FINAL REPORT NUMBER 201UI-MGA-09-07

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

AUTO ALLIANCE INTERNATIONAL, INC.
2009 Mazda 6 I Sedan Base
NHTSA No. C95401

MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083

Test Dates: May 27-28, 2009
Report Date: June 1, 2009

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 New Jersey Avenue, SE
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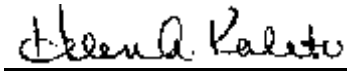
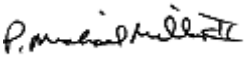
Prepared By: 

Donald J. Whiteside, Project Engineer



Helen A. Kaleto, Project Manager

Approved By: 

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Accepted By: _____

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4. Title and Subtitle Final Report of FMVSS 201 Compliance Testing of a 2009 Mazda 6 I Sedan Base, NHTSA No. C95401		5. Report Date June 1, 2009	
		6. Performing Organization Code MGA	
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9. Performing Organization Name and Address MGA Research Corporation 446 Executive Drive Troy, Michigan 48083		10. Work Unit No.	
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12. Sponsoring Agency Name and Address U.S. Department Of Transportation National Highway Traffic Safety Administration Enforcement Office of Vehicle Safety Compliance 1200 New Jersey Avenue, SE West Building, 4th Floor Washington, D.C. 20590		13. Type of Report and Period Covered Final Test Report	
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15. Supplementary Notes			
16. Abstract A compliance test series was conducted on the subject 2009 Mazda 6 I Sedan Base, NHTSA No. C95401, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-201U-01 for the determination of FMVSS 201 compliance. The testing was conducted at MGA Research Corporation in Troy, Michigan on May 27-28, 2009. Test failures identified were as follows: None The data recorded indicates that the 2009 Mazda 6 I Sedan Base tested appears to comply with the upper interior requirements of FMVSS 201.			
17. Key Words Compliance Testing Safety Engineering FMVSS 201UI 2009 Mazda 6 I Sedan Base		18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division, Mail Code: NPO-410 1200 New Jersey Avenue, SE West Building Washington, D.C. 20590	
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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 2009 Mazda 6 I Sedan Base, met the performance requirements of FMVSS 201, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted on May 27-28, 2009 on a 2009 Mazda 6 I Sedan Base, manufactured by Auto Alliance International, Inc.

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

All tests were conducted at MGA Research Corporation in Troy, Michigan and were performed by MGA engineers and technicians. The FMVSS 201U impactor test machine was used to conduct the testing. Target locations were determined by using a Coordinate Measurement Machine in conjunction with the MGA EZ-Target™ program and MGA procedure MGATP201U_Test Series dated July 1, 2005.

2.0 COMPLIANCE TEST DATA SUMMARY

The 2009 Mazda 6 I Sedan Base was equipped with A, B, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, grab handles located on the side rail above the front passenger door and on the side rails of the rear driver and passenger doors, 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	RP1	RH
AP2	BP3	RP2	UR4@BPR
AP3	BP4	SR2A	UR5@SR3-1

The 2009 Mazda 6 I Sedan Base 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: 2009 Mazda 6 I Sedan Base

VEH. NHTSA NO.: C95401 VIN: 1YVHP80A995M26348 COLOR: Silver

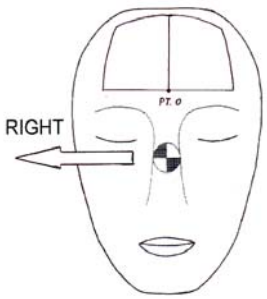
VEH. BUILD DATE: October, 2008 TEST DATES: May 27-28, 2009

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Andrew Gould, Ryan Jones, Helen A. Kaleto, Donald J. Whiteside

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	109	20	18.7	277	147	44	18 Left
AP2	Left	202	50	18.8	328	214	23	4 Left
AP3	Right	156	48	19.0	380	284	12	0
BP1	Left	270	24	19.0	584	554	45	3 Left
BP3	Left	293	-7	23.9	794	831	22	9 Left
BP4	Right	158	-3	23.8	793	830	12	3 Left
RP1	Right	30	20	23.4	336	224	68	2 Left
RP2	Left	325	23	19.0	315	197	25	5 Left
SR2A	Right	90	25	18.6	284	156	24	1 Right
RH	Left	0	50	24.0	409	322	13	9 Right
UR4@BPR	Right	90	46	24.0	711	721	36	2 Left
UR5@SR3-1	Left	270	34	24.1	620	602	48	10 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.

SR2A Right: Grab handle does not return unassisted.

UR4@BPR Right: Small indentation in headliner.

UR5@SR3-1 Left: Crease in the headliner.

REMARKS:

The targets listed were impacted in the following order:

Left: AP2, BP3, BP1, UR5@SR3-1, RP2, RH

Right: AP3, AP1, SR2A, BP4, UR4@BPR, RP1

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

RECORDED BY: Donald J. Whiteside DATE: May 28, 2009

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Mazda 6 I Sedan Base

VEH. NHTSA NO.: C95401 VIN: 1YVHP80A995M26348 COLOR: Silver

VEH. BUILD DATE: October, 2008 TEST DATES: May 27-28, 2009

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Andrew Gould, Ryan Jones, Helen A. Kaleto, Donald J. Whiteside

INTERIOR TRIM INFORMATION: A, B, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, grab handles located on the side rail above the front passenger door and on the side rails of the rear driver and passenger doors, and an overhead console located on the front upper roof.

SUNROOF INFORMATION:

Installed: ___Yes X___ No

Operation: ___Electric ____ Manual

SIDE RAIL CURTAIN AIRBAG INFORMATION:

Installed: _X_Yes ____ No

ROLL-BAR INFORMATION:

Installed: _____Yes _X_ No

Padded: _____Yes _X_ No

Braces: _____Yes _X_ No

GENERAL INFORMATION:

Date Received: February 25, 2009; Odometer Reading 51 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Auto Alliance International Inc.

Date of Manufacture: October, 2008; VIN: 1YVHP80A995M26348

GVWR: 1969 kg; GAWR FRONT: 1037 kg;

GAWR REAR: 935 kg;

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 220 kPa REAR: 220 kPa

Recommended Tire Size: P205/65R16

Recommended Cold Tire Pressure:

FRONT: 220 kPa REAR: 220 kPa

Size of Tire on Test Vehicle: P205/65R16

Type of Spare Tire: T115/70D16; Space Saver: X; Standard__

VEHICLE CAPACITY DATA:

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

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

VEHICLE CAPACITY WEIGHT:

Vehicle Capacity Weight (VCW) = 385 kg

No. of Occupants x 68 kg = 340 kg

Rated Cargo/Luggage Weight (RCLW) = 45 kg (difference)

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

Right Front =	417.0 kg	Right Rear =	315.0 kg
Left Front =	458.5 kg	Left Rear =	277.0 kg
TOTAL FRONT =	875.5 kg	TOTAL REAR =	592.0 kg
% Total Weight =	59.7 %	% Total Weight =	40.3 %

TOTAL DELIVERED WEIGHT = 1467.5 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1467.5 kg

Max. Test Cargo/Luggage Weight = 45.0 kg

Target Test Weight = 1512.5 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	414.5 kg	Right Rear =	339.0 kg
Left Front =	456.5 kg	Left Rear =	301.5 kg
TOTAL FRONT =	871.0 kg	TOTAL REAR =	640.5 kg
% Total Weight =	57.6 %	% Total Weight =	42.4 %

TOTAL TEST WEIGHT = 1511.5 kg

Weight of ballast secured in vehicle's cargo area = 44.0 kg

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 719 mm; Left Front 719 mm;
Right Rear 732 mm; Left Rear 733 mm;
Pitch Angle at Right Door Sill = 0.5 Rear is higher
Pitch Angle at Left Door Sill = 0.3 Rear is higher
Roll Angle at Front Bumper = 0.1 Rear is higher
Roll Angle at Rear Bumper = 0.1 Left is higher

FULLY LOADED: Right Front 720 mm; Left Front 721 mm;
Right Rear 721 mm; Left Rear 722 mm;
Pitch Angle at Right Door Sill = 0.0
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 = 0.1 Right is higher

AS TARGETED: Right Front 836 mm; Left Front 836 mm;
Right Rear 839 mm; Left Rear 838 mm;
Pitch Angle at Right Door Sill = 0.0
Pitch Angle at Left Door Sill = 0.1 Rear is higher
Roll Angle at Front Bumper = 0.1 Right is higher
Roll Angle at Rear Bumper = 0.0

AS TESTED ON RIGHT SIDE:

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

AS TESTED ON LEFT SIDE:

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

VEHICLE WHEELBASE = 2785 mm

REMARKS: The seat travel distance was measured to be 240 mm for the driver front seat and 240 mm for the passenger front seat.

RECORDED BY: Donald J. Whiteside DATE: May 22, 2009

APPROVED BY: Helen A. Kaleto

TABLE 2-3

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Mazda 6 I Sedan Base

VEH. NHTSA NO.: C95401 VIN: 1YVHP80A995M26348 COLOR: Silver

VEH. BUILD DATE: October, 2008 TEST DATES: May 27-28, 2009

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Andrew Gould, Ryan Jones, Helen A. Kaleto, Donald J. Whiteside

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

	HORIZONTAL ANGLE SPECIFIED RANGE	MINIMUM HORIZONTAL ANGLE	MAXIMUM HORIZONTAL ANGLE
A-PILLAR	L 195º-255º	L 202.8º	L 250.5º
	R 105º-165º	R 109.1º	R 156.9º
B-PILLAR	L 195º-345º	L 201.4º	L 293.4º
	R 15º-165º	R 67.6º	R 158.6º

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Donald J. Whiteside DATE: May 22, 2009

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Mazda 6 I Sedan Base

VEH. NHTSA NO.: C95401 VIN: 1YVHP80A995M26348 COLOR: Silver

VEH. BUILD DATE: October, 2008 TEST DATES: May 27-28, 2009

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Andrew Gould, Ryan Jones, Helen A. Kaleto, Donald J. Whiteside

VERTICAL IMPACT ANGLE RANGES

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	FH1	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
	FH2	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
SIDE RAIL	SR1	L 0º-50º	L 0º	L 24º
		R 0º-50º	R 0º	R 24º
	SR2A	L 0º-50º	L 0º	L 26º
		R 0º-50º	R 0º	R 25º
	SR2B	L 0º-50º	L 0º	L 40º
		R 0º-50º	R 0º	R 40º
	SR3-1	L 0º-50º	L 0º	L 27º
		R 0º-50º	R 0º	R 26º
	SR3-2	L 0º-50º	L 0º	L 27º
		R 0º-50º	R 0º	R 27º
REAR HEADER	RH	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
A-PILLAR	AP1	L -5º-50º	L -5º	L 20º
		R -5º-50º	R -5º	R 20º
	AP2	L -5º-50º	L -5º	L 50º
		R -5º-50º	R -5º	R 50º
	AP3	L -5º-50º	L -5º	L 49º
		R -5º-50º	R -5º	R 48º
B-PILLAR	BP1	L -10º-50º	L -10º	L 24º
		R -10º-50º	R -10º	R 22º
	BP2*	L 0º-50º	L 0º	L 6º
		R 0º-50º	R 0º	R 6º
	BP3	L -10º-50º	L -10º	L -7º
		R -10º-50º	R -10º	R -8º
	BP4	L -10º-50º	L -10º	L -2º
		R -10º-50º	R -10º	R -3º
REAR PILLAR	RP1	L -10º-50º	L -10º	L 22º
		R -10º-50º	R -10º	R 20º
	RP2	L -10º-50º	L -10º	L 23º
		R -10º-50º	R -10º	R 22º
UPPER ROOF 1		0º-50º	0º	50º
UPPER ROOF 2		0º-50º	0º	41º
UPPER ROOF 3		0º-50º	0º	45º
UPPER ROOF 4		0º-50º	0º	46º
UPPER ROOF 5		0º-50º	0º	34º
UPPER ROOF 6		0º-50º	0º	43º

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

RECORDED BY: Donald J. Whiteside DATE: May 22, 2009

APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Mazda 6 I Sedan Base

VEH. NHTSA NO.: C95401 VIN: 1YVHP80A995M26348 COLOR: Silver

VEH. BUILD DATE: October, 2008 TEST DATES: May 27-28, 2009

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Andrew Gould, Ryan Jones, Helen A. Kaleto, Donald J. Whiteside

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	240 mm	240 mm
T^{o}	Horizontal < {CG-F1 (Left Seat) to (Right A-Pillar)}	109.5^{o}	--
A1^{o}	360^{o} - T^{o}	250.5^{o}	--
W^{o}	Horizontal < {CG-2 (Left Seat) to (Left A-Pillar)}	202.8^{o}	--
A2^{o}	A2^{o} = W^{o}	202.8^{o}	--
U^{o}	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	293.4^{o}	--
B1^{o}	B1^{o} = U^{o}	293.4^{o}	--
V^{o}	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	201.4^{o}	--
B2^{o}	B2^{o} = V^{o}	201.4^{o}	--
W^{o} (right)	Horizontal < {CG-F2 (Right Seat) to (Right A-Pillar)}	--	156.9^{o}
A1^{o} (right)	A1^{o} (right) = W^{o} (right)	--	156.9^{o}
T ^{o} (right)	Horizontal < {CG-F1 (Right Seat) to (Left A-Pillar)}	--	250.9^{o}
A2^{o} (right)	360^{o}-T^{o} (right)	--	109.1^{o}
V ^{o} (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	158.6^{o}
B1^{o} (right)	B1^{o} (right) = V^{o} (right)	--	158.6^{o}
U ^{o} (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	67.6^{o}
B2^{o} (right)	B2^{o} (right) = U^{o} (right)	--	67.6^{o}
J	A-Pillar {(Plane 3) – (Plane 5)}	323.0 mm	321.9 mm
J/2	J ÷ 2	161.5 mm	161.0 mm
D1	Upper Roof {(Plane A) – (Plane B)}	1559.7 mm	
D1/2	D1 ÷ 2	779.9 mm	

Measurement	Description	Left Side	Right Side
D2	Upper Roof {(Plane C) – (Plane D)}	1170.7 mm	
D2/2	D2 ÷ 2	585.4 mm	
.35D1	.35 x D1	545.9 mm	
.35D2	.35 x D2	409.7 mm	
N	B-Pillar {(BPR) – (lowest point on daylight opening forward of B-Pillar)}	414.6 mm	415.5 mm
N/2	B-Pillar {(BP3) – (lowest point on daylight opening forward of B-Pillar)}	207.3 mm	207.8 mm
N/4	B-Pillar {(BP4) – (lowest point on daylight opening forward of B-Pillar)}	103.7 mm	103.9 mm
D	R-Pillar (Point 7 – Point M)	680 mm	680 mm
3D/7	3*D / 7	291.4 mm	291.4 mm

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

SgRP Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	267.4	-365.0	118.2	267.4	365.0	120.2
Rear	1158.4	-345.0	140.2	1158.4	345.0	140.2

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	267.4	-365.0	118.2	267.4	365.0	120.2
Rear	1158.4	-345.0	140.2	1158.4	345.0	140.2

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
CGF1	187.4	-365.0	778.2	187.4	365.0	780.2
CGF2	427.4	-365.0	778.2	427.4	365.0	780.2
CGR	1318.4	-345.0	800.2	1318.4	345.0	800.2

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Center hole (x, y, z) = 0, 0, 0

Front driver seat front outboard anchor hole (x, y, z) = -49.1, -582.0, -104.3

Front passenger seat front outboard anchor hole (x, y, z) = -49.1, 582.0, -104.3

REMARKS:

RECORDED BY: Donald J. Whiteside DATE: May 22, 2009

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Mazda 6 I Sedan Base

VEH. NHTSA NO.: C95401 VIN: 1YVHP80A995M26348 COLOR: Silver

VEH. BUILD DATE: October, 2008 TEST DATES: May 27-28, 2009

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Andrew Gould, Ryan Jones, Helen A. Kaleto, Donald J. Whiteside

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	67.7	-522.1	902.5	250	20	No	--	No
AP2	-55.6	-585.7	815.2	202	50	No	--	Yes
AP3	-224.2	-618.4	740.9	202	49	No	--	No
A-Pillar Right Side								
AP1	70.7	529.2	901.5	109	20	No	--	Yes
AP2	-62.4	585.2	814.5	156	50	No	--	No
AP3	-230.1	617.8	740.5	156	48	No	--	Yes
B-Pillar Left Side								
BP1	606.1	-474.7	983.4	270	24	No	--	Yes
BP2	558.6	-607.2	701.2	270	6	No	--	No
BP3	528.1	-613.3	775.2	293	-7	No	--	Yes
BP4	609.1	-657.5	672.0	201	-2	No	--	No
B-Pillar Right Side								
BP1	603.5	474.8	986.7	90	22	No	--	No
BP2	555.1	608.8	702.3	90	6	No	--	No
BP3	527.5	613.9	779.5	67	-8	No	--	No
BP4	609.3	657.7	676.8	158	-3	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					
Rear Pillar Left Side								
RP1	1347.5	-492.4	946.4	310	22	No	--	No
RP2	1431.8	-621.8	796.3	--	--	Yes	--	--
REL	1424.0	-574.3	826.6	325	23	--	2	Yes
Rear Pillar Right Side								
RP1	1348.0	491.1	947.0	30	20	No	--	Yes
RP2	1430.0	615.6	796.2	--	--	Yes	--	--
REL	1422.8	576.1	828.1	35	22	--	2	No
Front Header Left Side								
FH1	-4.7	-407.7	922.6	180	50	No	--	No
FH2	-22.8	-257.4	930.4	180	50	No	--	No
Front Header Right Side								
FH1	-4.8	413.1	922.8	180	50	No	--	No
FH2	-21.7	261.6	929.4	180	50	No	--	No
Side Rail Left Side								
SR1	218.3	-498.7	942.8	270	24	No	--	No
SR2A	368.2	-490.9	961.9	270	26	No	--	No
SR2B	307.1	-492.3	956.1	270	40	No	--	No
SR3-1	893.3	-484.3	950.5	270	27	No	--	No
SR3-2	1067.0	-497.3	929.7	270	27	No	--	No
Side Rail Right Side								
SR1	221.2	494.1	932.2	90	24	No	--	No
SR2A	371.7	500.9	970.3	--	--	Yes	--	--
REL	375.4	484.0	954.4	90	25	--	1	Yes
SR2B	302.6	501.6	966.3	--	--	Yes	--	--
REL	300.1	478.1	962.1	90	40	--	1	No
SR3-1	888.1	488.7	951.8	90	26	No	--	No
SR3-2	1062.4	500.4	930.6	90	27	No	--	No

SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
Rear Header Left Side								
RH	1332.1	-345.0	983.4	0	50	No	--	Yes
Rear Header Right Side								
RH	1326.9	344.3	985.1	0	50	No	--	No
Upper Roof Left Side								
UR1@APR	193.6	-398.5	968.3	270	50	No	--	No
UR3@BPR	631.1	-397.4	1009.9	270	45	No	--	No
UR5@SR3-1	927.2	-401.8	1014.0	270	34	No	--	Yes
Upper Roof Right Side								
UR2@SR2A	388.9	398.3	1018.7	90	41	No	--	No
UR4@BPR	619.4	395.0	1012.4	90	46	No	--	Yes
UR6@RP	1222.9	398.2	999.5	90	43	No	--	No

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

RECORDED BY: Donald J. Whiteside DATE: May 22, 2009

APPROVED BY: Helen A. Kaleto

3.0 TEST DATA (Including Acceleration and Velocity Plots)


mga
5/28/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP1
H/V IMPACT ANGLE= 109 / 20
FM9143
Post-Test


mga
5/28/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP1
H/V IMPACT ANGLE= 109 / 20
FM9143
Post-Test


mga
5/28/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP1
H/V IMPACT ANGLE= 109 / 20
FM9143
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#8

Target (Vehicle Side): AP1Right

Temperature:21.3C

MGA Test Reference No.:FM9143

Humidity:61.7%

Approach Horizontal Angles:109º

Time of Test:11:01:43 AM

Approach Vertical Angles:20º

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
277	147	8.1	18.7	44	18 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	AHTB2	-115.9	1.06	1.06
Y	6	J14103	93.7	0.85	0.85
Z	7	J35800	97.1	0.94	0.94

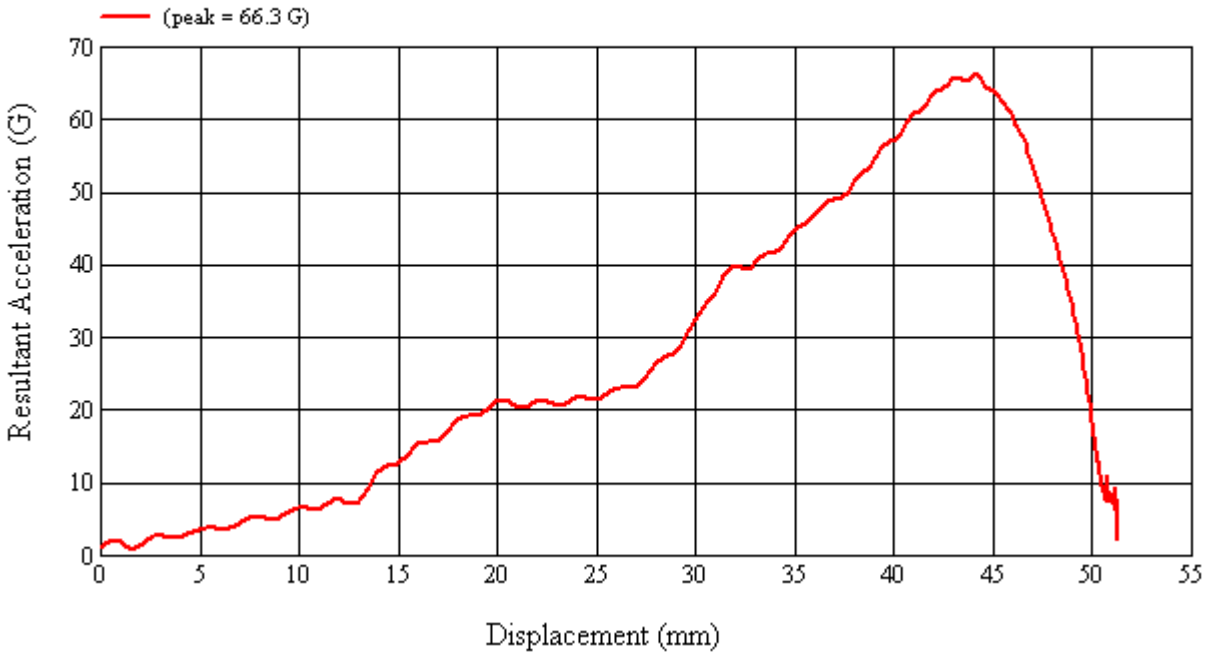
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

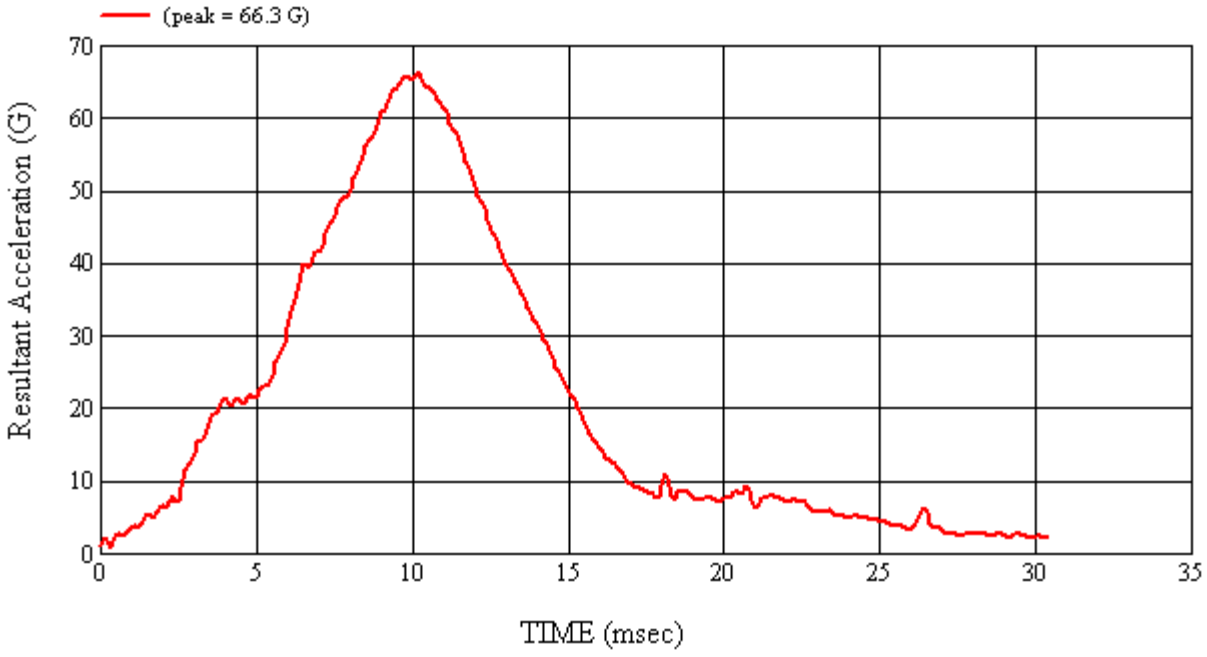
No damage observed

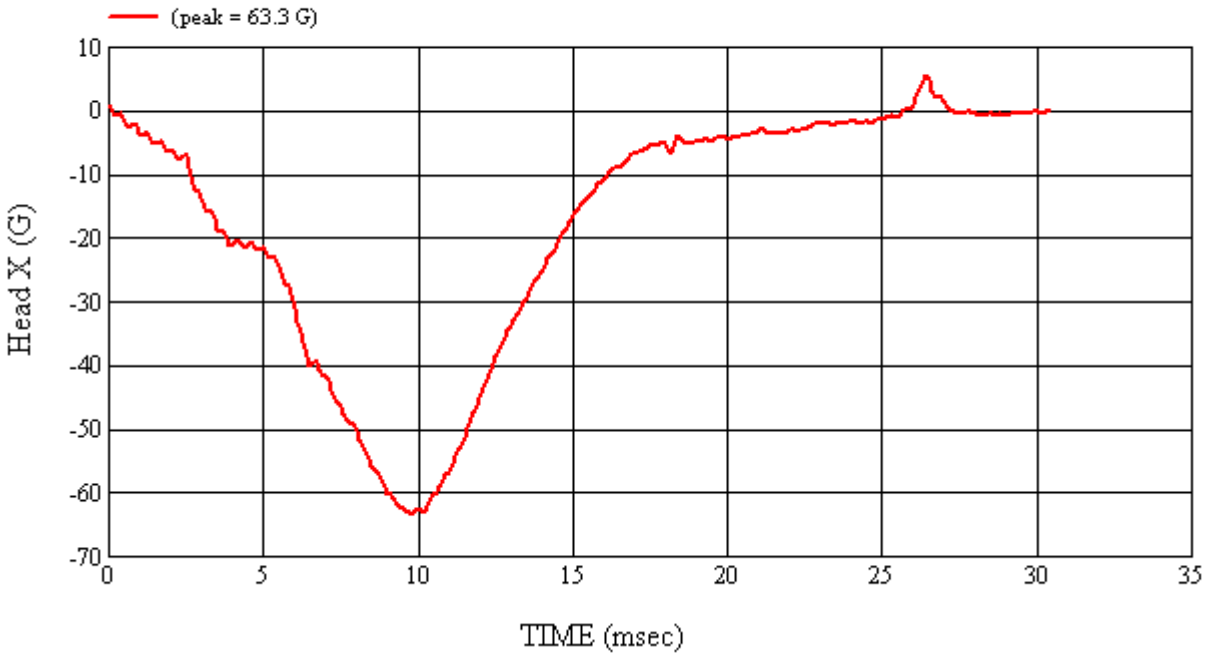
Recorded By: _____ Approved By*: _____ Date: 5/28/2009

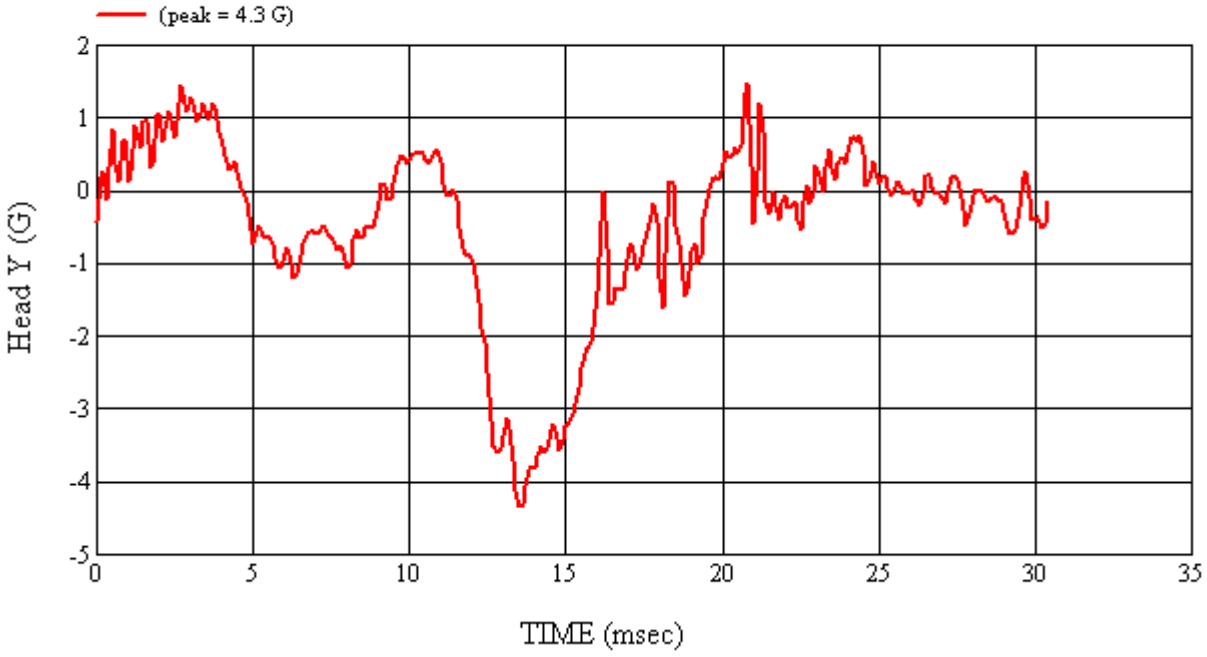
*Only necessary for NHTSA (Government) Compliance testing.

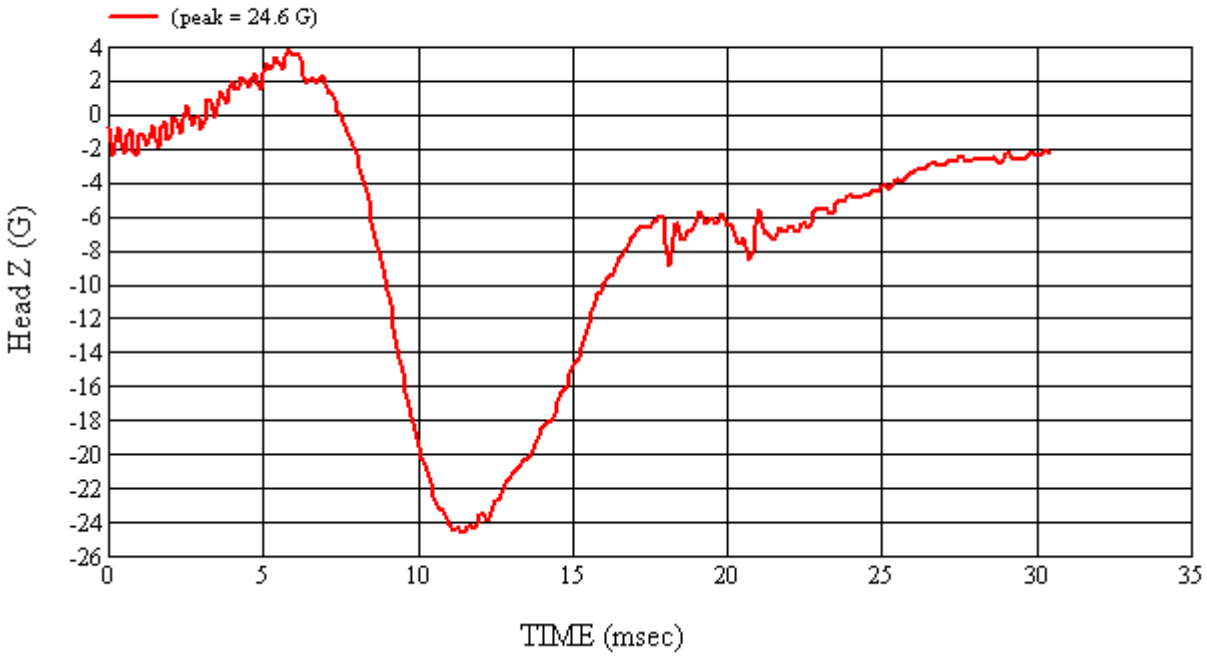
MGA Test #: FM9143 Target Location: AP1, Right Side Test Date: 5/28/2009

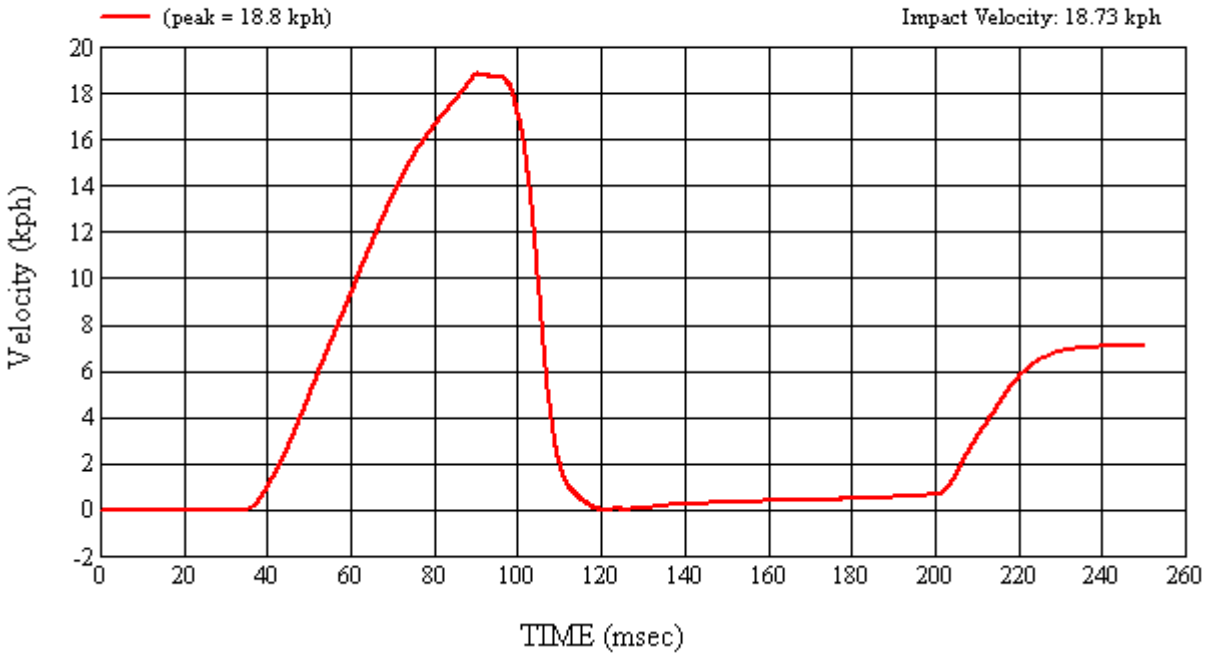


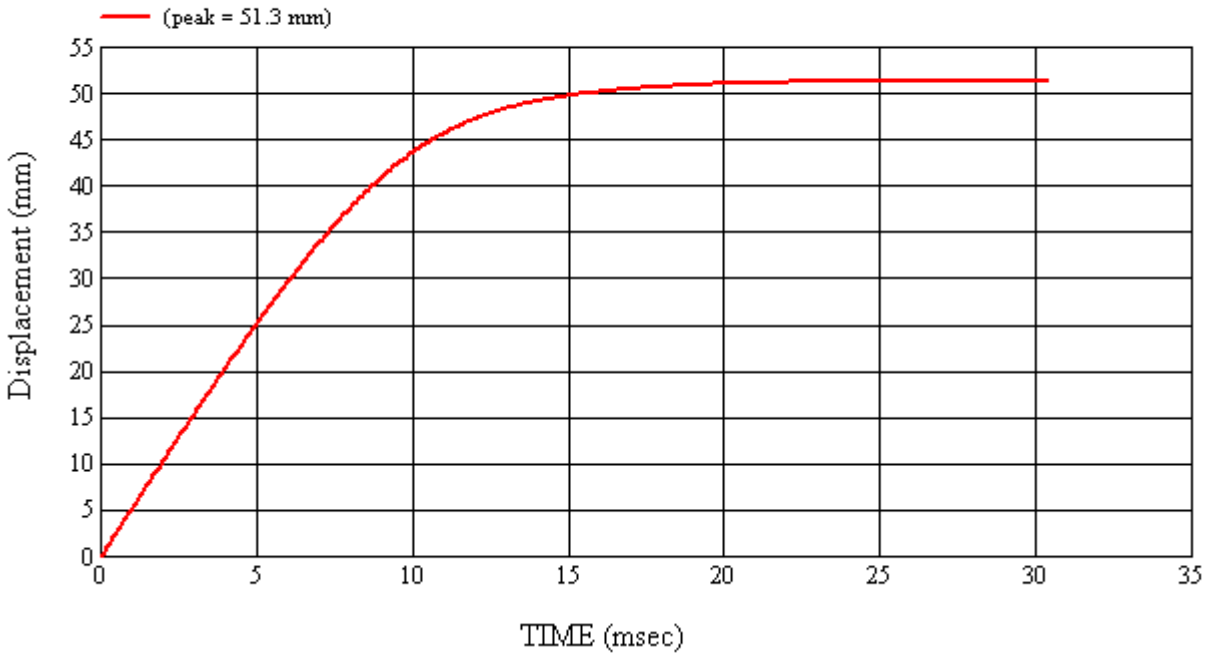



(peak = 63.3 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
0
5
10
15
20
25
30
35
TIME (msec)


(peak = 4.3 G)
Head Y (G)
2
1
0
-1
-2
-3
-4
-5
0
5
10
15
20
25
30
35
TIME (msec)

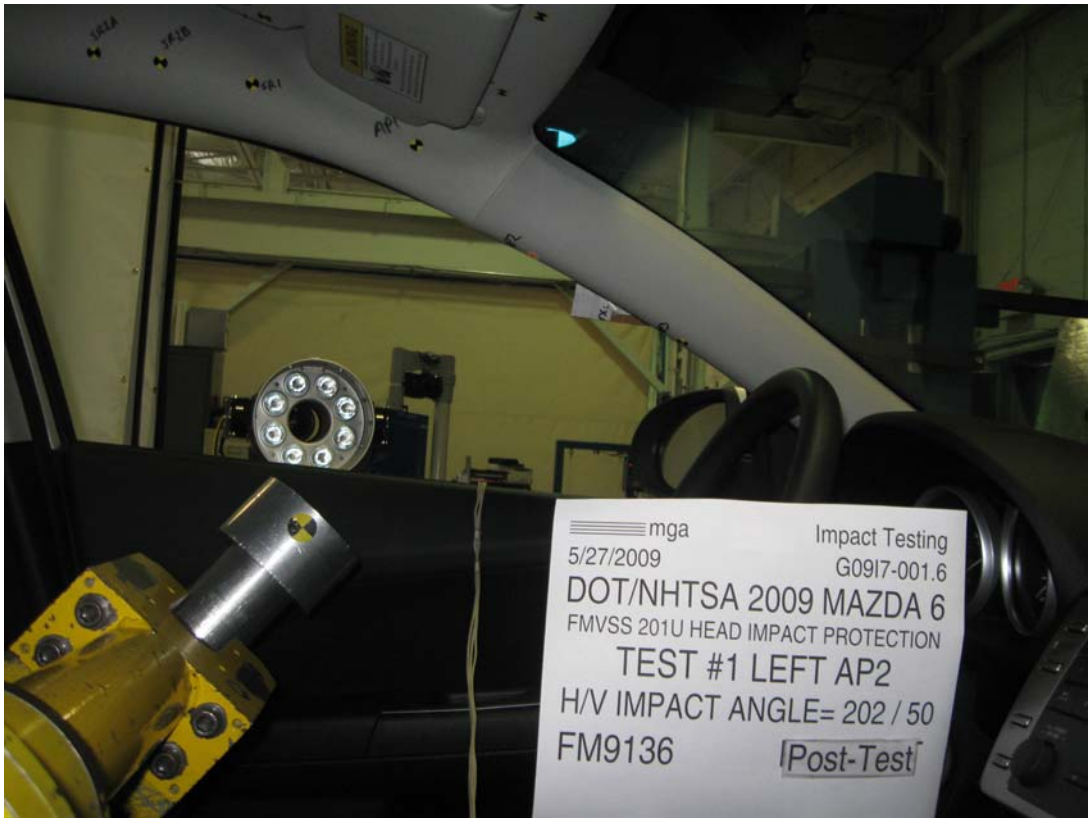

(peak = 24.6 G)
Head Z (G)
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
0
5
10
15
20
25
30
35
TIME (msec)


(peak = 18.8 kph)
Impact Velocity: 18.73 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 51.3 mm)
Displacement (mm)
55
50
45
40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
30
35
TIME (msec)


mga
5/27/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U HEAD IMPACT PROTECTION
TEST #1 LEFT AP2
H/V IMPACT ANGLE= 202 / 50
FM9136
PRE TEST


WARNING
mga
5/27/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U HEAD IMPACT PROTECTION
TEST #1 LEFT AP2
H/V IMPACT ANGLE= 202 / 50
FM9136
PRE TEST


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U HEAD IMPACT PROTECTION
TEST #1 LEFT AP2
H/V IMPACT ANGLE= 202 / 50
FM9136
Post-Test


WARNING
mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U HEAD IMPACT PROTECTION
TEST #1 LEFT AP2
H/V IMPACT ANGLE= 202 / 50
FM9136
Post-Test


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U HEAD IMPACT PROTECTION
TEST #1 LEFT AP2
H/V IMPACT ANGLE= 202 / 50
FM9136
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#1

Target (Vehicle Side): AP2Left

Temperature:21.9C

MGA Test Reference No.:FM9136

Humidity:58.3%

Approach Horizontal Angles:202º

Time of Test:11:19:12 AM

Approach Vertical Angles:50º

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
328	214	11.5	18.8	23	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	-95.6	1.06	1.06
Y	6	J22664	94.3	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

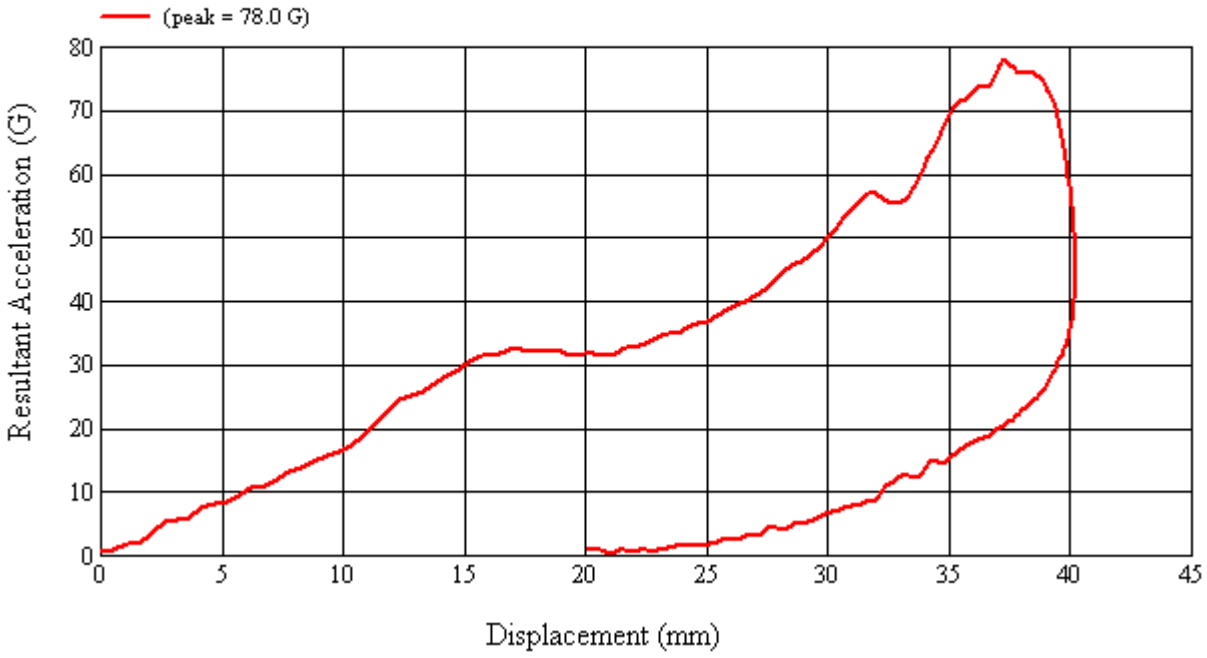
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

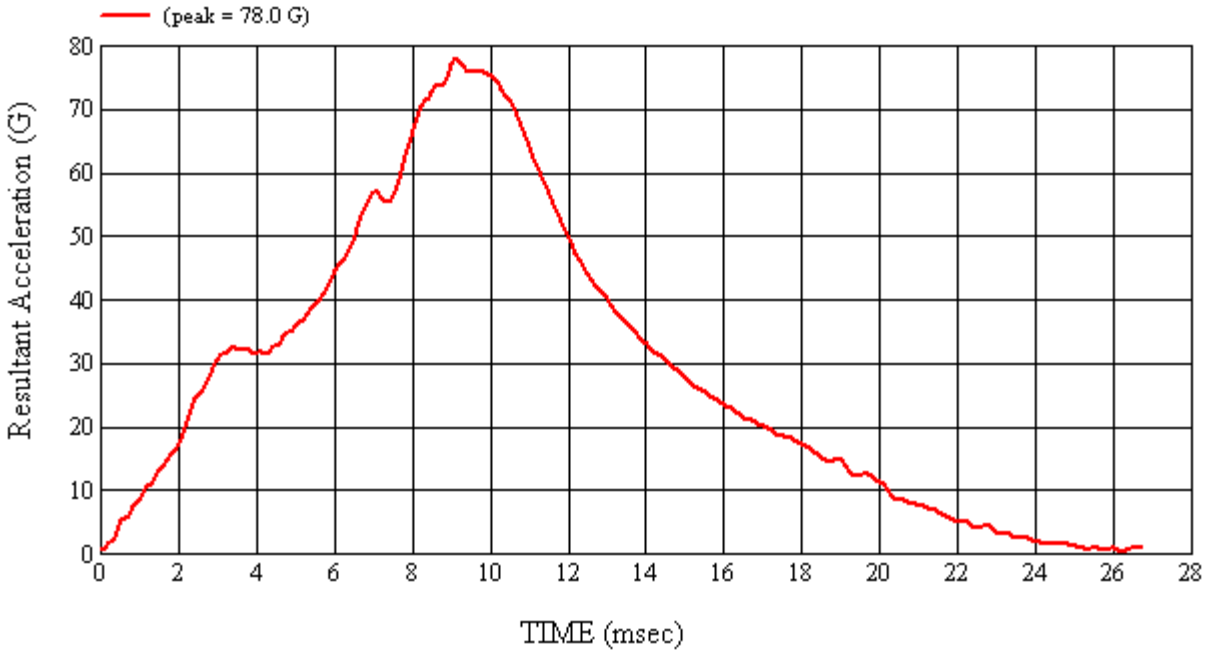
No damage observed

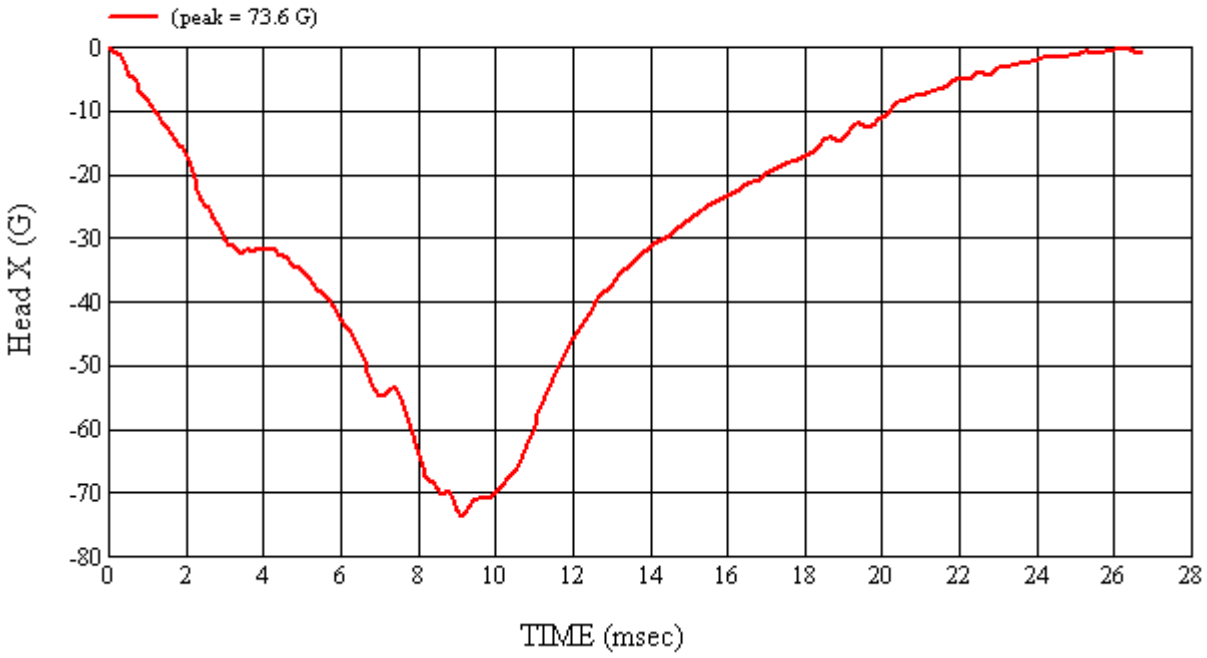
Recorded By: _____ Approved By*: _____ Date: 5/27/2009

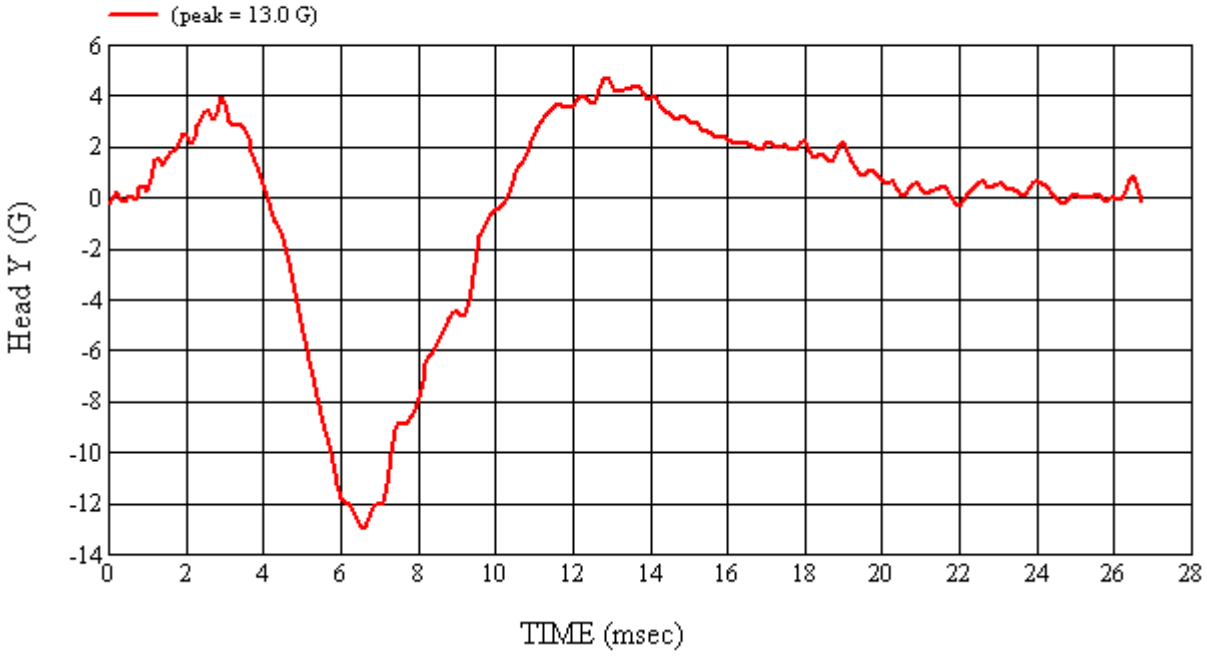
*Only necessary for NHTSA (Government) Compliance testing.

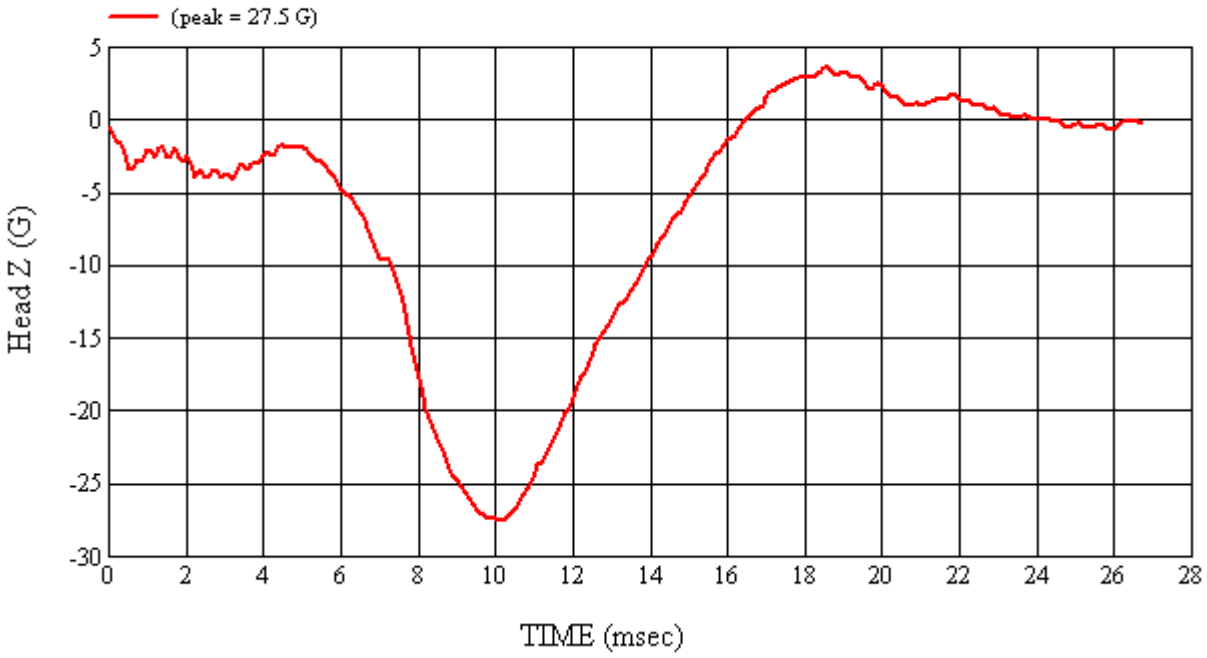
MGA Test #: FM9136 Target Location: AP2, Left Side Test Date: 5/27/2009

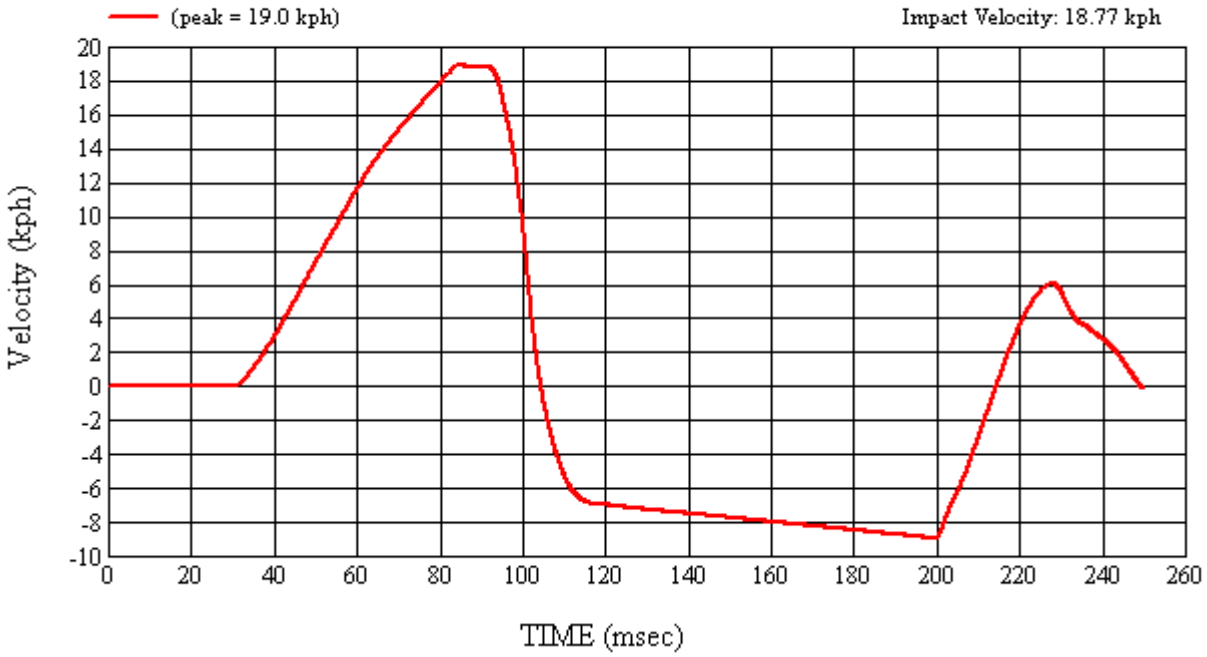


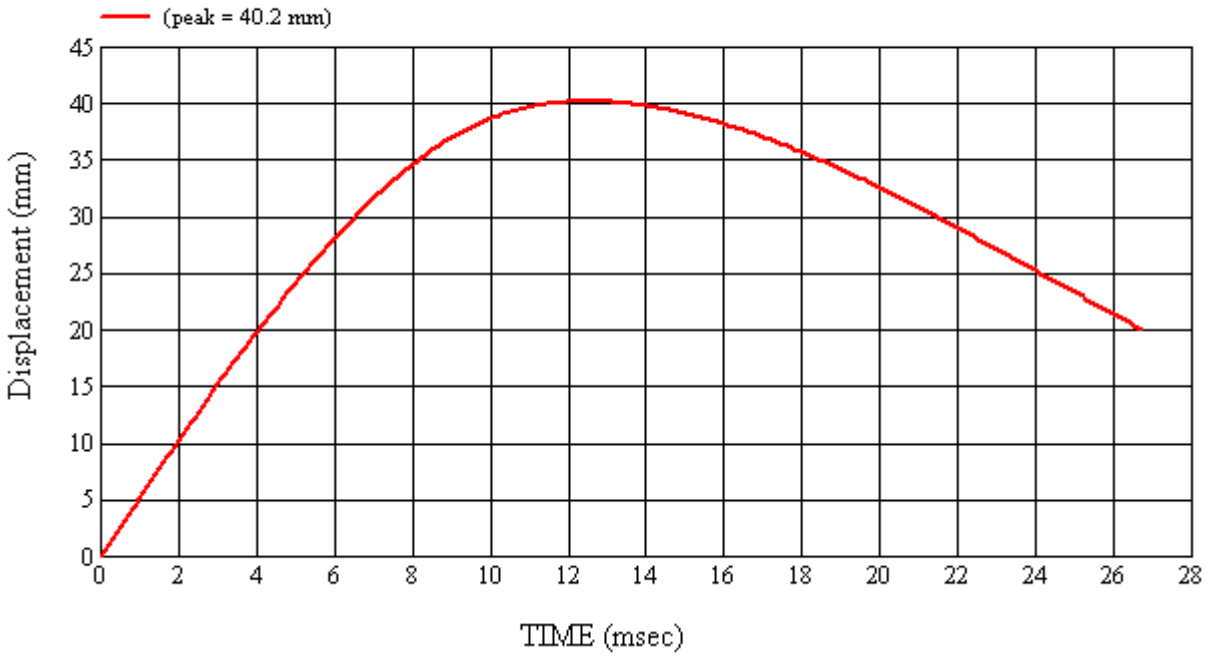


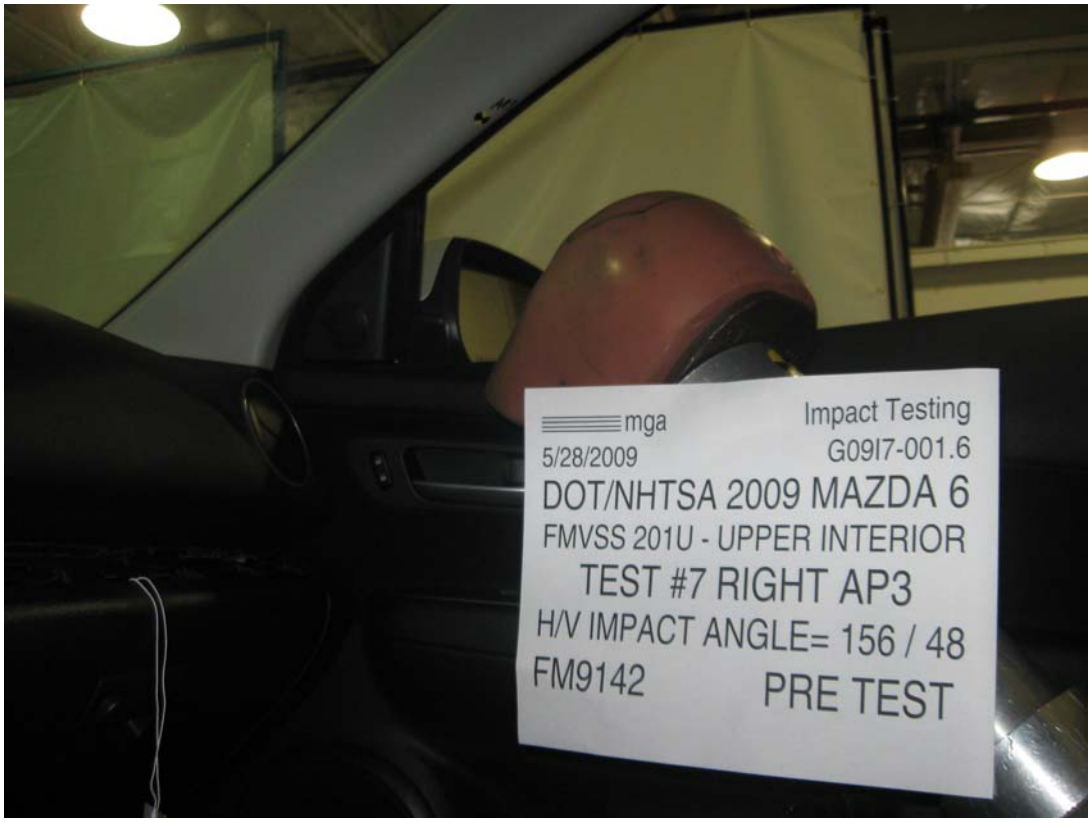

(peak = 73.6 G)
Head X (G)
0
-10
-20
-30
-40
-50
-60
-70
-80
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)

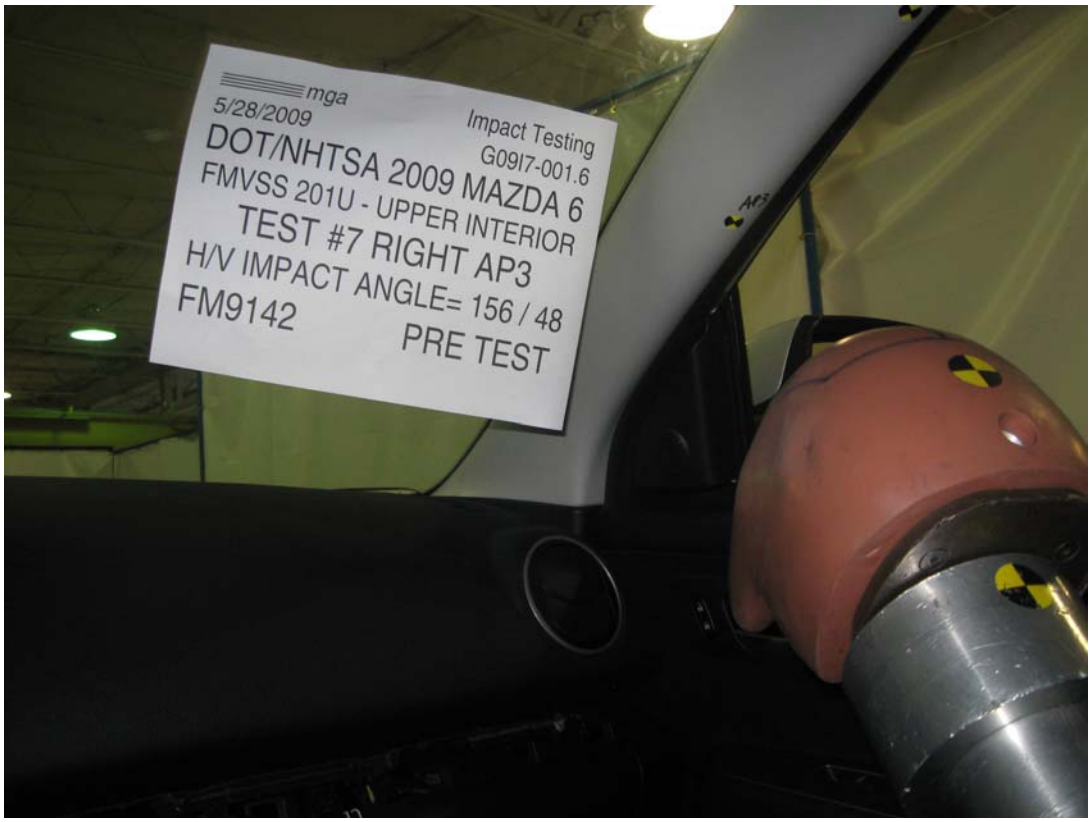

(peak = 13.0 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)

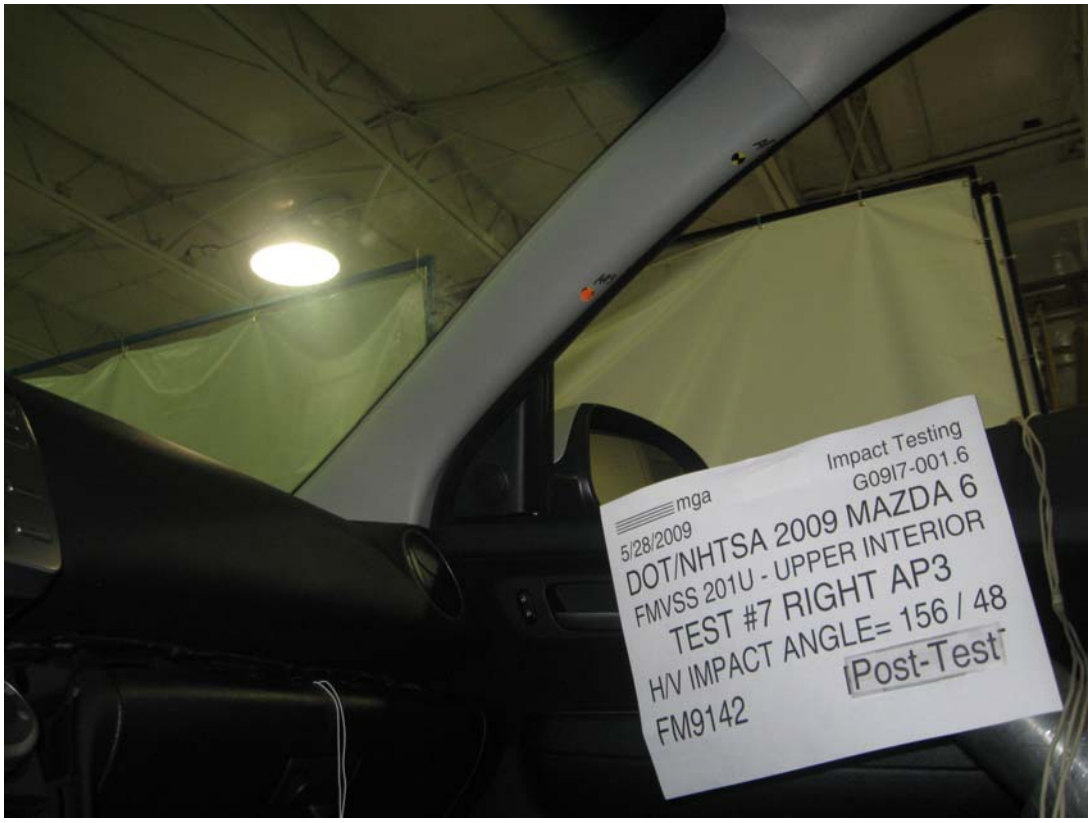

(peak = 27.5 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)


(peak = 19.0 kph)
Impact Velocity: 18.77 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 40.2 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP3
H/V IMPACT ANGLE= 156 / 48
FM9142
PRE TEST


mga
5/28/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP3
H/V IMPACT ANGLE= 156 / 48
FM9142
PRE TEST


mga
5/28/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP3
H/V IMPACT ANGLE= 156 / 48
FM9142
Post-Test


AP1
AP2
AP3
mga
5/28/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP3
H/V IMPACT ANGLE= 156 / 48
FM9142
Post-Test


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP3
H/V IMPACT ANGLE= 156 / 48
FM9142
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#7

Target (Vehicle Side): AP3Right

Temperature:21.7C

MGA Test Reference No.:FM9142

Humidity:63.2%

Approach Horizontal Angles:156º

Time of Test:9:48:13 AM

Approach Vertical Angles:48º

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
380	284	10.6	19.0	12	0

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.6	1.06	1.06
Y	6	J22664	94.3	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

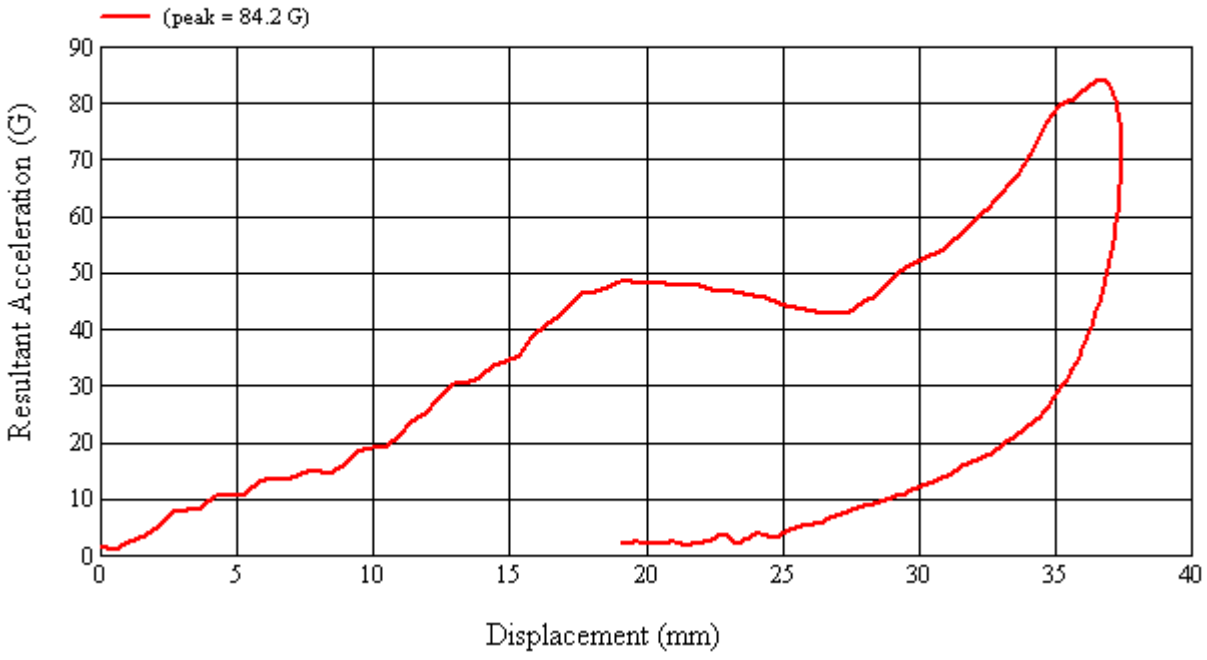
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

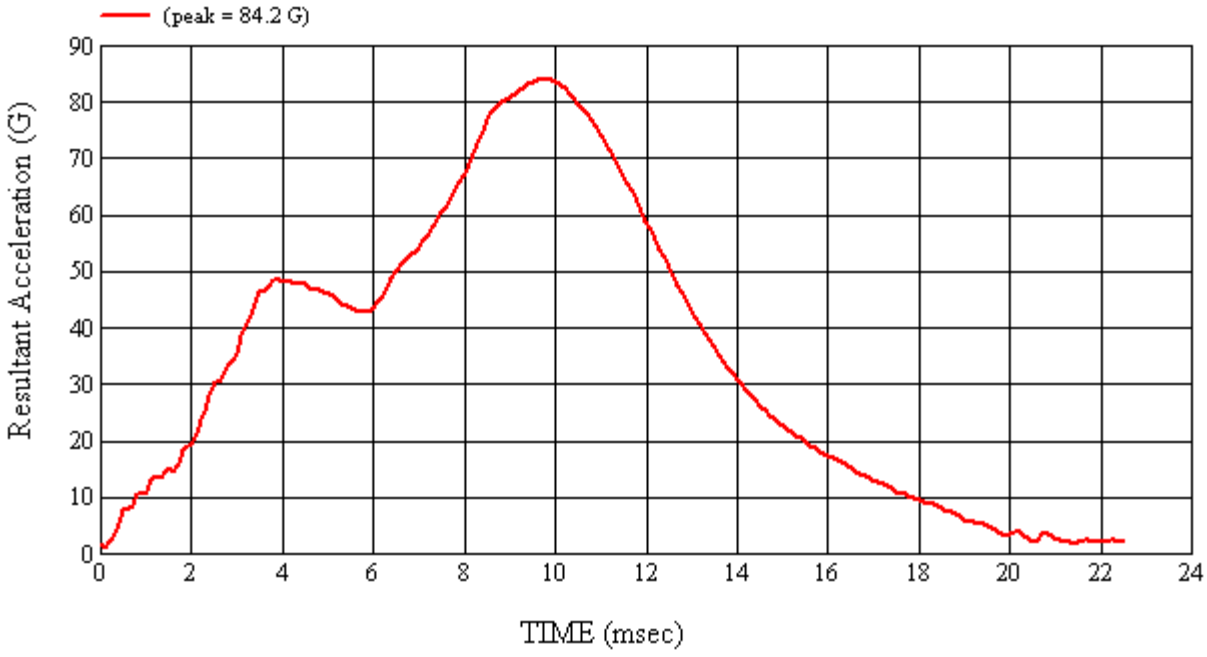
No damage observed

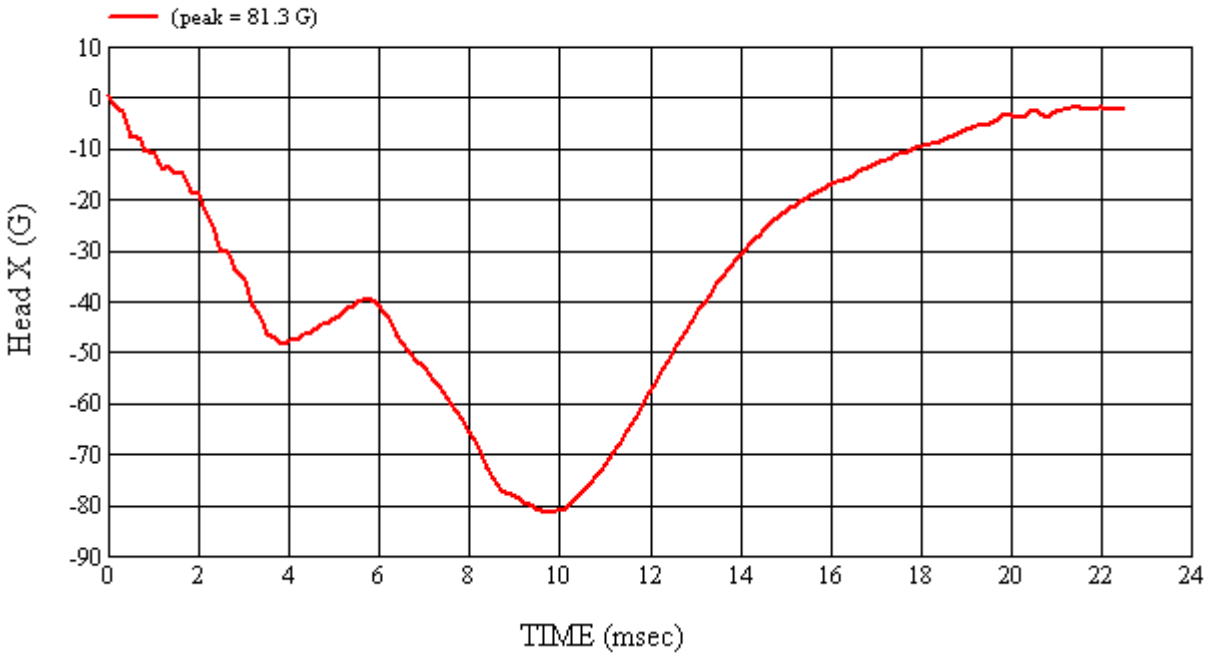
Recorded By: _____ Approved By*: _____ Date: 5/28/2009

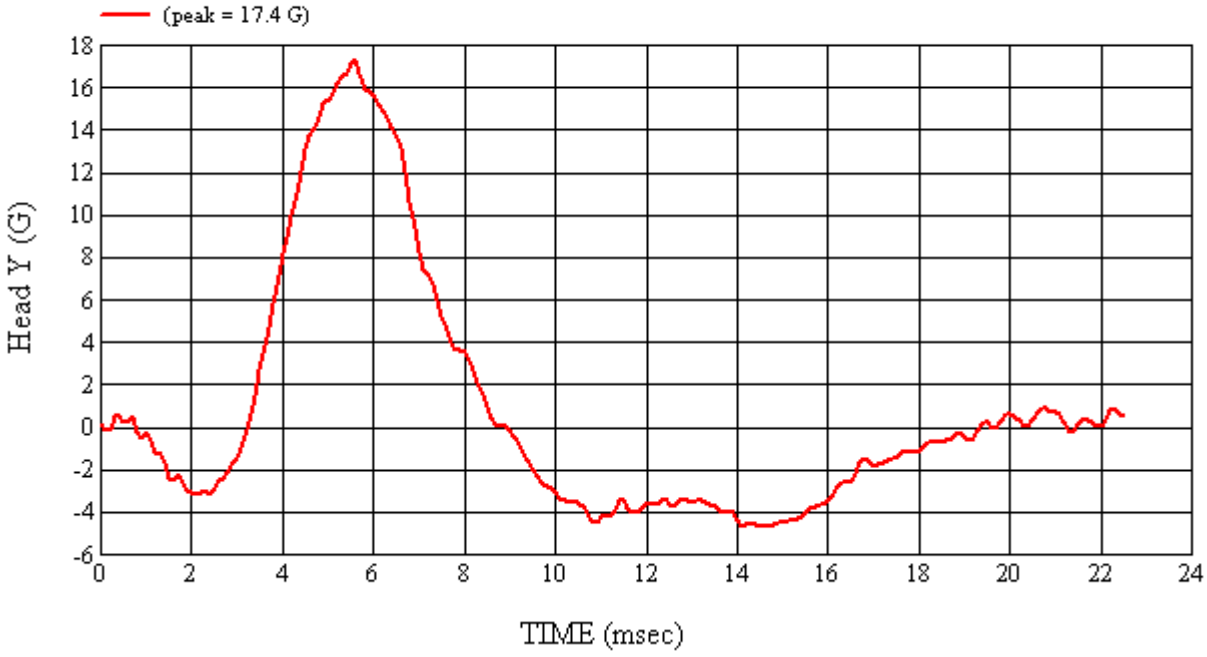
*Only necessary for NHTSA (Government) Compliance testing.

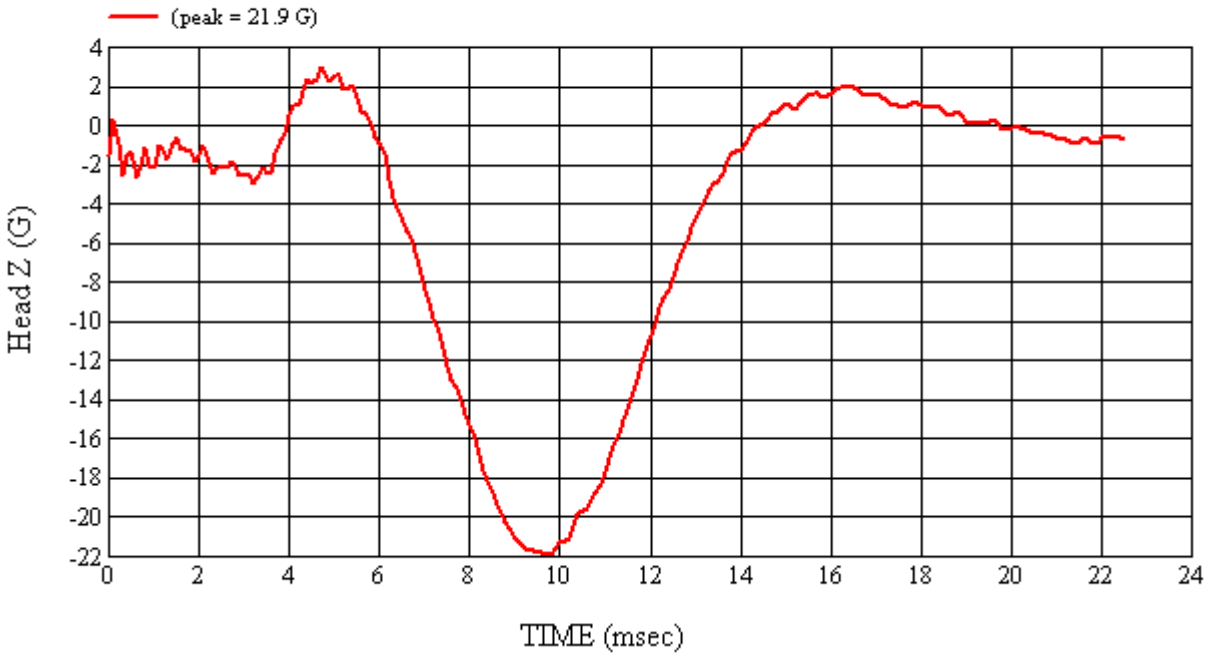
MGA Test #: FM9142 Target Location: AP3, Right Side Test Date: 5/28/2009

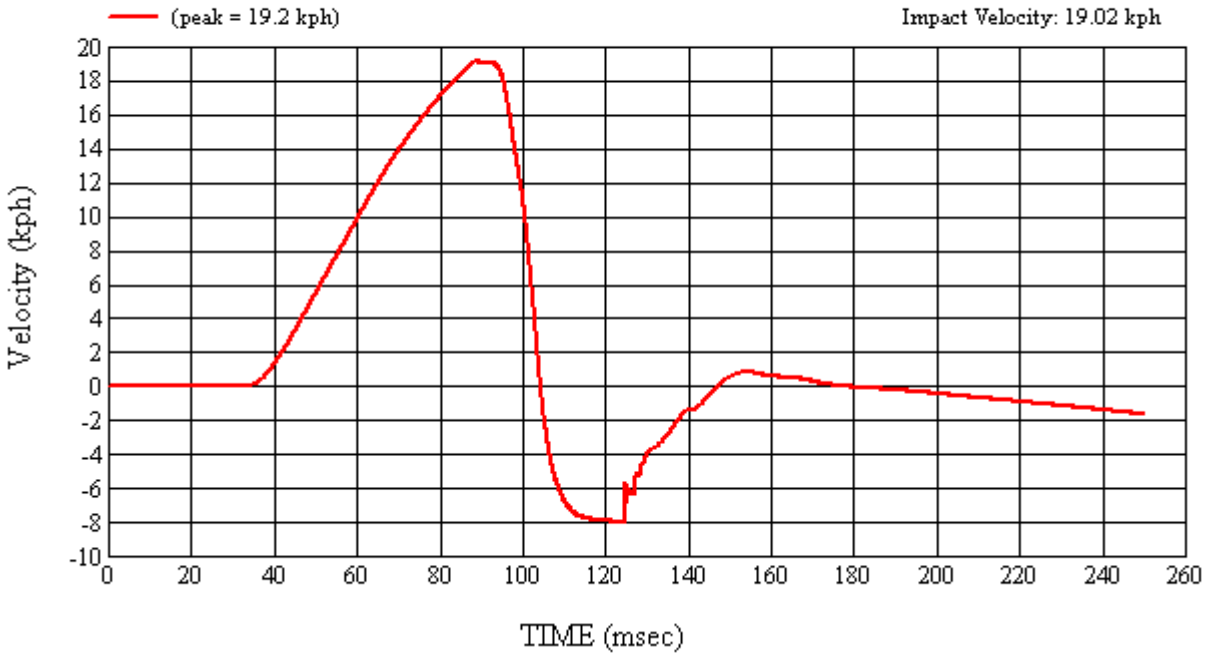


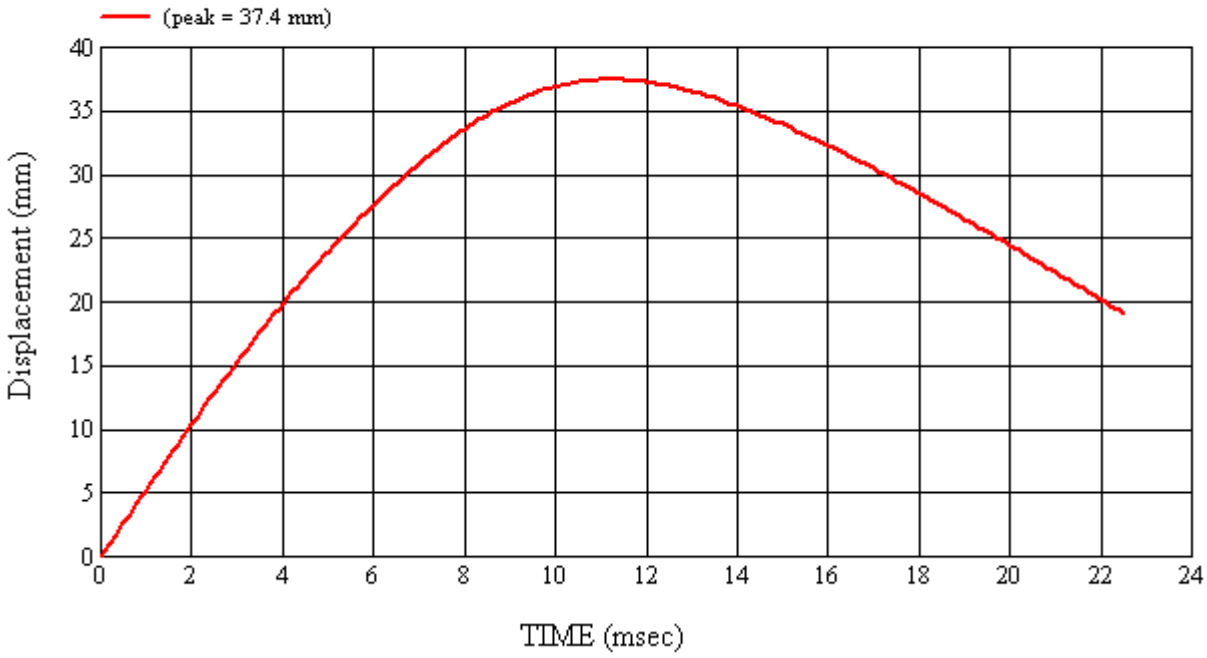



(peak = 81.3 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 17.4 G)
Head Y (G)
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 21.9 G)
Head Z (G)
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 19.2 kph)
Impact Velocity: 19.02 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 37.4 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


mga
Impact Testing
G09I7-001.6
5/27/2009
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP1
H/V IMPACT ANGLE= 270 / 24
FM9138
PRE TEST


BP1
mga
Impact Testing
G09I7-001.6
5/27/2009
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP1
H/V IMPACT ANGLE= 270 / 24
FM9138
PRE TEST


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP1
H/V IMPACT ANGLE= 270 / 24
FM9138
Post-Test


BP1
mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP1
H/V IMPACT ANGLE= 270 / 24
FM9138
Post-Test


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP1
H/V IMPACT ANGLE= 270 / 24
FM9138
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#3

Target (Vehicle Side): BP1Left

Temperature:22.0C

MGA Test Reference No.:FM9138

Humidity:59.0%

Approach Horizontal Angles:270º

Time of Test:1:21:49 PM

Approach Vertical Angles:24º

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
584	554	6.3	19.0	45	3 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-94	1.06	1.06
Y	6	J36197	106.3	0.85	0.85
Z	7	J36353	97.5	0.94	0.94

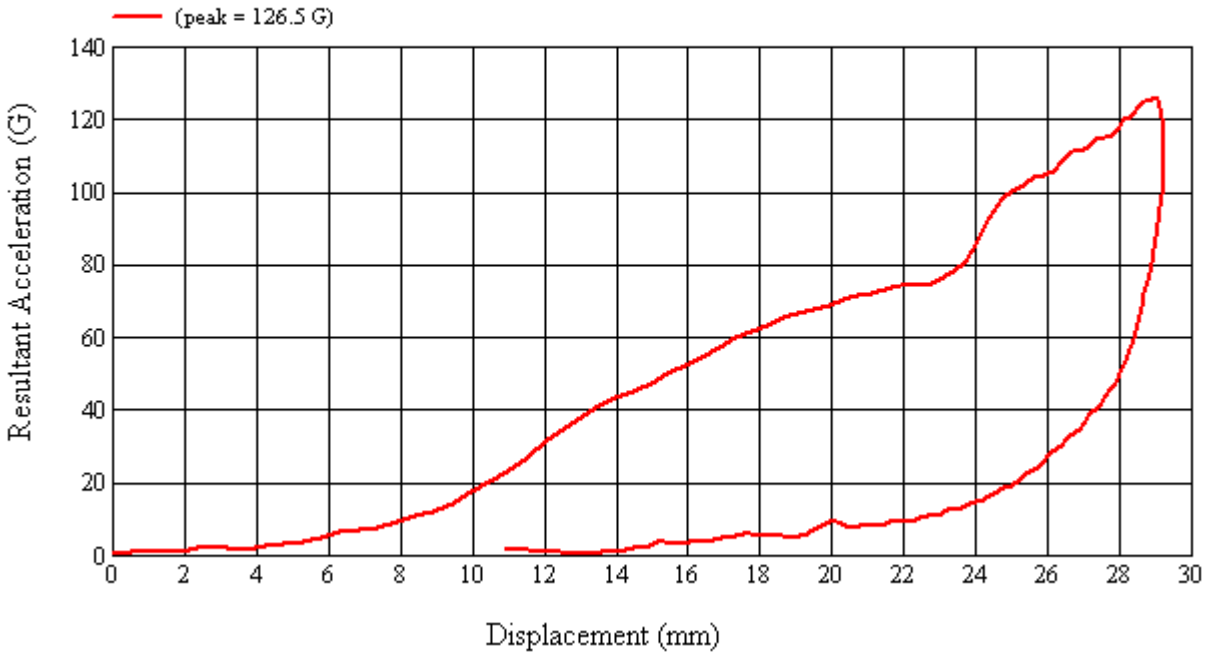
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

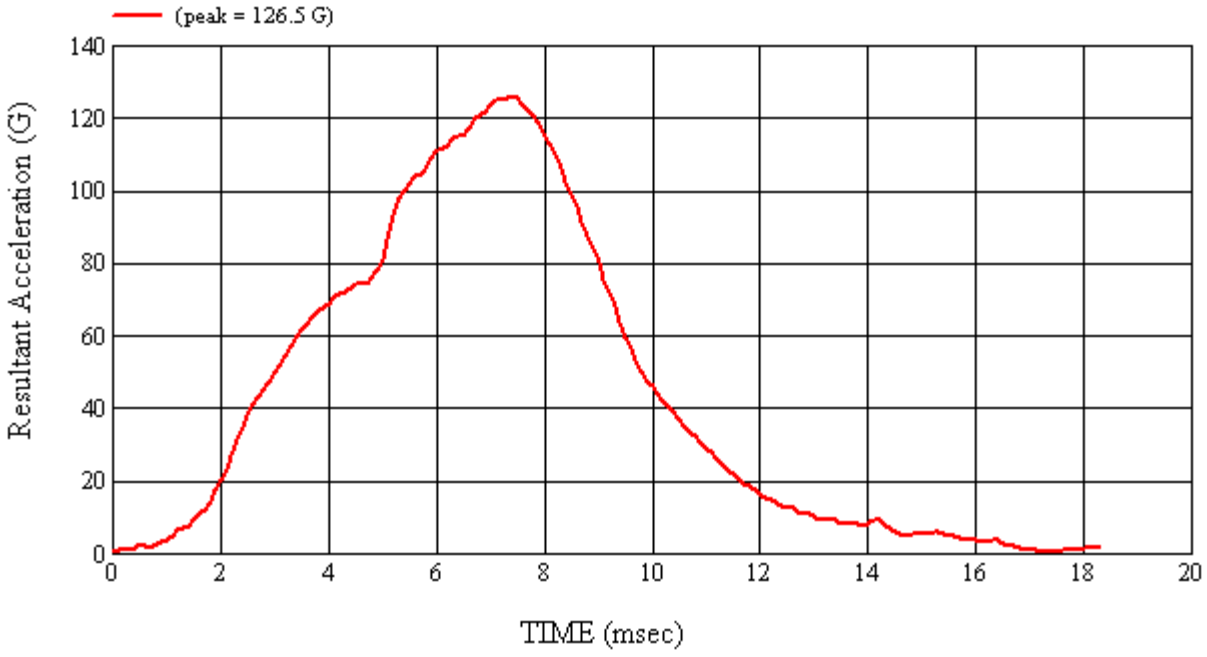
No damage observed

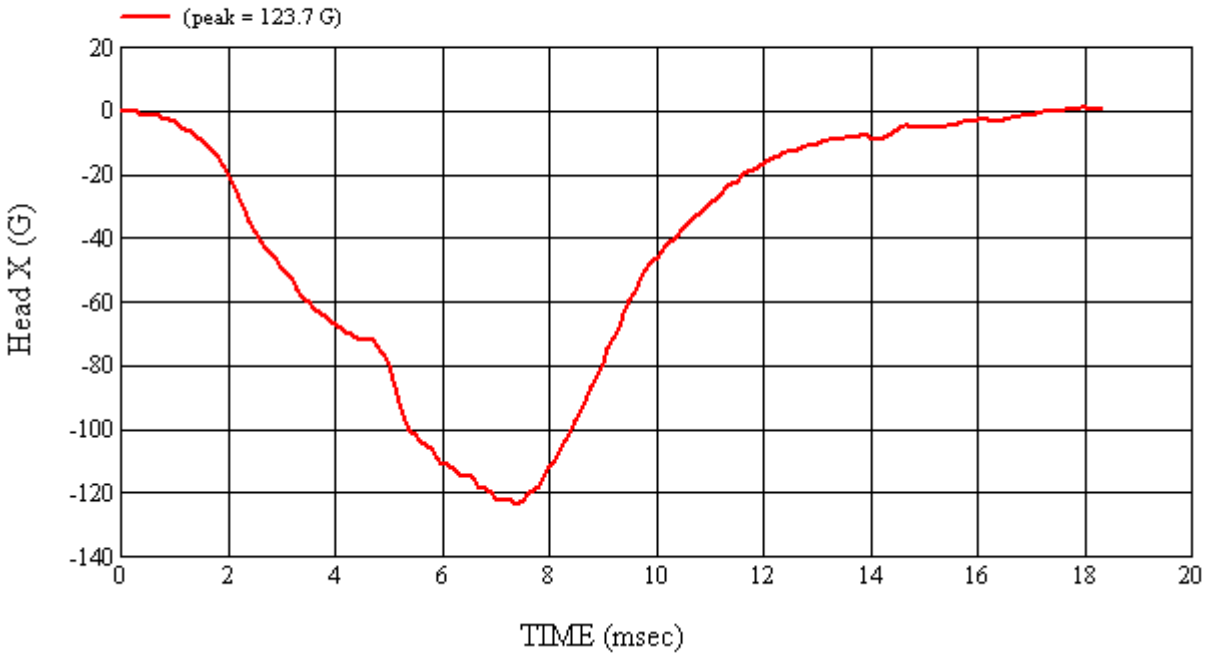
Recorded By: _____ Approved By*: _____ Date: 5/27/2009

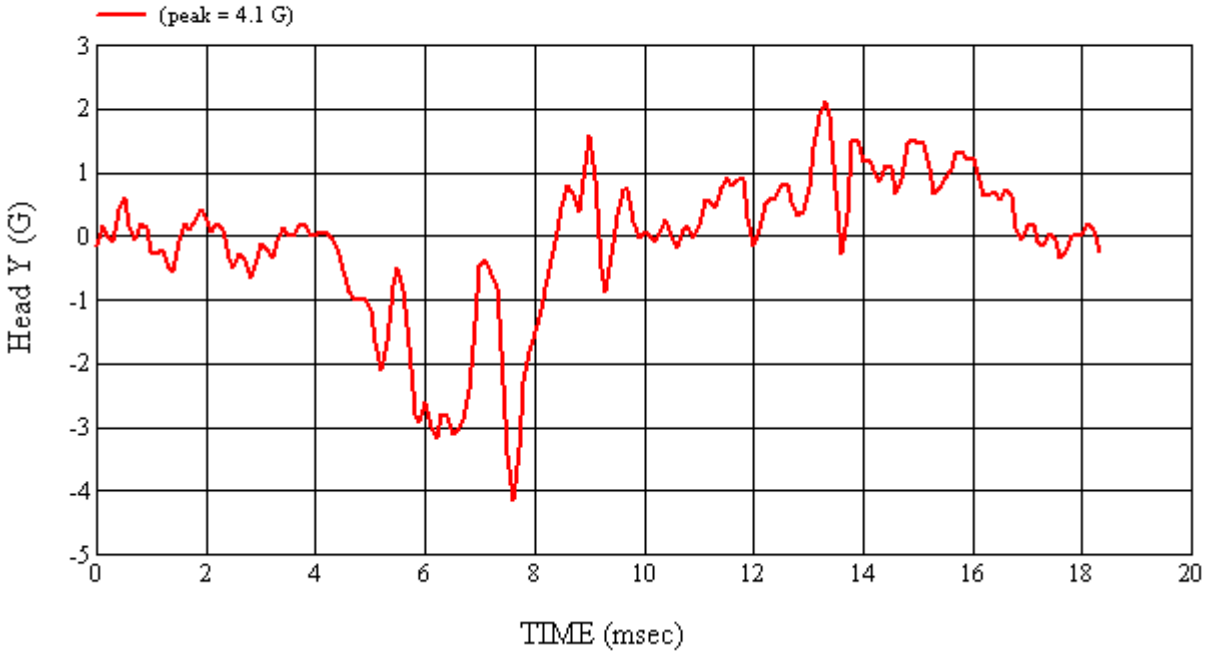
*Only necessary for NHTSA (Government) Compliance testing.

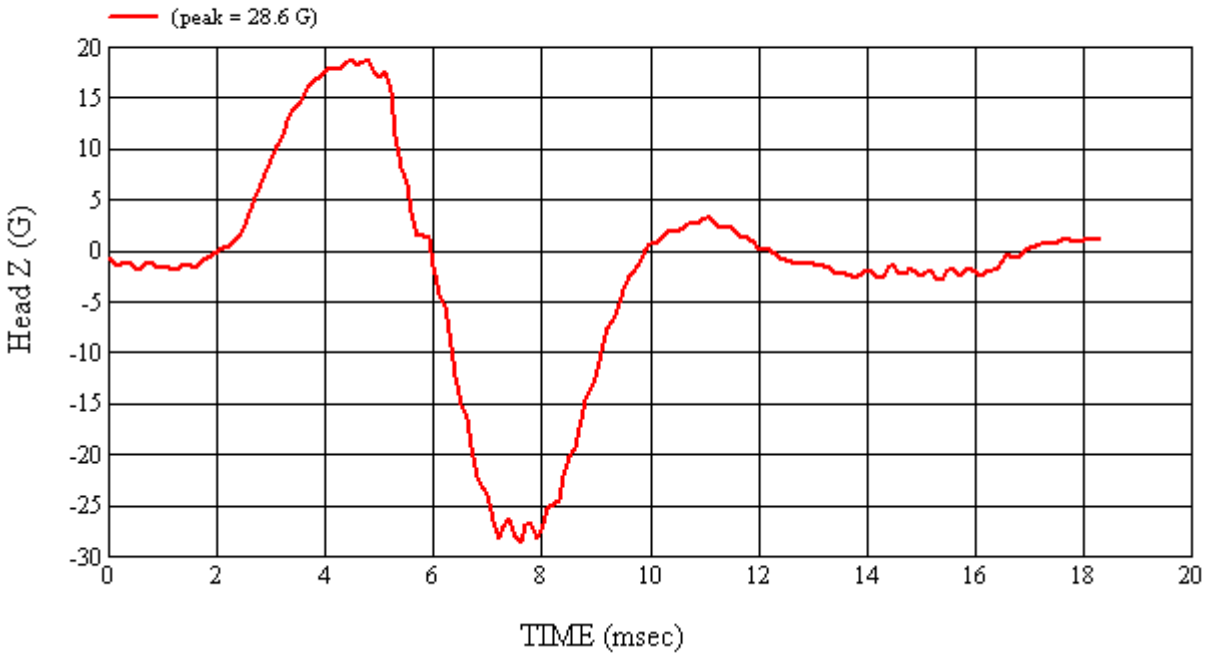
MGA Test #: FM9138 Target Location: BP1, Left Side Test Date: 5/27/2009

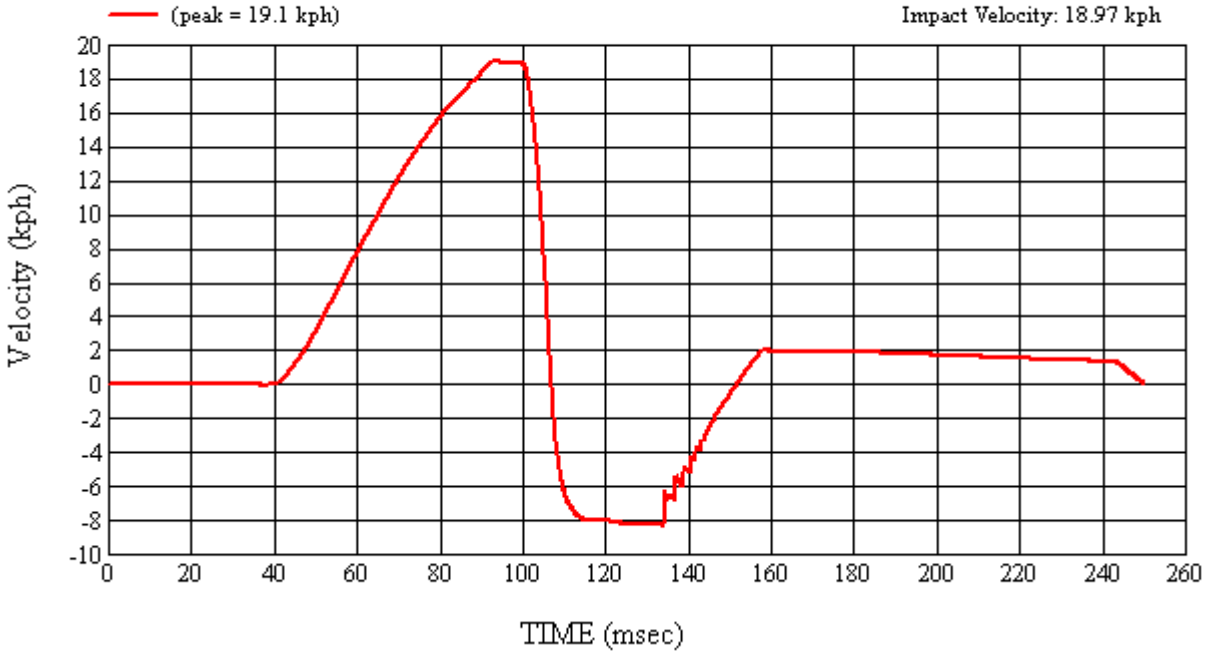


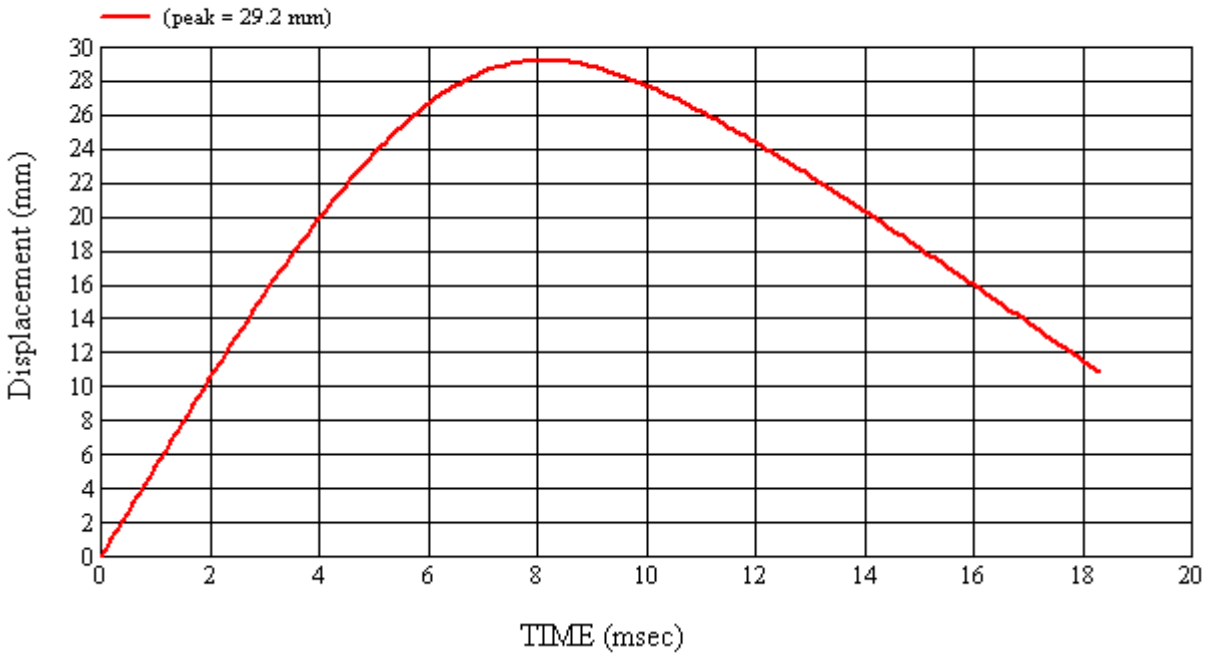



(peak = 123.7 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

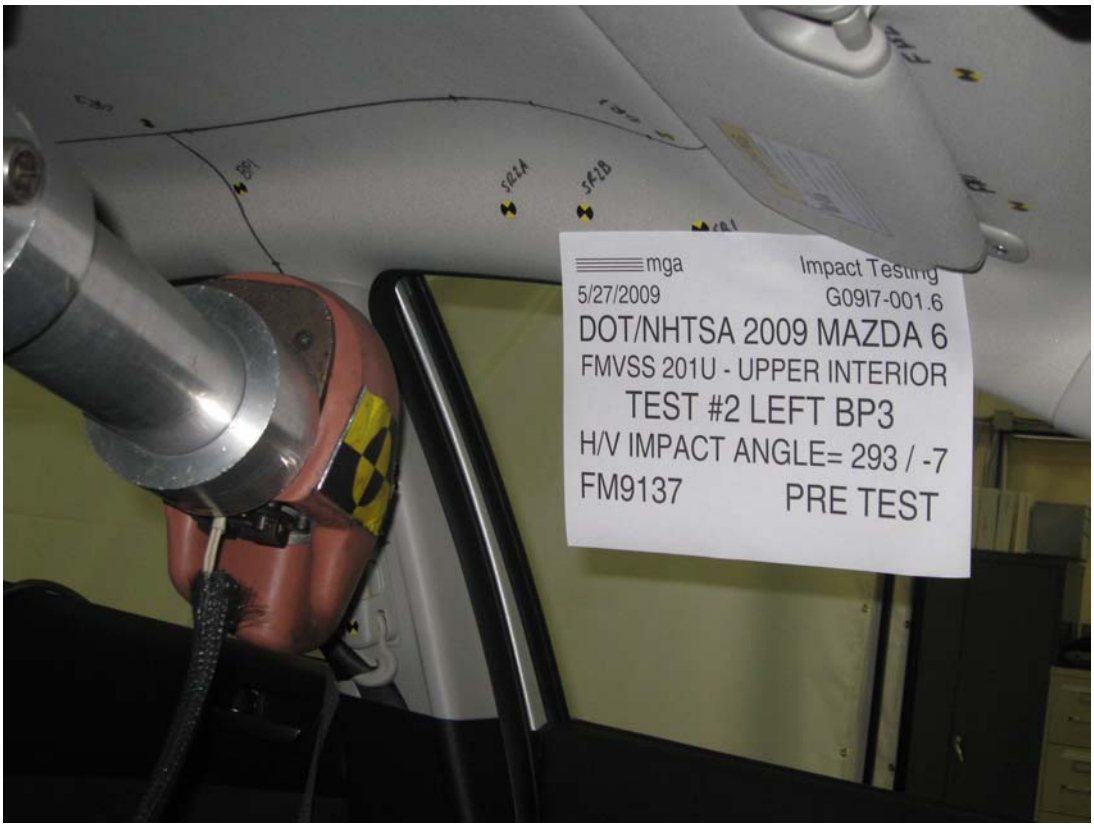

(peak = 4.1 G)
Head Y (G)
3
2
1
0
-1
-2
-3
-4
-5
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

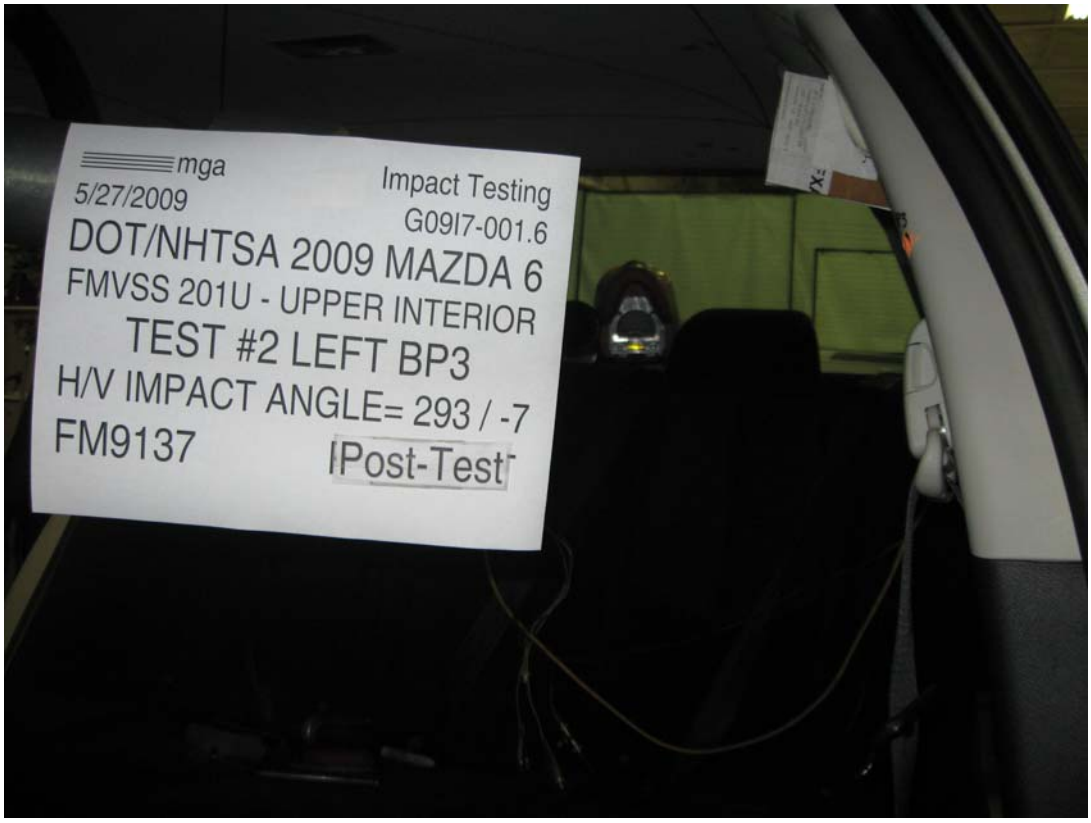

(peak = 28.6 G)
Head Z (G)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 19.1 kph)
Impact Velocity: 18.97 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 29.2 mm)
Displacement (mm)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT BP3
H/V IMPACT ANGLE= 293 / -7
FM9137
PRE TEST


mga
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT BP3
H/V IMPACT ANGLE= 293 / -7
FM9137
PRE TEST


mga
5/27/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT BP3
H/V IMPACT ANGLE= 293 / -7
FM9137
Post-Test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5/27/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT BP3
H/V IMPACT ANGLE= 293 / -7
FM9137
Post-Test


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT BP3
H/V IMPACT ANGLE= 293 / -7
FM9137
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#2

Target (Vehicle Side): BP3Left

Temperature:22.2C

MGA Test Reference No.:FM9137

Humidity:58.5%

Approach Horizontal Angles:293º

Time of Test:12:26:34 PM

Approach Vertical Angles:-7º

FMH Serial No:[037]

Additional Description: Anchorage position full down

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
794	831	7.7	23.9	22	9 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	AHTB2	-115.9	1.06	1.06
Y	6	J14103	93.7	0.85	0.85
Z	7	J35800	97.1	0.94	0.94

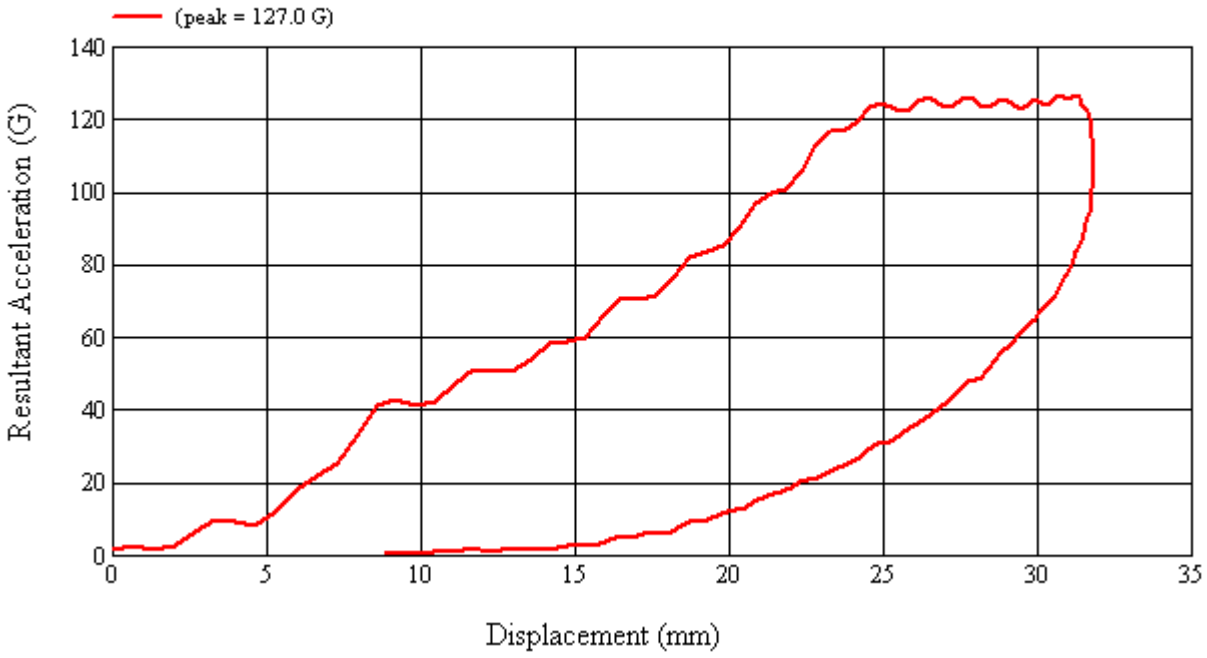
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

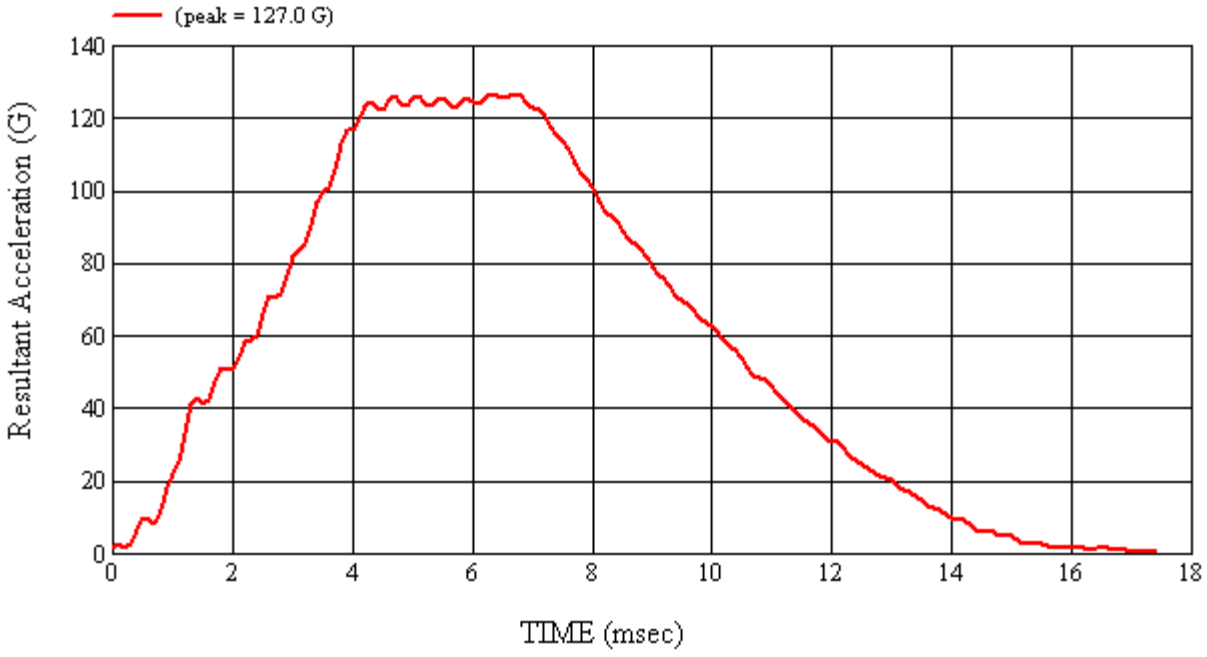
No damage observed

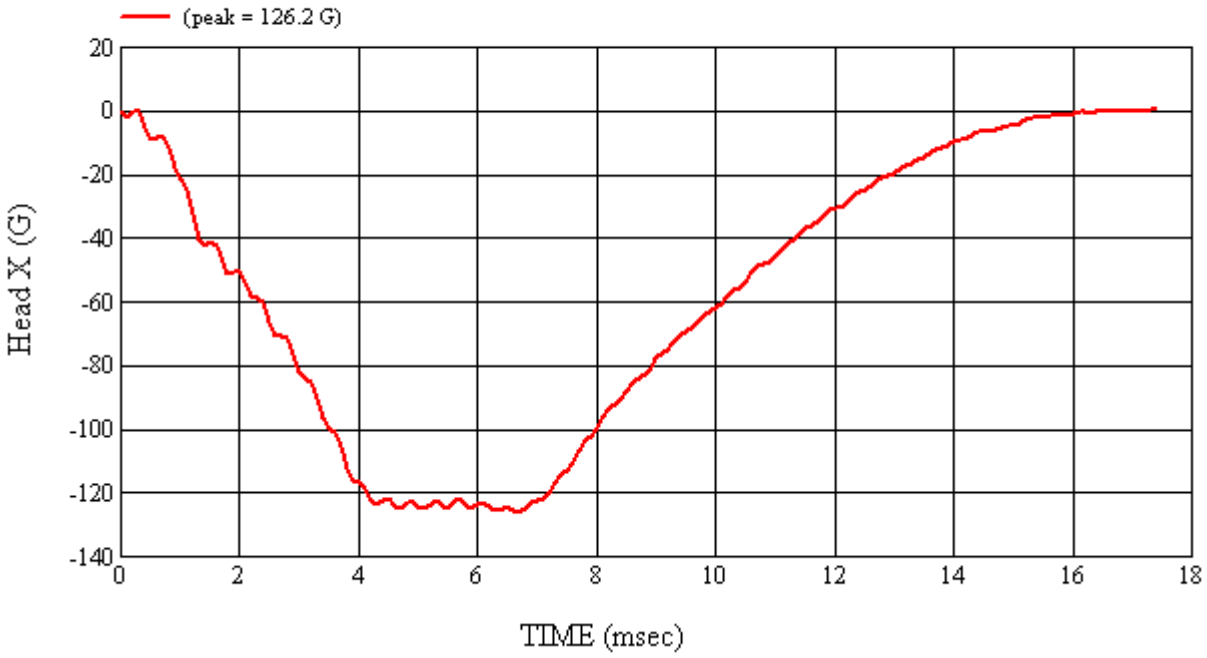
Recorded By: _____ Approved By*: _____ Date: 5/27/2009

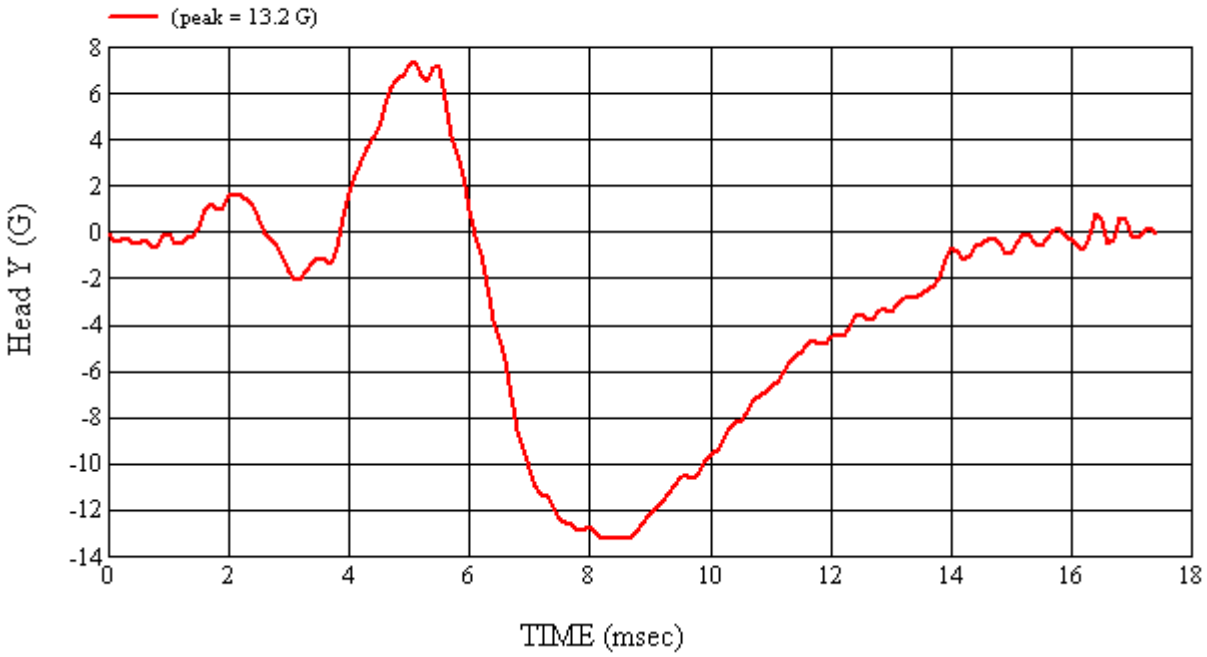
*Only necessary for NHTSA (Government) Compliance testing.

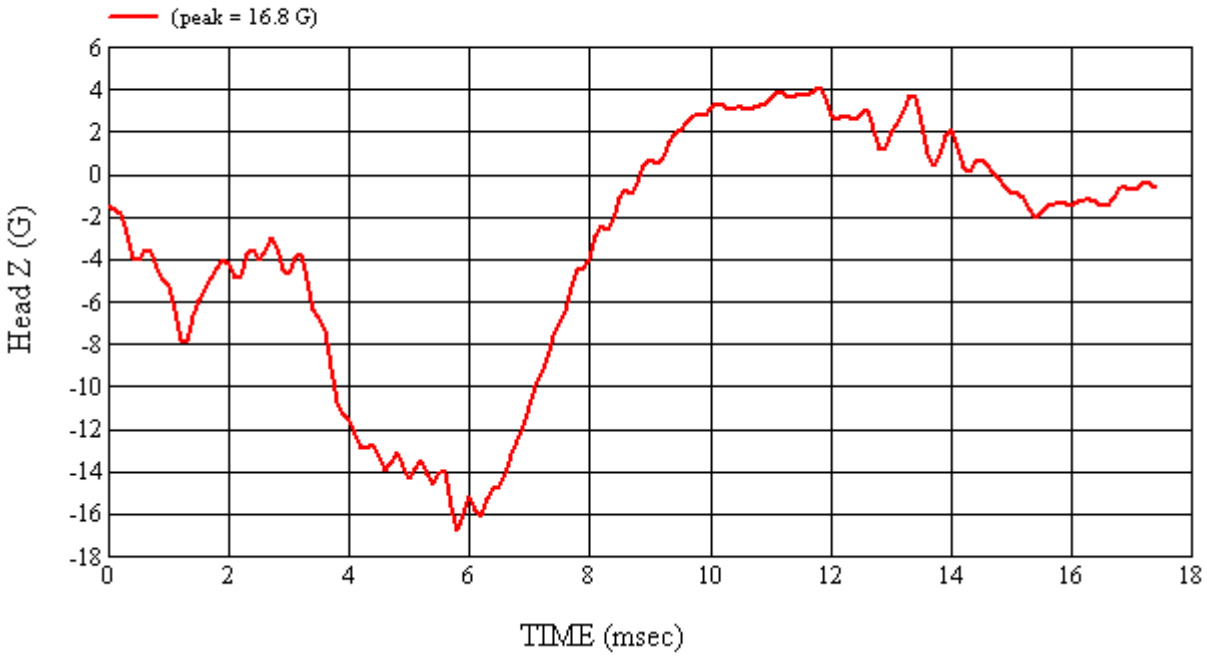
MGA Test #: FM9137 Target Location: BP3, Left Side Test Date: 5/27/2009

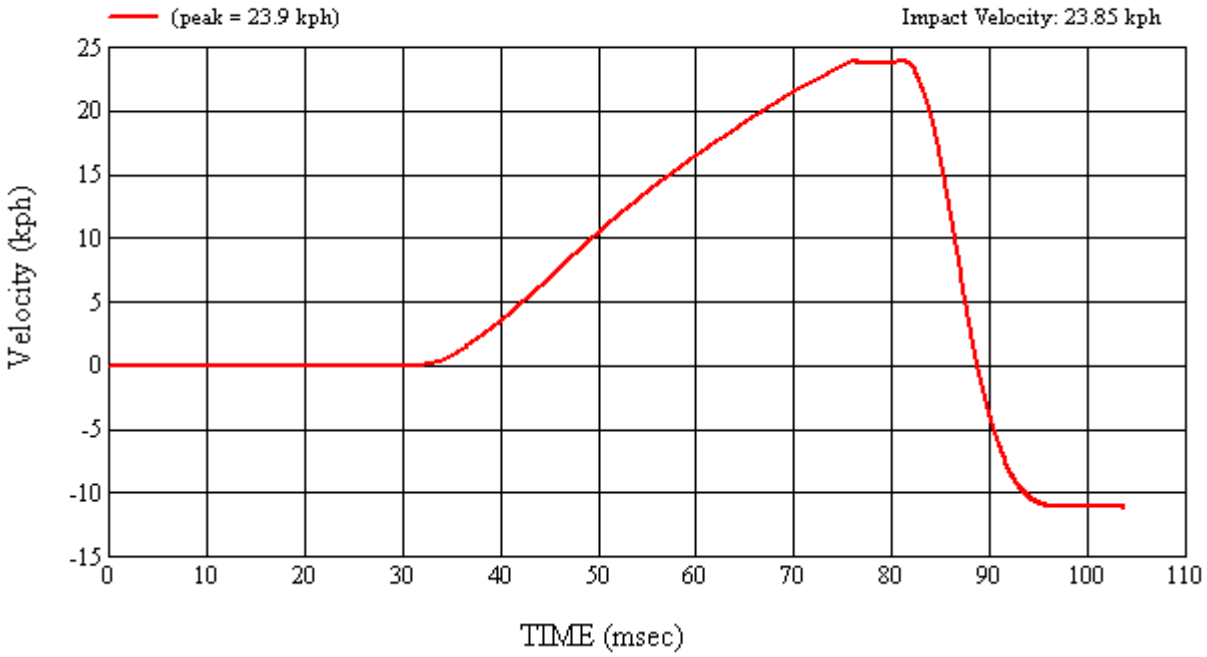


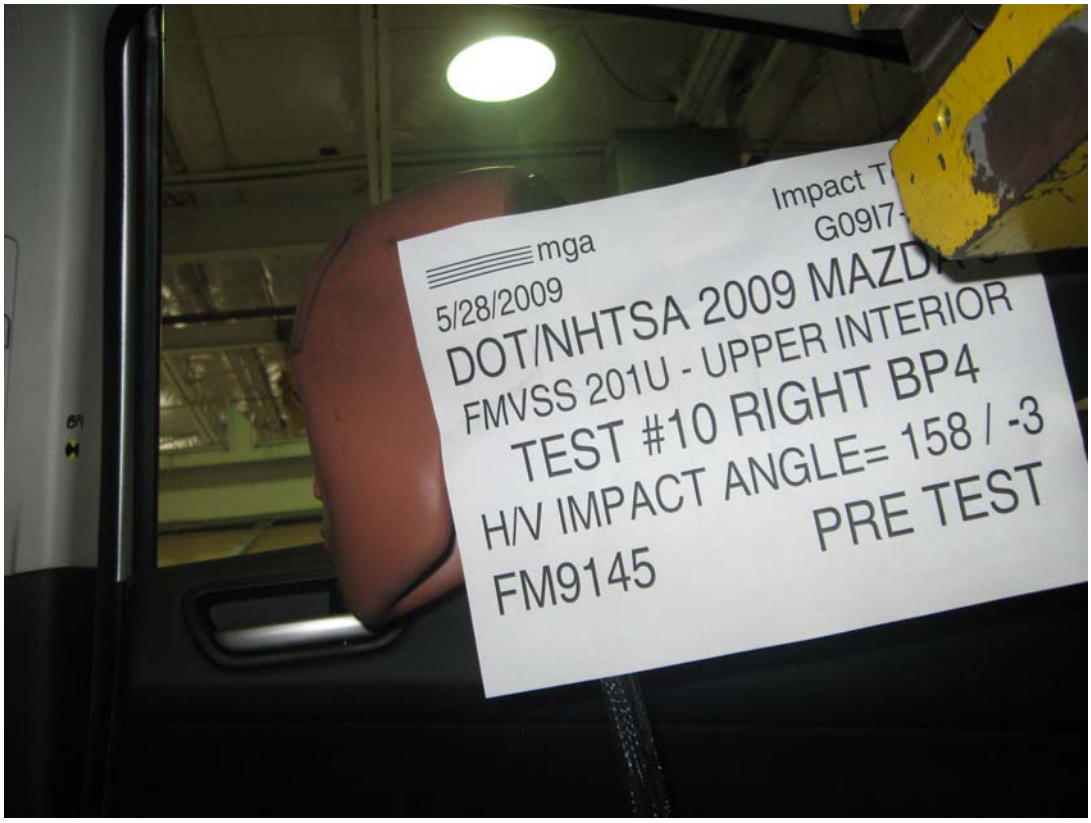



(peak = 126.2 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
16
18
TIME (msec)

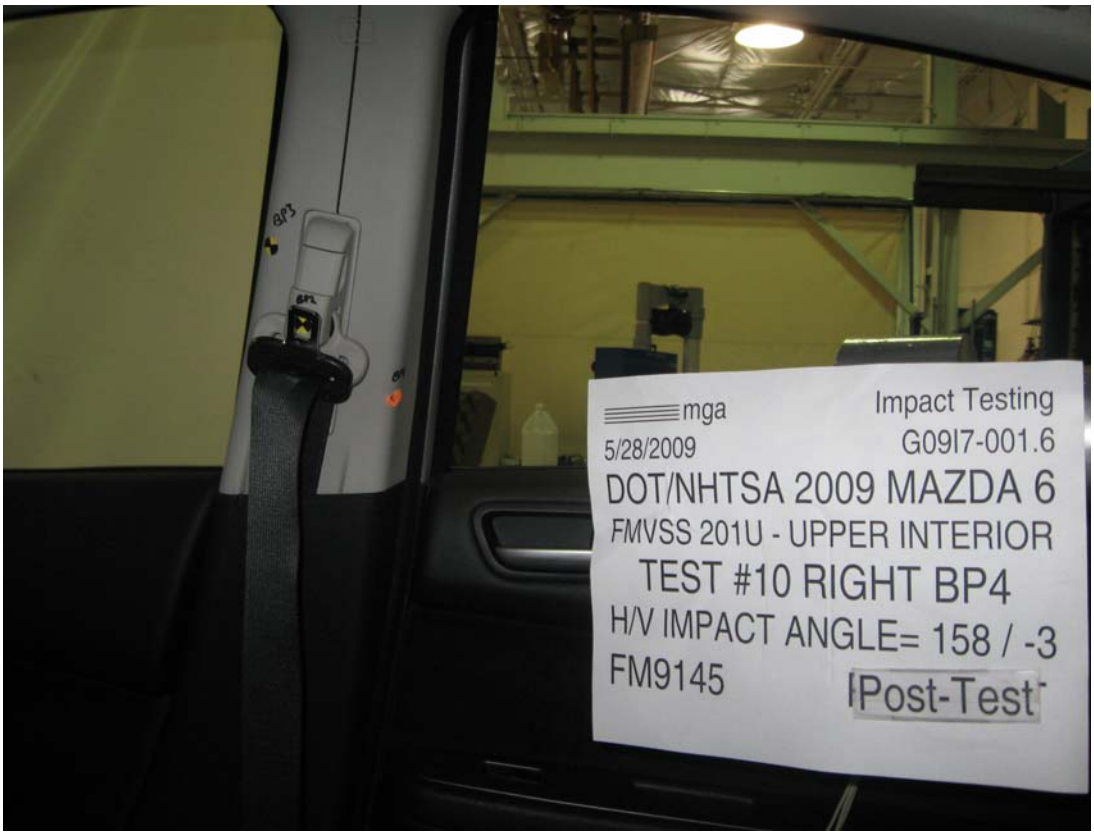

(peak = 13.2 G)
Head Y (G)
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 16.8 G)
Head Z (G)
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 23.9 kph)
Impact Velocity: 23.85 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
10
20
30
40
50
60
70
80
90
100
110
TIME (msec)


mga
5/28/2009
DOT/NHTSA 2009 MAZD
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP4
H/V IMPACT ANGLE= 158 / -3
FM9145
PRE TEST


5/28/2009
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP4
H/V IMPACT ANGLE= 158 / -3
FM9145
PRE TEST


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP4
H/V IMPACT ANGLE= 158 / -3
FM9145
Post-Test


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP4
H/V IMPACT ANGLE= 158 / -3
FM9145
Post-Test
BP4


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP4
H/V IMPACT ANGLE= 158 / -3
FM9145
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#10

Target (Vehicle Side): BP4Right

Temperature:21.6C

MGA Test Reference No.:FM9145

Humidity:55.9%

Approach Horizontal Angles:158º

Time of Test:2:20:24 PM

Approach Vertical Angles:-3º

FMH Serial No:[035]

Additional Description:anchorage full down

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
793	830	5.7	23.8	12	3 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.6	1.06	1.06
Y	6	J22664	94.3	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

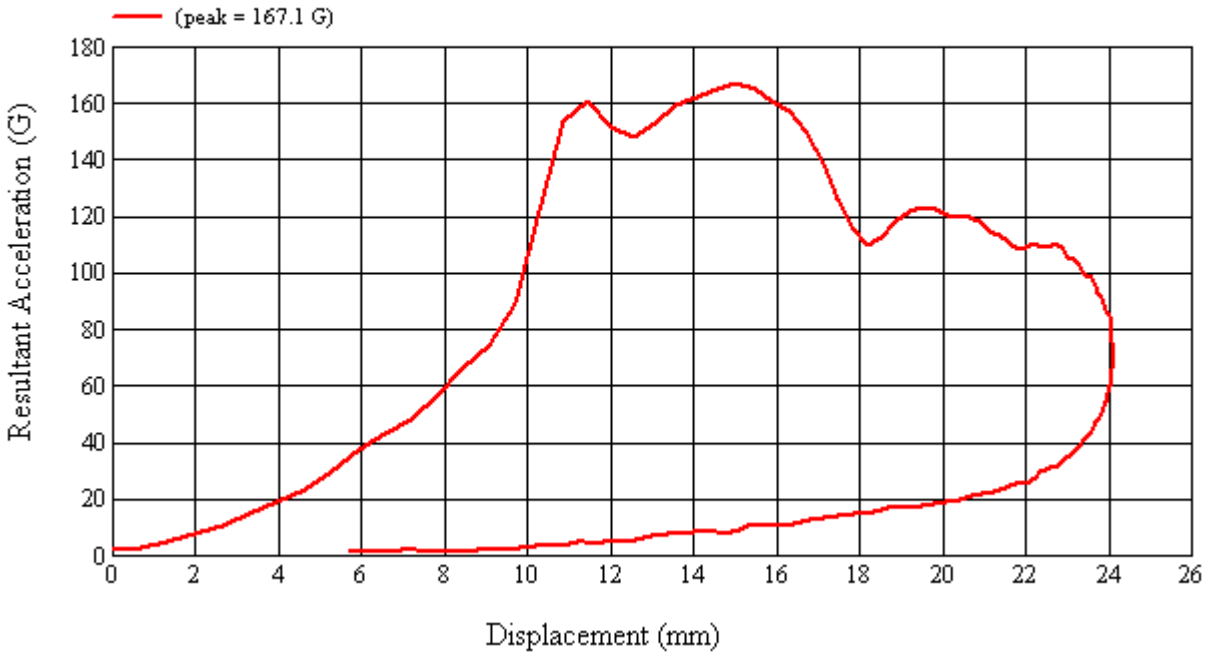
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

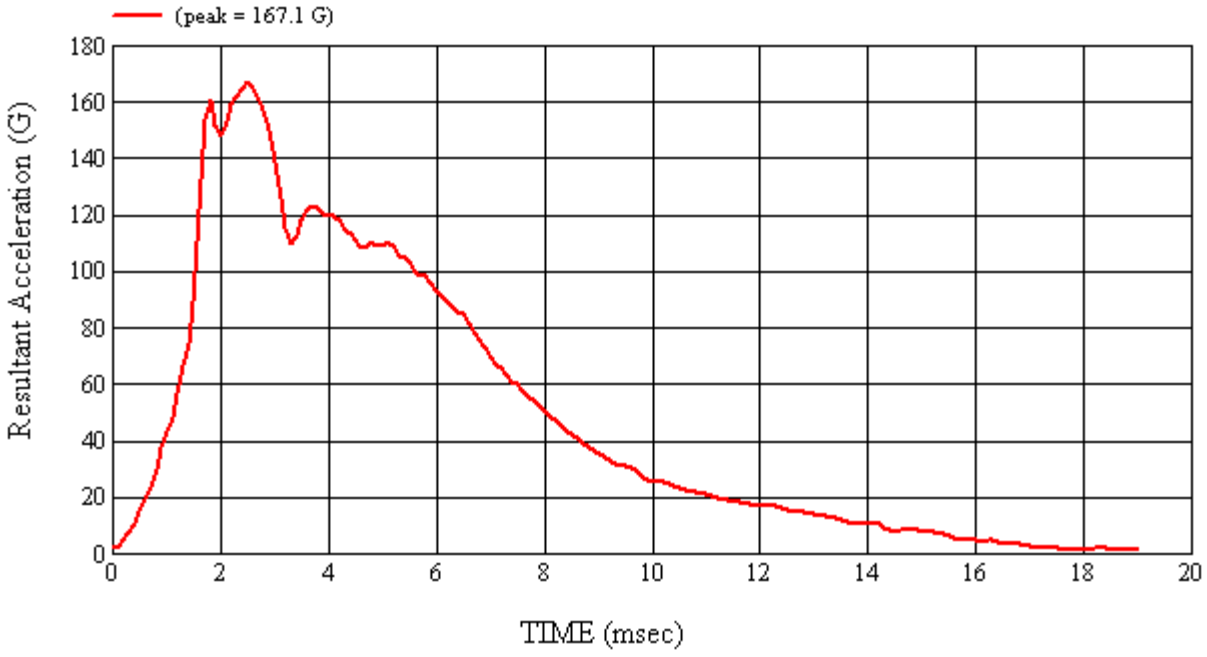
No damage observed

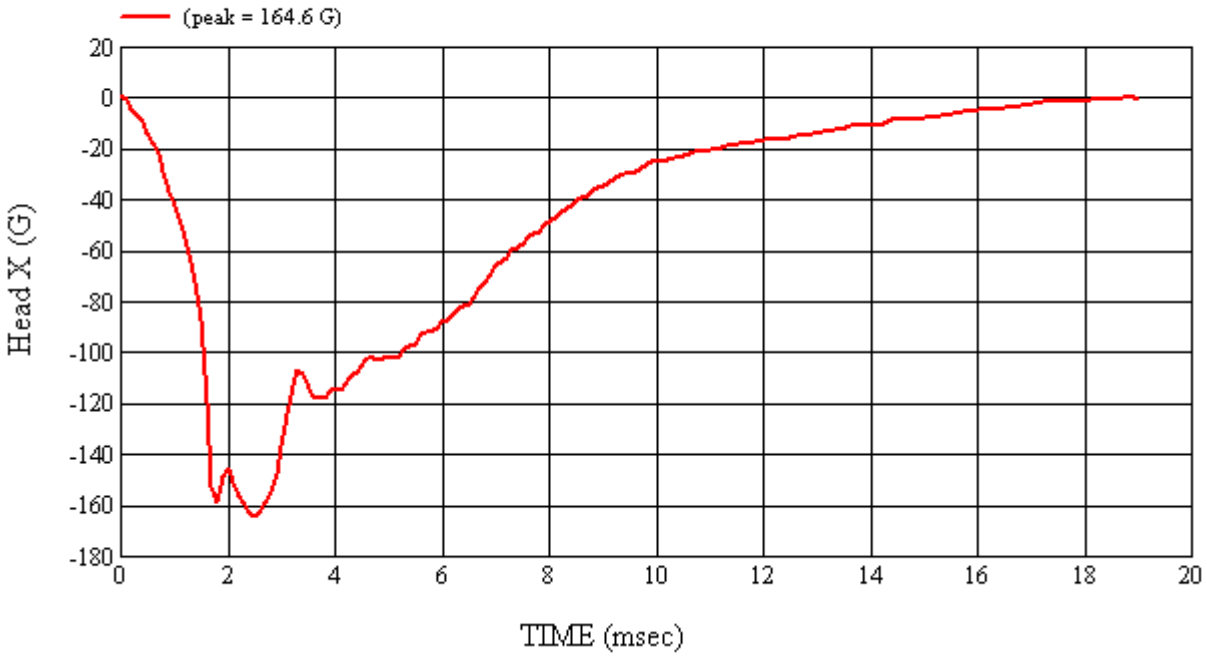
Recorded By: Andrew Gould Approved By*: Helen A. Kaleto Date: 5/28/2009

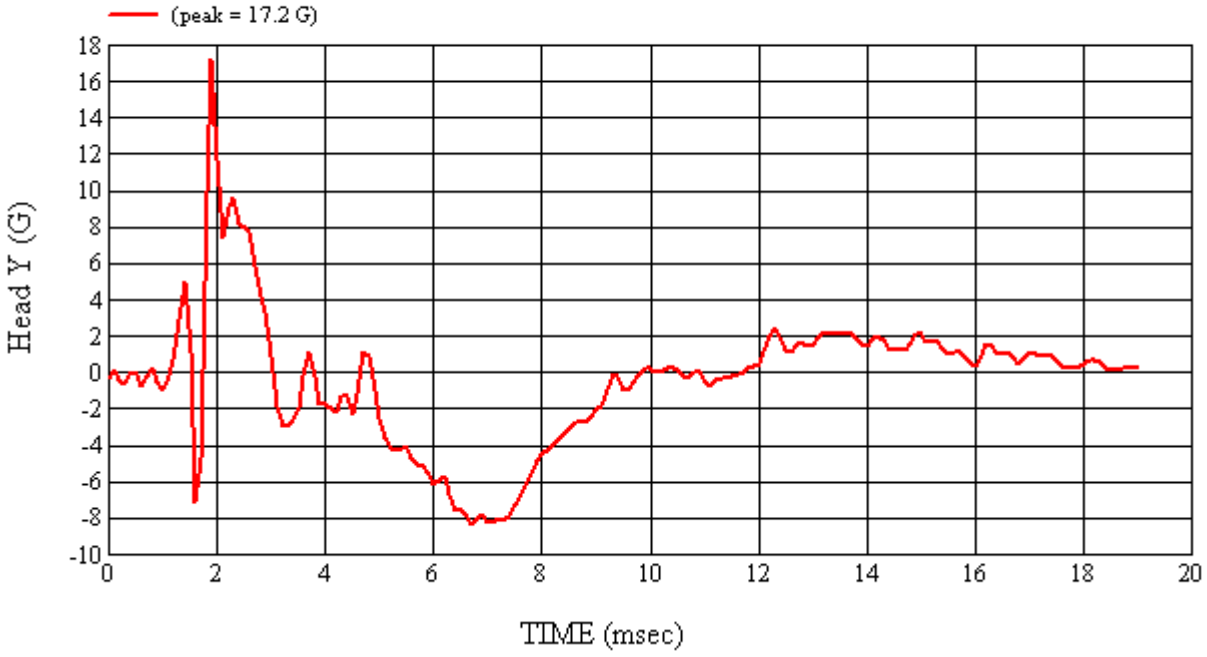
*Only necessary for NHTSA (Government) Compliance testing.

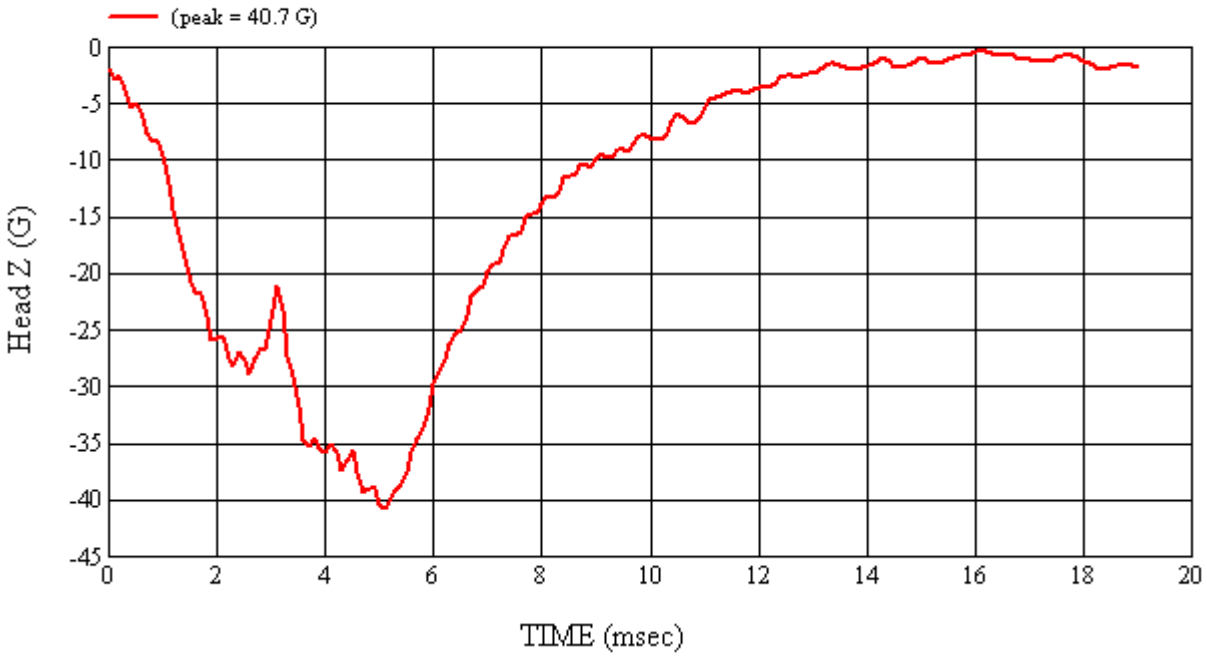
MGA Test #: FM9145 Target Location: BP4, Right Side Test Date: 5/28/2009

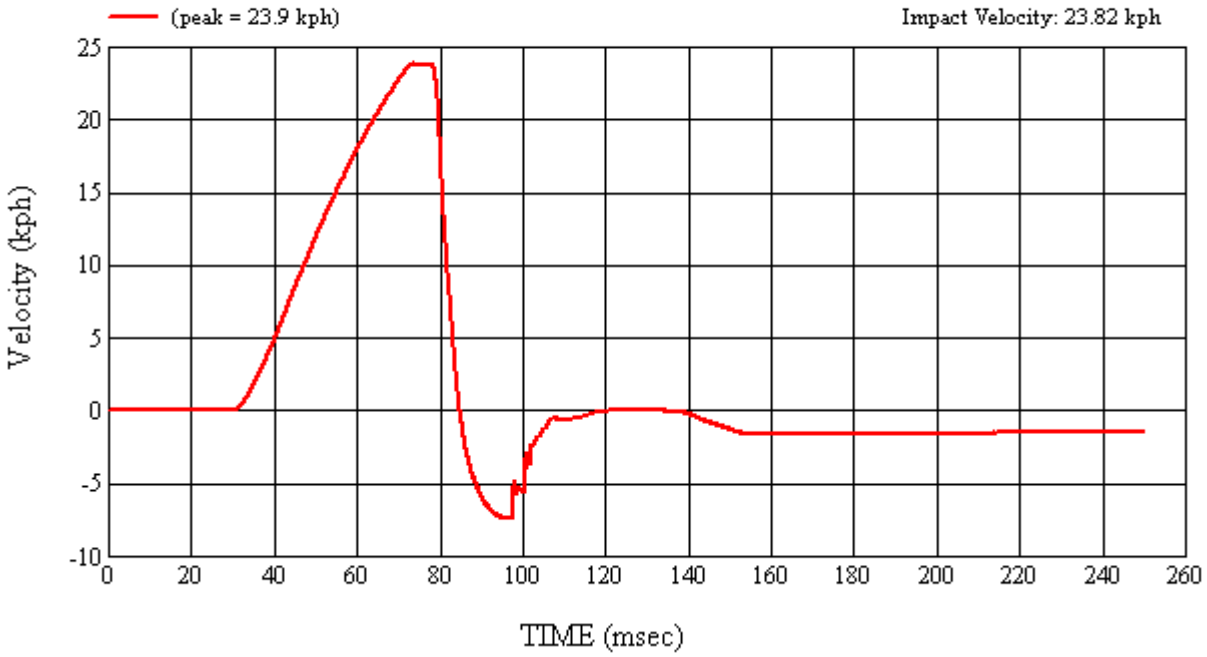


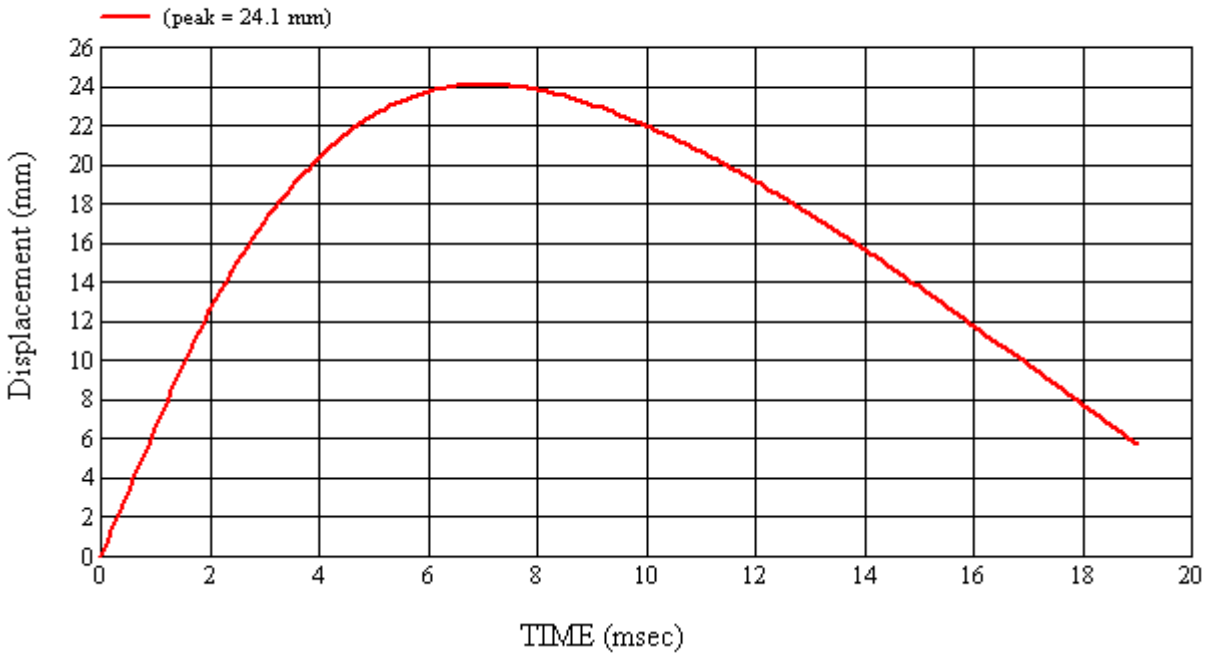


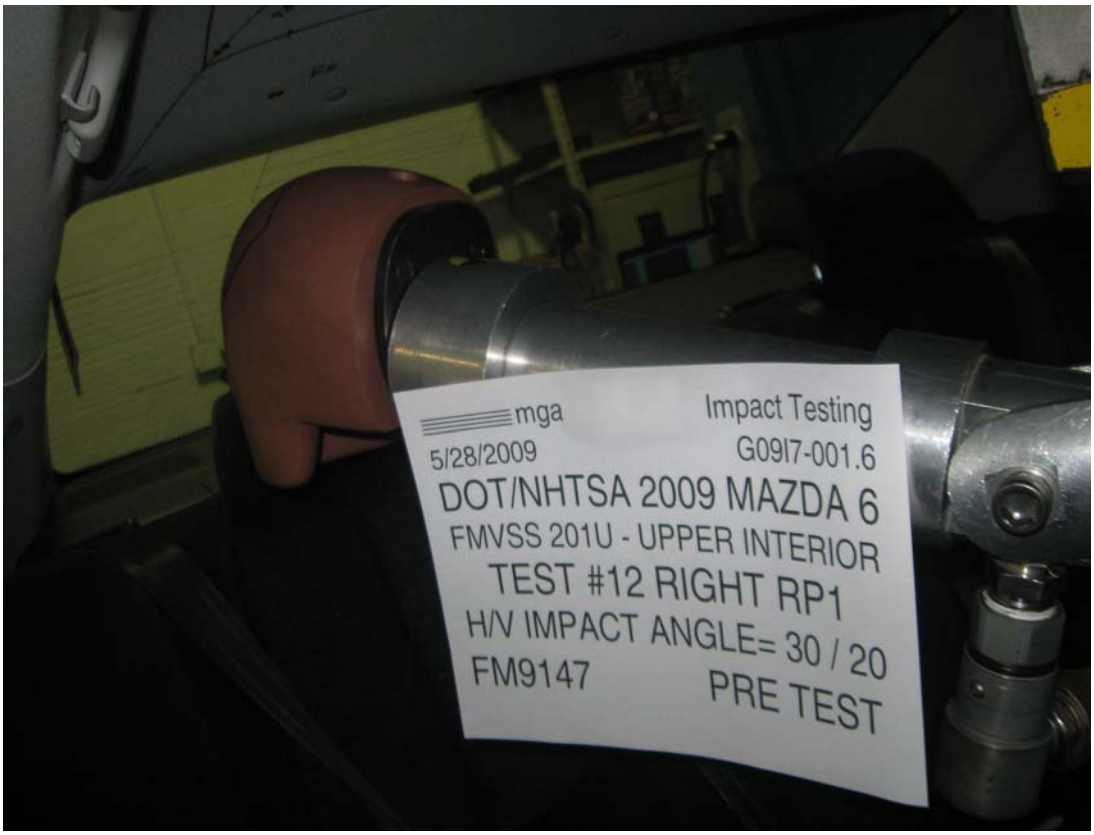

(peak = 164.6 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

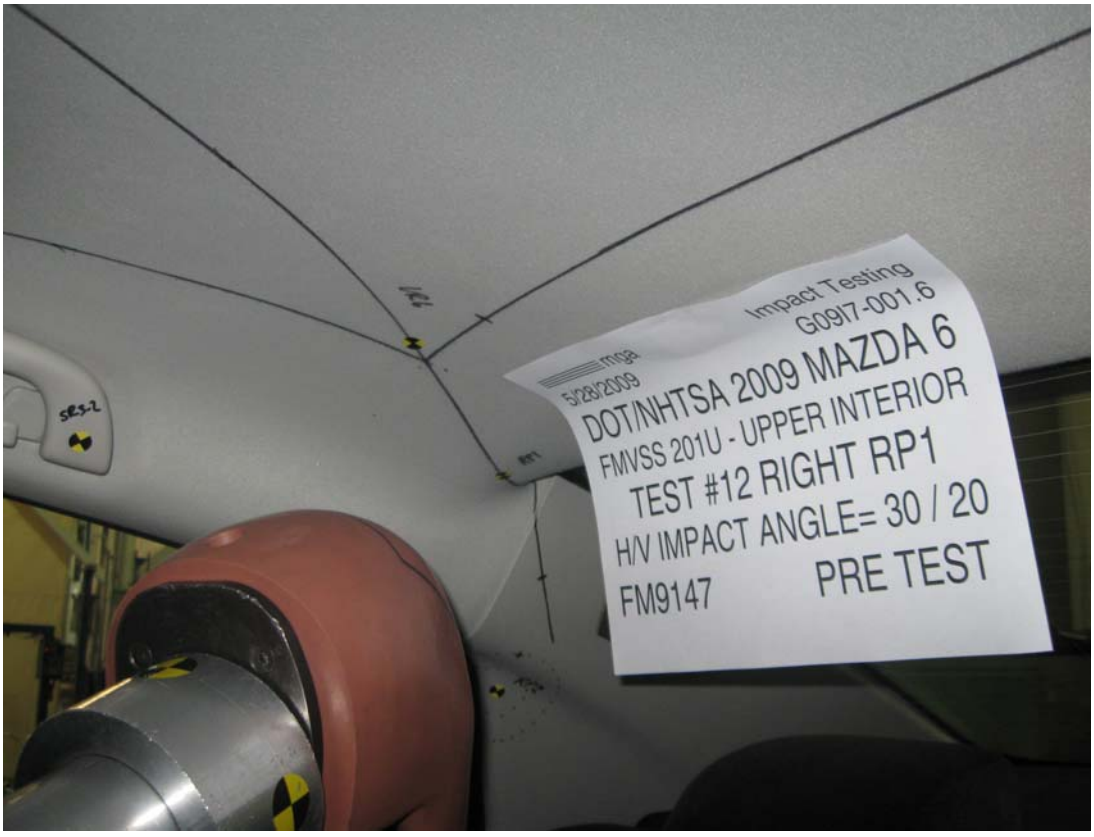

(peak = 17.2 G)
Head Y (G)
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

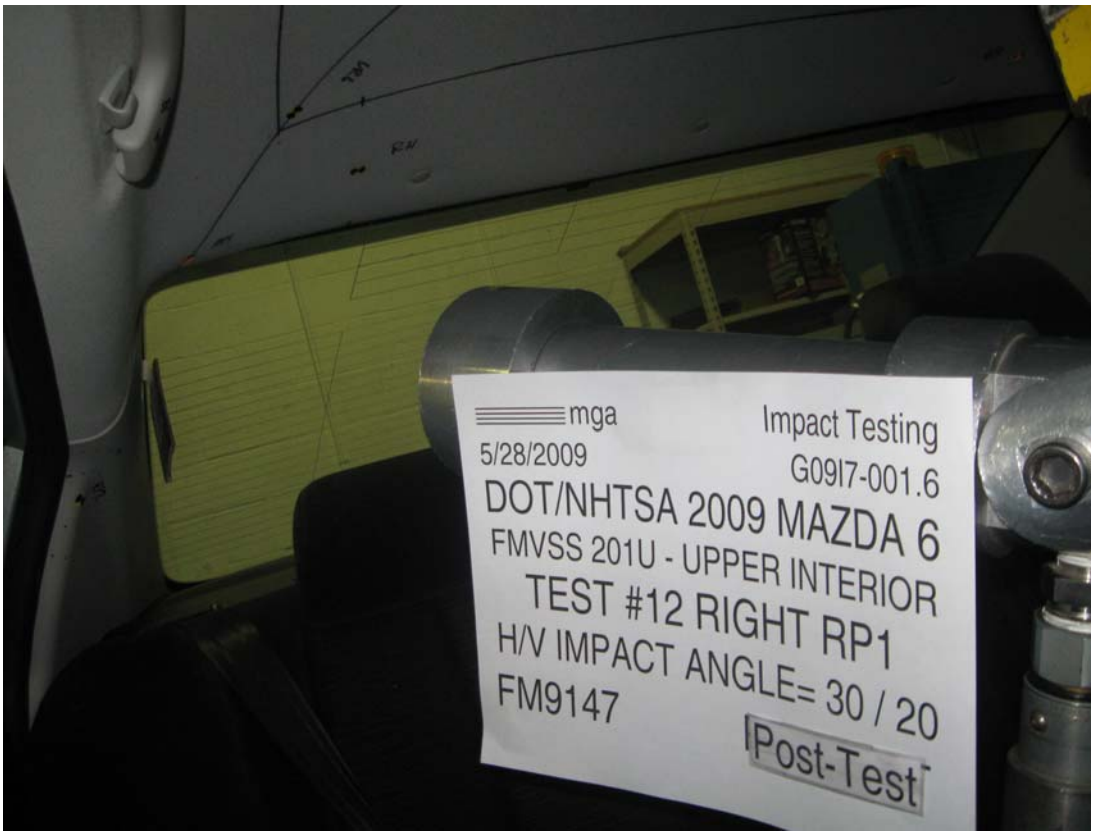

(peak = 40.7 G)
Head Z (G)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

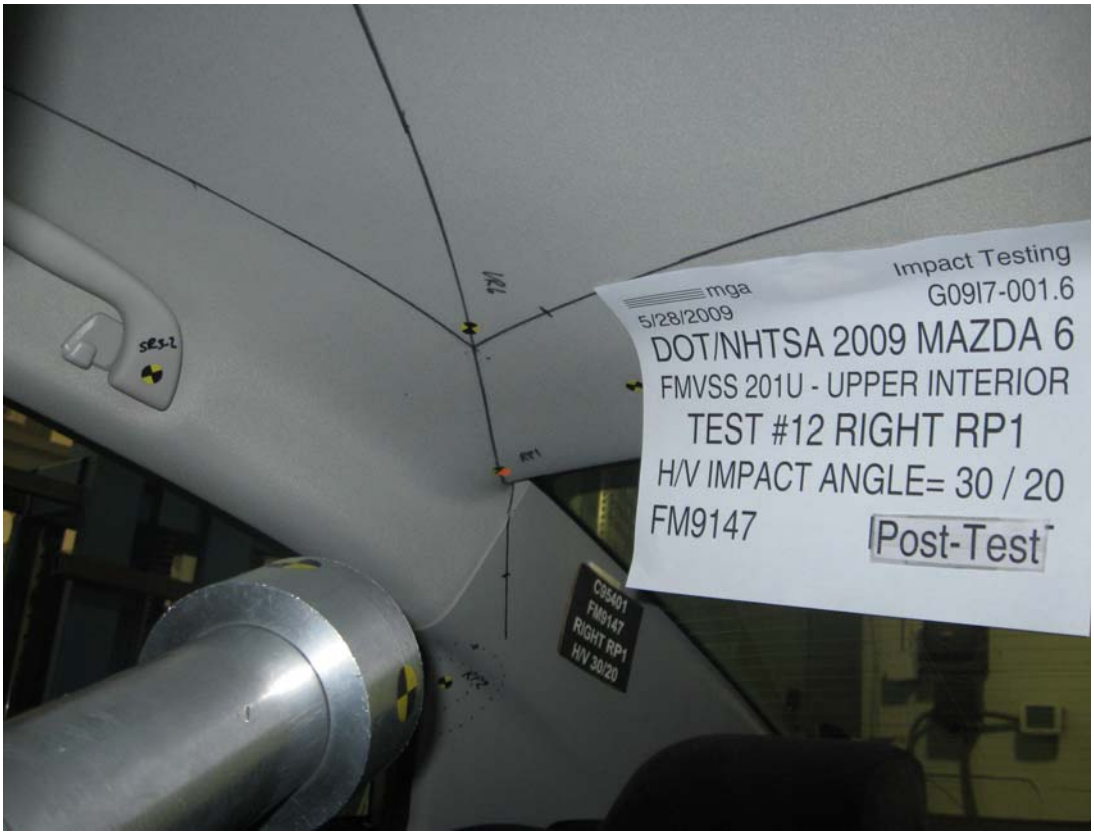

(peak = 23.9 kph)
Impact Velocity: 23.82 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 24.1 mm)
Displacement (mm)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT RP1
H/V IMPACT ANGLE= 30 / 20
FM9147
PRE TEST


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT RP1
H/V IMPACT ANGLE= 30 / 20
FM9147
PRE TEST


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT RP1
H/V IMPACT ANGLE= 30 / 20
FM9147
Post-Test


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT RP1
H/V IMPACT ANGLE= 30 / 20
FM9147
Post-Test
C95401
FM9147
RIGHT RP1
H/V 30/20


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT RP1
H/V IMPACT ANGLE= 30 / 20
FM9147
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#12

Target (Vehicle Side): RP1Right

Temperature:20.9C

MGA Test Reference No.:FM9147

Humidity:57.1%

Approach Horizontal Angles:30º

Time of Test:4:24:17 PM

Approach Vertical Angles:20º

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
336	224	10	23.4	68	2 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-94	1.06	1.06
Y	6	J36197	106.3	0.85	0.85
Z	7	J36353	97.5	0.94	0.94

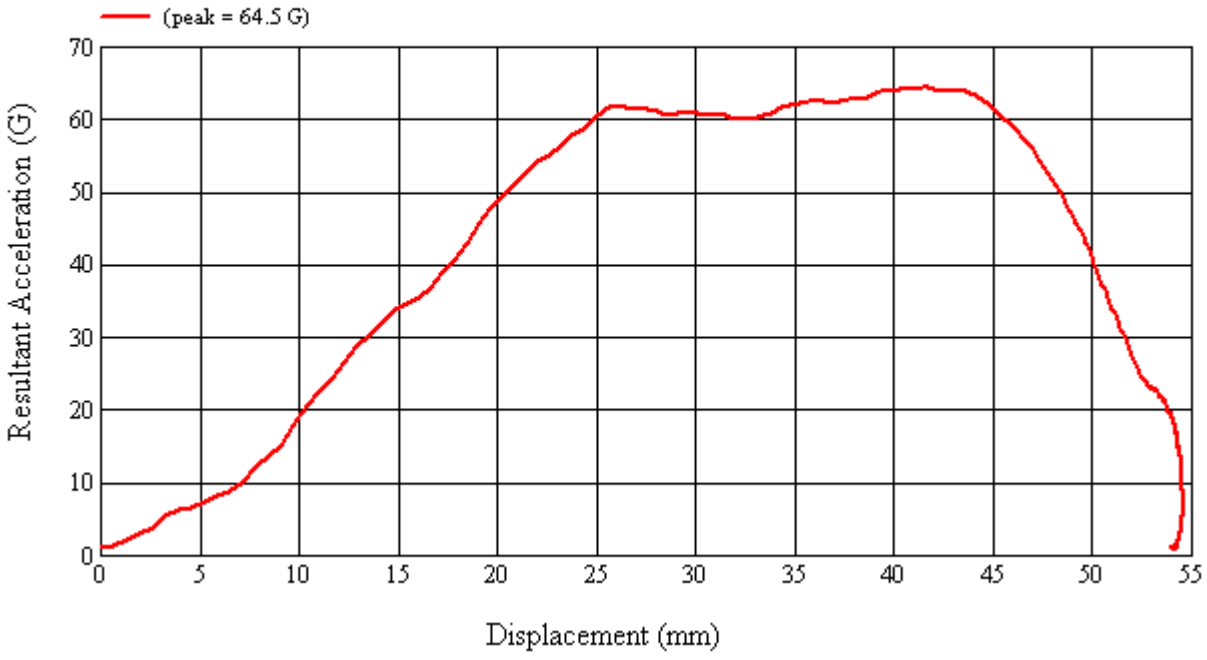
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

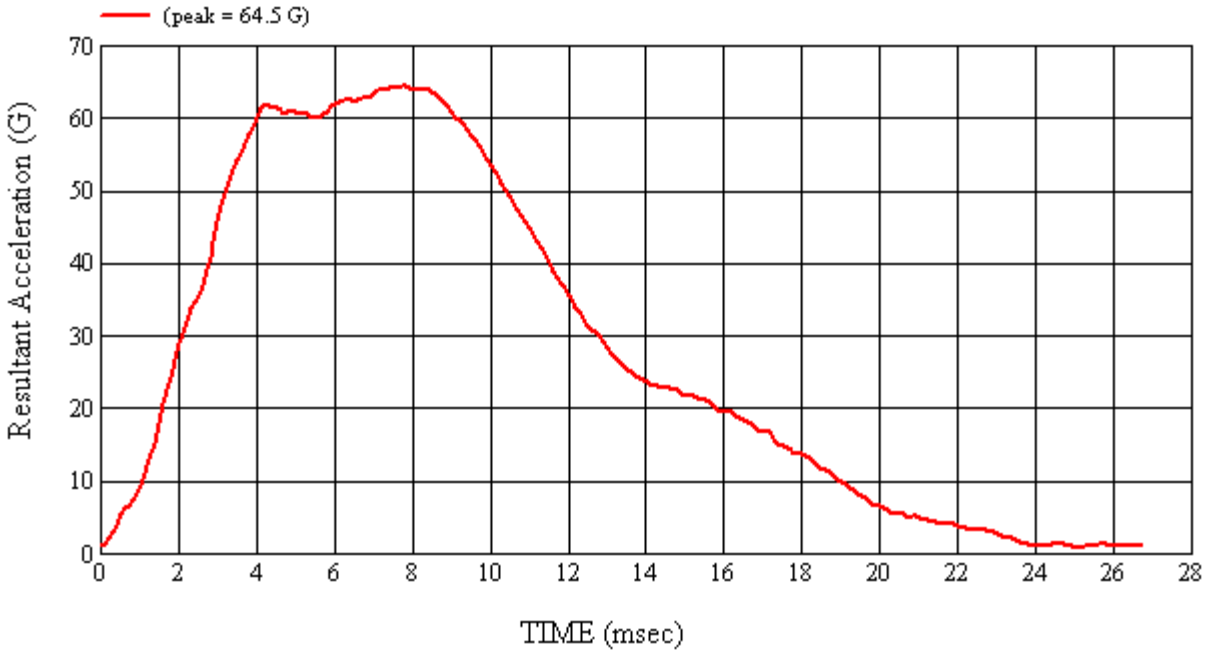
No damage observed

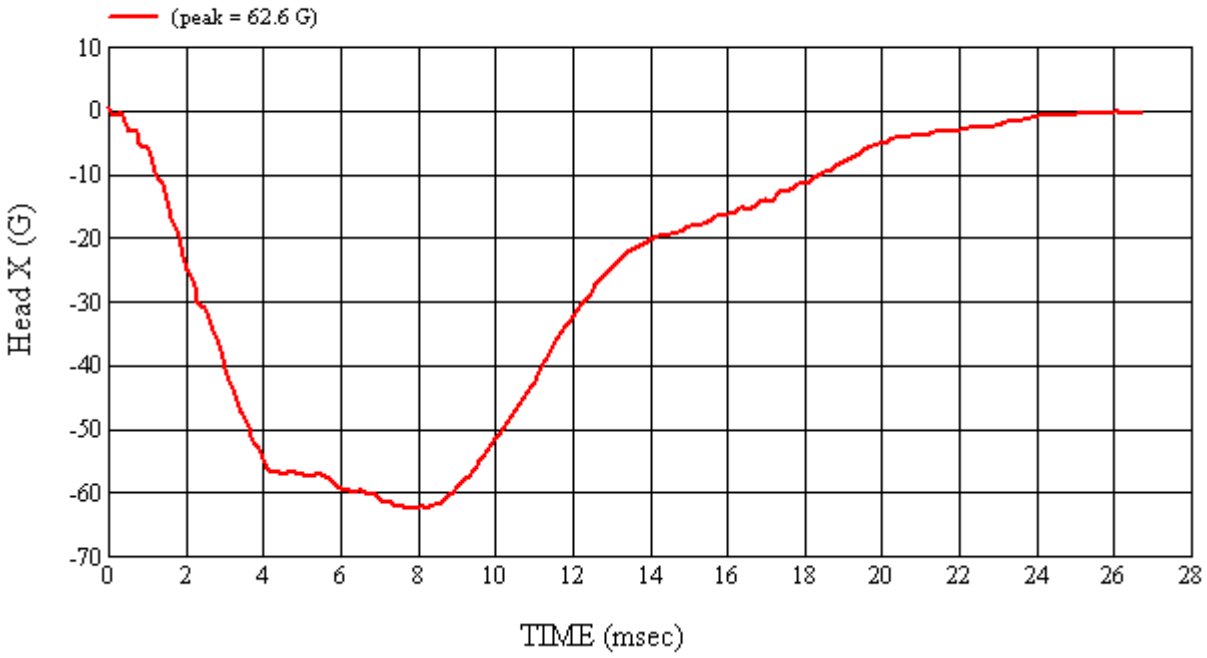
Recorded By: _____ Approved By*: _____ Date: 5/28/2009

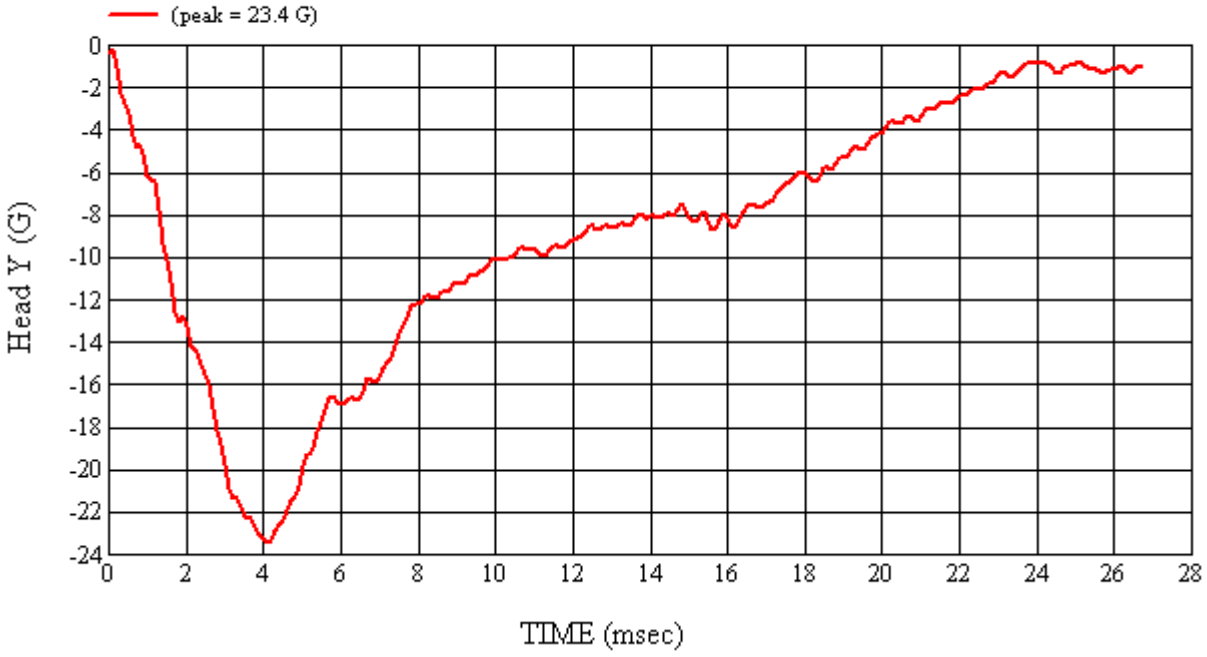
*Only necessary for NHTSA (Government) Compliance testing.

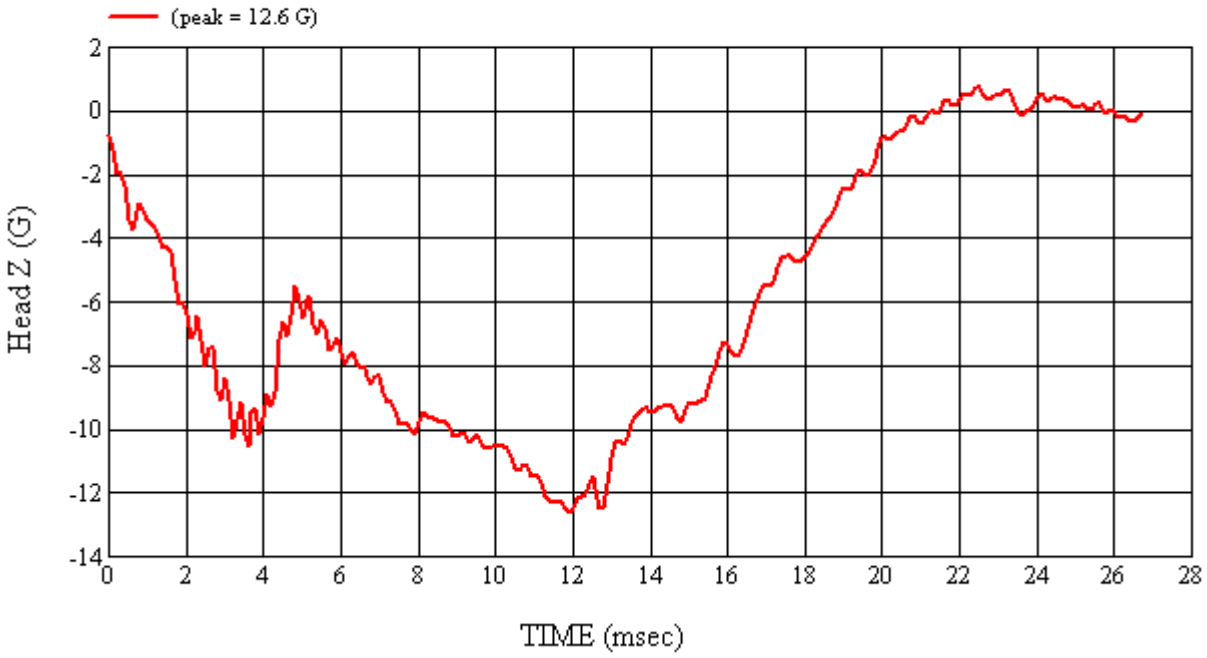
MGA Test #: FM9147 Target Location: RP1, Right Side Test Date: 5/28/2009

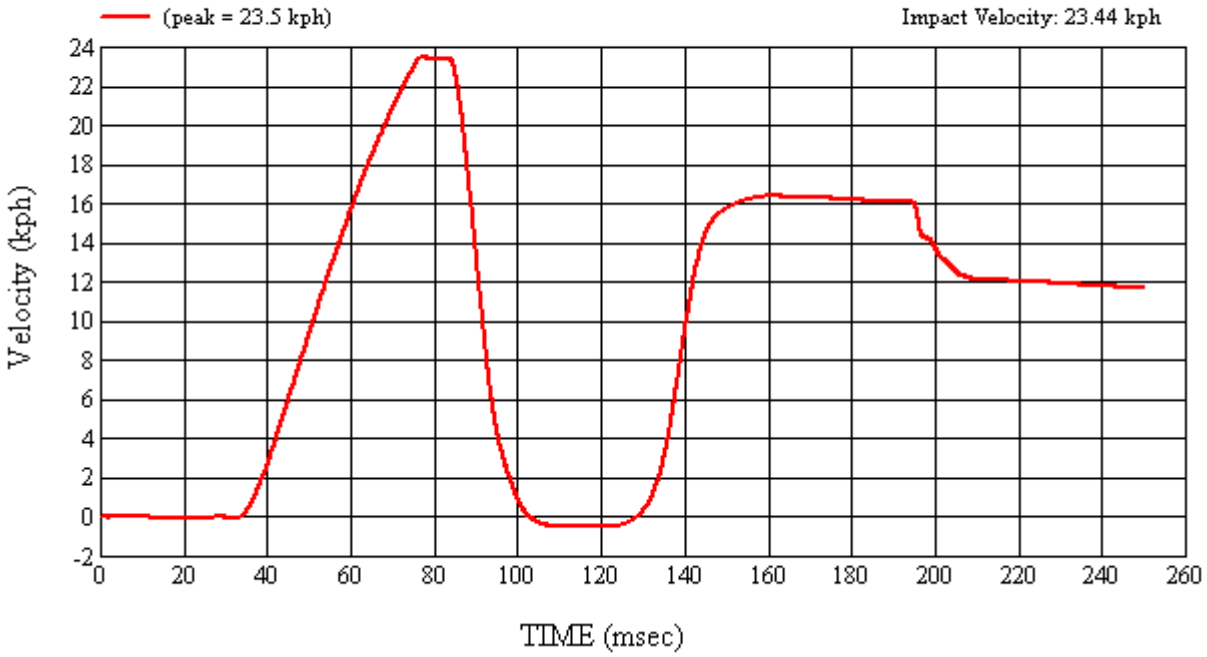


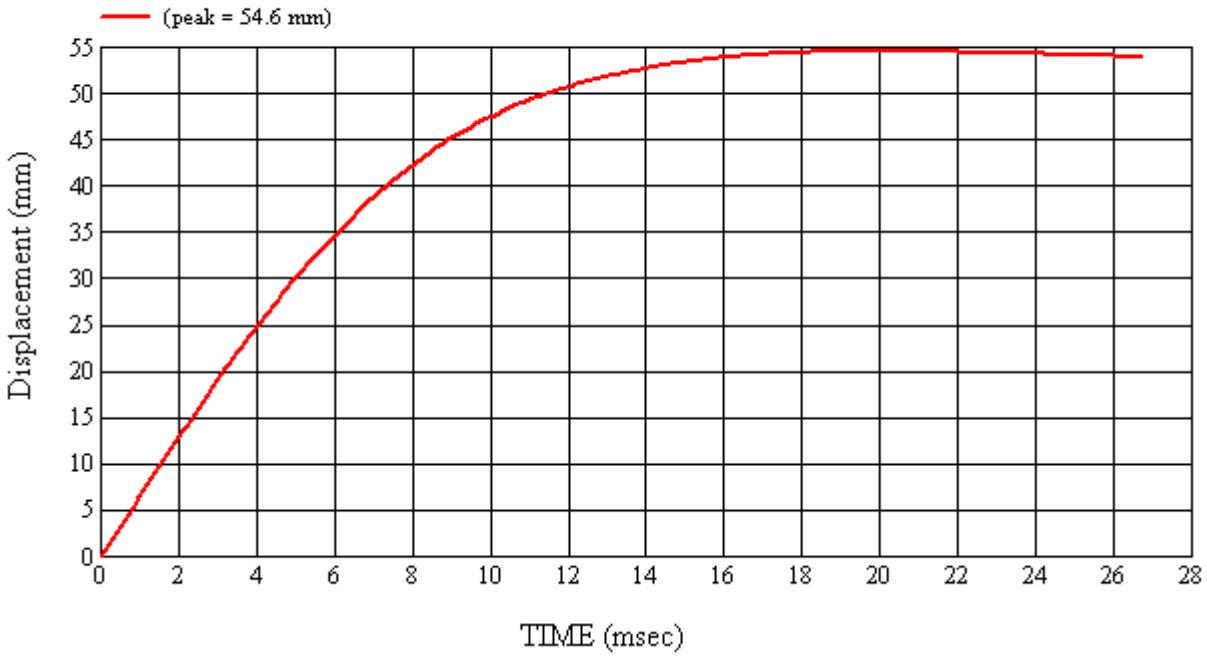


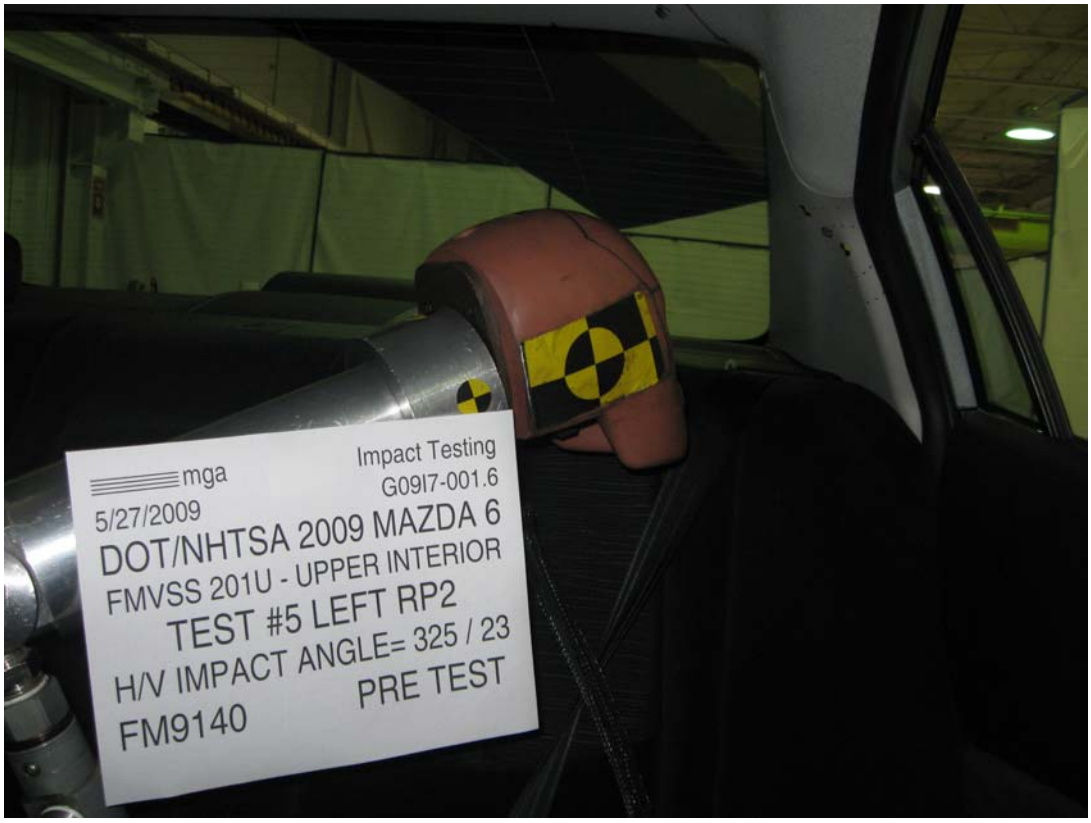

(peak = 62.6 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)


(peak = 23.4 G)
Head Y (G)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)

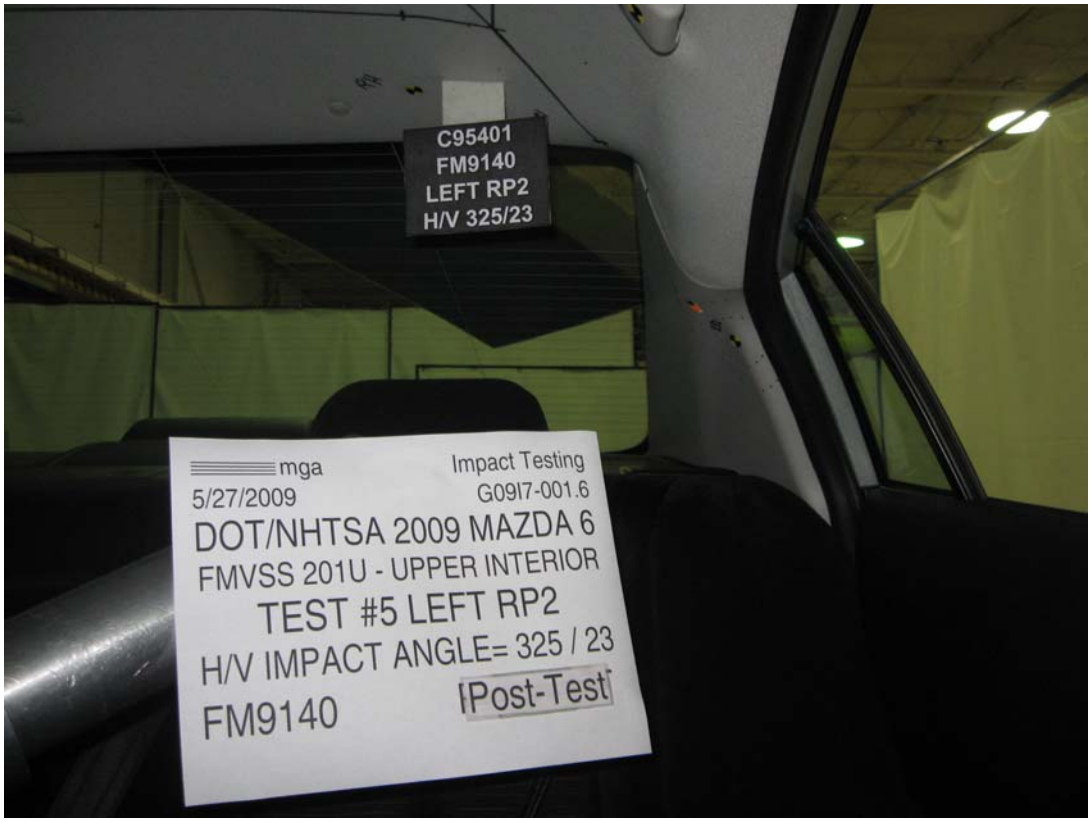

(peak = 12.6 G)
Head Z (G)
2
0
-2
-4
-6
-8
-10
-12
-14
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)

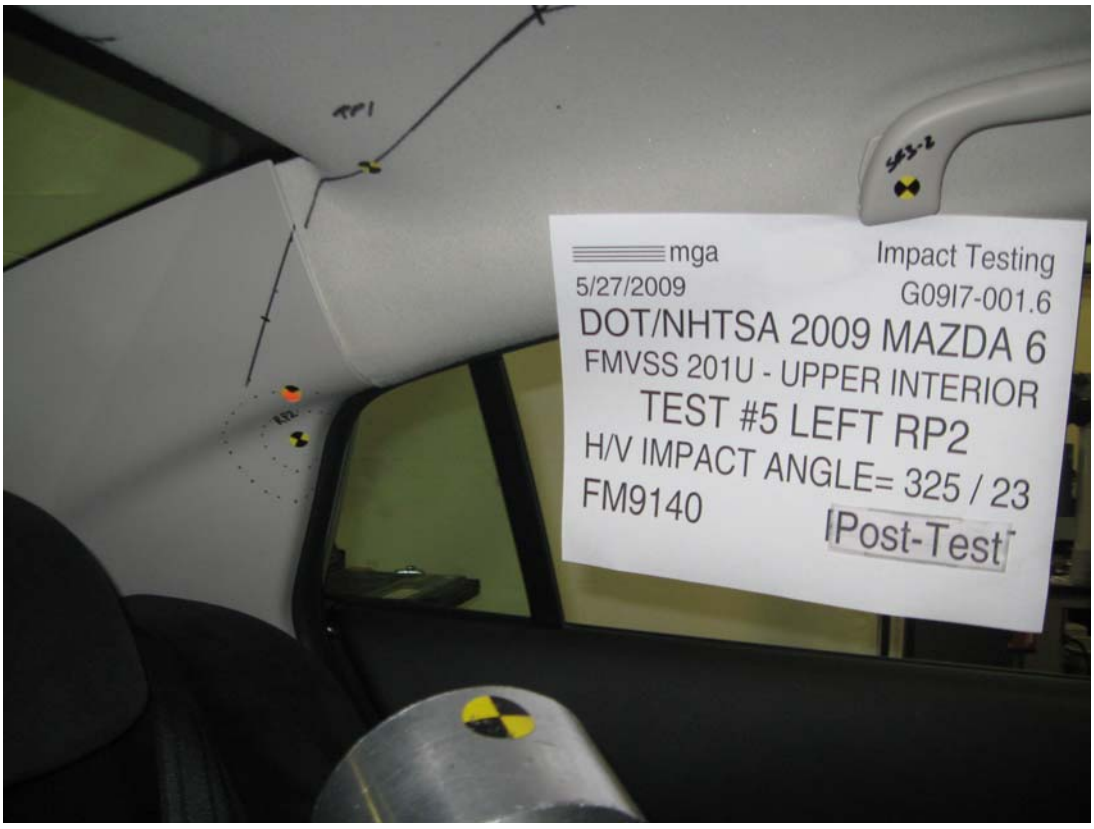

(peak = 23.5 kph)
Impact Velocity: 23.44 kph
Velocity (kph)
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 54.6 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
50
55
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)


mga
Impact Testing
G09I7-001.6
5/27/2009
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT RP2
H/V IMPACT ANGLE= 325 / 23
FM9140
PRE TEST


mga
Impact Testing
G09I7-001.6
5/27/2009
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT RP2
H/V IMPACT ANGLE= 325 / 23
FM9140
PRE TEST


C95401
FM9140
LEFT RP2
H/V 325/23
mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT RP2
H/V IMPACT ANGLE= 325 / 23
FM9140
Post-Test


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT RP2
H/V IMPACT ANGLE= 325 / 23
FM9140
Post-Test


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT RP2
H/V IMPACT ANGLE= 325 / 23
FM9140
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#5

Target (Vehicle Side): RP2Left

Temperature:21.4C

MGA Test Reference No.:FM9140

Humidity:60.1%

Approach Horizontal Angles:325º

Time of Test:3:44:46 PM

Approach Vertical Angles:23º

FMH Serial No:[037]

Additional Description:Relocation Spheres: 2

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
315	197	11.7	19.0	25	5 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	AHTB2	-115.9	1.06	1.06
Y	6	J14103	93.7	0.85	0.85
Z	7	J35800	97.1	0.94	0.94

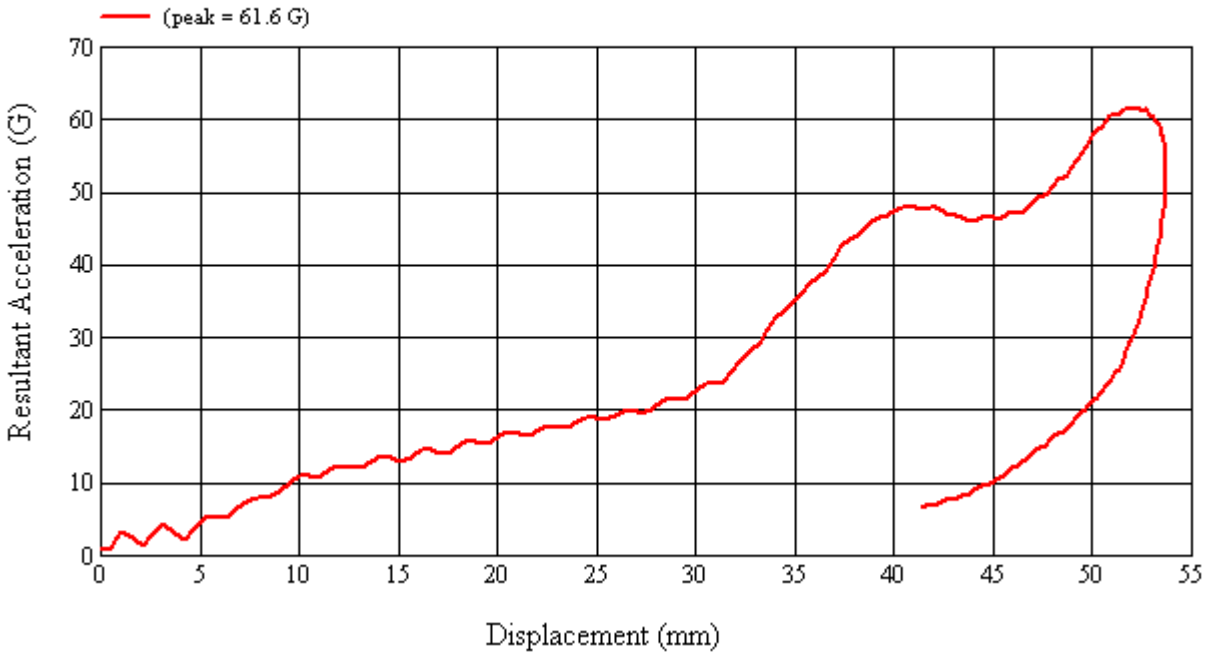
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

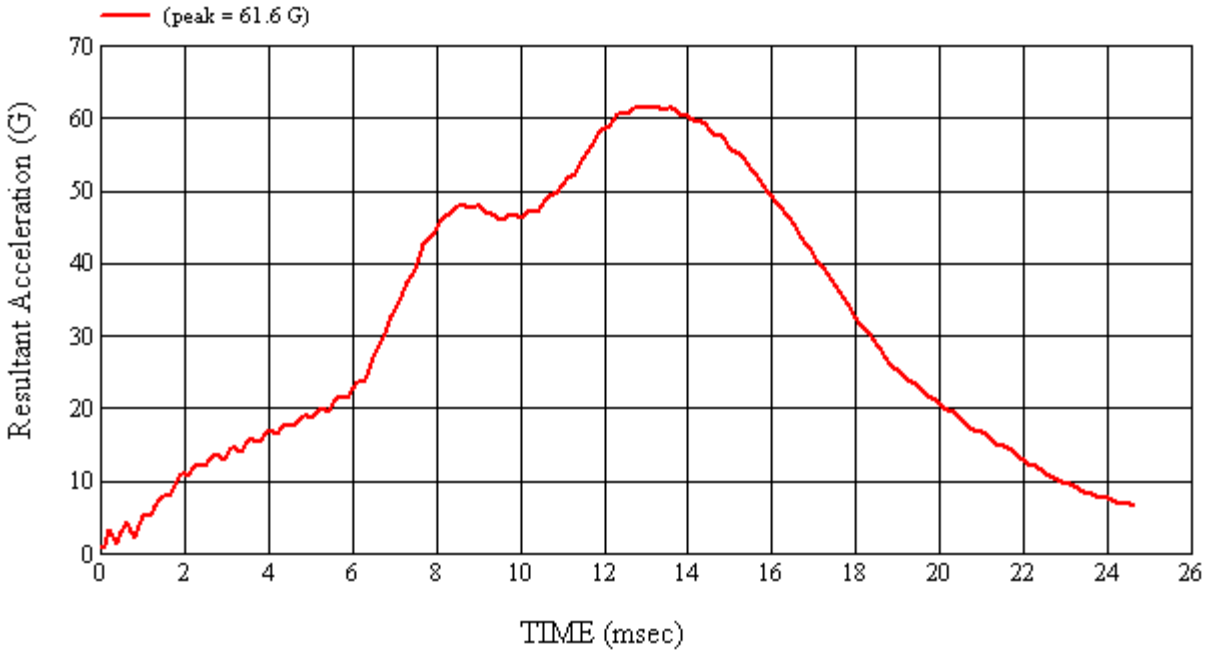
No damage observed

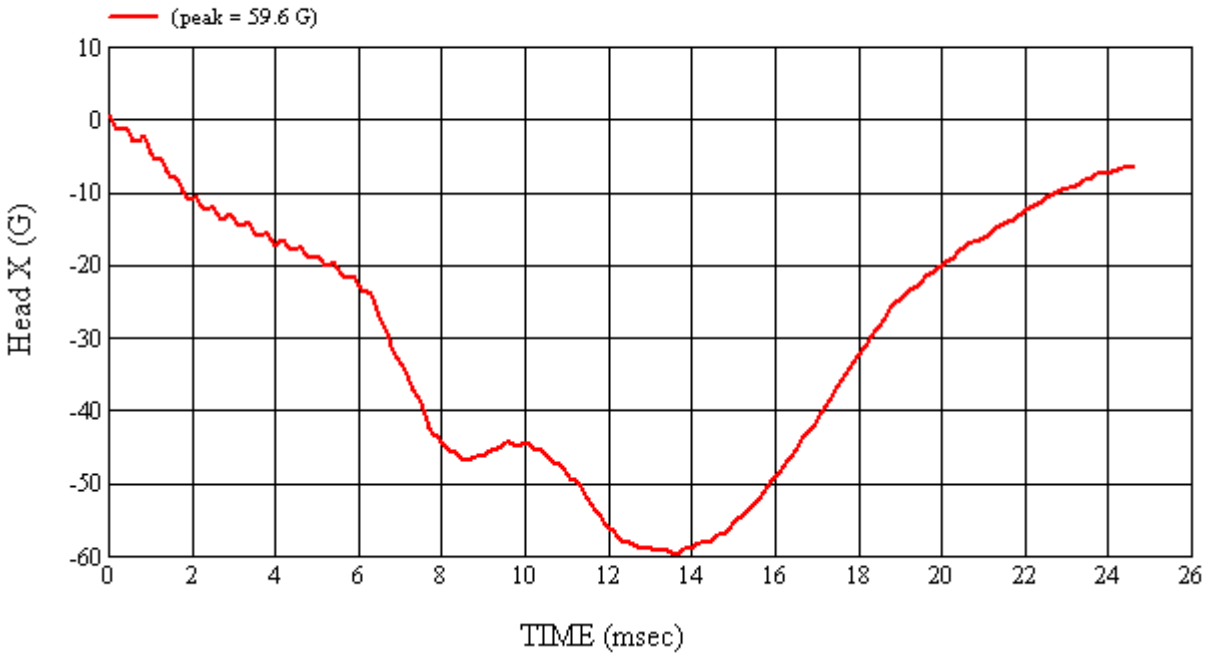
Recorded By: _____ Approved By*: _____ Date: 5/27/2009

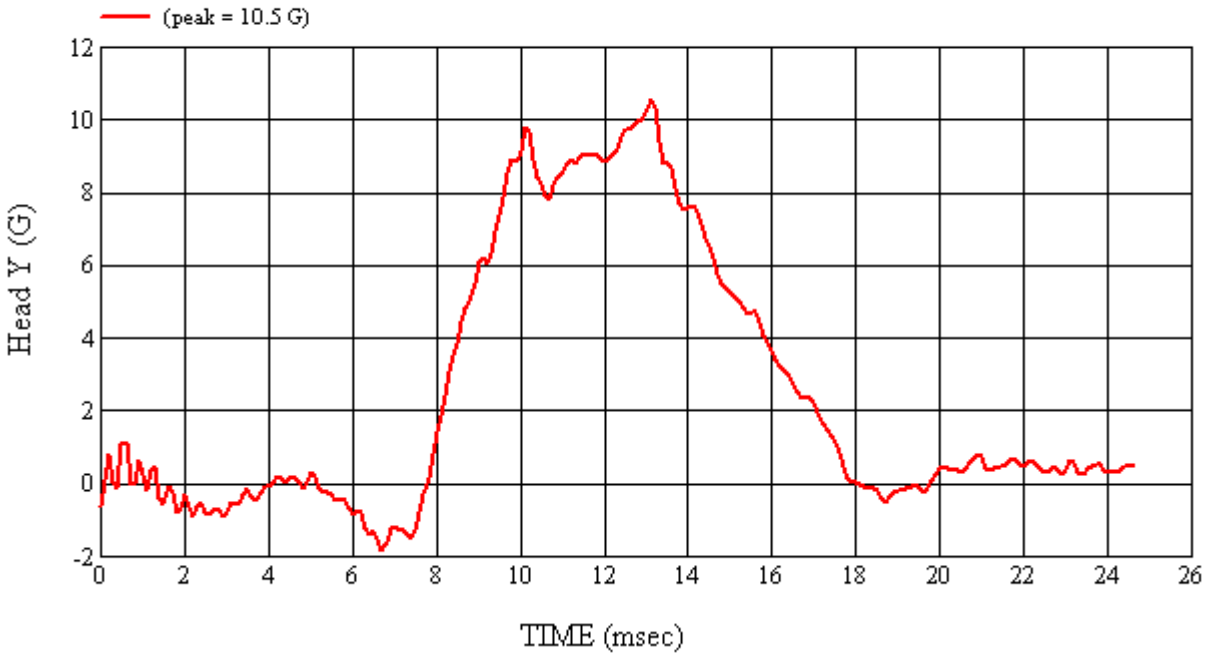
*Only necessary for NHTSA (Government) Compliance testing.

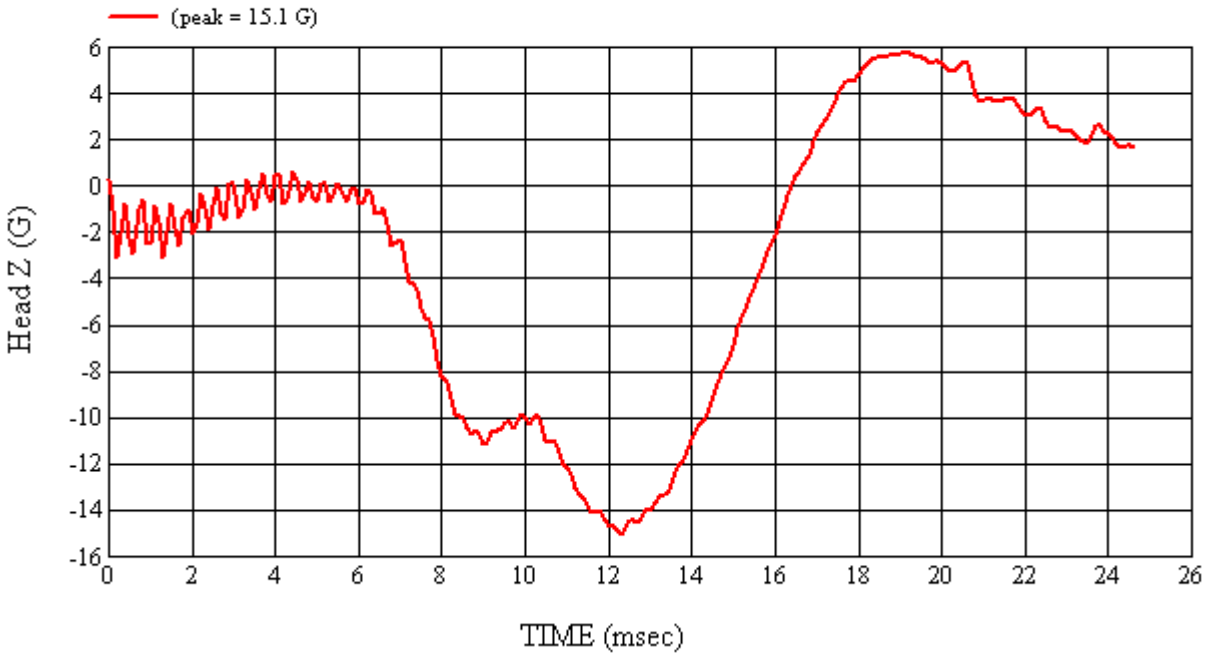
MGA Test #: FM9140 Target Location: RP2, Left Side Test Date: 5/27/2009

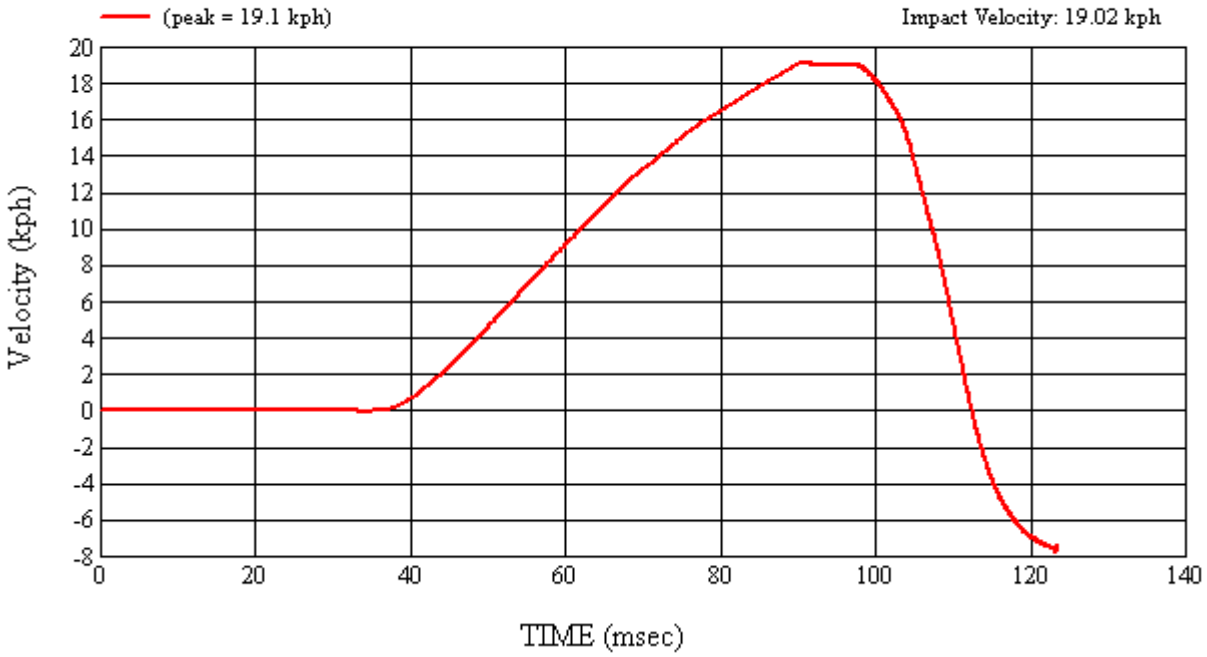


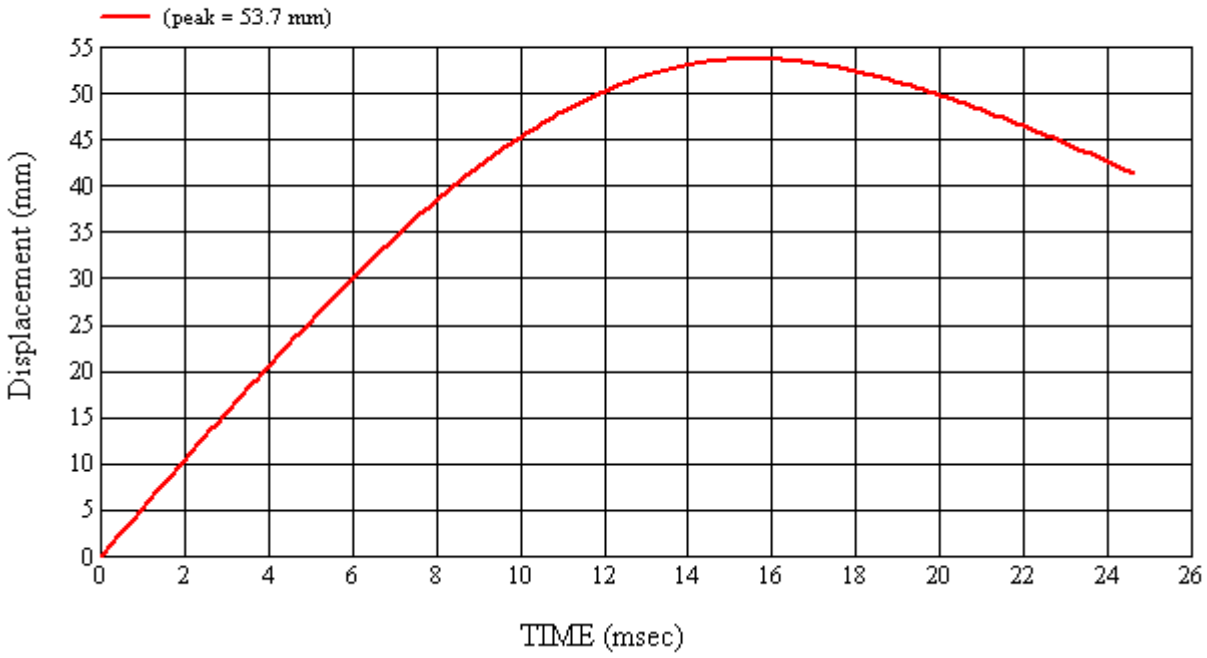


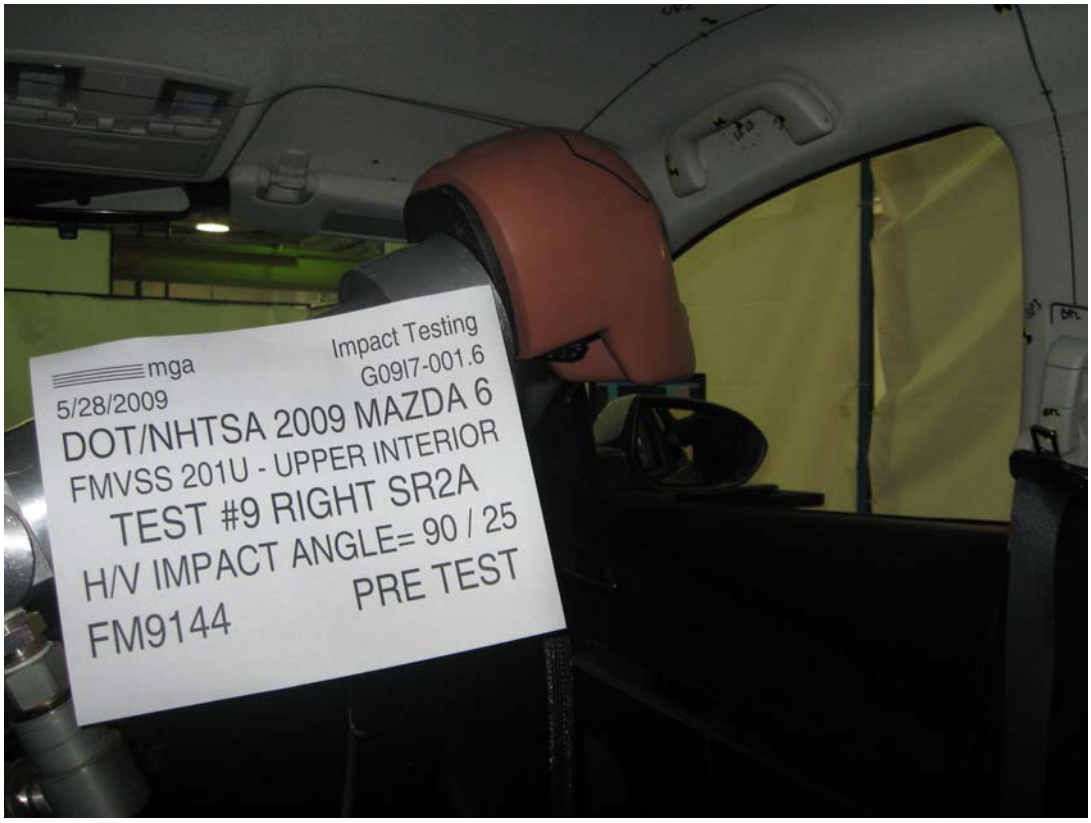

(peak = 59.6 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 10.5 G)
Head Y (G)
12
10
8
6
4
2
0
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 15.1 G)
Head Z (G)
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)

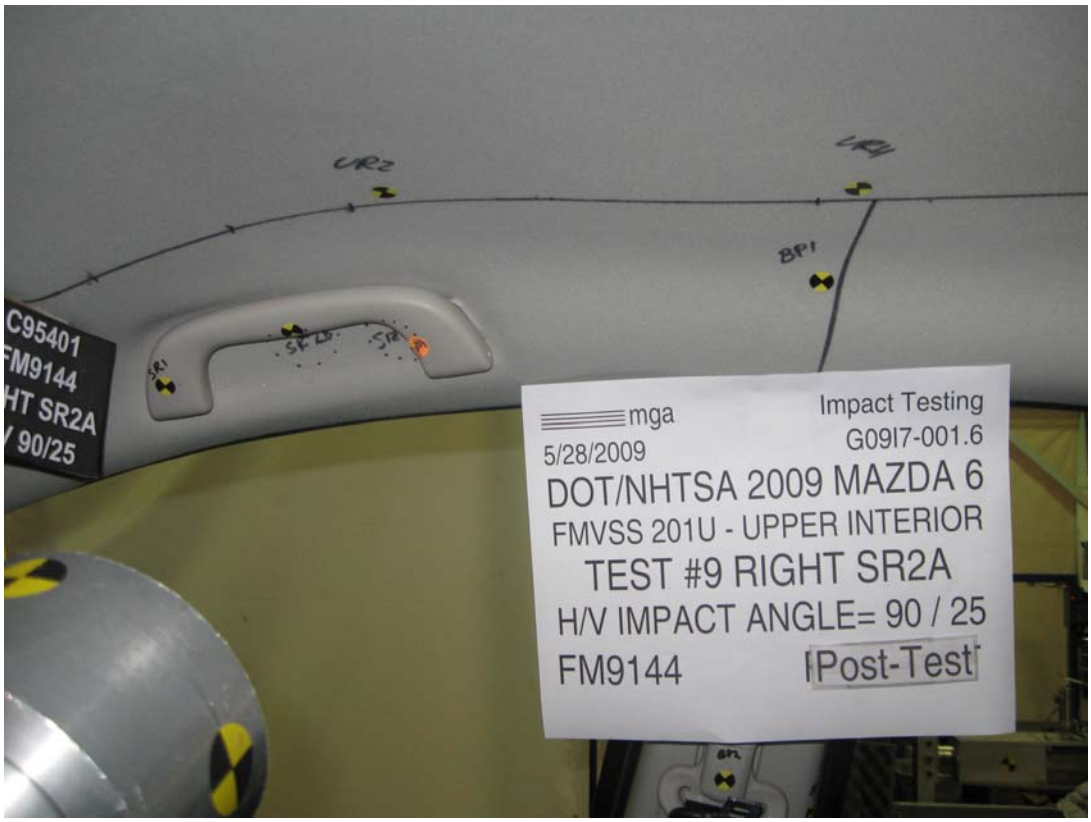

(peak = 19.1 kph)
Impact Velocity: 19.02 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
0
20
40
60
80
100
120
140
TIME (msec)


(peak = 53.7 mm)
Displacement (mm)
55
50
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


mga
Impact Testing
G09I7-001.6
5/28/2009
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT SR2A
H/V IMPACT ANGLE= 90 / 25
FM9144
PRE TEST


mga
Impact Testing
G09I7-001.6
5/28/2009
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT SR2A
H/V IMPACT ANGLE= 90 / 25
FM9144
PRE TEST


C95401
FM9144
RIGHT SR2A
H/V 90/25
mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT SR2A
H/V IMPACT ANGLE= 90 / 25
FM9144
Post-Test


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT SR2A
H/V IMPACT ANGLE= 90 / 25
FM9144
Post-Test


mga
5/28/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT SR2A
H/V IMPACT ANGLE= 90 / 25
FM9144
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#9

Target (Vehicle Side): SR2ARight

Temperature:21.7C

MGA Test Reference No.:FM9144

Humidity:57.4%

Approach Horizontal Angles:90º

Time of Test:11:56:08 AM

Approach Vertical Angles:25º

FMH Serial No:[038]

Additional Description:Relocation Spheres: 1

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
284	156	9.6	18.6	24	1 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-94	1.06	1.06
Y	6	J36197	106.3	0.85	0.85
Z	7	J36353	97.5	0.94	0.94

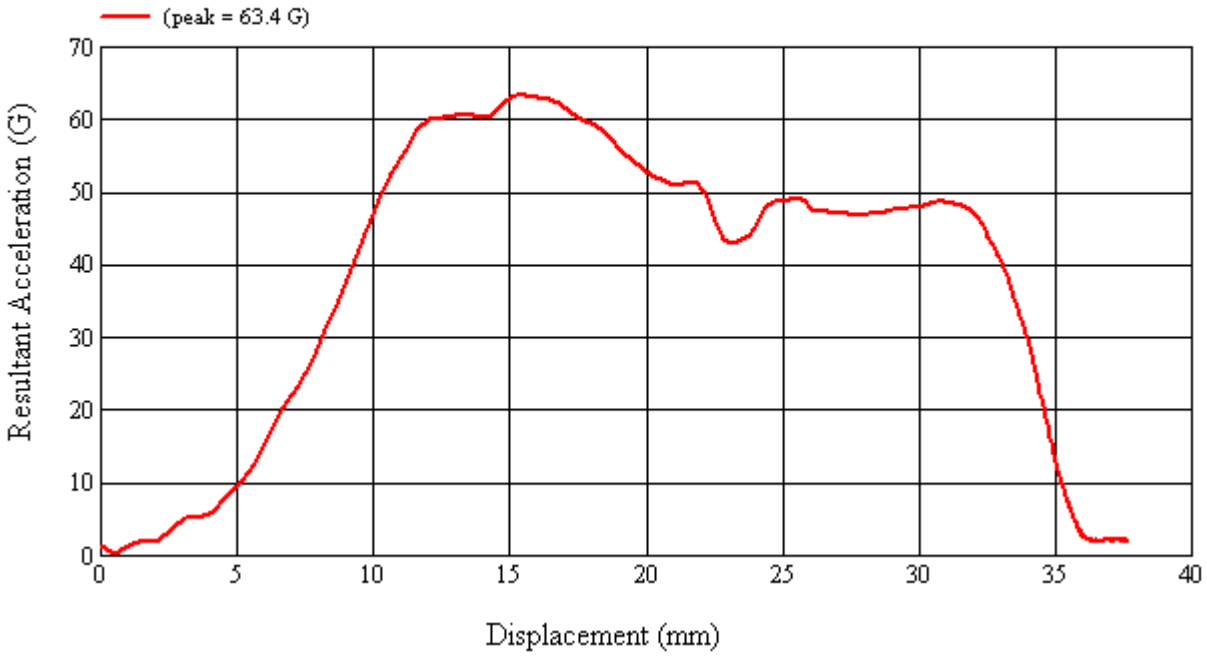
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

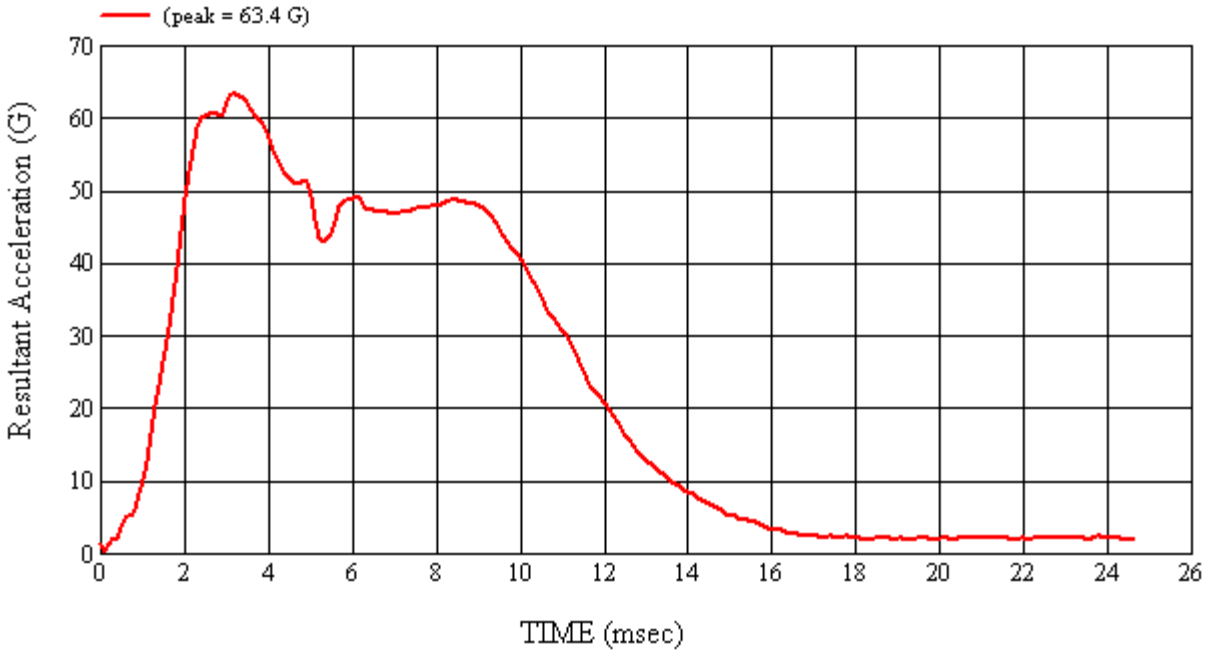
Grab handle does not return unassisted

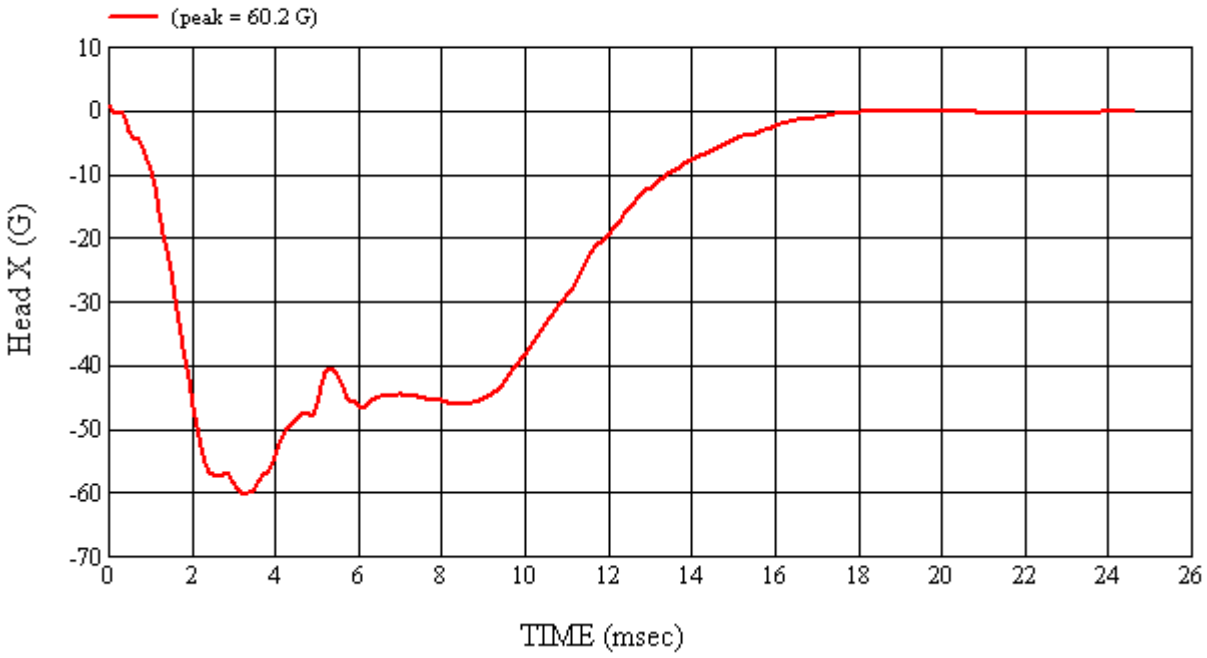
Recorded By: _____ Approved By*: _____ Date: 5/28/2009

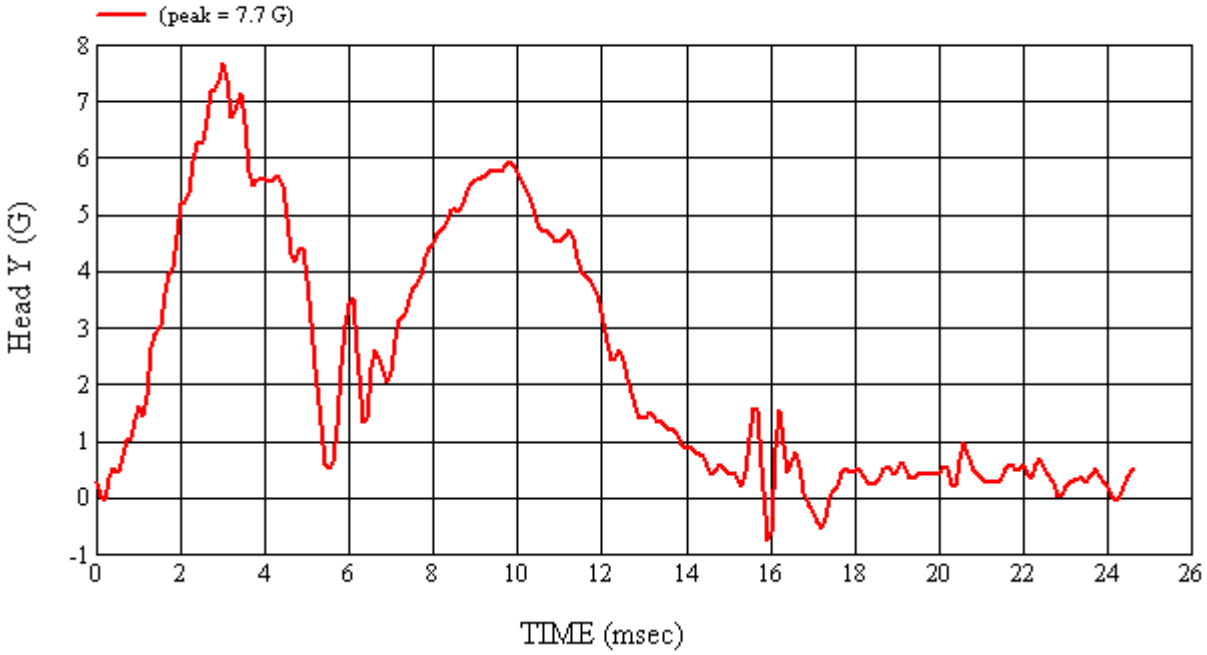
*Only necessary for NHTSA (Government) Compliance testing.

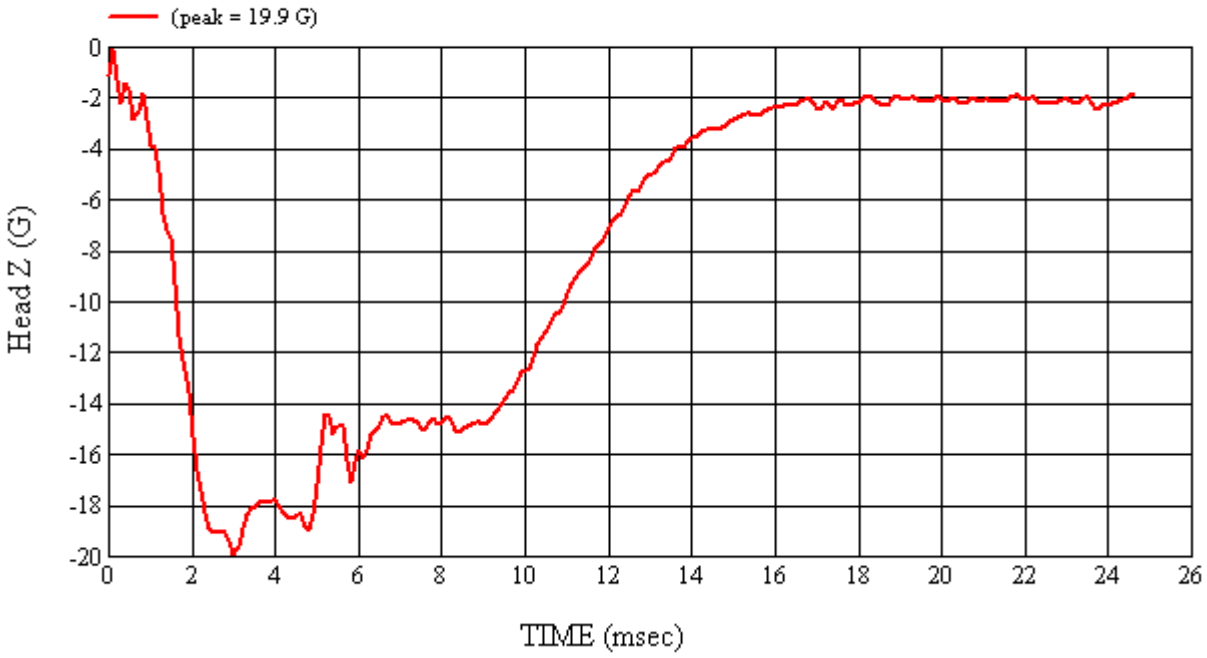
MGA Test #: FM9144 Target Location: SR2A, Right Side Test Date: 5/28/2009

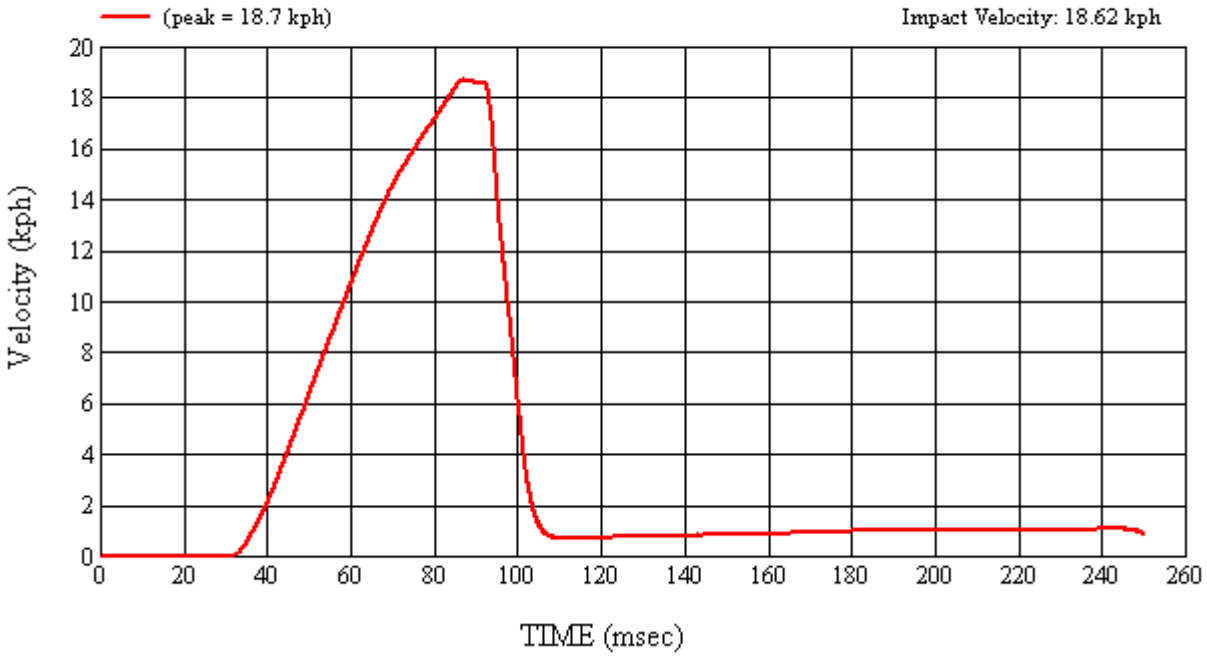


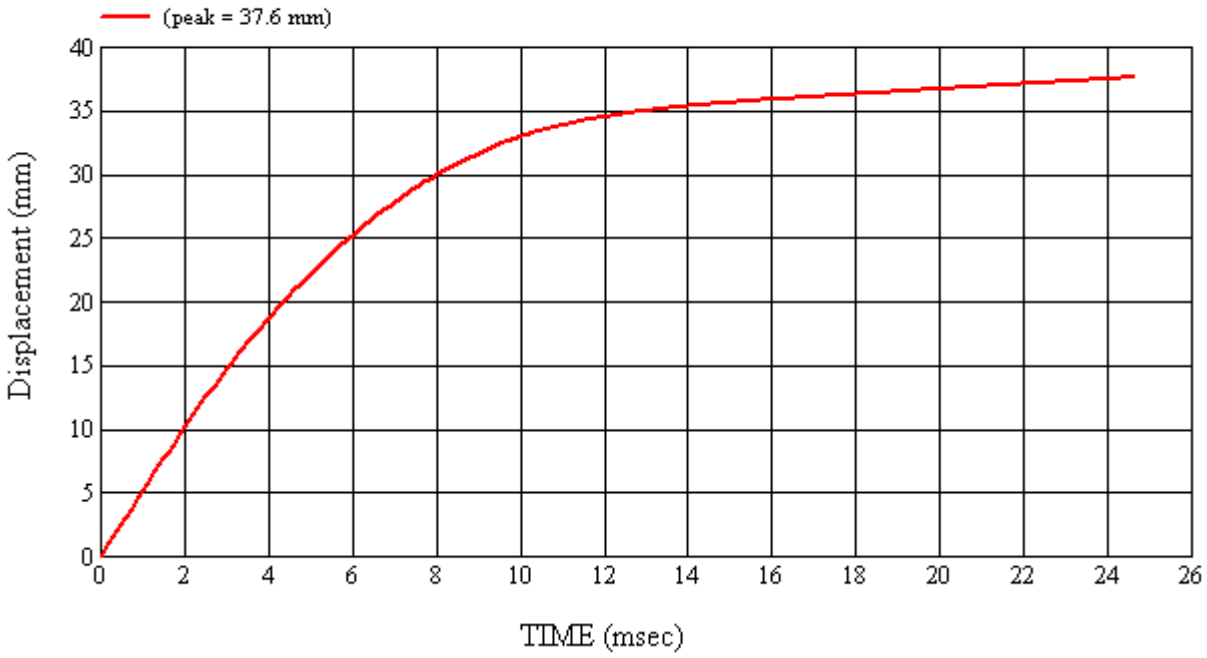



(peak = 60.2 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 7.7 G)
Head Y (G)
8
7
6
5
4
3
2
1
0
-1
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)

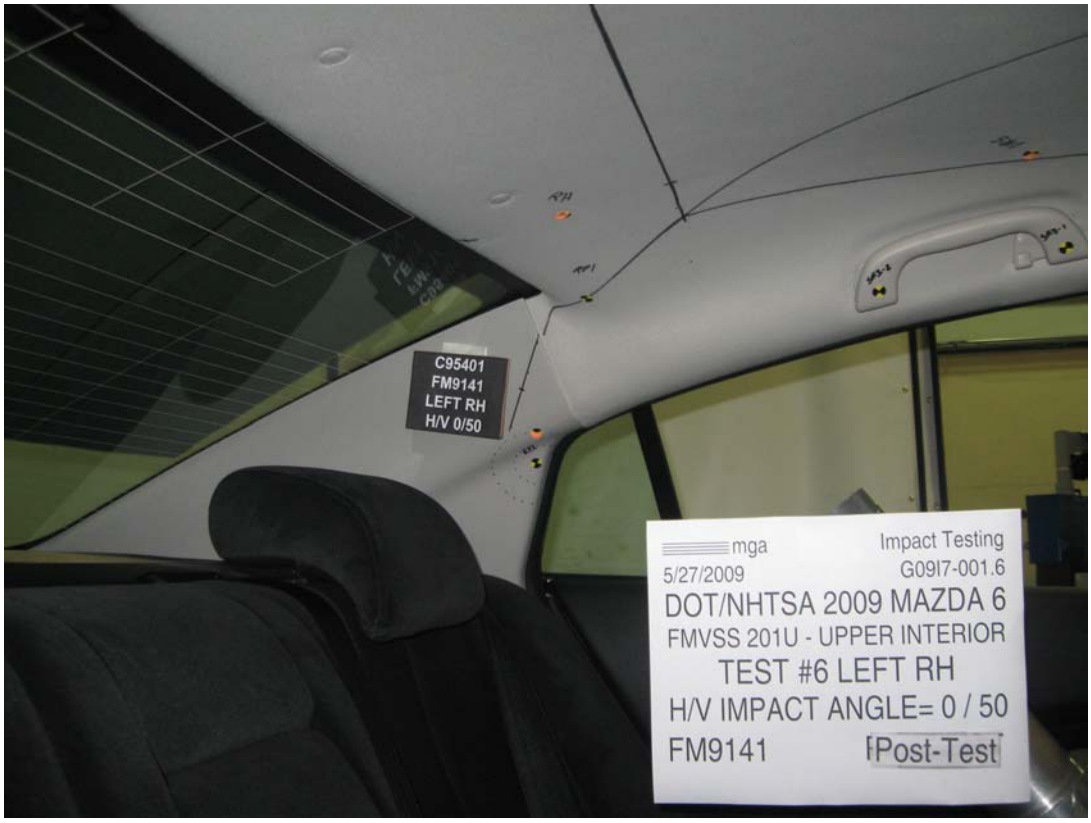

(peak = 19.9 G)
Head Z (G)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)

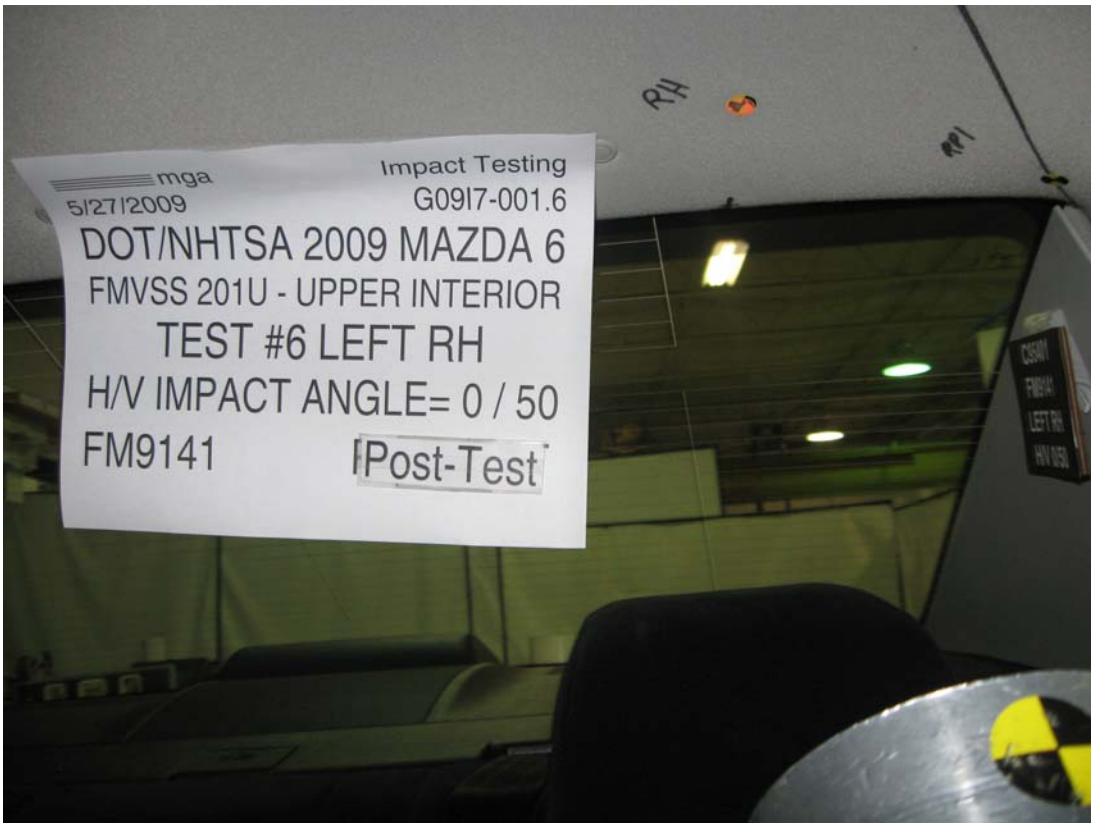

(peak = 18.7 kph)
Impact Velocity: 18.62 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 37.6 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


mga
Impact Testing
G09I7-001.6
5/27/2009
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT RH
H/V IMPACT ANGLE= 0 / 50
FM9141
PRE TEST


mga
Impact Testing
G09I7-001.6
5/27/2009
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT RH
H/V IMPACT ANGLE= 0 / 50
FM9141
PRE TEST
RH


C95401
FM9141
LEFT RH
H/V 0/50
mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT RH
H/V IMPACT ANGLE= 0 / 50
FM9141
Post-Test


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT RH
H/V IMPACT ANGLE= 0 / 50
FM9141
Post-Test


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT RH
H/V IMPACT ANGLE= 0 / 50
FM9141
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#6

Target (Vehicle Side): RHLeft

Temperature:21.4C

MGA Test Reference No.:FM9141

Humidity:59.9%

Approach Horizontal Angles:0º

Time of Test:4:26:35 PM

Approach Vertical Angles:50º

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
409	322	12.2	24.0	13	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	-94	1.06	1.06
Y	6	J36197	106.3	0.85	0.85
Z	7	J36353	97.5	0.94	0.94

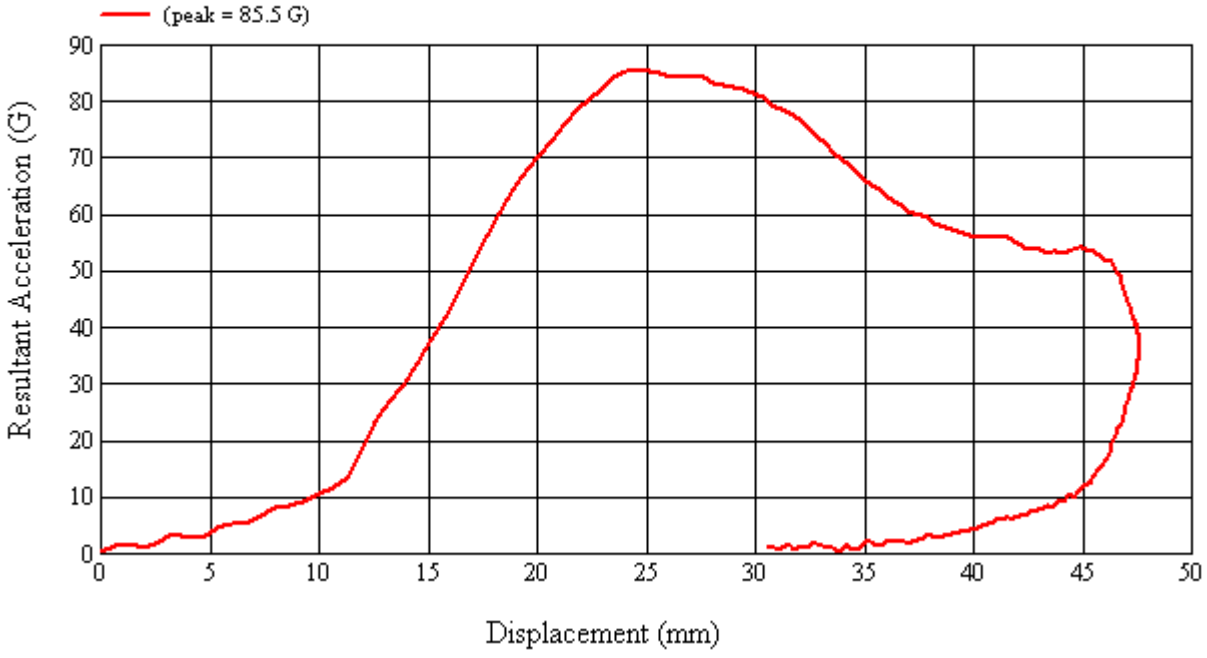
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

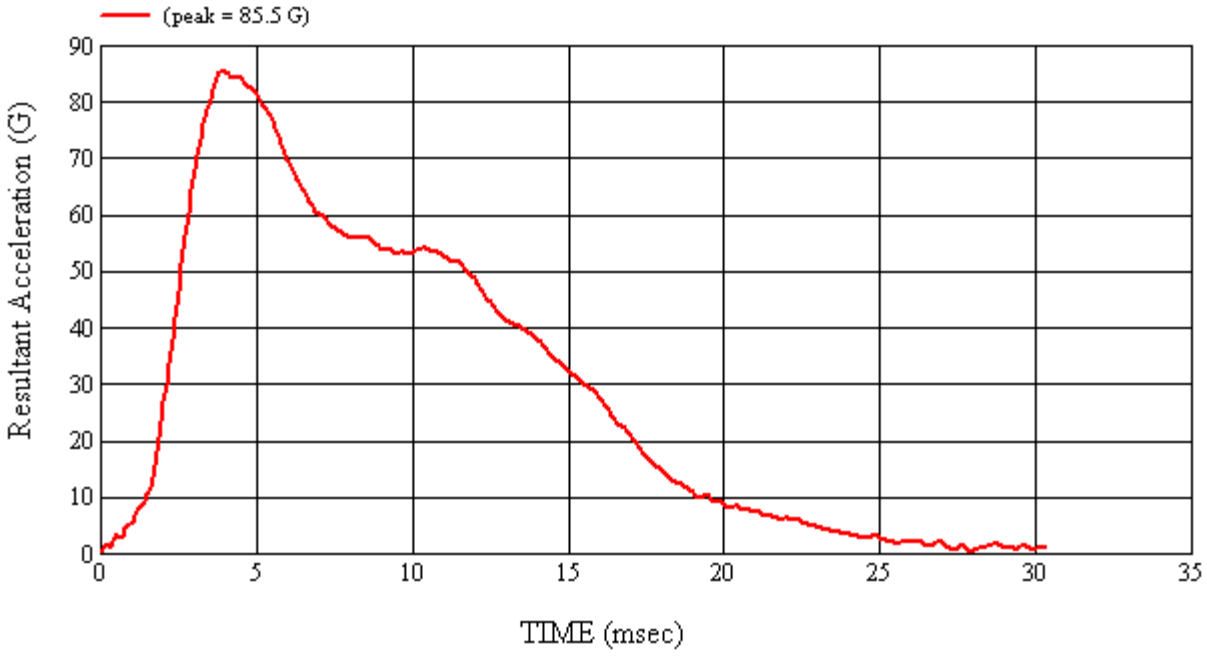
No damage observed

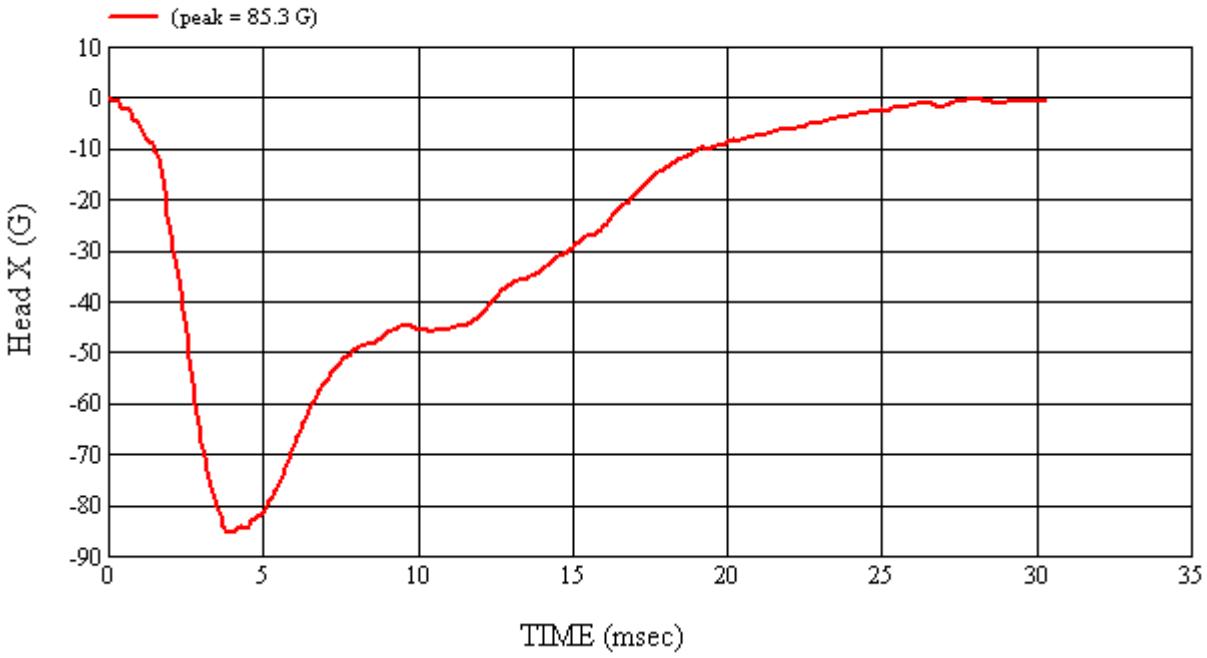
Recorded By: _____ Approved By*: _____ Date: 5/27/2009

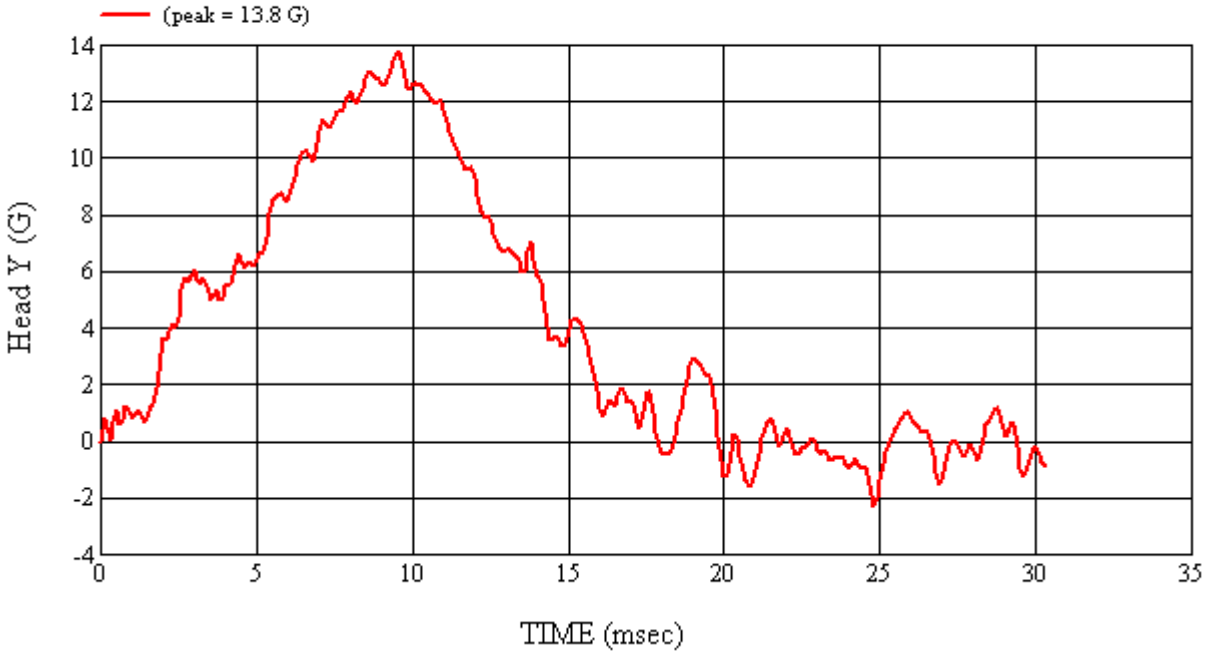
*Only necessary for NHTSA (Government) Compliance testing.

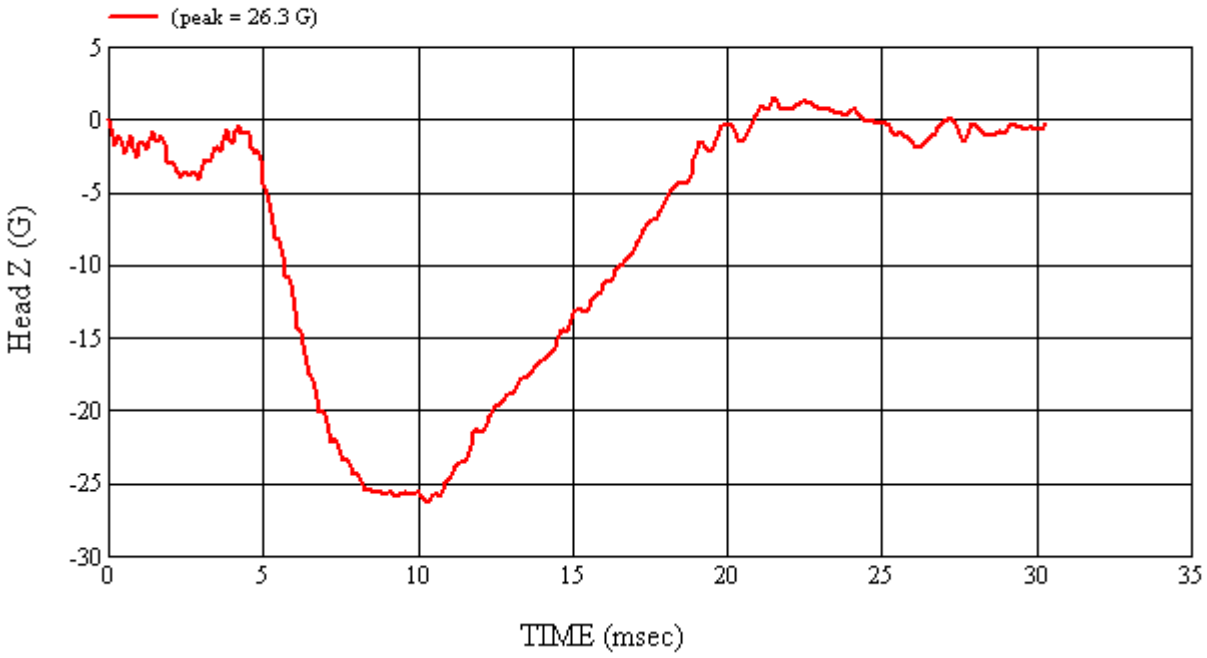
MGA Test #: FM9141 Target Location: RH, Left Side Test Date: 5/27/2009

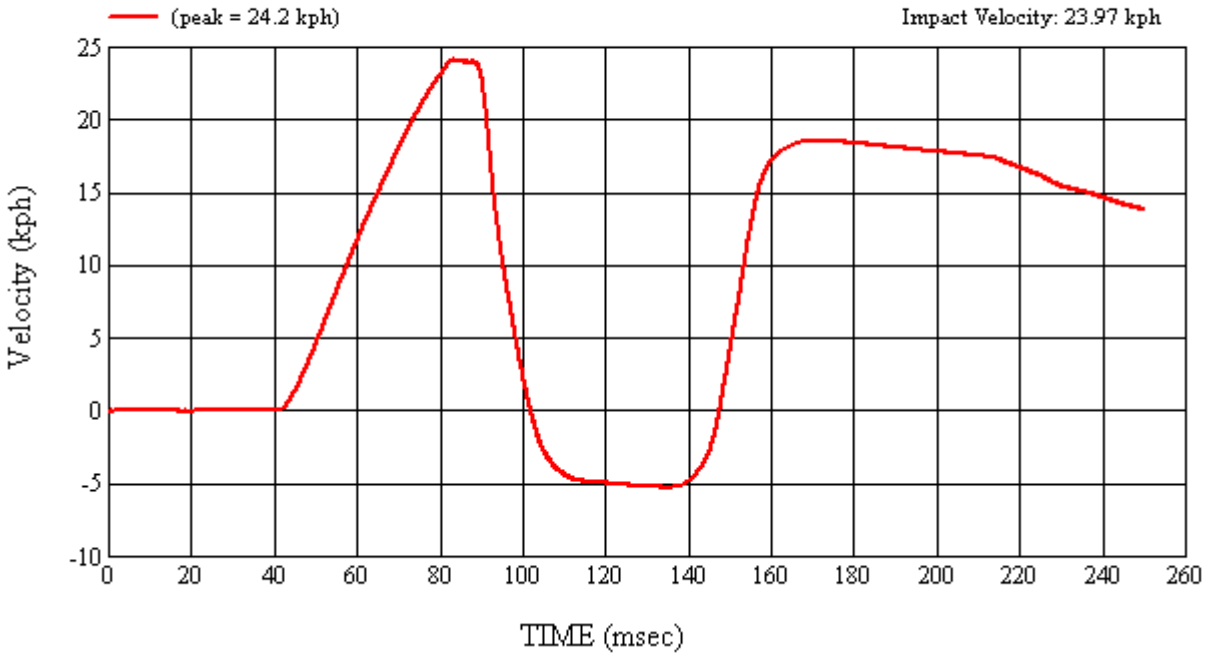


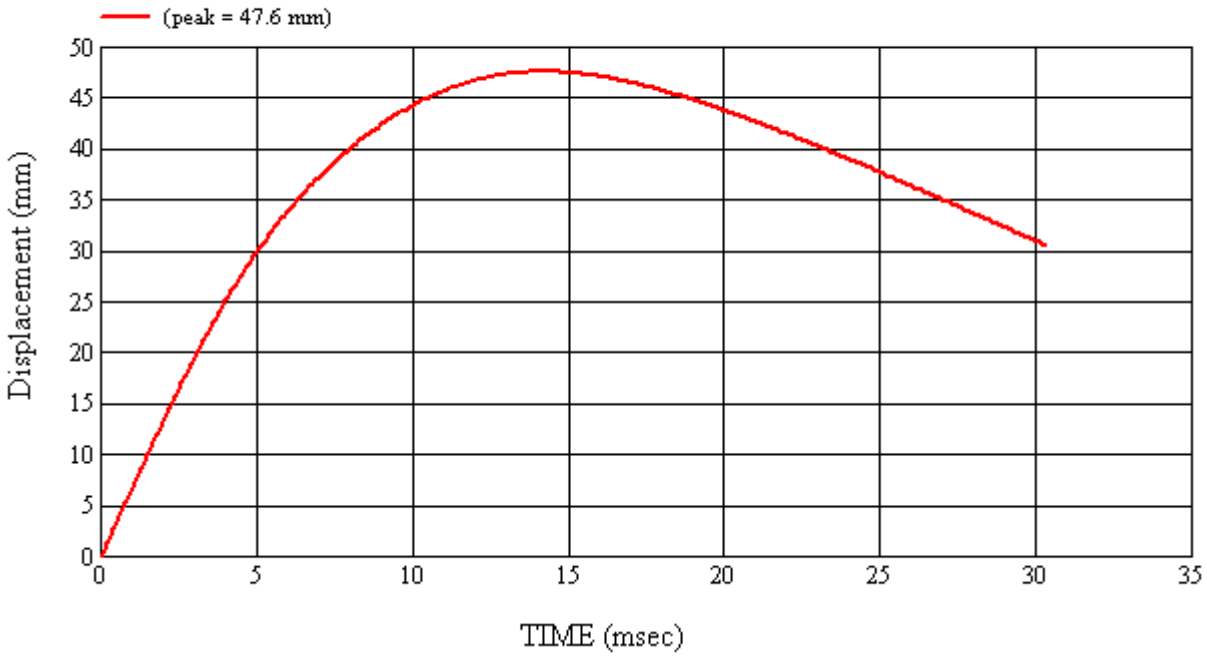


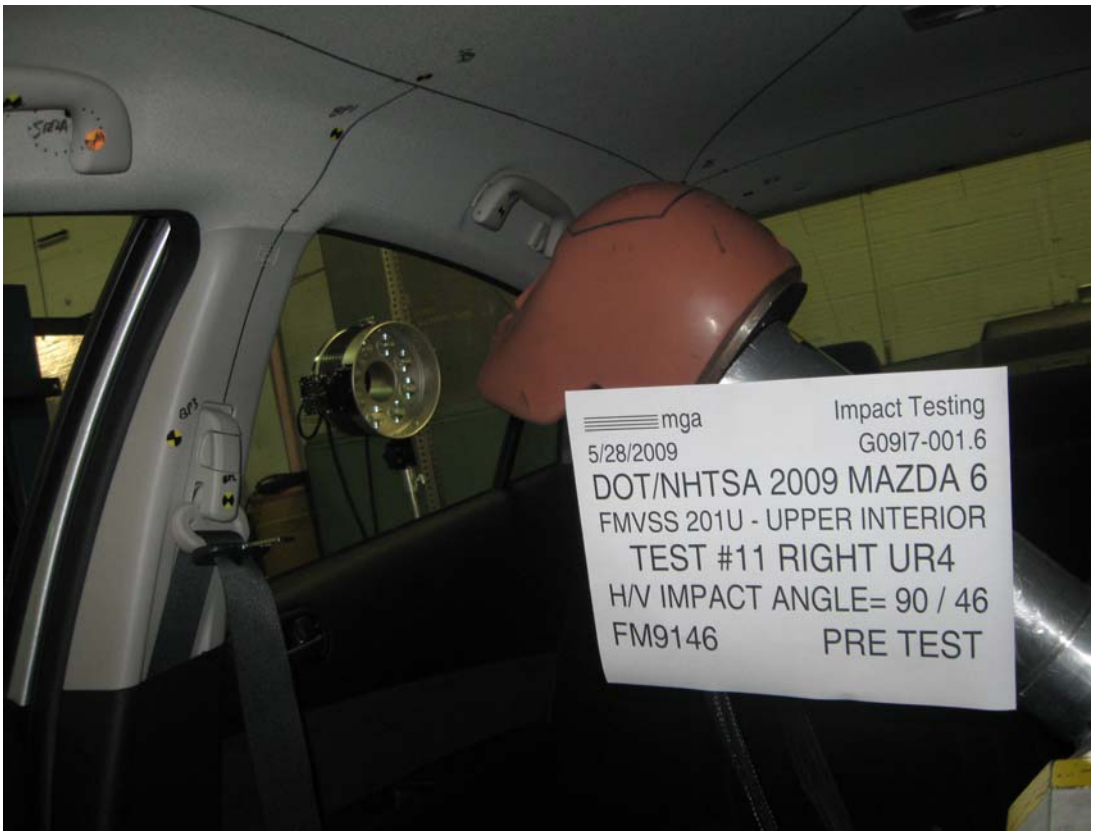

(peak = 85.3 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
0
5
10
15
20
25
30
35
TIME (msec)


(peak = 13.8 G)
Head Y (G)
14
12
10
8
6
4
2
0
-2
-4
0
5
10
15
20
25
30
35
TIME (msec)

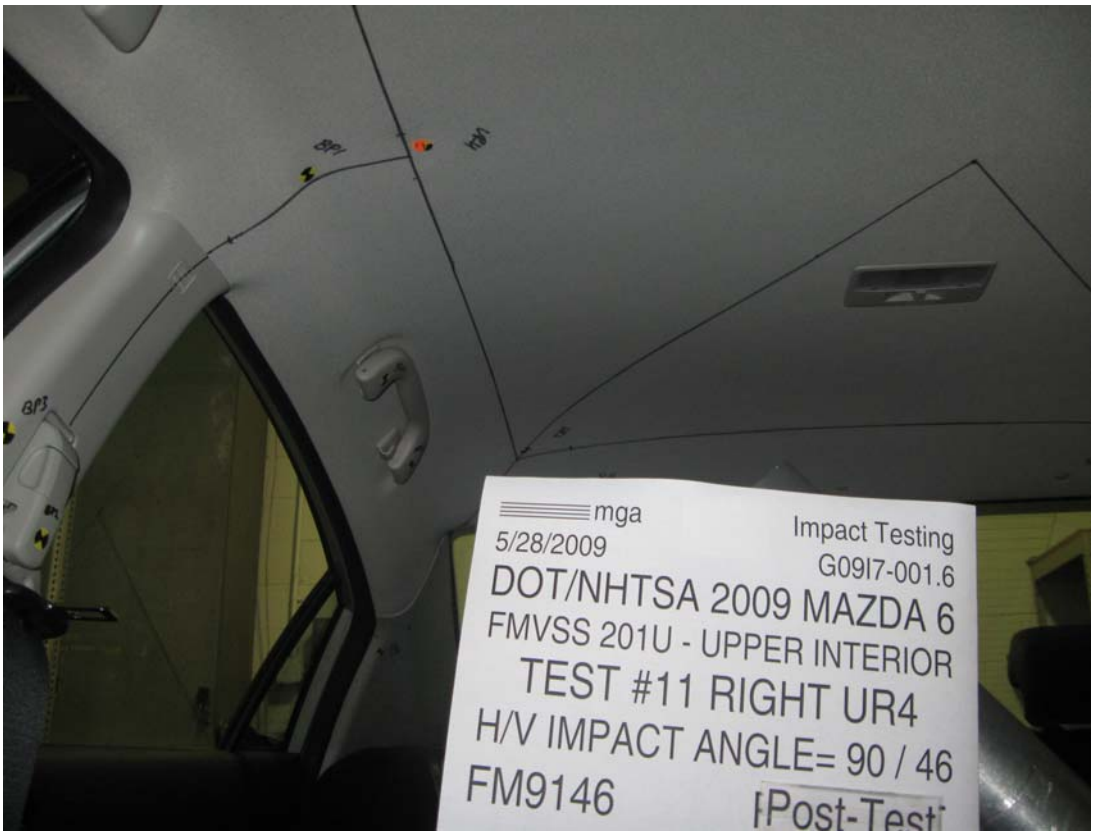

(peak = 26.3 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
0
5
10
15
20
25
30
35
TIME (msec)


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


(peak = 47.6 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
50
0
5
10
15
20
25
30
35
TIME (msec)


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 46
FM9146
PRE TEST


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 46
FM9146
PRE TEST


mga
5/28/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 46
FM9146
Post-Test


mga
5/28/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 46
FM9146
Post-Test


mga
Impact Testing
5/28/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 46
FM9146
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#11

Target (Vehicle Side): UR4Right

Temperature:20.9C

MGA Test Reference No.:FM9146

Humidity:57.2%

Approach Horizontal Angles:90º

Time of Test:3:18:15 PM

Approach Vertical Angles:46º

FMH Serial No:[037]

Additional Description: Located at BPR

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
711	721	8	24.0	36	2 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	AHTB2	-115.9	1.06	1.06
Y	6	J14103	93.7	0.85	0.85
Z	7	J35800	97.1	0.94	0.94

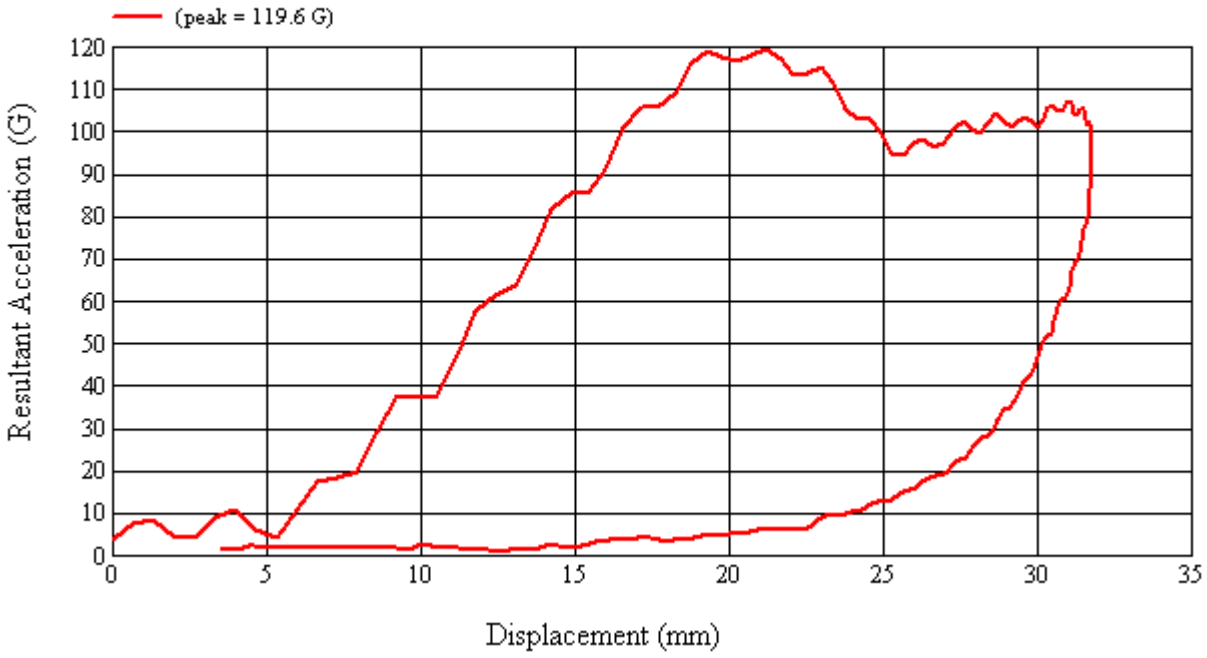
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

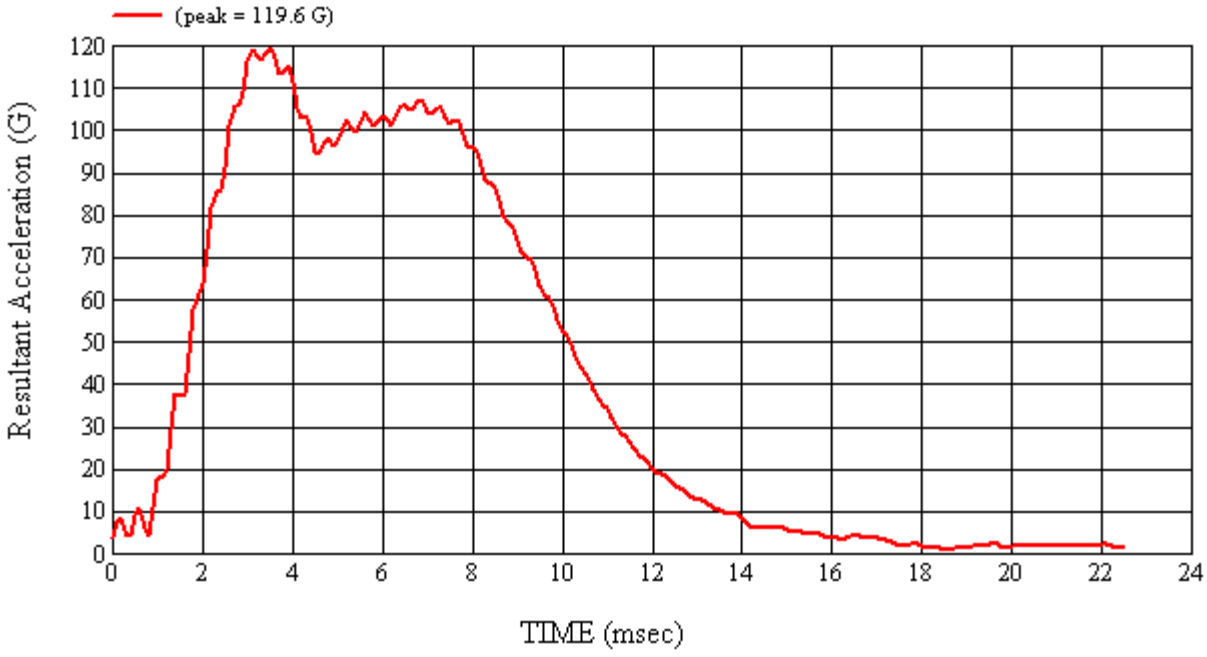
Small indentation in headliner

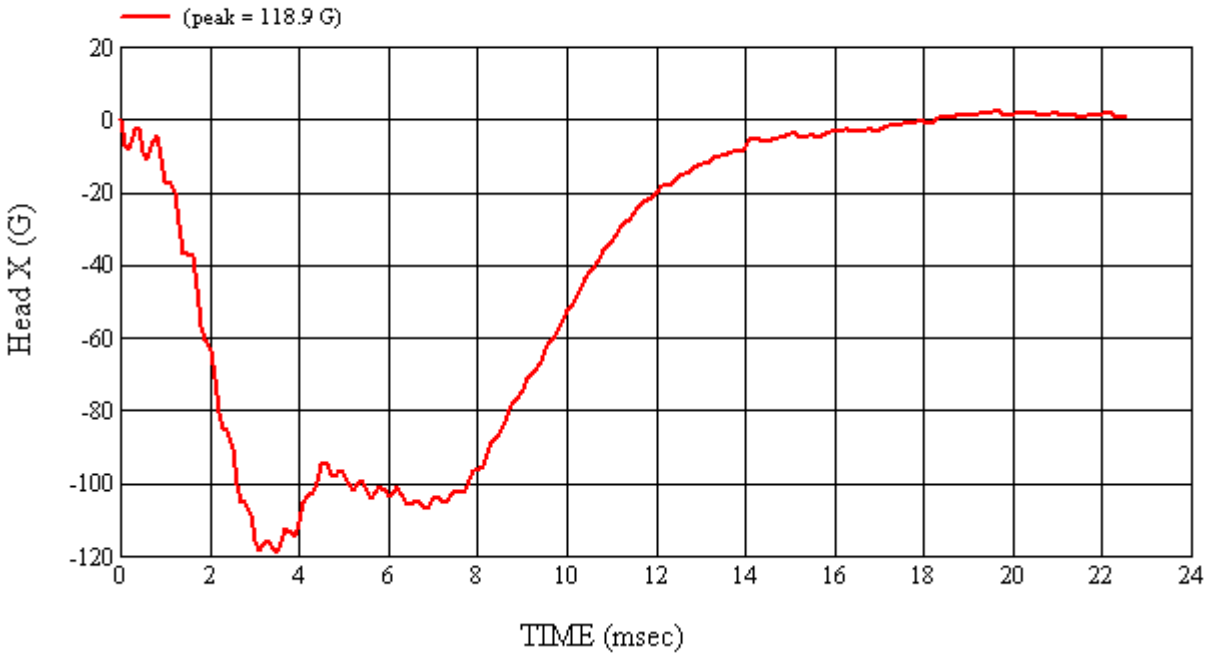
Recorded By: _____ Approved By*: _____ Date: 5/28/2009

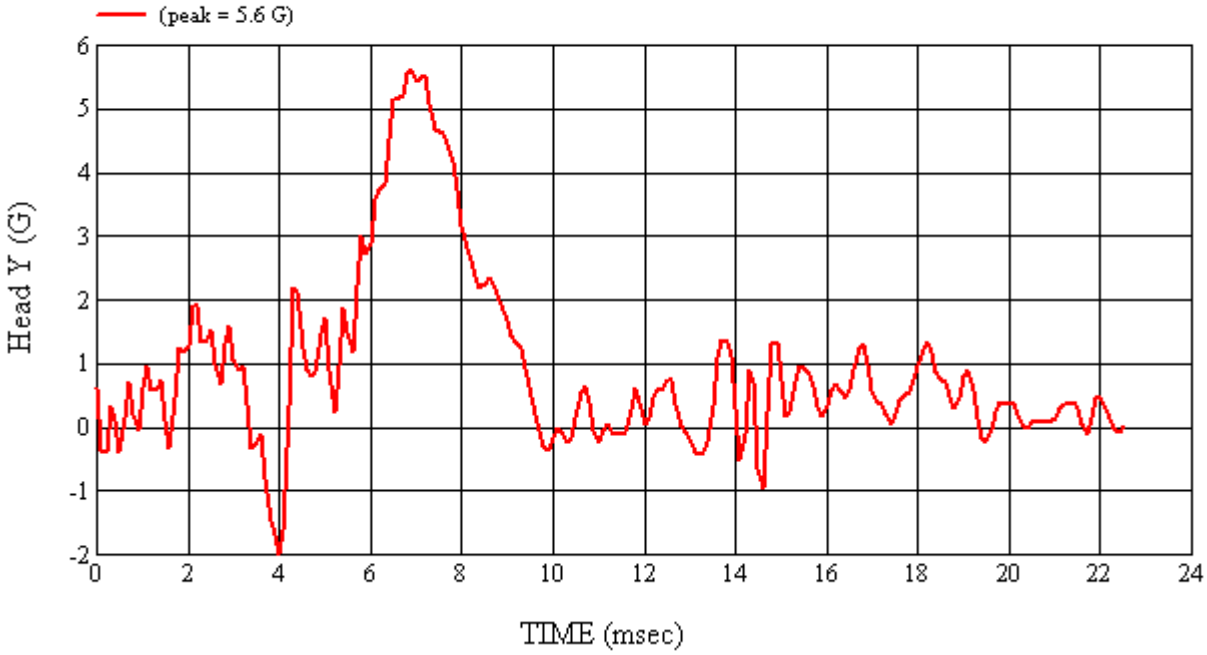
*Only necessary for NHTSA (Government) Compliance testing.

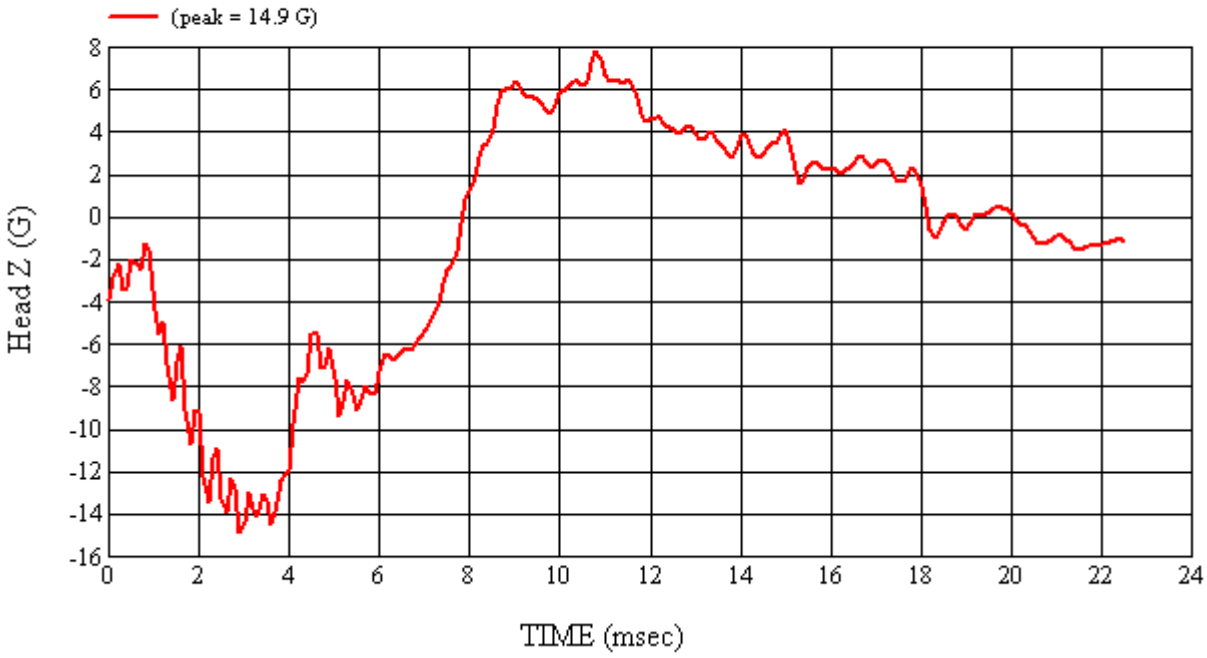
MGA Test #: FM9146 Target Location: UR4, Right Side Test Date: 5/28/2009

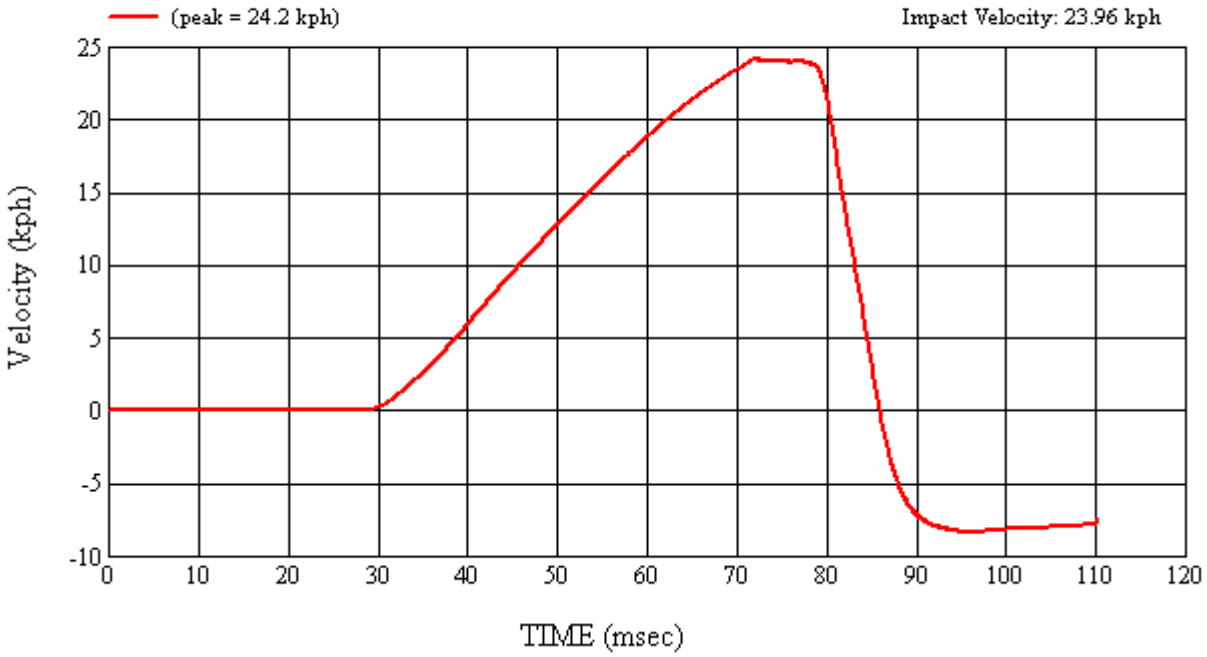


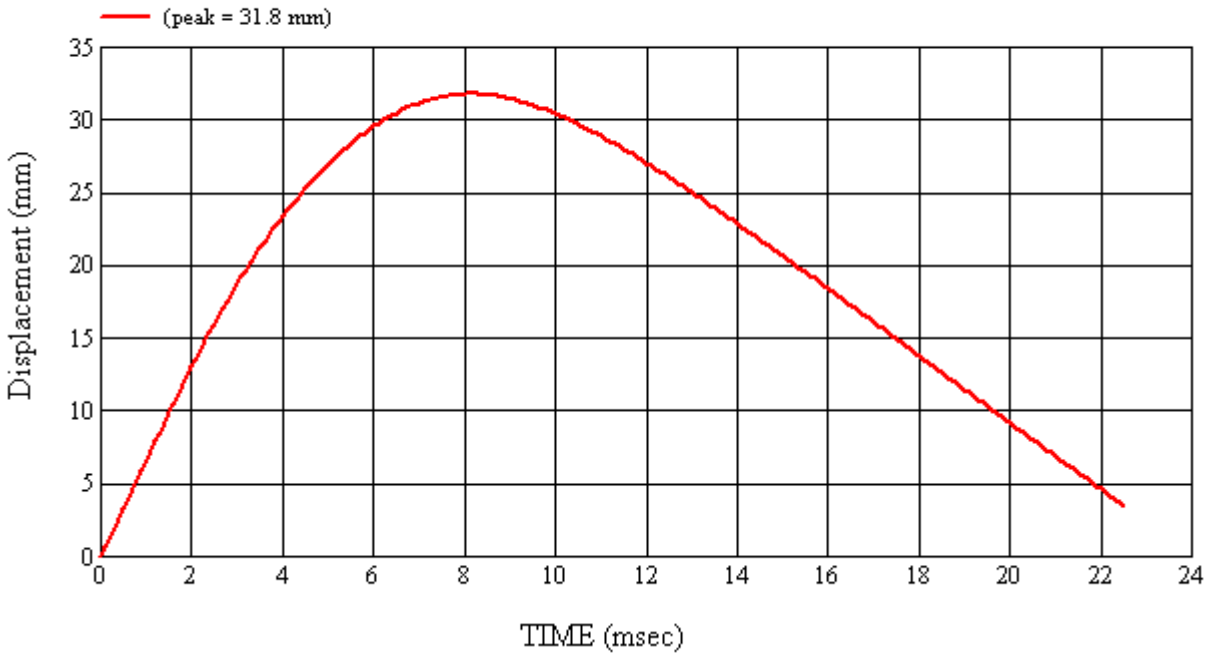


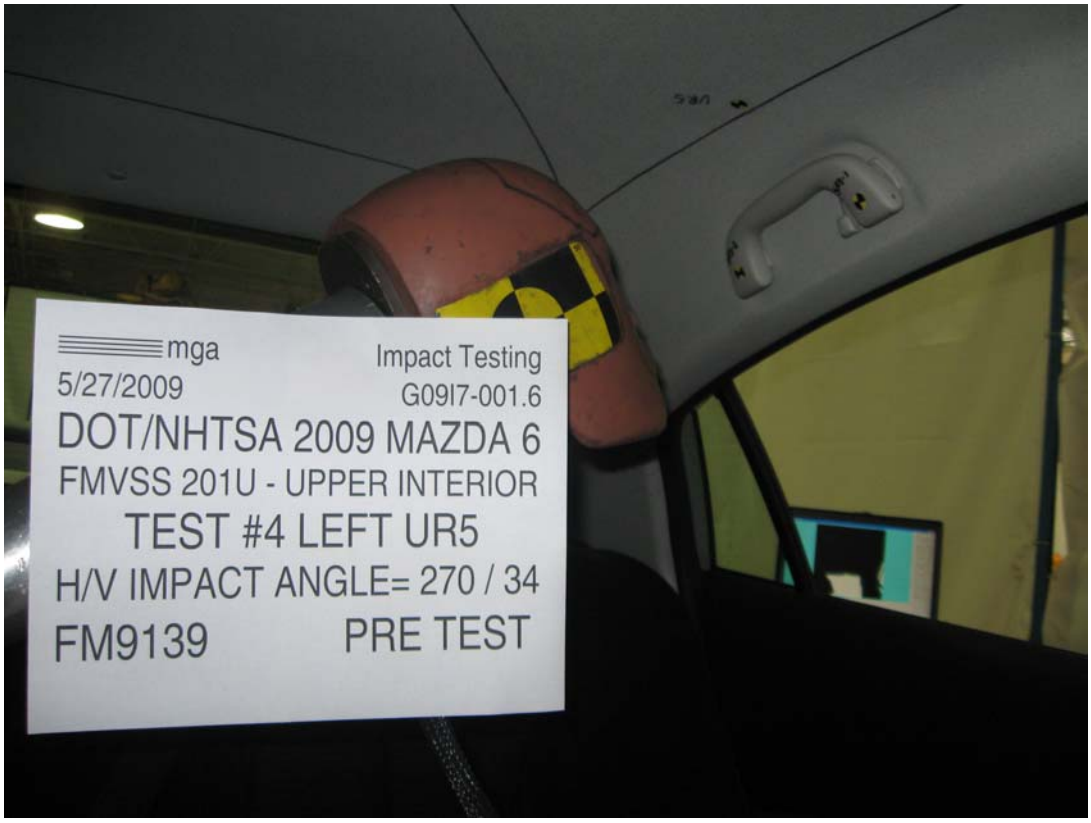

(peak = 118.9 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 5.6 G)
Head Y (G)
6
5
4
3
2
1
0
-1
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 14.9 G)
Head Z (G)
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 24.2 kph)
Impact Velocity: 23.96 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
TIME (msec)


(peak = 31.8 mm)
Displacement (mm)
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


mga
5/27/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR5
H/V IMPACT ANGLE= 270 / 34
FM9139
PRE TEST


mga
5/27/2009
Impact Testing
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR5
H/V IMPACT ANGLE= 270 / 34
FM9139
PRE TEST


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR5
H/V IMPACT ANGLE= 270 / 34
FM9139
Post-Test


mga
Impact Testing
G09I7-001.6
OT/NHTSA 2009 MAZDA 6
MVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR5
H/V IMPACT ANGLE= 270 / 34
FM9139
Post-Test


SR3-1


mga
Impact Testing
5/27/2009
G09I7-001.6
DOT/NHTSA 2009 MAZDA 6
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR5
H/V IMPACT ANGLE= 270 / 34
FM9139
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.6 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Mazda 6

GENERAL TEST PARAMETERS:

Test Number:#4

Target (Vehicle Side): UR5Left

Temperature:21.6C

MGA Test Reference No.:FM9139

Humidity:58.9%

Approach Horizontal Angles:270º

Time of Test:2:22:48 PM

Approach Vertical Angles:34º

FMH Serial No:[035]

Additional Description:Located at SR3-1

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
620	602	9	24.1	48	10 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.6	1.06	1.06
Y	6	J22664	94.3	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

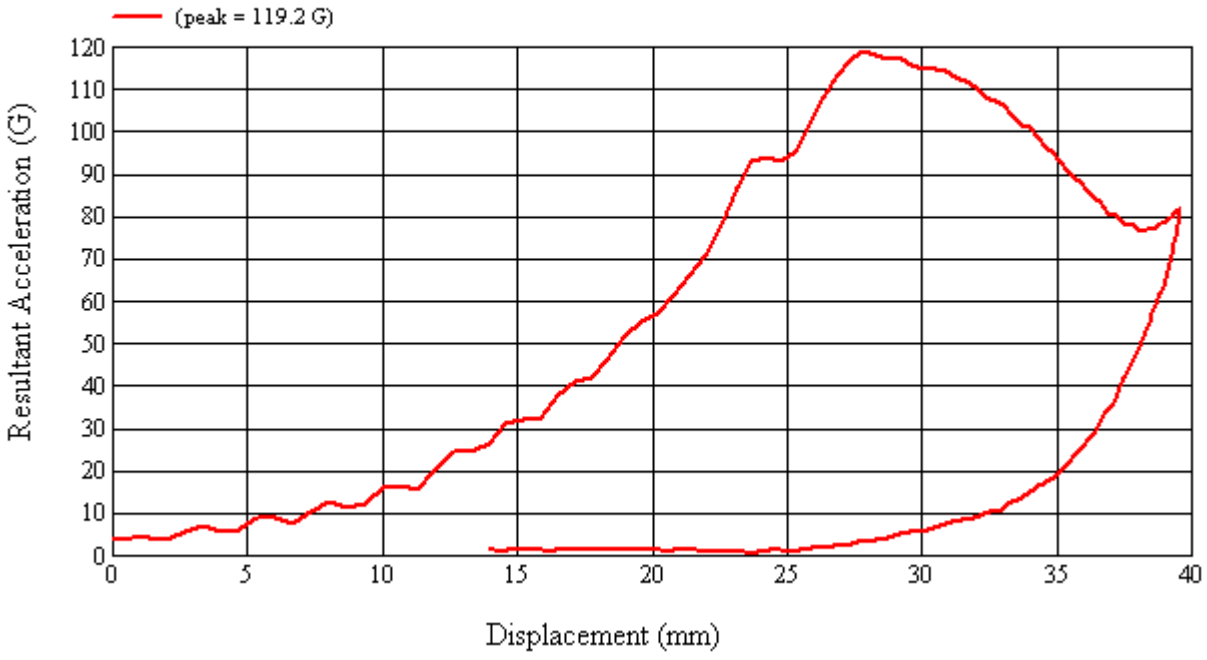
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

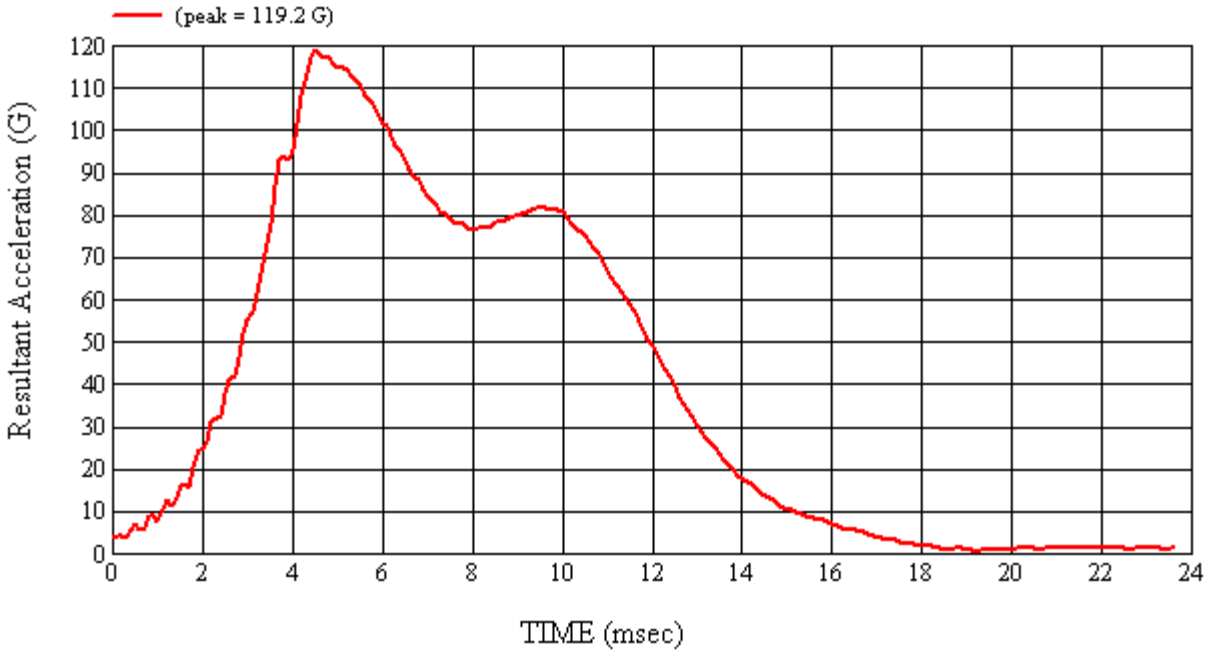
Crease in the headliner

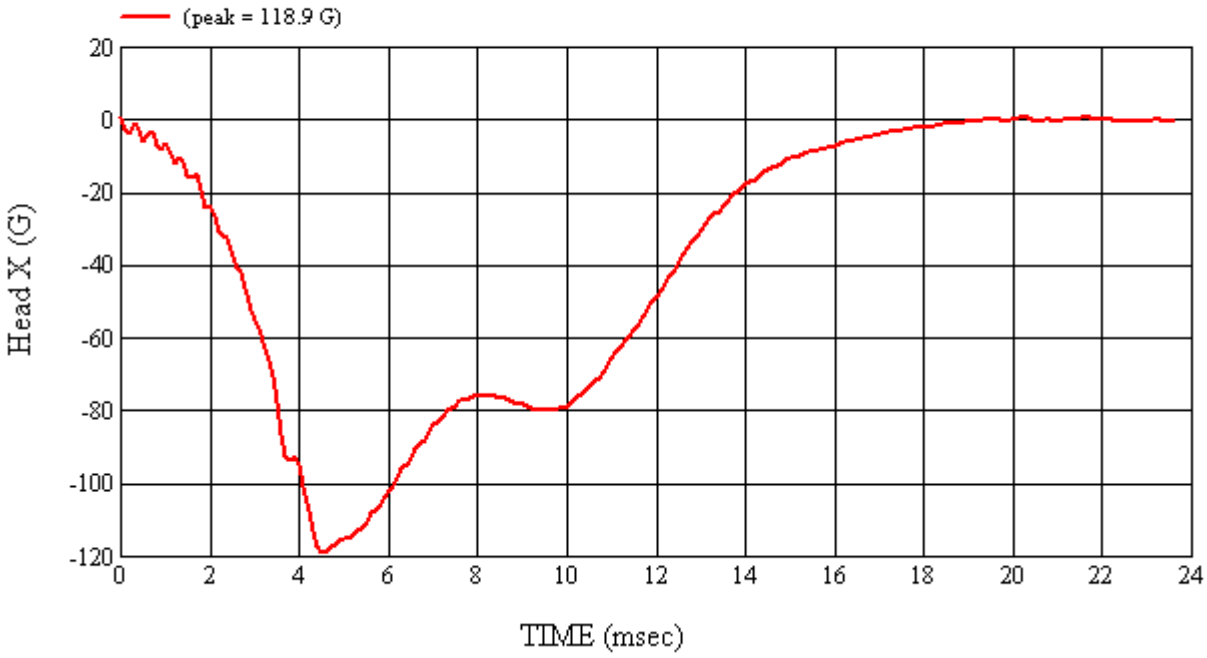
Recorded By: _____ Approved By*: _____ Date: 5/27/2009

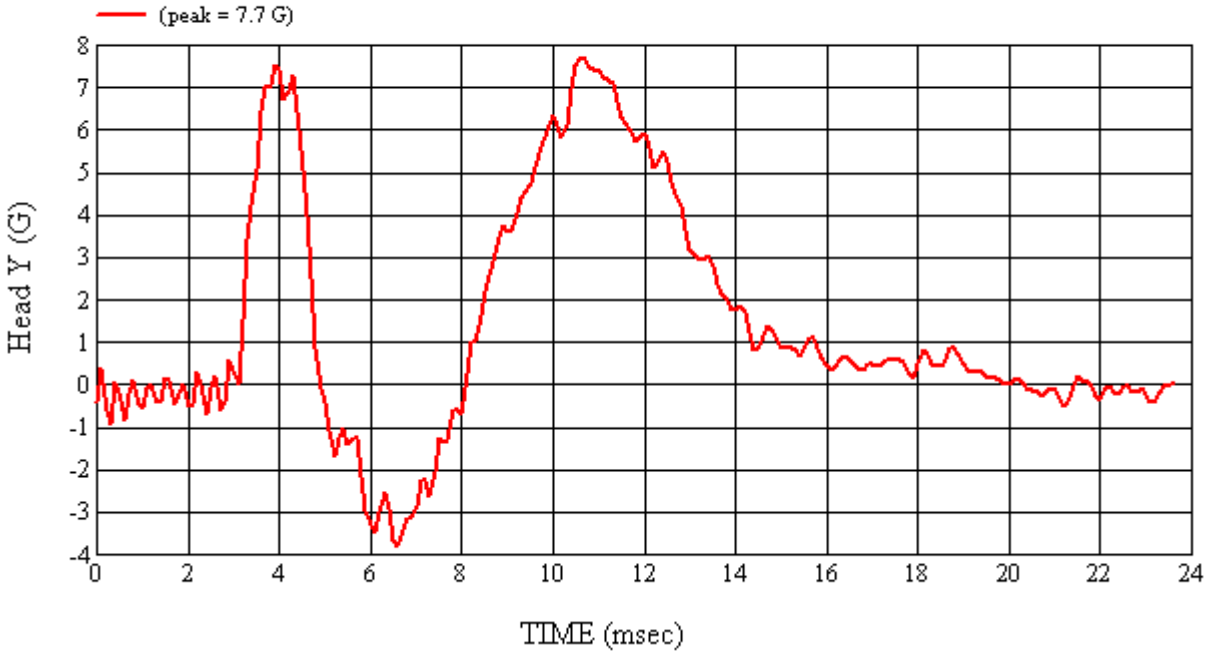
*Only necessary for NHTSA (Government) Compliance testing.

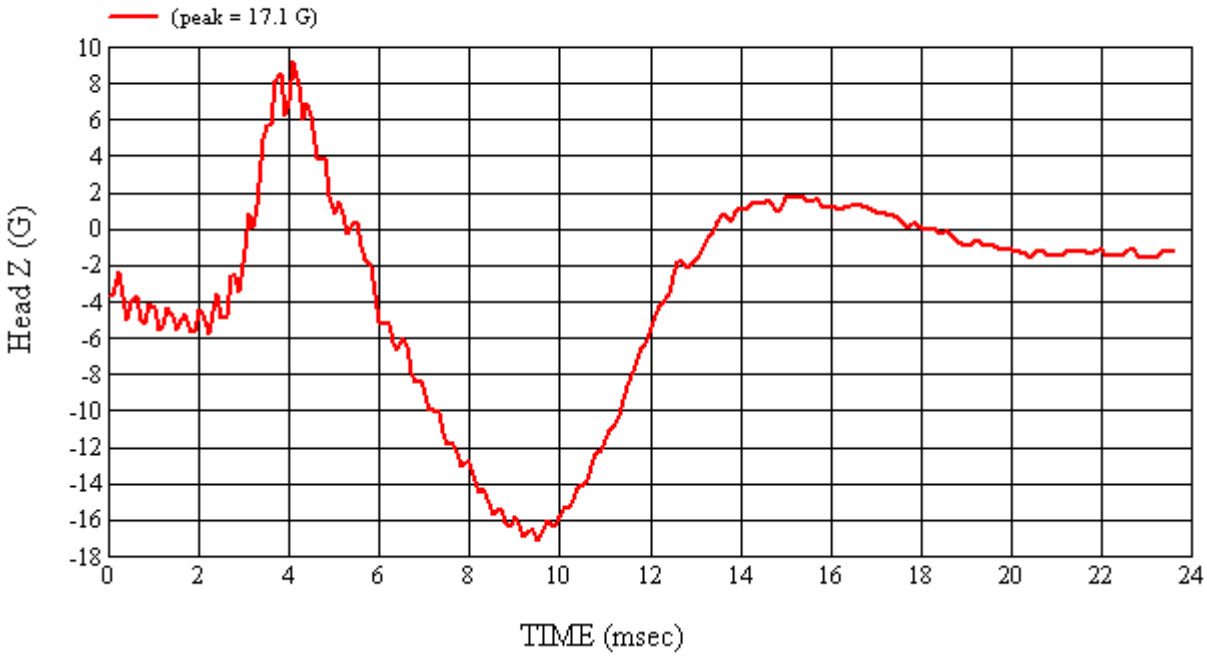
MGA Test #: FM9139 Target Location: UR5, Left Side Test Date: 5/27/2009

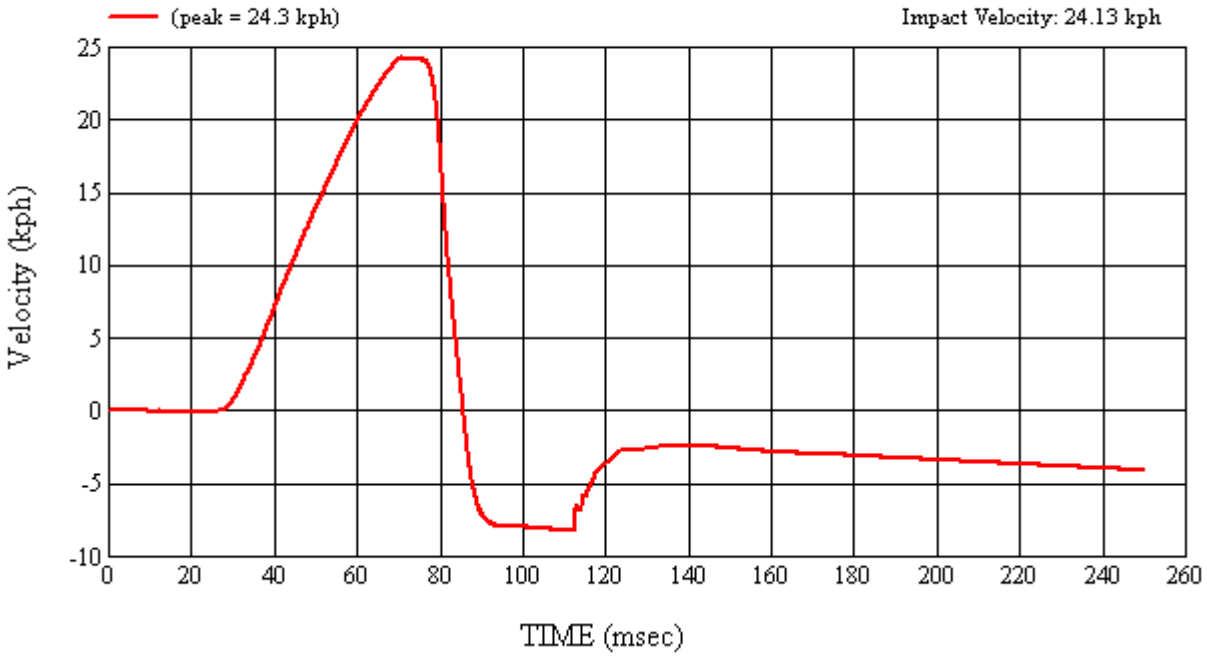


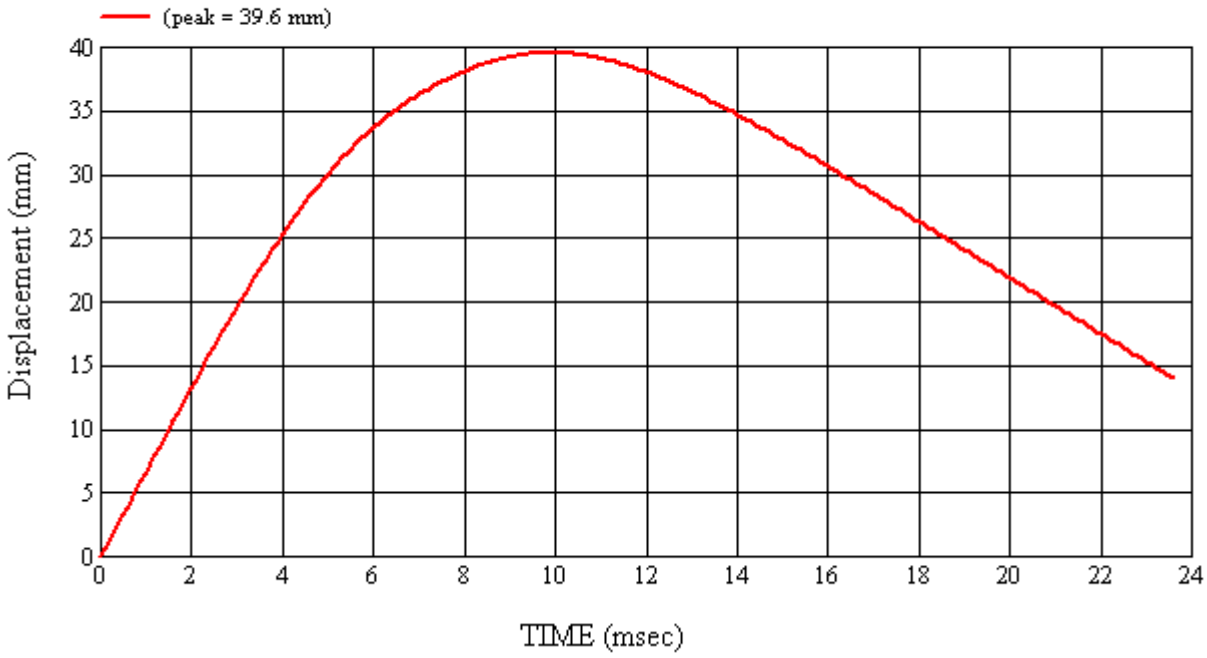



(peak = 118.9 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 7.7 G)
Head Y (G)
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 17.1 G)
Head Z (G)
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 24.3 kph)
Impact Velocity: 24.13 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


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

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

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

TABLE 4-1 LIST OF ITEMS USED

ITEM	MANUFACTURER NAME	MODEL #	FUNCTION OF ITEM	ACCURACY	CAL. INTERNAL
Head Drop Tower (includes test frame and DAS)	MGA Research Corp.	MGA-100-DC	FMH Calibration	N/A	N/A
Accelerometers	Endevco	7264-2000	Acceleration Data	±0.5%	6 months
*Digital Inclinometer	Mitutoyo	PRO 360 (MGA00730)	Set Angle of FMH/Targeting	0.1°	Annual
FMVSS 201U Test Frame (includes the propulsion control system, actuator, test frame, and DAS)	MGA Research Corp.	MGA-100-FMH	Test System	N/A	N/A
Free Motion Headforms	UTAMA UTAMA UTAMA	035 037 038	Test Device	N/A	Pre and Post-Test Series
High Speed Video	Vision Research	Miro	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	 TPM906 -- MGA00730	 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	MGA00081	Weigh FMH Head	± 0.01 lb	Annual
*Vehicle Scale	Sterling Scale Co.	26032389	Weighing Vehicle	± .5 kg	Annual

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

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

TABLE 4-2 FMH CALIBRATION SUMMARY

FMH Serial #		Headform Calibration Date	Weight (lbs)	Temp (ºC)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
Pre	#035	5/26/2009	9.90	22.1	40.4	237.5	1.7	Yes
Pre	#035	5/29/2009	9.90	21.8	57.2	235.5	6.8	Yes
Pre	#037	5/26/2009	9.96	22.1	41.3	253.0	4.5	Yes
Post	#037	5/29/2009	9.96	21.7	60.5	251.9	8.3	Yes
Pre	#038	5/26/2009	9.90	22.2	40.6	242.2	14.5	Yes
Post	#038	5/29/2009	9.90	21.8	55.1	250.9	8.4	Yes

4-1 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

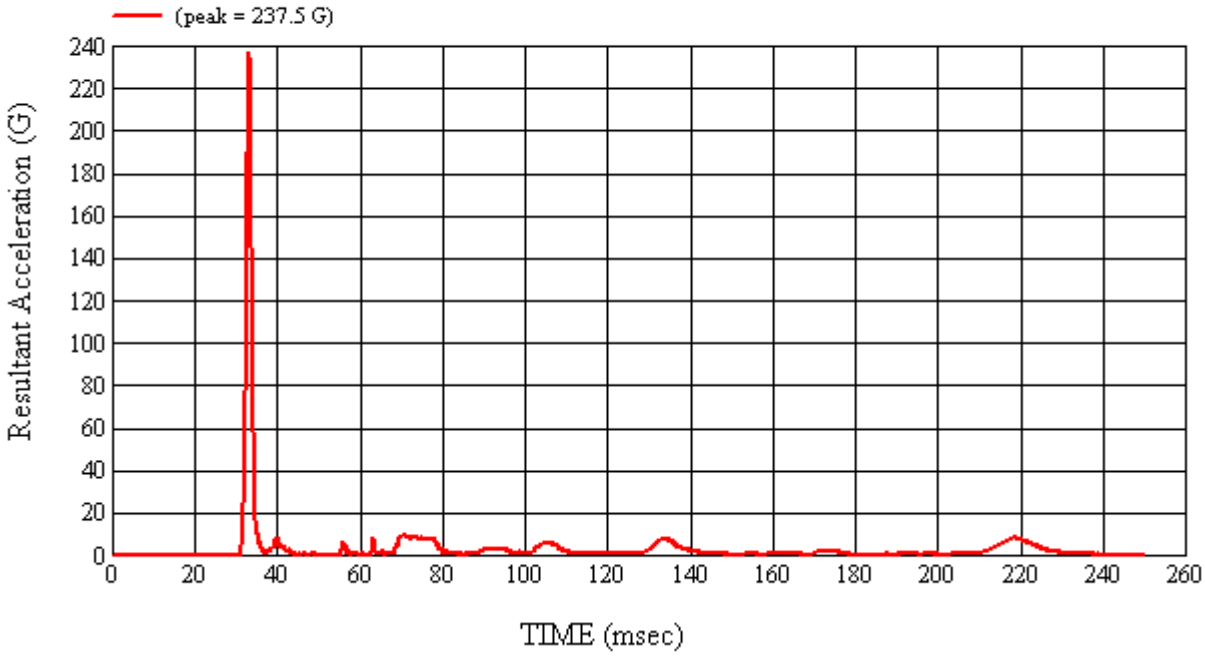
HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 5/26/2009 CALIBRATION TIME: 9:35:44 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.1
Relative Humidity	10% to 70%	40.4
Peak Resultant Acceleration	225 G's to 275 G's	237.5
Peak Lateral Acceleration	15 G's Maximum	1.7
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35919	03/02/09	09/02/09
2	ENDEVCO	7264-2000	J22664	03/02/09	09/02/09
3	ENDEVCO	7264-2000	J35924	03/02/09	09/02/09

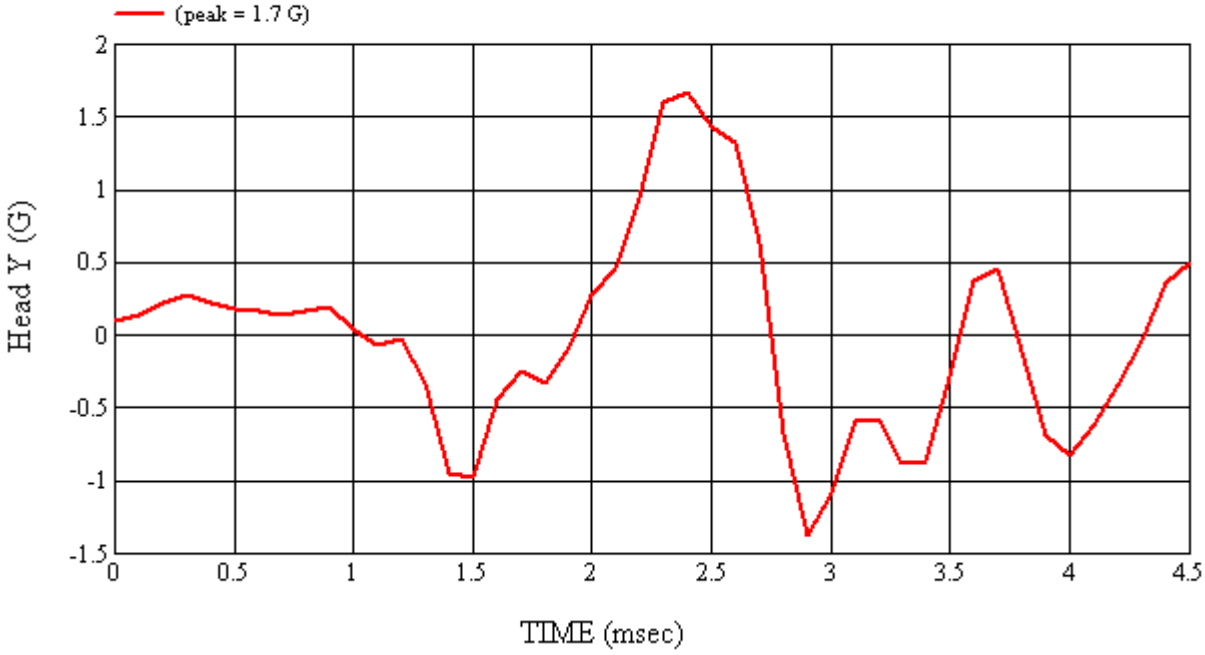
REMARKS:

RECORDED BY: _____ DATE: 5/26/2009

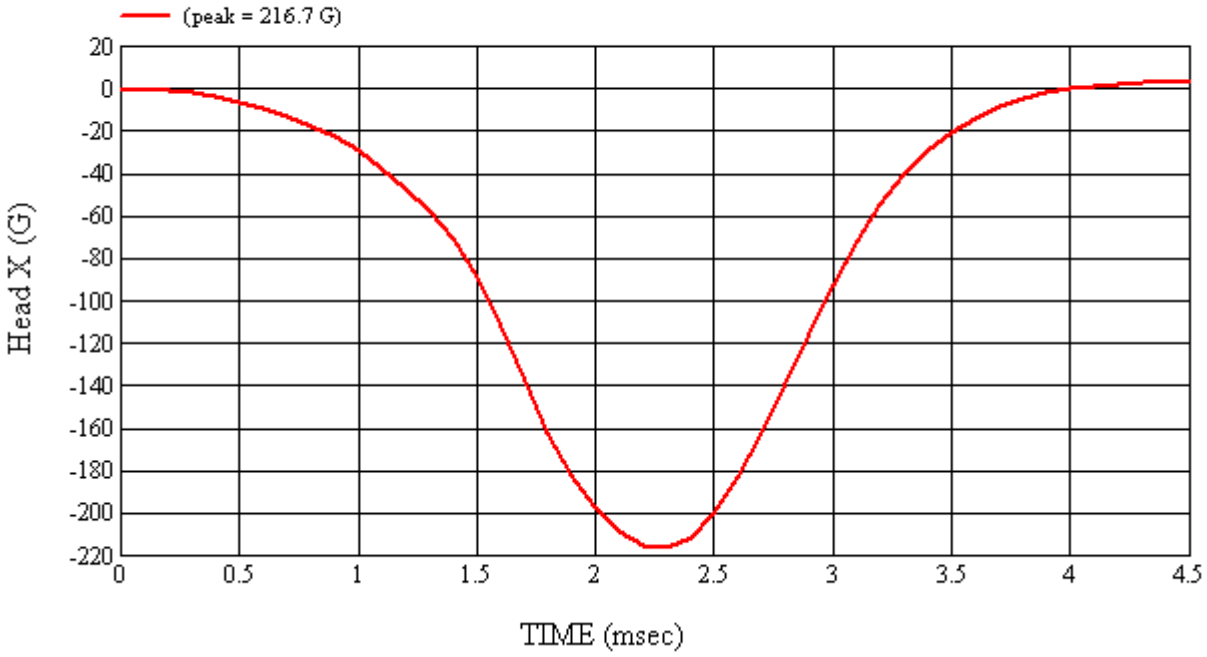
APPROVED BY: _____



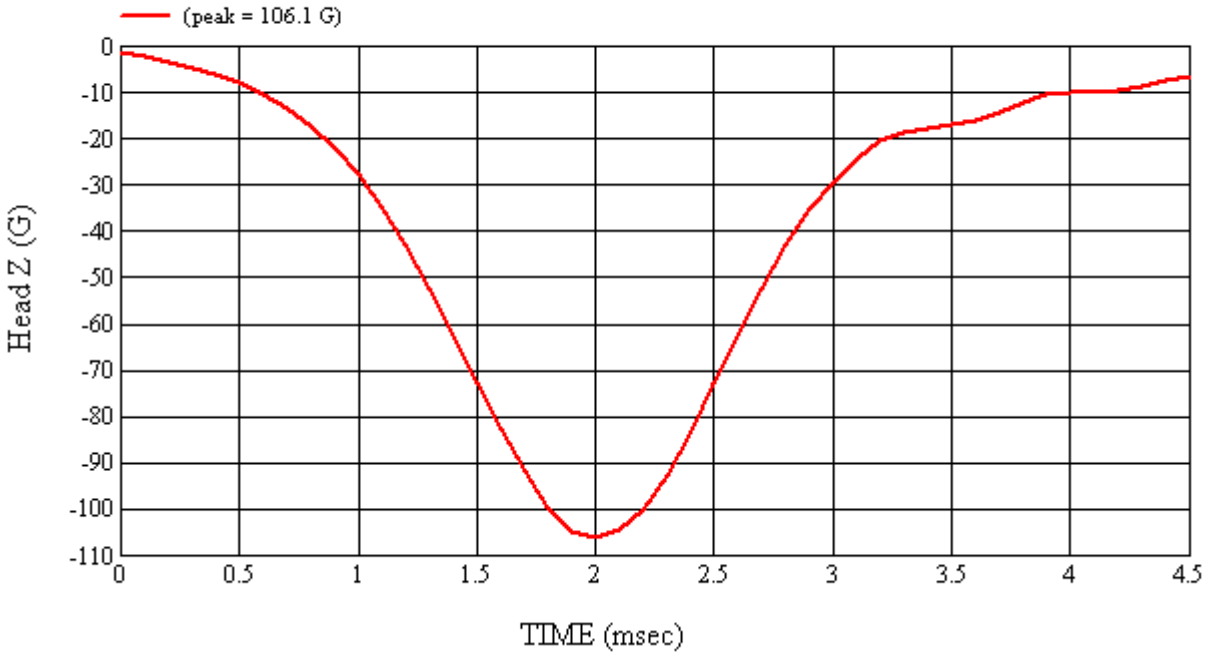
Head 035 (Pre) Calibration #H35017



Head 035 (Pre) Calibration #H35017



Head 035 (Pre) Calibration #H35017



Head 035 (Pre) Calibration #H35017

4-2 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 5/29/2009 CALIBRATION TIME: 10:47:34 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	21.8
Relative Humidity	10% to 70%	57.2
Peak Resultant Acceleration	225 G's to 275 G's	235.5
Peak Lateral Acceleration	15 G's Maximum	6.8
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION

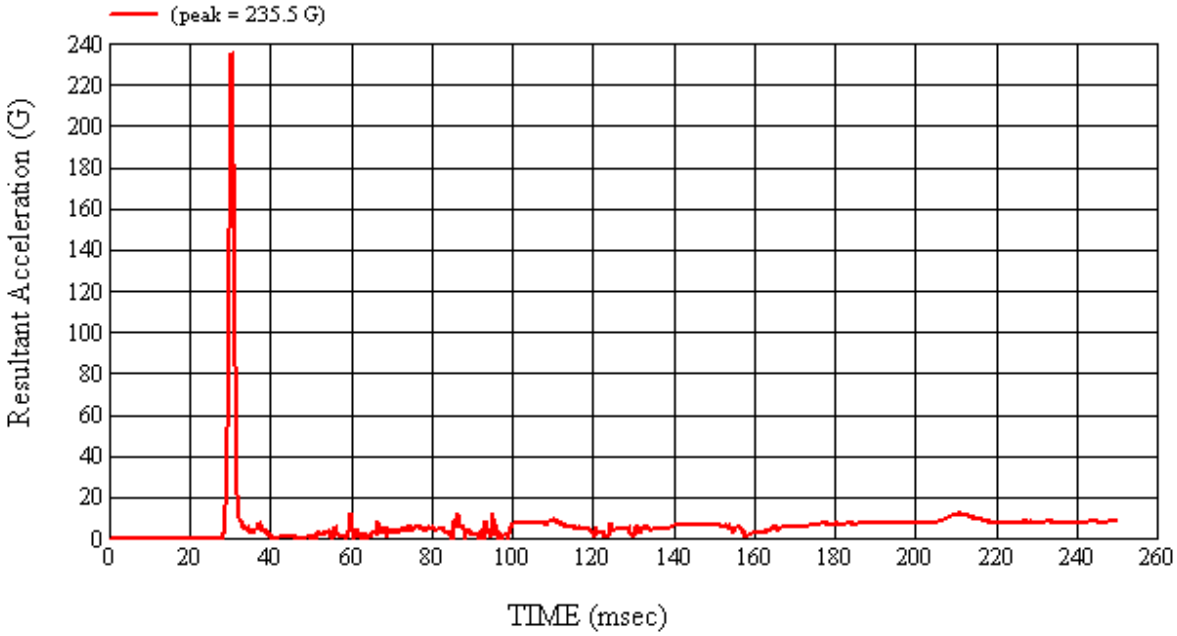
HEAD ACCELEROMETERS

Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	J35919	03/02/09	09/02/09
2	ENDEVCO	7264-2000	J22664	03/02/09	09/02/09
3	ENDEVCO	7264-2000	J35924	03/02/09	09/02/09

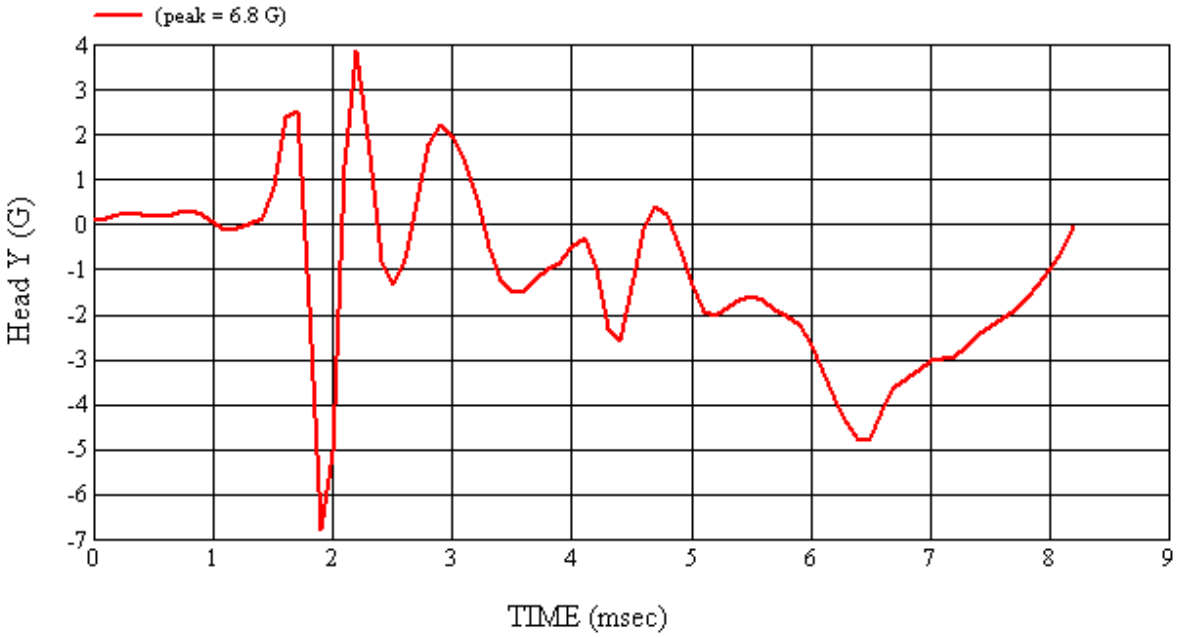
REMARKS:

RECORDED BY:  DATE: 5/29/2009

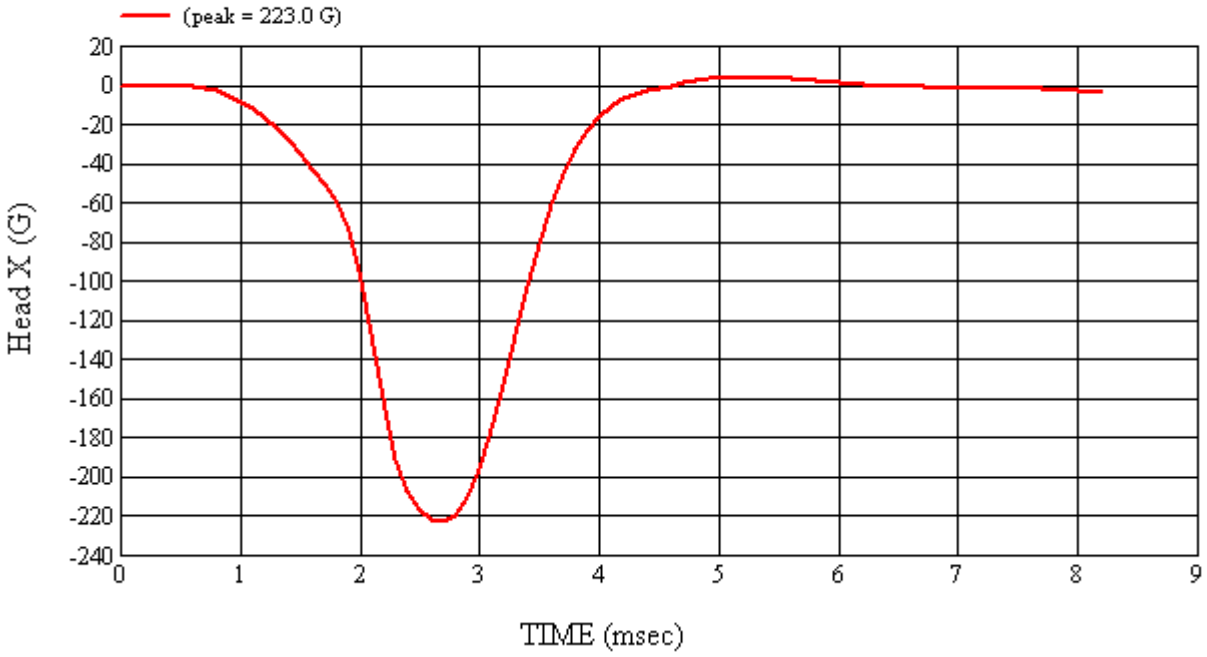
APPROVED BY: 



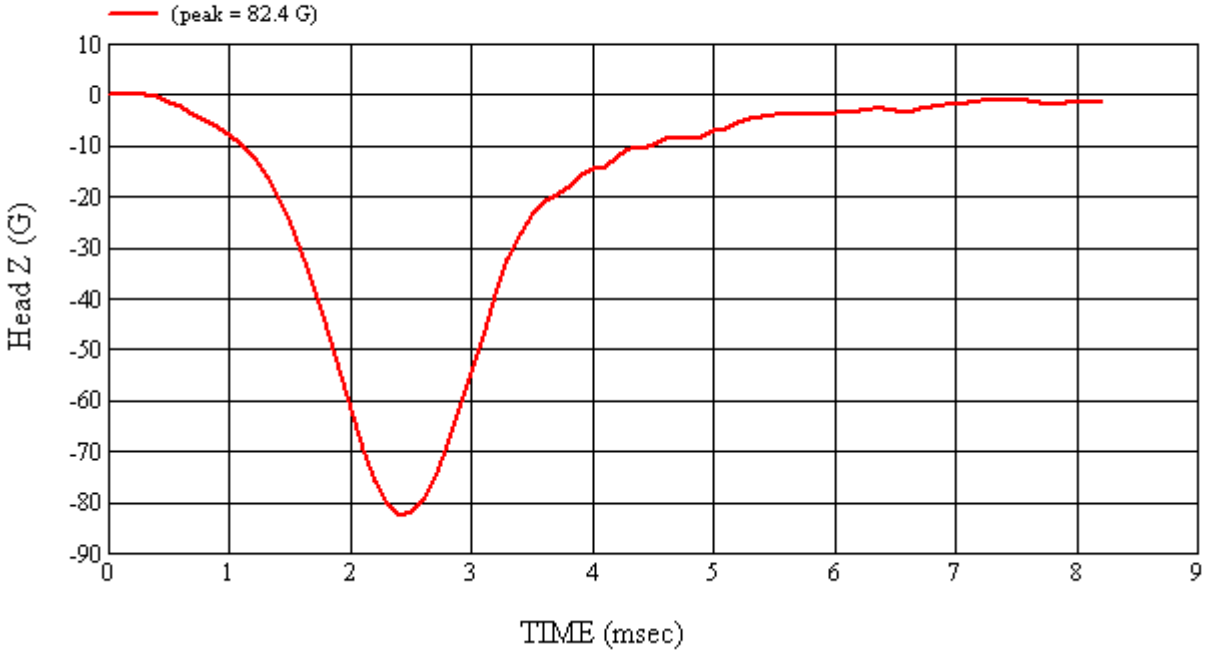
Head 035 (Pre) Calibration #H35018



Head 035 (Pre) Calibration #H35018



Head 035 (Pre) Calibration #H35018



Head 035 (Pre) Calibration #H35018

4-3 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 5/26/2009 CALIBRATION TIME: 9:57:57 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22.1
Relative Humidity	10% to 70%	41.3
Peak Resultant Acceleration	225 G's to 275 G's	253.0
Peak Lateral Acceleration	15 G's Maximum	4.5
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION

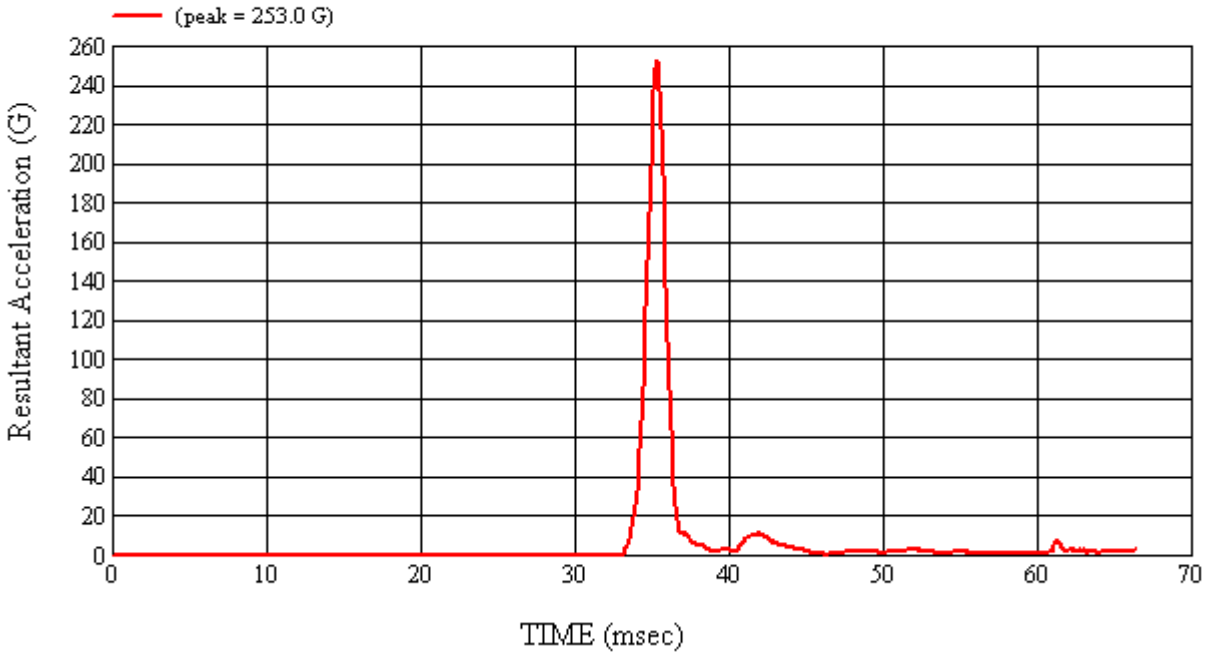
HEAD ACCELEROMETERS

Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	AHTB2	03/02/09	09/02/09
2	ENDEVCO	7264-2000	J14103	03/02/09	09/02/09
3	ENDEVCO	7264-2000	J35800	03/02/09	09/02/09

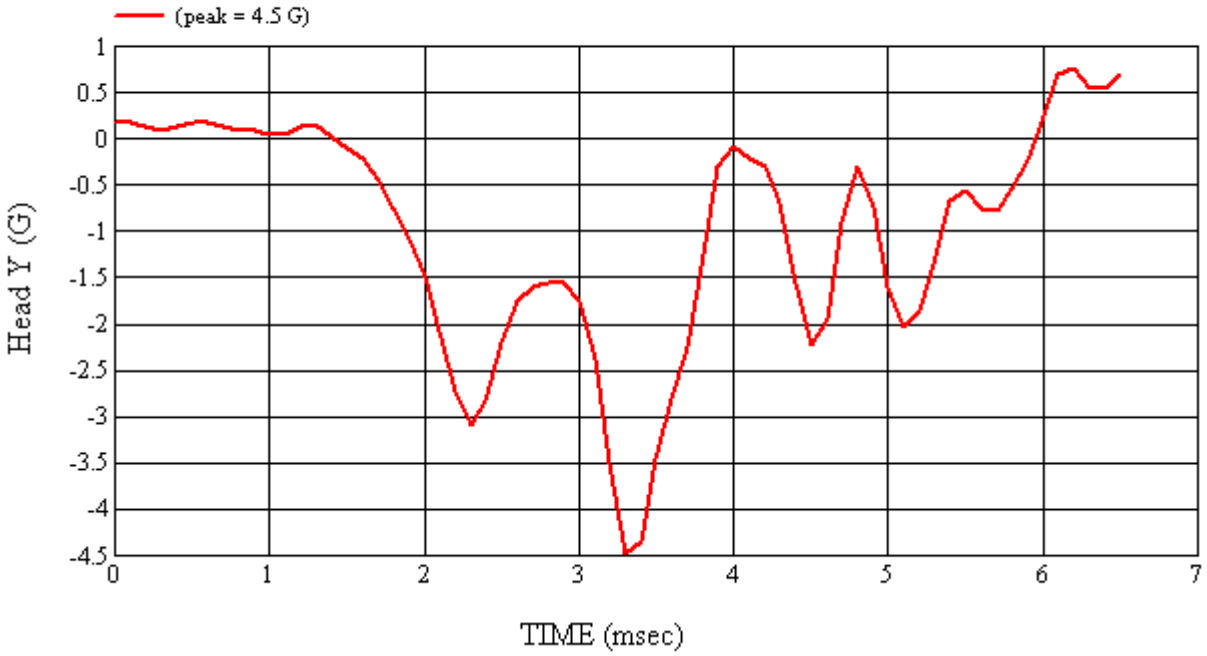
REMARKS:

RECORDED BY: _____ DATE: 5/26/2009

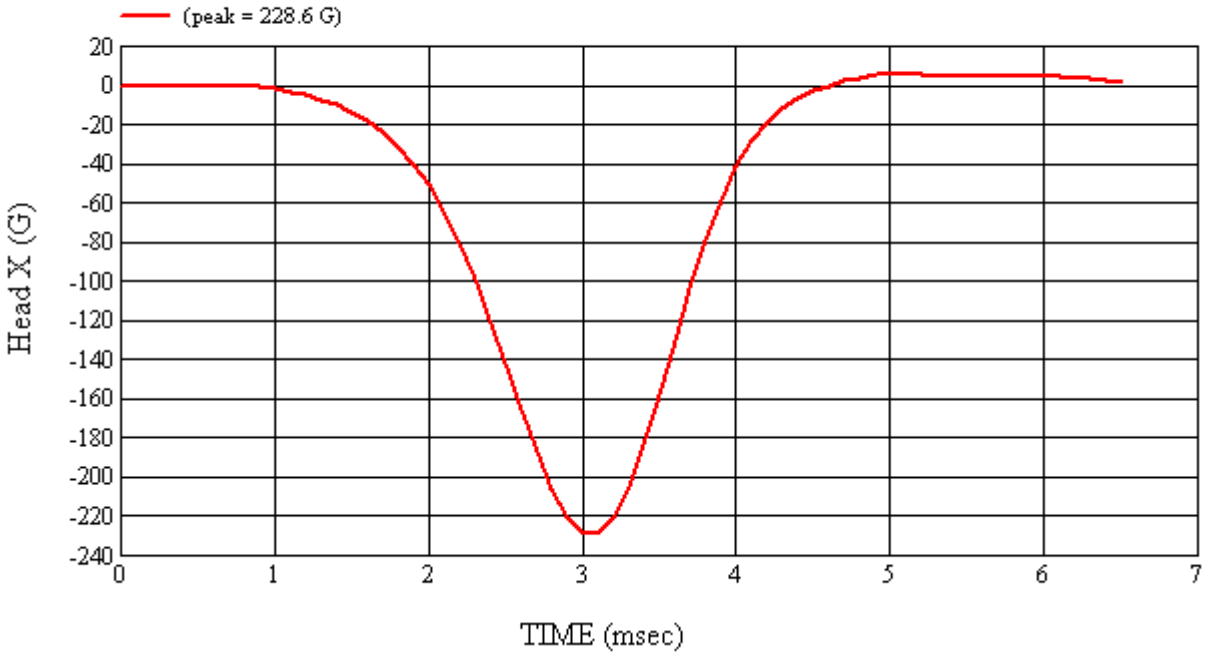
APPROVED BY: _____



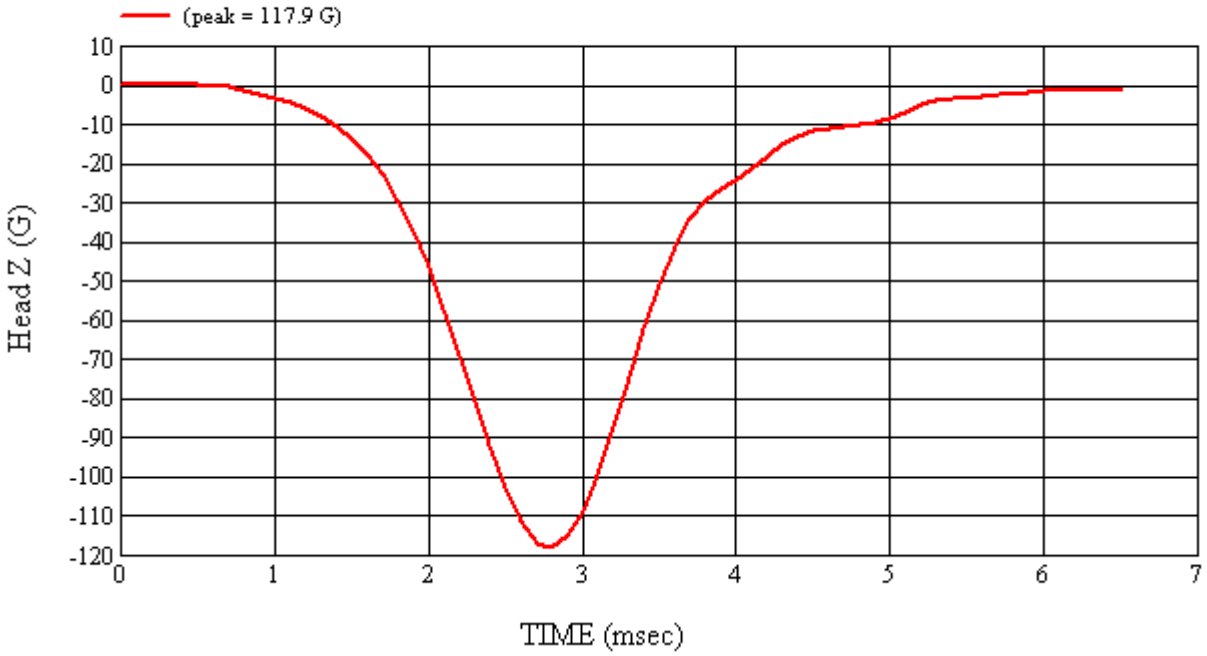
Head 037 (Pre) Calibration #H37017



Head 037 (Pre) Calibration #H37017



Head 037 (Pre) Calibration #H37017



Head 037 (Pre) Calibration #H37017

4-4 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

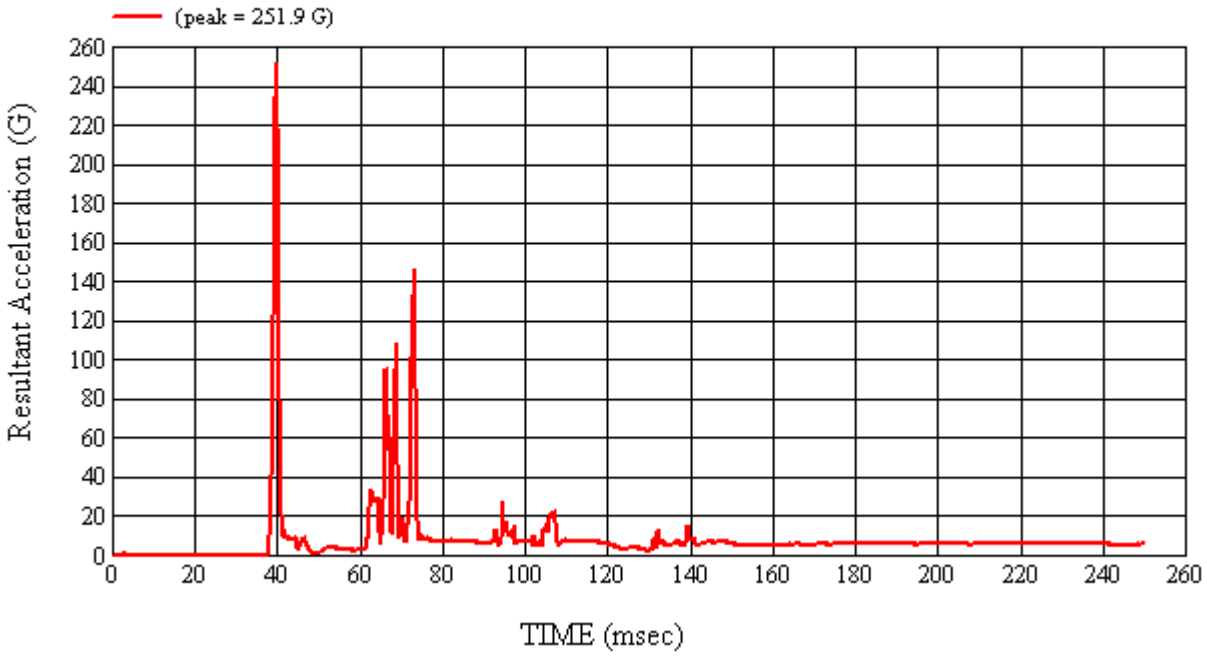
HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 5/29/2009 CALIBRATION TIME: 11:02:21 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	21.7
Relative Humidity	10% to 70%	60.5
Peak Resultant Acceleration	225 G's to 275 G's	251.9
Peak Lateral Acceleration	15 G's Maximum	8.3
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	AHTB2	03/02/09	09/02/09
2	ENDEVCO	7264-2000	J14103	03/02/09	09/02/09
3	ENDEVCO	7264-2000	J35800	03/02/09	09/02/09

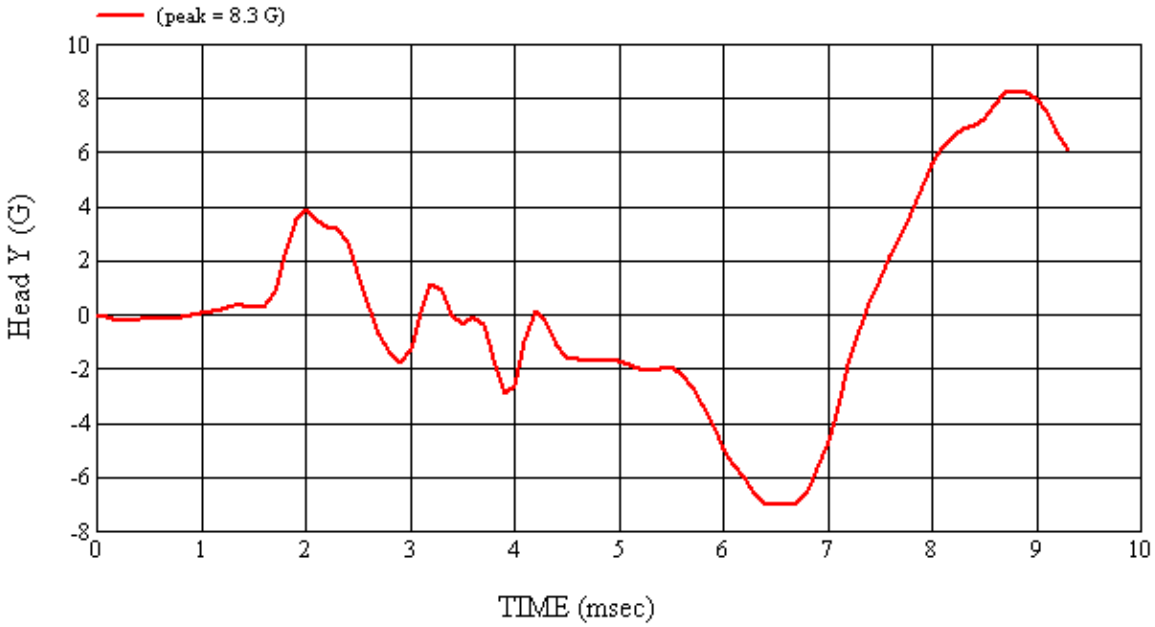
REMARKS:

RECORDED BY: _____ DATE: 5/29/2009

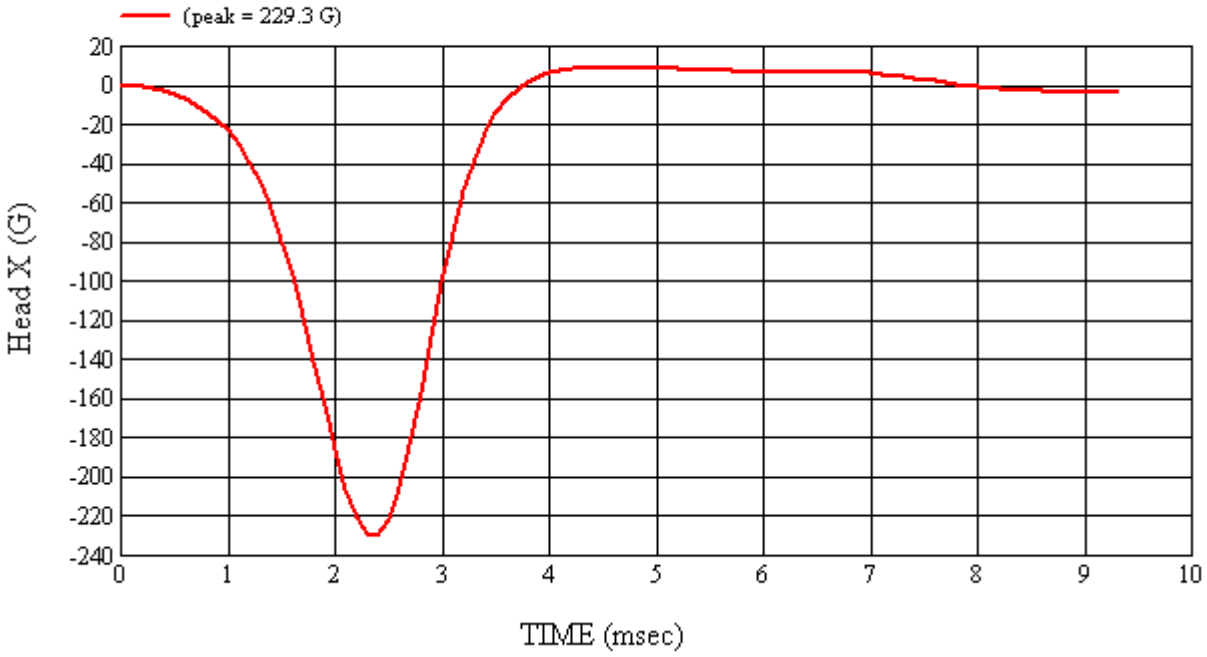
APPROVED BY: _____



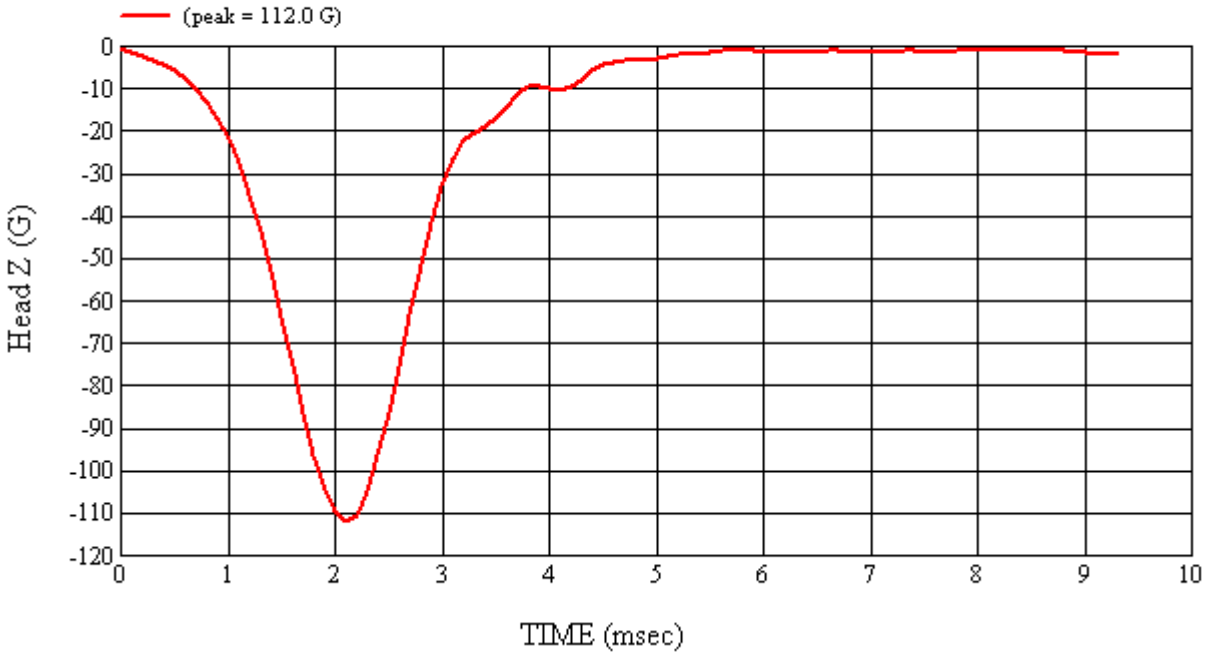
Head 037 (Post) Calibration #H37018



Head 037 (Post) Calibration #H37018



Head 037 (Post) Calibration #H37018



Head 037 (Post) Calibration #H37018

4-5 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

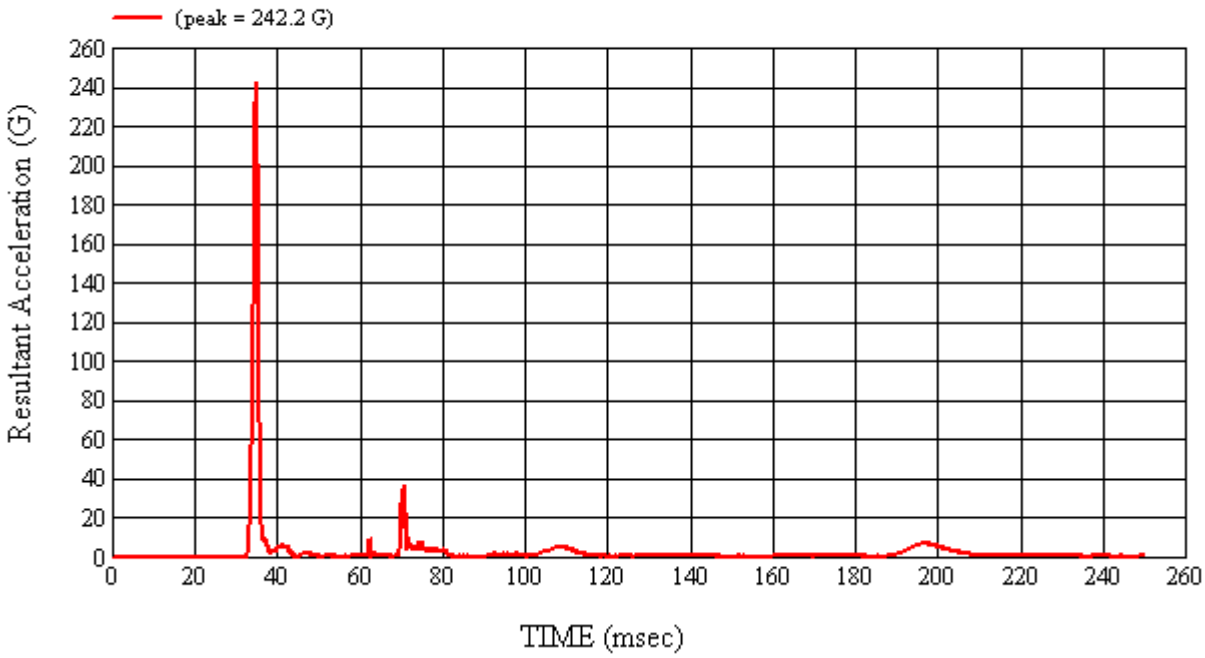
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 5/26/2009 CALIBRATION TIME: 10:25:33 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.2
Relative Humidity	10% to 70%	40.6
Peak Resultant Acceleration	225 G's to 275 G's	242.2
Peak Lateral Acceleration	15 G's Maximum	14.5
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J22700	04/17/09	10/17/09
2	ENDEVCO	7264-2000	J36197	04/17/09	10/17/09
3	ENDEVCO	7264-2000	J36353	04/17/09	10/17/09

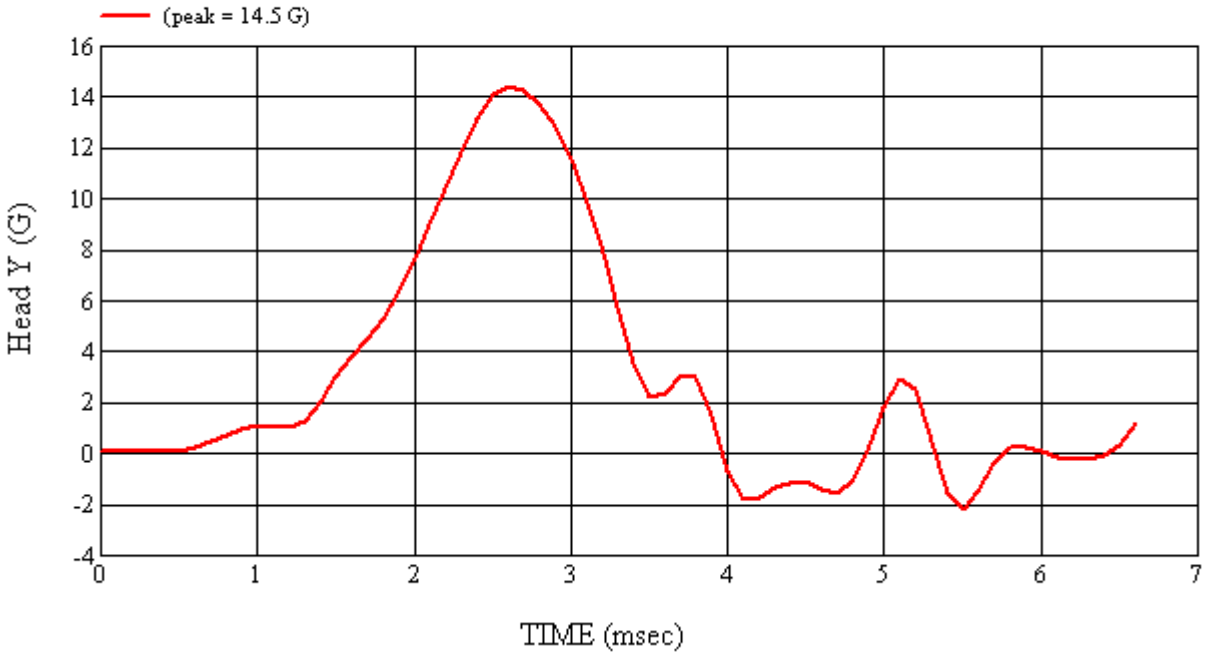
REMARKS:

RECORDED BY: _____ DATE: 5/26/2009

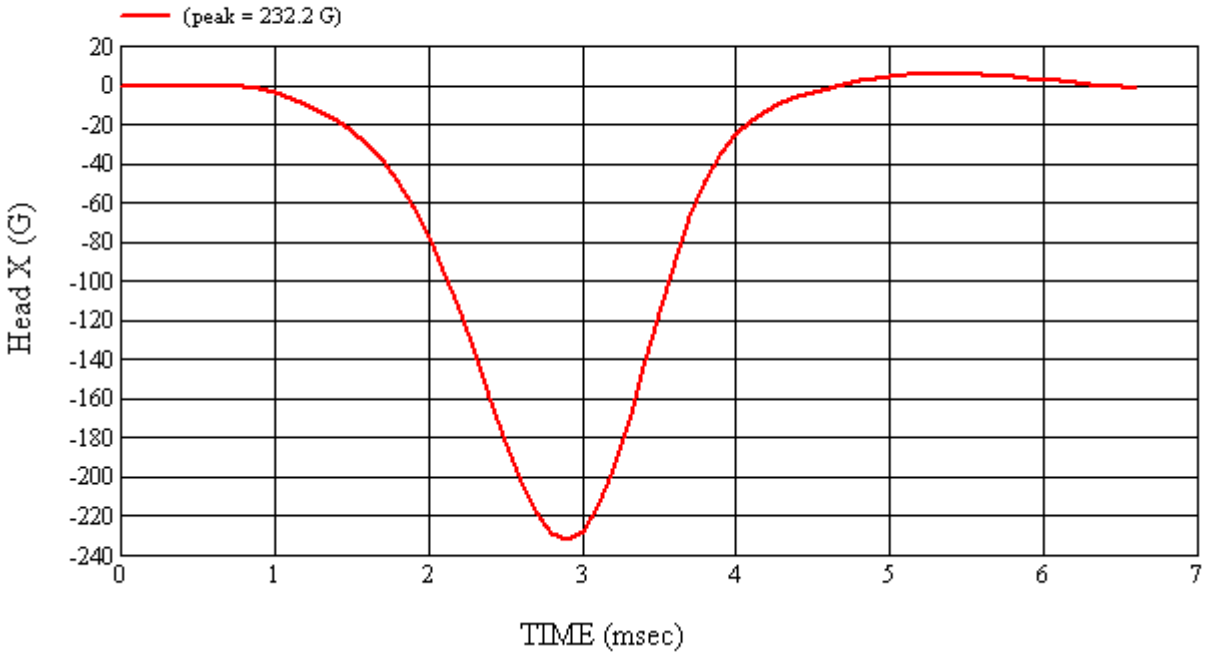
APPROVED BY: _____



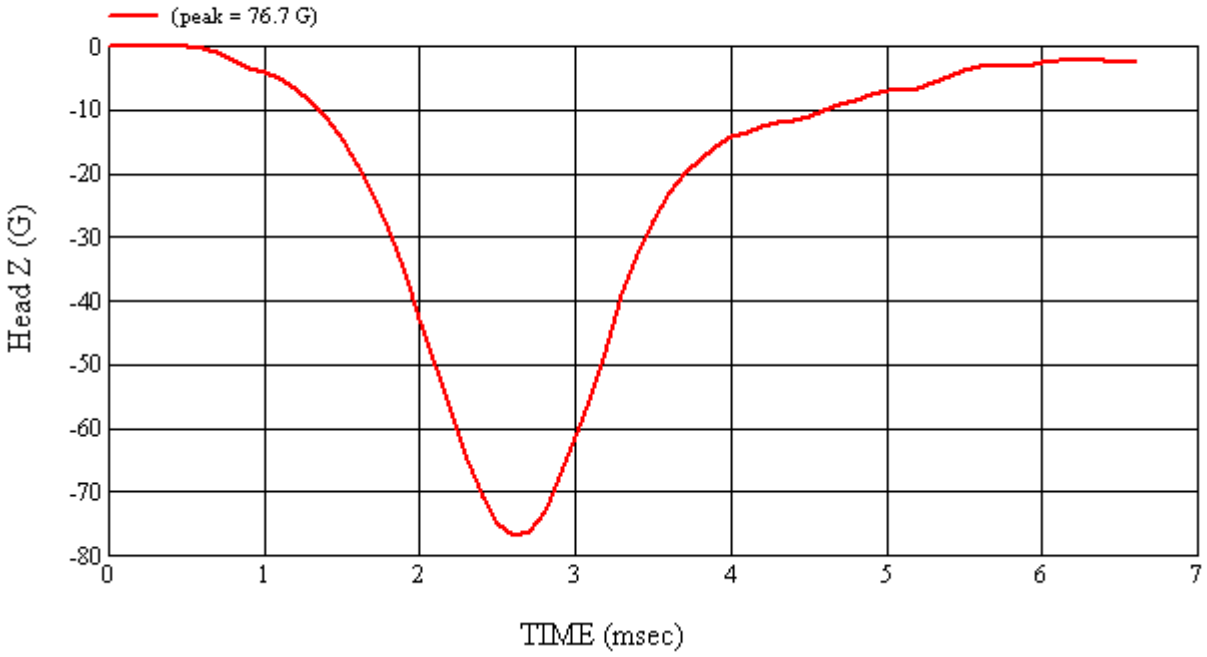
Head 038 (Pre) Calibration #H38017



Head 038 (Pre) Calibration #H38017



Head 038 (Pre) Calibration #H38017



Head 038 (Pre) Calibration #H38017

4-6 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

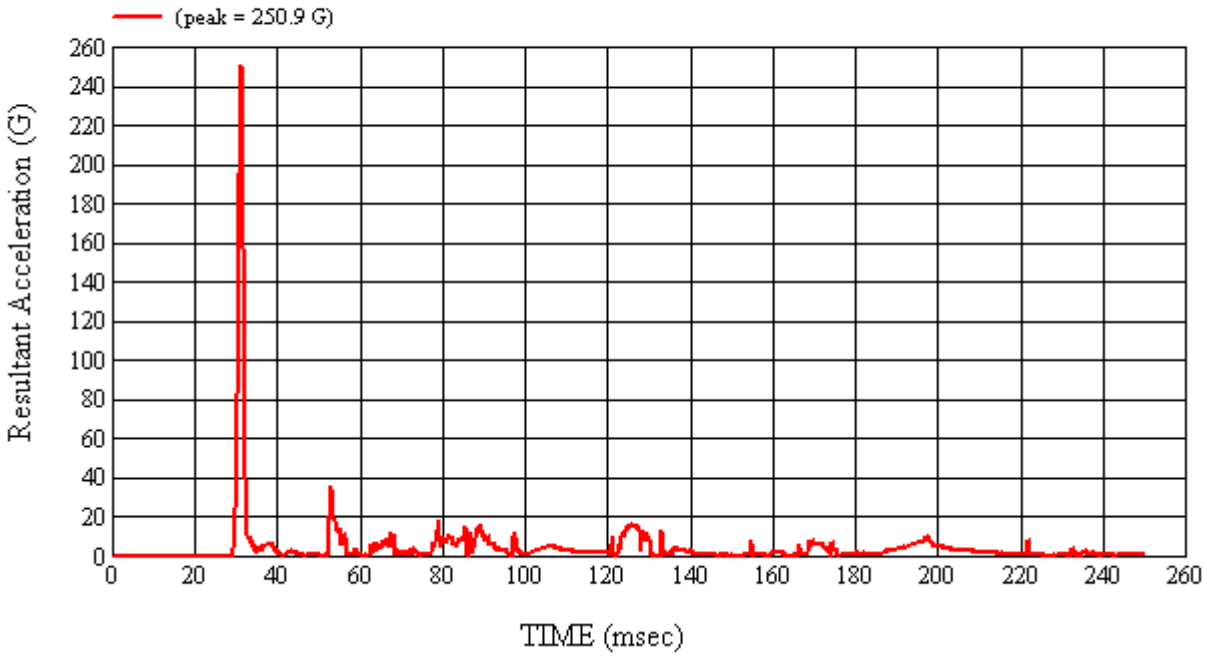
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 5/29/2009 CALIBRATION TIME: 9:53:21 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	21.8
Relative Humidity	10% to 70%	55.1
Peak Resultant Acceleration	225 G's to 275 G's	250.9
Peak Lateral Acceleration	15 G's Maximum	8.4
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	04/17/09	10/17/09
2	ENDEVCO	7264-2000	J36197	04/17/09	10/17/09
3	ENDEVCO	7264-2000	J36353	04/17/09	10/17/09

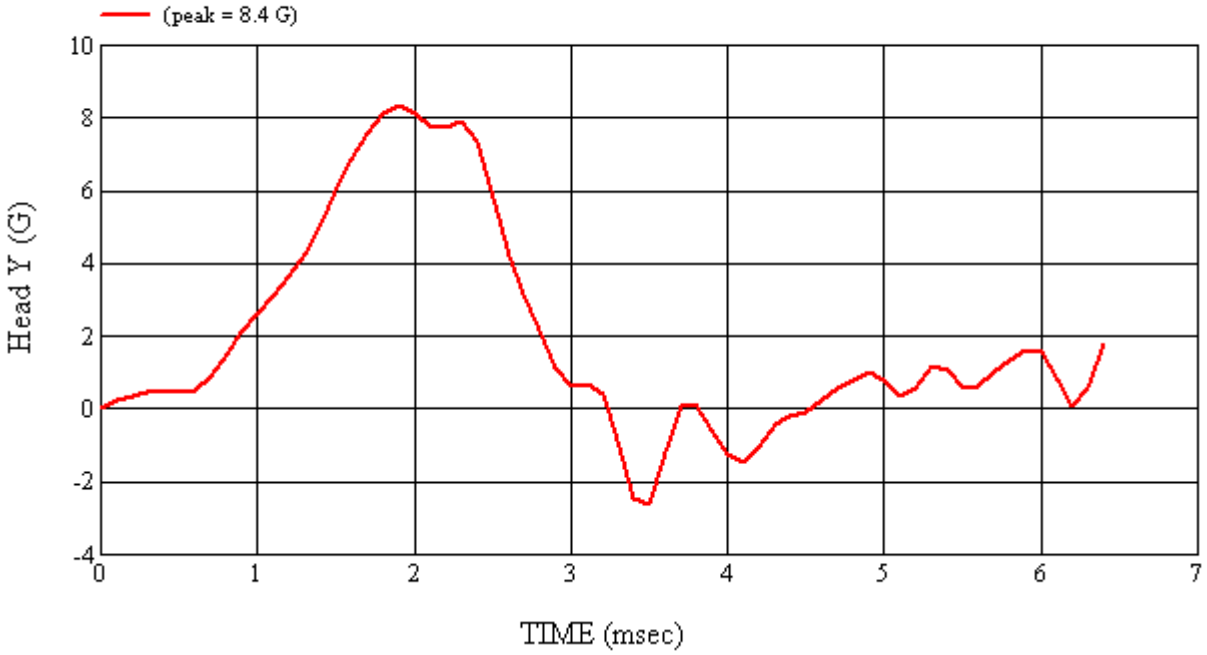
REMARKS:

RECORDED BY: _____ DATE: 5/29/2009

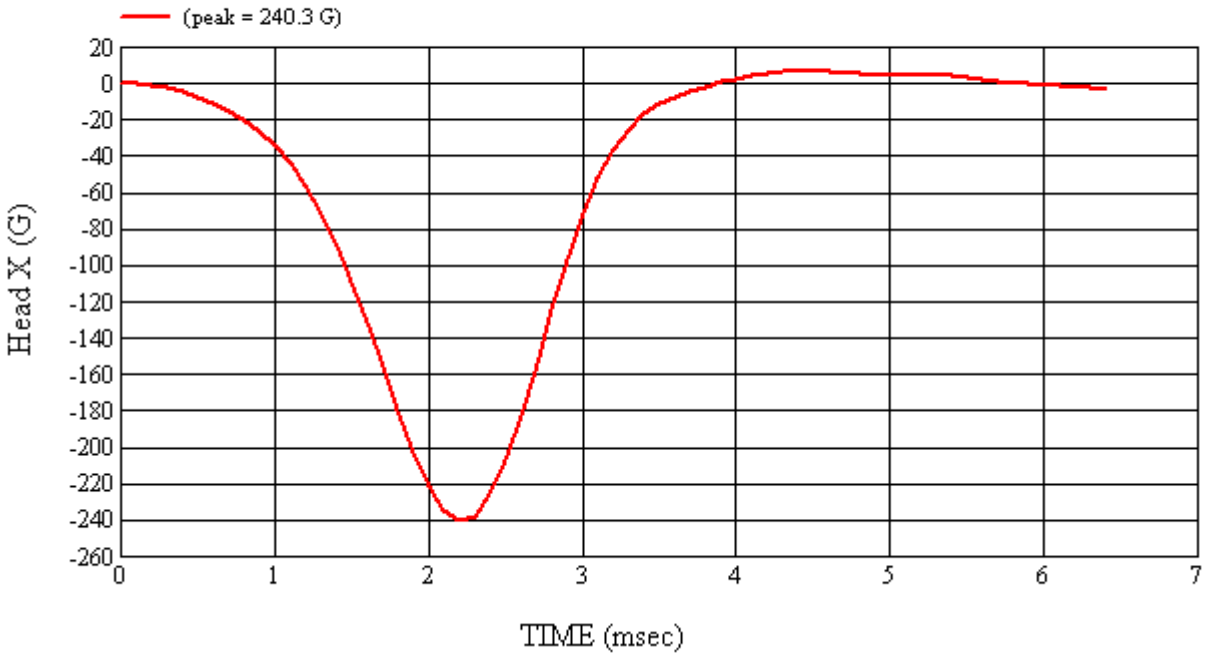
APPROVED BY: _____



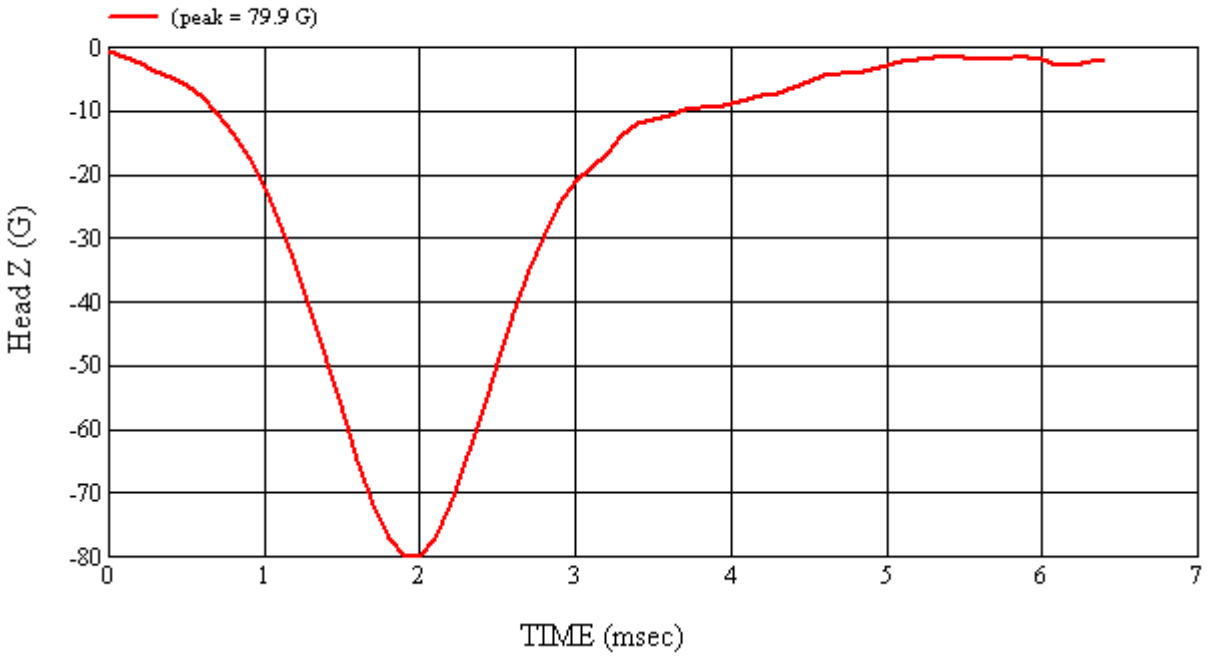
Head 038 (Post) Calibration #H38018



Head 038 (Post) Calibration #H38018



Head 038 (Post) Calibration #H38018



Head 038 (Post) Calibration #H38018

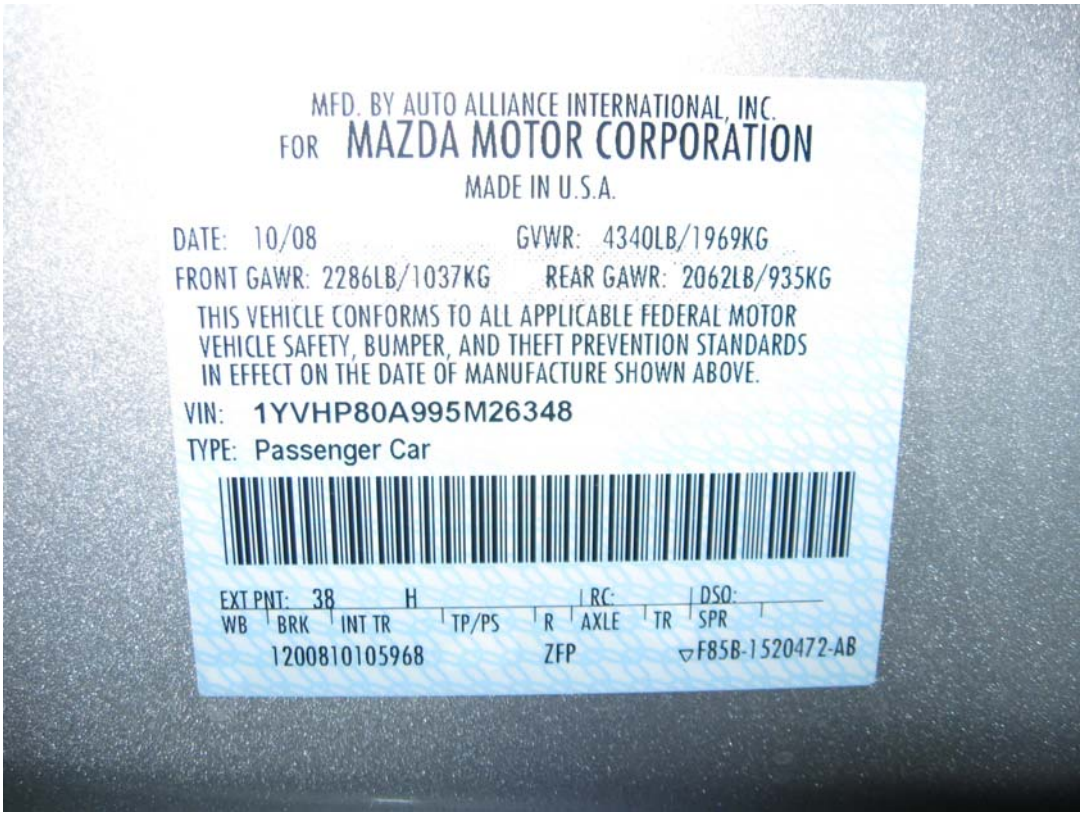
5.0 PHOTOGRAPHS

As Delivered – Left Side View

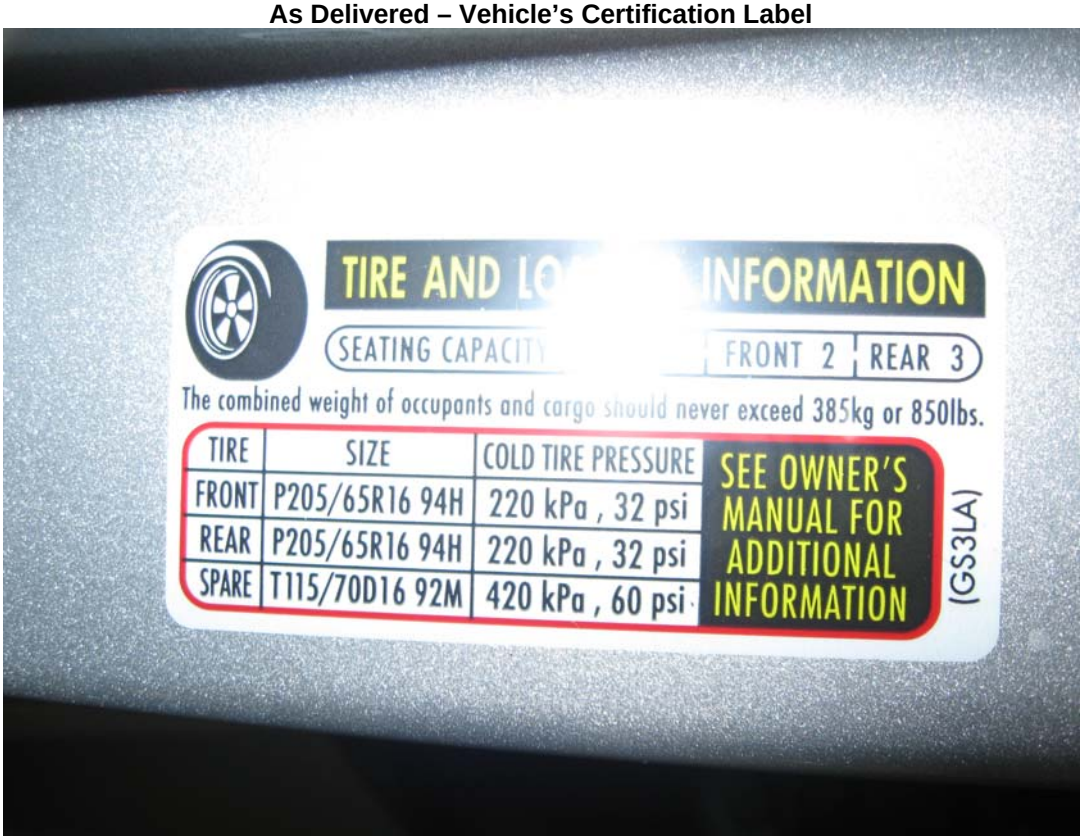
As Delivered – Right Side View

As Delivered – ¾ Front View From Left Side

As Delivered – ¾ Rear View From Right Side



As Delivered – Vehicle's Certification Label



As Delivered – Vehicle's Tire Information Label

Pre-Test Component Photographs

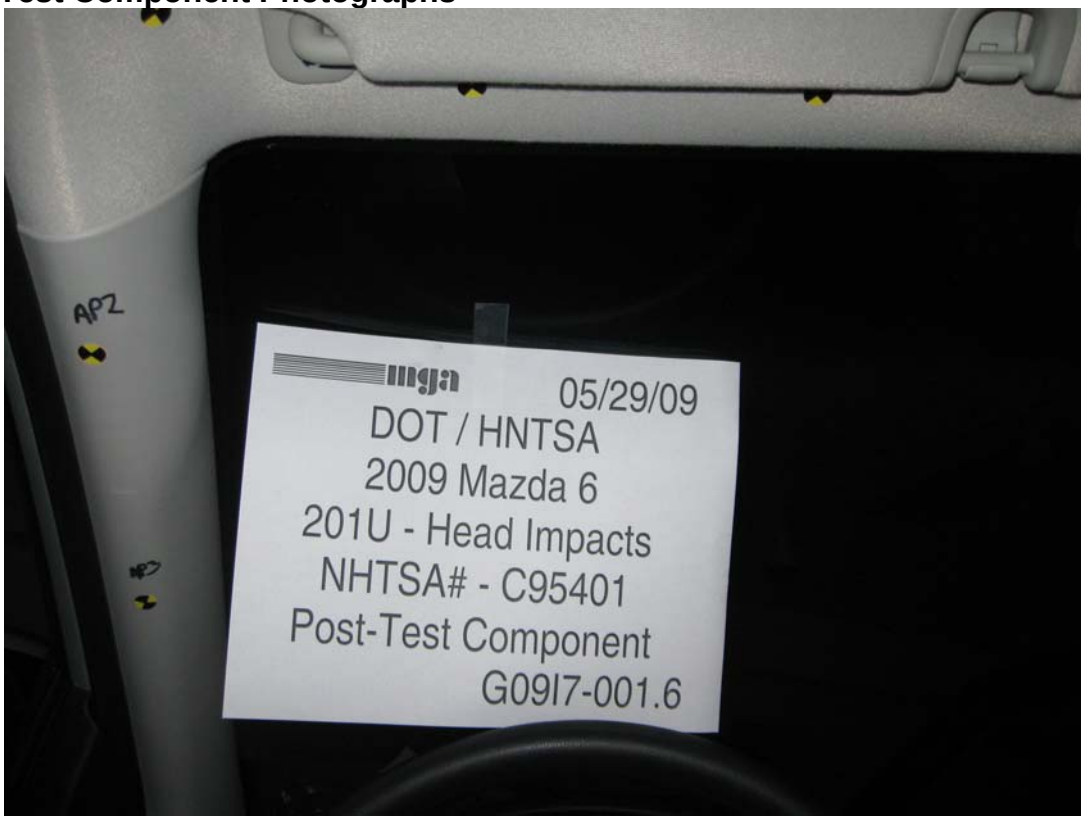

mga
05/27/09
DOT / NHTSA
2009 Mazda 6
FMVSS 201U - Head Impacts
NHTSA# C95401
Pre-Test Component
G09I7-001.6


mga
05/27/09
DOT / NHTSA
2009 Mazda 6
FMVSS 201U - Head Impacts
NHTSA# C95401
Pre-Test Component
G09I7-001.6


05/27/09
DOT / NHTSA
2009 Mazda 6
FMVSS 201U - Head Impacts
NHTSA# C95401
Pre-Test Component
G09I7-001.6


05/27/09
DOT / NHTSA
2009 Mazda 6
FMVSS 201U - Head Impacts
NHTSA# C95401
Pre-Test Component
G09I7-001.6

Post-Test Component Photographs



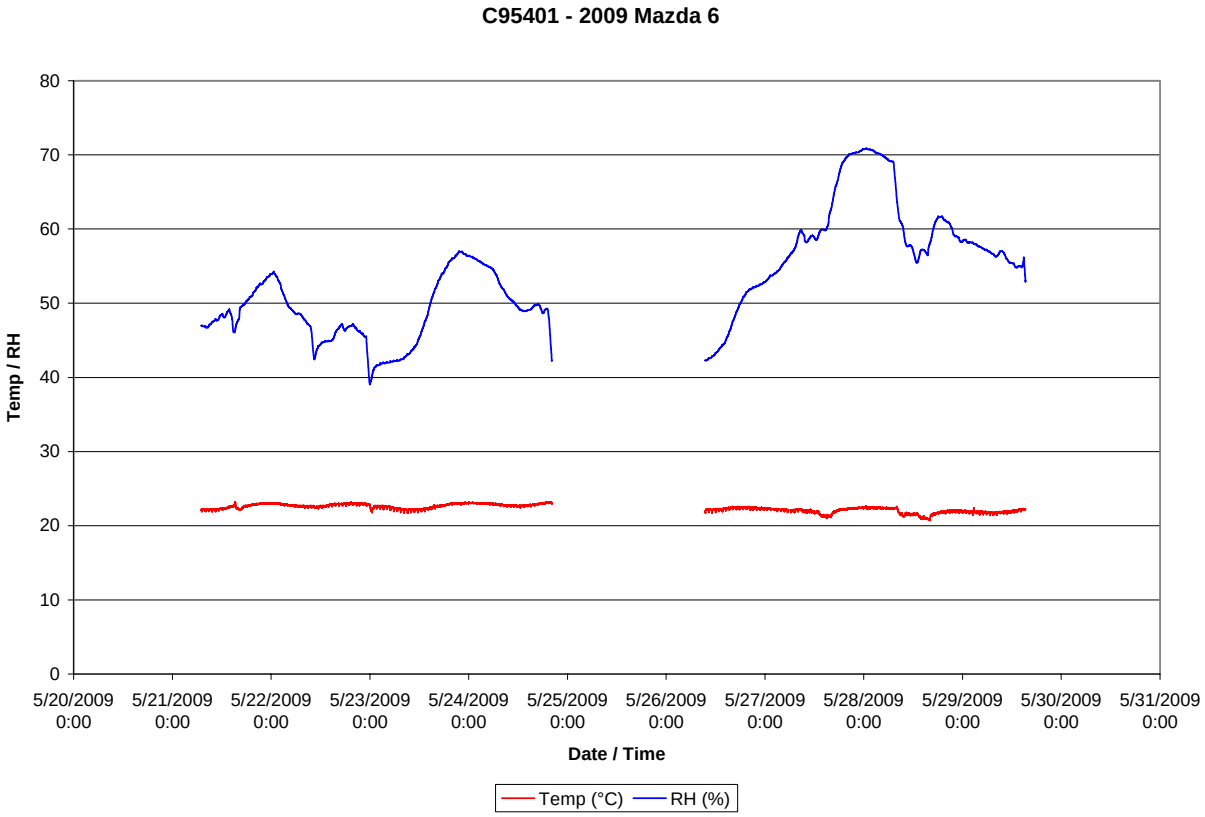

WARNING
mga
05/29/09
DOT / HNTSA
2009 Mazda 6
201U - Head Impacts
NHTSA# - C95401
Post-Test Component
G09I7-001.6


SRS-1
SRS-2
mga
05/29/09
DOT / HNTSA
2009 Mazda 6
201U - Head Impacts
NHTSA# - C95401
Post-Test Component
G09I7-001.6


RH
RP1
SR3-2
SR3-1
mga
05/29/09
DOT / HNTSA
2009 Mazda 6
201U - Head Impacts
NHTSA# - C95401
Post-Test Component
G09I7-001.6


BP1
SR2A
SR2B
SR1
AP1
BP3
mga
05/29/09
DOT / HNTSA
2009 Mazda 6
201U - Head Impacts
NHTSA# - C95401
Post-Test Component
G09I7-001.6

Appendix A – Temperature Trace



Appendix B – Calibration Certificates

Calibration Certificate

Part Description: Silver

Certification Date: 08/26/08

Serial#: S08-05-98-01273

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

Certificate#: S0127339686

Volumetric (Max Deviation) Specification: S08-05 +/-.108mm (+/-.0042")

Temperature: See attached data

Measurement Standards Traceability

Ball Bar Kit	Asset Number: 543	Calibration Date: 07/08/08	*SI Traceability: METAS-L20080708AB1
Thermometer	Asset Number: TQ023	Calibration Date: 02/19/08	*SI Traceability: NVLAP-A7C20031

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

Certification Results

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

Calibration and certification conforms to procedures developed in accordance with ASME B89.4.22-2004.

Instrument condition as received:
Inoperative

Instrument condition outgoing:
Within specifications

Technician: [signature] Arnold Torres Date: 8/26/08

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

125 Technology Park
Lake Mary, FL 32746
USA

@ 9/2/08

FARO®

Page 1 of 6

LABORATORY ACCREDITATION BUREAU
ISO/IEC 17025 Accredited

Revised: March 15, 2008

f:\control\records\05manufa\partspec\XH08-0495 ens Rev1 RevDate: 12/08/04

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

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

Tape Measure Calibration Certificate

Reference Steel Rule
Brand: SWANSON
S/N: MGA 00798
Calibration Date: 1/15/09

Subject Tape Measure
Brand: TPM 906 Stanley
S/N: TPM 906
Calibration Date: 1/23/09

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

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

Date: 1/23/2009 Performed By: [signature]

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

MetroCal inc.
Cert# 0513.01
4700 Barden Court SE, Kentwood MI 49512, Telephone: 616-698-3124, Fax: 616-698-2364, www.metrocal.com

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

Order Number: **59696**
Certificate Number: **080604806**
Page: **1 of 1**

Gauge Number: **MGA00730**
Gauge Desc: **Digital Protractor**
Manufacturer: **Mitutoyo**
Model Number: **N/A**
Serial Number: **N/A**

Customer PO: **A070681**
Last Calibration: **N/A**
Calibration Date: **6/4/08**
Next Calibration: **6/4/09**

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 Blk Set ID# 105	6/12/07	6/12/08	821/273187-06	0.0015°
DoAll Sine Bar ID#1879	12/31/07	12/31/08	Cert# 071231399	0.0015°

Results:

As Found Readings

Units	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°	40.00	40.0	0.00

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	40.0	0.00

Reference Level Check: Within ± 0.1 degrees

Comments: Environmental conditions during calibration: 68 °F, 41% RH.

Issued: 6/5/08

Shannon Shoemaker/bjk
Calibration Technician

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

6/6/08

Certificate of Calibration

Schober Calibration Service, Inc.
2550 Oakley Park Road, Suite #300
Walled Lake, MI 48390
Phone: (248) 926-6000 FAX: (248) 926-6006

ACCREDITED
CALIBRATION 1563.01

Certificate Number: 0001591:1212069510

CUSTOMER: MGA Research Corporation
446 Executive Drive
Troy MI 48083

Calibration Location: **In House**

Contact: Thomas Hutter

Equipment Calibrated

Manufacturer:	Dickson	Date Received:	05/08/2008
Description:	Temp/Humidity Recorder	Date Calibrated:	05/29/2008
Model Number:	FH125	Calibration Due Date:	05/29/2009
Serial Number:	06163263	Calibration Procedure:	CP0001
Asset Number:	MGA00152	Revision:	
Received Status:	Good	Performed By:	C. Atkinson

Condition as Received: In Tolerance
Condition as Returned: In Tolerance

Notes:

Ambient Calibration Conditions

Ambient Temperature: 21 °C Relative Humidity: 40 % RH Barometric Pressure: 988 mbar

Calibration Equipment Used

Asset Number:	Manufacturer:	Model:	Serial:	Cal Due:
RMS042	Fluke/Hart	1502A	A6C537	15 Feb 2009
RMS043	Hart Scientific	5614	778109	15 Feb 2009
RMS045	Vaisala	HMP76	C0630009	04 Jun 2008

The Uncertainty is estimated using expanded uncertainties and coverage factor (k) of 2, providing a confidence level of approximately 95%.
This calibration is traceable to the International system of units (SI) through standards calibrated by accredited laboratories, or through standards calibrated at NIST. This laboratory meets the requirements of ISO/IEC 17025-2005 and ANSI/NCSL Z540-1-1994. This certificate shall not be reproduced, except in full, without prior written approval by Schober Calibration Service.
Calibration interval determined by the customer. When determining the calibration interval, the customer should take into consideration that any number of factors may cause the calibration item to drift out of calibration before the calibration interval has expired.
The results herein apply only to the calibration of the item described above. No sampling plan was used for this calibration.

Approved By: _____ Quality Manager Date: 5/29/08
6/2/08

Calibration Data

MFG/MODEL: Dickson / FH126 Serial / ID #: 06163263 / MGA00152

Location: Schober Cal Lab (MGA Research) Date Calibrated: 05/29/08

Certificate No.: 0001591:1212069510

All calculations and data transfers have been reviewed for accuracy and completeness

Range	Nominal	Lower Limit	As Found	As Left	Upper Limit
Data Logger with Sensor System Tests					
Channel 1					
	20.9° C	19.1° C	20.5° C		22.7° C
	-0.4° C	-2.2° C	-0.6° C		1.4° C
Channel 2 (RH @ 21° C)					
	41.0 %rh	39.0 %rh	40.5 %rh		43.0 %rh
	98.8 %rh	96.8 %rh	98.8 %rh		100.8 %rh

Calibration Performed By: C. Atkinson

Temperature Measurement Uncertainty Utemp = 0.46°C Uhumidity = 1.6 %RH

MetroCal inc.
Cert#0513.01
4700 Barden Court SE, Kentwood MI 49512, Telephone: 616-698-3124, Fax: 616-698-2364, www.metrocal.com

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

Order Number: **60394**
Certificate Number: **080711801**
Page: **1 of 1**

Gauge Number: **MGA00081**
Gauge Desc: **0 to 20lb x 0.01lb Digital Scale**
Manufacturer: **Detecto**
Model Number: **AP-20**
Serial Number: **E33603-0213**

Customer PO: **A070765**
Last Calibration: **7/9/07**
Calibration Date: **7/11/08**
Next Calibration: **7/11/09**

As Found Condition: **In Tolerance**

As Left Condition: **In Tolerance**

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

Standard Used	Cal. Date	Due Date	Traceable No.	Calibration Procedure Uncertainty Expressed at 95% confidence , (K=2)
Weight Set ID# 2463	8/10/06	8/10/08	MI-04-06-8325	+/-0.001% of Load

Results:
Tolerance used: ± 0.02

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

	As Found				As Left		
Weight Test	**Nominal**	**Indication**	**Deviation**		**Nominal**	**Indication**	**Deviation**
0-25% fs	5	5.00	0.00		5	5.00	0.00
26-50% fs	10	9.99	-0.01		10	9.99	-0.01
51-75% fs	15	14.99	-0.01		15	14.99	-0.01
76-100% fs	20	19.99	-0.01		20	19.99	-0.01
Shift Test:	Pass			**Shift Test:**	Pass		
Half Load Test:	Pass			**Half Load Test:**	Pass		

Comments: Environmental conditions during calibration: 68 °F, 46 % RH.

Issued: 7/15/08
Shannon Shoemaker/bjk
Calibration Technician

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

7/17/08

Sterling Scale Co., Inc.
20950 Boening St.
Southfield, MI 48075

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

Certificate of Calibration

calibration cert. 1448.01

Customer: MGA Research *Cert#* 08-4587 *Temp/Humidity:* 70-20
Location of Calibration: 2839 Elliott Ave. Troy MI 48083
Calibration Date: 6/15/2008 *Cal Due:* 7-09 *Condition of Item:* Good
Equipment Make: Intercomp *Model:* SWD Deluxe *Serial/ID:* 26032389
Capacity single pad capacity 2200 x 1lb

Applied Test Wt	*Before Adustment*	*Tolerance*	*In-Tolerance Y/N*	*After Adjustment*	*In-Tolerance Y/N*	*Unc .5lb*	
100lb	100lb	1lb	y	n/a	n/a	.5lb	RR
1000lb	1000lb	2lb	y	n/a	n/a	.5lb	
100lb	101lb	1lb	y	n/a	n/a	.5lb	LR
1000lb	1000lb	2lb	y	n/a	n/a	.5lb	
100lb	100lb	1lb	y	n/a	n/a	.5lb	RF
1000lb	1000lb	2lb	y	n/a	n/a	.5lb	
100lb	100lb	1lb	y	n/a	n/a	.5lb	LF
1000lb	1000lb	2lb	y	n/a	n/a	.5lb	

shift test

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

Tests performed: ☑ Repeatability ☑ Linearl ☐ Sensitivity ☑ Discrimination

Technician COMMENTS/ System passes all tests.

Test wts used Our test weights s/n on file.

☑ Scale Certified ☐ Scale Rejected

Sterling Scale Service Rep: ED **Date:** 6/12/2008 1 of 1

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

QA 6/19/08

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	Q353B01
Serial #:	84592
Capacity:	G's:250
Calibration Date:	9/18/2008
Calibrated By:	DTI

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

Calibration Date:	3/2/2009
New DLR(Units:G'S) [1] 100K SHUNT	95.6
Linearity:[2]	0.99981
New vs Old Sensitivit (% Difference)	-0.4
Temperature:	69.9 ^{O}F
Humidity:	38 %
Sensitivity (mV/V/G):	0.026030
Calibrated By:	Thomas Miller

Signature: Thom D Miller

Approved by: David Winkelbauer

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	Q353B01
Serial #:	84592
Capacity:	G's:250
Calibration Date:	9/18/2008
Calibrated By:	DTI

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

Calibration Date:	3/2/2009
New DLR(Units:G'S) 100K SHUNT [1]	94.3
Linearity: [2]	0.99958
New vs Old Sensitivit (% Difference)	-0.5
Temperature:	69.9 ^{O}F
Humidity:	38 %
Sensitivity (mV/V/G):	0.026381
Calibrated By:	Thomas Miller

Signature: Thomas D Miller

Approved by: David Winkelbauer

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 #	Q353B01	**Manufacturer**	Endevco
Serial #:	84592	**Model #:**	7264-2000
Capacity:	G's:250	**Serial #:**	J35924
Calibration Date:	9/18/2008	**Capacity/Range: (G's)**	2,000
Calibrated By:	DTI		

Calibration Date:	3/2/2009
New DLR(Units:G'S) [1] **100K SHUNT**	92.8
Linearity:[2]	0.99935
New vs Old Sensitivit (% Difference)	-0.4
Temperature:	69.9 ^{o}F
Humidity:	38 %
Sensitivity (mV/V/G):	0.026815
Calibrated By:	Thomas Miller

Signature: [signature]

Approved by: [signature]

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 #	Q353B01	**Manufacturer**	Endevco
Serial #:	84592	**Model #:**	7264-2000
Capacity:	G's:250	**Serial #:**	AHTB2
Calibration Date:	9/18/2008	**Capacity/Range: (G's)**	2,000
Calibrated By:	DTI		

Calibration Date:	3/2/2009
New DLR(Units:G'S) [1] **100K SHUNT**	115.9
Linearity:[2]	0.99947
New vs Old Sensitivit (% Difference)	-0.7
Temperature:	69.9 ^{o}F
Humidity:	38 %
Sensitivity (mV/V/G):	0.021450
Calibrated By:	Thomas Miller

Signature: [signature]

Approved by: [signature]

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	Q353B01
Serial #:	84592
Capacity:	G's:250
Calibration Date:	9/18/2008
Calibrated By:	DTI

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

Calibration Date:	3/2/2009
New DLR(Units:G'S) 100K SHUNT [1]	93.7
Linearity: [2]	0.99893
New vs Old Sensitivit (% Difference)	-0.9
Temperature:	69.9 ^{o}F
Humidity:	38 %
Sensitivity (mV/V/G):	0.026528
Calibrated By:	Thomas Miller

Signature: Thomas L Miller

Approved by: David Winkelbauer

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 #	Q353B01	**Manufacturer**	Endevco
Serial #:	84592	**Model #:**	7264-2000
Capacity:	G's:250	**Serial #:**	J35800
Calibration Date:	9/18/2008	**Capacity/Range: (G's)**	2,000
Calibrated By:	DTI		

Calibration Date:	3/2/2009
New DLR(Units:G'S) [1] **100K SHUNT**	97.1
Linearity:[2]	0.99893
New vs Old Sensitivit (% Difference)	-0.5
Temperature:	69.9 °F
Humidity:	38 %
Sensitivity (mV/V/G):	0.025575
Calibrated By:	Thomas Miller

Signature: ______________

Approved by: ______________

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #:	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	7/24/2008
Calibrated By:	PCB

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

Calibration Date:	4/17/2009
New DLR(Units:G'S) 100K SHUNT [1]	94.0
Linearity: [2]	0.99977
New vs Old Sensitivity (% Difference)	2.0
Temperature:	70 ^{o}F
Humidity:	25 %
Sensitivity (mV/V/G):	0.02647
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Helen A. Kalata

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #:	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	7/24/2008
Calibrated By:	PCB

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

Calibration Date:	4/17/2009
New DLR(Units:G'S) [1] 100K SHUNT	106.3
Linearity:[2]	0.99945
New vs Old Sensitivity (% Difference)	2.1
Temperature:	70 ^{o}F
Humidity:	25 %
Sensitivity (mV/V/G):	0.023407
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Helen A. Kalata

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #:	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	7/24/2008
Calibrated By:	PCB

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

Calibration Date:	4/17/2009
New DLR(Units:G'S) 100K SHUNT [1]	97.5
Linearity: [2]	0.99962
New vs Old Sensitivity (% Difference)	1.4
Temperature:	70 ^{o}F
Humidity:	25 %
Sensitivity (mV/V/G):	0.025512
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Helen A. Kaleto

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

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

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

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

Dynamic Technology, Inc.

Certificate of Calibration

Certificate #: 125456001 *T*

Calibration Laboratory
Certificate #: 1022.01

Acct #:	090100
Customer:	MGA Research Corporation
Shipper #:	
Address:	5000 Warren Road Burlington, WI, 53105
Contact:	Jessica Gall
PO #:	03-08-0741

Manufacturer:	PCB
Model:	484B06
Description:	Power Unit
Serial Number:	00001458
Asset Number:	
Barcode:	

As Received	As Returned	Action Taken		
In Tolerance X	In Tolerance X	Full Calibration X	**Cal Date:**	09/18/2008
Out of Tolerance	Out of Tolerance	Special Calibration	**Due Date:**	03/18/2009
Malfunctioning	Malfunctioning	Oper. Verification	**Temperature:**	73.00 deg. F
Operational	Operational	Adjusted	**Humidity:**	36.00 %
Damaged	N/A	Repaired	**Baro. Press.:**	
N/A		Charted	**Procedure:**	DCN 05156
		Returned As Is	**Reference:**	manufacturer's manual

Incoming Remarks:
Replacement for unit on WO#124720006 In case with connector cable/power cord and accelerometer in case

Technical Remarks:
Uncertainty data to follow.

Calibration Standards Utilized

Cert. #	Manufacturer	Model #	Description	Cal Date	Due Date
108256017	TMS	9155C	Accelerometer Calibration W	02/18/2008	02/18/2009
108256027	PCB	442A102	Signal Conditioner	01/10/2008	01/10/2009

System Instrumentation Includes

ID	Manufacturer	Model	Description	Serial Number
84592	PCB	Q353B01	Accelerometer	84592

The above identified unit was calibrated in our laboratory at the address shown below.

Technician Name/Date: Joseph Leonard, 09/18/2008 Signatory: Mary Stanley QA Approved:

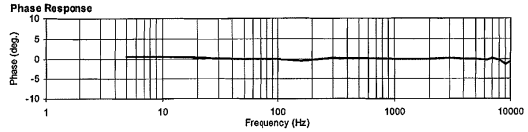
1200 N. Old US 23, PO Box 559, Hartland, MI 48353-0559 (810) 225-4601 FAX (810) 225-4602

JAG

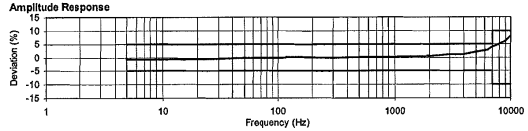
~Report of Calibration~

Sensor Information		Calibration Data			Transducer Specifications		
Model Number	484B06/Q353B01	Sensitivity @ Ref. Freq.:	20.28	mV/g	Range:	250.00	+/- g
Serial Number	1458/84592	Phase @ Ref. Freq.:	-0.06	deg.	Resolution:	0.0000	g
Manufacturer:	PCB	Test Level:	1.00	g	Temp Range:	-54 to 121	°C
ID Number:	1458/84592					-65 to 250	°F
Description:	ICP® Accelerometer				Axis:	Uniaxial	

Phase Response



Amplitude Response



Data Table

Frequency (Hz)	Sen(mV/g)	Phase (deg)
5.00	20.140	0.63
10.00	20.109	0.47
30.00	20.212	0.18
50.00	20.225	-0.07
100.00	20.281	-0.06
159.00	20.287	-0.44
300.00	20.254	0.04
500.00	20.325	0.03
1000.00	20.309	-0.10
2000.00	20.409	-0.16
3000.00	20.483	0.12
4000.00	20.498	-0.05
5000.00	20.672	-0.11
6300.00	20.825	-0.29
7000.00	21.059	0.14
8000.00	21.295	-0.25
9000.00	21.512	-1.27
10000.00	21.912	-0.67

Notes

Back-to-Back Comparison Calibration

This calibration was performed with TMS 9155c Calibration Workstation version 3.9.0

Calibration is NIST Traceable through project number 822/271196.

Customer	User Notes
090100	125456001 T

Unit Condition		Lab Conditions		
As Found:	In Tolerance	Temperature:	23.89	°C
As Left:	In Tolerance		75.00	°F
		Humidity:	36.00	%

Approval Information
Technician: J Leonard

Dynamic Technology, Inc.
1200 N. Old US 23 (PH)810.225.4601
P.O. Box 559 (FX)810.225.4602
Hartland, MI
48353-0559 www.dynamictechnology.com

~ Calibration Certificate ~

Per ISO 16063-21

Model Number: 352C03

Serial Number: 95980

Description: ICP® Accelerometer Method: Back-to-Back Comparison (AT401-3)

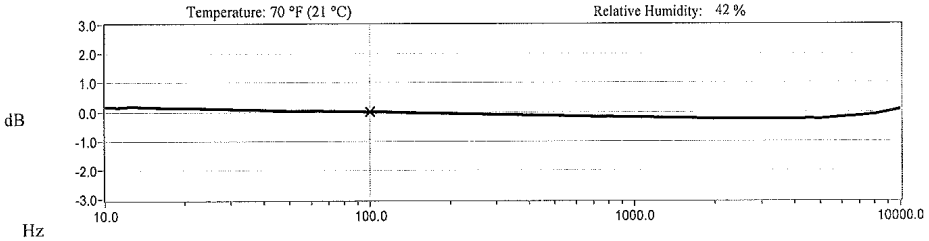
Manufacturer: PCB

Calibration Data

Sensitivity @ 100.0 Hz	**10.11**	**mV/g**	Output Bias	11.4	VDC
	(1.031	**mV/m/s²)**	Transverse Sensitivity	0.6	%
Discharge Time Constant	1.7	seconds	Resonant Frequency	57.2	kHz

Sensitivity Plot

Temperature: 70 °F (21 °C) Relative Humidity: 42 %



Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
10.0	1.9	300.0	-1.1	7000.0	-1.7
15.0	1.7	500.0	-1.6	10000.0	0.9
30.0	1.0	1000.0	-2.3		
50.0	0.3	3000.0	-3.0		
REF. FREQ.	0.0	5000.0	-2.9		

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

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

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

Condition of Unit

As Found: n/a

As Left: New Unit, In Tolerance

Notes

1. Calibration is NIST Traceable thru Project 822/274086 and PTB Traceable thru Project 1060.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1, ANSI/NCSL Z540-1-1994 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Measurement uncertainty (95% confidence level with coverage factor of 2) for frequency ranges tested during calibration are as follows: 5-9 Hz; +/- 2.0%, 10-99 Hz; +/- 1.5%, 100-1999 Hz; +/- 1.0%, 2-10 kHz; +/- 2.5%.

Technician: Susan Lyon Date: 07/31/08

ACCREDITED
CALIBRATION CERT #1862.02

PCB PIEZOTRONICS
VIBRATION DIVISION
Headquarters: 3425 Walden Avenue, Depew, NY 14043
Calibration Performed at: 10869 Highway 903, Halifax, NC 27839
TEL: 888-684-0013 · FAX: 716-685-3886 · www.pcb.com

PAGE 1 of 1

cal2 - 3360349075.73