

FINAL REPORT NUMBER 201UI-MGA-11-07

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

**FORD MOTOR CO.
2011 Ford Explorer XLT FWD
NHTSA No. CB0203**

**MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083**



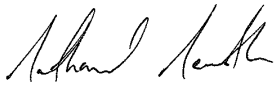
Test Dates: May 5-9, 2011
Report Date: May 11, 2011


FINAL REPORT

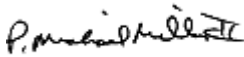
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**U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 New Jersey Avenue, SE
West Building
WASHINGTON, D.C. 20590**

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16. Abstract A compliance test series was conducted on the subject 2011 Ford Explorer XLT FWD, NHTSA No. CB0203, 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 May 5-9, 2011. Test failures identified were as follows: None The data recorded indicates that the 2011 Ford Explorer XLT FWD tested appears to comply with the upper interior requirements of FMVSS 201.					
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TABLE OF CONTENTS

<u>SECTION</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
1.0	PURPOSE OF COMPLIANCE TEST	6
2.0	COMPLIANCE TEST DATA SUMMARY	7
3.0	TEST DATA (Including Acceleration and Velocity Plots)	25
4.0	TEST EQUIPMENT LIST AND CALIBRATION INFORMATION	120
	4.1 Pre-Test Calibration FMH #35	
	4.2 Post-Test Calibration FMH #35	
	4.3 Pre-Test Calibration FMH #37	
	4.4 Post-Test Calibration FMH #37	
	4.5 Pre-Test Calibration FMH #38	
	4.6 Post-Test Calibration FMH #38	
5.0	PHOTOGRAPHS	140
	Appendix A - Temperature Trace	149
	Appendix B - Calibration Certificates	150

LIST OF TABLES

<u>TABLE</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
2-1	SUMMARY TABLE OF TEST RESULTS	8
2-2	GENERAL TEST AND VEHICLE PARAMETER DATA	10
2-3	HORIZONTAL IMPACT ANGLE RANGE FOR A- AND B-PILLARS	14
2-4	VERTICAL IMPACT ANGLE RANGES	15
2-5	TARGET MEASUREMENTS	18
2-6	SUMMARY OF TARGETING RESULTS	21
4-1	LIST OF ITEMS USED	120
4-2	FMH CALIBRATION SUMMARY	121

1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this head impact compliance test was to determine whether the subject vehicle, a 2011 Ford Explorer XLT FWD, meets the performance requirements of FMVSS 201, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted on May 5-9, 2011 on a 2011 Ford Explorer XLT FWD, manufactured by Ford Motor Company.

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 November 9, 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 Ford Explorer XLT FWD was equipped with A, B, O, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, a fixed seat belt anchorage on each O-pillar, assist handles located on the passenger side A-pillar and on each B-pillar.

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:

AP2	BP4	FH1	UR3@BP
BP2	OP2	RH	UR4@SR3-1
BP3	RP2	UR2@SR2B	UR5@SR3-2

The 2011 Ford Explorer XLT FWD 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 Ford Explorer XLT FWD

VEH. NHTSA NO.: CB0203 VIN: 1FMHK7D89BGA14944 COLOR: Kona Blue Met.

VEH. BUILD DATE: January, 2011 TEST DATES: May 5-9, 2011

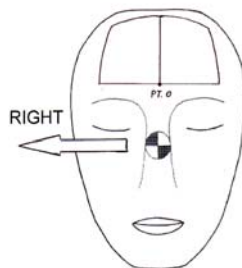
TEST LABORATORY: MGA Research Corporation

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
AP2	Right	159	44	18.8	474	408	13	3 Left
BP2	Right	90	8	23.8	794	832	10	1 Left
BP3	Left	285	-9	23.9	711	722	7	4 Left
BP4	Left	205	7	23.8	736	755	7	5 Left
OP2	Right	90	-10	23.8	608	586	51	1 Left
RP2	Left	330	21	23.9	729	746	17	2 Left
FH1	Left	180	50	23.6	666	663	21	10 Left
RH	Left	0	26	24.1	514	461	21	1 Left
UR2@SR2B	Right	90	50	24.0	547	505	25	0
UR3@BP	Left	270	50	23.5	550*	508*	28	3 Left
UR4@SR3-1	Right	90	50	23.9	535	488	35	3 Left
UR5@SR3-2	Left	270	50	24.1	589	561	28	10 Left

*The event included spikes from electrical noise which occurred during testing which produced a HIC(d) of 680 and a HIC of 680. The predicted HIC(d) and the HIC are shown above.

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.

BP2 Right: Adjustable anchorage cover dislodged.

BP3 Left: Dislodged pillar trim.

BP4 Left: Assist handle dislodged and deformed.

REMARKS:

The targets listed were impacted in the following order:

Right: UR2@SR2-B, AP2, BP2, UR4@SR3-1, OP2

Left: FH1, BP3, UR5@SR3-2, BP4, UR3@BP, RP2, RH

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: May 9, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Ford Explorer XLT FWD

VEH. NHTSA NO.: CB0203 VIN: 1FMHK7D89BGA14944 COLOR: Kona Blue Met.

VEH. BUILD DATE: January, 2011 TEST DATES: May 5-9, 2011

TEST LABORATORY: MGA Research Corporation

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

INTERIOR TRIM INFORMATION: A, B, O, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, a fixed seat belt anchorage on each O-pillar, assist handles located on the passenger side A-pillar and on each B-pillar.

SUNROOF INFORMATION:

Installed: Yes No

Operation: Electric Manual

SIDE RAIL CURTAIN AIRBAG INFORMATION:

Installed: Yes No

ROLL-BAR INFORMATION:

Installed: Yes No

Padded: Yes No

Braces: Yes No

GENERAL INFORMATION:

Date Received: March 17, 2011; Odometer Reading 57 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Ford Motor Company

Date of Manufacture: January, 2011; VIN: 1FMHK7D89BGA14944

GVWR: 2794 kg; GAWR FRONT: 1397 kg;

GAWR REAR: 1497 kg;

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 240 kPa REAR: 240 kPa

Recommended Tire Size: P245/60R18

Recommended Cold Tire Pressure:

FRONT: 240 kPa REAR: 240 kPa

Size of Tire on Test Vehicle: P245/60R18

Type of Spare Tire: T165/80D17; Space Saver: X; Standard __

VEHICLE CAPACITY DATA:

Type of Front Seats: Bench __; Bucket X; Split Bench __

Number of Occupants: Front 2; Rear 5; TOTAL 7

VEHICLE CAPACITY WEIGHT:

Vehicle Capacity Weight (VCW) = 695 kg

No. of Occupants x 68 kg = 476 kg

Rated Cargo/Luggage Weight (RCLW) = 219 kg (difference)

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

Right Front = 558.0 kg Right Rear = 443.5 kg

Left Front = 565.5 kg Left Rear = 456.5 kg

TOTAL FRONT = 1123.5 kg TOTAL REAR = 900.0 kg

% Total Weight = 55.5 % % Total Weight = 44.5 %

TOTAL DELIVERED WEIGHT = 2023.5 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 2023.5 kg

Max. Test Cargo/Luggage Weight = 136.0 kg

Target Test Weight = 2159.5 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	<u>541.5</u> kg	Right Rear =	<u>526.5</u> kg
Left Front =	<u>549.5</u> kg	Left Rear =	<u>539.5</u> kg
TOTAL FRONT =	<u>1091.0</u> kg	TOTAL REAR =	<u>1066.0</u> kg
% Total Weight =	<u>50.6</u> %	% Total Weight =	<u>49.4</u> %

TOTAL TEST WEIGHT = 2157.0 kg

Weight of ballast secured in vehicle's cargo area = 133.5 kg

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 820 mm; Left Front 811 mm;
Right Rear 845 mm; Left Rear 846 mm;
Pitch Angle at Right Door Sill = 0.9 Rear is higher
Pitch Angle at Left Door Sill = 0.8 Rear is higher
Roll Angle at Front Bumper = 0.2 Right is higher
Roll Angle at Rear Bumper = 0.3 Left is higher

FULLY LOADED: Right Front 826 mm; Left Front 823 mm;
Right Rear 826 mm; Left Rear 827 mm;
Pitch Angle at Right Door Sill = 0.3 Rear is higher
Pitch Angle at Left Door Sill = 0.2 Rear is higher
Roll Angle at Front Bumper = 0.0
Roll Angle at Rear Bumper = 0.5 Left is higher

AS TARGETED: Right Front 961 mm; Left Front 959 mm;
Right Rear 957 mm; Left Rear 962 mm;
Pitch Angle at Right Door Sill = 0.8 Rear is higher
Pitch Angle at Left Door Sill = 0.3 Rear is higher
Roll Angle at Front Bumper = 0.0
Roll Angle at Rear Bumper = 0.5 Left is higher

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill = 0.4 Rear is higher
Pitch Angle at Left Door Sill = 0.2 Rear is higher
Roll Angle at Front Bumper = 0.2 Right is higher
Roll Angle at Rear Bumper = 0.4 Left is higher

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill = 0.4 Rear is higher
Pitch Angle at Left Door Sill = 0.3 Rear is higher
Roll Angle at Front Bumper = 0.0
Roll Angle at Rear Bumper = 0.3 Left is higher

VEHICLE WHEELBASE = 2865 mm

REMARKS: The seat travel distance was measured to be 272 mm for the driver front seat and 253 mm for the passenger front seat.

RECORDED BY: Nathaniel Newth

DATE: April 28, 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 Ford Explorer XLT FWD

VEH. NHTSA NO.: CB0203 VIN: 1FMHK7D89BGA14944 COLOR: Kona Blue Met.

VEH. BUILD DATE: January, 2011 TEST DATES: May 5-9, 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 195°-255°	L 206.0°	L 251.3°
	R 105°-165°	R 110.6°	R 159.9°
B-PILLAR	L 195°-345°	L 204.6°	L 285.5°
	R 15°-165°	R 73.0°	R 155.1°

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Nathaniel Newth

DATE: April 28, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Ford Explorer XLT FWD

VEH. NHTSA NO.: CB0203 VIN: 1FMHK7D89BGA14944 COLOR: Kona Blue Met.

VEH. BUILD DATE: January, 2011 TEST DATES: May 5-9, 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	0°-50°	L	0°	L	50°
		R	0°-50°	R	0°	R	50°
	FH2	L	0°-50°	L	0°	L	50°
		R	0°-50°	R	0°	R	50°
SIDE RAIL	SR1	L	0°-50°	L	0°	L	22°
		R	0°-50°	R	0°	R	22°
	SR2A	L	0°-50°	L	0°	L	22°
		R	0°-50°	R	0°	R	22°
	SR2B	L	0°-50°	L	0°	L	22°
		R	0°-50°	R	0°	R	22°
	SR3-1	L	0°-50°	L	0°	L	27°
		R	0°-50°	R	0°	R	27°
	SR3-2	L	0°-50°	L	0°	L	46°
		R	0°-50°	R	0°	R	46°
	SR3-3	L	0°-50°	L	0°	L	8°
		R	0°-50°	R	0°	R	8°
REAR HEADER	RH	L	0°-50°	L	0°	L	26°
		R	0°-50°	R	0°	R	26°

		VERTICAL ANGLE SPECIFIED RANGE		MINIMUM VERTICAL ANGLE		MAXIMUM VERTICAL ANGLE	
A-PILLAR	AP1	L	-5°-50°	L	-5°	L	30°
		R	-5°-50°	R	-5°	R	30°
	AP2	L	-5°-50°	L	-5°	L	44°
		R	-5°-50°	R	-5°	R	44°
	AP3	L	-5°-50°	L	-5°	L	42°
		R	-5°-50°	R	-5°	R	36°
B-PILLAR	BP1	L	-10°-50°	L	-10°	L	26°
		R	-10°-50°	R	-10°	R	26°
	BP2*	L	0°-50°	L	0°	L	8°
		R	0°-50°	R	0°	R	8°
	BP3	L	-10°-50°	L	-10°	L	-9°
		R	-10°-50°	R	-10°	R	-9°
	BP4	L	-10°-50°	L	-10°	L	7°
		R	-10°-50°	R	-10°	R	7°
OTHER-PILLAR	OP1*	L	-10°-50°	L	-10°	L	10°
		R	0°-50°	R	0°	R	1°
	OP2	L	-10°-50°	L	-10°	L	1°
		R	-10°-50°	R	-10°	R	-10°
REAR PILLAR	RP1	L	-10°-50°	L	-10°	L	50°
		R	-10°-50°	R	-10°	R	50°
	RP2	L	-10°-50°	L	-10°	L	21°
		R	-10°-50°	R	-10°	R	21°
UPPER ROOF 1		0°-50°		0°		50°	
UPPER ROOF 2		0°-50°		0°		50°	
UPPER ROOF 3		0°-50°		0°		50°	
UPPER ROOF 4		0°-50°		0°		50°	
UPPER ROOF 5		0°-50°		0°		50°	

	VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
UPPER ROOF 6	0°-50°	0°	50°

As determined using the Procedures specified in S8.13.4.2. *Target BP2 and OP1 Right are seat belt anchorage locations.

RECORDED BY: Nathaniel Newth

DATE: April 28, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Ford Explorer XLT FWD

VEH. NHTSA NO.: CB0203 VIN: 1FMHK7D89BGA14944 COLOR: Kona Blue Met.

VEH. BUILD DATE: January, 2011 TEST DATES: May 5-9, 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)	272 mm	253 mm
T ⁰	Horizontal < {CG-F1 (Left Seat) to (Right A-Pillar)}	108.7 ⁰	--
A1 ⁰	360 ⁰ - T ⁰	251.3 ⁰	--
W ⁰	Horizontal < {CG-2 (Left Seat) to (Left A-Pillar)}	206.0 ⁰	--
A2 ⁰	A2 ⁰ = W ⁰	206.0 ⁰	--
U ⁰	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	285.5 ⁰	--
B1 ⁰	B1 ⁰ = U ⁰	285.5 ⁰	--
V ⁰	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	204.6 ⁰	--
B2 ⁰	B2 ⁰ = V ⁰	204.6 ⁰	--
W ⁰ (right)	Horizontal < {CG-F2 (Right Seat) to (Right A-Pillar)}	--	159.9 ⁰
A1 ⁰ (right)	A1 ⁰ (right) = W ⁰ (right)	--	159.9 ⁰
T ⁰ (right)	Horizontal < {CG-F1 (Right Seat) to (Left A-Pillar)}	--	249.4 ⁰
A2 ⁰ (right)	360 ⁰ -T ⁰ (right)	--	110.6 ⁰
V ⁰ (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	155.1 ⁰
B1 ⁰ (right)	B1 ⁰ (right) = V ⁰ (right)	--	155.1 ⁰
U ⁰ (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	73.0 ⁰
B2 ⁰ (right)	B2 ⁰ (right) = U ⁰ (right)	--	73.0 ⁰
J	A-Pillar {(Plane 3) – (Plane 5)}	350.7 mm	351.7 mm
J/2	J ÷ 2	175.4 mm	175.9 mm
D1	Upper Roof {(Plane A) – (Plane B)}	2585.0 mm	
D1/2	D1 ÷ 2	1292.5 mm	

Measurement	Description	Left Side	Right Side
D2	Upper Roof {(Plane C) – (Plane D)}	1365.8 mm	
D2/2	D2 ÷ 2	682.9 mm	
.35D1	.35 x D1	904.8 mm	
.35D2	.35 x D2	478.0 mm	
N	B-Pillar {(BPR) – (lowest point on daylight opening forward of B-Pillar)}	443.8 mm	444.1 mm
N/2	B-Pillar {(BP3) – (lowest point on daylight opening forward of B-Pillar)}	221.9 mm	222.1 mm
N/4	B-Pillar {(BP4) – (lowest point on daylight opening forward of B-Pillar)}	111.0 mm	111.0 mm
Q	O-Pillar (Plane 13 – Plane 14)	381.1 mm	404.6 mm
Q/2	Q / 2	190.6 mm	202.3 mm
D	R-Pillar (Point 7 – Point M)	1030.0 mm	1030.0 mm
3D/7	3*D / 7	441.4 mm	441.4 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
1 st Row	3300.0	-388.2	1351.1	3290.4	397.9	1323.4
2 nd Row	4168.7	-398.9	1371.2	4168.7	398.9	1371.2
3 rd Row	4966.8	-251.9	1425.8	4966.8	251.9	1425.8

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
1 st Row	3300.0	-388.2	1351.1	3290.4	397.9	1323.4
2 nd Row	4168.7	-398.9	1371.2	4168.7	398.9	1371.2
3 rd Row	4966.8	-251.9	1425.8	4966.8	251.9	1425.8

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	X	y	z
CGF1	3188.0	-388.2	2011.1	3197.4	397.9	1983.4
CGF2	3460.0	-388.2	2011.1	3450.4	397.9	1983.4
2 nd Row CGR	4328.7	-398.9	2031.2	4328.7	398.9	2031.2
3 rd Row CGR	5126.8	-251.9	2085.8	5126.8	251.9	2085.8

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Rear passenger door striker upper bolt hole (x, y, z) = 4587.0, 854.0, 1630.0

Front passenger seat front outboard anchorage bolt hole (x, y, z) = 2934.0, 582.0, 1027.0

Front driver seat front outboard anchorage bolt hole (x, y, z) = 2934.0, -582.0, 1027.0

REMARKS:

RECORDED BY: Nathaniel Newth

DATE: April 28, 2011

APPROVED BY: Helen A. Kalet

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Ford Explorer XLT FWD

VEH. NHTSA NO.: CB0203 VIN: 1FMHK7D89BGA14944 COLOR: Kona Blue Met.

VEH. BUILD DATE: January, 2011 TEST DATES: May 5-9, 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	3071.5	-600.8	2163.5	251	30	No	--	No
AP2	2965.2	-658.7	2076.0	206	44	No	--	No
AP3	2806.8	-691.0	1988.6	206	42	No	--	No
A-Pillar Right Side								
AP1	3070.0	595.5	2164.6	111	30	No	--	No
AP2	2964.5	655.0	2077.1	159	44	No	--	Yes
AP3	2836.0	622.6	1989.5	159	36	No	--	No
B-Pillar Left Side								
BP1	3623.9	-547.9	2237.9	--	--	Yes	--	--
REL	3631.0	-500.1	2253.8	270	26	--	2	No
BP2	3588.0	-657.9	1996.6	270	8	No	--	No
BP3	3539.8	-676.6	2016.9	285	-9	No	--	Yes
BP4	3700.1	-711.6	1907.4	205	7	No	--	Yes
B-Pillar Right Side								
BP1	3625.0	547.2	2238.3	--	--	Yes	--	--
REL	3630.7	502.9	2253.0	90	26	--	2	No
BP2	3588.5	657.7	1995.5	90	8	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					
BP3	3543.6	675.7	2017.0	73	-9	No	--	No
BP4	3700.4	713.0	1906.8	155	7	No	--	No
Other Pillar Left Side								
OP1	4526.5	-653.5	2048.0	270	10	No	--	No
OP2	4654.1	-668.5	2021.6	270	1	No	--	No
Other Pillar Right Side								
OP1	4669.3	701.0	2026.7	90	1	No	--	No
OP2	4640.8	721.7	2031.6	--	--	Yes	--	--
REL	4599.3	694.8	2086.4	90	-10	--	3	Yes
Rear Pillar Left Side								
RP1	5151.8	-560.3	2145.0	--	--	Yes	--	--
REL	5136.3	-542.4	2145.8	330	50	--	1	No
RP2	5307.7	-580.0	2037.3	330	21	No	--	Yes
Rear Pillar Right Side								
RP1	5152.2	559.5	2149.4	--	--	Yes	--	--
REL	5137.3	543.3	2149.7	30	50	--	1	No
RP2	5309.5	580.3	2039.8	30	21	No	--	No
Front Header Left Side								
FH1	2954.8	-484.3	2188.6	--	--	Yes	--	--
REL	2951.9	-460.7	2184.9	180	50	--	1	Yes
FH2	2916.3	-334.3	2187.5	180	50	No	--	No
Front Header Right Side								
FH1	2956.6	484.6	2189.8	--	--	Yes	--	--
REL	2952.2	460.2	2185.3	180	50	--	1	No
FH2	2917.2	335.2	2185.2	180	50	No	--	No
Side Rail Left Side								
SR1	3221.8	-555.6	2216.9	--	--	Yes	--	--
REL	3240.8	-568.0	2208.1	270	22	--	1	No
SR2A	3372.1	-552.0	2233.3	270	22	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					
SR2B	3323.6	-551.4	2230.1	270	22	No	--	No
SR3-1	3774.1	-559.0	2236.6	270	27	No	--	No
SR3-2	3950.0	-544.8	2224.3	270	46	No	--	No
SR3-3	4638.4	-498.5	2206.6	--	--	Yes	--	--
REL	4640.5	-511.3	2187.0	270	8	--	1	No
Side Rail Right Side								
SR1	3219.7	556.8	2216.0	--	--	Yes	--	--
REL	3235.8	566.3	2205.9	90	22	--	1	No
SR2A	3369.4	549.7	2233.0	90	22	No	--	No
SR2B	3325.3	551.3	2228.9	90	22	No	--	No
SR3-1	3774.6	557.9	2236.1	90	27	No	--	No
SR3-2	3946.9	544.7	2223.7	90	46	No	--	No
SR3-3	4647.7	532.2	2234.7	--	--	Yes	--	--
REL	4648.6	551.1	2215.4	90	8	--	1	No
Rear Header Left Side								
RH	5204.5	-250.9	2222.0	0	26	No	--	Yes
Rear Header Right Side								
RH	5204.4	252.4	2224.5	0	26	No	--	No
Upper Roof Left Side								
UR1@SR1	3225.3	-437.5	2261.0	270	50	No	--	No
UR3@BP	3633.3	-451.9	2257.3	270	50	No	--	Yes
UR5@SR3-2	3967.2	-402.1	2289.9	270	50	No	--	Yes
Upper Roof Right Side								
UR2@SR2B	3362.5	414.7	2287.5	90	50	No	--	Yes
UR4@SR3-1	3769.6	442.1	2266.5	90	50	No	--	Yes
UR6@OP	4495.2	432.1	2248.1	90	50	No	--	No

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

RECORDED BY: Nathaniel Newth

DATE: April 28, 2011

APPROVED BY: Helen A. Kaleto

3.0 TEST DATA (Including Acceleration and Velocity Plots)







SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Target (Vehicle Side): AP2Right

MGA Test Reference No.:U11145

Approach Horizontal Angles:159°

Approach Vertical Angles:44°

Additional Description:

Test Number:#2

Temperature:21.9C

Humidity:27.4%

Time of Test:12:28:22 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
474	408	6.3	18.8	13	3 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.):

No visible damage

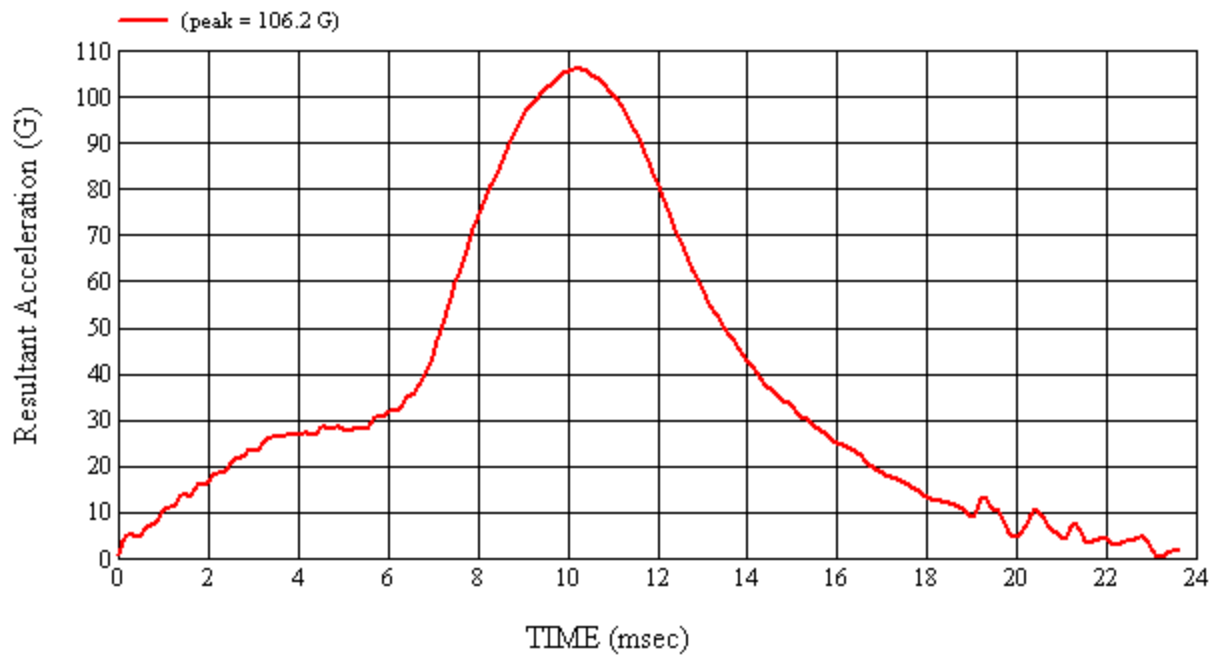
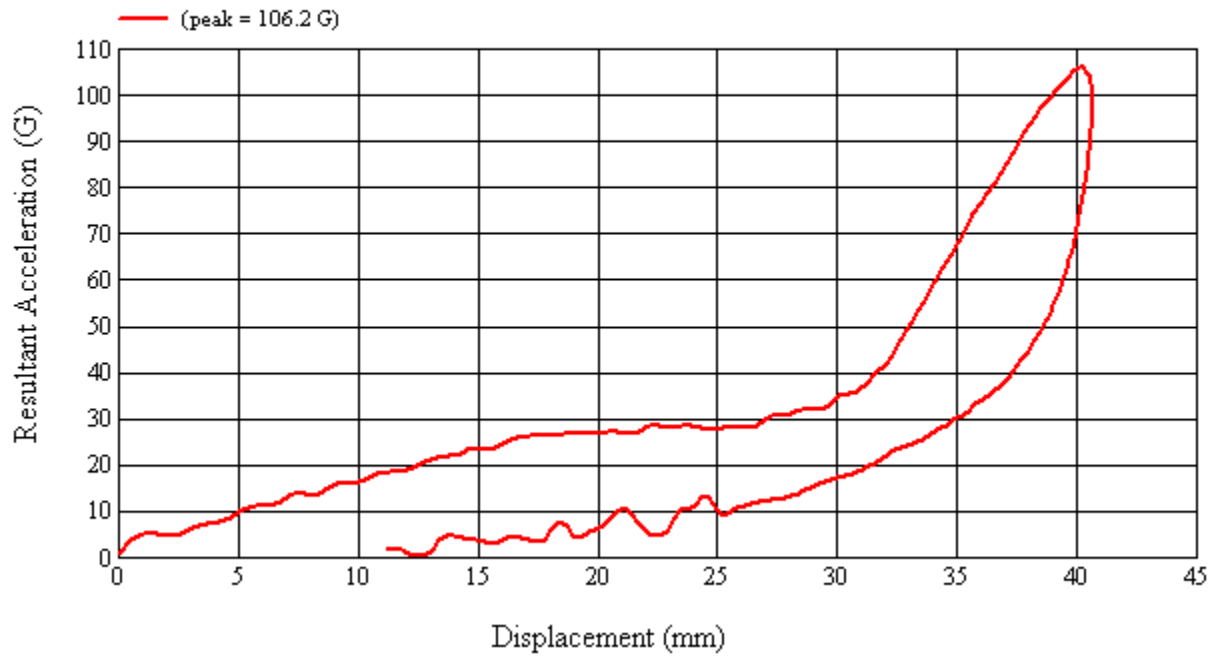
Recorded By: *Kevin D. McLean* Approved By*: *Richard I. Smith* Date: 5/5/2011

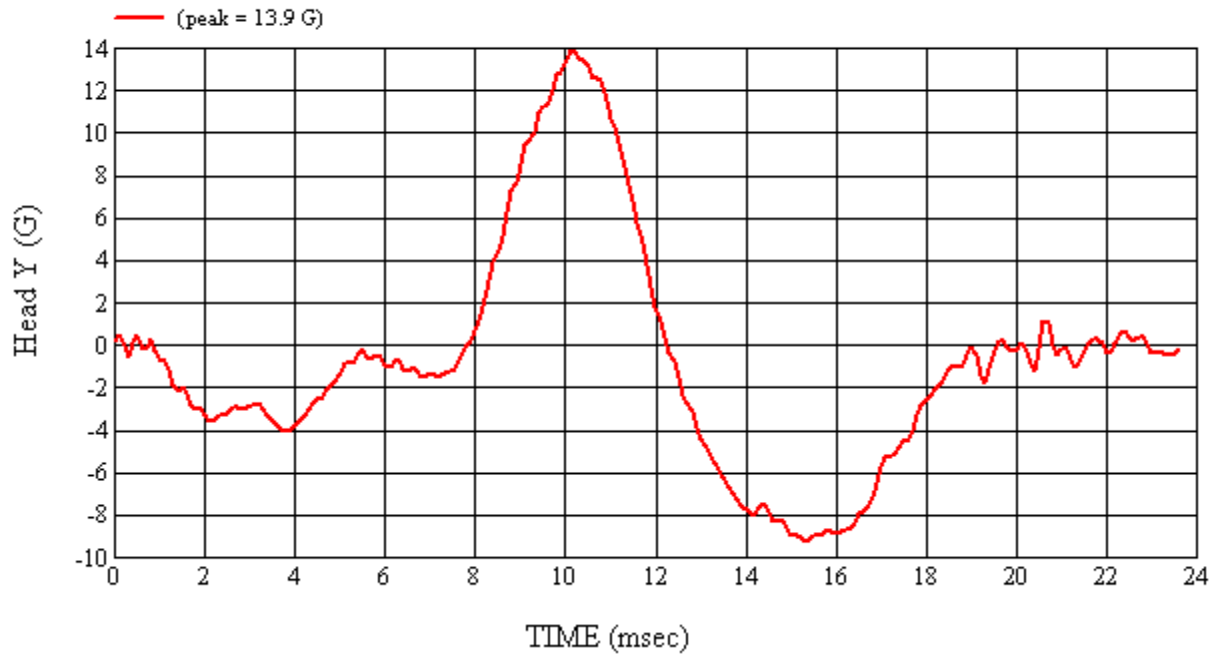
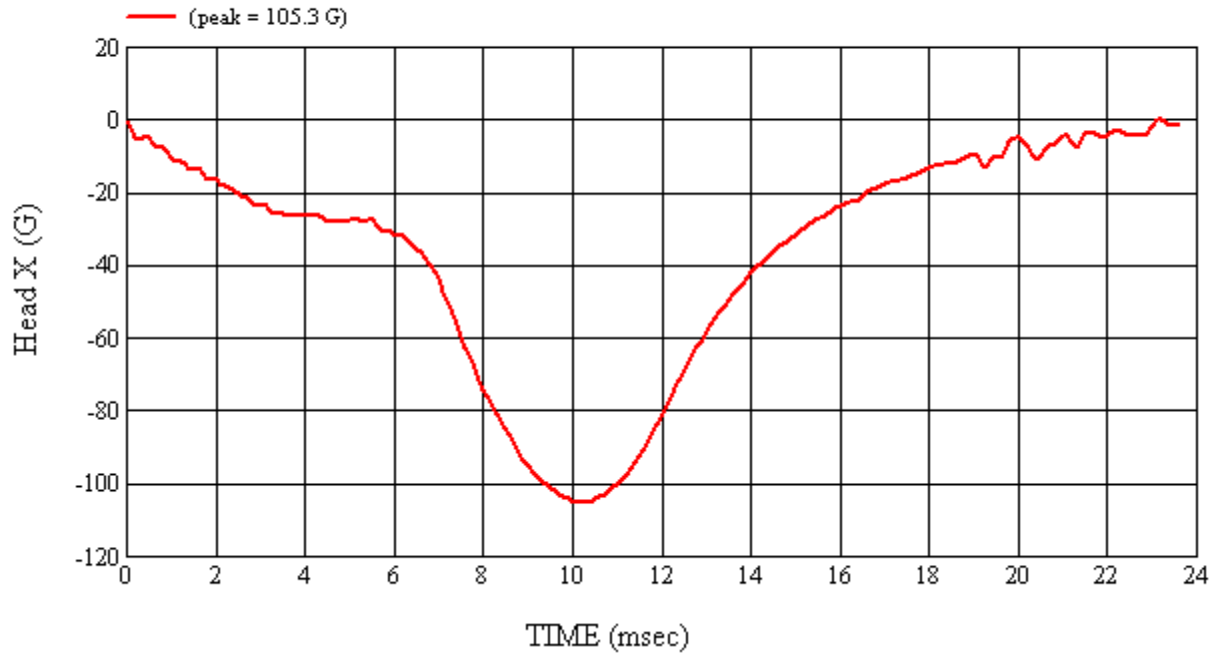
*Only necessary for NHTSA (Government) Compliance testing.

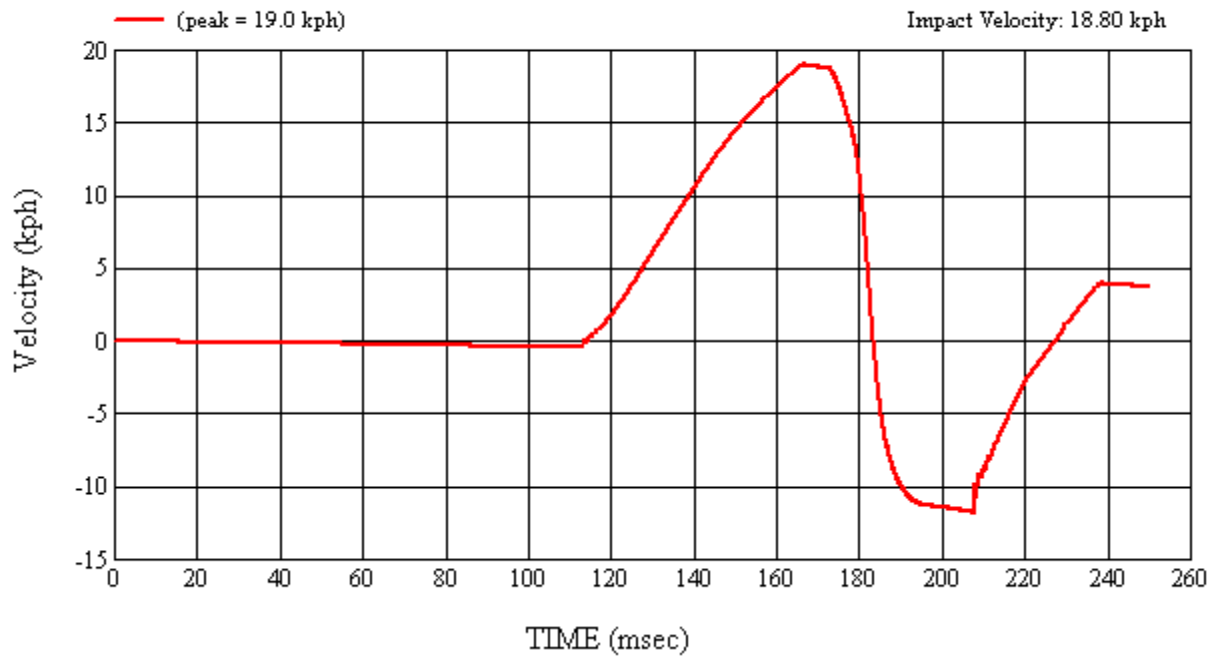
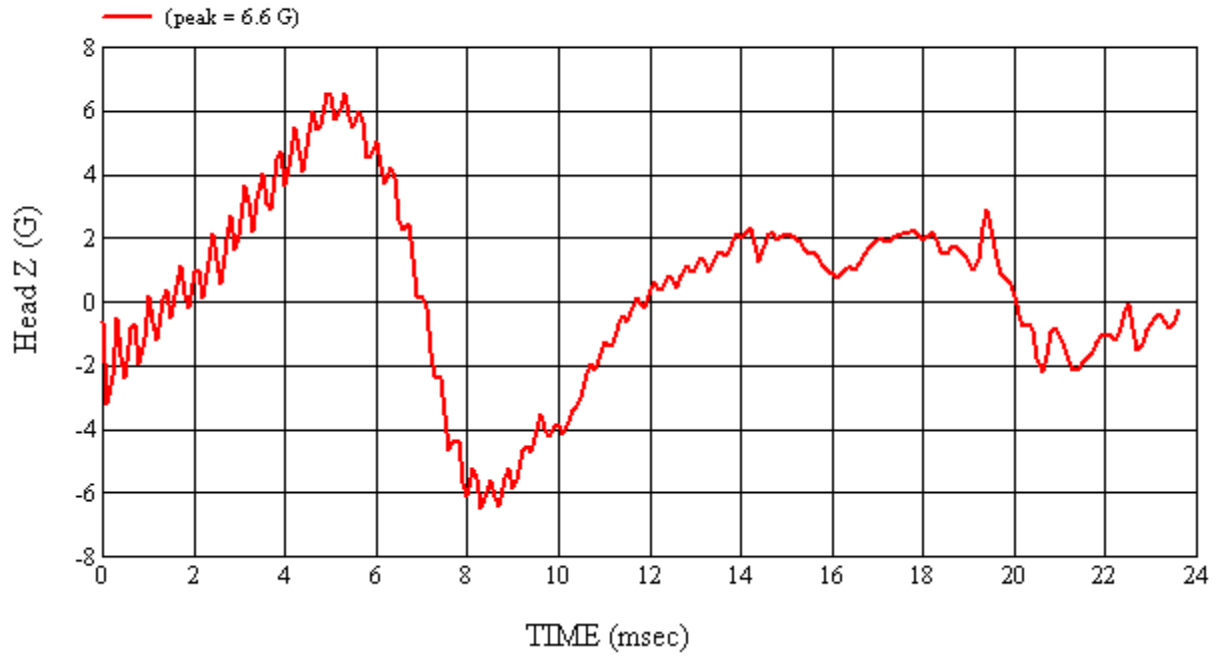
MGA Test #: U11145

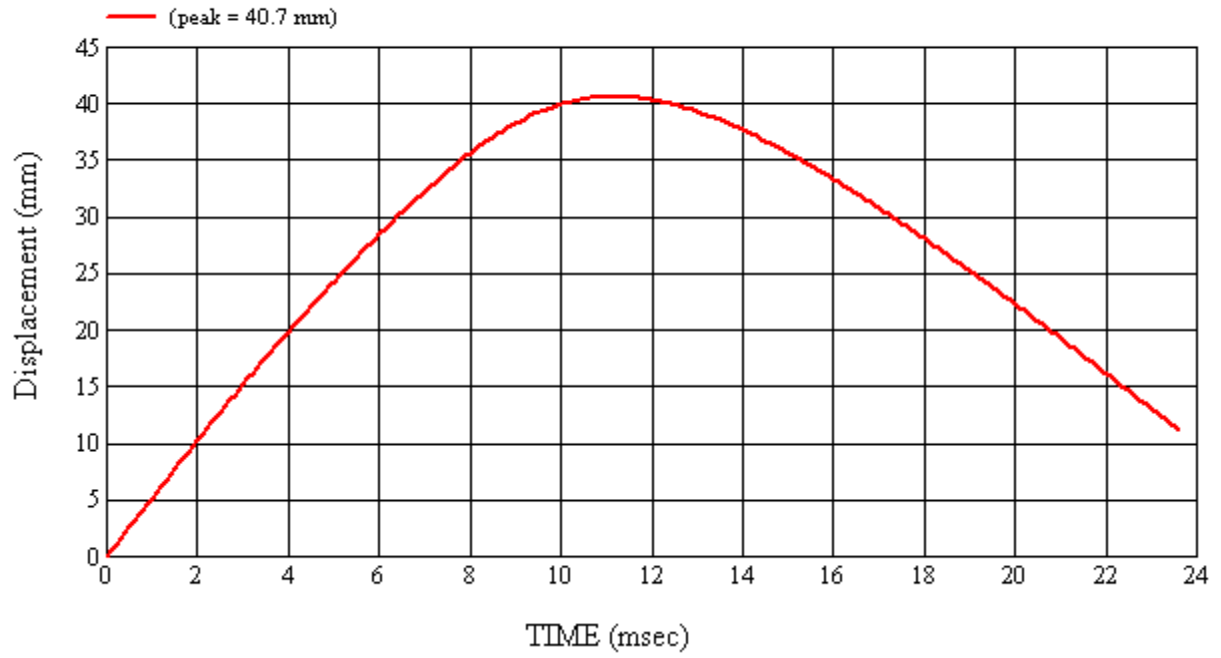
Target Location: AP2, Right Side

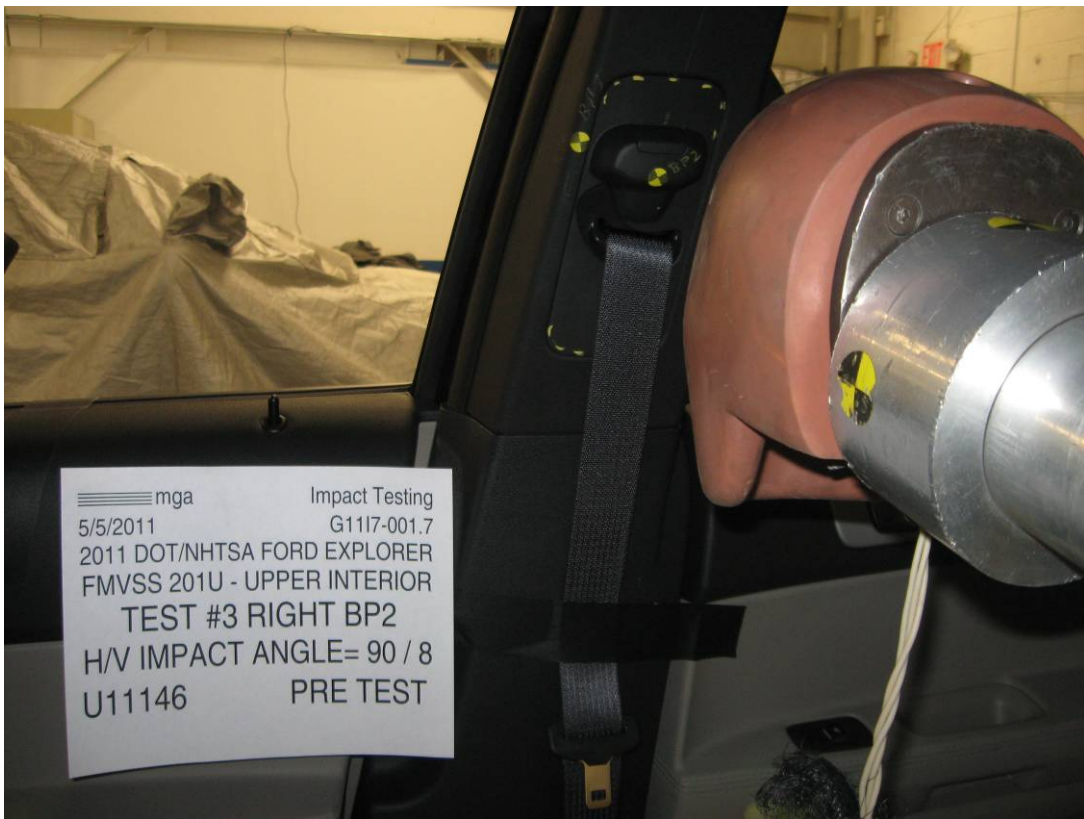
Test Date: 5/5/2011

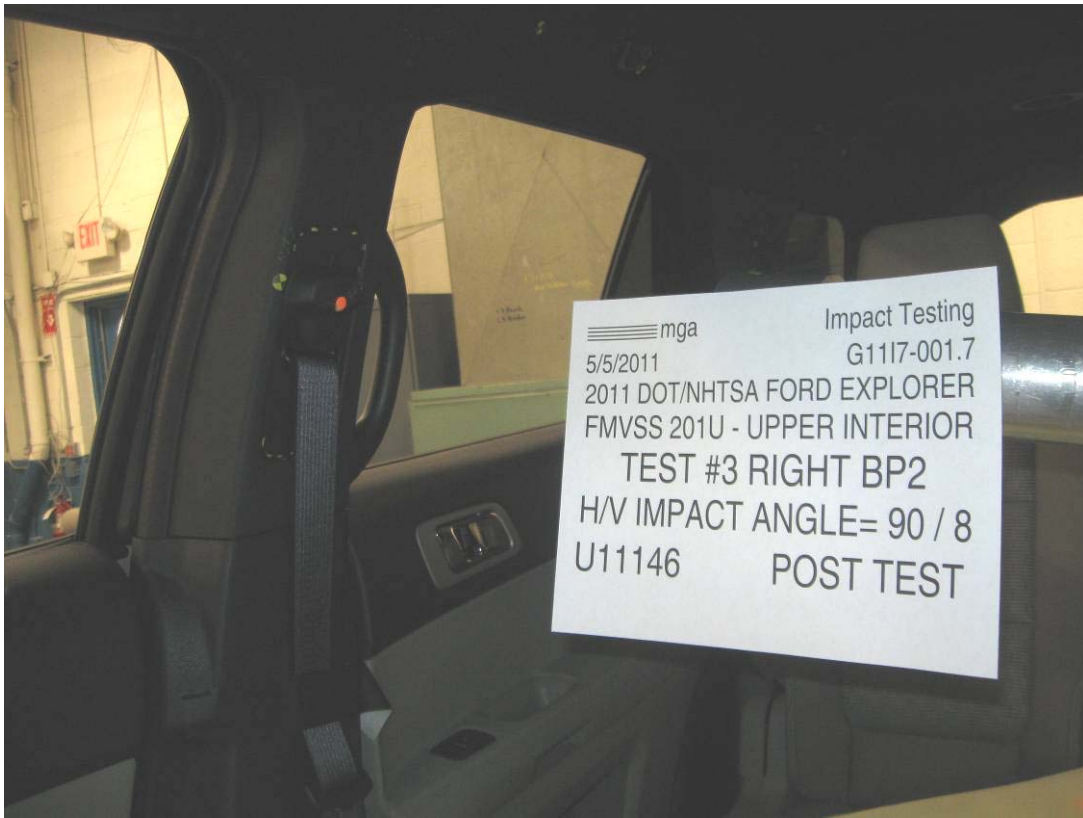


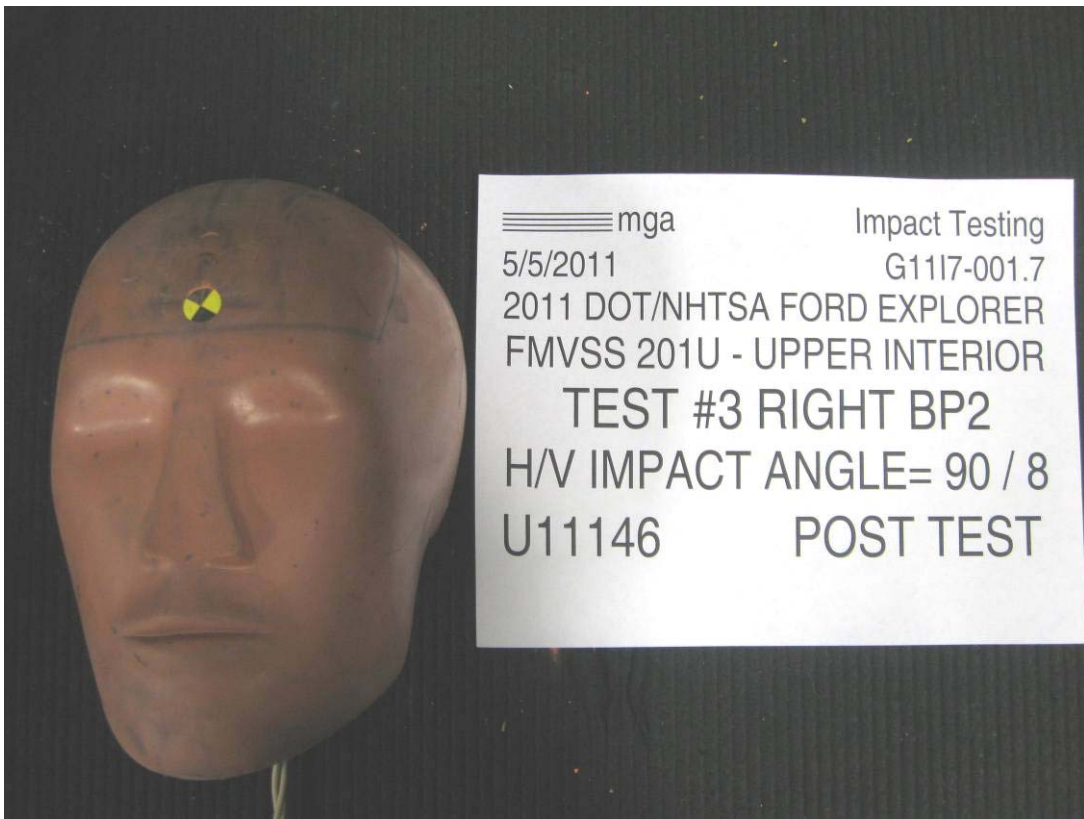












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Test Number:#3

Target (Vehicle Side): BP2Right

Temperature:21.7C

MGA Test Reference No.:U11146

Humidity:22.5%

Approach Horizontal Angles:90°

Time of Test:1:57:41 PM

Approach Vertical Angles:8°

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
794	832	5.5	23.8	10	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.):

Adjustable anchorage cover dislodged

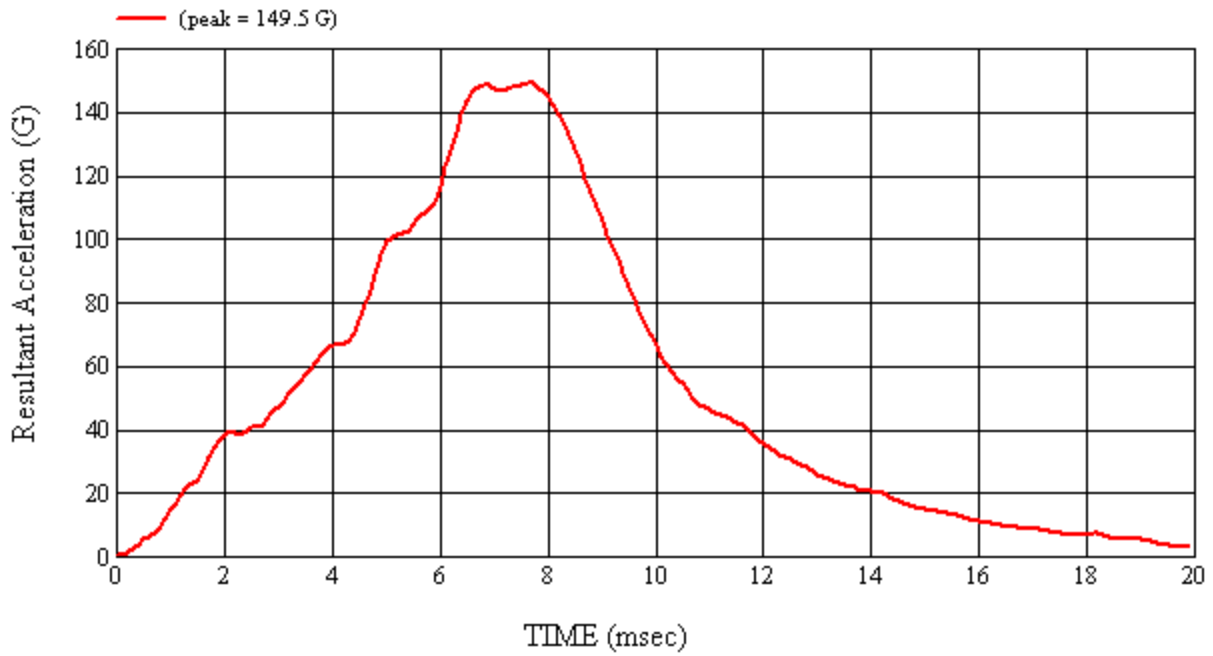
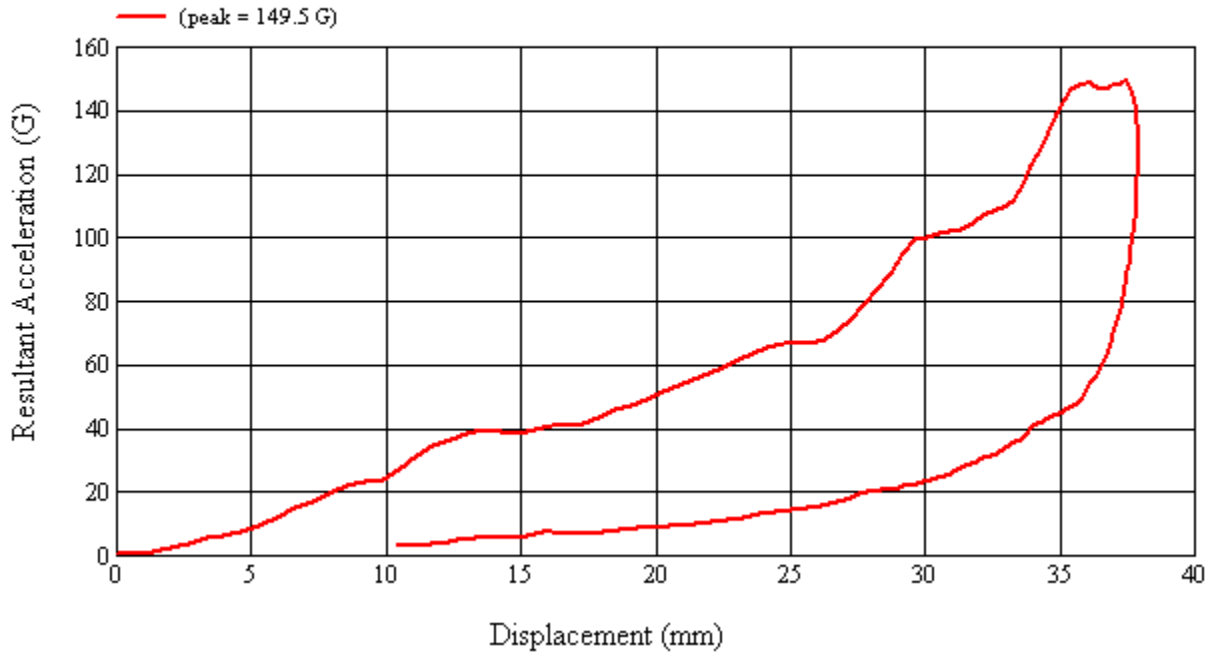
Recorded By: *Kevin D. McLean* Approved By*: *Richard I. Smith* Date: 5/5/2011

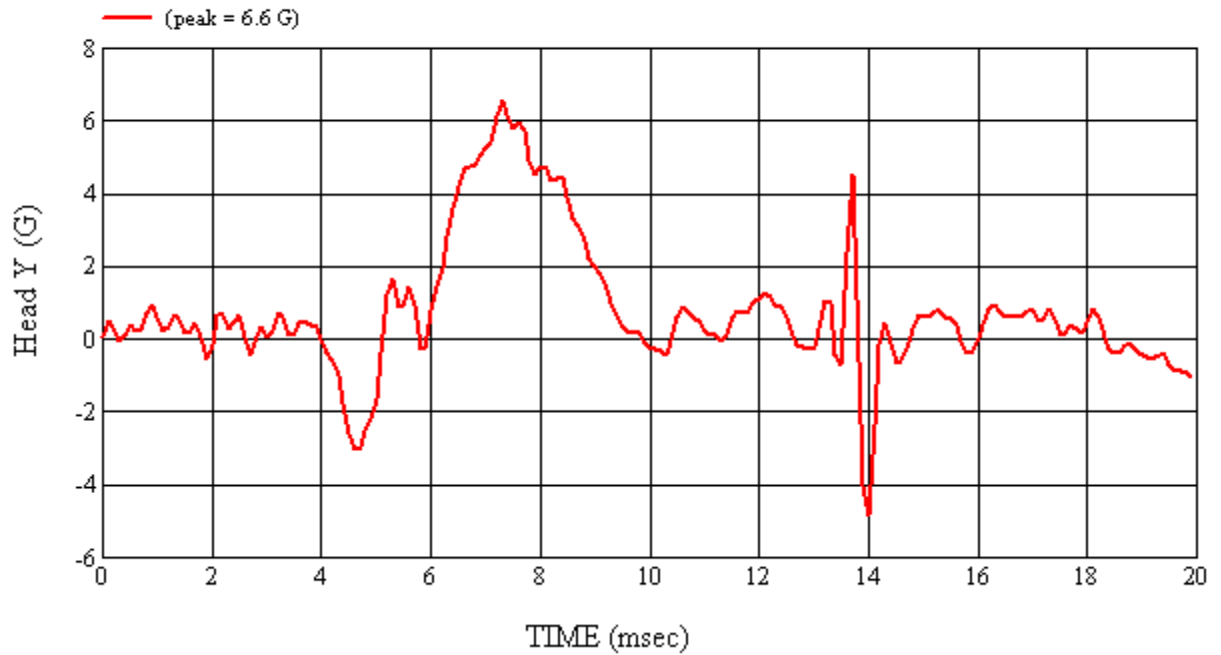
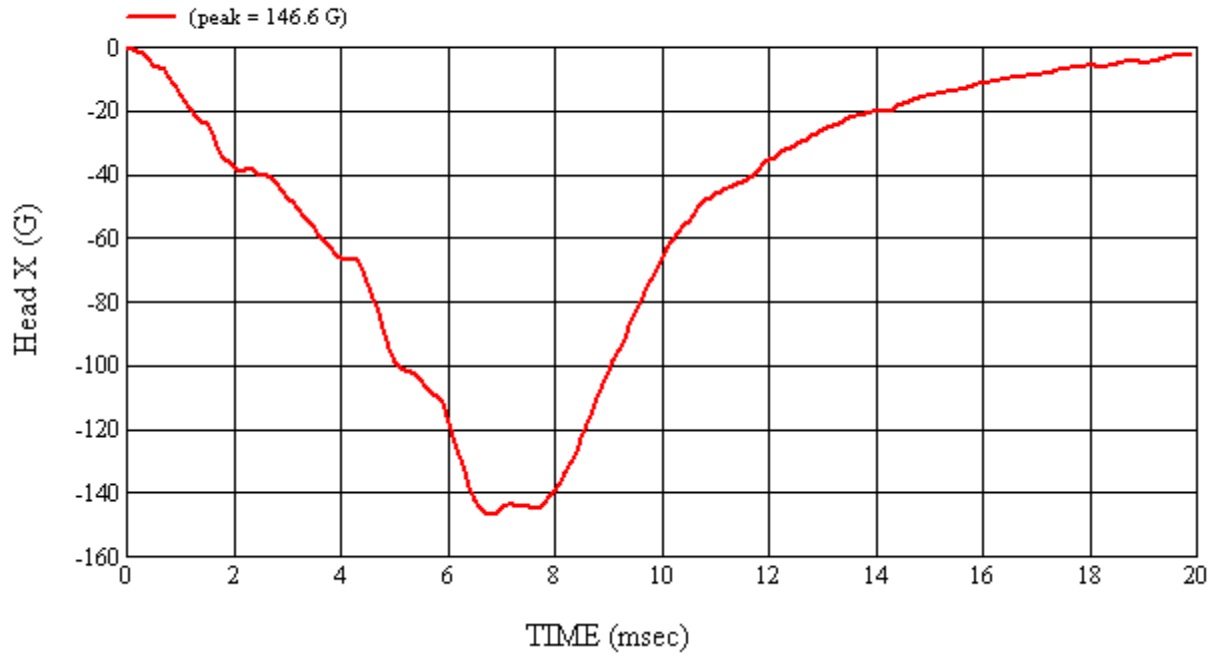
*Only necessary for NHTSA (Government) Compliance testing.

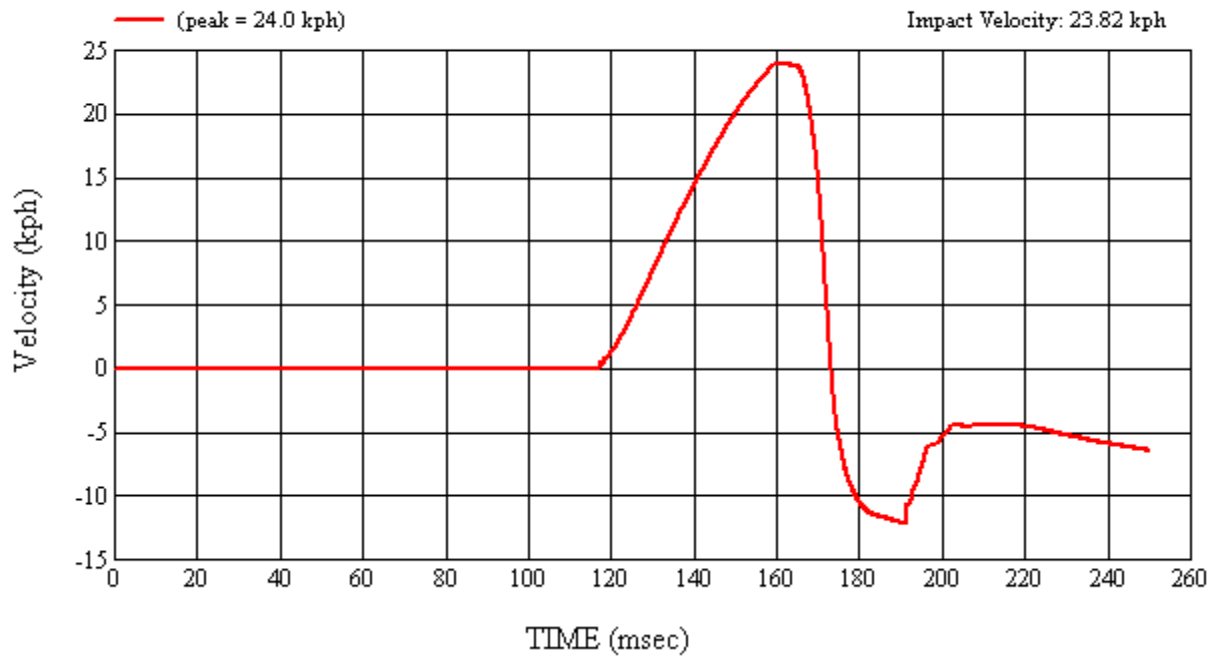
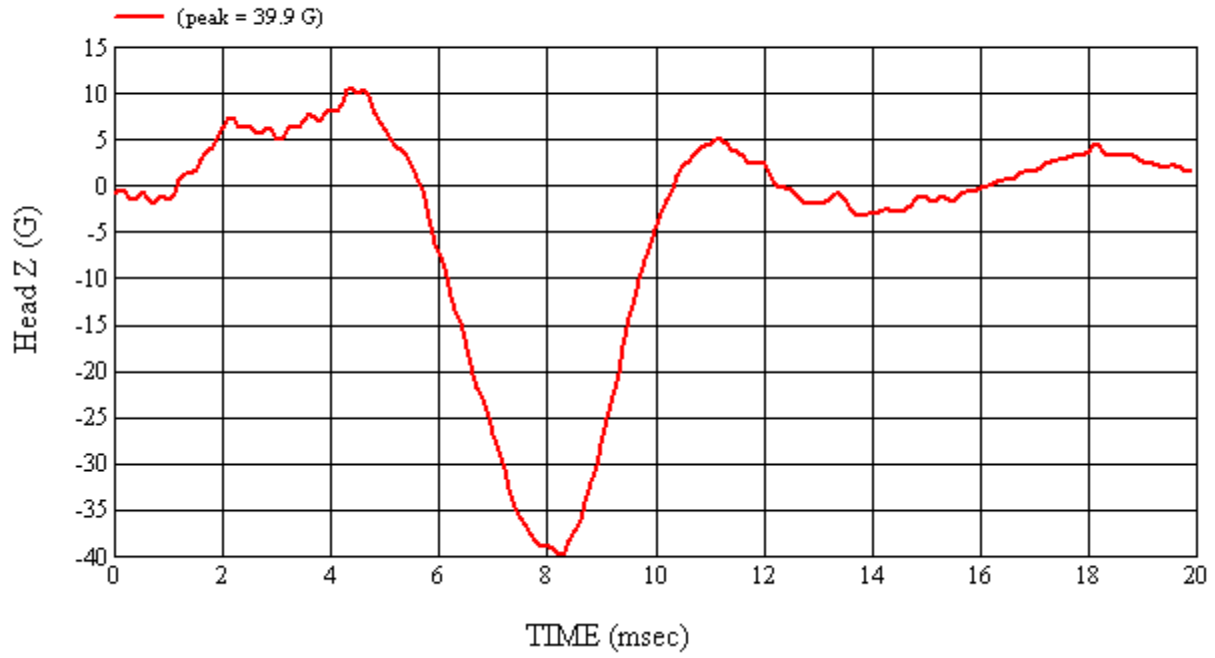
MGA Test #: U11146

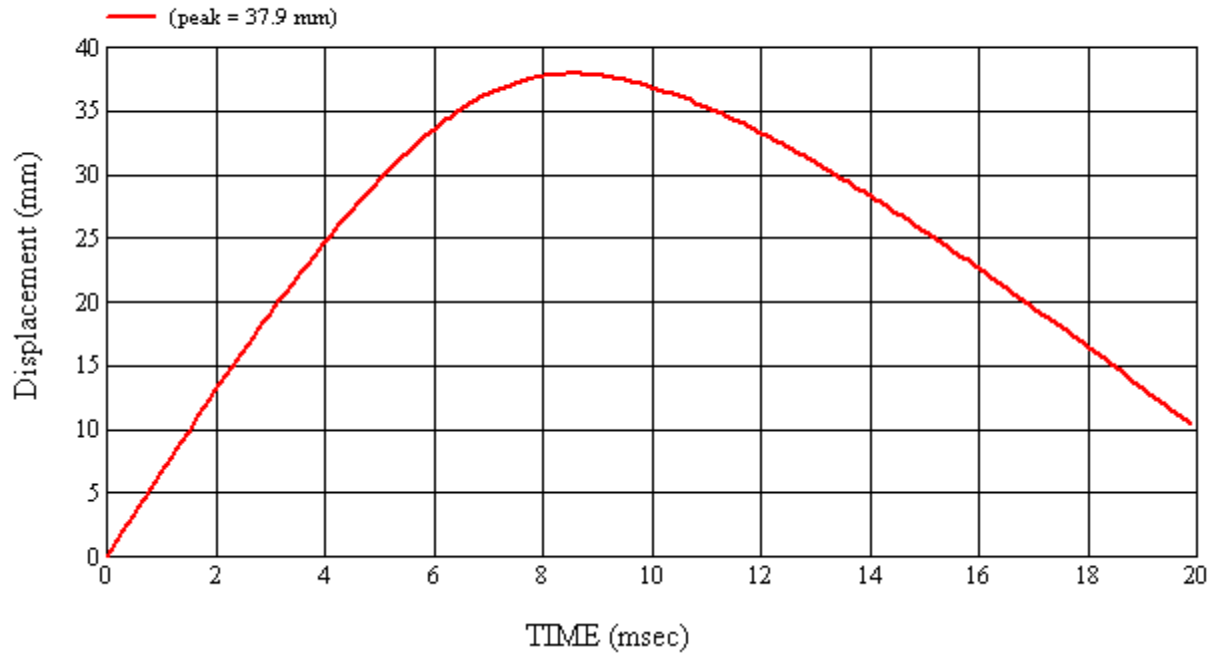
Target Location: BP2, Right Side

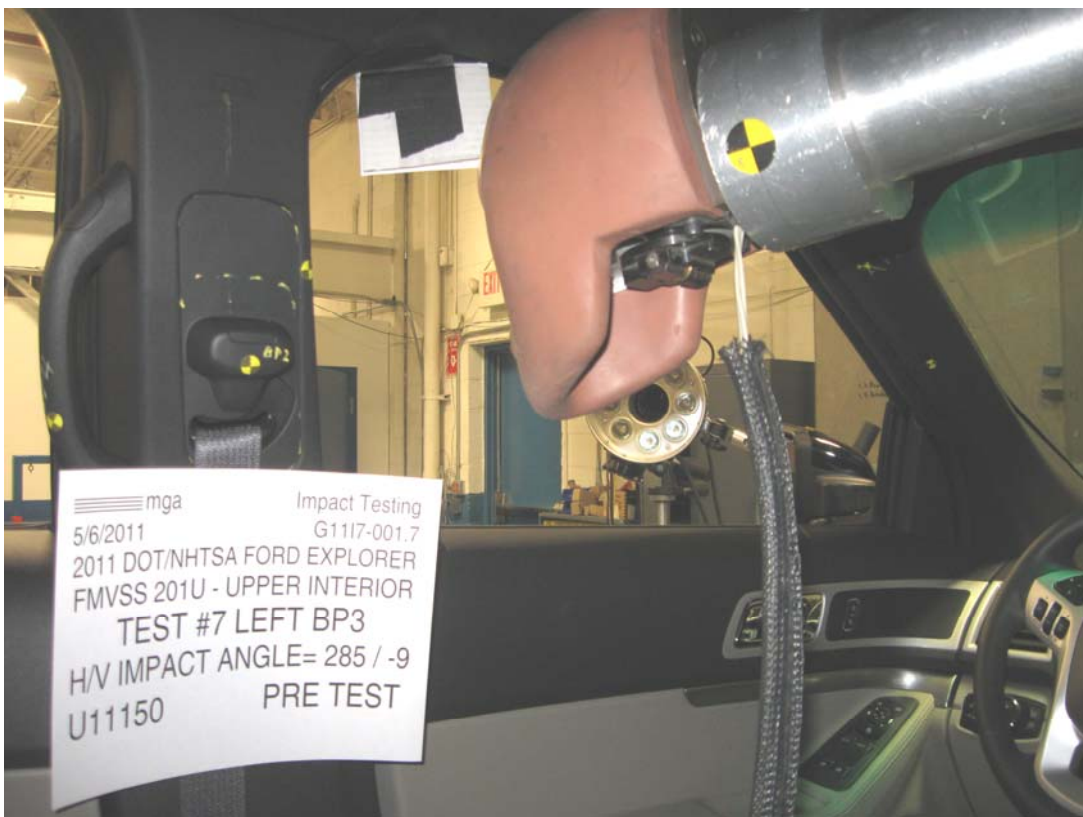
Test Date: 5/5/2011

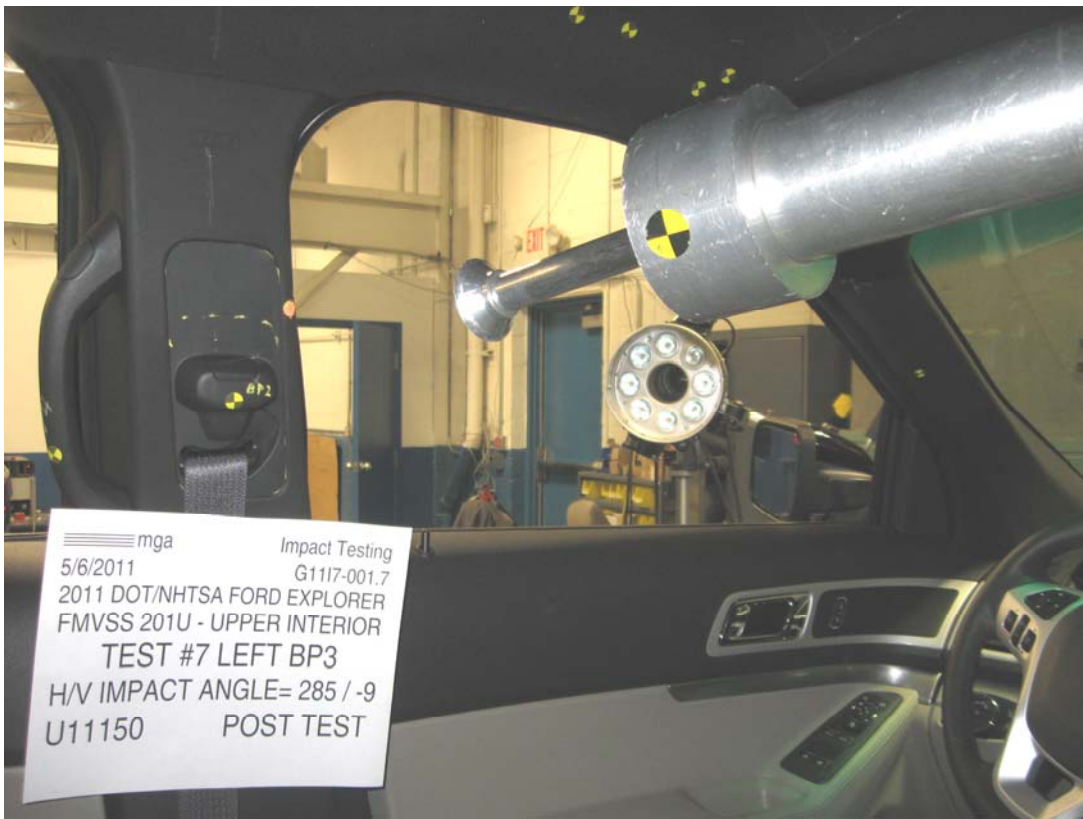


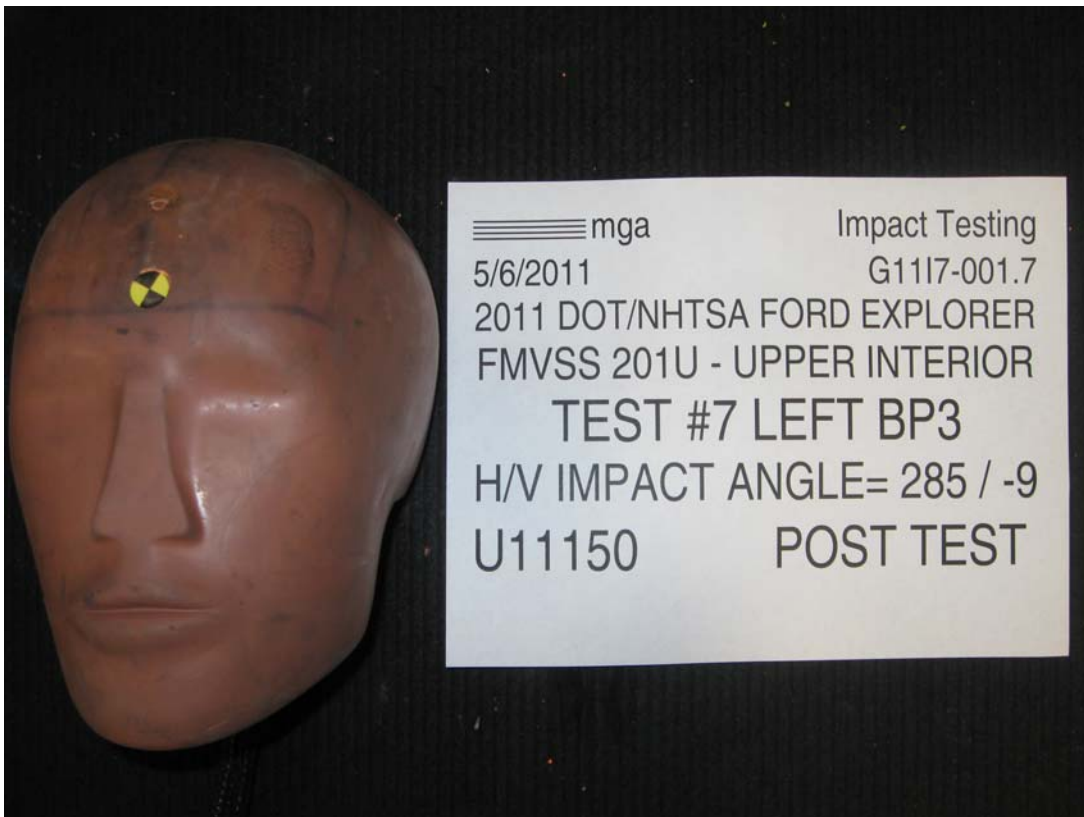












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Test Number:#7

Target (Vehicle Side): BP3Left

Temperature:22.1C

MGA Test Reference No.:U11150

Humidity:44.9%

Approach Horizontal Angles:285°

Time of Test:11:24:09 AM

Approach Vertical Angles:-9°

FMH Serial No:[035]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
711	722	5.4	23.9	7	4 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.):

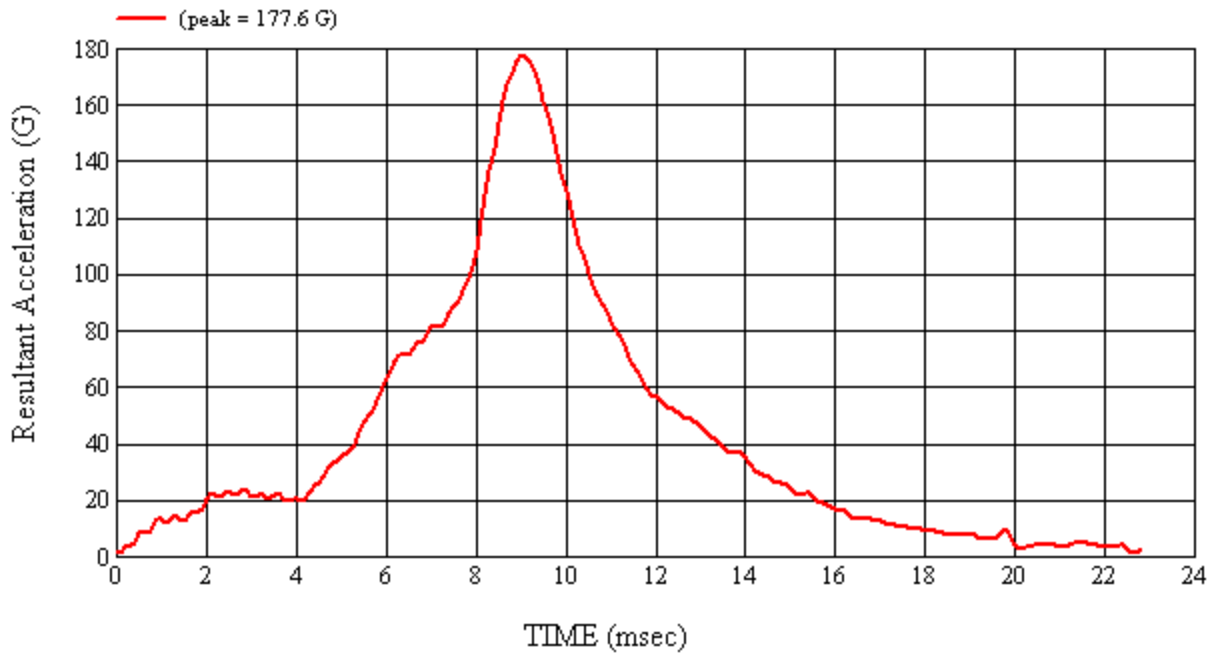
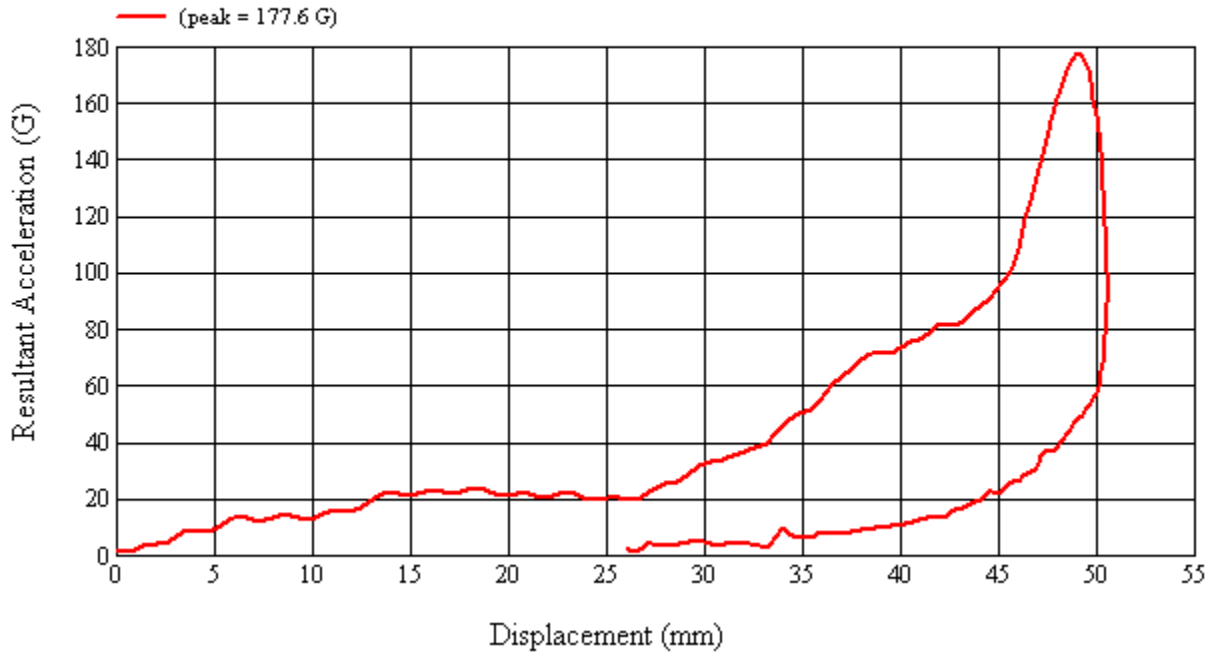
Dislodged pillar trim

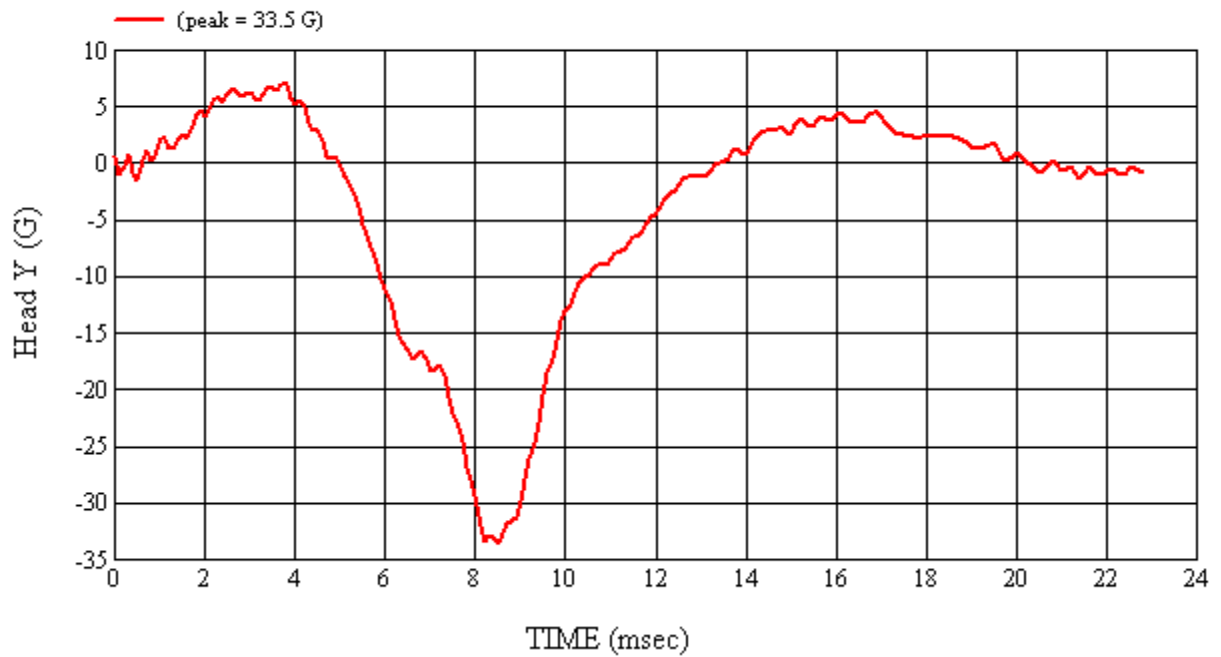
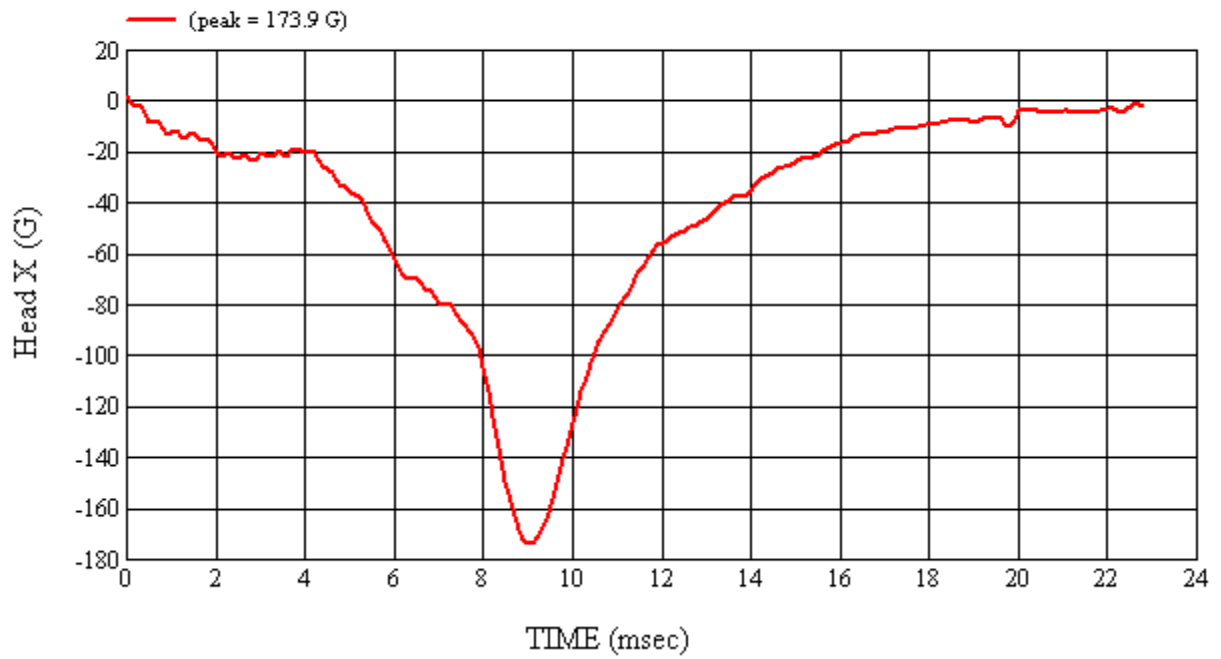
Recorded By: *Kevin D. McFerran* Approved By*: *Arthur I. Smith* Date: 5/6/2011
 *Only necessary for NHTSA (Government) Compliance testing.

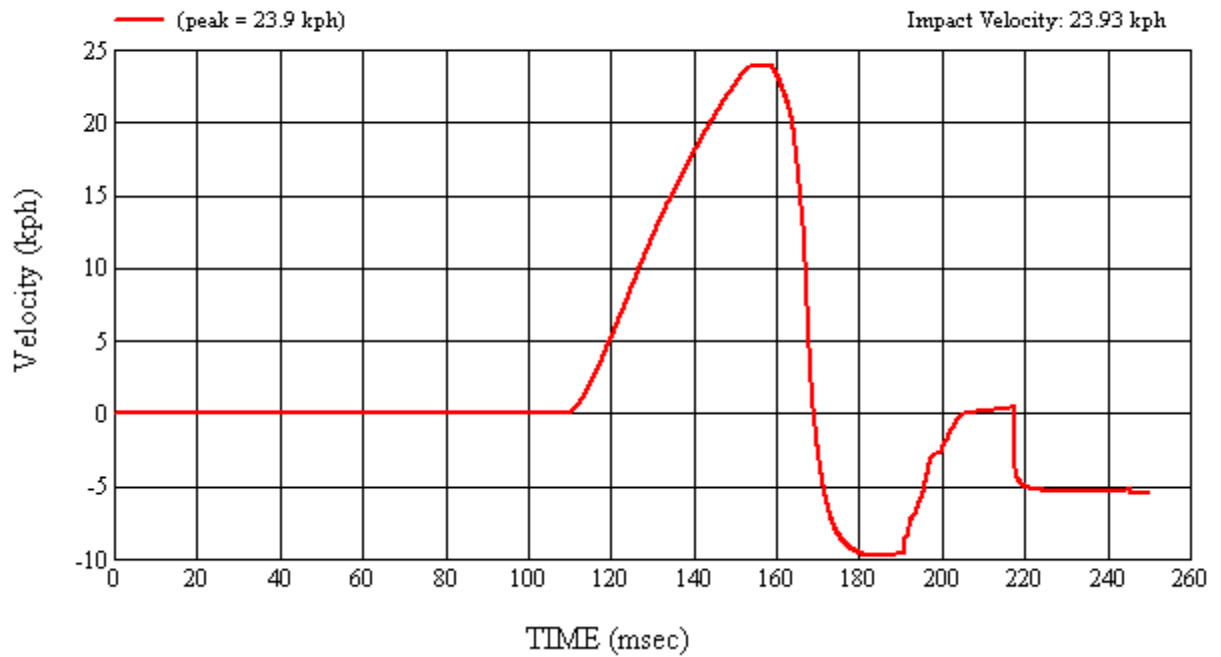
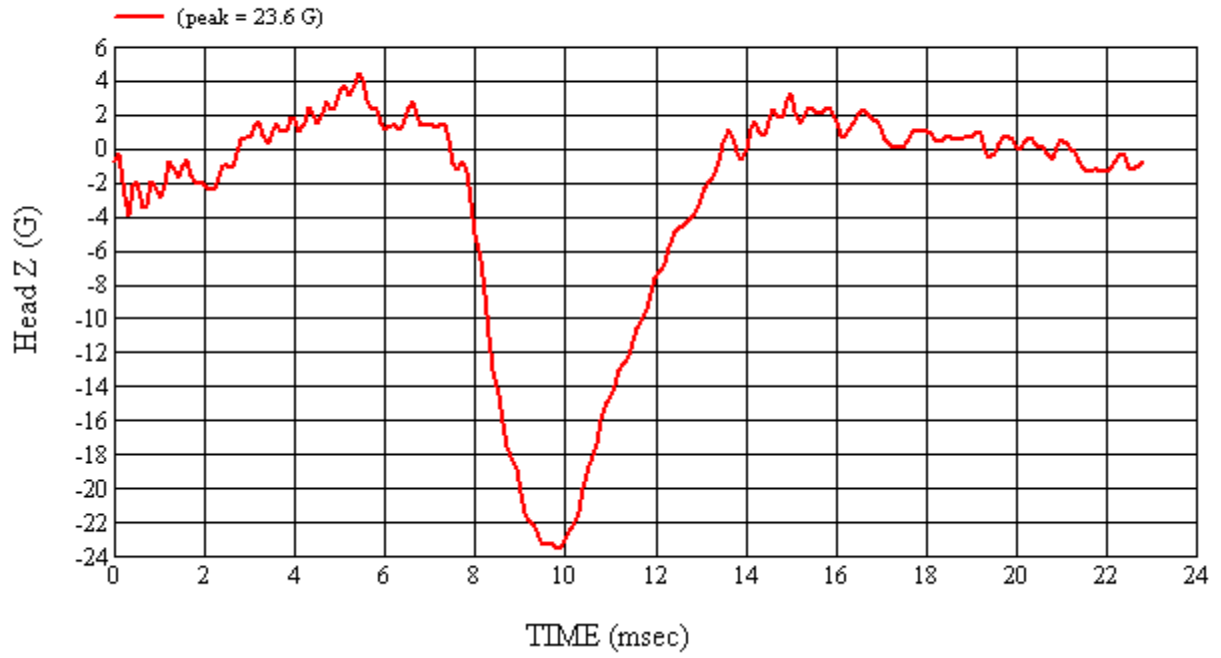
MGA Test #: U11150

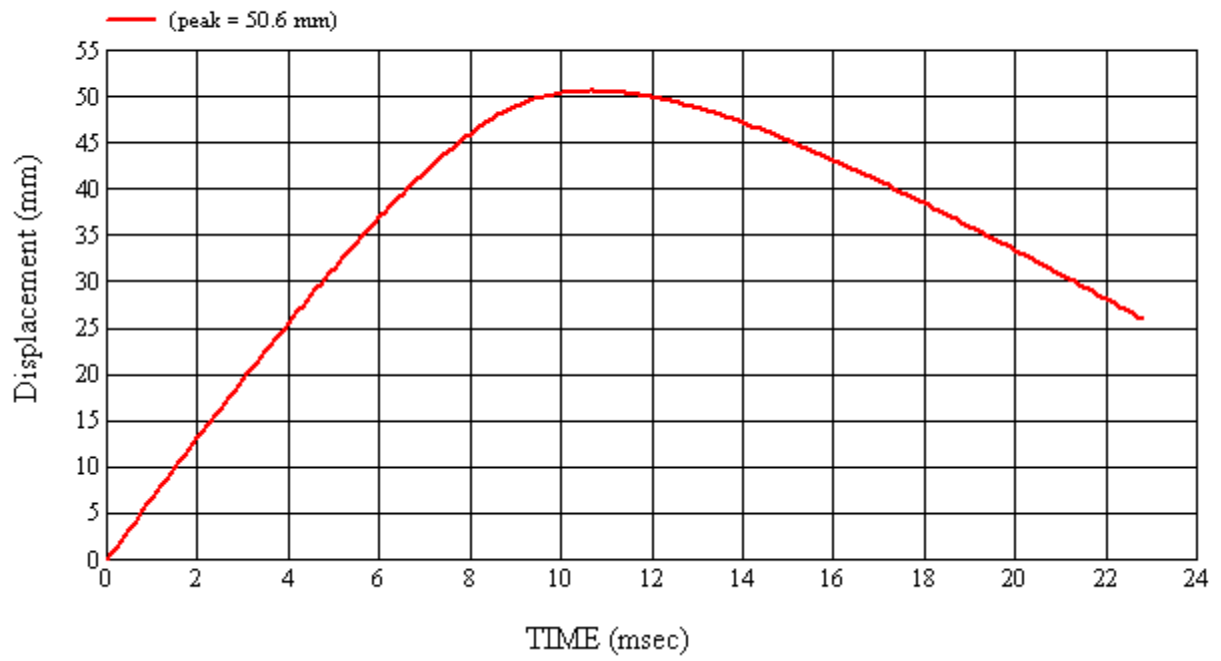
Target Location: BP3, Left Side

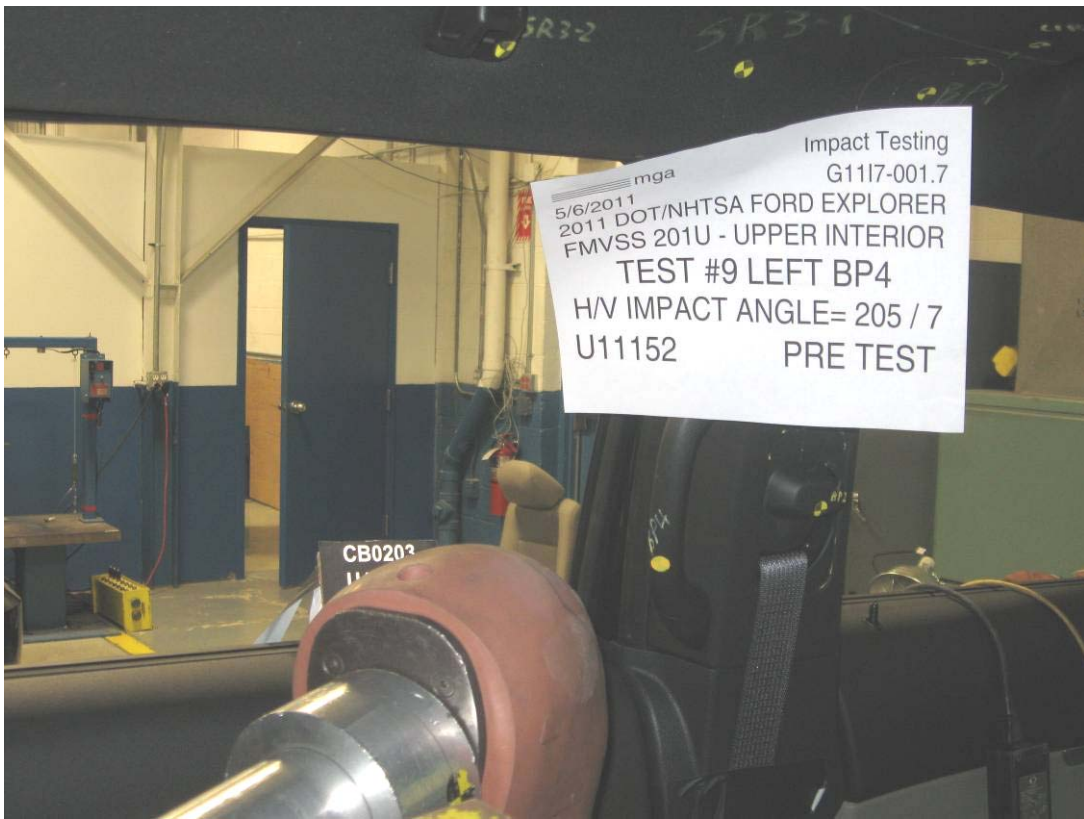
Test Date: 5/6/2011



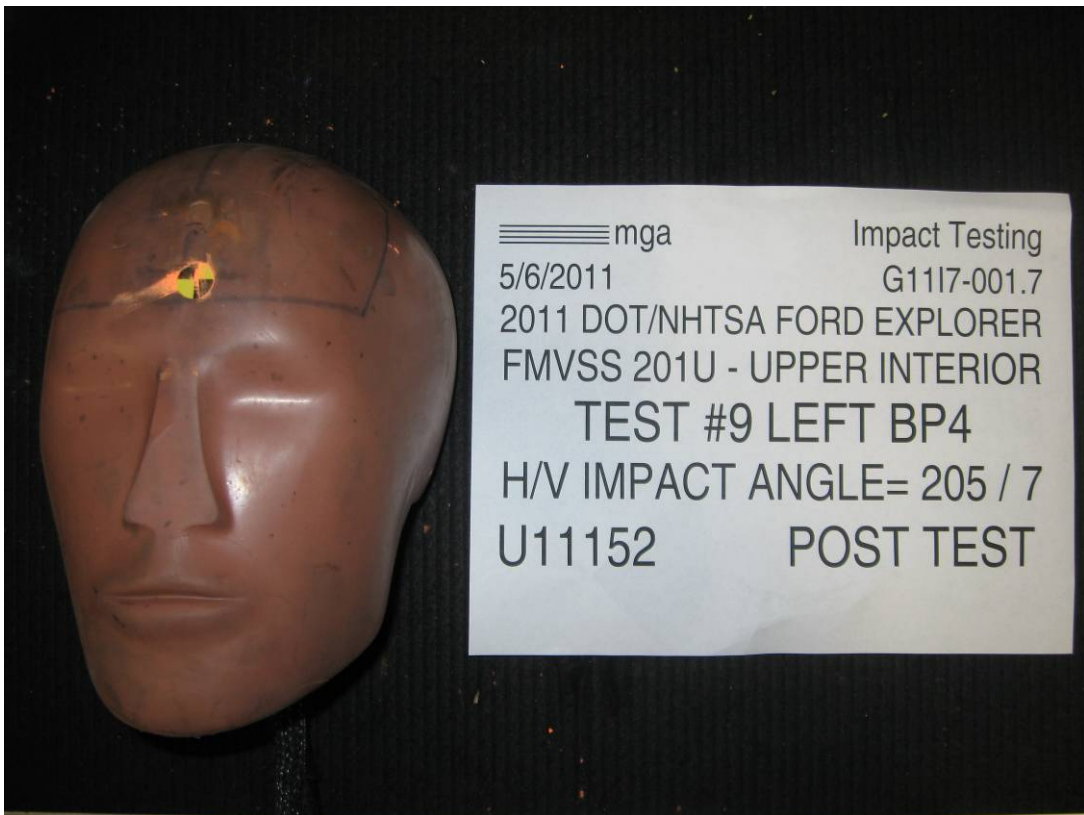












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Test Number:#9

Target (Vehicle Side): BP4Left

Temperature:22.1C

MGA Test Reference No.:U11152

Humidity:44.1%

Approach Horizontal Angles:205°

Time of Test:2:55:44 PM

Approach Vertical Angles:7°

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
736	755	4.6	23.8	7	5 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.):

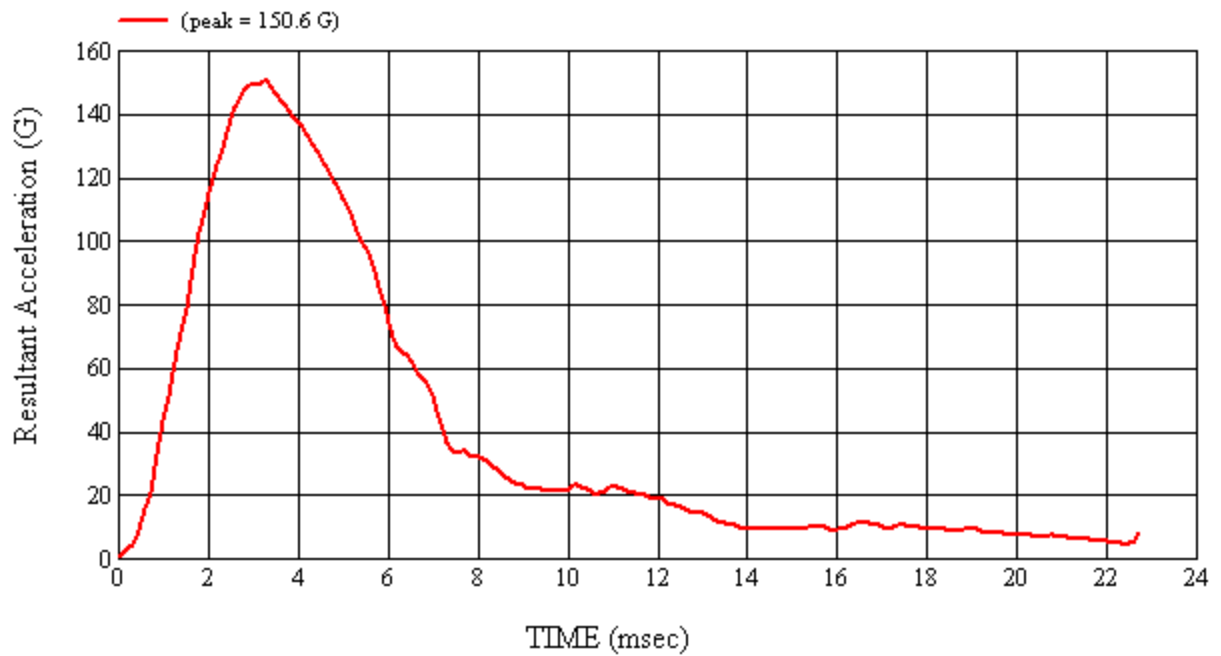
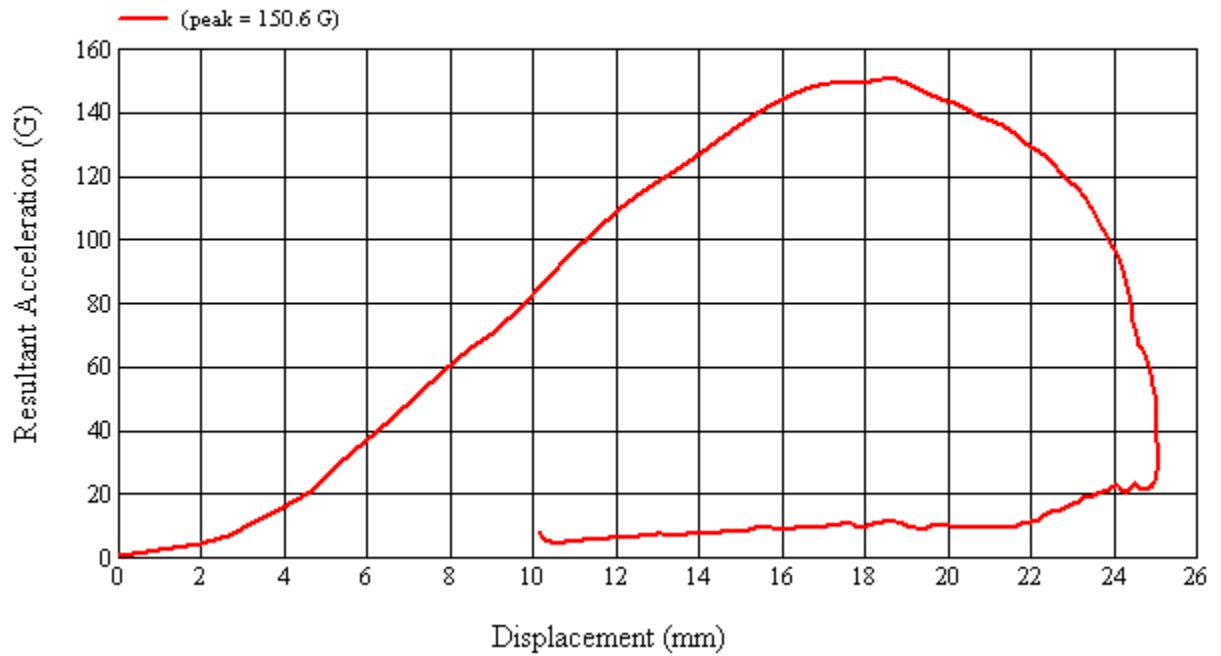
Assist handle dislodged and deformed

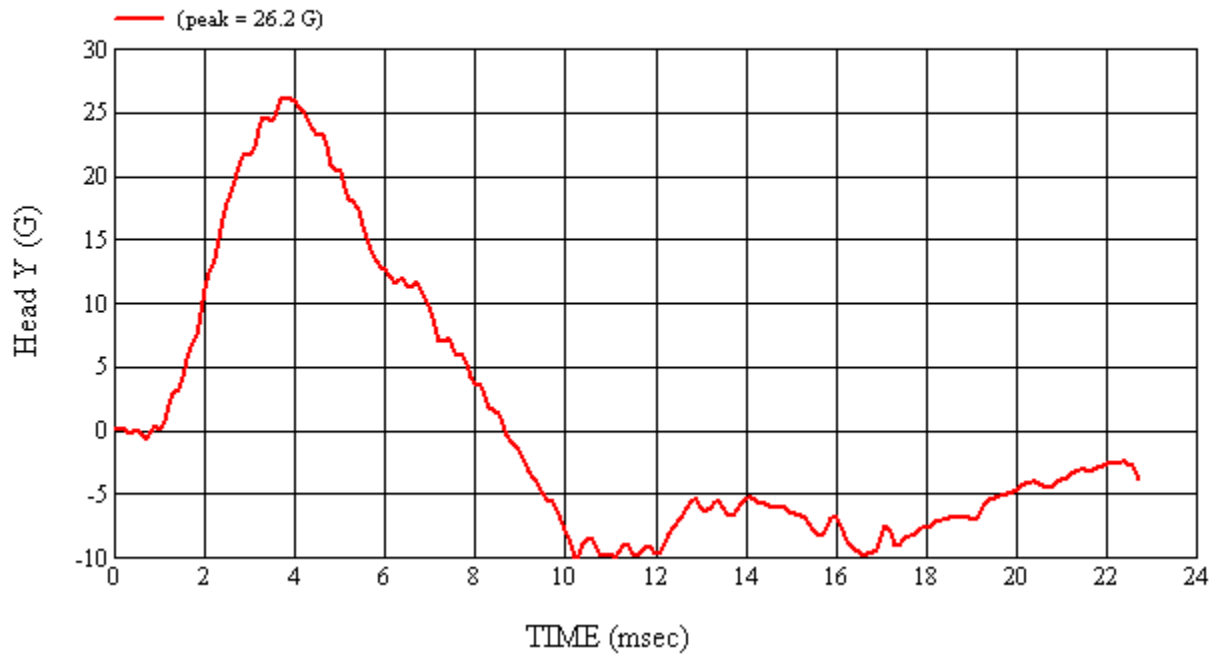
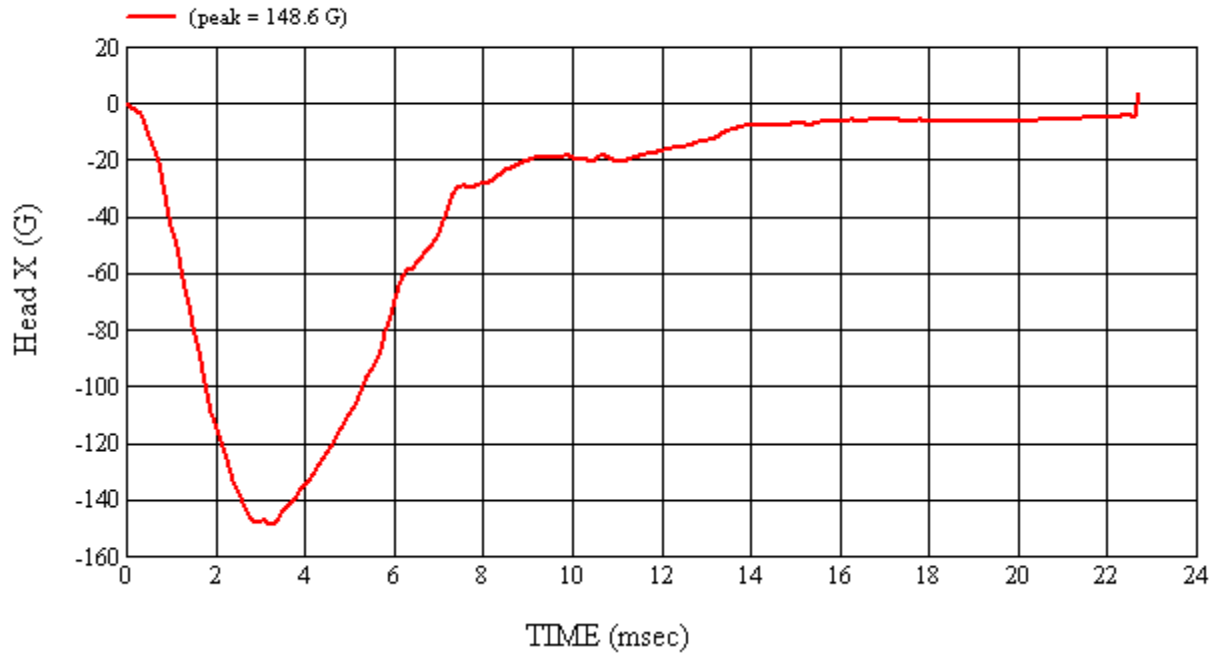
Recorded By: *Kevin D. McFerran* Approved By*: *Arthur I. Smith* Date: 5/6/2011
 *Only necessary for NHTSA (Government) Compliance testing.

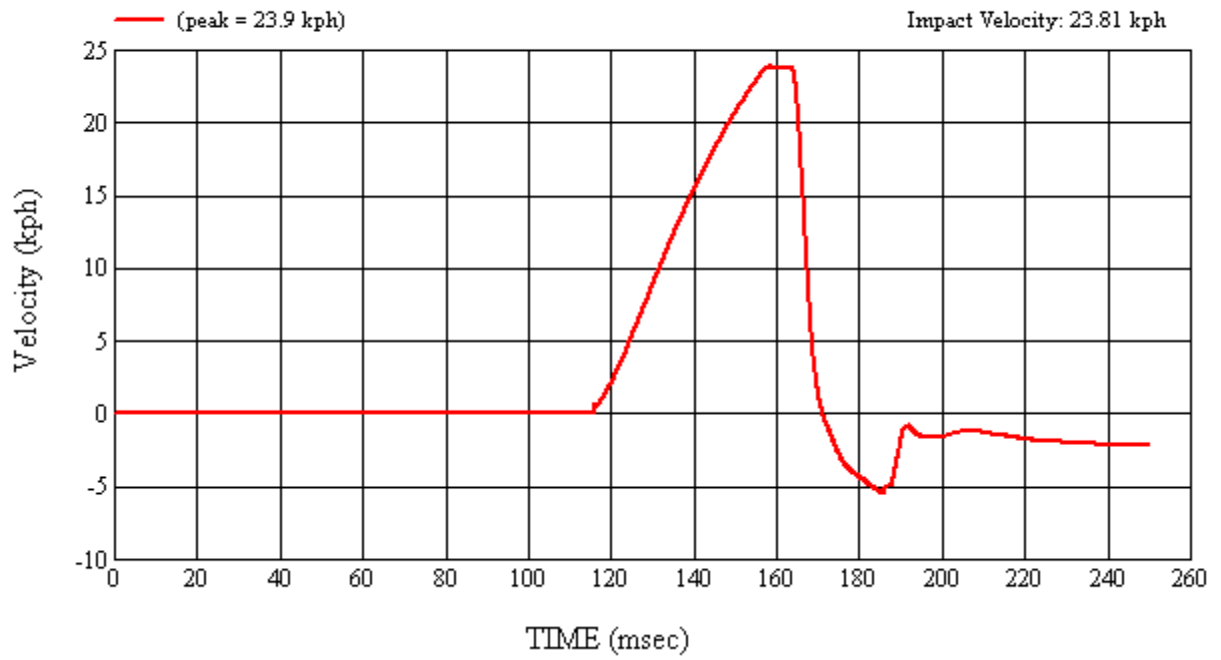
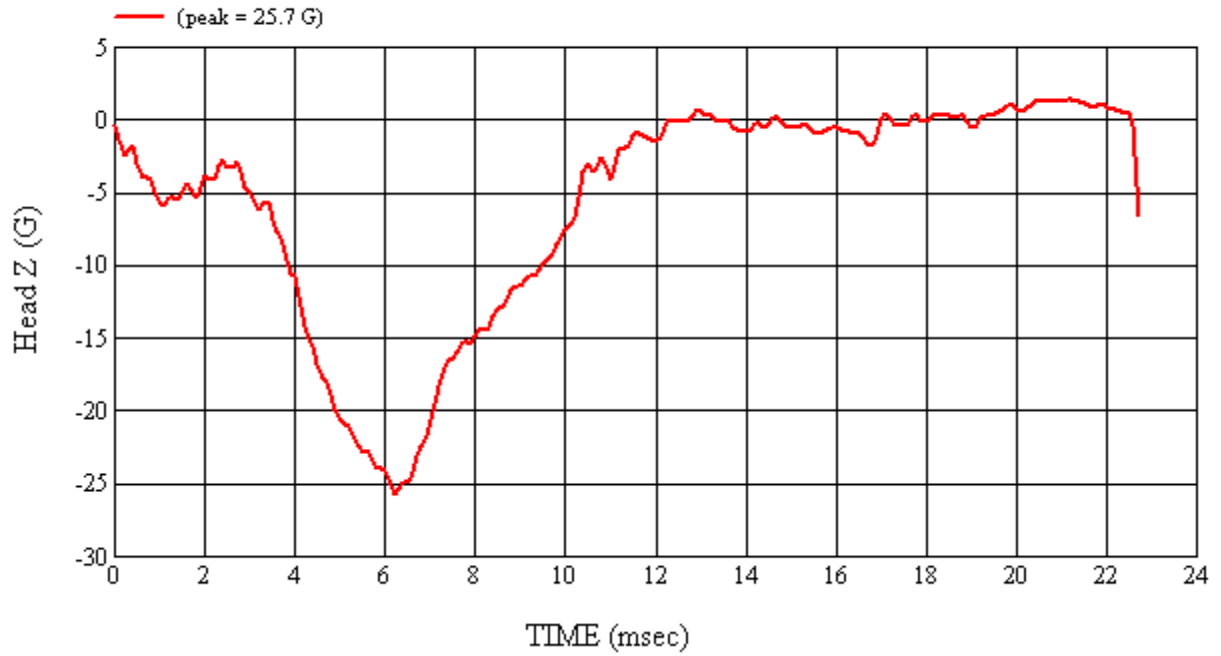
MGA Test #: U11152

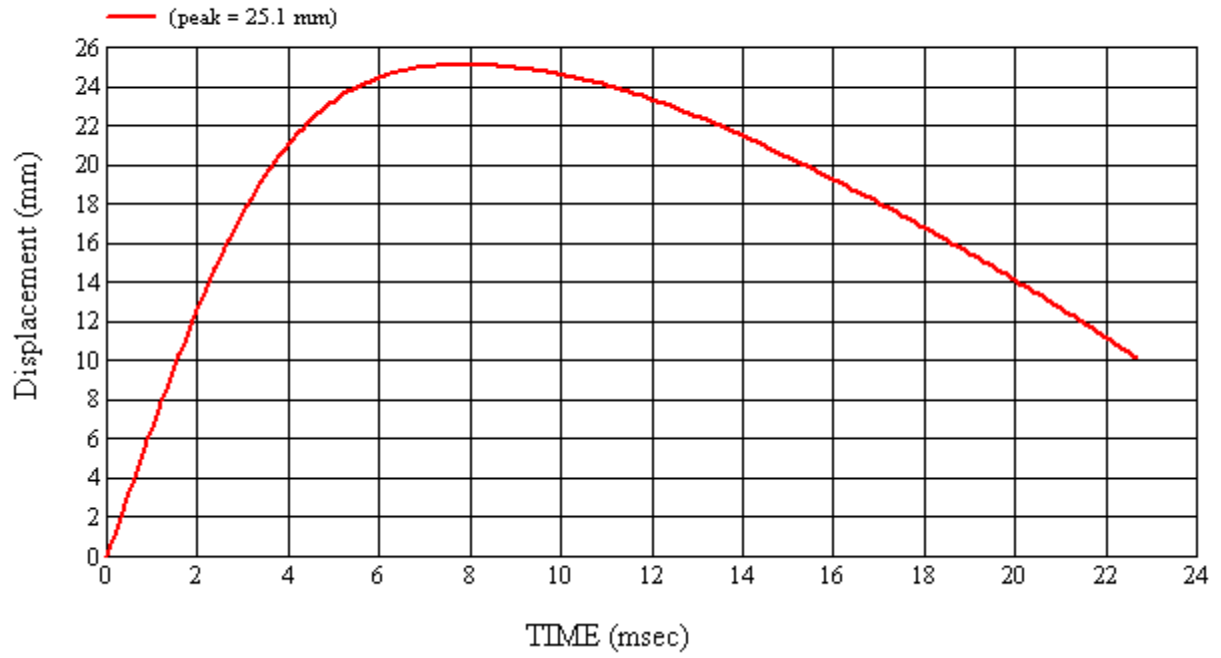
Target Location: BP4, Left Side

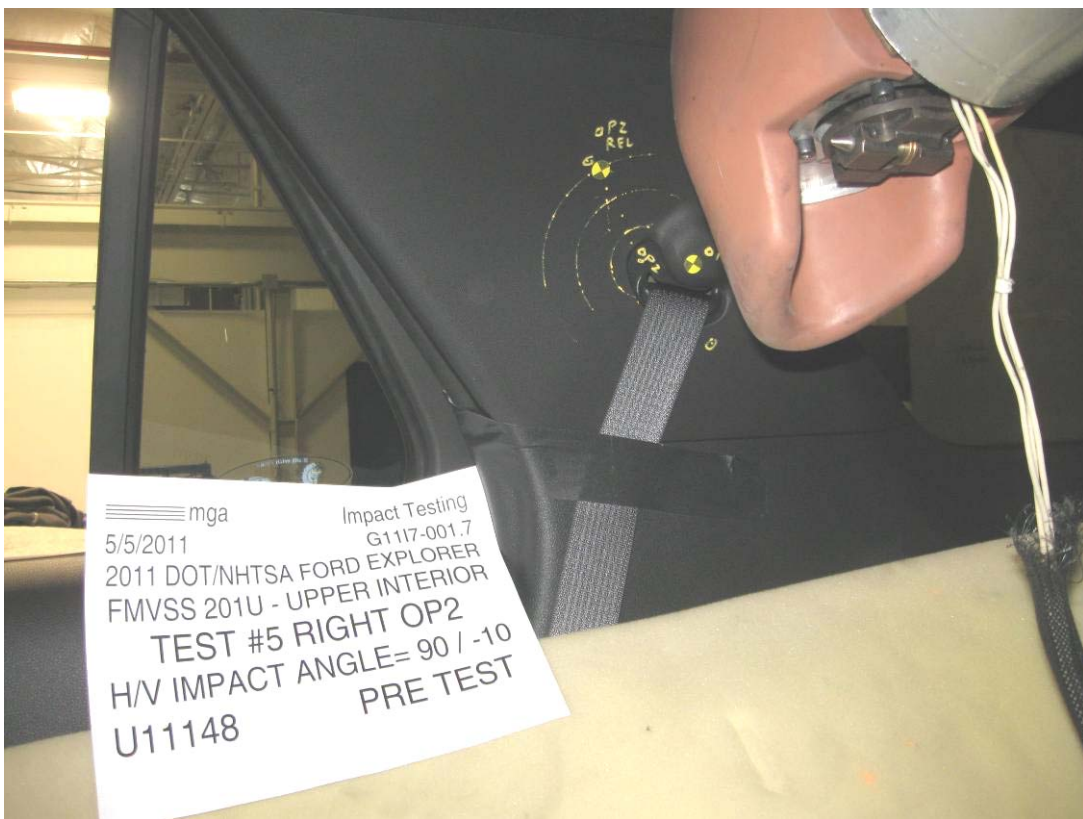
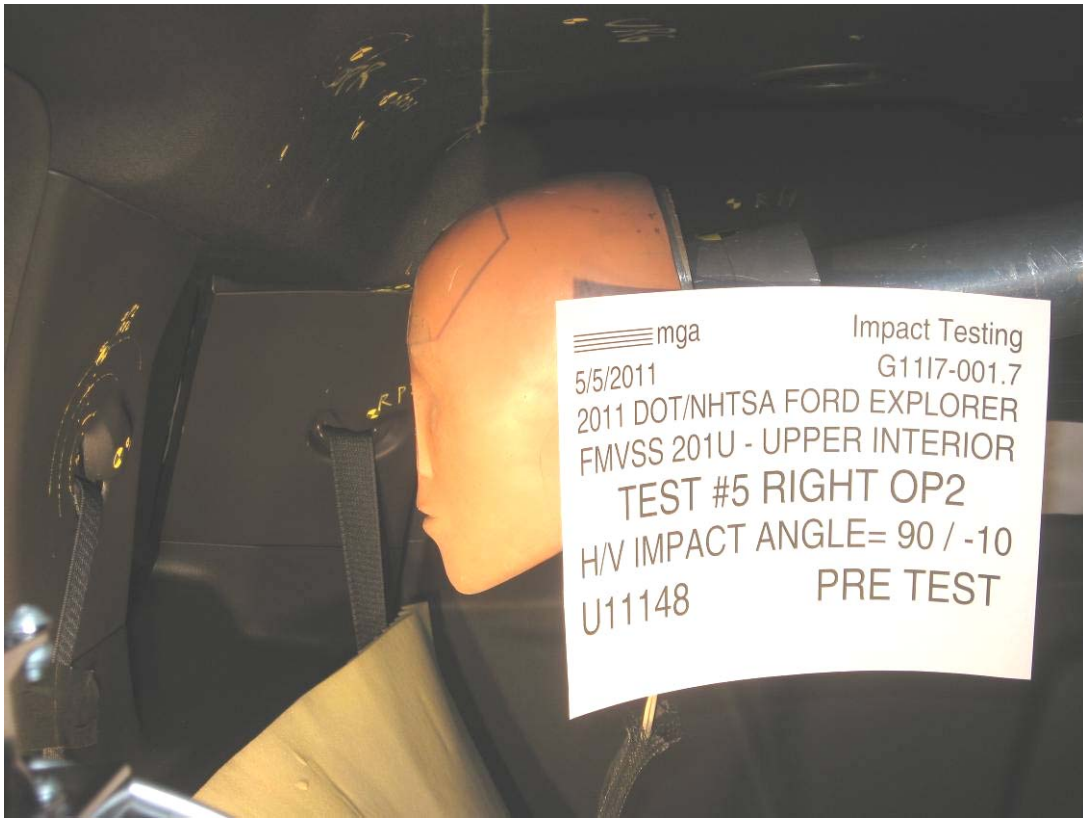
Test Date: 5/6/2011

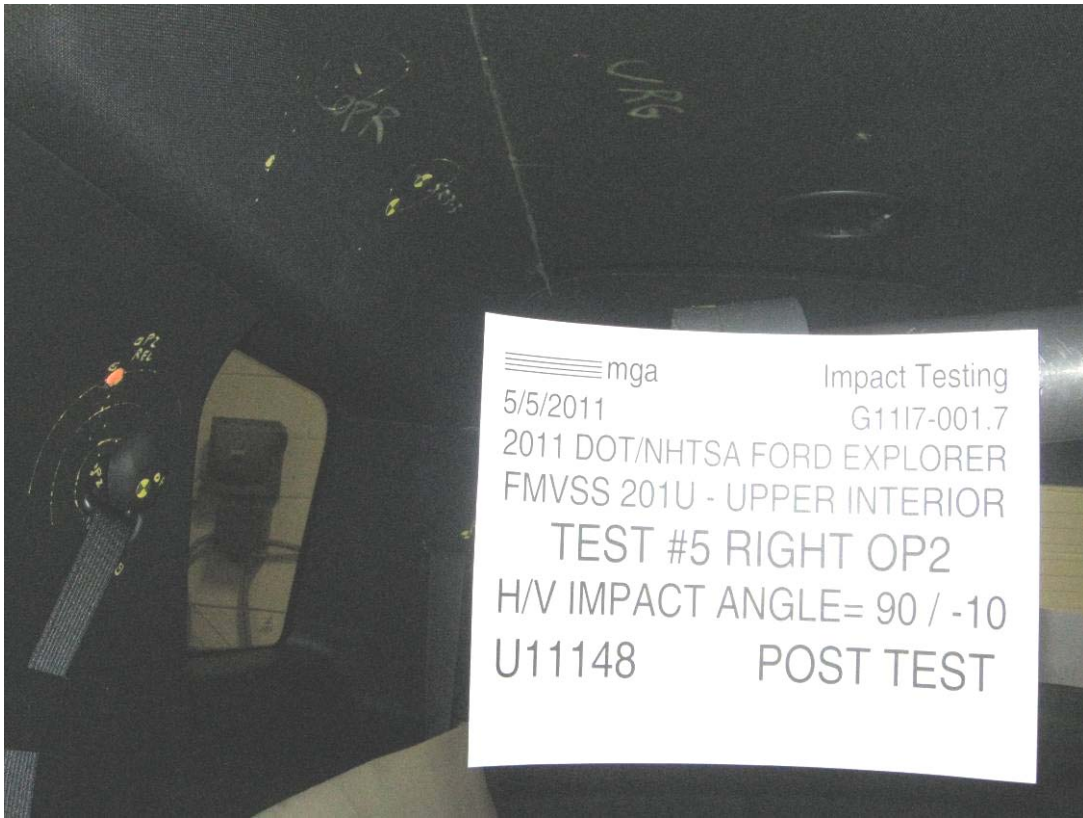


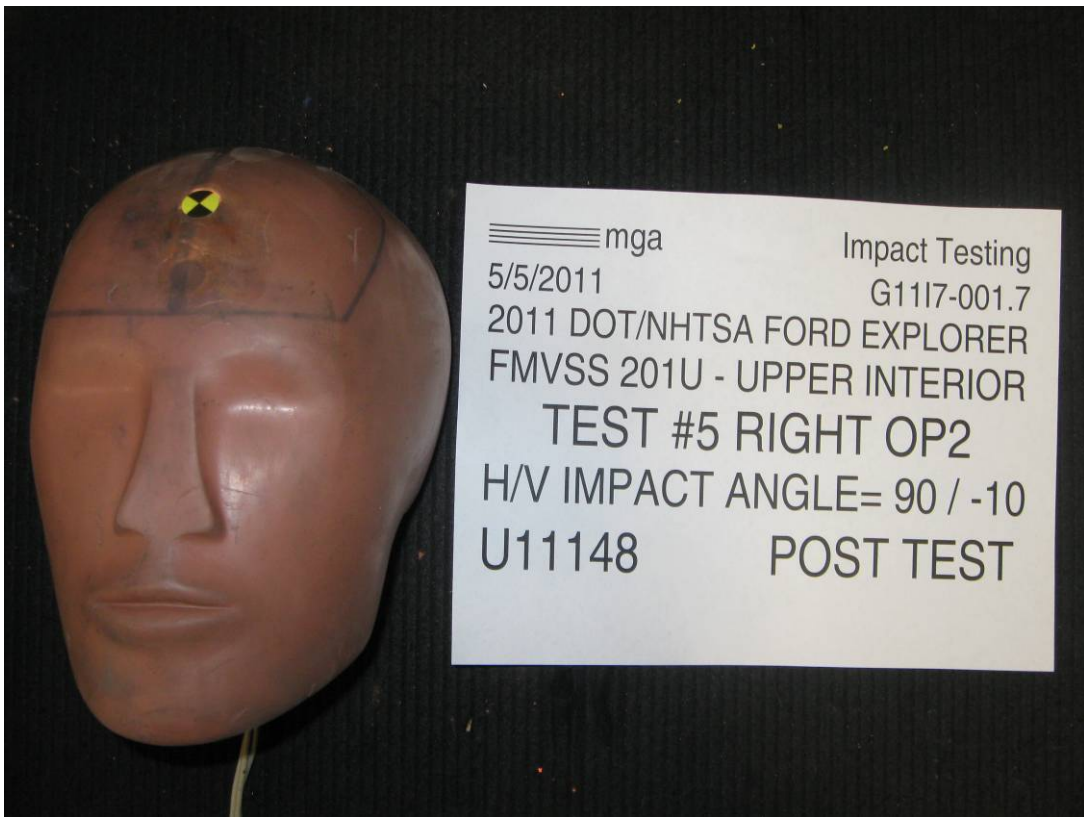












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Target (Vehicle Side): OP2Right

MGA Test Reference No.:U11148

Approach Horizontal Angles:90°

Approach Vertical Angles:-10°

Additional Description:

Test Number:#5

Temperature:23.1C

Humidity:23.4%

Time of Test:4:19:44 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
608	586	9.5	23.8	51	1 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.):

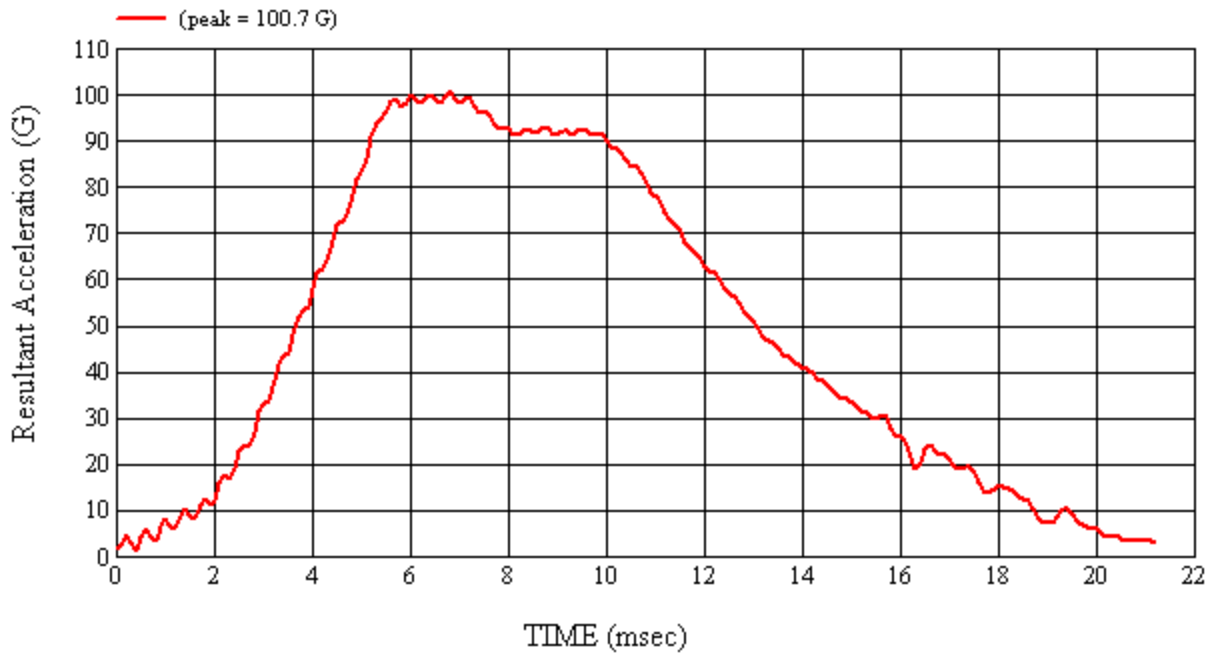
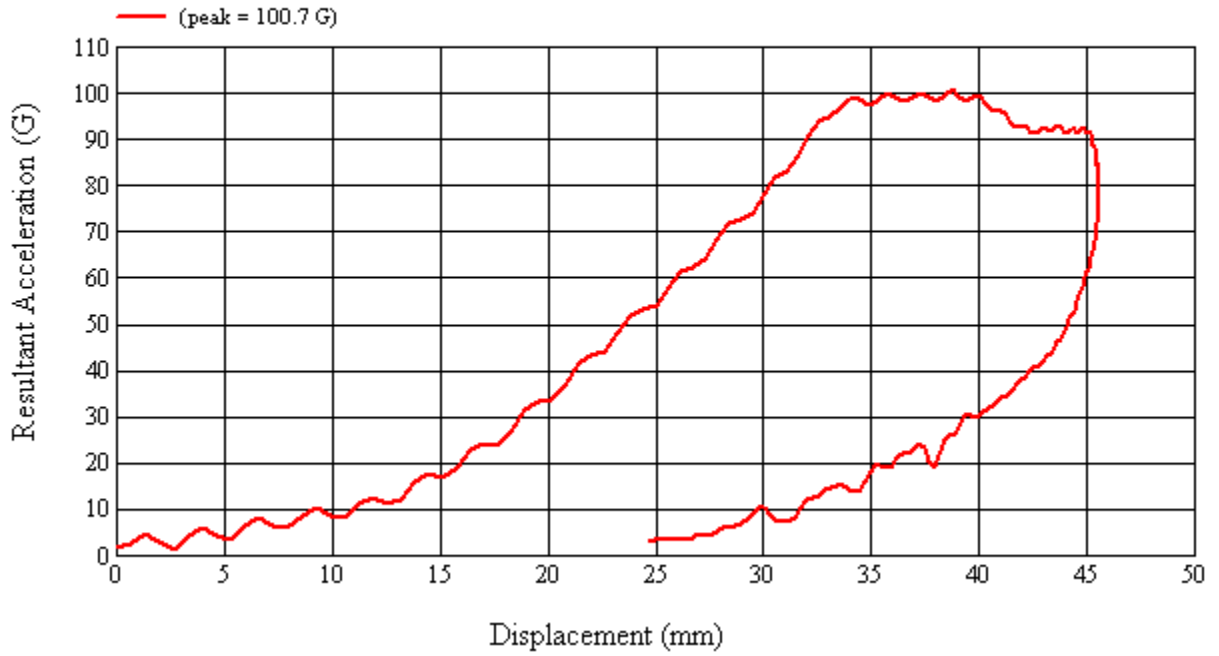
No visible damage

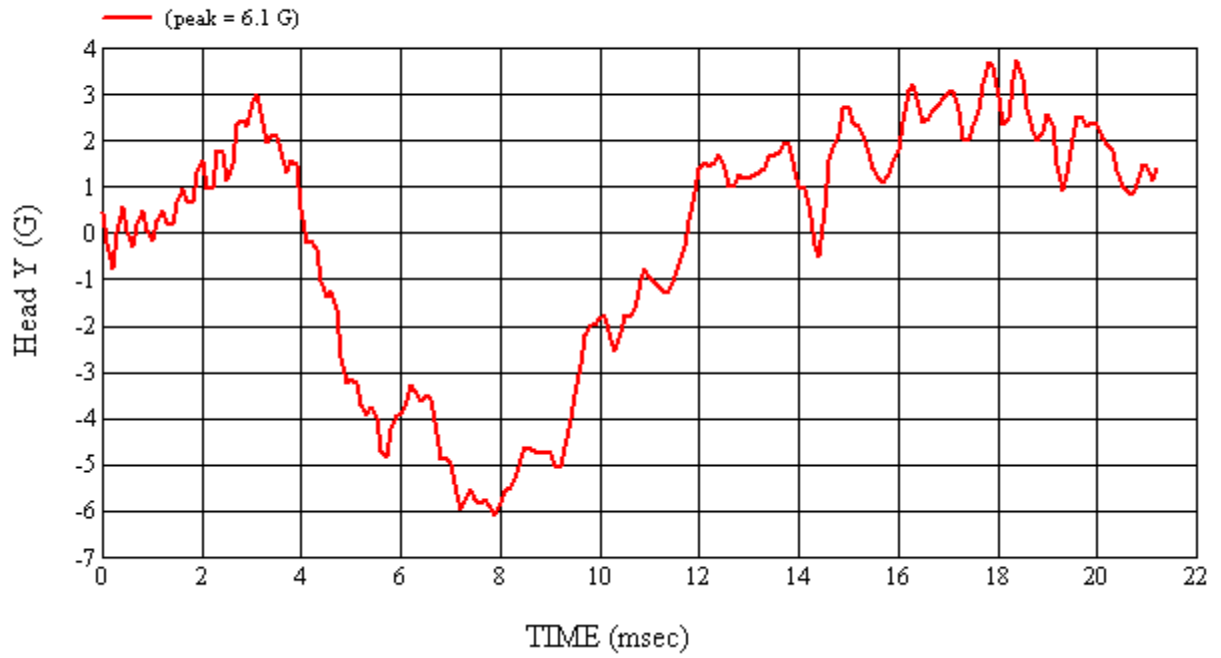
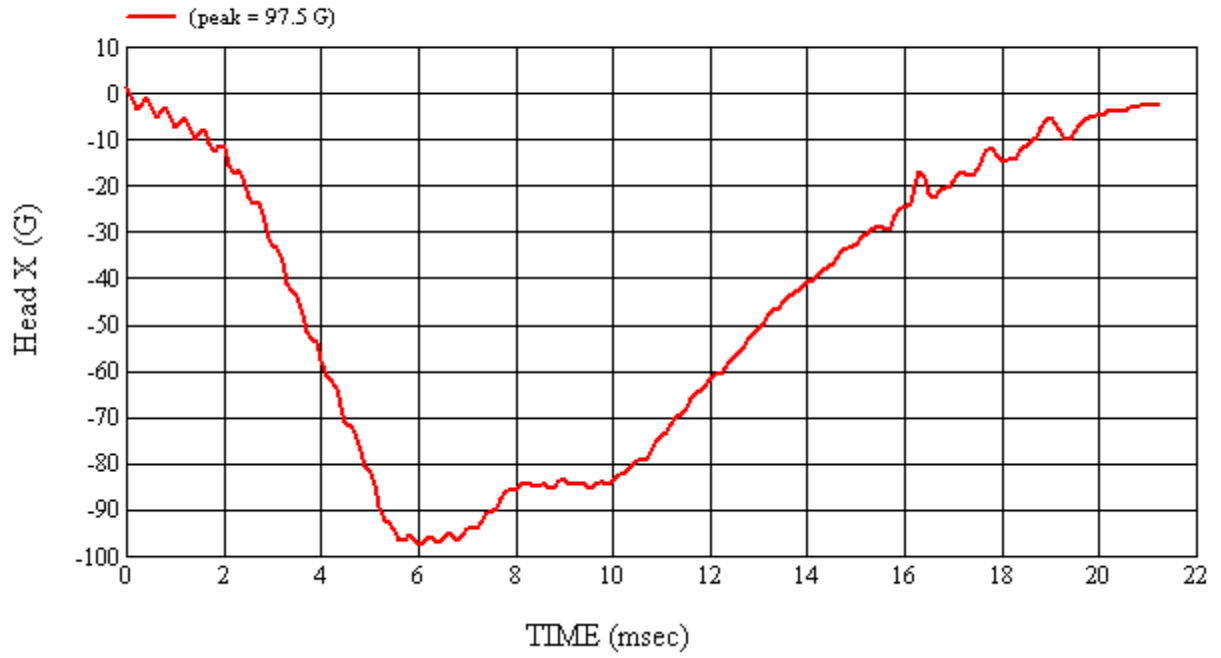
Recorded By: *Kevin D. McFerran* Approved By*: *Arthur I. Smith* Date: 5/5/2011
 *Only necessary for NHTSA (Government) Compliance testing.

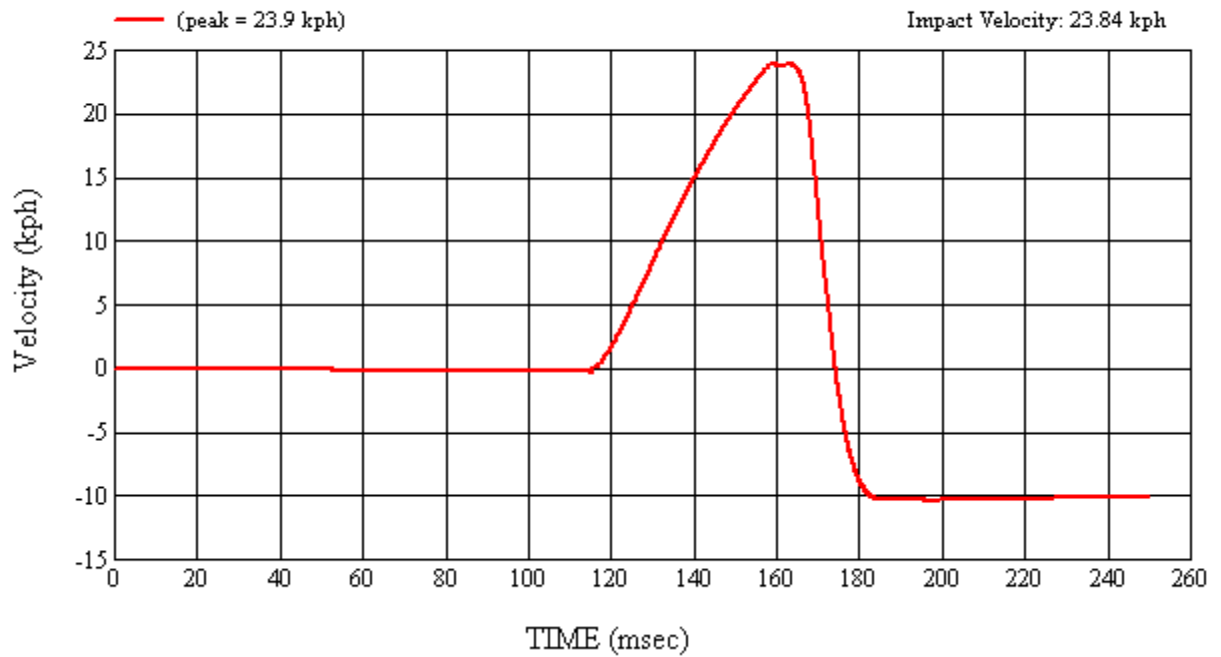
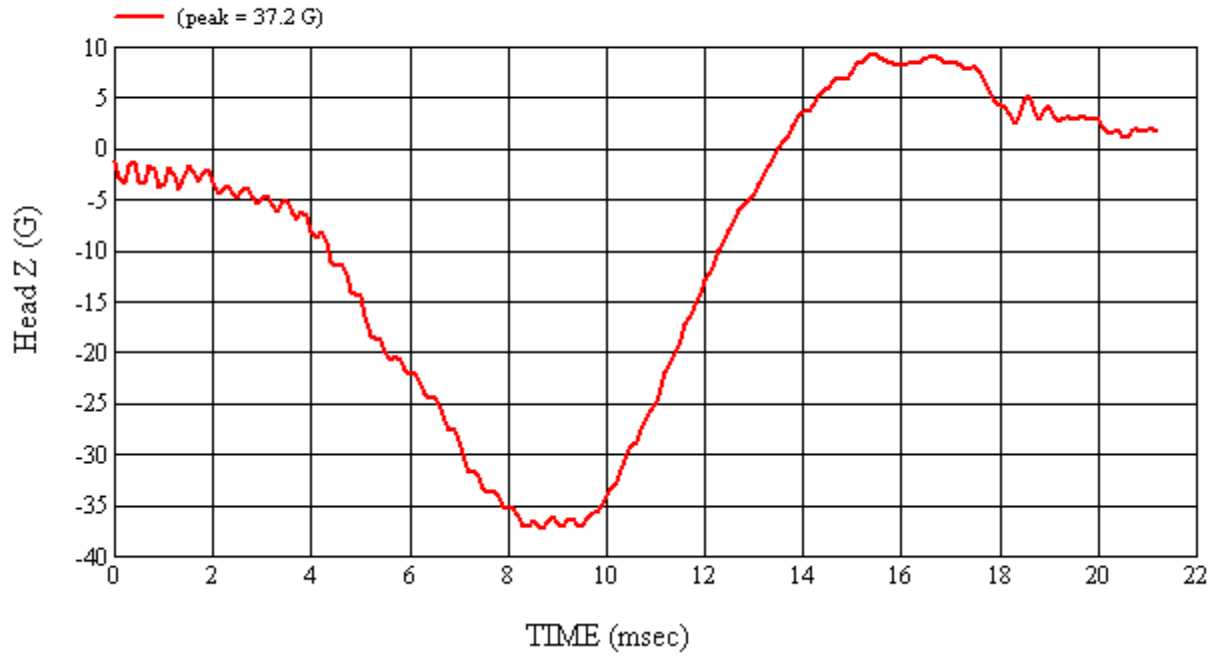
MGA Test #: U11148

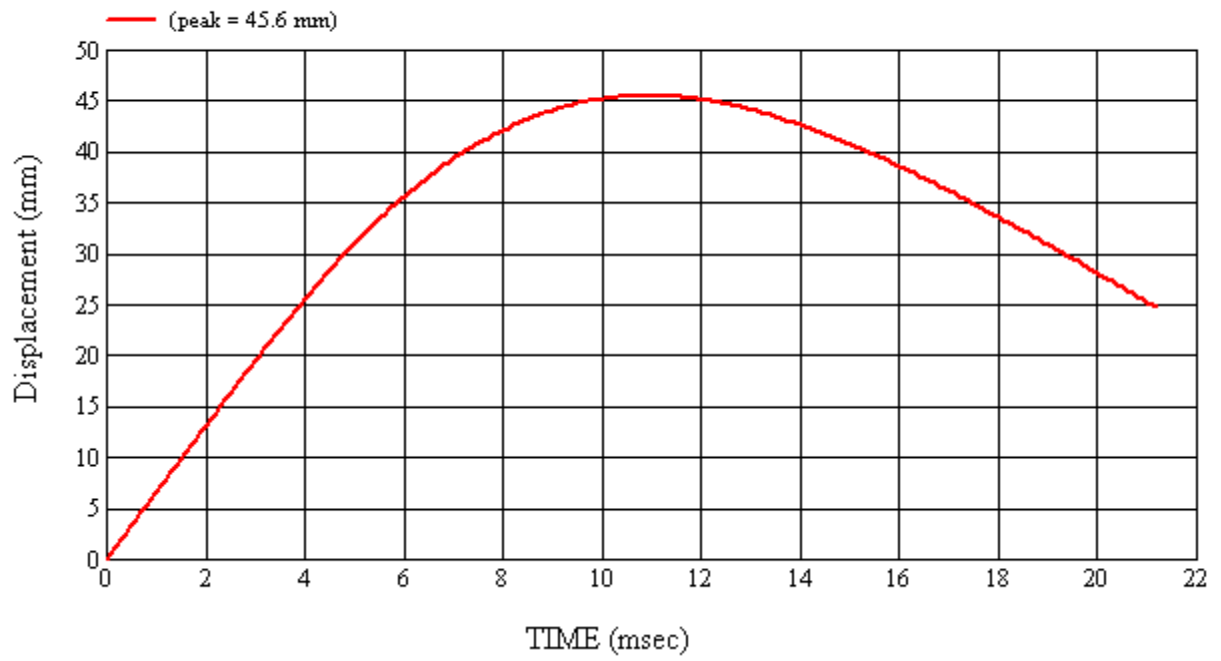
Target Location: OP2, Right Side

Test Date: 5/5/2011

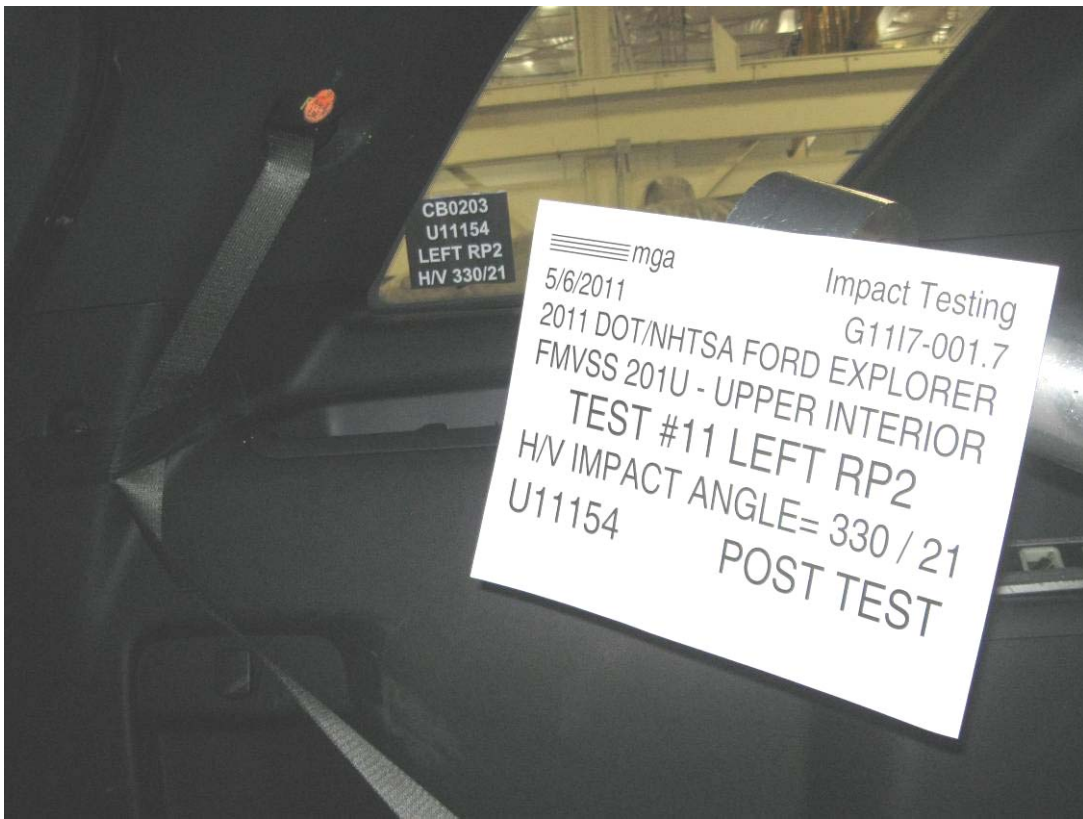
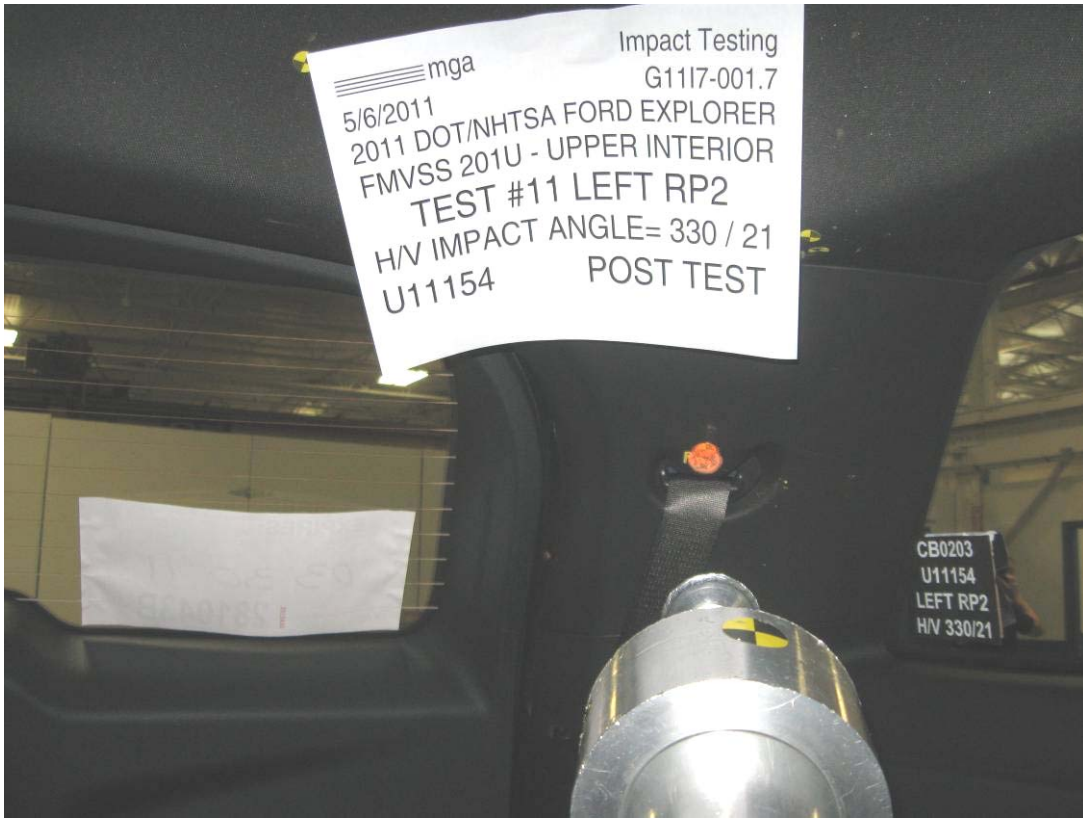


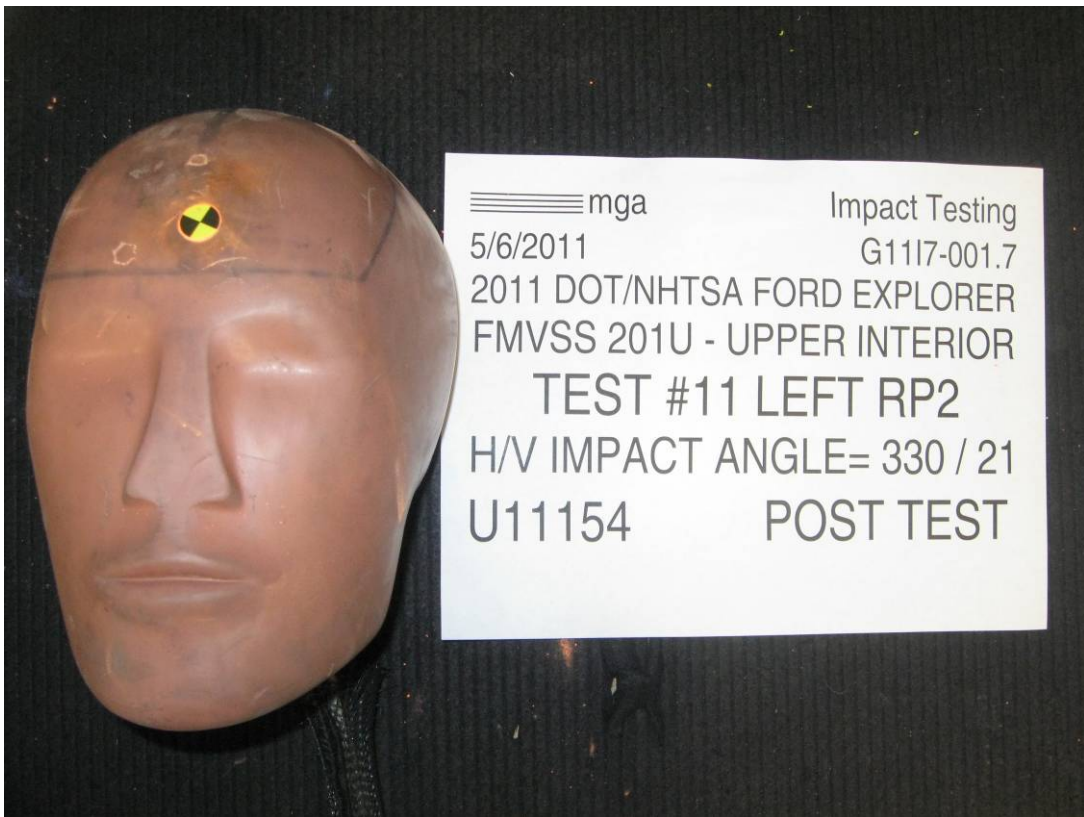












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Target (Vehicle Side): RP2Left

MGA Test Reference No.:U11154

Approach Horizontal Angles:330°

Approach Vertical Angles:21°

Additional Description:

Test Number:#11

Temperature:22.7C

Humidity:36.9%

Time of Test:5:49:34 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
729	746	7.8	23.9	17	2 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.):

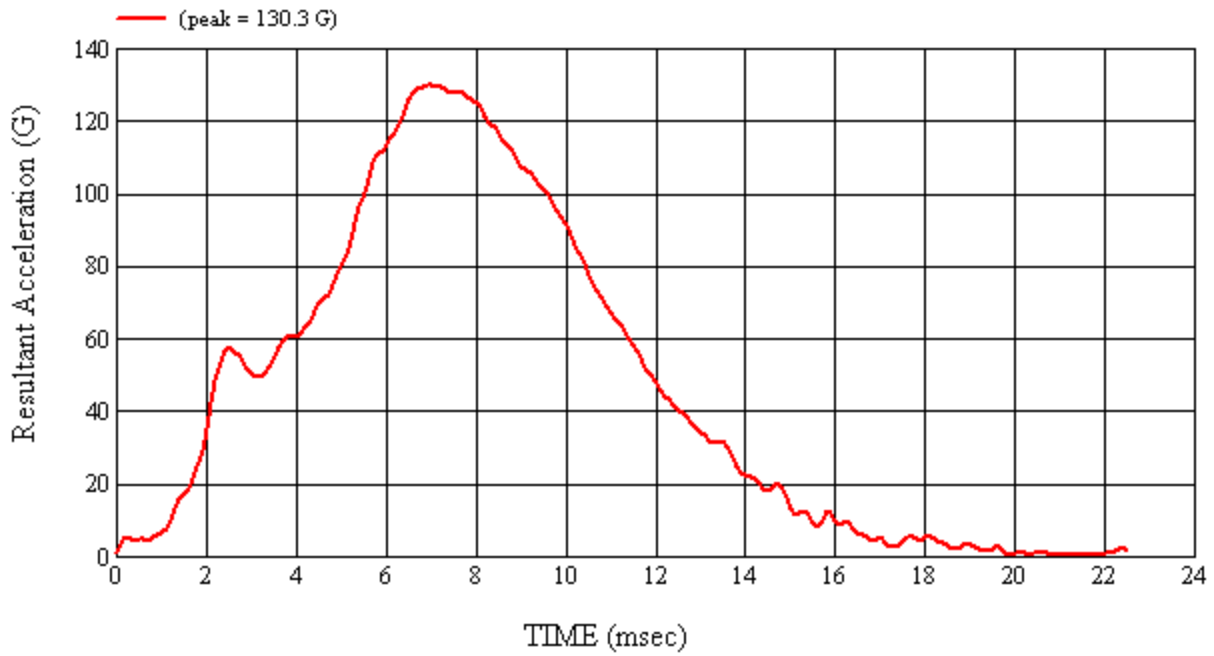
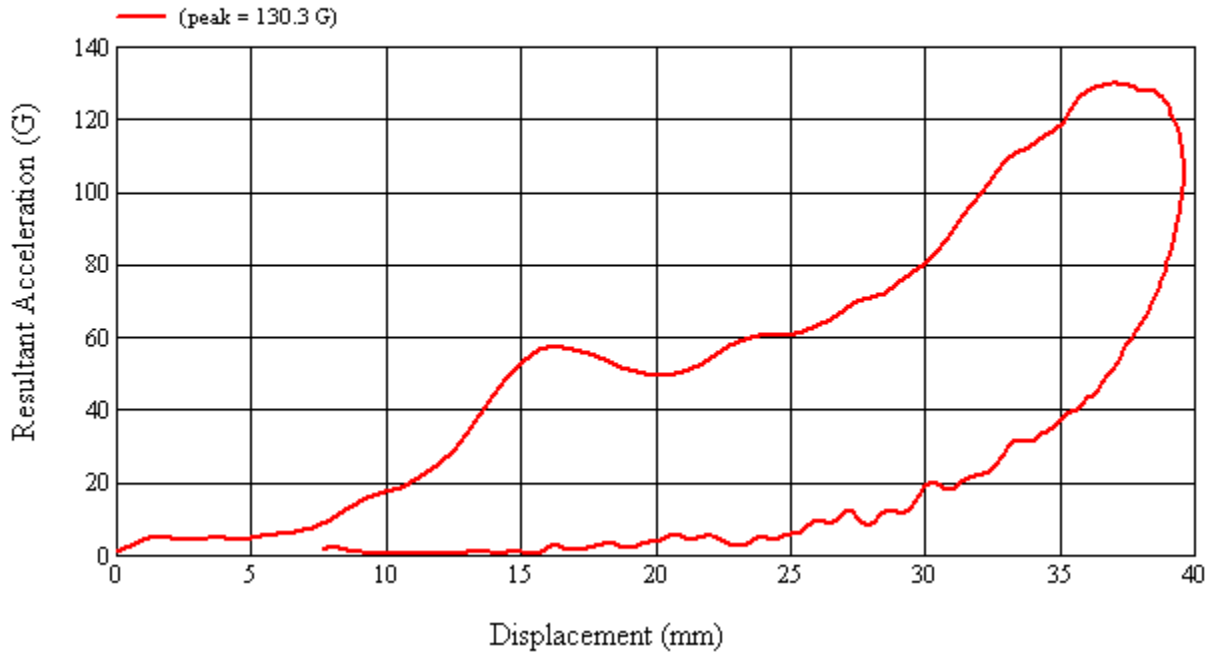
No visible damage

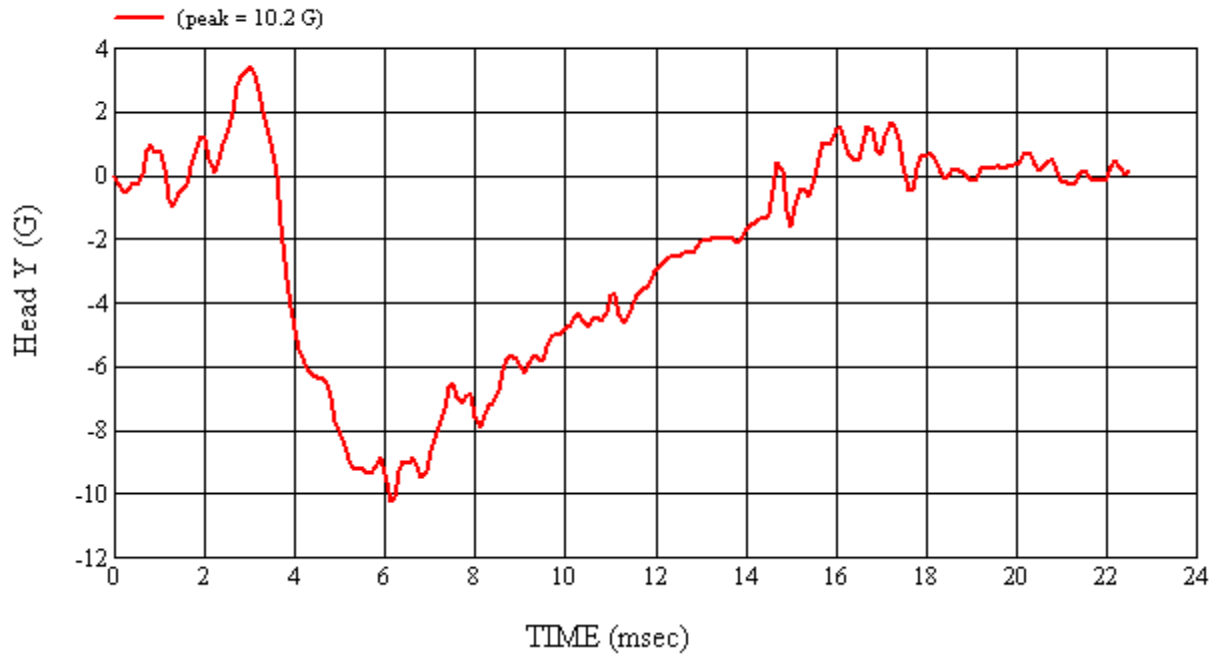
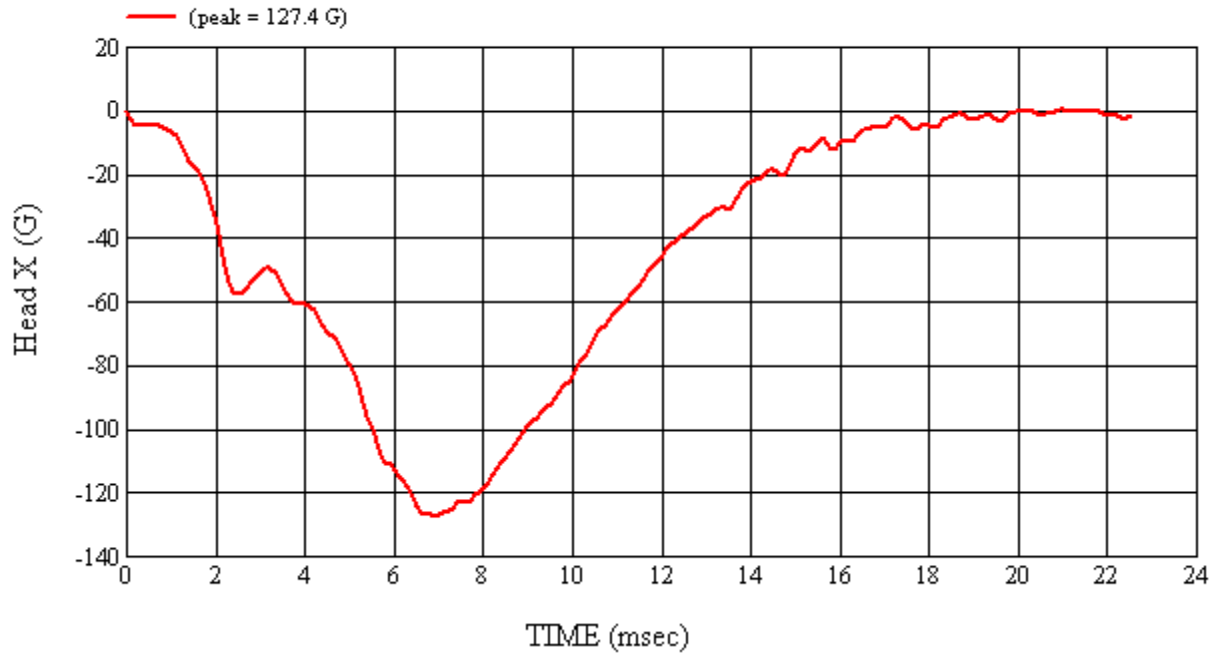
Recorded By:  Approved By*:  Date: 5/6/2011
 *Only necessary for NHTSA (Government) Compliance testing.

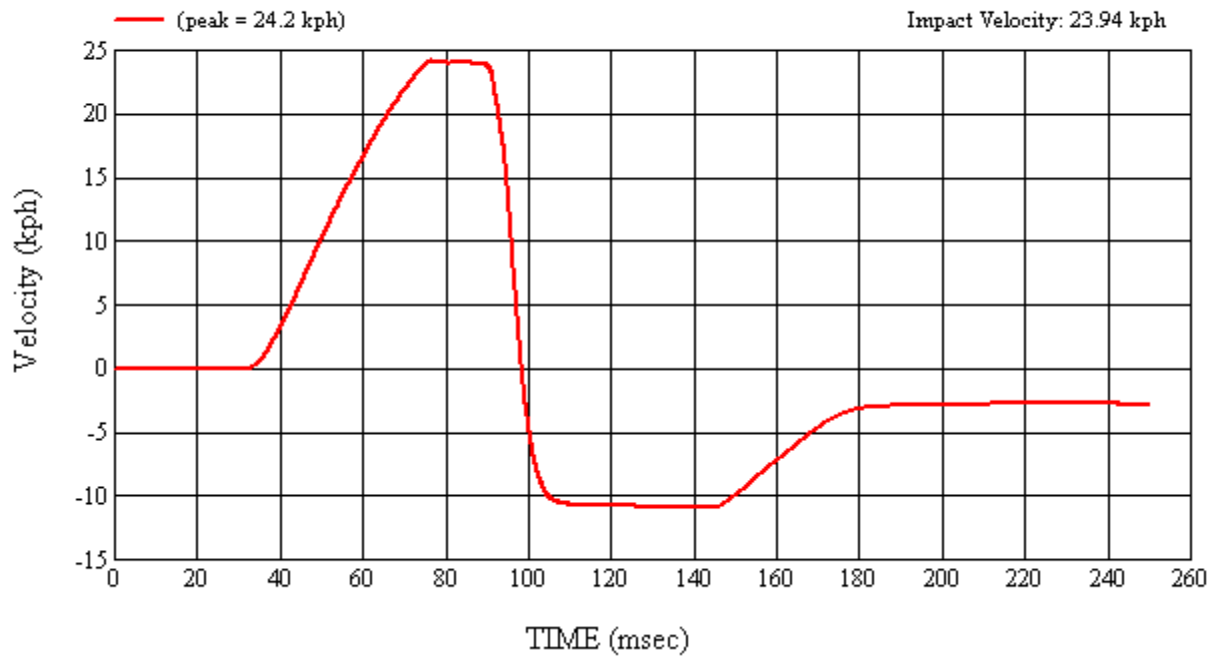
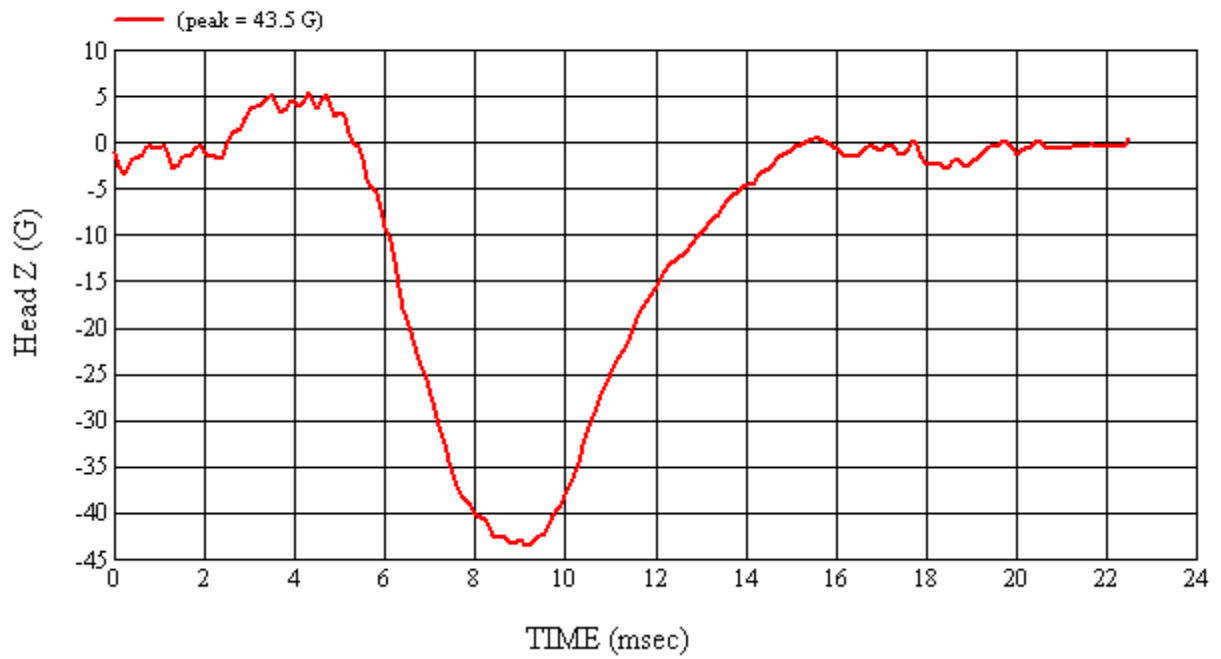
MGA Test #: U11154

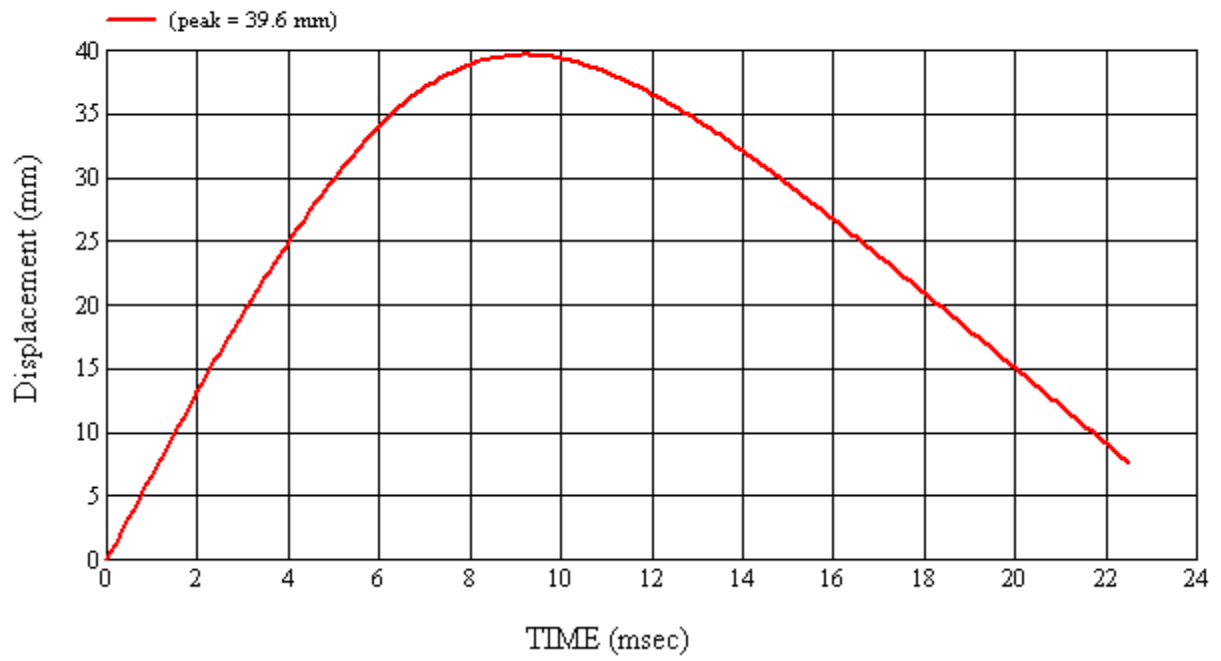
Target Location: RP2, Left Side

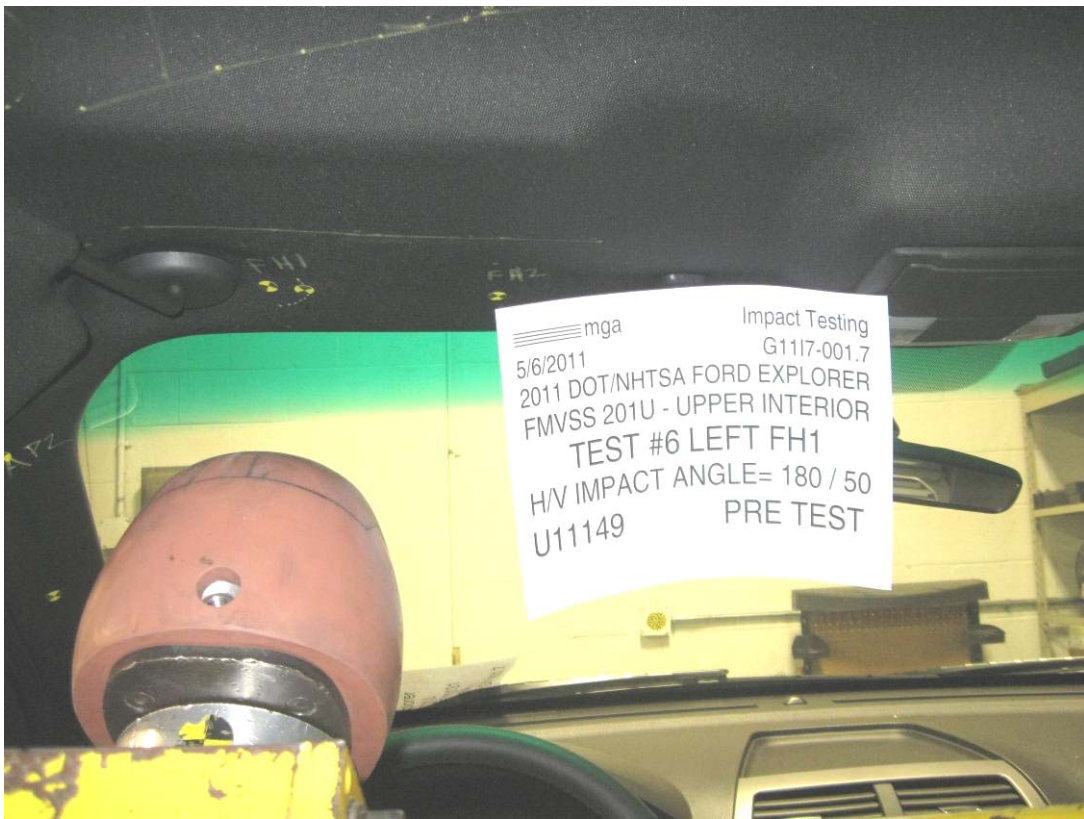
Test Date: 5/6/2011

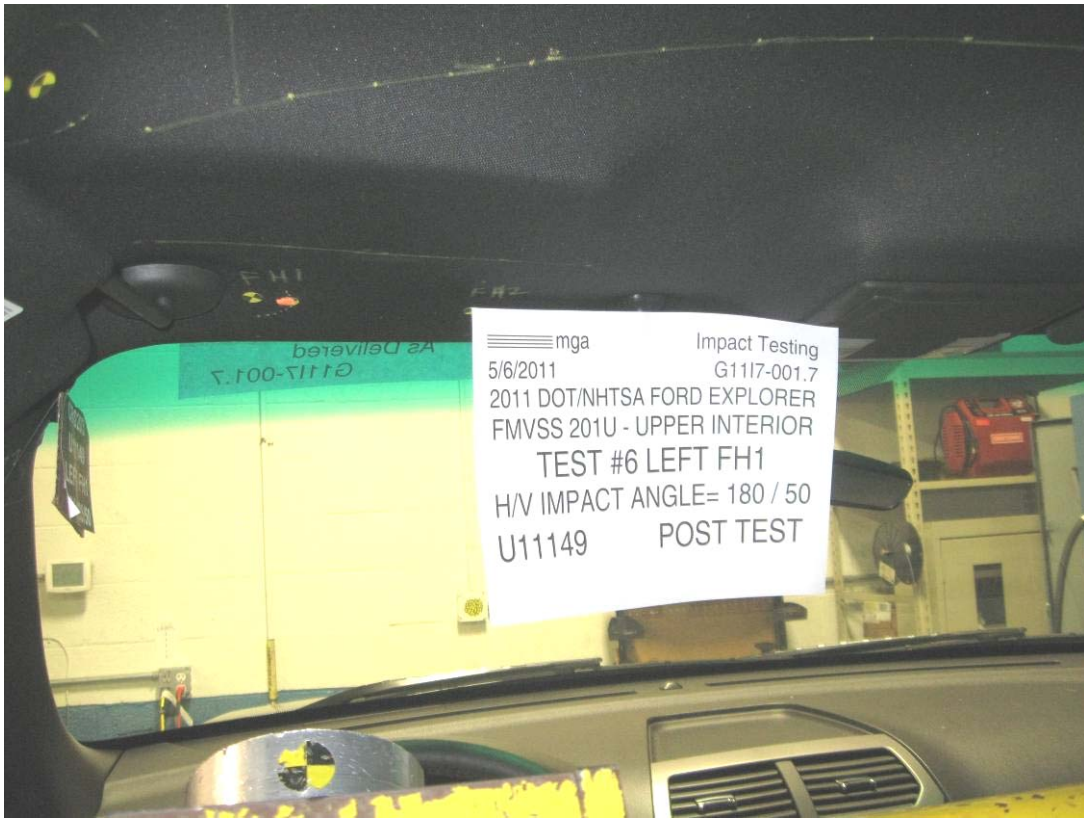


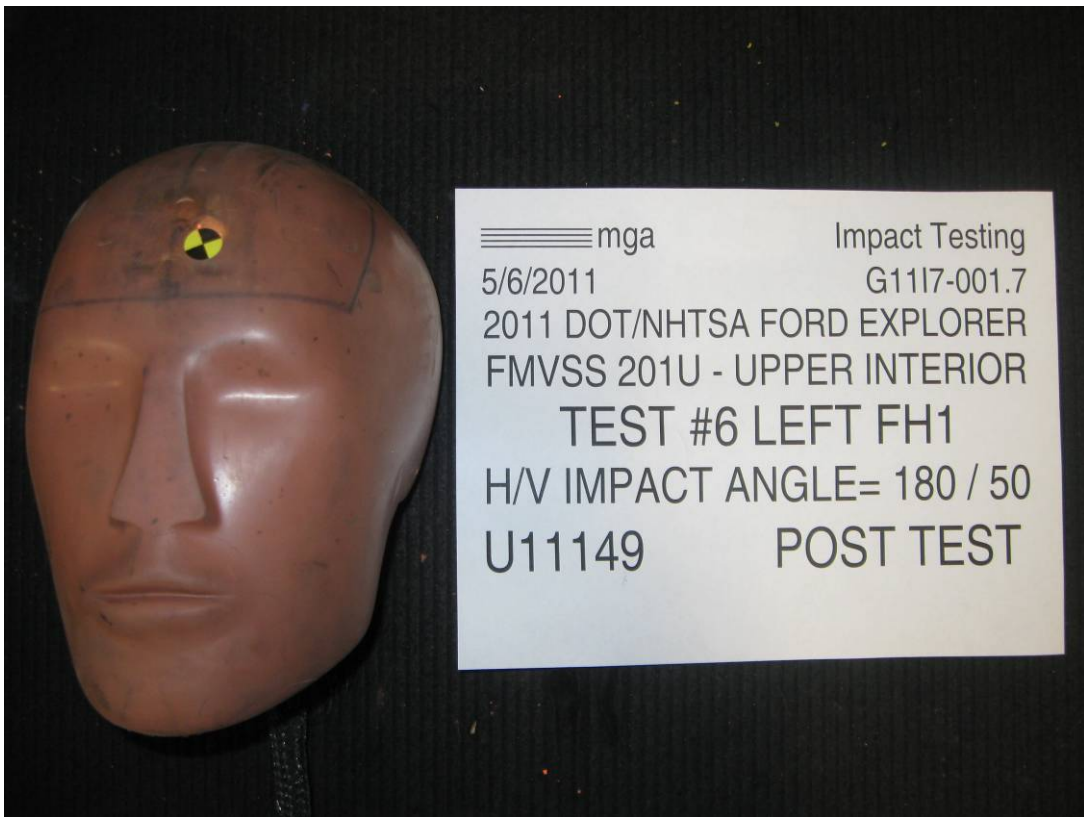












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Test Number:#6

Target (Vehicle Side): FH1Left

Temperature:21.8C

MGA Test Reference No.:U11149

Humidity:43.2%

Approach Horizontal Angles:180°

Time of Test:9:38:00 AM

Approach Vertical Angles:50°

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
666	663	6.4	23.6	21	10 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.):

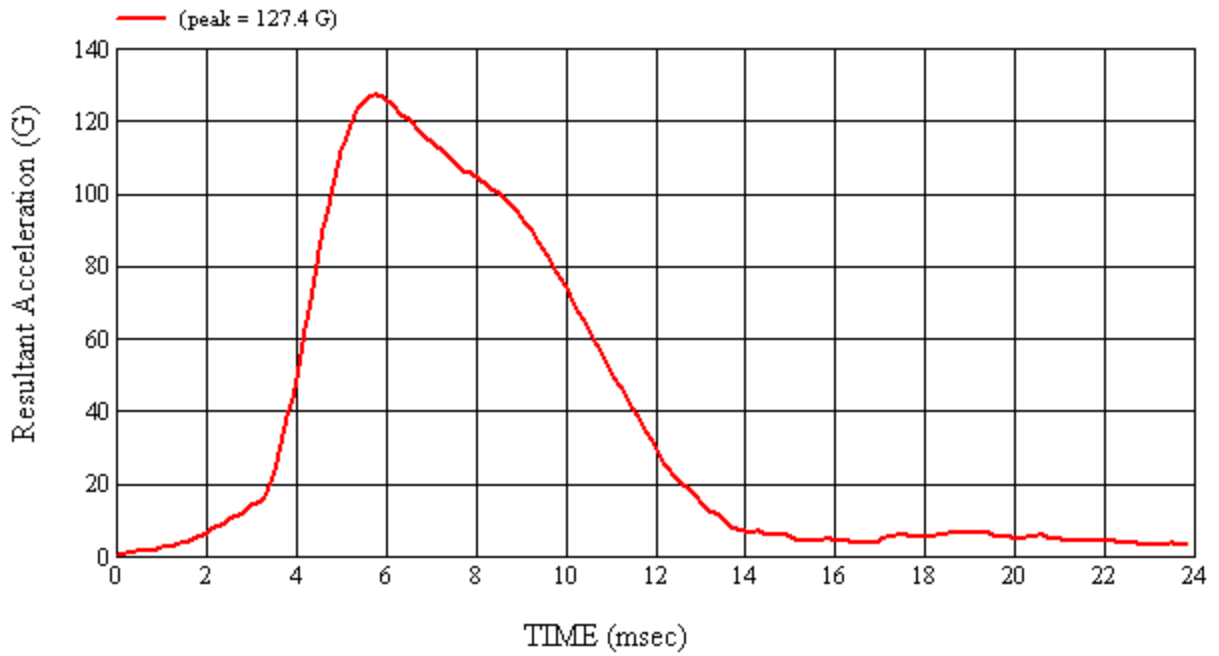
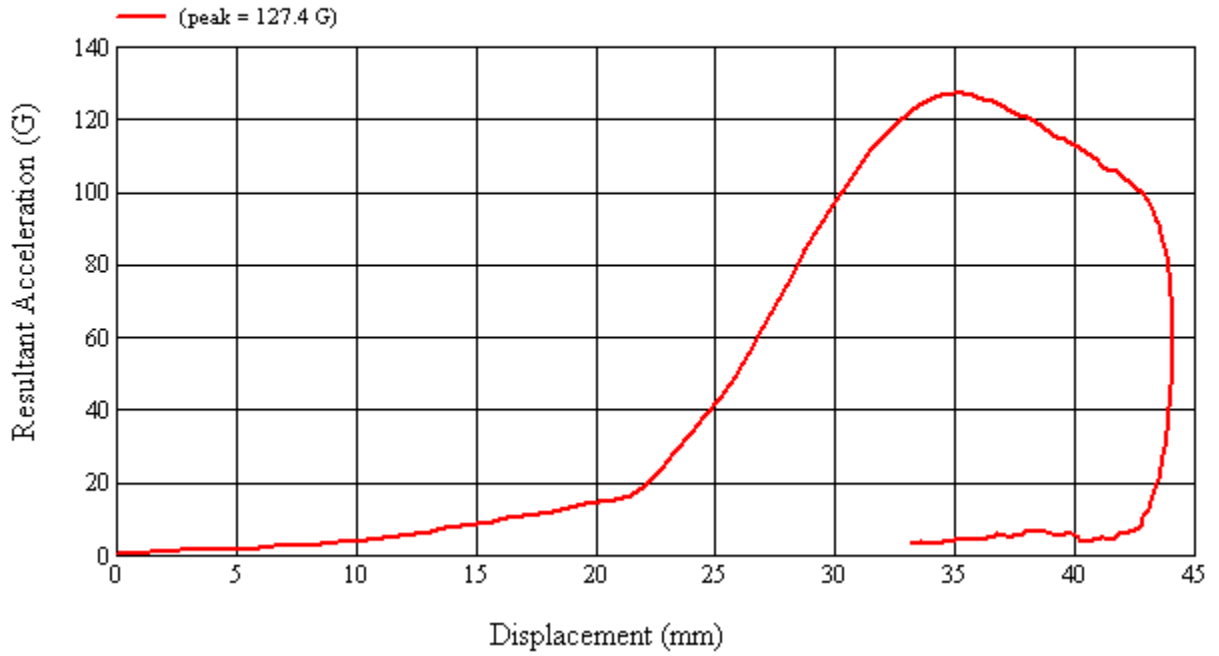
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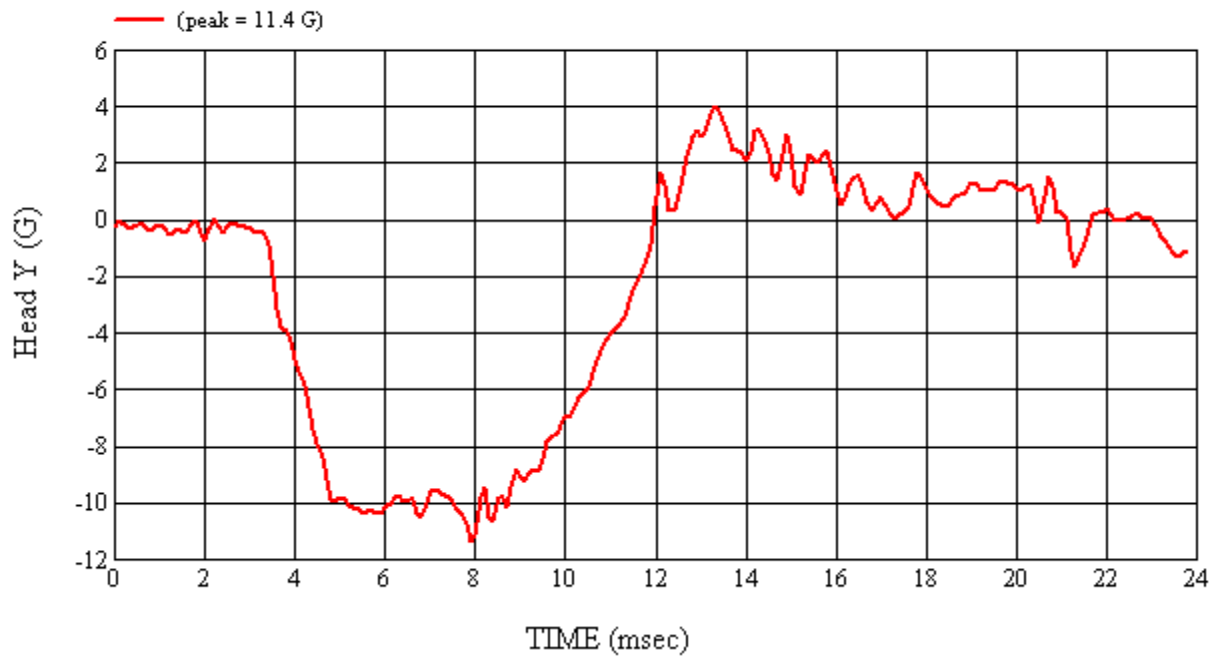
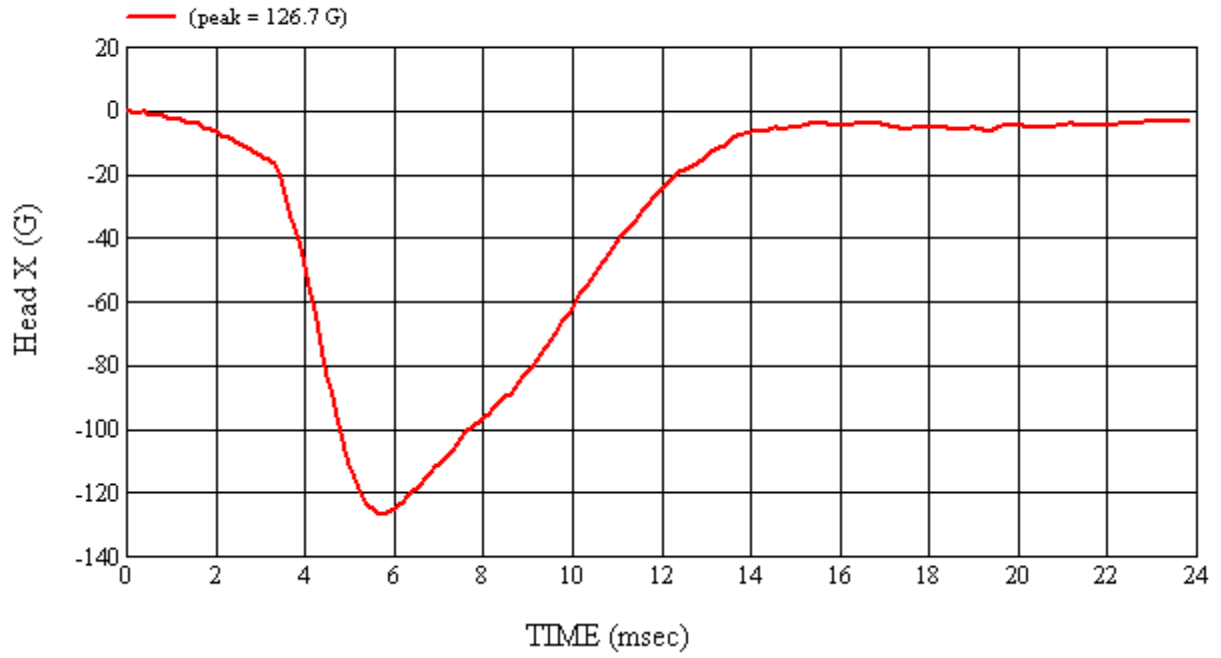
Recorded By: *Kevin D. McFerran* Approved By*: *Arthur I. Smith* Date: 5/6/2011
 *Only necessary for NHTSA (Government) Compliance testing.

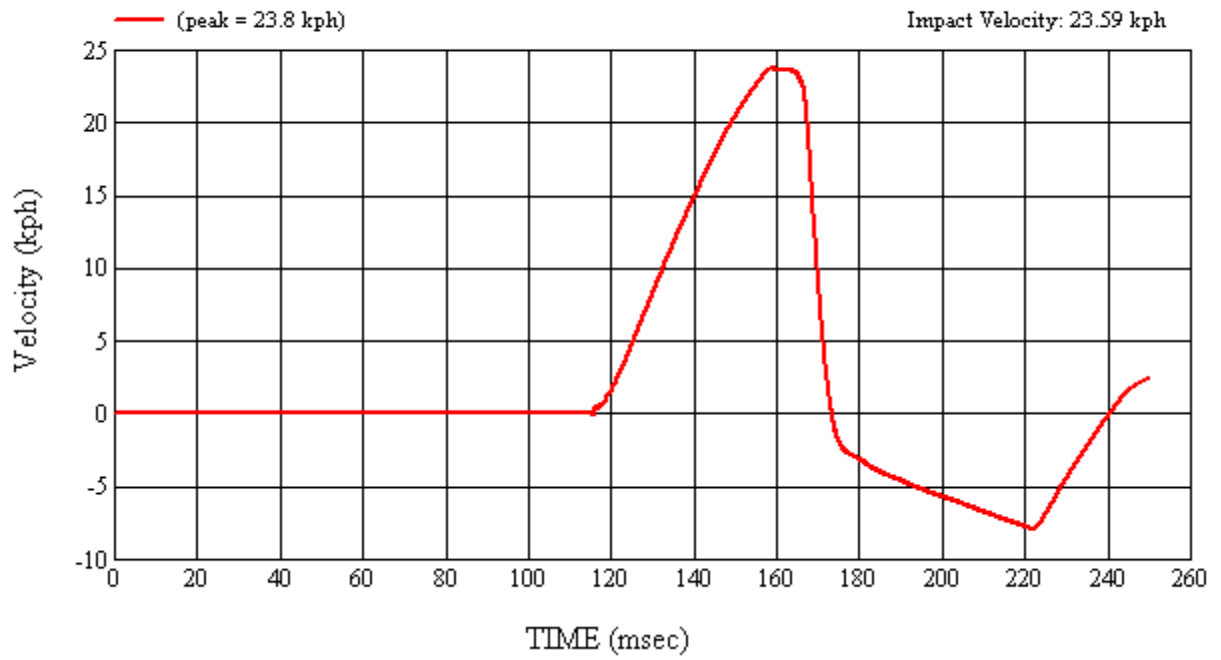
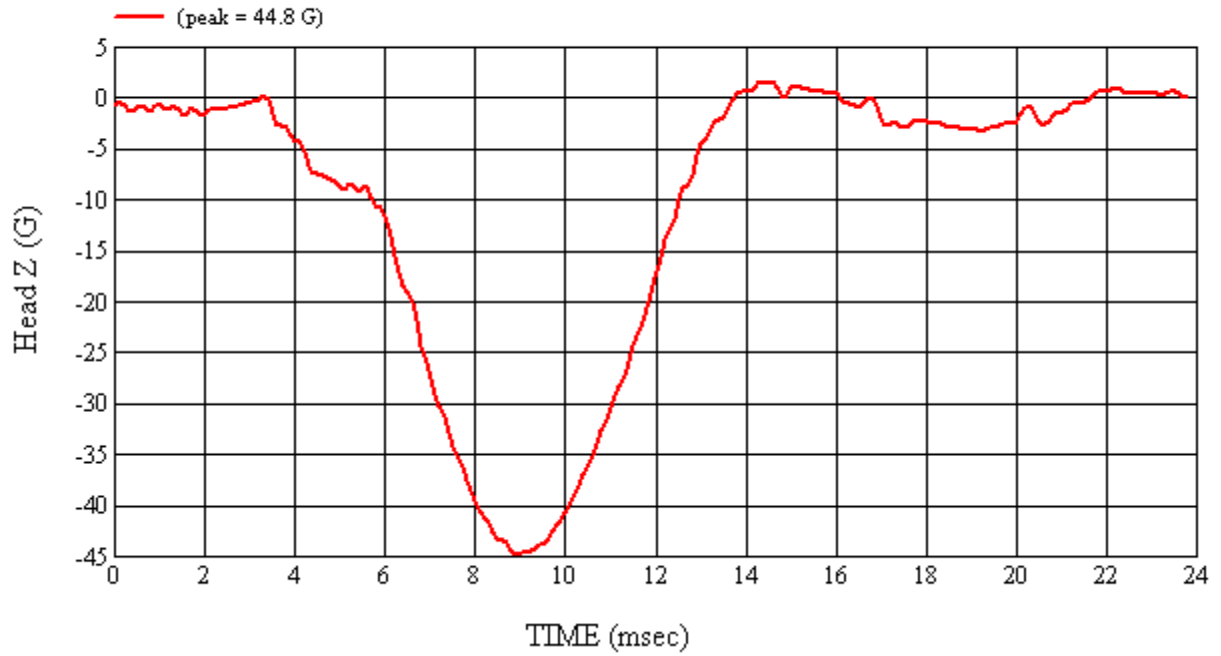
MGA Test #: U11149

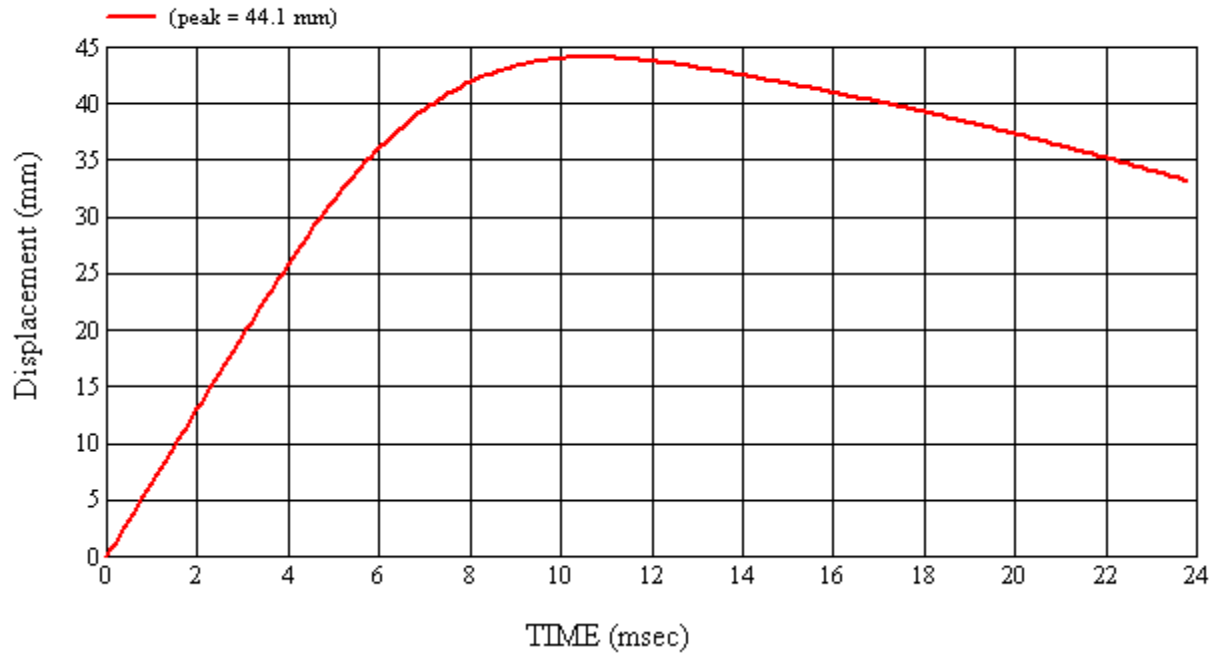
Target Location: FH1, Left Side

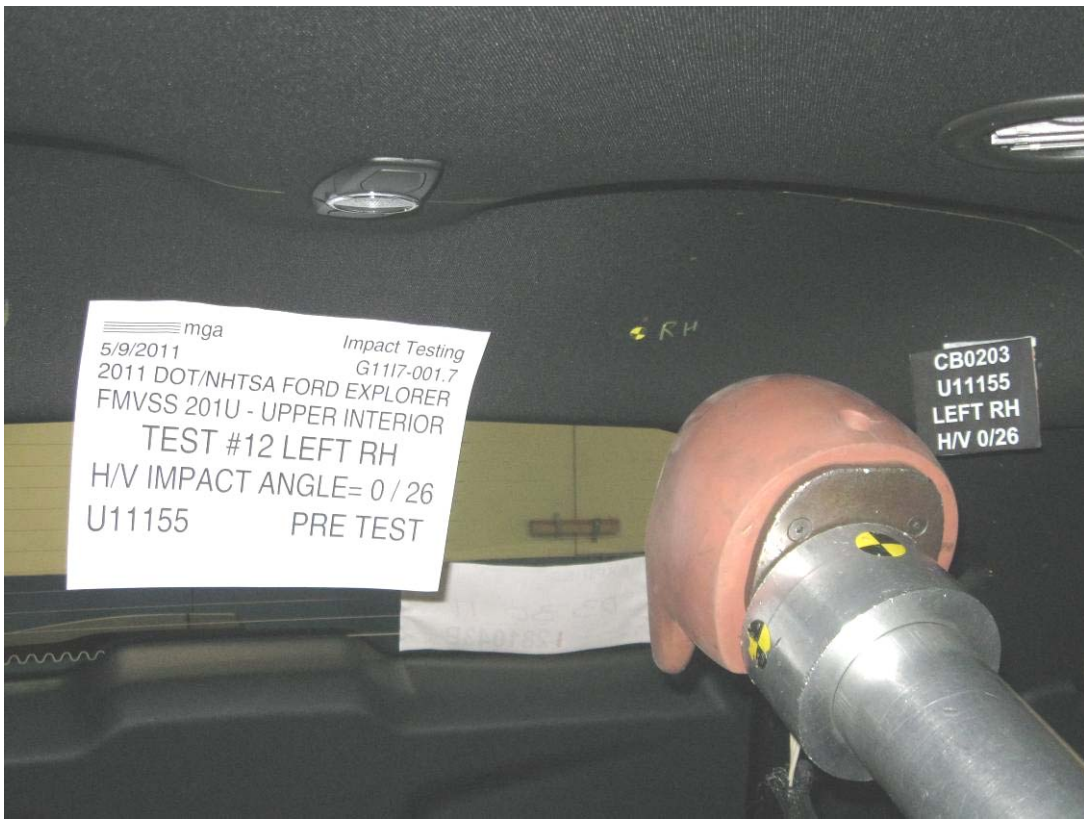
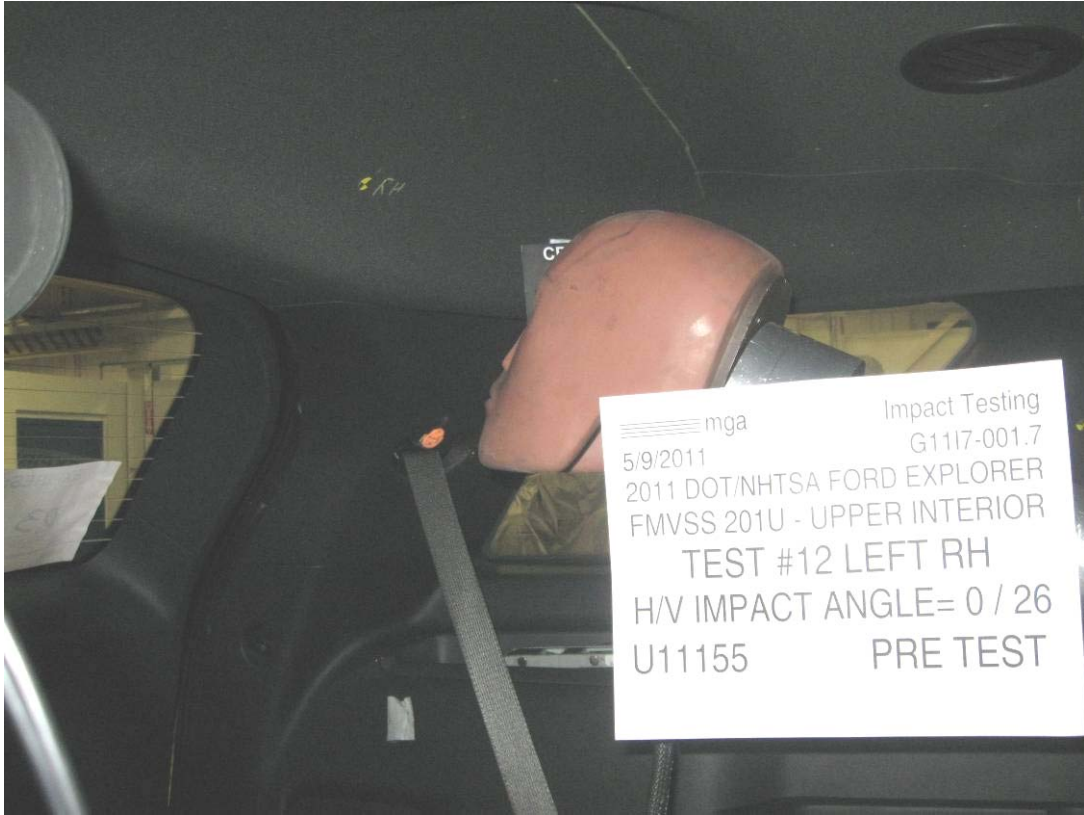
Test Date: 5/6/2011

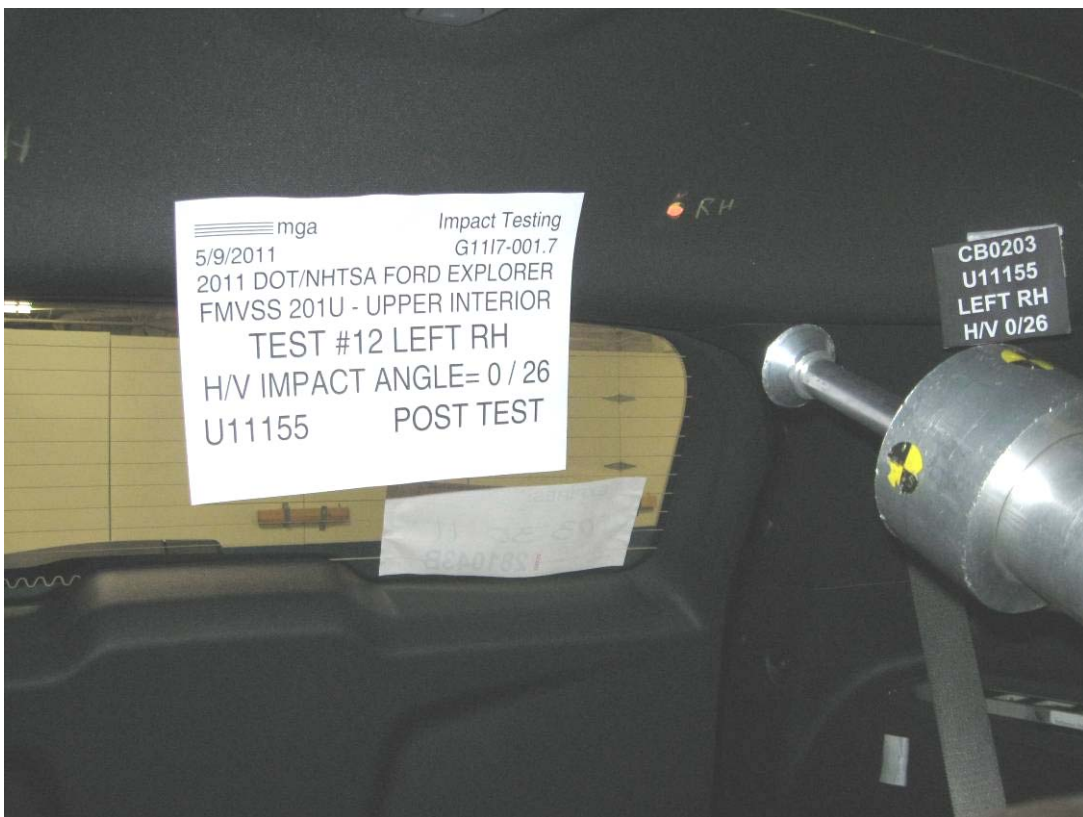


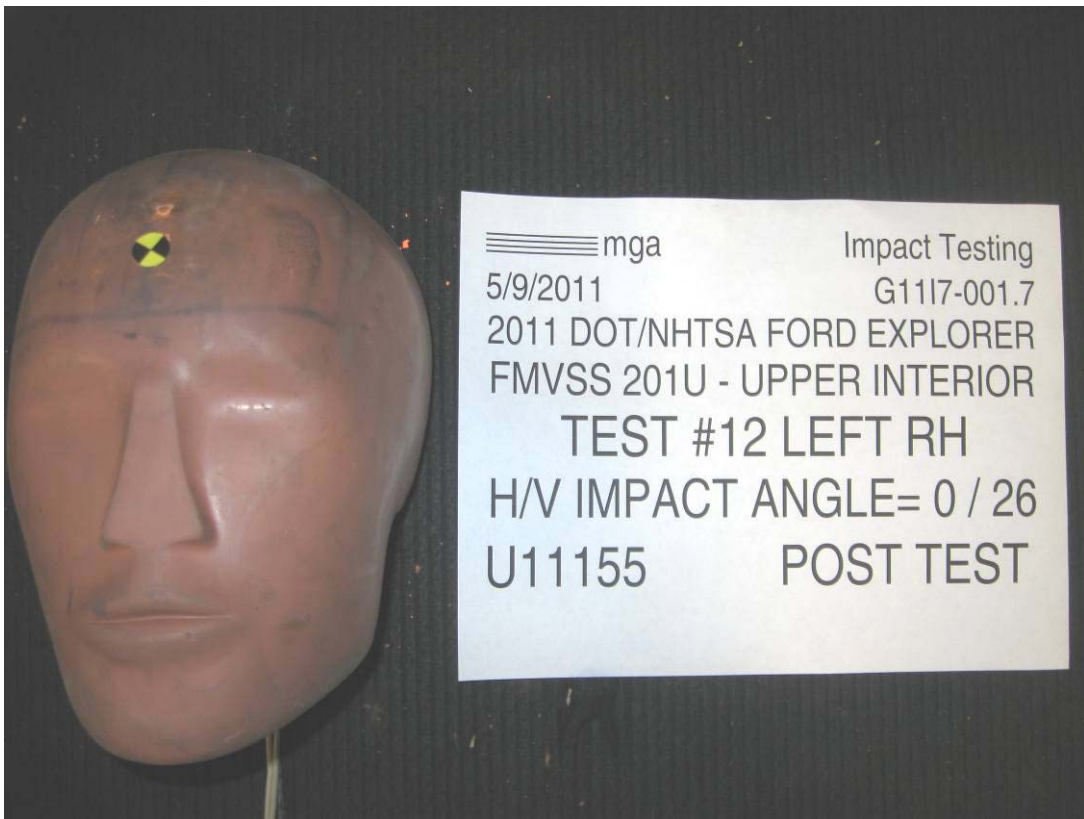












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Test Number:#12

Target (Vehicle Side): RHLeft

Temperature:22.5C

MGA Test Reference No.:U11155

Humidity:35.9%

Approach Horizontal Angles:0°

Time of Test:11:46:06 AM

Approach Vertical Angles:26°

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
514	461	10.1	24.1	21	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

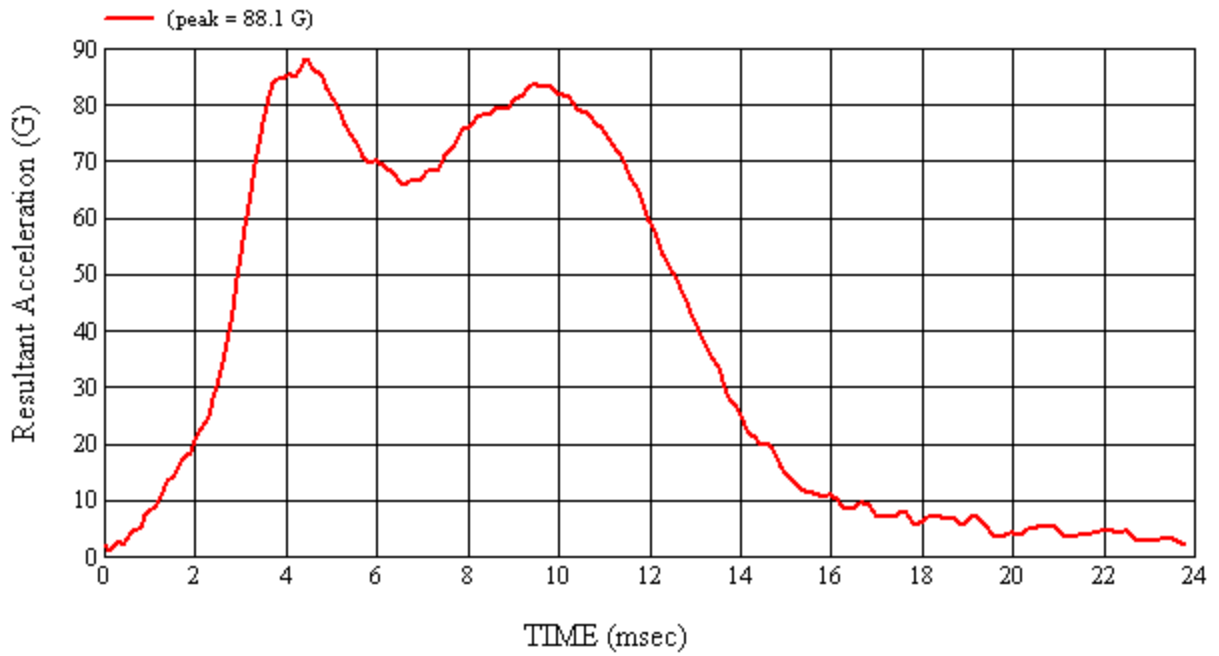
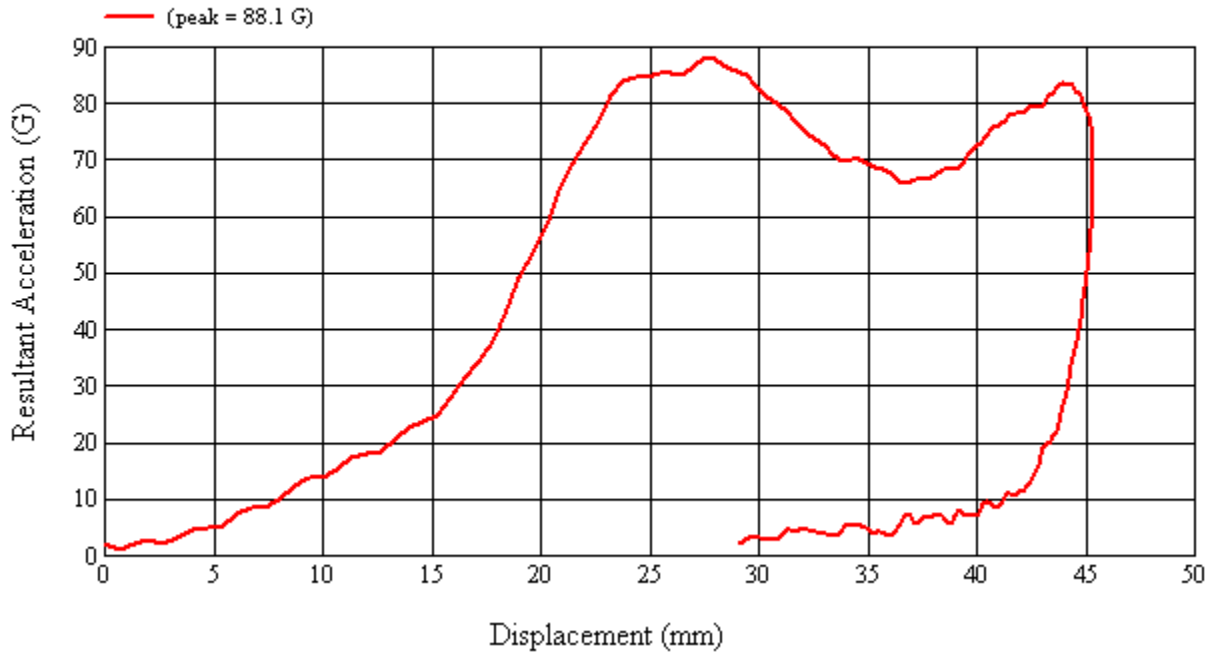
Recorded By:  Approved By*:  Date: 5/9/2011

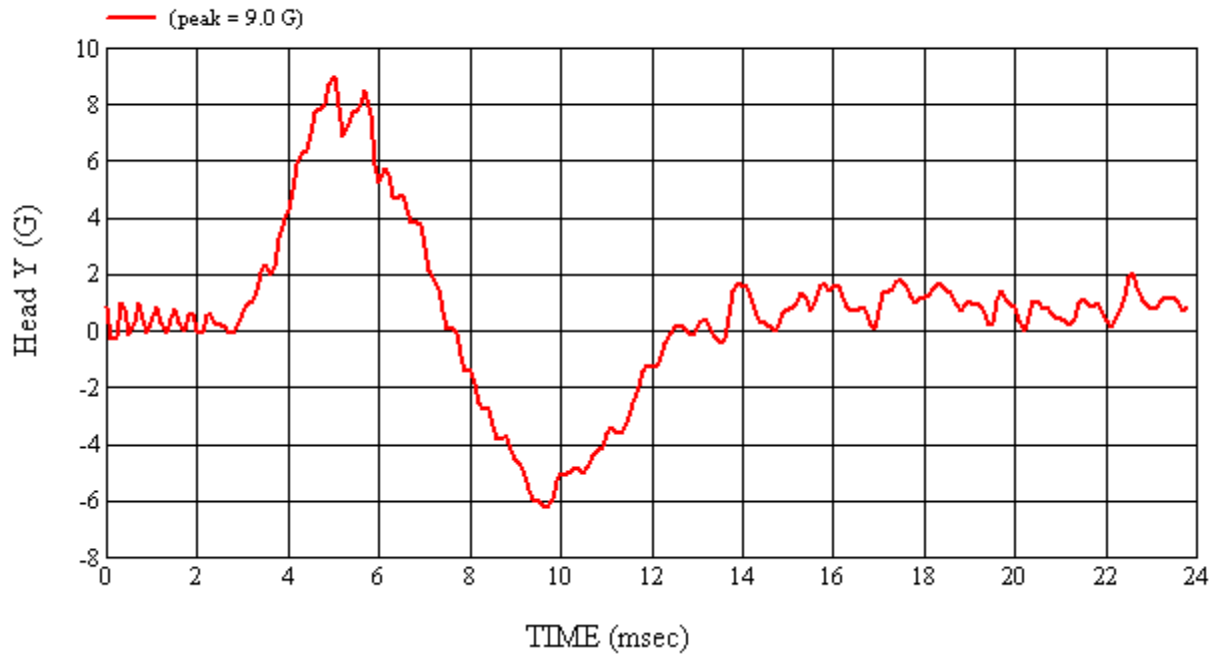
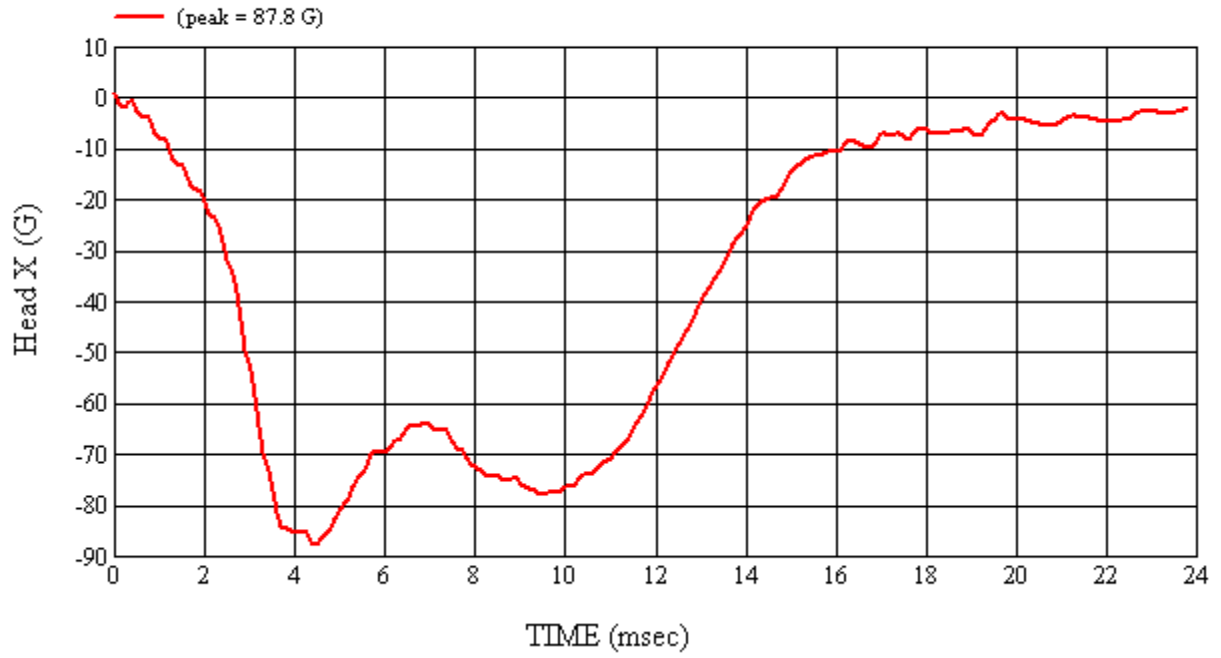
*Only necessary for NHTSA (Government) Compliance testing.

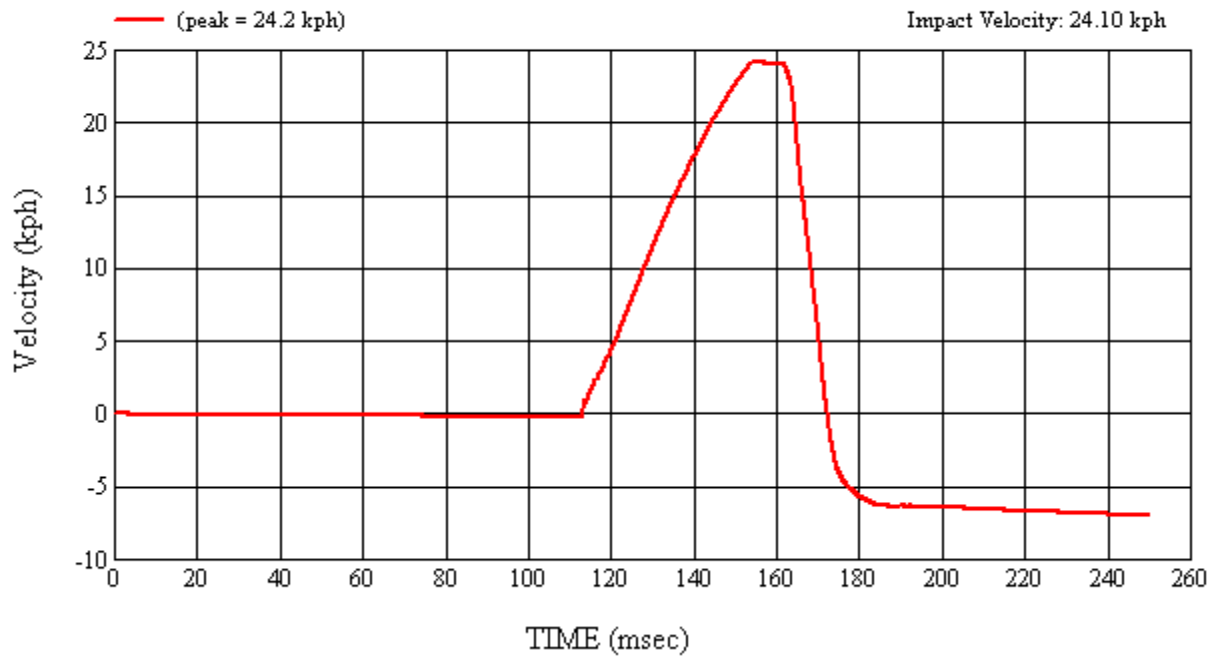
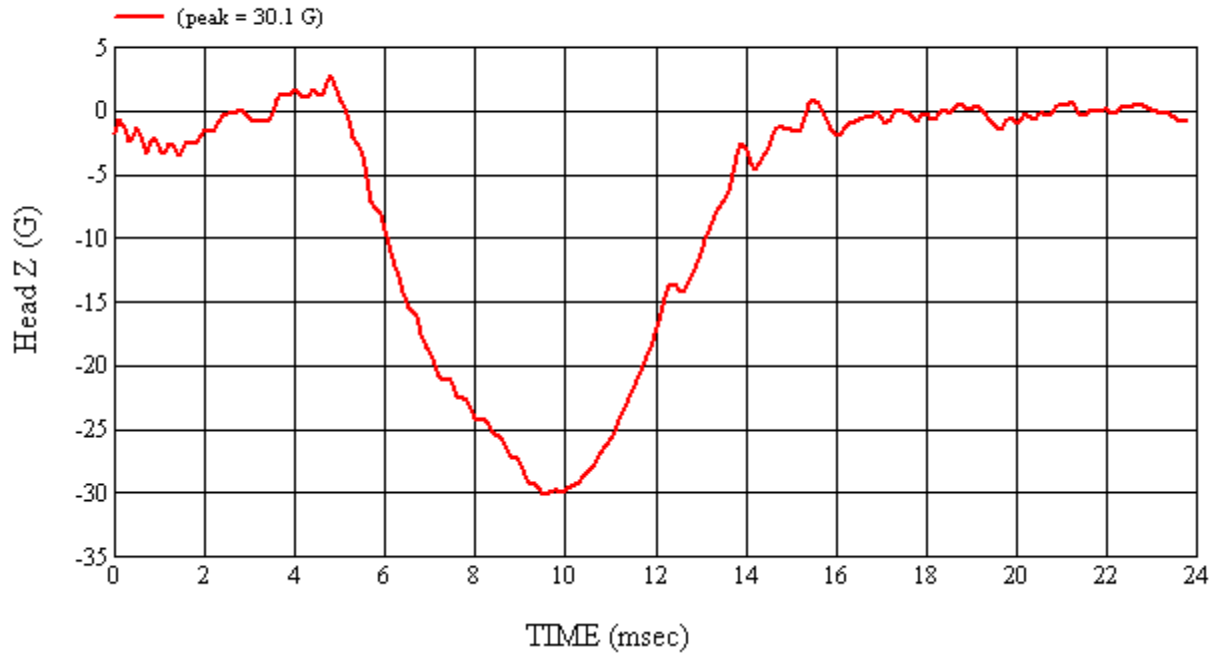
MGA Test #: U11155

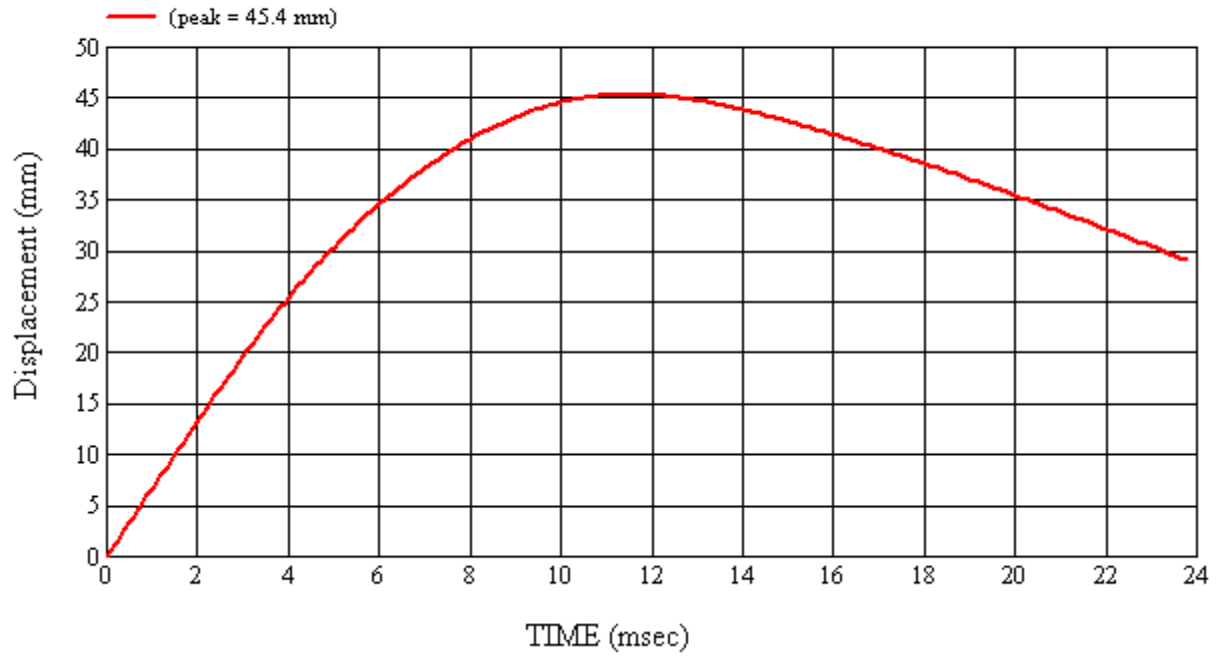
Target Location: RH, Left Side

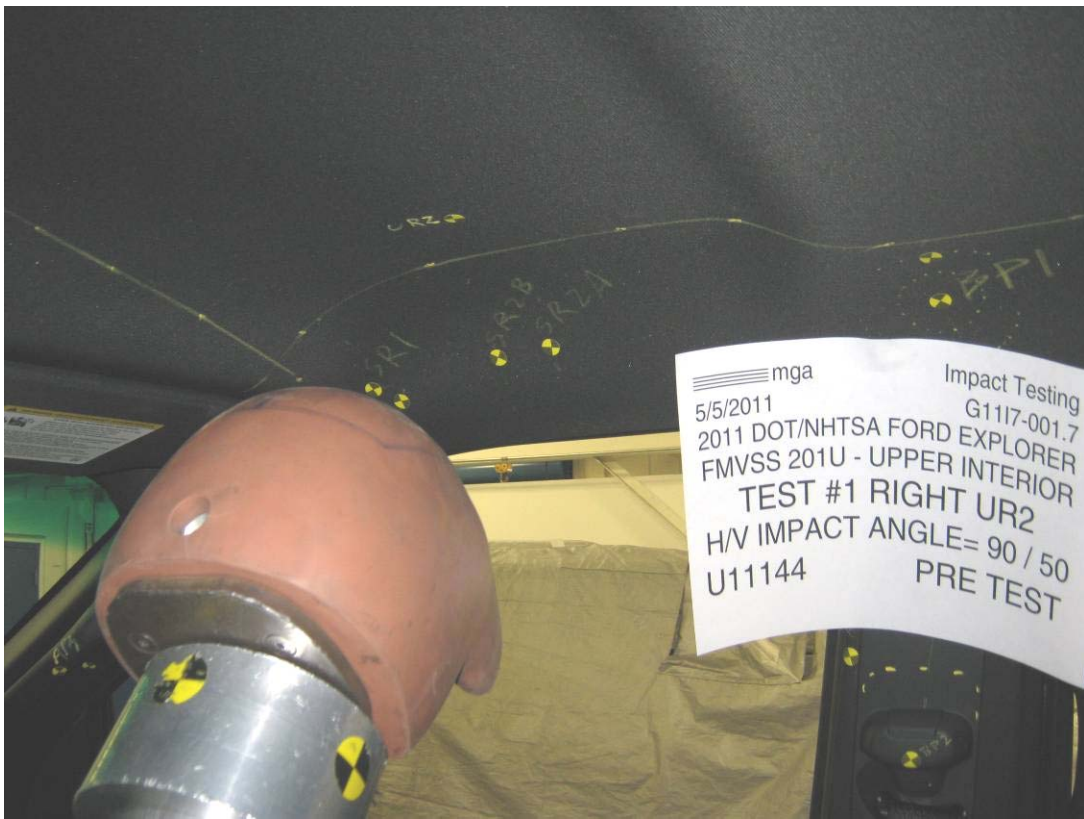
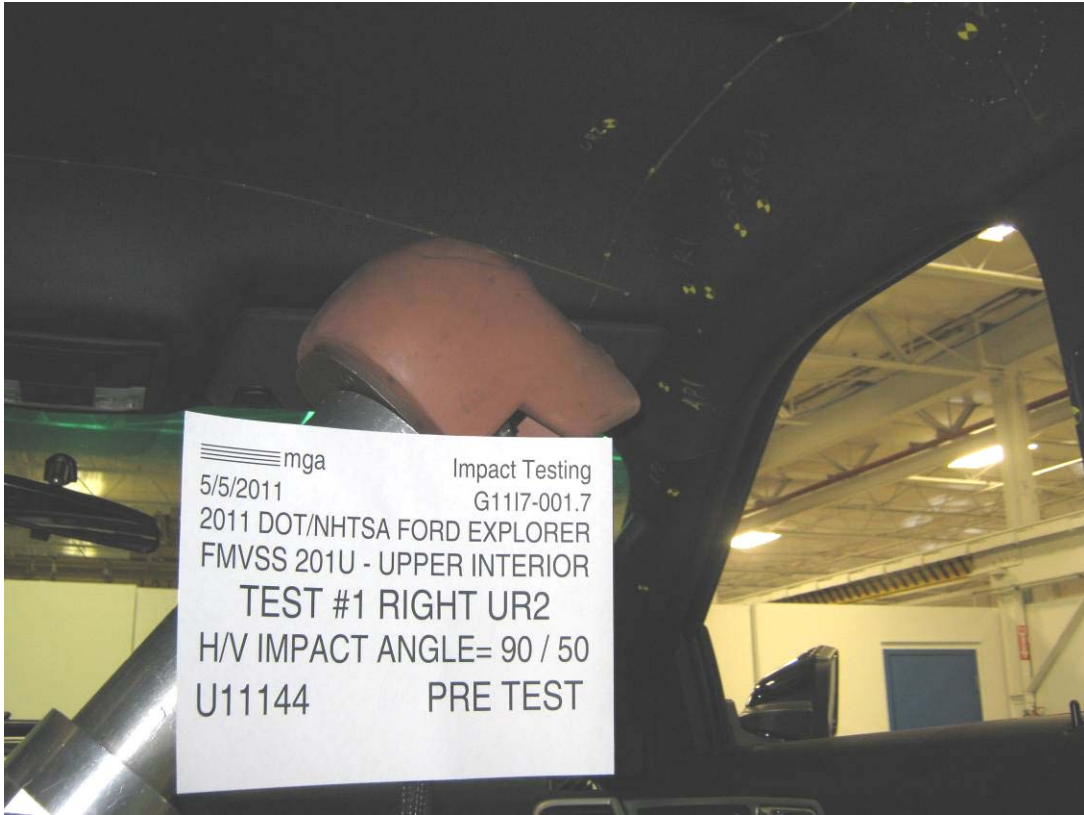
Test Date: 5/9/2011

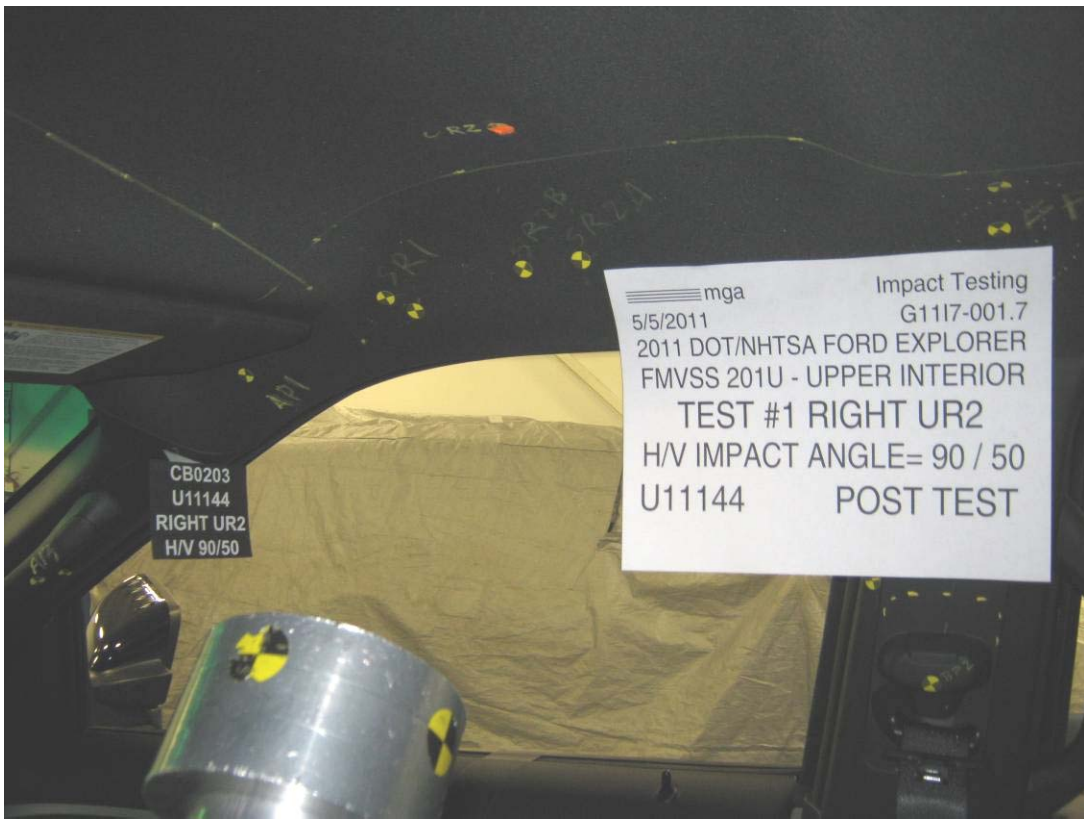
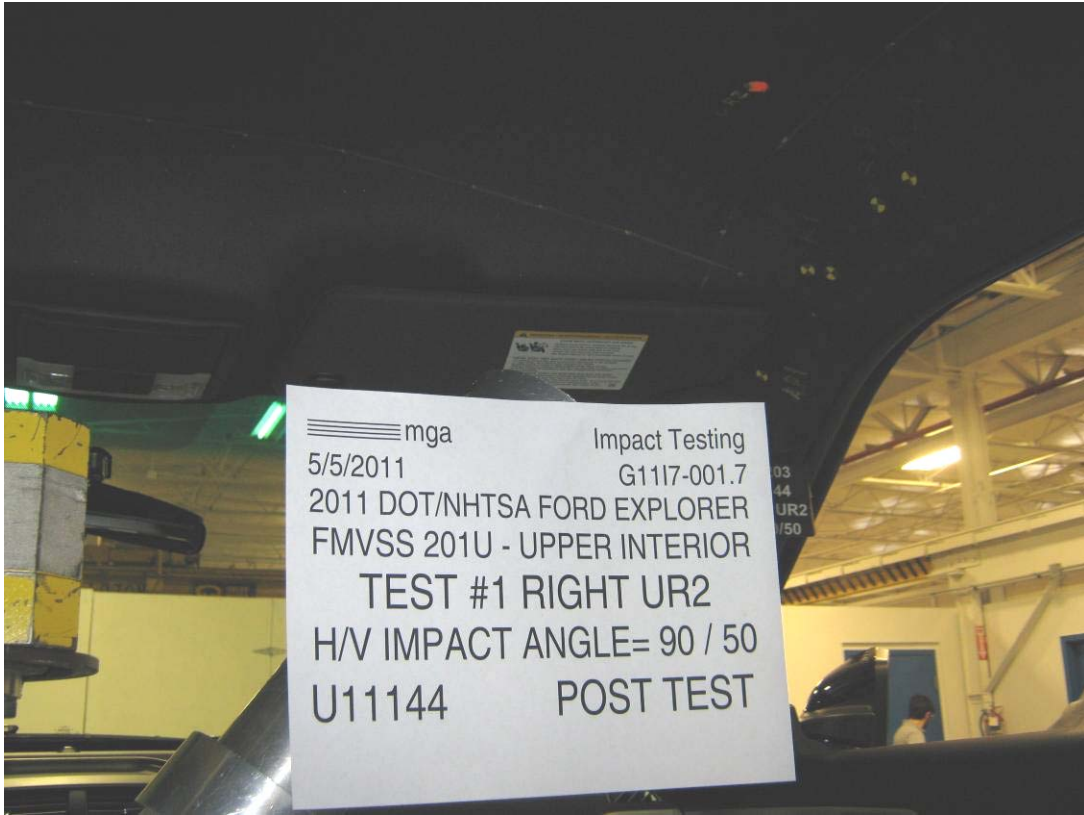


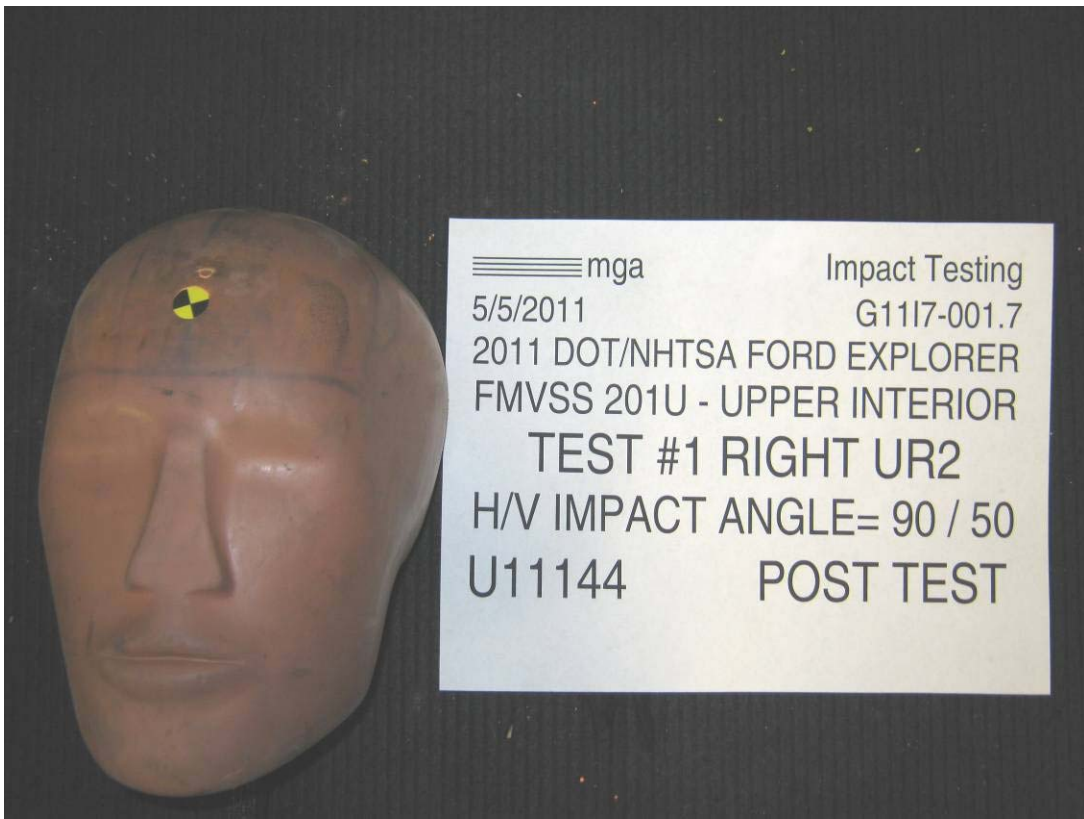












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR2Right

MGA Test Reference No.:U11144

Approach Horizontal Angles:90°

Approach Vertical Angles:50°

Additional Description:@ SR2-B

Test Number:#1

Temperature:21.9C

Humidity:29.6%

Time of Test:11:07:46 AM

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
547	505	12.3	24.0	25	0

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

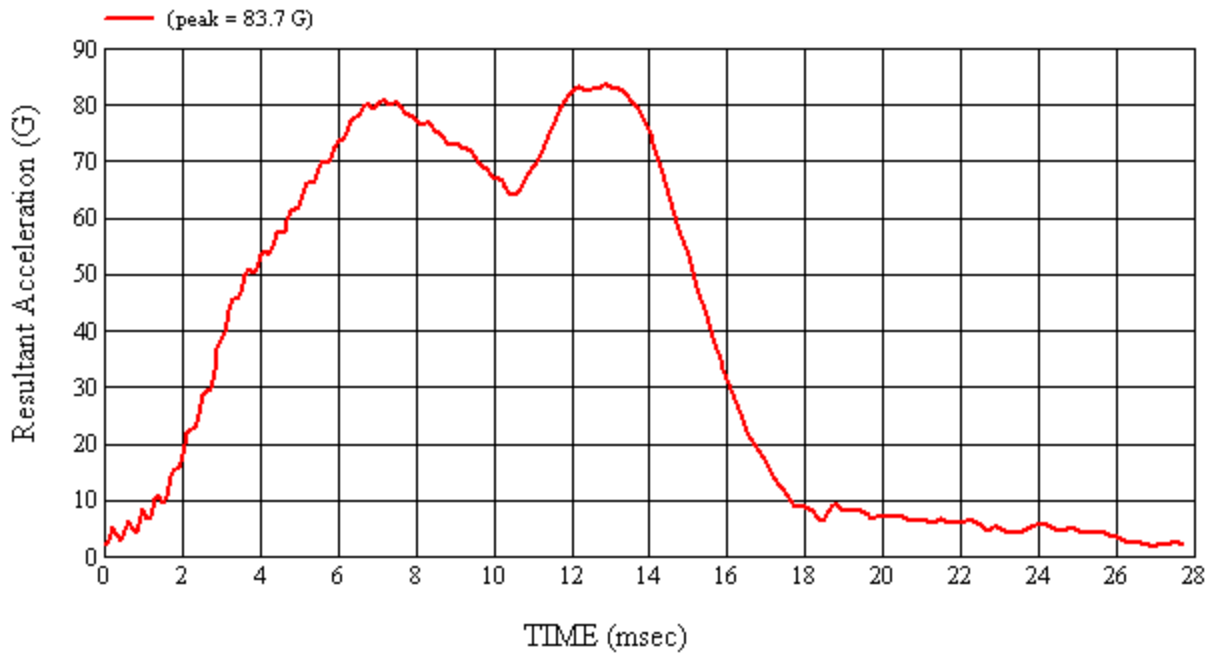
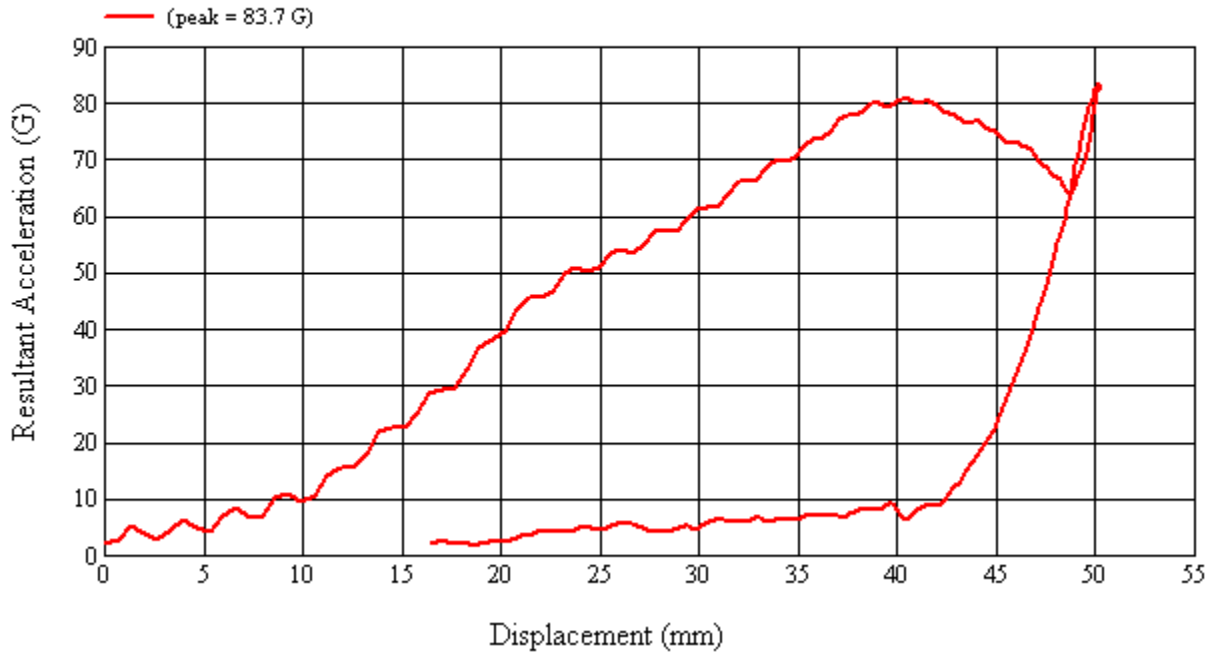
Recorded By: *Kevin D. McLean* Approved By*: *Richard I. Smith* Date: 5/5/2011

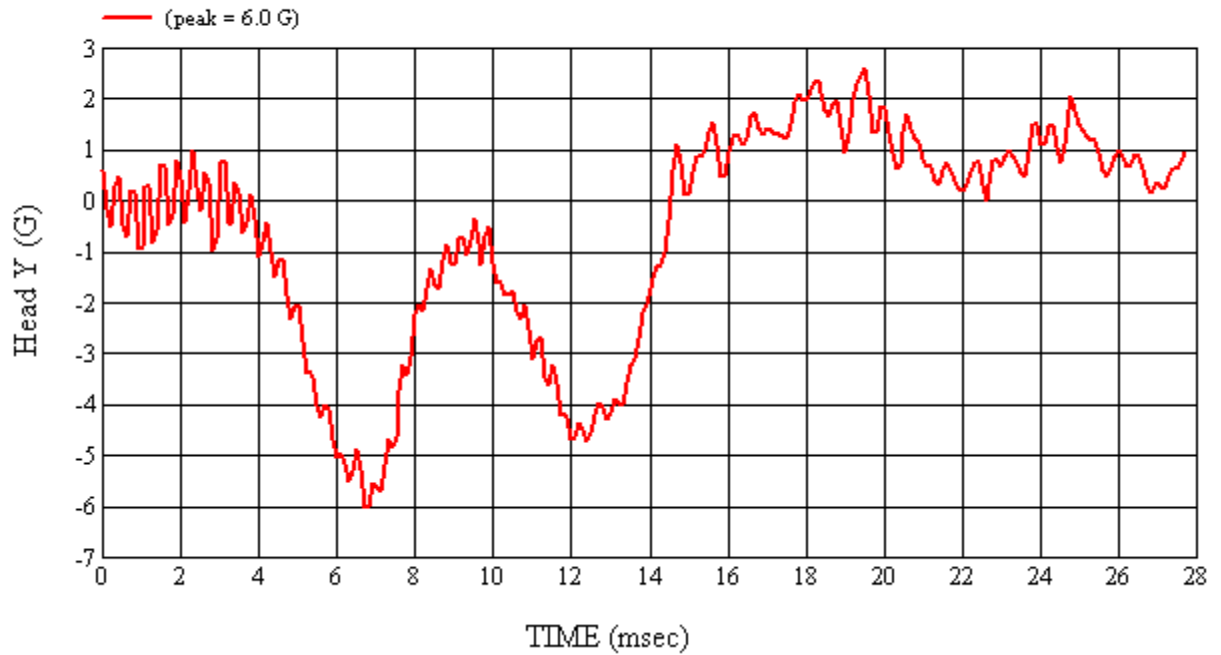
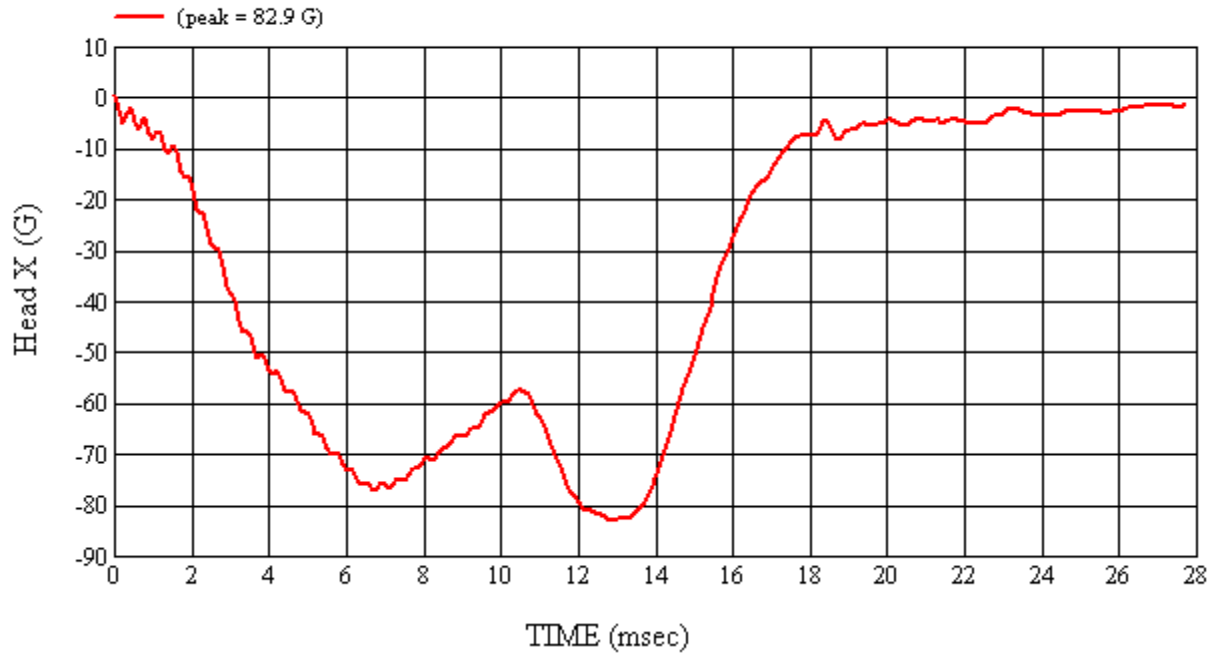
*Only necessary for NHTSA (Government) Compliance testing.

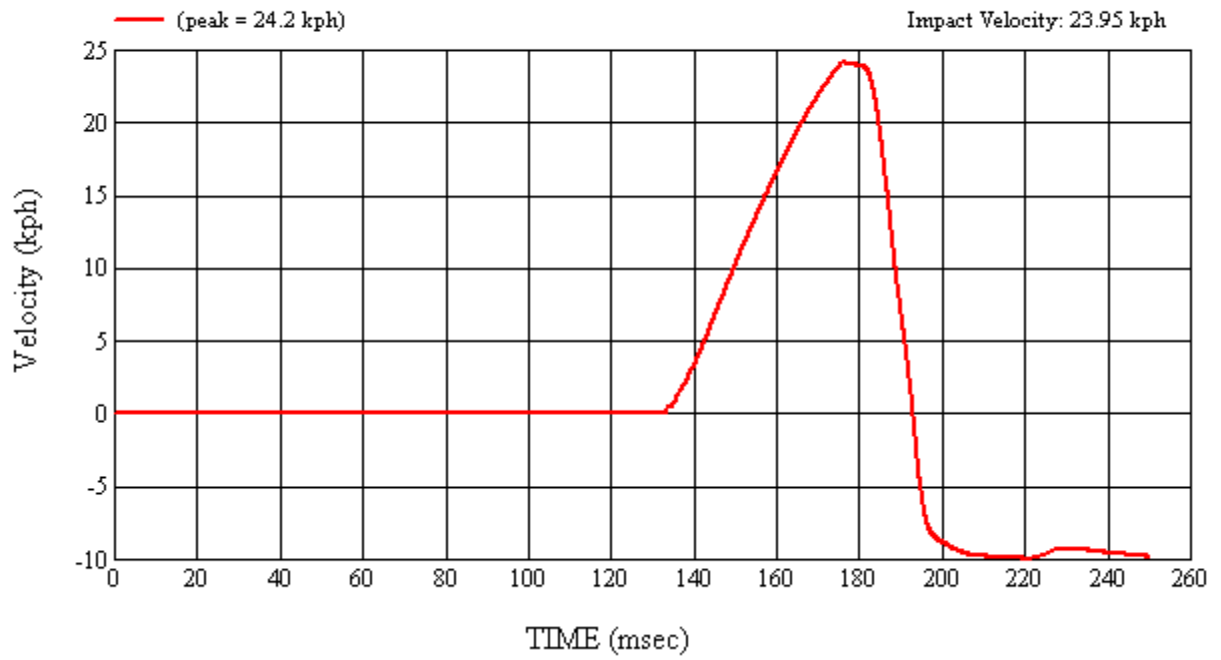
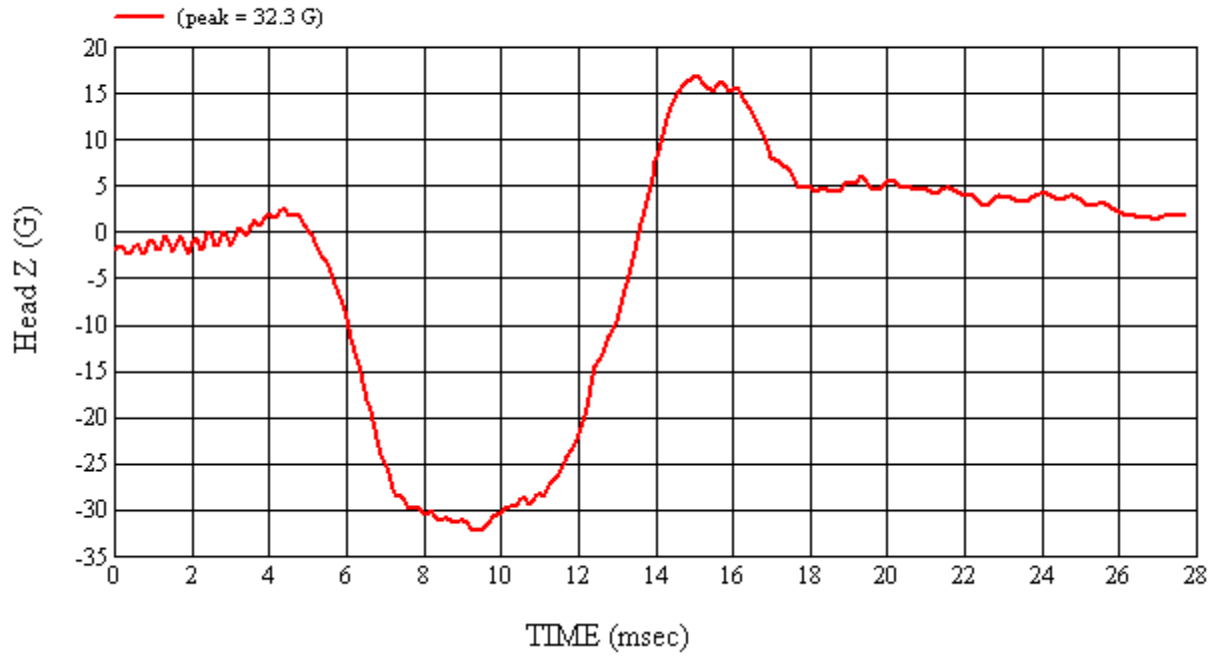
MGA Test #: U11144

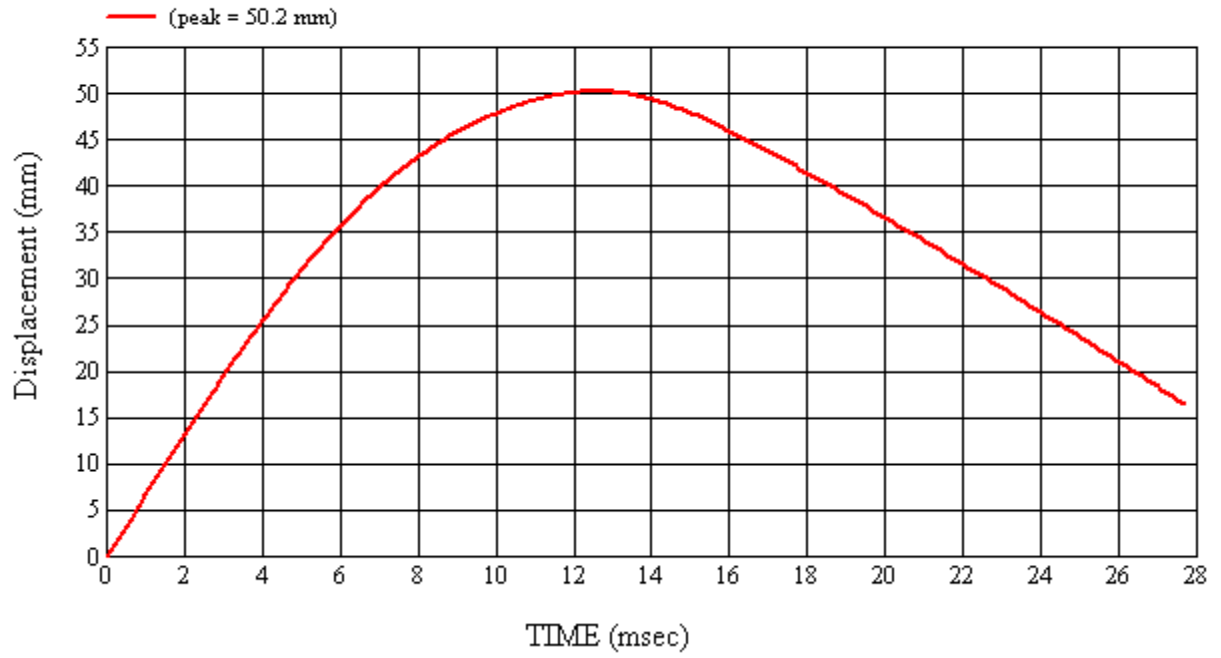
Target Location: UR2, Right Side

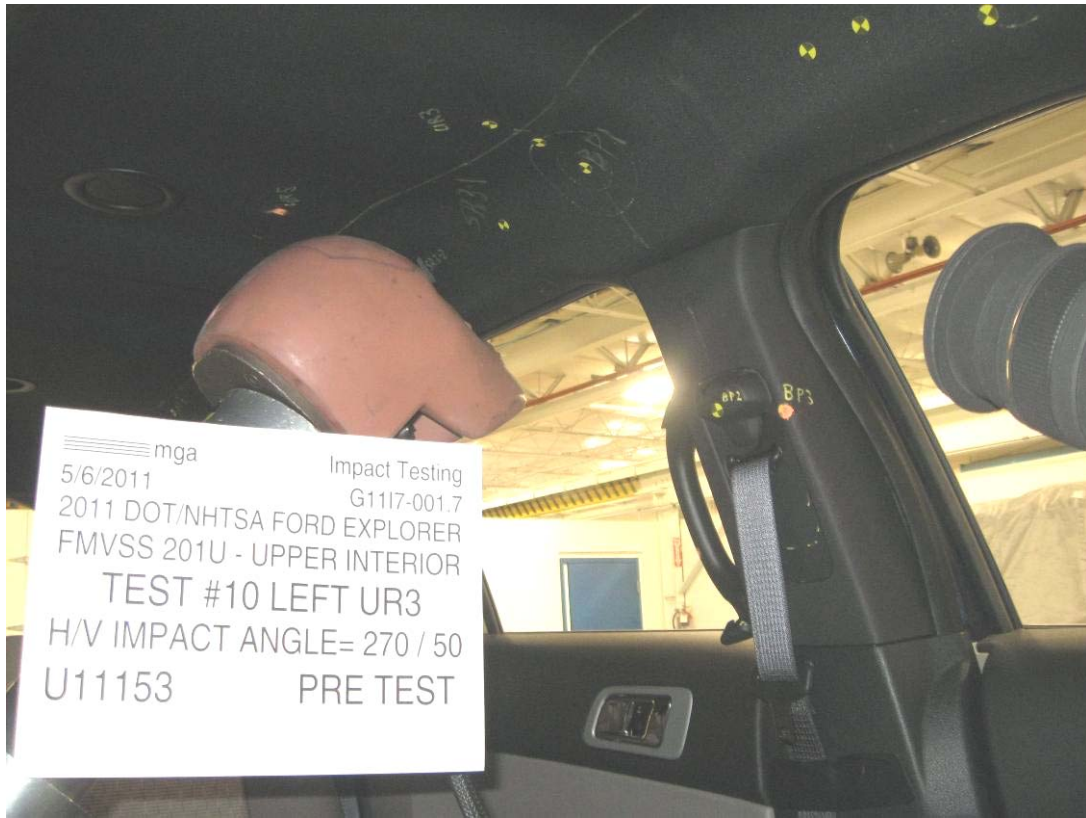
Test Date: 5/5/2011

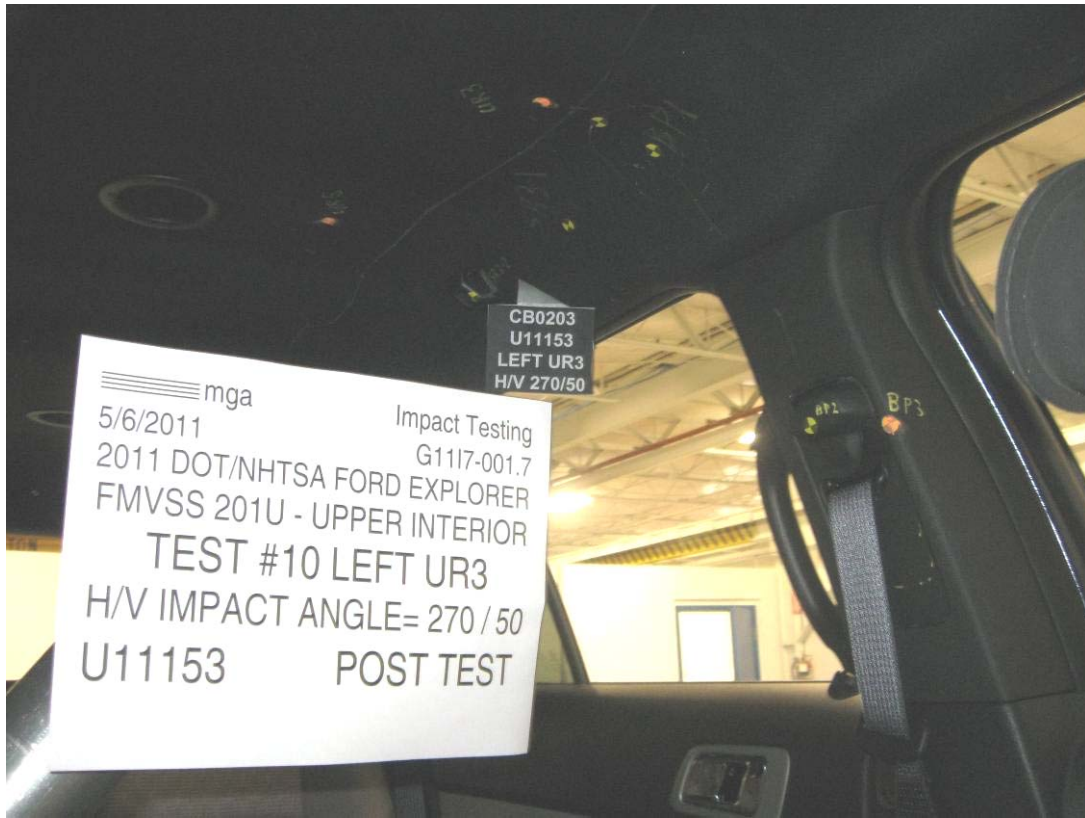


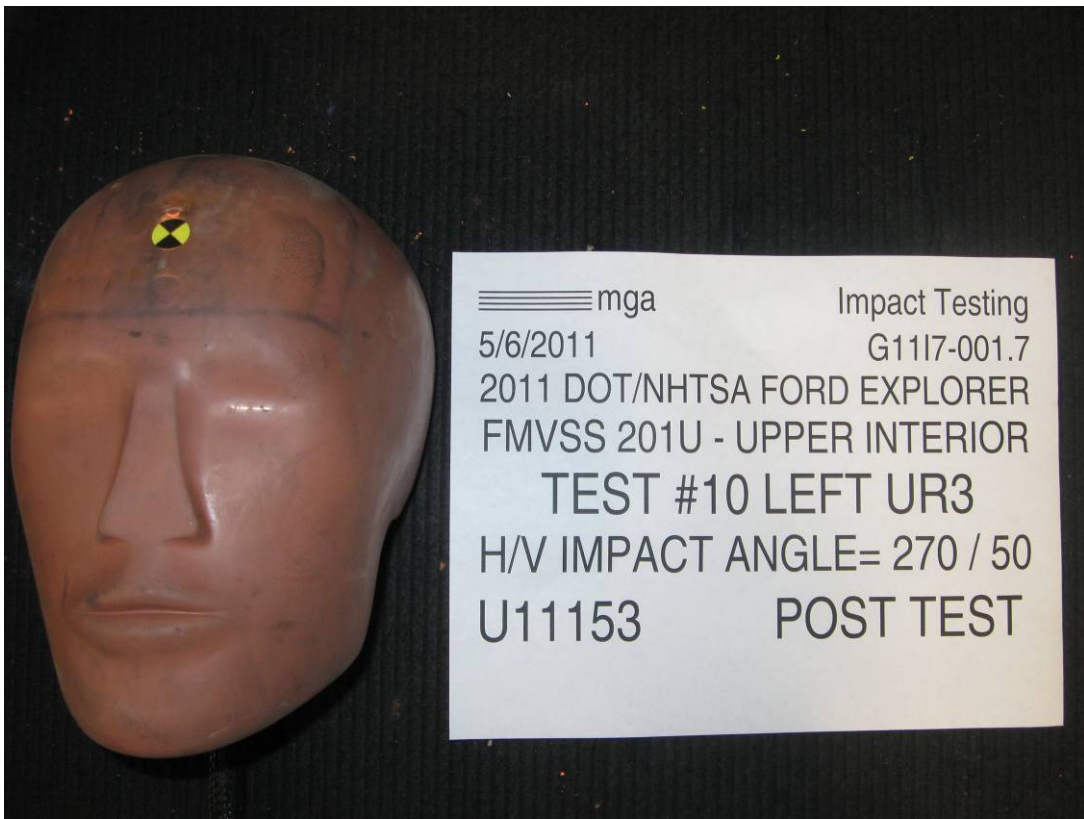












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Test Number:#10

Target (Vehicle Side): UR3Left

Temperature:22.3C

MGA Test Reference No.:U11153

Humidity:43.0%

Approach Horizontal Angles:270°

Time of Test:3:45:53 PM

Approach Vertical Angles:50°

FMH Serial No:[035]

Additional Description:@ BP

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
550	508	11.2	23.5	28	3 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

*Note: The event included spikes from electrical noise which occurred during testing which produced a HIC(d) of 680 and a HIC of 680. The predicted HIC(d) and the HIC are shown above.

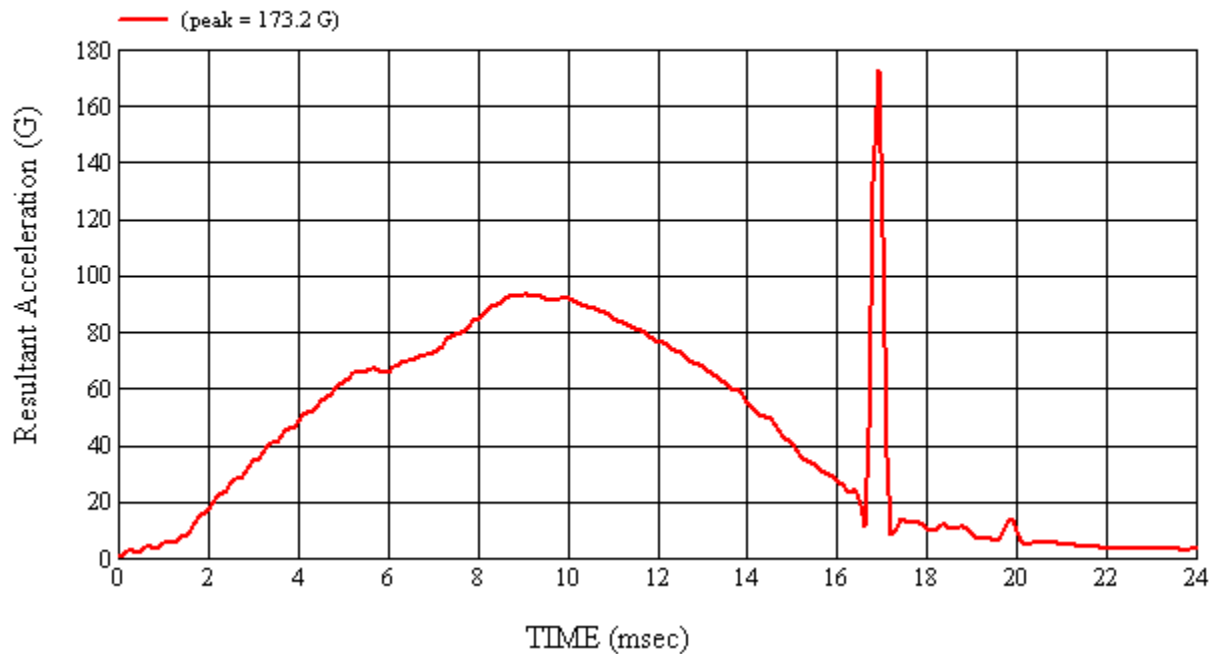
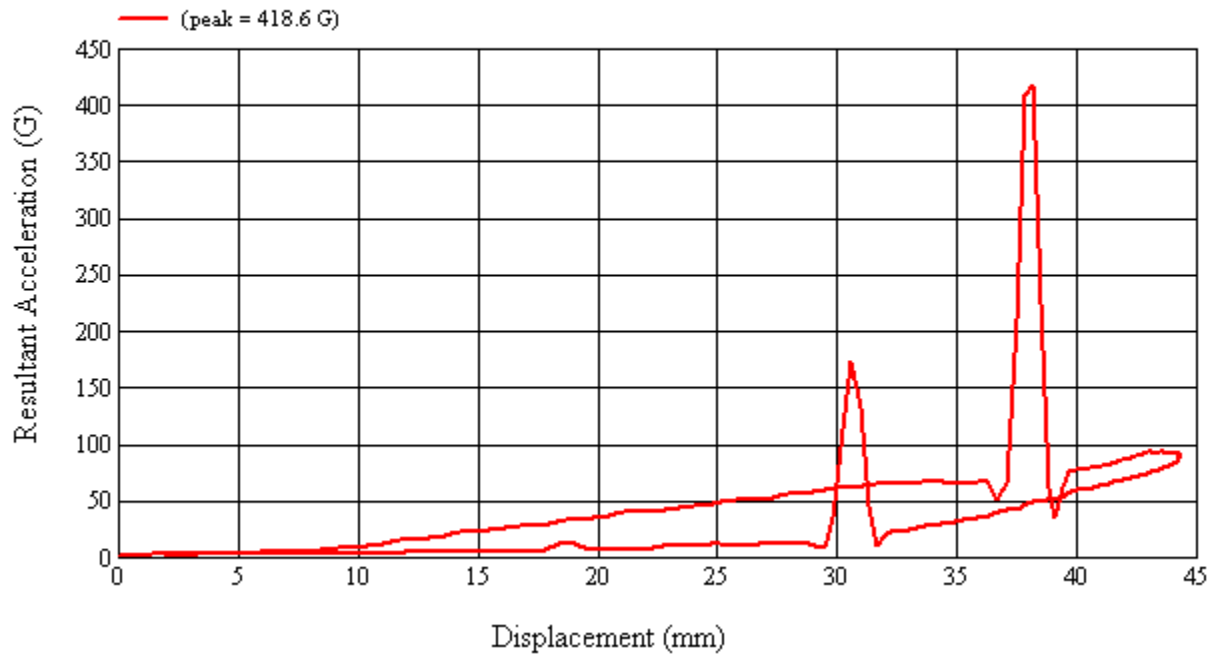
Recorded By: *Kevin D. McLeana* Approved By*: *Arthur I. Smith* Date: 5/6/2011

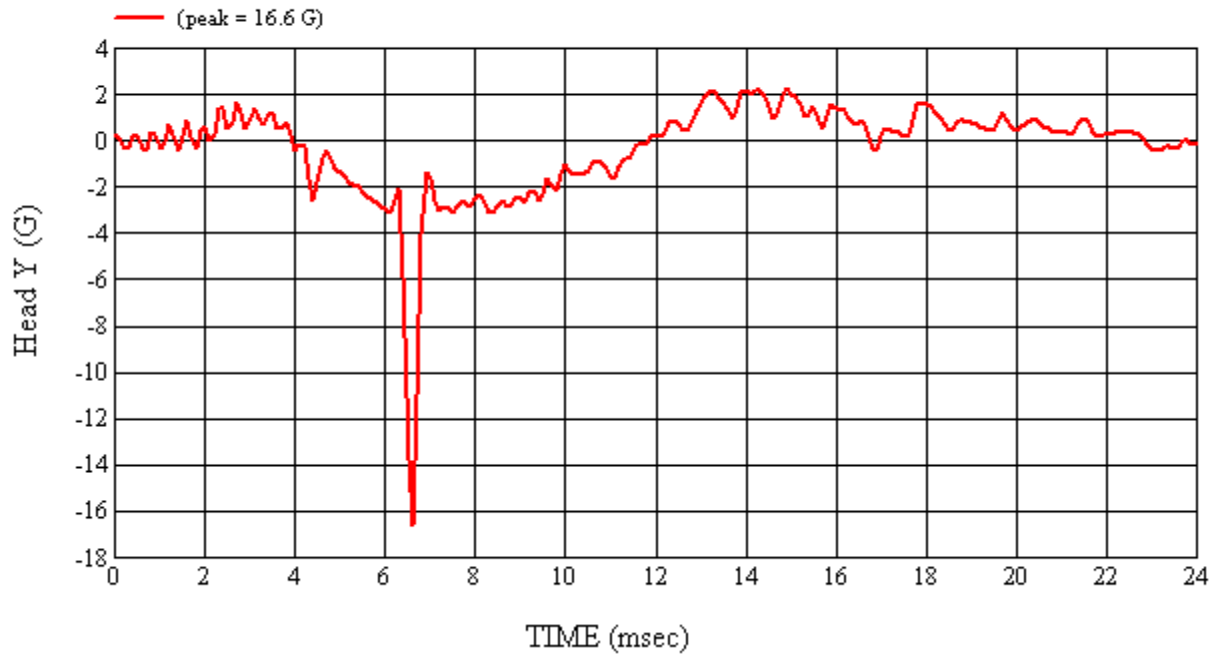
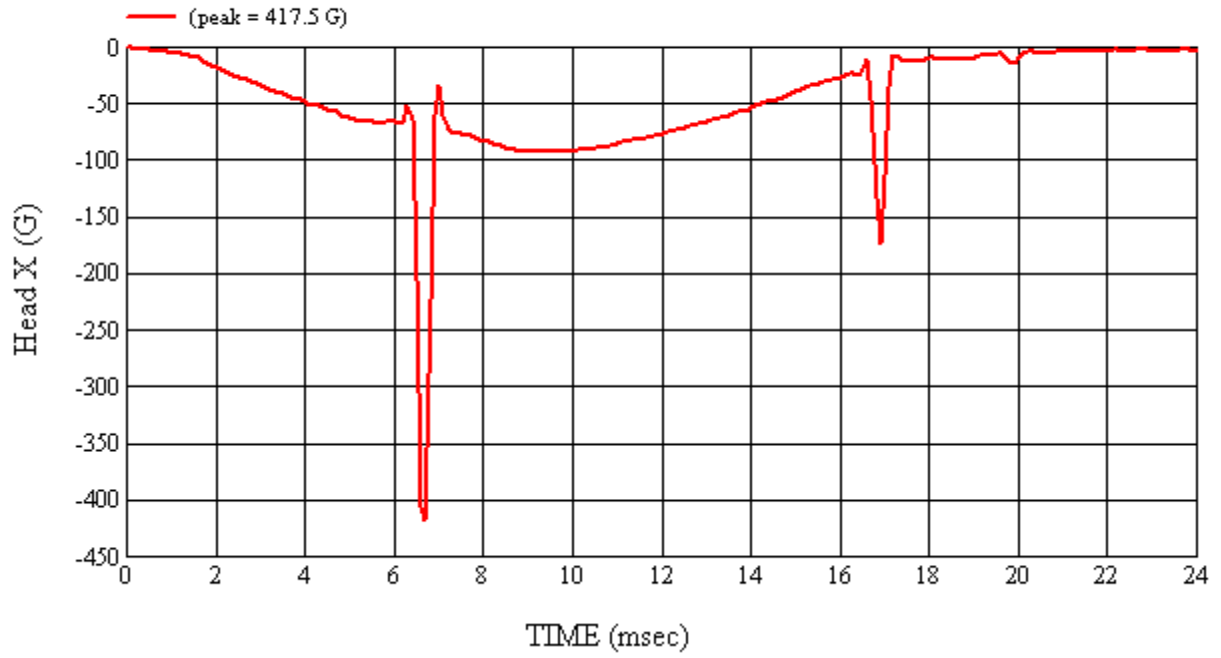
*Only necessary for NHTSA (Government) Compliance testing.

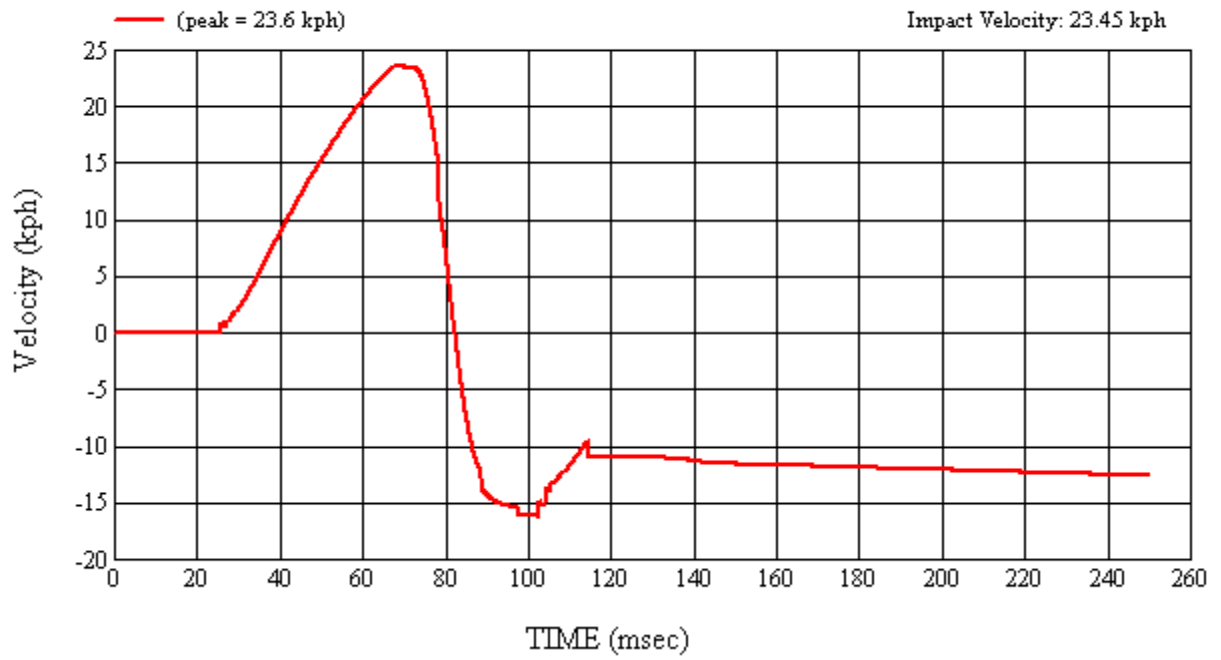
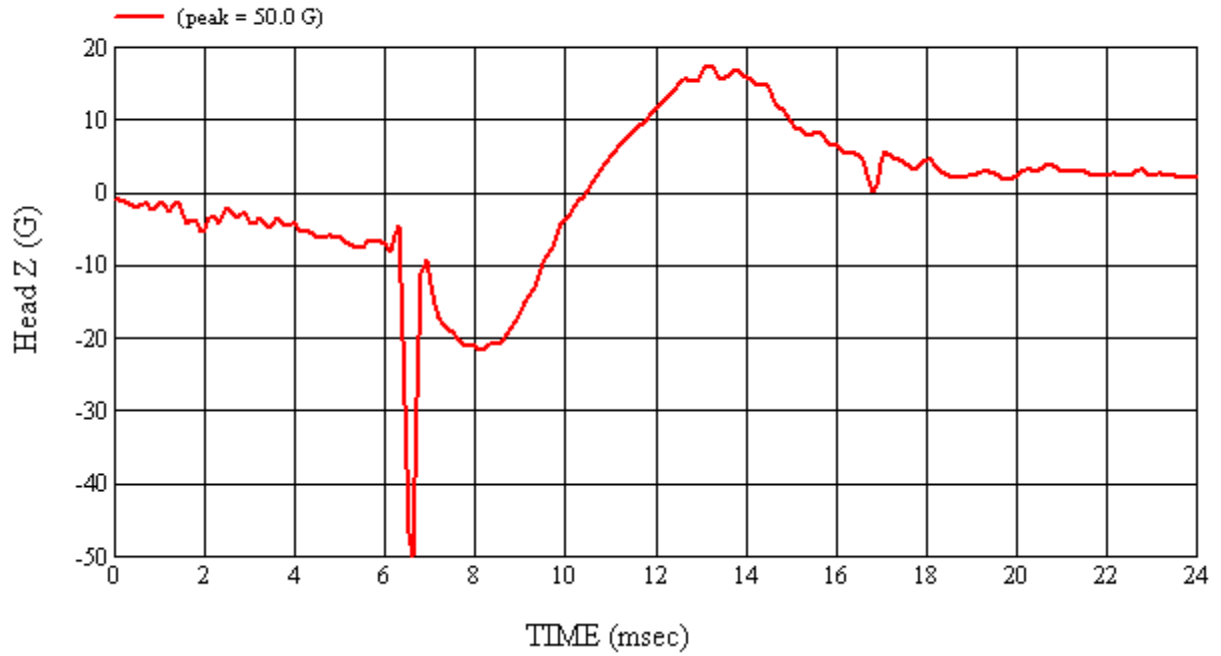
MGA Test #: U11153

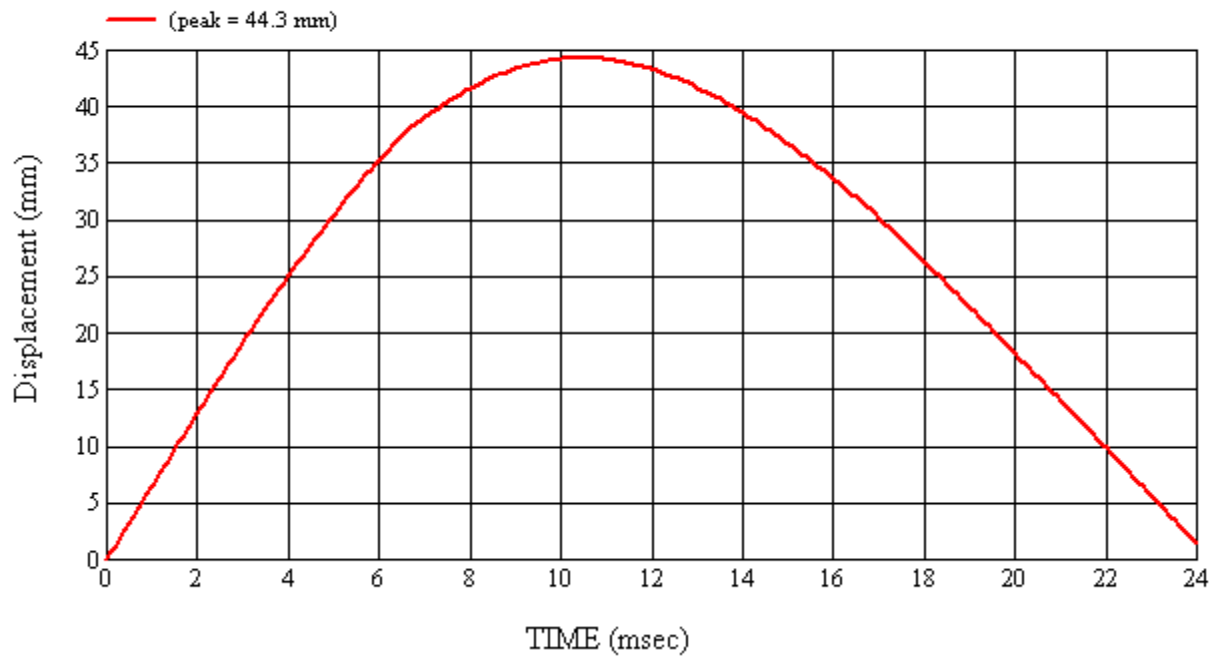
Target Location: UR3, Left Side

Test Date: 5/6/2011

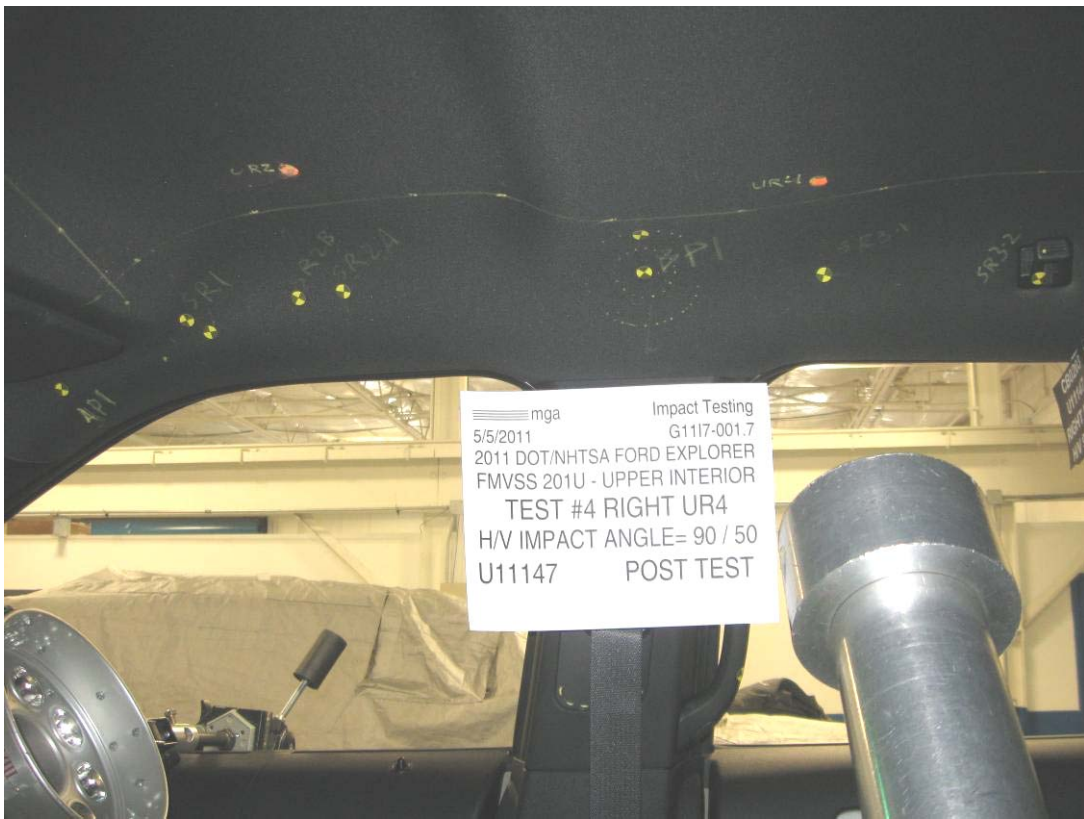
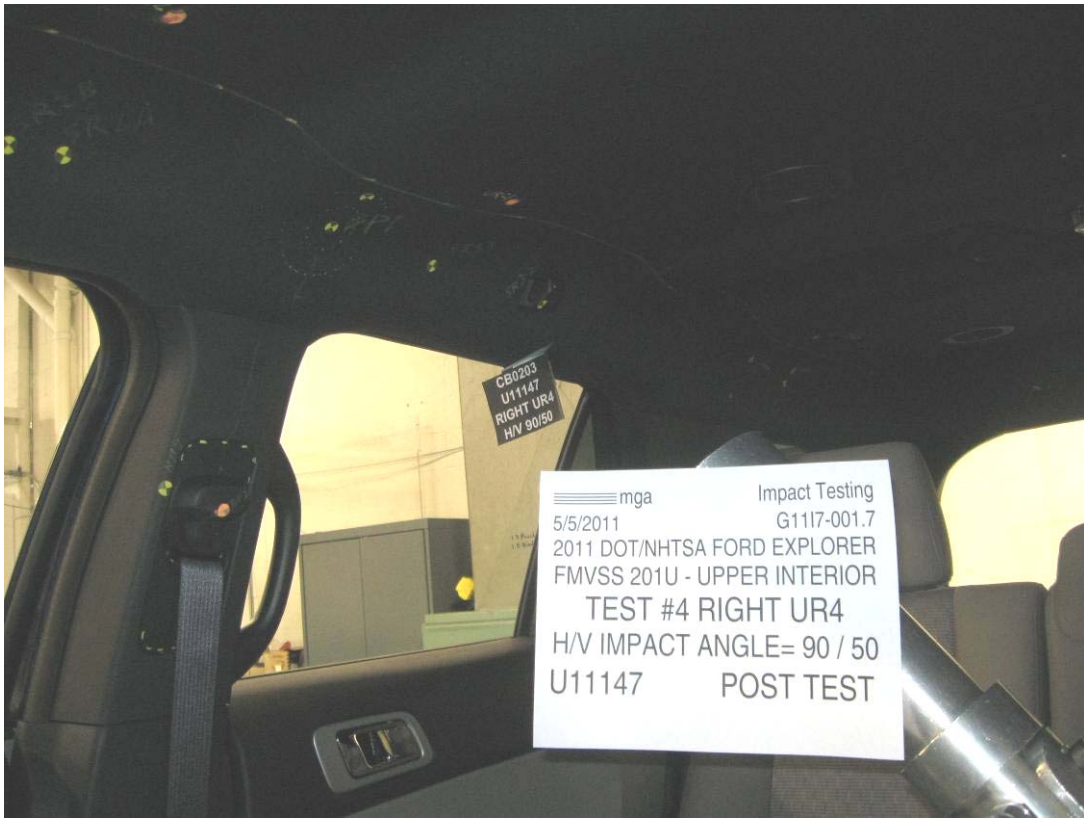


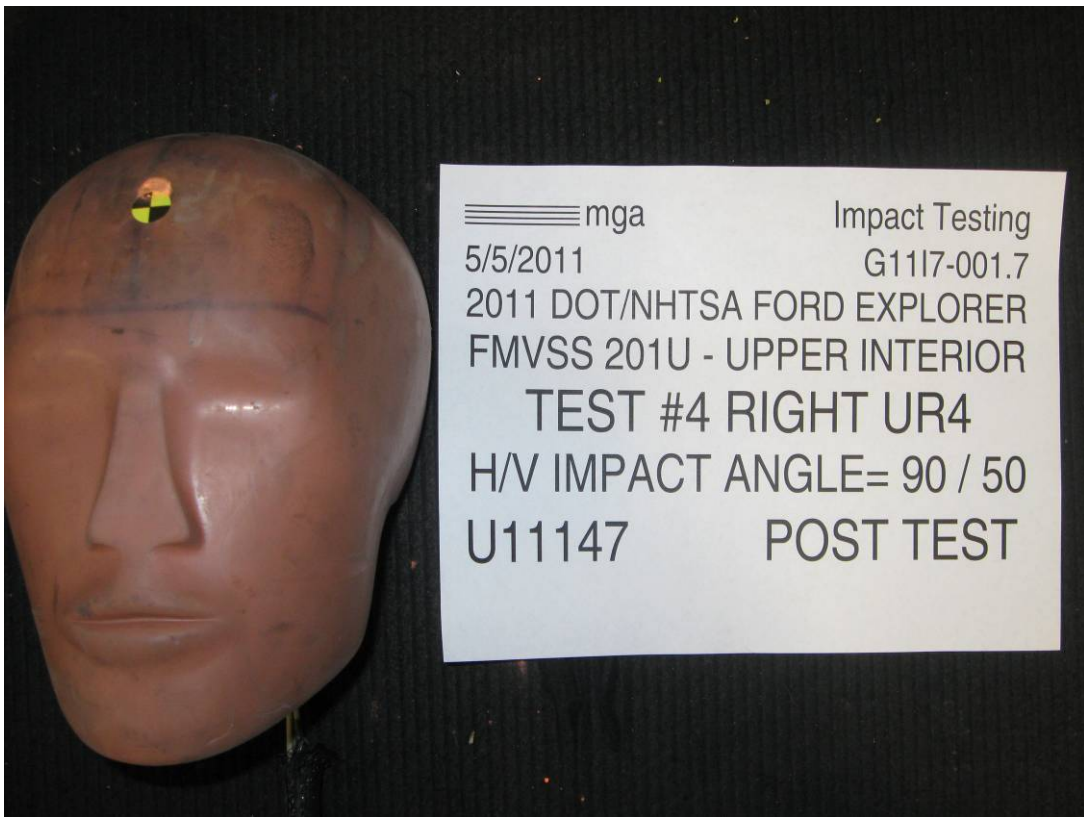












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR4Right

MGA Test Reference No.:U11147

Approach Horizontal Angles:90°

Approach Vertical Angles:50°

Additional Description:@SR3-1

Test Number:#4

Temperature:21.8C

Humidity:21.3%

Time of Test:2:45:35 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
535	488	11.3	23.9	35	3 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

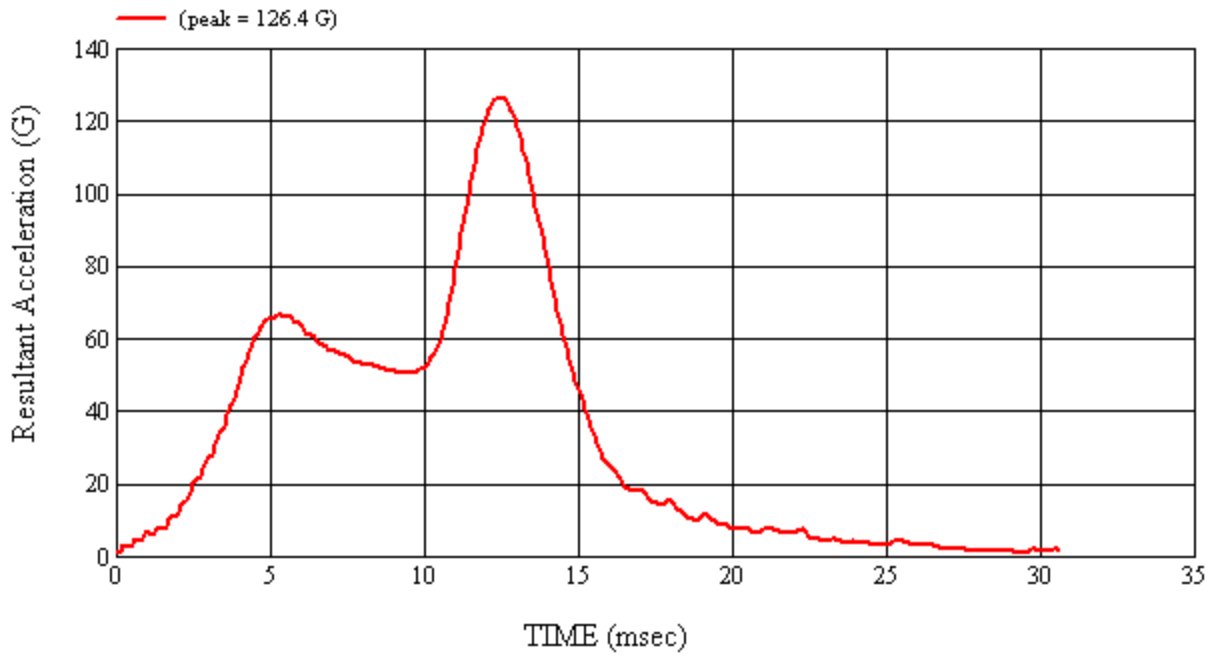
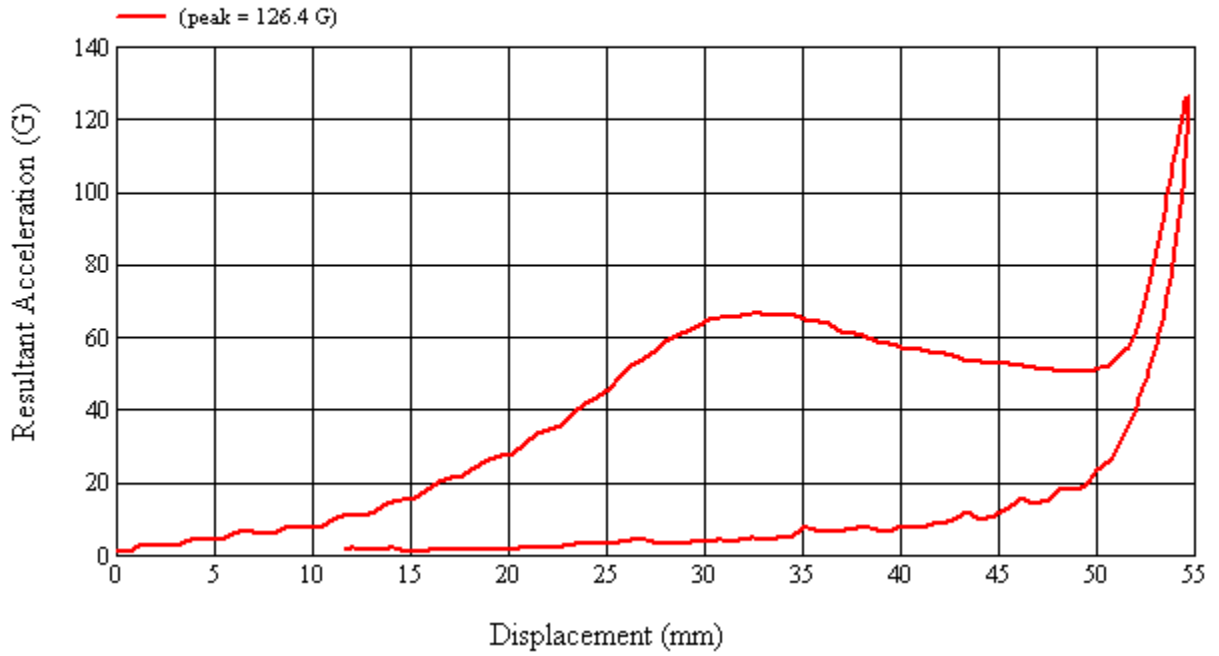
Recorded By: *Kevin D. McFenna* Approved By*: *Richard I. Smith* Date: 5/5/2011

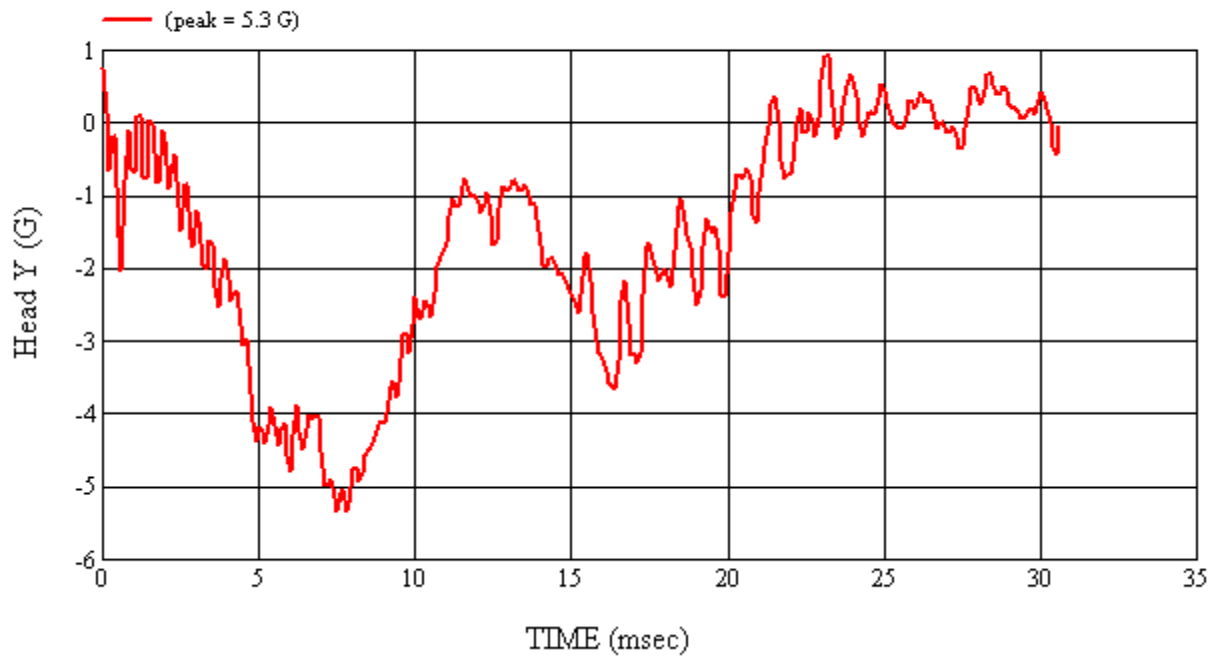
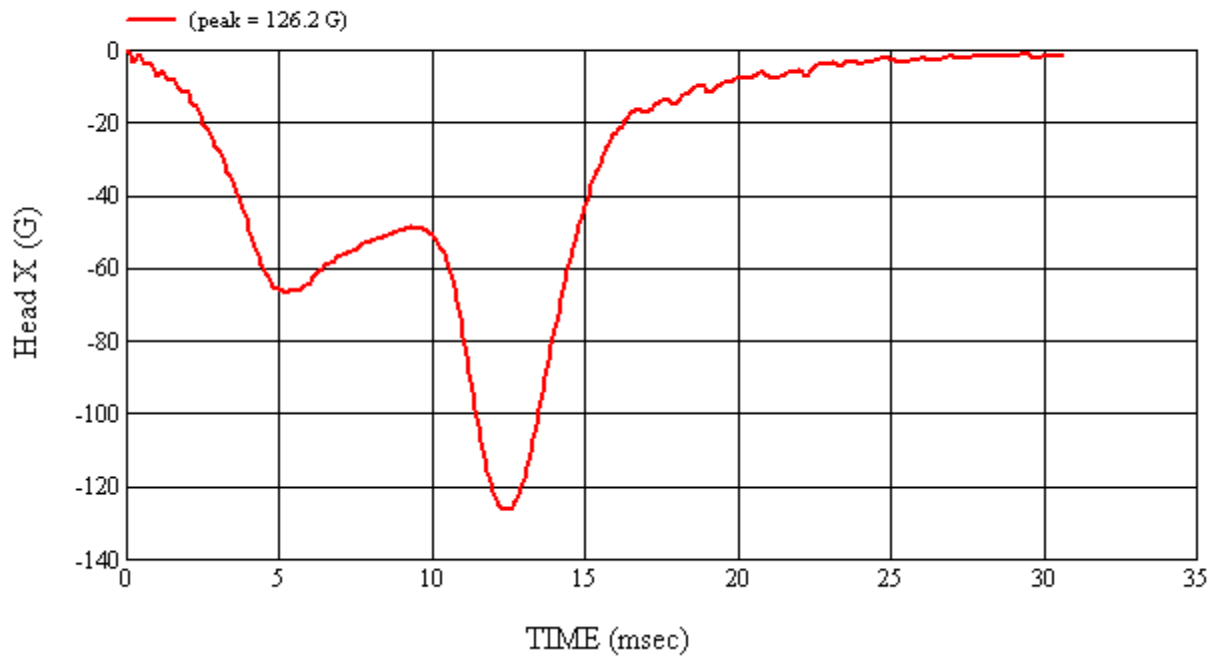
*Only necessary for NHTSA (Government) Compliance testing.

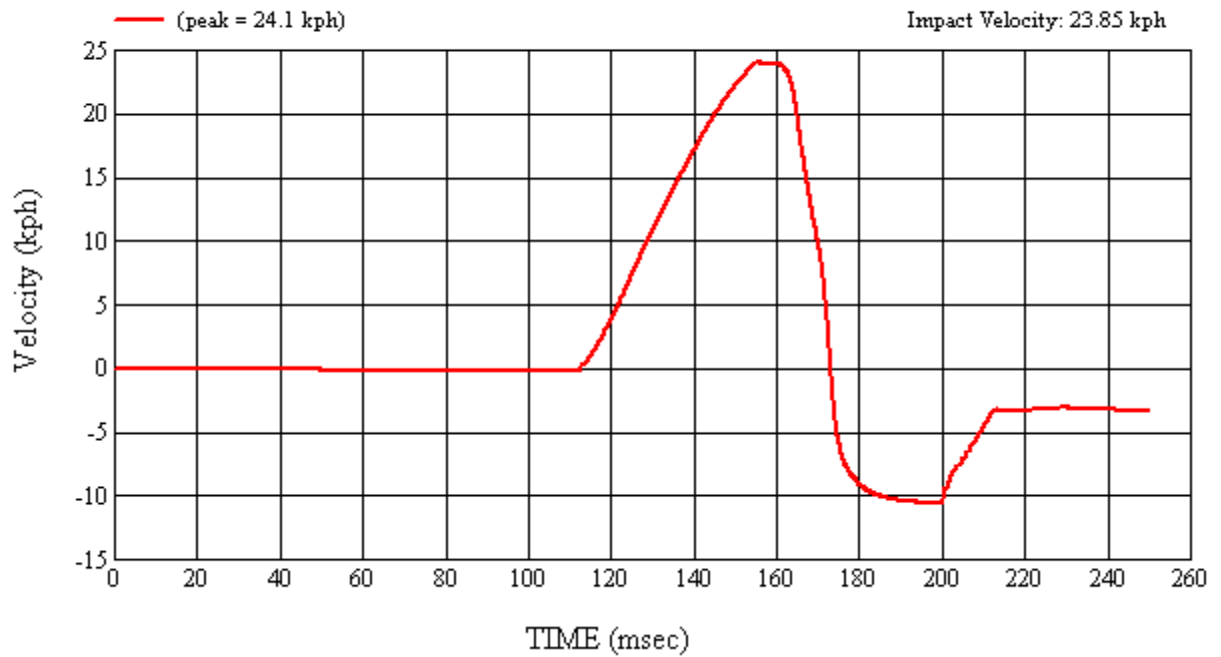
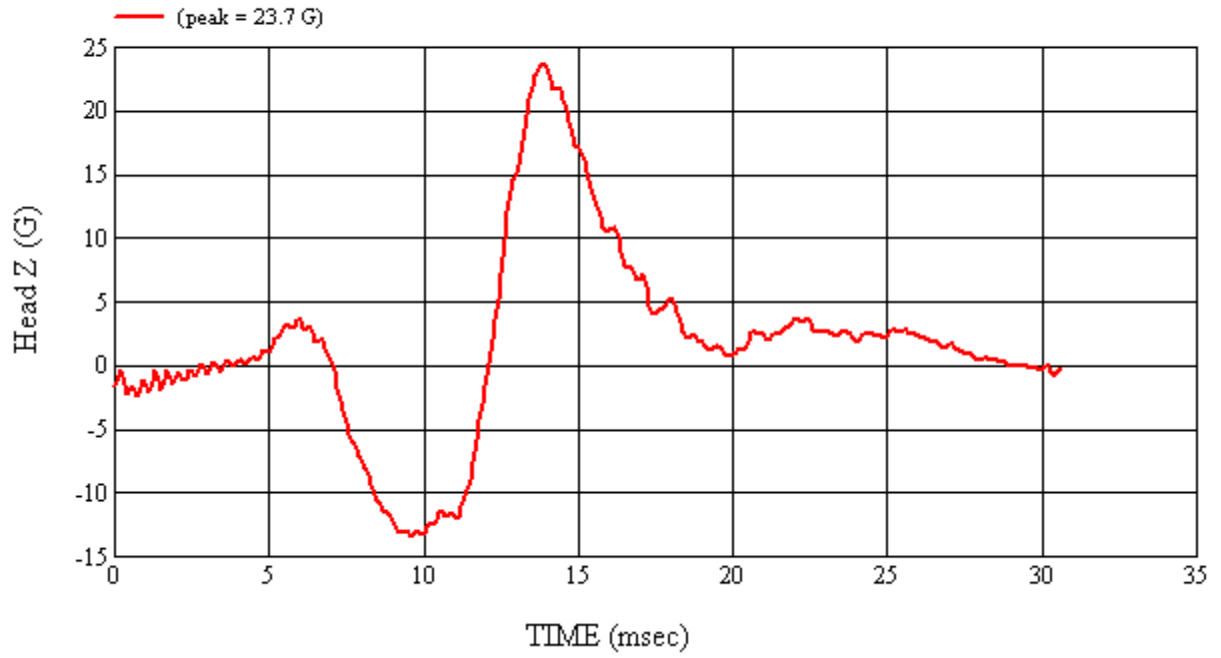
MGA Test #: U11147

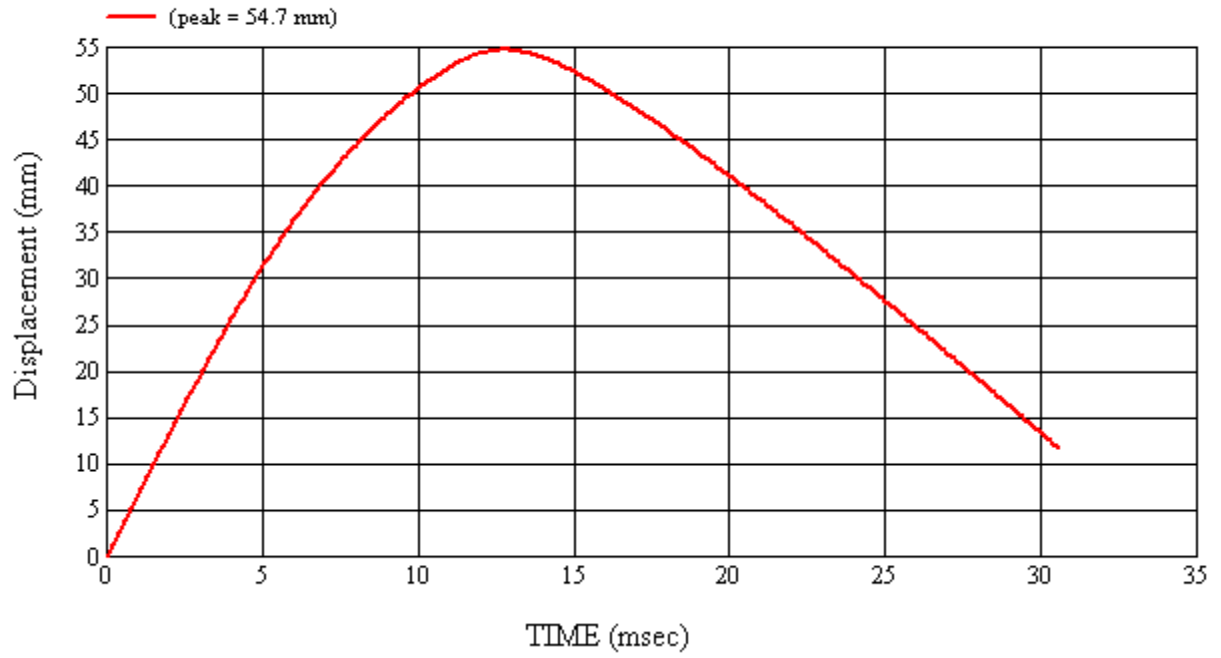
Target Location: UR4, Right Side

Test Date: 5/5/2011

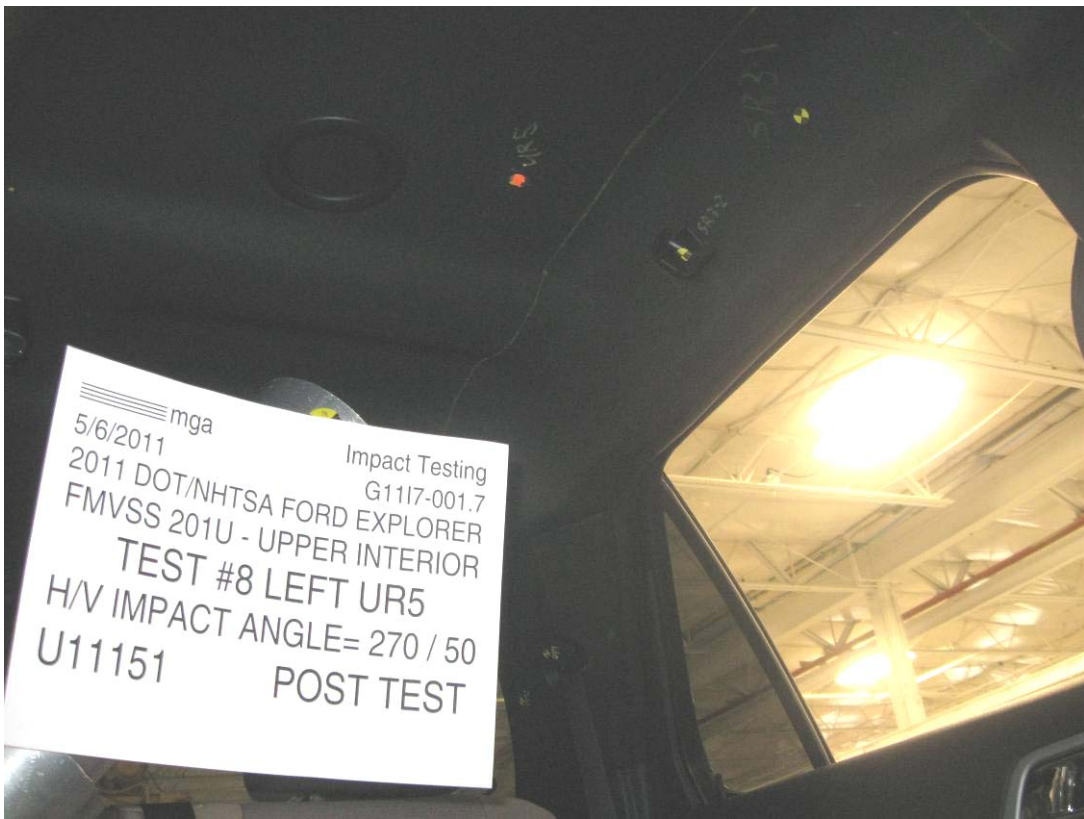
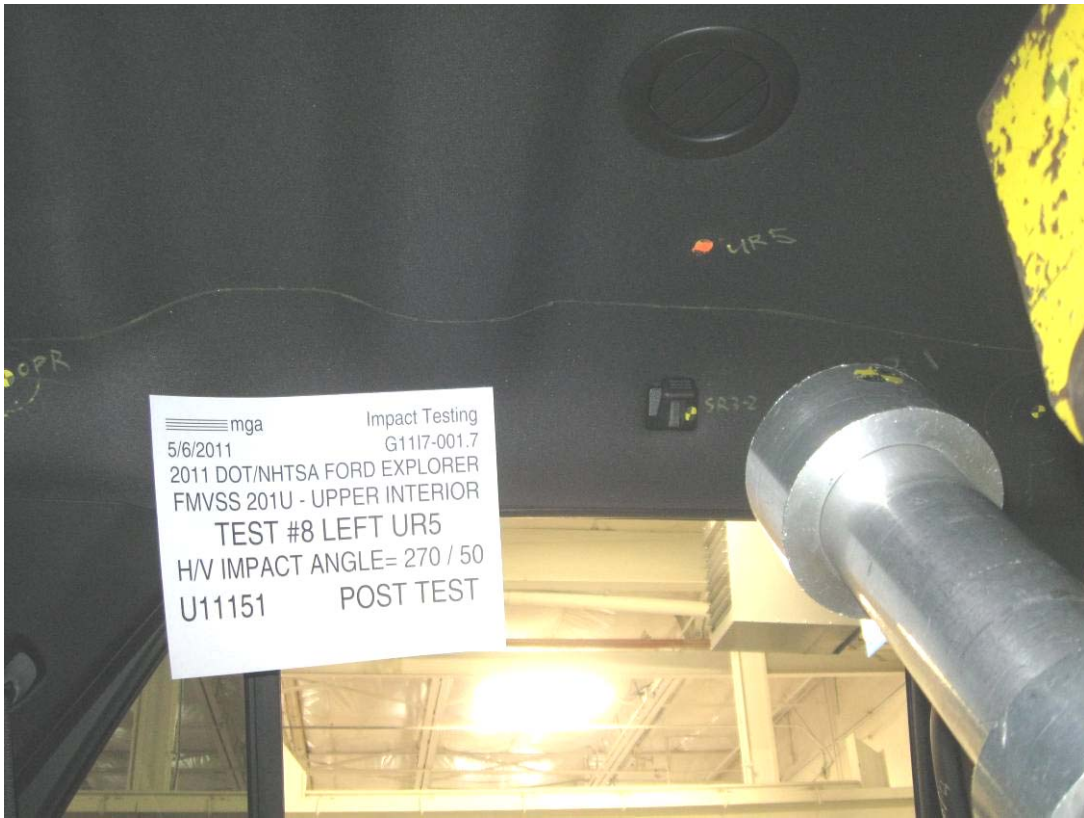














SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.7 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Ford Explorer

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR5Left

MGA Test Reference No.:U11151

Approach Horizontal Angles:270°

Approach Vertical Angles:50°

Additional Description:@SR3-2

Test Number:#8

Temperature:22.0C

Humidity:46.2%

Time of Test:12:30:15 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
589	561	8.7	24.1	28	10 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.):

No visible damage

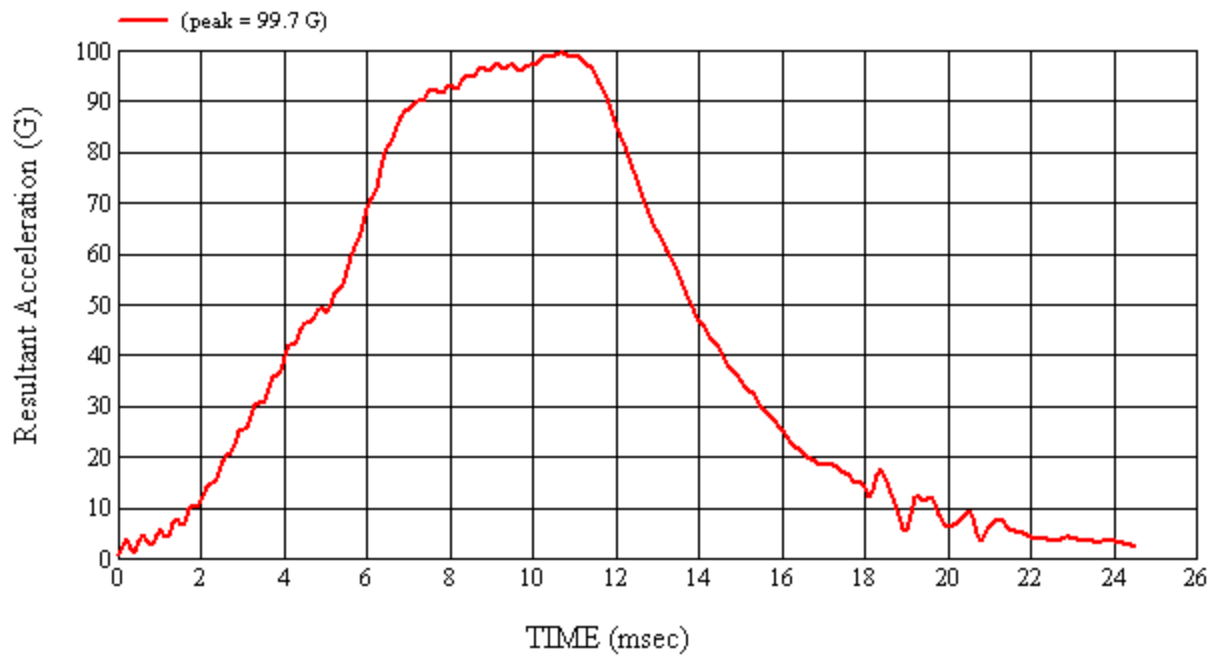
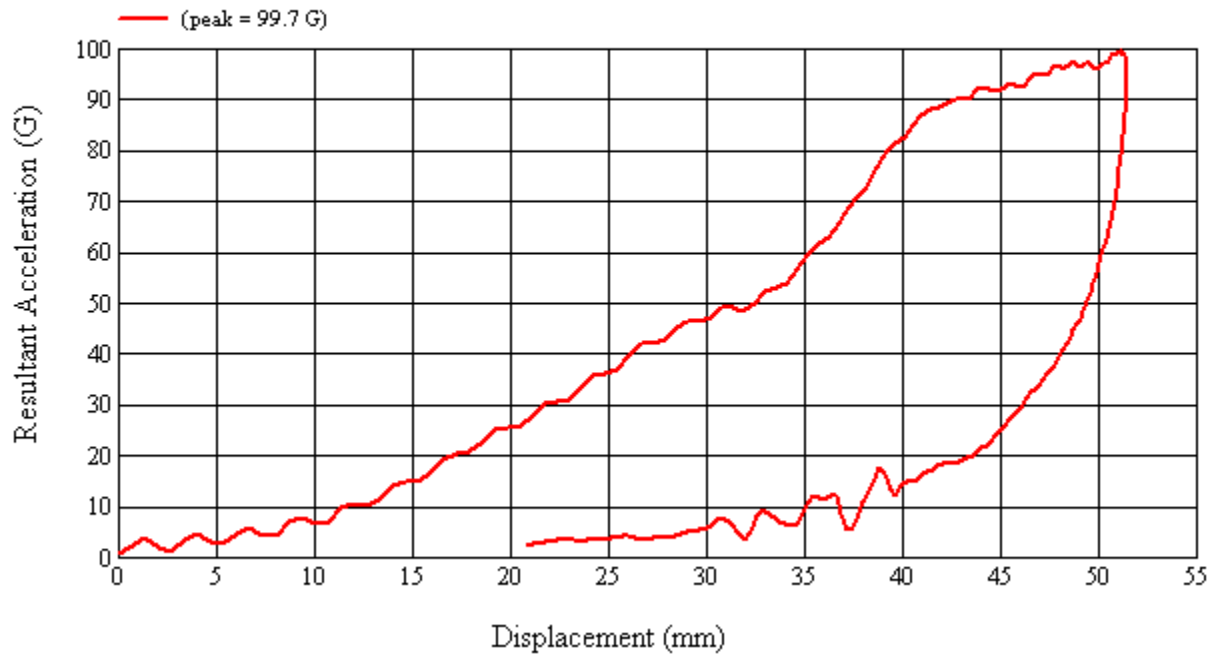
Recorded By: *Kevin D. McLean* Approved By*: *Richard I. Smith* Date: 5/6/2011

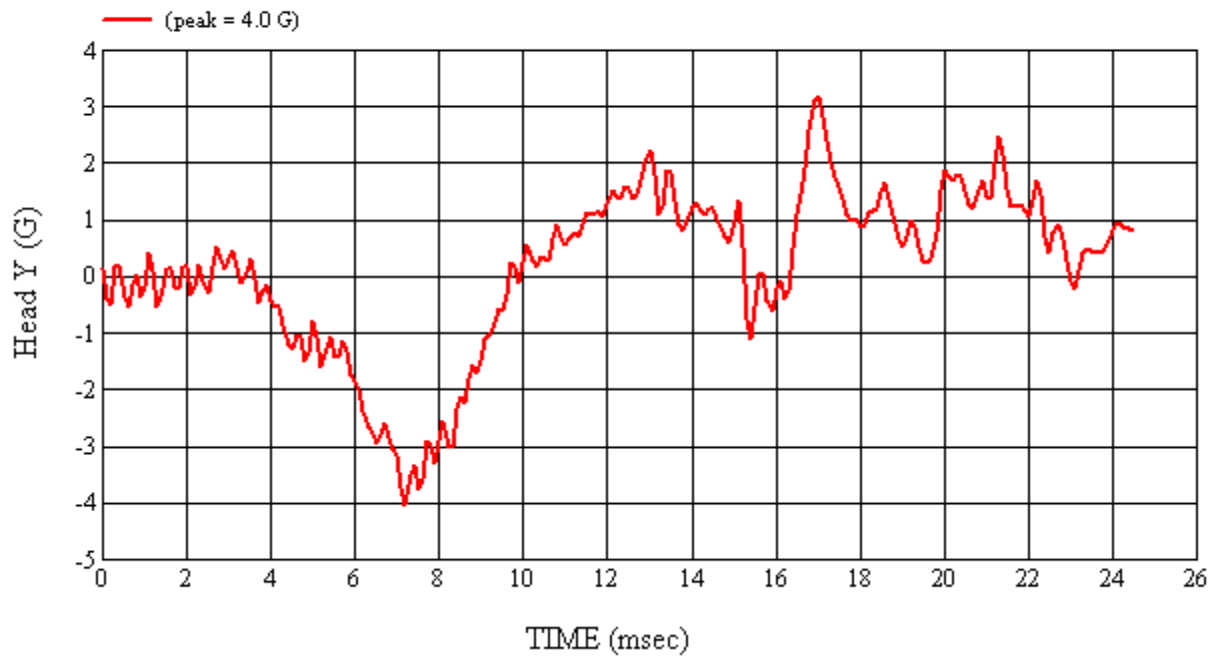
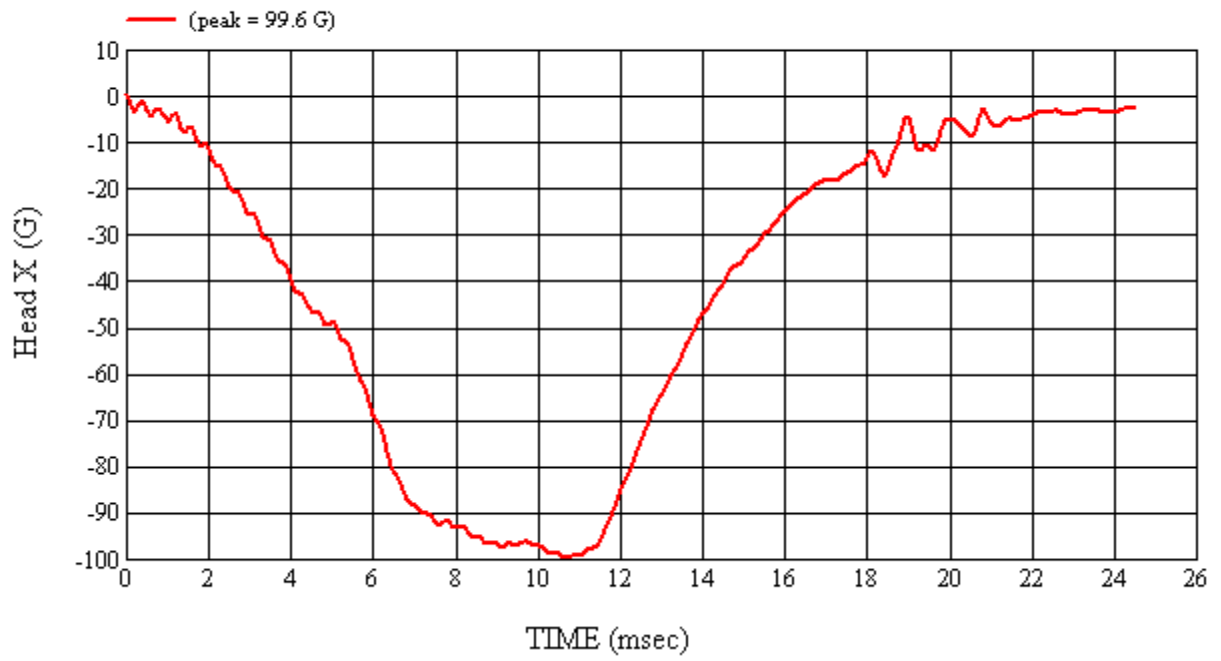
*Only necessary for NHTSA (Government) Compliance testing.

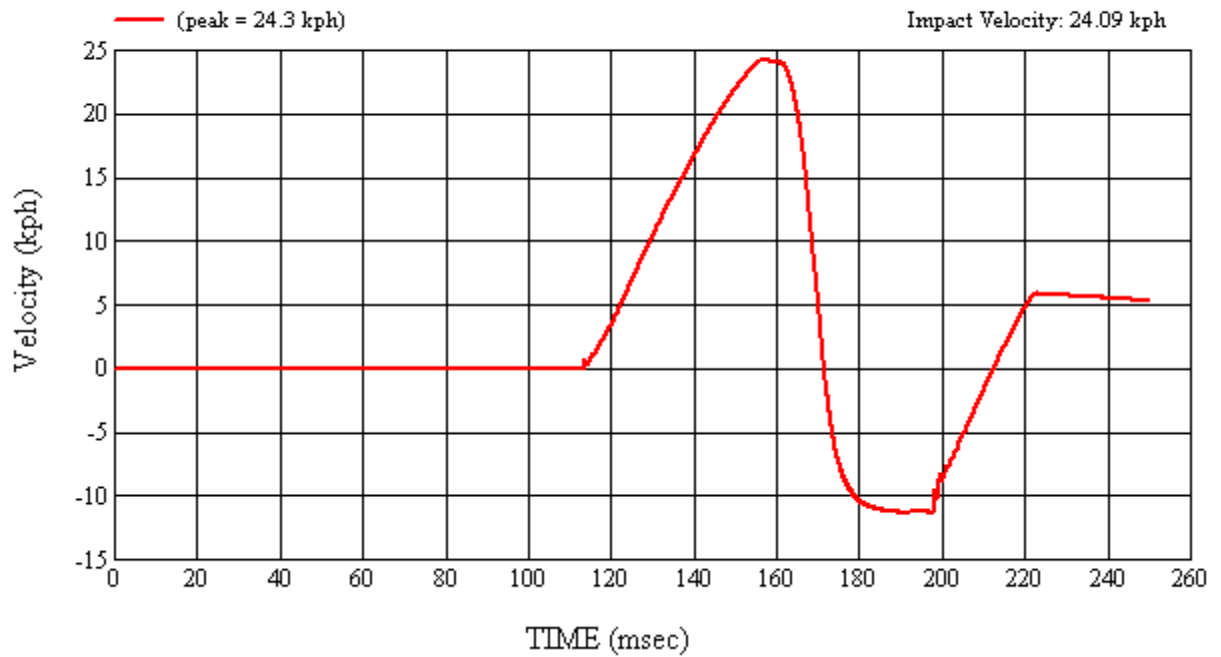
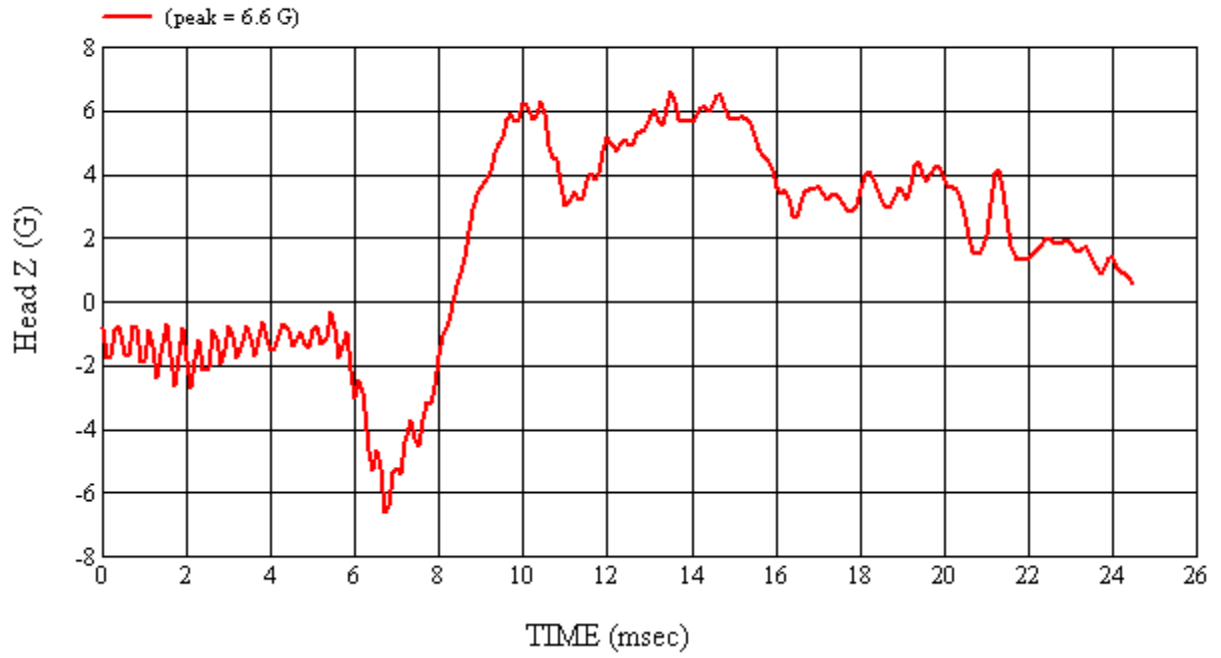
MGA Test #: U11151

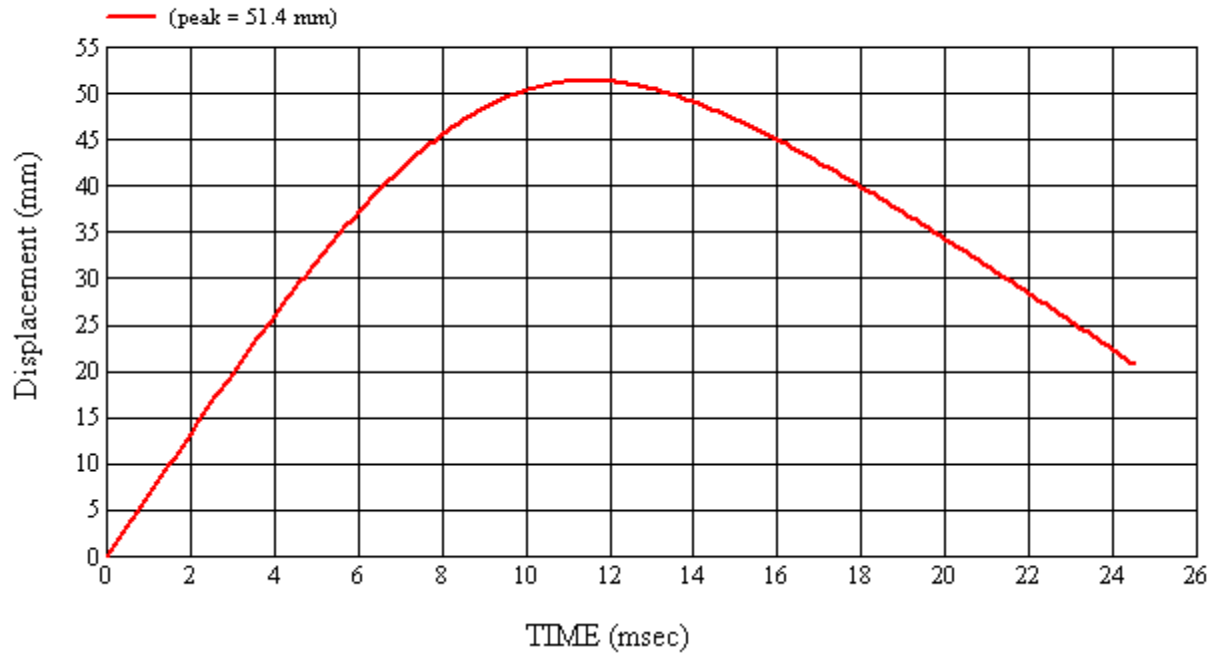
Target Location: UR5, Left Side

Test Date: 5/6/2011









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 66°F and 78°F (19°C – 26°C) 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	TPM112 -- MGA00049	Measurement Targeting FMH setup Horizontal Measurement	1 mm N/A 0.5°	Annual
*Temperature Recorder	Dickson	MGA00894	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 66°F to 78°F (19°C to 26°C) 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 (°C)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
Pre	#035	5/4/2011	9.90	21.1	33.3	252.7	5.7	Yes
Post	#035	5/10/2011	9.90	22.6	43.4	250.5	4.0	Yes
Pre	#037	5/4/2011	9.96	21.7	29.1	263.2	4.6	Yes
Post	#037	5/10/2011	9.96	22.7	39.7	266.2	6.7	Yes
Pre	#038	5/4/2011	9.90	21.6	29.7	267.2	14.0	Yes
Post	#038	5/10/2011	9.90	22.7	38.7	265.8	12.8	Yes

4-1 Pre-Test Calibration

**HEAD DROP TEST SUMMARY
 PART 572L**

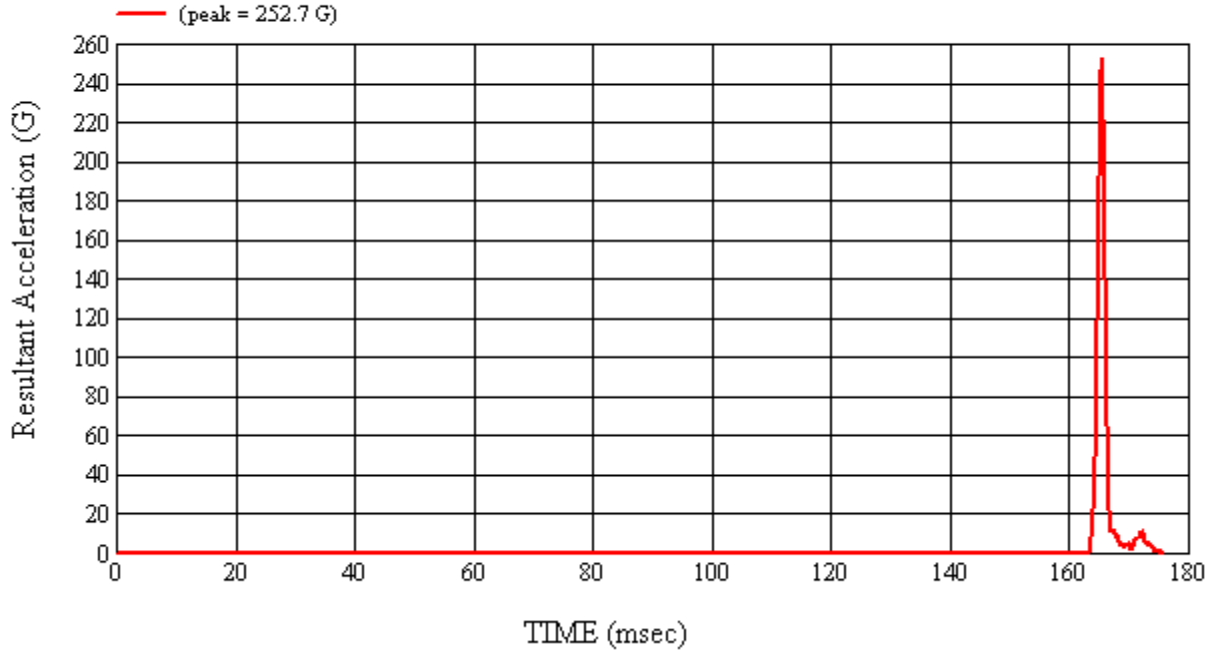
HEADFORM SERIAL NUMBER: 035		CALIBRATION DATE: 5/4/2011
CALIBRATION TIME: 2:43:23 PM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	21.1
Relative Humidity	10% to 70%	33.3
Peak Resultant Acceleration	225 G's to 275 G's	252.7
Peak Lateral Acceleration	15 G's Maximum	5.7
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	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

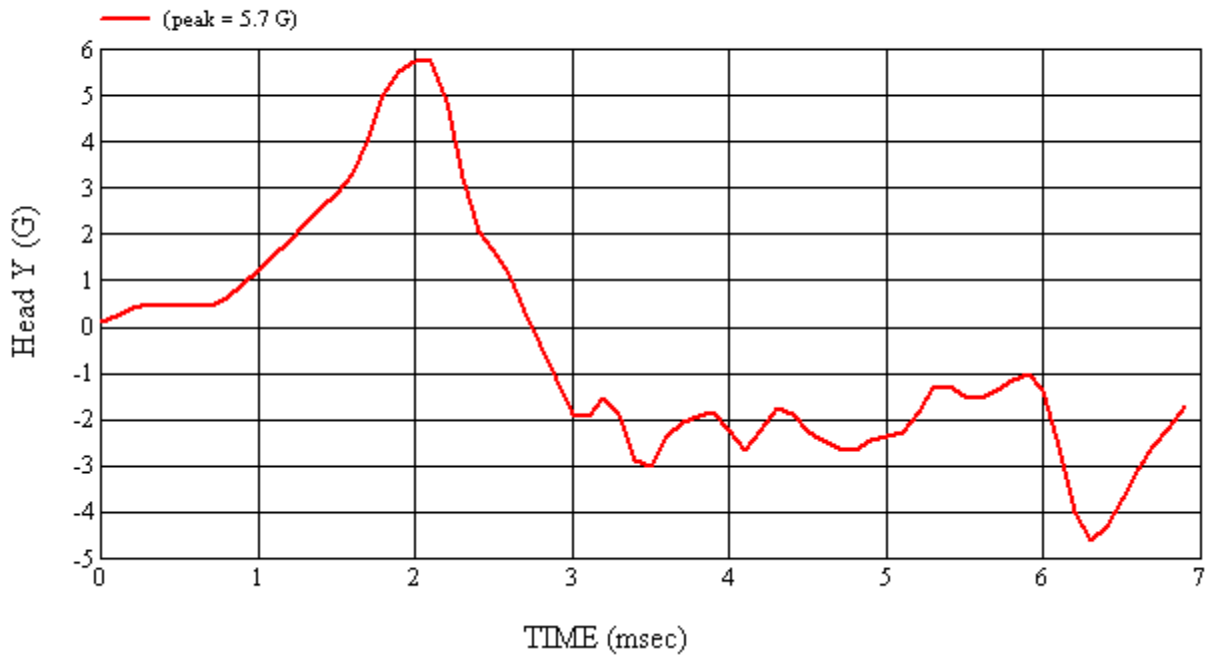
REMARKS:

RECORDED BY: *Keri D. McLean* DATE: 5/4/2011

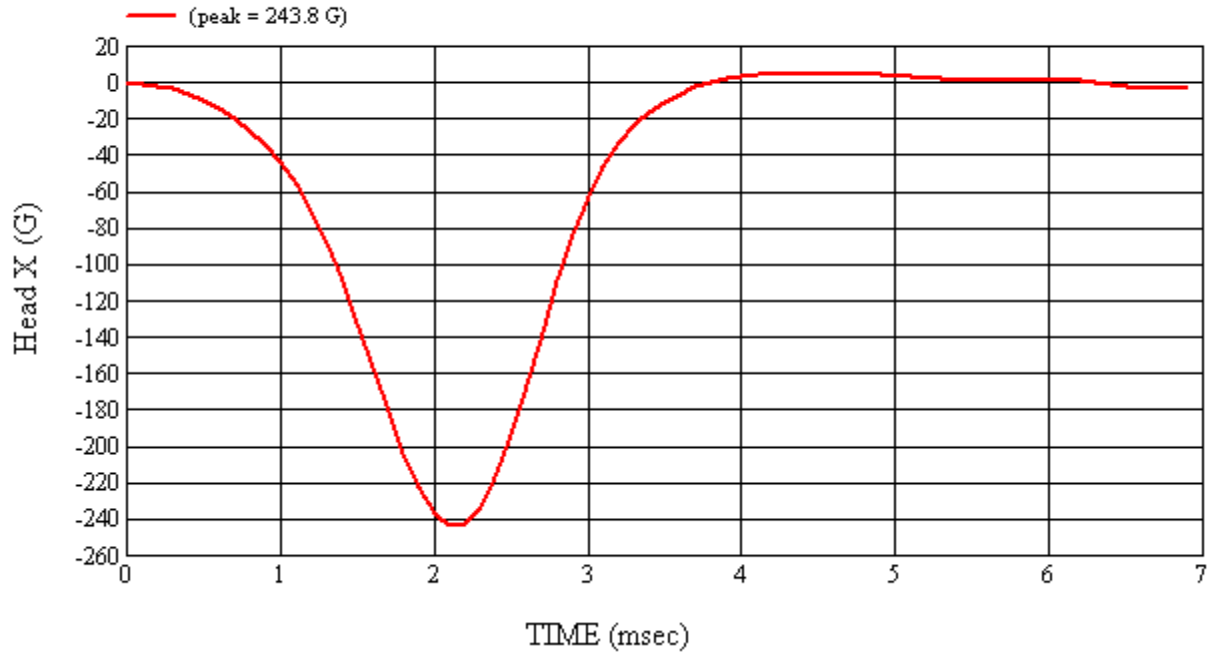
APPROVED BY: *Adrian I. Smith*



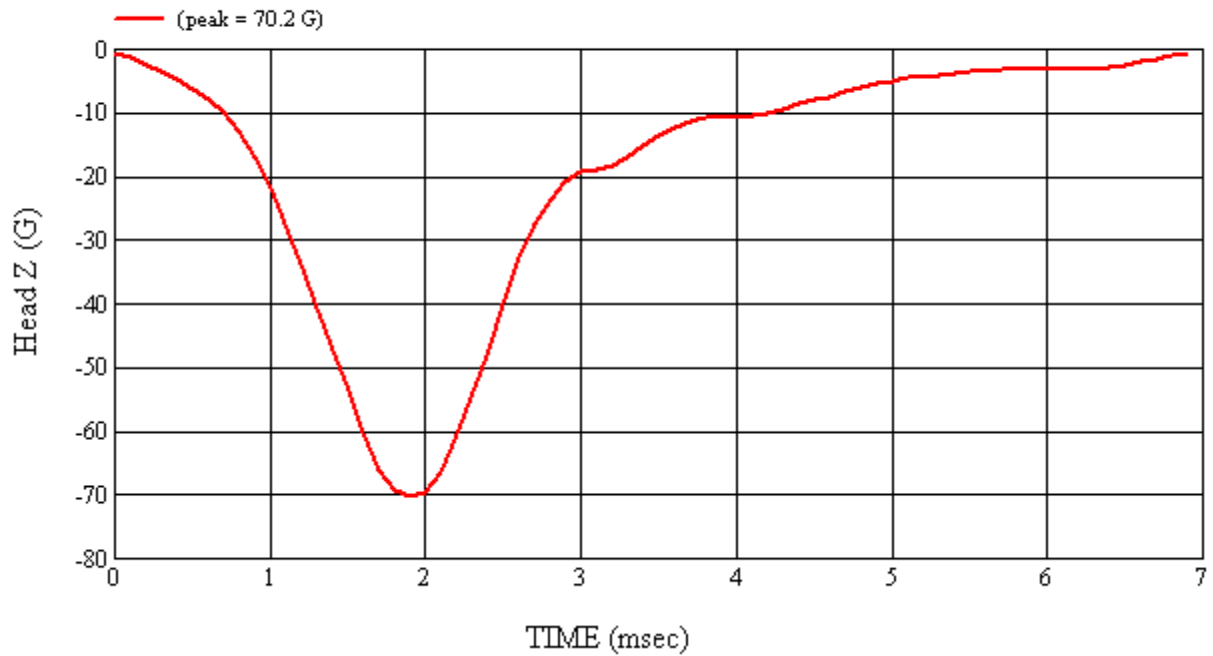
Head 035 (Pre) Calibration #H35017



Head 035 (Pre) Calibration #H35017



Head 035 (Pre) Calibration #H35017



Head 035 (Pre) Calibration #H35017

4-2 Post-Test Calibration

**HEAD DROP TEST SUMMARY
PART 572L**

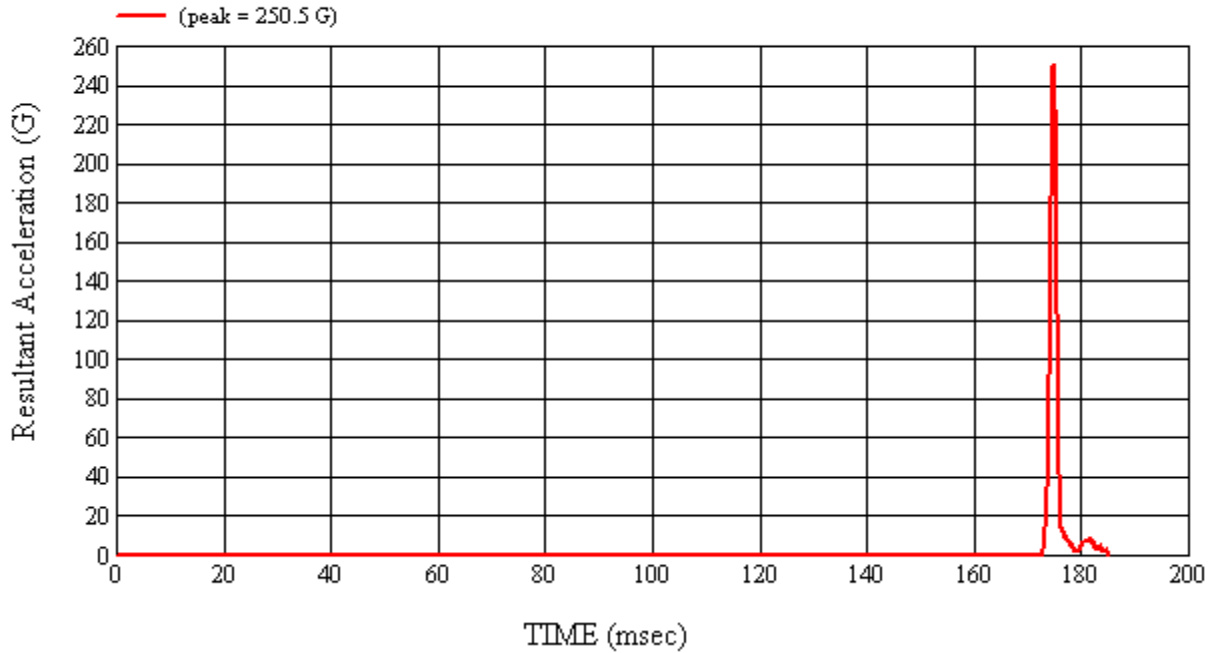
HEADFORM SERIAL NUMBER: 035		CALIBRATION DATE: 5/10/2011
CALIBRATION TIME: 10:38:31 AM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.6
Relative Humidity	10% to 70%	43.4
Peak Resultant Acceleration	225 G's to 275 G's	250.5
Peak Lateral Acceleration	15 G's Maximum	4.0
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

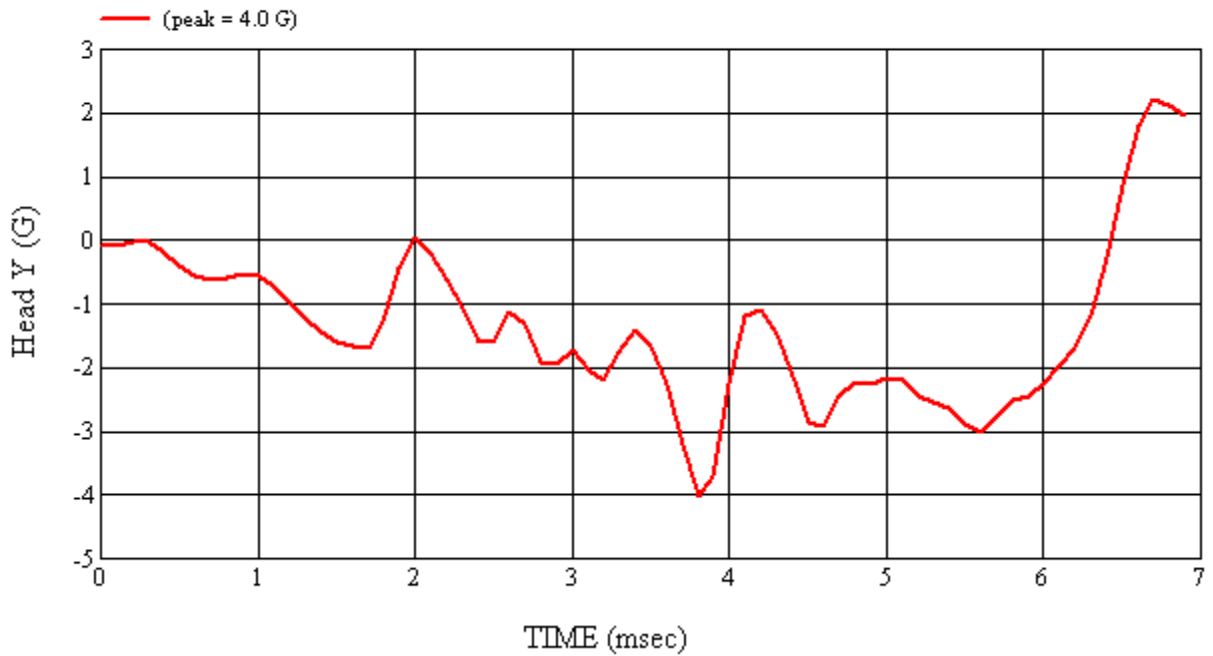
REMARKS:

RECORDED BY: *Keri D. McLean* DATE: 5/10/2011

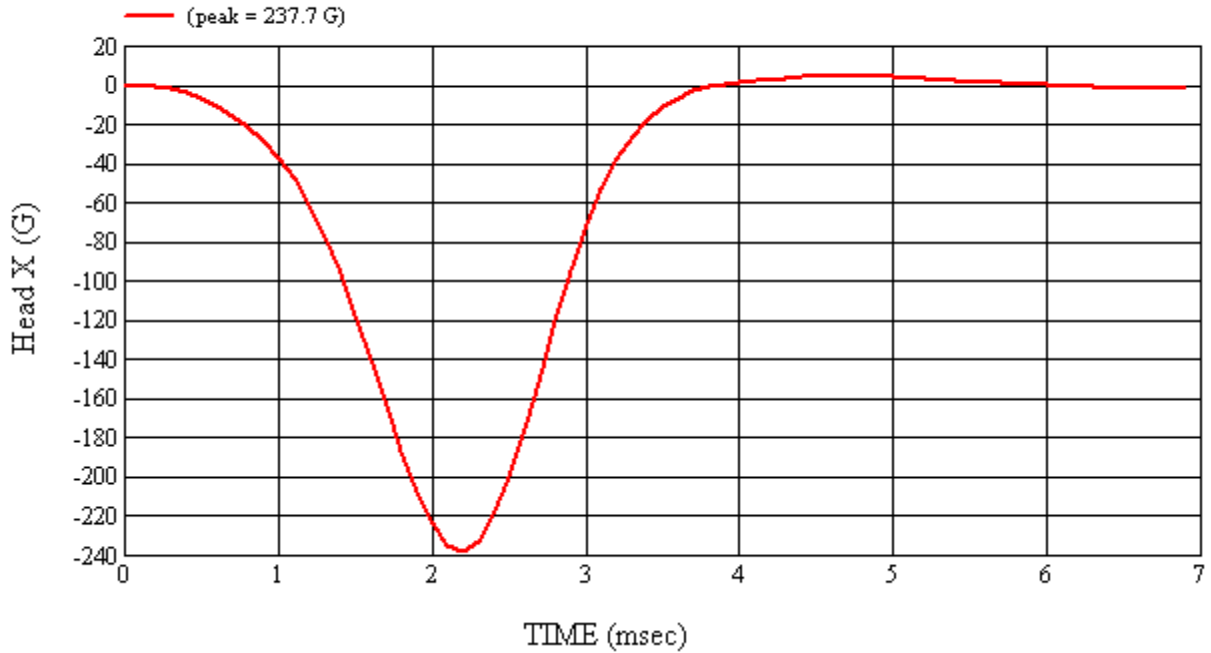
APPROVED BY: *Adham I. Smith*



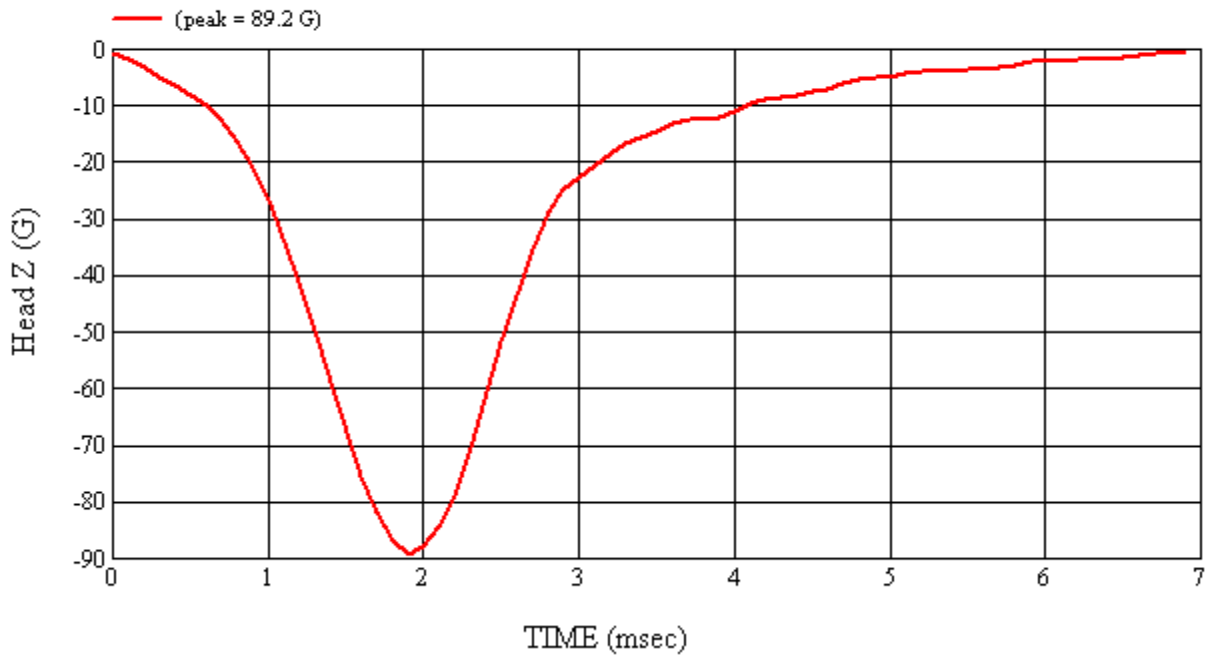
Head 035 (Post) Calibration #H35018



Head 035 (Post) Calibration #H35018



Head 035 (Post) Calibration #H35018



Head 035 (Post) Calibration #H35018

4-3 Pre-Test Calibration

**HEAD DROP TEST SUMMARY
 PART 572L**

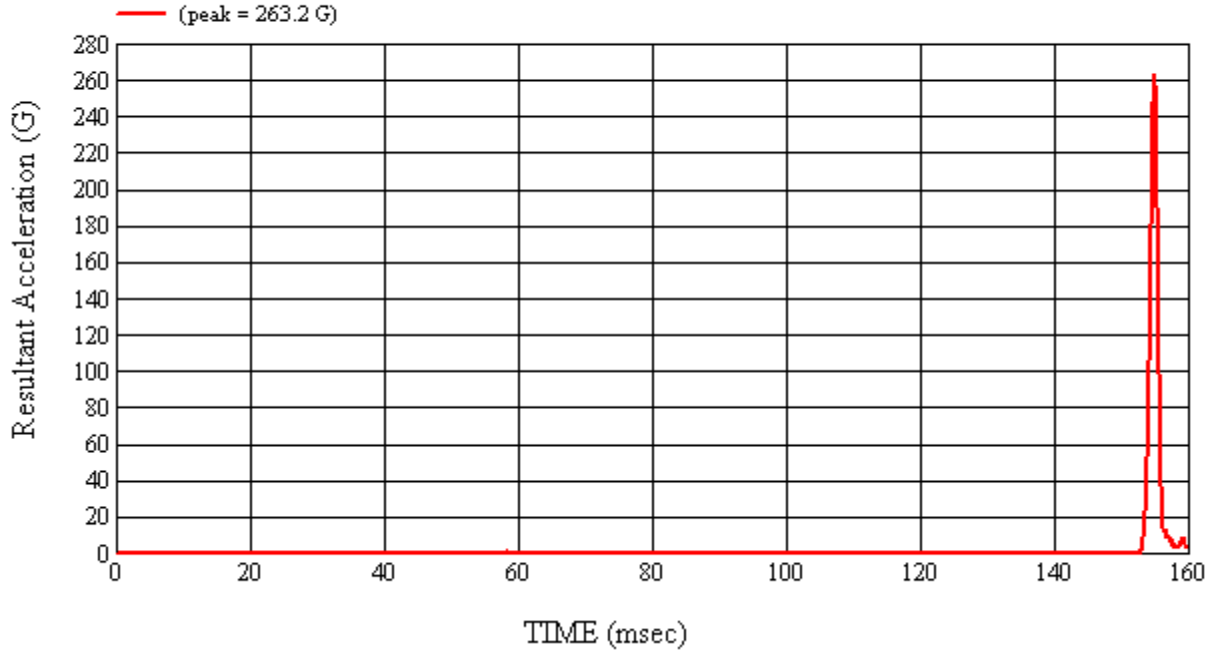
HEADFORM SERIAL NUMBER: 037		CALIBRATION DATE: 5/4/2011
CALIBRATION TIME: 3:16:40 PM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	21.7
Relative Humidity	10% to 70%	29.1
Peak Resultant Acceleration	225 G's to 275 G's	263.2
Peak Lateral Acceleration	15 G's Maximum	4.6
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	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

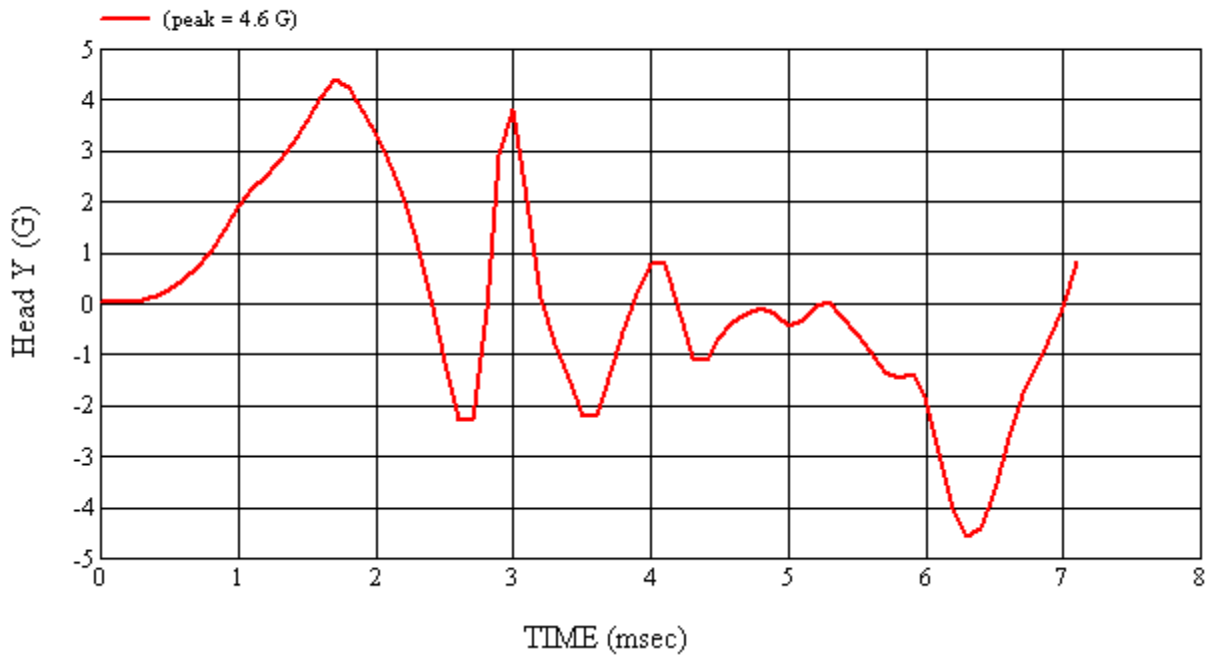
REMARKS:

RECORDED BY: *Keri D. McLean* DATE: 5/4/2011

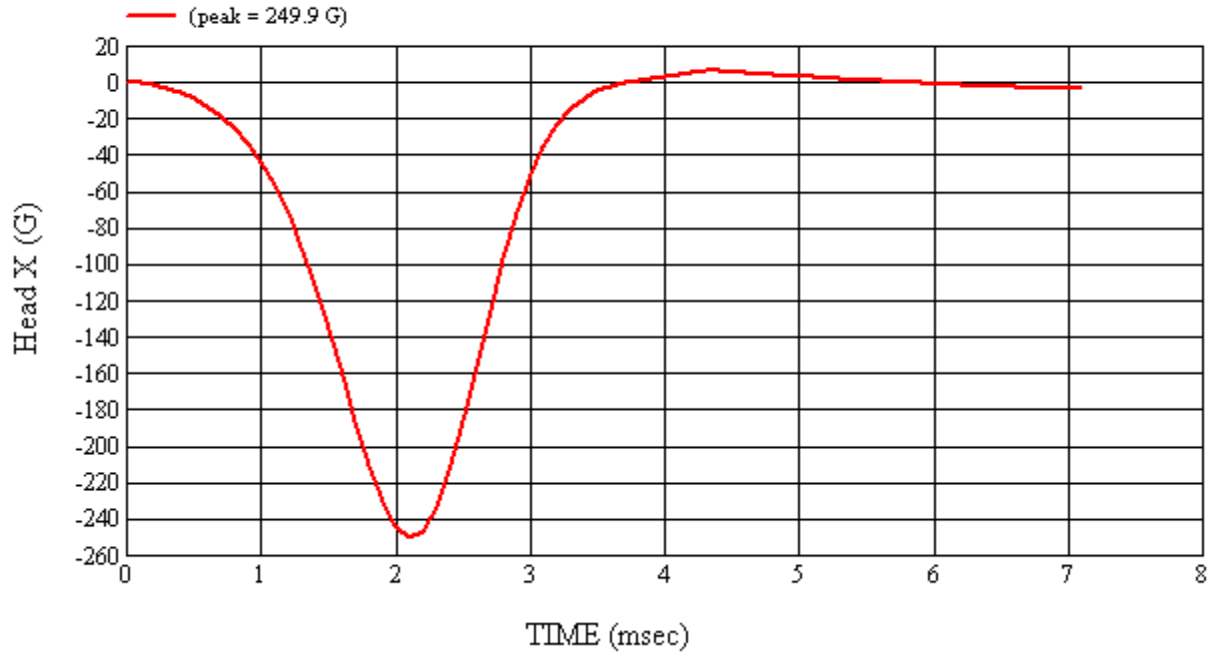
APPROVED BY: *Adrian I. Smith*



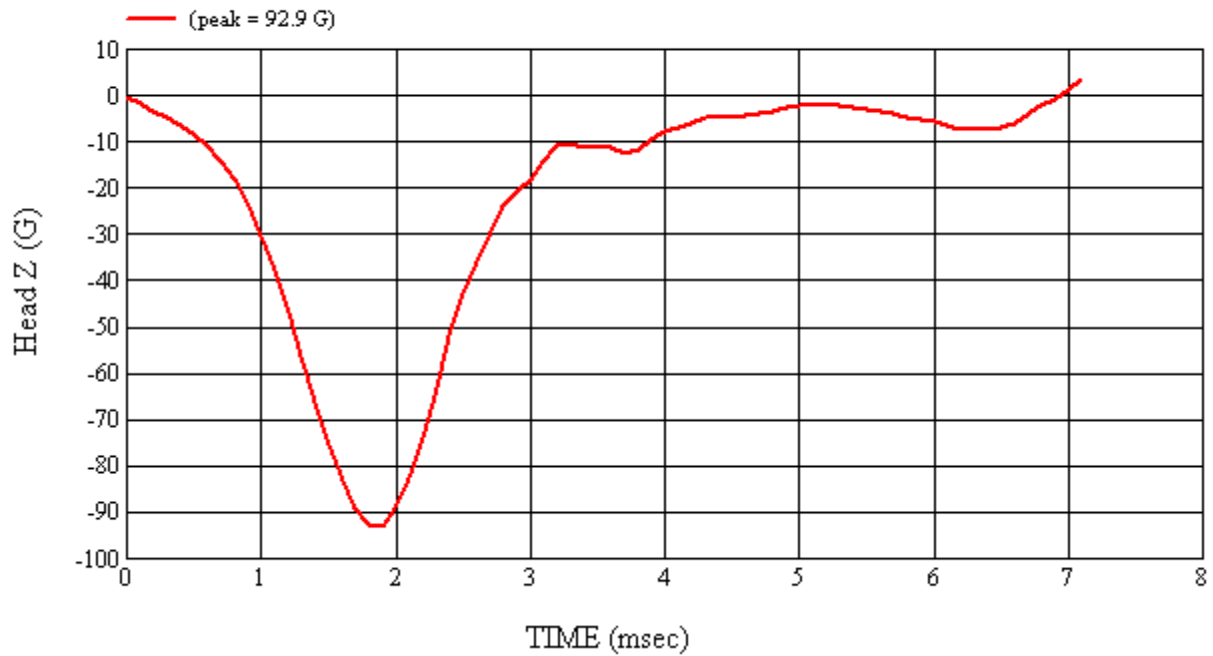
Head 037 (Pre) Calibration #H37017



Head 037 (Pre) Calibration #H37017



Head 037 (Pre) Calibration #H37017



Head 037 (Pre) Calibration #H37017

4-4 Post-Test Calibration

**HEAD DROP TEST SUMMARY
 PART 572L**

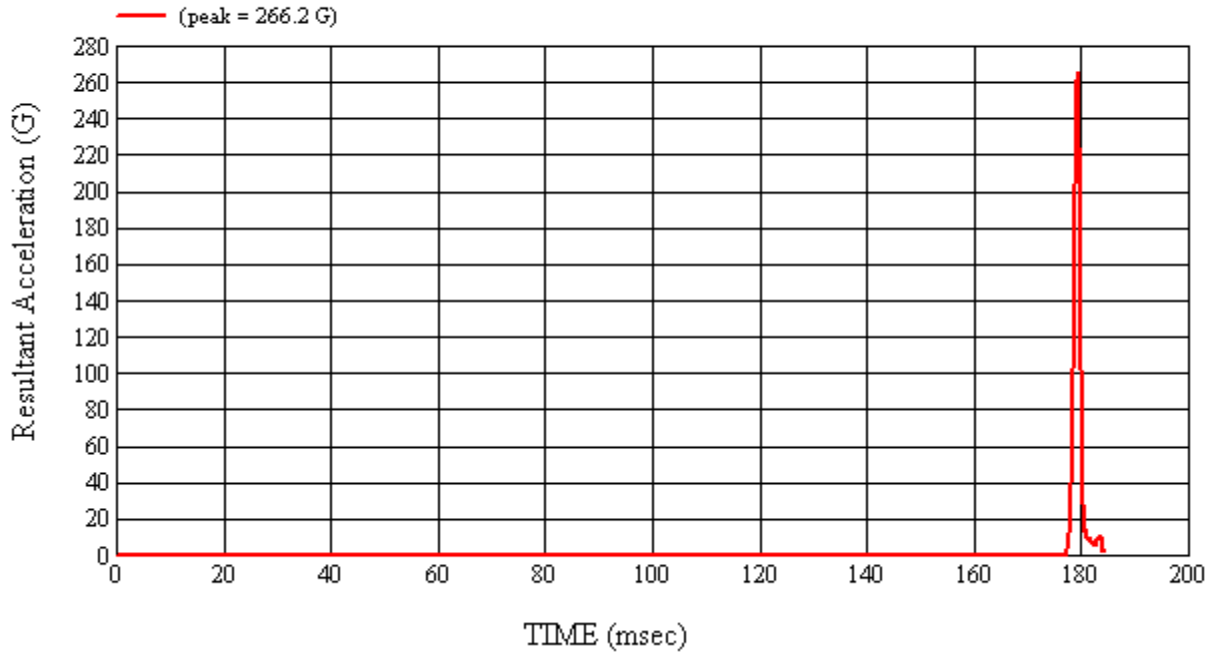
HEADFORM SERIAL NUMBER: 037		CALIBRATION DATE: 5/10/2011
CALIBRATION TIME: 10:58:53 AM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22.7
Relative Humidity	10% to 70%	39.7
Peak Resultant Acceleration	225 G's to 275 G's	266.2
Peak Lateral Acceleration	15 G's Maximum	6.7
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	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

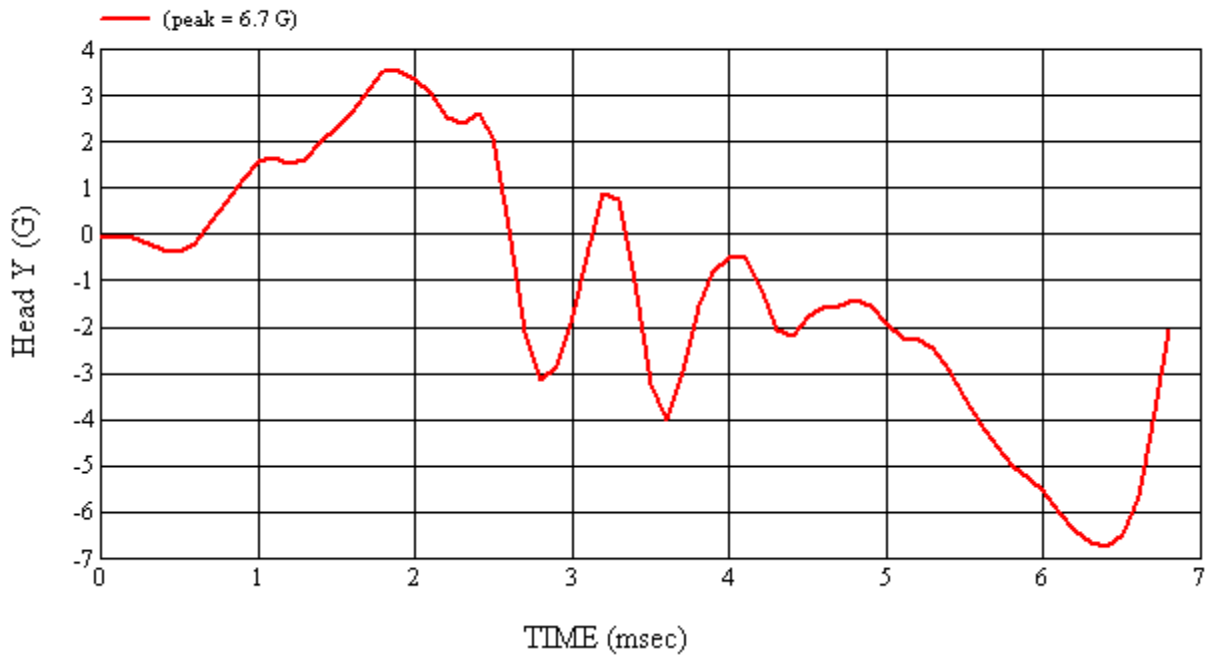
REMARKS:

RECORDED BY: *Keri D. McLean* DATE: 5/10/2011

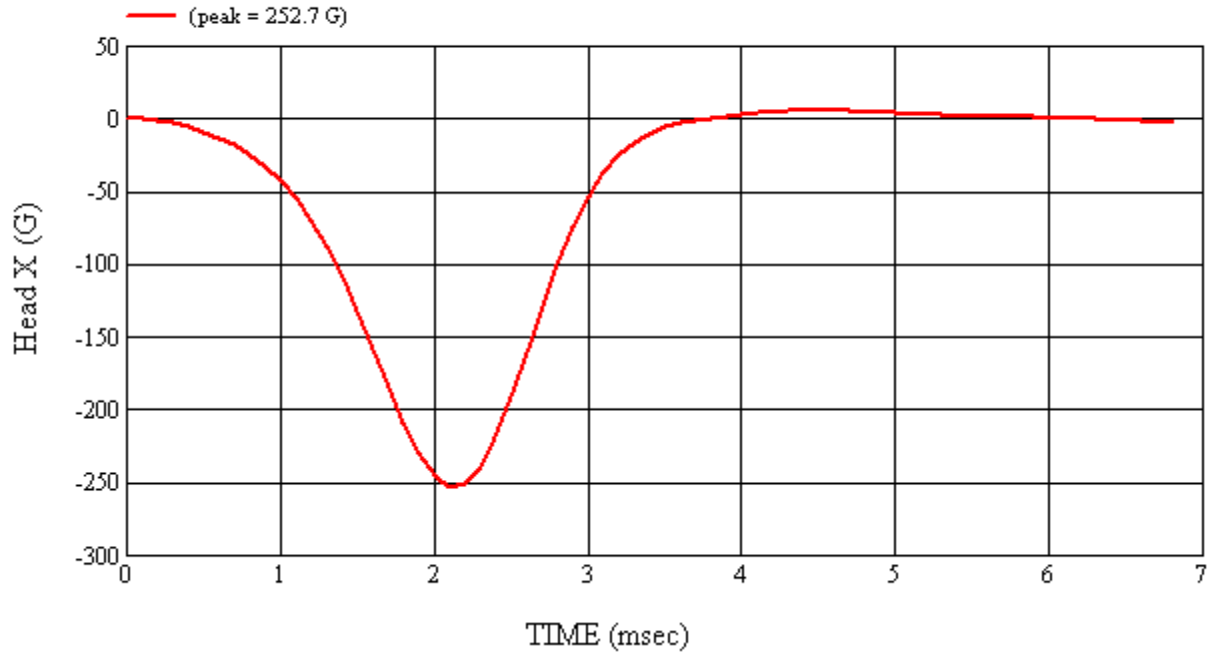
APPROVED BY: *Adham I. Smith*



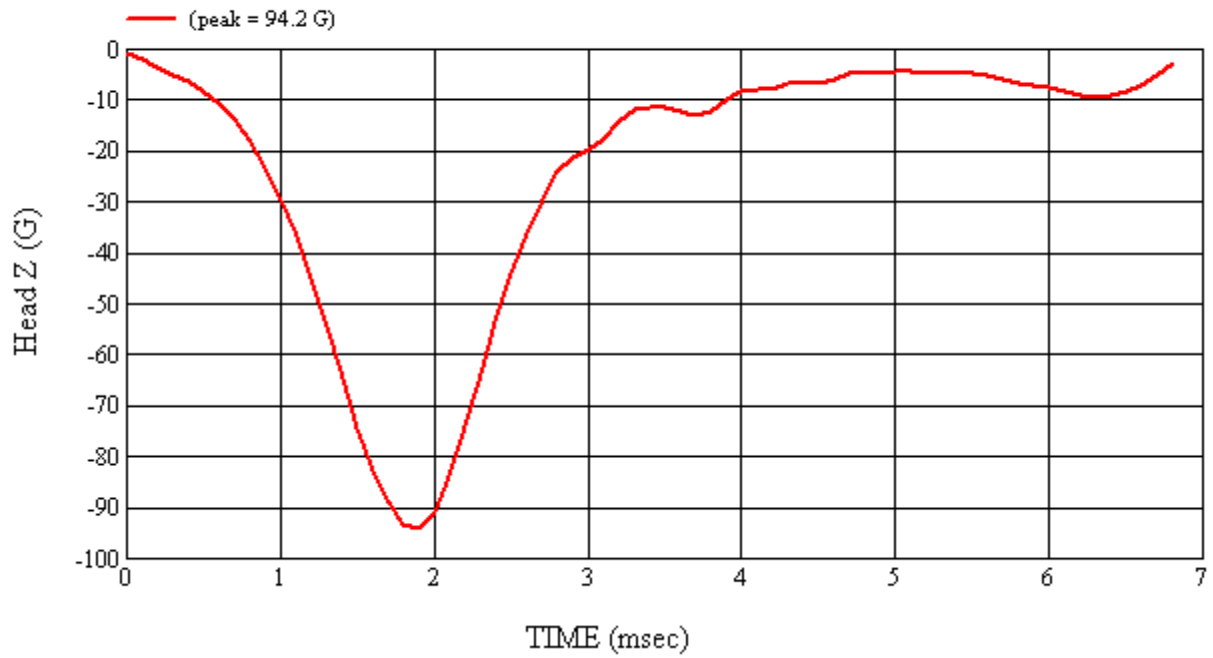
Head 037 (Post) Calibration #H37018



Head 037 (Post) Calibration #H37018



Head 037 (Post) Calibration #H37018



Head 037 (Post) Calibration #H37018

4-5 Pre-Test Calibration

**HEAD DROP TEST SUMMARY
 PART 572L**

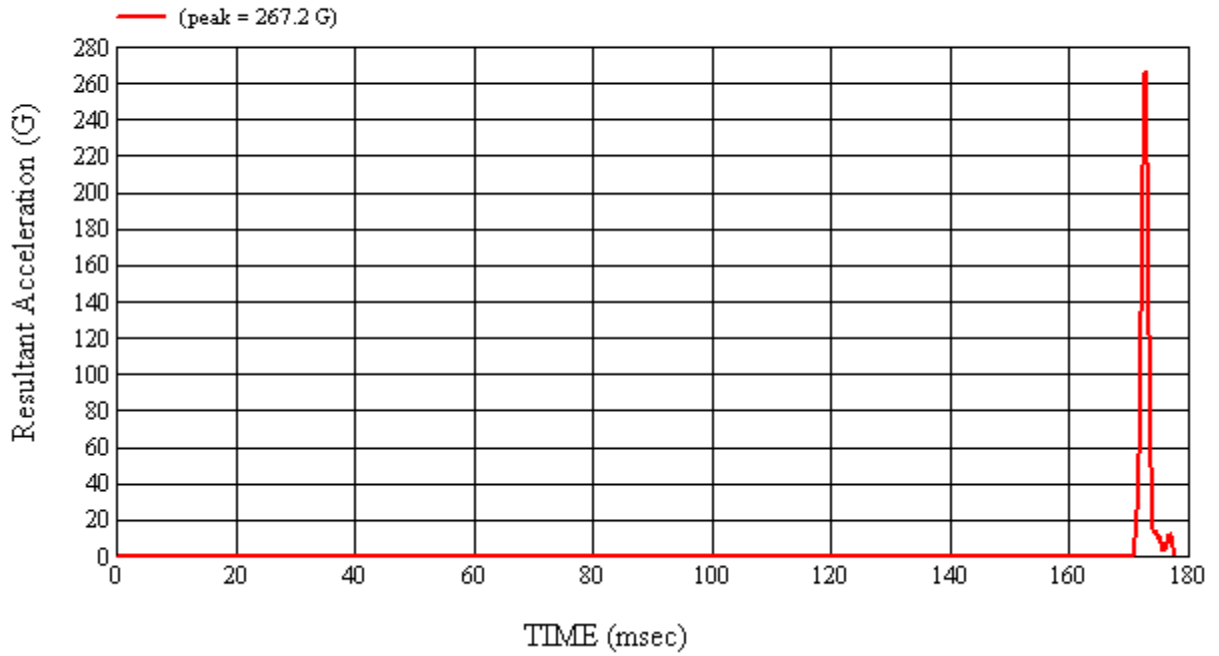
HEADFORM SERIAL NUMBER: 038		CALIBRATION DATE: 5/4/2011
CALIBRATION TIME: 3:37:48 PM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	21.6
Relative Humidity	10% to 70%	29.7
Peak Resultant Acceleration	225 G's to 275 G's	267.2
Peak Lateral Acceleration	15 G's Maximum	14.0
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

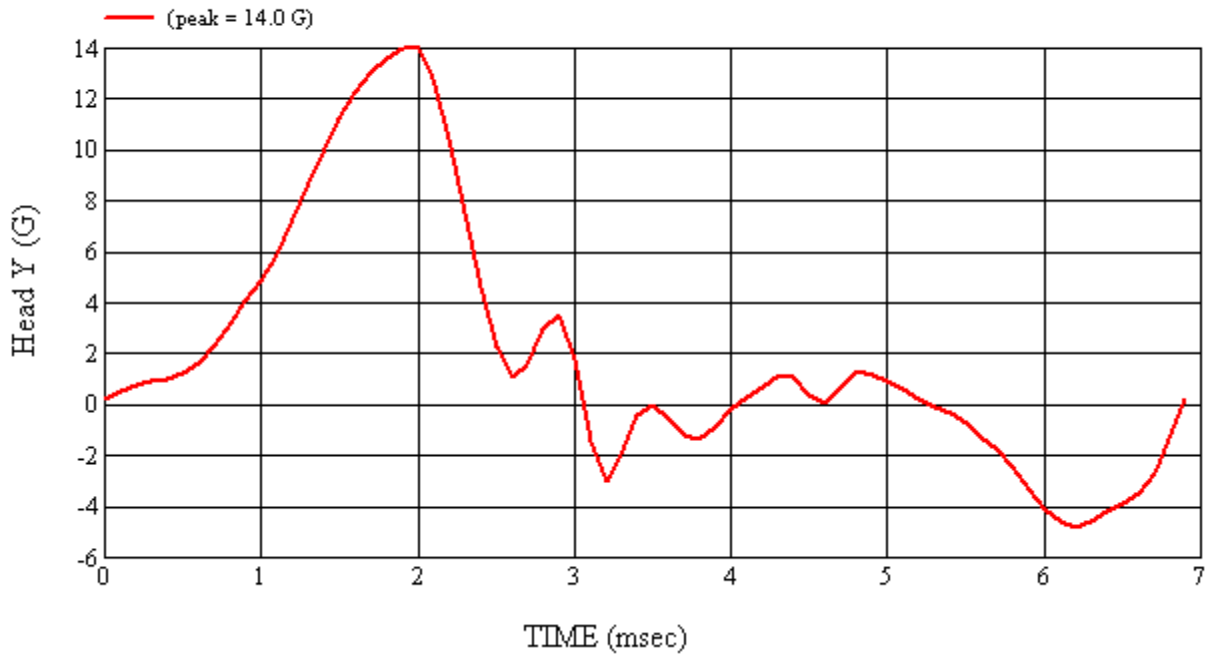
REMARKS:

RECORDED BY: *Keri D. McLean* DATE: 5/4/2011

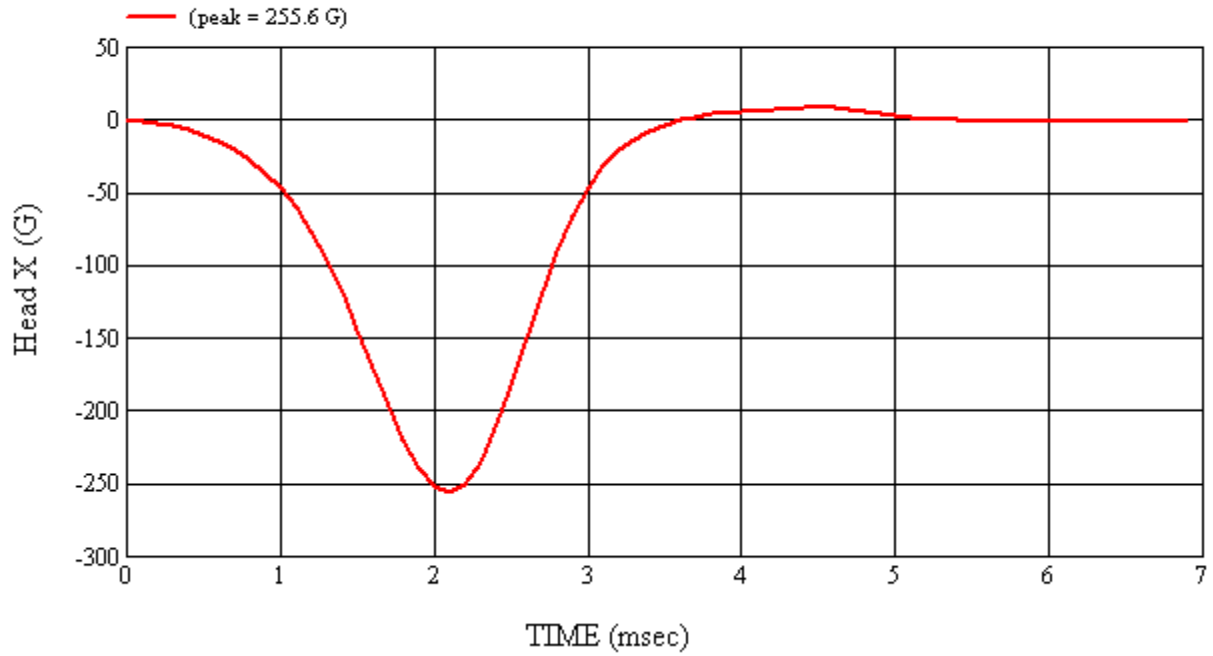
APPROVED BY: *Adrian Smith*



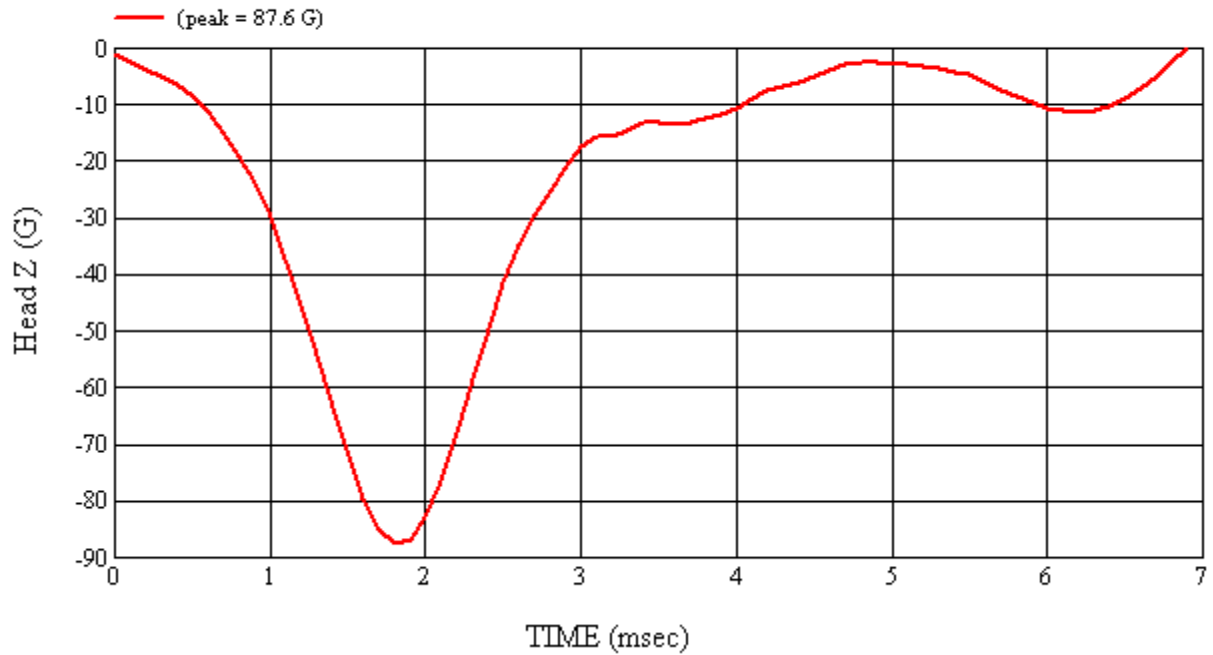
Head 038 (Pre) Calibration #H38017



Head 038 (Pre) Calibration #H38017



Head 038 (Pre) Calibration #H38017



Head 038 (Pre) Calibration #H38017

4-6 Post-Test Calibration

**HEAD DROP TEST SUMMARY
PART 572L**

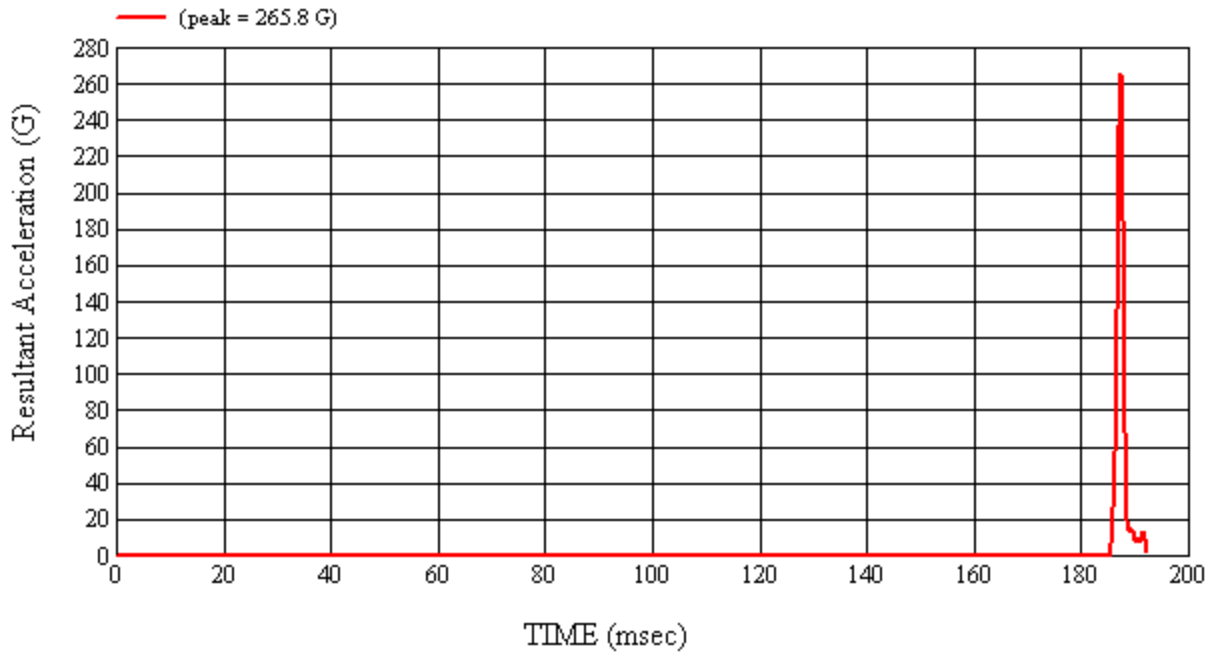
HEADFORM SERIAL NUMBER: 038		CALIBRATION DATE: 5/10/2011
CALIBRATION TIME: 11:16:21 AM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.7
Relative Humidity	10% to 70%	38.7
Peak Resultant Acceleration	225 G's to 275 G's	265.8
Peak Lateral Acceleration	15 G's Maximum	12.8
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	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

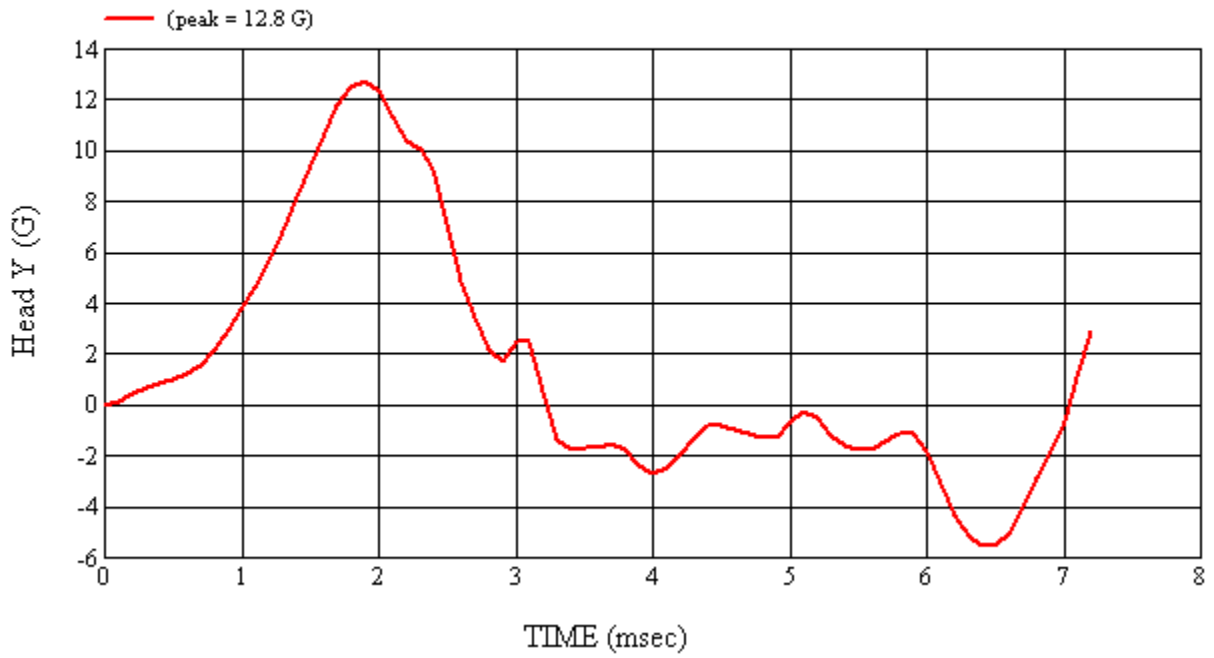
REMARKS:

RECORDED BY: *Keri D. McLean* DATE: 5/10/2011

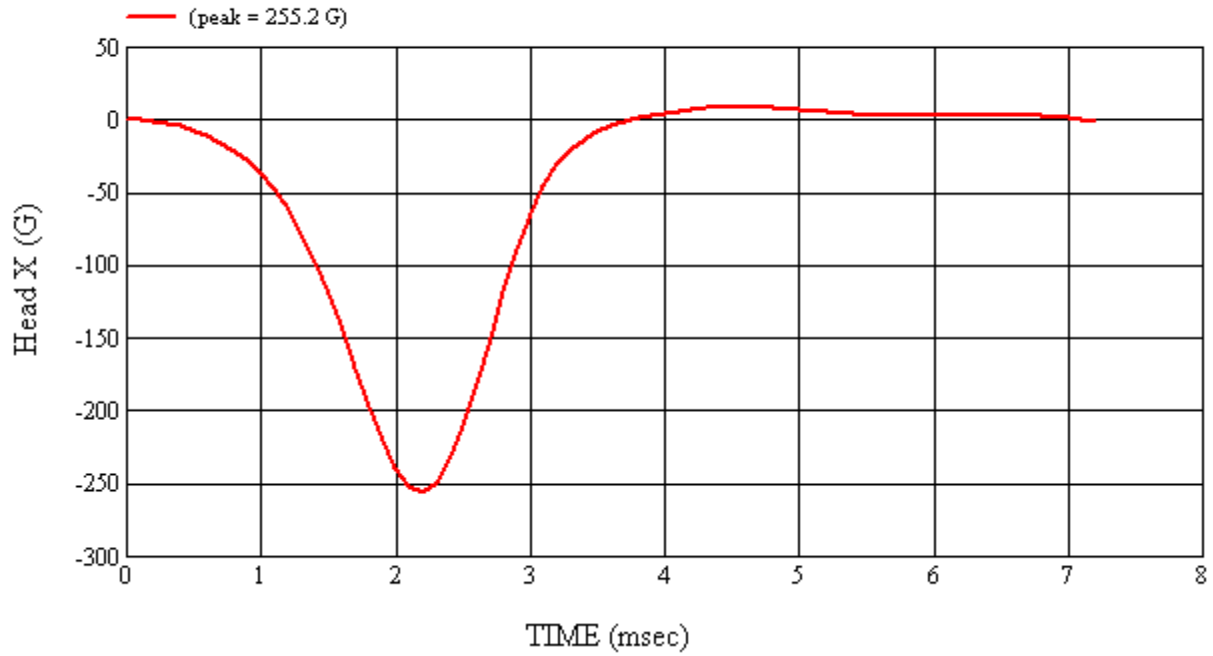
APPROVED BY: *Adham I. Smith*



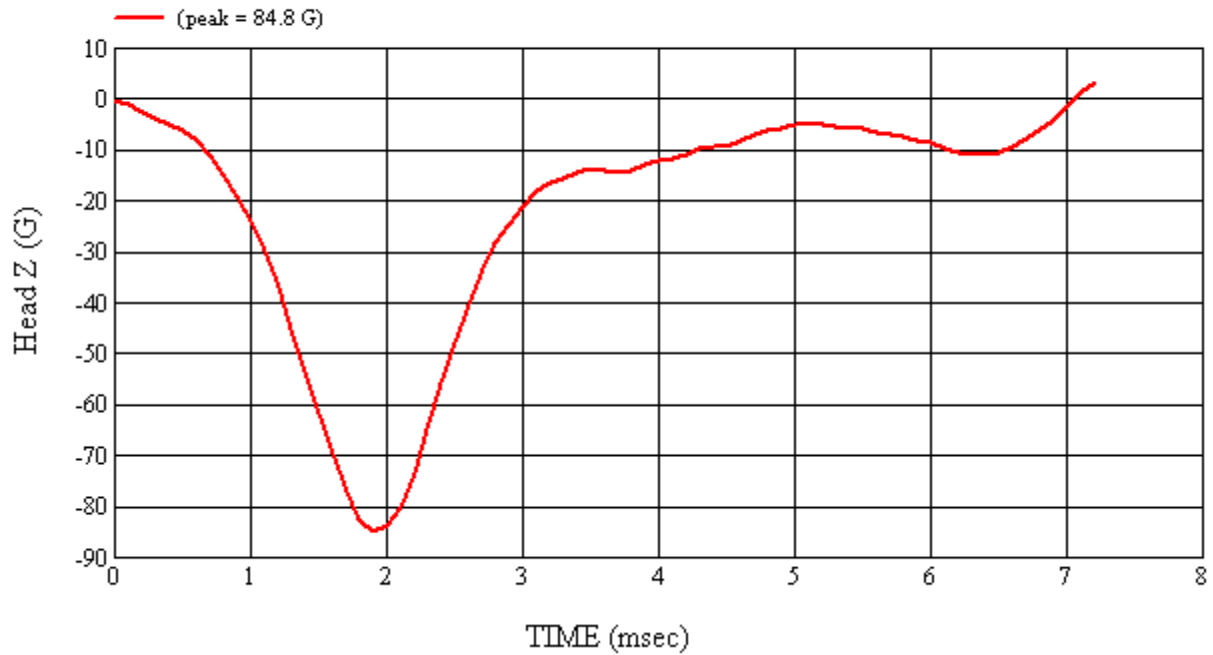
Head 038 (Post) Calibration #H38018



Head 038 (Post) Calibration #H38018



Head 038 (Post) Calibration #H38018



Head 038 (Post) Calibration #H38018

5.0 PHOTOGRAPHS



As Delivered – Left Side View



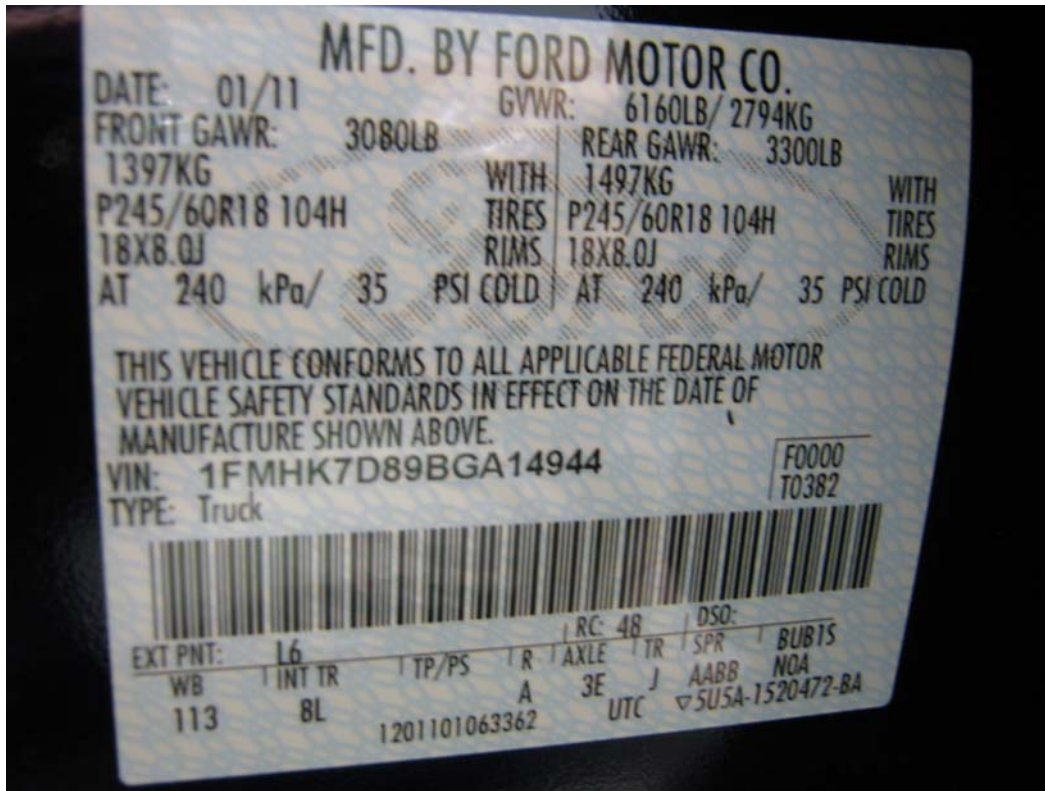
As Delivered – Right Side View



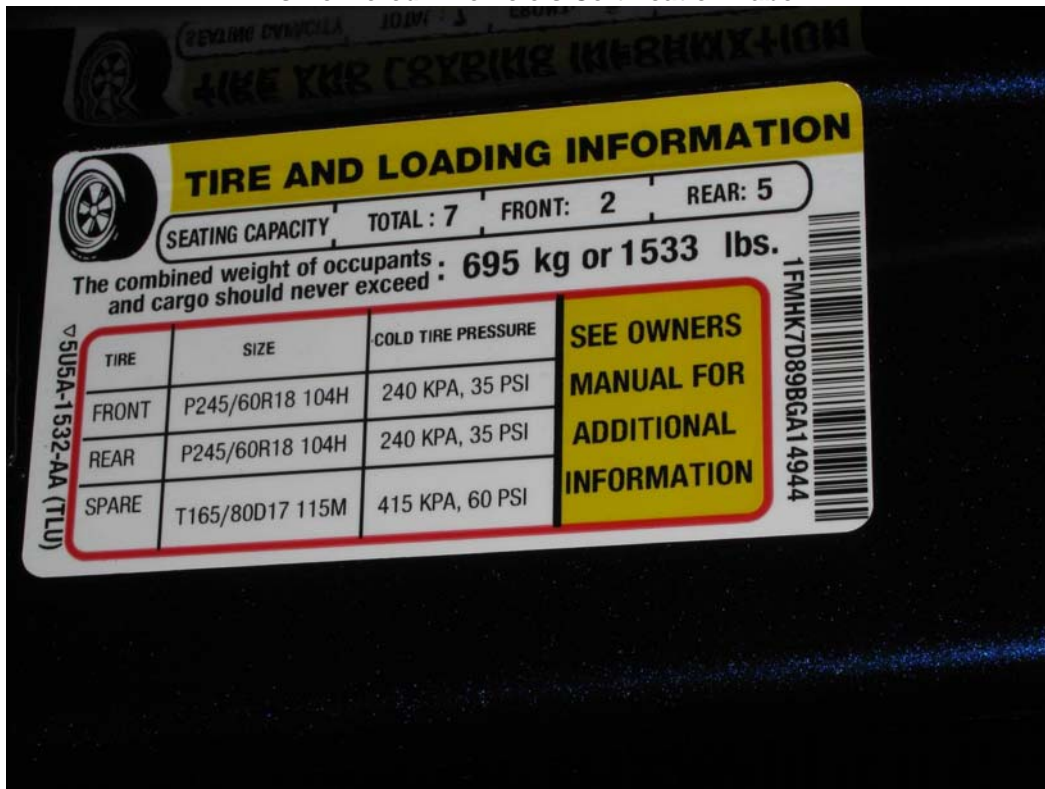
As Delivered – ¾ Front View From Left Side



As Delivered – ¾ Rear View From Right Side



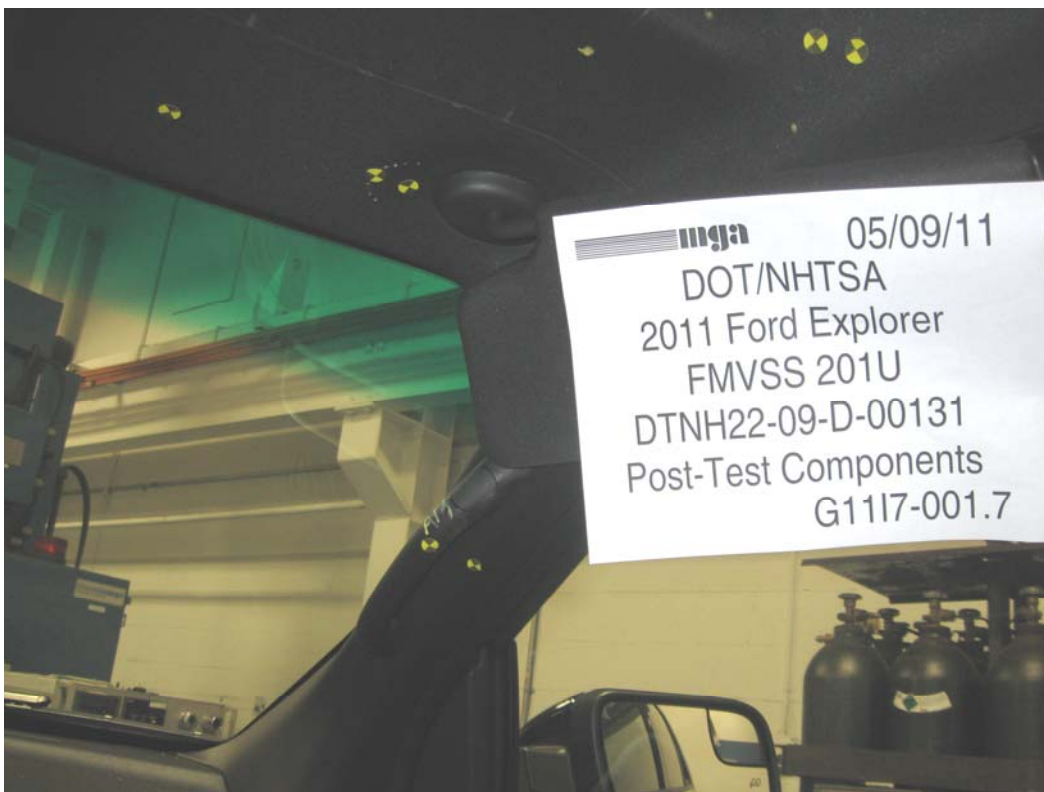
As Delivered – Vehicle’s Certification Label



As Delivered – Vehicle’s Tire Information Label

Pre-Test Component Photographs Not Available

Post-Test Component Photographs





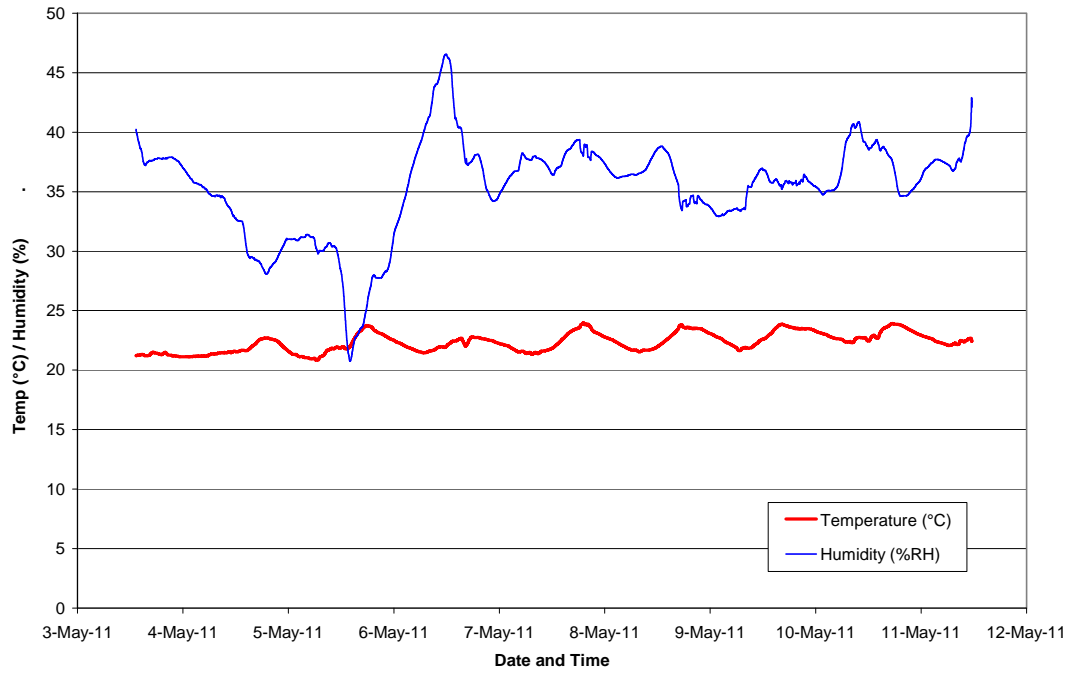






Appendix A – Temperature Trace

CB0203 - 2011 Ford Explorer - FMVSS 201U



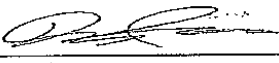
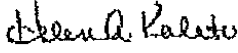
Appendix B – Calibration Certificates

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	Sensor
Name: Accel Standard	Name: MGA MI
Model #: 352C03	Manufacturer: Endeveco
Serial #: 95980	Model #: 7264-2000
Capacity: G's:250	Serial #: J35919
Calibration Date: 9/14/2010	Capacity/Range: 2,000 (G's)
Calibrated By: Modal Shop	

Calibration Date: 2/4/2011
New DLR(Units:G'S) ¹ 95.8
100K SHUNT
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: 

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.

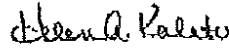
MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference		Sensor	
Name:	Accel Standard	Name:	MGAMI
Model #	352C03	Manufacturer	Endevco
Serial #:	95980	Model #:	7264-2000
Capacity:	G's:250	Serial #:	J22664
Calibration Date:	9/14/2010	Capacity/Range:	2,000 (G's)
Calibrated By:	Modal Shop		

Calibration Date: 2/4/2011
New DLR(Units:G'S) ¹ 94.2
100K SHUNT
Linearity: ² 0.99938
New vs Old Sensitivity
(% Difference) 1.2
Temperature: 72 °F
Humidity: 20 %
Sensitivity (mV/V/G): 0.026447
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

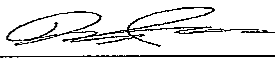

Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference		Sensor	
Name:	Accel Standard	Name:	MGA MI
Model #	352C03	Manufacturer:	Endevco
Serial #:	95980	Model #:	7264-2000
Capacity:	G's:250	Serial #:	J35924
Calibration Date:	9/14/2010	Capacity/Range:	2,000 (G's)
Calibrated By:	Modal Shop		

Calibration Date: 2/4/2011
New DLR(Units:G'S) ¹ 92.8
100K SHUNT
Linearity: ² 0.99947
New vs Old Sensitivity (% Difference) 1.2
Temperature: 72 °F
Humidity: 20 %
Sensitivity (mV/V/G): 0.026824
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 $1 - (\text{Standard Deviation} / \text{Mean})$

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		Sensor	
Name:	Accel Standard	Name:	MGAMI
Model #	352C03	Manufacturer	Endevco
Serial #:	95980	Model #:	7264-2000
Capacity:	G's:250	Serial #:	J32177
Calibration Date:	9/14/2010	Capacity/Range:	2,000 (G's)
Calibrated By:	Modal Shop		

Calibration Date: 2/4/2011
New DLR(Units:G'S) ¹ 113.7
100K SHUNT
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: _____

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

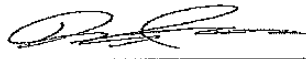
Calibration uncertainty no greater than 4.0 % at the 95% confidence level.

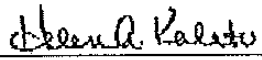
MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference		Sensor	
Name:	Accel Standard	Name:	MGAMI
Model #	352C03	Manufacturer	Endevco
Serial #:	95980	Model #:	7264-2000
Capacity:	G's:250	Serial #:	J14103
Calibration Date:	9/14/2010	Capacity/Range:	2,000 (G's)
Calibrated By:	Modal Shop		

Calibration Date: 2/4/2011
New DLR(Units:G'S) ¹ 93.9
100K SHUNT
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: 

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		Sensor	
Name:	Accel Standard	Name:	MGA MI
Model #:	352C03	Manufacturer:	Endevco
Serial #:	95980	Model #:	7264-2000
Capacity:	G's:250	Serial #:	I35800
Calibration Date:	9/14/2010	Capacity/Range:	2,000 (G's)
Calibrated By:	Modal Shop		

Calibration Date: 2/4/2011

New DLR(Units:G'S) ¹ 97.8
100K SHUNT

Linearity:² 0.9995

New vs Old Sensitivit
(% Difference) 0.6

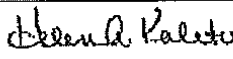
Temperature: 72 °F

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		Sensor	
Name:	Accel Standard	Name:	MGA MI
Model #	352C03	Manufacturer	Endevco
Serial #:	95980	Model #:	7264-2000
Capacity:	G's:250	Serial #:	J22700
Calibration Date:	9/14/2010	Capacity/Range:	2,000 (G's)
Calibrated By:	Modal Shop		

Calibration Date: 2/7/2011

New DLR(Units:G'S) ¹ 96.4
100K SHUNT

Linearity: ² 0.99966

New vs Old Sensitivity (% Difference) 0.5

Temperature: 70 °F

Humidity: 20 %

Sensitivity (mV/V/G): 0.025819

Calibrated By: Chris Collins

Signature: Chris Collins

Approved by: Aben D. Kalato

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

2. Linearity is defined as $1 - (\text{Standard Deviation} / \text{Mean})$

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		Sensor	
Name:	Accel Standard	Name:	MGAMI
Model #	352C03	Manufacturer	Endevco
Serial #:	95980	Model #:	7264-2000
Capacity:	G's:250	Serial #:	J36197
Calibration Date:	9/14/2010	Capacity/Range:	2,000 (G's)
Calibrated By:	Modal Shop		

Calibration Date: 2/7/2011

New DLR(Units:G'S) ¹ 108.7
100K SHUNT

Linearity: ² 0.99976

New vs Old Sensitivity
(% Difference) 0.9

Temperature: 70 °F

Humidity: 20 %

Sensitivity (mV/V/G): 0.022869

Calibrated By: Chris Collins

Signature: Chris Collins

Approved by: Alvan D. Kalish

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

2. Linearity is defined as $1 - (\text{Standard Deviation} / \text{Mean})$

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		Sensor	
Name:	Accel Standard	Name:	MGA MI
Model #	352C03	Manufacturer	Endevco
Serial #:	95980	Model #:	7264-2000
Capacity:	G's:250	Serial #:	J36353
Calibration Date:	9/14/2010	Capacity/Range:	2,000 (G's)
Calibrated By:	Modal Shop		

Calibration Date: 2/7/2011

New DLR(Units:G'S) ¹ 99.1
100K SHUNT

Linearity:² 0.99988

New vs Old Sensitivity
(% Difference) 0.9

Temperature: 70 °F

Humidity: 20 %

Sensitivity (mV/V/G): 0.025114

Calibrated By: Chris Collins

Signature: Chris Collins

Approved by: Heard Kaleski

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.



~Calibration Certificate~

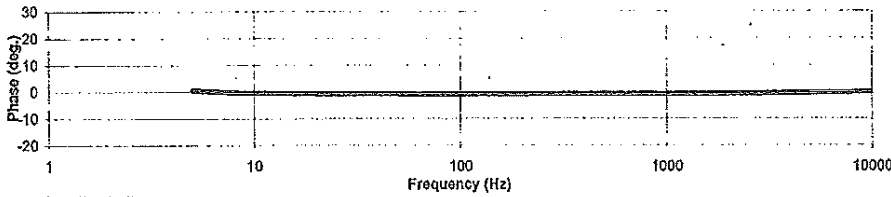
3149 East Kemper Rd.
 Cincinnati, OH 45241
 Ph: 513-351-9919
 Fax: 513-458-2172
 www.modalshop.com

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

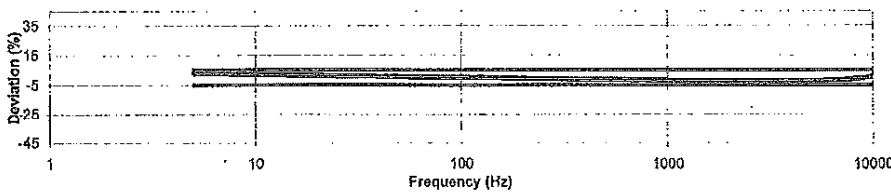
Calibration Data
 Sensitivity @ 100 Hz: 9.94 mV/g
 Phase @ 100 Hz: -0.87 deg.
 Test Level: 10.00 g

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 permission.
 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 822/271198).
 Back-to-Back Comparison Calibration per ISO 16063-21
 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; ± 2.50%, 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: *Ed Devlin*

Cal Date: 9/14/2010
 Due Date:



Cal ID: 15800 2649 01



~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 Acquisition 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 *Ed Devlin*

Cal Date: 9/14/2010

Customer: MGA Research Corp.

Due Date:



Calibration Certificate

Part Description: Silver Certification Date: 10/19/2010 Serial#: S08-05-98-01273
Single Point - (Max-Min)/2 Specification: S08-05 075mm (.0030") Manufacturer: 50127340470
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: 11/24/2011 *SI Traceability: NIST-8217276660-08

The articles 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 $\pm 2.0\%$ to $\pm 5.0\%$ microcentimeters, unless $K = \text{length in meters}$. Uncertainty is expressed at approximately a 95% Level of Confidence using $k=2.0$.

Calibration Results*

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

*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 certificate shall not be reproduced, except in full, without permission of FARO Technologies, Inc. The results of this certificate relate only to the items calibrated or tested.

FARO Technologies, Inc.
PH: 1-800-736-2771
FX: 407-333-5911
L-AB Cert Number: L1147-1



LABORATORY ACCREDITATION BUREAU
ISO/IEC 17025 Accredited

MICHIGAN OPERATIONS
 DATE: 2/7/14
 SUPERCEDES: MGATPTMCS

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

Tape Measure Calibration Certificate

Reference Steel Rule

Brand: SUSANSON
 S/N: MB90799
 Calibration Date: 1/15/10

Subject Tape Measure

Brand: STANLEY
 S/N: TPM 112
 Calibration Date: 12/13/10

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

If all differences are $\pm 1/32$ of an inch (1 mm), then the tape measure is acceptable.

Pass Fail Maximum Difference = 0

Date: 12/13/2010 Performed By: [Signature]

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 0.2\%$. 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 $k=2$.



Metrology Management Services
Remit to address:

Calibration Certificate

35200 Plymouth Rd.
Livonia, MI 48150



CALIBRATION # 1277.01

Calibration Certificate #:
Z52545:1300708444

PRO PRO 360 PROTRACTOR		WORK ORDER: 1300708444
SERIAL NUMBER: N/A		
ASSET NUMBER: Z52545		
CUST. ASSET NUM: MGA00049		
PROCEDURE NAME: PRO 3600		
PROCEDURE REV: A		
CALIBRATED BY: JOE McCONNAUGHAY		TEST RESULT: PASS
CUSTOMER: MGA RESEARCH		PERFORMED ON: 3/21/2011
446 Executive Drive		CAL DUE DATE: 3/21/2012
Troy, MI 48083		DATA TYPE: FOUND-LEFT
PRIMARY CONTACT: BOB MILLER		TEMPERATURE: 21.00 °C
		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).

This report may not be reproduced, except in full, without written approval from NovaStar Solutions.

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

Action Taken: FULL CALIBRATION

REMARKS:

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 *****

@ 3/20/11

QA approved: Steve Hall Date: 3-22-11
Signature: [Signature]

Asset Barcode:



Metrology Management Services
Remit to address:

Calibration Certificate

35200 Plymouth Rd.
Livonia, MI 48150



CALIBRATION # 1277.01
Calibration Certificate #:
Z52549:1300715528

DICKSON TM325 TEMP/HUMD DISP		WORK ORDER: 1300715528
SERIAL NUMBER:	N/A	
ASSET NUMBER:	Z52549	
CUST. ASSET NUM:	MGA00894	
PROCEDURE NAME:	1012	
PROCEDURE REV:	A	
CALIBRATED BY:	JOE McCONNAUGHAY	TEST RESULT: PASS
CUSTOMER:	MGA RESEARCH	PERFORMED ON: 3/21/2011
	446 Executive Drive	CAL DUE DATE: 3/21/2012
	Troy, MI 48083	DATA TYPE: FOUND-LEFT
PRIMARY CONTACT:	BOB MILLER	TEMPERATURE: 21.00 °C
		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).

This report may not be reproduced, except in full, without written approval from NovaStar Solutions

As Received Condition: IN TOLERANCE As Returned Condition: IN TOLERANCE
Action Taken: FULL CALIBRATION

REMARKS:

Asset #	Cert#	Description	Cal Date	Due Date
1504	1504:1296548177	HART SCIENTIFIC 1502A THERMOMETER READOUT	2/7/2011	2/7/2012
1541	1541:1300372477	NEWPORT CT485AL HYGROTHERMOGRAPH	3/17/2011	3/17/2012
1717	1717:1297150241	HART SCIENTIFIC 5614 PRT	2/7/2011	2/7/2012
1917	1917:1296319659	VAISALA M170/HMP76 MEASUREMENT INDICATOR/PROBE	1/29/2011	1/29/2012

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

@ 3/28/11

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

Asset Barcode:



ACCREDITED
 CALIBRATION CERT #0513101

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 48063

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.

Calibration Procedure
 Uncertainty Expressed at
 95% confidence, (K=2)

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

Weight Test	As Found			As Left		
	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
 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 48075

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 48063
 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 Adjustment	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: 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.
 COMMENTS/ Scale passes tests
 weights used 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 determined by the customer
 Sterling Scale does not warranty calibration.