FINAL REPORT NUMBER 201UI-MGA-11-02

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

KIA MOTORS CORPORATION
2011 KIA OPTIMA LX
NHTSA No. CB0506

MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083

Test Dates: March 31-April 1, 2011
Report Date: April 5, 2011

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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Accepted By: _____

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16. Abstract A compliance test series was conducted on the subject 2011 Kia Optima LX, NHTSA No. CB0506, 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 March 31-April 1, 2011. Test failures identified were as follows: None The data recorded indicates that the 2011 Kia Optima LX tested appears to comply with the upper interior requirements of FMVSS 201.			
17. Key Words Compliance Testing Safety Engineering FMVSS 201UI 2011 Kia Optima LX		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 2011 Kia Optima LX, meets the performance requirements of FMVSS 201, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted on March 31-April 1, 2011 on a 2011 Kia Optima LX, manufactured by Kia Motors Corporation.

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

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

2.0 COMPLIANCE TEST DATA SUMMARY

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

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

AP1	BP1	FH1	UR3@BP
AP2	BP3	SR2B	UR4@SR3-1
AP3	BP4	UR2@SR2A	UR5@SR3-2

The 2011 Kia Optima LX tested appears to comply with the upper interior performance criteria for FMVSS 201. The HIC(d) measured using the Part 572L (Free Motion Headform) was below 1000 for each tested component.

TABLE 2-1

SUMMARY TABLE OF TEST RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Kia Optima LX

VEH. NHTSA NO.: CB0506 VIN: KNAGM4A76B5056405 COLOR: Spicy Red

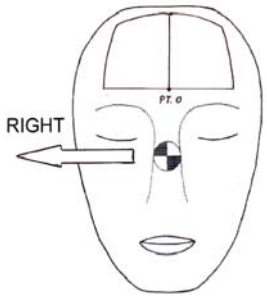
VEH. BUILD DATE: October, 2010 TEST DATES: March 31-April 1, 2011

TEST LABORATORY: MGA Research Corporation

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

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	113	40	18.8	553	512	14	16 Left
AP2	Left	204	49	18.6	363	261	14	6 Left
AP3	Right	158	49	19.0	370	269	18	1 Right
BP1	Right	90	28	18.8	549	507	25	3 Left
BP3	Left	286	-1	23.5	448	373	19	4 Right
BP4	Right	158	-3	23.4	849	904	32	3 Left
FH1	Left	180	50	23.8	656	649	10	3 Right
SR2B	Left	270	35	19.1	576	543	8	7 Right
UR2@SR2A	Right	90	50	23.8	804	846	32	5 Left
UR3@BP	Left	270	40	23.9	649	640	46	6 Left
UR4@SR3-1	Right	90	50	23.9	719	733	33	2 Left
UR5@SR3-2	Left	270	50	23.6	717	730	40	5 Left

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



POST TEST COMMENTS:

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

AP2 Left: Trim dislodged.

BP3 Left: Cracked trim.

BP4 Right: Cracked pillar trim.

FH1 Left: Sunglasses holder opened.

REMARKS:

The targets listed were impacted in the following order:

Left: UR5@SR3-2, UR3@BP, SR2B, BP3, AP2, FH1

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

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

RECORDED BY: Nathaniel Newth DATE: April 1,2011

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Kia Optima LX

VEH. NHTSA NO.: CB0506 VIN: KNAGM4A76B5056405 COLOR: Spicy Red

VEH. BUILD DATE: October, 2010 TEST DATES: March 31-April 1, 2011

TEST LABORATORY: MGA Research Corporation

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

INTERIOR TRIM INFORMATION: The 2011 Kia Optima LX was equipped with A, B, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, a grab handle located on the side rail above each door (front and rear), and an overhead console located on the front upper roof.

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 22, 2011; Odometer Reading 83 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Kia Motors Corporation

Date of Manufacture: October, 2010; VIN: KNAGM4A76B5056405

GVWR: 1950 kg; GAWR FRONT: 1100 kg;

GAWR REAR: 960 kg;

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 225 kPa REAR: 225 kPa

Recommended Tire Size: P205/65R16

Recommended Cold Tire Pressure:

FRONT: 225 kPa REAR: 225 kPa

Size of Tire on Test Vehicle: P205/65R16

Type of Spare Tire: T125/80D16; 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) = 410 kg

No. of Occupants x 68 kg = 340 kg

Rated Cargo/Luggage Weight (RCLW) = 70 kg (difference)

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

Right Front =	445.5 kg	Right Rear =	283.5 kg
Left Front =	416.0 kg	Left Rear =	321.5 kg
TOTAL FRONT =	861.5 kg	TOTAL REAR =	605.0 kg
% Total Weight =	58.7 %	% Total Weight =	41.3 %

TOTAL DELIVERED WEIGHT = 1466.5 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1466.5 kg

Max. Test Cargo/Luggage Weight = 70.0 kg

Target Test Weight = 1536.5 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	430.0 kg	Right Rear =	331.0 kg
Left Front =	420.5 kg	Left Rear =	353.0 kg
TOTAL FRONT =	850.5 kg	TOTAL REAR =	684.0 kg
% Total Weight =	55.4 %	% Total Weight =	44.6 %

TOTAL TEST WEIGHT = 1534.5 kg

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

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 708 mm; Left Front 706 mm;
Right Rear 702 mm; Left Rear 705 mm;
Pitch Angle at Right Door Sill = 0.2 Rear is higher
Pitch Angle at Left Door Sill = 0.2 Rear is higher
Roll Angle at Front Bumper = 0.2 Left is higher
Roll Angle at Rear Bumper = 0.0

FULLY LOADED: Right Front 710 mm; Left Front 708 mm;
Right Rear 689 mm; Left Rear 694 mm;
Pitch Angle at Right Door Sill = 0.2 Front is higher
Pitch Angle at Left Door Sill = 0.1 Front is higher
Roll Angle at Front Bumper = 0.1 Left is higher
Roll Angle at Rear Bumper = 0.0

AS TARGETED: Right Front 882 mm; Left Front 881 mm;
Right Rear 859 mm; Left Rear 865 mm;
Pitch Angle at Right Door Sill = 0.2 Front is higher
Pitch Angle at Left Door Sill = 0.1 Front is higher
Roll Angle at Front Bumper = 0.2 Left is higher
Roll Angle at Rear Bumper = 0.0

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill =	0.2 Front is higher
Pitch Angle at Left Door Sill =	0.1 Front is higher
Roll Angle at Front Bumper =	0.2 Left is higher
Roll Angle at Rear Bumper =	0.0

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill =	0.2 Front is higher
Pitch Angle at Left Door Sill =	0.1 Front is higher
Roll Angle at Front Bumper =	0.2 Left is higher
Roll Angle at Rear Bumper =	0.0

VEHICLE WHEELBASE = 2800 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: Nathaniel Newth DATE: March 28, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-3

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Kia Optima LX

VEH. NHTSA NO.: CB0506 VIN: KNAGM4A76B5056405 COLOR: Spicy Red

VEH. BUILD DATE: October, 2010 TEST DATES: March 31-April 1, 2011

TEST LABORATORY: MGA Research Corporation

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

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

	HORIZONTAL ANGLE SPECIFIED RANGE	MINIMUM HORIZONTAL ANGLE	MAXIMUM HORIZONTAL ANGLE
A-PILLAR	L 195º-255º	L 203.8º	L 252.7º
	R 105º-165º	R 112.3º	R 158.4º
B-PILLAR	L 195º-345º	L 201.4º	L 286.8º
	R 15º-165º	R 80.7º	R 158.6º

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Nathaniel Newth DATE: March 28, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Kia Optima LX

VEH. NHTSA NO.: CB0506 VIN: KNAGM4A76B5056405 COLOR: Spicy Red

VEH. BUILD DATE: October, 2010 TEST DATES: March 31-April 1, 2011

TEST LABORATORY: MGA Research Corporation

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

VERTICAL IMPACT ANGLE RANGES

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	FH1	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
	FH2	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
SIDE RAIL	SR1	L 0º-50º	L 0º	L 45º
		R 0º-50º	R 0º	R 45º
	SR2A	L 0º-50º	L 0º	L 43º
		R 0º-50º	R 0º	R 43º
	SR2B	L 0º-50º	L 0º	L 35º
		R 0º-50º	R 0º	R 35º
	SR3-1	L 0º-50º	L 0º	L 45º
		R 0º-50º	R 0º	R 45º
	SR3-2	L 0º-50º	L 0º	L 41º
		R 0º-50º	R 0º	R 41º
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 40º
		R -5º-50º	R -5º	R 40º
	AP2	L -5º-50º	L -5º	L 49º
		R -5º-50º	R -5º	R 49º
	AP3	L -5º-50º	L -5º	L 49º
		R -5º-50º	R -5º	R 49º
B-PILLAR	BP1	L -10º-50º	L -10º	L 28º
		R -10º-50º	R -10º	R 28º
	BP2*	L 0º-50º	L 0º	L 18º
		R 0º-50º	R 0º	R 18º
	BP3	L -10º-50º	L -10º	L -1º
		R -10º-50º	R -10º	R -1º
	BP4	L -10º-50º	L -10º	L -3º
		R -10º-50º	R -10º	R -3º
REAR PILLAR	RP1	L -10º-50º	L -10º	L 25º
		R -10º-50º	R -10º	R 25º
	RP2	L -10º-50º	L -10º	L 22º
		R -10º-50º	R -10º	R 19º
UPPER ROOF 1		0º-50º	0º	50º
UPPER ROOF 2		0º-50º	0º	50º
UPPER ROOF 3		0º-50º	0º	40º
UPPER ROOF 4		0º-50º	0º	50º
UPPER ROOF 5		0º-50º	0º	50º
UPPER ROOF 6		0º-50º	0º	42º

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

RECORDED BY: Nathaniel Newth DATE: March 28, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Kia Optima LX

VEH. NHTSA NO.: CB0506 VIN: KNAGM4A76B5056405 COLOR: Spicy Red

VEH. BUILD DATE: October, 2010 TEST DATES: March 31-April 1, 2011

TEST LABORATORY: MGA Research Corporation

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

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	240 mm	240 mm
Tº	Horizontal < {CG-F1 (Left Seat) to (Right A-Pillar)}	107.3º	--
A1º	360º - Tº	252.7º	--
Wº	Horizontal < {CG-2 (Left Seat) to (Left A-Pillar)}	203.8º	--
A2º	A2º = Wº	203.8º	--
Uº	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	286.8º	--
B1º	B1º = Uº	286.8º	--
Vº	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	201.4º	--
B2º	B2º = Vº	201.4º	--
Wº (right)	Horizontal < {CG-F2 (Right Seat) to (Right A-Pillar)}	--	158.4º
A1º (right)	A1º (right) = Wº (right)	--	158.4º
T º (right)	Horizontal < {CG-F1 (Right Seat) to (Left A-Pillar)}	--	247.7º
A2º (right)	360º-Tº (right)	--	112.3º
V º (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	158.6º
B1º (right)	B1º (right) = Vº (right)	--	158.6º
U º (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	80.7º
B2º (right)	B2º (right) = Uº (right)	--	80.7º
J	A-Pillar {(Plane 3) – (Plane 5)}	306.6 mm	308.1 mm
J/2	J ÷ 2	153.3 mm	154.1 mm
D1	Upper Roof {(Plane A) – (Plane B)}	1677.6 mm	
D1/2	D1 ÷ 2	838.8 mm	

Measurement	Description	Left Side	Right Side
D2	Upper Roof {(Plane C) – (Plane D)}	1210.5 mm	
D2/2	D2 ÷ 2	605.3 mm	
.35D1	.35 x D1	587.2 mm	
.35D2	.35 x D2	423.7 mm	
N	B-Pillar {(BPR) – (lowest point on daylight opening forward of B-Pillar)}	376.9 mm	378.2 mm
N/2	B-Pillar {(BP3) – (lowest point on daylight opening forward of B-Pillar)}	188.5 mm	189.1 mm
N/4	B-Pillar {(BP4) – (lowest point on daylight opening forward of B-Pillar)}	94.2 mm	94.6 mm
D	R-Pillar (Point 7 – Point M)	730.0 mm	730.0 mm
3D/7	3*D / 7	312.9 mm	312.9 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	1405.0	-370.0	192.0	1427.7	370.0	158.0
Rear	2282.0	-345.0	185.0	2282.0	345.0	185.0

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	Z
Front	1405.0	-370.0	192.0	1427.7	370.0	158.0
Rear	2282.0	-345.0	185.0	2282.0	345.0	185.0

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
CGF1	1325.0	-370.0	852.0	1347.7	370.00	818.0
CGF2	1565.0	-370.0	852.0	1587.7	370.0	818.0
CGR	2442.0	-345.0	845.0	2442.0	345.0	845.0

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Front driver door upper striker bolt (x, y, z) = 1563.2, -786.8, 472.6

Front passenger door lower striker bolt (x, y, z) = 1562.7, 787.8, 445.7

Rear passenger door lower striker bolt (x, y, z) = 2520.8, 784.6, 441.0

REMARKS:

RECORDED BY: Nathaniel Newth DATE: March 28, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Kia Optima LX

VEH. NHTSA NO.: CB0506 VIN: KNAGM4A76B5056405 COLOR: Spicy Red

VEH. BUILD DATE: October, 2010 TEST DATES: March 31-April 1, 2011

TEST LABORATORY: MGA Research Corporation

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

SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
A-Pillar Left Side								
AP1	1191.3	-539.1	963.0	--	--	Yes	--	--
REL	1216.9	-557.1	924.5	252	40	--	2	No
AP2	1088.8	-594.7	874.5	204	49	No	--	Yes
AP3	943.4	-617.1	810.0	204	49	No	--	No
A-Pillar Right Side								
AP1	1191.1	539.4	964.4	--	--	Yes	--	--
REL	1199.1	561.7	919.9	113	40	--	2	Yes
AP2	1091.3	595.4	875.5	158	49	No	--	No
AP3	946.6	615.4	811.1	158	49	No	--	Yes
B-Pillar Left Side								
BP1	1724.6	-480.7	1008.3	270	28	No	--	No
BP2	1676.4	-608.4	774.1	270	18	No	--	No
BP3	1625.2	-612.3	820.8	286	-1	No	--	Yes
BP4	1752.7	-660.1	727.7	202	-3	No	--	No
B-Pillar Right Side								
BP1	1724.0	480.1	1009.7	90	28	No	--	Yes
BP2	1673.6	609.1	773.7	90	18	No	--	No
BP3	1626.6	612.3	820.6	81	-1	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**					
BP4	1750.2	660.9	726.8	158	-3	No	--	Yes
Rear Pillar Left Side								
RP1	2530.0	-502.3	929.2	270	25	No	--	No
RP2	2592.8	-610.7	780.1	--	--	Yes	--	--
REL	2548.4	-552.9	878.9	300	22	--	5	No
Rear Pillar Right Side								
RP1	2526.3	501.3	928.8	90	25	No	--	No
RP2	2589.5	612.1	779.7	--	--	Yes	--	--
REL	2546.4	550.6	876.9	35	19	--	5	No
Front Header Left Side								
FH1	1103.0	-424.7	972.8	180	50	No	--	Yes
FH2	1076.5	-274.6	981.9	180	50	No	--	No
Front Header Right Side								
FH1	1102.3	424.6	972.6	180	50	No	--	No
FH2	1076.7	275.5	982.7	180	50	No	--	No
Side Rail Left Side								
SR1	1340.9	-505.6	973.5	270	45	No	--	No
SR2A	1492.1	-496.9	993.7	--	--	Yes	--	--
REL	1491.8	-484.4	998.6	270	43	--	1	No
SR2B	1424.2	-509.8	1007.5	--	--	Yes	--	--
REL	1425.5	-534.3	967.3	270	35	--	2	Yes
SR3-1	2058.0	-467.1	997.8	270	45	No	--	No
SR3-2	2212.2	-468.7	988.5	270	41	No	--	No
Side Rail Right Side								
SR1	1340.1	506.5	972.6	90	45	No	--	No
SR2A	1491.8	498.2	992.5	--	--	Yes	--	--
REL	1493.6	486.9	997.4	90	43	--	1	No
SR2B	1423.5	510.7	1008.3	--	--	Yes	--	--
REL	1424.3	535.3	969.1	90	35	--	2	No

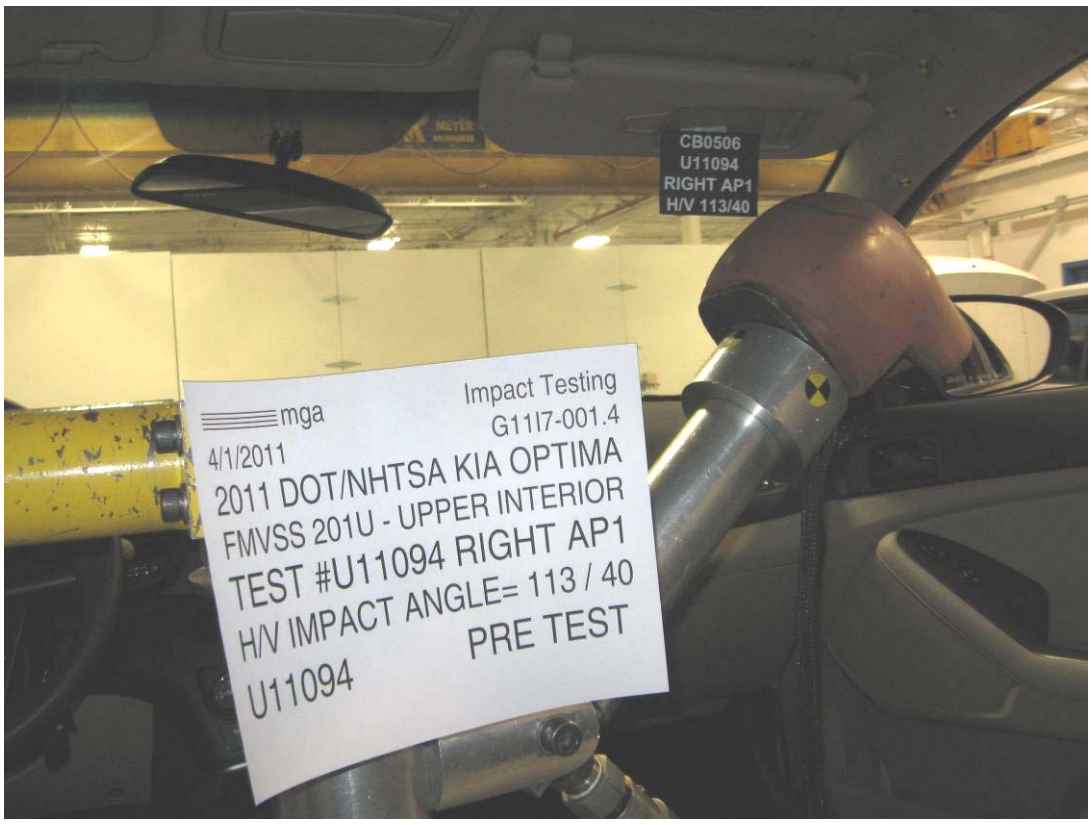
SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
SR3-1	2056.7	468.1	998.0	90	45	No	--	No
SR3-2	2212.4	468.0	988.4	90	41	No	--	No
Rear Header Left Side								
RH	2593.4	-345.7	974.3	0	50	No	--	No
Rear Header Right Side								
RH	2594.1	344.7	973.9	0	50	No	--	No
Upper Roof Left Side								
UR1@SR1	1274.2	-413.5	1000.8	270	50	No	--	No
UR3@BP	1737.7	-400.1	1044.4	270	40	No	--	Yes
UR5@SR3-2	2214.8	-319.2	1048.3	270	50	No	--	Yes
Upper Roof Right Side								
UR2@SR2A	1493.0	355.9	1054.2	90	50	No	--	Yes
UR4@SR3-1	2072.9	336.8	1052.2	90	50	No	--	Yes
UR6@RP	2400.0	408.8	1012.8	45	42	No	--	No

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

RECORDED BY: Nathaniel Newth DATE: March 28, 2011

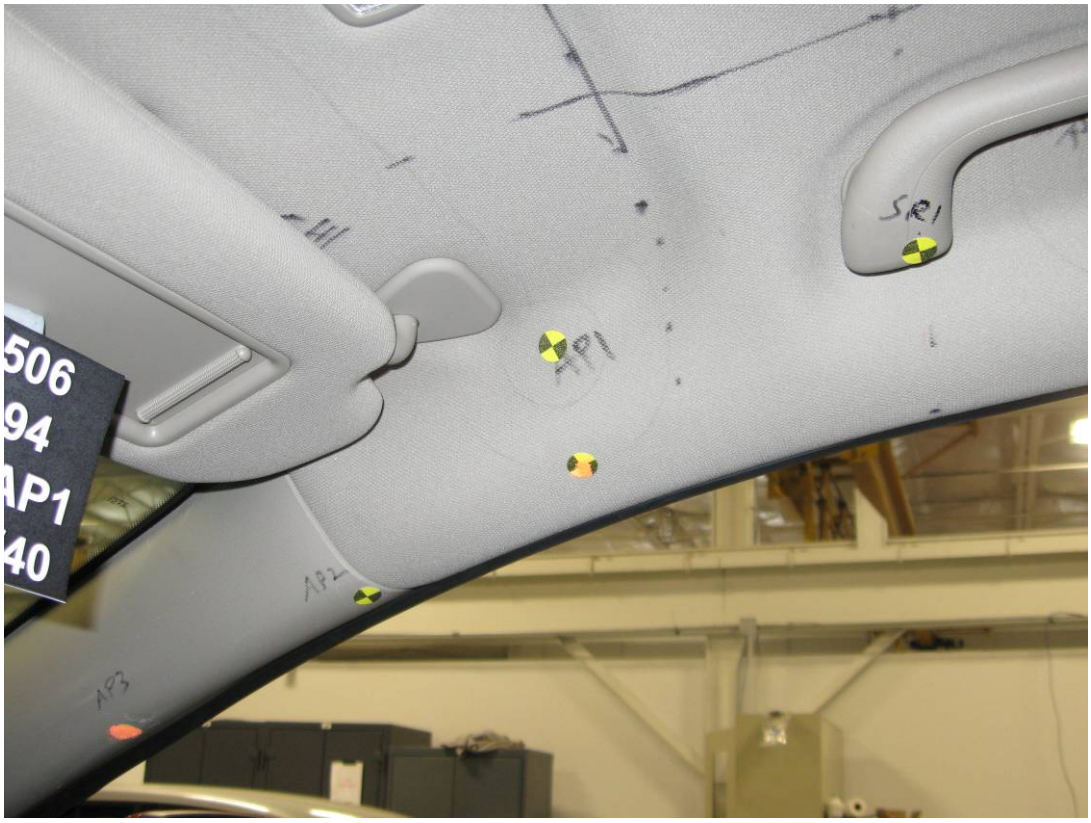
APPROVED BY: Helen A. Kaleto

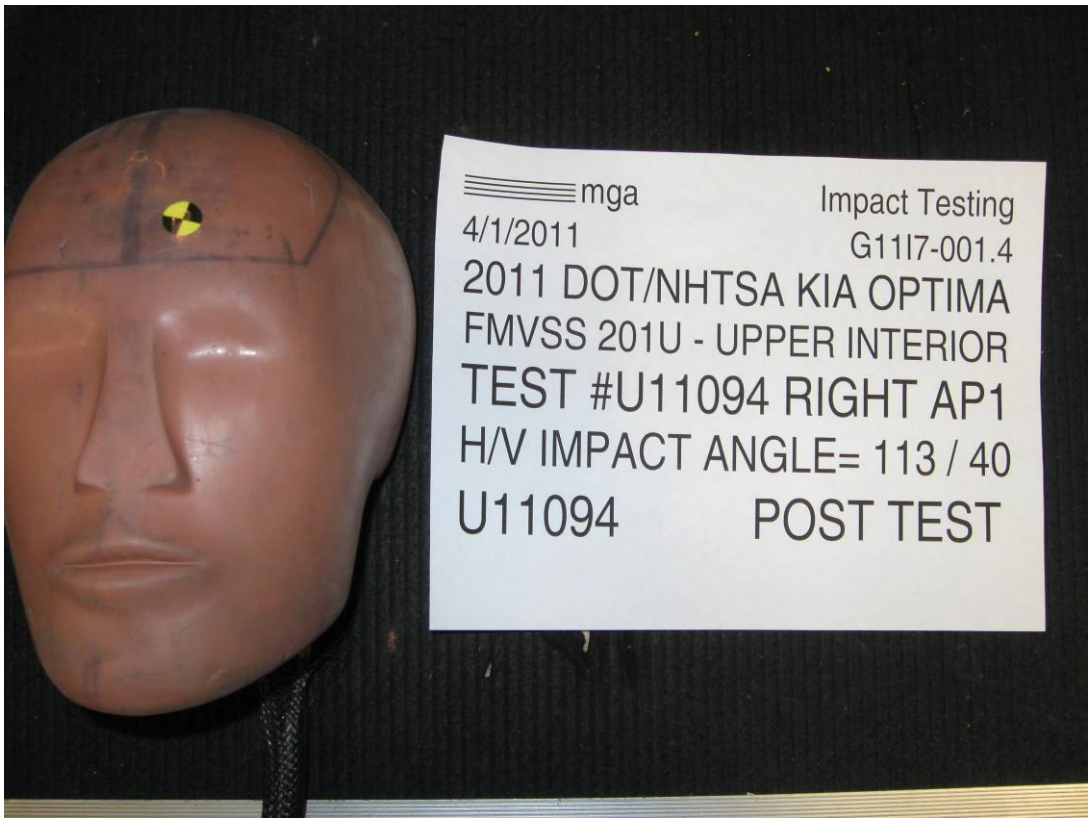
3.0 TEST DATA (Including Acceleration and Velocity Plots)




CB0506
U11094
mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11094 RIGHT AP1
H/V IMPACT ANGLE= 113 / 40
U11094
POST TEST


CB0506
U11094
RIGHT AP1
H/V 113/40
mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11094 RIGHT AP1
H/V IMPACT ANGLE= 113 / 40
U11094
POST TEST


506
94
AP1
40
AP1
AP2
AP3
SR1


mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11094 RIGHT AP1
H/V IMPACT ANGLE= 113 / 40
U11094
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Test Number:#U11094

Target (Vehicle Side): AP1Right

Temperature:20.6C

MGA Test Reference No.:U11094

Humidity:24.2%

Approach Horizontal Angles:113º

Time of Test:3:34:21 PM

Approach Vertical Angles:40º

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

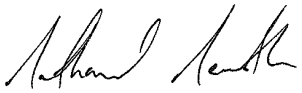
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
553	512	3.8	18.8	14	16 Left

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

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

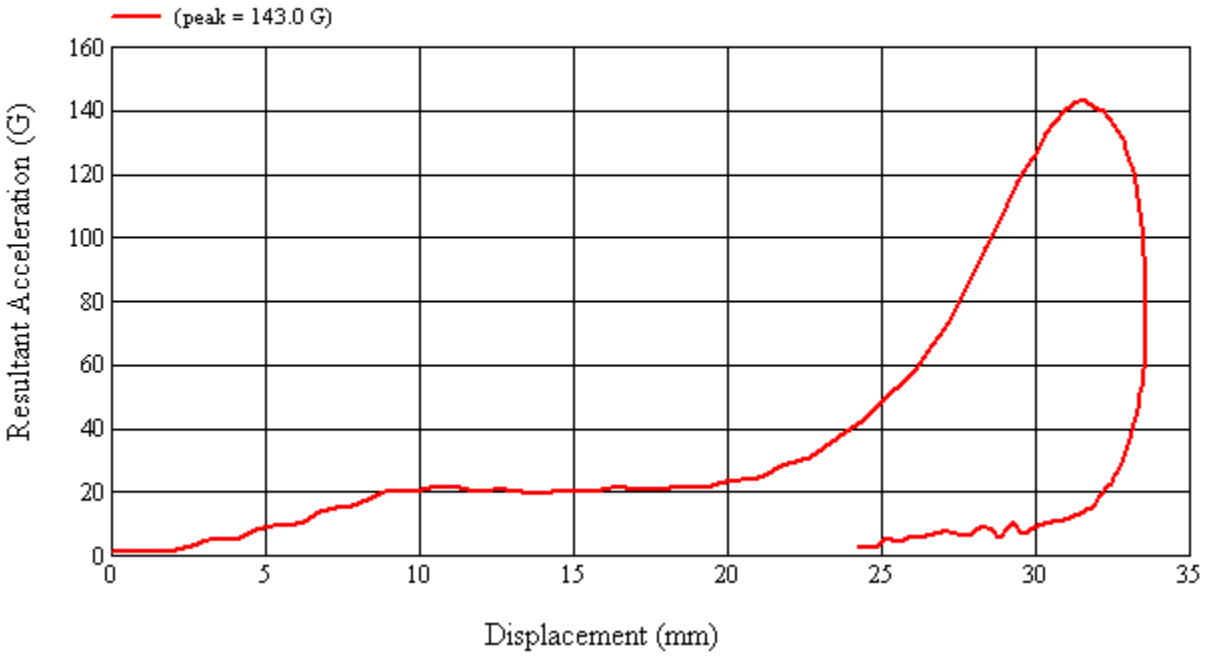
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

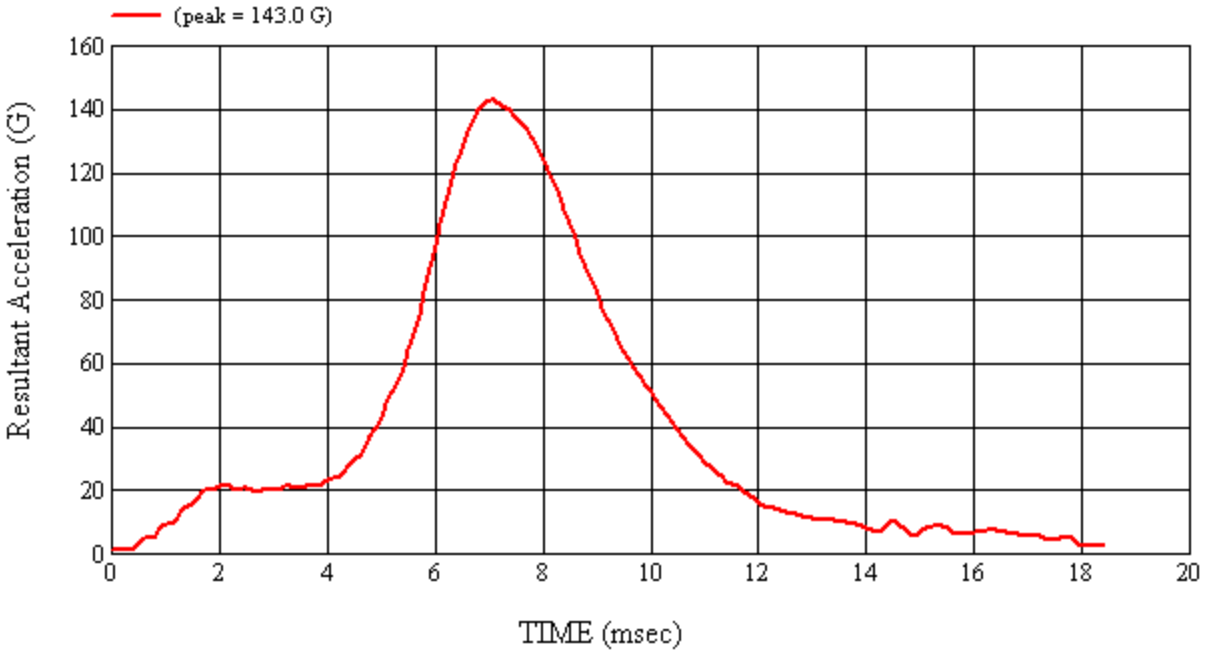
No visible damage

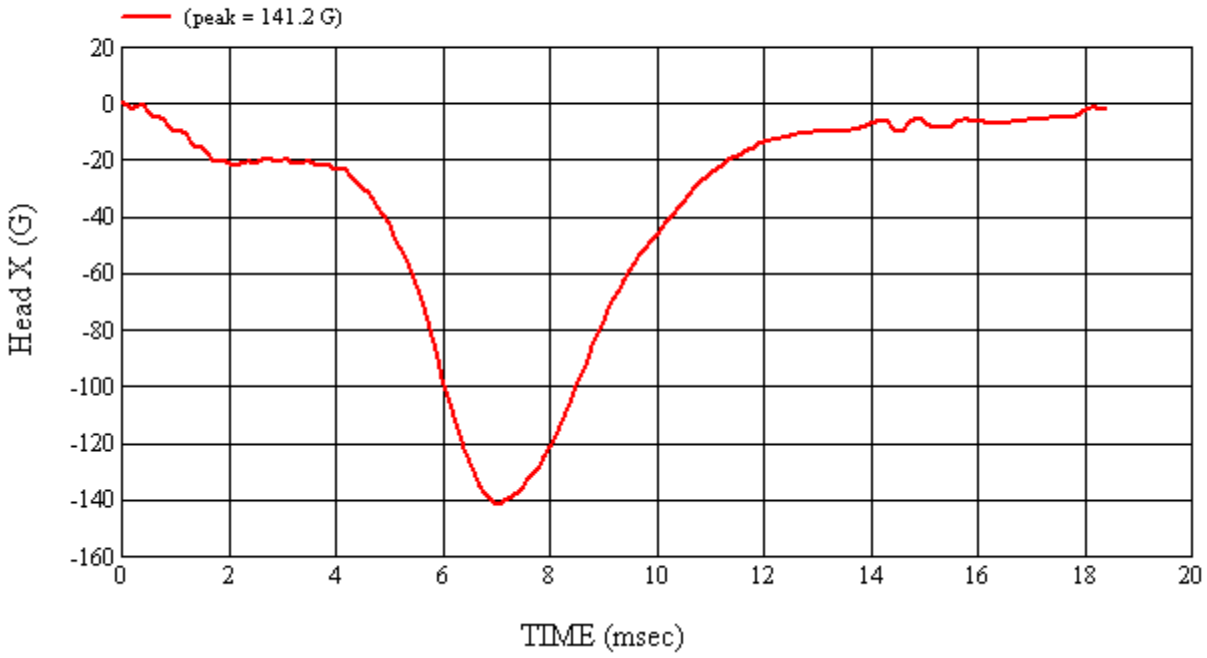
Recorded By:  Approved By*:  Date: 4/1/2011

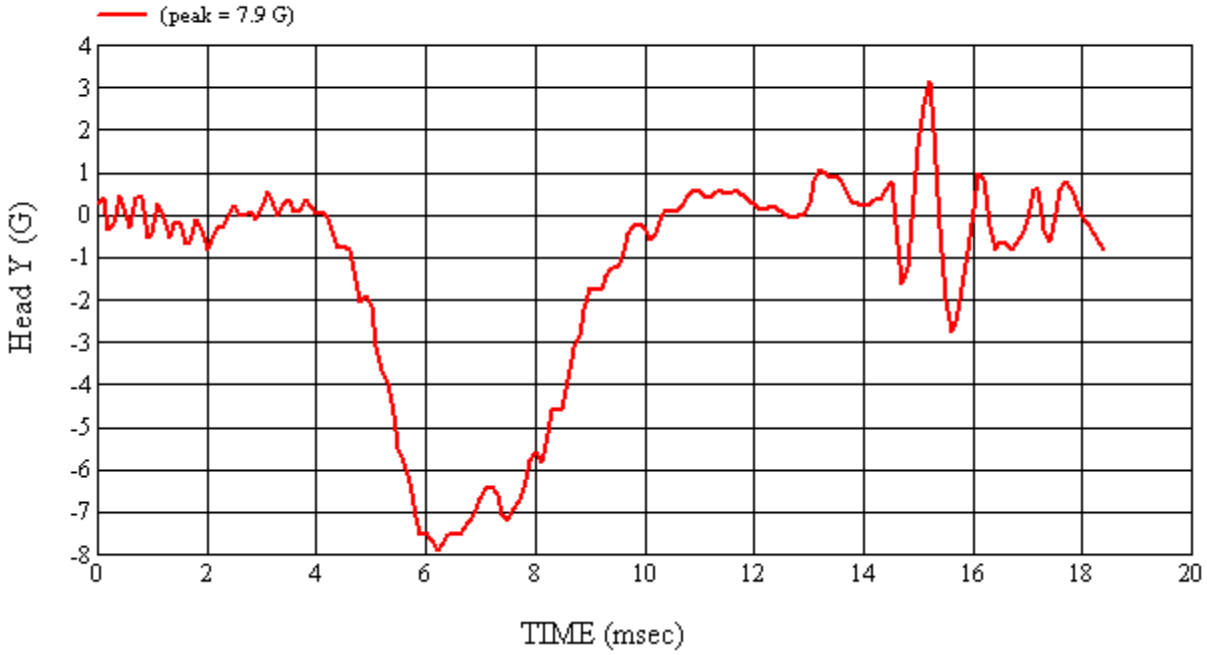
*Only necessary for NHTSA (Government) Compliance testing.

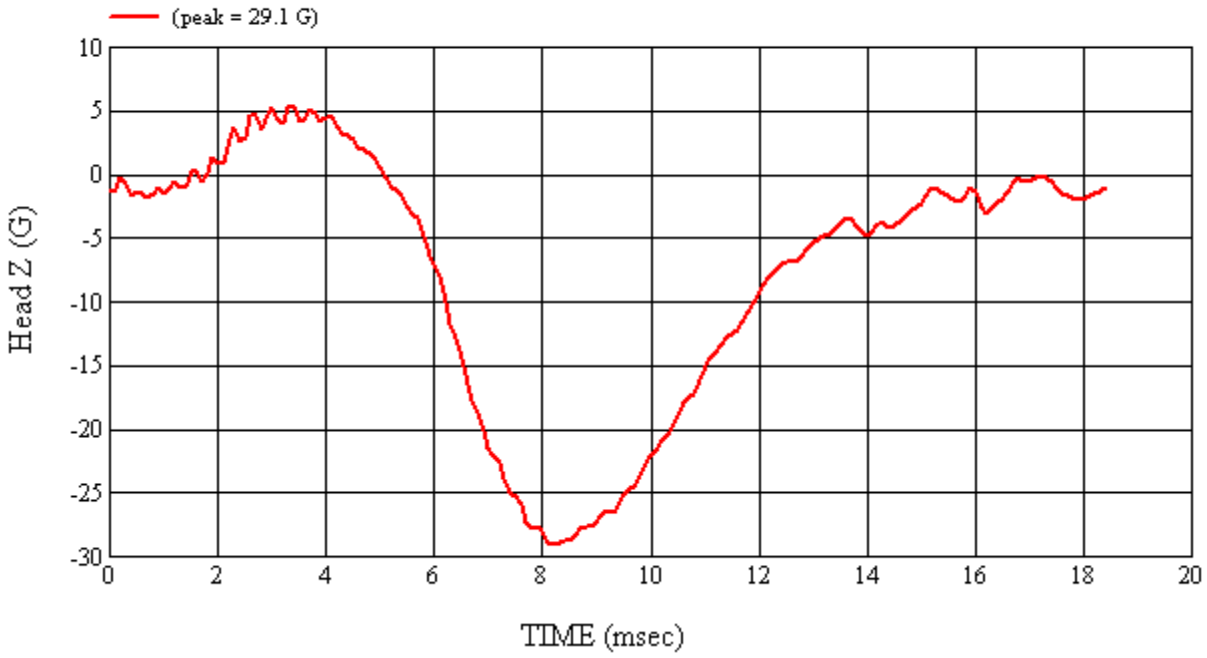
MGA Test #: U11094 Target Location: AP1, Right Side Test Date: 4/1/2011

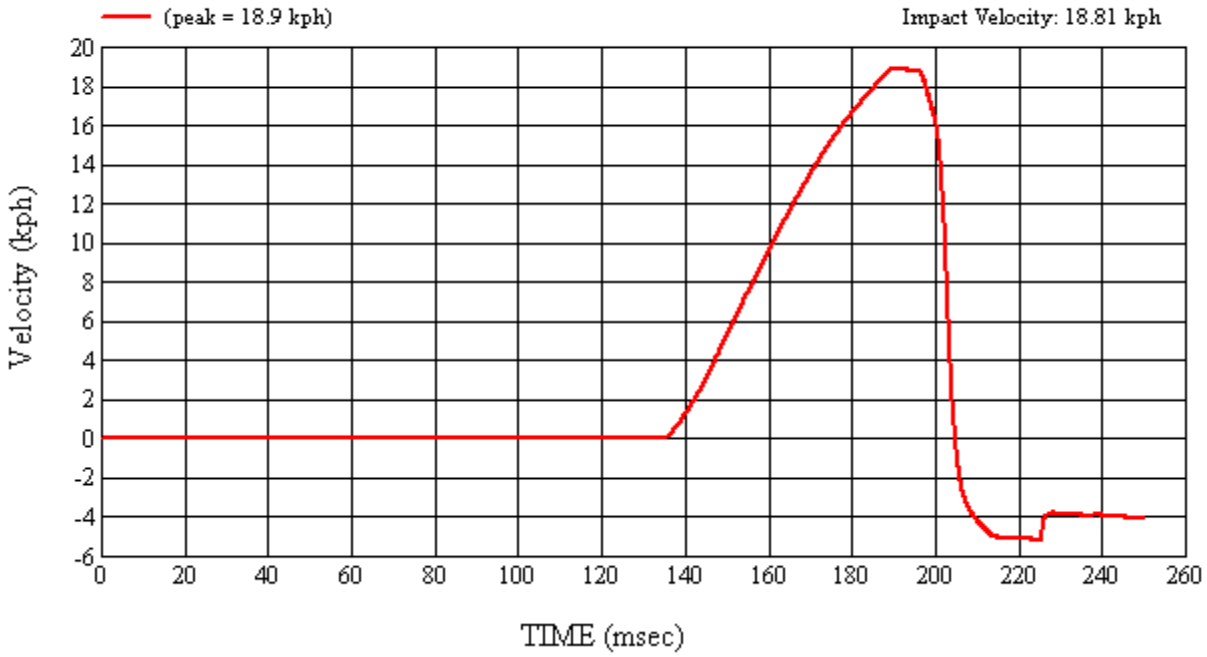


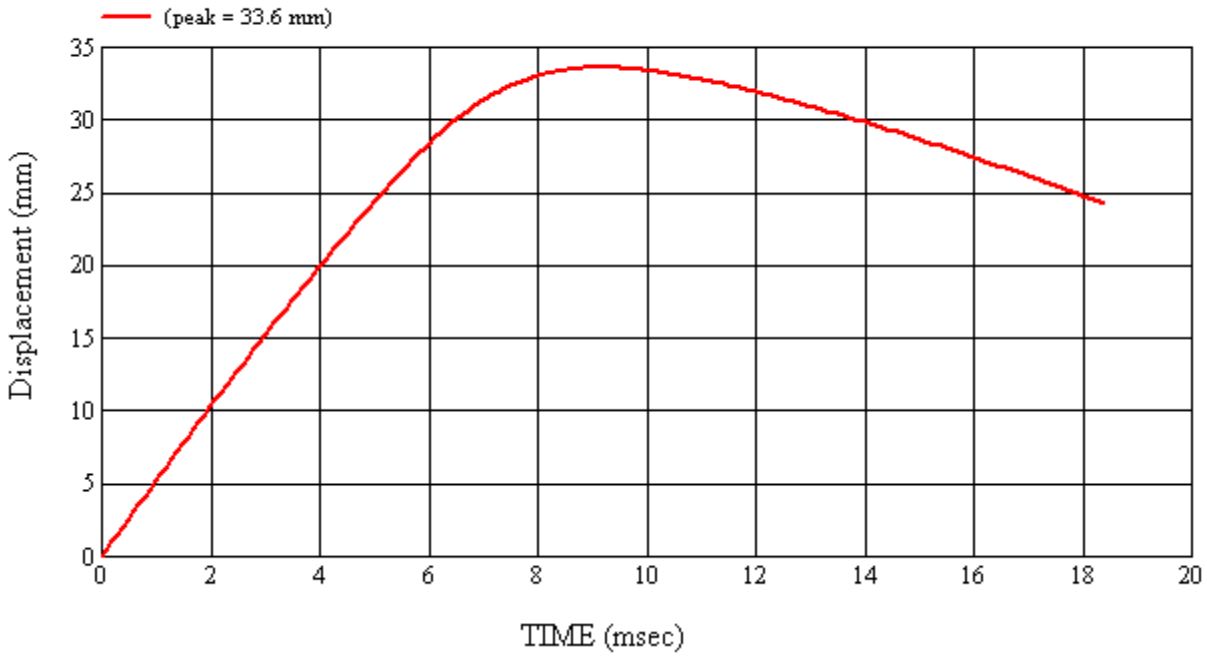



(peak = 141.2 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
-160
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 7.9 G)
Head Y (G)
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 29.1 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

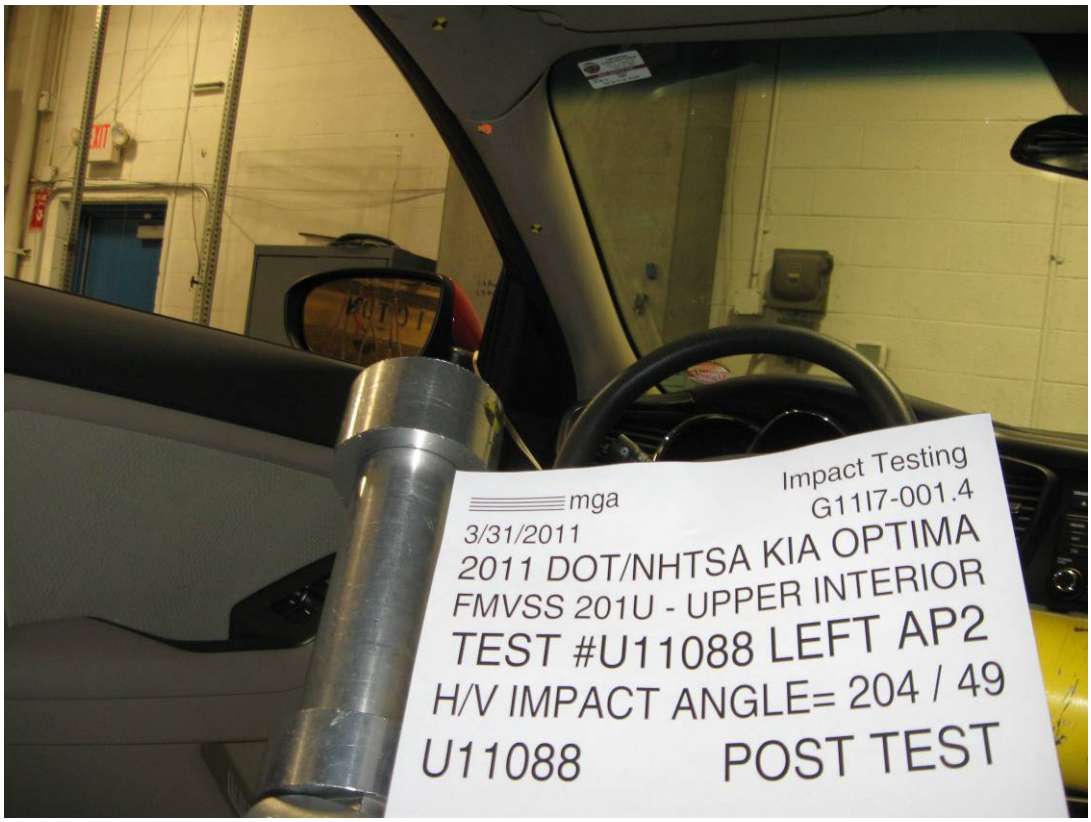

(peak = 18.9 kph)
Impact Velocity: 18.81 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

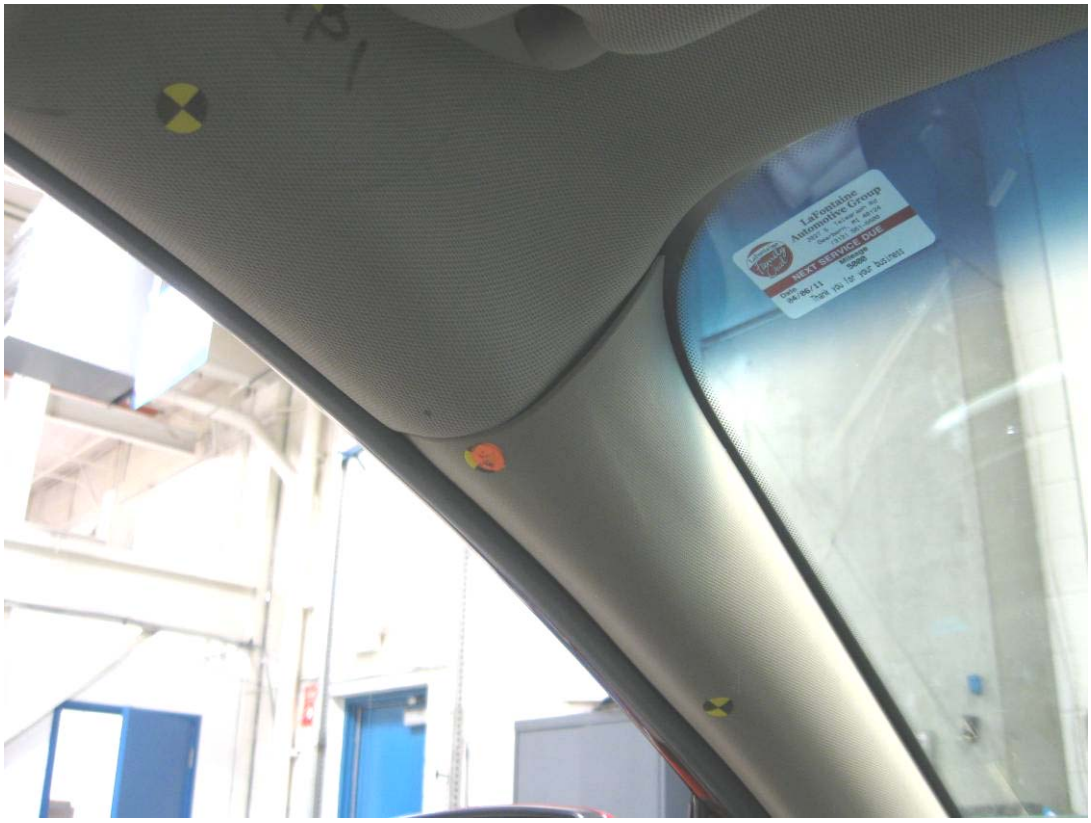

(peak = 33.6 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

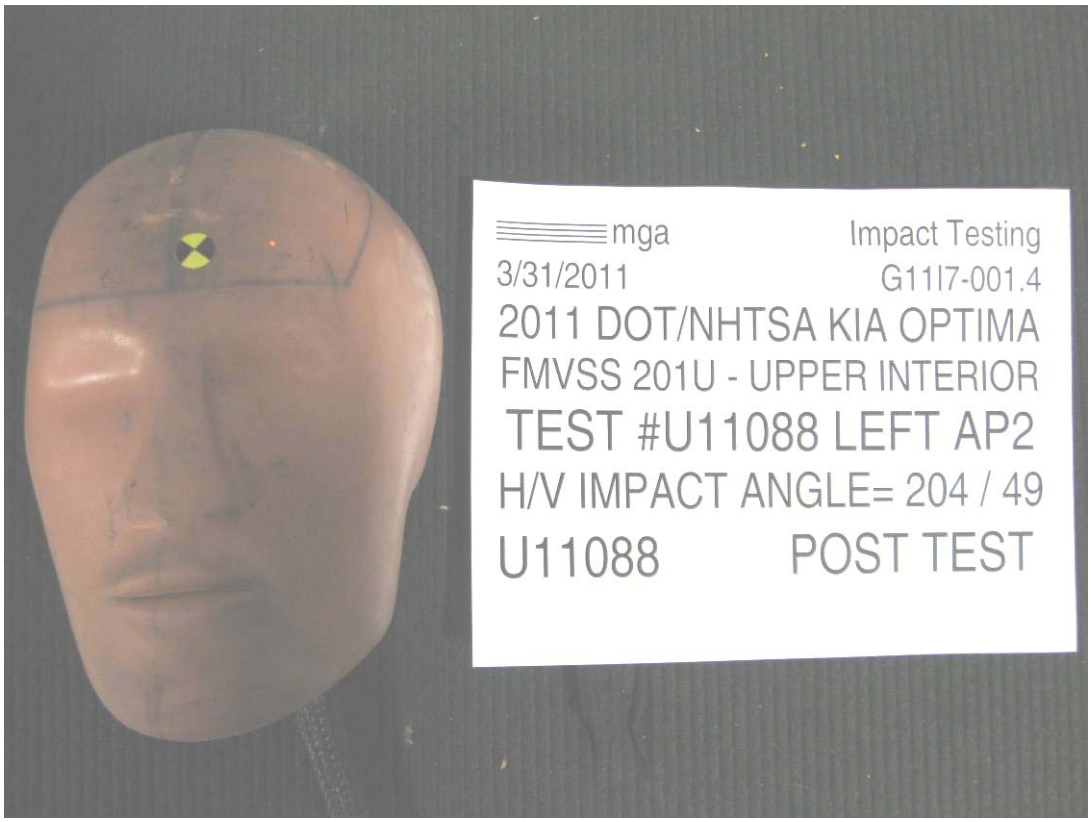

mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11088 LEFT AP2
H/V IMPACT ANGLE= 204 / 49
U11088
PRE TEST


mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11088 LEFT AP2
H/V IMPACT ANGLE= 204 / 49
U11088
PRE TEST


mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11088 LEFT AP2
H/V IMPACT ANGLE= 204 / 49
U11088
POST TEST


mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11088 LEFT AP2
H/V IMPACT ANGLE= 204 / 49
U11088
POST TEST


LaFontaine
Automotive Group
NEXT SERVICE DUE


mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11088 LEFT AP2
H/V IMPACT ANGLE= 204 / 49
U11088
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Test Number:#U11088

Target (Vehicle Side): AP2Left

Temperature:20.7C

MGA Test Reference No.:U11088

Humidity:23.2%

Approach Horizontal Angles:204º

Time of Test:2:41:13 PM

Approach Vertical Angles:49º

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
363	261	10.7	18.6	14	6 Left

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

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

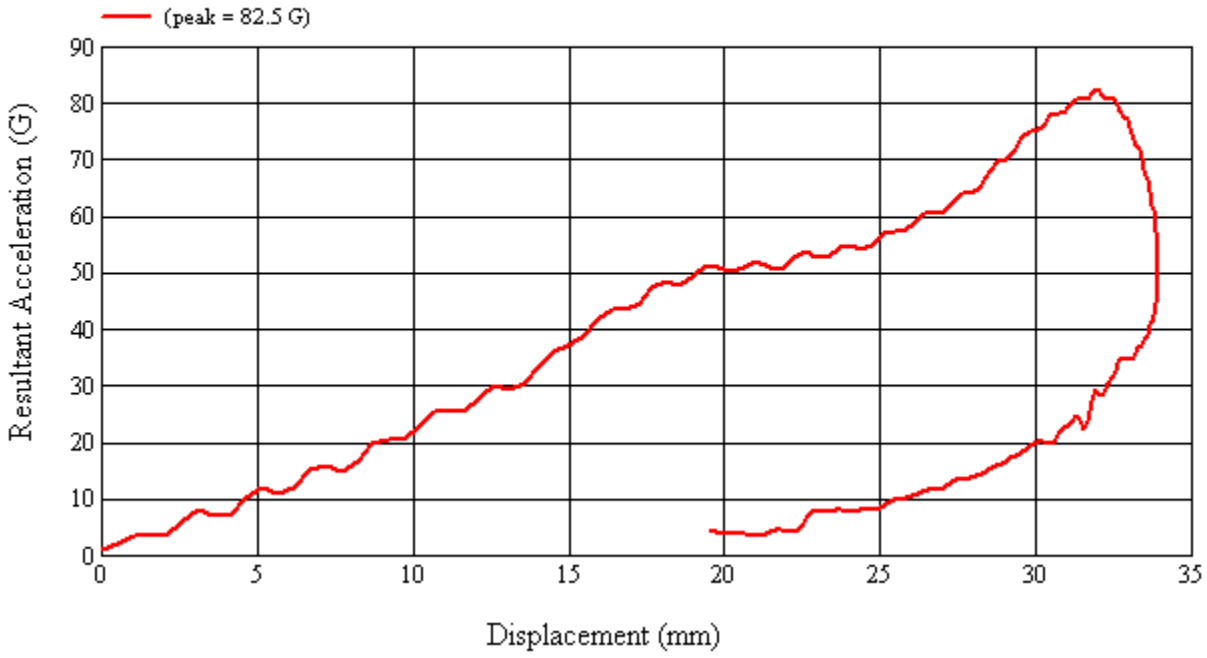
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

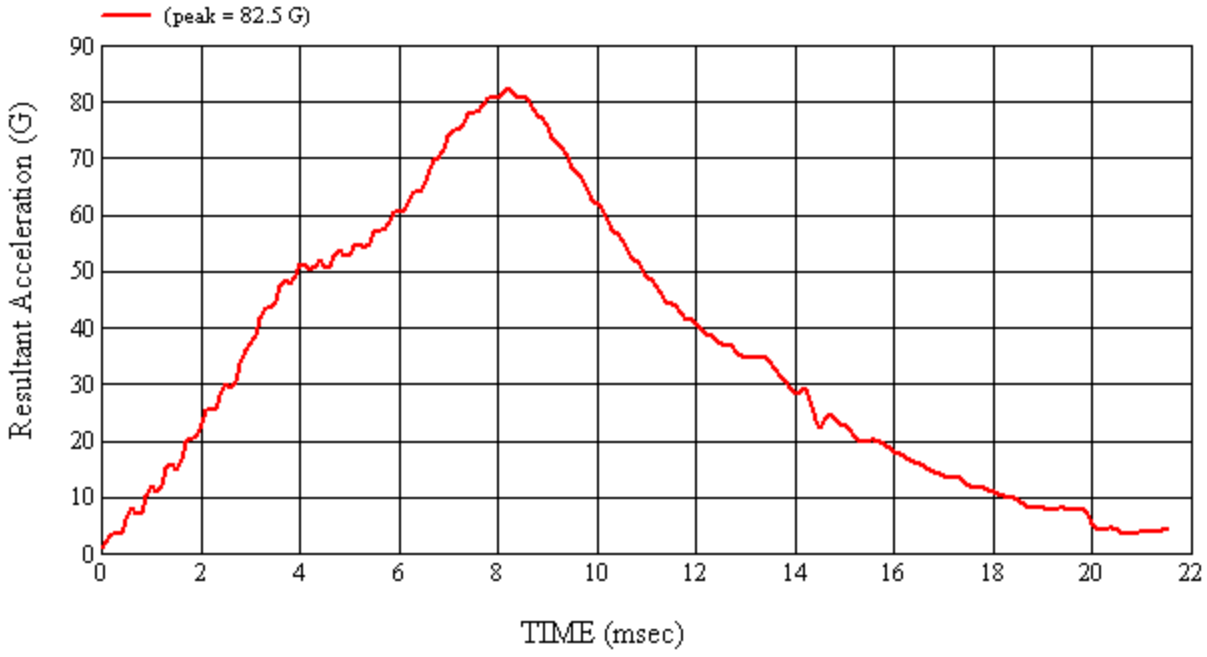
Trim dislodged

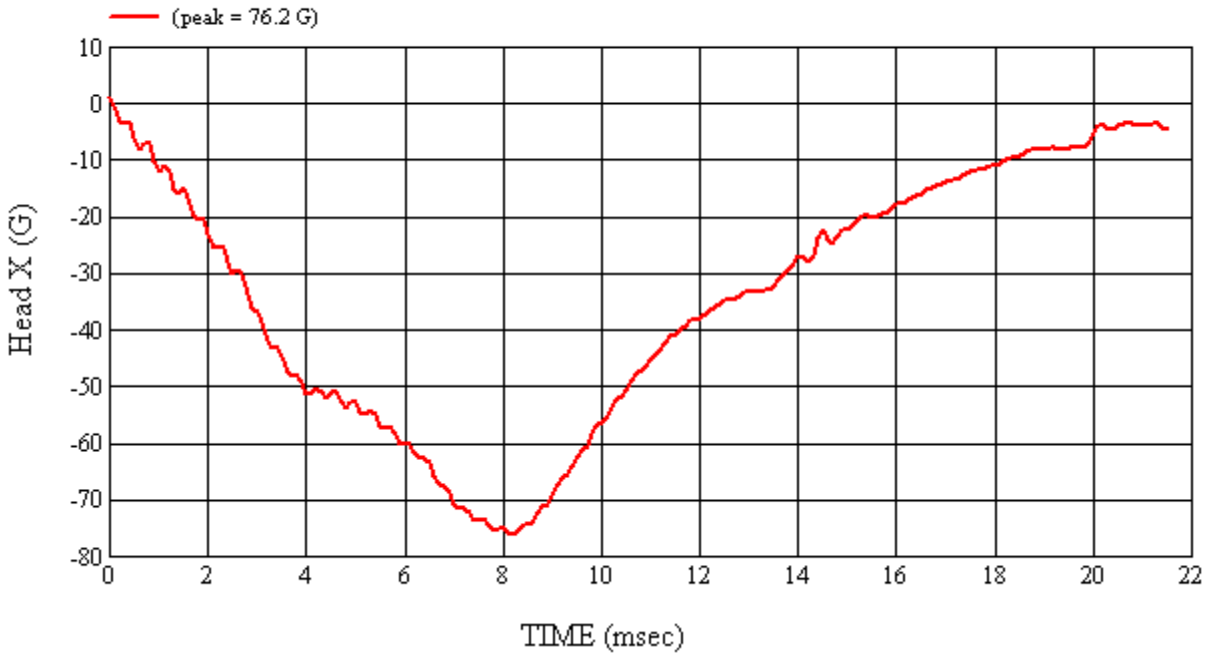
Recorded By: _____ Approved By*: _____ Date: 3/31/2011

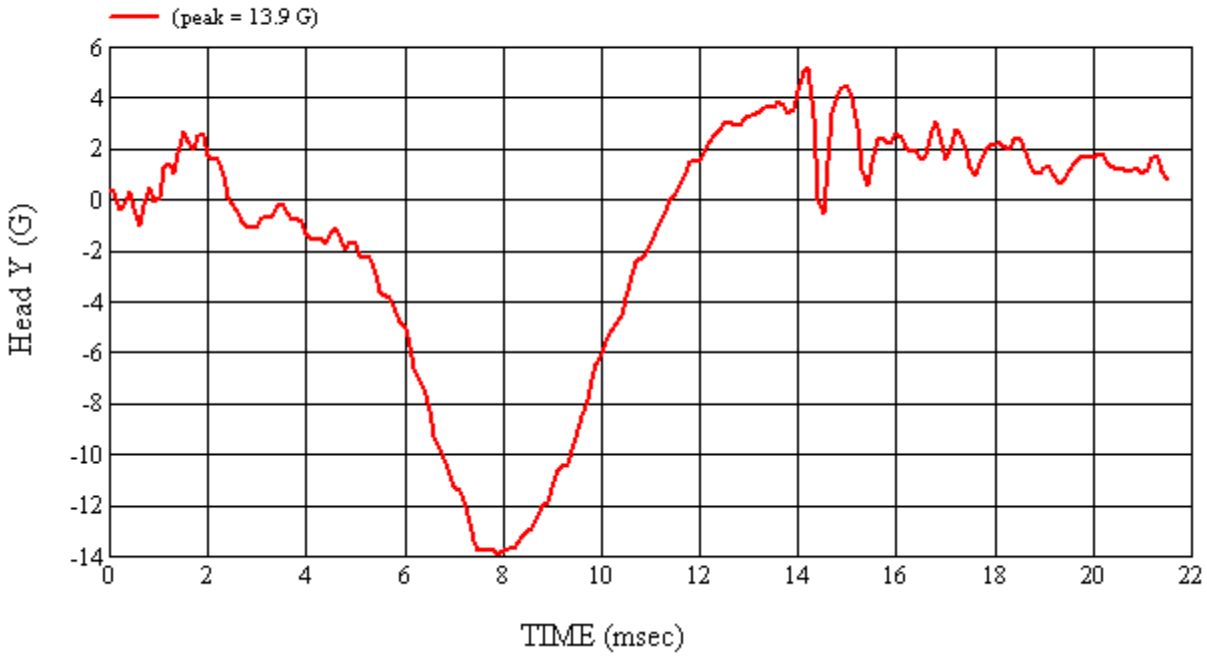
*Only necessary for NHTSA (Government) Compliance testing.

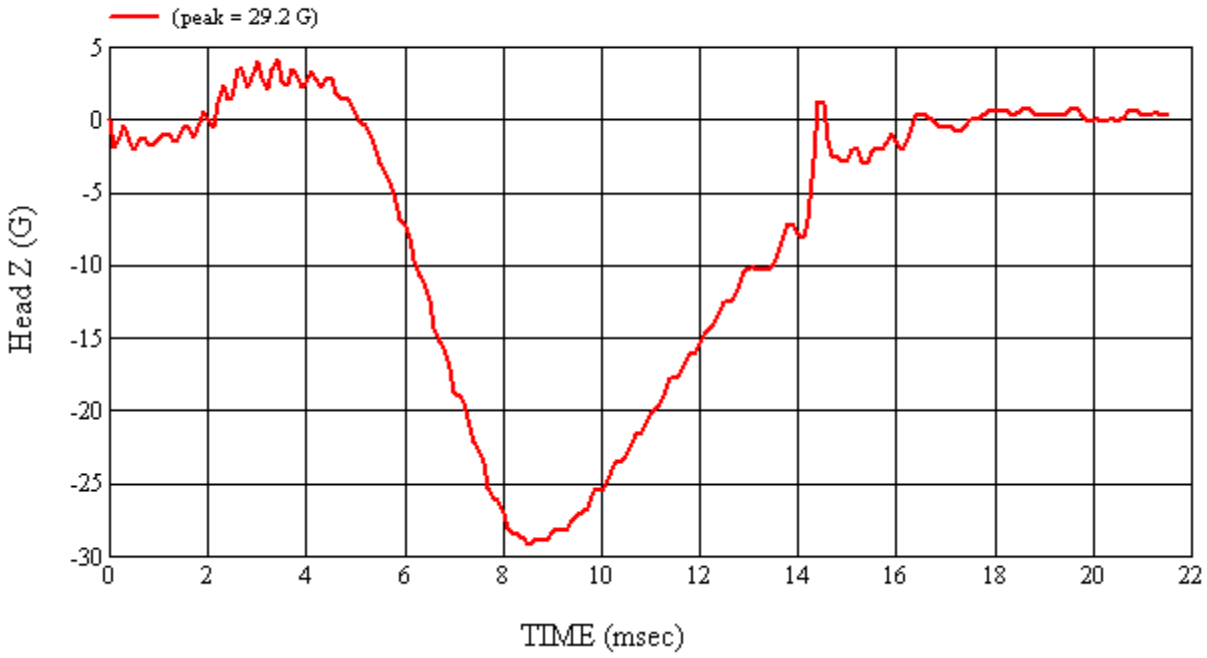
MGA Test #: U11088 Target Location: AP2, Left Side Test Date: 3/31/2011

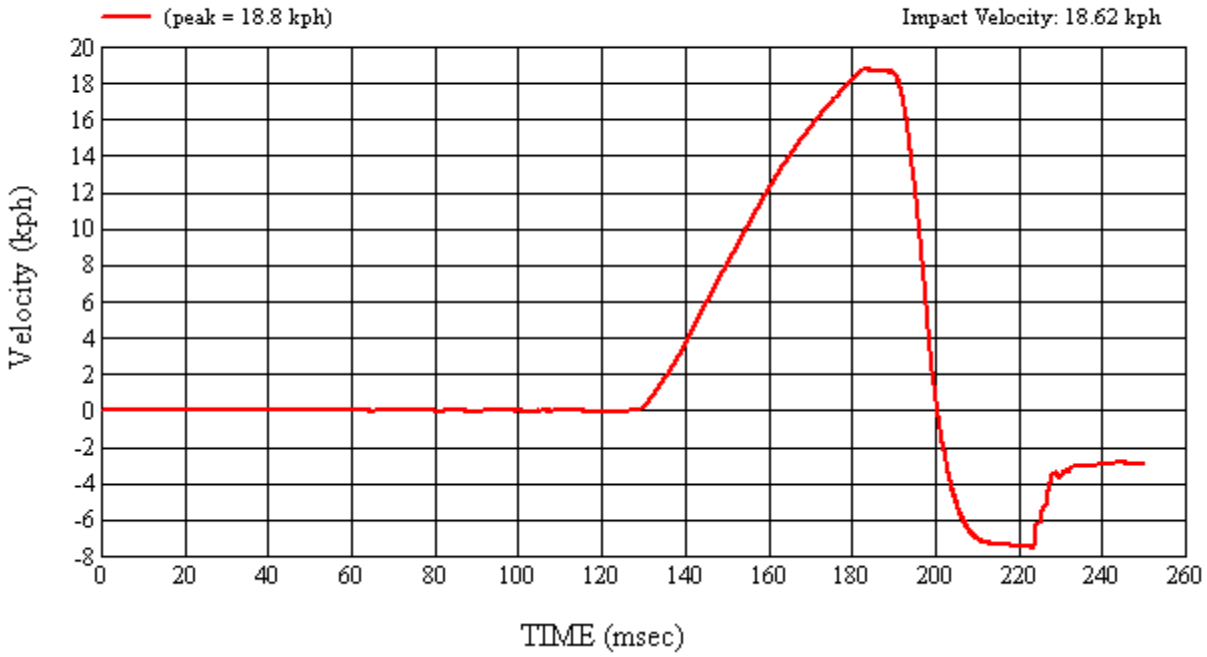


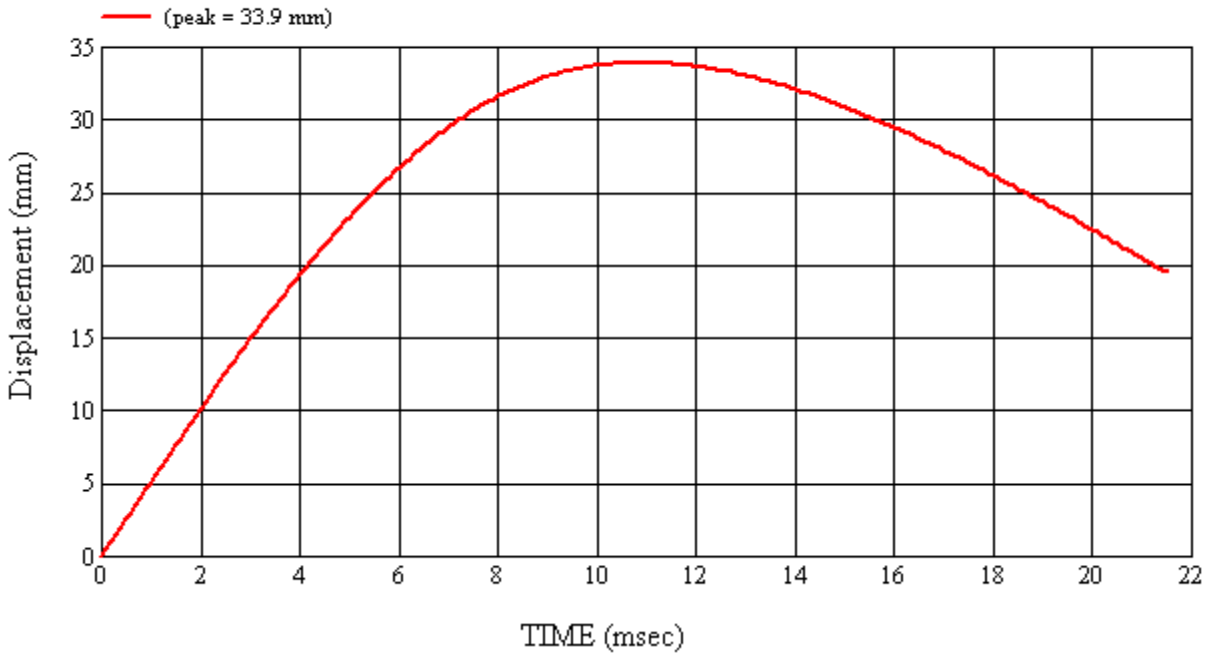


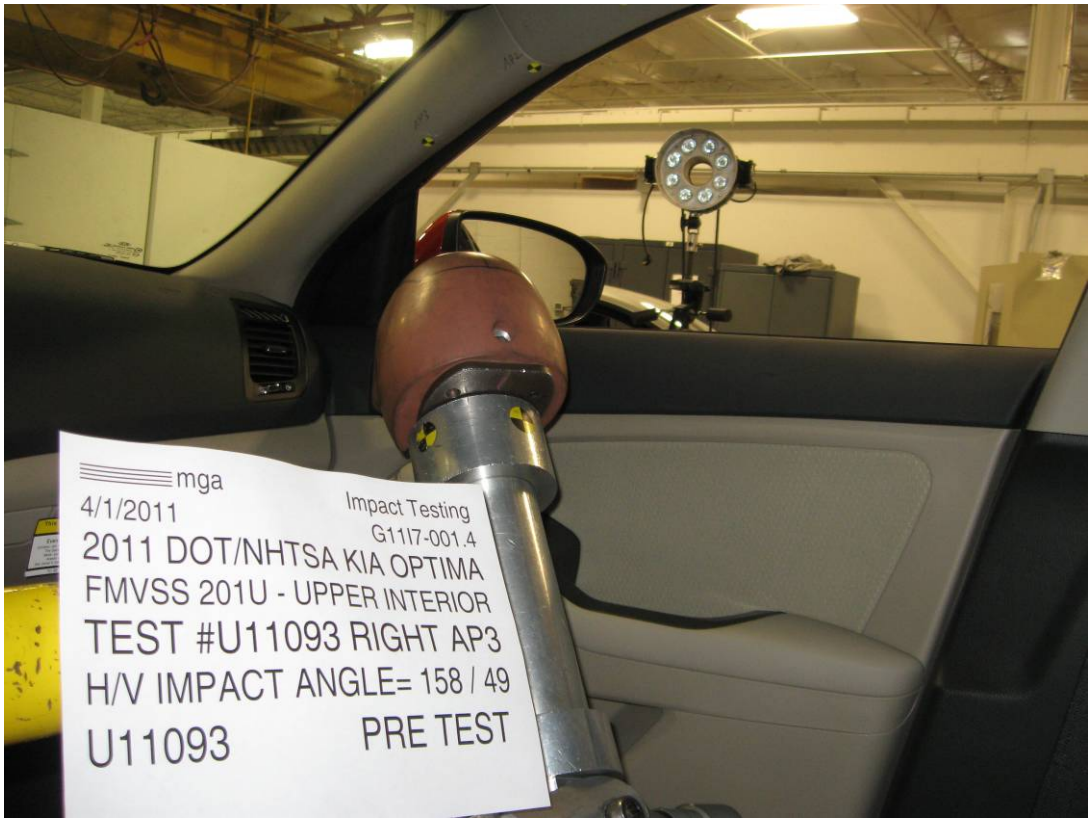

(peak = 76.2 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 13.9 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
TIME (msec)


(peak = 29.2 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 18.8 kph)
Impact Velocity: 18.62 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
160
180
200
220
240
260
TIME (msec)


(peak = 33.9 mm)
Displacement (mm)
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11093 RIGHT AP3
H/V IMPACT ANGLE= 158 / 49
U11093
PRE TEST


mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11093 RIGHT AP3
H/V IMPACT ANGLE= 158 / 49
U11093
PRE TEST


mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11093 RIGHT AP3
H/V IMPACT ANGLE= 158 / 49
U11093
POST TEST


mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11093 RIGHT AP3
H/V IMPACT ANGLE= 158 / 49
U11093
POST TEST


AP2
AP3


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11093 RIGHT AP3
H/V IMPACT ANGLE= 158 / 49
U11093
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Test Number:#U11093

Target (Vehicle Side): AP3Right

Temperature:20.6C

MGA Test Reference No.:U11093

Humidity:24.8%

Approach Horizontal Angles:158º

Time of Test:1:05:38 PM

Approach Vertical Angles:49º

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
370	269	11.7	19.0	18	1 Right

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

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

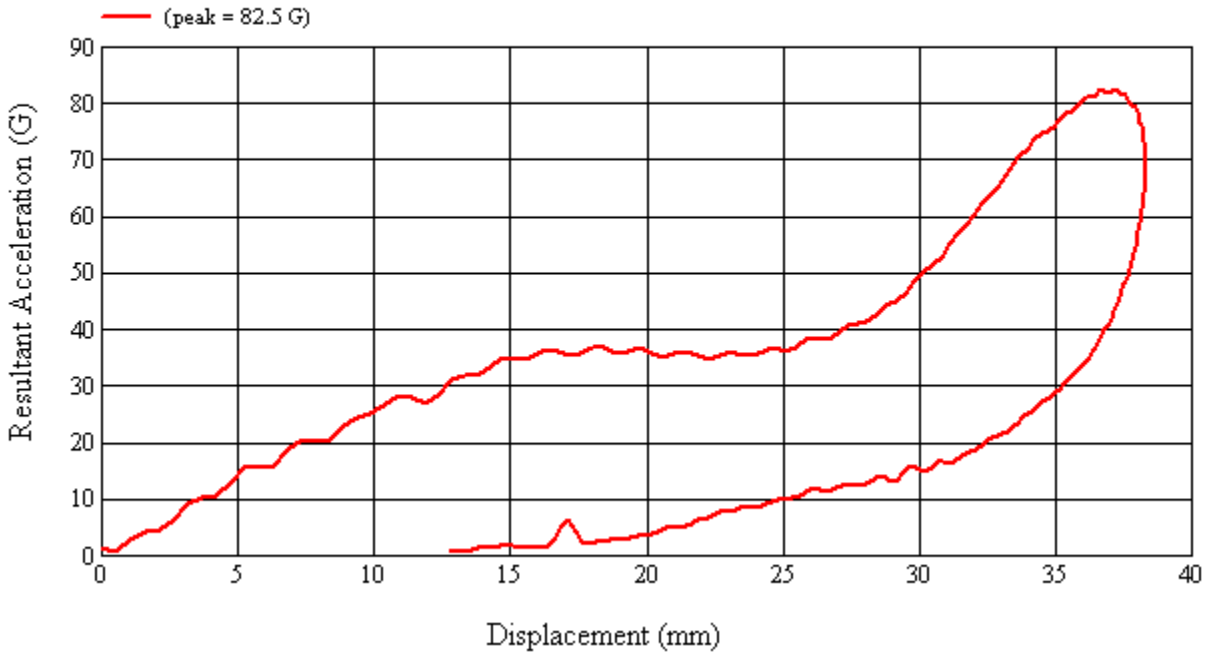
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

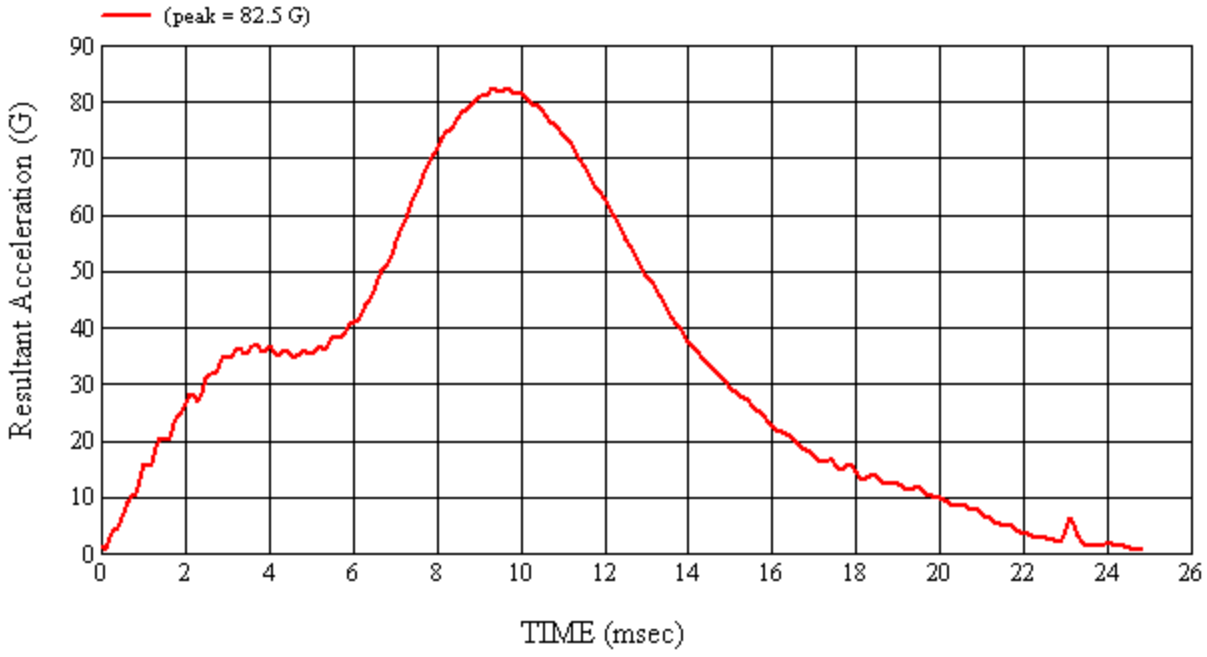
No visible damage

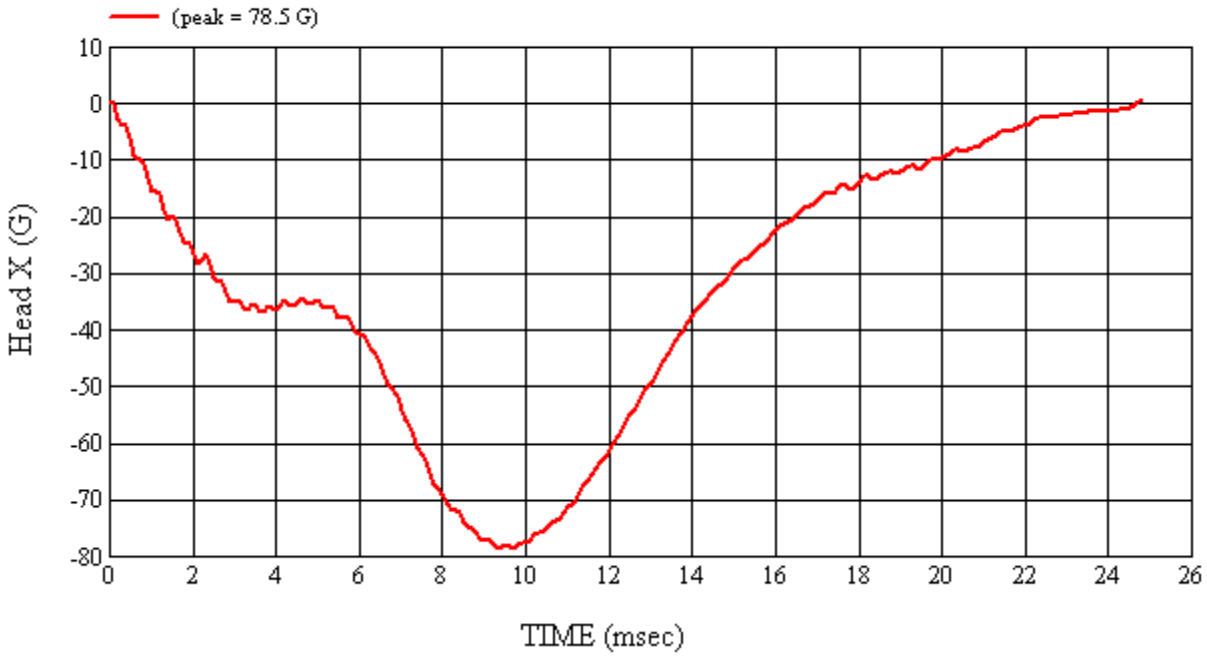
Recorded By:  Approved By*:  Date: 4/1/2011

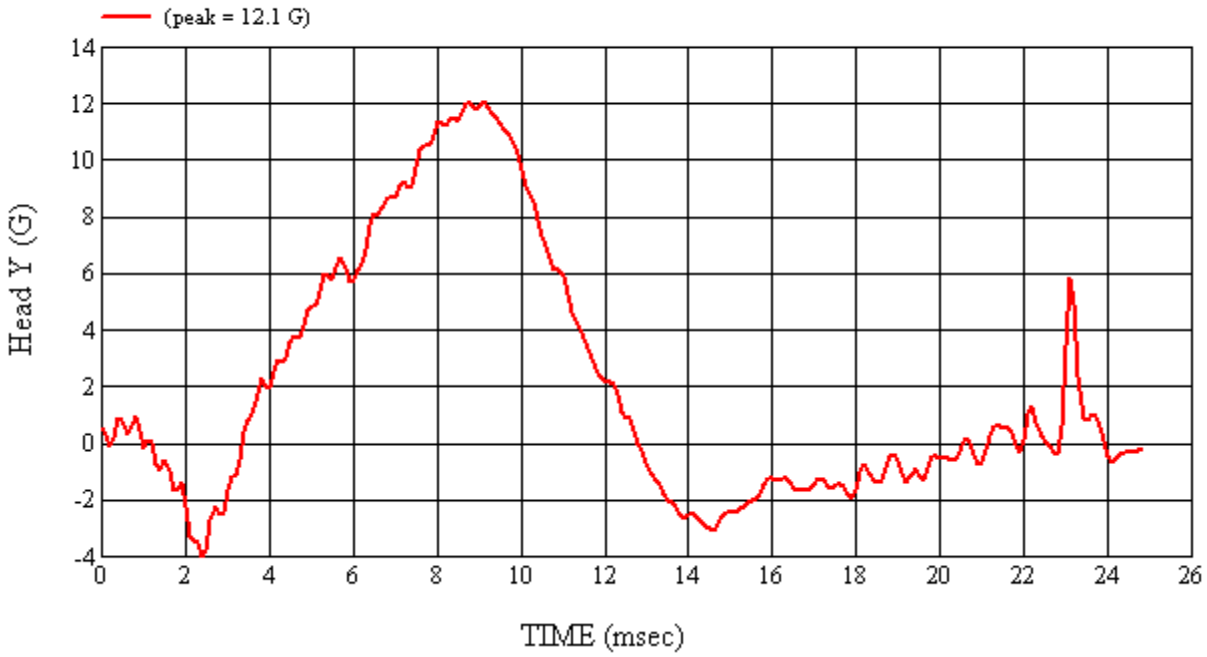
*Only necessary for NHTSA (Government) Compliance testing.

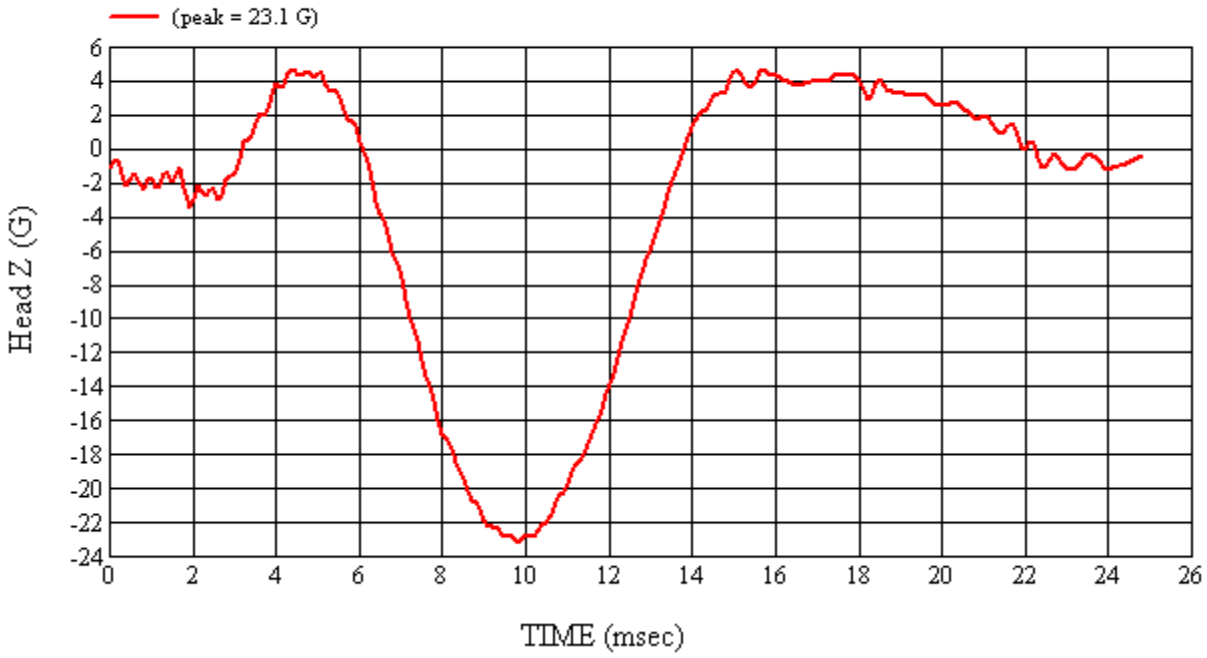
MGA Test #: U11093 Target Location: AP3, Right Side Test Date: 4/1/2011

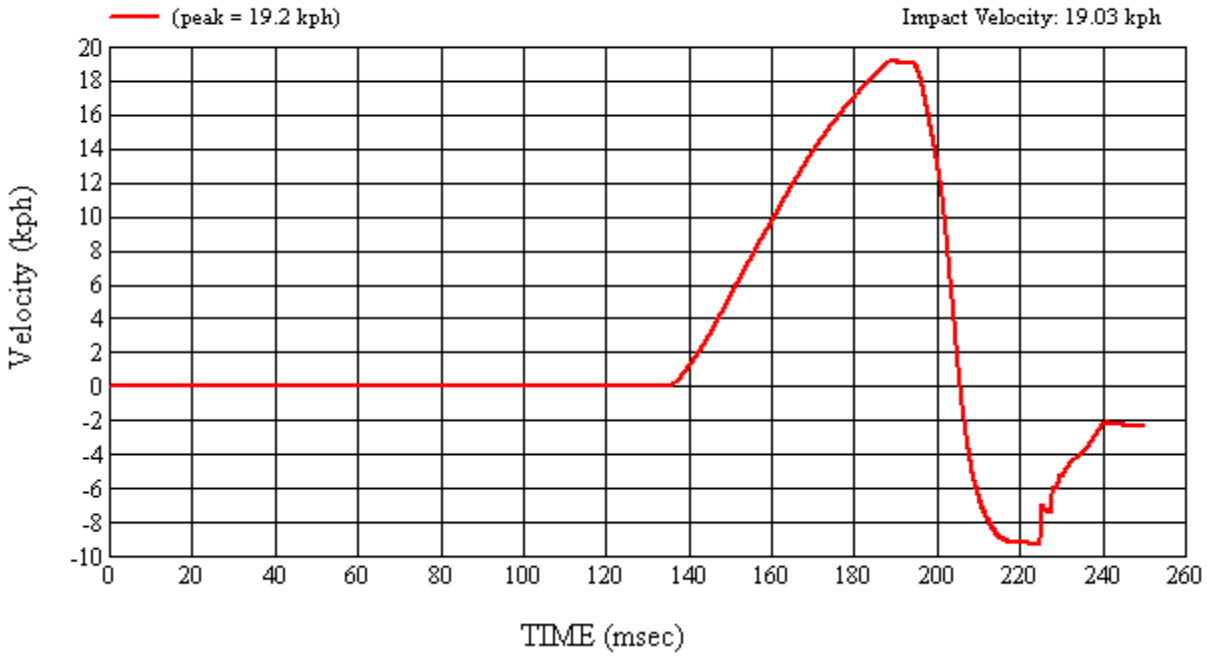


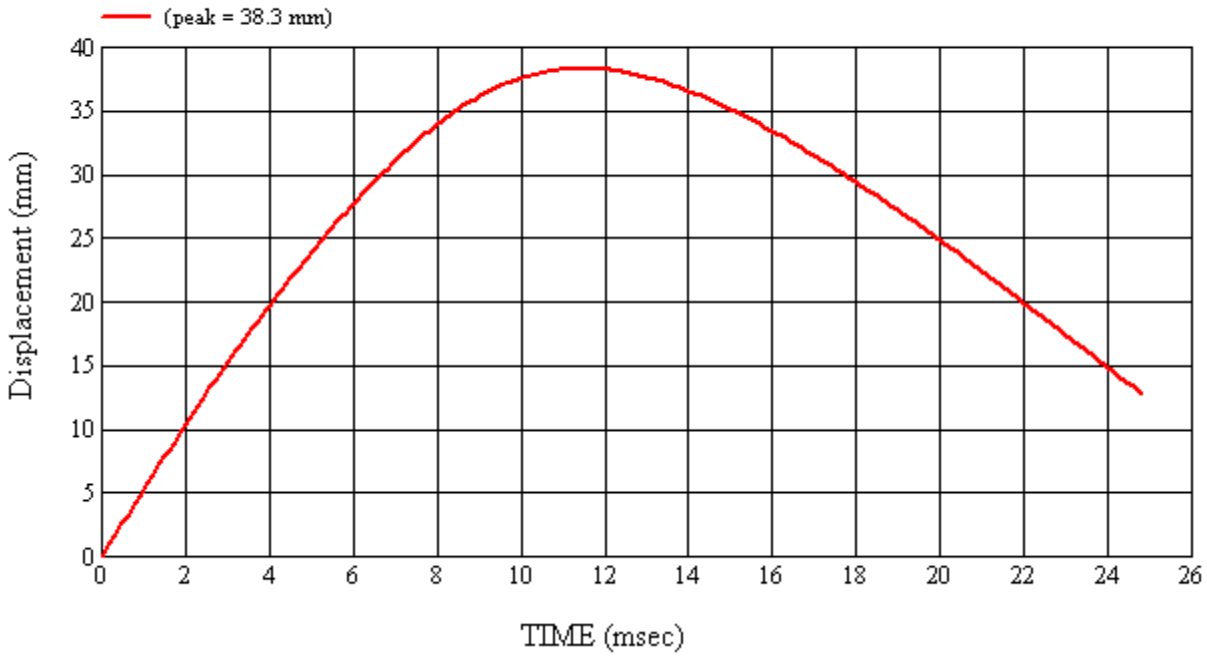



(peak = 78.5 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 12.1 G)
Head Y (G)
14
12
10
8
6
4
2
0
-2
-4
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 23.1 G)
Head Z (G)
6
4
2
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
TIME (msec)

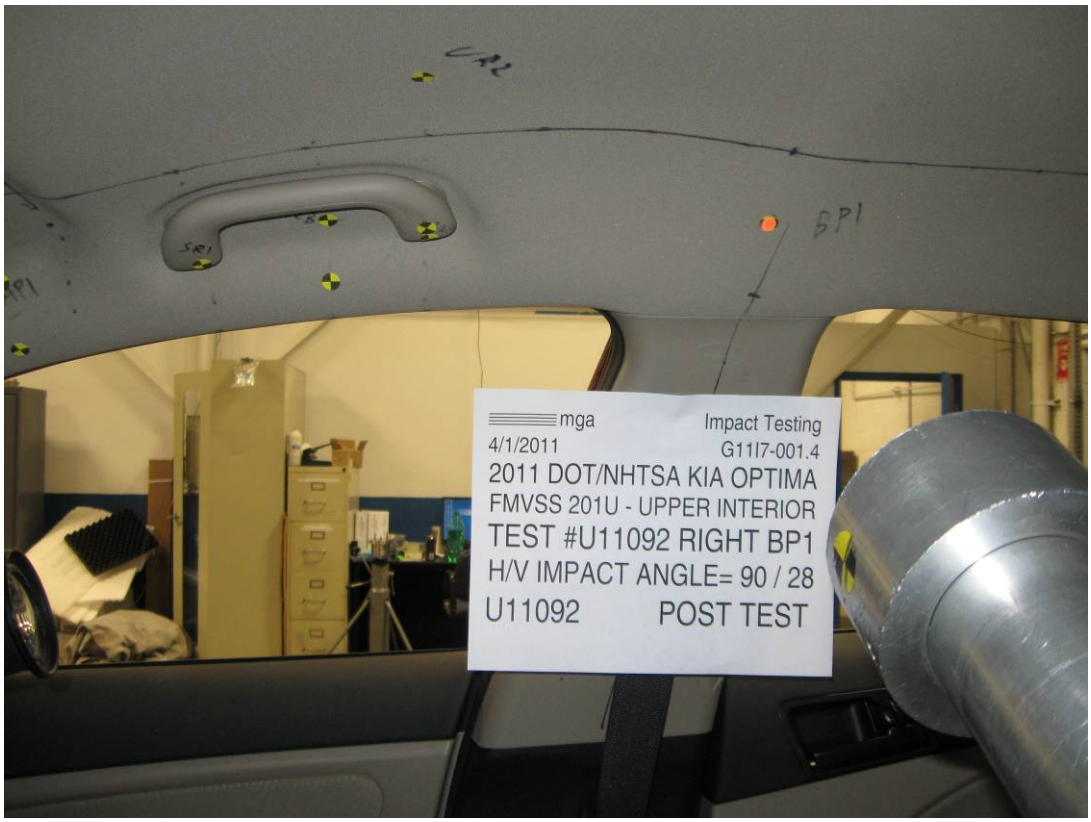

(peak = 19.2 kph)
Impact Velocity: 19.03 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

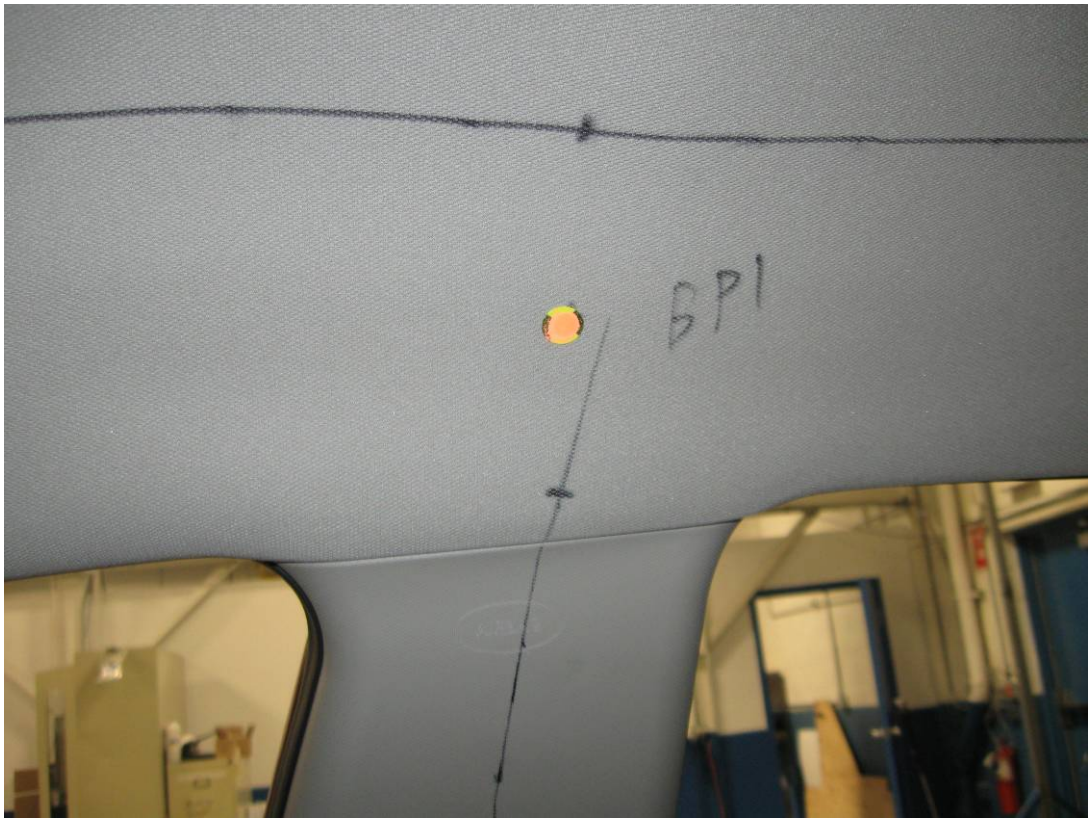

(peak = 38.3 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


CB0506
U11092
RIGHT BP1
H/V 90/28
mga
Impact Testing
G11I7-001.4
4/1/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11092 RIGHT BP1
H/V IMPACT ANGLE= 90 / 28
U11092
PRE TEST


mga
Impact Testing
G11I7-001.4
4/1/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11092 RIGHT BP1
H/V IMPACT ANGLE= 90 / 28
U11092
PRE TEST


CB0506
U11092
RIGHT BP1
mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11092 RIGHT BP
H/V IMPACT ANGLE= 90 /
U11092
POST TES


mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11092 RIGHT BP1
H/V IMPACT ANGLE= 90 / 28
U11092
POST TEST


BP1


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11092 RIGHT BP1
H/V IMPACT ANGLE= 90 / 28
U11092
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Test Number:#U11092

Target (Vehicle Side): BP1Right

Temperature:20.6C

MGA Test Reference No.:U11092

Humidity:25.3%

Approach Horizontal Angles:90º

Time of Test:11:39:54 AM

Approach Vertical Angles:28º

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
549	507	4.4	18.8	25	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	-96.4	1.07	1.07
Y	6	J36197	108.7	0.85	0.86
Z	7	J36353	99.1	0.94	0.94

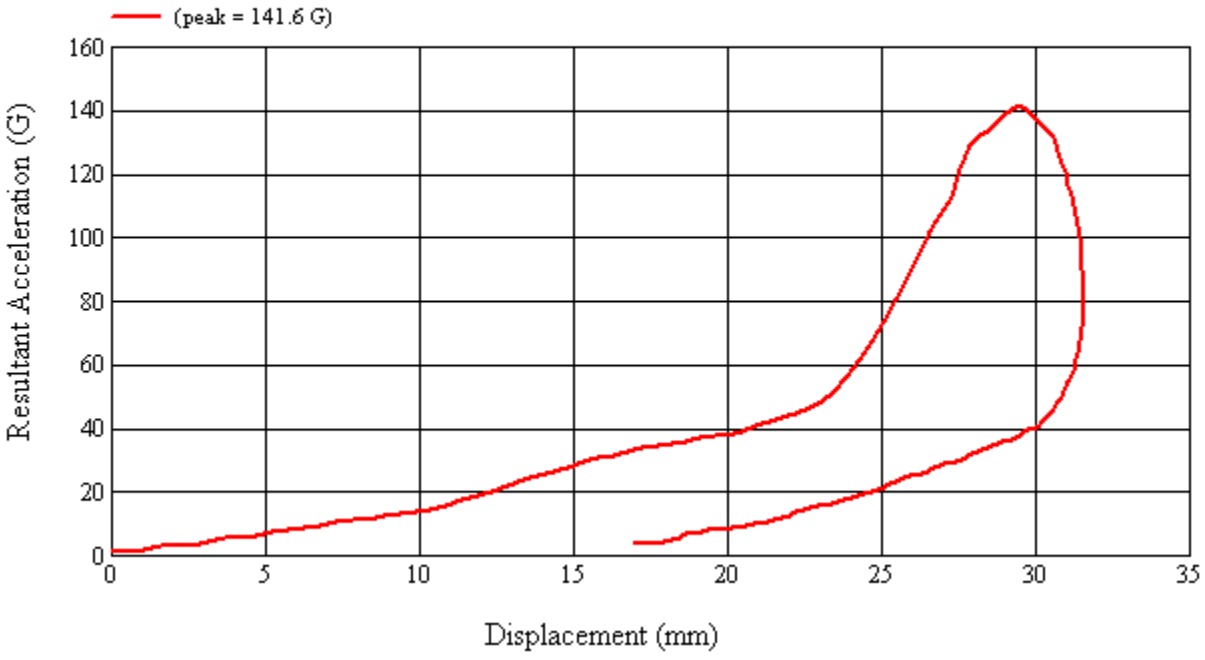
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

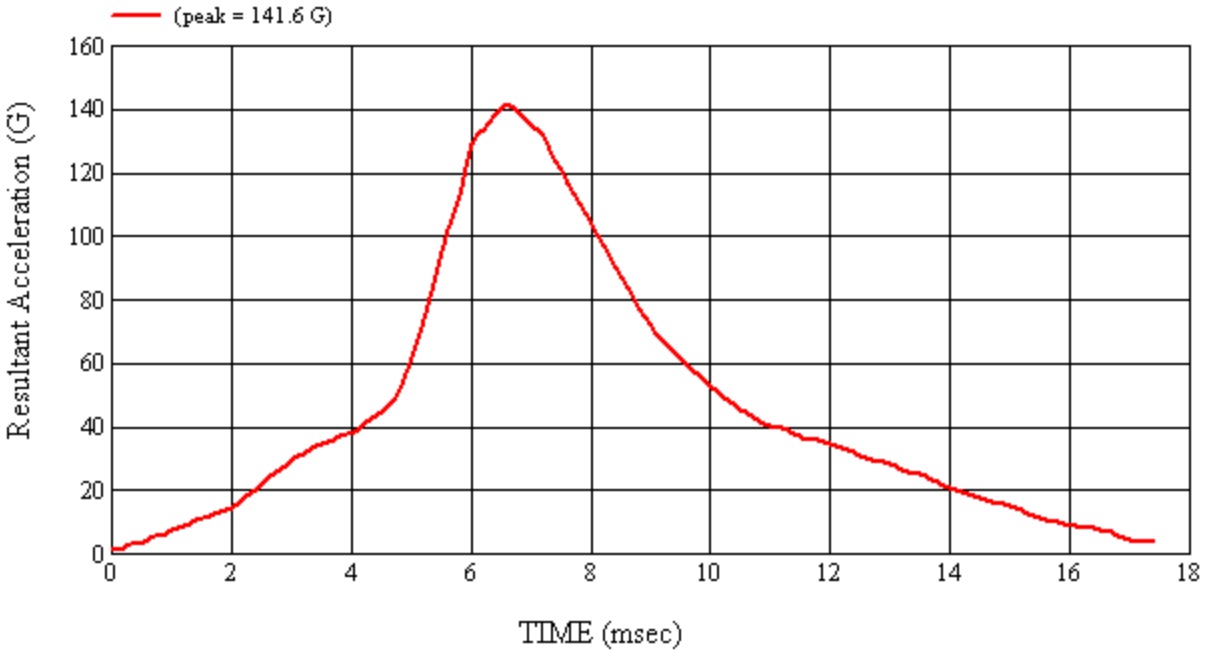
No visible damage

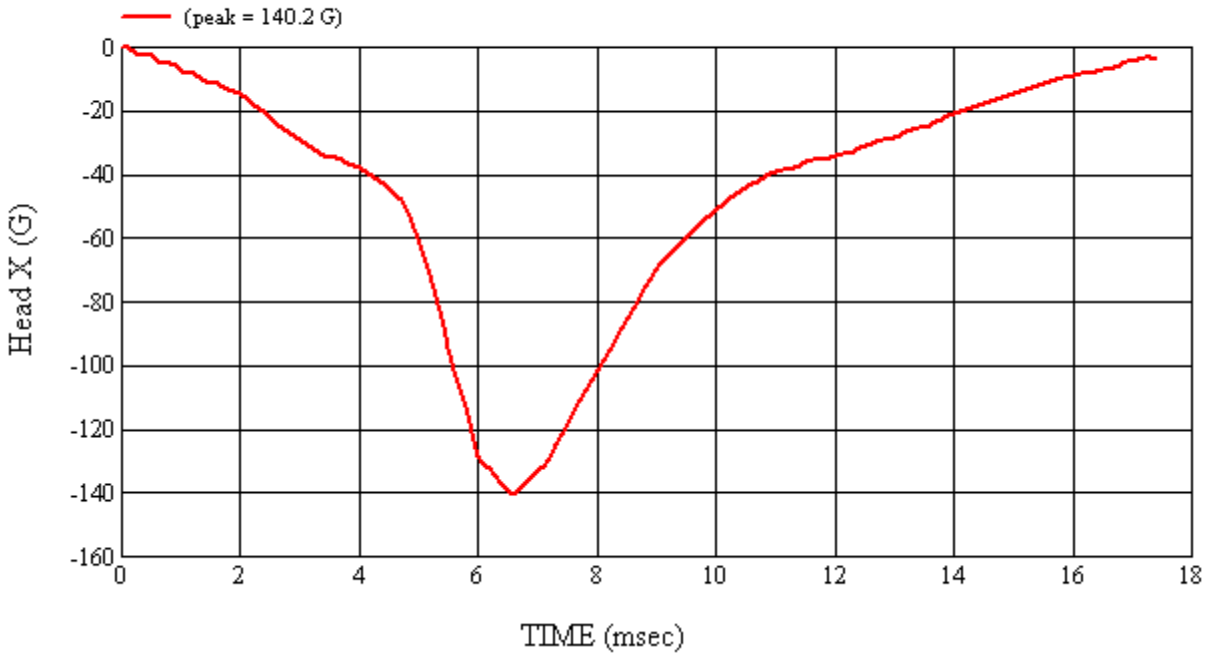
Recorded By:  Approved By*:  Date: 4/1/2011

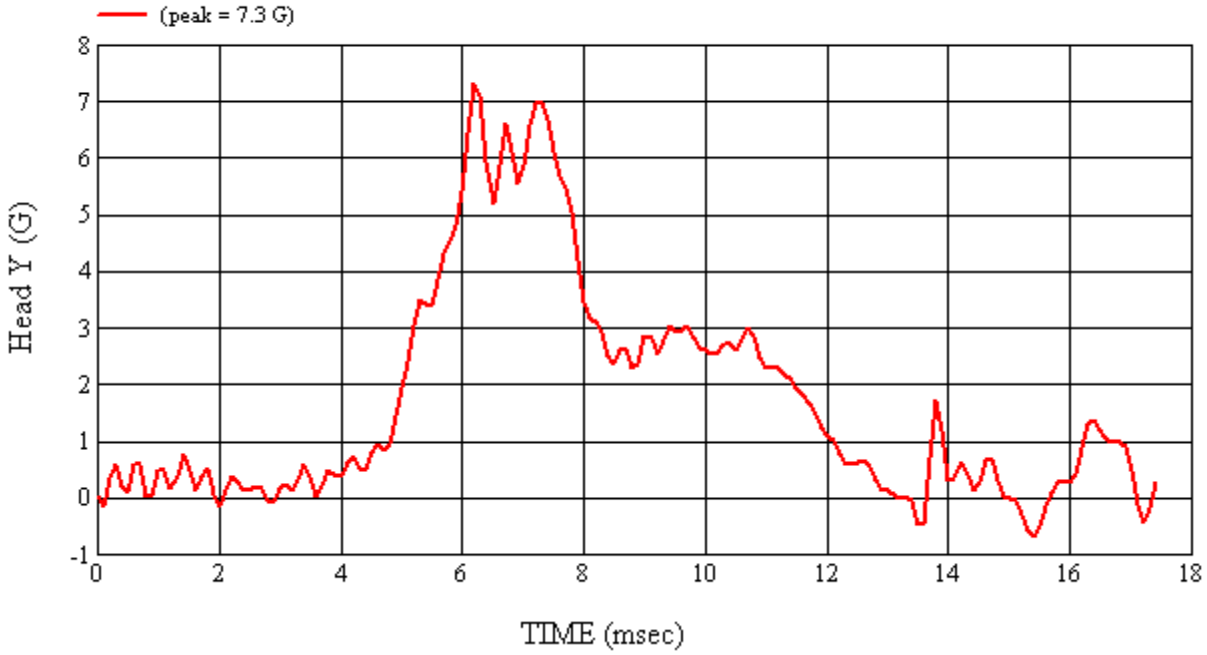
*Only necessary for NHTSA (Government) Compliance testing.

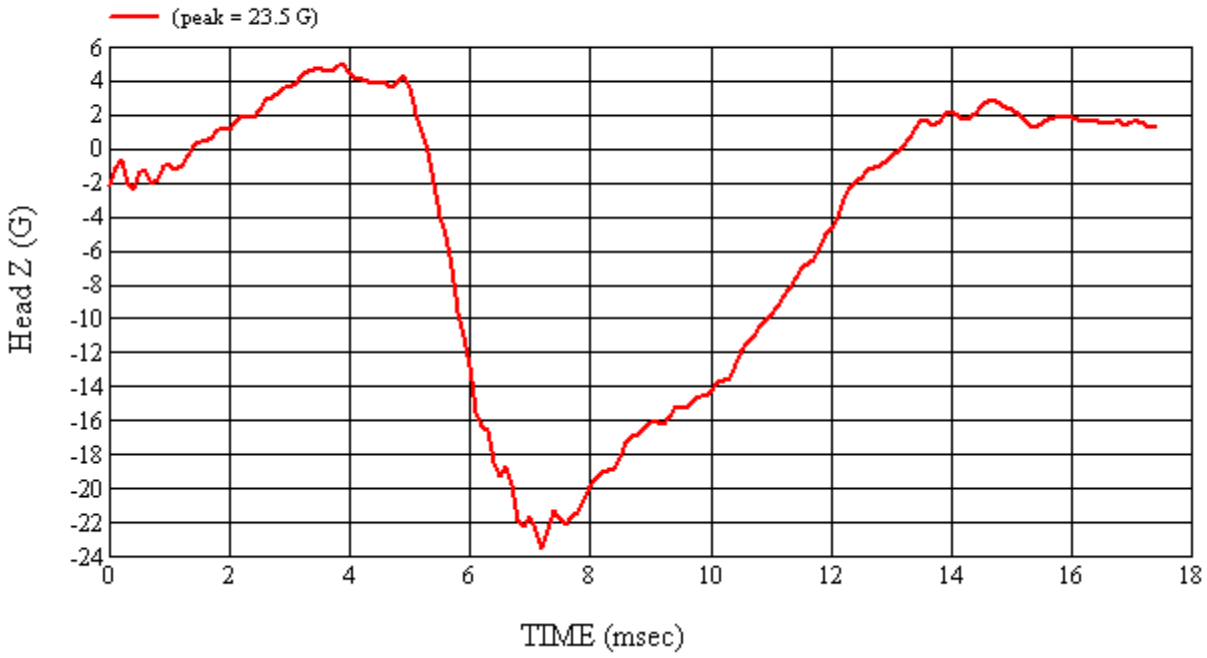
MGA Test #: U11092 Target Location: BP1, Right Side Test Date: 4/1/2011

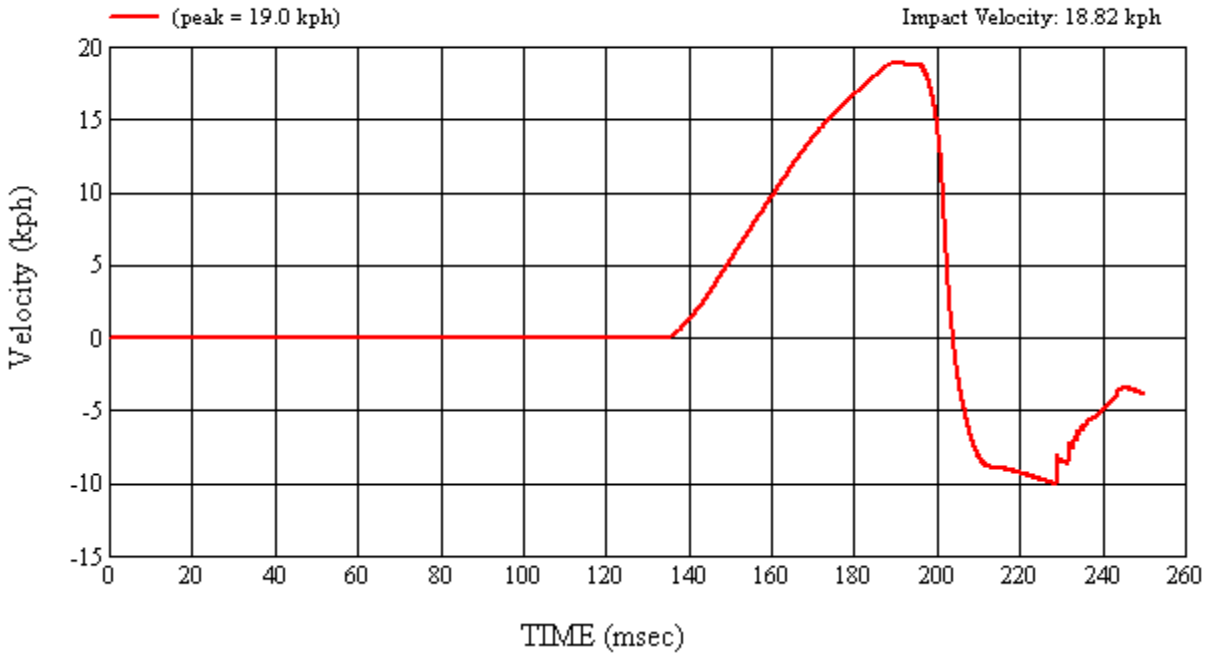


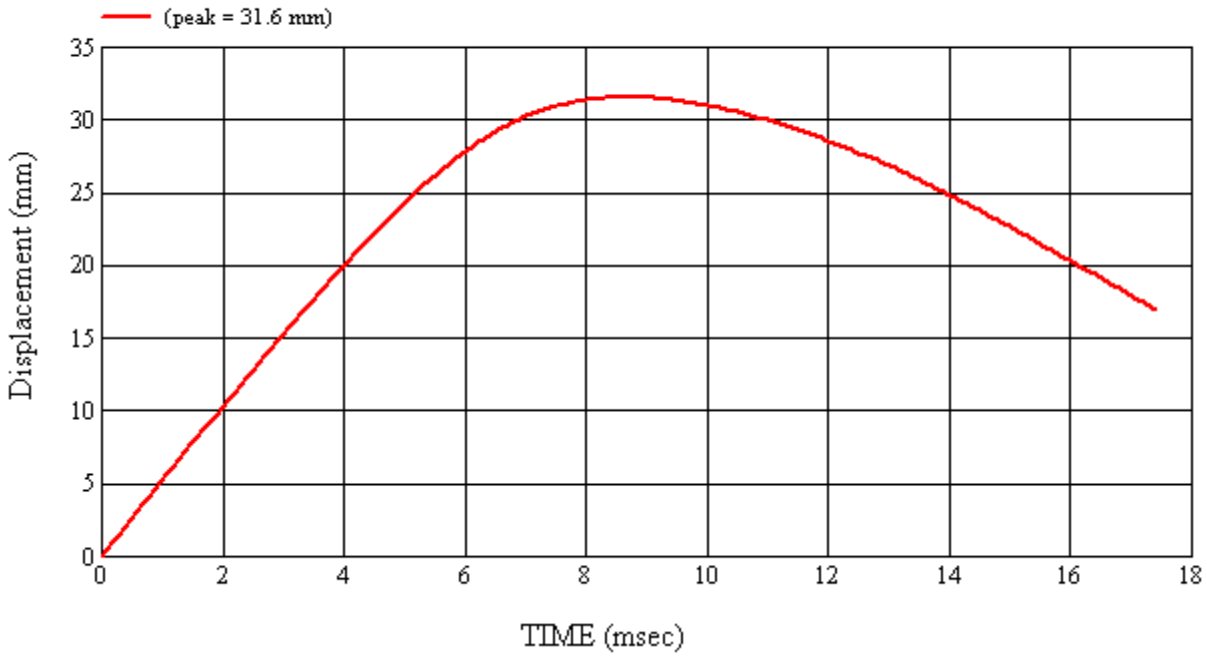



(peak = 140.2 G)
Head X (G)
0
-20
-40
-60
-80
-100
-120
-140
-160
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 7.3 G)
Head Y (G)
8
7
6
5
4
3
2
1
0
-1
0
2
4
6
8
10
12
14
16
18
TIME (msec)

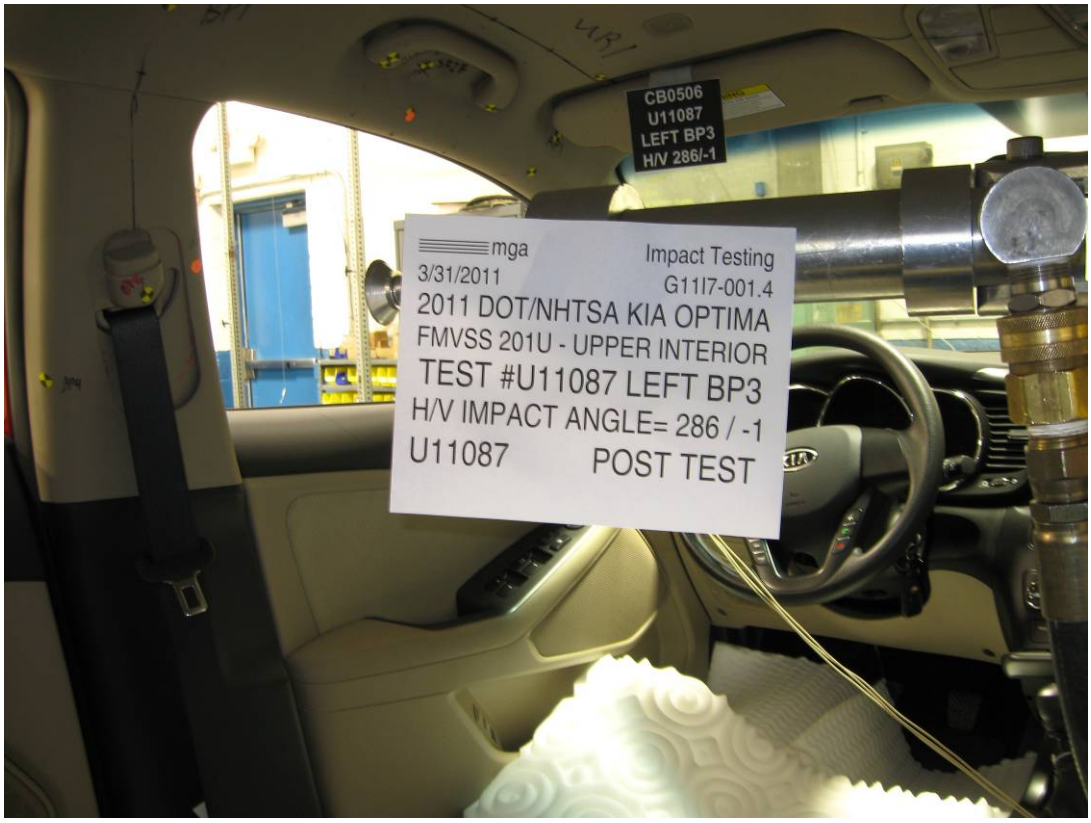

(peak = 23.5 G)
Head Z (G)
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 19.0 kph)
Impact Velocity: 18.82 kph
Velocity (kph)
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

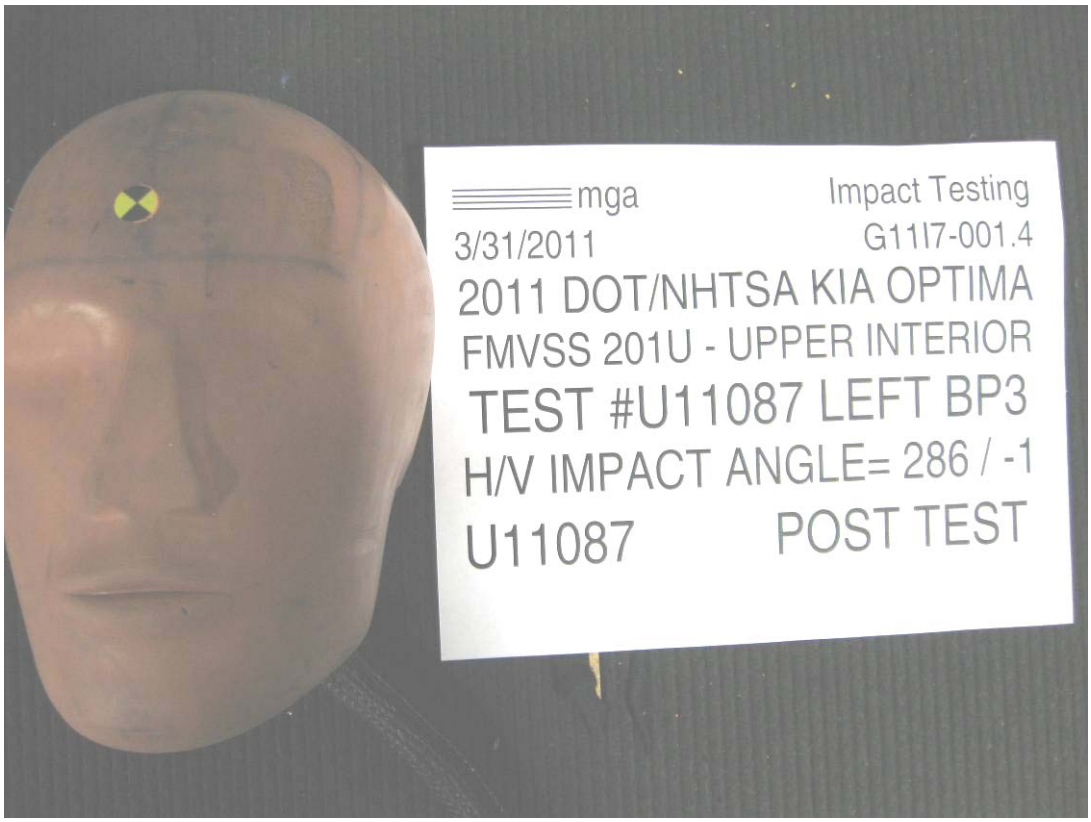

(peak = 31.6 mm)
Displacement (mm)
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
TIME (msec)


BP1
CB0506
U11087
LEFT BP3
H/V 286/-1
mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11087 LEFT BP3
H/V IMPACT ANGLE= 286 / -1
U11087
PRE TEST


BP1
mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11087 LEFT BP3
H/V IMPACT ANGLE= 286 / -1
PRE TEST
U11087


CB0506
U11087
LEFT BP3
H/V 286/-1
mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11087 LEFT BP3
H/V IMPACT ANGLE= 286 / -1
U11087
POST TEST


mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11087 LEFT BP3
H/V IMPACT ANGLE= 286 / -1
U11087
POST TEST


mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11087 LEFT BP3
H/V IMPACT ANGLE= 286 / -1
U11087
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Test Number:#U11087

Target (Vehicle Side): BP3Left

Temperature:20.6C

MGA Test Reference No.:U11087

Humidity:20.8%

Approach Horizontal Angles:286º

Time of Test:1:49:48 PM

Approach Vertical Angles:-1º

FMH Serial No:[035]

Additional Description: Anchorage full up

TEST RESULTS:

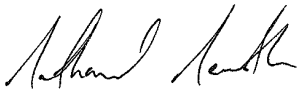
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
448	373	9.9	23.5	19	4 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.8	1.07	1.08
Y	6	J22664	94.2	0.85	0.85
Z	7	J35924	92.8	0.94	0.95

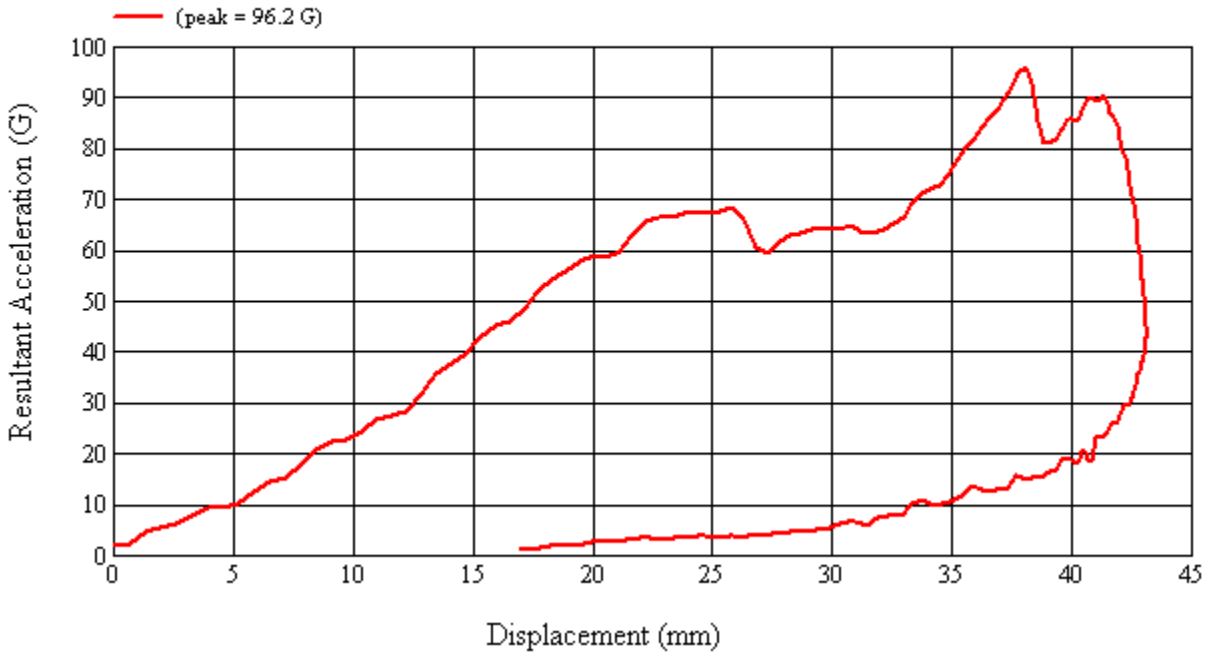
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

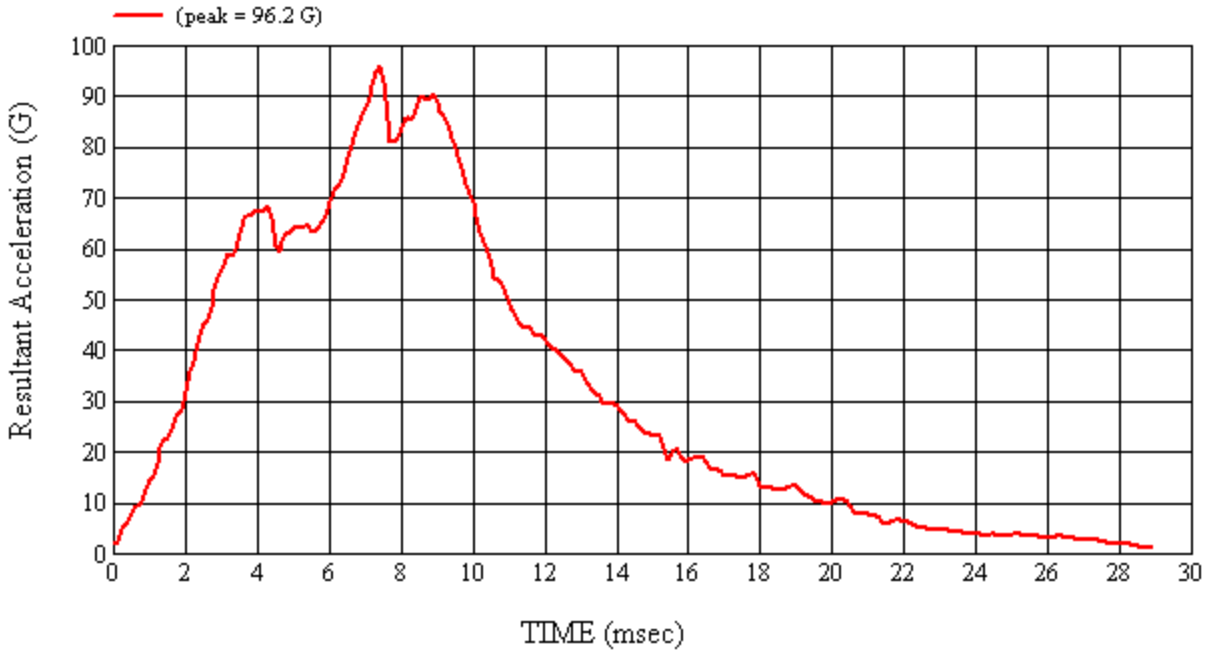
Cracked trim

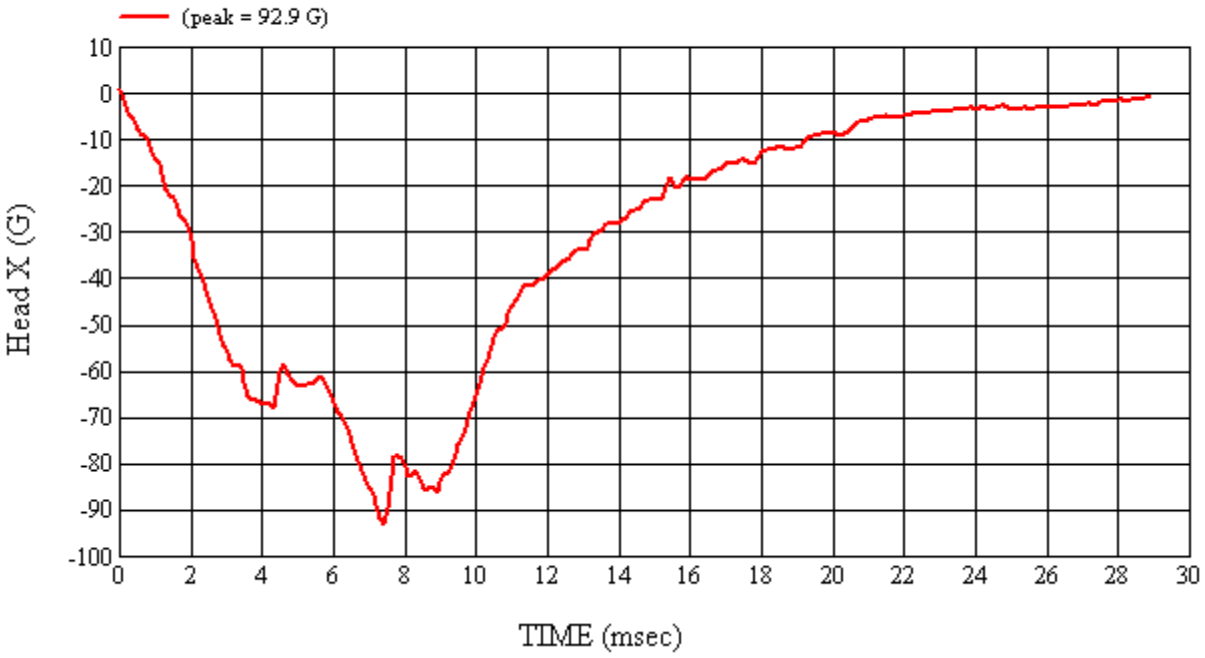
Recorded By:  Approved By*:  Date: 3/31/2011

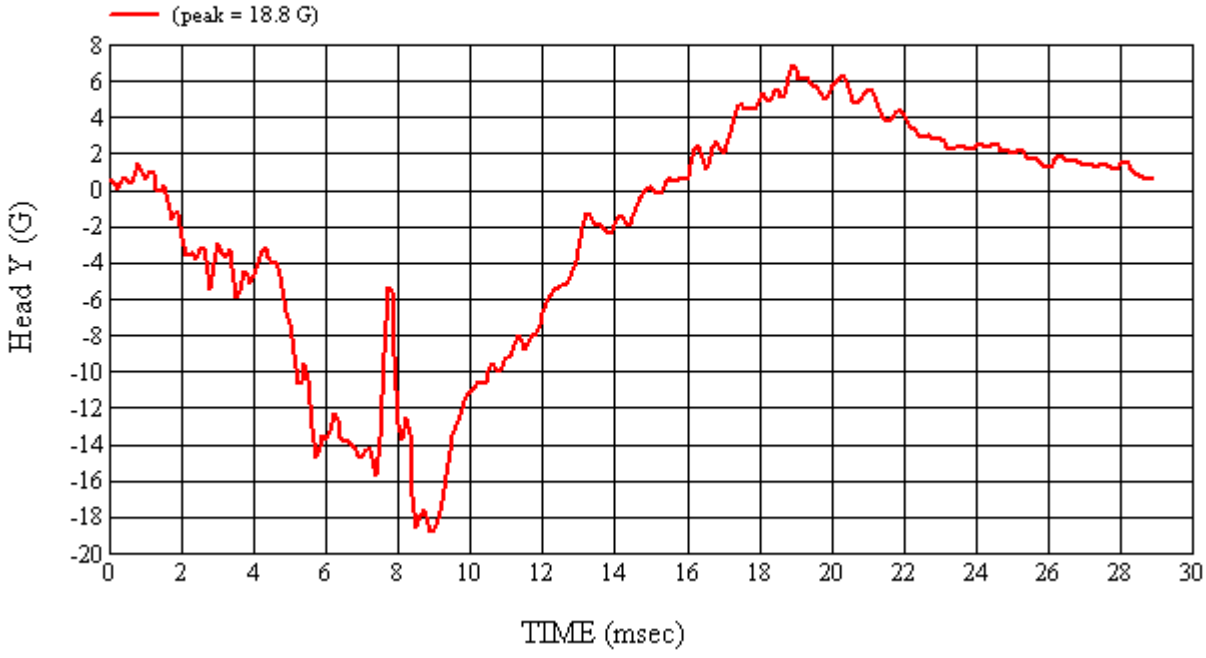
*Only necessary for NHTSA (Government) Compliance testing.

MGA Test #: U11087 Target Location: BP3, Left Side Test Date: 3/31/2011

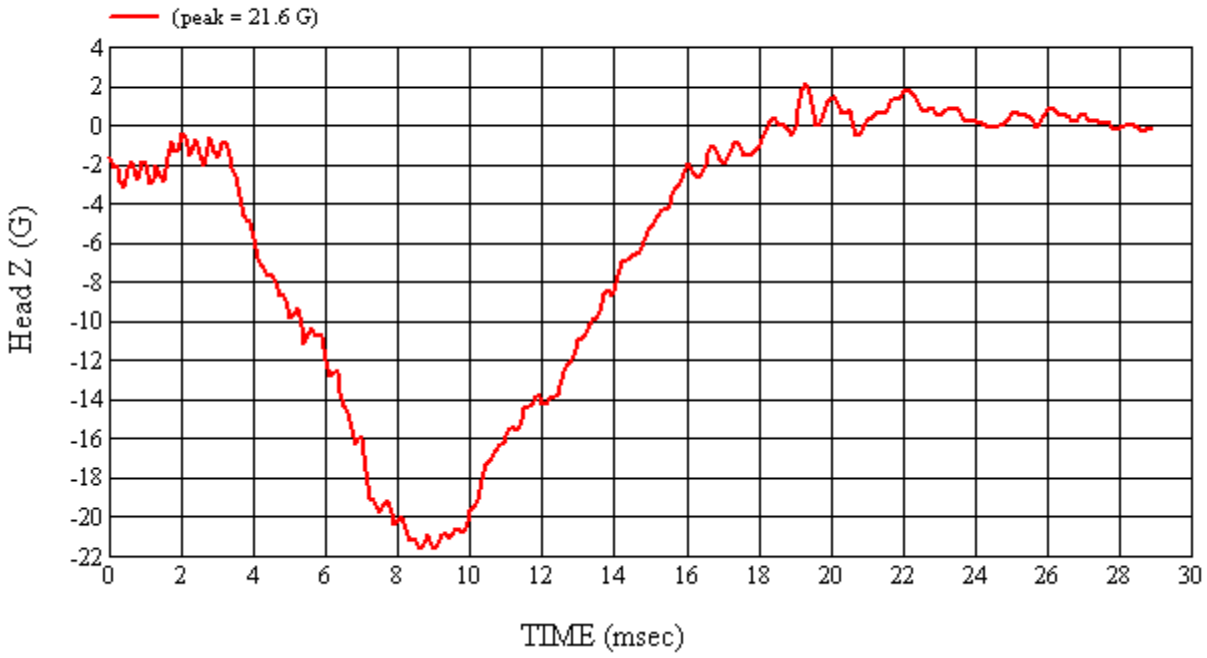


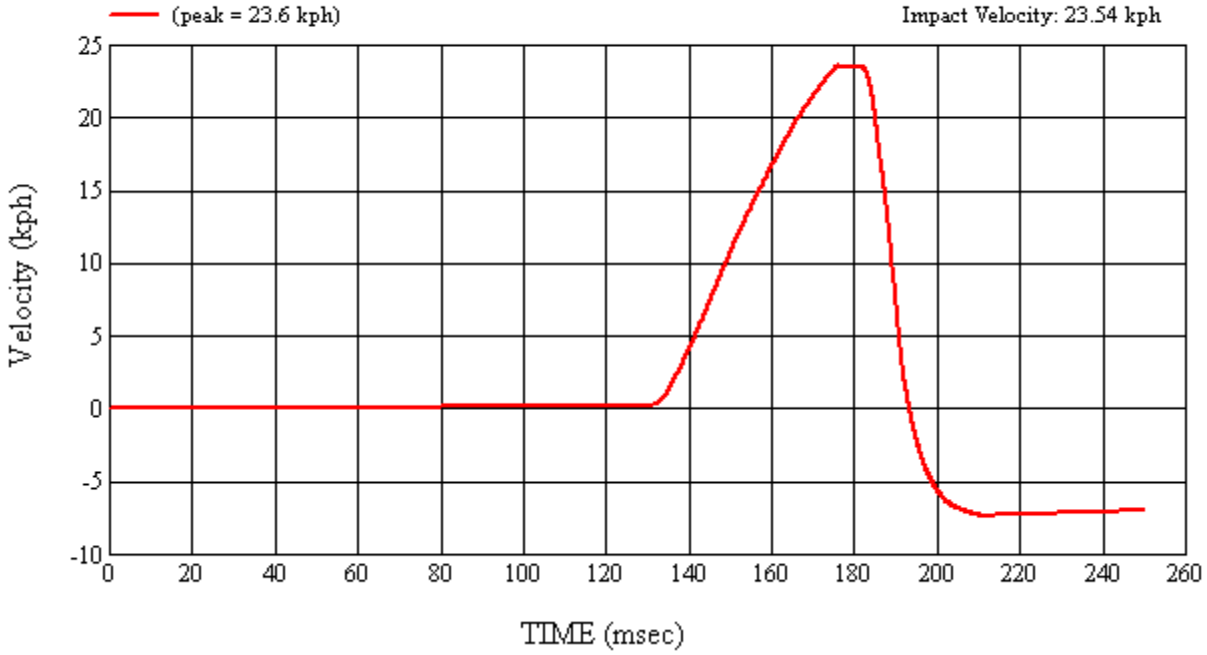


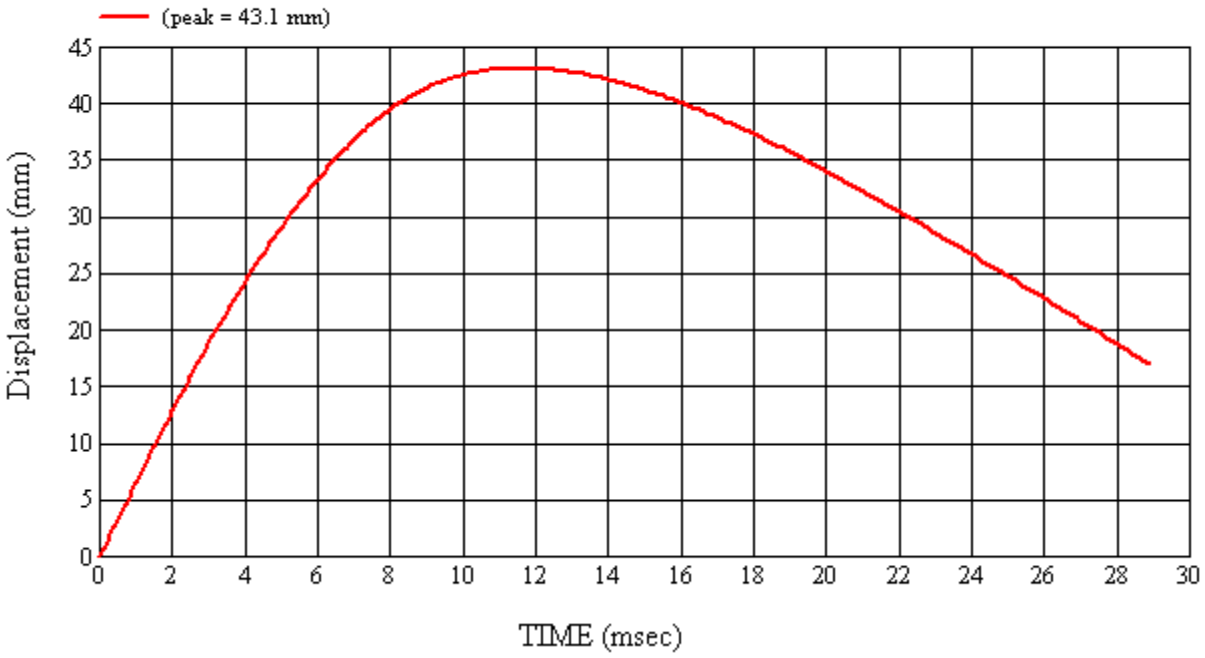




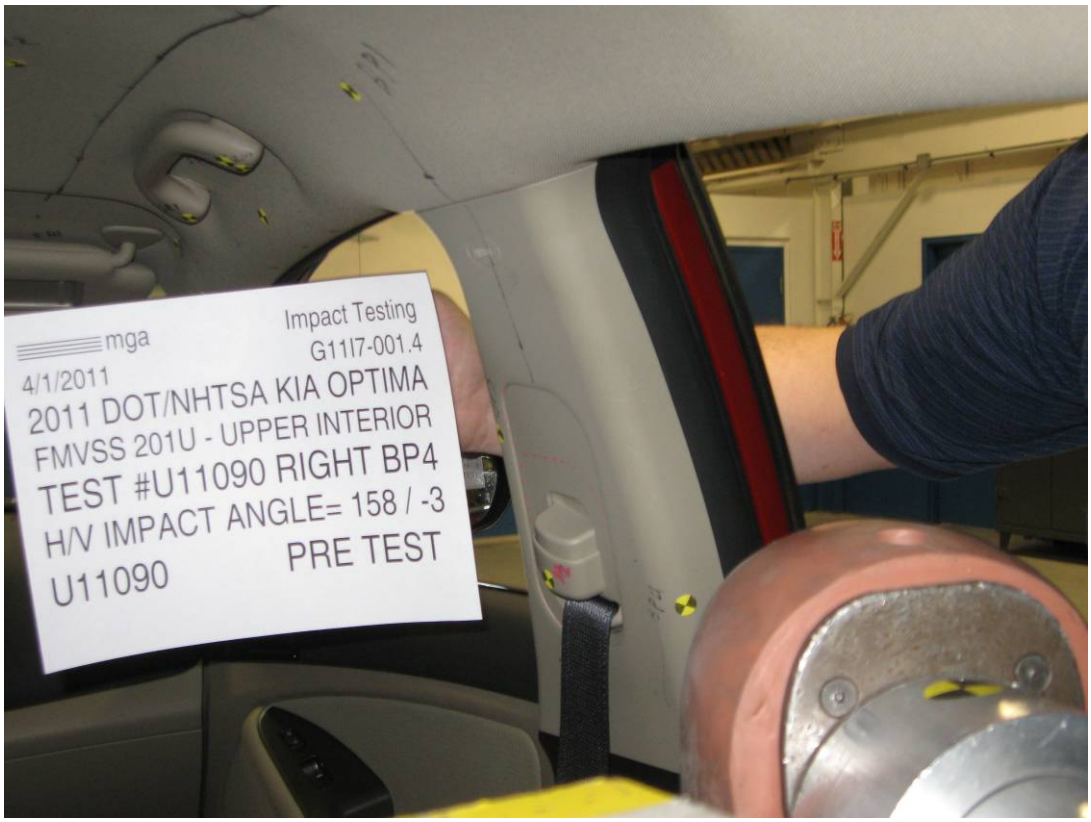
t


(peak = 21.6 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
26
28
30
TIME (msec)


(peak = 23.6 kph)
Impact Velocity: 23.54 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)

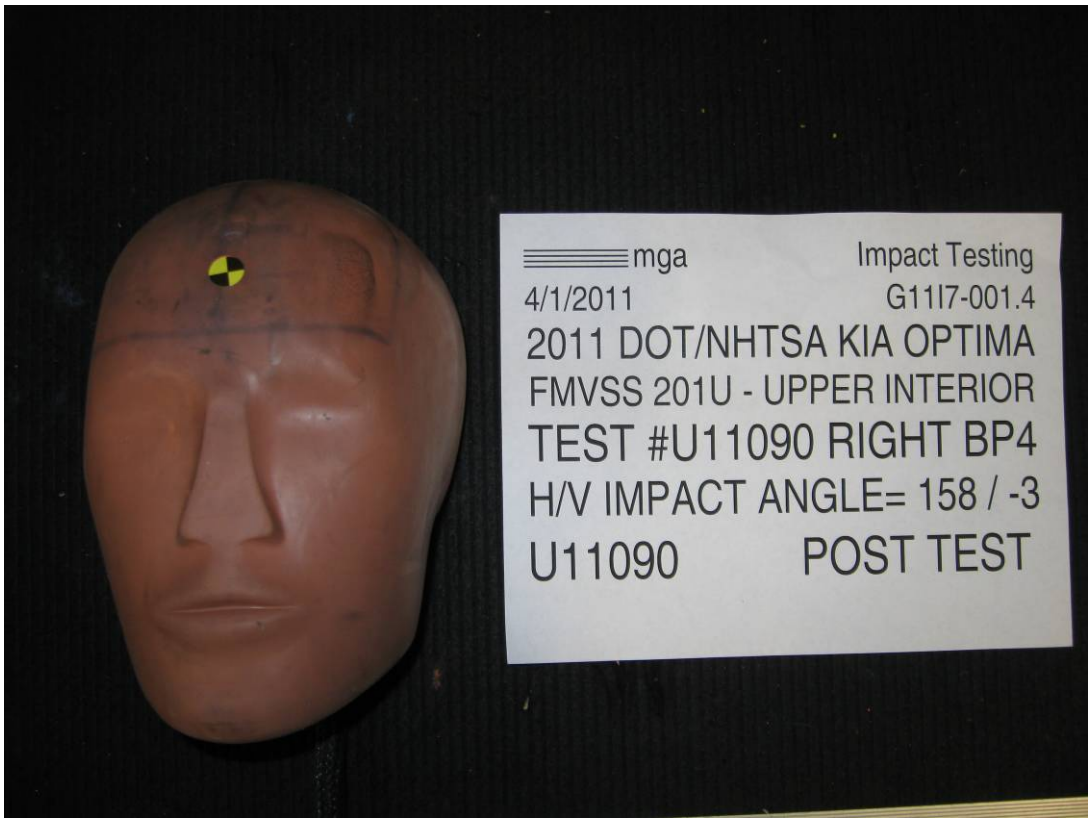

(peak = 43.1 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11090 RIGHT BP4
H/V IMPACT ANGLE= 158 / -3
U11090
PRE TEST


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11090 RIGHT BP4
H/V IMPACT ANGLE= 158 / -3
U11090
PRE TEST


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11090 RIGHT BP4
H/V IMPACT ANGLE= 158 / -3
U11090
POST TEST


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11090 RIGHT BP4
H/V IMPACT ANGLE= 158 / -3
U11090
POST TEST


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11090 RIGHT BP4
H/V IMPACT ANGLE= 158 / -3
U11090
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Test Number:#U11090

Target (Vehicle Side): BP4Right

Temperature:20.5C

MGA Test Reference No.:U11090

Humidity:24.8%

Approach Horizontal Angles:158º

Time of Test:9:29:45 AM

Approach Vertical Angles:-3º

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
849	904	2.9	23.4	32	3 Left

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

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

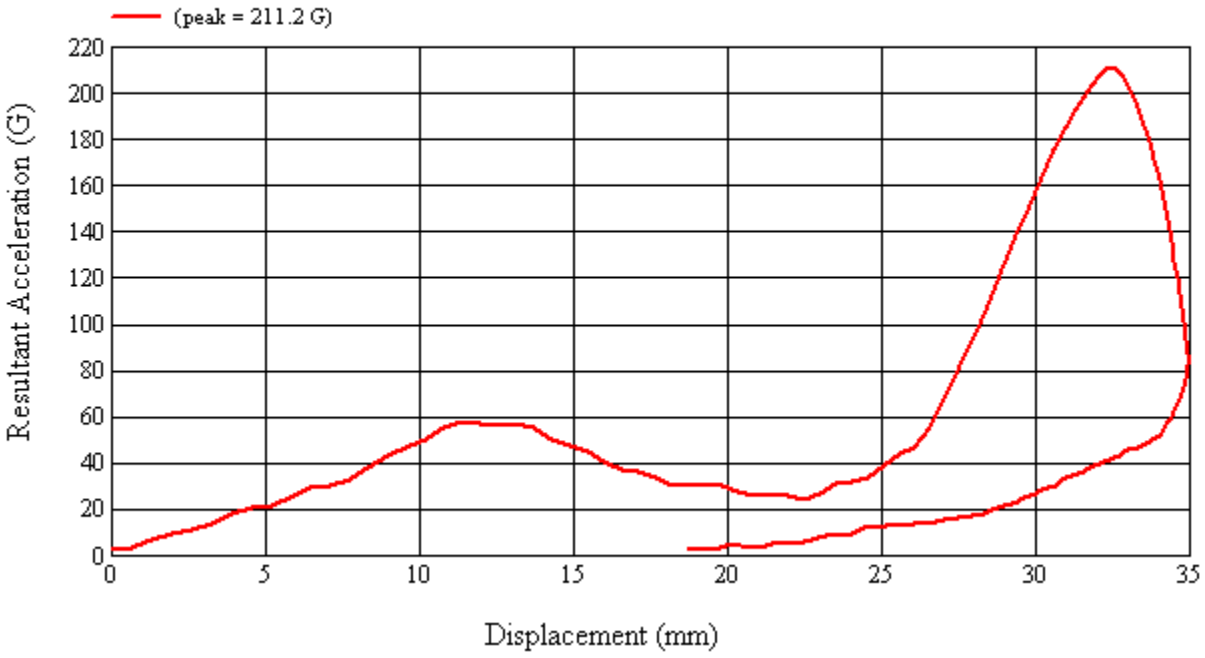
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

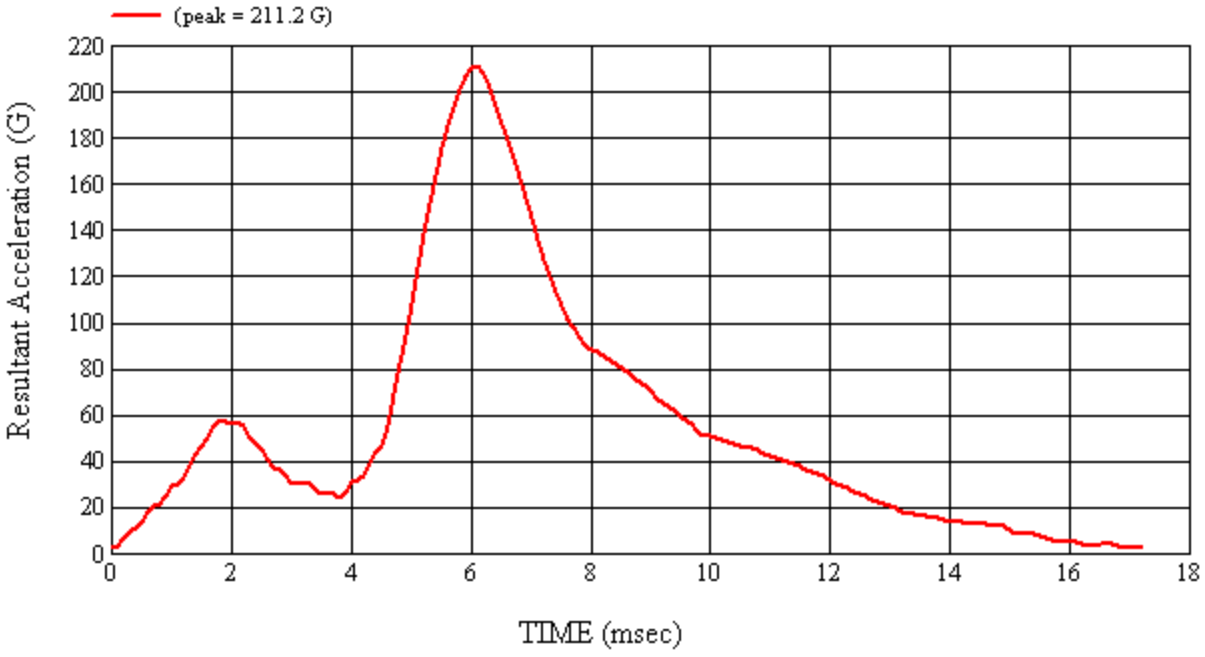
Cracked pillar trim

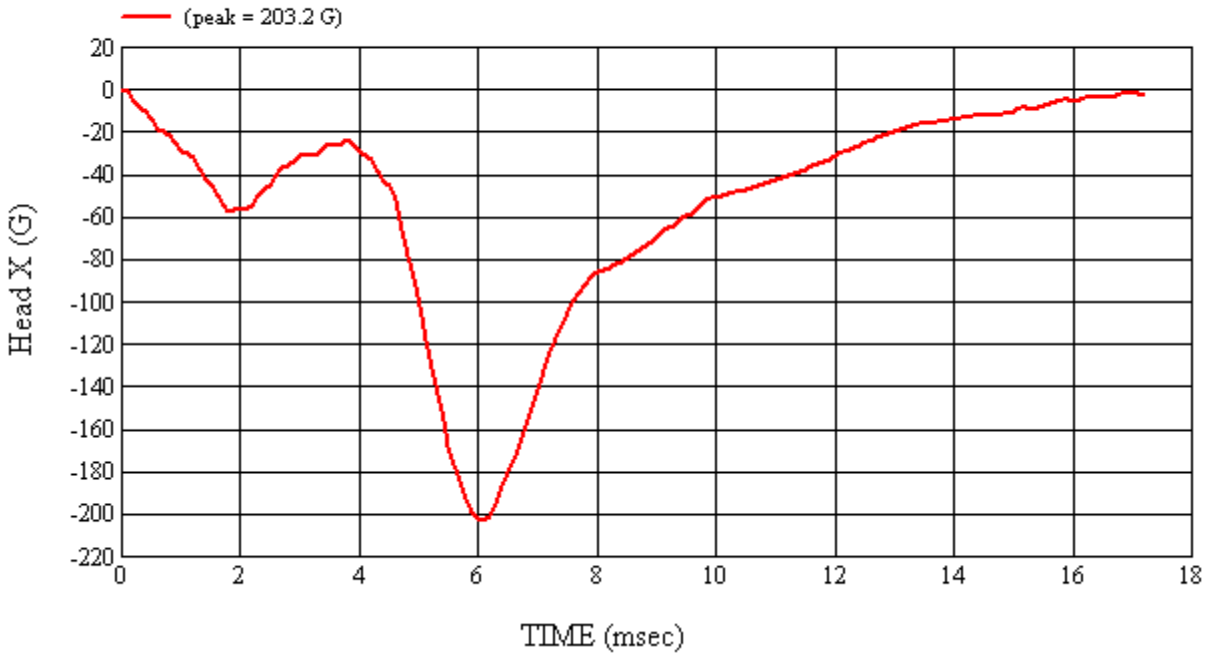
Recorded By: _____ Approved By*: _____ Date: 4/1/2011

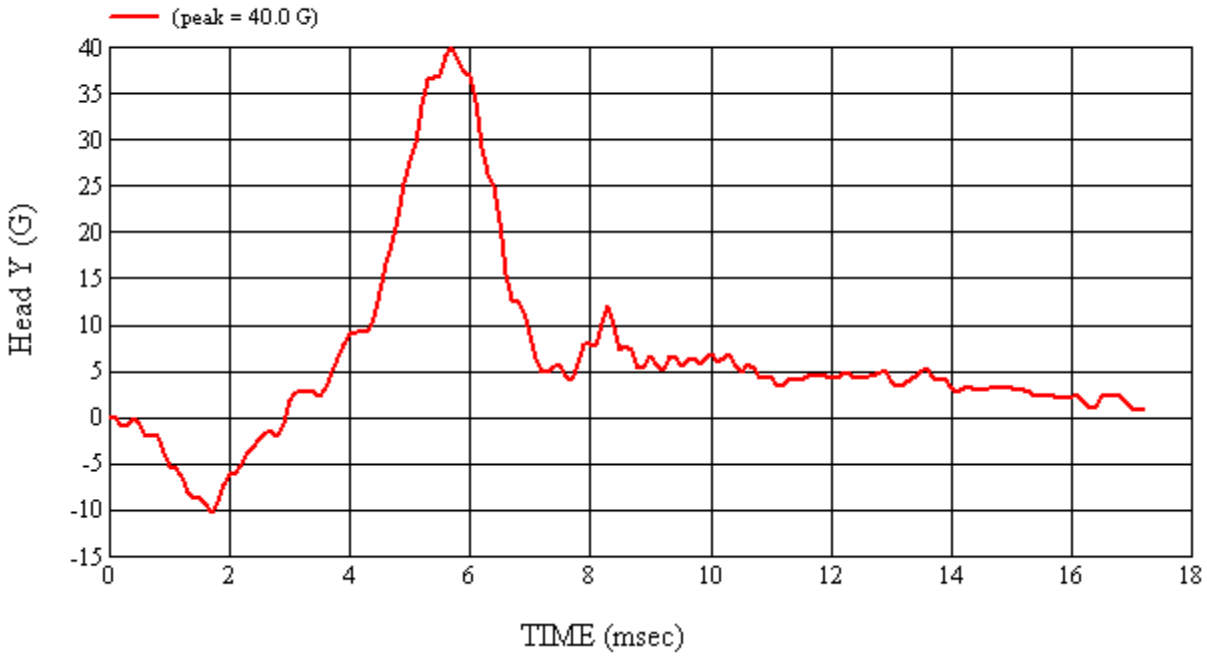
*Only necessary for NHTSA (Government) Compliance testing.

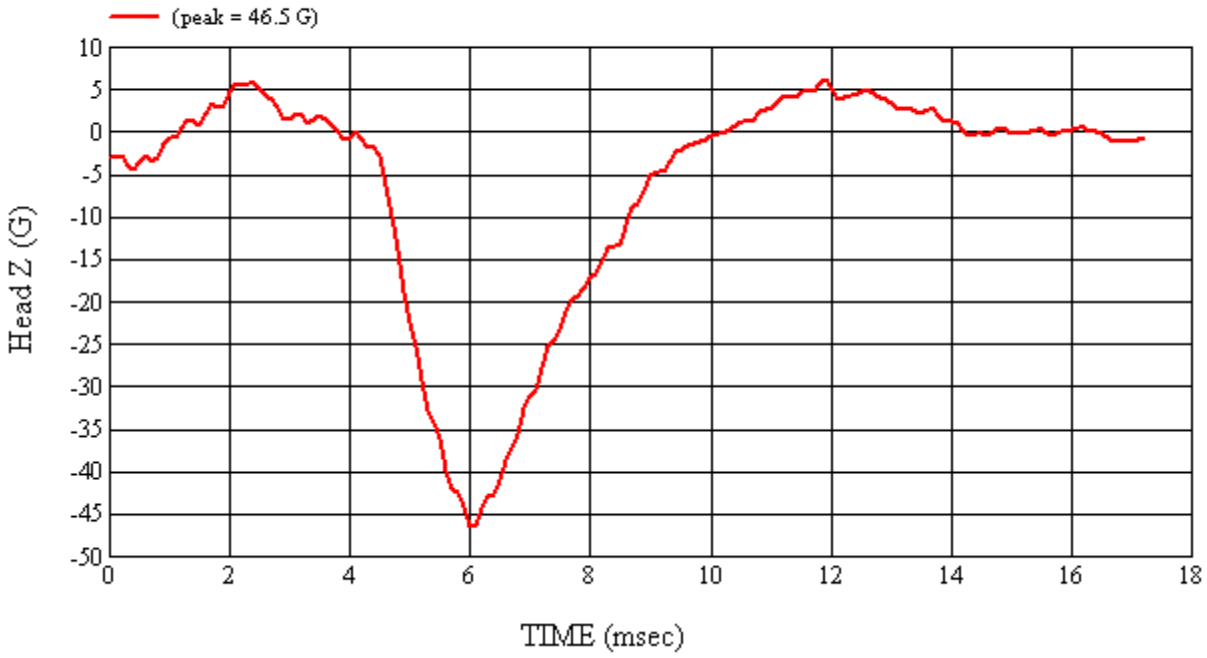
MGA Test #: U11090 Target Location: BP4, Right Side Test Date: 4/1/2011

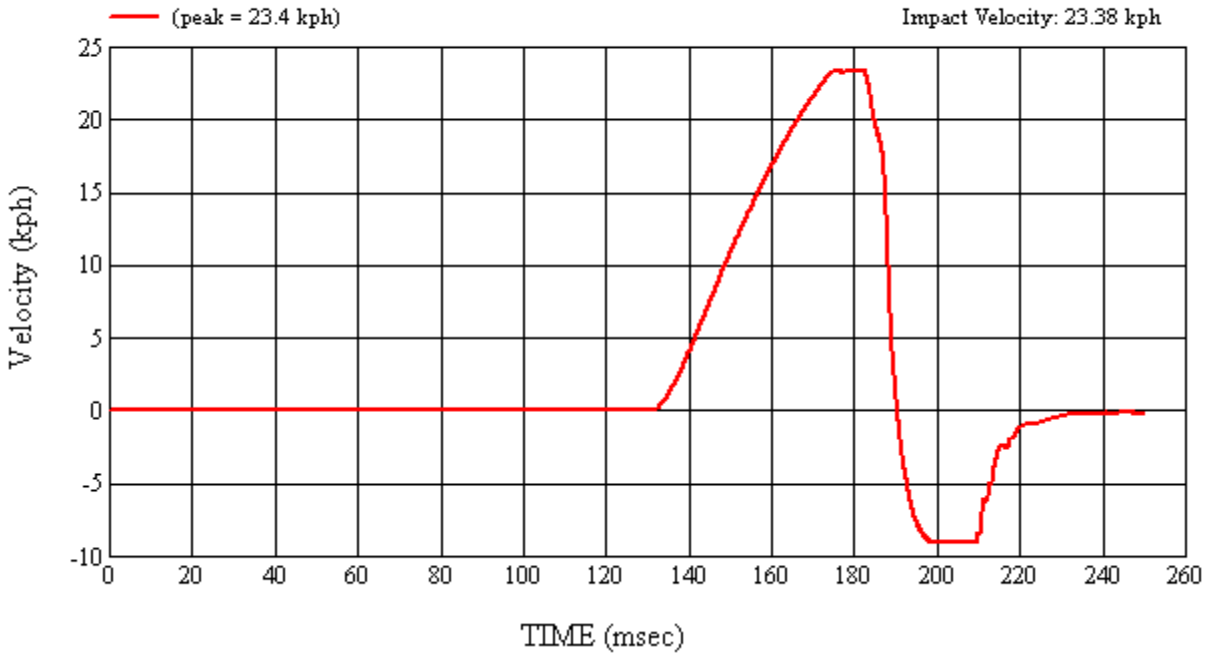


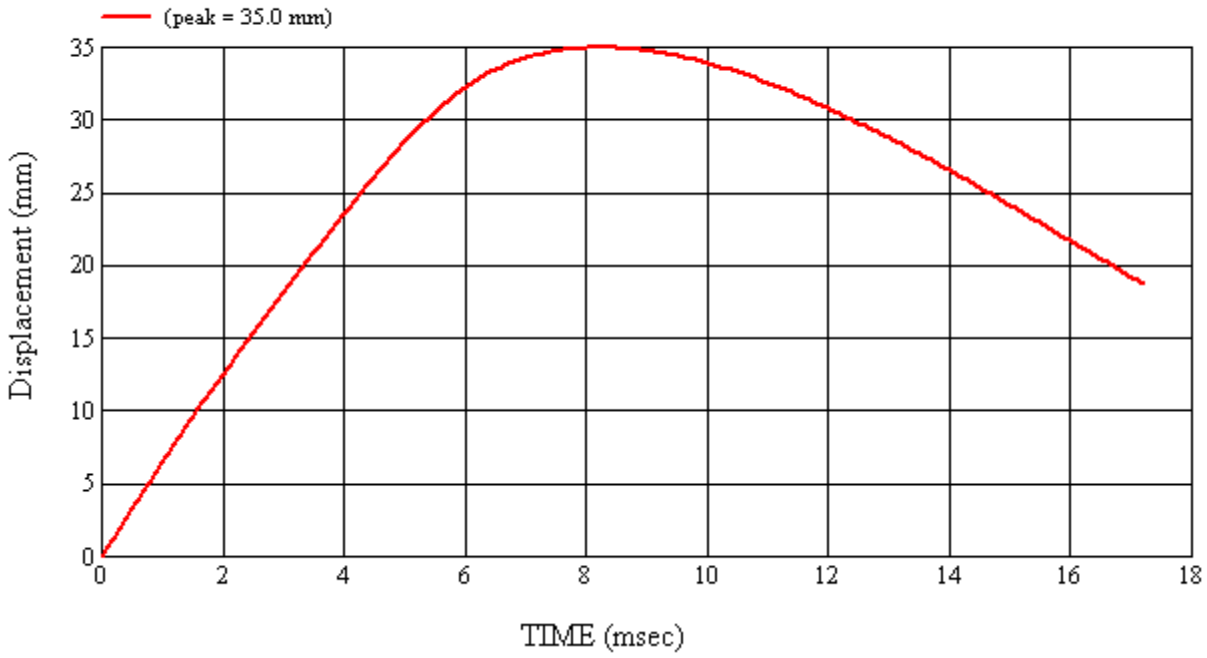



(peak = 203.2 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 40.0 G)
Head Y (G)
40
35
30
25
20
15
10
5
0
-5
-10
-15
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 46.5 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 23.4 kph)
Impact Velocity: 23.38 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 = 35.0 mm)
Displacement (mm)
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
TIME (msec)


CB0506
U11089
LEFT FH1
H/V 180/50
mga
3/31/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTER
TEST #U11089 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U11089
PRE TEST


CB0506
U11089
LEFT FH1
H/V 180/50
mga
3/31/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11089 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U11089
PRE TEST


mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11089 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U11089
POST TEST


mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11089 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U11089
POST TEST


FH1
LaFontaine Automotive Group
NEXT SERVICE DUE
Date
04/06/11
Mileage
5000
Thank you for your business


mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11089 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U11089
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Target (Vehicle Side): FH1Left

MGA Test Reference No.:U11089

Approach Horizontal Angles:180º

Approach Vertical Angles:50º

Additional Description:

Test Number:#U11089

Temperature:20.7C

Humidity:24.2%

Time of Test:4:03:19 PM

FMH Serial No:[038]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
656	649	7.2	23.8	10	3 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-96.4	1.07	1.06
Y	6	J36197	108.7	0.85	0.87
Z	7	J36353	99.1	0.94	0.94

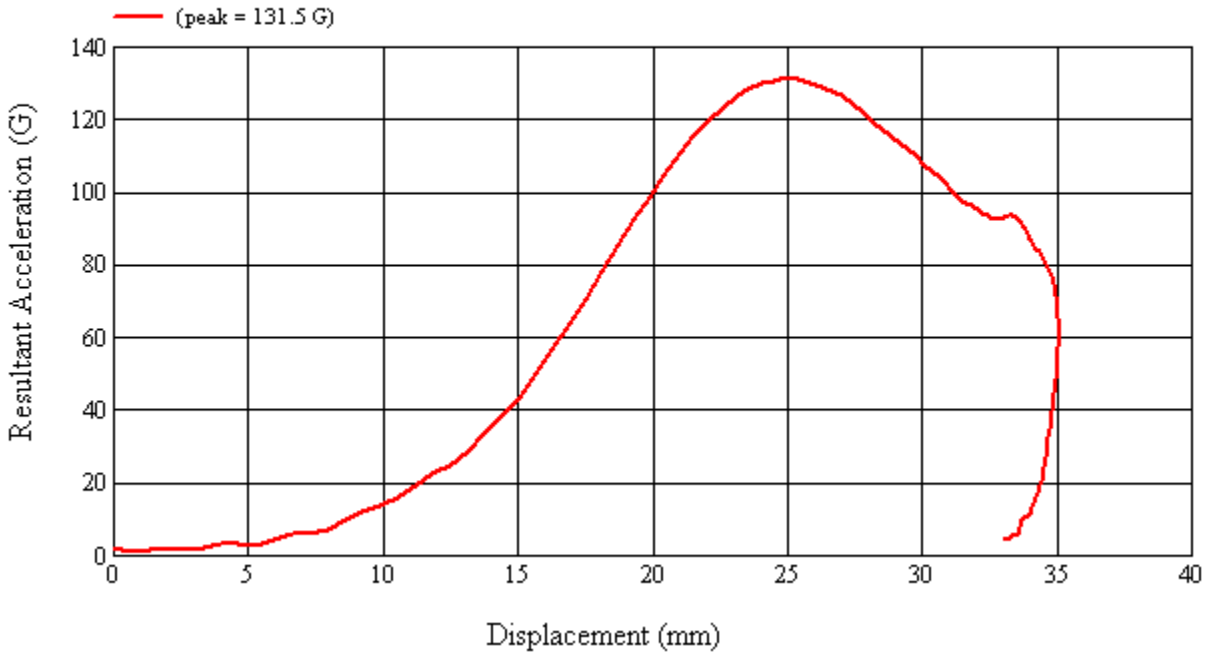
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

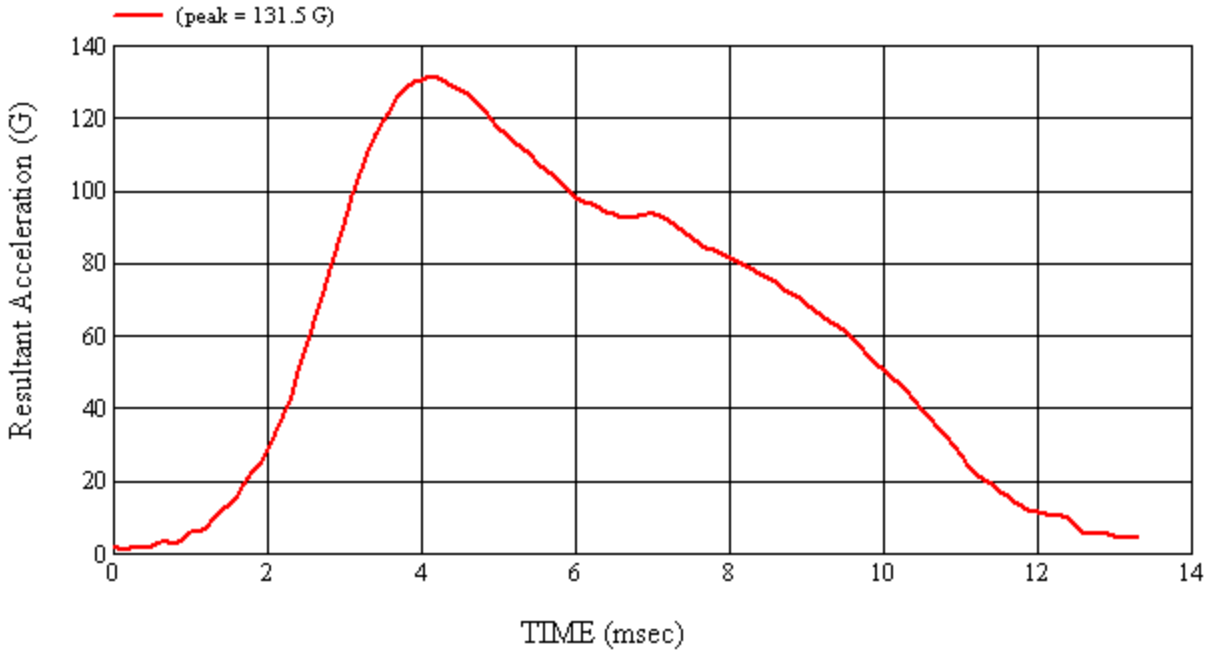
Sunglasses holder opened

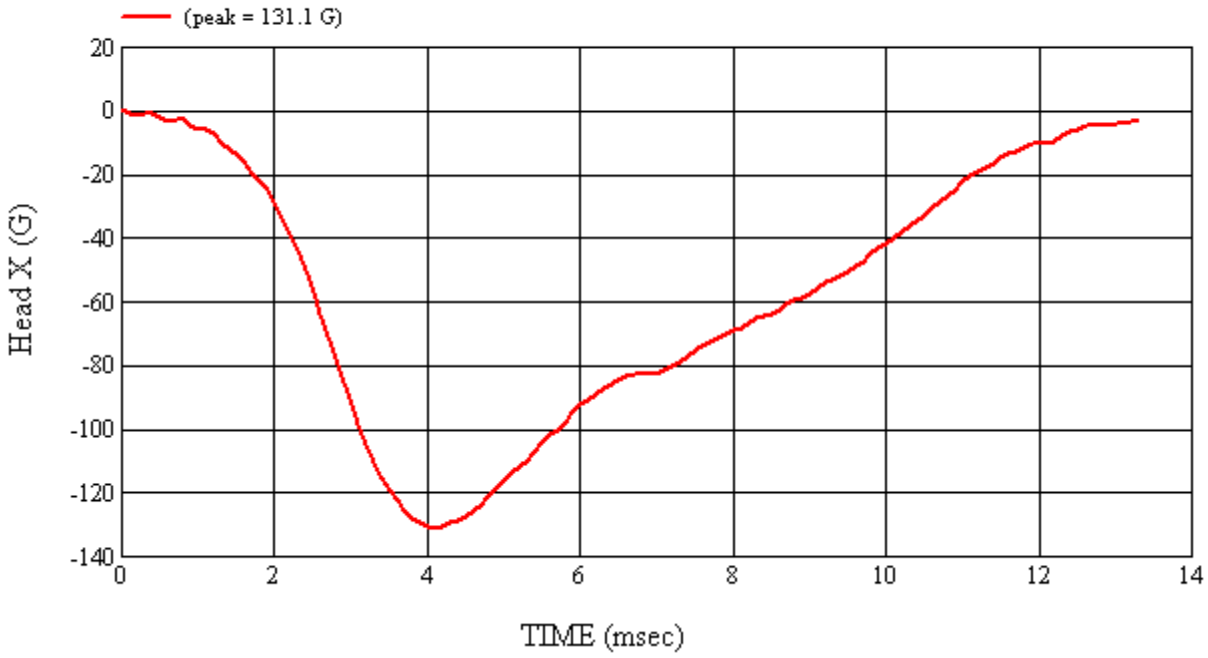
Recorded By: _____ Approved By*: _____ Date: 3/31/2011

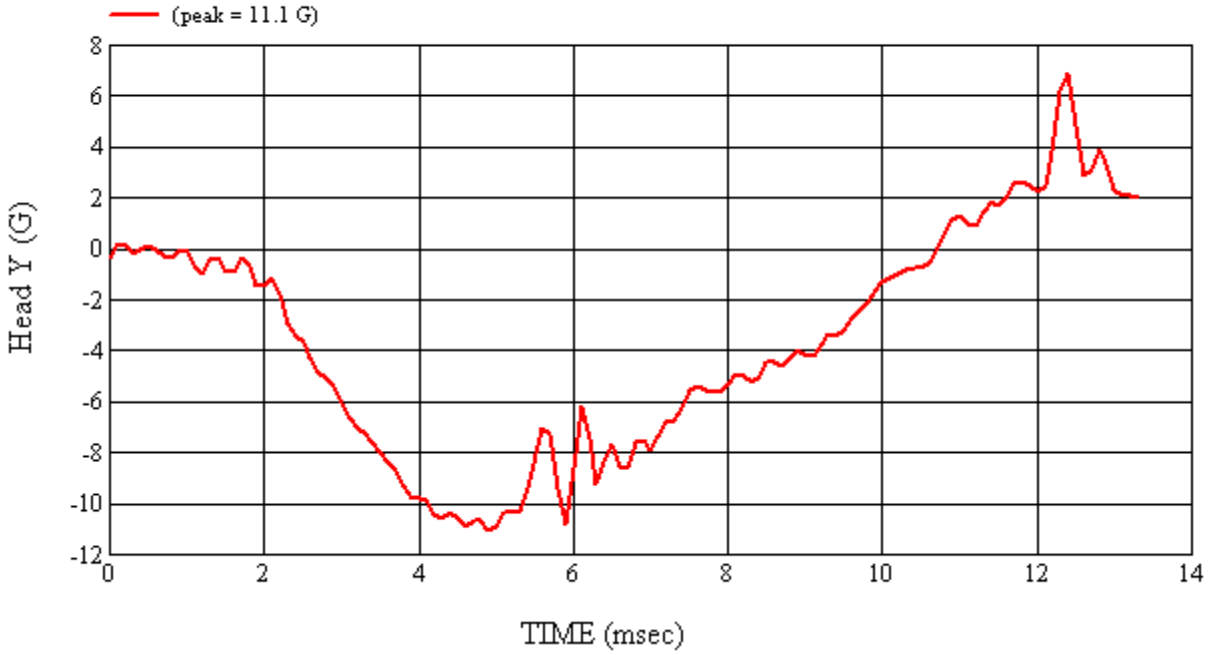
*Only necessary for NHTSA (Government) Compliance testing.

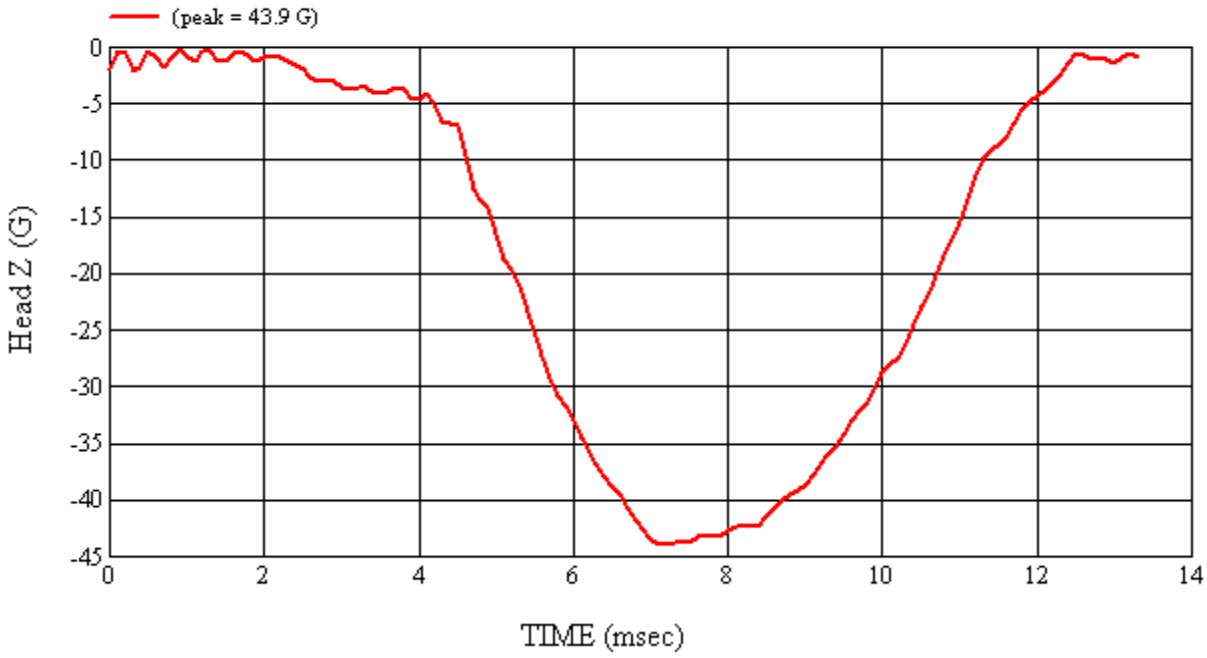
MGA Test #: U11089 Target Location: FH1, Left Side Test Date: 3/31/2011

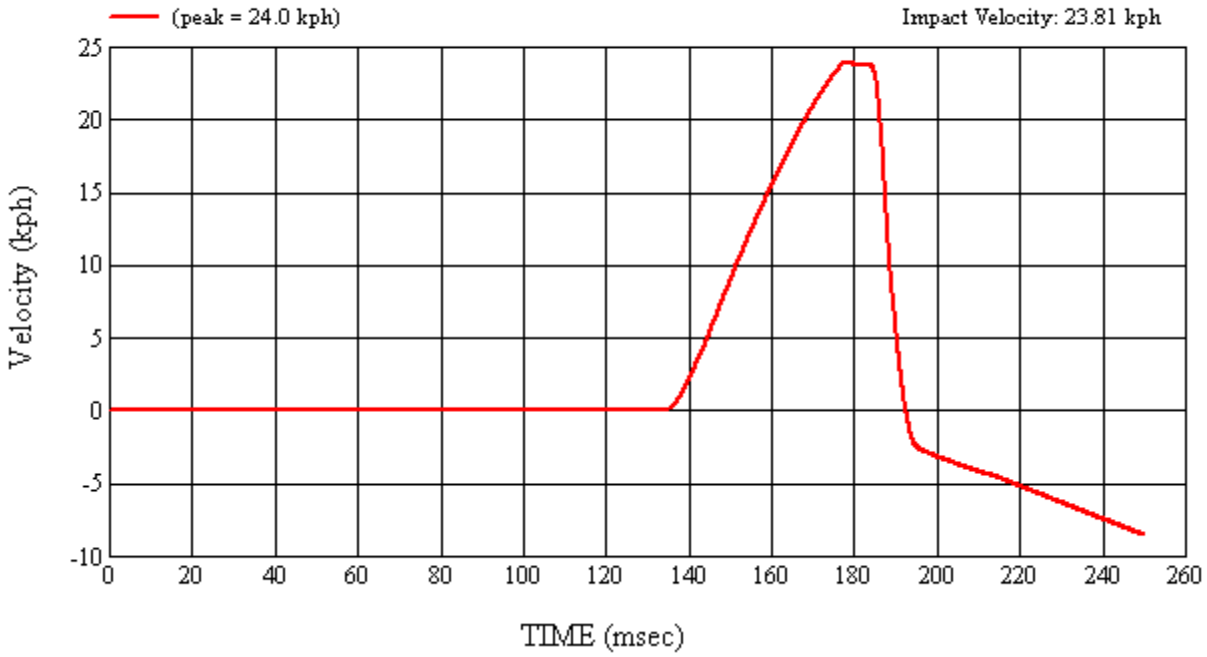


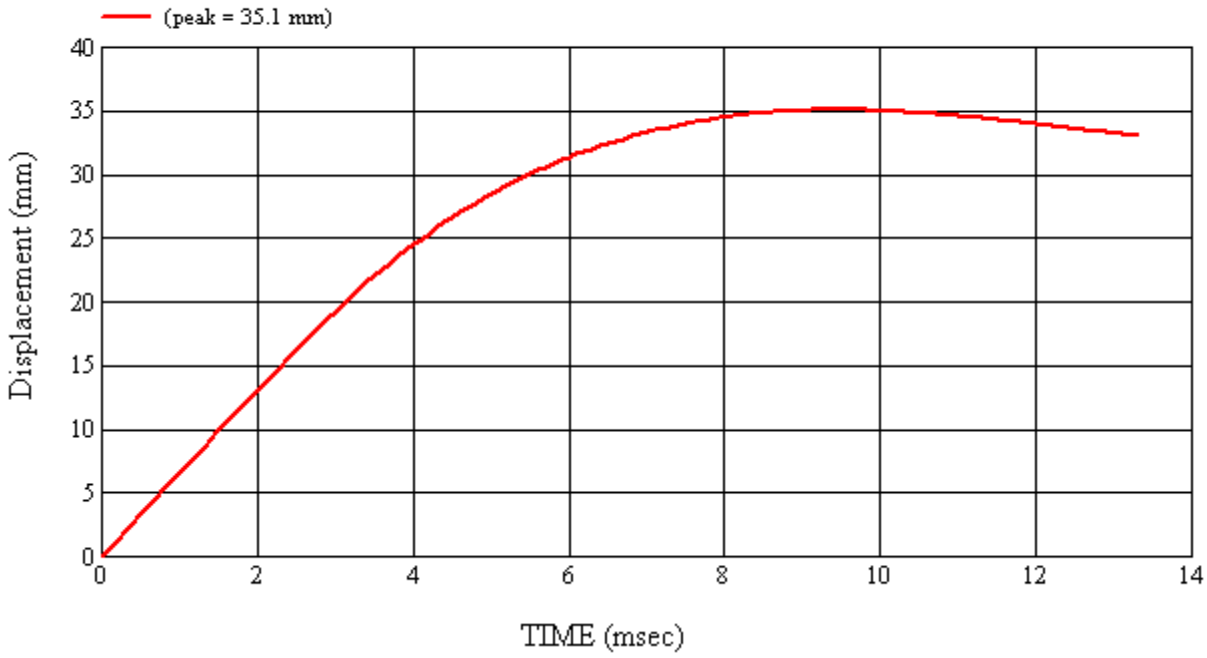



(peak = 131.1 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
TIME (msec)


(peak = 11.1 G)
Head Y (G)
8
6
4
2
0
-2
-4
-6
-8
-10
-12
0
2
4
6
8
10
12
14
TIME (msec)

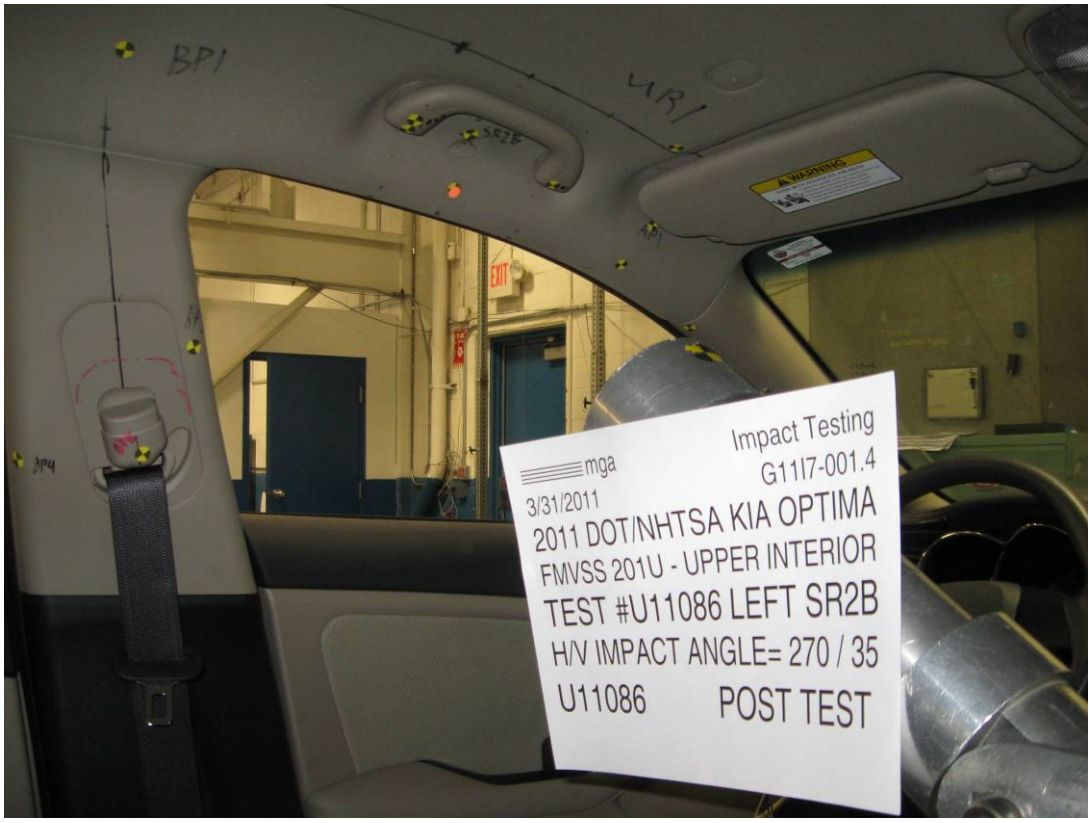

(peak = 43.9 G)
Head Z (G)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
0
2
4
6
8
10
12
14
TIME (msec)


(peak = 24.0 kph)
Impact Velocity: 23.81 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)

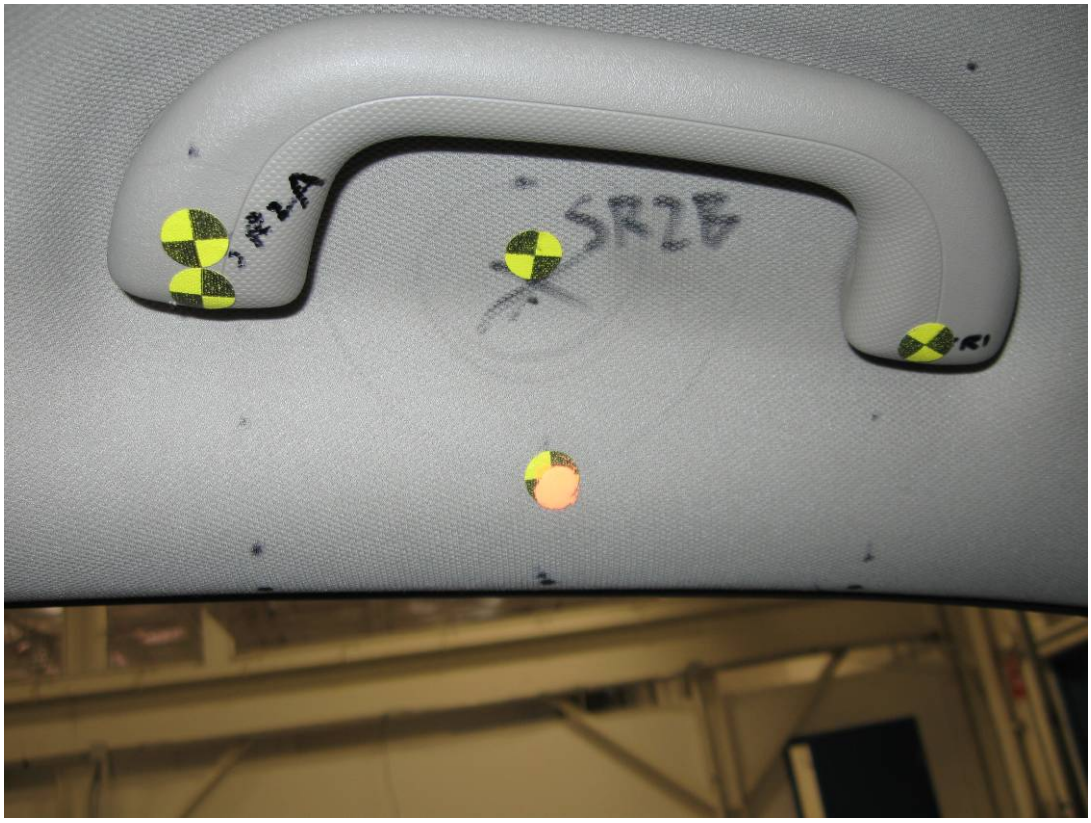

(peak = 35.1 mm)
Displacement (mm)
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
TIME (msec)

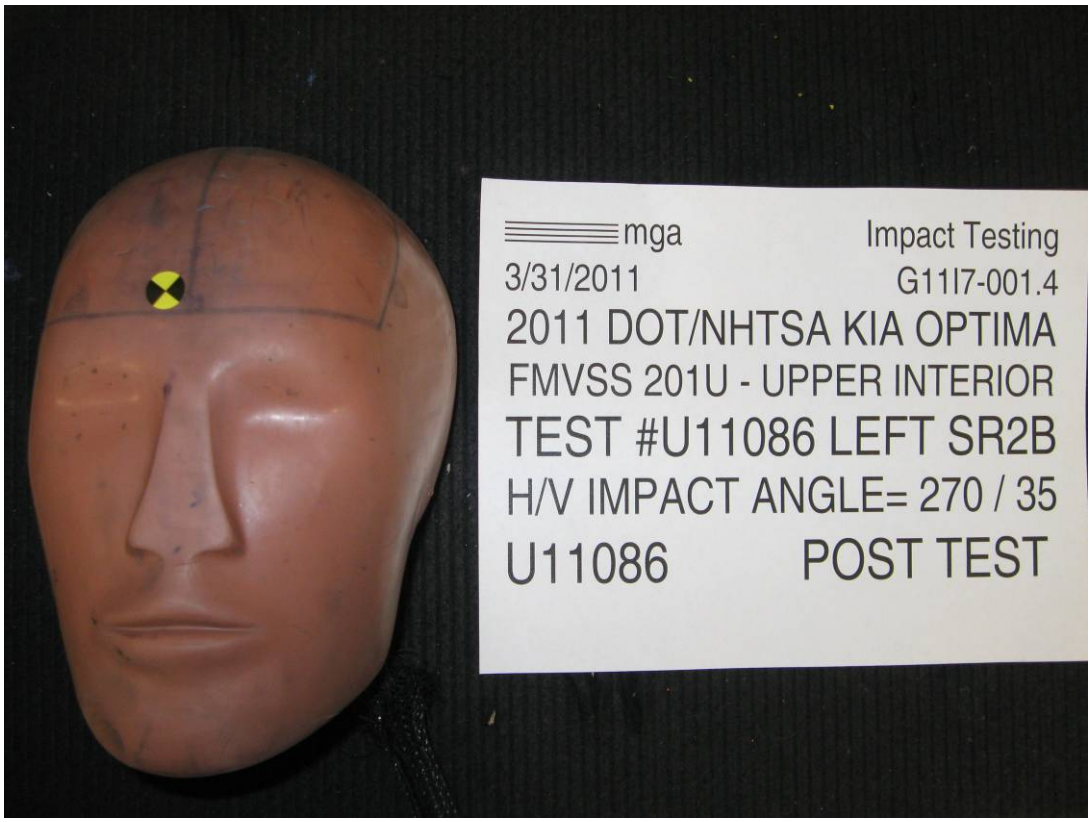

CB0506
U11086
LEFT SR2B
H/V 270/35
mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11086 LEFT SR2B
H/V IMPACT ANGLE= 270 / 35
U11086
PRE TEST


UR3
UR1
SR2B
CB0506
U11086
LEFT SR2B
H/V 270/35
mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11086 LEFT SR2B
H/V IMPACT ANGLE= 270 / 35
U11086
PRE TEST


BP1
UR1
EXIT
mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11086 LEFT SR2B
H/V IMPACT ANGLE= 270 / 35
U11086
POST TEST


UR3
UR1
BP1
mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11086 LEFT SR2B
H/V IMPACT ANGLE= 270 / 35
U11086
POST TEST


SR2A
SR2B


mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11086 LEFT SR2B
H/V IMPACT ANGLE= 270 / 35
U11086
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Test Number:#U11086

Target (Vehicle Side): SR2BLeft

Temperature:20.7C

MGA Test Reference No.:U11086

Humidity:23.3%

Approach Horizontal Angles:270º

Time of Test:12:53:06 PM

Approach Vertical Angles:35º

FMH Serial No:[038]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
576	543	4.7	19.1	8	7 Right

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

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

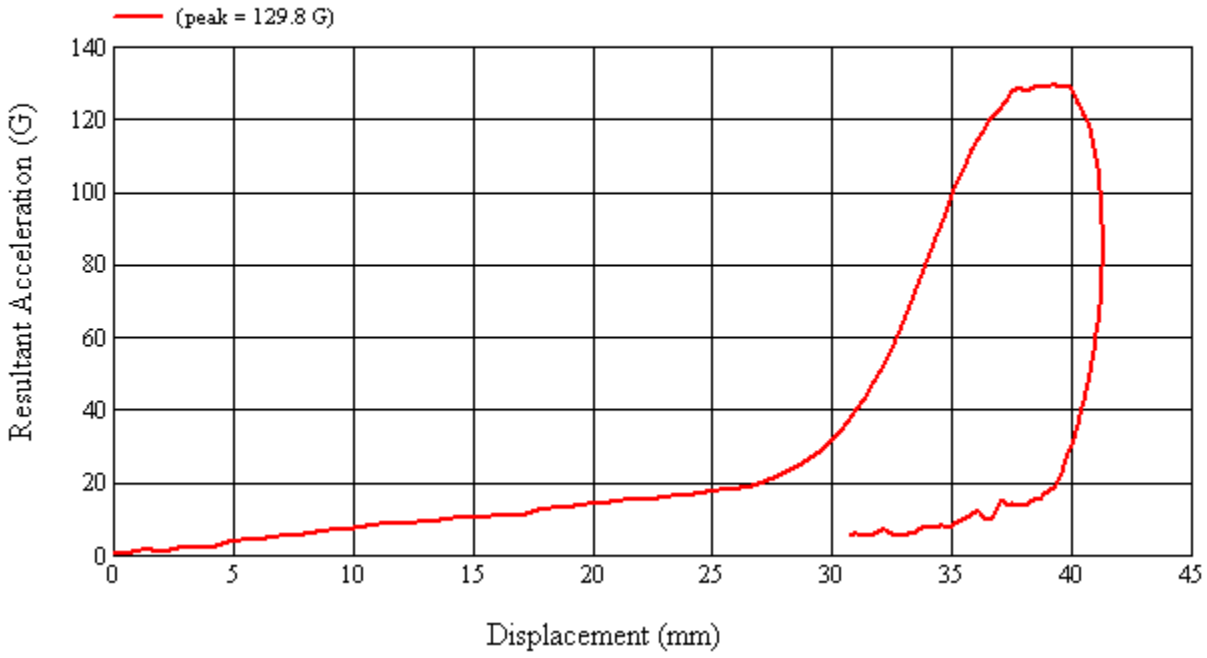
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

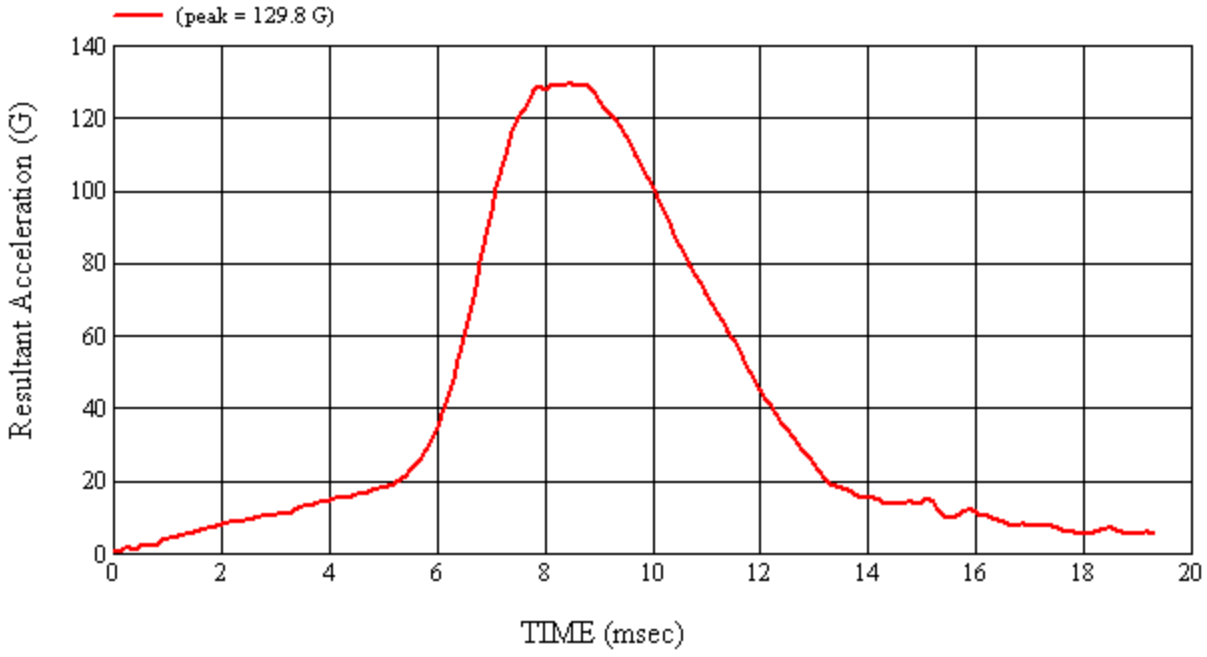
No visible damage

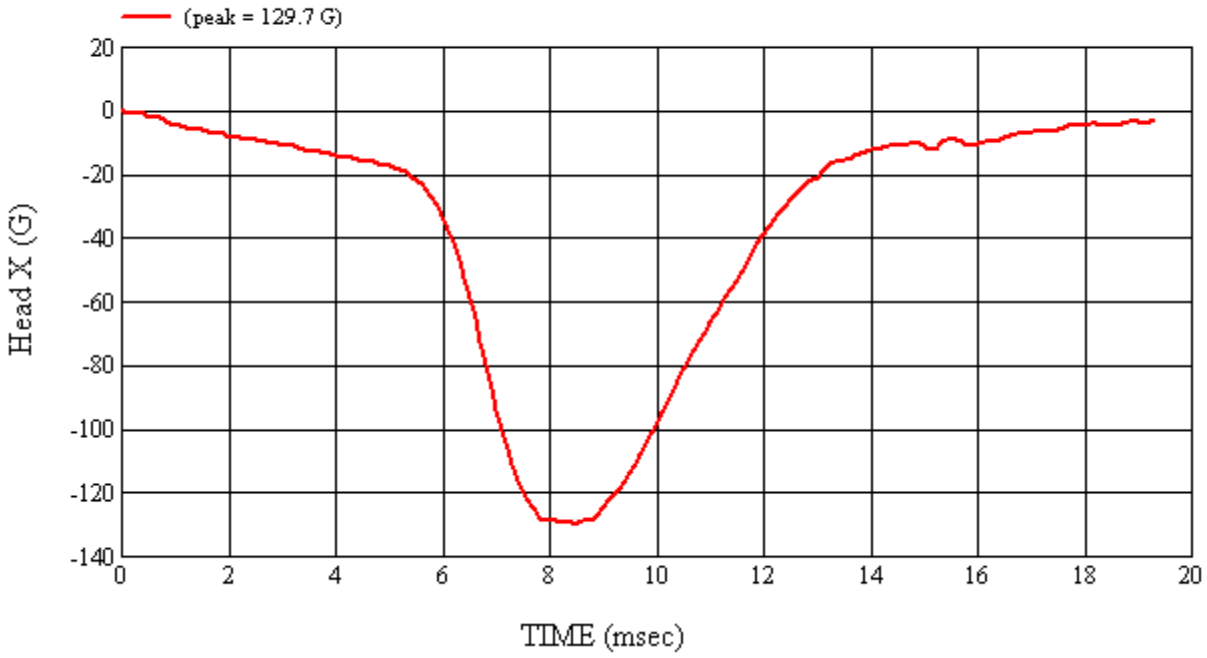
Recorded By: _____ Approved By*: _____ Date: 3/31/2011

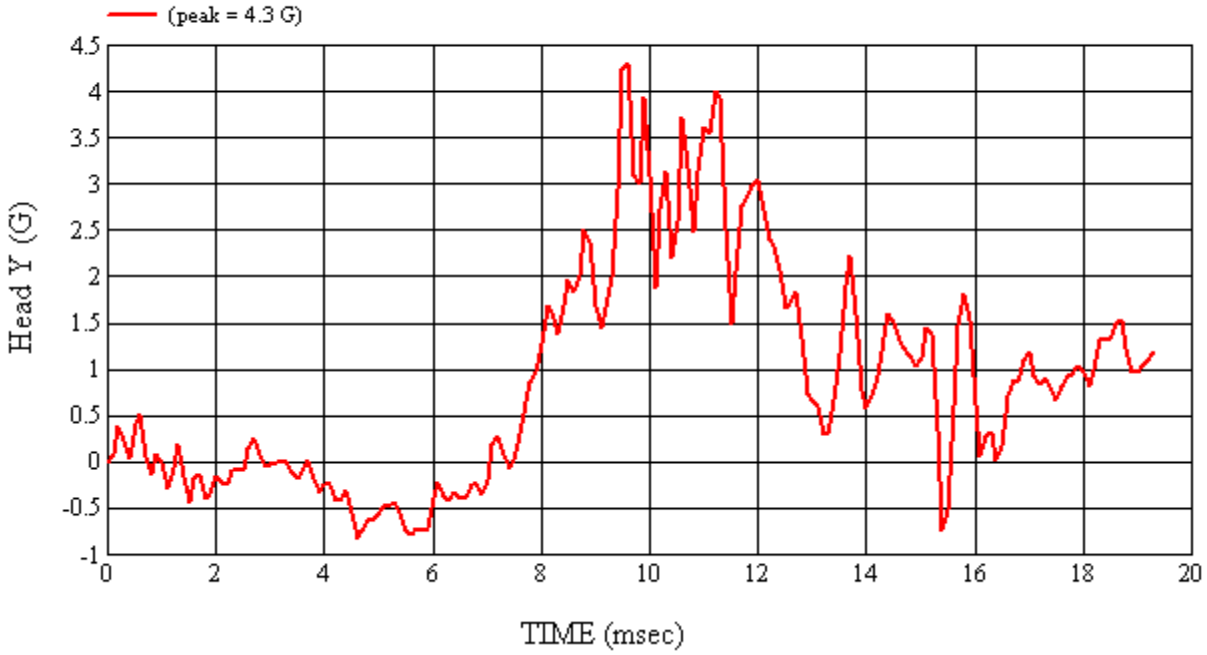
*Only necessary for NHTSA (Government) Compliance testing.

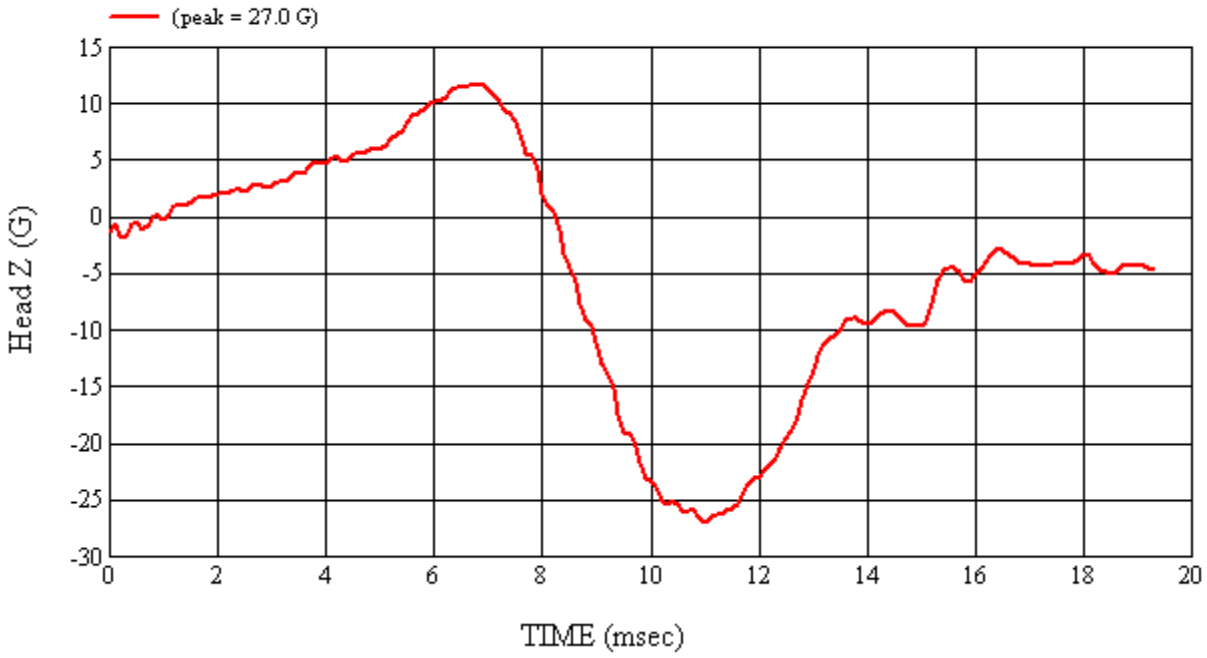
MGA Test #: U11086 Target Location: SR2B, Left Side Test Date: 3/31/2011

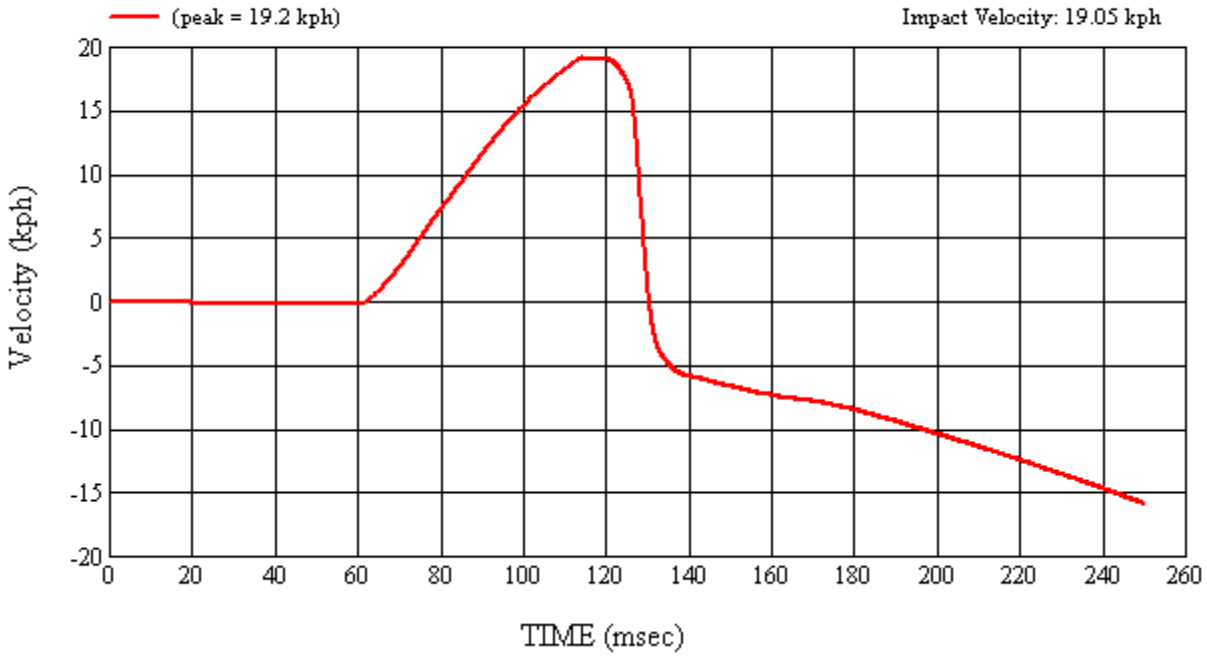


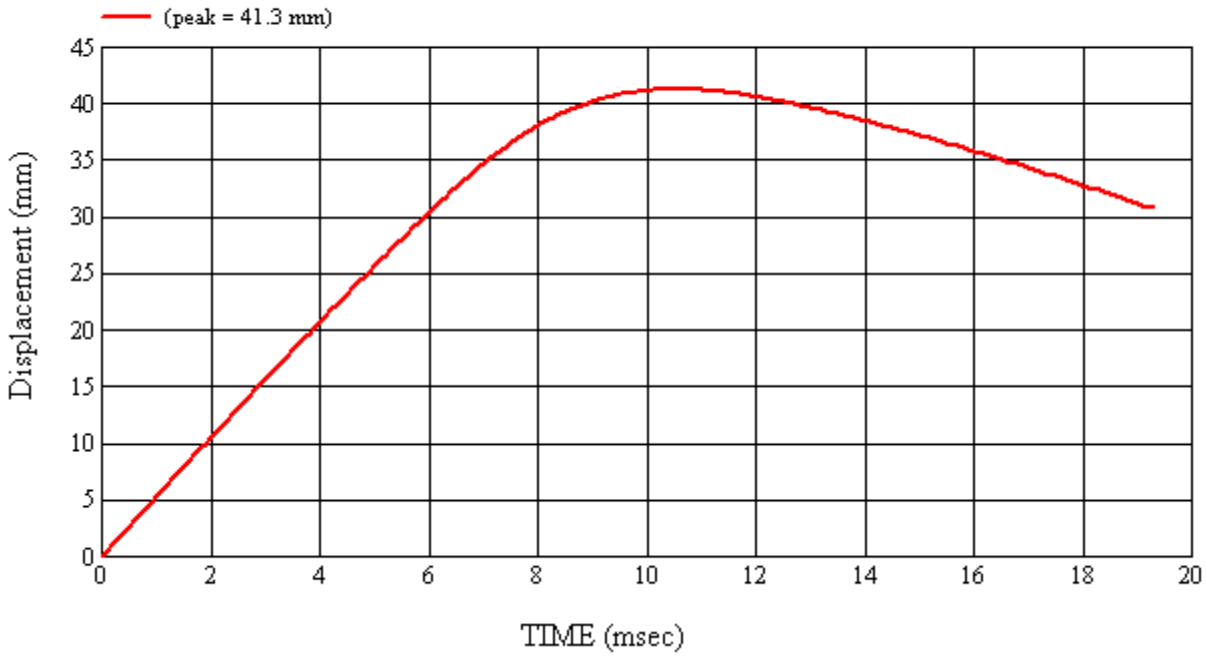


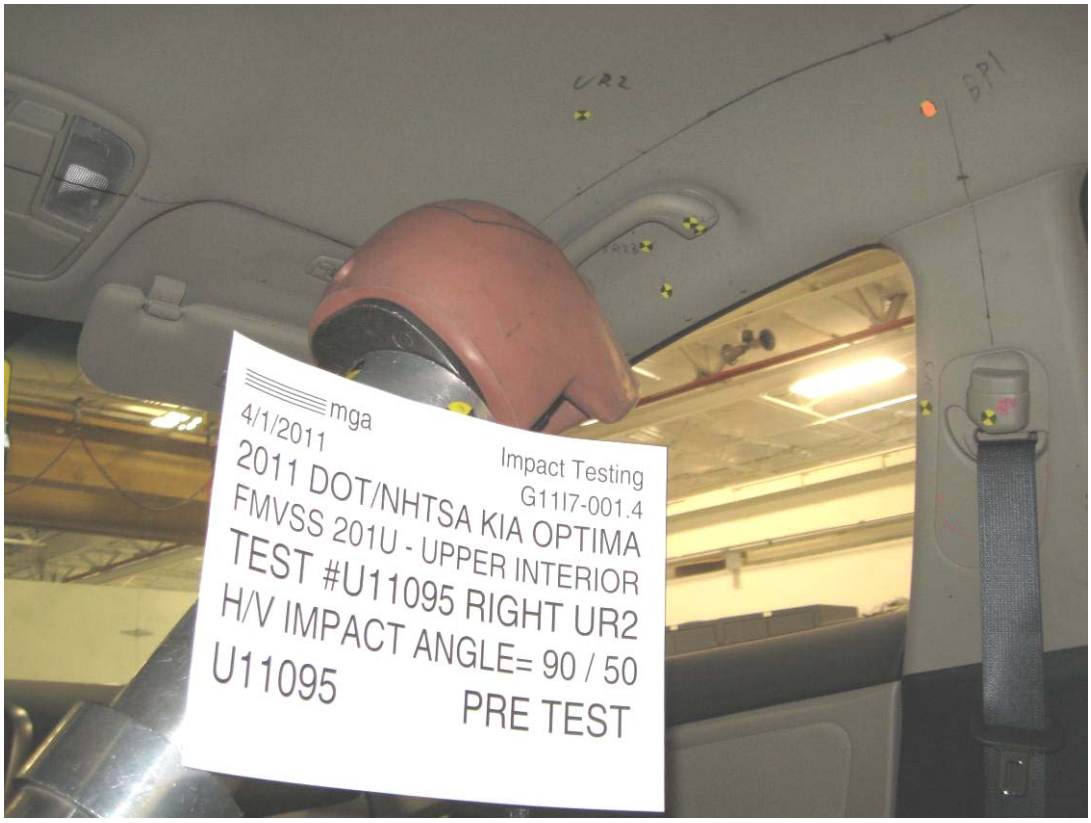

(peak = 129.7 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 4.3 G)
Head Y (G)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 27.0 G)
Head Z (G)
15
10
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 19.2 kph)
Impact Velocity: 19.05 kph
Velocity (kph)
20
15
10
5
0
-5
-10
-15
-20
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 41.3 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


UR2
DP1
mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11095 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11095
PRE TEST


UR2
DP1
mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11095 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11095
PRE TEST


CB0506
U11095
mga
Impact Testing
G11I7-001.4
4/1/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11095 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11095
POST TEST


UR2
mga
Impact Testing
G11I7-001.4
4/1/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11095 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11095
POST TEST


UR2
SR1
R2B


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11095 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11095
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Test Number:#U11095

Target (Vehicle Side): UR2Right

Temperature:20.6C

MGA Test Reference No.:U11095

Humidity:23.4%

Approach Horizontal Angles:90º

Time of Test:4:34:09 PM

Approach Vertical Angles:50º

FMH Serial No:[038]

Additional Description:@SR2A

TEST RESULTS:

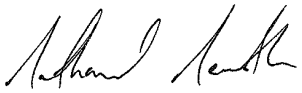
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
804	846	7.1	23.8	32	5 Left

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

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

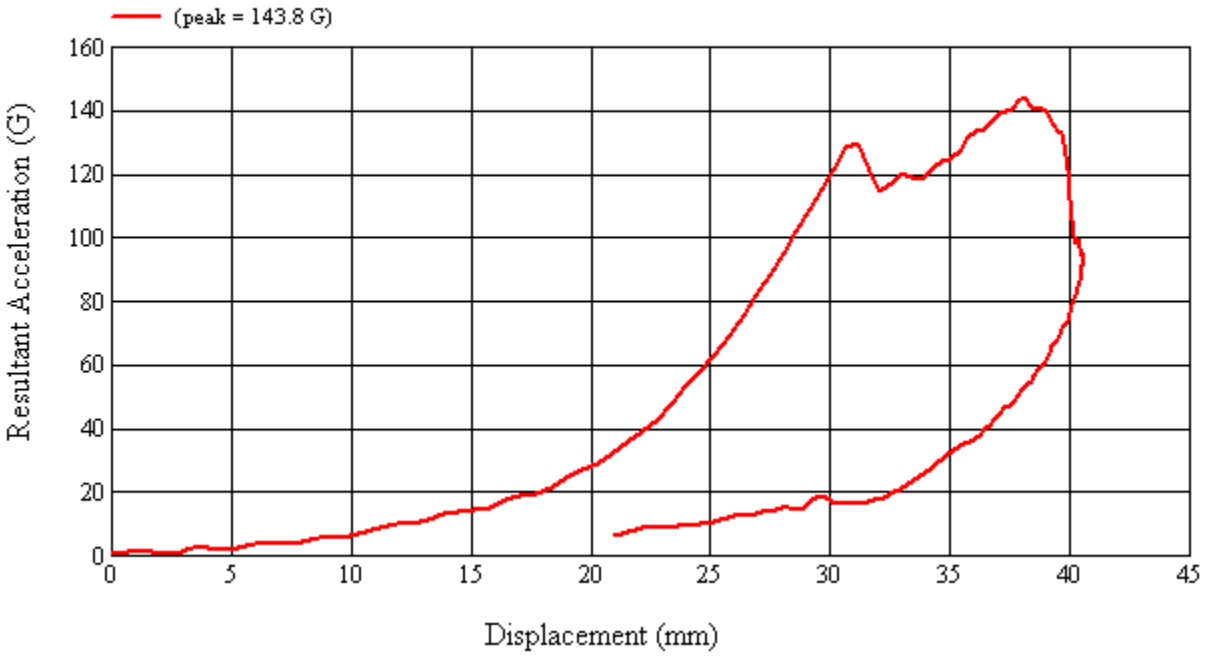
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

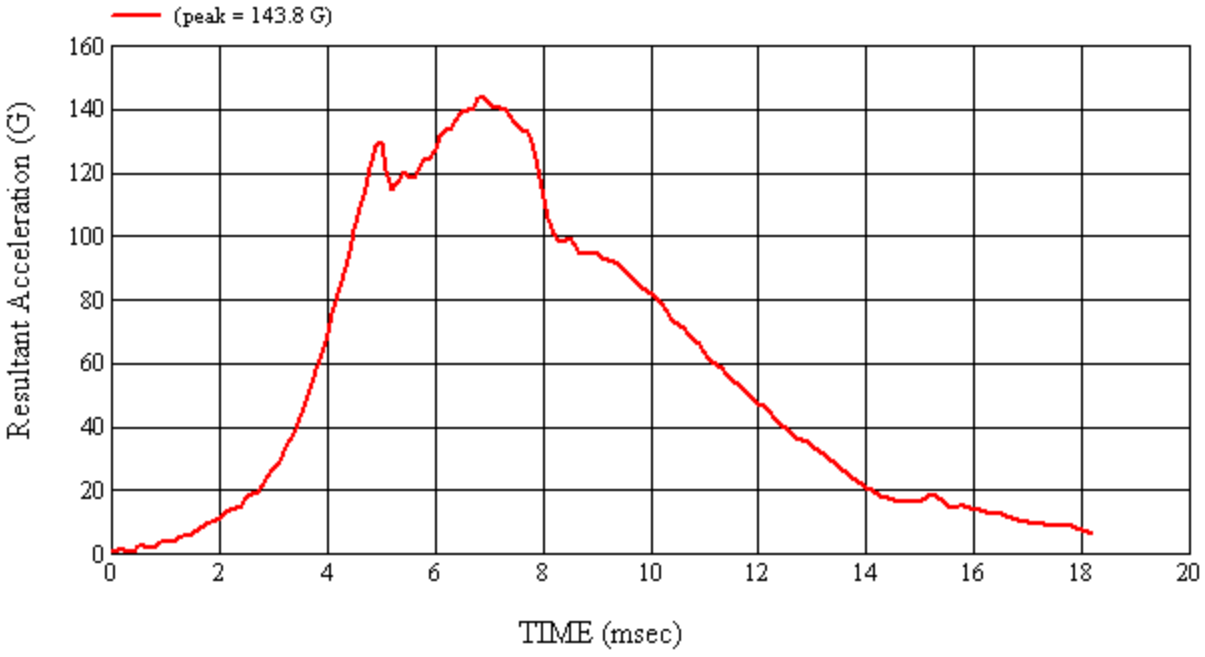
No visible damage

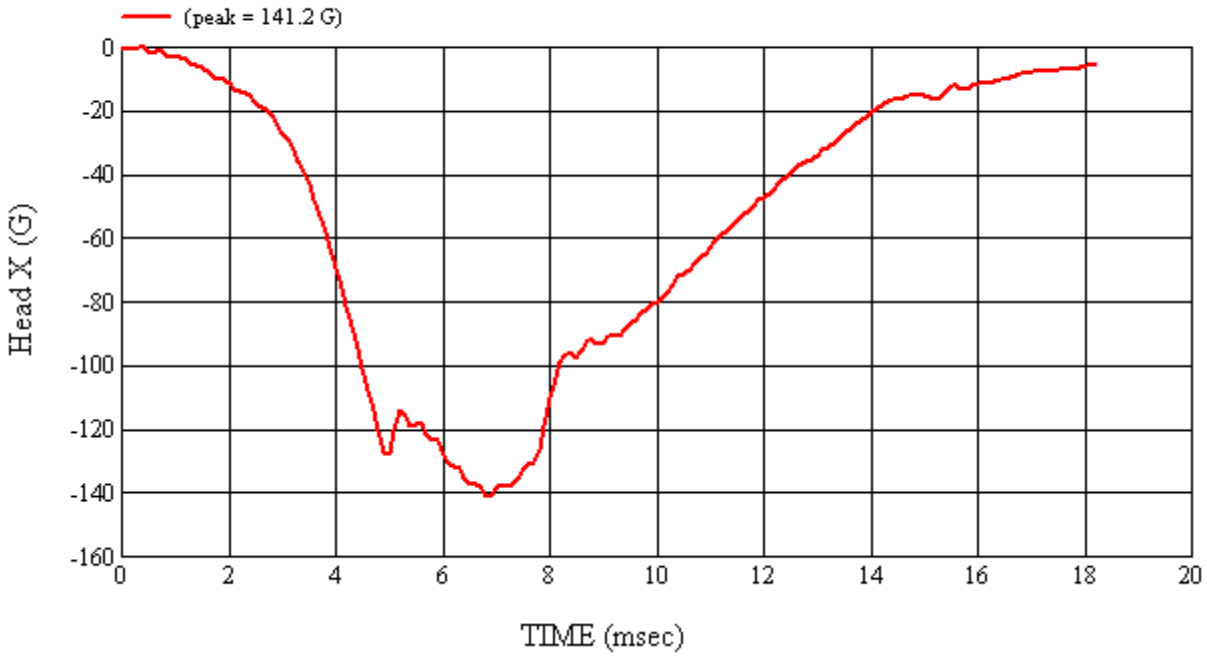
Recorded By:  Approved By*:  Date: 4/1/2011

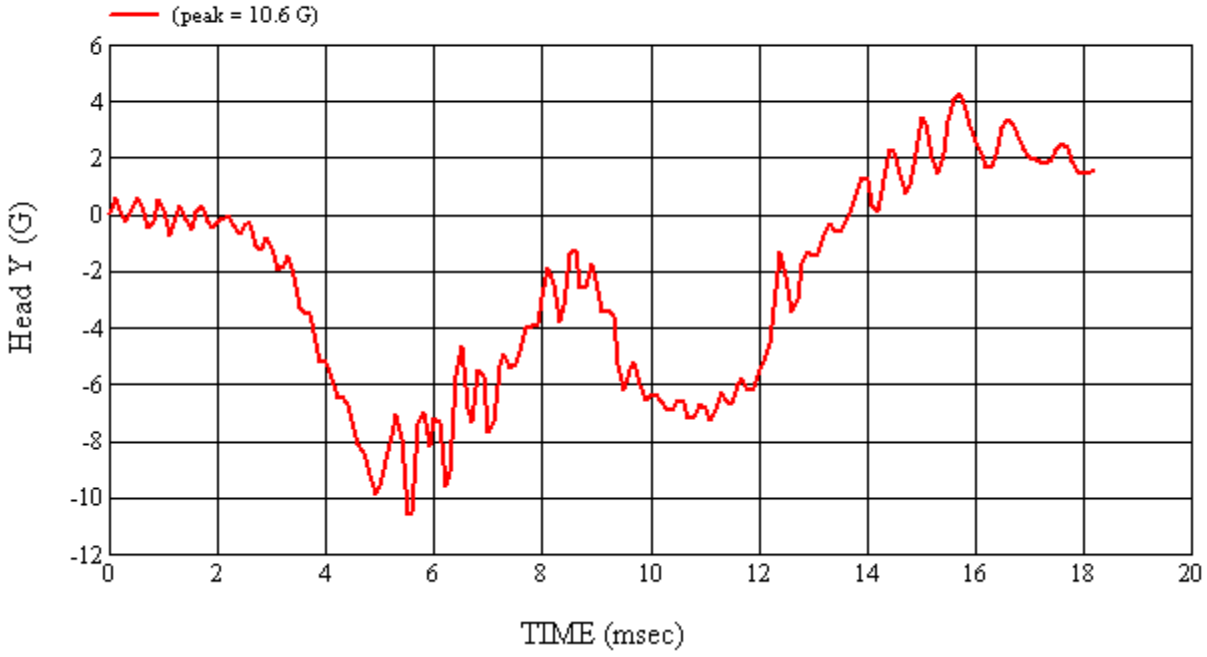
*Only necessary for NHTSA (Government) Compliance testing.

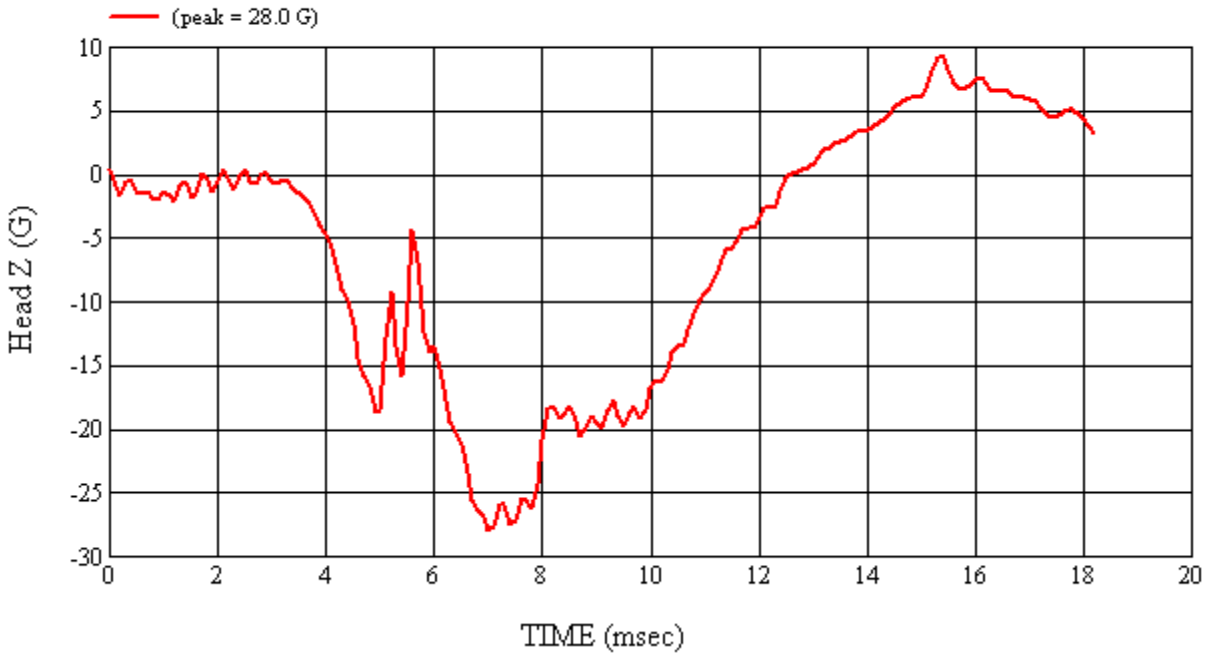
MGA Test #: U11095 Target Location: UR2, Right Side Test Date: 4/1/2011

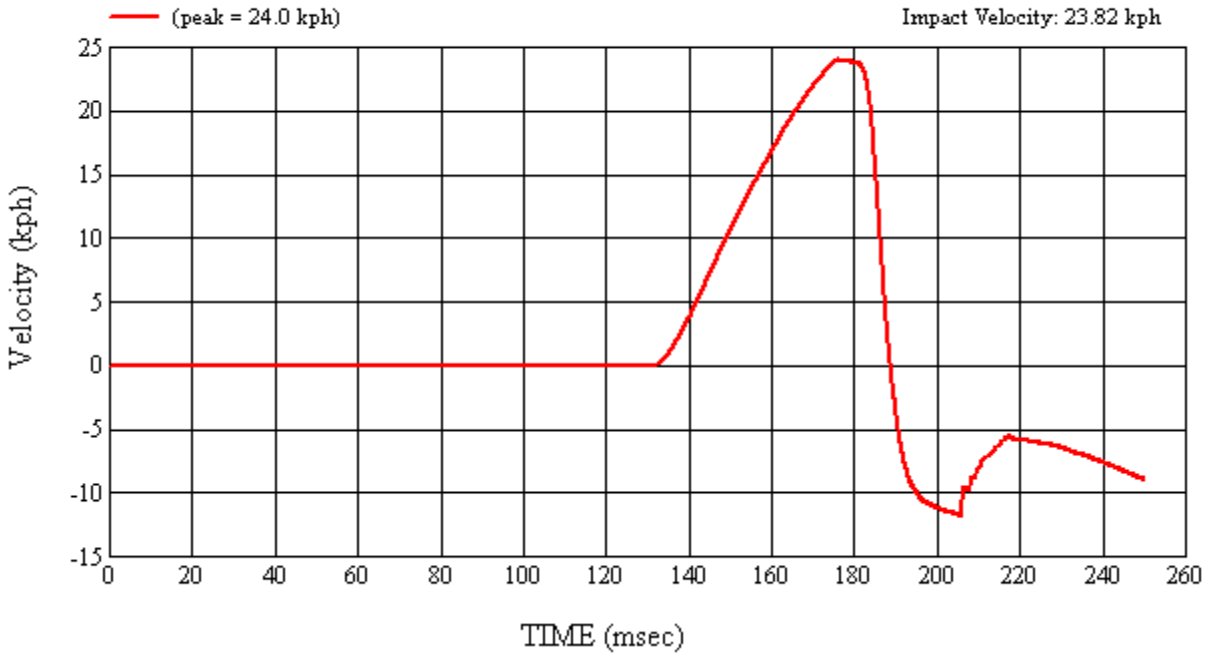


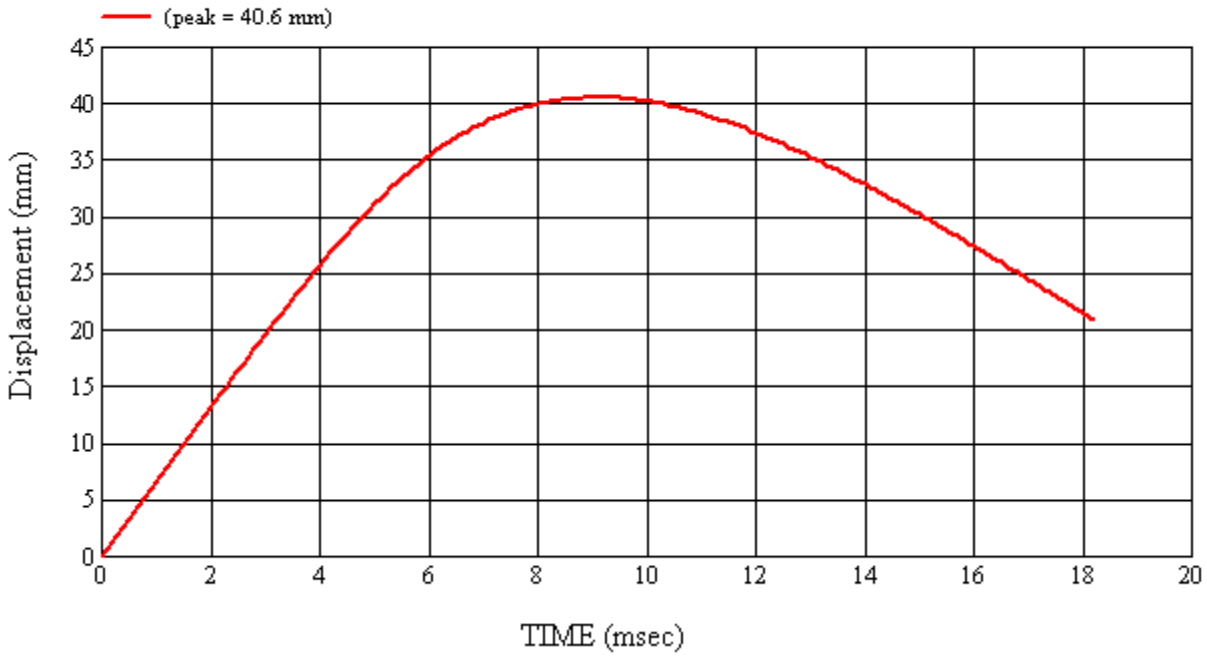



(peak = 141.2 G)
Head X (G)
0
-20
-40
-60
-80
-100
-120
-140
-160
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 10.6 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
-10
-12
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

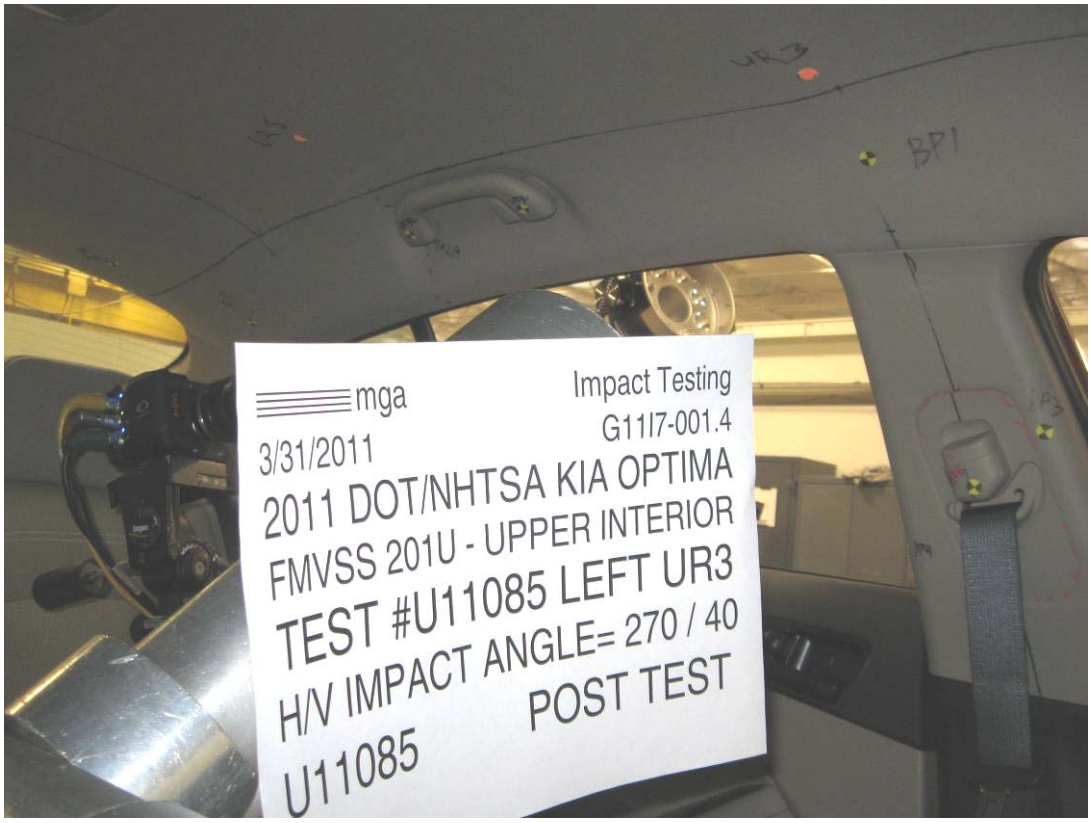

(peak = 28.0 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 24.0 kph)
Impact Velocity: 23.82 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

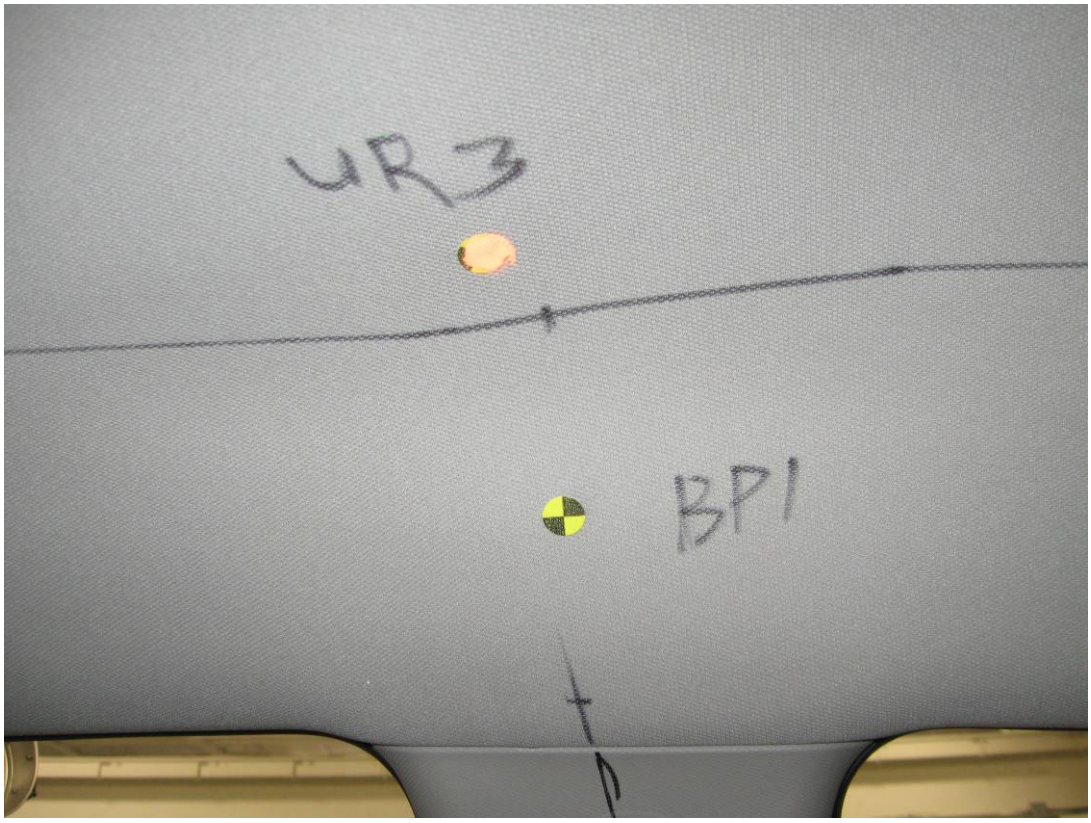

(peak = 40.6 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11085 LEFT UR3
H/V IMPACT ANGLE= 270 / 40
PRE TEST
U11085


mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11085 LEFT UR3
H/V IMPACT ANGLE= 270 / 40
U11085
PRE TEST


mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11085 LEFT UR3
H/V IMPACT ANGLE= 270 / 40
U11085
POST TEST


UR3
BP1
mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11085 LEFT UR3
H/V IMPACT ANGLE= 270 / 40
U11085
POST TEST


UR3
BP1


mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11085 LEFT UR3
H/V IMPACT ANGLE= 270 / 40
U11085
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR3Left

MGA Test Reference No.:U11085

Approach Horizontal Angles:270º

Approach Vertical Angles:40º

Additional Description:@BP

Test Number:#U11085

Temperature:20.6C

Humidity:22.0%

Time of Test:11:38:39 AM

FMH Serial No:[037]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
649	640	9.6	23.9	46	6 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J32177	-113.7	1.07	1.08
Y	6	J14103	93.9	0.85	0.85
Z	7	J35800	97.8	0.94	0.93

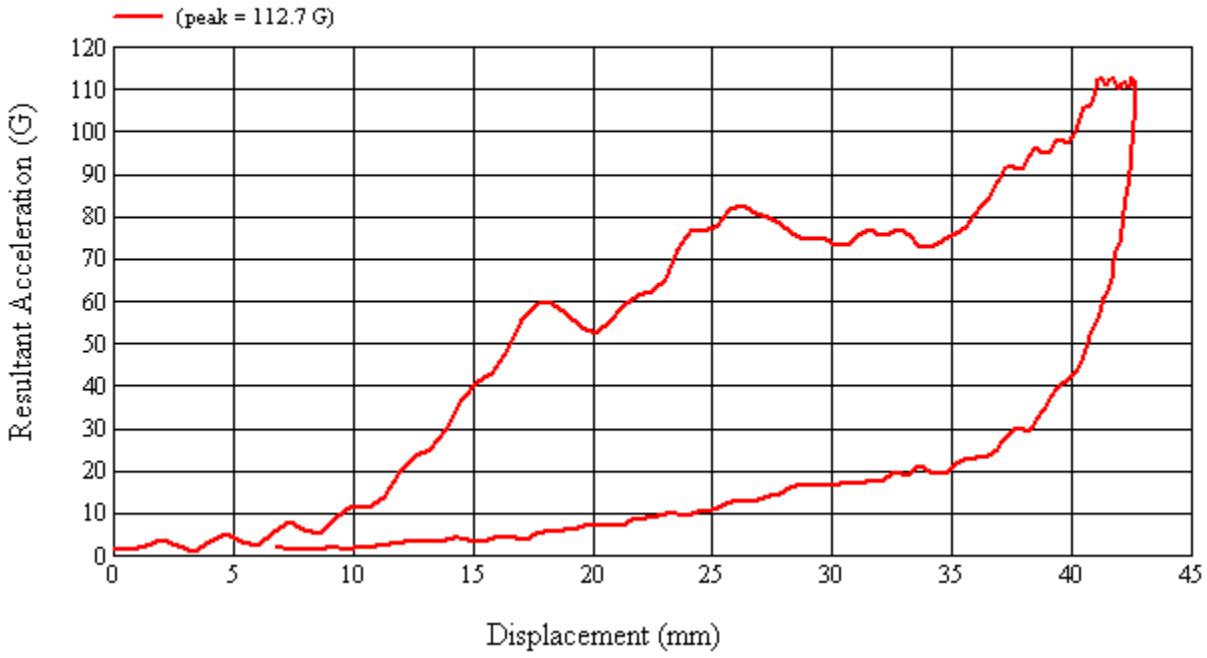
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

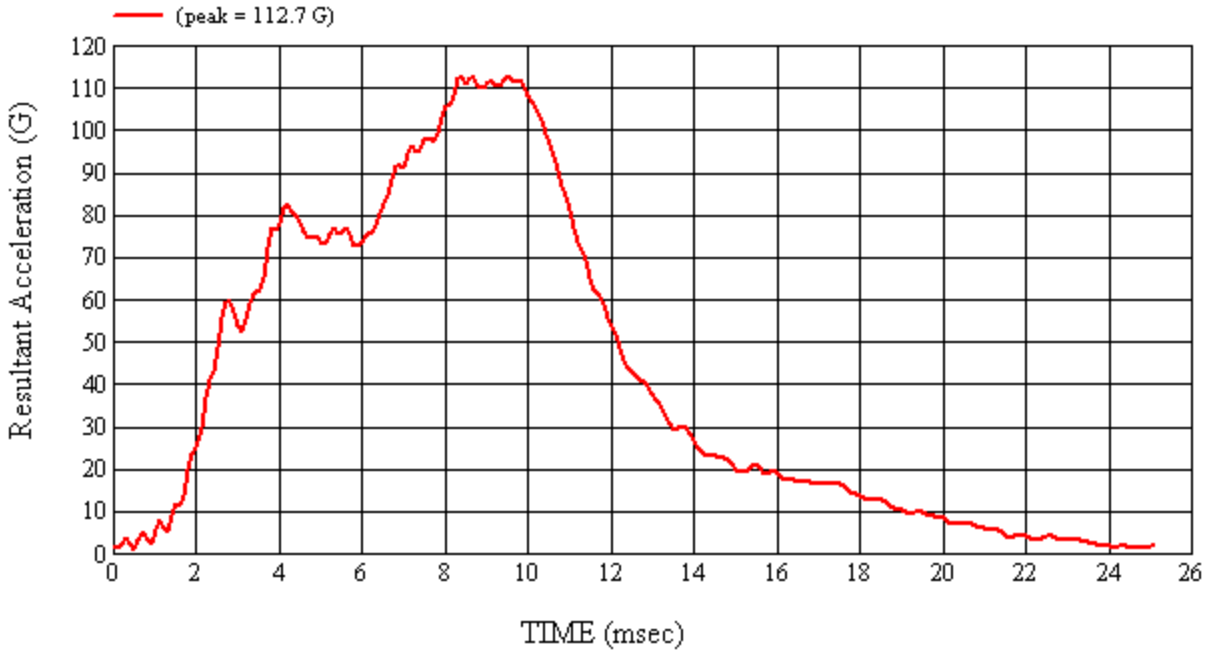
No visible damage

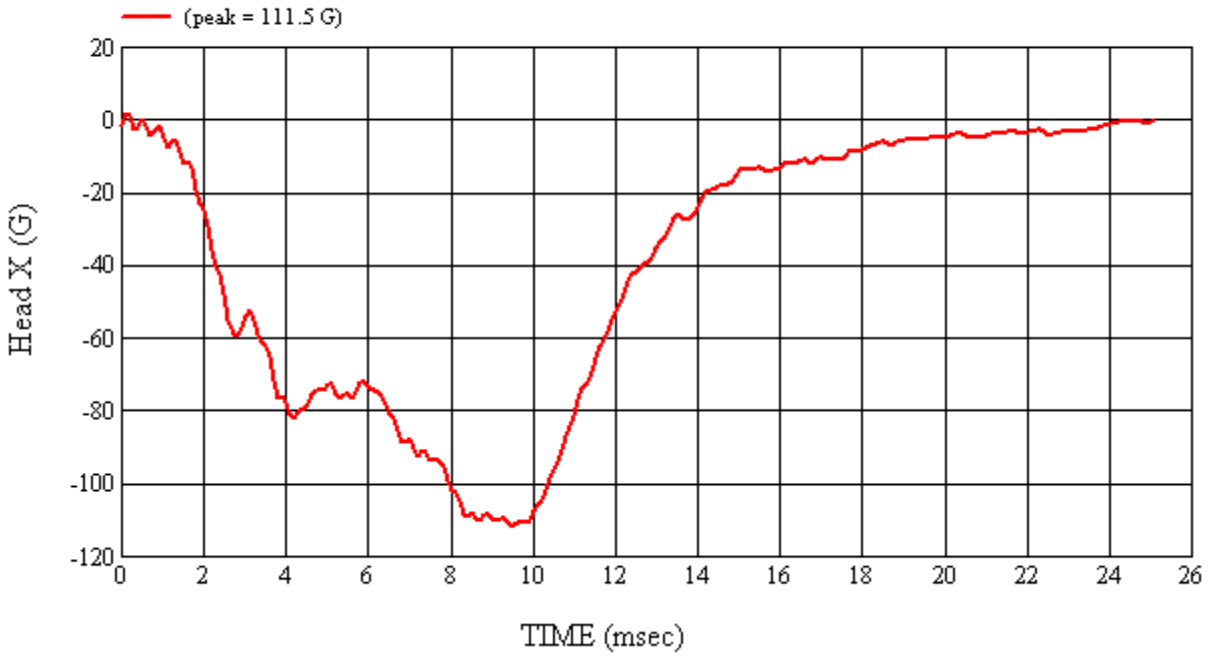
Recorded By: _____ Approved By*: _____ Date: 3/31/2011

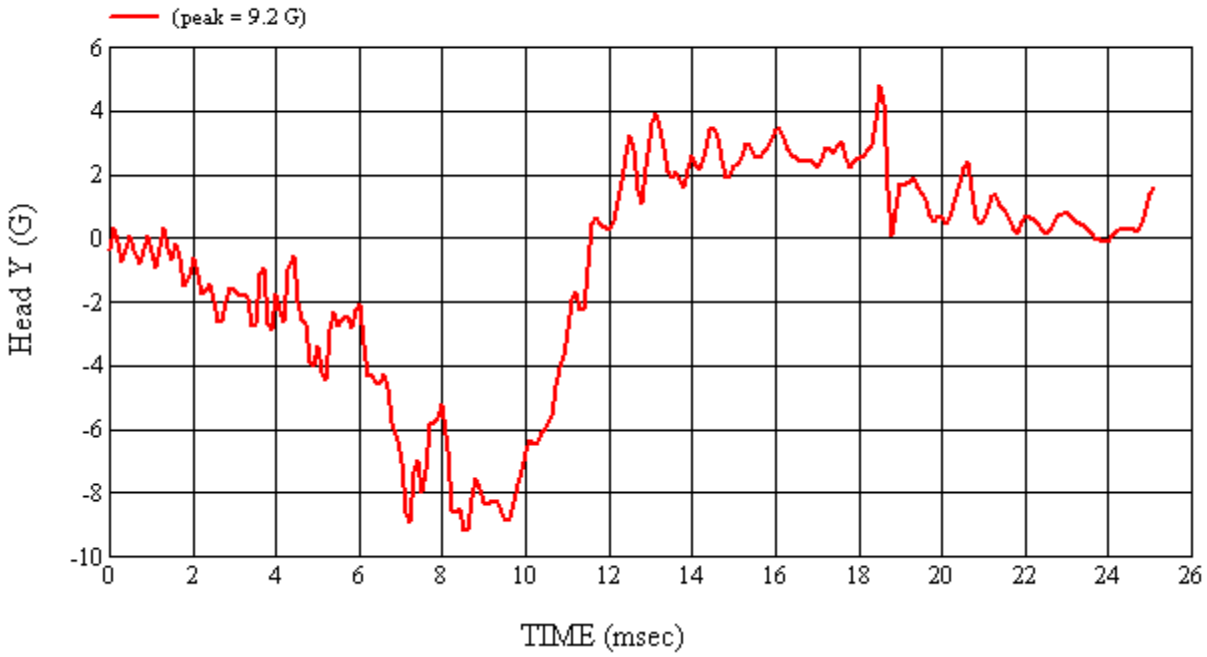
*Only necessary for NHTSA (Government) Compliance testing.

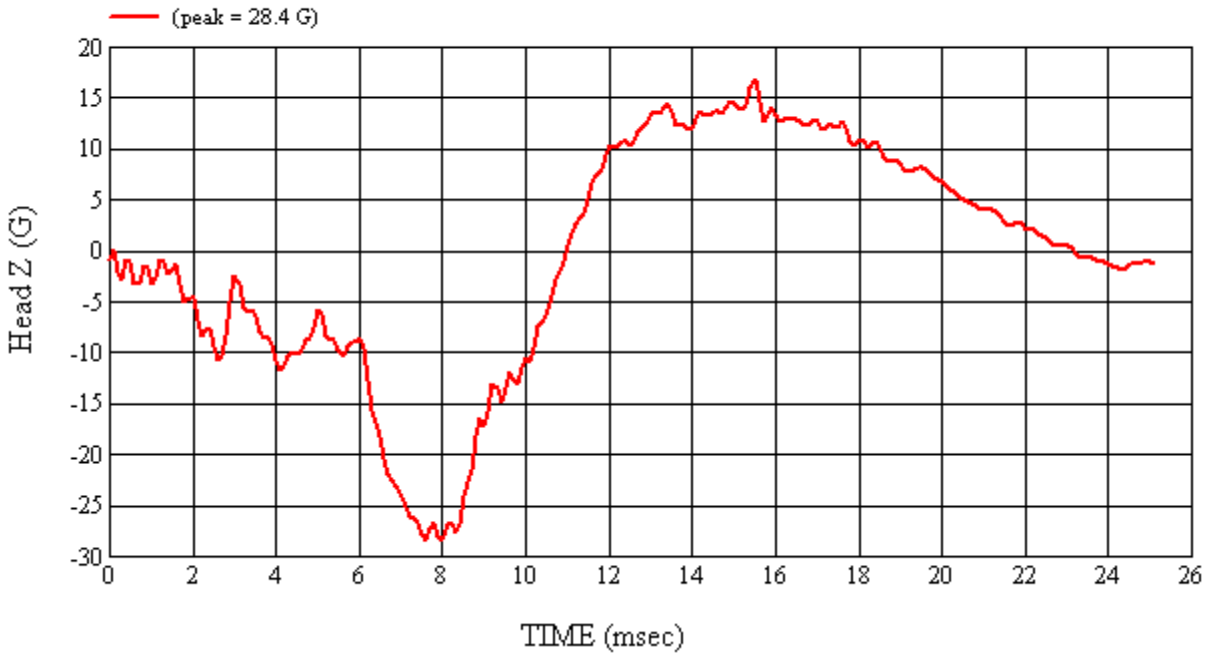
MGA Test #: U11085 Target Location: UR3, Left Side Test Date: 3/31/2011

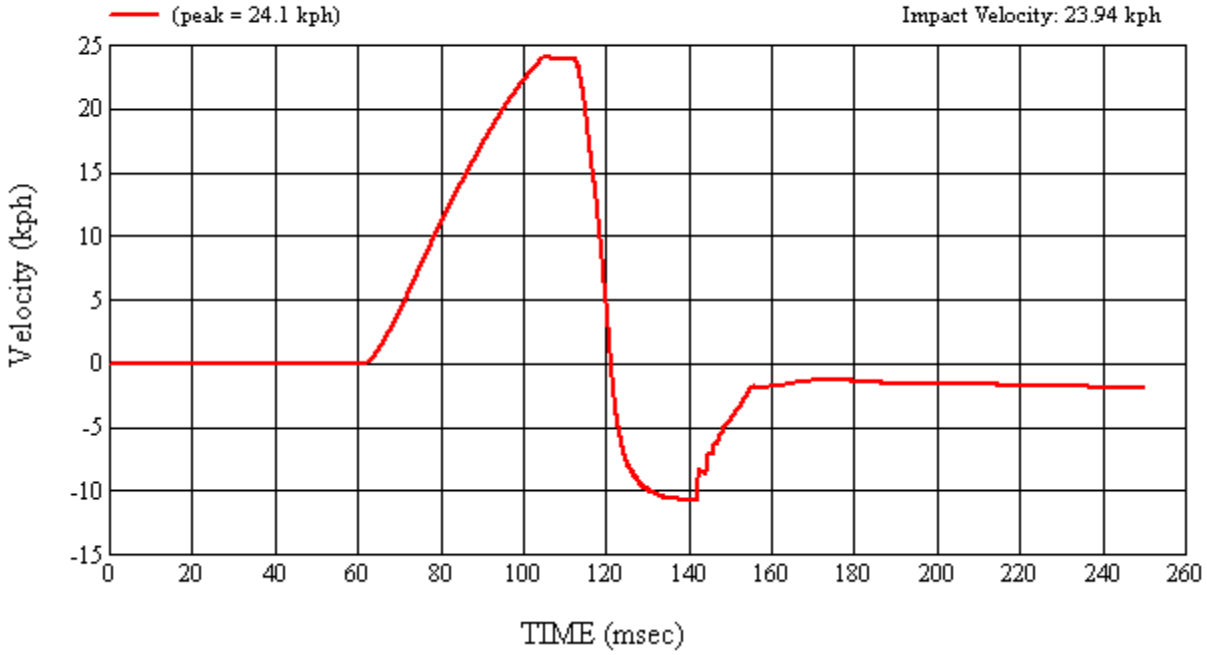


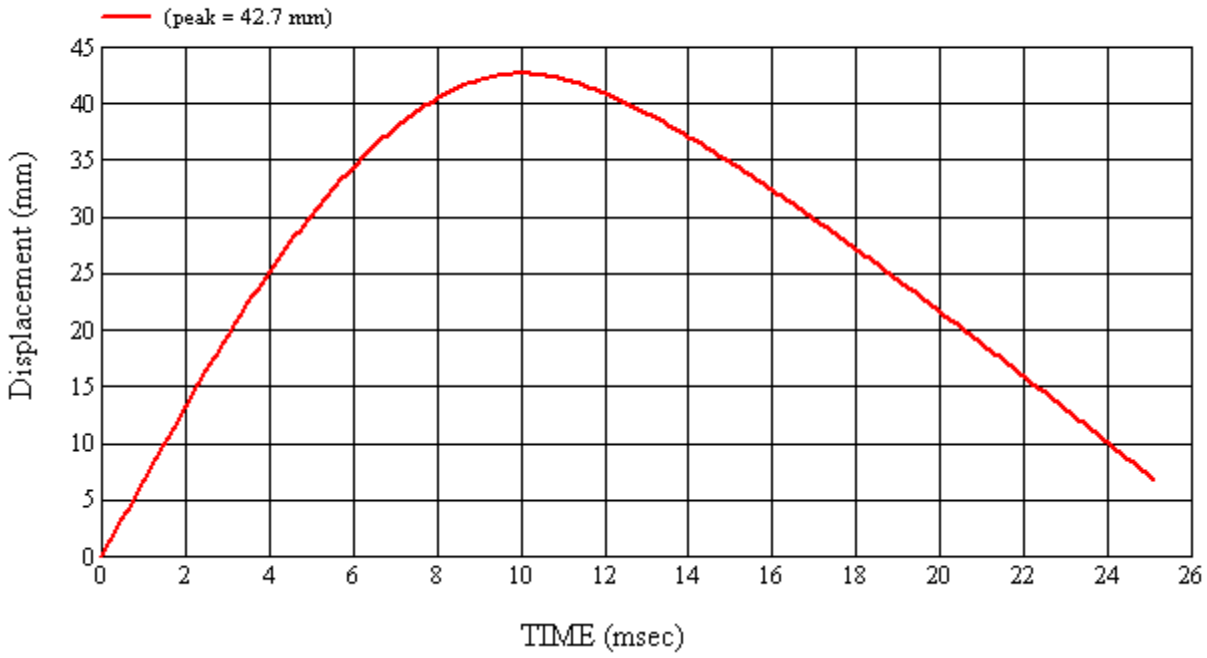



(peak = 111.5 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 9.2 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
-10
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)

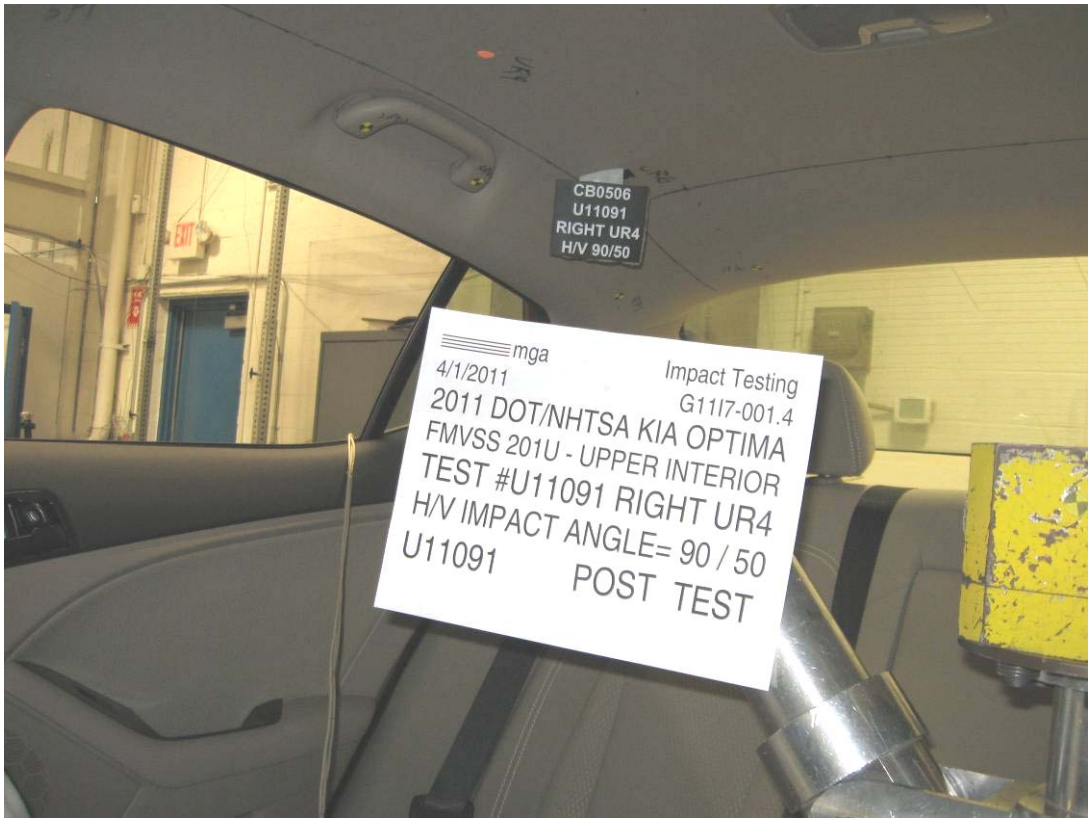

(peak = 28.4 G)
Head Z (G)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


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

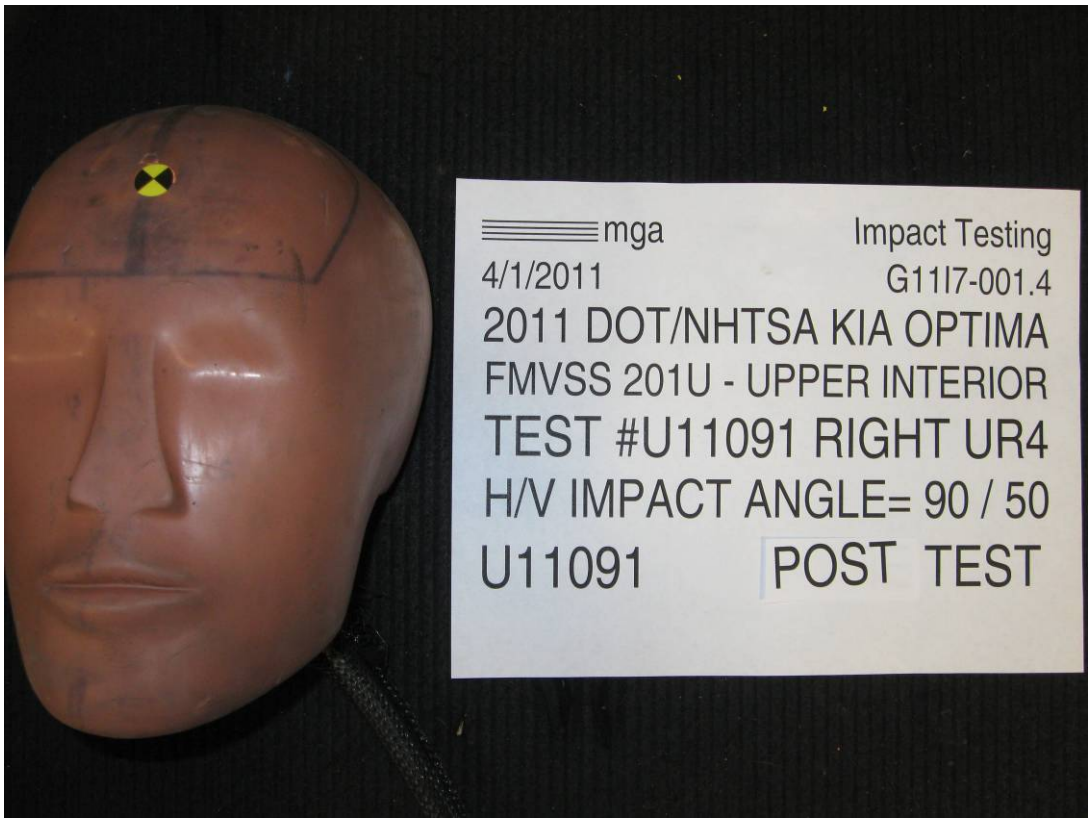

(peak = 42.7 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11091 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U11091
PRE TEST


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11091 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U11091
PRE TEST


CB0506
U11091
RIGHT UR4
H/V 90/50
mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11091 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U11091 POST TEST


mga
4/1/2011
Impact Testing
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11091 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U11091 POST TEST
CB0506
U11091
RIGHT UR4
H/V 90/50


mga
Impact Testing
4/1/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11091 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U11091
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Test Number:#U11091

Target (Vehicle Side): UR4Right

Temperature:20.6C

MGA Test Reference No.:U11091

Humidity:25.2%

Approach Horizontal Angles:90º

Time of Test:10:39:58 AM

Approach Vertical Angles:50º

FMH Serial No:[037]

Additional Description: @SR3-1

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
719	733	8.1	23.9	33	2 Left

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

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

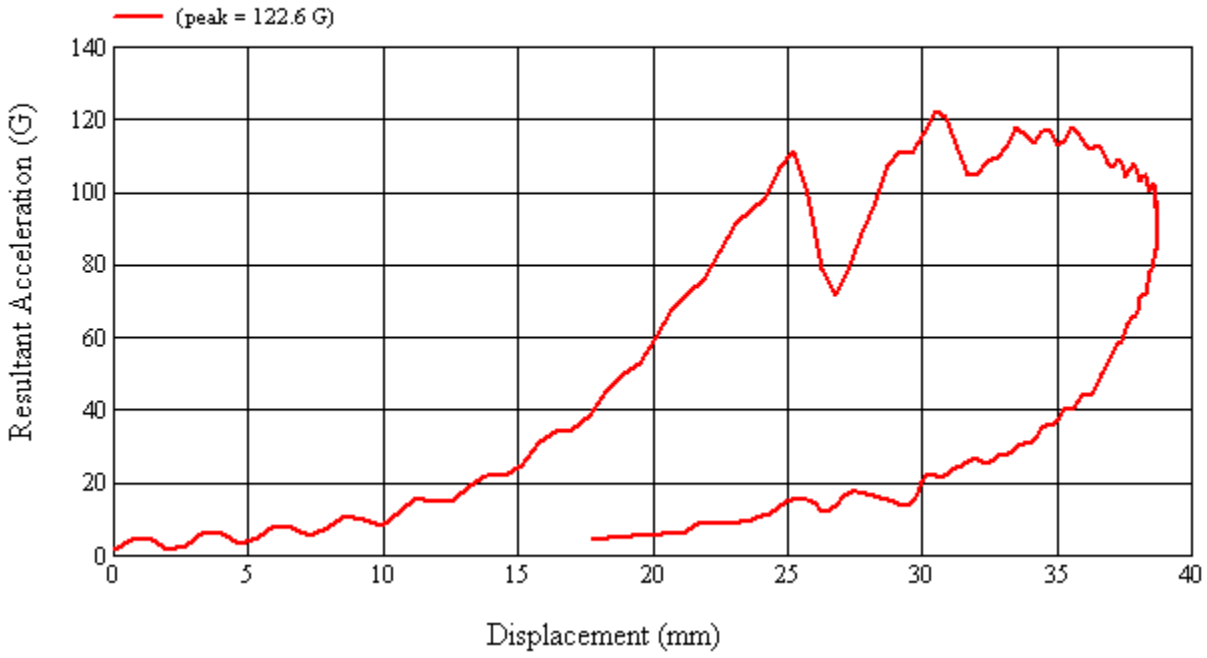
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

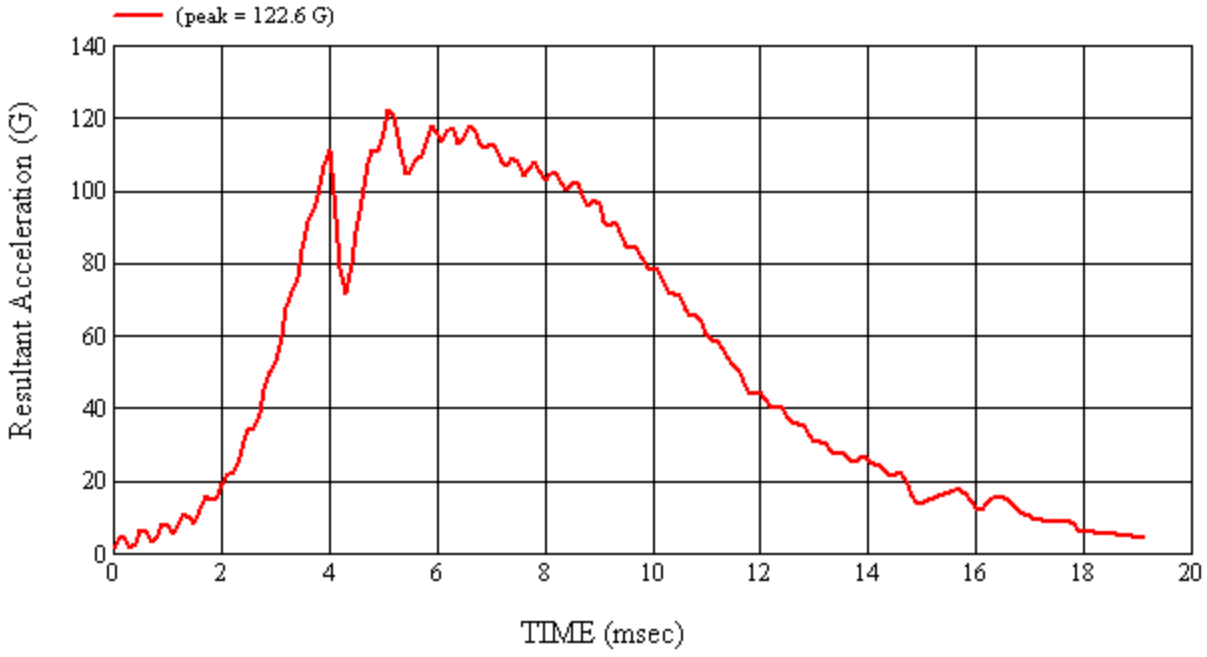
No visible damage

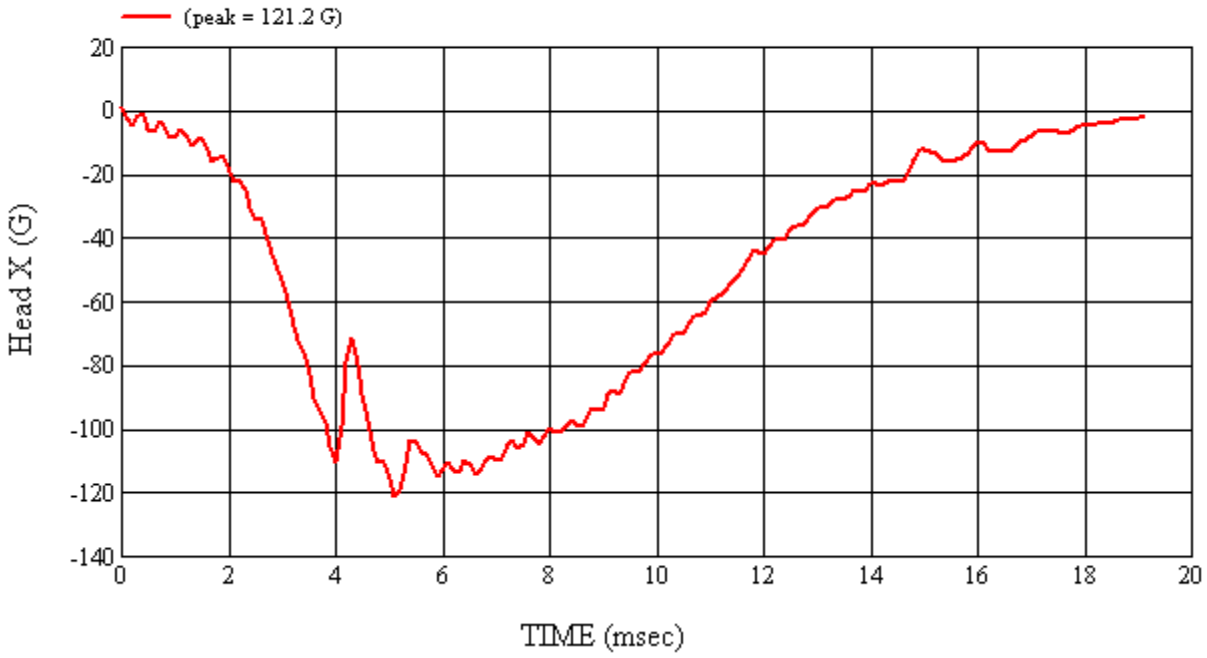
Recorded By: _____ Approved By*: _____ Date: 4/1/2011

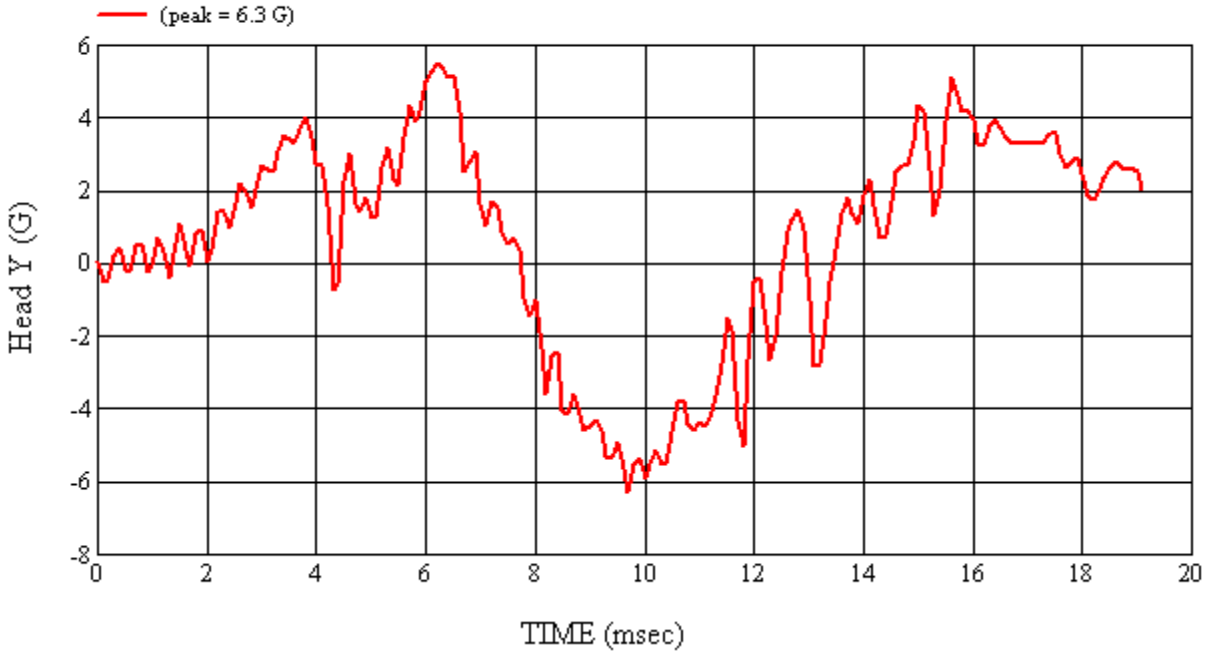
*Only necessary for NHTSA (Government) Compliance testing.

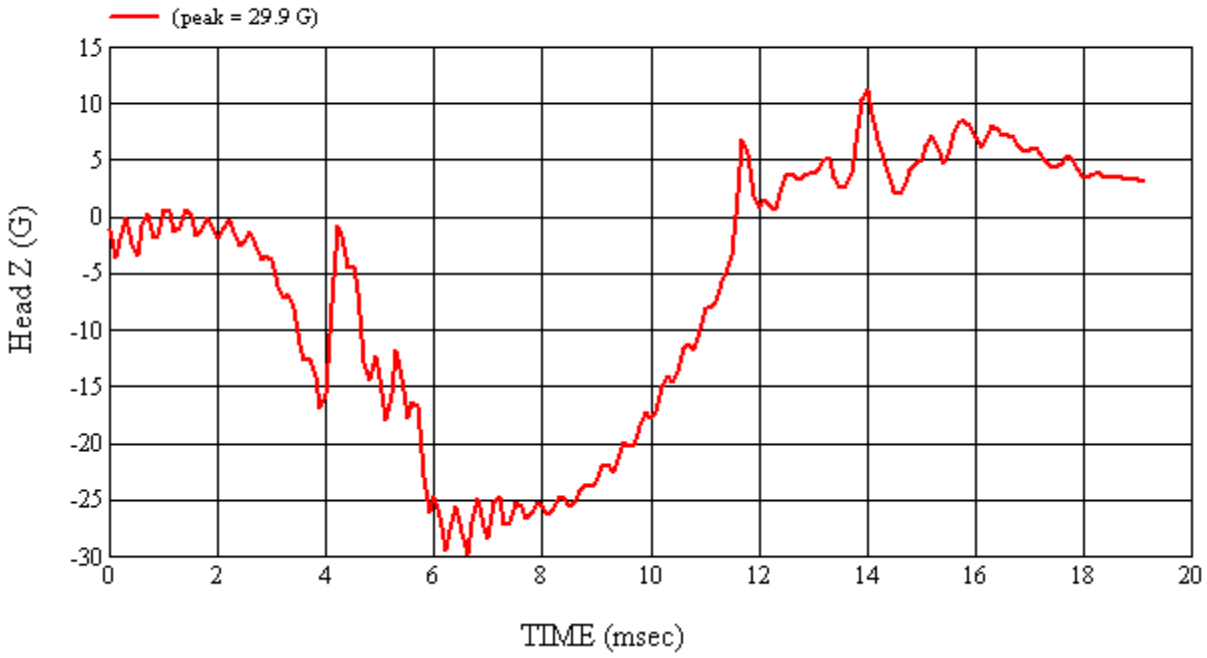
MGA Test #: U11091 Target Location: UR4, Right Side Test Date: 4/1/2011

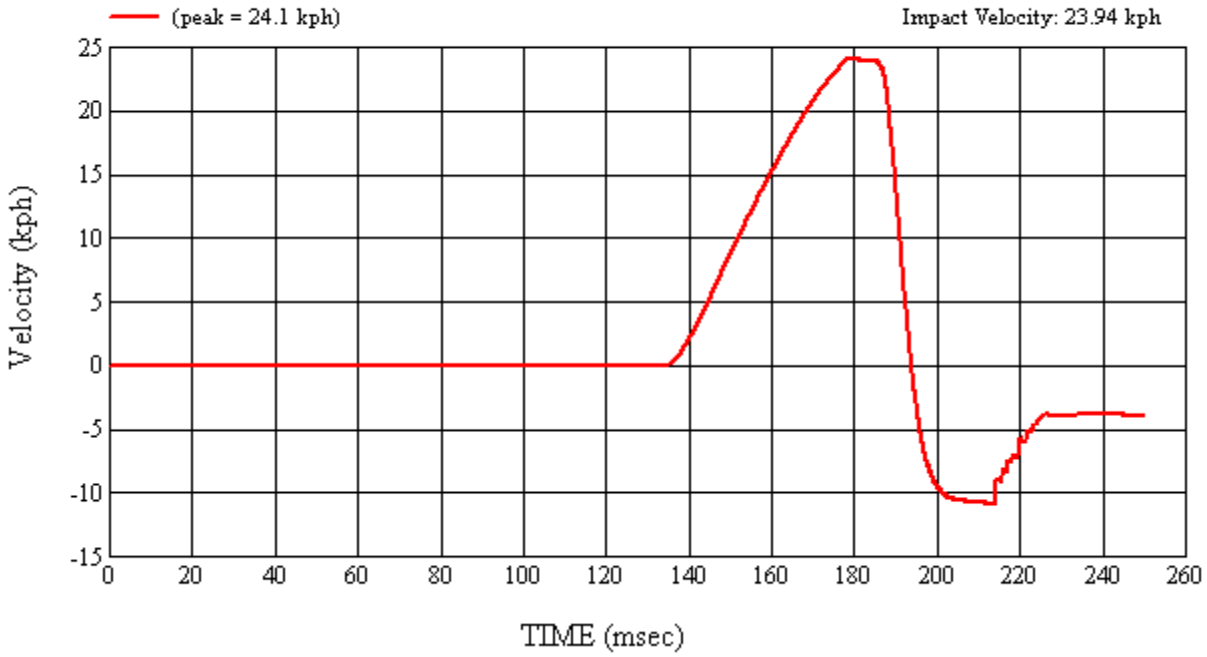


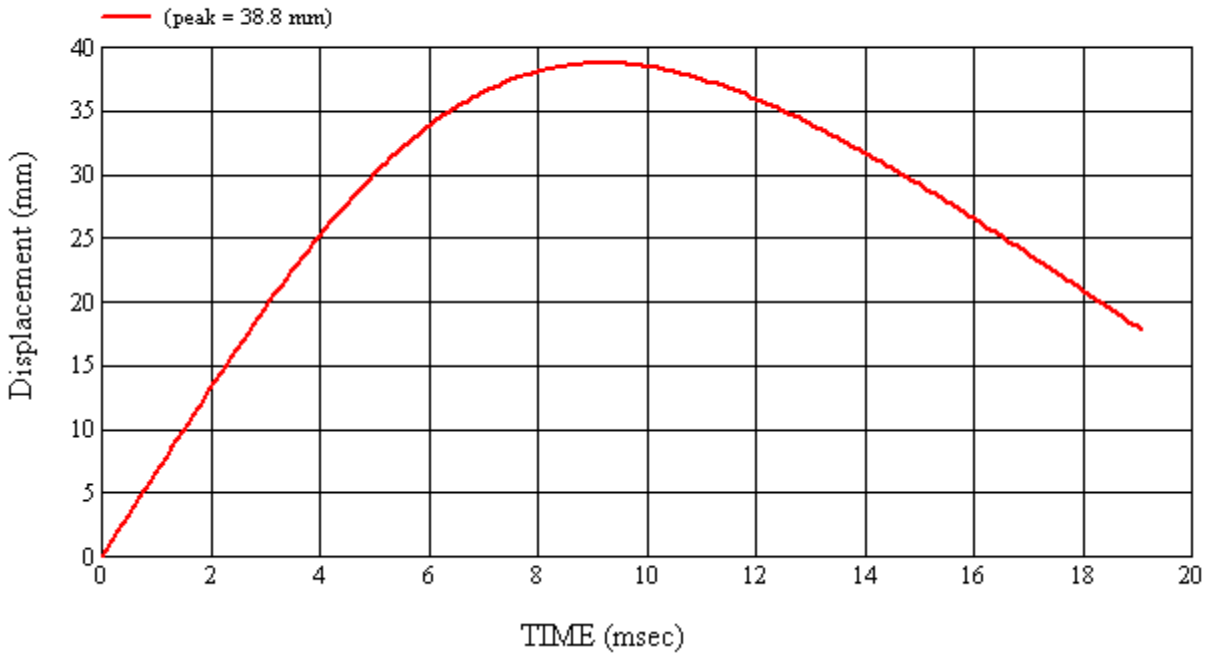



(peak = 121.2 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

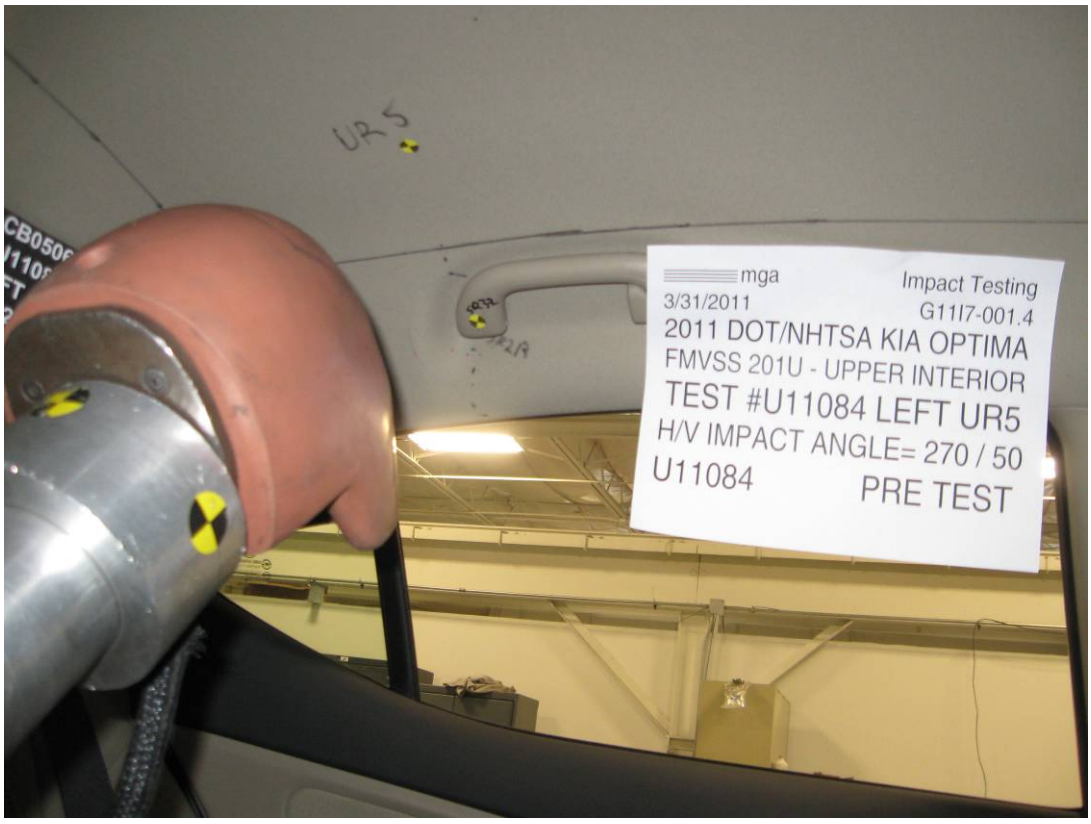

(peak = 6.3 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 29.9 G)
Head Z (G)
15
10
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

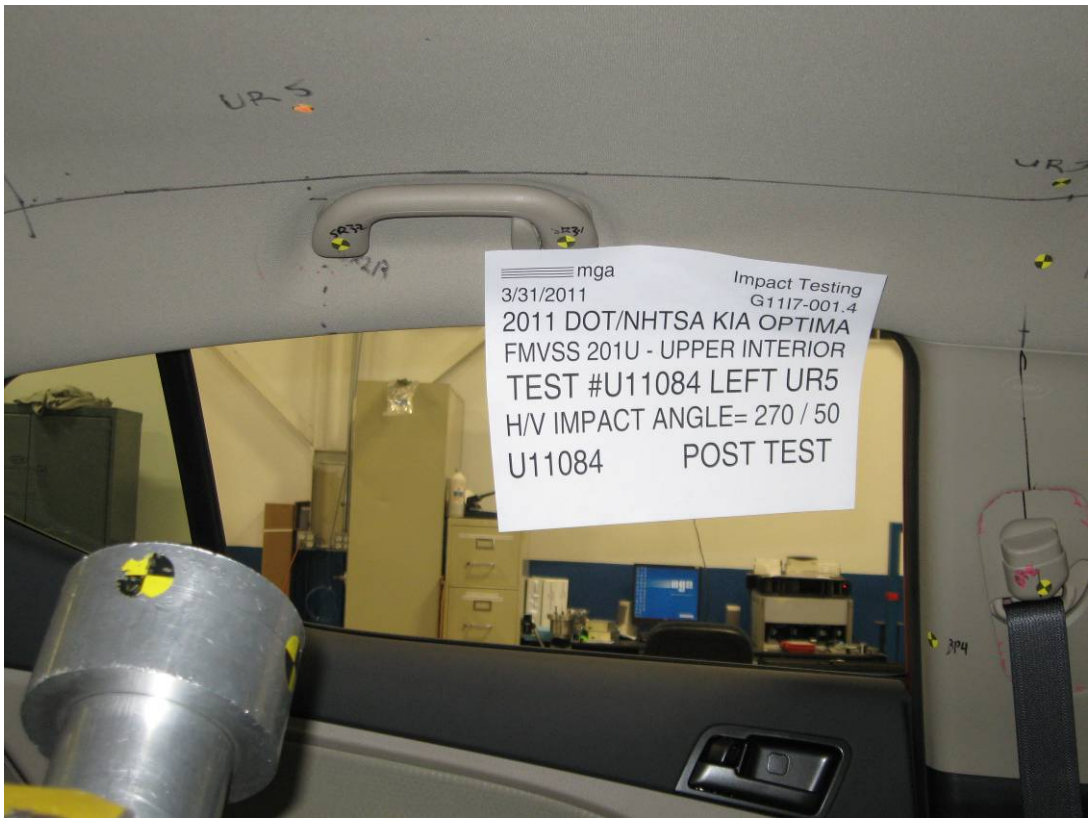

(peak = 24.1 kph)
Impact Velocity: 23.94 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

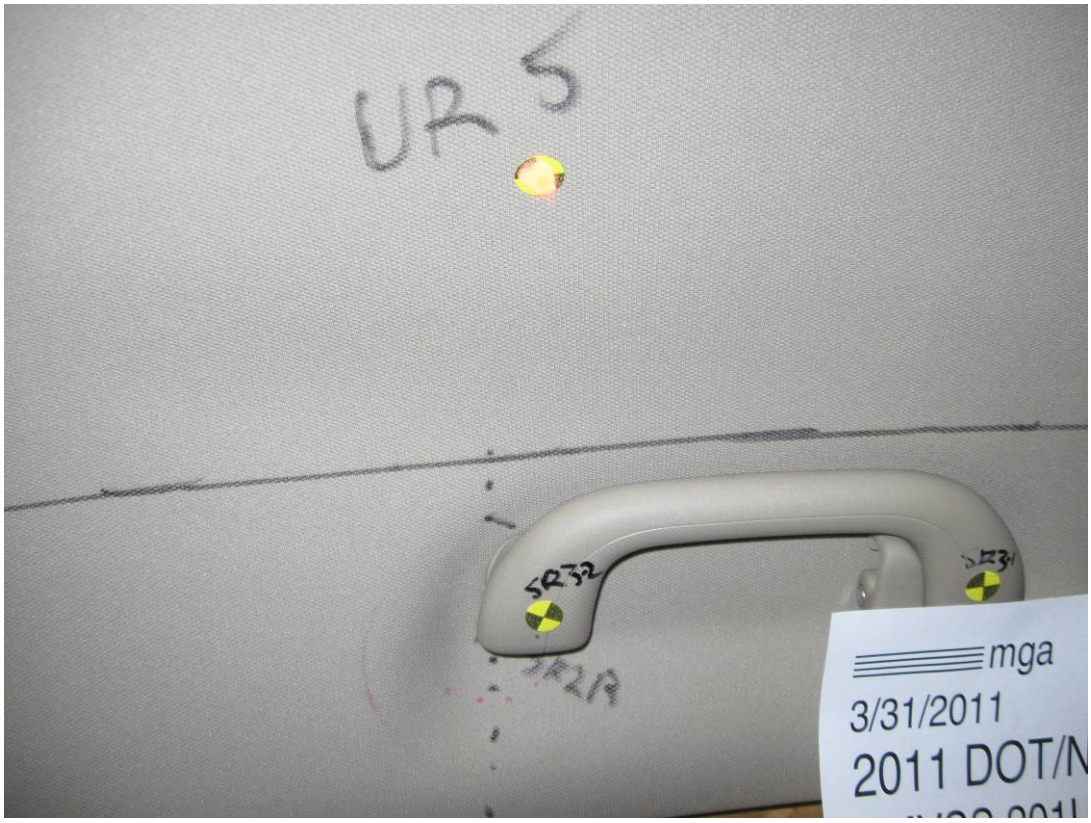

(peak = 38.8 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

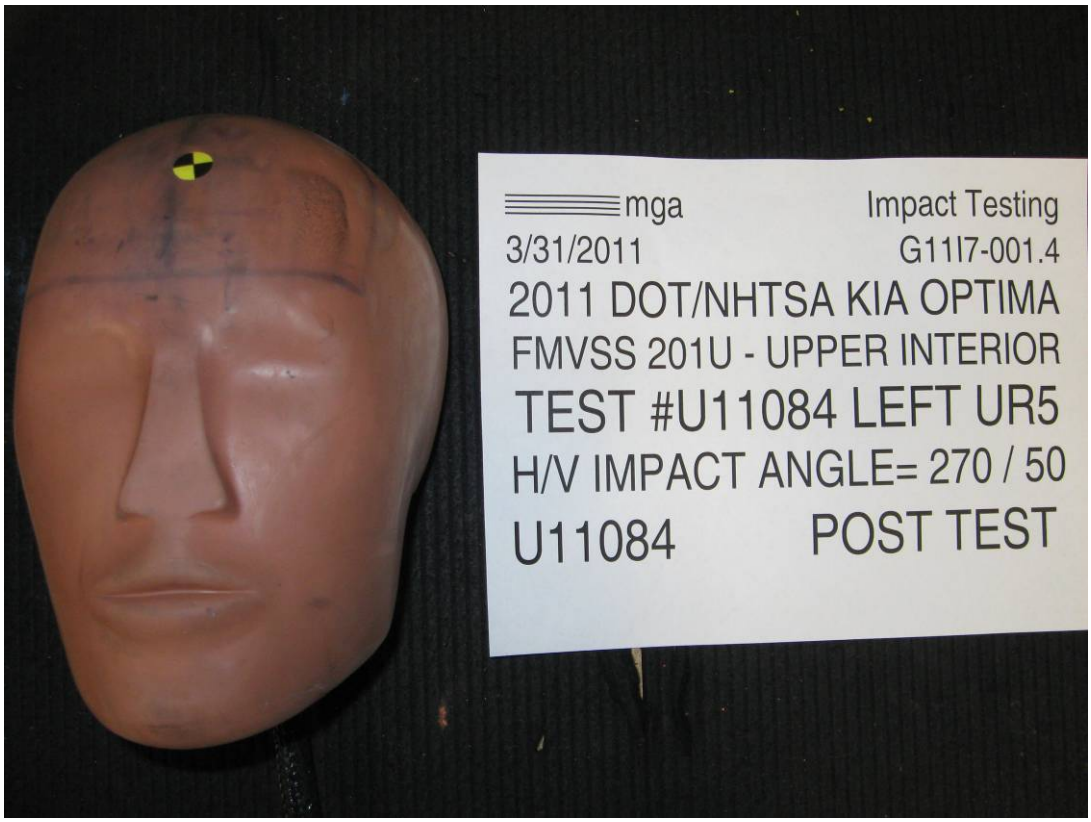

CB0506
U11084
LEFT UR5
mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11084 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11084
PRE TEST


UR5
mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11084 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11084
PRE TEST


mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11084 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11084
POST TEST


UR5
mga
Impact Testing
G11I7-001.4
3/31/2011
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11084 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11084
POST TEST


UR 5
mga
3/31/2011
2011 DOT/N


mga
Impact Testing
3/31/2011
G11I7-001.4
2011 DOT/NHTSA KIA OPTIMA
FMVSS 201U - UPPER INTERIOR
TEST #U11084 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11084
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.4 VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Kia Optima

GENERAL TEST PARAMETERS:

Test Number:#U11084

Target (Vehicle Side): UR5Left

Temperature:20.6C

MGA Test Reference No.:U11084

Humidity:21.8%

Approach Horizontal Angles:270º

Time of Test:10:25:05 AM

Approach Vertical Angles:50º

FMH Serial No:[035]

Additional Description: @SR3-2

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
717	730	7.8	23.6	40	5 Left

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

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

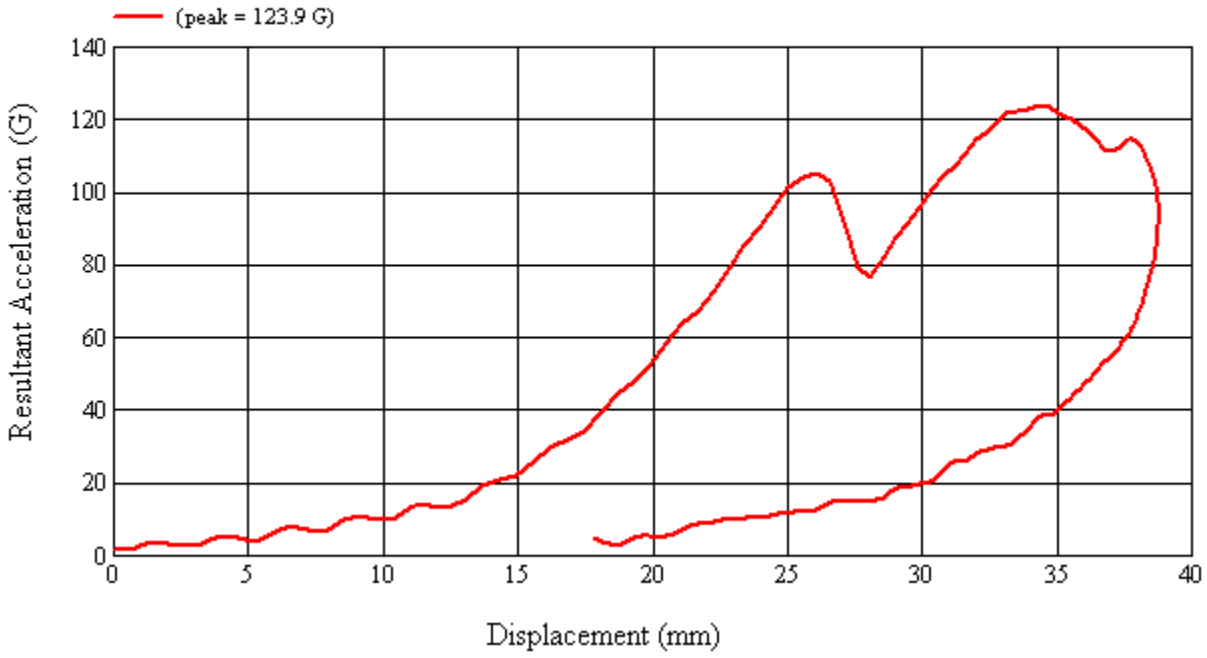
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

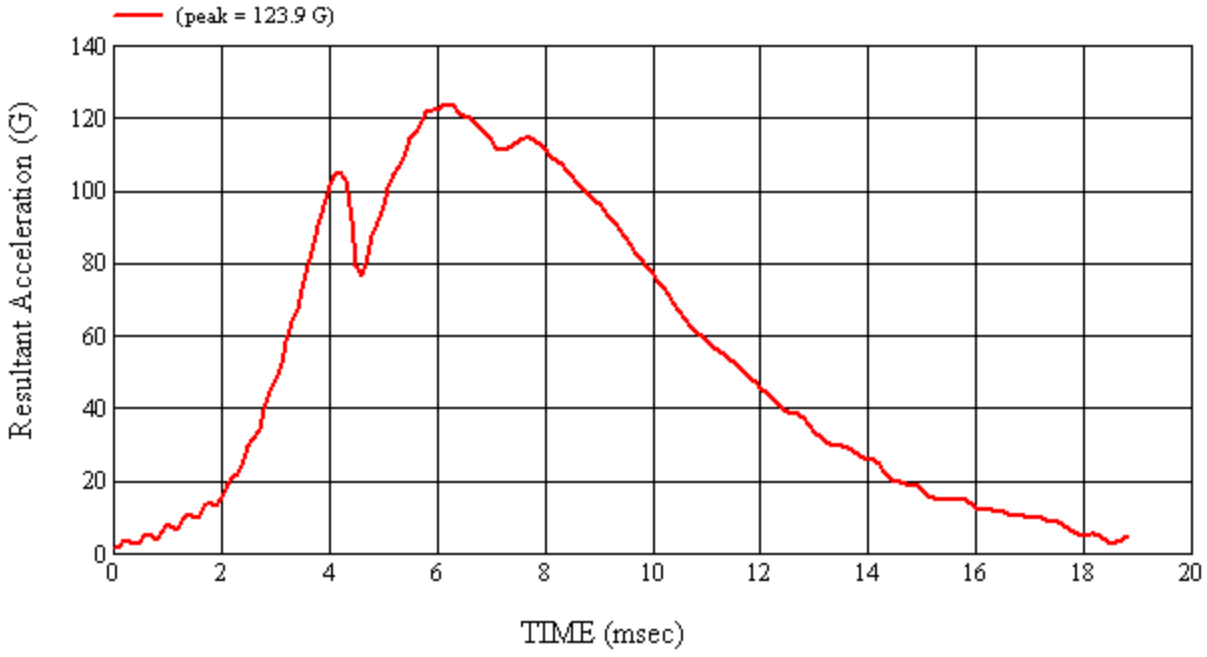
No visible damage

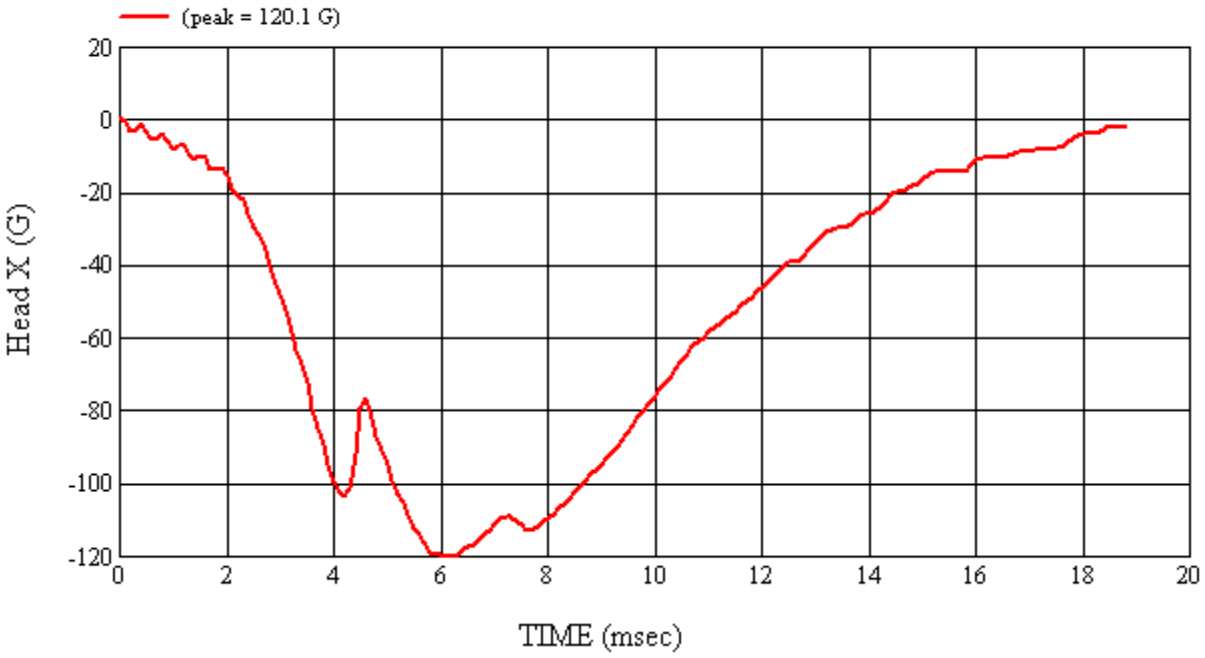
Recorded By: _____ Approved By*: _____ Date: 3/31/2011

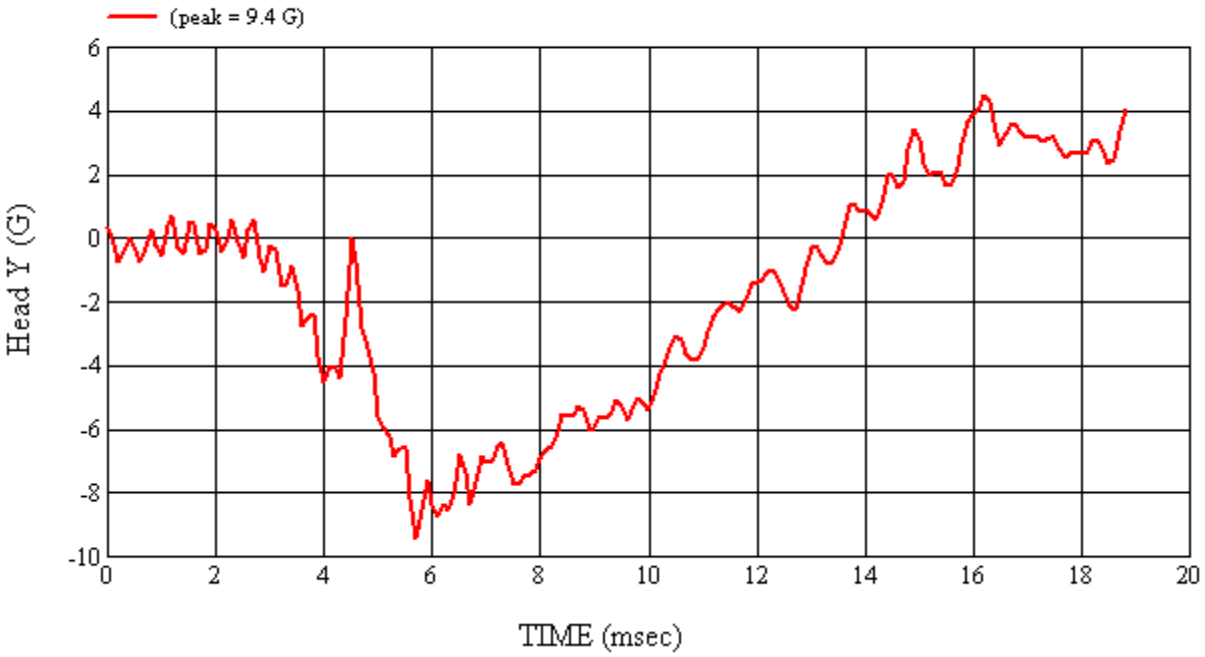
*Only necessary for NHTSA (Government) Compliance testing.

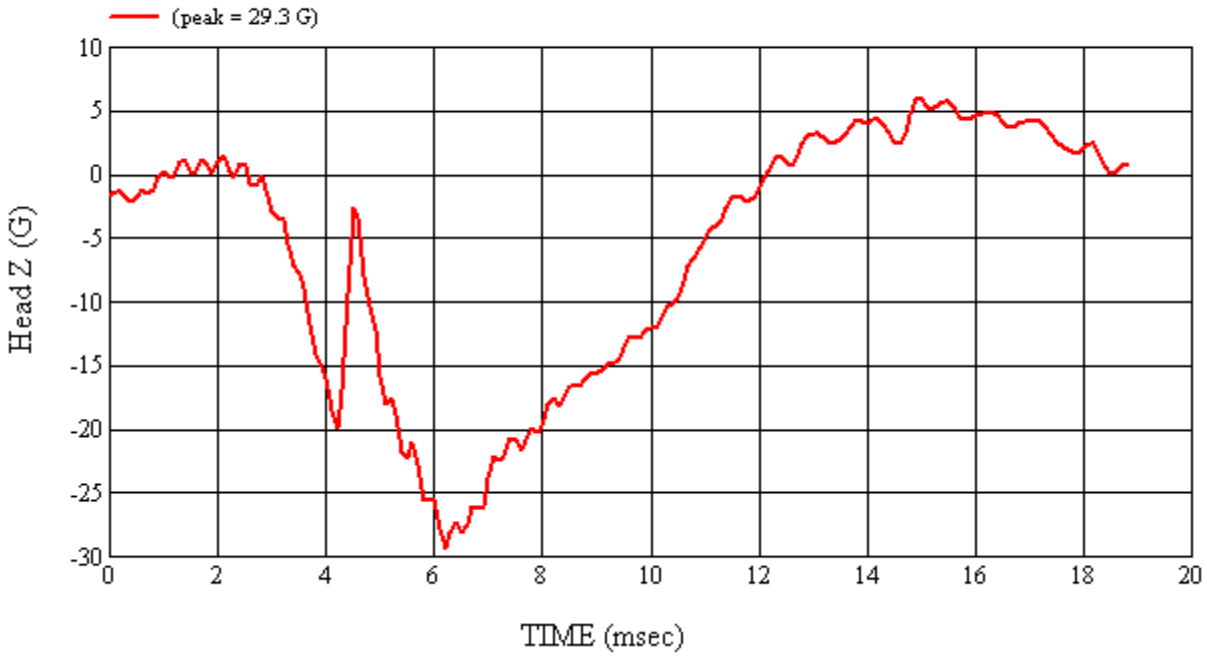
MGA Test #: U11084 Target Location: UR5, Left Side Test Date: 3/31/2011

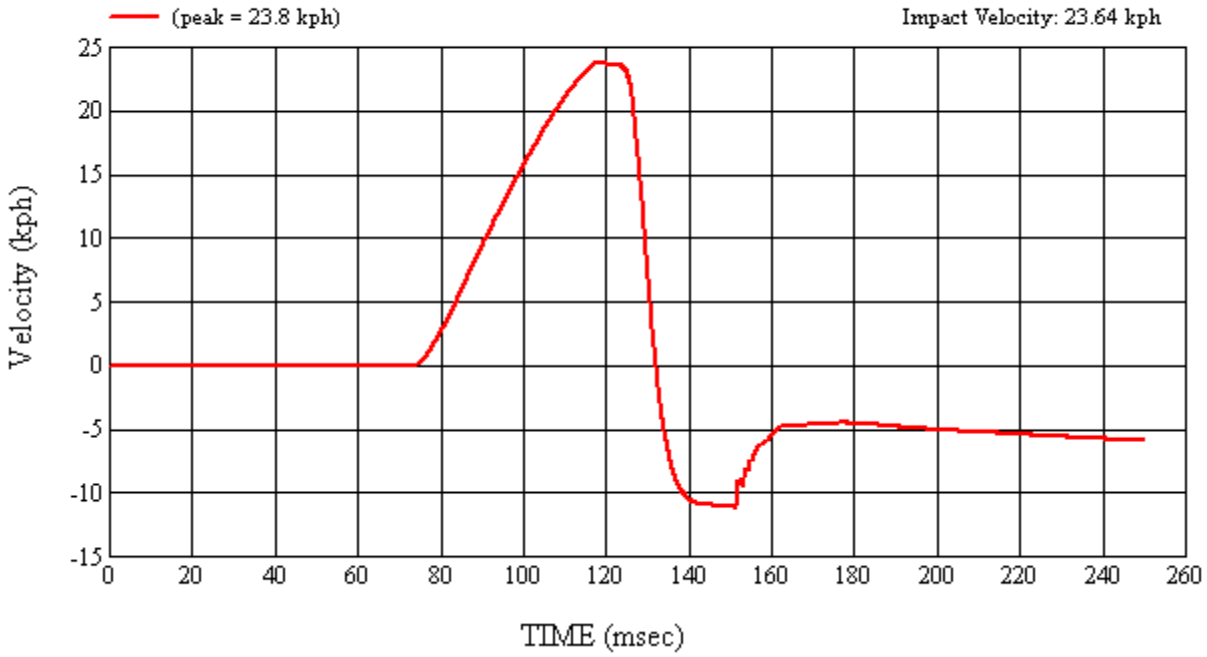


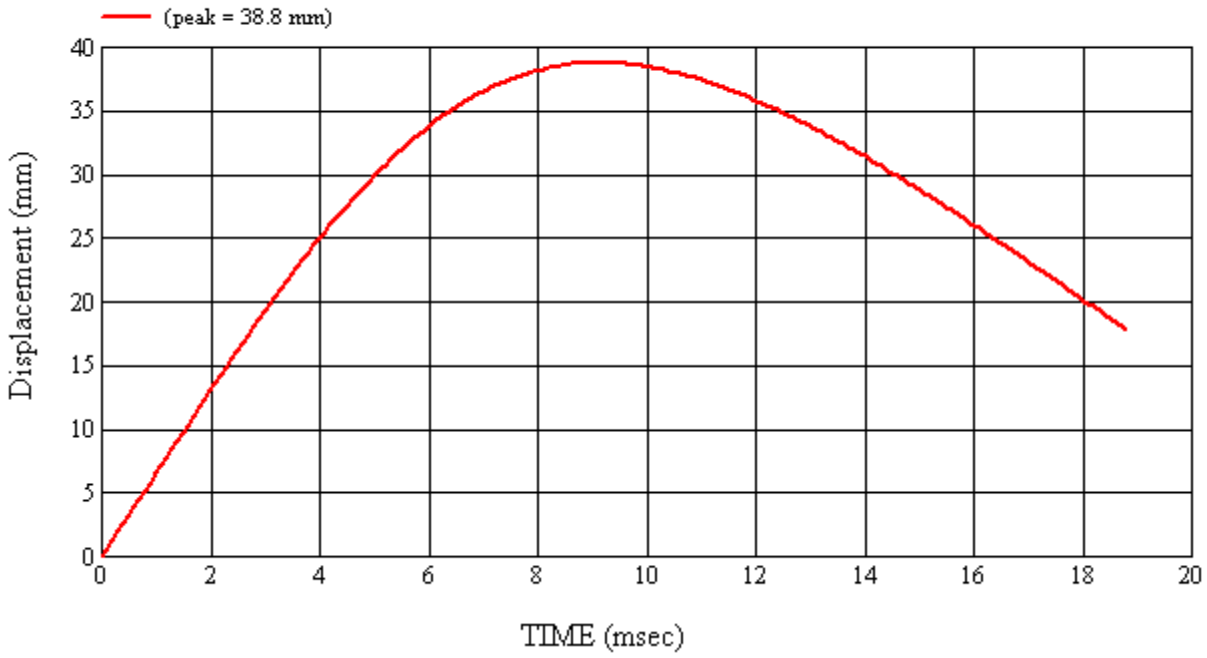



(peak = 120.1 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 9.4 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
-10
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 29.3 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 23.8 kph)
Impact Velocity: 23.64 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 38.8 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

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

TABLE 4-1 LIST OF ITEMS USED

ITEM	MANUFACTURER NAME	MODEL #	FUNCTION OF ITEM	ACCURACY	CAL. INTERNAL
Head Drop Tower (includes test frame and DAS)	MGA Research Corp.	MGA-100-DC	FMH Calibration	N/A	N/A
Accelerometers	Endevco	7264-2000	Acceleration Data	±0.5%	6 months
FMVSS 201U Test Frame (includes the propulsion control system, actuator, test frame, and DAS)	MGA Research Corp.	MGA-100-FMH	Test System	N/A	N/A
Free Motion Headforms	UTAMA UTAMA UTAMA	035 037 038	Test Device	N/A	Pre and Post-Test Series
High Speed Video	Vision Research	Miro Ex4	Record Event	N/A	N/A
*FARO™	Faro Technologies	S08059801273	Targeting	0.1 mm	Annual
Measuring Devices: - Tape Measure - Plumb Bobs - Digital Protractor	 Stanley N/A Mitutoyo	 TPM112 -- MGA00712	 Measurement Targeting FMH setup Horizontal Measurement	 1 mm N/A 0.5°	Annual
*Temperature Recorder	Dickson	MGA00152	Record Temperature and Humidity	± 1°C ± 1% RH	Annual
* Scale	Detecto	MGA00783	Weigh FMH Head	± 0.01 lb	Annual
*Vehicle Scale	Intercomp	26032389	Weighing Vehicle	± .5 kg	Annual

Each headform was calibrated by an engineer after the headform had soaked in an environment of 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	3/30/2011	9.90	22.0	17.3	245.9	4.0	Yes
Post	#035	4/4/2011	9.90	20.4	33.2	255.0	4.0	Yes
Pre	#037	3/30/2011	9.96	22.1	17.2	257.7	4.3	Yes
Post	#037	4/4/2011	9.96	20.2	33.4	269.8	4.2	Yes
Pre	#038	3/30/2011	9.90	22.2	17.0	259.9	12.5	Yes
Post	#038	4/4/2011	9.90	20.5	33.6	263.7	9.4	Yes

4-1 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

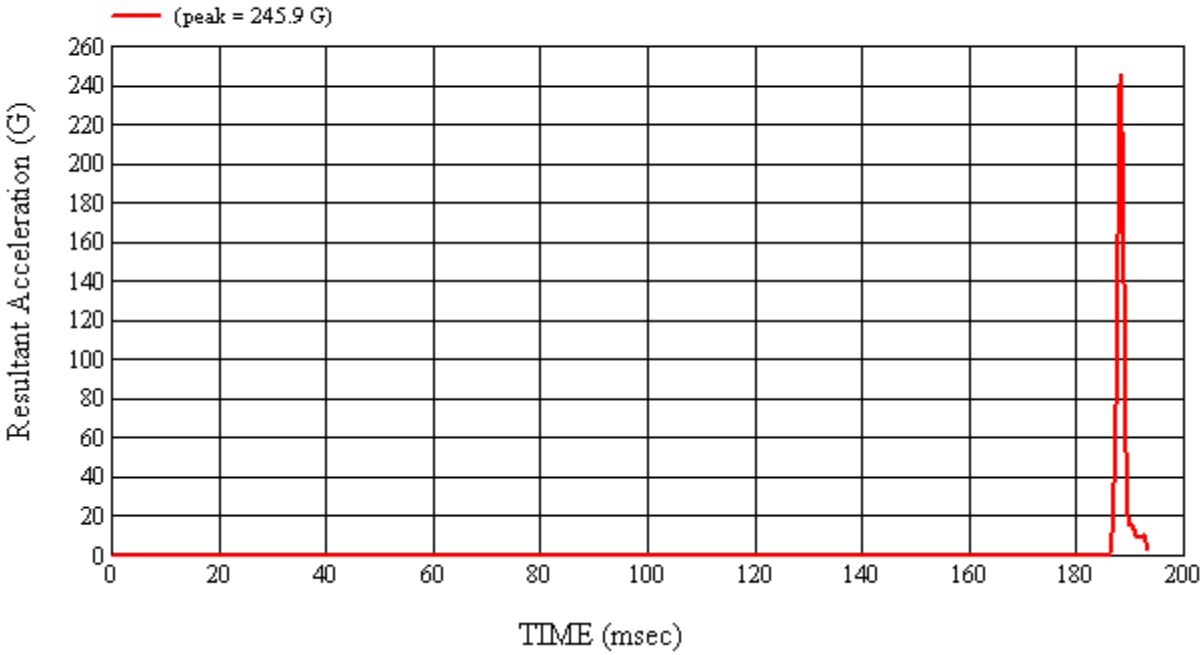
HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 3/30/2011 CALIBRATION TIME: 10:43:49 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.0
Relative Humidity	10% to 70%	17.3
Peak Resultant Acceleration	225 G's to 275 G's	245.9
Peak Lateral Acceleration	15 G's Maximum	4.0
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35919	02/04/11	08/04/11
2	ENDEVCO	7264-2000	J22664	02/04/11	08/04/11
3	ENDEVCO	7264-2000	J35924	02/04/11	08/04/11

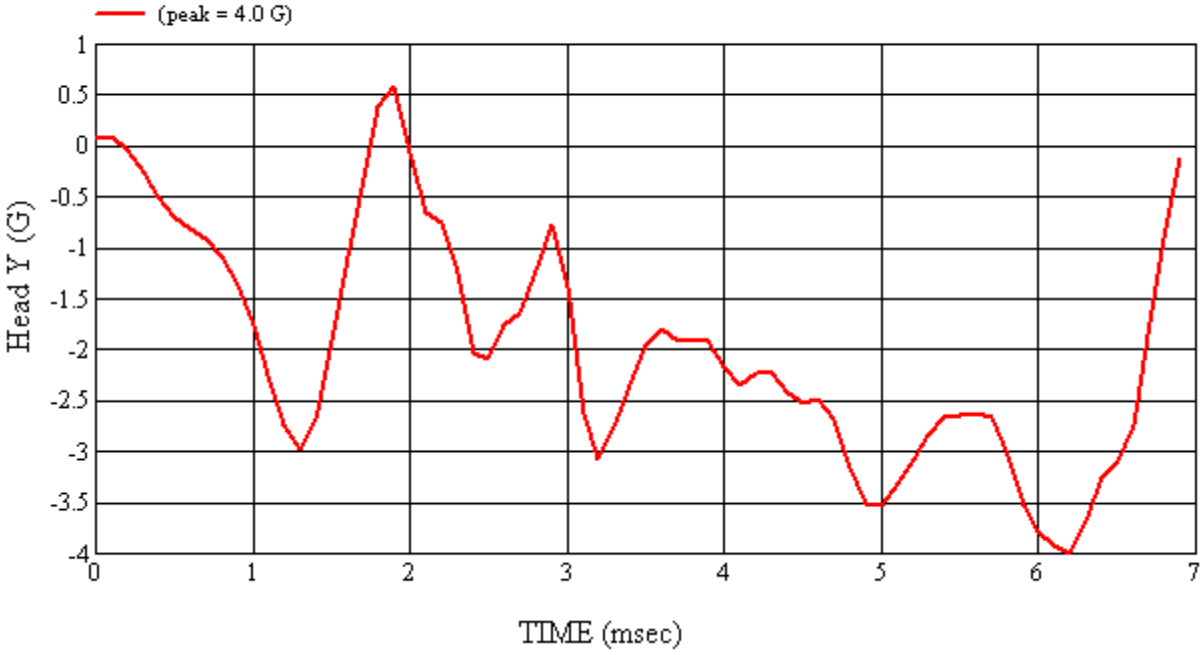
REMARKS:

RECORDED BY:  DATE: 3/30/2011

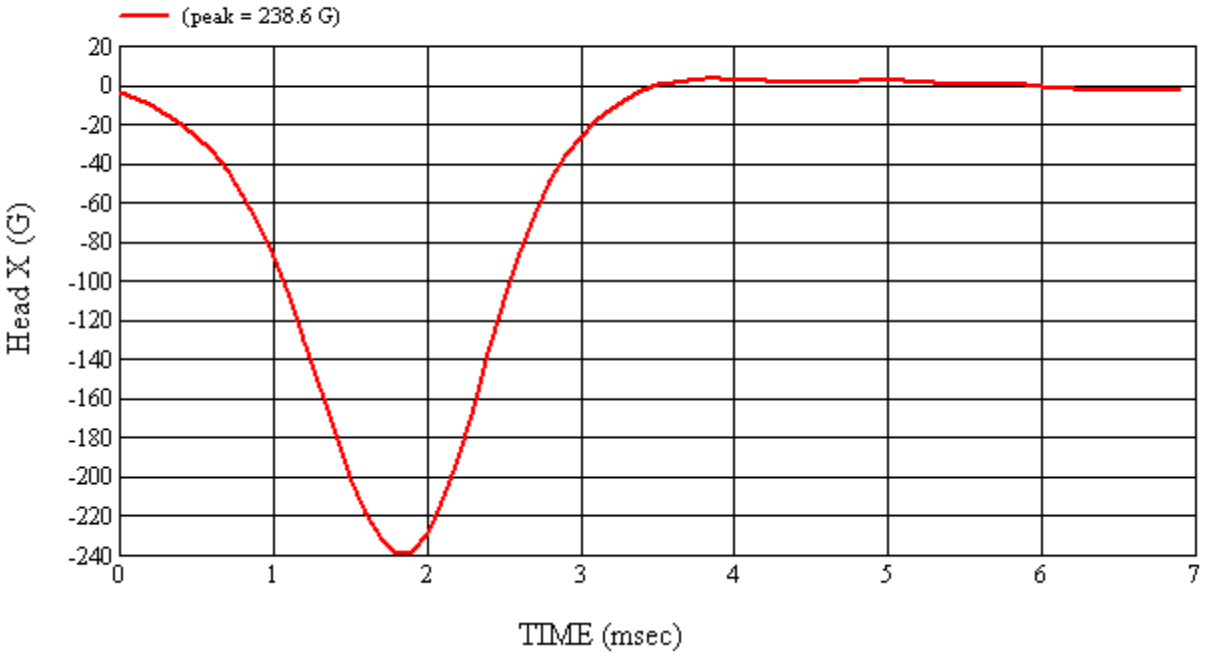
APPROVED BY: 



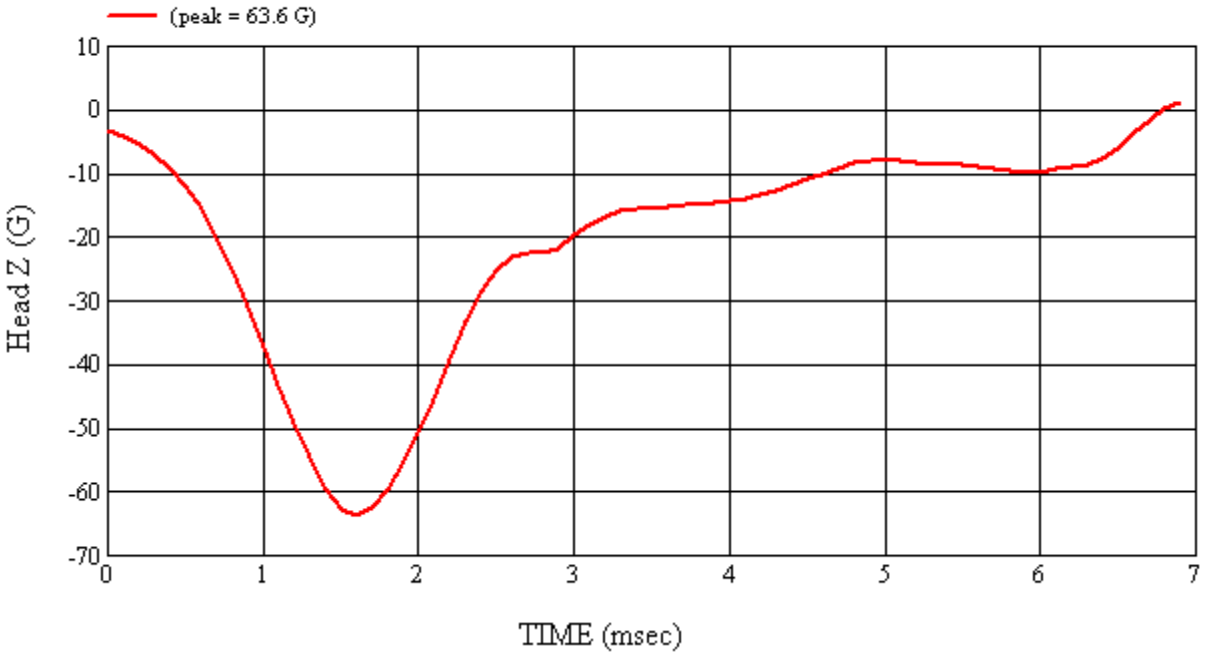
Head 035 (Pre) Calibration #H35007



Head 035 (Pre) Calibration #H35007



Head 035 (Pre) Calibration #H35007



Head 035 (Pre) Calibration #H35007

4-2 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

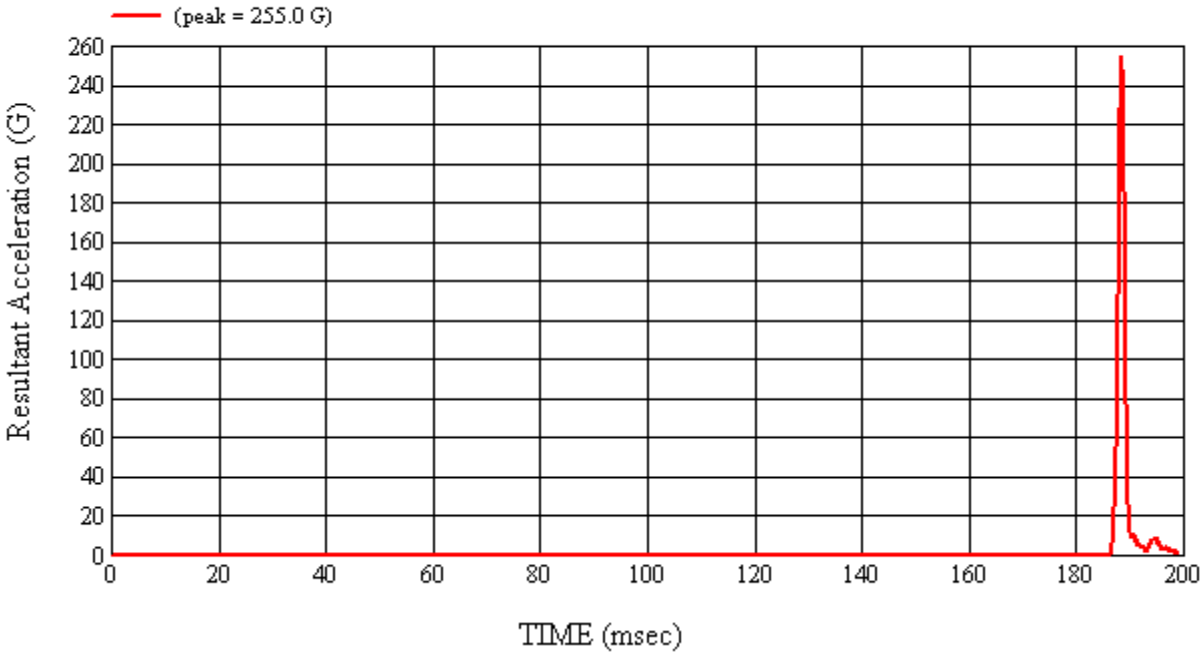
HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 4/4/2011 CALIBRATION TIME: 8:37:23 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	20.4
Relative Humidity	10% to 70%	33.2
Peak Resultant Acceleration	225 G's to 275 G's	255.0
Peak Lateral Acceleration	15 G's Maximum	4.0
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J35919	02/04/11	08/04/11
2	ENDEVCO	7264-2000	J22664	02/04/11	08/04/11
3	ENDEVCO	7264-2000	J35924	02/04/11	08/04/11

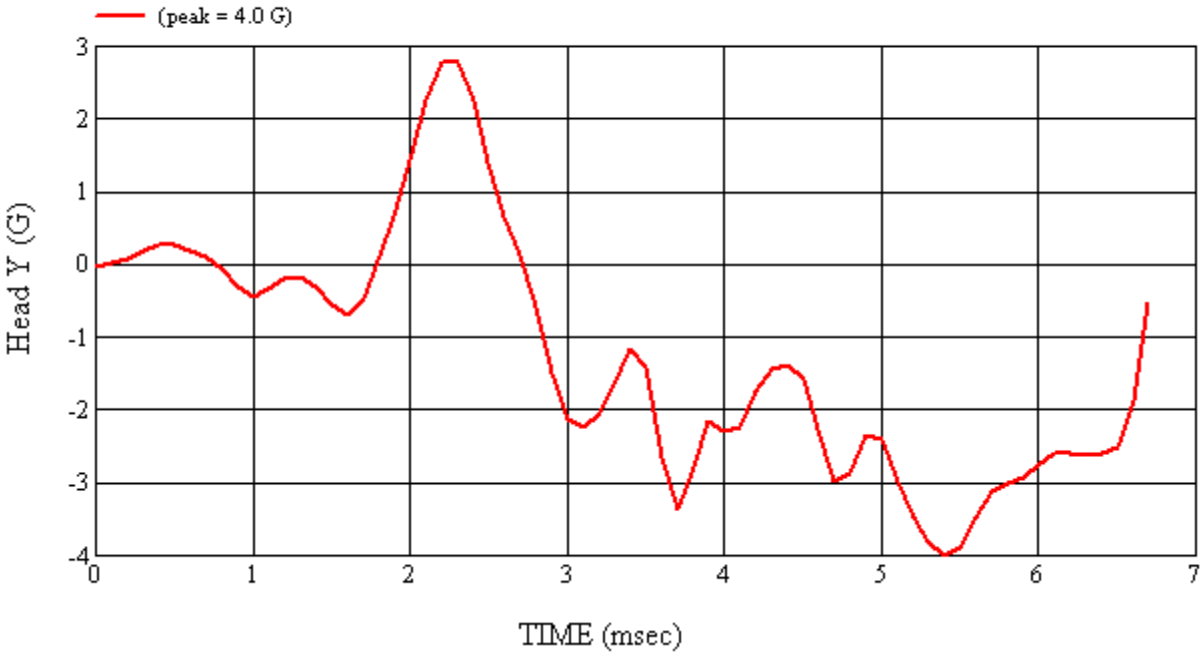
REMARKS:

RECORDED BY: _____ DATE: __4/4/2011____

APPROVED BY: _____



Head 035 (Post) Calibration #H35008



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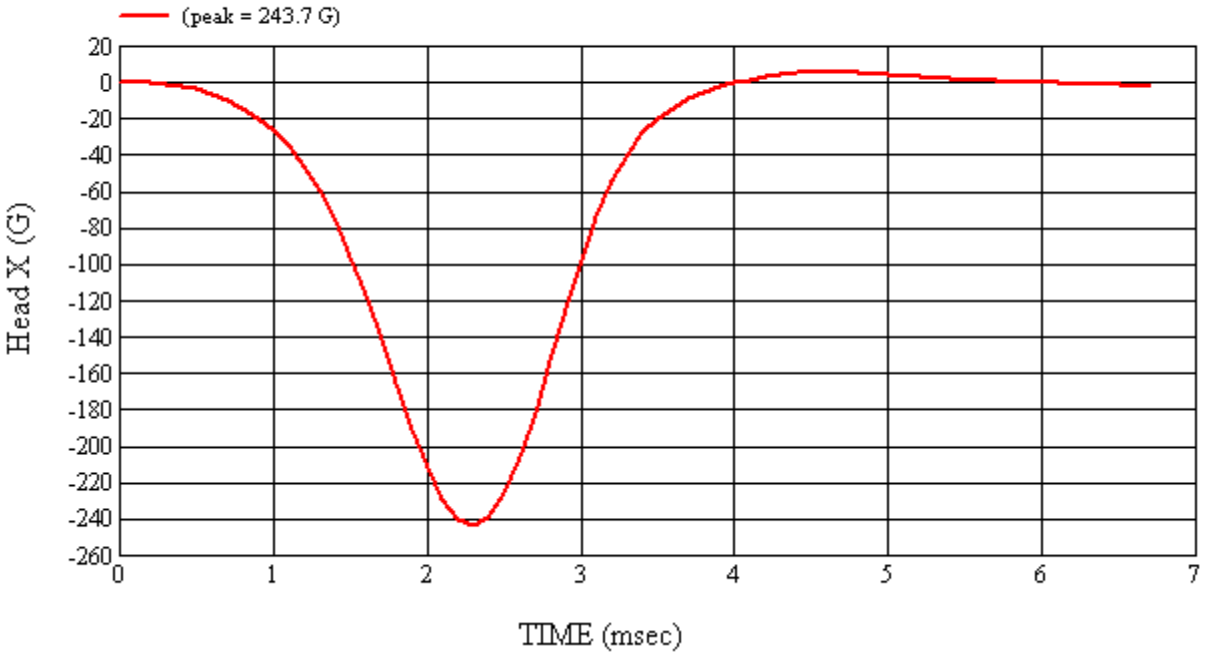
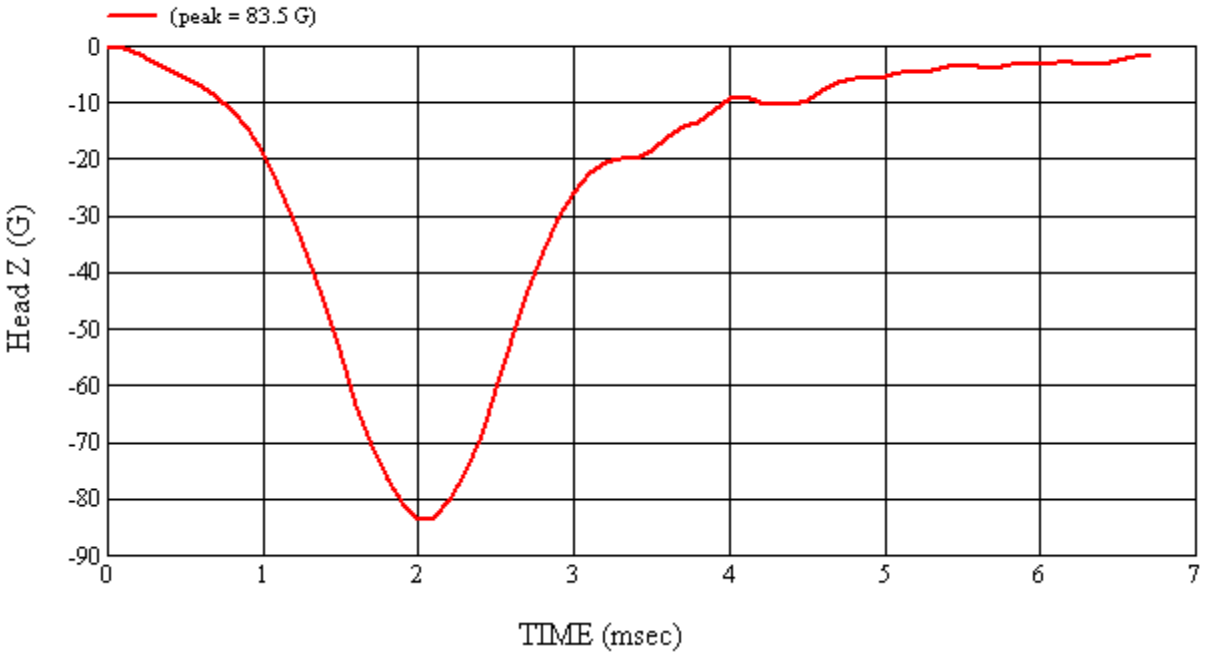


Head 035 (Post) Calibration #H35008



Head 035 (Post) Calibration #H35008

4-3 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

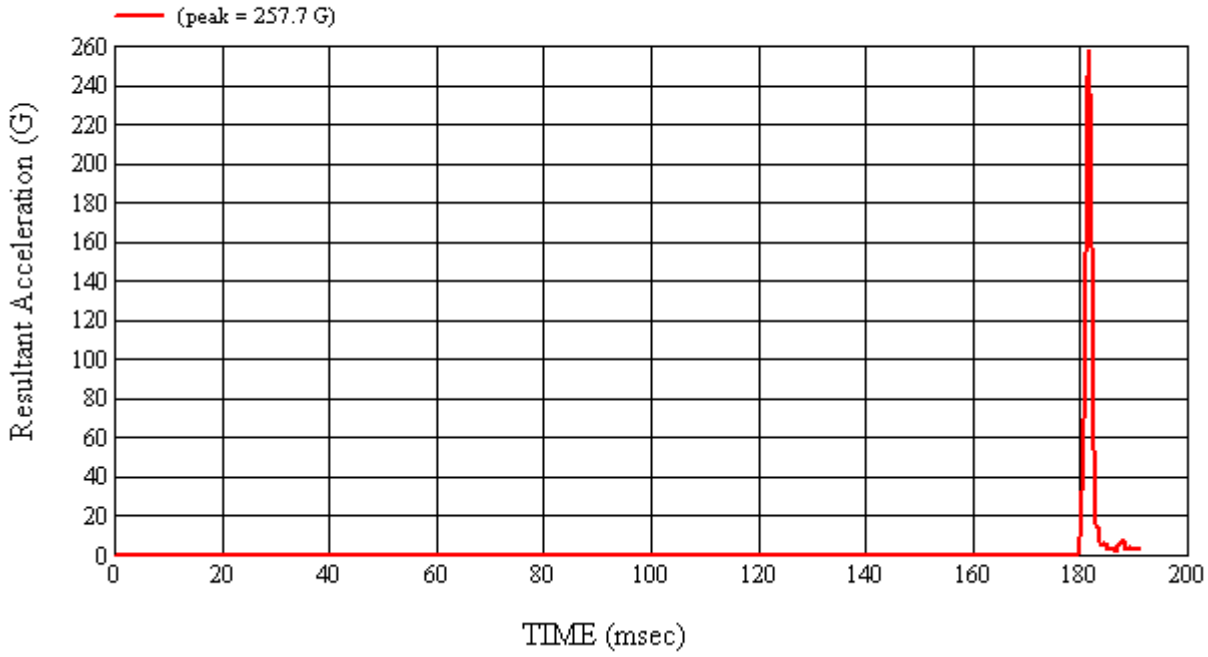
HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 3/30/2011 CALIBRATION TIME: 10:56:45 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22.1
Relative Humidity	10% to 70%	17.2
Peak Resultant Acceleration	225 G's to 275 G's	257.7
Peak Lateral Acceleration	15 G's Maximum	4.3
Unimodal Acceleration Curve	YES	YES

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

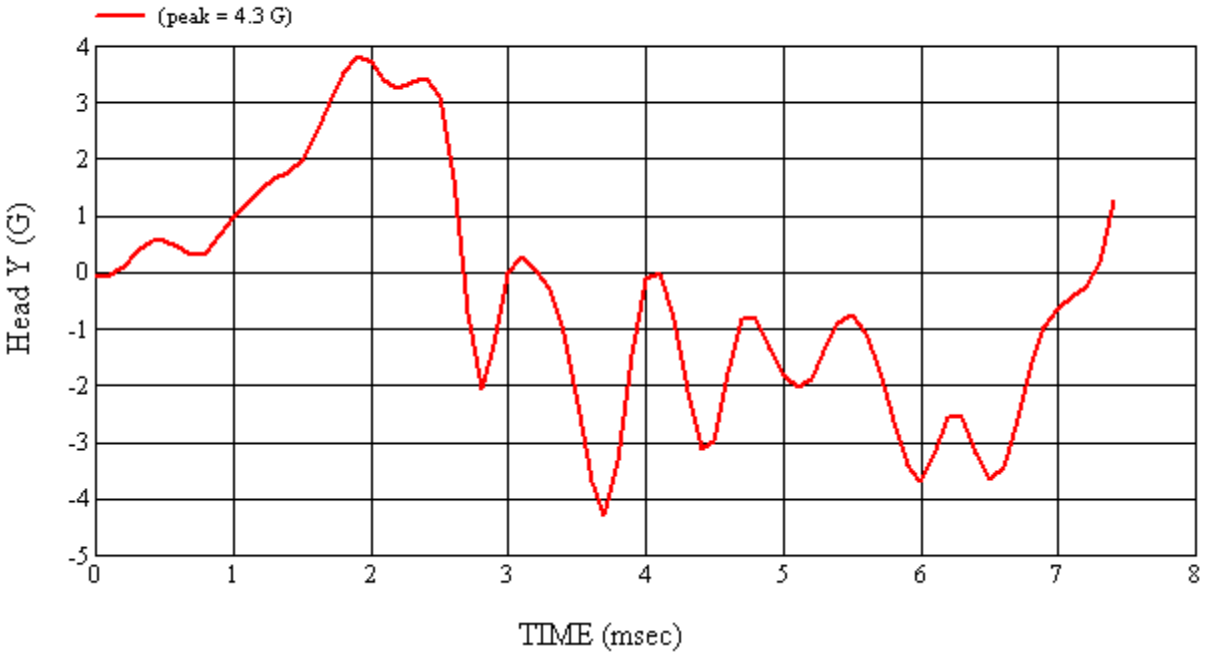
REMARKS:

RECORDED BY: _____ DATE: __3/30/2011____

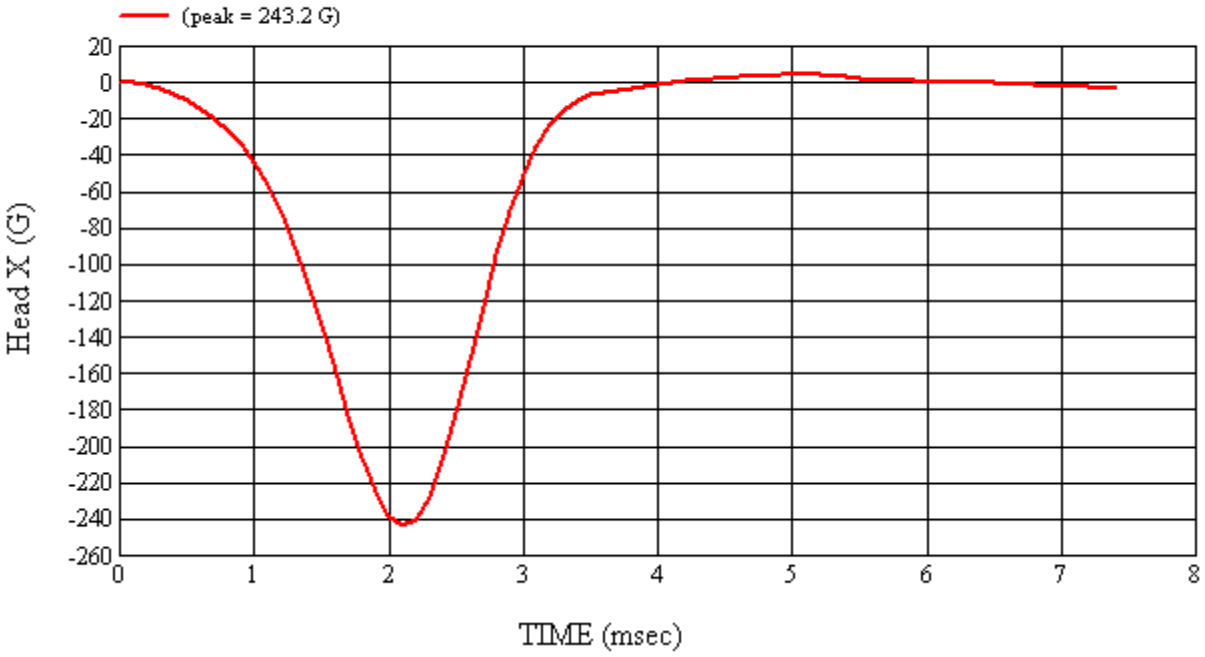
APPROVED BY: _____



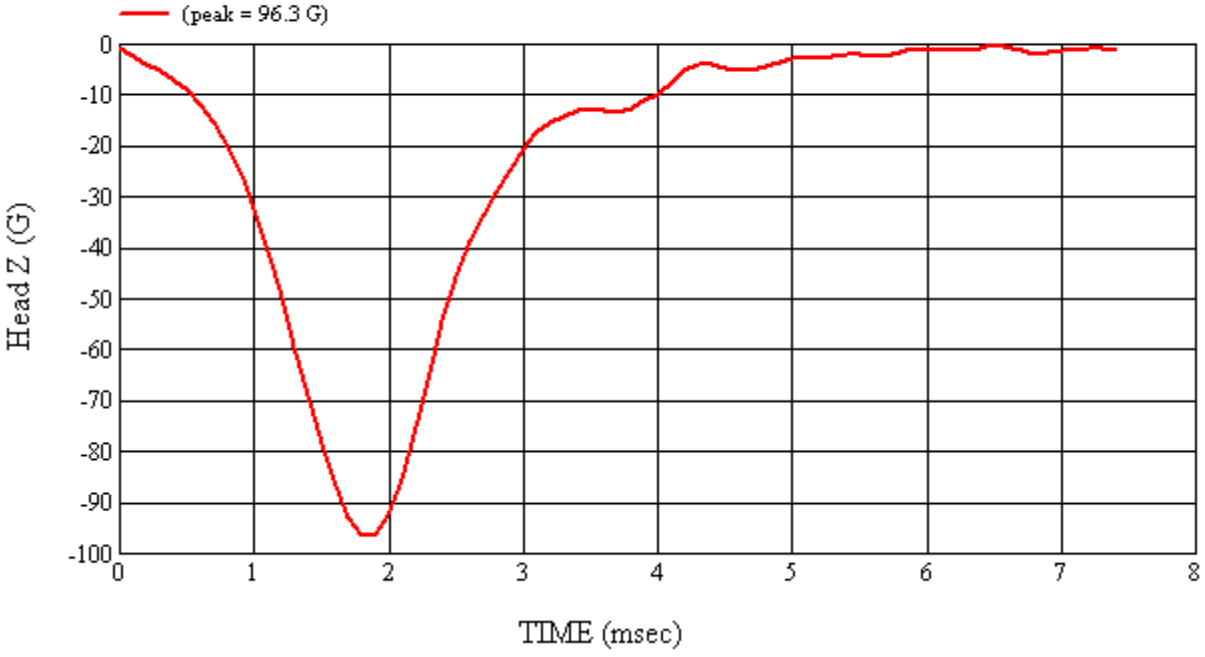
Head 037 (Pre) Calibration #H37007



Head 037 (Pre) Calibration #H37007



Head 037 (Pre) Calibration #H37007



Head 037 (Pre) Calibration #H37007

4-4 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

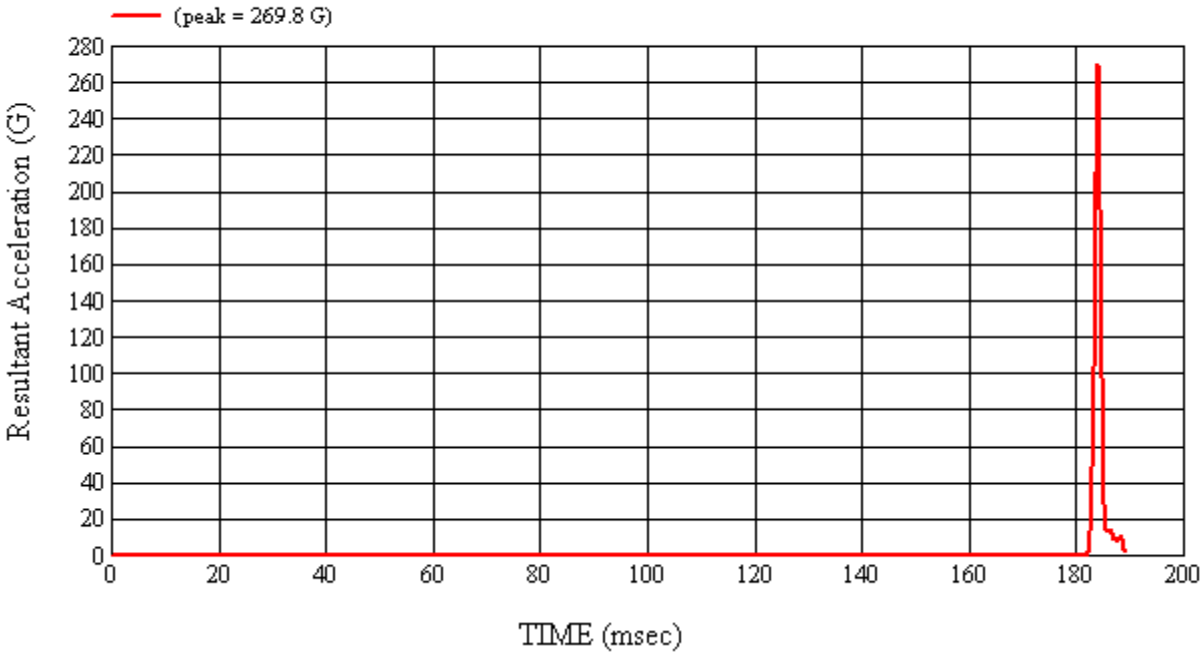
HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 4/4/2011 CALIBRATION TIME: 9:02:45 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	20.2
Relative Humidity	10% to 70%	33.4
Peak Resultant Acceleration	225 G's to 275 G's	269.8
Peak Lateral Acceleration	15 G's Maximum	4.2
Unimodal Acceleration Curve	YES	YES

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

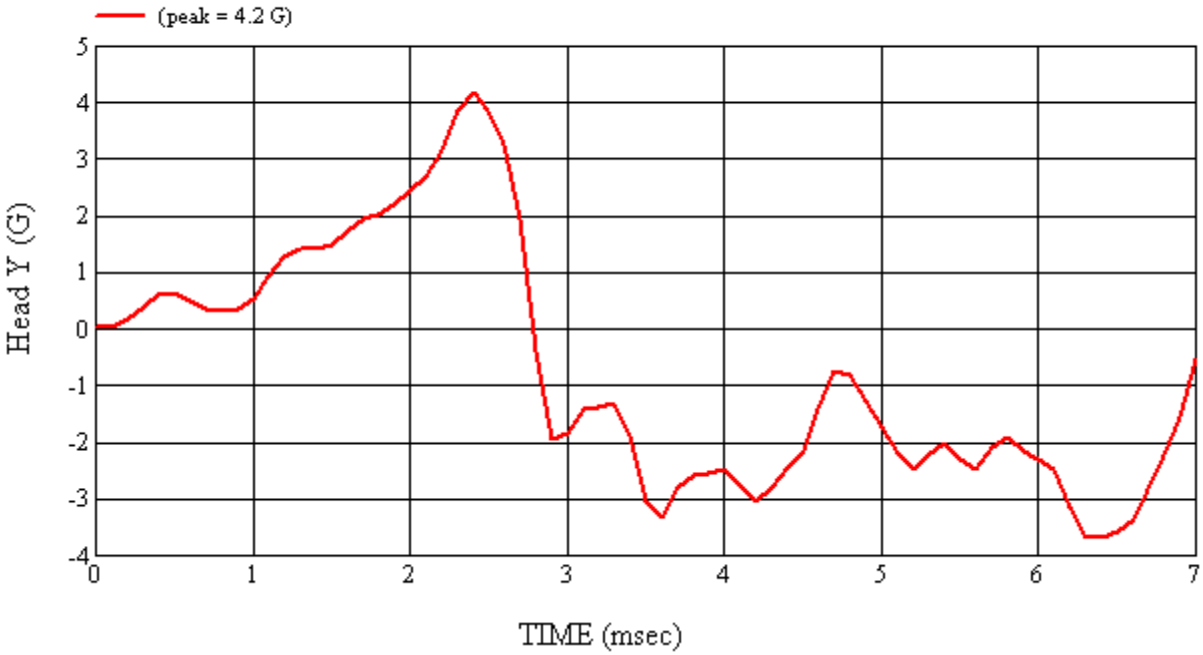
REMARKS:

RECORDED BY:  DATE: 4/4/2011

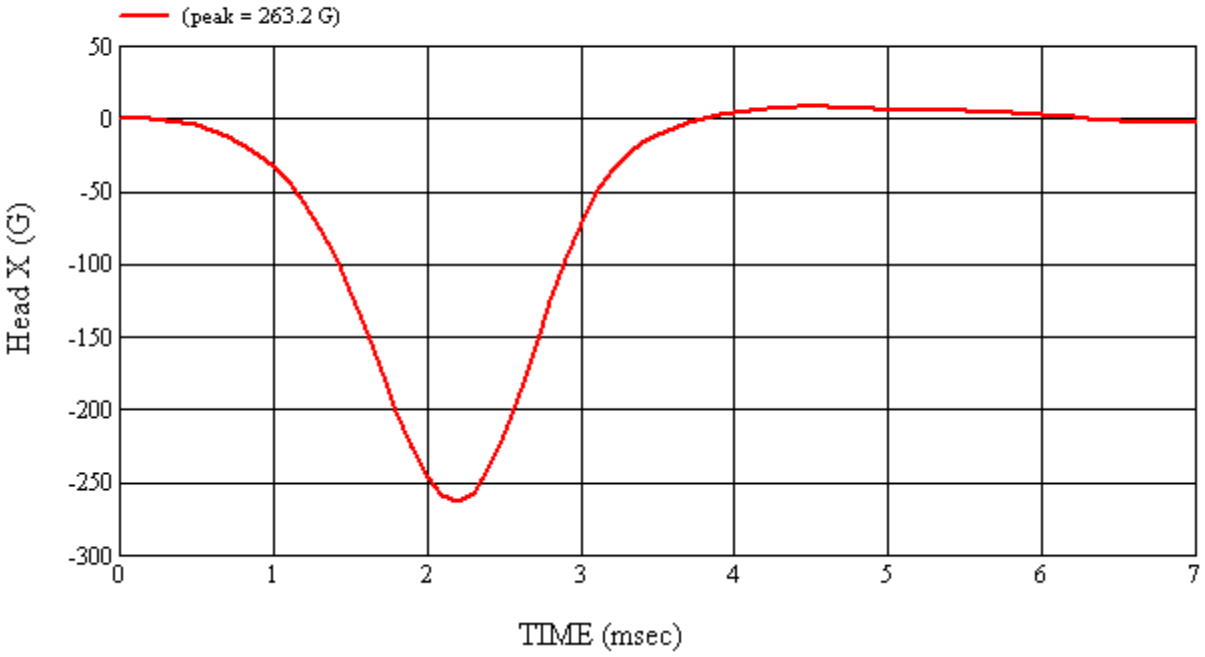
APPROVED BY: 



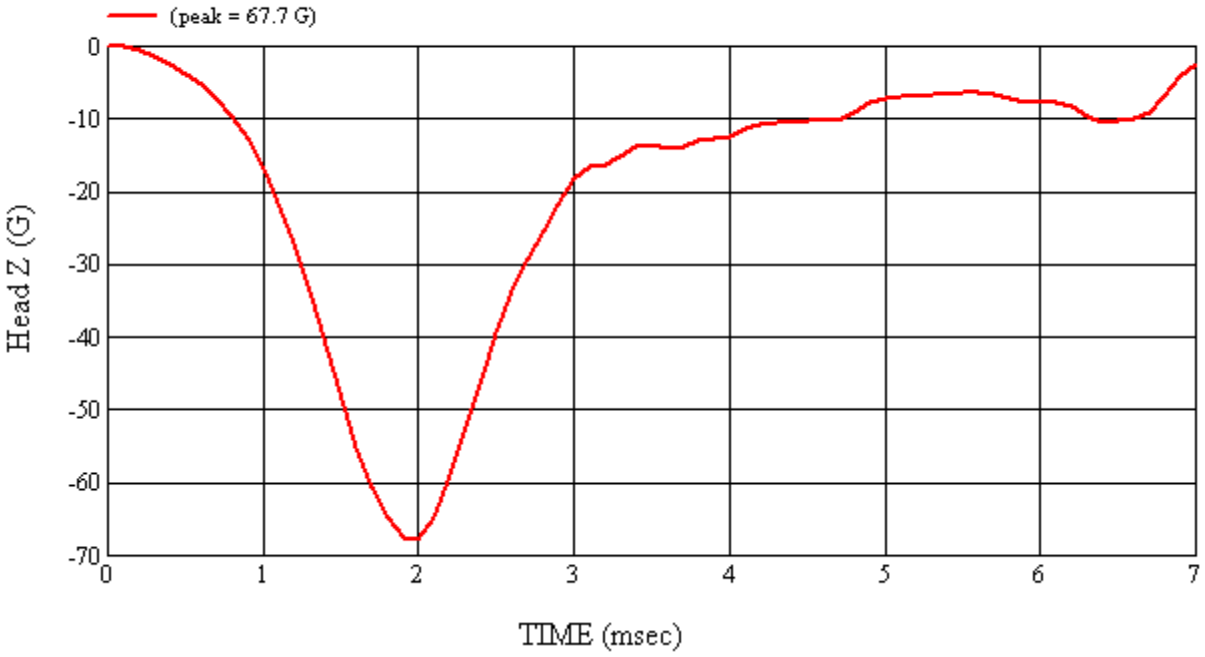
Head 037 (Post) Calibration #H37008



Head 037 (Post) Calibration #H37008



Head 037 (Post) Calibration #H37008



Head 037 (Post) Calibration #H37008

4-5 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

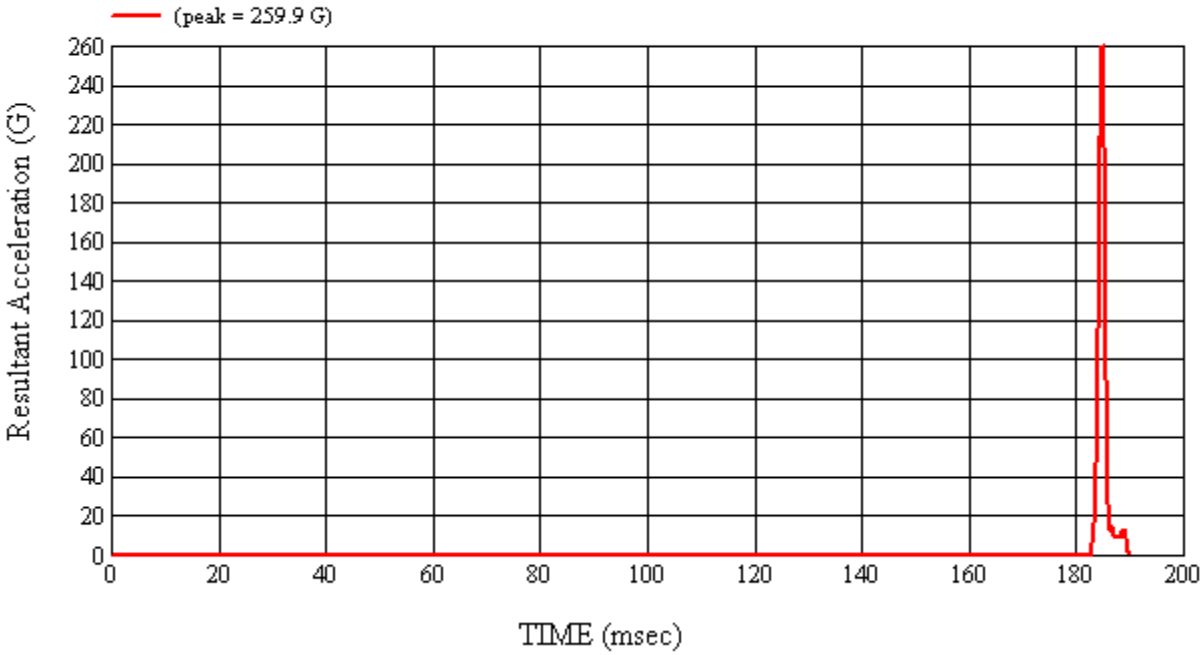
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 3/30/2011 CALIBRATION TIME: 11:36:40 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.2
Relative Humidity	10% to 70%	17.0
Peak Resultant Acceleration	225 G's to 275 G's	259.9
Peak Lateral Acceleration	15 G's Maximum	12.5
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	02/07/11	08/07/11
2	ENDEVCO	7264-2000	J36197	02/07/11	08/07/11
3	ENDEVCO	7264-2000	J36353	02/07/11	08/07/11

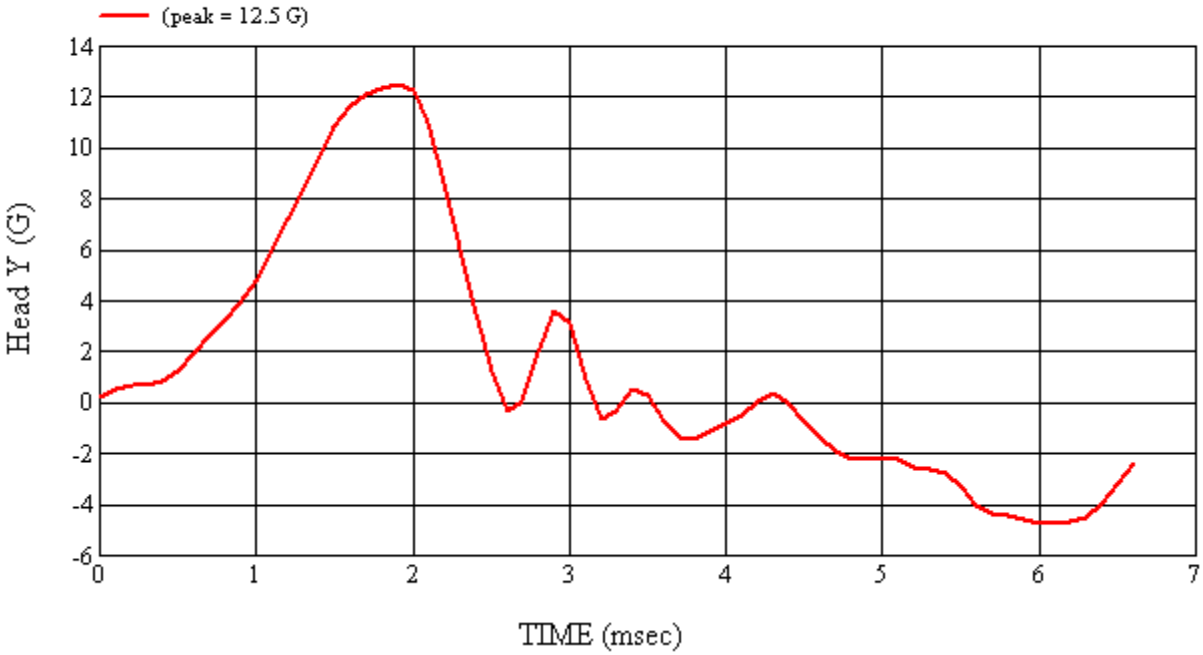
REMARKS:

RECORDED BY: _____ DATE: __3/30/2011____

APPROVED BY: _____



Head 038 (Pre) Calibration #H38007



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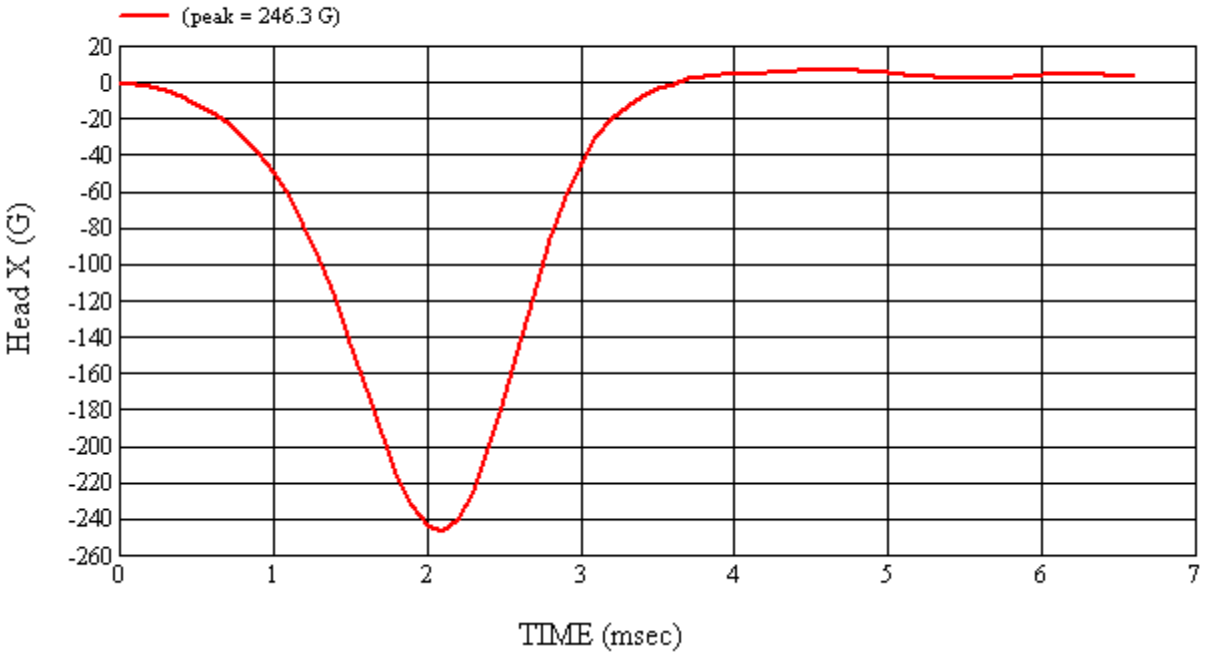
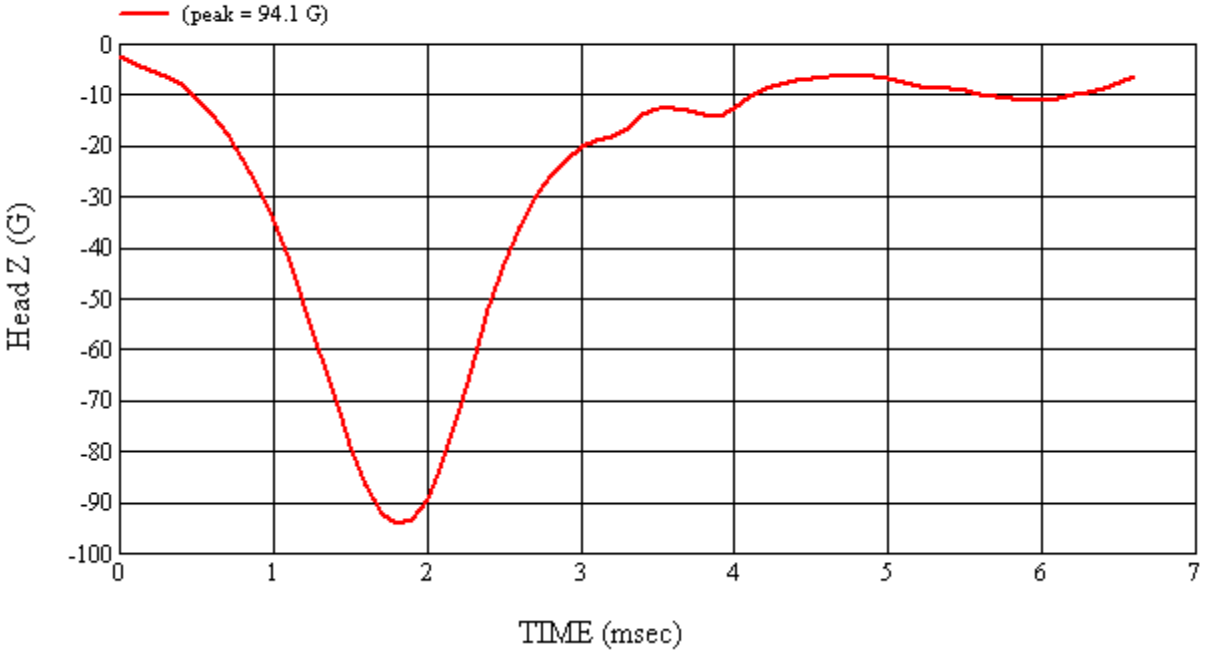


Head 038 (Pre) Calibration #H38007



Head 038 (Pre) Calibration #H38007

4-6 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

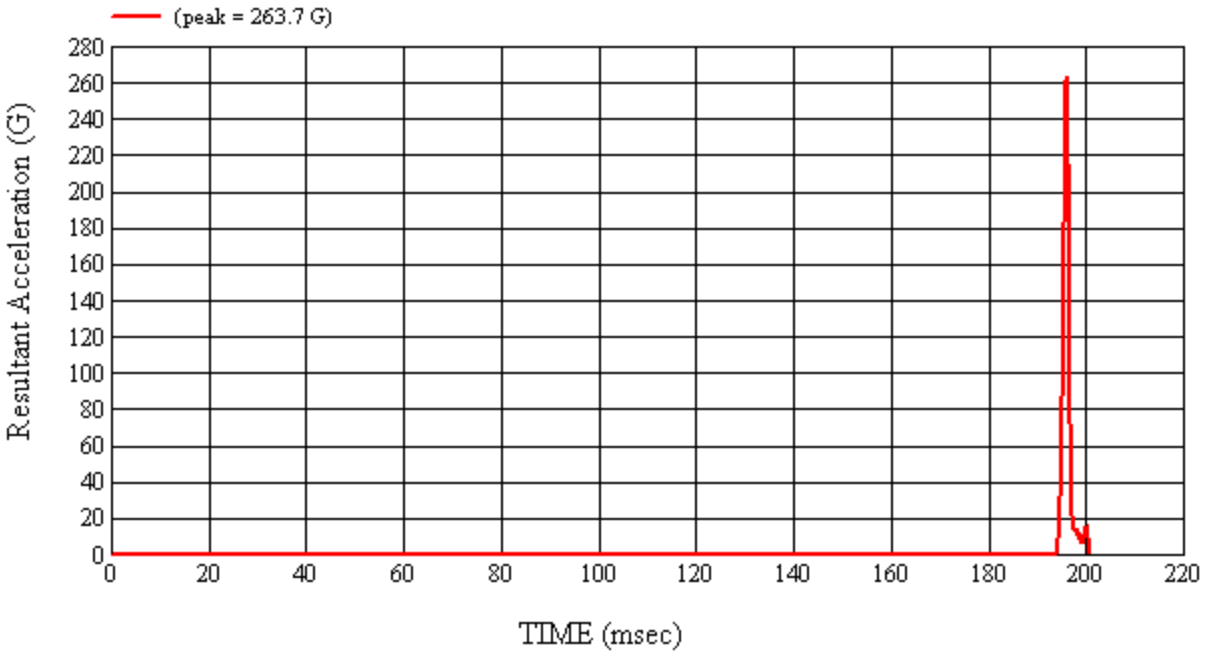
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 4/4/2011 CALIBRATION TIME: 9:17:55 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	20.5
Relative Humidity	10% to 70%	33.6
Peak Resultant Acceleration	225 G's to 275 G's	263.7
Peak Lateral Acceleration	15 G's Maximum	9.4
Unimodal Acceleration Curve	YES	YES

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

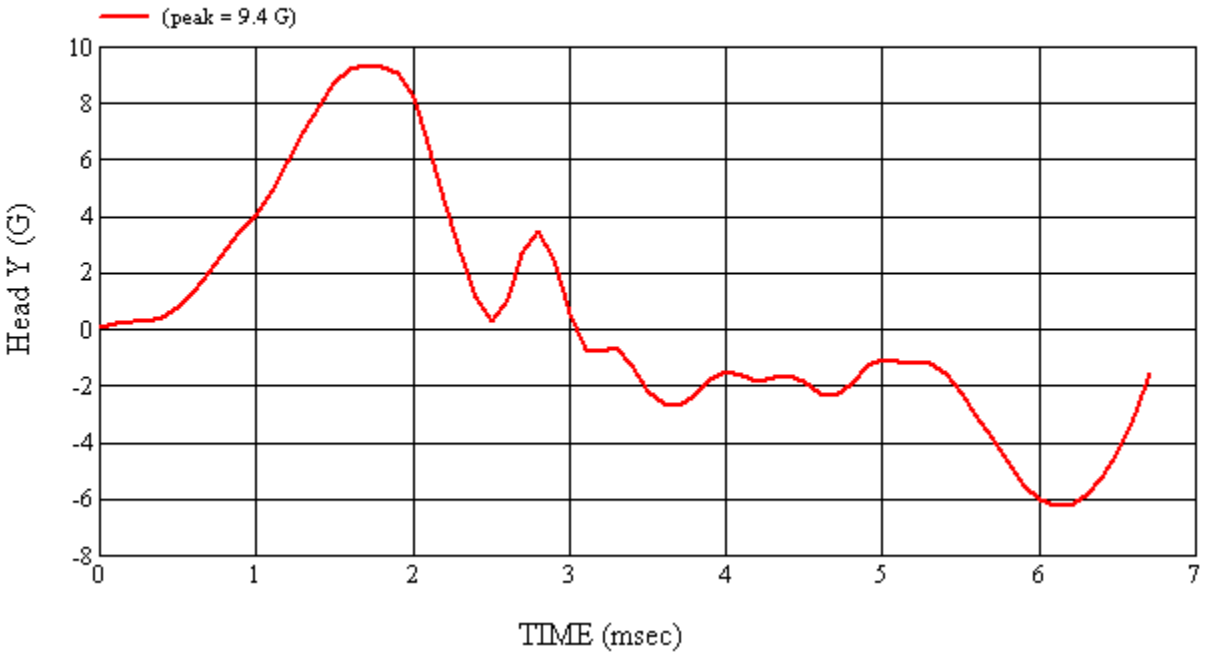
REMARKS:

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

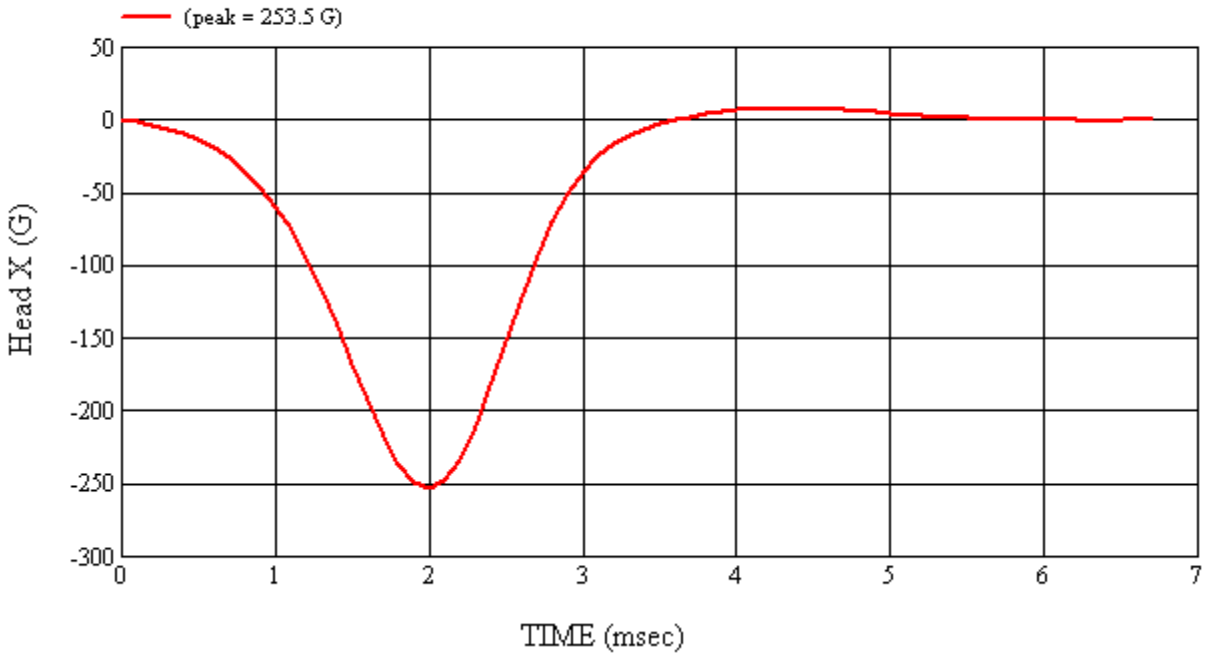
APPROVED BY: Nathaniel Hamlin



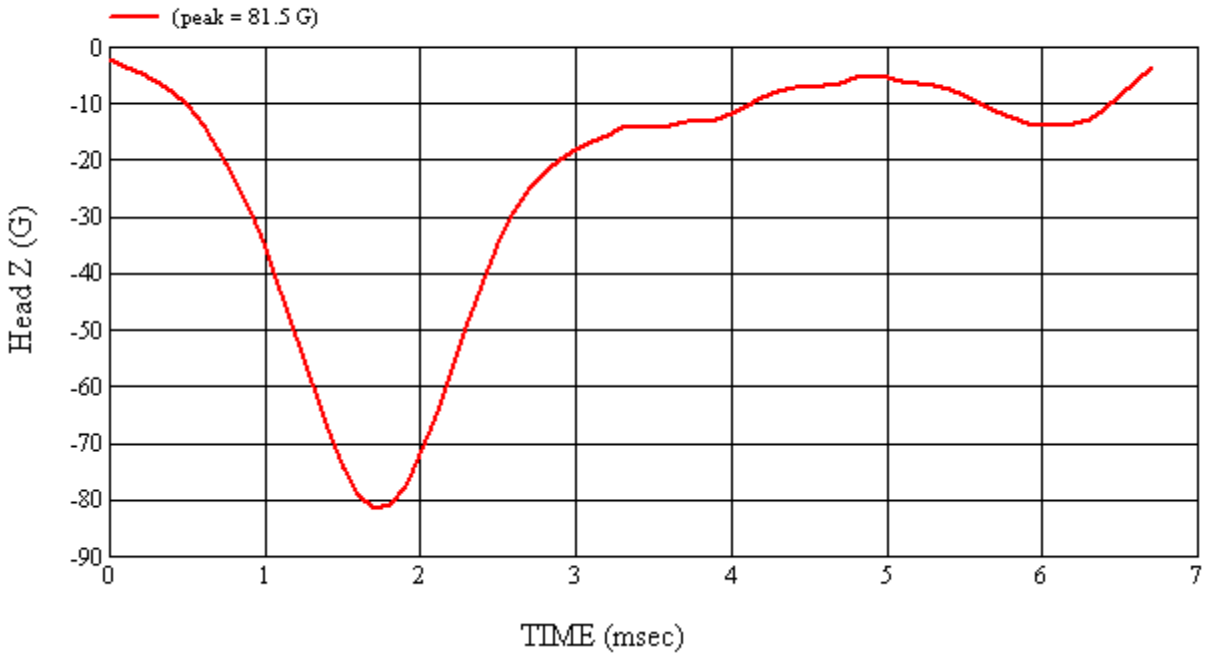
Head 038 (Post) Calibration #H38008



Head 038 (Post) Calibration #H38008



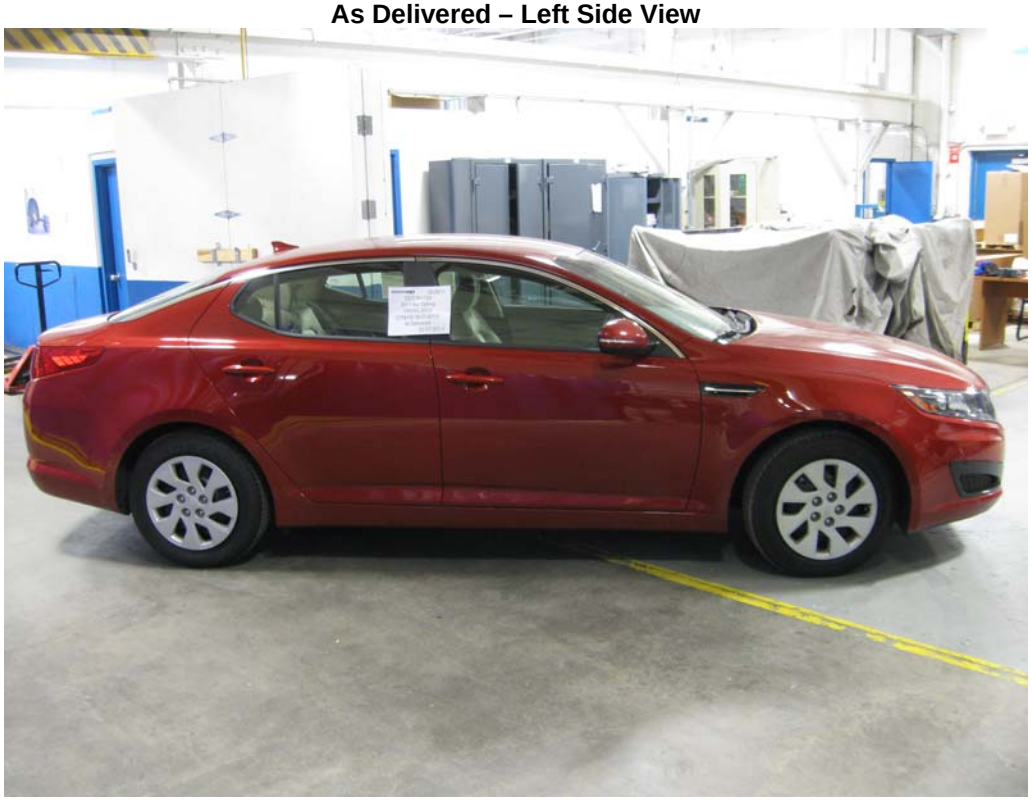
Head 038 (Post) Calibration #H38008



Head 038 (Post) Calibration #H38008

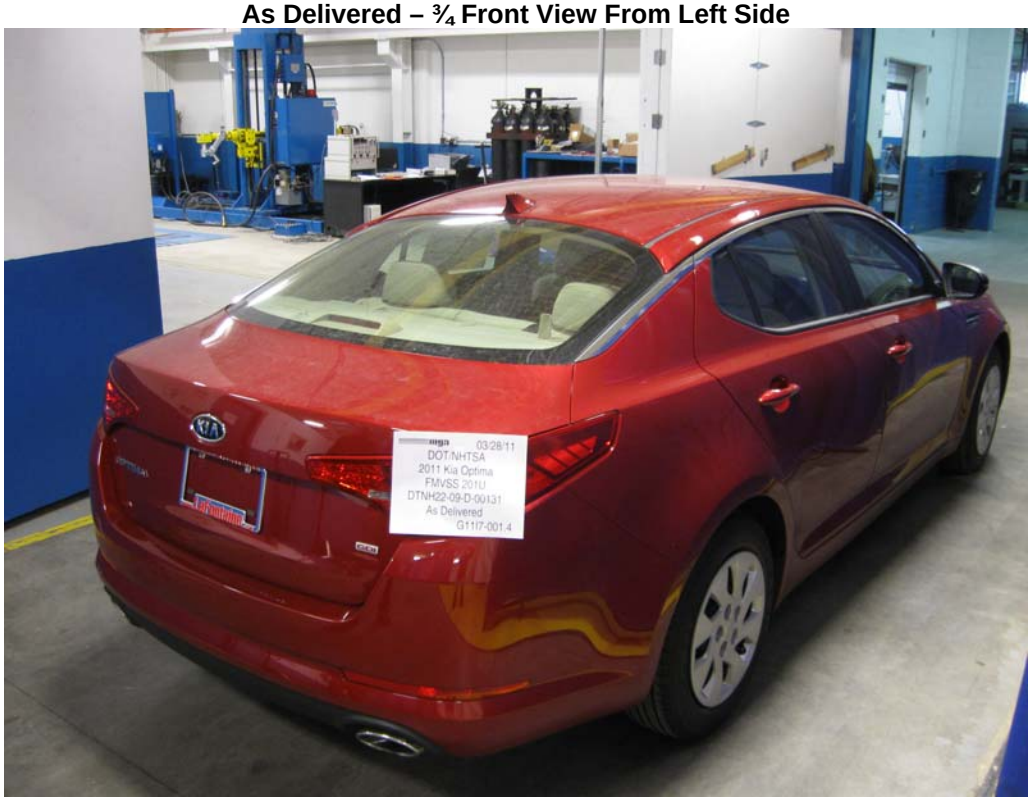
5.0 PHOTOGRAPHS

As Delivered – Left Side View



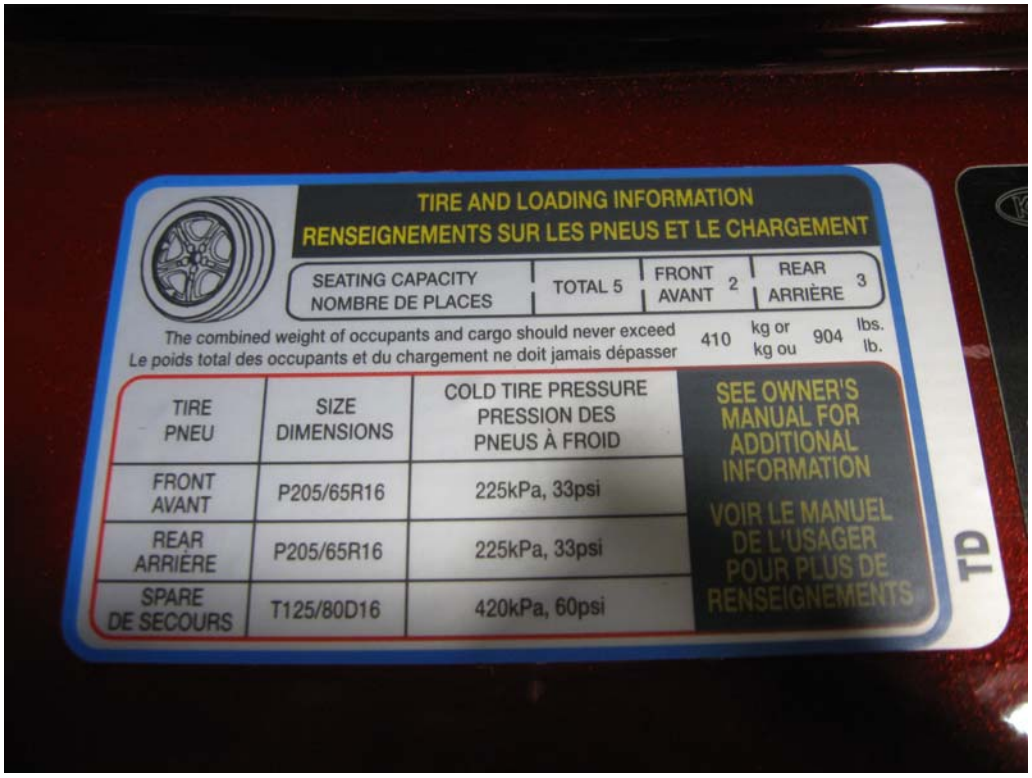
As Delivered – Right Side View

As Delivered – ¾ Front View From Left Side



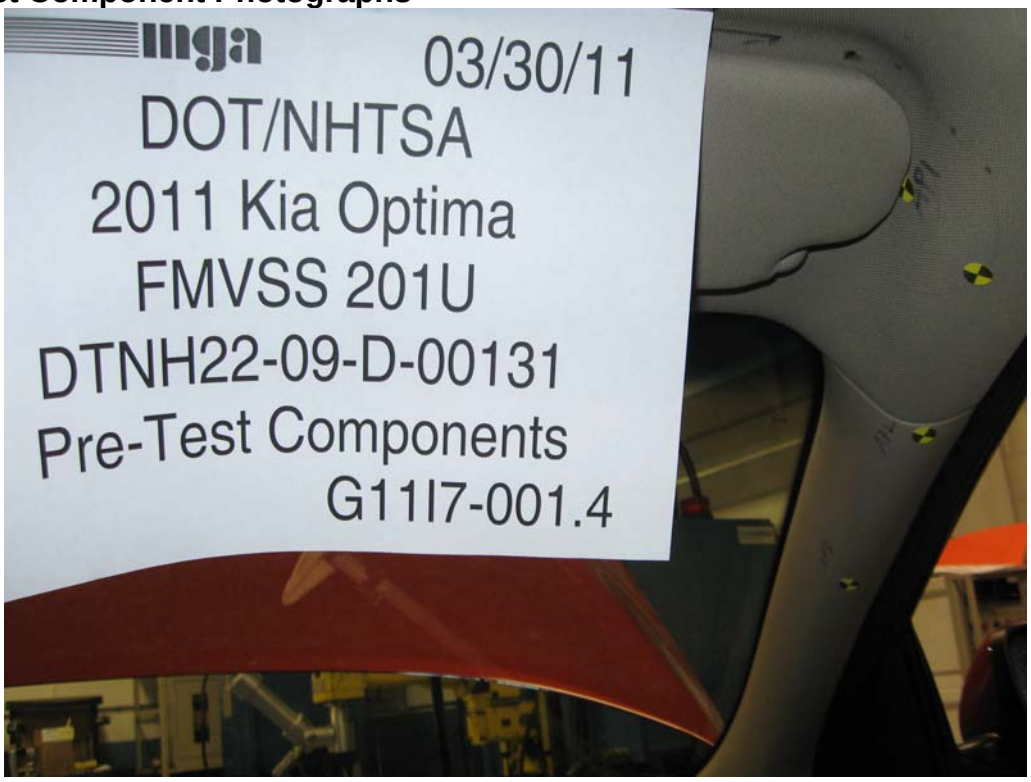
As Delivered – ¾ Rear View From Right Side

As Delivered – Vehicle's Certification Label



As Delivered – Vehicle's Tire Information Label

Pre-Test Component Photographs



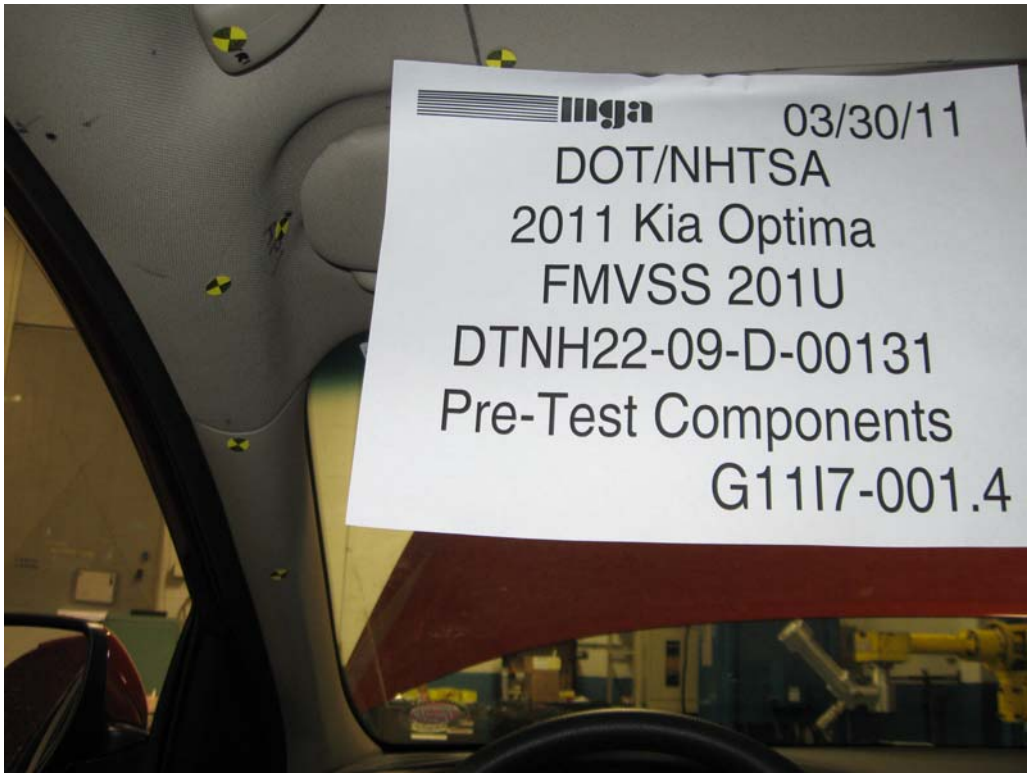

mga
03/30/11
DOT/NHTSA
2011 Kia Optima
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.4


mga
03/30/11
DOT/NHTSA
2011 Kia Optima
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.4

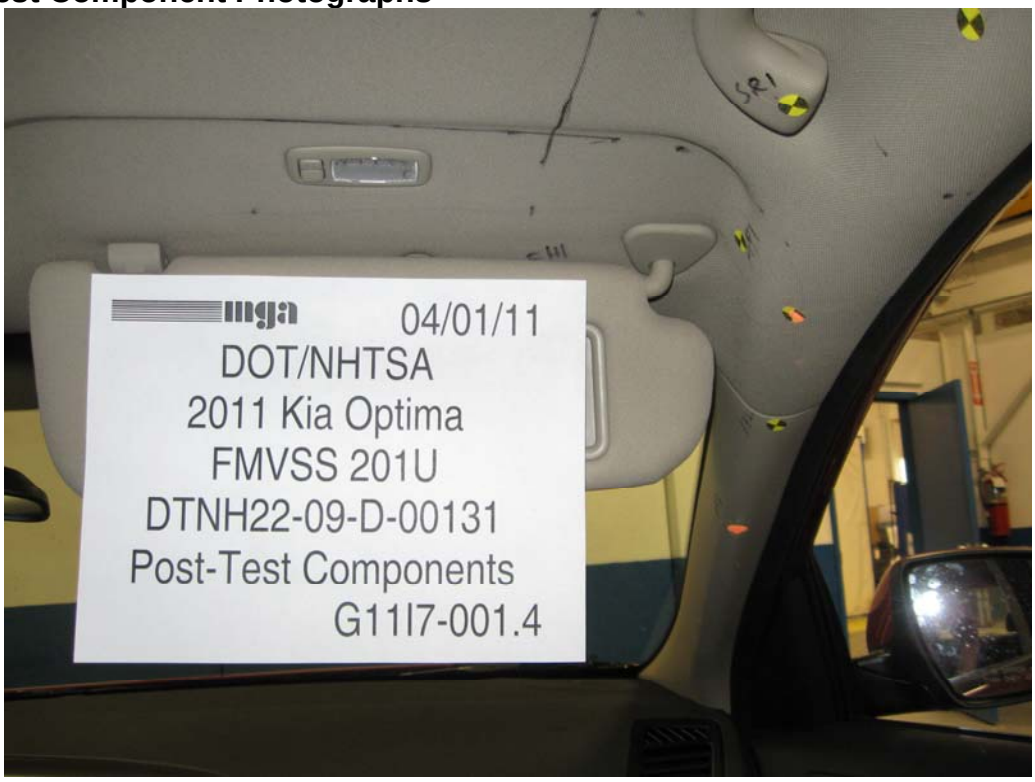

UR5
mga
03/30/11
DOT/NHTSA
2011 Kia Optima
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.4

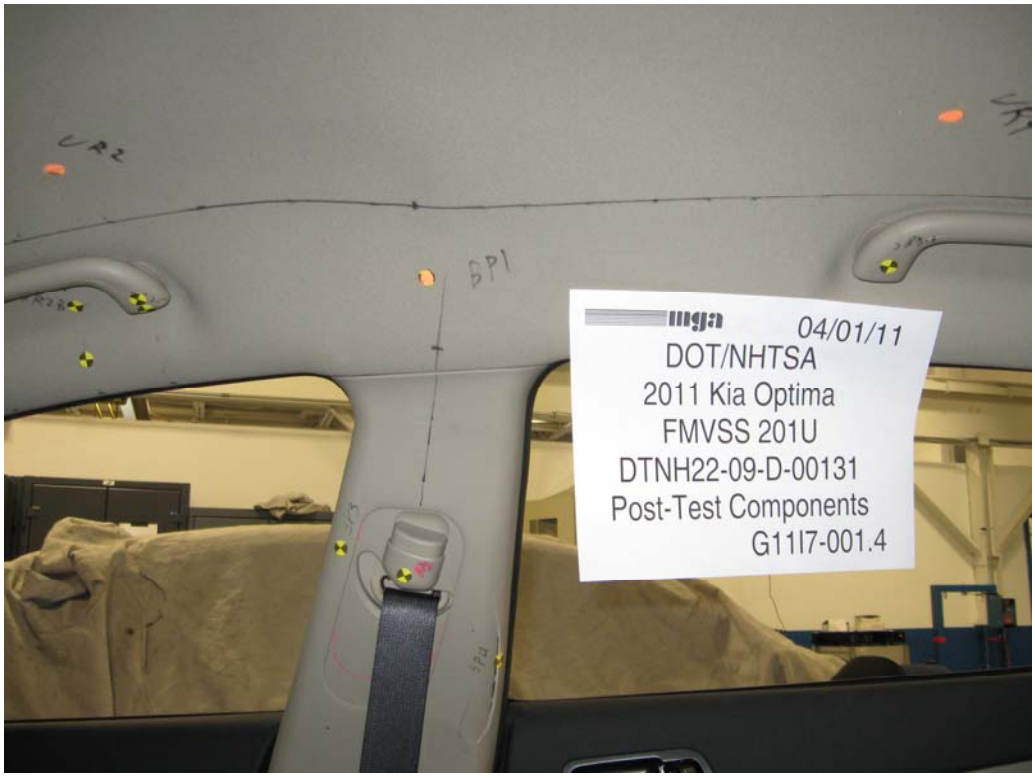

UR3
BP1
mga
03/30/11
DOT/NHTSA
2011 Kia Optima
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.4


mga
03/30/11
DOT/NHTSA
2011 Kia Optima
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.4


mga
03/30/11
DOT/NHTSA
2011 Kia Optima
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.4

Post-Test Component Photographs





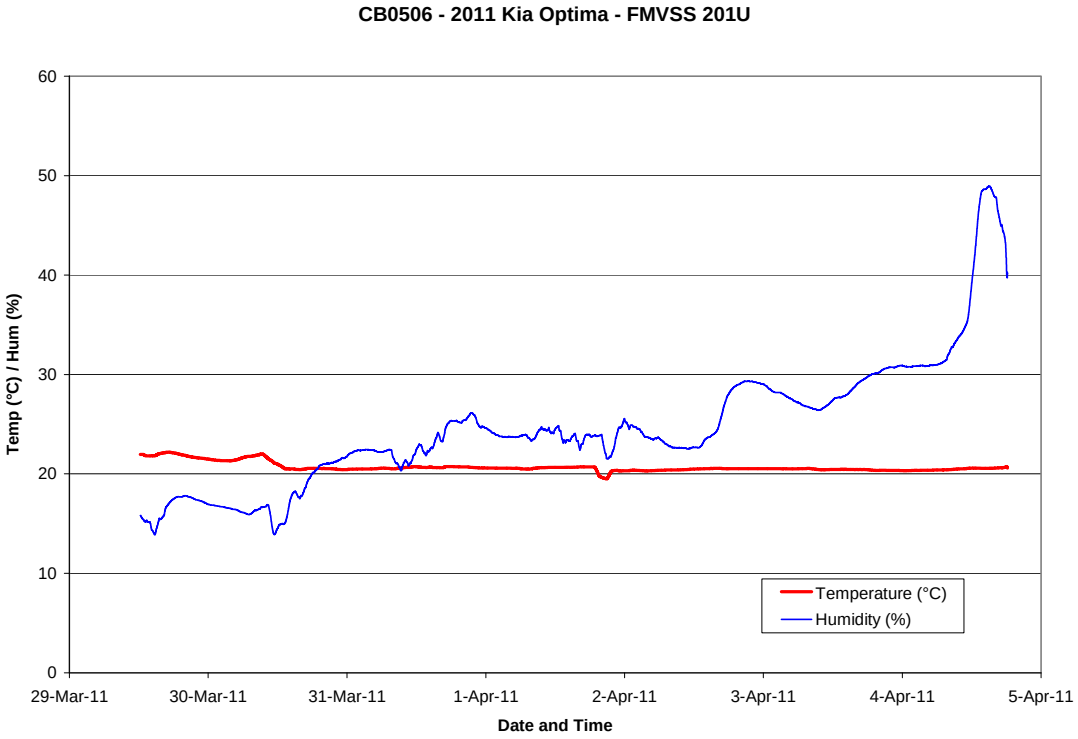

04/01/11
DOT/NHTSA
2011 Kia Optima
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.4


04/01/11
DOT/NHTSA
2011 Kia Optima
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.4


UR3
BP1
SRZF
mga
04/01/11
DOT/NHTSA
2011 Kia Optima
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.4


UR1
SRZF
mga
04/01/11
DOT/NHTSA
2011 Kia Optima
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.4

Appendix A – Temperature Trace



Appendix B – Calibration Certificates

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Helen R. Kalata

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Helen A. Kalata

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Steven A. Kaleto

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Helen A. Kaleto

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Helen A. Kalata

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Edward A. Kaleto

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Chris Collins

Approved by: Steven A. Kaleto

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Chris Collins

Approved by: Helen A. Kaleto

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Chris Collins

Approved by: Helen R. 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.

THE MODAL SHOP INC

~Calibration Certificate~

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

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

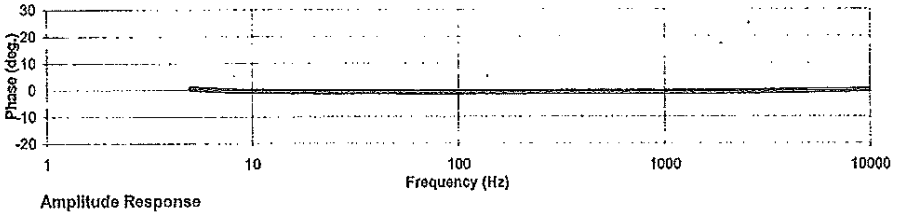
Calibration Data

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

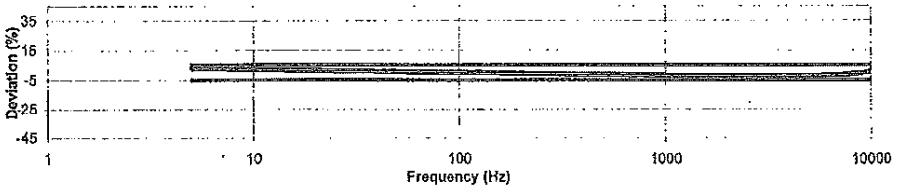
Transducer Specifications

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

Phase Response



Amplitude Response



Data Table

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

Notes
Results relate only to the items calibrated.
This certificate may not be reproduced except in full, without written permission.
Method: Calibration is performed in compliance with ISO 9001 and ISO 17025
This calibration was performed with TMS 9155C Calibration Workstation version 4.6.1
Calibration traceable to primary method which has been proficiency validated through interlaboratory comparison to NIST (project number 822/271196).
Back-to-Back Comparison Calibration per ISO16063-21 .
Procedure Used: PRD-P220
Measurement uncertainty (95% confidence level with coverage factor 2) for frequency ranges tested during calibration are as follows: 0.5-4.99 Hz; ± 3.00%, 5-9.99 Hz; ± 2.50%, 10-99 Hz; ± 1.70%, 100 Hz; ± 1.25%, 101-920 Hz; ± 1.40%, 921-5000 Hz; ± 1.70%, 5001-10,000 Hz; ± 2.20%, 10,001-15,000 Hz; ± 3.65%, 15,001-20,000 Hz; ± 4.75%.

Customer
MGA Research Corp.

User Notes

Unit Condition
As Found: In Tolerance
As Left: In Tolerance

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

Approval Information
Technician: Ed Devlin
Approval:

Cal Date: 9/14/2010
Due Date:

ACCREDITED

Cal ID: 15800 264901

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

~Calibration Certificate~

Sensor Information

Model Number	352C03
Serial Number	95980
Manufacturer	PCB
ID Number	

Note

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

Standards and/or Equipment Used During Calibration

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

Technician: Ed Devlin

Cal Date: 9/14/2010

Customer: MGA Research Corp.

Due Date:

ACCREDITED

Cal ID: 16800 2849.01

Calibration Certificate

Part Description: Silver **Certification Date:** 10/19/2010 (M/d/yyyy) **Serial#:** S08-05-98-01273

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

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

Measurement Standards Traceability

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

The artifacts above have been calibrated with a device traceable to the International System of Units (SI) through a National Metrological Institute (NMI) or through an ISO17025 Accredited Laboratory.
Measurement uncertainty is 3.9 + 3.0X micrometers, where X = length in meters.
Uncertainty is expressed at approximately a 95% Level of Confidence using k=2.00.

Calibration Results*

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

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

Instrument condition as received:
Not Within Specification

Instrument condition outgoing:
Within specifications

Technician: Anthony Parker Date: 10/19/10

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

125 Technology Park
Lake Mary, FL 32746
USA

BMC 9/1/10

FARO®

Page 1 of 6

LABORATORY ACCREDITATION BUREAU
ISO/IEC 17025 Accredited

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

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

Tape Measure Calibration Certificate

Reference Steel Rule
Brand: SWANSON
S/N: MGA007999
Calibration Date: 1/15/10

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

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

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

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

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

gary.hockin@midwayproducts.com

MetroCal Inc.

ACCREDITED
CALIBRATION CERT #0513.01

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

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

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

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

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

As Found Condition: **In Tolerance**

As Left Condition: **In Tolerance**

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

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

Results:

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° Level	40.00	39.9	-0.10
± 0.2° Maximum Error			

Reference Level Check: Within ± 0.1 degrees

As Left Readings

Nominal	Actual	Deviation
5.00	5.0	0.00
10.00	10.1	0.10
20.00	20.0	0.00
30.00	30.0	0.00
40.00	39.9	-0.10

Reference Level Check: Within ± 0.1 degrees

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

Shannon Kubicek
Calibration Technician

Issued: 9/3/10

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

@ 9/8/10

NovaStar SOLUTIONS

Calibration Certificate

ACCREDITED
CALIBRATION # 1277.01

Metrology Management Services
Remit to address:

35200 Plymouth Rd.
Livonia, MI 48150

Calibration Certificate #:
Z50918:1281429469

DICKSON FH125 TEMP/RH RECORDER

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

WORK ORDER: 1281429469

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

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

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

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

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

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

Action Taken: FULL CALIBRATION

REMARKS:

Standards Used

Asset #	Cert#	Description	Cal Date	Due Date
002326	002326:1264688323	VAISALA HMK-15 HUMIDITY SALTS	1/27/2010	1/27/2011
1914	1914:1262706187	FLUKE 1502A THERMOMETER READOUT	1/5/2010	1/5/2011
1915	1915:1264951189	HART SCIENTIFIC 5614 PRT	1/31/2010	1/31/2011
1917	1917:1263989036	VAISALA M170/HMP76 MEASUREMENT INDICATOR/PROBE	1/20/2010	1/20/2011

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

8/13/2010

QA approved: MG Date: 8-11-10

Signature:

Asset Barcode:

MetroCal Inc.

ACCREDITED
CALIBRATION CERT #0513.01

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

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

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

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

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

As Found Condition: See Results

As Left Condition: See Results

MetroCal Inc. maintains reference standards of measurement which are traceable to the National Institute of Standards and Technology, or other authorized National Standards. Calibration was performed in accordance with MetroCal Procedure CP042 and relevant sections of the manufacturer's manual. This calibration complies with ISO/IEC 17025 and ANSI/NCSL Z540-1 Standards. Results shall not be reproduced except in full without the written approval of MetroCal Inc. Results relate only to the item(s) calibrated. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired. Statements of compliance made using simple acceptance rule.

Standard Used	Cal. Date	Due Date	Traceable No.	Calibration Procedure Uncertainty Expressed at 95% confidence , (K=2)
Dead Weight Set	3/3/09	3/3/11	ID# 16992	+/-0.001% of Load
Weight Set	9/3/08	9/3/10	ID# 2463	+/-0.001% of Load

Results:
Tolerance used: Class III

Units: lbs — TI Division/Increment: 0.01

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

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

Shannon Kubicek
Calibration Technician

Issued: 8/26/10

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

@ 9/8/10

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

Certificate of Calibration

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

calibration cert. 1448.01

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

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

shift test
n/a

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

Tests performed: ☑ Repeatability ☑ Linearity ☐ Sensitivity ☑ Discrimination

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

Page 2 of 2

☑ Scale Certified ☐ Scale Rejected

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

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