FINAL REPORT NUMBER 201UI-MGA-11-05

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

GENERAL MOTORS LLC
2011 Chevrolet Cruze
NHTSA No. CB0103

MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083

Test Dates: April 21-26, 2011
Report Date: April 28, 2011

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 New Jersey Avenue, SE
West Building
WASHINGTON, D.C. 20590

Prepared By: _____
Nathaniel Newth, Project Engineer

_____
Helen A. Kaleto, Project Manager

Approved By: _____

Approval Date: _____

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Accepted By: _____

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16. Abstract A compliance test series was conducted on the subject 2011 Chevrolet Cruze, NHTSA No. CB0103, 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 April 21-26 2011. Test failures identified were as follows: None The data recorded indicates that the 2011 Chevrolet Cruze tested appears to comply with the upper interior requirements of FMVSS 201.			
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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 2011 Chevrolet Cruze, meets the performance requirements of FMVSS 201, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted on April 21-26, 2011 on a 2011 Chevrolet Cruze, manufactured by General Motors LLC.

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 August 21, 2009.

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 November 9, 2009.

2.0 COMPLIANCE TEST DATA SUMMARY

The 2011 Chevrolet Cruze was equipped with A, B, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, and a grab handle located on the side rail above each door (front and rear).

Upon completion of targeting the test vehicle, twelve (12) targets were chosen to be impacted based upon engineering judgment and certification test data provided by the manufacturer. The twelve (12) targets chosen were:

AP1	BP2	UR1@SR1	UR4@SR3-1
AP2	BP3	UR2@SR2A	UR5@SR3-2
AP3	FH1	UR3@BP	UR6@RP

The 2011 Chevrolet Cruze tested appears 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.

TABLE 2-1

SUMMARY TABLE OF TEST RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Chevrolet Cruze

VEH. NHTSA NO.: CB0103 VIN: 1G1PD5SH8B7171987 COLOR: Silver Ice Metallic

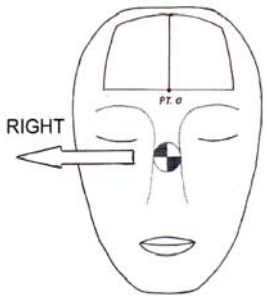
VEH. BUILD DATE: January, 2011 TEST DATES: April 21-26, 2011

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Nathaniel Newth, Kevin McKenna, Sean Moran, Ryan Jones

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	110	34	19.0	605	582	12	1 Right
AP2	Left	202	49	18.9	538	493	22	2 Left
AP3	Right	158	48	18.8	499	441	9	2 Right
BP2	Left	270	0	23.9	535	488	13	6 Left
BP3	Right	90	-1	24.0	749	772	20	7 Right
FH1	Left	180	50	23.9	605	582	26	5 Left
UR1@SR1	Left	270	50	23.8	756	782	35	9 Right
UR2@SR2A	Right	90	50	23.9	718	731	28	1 Left
UR3@BP	Left	270	50	23.6	772	803	30	6 Left
UR4@SR3-1	Right	90	50	24.0	577	544	22	9 Left
UR5@SR3-2	Left	270	50	23.6	690	694	38	5 Left
UR6@RP	Right	90	45	24.0	617	597	31	1 Left

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.

AP2 Left: Dislodged trim.

BP2 Left: Dislodged trim; anchorage adjuster moved.

BP3 Right: Non functional anchorage adjuster.

FH1 Left: Broken windshield.

UR2 Right: Grab handle compression; dislodged headliner.

UR3 Left: Headliner deformation.

UR4 Right: Headliner deformation; grab handle compression.

UR5 Left: Grab handle compression; headliner deformation.

REMARKS:

The targets listed were impacted in the following order:

Left: UR1@SR1, BP2, UR3@BP, UR5@SR3-2, FH1, AP2

Right: UR6@RP, UR4@SR3-1, UR2@SR2A, BP3, AP1, 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: Nathaniel Newth DATE: April 26, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Chevrolet Cruze

VEH. NHTSA NO.: CB0103 VIN: 1G1PD5SH8B7171987 COLOR: Silver Ice Metallic

VEH. BUILD DATE: January, 2011 TEST DATES: April 21-26, 2011

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Nathaniel Newth, Kevin McKenna, Sean Moran, Ryan Jones

INTERIOR TRIM INFORMATION: A, B, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, and a grab handle located on the side rail above each door (front and rear).

SUNROOF INFORMATION:

Installed:	_____Yes	_X_ No
Operation:	_____Electric	____ Manual

SIDE RAIL CURTAIN AIRBAG INFORMATION:

Installed:	_X_Yes	___ No

ROLL-BAR INFORMATION:

Installed:	_____Yes	_X_ No
Padded:	_____Yes	_X_ No
Braces:	_____Yes	_X_ No

GENERAL INFORMATION:

Date Received: February 17, 2011; Odometer Reading 7 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: General Motors, LLC.

Date of Manufacture: January 2011; VIN: 1G1PD5SH8B7171987

GVWR: 1824 kg; GAWR FRONT: 946 kg;

GAWR REAR: 878 kg;

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 240 kPa REAR: 240 kPa

Recommended Tire Size: P215/60R16

Recommended Cold Tire Pressure:

FRONT: 240 kPa REAR: 240 kPa

Size of Tire on Test Vehicle: P215/60/R16

Type of Spare Tire: N/A; Space Saver:__; 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) = 412 kg

No. of Occupants x 68 kg = 340 kg

Rated Cargo/Luggage Weight (RCLW) = 72 kg (difference)

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

Right Front =	399.0 kg	Right Rear =	280.5 kg
Left Front =	442.5 kg	Left Rear =	267.0 kg
TOTAL FRONT =	841.5 kg	TOTAL REAR =	547.5 kg
% Total Weight =	60.6 %	% Total Weight =	39.4 %

TOTAL DELIVERED WEIGHT = 1389.0 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1389.0 kg

Max. Test Cargo/Luggage Weight = 72.0 kg

Target Test Weight = 1461.0 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	394.0 kg	Right Rear =	322.0 kg
Left Front =	434.0 kg	Left Rear =	310.5 kg
TOTAL FRONT =	828.0 kg	TOTAL REAR =	632.5 kg
% Total Weight =	56.7 %	% Total Weight =	43.3 %

TOTAL TEST WEIGHT = 1460.5 kg

Weight of ballast secured in vehicle's cargo area = 71.5 kg

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 713 mm; Left Front 707 mm;
Right Rear 714 mm; Left Rear 709 mm;
Pitch Angle at Right Door Sill = 0.4 Rear is higher
Pitch Angle at Left Door Sill = 0.1 Rear is higher
Roll Angle at Front Bumper = 0.0
Roll Angle at Rear Bumper = 0.3 Right is higher

FULLY LOADED: Right Front 716 mm; Left Front 711 mm;
Right Rear 694 mm; Left Rear 690 mm;
Pitch Angle at Right Door Sill = 0.1 Front is higher
Pitch Angle at Left Door Sill = 0.4 Front is higher
Roll Angle at Front Bumper = 0.1 Right is higher
Roll Angle at Rear Bumper = 0.1 Right is higher

AS TARGETED: Right Front 880 mm; Left Front 878 mm;
Right Rear 885 mm; Left Rear 881 mm;
Pitch Angle at Right Door Sill = 0.3 Rear is higher
Pitch Angle at Left Door Sill = 0.1 Rear is higher
Roll Angle at Front Bumper = 0.0
Roll Angle at Rear Bumper = 0.1 Right is higher

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill =	0.4 Rear is higher
Pitch Angle at Left Door Sill =	0.1 Rear is higher
Roll Angle at Front Bumper =	0.1 Right is higher
Roll Angle at Rear Bumper =	0.1 Right is higher

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill =	0.3 Rear is higher
Pitch Angle at Left Door Sill =	0.3 Front is higher
Roll Angle at Front Bumper =	0.0
Roll Angle at Rear Bumper =	0.1 Right is higher

VEHICLE WHEELBASE = 2685 mm

REMARKS: The seat travel distance was measured to be 270 mm for the driver front seat and 245 mm for the passenger front seat.

RECORDED BY: Nathaniel Newth DATE: April 11, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-3

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Chevrolet Cruze

VEH. NHTSA NO.: CB0103 VIN: 1G1PD5SH8B7171987 COLOR: Silver Ice Metallic

VEH. BUILD DATE: January, 2011 TEST DATES: April 21-26, 2011

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Nathaniel Newth, Kevin McKenna, Sean Moran, Ryan Jones

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 201.8º	L 251.2º
	R 105º-165º	R 110.0º	R 158.1º
B-PILLAR	L 195º-345º	L 198.4º	L 277.9º
	R 15º-165º	R 81.7º	R 161.6º

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Nathaniel Newth DATE: April 11, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Chevrolet Cruze

VEH. NHTSA NO.: CB0103 VIN: 1G1PD5SH8B7171987 COLOR: Silver Ice Metallic

VEH. BUILD DATE: January, 2011 TEST DATES: April 21-26, 2011

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Nathaniel Newth, Kevin McKenna, Sean Moran, Ryan Jones

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 46º
		R 0º-50º	R 0º	R 46º
	SR2A	L 0º-50º	L 0º	L 46º
		R 0º-50º	R 0º	R 46º
	SR2B	L 0º-50º	L 0º	L 44º
		R 0º-50º	R 0º	R 44º
	SR3-1	L 0º-50º	L 0º	L 47º
		R 0º-50º	R 0º	R 47º
	SR3-2	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

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
A-PILLAR	AP1	L -5º-50º	L -5º	L 34º
		R -5º-50º	R -5º	R 34º
	AP2	L -5º-50º	L -5º	L 49º
		R -5º-50º	R -5º	R 50º
	AP3	L -5º-50º	L -5º	L 48º
		R -5º-50º	R -5º	R 48º
B-PILLAR	BP1	L -10º-50º	L -10º	L 12º
		R -10º-50º	R -10º	R 12º
	BP2*	L 0º-50º	L 0º	L 0º
		R 0º-50º	R 0º	R 0º
	BP3	L -10º-50º	L -10º	L -2º
		R -10º-50º	R -10º	R -1º
	BP4	L -10º-50º	L -10º	L -4º
		R -10º-50º	R -10º	R -4º
REAR PILLAR	RP1	L -10º-50º	L -10º	L 17º
		R -10º-50º	R -10º	R 17º
	RP2	L -10º-50º	L -10º	L 6º
		R -10º-50º	R -10º	R 6º
UPPER ROOF 1		0º-50º	0º	50º
UPPER ROOF 2		0º-50º	0º	50º
UPPER ROOF 3		0º-50º	0º	50º
UPPER ROOF 4		0º-50º	0º	50º
UPPER ROOF 5		0º-50º	0º	50º
UPPER ROOF 6		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: Nathaniel Newth DATE: April 11, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Chevrolet Cruze

VEH. NHTSA NO.: CB0103 VIN: 1G1PD5SH8B7171987 COLOR: Silver Ice Metallic

VEH. BUILD DATE: January, 2011 TEST DATES: April 21-26, 2011

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Nathaniel Newth, Kevin McKenna, Sean Moran, Ryan Jones

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	270 mm	245 mm
Tº	Horizontal < {CG-F1 (Left Seat) to (Right A-Pillar)}	108.8º	--
A1º	360º - Tº	251.2º	--
Wº	Horizontal < {CG-2 (Left Seat) to (Left A-Pillar)}	201.8º	--
A2º	A2º = Wº	201.8º	--
Uº	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	277.9º	--
B1º	B1º = Uº	277.9º	--
Vº	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	198.4º	--
B2º	B2º = Vº	198.4º	--
Wº (right)	Horizontal < {CG-F2 (Right Seat) to (Right A-Pillar)}	--	158.1º
A1º (right)	A1º (right) = Wº (right)	--	158.1º
T º (right)	Horizontal < {CG-F1 (Right Seat) to (Left A-Pillar)}	--	250.0º
A2º (right)	360º-Tº (right)	--	110.0º
V º (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	161.6º
B1º (right)	B1º (right) = Vº (right)	--	161.6º
U º (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	81.7º
B2º (right)	B2º (right) = Uº (right)	--	81.7º
J	A-Pillar {(Plane 3) – (Plane 5)}	335.6 mm	333.5 mm
J/2	J ÷ 2	167.8 mm	166.8 mm
D1	Upper Roof {(Plane A) – (Plane B)}	1540.8 mm	
D1/2	D1 ÷ 2	770.4 mm	

Measurement	Description	Left Side	Right Side
D2	Upper Roof {(Plane C) – (Plane D)}	1116.3 mm	
D2/2	D2 ÷ 2	558.2 mm	
.35D1	.35 x D1	539.3 mm	
.35D2	.35 x D2	390.7 mm	
N	B-Pillar {(BPR) – (lowest point on daylight opening forward of B-Pillar)}	400.1 mm	398.6 mm
N/2	B-Pillar {(BP3) – (lowest point on daylight opening forward of B-Pillar)}	200.1 mm	199.3 mm
N/4	B-Pillar {(BP4) – (lowest point on daylight opening forward of B-Pillar)}	100.0 mm	99.6 mm
D	R-Pillar (Point 7 – Point M)	675.0 mm	675.0 mm
3D/7	3*D / 7	289.3 mm	289.3 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	3137.9	-350.0	458.0	3137.9	350.0	458.0
Rear	3928.0	-345.0	466.0	3928.0	345.0	466.0

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	3137.9	-350.0	458.0	3137.9	350.0	458.0
Rear	3928.0	-345.0	466.0	3928.0	345.0	466.0

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	X	y	z
CGF1	3027.9	-350.0	1118.0	3052.9	350.0	1118.0
CGF2	3297.9	-350.0	1118.0	3297.9	350.0	1118.0
CGR	4088.0	-345.0	1126.0	4088.0	345.0	1126.0

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Front driver door checker bolt hole (x, y, z) = 2327.11, -731.05, 588.97

Front driver door striker upper bolt hole (x, y, z) = 3248.37, -752.09, 644.61

Front passenger door striker lower bolt hole (x, y, z) = 3244.88, 753.93, 604.8

REMARKS:

RECORDED BY: Nathaniel Newth DATE: April 11, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Chevrolet Cruze

VEH. NHTSA NO.: CB0103 VIN: 1G1PD5SH8B7171987 COLOR: Silver Ice Metallic

VEH. BUILD DATE: January, 2011 TEST DATES: April 21-26, 2011

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Nathaniel Newth, Kevin McKenna, Sean Moran, Ryan Jones

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	2905.5	-516.2	1248.7	--	--	Yes	--	--
REL	2922.5	-525.8	1207.3	251	34	--	2	No
AP2	2819.3	-562.8	1161.0	202	49	No	--	Yes
AP3	2642.0	-591.7	1080.7	202	48	No	--	No
A-Pillar Right Side								
AP1	2905.0	516.5	1246.8	--	--	Yes	--	--
REL	2922.7	529.5	1204.7	110	34	--	2	Yes
AP2	2818.2	566.4	1159.8	158	50	No	--	No
AP3	2642.6	594.9	1080.7	158	48	No	--	Yes
B-Pillar Left Side								
BP1	3400.4	-449.3	1292.5	270	12	No	--	No
BP2	3353.8	-580.9	1044.6	270	0	No	--	Yes
BP3	3322.1	-574.2	1093.2	270	-2	No	--	No
BP4	3427.8	-618.8	994.4	199	-4	No	--	No
B-Pillar Right Side								
BP1	3402.8	448.4	1291.6	90	12	No	--	No
BP2	3354.1	582.2	1041.7	90	0	No	--	No
BP3	3325.3	574.9	1093.2	90	-1	No	--	Yes

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**					
BP4	3428.2	619.2	993.7	161	-4	No	--	No
Rear Pillar Left Side								
RP1	4180.2	-468.4	1254.1	280	17	No	--	No
RP2	4262.5	-568.7	1105.0	--	--	Yes	--	--
REL	4267.9	-552.6	1120.6	285	6	--	1	No
Rear Pillar Right Side								
RP1	4177.9	468.0	1254.0	80	17	No	--	No
RP2	4264.0	565.0	1104.9	--	--	Yes	--	--
REL	4268.2	550.7	1121.3	75	6	--	1	No
Front Header Left Side								
FH1	2834.7	-399.7	1260.0	180	50	No	--	Yes
FH2	2824.7	-251.6	1266.0	180	50	No	--	No
Front Header Right Side								
FH1	2835.6	402.8	1260.1	180	50	No	--	No
FH2	2823.3	252.8	1266.7	180	50	No	--	No
Side Rail Left Side								
SR1	3055.0	-482.8	1286.3	--	--	Yes	--	--
REL	3086.7	-472.9	1267.6	270	46	--	2	No
SR2A	3205.1	-477.1	1312.4	--	--	Yes	--	--
REL	3226.0	-461.6	1286.0	270	46	--	2	No
SR2B	3099.5	-468.0	1272.1	270	44	No	--	No
SR3-1	3719.5	-467.5	1276.1	270	47	No	--	No
SR3-2	3857.3	-475.4	1261.4	270	35	No	--	No
Side Rail Right Side								
SR1	3054.0	480.0	1287.2	--	--	Yes	--	--
REL	3087.3	475.7	1263.9	90	46	--	2	No
SR2A	3205.7	473.8	1313.6	--	--	Yes	--	--
REL	3227.1	464.1	1281.2	90	46	--	2	No
SR2B	3101.9	470.8	1268.3	90	44	No	--	No

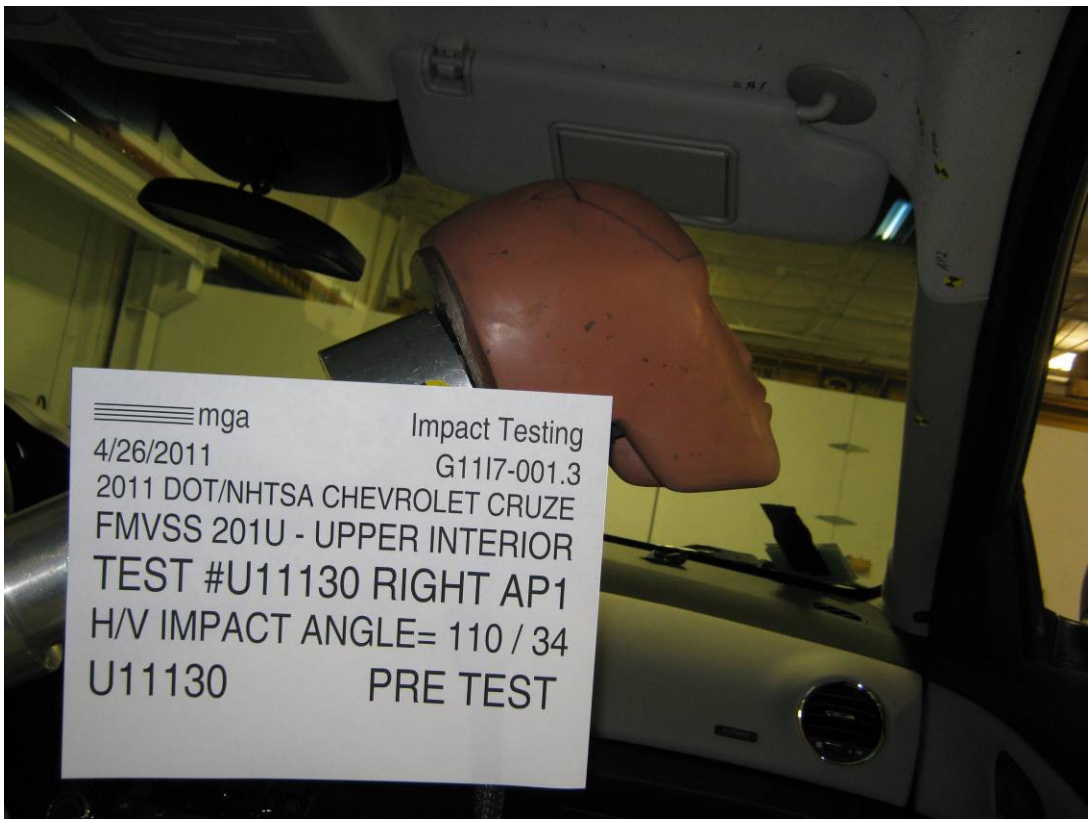
SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
SR3-1	3719.1	463.6	1277.3	90	47	No	--	No
SR3-2	3859.0	472.8	1261.7	90	35	No	--	No
Rear Header Left Side								
RH	4166.1	-345.7	1289.9	0	50	No	--	No
Rear Header Right Side								
RH	4166.2	344.9	1287.1	0	50	No	--	No
Upper Roof Left Side								
UR1@SR1	3137.0	-346.2	1332.2	270	50	No	--	Yes
UR3@BP	3398.9	-343.2	1324.1	270	50	No	--	Yes
UR5@SR3-2	3860.8	-332.6	1333.6	270	50	No	--	Yes
Upper Roof Right Side								
UR2@SR2A	3232.8	320.9	1345.1	90	50	No	--	Yes
UR4@SR3-1	3720.8	342.8	1331.7	90	50	No	--	Yes
UR6@RP	4047.6	368.9	1316.5	90	45	No	--	Yes

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

RECORDED BY: Nathaniel Newth DATE: April 11, 2011

APPROVED BY: Helen A. Kaleto

3.0 TEST DATA (Including Acceleration and Velocity Plots)




CB0103
U11130
RIGHT AP1
mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11130 RIGHT AP1
H/V IMPACT ANGLE= 110 / 34
U11130
POST TEST


CB0103
U11130
RIGHT AP1
H/V 110/34
mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11130 RIGHT AP1
H/V IMPACT ANGLE= 110 / 34
U11130
POST TEST


AP1
AP1


mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11130 RIGHT AP1
H/V IMPACT ANGLE= 110 / 34
U11130
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Test Number:#U11130

Target (Vehicle Side): AP1Right

Temperature:22.0C

MGA Test Reference No.:U11130

Humidity:56.3%

Approach Horizontal Angles:110º

Time of Test:2:05:16 PM

Approach Vertical Angles:34º

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
605	582	3.2	19.0	12	1 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J32177	-113.7	1.07	1.07
Y	6	J14103	93.9	0.85	1.30
Z	7	J35800	97.8	0.94	0.94

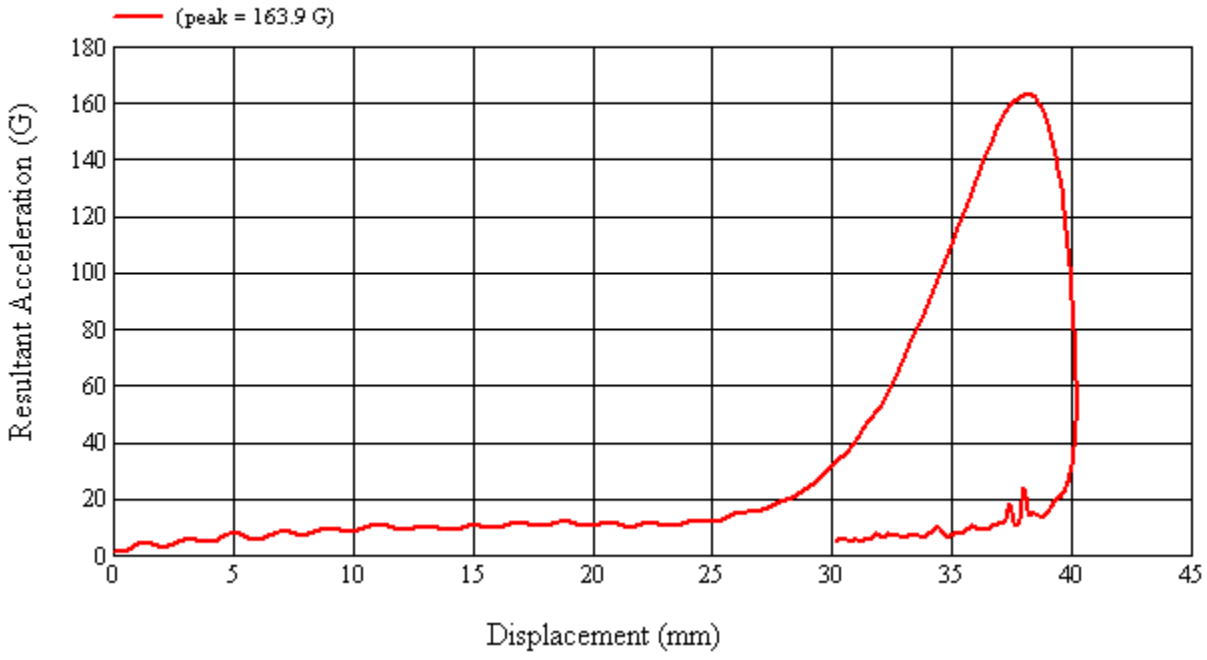
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

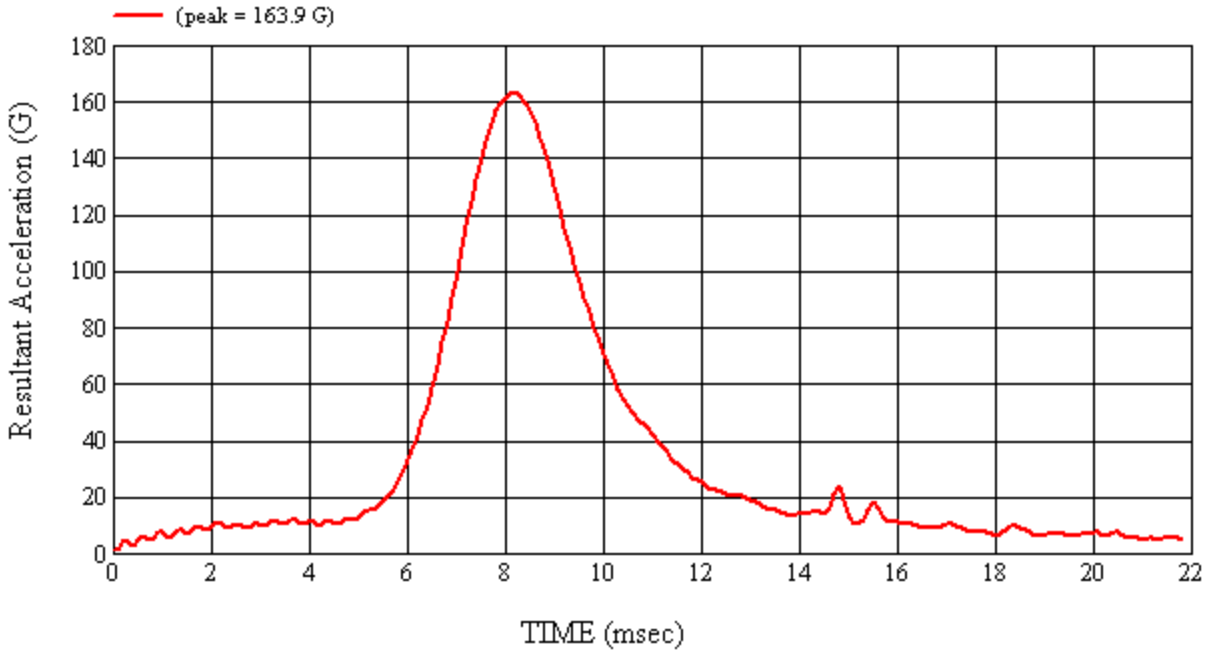
No visible damage.

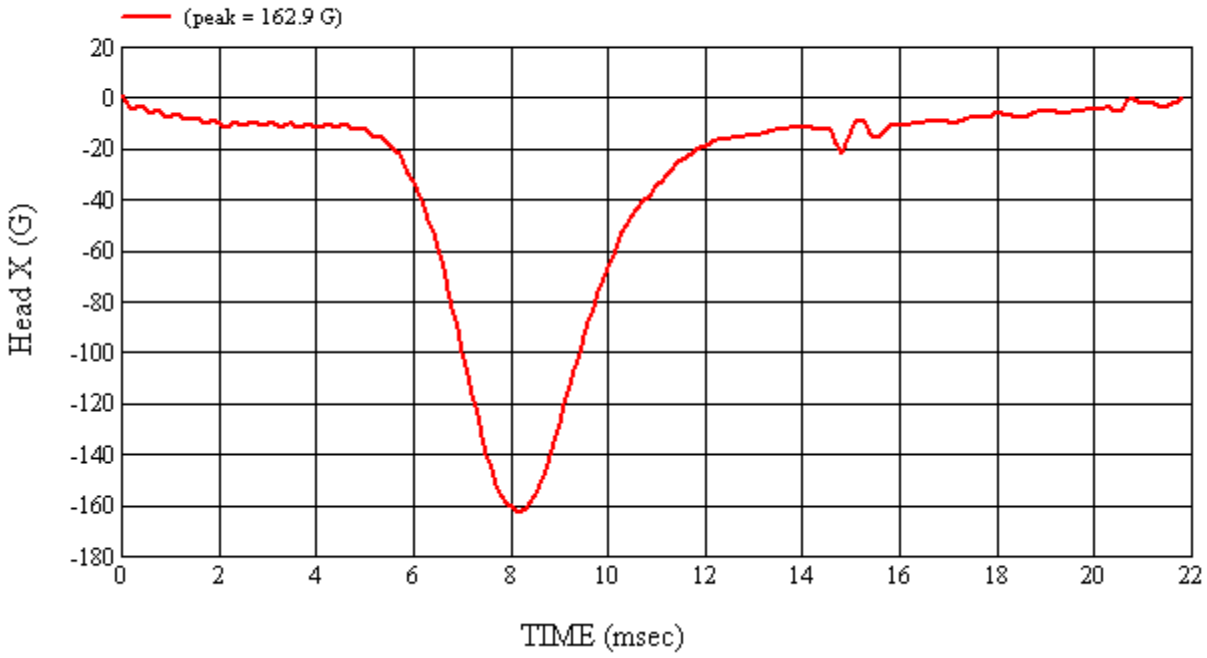
Recorded By: _____ Approved By*: _____ Date: 4/26/2011

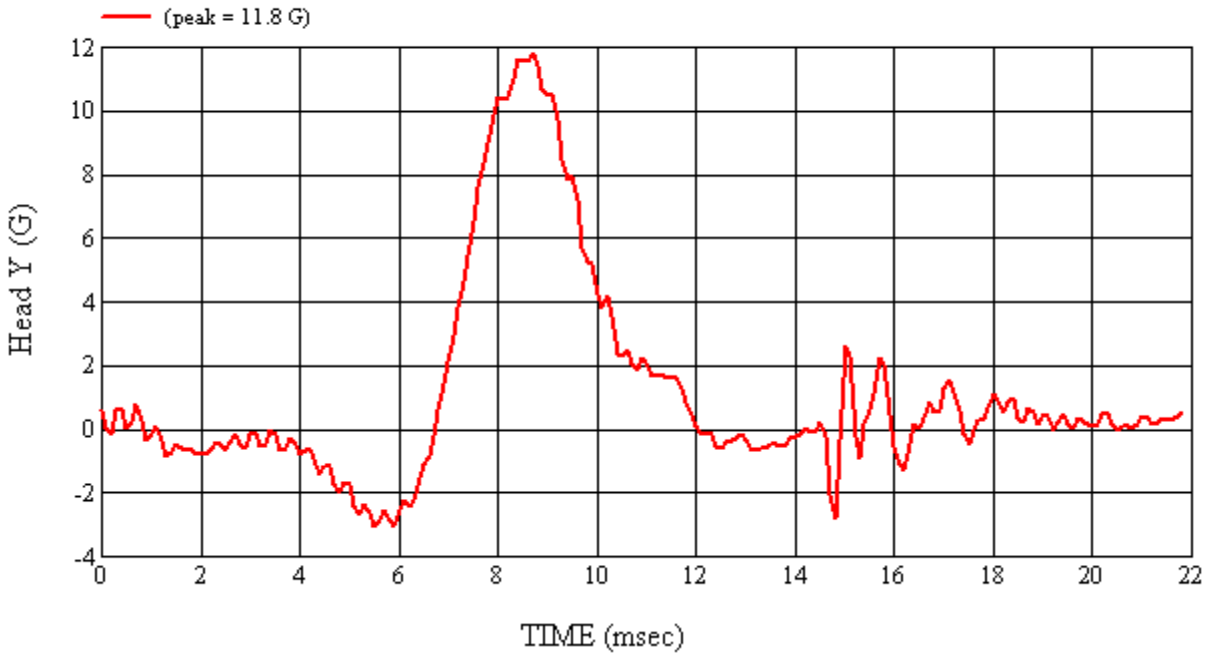
*Only necessary for NHTSA (Government) Compliance testing.

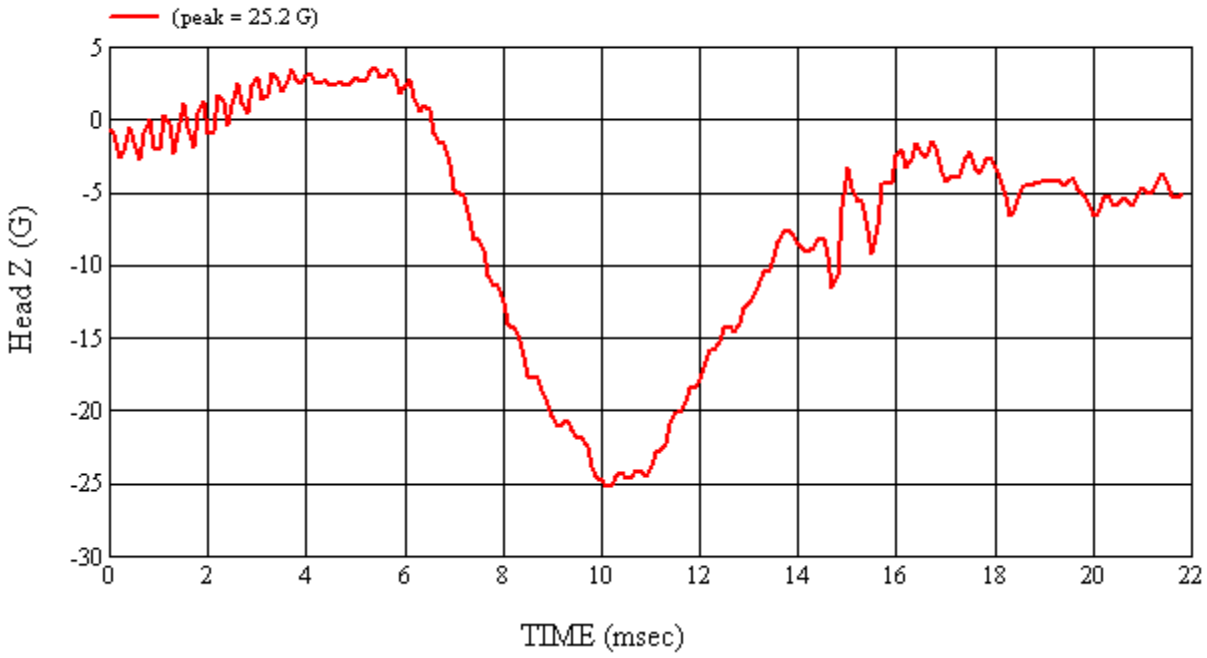
MGA Test #: U11130 Target Location: AP1, Right Side Test Date: 4/26/2011

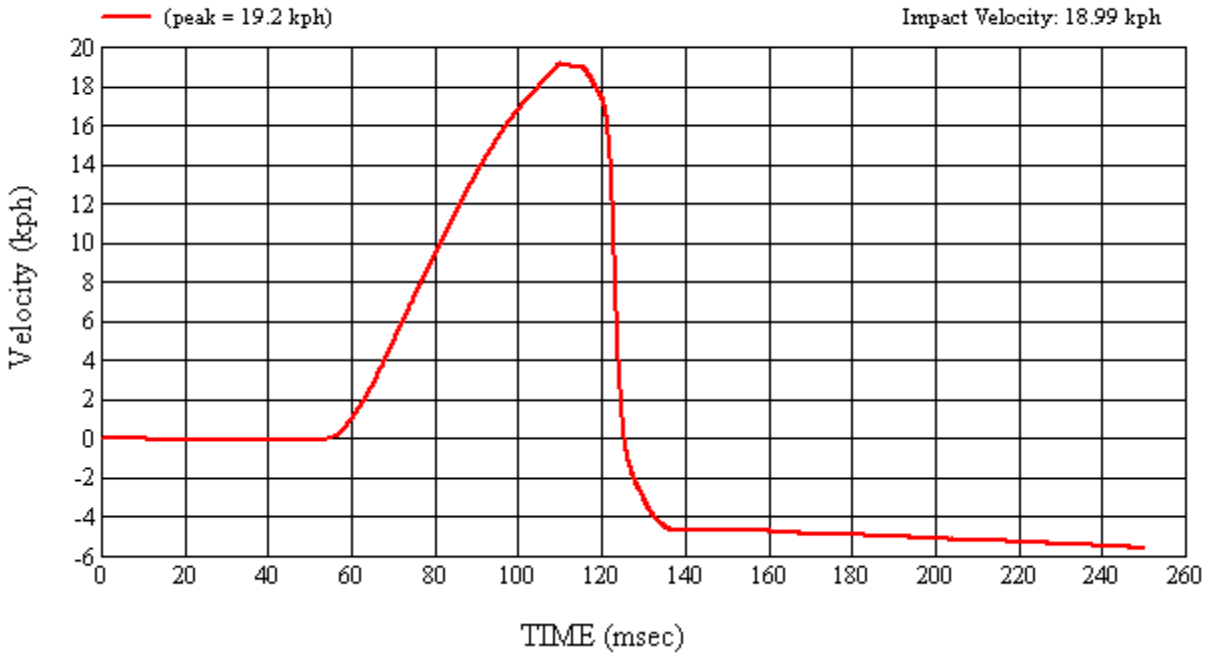


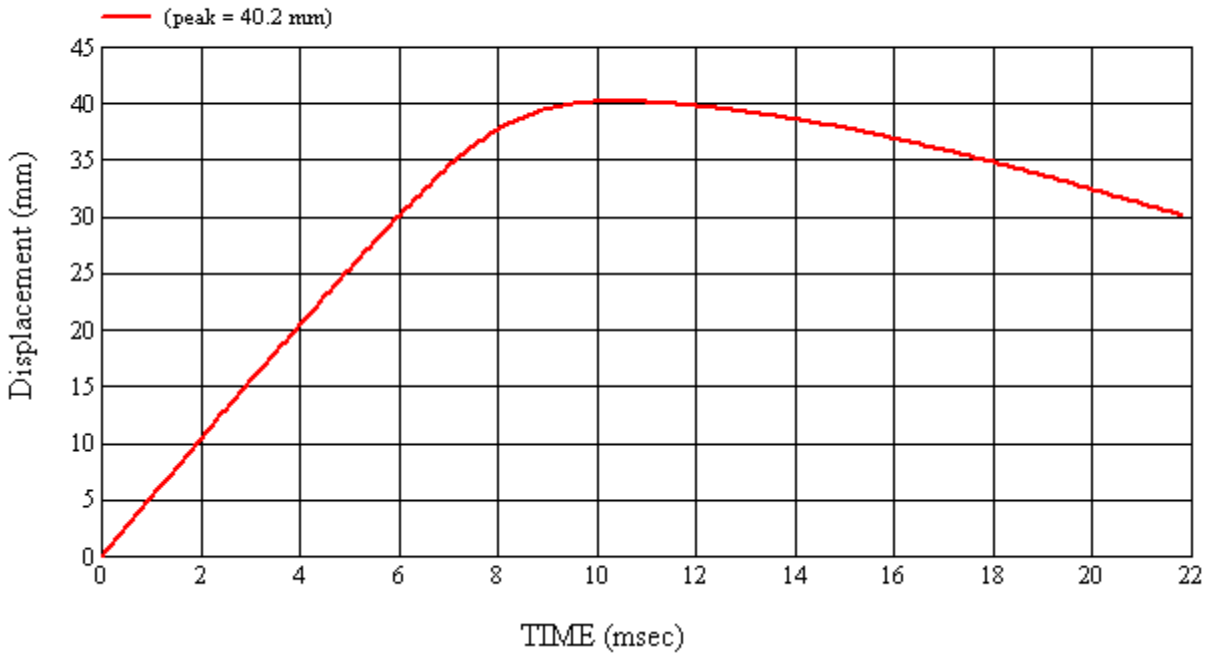



(peak = 162.9 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 11.8 G)
Head Y (G)
12
10
8
6
4
2
0
-2
-4
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

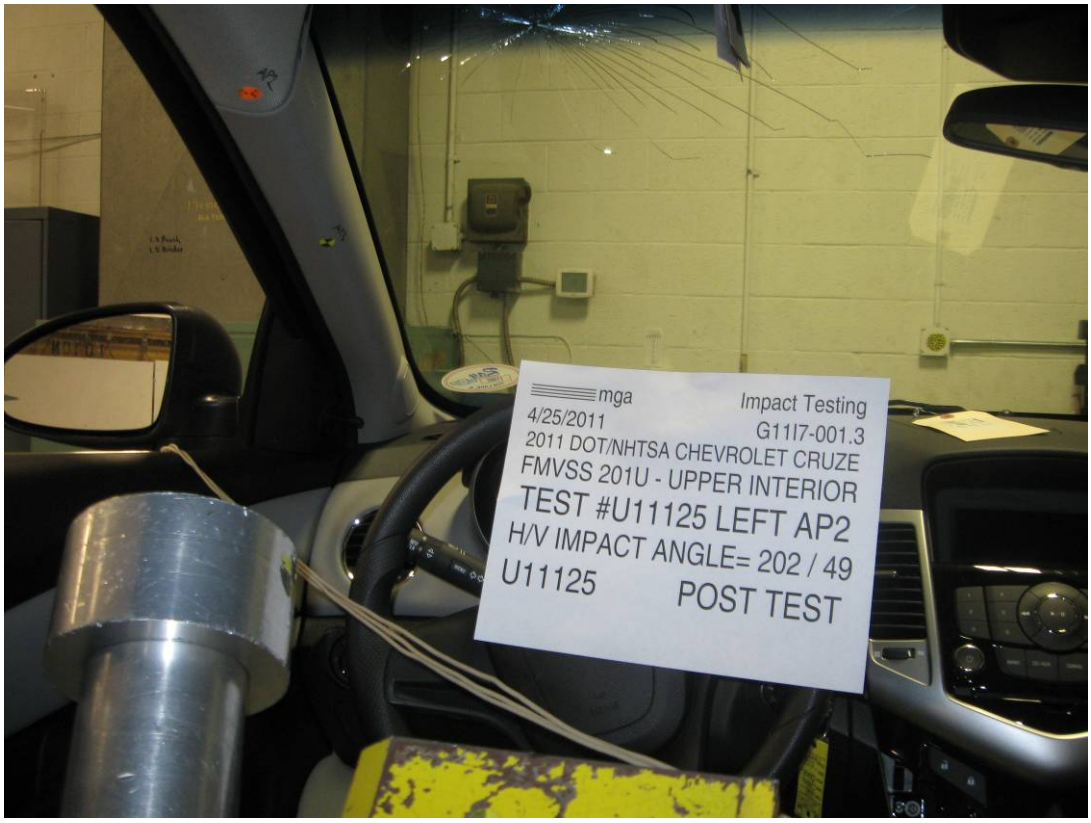

(peak = 25.2 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

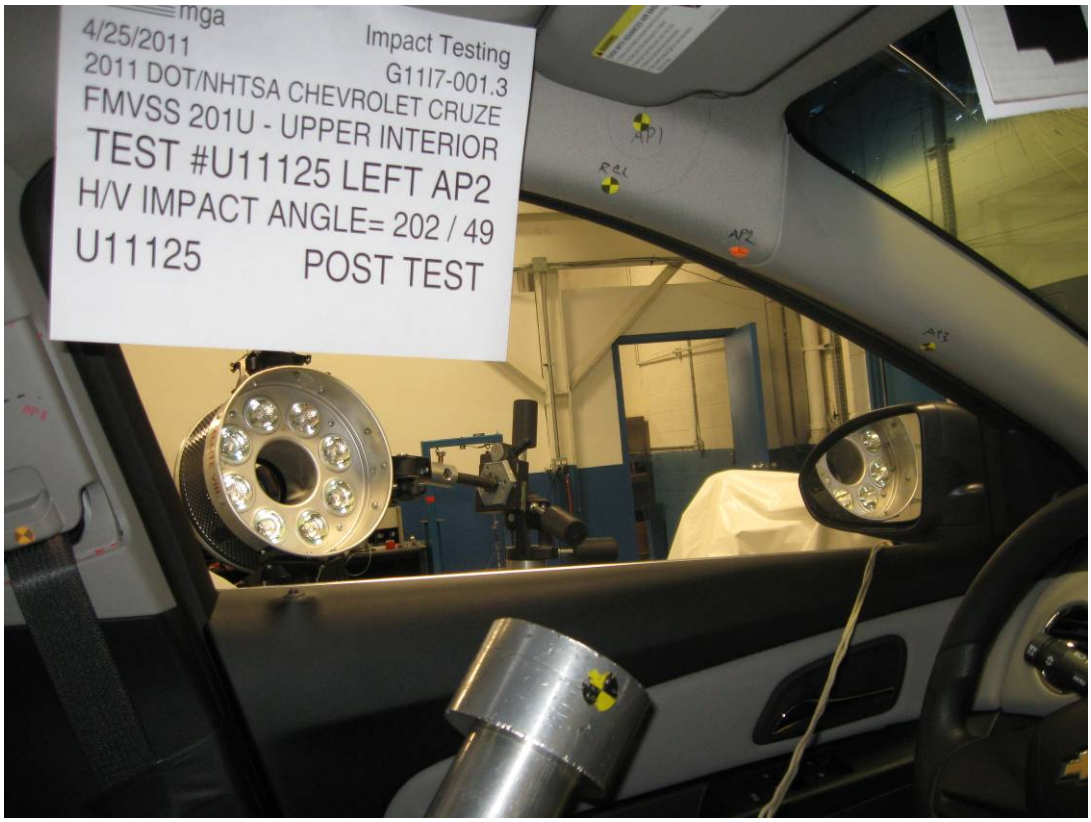

(peak = 19.2 kph)
Impact Velocity: 18.99 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 40.2 mm)
Displacement (mm)
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

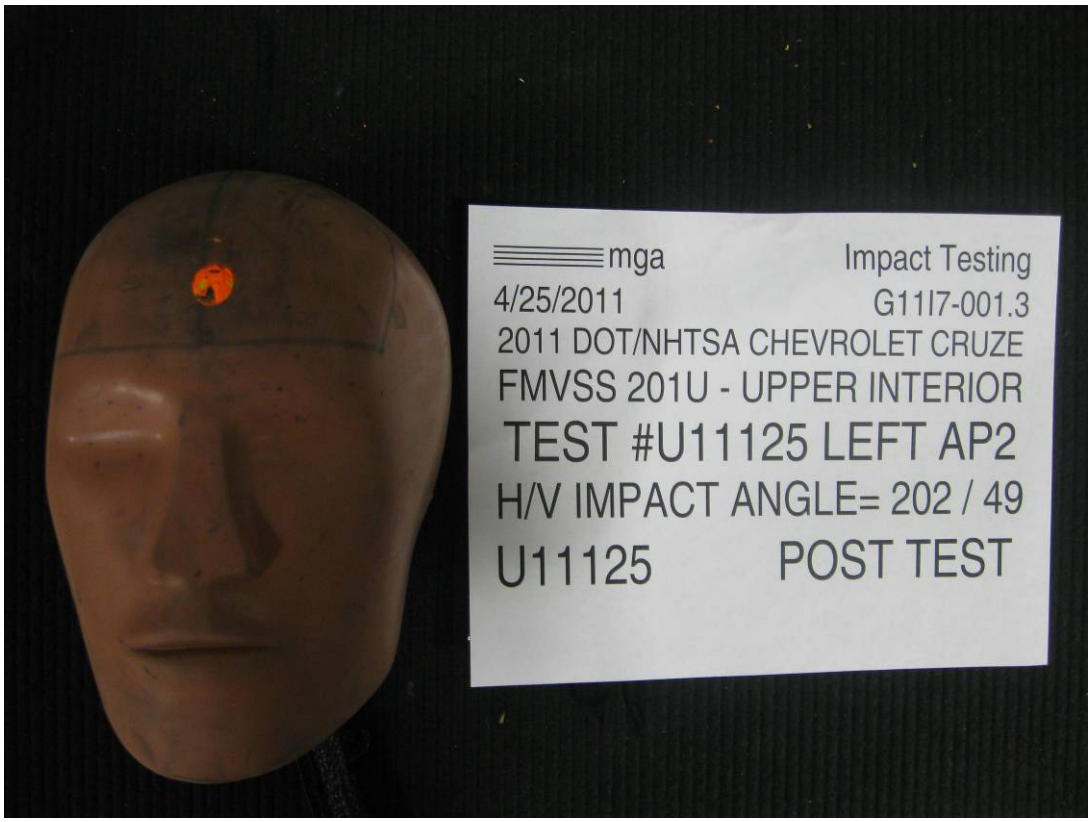

CB0103
U11125
mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11125 LEFT AP2
H/V IMPACT ANGLE= 202 / 49
U11125
PRE TEST


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11125 LEFT AP2
H/V IMPACT ANGLE= 202 / 49
U11125
PRE TEST
CB0103
U11125
LEFT AP2
H/V 202/49


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11125 LEFT AP2
H/V IMPACT ANGLE= 202 / 49
U11125
POST TEST


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11125 LEFT AP2
H/V IMPACT ANGLE= 202 / 49
U11125
POST TEST


AP2


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11125 LEFT AP2
H/V IMPACT ANGLE= 202 / 49
U11125
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Test Number:#U11125

Target (Vehicle Side): AP2Left

Temperature:21.7C

MGA Test Reference No.:U11125

Humidity:44.4%

Approach Horizontal Angles:202º

Time of Test:12:53:03 PM

Approach Vertical Angles:49º

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
538	493	5.4	18.9	22	2 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-96.4	1.07	1.07
Y	6	J36197	108.7	0.85	0.85
Z	7	J36353	99.1	0.94	0.94

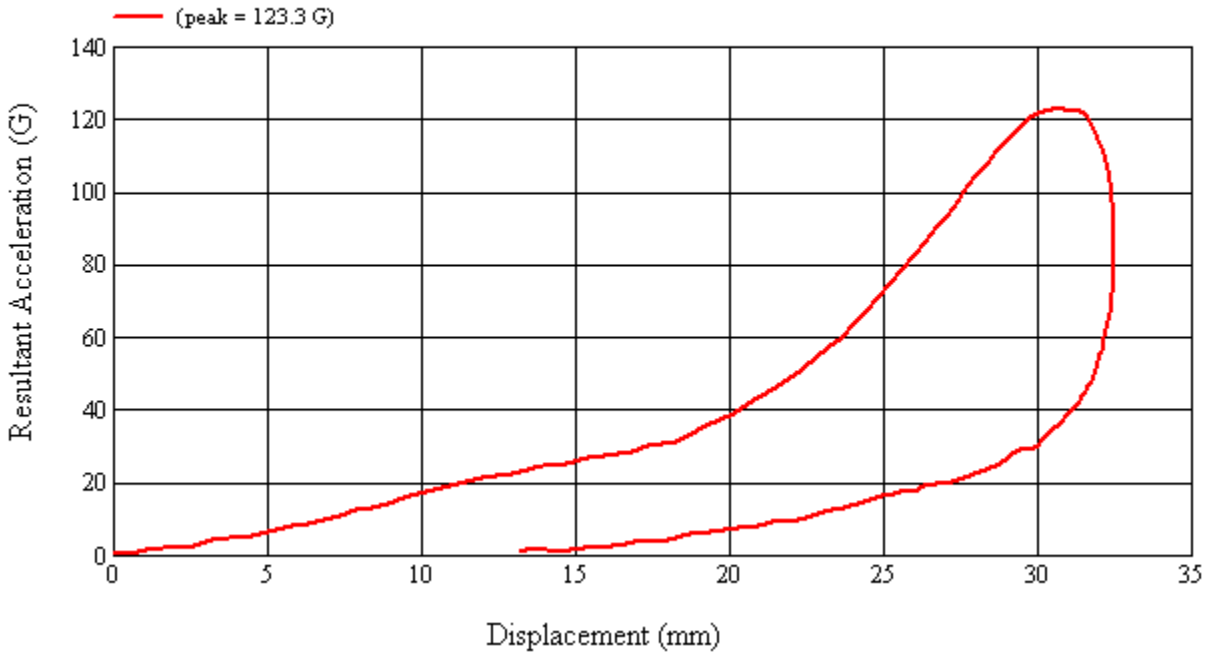
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

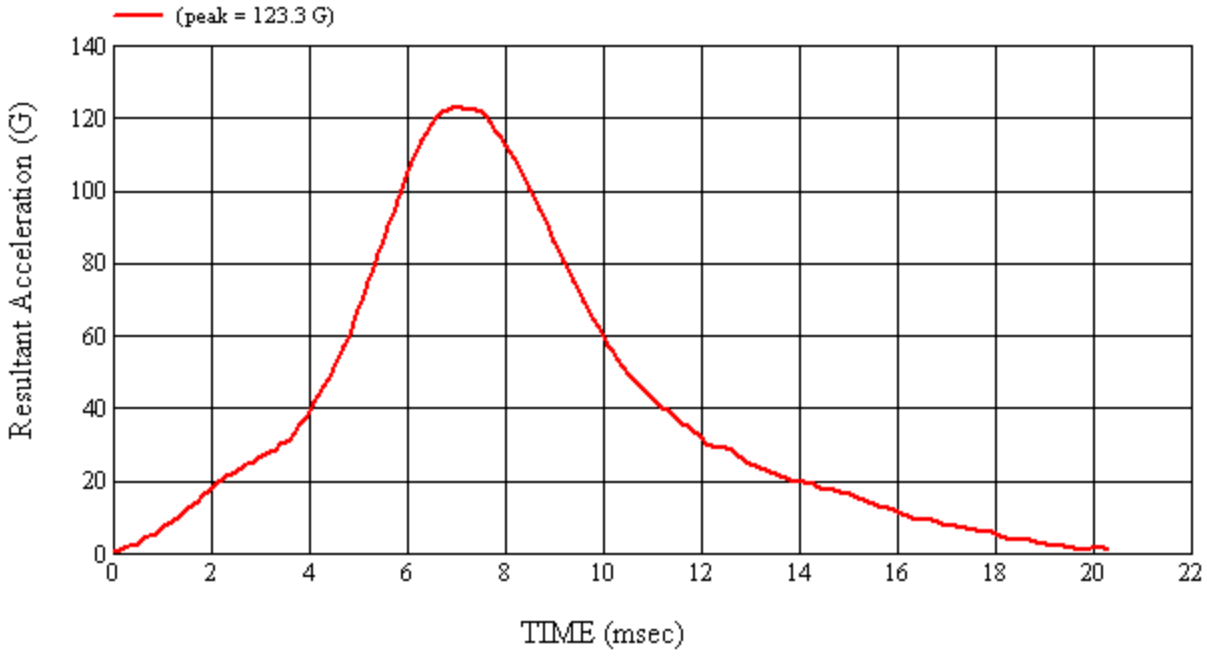
Dislodged trim

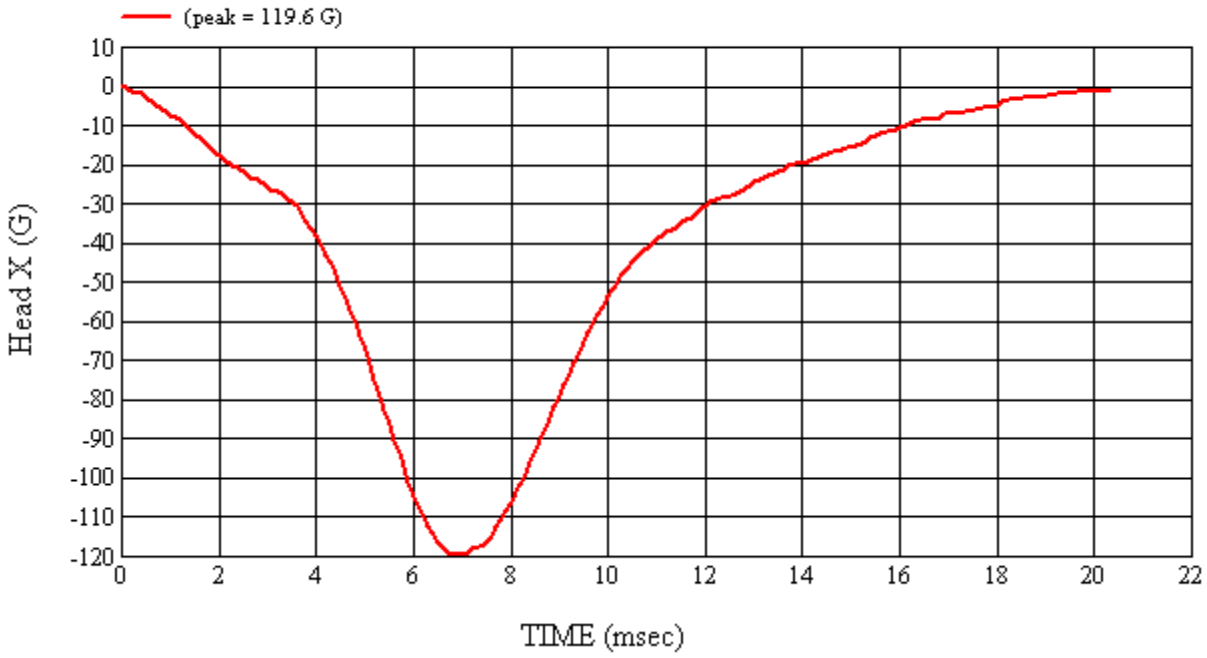
Recorded By: _____ Approved By*: _____ Date: 4/25/2011

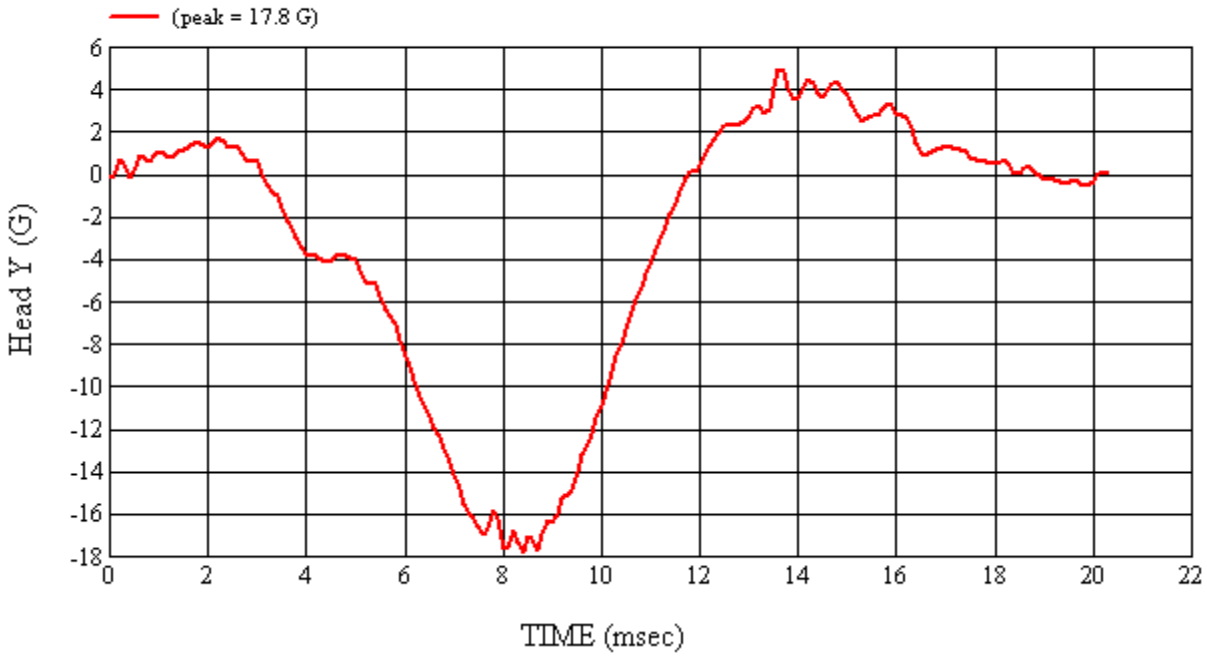
*Only necessary for NHTSA (Government) Compliance testing.

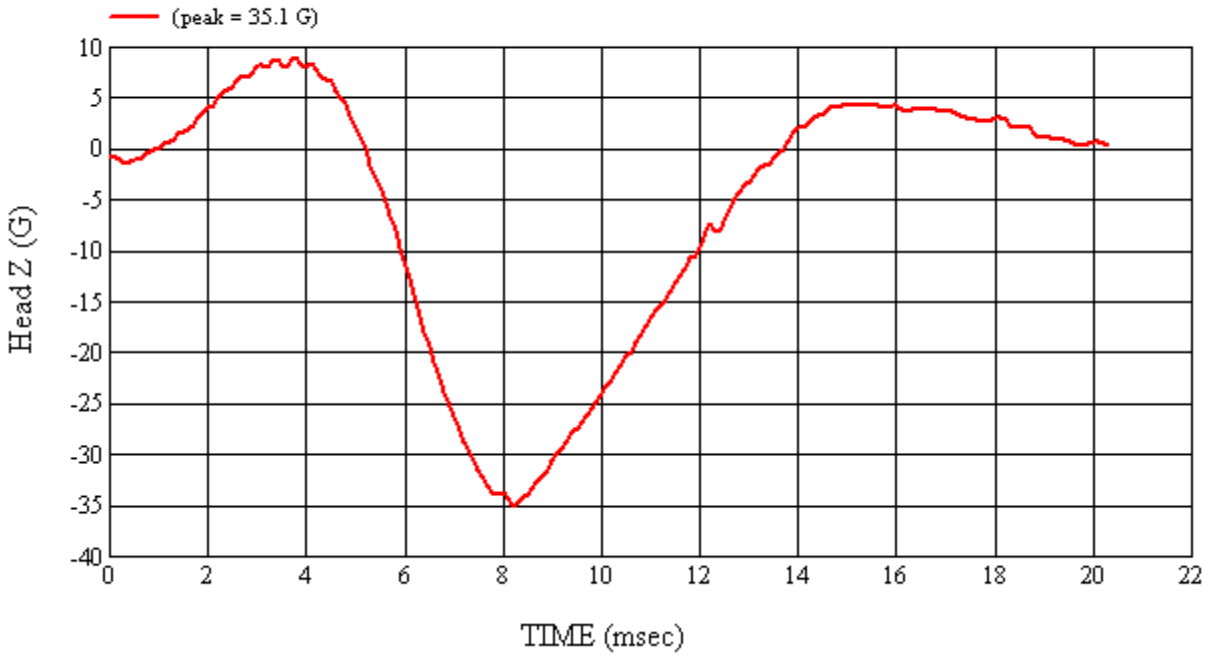
MGA Test #: U11125 Target Location: AP2, Left Side Test Date: 4/25/2011

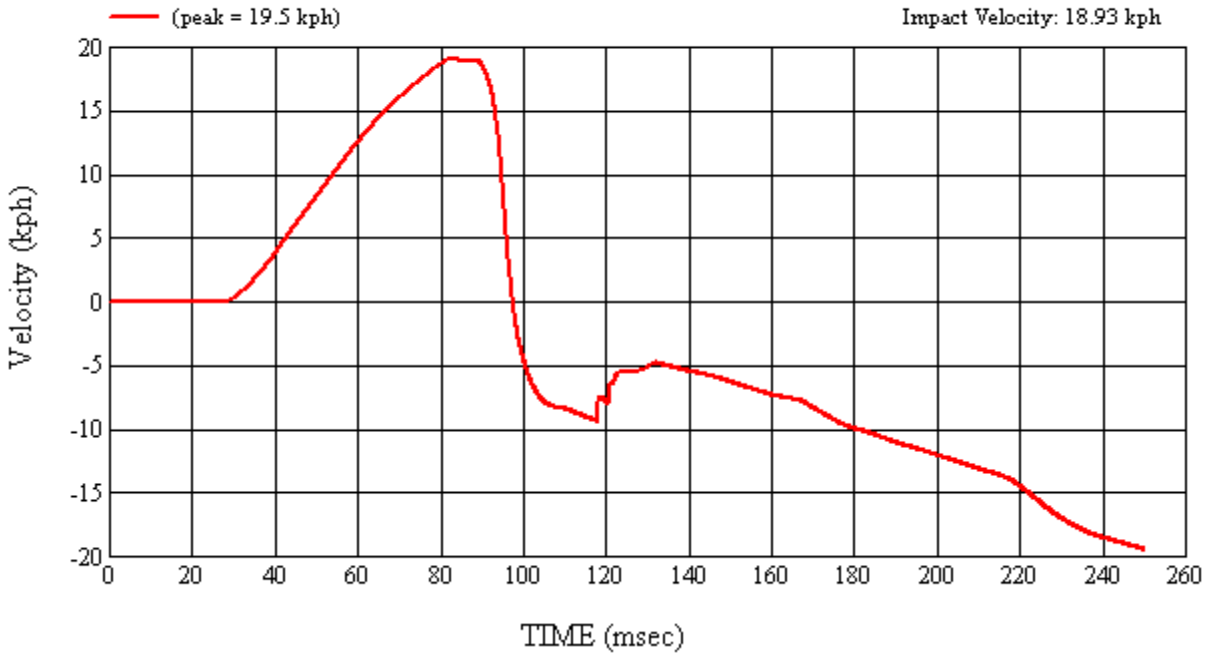


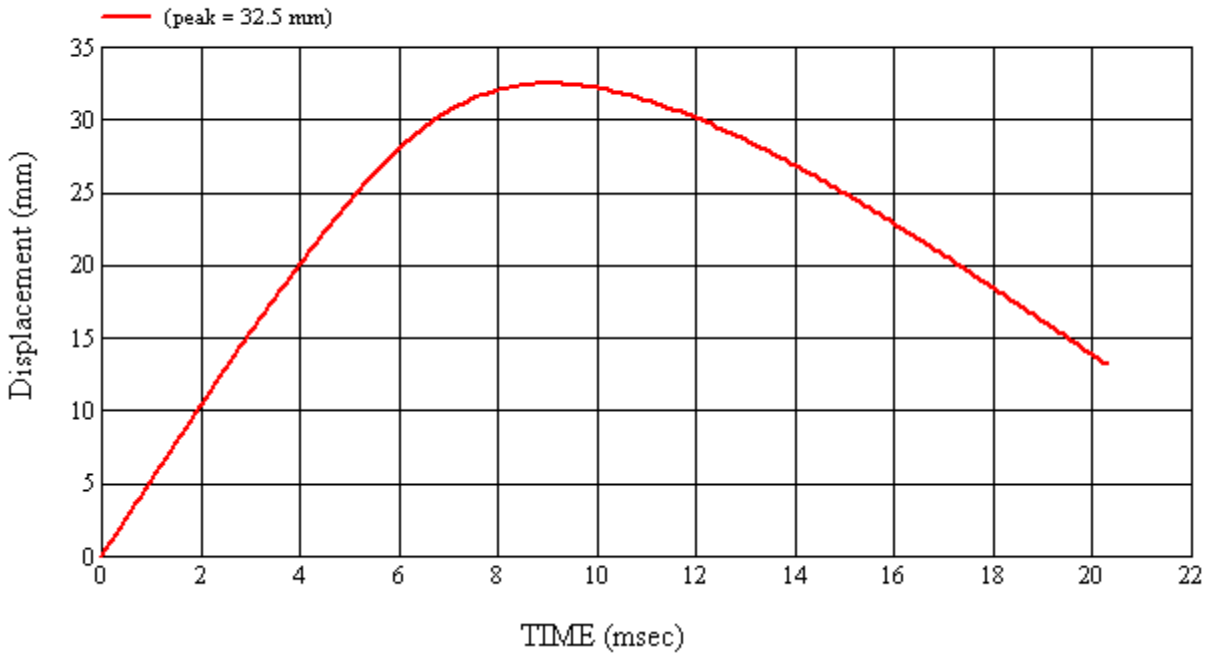


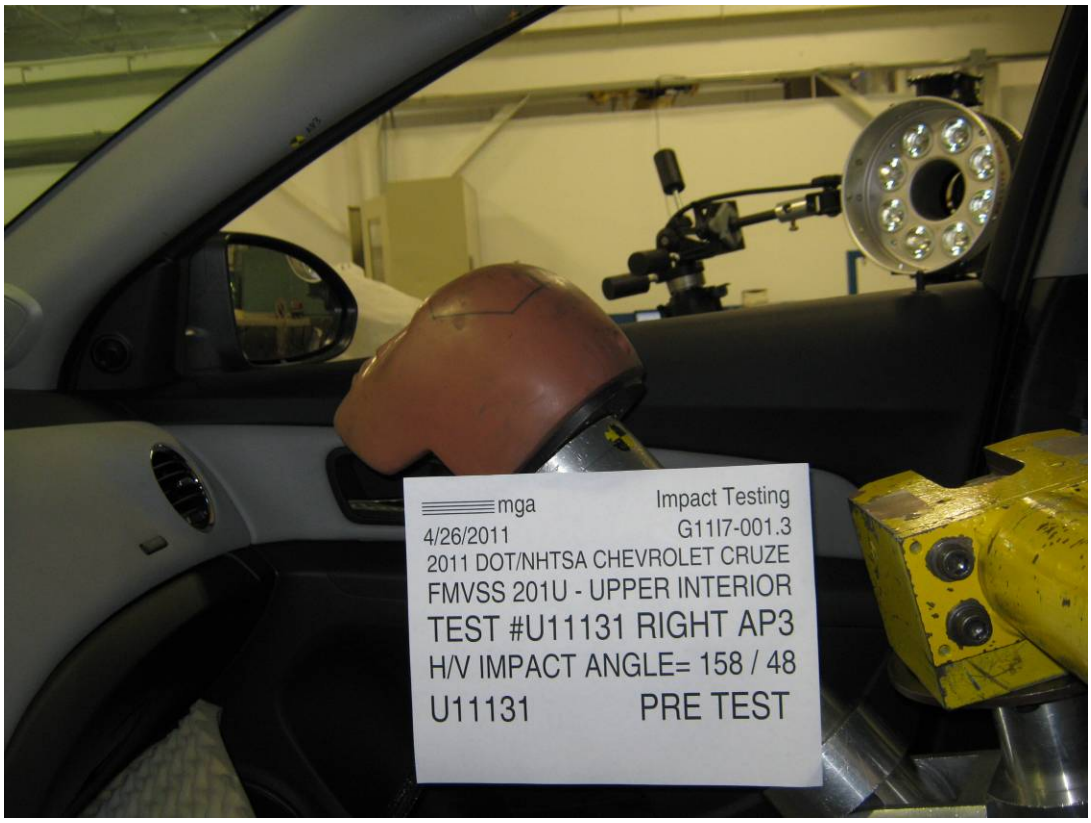

(peak = 119.6 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 17.8 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

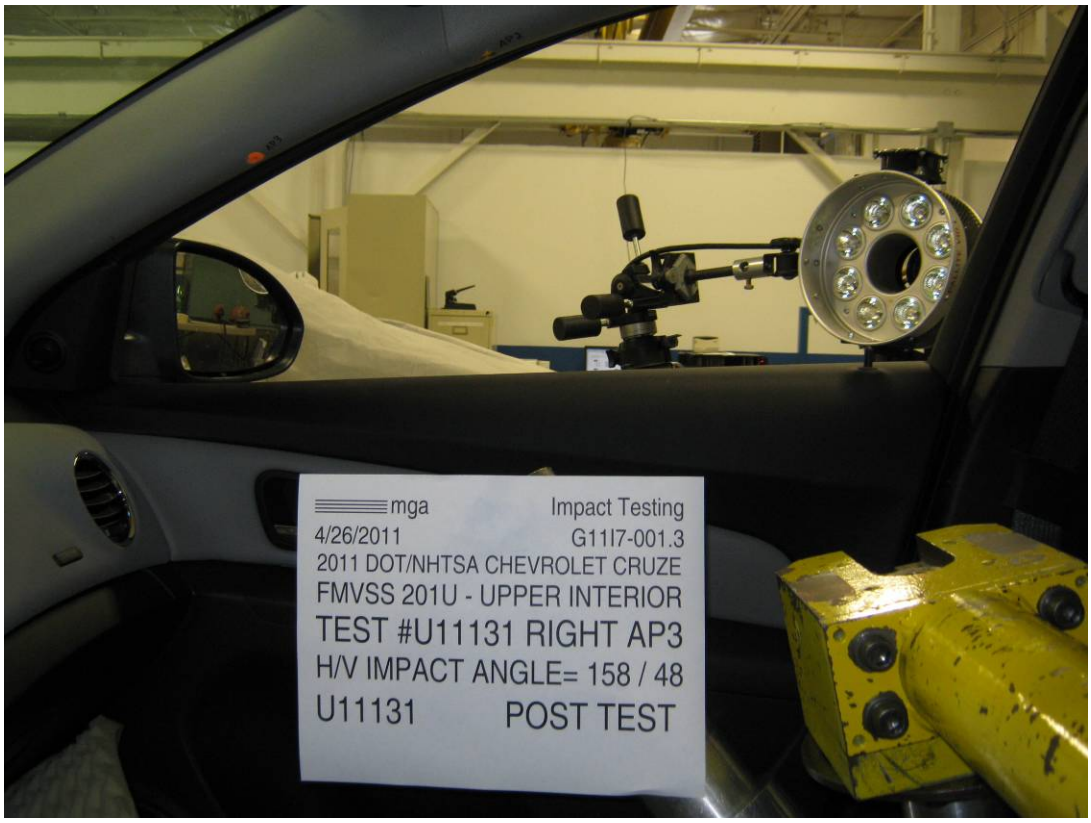

(peak = 35.1 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 19.5 kph)
Impact Velocity: 18.93 kph
Velocity (kph)
20
15
10
5
0
-5
-10
-15
-20
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 32.5 mm)
Displacement (mm)
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

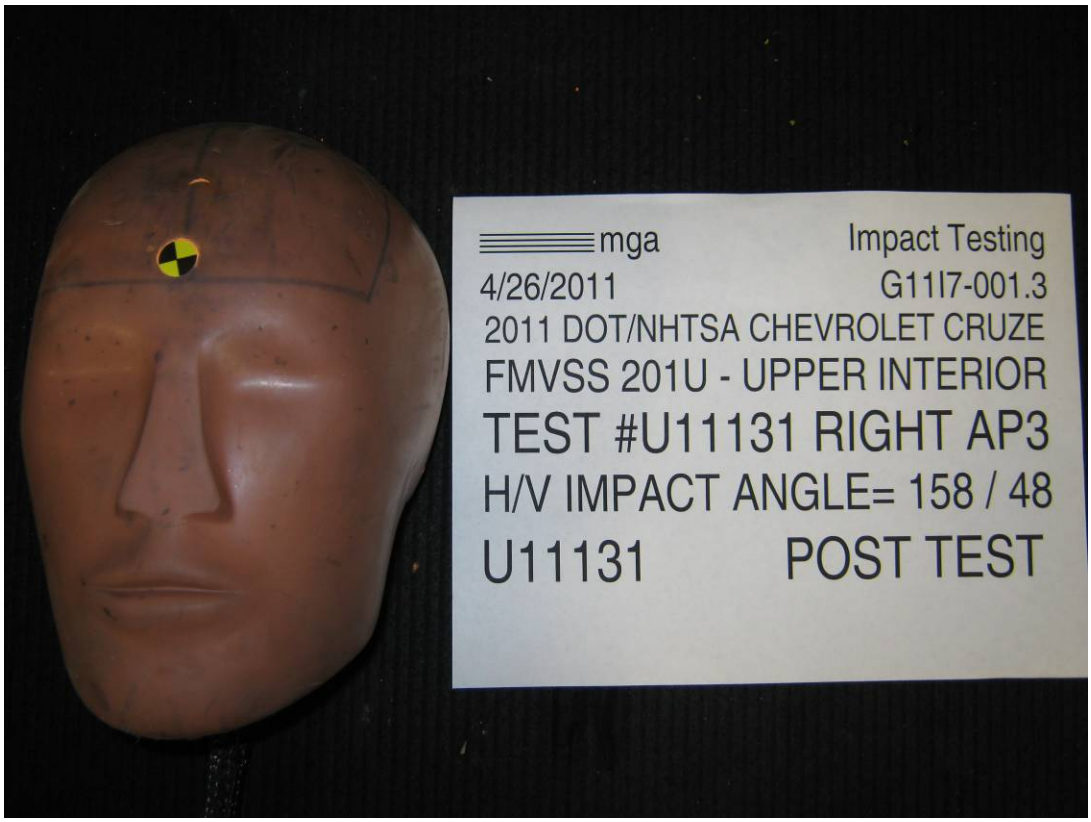

mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11131 RIGHT AP3
H/V IMPACT ANGLE= 158 / 48
U11131
PRE TEST


mga
4/26/2011
Impact Testing
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11131 RIGHT AP3
H/V IMPACT ANGLE= 158 / 48
U11131
PRE TEST


mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11131 RIGHT AP3
H/V IMPACT ANGLE= 158 / 48
U11131
POST TEST


mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11131 RIGHT AP3
H/V IMPACT ANGLE= 158 / 48
U11131
POST TEST


AP3


mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11131 RIGHT AP3
H/V IMPACT ANGLE= 158 / 48
U11131
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Test Number:#U11131

Target (Vehicle Side): AP3Right

Temperature:22.3C

MGA Test Reference No.:U11131

Humidity:58.1%

Approach Horizontal Angles:158º

Time of Test:3:08:18 PM

Approach Vertical Angles:48º

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
499	441	6	18.8	9	2 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-96.4	1.07	1.07
Y	6	J36197	108.7	0.85	0.85
Z	7	J36353	99.1	0.94	0.94

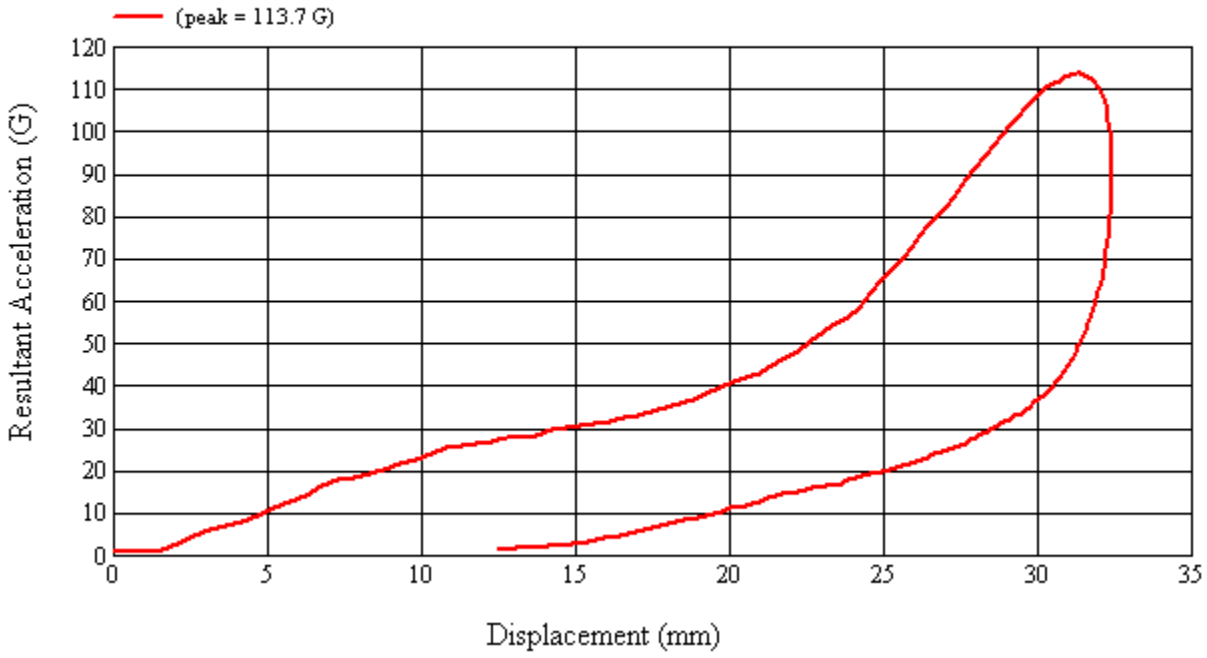
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

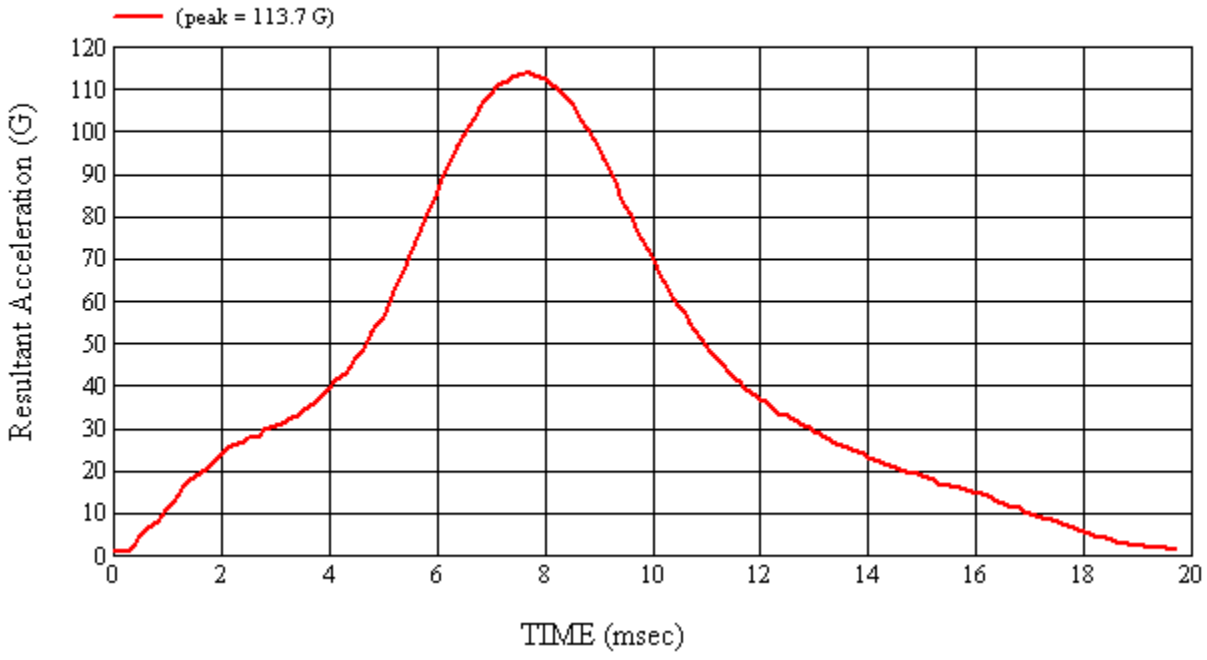
No visible damage.

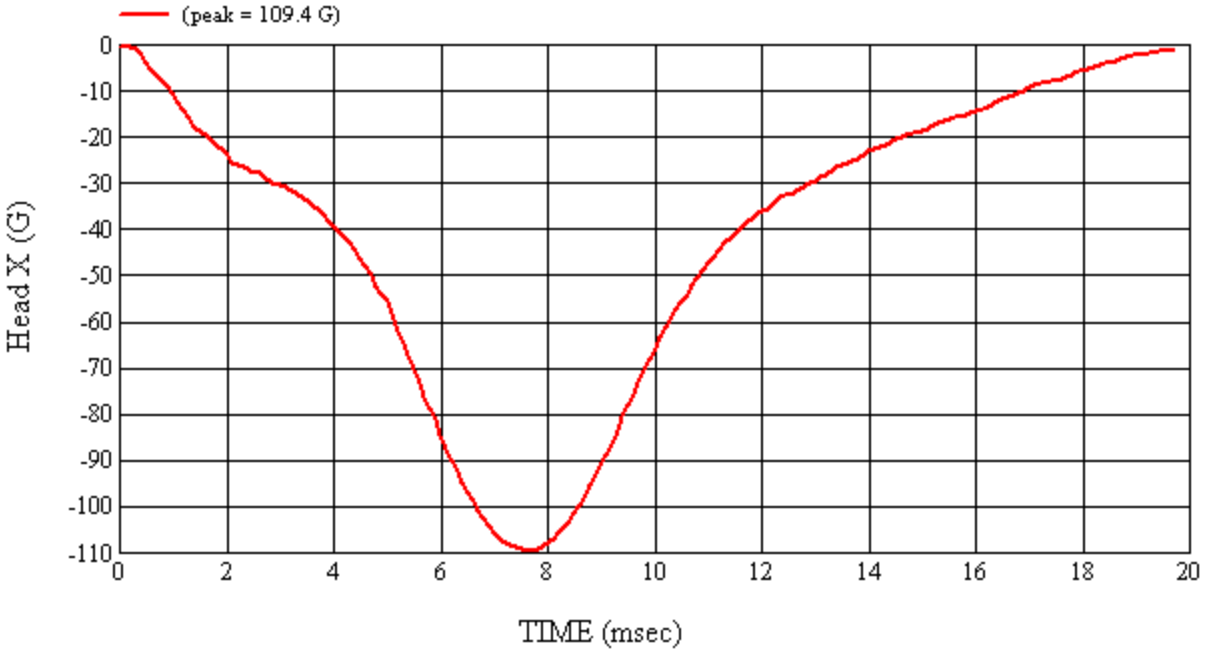
Recorded By: _____ Approved By*: _____ Date: 4/26/2011

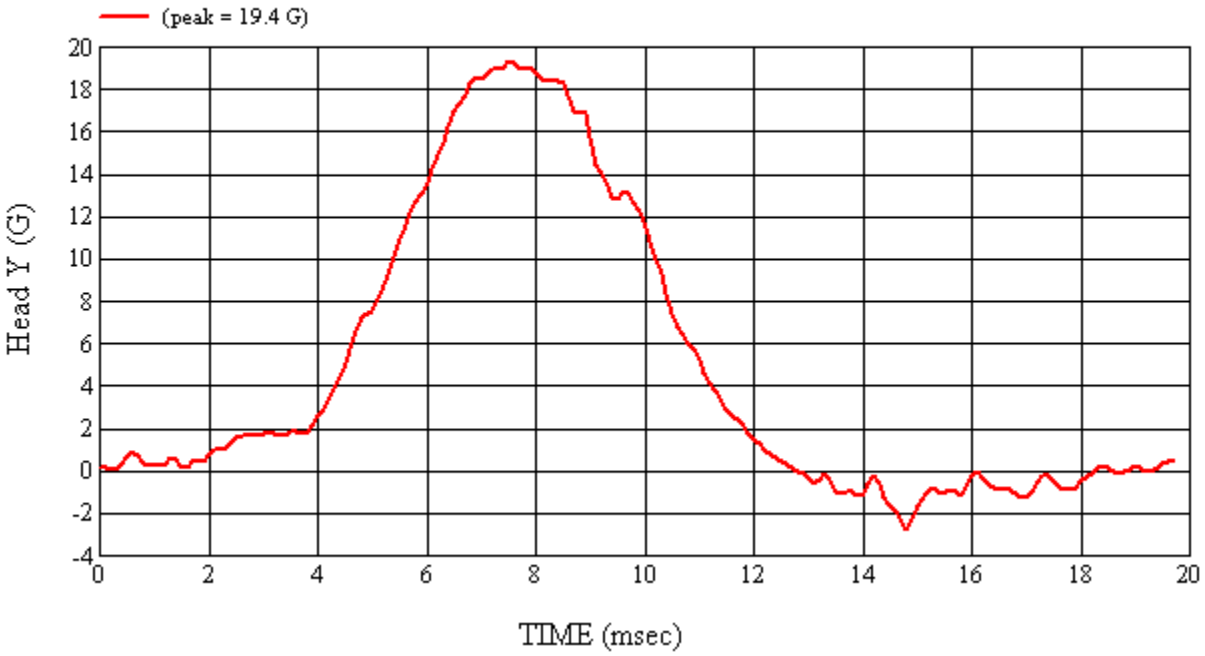
*Only necessary for NHTSA (Government) Compliance testing.

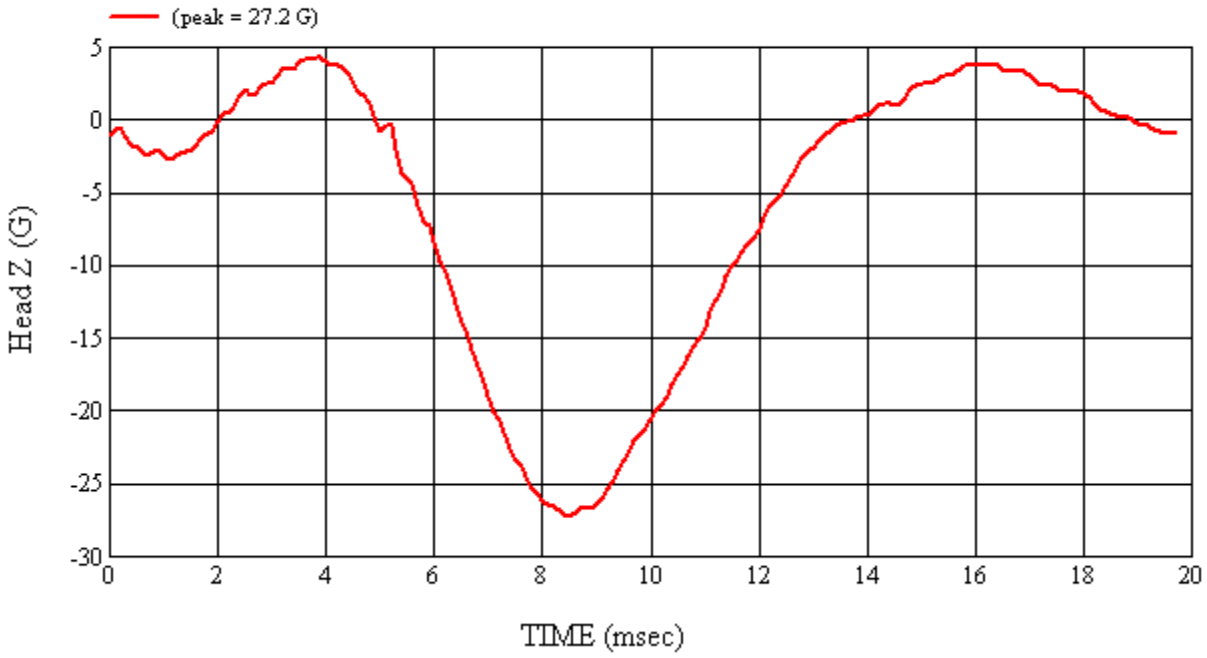
MGA Test #: U11131 Target Location: AP3, Right Side Test Date: 4/26/2011

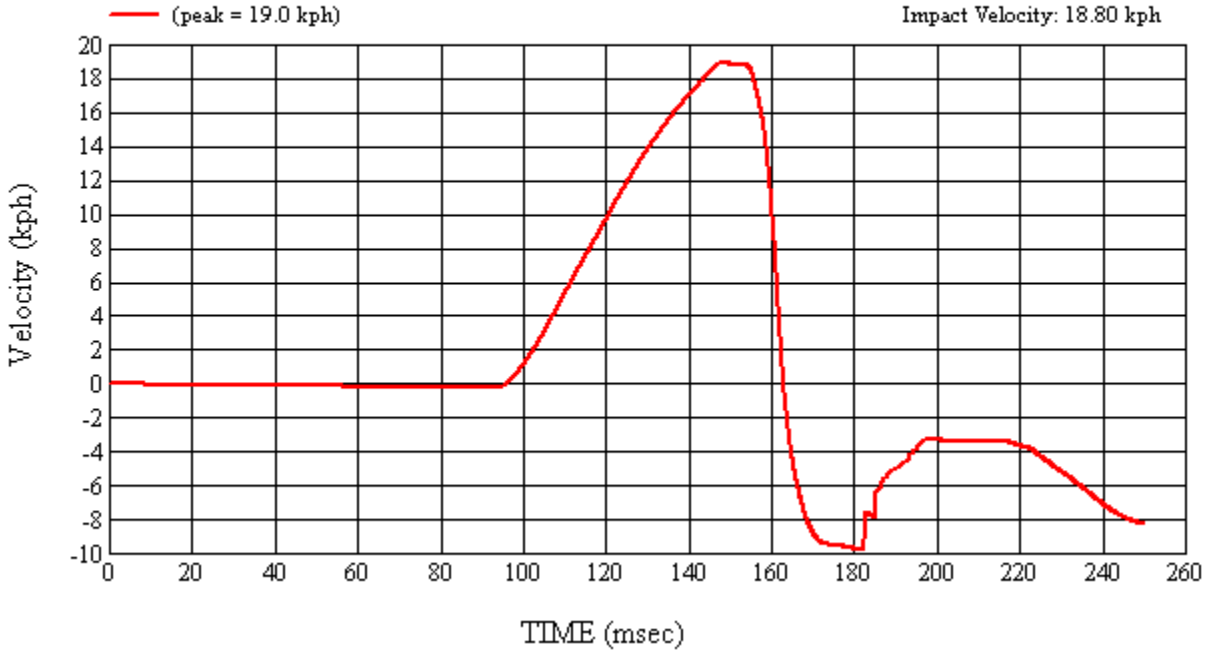


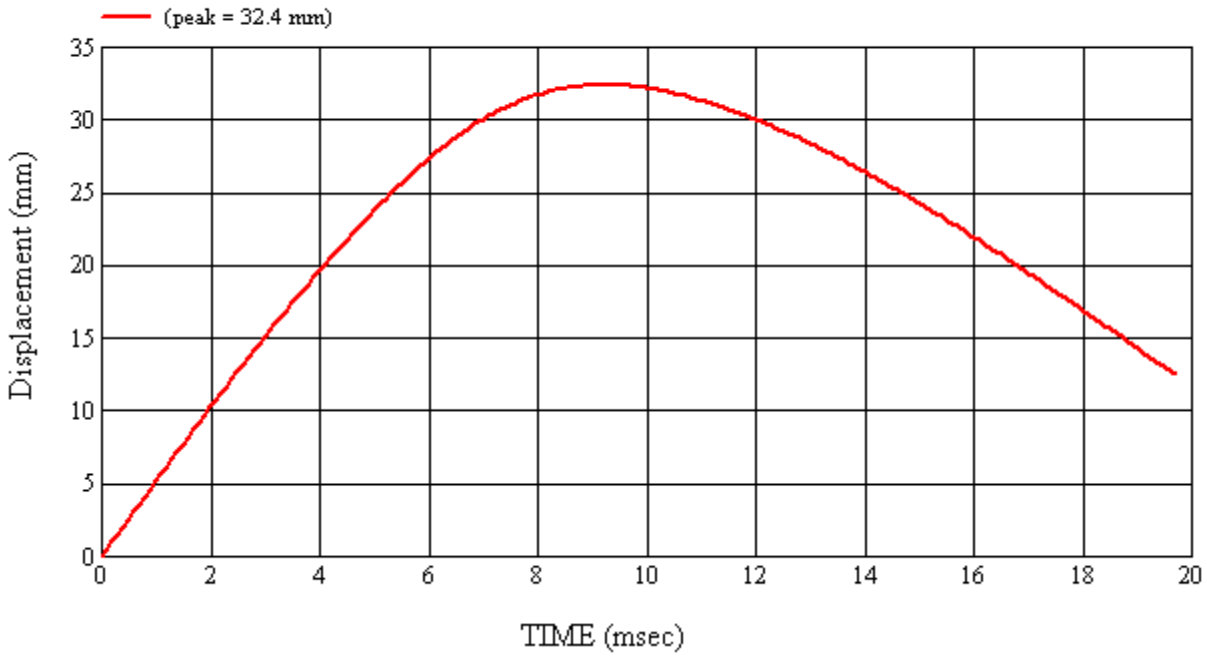


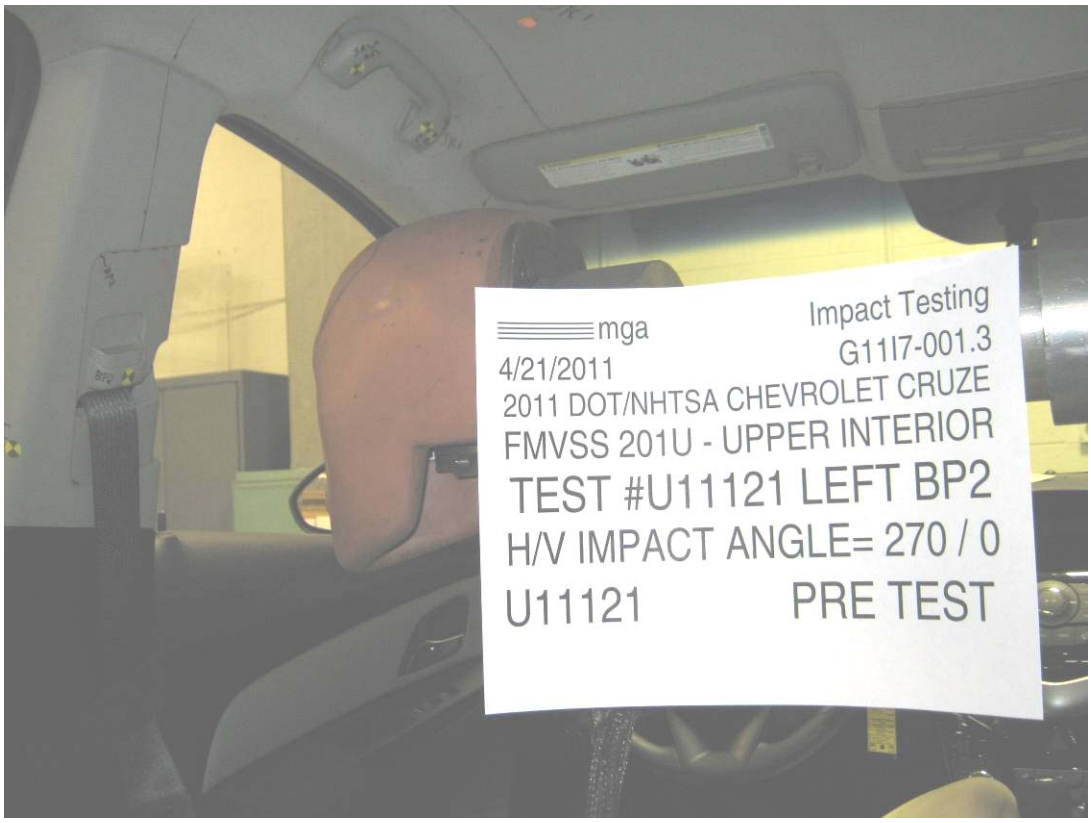

(peak = 109.4 G)
Head X (G)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 19.4 G)
Head Y (G)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 27.2 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 19.0 kph)
Impact Velocity: 18.80 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 32.4 mm)
Displacement (mm)
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11121 LEFT BP2
H/V IMPACT ANGLE= 270 / 0
U11121
PRE TEST


mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11121 LEFT BP2
H/V IMPACT ANGLE= 270 / 0
U11121
PRE TEST


mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11121 LEFT BP2
H/V IMPACT ANGLE= 270 / 0
U11121
POST TEST


mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11121 LEFT BP2
H/V IMPACT ANGLE= 270 / 0
U11121
POST TEST
BP1
BP2


BP2
BP2


BP1


mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11121 LEFT BP2
H/V IMPACT ANGLE= 270 / 0
U11121
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Test Number:#U11121

Target (Vehicle Side): BP2Left

Temperature:22.0C

MGA Test Reference No.:U11121

Humidity:25.3%

Approach Horizontal Angles:270º

Time of Test:2:32:04 PM

Approach Vertical Angles:0º

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
535	488	6.8	23.9	13	6 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J32177	-113.7	1.07	1.07
Y	6	J14103	93.9	0.85	0.85
Z	7	J35800	97.8	0.94	0.94

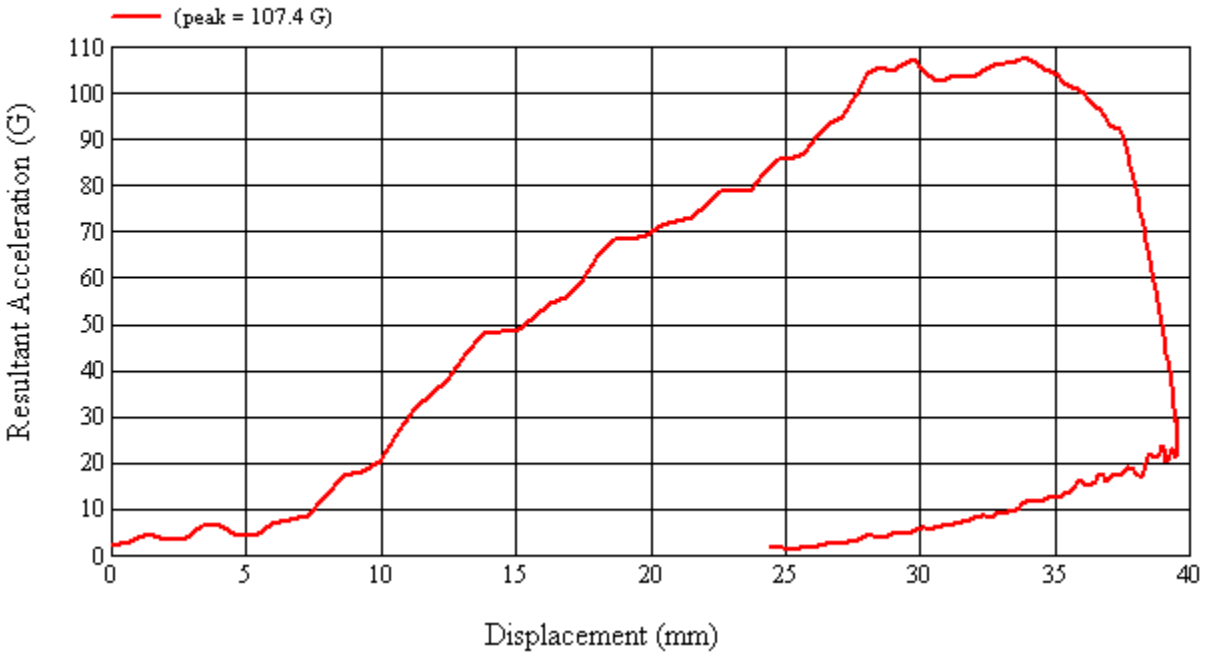
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

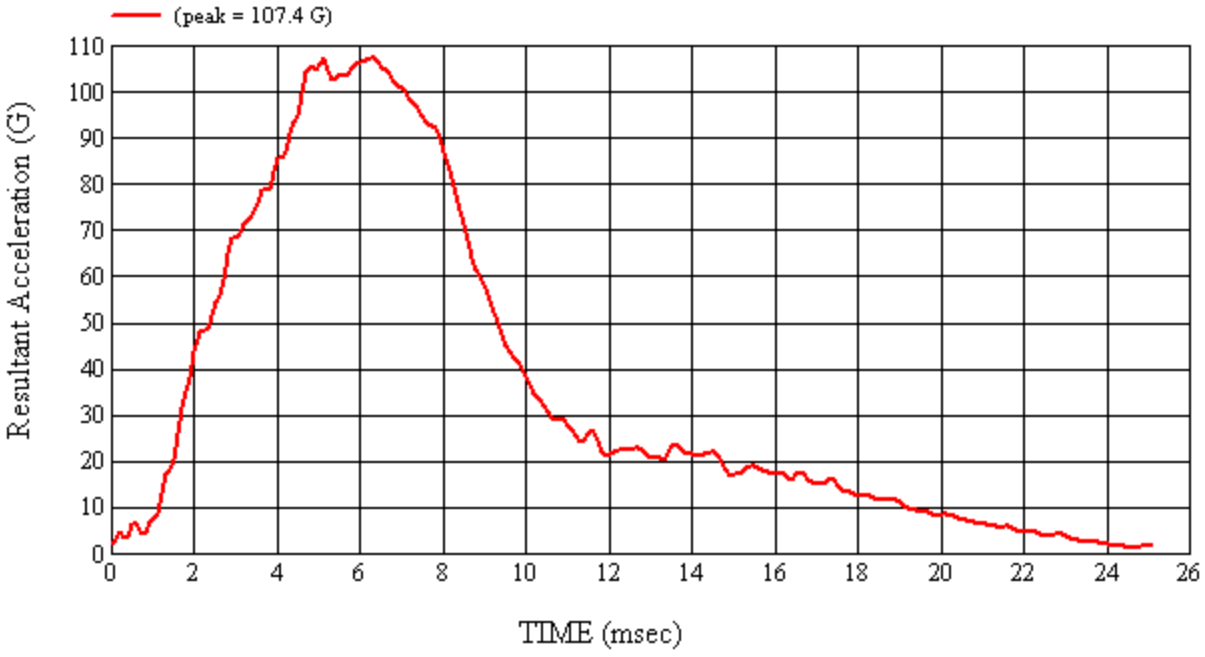
Dislodged trim, anchorage adjuster moved.

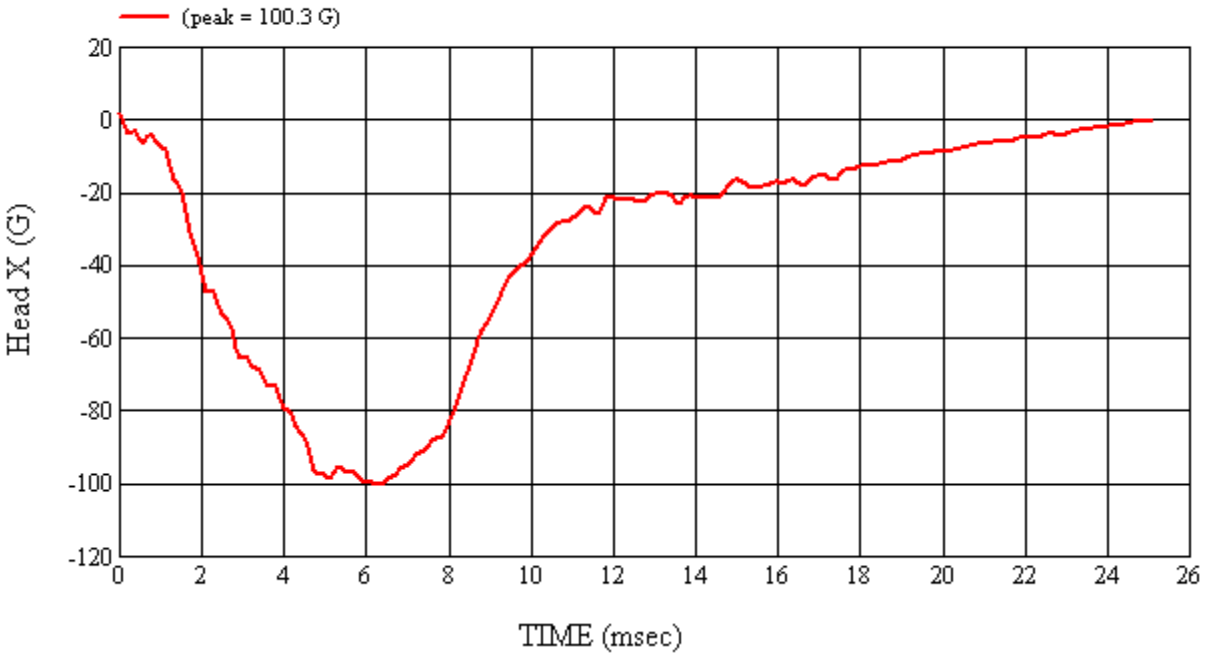
Recorded By: _____ Approved By*: _____ Date: 4/21/2011

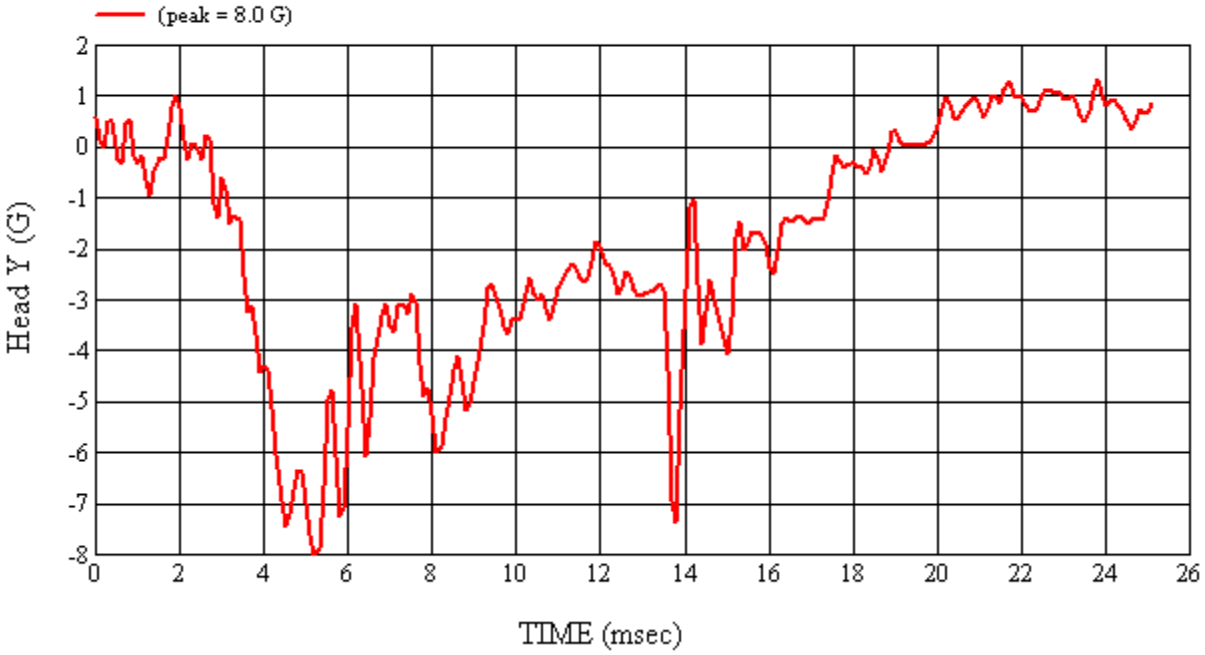
*Only necessary for NHTSA (Government) Compliance testing.

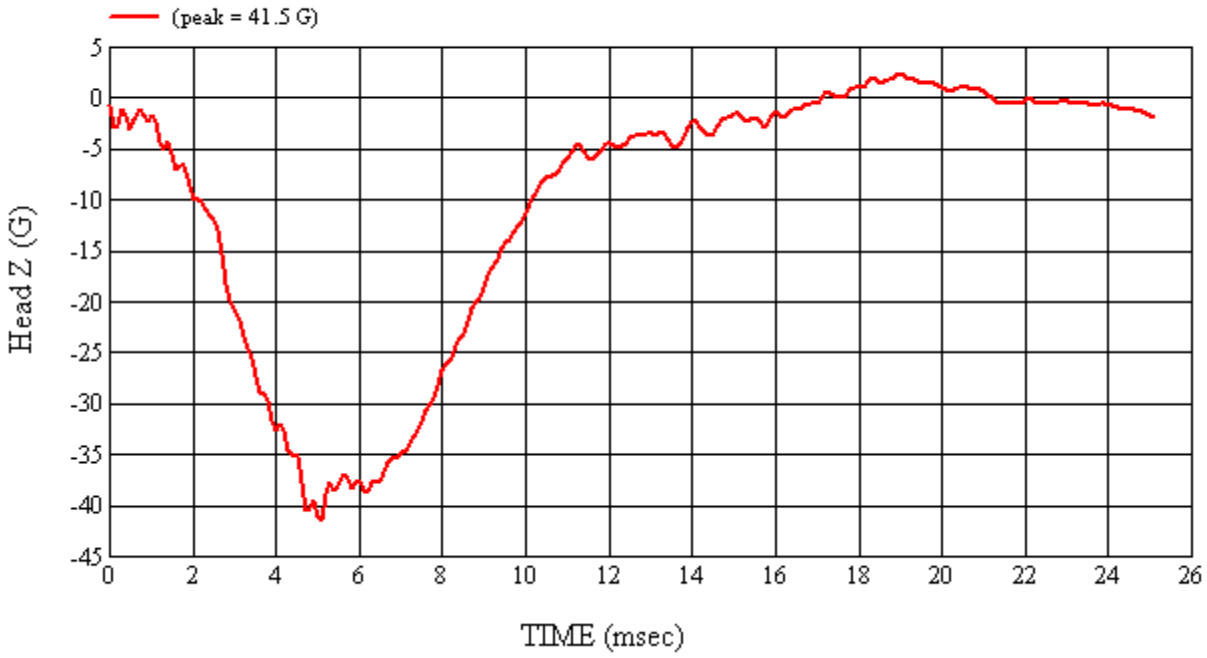
MGA Test #: U11121 Target Location: BP2, Left Side Test Date: 4/21/2011

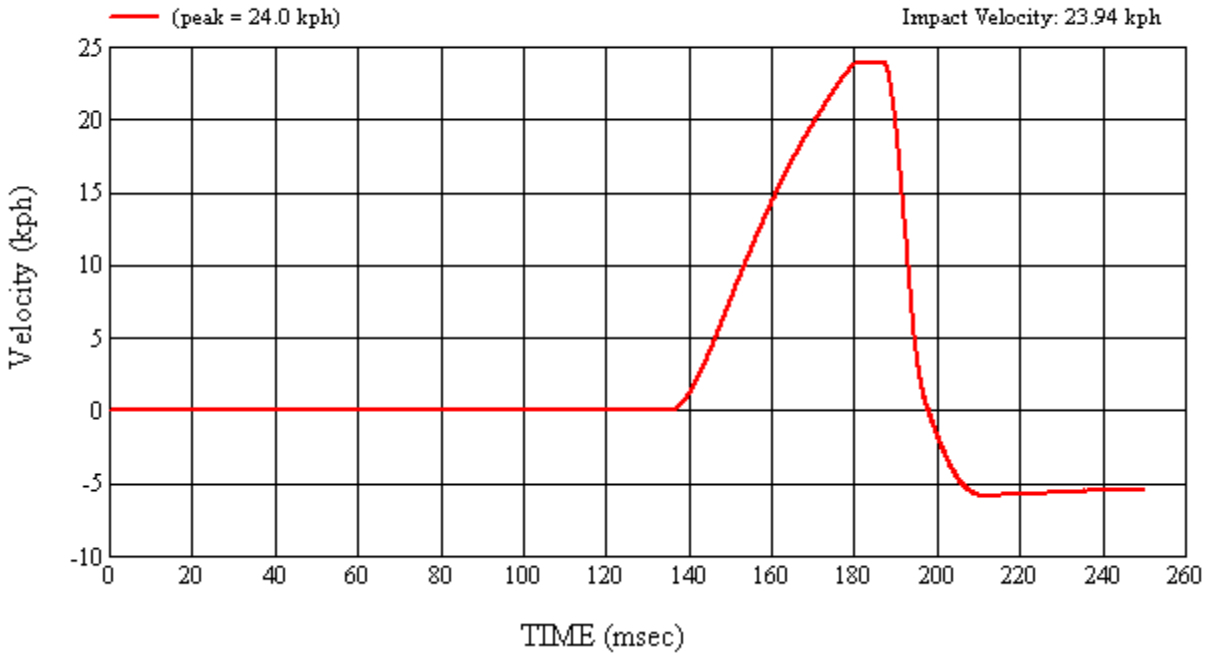


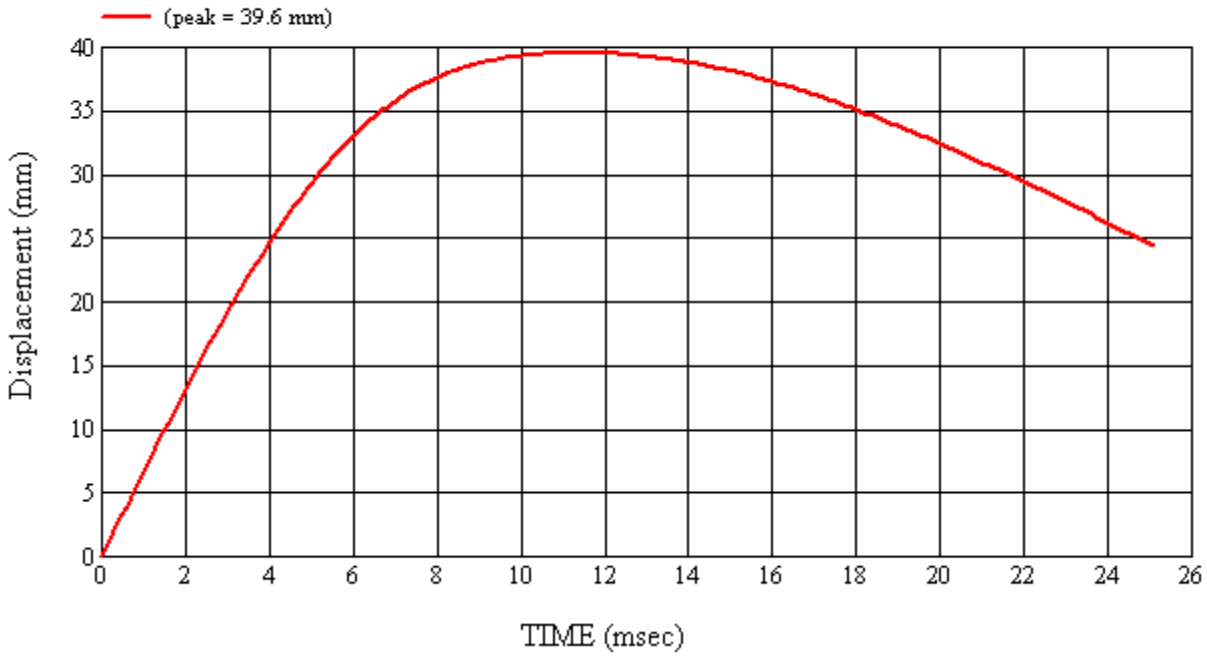


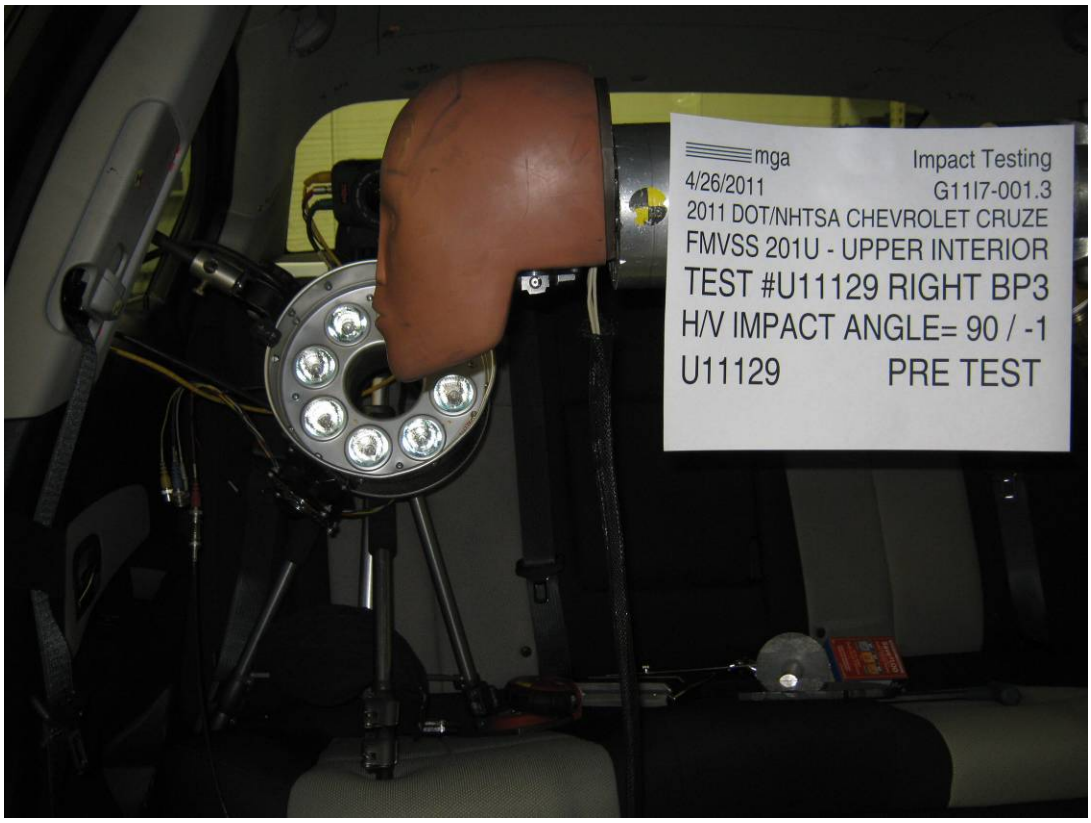

(peak = 100.3 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 8.0 G)
Head Y (G)
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 41.5 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 24.0 kph)
Impact Velocity: 23.94 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 39.6 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11129 RIGHT BP3
H/V IMPACT ANGLE= 90 / -1
U11129
PRE TEST


mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11129 RIGHT BP3
H/V IMPACT ANGLE= 90 / -1
U11129
PRE TEST


mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11129 RIGHT BP3
H/V IMPACT ANGLE= 90 / -1
U11129
POST TEST


mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11129 RIGHT BP3
H/V IMPACT ANGLE= 90 / -1
U11129
POST TEST


BP3
BP2


mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11129 RIGHT BP3
H/V IMPACT ANGLE= 90 / -1
U11129
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Test Number:#U11129

Target (Vehicle Side): BP3Right

Temperature:21.7C

MGA Test Reference No.:U11129

Humidity:47.4%

Approach Horizontal Angles:90º

Time of Test:10:06:24 AM

Approach Vertical Angles:-1º

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
749	772	4.9	24.0	20	7 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.8	1.07	1.07
Y	6	J22664	94.2	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

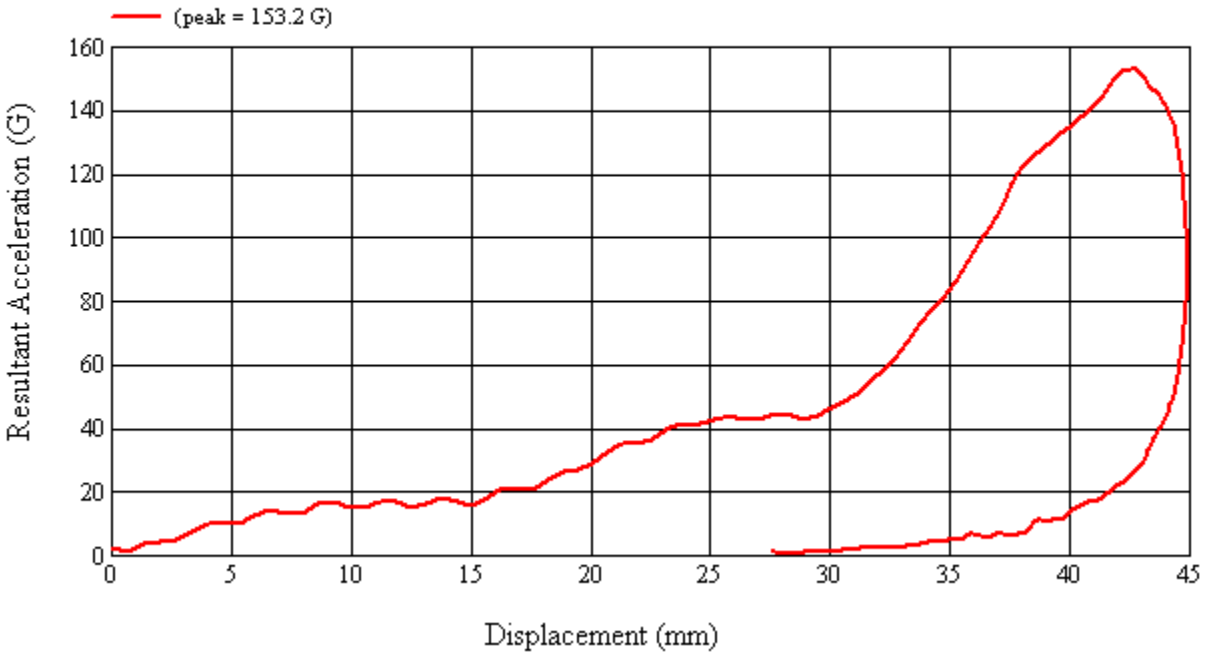
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

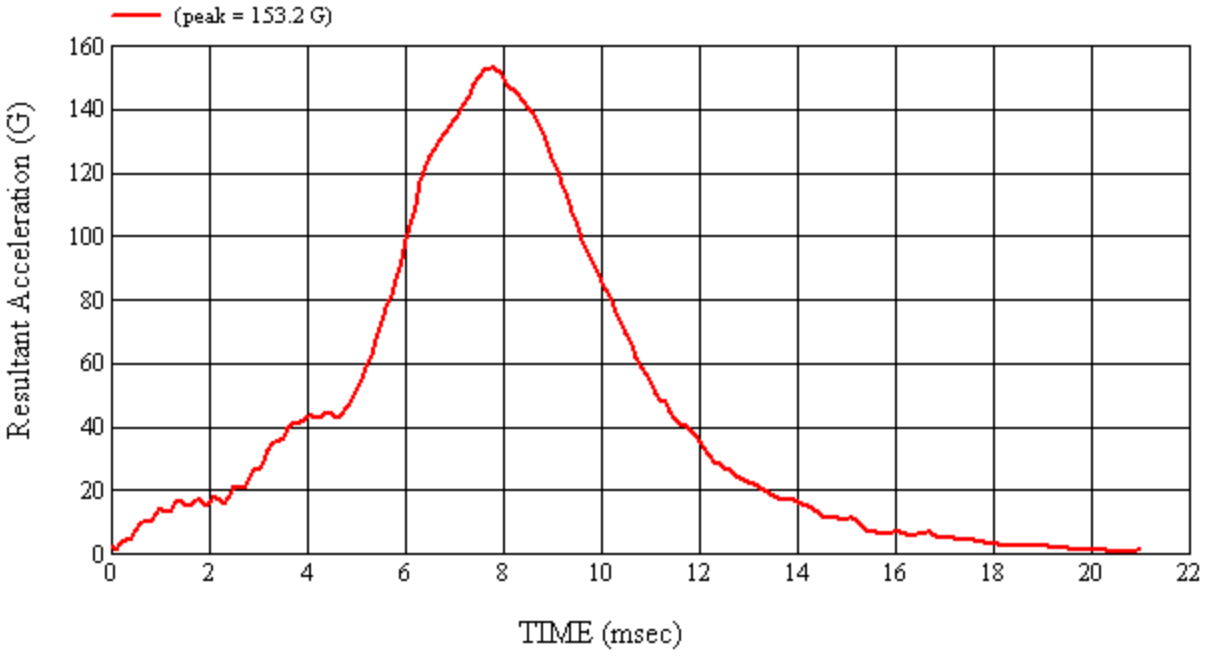
Non functional anchorage adjuster.

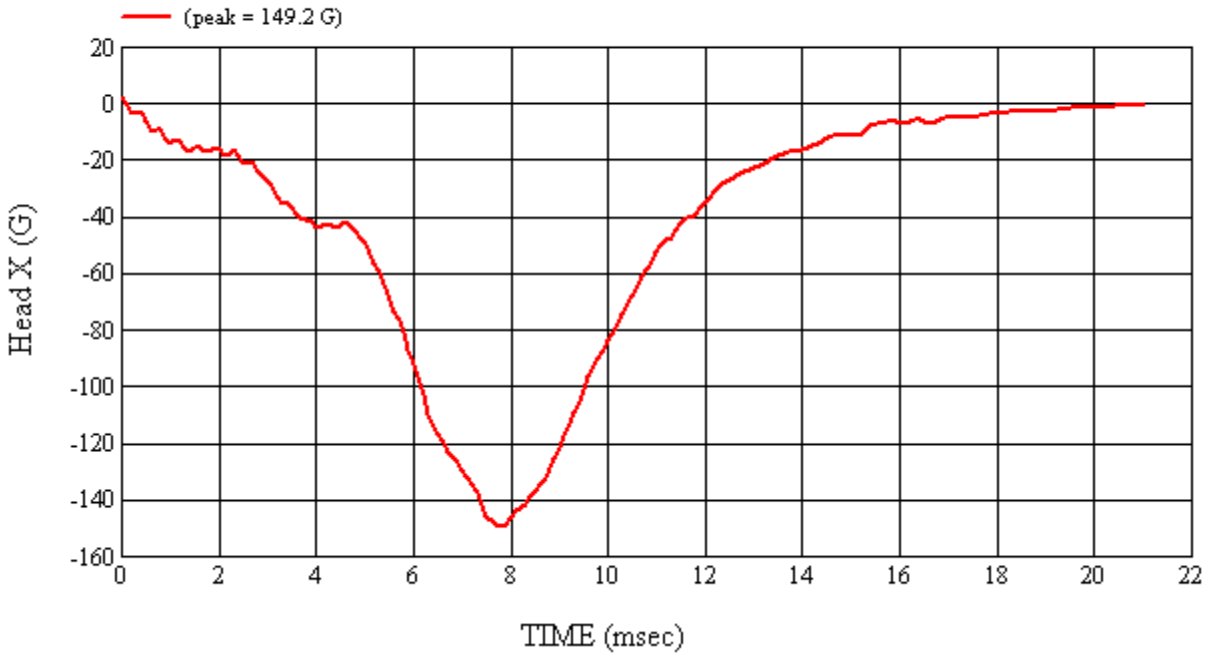
Recorded By: _____ Approved By*: _____ Date: 4/26/2011

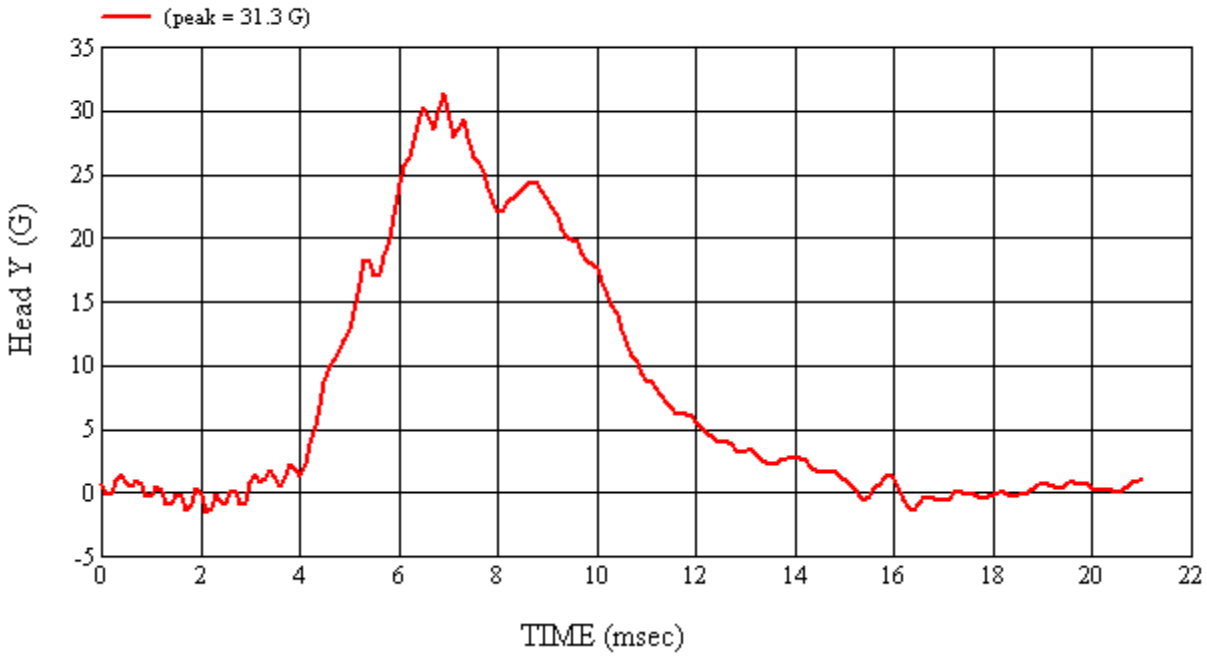
*Only necessary for NHTSA (Government) Compliance testing.

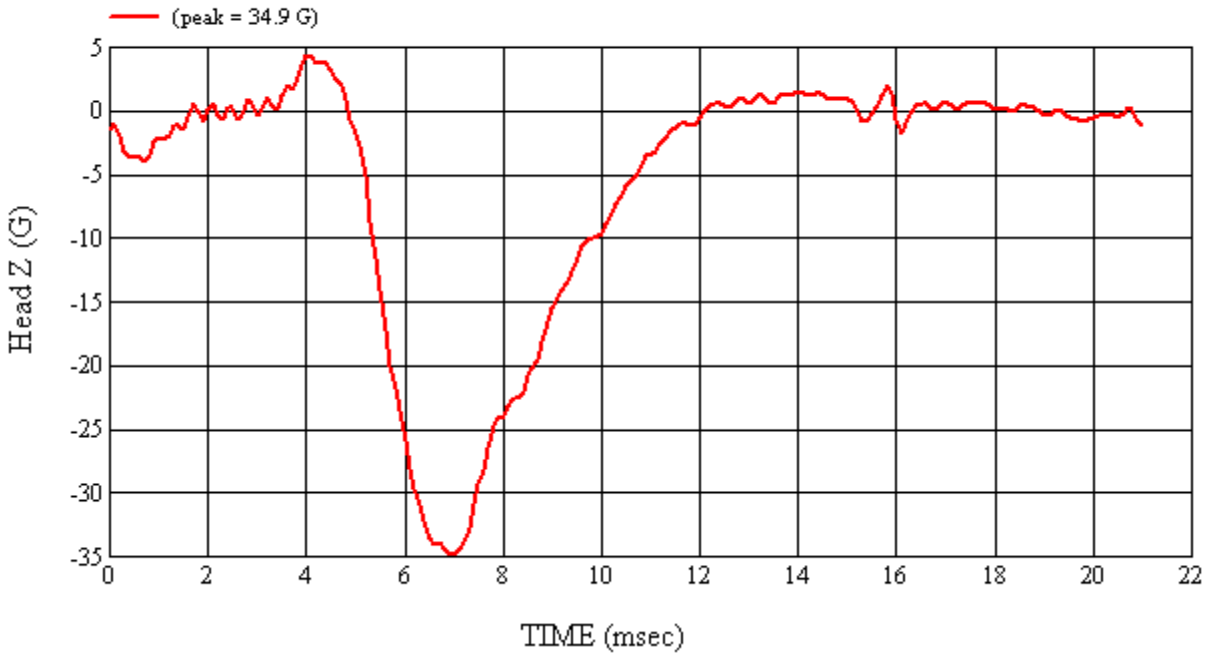
MGA Test #: U11129 Target Location: BP3, Right Side Test Date: 4/26/2011

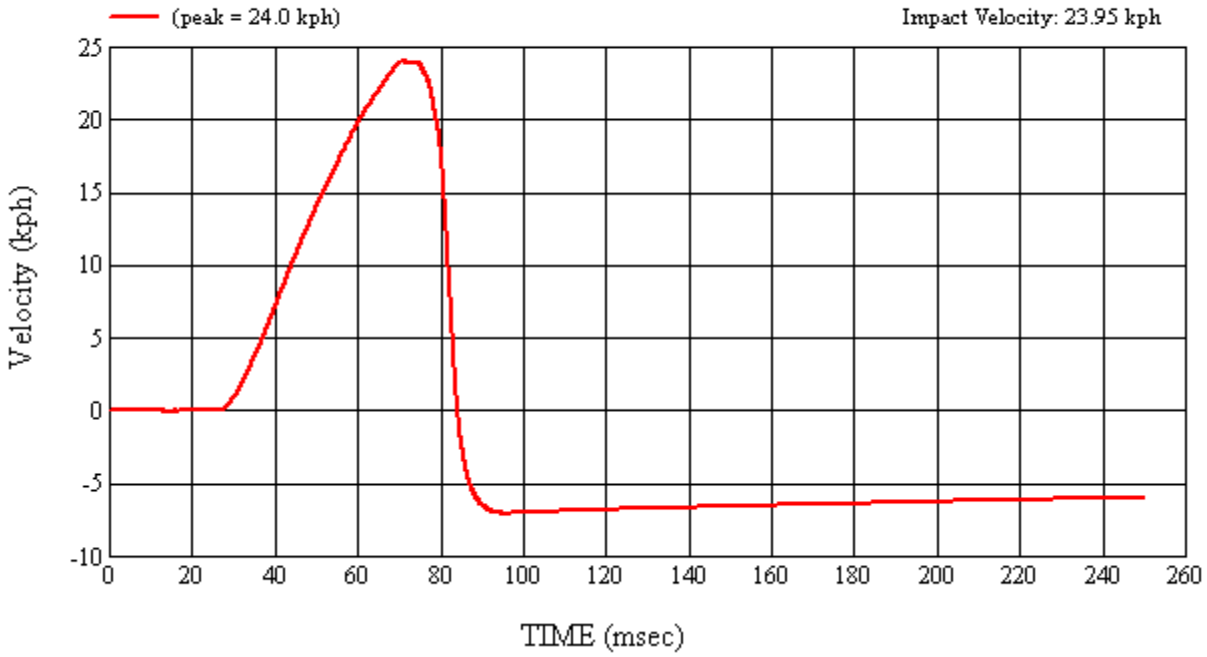


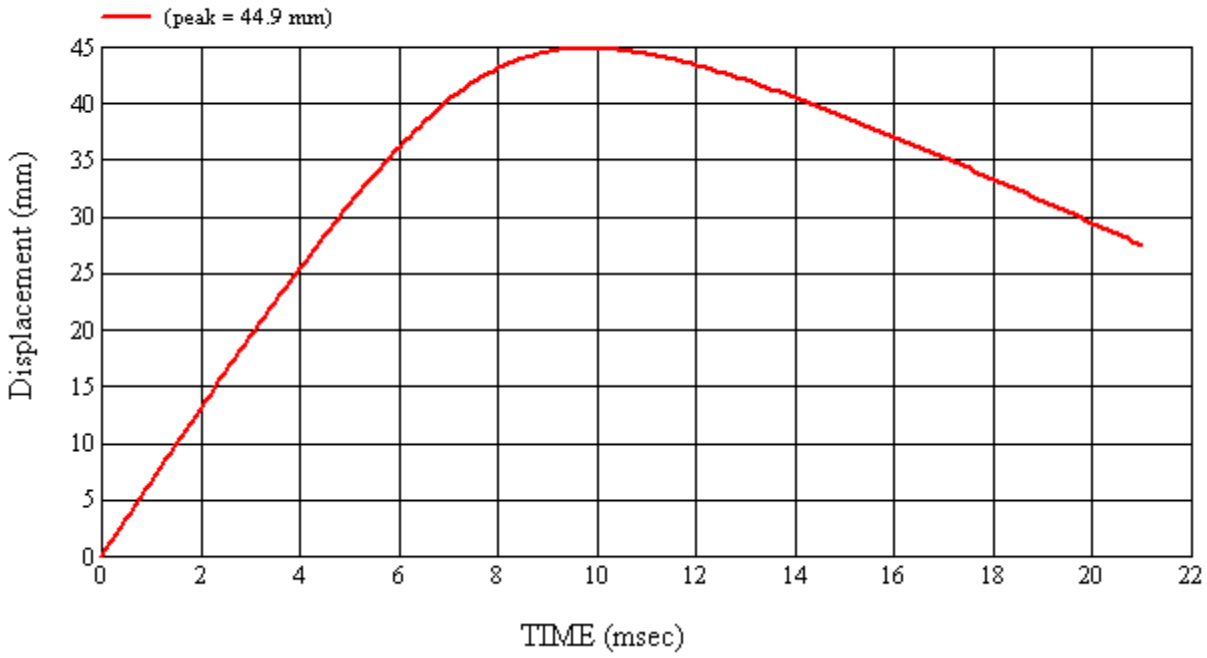



(peak = 149.2 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
-160
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

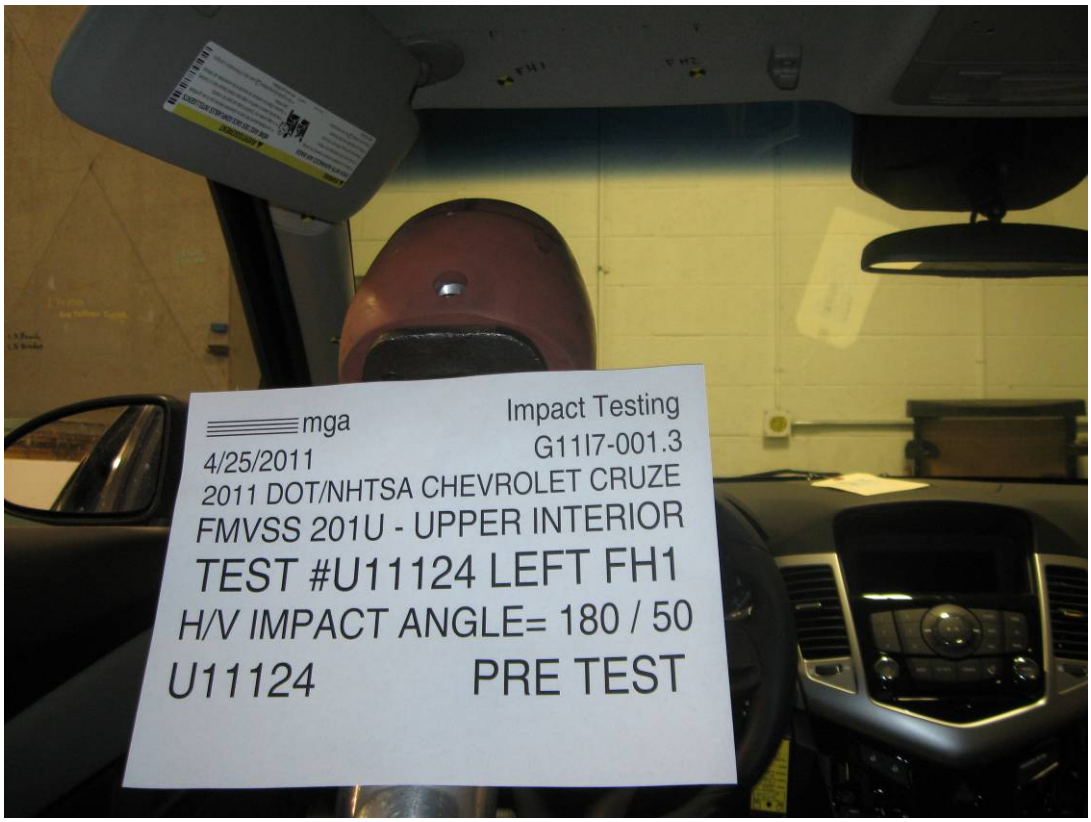

(peak = 31.3 G)
Head Y (G)
35
30
25
20
15
10
5
0
-5
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 34.9 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
-35
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 24.0 kph)
Impact Velocity: 23.95 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 44.9 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

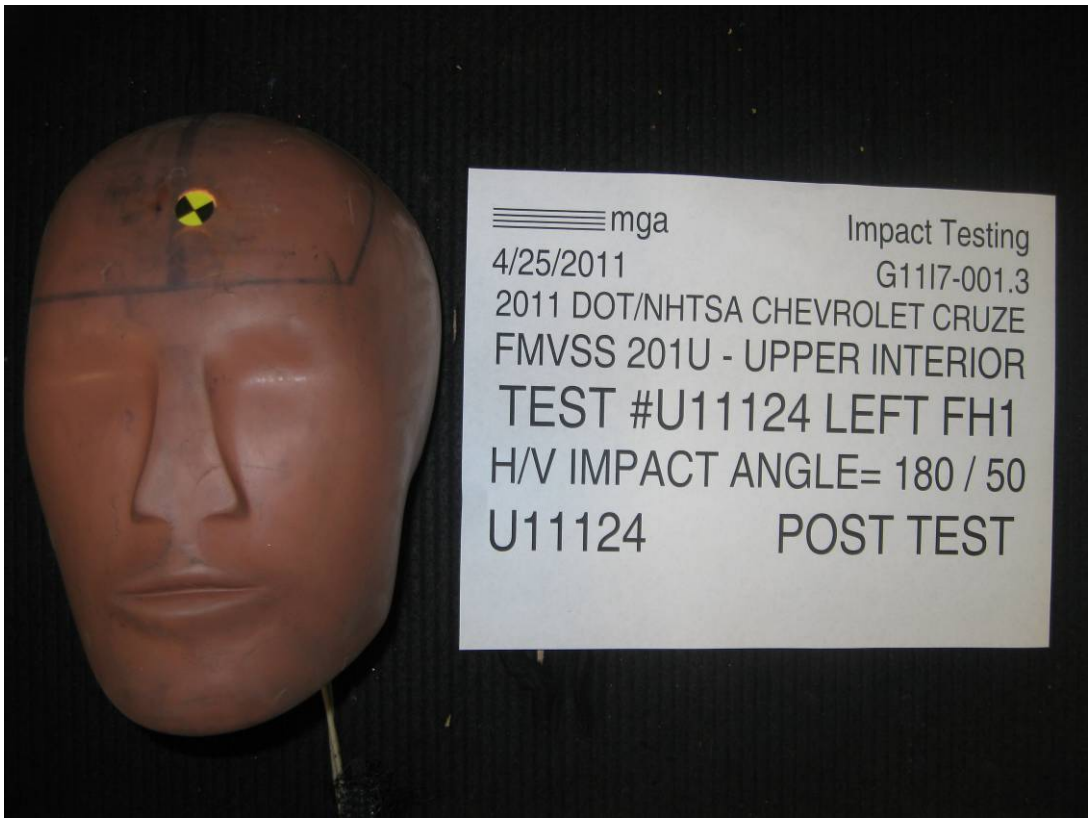

mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11124 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U11124
PRE TEST


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11124 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U11124
PRE TEST


mga
Impact Testing
G11I7-001.3
4/25/2011
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11124 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U11124
POST TEST


mga
4/25/2011
2011 DOT/NHTSA CHEVROLET CRUZE
Impact Testing
G11I7-001.3
FMVSS 201U - UPPER INTERIOR
TEST #U11124 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U11124
POST TEST


FH1


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11124 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U11124
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Test Number:#U11124

Target (Vehicle Side): FH1Left

Temperature:21.6C

MGA Test Reference No.:U11124

Humidity:43.4%

Approach Horizontal Angles:180º

Time of Test:11:18:04 AM

Approach Vertical Angles:50º

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
605	582	6.1	23.9	26	5 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J32177	-113.7	1.07	1.07
Y	6	J14103	93.9	0.85	0.85
Z	7	J35800	97.8	0.94	0.94

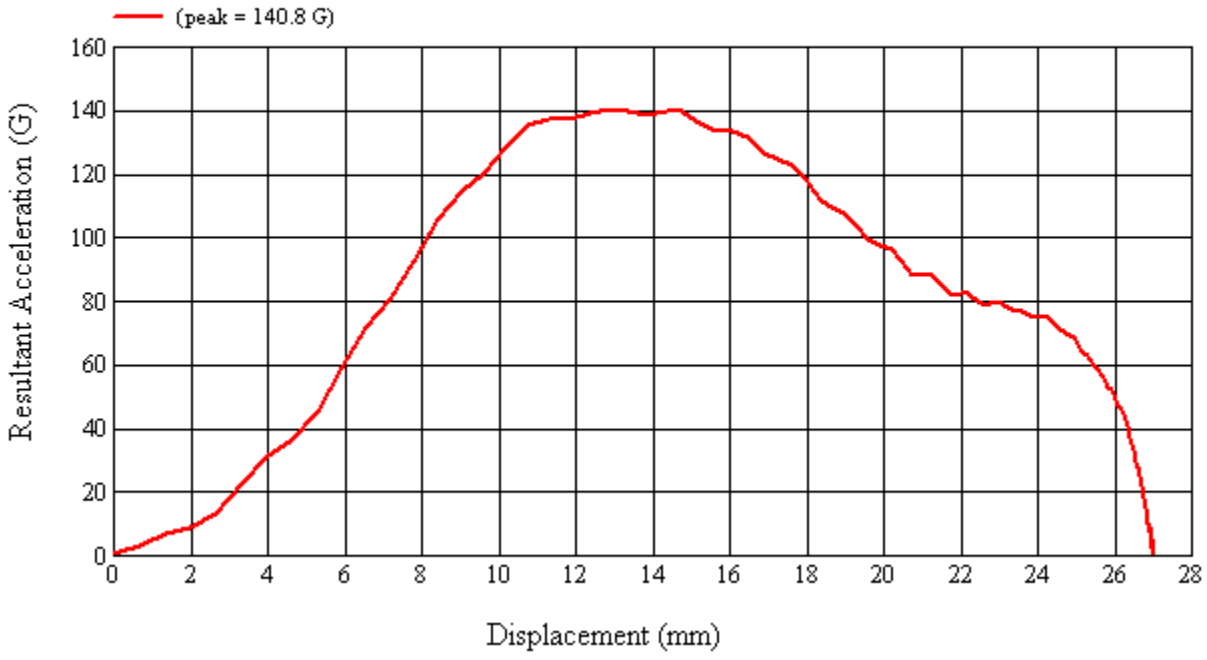
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

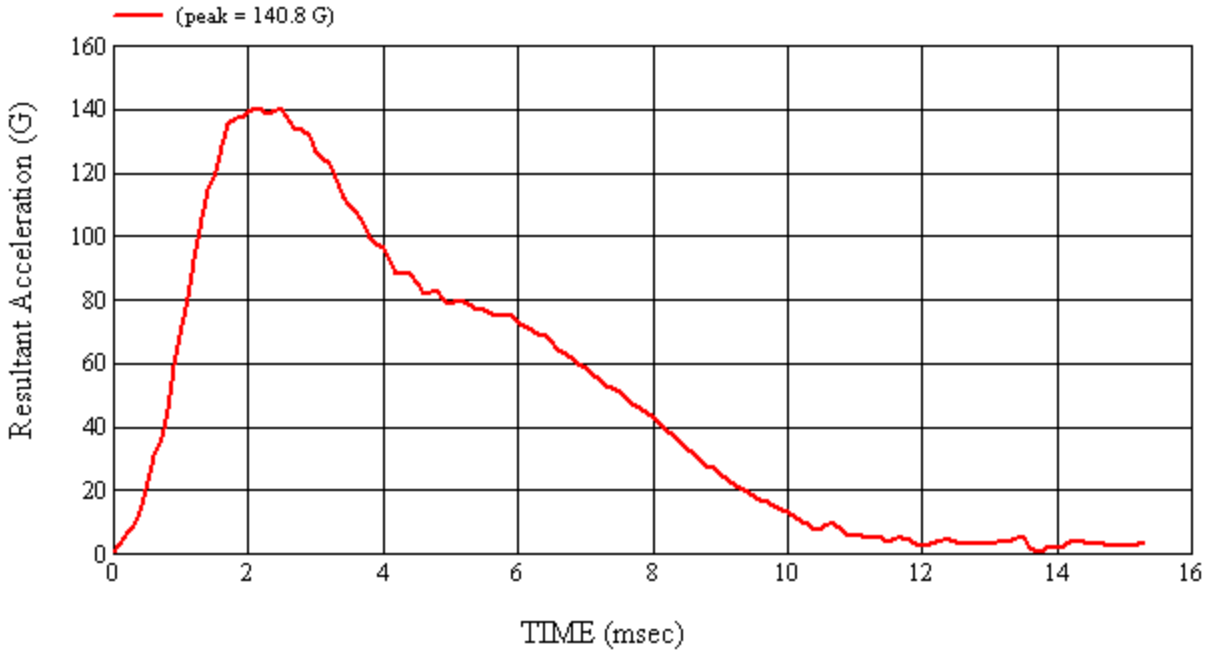
Broken windshield.

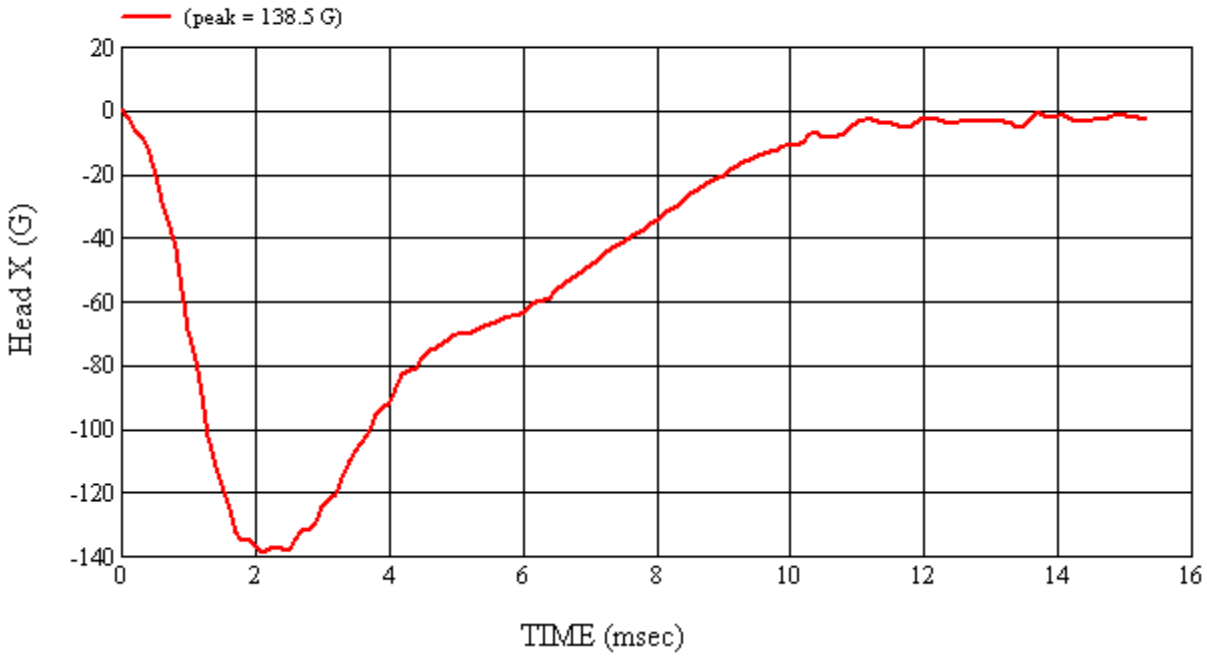
Recorded By: _____ Approved By*: _____ Date: 4/25/2011

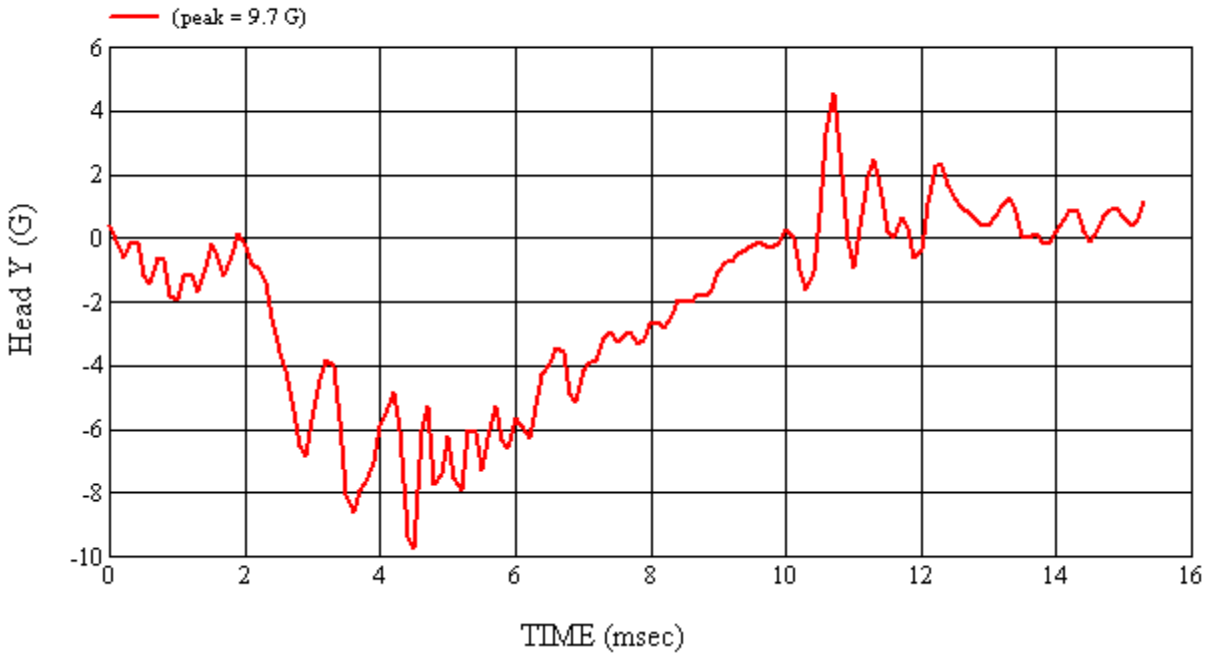
*Only necessary for NHTSA (Government) Compliance testing.

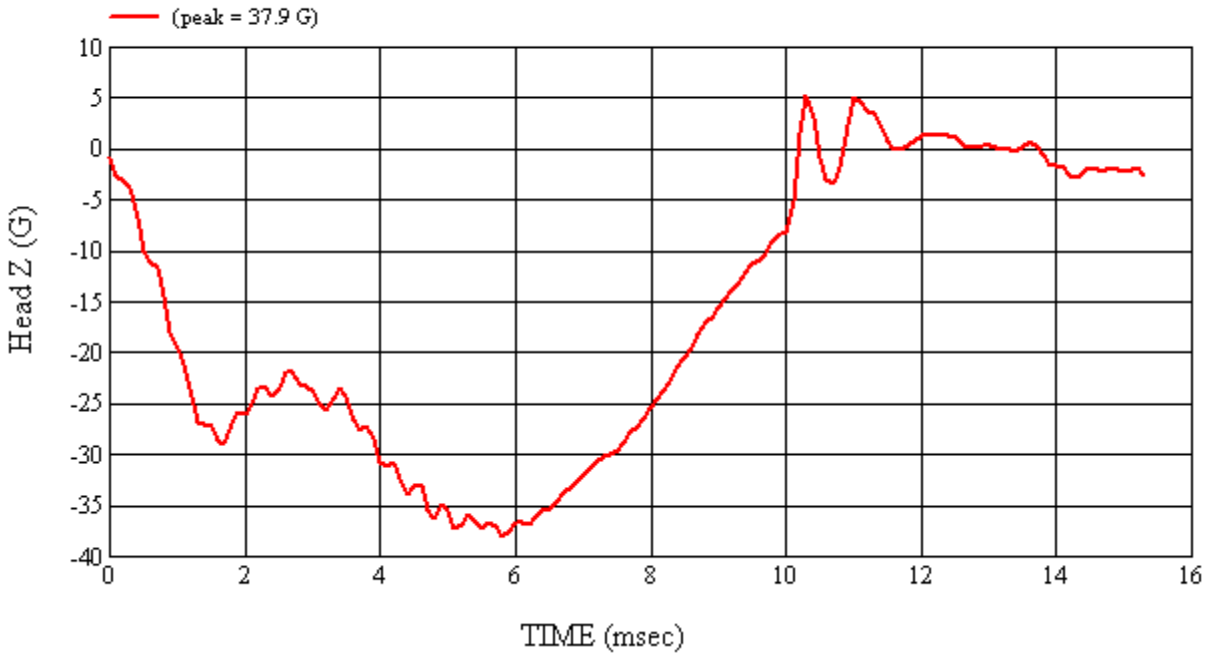
MGA Test #: U11124 Target Location: FH1, Left Side Test Date: 4/25/2011

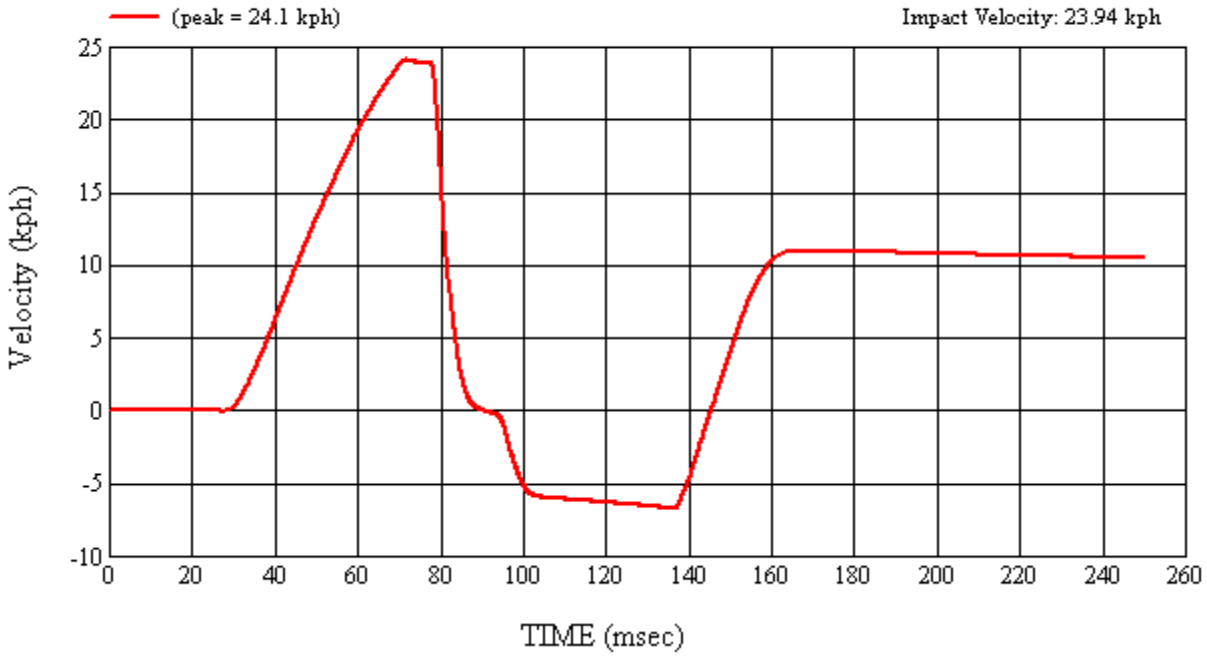


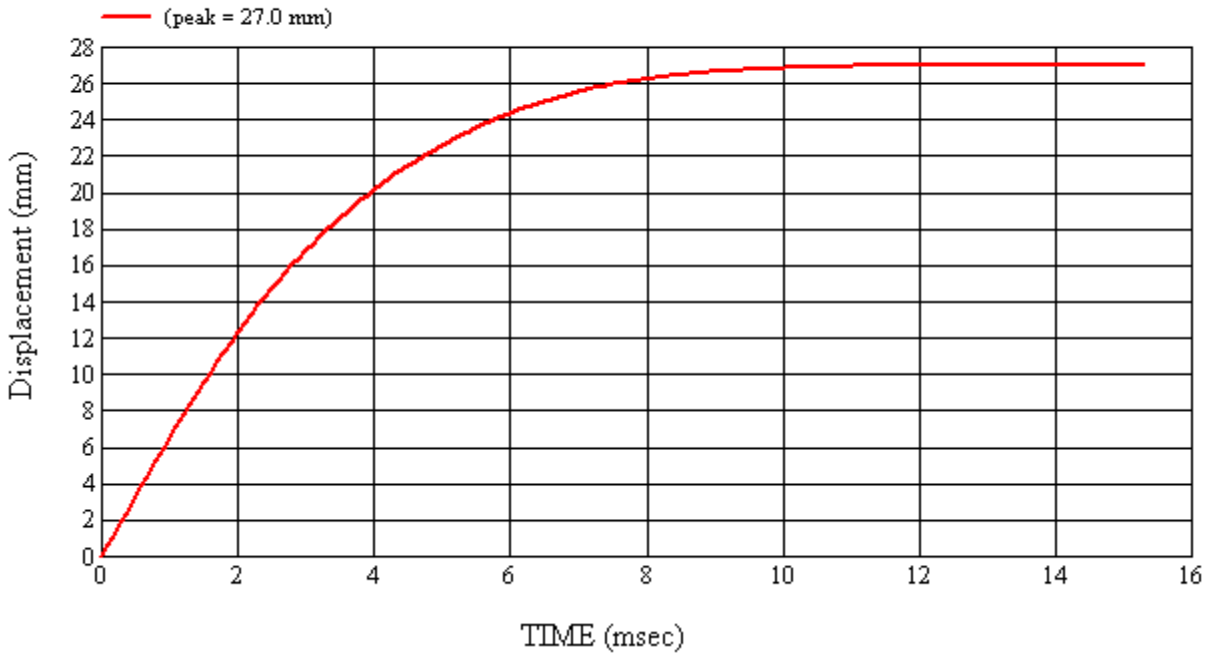


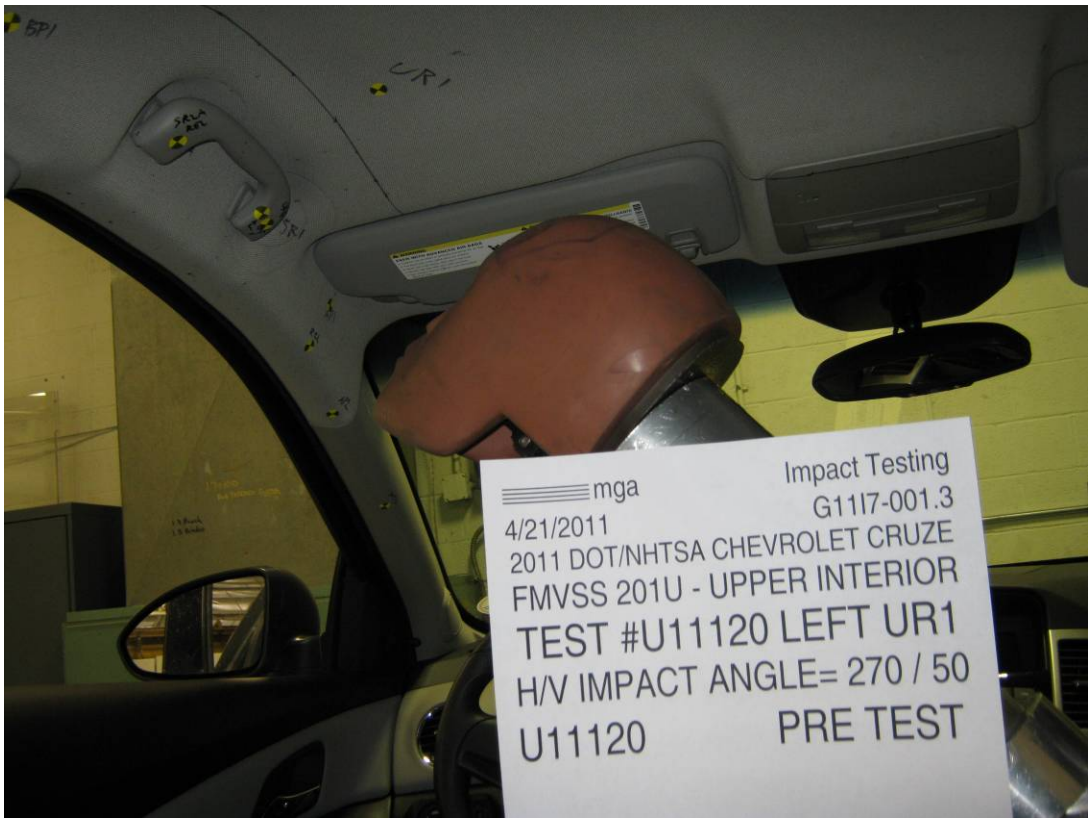

(peak = 138.5 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
16
TIME (msec)


(peak = 9.7 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
-10
0
2
4
6
8
10
12
14
16
TIME (msec)

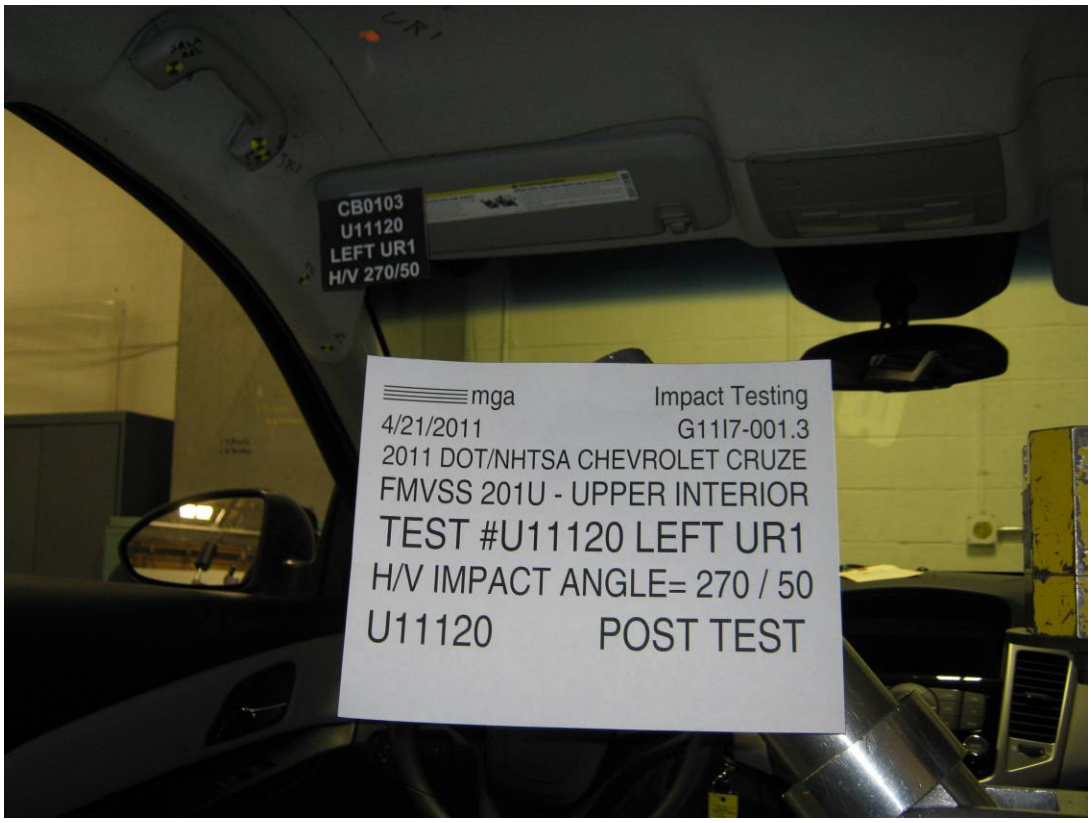

(peak = 37.9 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0
2
4
6
8
10
12
14
16
TIME (msec)


(peak = 24.1 kph)
Impact Velocity: 23.94 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 27.0 mm)
Displacement (mm)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
0
2
4
6
8
10
12
14
16
TIME (msec)


mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11120 LEFT UR1
H/V IMPACT ANGLE= 270 / 50
U11120
PRE TEST


UR3
UR1
mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11120 LEFT UR1
H/V IMPACT ANGLE= 270 / 50
U11120
PRE TEST


CB0103
U11120
LEFT UR1
H/V 270/50
mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11120 LEFT UR1
H/V IMPACT ANGLE= 270 / 50
U11120
POST TEST


UR3
UR1
mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11120 LEFT UR1
H/V IMPACT ANGLE= 270 / 50
U11120
POST TEST
CB0103
U11120
LEFT UR1
H/V 270/50


UR1
CB0103


mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11120 LEFT UR1
H/V IMPACT ANGLE= 270 / 50
U11120
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR1Left

MGA Test Reference No.:U11120

Approach Horizontal Angles:270º

Approach Vertical Angles:50º

Additional Description:@SR1

Test Number:#U11120

Temperature:22.0C

Humidity:27.1%

Time of Test:12:39:35 PM

FMH Serial No:[035]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
756	782	8.3	23.8	35	9 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.8	1.07	1.07
Y	6	J22664	94.2	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

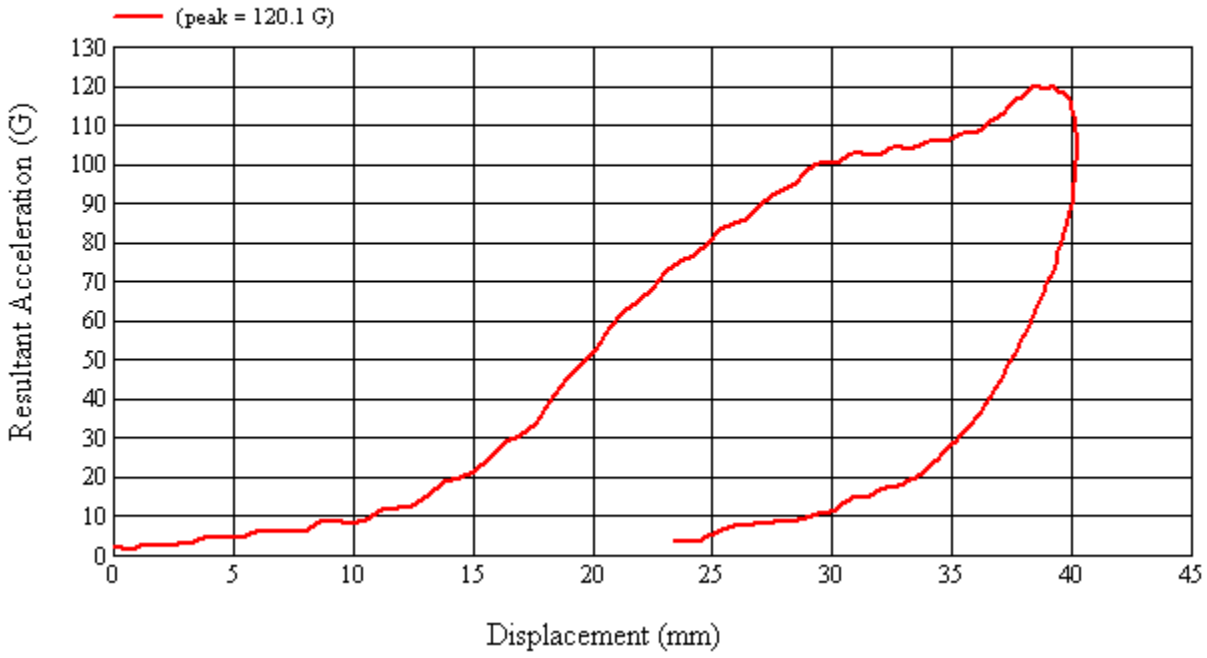
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

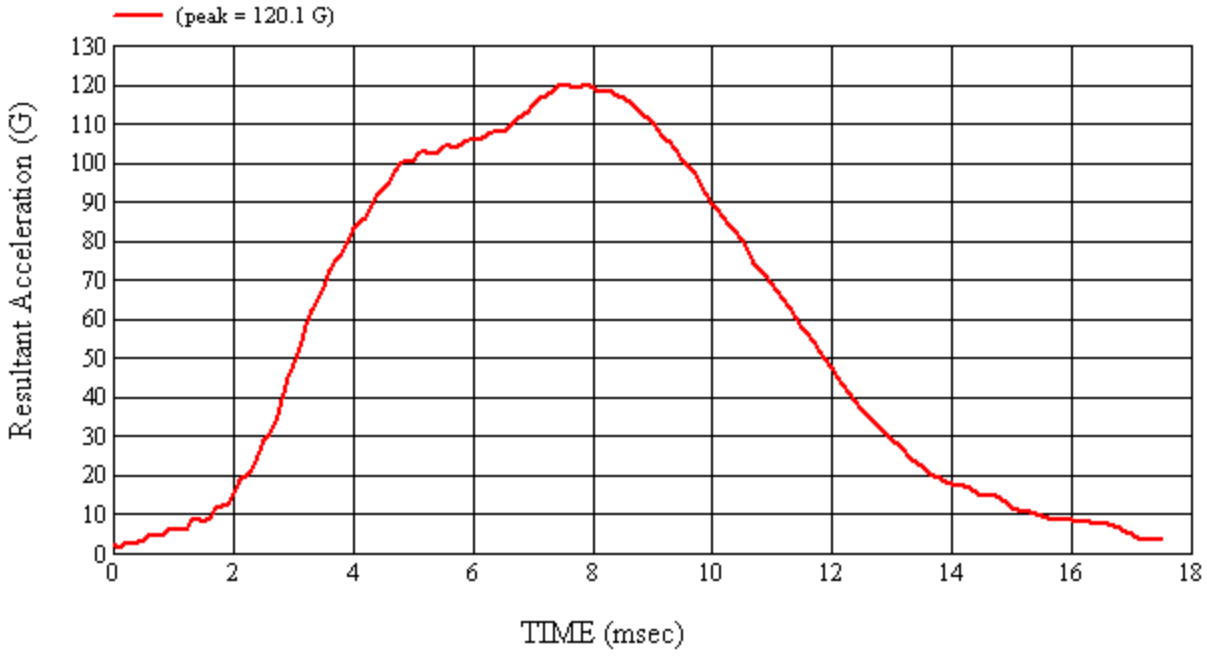
No visible damage.

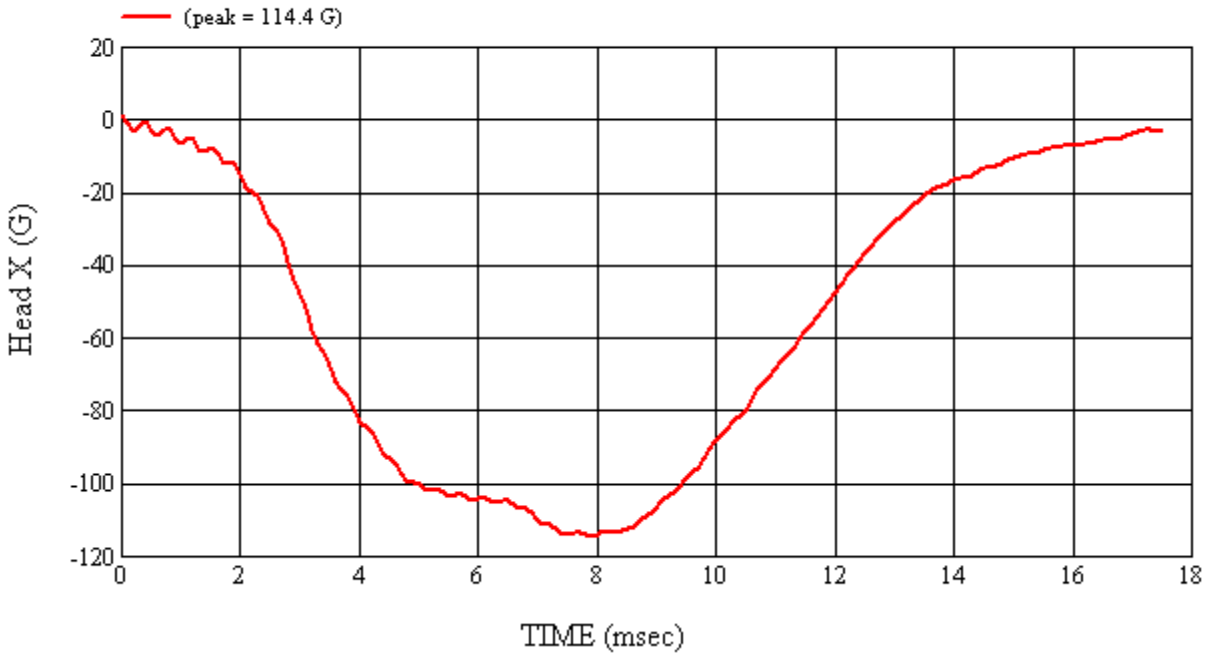
Recorded By: _____ Approved By*: _____ Date: 4/21/2011

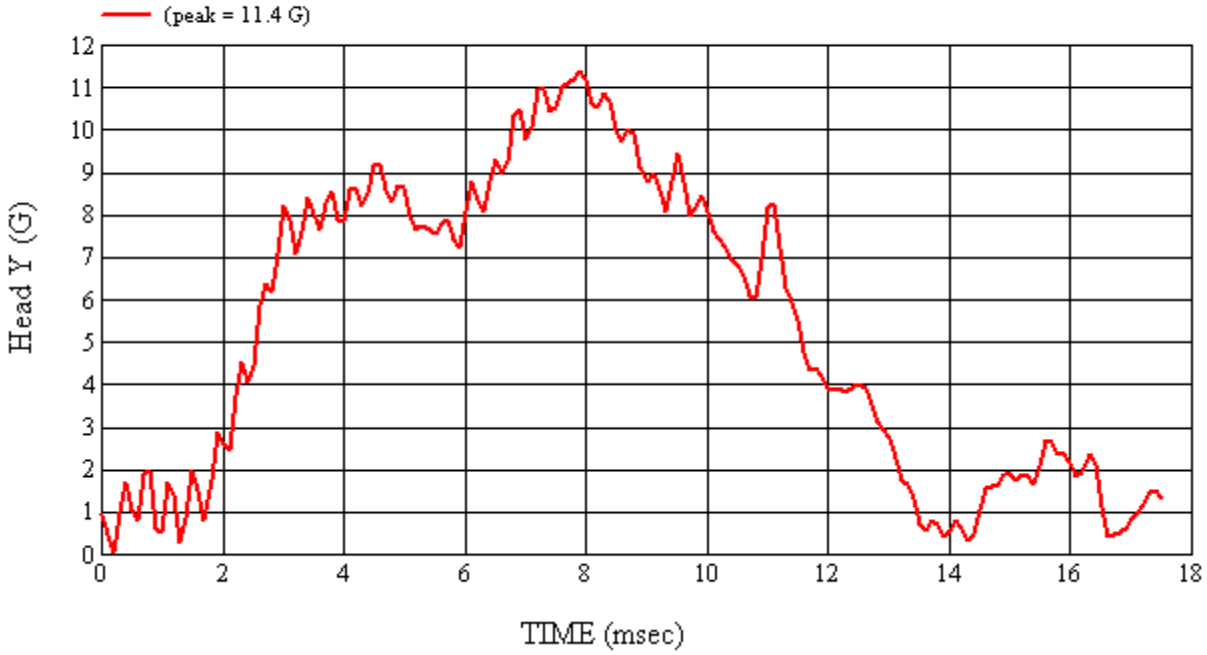
*Only necessary for NHTSA (Government) Compliance testing.

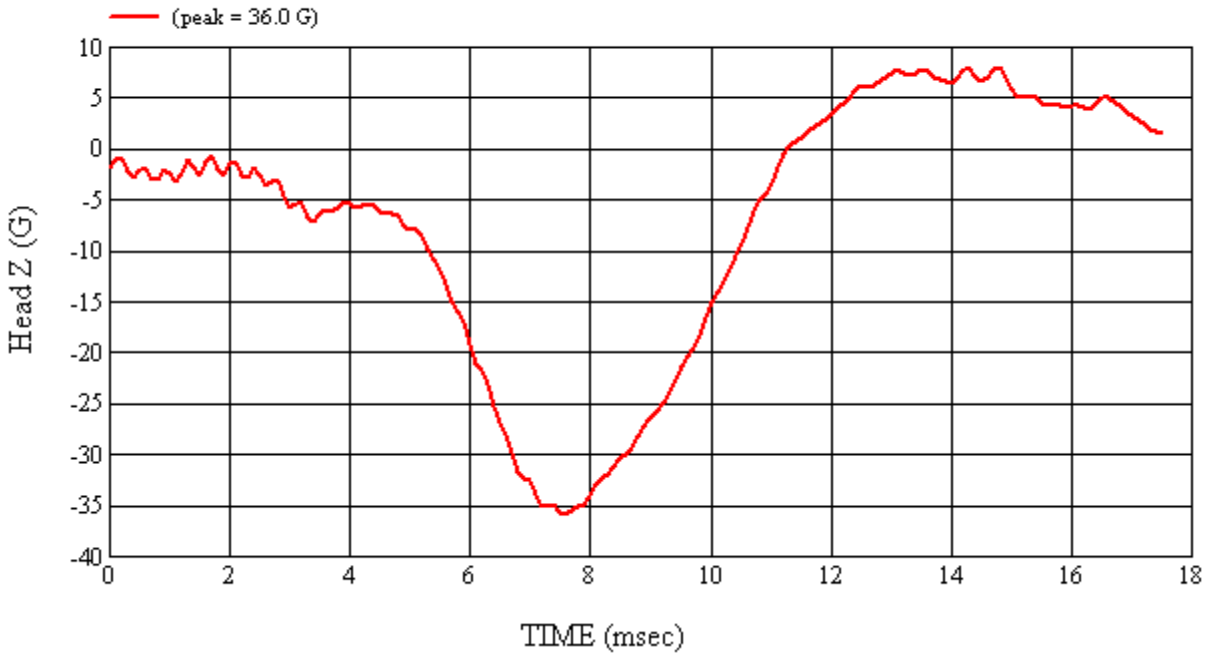
MGA Test #: U11120 Target Location: UR1, Left Side Test Date: 4/21/2011

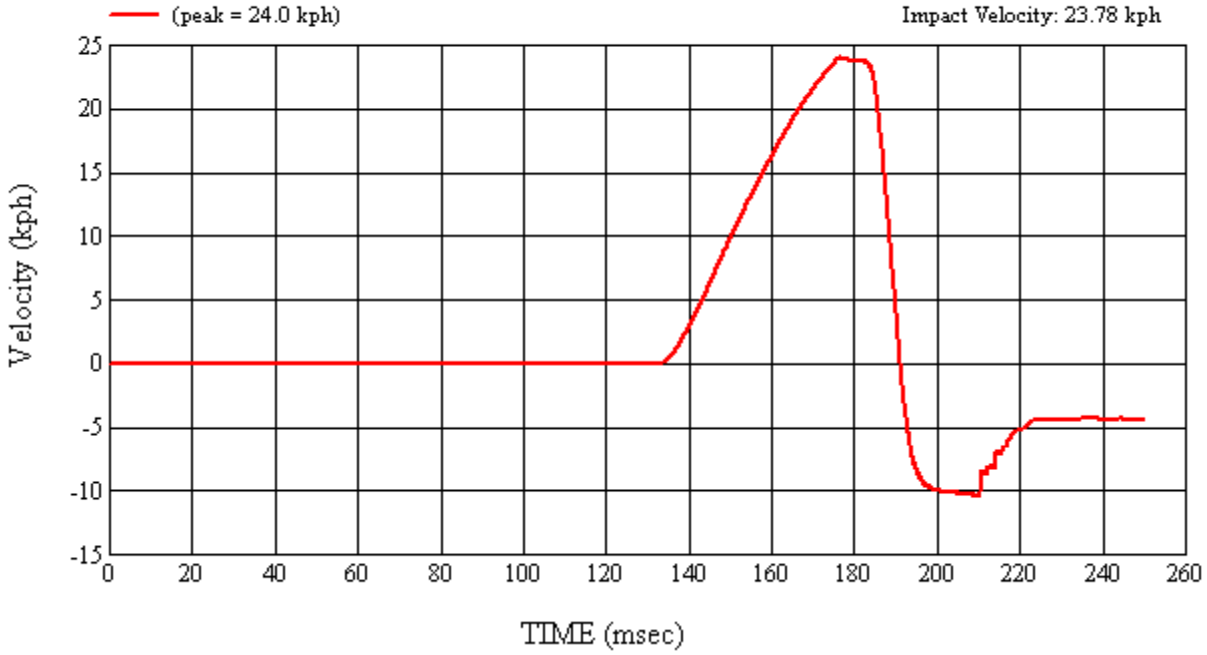


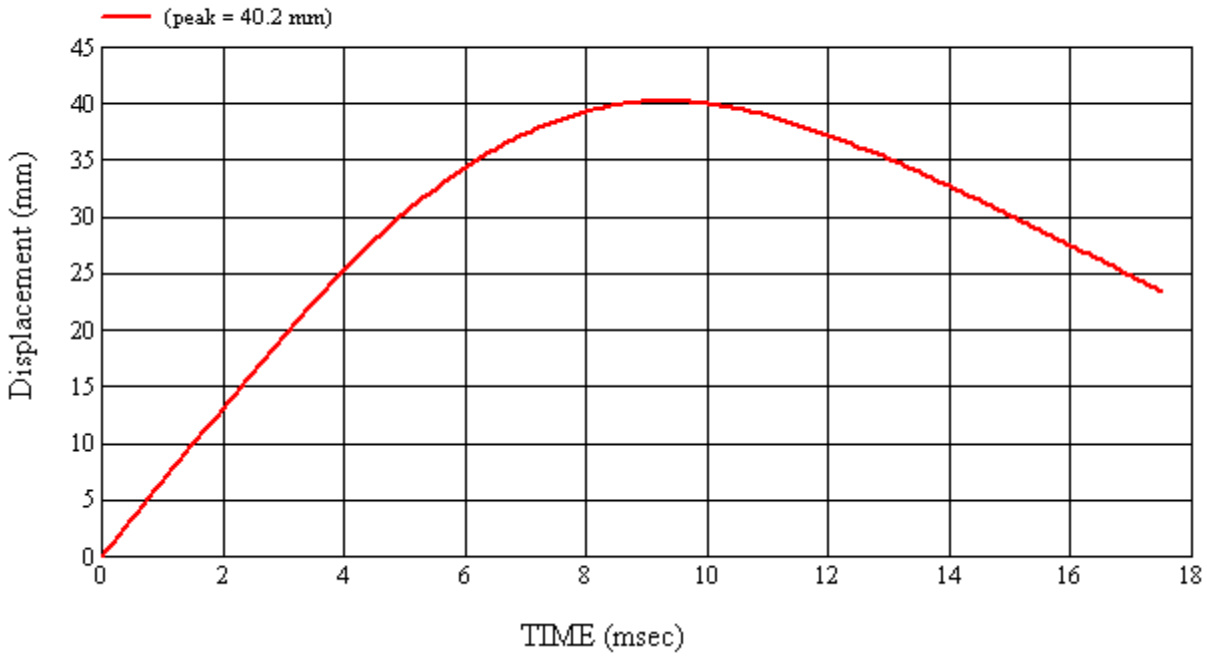



(peak = 114.4 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
TIME (msec)

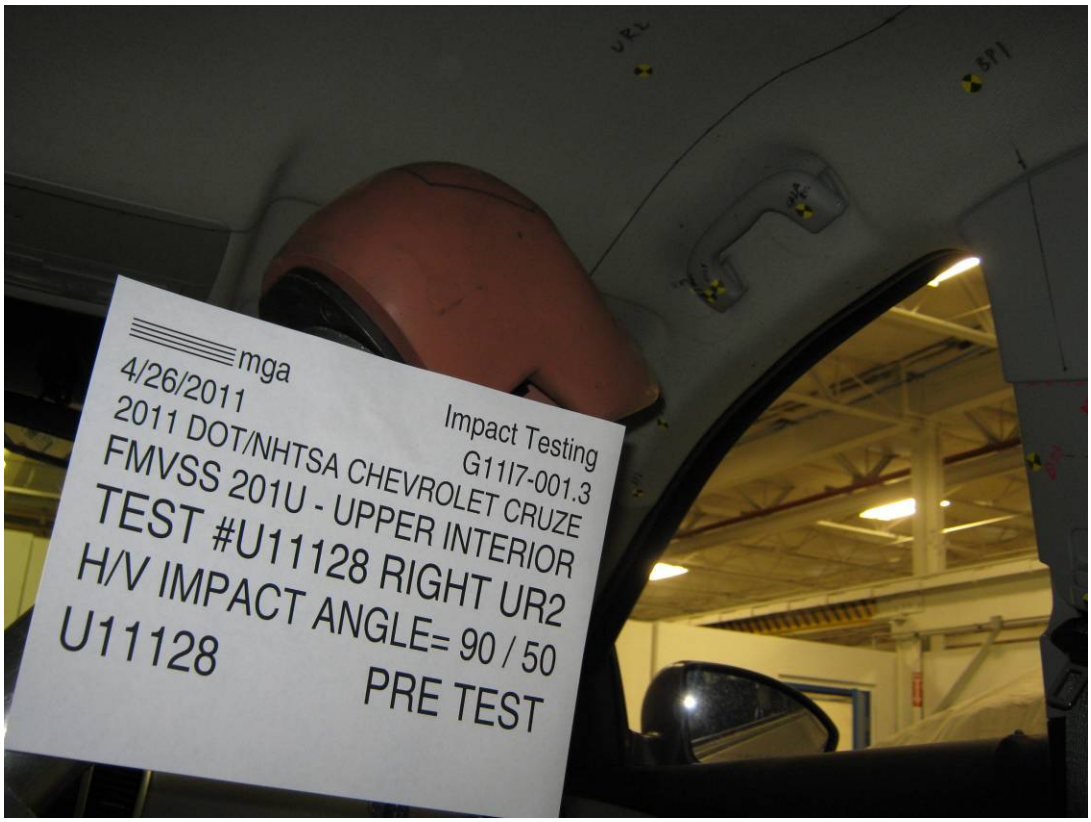

(peak = 11.4 G)
Head Y (G)
12
11
10
9
8
7
6
5
4
3
2
1
0
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 36.0 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 24.0 kph)
Impact Velocity: 23.78 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

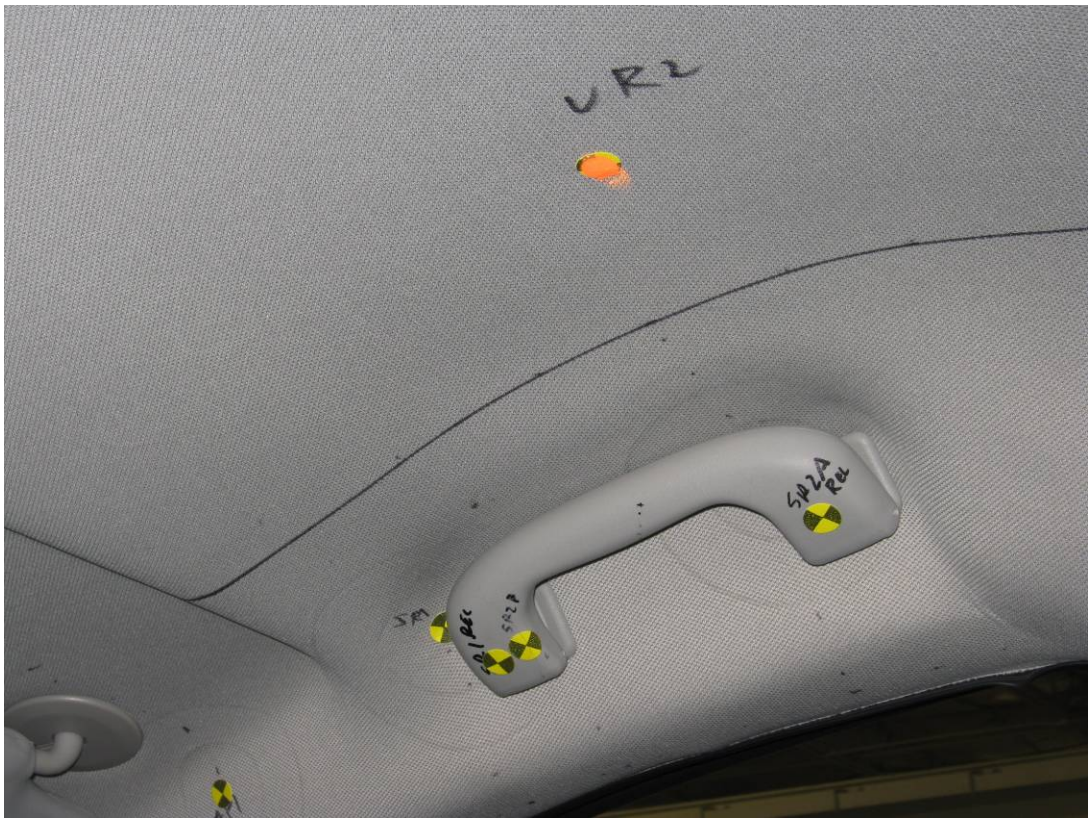

(peak = 40.2 mm)
Displacement (mm)
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
TIME (msec)


mga
Impact Testing
G11I7-001.3
4/26/2011
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11128 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11128
PRE TEST


mga
4/26/2011
Impact Testing
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11128 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11128
PRE TEST


CB0103
U11128
RIGHT UR2
H/V 90/50
mga
4/26/2011
Impact Testing
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11128 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11128
POST TEST


mga
4/26/2011
Impact Testing
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11128 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11128
POST TEST


UR2
SW2A
Rel


mga
Impact Testing
4/26/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11128 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11128
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR2Right

MGA Test Reference No.:U11128

Approach Horizontal Angles:90º

Approach Vertical Angles:50º

Additional Description:@ SR2A

Test Number:#U11128

Temperature:21.3C

Humidity:51.1%

Time of Test:9:26:31 AM

FMH Serial No:[038]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
718	731	6.7	23.9	28	1 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-96.4	1.07	1.07
Y	6	J36197	108.7	0.85	0.85
Z	7	J36353	99.1	0.94	0.94

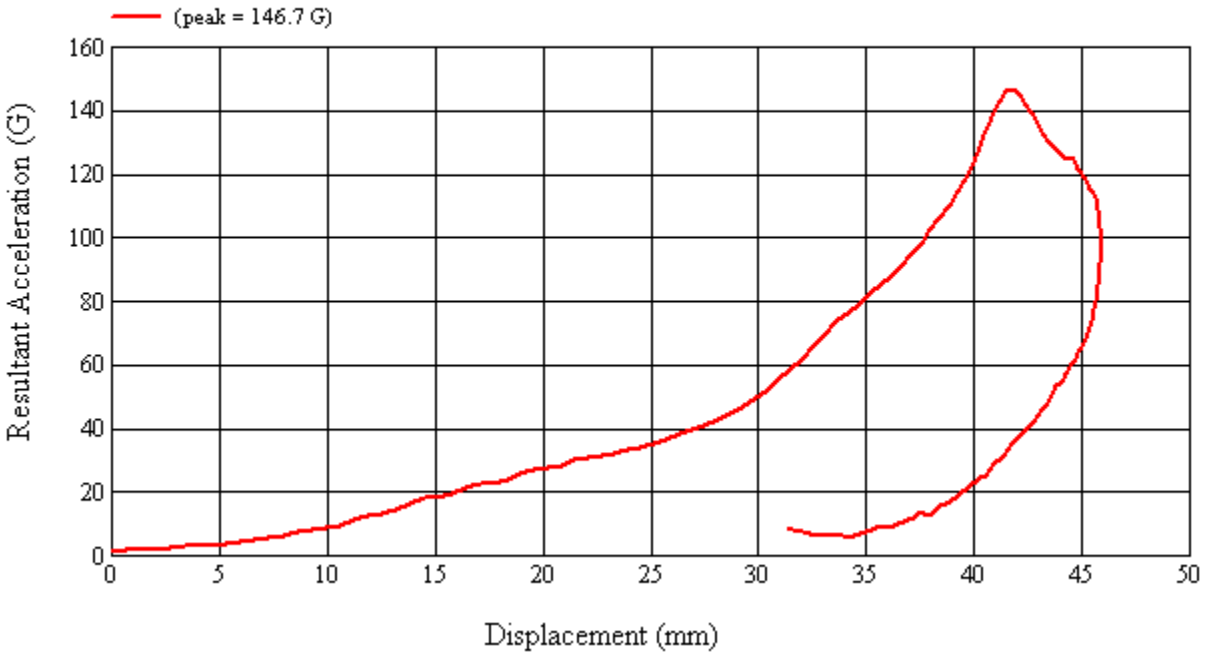
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

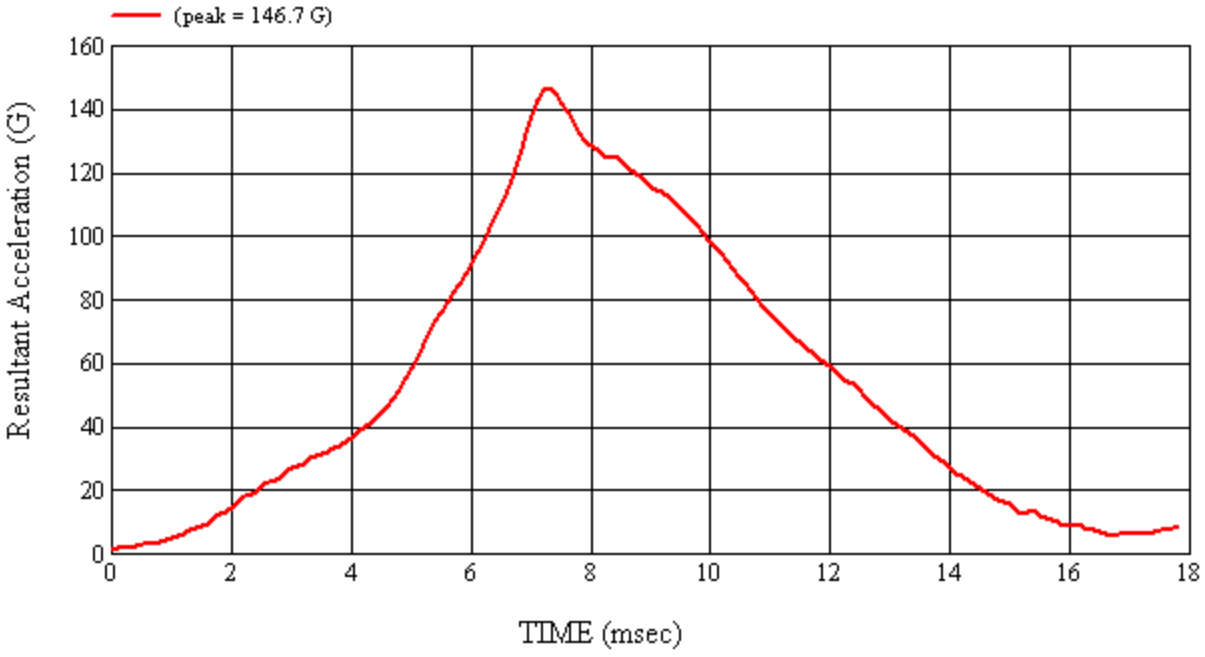
Grab handle compression, dislodged headliner.

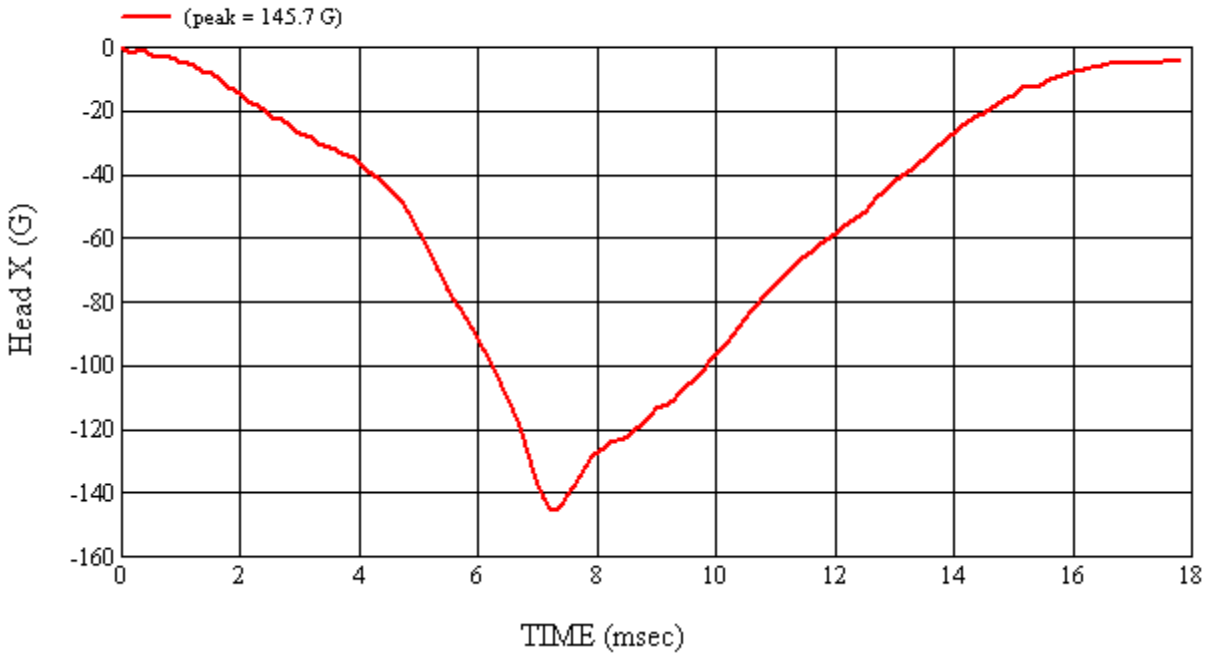
Recorded By: _____ Approved By*: _____ Date: 4/26/2011

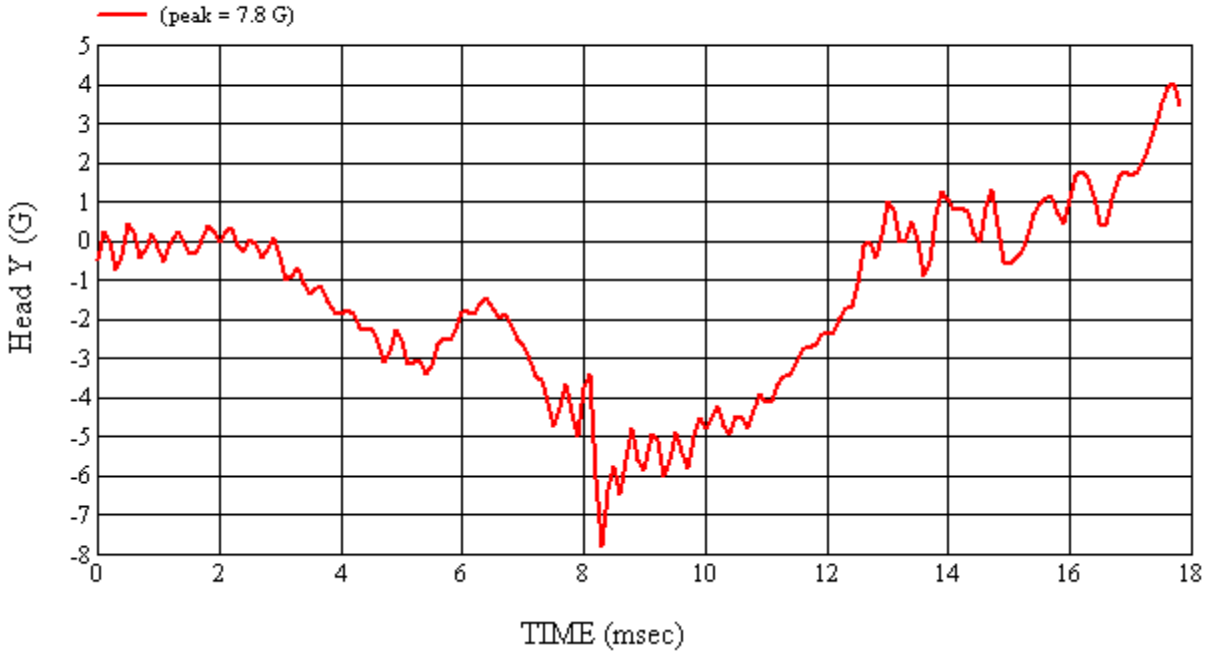
*Only necessary for NHTSA (Government) Compliance testing.

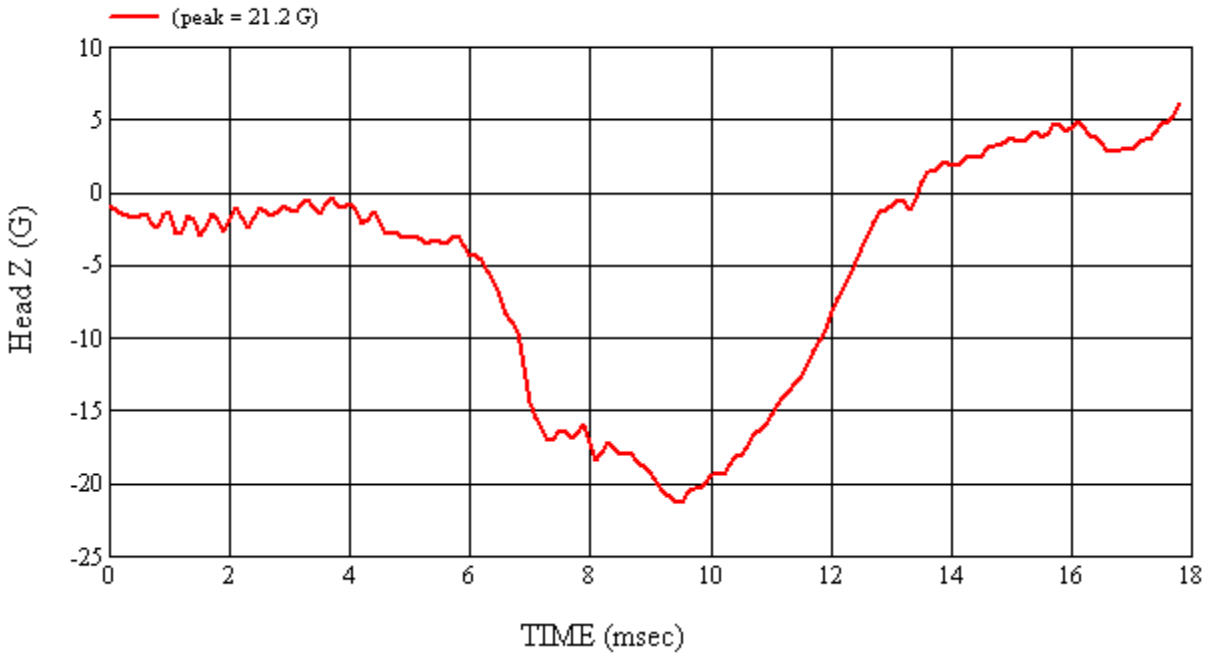
MGA Test #: U11128 Target Location: UR2, Right Side Test Date: 4/26/2011

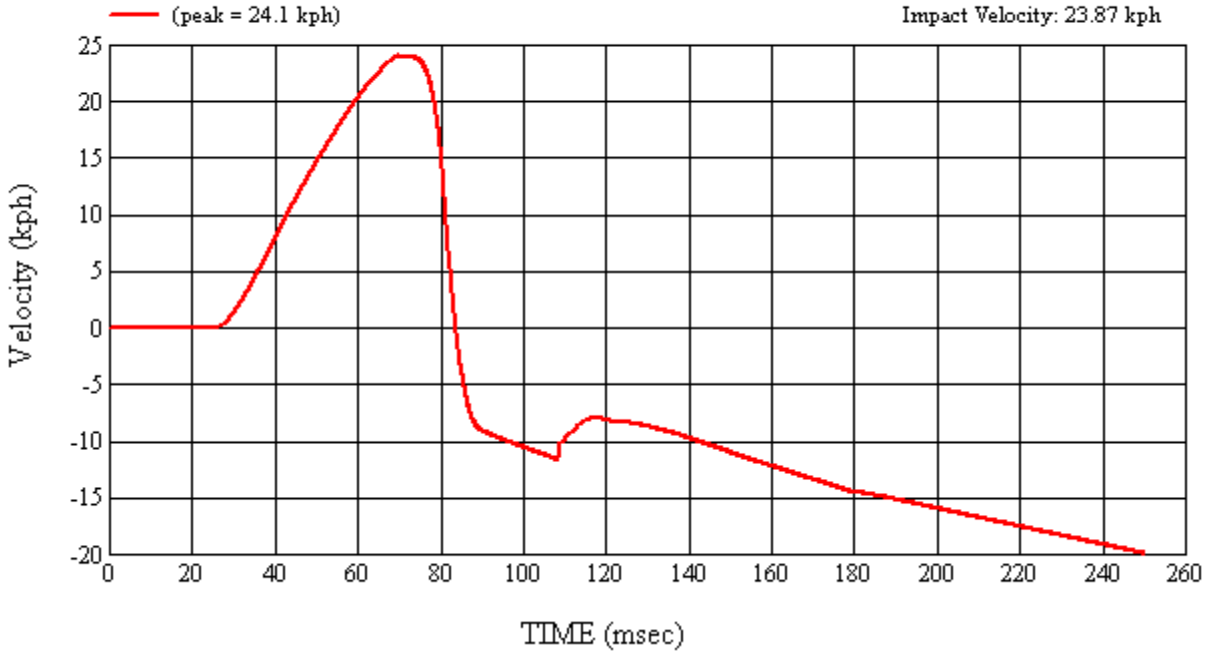


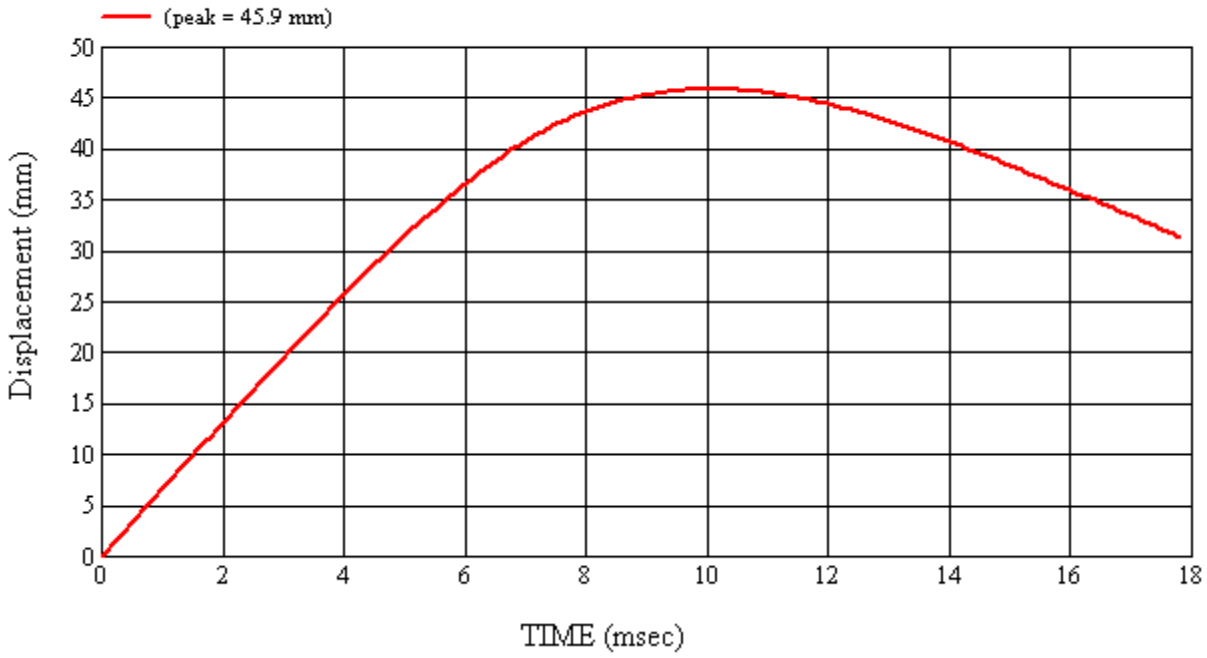


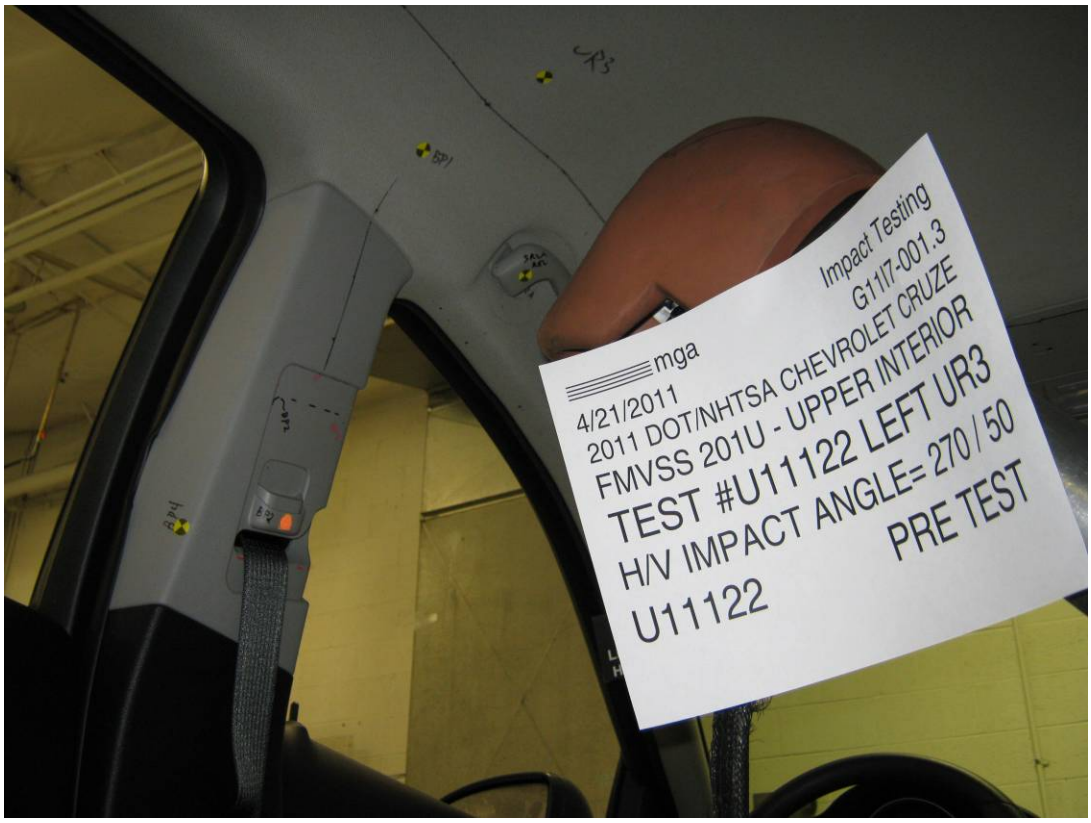

(peak = 145.7 G)
Head X (G)
0
-20
-40
-60
-80
-100
-120
-140
-160
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 7.8 G)
Head Y (G)
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 21.2 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 24.1 kph)
Impact Velocity: 23.87 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
-20
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 45.9 mm)
Displacement (mm)
50
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
TIME (msec)

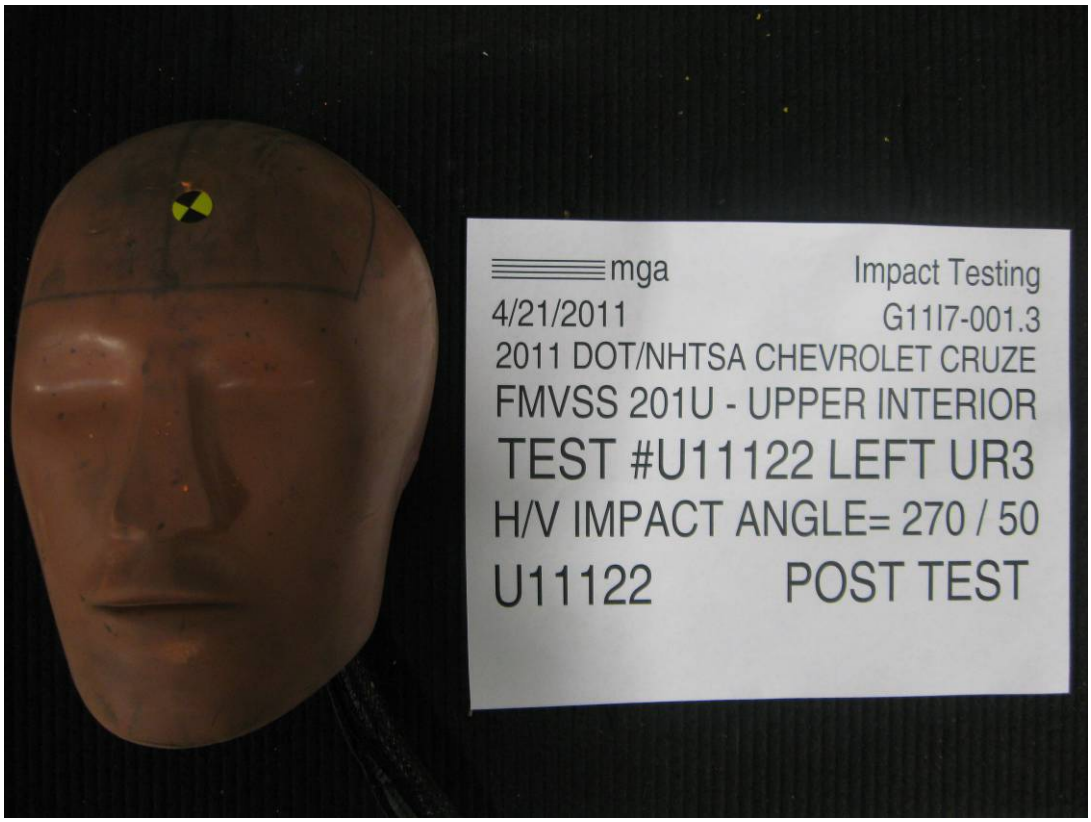

mga
Impact Testing
G11I7-001.3
4/21/2011
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11122 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U11122
PRE TEST


mga
Impact Testing
G11I7-001.3
4/21/2011
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11122 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U11122
PRE TEST


mga
4/21/2011
Impact Testing
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11122 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U11122
POST TEST
CB0103
U11122
LEFT UR3
H/V 270/50


mga
4/21/2011
Impact Testing
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11122 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U11122
POST TEST


UR3
BP1
CB0103
U11122
LEFT UR3
H/V 270/50


mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11122 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U11122
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Test Number:#U11122

Target (Vehicle Side): UR3Left

Temperature:22.1C

MGA Test Reference No.:U11122

Humidity:25.3%

Approach Horizontal Angles:270º

Time of Test:4:01:16 PM

Approach Vertical Angles:50º

FMH Serial No:[038]

Additional Description:@ BP

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
772	803	6.9	23.6	30	6 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-96.4	1.07	1.07
Y	6	J36197	108.7	0.85	0.85
Z	7	J36353	99.1	0.94	0.94

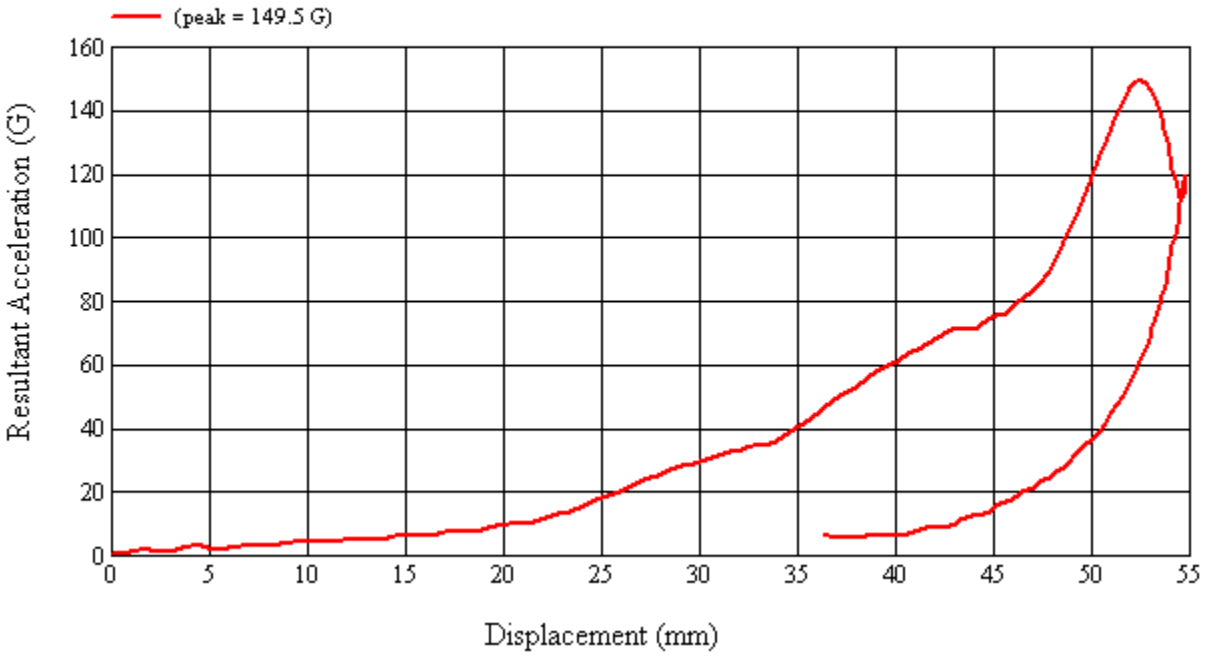
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

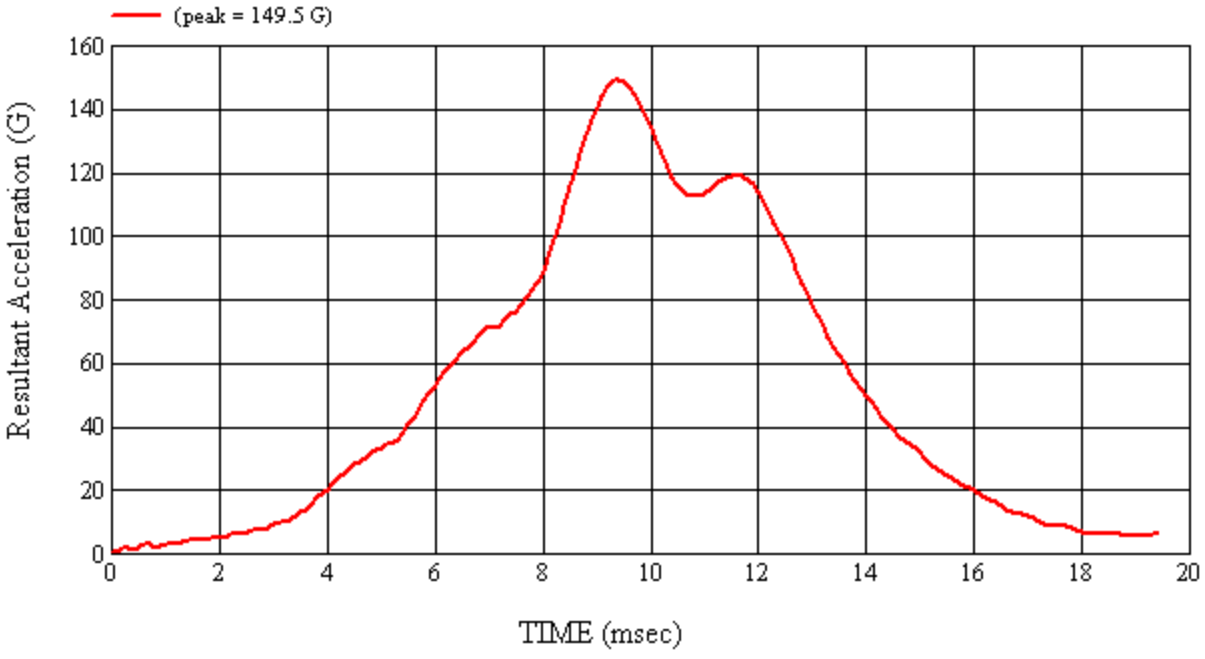
Headliner deformation

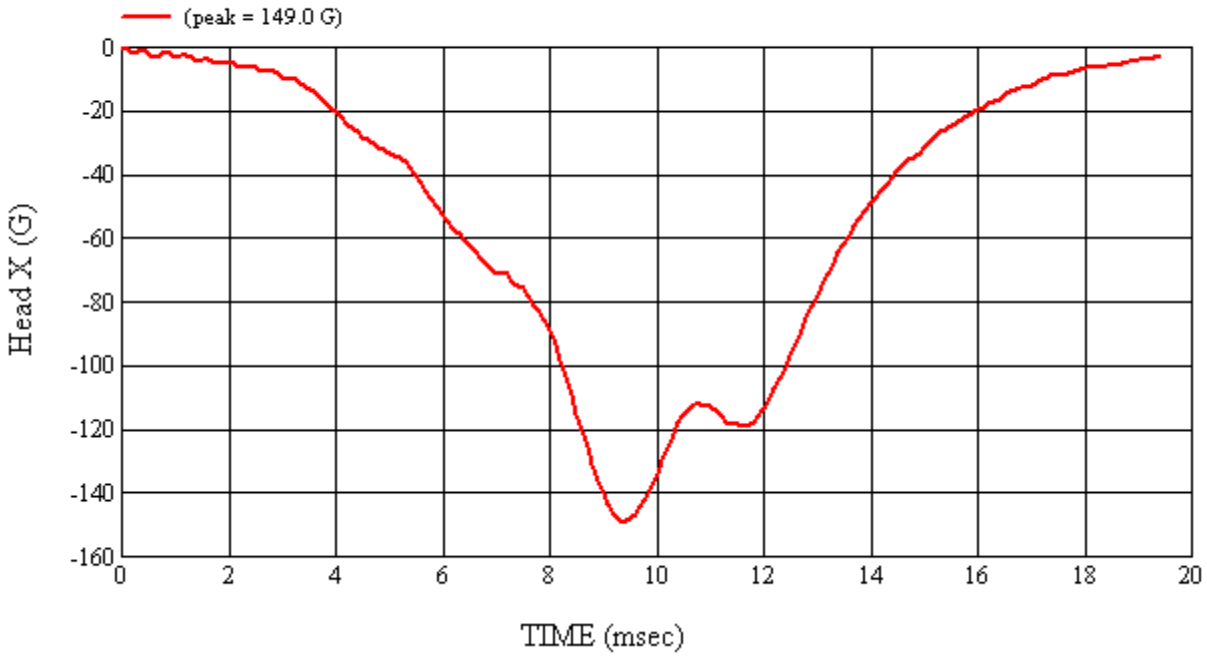
Recorded By:  Approved By*:  Date: 4/21/2011

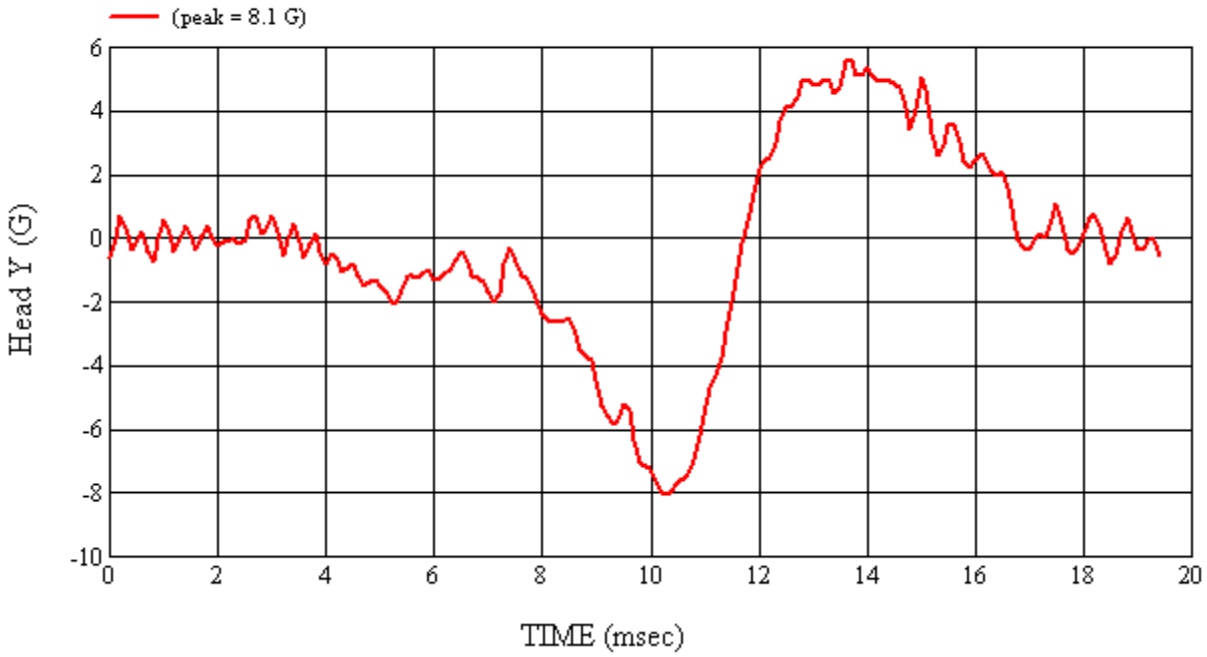
*Only necessary for NHTSA (Government) Compliance testing.

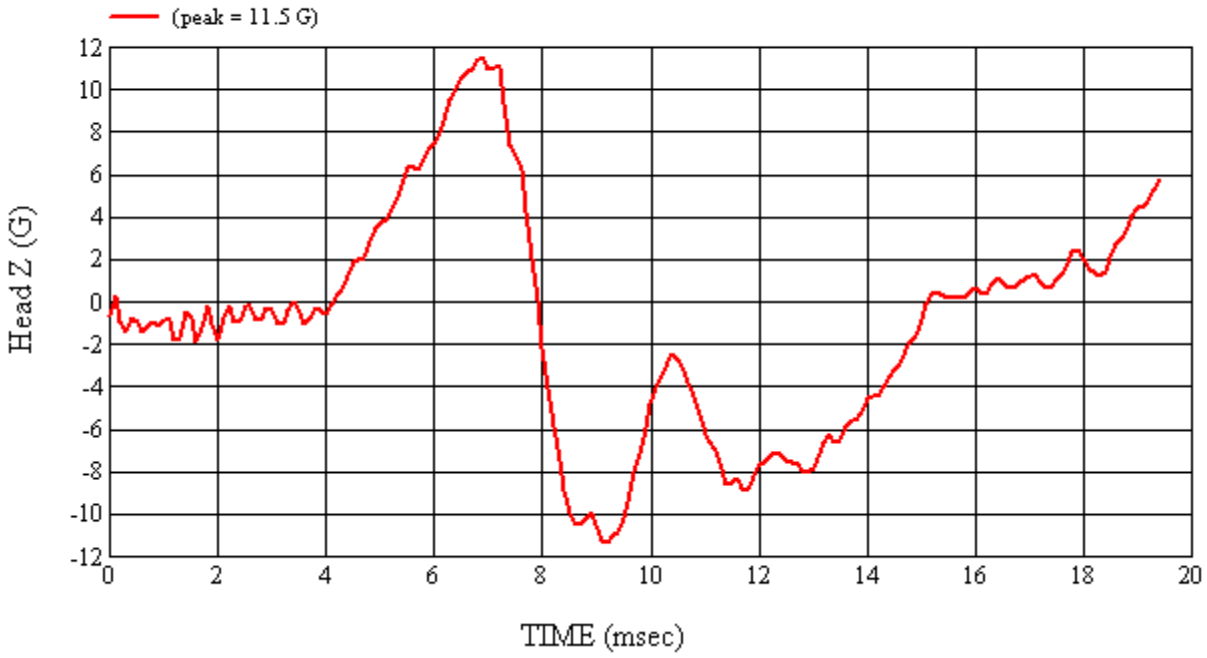
MGA Test #: U11122 Target Location: UR3, Left Side Test Date: 4/21/2011

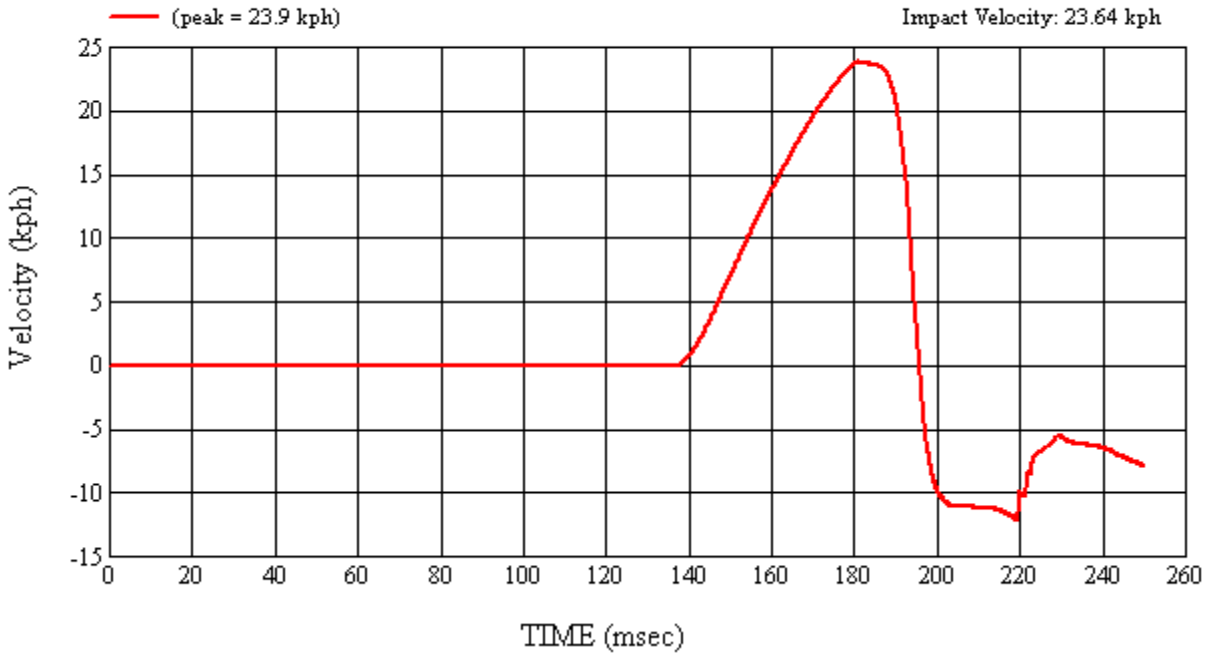


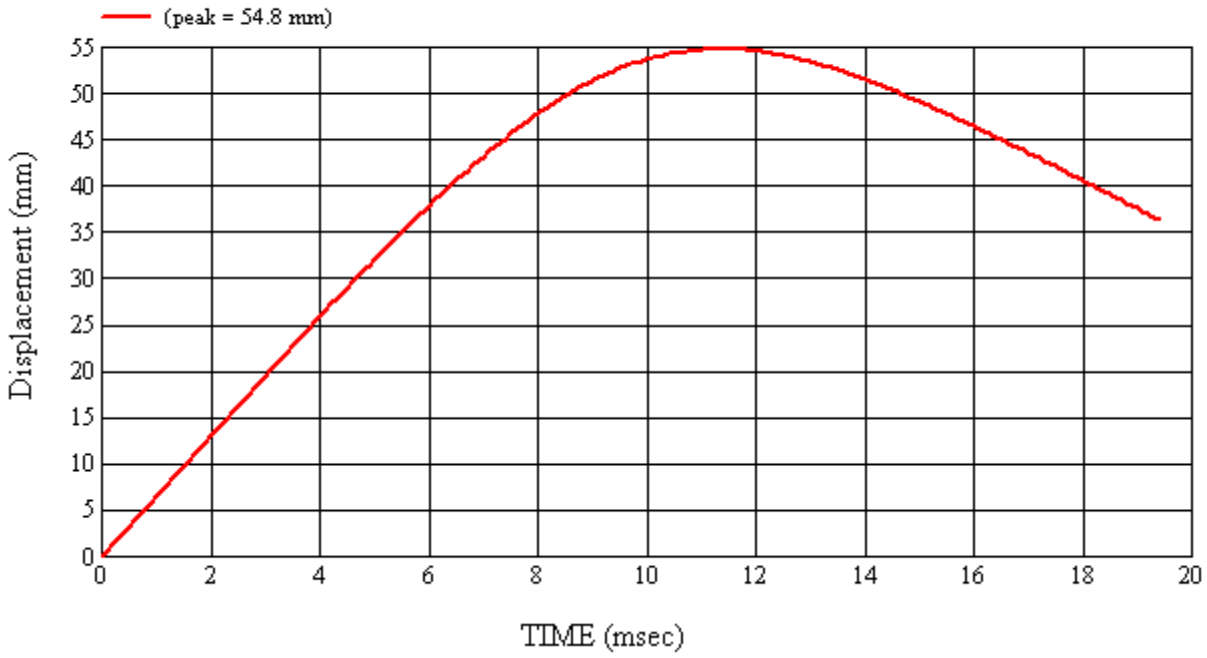


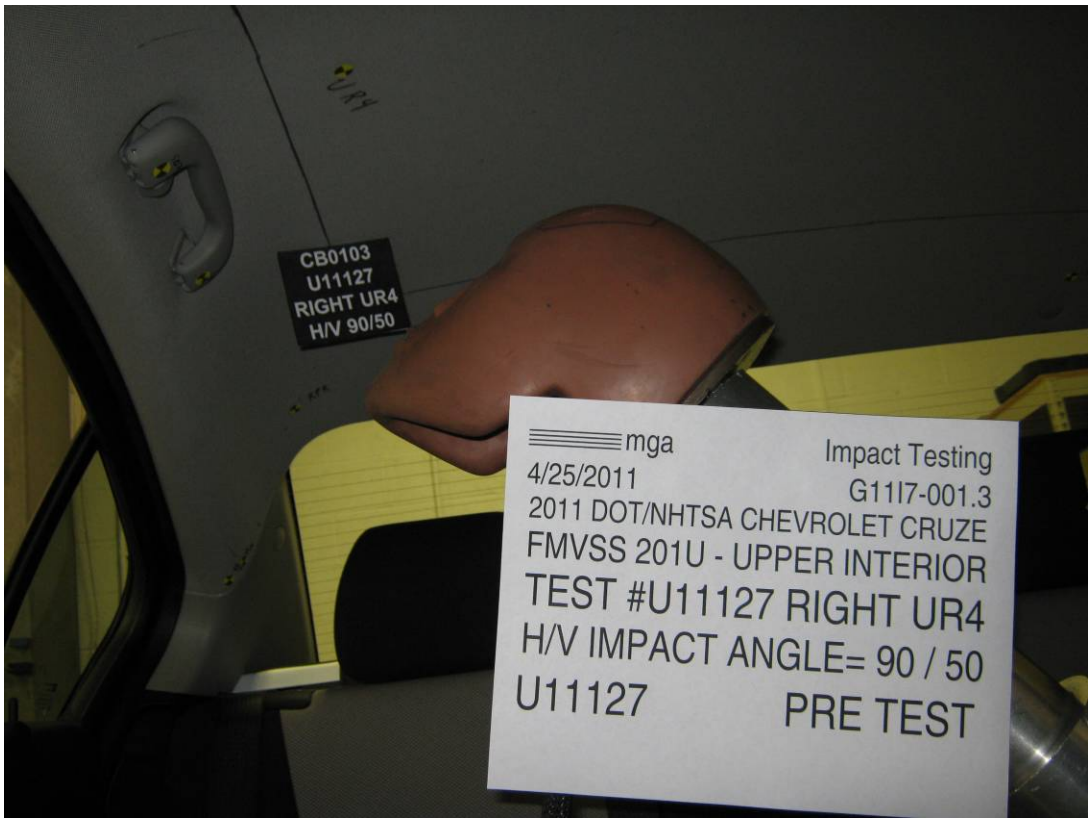

(peak = 149.0 G)
Head X (G)
0
-20
-40
-60
-80
-100
-120
-140
-160
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 8.1 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
-10
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 11.5 G)
Head Z (G)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 23.9 kph)
Impact Velocity: 23.64 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 54.8 mm)
Displacement (mm)
55
50
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

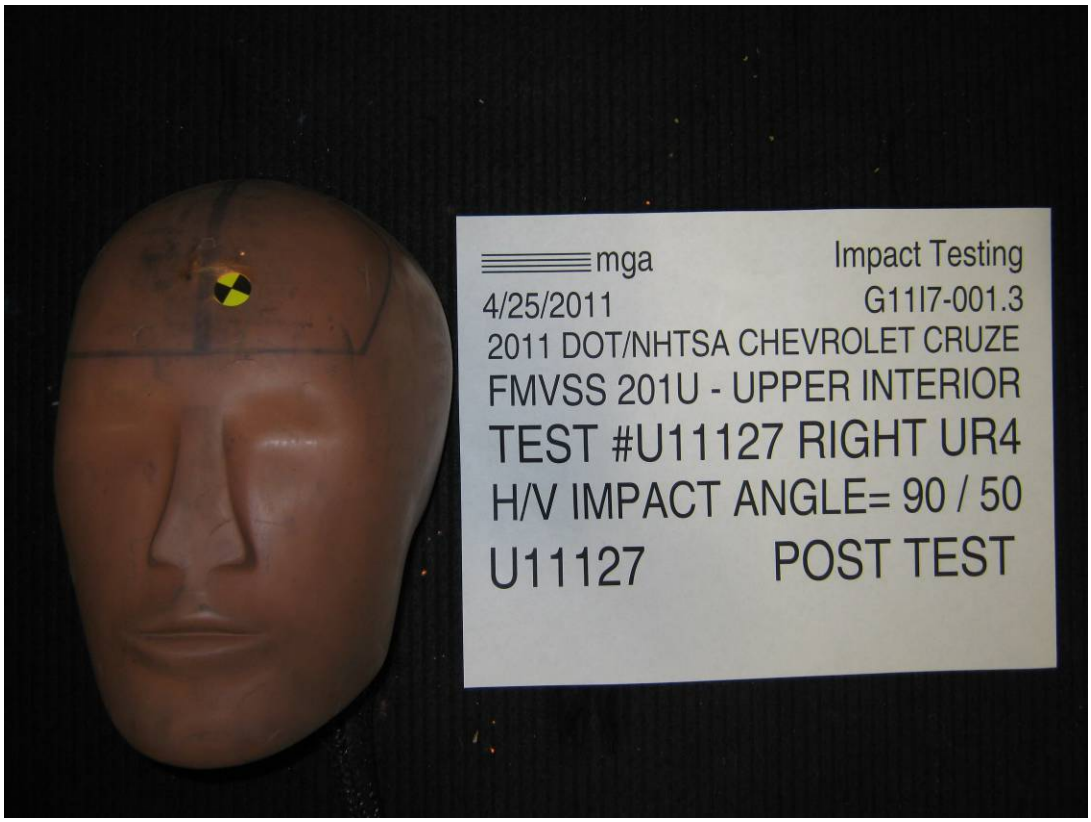

CB0103
U11127
RIGHT UR4
H/V 90/50
mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11127 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U11127
PRE TEST


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11127 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U11127
PRE TEST


CB0103
U11127
RIGHT UR4
H/V 90/50
mga
Impact Testing
G11I7-001.3
4/25/2011
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11127 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U11127
POST TEST


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11127 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U11127
POST TEST
CB0103
U11127
RIGHT UR4
H/V 90/50


CB0103
U11127
RIGHT UR4
H/V 90/50


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11127 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U11127
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR4Right

MGA Test Reference No.:U11127

Approach Horizontal Angles:90º

Approach Vertical Angles:50º

Additional Description:At SR3-1

Test Number:#U11127

Temperature:21.7C

Humidity:48.5%

Time of Test:5:07:34 PM

FMH Serial No:[037]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
577	544	9.8	24.0	22	9 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J32177	-113.7	1.07	1.07
Y	6	J14103	93.9	0.85	0.85
Z	7	J35800	97.8	0.94	0.94

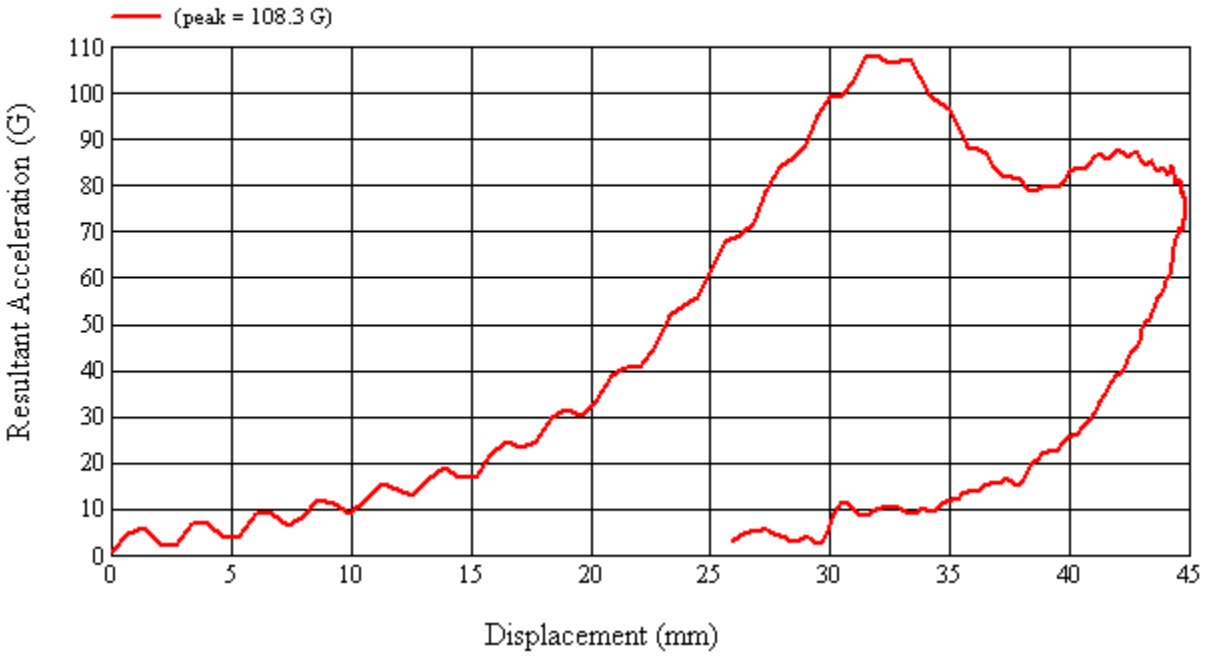
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

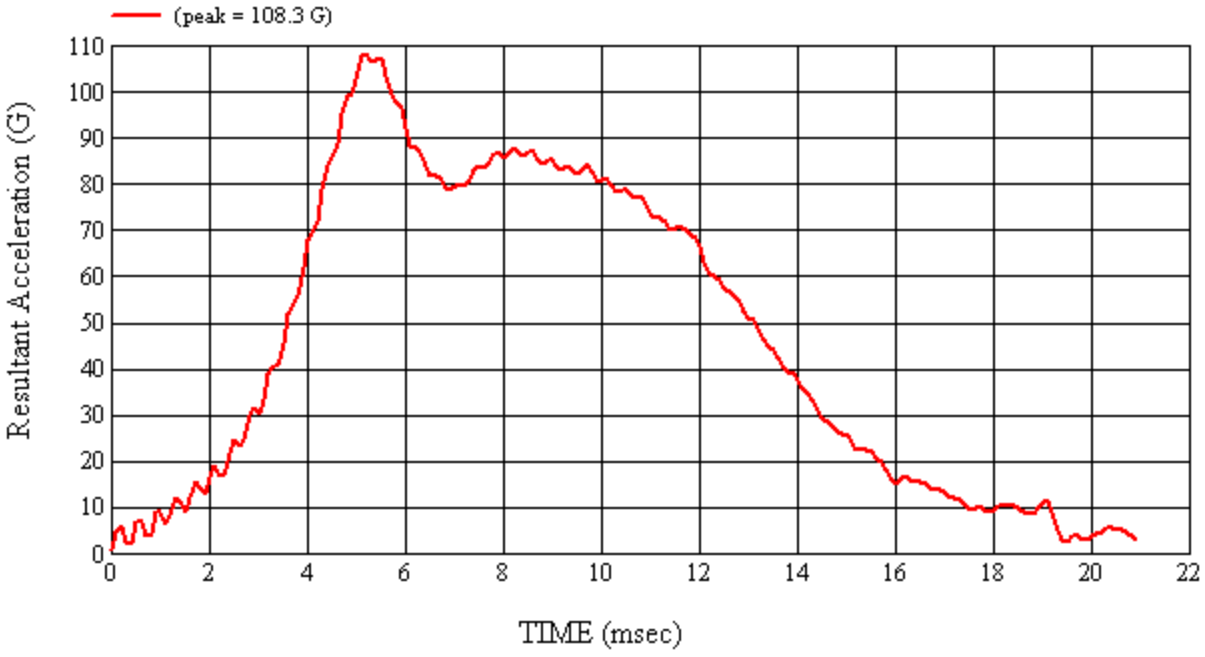
Headliner deformation, grab handle compression

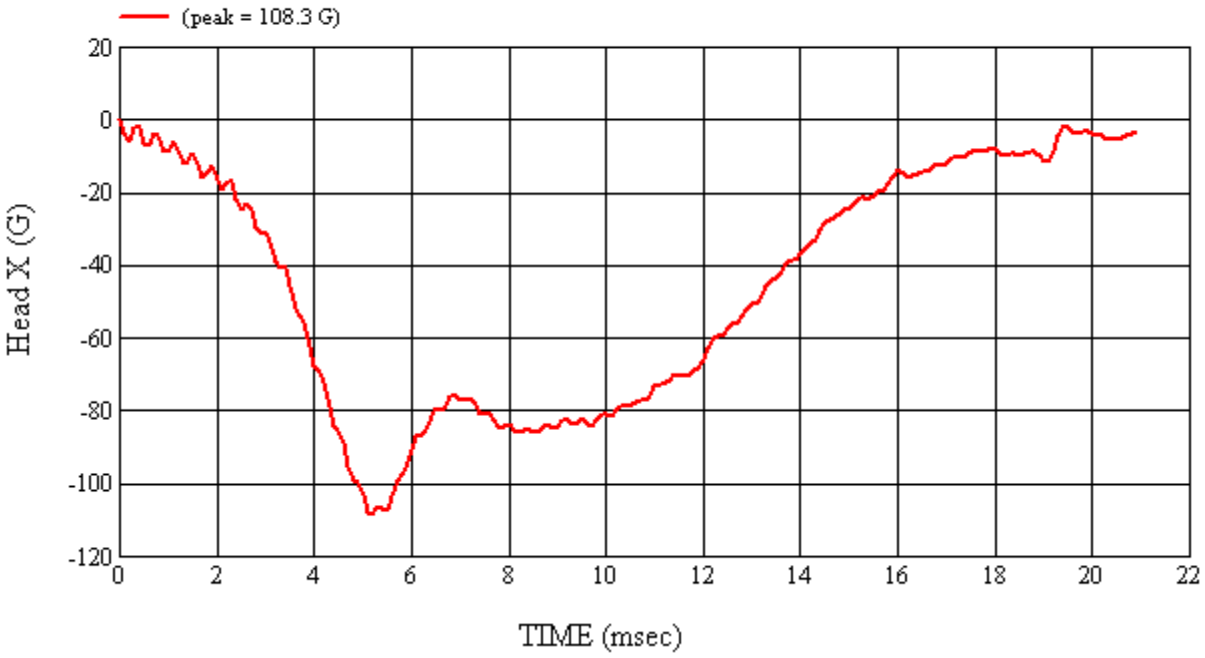
Recorded By: _____ Approved By*: _____ Date: 4/25/2011

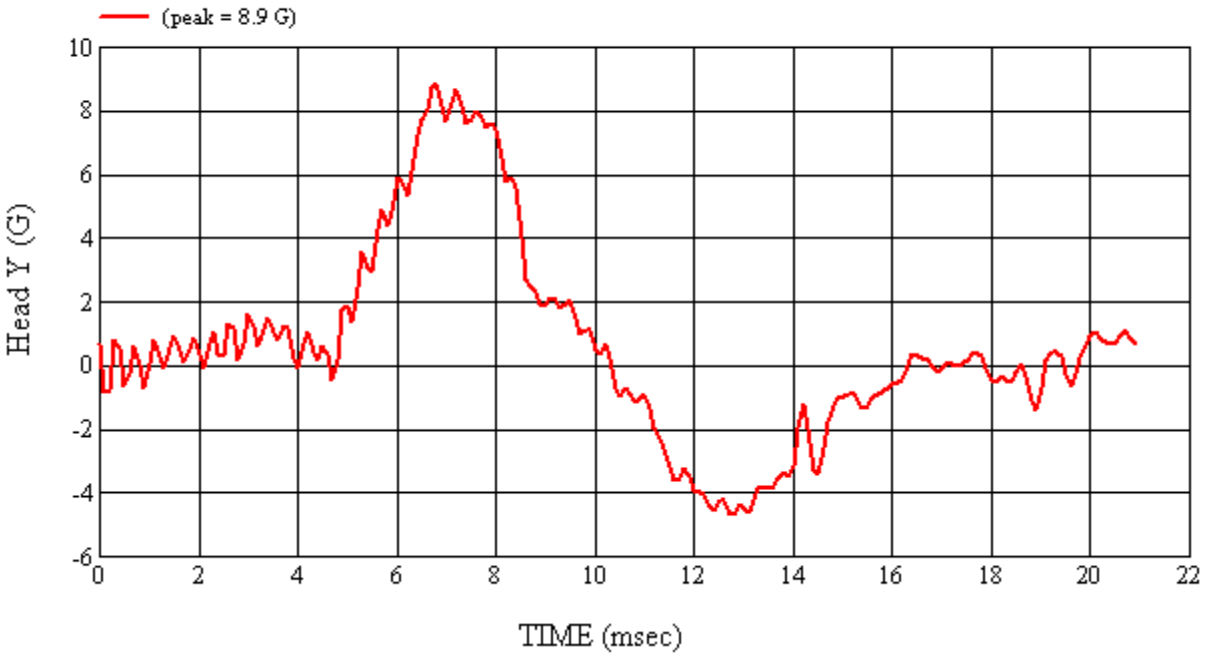
*Only necessary for NHTSA (Government) Compliance testing.

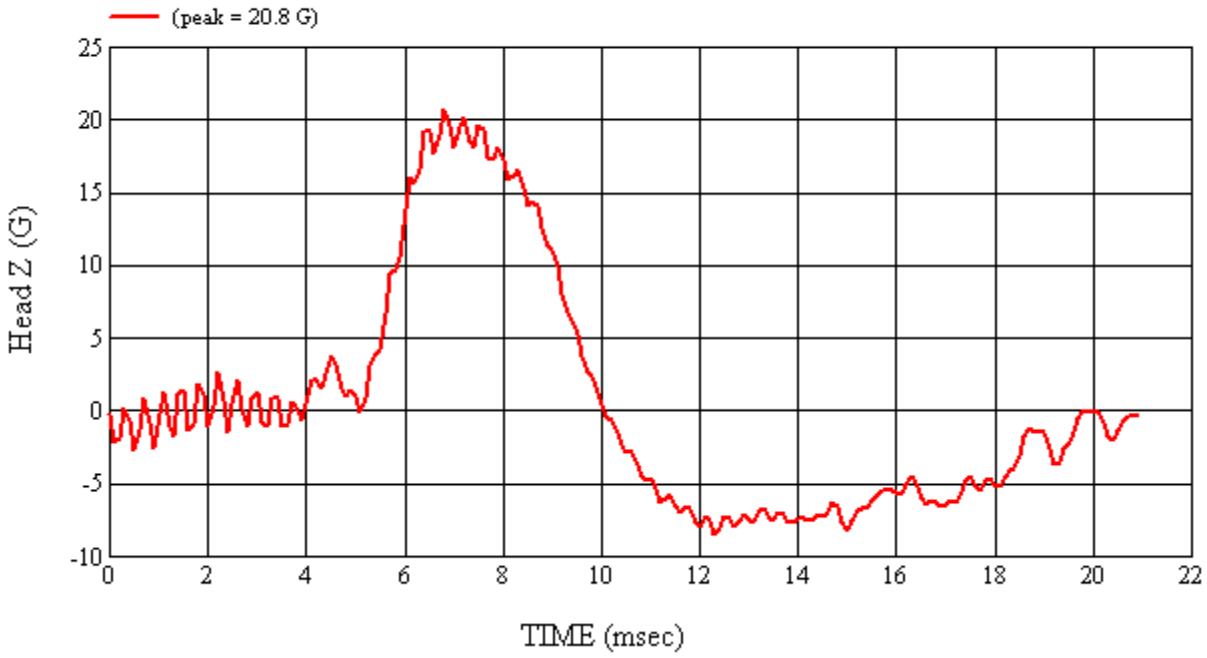
MGA Test #: U11127 Target Location: UR4, Right Side Test Date: 4/25/2011

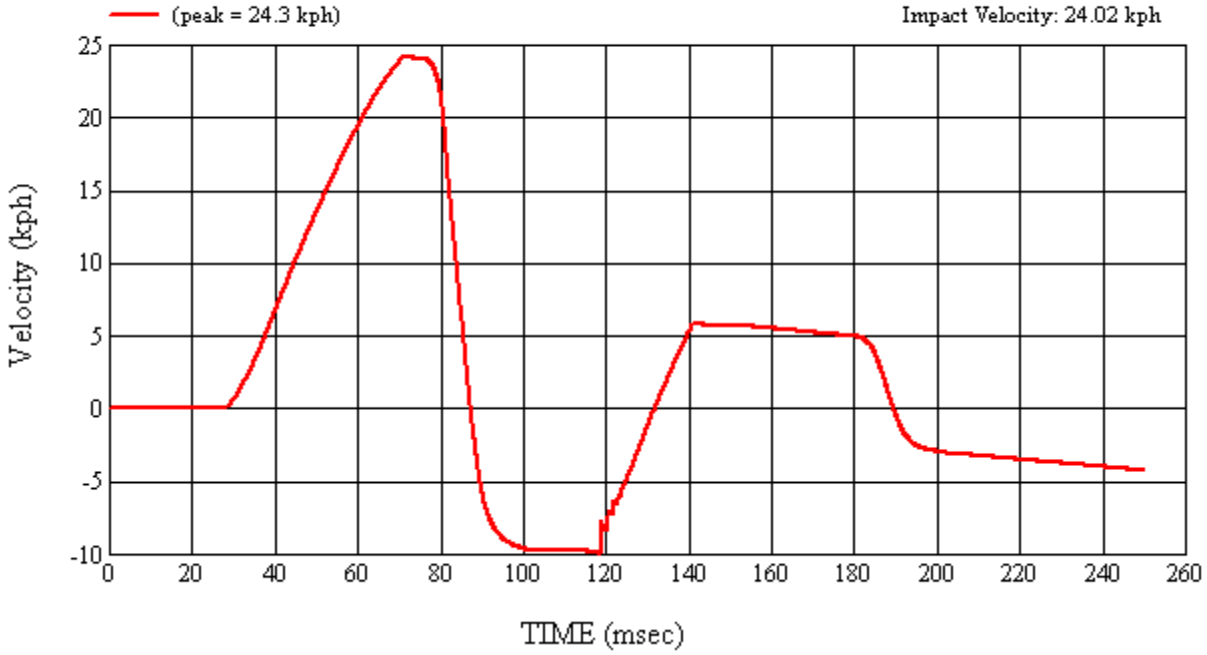


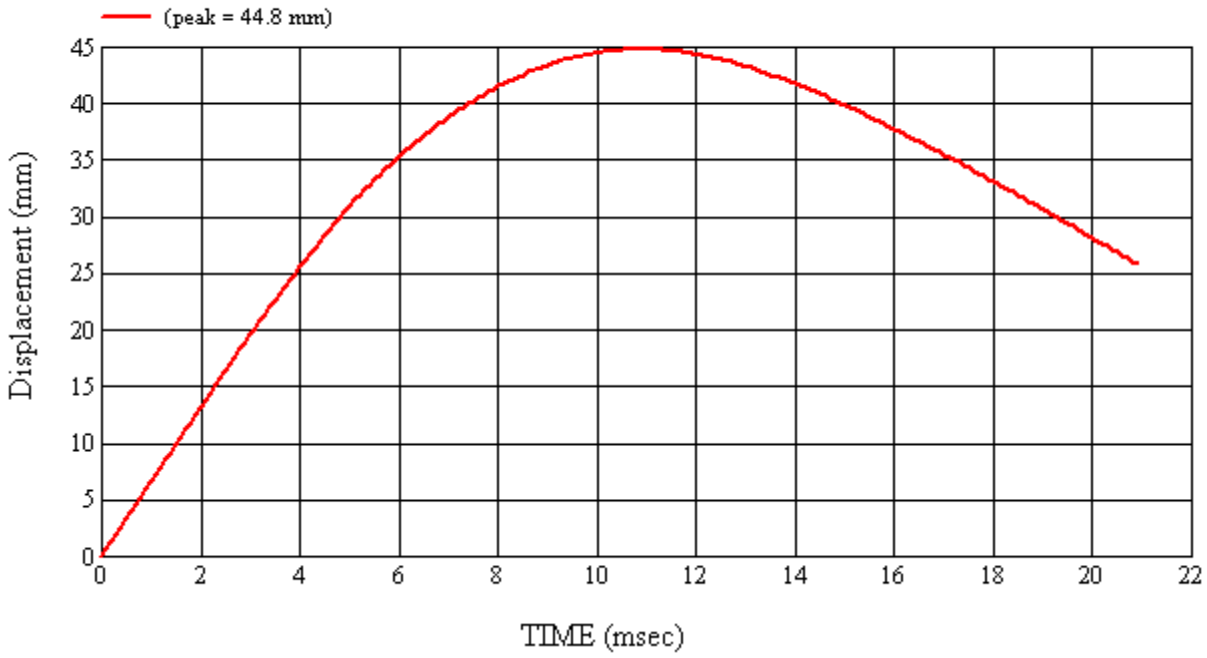



(peak = 108.3 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 8.9 G)
Head Y (G)
10
8
6
4
2
0
-2
-4
-6
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

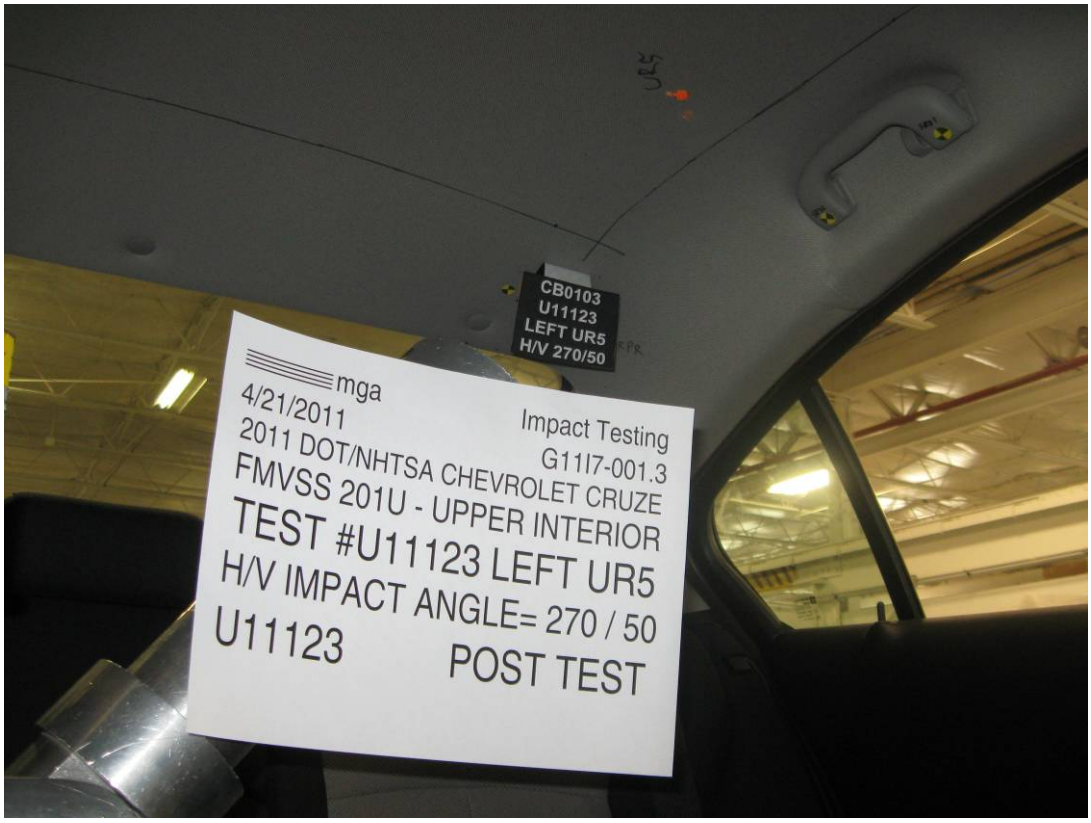

(peak = 20.8 G)
Head Z (G)
25
20
15
10
5
0
-5
-10
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 24.3 kph)
Impact Velocity: 24.02 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 44.8 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

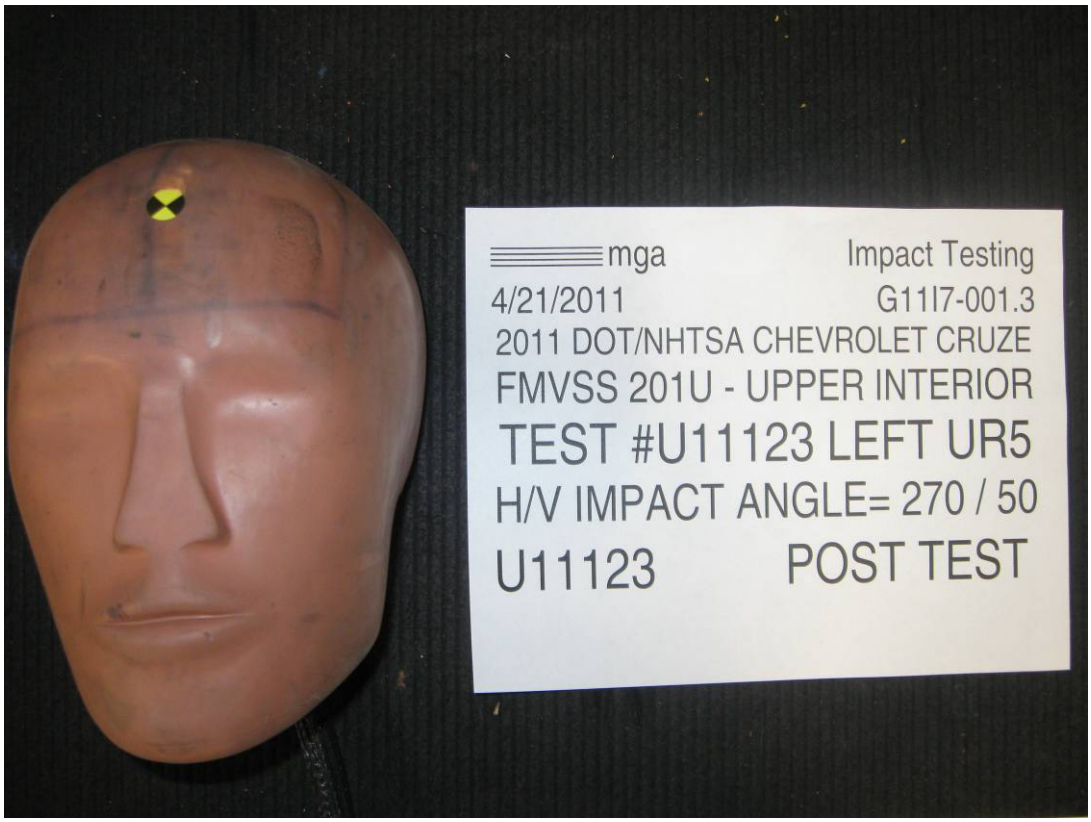

CB0103
U11123
LEFT UR5
H/V 270/50
mga
4/21/2011
Impact Testing
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11123 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11123
PRE TEST


CB0103
U11123
LEFT UR5
H/V 270/50
mga
4/21/2011
Impact Testing
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11123 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11123
PRE TEST


CB0103
U11123
LEFT UR5
H/V 270/50
mga
4/21/2011
Impact Testing
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11123 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11123
POST TEST


CB0103
U11123
LEFT UR5
H/V 270/50
mga
4/21/2011
Impact Testing
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11123 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11123
POST TEST


UR5
SR32
SR31


mga
Impact Testing
4/21/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11123 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11123
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Test Number:#U11123

Target (Vehicle Side): UR5Left

Temperature:22.5C

MGA Test Reference No.:U11123

Humidity:26.6%

Approach Horizontal Angles:270º

Time of Test:5:02:11 PM

Approach Vertical Angles:50º

FMH Serial No:[035]

Additional Description:@ SR3-2

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
690	694	8.4	23.6	38	5 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.8	1.07	1.07
Y	6	J22664	94.2	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

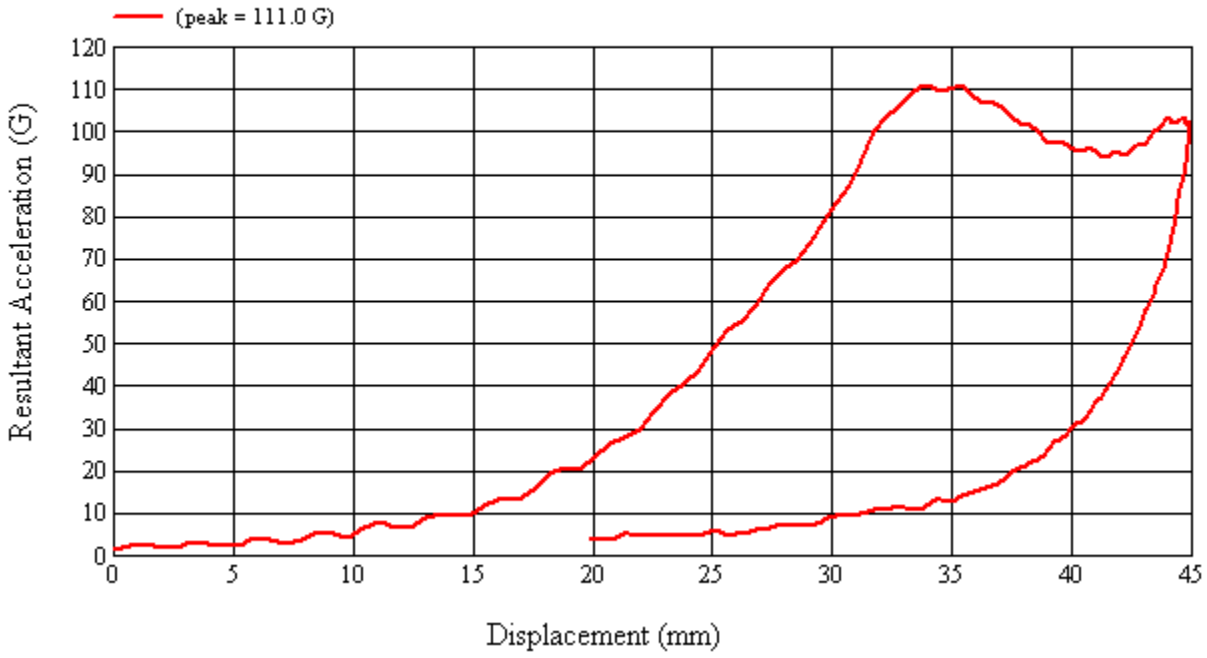
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

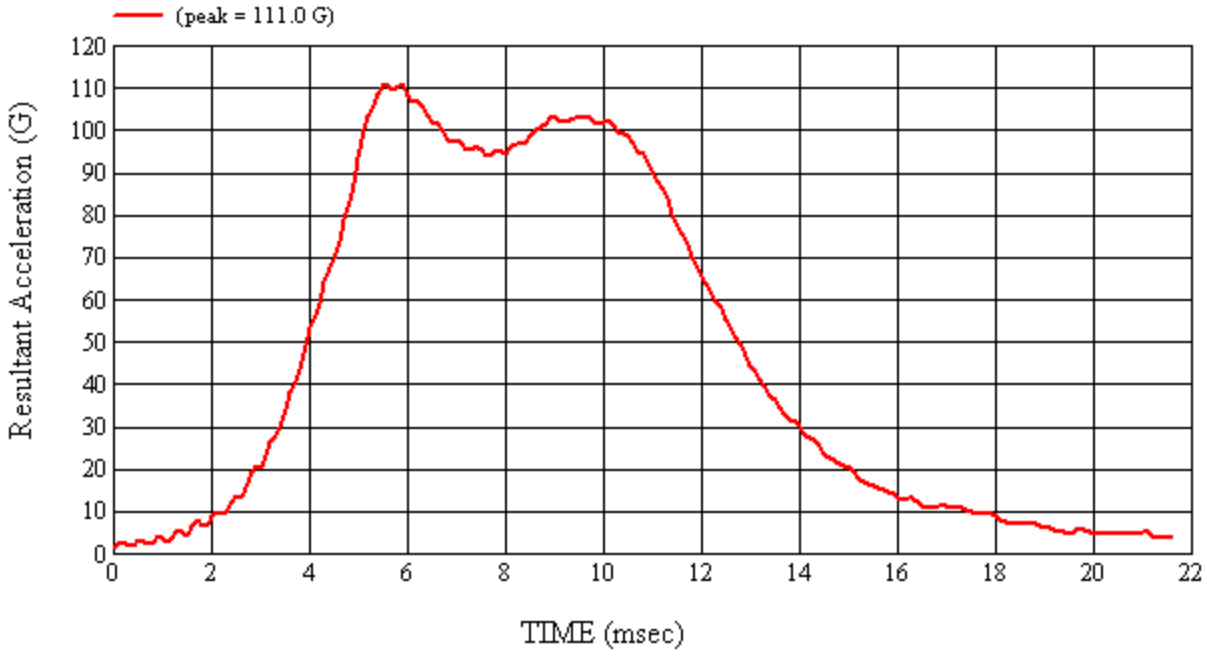
Grab handle compression. Headliner deformation.

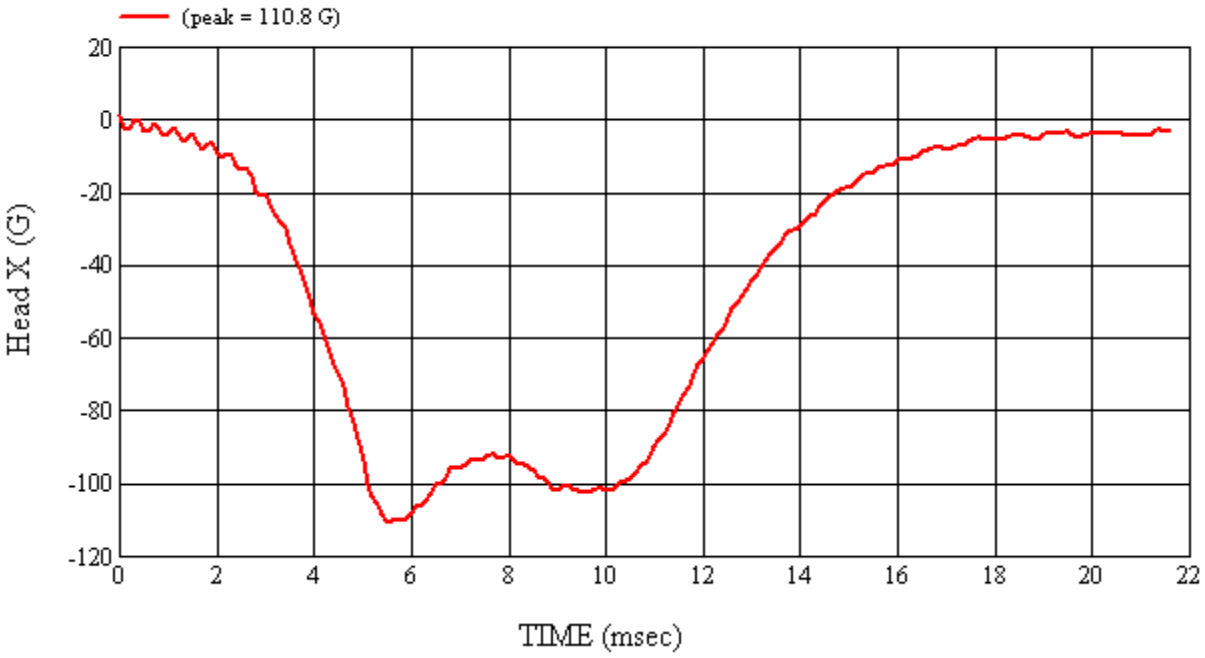
Recorded By: _____ Approved By*: _____ Date: 4/21/2011

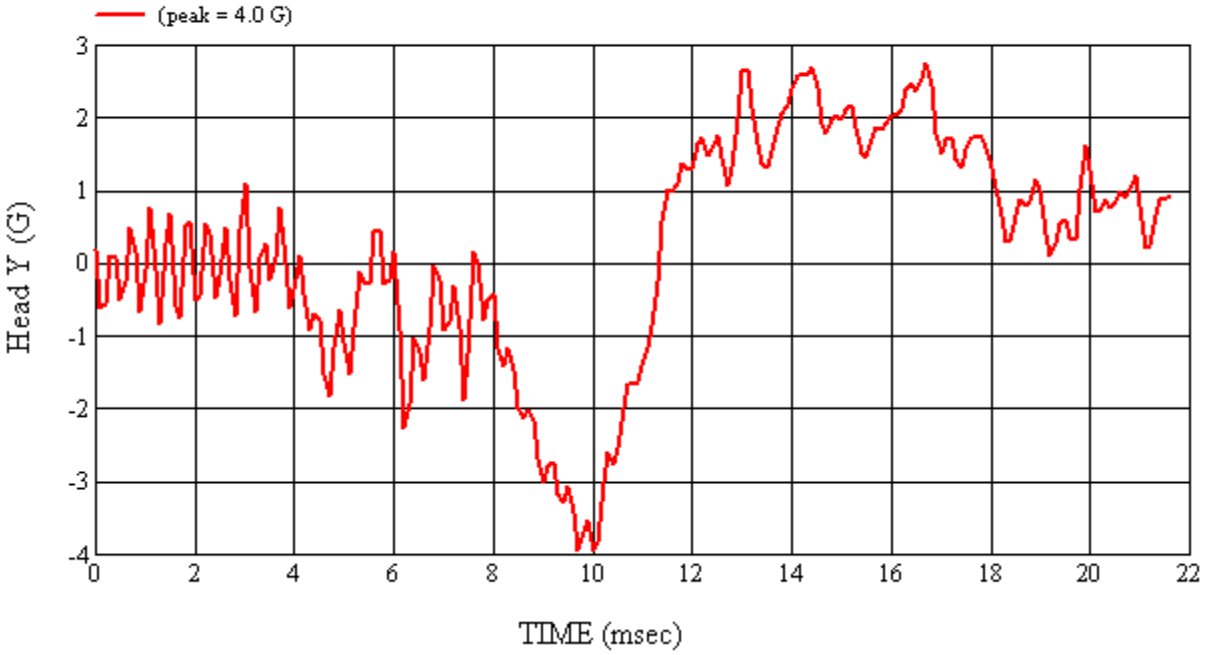
*Only necessary for NHTSA (Government) Compliance testing.

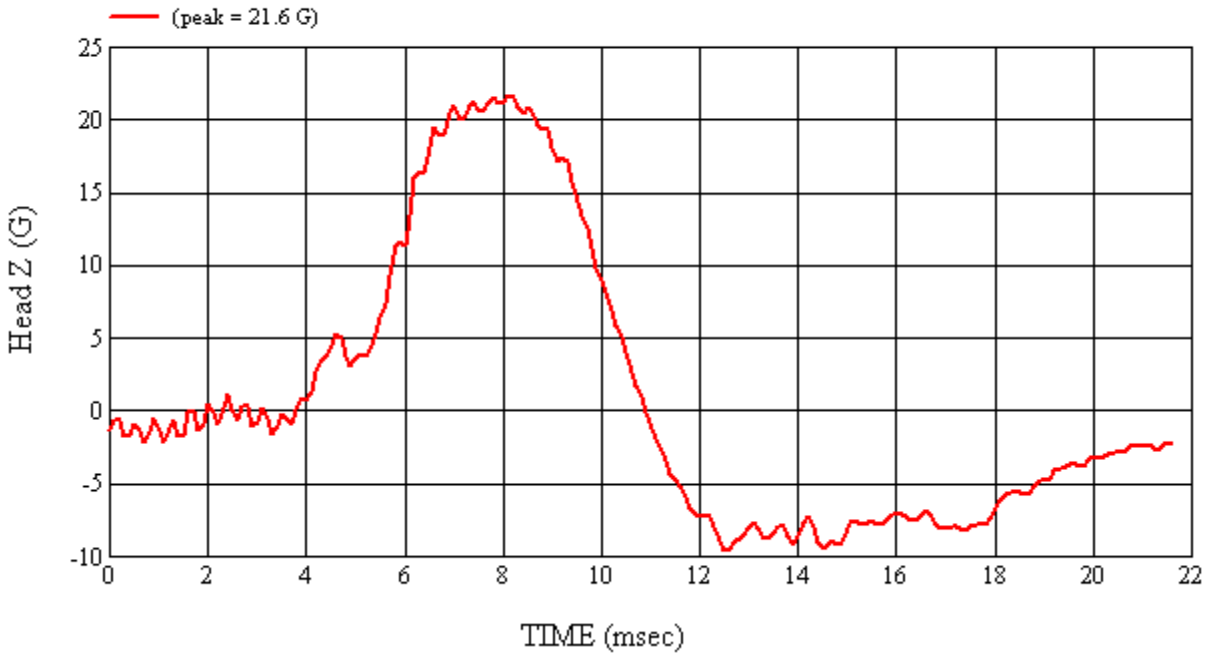
MGA Test #: U11123 Target Location: UR5, Left Side Test Date: 4/21/2011

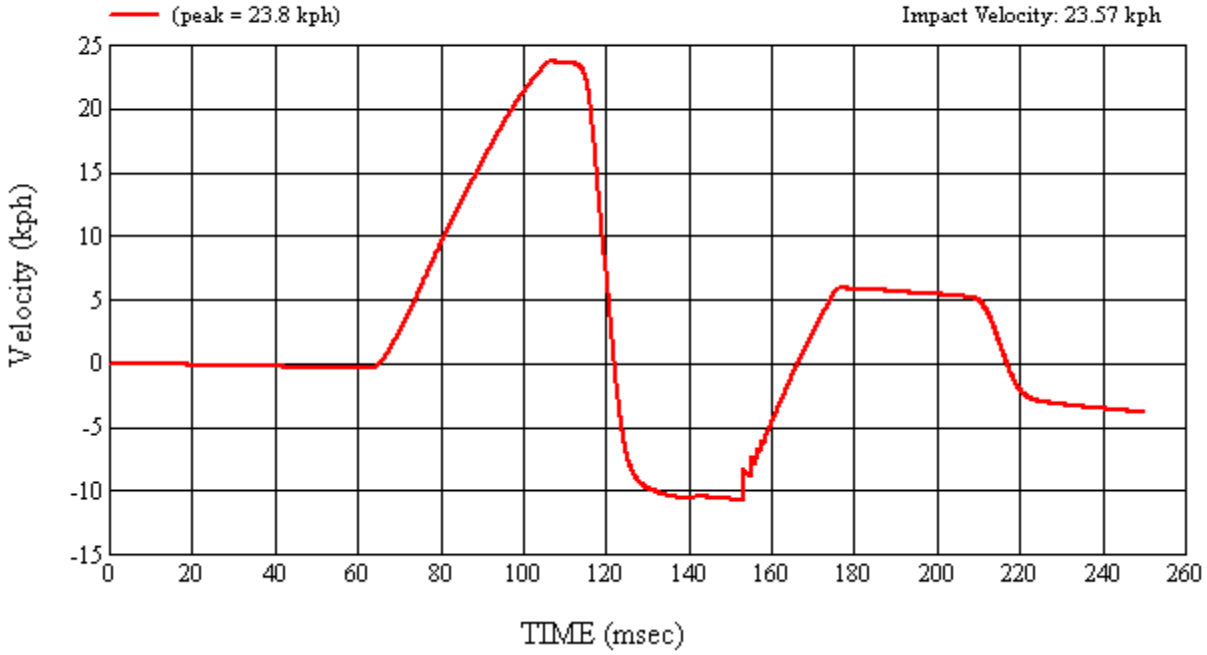


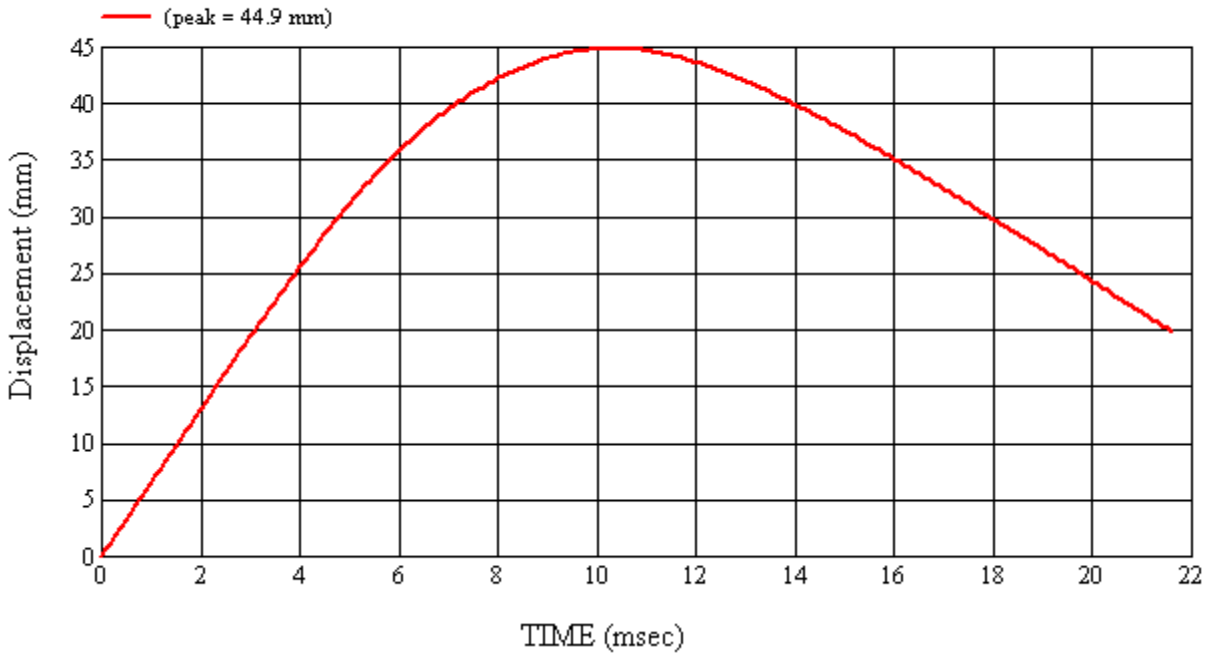


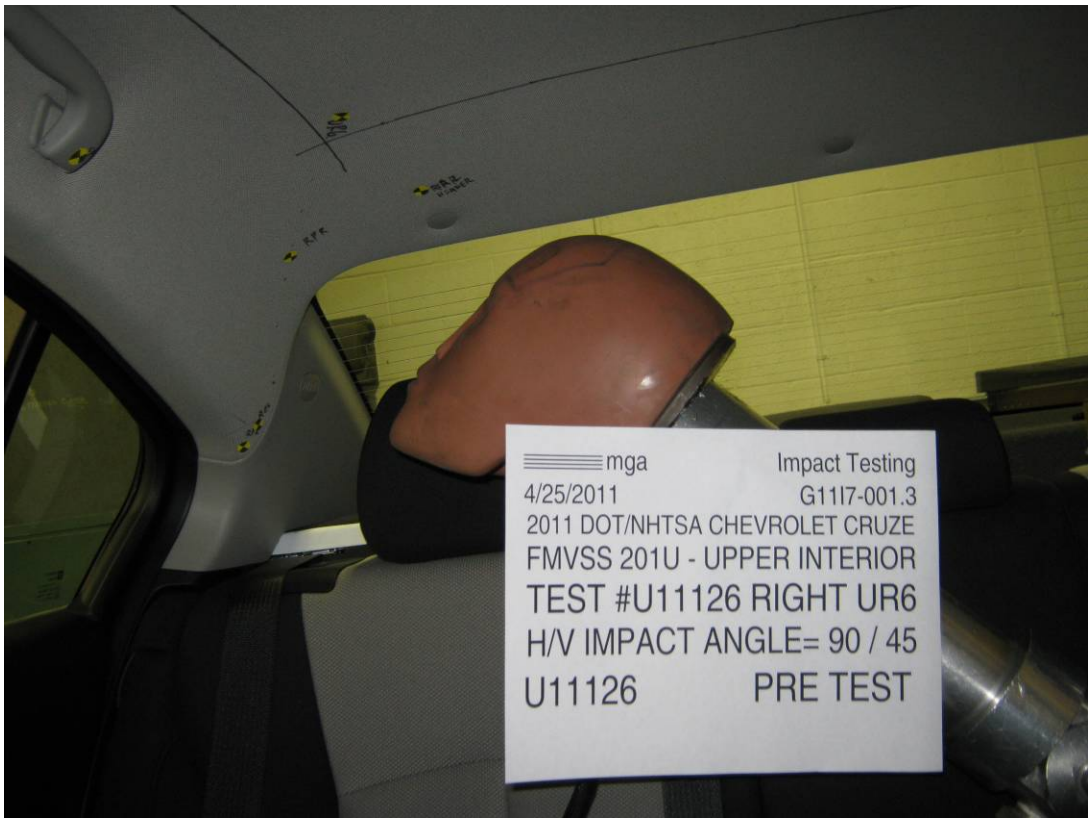

(peak = 110.8 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

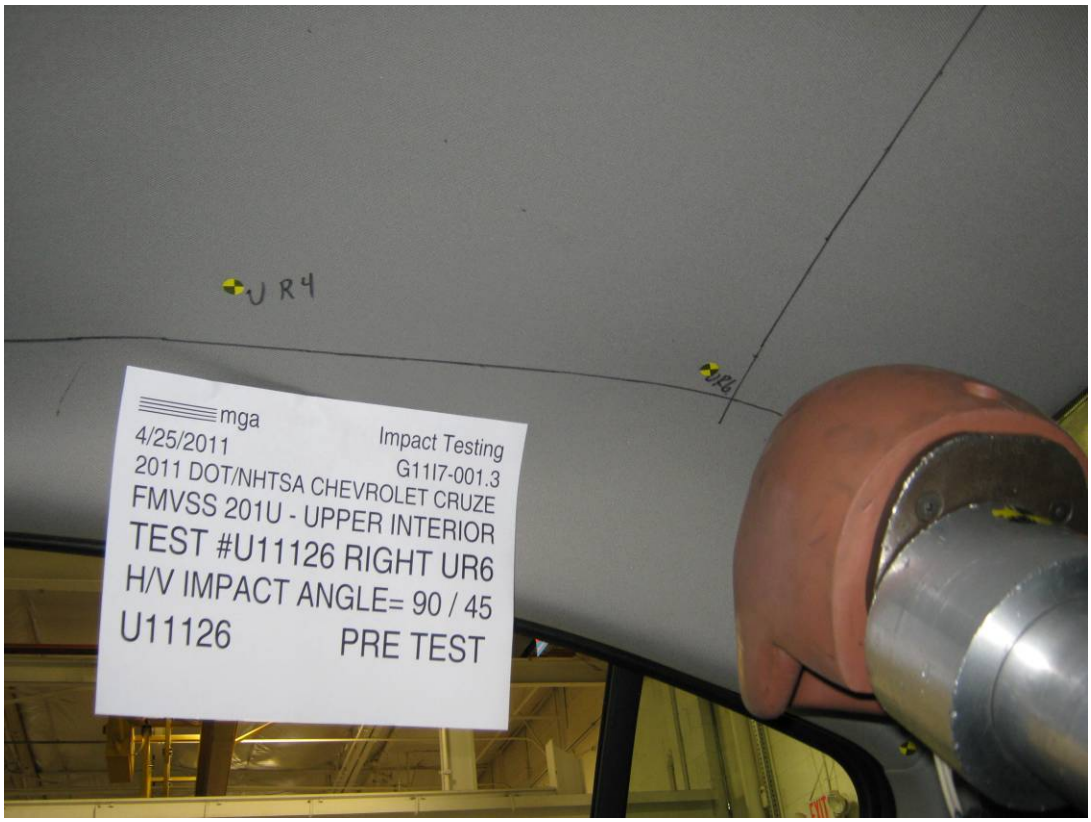

(peak = 4.0 G)
Head Y (G)
3
2
1
0
-1
-2
-3
-4
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

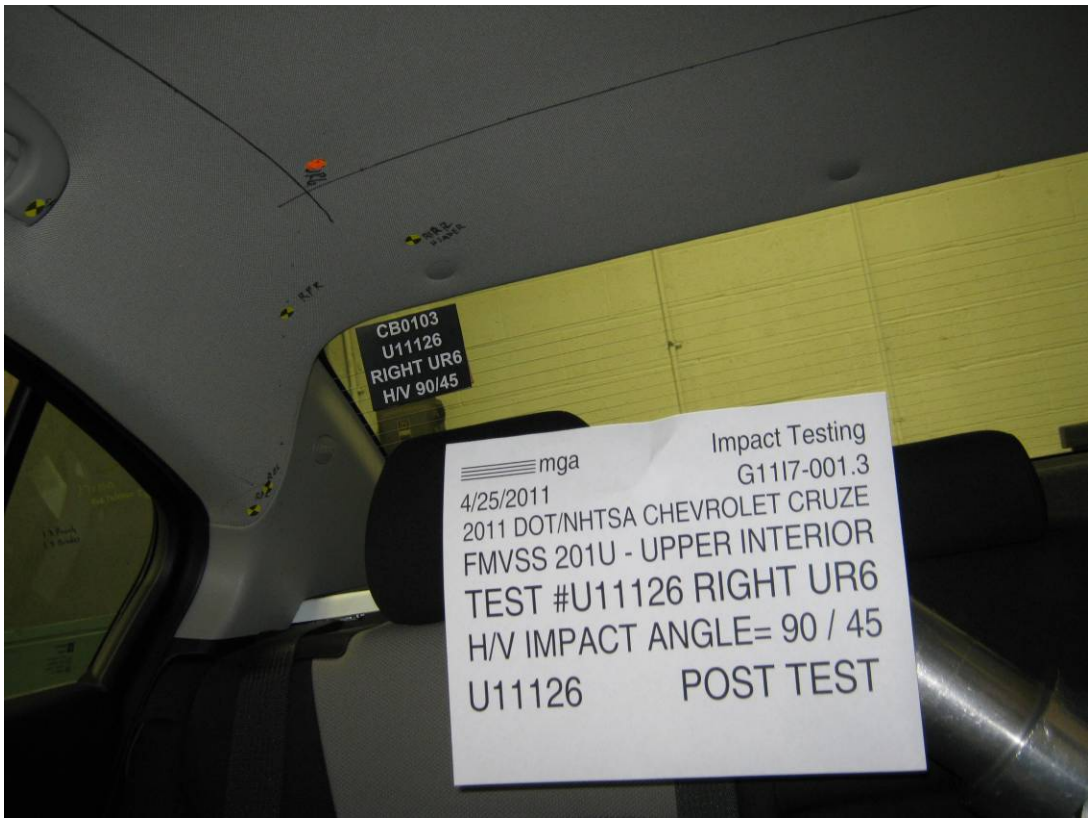

(peak = 21.6 G)
Head Z (G)
25
20
15
10
5
0
-5
-10
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 23.8 kph)
Impact Velocity: 23.57 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 44.9 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11126 RIGHT UR6
H/V IMPACT ANGLE= 90 / 45
U11126
PRE TEST


UR4
mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11126 RIGHT UR6
H/V IMPACT ANGLE= 90 / 45
U11126
PRE TEST


CB0103
U11126
RIGHT UR6
H/V 90/45
mga
Impact Testing
G11I7-001.3
4/25/2011
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11126 RIGHT UR6
H/V IMPACT ANGLE= 90 / 45
U11126
POST TEST


UR4
mga
Impact Testing
G11I7-001.3
4/25/2011
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11126 RIGHT UR6
H/V IMPACT ANGLE= 90 / 45
U11126
POST TEST
CB0103
U11126
RIGHT UR6
H/V 90/45


UR6
REAR HEADER
RPR


mga
Impact Testing
4/25/2011
G11I7-001.3
2011 DOT/NHTSA CHEVROLET CRUZE
FMVSS 201U - UPPER INTERIOR
TEST #U11126 RIGHT UR6
H/V IMPACT ANGLE= 90 / 45
U11126
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.3 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Chevrolet Cruze

GENERAL TEST PARAMETERS:

Test Number:#U11126

Target (Vehicle Side): UR6Right

Temperature:21.7C

MGA Test Reference No.:U11126

Humidity:48.3%

Approach Horizontal Angles:90º

Time of Test:3:28:27 PM

Approach Vertical Angles:45º

FMH Serial No:[035]

Additional Description:At rear pillar

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
617	597	6.8	24.0	31	1 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.8	1.07	1.07
Y	6	J22664	94.2	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

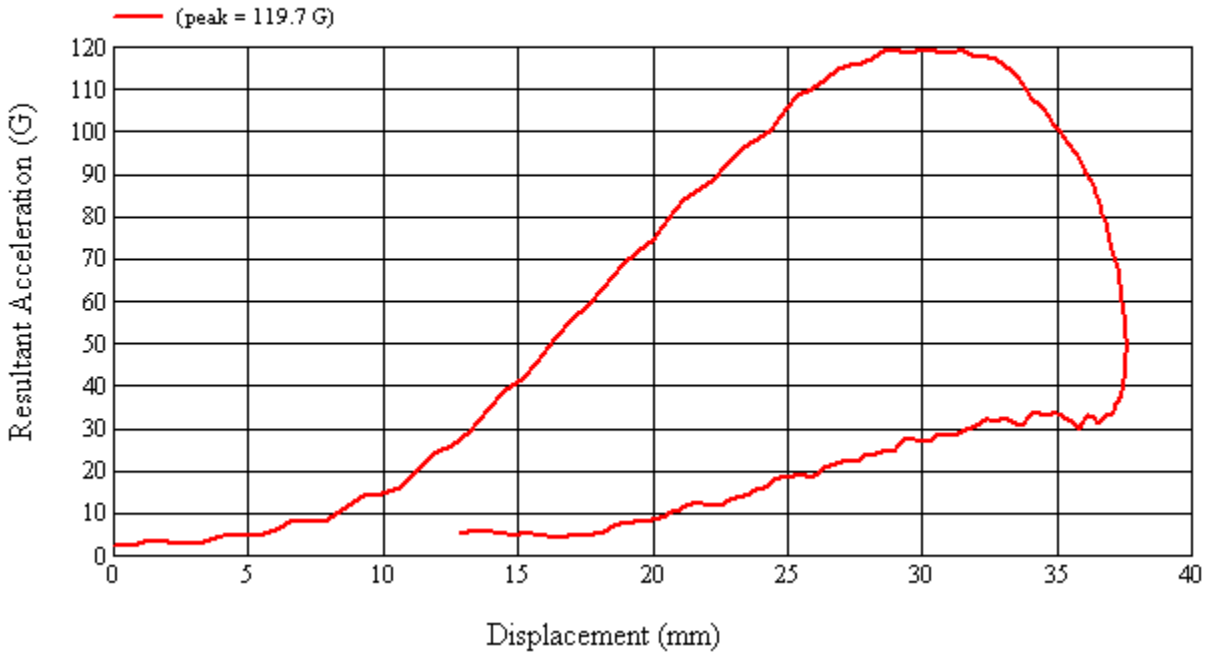
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

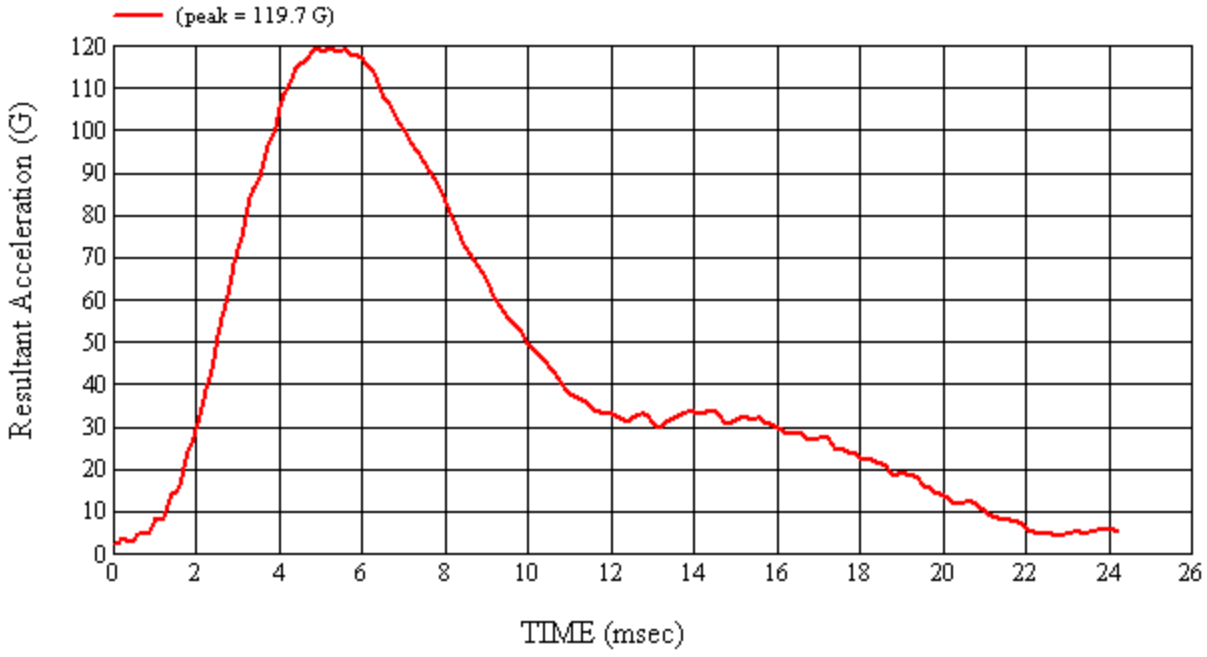
No visible damage

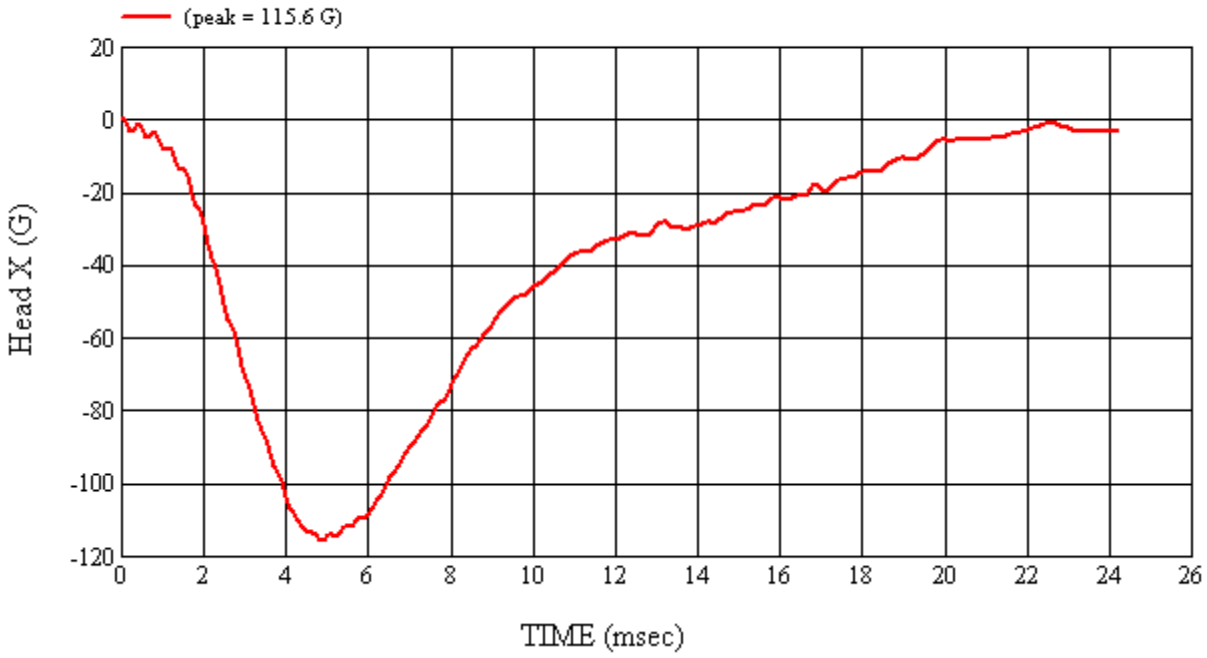
Recorded By: _____ Approved By*: _____ Date: 4/25/2011

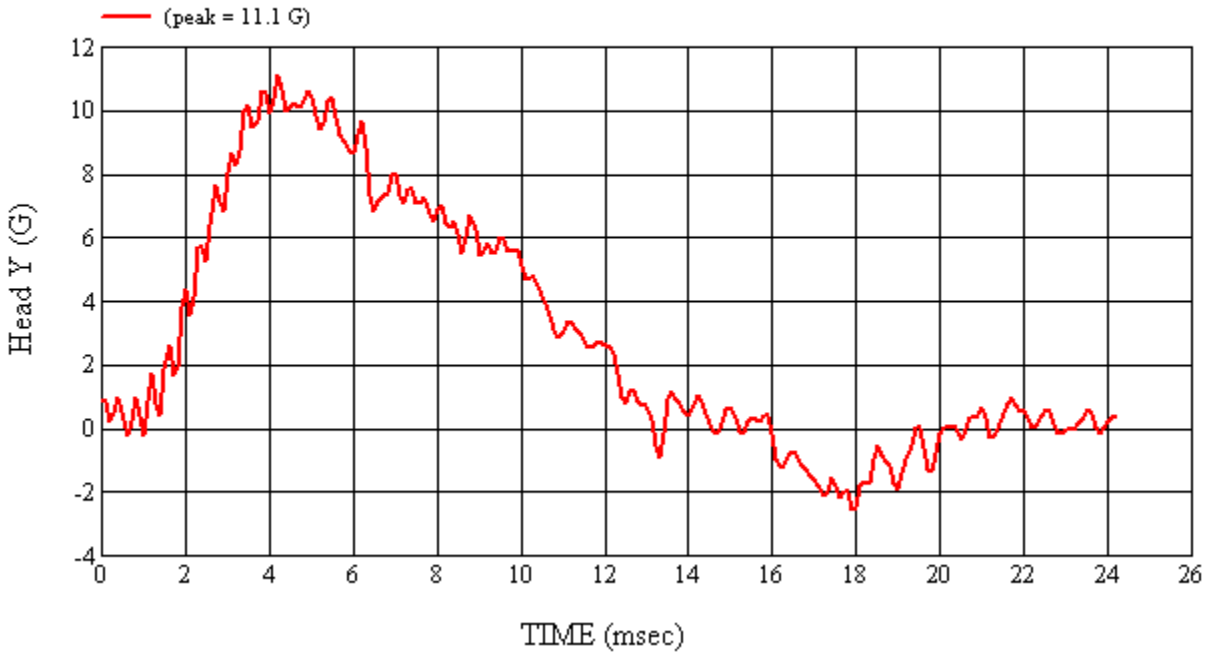
*Only necessary for NHTSA (Government) Compliance testing.

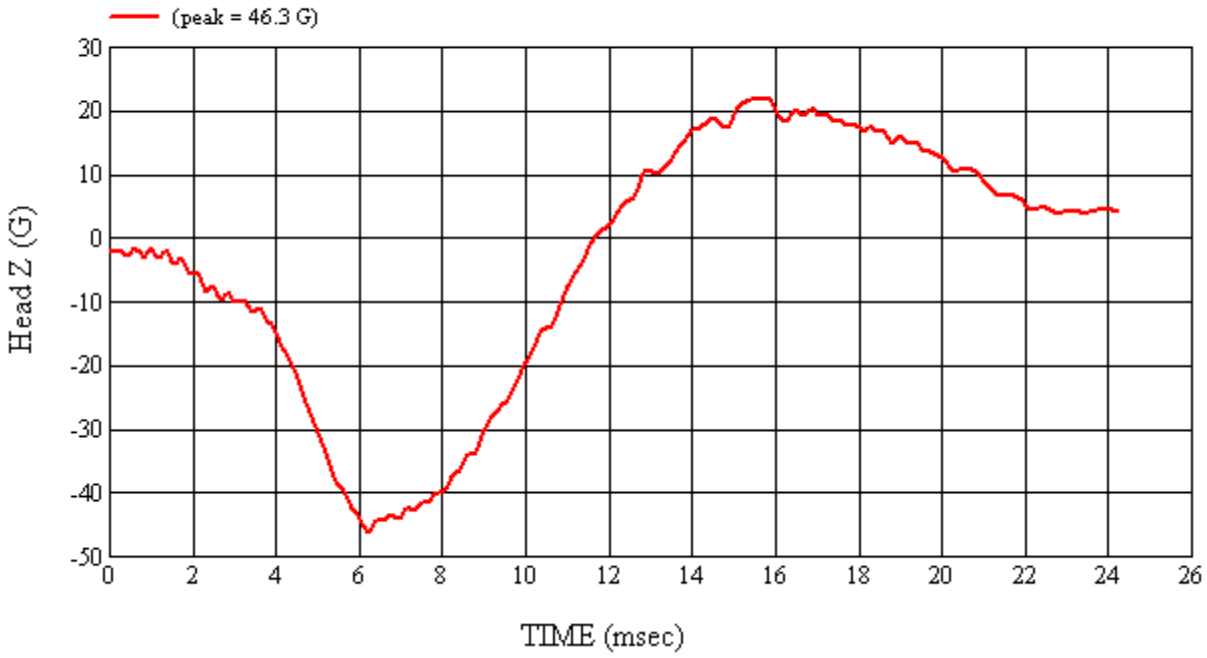
MGA Test #: U11126 Target Location: UR6, Right Side Test Date: 4/25/2011

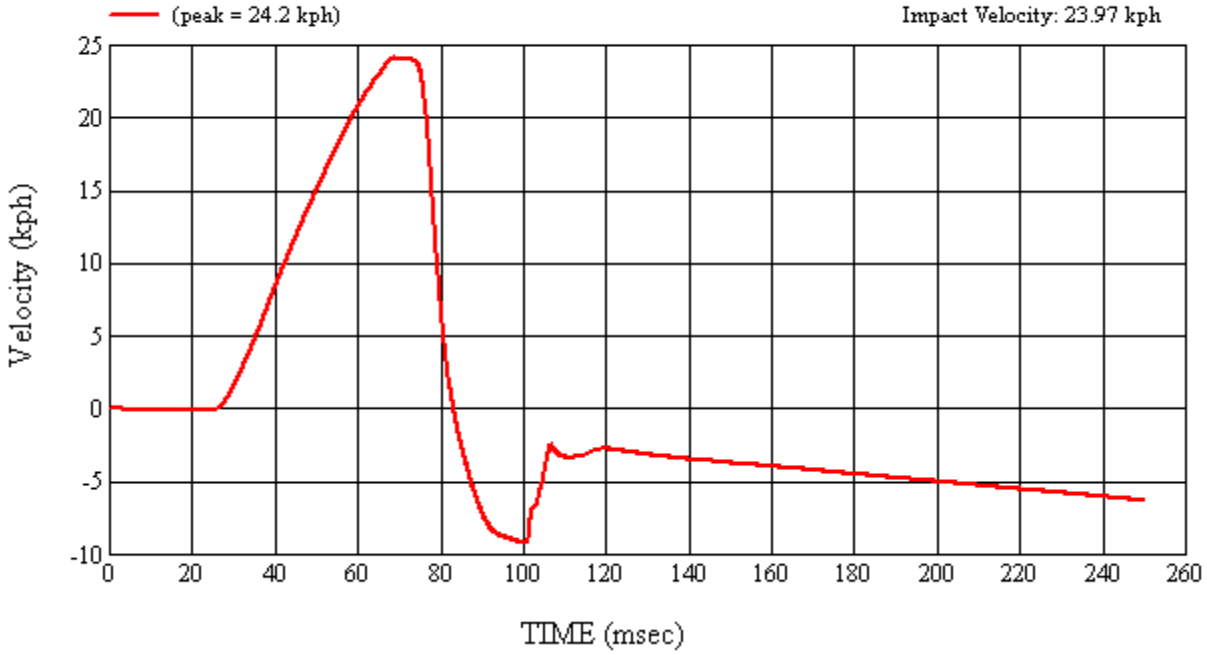


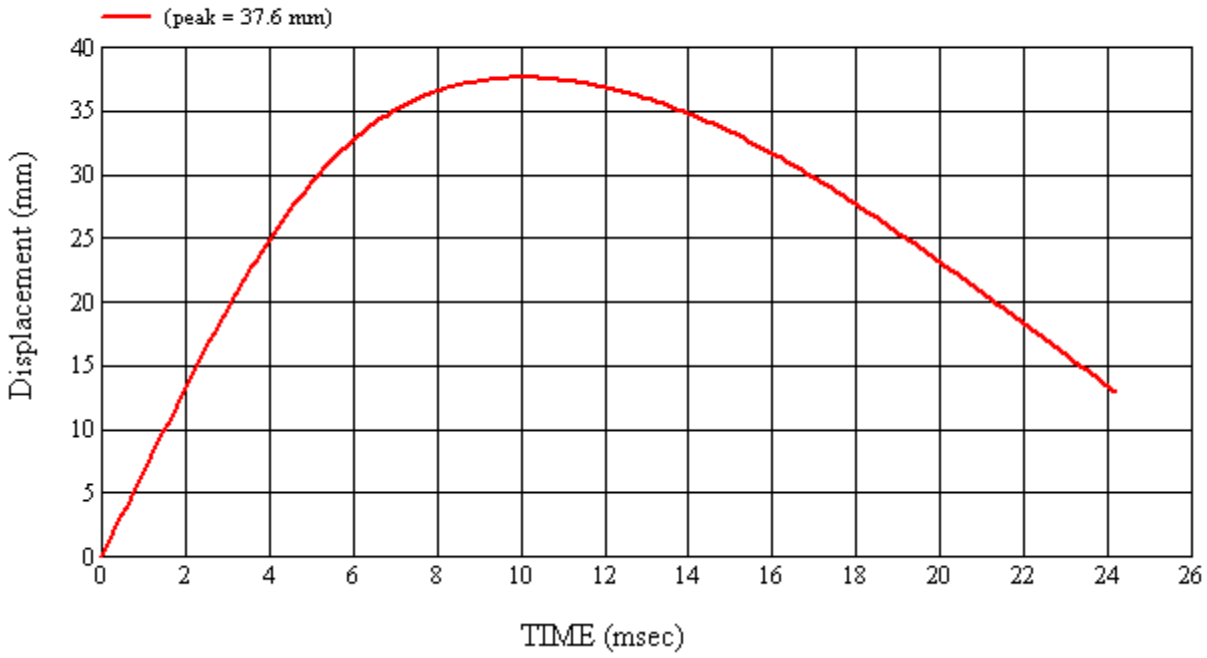



(peak = 115.6 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 11.1 G)
Head Y (G)
12
10
8
6
4
2
0
-2
-4
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 46.3 G)
Head Z (G)
30
20
10
0
-10
-20
-30
-40
-50
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 24.2 kph)
Impact Velocity: 23.97 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 37.6 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
24
26
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
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	035 037 038	Test Device	N/A	Pre and Post-Test Series
High Speed Video	Vision Research	Miro Ex4	Record Event	N/A	N/A
*FARO™	Faro Technologies	S08059801273	Targeting	0.1 mm	Annual
Measuring Devices: - Tape Measure - Plumb Bobs - Digital Protractor	 Stanley N/A Mitutoyo	 TPM992 -- MGA00049	 Measurement Targeting FMH setup Horizontal Measurement	 1 mm N/A 0.5°	Annual
*Temperature Recorder	Dickson	MGA00152	Record Temperature and Humidity	± 1°C ± 1% RH	Annual
* Scale	Detecto	MGA00783	Weigh FMH Head	± 0.01 lb	Annual
*Vehicle Scale	Intercomp	26032389	Weighing Vehicle	± .5 kg	Annual

Each headform was calibrated by an engineer after the headform had soaked in an environment of 66ºF to 78ºF (19ºC to 26ºC) for a period of at least four hours.

Each headform was found to comply with the performance criteria under Part 572L for pre and post-test calibrations. That is, the peak resultant acceleration was between 225 and 275 G's, the peak lateral acceleration was less than 15 G's, the headform weighed between 9.9 and 10.1 lbs., the pulse was determined to be unimodal, and there was no major damage to the headform.

TABLE 4-2 FMH CALIBRATION SUMMARY

FMH Serial #		Headform Calibration Date	Weight (lbs)	Temp (ºC)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
Pre	#035	4/20/2011	9.90	21.7	33.5	266.8	4.5	Yes
Post	#035	4/27/2011	9.90	22.5	61.6	270.2	9.2	Yes
Pre	#037	4/20/2011	9.96	21.6	34.0	272.1	4.3	Yes
Post	#037	4/27/2011	9.96	22.5	62.5	257.9	5.2	Yes
Pre	#038	4/20/2011	9.90	21.3	34.1	267.5	13.2	Yes
Post	#038	4/27/2011	9.90	22.3	62.2	269.9	9.7	Yes

4-1 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

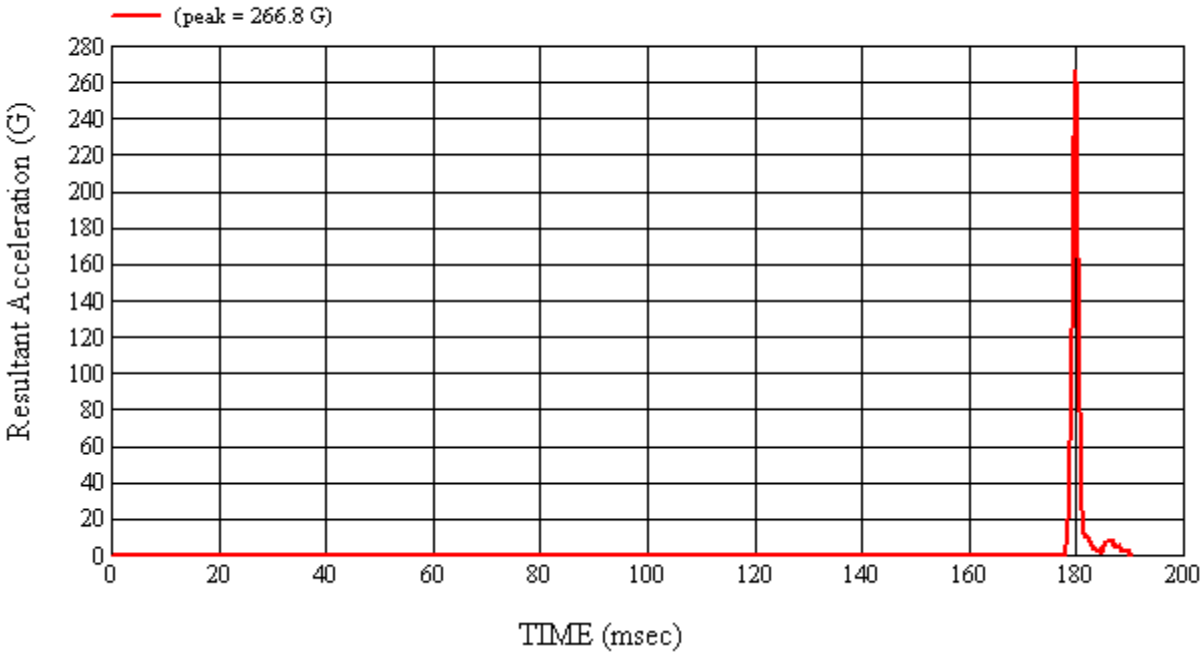
HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 4/20/2011 CALIBRATION TIME: 10:06:11 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	21.7
Relative Humidity	10% to 70%	33.5
Peak Resultant Acceleration	225 G's to 275 G's	266.8
Peak Lateral Acceleration	15 G's Maximum	4.5
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	J35919	02/04/11	08/04/11
2	ENDEVCO	7264-2000	J22664	02/04/11	08/04/11
3	ENDEVCO	7264-2000	J35924	02/04/11	08/04/11

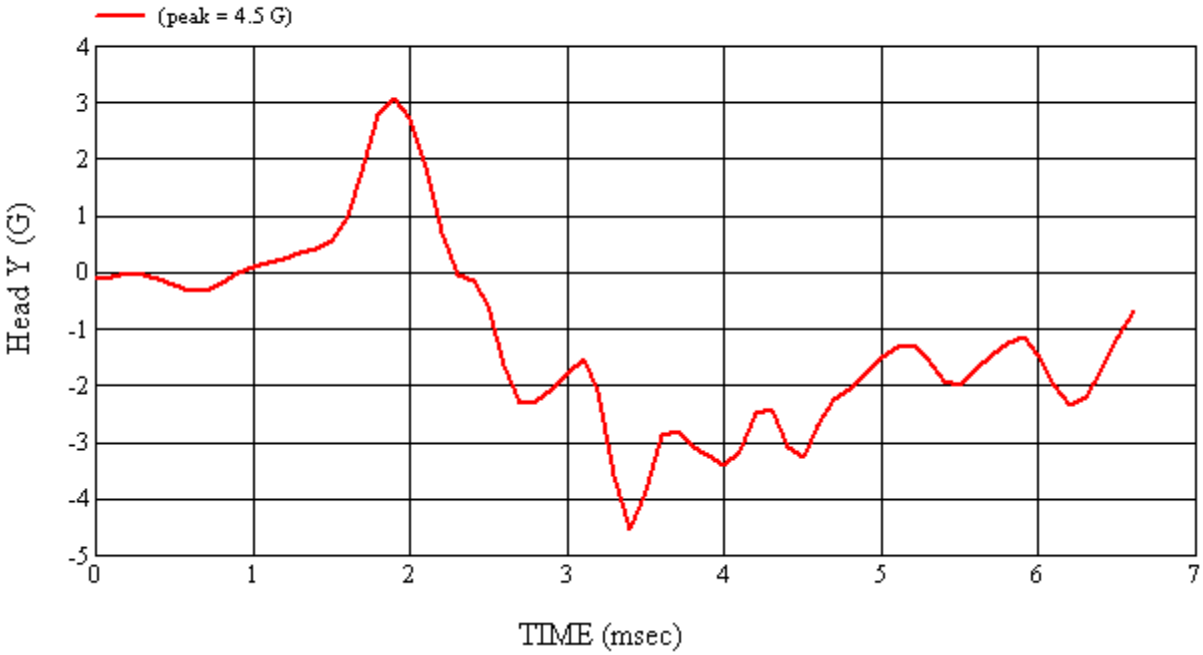
REMARKS:

RECORDED BY: _____ DATE: 4/20/2011

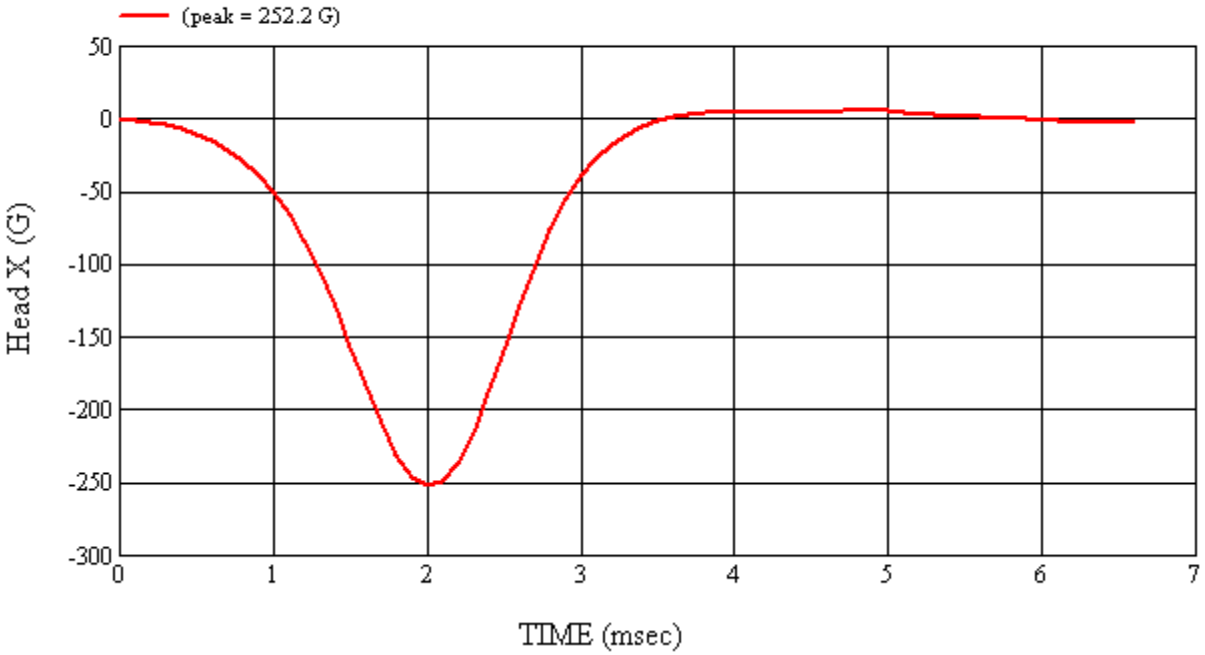
APPROVED BY: _____



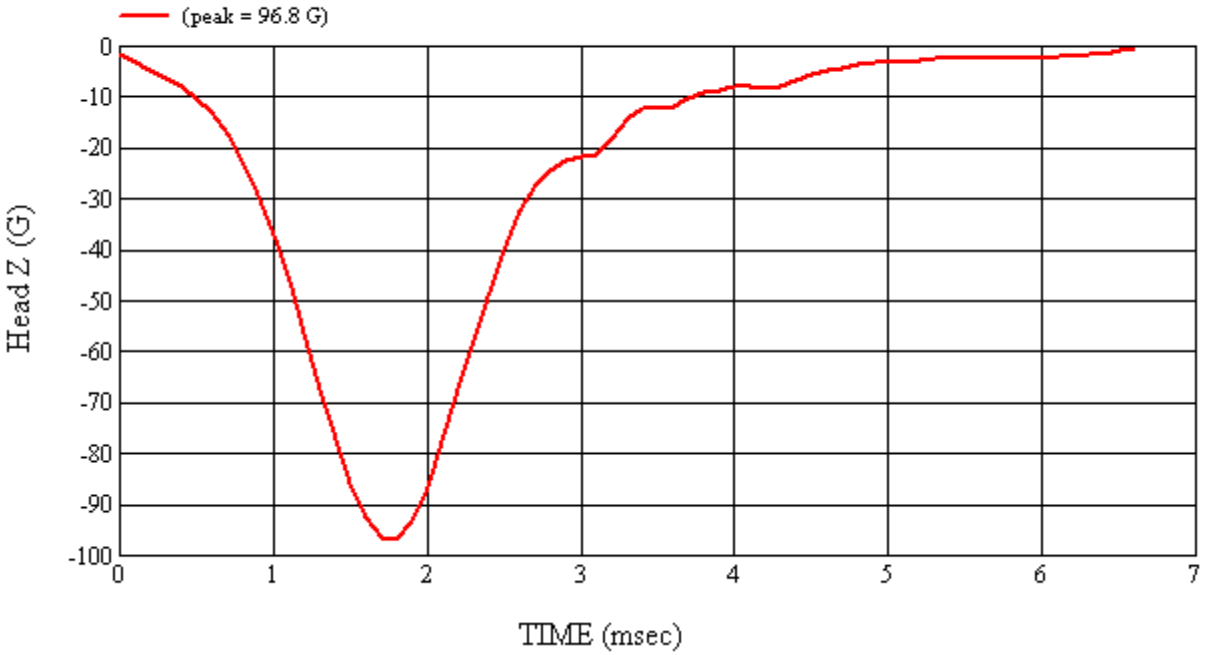
Head 035 (Pre) Calibration #H35013



Head 035 (Pre) Calibration #H35013



Head 035 (Pre) Calibration #H35013



Head 035 (Pre) Calibration #H35013

4-2 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

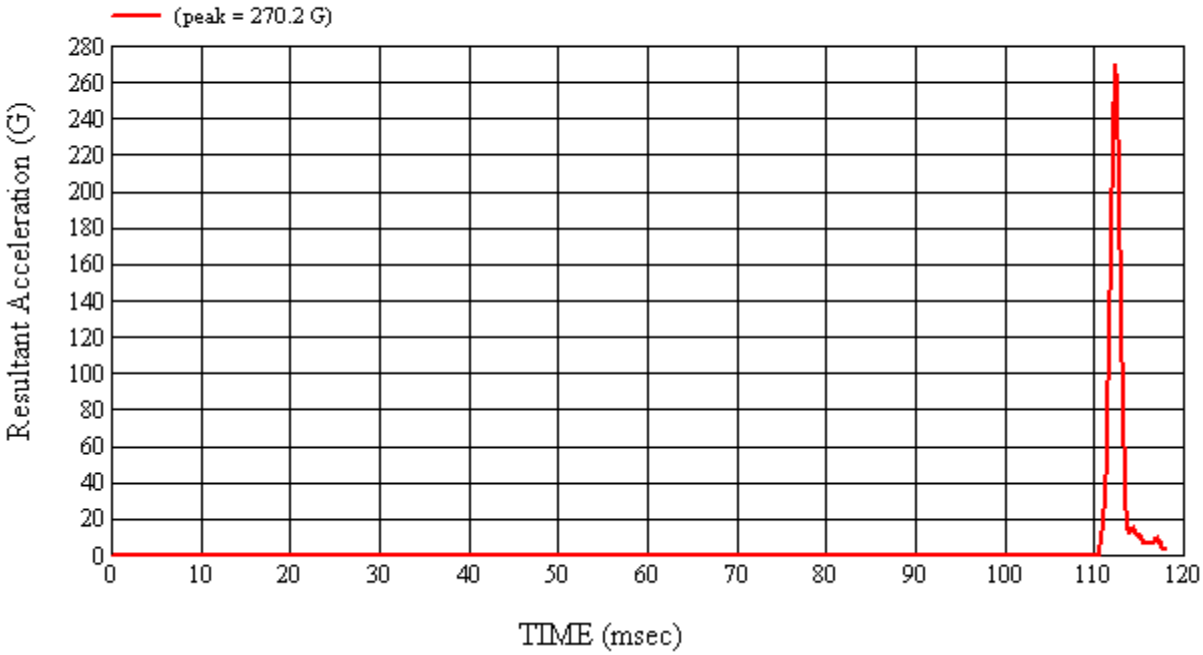
HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 4/27/2011 CALIBRATION TIME: 11:12:33 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.5
Relative Humidity	10% to 70%	61.6
Peak Resultant Acceleration	225 G's to 275 G's	270.2
Peak Lateral Acceleration	15 G's Maximum	9.2
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	J35919	02/04/11	08/04/11
2	ENDEVCO	7264-2000	J22664	02/04/11	08/04/11
3	ENDEVCO	7264-2000	J35924	02/04/11	08/04/11

REMARKS:

RECORDED BY:  DATE: 4/27/2011

APPROVED BY: 



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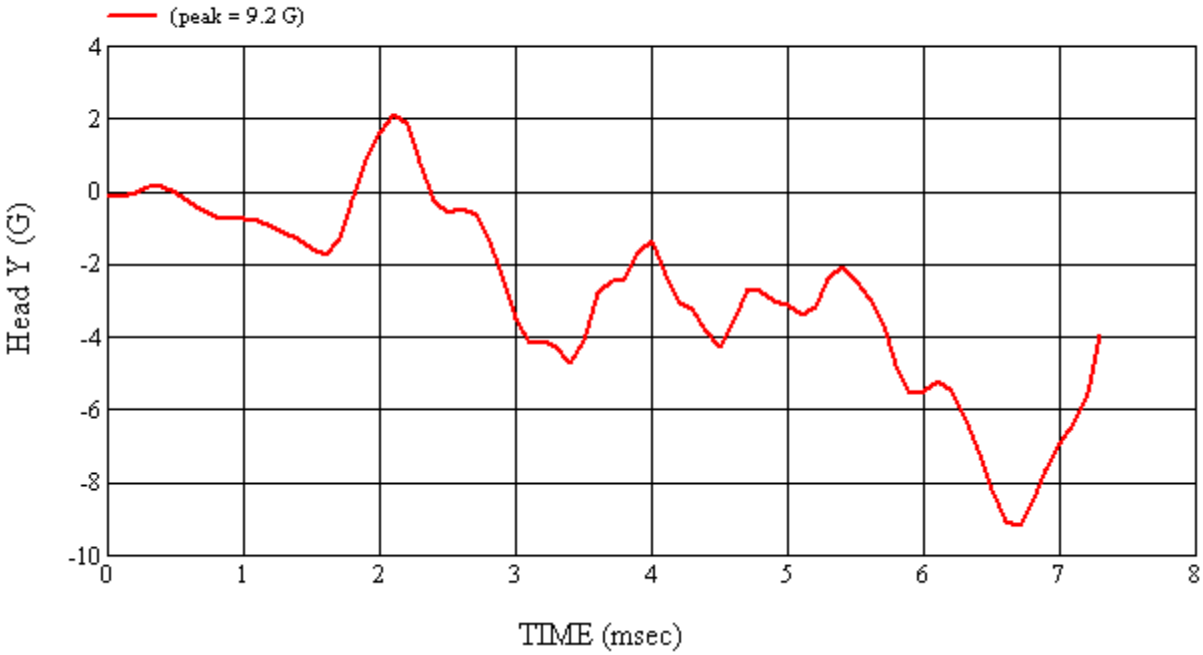

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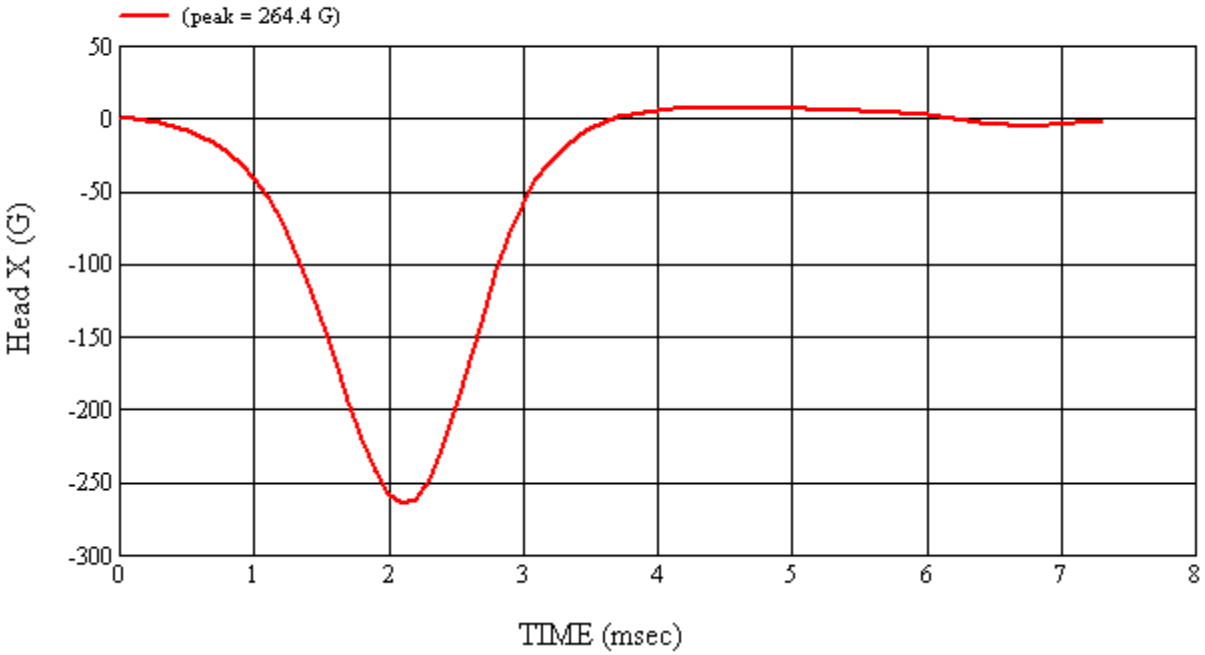

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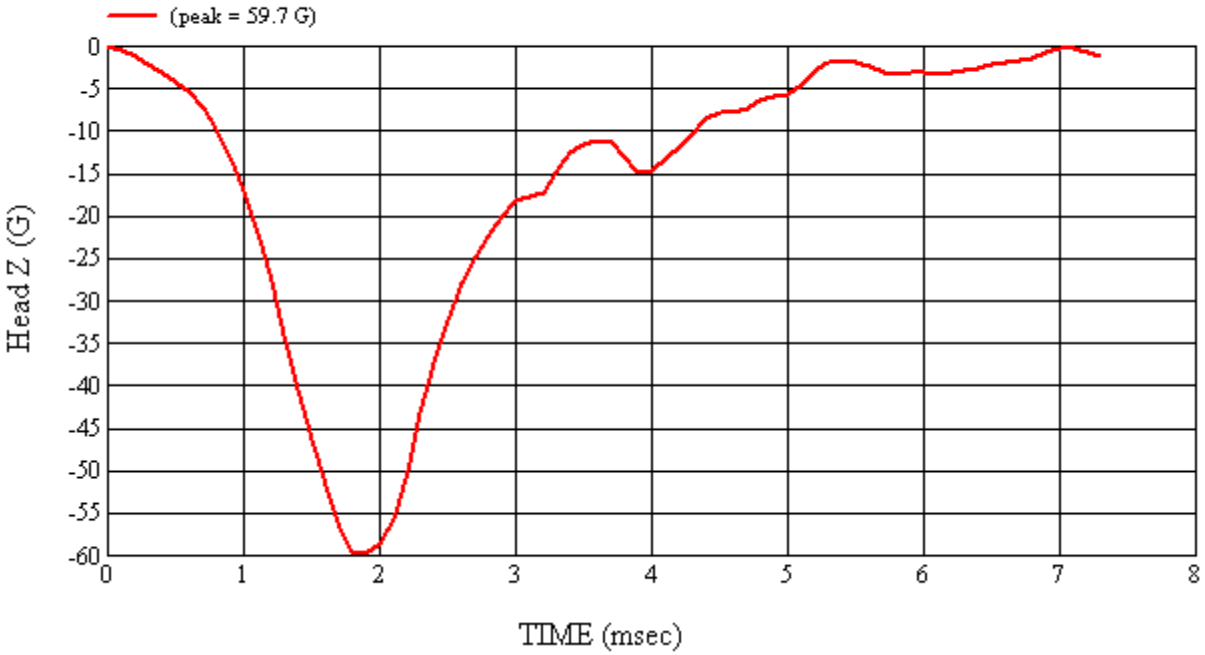


Head 035 (Post) Calibration #H35014

4-3 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

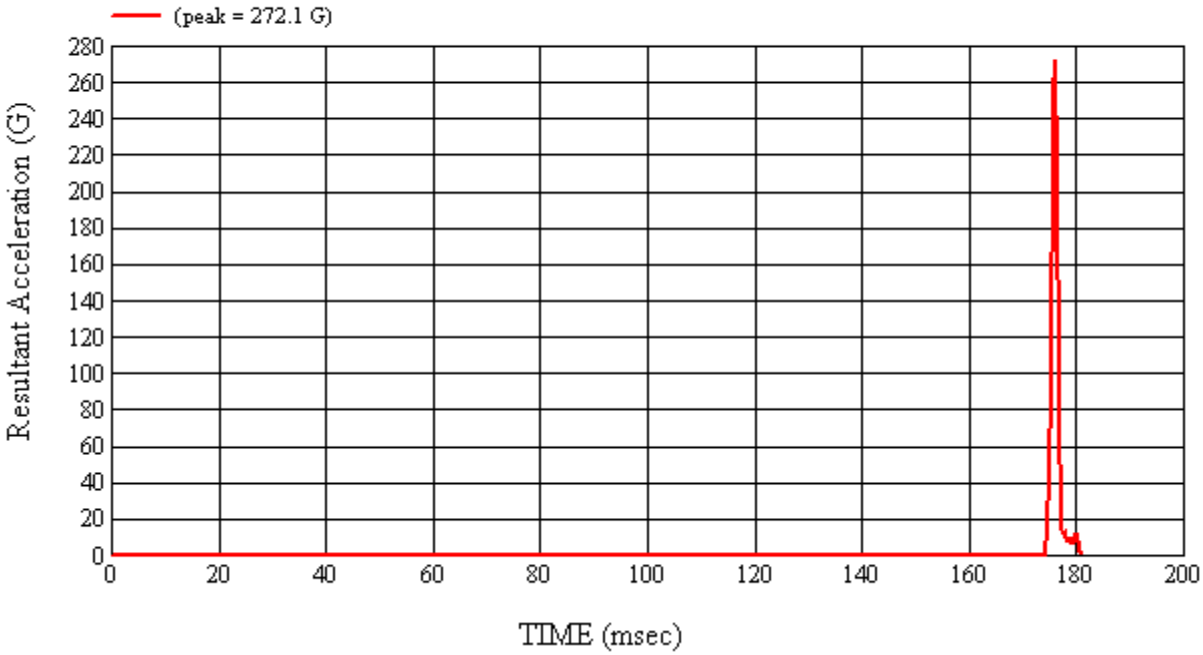
HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 4/20/2011 CALIBRATION TIME: 10:33:20 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	21.6
Relative Humidity	10% to 70%	34.0
Peak Resultant Acceleration	225 G’s to 275 G’s	272.1
Peak Lateral Acceleration	15 G’s Maximum	4.3
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	J32177	02/04/11	08/04/11
2	ENDEVCO	7264-2000	J14103	02/04/11	08/04/11
3	ENDEVCO	7264-2000	J35800	02/04/11	08/04/11

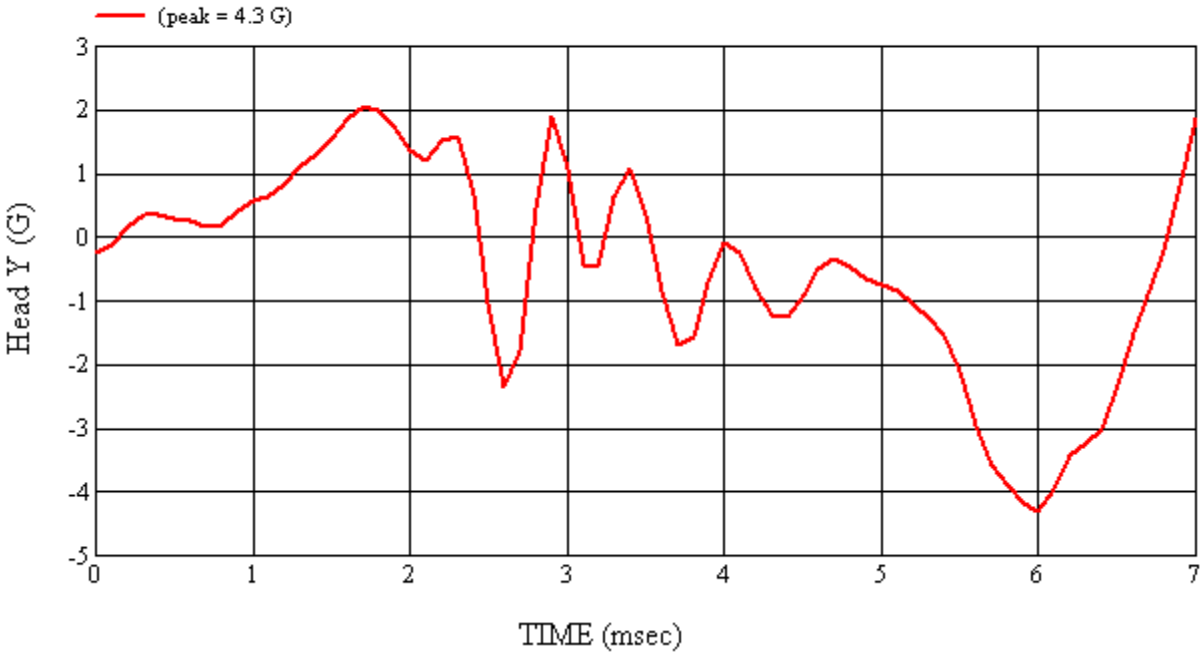
REMARKS:

RECORDED BY: [signature] DATE: 4/20/2011

APPROVED BY: [signature]



Head 037 (Pre) Calibration #H37013



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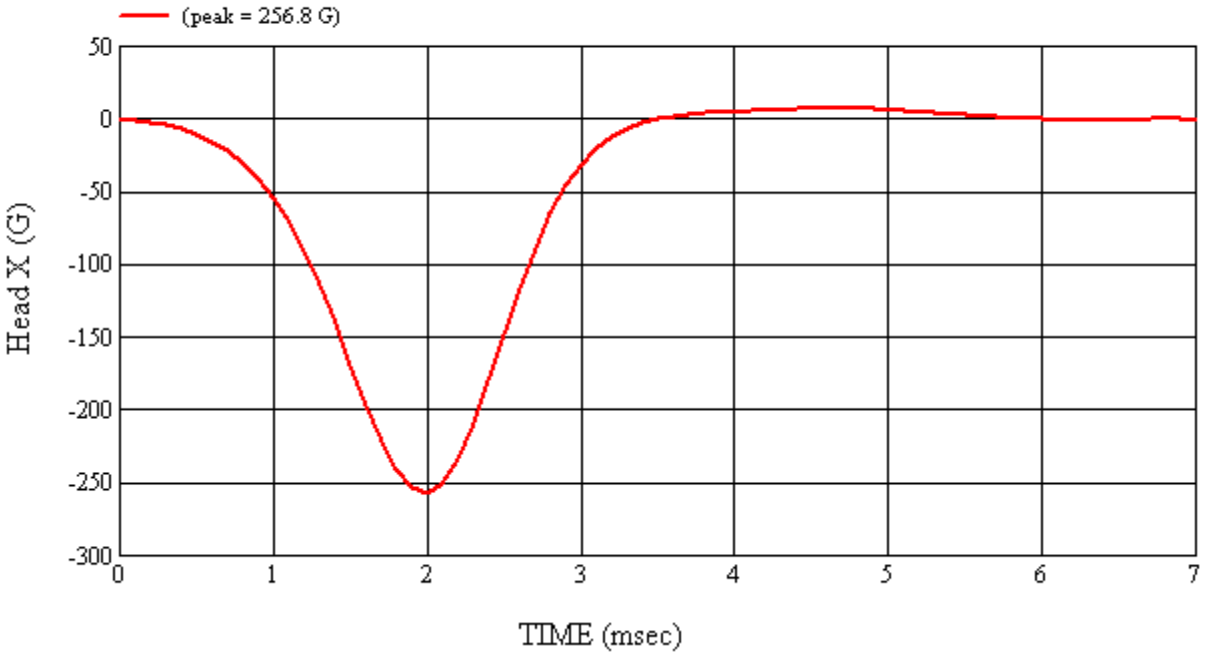
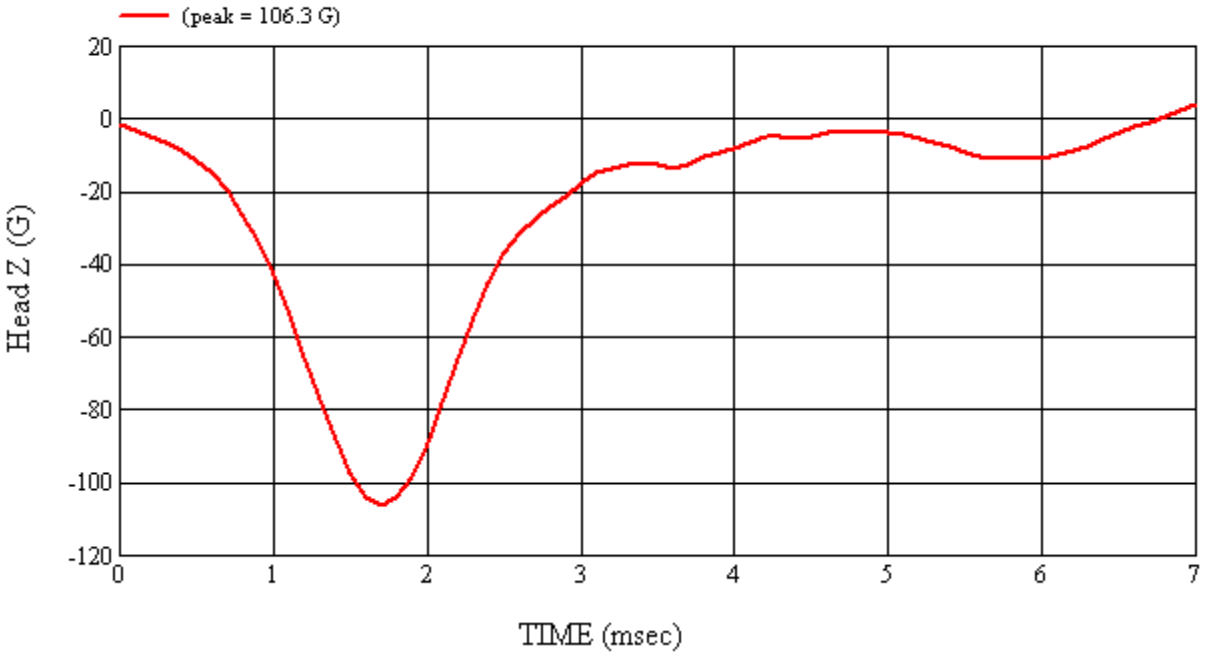


Head 037 (Pre) Calibration #H37013



Head 037 (Pre) Calibration #H37013

4-4 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 4/27/2011 CALIBRATION TIME: 2:55:21 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22.5
Relative Humidity	10% to 70%	62.5
Peak Resultant Acceleration	225 G's to 275 G's	257.9
Peak Lateral Acceleration	15 G's Maximum	5.2
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION

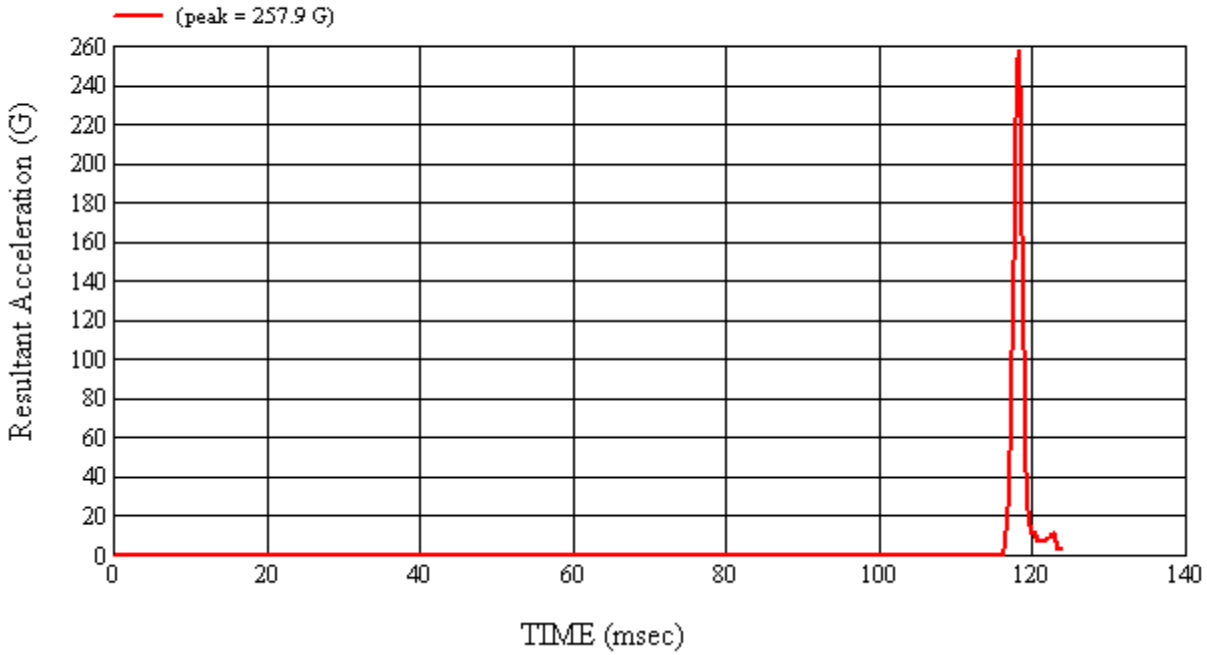
HEAD ACCELEROMETERS

Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	J32177	02/04/11	08/04/11
2	ENDEVCO	7264-2000	J14103	02/04/11	08/04/11
3	ENDEVCO	7264-2000	J35800	02/04/11	08/04/11

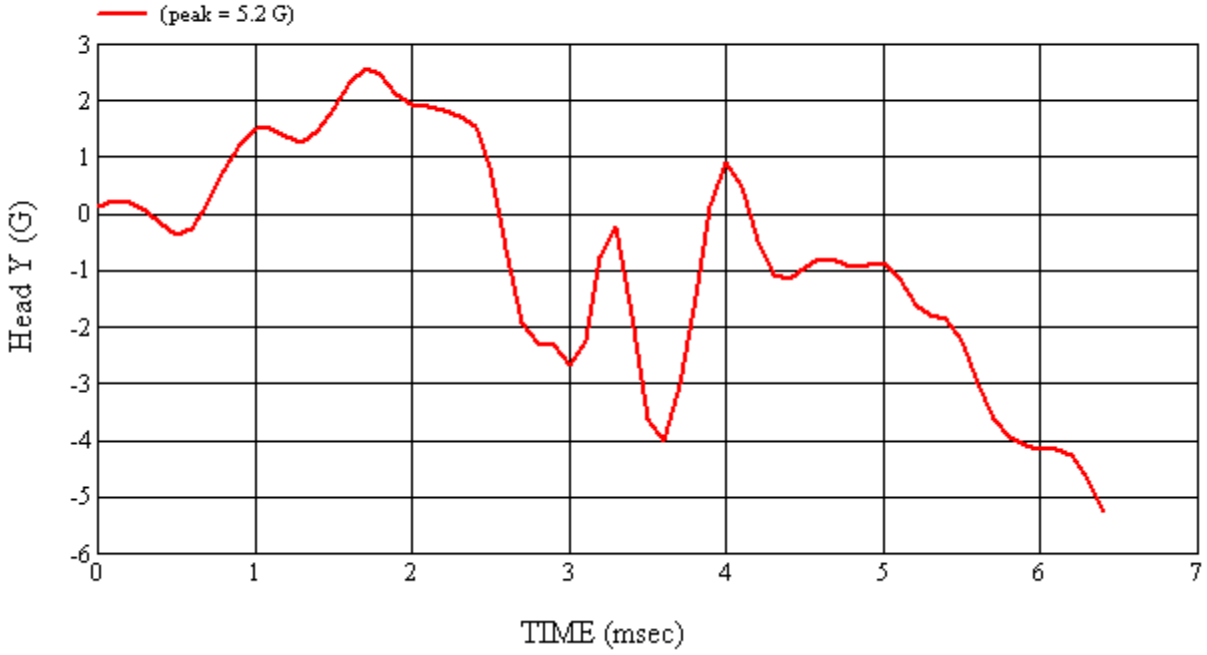
REMARKS:

RECORDED BY: Kevin D. McLemore DATE: 4/27/2011

APPROVED BY: Nathaniel Hendrix



Head 037 (Post) Calibration #H37014



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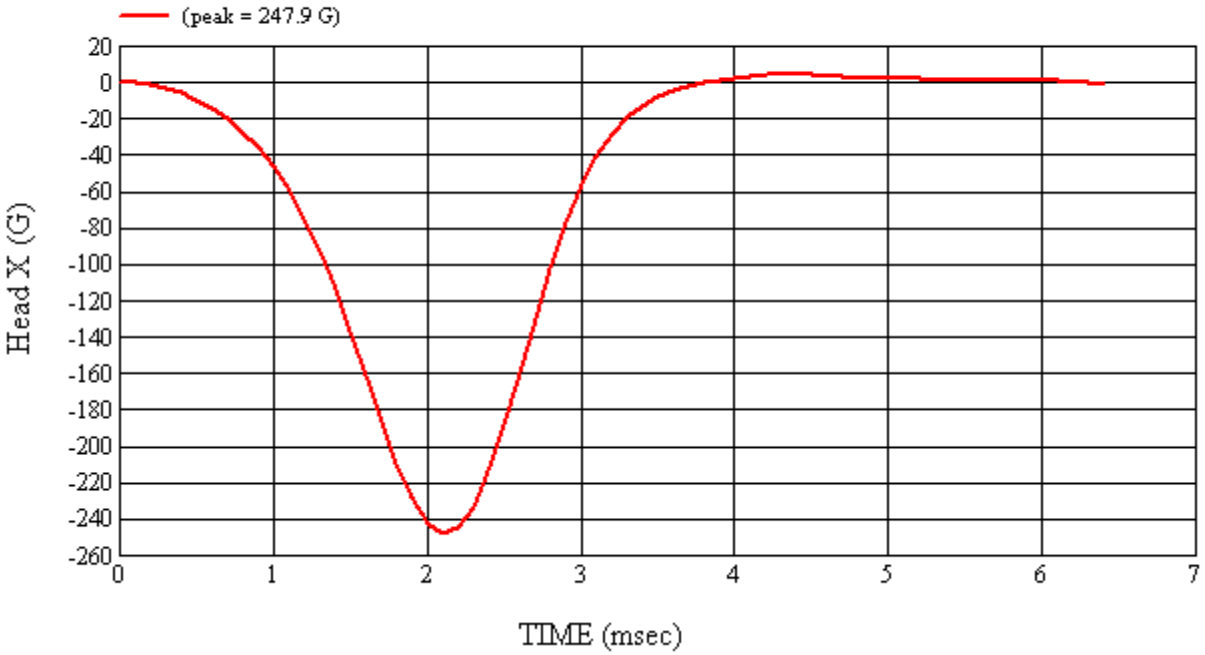
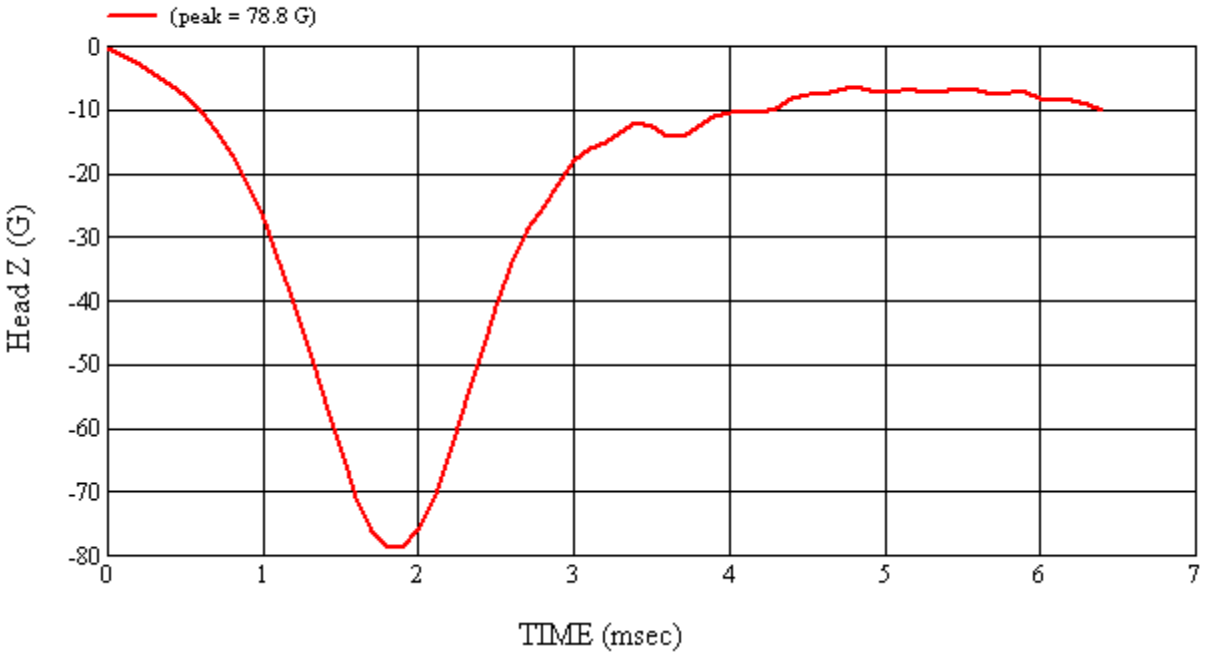


Head 037 (Post) Calibration #H37014



Head 037 (Post) Calibration #H37014

4-5 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

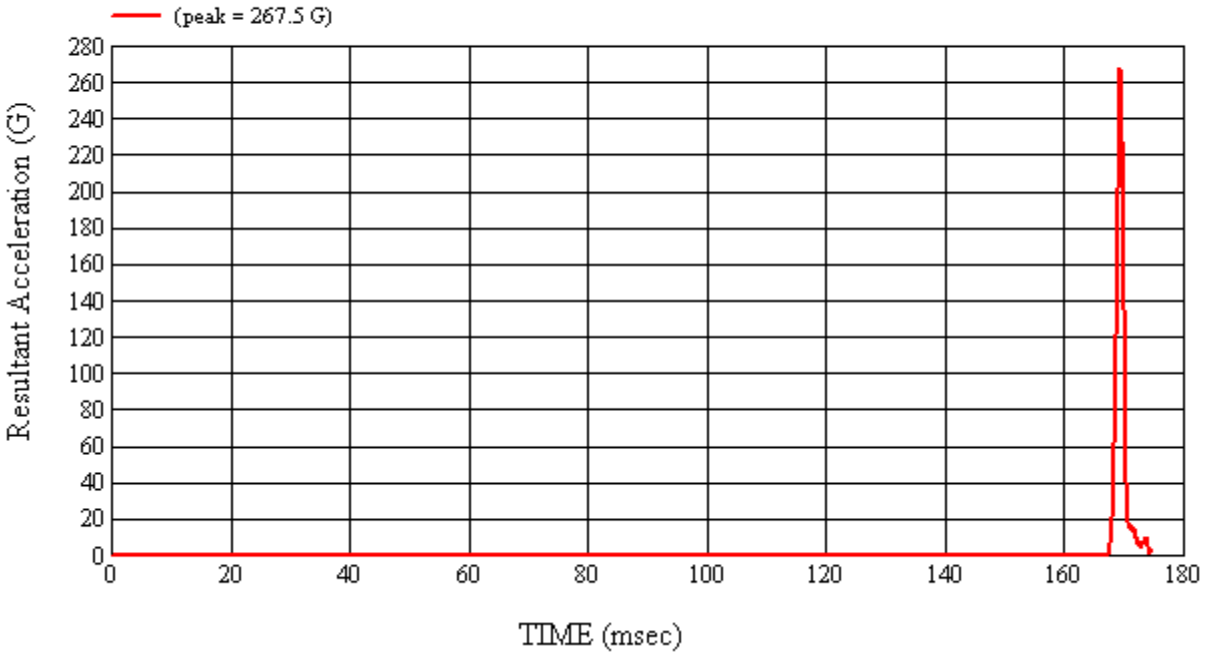
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 4/20/2011 CALIBRATION TIME: 1:31:17 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	21.3
Relative Humidity	10% to 70%	34.1
Peak Resultant Acceleration	225 G's to 275 G's	267.5
Peak Lateral Acceleration	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	J22700	02/07/11	08/07/11
2	ENDEVCO	7264-2000	J36197	02/07/11	08/07/11
3	ENDEVCO	7264-2000	J36353	02/07/11	08/07/11

REMARKS:

RECORDED BY: _____ DATE: __4/20/2011____

APPROVED BY: _____



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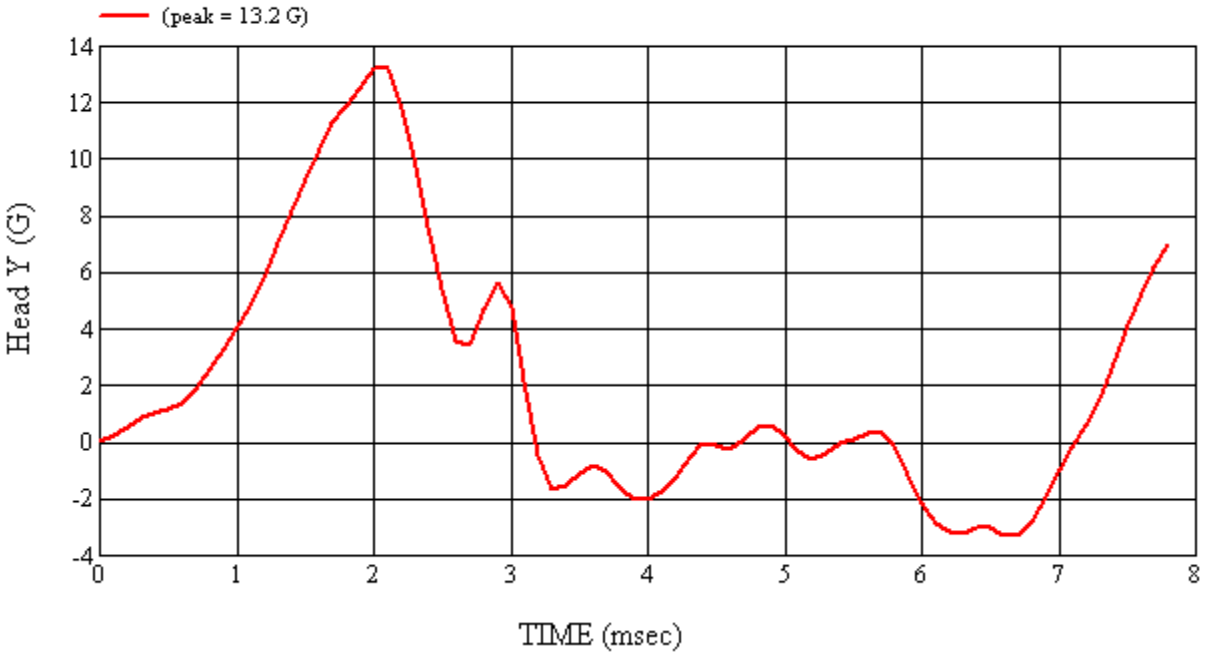

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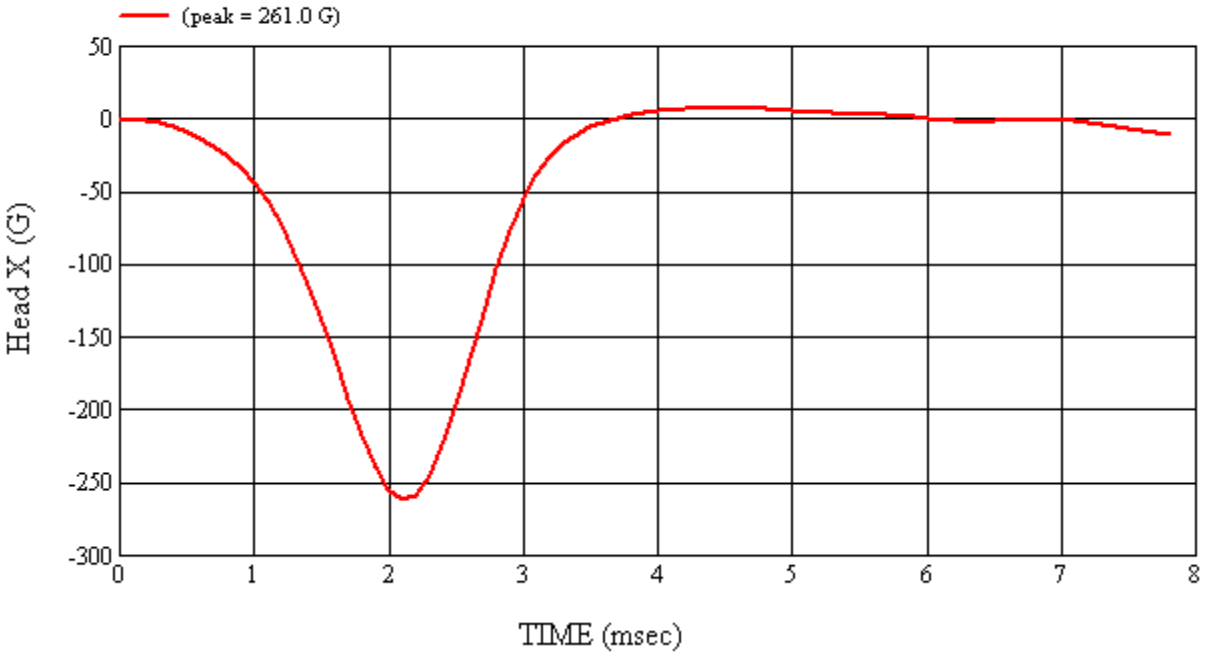

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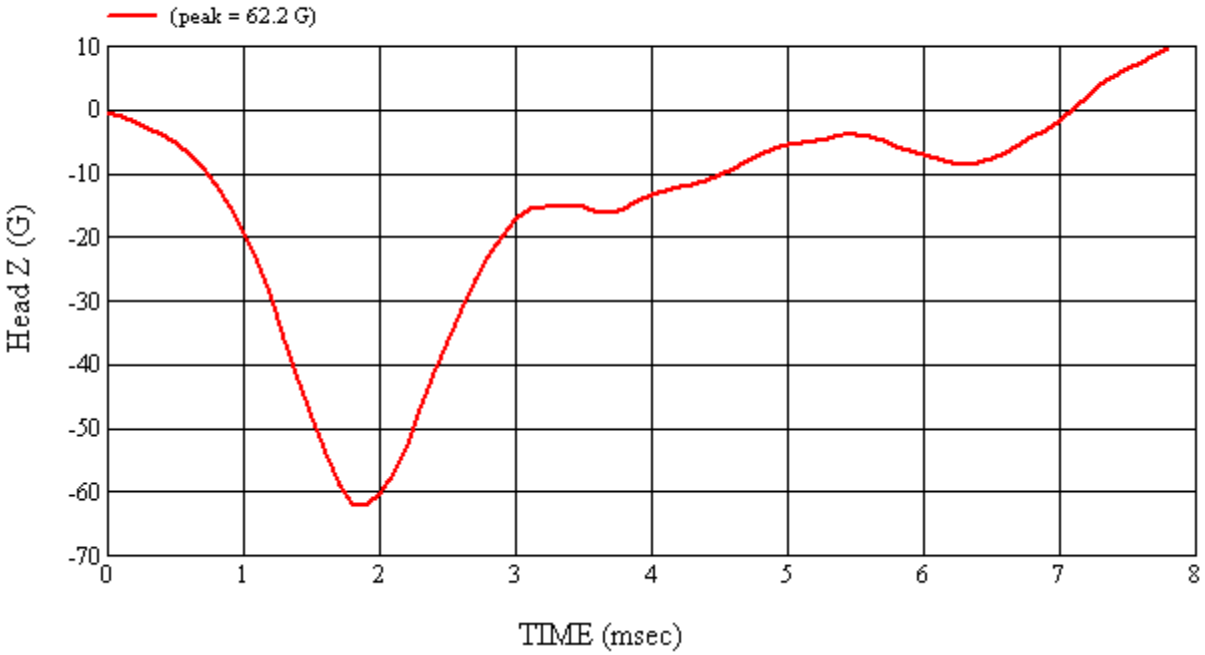


Head 038 (Pre) Calibration #H38013

4-6 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 4/27/2011 CALIBRATION TIME: 11:51:23 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.3
Relative Humidity	10% to 70%	62.2
Peak Resultant Acceleration	225 G's to 275 G's	269.9
Peak Lateral Acceleration	15 G's Maximum	9.7
Unimodal Acceleration Curve	YES	YES

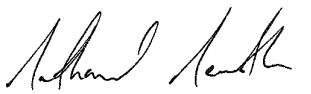
FMH INSTRUMENTATION

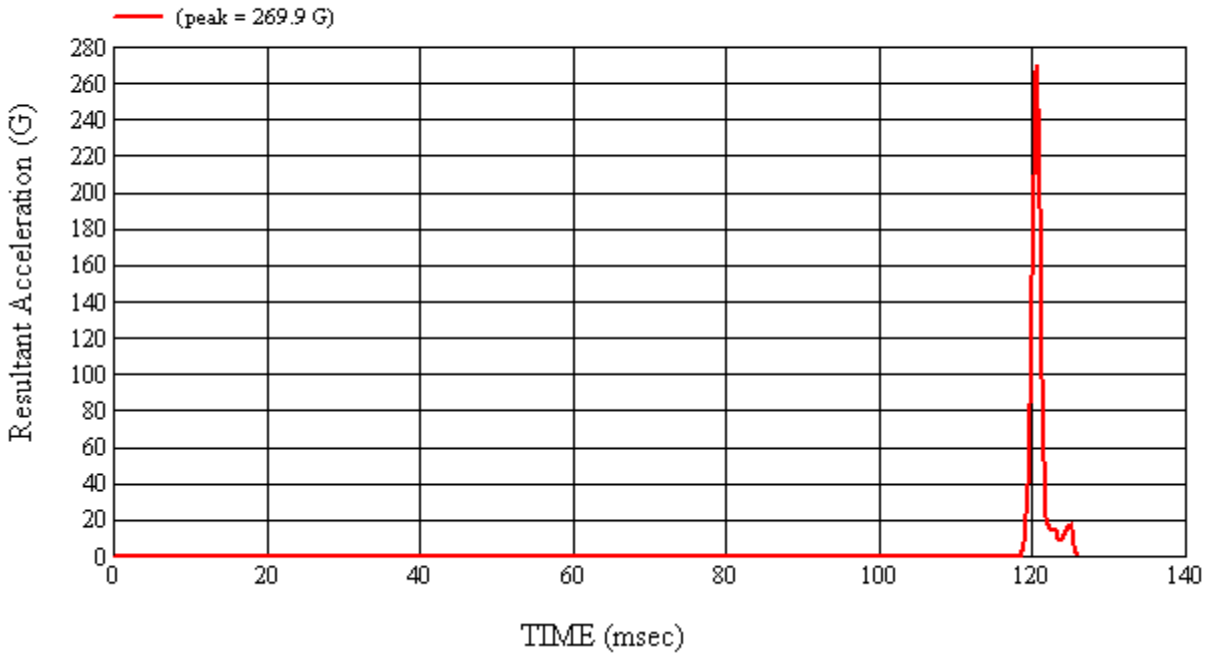
HEAD ACCELEROMETERS

Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	J22700	02/07/11	08/07/11
2	ENDEVCO	7264-2000	J36197	02/07/11	08/07/11
3	ENDEVCO	7264-2000	J36353	02/07/11	08/07/11

REMARKS:

RECORDED BY:  DATE: 4/27/2011

APPROVED BY: 



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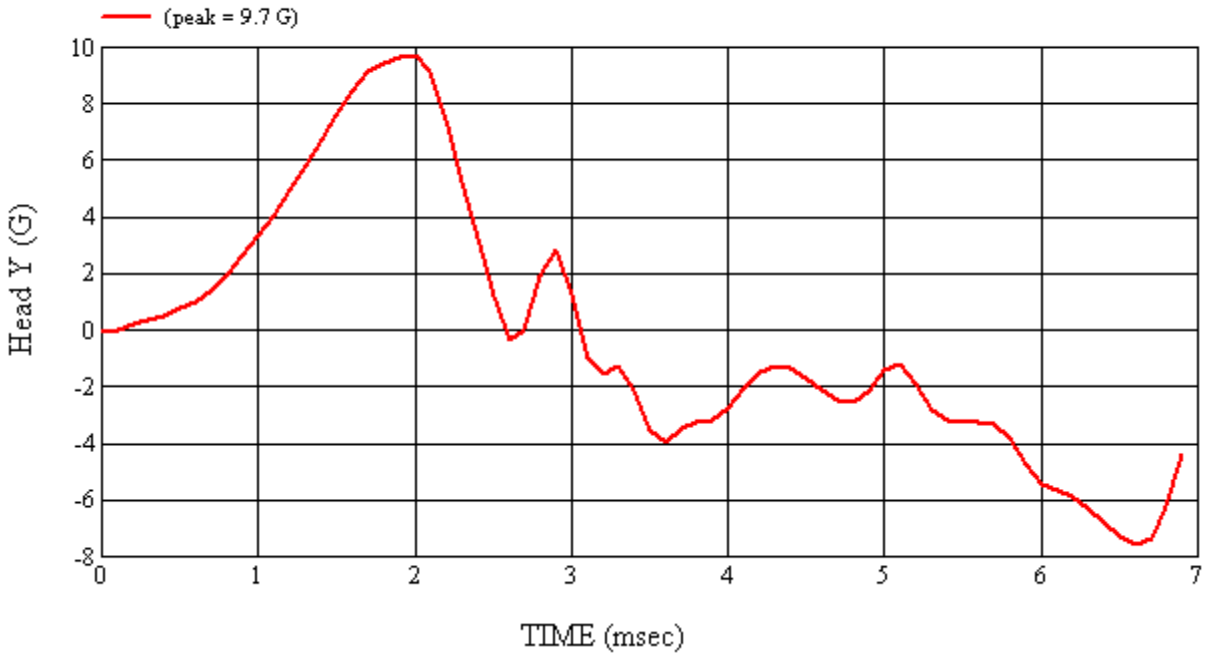

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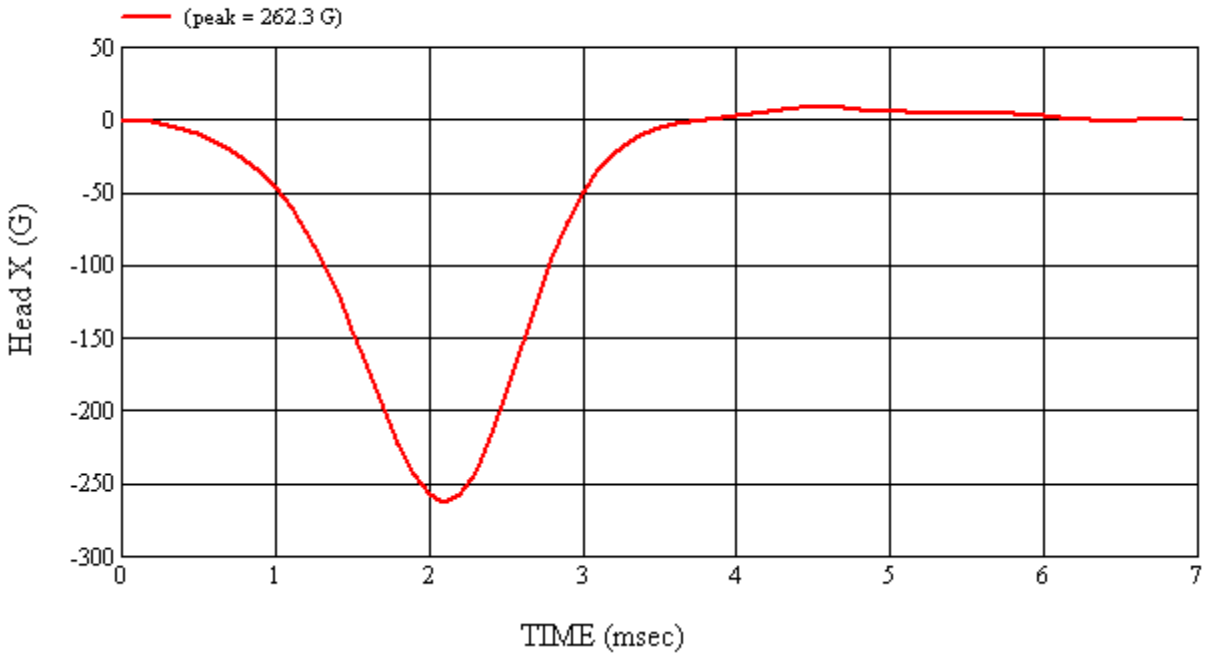
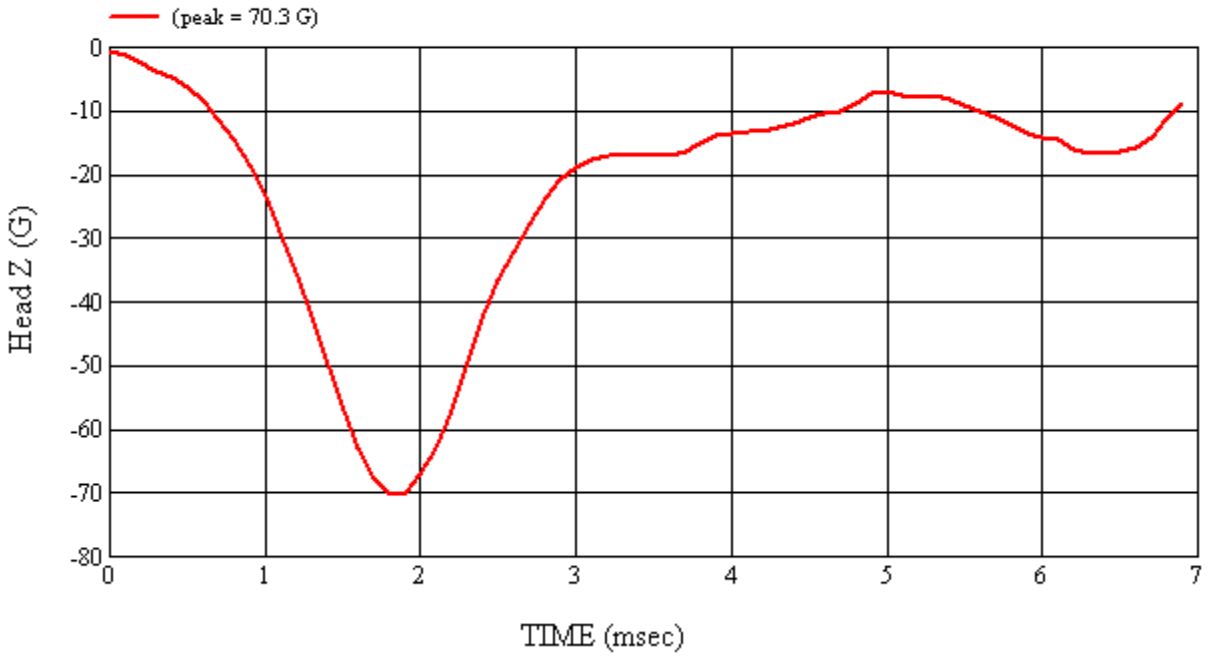


Head 038 (Post) Calibration #H38014



Head 038 (Post) Calibration #H38014

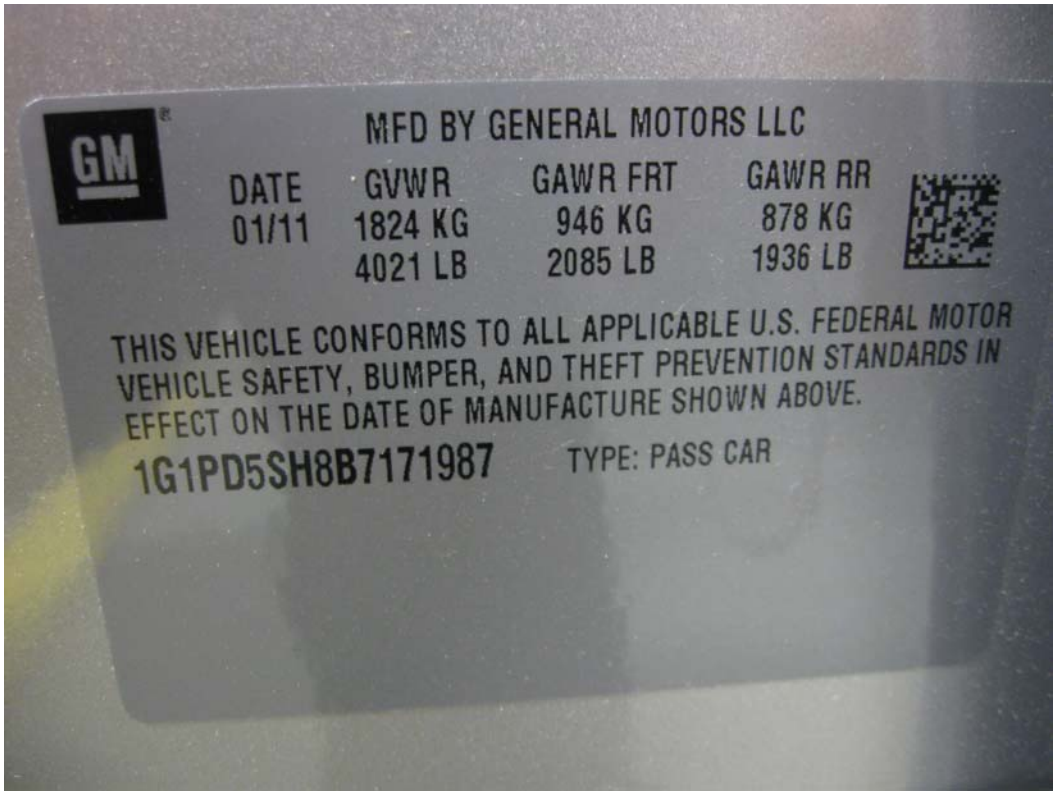
5.0 PHOTOGRAPHS

As Delivered – Left Side View

As Delivered – Right Side View

As Delivered – ¾ Front View From Left Side

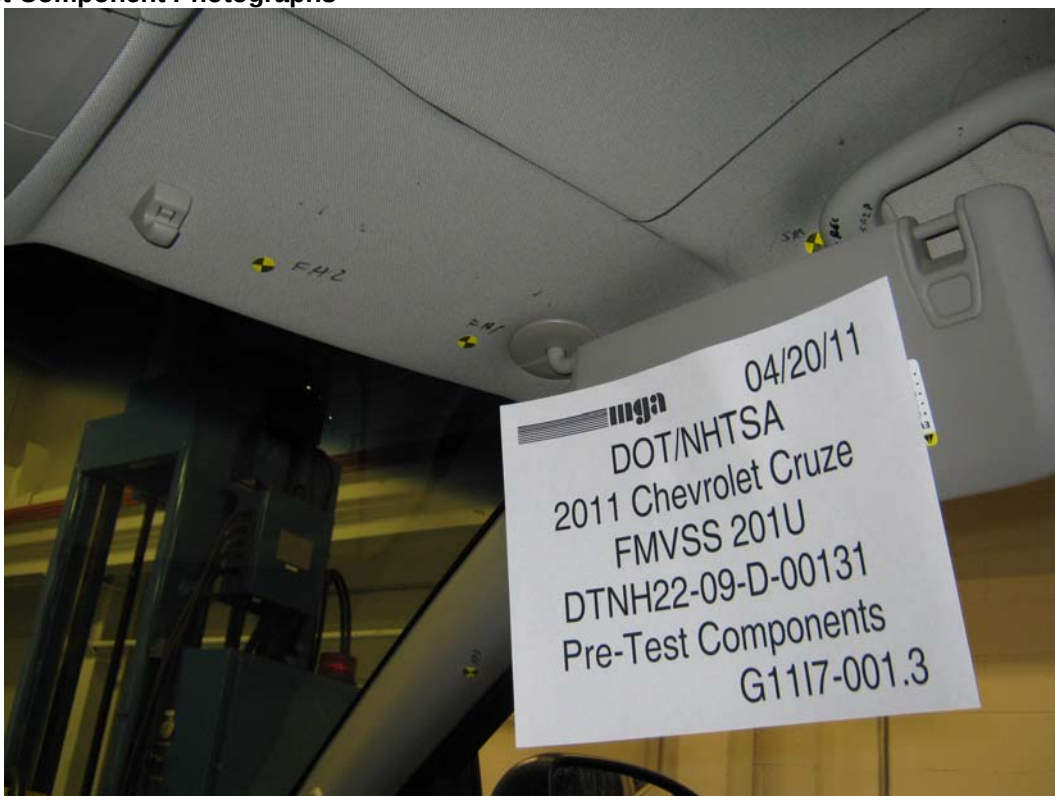
As Delivered – ¾ Rear View From Right Side

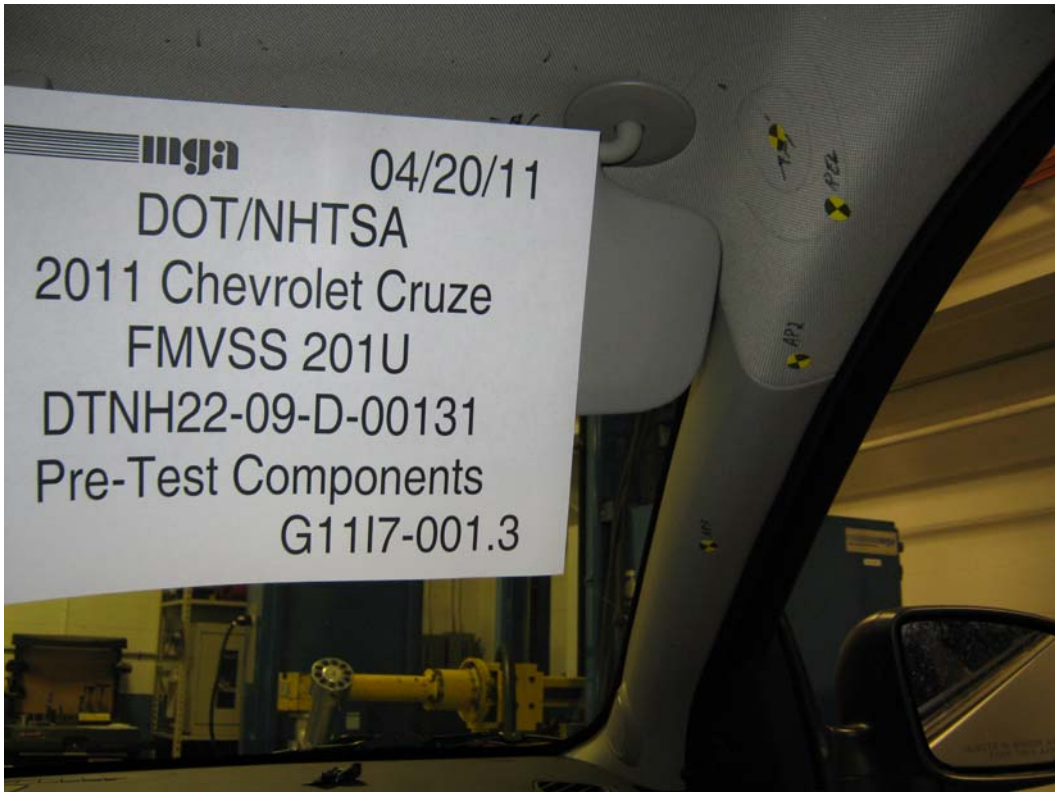


As Delivered – Vehicle's Certification Label

As Delivered – Vehicle's Tire Information Label

Pre-Test Component Photographs



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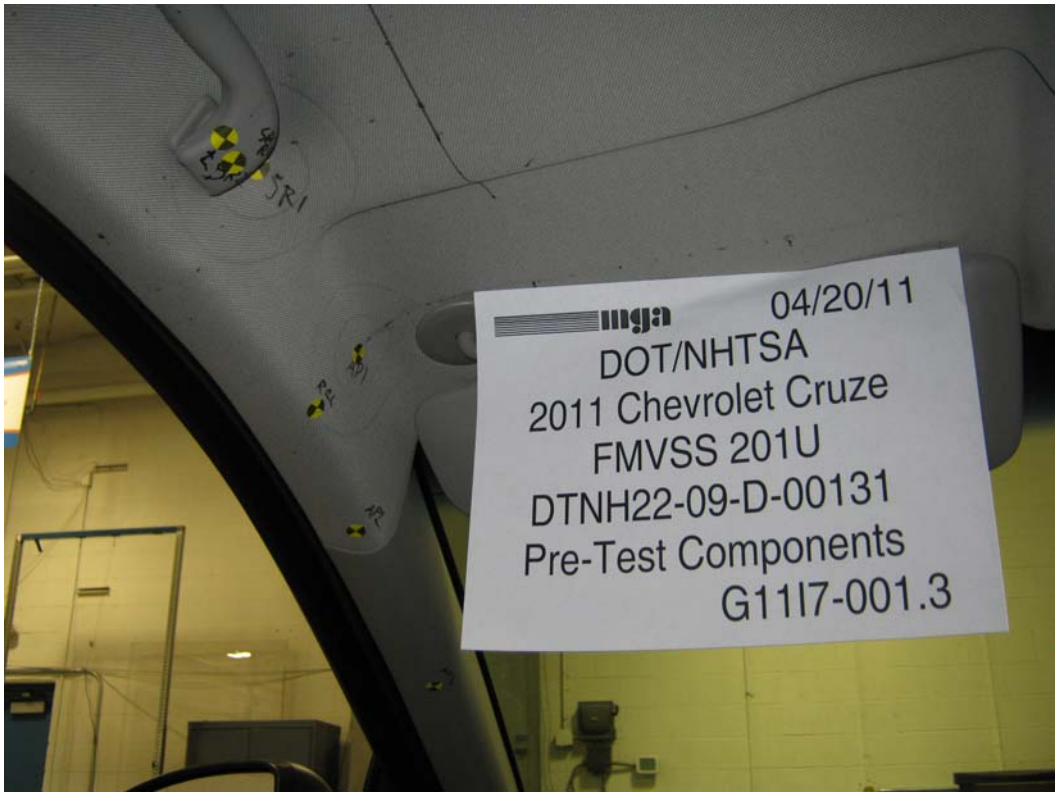
04/20/11
DOT/NHTSA
2011 Chevrolet Cruze
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.3


URY
mga
04/20/11
DOT/NHTSA
2011 Chevrolet Cruze
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.3

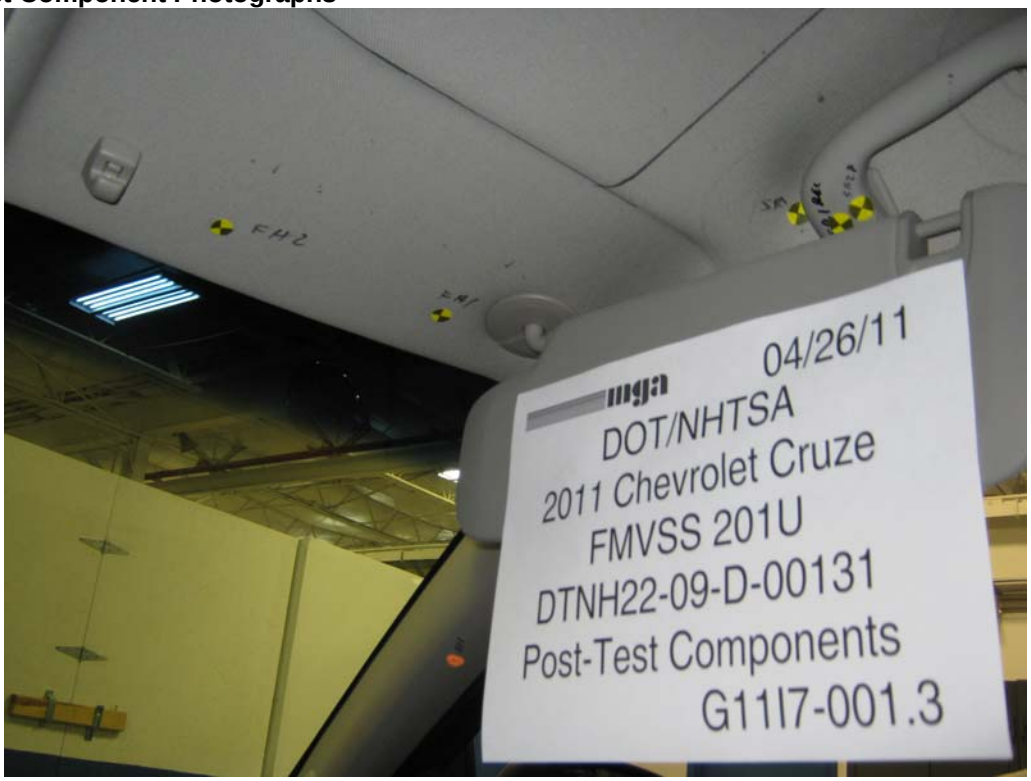

mga
04/20/11
DOT/NHTSA
2011 Chevrolet Cruze
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.3

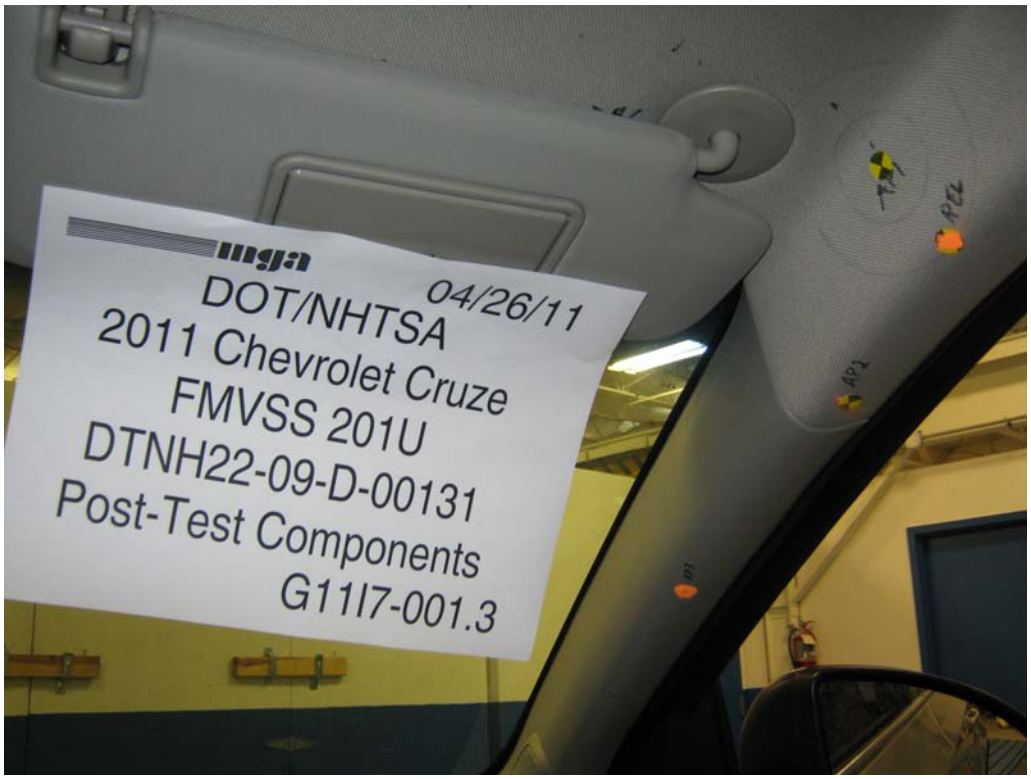

mga
04/20/11
DOT/NHTSA
2011 Chevrolet Cruze
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.3


mga
04/20/11
DOT/NHTSA
2011 Chevrolet Cruze
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.3


mga
04/20/11
DOT/NHTSA
2011 Chevrolet Cruze
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.3

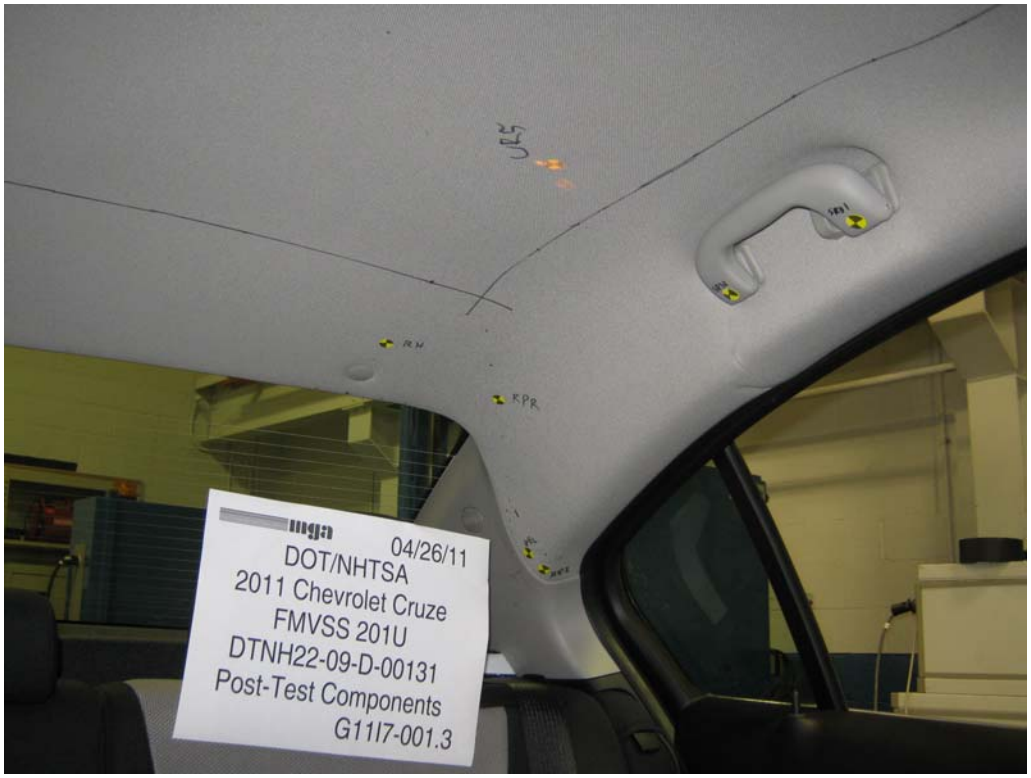
Post-Test Component Photographs






UR2
mga
04/26/11
DOT/NHTSA
2011 Chevrolet Cruze
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.3


UR4
EXIT
mga
04/26/11
DOT/NHTSA
2011 Chevrolet Cruze
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.3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2011 Chevrolet Cruze
FMVSS 201U
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Post-Test Components
G11I7-001.3


04/26/11
DOT/NHTSA
2011 Chevrolet Cruze
FMVSS 201U
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Post-Test Components
G11I7-001.3


mga
04/26/11
DOT/NHTSA
2011 Chevrolet Cruze
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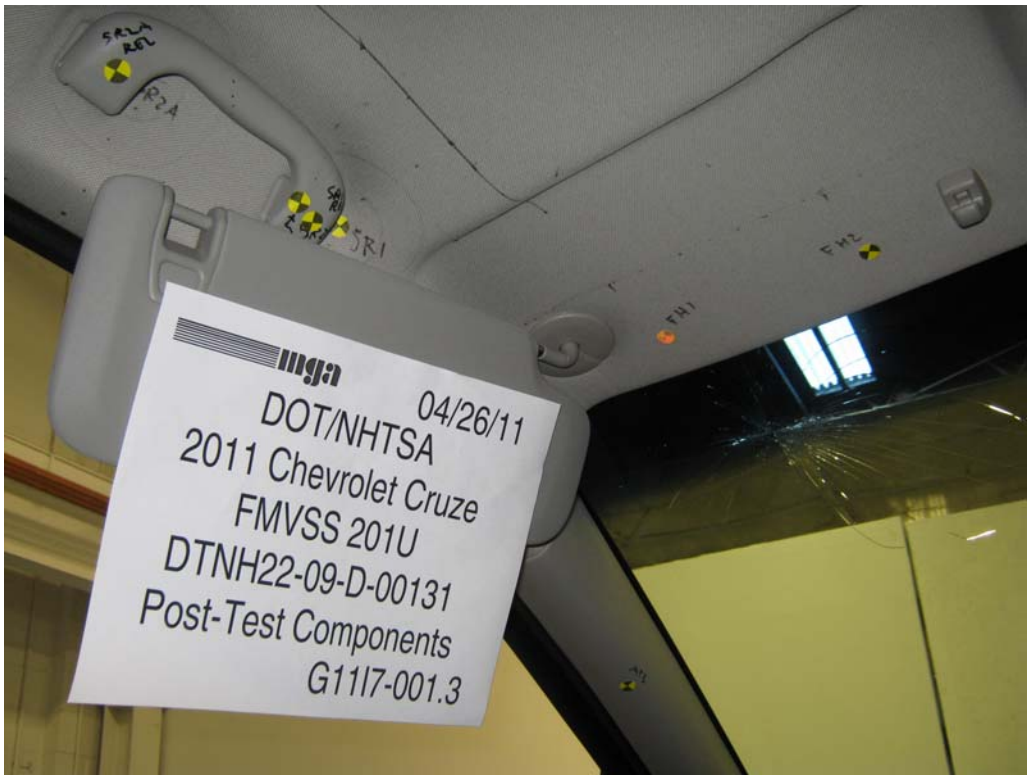
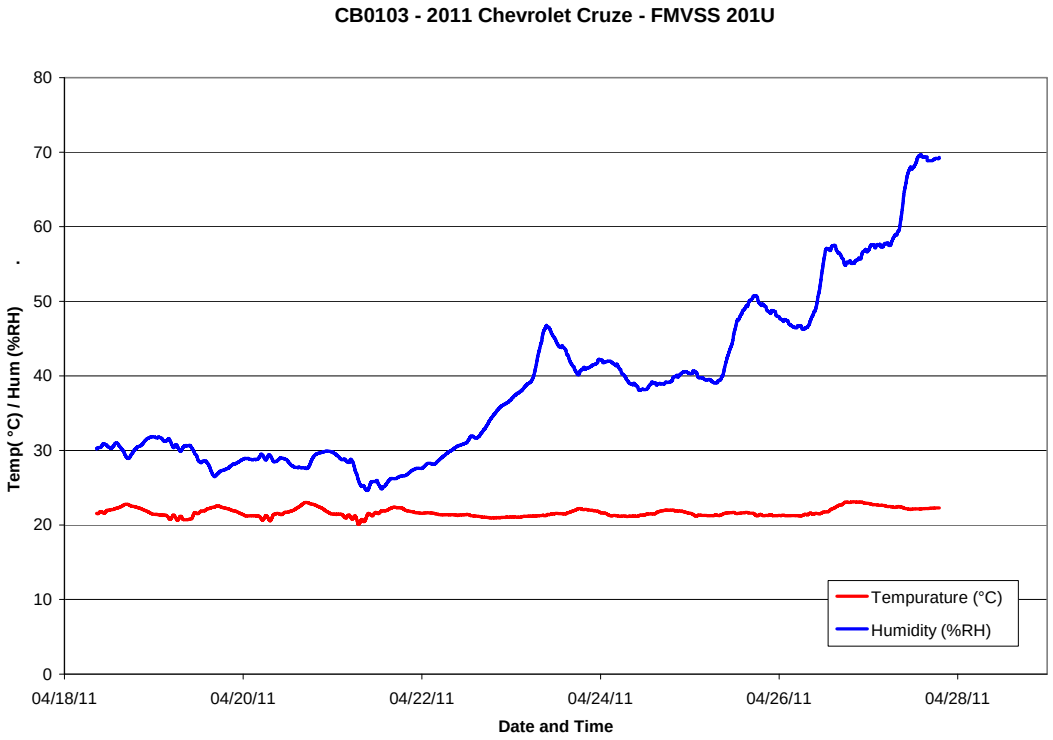
Post-Test Components
G11I7-001.3


mga
04/26/11
DOT/NHTSA
2011 Chevrolet Cruze
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.3

Appendix A – Temperature Trace



Appendix B – Calibration Certificates

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	9/14/2010
Calibrated By:	Modal Shop

Sensor	
Name:	MGA MI
Manufacturer	Endevco
Model #:	7264-2000
Serial #:	J35919
Capacity/Range: (G's)	2,000

Calibration Date:	2/4/2011
New DLR(Units:G'S) [1] 100K SHUNT	95.8
Linearity:[2]	0.99951
New vs Old Sensitivit (% Difference)	0.7
Temperature:	72 °F
Humidity:	20 %
Sensitivity (mV/V/G):	0.025975
Calibrated By:	Ryan Jones

Signature: _____

Approved by: Helen A. Kaleto

1. Actual data of reference and sensor instruments is found in calibration files

2. Linearity is defined as 1- (Standard Deviation/ Mean)

All calibrations are traceable to the National Institute of Standards and Technology

Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	9/14/2010
Calibrated By:	Modal Shop

Sensor	
Name:	MGA MI
Manufacturer	Endevco
Model #:	7264-2000
Serial #:	J22664
Capacity/Range: (G's)	2,000

Calibration Date:	2/4/2011
New DLR(Units:G'S) [1] 100K SHUNT	94.2
Linearity:[2]	0.99938
New vs Old Sensitivit (% Difference)	1.2
Temperature:	72 ^{0}F
Humidity:	20 %
Sensitivity (mV/V/G):	0.026447
Calibrated By:	Ryan Jones

Signature: _____

Approved by: Helen A. Kalata

1. Actual data of reference and sensor instruments is found in calibration files

2. Linearity is defined as 1- (Standard Deviation/ Mean)

All calibrations are traceable to the National Institute of Standards and Technology

Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	9/14/2010
Calibrated By:	Modal Shop

Sensor	
Name:	MGA MI
Manufacturer	Endevco
Model #:	7264-2000
Serial #:	J35924
Capacity/Range: (G's)	2,000

Calibration Date:	2/4/2011
New DLR(Units:G'S) [1] 100K SHUNT	92.8
Linearity:[2]	0.99947
New vs Old Sensitivit (% Difference)	1.2
Temperature:	72 °F
Humidity:	20 %
Sensitivity (mV/V/G):	0.026824
Calibrated By:	Ryan Jones

Signature: _____

Approved by: Steven A. Kaleto

1. Actual data of reference and sensor instruments is found in calibration files

2. Linearity is defined as 1- (Standard Deviation/ Mean)

All calibrations are traceable to the National Institute of Standards and Technology

Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	9/14/2010
Calibrated By:	Modal Shop

Sensor	
Name:	MGA MI
Manufacturer	Endevco
Model #:	7264-2000
Serial #:	J32177
Capacity/Range: (G's)	2,000

Calibration Date:	2/4/2011
New DLR(Units:G'S) [1] 100K SHUNT	113.7
Linearity:[2]	0.9997
New vs Old Sensitivit (% Difference)	-0.2
Temperature:	72 °F
Humidity:	20 %
Sensitivity (mV/V/G):	0.021883
Calibrated By:	Ryan Jones

Signature: _____

Approved by: Helen A. Kaleto

1. Actual data of reference and sensor instruments is found in calibration files

2. Linearity is defined as 1- (Standard Deviation/ Mean)

All calibrations are traceable to the National Institute of Standards and Technology

Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	9/14/2010
Calibrated By:	Modal Shop

Sensor	
Name:	MGA MI
Manufacturer	Endevco
Model #:	7264-2000
Serial #:	J14103
Capacity/Range: (G's)	2,000

Calibration Date:	2/4/2011
New DLR(Units:G'S) [1] 100K SHUNT	93.9
Linearity:[2]	0.99955
New vs Old Sensitivit (% Difference)	-0.1
Temperature:	72 °F
Humidity:	20 %
Sensitivity (mV/V/G):	0.026479
Calibrated By:	Ryan Jones

Signature: _____

Approved by: Helen A. Kalata

1. Actual data of reference and sensor instruments is found in calibration files

2. Linearity is defined as 1- (Standard Deviation/ Mean)

All calibrations are traceable to the National Institute of Standards and Technology

Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	9/14/2010
Calibrated By:	Modal Shop

Sensor	
Name:	MGA MI
Manufacturer	Endevco
Model #:	7264-2000
Serial #:	J35800
Capacity/Range: (G's)	2,000

Calibration Date:	2/4/2011
New DLR(Units:G'S) [1] 100K SHUNT	97.8
Linearity:[2]	0.9995
New vs Old Sensitivit (% Difference)	0.6
Temperature:	72 °F
Humidity:	20 %
Sensitivity (mV/V/G):	0.025451
Calibrated By:	Ryan Jones

Signature: _____

Approved by: _____

1. Actual data of reference and sensor instruments is found in calibration files

2. Linearity is defined as 1- (Standard Deviation/ Mean)

All calibrations are traceable to the National Institute of Standards and Technology

Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	9/14/2010
Calibrated By:	Modal Shop

Sensor	
Name:	MGA MI
Manufacturer	Endevco
Model #:	7264-2000
Serial #:	J22700
Capacity/Range: (G's)	2,000

Calibration Date:	2/7/2011
New DLR(Units:G'S) [1] 100K SHUNT	96.4
Linearity:[2]	0.99966
New vs Old Sensitivit (% Difference)	0.5
Temperature:	70 ^{o}F
Humidity:	20 %
Sensitivity (mV/V/G):	0.025819
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Helen R. Kalata

1. Actual data of reference and sensor instruments is found in calibration files

2. Linearity is defined as 1- (Standard Deviation/ Mean)

All calibrations are traceable to the National Institute of Standards and Technology

Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	9/14/2010
Calibrated By:	Modal Shop

Sensor	
Name:	MGA MI
Manufacturer	Endevco
Model #:	7264-2000
Serial #:	J36197
Capacity/Range: (G's)	2,000

Calibration Date:	2/7/2011
New DLR(Units:G'S) [1] 100K SHUNT	108.7
Linearity:[2]	0.99976
New vs Old Sensitivit (% Difference)	0.9
Temperature:	70 °F
Humidity:	20 %
Sensitivity (mV/V/G):	0.022869
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Helen A. Kaleto

1. Actual data of reference and sensor instruments is found in calibration files

2. Linearity is defined as 1- (Standard Deviation/ Mean)

All calibrations are traceable to the National Institute of Standards and Technology

Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	9/14/2010
Calibrated By:	Modal Shop

Sensor	
Name:	MGA MI
Manufacturer	Endevco
Model #:	7264-2000
Serial #:	J36353
Capacity/Range: (G's)	2,000

Calibration Date:	2/7/2011
New DLR(Units:G'S) [1] 100K SHUNT	99.1
Linearity:[2]	0.99988
New vs Old Sensitivit (% Difference)	0.9
Temperature:	70 °F
Humidity:	20 %
Sensitivity (mV/V/G):	0.025114
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Helen A. Kalata

1. Actual data of reference and sensor instruments is found in calibration files

2. Linearity is defined as 1- (Standard Deviation/ Mean)

All calibrations are traceable to the National Institute of Standards and Technology

Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

THE MODAL SHOP INC
3149 East Kemper Rd.
Cincinnati, OH 45241
Ph: 513-351-9919
Fax: 513-458-2172
www.modalshop.com

~Calibration Certificate~

Sensor Information

Model Number: 352C03
Serial Number: 95980
Manufacturer: PCB
ID Number:
Description: ICP® Accelerometer

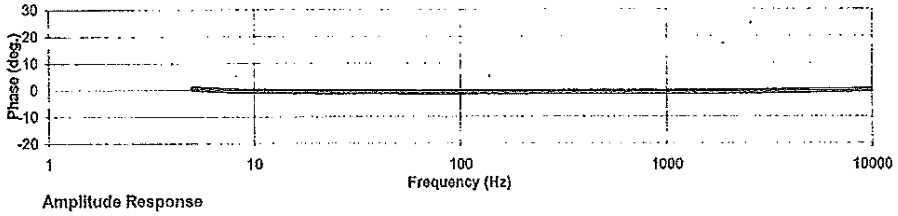
Calibration Data

Sensitivity @ 100 Hz:	9.94	mV/g
Phase @ 100 Hz:	-0.87	deg.
Test Level:	10.00	g

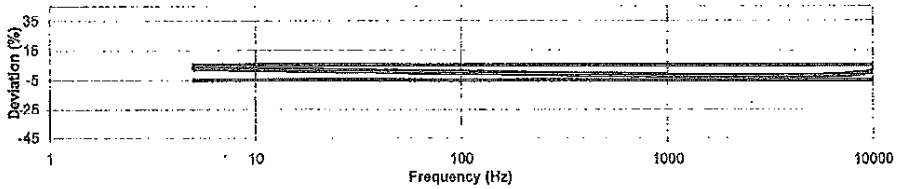
Transducer Specifications

Amp. Range:	± 500	g
Resolution:	0.0005	g
Resonant Freq:	≥ 50000	Hz
Temp. Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uni-Axial	

Phase Response



Amplitude Response



Data Table

Freq. (Hz)	Deviation (%)	Phase (deg)
5	3.15	0.41
10	2.18	-0.36
30	0.99	-0.71
50	0.62	-0.68
100	0.00	-0.87
300	-0.88	-0.81
500	-1.29	-0.77
1000	-1.87	-0.77
2000	-2.45	-0.68
3000	-2.46	-0.61
4000	-2.59	-0.49
5000	-2.40	-0.40
6000	-2.09	-0.26
7000	-1.63	-0.23
8000	-1.10	-0.13
9000	-0.30	0.02
10000	0.76	-0.01

Notes

Results relate only to the items calibrated.
This certificate may not be reproduced except in full, without written permision.
Method: Calibration is performed in compliance with ISO 9001 and ISO 17025
This calibration was performed with TMS 9155C Calibration Workstation version 4.6.1
Calibration traceable to primary method which has been proficiency validated through interlaboratory comparison to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO16063-21 .
Procedure Used: PRD-P220
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-4.99 Hz; ± 3.00%, 5-9.99 Hz; ± 2.60%, 10-99 Hz; ± 1.70%, 100 Hz; ± 1.25%, 101-920 Hz; ± 1.40%, 921-5000 Hz; ± 1.70%, 5001-10,000 Hz; ± 2.20%, 10,001-15,000 Hz; ± 3.65%, 15,001-20,000 Hz; ± 4.75%.

Customer
MGA Research Corp.

User Notes

Unit Condition

As Found:	In Tolerance
As Left:	In Tolerance

Lab Conditions

Temperature:	73 (23) °F (°C)
Humidity:	32 %

Approval Information

Technician: Ed Devlin
Approval:

Cal Date: 9/14/2010
Due Date:

ACCREDITED

Cal ID: 15800 2649 01

THE MODAL SHOP INC

~Calibration Certificate~

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph: 513-351-9919
Fax: 513-458-2172
www.modalshop.com

Sensor Information

Model Number	352C03
Serial Number	95980
Manufacturer	PCB
ID Number	

Note

This certificate may not be reproduced except in full, without written permission.

Standards and/or Equipment Used During Calibration

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	4461	15004324	6/29/2011
Std Accelerometer	PCB	080A200	110553	12/8/2010
Air Bearing Shaker	PCB	396C11	603	n/a
Std Sig Conditioner	PCB	442A102	173	12/8/2010
SUT Signal Conditioner	PCB	443B101	379	9/19/2010
Power Amplifier	TMS	2100E21-C	1002	n/a

Technician: Ed Devlin

Cal Date: 9/14/2010

Customer: MGA Research Corp.

Due Date:

ACCREDITED

Cal ID: 16800 2849.01

Calibration Certificate

Part Description: Silver **Certification Date:** 10/19/2010 (MM/DD/YYYY) **Serial#:** S08-05-98-01273

Single Point - (Max-Min)/2 Specification: S08-05 .076mm (.0030") **Certificate#:** S0127340470

Volumetric (Max Deviation) Specification: S08-05 +/-.108mm (+/-.0042") **Temperature:** See attached data

Measurement Standards Traceability

Ball Bar Kit	Asset Number:	1039	Calibration Due: 10/23/2010	*SI Traceability: METAS-L20100204RG1
Thermometer	Asset Number:	TQ023	Calibration Due: 11/20/2010	*SI Traceability: A2LA-1001059862
Reference Sphere	Asset Number:	1241	Calibration Due: 11/21/2011	*SI Traceability: NIST-821/276660-08

The artifacts above have 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.
Measurement uncertainty is 1.9 + 5.0X micrometers, where X = length in meters.
Uncertainty is expressed at approximately a 95% Level of Confidence using k=2.00.

Calibration Results*

3 Single Point Articulation Tests at <=20%, 20%-80% and >=80% range.	PASSED
1 Effective diameter sphere test.	PASSED
20 Volumetric ball bar tests in 4 quadrants and 2 orientations.	PASSED

*Calibration conforms to procedures developed in accordance with ASME B89.4.22-2004. See attached data for measurement results.

Instrument condition as received: Not Within Specification

Instrument condition outgoing: Within specifications

Technician: Anthony Parker Date: 10/19/10

This results of this certificate relate only to the items calibrated or tested.

FARO Technologies, Inc:
PH1:1-800-736-2771
PH2:407-333-9911
FAX:407-333-8056
L-A-B Cert Number: L1147-1

125 Technology Park
Lake Mary, FL 32746
USA

BMC 9/1/10

FARO®

LABORATORY ACCREDITATION BUREAU
ISO/IEC 17025 Accredited

t:\control\records\05manufa\partspec\XH08-0495.eps Rev1 RevDate: 12/08/04

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

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

Tape Measure Calibration Certificate

Reference Steel Rule
Brand: SWANSON
S/N: MGA00799
Calibration Date: 1/15/2010

Subject Tape Measure
Brand: STANLEY
S/N: TPM 992
Calibration Date: 5/27/10

Reference (mm)	Subject Tape Measure	Difference	Reference (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: 5/27/10 Performed By: RJ Mill

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.

NovaStar SOLUTIONS

Calibration Certificate

ACCREDITED
CALIBRATION # 1277.01

Metrology Management Services
Remit to address:
35200 Plymouth Rd.
Livonia, MI 48150

Calibration Certificate #: Z52545:1300708444

PRO PRO 360 PROTRACTOR

SERIAL NUMBER:	N/A	WORK ORDER:	1300708444
ASSET NUMBER:	Z52545		
CUST. ASSET NUM:	MGA00049		
PROCEDURE NAME:	PRO 3600		
PROCEDURE REV:	A	TEST RESULT:	PASS
CALIBRATED BY:	JOE McCONNAUGHHAY	PERFORMED ON:	3/21/2011
CUSTOMER:	MGA RESEARCH 446 Executive Drive Troy, MI 48083	CAL DUE DATE:	3/21/2012
		DATA TYPE:	FOUND-LEFT
		TEMPERATURE:	21.00 °C
PRIMARY CONTACT:	BOB MILLER	HUMIDITY:	38 %

This instrument has been processed and calibrated in accordance with the NovaStar Solutions Quality System Manual and is traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. The NovaStar Solutions quality system is accredited to ISO/IEC 17025:2005 and ANSI/NCSL Z540-1-1994.

The results reported herein apply only to the calibration of the item described above. No sampling plan was used for this calibration.

The ratio of the tolerance of the instrument or parameter being calibrated to the expanded uncertainty of the standard (TUR) is greater than 4:1 unless otherwise specified. Expanded uncertainties are expressed at the approximate 95% level of confidence using a K=2.
Due to any number of factors, the recommended due date on the item does not imply continuing conformance to specifications during the recommended interval. Unless otherwise stated the unit under test meets or exceeds manufacturer specifications.

For range and best measurement capability specifications for the standards used to perform this calibration, see the most recent calibration report maintained by this calibration laboratory (available upon request).

As Received Condition: IN TOLERANCE **As Returned Condition:** IN TOLERANCE

Action Taken: FULL CALIBRATION

REMARKS:

Standards Used

Asset #	Cert#	Description	Cal Date	Due Date
1437	1437:1232010439	PHASE 2 220-006 ROTARY TABLE	1/15/2009	1/15/2013
1541	1541:1300372477	NEWPORT CT485AL HYGROTHERMOGRAPH	3/17/2011	3/17/2012
1577	1577:1297694647	RAHN SUPER 100 SURFACE PLATE	2/14/2011	2/14/2012

***** End of Certificate *****

@ 3/28/11

QA approved: Steve Hall **Date:** 3-22-11
Signature:

Asset Barcode:

NovaStar SOLUTIONS
Metrology Managment Services

Calibration Data Sheet

Page 1 of 1
35200 Plymouth Rd.
Livonia, MI 48150
734-453-8003

Inst. Type	Digital Protractor	**Mfr.**	Mitutoyo	**W.O.**	1300708444
Last Cal Date	2/16/2010	**Mod.**	Pro 360	**Date**	3/21/2011
Form Number	25052 Rev A	**S/N**	N/A	**Test Eng'r**	JM
		ID#	MGA00049		

Note

Function	Calibration Point	Unit		As Found	Note	As Left	Low Limit	Hi Limit	Unit
LINEARITY CHECK	0	°		0.0		0.0	-0.1	0.1	°
	5	°		5.0		5.0	4.9	5.1	°
	30	°		29.9		29.9	29.8	30.2	°
	60	°		60.0		60.0	59.8	60.2	°
	90	°		89.9		89.9	89.9	90.1	°
	60	°		59.9		59.9	59.8	60.2	°
	30	°		30.0		30.0	29.8	30.2	°
	5	°		5.0		5.0	4.9	5.1	°
	0	°		0.0		0.0	-0.1	0.1	°
	5	°		5.0		5.0	4.9	5.1	°
	30	°		30.0		30.0	29.8	30.2	°
	60	°		60.0		60.0	59.8	60.2	°
	90	°		89.9		89.9	89.9	90.1	°
	60	°		60.1		60.1	59.8	60.2	°
	30	°		30.0		30.0	29.8	30.2	°
	5	°		5.0		5.0	4.9	5.1	°
	0	°		0.0		0.0	-0.1	0.1	°
ABSOLUTE ZERO ANGLE	0	°		0.1		0.1	-0.1	0.1	°

NovaStar SOLUTIONS

Calibration Certificate

ACCREDITED
CALIBRATION # 1277.01

Metrology Management Services
Remit to address:

35200 Plymouth Rd.
Livonia, MI 48150

Calibration Certificate #:
Z50918:1281429469

DICKSON FH125 TEMP/RH RECORDER

SERIAL NUMBER:	06163263
ASSET NUMBER:	Z50918
CUST. ASSET NUM:	MGA00152
PROCEDURE NAME:	1012
PROCEDURE REV:	A
CALIBRATED BY:	JOE McCONNAUGHHAY
CUSTOMER:	MGA RESEARCH CORP 446 EXECUTIVE DRIVE TROY, MI 48083
PRIMARY CONTACT:	THOMAS M. HUTTER

WORK ORDER: 1281429469

TEST RESULT:	PASS
PERFORMED ON:	8/10/2010
CAL DUE DATE:	8/10/2011
DATA TYPE:	FOUND-LEFT
TEMPERATURE:	21.00 °C
HUMIDITY:	43 %

This instrument has been processed and calibrated in accordance with the NovaStar Solutions Quality System Manual and is traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. The NovaStar Solutions quality system is accredited to ISO/IEC 17025:2005 and ANSI/NCSL Z540-1-1994.

The results reported herein apply only to the calibration of the item described above. No sampling plan was used for this calibration.

The ratio of the tolerance of the instrument or parameter being calibrated to the expanded uncertainty of the standard (TUR) is greater than 4:1 unless otherwise specified. Expanded uncertainties are expressed at the approximate 95% level of confidence using a K=2.
Due to any number of factors, the recommended due date on the item does not imply continuing conformance to specifications during the recommended interval.

For range and best measurement capability specifications for the standards used to perform this calibration, see the most recent calibration report maintained by this calibration laboratory (available upon request).

As Received Condition: IN TOLERANCE **As Returned Condition:** IN TOLERANCE

Action Taken: FULL CALIBRATION

REMARKS:

Standards Used

Asset #	Cert#	Description	Cal Date	Due Date
002326	002326:1264588323	VAISALA HMK-15 HUMIDITY SALTS	1/27/2010	1/27/2011
1914	1914:1262706187	FLUKE 1502A THERMOMETER READOUT	1/5/2010	1/5/2011
1915	1915:1264951189	HART SCIENTIFIC 5614 PRT	1/31/2010	1/31/2011
1917	1917:1263989036	VAISALA M170/HMP76 MEASUREMENT INDICATOR/PROBE	1/20/2010	1/20/2011

***** End of Certificate *****

8/13/2010

QA approved: mb **Date:** 8-11-10
Signature:

Asset Barcode:

MetroCal Inc.

ACCREDITED
CALIBRATION CERT #0513.01

4700 Barden Court SE, Kentwood MI 49512, Telephone: 616-698-3124, Fax: 616-698-2364, www.metrocal.com

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

Order Number: 69370
Certificate Number: 100826804
Page: 1 of 1

Gauge Number: MGA00783
Gauge Desc: 0 to 20lb x 0.01lb Digital Scale
Manufacturer: Detecto
Model Number: AP-20
Serial Number: E10807-0187

Customer PO: N/A
Last Calibration: 8/14/09
Calibration Date: 8/26/10
Next Calibration: 8/26/11

As Found Condition: See Results

As Left Condition: See Results

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 Procedure CP042 and relevant sections of the manufacturer's manual. This calibration complies with 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	3/3/09	3/3/11	ID# 16992	+/-0.001% of Load
Weight Set	9/3/08	9/3/10	ID# 2463	+/-0.001% of Load

Results:
Tolerance used: Class III

Units: lbs — TI Division/Increment: 0.01

	As Found				As Left		
Weight Test	Nominal	Indication	Deviation		Nominal	Indication	Deviation
Zero	0.00	0.00	0.00		0.00	0.00	0.00
0-25% fs	5.00	5.01	0.01		5.00	5.01	0.01
26-50% fs	10.00	10.02	0.02		10.00	10.02	0.02
51-75% fs	15.00	15.02	0.02		15.00	15.02	0.02
76-100% fs	20.00	20.03	0.03		20.00	20.03	0.03
1/2 load test	10.00	10.02	0.02		10.00	10.02	0.02
return to zero	0.00	0.00	0.00		0.00	0.00	0.00
4 quad/Shift Test:	Pass			4 quad/Shift Test:	Pass		

Comments: Environmental conditions during calibration: 75 °F, 39 % RH.
The adapter that was sent in with the scale has loose components, be careful when using.
No adjustments required.

Shannon Kubicek
Calibration Technician

Issued: 8/26/10

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

@ 9/8/10

Sterling Scale Co., Inc.
20950 Boening St.
Southfield, MI 48076

Certificate of Calibration

F410/12-3
Rev. Date 11/23/05

calibration cert. 1448.01

Customer: MGA Research *Cert#* 10-6914 *Temp/Humidity:* ok
Location of Calibration: 2839 Elliot Rd Troy MI 48083
Calibration Date: 7/21/2010 *Due Date:* Jul-11 *Condition of Item:* Fair
Equipment Make: Intercomp *Model:* SW Deluxe *Serial Number* 26032389 *Capacity:* 2200 lb x 1 lb Per weigh pad
8800 lb x 1 lb Scale system total capacity

Applied Test Wt	*Before Adustment*	*Tolerance*	*In-Tolerance Y/N*	*After Adjustment*	*In-Tolerance Y/N*	*Unc*	
10 lb	9 lb	1 lb	y	n/a	y	0.002 lb	Right Rear Pad
100 lb	100 lb	1 lb	y	n/a	y	0.11 lb	
1000 lb	1000 lb	2 lb	y	n/a	y	0.14 lb	
10 lb	10 lb	1 lb	y	n/a	y	0.002 lb	Right Front Pad
100 lb	100 lb	1 lb	y	n/a	y	0.11 lb	
1000 lb	999 lb	2 lb	y	n/a	y	0.14 lb	

shift test
n/a

Platform #1	*Platform #2*	*Platform #3*
☐ Pass	☐ Pass	☐ Pass
☐ Fail	☐ Fail	☐ Fail

Tests performed: ☑ Repeatability ☑ Linearity ☐ Sensitivity ☑ Discrimination

Technician COMMENTS/ weights used: This scale is a wheel weigh system, there are a total of 4 wheel pads. Each pad has a capacity of 2200lb. A lb. All 4 pads together have a total capacity of 8800 lb. Scale passes tests sn on file

Page 2 of 2

☑ Scale Certified ☐ Scale Rejected

Sterling Scale Service Rep: E.Denny Date: 7/21/2010 1 of 1

The above item has been calibrated using the relevant EPO or OEM procedures utilizing test weights
Traceable to International Systems of Units (SI), through the Michigan Department of Agriculture.
Test numbers on file. Expanded uncertainty(k=2) confidence level of 95% as reported.
Results relate only to items listed.
The reported uncertainty is valid only for the environment in which it is determined.
Any number of factors may cause the item to drift out of calibration before recommended interval has expired
This report shall not be reproduced, except in full without approval of the laboratory
Tolerances followed are maintenance/acceptance per HB 44 or as detremined by the customer
Sterling Scale does not warranty calibration.