FINAL REPORT NUMBER 201UI-MGA-06-08

SAFETY COMPLIANCE TESTING FOR FMVSS 201
Occupant Protection In Interior Impact
Upper Interior Head Impact Protection

GENERAL MOTORS CORPORATION
2006 Saturn Ion 2, 4-Door Sedan
NHTSA No. C60103

MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083

Test Dates: September 20-22, 2006 and May 1, 2007
Report Date: May 2, 2007

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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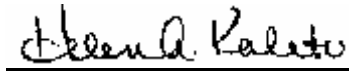
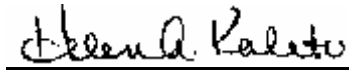
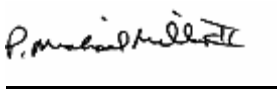
Prepared By: 
Helen A. Kaleto, Project Engineer


Helen A. Kaleto, Project Manager

Approved By: 

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4. Title and Subtitle Final Report of FMVSS 201U Compliance Testing of a 2006 Saturn Ion 2, 4-Door Sedan, NHTSA No. C60103		5. Report Date May 2, 2007 6. Performing Organization Code MGA	
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12. Sponsoring Agency Name and Address U.S. Department Of Transportation National Highway Traffic Safety Administration Enforcement Office of Vehicle Safety Compliance (NVS-220) 1200 New Jersey Avenue, West Building, 4th Floor Washington, D.C. 20590		13. Type of Report and Period Covered Final Test Report 14. Sponsoring Agency Code NVS-220	
15. Supplementary Notes			
16. Abstract A compliance test series was conducted on the subject 2006 Saturn Ion 2, 4-Door Sedan, NHTSA No. C60103, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-201U-01 for the determination of FMVSS 201 compliance. The testing was conducted at MGA Research Corporation in Troy, Michigan on September 20-22, 2006 and May 1, 2007. Test failures identified were as follows: AP3 - Right			
17. Key Words Compliance Testing Safety Engineering FMVSS 201UI 2006 Saturn Ion 2, 4-Door Sedan		18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division, Mail Code: NPO-410 1200 New Jersey Avenue, West Building, 4th Floor Washington, D.C. 20590 Telephone No. (202) 366-4946	
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1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this head impact compliance test was to determine whether the subject vehicle, a 2006 Saturn Ion 2, 4-Door Sedan, meets the performance requirements of FMVSS 201, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted on September 20-22, 2006 and May 1, 2007 on a 2006 Saturn Ion 2, 4-Door Sedan, manufactured by General Motors Corporation.

All tests were conducted in accordance with the U. S. Department of Transportation, National Highway Traffic Safety Administration's Laboratory Test Procedure TP-201U-01 dated April 3, 1998 and the corresponding MGA Research Corporation's FMVSS 201U procedure number MGATP201U_FRAME#2 dated July 1, 2005.

All tests were conducted at MGA Research Corporation in Troy, Michigan and were performed by MGA engineers and technicians. The FMVSS 201U impactor test machine was used to conduct the testing. Target locations were determined by using a Coordinate Measurement Machine in conjunction with the MGA EZ-Target™ program and MGA procedure MGATP201U_Test Series dated March 20, 2003.

2.0 COMPLIANCE TEST DATA SUMMARY

The 2006 Saturn Ion 2, 4-Door Sedan, was equipped with A, B, and rear pillars, an adjustable seat belt anchorage on each B-pillar, and a center roof dome light.

Upon completion of targeting the test vehicle, eleven (11) targets were chosen to be impacted based upon engineering judgment and certification test data provided by General Motors. The eleven (11) targets chosen were:

AP1	BP1	RP1	UR5 (BP1)
AP3 - Left	BP2	SR2-A	UR7 (RP1)
AP3 - Right	BP4	UR4 (SR2-B)	

The 2006 Saturn Ion 2, 4-Door Sedan, tested does not appear to comply with the upper interior performance criteria for FMVSS 201. The HIC(d) measured using the Part 572L (Free Motion Headform) was below 1000 for each tested component with the exception of AP3 Right.

TABLE 2-1

SUMMARY TABLE OF TEST RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2006 Saturn Ion 2, 4-Door Sedan

VEH. NHTSA NO.: C60103 VIN: 1G8AZ55F46Z145819 COLOR: Silver

VEH. BUILD DATE: October, 2005

TEST DATES: September 20-22, 2006 and May 1, 2007

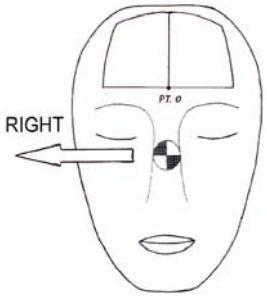
TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen A. Kaleto, Louis Campbell, Bryan Hood, Scott Keyser

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	112	38	24.1	505	448	18	5 Left
AP3	Left	202	45	23.5	698	704	11	4 Left
AP3	Right	158	45	23.6	1088	1221	8	12 Left
BP1	Left	270	35	23.2	811	854	30	10 Left
BP2*	Right	90	-9	24.2	455	383	23	0
BP4	Left	201	-4	23.9	593	566	15	3 Left
RP1	Right	90	10	24.2	268	135	45	0
SR2-A	Left	270	35	24.0	463	394	20	10
UR4 (SR2-B)	Right	90	37	24.0	686	689	30	3 Left
UR5 (BP1)	Right	90	35	23.8	689	693	15	4 Left
UR7 (RP1)	Left	270	45	23.8	711	722	45	9 Left

*For BP2, the impact angle range is 0°-50° per S8.13.4, approach angles, of FMVSS 201.

Above and left/right refers to the position relative to reference pt. 0 where the target made contact with the Free Motion Headform. See the diagram below for details.



POST TEST COMMENTS:

The following description lists any post-test damage or other test observations for each target.

AP3 Left: A-Pillar displacement; screw cover displacement.

AP3 Right: The A-pillar screw cover was knocked out.

BP2 Right: The D-ring cover broke off.

BP4 Left: The bottom of the B-pillar trim broke off.

RP1 Right: Headliner deformation.

UR4 (SR2-B) Right: Headliner deformation.

UR7 (RP1) Left: Headliner deformation.

REMARKS:

The targets listed were impacted in the following order:

Right: AP3, AP1, UR4 (SR2-B), BP2, UR5 (BP1), RP1

Left: UR7 (RP1), BP4, BP1, SR2(A), AP3

The 150 mm rule was observed for targets horizontal to each other and the 200 mm rule was observed for vertical components.

RECORDED BY: Louis Campbell DATE: May 1, 2007

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2006 Saturn Ion 2, 4-Door Sedan

VEH. NHTSA NO.: C60103 VIN: 1G8AZ55F46Z145819 COLOR: Silver

VEH. BUILD DATE: October, 2005

TEST DATES: September 20-22, 2006 and May 1, 2007

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen A. Kaleto, Louis Campbell, Bryan Hood, Scott Keyser

INTERIOR TRIM INFORMATION: A, B, and rear pillars, an adjustable seat belt anchorage on each B-pillar, and a center roof domelight.

SUNROOF INFORMATION:

Installed: _____Yes __X__ No

Operation: _____Electric ____ Manual

SIDE RAIL CURTAIN AIRBAG INFORMATION:

Installed: _____Yes __X__ No

ROLL-BAR INFORMATION:

Installed: _____Yes __X__ No

Padded: _____Yes __X__ No

Braces: _____Yes __X__ No

GENERAL INFORMATION:

Date Received: 9/8/2006; Odometer Reading: 191 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: General Motors Corporation

Date of Manufacture: October, 2005; VIN: 1G8AZ55F46Z145819

GVWR: 1662 kg; GAWR FRONT: 849 kg;

GAWR REAR: 813 kg

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 210 kpa REAR: 210 kpa

Recommended Tire Size: P195/60R15

Recommended Cold Tire Pressure:

FRONT: 210 kpa REAR: 210 kpa

Size of Tire on Test Vehicle: P195/60R15

Type of Spare Tire: T115/70R14; Saver: X; Standard_____

VEHICLE CAPACITY DATA:

Type of Front Seats: Bench___; Bucket __X__; Split Bench _____

Number of Occupants: Front 2; Rear 3; TOTAL 5

VEHICLE CAPACITY WEIGHT:

Vehicle Capacity Weight (VCW) = 408 kg

No. of Occupants x 68 kg = 340 kg

Rated Cargo/Luggage Weight (RCLW) = 68 kg (difference) (150 lbs.)

WEIGHT OF TEST VEHICLE AS DELIVERED AT LABORATORY: (with maximum fluids)

Right Front =	365.0 kg	Right Rear =	251.5 kg
Left Front =	377.5 kg	Left Rear =	246.0 kg
TOTAL FRONT =	742.5 kg	TOTAL REAR =	497.5 kg
% Total Weight =	59.9 %	% Total Weight =	40.1 %

TOTAL DELIVERED WEIGHT = 1240.0 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1240.0 kg

Max. Test Cargo/Luggage Weight = 68.0 kg

Target Test Weight = 1308.0 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	364.0 kg	Right Rear =	286.0 kg
Left Front =	377.0 kg	Left Rear =	282.5 kg
TOTAL FRONT =	741.0 kg	TOTAL REAR =	568.5 kg
% Total Weight =	56.6 %	% Total Weight =	43.4 %

TOTAL TEST WEIGHT = 1309.5 kg

Weight of ballast secured in vehicle's cargo area = 68.0 kg

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 695 mm; Left Front 690 mm;
Right Rear 707 mm; Left Rear 701 mm;
Pitch Angle at Right Door Sill = 0.3 Rear is higher
Pitch Angle at Left Door Sill = 0.2 Rear is higher
Roll Angle at Front Bumper = 0.1 Left-side is higher
Roll Angle at Rear Bumper = 0.1 Left-side is higher

FULLY LOADED: Right Front 694 mm; Left Front 692 mm;
Right Rear 690 mm; Left Rear 685 mm;
Pitch Angle at Right Door Sill = 0.1 Front is higher
Pitch Angle at Left Door Sill = 0.1 Front is higher
Roll Angle at Front Bumper = 0.1 Left-side is higher
Roll Angle at Rear Bumper = 0.1 Left-side is higher

AS TARGETED: Right Front 894 mm; Left Front 888 mm;
Right Rear 887 mm; Left Rear 877 mm;
Pitch Angle at Right Door Sill = 0.1 Front is higher
Pitch Angle at Left Door Sill = 0.1 Front is higher
Roll Angle at Front Bumper = 0.1 Left-side is higher
Roll Angle at Rear Bumper = 0.0

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill =	0.1 Front is higher
Pitch Angle at Left Door Sill =	0.1 Front is higher
Roll Angle at Front Bumper =	0.1 Left-side is higher
Roll Angle at Rear Bumper =	0.2 Left-side is higher

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill =	0.0
Pitch Angle at Left Door Sill =	0.1 Front is higher
Roll Angle at Front Bumper =	0.1 Left-side is higher
Roll Angle at Rear Bumper =	0.1 Left-side is higher

VEHICLE WHEELBASE = 2615 mm

REMARKS: The seat travel distance was measured to be 260 mm for the driver front seat and 250 mm for the passenger front seat.

RECORDED BY: Louis Campbell DATE: September 17, 2006

APPROVED BY: Helen A. Kaleto

TABLE 2-3

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2006 Saturn Ion 2, 4-Door Sedan

VEH. NHTSA NO.: C60103 VIN: 1G8AZ55F46Z145819 COLOR: Silver

VEH. BUILD DATE: October, 2005

TEST DATES: September 20-22, 2006 and May 1, 2007

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen A. Kaleto, Louis Campbell, Bryan Hood, Scott Keyser

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

	HORIZONTAL ANGLE SPECIFIED RANGE	MINIMUM HORIZONTAL ANGLE	MAXIMUM HORIZONTAL ANGLE
A-PILLAR	L 195º-255º	L 201.5º	L 248.5º
	R 105º-165º	R 112.1º	R 158.3º
B-PILLAR	L 195º-345º	L 201.1º	L 289.6º
	R 15º-165º	R 69.5º	R 158.6º

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Louis Campbell DATE: September 17, 2006

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2006 Saturn Ion 2, 4-Door Sedan

VEH. NHTSA NO.: C60103 VIN: 1G8AZ55F46Z145819 COLOR: Silver

VEH. BUILD DATE: October, 2005

TEST DATES: September 20-22, 2006 and May 1, 2007

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen A. Kaleto, Louis Campbell, Bryan Hood, Scott Keyser

VERTICAL IMPACT ANGLE RANGES

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	FH1	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
	FH2	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
SIDE RAIL	SR1	L 0º-50º	L 0º	L 35º
		R 0º-50º	R 0º	R 35º
	SR2A	L 0º-50º	L 0º	L 35º
		R 0º-50º	R 0º	R 35º
	SR2B	L 0º-50º	L 0º	L 35º
		R 0º-50º	R 0º	R 35º
	SR3-1	L 0º-50º	L 0º	L 35º
		R 0º-50º	R 0º	R 35º
REAR HEADER	RH	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
A-PILLAR	AP1	L -5º-50º	L -5º	L 38º
		R -5º-50º	R -5º	R 38º
	AP2	L -5º-50º	L -5º	L 49º
		R -5º-50º	R -5º	R 49º

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
	AP3	L -5º-50º	L -5º	L 45º
		R -5º-50º	R -5º	R 45º
B-PILLAR	BP1	L -10º-50º	L -10º	L 26º
		R -10º-50º	R -10º	R 26º
	BP2*	L 0º-50º	L 0º	L 0º
		R 0º-50º	R 0º	R 0º
	BP3	L -10º-50º	L -10º	L -10º
		R -10º-50º	R -10º	R -10º
	BP4	L -10º-50º	L -10º	L -4º
		R -10º-50º	R -10º	R -4º
REAR PILLAR	RP1	L -10º-50º	L -10º	L 10º
		R -10º-50º	R -10º	R 10º
	RP2	L -10º-50º	L -10º	L 48º
		R -10º-50º	R -10º	R 48º
UPPER ROOF 1		0º-50º	0º	45º
UPPER ROOF 2		0º-50º	0º	35º
UPPER ROOF 3		0º-50º	0º	33º
UPPER ROOF 4		0º-50º	0º	37º
UPPER ROOF 5		0º-50º	0º	35º
UPPER ROOF 6		0º-50º	0º	45º
UPPER ROOF 7		0º-50º	0º	45º

As determined using the Procedures specified in S8.13.4.2. *Target BP2 is a seat belt anchorage location.

RECORDED BY: Louis Campbell DATE: September 17, 2006

APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2006 Saturn Ion 2, 4-Door Sedan

VEH. NHTSA NO.: C60103 VIN: 1G8AZ55F46Z145819 COLOR: Silver

VEH. BUILD DATE: November, 2005

TEST DATES: September 20, 2006 - May 1, 2007

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen A. Kaleto, Louis Campbell, Bryan Hood, Scott Keyser

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	260 mm	250 mm
T^{o}	Horizontal < {CG-F1 (Left Seat) to (Right A-Pillar)}	111.5^{o}	--
A1^{o}	360^{o} - T^{o}	248.5^{o}	--
W^{o}	Horizontal < {CG-2 (Left Seat) to (Left A-Pillar)}	201.5^{o}	--
A2^{o}	A2^{o} = W^{o}	201.5^{o}	--
U^{o}	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	289.6^{o}	--
B1^{o}	B1^{o} = U^{o}	289.6^{o}	--
V^{o}	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	201.1^{o}	--
B2^{o}	B2^{o} = V^{o}	201.1^{o}	--
W^{o} (right)	Horizontal < {CG-F2 (Right Seat) to (Right A-Pillar)}	--	158.3^{o}
A1^{o} (right)	A1^{o} (right) = W^{o} (right)	--	158.3^{o}
T ^{o} (right)	Horizontal < {CG-F1 (Right Seat) to (Left A-Pillar)}	--	247.9^{o}
A2^{o} (right)	360^{o}-T^{o} (right)	--	112.1^{o}
V ^{o} (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	158.6^{o}
B1^{o} (right)	B1^{o} (right) = V^{o} (right)	--	158.6^{o}
U ^{o} (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	69.5^{o}
B2^{o} (right)	B2^{o} (right) = U^{o} (right)	--	69.5^{o}
J	A-Pillar {(Plane 3) - (Plane 5)}	307.3 mm	306.3 mm
J/2	J ÷ 2	153.7 mm	153.2 mm
D1	Upper Roof {(Plane A) - (Plane B)}	1506.1 mm	
D1/2	D1 ÷ 2	753.1 mm	
D2	Upper Roof {(Plane C) - (Plane D)}	1170.5 mm	
D2/2	D2 ÷ 2	585.3 mm	

Measurement	Description	Left Side	Right Side
.35D1	.35 x D1	527.1 mm	
.35D2	.35 x D2	409.7 mm	
N	B-Pillar {(BPR) - (lowest point on daylight opening forward of B-Pillar)}	427.2 mm	423.3 mm
N/2	B-Pillar {(BP3) - (lowest point on daylight opening forward of B-Pillar)}	213.6 mm	211.7 mm
N/4	B-Pillar {(BP4) - (lowest point on daylight opening forward of B-Pillar)}	106.8 mm	105.8 mm
D	R-Pillar (Point 7 – Point M)	676.0 mm	676.0 mm
3D/7	3*D / 7	289.7 mm	289.7 mm

As determined using the Procedures specified in S10.1-10.13.

SgRP Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	Y	z
Front	2046.3	-341.4	1449.4	2047.9	338.6	1449.5
Rear	2824.7	-333.0	1493.2	2826.3	327.1	1493.3

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	Y	z
Front	3116.0	-340.0	461.0	3116.0	340.0	461.0
Rear	3895.0	-330.0	502.0	3895.0	330.0	502.0

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	Y	z
CGF1	1946.3	-341.4	2109.4	1957.9	338.6	2109.5
CGF2	2206.3	-341.4	2109.4	2207.9	338.6	2109.5
CGR	2984.7	-333.0	2153.2	2986.3	327.1	2153.3

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Driver door, front top striker bolt hole (x, y, z) = 3262.9, -753.3, 593.9

Passenger door, front top striker bolt hole (x, y, z) = 3262.9, 753.3, 593.9

Passenger door, front outboard seat anchorage (x, y, z) = 2841.0, 578.0, 258.1

REMARKS:

RECORDED BY: Louis Campbell DATE: September 17, 2006

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2006 Saturn Ion 2, 4-Door Sedan

VEH. NHTSA NO.: C60103 VIN: 1G8AZ55F46Z145819 COLOR: Silver

VEH. BUILD DATE: October, 2005

TEST DATES: September 20-22, 2006 and May 1, 2007

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen A. Kaleto, Louis Campbell, Bryan Hood, Scott Keyser

SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
A-Pillar Left Side								
AP1	2907.7	-522.2	1220.2	249	38	No	--	No
AP2	2674.7	-577.8	1132.2	202	49	--	--	--
AP3	2547.1	-607.9	1067.8	202	45	No	--	Yes
A-Pillar Right Side								
AP1	2906.0	522.5	1223.5	112	38	No	--	Yes
AP2	2677.4	576.8	1135.8	158	49	No	--	No
AP3	2548.1	605.4	1071.1	158	45	No	--	Yes
B-Pillar Left Side								
BP1	3398.6	-445.0	1307.7	270	26	No	--	Yes
BP2*	3371.7	-553.6	1099.5	270	-9	No	--	No
BP3	3339.0	-594.0	1094.1	--	--	Yes	--	--
REL	3329.4	-610.2	1077.6	290	-10	--	1	No
BP4	3400.8	-636.4	987.8	201	-4	No	--	Yes
B-Pillar Right Side								
BP1	3401.3	449.3	1309.3	90	26	No	--	No
BP2*	3379.3	548.2	1121.1	90	-9	No	--	Yes
BP3	3337.0	595.7	1098.2	--	--	Yes	--	--
REL	3316.8	604.6	1081.9	70	-10	--	1	No
BP4	3398.8	636.7	992.9	157	-4	No	--	No

SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
Rear Pillar Left Side								
RP1	4089.2	-481.4	1234.7	270	10	No	--	No
RP2	4280.5	-589.9	1085.4	--	--	Yes	--	--
REL	4190.5	-514.8	1173.9	315	48	--	6	No
Rear Pillar Right Side								
RP1	4087.9	489.5	1232.6	90	10	No	--	Yes
RP2	4286.4	595.2	1082.9	--	--	Yes	--	--
REL	4201.8	519.6	1170.0	45	48	--	6	No
Front Header Left Side								
FH1	2815.1	-414.3	1268.0	--	--	Yes	--	--
REL	2806.8	-394.4	1261.3	180	50	--	1	No
FH2	2797.8	-263.9	1275.2	180	50	No	--	No
Front Header Right Side								
FH1	2817.0	416.6	1270.1	--	--	Yes	--	--
REL	2802.7	393.4	1262.9	180	50	--	1	No
FH2	2796.3	266.2	1275.5	180	50	No	--	No
Side Rail Left Side								
SR1	3057.1	-461.4	1279.2	270	35	No	--	No
SR2A	3207.3	-453.8	1295.8	270	35	No	--	Yes
SR2B	3098.8	-460.7	1282.9	270	35	No	--	No
SR3-1	3547.8	-452.9	1302.9	270	35	No	--	No
Side Rail Right Side								
SR1	3056.2	471.2	1276.4	90	35	No	--	No
SR2A	3206.0	461.6	1292.9	90	35	No	--	No
SR2B	3100.8	466.6	1282.9	90	35	No	--	No
SR3-1	3550.8	462.7	1302.2	90	35	No	--	No
Rear Header Left Side								
RH	4089.8	-328.3	1296.3	0	50	No	--	No

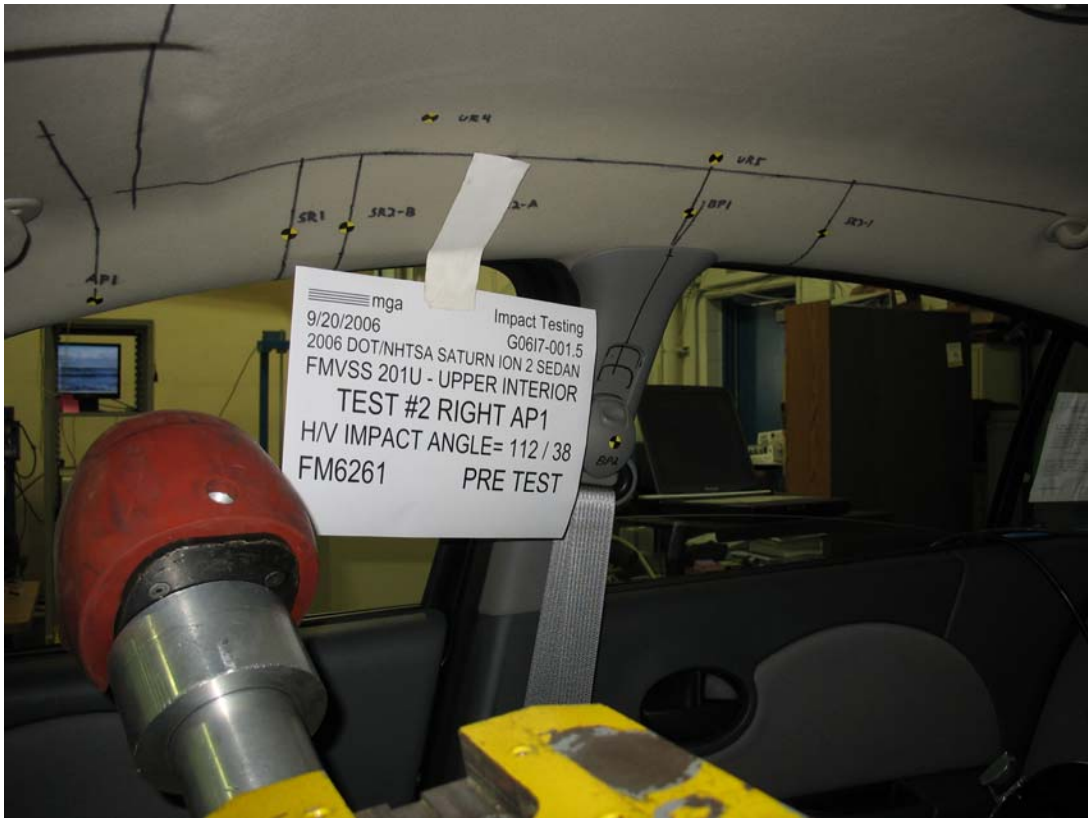
SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
Rear Header Right Side								
RH	4099.2	332.0	1294.8	0	50	No	--	No
Upper Roof Left Side								
UR1	2960.2	-396.5	1292.3	270	45	No	--	No
UR2	3703.8	-385.5	1342.3	270	35	No	--	No
UR3	3994.8	-402.2	1310.6	270	33	No	--	No
UR7	3830.0	-296.0	1367.0	270	45	No	--	Yes
Upper Roof Right Side								
UR4	3136.4	374.9	1350.6	90	37	No	--	Yes
UR5	3394.8	398.0	1346.5	90	35	No	--	Yes
UR6	3830.9	296.0	1367.0	90	45	No	--	No

REMARKS: For BP2, the impact angle range is 0 - 50° per S8.13.4, approach angles, of FMVSS 201.

RECORDED BY: Louis Campbell DATE: September 17, 2006

APPROVED BY: Helen A. Kaleto

3.0 **TEST DATA** (Included Acceleration and Velocity Plots)




mga
Impact Testing
9/20/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #2 RIGHT AP1
H/V IMPACT ANGLE= 112 / 38
FM6261
POST TEST


mga
Impact Testing
9/20/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #2 RIGHT AP1
H/V IMPACT ANGLE= 112 / 38
FM6261
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#2

Target (Vehicle Side): AP1Right

Temperature:22C

MGA Test Reference No.:FM6261

Humidity:43%

Approach Horizontal Angles:112º

Time of Test:1:33 PM

Approach Vertical Angles:38º

FMH Serial No:[038]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
505	448	8.1	24.1	18	5 Left

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-108.8	1.29	1.29
Y	6	J36193	102.7	1.80	1.79
Z	7	J36353	97.2	1.31	1.31

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage.

Recorded By: _____ Approved By*: _____ Date: 9/20/2006

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

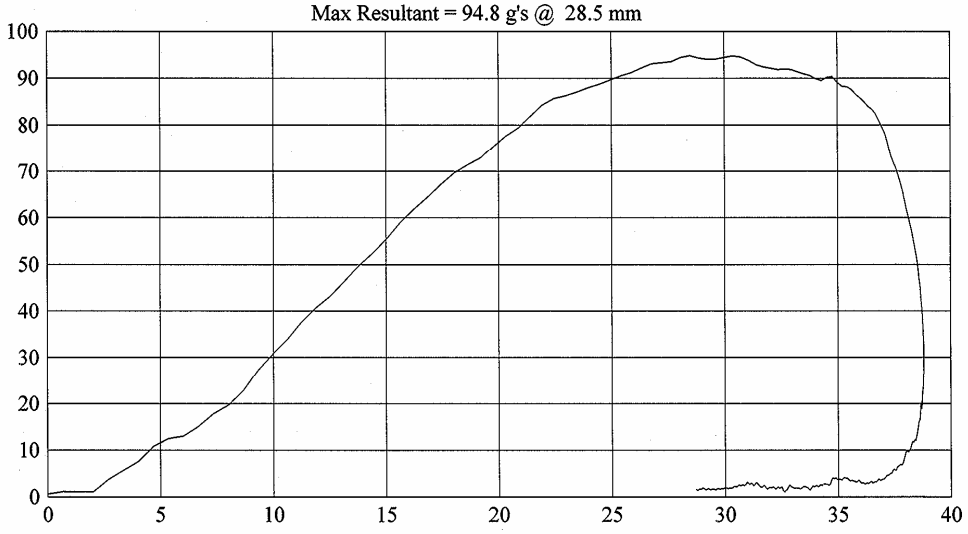
Customer: DOT/NHTSA
Test # 2
FM6261
Additional Desc: N/A

Vehicle Program : Saturn Ion 2 Sedan
Test Date: 9/20/2006

Model Year: 2006
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 112/38

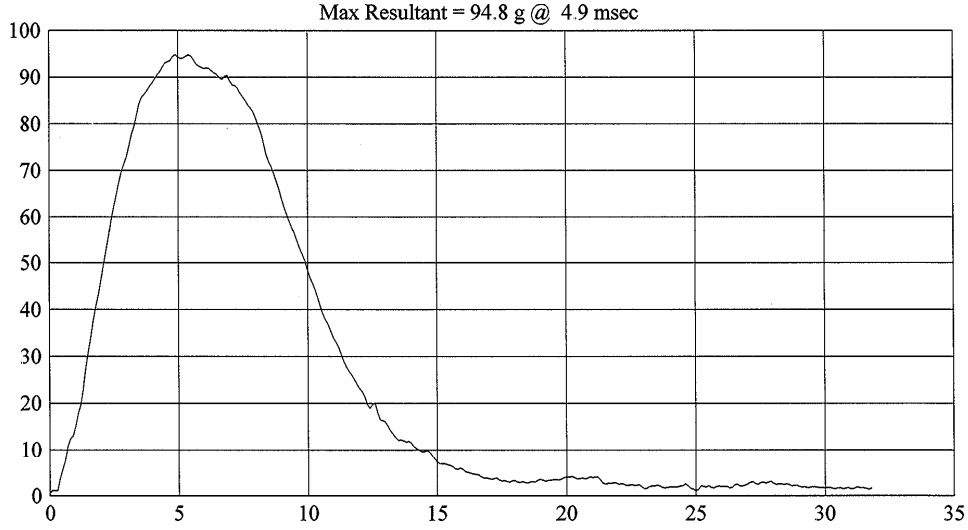
HIC(d) = 505, HIC = 448, Delta T = 8.1 msec

Max Resultant = 94.8 g's @ 28.5 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 94.8 g @ 4.9 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G06I7-001.5

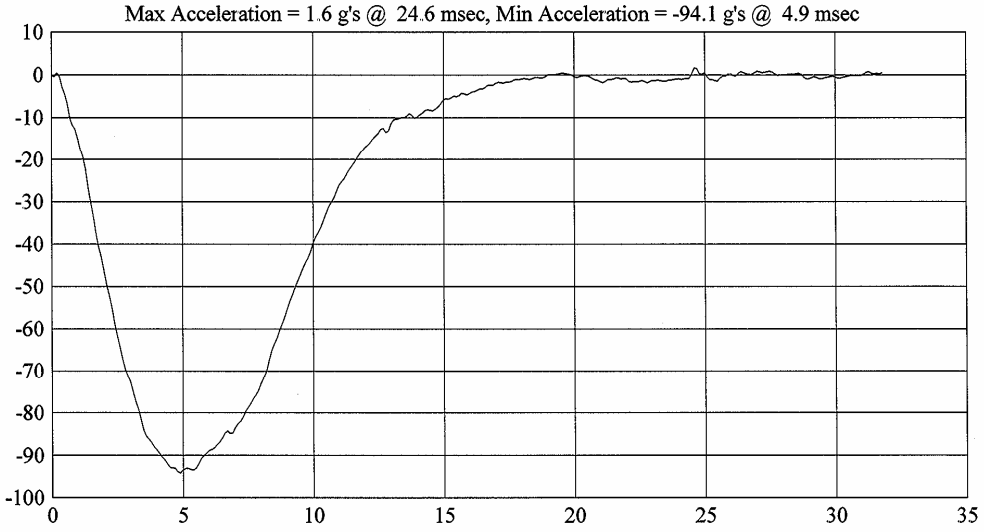
Customer: DOT/NHTSA
Test # 2
FM6261
Additional Desc: N/A

Vehicle Program : Saturn Ion 2 Sedan
Test Date: 9/20/2006

Model Year: 2006
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 112/38

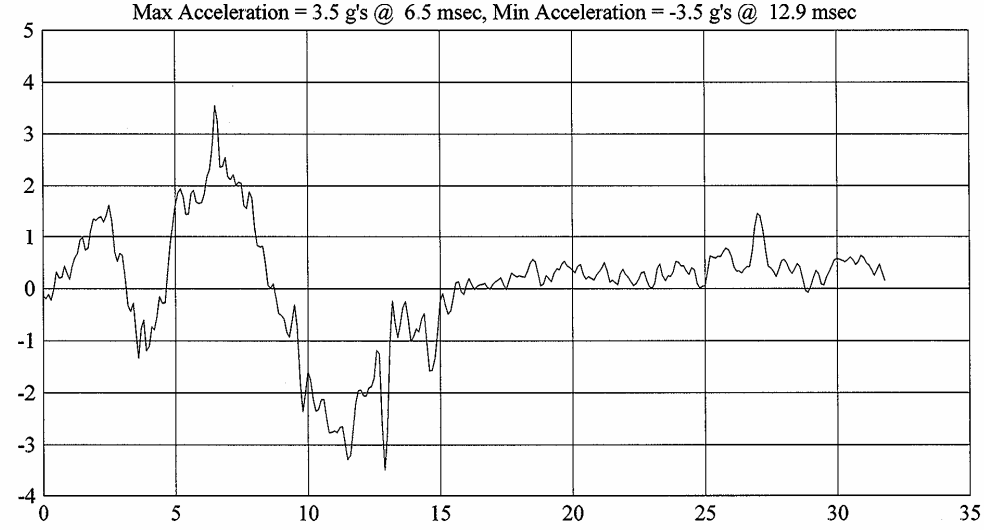
HIC(d) = 505, HIC = 448, Delta T = 8.1 msec

Max Acceleration = 1.6 g's @ 24.6 msec, Min Acceleration = -94.1 g's @ 4.9 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 3.5 g's @ 6.5 msec, Min Acceleration = -3.5 g's @ 12.9 msec



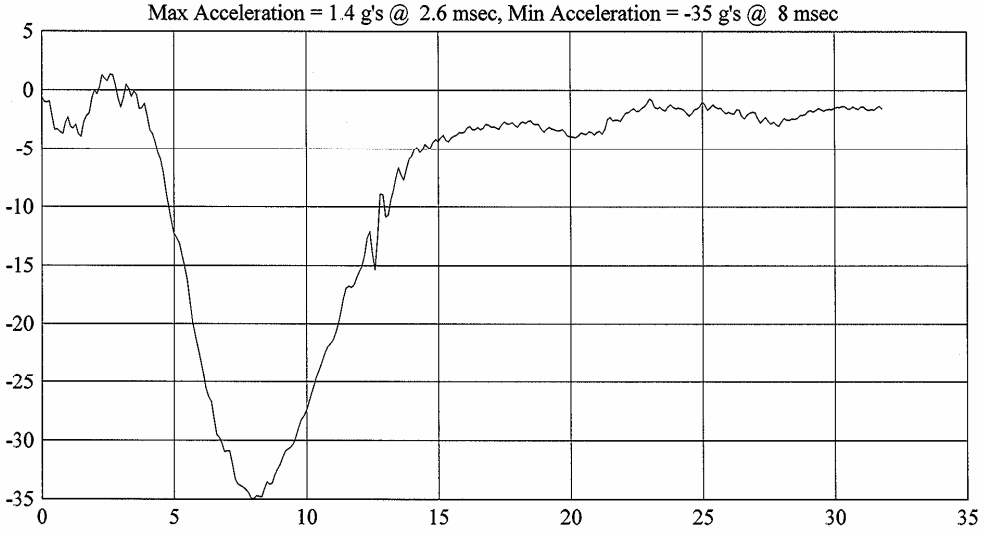
Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA	Vehicle Program : Saturn Ion 2 Sedan	Model Year: 2006
Test # 2		Target: AP1
FM6261	Test Date: 9/20/2006	Vehicle Side: Right
Additional Desc: N/A		Horz/Vert Angle: 112/38

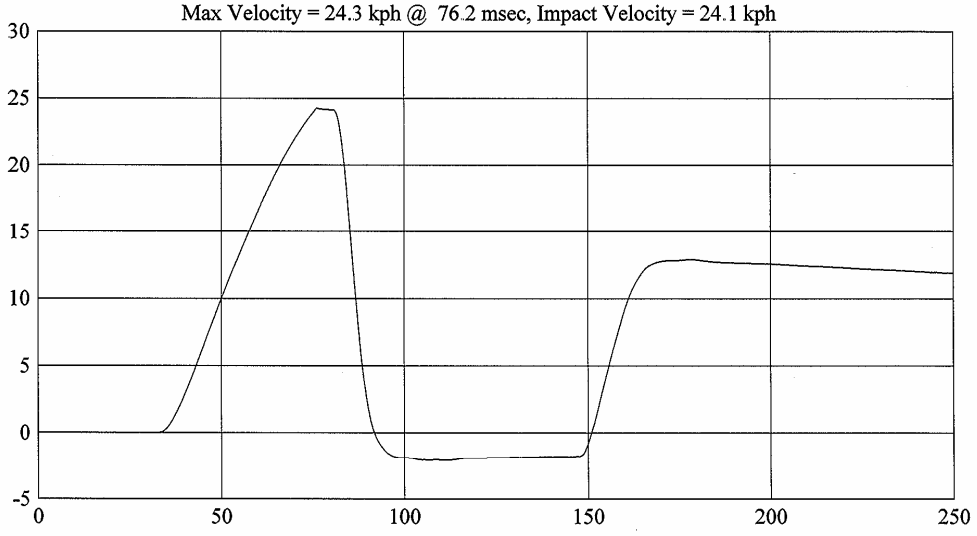
HIC(d) = 505, HIC = 448, Delta T = 8.1 msec

Max Acceleration = 1.4 g's @ 2.6 msec, Min Acceleration = -35 g's @ 8 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 24.3 kph @ 76.2 msec, Impact Velocity = 24.1 kph



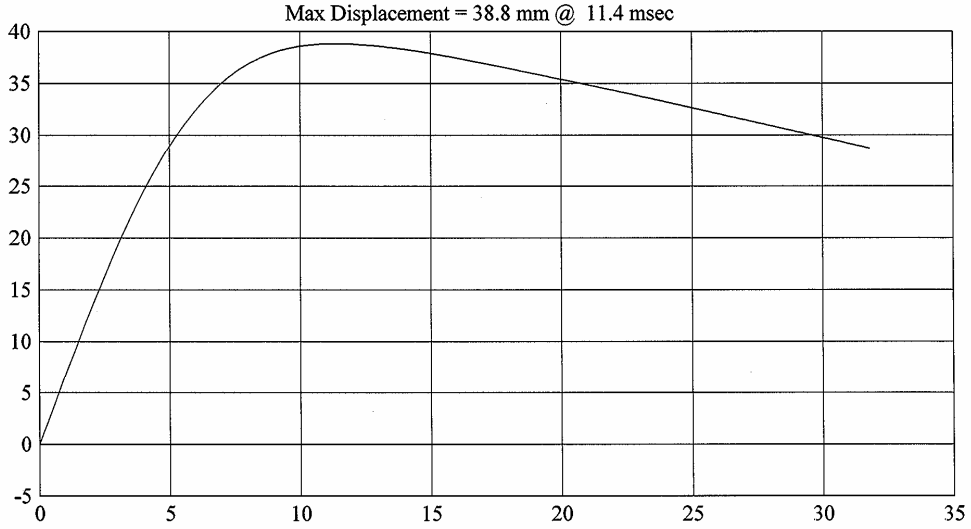
Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA	Vehicle Program : Saturn Ion 2 Sedan	Model Year: 2006
Test # 2		Target: AP1
FM6261	Test Date: 9/20/2006	Vehicle Side: Right
Additional Desc: N/A		Horz/Vert Angle: 112/38

HIC(d) = 505, HIC = 448, Delta T = 8.1 msec

Max Displacement = 38.8 mm @ 11.4 msec



Displacement (mm) vs. Time (msec)


mga
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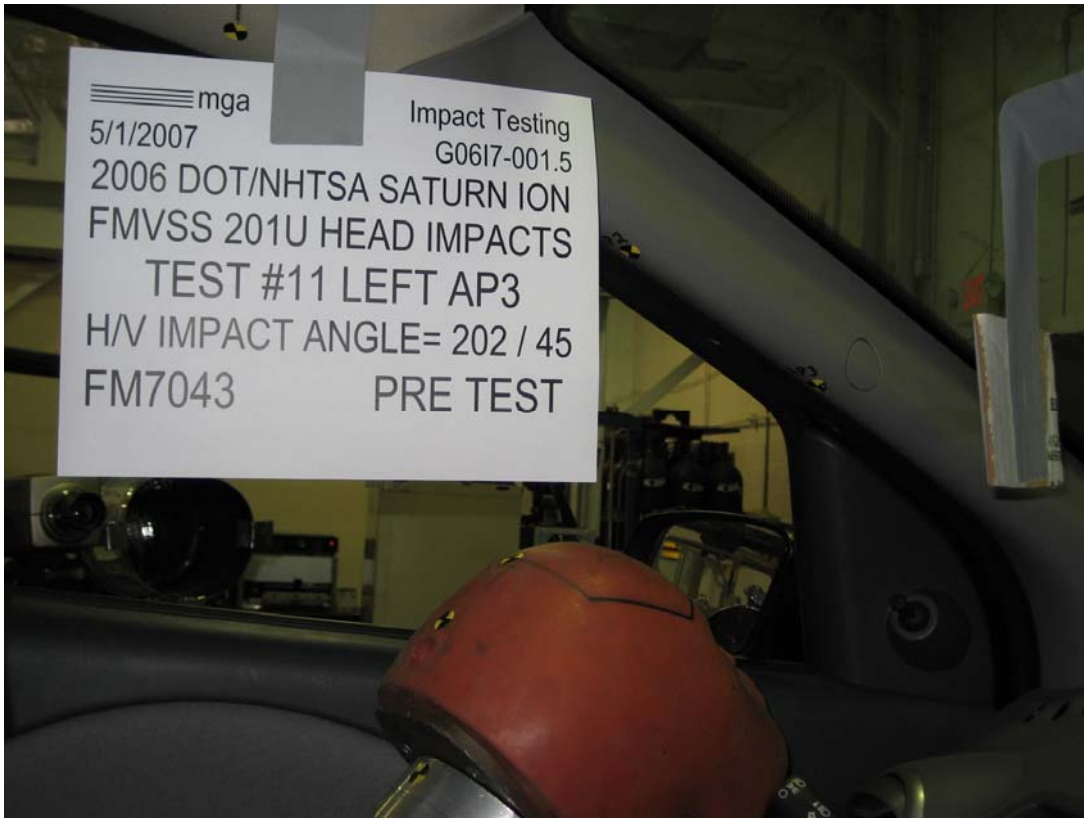
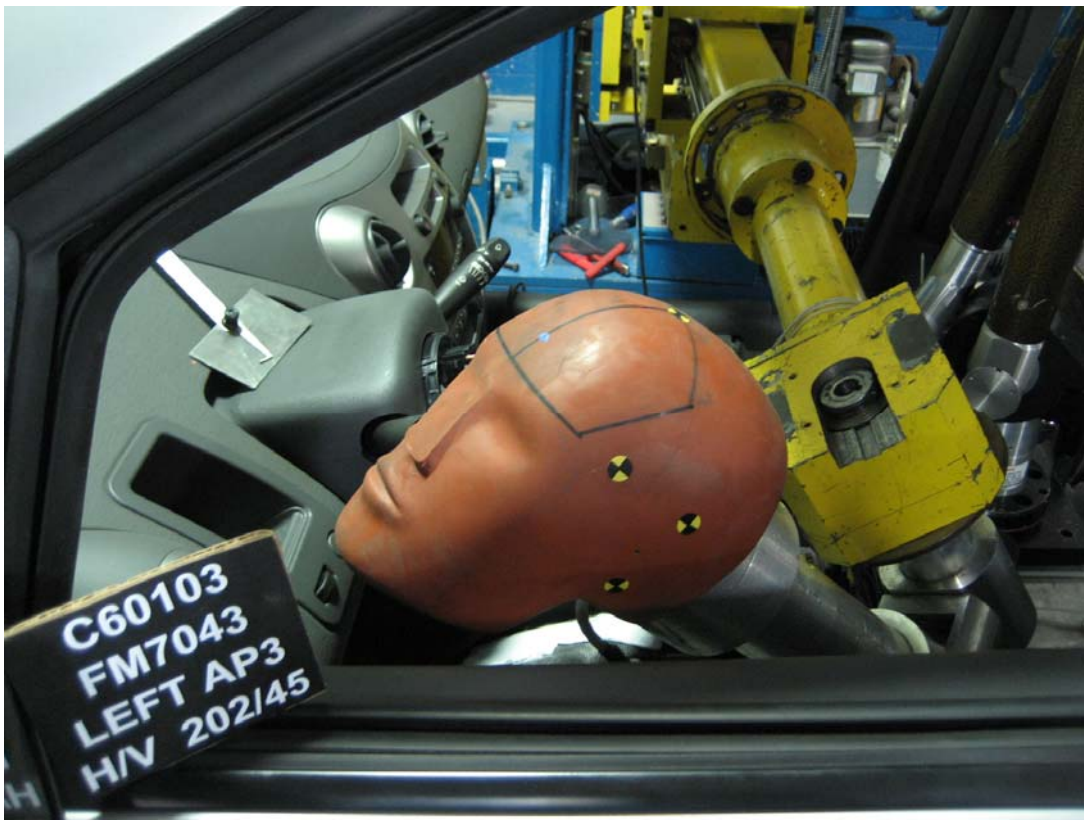
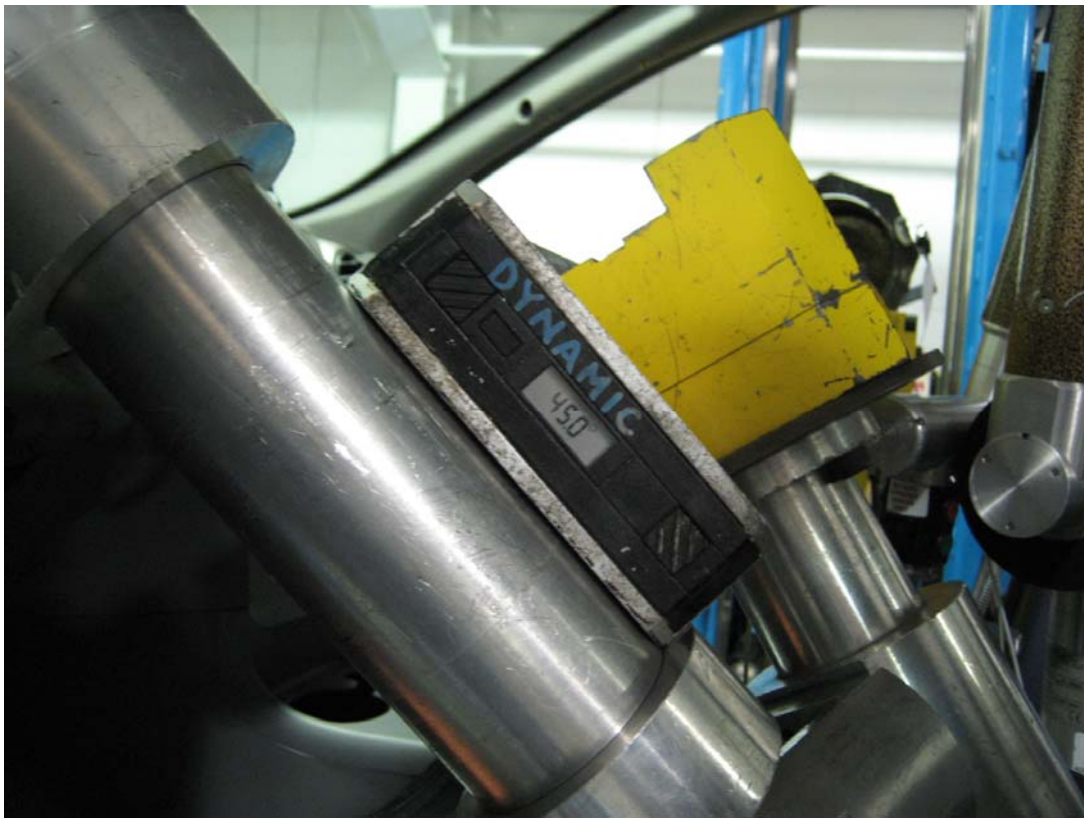
Impact Testing
G06I7-001.5
2006 DOT/NHTSA SATURN ION
FMVSS 201U HEAD IMPACTS
TEST #11 LEFT AP3
H/V IMPACT ANGLE= 202 / 45
FM7043
PRE TEST


mga
5/1/2007
Impact Testing
G06I7-001.5
2006 DOT/NHTSA SATURN ION
FMVSS 201U HEAD IMPACTS
TEST #11 LEFT AP3
H/V IMPACT ANGLE= 202 / 45
FM7043
PRE TEST


C60103
FM7043
LEFT AP3
H/V 202/45

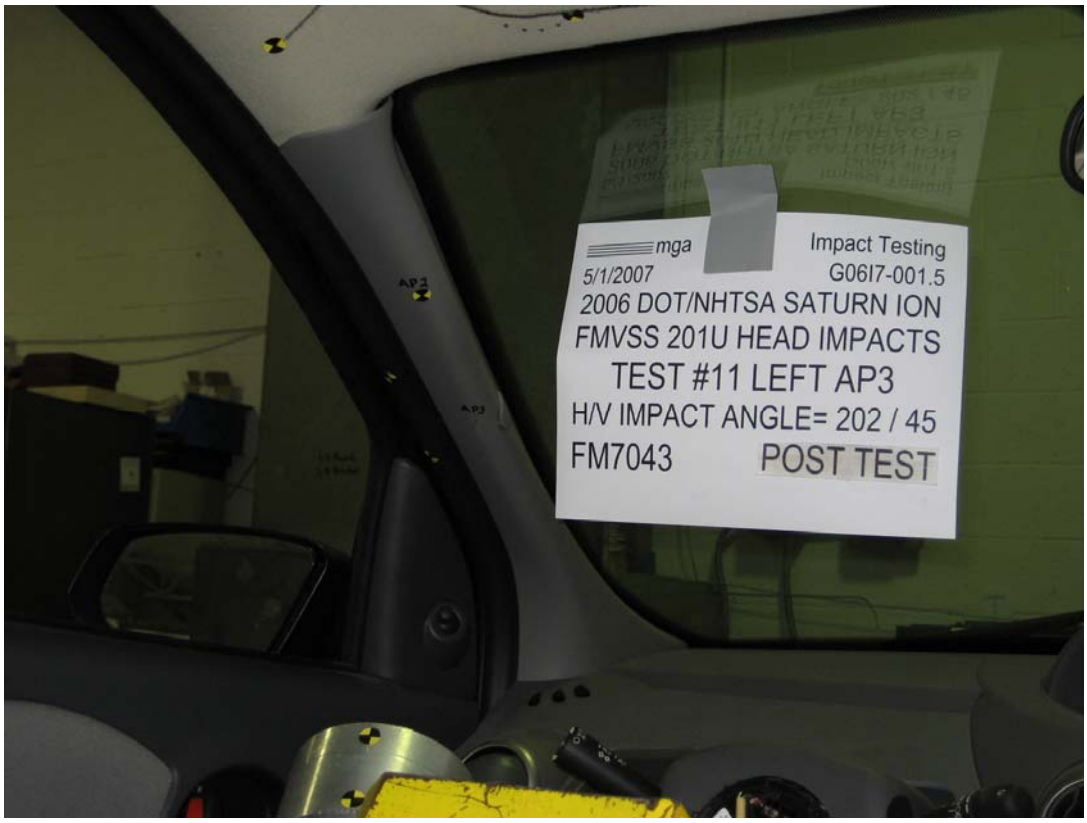

C60103
FM7043
LEFT AP3
H/V 202/45

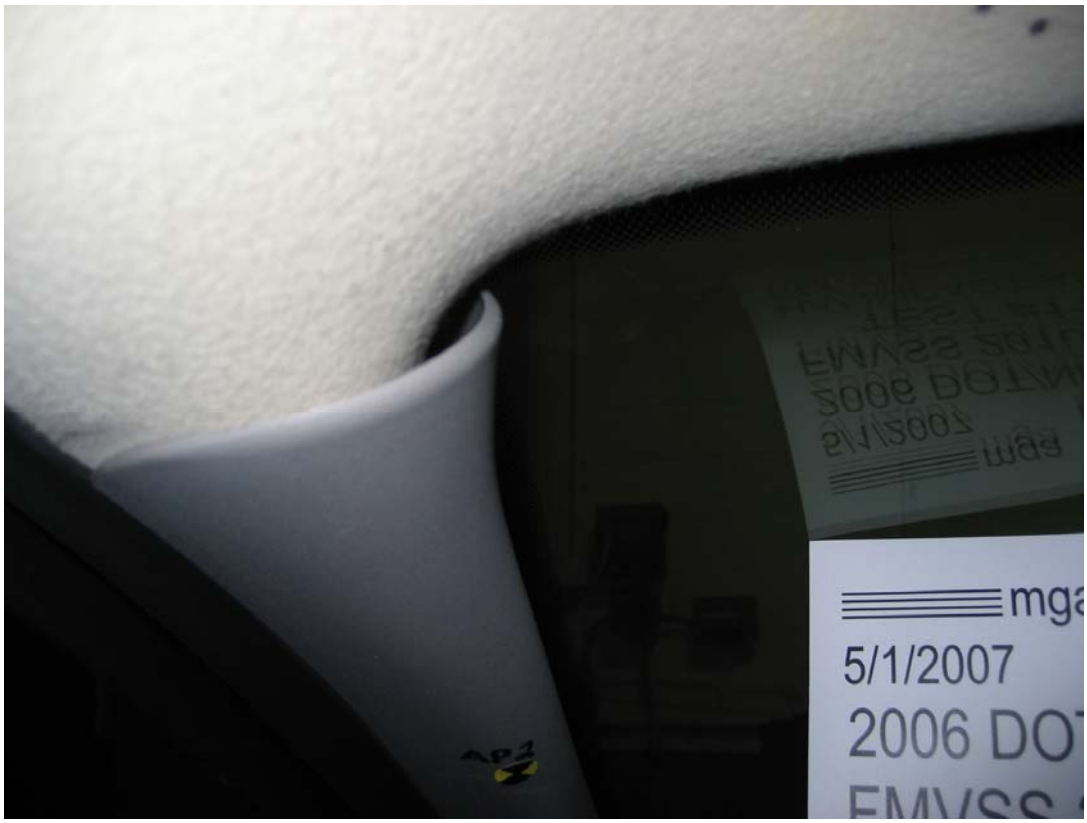

C60103
FM7043
LEFT AP3
H/V 202/45


DYNAMIC
450


DYNAMIC


mga
Impact Testing
5/1/2007
G06I7-001.5
2006 DOT/NHTSA SATURN ION
FMVSS 201U HEAD IMPACTS
TEST #11 LEFT AP3
H/V IMPACT ANGLE= 202 / 45
FM7043
POST TEST


mga
Impact Testing
5/1/2007
G06I7-001.5
2006 DOT/NHTSA SATURN ION
FMVSS 201U HEAD IMPACTS
TEST #11 LEFT AP3
H/V IMPACT ANGLE= 202 / 45
FM7043
POST TEST


mga
5/1/2007
2006 DOT


AP3


mga
Impact Testing
5/1/2007
G06I7-001.5
2006 DOT/NHTSA SATURN ION
FMVSS 201U HEAD IMPACTS
TEST #11 LEFT AP3
H/V IMPACT ANGLE= 202 / 45
FM7043
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#11

Target (Vehicle Side): AP3Left

Temperature:23C

MGA Test Reference No.:FM7043

Humidity:38%

Approach Horizontal Angles:202º

Time of Test:11:56:41 AM

Approach Vertical Angles:45º

FMH Serial No:[036]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
698	704	7.7	23.4	11	4 Left

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J21969	-90.883	1.24	1.24
Y	6	J35916	103.15	1.54	1.54
Z	7	J35918	99.409	1.07	1.07

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Recorded By: Travis Campbell Approved By*: Helen A. Kalafut Date: 5/1/2007
*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 11
FM7043
Additional Desc: N/A

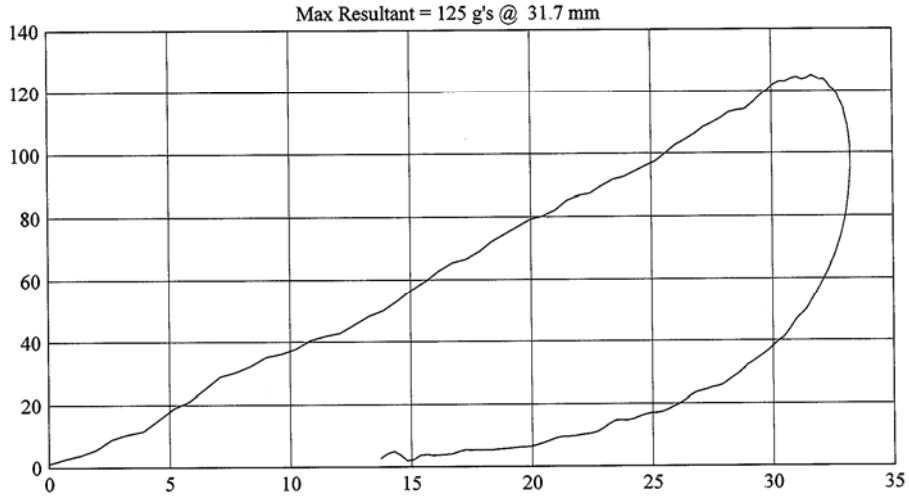
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 5/1/2007

Model Year: 2006
Target: AP3
Vehicle Side: Left
Horz/Vert Angle: 202/45

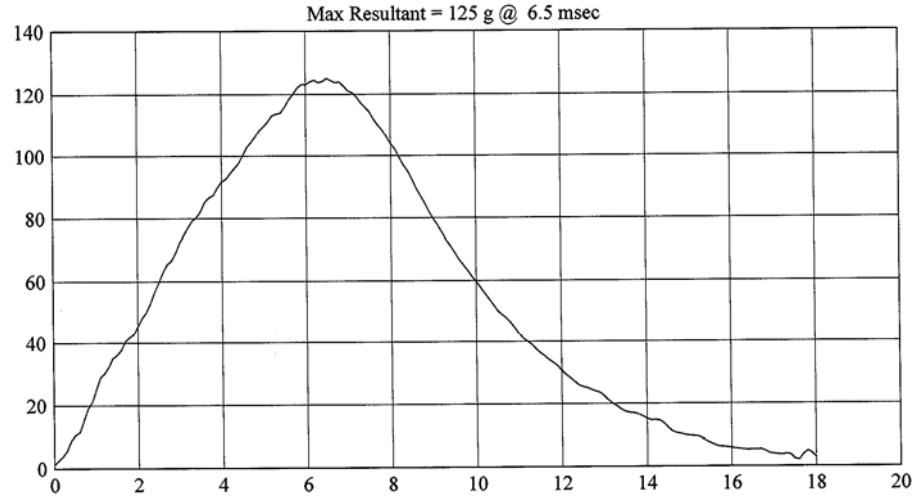
HIC(d) = 698, HIC = 704, Delta T = 7.7 msec

Max Resultant = 125 g's @ 31.7 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 125 g @ 6.5 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 11
FM7043
Additional Desc: N/A

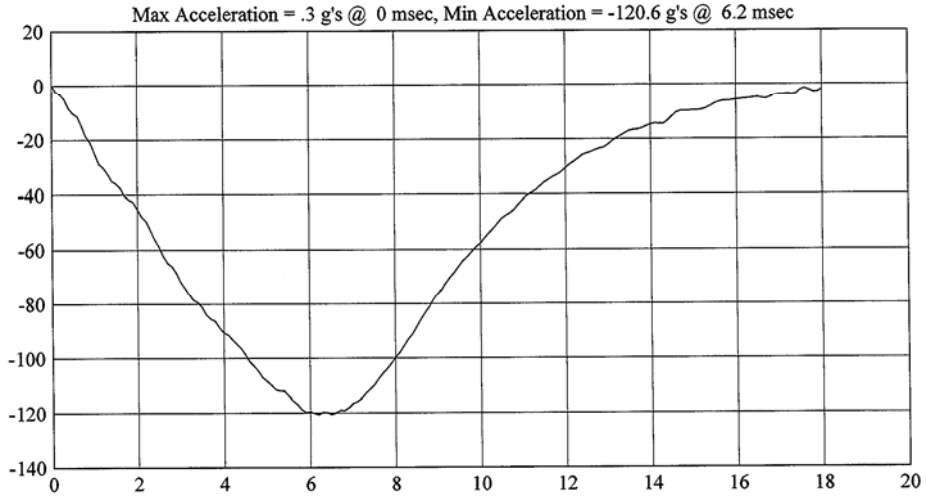
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 5/1/2007

Model Year: 2006
Target: AP3
Vehicle Side: Left
Horz/Vert Angle: 202/45

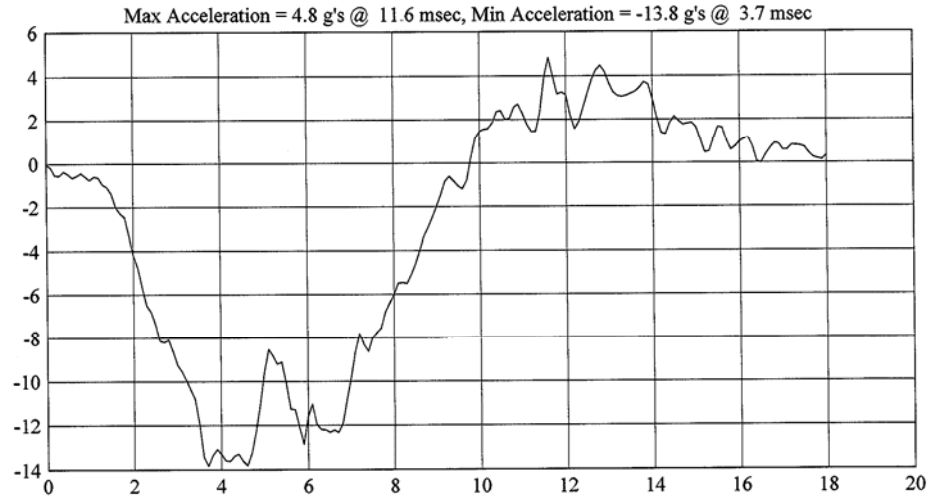
HIC(d) = 698, HIC = 704, Delta T = 7.7 msec

Max Acceleration = .3 g's @ 0 msec, Min Acceleration = -120.6 g's @ 6.2 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 4.8 g's @ 11.6 msec, Min Acceleration = -13.8 g's @ 3.7 msec



Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 11
FM7043
Additional Desc: N/A

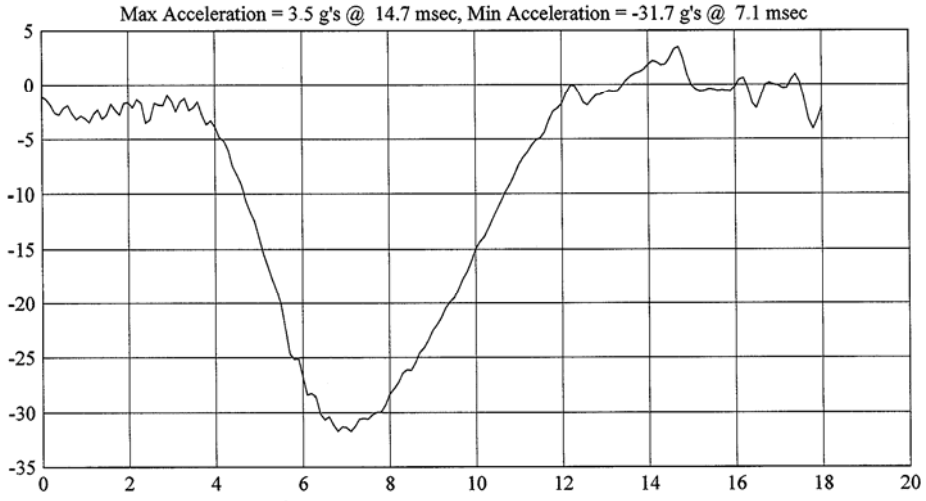
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 5/1/2007

Model Year: 2006
Target: AP3
Vehicle Side: Left
Horz/Vert Angle: 202/45

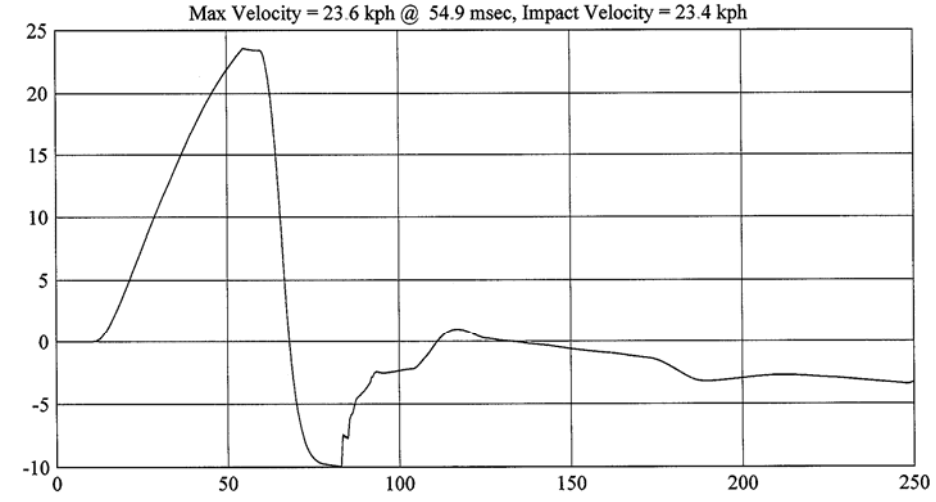
HIC(d) = 698, HIC = 704, Delta T = 7.7 msec

Max Acceleration = 3.5 g's @ 14.7 msec, Min Acceleration = -31.7 g's @ 7.1 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 23.6 kph @ 54.9 msec, Impact Velocity = 23.4 kph



Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

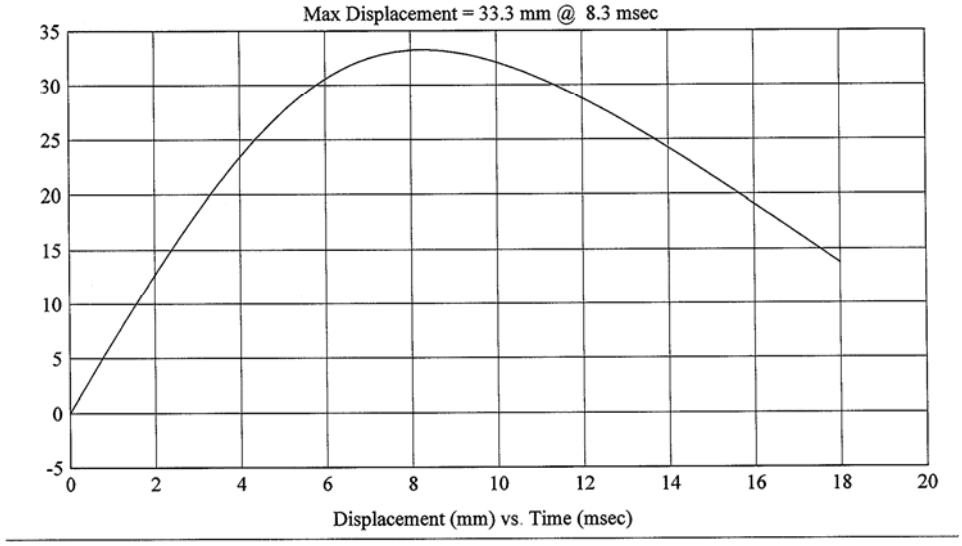
Customer: DOT/NHTSA
Test # 11
FM7043
Additional Desc: N/A

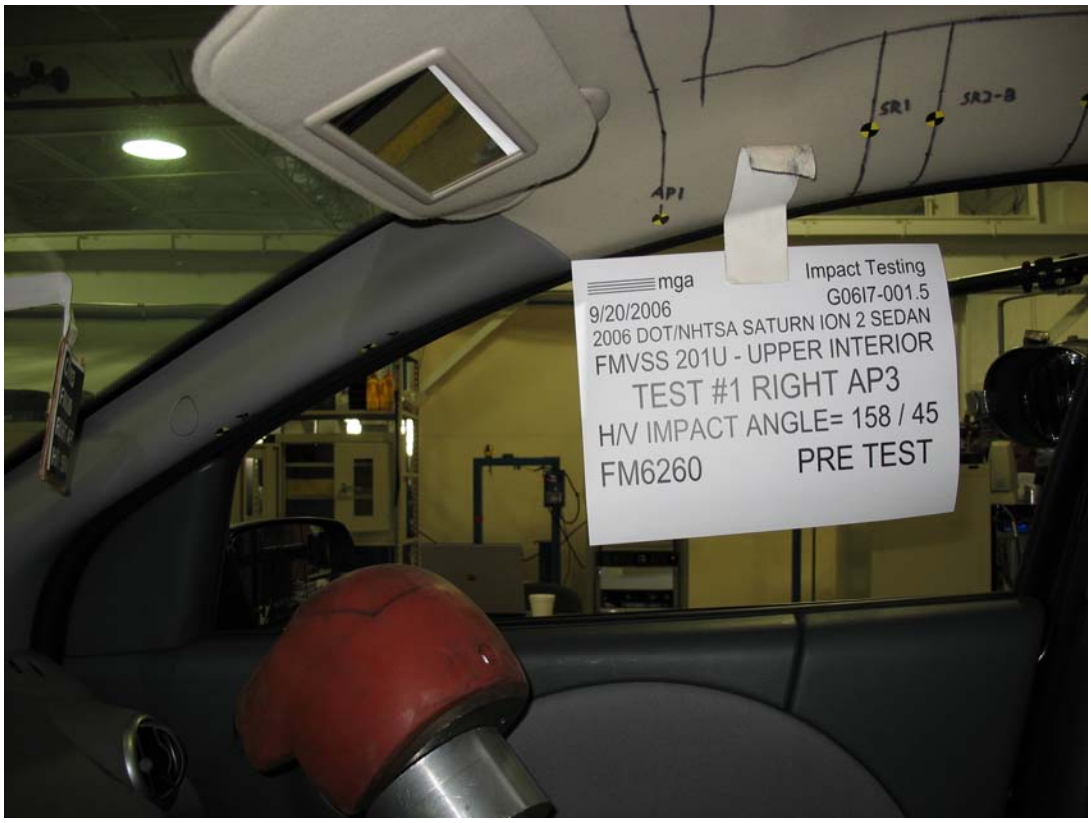
Vehicle Program : Saturn Ion 2 Sedan

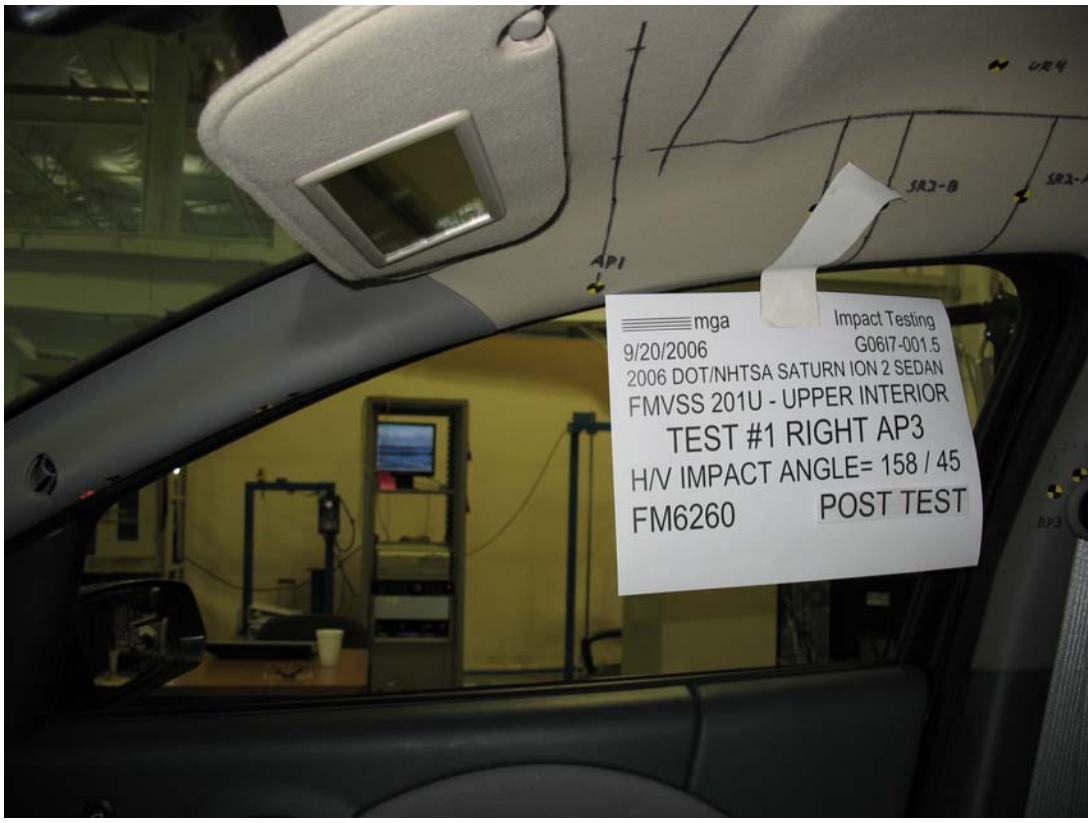
Test Date: 5/1/2007

Model Year: 2006
Target: AP3
Vehicle Side: Left
Horz/Vert Angle: 202/45

HIC(d) = 698, HIC = 704, Delta T = 7.7 msec

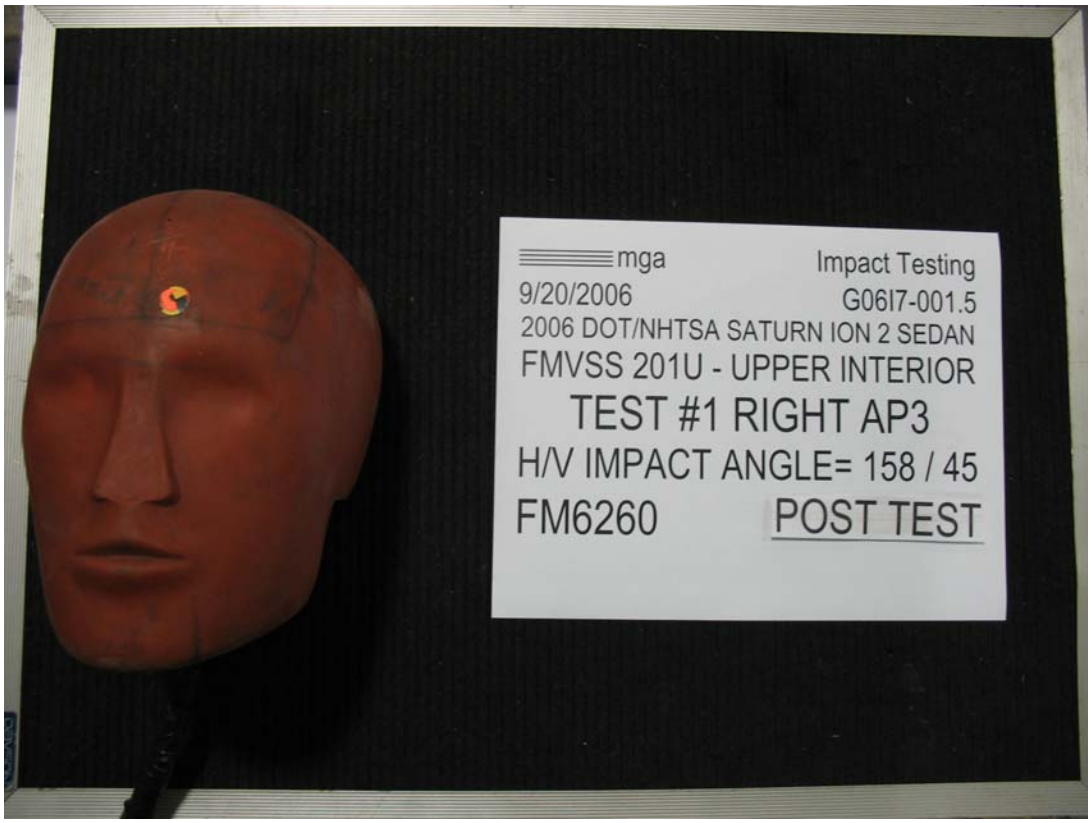



SR1
SR2-B
AP1
mga
Impact Testing
G06I7-001.5
9/20/2006
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #1 RIGHT AP3
H/V IMPACT ANGLE= 158 / 45
FM6260
PRE TEST


mga
Impact Testing
9/20/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #1 RIGHT AP3
H/V IMPACT ANGLE= 158 / 45
FM6260
POST TEST
AP1


C60103
FM6260
RIGHT AP3
H/V 158/45
AP3


C60103
FM6260
RIGHT AP3
H/V 158/45


mga
Impact Testing
9/20/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #1 RIGHT AP3
H/V IMPACT ANGLE= 158 / 45
FM6260
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#1

Target (Vehicle Side): AP3Right

Temperature:22C

MGA Test Reference No.:FM6260

Humidity:44%

Approach Horizontal Angles:158º

Time of Test:11:13 AM

Approach Vertical Angles:45º

FMH Serial No:[035]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
1088	1221	4.3	23.6	8	12 Left

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-91.4	1.29	1.29
Y	6	J35919	94.4	1.79	1.79
Z	7	J22664	94.3	1.31	1.31

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

A-pillar screw cover knocked out.

Recorded By: _____ Approved By*: _____ Date: 9/20/2006

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

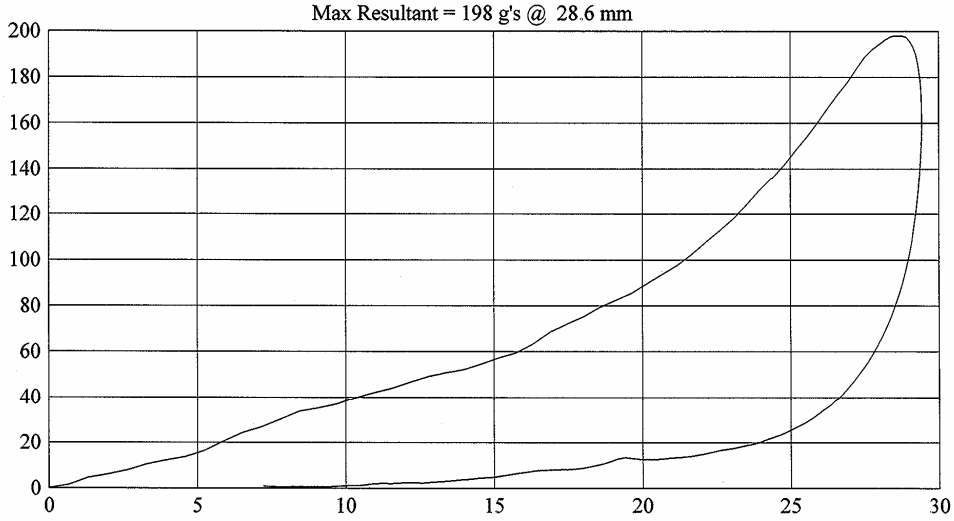
Customer: DOT/NHTSA
Test # 1
FM6260
Additional Desc: N/A

Vehicle Program : Saturn Ion 2 Sedan
Test Date: 9/20/2006

Model Year: 2006
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 158/45

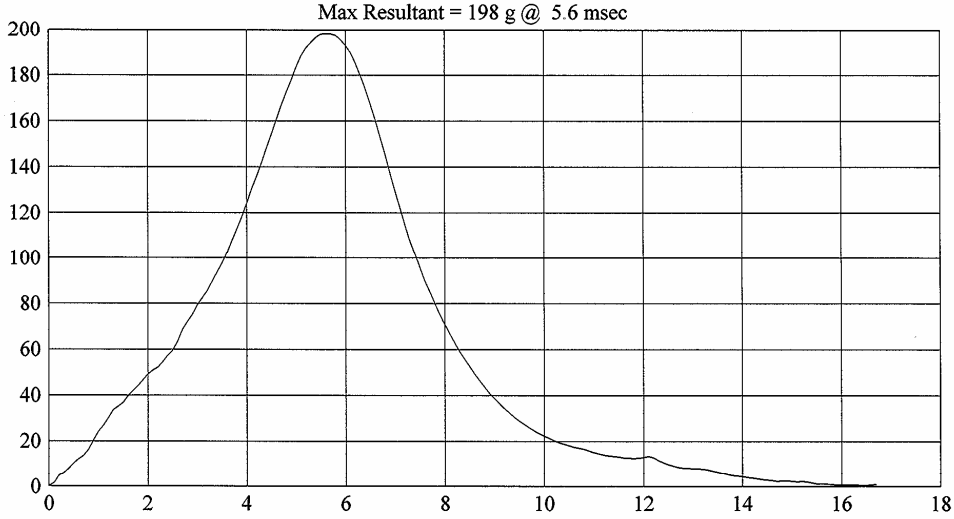
HIC(d) = 1088, HIC = 1221, Delta T = 4.3 msec

Max Resultant = 198 g's @ 28.6 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 198 g @ 5.6 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 1
FM6260
Additional Desc: N/A

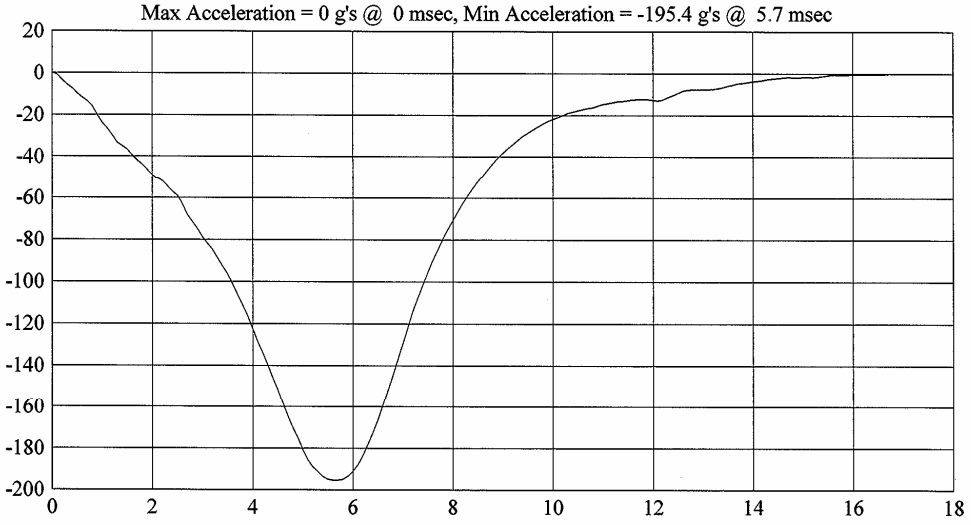
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/20/2006

Model Year: 2006
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 158/45

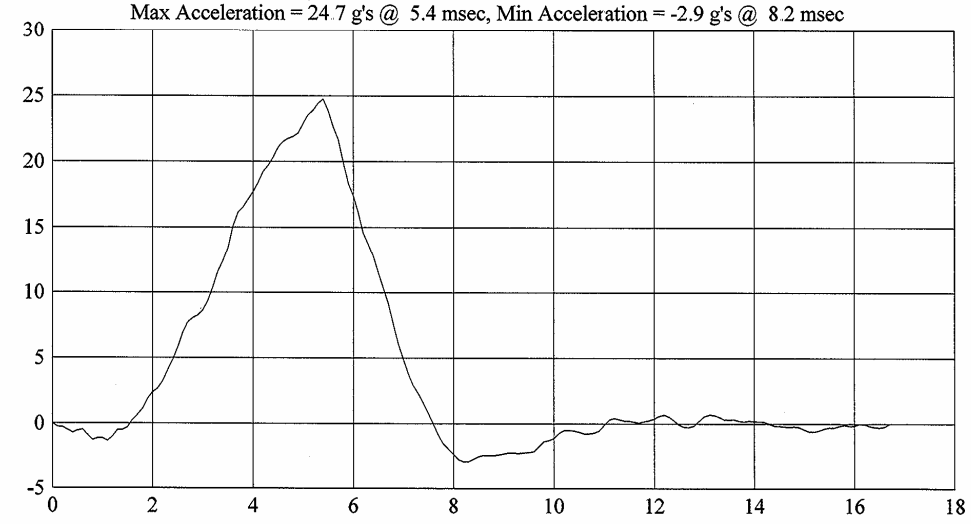
HIC(d) = 1088, HIC = 1221, Delta T = 4.3 msec

Max Acceleration = 0 g's @ 0 msec, Min Acceleration = -195.4 g's @ 5.7 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 24.7 g's @ 5.4 msec, Min Acceleration = -2.9 g's @ 8.2 msec



Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 1
FM6260
Additional Desc: N/A

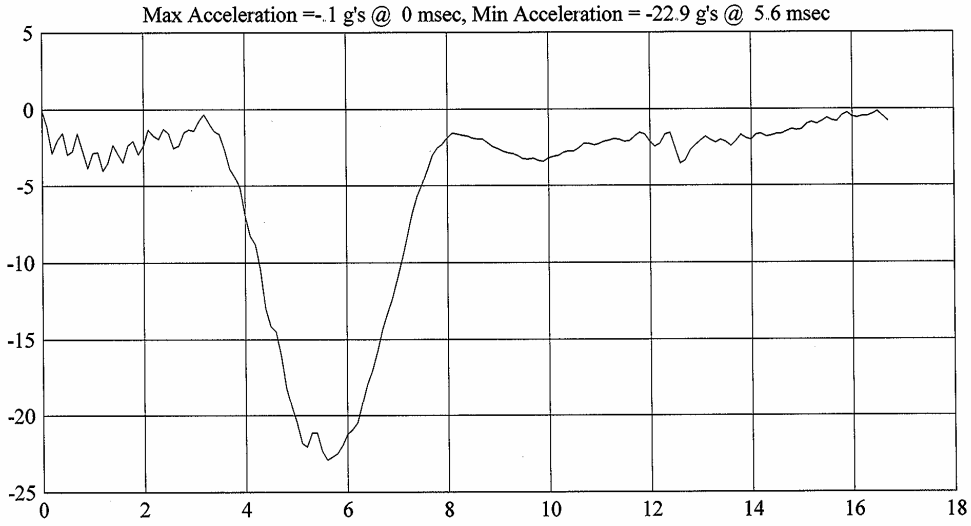
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/20/2006

Model Year: 2006
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 158/45

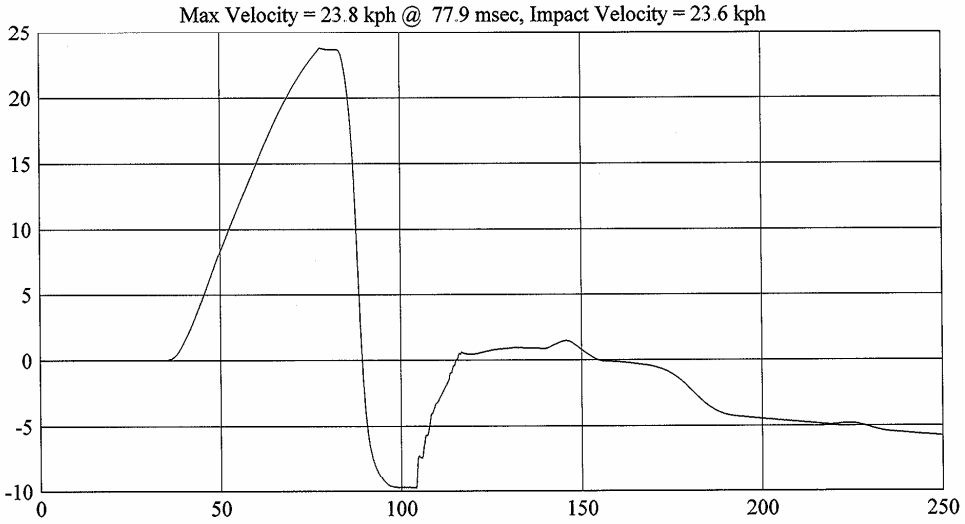
HIC(d) = 1088, HIC = 1221, Delta T = 4.3 msec

Max Acceleration =-.1 g's @ 0 msec, Min Acceleration = -22.9 g's @ 5.6 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 23.8 kph @ 77.9 msec, Impact Velocity = 23.6 kph



Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 1
FM6260
Additional Desc: N/A

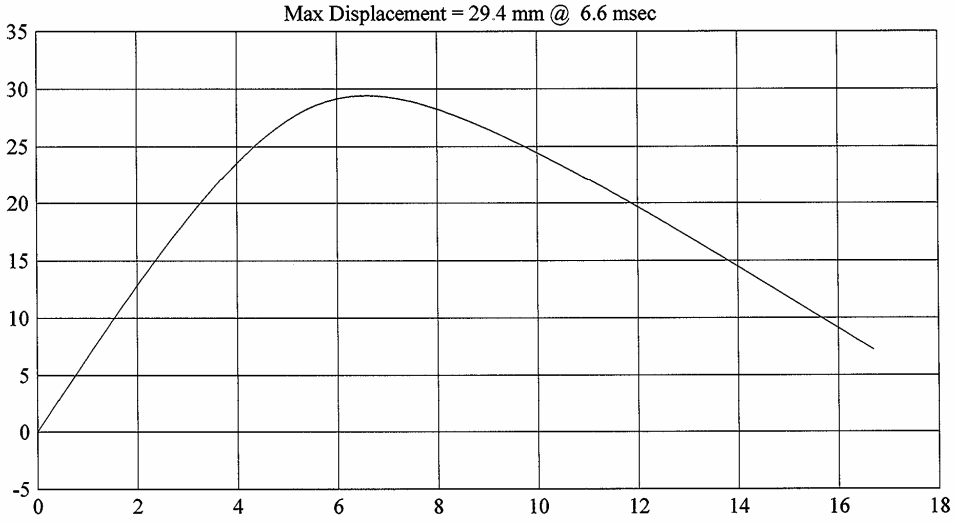
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/20/2006

Model Year: 2006
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 158/45

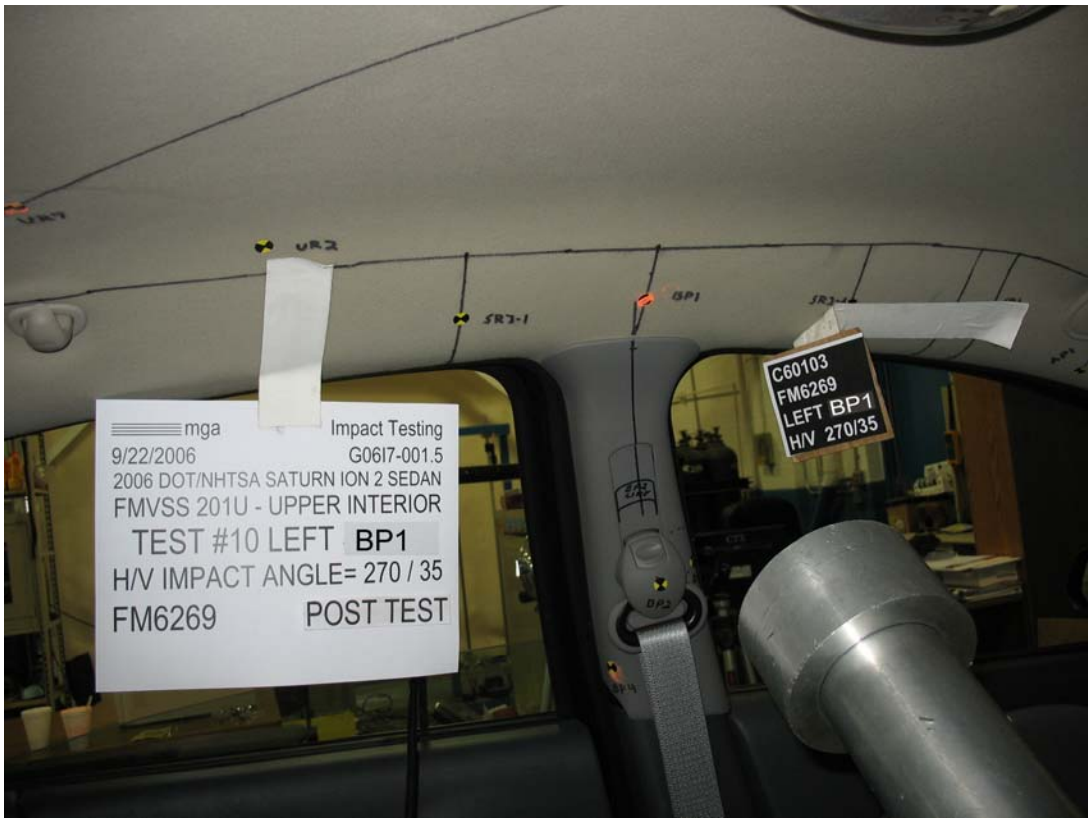
HIC(d) = 1088, HIC = 1221, Delta T = 4.3 msec

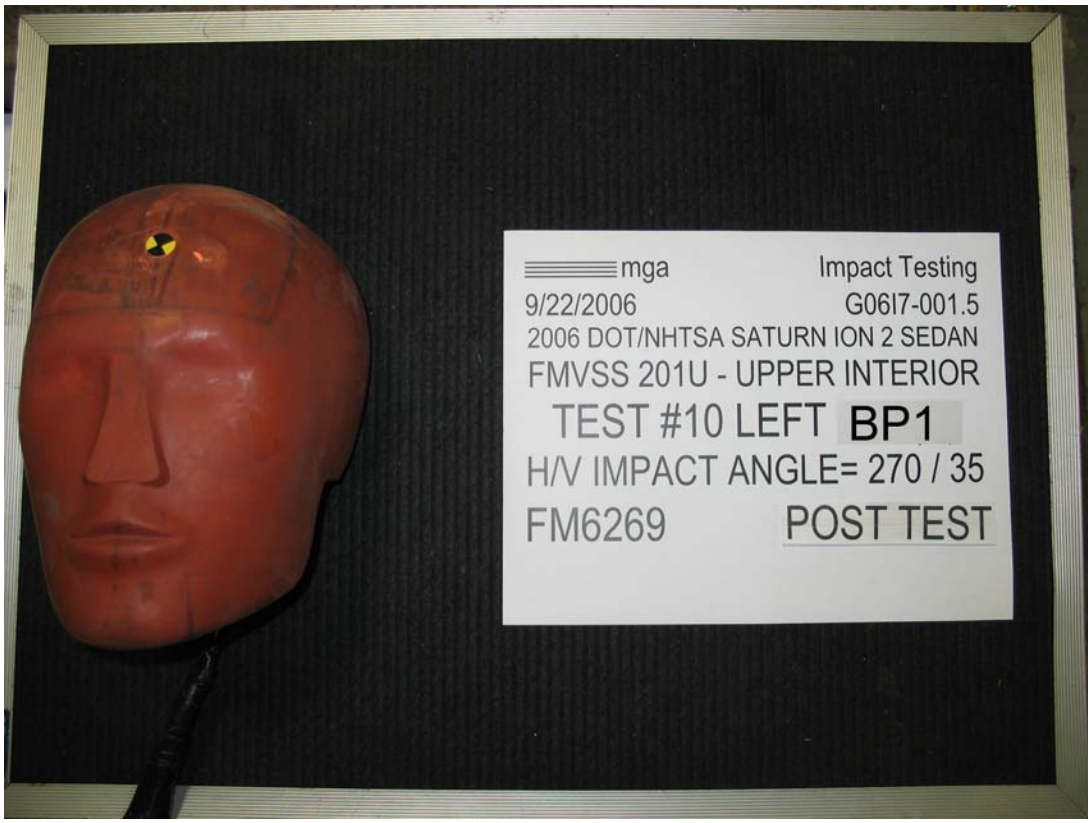
Max Displacement = 29.4 mm @ 6.6 msec



Displacement (mm) vs. Time (msec)


mga
Impact Testing
9/22/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #10 LEFT BP1
H/V IMPACT ANGLE= 270 / 35
FM6269
PRE TEST
C60103
UR2
SR3-1
BP1


mga
Impact Testing
9/22/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #10 LEFT BP1
H/V IMPACT ANGLE= 270 / 35
FM6269
POST TEST
C60103
FM6269
LEFT BP1
H/V 270/35


mga
Impact Testing
9/22/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #10 LEFT BP1
H/V IMPACT ANGLE= 270 / 35
FM6269
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#10

Target (Vehicle Side): BP1Left

Temperature:21C

MGA Test Reference No.:FM6269

Humidity:47%

Approach Horizontal Angles:270º

Time of Test:9:24:15 AM

Approach Vertical Angles:35º

FMH Serial No:[035]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
811	854	5.8	23.2	30	10 Left

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-91.4	1.29	1.29
Y	6	J35919	94.4	1.79	1.79
Z	7	J22664	94.3	1.31	1.31

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage.

Recorded By: _____ Approved By*: _____ Date: 9/22/2006

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 10
FM6269
Additional Desc: N/A

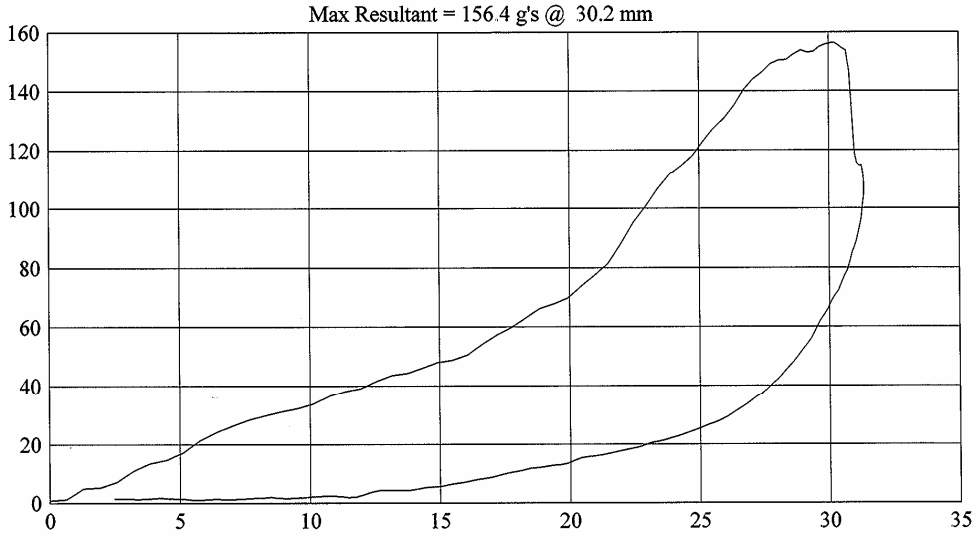
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/22/2006

Model Year: 2006
Target: BP1
Vehicle Side: Left
Horz/Vert Angle: 270/35

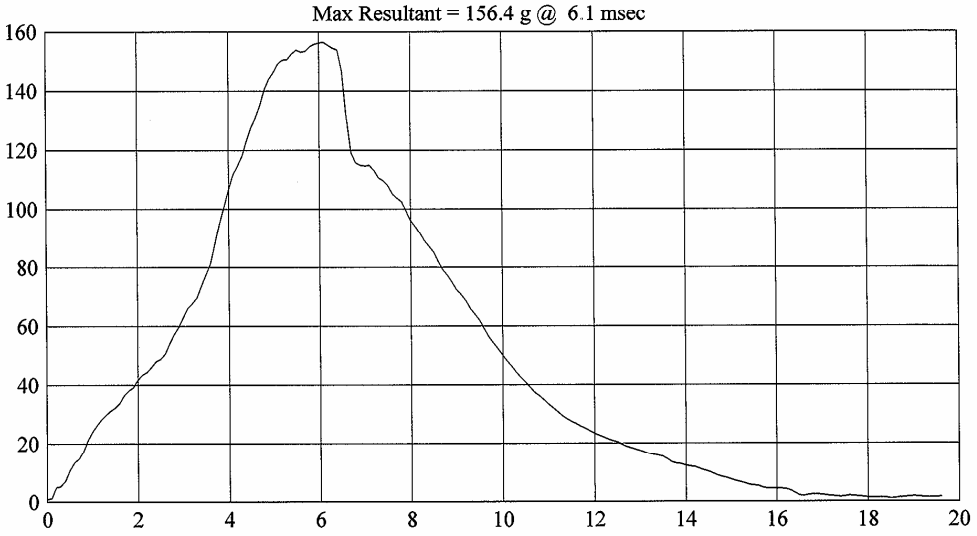
HIC(d) = 811, HIC = 854, Delta T = 5.8 msec

Max Resultant = 156.4 g's @ 30.2 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 156.4 g @ 6.1 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 10
FM6269
Additional Desc: N/A

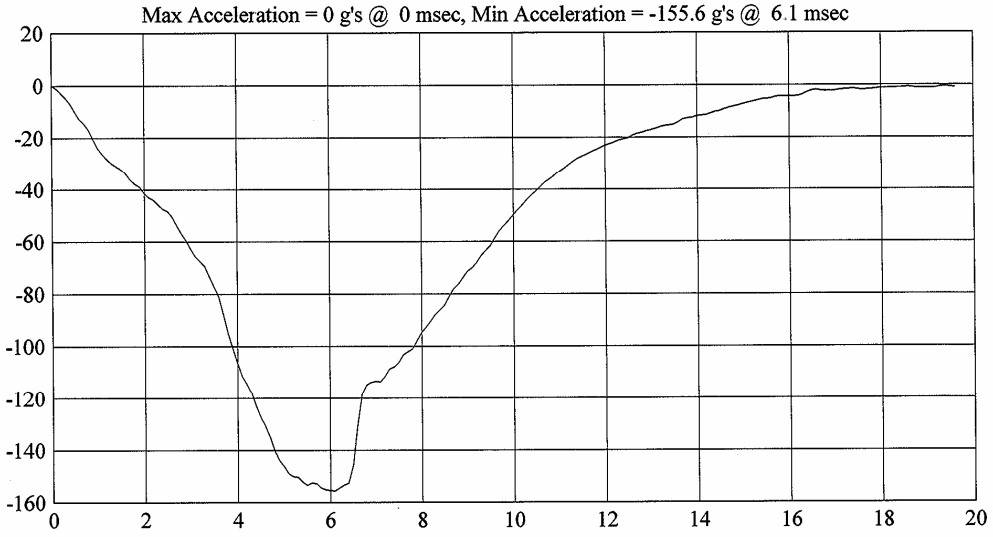
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/22/2006

Model Year: 2006
Target: BP1
Vehicle Side: Left
Horz/Vert Angle: 270/35

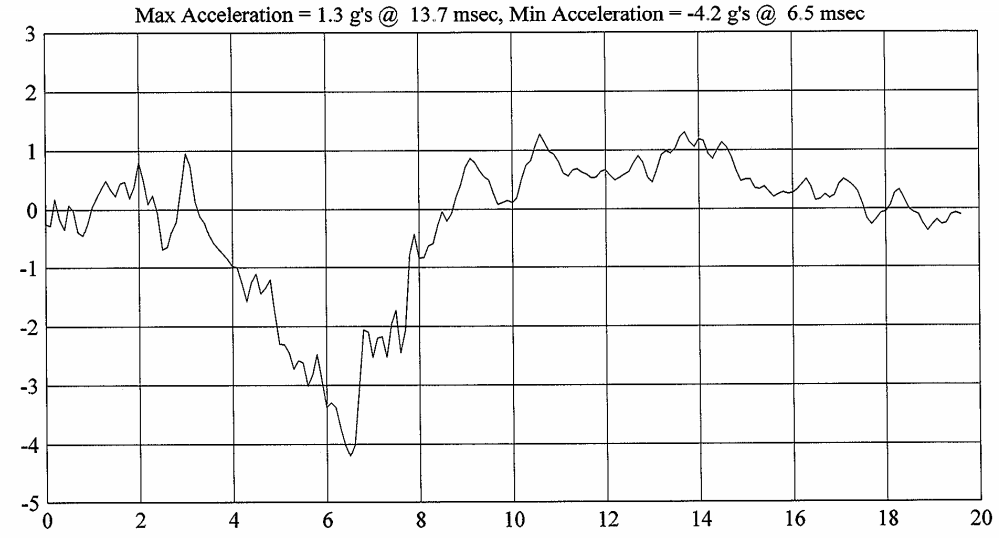
HIC(d) = 811, HIC = 854, Delta T = 5.8 msec

Max Acceleration = 0 g's @ 0 msec, Min Acceleration = -155.6 g's @ 6.1 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 1.3 g's @ 13.7 msec, Min Acceleration = -4.2 g's @ 6.5 msec



Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 10
FM6269
Additional Desc: N/A

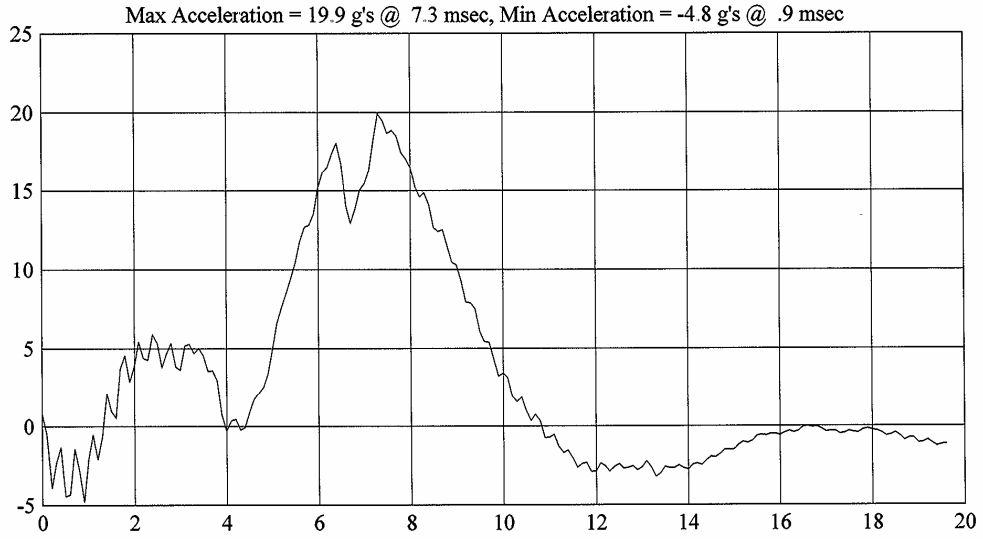
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/22/2006

Model Year: 2006
Target: BP1
Vehicle Side: Left
Horz/Vert Angle: 270/35

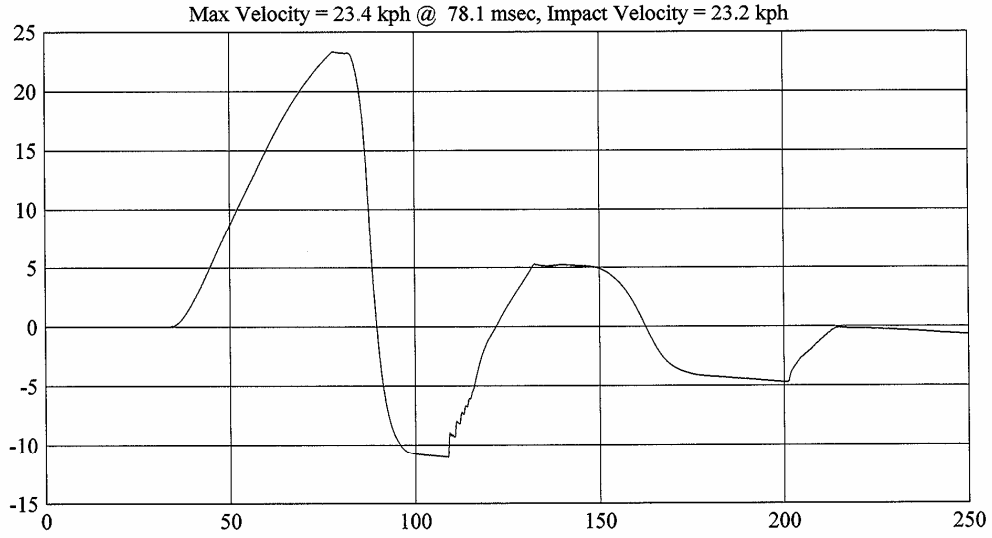
HIC(d) = 811, HIC = 854, Delta T = 5.8 msec

Max Acceleration = 19.9 g's @ 7.3 msec, Min Acceleration = -4.8 g's @ .9 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 23.4 kph @ 78.1 msec, Impact Velocity = 23.2 kph



Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 10
FM6269
Additional Desc: N/A

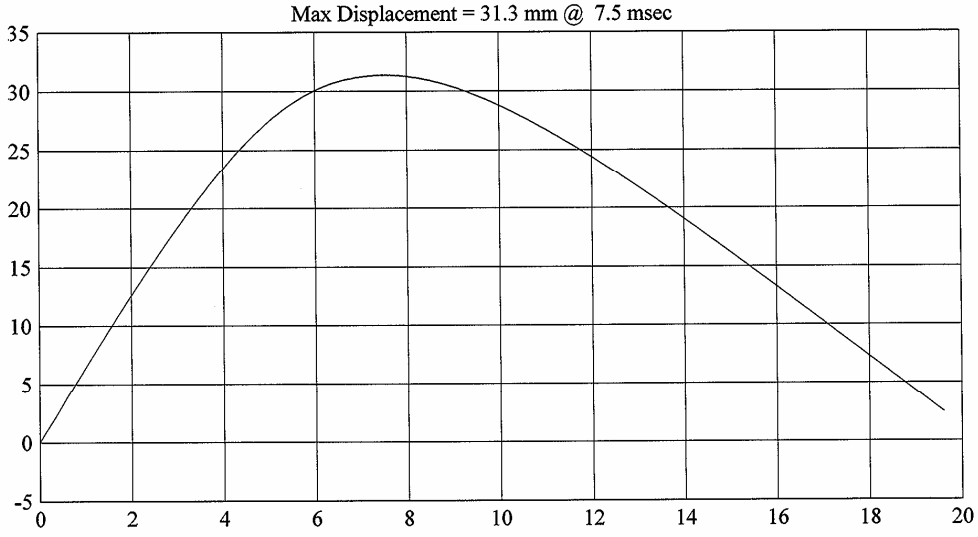
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/22/2006

Model Year: 2006
Target: BP1
Vehicle Side: Left
Horz/Vert Angle: 270/35

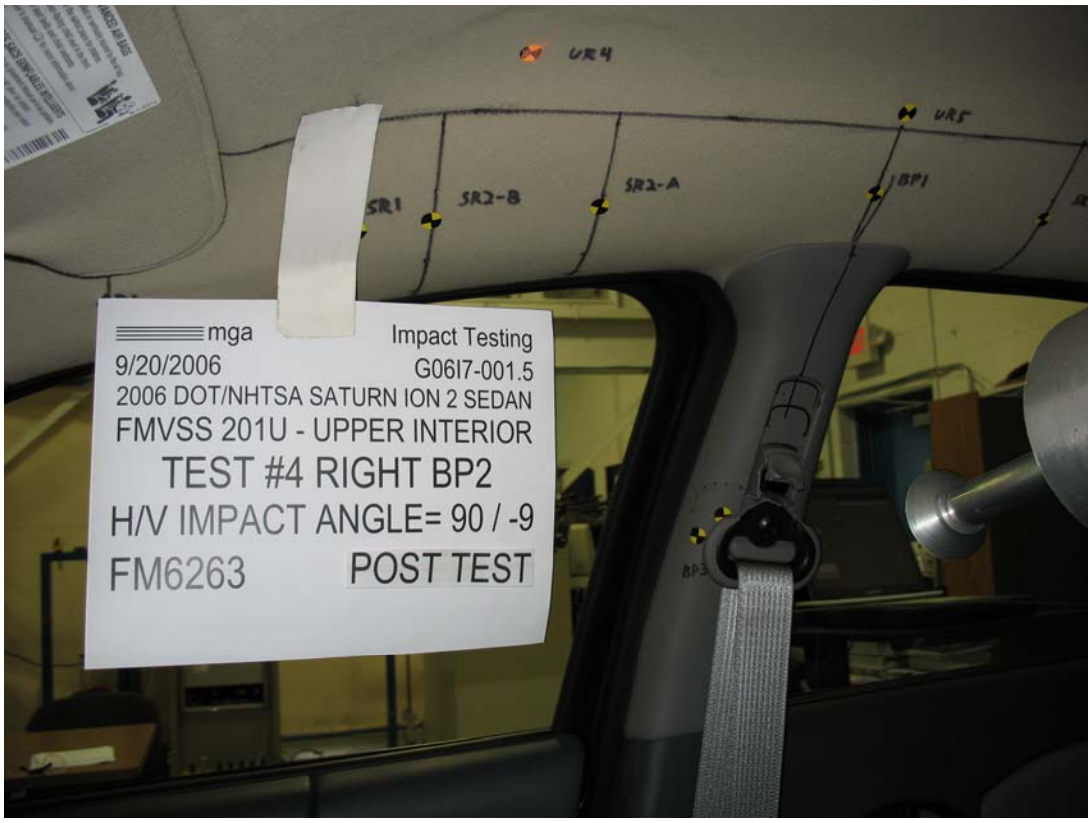
HIC(d) = 811, HIC = 854, Delta T = 5.8 msec

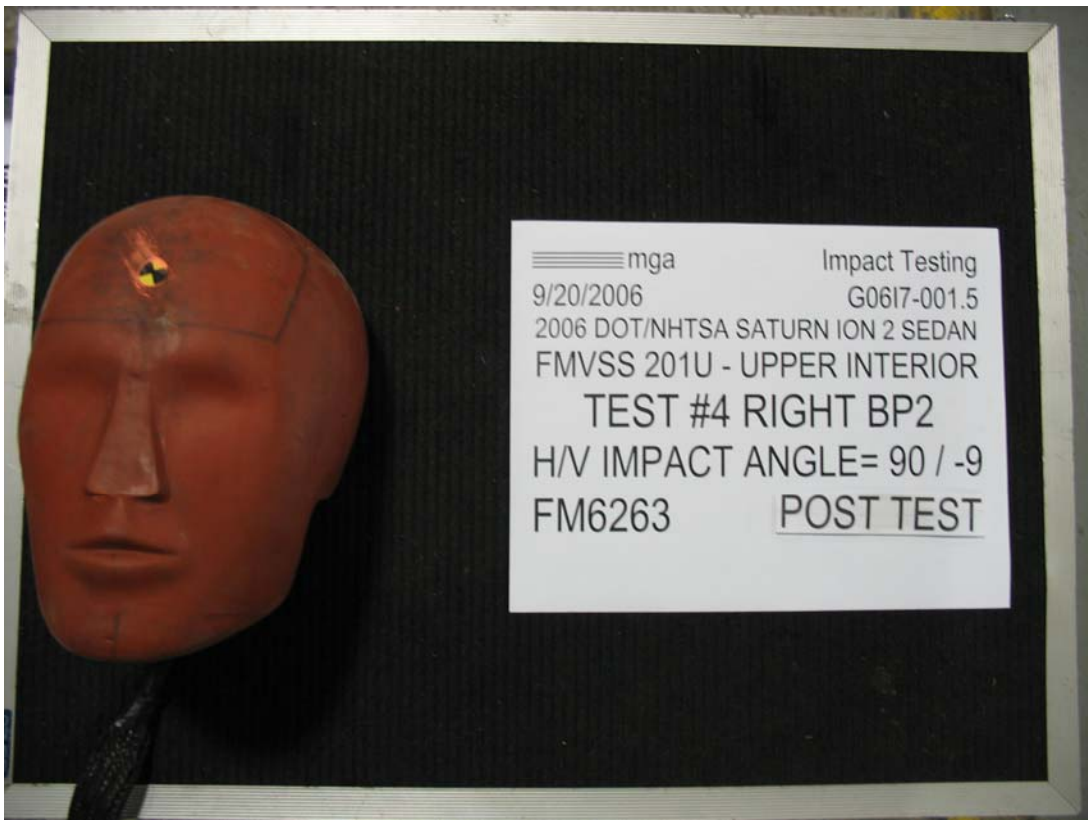
Max Displacement = 31.3 mm @ 7.5 msec



Displacement (mm) vs. Time (msec)


mga
Impact Testing
9/20/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #4 RIGHT BP2
H/V IMPACT ANGLE= 90 / -9
FM6263
PRE TEST
BP2


UR4
UR5
SR1
SR2-B
SR2-A
BP1
mga
Impact Testing
9/20/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #4 RIGHT BP2
H/V IMPACT ANGLE= 90 / -9
FM6263
POST TEST


mga
Impact Testing
9/20/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #4 RIGHT BP2
H/V IMPACT ANGLE= 90 / -9
FM6263
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#4

Target (Vehicle Side): BP2Right

Temperature:22C

MGA Test Reference No.:FM6263

Humidity:43%

Approach Horizontal Angles:90º

Time of Test:4:36 PM

Approach Vertical Angles:-9º

FMH Serial No:[038]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
455	383	9.1	24.2	23	0

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-108.8	1.29	1.29
Y	6	J36193	102.7	1.79	1.79
Z	7	J36353	97.2	1.31	1.31

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

D-ring cover broke off.

Recorded By: _____ Approved By*: _____ Date: 9/20/2006

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 4
FM6263
Additional Desc: N/A

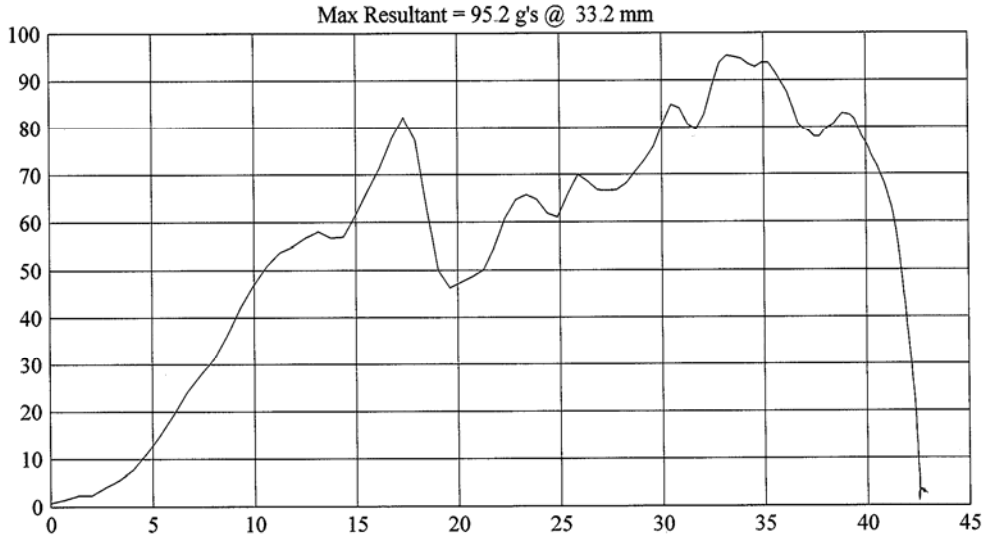
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/20/2006

Model Year: 2006
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/-9

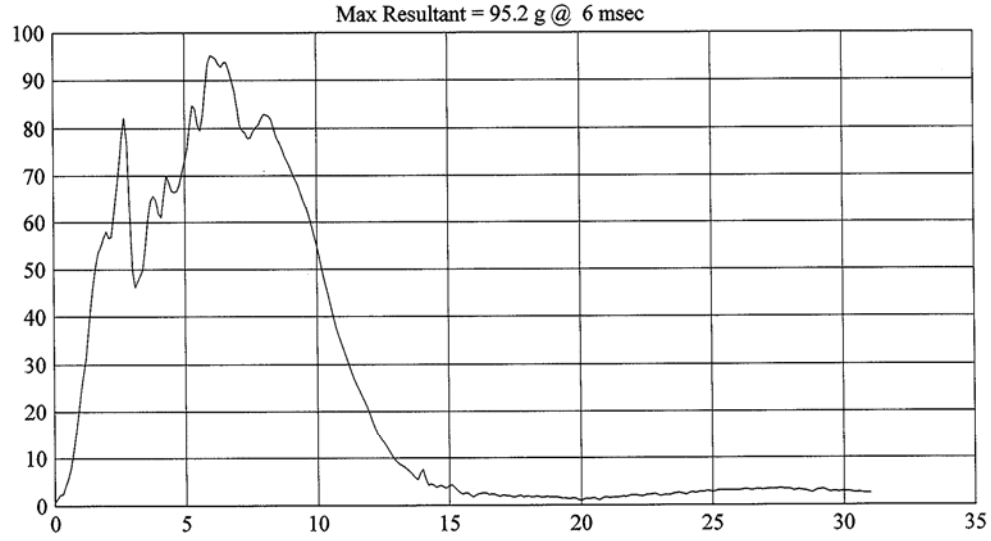
HIC(d) = 455, HIC = 383, Delta T = 9.1 msec

Max Resultant = 95.2 g's @ 33.2 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 95.2 g @ 6 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 4
FM6263
Additional Desc: N/A

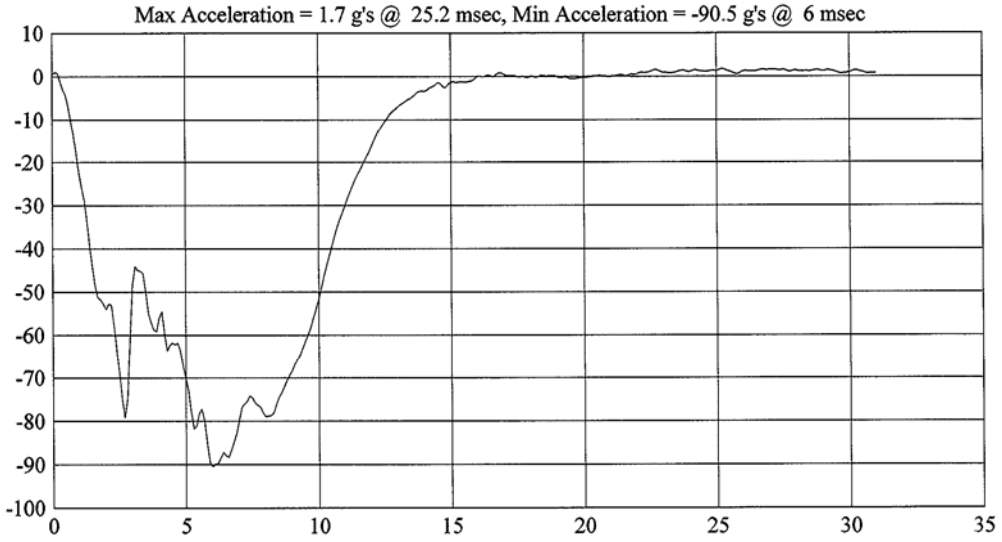
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/20/2006

Model Year: 2006
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/-9

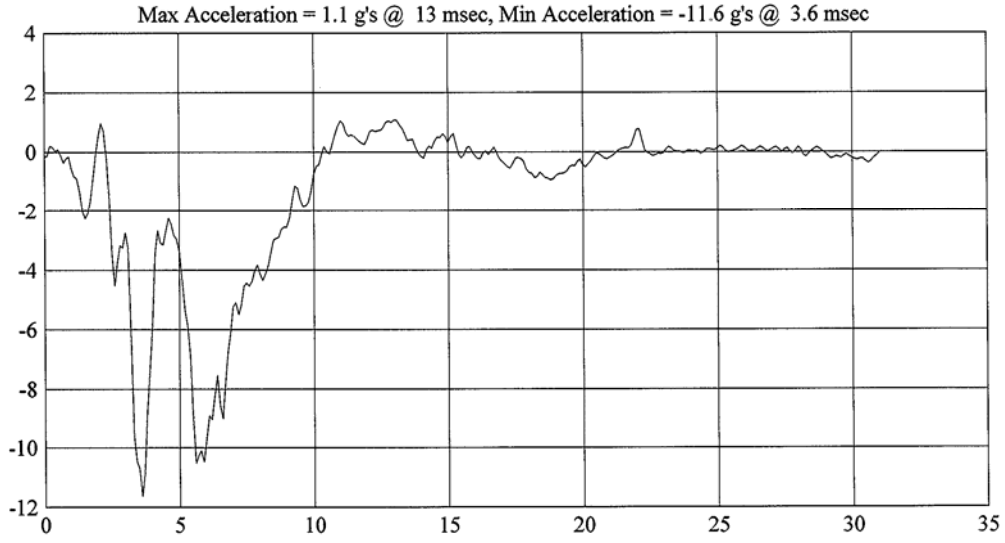
HIC(d) = 455, HIC = 383, Delta T = 9.1 msec

Max Acceleration = 1.7 g's @ 25.2 msec, Min Acceleration = -90.5 g's @ 6 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 1.1 g's @ 13 msec, Min Acceleration = -11.6 g's @ 3.6 msec



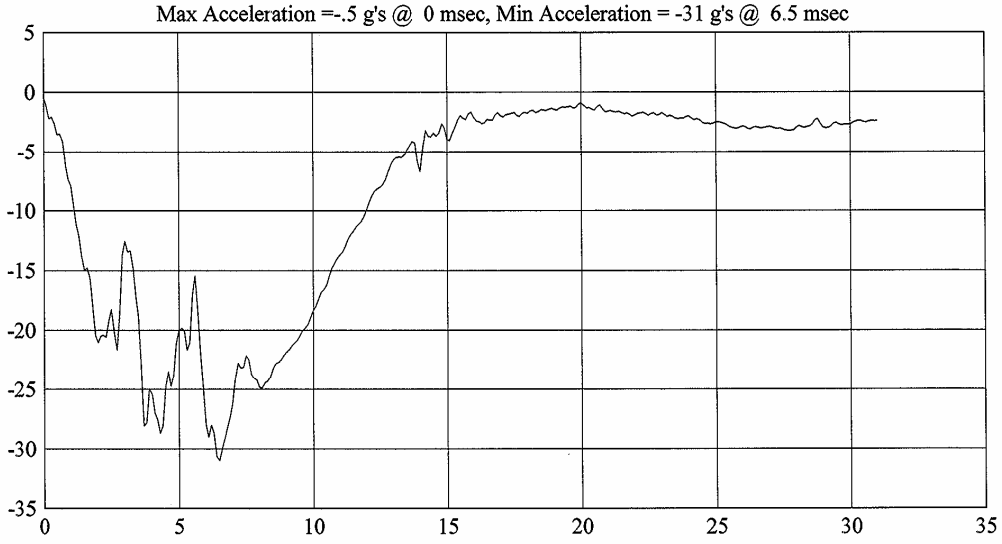
Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA	Vehicle Program : Saturn Ion 2 Sedan	Model Year: 2006
Test # 4		Target: BP2
FM6263	Test Date: 9/20/2006	Vehicle Side: Right
Additional Desc: N/A		Horz/Vert Angle: 90/-9

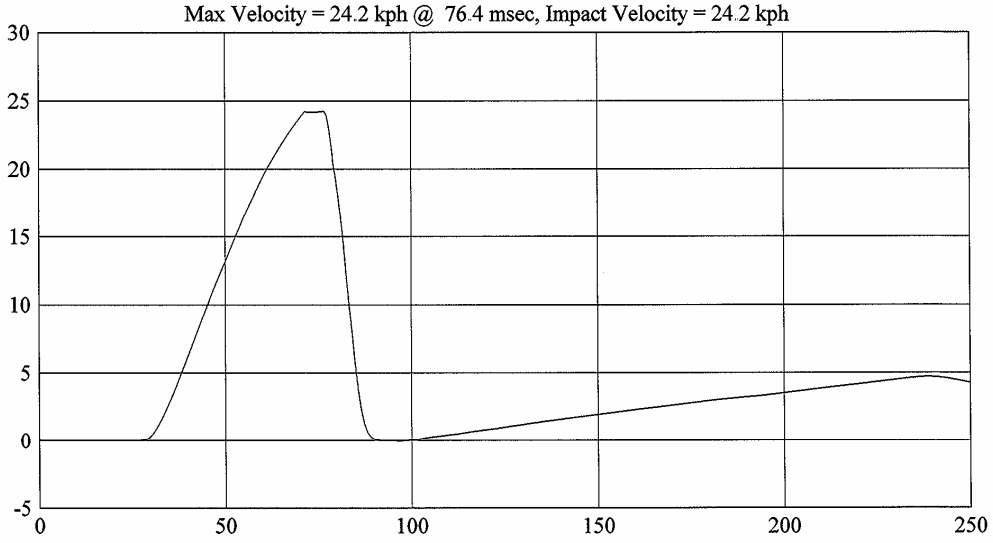
HIC(d) = 455, HIC = 383, Delta T = 9.1 msec

Max Acceleration =-.5 g's @ 0 msec, Min Acceleration = -31 g's @ 6.5 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 24.2 kph @ 76.4 msec, Impact Velocity = 24.2 kph



Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 4
FM6263
Additional Desc: N/A

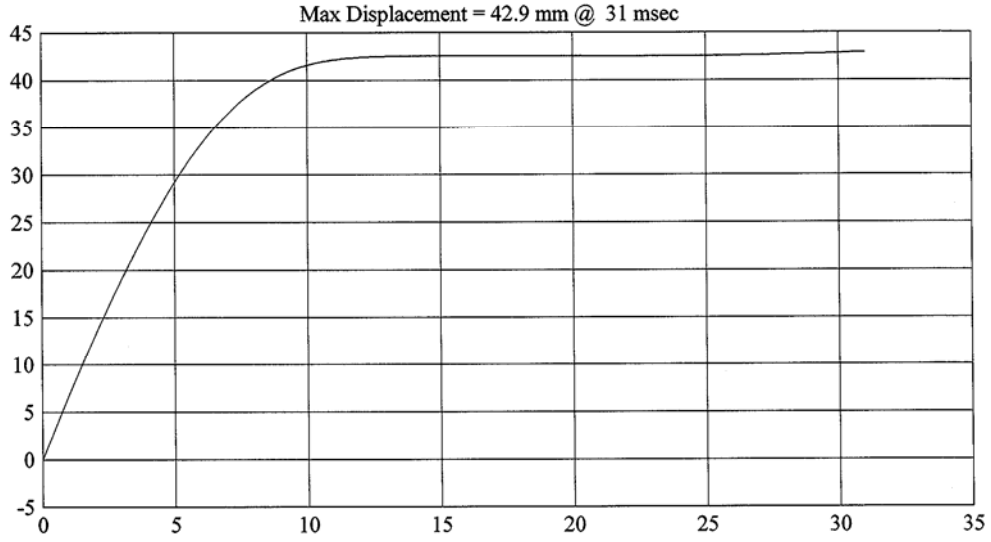
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/20/2006

Model Year: 2006
Target: BP2
Vehicle Side: Right
Horz/Vert Angle: 90/-9

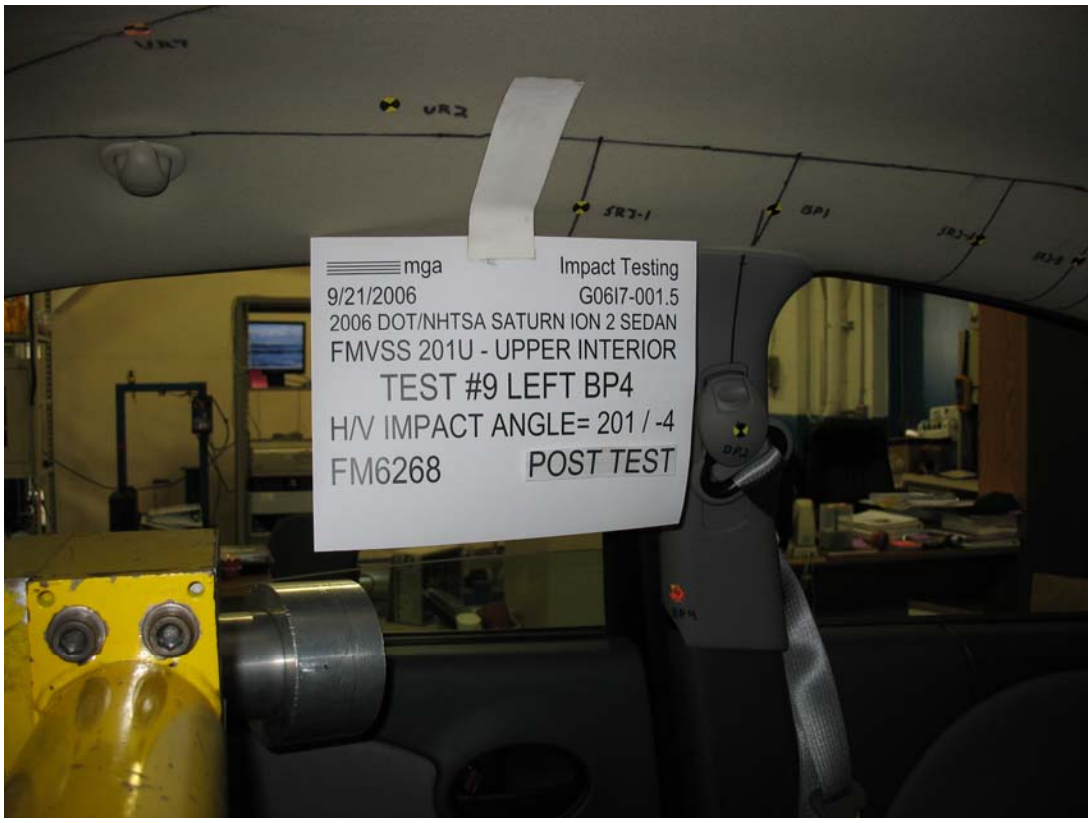
HIC(d) = 455, HIC = 383, Delta T = 9.1 msec

Max Displacement = 42.9 mm @ 31 msec



Displacement (mm) vs. Time (msec)


mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #9 LEFT BP4
H/V IMPACT ANGLE= 201 / -4
FM6268
PRE TEST


mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #9 LEFT BP4
H/V IMPACT ANGLE= 201 / -4
FM6268
POST TEST


mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #9 LEFT BP4
H/V IMPACT ANGLE= 201 / -4
FM6268
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#9

Target (Vehicle Side): BP4Left

Temperature:21C

MGA Test Reference No.:FM6268

Humidity:40%

Approach Horizontal Angles:201º

Time of Test:4:36 PM

Approach Vertical Angles:-4º

FMH Serial No:[038]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
593	566	5.8	23.9	15	3 Left

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-108.8	1.29	1.29
Y	6	J36193	102.7	1.79	1.79
Z	7	J36353	97.2	1.31	1.31

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Broke the bottom of the B-pillar trim off.

Recorded By: Kevin Campbell Approved By*: Eileen A. Kaleto Date: 9/21/2006

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

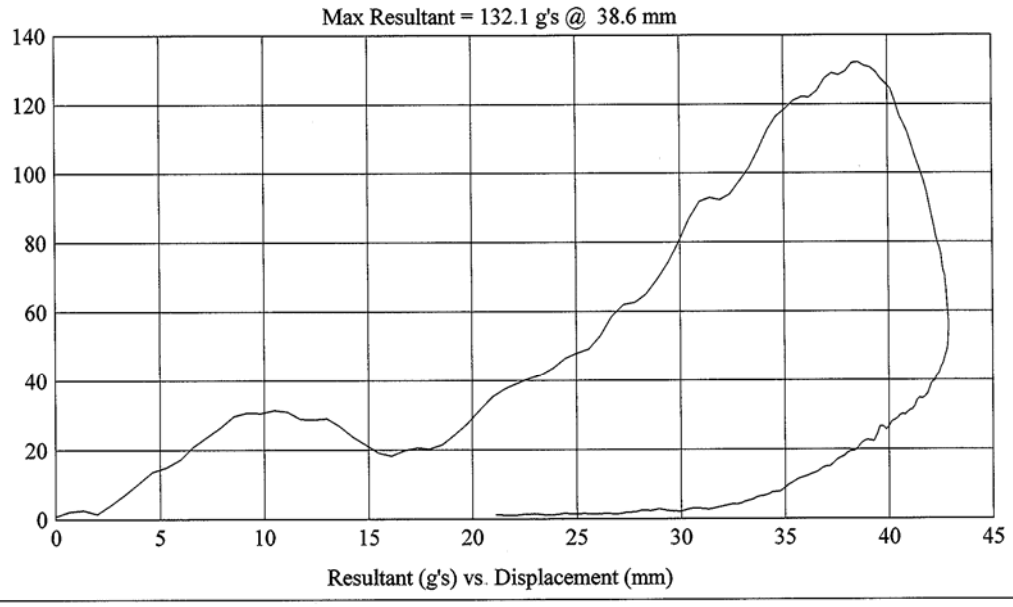
Customer: DOT/NHTSA
Test # 9
FM6268
Additional Desc: N/A

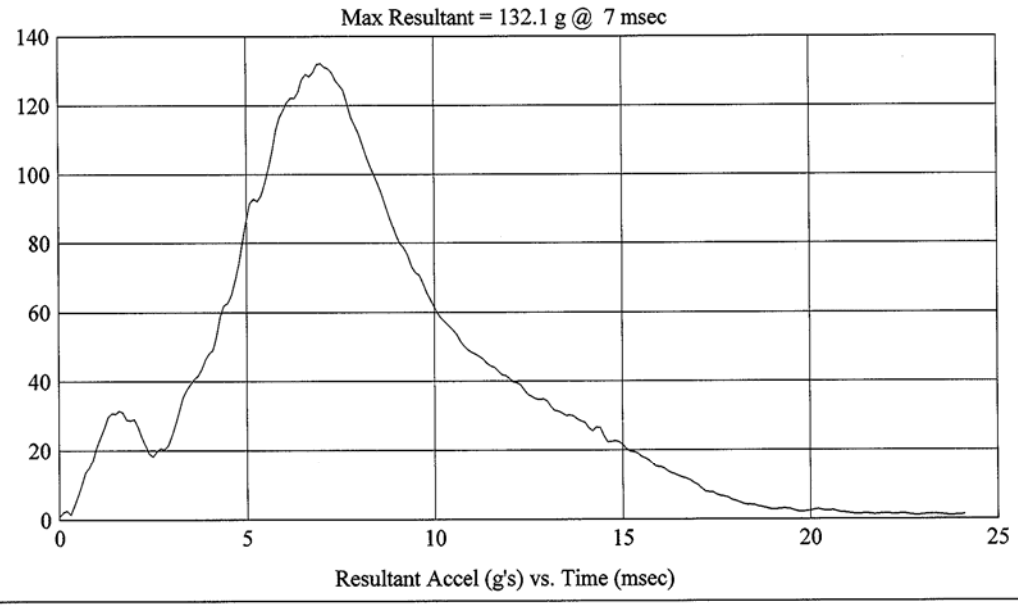
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: BP4
Vehicle Side: Left
Horz/Vert Angle: 201/-4

HIC(d) = 593, HIC = 566, Delta T = 5.8 msec





FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 9
FM6268
Additional Desc: N/A

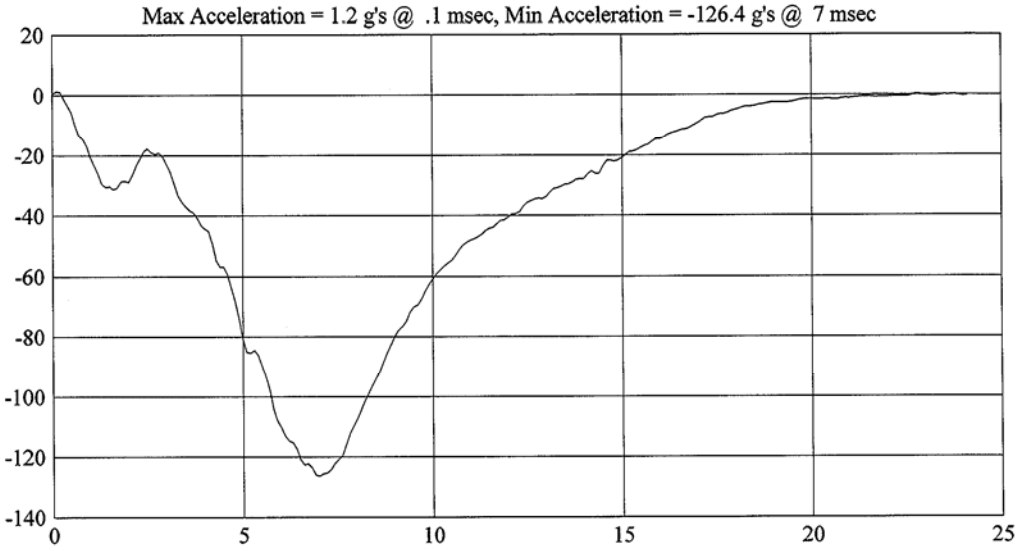
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: BP4
Vehicle Side: Left
Horz/Vert Angle: 201/-4

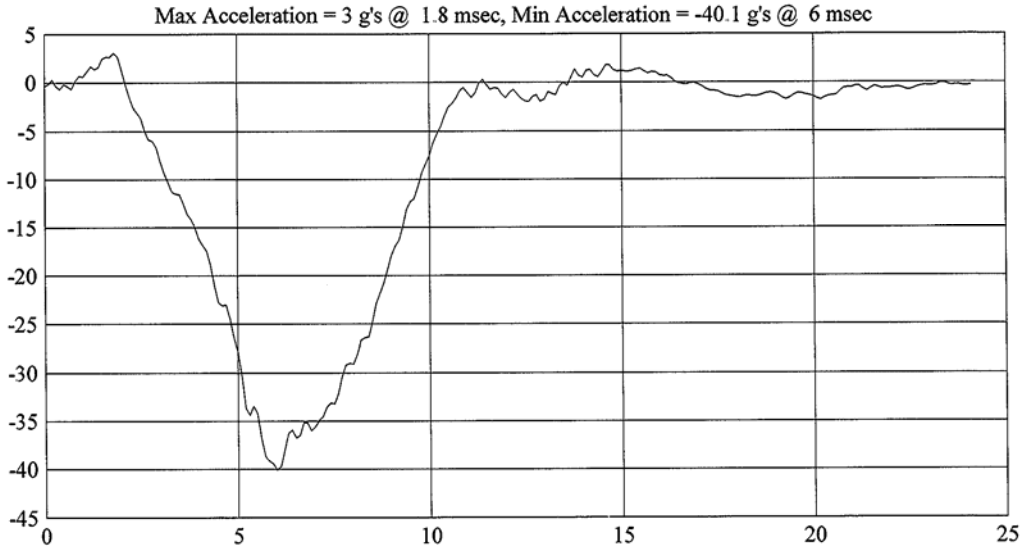
HIC(d) = 593, HIC = 566, Delta T = 5.8 msec

Max Acceleration = 1.2 g's @ .1 msec, Min Acceleration = -126.4 g's @ 7 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 3 g's @ 1.8 msec, Min Acceleration = -40.1 g's @ 6 msec



Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 9
FM6268
Additional Desc: N/A

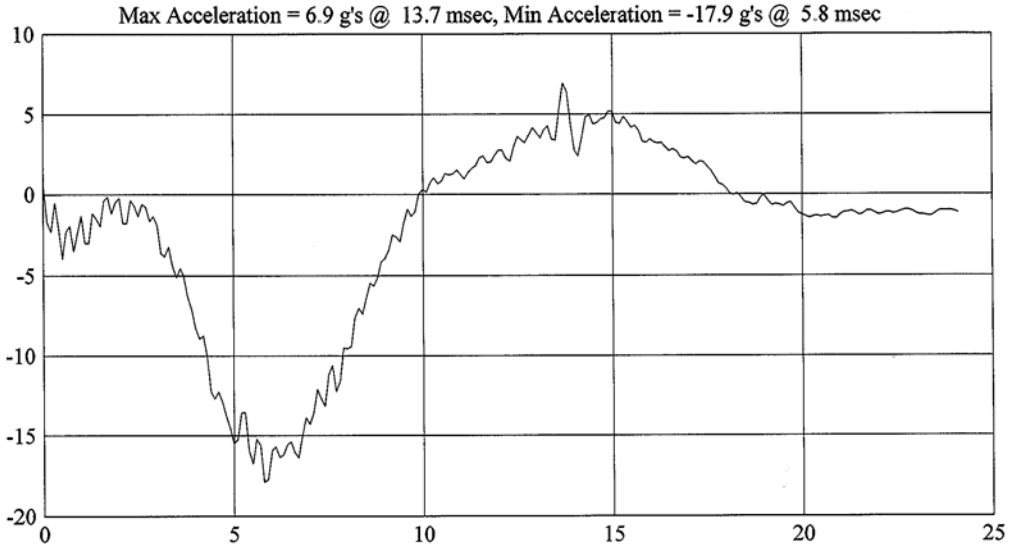
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: BP4
Vehicle Side: Left
Horz/Vert Angle: 201/-4

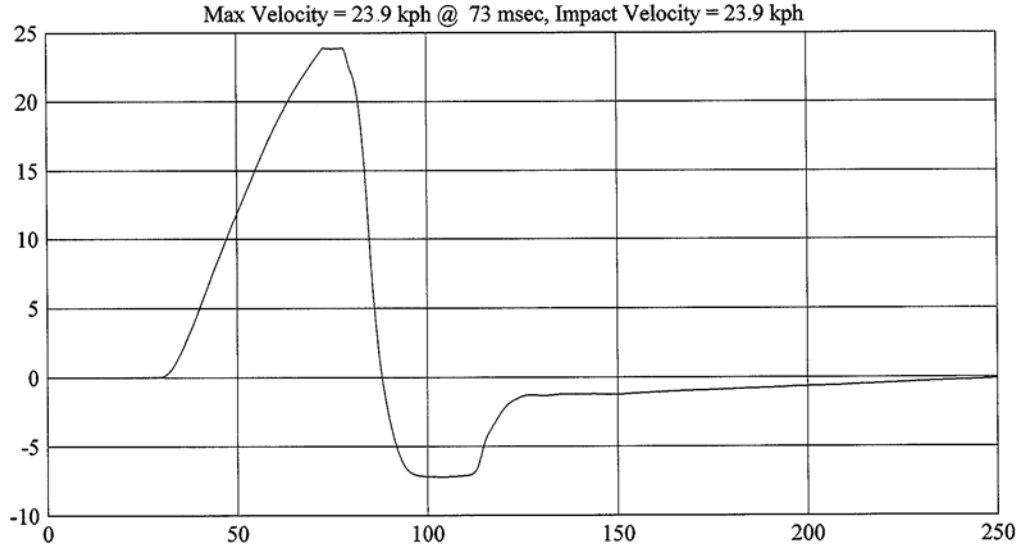
HIC(d) = 593, HIC = 566, Delta T = 5.8 msec

Max Acceleration = 6.9 g's @ 13.7 msec, Min Acceleration = -17.9 g's @ 5.8 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 23.9 kph @ 73 msec, Impact Velocity = 23.9 kph



Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 9
FM6268
Additional Desc: N/A

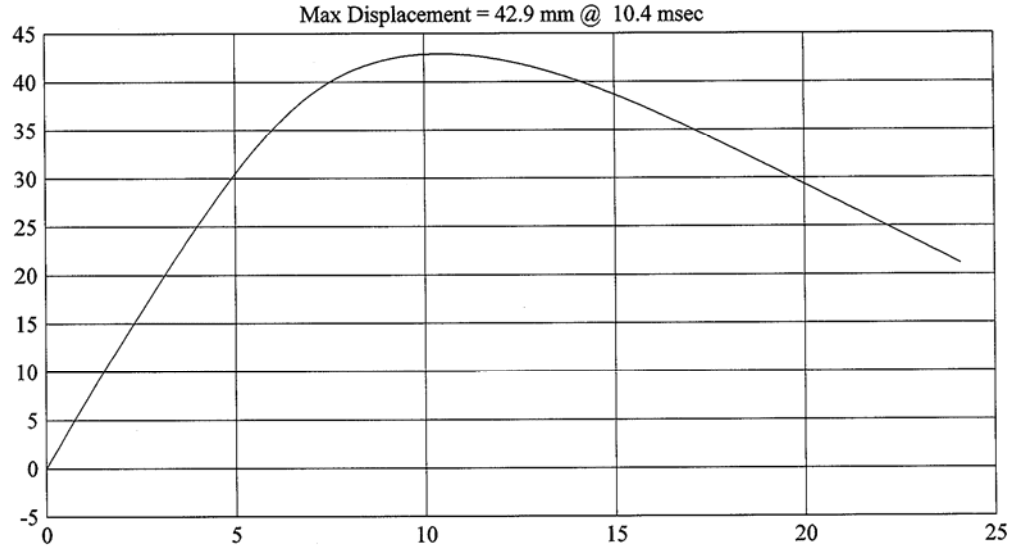
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: BP4
Vehicle Side: Left
Horz/Vert Angle: 201/-4

HIC(d) = 593, HIC = 566, Delta T = 5.8 msec

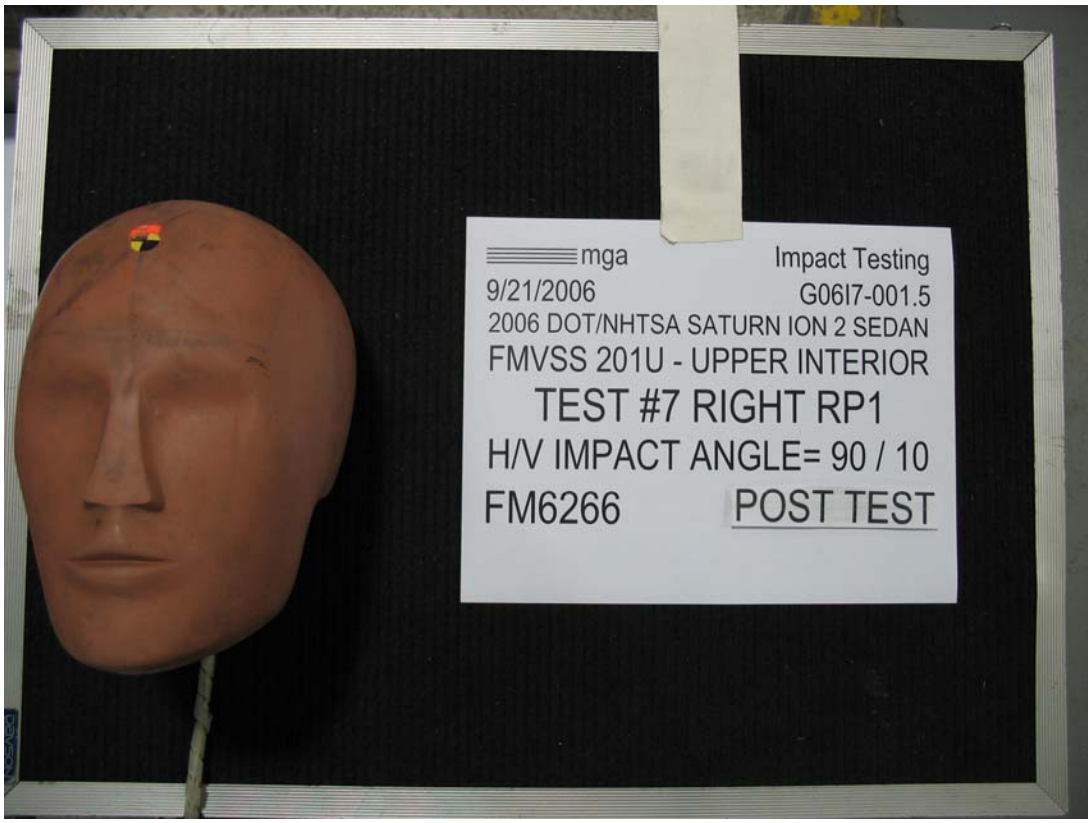
Max Displacement = 42.9 mm @ 10.4 msec



Displacement (mm) vs. Time (msec)


mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT RP1
H/V IMPACT ANGLE= 90 / 10
FM6266
PRE TEST


C60103
FM6266
RIGHT RP1
H/V 90/10
mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT RP1
H/V IMPACT ANGLE= 90 / 10
FM6266
POST TEST


mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT RP1
H/V IMPACT ANGLE= 90 / 10
FM6266
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#7

Target (Vehicle Side): RP1Right

Temperature:22C

MGA Test Reference No.:FM6266

Humidity:42%

Approach Horizontal Angles:90º

Time of Test:9:56 AM

Approach Vertical Angles:10º

FMH Serial No:[039]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
268	135	14.2	24.2	45	0

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J13753	-103.6	1.29	1.29
Y	6	J22700	94.4	1.79	1.79
Z	7	J32734	95.5	1.31	1.31

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Headliner deformation

Recorded By: _____ Approved By*: _____ Date: 9/21/2006

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 7
FM6266
Additional Desc: N/A

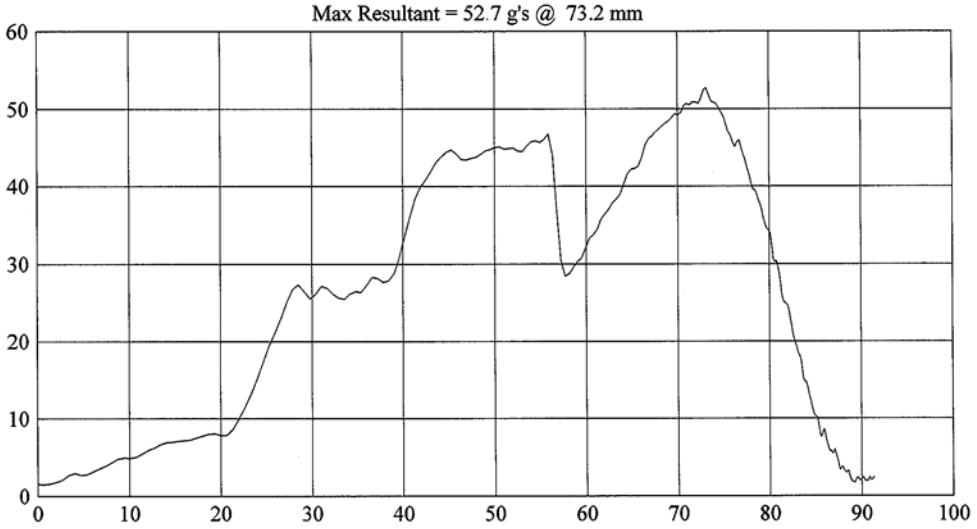
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: RP1
Vehicle Side: Right
Horz/Vert Angle: 90/10

HIC(d) = 268, HIC = 135, Delta T = 14.2 msec

Max Resultant = 52.7 g's @ 73.2 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 52.7 g @ 13.7 msec

Resultant Accel (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 7
FM6266
Additional Desc: N/A

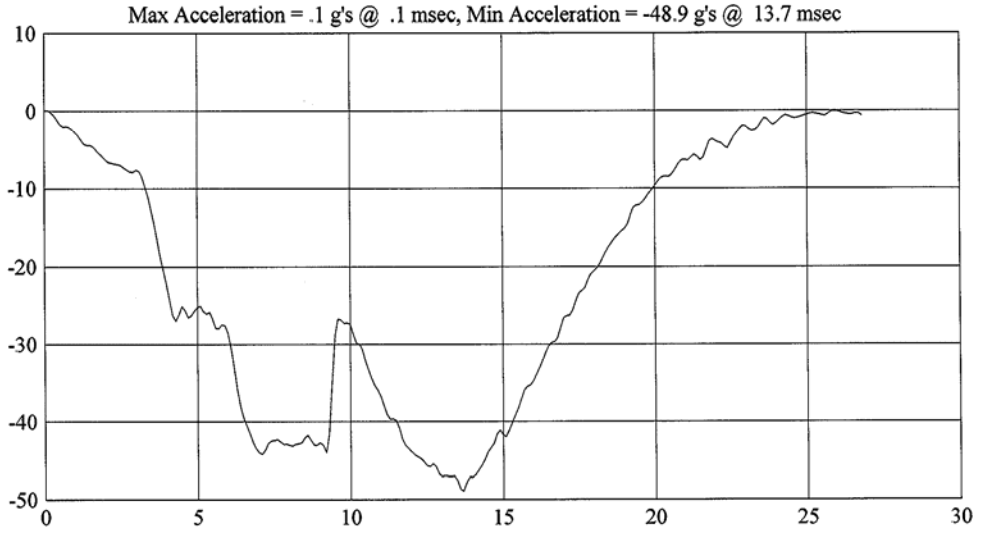
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: RP1
Vehicle Side: Right
Horz/Vert Angle: 90/10

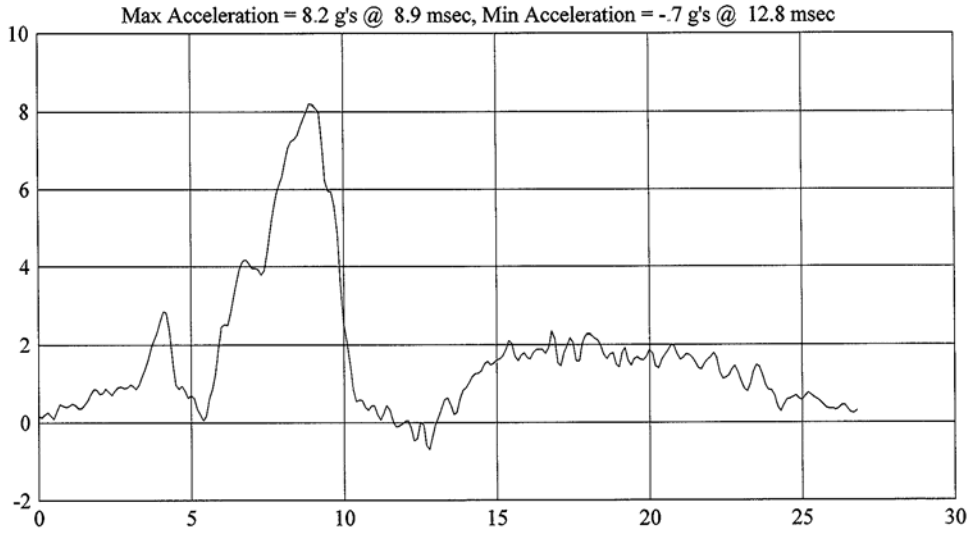
HIC(d) = 268, HIC = 135, Delta T = 14.2 msec

Max Acceleration = .1 g's @ .1 msec, Min Acceleration = -48.9 g's @ 13.7 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 8.2 g's @ 8.9 msec, Min Acceleration = -.7 g's @ 12.8 msec



Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 7
FM6266
Additional Desc: N/A

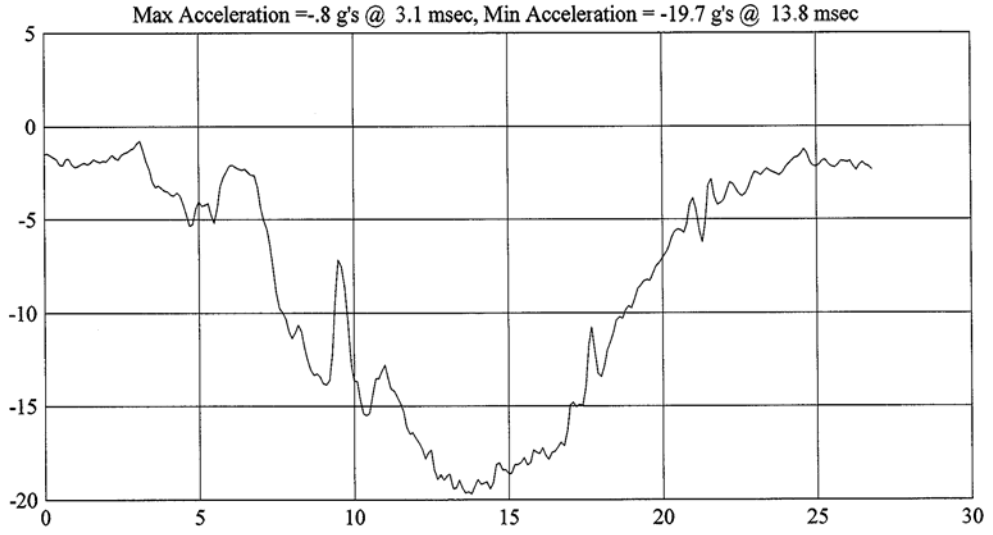
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: RP1
Vehicle Side: Right
Horz/Vert Angle: 90/10

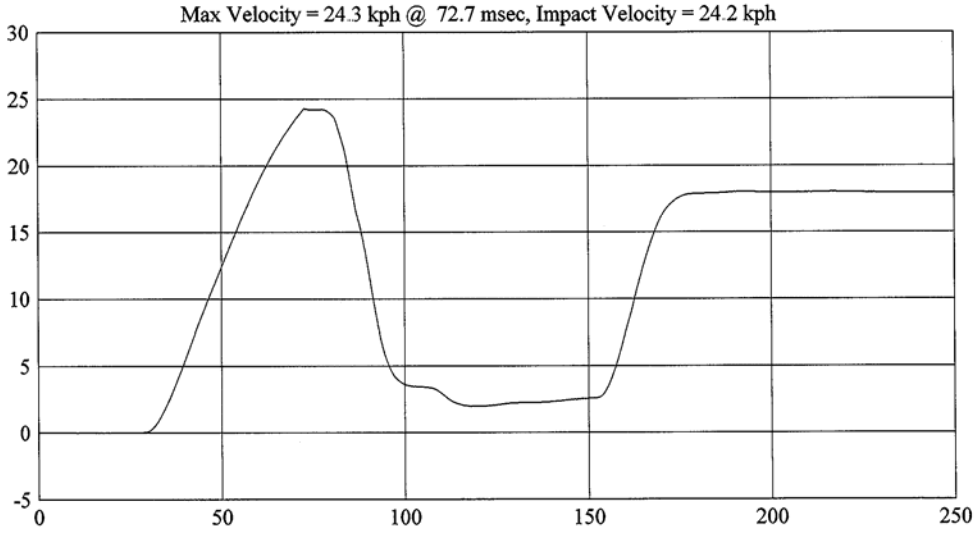
HIC(d) = 268, HIC = 135, Delta T = 14.2 msec

Max Acceleration =-.8 g's @ 3.1 msec, Min Acceleration = -19.7 g's @ 13.8 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 24.3 kph @ 72.7 msec, Impact Velocity = 24.2 kph



Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 7
FM6266
Additional Desc: N/A

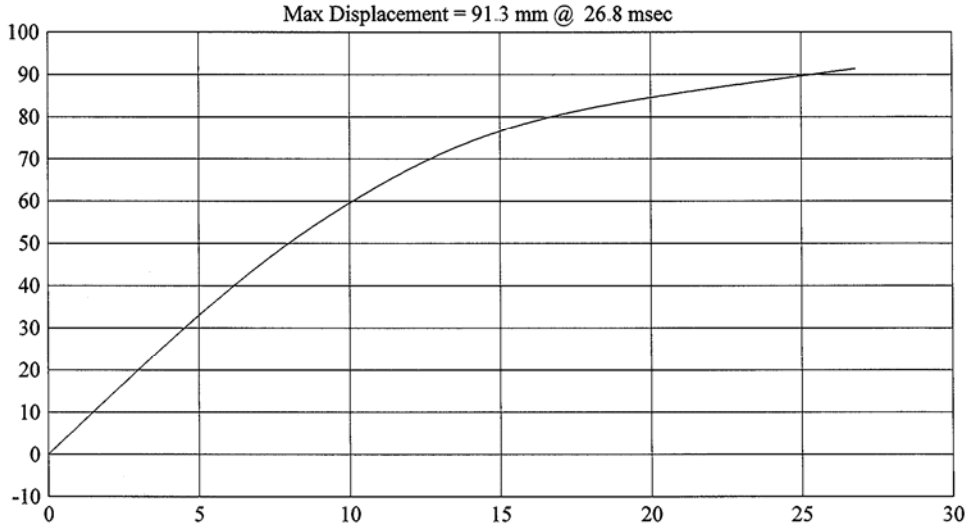
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

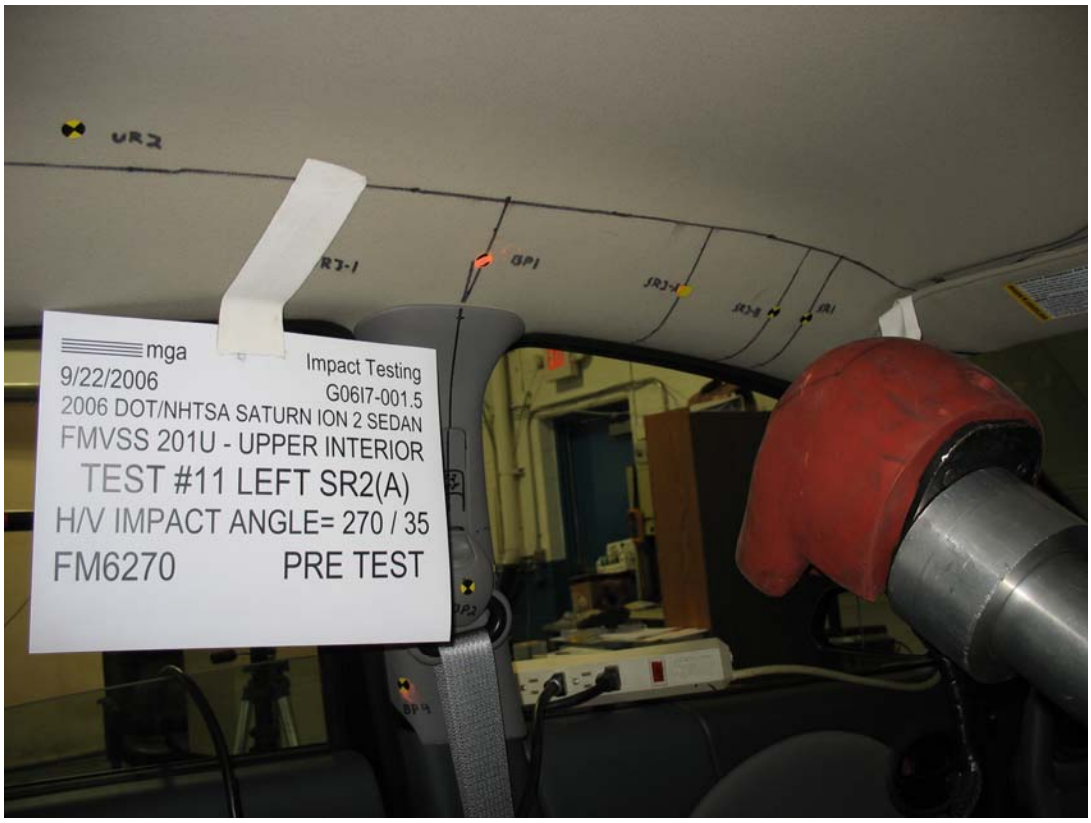
Model Year: 2006
Target: RP1
Vehicle Side: Right
Horz/Vert Angle: 90/10

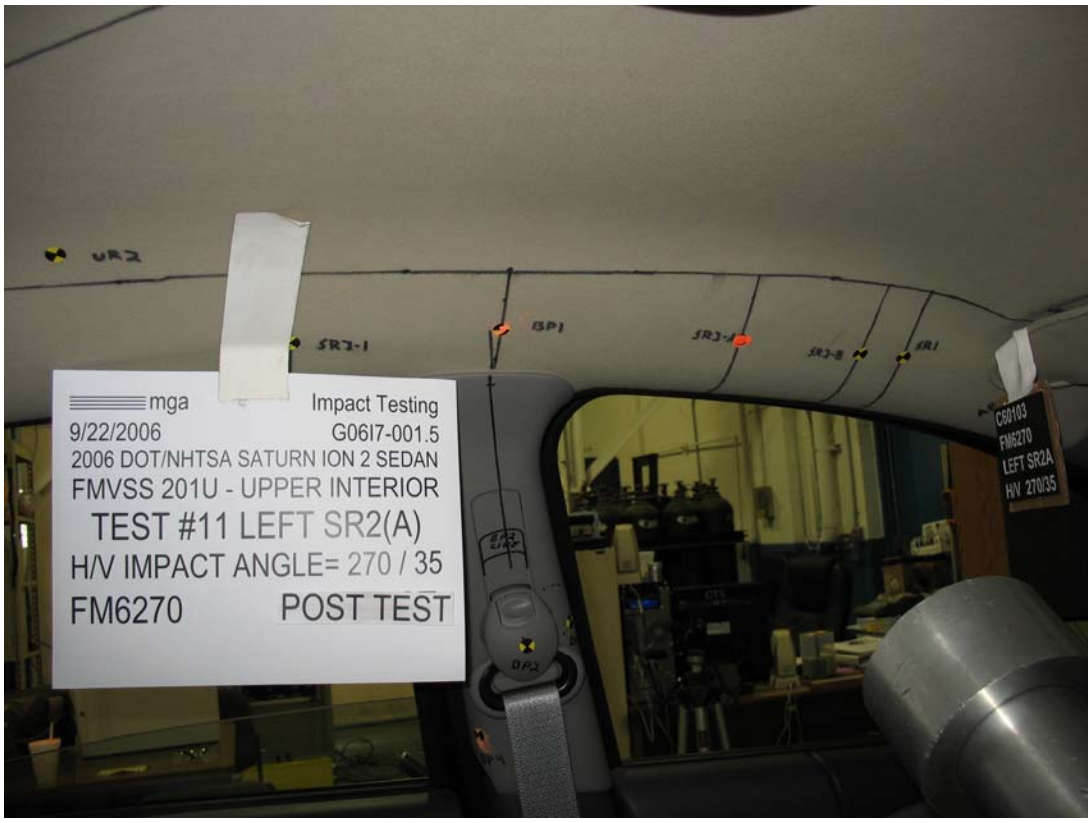
HIC(d) = 268, HIC = 135, Delta T = 14.2 msec

Max Displacement = 91.3 mm @ 26.8 msec



Displacement (mm) vs. Time (msec)


mga
9/22/2006
Impact Testing
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #11 LEFT SR2(A)
H/V IMPACT ANGLE= 270 / 35
FM6270
PRE TEST


mga
Impact Testing
9/22/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #11 LEFT SR2(A)
H/V IMPACT ANGLE= 270 / 35
FM6270
POST TEST
C60103
FM6270
LEFT SR2A
H/V 270/35


mga
Impact Testing
9/22/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #11 LEFT SR2(A)
H/V IMPACT ANGLE= 270 / 35
FM6270
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#11

Target (Vehicle Side): SR2(a)Left

Temperature:22C

MGA Test Reference No.:FM6270

Humidity:48%

Approach Horizontal Angles:270º

Time of Test:10:33:17 AM

Approach Vertical Angles:35º

FMH Serial No:[038]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
463	394	9.3	24.0	20	10

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-108.8	1.29	1.30
Y	6	J36193	102.7	1.79	1.79
Z	7	J36353	97.2	1.31	1.31

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage.

Recorded By: Travis Campbell Approved By*: Eileen A. Kaleto Date: 9/22/2006

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 11
FM6270
Additional Desc: N/A

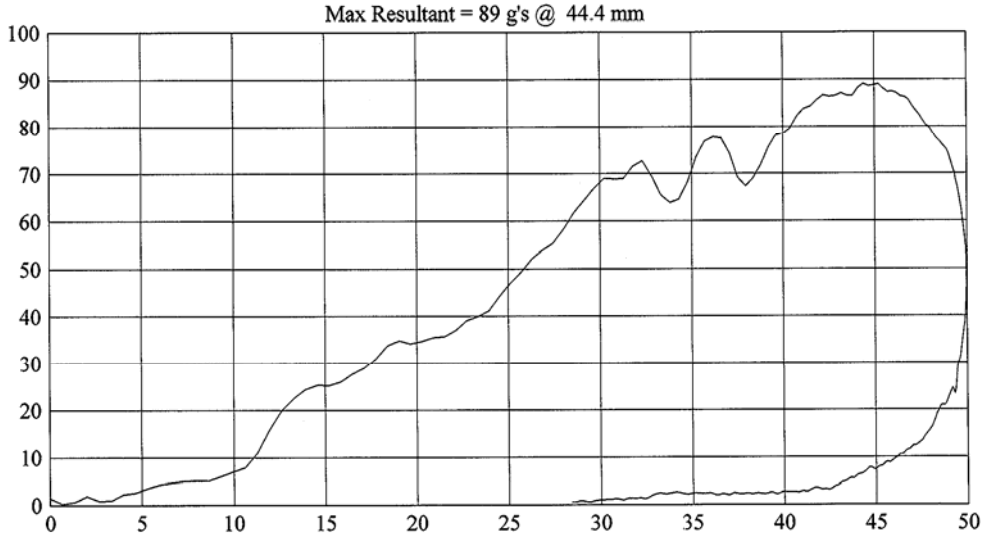
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/22/2006

Model Year: 2006
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/35

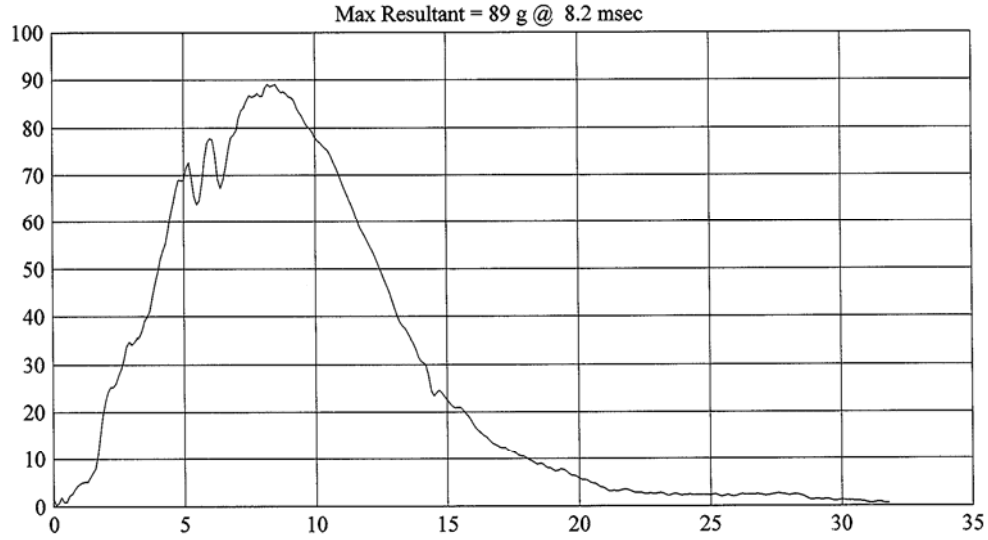
HIC(d) = 463, HIC = 394, Delta T = 9.3 msec

Max Resultant = 89 g's @ 44.4 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 89 g @ 8.2 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 11
FM6270
Additional Desc: N/A

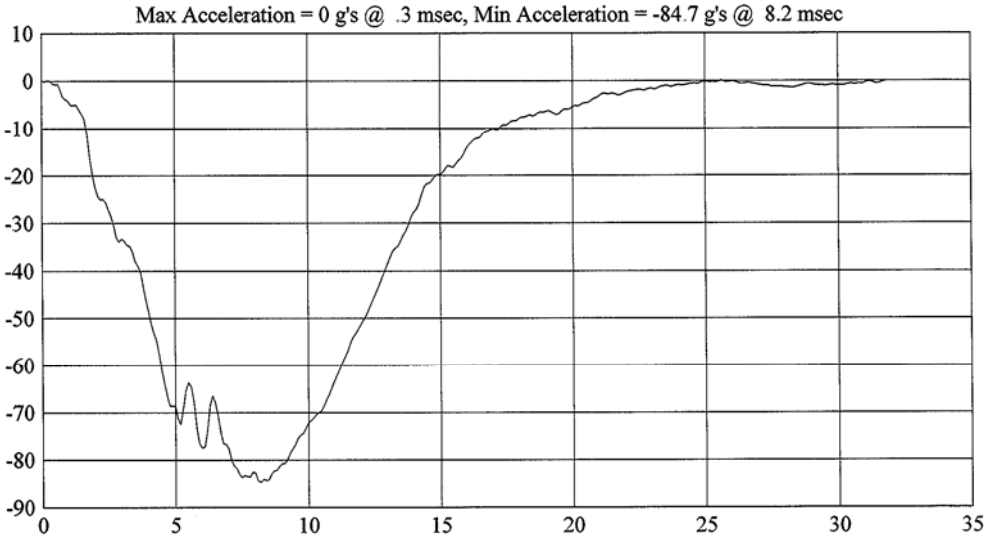
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/22/2006

Model Year: 2006
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/35

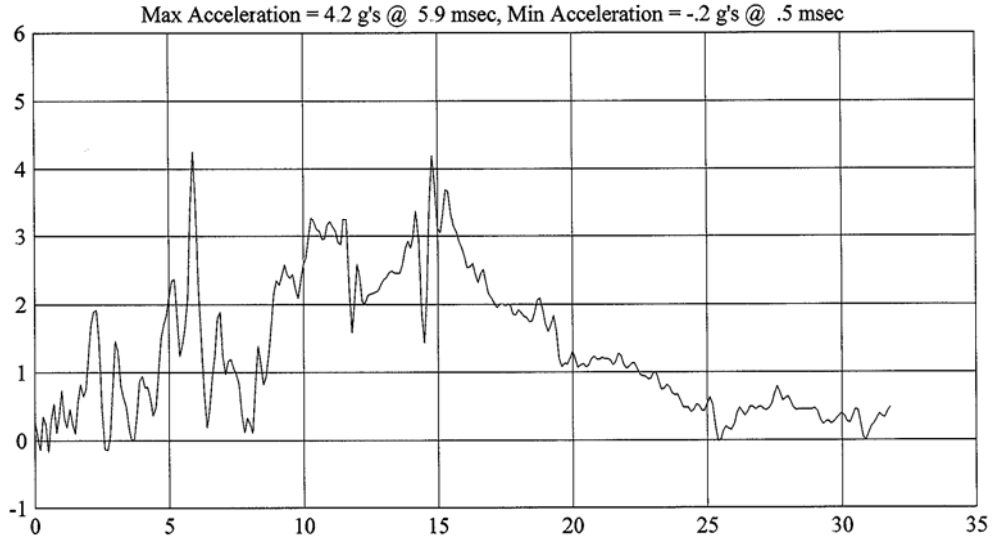
HIC(d) = 463, HIC = 394, Delta T = 9.3 msec

Max Acceleration = 0 g's @ .3 msec, Min Acceleration = -84.7 g's @ 8.2 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 4.2 g's @ 5.9 msec, Min Acceleration = -.2 g's @ .5 msec



Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 11
FM6270
Additional Desc: N/A

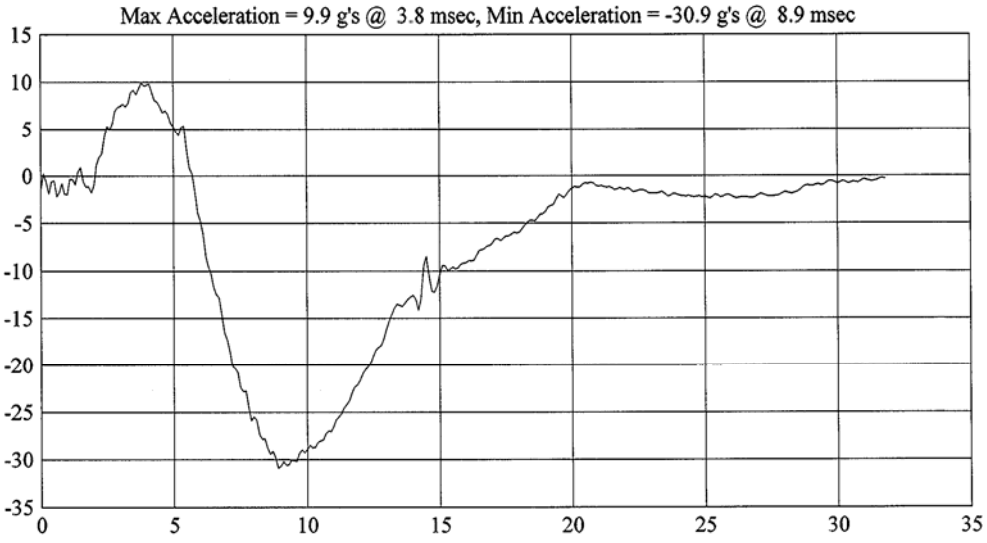
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/22/2006

Model Year: 2006
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/35

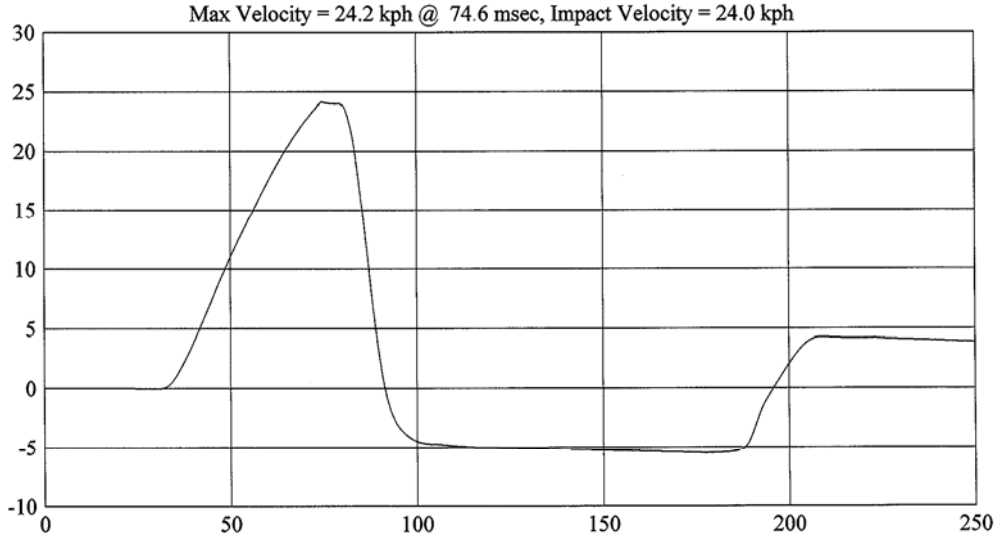
HIC(d) = 463, HIC = 394, Delta T = 9.3 msec

Max Acceleration = 9.9 g's @ 3.8 msec, Min Acceleration = -30.9 g's @ 8.9 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 24.2 kph @ 74.6 msec, Impact Velocity = 24.0 kph



Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 11
FM6270
Additional Desc: N/A

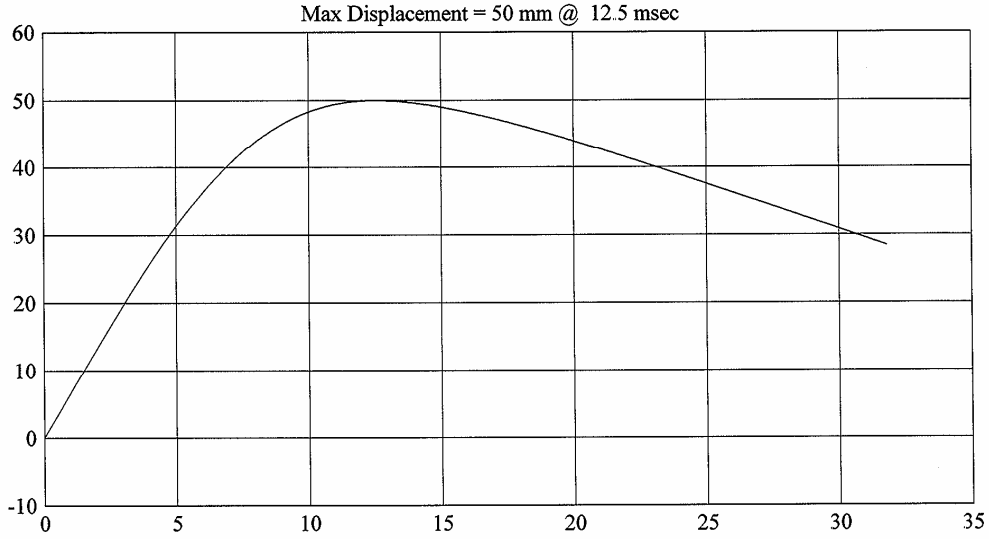
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/22/2006

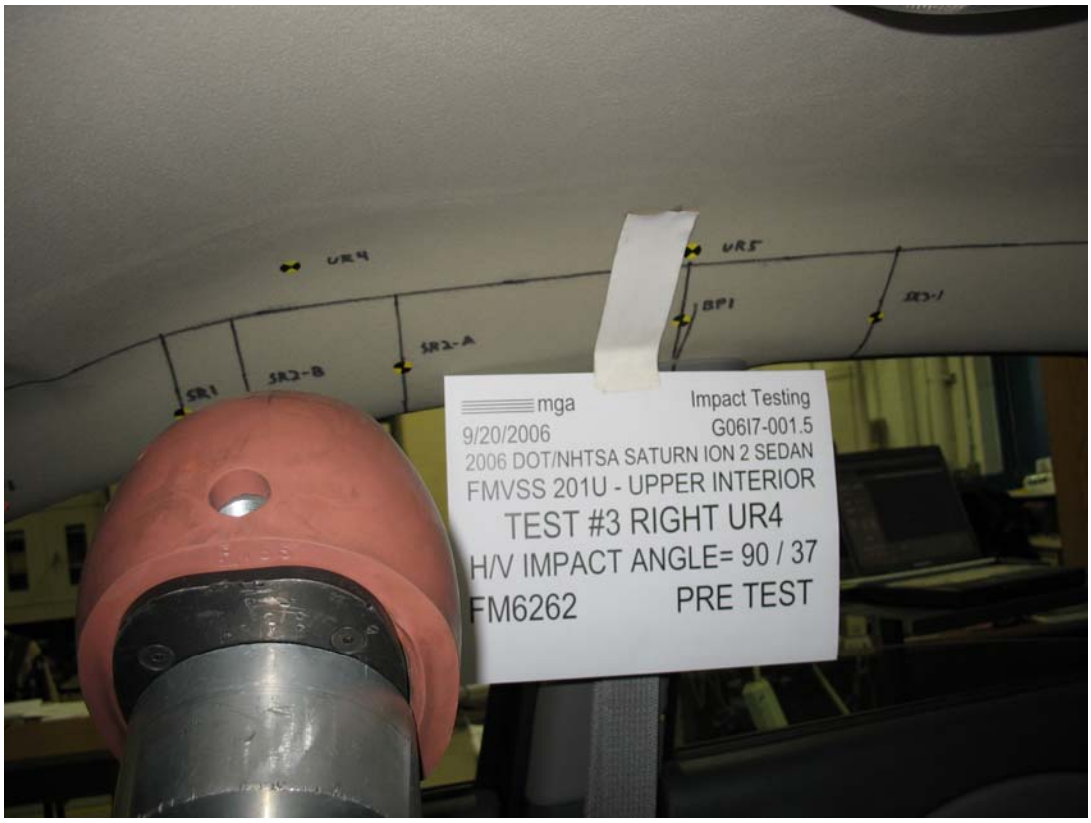
Model Year: 2006
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/35

HIC(d) = 463, HIC = 394, Delta T = 9.3 msec

Max Displacement = 50 mm @ 12.5 msec



Displacement (mm) vs. Time (msec)


UR4
UR5
BP1
SR1
SR2-B
SR2-A
mga
Impact Testing
9/20/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #3 RIGHT UR4
H/V IMPACT ANGLE= 90 / 37
FM6262
PRE TEST


UR4
UR5
BP1
SR1
SR2-B
SR2-A
mga
Impact Testing
9/20/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #3 RIGHT UR4
H/V IMPACT ANGLE= 90 / 37
FM6262
POST TEST


mga
Impact Testing
9/20/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #3 RIGHT UR4
H/V IMPACT ANGLE= 90 / 37
FM6262
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#3

Target (Vehicle Side): UR4Right

Temperature:22C

MGA Test Reference No.:FM6262

Humidity:43%

Approach Horizontal Angles:90º

Time of Test:2:17 PM

Approach Vertical Angles:37º

FMH Serial No:[039]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
686	689	7.5	24.0	30	3 Left

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J13753	-103.6	1.29	1.29
Y	6	J22700	94.4	1.79	1.79
Z	7	J32734	95.5	1.31	1.31

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Headliner deformation.

Recorded By: _____ Approved By*: _____ Date: 9/20/2006

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 3
FM6262
Additional Desc: N/A

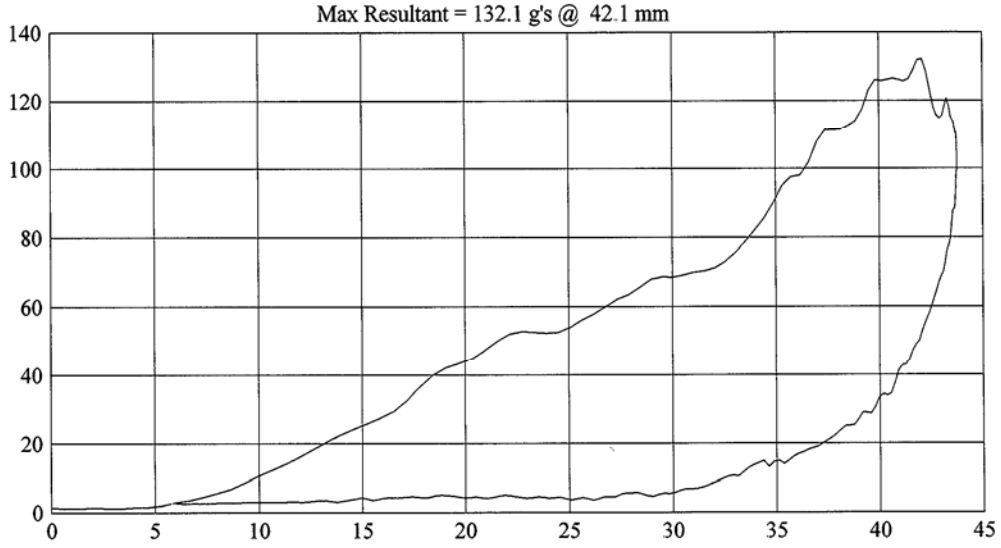
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/20/2006

Model Year: 2006
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 90/37

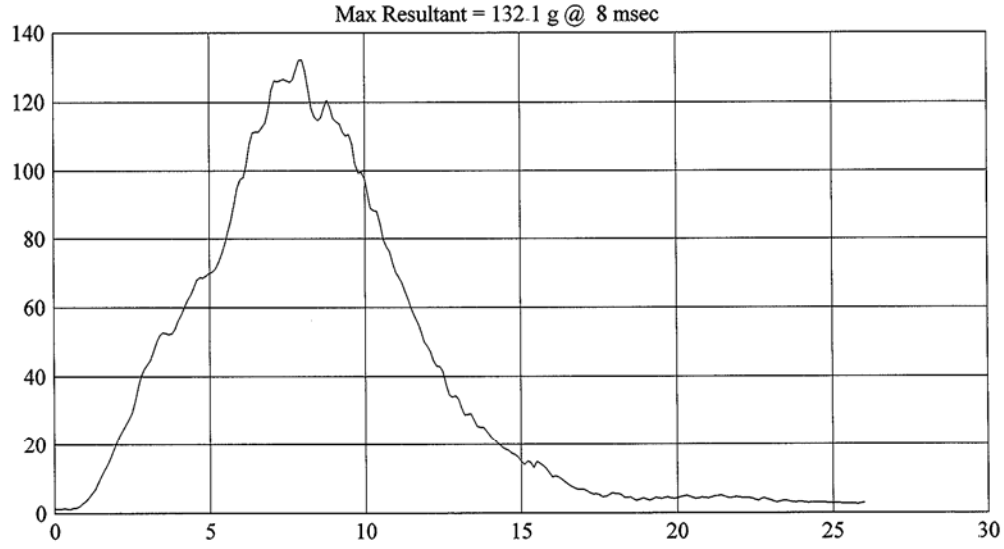
HIC(d) = 686, HIC = 689, Delta T = 7.5 msec

Max Resultant = 132.1 g's @ 42.1 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 132.1 g @ 8 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 3
FM6262
Additional Desc: N/A

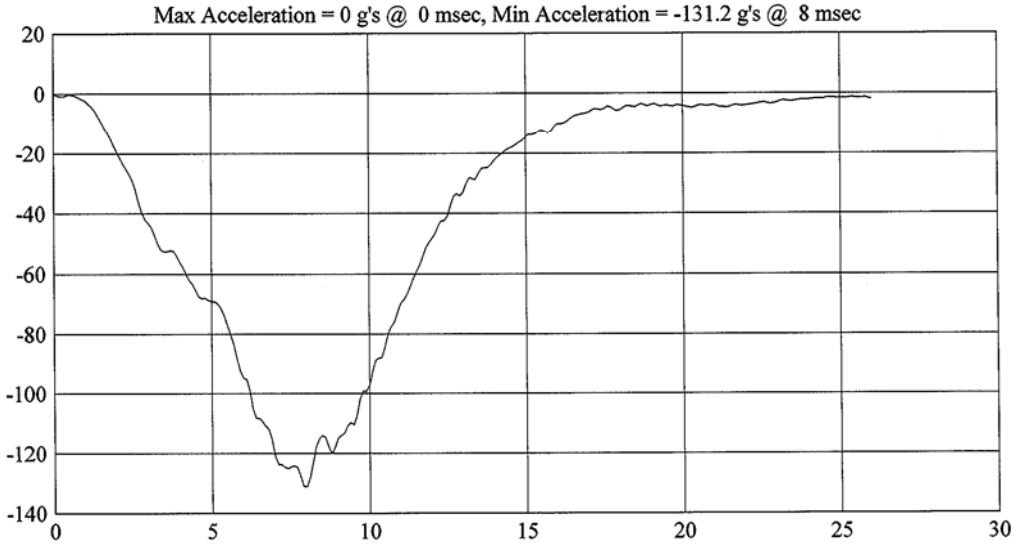
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/20/2006

Model Year: 2006
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 90/37

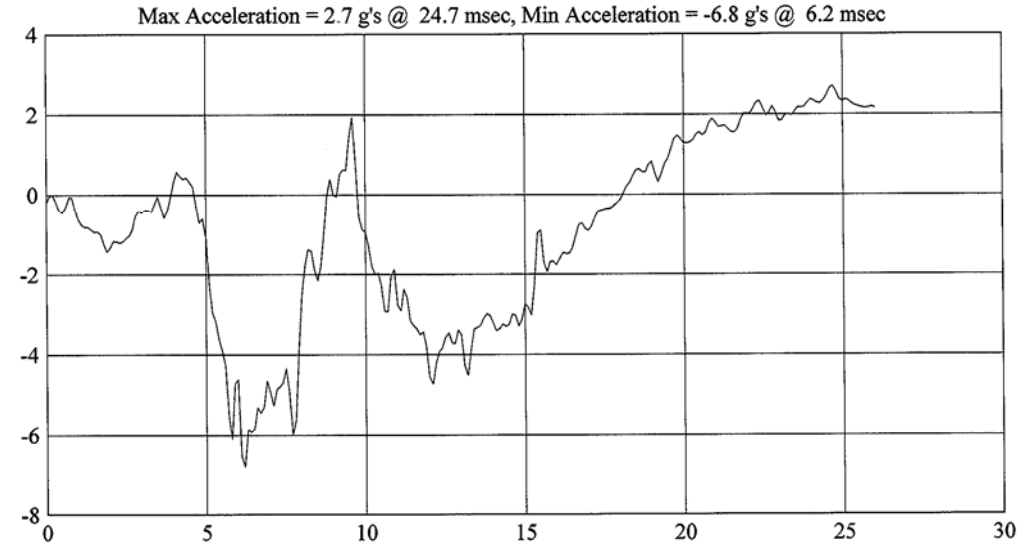
HIC(d) = 686, HIC = 689, Delta T = 7.5 msec

Max Acceleration = 0 g's @ 0 msec, Min Acceleration = -131.2 g's @ 8 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 2.7 g's @ 24.7 msec, Min Acceleration = -6.8 g's @ 6.2 msec



Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 3
FM6262
Additional Desc: N/A

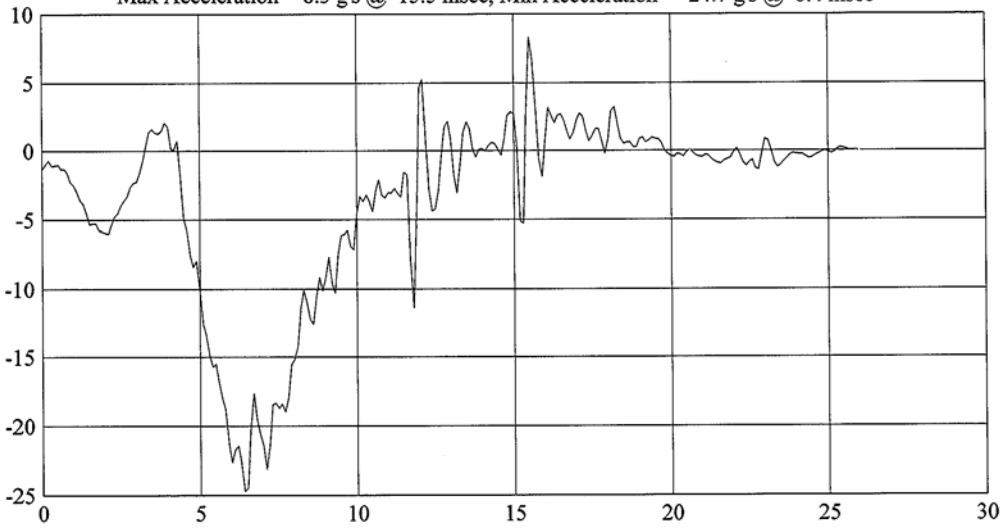
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/20/2006

Model Year: 2006
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 90/37

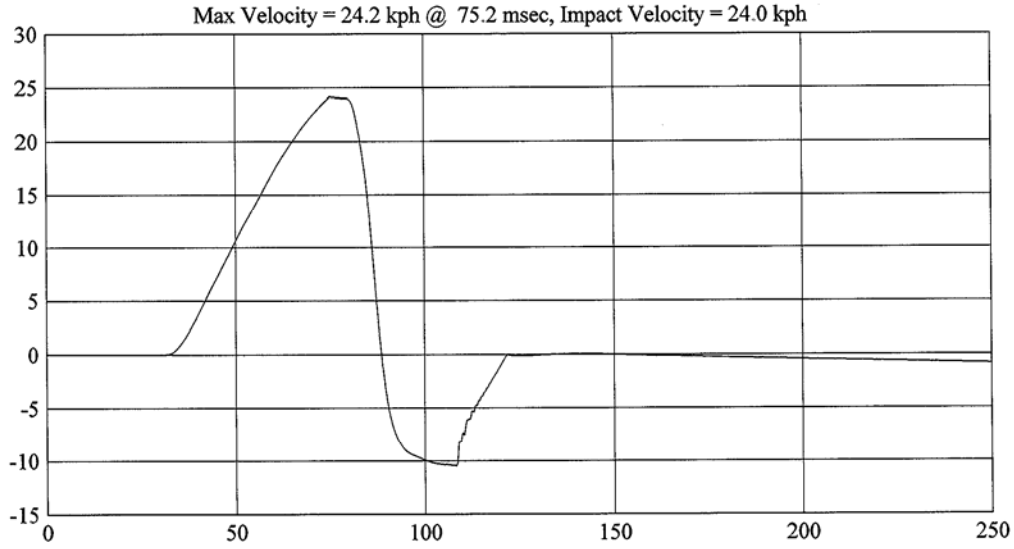
HIC(d) = 686, HIC = 689, Delta T = 7.5 msec

Max Acceleration = 8.3 g's @ 15.5 msec, Min Acceleration = -24.7 g's @ 6.4 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 24.2 kph @ 75.2 msec, Impact Velocity = 24.0 kph



Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

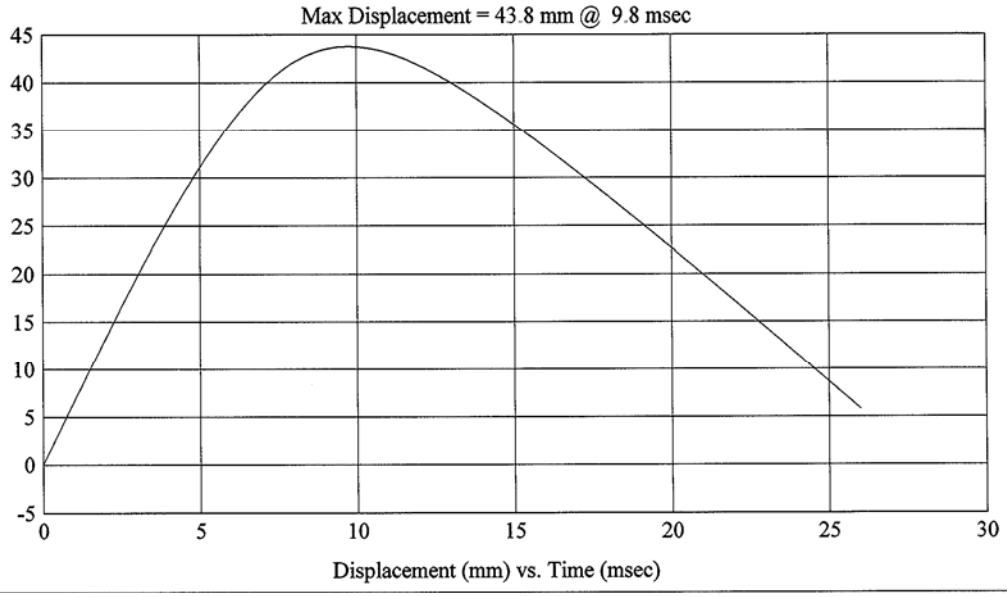
Customer: DOT/NHTSA
Test # 3
FM6262
Additional Desc: N/A

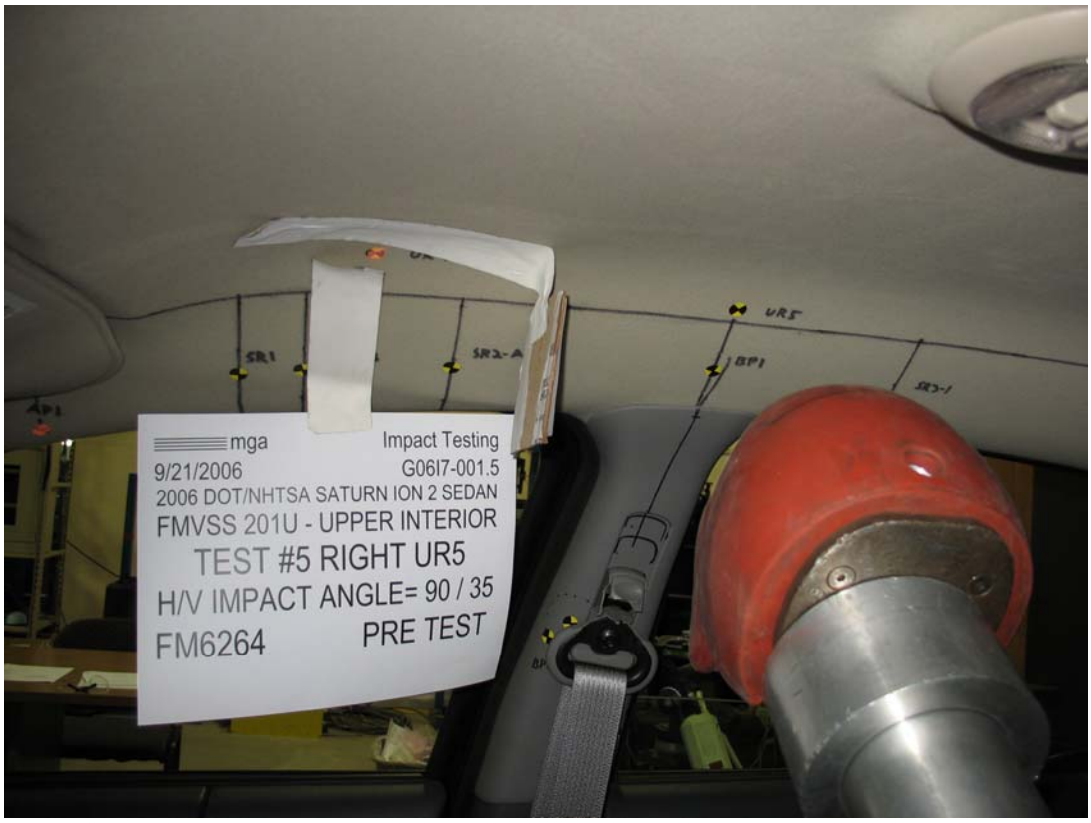
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/20/2006

Model Year: 2006
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 90/37

HIC(d) = 686, HIC = 689, Delta T = 7.5 msec




mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #5 RIGHT UR5
H/V IMPACT ANGLE= 90 / 35
FM6264
PRE TEST


mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #5 RIGHT UR5
H/V IMPACT ANGLE= 90 / 35
FM6264
POST TEST


mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #5 RIGHT UR5
H/V IMPACT ANGLE= 90 / 35
FM6264
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#5

Target (Vehicle Side): UR5Right

Temperature:22C

MGA Test Reference No.:FM6264

Humidity:42%

Approach Horizontal Angles:90º

Time of Test:8:32 AM

Approach Vertical Angles:35º

FMH Serial No:[035]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
689	693	8	23.8	15	4 Left

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-91.4	1.29	1.29
Y	6	J35919	94.4	1.79	1.79
Z	7	J22664	94.3	1.31	1.31

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

No visible damage.

Recorded By: Travis Campbell Approved By*: Eileen A. Kaleto Date: 9/21/2006

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 5
FM6264
Additional Desc: N/A

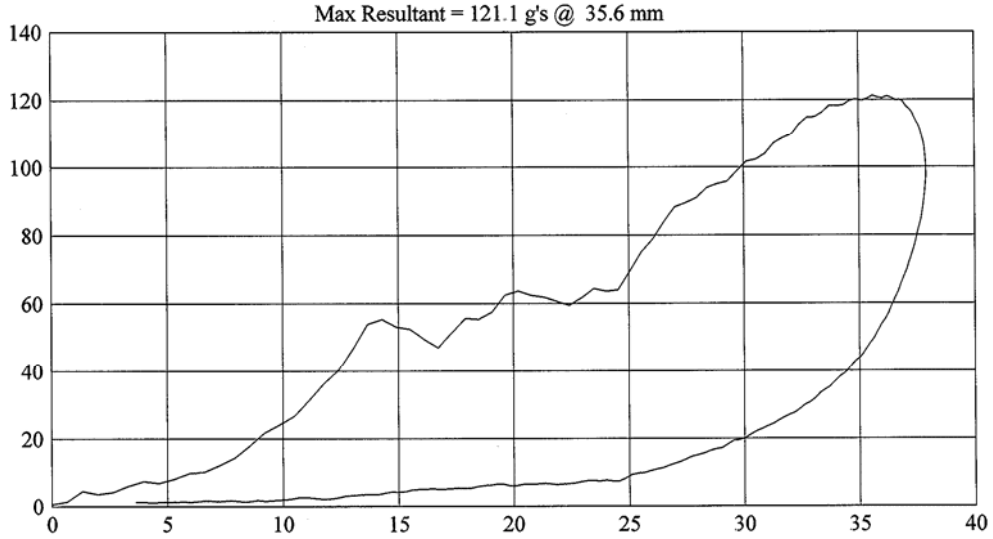
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: UR5
Vehicle Side: Right
Horz/Vert Angle: 90/35

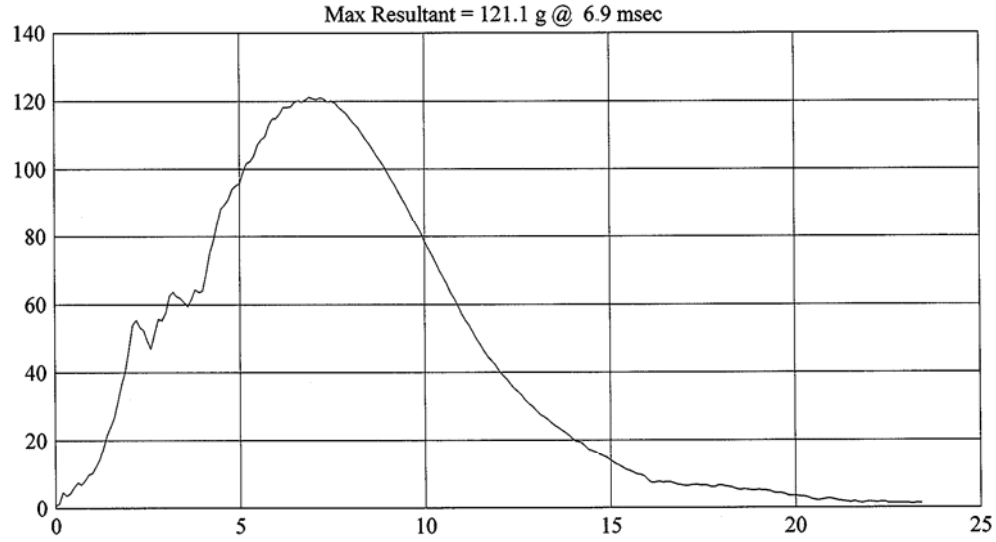
HIC(d) = 689, HIC = 693, Delta T = 8 msec

Max Resultant = 121.1 g's @ 35.6 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 121.1 g @ 6.9 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 5
FM6264
Additional Desc: N/A

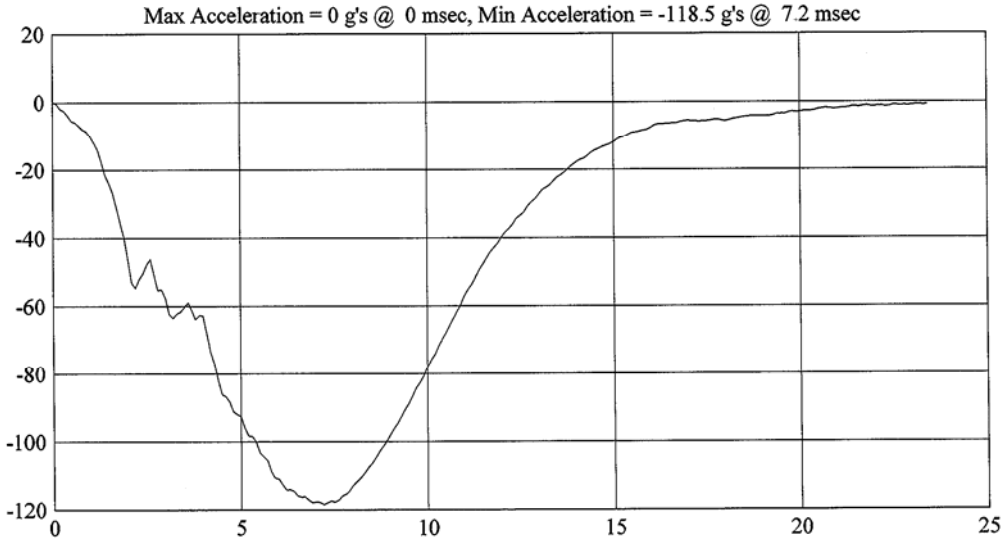
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: UR5
Vehicle Side: Right
Horz/Vert Angle: 90/35

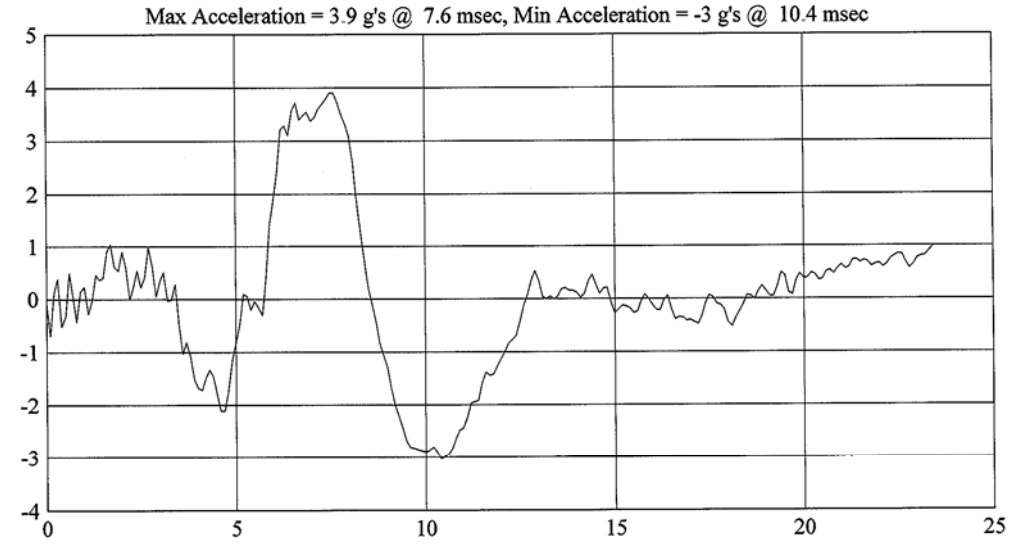
HIC(d) = 689, HIC = 693, Delta T = 8 msec

Max Acceleration = 0 g's @ 0 msec, Min Acceleration = -118.5 g's @ 7.2 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 3.9 g's @ 7.6 msec, Min Acceleration = -3 g's @ 10.4 msec



Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 5
FM6264
Additional Desc: N/A

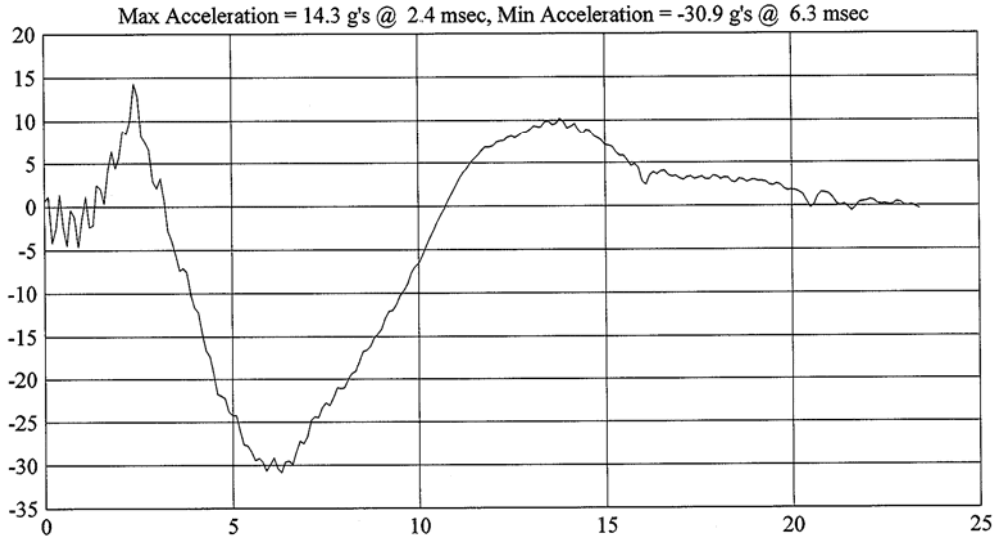
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: UR5
Vehicle Side: Right
Horz/Vert Angle: 90/35

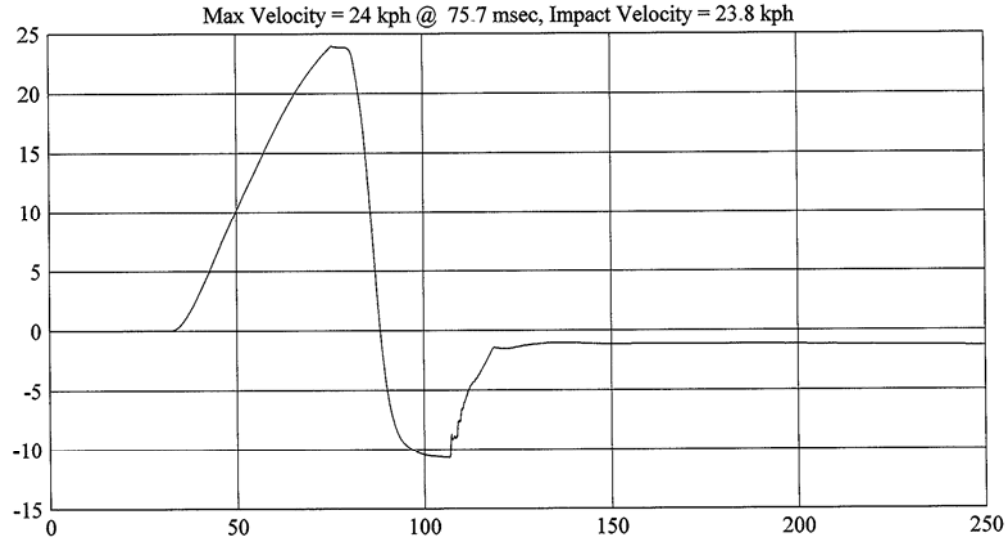
HIC(d) = 689, HIC = 693, Delta T = 8 msec

Max Acceleration = 14.3 g's @ 2.4 msec, Min Acceleration = -30.9 g's @ 6.3 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 24 kph @ 75.7 msec, Impact Velocity = 23.8 kph



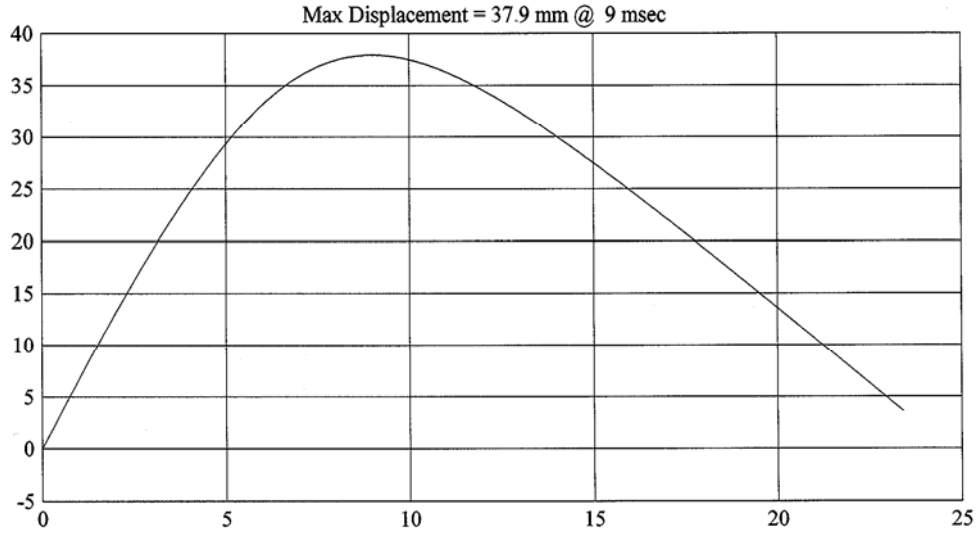
Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA	Vehicle Program : Saturn Ion 2 Sedan	Model Year: 2006
Test # 5		Target: UR5
FM6264	Test Date: 9/21/2006	Vehicle Side: Right
Additional Desc: N/A		Horz/Vert Angle: 90/35

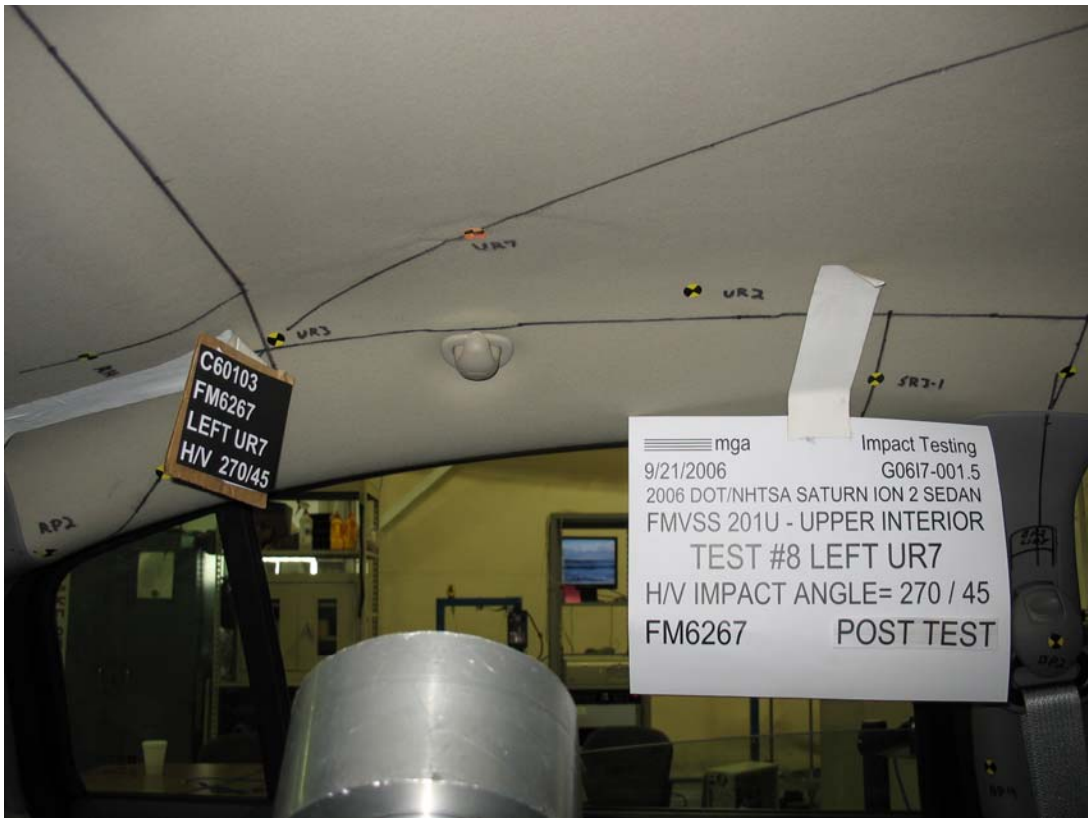
HIC(d) = 689, HIC = 693, Delta T = 8 msec

Max Displacement = 37.9 mm @ 9 msec



Displacement (mm) vs. Time (msec)


UR7
UR2
UR3
RP1
RP2
GP1
mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #8 LEFT UR7
H/V IMPACT ANGLE= 270 / 45
FM6267
PRE TEST


C60103
FM6267
LEFT UR7
H/V 270/45
mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #8 LEFT UR7
H/V IMPACT ANGLE= 270 / 45
FM6267
POST TEST


mga
Impact Testing
9/21/2006
G06I7-001.5
2006 DOT/NHTSA SATURN ION 2 SEDAN
FMVSS 201U - UPPER INTERIOR
TEST #8 LEFT UR7
H/V IMPACT ANGLE= 270 / 45
FM6267
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G06I7-001.5 VEHICLE YR/MAKE/MODEL:2006/DOT/NHTSA/Saturn Ion 2 Sedan

GENERAL TEST PARAMETERS:

Test Number:#8

Target (Vehicle Side): UR7Left

Temperature:22C

MGA Test Reference No.:FM6267

Humidity:41%

Approach Horizontal Angles:270º

Time of Test:3:51 PM

Approach Vertical Angles:45º

FMH Serial No:[035]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
711	722	7.6	23.8	45	9 Left

INSTRUMENTATION INFORMATION: (all accelerometers are Endevco 7264-2000)

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-91.4	1.29	1.30
Y	6	J35919	94.4	1.79	1.79
Z	7	J22664	94.3	1.31	1.32

REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

Headliner deformation.

Recorded By: Travis Campbell Approved By*: Eileen A. Kaleto Date: 9/21/2006

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 8
FM6267
Additional Desc: N/A

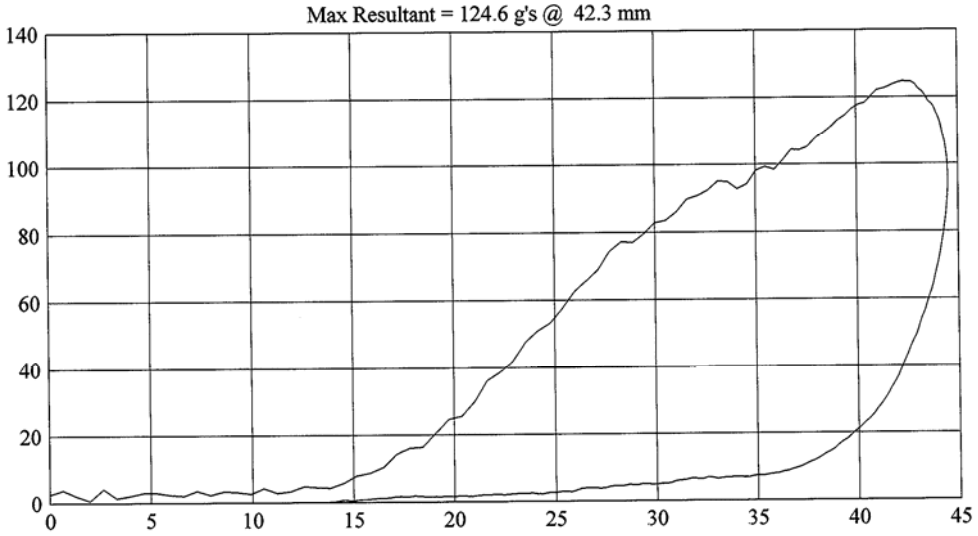
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: UR7
Vehicle Side: Left
Horz/Vert Angle: 270/45

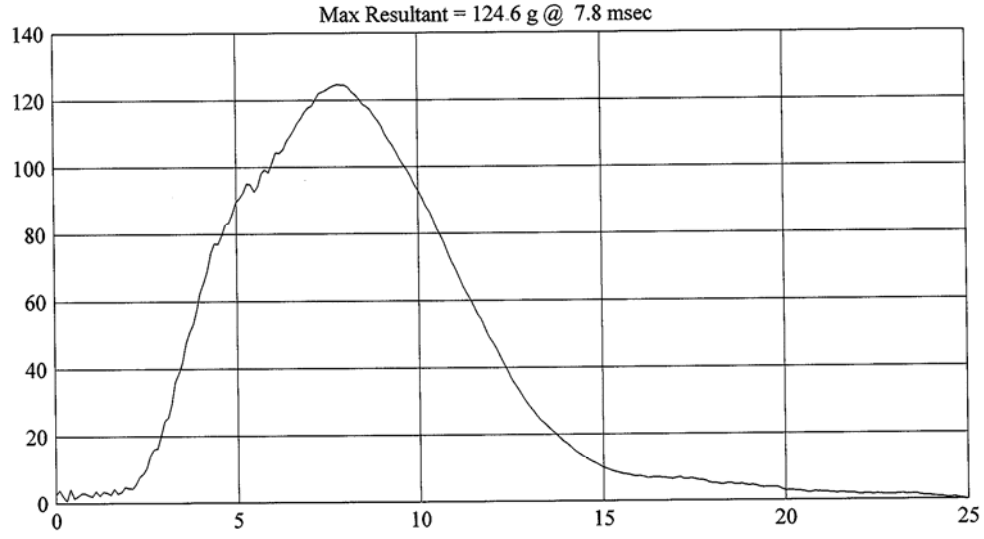
HIC(d) = 711, HIC = 722, Delta T = 7.6 msec

Max Resultant = 124.6 g's @ 42.3 mm



Resultant (g's) vs. Displacement (mm)

Max Resultant = 124.6 g @ 7.8 msec



Resultant Accel (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 8
FM6267
Additional Desc: N/A

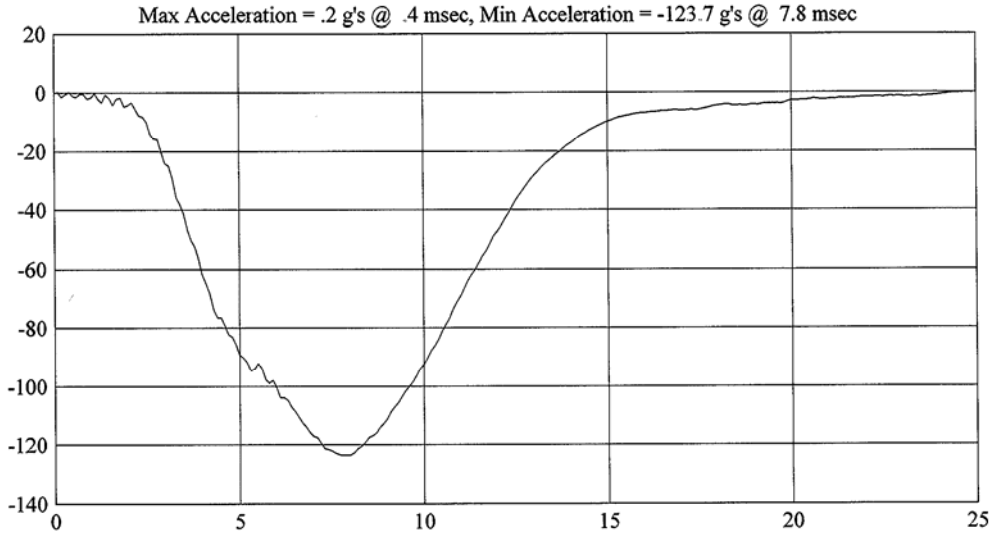
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: UR7
Vehicle Side: Left
Horz/Vert Angle: 270/45

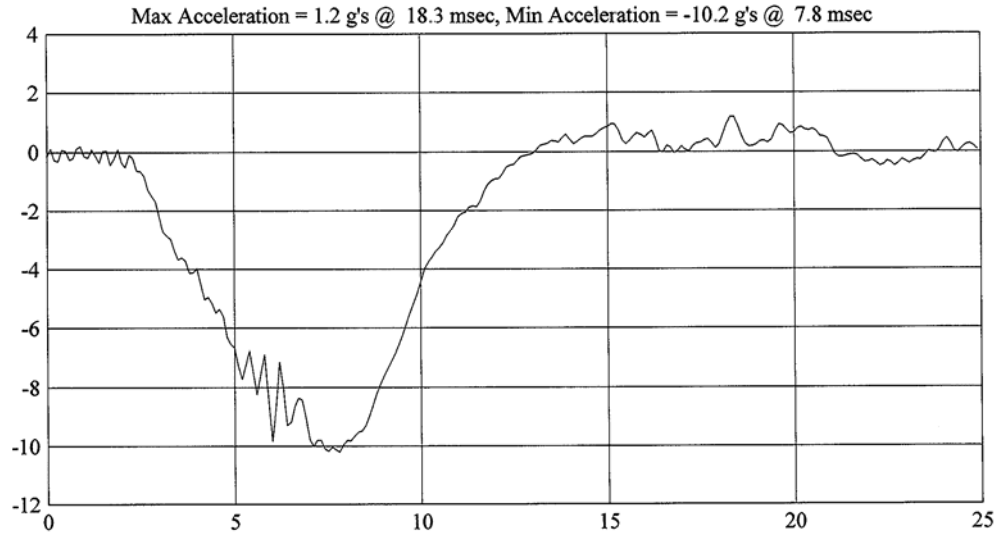
HIC(d) = 711, HIC = 722, Delta T = 7.6 msec

Max Acceleration = .2 g's @ .4 msec, Min Acceleration = -123.7 g's @ 7.8 msec



Accel X (g's) vs. Time (msec)

Max Acceleration = 1.2 g's @ 18.3 msec, Min Acceleration = -10.2 g's @ 7.8 msec



Accel Y (g's) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 8
FM6267
Additional Desc: N/A

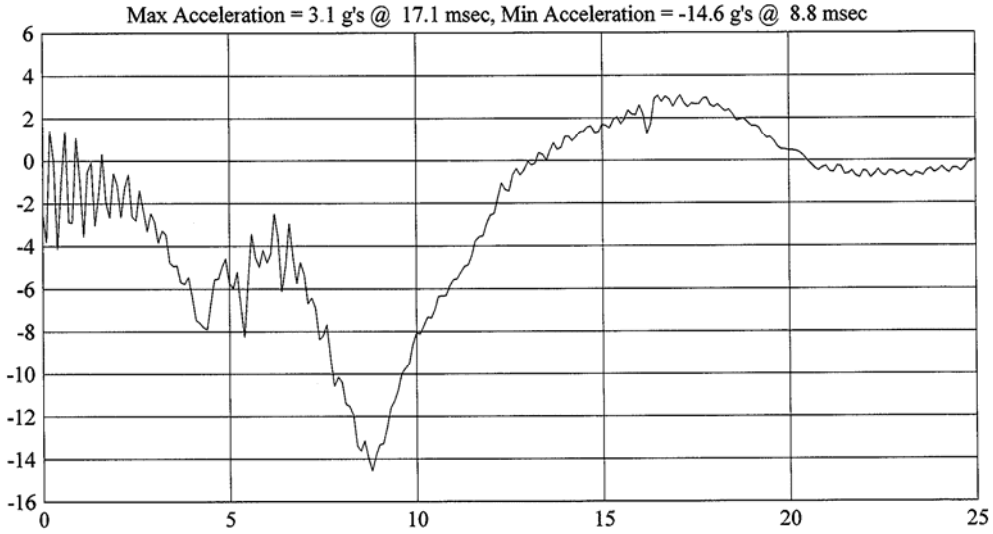
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: UR7
Vehicle Side: Left
Horz/Vert Angle: 270/45

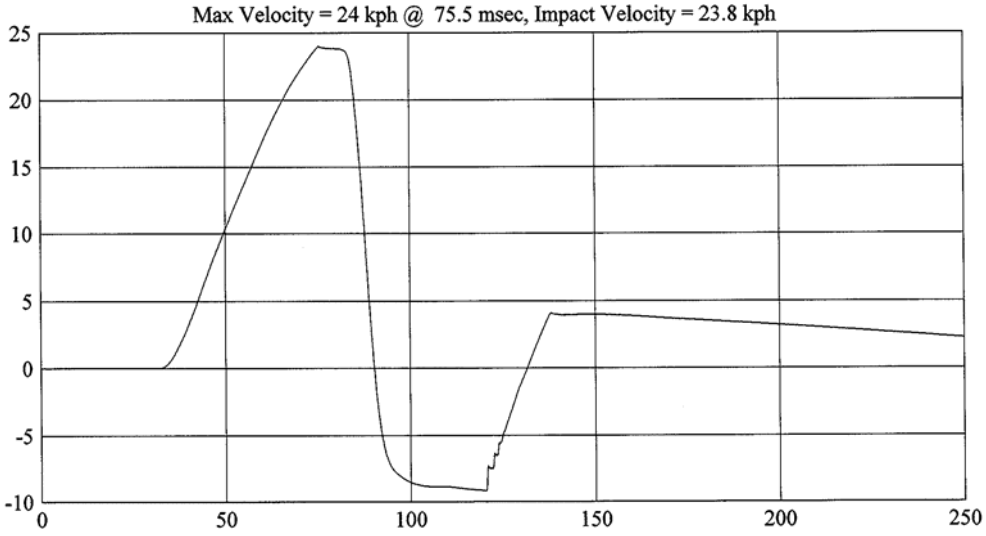
HIC(d) = 711, HIC = 722, Delta T = 7.6 msec

Max Acceleration = 3.1 g's @ 17.1 msec, Min Acceleration = -14.6 g's @ 8.8 msec



Accel Z (g's) vs. Time (msec)

Max Velocity = 24 kph @ 75.5 msec, Impact Velocity = 23.8 kph



Velocity (kph) vs. Time (msec)

FMH
G06I7-001.5

Customer: DOT/NHTSA
Test # 8
FM6267
Additional Desc: N/A

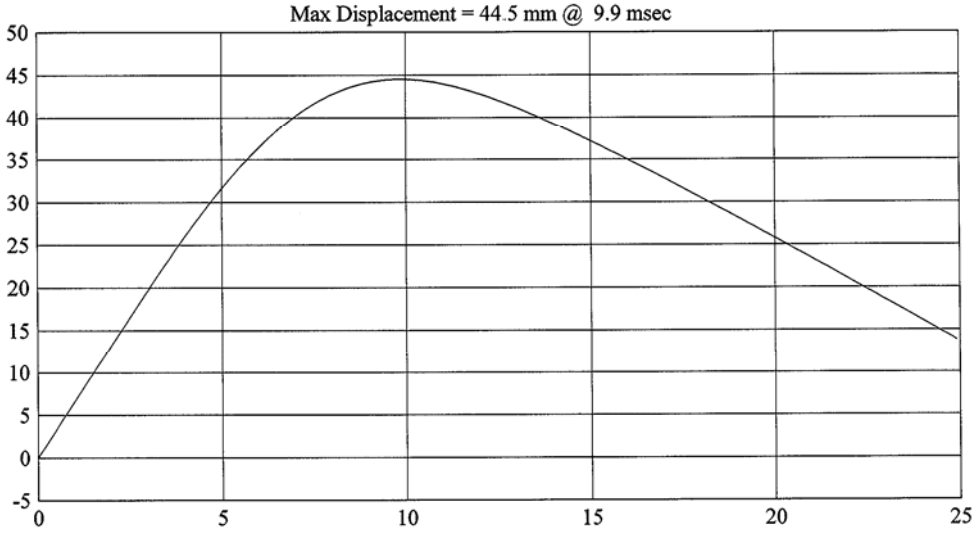
Vehicle Program : Saturn Ion 2 Sedan

Test Date: 9/21/2006

Model Year: 2006
Target: UR7
Vehicle Side: Left
Horz/Vert Angle: 270/45

HIC(d) = 711, HIC = 722, Delta T = 7.6 msec

Max Displacement = 44.5 mm @ 9.9 msec



Displacement (mm) vs. Time (msec)

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

The following section lists the test equipment for the compliance test series. Items marked with an asterisk are calibrated by an external lab. An additional summary table is given for the pre and post-test calibration data for the Free Motion Headforms. The temperature trace to confirm testing was conducted between 66ºF and 78ºF (19ºC - 26ºC) is included in Appendix A. Calibration certificates can be found in Appendix B.

TABLE 4-1 LIST OF ITEMS USED

ITEM	MANUFACTURER NAME	MODEL #	FUNCTION OF ITEM	ACCURACY	CAL. INTERNAL
Head Drop Tower (includes test frame and DAS)	MGA Research Corp.	MGA-100-DC	FMH Calibration	N/A	N/A
Accelerometers	Endevco	7264-2000	Acceleration Data	±0.5%	6 months
*Digital Inclinometer	Macklanburg-Duncan	PRO 360 (MGA00060 and MGA00048)	Set Angle of FMH/Targeting	0.1°	Annual
FMVSS 201U Test Frame (includes the propulsion control system, actuator, test frame, and DAS)	MGA Research Corp.	MGA-100-FMH	Test System	N/A	N/A
Free Motion Headforms	UTAMA UTAMA UTAMA UTAMA UTAMA	035 036 037 038 039	Test Device	N/A	Pre and Post-Test Series
High Speed Video	Redlake	HGLE	Record Event	N/A	N/A
*FARO™	Faro Technologies	G08020203122	Targeting	0.1 mm	Annual
Measuring Devices: - Tape Measure - Tape Measure - Plumb Bobs - Digital Protractor	 Stanley Stanley N/A Macklanburg-Duncan	 617 122 -- MGA00048 MGA00060	 Measurement Measurement Targeting FMH setup Horizontal Measurement	 1 mm 1 mm N/A 0.5°	 Annual Annual
*Vehicle Scale	SW Scales	26032389	Weighing Vehicle	± .5 kg	Annual
* Scale	Detecto	MGA00081	Weigh FMH Head	± 0.01 lb	Annual

ITEM	MANUFACTURER NAME	MODEL #	FUNCTION OF ITEM	ACCURACY	CAL. INTERNAL
*Temperature Recorder	Extech	MGA00115	Record Temperature and Humidity	± 1°C ± 1% RH	Annual
*Temperature Recorder	Dickson	FH125	Record Temperature and Humidity	± 1°C ± 1% RH	Annual

TABLE 4-2 FMH CALIBRATION SUMMARY DATA SUMMARY TABLE

FMH Serial #		Weight (lbs)	Temp (^{O}C)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
Pre	#35	10.03	22.0	47.0	235.9	6.8	Yes
Post (AP3 Right)	#35	10.03	22.0	42.0	241.5	13.2	Yes
Post	#35	10.03	21.0	47.0	234.0	3.6	Yes
Pre	#36	9.97	23.0	26.0	262.3	14.4	Yes
Post	#36	9.97	23.0	25.0	262.9	14.3	Yes
Pre	#38	9.92	22.0	47.0	256.7	14.6	Yes
Post	#38	9.92	21.0	47.0	257.5	14.1	Yes
Pre	#39	10.00	22.0	47.0	250.7	2.5	Yes
Post	#39	10.00	21.0	47.0	244.8	3.9	Yes

RECORDED BY: Louis Campbell DATE: May 1, 2007

APPROVED BY: Helen A. Kaleto

4.1 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

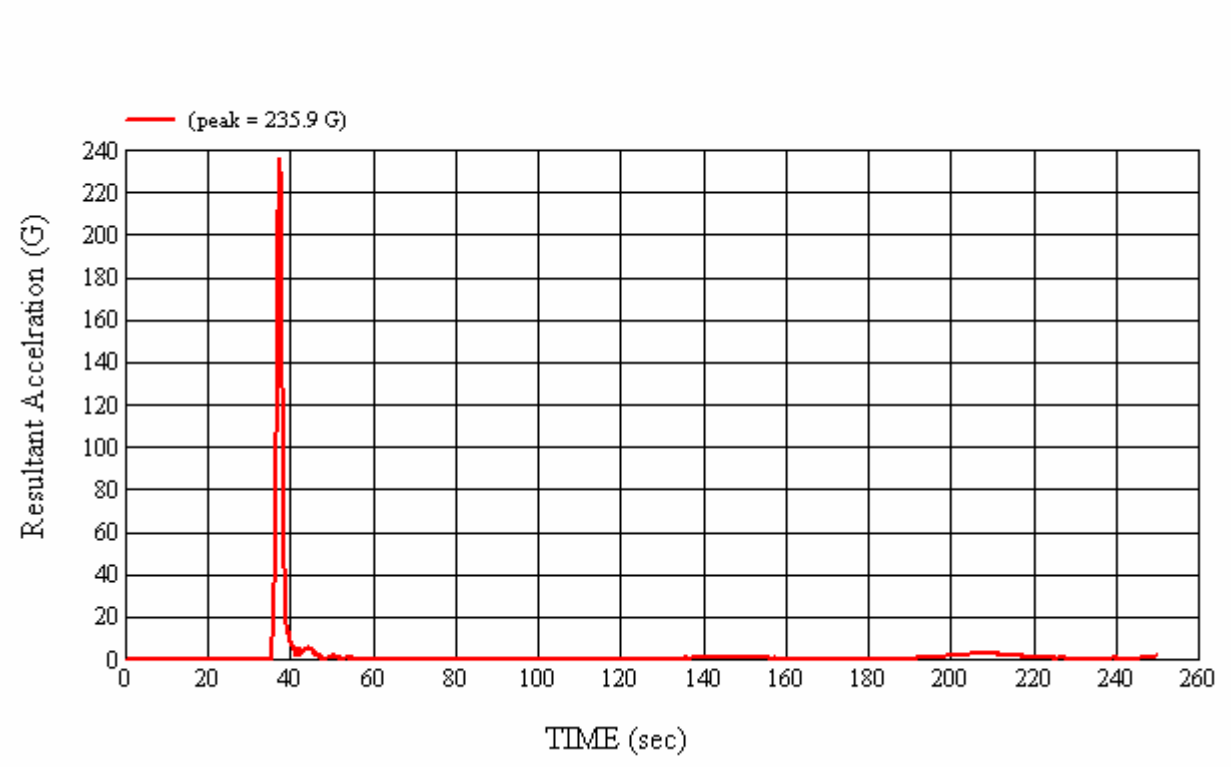
HEADFORM SERIAL NUMBER: __035____	CALIBRATION DATE: _09/19/2006___	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	10.03
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	47
Peak Resultant Acceleration	225 G's to 275 G's	235.9
Peak Lateral Acceleration	15 G's Maximum	6.8
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35924	04/06/06	10/06/06
2	ENDEVCO	7264-2000	J35919	04/06/06	10/06/06
3	ENDEVCO	7264-2000	J22664	04/06/06	10/06/06

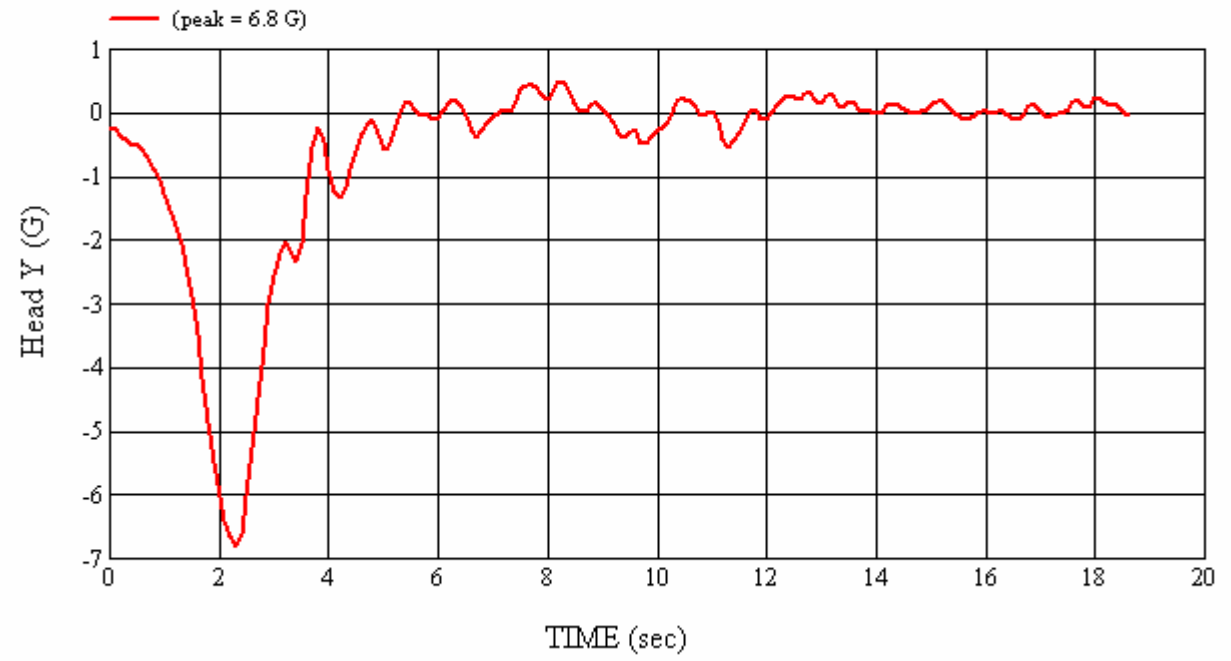
REMARKS:

RECORDED BY: Kaitlin Campbell DATE: __9/19/2006____

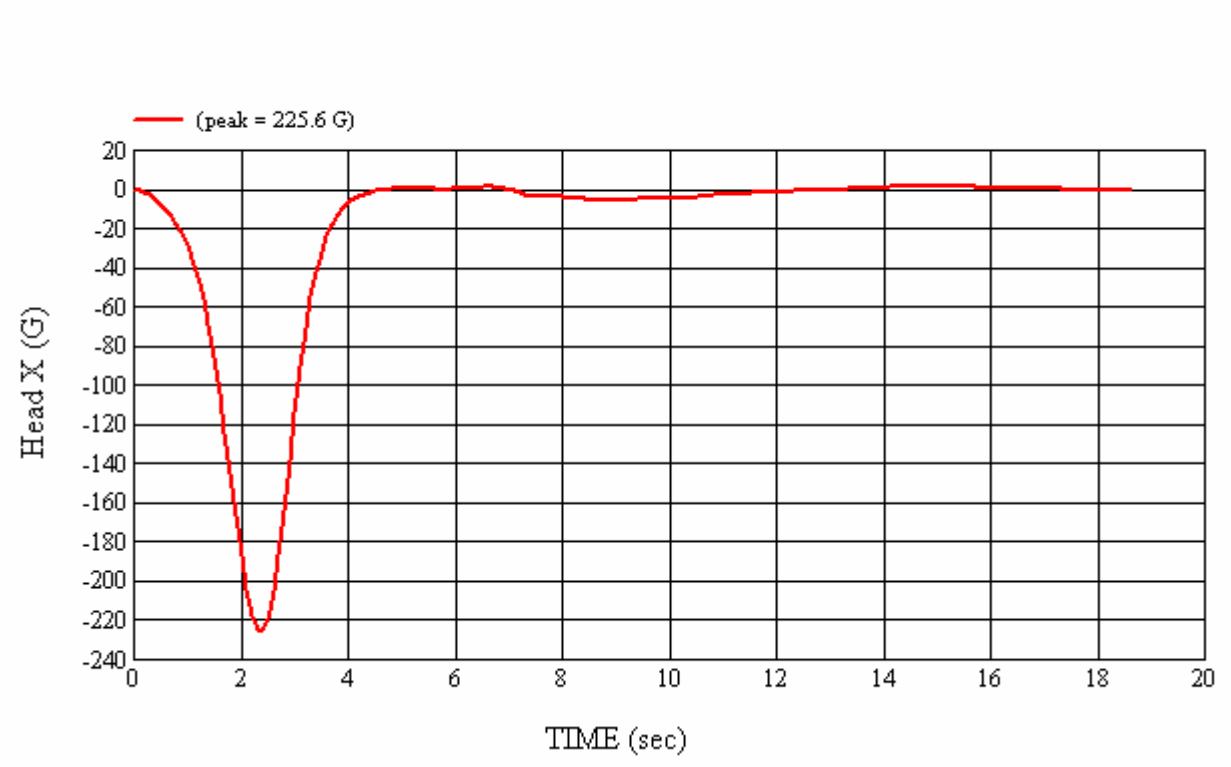
APPROVED BY: Helen A. Kalesto



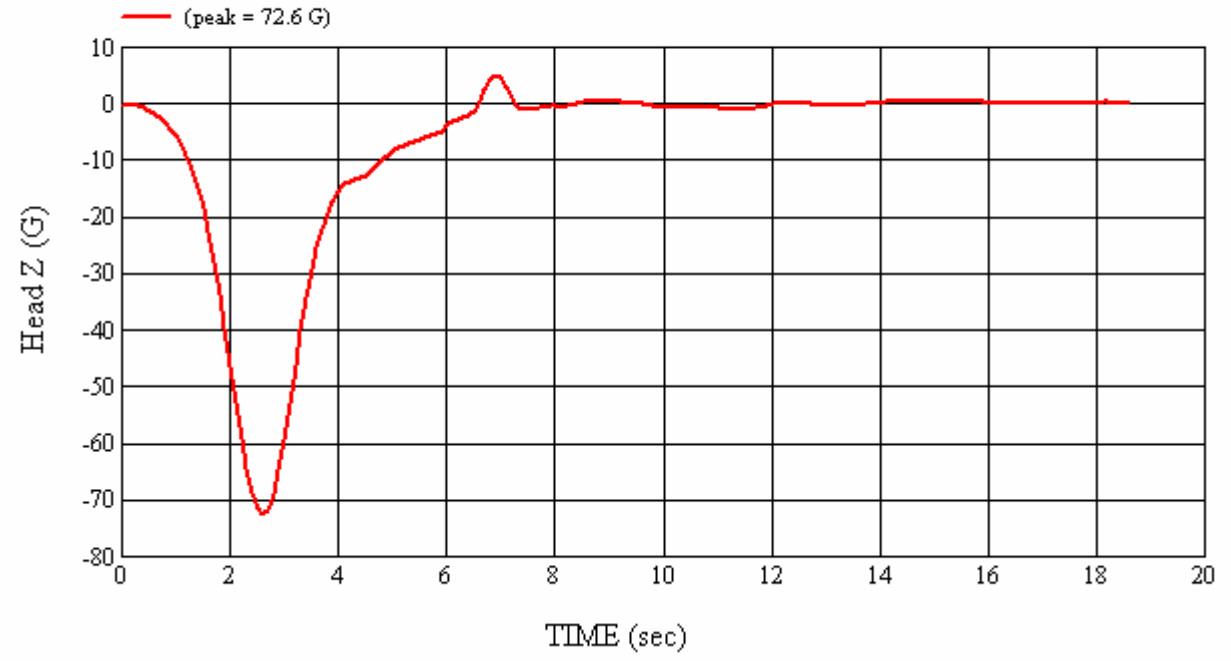
Head 035 (Pre) Calibration #H35333



Head 035 (Pre) Calibration #H35333



Head 035 (Pre) Calibration #H35333



Head 035 (Pre) Calibration #H35333

4.2 Post-Test (AP3 Right) Calibration

HEAD DROP TEST SUMMARY
PART 572L

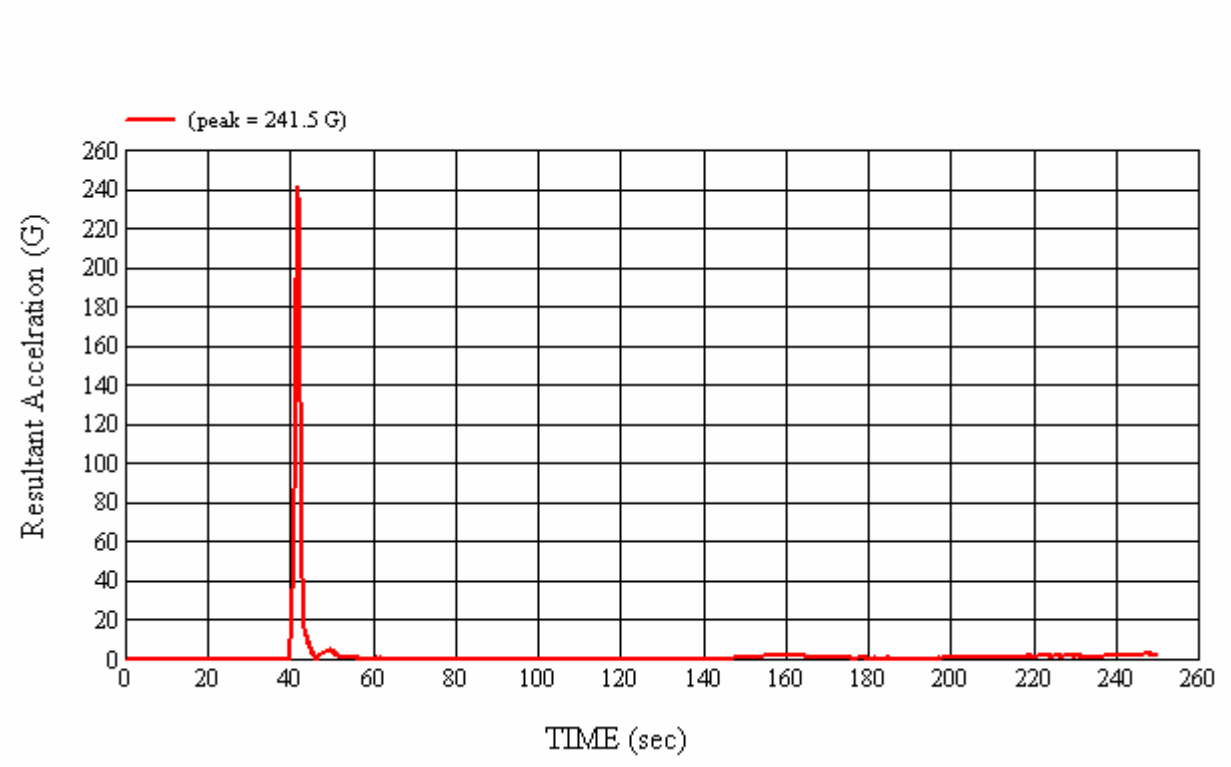
HEADFORM SERIAL NUMBER: __035____	CALIBRATION DATE: _09/20/2006___	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	10.03
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	42
Peak Resultant Acceleration	225 G's to 275 G's	241.5
Peak Lateral Acceleration	15 G's Maximum	13.2
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35924	04/06/06	10/06/06
2	ENDEVCO	7264-2000	J35919	04/06/06	10/06/06
3	ENDEVCO	7264-2000	J22664	04/06/06	10/06/06

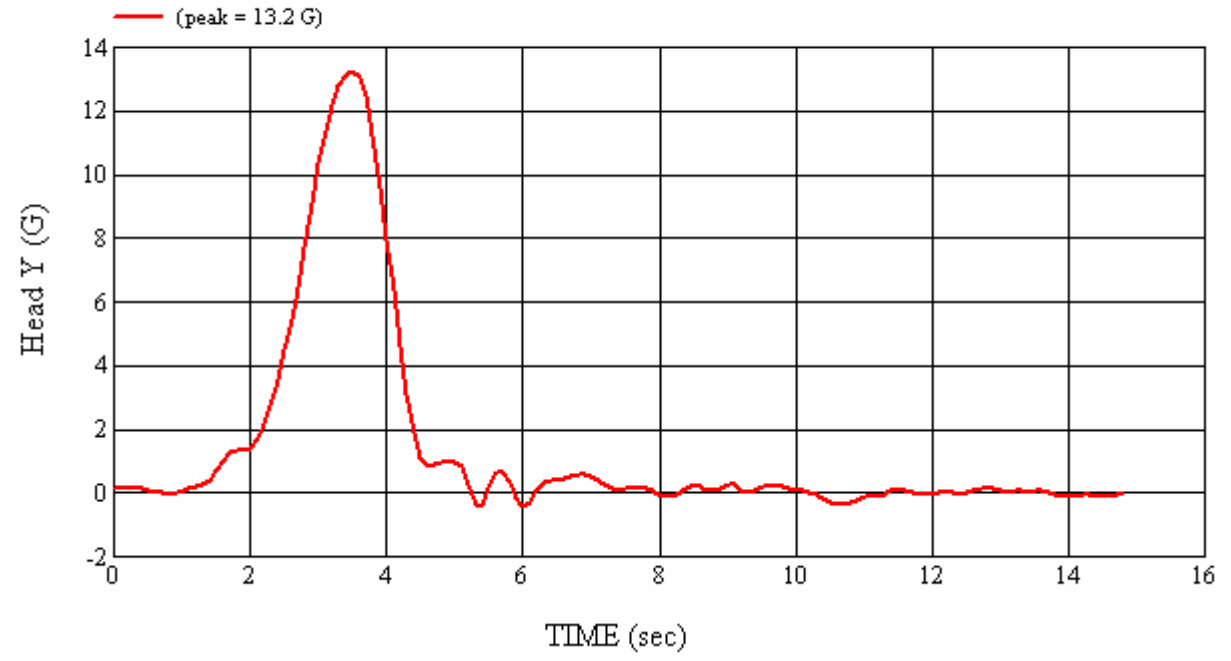
REMARKS:

RECORDED BY: _____ DATE: __9/20/2006____

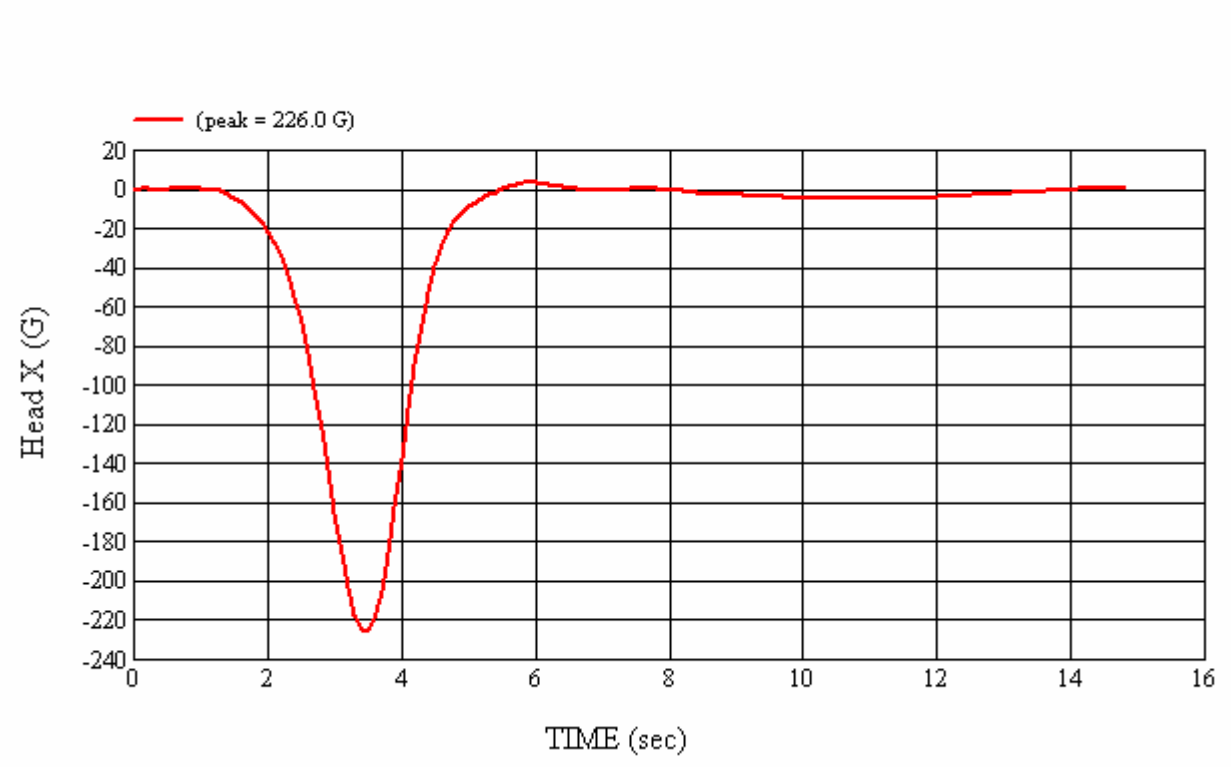
APPROVED BY: _____



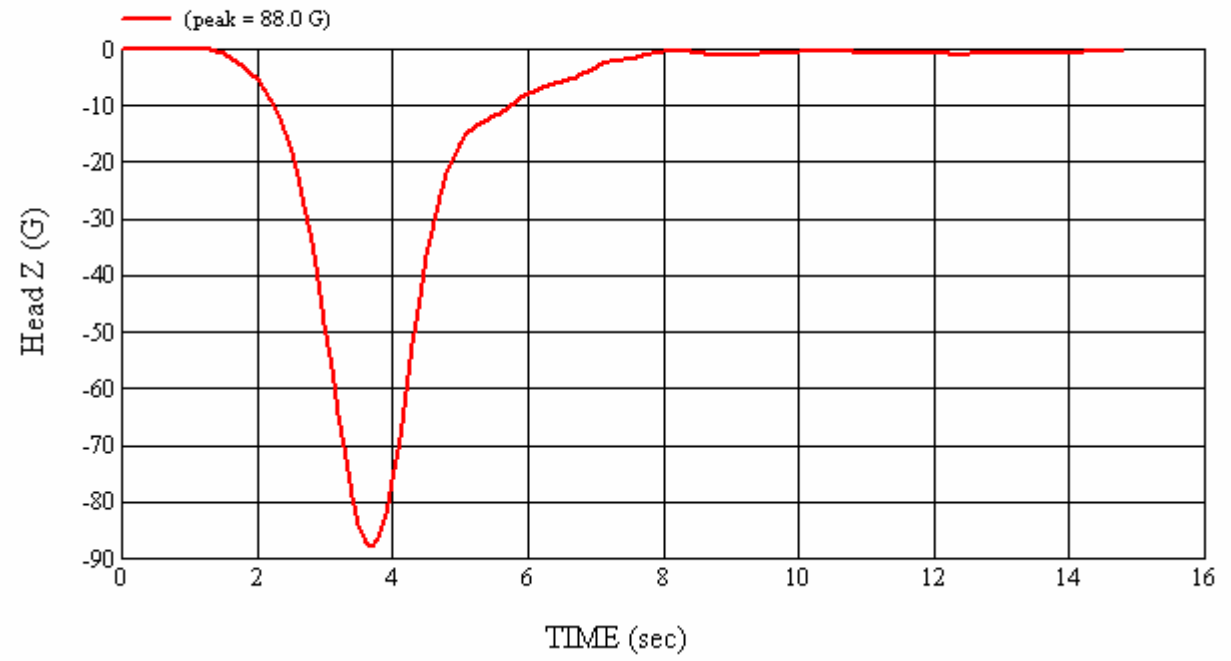
Head 035 (Post) Calibration #H35334



Head 035 (Post) Calibration #H35334



Head 035 (Post) Calibration #H35334



Head 035 (Post) Calibration #H35334

4.3 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

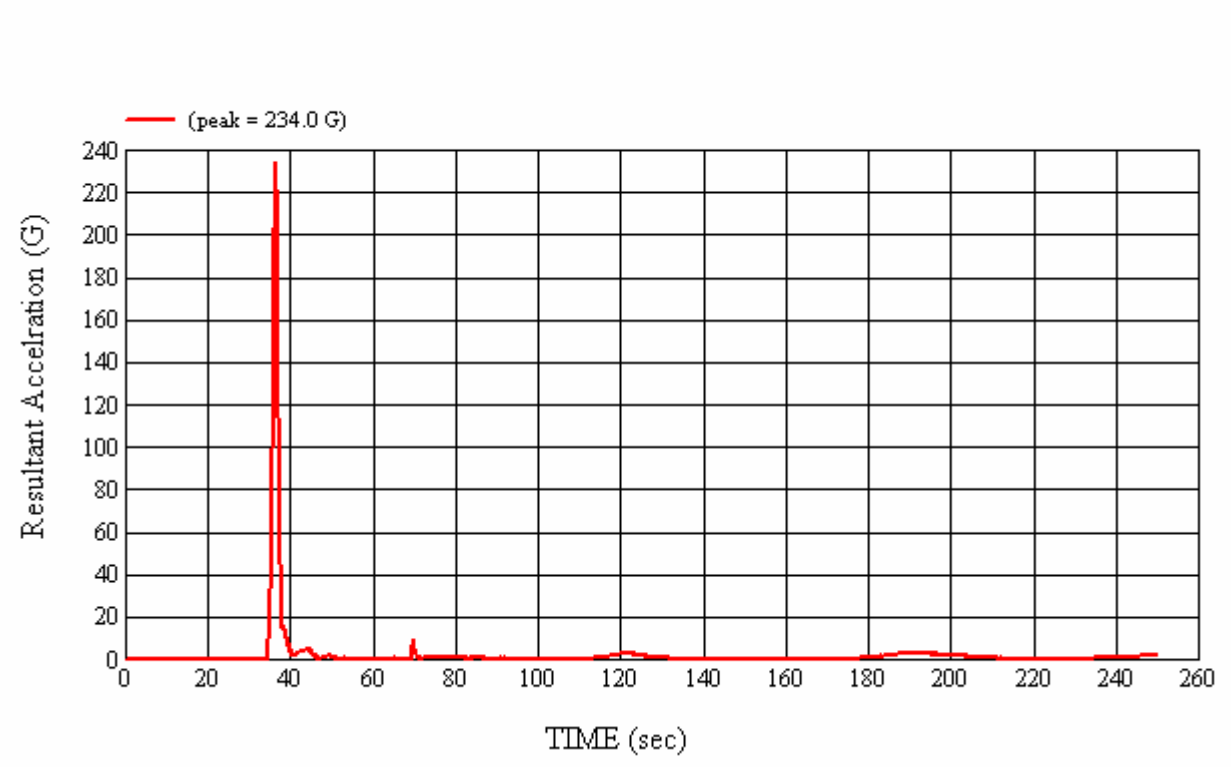
HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 09/25/2006 CALIBRATION TIME: 2:44:03 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	10.03
Temperature	19° C to 26° C	21
Relative Humidity	10% to 70%	47
Peak Resultant Acceleration	225 G's to 275 G's	234.0
Peak Lateral Acceleration	15 G's Maximum	3.6
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35924	04/06/06	10/06/06
2	ENDEVCO	7264-2000	J35919	04/06/06	10/06/06
3	ENDEVCO	7264-2000	J22664	04/06/06	10/06/06

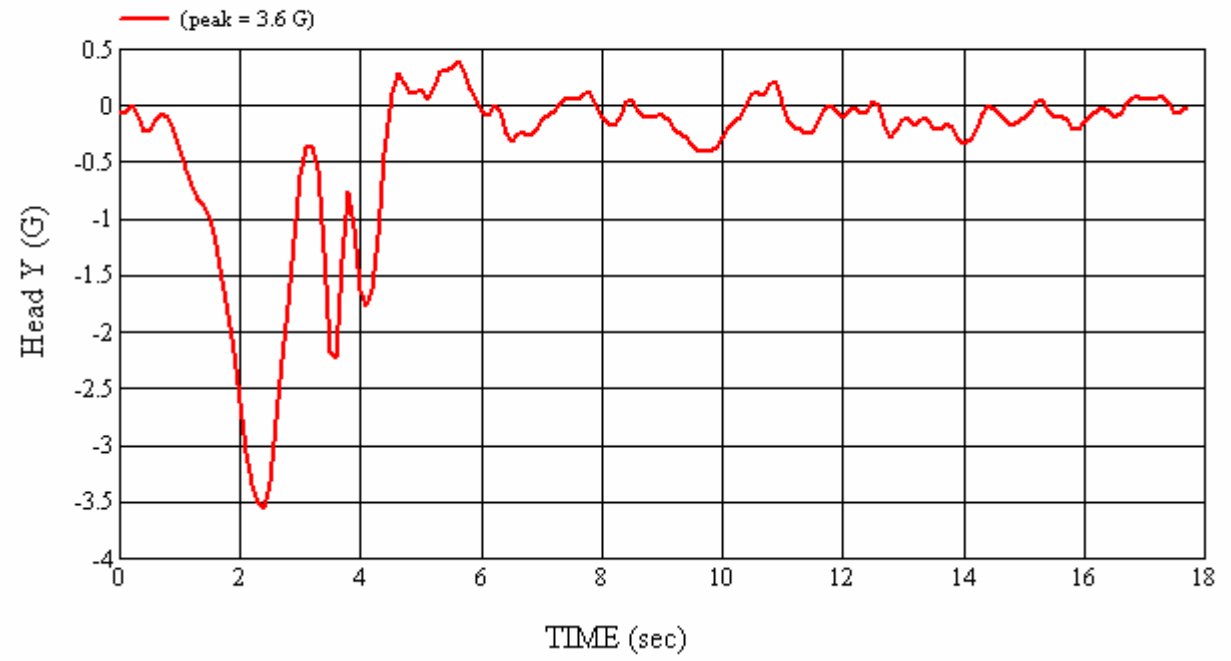
REMARKS:

RECORDED BY: Kaitlin Campbell DATE: 9/25/2006

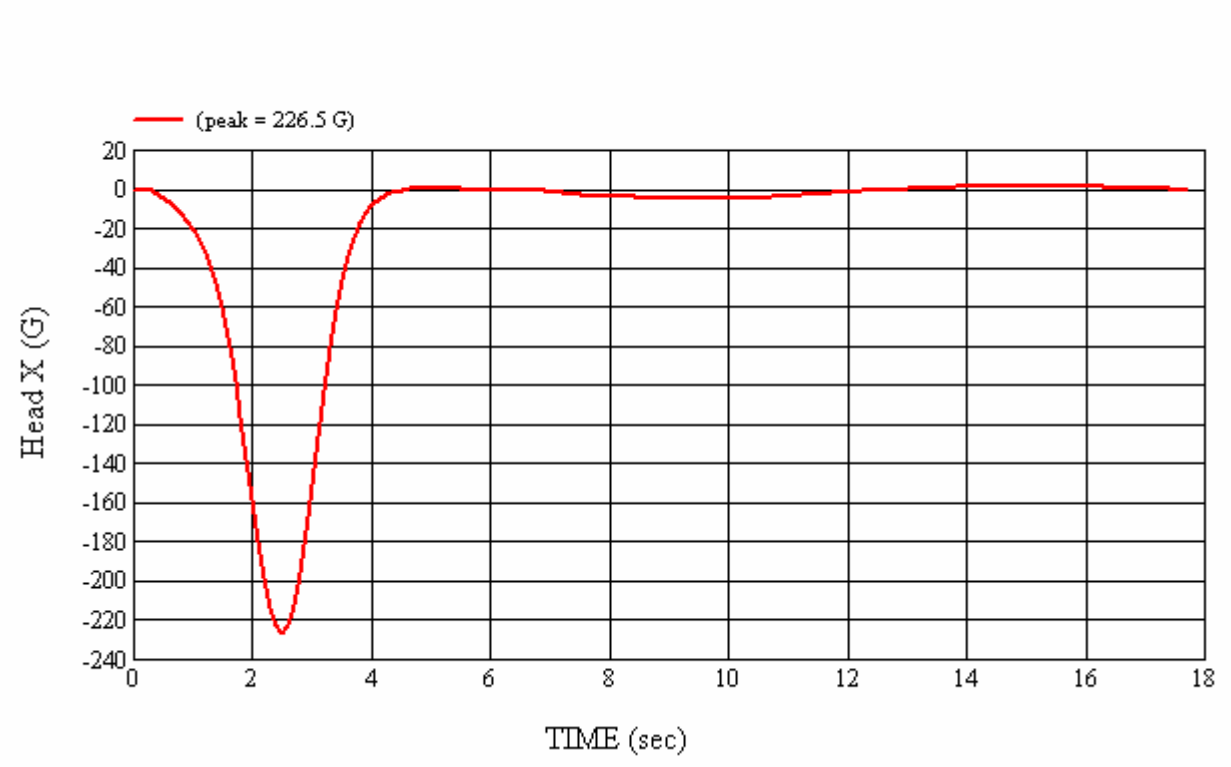
APPROVED BY: Helen A. Kalesto



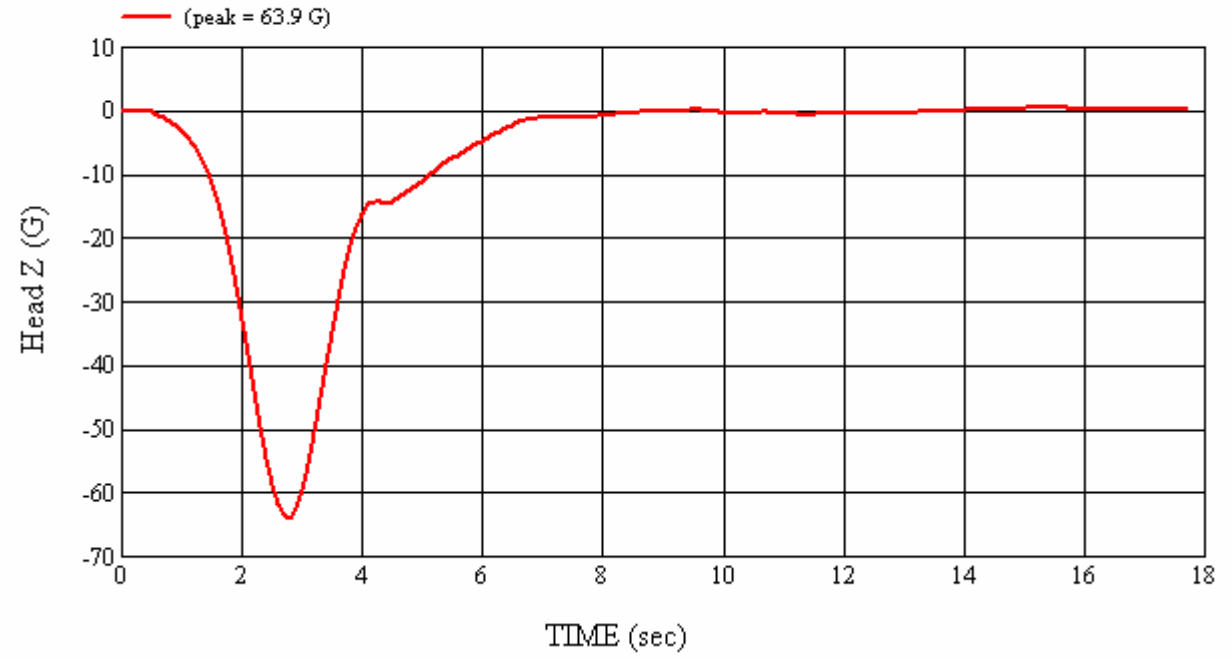
Head 035 (Post) Calibration #H35335



Head 035 (Post) Calibration #H35335



Head 035 (Post) Calibration #H35335



Head 035 (Post) Calibration #H35335

4.4 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

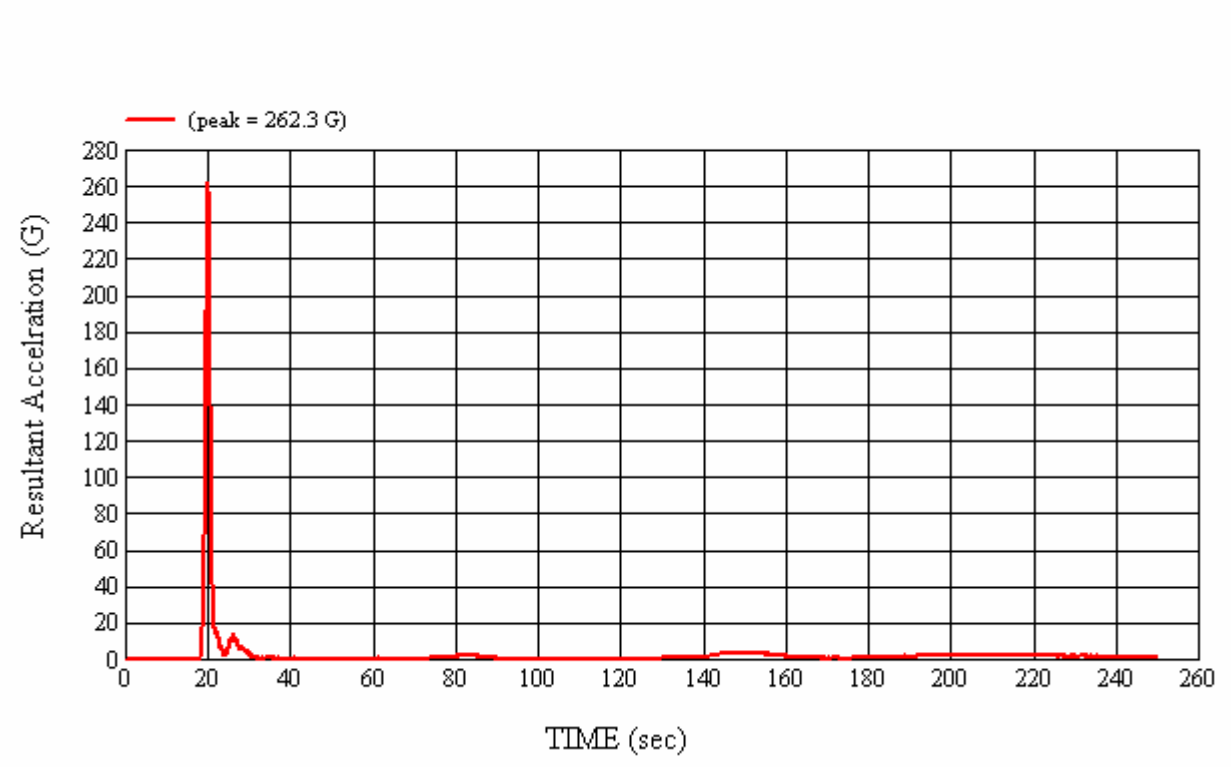
HEADFORM SERIAL NUMBER: 036	CALIBRATION DATE: 4/30/2007 CALIBRATION TIME: 5:26:34 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.97
Temperature	19° C to 26° C	23
Relative Humidity	10% to 70%	26
Peak Resultant Acceleration	225 G's to 275 G's	262.3
Peak Lateral Acceleration	15 G's Maximum	14.4
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J21969	04/29/07	10/29/07
2	ENDEVCO	7264-2000	J35916	04/29/07	10/29/07
3	ENDEVCO	7264-2000	J35918	04/29/07	10/29/07

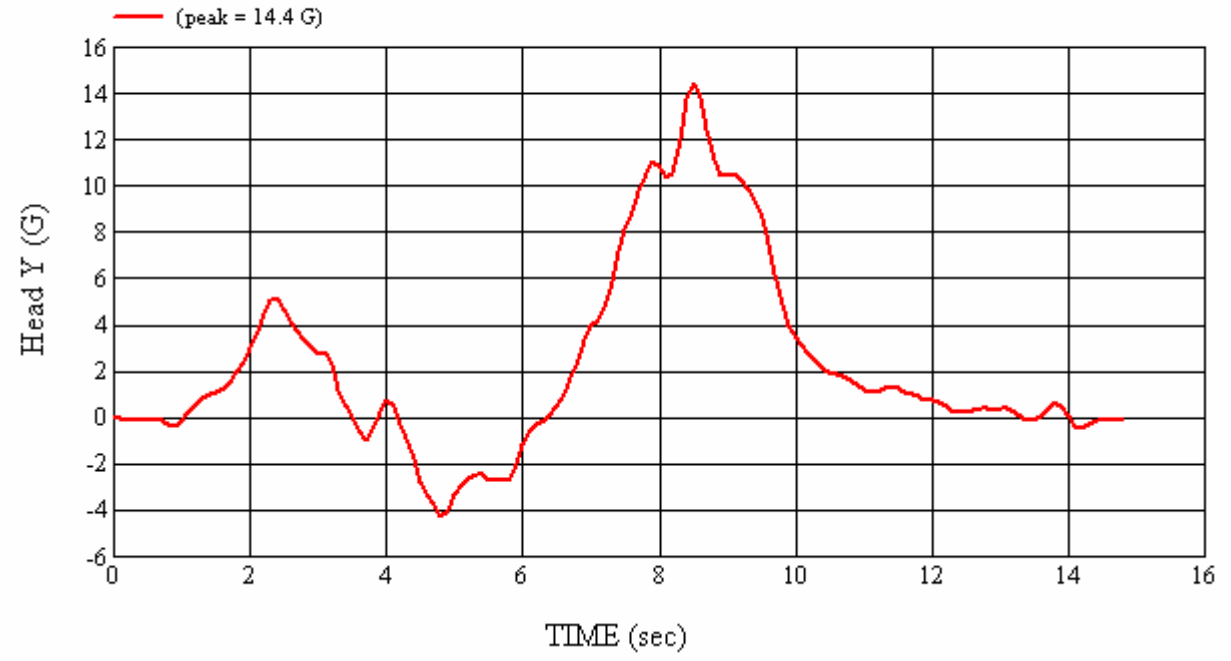
REMARKS:

RECORDED BY: Kevin Campbell DATE: 4/30/2007

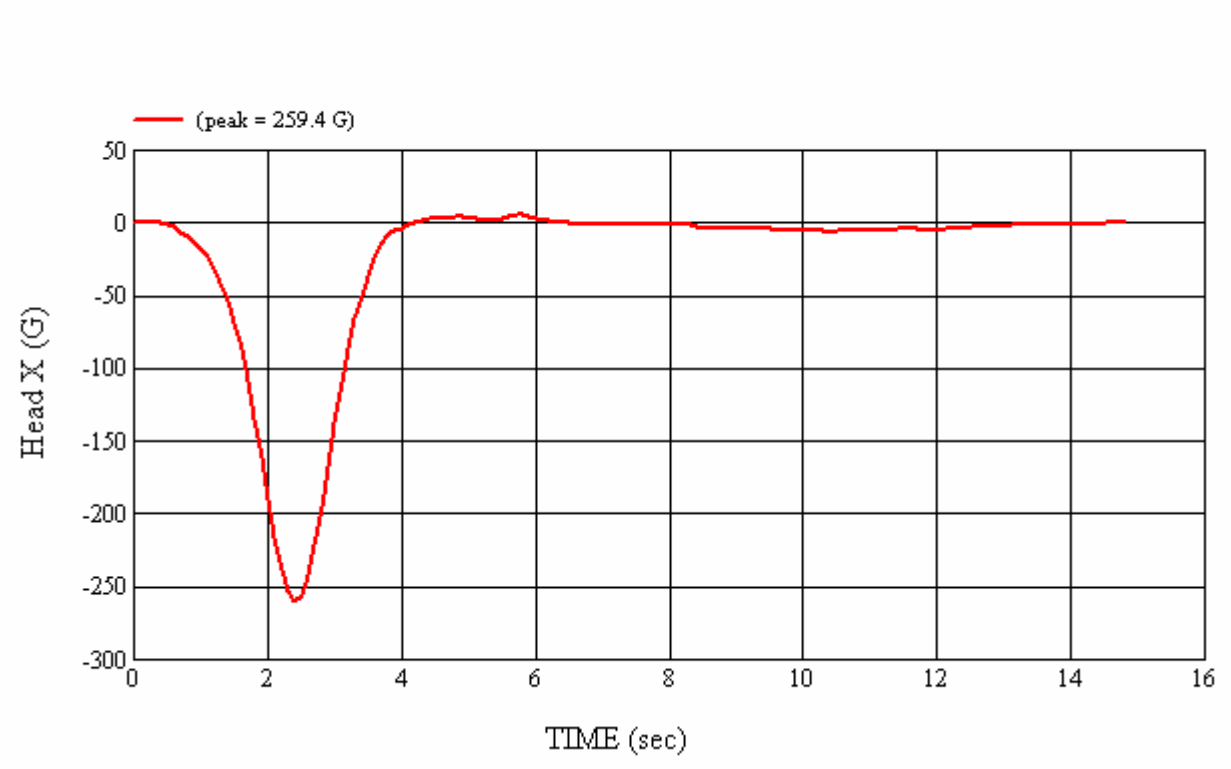
APPROVED BY: Helen A. Kalista



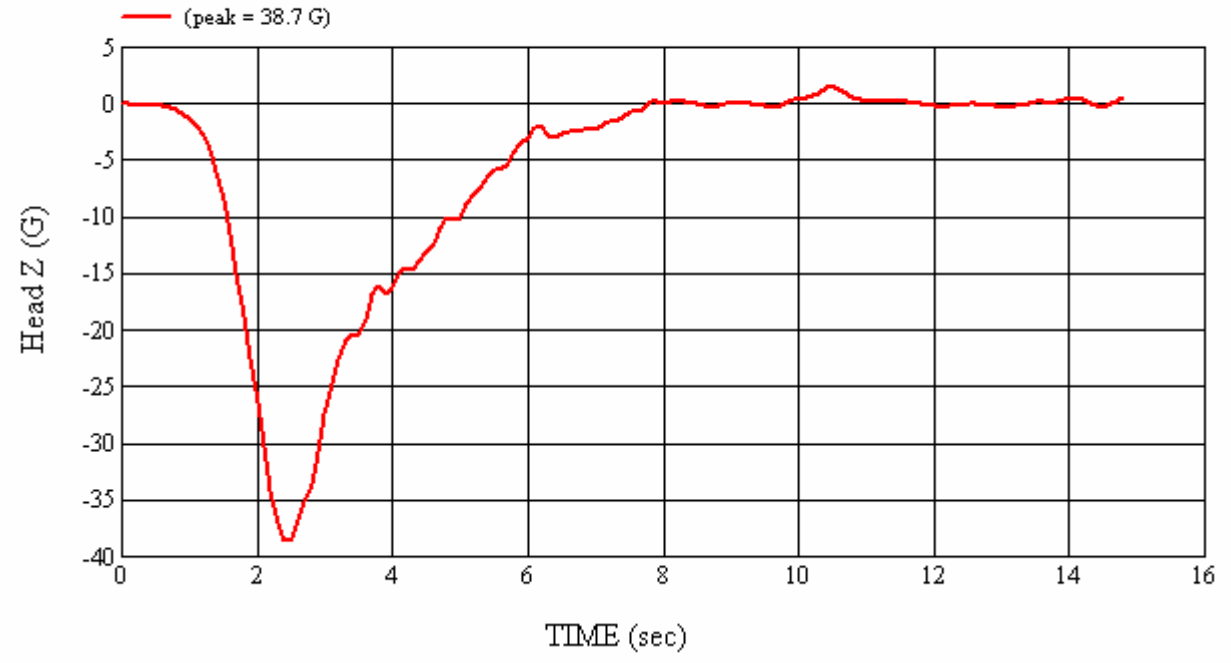
Head 036 (Pre) Calibration #H36003



Head 036 (Pre) Calibration #H36003



Head 036 (Pre) Calibration #H36003



Head 036 (Pre) Calibration #H36003

4.5 Post-Test Calibration

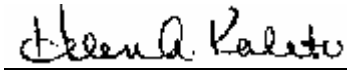
HEAD DROP TEST SUMMARY
PART 572L

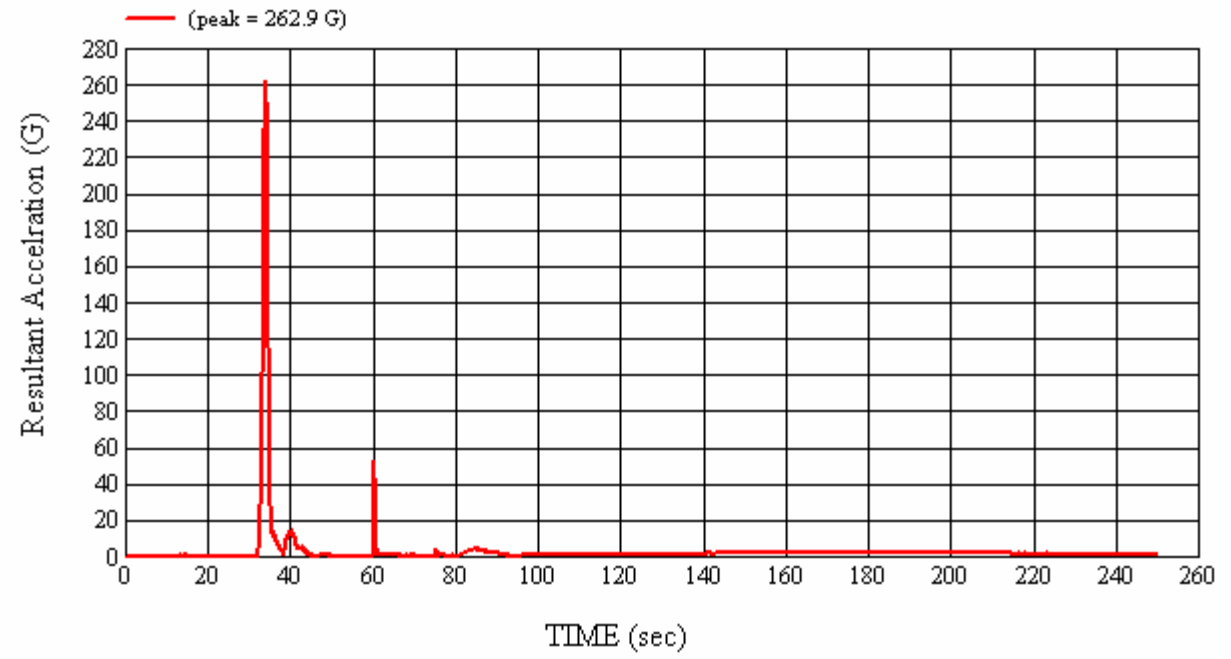
HEADFORM SERIAL NUMBER: 036	CALIBRATION DATE: 5/2/2007 CALIBRATION TIME: 4:17:28 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.97
Temperature	19° C to 26° C	23
Relative Humidity	10% to 70%	25
Peak Resultant Acceleration	225 G's to 275 G's	262.9
Peak Lateral Acceleration	15 G's Maximum	14.3
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J21969	04/29/07	10/29/07
2	ENDEVCO	7264-2000	J35916	04/29/07	10/29/07
3	ENDEVCO	7264-2000	J35918	04/29/07	10/29/07

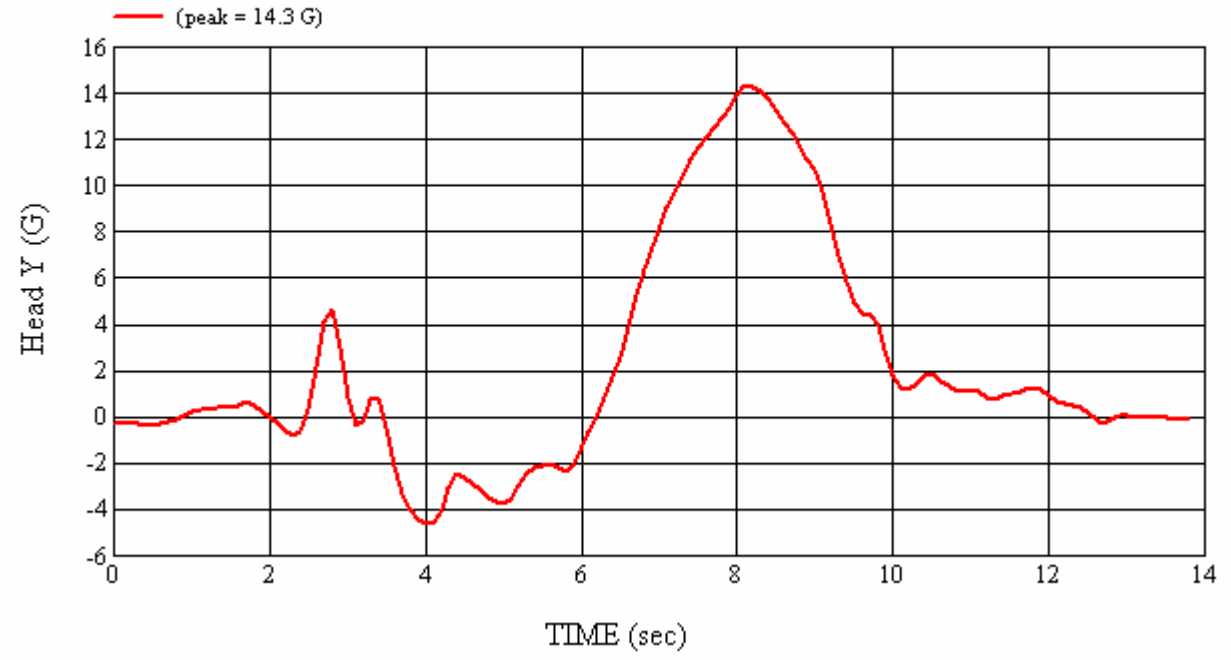
REMARKS:

RECORDED BY:  DATE: 5/2/2007

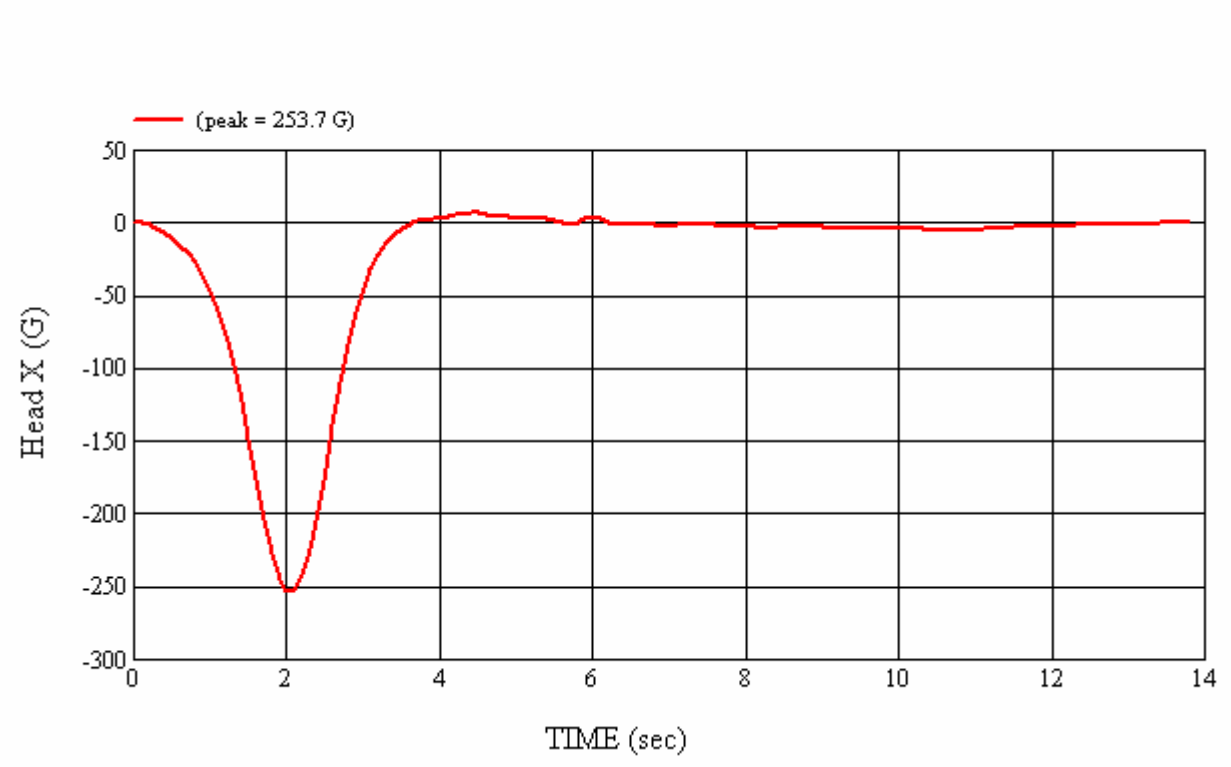
APPROVED BY: 



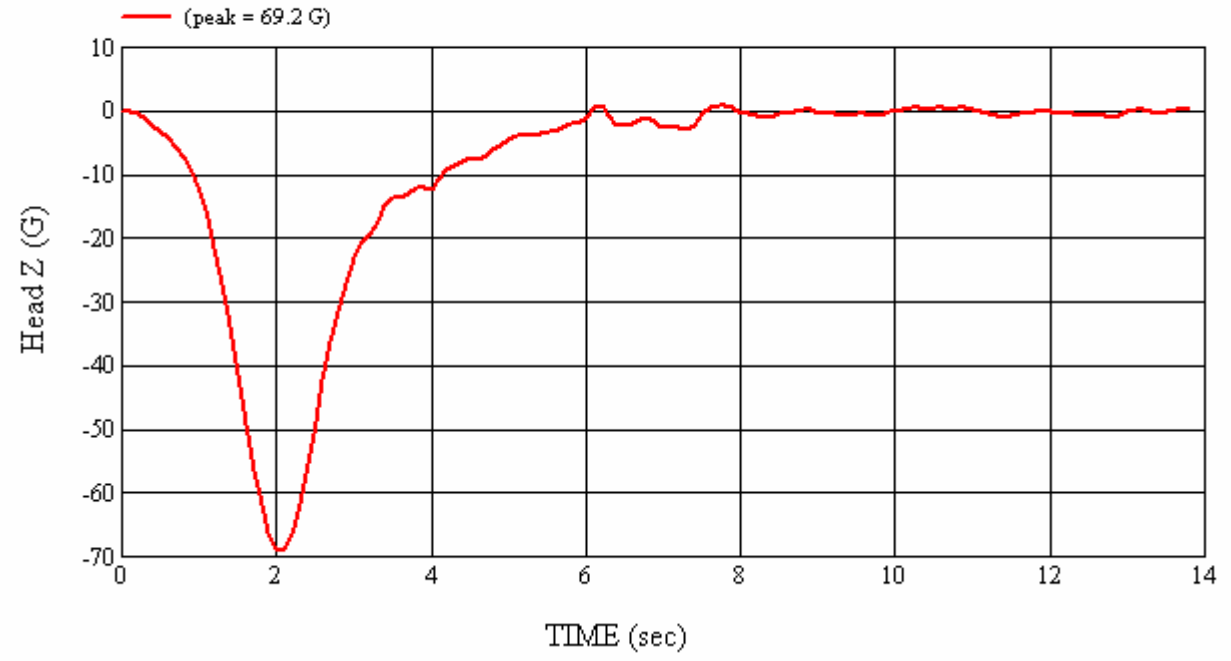
Head 036 (Post) Calibration #H36004



Head 036 (Post) Calibration #H36004



Head 036 (Post) Calibration #H36004



Head 036 (Post) Calibration #H36004

4.6 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

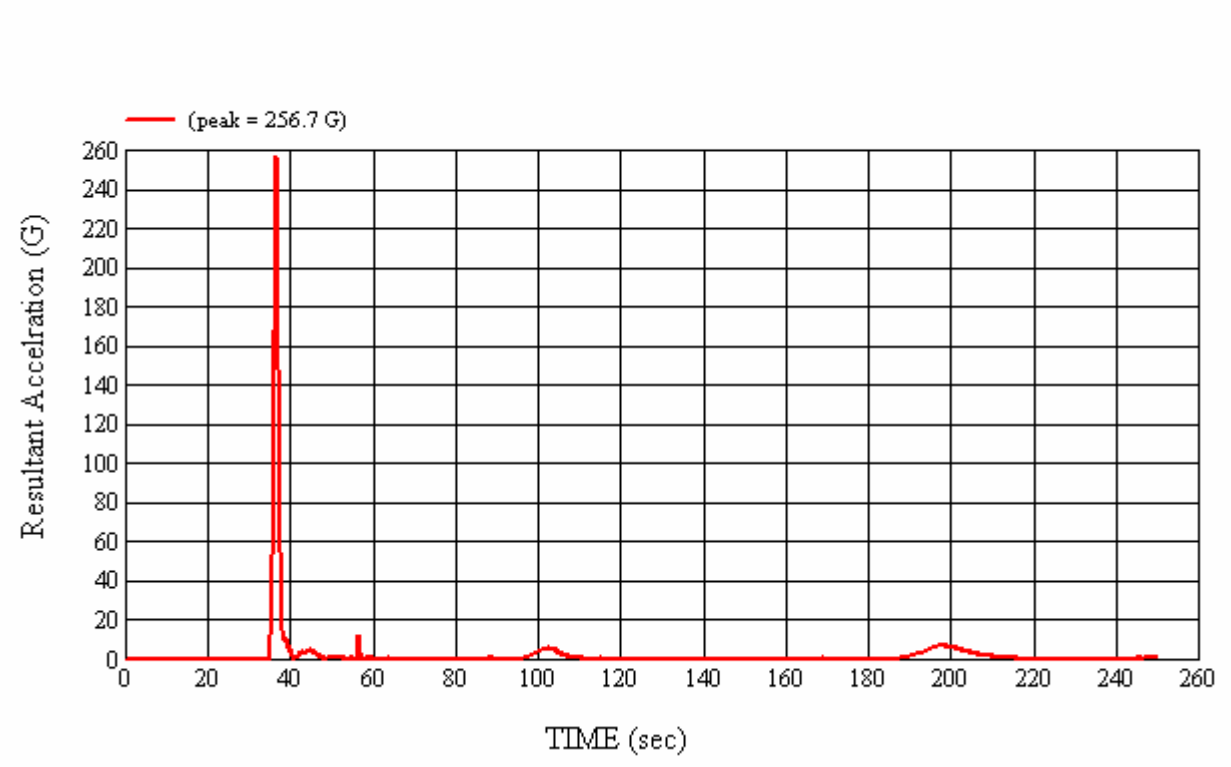
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 09/19/2006 CALIBRATION TIME: 10:40:28 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.92
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	47
Peak Resultant Acceleration	225 G's to 275 G's	256.7
Peak Lateral Acceleration	15 G's Maximum	14.6
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J36197	04/07/06	10/07/06
2	ENDEVCO	7264-2000	J36193	04/07/06	10/07/06
3	ENDEVCO	7264-2000	J36353	04/07/06	10/07/06

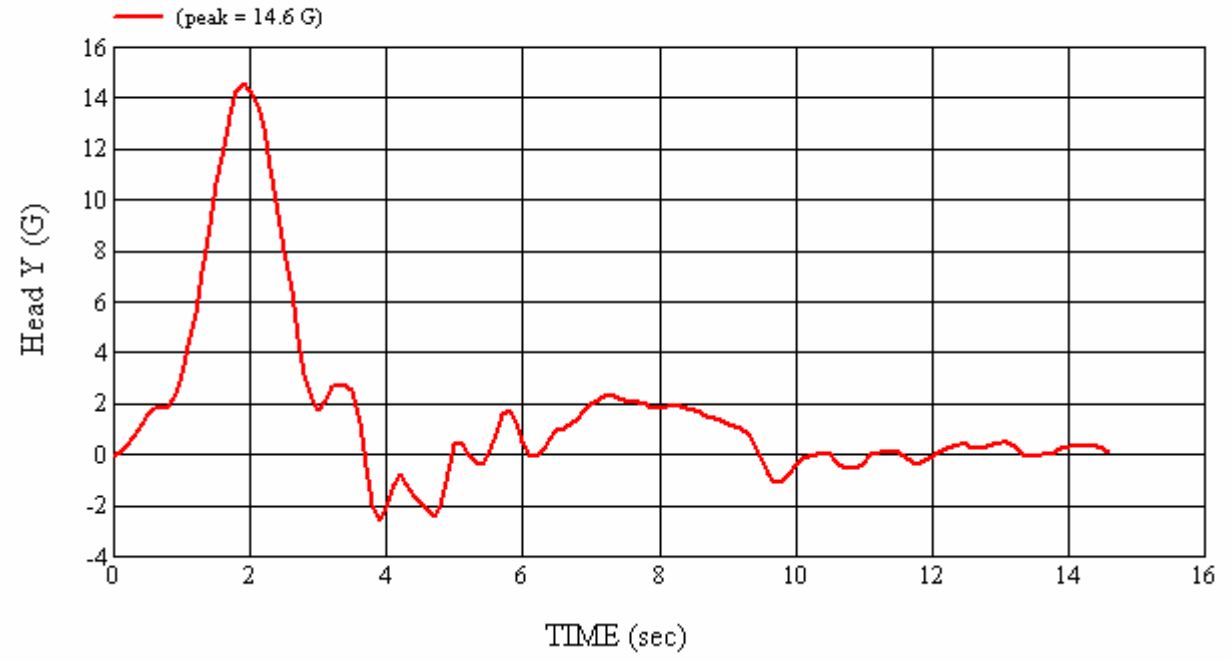
REMARKS:

RECORDED BY: _____ DATE: 9/19/2006

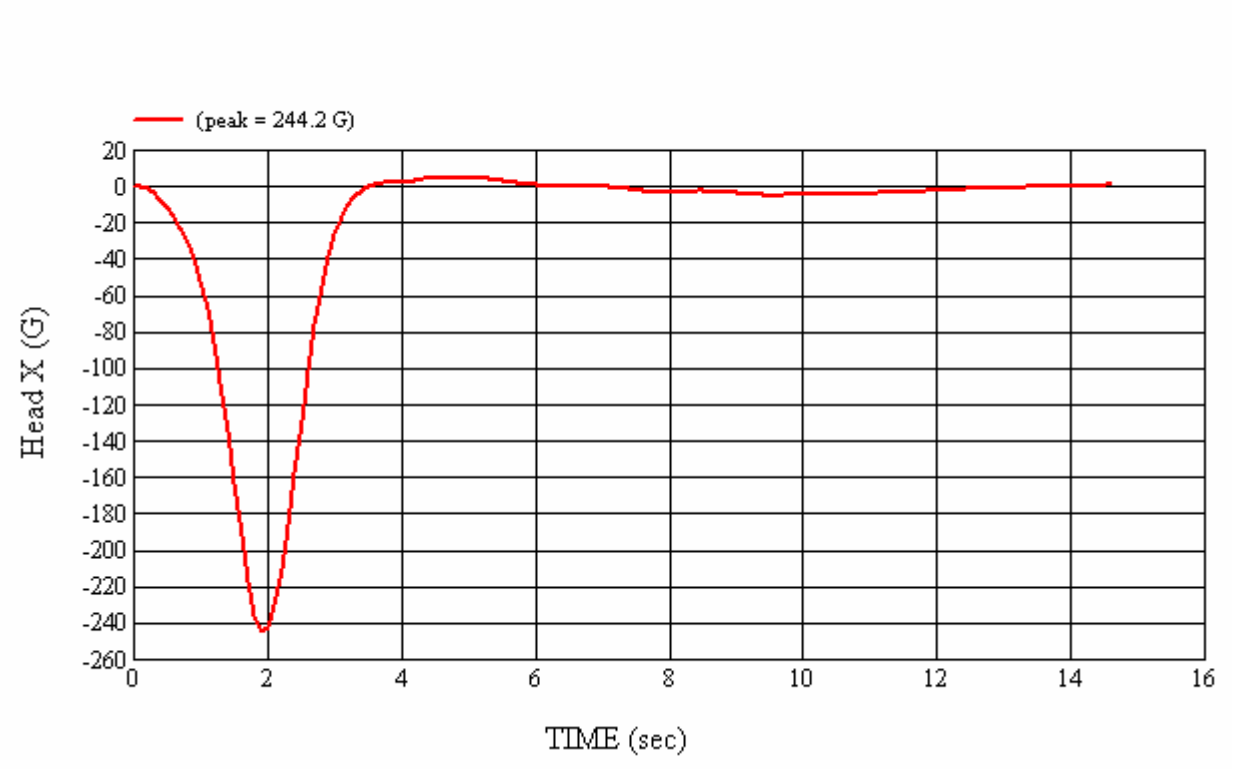
APPROVED BY: _____



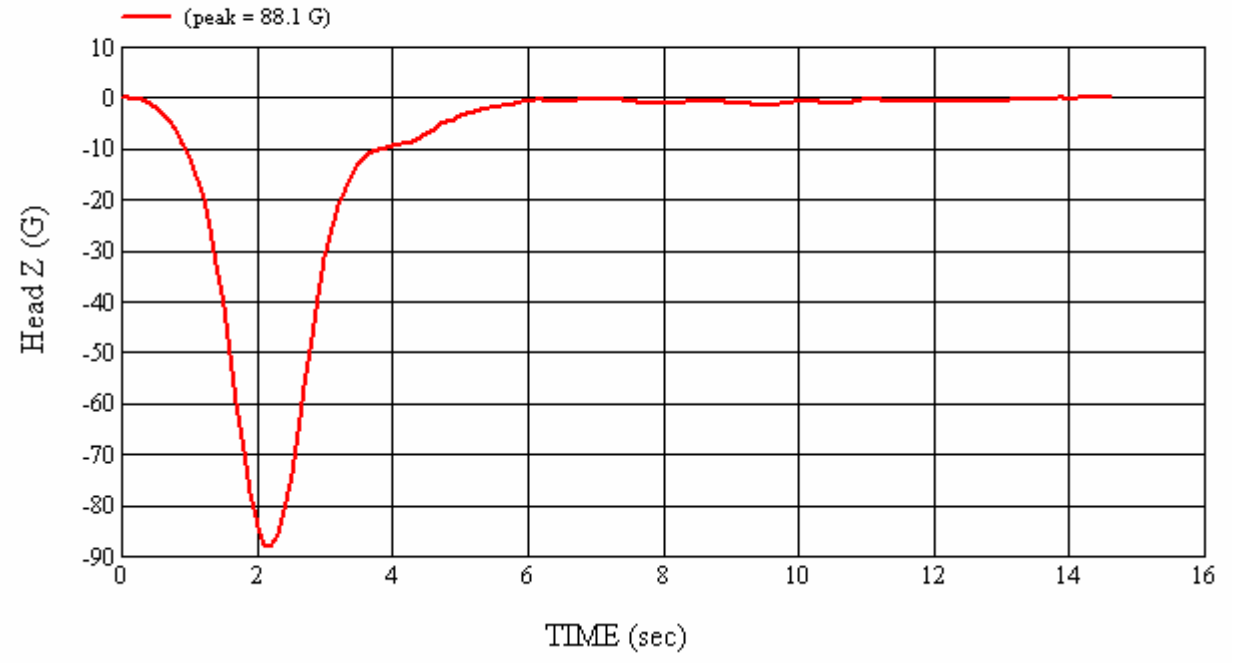
Head 038 (Pre) Calibration #H38309



Head 038 (Pre) Calibration #H38309



Head 038 (Pre) Calibration #H38309



Head 038 (Pre) Calibration #H38309

4.7 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

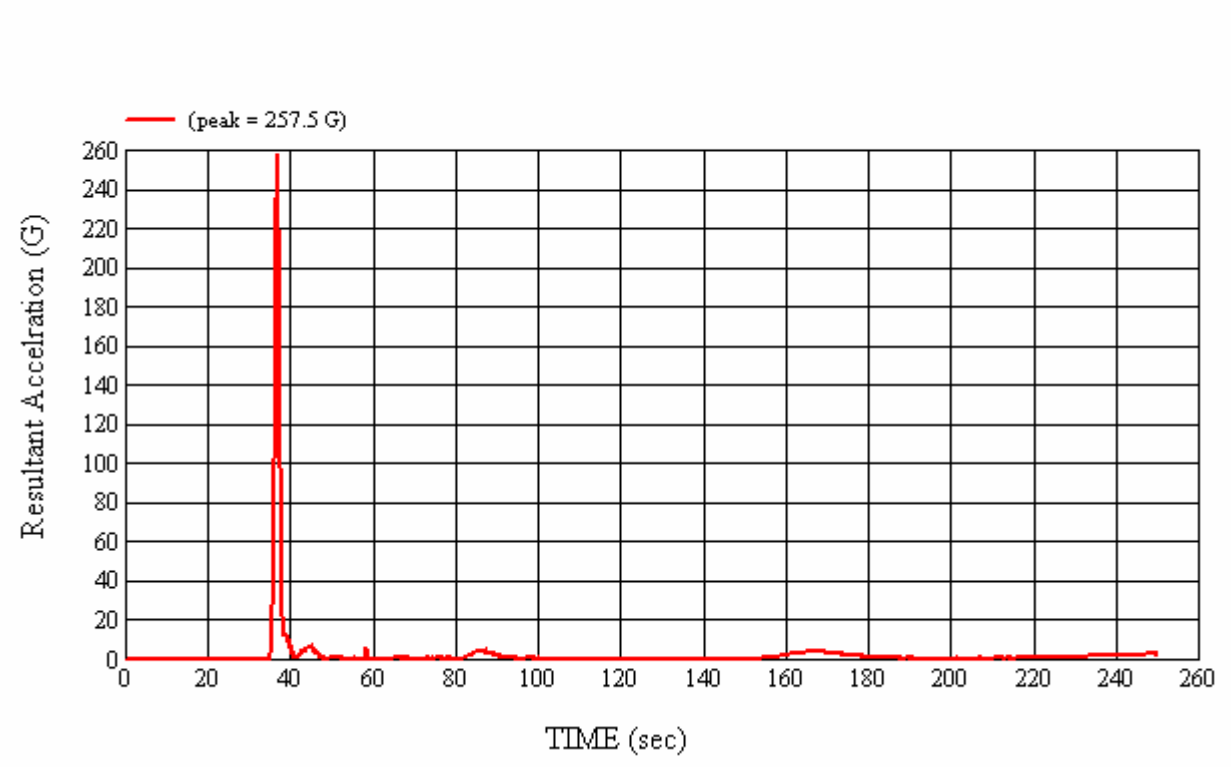
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 09/25/2006 CALIBRATION TIME: 2:46:43 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.92
Temperature	19° C to 26° C	21
Relative Humidity	10% to 70%	47
Peak Resultant Acceleration	225 G's to 275 G's	257.5
Peak Lateral Acceleration	15 G's Maximum	14.1
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J36197	04/07/06	10/07/06
2	ENDEVCO	7264-2000	J36193	04/07/06	10/07/06
3	ENDEVCO	7264-2000	J36353	04/07/06	10/07/06

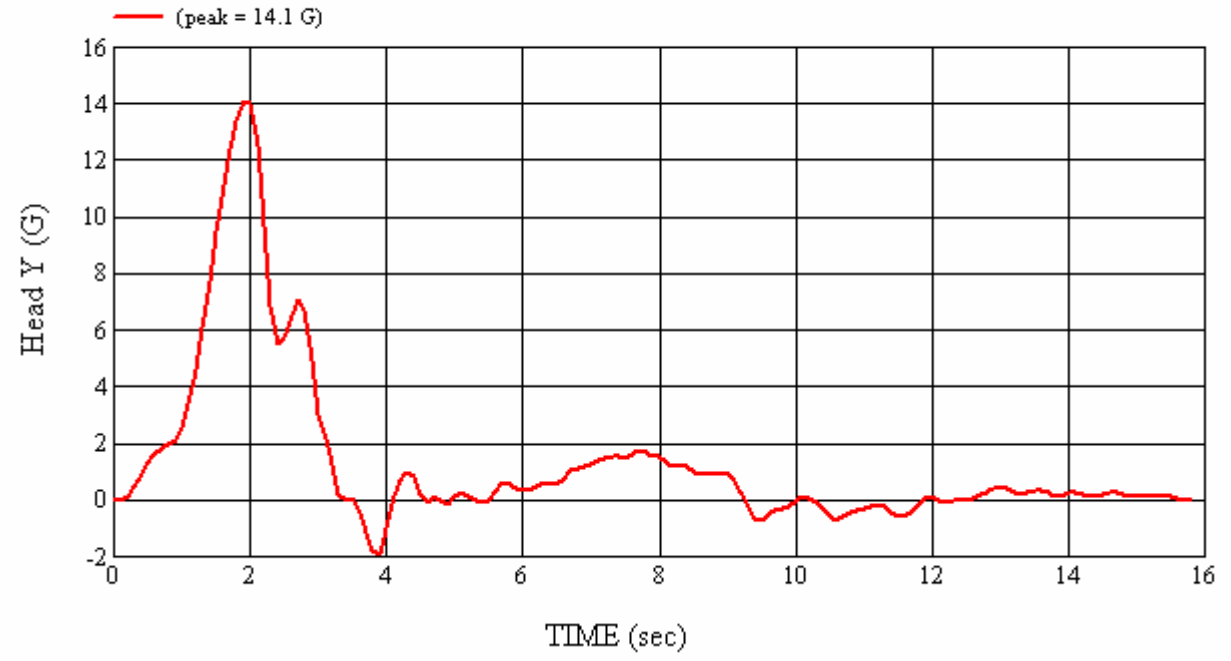
REMARKS:

RECORDED BY: Kaitlin Campbell DATE: 9/25/2006

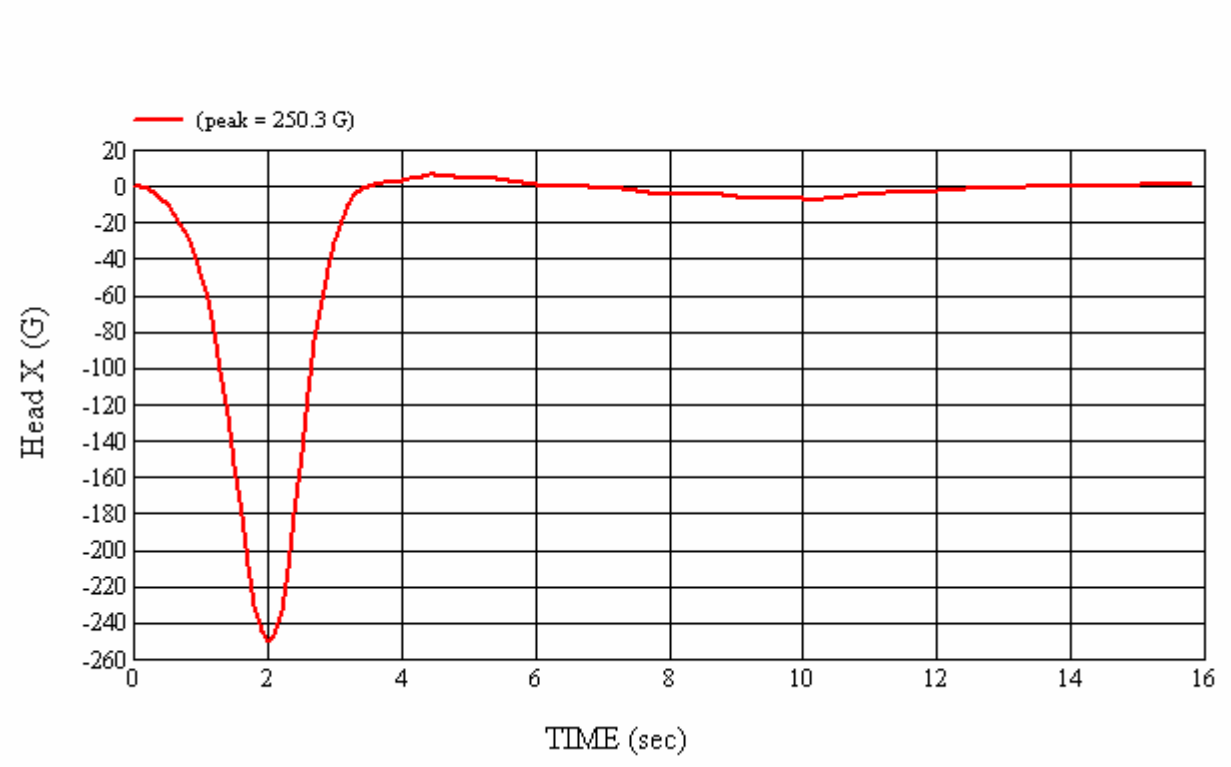
APPROVED BY: Helen A. Kalista



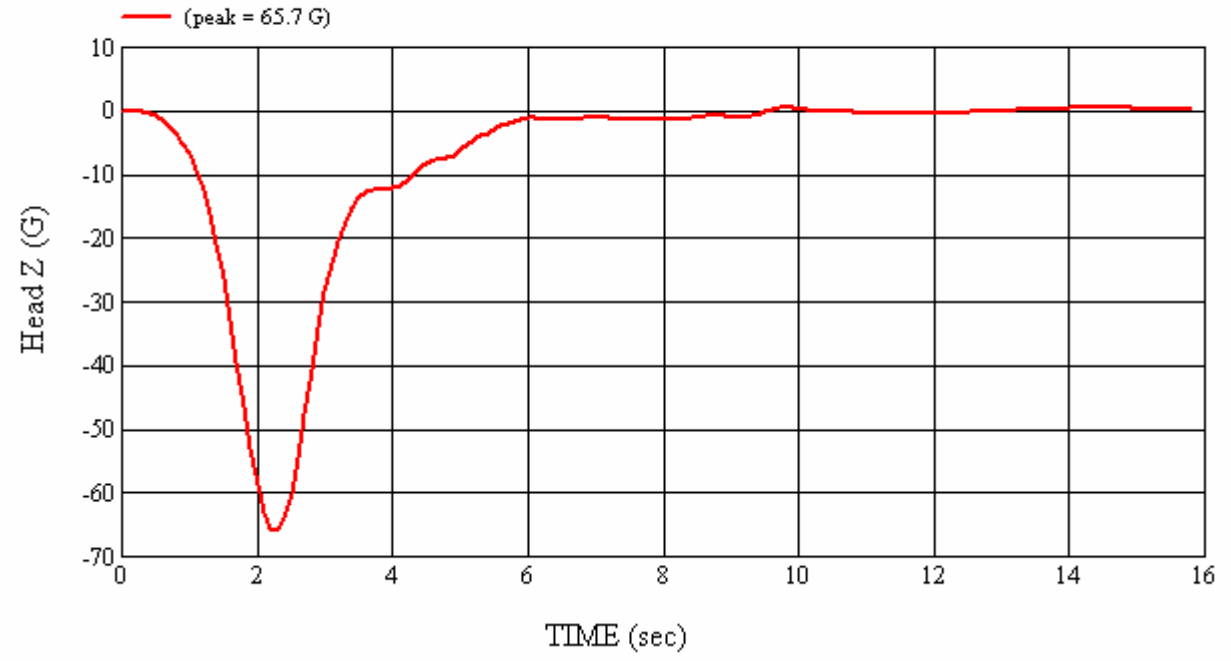
Head 038 (Post) Calibration #H38310



Head 038 (Post) Calibration #H38310



Head 038 (Post) Calibration #H38310



Head 038 (Post) Calibration #H38310

4.8 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

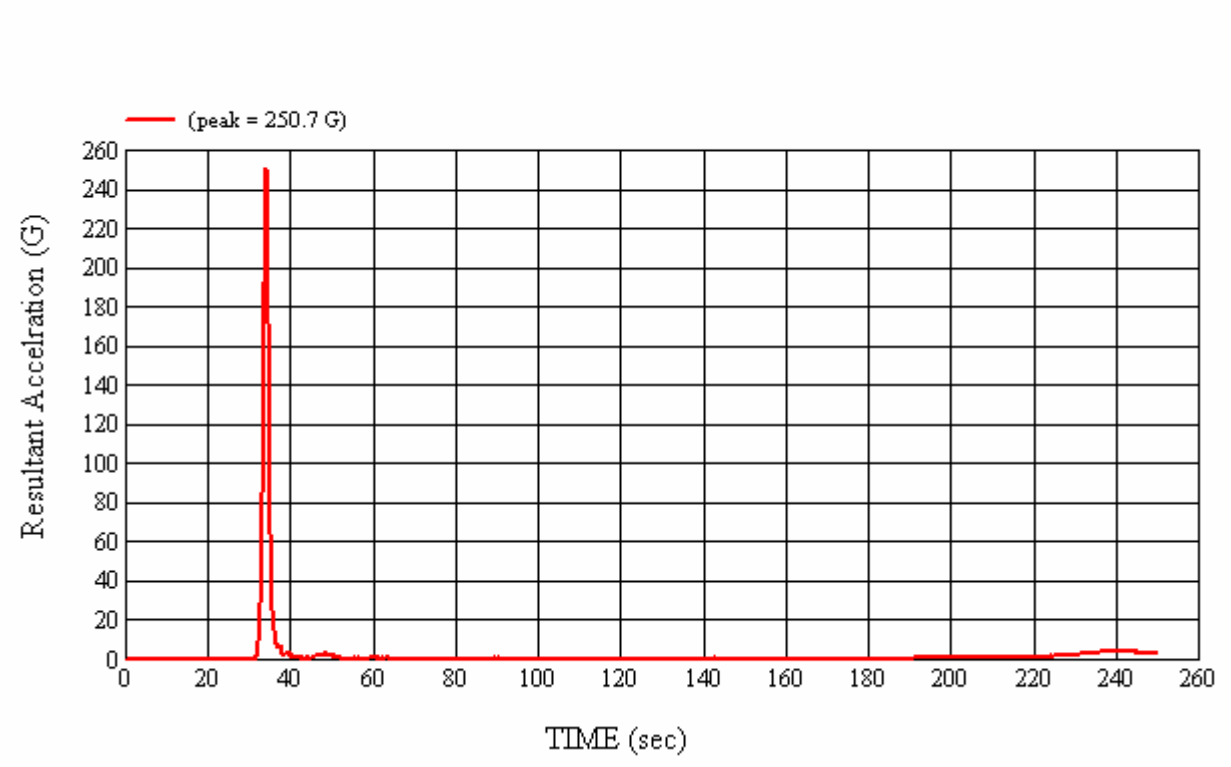
HEADFORM SERIAL NUMBER: __039____	CALIBRATION DATE: _09/19/2006___	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	10.00
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	47
Peak Resultant Acceleration	225 G's to 275 G's	250.7
Peak Lateral Acceleration	15 G's Maximum	2.5
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J13753	04/07/06	10/07/06
2	ENDEVCO	7264-2000	J22700	04/07/06	10/07/06
3	ENDEVCO	7264-2000	J32734	04/07/06	10/07/06

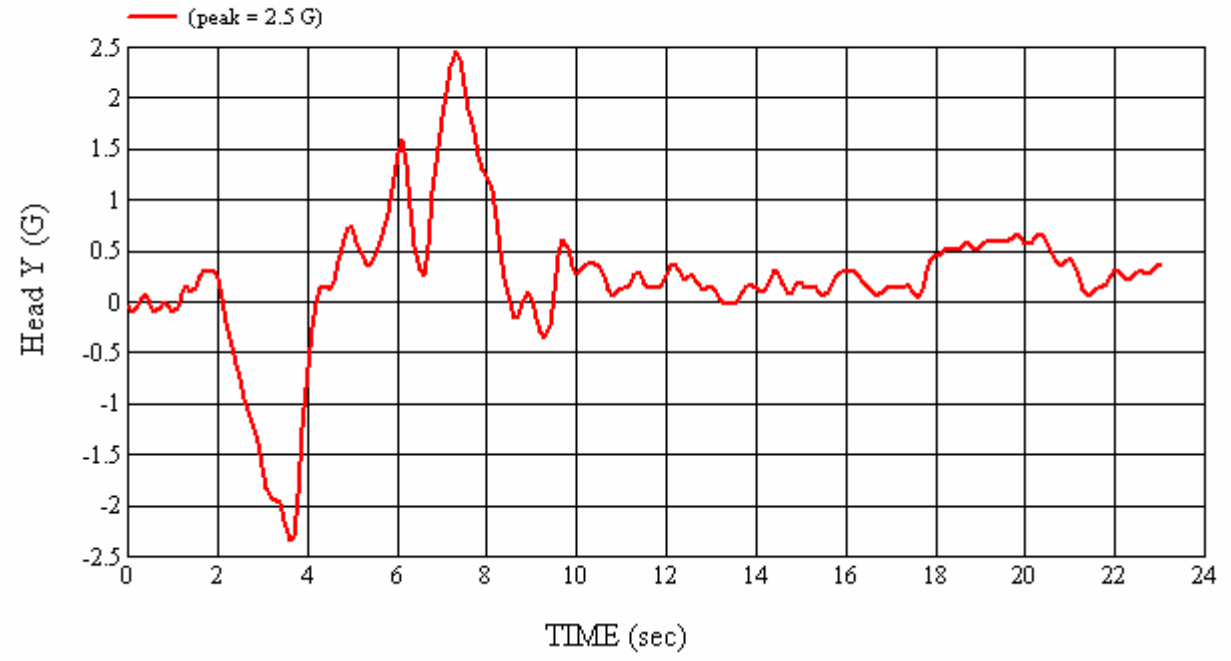
REMARKS:

RECORDED BY: Janis Campbell DATE: __9/19/2006____

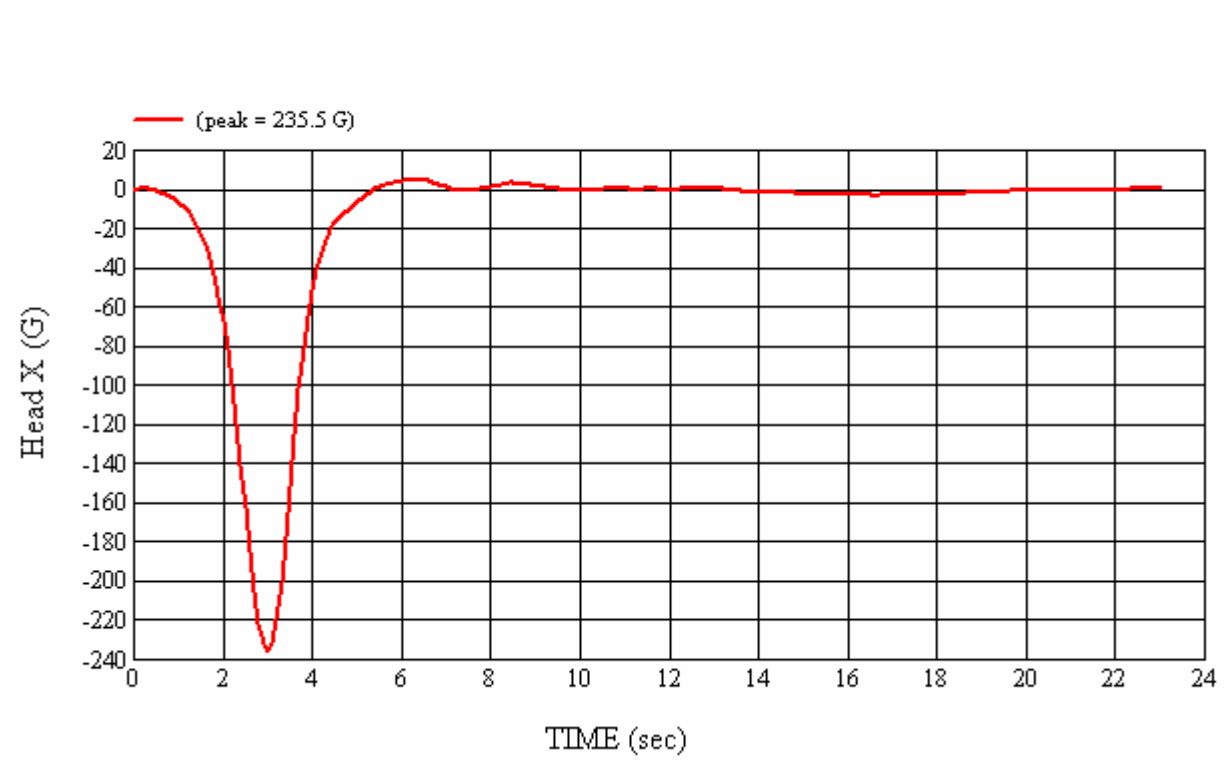
APPROVED BY: Helen A. Kalata



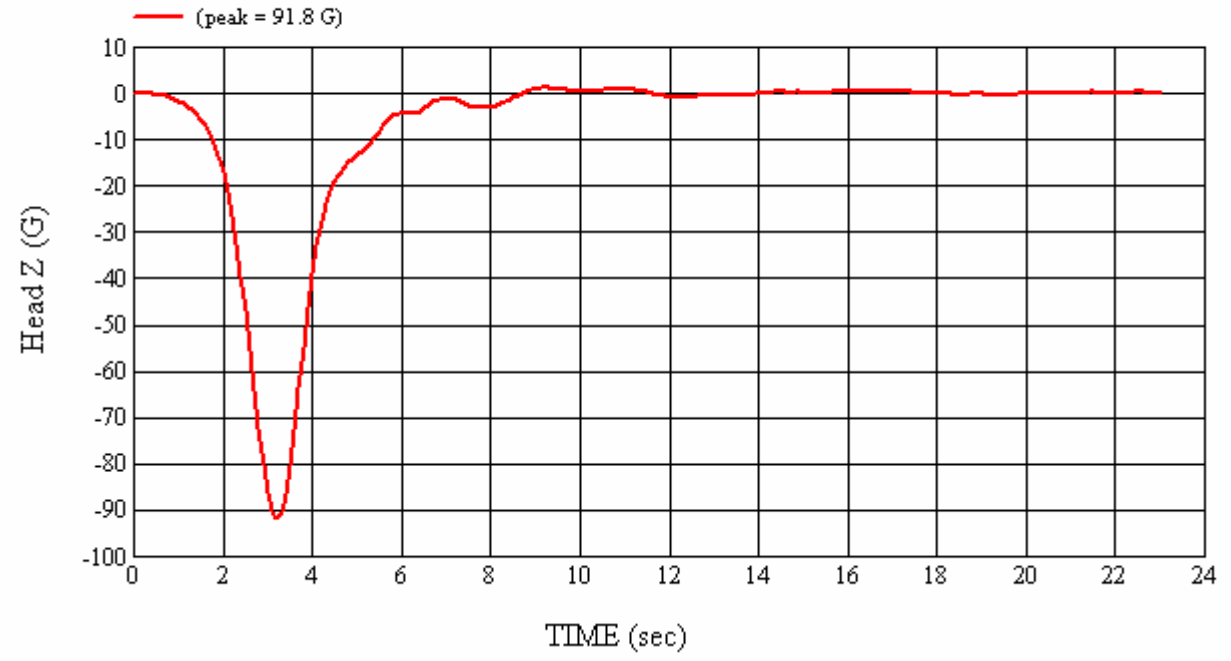
Head 039 (Pre) Calibration #H39020



Head 039 (Pre) Calibration #H39020



Head 039 (Pre) Calibration #H39020



Head 039 (Pre) Calibration #H39020

4.9 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

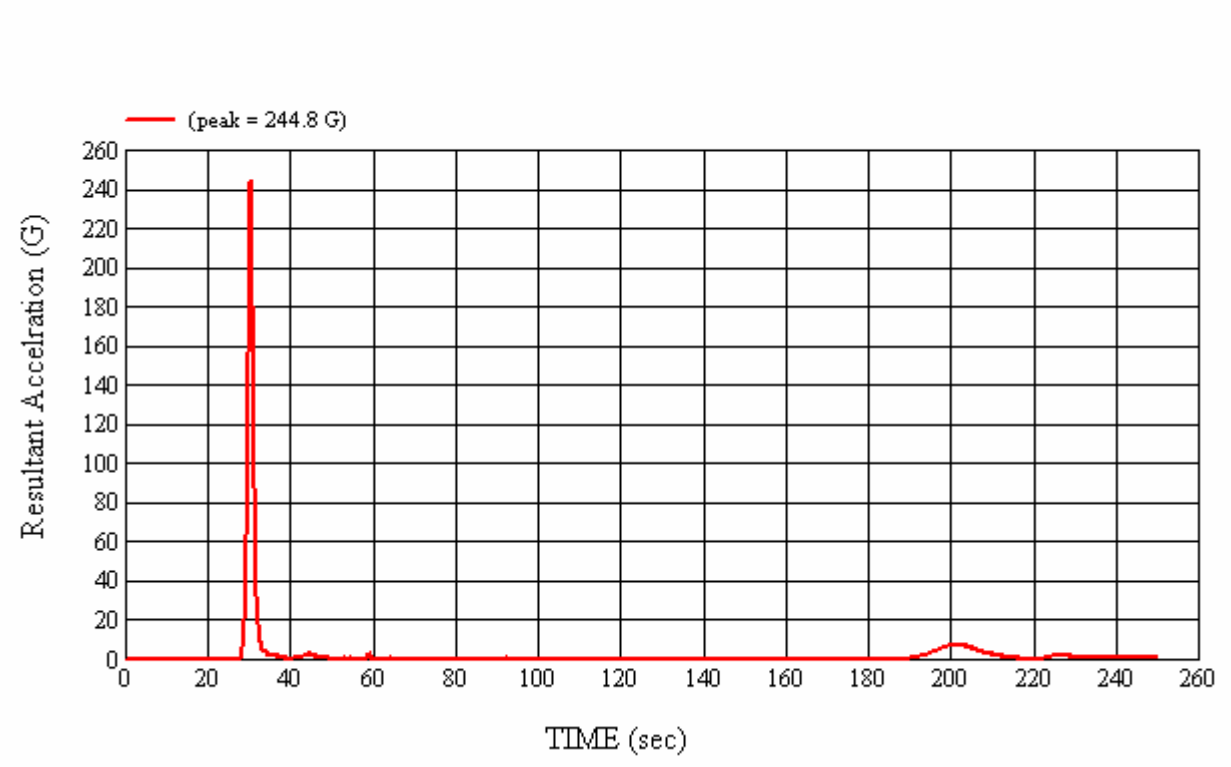
HEADFORM SERIAL NUMBER: 039	CALIBRATION DATE: 09/25/2006 CALIBRATION TIME: 2:48:09 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	10.00
Temperature	19° C to 26° C	21
Relative Humidity	10% to 70%	47
Peak Resultant Acceleration	225 G's to 275 G's	244.8
Peak Lateral Acceleration	15 G's Maximum	3.9
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J13753	04/07/06	10/09/06
2	ENDEVCO	7264-2000	J22700	04/07/06	10/09/06
3	ENDEVCO	7264-2000	J32734	04/07/06	10/09/06

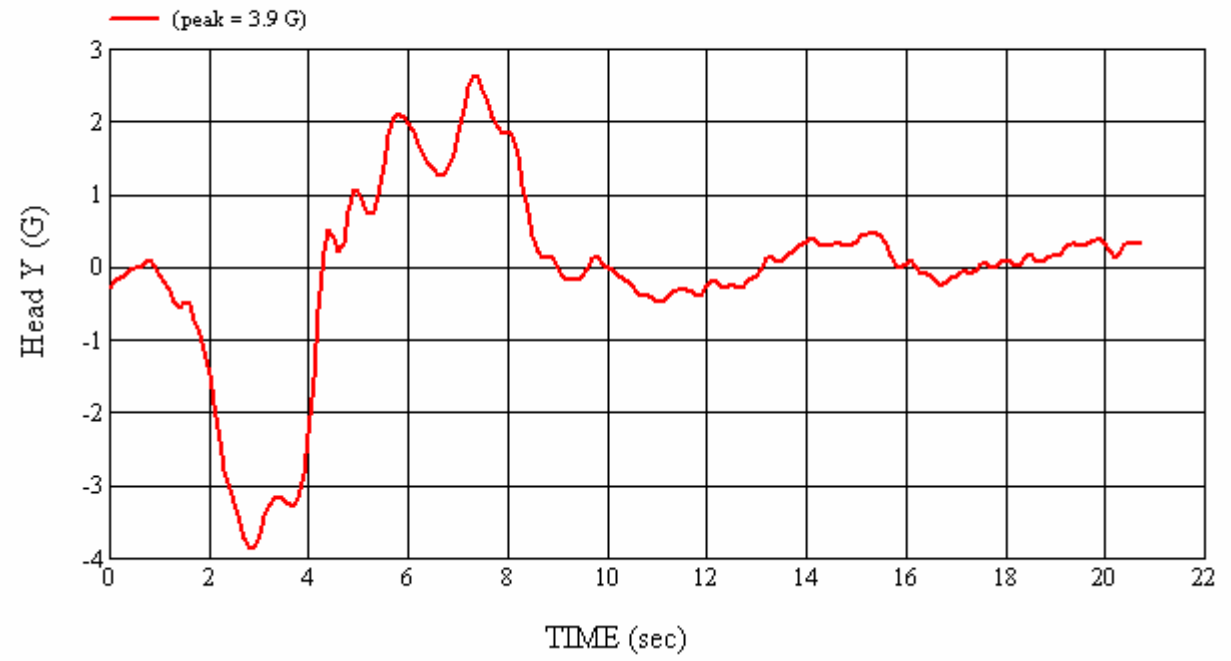
REMARKS:

RECORDED BY: Kaitlin Campbell DATE: 9/25/2006

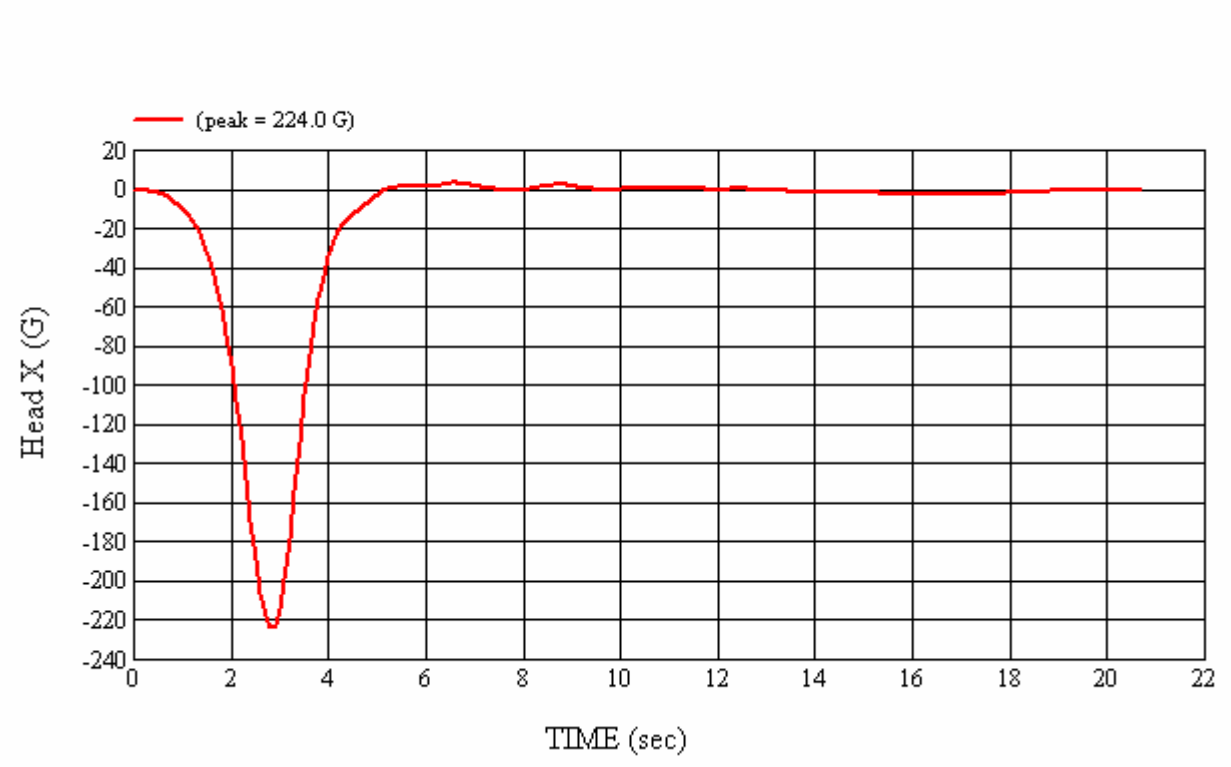
APPROVED BY: Helen A. Kalista



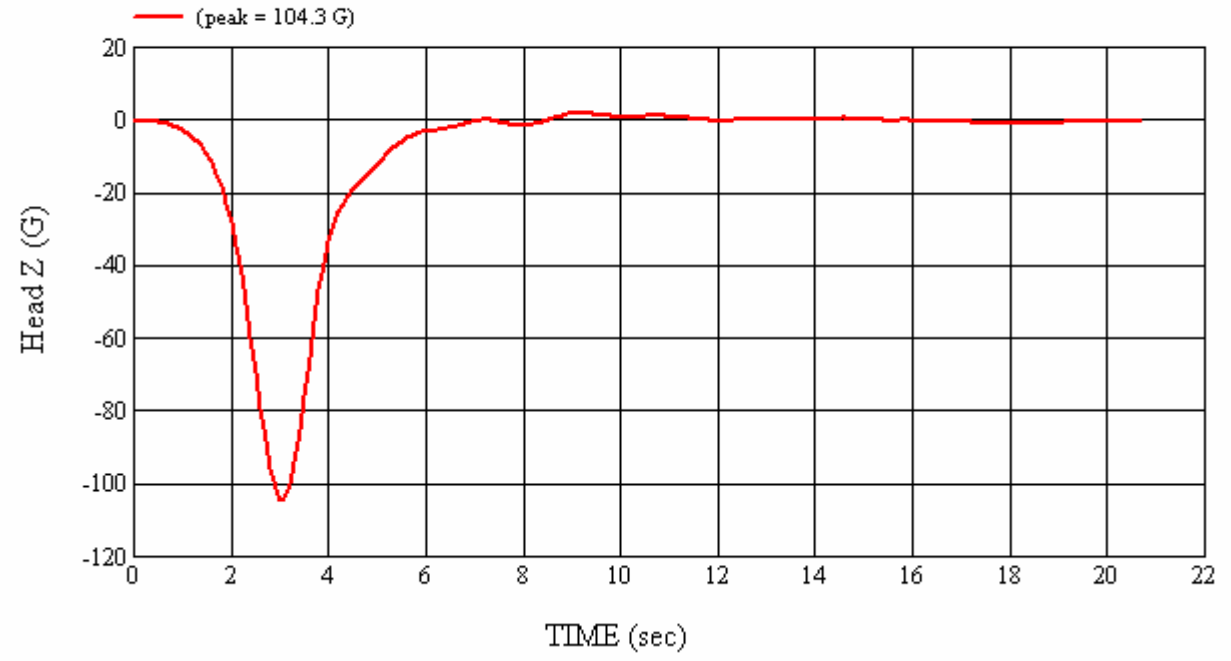
Head 039 (Post) Calibration #H39021



Head 039 (Post) Calibration #H39021



Head 039 (Post) Calibration #H39021



Head 039 (Post) Calibration #H39021

5.0 PHOTOGRAPHS

As Delivered – Left Side View

As Delivered – Right Side View

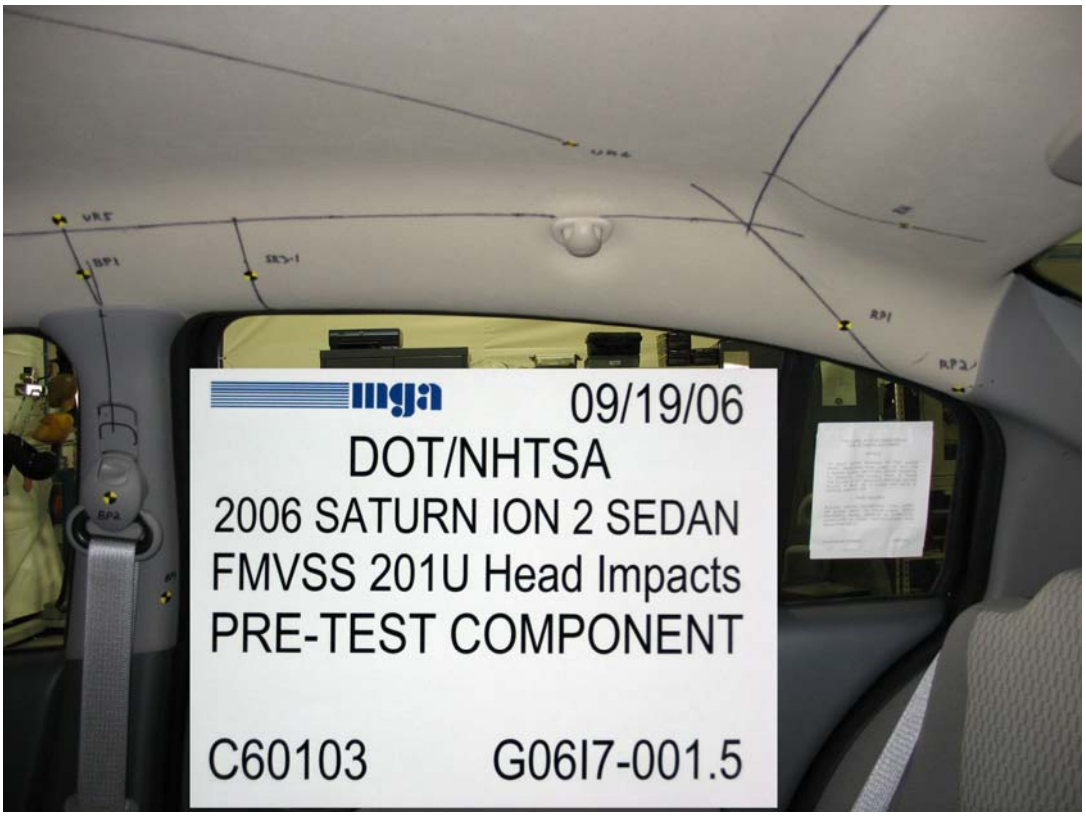
As Delivered – ¾ Front View From Left Side

As Delivered – Rear View from Right Side

As Delivered – Vehicle's Certification Label

As Delivered – Vehicle's Tire Information Label

Pre-Test Component Photographs


mga
09/19/06
DOT/NHTSA
2006 SATURN ION 2 SEDAN
FMVSS 201U Head Impacts
PRE-TEST COMPONENT
C60103
G06I7-001.5


mga
09/19/06
DOT/NHTSA
2006 SATURN ION 2 SEDAN
FMVSS 201U Head Impacts
PRE-TEST COMPONENT
C60103
G06I7-001.5


mga
09/19/06
DOT/NHTSA
2006 SATURN ION 2 SEDAN
FMVSS 201U Head Impacts
PRE-TEST COMPONENT
C60103
G06I7-001.5

Post-Test Component Photographs


mga
05/01/07
DOT/NHTSA
2006 SATURN ION 2 SEDAN
FMVSS 201U Head Impacts
POST-TEST COMPONENT
C60103
G06I7-001.5


mga
05/01/07
DOT/NHTSA
2006 SATURN ION 2 SEDAN
FMVSS 201U Head Impacts
POST-TEST COMPONENT
C60103
G06I7-001.5


mga
05/01/07
DOT/NHTSA
2006 SATURN ION 2 SEDAN
FMVSS 201U Head Impacts
POST-TEST COMPONENT
C60103
G06I7-001.5

6.0 NOTICE OF TEST FAILURES

16. FORMS....Continued

LABORATORY NOTICE OF APPARENT TEST FAILURE TO OVSC

FMVSS NO.: 201U TEST DATE: SEPTEMBER 20, 2006

LABORATORY: MGA RESEARCH CORPORATION

CONTRACT NO.: DTNH22-04-C-11027; DELV. ORDER NO.: 0003

LABORATORY PROJECT ENGINEER'S NAME: HELEN KALETO

TEST SPECIMEN DESCRIPTION: 2006 SATORN ION 2 SEDAN STANDARD ROOF

VEHICLE NHTSA NO.: C60103 VIN: 1G8AZ55F46Z145819

MFR: GENERAL MOTORS CORP.

APPARENT TEST FAILURE DESCRIPTION: TARGET AP3 ON THE RIGHT SIDE OF THE VEHICLE WAS TESTED A HORIZONTAL ANGLE OF 158°, AND A VERTICAL ANGLE OF 45°. THE VELOCITY OF THIS TEST WAS 23.6kph. THE RESULTING HIC WAS 1221, WITH A HIC(d) OF 1688. THE IMPACT LOCATION WAS 8 UP AND 12 LEFT.

FMVSS REQUIREMENT, PARAGRAPH S___ : 49CFR571.201 S7

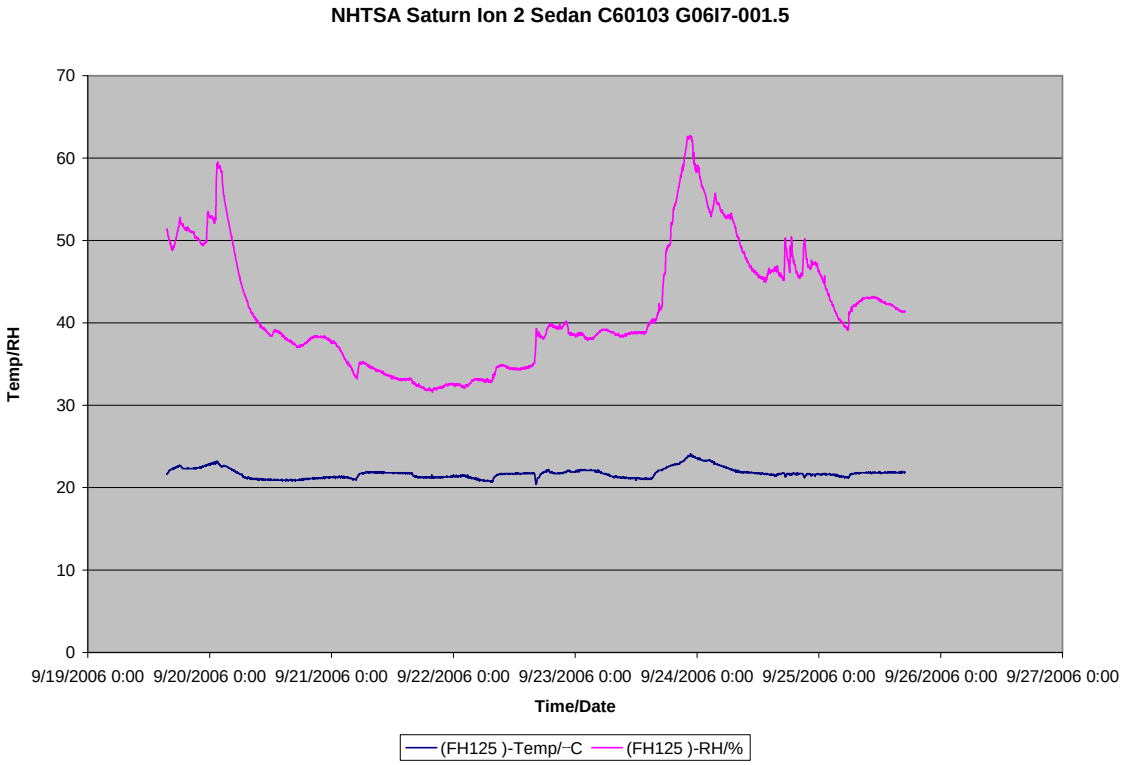
THE HIC(d) SHALL NOT EXCEED 1000

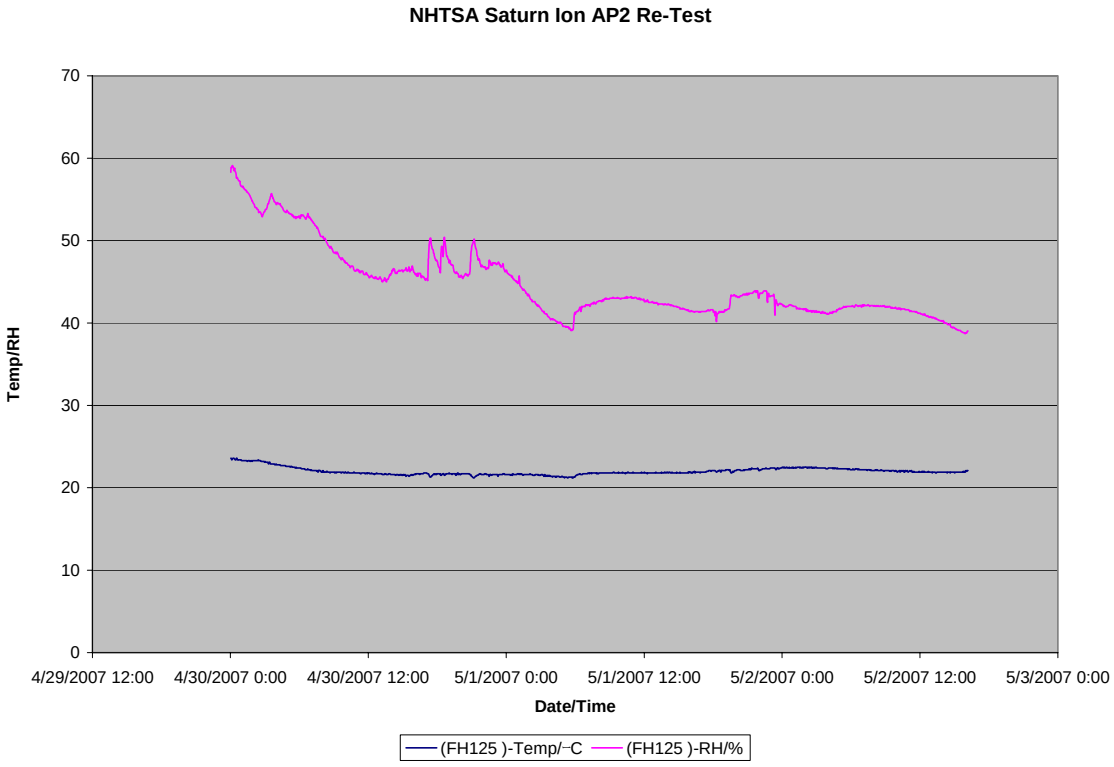
NOTIFICATION TO NHTSA (COTR): KAREN NUSCHLER

DATE: SEPTEMBER 20, 2006 BY: LOUIS S. CAMPBELL

REMARKS:

Appendix A - Temperature Trace(s)





Appendix B - Calibration Certificates

mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35924	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 04/06/2006	**Calibration Date:** *06/13/2005*
	Calibrated By: *Chuck DiMaggio/PCB Piezotronics, Inc.*

Test Reference Number:	A0602
New DLR (100k **, Units:G):**	91.4
StdDeviation (%)	0.333
% Difference in DLR (New vs. Old):	-0.253
Temperature (^{o}F):	74
Humidity (%):	34

Performed By: Matt Kerr

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±4.1%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

446 executive drive • troy, mi 48083
248 / 577-5001 • fax 248 / 577-5025
www.mgaresearch.com

mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35919	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 04/06/2006	**Calibration Date:** *06/13/2005*
	Calibrated By: *Chuck DiMaggio/PCB Piezotronics, Inc.*

Test Reference Number: A0602

New DLR (100k **, Units:G):** 94.4

StdDeviation (%) 0.447

% Difference in DLR (New vs. Old): -0.659

Temperature (°F): 74

Humidity (%): 34

Performed By: Matt Kerr

Approved By: Helen A. Kaluto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±4.1%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J22664	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 04/06/2006	**Calibration Date:** *06/13/2005*
	Calibrated By: *Chuck DiMaggio/PCB Piezotronics, Inc.*

Test Reference Number: A0602

New DLR (100k **, Units:G):** 94.3

StdDeviation (%) 0.379

% Difference in DLR (New vs. Old): 1.167

Temperature (°F): 74

Humidity (%): 34

Performed By: Matt Kerr

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±4.1%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J36197	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 04/07/2006	**Calibration Date:** *06/13/2005*
	Calibrated By: *Chuck DiMaggio/PCB Piezotronics, Inc.*

Test Reference Number:	A0604
New DLR (100k **, Units:G):**	108.8
StdDeviation (%)	0.008
% Difference in DLR (New vs. Old):	-1.418
Temperature (°F):	72
Humidity (%):	38

Performed By: Matt Kerr

Approved By: Helen R. Kaluto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±4.1%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J36193	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 04/07/2006	**Calibration Date:** *06/13/2005*
	Calibrated By: *Chuck DiMaggio/PCB Piezotronics, Inc.*

Test Reference Number: A0604

New DLR (100k **, Units:G):** 102.7

StdDeviation (%) 0.015

% Difference in DLR (New vs. Old): -1.848

Temperature (°F): 72

Humidity (%): 38

Performed By: Matt Kerr

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±4.1%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J36353	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 04/07/2006	**Calibration Date:** *06/13/2005*
	Calibrated By: *Chuck DiMaggio/PCB Piezotronics, Inc.*

Test Reference Number: A0604

New DLR (100k **, Units:G):** 97.2

StdDeviation (%) 0.003

% Difference in DLR (New vs. Old): -0.381

Temperature (°F): 72

Humidity (%): 38

Performed By: Matt Kerr

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±4.1%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J13753	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 04/07/2006	**Calibration Date:** *06/13/2005*
	Calibrated By: *Chuck DiMaggio/PCB Piezotronics, Inc.*

Test Reference Number: A0603

New DLR (100k **, Units:G):** 103.6

StdDeviation (%) 0.411

% Difference in DLR (New vs. Old): .013

Temperature (^{o}F): 72

Humidity (%): 38

Performed By: Matt Kerr

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±4.1%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J22700	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 04/07/2006	**Calibration Date:** *06/13/2005*
	Calibrated By: *Chuck DiMaggio/PCB Piezotronics, Inc.*

Test Reference Number: A0603

New DLR (100k **, Units:G):** 94.4

StdDeviation (%) 0.342

% Difference in DLR (New vs. Old): -1.008

Temperature (°F): 72

Humidity (%): 38

Performed By: Matt Kerr

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±4.1%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J32734	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 04/07/2006	**Calibration Date:** *06/13/2005*
	Calibrated By: *Chuck DiMaggio/PCB Piezotronics, Inc.*

Test Reference Number:	A0603
New DLR (100k **, Units:G):**	95.5
StdDeviation (%)	0.25
% Difference in DLR (New vs. Old):	1.345
Temperature (°F):	72
Humidity (%):	38

Performed By: Matt Kerr

Approved By: Helen A. Kaleto

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±4.1%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J21969	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 4/29/2007	**Calibration Date:** *7/27/2006*
	Calibrated By: *Chuck DiMaggio*

Test Reference Number:	A0712
New DLR (100k **, Units:G):**	90.9
StdDeviation (%)	0.113
% Difference in DLR (New vs. Old):	-0.839
Temperature (°F):	74
Humidity (%):	36

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.7%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35916	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 4/29/2007	**Calibration Date:** *7/27/2006*
	Calibrated By: *Chuck DiMaggio*

Test Reference Number: A0712

New DLR (100k **, Units:G):** 103.2

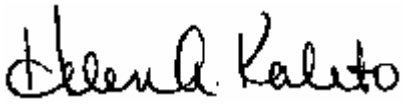
StdDeviation (%) 0.19

% Difference in DLR (New vs. Old): 0.033

Temperature (°F): 74

Humidity (%): 36

Performed By: 

Approved By: 

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.7%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	**Name:** *Reference Accelerometer*
Model: 7264-2000	**Model:** *301M09/484B*
S/N: J35918	**S/N:** *862/247*
Capacity: 2000 G	**Capacity:** *170 G*
Calibration Date: 4/29/2007	**Calibration Date:** *7/27/2006*
	Calibrated By: *Chuck DiMaggio*

Test Reference Number:	A0712
New DLR (100k **, Units:G):**	99.4
StdDeviation (%)	0.149
% Difference in DLR (New vs. Old):	-1.369
Temperature (°F):	74
Humidity (%):	36

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±3.7%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

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08/24/05 14:40 FAX 716 685 3886 PCB PIEZOTRONICS 002/00

~ Calibration Certificate ~

Per ISO 16063-21

Model Number: 301M09/484B (394M17 SYSTEM)

Serial Number: 862/2470

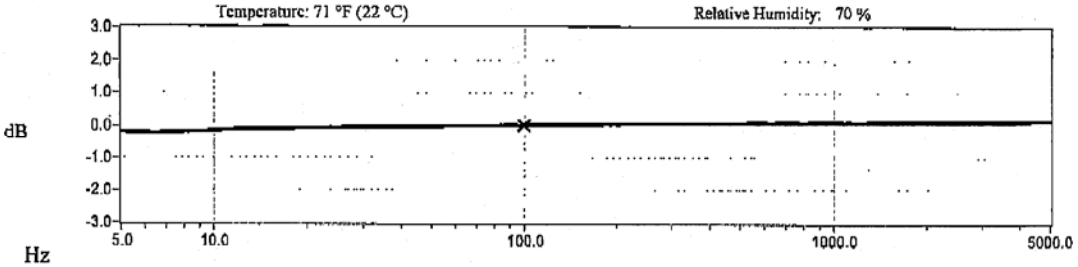
Description: ICP® Accelerometer Method: Back-to-Back Comparison Calibration

Manufacturer: PCB

Calibration Data

Sensitivity @ 100.0 Hz	**31.05**	**mV/g**	Output Bias	8.6	VDC
	(3.17	**mV/m/s²)**	Transverse Sensitivity	3.0	%

Sensitivity



Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
5.0	-2.3	REF. FREQ.	0.0	5000.0	1.8
10.0	-1.9	300.0	0.6		
15.0	-1.4	500.0	0.8		
30.0	-0.7	1000.0	1.0		
50.0	-0.4	3000.0	1.4		

Mounting Surface: Stainless Steel w/Silicone Grease Coating Fastener: Stud Mount Vertical
Acceleration Level (rms)*: 10.0 g (98.1 m/s²)*
*The acceleration level may be limited by shaker displacement at low frequencies. If the listed level cannot be obtained, the calibration system uses the following formula to set the vibration amplitude: Acceleration Level (g) = 0.010 x (freq)²
*The gravitational constant used for calculations by the calibration system is: 1 g = 9.80665 m/s².

Condition of Unit

As Found: In Tolerance, No Adjustment Necessary

As Left: In Tolerance

Notes

1. Calibration is NIST Traceable thru Project 822/271196 and PTB Traceable thru Project 5399.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1, ANSI/NCSL Z540-1-1994 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Due to state of the art limitations, the test accuracy ratio is 2:1. Measurement uncertainty (95% confidence level with coverage factor of 2) for frequency ranges tested during calibration are as follows: 5-9 Hz; +/- 2.0%, 10-99 Hz; +/- 1.5%, 100-1999 Hz; +/- 1.0%, 2-10 kHz; +/- 2.5%.

Technician: Chuck DiMaggio Date: 06/13/05

ACCREDITED
Cert No 1862.01

PCB PIEZOTRONICS
VIBRATION DIVISION
3425 Walden Avenue · Depew, NY 14043
TEL: 888-684-0013 · FAX: 716-685-3886 · www.pcb.com

PAGE 1 of 1

cal3 - 2201505619.38

~Certificate of Calibration~

Model Number: 484B
Serial Number: 2470
Description: Signal Conditioner
Test Procedure: AT-106-1
Temperature: 70° F

N.I.S.T. Project #: F2565002/5UU2VF-2-1/81000539626720012
Calibration Date: 6/15/2005
Recalibration Date:
Calibration Technician: James Higbee 2b
Relative Humidity: 54%

Volts	*Current (mA)*	*Gain**
24.0	3.85	1.000

As Received: In tolerance, no adjustment required.

As Left: In tolerance.

Special Notes:

This document certifies that the equipment referenced above meets published specifications. The calibration procedure is in compliance with ISO 10012-1, and former MIL-STD-45662A and is traceable to NIST. *Measurement uncertainty (95% confidence level w\coverage factor of 2) for scale factors is +/- 0.2%.

ACCREDITED
Cert. No. 1862.01

PCB PIEZOTRONICS

3425 Walden Avenue Depew, New York, USA 14043-2495

For any questions concerning this certificate, please call PCB at (716) 684-0001 and ask for an application engineer.

~ Calibration Certificate ~

Per ISO 16063-21

Model Number: 301M09/484B (394M17 SYSTEM)

Serial Number: 862/2470

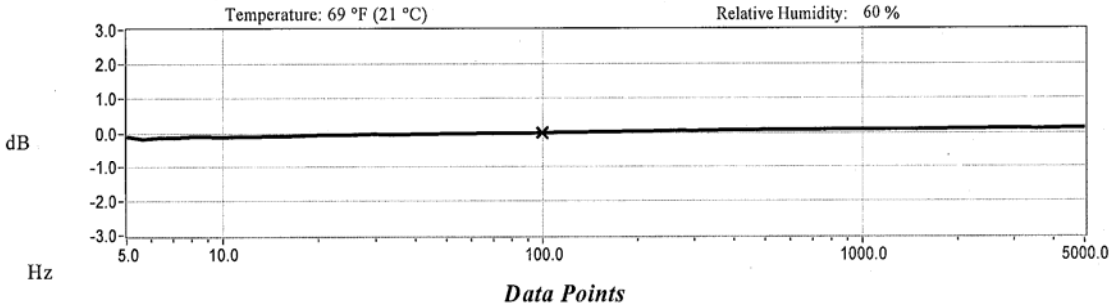
Description: ICP® Accelerometer Method: Back-to-Back Comparison Calibration

Manufacturer: PCB

Calibration Data

Sensitivity @ 100.0 Hz	**31.03**	**mV/g**	Output Bias	8.6	VDC
	(3.16	**mV/m/s²)**	Transverse Sensitivity	3.0	%

Sensitivity Plot



Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
5.0	-1.2	REF. FREQ.	0.0	5000.0	1.5
10.0	-1.4	300.0	0.6		
15.0	-1.0	500.0	0.9		
30.0	-0.4	1000.0	1.0		
50.0	-0.3	3000.0	1.4		

Mounting Surface: Stainless Steel w/Silicone Grease Coating Fastener: Stud Mount Fixture Orientation: Vertical
Acceleration Level (rms)[1]: 10.0 g (98.1 m/s²)²

[1]The acceleration level may be limited by shaker displacement at low frequencies. If the listed level cannot be obtained, the calibration system uses the following formula to set the vibration amplitude; Acceleration Level (g) = 0.010 x (freq)².

[2]The gravitational constant used for calculations by the calibration system is; 1 g = 9.80665 m/s².

Condition of Unit

As Found: In Tolerance, No Adjustment Necessary

As Left: In Tolerance

Notes

1. Calibration is NIST Traceable thru Project 822/271196 and PTB Traceable thru Project 5399.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1, ANSI/NCSL Z540-1-1994 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Measurement uncertainty (95% confidence level with coverage factor of 2) for frequency ranges tested during calibration are as follows: 5-9 Hz; +/- 2.0%, 10-99 Hz; +/- 1.5%, 100-1999 Hz; +/- 1.0%, 2-10 kHz; +/- 2.5%.

Technician: Chuck DiMaggio CD 7/27/06 Date: 07/27/06

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Cert No 1862.01

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PAGE 1 of 1

cal3 - 3236847234.40

~Certificate of Calibration~

Model Number: 484B
Serial Number: 2470
Description: Signal Conditioner
Test Procedure: AT-106-1
Temperature: 70° F

PCB Control #: QC214/QC184/QC198/CA514
Calibration Date: 07/22/2006
Recalibration Date:
Calibration Technician: James Higbee 2b 7/21/06
Relative Humidity: 58%

Volts	*Current (mA)*	*Gain**
24.0	3.9	1.000

As Received: In tolerance, no adjustment required.

As Left: In tolerance.

Special Notes:

This document certifies that the equipment referenced above meets published specifications. The calibration procedure is in compliance with ISO 10012-1, and former MIL-STD-45662A and is traceable to NIST. *Measurement uncertainty (95% confidence level w\coverage factor of 2) for scale factors is +/- 0.2%.

ACCREDITED
Cert. No. 1862.01

PCB PIEZOTRONICS INC.

3425 Walden Avenue Depew, New York, USA 14043-2495

For any questions concerning this certificate, please call PCB at (716) 684-0001 and ask for an application engineer.

Interim Certification Document

rt Description: Gold **Certification Date:** 07/21/06 **Serial#:** G08-02-02-03122

ngle Point 2 Sigma: G08-02 +/-.051mm (+/-.0020") **Certificate#:** G0312238919

near Displacement 2 Sigma: G08-02 +/-.072mm (+/-.0028") **Ambient Temperature: 22°C +/- 3°C**

easurement Standards Traceability

Ball Bar Kit	Asset Number: 1041	Calibration Date: 06/07/06	*SI Traceability: NPL-LL0101/0501
10mm Step Gauge, Mitutoyo Code No.: 515-744 Measuring range: 1.5m	Asset Number: 682	Calibration Date: 10/03/05	*SI Traceability: NIST-821/270467-04

*The artifact above has been calibrated with a device traceable to the International System of Units (SI) through a National Metrological Institute (NMI) or through an ISO17025 Accredited Laboratory. Expanded measurement uncertainty is 3.9 + 5.9X micrometers, where X=measured value in meters. Uncertainty is expressed at approximately the 95% Level of Confidence using k=2.00.

ertification Results

A basic four quadrant certification included with all FARO Arms and comprised of: 2 vertical level single point repeatability test in 4 quadrants with 5 repeats from 4 directions	**PASSED**
Step Gauge Test in 4 quadrants, 3 orientations per quadrant	**PASSED**
3 Length, 3 position free ball bar test in 4 quadrants	**PASSED**

Calibration and certification conforms to procedures developed in accordance with ASME B89.4.22-200X.

Instrument condition as received
Not within specifications

Instrument condition outgoing
Within specifications

Technician: David Richards Date: 7/21/06

FARO Technologies, Inc.
Michigan Regional Office
PH1:248-669-8620

FAX:248-669-8656

46998 Magellan Drive
Wixom, MI 48393
USA

FARO®

LABORATORY ACCREDITATION BUREAU
ISO/IEC 17025 Accredited

Revised: June 7, 2006

MICHIGAN OPERATIONS
DATE: 2/7/04
SUPERCEDES: MGATPTMC.5

DOC. NO.: MGATPTMC
REVISION NO.: 6
PAGE 3 OF 3

Tape Measure Calibration Certificate

Reference Steel Rule
Brand: GEI SYRACUSE
S/N: M6A00067
Calibration Date: 8.30.05

Subject Tape Measure
Brand: STANLEY
S/N: 017
Calibration Date: 12.20.2005

Reference (in) (mm)	Subject Tape Measure	Difference	Reference (in) (mm)	Subject Tape Measure	Difference
0 (0)	0	0	18 (450)	18	0
1 (25)	1	0	19 (475)	19	0
2 (50)	2	0	20 (500)	20	0
3 (75)	3	0	21 (525)	21	0
4 (100)	4	0	22 (550)	22	0
5 (125)	5	0	23 (575)	23	0
6 (150)	6	0	24 (600)	24	0
7 (175)	7	0	25 (625)	25	0
8 (200)	8	0	26 (650)	26	0
9 (225)	9	0	27 (675)	27	0
10 (250)	10	0	28 (700)	28	0
11 (275)	11	0	29 (725)	29	0
12 (300)	12	0	30 (750)	30	0
13 (325)	13	0	31 (775)	31	0
14 (350)	14	0	32 (800)	32	0
15 (375)	15	0	33 (825)	33	0
16 (400)	16	0	34 (850)	34	0
17 (425)	17	0	35 (875)	35	0

If all differences are ± 1/32 of an inch (1 mm), then the tape measure is acceptable.
Pass X Fail ____ Maximum Difference = 0

Date: 12.20.2005 Performed By: [signature]

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ± 0.2%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

JH 1/5/06

MetroCal inc.
#0513.01
4700 Barden Court S.E. • Kentwood, MI 49512 • Telephone: 616.698.3124 • Fax: 616.698.2364

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

Order Number: **50054**
Report Number: **060707606**
Page: **1 of 1**

Gauge Number: **MGA00081**
Gauge Desc: **0 to 20lb x .01lb Digital Scale**
Manufacturer: **Detecto**
Model Number: **AP-20**
Serial Number: **E33603-0213**

Customer PO: **07-05-1590**
Last Calibration: **4/8/05**
Calibration Date: **7/7/06**
Next Calibration: **7/7/07**

As Found Condition: **In Tolerance**

As Left Condition: **In Tolerance**

MetroCal Inc. maintains reference standards of measurement which traceable to the National Institute of Standards and Technology, or other authorized National Standards. Calibration was performed in accordance with MetroCal's Procedure No. CP-042 and the relevant sections of the manufacturers manual. This Calibration complies with the ISO/IEC 17025 and ANSI/NCSL Z540-1 Standards. Results shall not be reproduced except in full without the written approval of MetroCal Inc. Results relate only to the item(s) calibrated. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired. Statements of compliance made using simple acceptance rule.

Standard Used	Cal. Date	Due Date	Traceable No.	Calibration Procedure Uncertainty Expressed at 95% confidence , (K=2)
Dead Weight Set ID#2463	8/20/04	8/20/06	MI-04-04-7444	+/-0.001% of Load

Results:

Tolerance used: ± 1 Division

Units: lbs **TI Division/Increment:** 0.01

	As Found				As Left		
Weight Test	**Nominal**	**Indication**	**Deviation**		**Nominal**	**Indication**	**Deviation**
0-25% fs	5.00	5.00	0.00		5.00	5.00	0.00
26-50% fs	10.00	10.00	0.00		10.00	10.00	0.00
51-75% fs	15.00	15.00	0.00		15.00	15.00	0.00
76-100% fs	20.00	20.00	0.00		20.00	20.00	0.00
Beam 2							
0-25% fs							
26-50% fs							
51-75% fs							
76-100% fs							
Beam 3							
0-25% fs							
26-50% fs							
51-75% fs							
76-100% fs							
Shift Test:	Pass			**Shift Test:**	Pass		
Half Load Test:	Pass			**Half Load Test:**	Pass		

Comments: Environmental conditions during calibration: 68° F, 40% RH.

Karen Shipley issued: 7/7/06
Karen Shipley/bjk
Calibration Technician

☐ Checked box indicate this calibration was performed at the customers facility.

7/12/06

MetroCal inc.
#0513.01
4700 Barden Court S.E. • Kentwood, MI 49512 • Telephone: 616.698.3124 • Fax: 616.698.2364

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

Order Number: **48016**
Report Number: **060209704**
Page: **1 of 1**

Gauge Number: **MGA00060**
Gauge Desc: **Digital Protractor**
Manufacturer: **Macklanburg-Duncan**
Model Number: **Pro 360**
Serial Number: **N/A**

Customer PO: **07-05-1517**
Last Calibration: **1/19/05**
Calibration Date: **2/9/06**
Next Calibration: **2/9/07**

As Found Condition: **In Tolerance**

As Left Condition: **In Tolerance**

MetroCal Inc. maintains reference standards of measurement which are traceable to the National Institute of Standards and Technology, or other authorized National Standards. Calibration was performed in accordance with MetroCal Proc. No. CP045 and complies with the ANSI/NCSL Z540-1 and ISO/IEC 17025 Standards. Results shall not be reproduced except in full without the written approval of MetroCal, Inc. Results relate only to the item(s) calibrated. Any number of factors may cause the calibration Item to drift out of calibration before the recommended interval has expired. Statements of compliance made using simple acceptance rule.

Standard Used	Cal Date	Due Date	Traceable No.	Calibration Procedure Uncertainty Expressed at 95% confidence (K=2)
Gage Blk Set ID# 105	6/6/05	6/6/06	821/270003-04	(0.6R + 2L)microinches
DoAll Sine Bar ID#1879	12/6/05	12/6/06	821/270003-04 & 3600042619	

Results:

As Found Readings

Units	Nominal	Actual	Deviation
Decimal Deg.	5.00	5.0	0.00
	10.00	10.0	0.00
	20.00	19.9	-0.10
Tolerance	30.00	29.9	-0.10
± 0.1°	40.00	40.0	0.00

Reference Level Check: Within +/- .1 degrees

As Left Readings

Nominal	Actual	Deviation
5.00	5.0	0.00
10.00	10.0	0.00
20.00	19.9	-0.10
30.00	29.9	-0.10
40.00	40.0	0.00

Reference Level Check: Within +/- .1 degrees

Comments: Environmental conditions during calibraiton: 68 deg. F., 41 % RH.
No adjustments required.

Bill Rinzema issued: 2-9-06
Bill Rinzema/bjk
Calibration Technician

☐ Checked box indicate this calibration was performed at the customers facility.

JH 2/21/06

Certificate of Instrument Calibration and Testing

Customer Instrument

Dickson Model Number: FH125

Serial Number: 06018122

Calibration Technician *Dan Gawel*

Calibration Date: 01/20/2006

Calibration Standards

ACCREDITED Cert # 1621.01

General Eastern: Model # M3
Ser. # 0850800 / 2360502
Accuracy: ± .4% FS RH and ± .4 °F
Certified Feb, 2005

Azonix Model # A1011 Ser. # T2513-9027
RTD Platinum Probe Ser. # 496013 Accuracy: ± .2 °F
Certified March, 2005

The calibration standards are traceable through the National Institute of Standards and Technology.

Calibration Procedure P1130

The customer instrument was compared to the calibration standard. Drifts and faults were determined, and any necessary mechanical or electronic adjustments were taken. The Dickson calibration system conforms to the requirements of MIL-STD-45662A, ANSI/NCSL Z540, and ISO 17025 as appropriate. Recalibration of the customer instrument is recommended within 6 months after the unit is placed into service. Any number of factors may cause the calibration item to drift before the recomended interval has expired.
This certificate only relates to this specific unit.

Environmental Conditions

72 °F 41 %RH

Calibration Standard Reading	Customer Instrument Reading	Unit Specification
Humidity (%RH)	Humidity (%RH)	Humidity
21.1	22.4	± 2% RH
30.7	30.6	± 2% RH
80.3	81.3	± 3% RH
Temperature °F	Temperature °F	Temperature
12.4	12.5	± 1.8 ° F (± 1.0 ° C)
72.7	73.1	
111.1	110.7	

The FH125 has an ISO/IEC 17025 required NIST Technical note 1297, Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results, estimated measurement uncertainty at 95% CL (K=2) of ±0 7°F and ±1 1 %RH

FOR YOUR NEXT CALIBRATION NO PHONE CALLS REQUIRE

Fill out and send this form along with your instrument to Dickson. Label the outside of the box with "CCM" - that is your RA#.

That's all there is to it!

1. Purchase Order #: _____
Name: _____
Phone: _____
Model #: FH125
Serial #: 06018122

A 3-pt Deluxe NIST will be performed unless otherwise requested

2. ☐ 1-Point Deluxe NIST Calibration $149.00
☐ 3-Point Deluxe NIST Calibration $199.00
☐ 3-Point Ultima Deluxe A2LA NIST $299.00 (with incoming reading)
☐ N995 - User selectable NIST Temperature points $50.00 each
(to be selected in addition to one of the above calibration options)
☐ N997- Next Day Service $50.00 (Not available for ULTIMA service)

3. Please return via:
☐ Ground Freight*
☐ 2nd Day Air*
☐ Next Day Air*
***Charges added at factory**

Returned UPS 2nd Day unless otherwise requested

4. Ship To: _____

Bill To: _____

Charts/Pens
(Order now and receive them with your calibrated unit)

	Order No.	Qty.	Price Ea
☐ 6 Red Pens	P222	____	$36 pk
☐ 3 Red/3 Blue Pens	P246	____	$36 pk
☐ Charts* (60 per box)	C___	____	$24 box

*Please fill in the chart order number For a listing of available charts got to www dicksonweb com, click on "product search" and select the product type, "Parts Accessories"

Prices are subject to change

Let Dickson remind you the next time your unit is due for calibration. Register for our FREE Calibration Club now at www.dicksonweb.com

Dickson Calibration Services
930 South Westwood Avenue Addison, Illinois 60101 630-543-3747 Fax 630-543-0498

Form: F410/12-3 Revision Date 03-11-03
Revision Level: E
STANDARD FORM

20950 Boening St.
Southfield Mi.48075
Phone (248) 358-0590 Fax (248) 355-2529

Sterling Scale Company Inc.
Scale Certificate of Calibration

Customer: MGA RESEARCH

Location of Calibration: 446 EXECUTIVE DRIVE
TROY, MI 48083

Certification Number: 9436

Date of Calibration: 7-20-06

**Next Calibration Due: 7-07

Environmental Condition: (Good) Fair Poor

Make:	Model:	Serial/ID#:	Capacity:
SW SCALES	SW DELUXE	26032389	8800 x 1lb

This certifies that the above scale has been calibrated using the relevant EPO, original equipment manufacturer calibration procedures along with Handbook 44 tolerances using weights traceable to the National Institute of Standards and Technology as well as the International Systems of Units (SI).

Sterling Scale Weight/Weight kit serial #: 1216, 1218, 1220, 1221, 50967, 10002

Calibrated to class: III

Date Weight/Weight kit calibrated: 4/06 9/05

Date Weight/Weight kit due: 4/08 9/07

Expanded Uncertainty (k=2) confidence level of 95% is reported with the before and after readings on next page.

Temperature 78 Humidity 66

Pg 1 of 3

These items relate only to these results
Tolerances followed are maintenance/acceptance per HB-44
This report shall not be reproduced, except in full, without written approval of the laboratory.
**** Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.**
The reported uncertainty is valid only for the environment in which it is determined.

7/20/06

ACCREDITED
1448.01

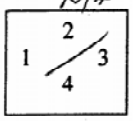
Form: F410/12-3 Revision Date 03-11-03
Revision Level: E
STANDARD FORM

20950 Boening St.
Southfield Mi.48075
Phone (248) 358-0590 Fax (248) 358-0590

Sterling Scale Company Inc.
Scale Certificate of Calibration

	Applied Test Weight	Before Adjustment	Tolerance +/-	in tolerance Y / N	After Adjustment	in tolerance Y / N	expanded uncertainty
RP1)	50 LB	50 LB	1 LB	Y	50 LB	Y	.003 LB
	1000 LB	1000 LB	2 LB	Y	1000 LB	Y	.06 LB
	2200 LB	2200 LB	2 LB	Y	2200 LB	Y	.13 LB
RP2)	50 LB	50 LB	1 LB	Y	50 LB	Y	.003 LB
	1000 LB	1000 LB	2 LB	Y	1000 LB	Y	.06 LB
	2200 LB	2200 LB	2 LB	Y	2200 LB	Y	.13 LB

Shift test. N/A



4 PAD System

	1	2	3	4
Before Adj.				
After Adj.				

Scale condition as found: GOOD

Tests performed: ☒ Repeatability ☒ Linearity ☐ Sensitivity ☒ Discrimination

☒ **Scale Certified** ☐ **Scale Rejected**

If scale is rejected, why?

GARY
Sterling Scale Service Rep. **Date:** 7-20-06 pg 2 of 3

These items relate only to these results.
This report shall not be reproduced, except in full, without written approval of the laboratory.
Tolerances followed are maintenance/acceptance per HB-44
**** Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.**

ACCREDITED
1448.01

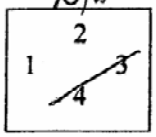
Form: F410/12-3 Revision Date 03-11-03
Revision Level: E
STANDARD FORM

20950 Boening St.
Southfield Mi.48075
Phone (248) 358-0590 Fax (248) 358-0590

Sterling Scale Company Inc.
Scale Certificate of Calibration

	Applied Test Weight	Before Adjustment	Tolerance +/-	in tolerance Y / N	After Adjustment	in tolerance Y / N	expanded uncertainty
LR3)	50 lb	50 lb	1 lb	Y	50 lb	Y	.003 lb
	1000 lb	1000 lb	2 lb	Y	1000 lb	Y	.06 lb
	2300 lb	2200 lb	2 lb	Y	2200 lb	Y	.13 lb
LF4)	50 lb	50 lb	1 lb	Y	50 lb	Y	.003 lb
	1000 lb	1000 lb	2 lb	Y	1000 lb	Y	.06 lb
	2200 lb	2200 lb	2 lb	Y	2200 lb	Y	.13 lb

Shift test. N/A



4 PAD System

	1	2	3	4
Before Adj.				
After Adj.				

Scale condition as found: GOOD

Tests performed: ☒ Repeatability ☒ Linearity ☐ Sensitivity ☒ Discrimination

☒ **Scale Certified** ☐ **Scale Rejected**

If scale is rejected, why? _____

GARY
Sterling Scale Service Rep. **Date:** 7-26-06 pg 3 of 3

These items relate only to these results.
This report shall not be reproduced, except in full, without written approval of the laboratory.
Tolerances followed are maintenance/acceptance per HB-44
**** Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.**

ACCREDITED
1448.01

MetroCal inc.
ACCREDITED #0513.01
4700 Barden Court S.E. • Kentwood, MI 49512 • Telephone: 616.698.3124 • Fax: 616.698.2364

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

Order Number: **51186**
Report Number: **060926810**
Page: **1 of 1**

Gauge Number: **MGA00048**
Gauge Desc: **Digital Protractor**
Manufacturer: **N/A**
Model Number: **Pro 360**
Serial Number: **N/A**

Customer PO: **07-06-0081**
Last Calibration: **8/29/05**
Calibration Date: **9/26/06**
Next Calibration: **9/26/07**

As Found Condition: **In Tolerance**

As Left Condition: **In Tolerance**

MetroCal Inc. maintains reference standards of measurement which are traceable to the National Institute of Standards and Technology, or other authorized National Standards. Calibration was performed in accordance with MetroCal Proc. No. CP045 and complies with the ANSI/NCSL Z540-1 and ISO/IEC 17025 Standards. Results shall not be reproduced except in full without the written approval of MetroCal, Inc. Results relate only to the item(s) calibrated. Any number of factors may cause the calibration Item to drift out of calibration before the recommended interval has expired. Statements of compliance made using simple acceptance rule.

Standard Used	Cal Date	Due Date	Traceable No.	Calibration Procedure Uncertainty Expressed at 95% confidence (K=2)
Gage Blk Set ID# 105	6/14/06	6/14/07	821/271641-05	0.0015 Decimal Deg.
DoAll Sine Bar ID#1879	12/6/05	12/6/06	821/270003-04 & 3600042619	

Results:

As Found Readings

Units	Nominal	Actual	Deviation
Decimal Deg.	5.0	5.0	0.0
	10.0	10.0	0.0
	20.0	20.0	0.0
Tolerance	30.0	30.1	0.1
± 0.1°	40.0	40.0	0.0

Reference Level Check: Within +/- 0.1 degrees

As Left Readings

Nominal	Actual	Deviation
5.0	5.0	0.0
10.0	10.0	0.0
20.0	20.0	0.0
30.0	30.1	0.1
40.0	40.0	0.0

Reference Level Check: Within +/- 0.1 degrees

Comments: Environmental conditions during calibraiton: 68 deg. F., 37 % RH.

Shannon Kubicek issued: 9.26.06
Shannon Kubicek
Calibration Technician

☐ Checked box indicate this calibration was performed at the customers facility.

9/27/06

MICHIGAN OPERATIONS
DATE: 2/7/04
SUPERCEDES: MGATPTMC.5

DOC. NO.: MGATPTMC
REVISION NO.: 6
PAGE 3 OF 3

Tape Measure Calibration Certificate

Reference Steel Rule
Brand: GEI SYRACUSE
S/N: MGA 00067
Calibration Date: 8·30·05

Subject Tape Measure
Brand: STANLEY
S/N: TPM 700
Calibration Date: 8·29·06

Reference in (mm)	Subject Tape Measure	Difference	Reference in (mm)	Subject Tape Measure	Difference
0 (0)	0	0	18 (450)	450	0
1 (25)	25	0	19 (475)	475	0
2 (50)	50	0	20 (500)	500	0
3 (75)	75	0	21 (525)	525	0
4 (100)	100	0	22 (550)	550	0
5 (125)	125	0	23 (575)	575	0
6 (150)	150	0	24 (600)	600	0
7 (175)	175	0	25 (625)	625	0
8 (200)	200	0	26 (650)	650	0
9 (225)	225	0	27 (675)	675	0
10 (250)	250	0	28 (700)	700	0
11 (275)	275	0	29 (725)	725	0
12 (300)	300	0	30 (750)	750	0
13 (325)	325	0	31 (775)	775	0
14 (350)	350	0	32 (800)	800	0
15 (375)	375	0	33 (825)	825	0
16 (400)	400	0	34 (850)	850	0
17 (425)	425	0	35 (875)	875	0

If all differences are ± 1/32 of an inch (1 mm), then the tape measure is acceptable.
Pass X Fail ____ Maximum Difference = 0

Date: 8·29·06 Performed By: [signature]

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ± 0.2%. All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor k=2.

[signature] 8/30/06

MetroCal inc.
#0513.01
4700 Barden Court S.E. • Kentwood, MI 49512 • Telephone: 616.698.3124 • Fax: 616.698.2364

Certificate of Calibration

MGA Research
446 Executive Dr.
Troy, MI 48083

Order Number: **53940**
Report Number: **070403601**
Page: **1 of 1**

Gauge Number: **MGA00115**
Gauge Desc: **Hygro-Thermometer Clock**
Manufacturer: **Extech**
Model Number: **445702**
Serial Number: **N/A**

Customer PO: **A070131**
Last Calibration: **7/27/06**
Calibration Date: **4/3/07**
Next Calibration: **4/3/08**

As Found Condition: **In Tolerance**

As Left Condition: **In Tolerance**

MetroCal Inc maintains reference standards of measurement which are traceable to the National Institute of Standards and Technology or natural physical constants (Lithium Chloride and Sodium Chloride for humidity). Calibration was performed in accordance with MetroCal procedure # CP048 and complies with the ISO/IEC 17025 and ANSI/NCSL Z540-1 Standards. Results shall not be reproduced except in full without the written approval of MetroCal, Inc. Results relate only to the item(s) calibrated. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired. Statements of compliance made using simple acceptance rule.

Standard Used	Cal. Date	Due Date	Traceable No.	Calibration Procedure Uncertainty expressed at 95% confidence, (K=2)
Vaisala Temperature and Humidity Meter ID#13337	12/12/06	12/12/07	061212850	Temp. ± 0.75 °F. Humidity ± 2.3% R.H.
Calibrator ID #30966	2/14/07	2/14/08	070214601	± 0.75°F
Standard RTD Probe #4525	6/29/06	6/29/07	NK134160	

Results:

Temperature

Tolerance	As Found Readings Standard	Actual	Error	As Left Readings Standard	Actual	Error
Temp: ± 1.8°F	38.9	39.3	0.4	38.9	39.3	0.4
Hum: ± 6% RH from 25 to 85% RH	70.3	69.9	-0.4	70.3	69.9	-0.4

Percent of Relative Humidity

Temp. Units	As Found Readings Standard	Actual	Error	As Left Readings Standard	Actual	Error
°F	32.6	37	4.4	32.6	37	4.4
	67.5	69	1.5	67.5	69	1.5

Comments: Environmental Conditions During Test: 70° F, 30% RH

Karen Shipley issued: 4/3/07
Karen Shipley/bjk
Calibration Technician

☐ Checked box indicate this calibration was performed at the customers facility.

4/17/07