

FINAL REPORT NUMBER 201UI-MGA-11-03

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

**VOLKSWAGEN DE MEXICO S.A. DE C.V.
2011 Volkswagen Jetta S
NHTSA No. CB5801**

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



Test Dates: April 7-11, 2011
Report Date: April 12, 2011


FINAL REPORT

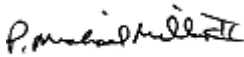
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ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 New Jersey Avenue, SE
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WASHINGTON, D.C. 20590**

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16. Abstract A compliance test series was conducted on the subject 2011 Volkswagen Jetta S, NHTSA No. CB5801, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-201U-01 for the determination of FMVSS 201 compliance. The testing was conducted at MGA Research Corporation in Troy, Michigan on April 7-11, 2011. Test failures identified were as follows: None The data recorded indicates that the 2011 Volkswagen Jetta S tested appears to comply with the upper interior requirements of FMVSS 201.					
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1.0 PURPOSE OF COMPLIANCE TEST

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

Tests were conducted on April 7-11, 2011 on a 2011 Volkswagen Jetta S, manufactured by Volkswagen de Mexico S.A. DE C.V.

All tests were conducted in accordance with the U. S. Department of Transportation, National Highway Traffic Safety Administration's Laboratory Test Procedure TP-201U-01 dated April 3, 1998 and the corresponding MGA Research Corporation's FMVSS 201U procedure number MGATP201U_FRAME#2 dated August 21, 2009.

All tests were conducted at MGA Research Corporation in Troy, Michigan and were performed by MGA engineers and technicians. The FMVSS 201U impactor test machine was used to conduct the testing. Target locations were determined by using a Coordinate Measurement Machine in conjunction with the MGA EZ-Target™ program and MGA procedure MGATP201U_Test Series dated November 9, 2009.

2.0 COMPLIANCE TEST DATA SUMMARY

The 2011 Volkswagen Jetta S was equipped with A, B, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, a grab handle located on the side rail above each door (front and rear), and an overhead console located on the front upper roof.

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

AP1	BP1	FH1	UR3@BP
AP2	BP2	SR2B	UR4@SR3-1
AP3	BP4	UR2@SR2A	UR5@SR3-2

The 2011 Volkswagen Jetta S 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 Volkswagen Jetta S

VEH. NHTSA NO.: CB5801 VIN: 3VW1K7AJ2BM056484 COLOR: Reflex Silver

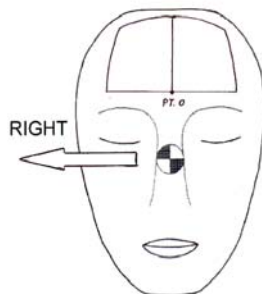
VEH. BUILD DATE: January, 2011 TEST DATES: April 7-11, 2011

TEST LABORATORY: MGA Research Corporation

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

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	107	14	18.9	317	200	13	7 Right
AP2	Left	204	50	18.9	468	399	19	5 Left
AP3	Right	156	50	18.6	506	449	26	1 Right
BP1	Right	90	16	18.6	492	431	39	0
BP2	Left	270	10	24.0	518	466	9	2 Left
BP4	Right	125	0	23.9	664	659	31	11 Right
FH1	Left	180	50	24.1	513	460	14	7 Left
SR2B	Left	270	47	23.9	981	1080	8	9 Right
UR2@SR2A	Right	90	50	23.7	564	527	39	15 Left
UR3@BP	Left	270	50	23.6	659	653	31	3 Right
UR4@SR3-1	Right	90	50	23.9	560	522	21	4 Left
UR5@SR3-2	Left	270	50	23.6	522	471	42	7 Left

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



POST TEST COMMENTS:

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

AP2 Left: Slightly dislodged trim.

AP3 Right: Trim dislodged.

BP2 Left: Cracked trim. Non-functional adjustable anchorage.

BP4 Right: Dislodged pillar trim.

SR2B Left: Grab handle compression.

UR2 Right: Grab handle compression; trim dislodged.

UR4 Right: Grab handle compression and headliner deformation.

UR5 Left: Headliner deformation.

REMARKS:

The targets listed were impacted in the following order:

Left: UR5@SR3-2, BP2, UR3@BP, AP2, FH1, SR2B,

Right: UR2@SR2A, AP3, BP1, UR4@SR3-1, BP4, AP1

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

RECORDED BY: Nathaniel Newth

DATE: April 11, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Volkswagen Jetta S

VEH. NHTSA NO.: CB5801 VIN: 3VW1K7AJ2BM056484 COLOR: Reflex Silver

VEH. BUILD DATE: January, 2011 TEST DATES: April 7-11, 2011

TEST LABORATORY: MGA Research Corporation

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

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

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: February 22, 2011; Odometer Reading 164 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Volkswagen de Mexico S.A. DE C.V.

Date of Manufacture: January, 2011; VIN: 3VW1K7AJ2BM056484

GVWR: 1819.8 kg; GAWR FRONT: 909.9 kg;

GAWR REAR: 959.8 kg;

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 220 kPa REAR: 220 kPa

Recommended Tire Size: P195/65R15

Recommended Cold Tire Pressure:

FRONT: 220 kPa REAR: 220 kPa

Size of Tire on Test Vehicle: P195/65R15

Type of Spare Tire: P195/65R15; Space Saver: __; Standard X

VEHICLE CAPACITY DATA:

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

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

VEHICLE CAPACITY WEIGHT:

Vehicle Capacity Weight (VCW) = 495 kg

No. of Occupants x 68 kg = 340 kg

Rated Cargo/Luggage Weight (RCLW) = 155 kg (difference)

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

Right Front = 373.5 kg Right Rear = 278.0 kg

Left Front = 372.0 kg Left Rear = 273.5 kg

TOTAL FRONT = 745.5 kg TOTAL REAR = 551.5 kg

% Total Weight = 57.5 % % Total Weight = 42.5 %

TOTAL DELIVERED WEIGHT = 1297.0 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1297.0 kg

Max. Test Cargo/Luggage Weight = 136.0 kg

Target Test Weight = 1433.0 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	<u>361.0</u> kg	Right Rear =	<u>361.0</u> kg
Left Front =	<u>355.5</u> kg	Left Rear =	<u>354.5</u> kg
TOTAL FRONT =	<u>716.5</u> kg	TOTAL REAR =	<u>715.5</u> kg
% Total Weight =	<u>50.0</u> %	% Total Weight =	<u>50.0</u> %

TOTAL TEST WEIGHT = 1432.0 kg

Weight of ballast secured in vehicle's cargo area = 135.0 kg

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 674 mm; Left Front 671 mm;
Right Rear 690 mm; Left Rear 685 mm;
Pitch Angle at Right Door Sill = 1.0 Rear is higher
Pitch Angle at Left Door Sill = 0.7 Rear is higher
Roll Angle at Front Bumper = 0.0
Roll Angle at Rear Bumper = 0.0

FULLY LOADED: Right Front 681 mm; Left Front 680 mm;
Right Rear 650 mm; Left Rear 647 mm;
Pitch Angle at Right Door Sill = 0.1 Front is higher
Pitch Angle at Left Door Sill = 0.3 Front is higher
Roll Angle at Front Bumper = 0.1 Left is higher
Roll Angle at Rear Bumper = 0.2 Left is higher

AS TARGETED: Right Front 865 mm; Left Front 865 mm;
Right Rear 852 mm; Left Rear 851 mm;
Pitch Angle at Right Door Sill = 0.4 Rear is higher
Pitch Angle at Left Door Sill = 0.1 Rear is higher
Roll Angle at Front Bumper = 0.1 Left is higher
Roll Angle at Rear Bumper = 0.2 Left is higher

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill = 0.3 Rear is higher
Pitch Angle at Left Door Sill = 0.3 Rear is higher
Roll Angle at Front Bumper = 0.1 Left is higher
Roll Angle at Rear Bumper = 0.2 Left is higher

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill = 0.3 Rear is higher
Pitch Angle at Left Door Sill = 0.2 Rear is higher
Roll Angle at Front Bumper = 0.1 Left is higher
Roll Angle at Rear Bumper = 0.2 Left is higher

VEHICLE WHEELBASE = 2656 mm

REMARKS: The seat travel distance was measured to be 254 mm for the driver front seat and 254 mm for the passenger front seat.

RECORDED BY: Nathaniel Newth

DATE: April 1, 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 Volkswagen Jetta S

VEH. NHTSA NO.: CB5801 VIN: 3VW1K7AJ2BM056484 COLOR: Reflex Silver

VEH. BUILD DATE: January, 2011 TEST DATES: April 7-11, 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 203.9°	L 253.6°
	R 105°-165°	R 106.4°	R 156.2°
B-PILLAR	L 195°-345°	L 199.9°	L 288.8°
	R 15°-165°	R 71.2°	R 160.2°

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Nathaniel Newth

DATE: April 1, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Volkswagen Jetta S

VEH. NHTSA NO.: CB5801 VIN: 3VW1K7AJ2BM056484 COLOR: Reflex Silver

VEH. BUILD DATE: January, 2011 TEST DATES: April 7-11, 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	49°	
		R	0°-50°	R	0°	R	49°	
	SR2A	L	0°-50°	L	0°	L	47°	
		R	0°-50°	R	0°	R	47°	
	SR2B	L	0°-50°	L	0°	L	47°	
		R	0°-50°	R	0°	R	47°	
	SR3-1	L	0°-50°	L	0°	L	47°	
		R	0°-50°	R	0°	R	47°	
	SR3-2	L	0°-50°	L	0°	L	47°	
		R	0°-50°	R	0°	R	47°	
	REAR HEADER	RH	L	0°-50°	L	0°	L	50°
			R	0°-50°	R	0°	R	50°

		VERTICAL ANGLE SPECIFIED RANGE		MINIMUM VERTICAL ANGLE		MAXIMUM VERTICAL ANGLE		
A-PILLAR	AP1	L	-5°-50°	L	-5°	L	14°	
		R	-5°-50°	R	-5°	R	14°	
	AP2	L	-5°-50°	L	-5°	L	50°	
		R	-5°-50°	R	-5°	R	50°	
	AP3	L	-5°-50°	L	-5°	L	50°	
		R	-5°-50°	R	-5°	R	50°	
B-PILLAR	BP1	L	-10°-50°	L	-10°	L	16°	
		R	-10°-50°	R	-10°	R	16°	
	BP2*	L	0°-50°	L	0°	L	10°	
		R	0°-50°	R	0°	R	10°	
	BP3	L	-10°-50°	L	-10°	L	-10°	
		R	-10°-50°	R	-10°	R	-10°	
	BP4	L	-10°-50°	L	-10°	L	0°	
		R	-10°-50°	R	-10°	R	0°	
	REAR PILLAR	RP1	L	-10°-50°	L	-10°	L	13°
			R	-10°-50°	R	-10°	R	13°
RP2		L	-10°-50°	L	-10°	L	30°	
		R	-10°-50°	R	-10°	R	30°	
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°		
UPPER ROOF 6		0°-50°		0°		50°		

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

RECORDED BY: Nathaniel Newth

DATE: April 1, 2011

APPROVED BY: Helen A. Kalet

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Volkswagen Jetta S

VEH. NHTSA NO.: CB5801 VIN: 3VW1K7AJ2BM056484 COLOR: Reflex Silver

VEH. BUILD DATE: January, 2011 TEST DATES: April 7-11, 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)	254 mm	254 mm
T°	Horizontal < {CG-F1 (Left Seat) to (Right A-Pillar)}	106.4°	--
A1°	360° - T°	253.6°	--
W°	Horizontal < {CG-2 (Left Seat) to (Left A-Pillar)}	203.9°	--
A2°	A2° = W°	203.9°	--
U°	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	288.8°	--
B1°	B1° = U°	288.8°	--
V°	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	199.9°	--
B2°	B2° = V°	199.9°	--
W° (right)	Horizontal < {CG-F2 (Right Seat) to (Right A-Pillar)}	--	156.2°
A1° (right)	A1° (right) = W° (right)	--	156.2°
T ° (right)	Horizontal < {CG-F1 (Right Seat) to (Left A-Pillar)}	--	253.6°
A2° (right)	360°-T° (right)	--	106.4°
V ° (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	160.2°
B1° (right)	B1° (right) = V° (right)	--	160.2°
U ° (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	71.2°
B2° (right)	B2° (right) = U° (right)	--	71.2°
J	A-Pillar {(Plane 3) – (Plane 5)}	310.4 mm	310.7 mm
J/2	J ÷ 2	155.2 mm	155.4 mm
D1	Upper Roof {(Plane A) – (Plane B)}	1644.1 mm	
D1/2	D1 ÷ 2	822.1 mm	

Measurement	Description	Left Side	Right Side
D2	Upper Roof {(Plane C) – (Plane D)}	1129.4 mm	
D2/2	D2 ÷ 2	564.7 mm	
.35D1	.35 x D1	575.4 mm	
.35D2	.35 x D2	395.3 mm	
N	B-Pillar {(BPR) – (lowest point on daylight opening forward of B-Pillar)}	409.7 mm	409.4 mm
N/2	B-Pillar {(BP3) – (lowest point on daylight opening forward of B-Pillar)}	204.9 mm	204.7 mm
N/4	B-Pillar {(BP4) – (lowest point on daylight opening forward of B-Pillar)}	102.4 mm	102.4 mm
D	R-Pillar (Point 7 – Point M)	700.0 mm	700.0 mm
3D/7	3*D / 7	300.0 mm	300.0 mm

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

SgRP Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1295.0	-345.0	251.0	1295.0	345.0	251.0
Rear	2158.0	-350.0	271.0	2158.0	350.0	271.0

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1295.0	-345.0	251.0	1295.0	345.0	251.0
Rear	2158.0	-350.0	271.0	2158.0	350.0	271.0

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	X	y	z
CGF1	1201.0	-345.0	911.0	1201.0	345.0	911.0
CGF2	1455.0	-345.0	911.0	1455.0	345.0	911.0
CGR	2318.0	-350.0	931.0	2318.0	350.0	931.0

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Front right passenger door striker upper hole (x, y, z) = 1471.4, 760.9, 461.0

Front driver door striker upper hole (x, y, z) = 1471.4, -760.9, 461.0

Rear driver seat belt anchorage (x, y, z) = 2215.7, -588.0, 130.9

REMARKS:

RECORDED BY: Nathaniel Newth

DATE: April 1, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Volkswagen Jetta S

VEH. NHTSA NO.: CB5801 VIN: 3VW1K7AJ2BM056484 COLOR: Reflex Silver

VEH. BUILD DATE: January, 2011 TEST DATES: April 7-11, 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	1022.2	-519.0	1025.6	--	--	Yes	--	--
REL	1045.0	-543.4	958.0	253	14	--	3	No
AP2	1004.8	-556.6	938.5	204	50	No	--	Yes
AP3	854.6	-589.3	870.8	204	50	No	--	No
A-Pillar Right Side								
AP1	1021.4	519.9	1025.1	--	--	Yes	--	Yes
REL	1046.2	539.3	958.4	107	14	--	3	Yes
AP2	1006.9	555.2	938.0	156	50	No	--	No
AP3	856.1	588.8	870.7	156	50	No	--	Yes
B-Pillar Left Side								
BP1	1590.8	-459.9	1075.7	270	16	No	--	No
BP2	1564.6	-582.0	866.7	270	10	No	--	Yes
BP3	1526.0	-599.1	871.8	--	--	Yes	--	--
REL	1503.9	-607.2	880.8	280	-10	--	1	No
BP4	1638.1	-657.8	770.4	--	--	Yes	--	--
REL	1619.8	-645.3	768.0	235	0	--	1	No
B-Pillar Right Side								
BP1	1587.7	461.1	1075.4	90	16	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					
BP2	1562.9	581.8	867.8	90	10	No	--	No
BP3	1525.4	598.0	871.7	--	--	Yes	--	--
REL	1499.9	607.7	879.4	80	-10	--	1	No
BP4	1635.5	659.6	769.5	--	--	Yes	--	--
REL	1619.5	647.0	767.1	125	0	--	1	No
Rear Pillar Left Side								
RP1	2488.5	-538.7	970.0	280	13	No	--	No
RP2	2547.7	-619.2	820.4	--	--	Yes	--	--
REL	2423.4	-560.7	930.4	285	30	--	7	No
Rear Pillar Right Side								
RP1	2488.1	540.7	969.0	80	13	No	--	No
RP2	2547.4	619.8	820.2	--	--	Yes	--	--
REL	2425.2	560.8	931.2	75	30	--	7	No
Front Header Left Side								
FH1	956.6	-404.4	1026.7	180	50	No	--	Yes
FH2	939.8	-255.2	1034.8	180	50	No	--	No
Front Header Right Side								
FH1	955.2	402.5	1025.0	180	50	No	--	No
FH2	940.0	253.8	1035.7	180	50	No	--	No
Side Rail Left Side								
SR1	1172.9	-472.4	1029.7	--	--	Yes	--	--
REL	1188.9	-487.8	1015.1	270	49	--	1	No
SR2A	1322.8	-464.4	1045.5	270	47	No	--	No
SR2B	1291.5	-473.5	1069.1	--	--	Yes	--	--
REL	1293.1	-444.1	1052.4	270	47	--	2	Yes
SR3-1	1988.8	-470.0	1059.5	270	47	No	--	No
SR3-2	2137.9	-477.2	1044.9	270	47	No	--	No
Side Rail Right Side								
SR1	1172.0	473.8	1028.8	--	--	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					
REL	1187.6	485.9	1014.7	90	49	--	1	No
SR2A	1320.7	463.8	1043.8	90	47	No	--	No
SR2B	1288.5	474.9	1067.4	--	--	Yes	--	--
REL	1292.4	443.5	1050.8	90	47	--	2	No
SR3-1	1986.1	469.9	1060.9	90	47	No	--	No
SR3-2	2138.0	477.1	1048.2	90	47	No	--	No
Rear Header Left Side								
RH	2408.3	-350.8	1086.7	0	50	No	--	NO
Rear Header Right Side								
RH	2407.3	350.4	1087.0	0	50	No	--	No
Upper Roof Left Side								
UR1@SR1	1178.5	-373.8	1059.8	270	50	No	--	No
UR3@BP	1586.2	-342.5	1124.8	270	50	No	--	Yes
UR5@SR2-3	2150.7	-319.6	1129.2	270	50	No	--	Yes
Upper Roof Right Side								
UR2@SR2A	1316.7	331.3	1101.6	90	50	No	--	Yes
UR4@SR3-1	1993.8	329.4	1132.7	90	50	No	--	Yes
UR6@RO	2247.9	363.7	1116.7	70	50	No	--	No

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

RECORDED BY: Nathaniel Newth

DATE: April 1, 2011

APPROVED BY: Helen A. Kalet

3.0 TEST DATA (Including Acceleration and Velocity Plots)







SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Test Number:#U11107

Target (Vehicle Side): AP1Right

Temperature:22.0C

MGA Test Reference No.:U11107

Humidity:61.6%

Approach Horizontal Angles:107°

Time of Test:9:38:48 AM

Approach Vertical Angles:14°

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
317	200	6	18.9	13	7 Right

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

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

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

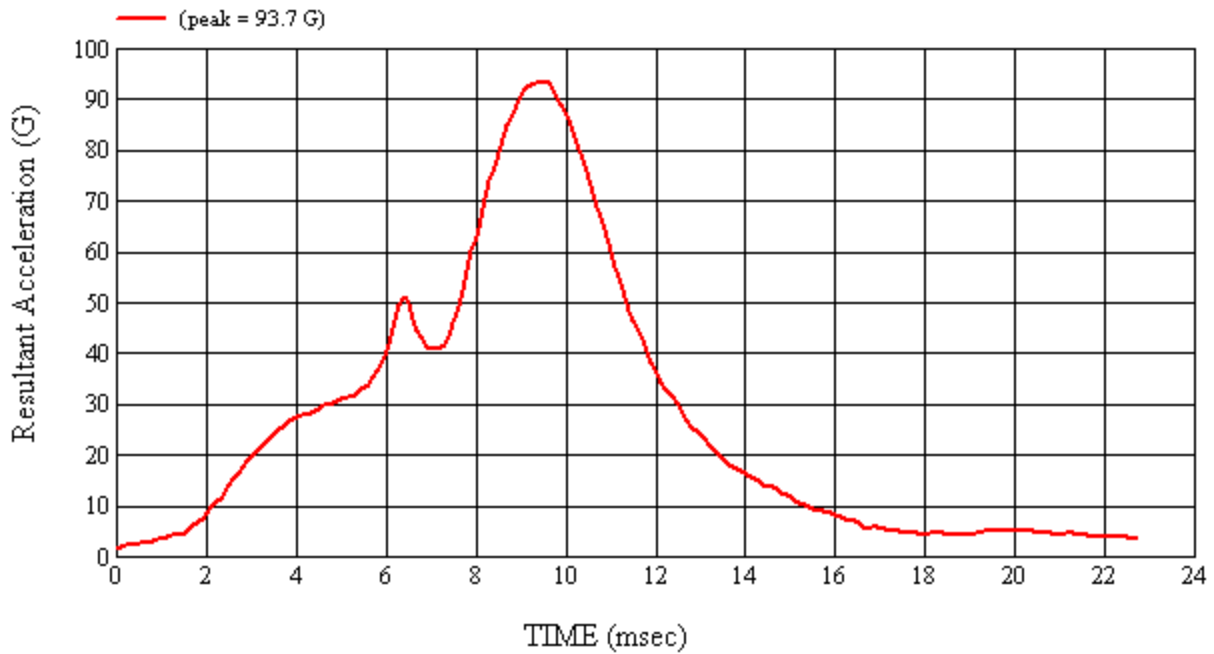
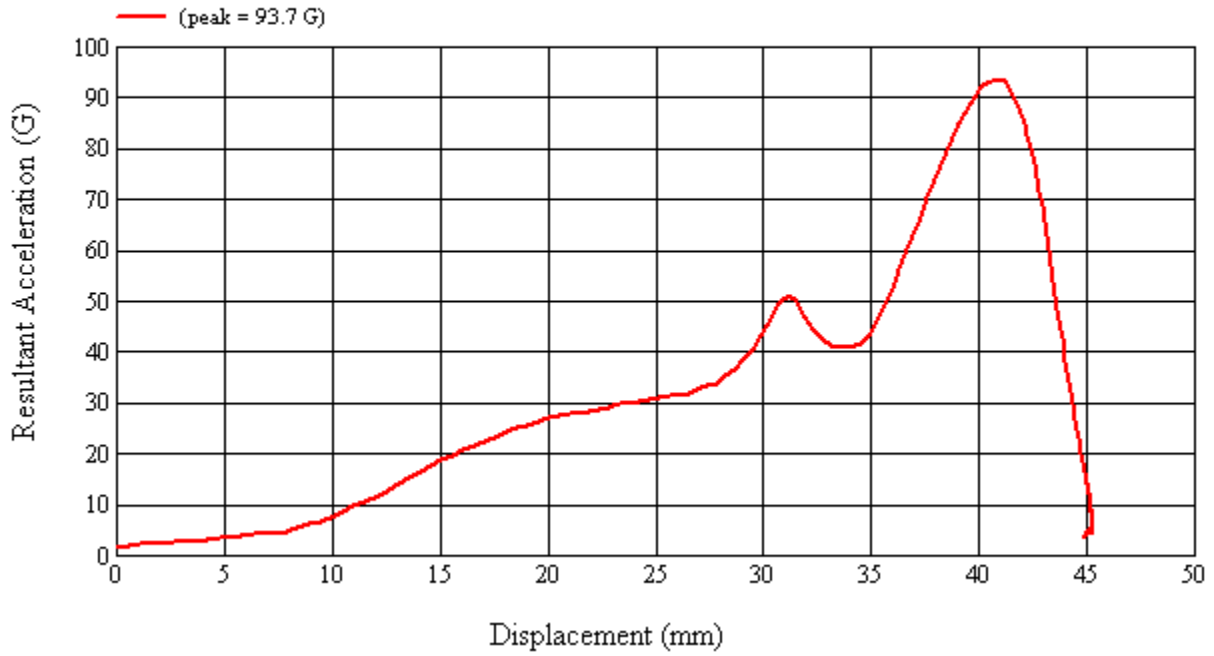
No visible damage

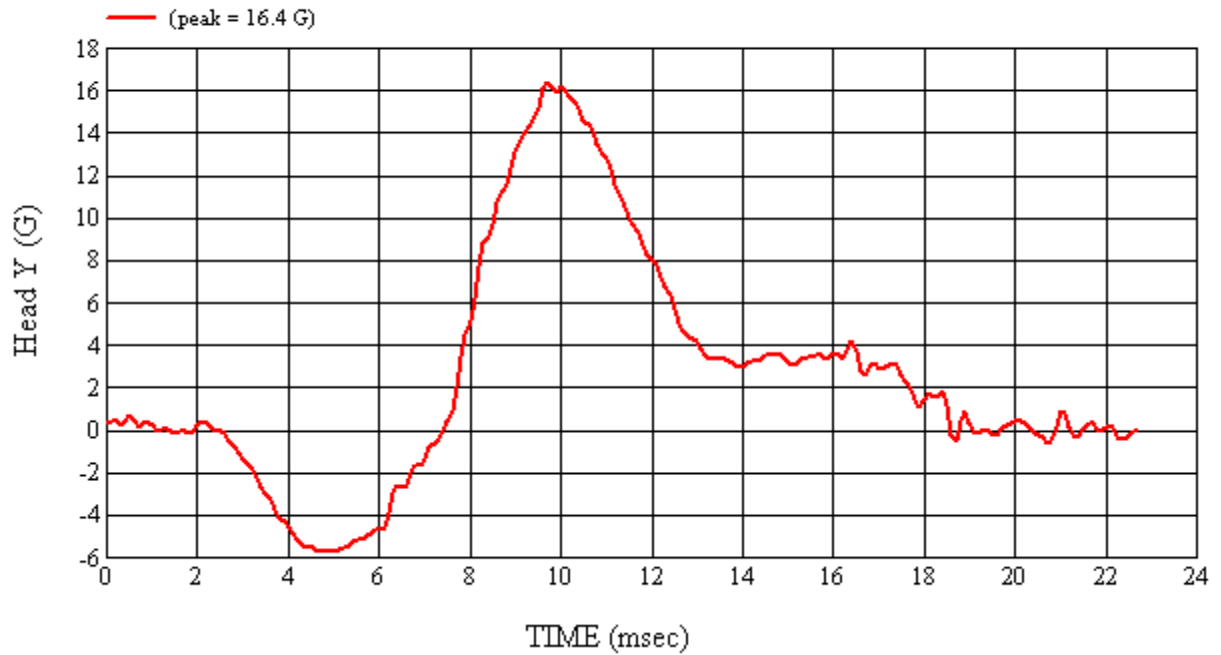
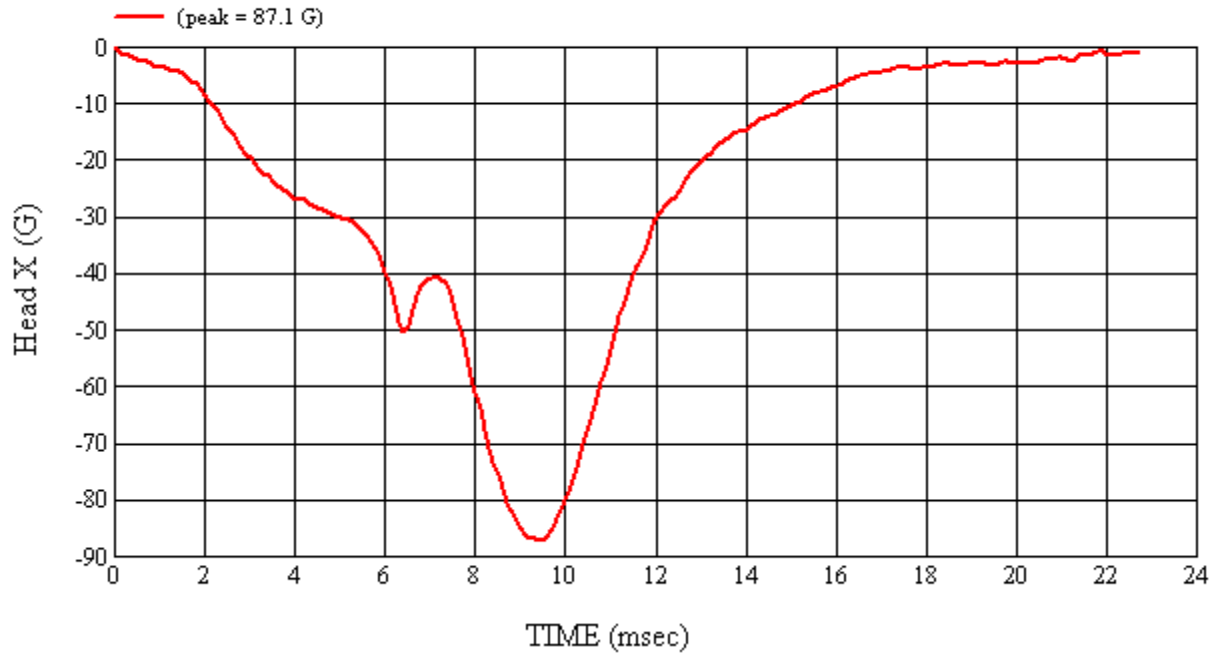
Recorded By: *Kevin D. McFerran* Approved By*: *Arthur I. Smith* Date: 4/11/2011
 *Only necessary for NHTSA (Government) Compliance testing.

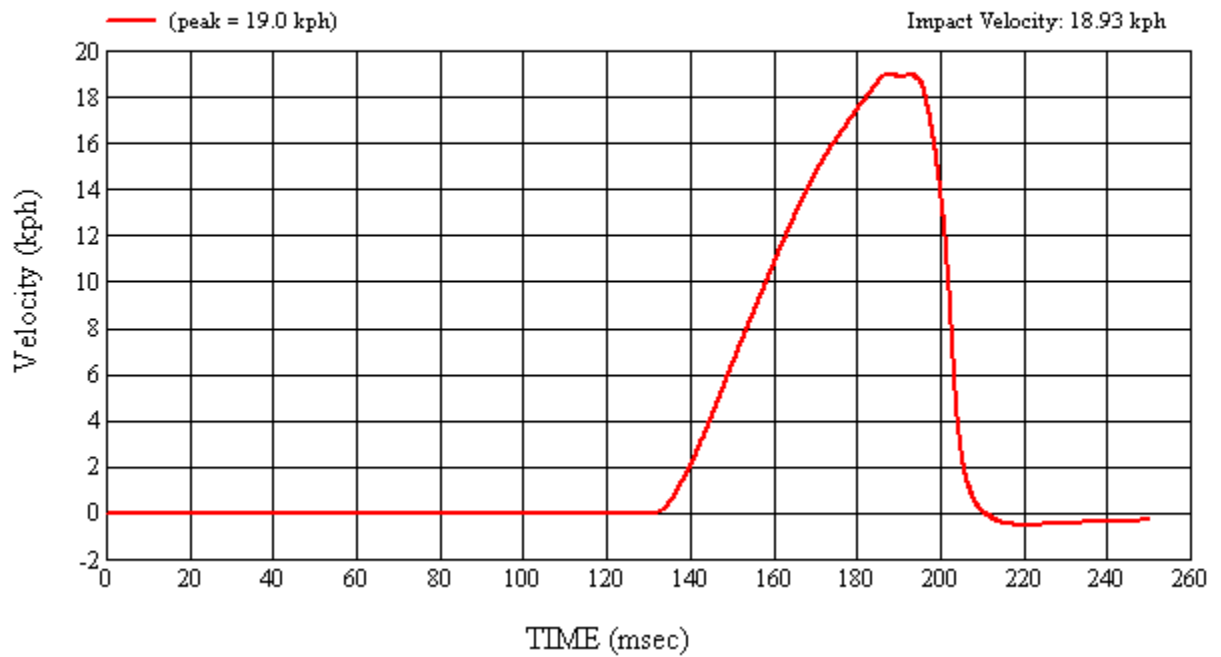
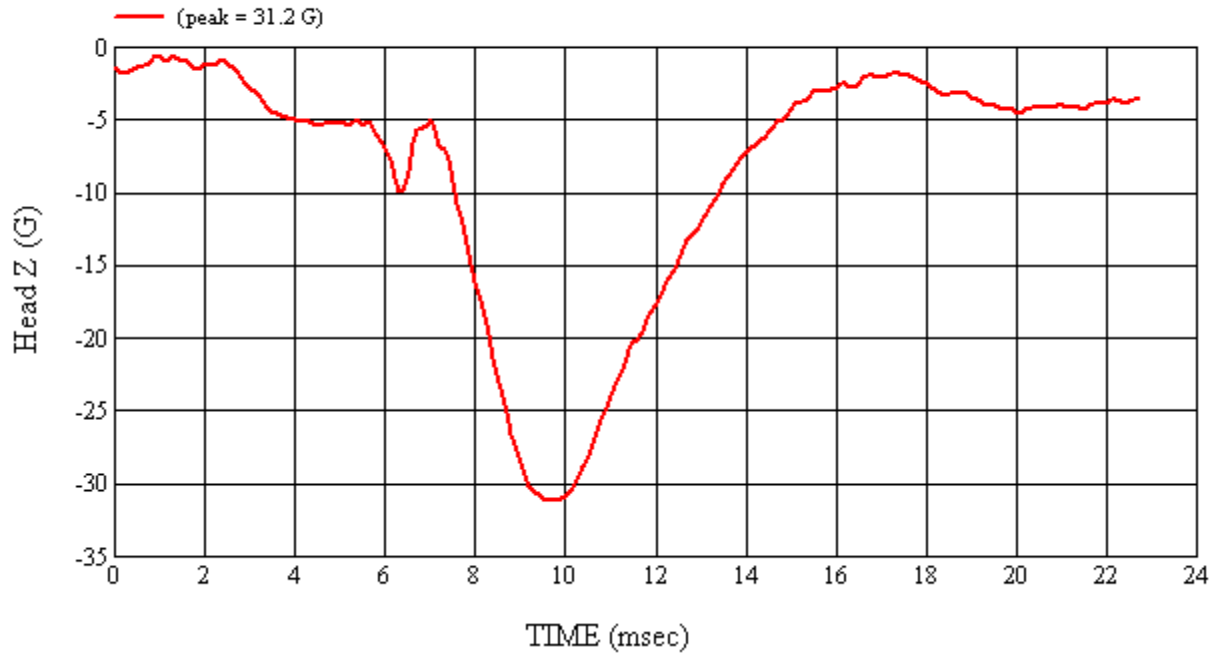
MGA Test #: U11107

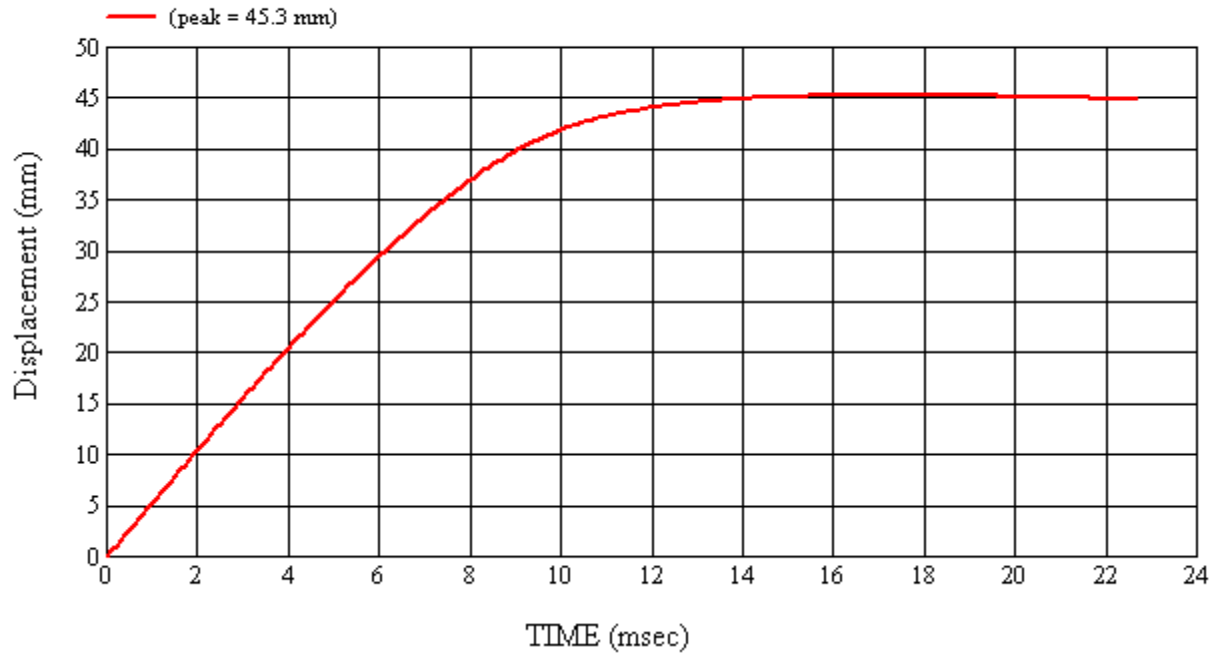
Target Location: API, Right Side

Test Date: 4/11/2011



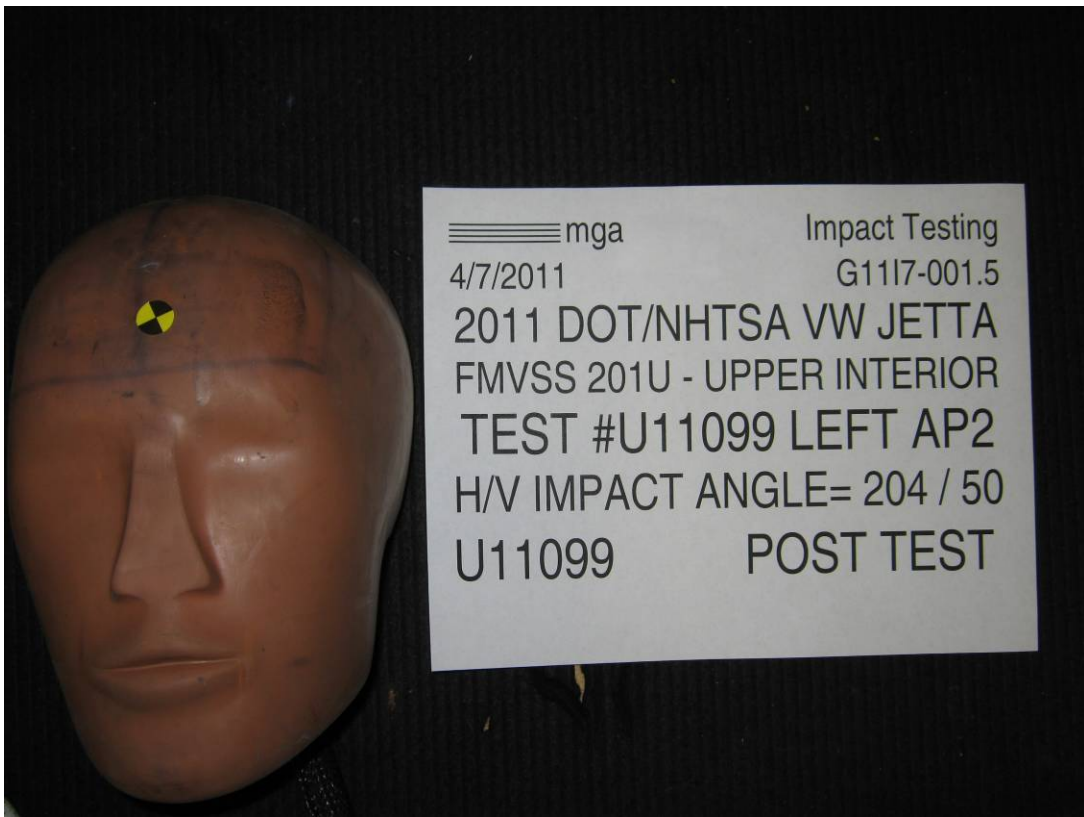












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Test Number:#U11099

Target (Vehicle Side): AP2Left

Temperature:20.5C

MGA Test Reference No.:U11099

Humidity:36.0%

Approach Horizontal Angles:204°

Time of Test:2:53:30 PM

Approach Vertical Angles:50°

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
468	399	5.3	18.9	19	5 Left

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

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

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

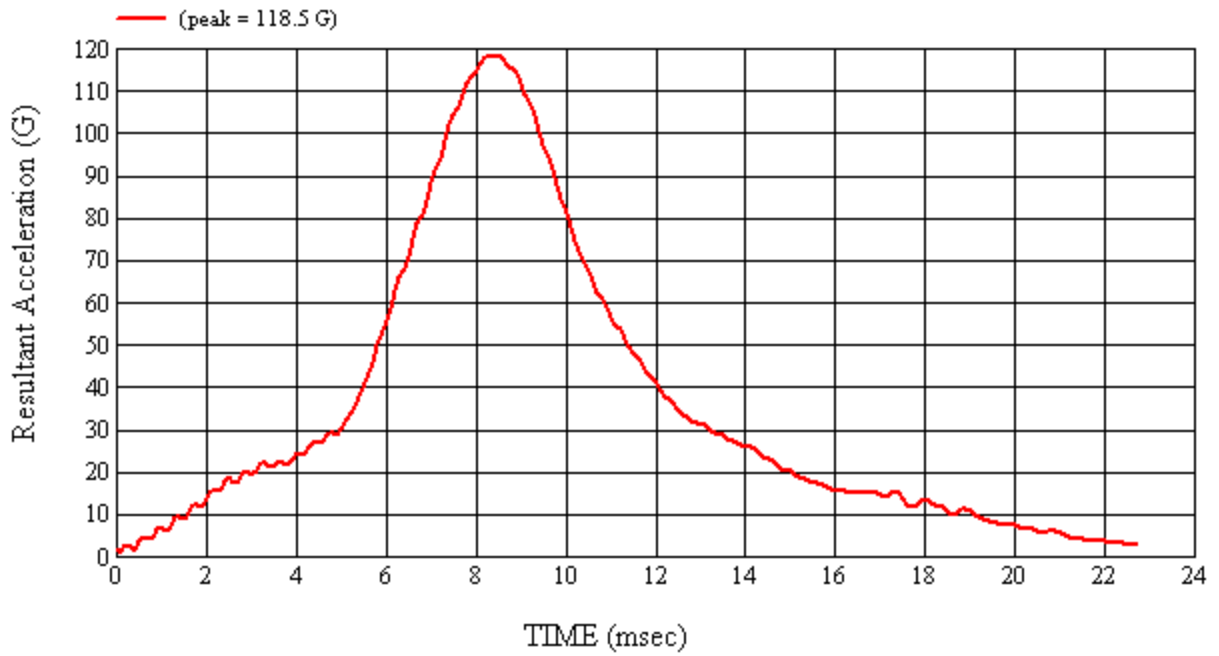
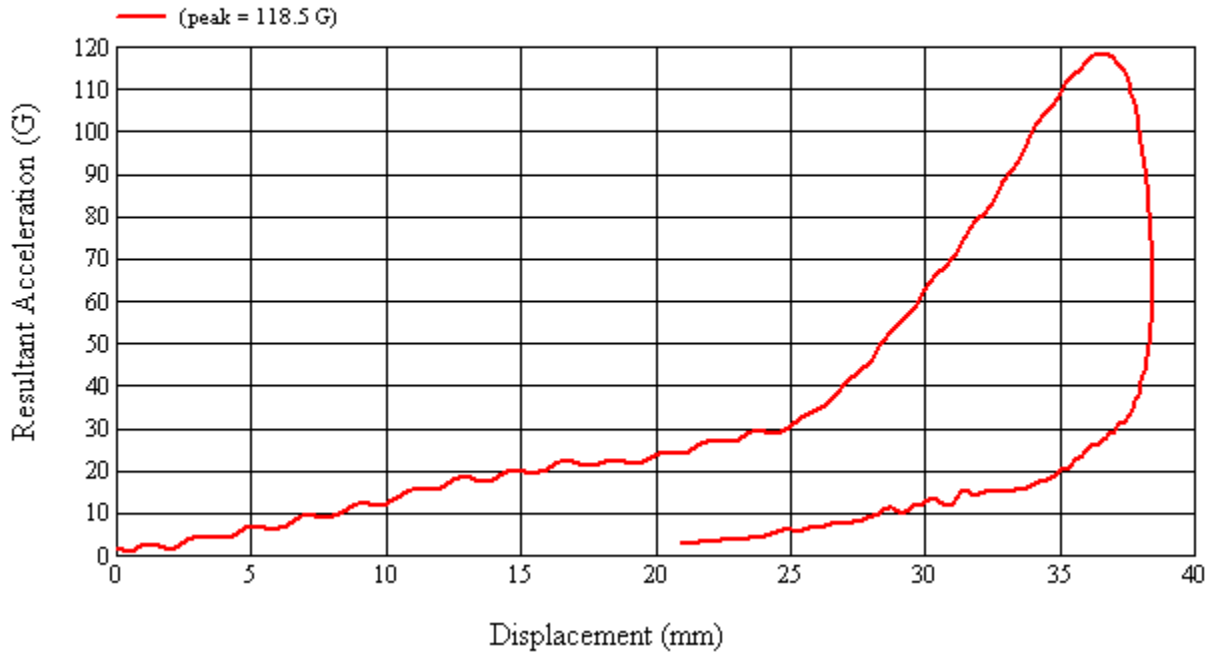
Slightly dislodged trim

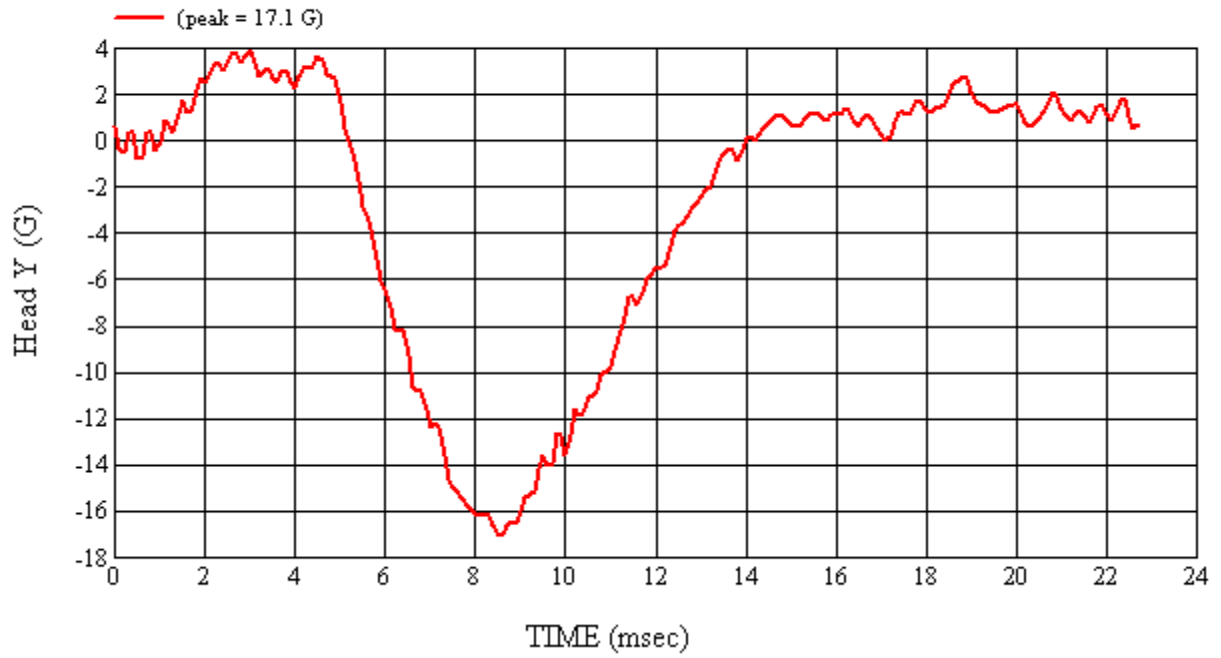
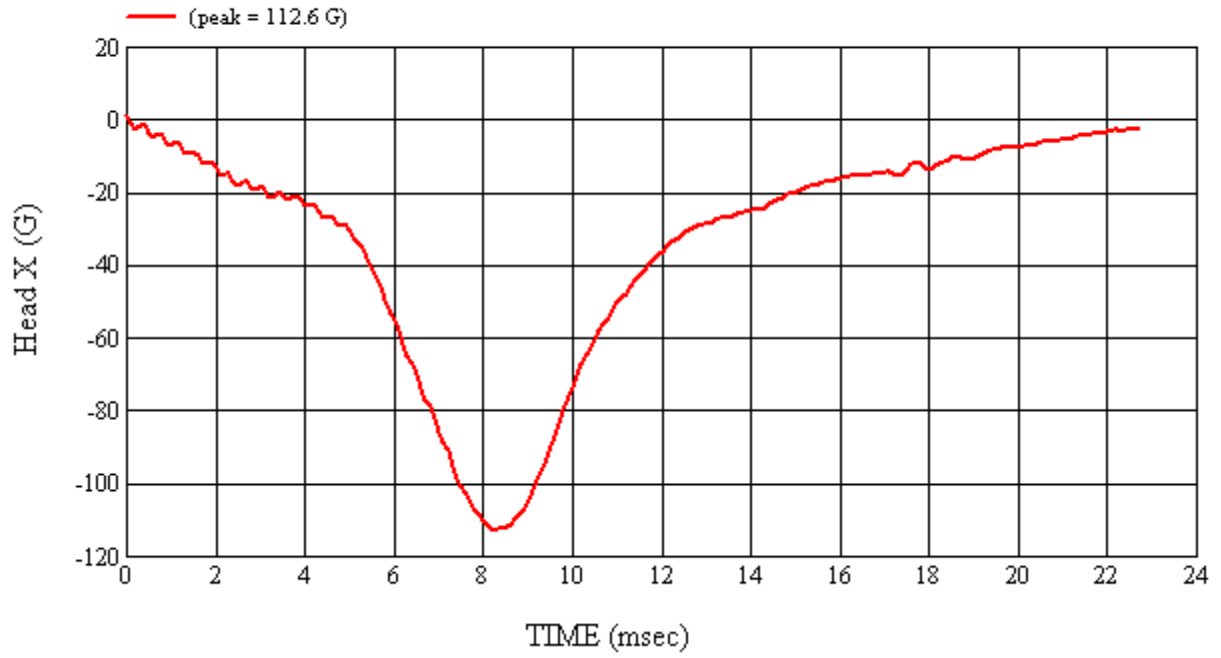
Recorded By: *Kevin D. McFerran* Approved By*: *Arthur I. Smith* Date: 4/7/2011
 *Only necessary for NHTSA (Government) Compliance testing.

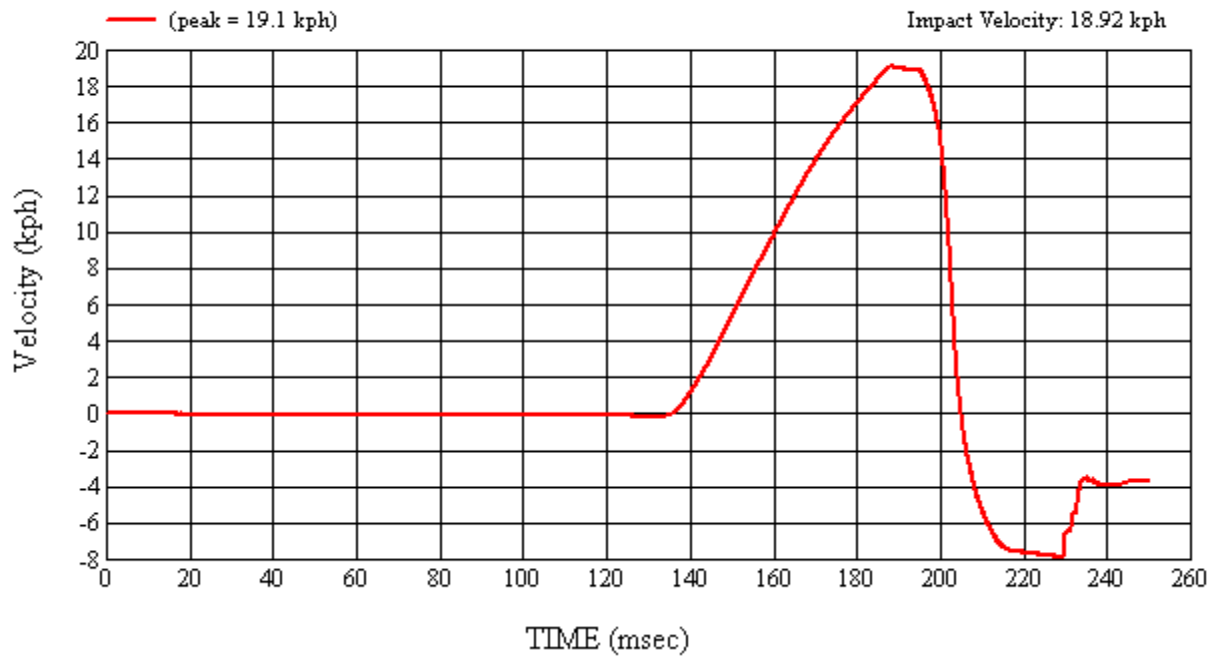
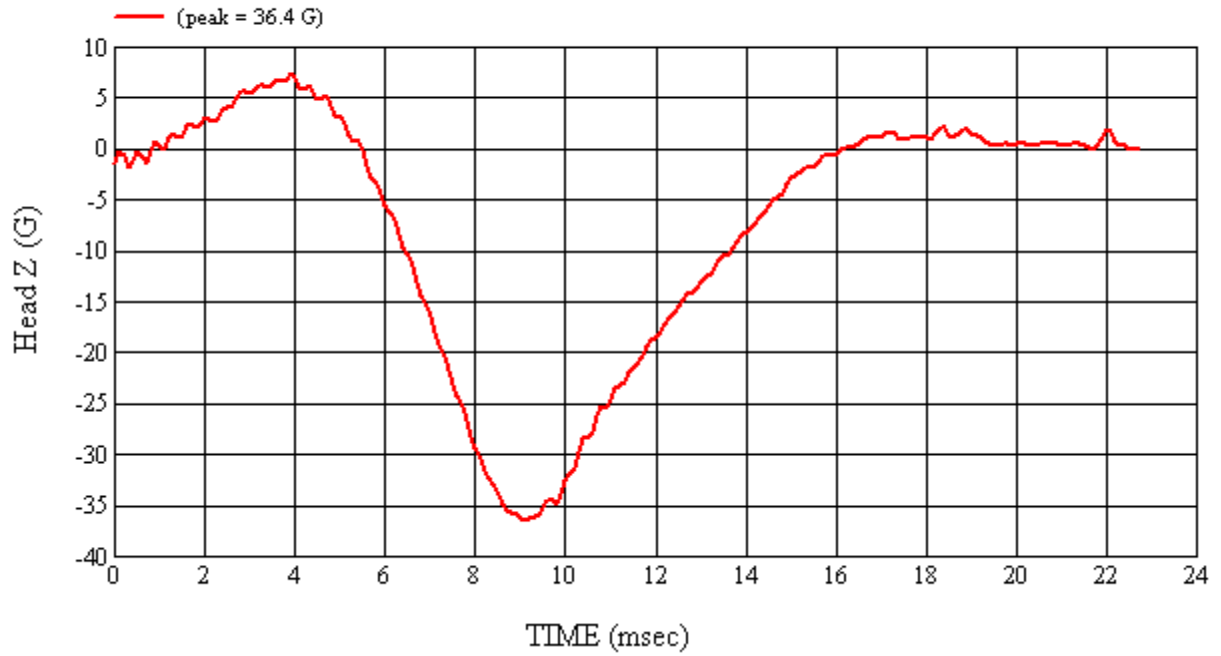
MGA Test #: U11099

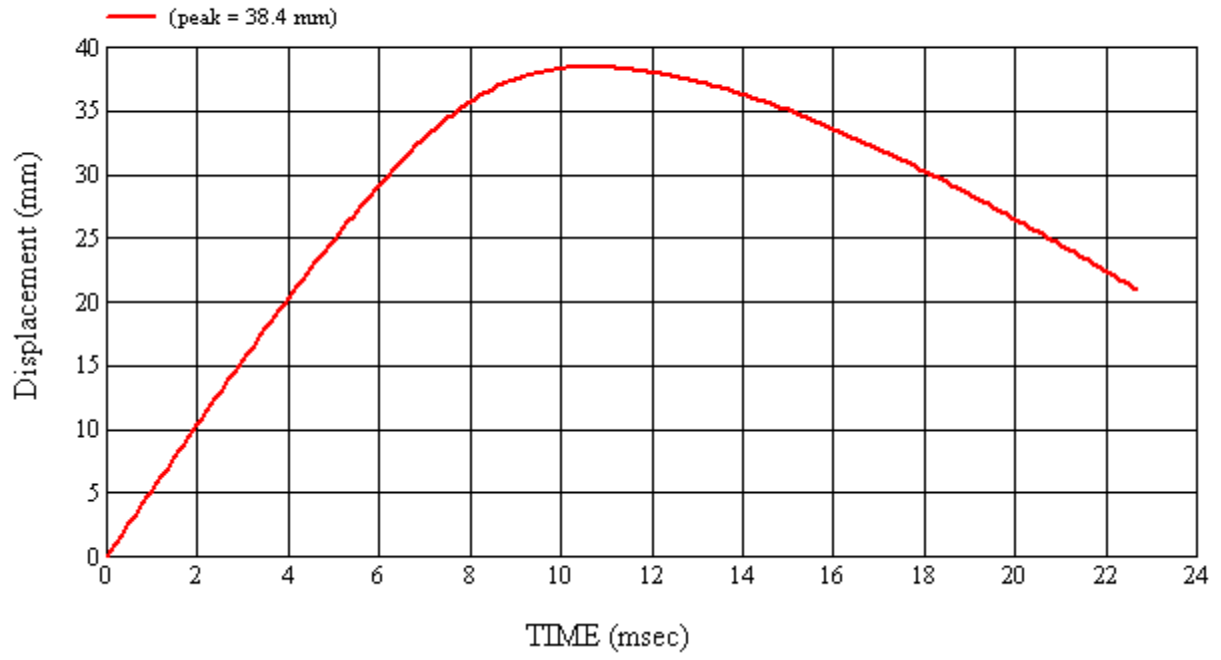
Target Location: AP2, Left Side

Test Date: 4/7/2011















SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Test Number:#U11103

Target (Vehicle Side): AP3Right

Temperature:20.4C

MGA Test Reference No.:U11103

Humidity:37.6%

Approach Horizontal Angles:156°

Time of Test:1:23:01 PM

Approach Vertical Angles:50°

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
506	449	5.1	18.6	26	1 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J32177	-113.7	1.07	1.07
Y	6	J14103	93.9	0.85	0.85
Z	7	J35800	97.8	1.87	1.87

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

Trim dislodged

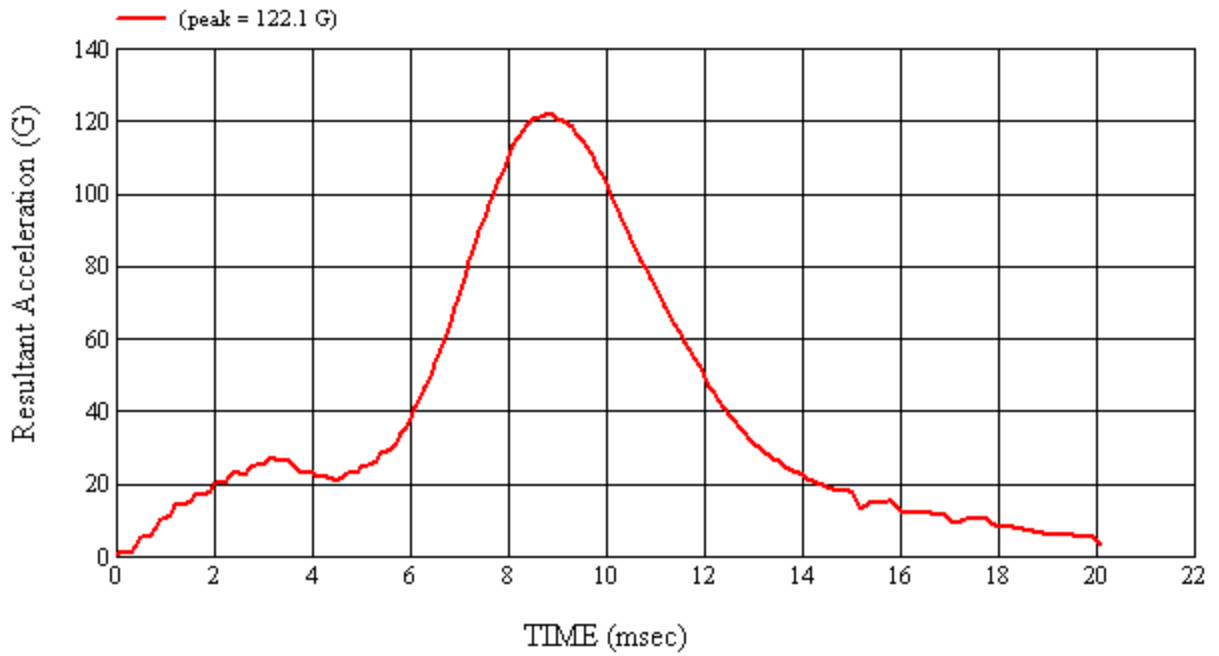
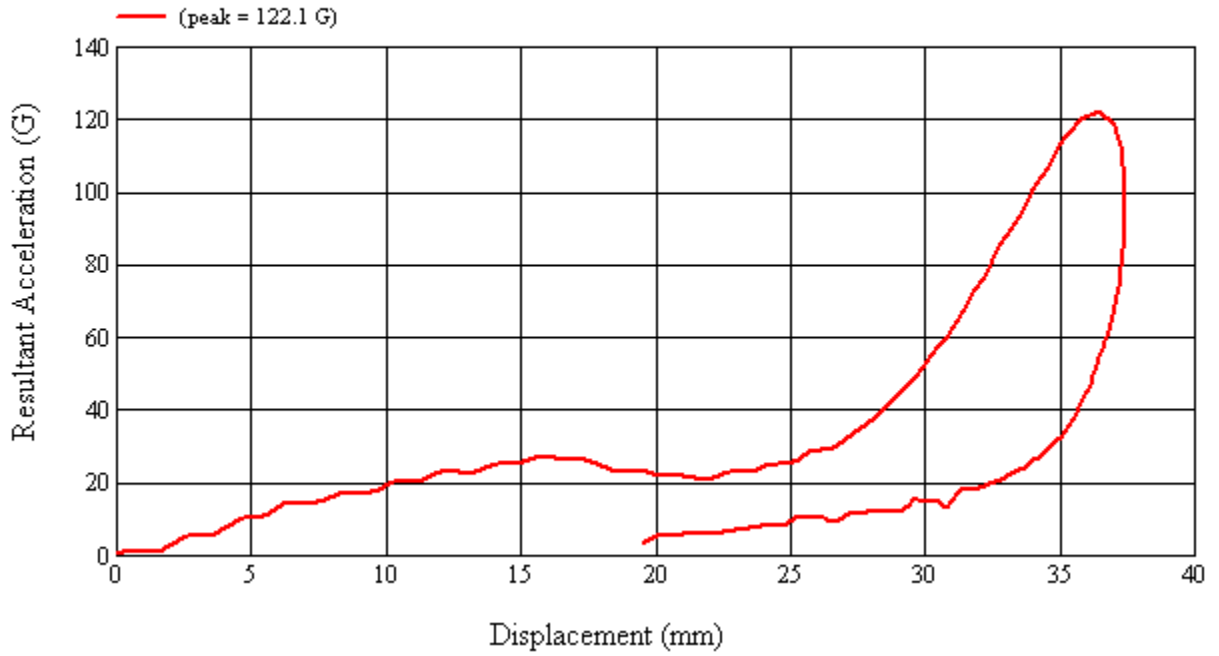
Recorded By: *Keri D. McKenna* Approved By*: *Adrian I. Smith* Date: 4/8/2011

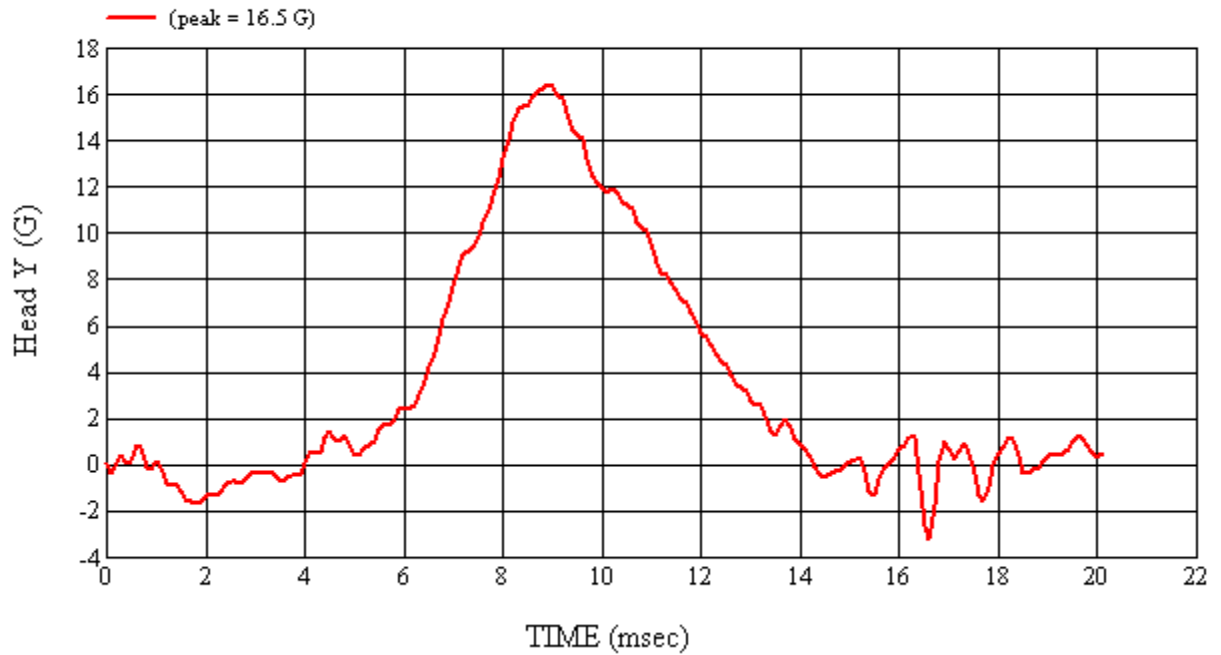
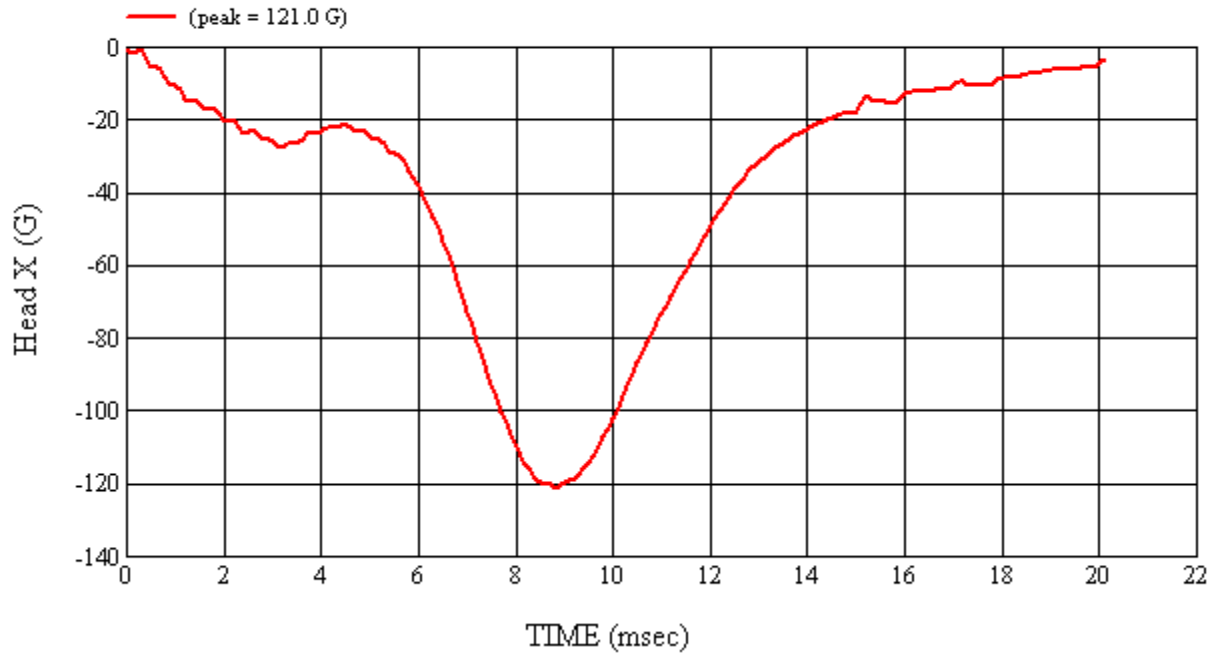
*Only necessary for NHTSA (Government) Compliance testing.

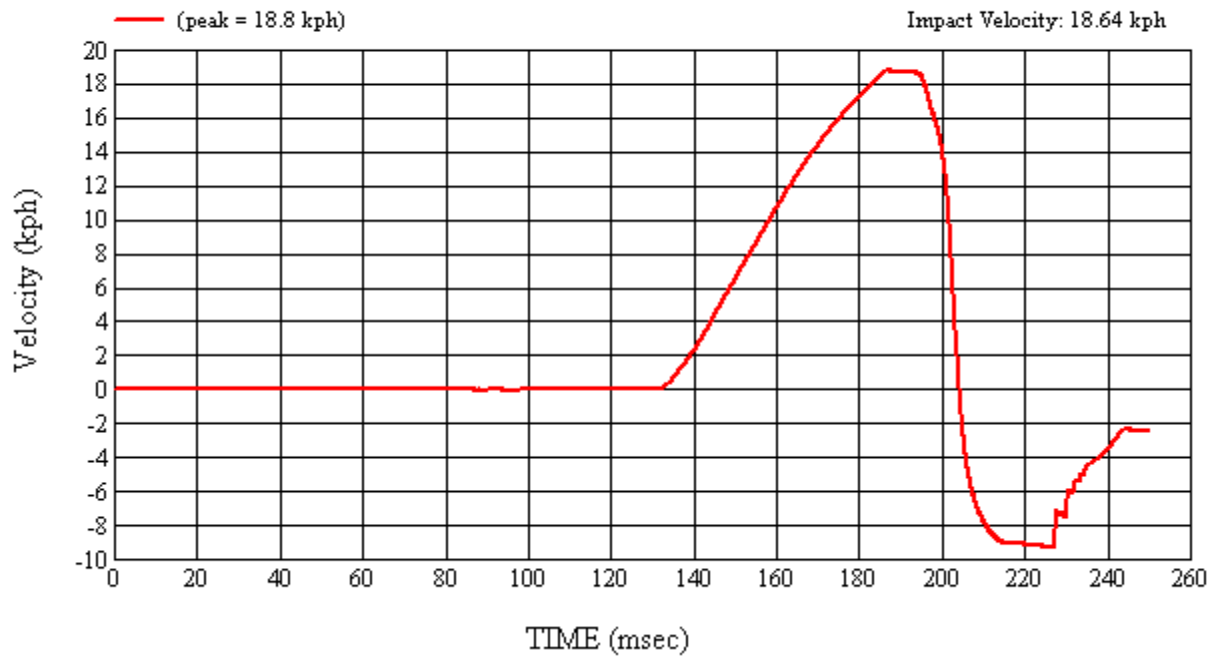
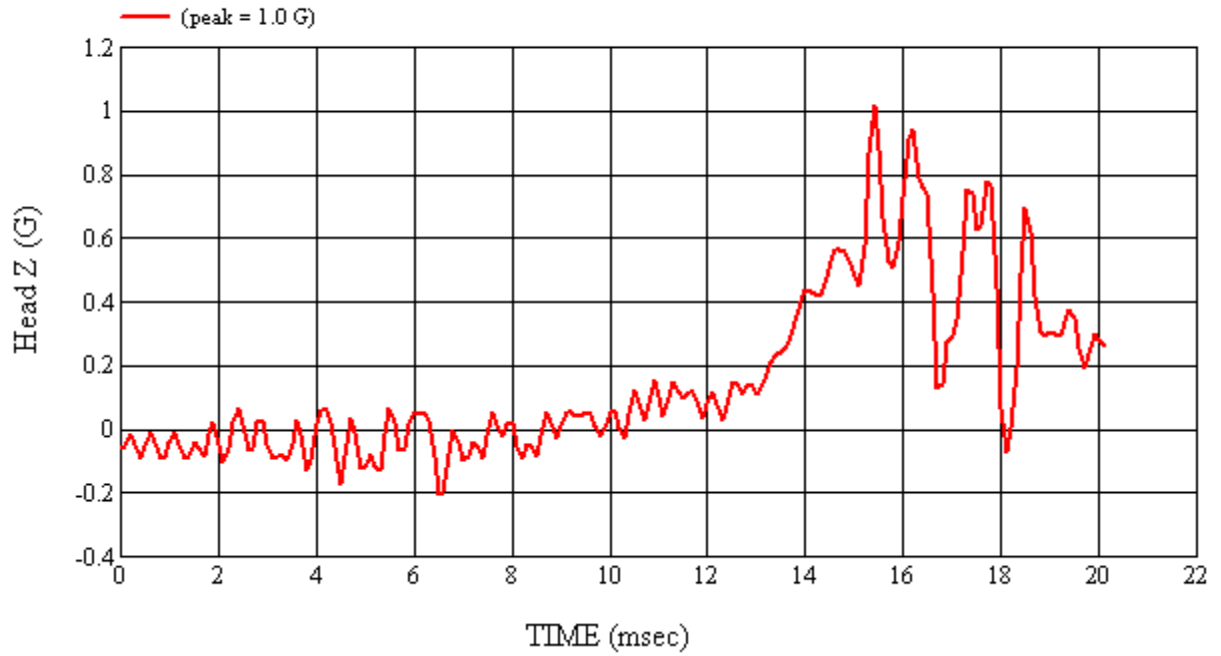
MGA Test #: U11103

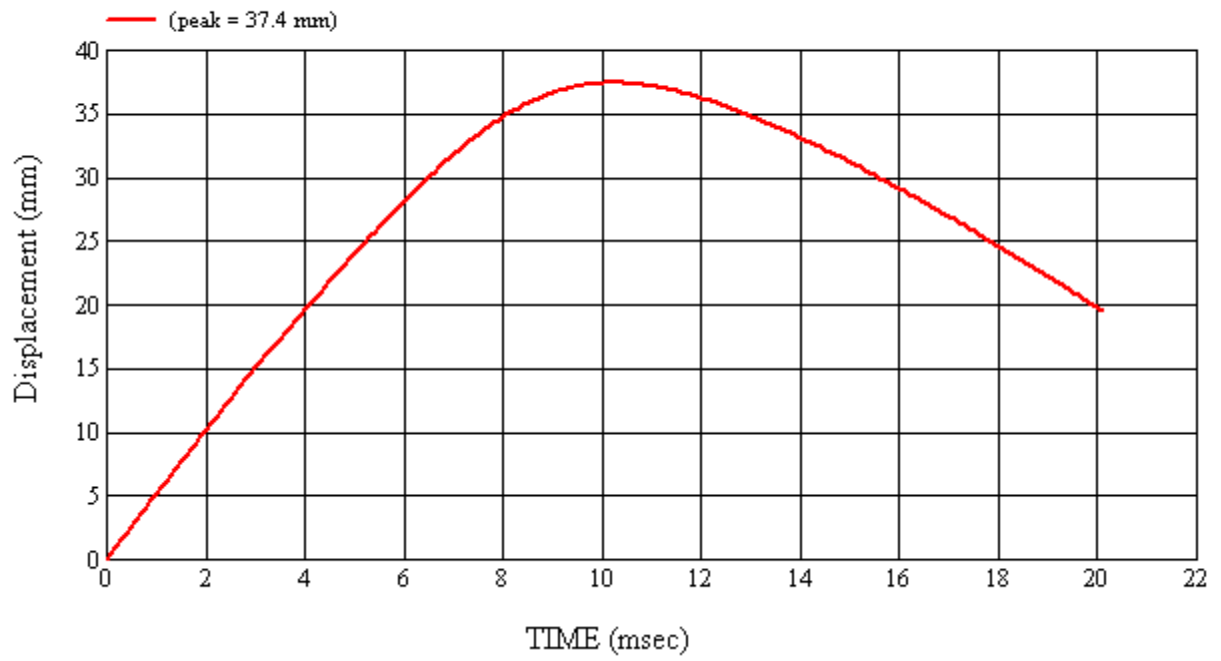
Target Location: AP3, Right Side

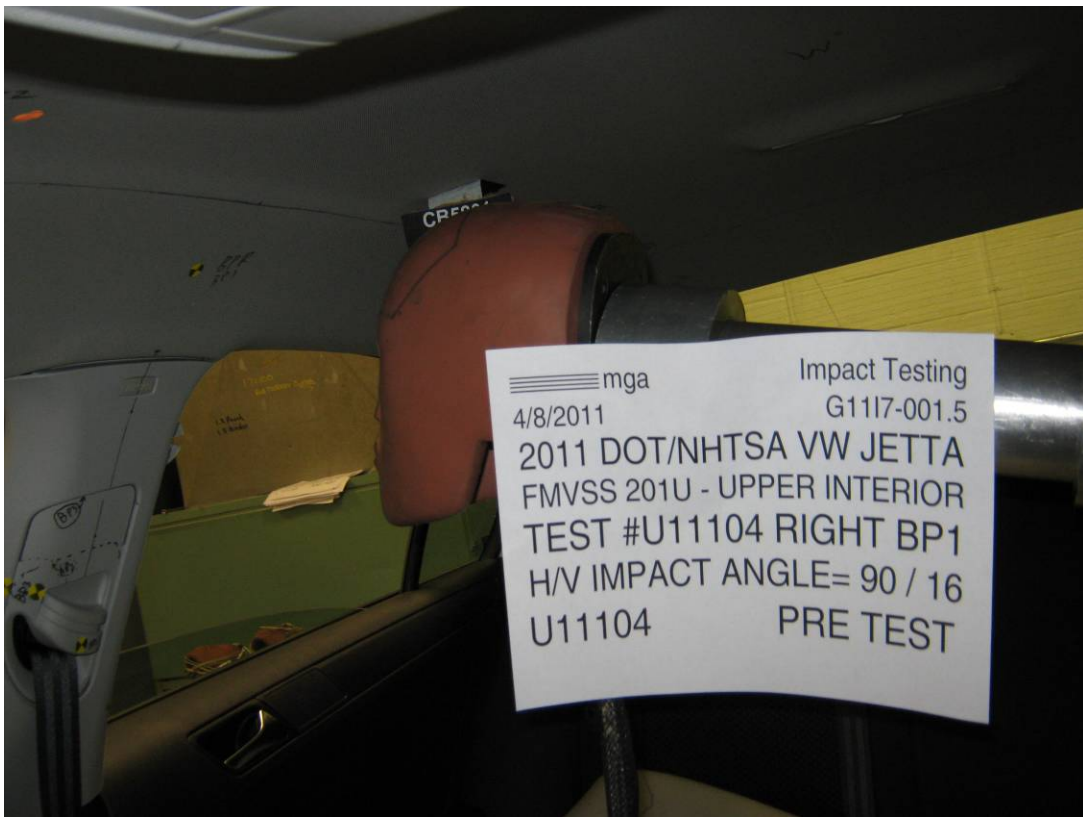
Test Date: 4/8/2011

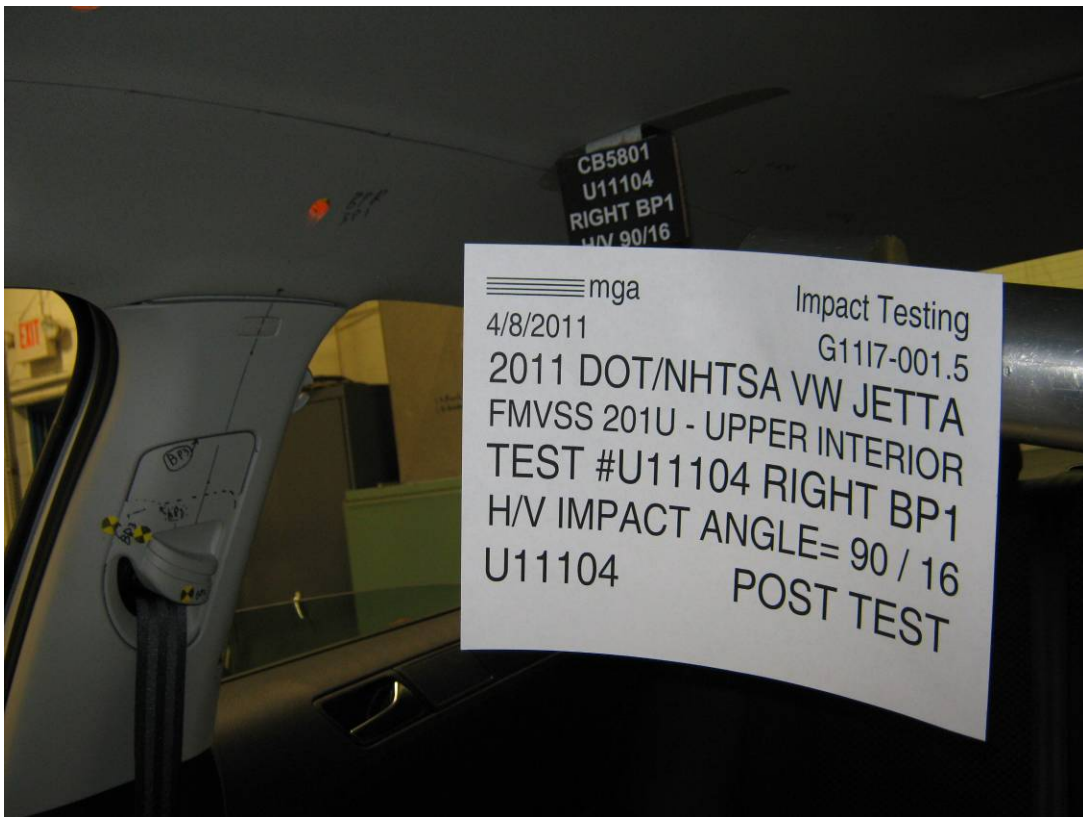














SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Test Number:#U11104

Target (Vehicle Side): BP1Right

Temperature:20.5C

MGA Test Reference No.:U11104

Humidity:37.9%

Approach Horizontal Angles:90°

Time of Test:2:42:50 PM

Approach Vertical Angles:16°

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
492	431	6.2	18.6	39	0

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

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

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

No visible damage.

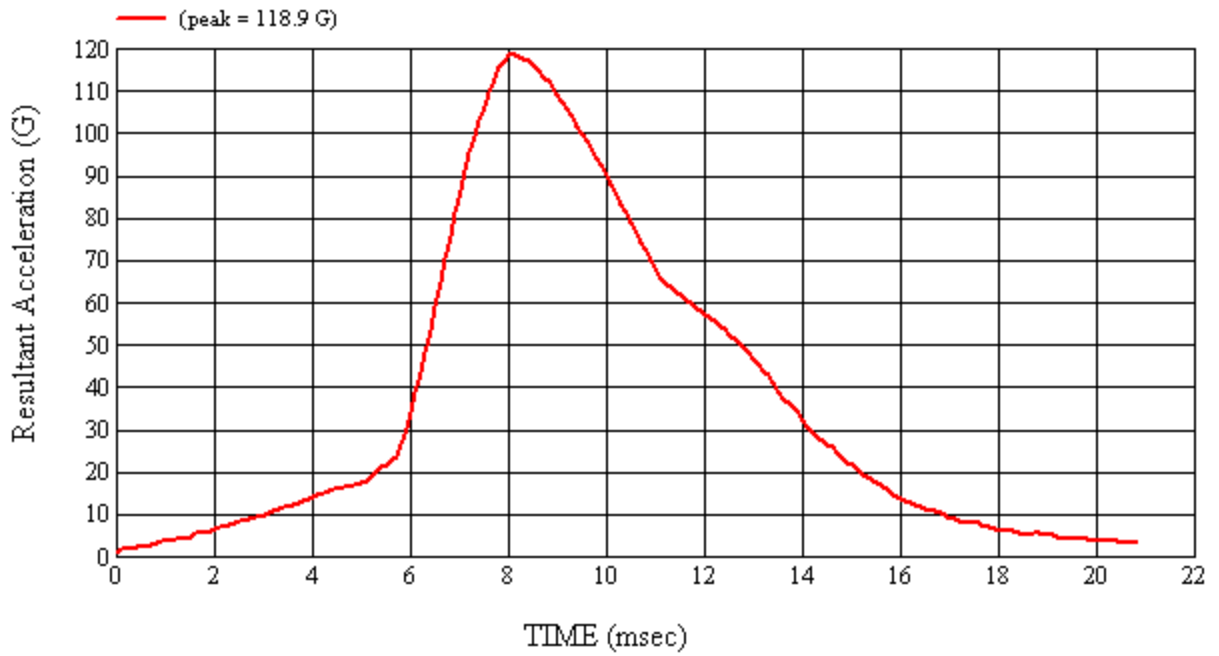
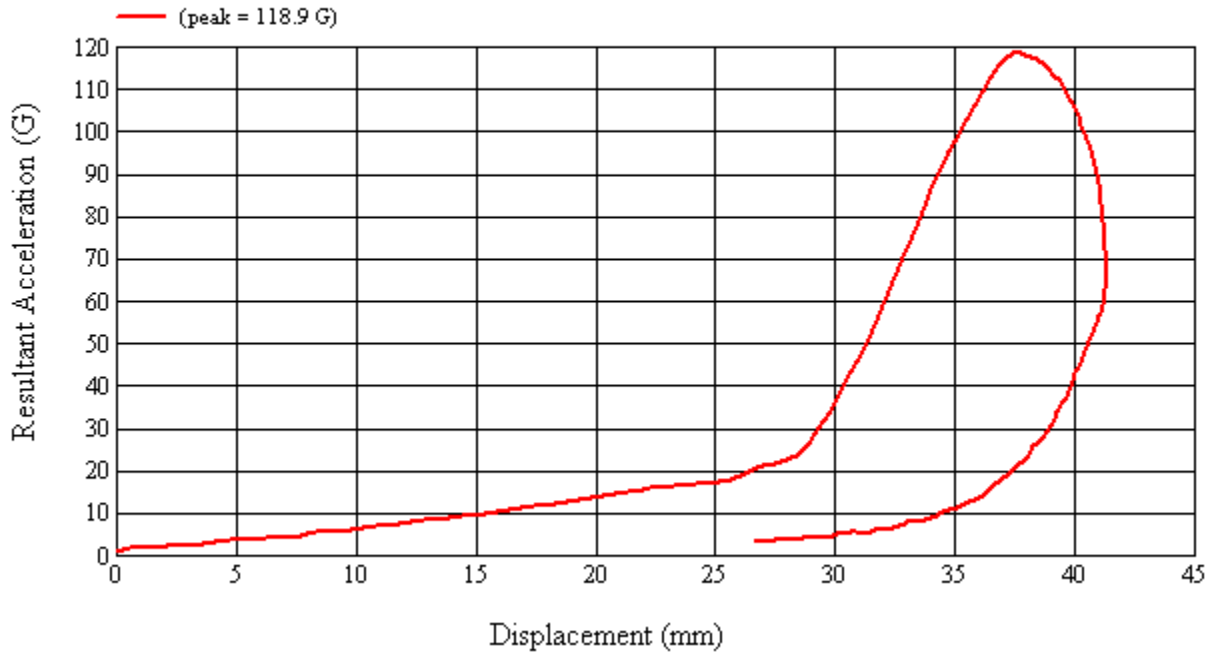
Recorded By: *Kevin D. McLean* Approved By*: *Richard I. Smith* Date: 4/8/2011

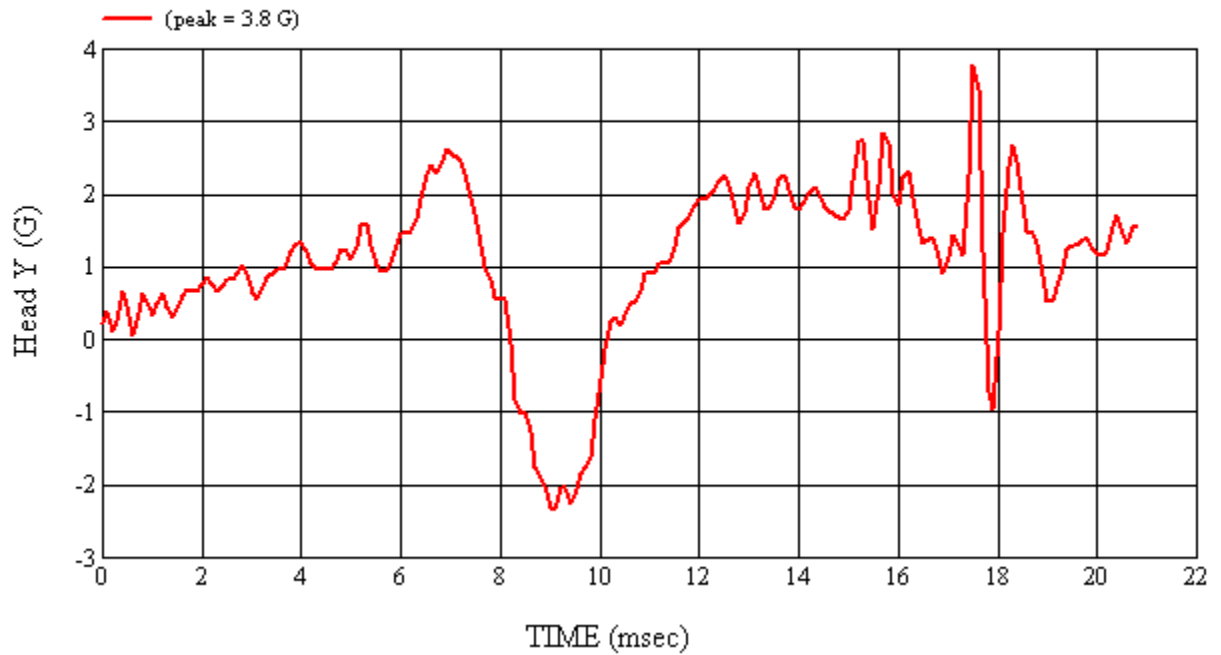
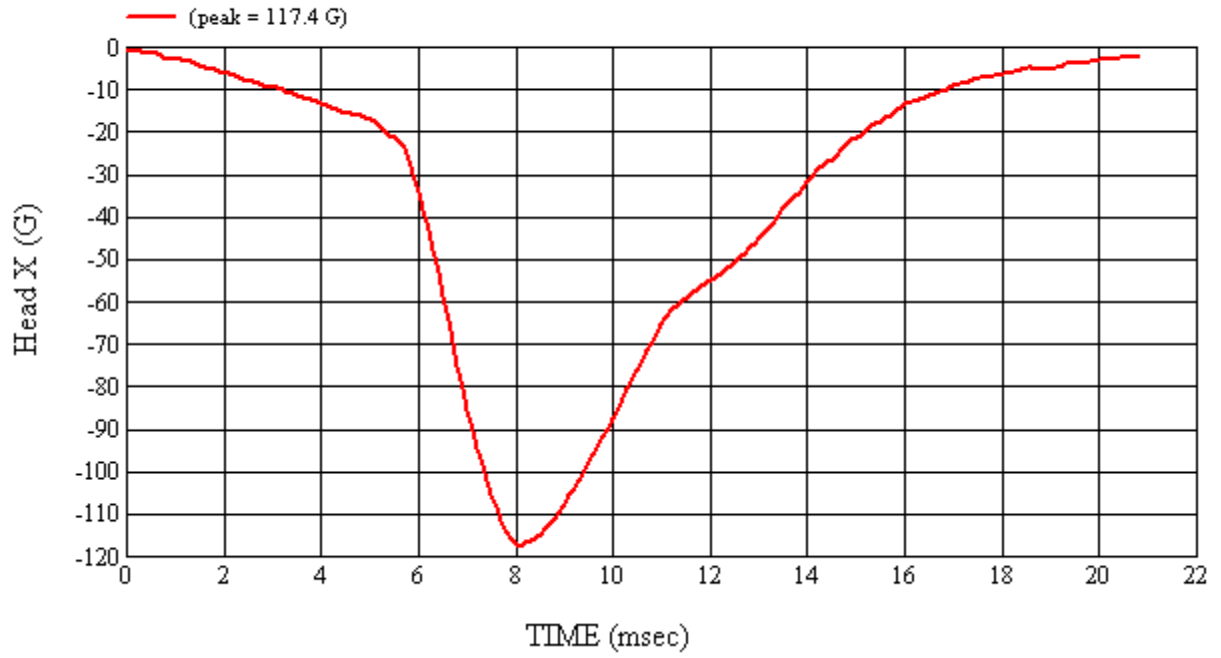
*Only necessary for NHTSA (Government) Compliance testing.

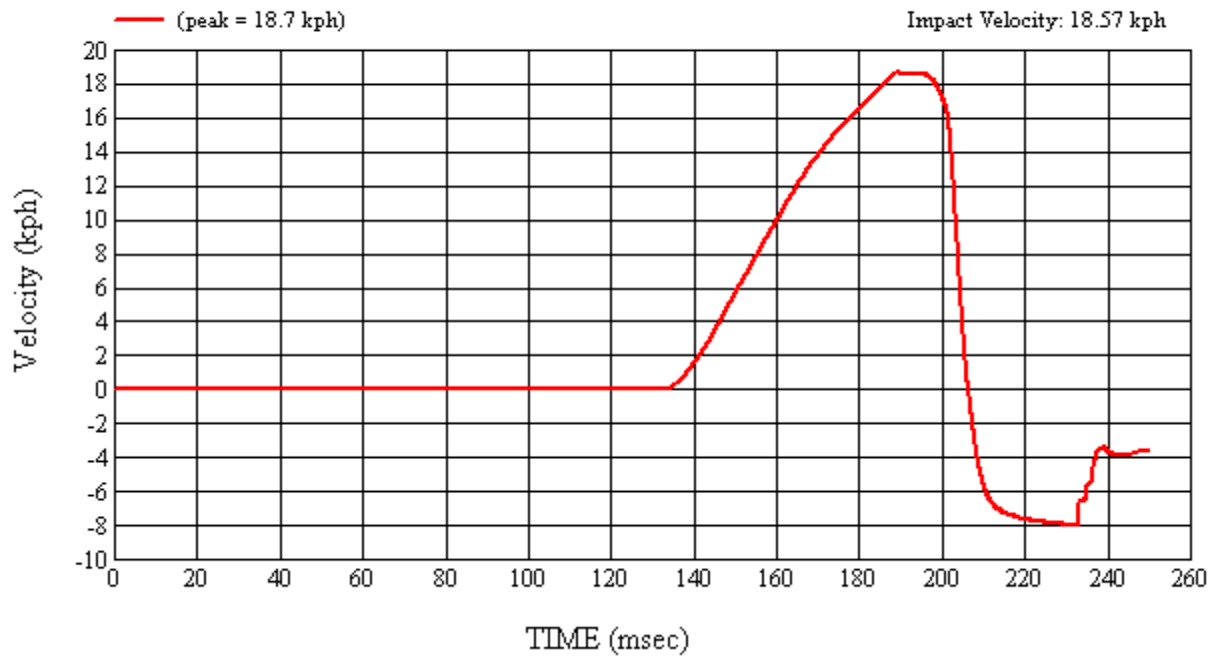
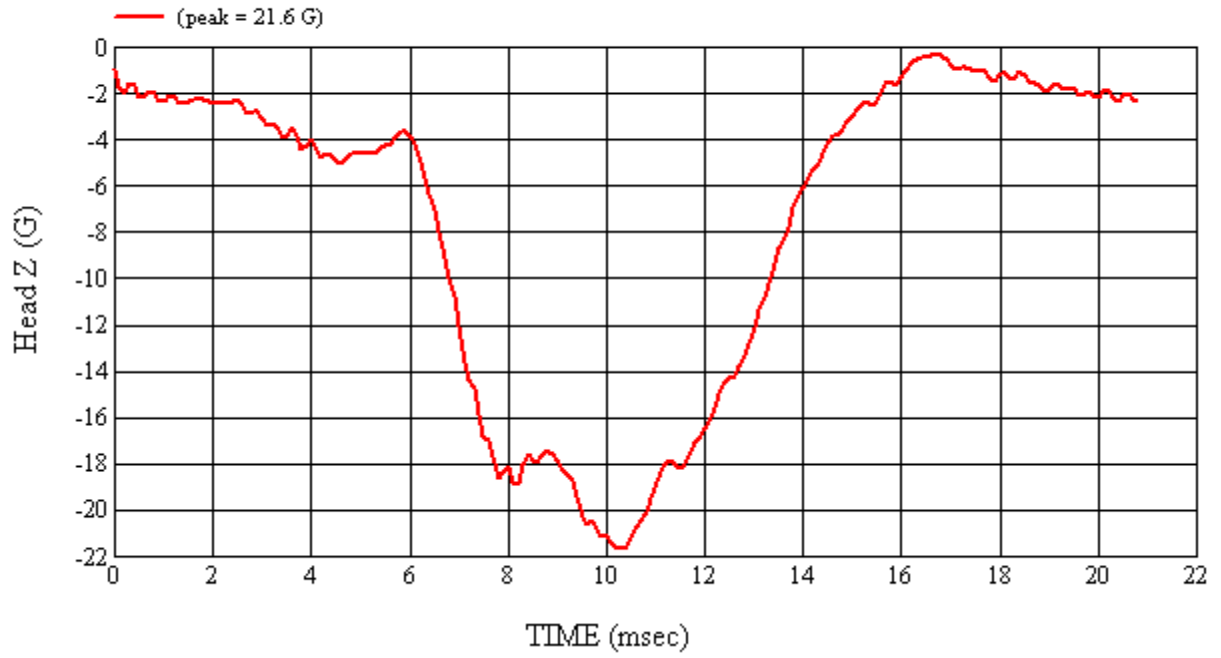
MGA Test #: U11104

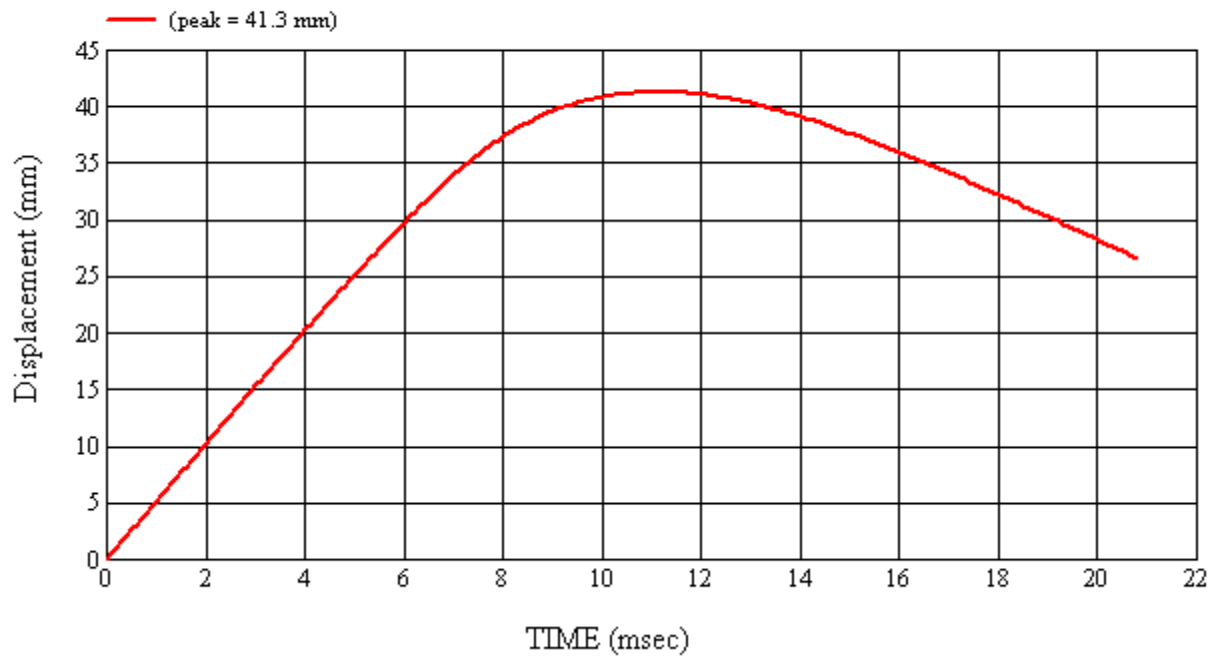
Target Location: BPI, Right Side

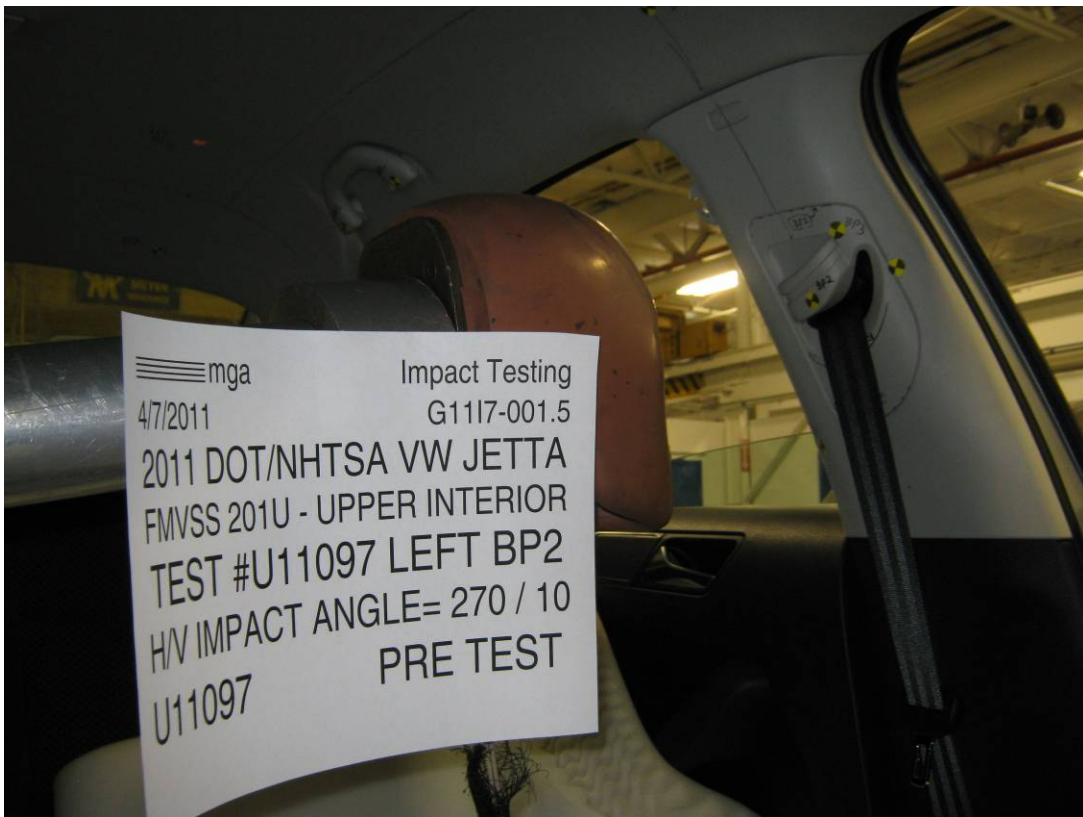
Test Date: 4/8/2011

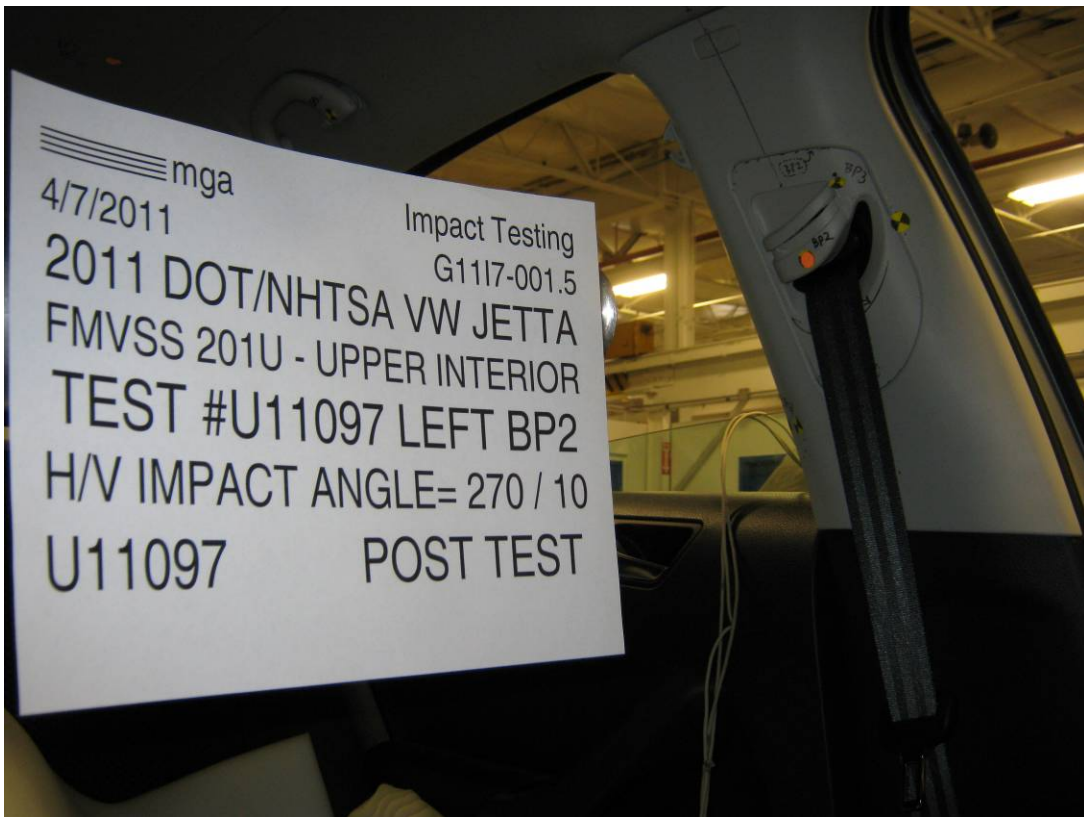














SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Test Number:#U11097

Target (Vehicle Side): BP2Left

Temperature:20.5C

MGA Test Reference No.:U11097

Humidity:34.3%

Approach Horizontal Angles:270°

Time of Test:12:26:47 PM

Approach Vertical Angles:10°

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
518	466	8.5	24.0	9	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.):

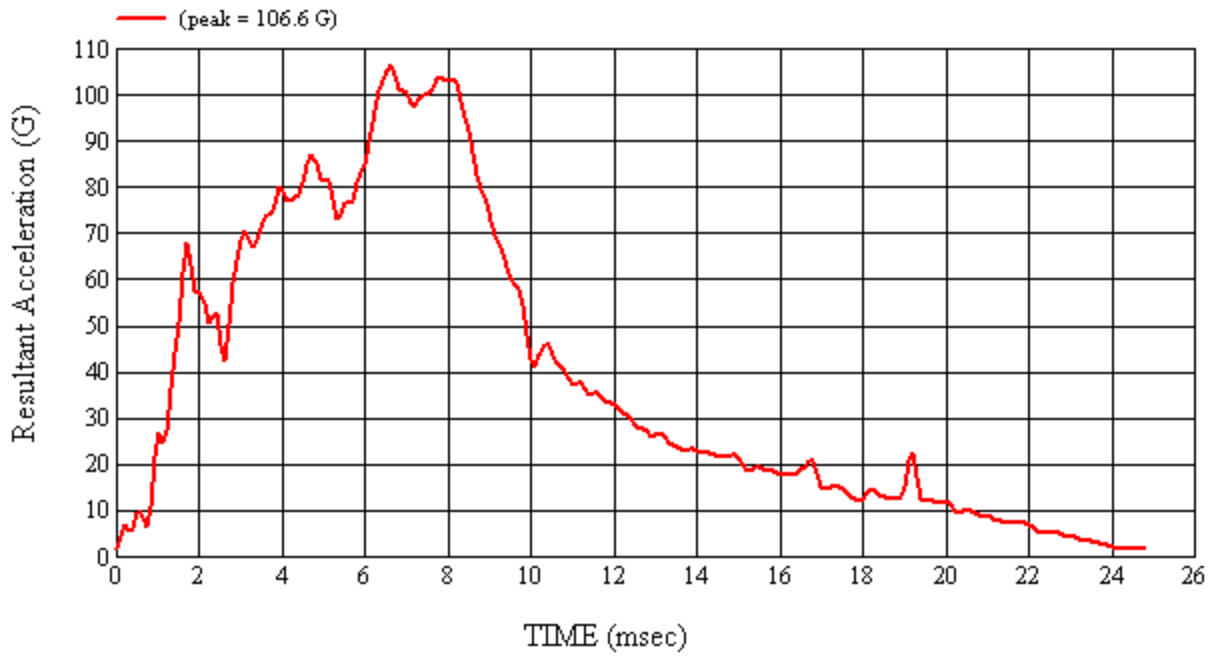
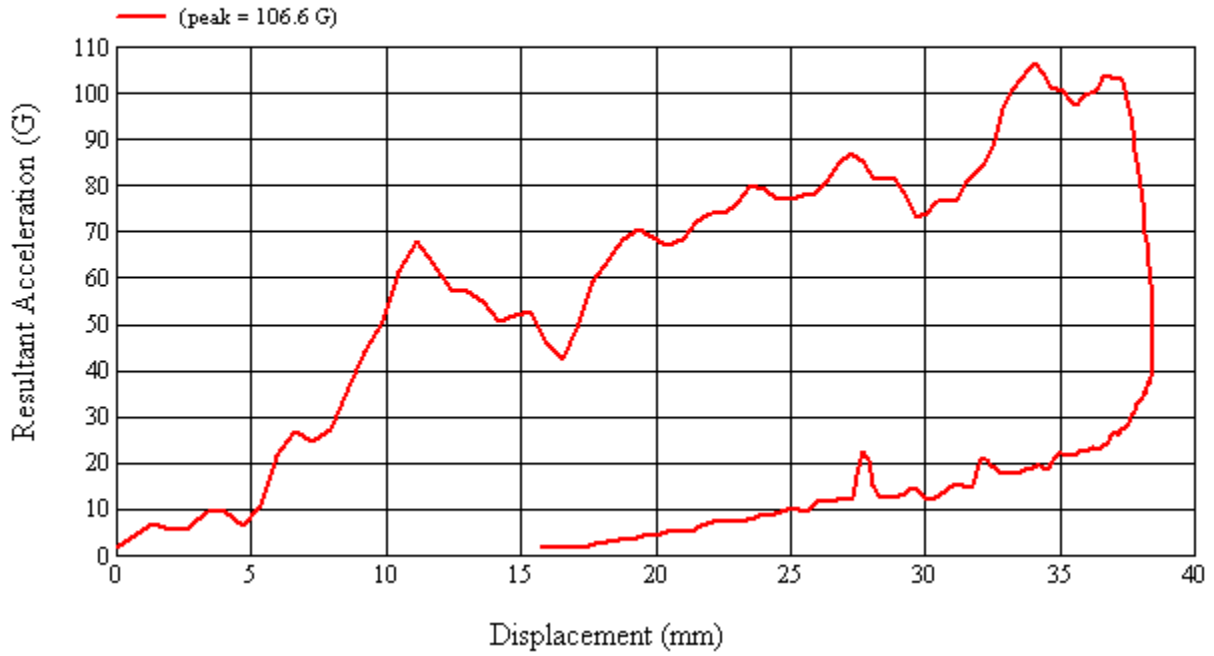
Cracked trim. Non-functional adjustable anchorage.

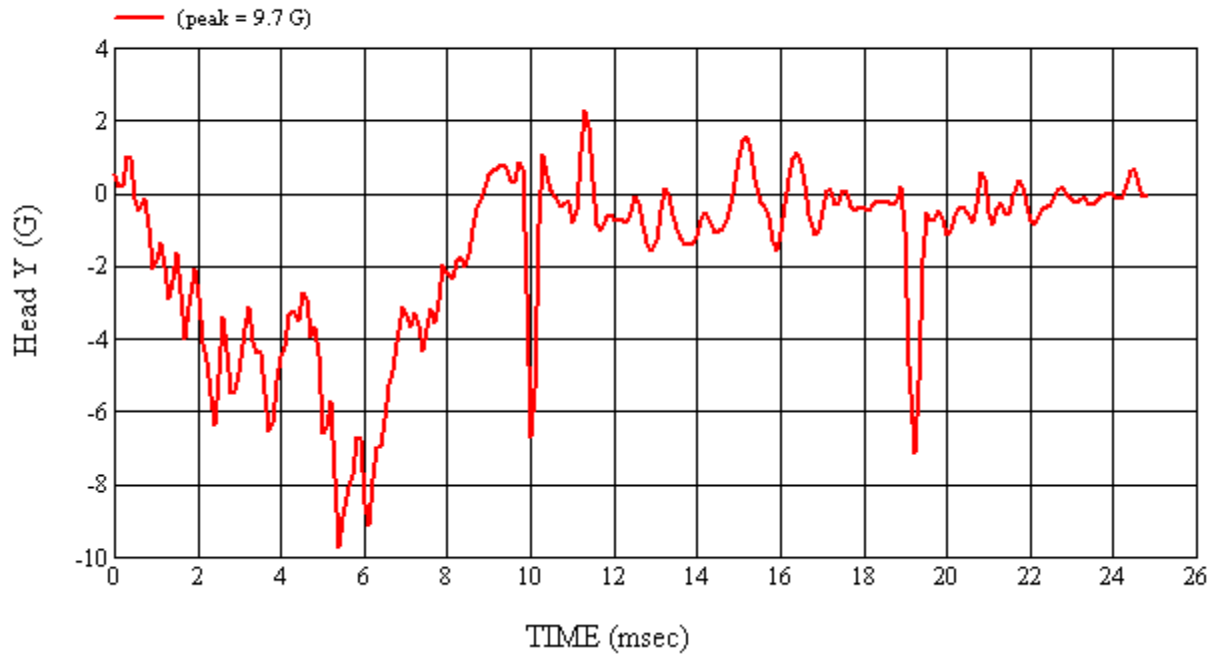
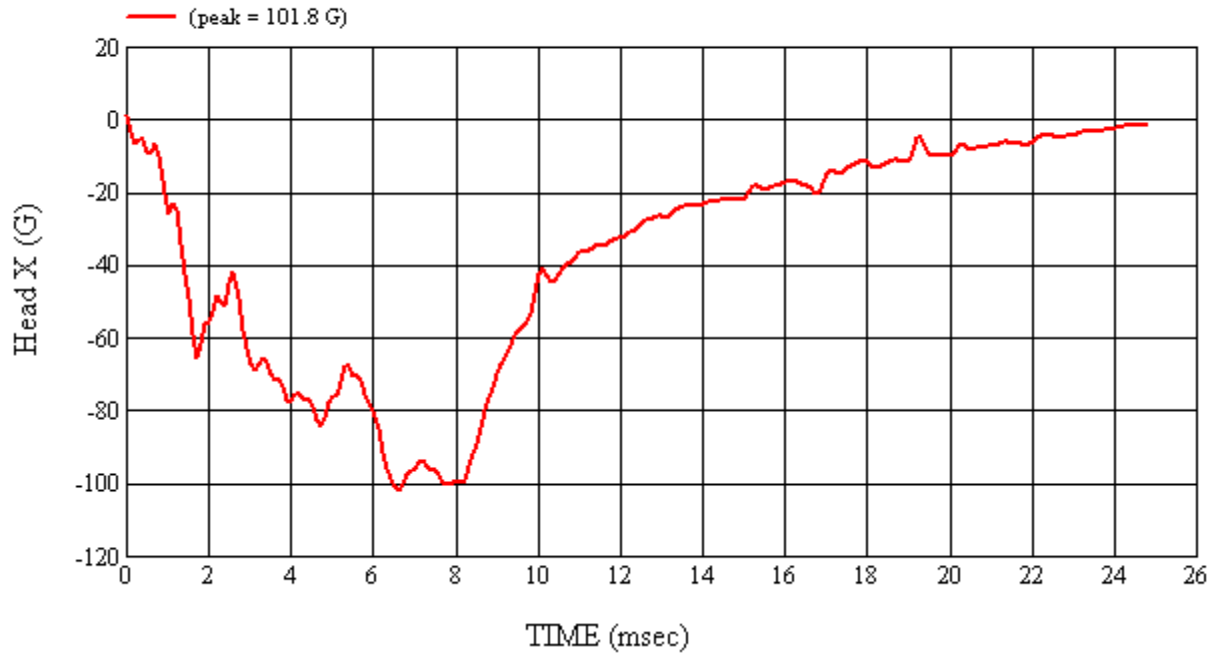
Recorded By: *Kevin D. McFerran* Approved By*: *Arthur I. Smith* Date: 4/7/2011
 *Only necessary for NHTSA (Government) Compliance testing.

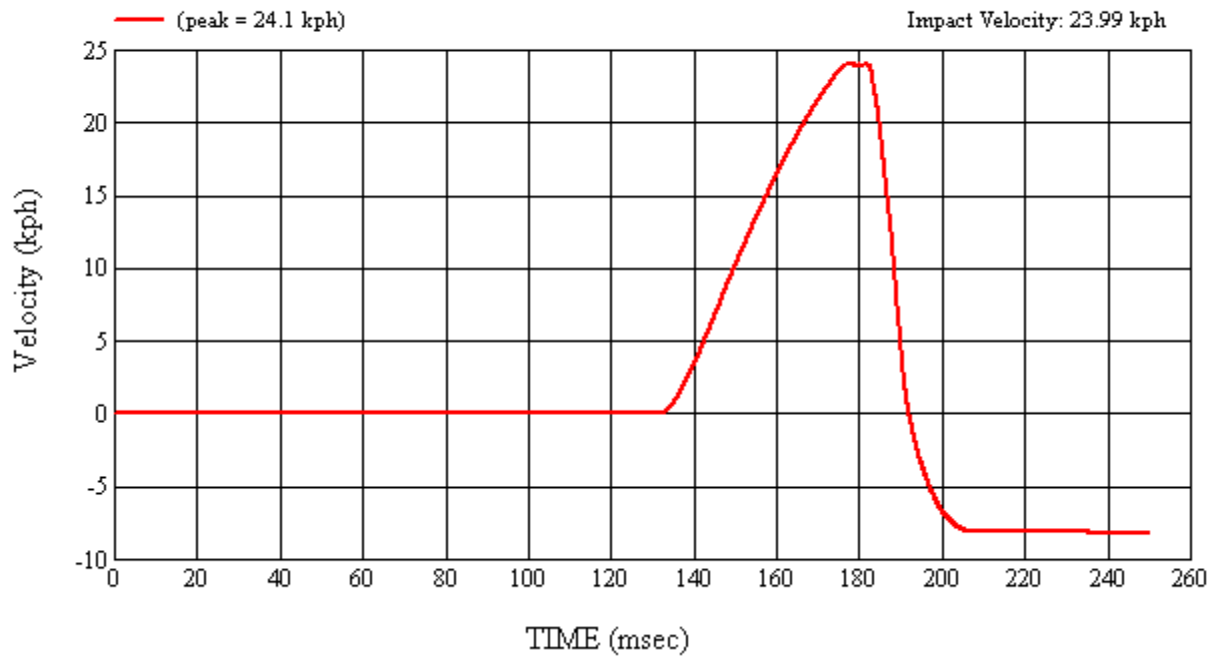
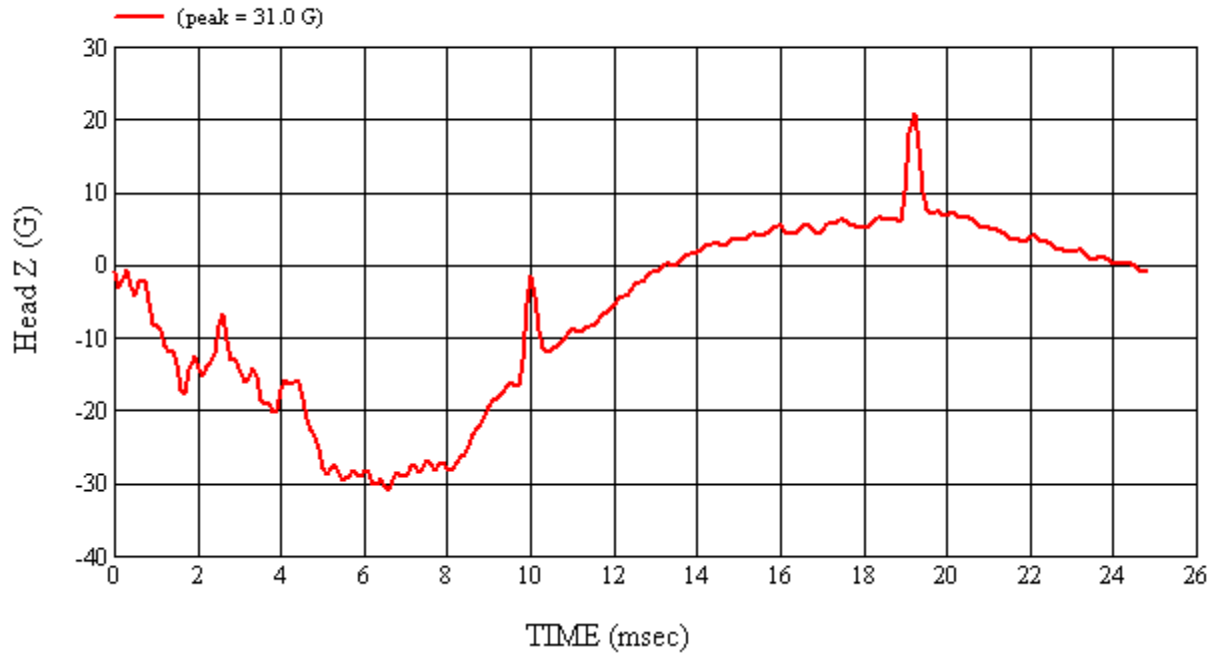
MGA Test #: U11097

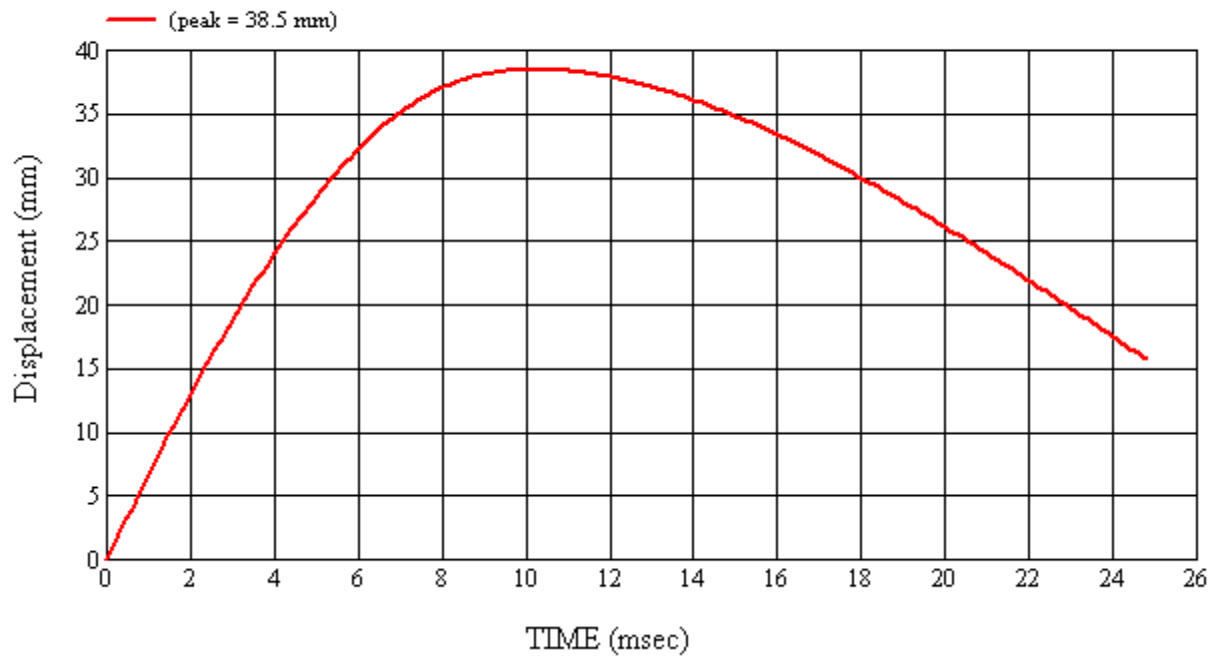
Target Location: BP2, Left Side

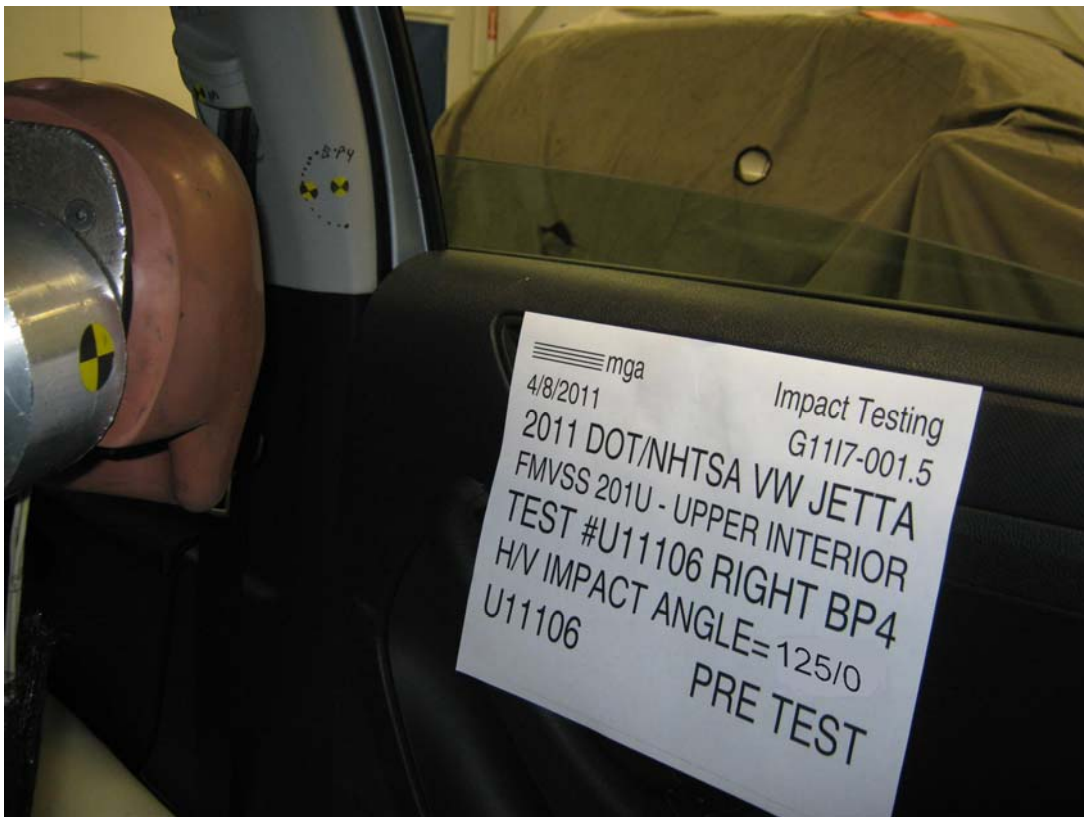
Test Date: 4/7/2011

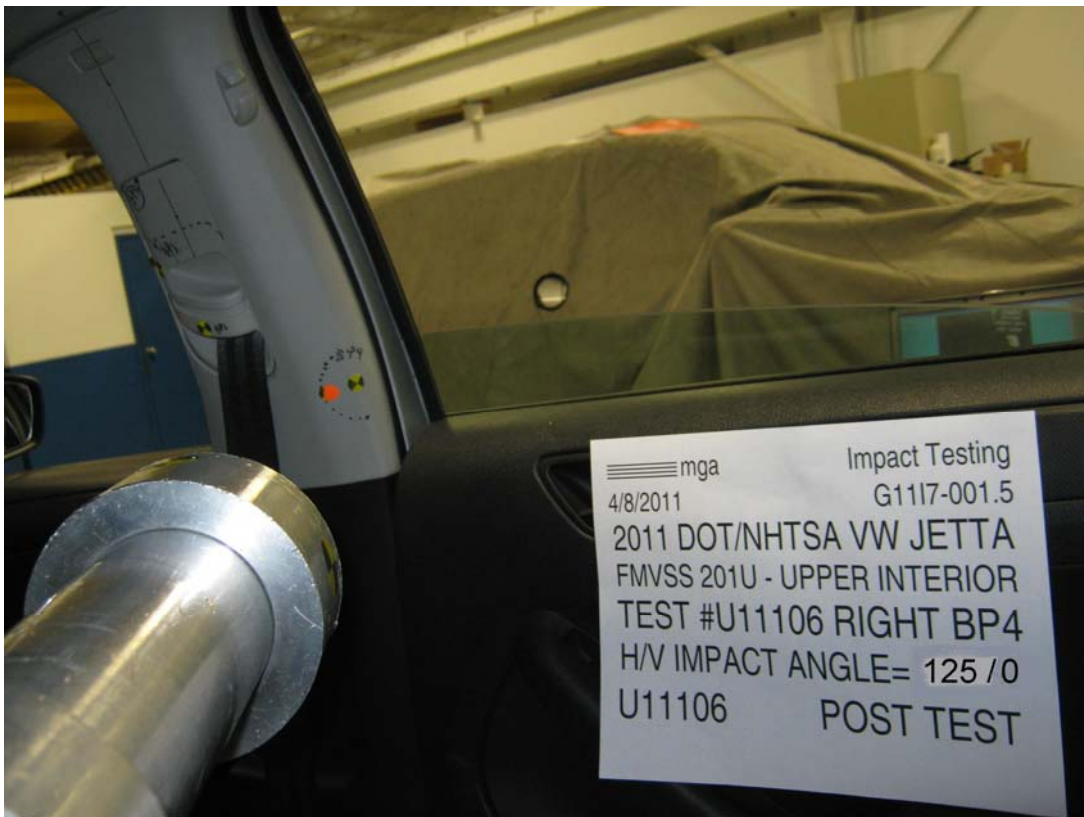
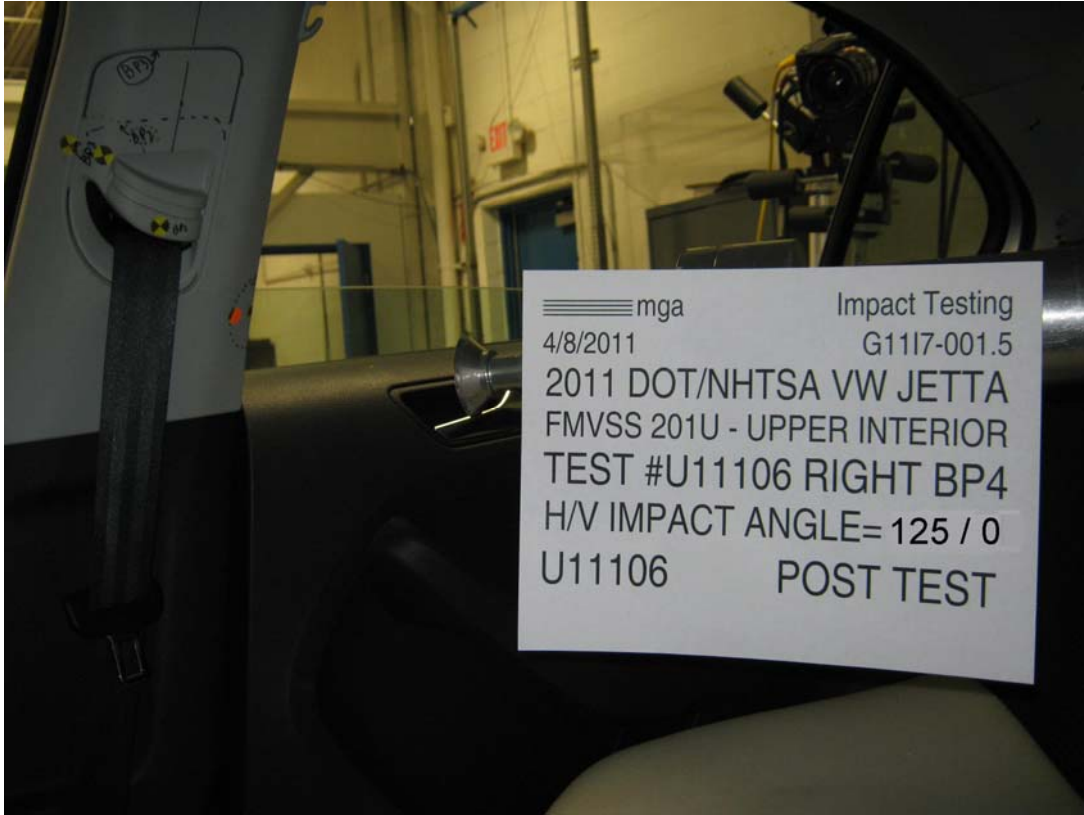


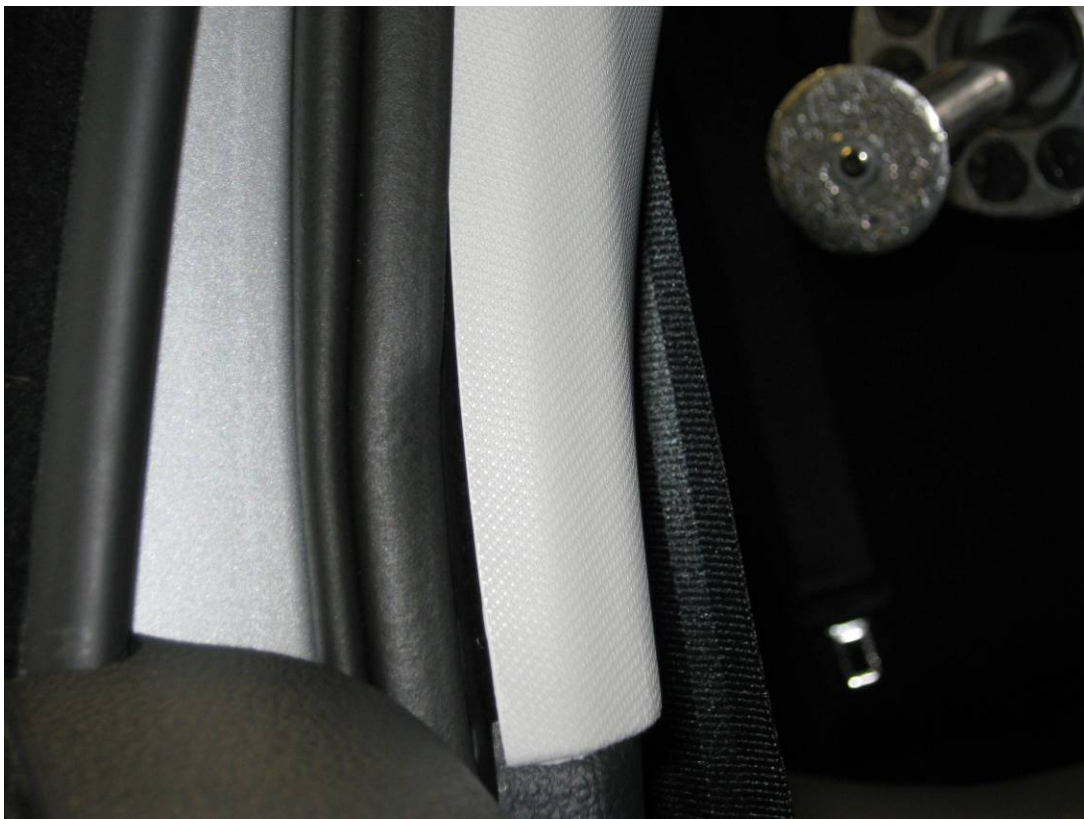
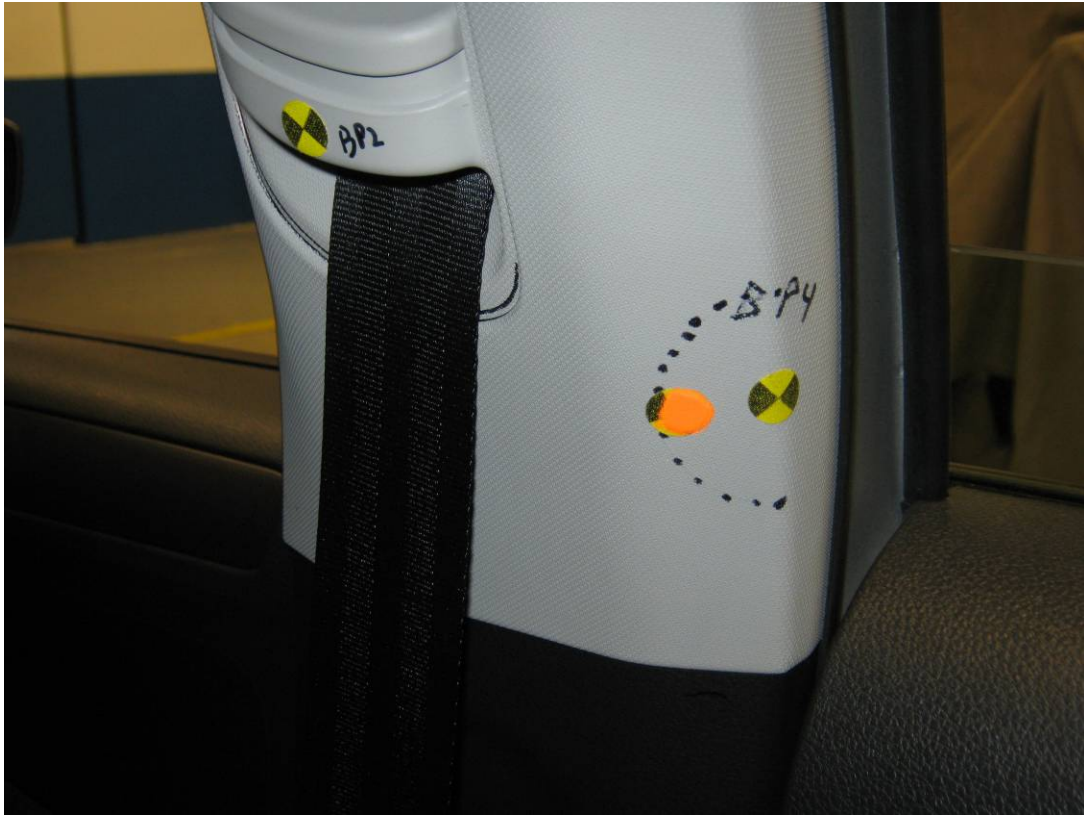














SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Test Number:#U11106

Target (Vehicle Side): BP4Right

Temperature:20.6C

MGA Test Reference No.:U11106

Humidity:39.5%

Approach Horizontal Angles:125°

Time of Test:5:02:24 PM

Approach Vertical Angles:0°

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
664	659	6	23.9	31	11 Right

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

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

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

Dislodged pillar

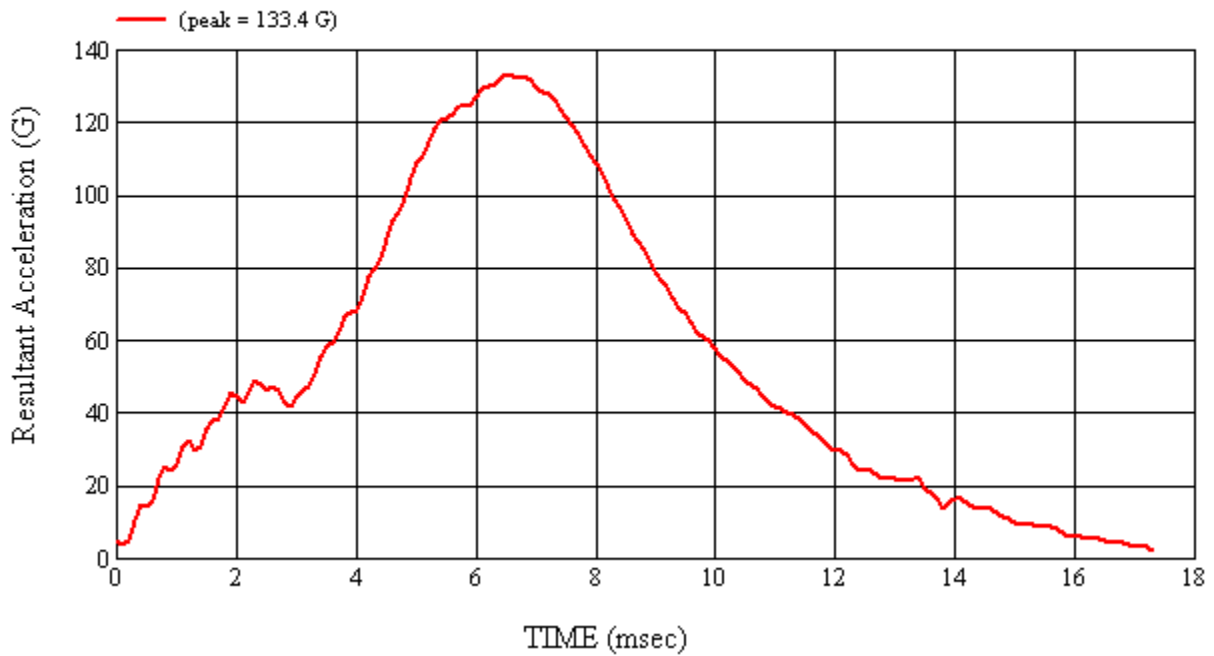
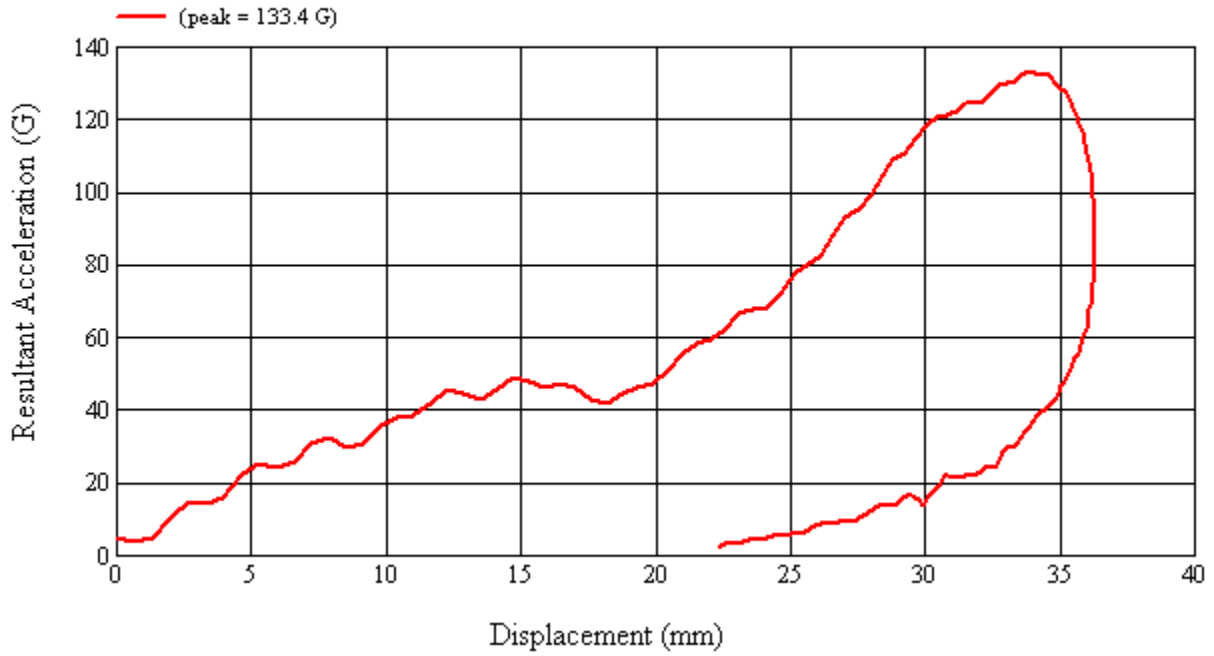
Recorded By: *Keri D. McJannet* Approved By*: *Adrian I. Smith* Date: 4/8/2011

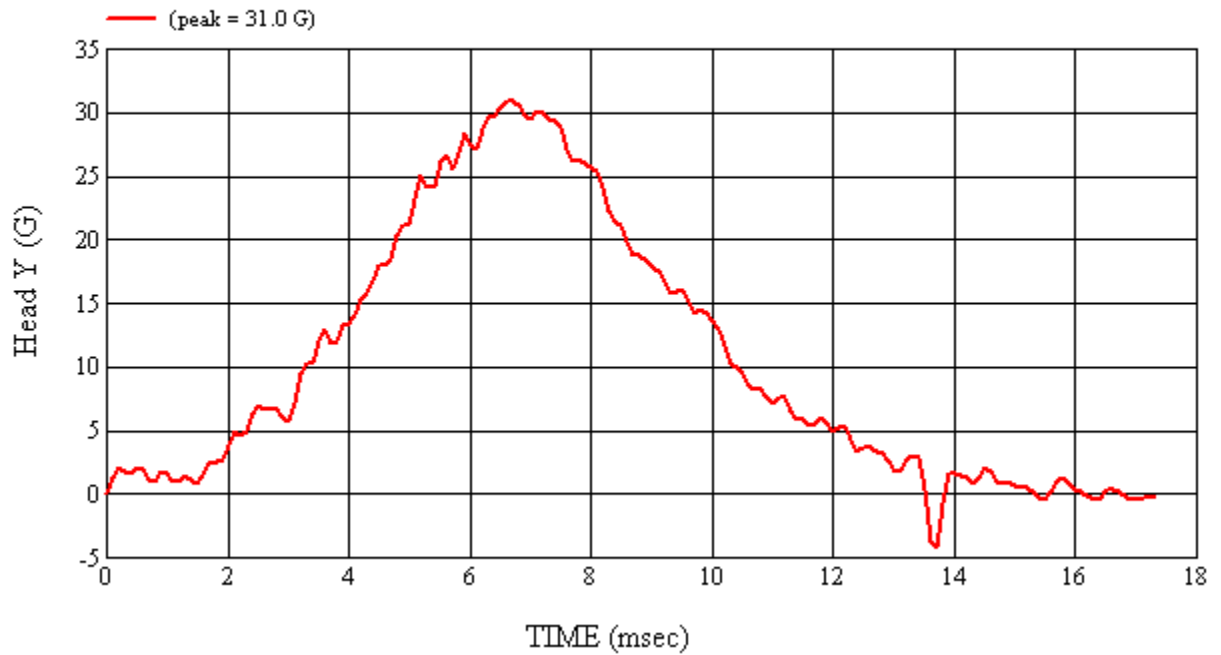
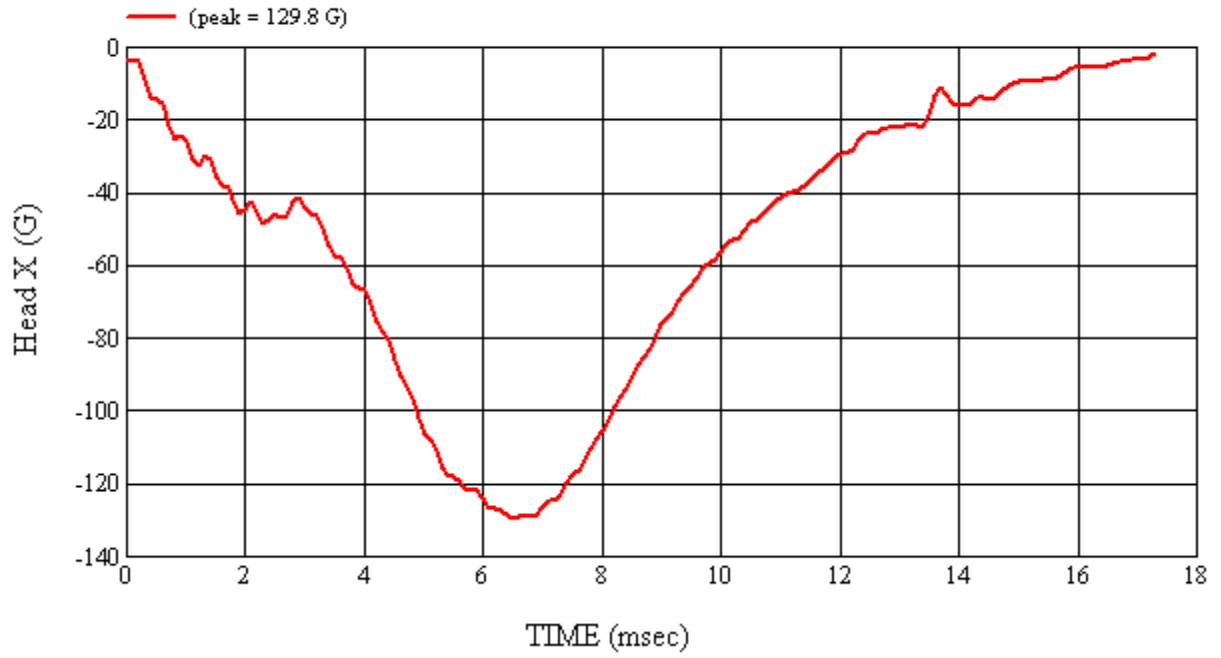
*Only necessary for NHTSA (Government) Compliance testing.

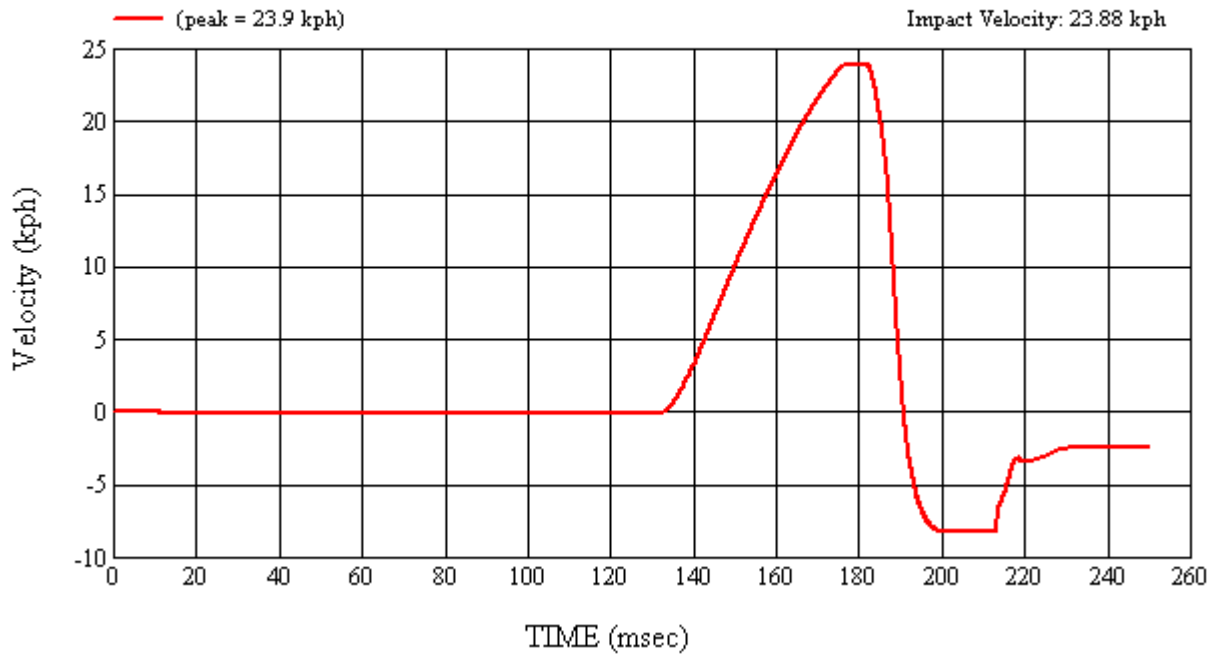
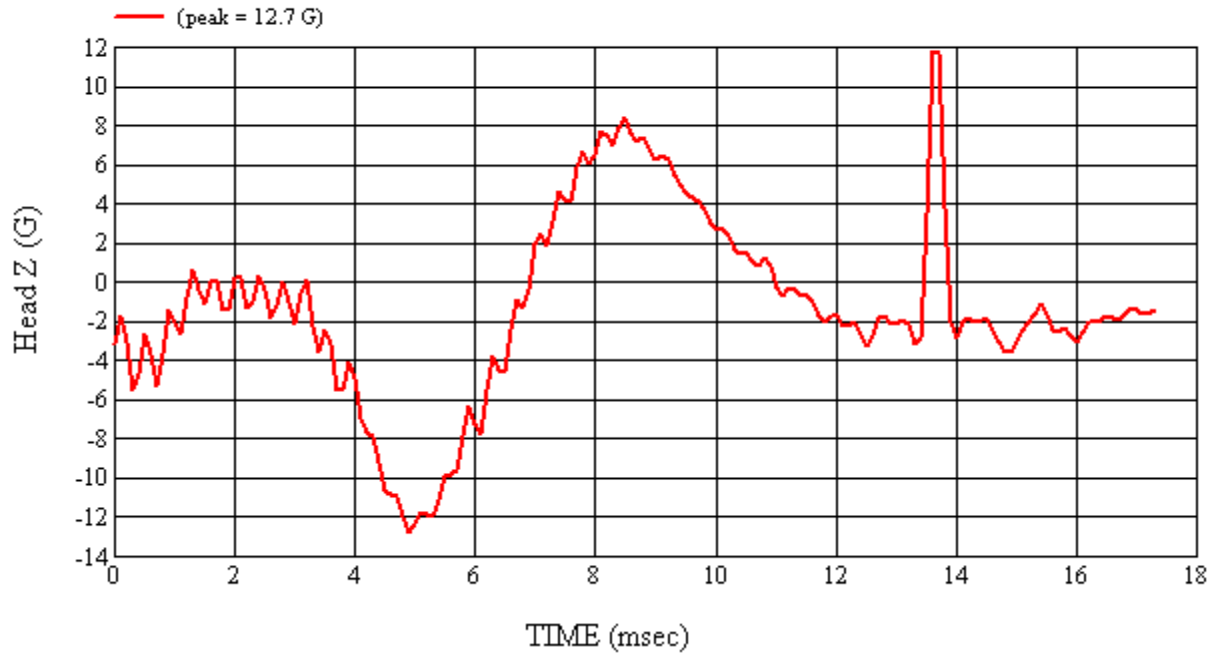
MGA Test #: U11106

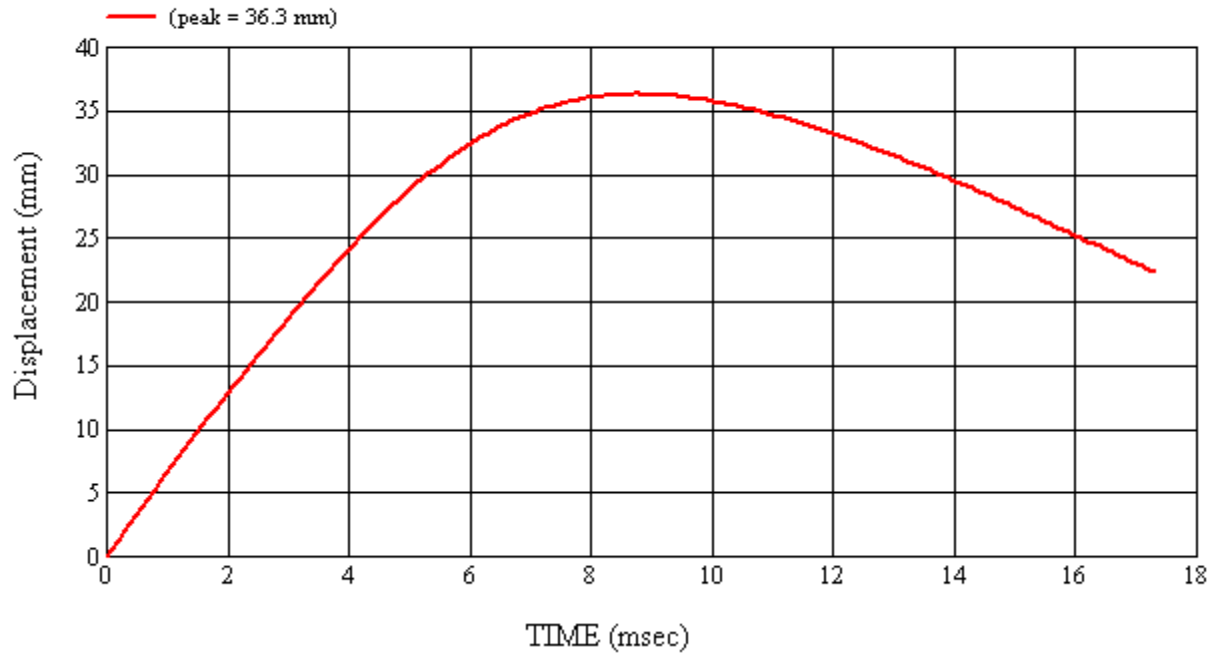
Target Location: BP4, Right Side

Test Date: 4/8/2011



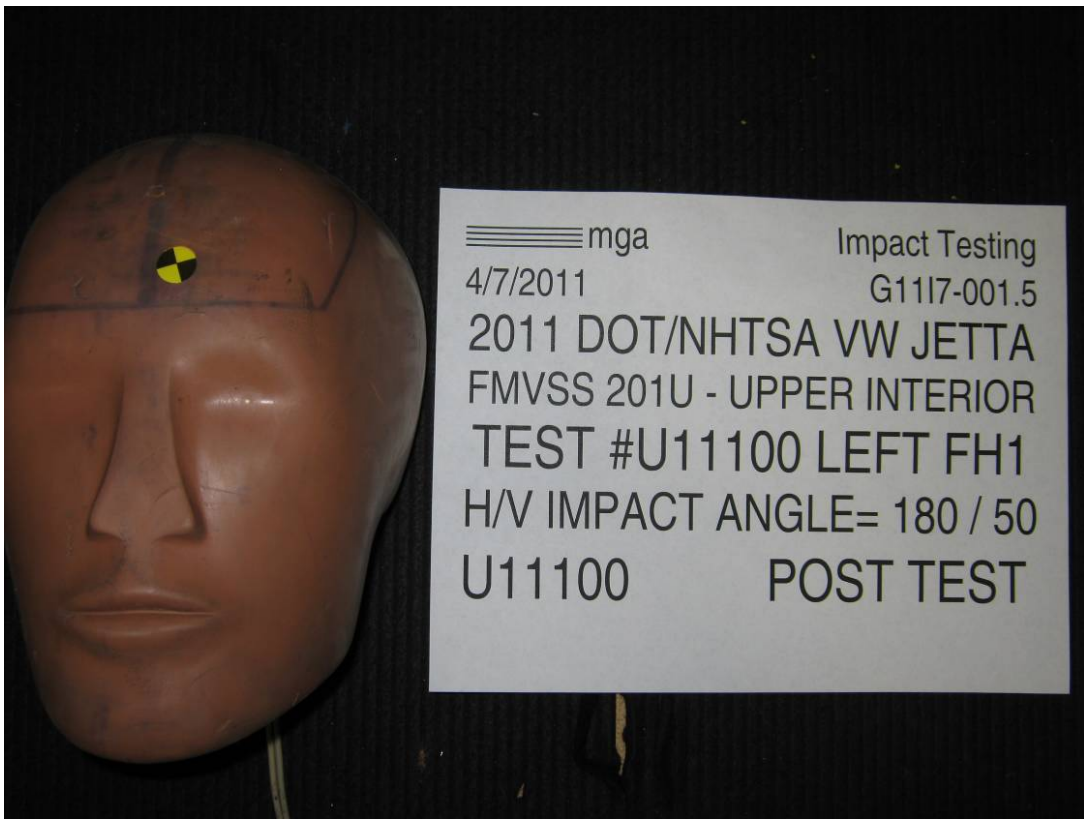












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Test Number:#U11100

Target (Vehicle Side): FH1Left

Temperature:20.6C

MGA Test Reference No.:U11100

Humidity:36.6%

Approach Horizontal Angles:180°

Time of Test:3:33:47 PM

Approach Vertical Angles:50°

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
513	460	7.8	24.1	14	7 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

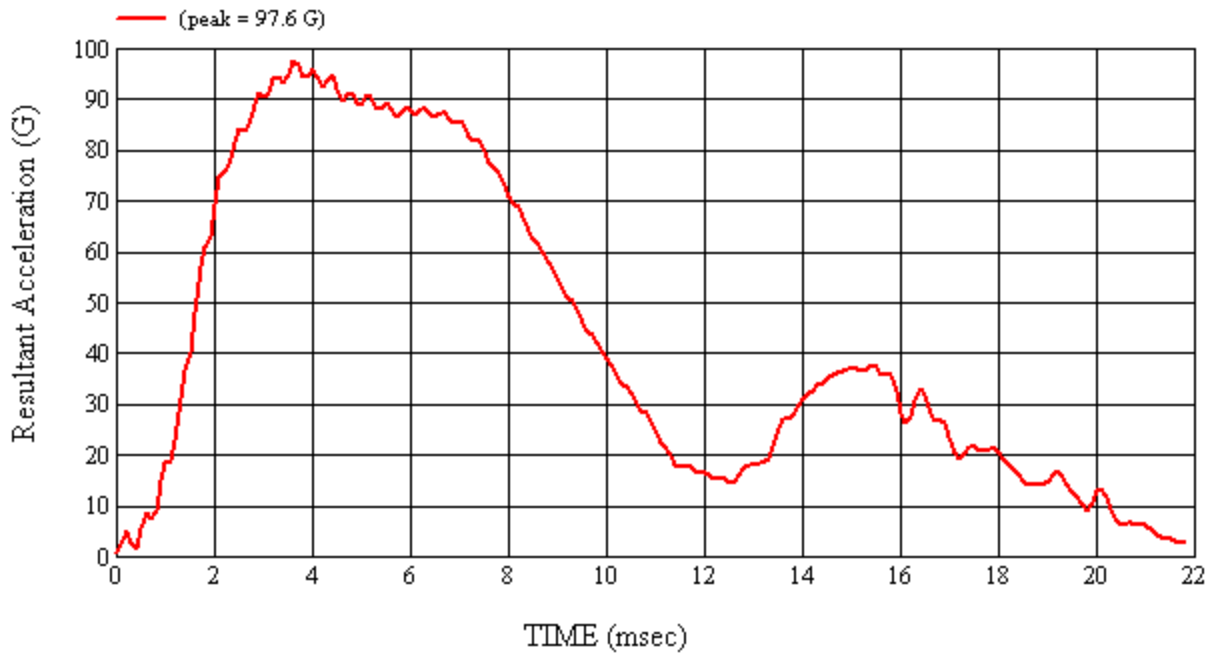
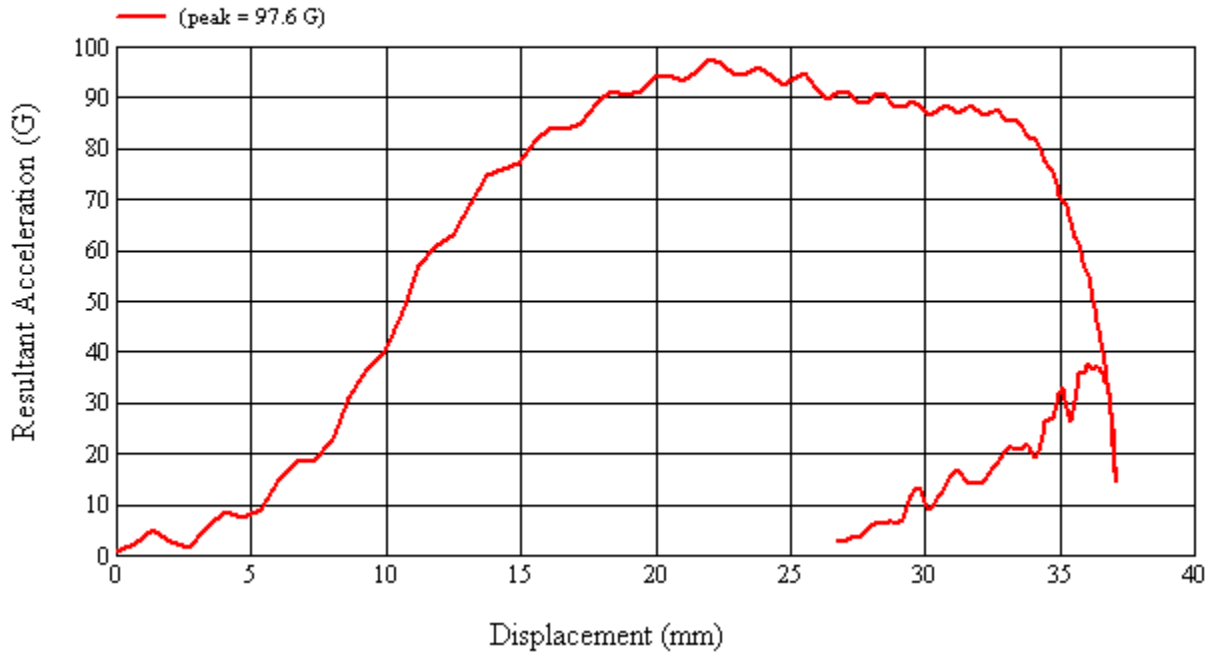
Recorded By: *Kevin D. McFerson* Approved By*: *Richard I. Smith* Date: 4/7/2011

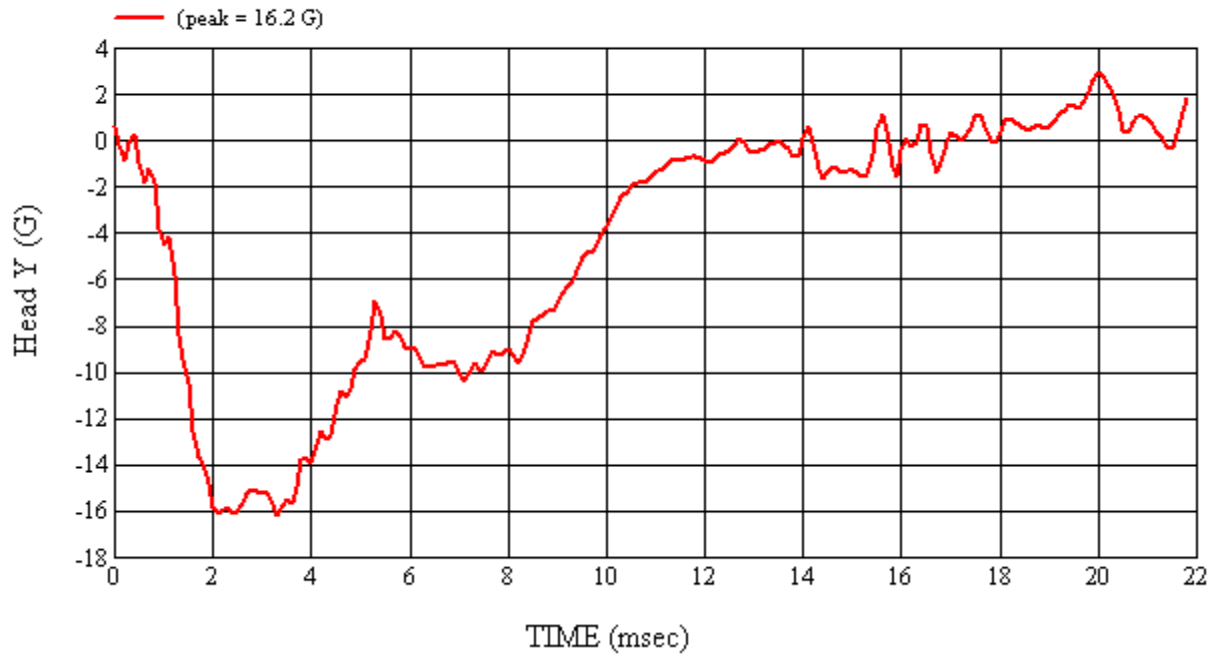
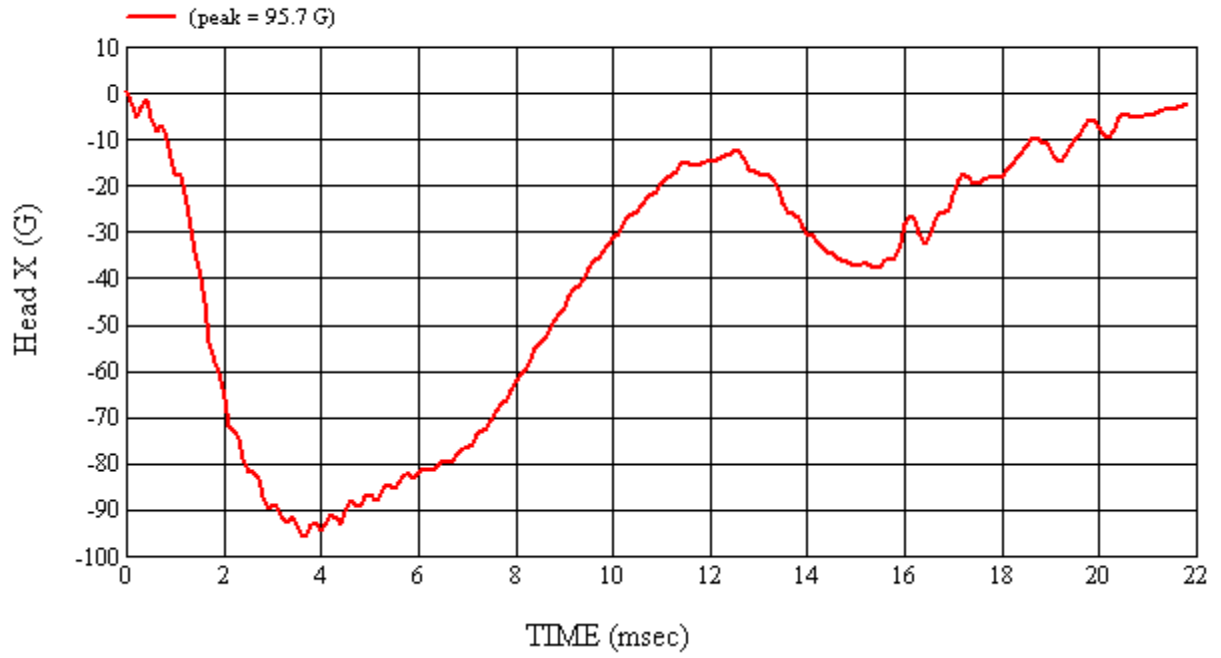
*Only necessary for NHTSA (Government) Compliance testing.

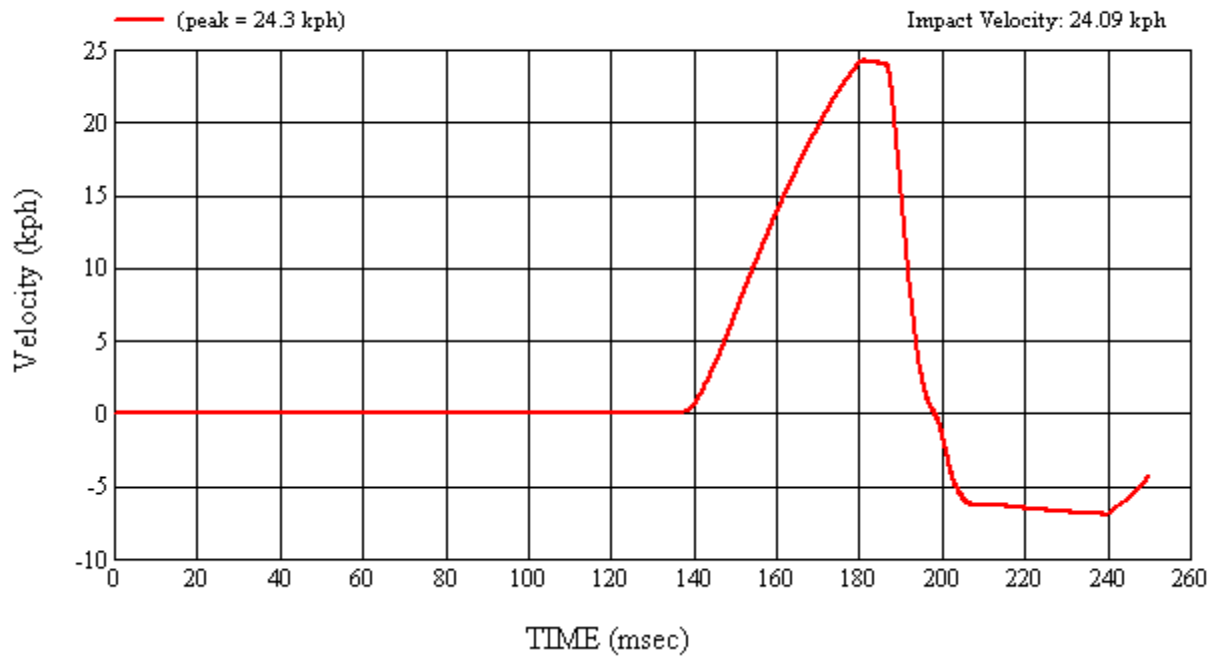
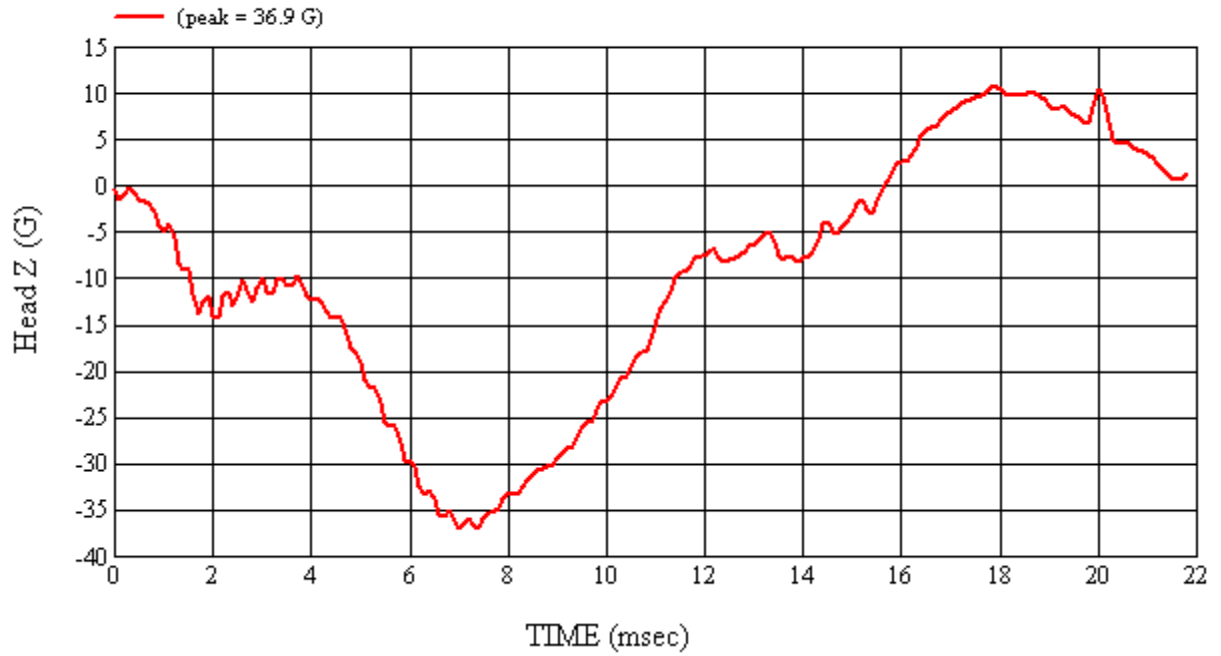
MGA Test #: U11100

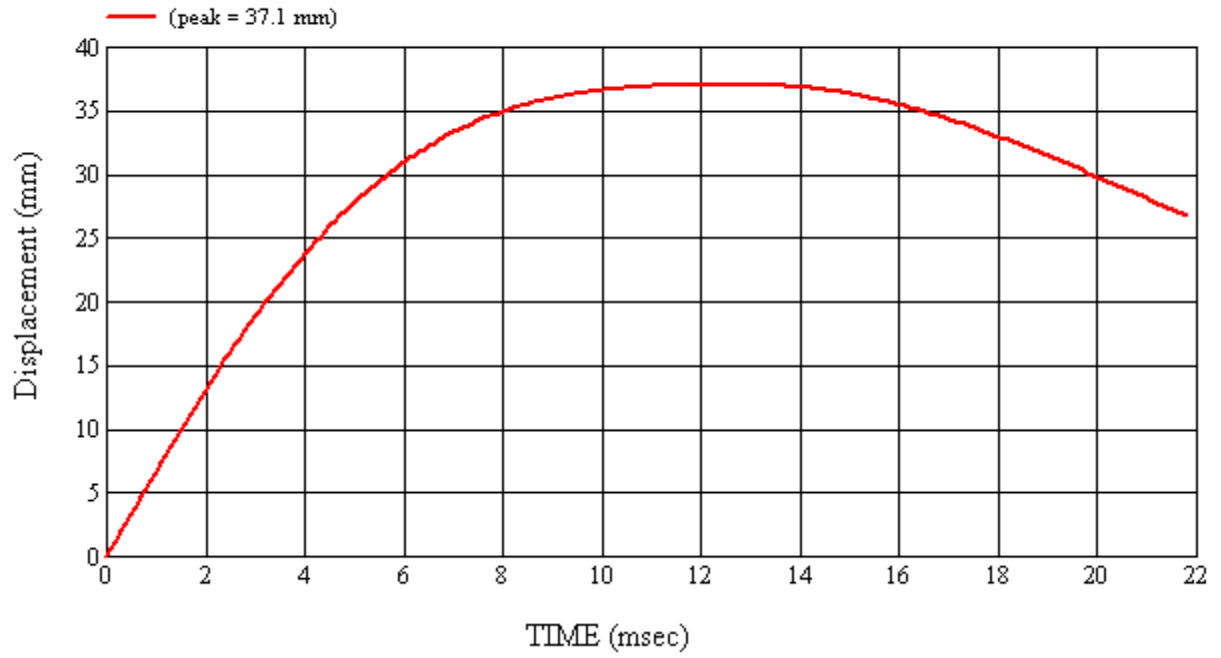
Target Location: FH1, Left Side

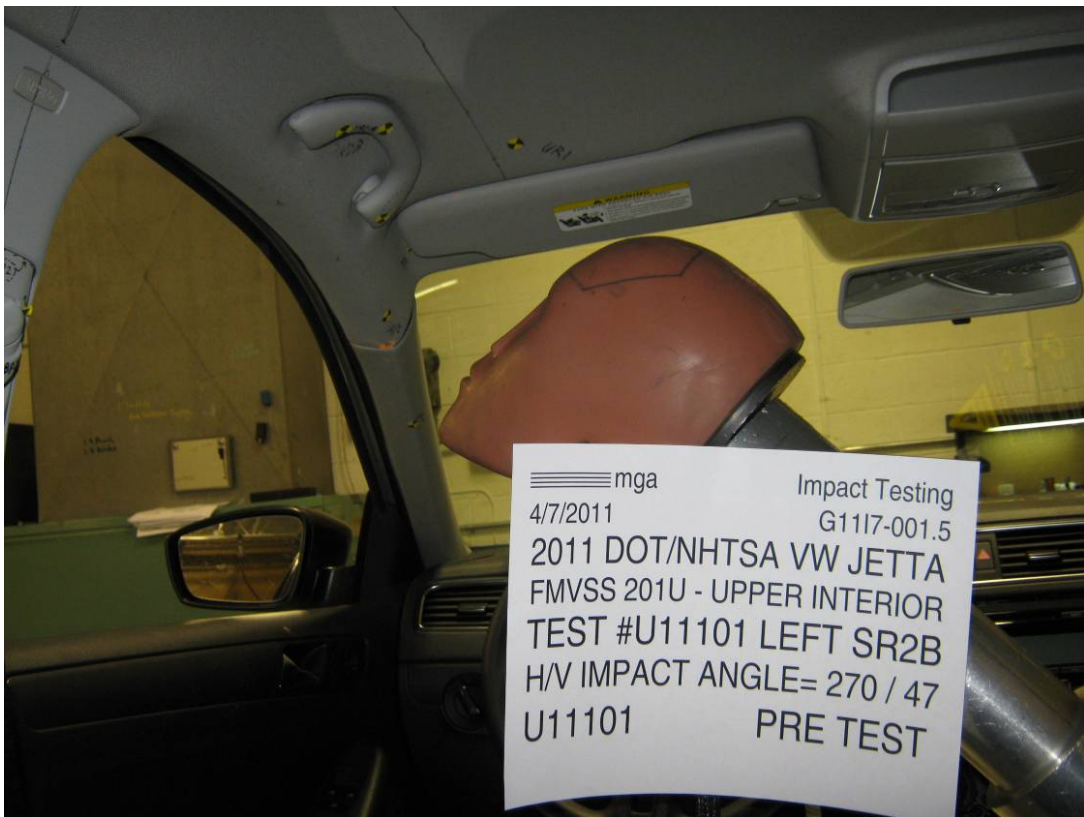
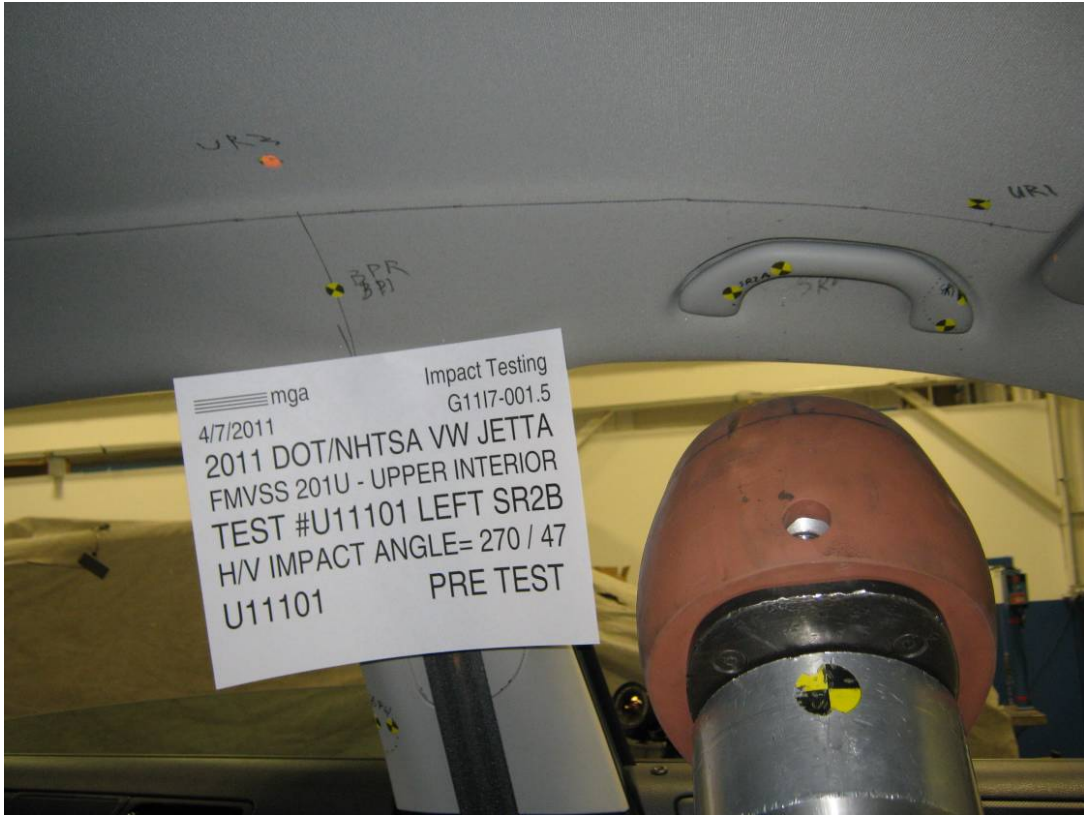
Test Date: 4/7/2011





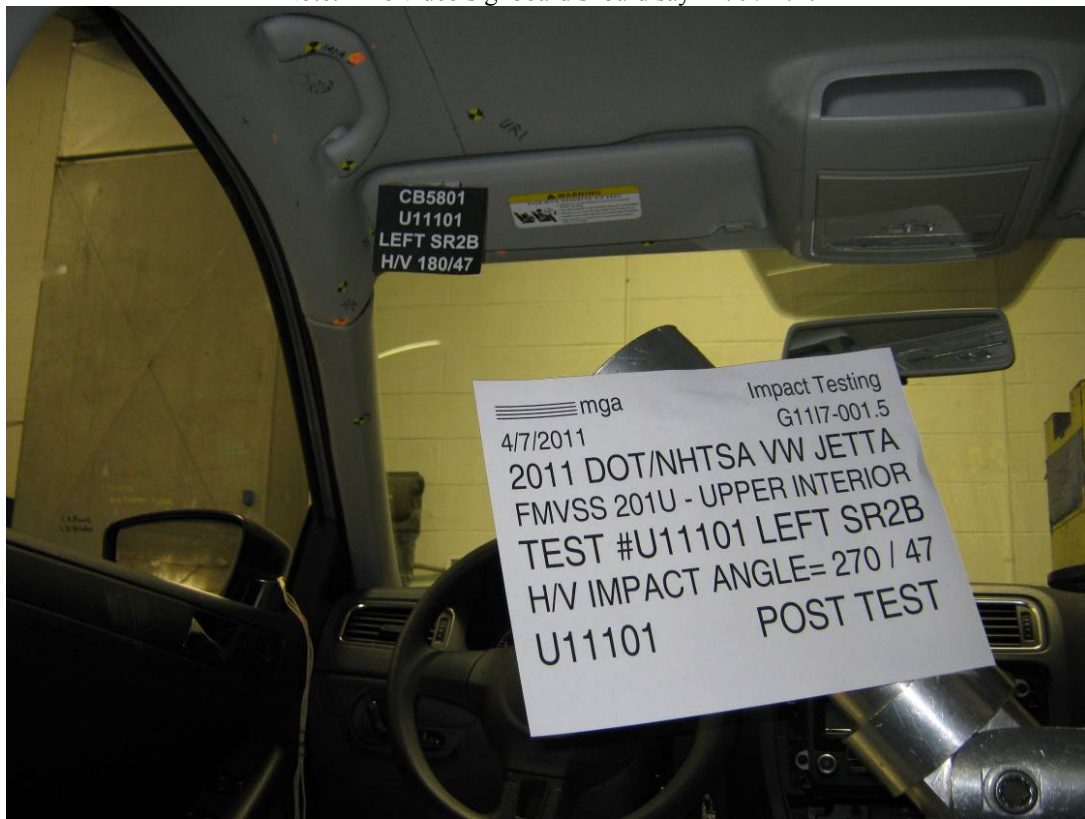




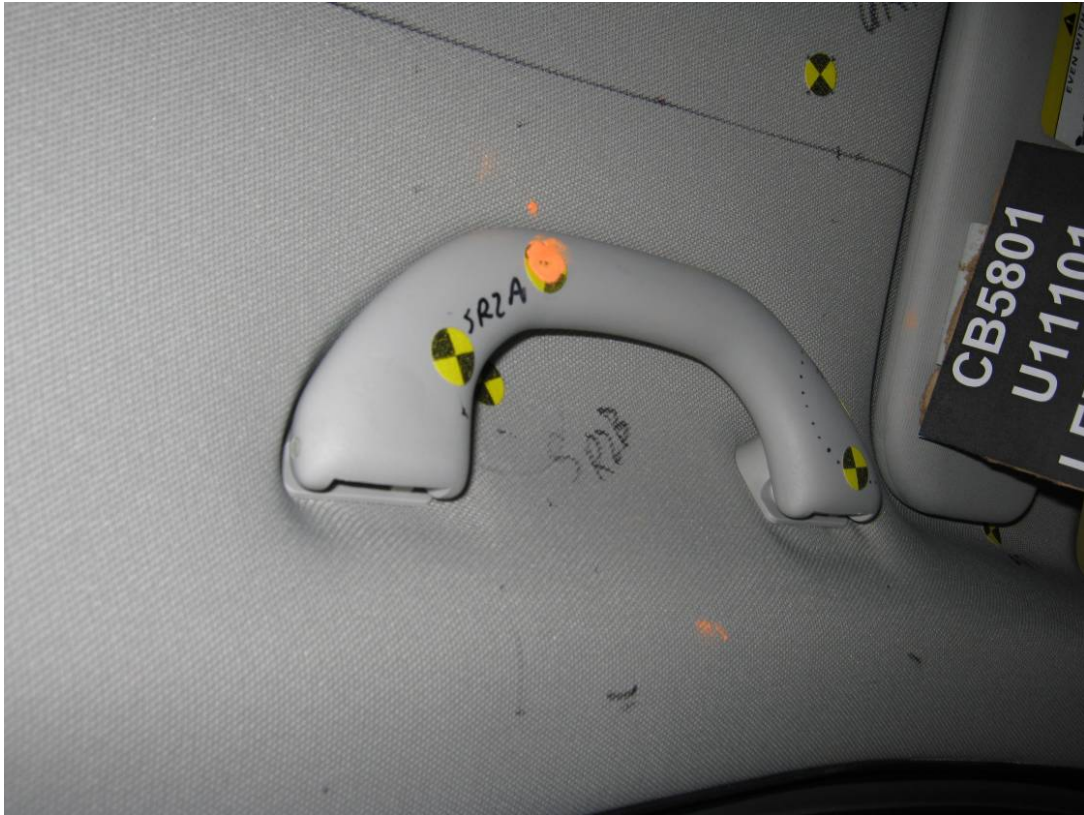




Note: The video signboard should say "270 / 47".



Note: The video signboard should say "270 / 47".



SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Test Number:#U11101

Target (Vehicle Side): SR2BLeft

Temperature:20.7C

MGA Test Reference No.:U11101

Humidity:37.2%

Approach Horizontal Angles:270°

Time of Test:4:24:49 PM

Approach Vertical Angles:47°

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
981	1080	3	23.9	8	9 Right

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

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

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

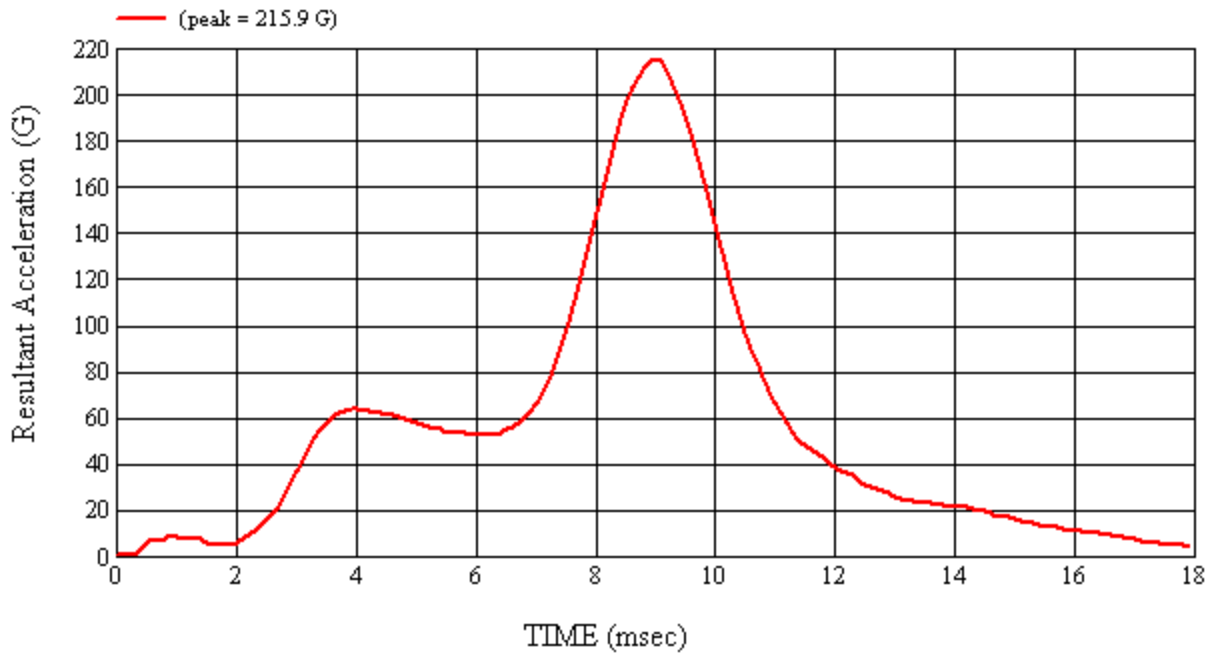
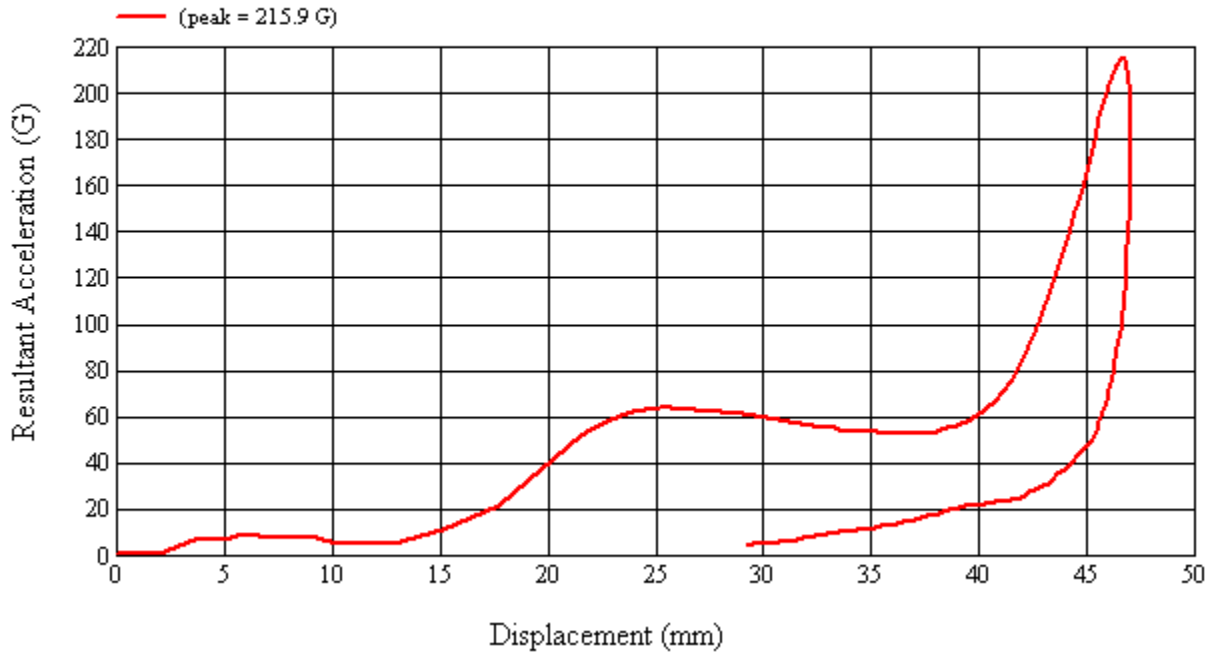
Grab handle compression

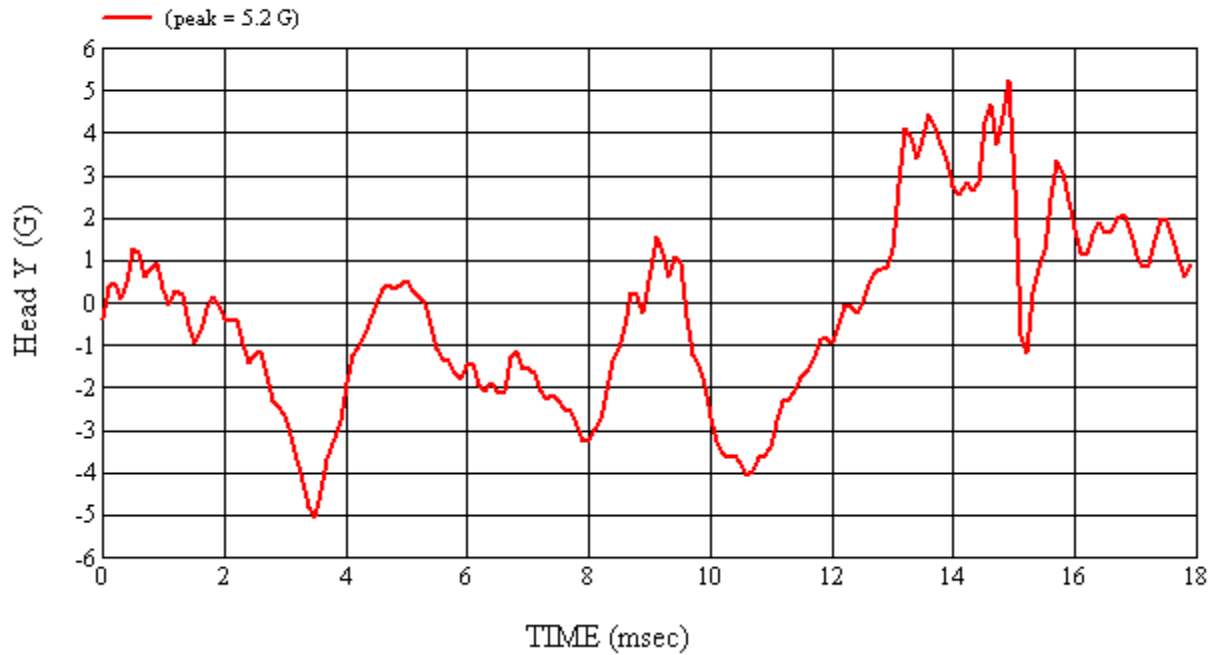
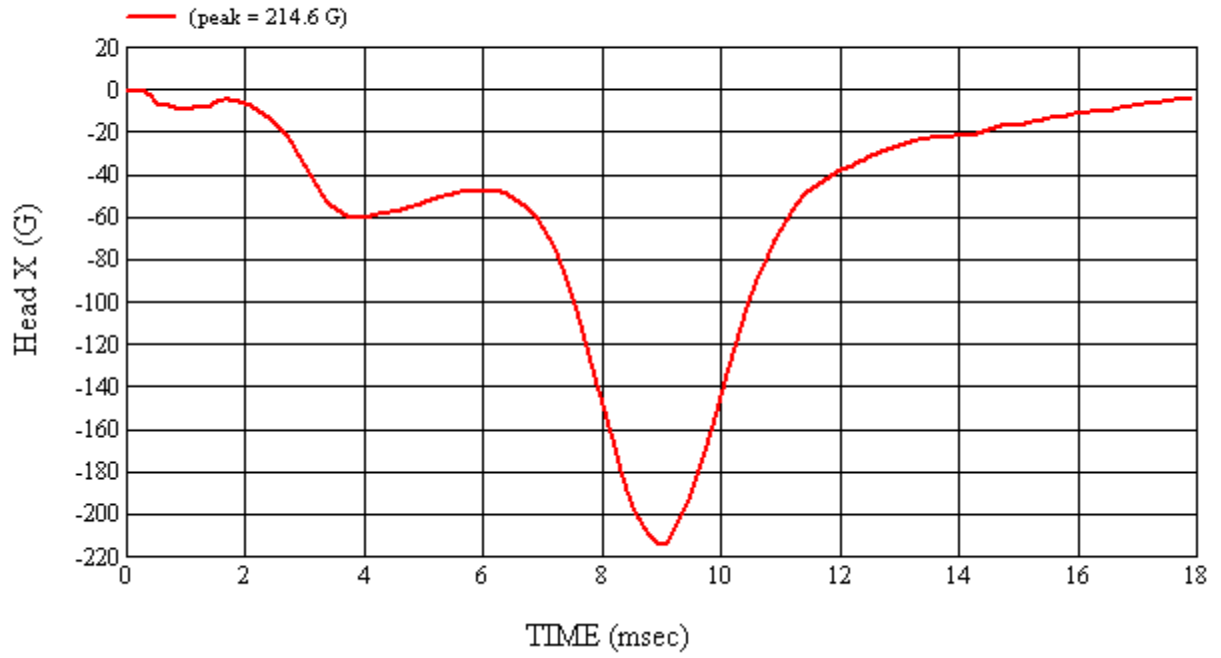
Recorded By: *Kevin D. McFerran* Approved By*: *Arthur I. Smith* Date: 4/7/2011
 *Only necessary for NHTSA (Government) Compliance testing.

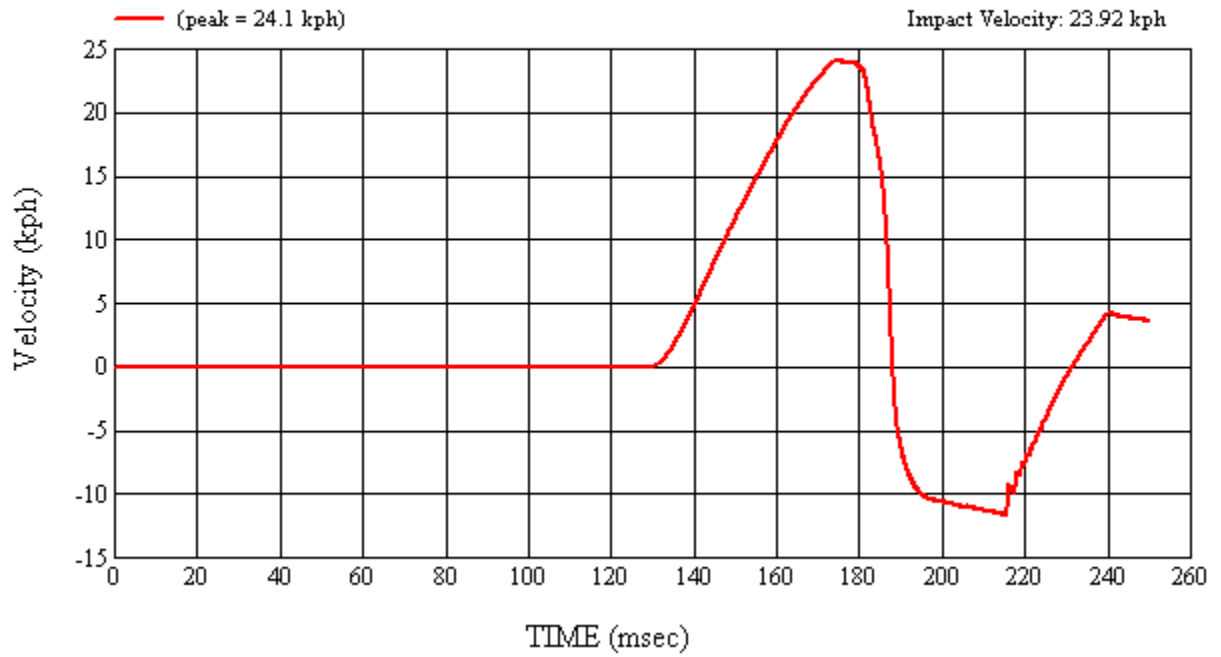
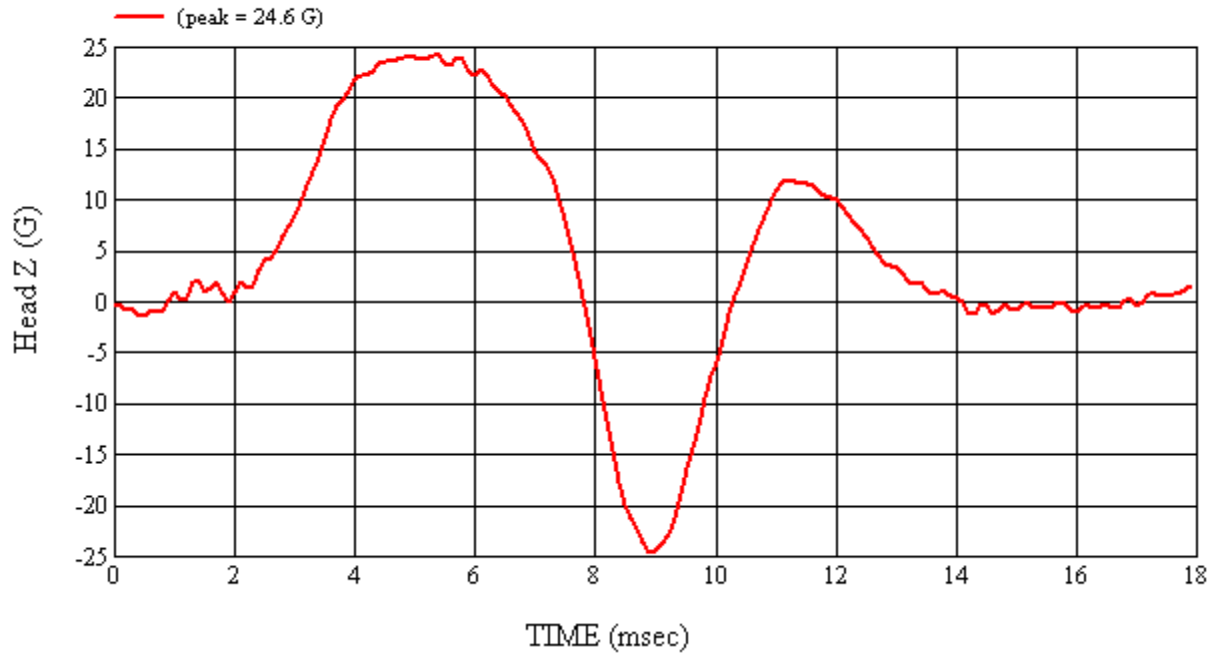
MGA Test #: U11101

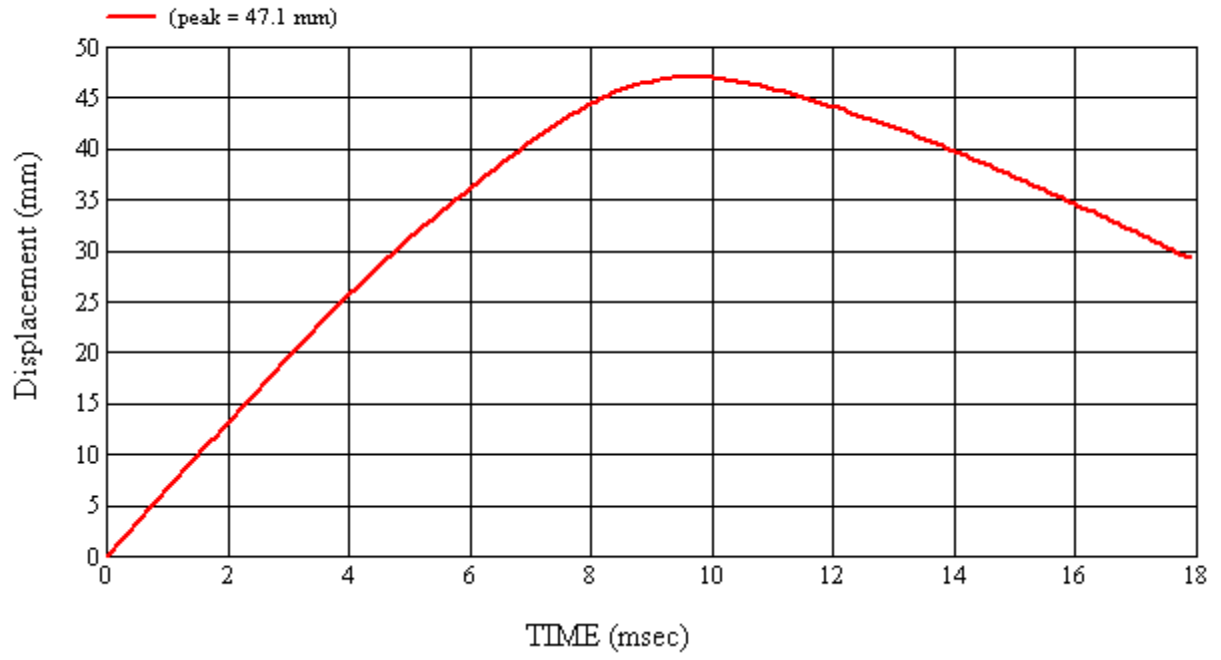
Target Location: SR2B, Left Side

Test Date: 4/7/2011

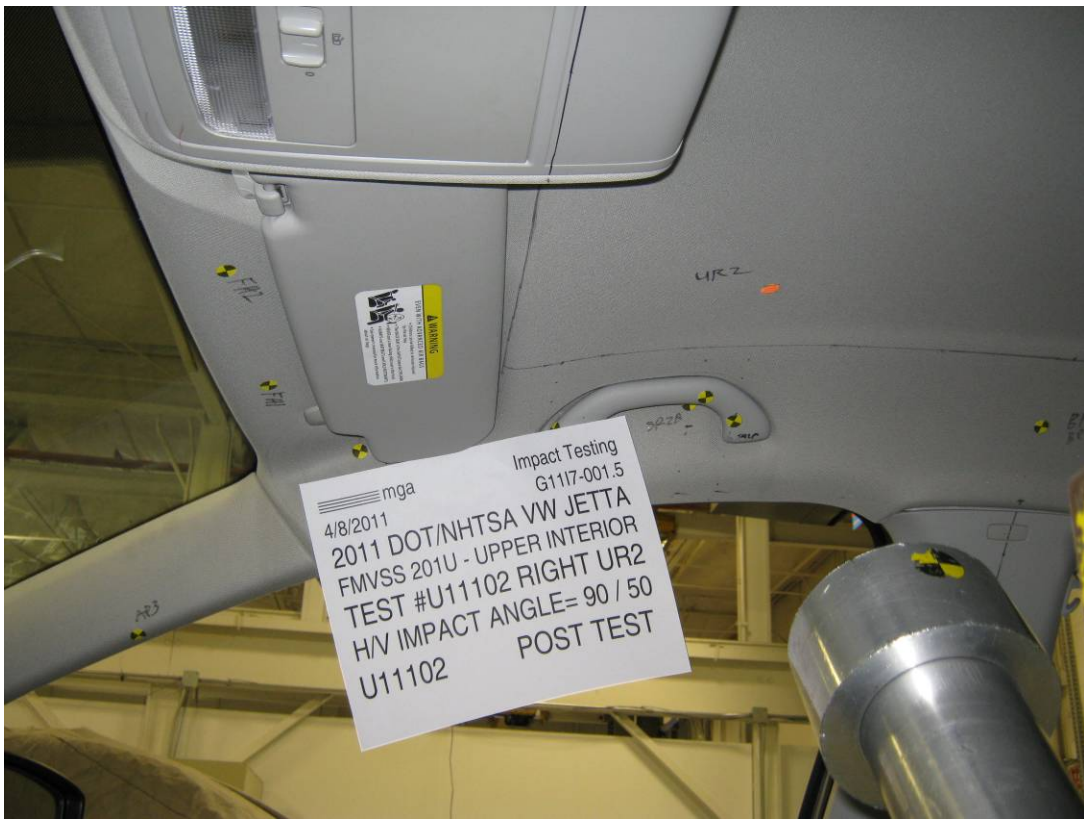


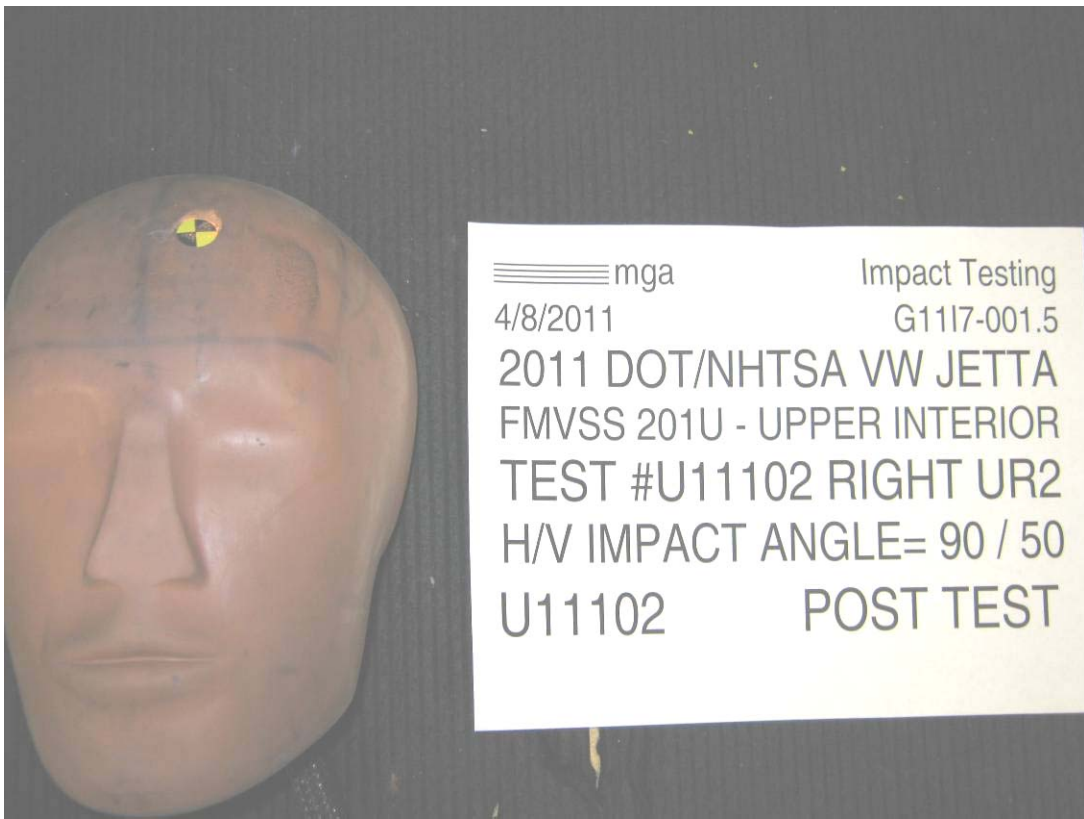
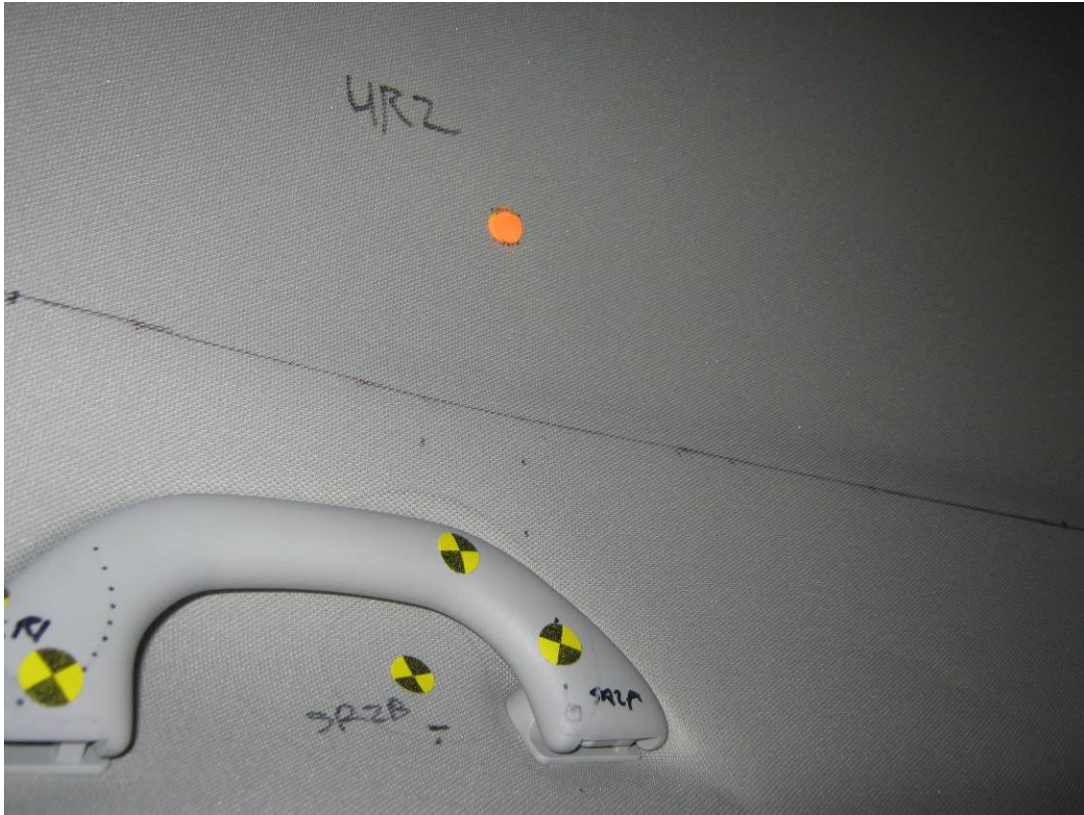


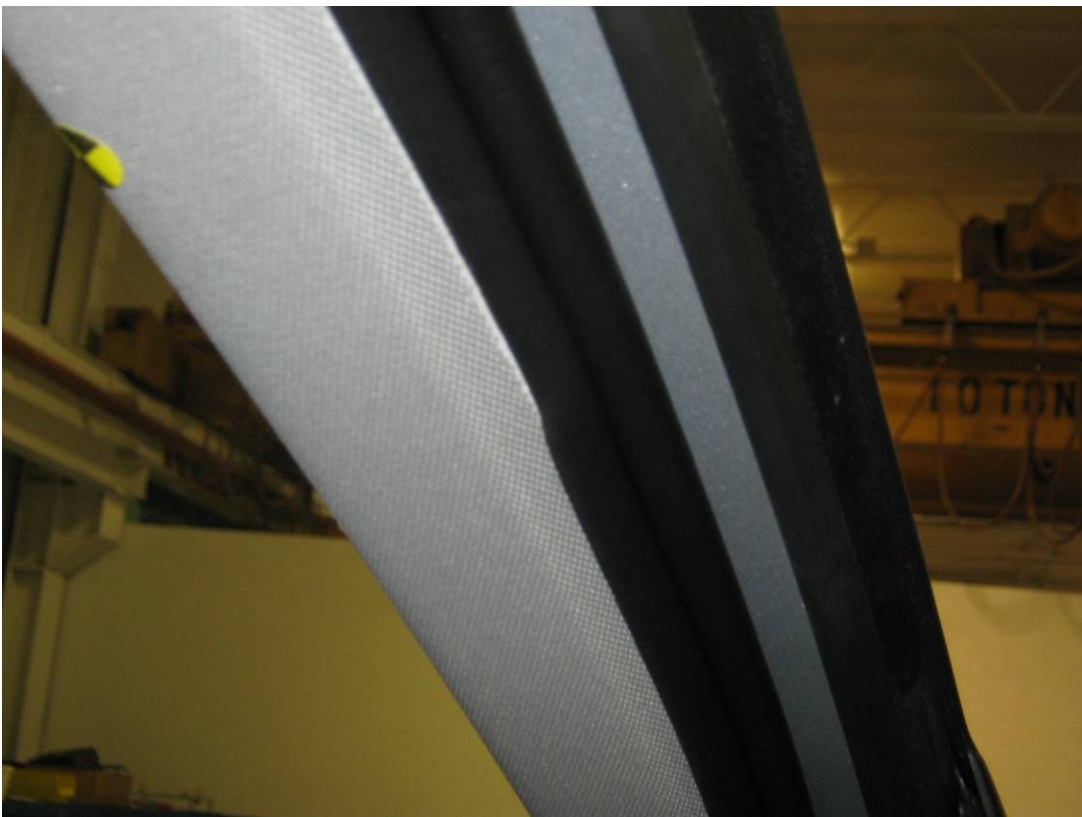












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Test Number:#U11102

Target (Vehicle Side): UR2Right

Temperature:20.6C

MGA Test Reference No.:U11102

Humidity:35.7%

Approach Horizontal Angles:90°

Time of Test:11:21:49 AM

Approach Vertical Angles:50°

FMH Serial No:[035]

Additional Description:@ SR2A

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
564	527	9.7	23.7	39	15 Left

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

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

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

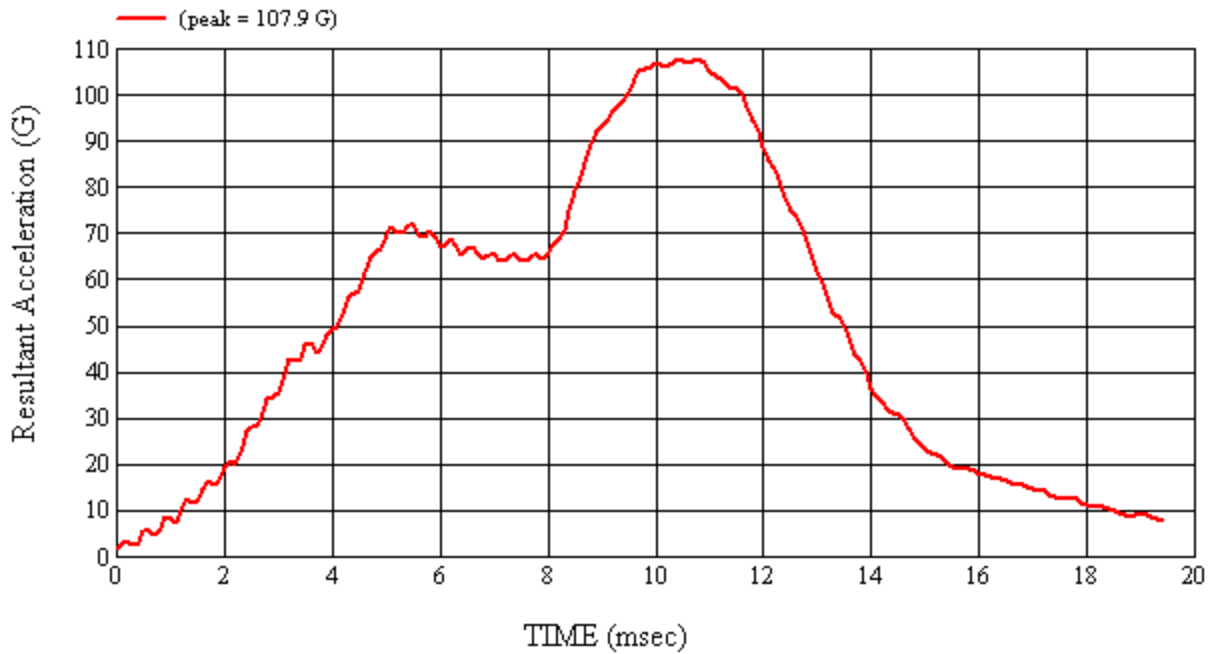
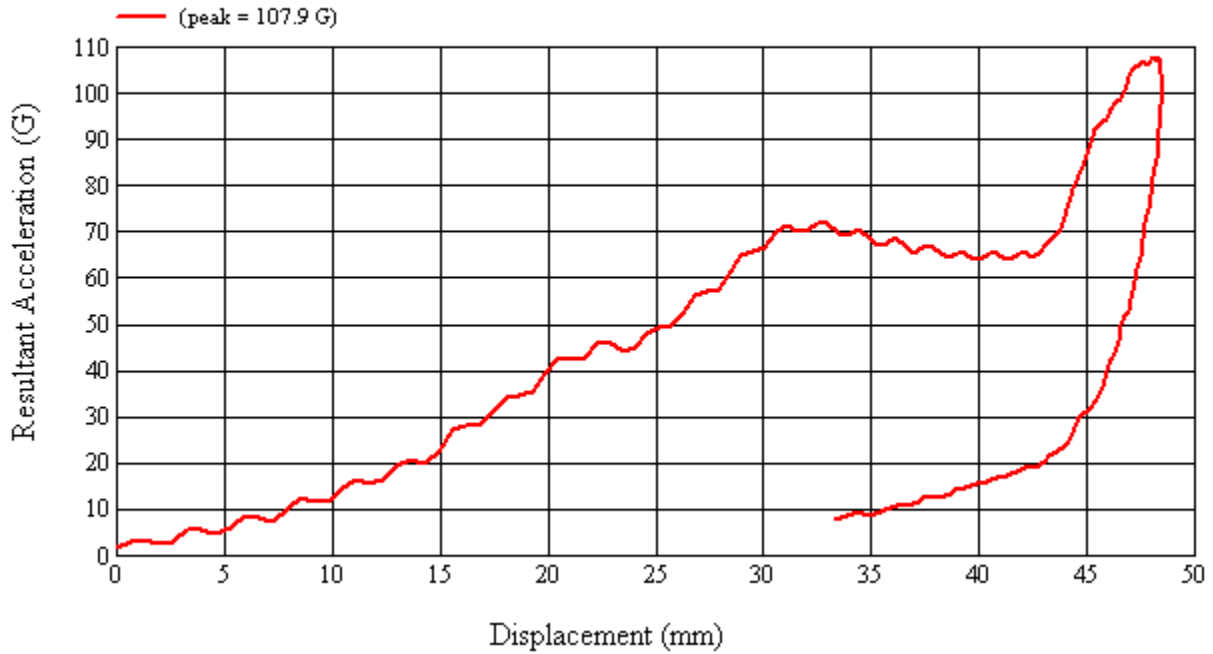
Grab handle compression, trim dislodged.

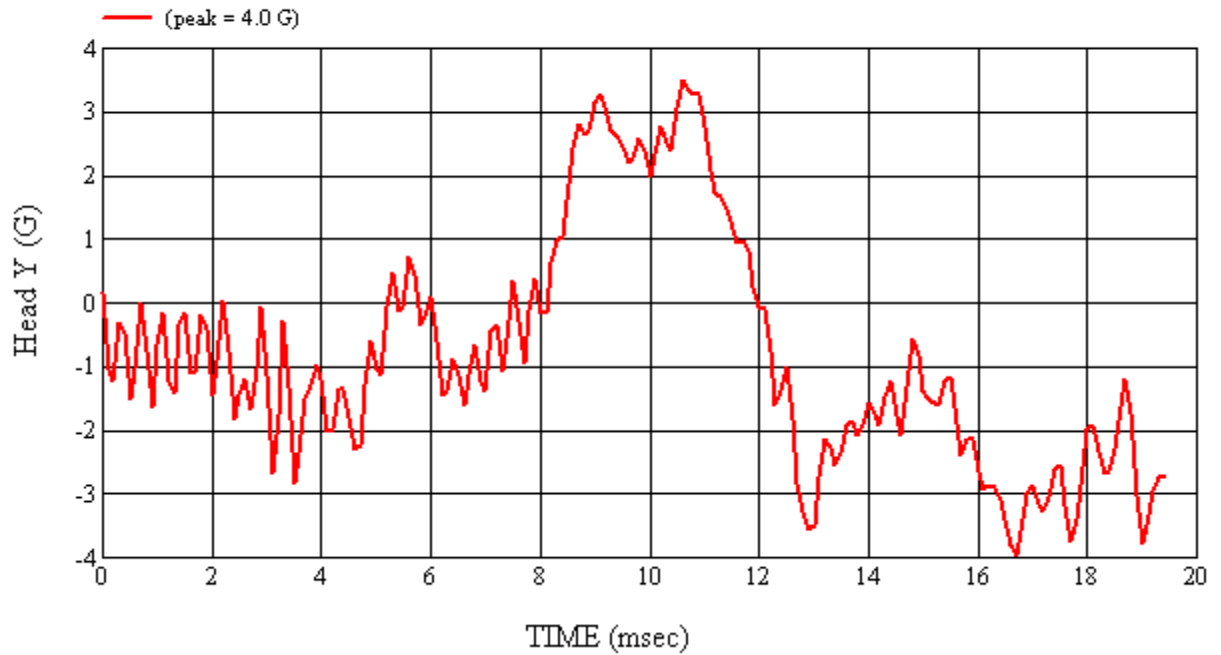
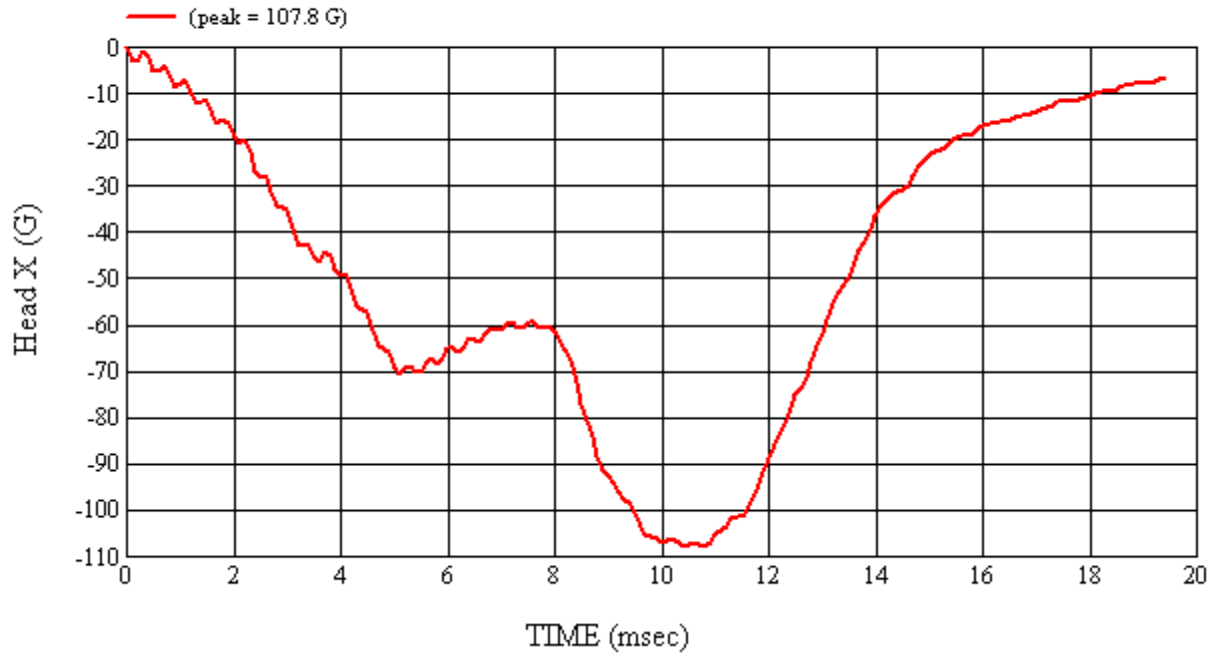
Recorded By: *Kevin D. McFerran* Approved By*: *Arthur I. Smith* Date: 4/8/2011
 *Only necessary for NHTSA (Government) Compliance testing.

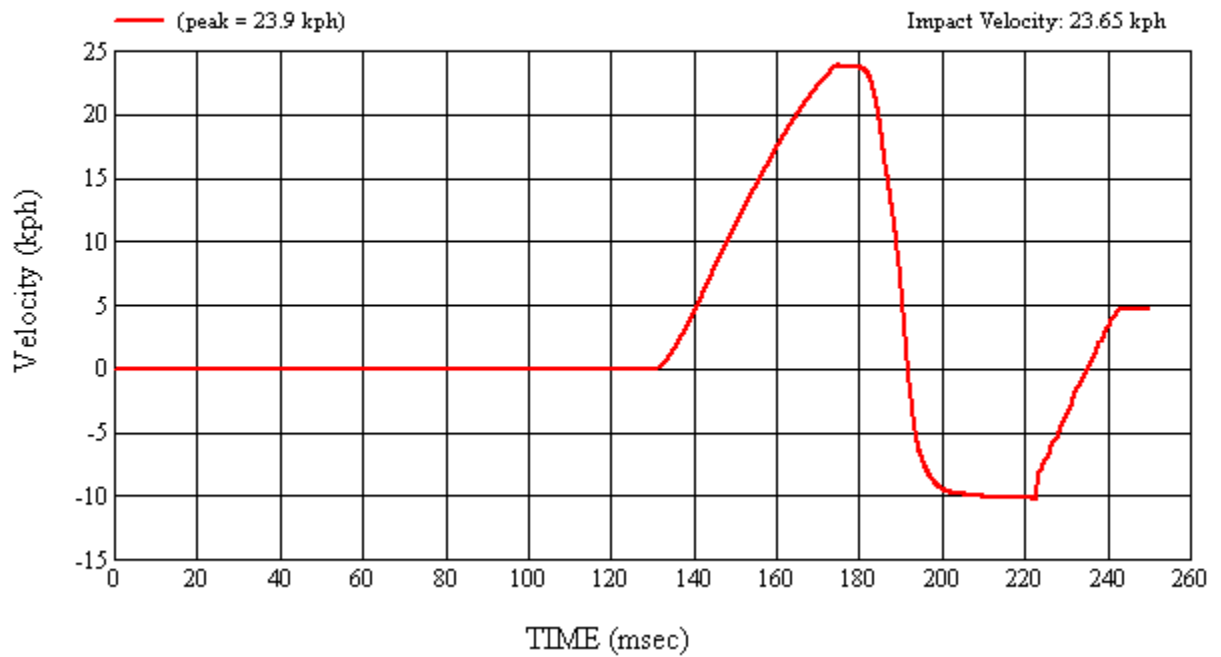
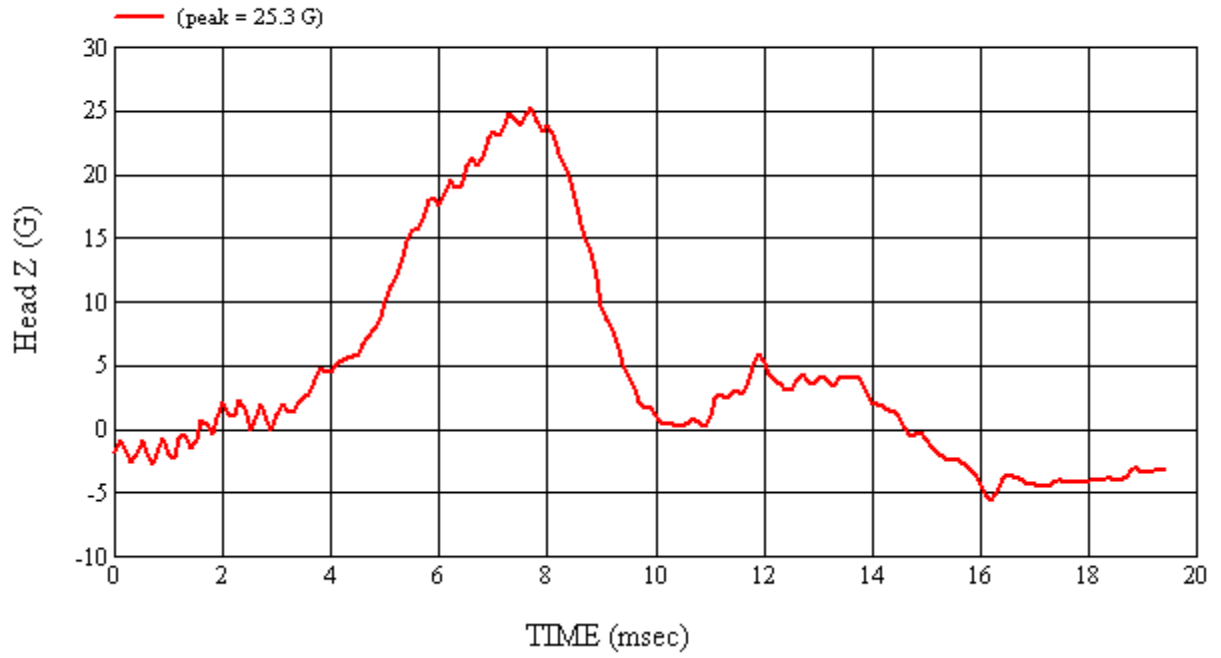
MGA Test #: U11102

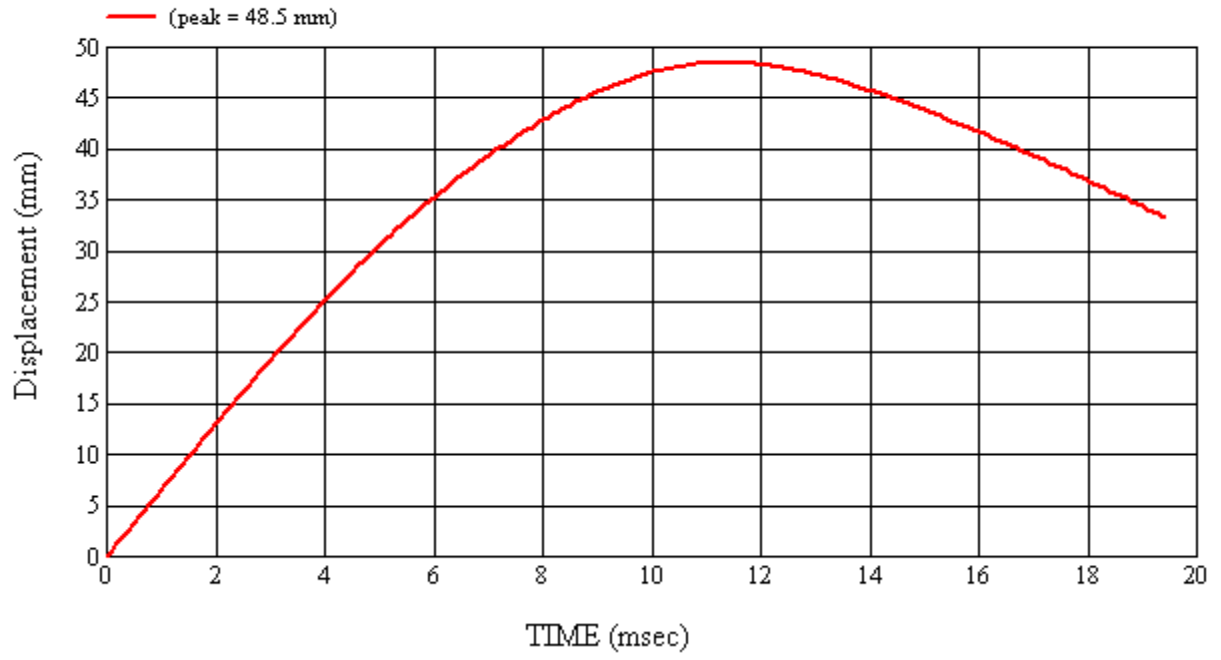
Target Location: UR2, Right Side

Test Date: 4/8/2011

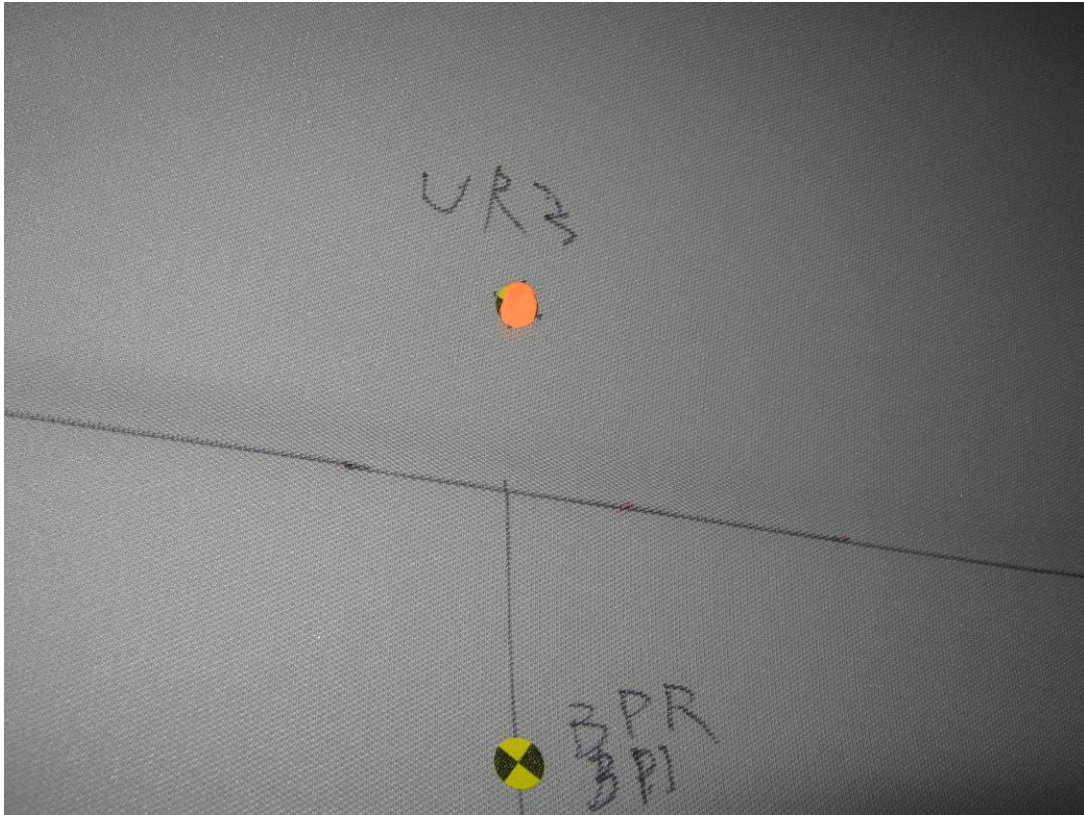












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR3Left

MGA Test Reference No.:U11098

Approach Horizontal Angles:270°

Approach Vertical Angles:50°

Additional Description:@BP

Test Number:#U11098

Temperature:20.6C

Humidity:35.2%

Time of Test:1:37:36 PM

FMH Serial No:[038]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
659	653	6.9	23.6	31	3 Right

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

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

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

No visible damage

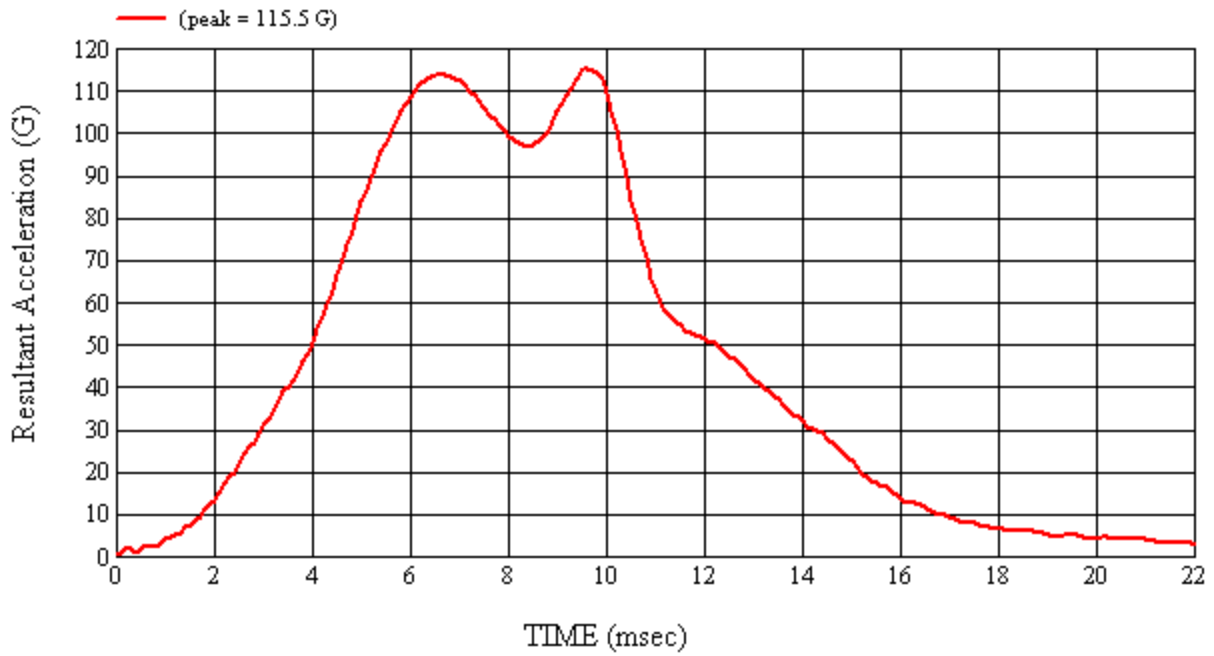
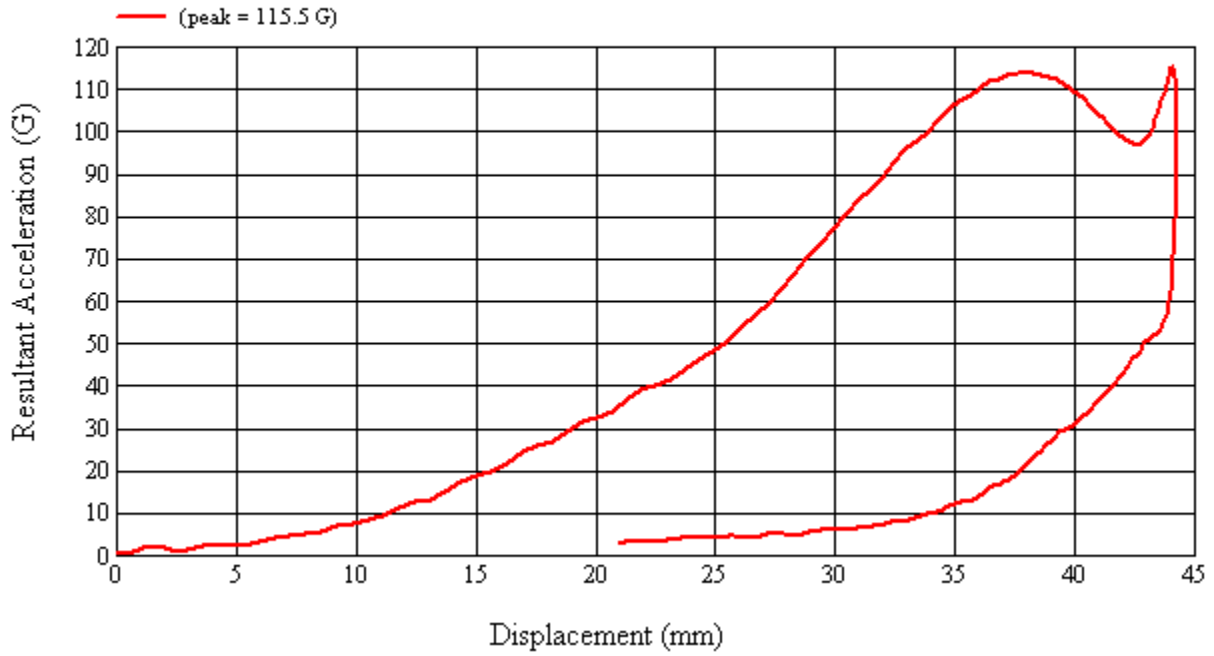
Recorded By:  Approved By*:  Date: 4/7/2011

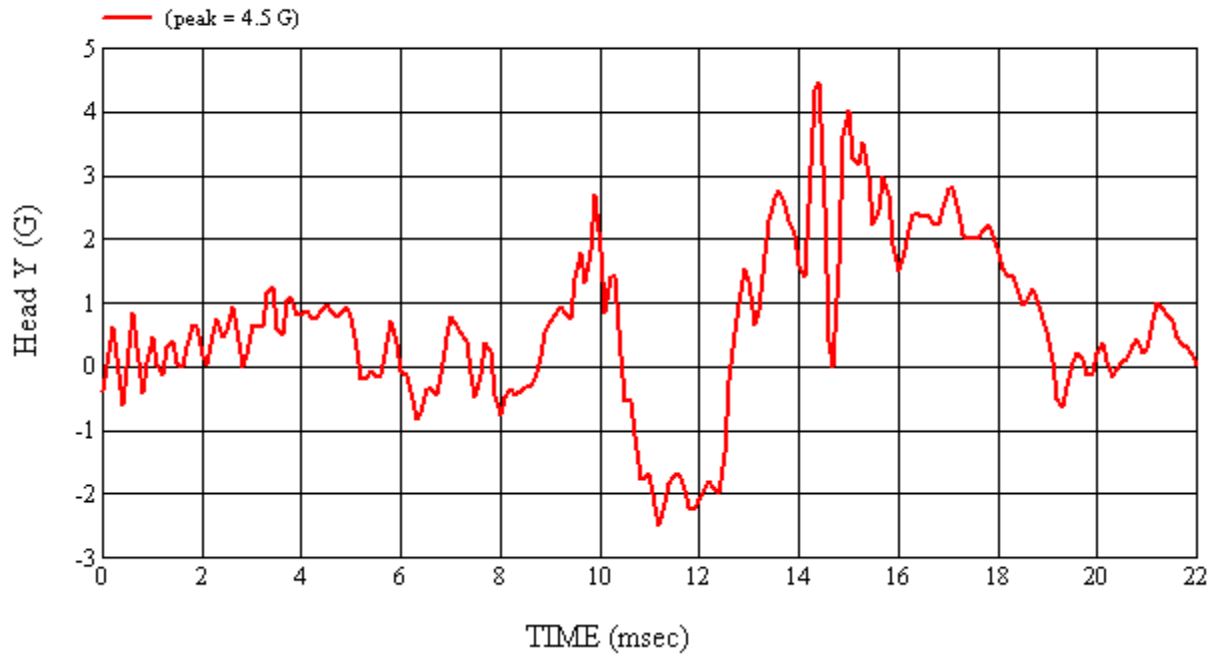
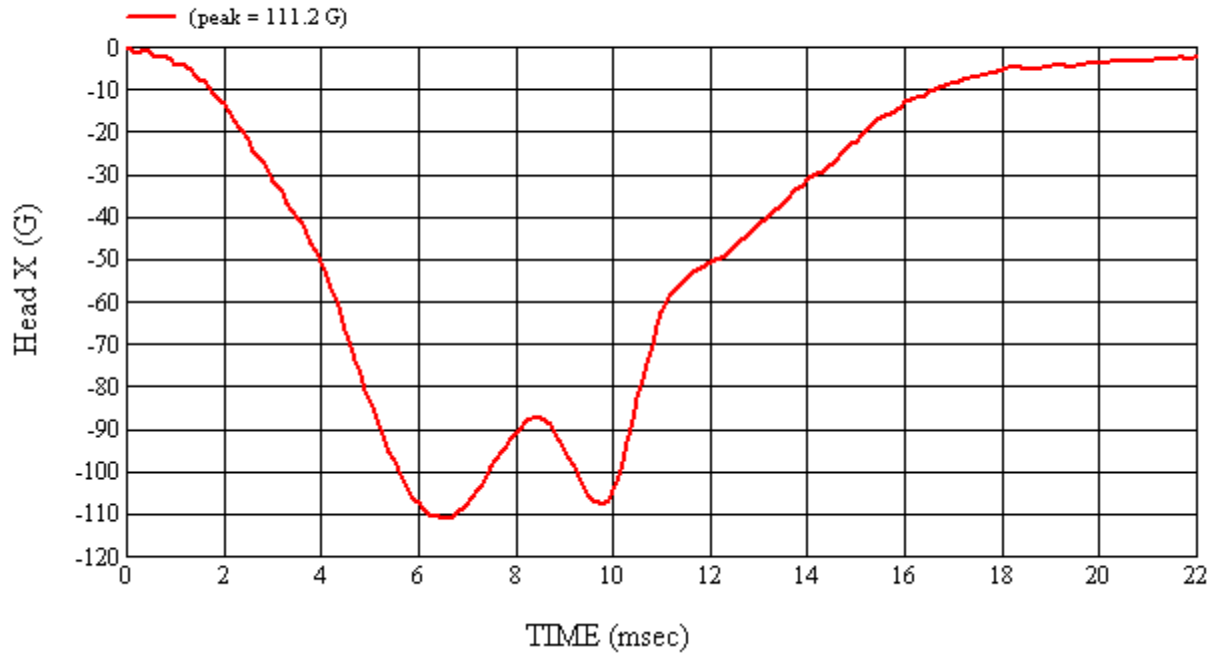
*Only necessary for NHTSA (Government) Compliance testing.

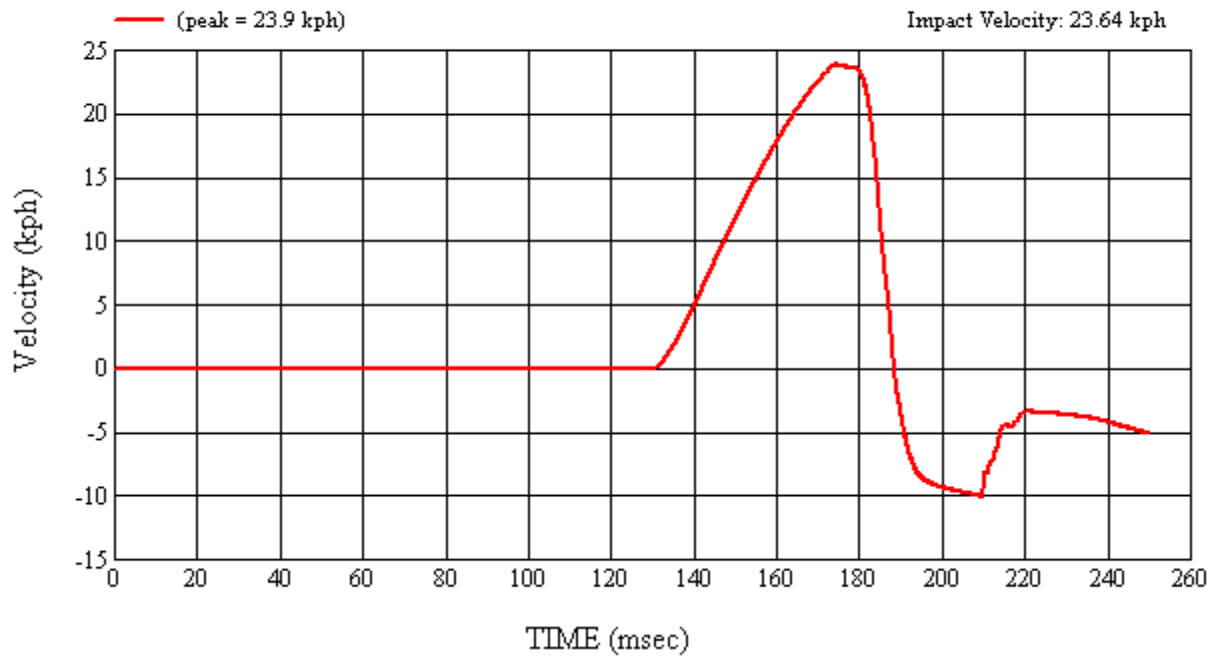
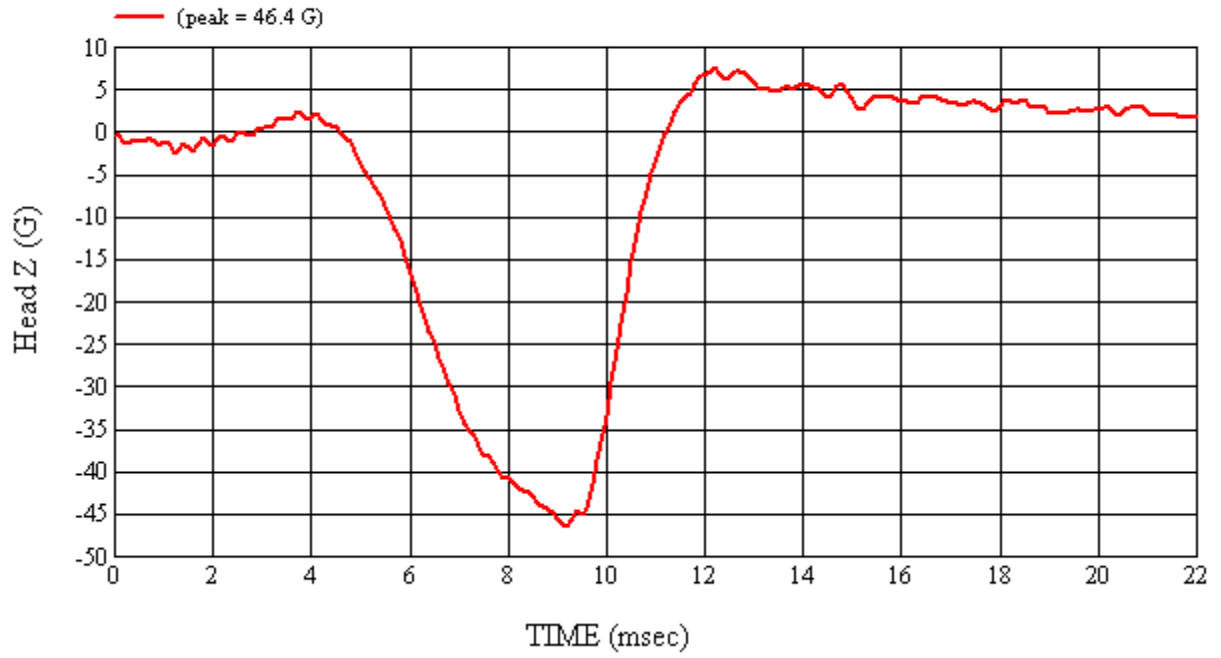
MGA Test #: U11098

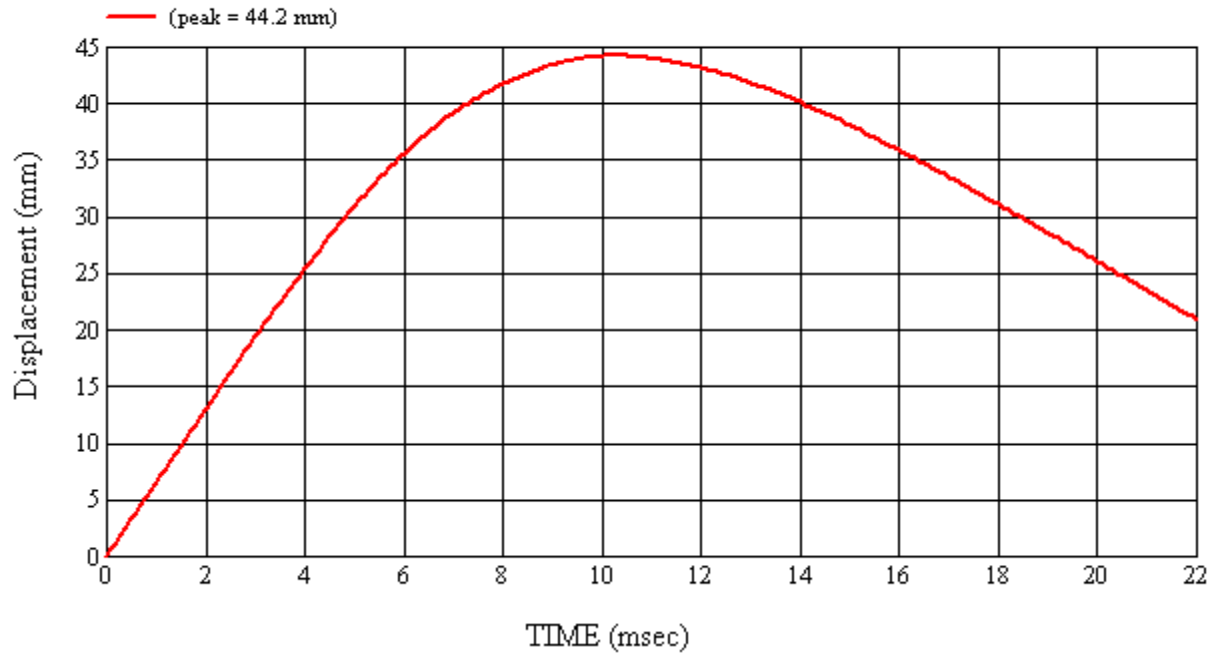
Target Location: UR3, Left Side

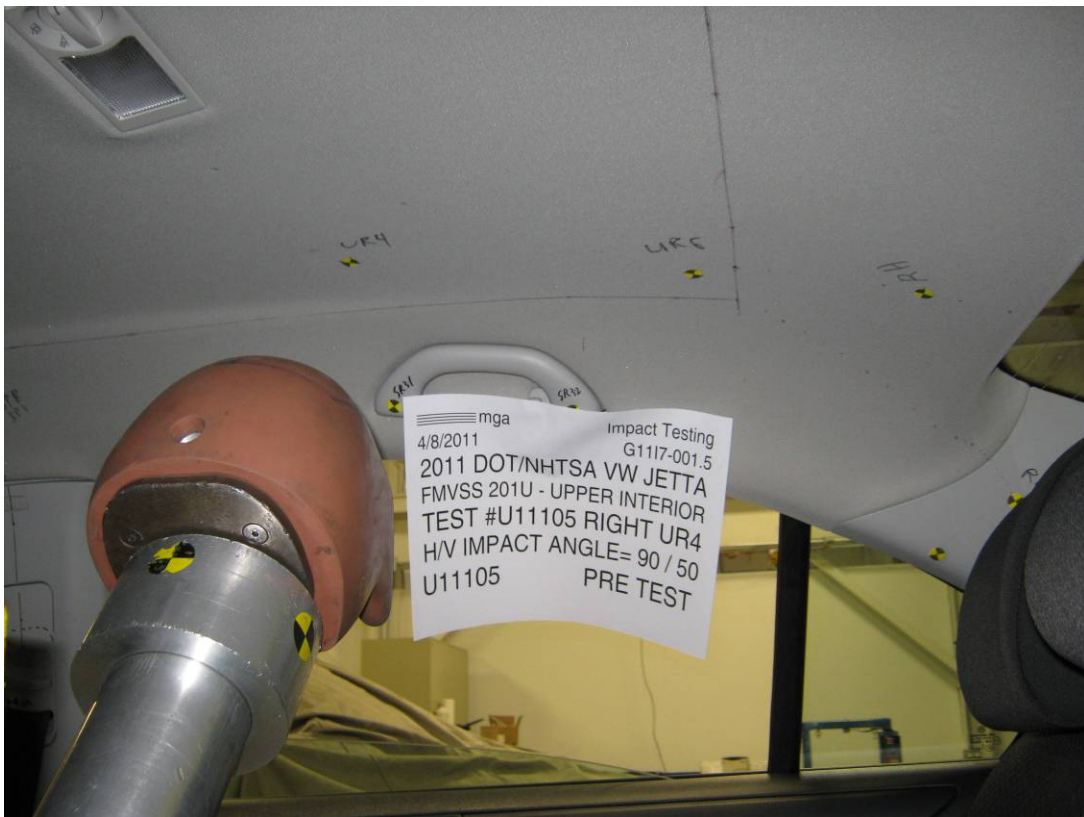
Test Date: 4/7/2011



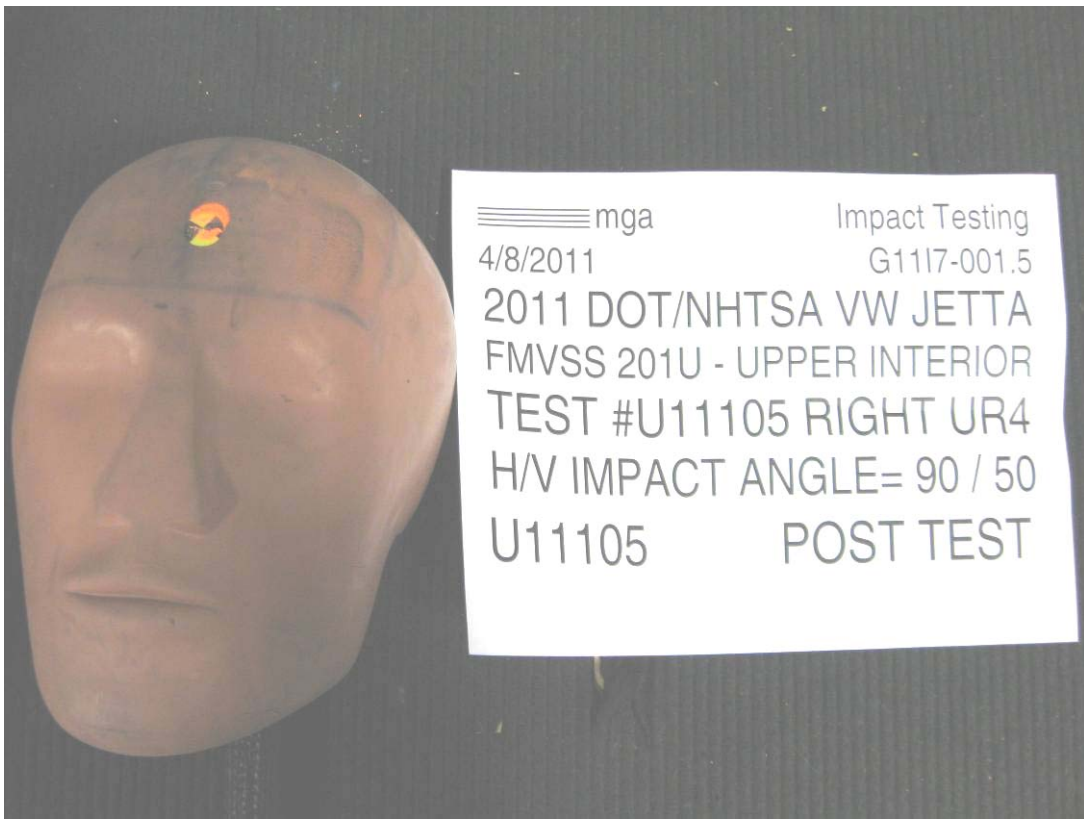














SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR4Right

MGA Test Reference No.:U11105

Approach Horizontal Angles:90°

Approach Vertical Angles:50°

Additional Description:@SR3-1

Test Number:#U11105

Temperature:20.6C

Humidity:37.9%

Time of Test:3:53:21 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
560	522	9.3	23.9	21	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.):

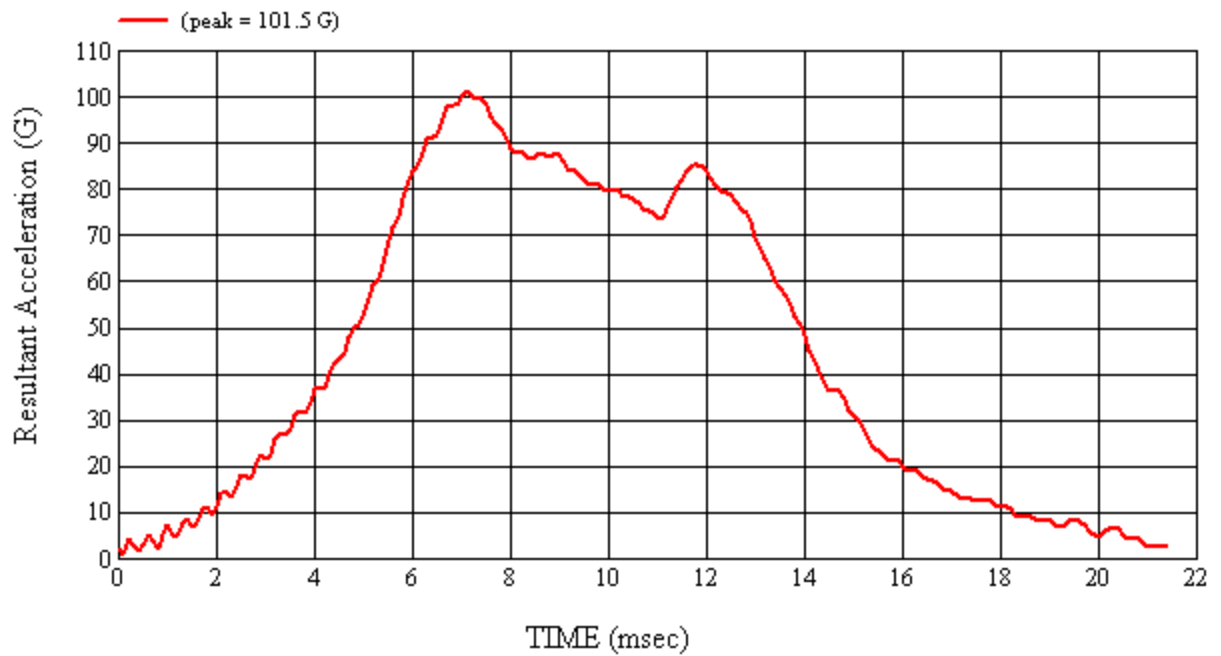
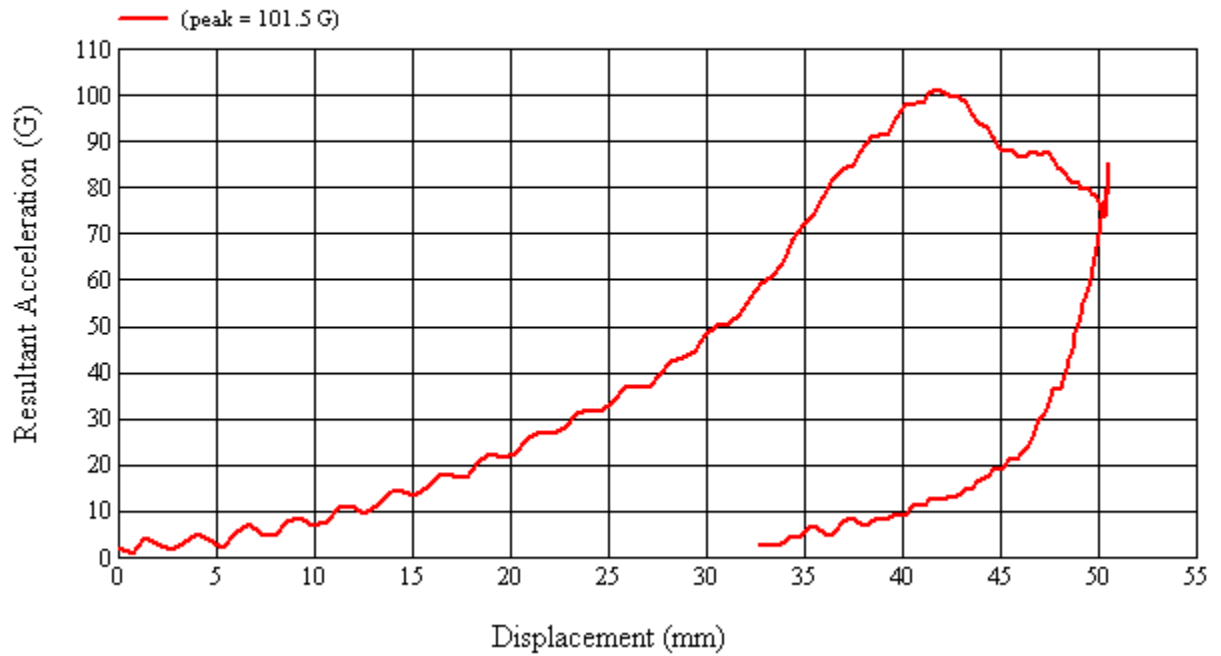
Grabhandle compression and headliner deformation

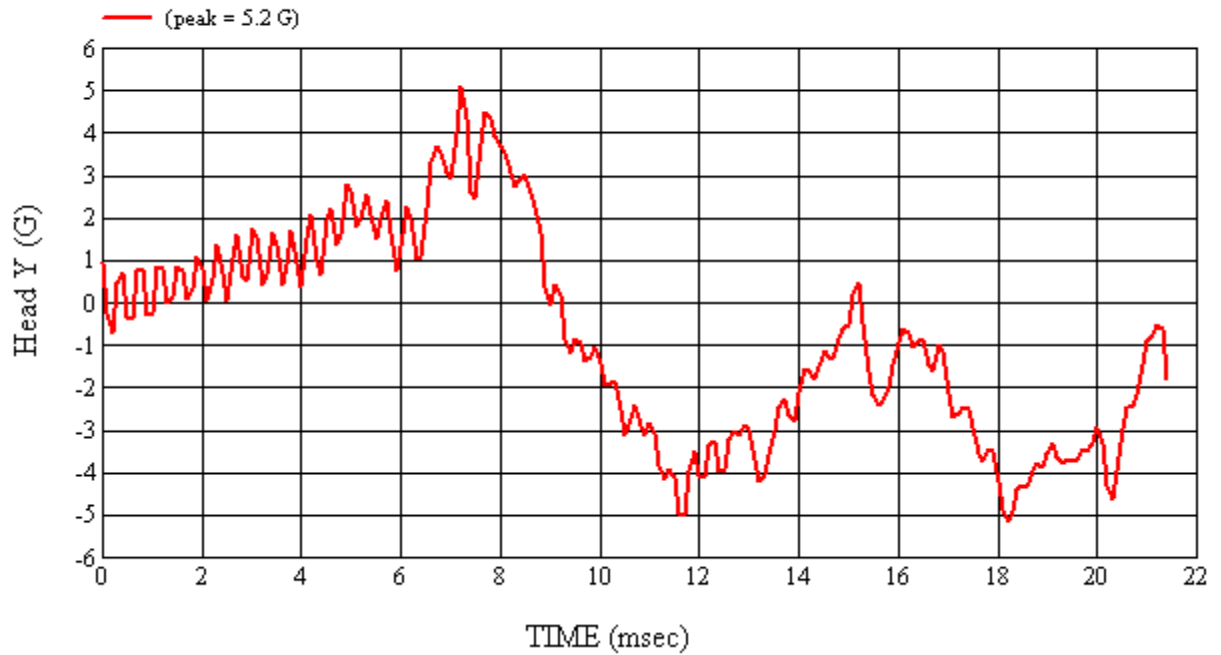
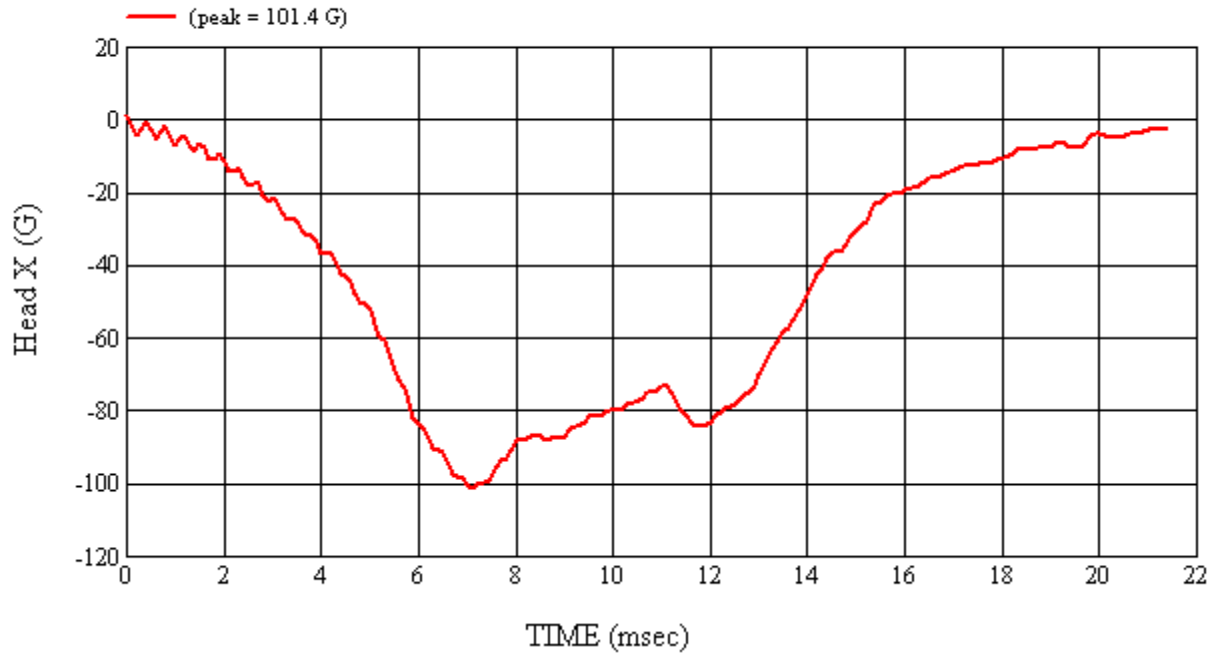
Recorded By: *Kevin D. McFerran* Approved By*: *Arthur I. Smith* Date: 4/8/2011
 *Only necessary for NHTSA (Government) Compliance testing.

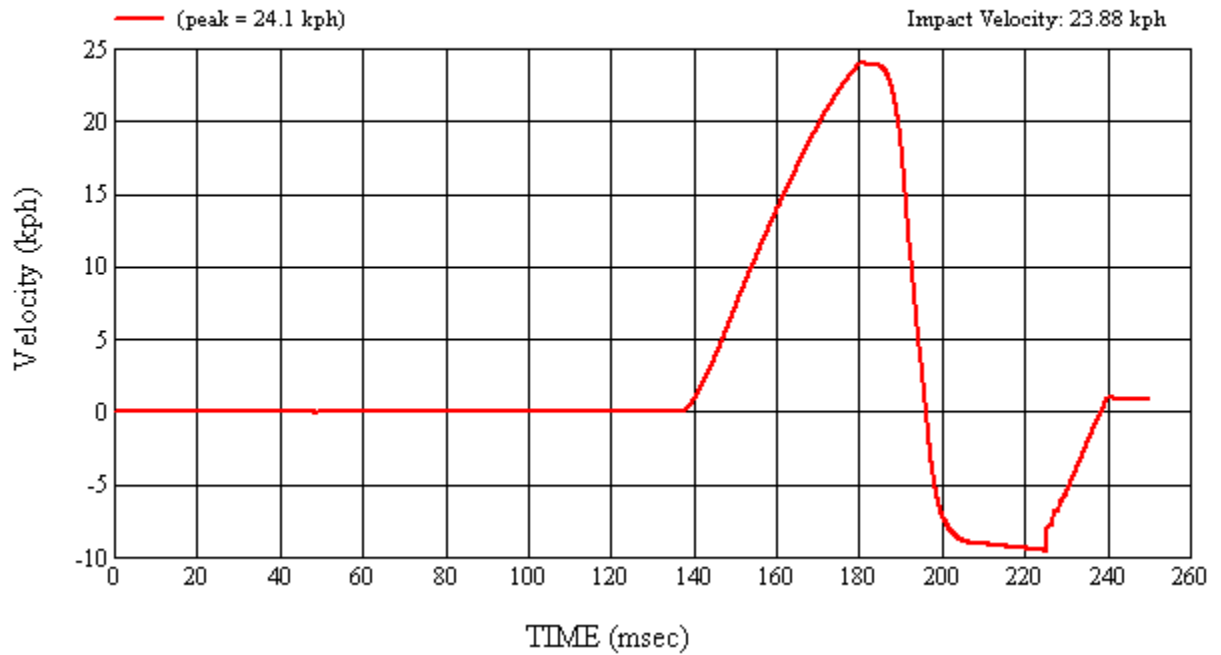
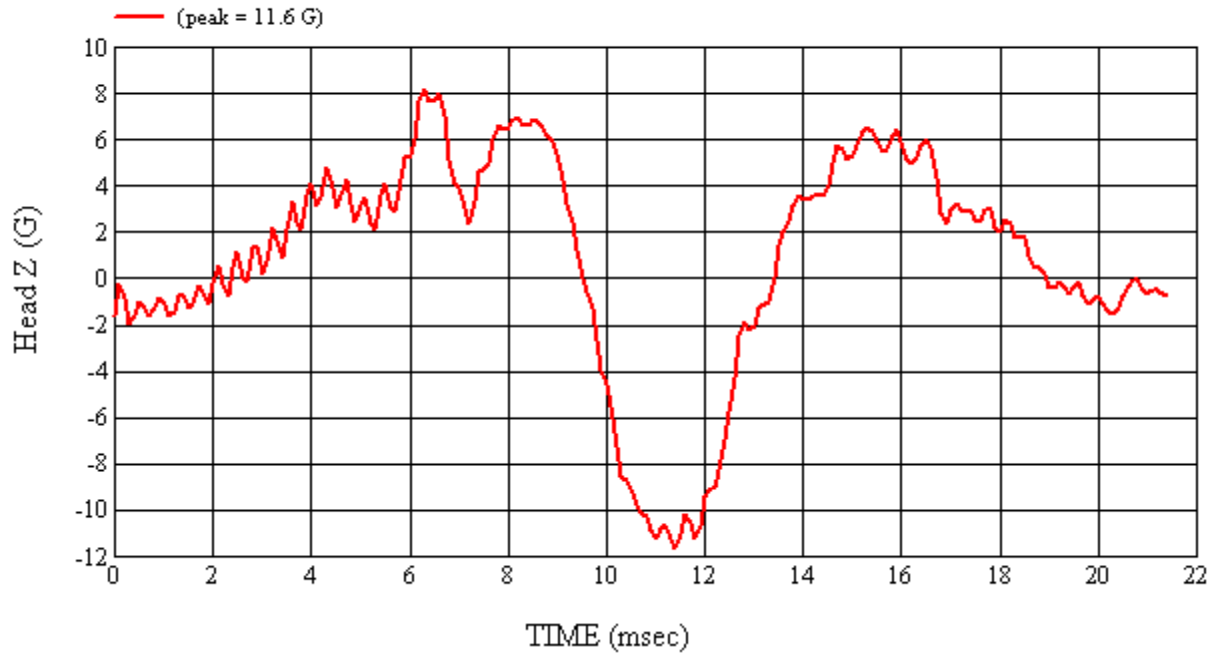
MGA Test #: U11105

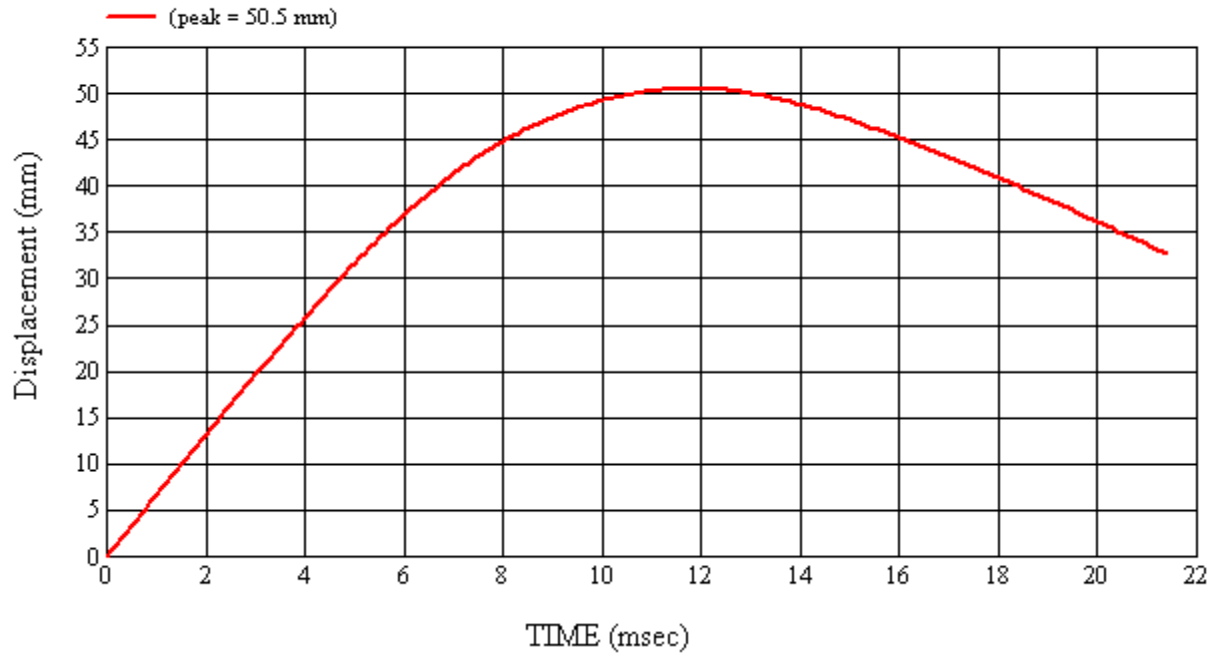
Target Location: UR4, Right Side

Test Date: 4/8/2011

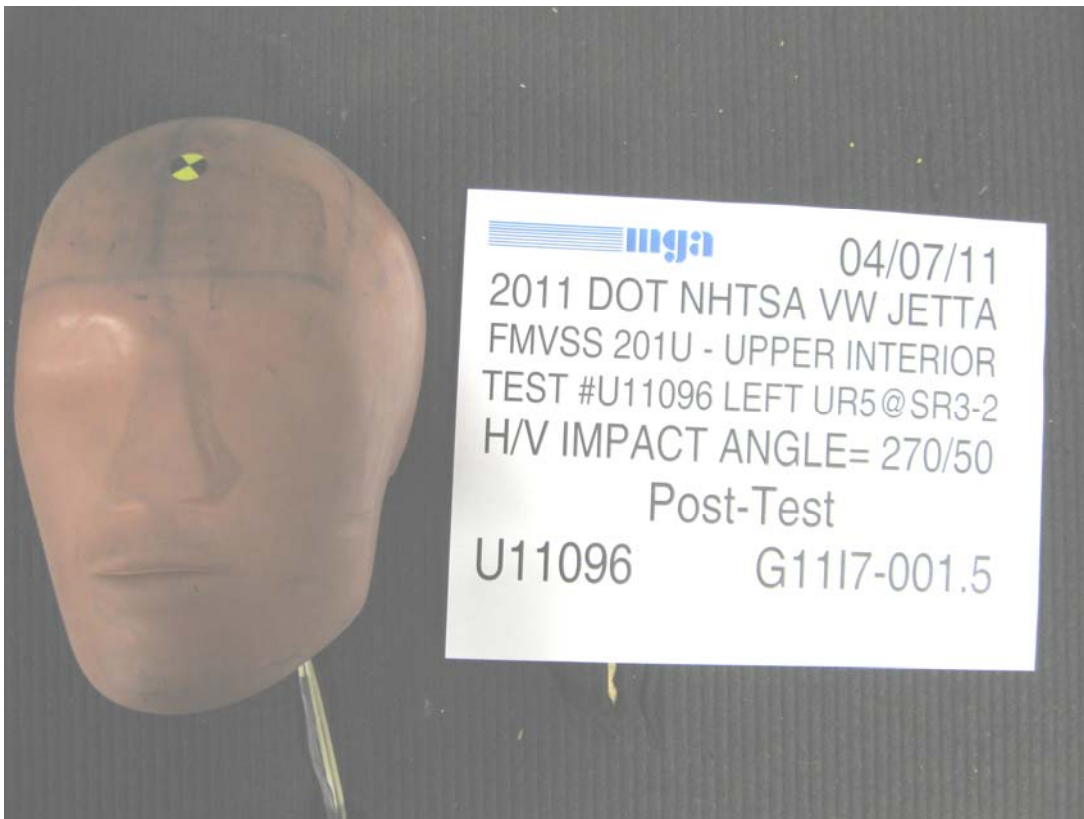












SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G1117-001.5 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/VW Jetta

GENERAL TEST PARAMETERS:

Test Number:#U11096

Target (Vehicle Side): UR5Left

Temperature:20.5C

MGA Test Reference No.:U11096

Humidity:32%

Approach Horizontal Angles:270°

Time of Test:11:11:57 AM

Approach Vertical Angles:50°

FMH Serial No:[035]

Additional Description:@SR3-2

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
522	471	10.3	23.6	42	7 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	0.93

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

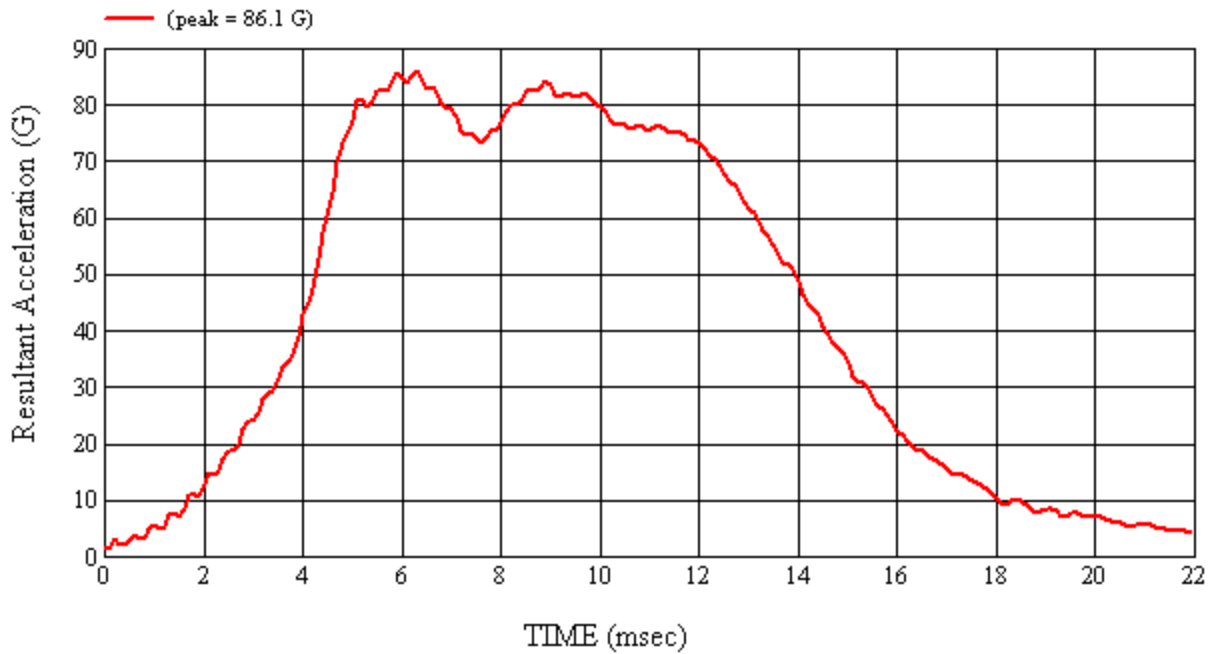
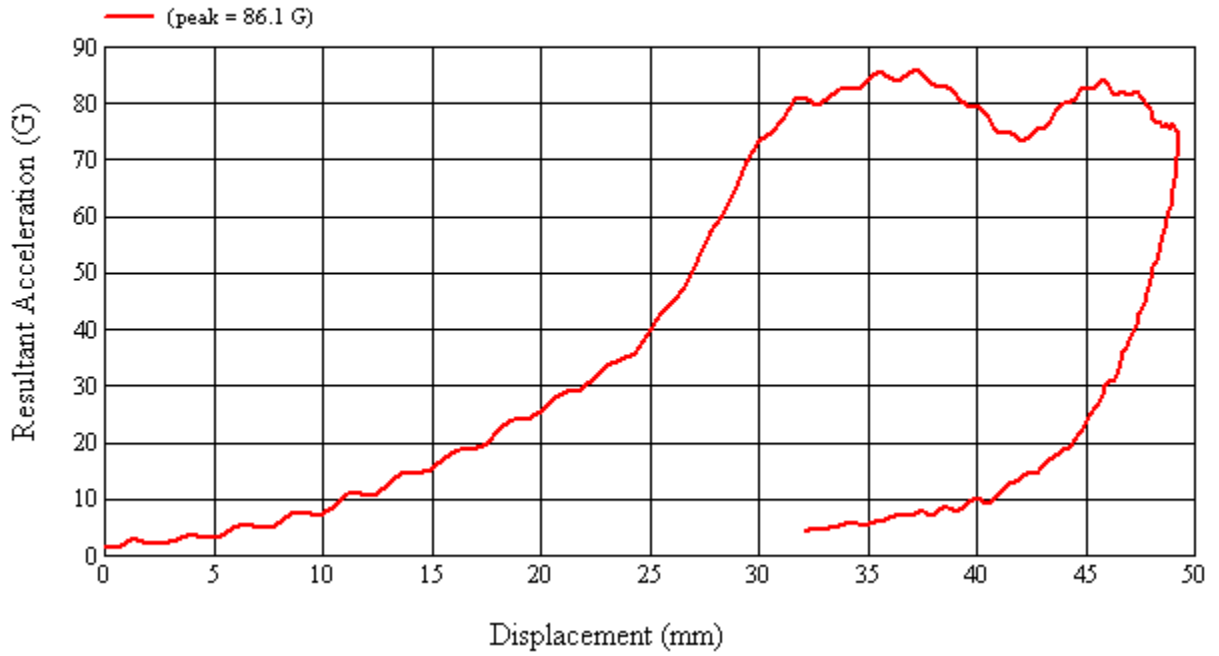
Headliner deformation

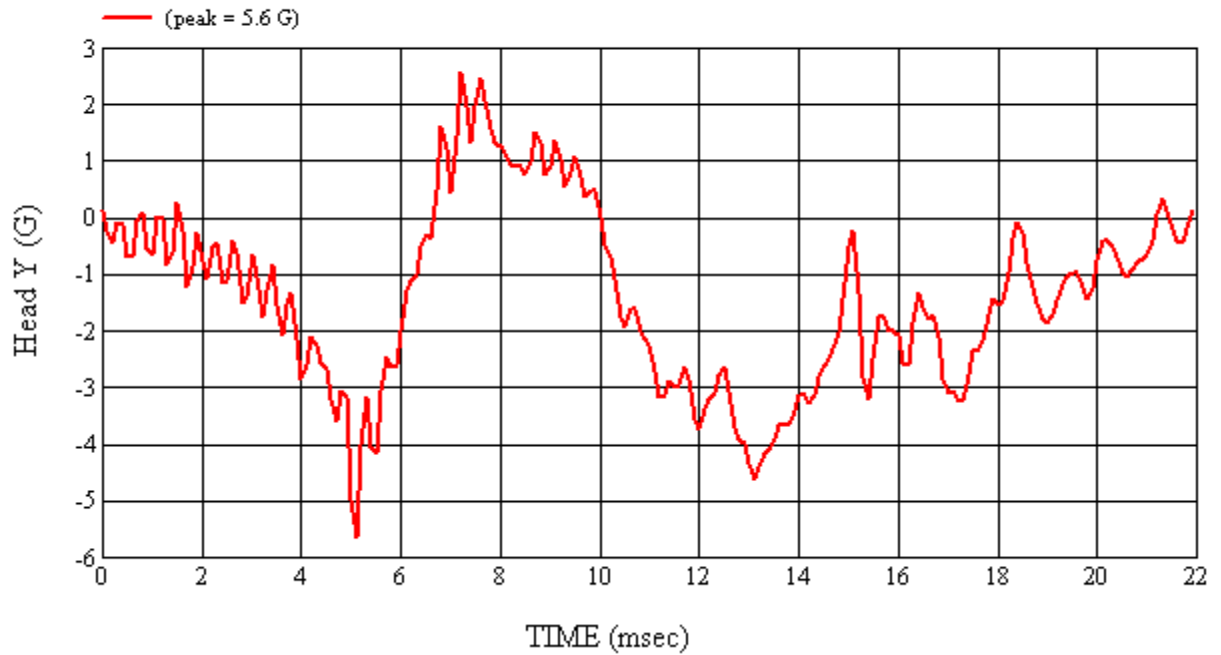
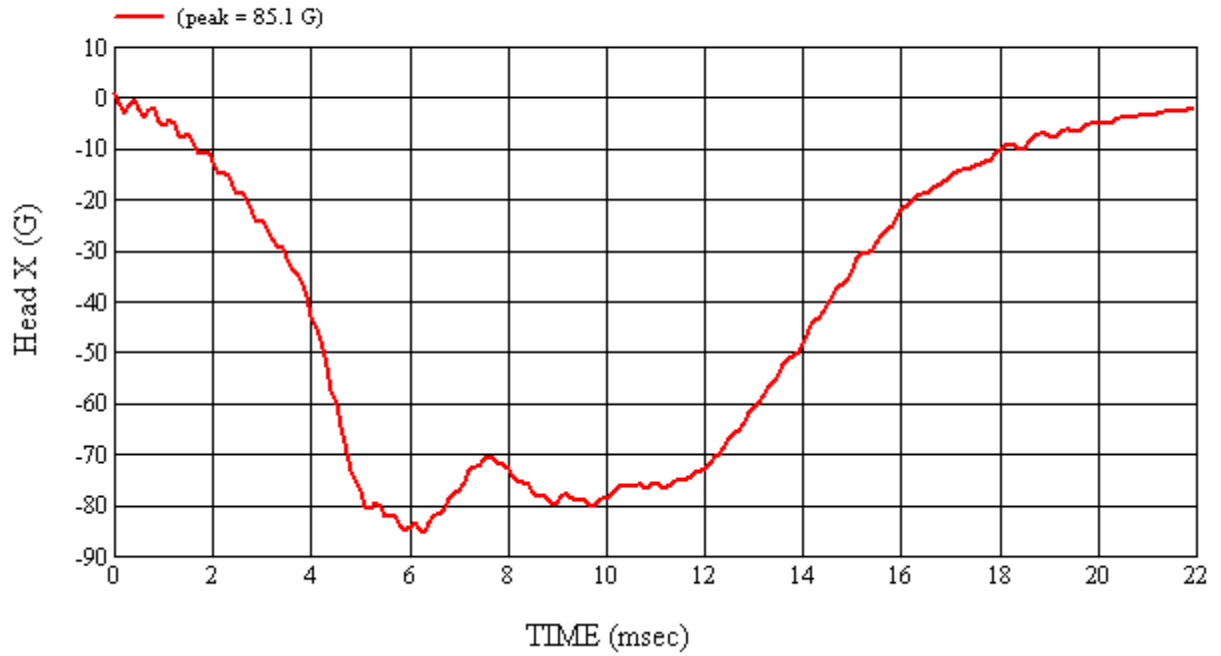
Recorded By: *Kevin D. McLeana* Approved By*: *Arthur I. Smith* Date: 4/7/2011
*Only necessary for NHTSA (Government) Compliance testing.

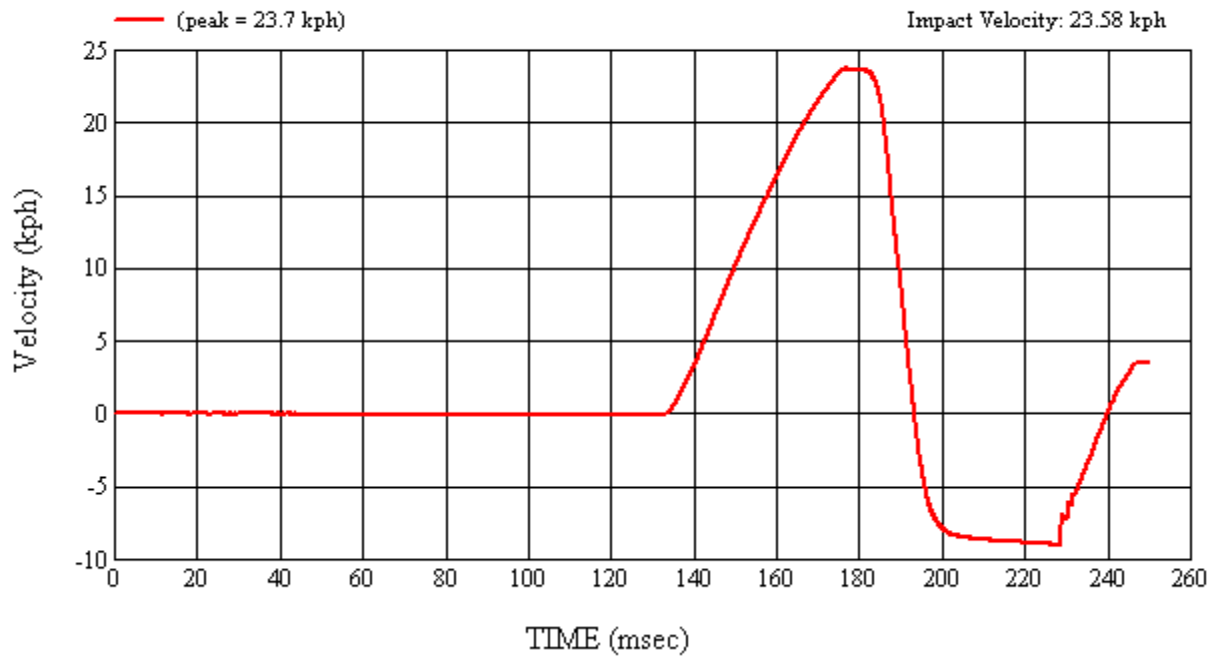
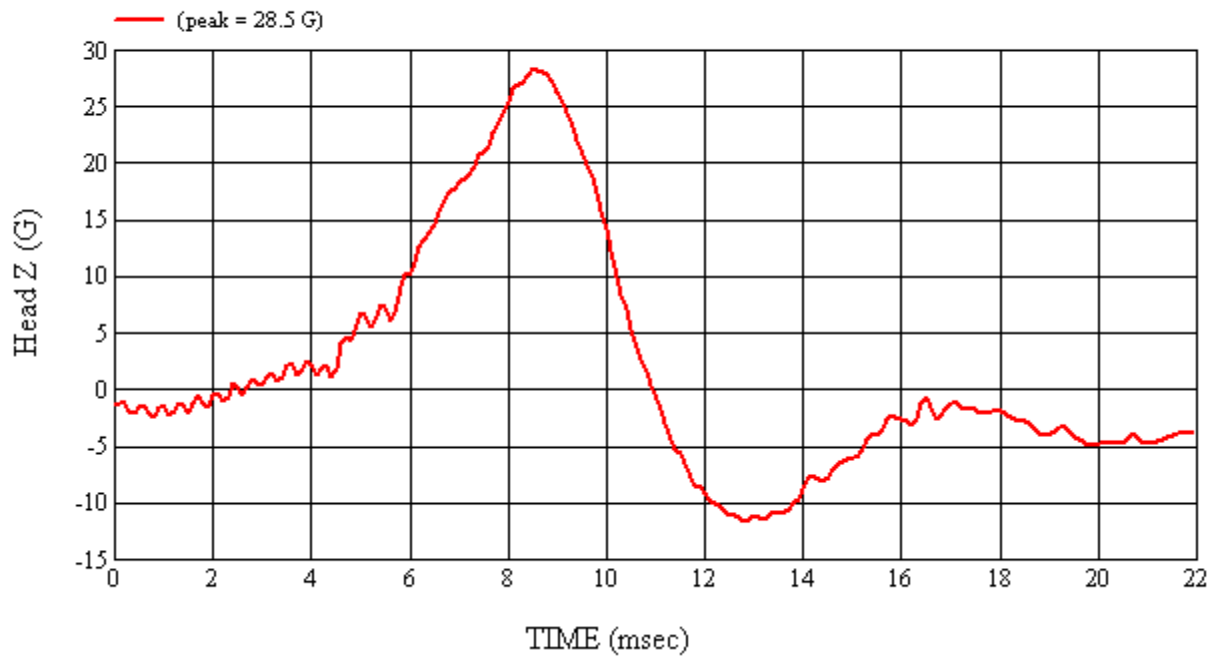
MGA Test #: U11096

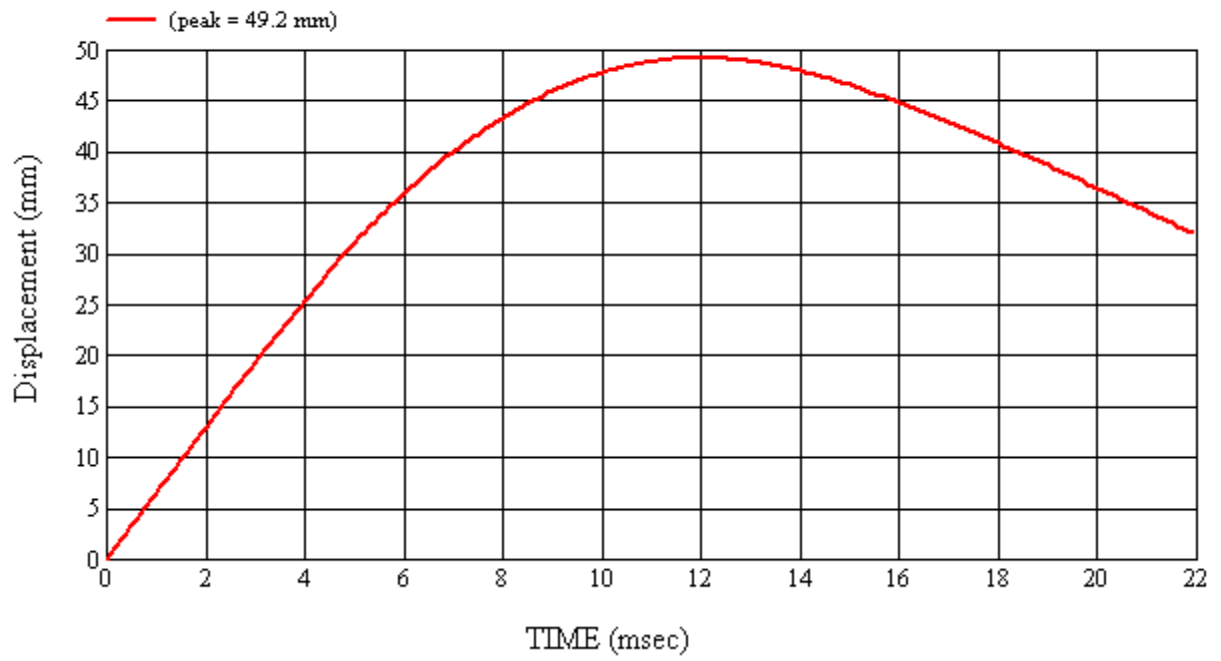
Target Location: UR5, Left Side

Test Date: 4/7/2011









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 -- MGA00712	Measurement Targeting FMH setup Horizontal Measurement	1 mm N/A 0.5°	Annual
*Temperature Recorder	Dickson	MGA00152	Record Temperature and Humidity	± 1°C ± 1% RH	Annual
* Scale	Detecto	MGA00783	Weigh FMH Head	± 0.01 lb	Annual
*Vehicle Scale	Intercomp	26032389	Weighing Vehicle	± .5 kg	Annual

Each headform was calibrated by an engineer after the headform had soaked in an environment of 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	4/6/2011	9.90	20.5	26.9	248.4	4.3	Yes
Post	#035	4/11/2011	9.90	23.2	44.2	252.6	6.0	Yes
Pre	#037	4/6/2011	9.96	20.6	27.0	263.9	6.3	Yes
Post	#037	4/11/2011	9.96	23.4	44.5	269.9	8.7	Yes
Pre	#038	4/6/2011	9.90	20.8	26.7	264.8	9.7	Yes
Post	#038	4/11/2011	9.90	23.0	44.0	268.1	12.4	Yes

4-1 Pre-Test Calibration

**HEAD DROP TEST SUMMARY
 PART 572L**

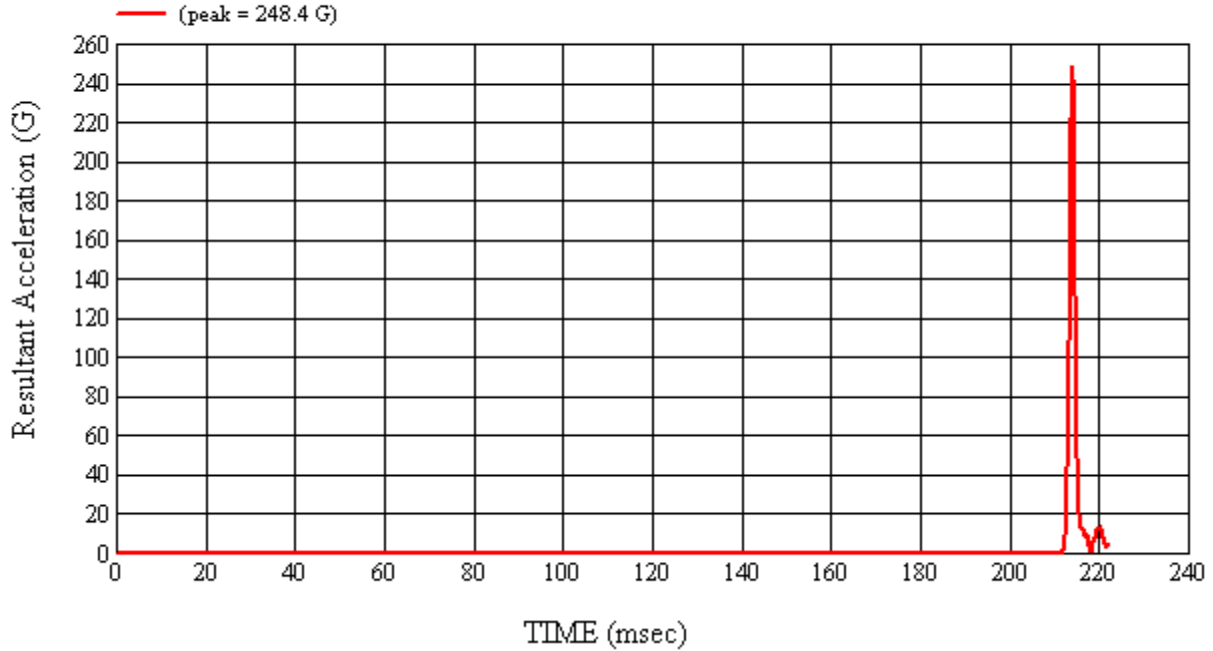
HEADFORM SERIAL NUMBER: 035		CALIBRATION DATE: 4/6/2011
CALIBRATION TIME: 8:30:11 AM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	20.5
Relative Humidity	10% to 70%	26.9
Peak Resultant Acceleration	225 G's to 275 G's	248.4
Peak Lateral Acceleration	15 G's Maximum	4.3
Unimodal Acceleration Curve	YES	YES

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

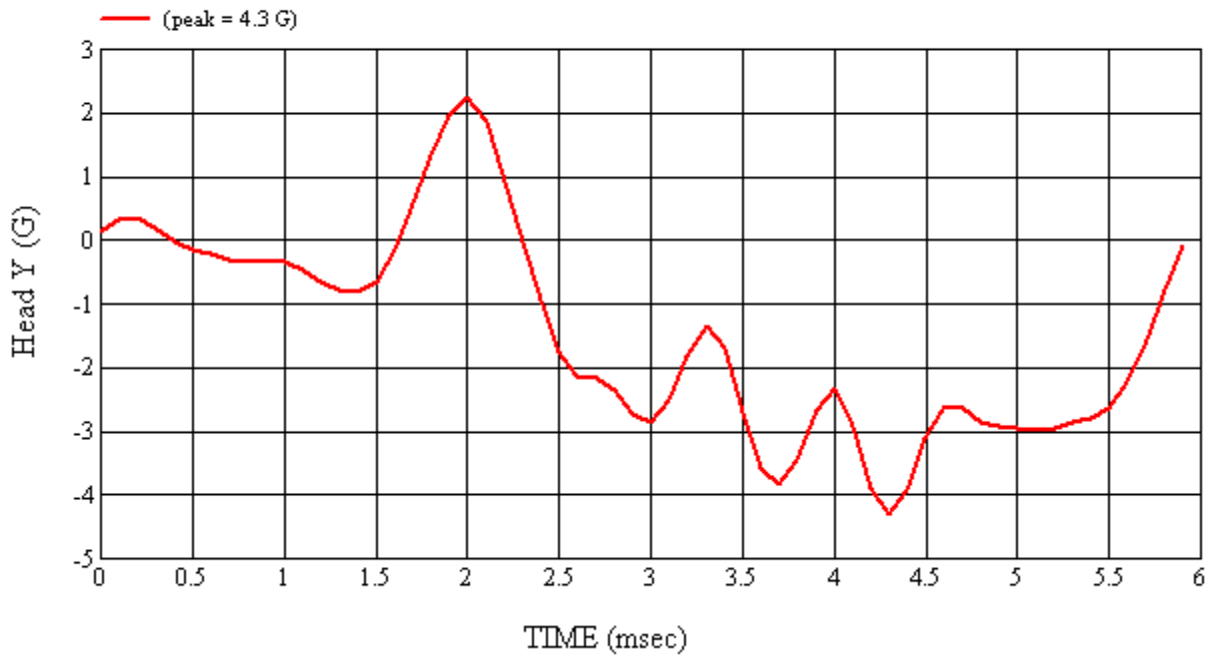
REMARKS:

RECORDED BY: *Keri D. McLean* DATE: 4/6/2011

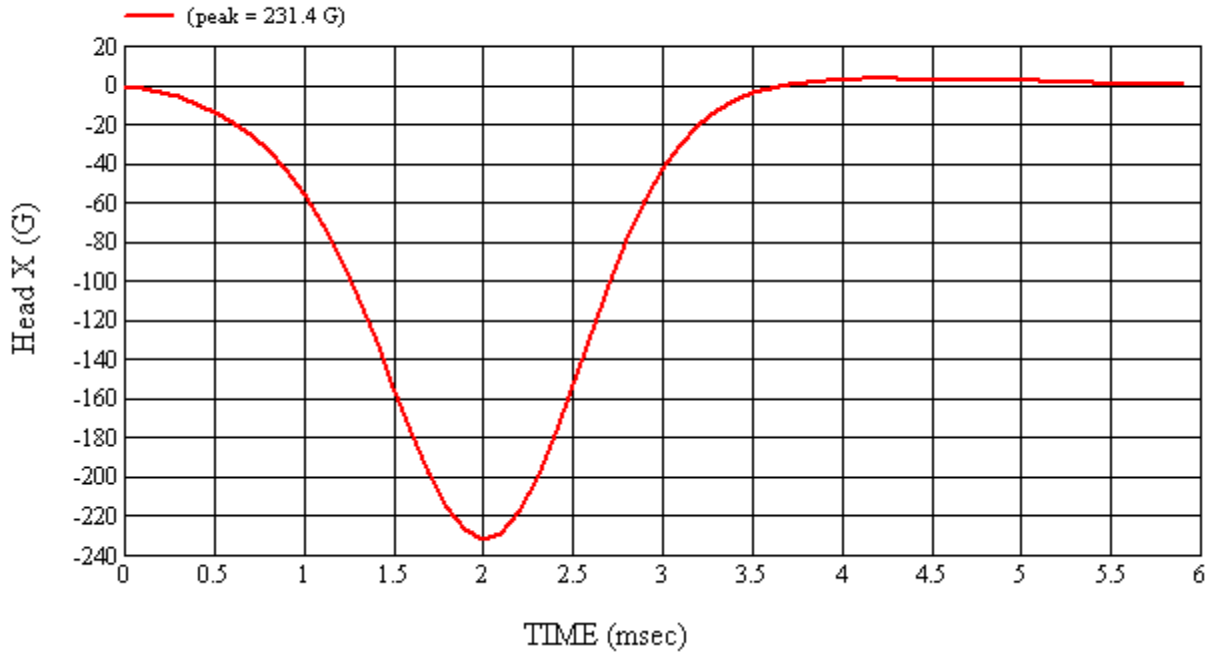
APPROVED BY: *Adrian I. Smith*



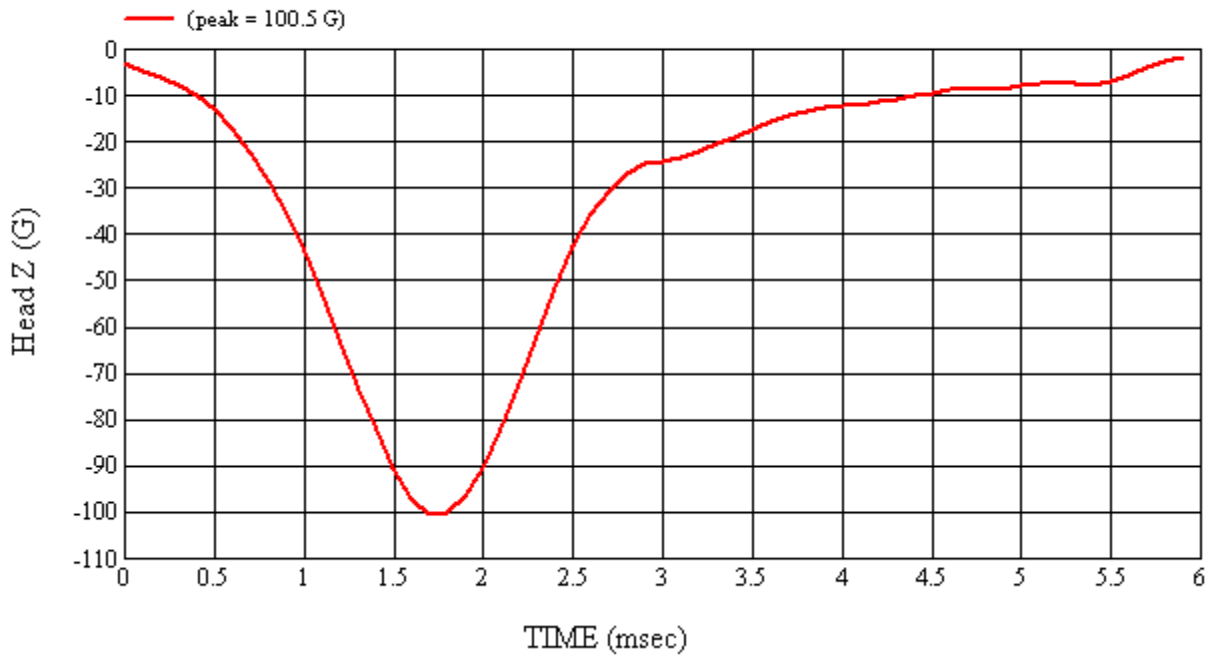
Head 035 (Pre) Calibration #H35009



Head 035 (Pre) Calibration #H35009



Head 035 (Pre) Calibration #H35009



Head 035 (Pre) Calibration #H35009

4-2 Post-Test Calibration

**HEAD DROP TEST SUMMARY
PART 572L**

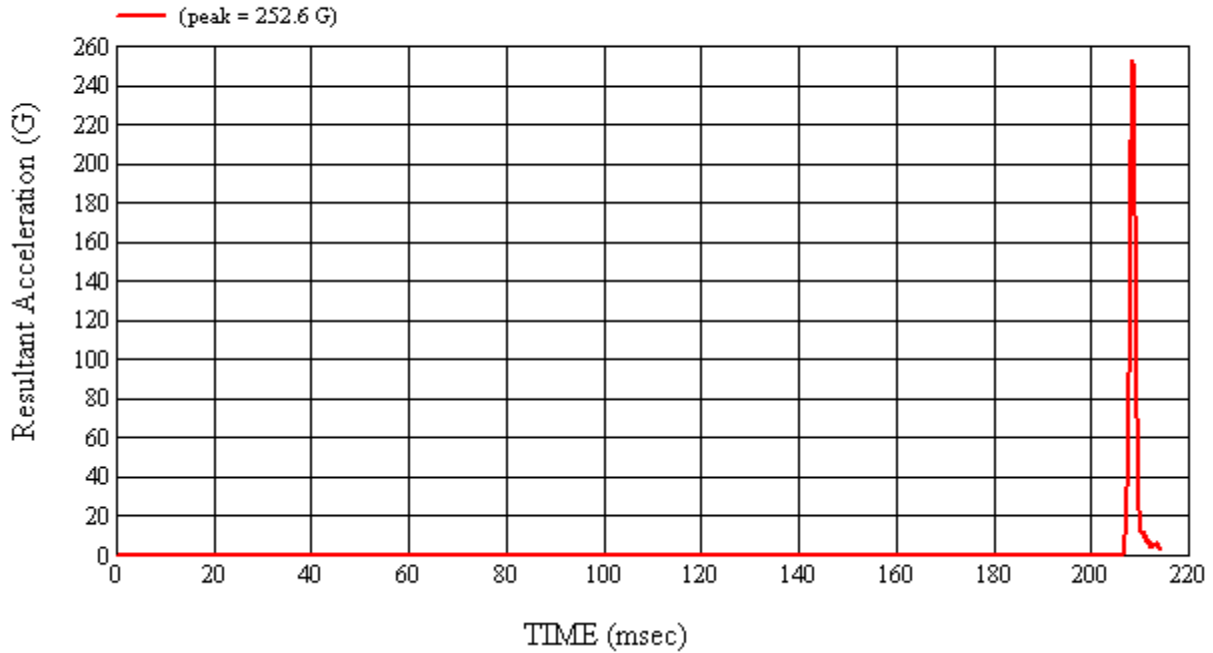
HEADFORM SERIAL NUMBER: 035		CALIBRATION DATE: 4/11/2011
CALIBRATION TIME: 2:39:15 PM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	23.2
Relative Humidity	10% to 70%	44.2
Peak Resultant Acceleration	225 G's to 275 G's	252.6
Peak Lateral Acceleration	15 G's Maximum	6.0
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

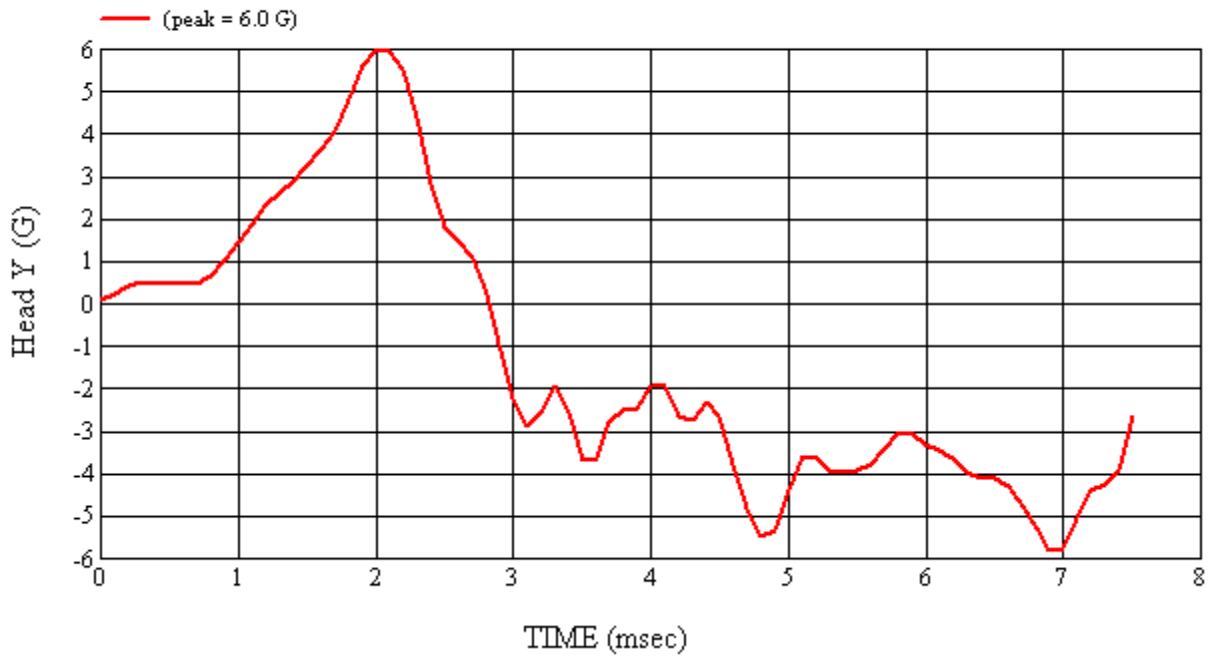
REMARKS:

RECORDED BY: *Keri D. McLean* DATE: 4/11/2011

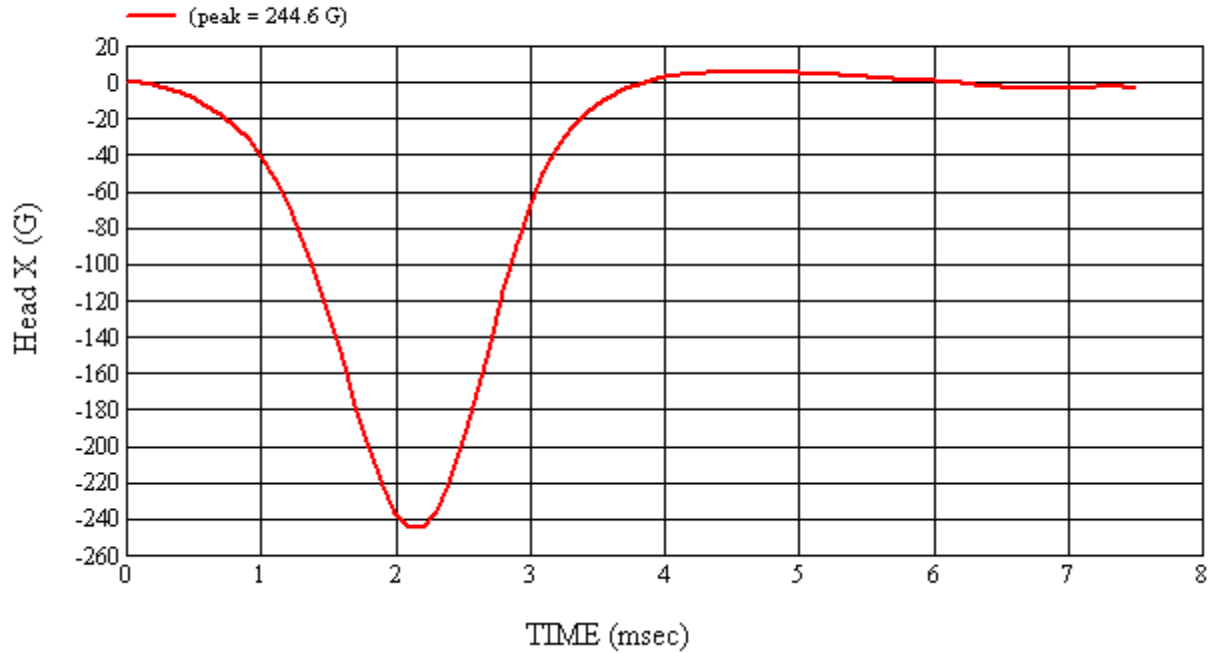
APPROVED BY: *Adrian I. Smith*



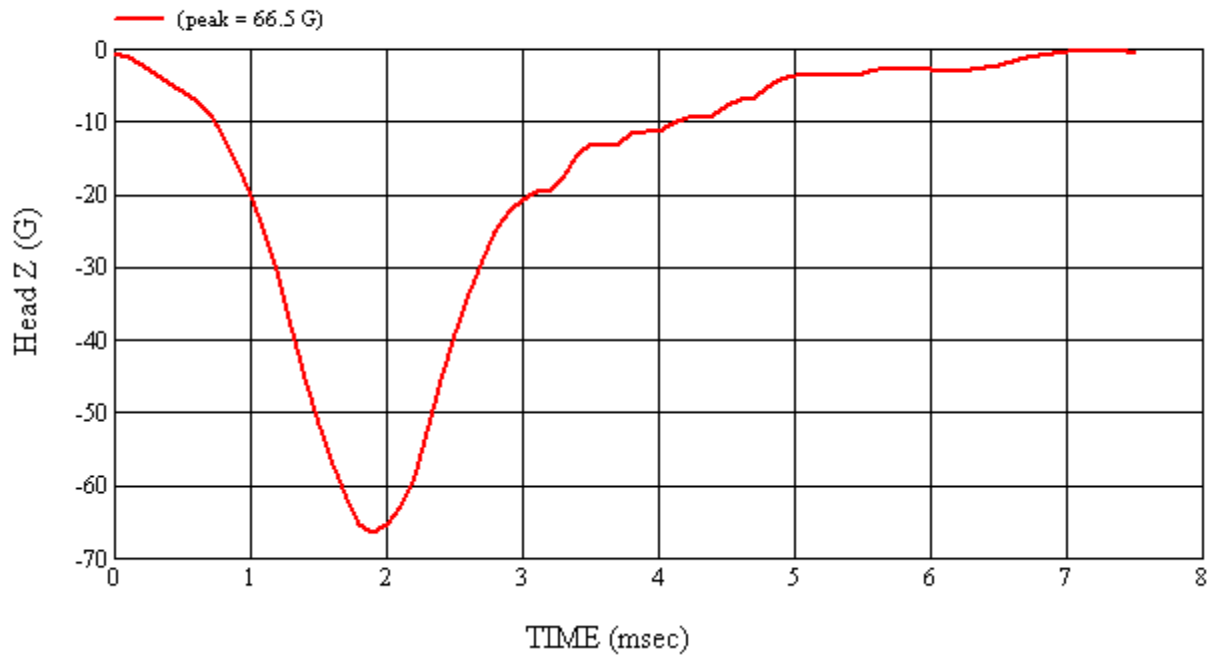
Head 035 (Post) Calibration #H35010



Head 035 (Post) Calibration #H35010



Head 035 (Post) Calibration #H35010



Head 035 (Post) Calibration #H35010

4-3 Pre-Test Calibration

**HEAD DROP TEST SUMMARY
 PART 572L**

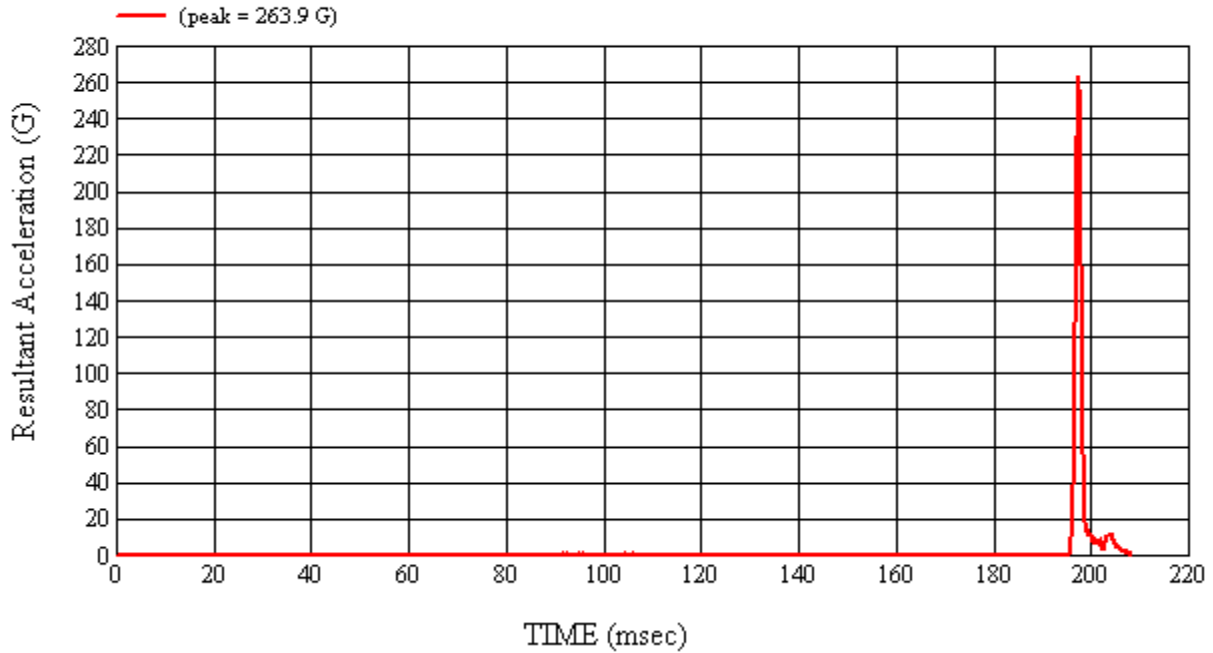
HEADFORM SERIAL NUMBER: 037		CALIBRATION DATE: 4/6/2011
CALIBRATION TIME: 8:57:12 AM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	20.6
Relative Humidity	10% to 70%	27.0
Peak Resultant Acceleration	225 G's to 275 G's	263.9
Peak Lateral Acceleration	15 G's Maximum	6.3
Unimodal Acceleration Curve	YES	YES

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

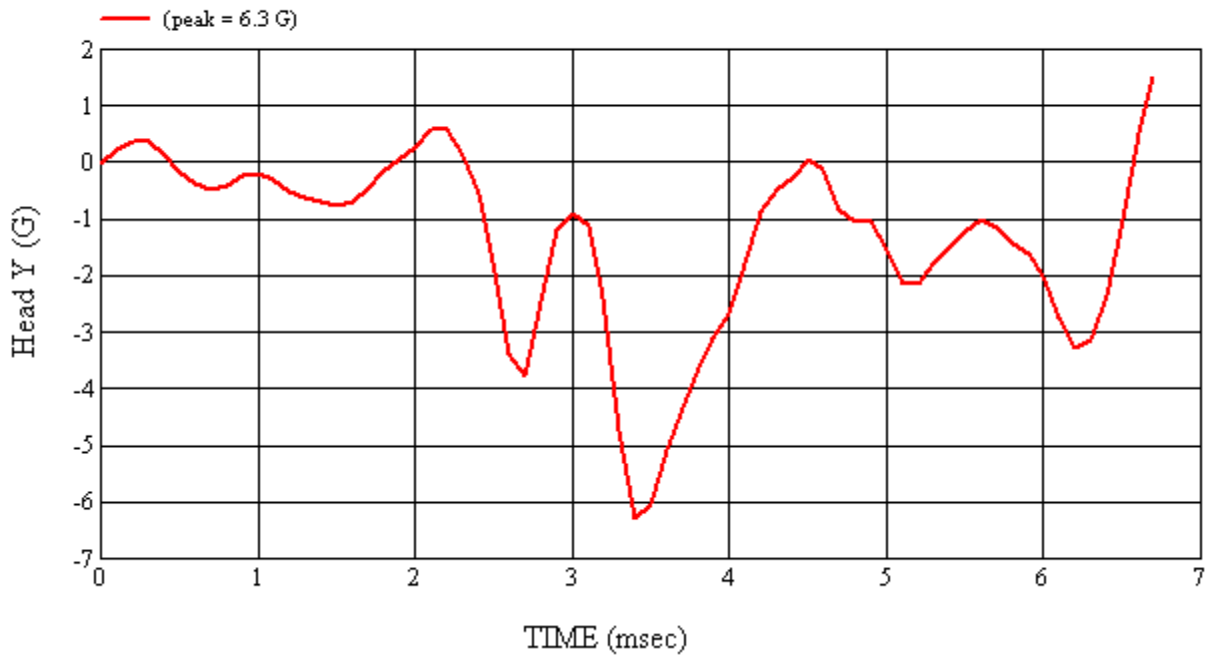
REMARKS:

RECORDED BY: *Keri D. McLean* DATE: 4/6/2011

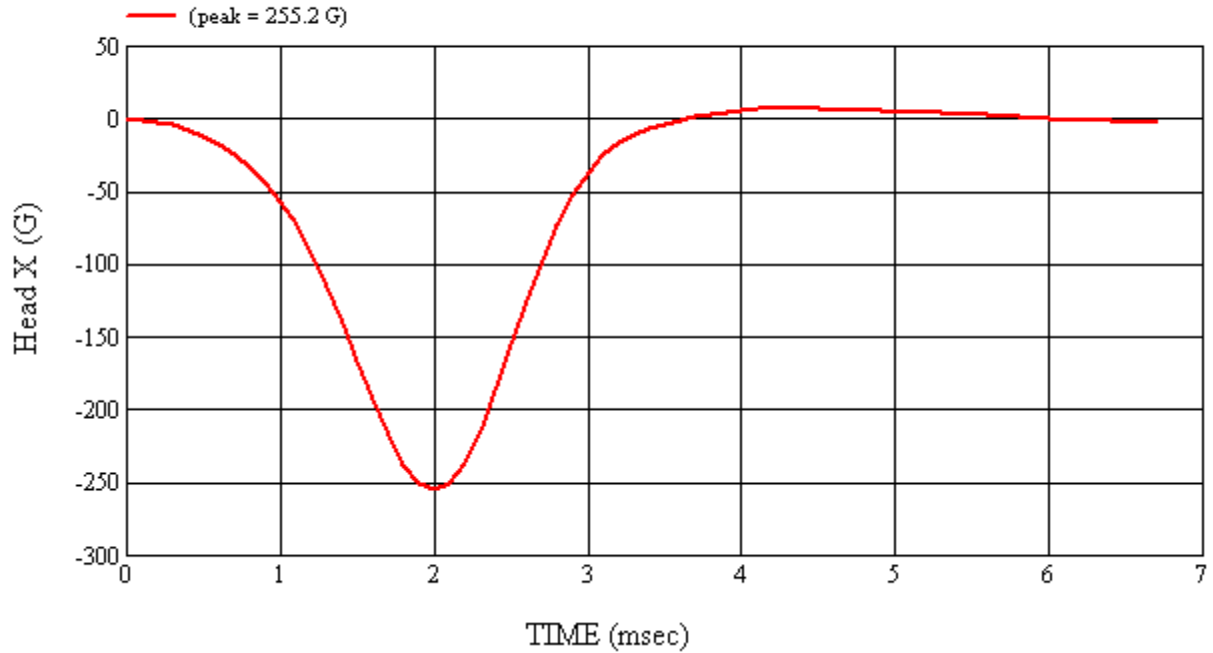
APPROVED BY: *Adrian I. Smith*



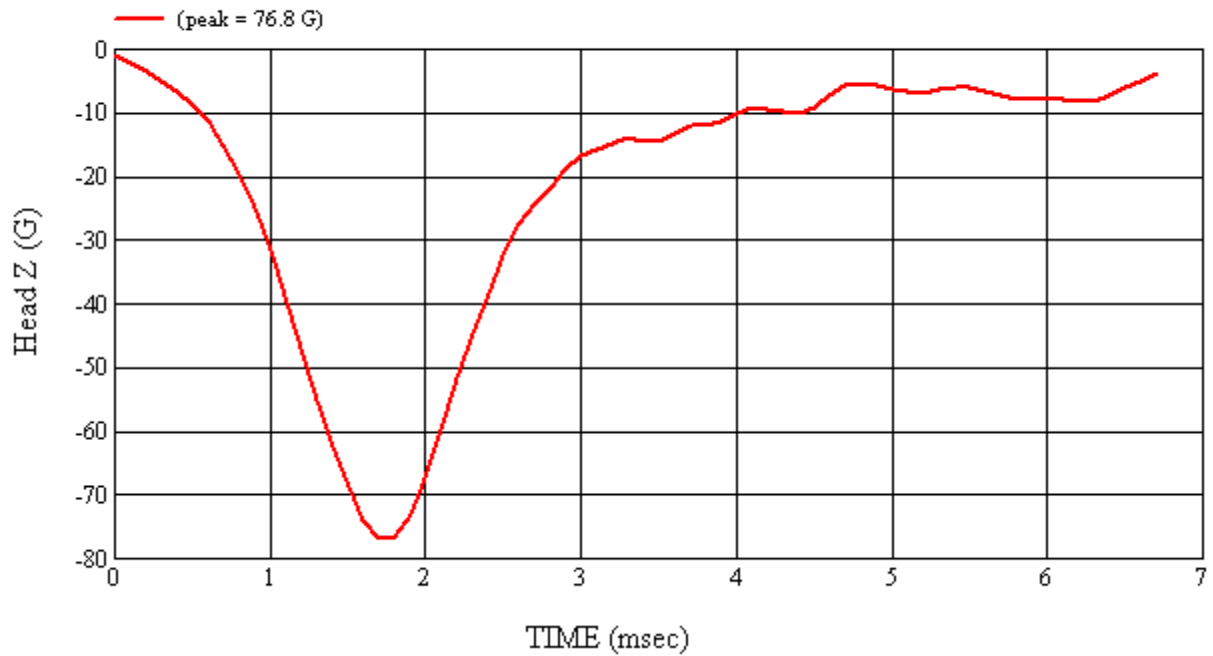
Head 037 (Pre) Calibration #H37009



Head 037 (Pre) Calibration #H37009



Head 037 (Pre) Calibration #H37009



Head 037 (Pre) Calibration #H37009

4-4 Post-Test Calibration

**HEAD DROP TEST SUMMARY
PART 572L**

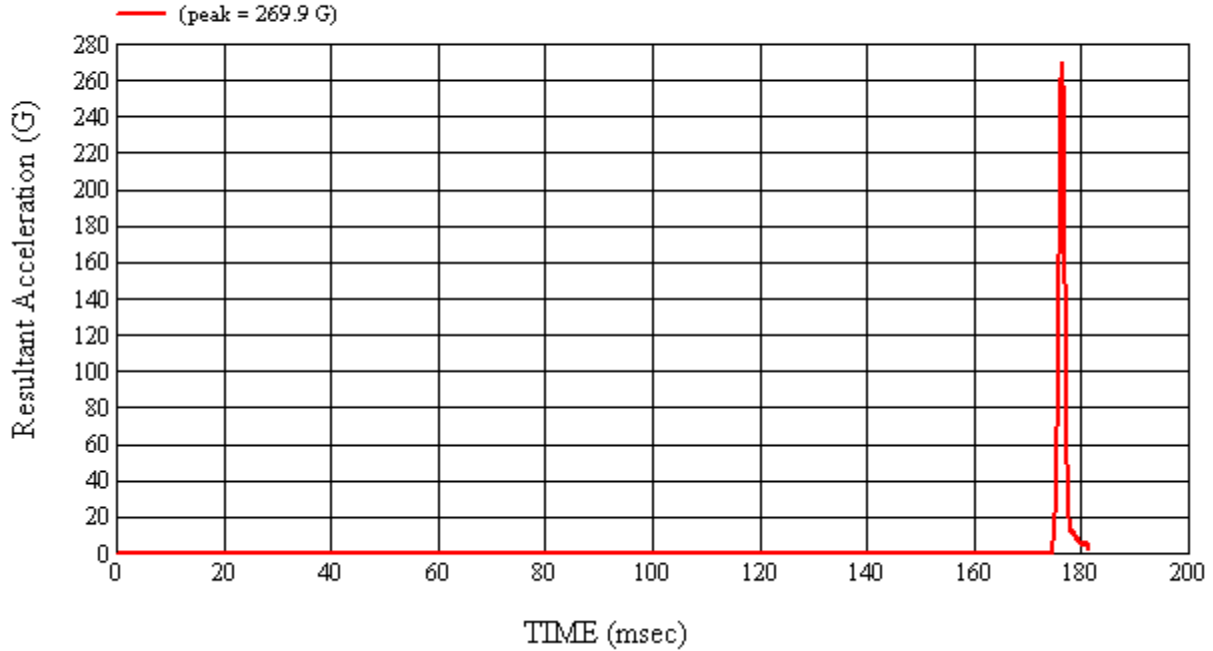
HEADFORM SERIAL NUMBER: 037		CALIBRATION DATE: 4/11/2011
CALIBRATION TIME: 2:58:15 PM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	23.4
Relative Humidity	10% to 70%	44.5
Peak Resultant Acceleration	225 G's to 275 G's	269.9
Peak Lateral Acceleration	15 G's Maximum	8.7
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

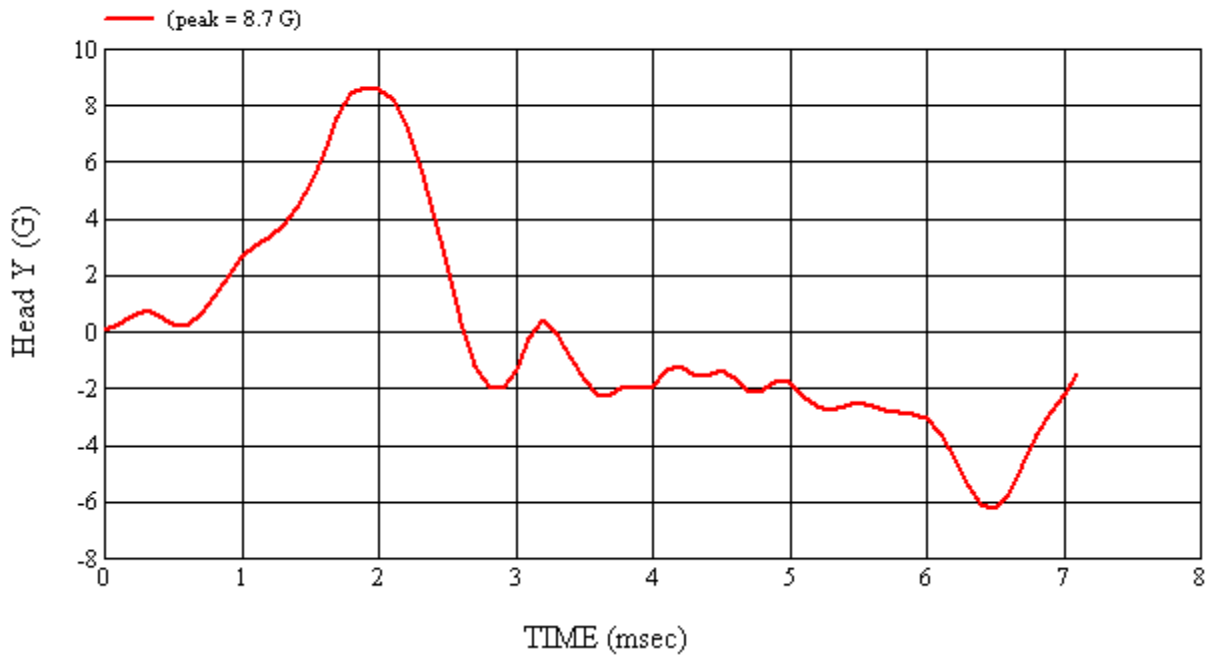
REMARKS:

RECORDED BY: *Keri D. McLean* DATE: 4/11/2011

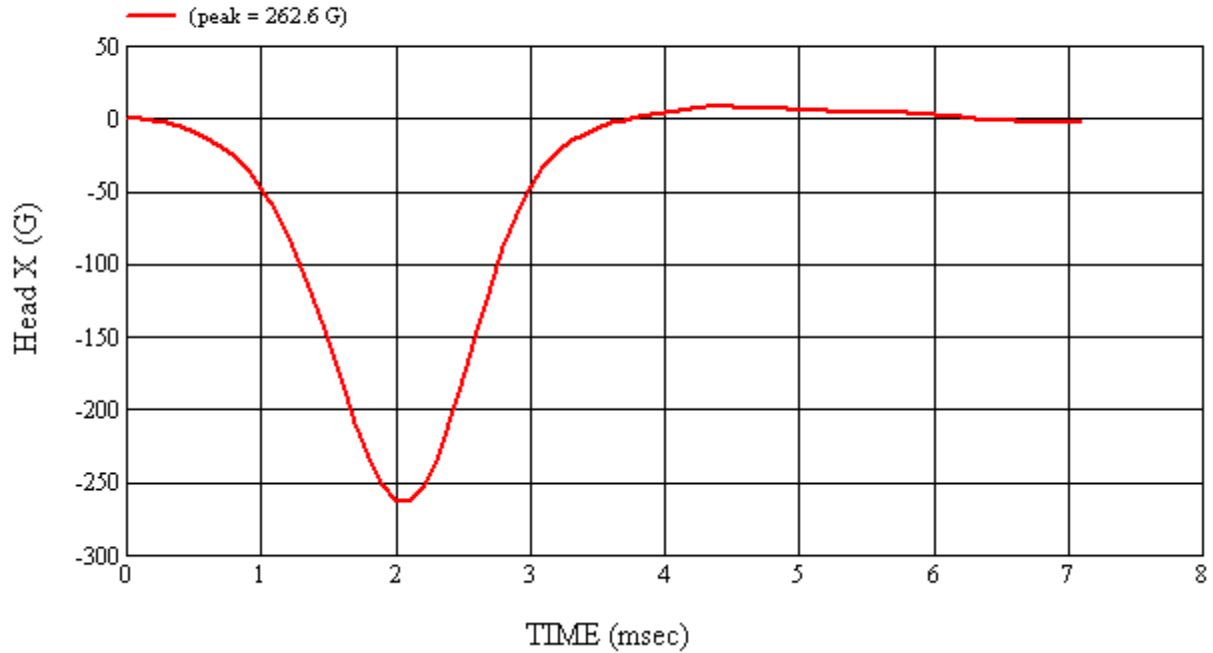
APPROVED BY: *Adrian I. Smith*



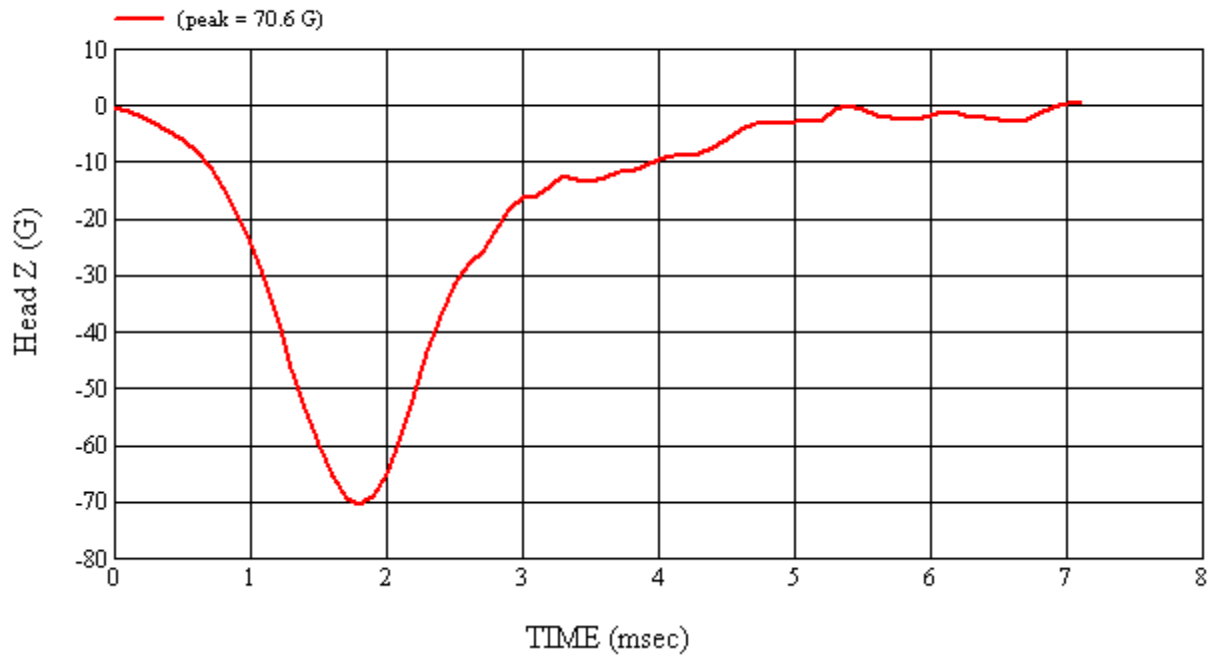
Head 037 (Post) Calibration #H37010



Head 037 (Post) Calibration #H37010



Head 037 (Post) Calibration #H37010



Head 037 (Post) Calibration #H37010

4-5 Pre-Test Calibration

**HEAD DROP TEST SUMMARY
 PART 572L**

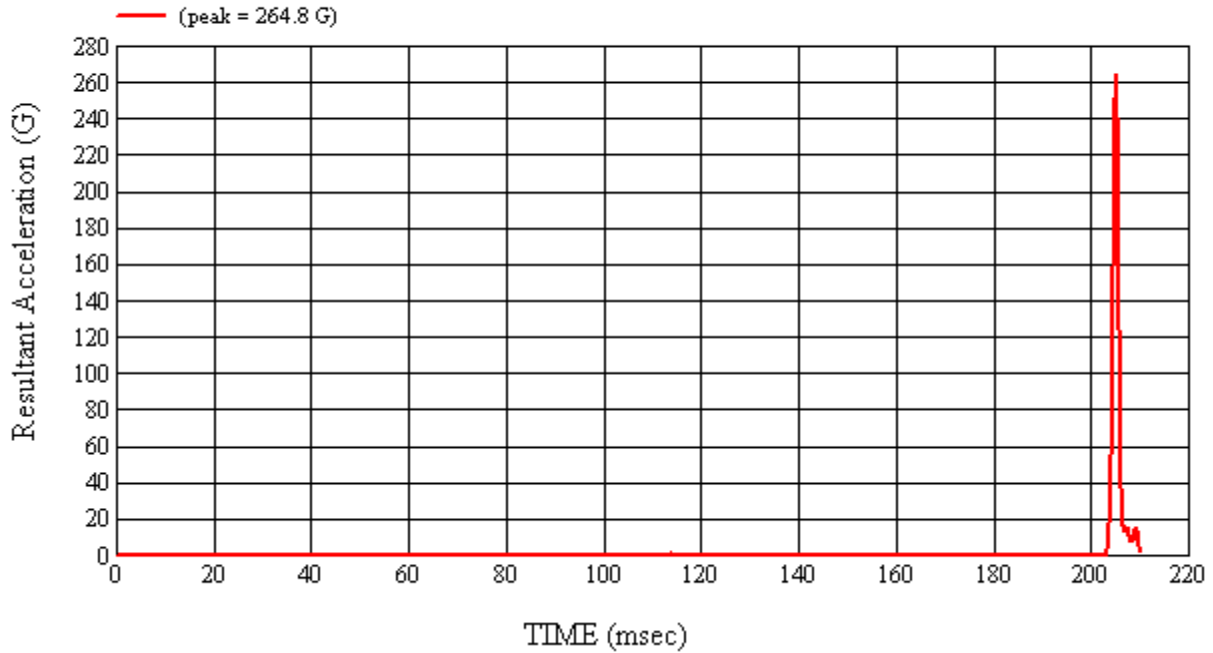
HEADFORM SERIAL NUMBER: 038		CALIBRATION DATE: 4/6/2011
CALIBRATION TIME: 9:18:08 AM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	20.8
Relative Humidity	10% to 70%	26.7
Peak Resultant Acceleration	225 G's to 275 G's	264.8
Peak Lateral Acceleration	15 G's Maximum	9.7
Unimodal Acceleration Curve	YES	YES

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

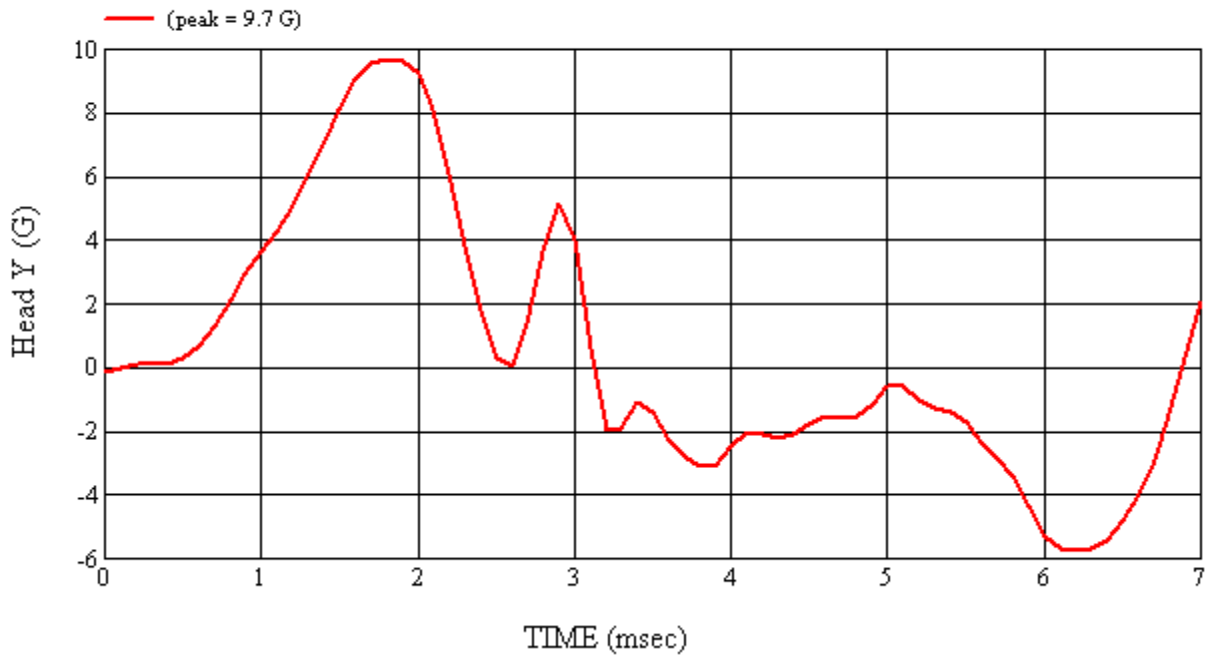
REMARKS:

RECORDED BY: *Kevin D. McLean* DATE: 4/6/2011

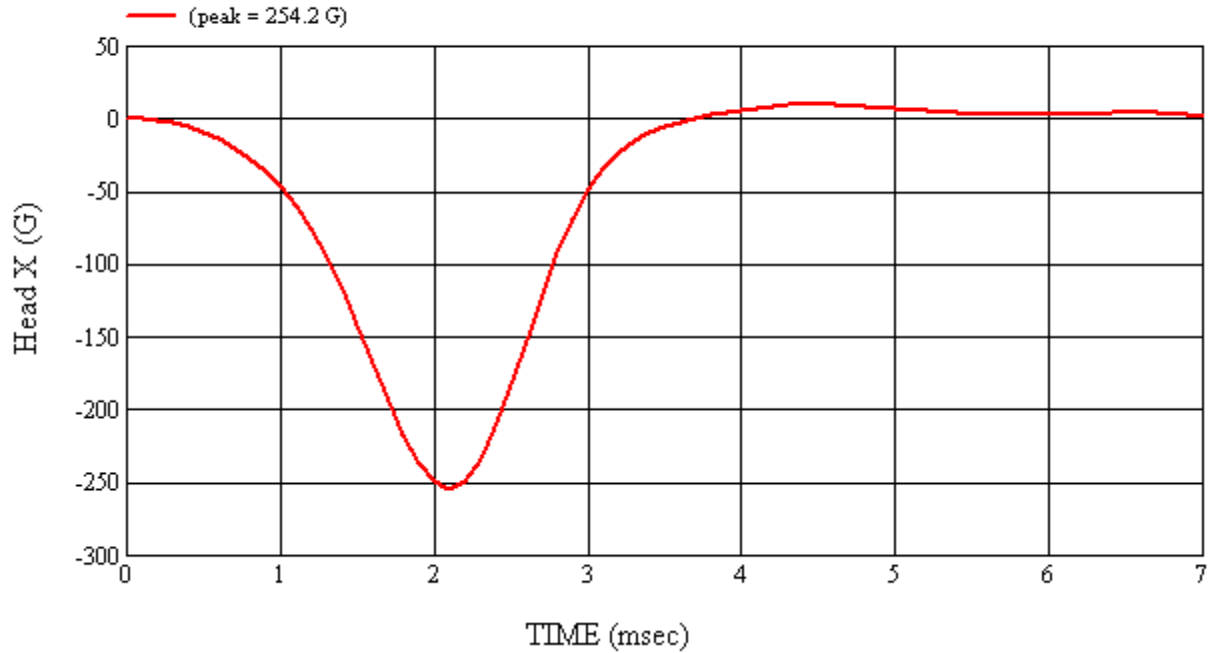
APPROVED BY: *Adrian I. Smith*



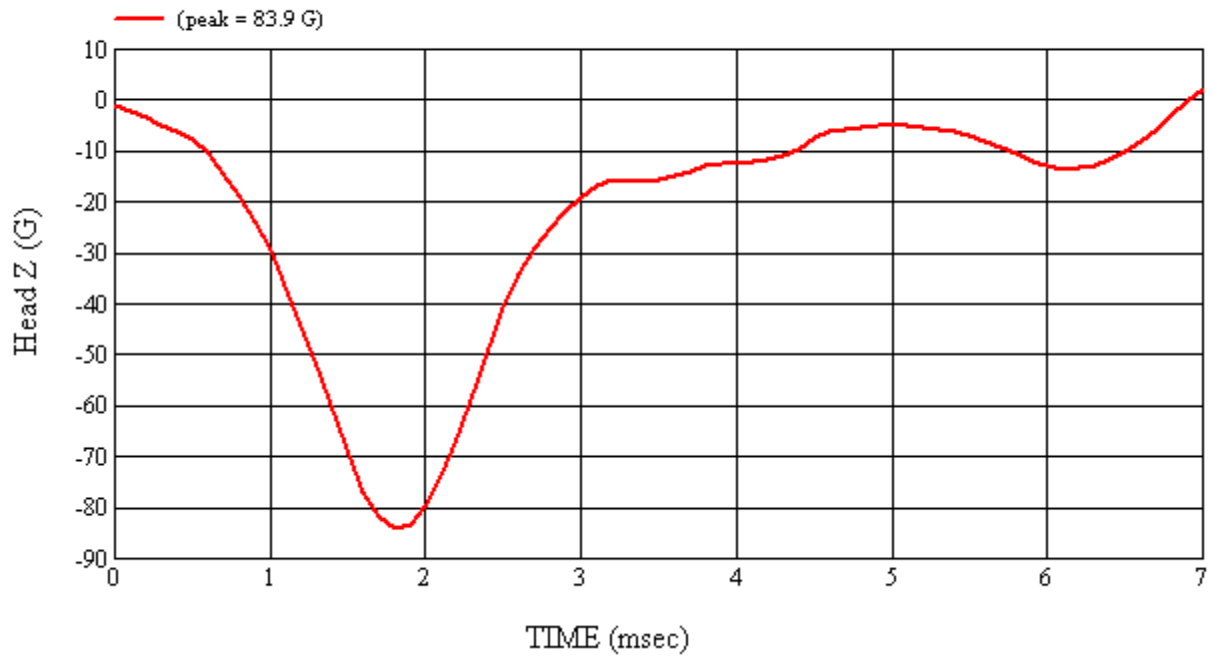
Head 038 (Pre) Calibration #H38009



Head 038 (Pre) Calibration #H38009



Head 038 (Pre) Calibration #H38009



Head 038 (Pre) Calibration #H38009

4-6 Post-Test Calibration

**HEAD DROP TEST SUMMARY
 PART 572L**

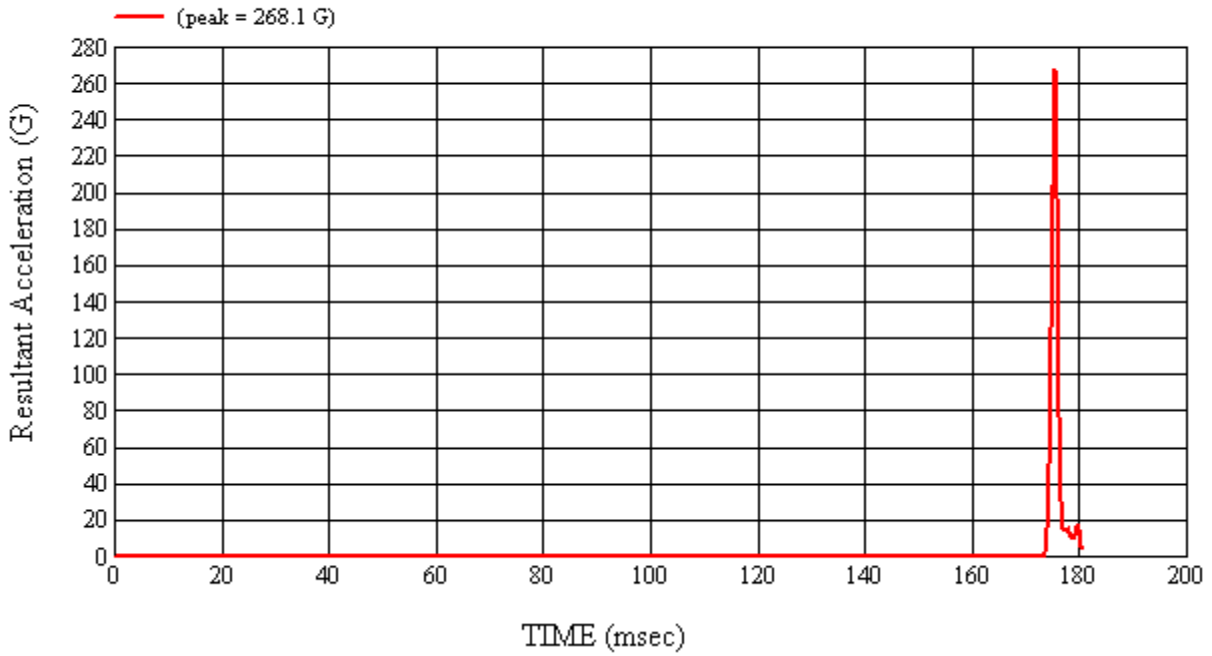
HEADFORM SERIAL NUMBER: 038		CALIBRATION DATE: 4/11/2011
CALIBRATION TIME: 3:16:10 PM		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	23.0
Relative Humidity	10% to 70%	44.0
Peak Resultant Acceleration	225 G's to 275 G's	268.1
Peak Lateral Acceleration	15 G's Maximum	12.4
Unimodal Acceleration Curve	YES	YES

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

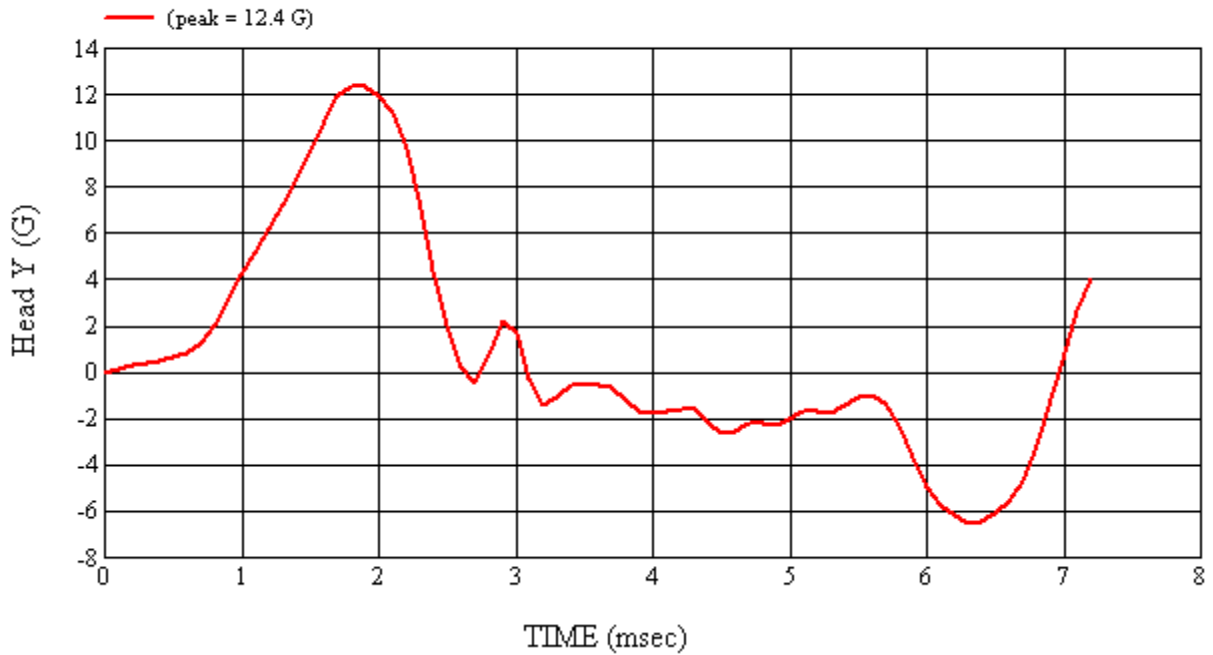
REMARKS:

RECORDED BY: *Kerri D. McLean* DATE: 4/11/2011

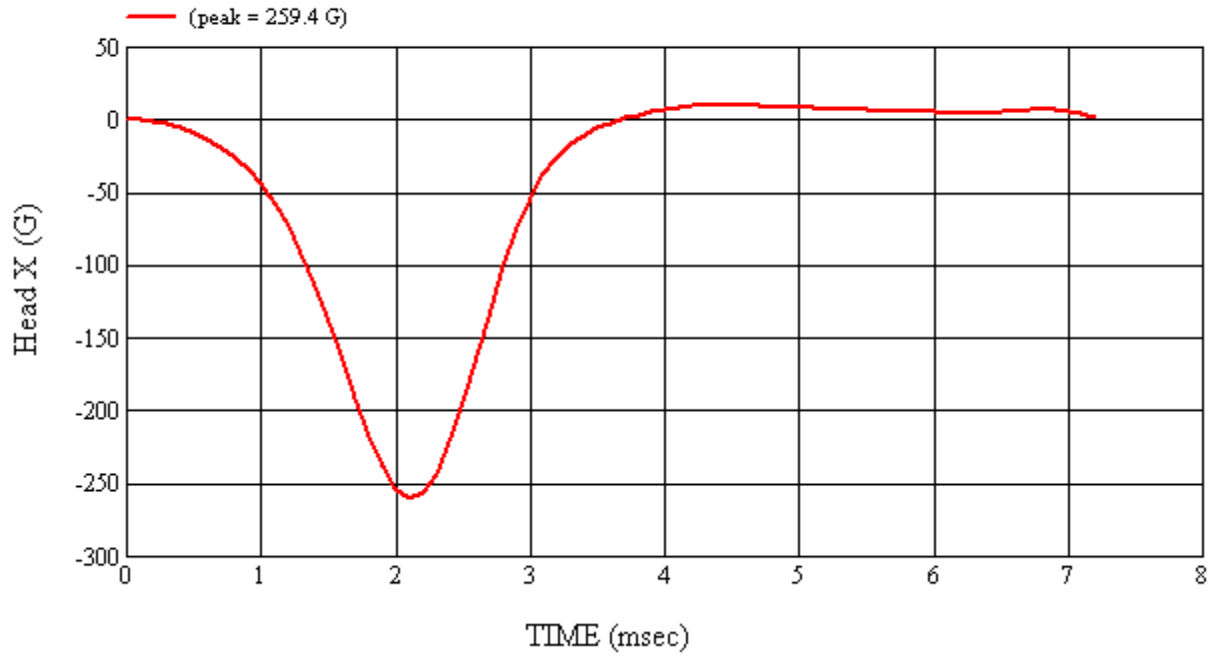
APPROVED BY: *Adrian I. Smith*



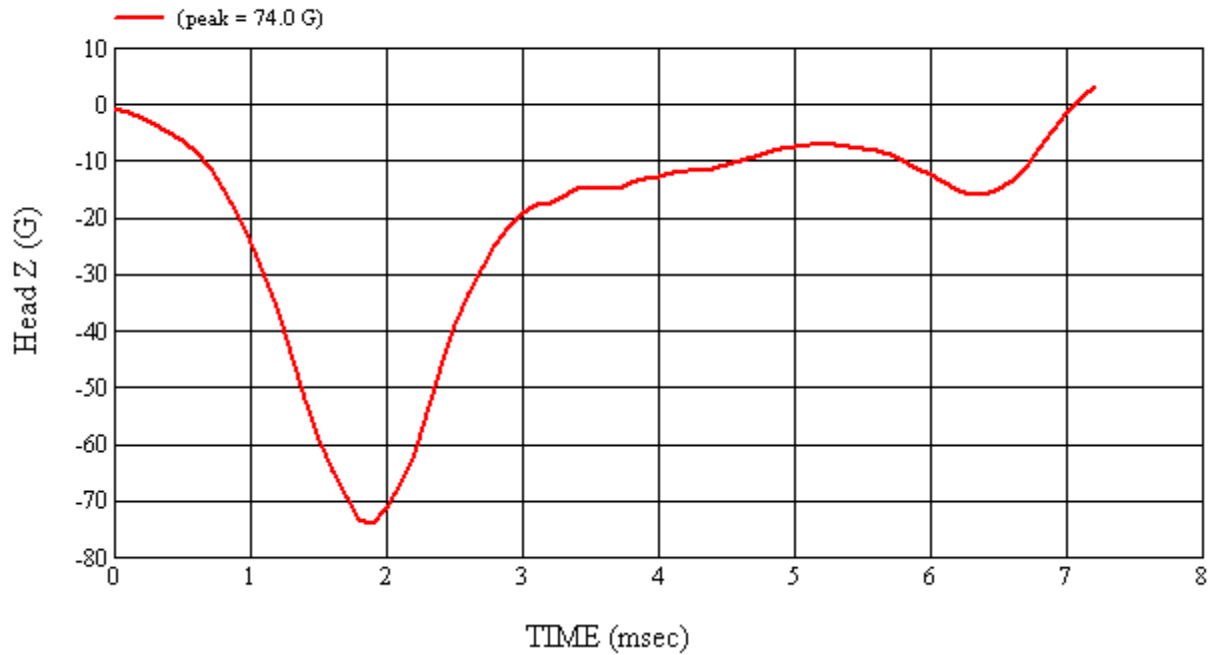
Head 038 (Post) Calibration #H38010



Head 038 (Post) Calibration #H38010



Head 038 (Post) Calibration #H38010

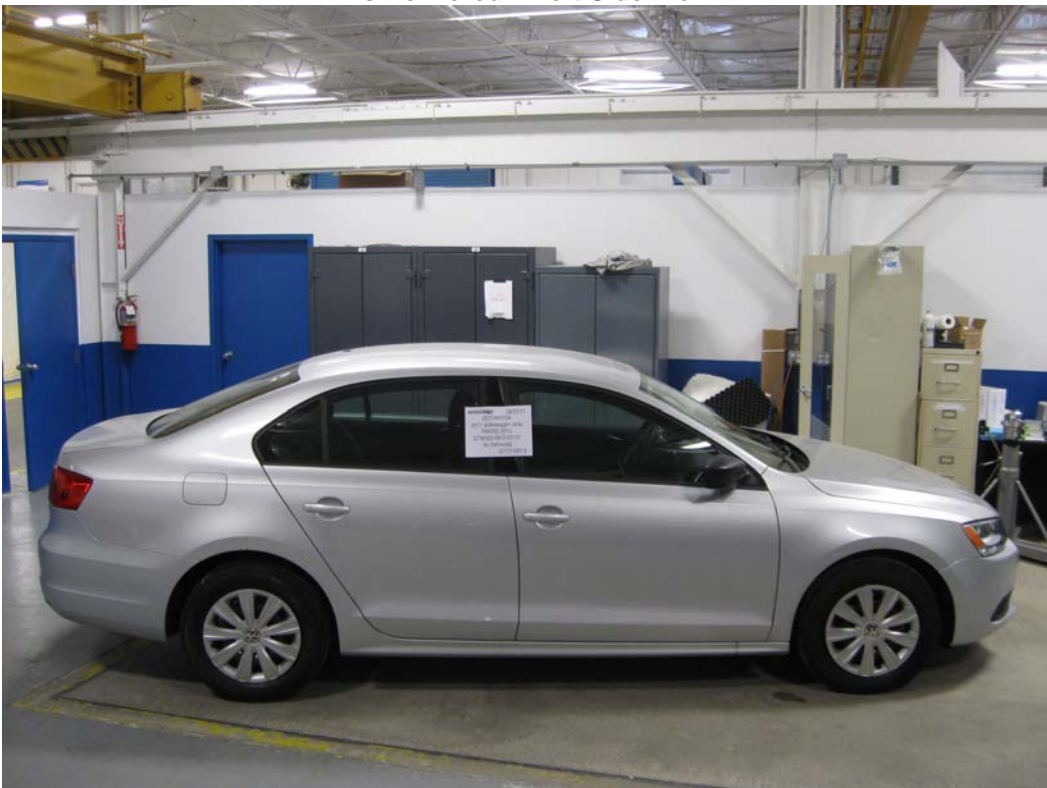


Head 038 (Post) Calibration #H38010

5.0 PHOTOGRAPHS



As Delivered – Left Side View



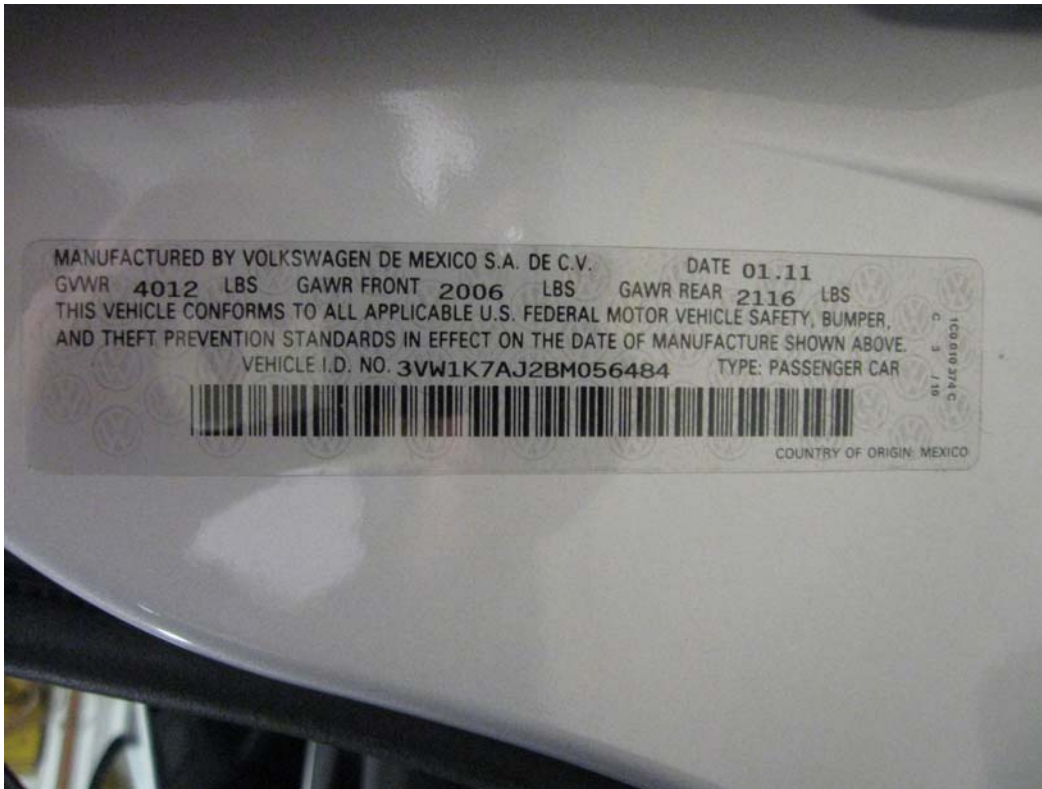
As Delivered – Right Side View



As Delivered – ¾ Front View From Left Side



As Delivered – ¾ Rear View From Right Side



As Delivered – Vehicle’s Certification Label

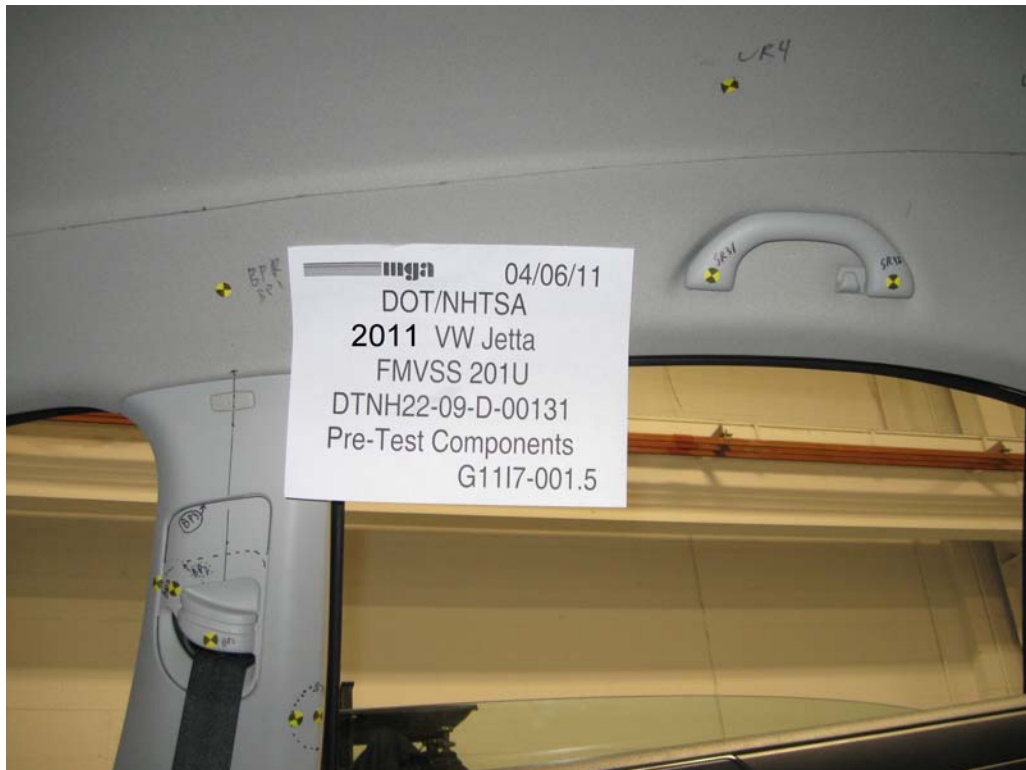


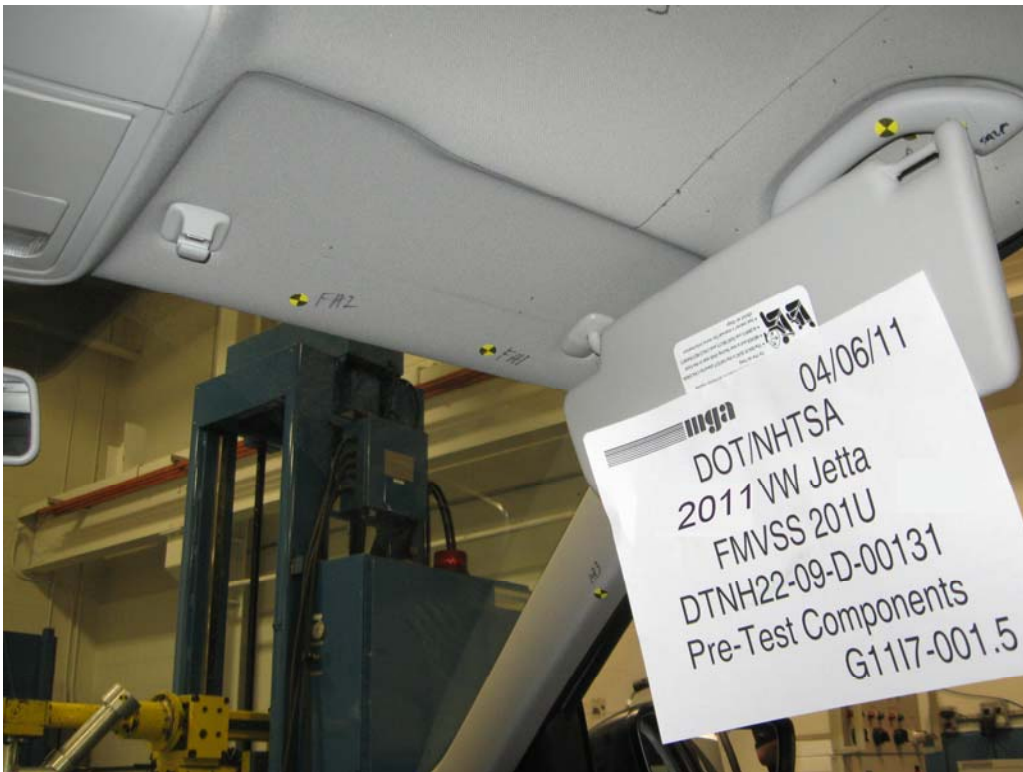
As Delivered – Vehicle’s Tire Information Label

Pre-Test Component Photographs

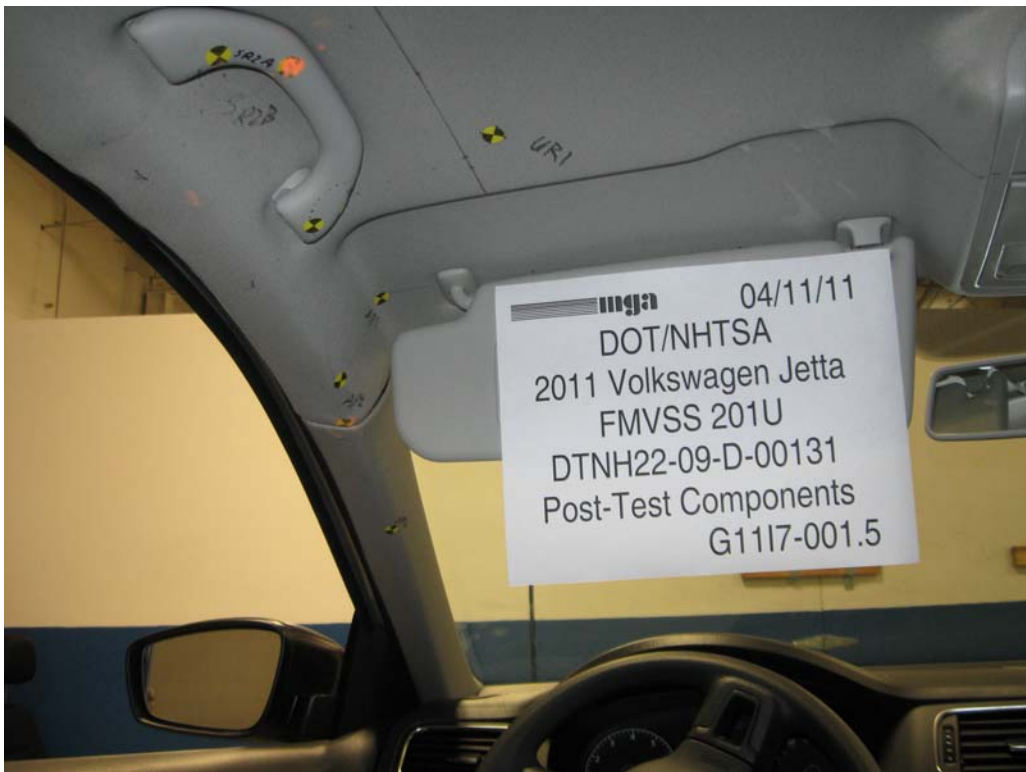


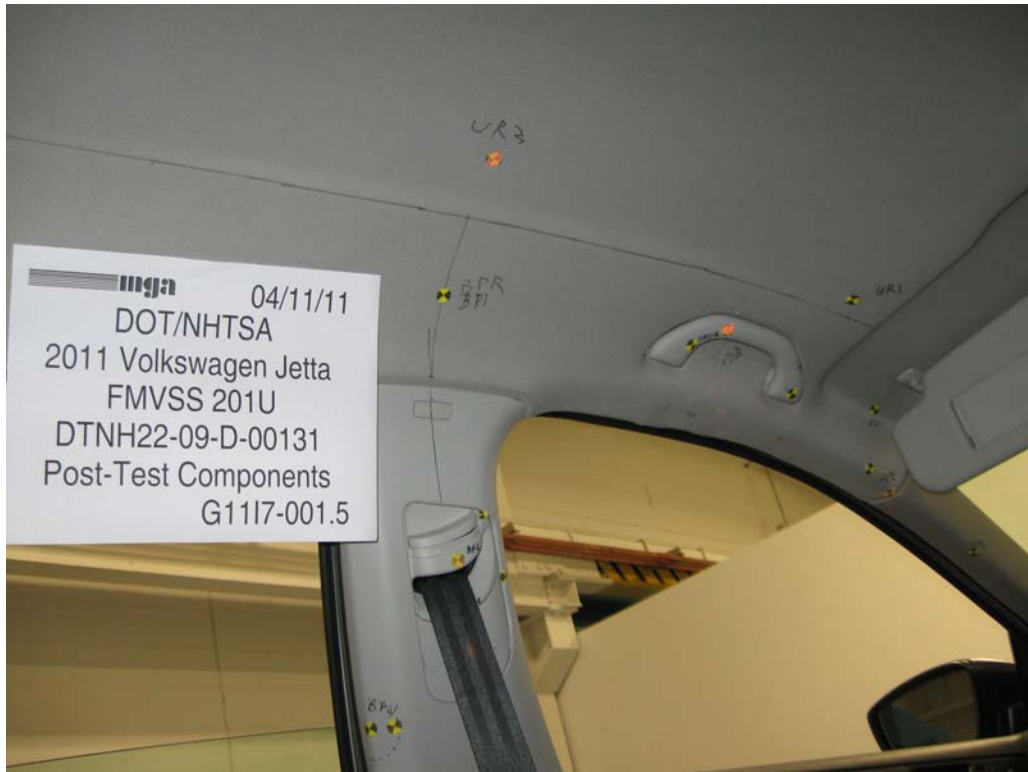


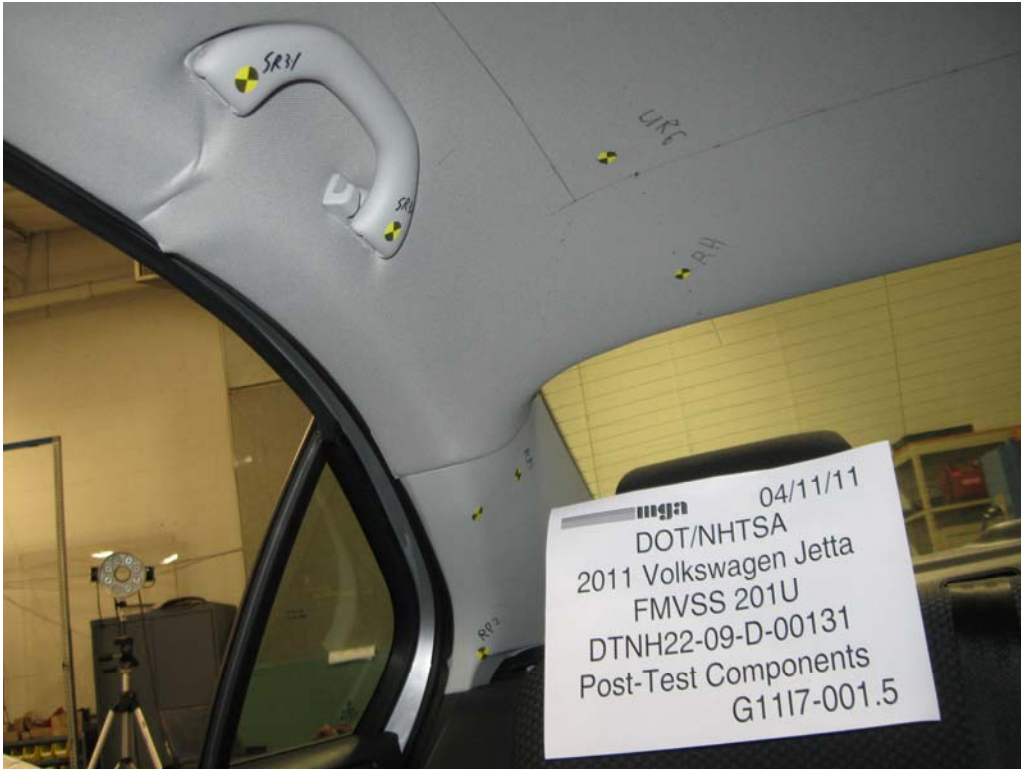




Post-Test Component Photographs



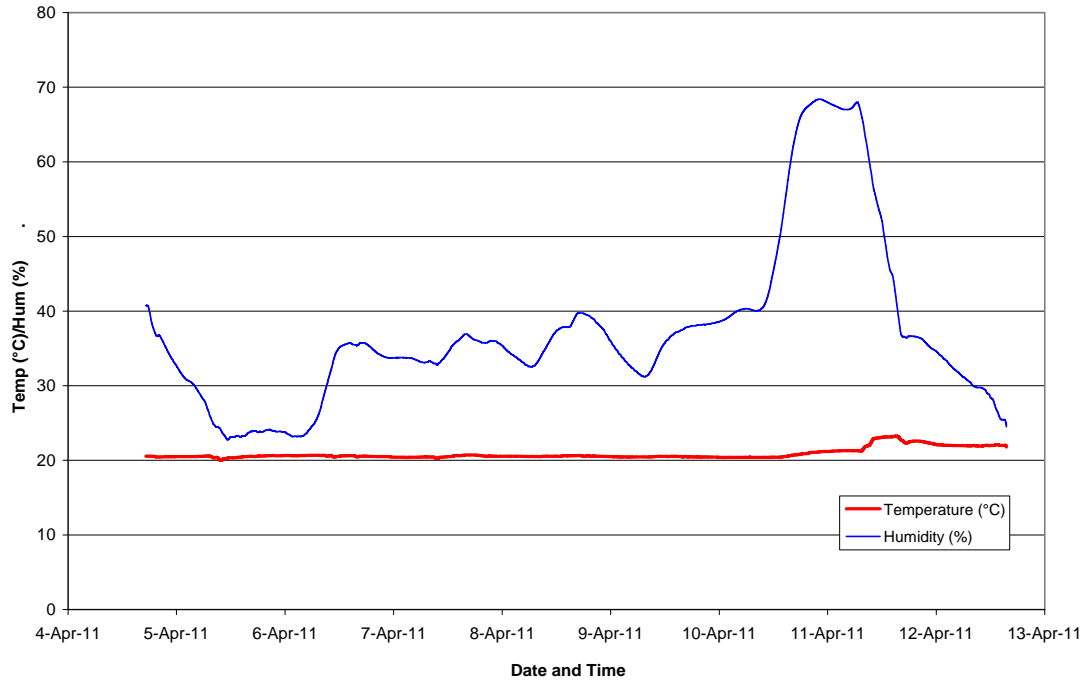






Appendix A – Temperature Trace

CB5801 - 2011 Volkswagon Jetta - FMVSS 201U





Appendix B – Calibration Certificates

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 #:	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: 


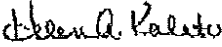
1. Actual data of reference and sensor instruments is found in calibration files
 2. Linearity is defined as $1 - (\text{Standard Deviation} / \text{Mean})$
- All calibrations are traceable to the National Institute of Standards and Technology
Calibration uncertainty no greater than 4.0% at the 95% confidence 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 #:	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 Sensitivit
(% 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 $1 - (\text{Standard Deviation} / \text{Mean})$

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 #:	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.

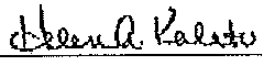
MGA Research Corporation-Calibration Certificate

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.

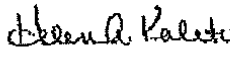
MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference		Sensor	
Name:	Accel Standard	Name:	MGA MI
Model #	352C03	Manufacturer	Endevco
Serial #:	95980	Model #:	7264-2000
Capacity:	G's:250	Serial #:	J35800
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 $1 - (\text{Standard Deviation} / \text{Mean})$

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 #:	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: Blair A. Kaleski

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 Sensitivit (% Difference) 0.9

Temperature: 70 °F

Humidity: 20 %

Sensitivity (mV/W/G): 0.025114

Calibrated By: Chris Collins

Signature: Chris Collins


Approved by: Heaven A. Kaleski

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

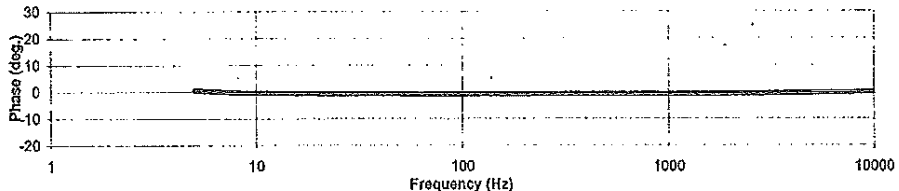
Calibration uncertainty no greater than 4.0% at the 95% confidence level.

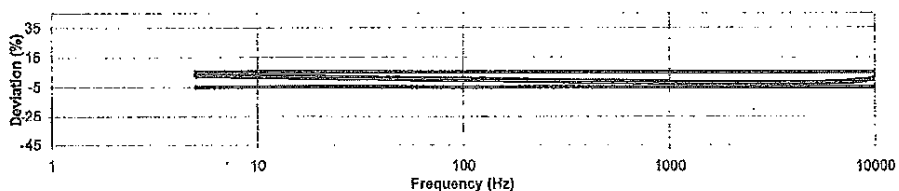


~Calibration Certificate~

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: ≥ 60000 Hz Temp. Range: -54 to 121 °C -65 to 250 °F Axis: Uni-Axial
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Phase Response


Amplitude Response


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 822/271196).
 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

<p>Unit Condition As Found: In Tolerance As Left: In Tolerance</p>	<p>Lab Conditions Temperature: 73 (23) °F (°C) Humidity: 32 %</p>
---	--

<p>Approval Information Technician: Ed Devlin Approval: <i>Ed Devlin</i></p>	<p>Cal Date: 9/14/2010 Due Date:</p>
---	---



Cal ID: 15803 2649 01

Page 1 of 2



~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: <u>Silver</u>	Certification Date: <u>10/19/2010</u>	Serial#: <u>S08-05-98-01273</u>	
Single Point - (Max./Min)/2 Specification: <u>S08-05 .075mm (.0030")</u>	ISO9001	Certificate#: <u>S01273-0470</u>	
Volumetric (Max Deviation) Specification: <u>S08-05 +/- .108mm (+/- .0042")</u>		Temporaries: See attached data	
Measurement Standards Traceability			
Ball Bar Kit	Asset Number: <u>1039</u>	Calibration Due: <u>10/24/2010</u>	*SI Traceability: METAS-L20100204R61
Thermometer	Asset Number: <u>TQ023</u>	Calibration Due: <u>11/20/2010</u>	*SI Traceability: A2LA-1001059862
Reference Sphere	Asset Number: <u>1241</u>	Calibration Due: <u>11/21/2011</u>	*SI Traceability: NIST-921276660-08

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 @ 2σ = 2.5x the maximum value of length in meters. Uncertainty is expressed as approximately a 95% level of confidence using GUM.

Calibration Results*

3 Single Point Articulation Tests at $\pm 20\%$,
 1. Effective diameter sphere test
 2. Volumetric ball bar test in 4 quadrants and 2 orientations.
 *Calibration conforms to procedure developed in accordance with AIAA-22-304. See attached data for measurement results.

**Instrument Condition as Received:
 Not Within Specification**

Instrument condition outstanding
 Within specifications
 PASSED
 PASSED
 PASSED

Technician: Anthony Parker Date: 10/19/10

FARO Technologies, Inc.
 PH: 1-800-736-2771
 PH: 2-407-333-6911
 FAX: 407-333-8056
 L-A-B Cert Number: L1147-1



MICHIGAN OPERATIONS
 DATE: 2/7/10
 SUPERCERDES: MGATP.TMC.5

DOC. NO.: MGATP.TMC
 REVISION NO.: 6
 PAGE 3 OF 3

Tape Measure Calibration Certificate

Reference Steel Rule

Brand: SUN ANSON
 S/N: MA00799
 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 $k=2$.

gary.hockin@midwayproducts.com



4700 Barden Court SE, Kentwood MI 49512, Telephone: 616-698-3124, Fax: 616-698-2354, www.metrocal.com

Certificate of Calibration

MGA Research
 446 Executlve Drive
 Troy, MI 48083

Gauge Number: MGA00712
 Gauge Desc: Digital Protractor
 Manufacturer: Mitutoyo
 Model Number: 950-315
 Serial Number: 06091641

Order Number: 69370
 Certificate Number: 100903801
 Page: 1 of 1

Customer PO: N/A
 Last Calibration: N/A
 Calibration Date: 9/3/10
 Next Calibration: 9/3/11

As Found Condition: In Tolerance

As Left Condition: In Tolerance

MetroCal, Inc maintains reference standards of measurement which are traceable to the National Institute of Standards and Technology, or other authorized National Standards. Calibration was performed in accordance with MetroCal Procedure CP045 and complies with the ANSI/NCSL Z540-1 and ISO/IEC 17025 Standards. Results shall not be reproduced, except in full, without the written approval of MetroCal, Inc. Results relate only to the item(s) calibrated. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired. Statements of compliance made using simple acceptance rule.

Standard Used	Cal Date	Due Date	Traceable No.	Calibration Procedure
				Uncertainty Expressed at 95% confidence (K=2)
Gage Block Set	8/2/10	8/2/11	ID# 105	0.0015°
DoAll Sine Bar	1/21/10	1/21/11	ID# 1879	0.0015°

Results:

Units	As Found Readings		
	Nominal	Actual	Deviation
Decimal Deg.	5.00	5.0	0.00
	10.00	10.1	0.10
	20.00	20.0	0.00
Tolerance	30.00	30.0	0.00
± 0.1° Level	40.00	39.9	-0.10
± 0.2° Maximum Error	Reference Level Check: Within ± 0.1 degrees		

As Left Readings		
Nominal	Actual	Deviation
5.00	5.0	0.00
10.00	10.1	0.10
20.00	20.0	0.00
30.00	30.0	0.00
40.00	39.9	-0.10
Reference Level Check: Within ± 0.1 degrees		

Comments: Environmental conditions during calibration: 68 °F, 44% RH.
 No adjustment required.

Shannon Kubicek
 Shannon Kubicek
 Calibration Technician

Issued: 9/3/10

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

@ 9/8/10



Metrology Management Services
 Remit to address:

Calibration Certificate

35200 Plymouth Rd.
 Livonia, MI 48150



CALIBRATION # 1277.01
 Calibration Certificate #:
 Z50918:1281429469

DICKSON FH125 TEMP/RH RECORDER		WORK ORDER: 1281429469
SERIAL NUMBER:	06163263	
ASSET NUMBER:	Z50918	
CUST. ASSET NUM:	MGA00152	
PROCEDURE NAME:	1012	
PROCEDURE REV:	A	TEST RESULT: PASS
CALIBRATED BY:	JOE McCONNAUGHAY	PERFORMED ON: 8/10/2010
CUSTOMER:	MGA RESEARCH CORP	CAL DUE DATE: 8/10/2011
	446 EXECUTIVE DRIVE	DATA TYPE: FOUND-LEFT
	TROY, MI 48083	TEMPERATURE: 21.00 °C
PRIMARY CONTACT:	THOMAS M. HUTTER	HUMIDITY: 43 %

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

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

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

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

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:

Standards Used				
Asset #	Cert#	Description	Cal Date	Due Date
002326	002326:1264588323	VAISALA HMK-15 HUMIDITY SALTS	1/27/2010	1/27/2011
1914	1914:1262708187	FLUKE 1502A THERMOMETER READOUT	1/5/2010	1/5/2011
1915	1915:1264951189	HART SCIENTIFIC 5614 PRT	1/31/2010	1/31/2011
1917	1917:1263989036	VAISALA MI70/HMP76 MEASUREMENT INDICATOR/PROBE	1/20/2010	1/20/2011

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

8/13/2010

QA approved: MB Date: 8-11-10
 Signature: [Signature]

Asset Barcode:



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: 8/28/10
 Next Calibration: 8/28/11

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
25-50% 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: 8/28/10

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.