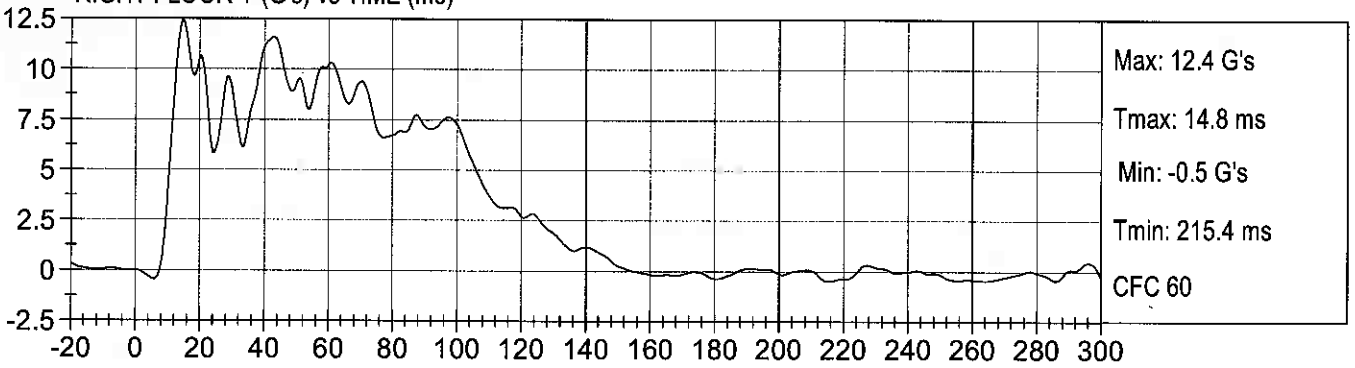
FIREWALL Y (G's) vs TIME (ms)



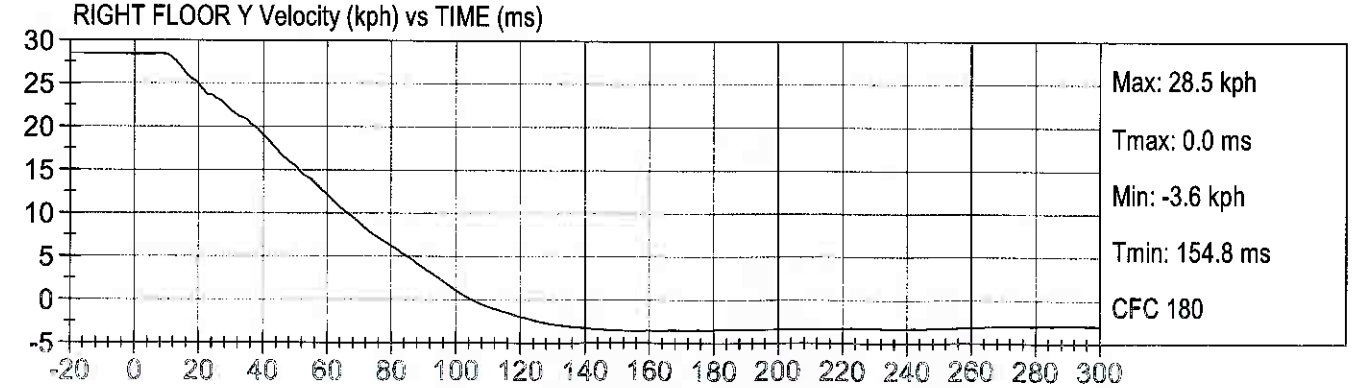
FIREWALL Y Velocity (kph) vs TIME (ms)



RIGHT FLOOR Y (G's) vs TIME (ms)



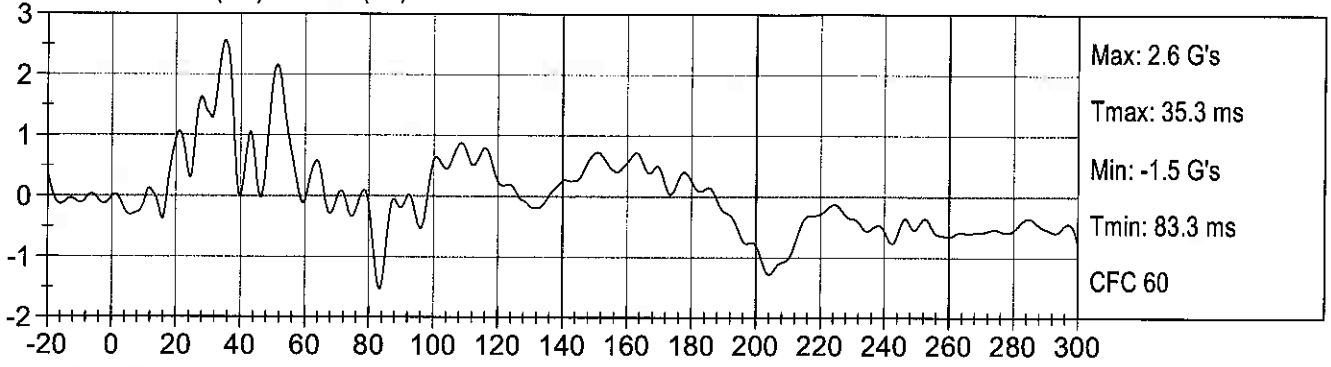
RIGHT FLOOR Y Velocity (kph) vs TIME (ms)



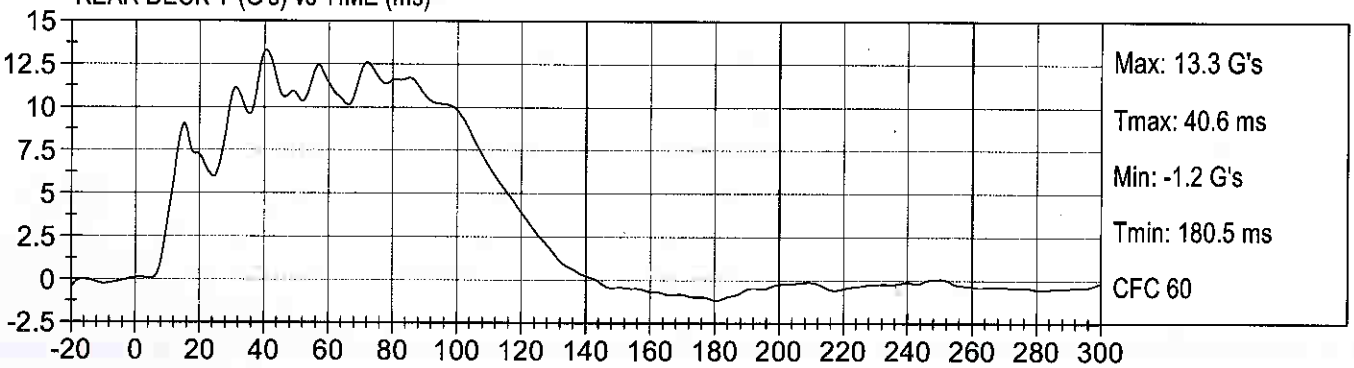
FMVSS 201 RIGID POLE
2009 CHEVROLET MALIBU C90110

Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

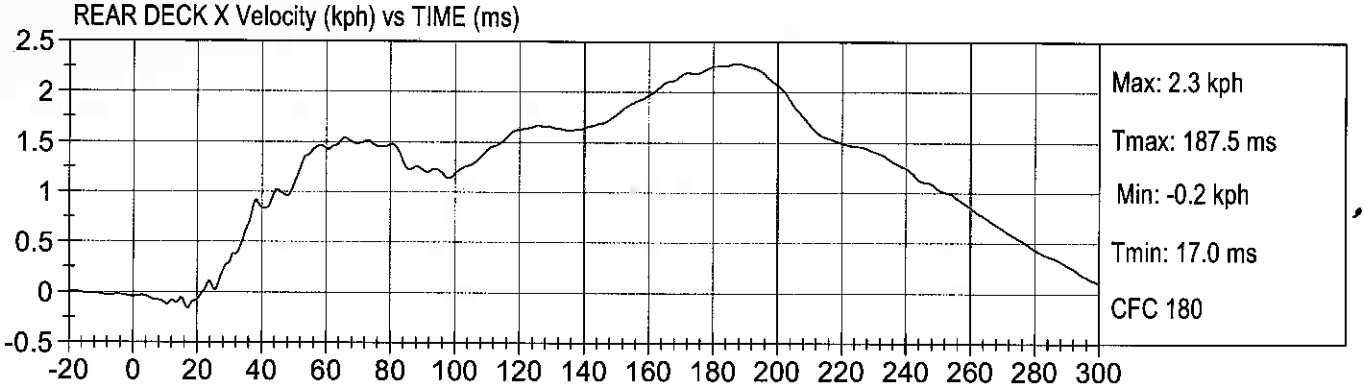
REAR DECK X (G's) vs TIME (ms)



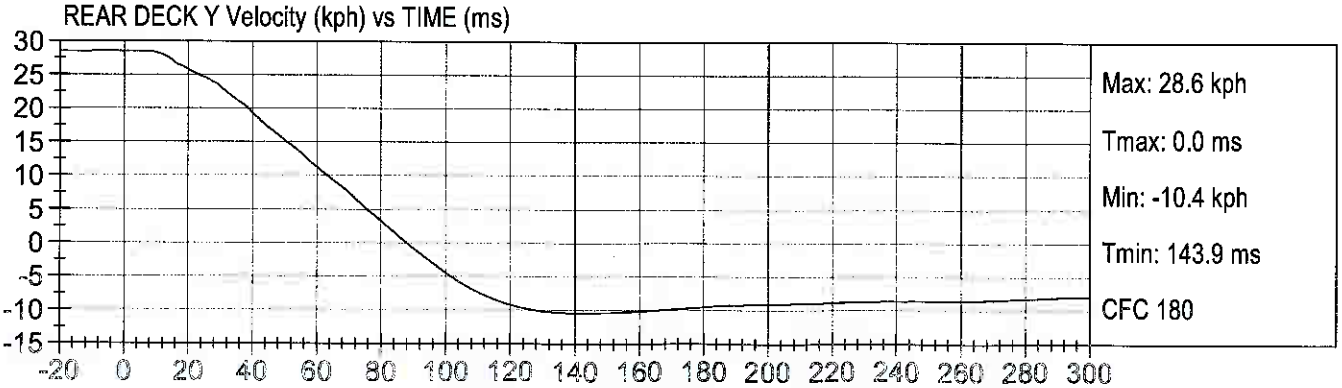
REAR DECK Y (G's) vs TIME (ms)



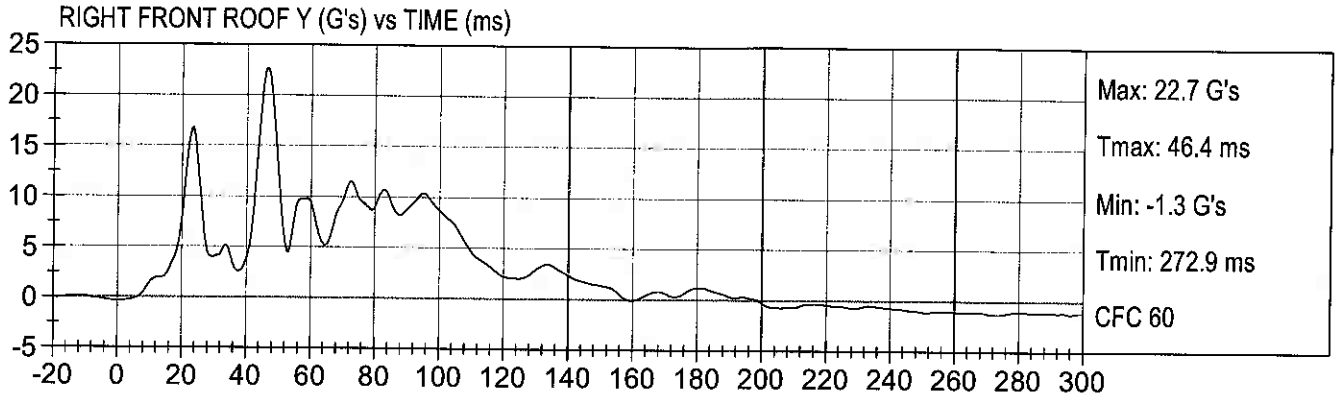
REAR DECK X Velocity (kph) vs TIME (ms)

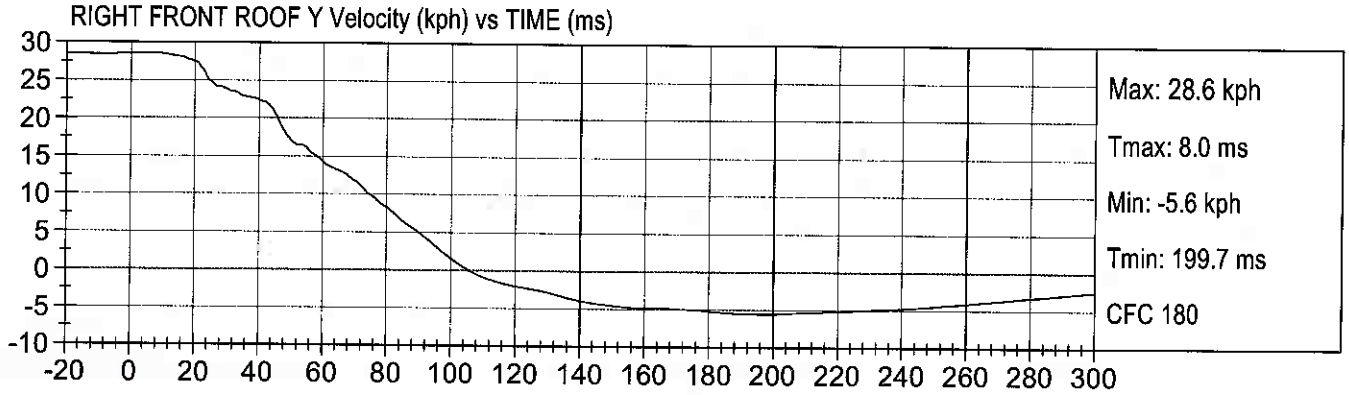


REAR DECK Y Velocity (kph) vs TIME (ms)



FMVSS 201 RIGID POLE
2009 CHEVROLET MALIBU C90110
Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

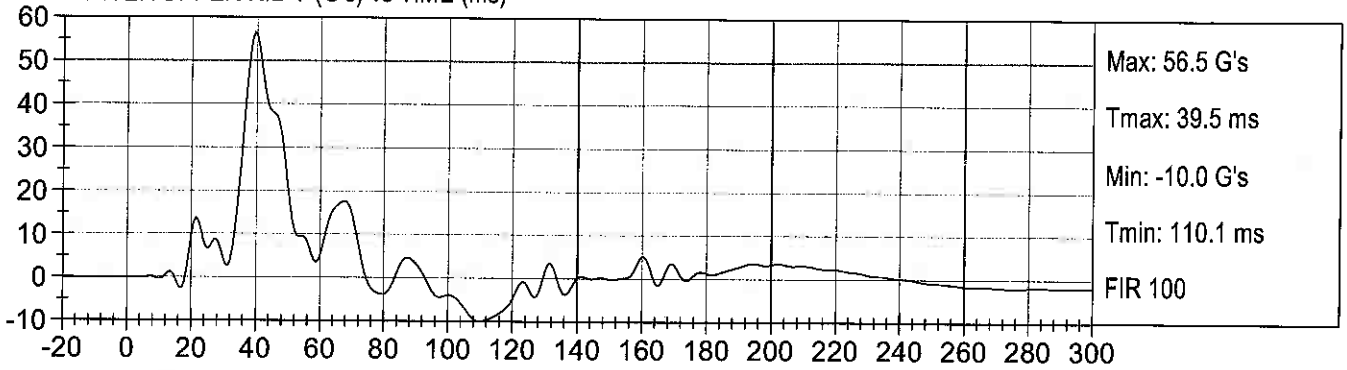




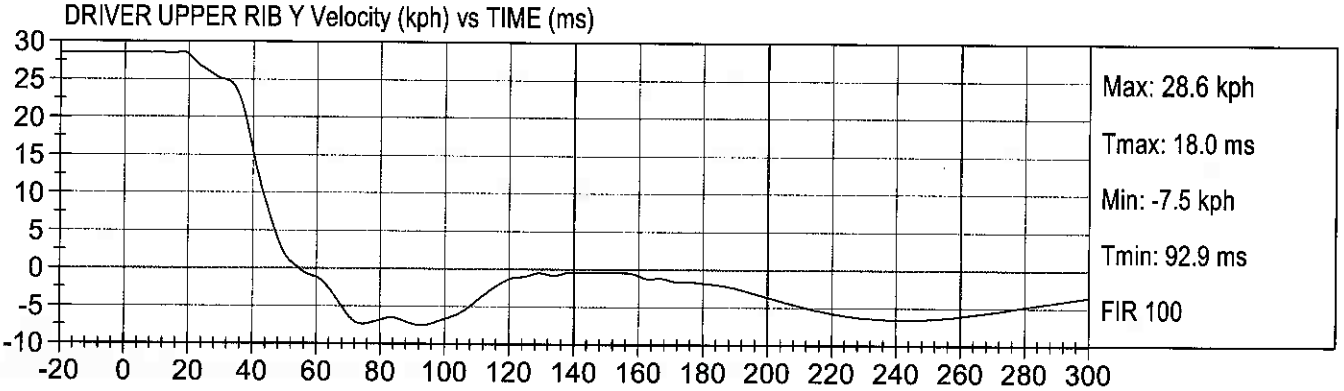
FMVSS 201 RIGID POLE
2009 CHEVROLET MALIBU C90110

Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

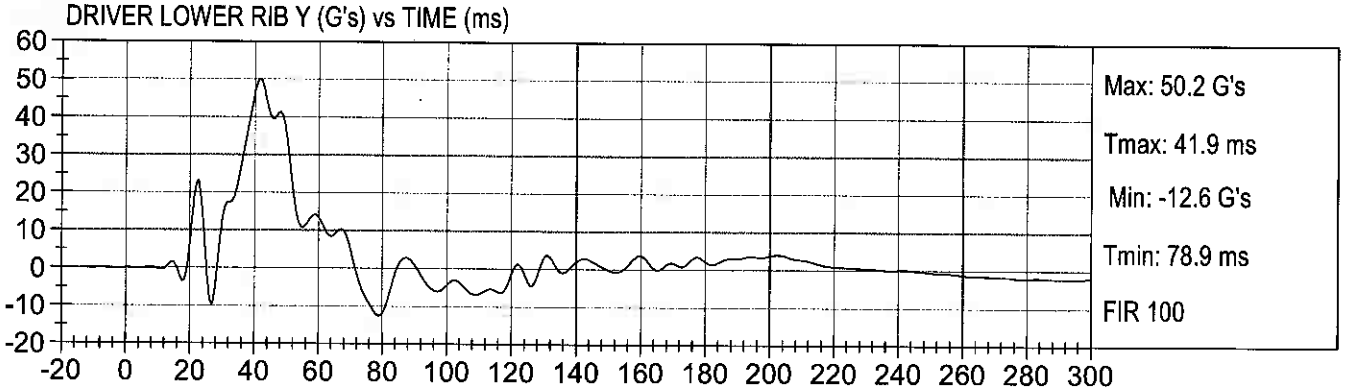
DRIVER UPPER RIB Y (G's) vs TIME (ms)



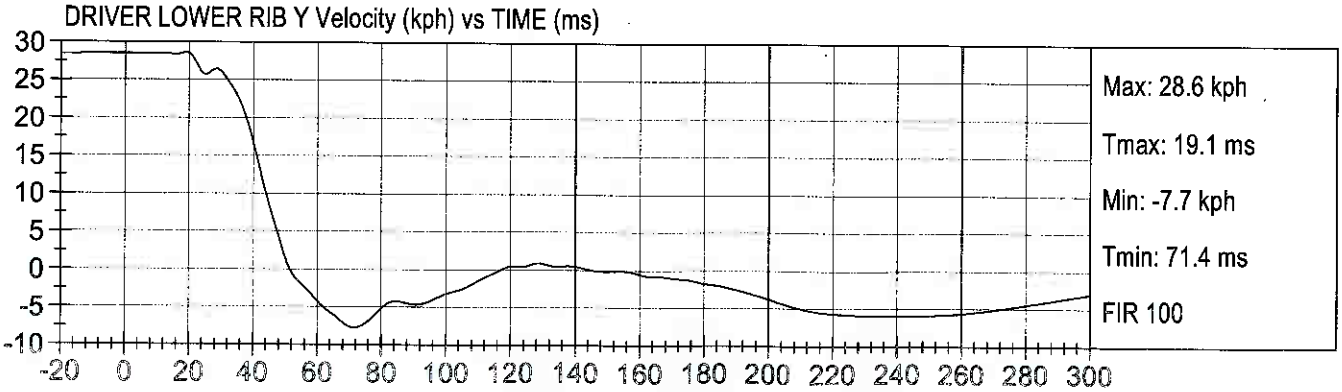
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)



DRIVER LOWER RIB Y (G's) vs TIME (ms)



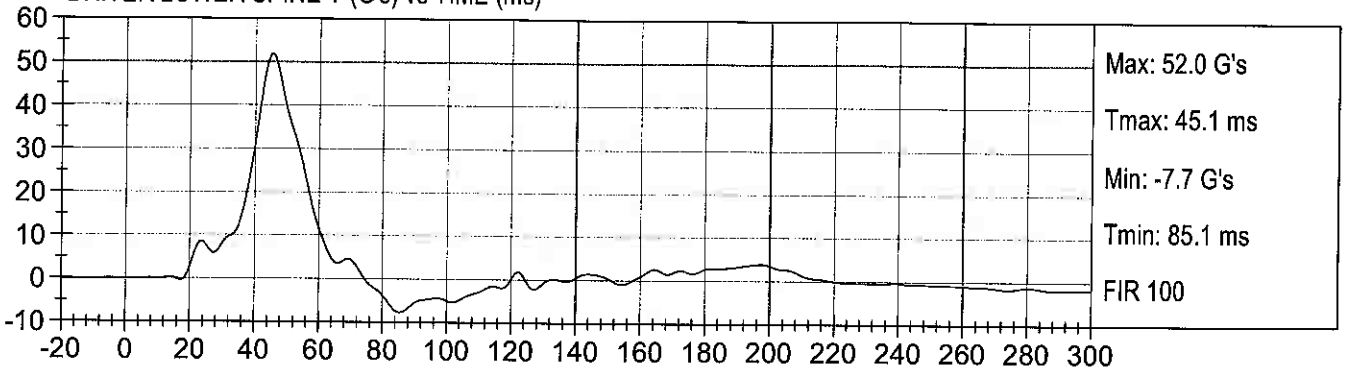
DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



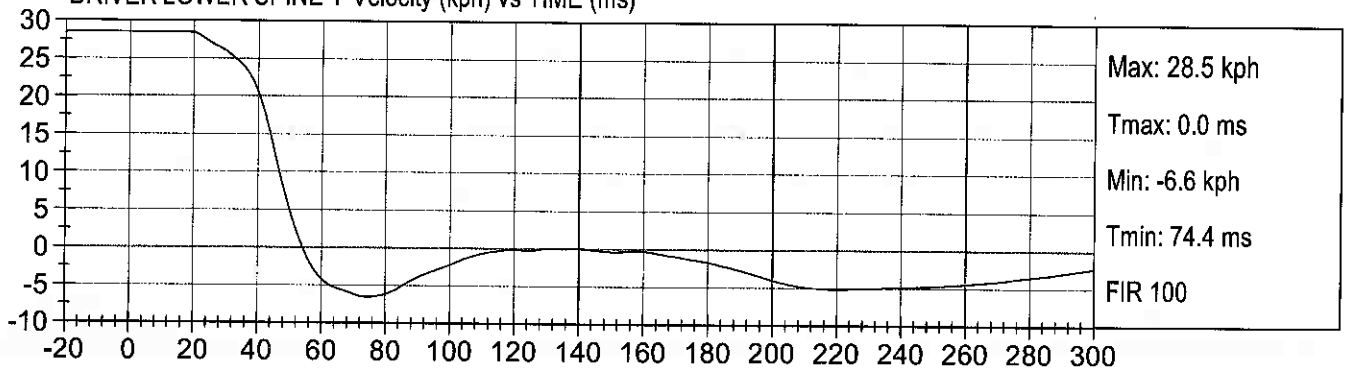
FMVSS 201 RIGID POLE
2009 CHEVROLET MALIBU C90110

Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

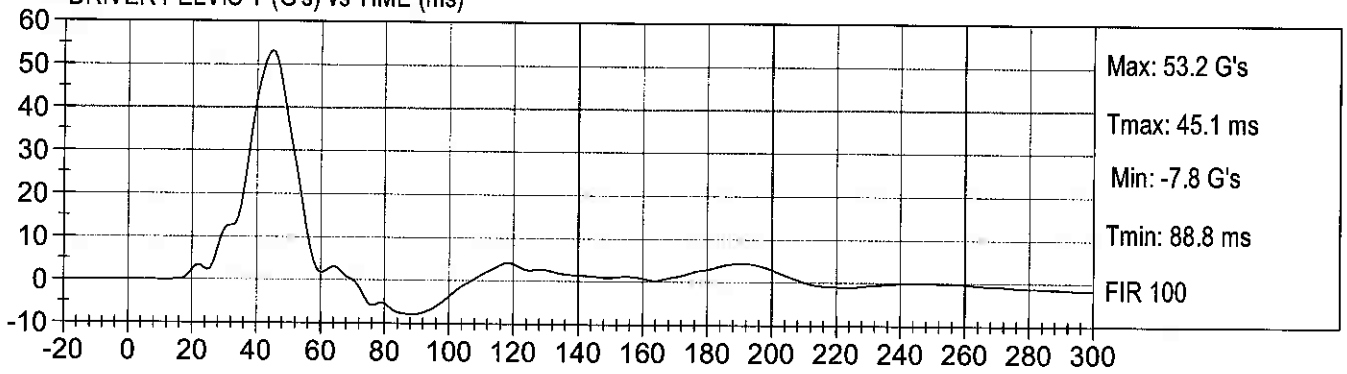
DRIVER LOWER SPINE Y (G's) vs TIME (ms)



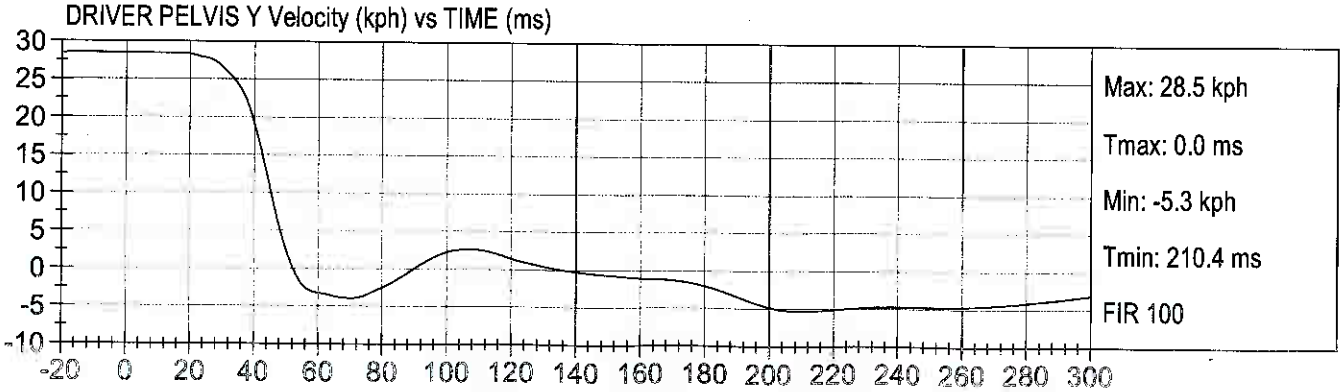
DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)



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



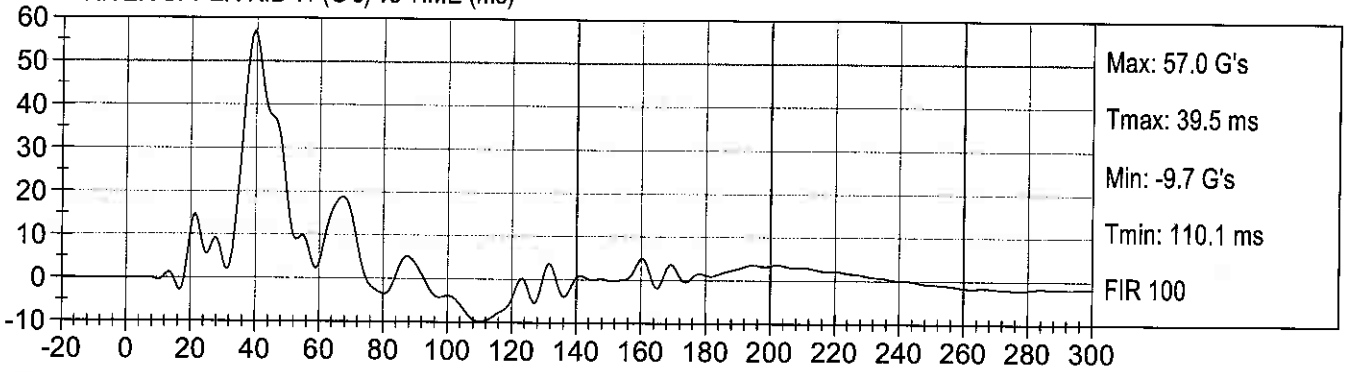
DRIVER PELVIS Y Velocity (kph) vs TIME (ms)



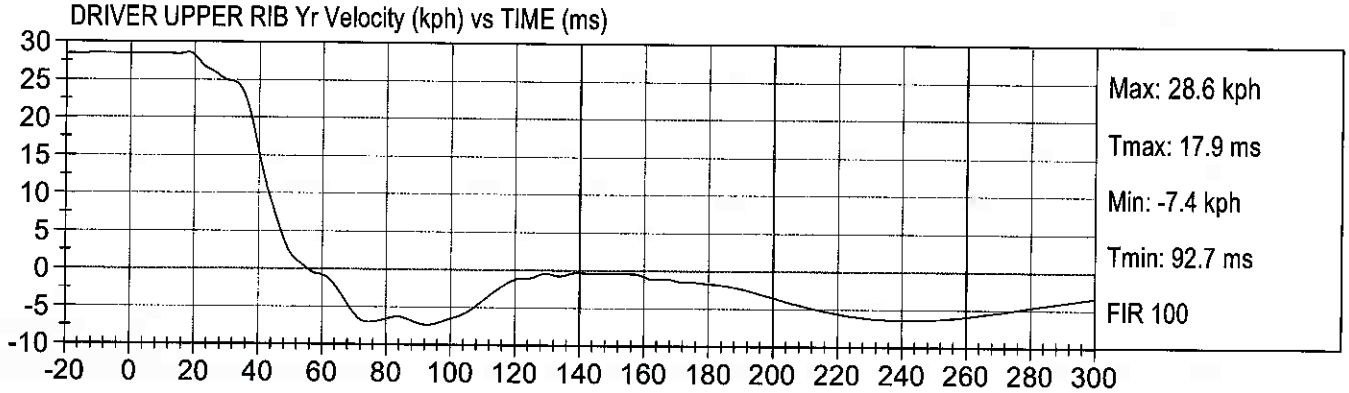
FMVSS 201 RIGID POLE
2009 CHEVROLET MALIBU C90110

Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

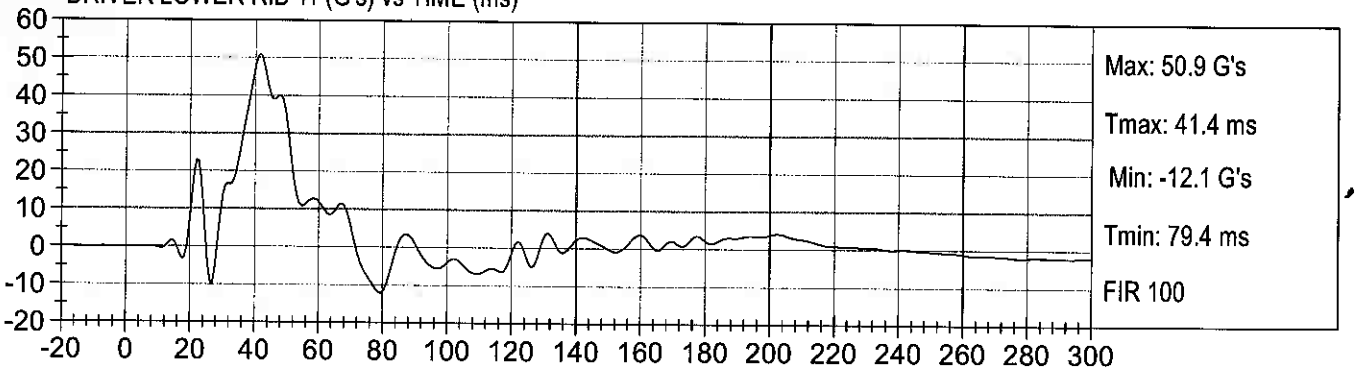
DRIVER UPPER RIB Yr (G's) vs TIME (ms)



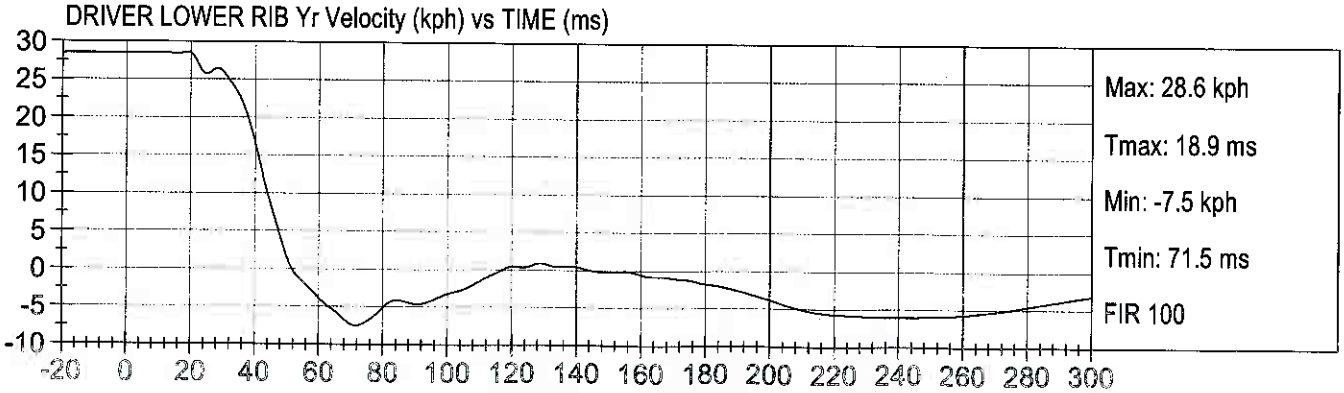
DRIVER UPPER RIB Yr Velocity (kph) vs TIME (ms)



DRIVER LOWER RIB Yr (G's) vs TIME (ms)



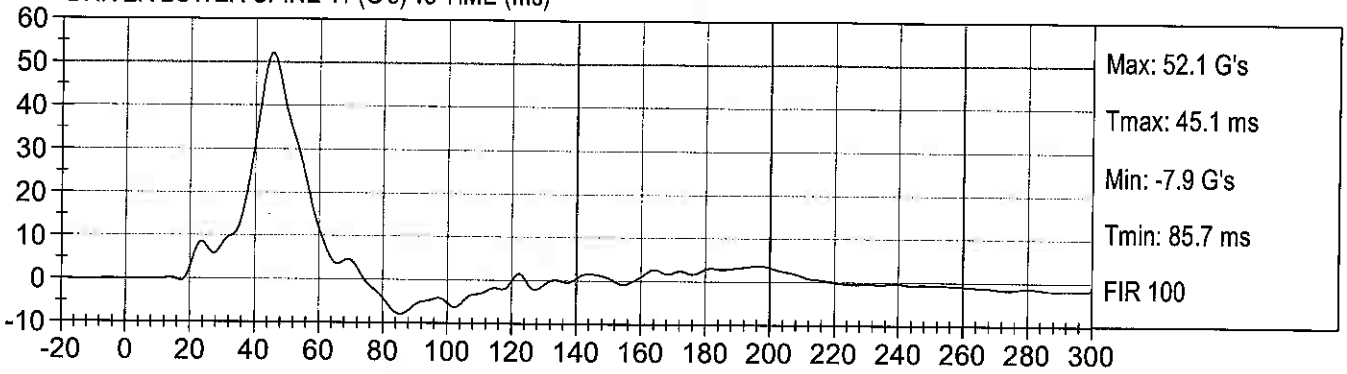
DRIVER LOWER RIB Yr Velocity (kph) vs TIME (ms)



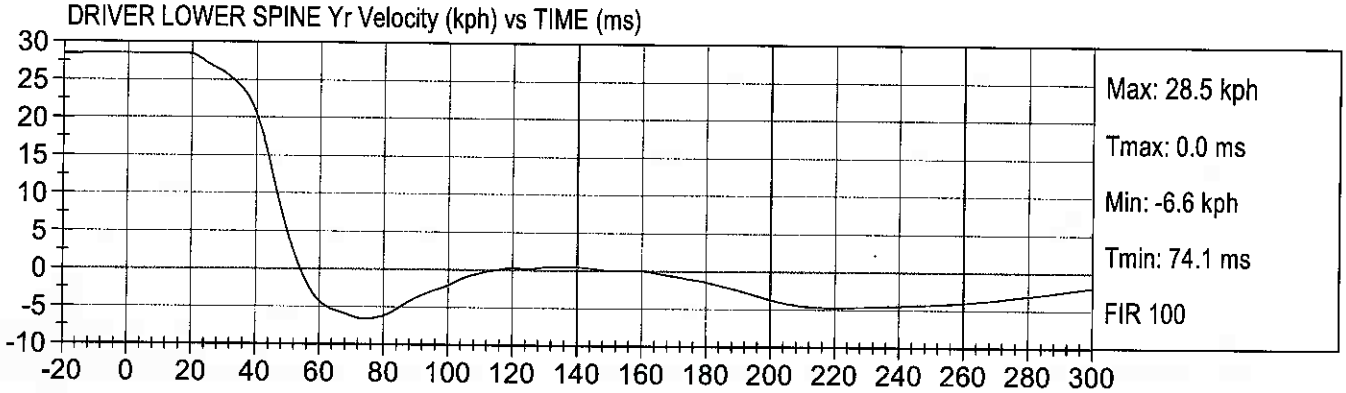
FMVSS 201 RIGID POLE
2009 CHEVROLET MALIBU C90110

Test Date: 03/11/2009
Speed: 17.7 mph (28.5 km/h)

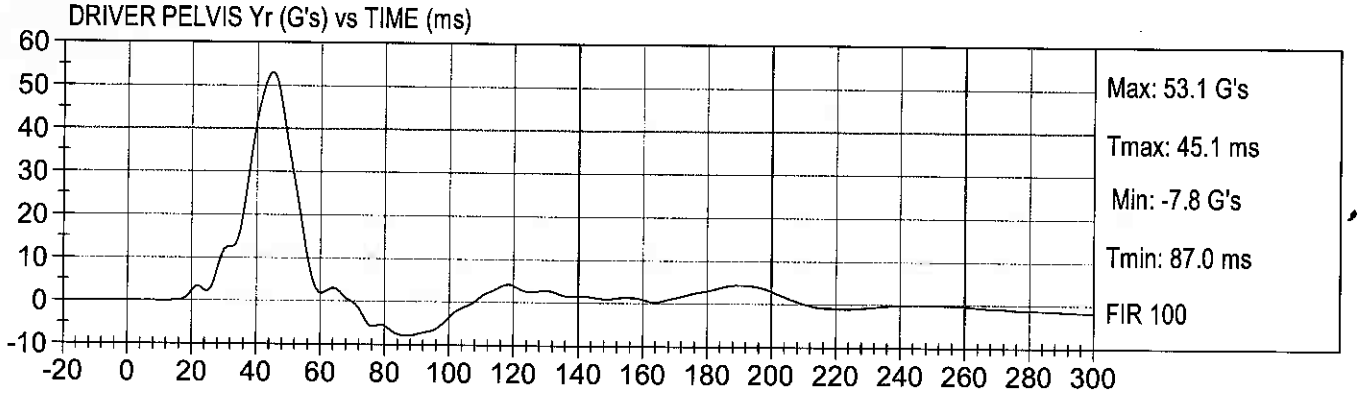
DRIVER LOWER SPINE Yr (G's) vs TIME (ms)



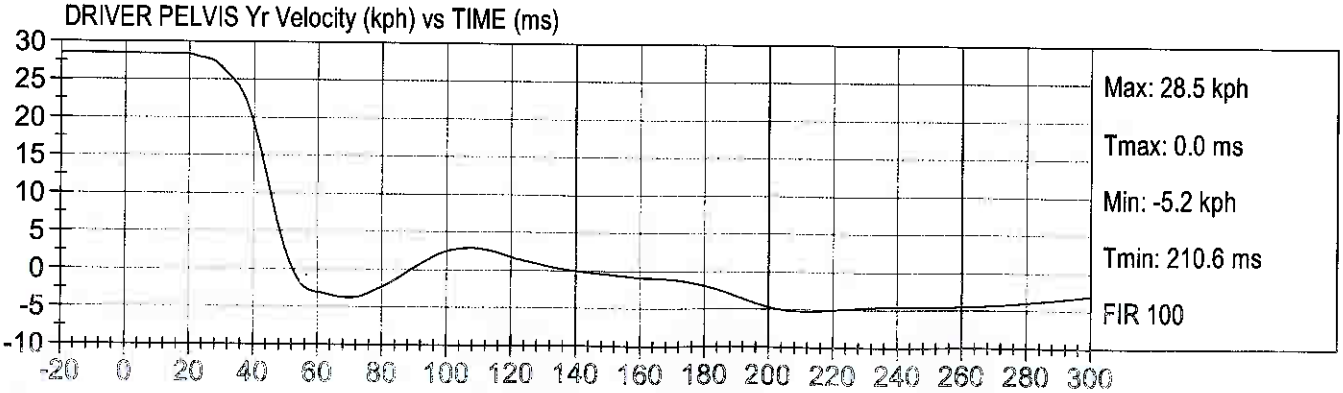
DRIVER LOWER SPINE Yr Velocity (kph) vs TIME (ms)



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



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

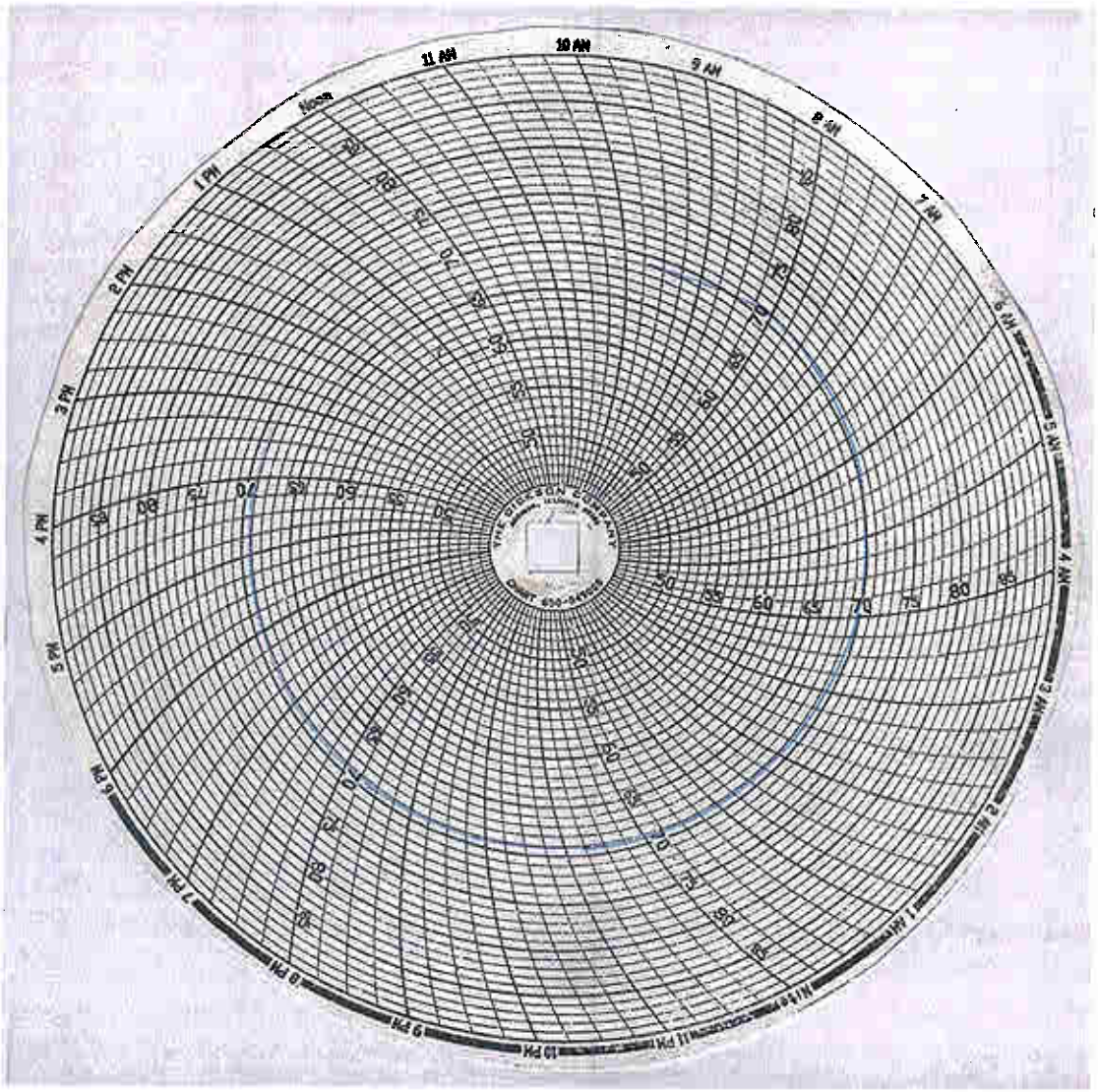


APPENDIX C

SID/HIII CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Vehicle and Dummy Temperature

Test Vehicle:	2009 Chevrolet Malibu	NHTSA No.	C90110
Test Program:	FMVSS 201P	Test Date:	March 11, 2009



SID/HIII Calibration Data Sheet
Side Impact Dummy
Head Drop Calibration (Lateral)

ATD Serial No: 036 **Test I.D:** D09261

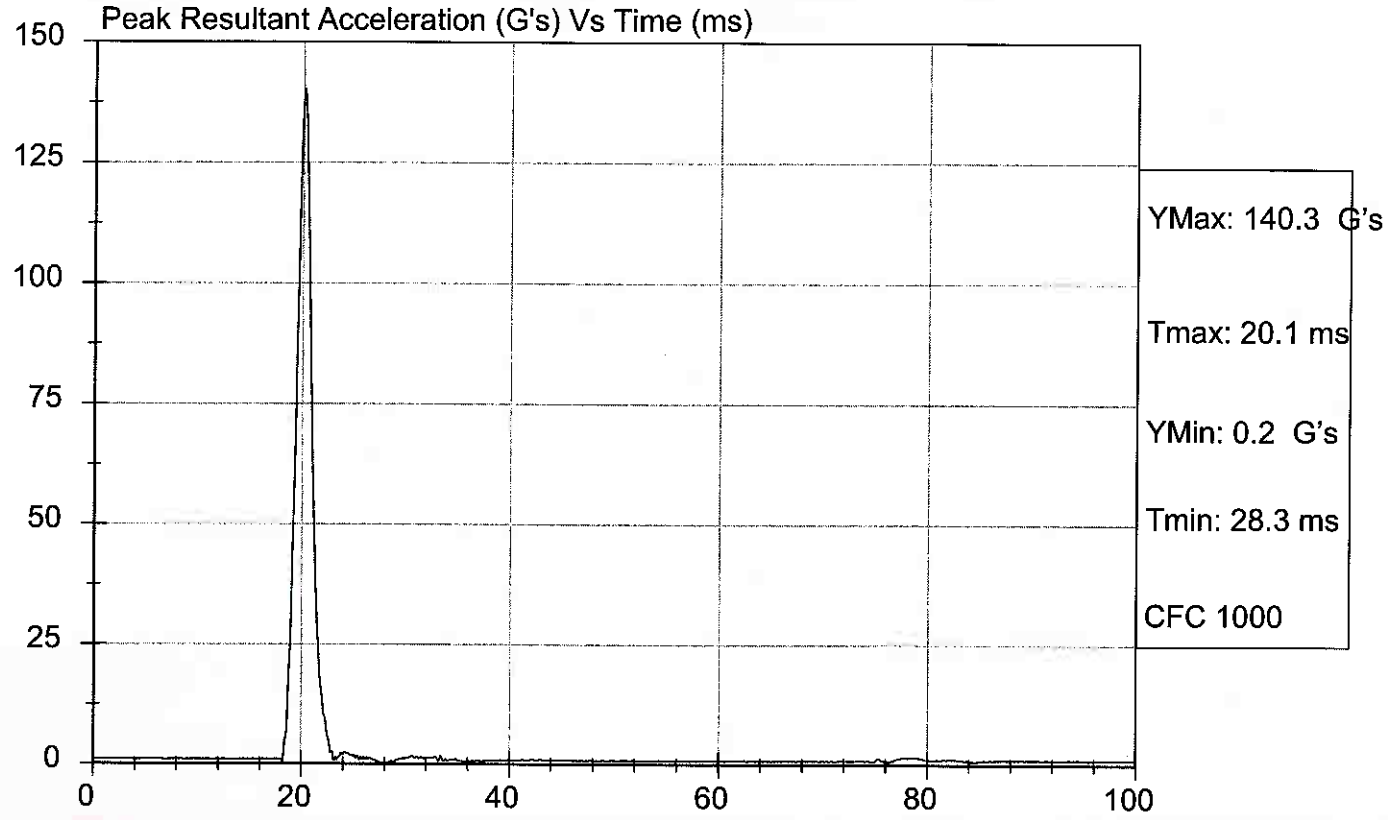
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.3	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Peak Resultant Acceleration	G's	120 to 150	140	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	8.6	Pass
		Overall Test Results		Pass

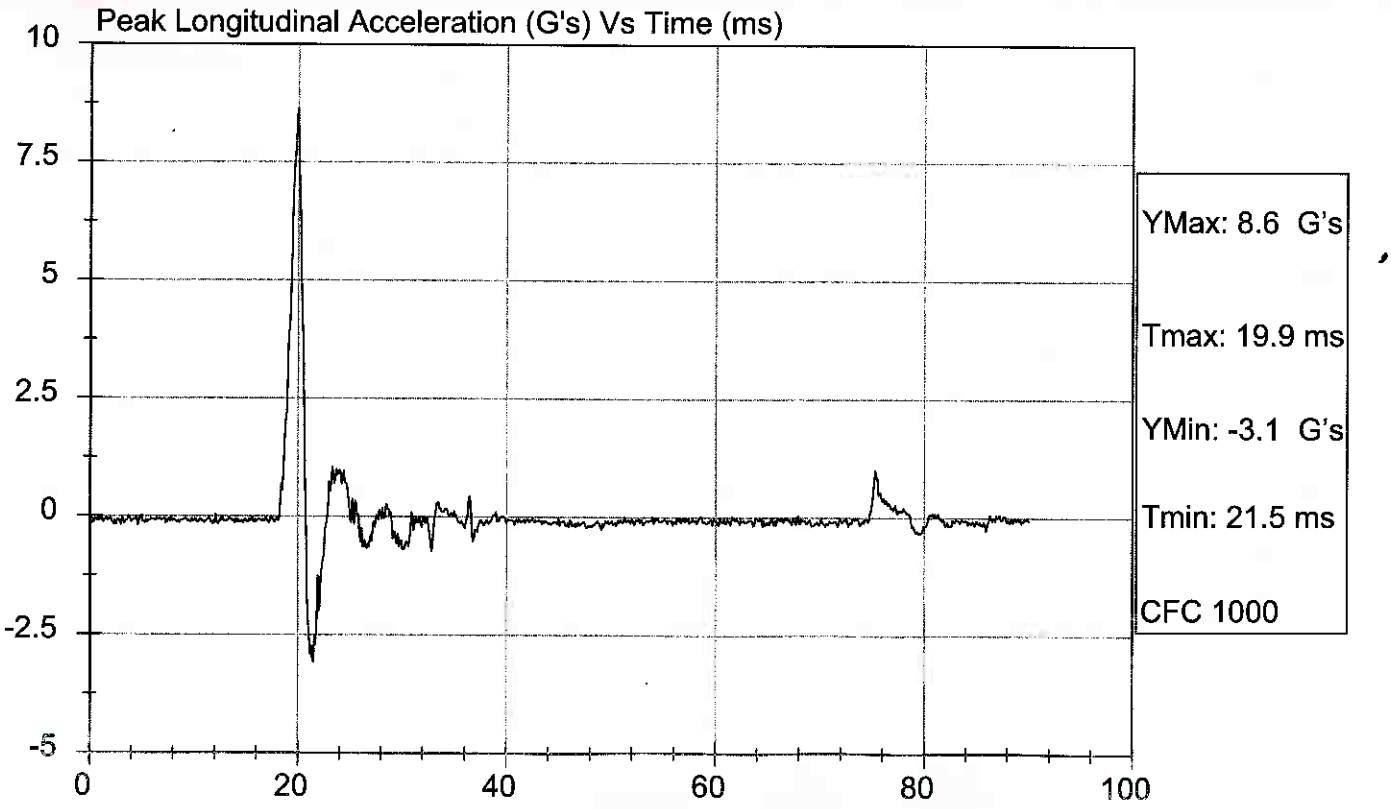
Laboratory Technician

2/12/09
Test Date

David Winkelbauer
Approved By

mga	Test Description: Head Drop	Test Date: 2/12/09
	Component: D09261	Speed: 0 ft/s, 0 m/s





SID/HIII Calibration Data Sheet

Side Impact Dummy

Thorax Impact Test

ATD Serial No: 036 **Test I.D:** D09262

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Probe Velocity	m/s	4.22 - 4.31	4.30	Pass
Upper Rib	G's	37 - 46	42	Pass
Lower Rib	G's	37 - 46	43	Pass
Lower Spine	G's	15 - 22	17	Pass
		Overall Test Results		Pass

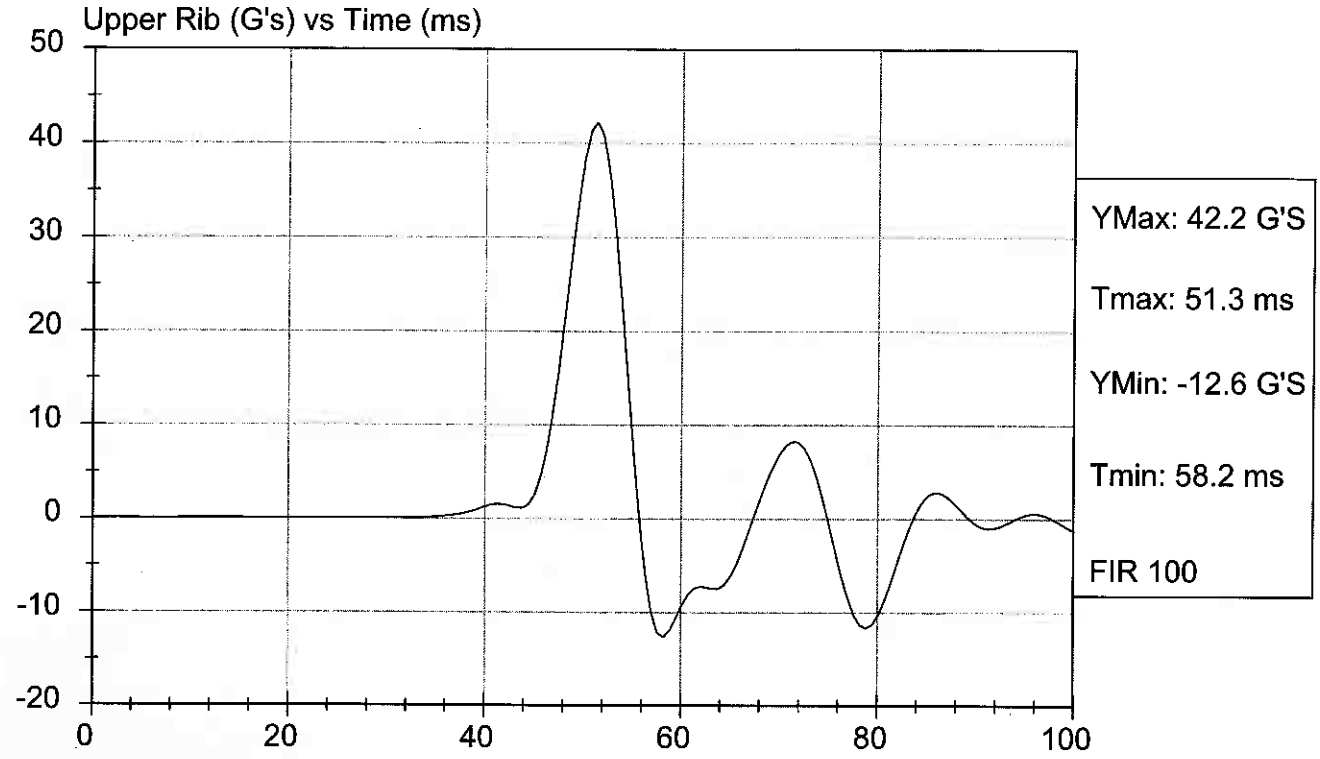
Tim Brady
Laboratory Technician

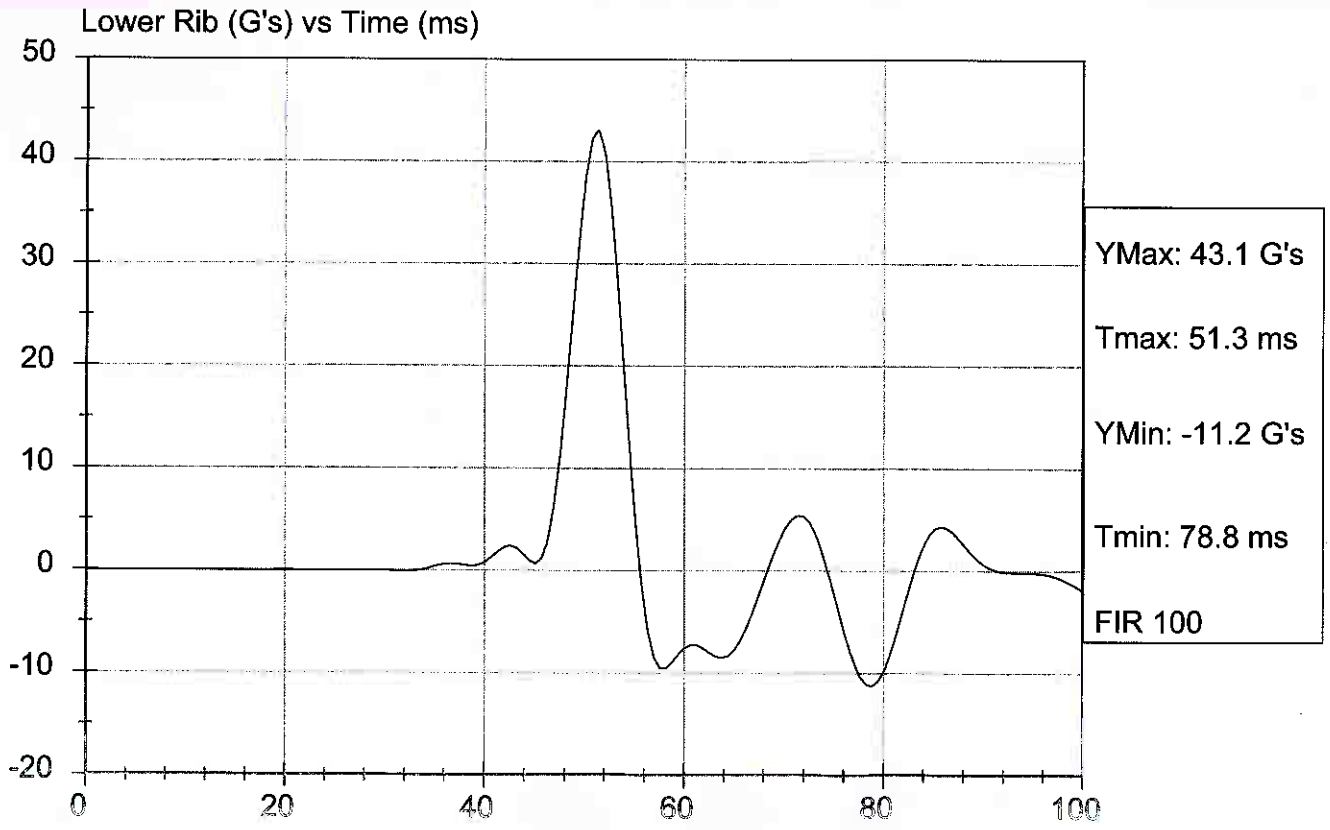
2/16/09
Test Date

David Winkelbauer
Approved By

Test Desc: Thorax Impact
Component ID: D09262

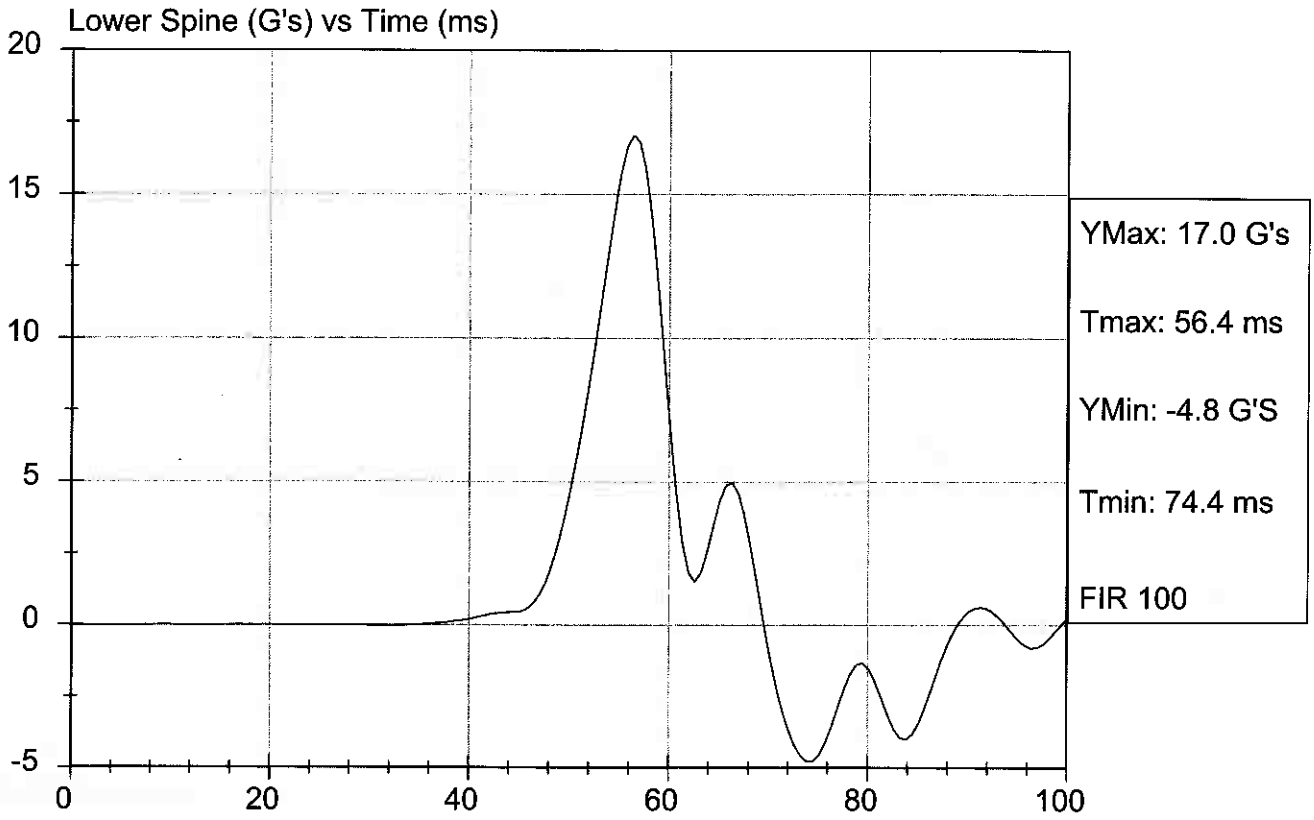
Test Date: 2/16/09
Speed: 14.12 ft/sec, 4.30 m/s





Test Desc: Thorax Impact
Component ID: D09262

Test Date: 2/16/09
Speed: 14.12 ft/sec, 4.30 m/s



SID/HIII Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Test

ATD Serial No: 036 **Test I.D:** D09263

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Probe Velocity	m/s	4.27 - 4.33	4.27	Pass
Pelvis Acceleration	G's	40 - 60	41	Pass
		Overall Test Results		Pass

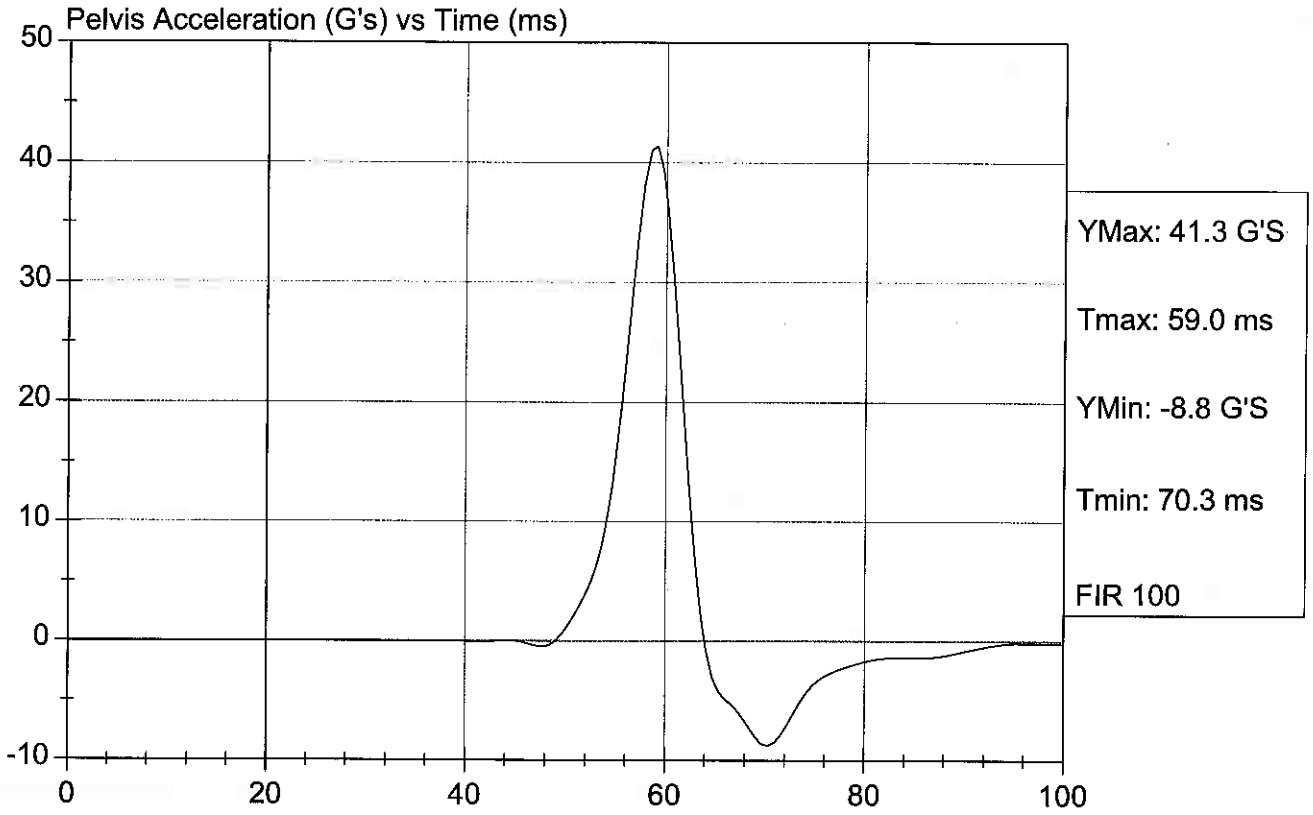
Laboratory Technician

2/16/09
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D09263

Test Date: 2/16/09
Speed: 14.01 ft/sec, 4.27 m/s



SID/HIII Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 036 **Test I.D:** D09264

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Force At 12.7 mm	N	104 -162	145	Pass
Force At 19 mm	N	163 - 222	199	Pass
Force At 25.4 mm	N	222 - 280	268	Pass
Force At 33 mm	N	325 - 391	360	Pass
		Overall Test Results		Pass

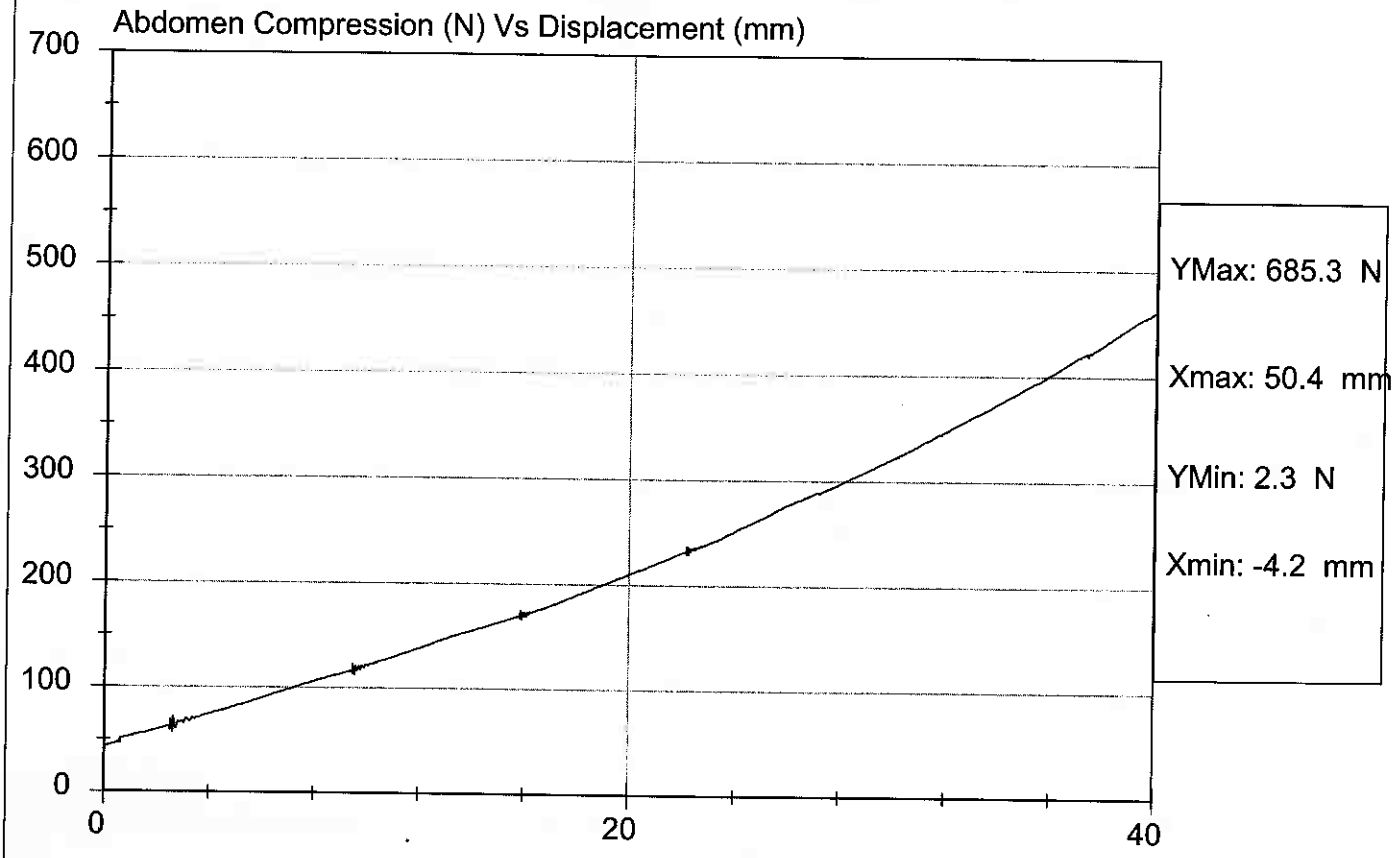
Laboratory Technician

2/12/09
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 2/12/09

Component: D09264 Speed: 0 ft/sec, 0 m/s



SID/HIII Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No: 039 **Test I.D:** D09265

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Force At 0 deg	N	0.0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	121.7	Pass
Force At 30 deg	N	151.2 - 204.6	157.0	Pass
Force At 40 deg	N	204.6 - 258.0	220.3	Pass
Return Angle	deg	12 Maximum	1	Pass
		Overall Test Results		Pass

Laboratory Technician

2/12/09
Test Date

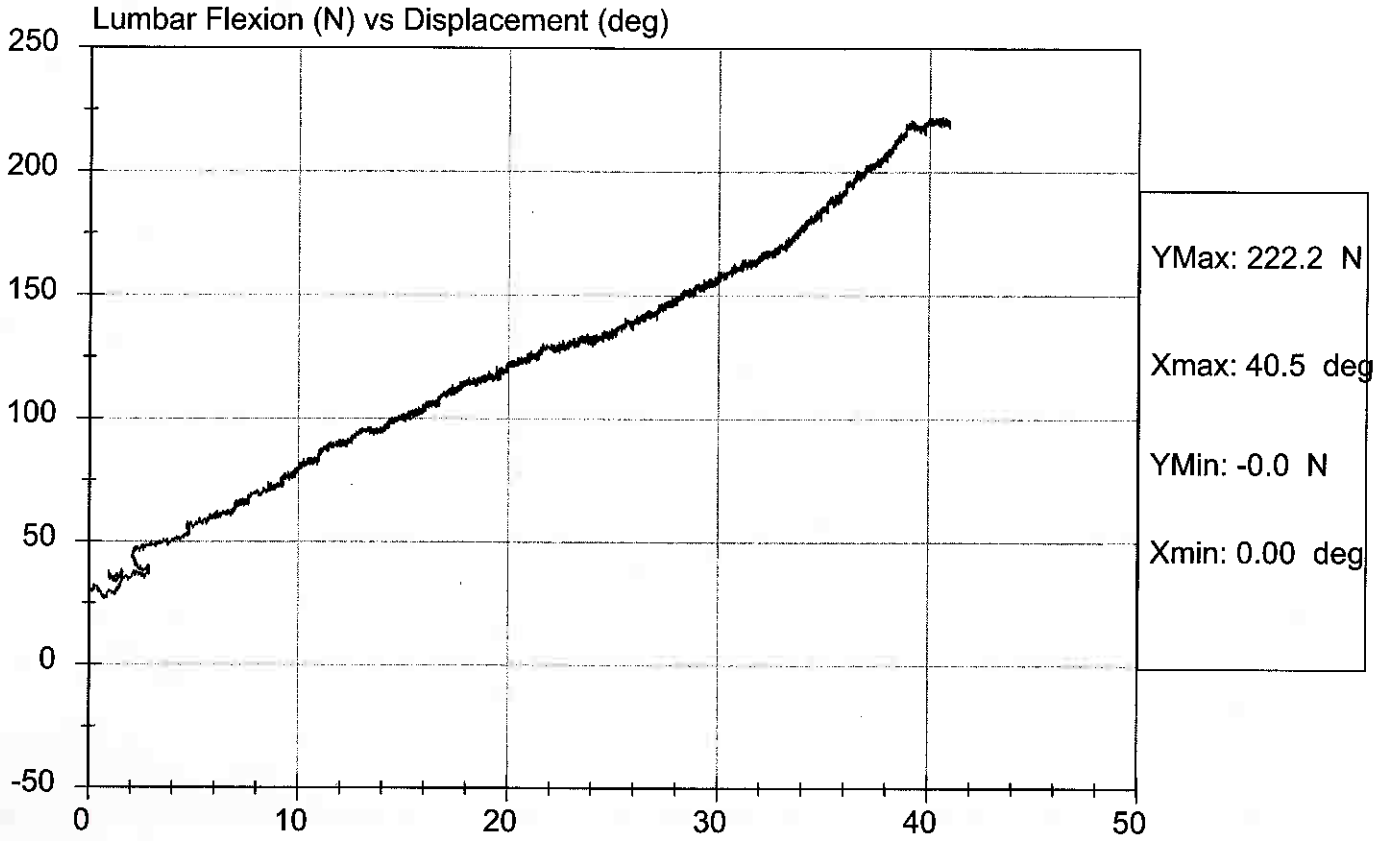
David Winkelbauer
Approved By

Test Description: Lumbar Flexion

Test Date: 2/12/09

Component: D09265

Speed: 0 ft/sec, 0 m/s



SID/HIII Calibration Data Sheet
Side Impact Dummy
Neck Pendulum Test

ATD Serial No: 036 **Test I.D:** D09269

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	20	Pass
Impact Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 ms	m/s	1.96 to 2.55	2.32	Pass
	20 ms	m/s	4.12 to 5.10	4.43	Pass
	30 ms	m/s	5.73 to 7.01	6.11	Pass
	40 to 70 ms	m/s	6.27 to 7.64	6.96	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	70	Pass
Head Rotation Peak to Zero - Decay Time		ms	58 to 67	67	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	75	Pass
Mx Peak To Zero - Decay Time		ms	49 to 64	56	Pass
Mx Peak to Max. Head Rotation		ms	2 to 16	10	Pass

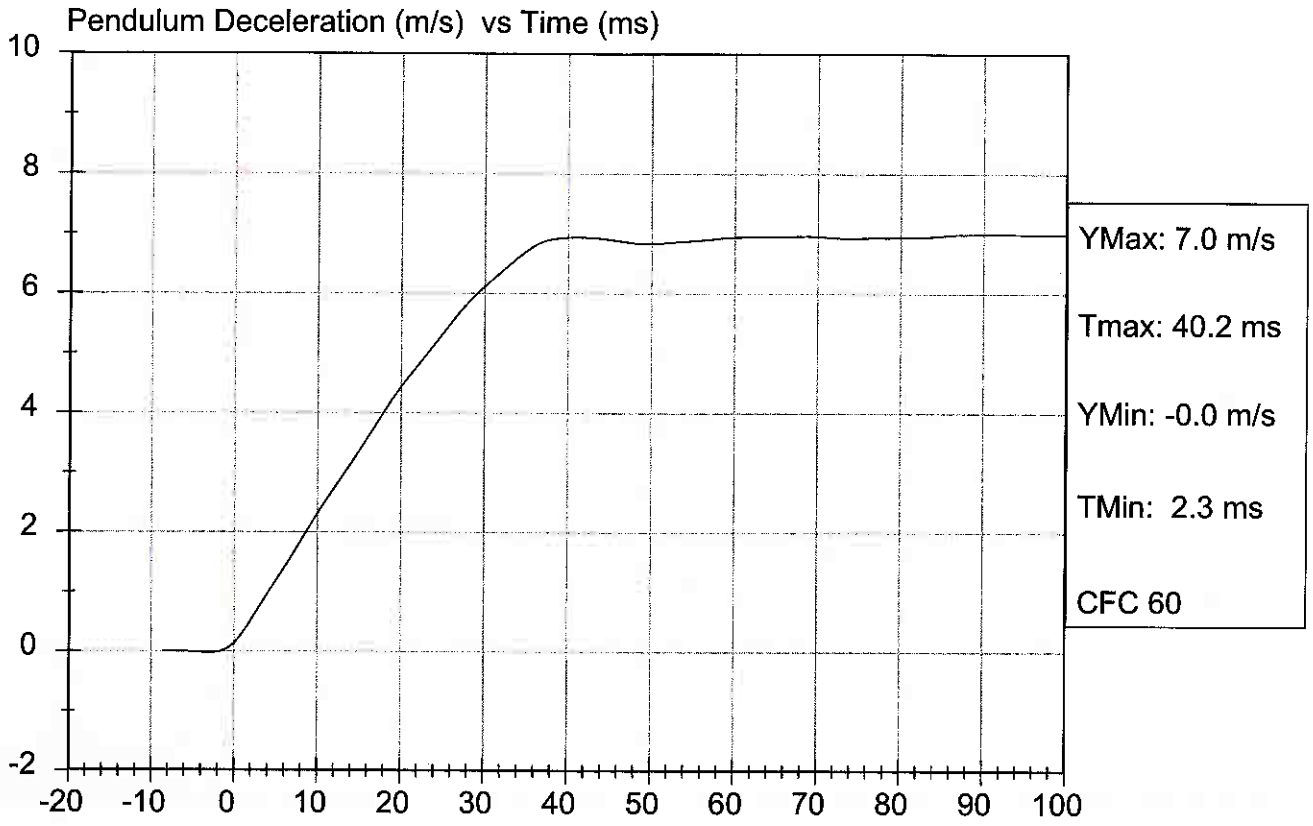
Tim Brady
Laboratory Technician

2/13/09
Test Date

David Winkelbauer
Approved By

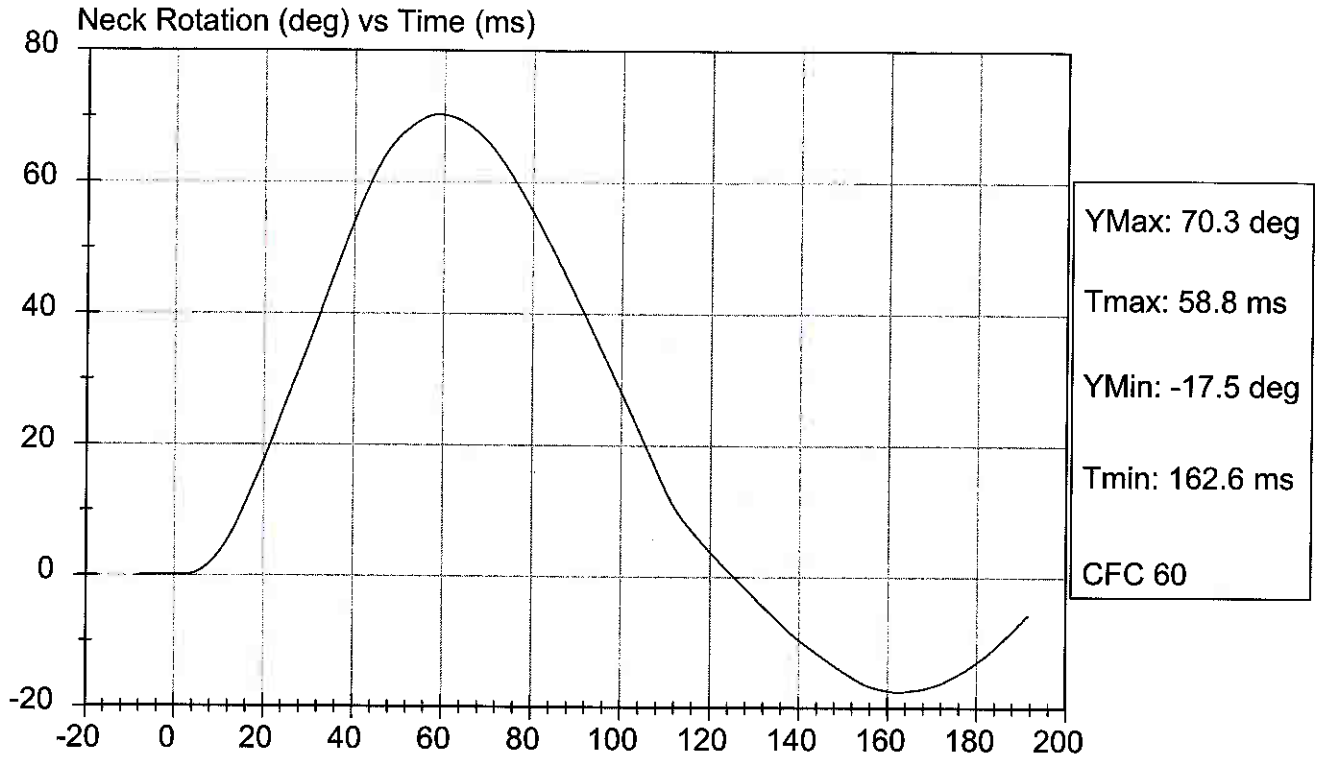
Test Desc: Neck Bending
Component ID: D09269

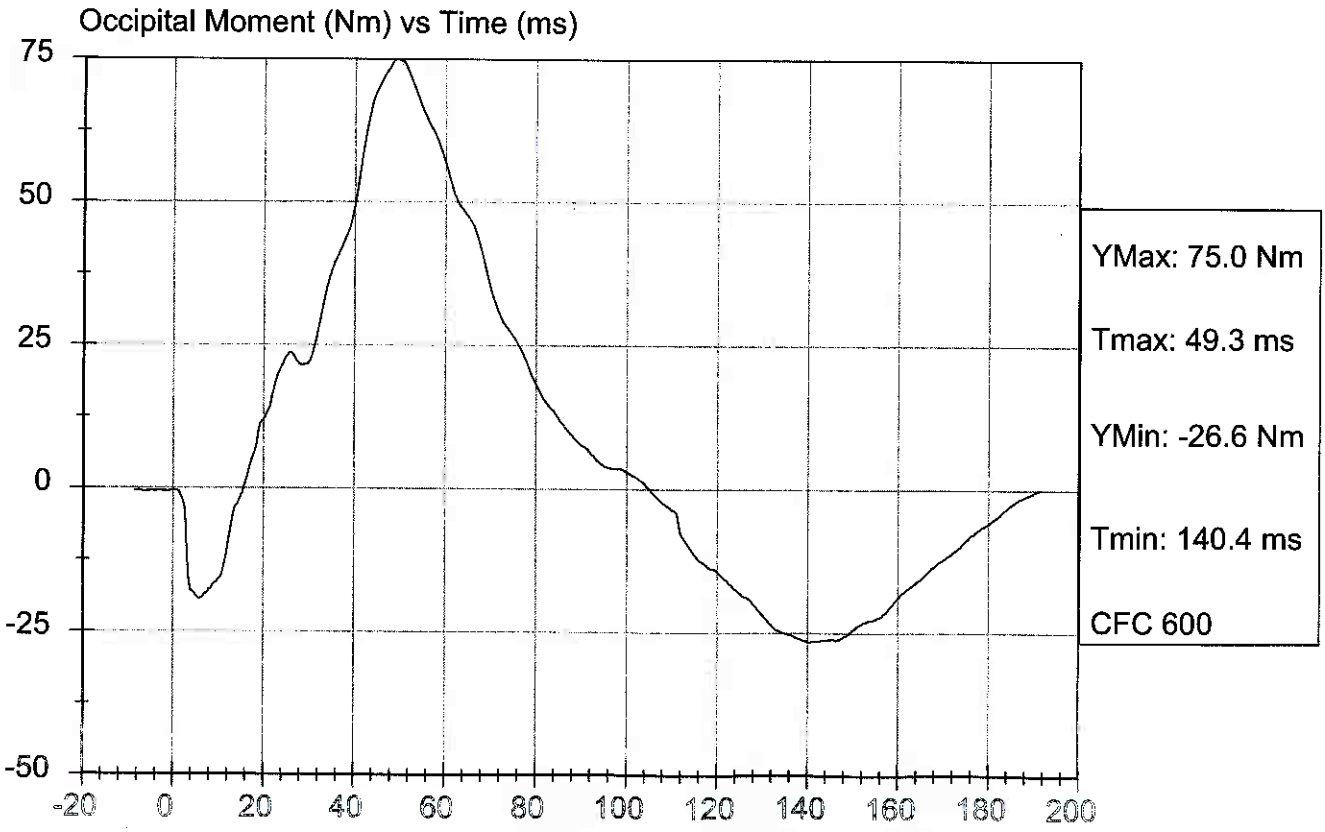
Test Date: 2/13/09
Speed: 22.83 ft/sec, 6.96 m/s



Test Desc: Neck Bending
Component ID: D09269

Test Date: 2/13/09
Speed: 22.83 ft/sec, 6.96 m/s





SID/HIII Calibration Data Sheet
Side Impact Dummy
Head Drop Calibration (Lateral)

ATD Serial No: 036 **Test I.D:** D09471

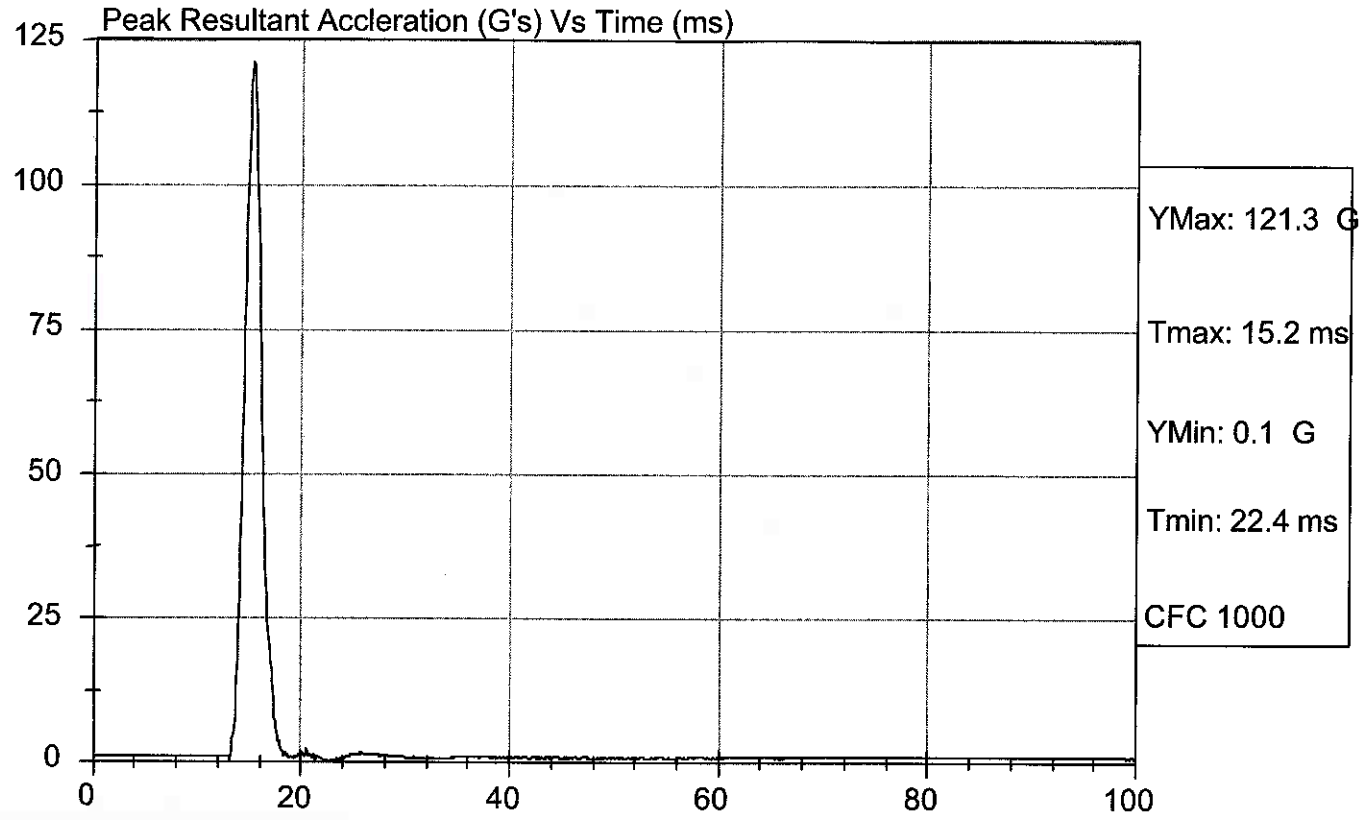
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.2	Pass
Laboratory Relative Humidity	%	10 to 70	19	Pass
Peak Resultant Acceleration	G's	120 to 150	121	Pass
Is Resultant Curve Unimodal?	N/A	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-7	Pass
		Overall Test Results		Pass

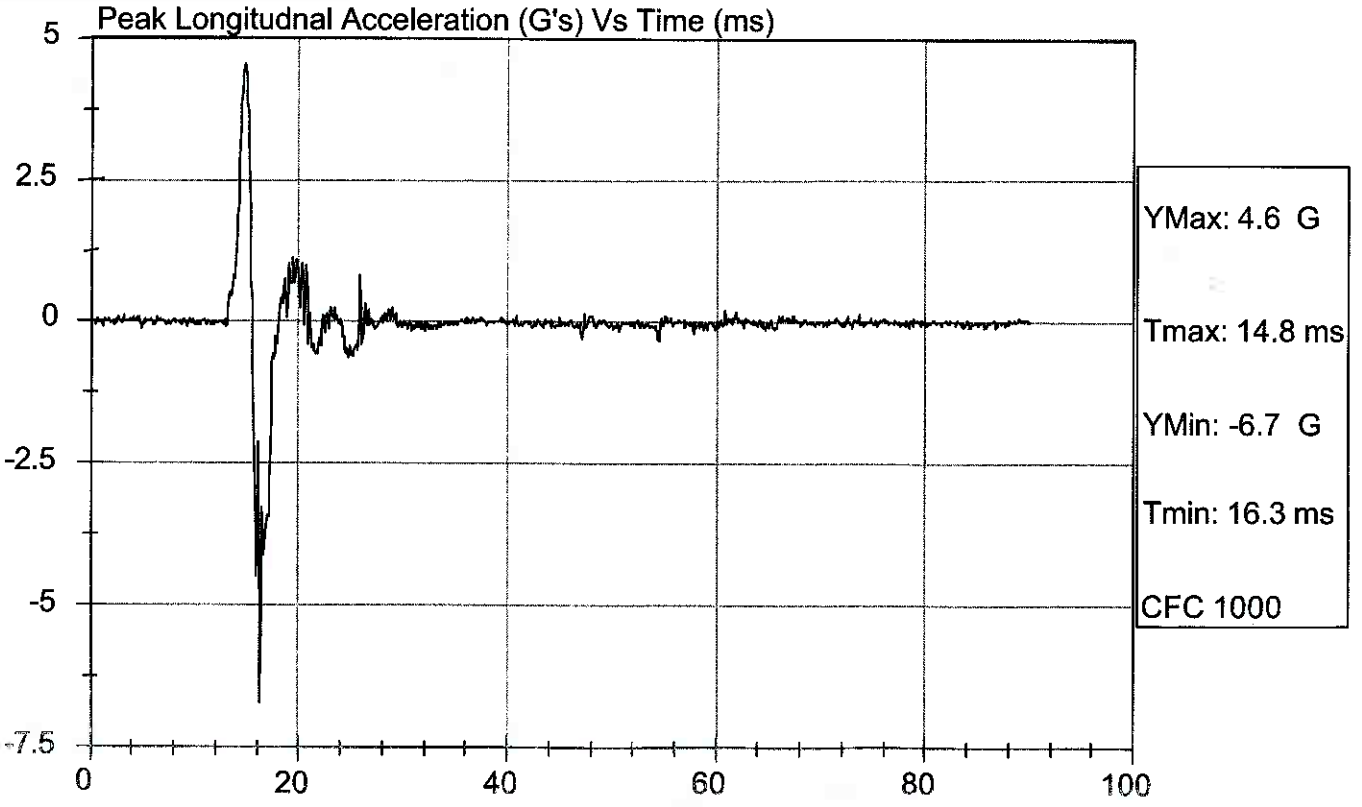
Laboratory Technician

3/11/09
Test Date

David Winkelbauer
Approved By

mga	Test Description: Head Drop	Test Date: 3/11/09
	Component: D09471	Speed: 0 ft/s, 0 m/s





SID/HIII Calibration Data Sheet
Side Impact Dummy
Thorax Impact Test

ATD Serial No: 036 **Test I.D:** D09472

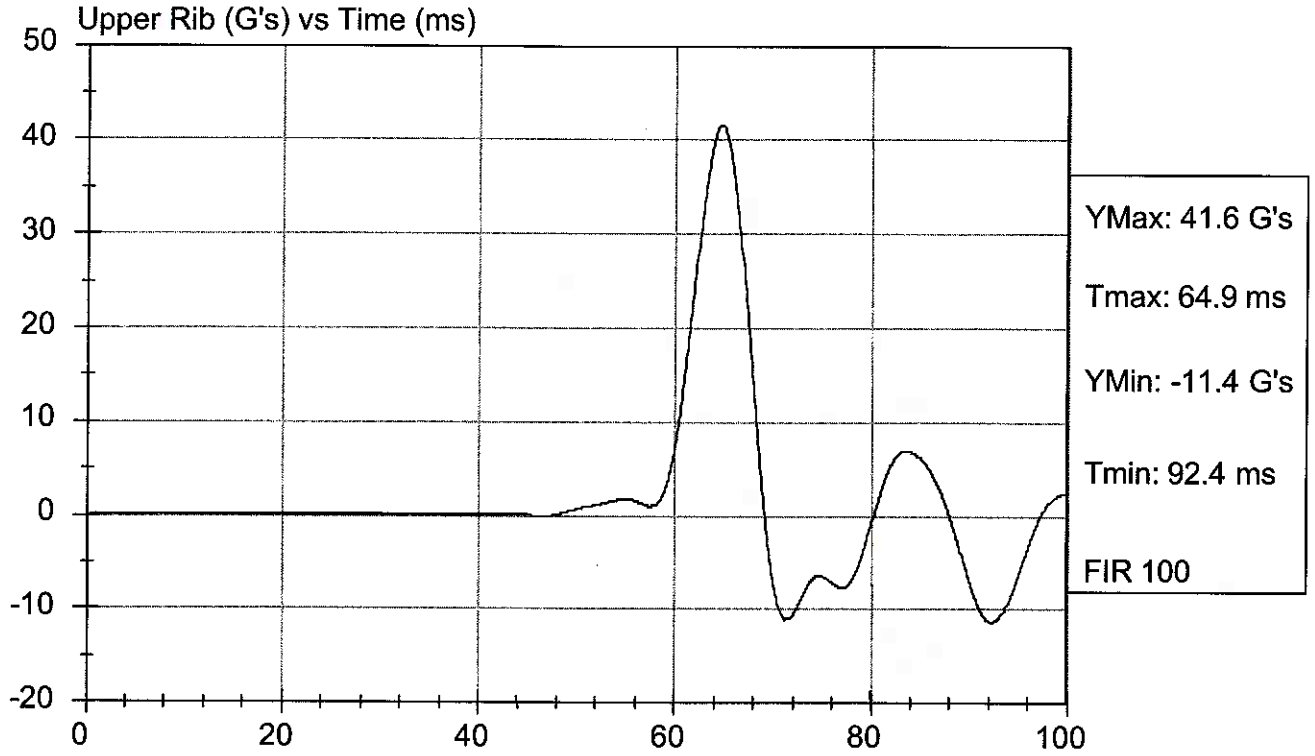
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Velocity	m/s	4.22 - 4.31	4.23	Pass
Upper Rib	G's	37 - 46	42	Pass
Lower Rib	G's	37 - 46	41	Pass
Lower Spine	G's	15 - 22	18	Pass
		Overall Test Results		Pass

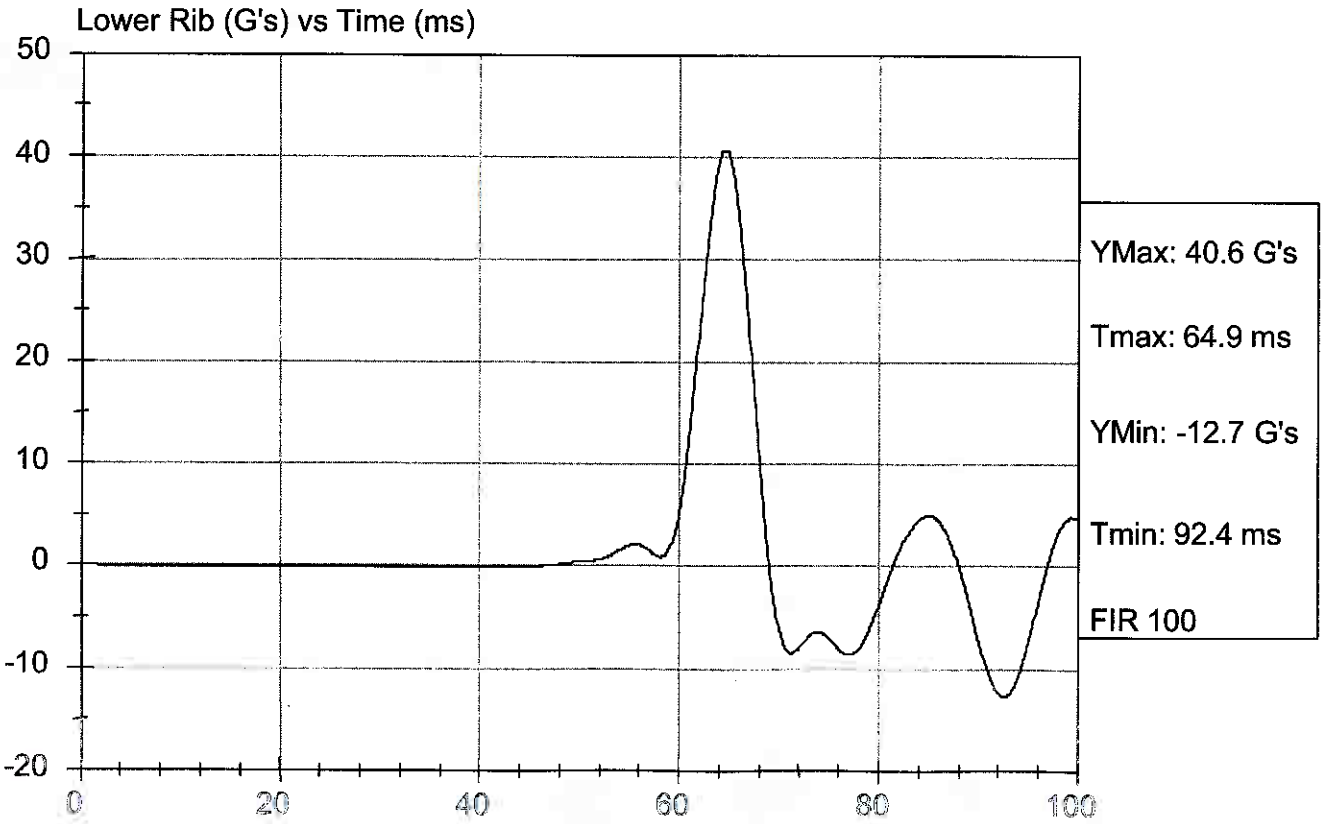
Tim Brady
Laboratory Technician

3/11/09
Test Date

David Winkelbauer
Approved By

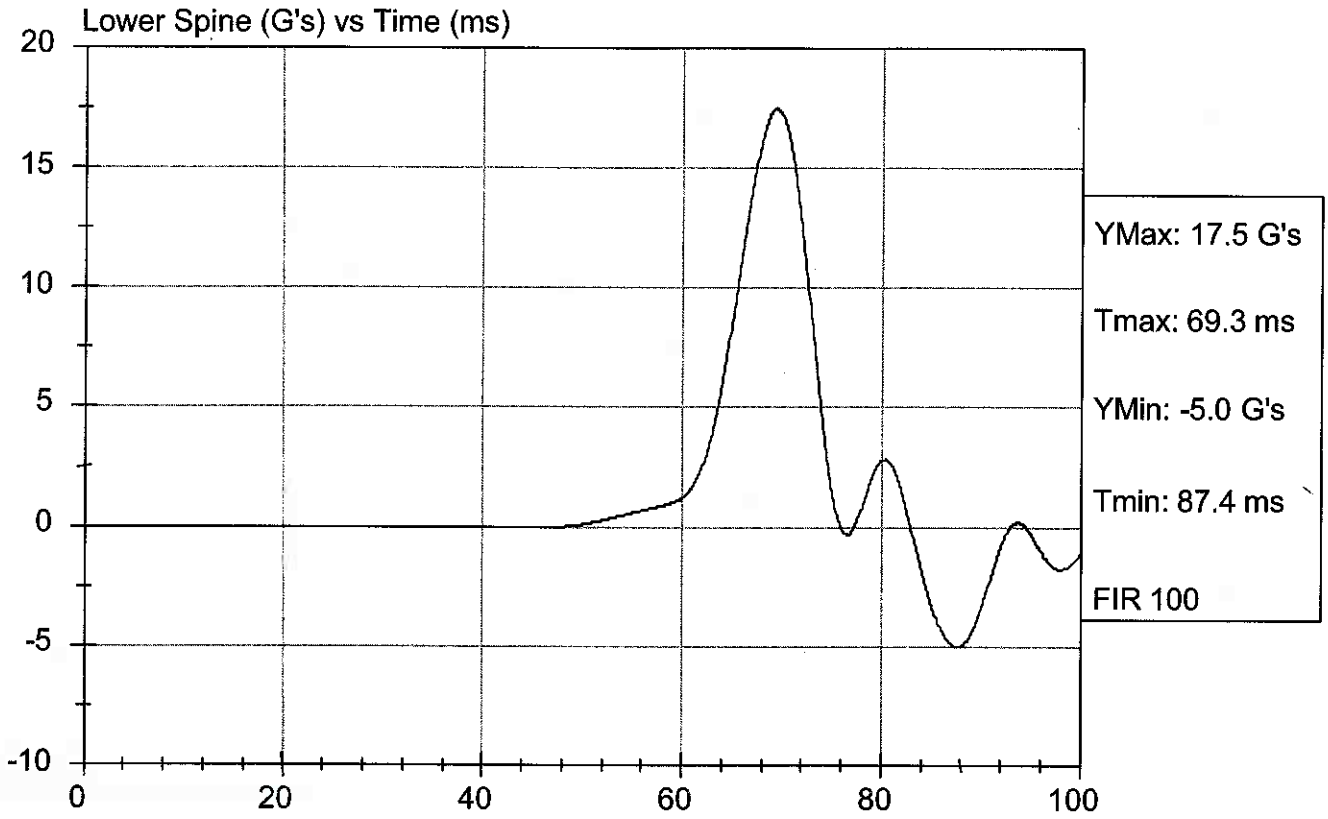
mga	Test Desc: Thorax Impact Component ID: D09472	Test Date: 3/11/09 Speed: 13.9 ft/s, 4.23 m/s





Test Desc: Thorax Impact
Component ID: D09472

Test Date: 3/11/09
Speed: 13.9 ft/s, 4.23 m/s



SID/HIII Calibration Data Sheet

Side Impact Dummy

Pelvis Impact Test

ATD Serial No: 036 **Test I.D:** D09473

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	42	Pass
		Overall Test Results		Pass

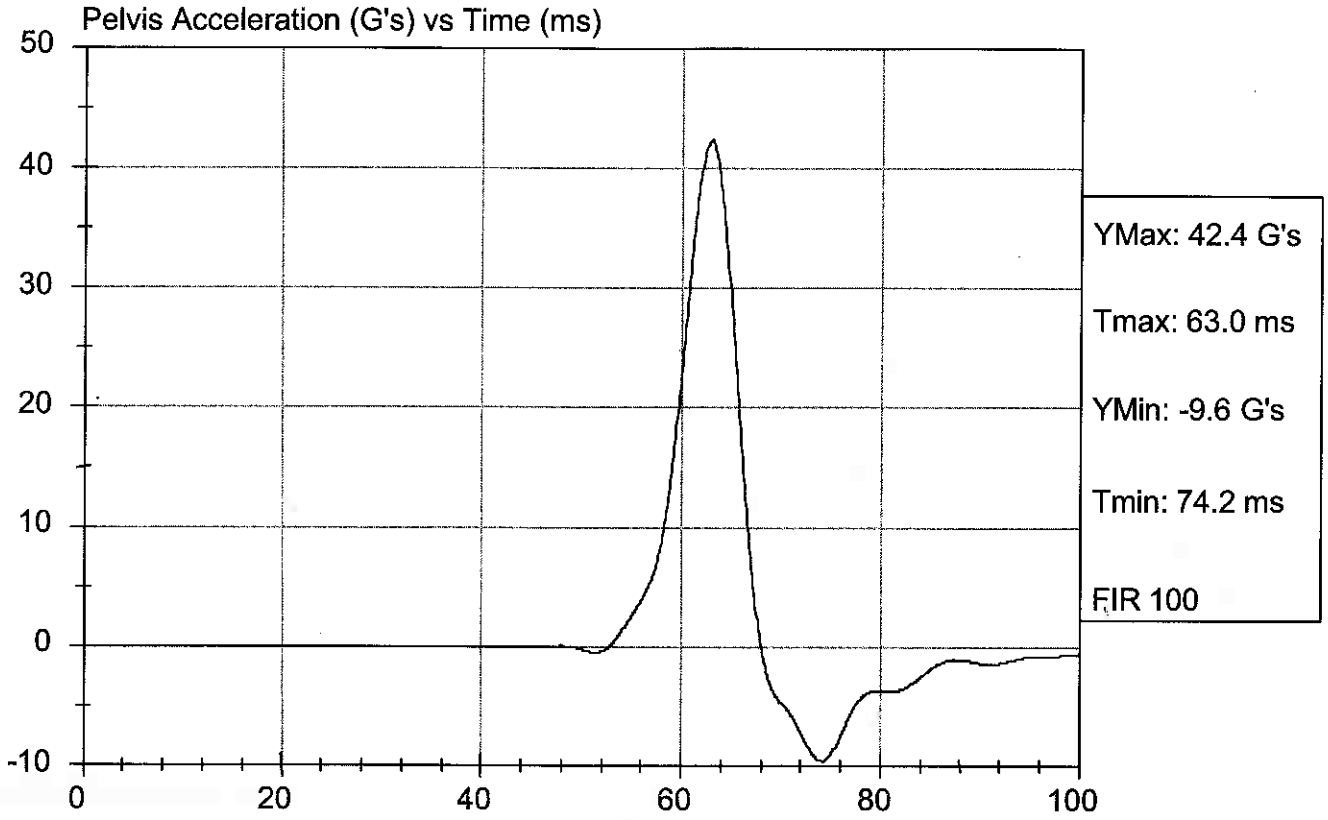
Tim Brady
Laboratory Technician

3/11/09
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Component ID: D09473

Test Date: 3/11/09
Speed: 14.1 ft/s, 4.30 m/s



SID/HIII Calibration Data Sheet

Side Impact Dummy

Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 036 **Test I.D:** D09474

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Force At 12.7 mm	N	104 -162	114	Pass
Force At 19 mm	N	163 - 222	172	Pass
Force At 25.4 mm	N	222 - 280	245	Pass
Force At 33 mm	N	325 - 391	345	Pass
		Overall Test Results		Pass

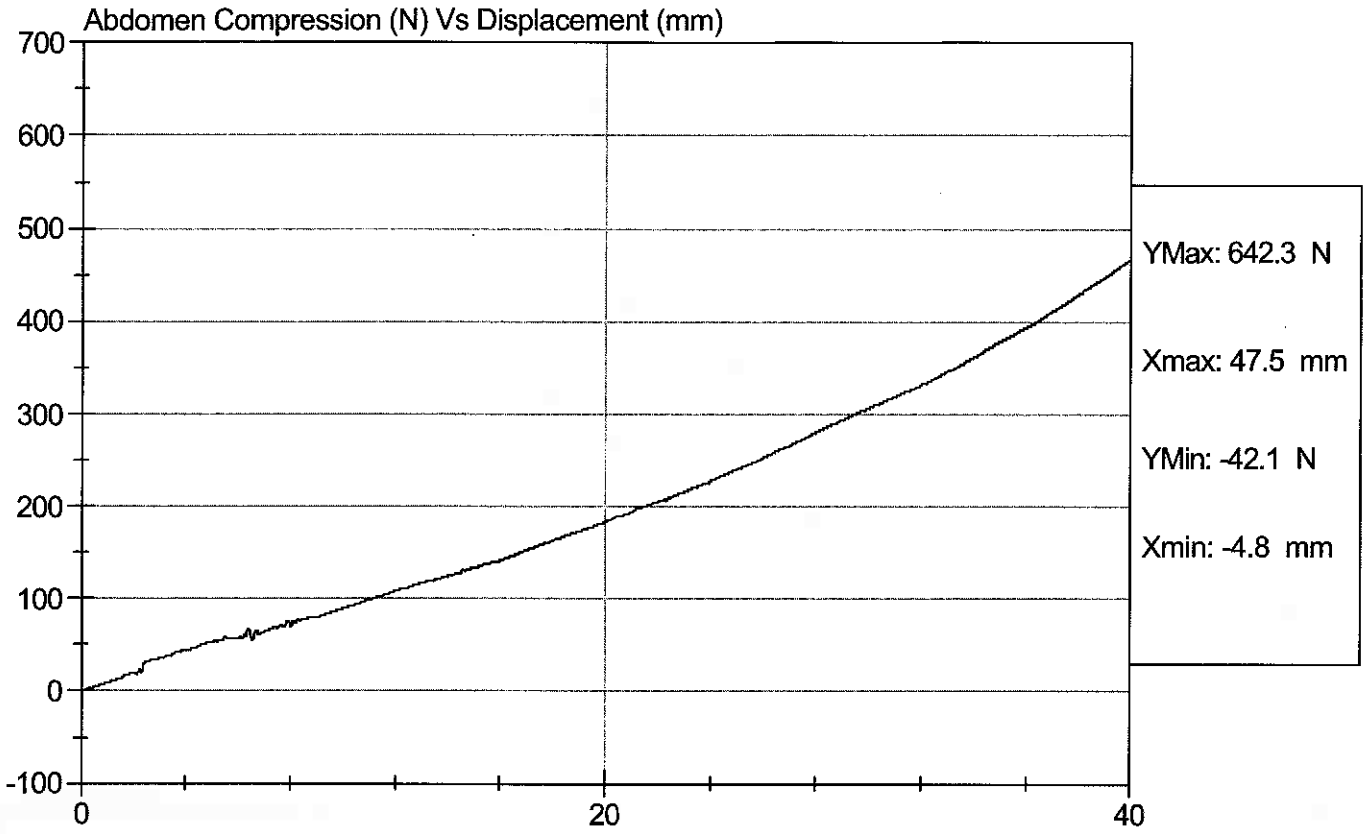
Laboratory Technician

3/11/09
Test Date

David Winkelbauer
Approved By

Test Description: Abdomen Compression Test Date: 3/11/09

Component: D09474 Speed: 0 ft/sec, 0 m/s



SID/HIII Calibration Data Sheet

Side Impact Dummy

Lumbar Flexion Calibration

ATD Serial No: 036 **Test I.D:** D09475

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Force At 0 deg	N	0 - 26.7	0	Pass
Force At 20 deg	N	97.9 - 151.2	138.8	Pass
Force At 30 deg	N	151.2 - 204.6	180.3	Pass
Force At 40 deg	N	204.6 - 258.0	252.0	Pass
Return Angle	Deg	12 Maximum	6	Pass
		Overall Test Results		Pass

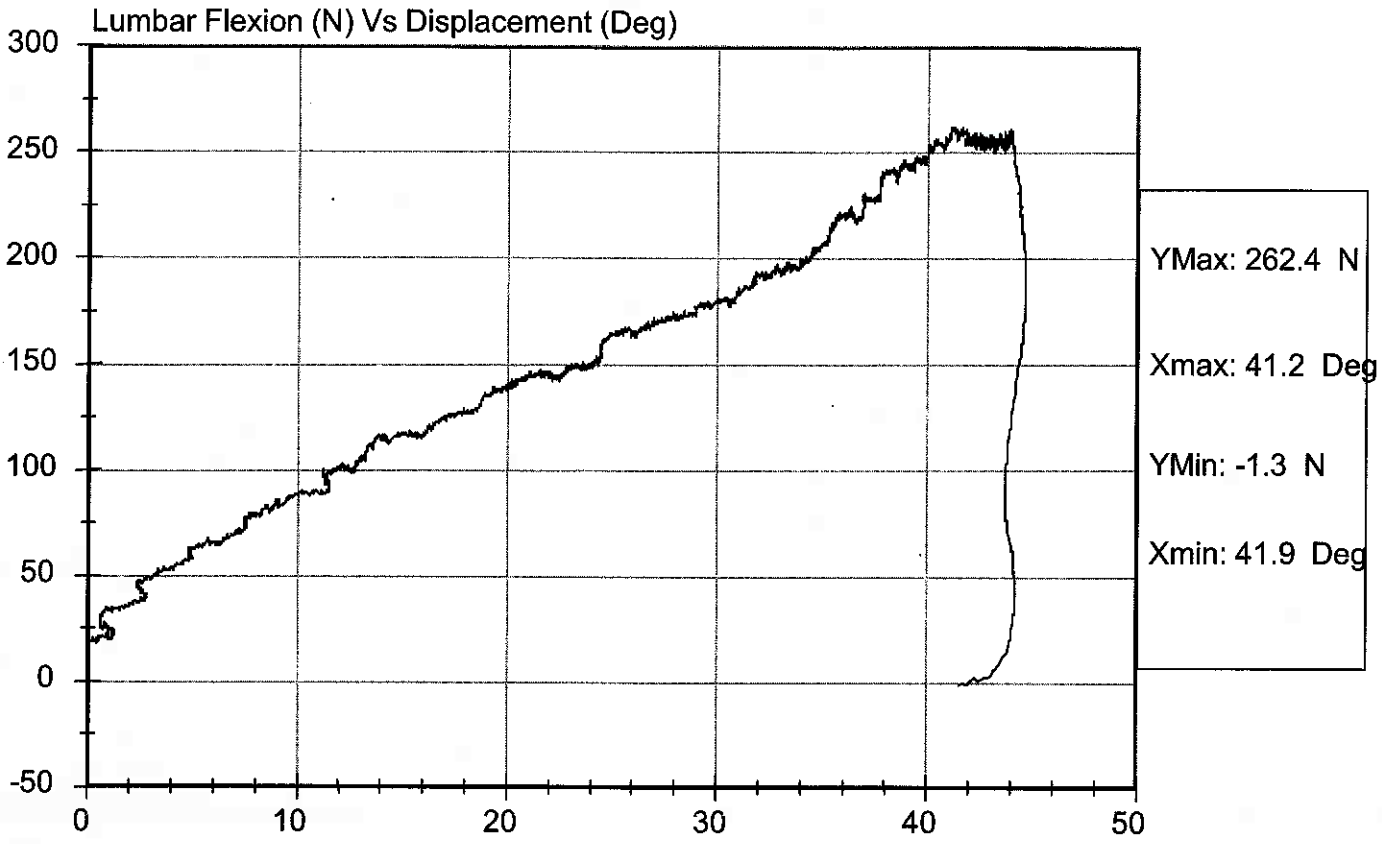
Tim Brady
Laboratory Technician

3/11/09
Test Date

David Winkelbauer
Approved By

Test Description: Lumbar Flexion | Test Date: 3/11/09

Component: D09475 | Speed: 0 ft/s, 0 m/s



SID/HIII Calibration Data Sheet
Side Impact Dummy
Neck Pendulum Test

ATD Serial No: 036 **Test I.D:** D09479

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	19	Pass
Impact Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 ms	m/s	1.96 to 2.55	2.51	Pass
	20 ms	m/s	4.12 to 5.10	4.80	Pass
	30 ms	m/s	5.73 to 7.01	6.55	Pass
	40 to 70 ms	m/s	6.27 to 7.64	6.85	Pass
Midsaggital Plane Max Rotation		deg	66 to 82	70	Pass
Head Rotation Peak to Zero - Decay Time		ms	58 to 67	59	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	74	Pass
Mx Peak To Zero - Decay Time		ms	49 to 64	58	Pass
Mx Peak to Max. Head Rotation		ms	2 to 16	13	Pass

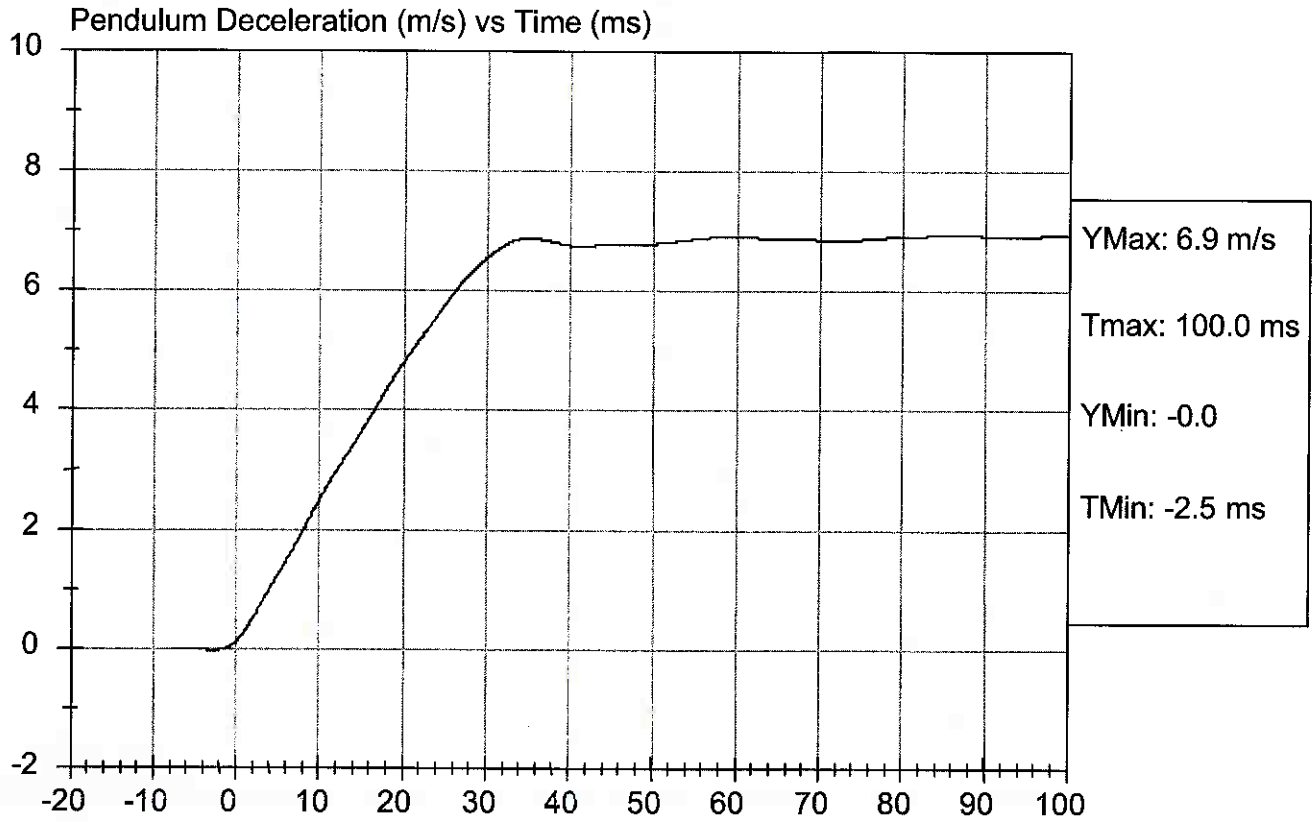
Laboratory Technician

3/11/09
Test Date

David Winkelbauer
Approved By

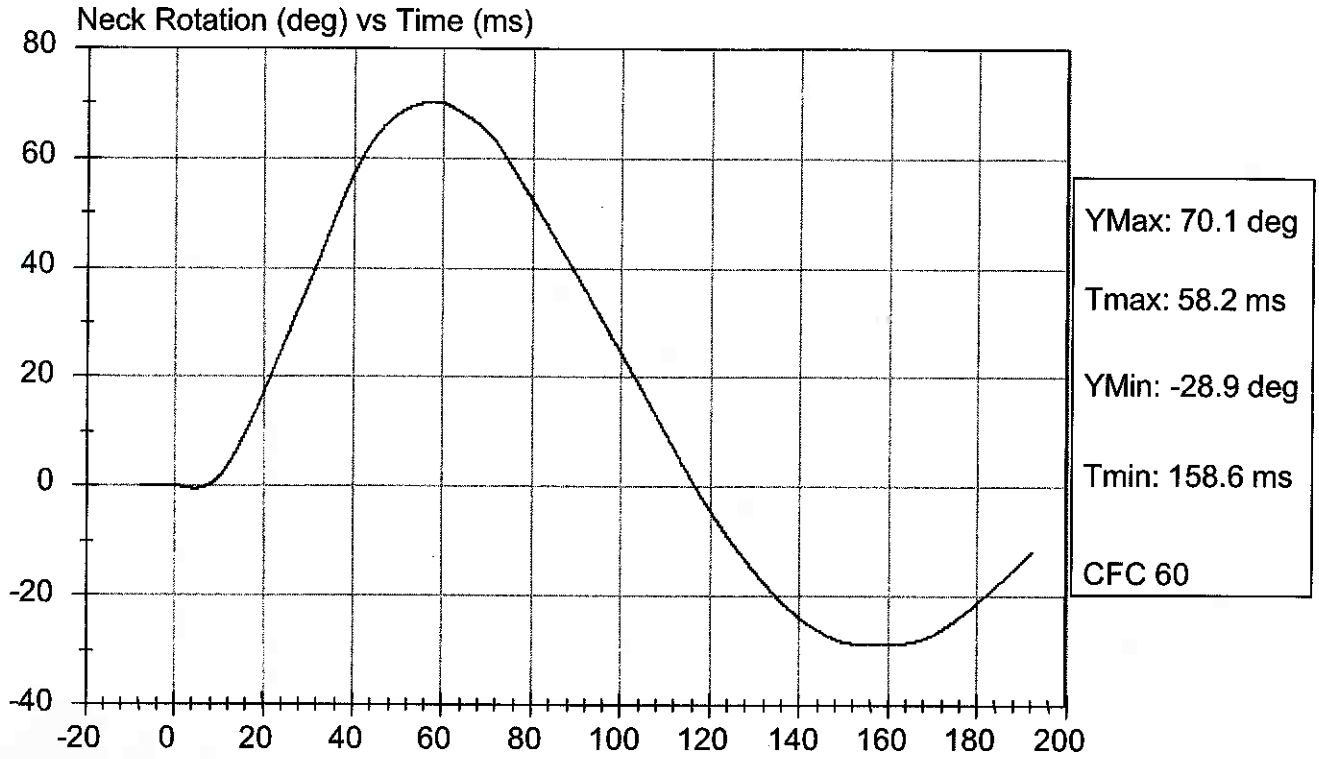
Test Desc: Neck Bending
Component ID: D09479

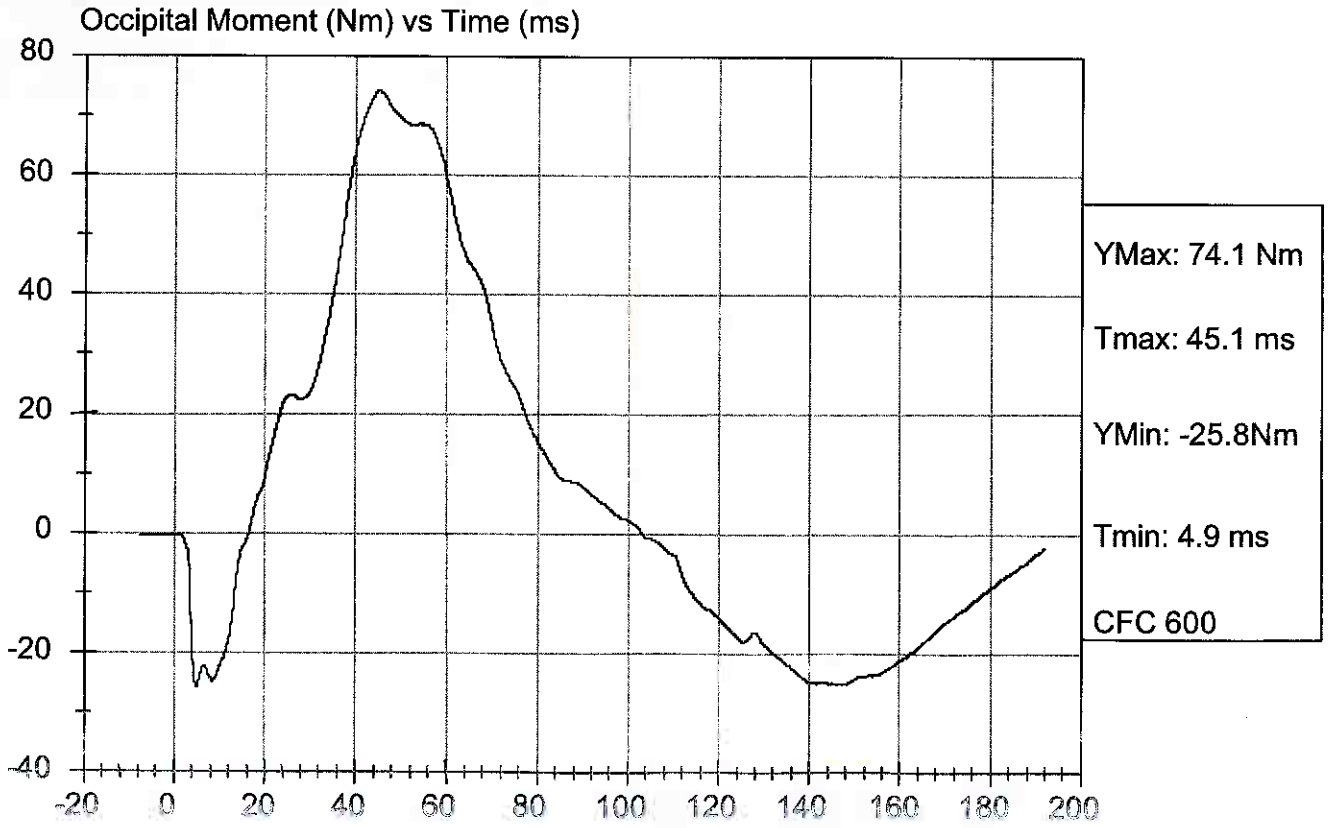
Test Date: 3/11/09
Speed: 23.1 ft/s, 7.05 m/s



Test Desc: Neck Bending
Component ID: D09479

Test Date: 3/11/09
Speed: 23.12 ft/s, 7.05 m/s





APPENDIX D

CALIBRATION INFORMATION DATA

DUMMY AND VEHICLE CALIBRATION DATA

	INSTRUMENTS FOR DRIVER S/N 037		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head CG X	AGH74	Endevco	2/23/2009
Head CG Y	C13046	Endevco	2/23/2009
Head CG Z	C10686	Endevco	2/23/2009
Neck Load Cell	650	Denton	11/21/2008
Upper Rib Y	P47096	Endevco	2/11/2009
Lower Rib Y	P52171	Endevco	2/11/2009
Lower Spine Y	P59301	Endevco	2/11/2009
Pelvis Y	P47093	Endevco	2/11/2009
Upper Rib Redundant Y	P47106	Endevco	2/11/2009
Lower Rib Redundant Y	P52170	Endevco	2/11/2009
Lower Spine Redundant Y	P59303	Endevco	2/11/2009
Pelvis Redundant Y	P47094	Endevco	2/11/2009

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Vehicle CG X	A28-H05	Entran	12/13/2009
Vehicle CG Y	B10-Z24	Entran	12/13/2008
Vehicle CG Z	A27-Z25	Entran	12/13/2008
Left Floor Y	AJ9F3	Endevco	11/13/2008
Left A-Post @ Sill Y	P26985	Endevco	12/18/2008
Left Lower A-Post Y	ALB87	Endevco	11/13/2008
Left Mid A-Post Y	AJ462	Endevco	10/07/2008
Left B-Post @ Sill Y	P24265	Endevco	11/13/2008
Left Lower B-Post Y	P28960	Endevco	11/13/2008
Left Mid B-Post Y	AGAY0	Endevco	12/18/2008
Driver Seat Track Y	P27001	Endevco	11/13/2008
Upper Engine X	H06-L13	Entran	1/13/2009
Upper Engine Y	H06-L18	Entran	1/13/2009
Firewall Y	C09-Y11	Entran	1/13/2009
Right Front Roof Y	A29-N14	Entran	11/13/2008
Right Floor Y	P26982	Endevco	12/18/2008
Rear Deck X	D12-X14	Entran	12/13/2008
Rear Deck Y	A12-Z01	Entran	12/13/2008