FINAL REPORT NUMBER 201UI-MGA-12-09

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

TOYOTA MOTOR MANUFACTURING NORTHERN KENTUCKY, INC.
2012 Toyota Camry
NHTSA No. CC5101

MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083

Test Dates: April 26-27, 2012
Report Date: April 30, 2012

FINAL REPORT

PREPARED FOR:

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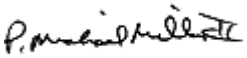
Approved By: 

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9. Performing Organization Name and Address MGA Research Corporation 446 Executive Drive Troy, Michigan 48083		10. Work Unit No.	
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		14. Sponsoring Agency Code NVS-220	
15. Supplementary Notes			
16. Abstract A compliance test series was conducted on the subject 2012 Toyota Camry, NHTSA No. CC5101, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-201U-01 for the determination of FMVSS 201 compliance. The testing was conducted at MGA Research Corporation in Troy, Michigan on April 26-27, 2012. Test failures identified were as follows: None The data recorded indicates that the 2012 Toyota Camry tested appears to comply with the upper interior requirements of FMVSS 201.			
17. Key Words Compliance Testing Safety Engineering FMVSS 201UI 2012 Toyota Camry		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 2012 Toyota Camry, meets the performance requirements of FMVSS 201, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted on April 26-27, 2012 on a 2012 Toyota Camry, manufactured by Toyota Motor Manufacturing, Northern Kentucky, Inc.

All tests were conducted in accordance with the U. S. Department of Transportation, National Highway Traffic Safety Administration's Laboratory Test Procedure TP-201U-01 dated April 3, 1998 and the corresponding MGA Research Corporation's FMVSS 201U procedure number MGATP201U_FRAME#2 dated 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 2012 Toyota Camry 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	BP2	FH1	UR3@BP
AP2	BP4	FH2	UR4@x=2956
AP3	RP2	UR2@SR2A	UR5@SR3-1

The 2012 Toyota Camry 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: 2012 Toyota Camry

VEH. NHTSA NO.:CC5101 VIN: 4T4BF1FK1CR196695 COLOR: Classic Silver Metallic

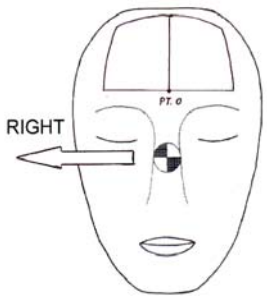
VEH. BUILD DATE: February 2012 TEST DATES: April 26-27, 2012

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Kevin McKenna, Sean Moran, Josh Campbell

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	109	35	19.0	472	405	13	7 Right
AP2	Left	204	50	18.7	377	280	12	0 Left
AP3	Right	156	50	18.8	392	300	13	1 Right
BP2	Left	270	20	23.8	654	646	7	3 Right
BP4	Right	160	1	23.6	899	971	12	11 Right
RP2	Left	298	28	23.8	623	606	6	3 Right
FH1	Left	180	50	23.3	740	761	9	4 Left
FH2	Right	180	50	23.5	570	535	8	4 Right
UR2@SR2A	Right	90	50	23.4	855	913	35	5 Left
UR3@BP	Left	270	50	23.4	841	894	36	4 Right
UR4@x=2956	Right	90	50	23.5	710	721	37	2 Right
UR5@SR3-1	Left	270	45	23.7	819	865	34	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: Dislodged pillar trim.

AP3 Right: Dislodged pillar trim.

BP2 Left: Non functional seat belt adjuster anchorage.

BP4 Right: Stress marks on pillar trim.

RP2 Left: Pillar trim deformation.

FH2 Right: Sunglasses holder opened.

UR2 Right: Headliner deformation.

REMARKS:

The targets listed were impacted in the following order:

Left: BP2, UR3@BP, RP2, UR5@SR3-1, FH1, AP2

Right: AP3, AP1, UR2@SR2A, FH2, BP4, UR4@x=2956

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

RECORDED BY: Kevin McKenna DATE: April 27, 2012

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2012 Toyota Camry

VEH. NHTSA NO.:CC5101 VIN: 4T4BF1FK1CR196695 COLOR: Classic Silver Metallic

VEH. BUILD DATE: February 2012 TEST DATES: April 26-27, 2012

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Kevin McKenna, Sean Moran, Josh Campbell

INTERIOR TRIM INFORMATION: The 2012 Toyota Camry 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 29, 2012; Odometer Reading 145 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Toyota Motor Manufacturing, Northern Kentucky, Inc.

Date of Manufacture: February, 2012; VIN: 4T4BF1FK1CR196695

GVWR: 4630 lbs; GAWR FRONT: 2625 lbs;

GAWR REAR: 2625 lbs;

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 240 kPa REAR: 240 kPa

Recommended Tire Size: P205/65R16

Recommended Cold Tire Pressure:

FRONT: 240 kPa REAR: 240 kPa

Size of Tire on Test Vehicle: P205/65R16

Type of Spare Tire: T155/70D17; 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) = 405 kg

No. of Occupants x 68 kg = 340 kg

Rated Cargo/Luggage Weight (RCLW) = 65 kg (difference)

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

Right Front =	435.5 kg	Right Rear =	275.0 kg
Left Front =	449.0 kg	Left Rear =	280.0 kg
TOTAL FRONT =	884.5 kg	TOTAL REAR =	555.0 kg
% Total Weight =	61.4 %	% Total Weight =	38.6 %

TOTAL DELIVERED WEIGHT = 1439.5 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1439.5 kg

Max. Test Cargo/Luggage Weight = 65.0 kg

Target Test Weight = 1504.5 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	428.0 kg	Right Rear =	316.0 kg
Left Front =	440.5 kg	Left Rear =	319.5 kg
TOTAL FRONT =	868.5 kg	TOTAL REAR =	635.5 kg
% Total Weight =	57.8 %	% Total Weight =	42.2 %

TOTAL TEST WEIGHT = 1504.0 kg

Weight of ballast secured in vehicle's cargo area = 64.5 kg

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 728 mm; Left Front 721 mm;
Right Rear 718 mm; Left Rear 715 mm;
Pitch Angle at Right Door Sill = 0.3 Rear is higher
Pitch Angle at Left Door Sill = 0.4 Rear is higher
Roll Angle at Front Bumper = 0.4 Right is higher
Roll Angle at Rear Bumper = 0.1 Right is higher

FULLY LOADED: Right Front 730 mm; Left Front 724 mm;
Right Rear 704 mm; Left Rear 702 mm;
Pitch Angle at Right Door Sill = 0.0
Pitch Angle at Left Door Sill = 0.0
Roll Angle at Front Bumper = 0.6 Right is higher
Roll Angle at Rear Bumper = 0.2 Right is higher

AS TARGETED: Right Front 860 mm; Left Front 877 mm;
Right Rear 845 mm; Left Rear 860 mm;
Pitch Angle at Right Door Sill = 0.2 Rear is higher
Pitch Angle at Left Door Sill = 0.1 Rear is higher
Roll Angle at Front Bumper = 0.4 Right is higher
Roll Angle at Rear Bumper = 0.1 Right is higher

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill =	0.1 Rear is higher
Pitch Angle at Left Door Sill =	0.2 Rear is higher
Roll Angle at Front Bumper =	0.5 Right is higher
Roll Angle at Rear Bumper =	0.2 Right is higher

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill =	0.0
Pitch Angle at Left Door Sill =	0.0
Roll Angle at Front Bumper =	0.6 Right is higher
Roll Angle at Rear Bumper =	0.2 Right is higher

VEHICLE WHEELBASE = 2765 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: Kevin McKenna DATE: April 18, 2012

APPROVED BY: Helen A. Kaleto

TABLE 2-3

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2012 Toyota Camry

VEH. NHTSA NO.:CC5101 VIN: 4T4BF1FK1CR196695 COLOR: Classic Silver Metallic

VEH. BUILD DATE: February 2012 TEST DATES: April 26-27, 2012

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Kevin McKenna, Sean Moran, Josh Campbell

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 203.2º	L 251.4º
	R 105º-165º	R 108.2º	R 156.5º
B-PILLAR	L 195º-345º	L 199.5º	L 286.7º
	R 15º-165º	R 73.5º	R 160.5º

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Kevin McKenna DATE: April 18, 2012

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2012 Toyota Camry

VEH. NHTSA NO.:CC5101 VIN: 4T4BF1FK1CR196695 COLOR: Classic Silver Metallic

VEH. BUILD DATE: February 2012 TEST DATES: April 26-27, 2012

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Kevin McKenna, Sean Moran, Josh Campbell

VERTICAL IMPACT ANGLE RANGES

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	FH1	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
	FH2	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
SIDE RAIL	SR1	L 0º-50º	L 0º	L 24º
		R 0º-50º	R 0º	R 24º
	SR2A	L 0º-50º	L 0º	L 46º
		R 0º-50º	R 0º	R 46º
	SR2B	L 0º-50º	L 0º	L 44º
		R 0º-50º	R 0º	R 44º
	SR3-1	L 0º-50º	L 0º	L 25º
		R 0º-50º	R 0º	R 25º
	SR3-2	L 0º-50º	L 0º	L 24º
		R 0º-50º	R 0º	R 24º
REAR HEADER	RH	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
A-PILLAR	AP1	L -5º-50º	L -5º	L 35º

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
		R -5º-50º	R -5º	R 35º
	AP2	L -5º-50º	L -5º	L 50º
		R -5º-50º	R -5º	R 50º
	AP3	L -5º-50º	L -5º	L 50º
		R -5º-50º	R -5º	R 50º
B-PILLAR	BP1	L -10º-50º	L -10º	L 12º
		R -10º-50º	R -10º	R 12º
	BP2*	L 0º-50º	L 0º	L 20º
		R 0º-50º	R 0º	R 20º
	BP3	L -10º-50º	L -10º	L 11º
		R -10º-50º	R -10º	R 11º
	BP4	L -10º-50º	L -10º	L 1º
		R -10º-50º	R -10º	R 1º
REAR PILLAR	RP1	L -10º-50º	L -10º	L 0º
		R -10º-50º	R -10º	R 0º
	RP2	L -10º-50º	L -10º	L 28º
		R -10º-50º	R -10º	R 28º
UPPER ROOF 1		0º-50º	0º	50º
UPPER ROOF 2		0º-50º	0º	50º
UPPER ROOF 3		0º-50º	0º	50º
UPPER ROOF 4		0º-50º	0º	50º
UPPER ROOF 5		0º-50º	0º	45º
UPPER ROOF 6		0º-50º	0º	50º

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

RECORDED BY: Kevin McKenna DATE: April 18, 2012

APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2012 Toyota Camry

VEH. NHTSA NO.:CC5101 VIN: 4T4BF1FK1CR196695 COLOR: Classic Silver Metallic

VEH. BUILD DATE: February 2012 TEST DATES: April 26-27, 2012

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Kevin McKenna, Sean Moran, Josh Campbell

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)}	108.6º	--
A1º	360º - Tº	251.4º	--
Wº	Horizontal < {CG-2 (Left Seat) to (Left A-Pillar)}	203.2º	--
A2º	A2º = Wº	203.2º	--
Uº	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	286.7º	--
B1º	B1º = Uº	286.7º	--
Vº	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	199.5º	--
B2º	B2º = Vº	199.5º	--
Wº (right)	Horizontal < {CG-F2 (Right Seat) to (Right A-Pillar)}	--	156.5º
A1º (right)	A1º (right) = Wº (right)	--	156.5º
T º (right)	Horizontal < {CG-F1 (Right Seat) to (Left A-Pillar)}	--	251.8º
A2º (right)	360º-Tº (right)	--	108.2º
V º (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	160.5º
B1º (right)	B1º (right) = Vº (right)	--	160.5º
U º (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	73.5º
B2º (right)	B2º (right) = Uº (right)	--	73.5º
J	A-Pillar {(Plane 3) – (Plane 5)}	327.6 mm	325.4 mm
J/2	J ÷ 2	163.8 mm	162.7 mm
D1	Upper Roof {(Plane A) – (Plane B)}	1589.2 mm	
D1/2	D1 ÷ 2	794.6 mm	

Measurement	Description	Left Side	Right Side
D2	Upper Roof {(Plane C) – (Plane D)}	1185.3 mm	
D2/2	D2 ÷ 2	592.7 mm	
.35D1	.35 x D1	556.2 mm	
.35D2	.35 x D2	414.9 mm	
N	B-Pillar {(BPR) – (lowest point on daylight opening forward of B-Pillar)}	406.3 mm	406.0 mm
N/2	B-Pillar {(BP3) – (lowest point on daylight opening forward of B-Pillar)}	203.2 mm	203.0 mm
N/4	B-Pillar {(BP4) – (lowest point on daylight opening forward of B-Pillar)}	101.6 mm	101.5 mm
D	R-Pillar (Point 7 – Point M)	695.0 mm	695.0 mm
3D/7	3*D / 7	297.9 mm	297.9 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	2371.6	-375.0	1293.4	2371.6	375.0	1293.4
Rear	3264.4	-365.0	1291.0	3264.4	365.0	1291.0

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	2371.6	-375.0	1293.4	2371.6	375.0	1293.4
Rear	3264.4	-365.0	1291.0	3264.4	365.0	1291.0

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
CGF1	2291.6	-375.0	1953.4	2291.6	375.0	1953.4
CGF2	2531.6	-375.0	1953.4	2531.6	375.0	1953.4
CGR	3424.4	-365.0	1951.0	3424.4	365.0	1951.0

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Front driver door striker upper (x, y, z) = 2557.9, -804.0, 1551.7

Front driver seat front outboard anchorage (x, y, z) = 2042.6, -592.0, 1054.3

Front passenger seat front outboard anchorage (x, y, z) = 2042.6, 592.0, 1054.3

REMARKS:

RECORDED BY: Kevin McKenna DATE: April 18, 2012

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2012 Toyota Camry

VEH. NHTSA NO.:CC5101 VIN: 4T4BF1FK1CR196695 COLOR: Classic Silver Metallic

VEH. BUILD DATE: February 2012 TEST DATES: April 26-27, 2012

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Kevin McKenna, Sean Moran, Josh Campbell

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	2162.7	-522.6	2087.4	--	--	Yes	--	--
REL	2189.4	-544.5	2052.6	251	35	--	2	No
AP2	2078.4	-582.9	1998.4	204	50	No	--	Yes
AP3	1913.6	-621.5	1924.3	204	50	No	--	No
A-Pillar Right Side								
AP1	2165.6	523.7	2085.7	--	--	Yes	--	--
REL	2191.3	546.1	2053.0	109	35	--	2	Yes
AP2	2076.6	584.8	1998.6	156	50	No	--	No
AP3	1909.5	624.4	1923.7	156	50	No	--	Yes
B-Pillar Left Side								
BP1	2683.8	-484.4	2128.5	270	12	No	--	No
BP2	2652.3	-600.4	1909.9	270	20	No	--	Yes
BP3	2627.4	-597.7	1924.9	275	11	No	--	No
BP4	2707.0	-665.0	1823.0	200	1	No	--	No
B-Pillar Right Side								
BP1	2684.0	484.0	2128.8	90	12	No	--	No
BP2	2654.3	600.6	1910.1	90	20	No	--	No
BP3	2629.4	597.3	1926.6	85	11	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	2708.4	662.6	1826.4	160	1	No	--	Yes
Rear Pillar Left Side								
RP1	3438.1	-498.2	2110.2	--	--	Yes	--	--
REL	3429.3	-512.8	2093.3	270	0	--	1	No
RP2	3497.7	-595.8	1961.1	298	28	No	--	Yes
Rear Pillar Right Side								
RP1	3440.6	499.4	2108.8	--	--	Yes	--	--
REL	3426.6	511.5	2094.3	90	0	--	1	No
RP2	3496.3	598.3	1959.3	62	28	No	--	No
Front Header Left Side								
FH1	2077.9	-401.8	2084.8	180	50	No	--	Yes
FH2	2052.6	-254.2	2088.4	180	50	No	--	No
Front Header Right Side								
FH1	2079.0	403.9	2085.6	180	50	No	--	No
FH2	2054.0	253.2	2090.9	180	50	No	--	Yes
Side Rail Left Side								
SR1	2311.9	-505.6	2115.0	--	--	Yes	--	--
REL	2334.1	-503.4	2085.3	270	24	--	2	No
SR2A	2462.2	-503.8	2131.7	--	--	Yes	--	--
REL	2463.5	-482.8	2115.1	270	46	--	1	No
SR2B	2383.4	-502.4	2128.5	--	--	Yes	--	--
REL	2385.2	-485.9	2109.8	270	44	--	1	No
SR3-1	3100.6	-495.0	2098.9	270	25	No	--	No
SR3-2	3283.8	-503.1	2076.2	270	24	No	--	No
Side Rail Right Side								
SR1	2315.2	506.4	2117.8	--	--	Yes	--	--
REL	2334.7	505.4	2085.3	90	24	--	2	No
SR2A	2465.3	501.9	2134.4	--	--	Yes	--	--
REL	2465.2	484.2	2116.6	90	46	--	1	No

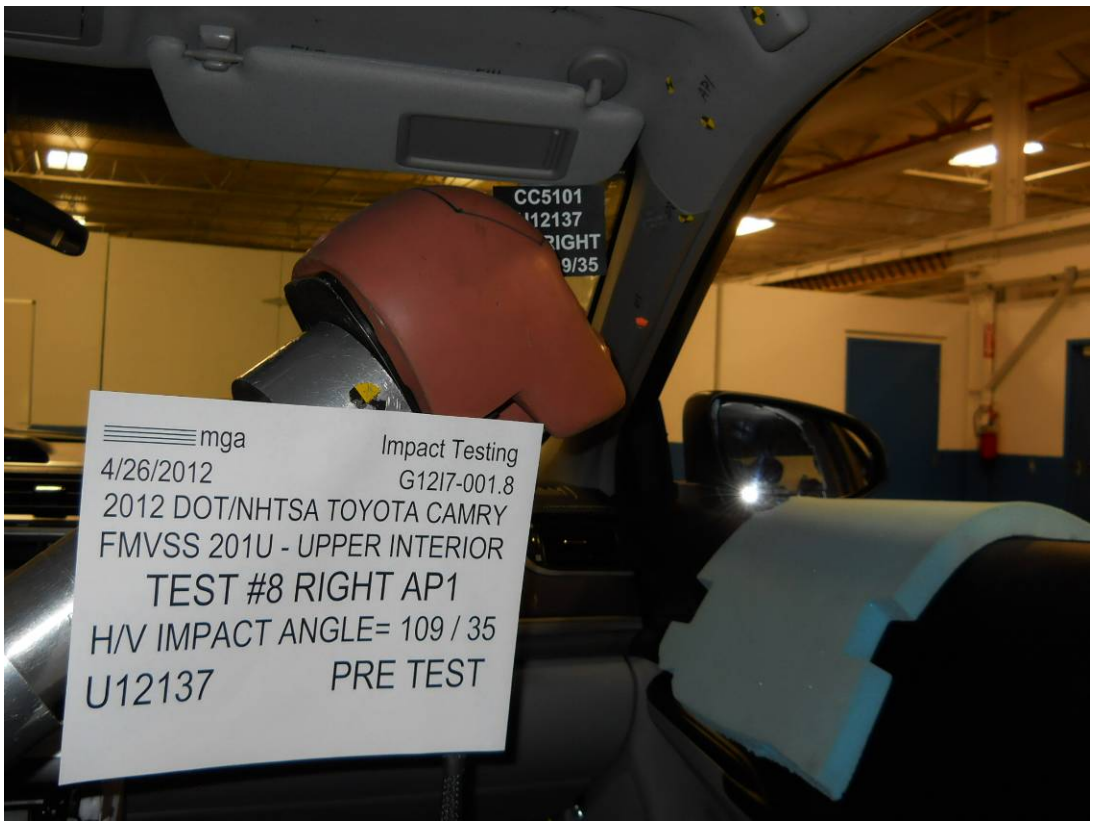
SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
SR2B	2383.5	505.3	2128.3	--	--	Yes	--	--
REL	2386.9	486.3	2111.4	90	44	--	1	No
SR3-1	3101.5	495.1	2099.2	90	25	No	--	No
SR3-2	3284.4	502.6	2076.1	90	24	No	--	No
Rear Header Left Side								
RH	3428.0	-365.9	2139.3	0	50	No	--	No
Rear Header Right Side								
RH	3430.1	364.3	2139.4	0	50	No	--	No
Upper Roof Left Side								
UR1@SR2	2770.0	-406.6	2106.1	270	50	No	--	No
UR3@BP	2688.3	-392.6	2150.5	270	50	No	--	Yes
UR5@SR3-1	3102.9	-365.8	2169.8	270	45	No	--	Yes
Upper Roof Right Side								
UR2@SR2A	2472.8	350.3	2172.9	90	50	No	--	Yes
UR4@x=2956	2955.6	359.9	2174.4	90	50	No	--	Yes
UR6@SR3-2	3291.4	367.4	2160.7	90	50	No	--	No

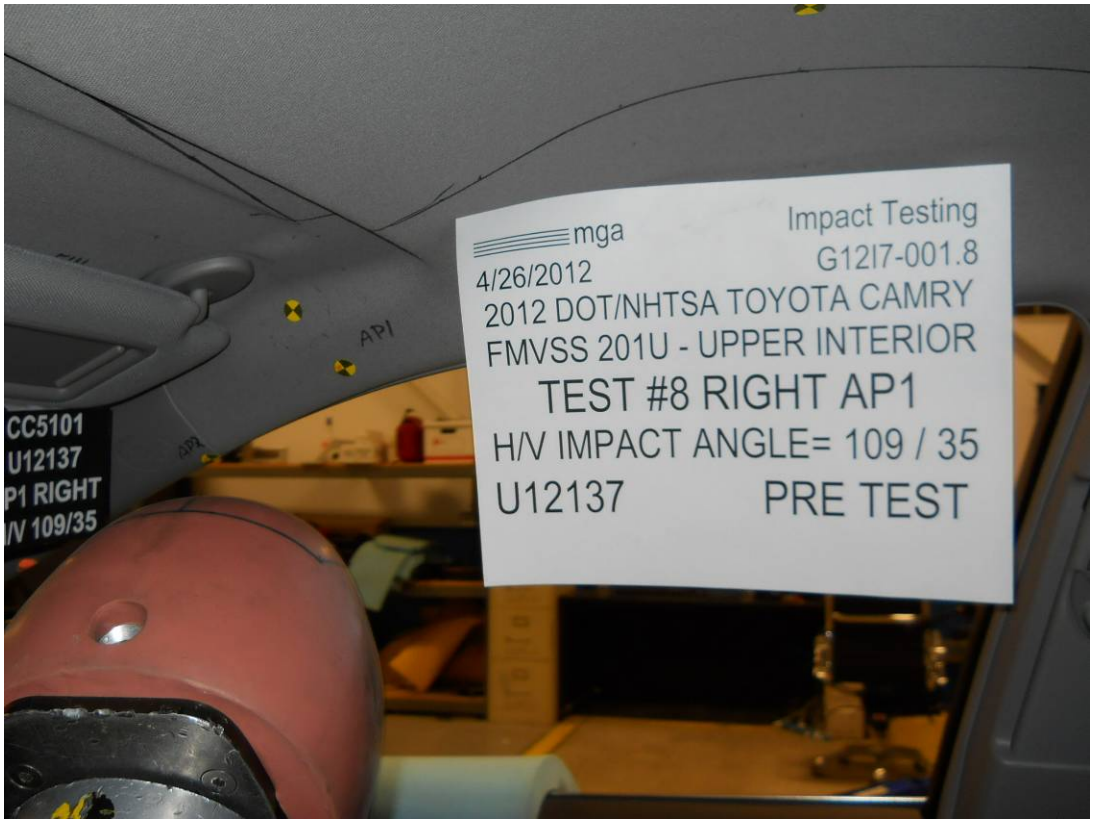
As determined using the Procedures specified in S10.1-10.13.

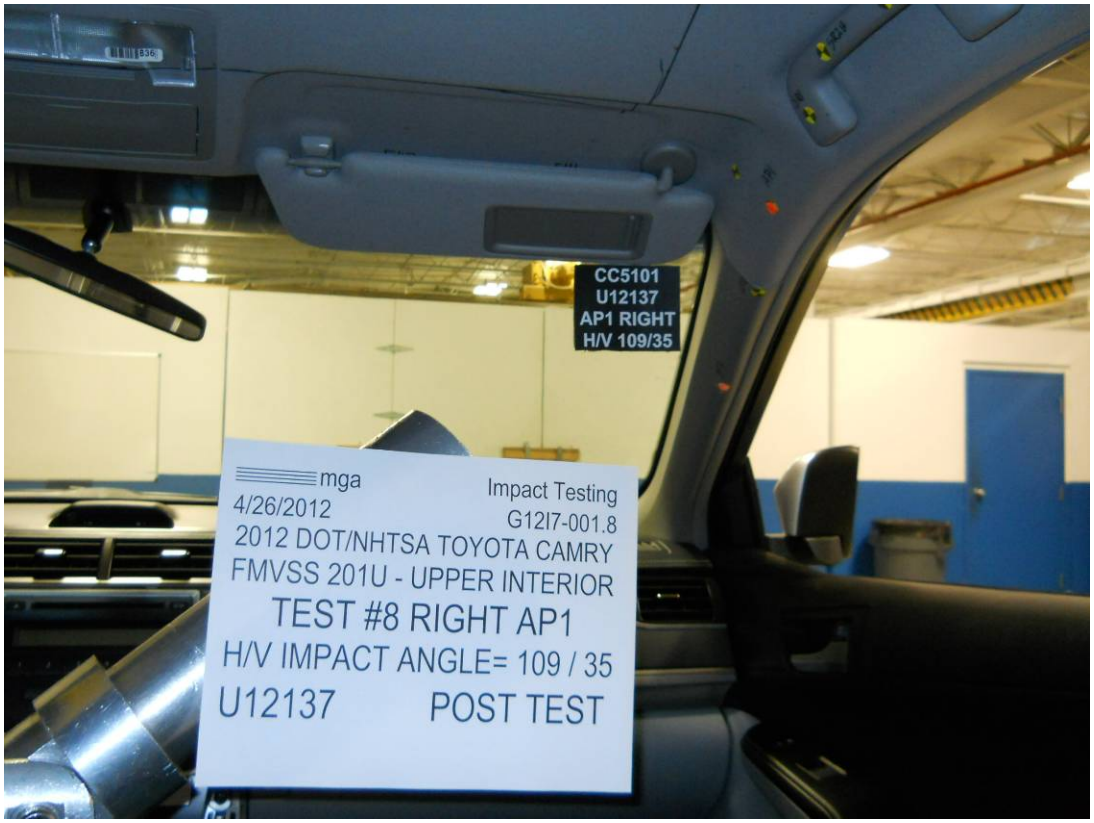
RECORDED BY: Kevin McKenna DATE: April 18, 2012

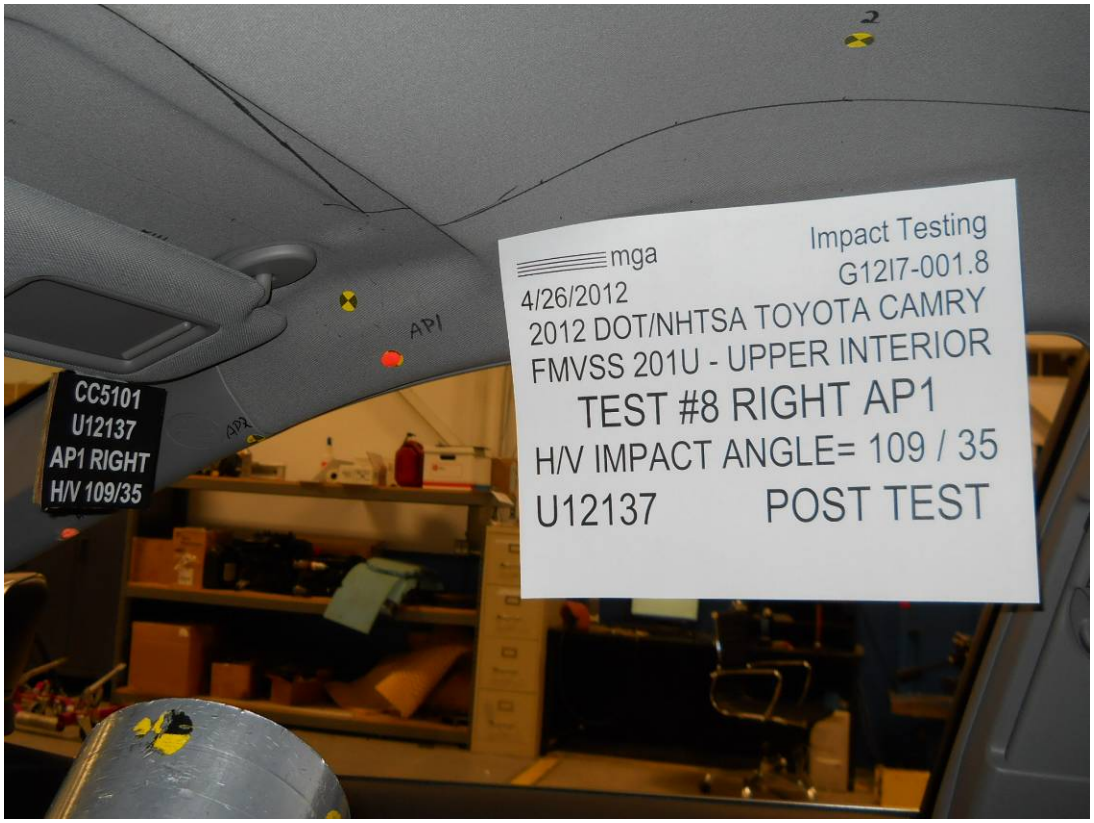
APPROVED BY: Helen A. Kaleto

3.0 TEST DATA (Including Acceleration and Velocity Plots)

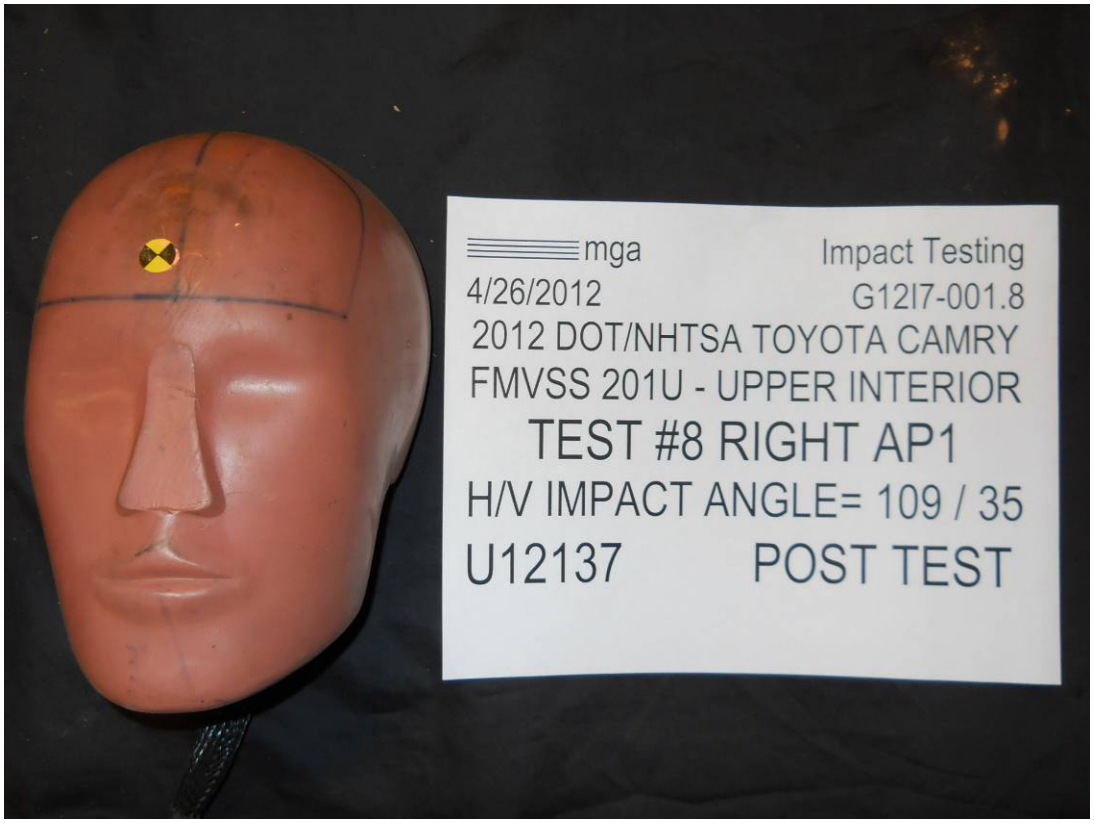





CC5101
U12137
AP1 RIGHT
H/V 109/35
mga
Impact Testing
G12I7-001.8
4/26/2012
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP1
H/V IMPACT ANGLE= 109 / 35
U12137
POST TEST


CC5101
U12137
AP1 RIGHT
H/V 109/35
mga
Impact Testing
G12I7-001.8
4/26/2012
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP1
H/V IMPACT ANGLE= 109 / 35
U12137
POST TEST


AP1
AP2


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP1
H/V IMPACT ANGLE= 109 / 35
U12137
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#8

Target (Vehicle Side): AP1Right

Temperature:22.2C

MGA Test Reference No.:U12137

Humidity:38.1%

Approach Horizontal Angles:109º

Time of Test:4:48:21 PM

Approach Vertical Angles:35º

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
472	405	4.1	19.0	13	7 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J32177	-113.3	0.87	0.87
Y	6	J14103	95.2	0.97	0.97
Z	7	J35800	98.5	0.96	0.96

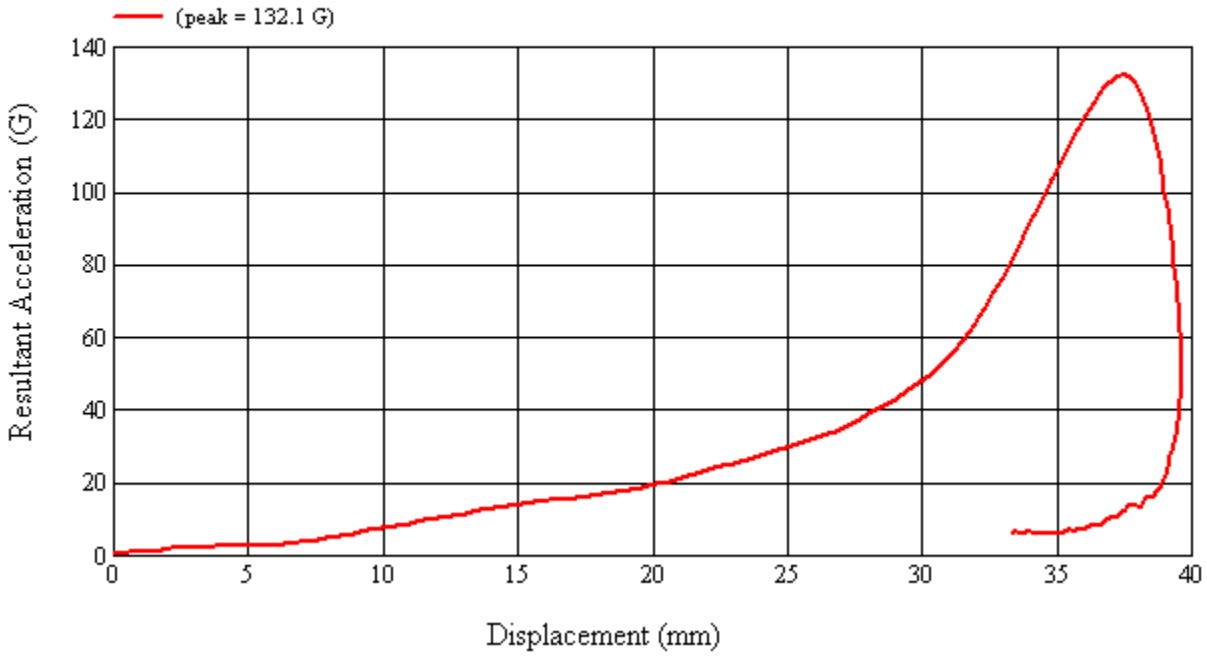
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

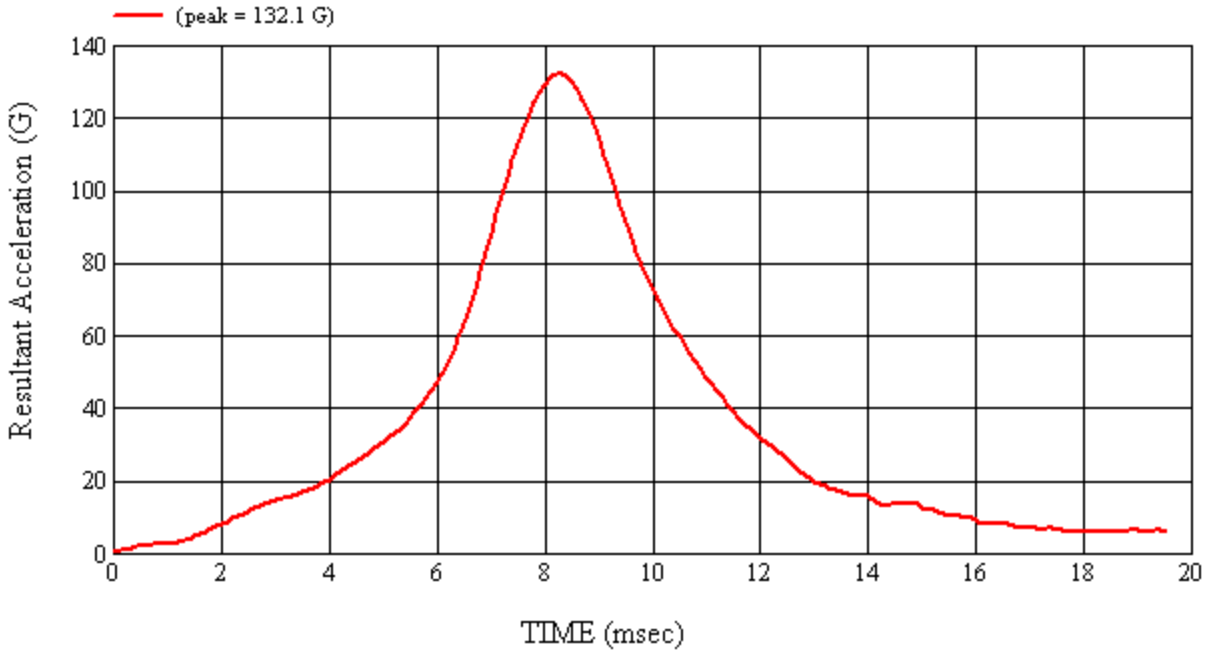
No visible damage

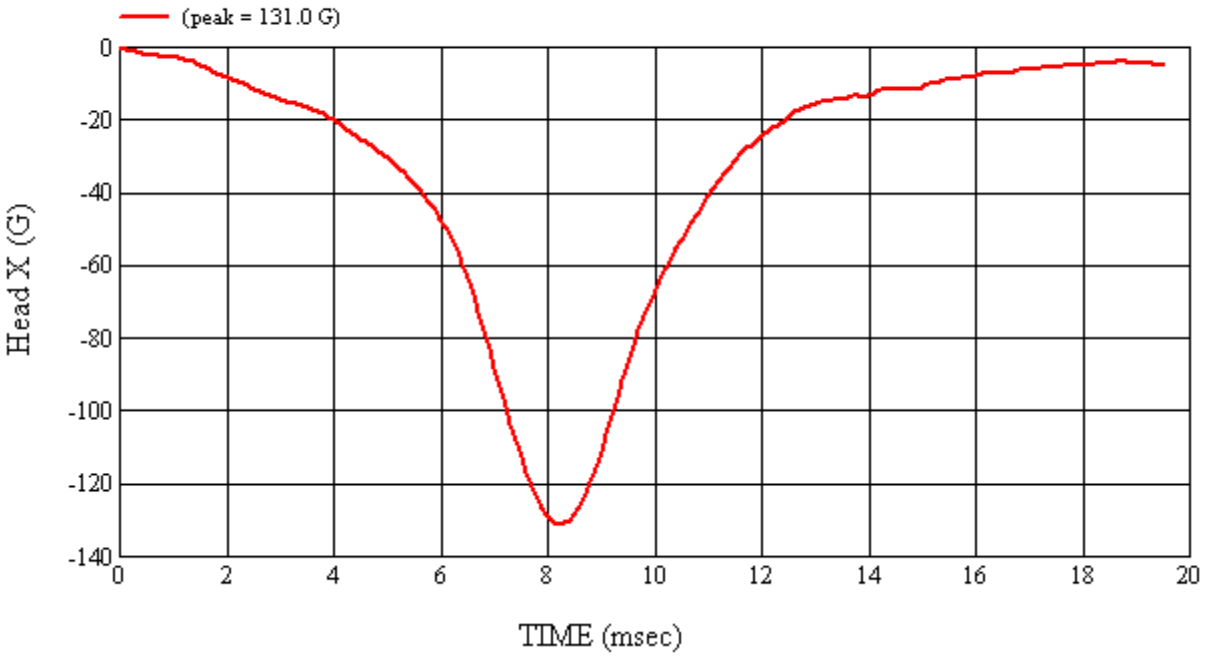
Recorded By: ____________ Approved By*: ____________ Date: 4/26/2012

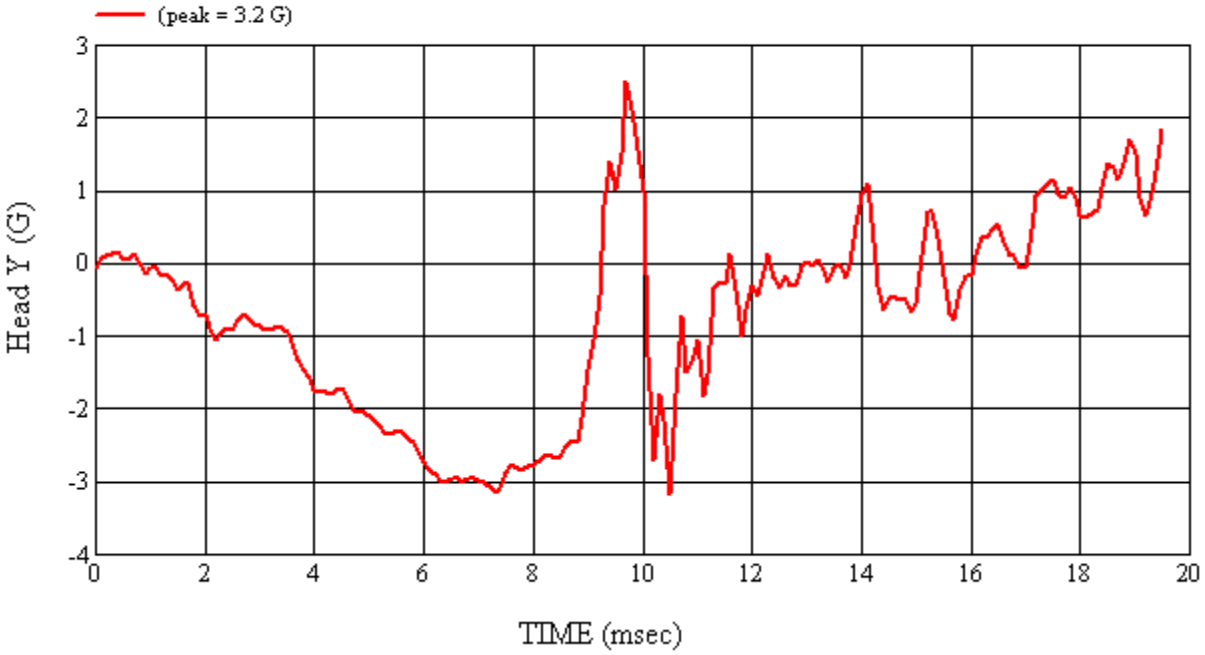
*Only necessary for NHTSA (Government) Compliance testing.

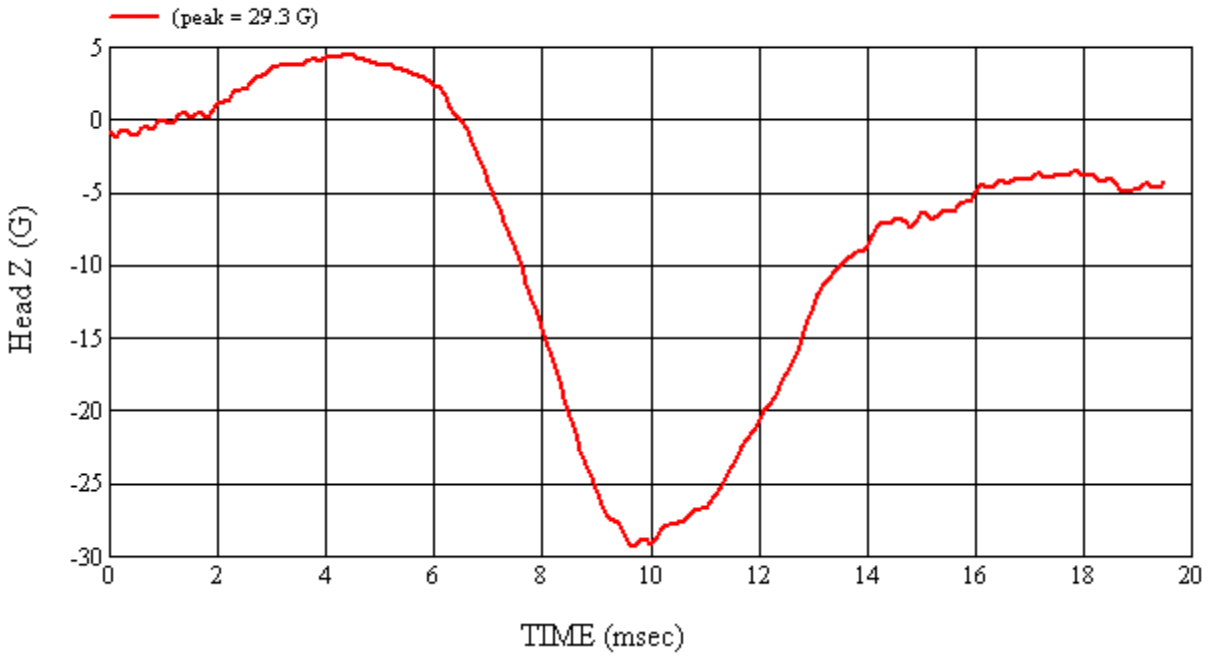
MGA Test #: U12137 Target Location: AP1, Right Side Test Date: 4/26/2012

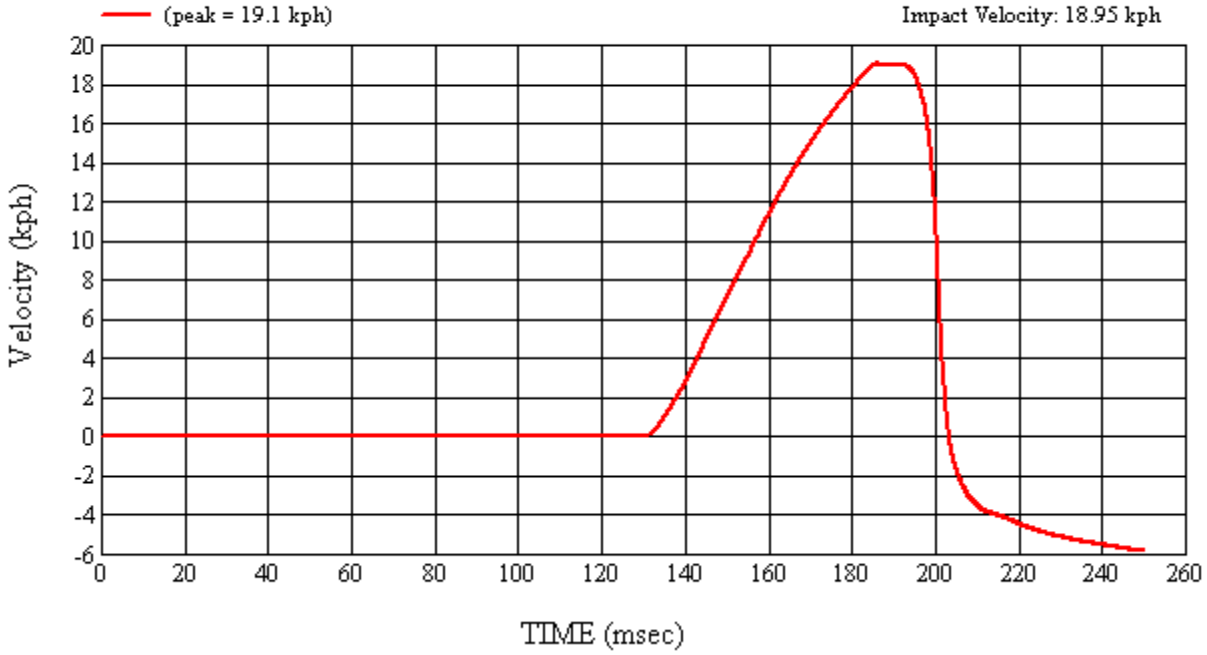


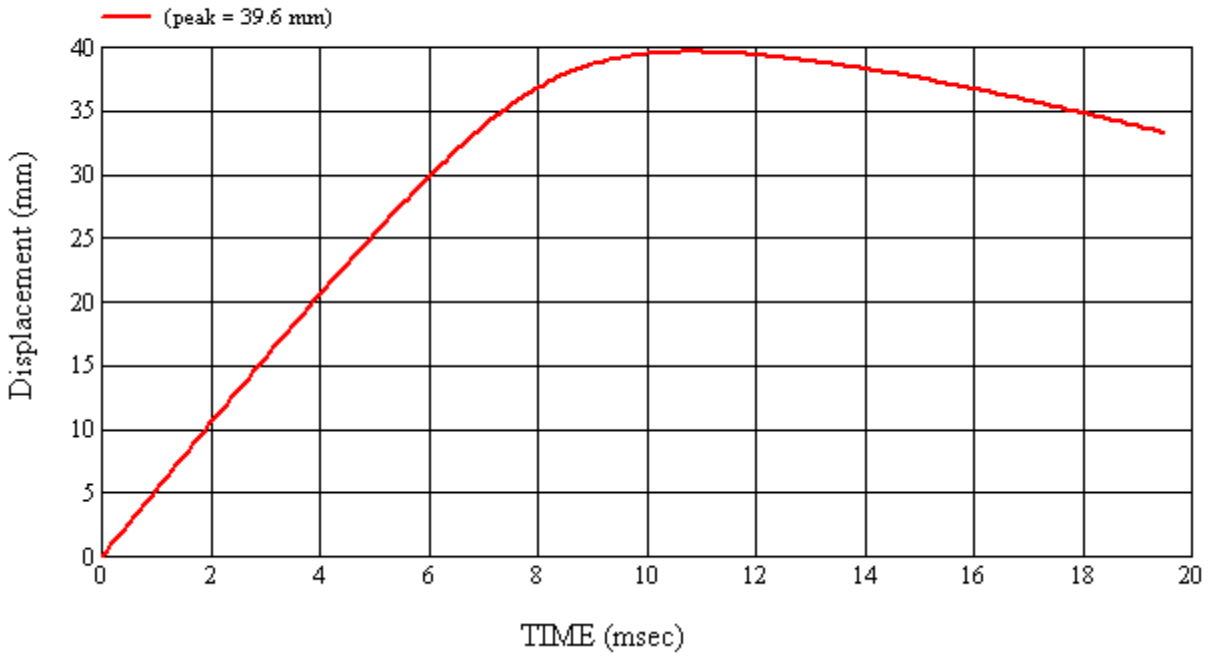



(peak = 131.0 G)
Head X (G)
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

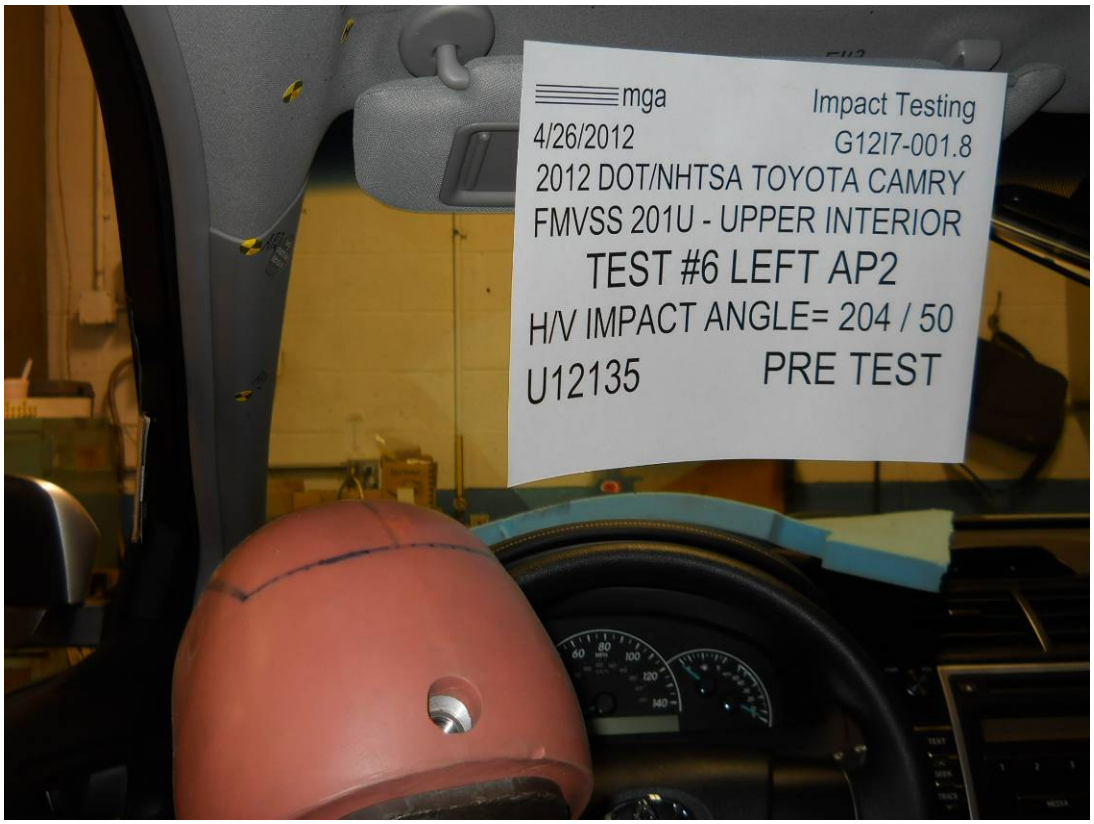

(peak = 3.2 G)
Head Y (G)
3
2
1
0
-1
-2
-3
-4
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

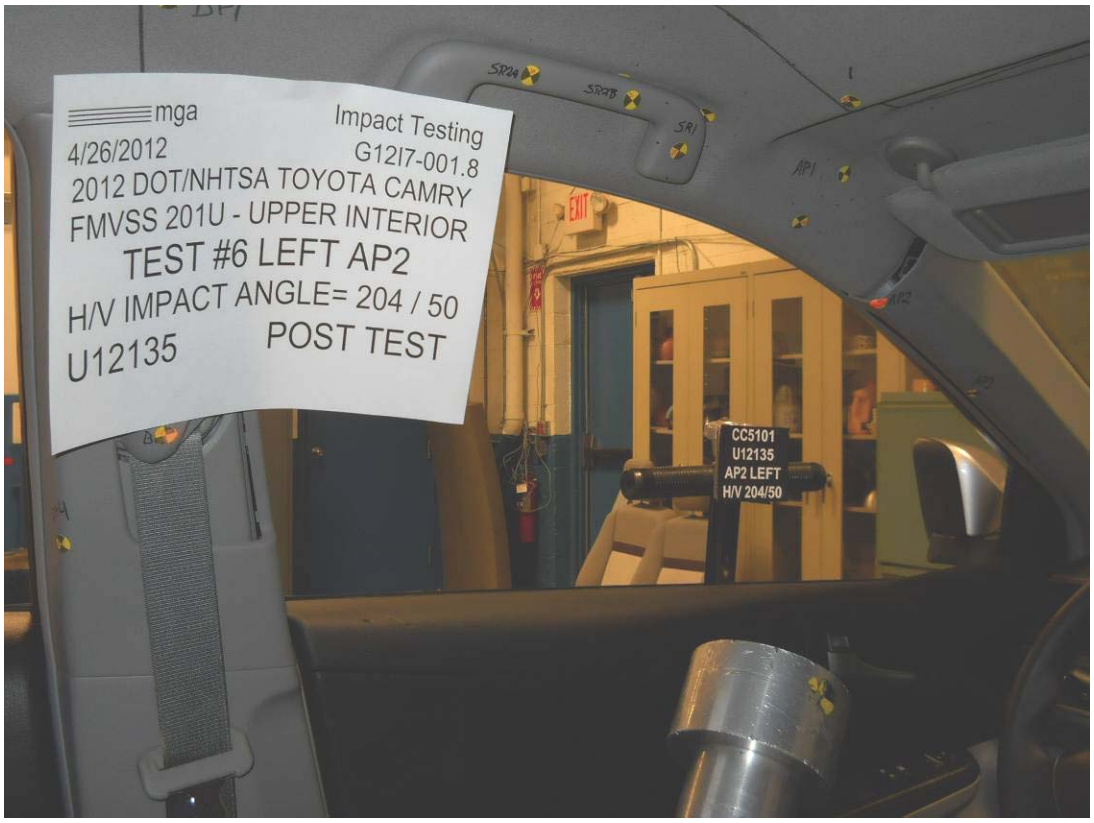

(peak = 29.3 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

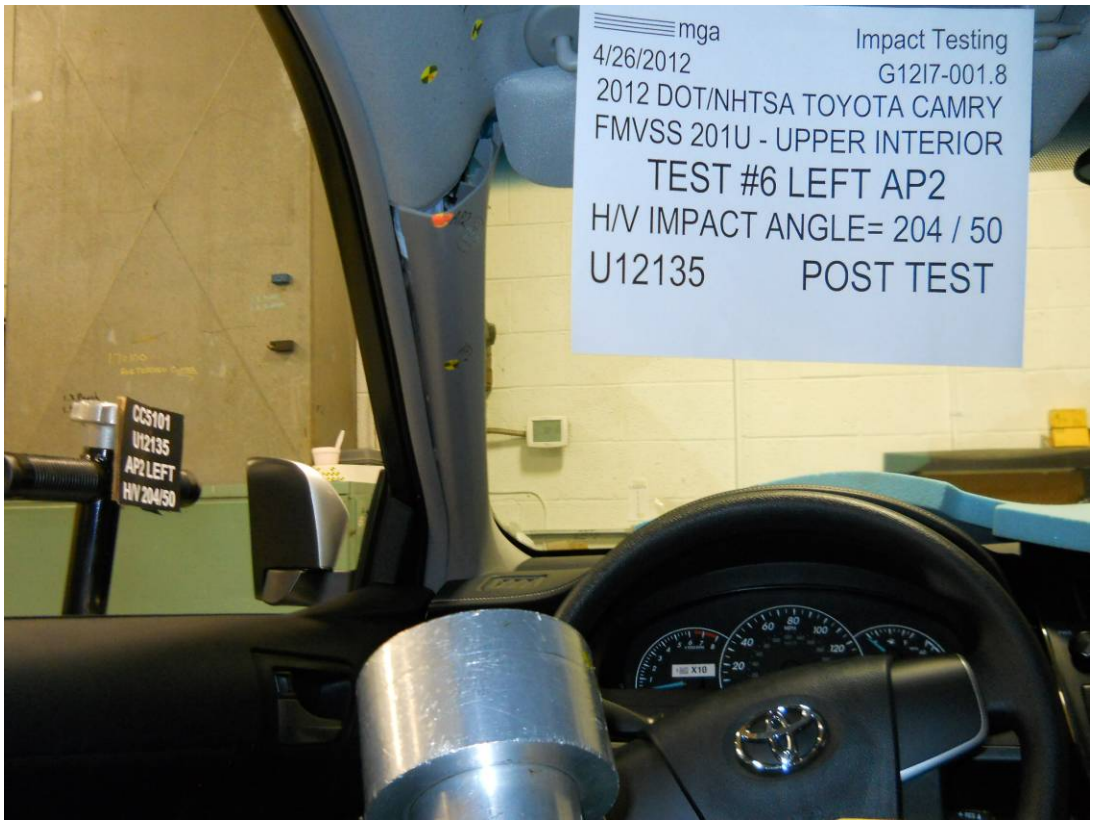

(peak = 19.1 kph)
Impact Velocity: 18.95 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


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


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT AP2
H/V IMPACT ANGLE= 204 / 50
U12135
PRE TEST
CC5101
U12135
AP2 LEFT
H/V 204/50


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT AP2
H/V IMPACT ANGLE= 204 / 50
U12135
PRE TEST


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT AP2
H/V IMPACT ANGLE= 204 / 50
U12135
POST TEST
CC5101
U12135
AP2 LEFT
H/V 204/50


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT AP2
H/V IMPACT ANGLE= 204 / 50
U12135
POST TEST
CC5101
U12135
AP2 LEFT
H/V 204/50


AP2
SRS
CURTAIN
AIRBAG
AP3


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT AP2
H/V IMPACT ANGLE= 204 / 50
U12135
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#6

Target (Vehicle Side): AP2Left

Temperature:22.1C

MGA Test Reference No.:U12135

Humidity:41.3%

Approach Horizontal Angles:204º

Time of Test:2:30:20 PM

Approach Vertical Angles:50º

FMH Serial No:[038]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
377	280	7.5	18.7	12	0 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-96.7	0.87	0.87
Y	6	J36197	110.3	0.97	0.97
Z	7	J36353	100.2	0.96	0.96

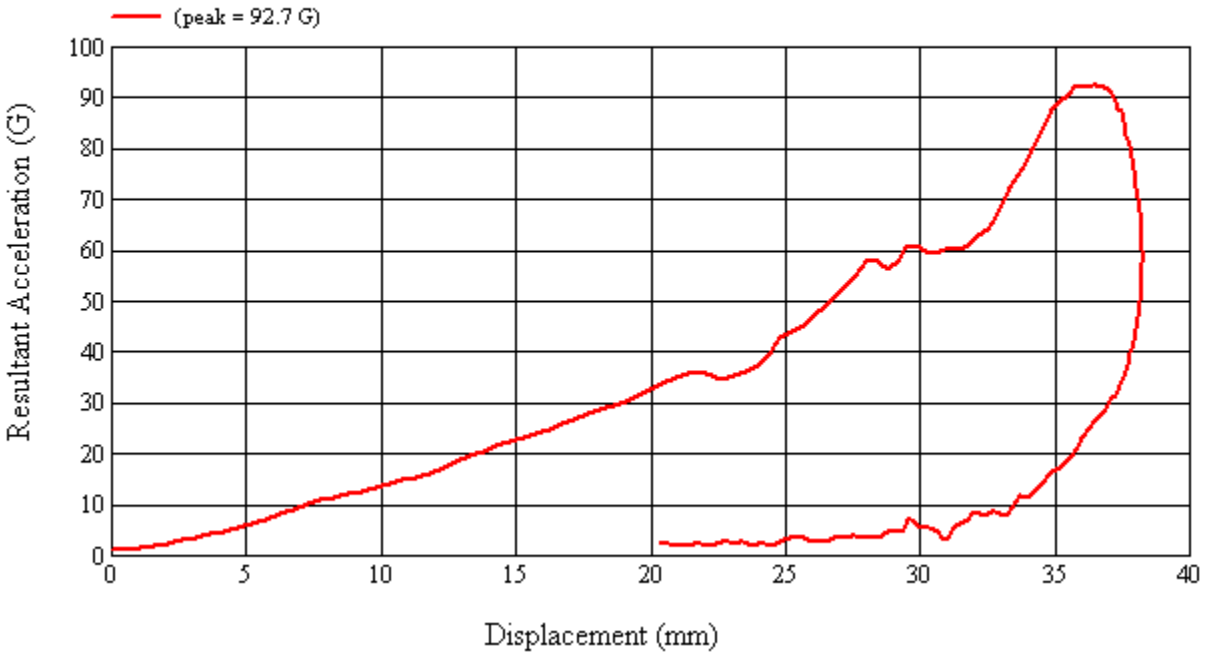
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

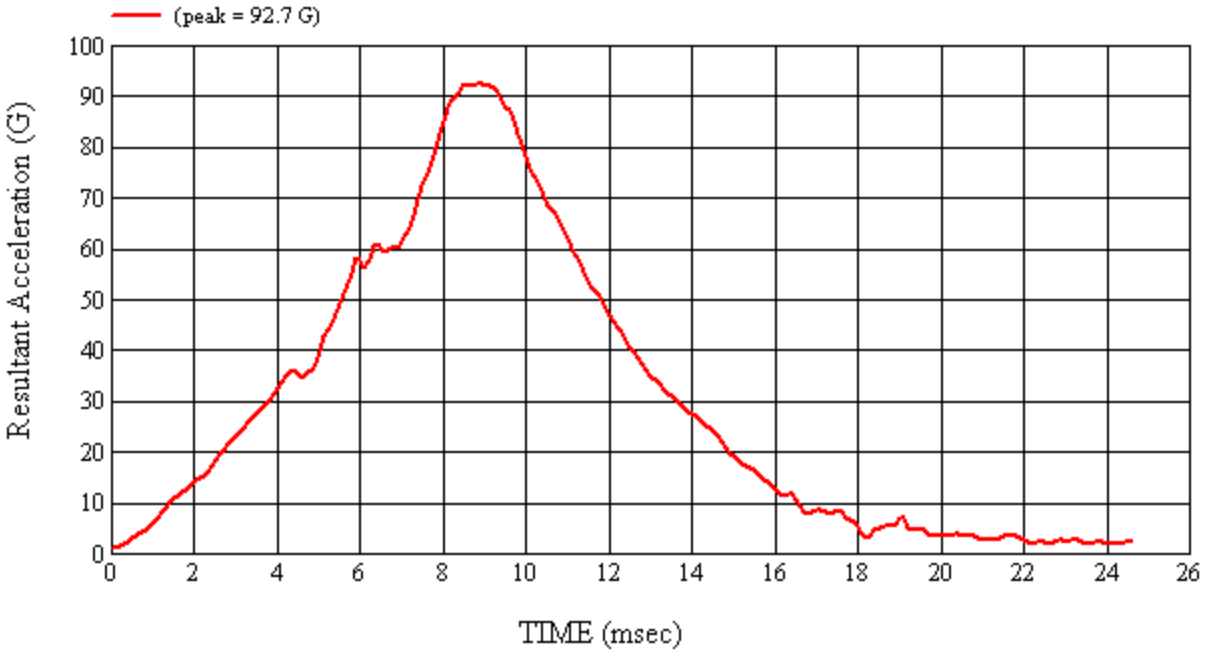
Dislodged pillar trim

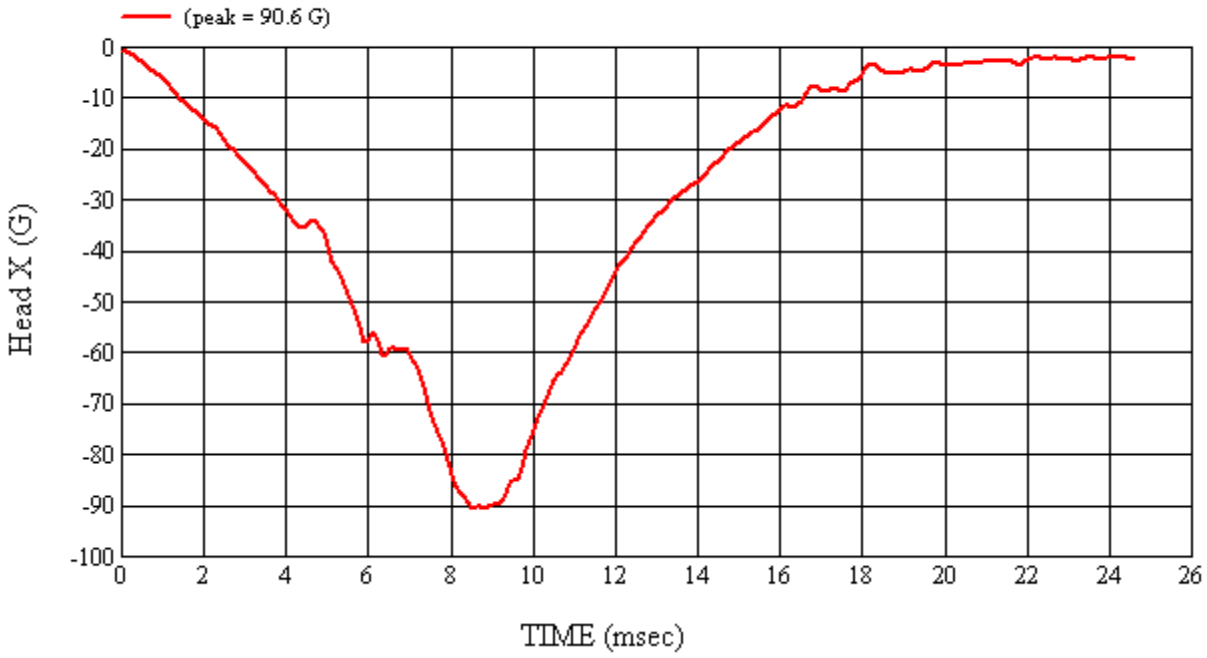
Recorded By: Ken D. McLean Approved By*: Helen A. Kalata Date: 4/26/2012

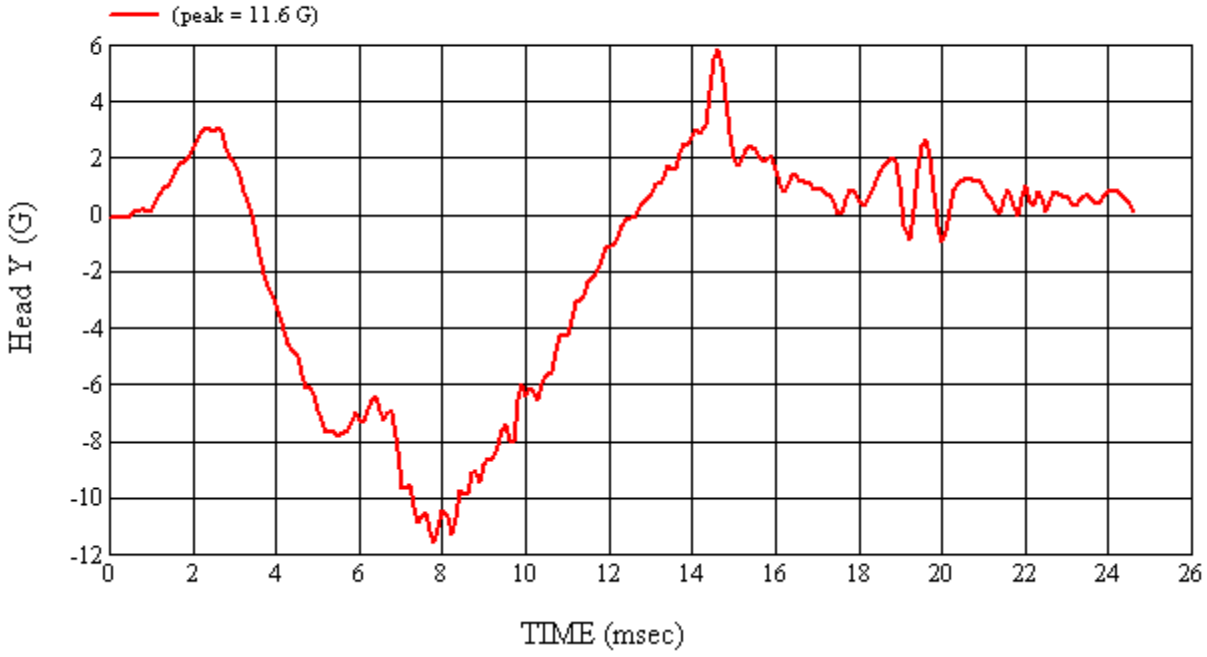
*Only necessary for NHTSA (Government) Compliance testing.

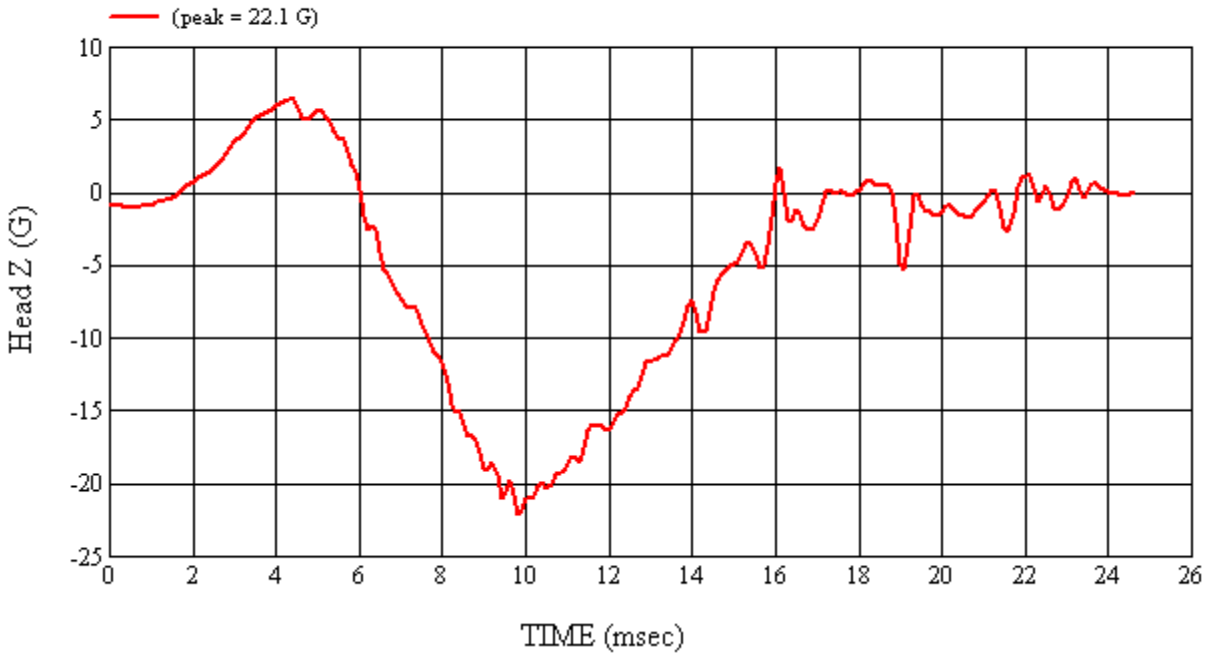
MGA Test #: U12135 Target Location: AP2, Left Side Test Date: 4/26/2012

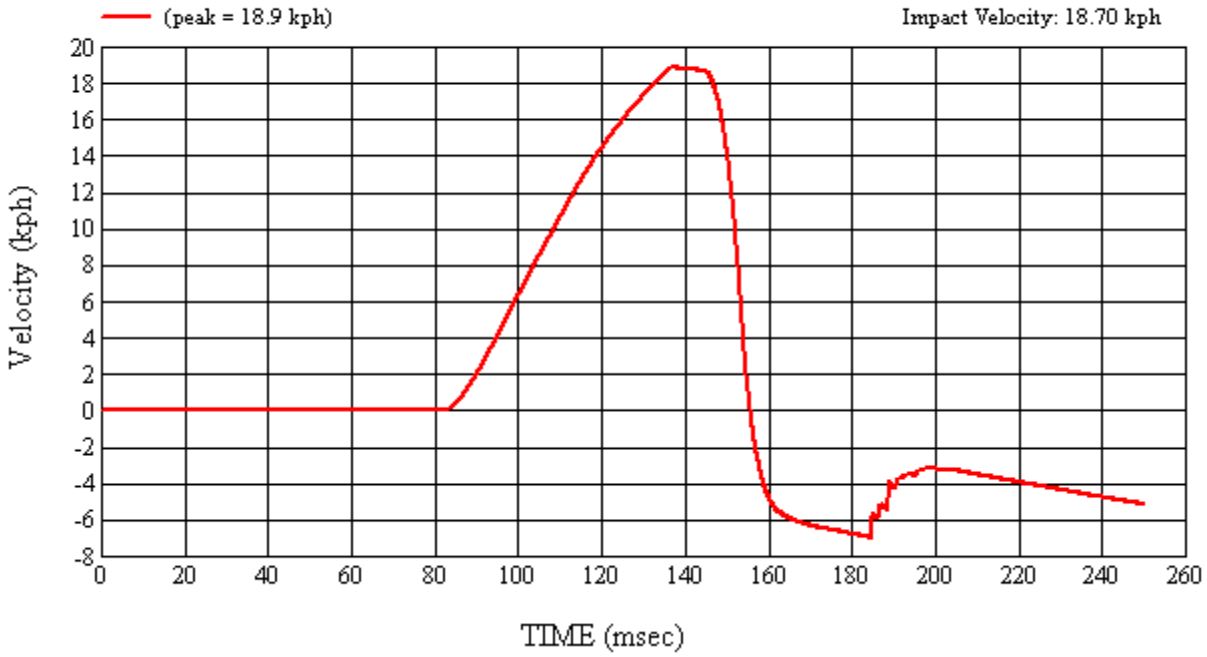


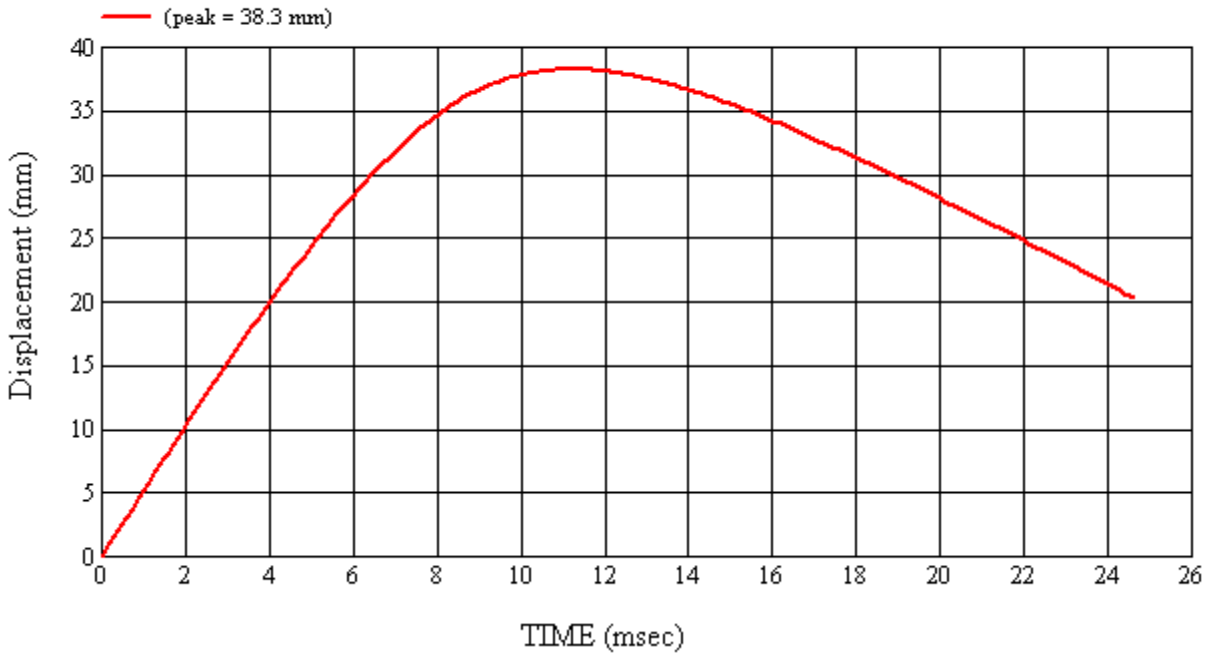


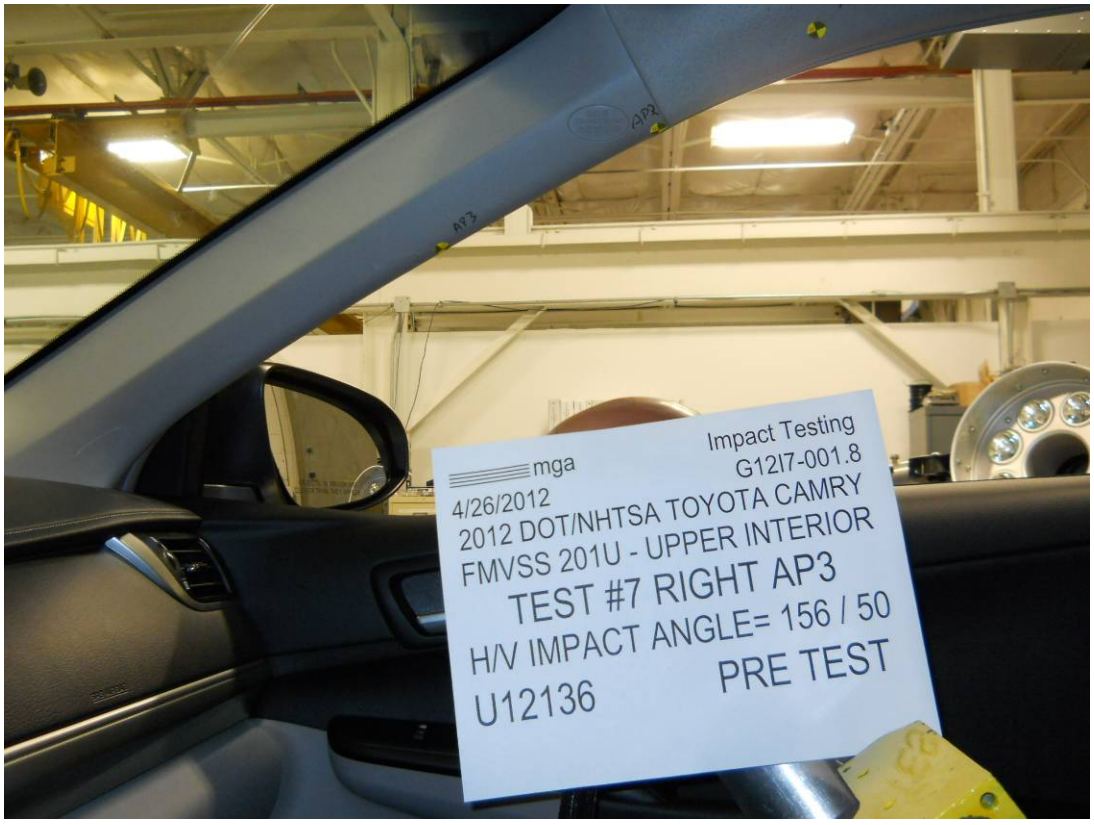

(peak = 90.6 G)
Head X (G)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)

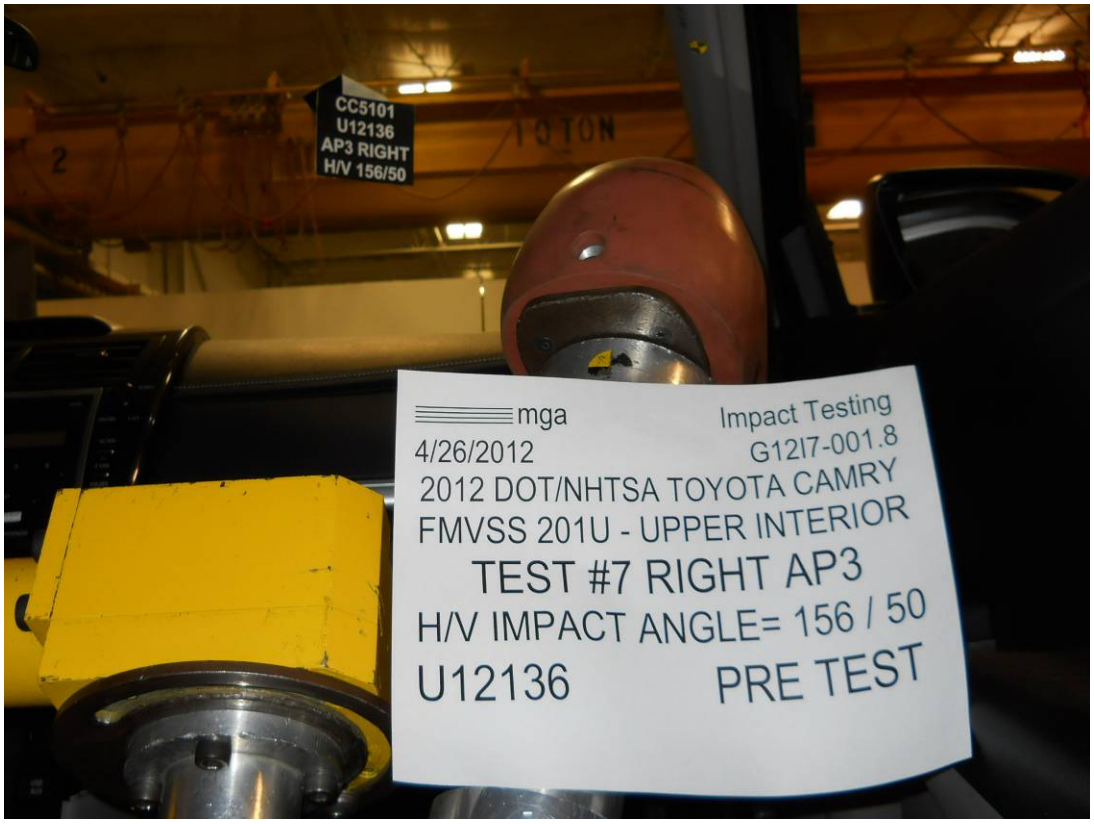

(peak = 11.6 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
-10
-12
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)

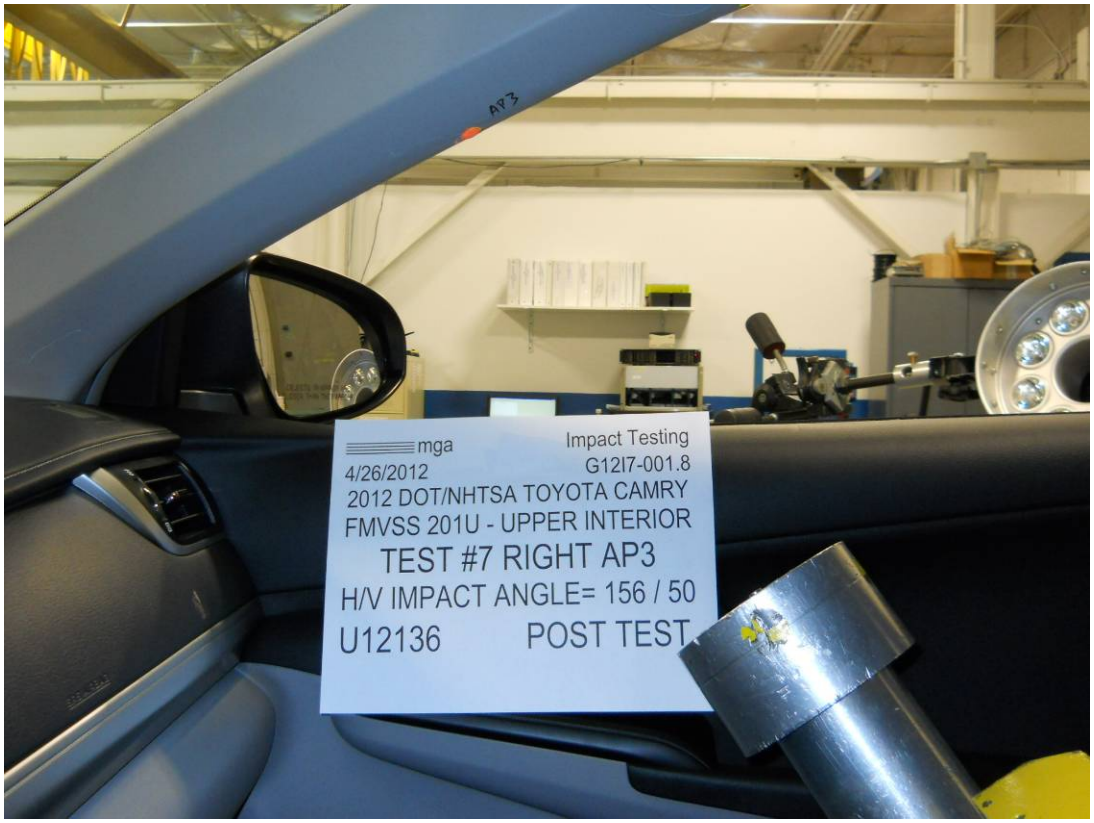

(peak = 22.1 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 18.9 kph)
Impact Velocity: 18.70 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 = 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)

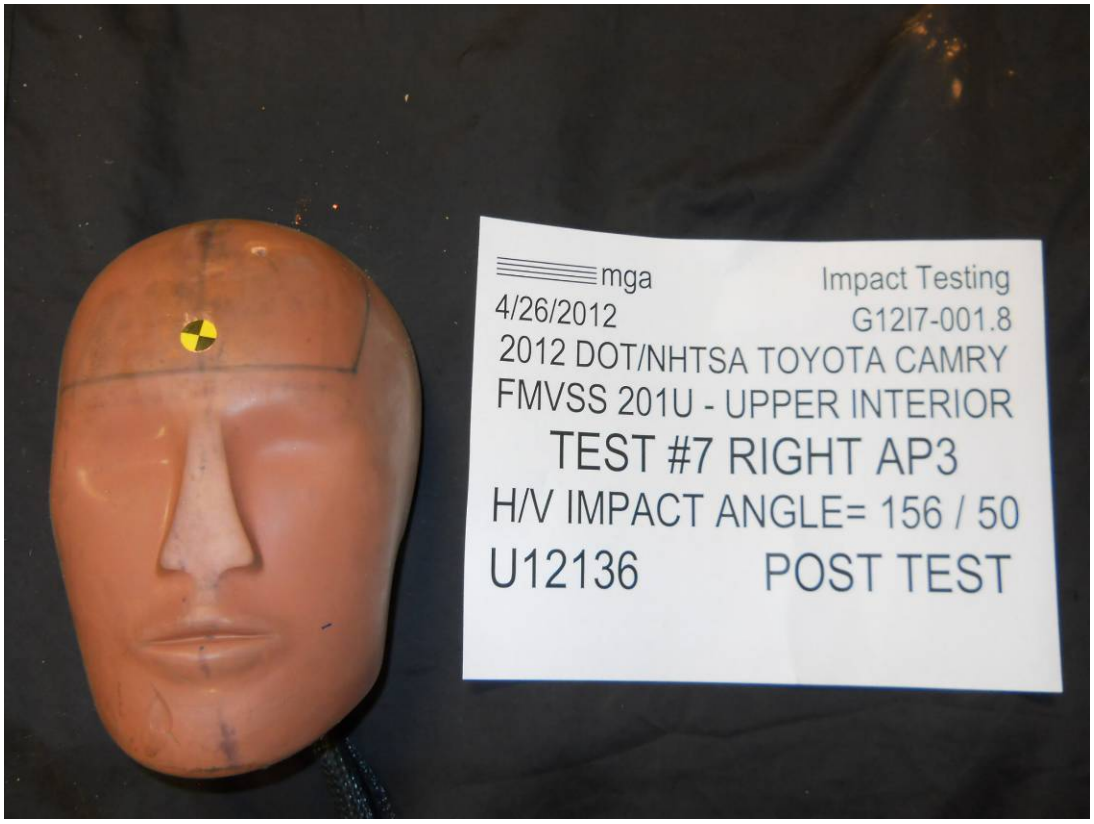

mga
Impact Testing
G12I7-001.8
4/26/2012
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP3
H/V IMPACT ANGLE= 156 / 50
U12136
PRE TEST


CC5101
U12136
AP3 RIGHT
H/V 156/50
mga
Impact Testing
G12I7-001.8
4/26/2012
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP3
H/V IMPACT ANGLE= 156 / 50
U12136
PRE TEST


AP3
mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP3
H/V IMPACT ANGLE= 156 / 50
U12136
POST TEST


CC5101
U12136
AP3 RIGHT
H/V 156/50
mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP3
H/V IMPACT ANGLE= 156 / 50
U12136
POST TEST


AP3
AP3


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP3
H/V IMPACT ANGLE= 156 / 50
U12136
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#7

Target (Vehicle Side): AP3Right

Temperature:22.2C

MGA Test Reference No.:U12136

Humidity:39.1%

Approach Horizontal Angles:156º

Time of Test:4:12:15 PM

Approach Vertical Angles:50º

FMH Serial No:[035]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
392	300	6.2	18.8	13	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	-96.8	0.87	0.87
Y	6	J22664	95.5	0.97	0.97
Z	7	J35924	94.1	0.96	0.96

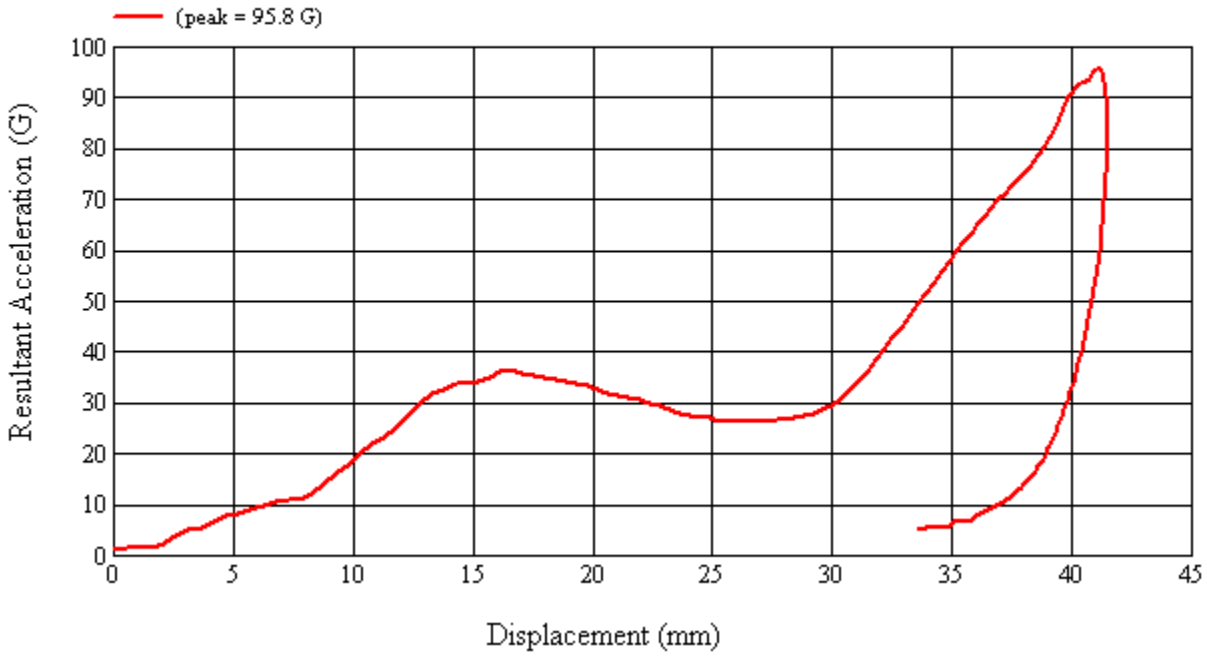
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

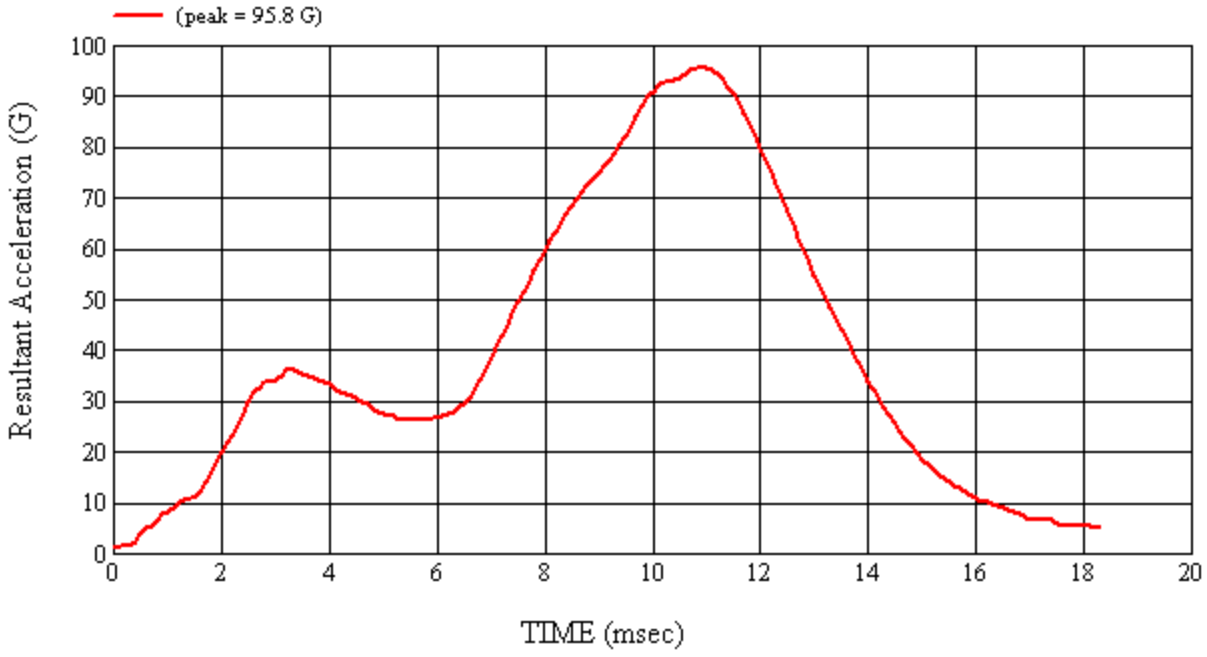
Dislodged pillar trim

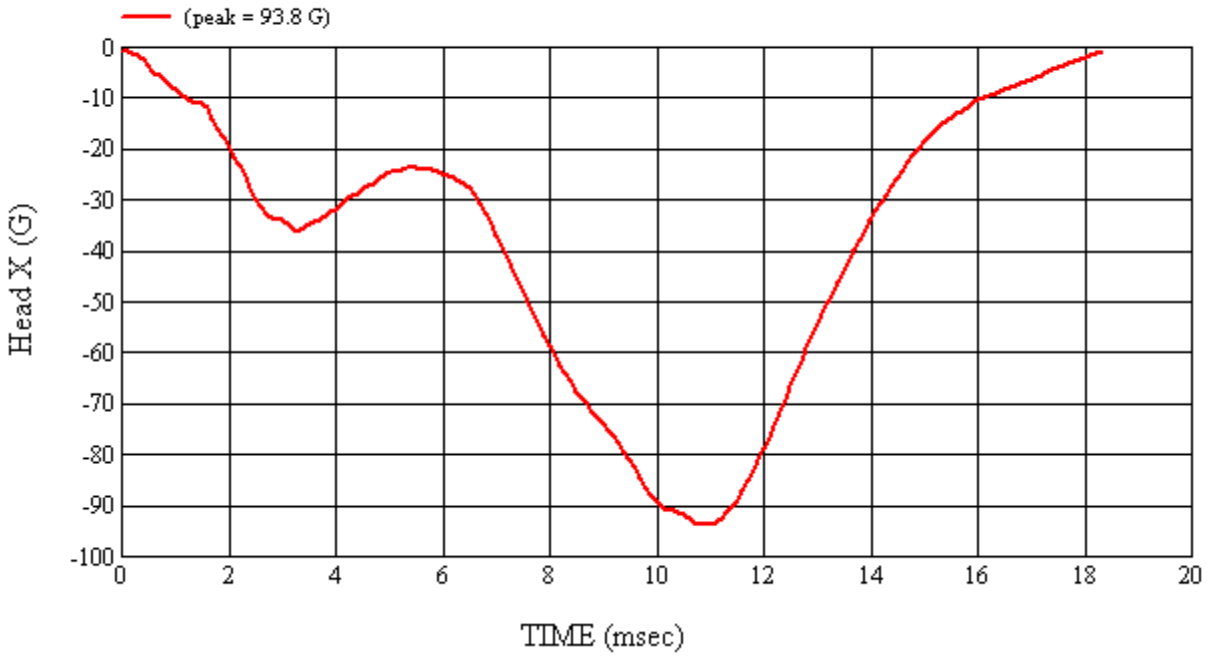
Recorded By: [signature] Approved By*: [signature] Date: 4/26/2012

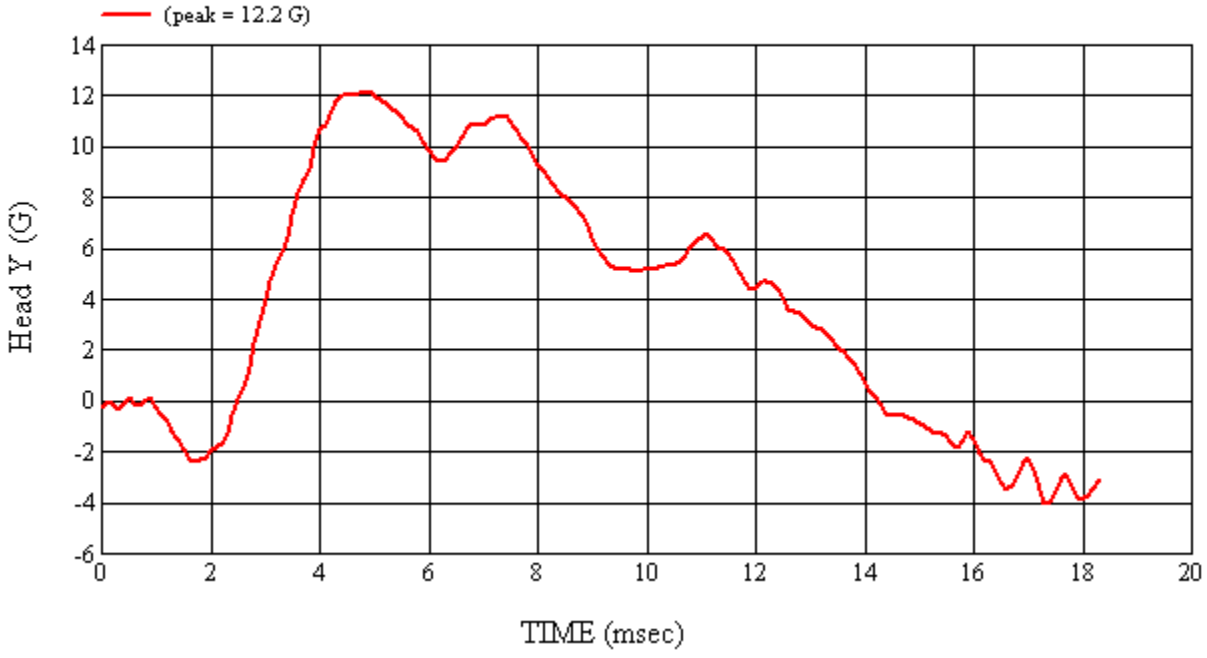
*Only necessary for NHTSA (Government) Compliance testing.

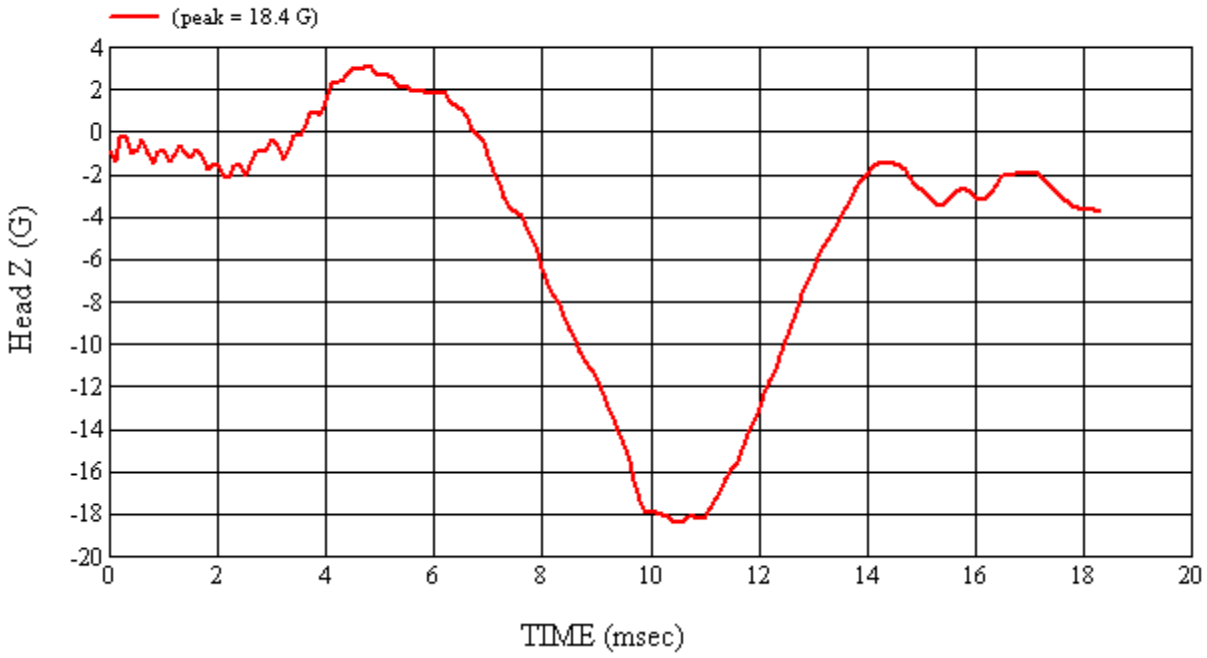
MGA Test #: U12136 Target Location: AP3, Right Side Test Date: 4/26/2012

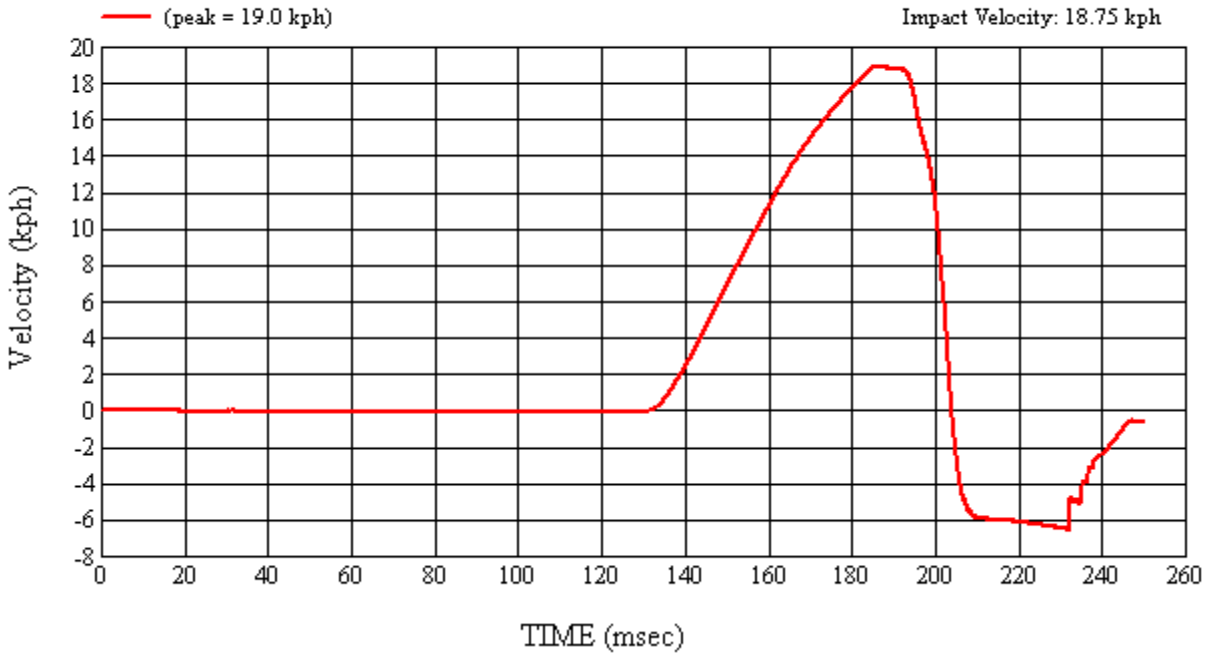


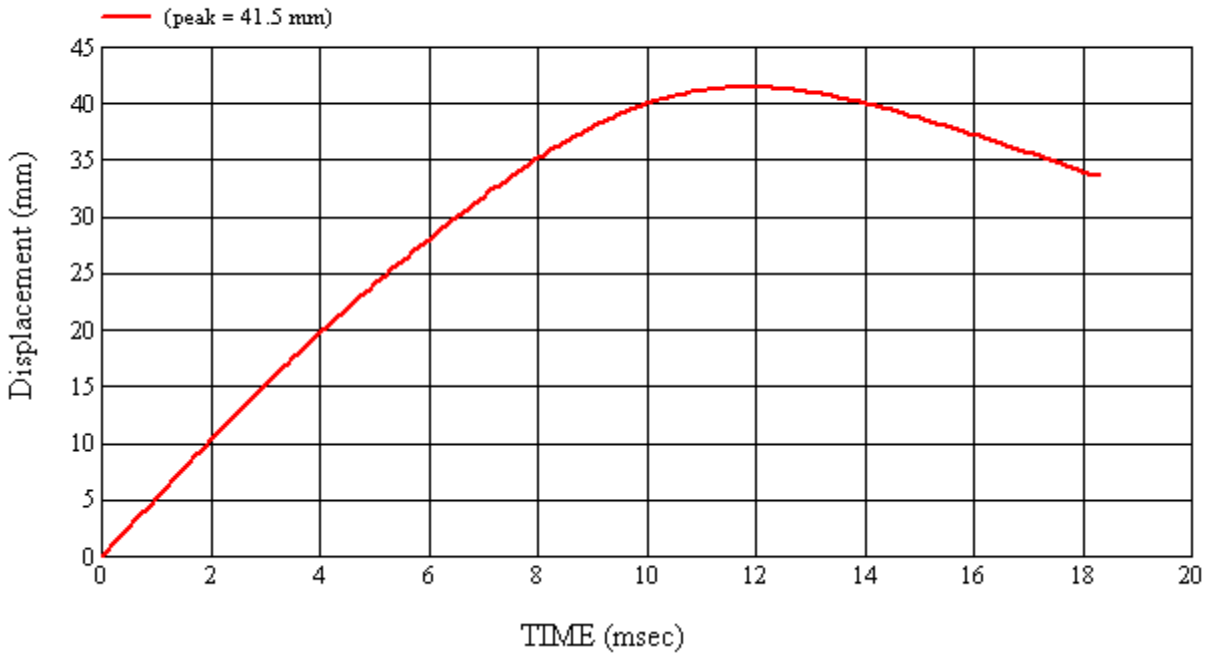


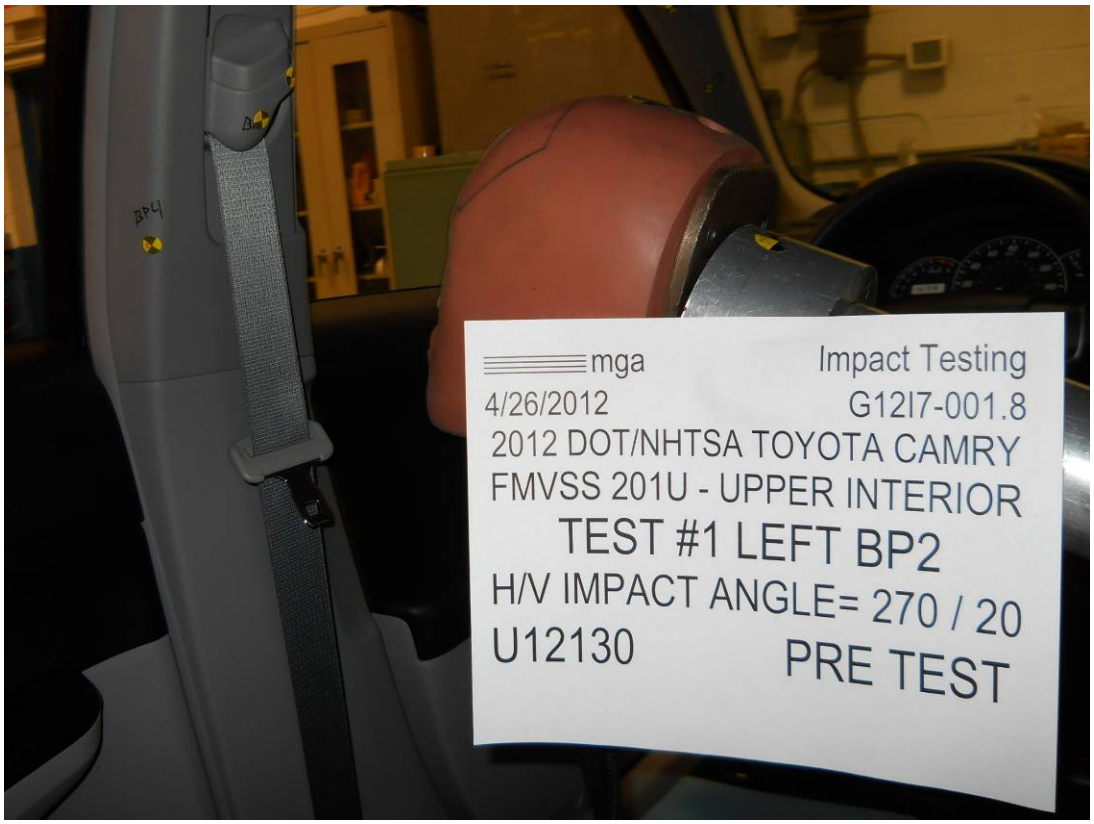

(peak = 93.8 G)
Head X (G)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

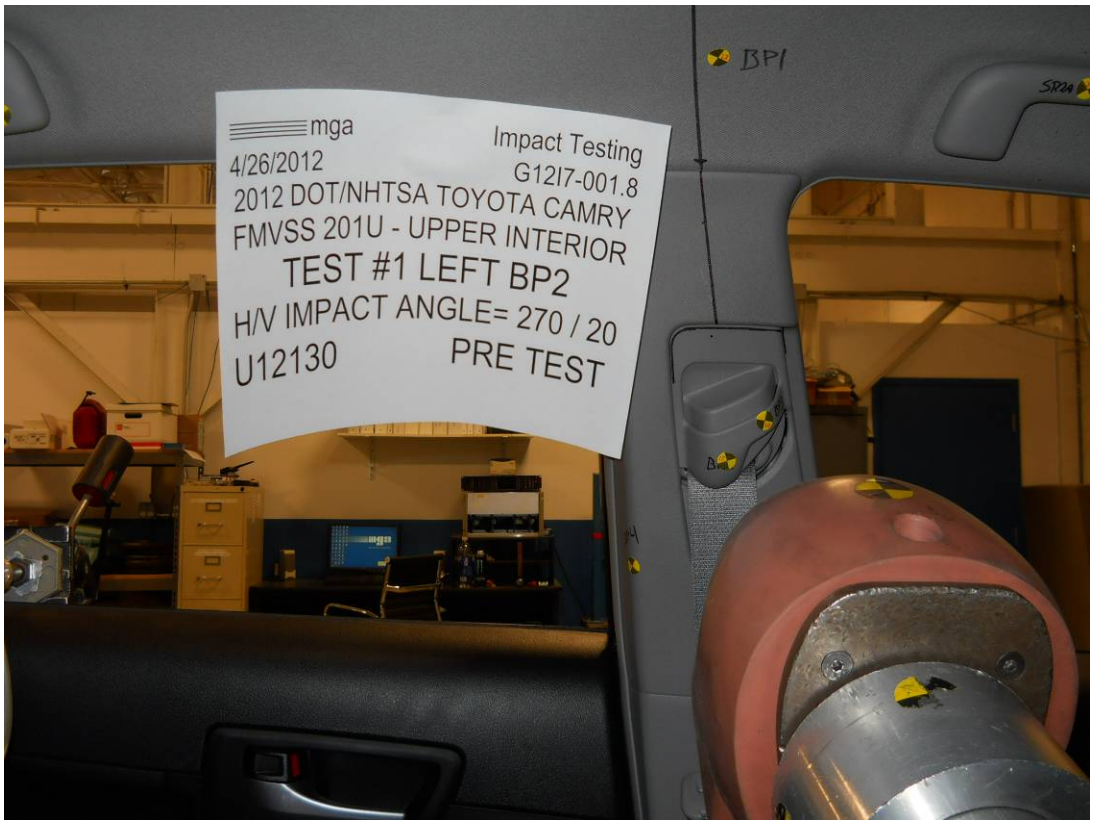

(peak = 12.2 G)
Head Y (G)
14
12
10
8
6
4
2
0
-2
-4
-6
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

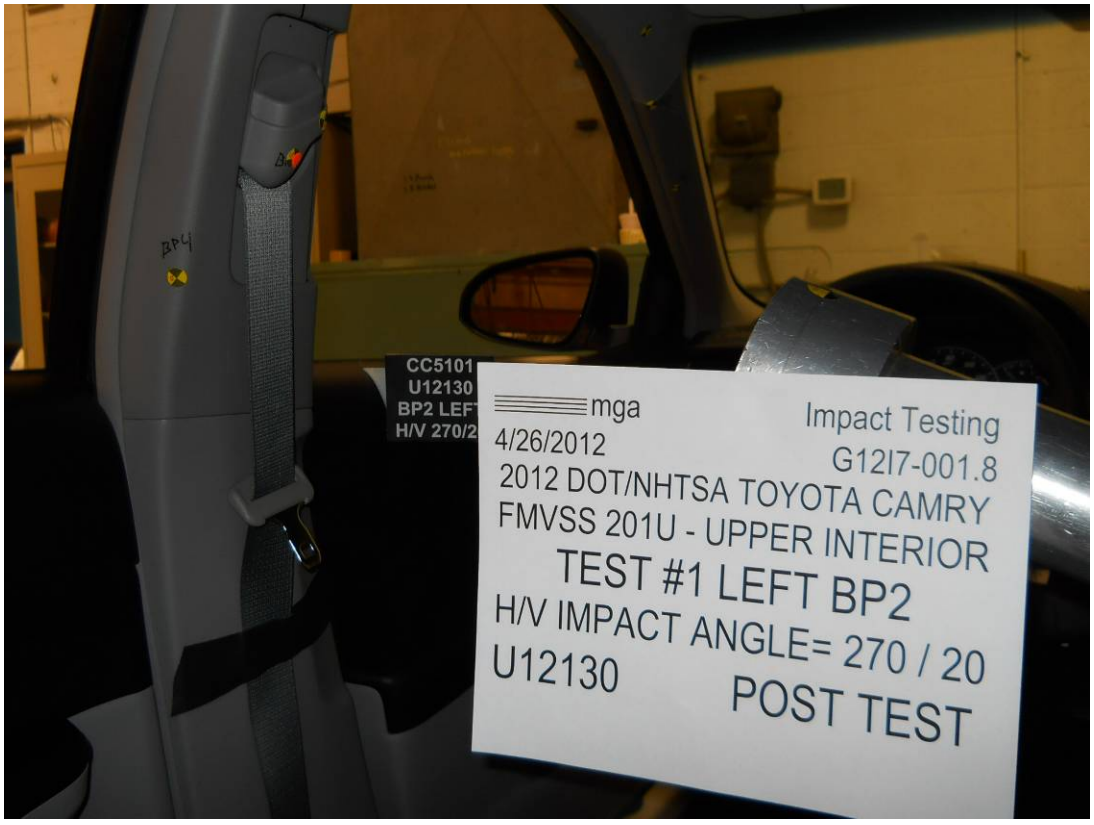

(peak = 18.4 G)
Head Z (G)
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 19.0 kph)
Impact Velocity: 18.75 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)

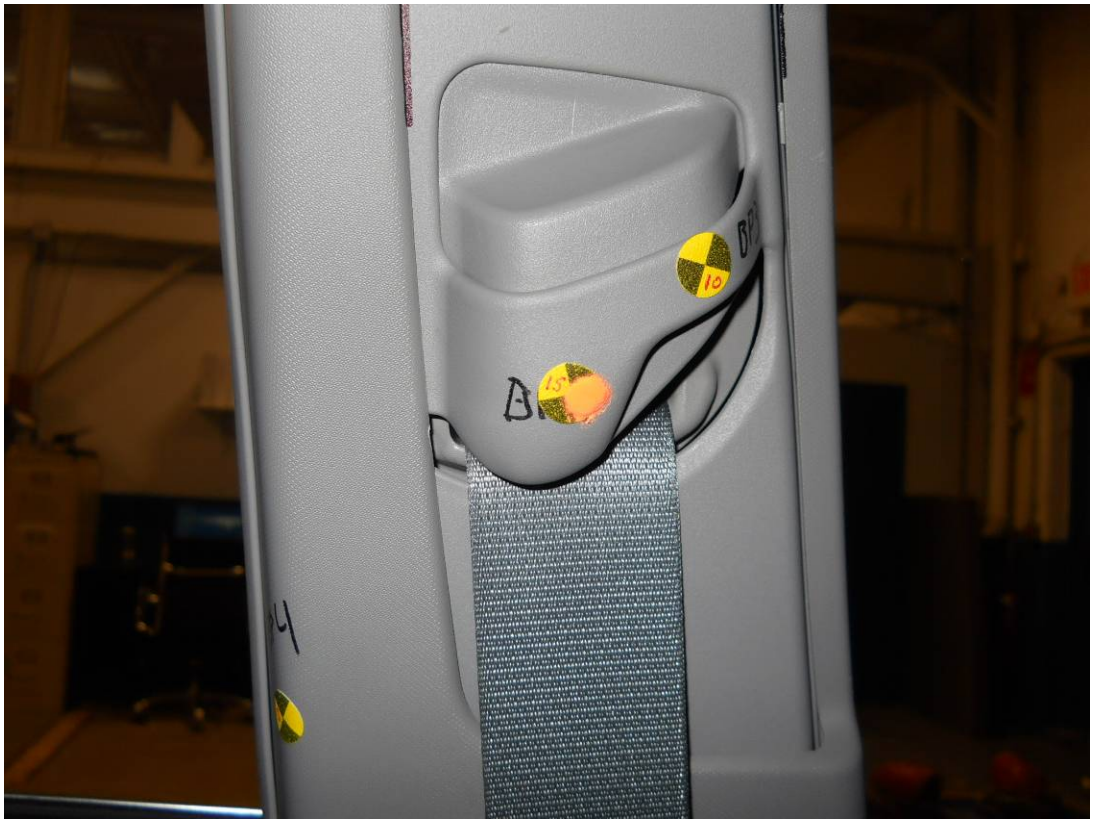

(peak = 41.5 mm)
Displacement (mm)
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT BP2
H/V IMPACT ANGLE= 270 / 20
U12130
PRE TEST


BP1
mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT BP2
H/V IMPACT ANGLE= 270 / 20
U12130
PRE TEST


CC5101
U12130
mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT BP2
H/V IMPACT ANGLE= 270 / 20
U12130
POST TEST


4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT BP2
H/V IMPACT ANGLE= 270 / 20
U12130
POST TEST




mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT BP2
H/V IMPACT ANGLE= 270 / 20
U12130
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#1

Target (Vehicle Side): BP2Left

Temperature:21.7C

MGA Test Reference No.:U12130

Humidity:39.8%

Approach Horizontal Angles:270º

Time of Test:9:54:29 AM

Approach Vertical Angles:20º

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
654	646	9.4	23.8	7	3 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-96.8	0.87	0.87
Y	6	J22664	95.5	0.97	0.97
Z	7	J35924	94.1	0.96	0.96

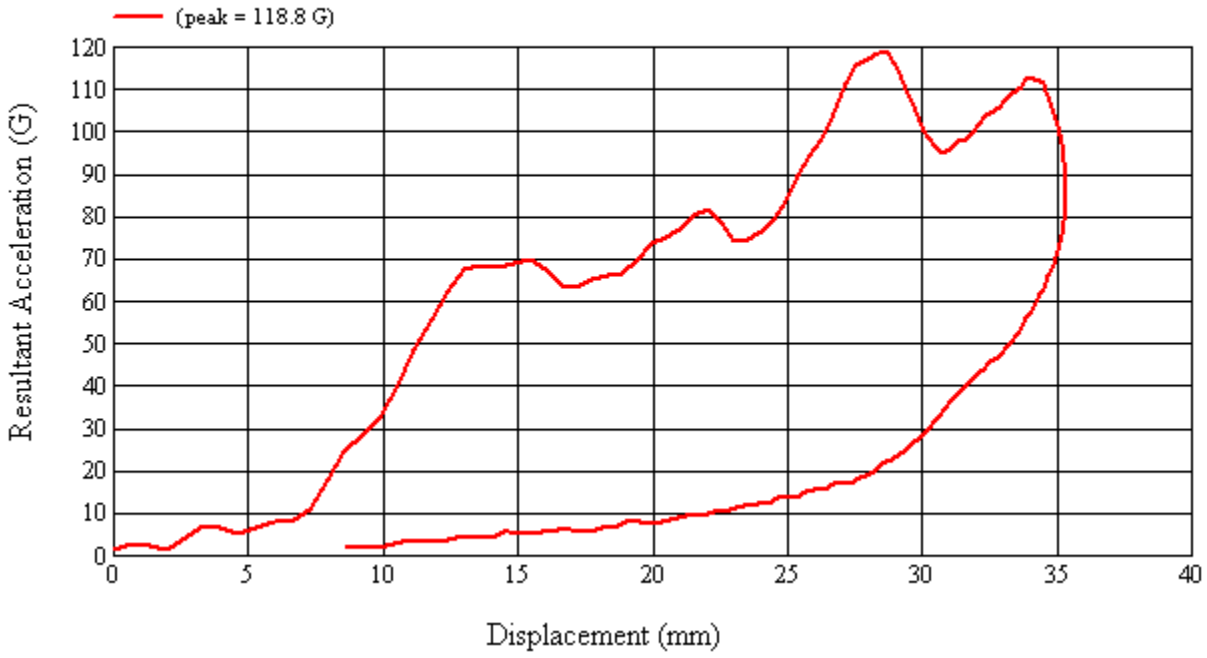
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

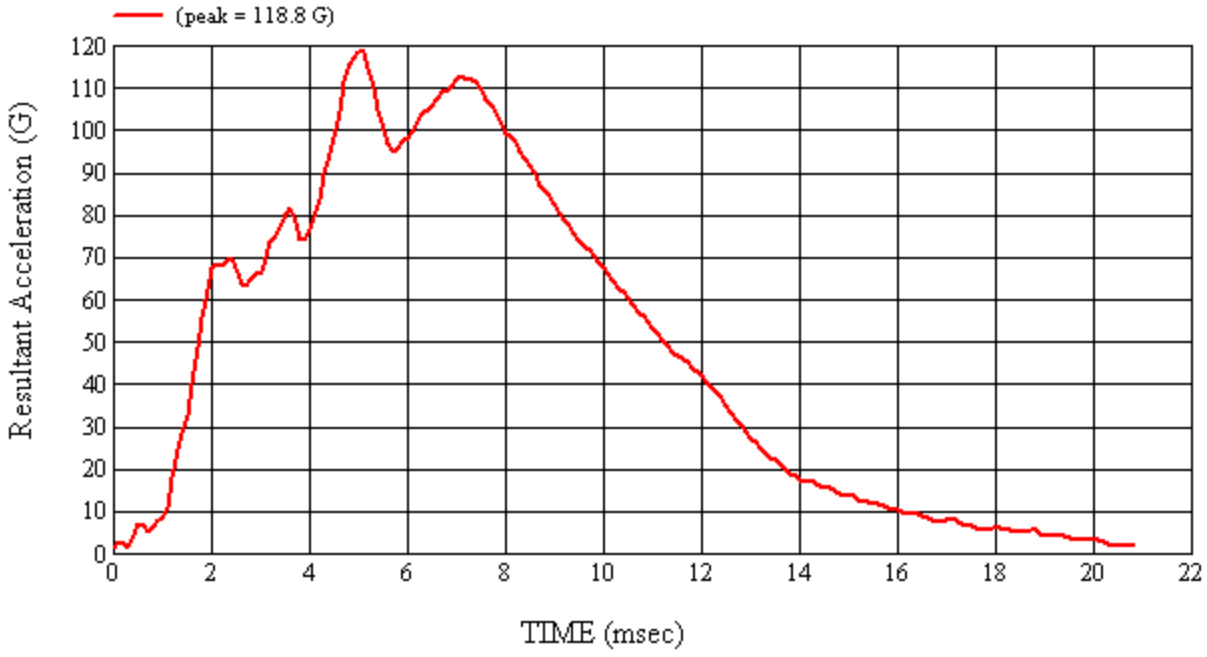
Non functional seat belt adjuster anchorage

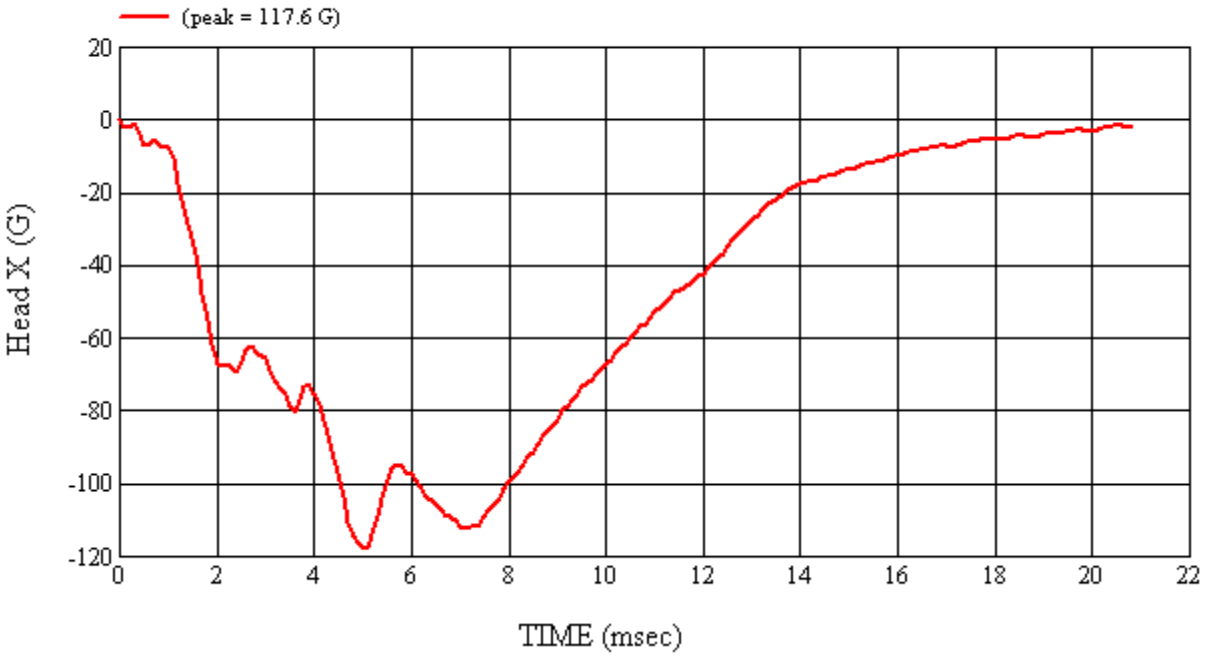
Recorded By: Ken D. McLean Approved By*: Helen A. Kalata Date: 4/26/2012

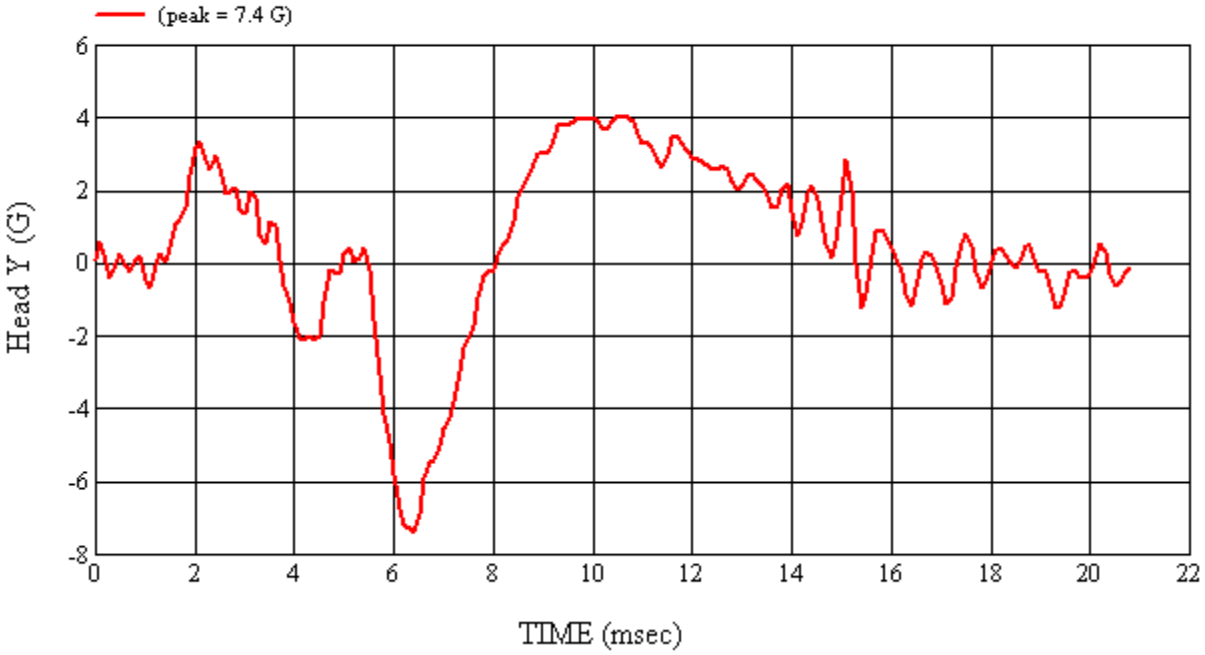
*Only necessary for NHTSA (Government) Compliance testing.

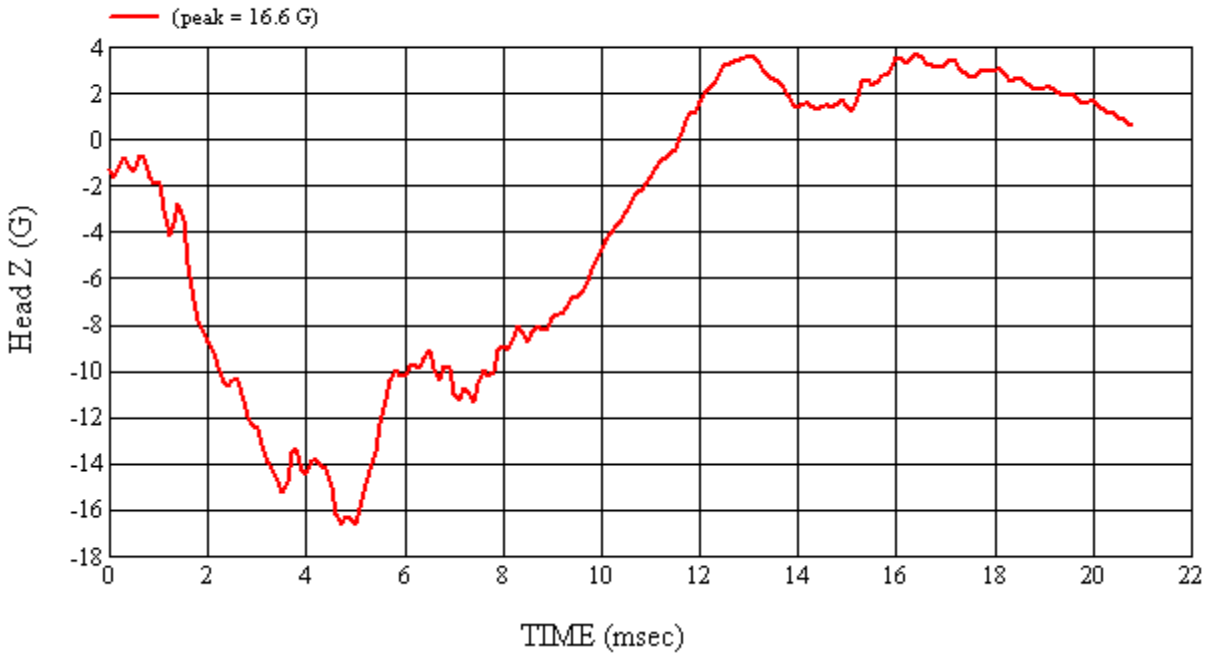
MGA Test #: U12130 Target Location: BP2, Left Side Test Date: 4/26/2012

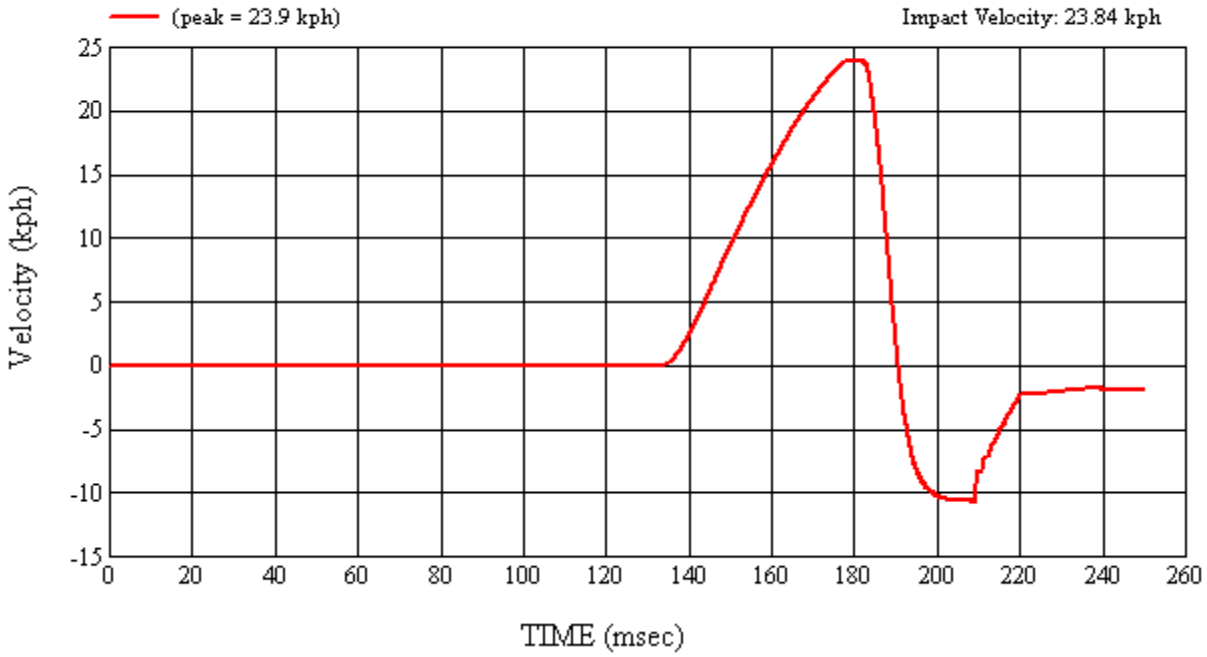


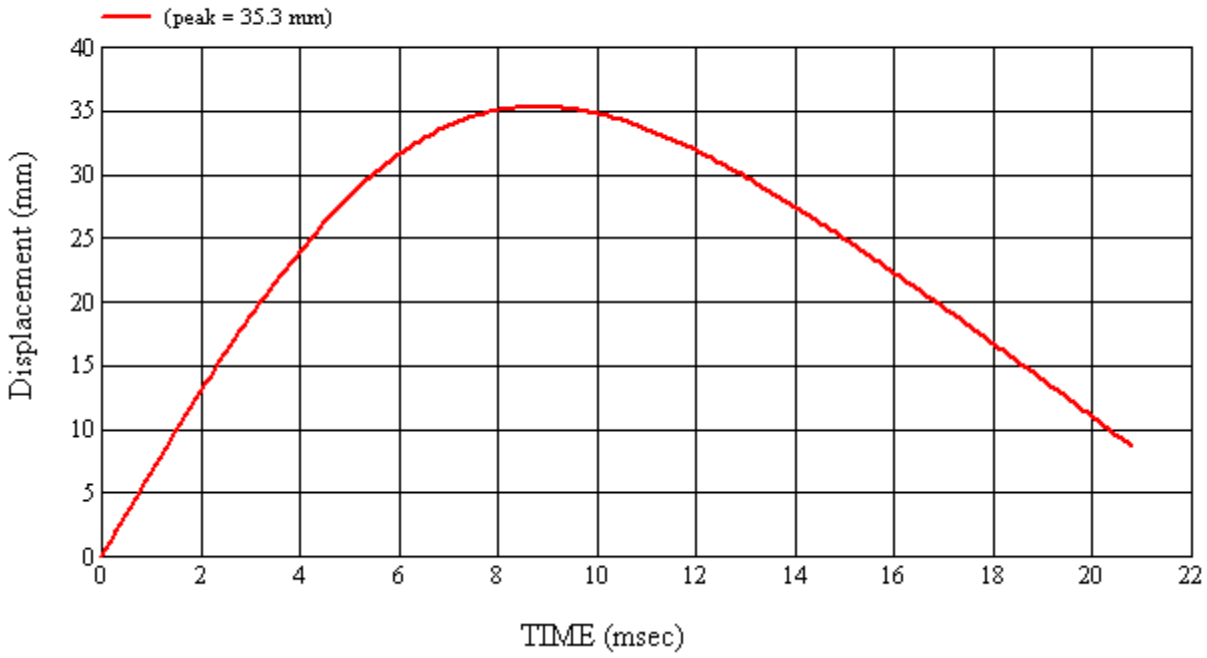


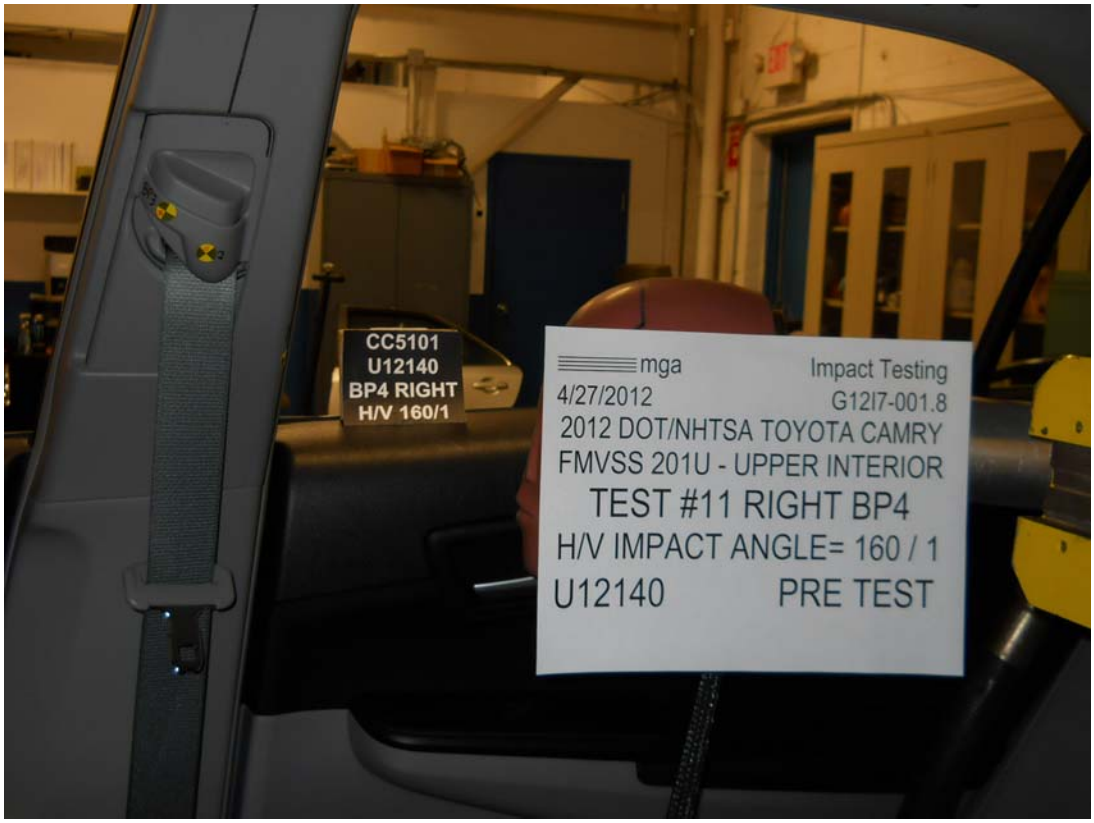

(peak = 117.6 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

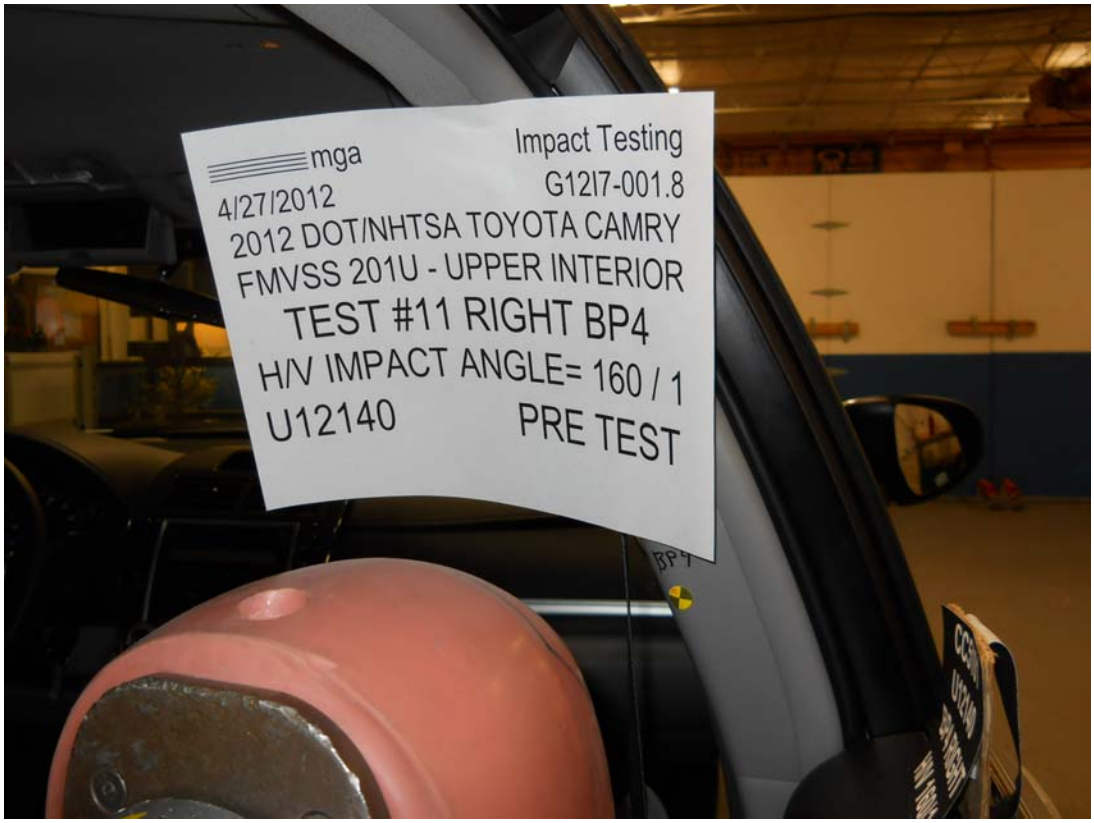

(peak = 7.4 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 16.6 G)
Head Z (G)
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

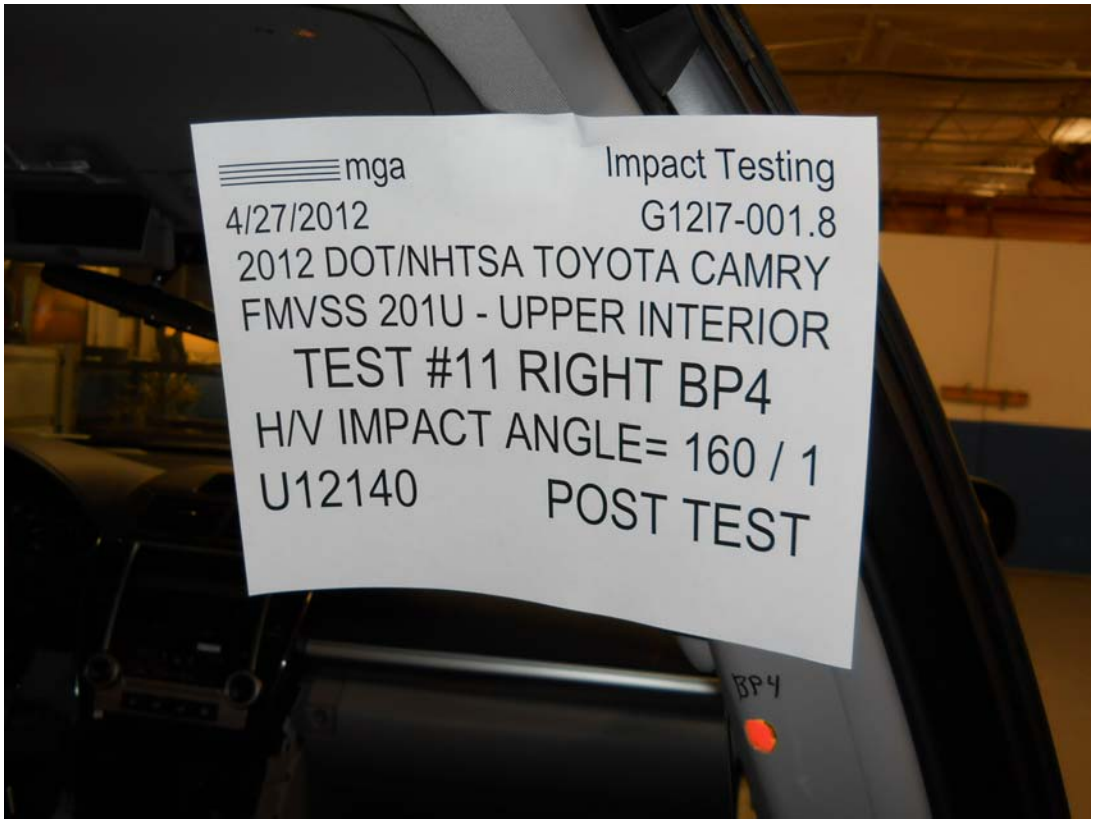

(peak = 23.9 kph)
Impact Velocity: 23.84 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 35.3 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


CC5101
U12140
BP4 RIGHT
H/V 160/1
mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT BP4
H/V IMPACT ANGLE= 160 / 1
U12140
PRE TEST


mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT BP4
H/V IMPACT ANGLE= 160 / 1
U12140
PRE TEST


mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT BP4
H/V IMPACT ANGLE= 160 / 1
U12140
POST TEST


mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT BP4
H/V IMPACT ANGLE= 160 / 1
U12140
POST TEST
BP4


BP4


mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT BP4
H/V IMPACT ANGLE= 160 / 1
U12140
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#11

Target (Vehicle Side): BP4Right

Temperature:21.1C

MGA Test Reference No.:U12140

Humidity:23.0%

Approach Horizontal Angles:160º

Time of Test:10:15:09 AM

Approach Vertical Angles:1º

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
899	971	2.4	23.6	12	11 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-96.7	0.87	0.86
Y	6	J36197	110.3	0.97	0.97
Z	7	J36353	100.2	0.96	0.96

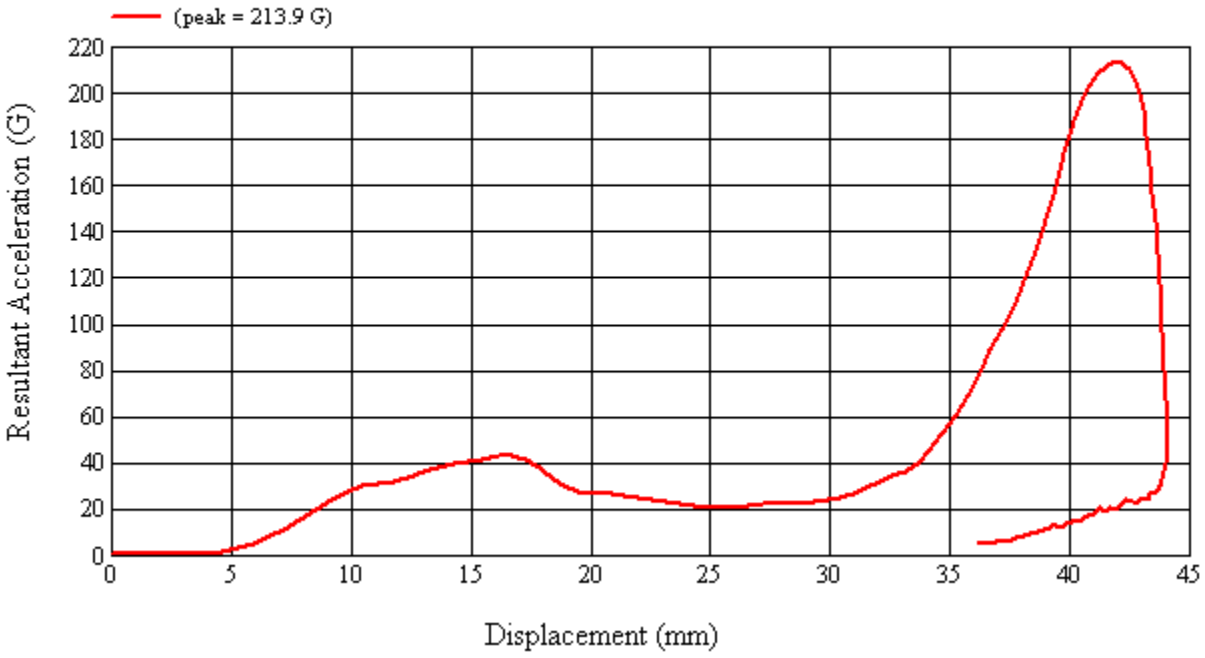
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

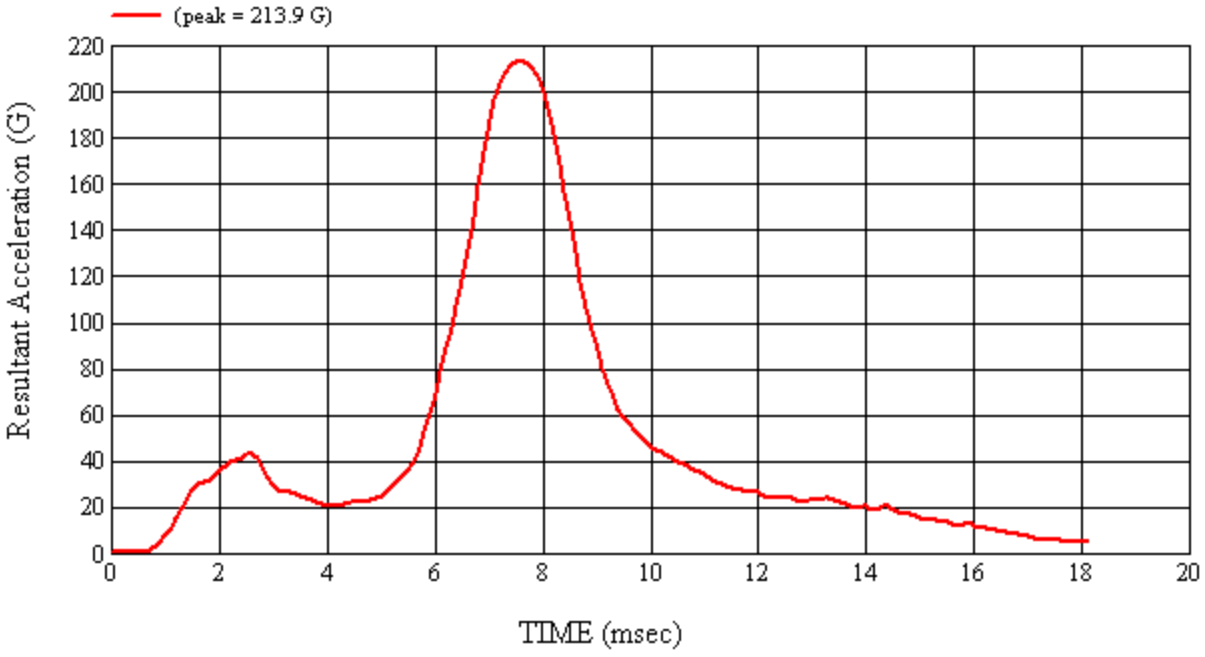
Stress marks on pillar trim

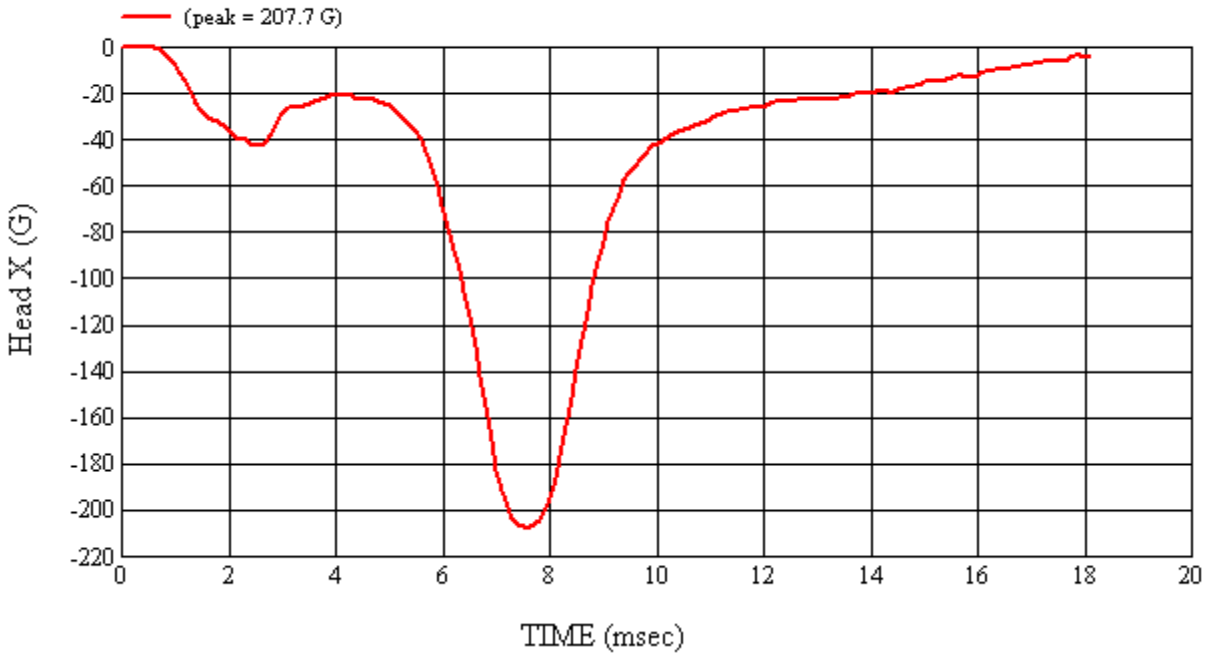
Recorded By: Kevin D. McKenna Approved By*: Helen A. Kaleta Date: 4/27/2012

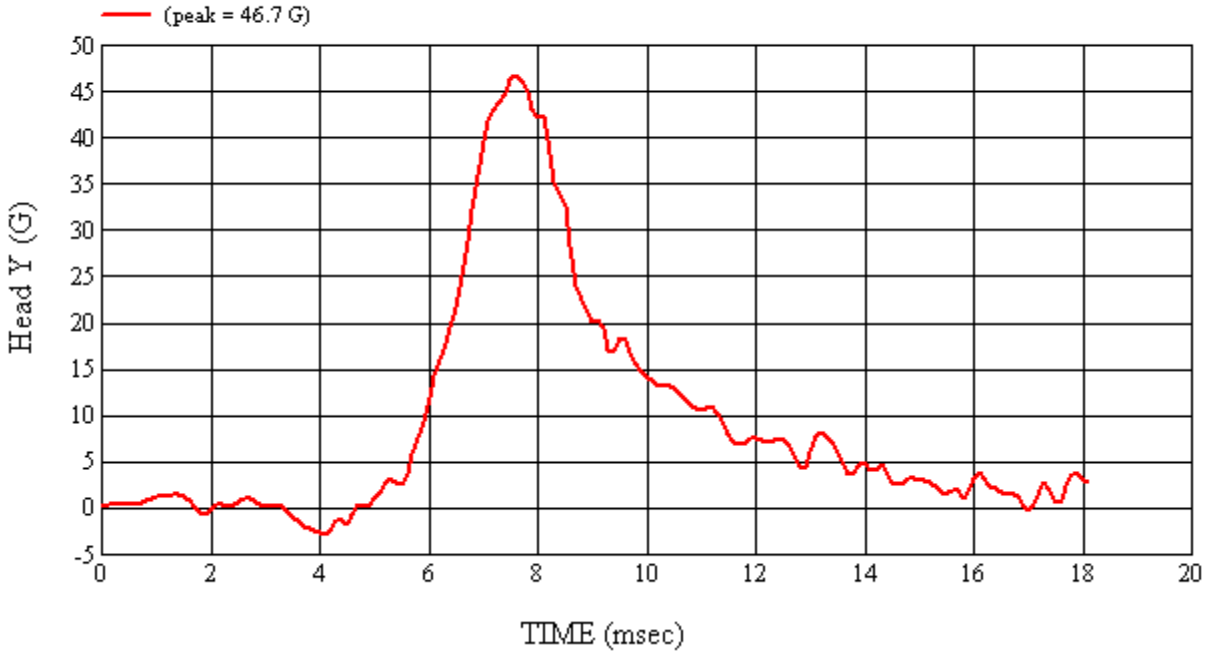
*Only necessary for NHTSA (Government) Compliance testing.

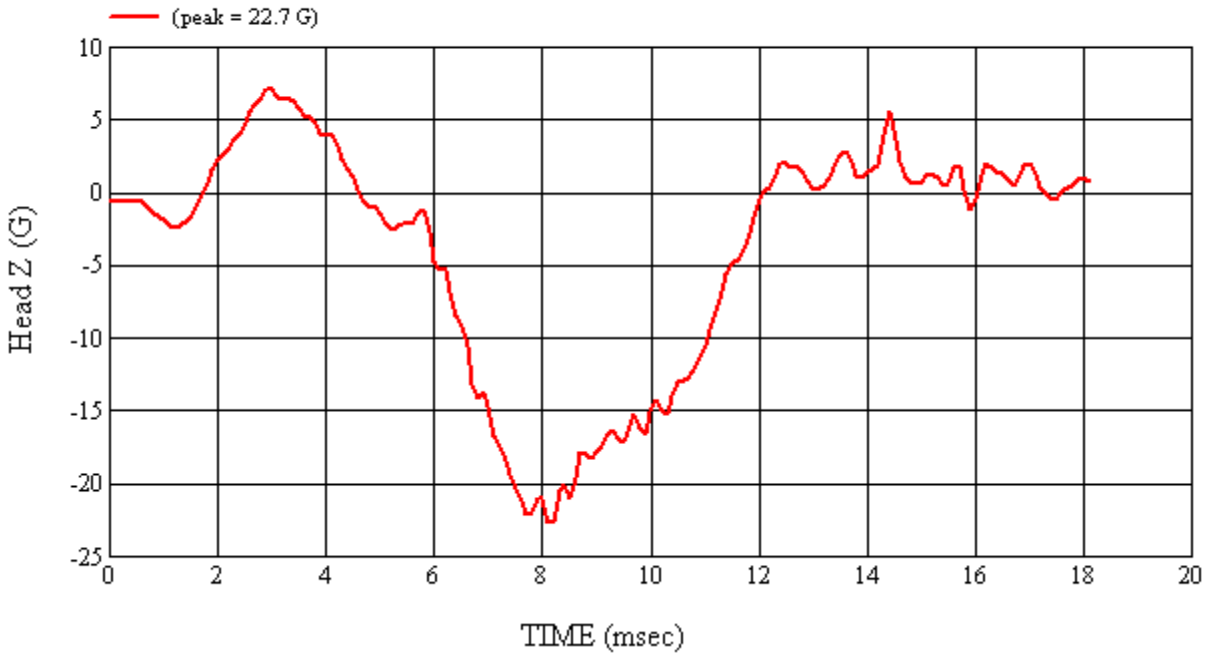
MGA Test #: U12140 Target Location: BP4, Right Side Test Date: 4/27/2012

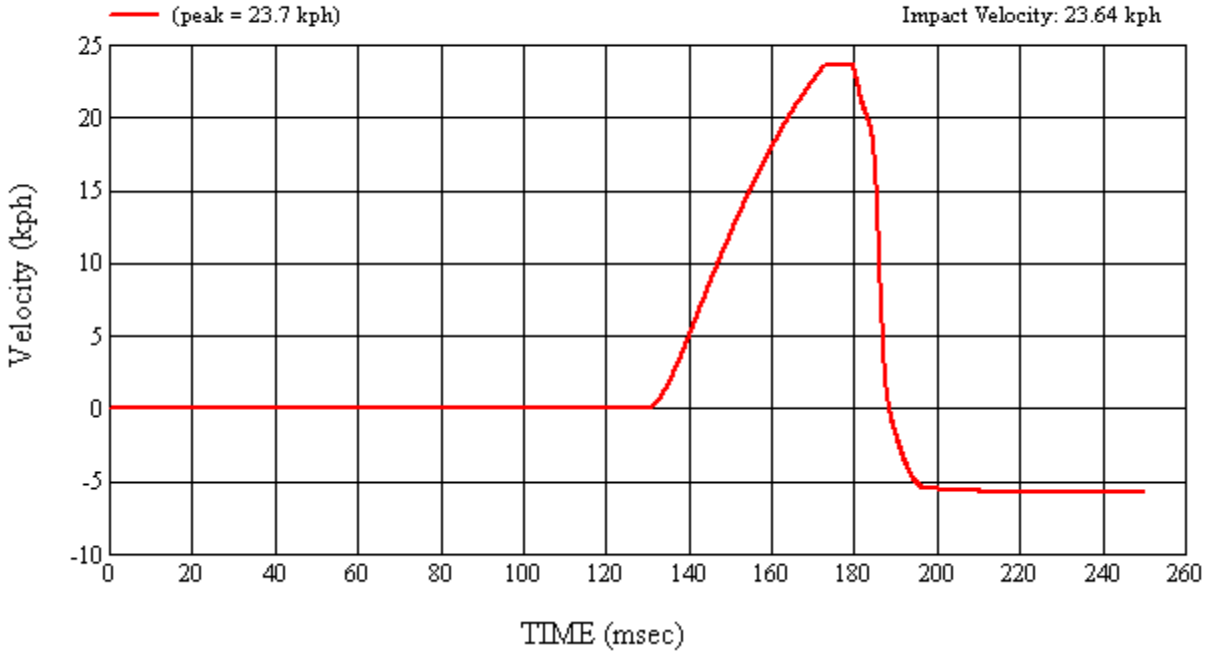


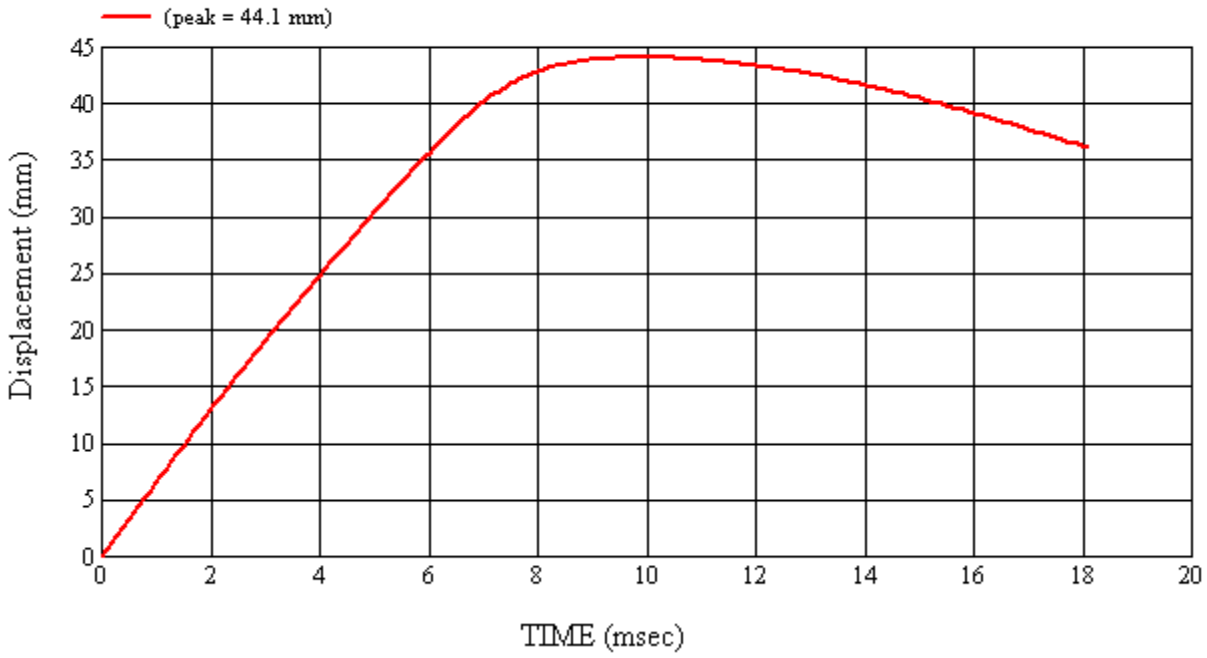



(peak = 207.7 G)
Head X (G)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
-220
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 46.7 G)
Head Y (G)
50
45
40
35
30
25
20
15
10
5
0
-5
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

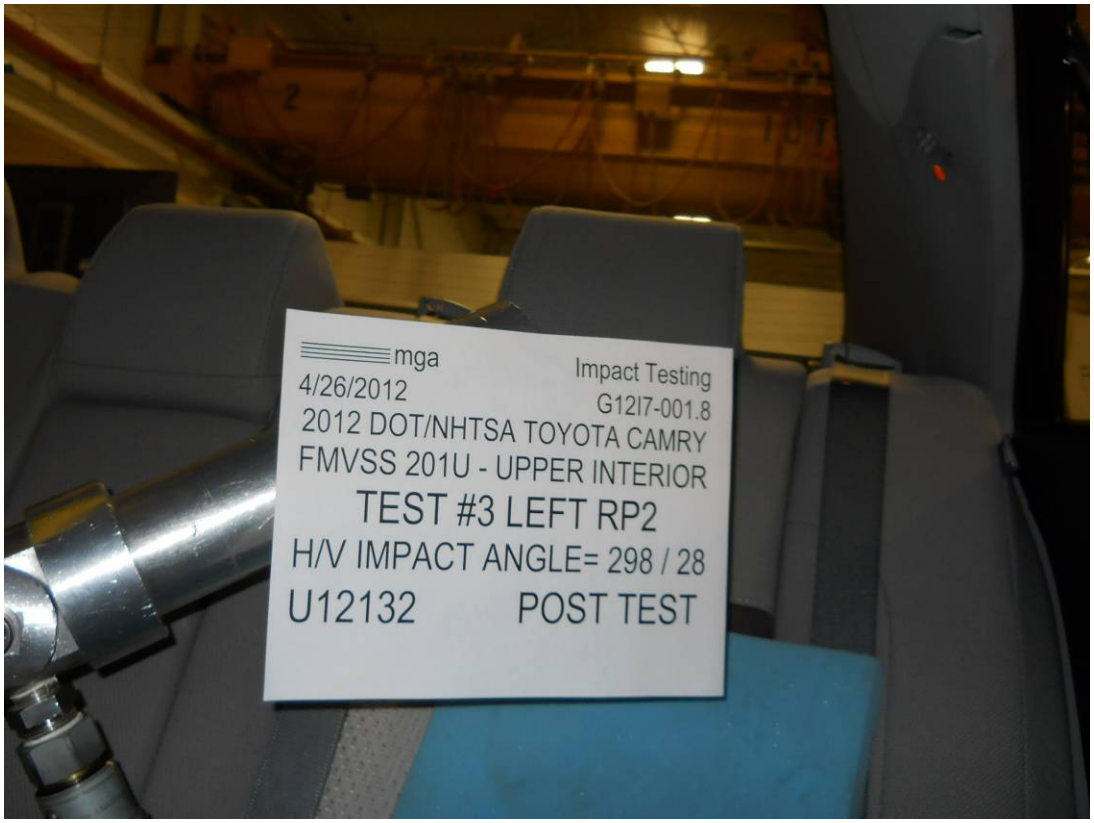

(peak = 22.7 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 23.7 kph)
Impact Velocity: 23.64 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 44.1 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT RP2
H/V IMPACT ANGLE= 298 / 28
U12132
PRE TEST


RP2
mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT RP2
H/V IMPACT ANGLE= 298 / 28
U12132
PRE TEST


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT RP2
H/V IMPACT ANGLE= 298 / 28
U12132
POST TEST


RP2
mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT RP2
H/V IMPACT ANGLE= 298 / 28
U12132
POST TEST


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT RP2
H/V IMPACT ANGLE= 298 / 28
U12132
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#3

Target (Vehicle Side): RP2Left

Temperature:21.8C

MGA Test Reference No.:U12132

Humidity:41.3%

Approach Horizontal Angles:298º

Time of Test:11:09:24 AM

Approach Vertical Angles:28º

FMH Serial No:[038]

Additional Description:

TEST RESULTS:

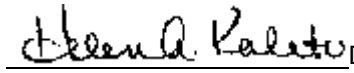
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
623	606	8.9	23.8	6	3 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-96.7	0.87	0.87
Y	6	J36197	110.3	0.97	0.97
Z	7	J36353	100.2	0.96	0.96

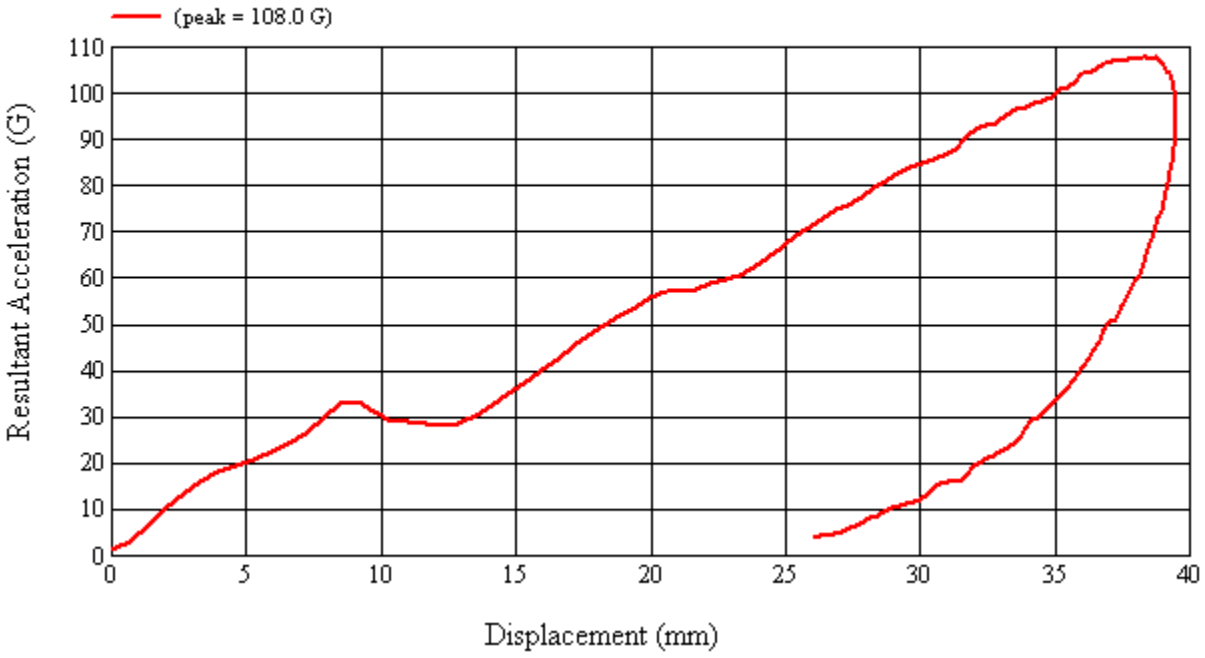
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

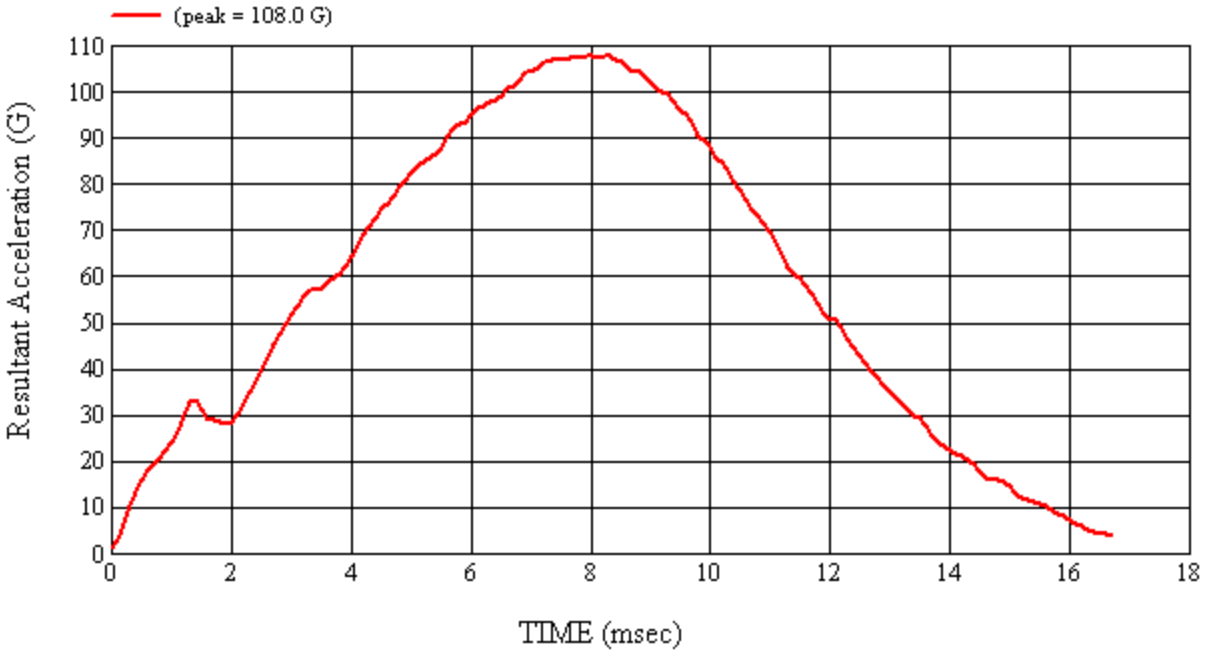
Pillar trim deformation

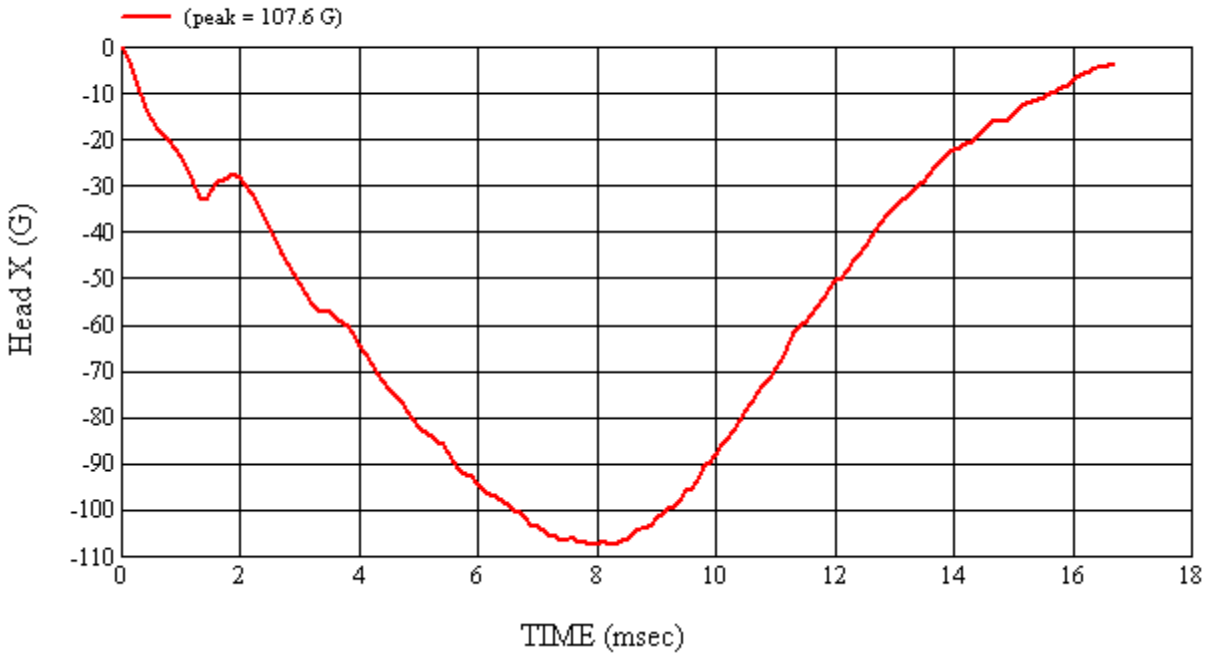
Recorded By:  Approved By*:  Date: 4/26/2012

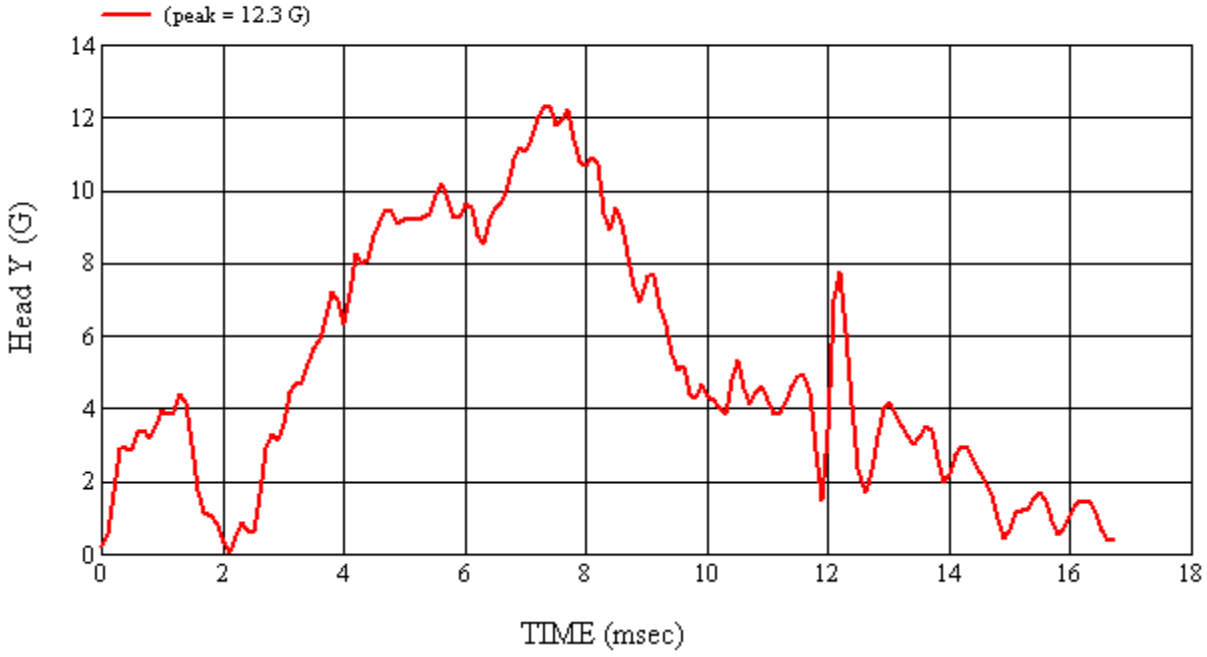
*Only necessary for NHTSA (Government) Compliance testing.

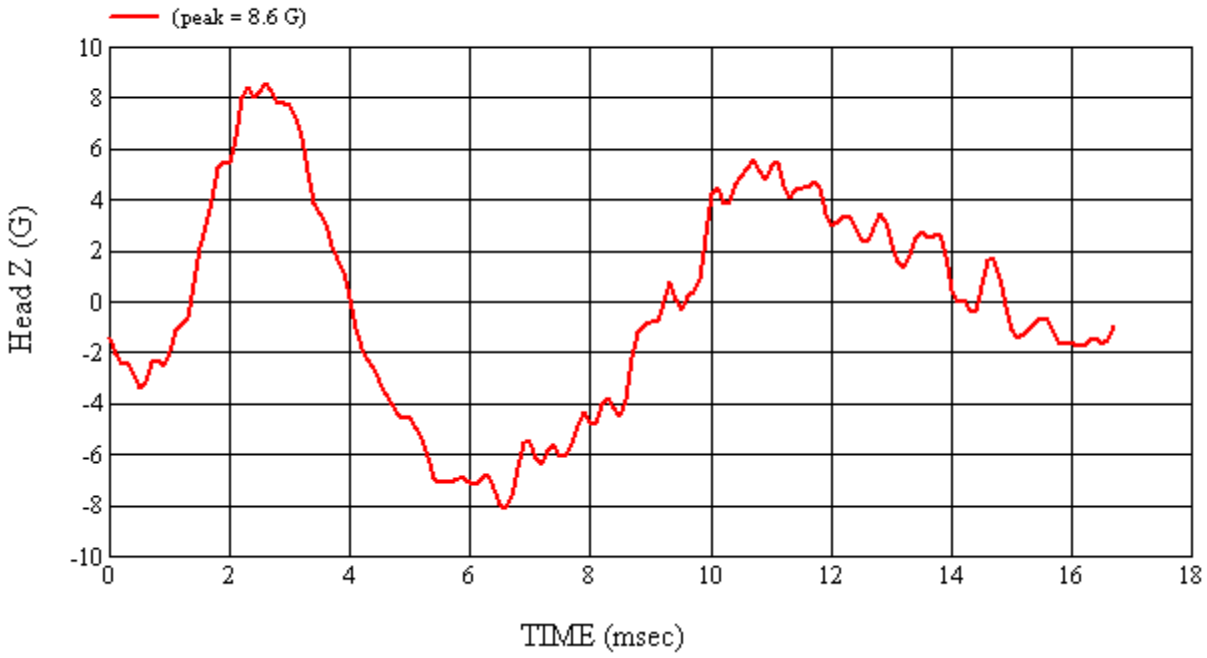
MGA Test #: U12132 Target Location: RP2, Left Side Test Date: 4/26/2012

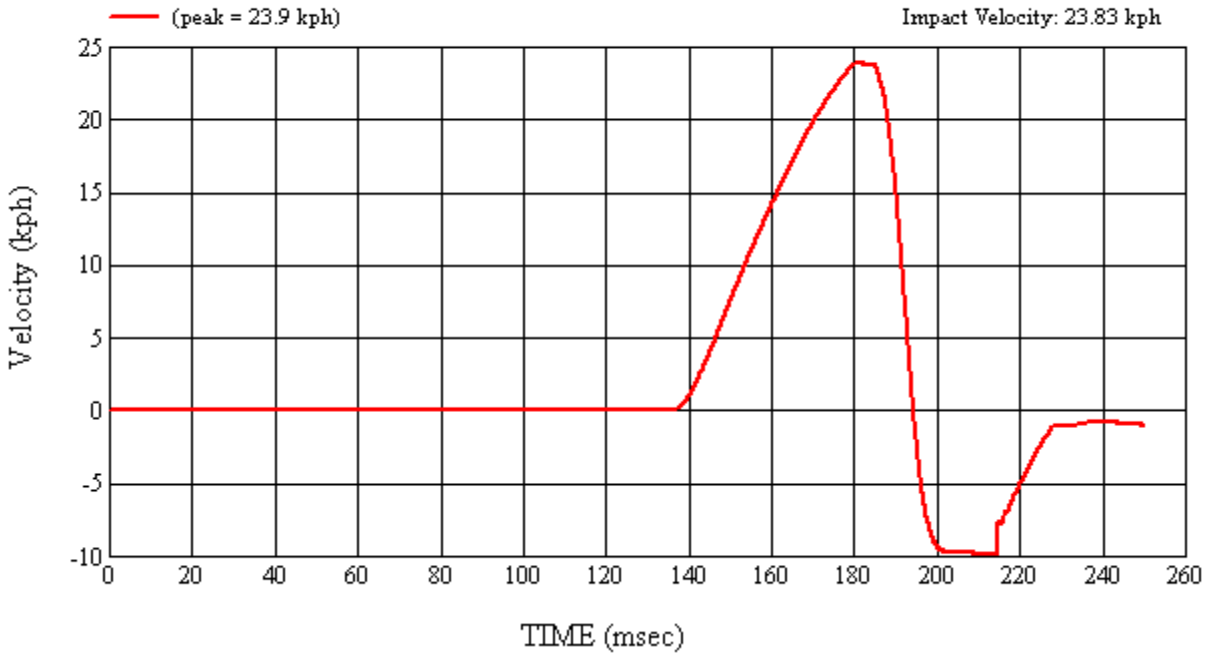


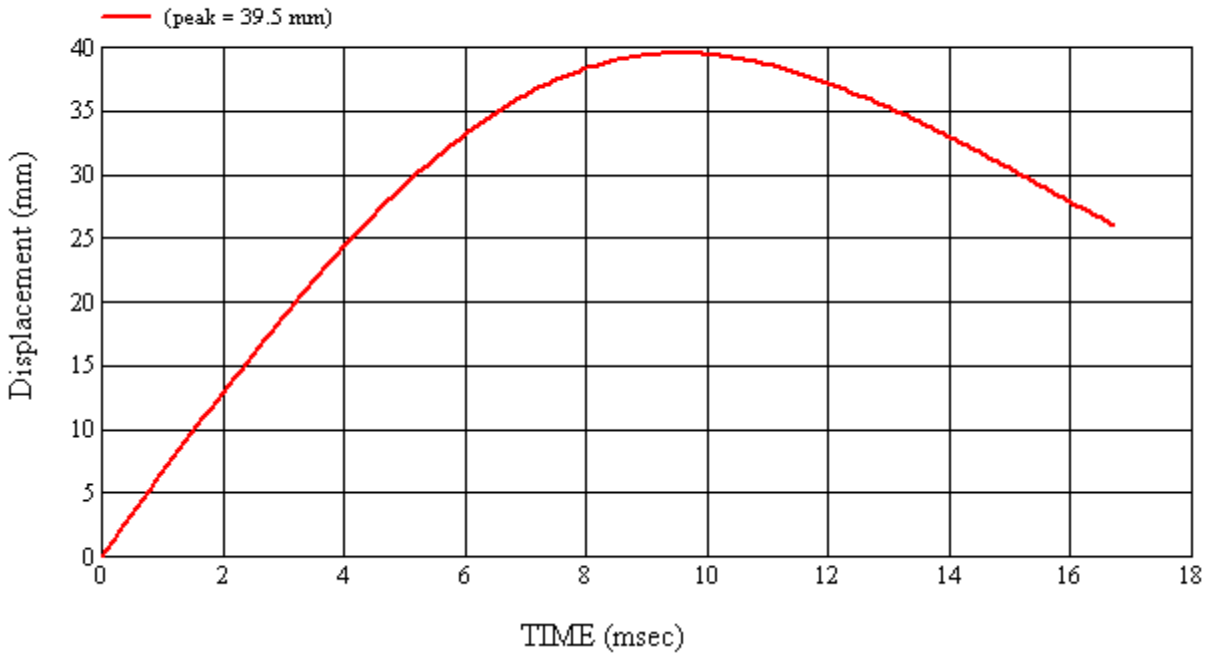



(peak = 107.6 G)
Head X (G)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 12.3 G)
Head Y (G)
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 8.6 G)
Head Z (G)
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
2
4
6
8
10
12
14
16
18
TIME (msec)

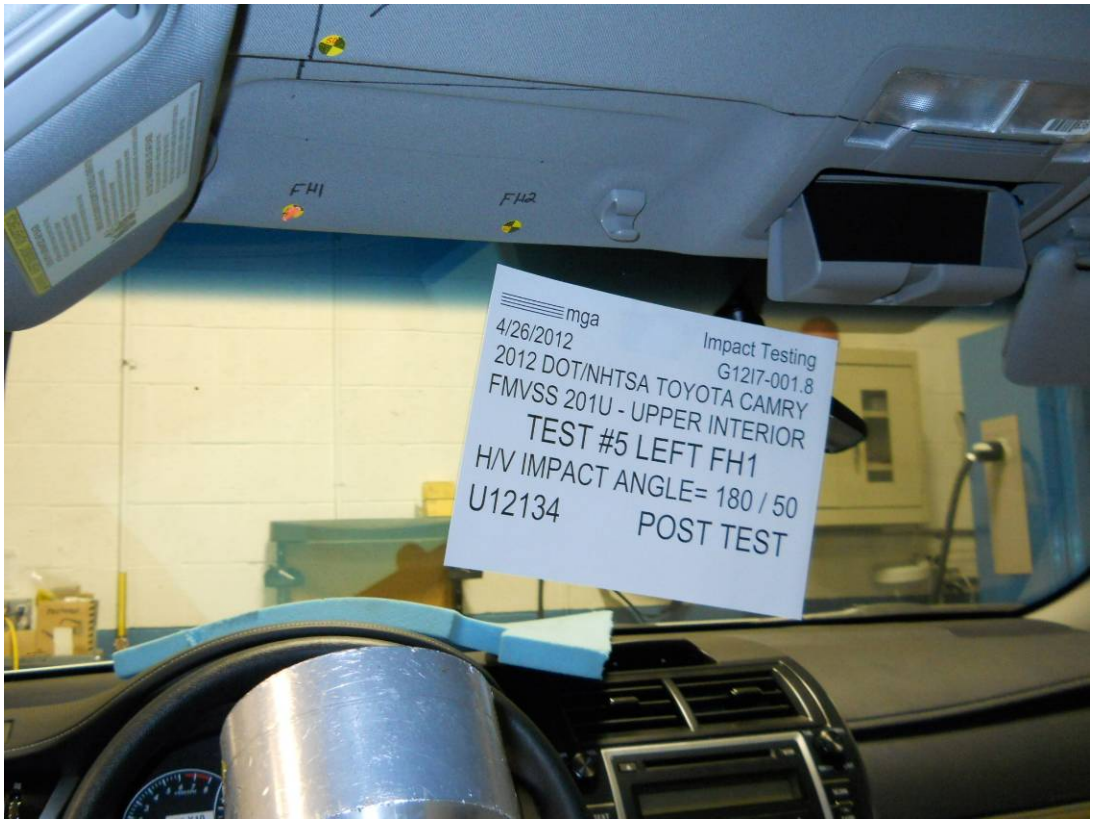

(peak = 23.9 kph)
Impact Velocity: 23.83 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 39.5 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
TIME (msec)

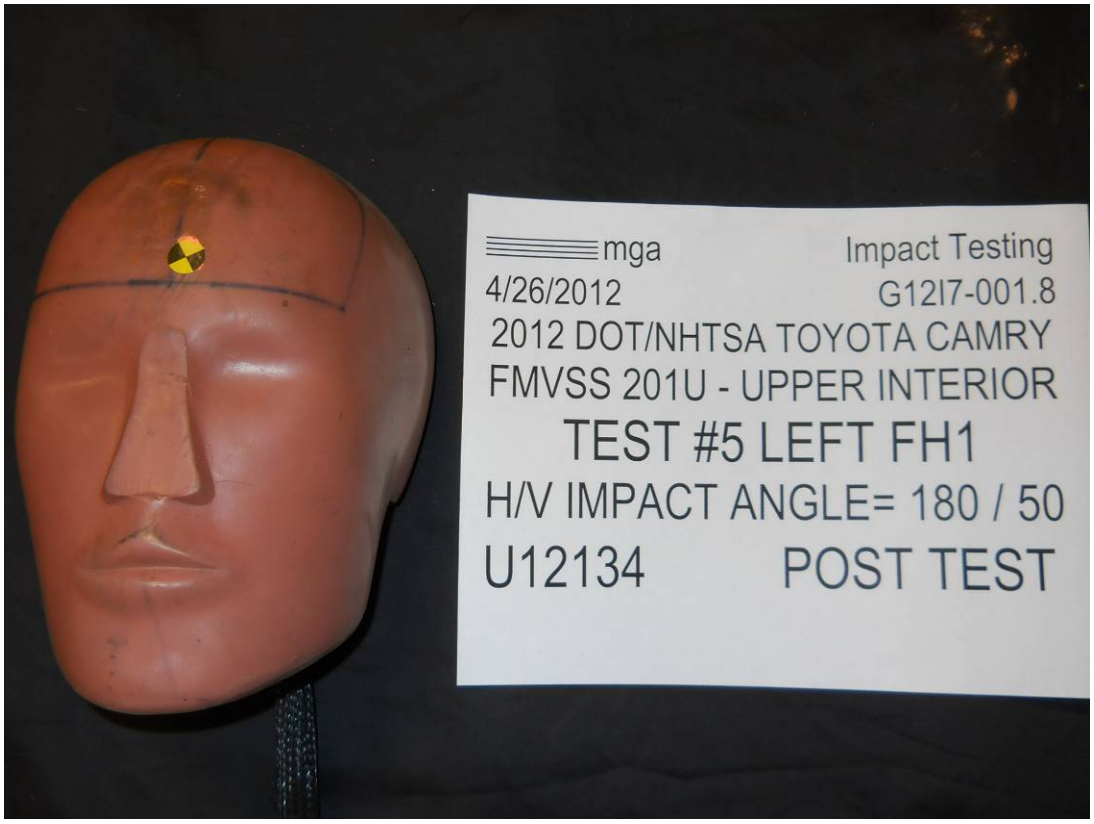

mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U12134
PRE TEST


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U12134
PRE TEST


mga
Impact Testing
G12I7-001.8
4/26/2012
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U12134
POST TEST
CC5101
U12134
FH1 LEFT
H/V 180/50


mga
4/26/2012
Impact Testing
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U12134
POST TEST


FH1
FH2


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
U12134
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#5

Target (Vehicle Side): FH1Left

Temperature:22.1C

MGA Test Reference No.:U12134

Humidity:41.6%

Approach Horizontal Angles:180º

Time of Test:1:41:48 PM

Approach Vertical Angles:50º

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
740	761	4.1	23.3	9	4 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J32177	-113.3	0.87	0.87
Y	6	J14103	95.2	0.97	0.97
Z	7	J35800	98.5	0.96	0.96

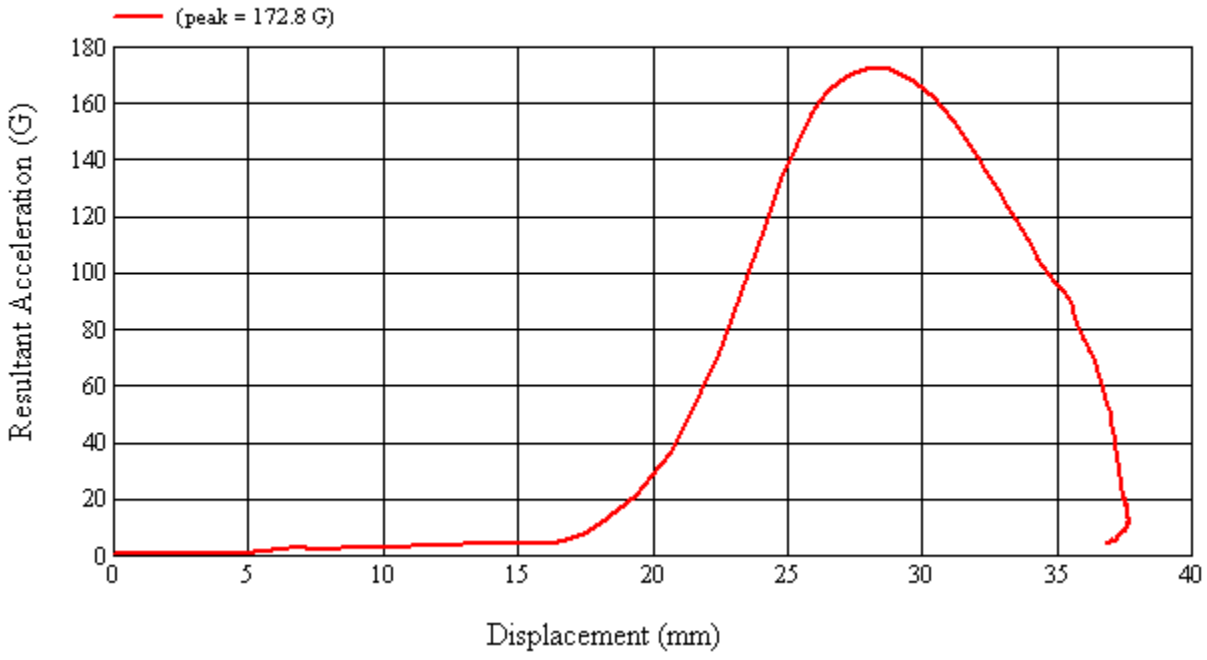
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

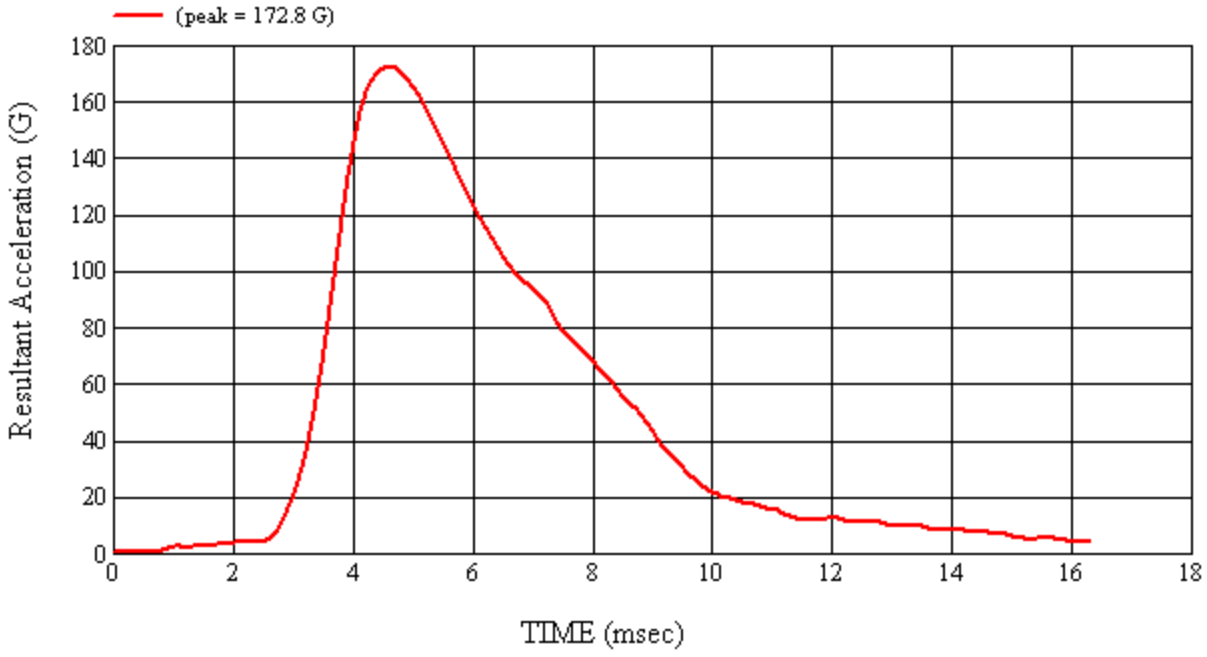
No visible damage

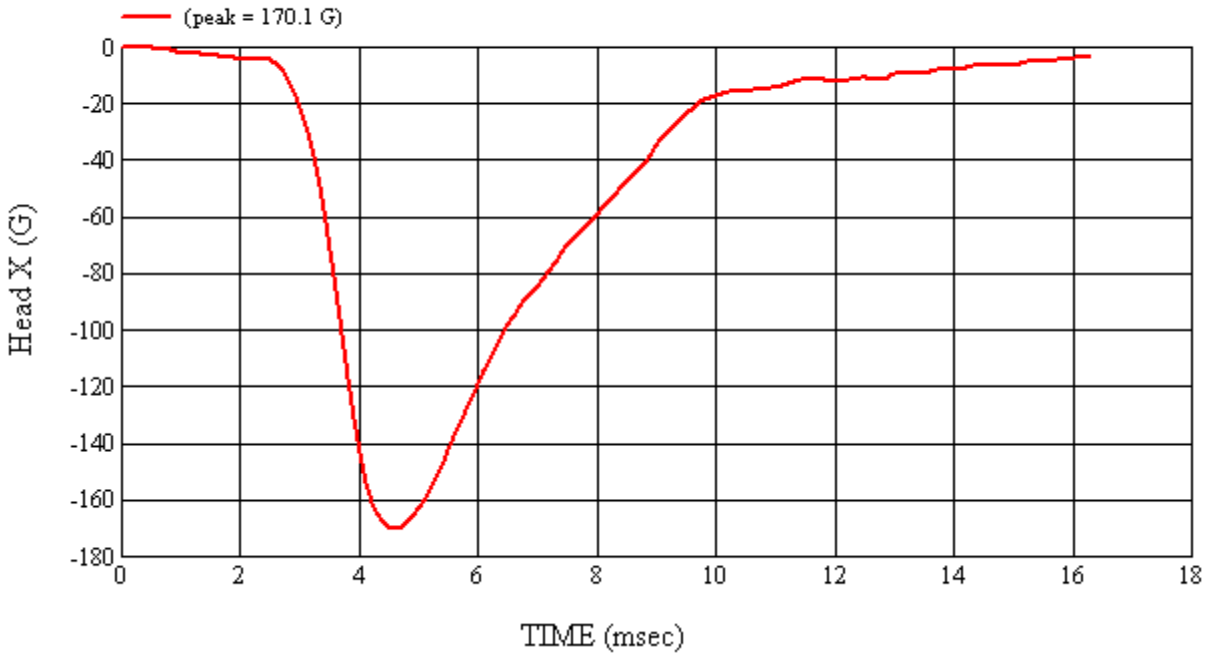
Recorded By: Ken D. McLean Approved By*: Helen A. Kalata Date: 4/26/2012

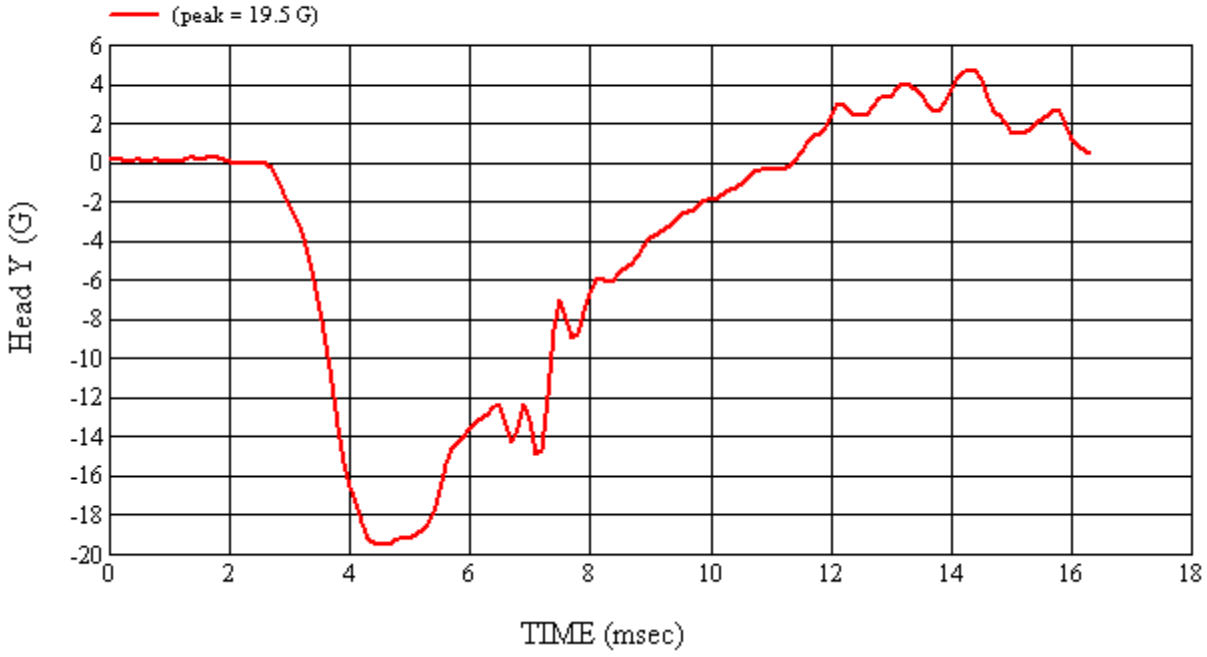
*Only necessary for NHTSA (Government) Compliance testing.

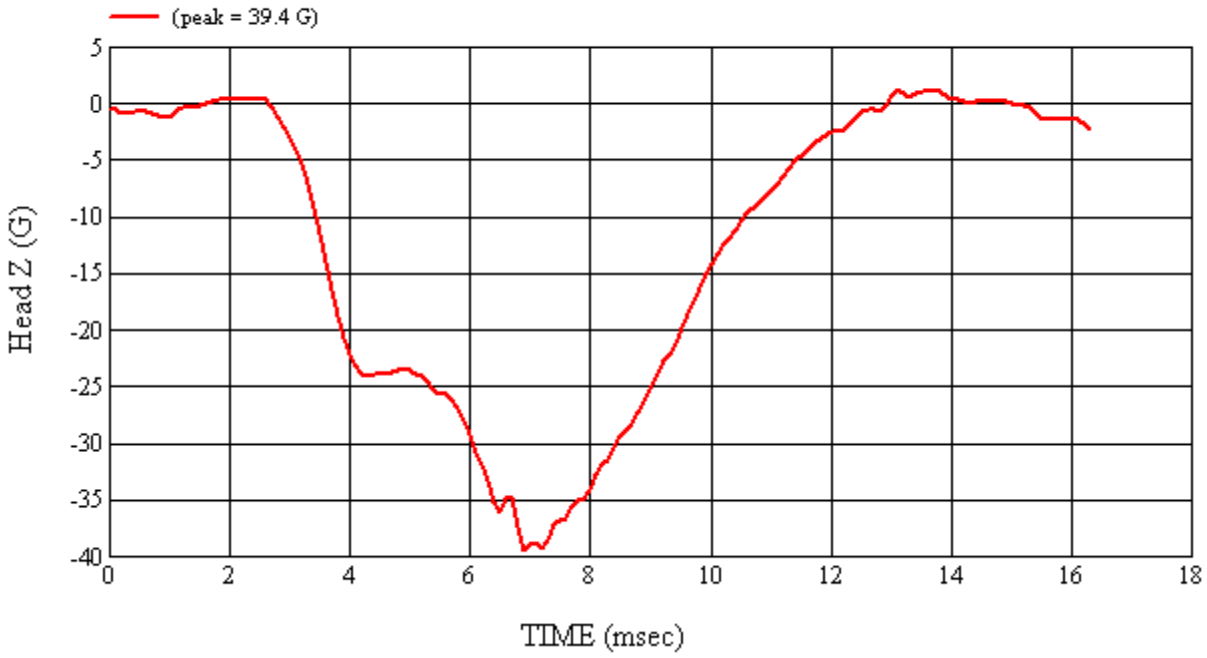
MGA Test #: U12134 Target Location: FH1, Left Side Test Date: 4/26/2012

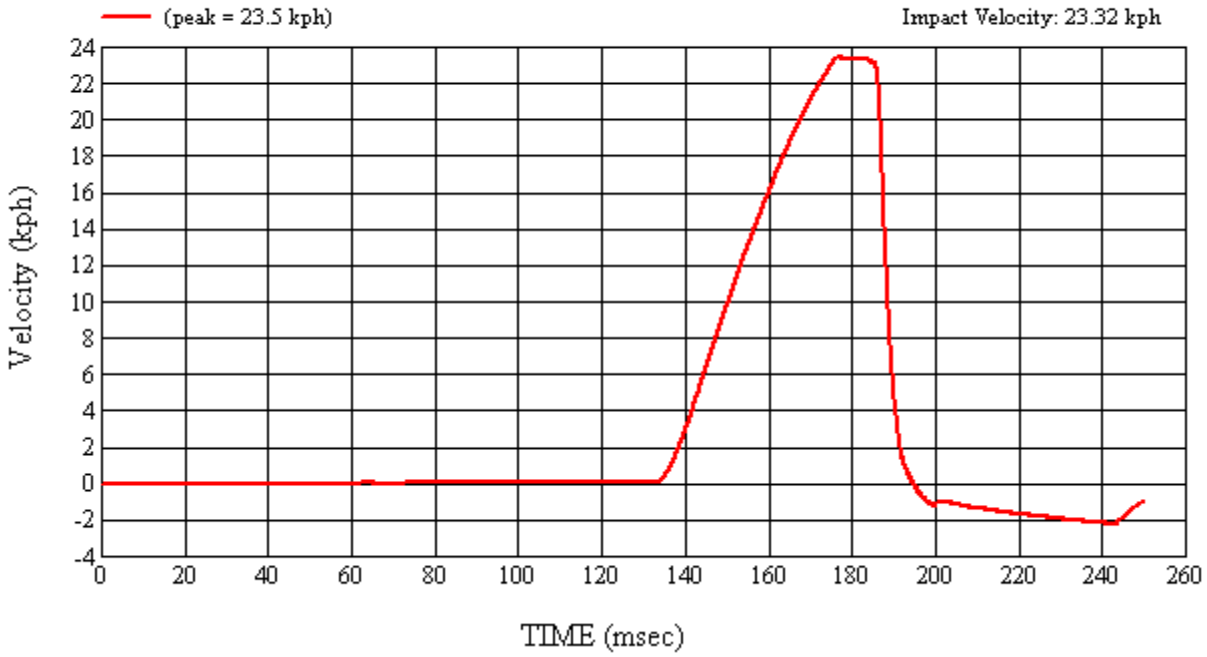


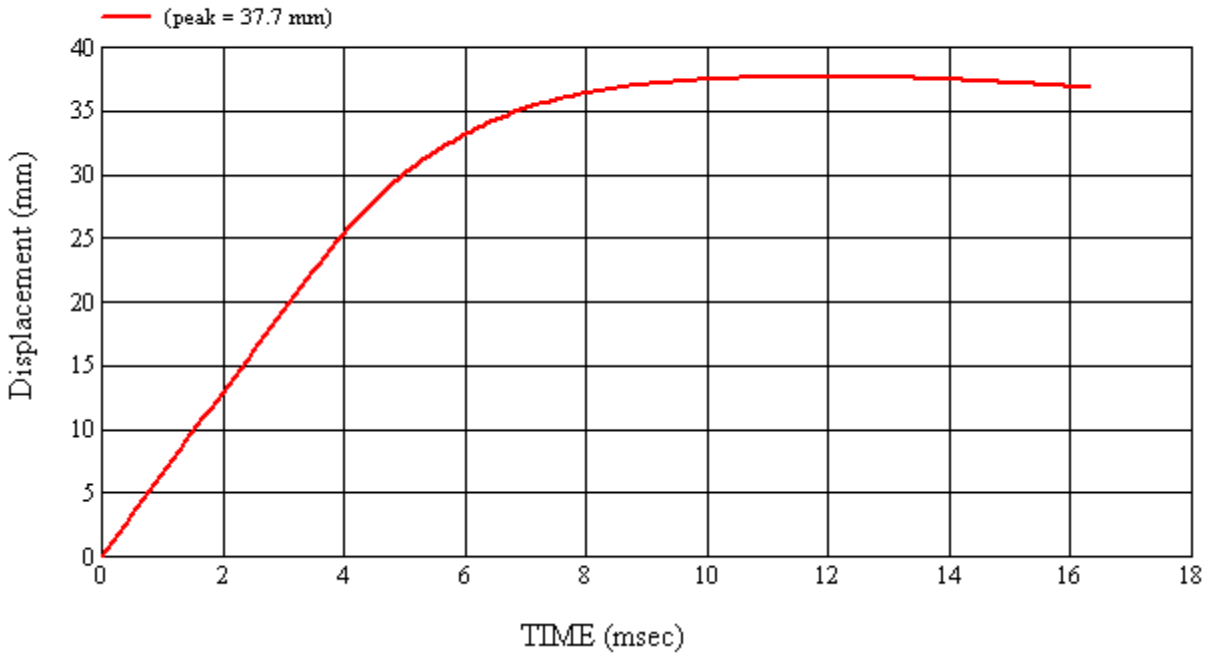


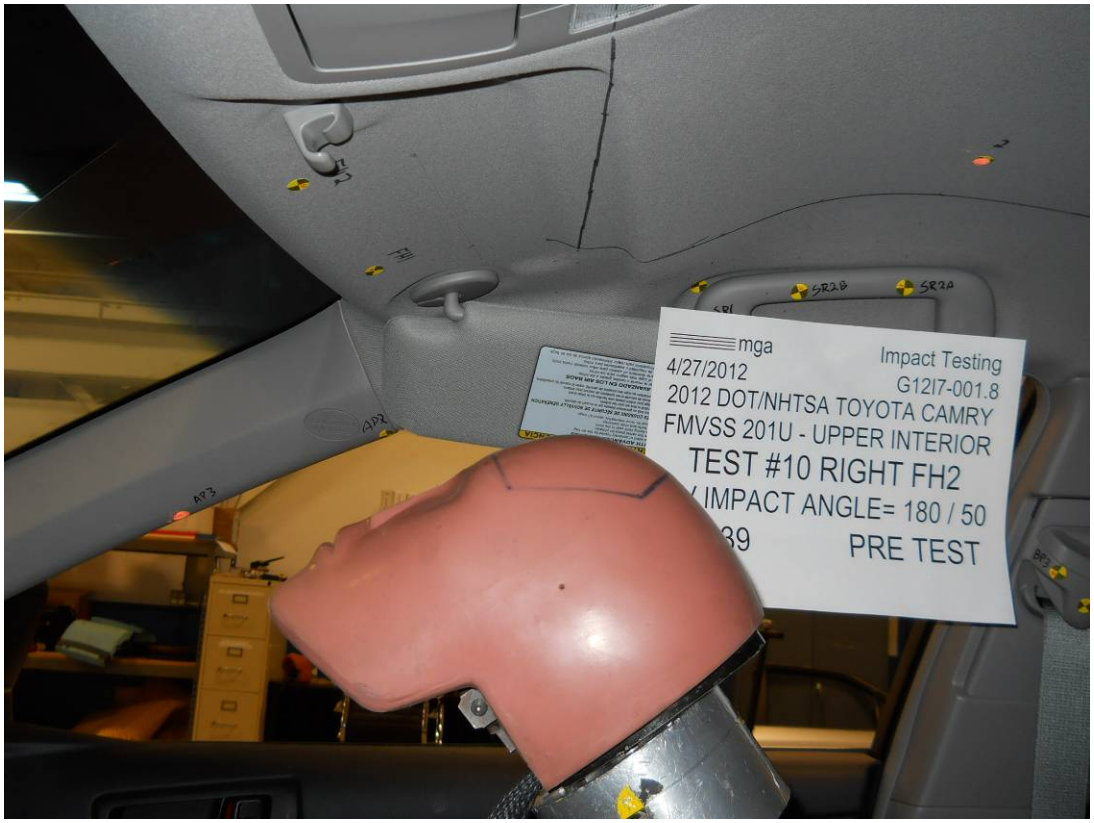

(peak = 170.1 G)
Head X (G)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
0
2
4
6
8
10
12
14
16
18
TIME (msec)

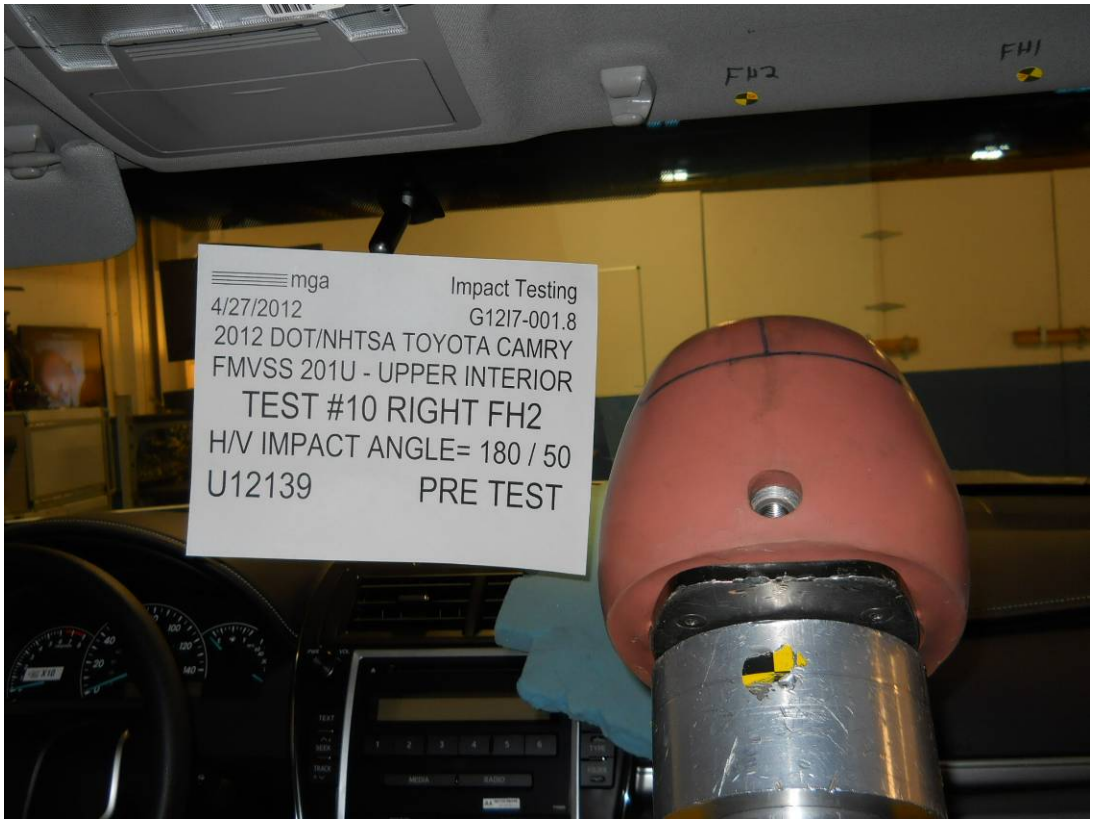

(peak = 19.5 G)
Head Y (G)
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
0
2
4
6
8
10
12
14
16
18
TIME (msec)

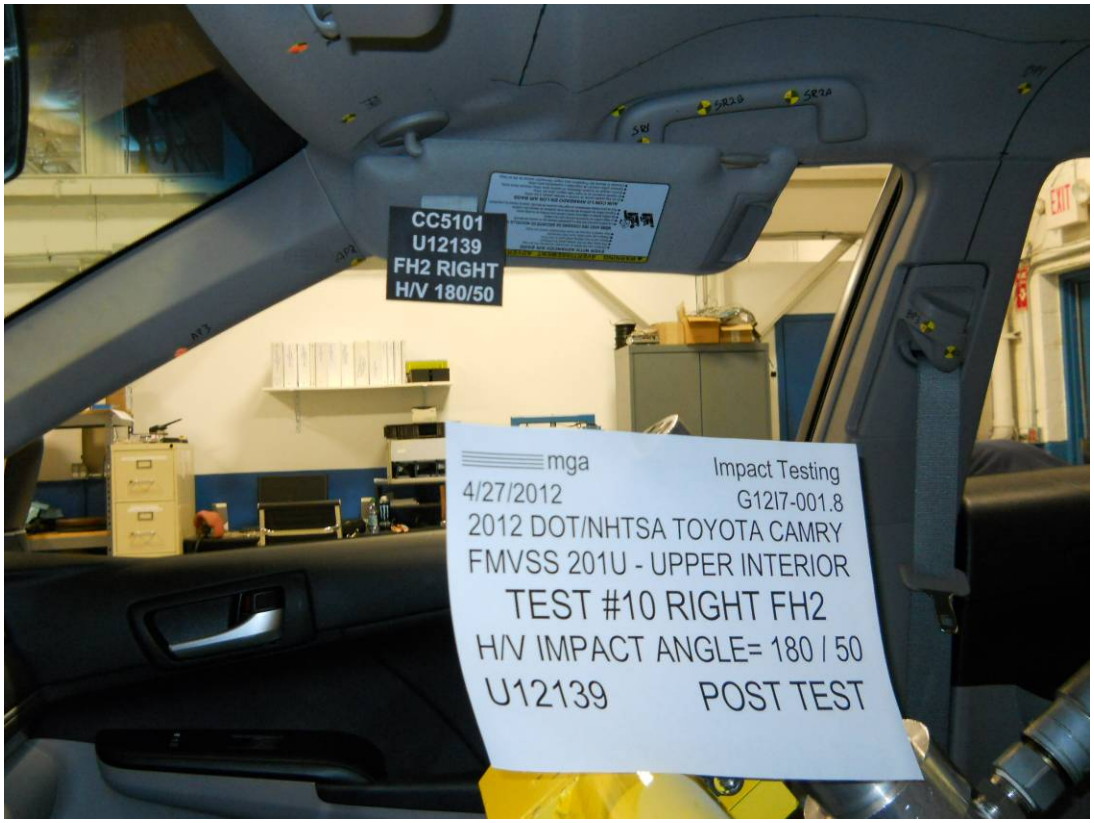

(peak = 39.4 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 23.5 kph)
Impact Velocity: 23.32 kph
Velocity (kph)
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 37.7 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
TIME (msec)

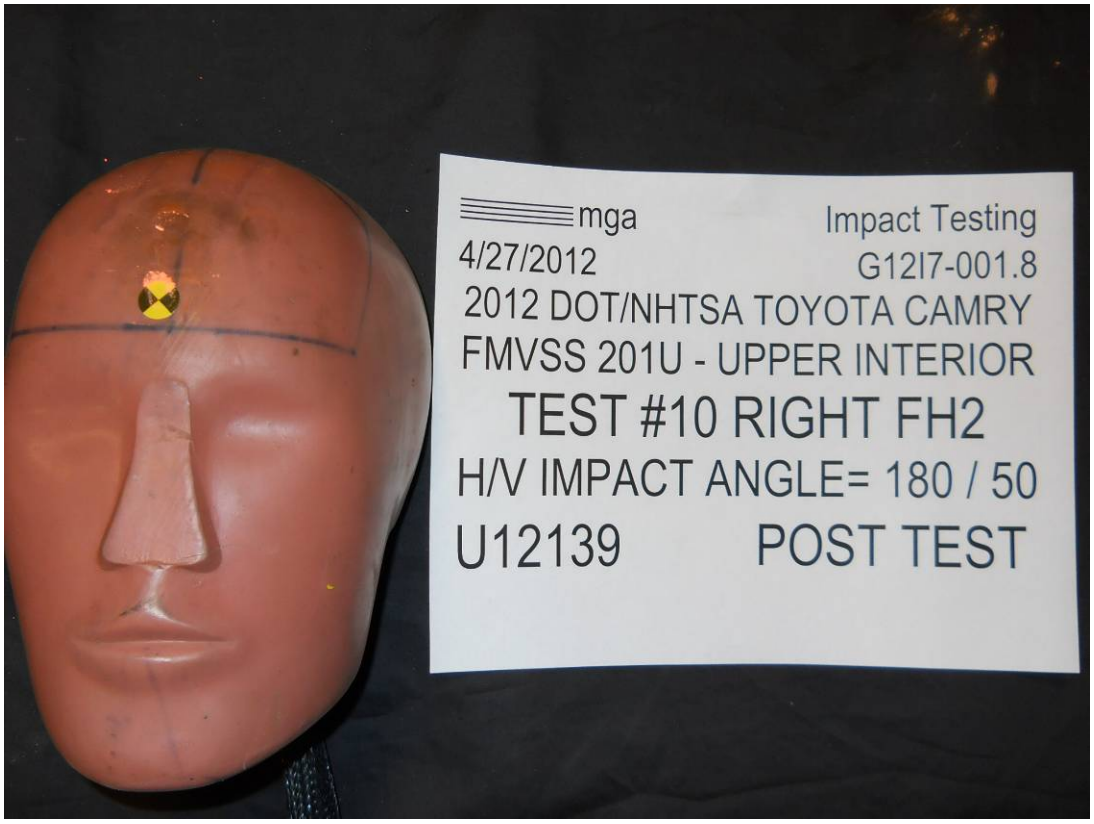

mga
4/27/2012
Impact Testing
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT FH2
IMPACT ANGLE= 180 / 50
PRE TEST


mga
4/27/2012
Impact Testing
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT FH2
H/V IMPACT ANGLE= 180 / 50
U12139
PRE TEST


CC5101
U12139
FH2 RIGHT
H/V 180/50
mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT FH2
H/V IMPACT ANGLE= 180 / 50
U12139
POST TEST


FH2
FH1
mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT FH2
H/V IMPACT ANGLE= 180 / 50
U12139
POST TEST
CC5101
U12139
FH2 RIGHT
H/V 180/50


FH2


mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT FH2
H/V IMPACT ANGLE= 180 / 50
U12139
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#10

Target (Vehicle Side): FH2Right

Temperature:21.1C

MGA Test Reference No.:U12139

Humidity:24.0%

Approach Horizontal Angles:180º

Time of Test:9:21:33 AM

Approach Vertical Angles:50º

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
570	535	4.8	23.5	8	4 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J32177	-113.3	0.87	0.87
Y	6	J14103	95.2	0.97	0.97
Z	7	J35800	98.5	0.96	0.96

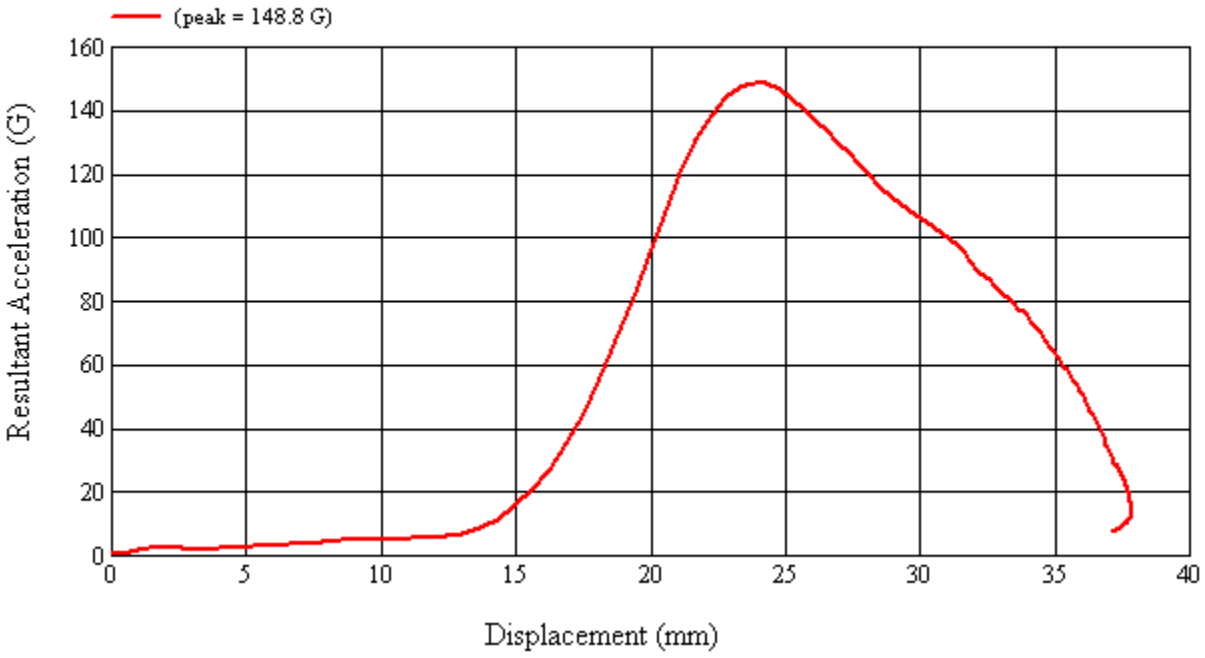
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

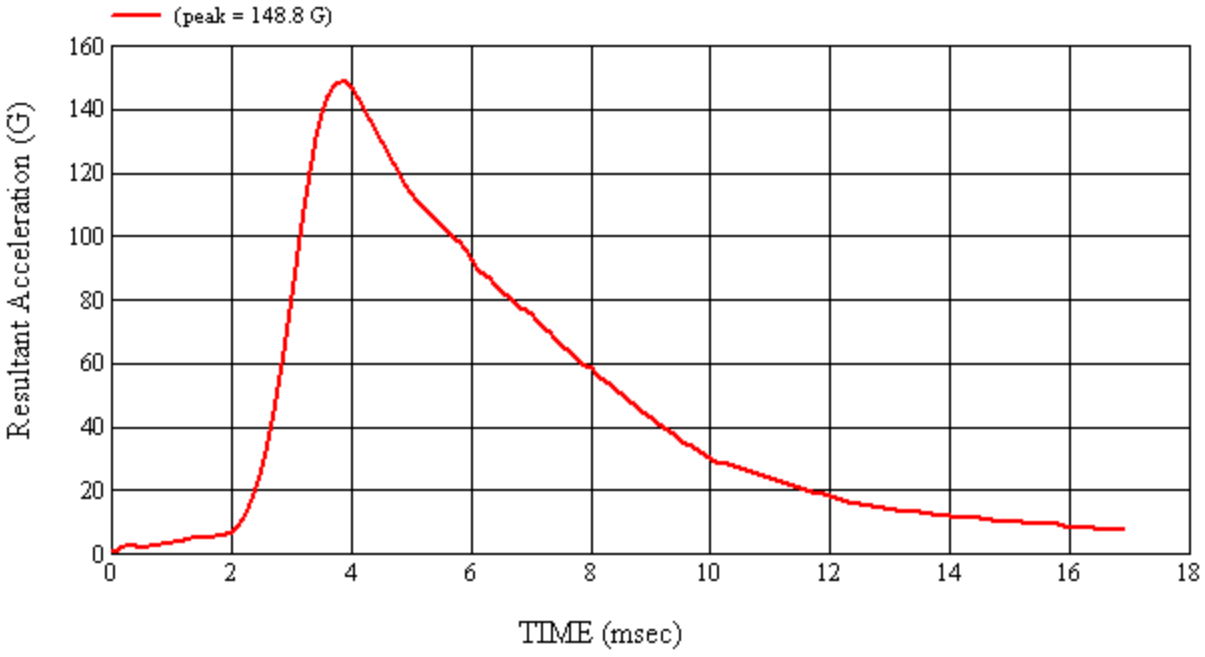
Sunglasses holder opened

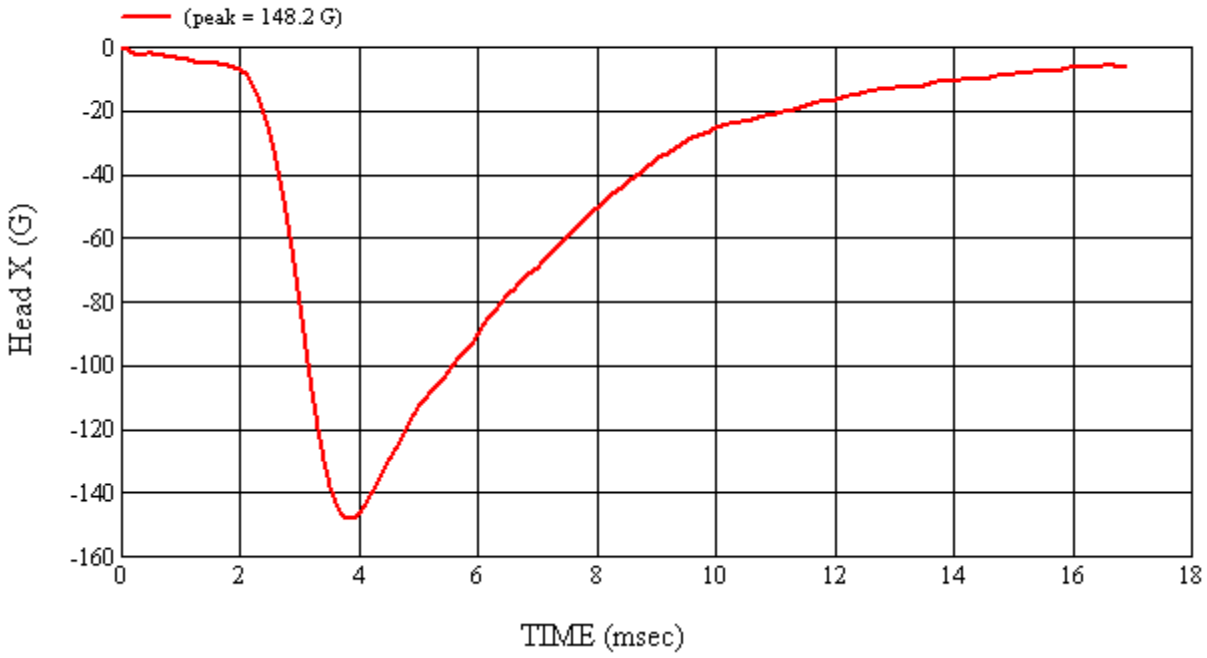
Recorded By: Ken D. McLean Approved By*: Helen A. Kalata Date: 4/27/2012

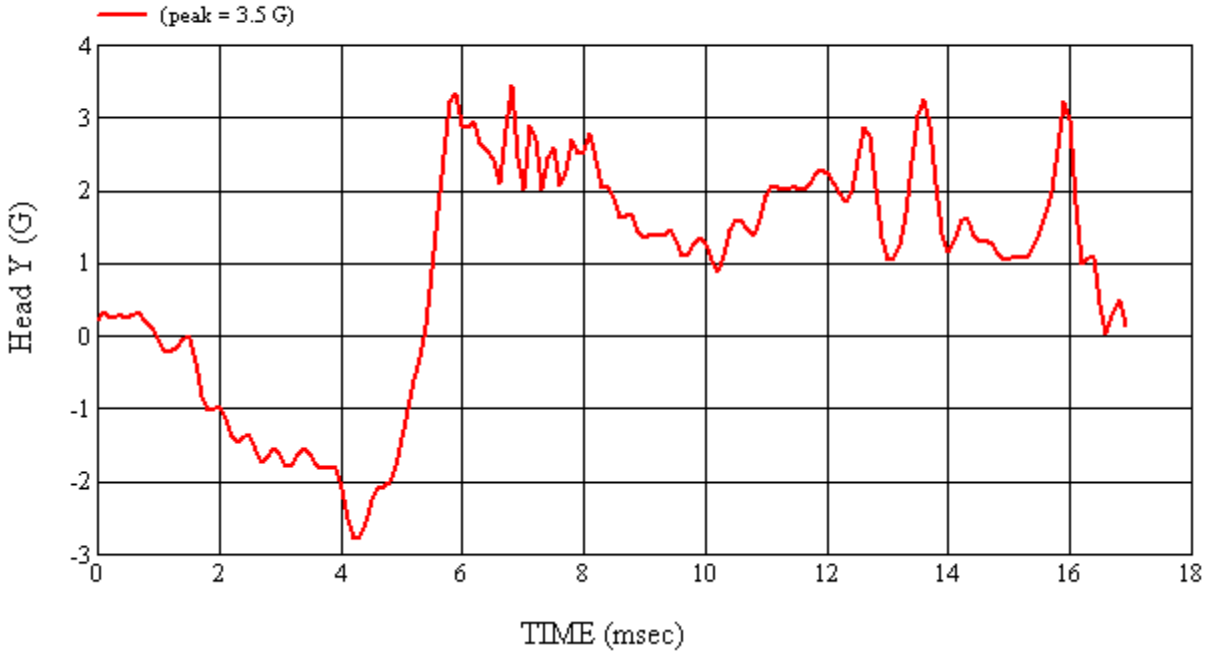
*Only necessary for NHTSA (Government) Compliance testing.

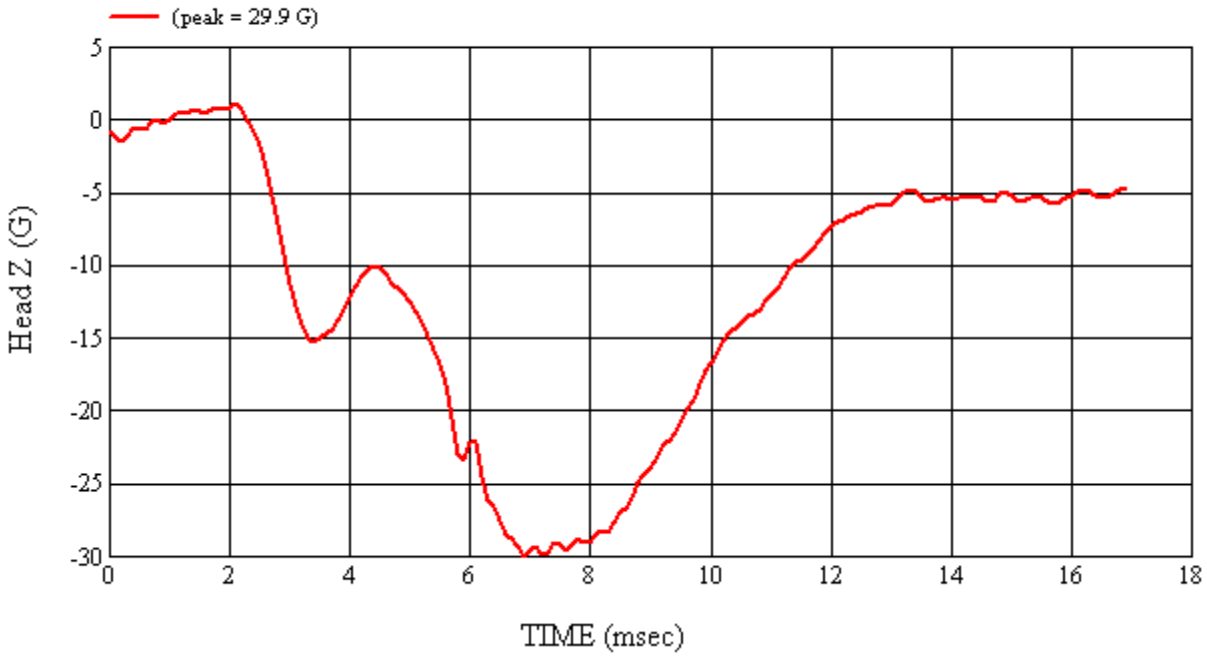
MGA Test #: U12139 Target Location: FH2, Right Side Test Date: 4/27/2012

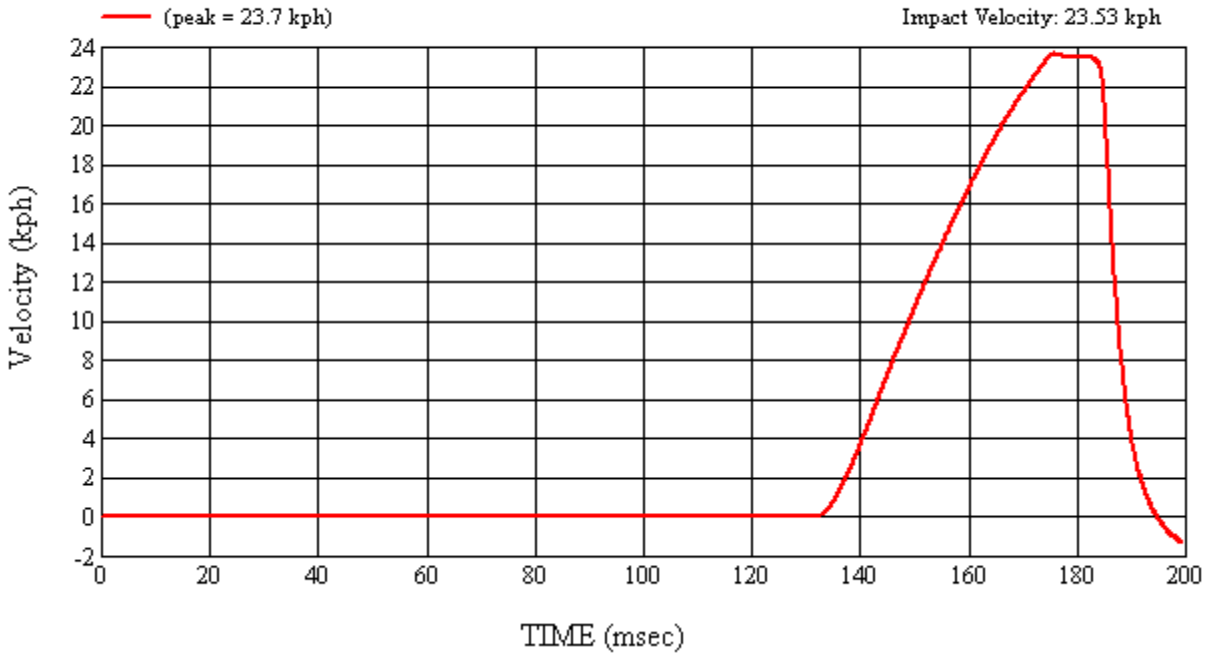


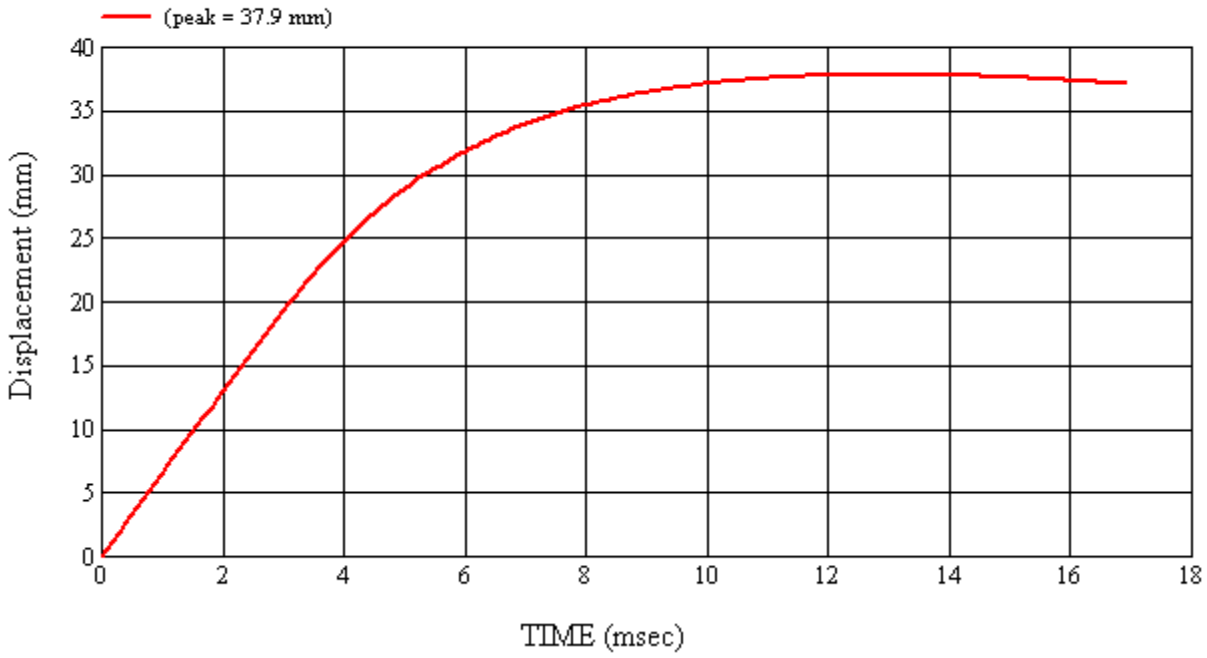



(peak = 148.2 G)
Head X (G)
0
-20
-40
-60
-80
-100
-120
-140
-160
0
2
4
6
8
10
12
14
16
18
TIME (msec)

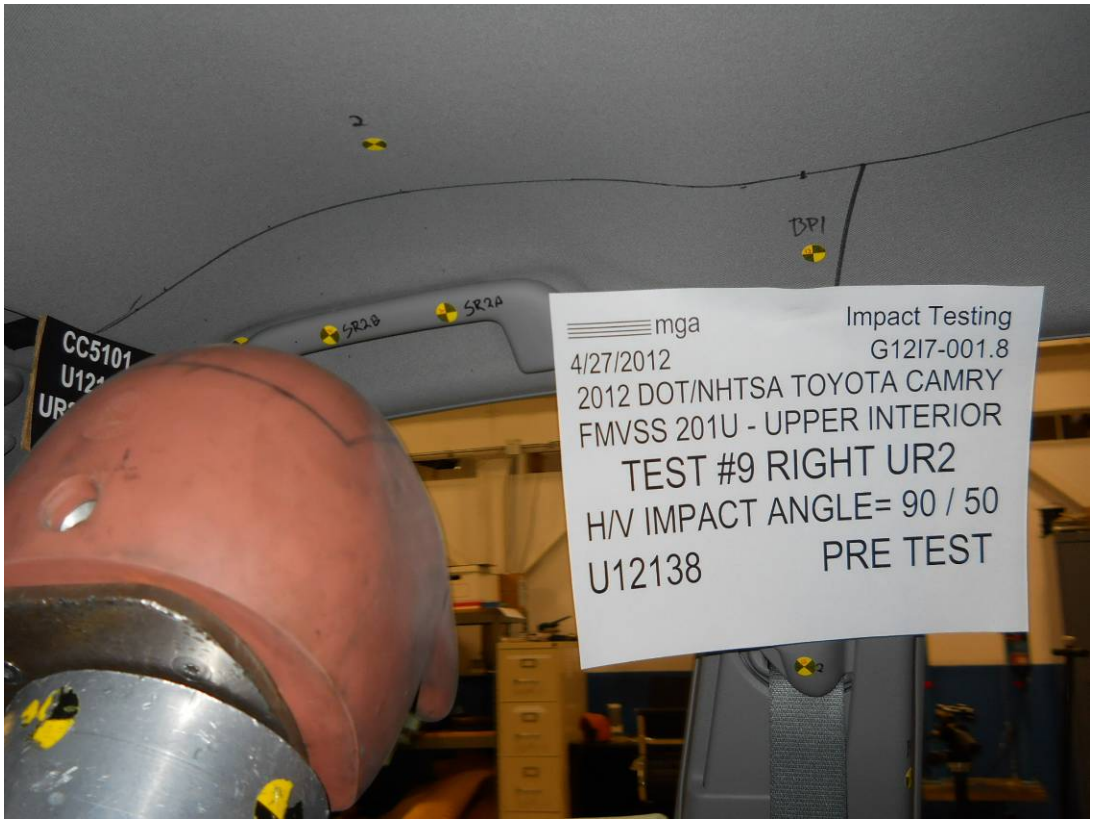

(peak = 3.5 G)
Head Y (G)
4
3
2
1
0
-1
-2
-3
0
2
4
6
8
10
12
14
16
18
TIME (msec)

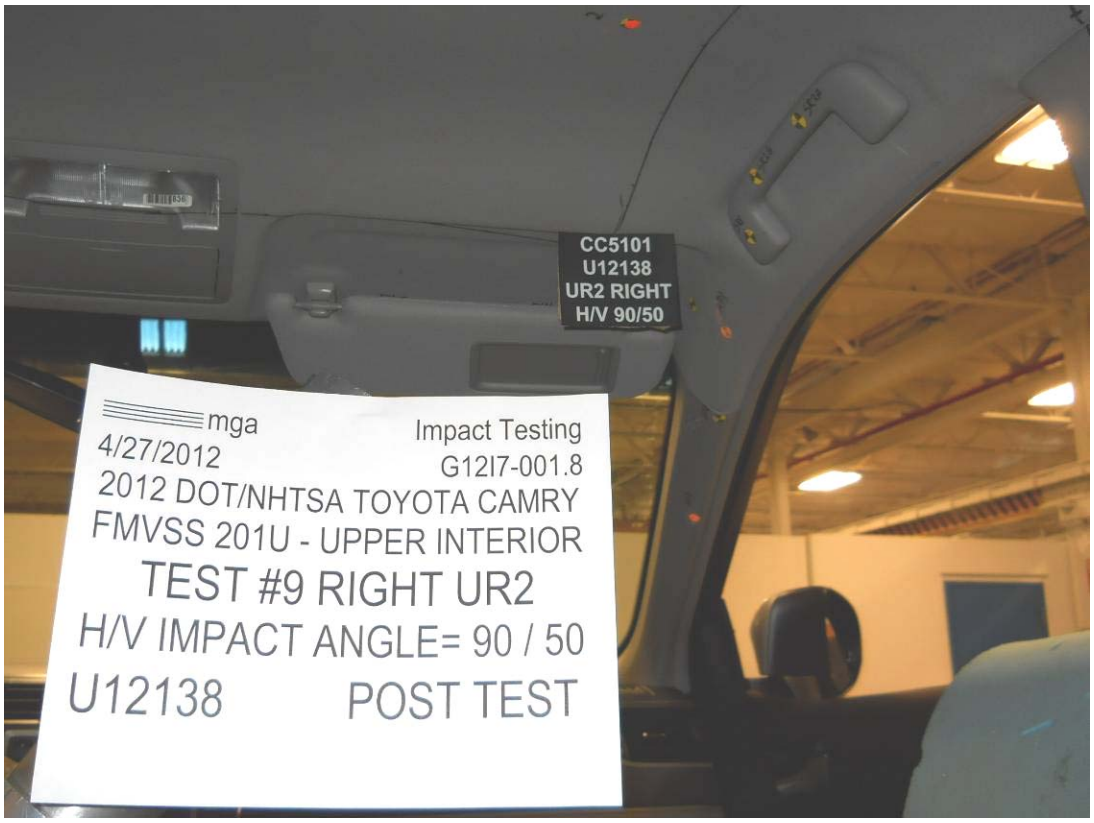

(peak = 29.9 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 23.7 kph)
Impact Velocity: 23.53 kph
Velocity (kph)
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
0
20
40
60
80
100
120
140
160
180
200
TIME (msec)

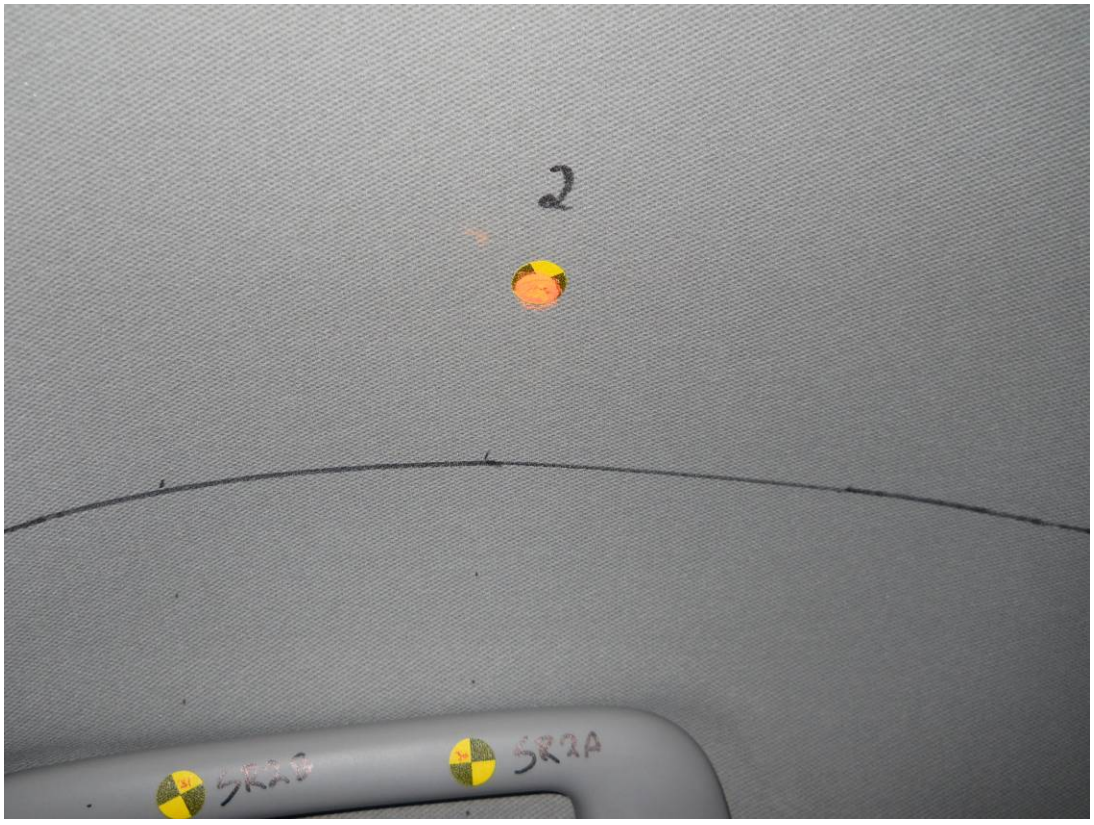

(peak = 37.9 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
TIME (msec)


CC5101
U12138
UR2 RIGHT
H/V 90/50
mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U12138
PRE TEST


BPI
SR2B
SR2A
mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U12138
PRE TEST


CC5101
U12138
UR2 RIGHT
H/V 90/50
mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U12138
POST TEST


CC5101
U12138
UR2 RIGHT
SR1
SR2B
SR2A
BP1
mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U12138
POST TEST


2
SR2B
SR2A


mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U12138
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#9

Target (Vehicle Side): UR2Right

Temperature:21.3C

MGA Test Reference No.:U12138

Humidity:24.7%

Approach Horizontal Angles:90º

Time of Test:8:40:39 AM

Approach Vertical Angles:50º

FMH Serial No:[035]

Additional Description:@ SR2A

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
855	913	6.9	23.4	35	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	-96.8	0.87	0.87
Y	6	J22664	95.5	0.97	0.97
Z	7	J35924	94.1	0.96	0.96

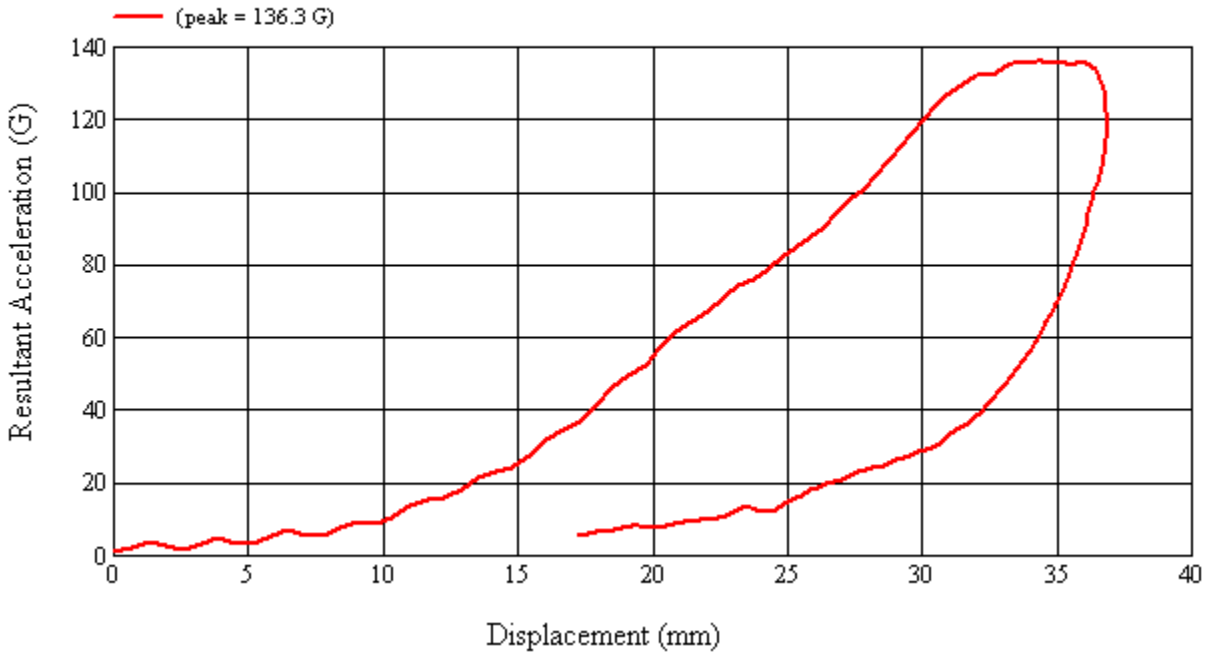
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

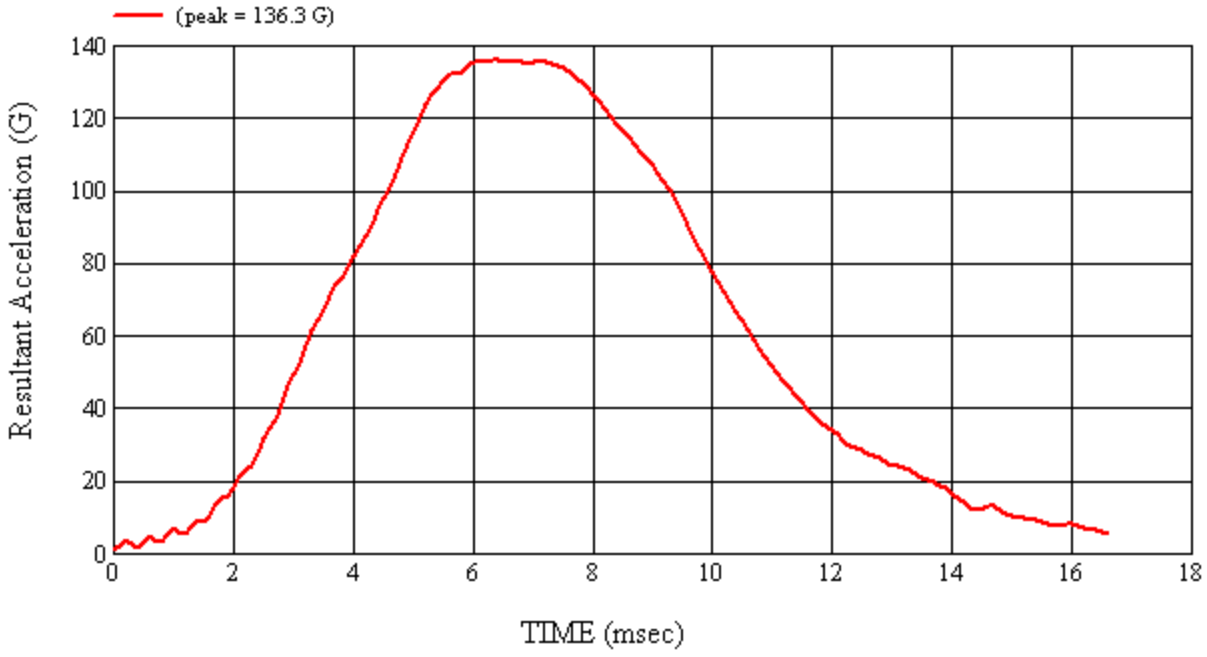
Headliner deformation

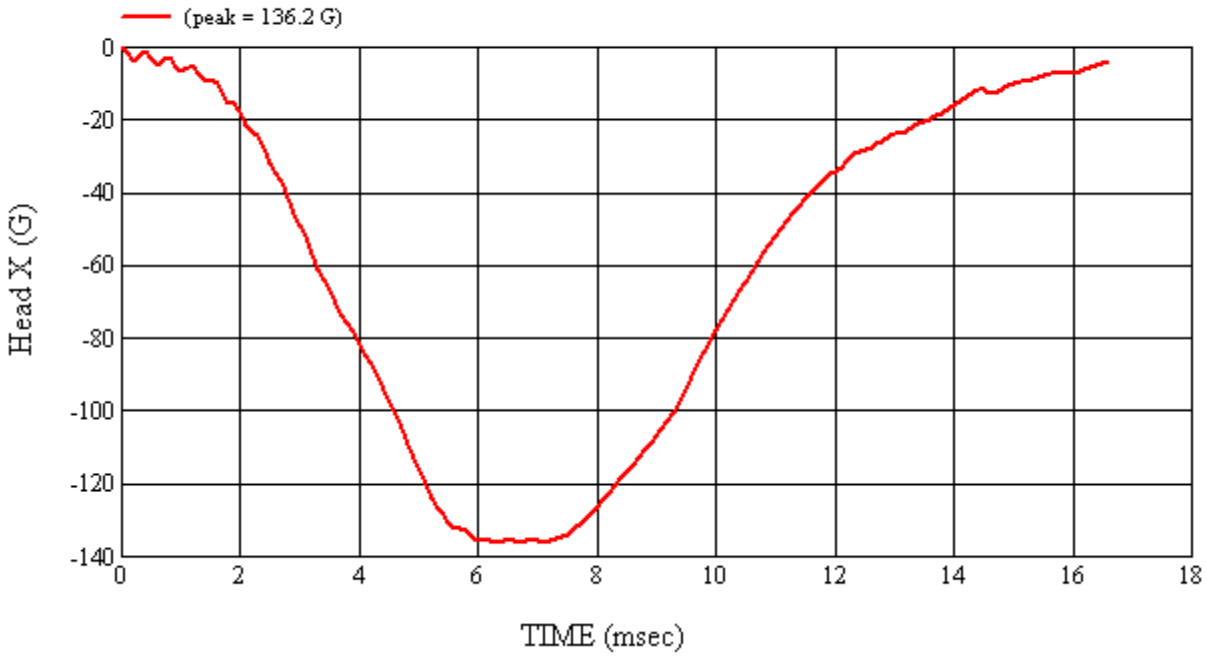
Recorded By: ________ Approved By*: ________ Date: 4/27/2012

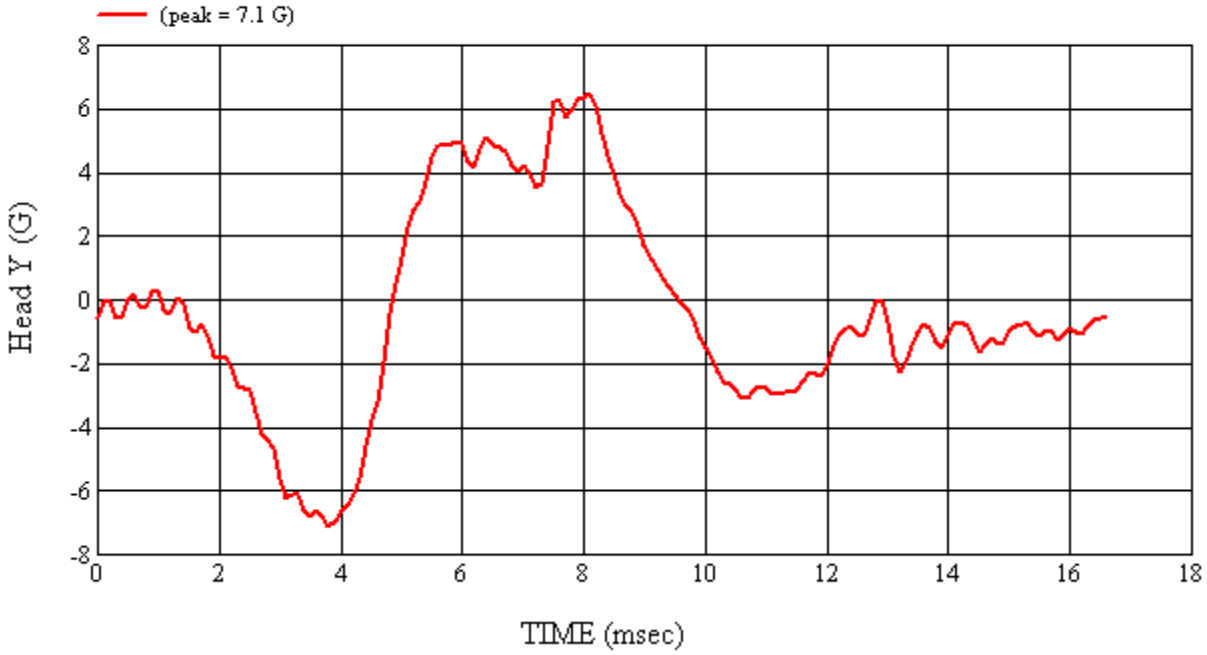
*Only necessary for NHTSA (Government) Compliance testing.

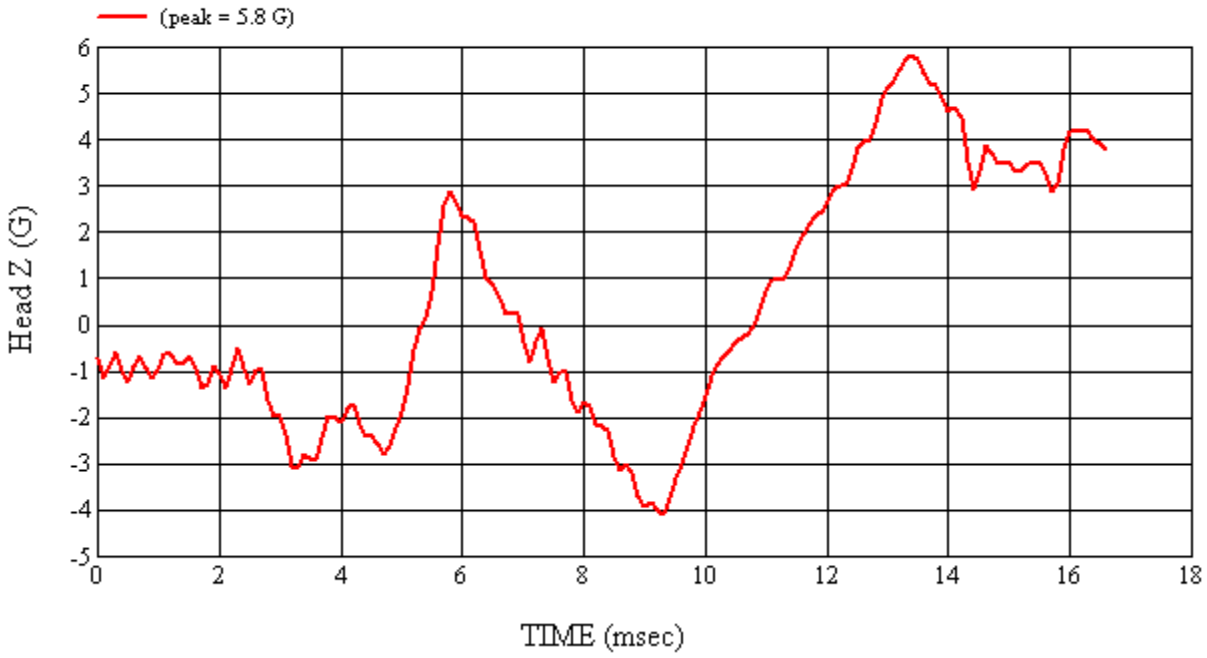
MGA Test #: U12138 Target Location: UR2, Right Side Test Date: 4/27/2012

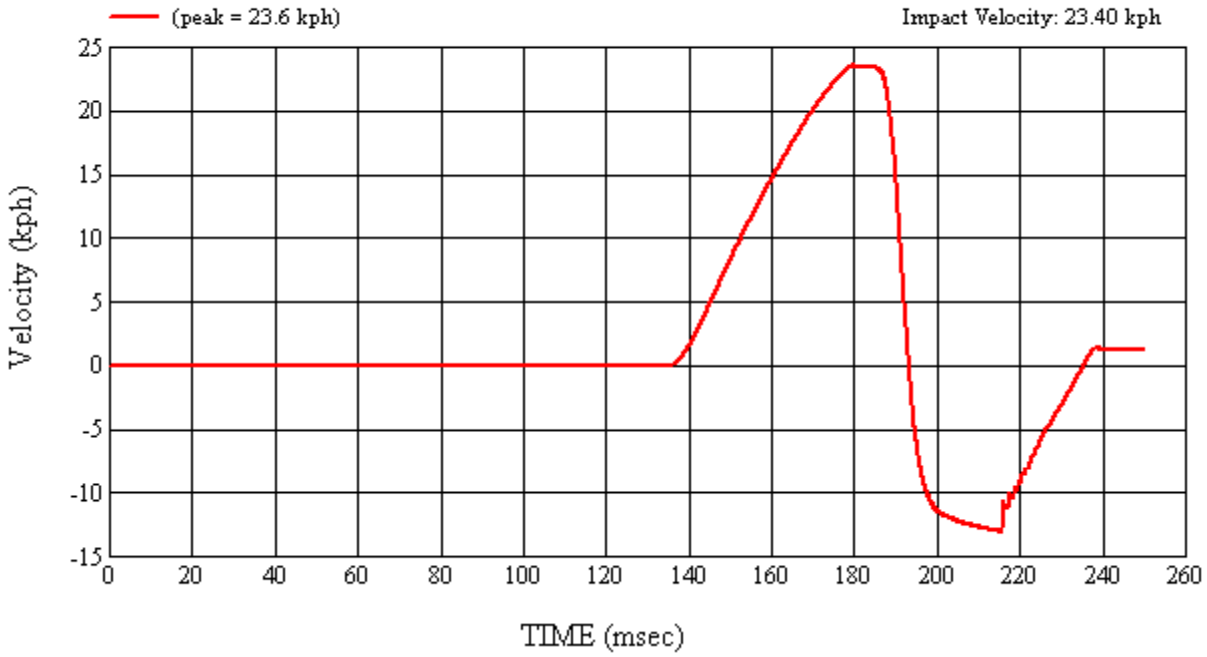


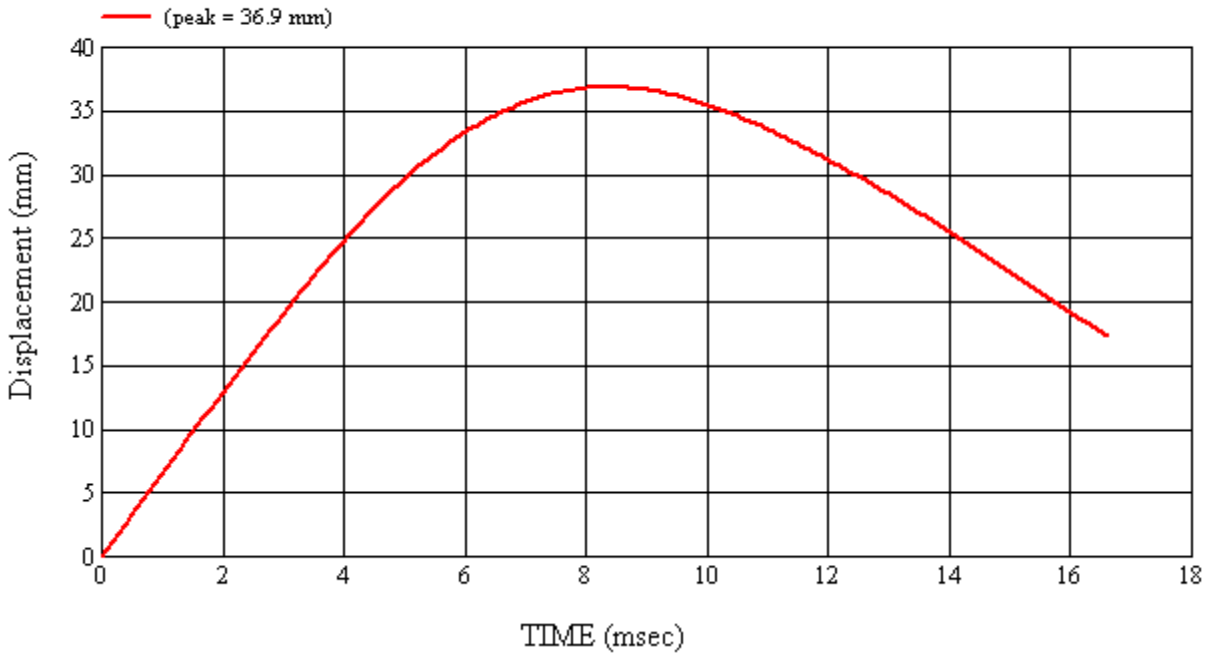



(peak = 136.2 G)
0
-20
-40
-60
-80
-100
-120
-140
Head X (G)
0
2
4
6
8
10
12
14
16
18
TIME (msec)

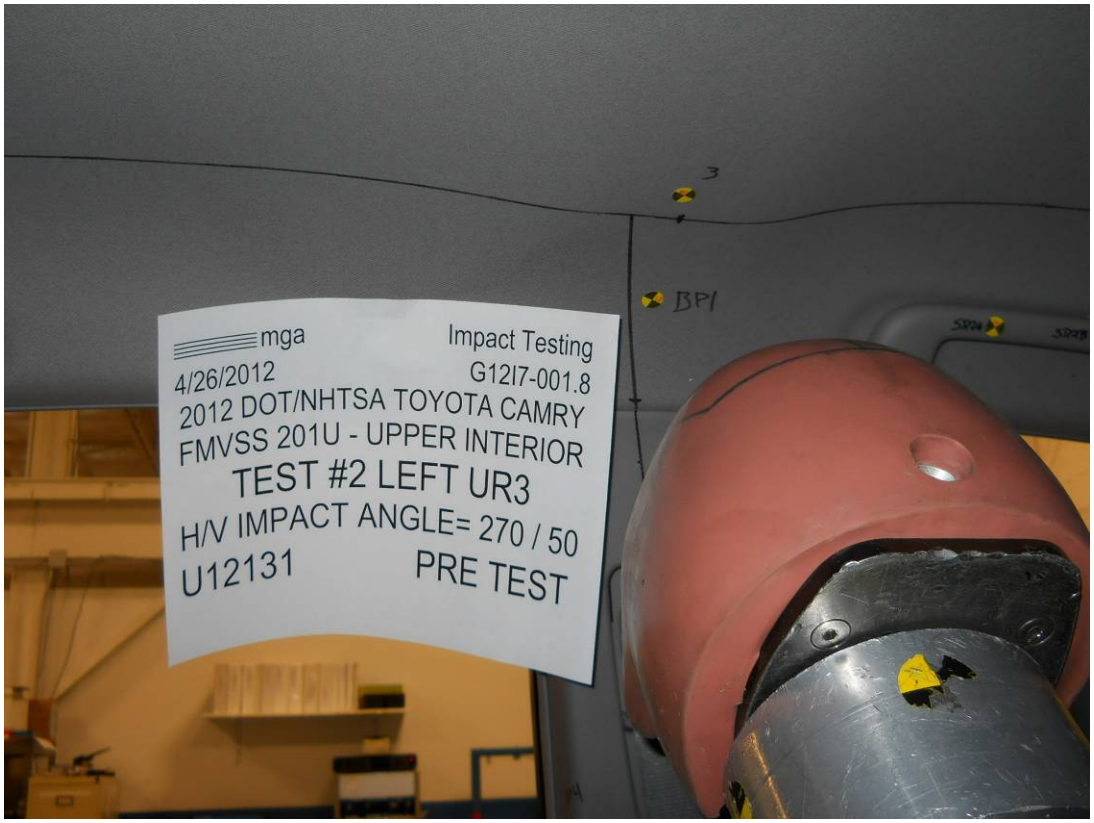

(peak = 7.1 G)
8
6
4
2
0
-2
-4
-6
-8
Head Y (G)
0
2
4
6
8
10
12
14
16
18
TIME (msec)

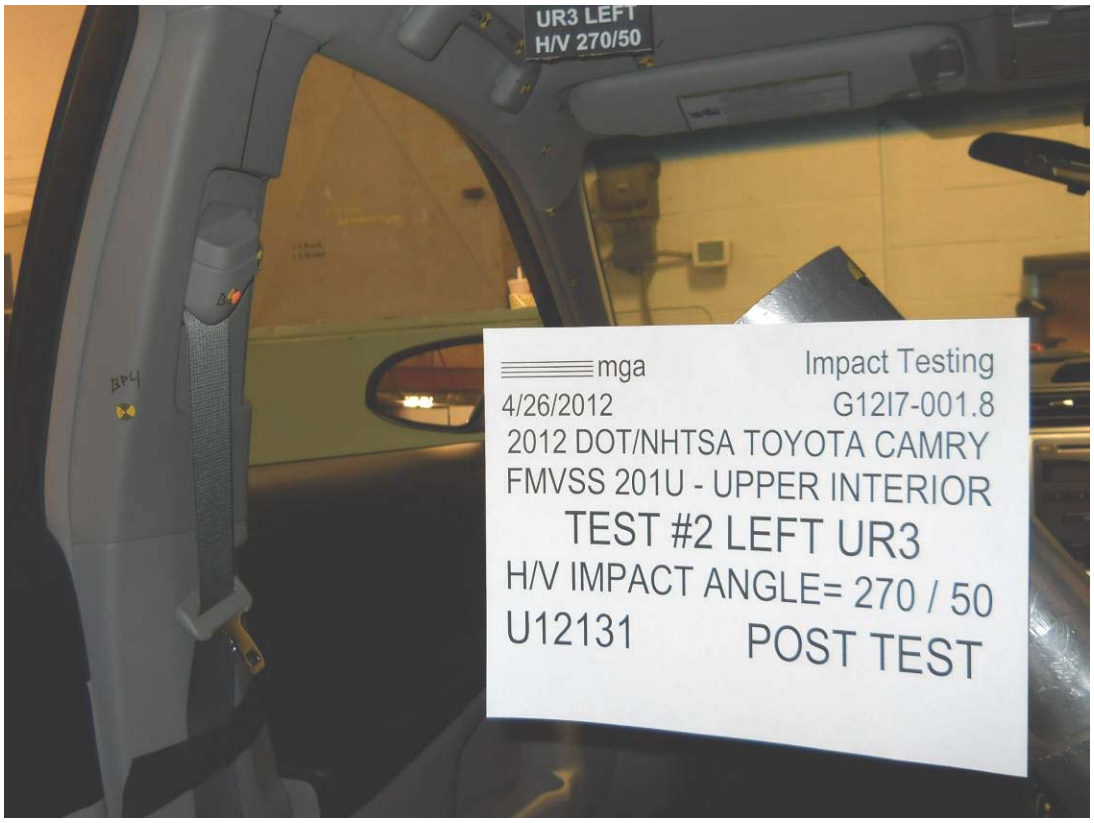

(peak = 5.8 G)
Head Z (G)
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 23.6 kph)
Impact Velocity: 23.40 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)

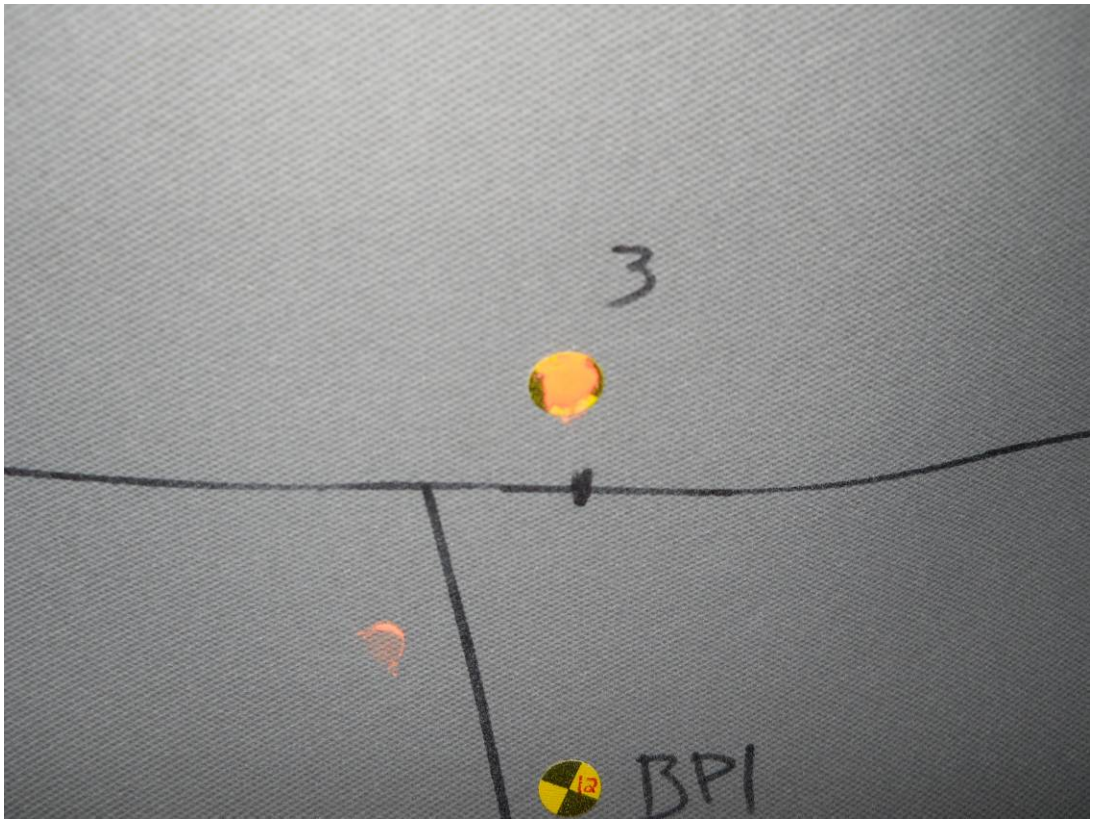

(peak = 36.9 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
TIME (msec)


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U12131
PRE TEST


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U12131
PRE TEST


UR3 LEFT
H/V 270/50
mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U12131
POST TEST


3
BP1
SR24
mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U12131
POST TEST


3
BP1


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U12131
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#2

Target (Vehicle Side): UR3Left

Temperature:21.7C

MGA Test Reference No.:U12131

Humidity:40.6%

Approach Horizontal Angles:270º

Time of Test:10:24:57 AM

Approach Vertical Angles:50º

FMH Serial No:[037]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
841	894	6	23.4	36	4 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J32177	-113.3	0.87	0.87
Y	6	J14103	95.2	0.97	0.97
Z	7	J35800	98.5	0.96	0.96

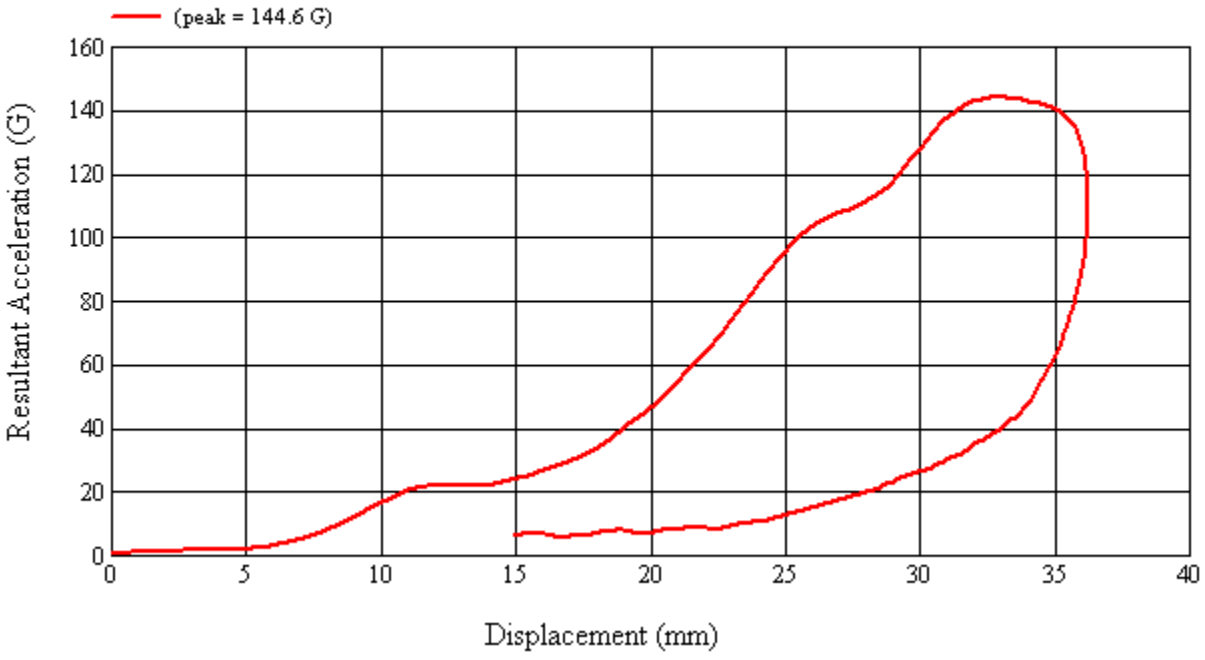
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

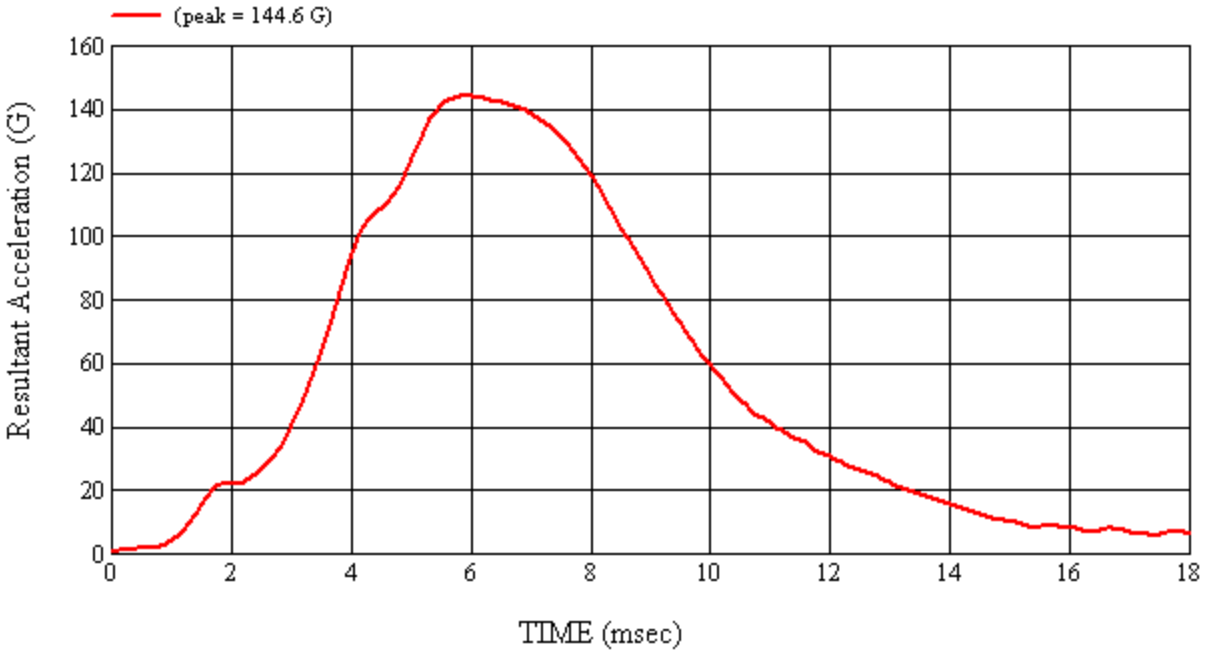
No visible damage

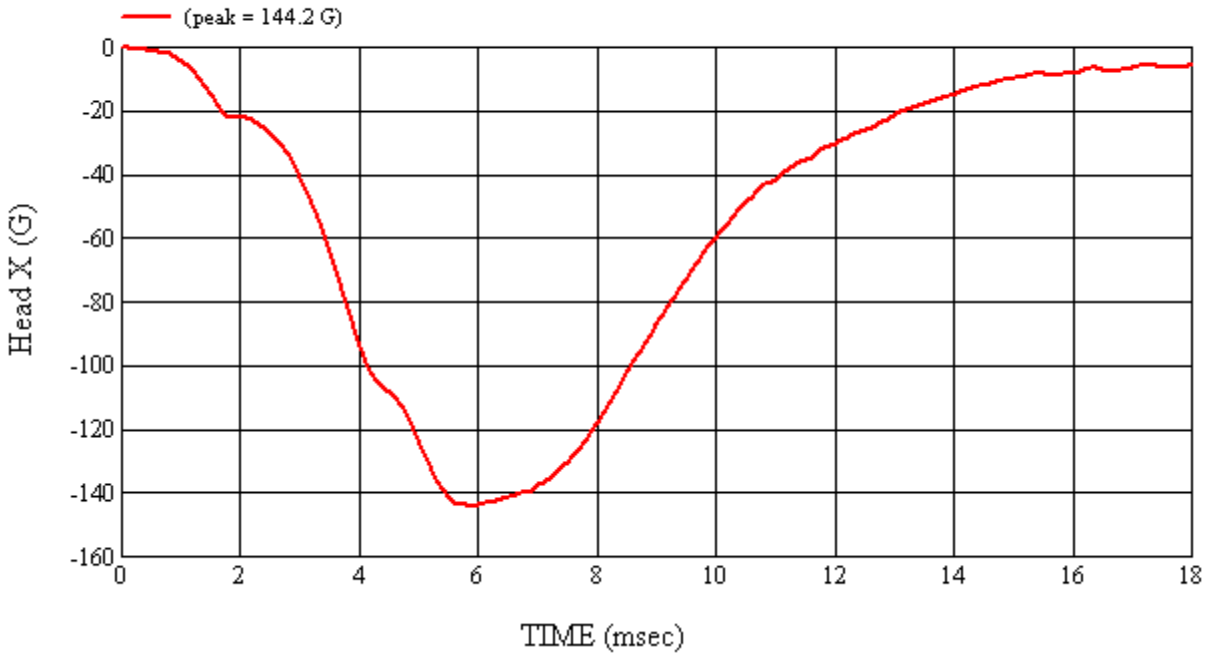
Recorded By: Ken D. McLean Approved By*: Helen A. Kalata Date: 4/26/2012

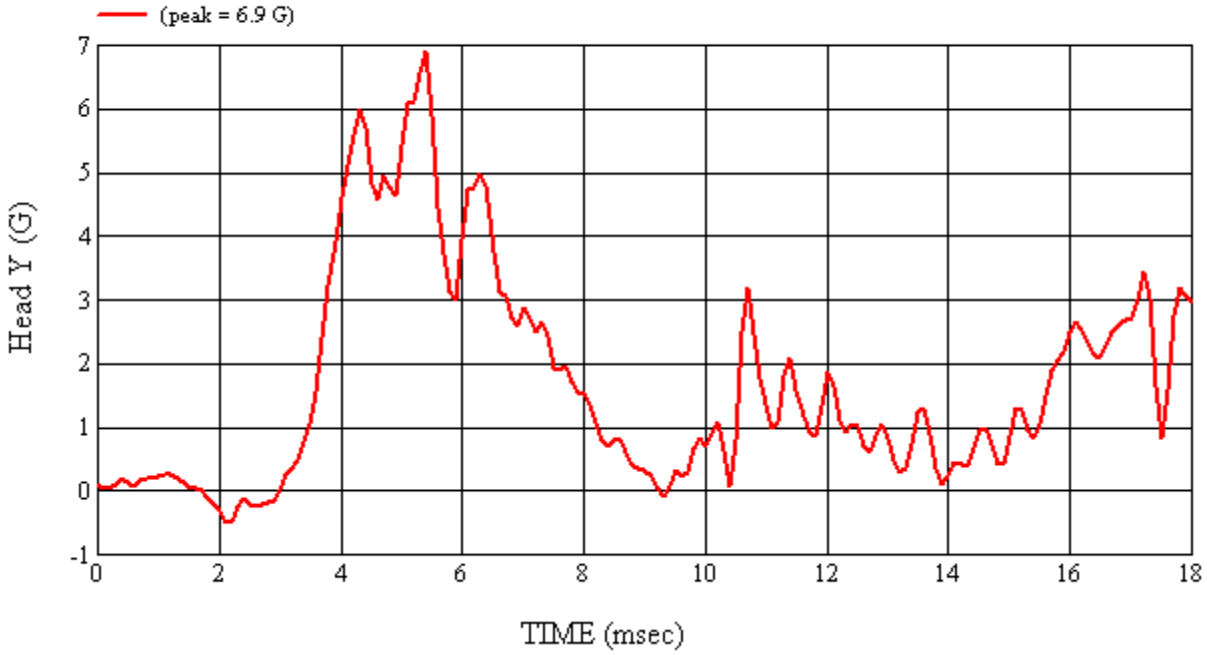
*Only necessary for NHTSA (Government) Compliance testing.

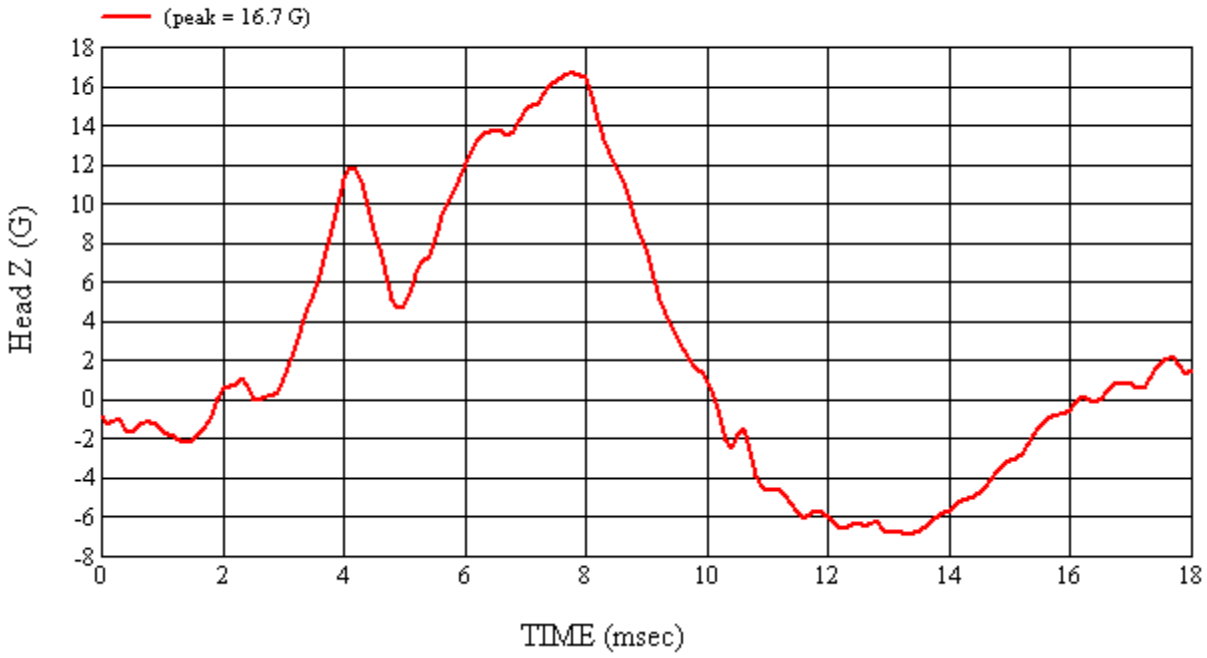
MGA Test #: U12131 Target Location: UR3, Left Side Test Date: 4/26/2012

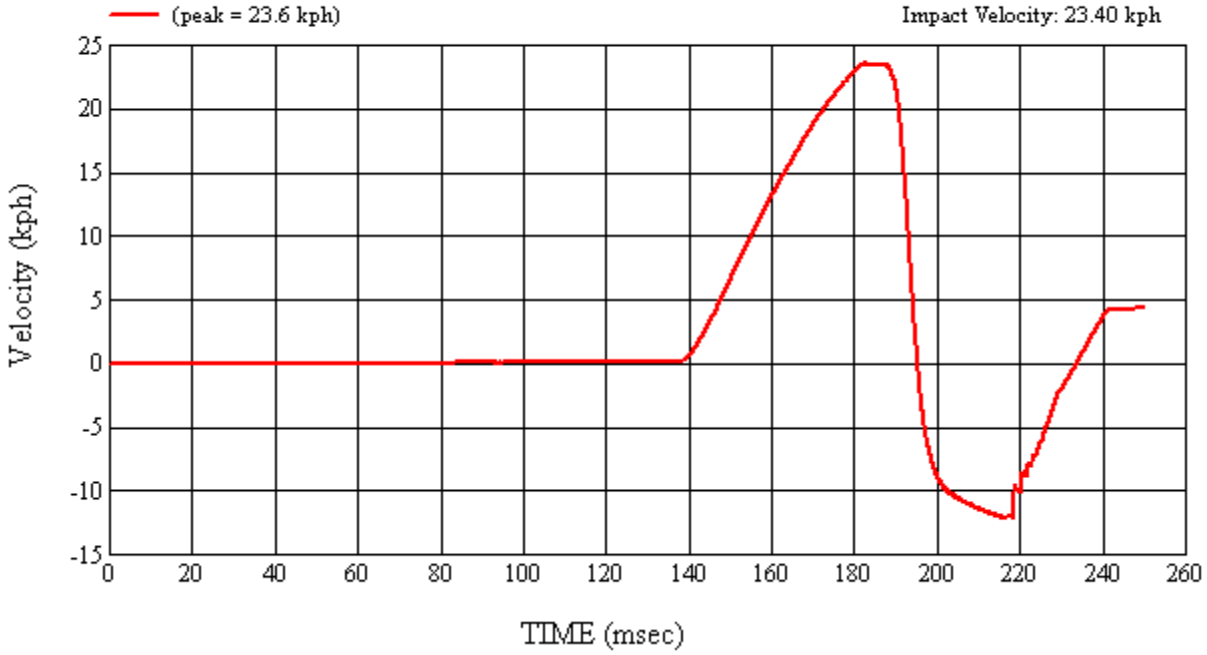


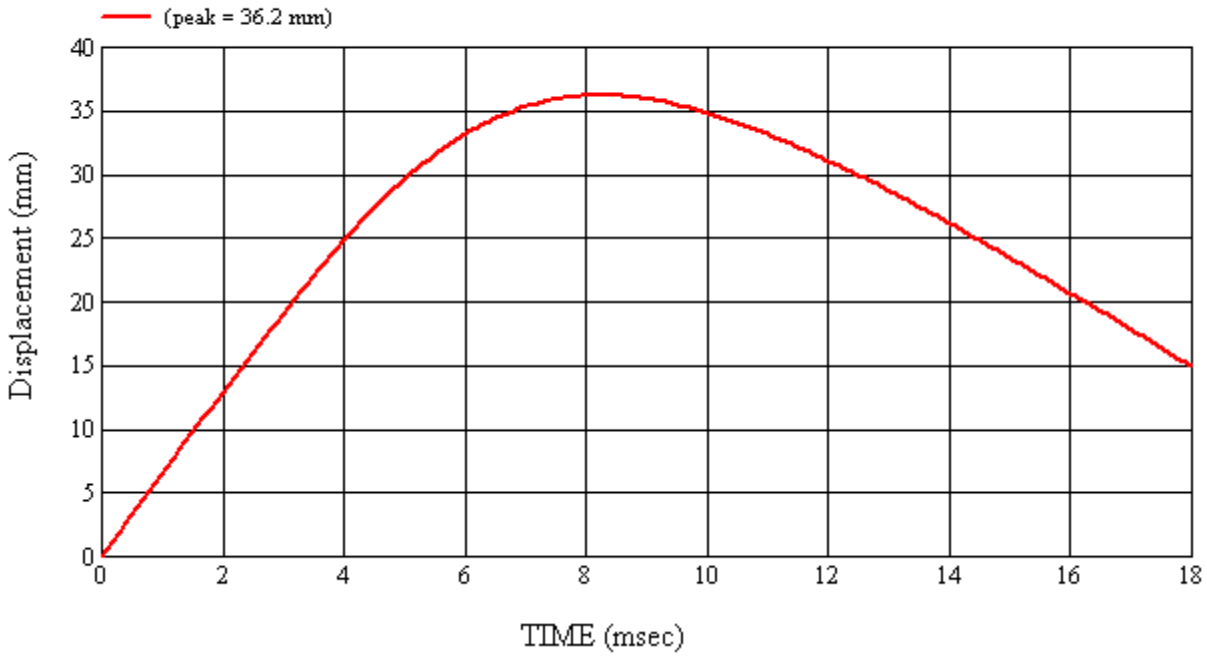


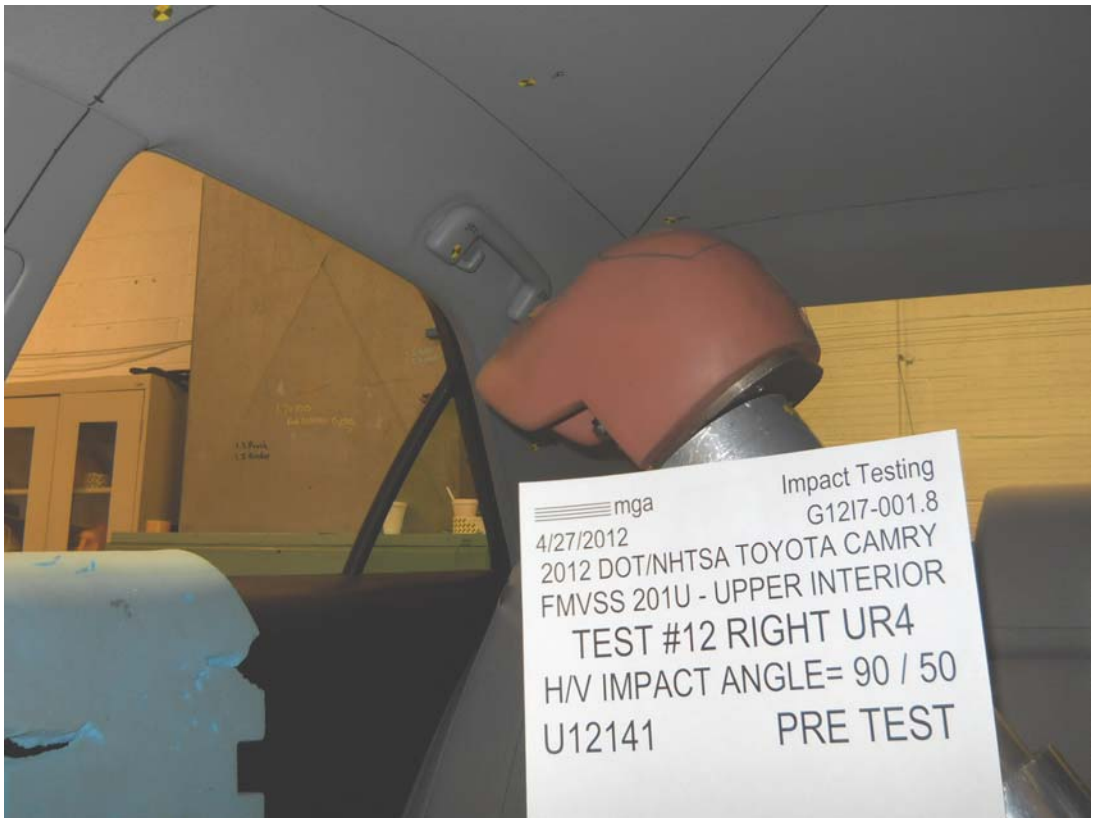

(peak = 144.2 G)
Head X (G)
0
-20
-40
-60
-80
-100
-120
-140
-160
0
2
4
6
8
10
12
14
16
18
TIME (msec)

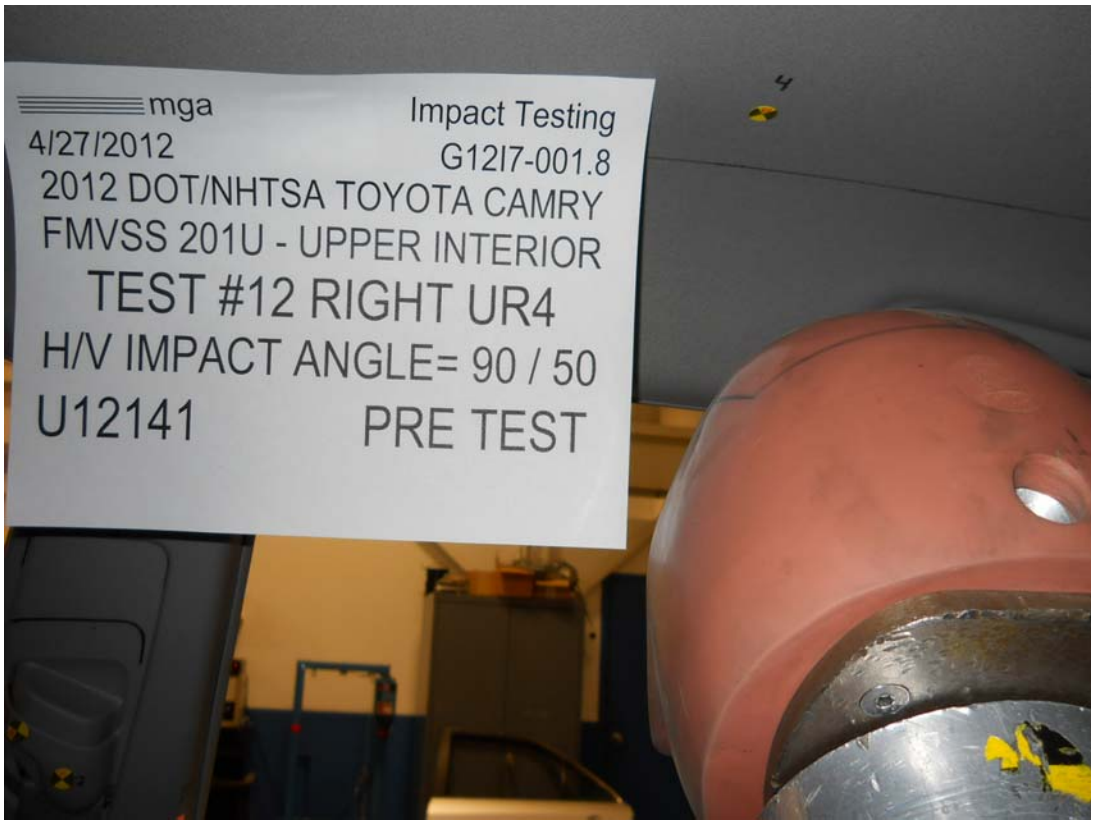

(peak = 6.9 G)
Head Y (G)
7
6
5
4
3
2
1
0
-1
0
2
4
6
8
10
12
14
16
18
TIME (msec)

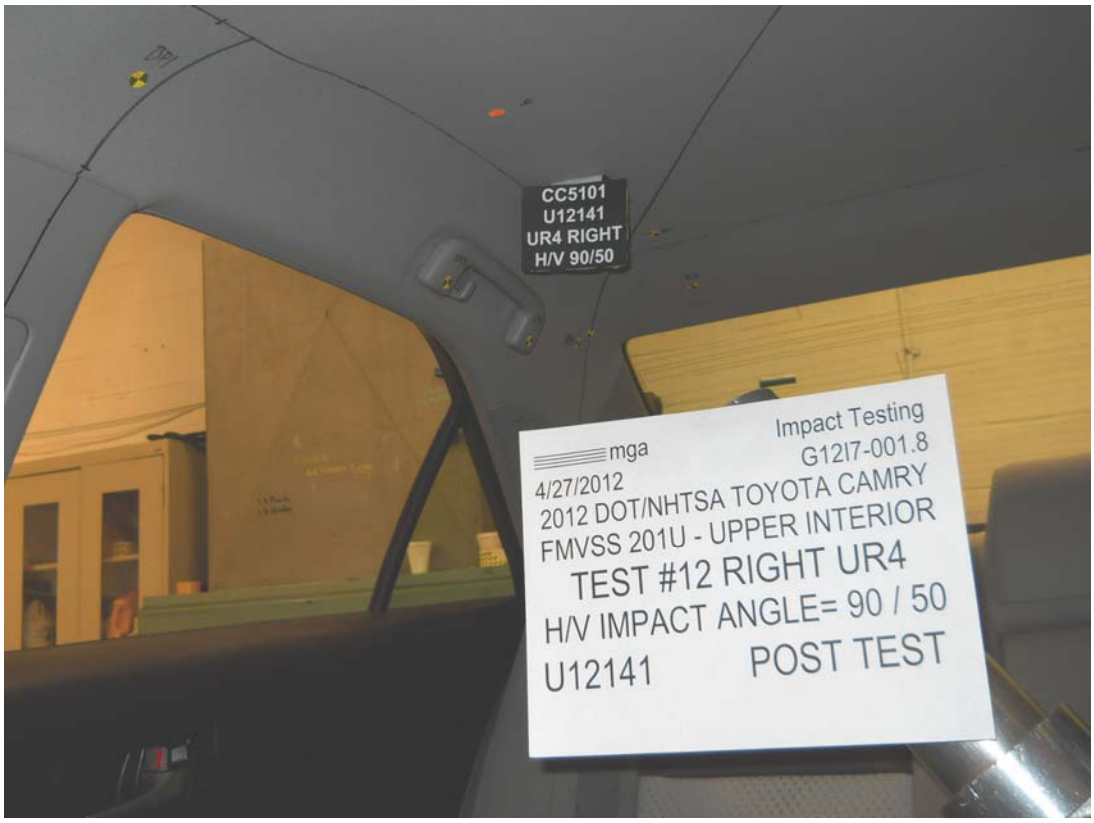

(peak = 16.7 G)
Head Z (G)
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
0
2
4
6
8
10
12
14
16
18
TIME (msec)

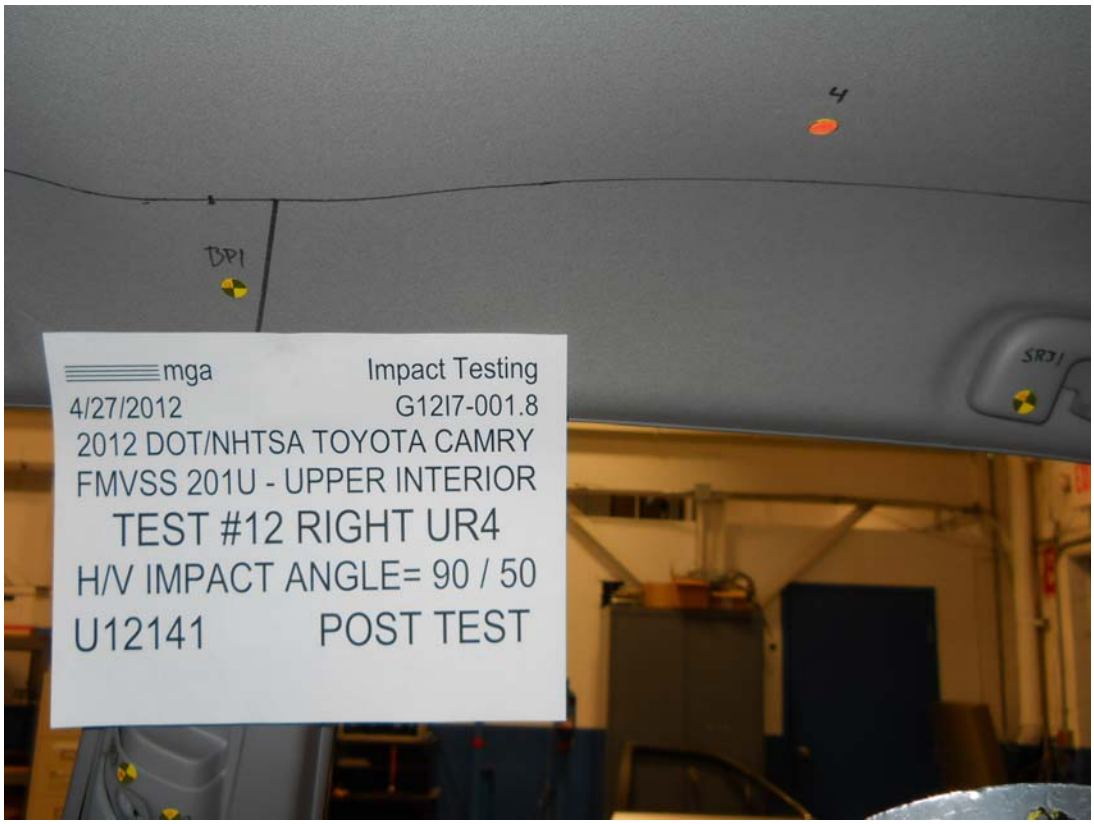

(peak = 23.6 kph)
Impact Velocity: 23.40 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 36.2 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
TIME (msec)


mga
Impact Testing
G12I7-001.8
4/27/2012
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U12141
PRE TEST


mga
Impact Testing
G12I7-001.8
4/27/2012
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U12141
PRE TEST


CC5101
U12141
UR4 RIGHT
H/V 90/50
mga
Impact Testing
G12I7-001.8
4/27/2012
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U12141
POST TEST


4
BP1
SR3 I
mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U12141
POST TEST


4


mga
Impact Testing
4/27/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT UR4
H/V IMPACT ANGLE= 90 / 50
U12141
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Test Number:#12

Target (Vehicle Side): UR4Right

Temperature:21.6C

MGA Test Reference No.:U12141

Humidity:23.3%

Approach Horizontal Angles:90º

Time of Test:11:45:09 AM

Approach Vertical Angles:50º

FMH Serial No:[035]

Additional Description:X=2956

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
710	721	8.8	23.5	37	2 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-96.8	0.87	0.87
Y	6	J22664	95.5	0.97	0.97
Z	7	J35924	94.1	0.96	0.96

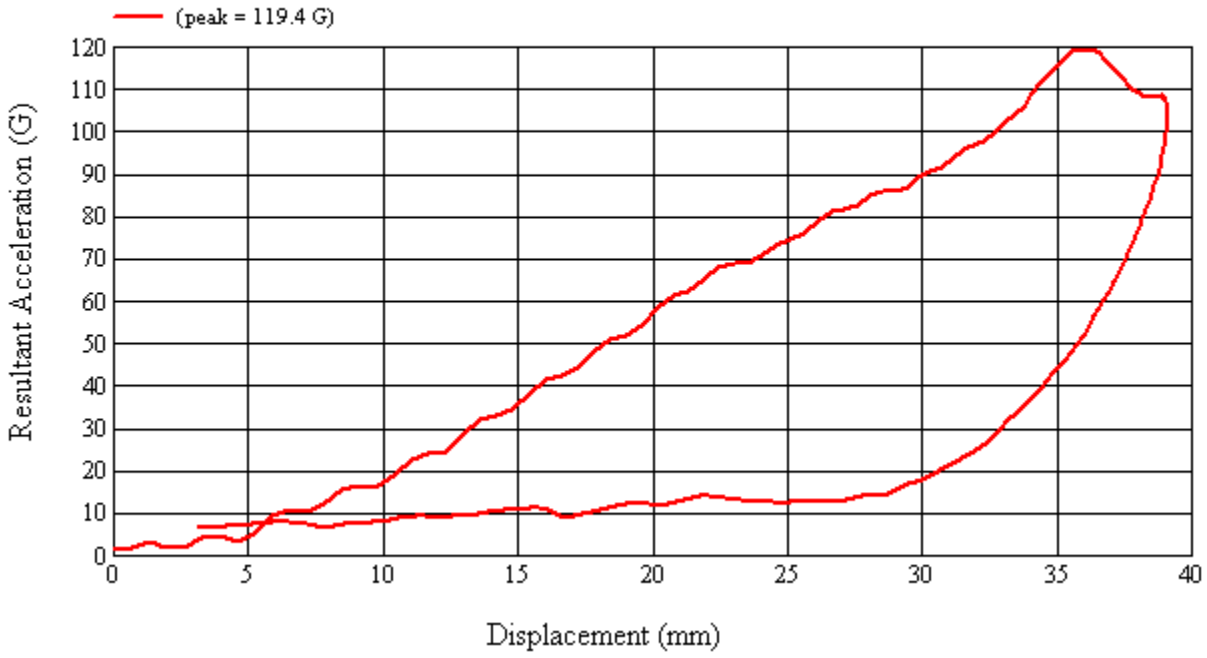
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

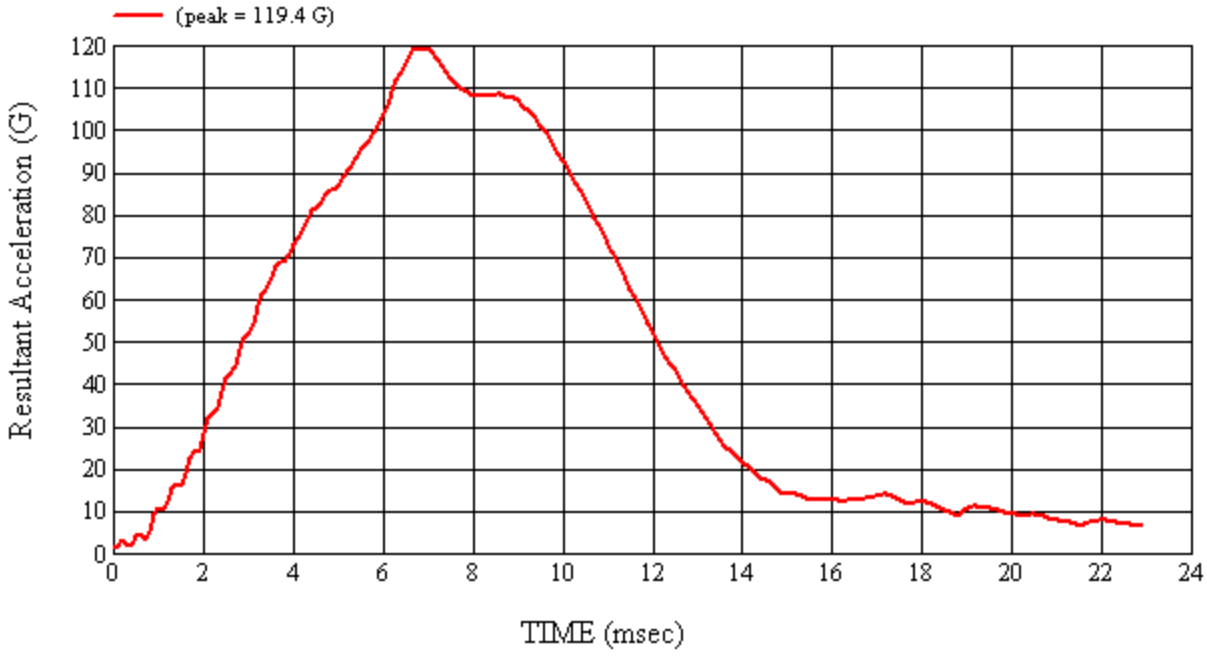
No visible damage

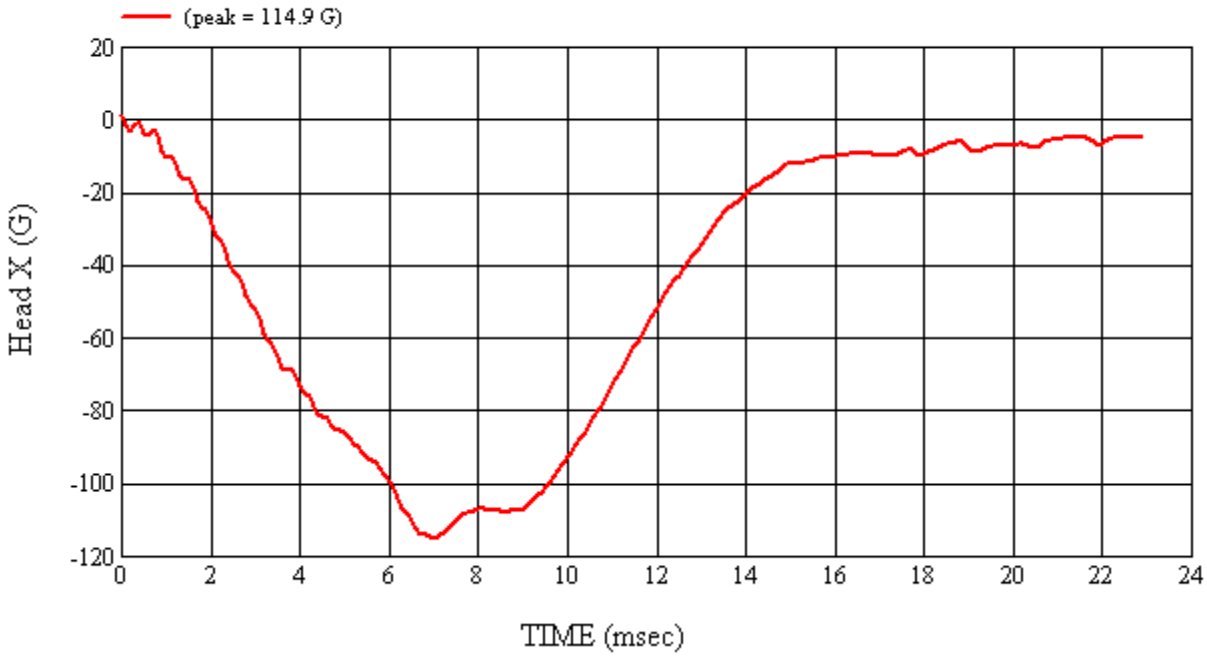
Recorded By: [signature] Approved By*: [signature] Date: 4/27/2012

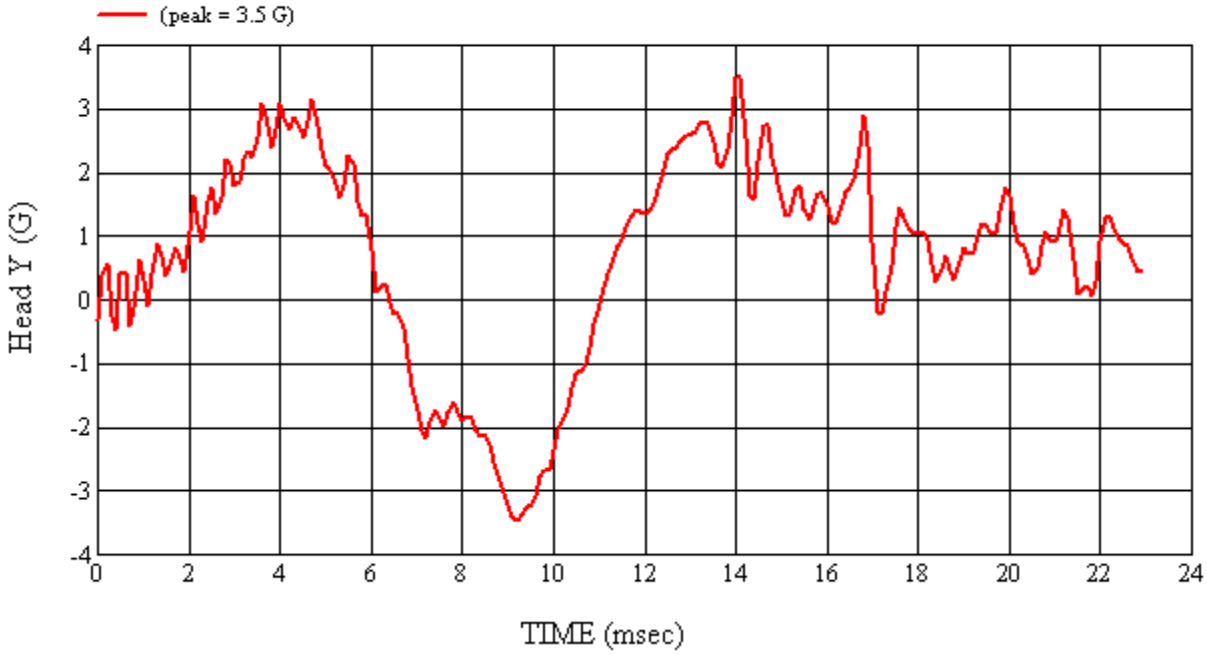
*Only necessary for NHTSA (Government) Compliance testing.

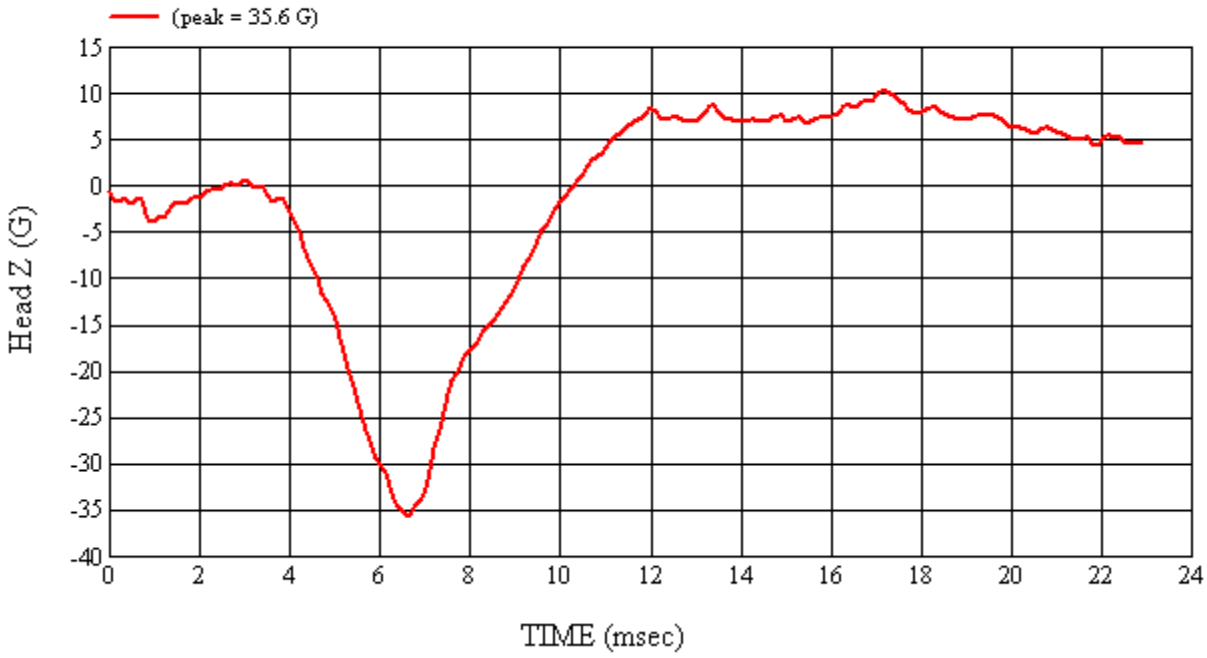
MGA Test #: U12141 Target Location: UR4, Right Side Test Date: 4/27/2012

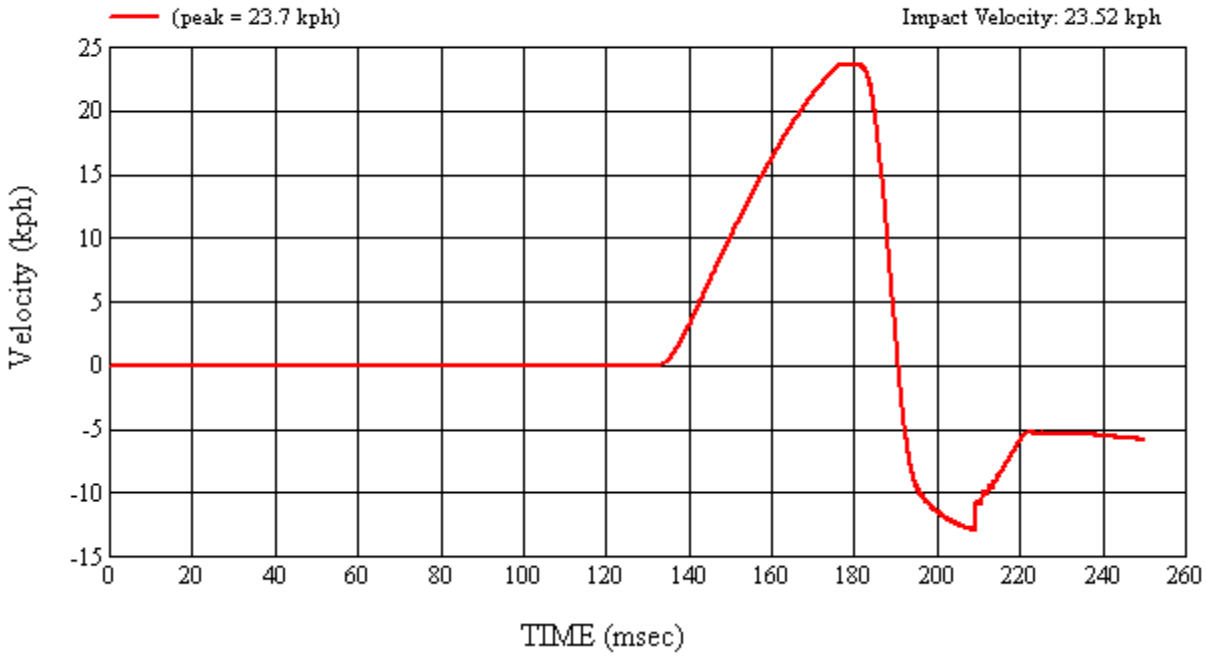


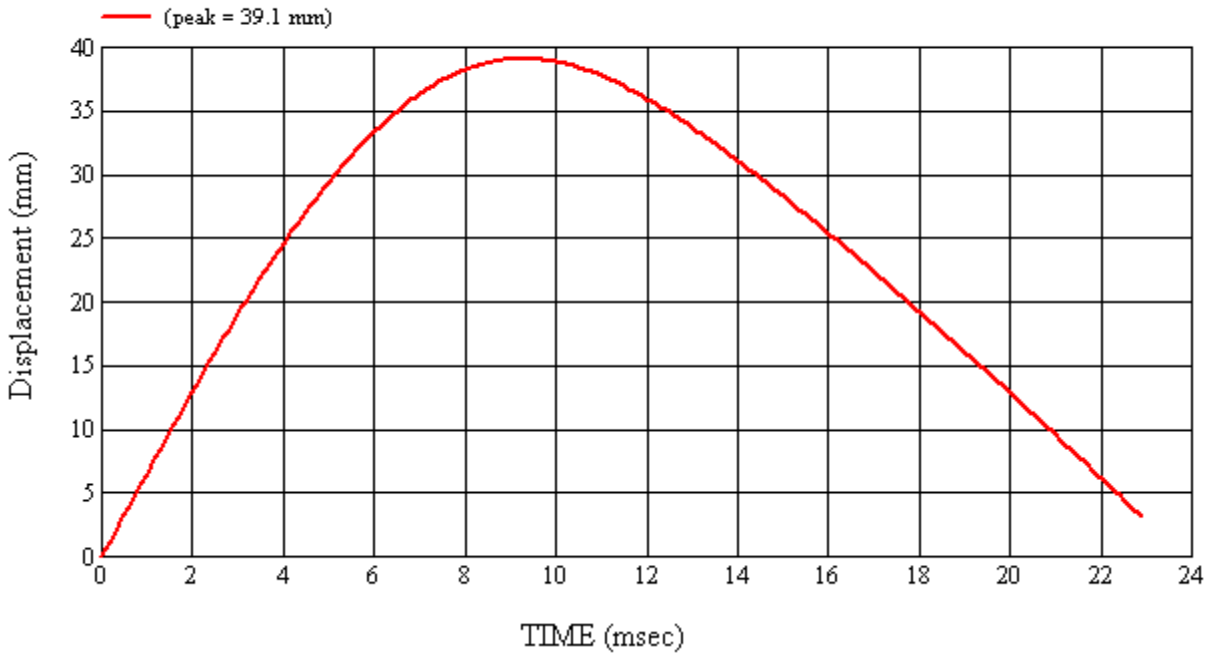


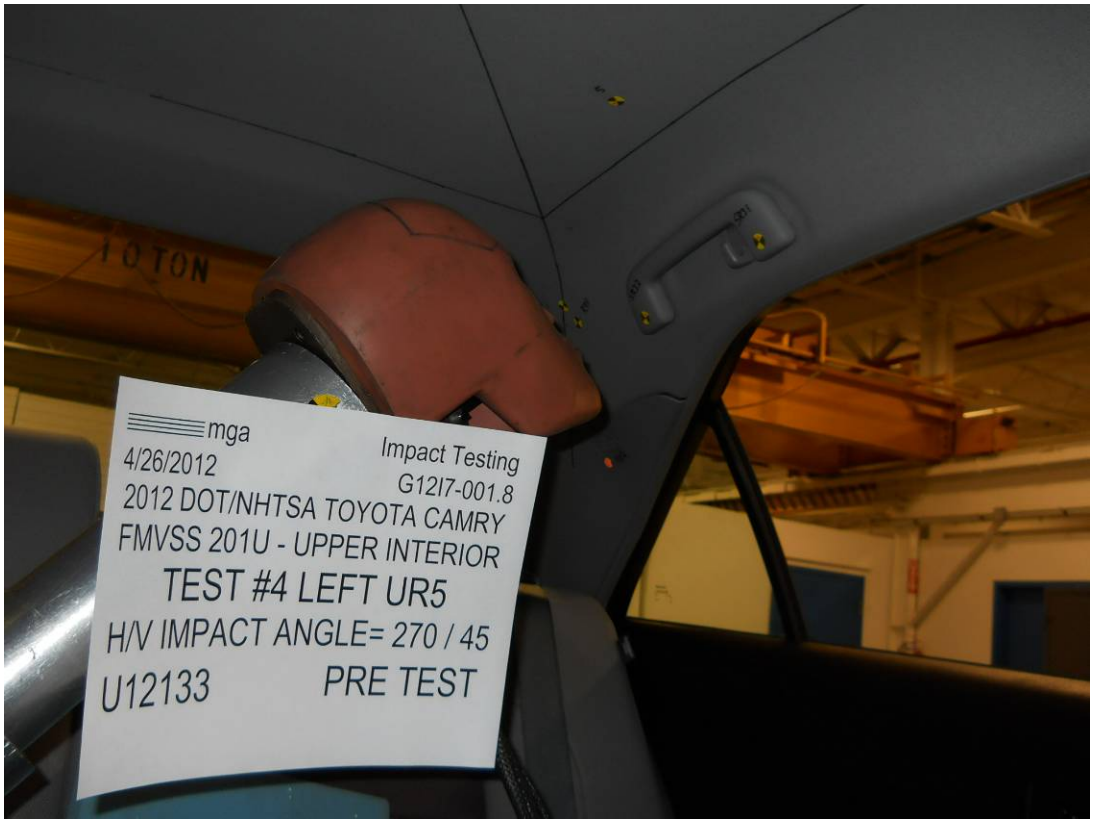

(peak = 114.9 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)

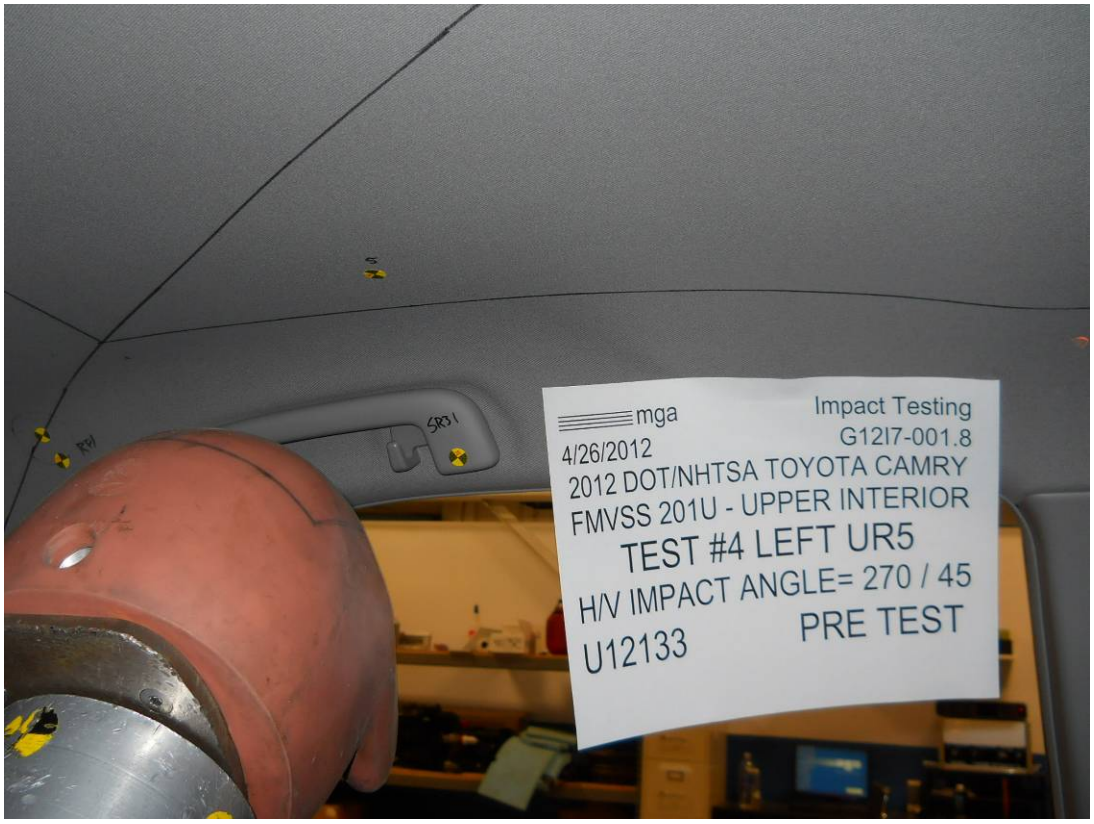

(peak = 3.5 G)
Head Y (G)
4
3
2
1
0
-1
-2
-3
-4
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)

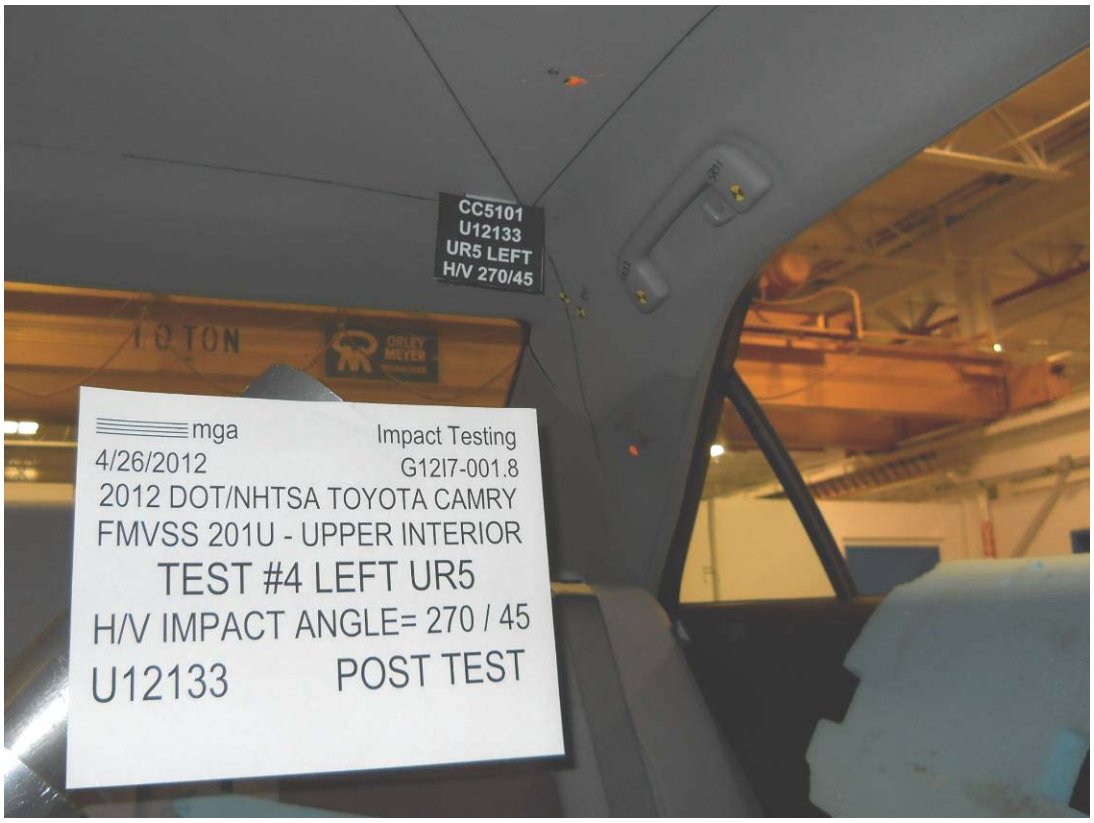

(peak = 35.6 G)
Head Z (G)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)

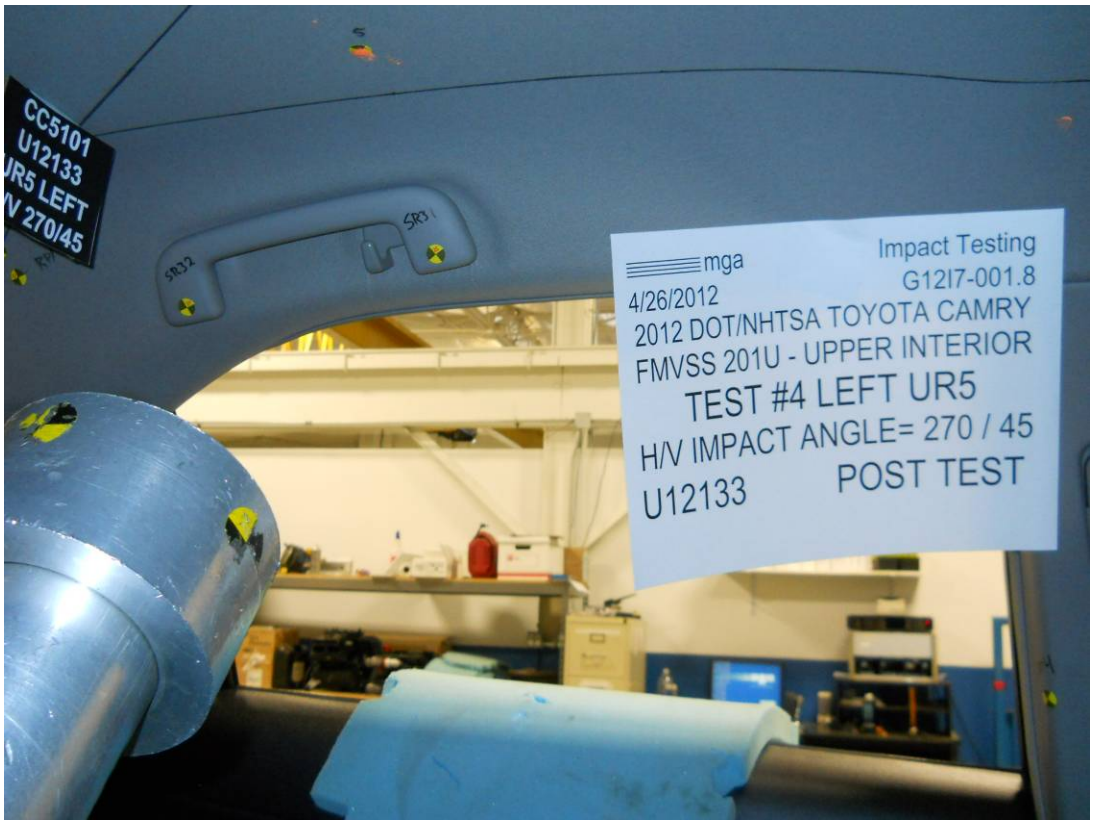

(peak = 23.7 kph)
Impact Velocity: 23.52 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 39.1 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


mga
4/26/2012
Impact Testing
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR5
H/V IMPACT ANGLE= 270 / 45
U12133
PRE TEST


mga
4/26/2012
Impact Testing
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR5
H/V IMPACT ANGLE= 270 / 45
U12133
PRE TEST


CC5101
U12133
UR5 LEFT
H/V 270/45
mga
Impact Testing
G12I7-001.8
4/26/2012
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR5
H/V IMPACT ANGLE= 270 / 45
U12133
POST TEST


CC5101
U12133
UR5 LEFT
V 270/45
SR32
SR31
mga
Impact Testing
G12I7-001.8
4/26/2012
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR5
H/V IMPACT ANGLE= 270 / 45
U12133
POST TEST


5


mga
Impact Testing
4/26/2012
G12I7-001.8
2012 DOT/NHTSA TOYOTA CAMRY
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR5
H/V IMPACT ANGLE= 270 / 45
U12133
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G12I7-001.8 VEHICLE YR/MAKE/MODEL:2012/DOT/NHTSA/Toyota Camry

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR5Left

MGA Test Reference No.:U12133

Approach Horizontal Angles:270º

Approach Vertical Angles:45º

Additional Description:

Test Number:#4

Temperature:22.0C

Humidity:41.3%

Time of Test:1:07:55 PM

FMH Serial No:[035]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
819	865	7.3	23.7	34	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	-96.8	0.87	0.87
Y	6	J22664	95.5	0.97	0.97
Z	7	J35924	94.1	0.96	0.96

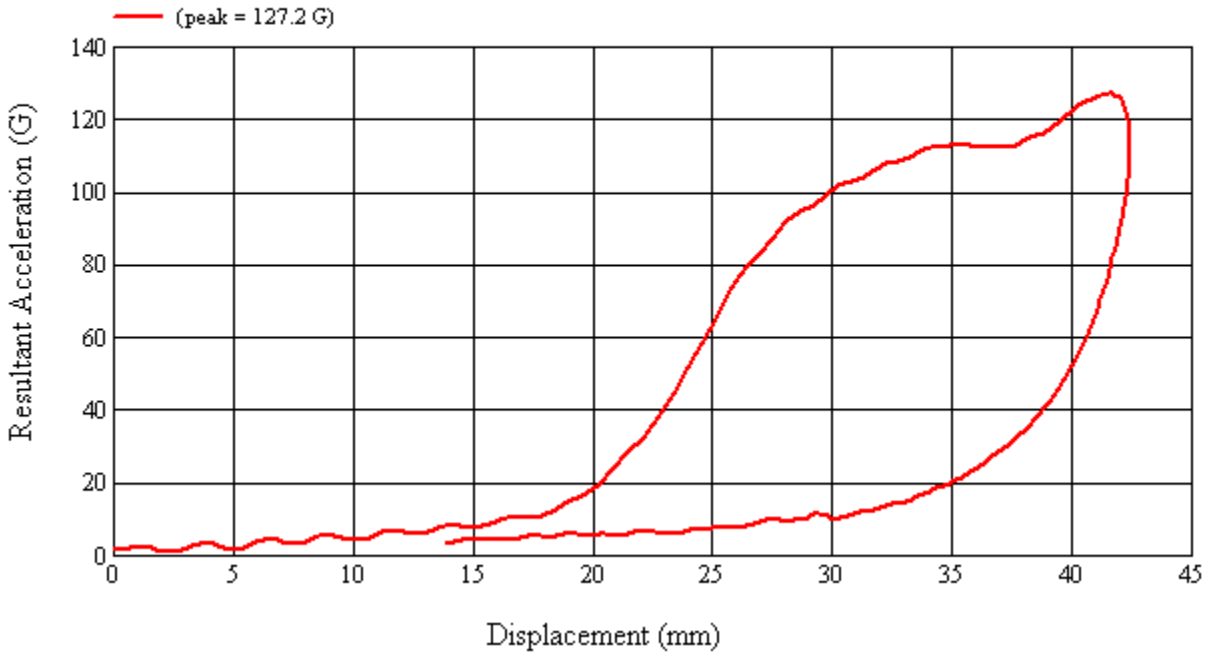
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

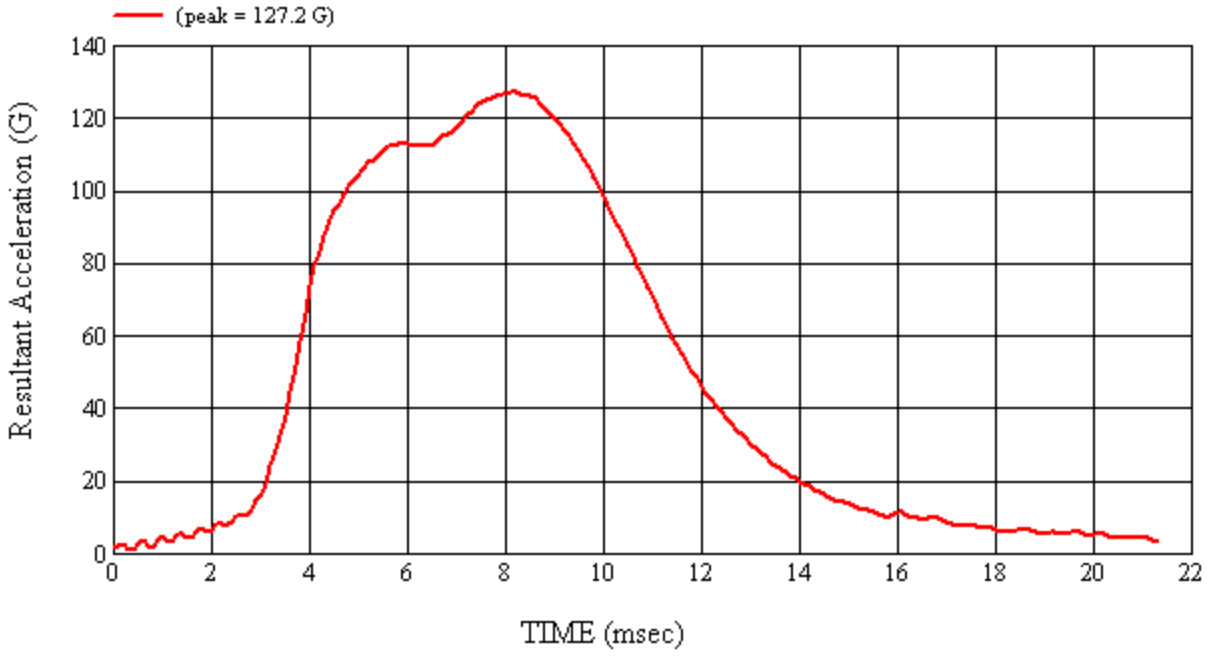
No visible damage

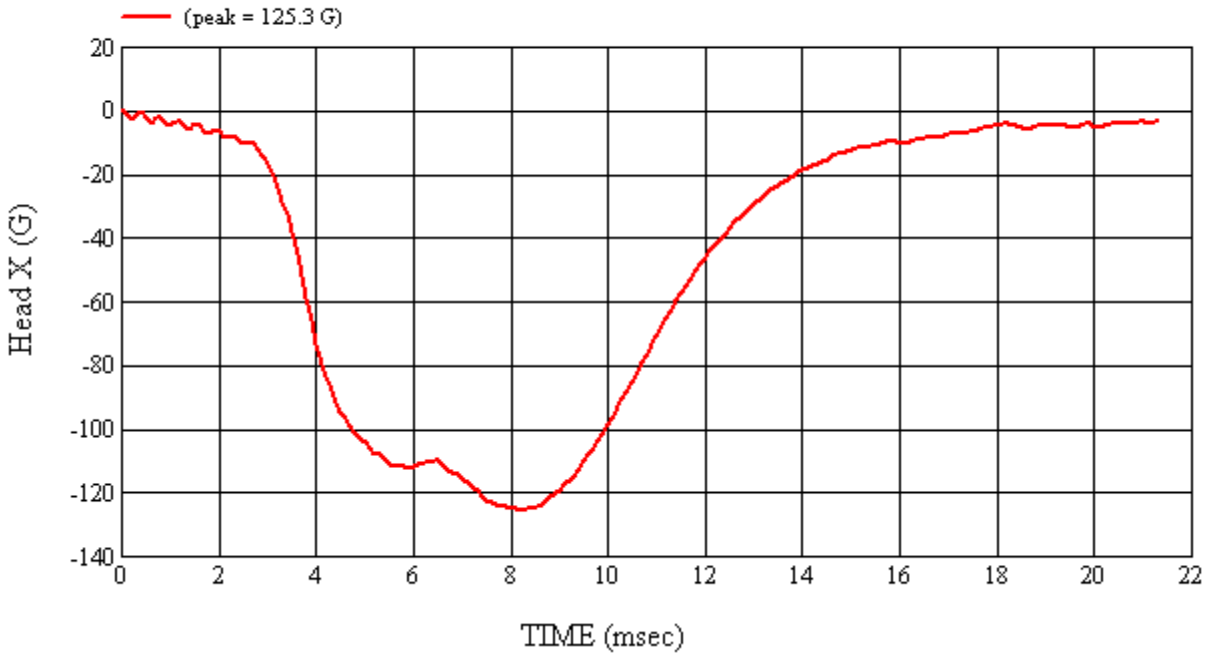
Recorded By: Kevin D. McKenna Approved By*: Helen A. Kalata Date: 4/26/2012

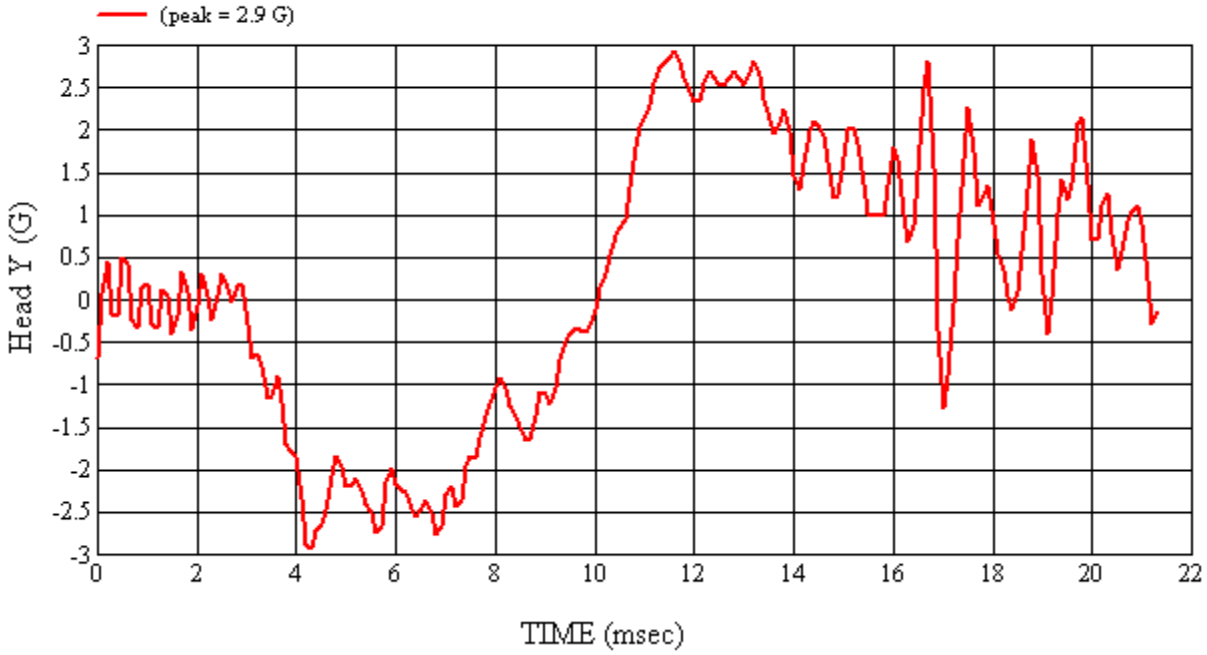
*Only necessary for NHTSA (Government) Compliance testing.

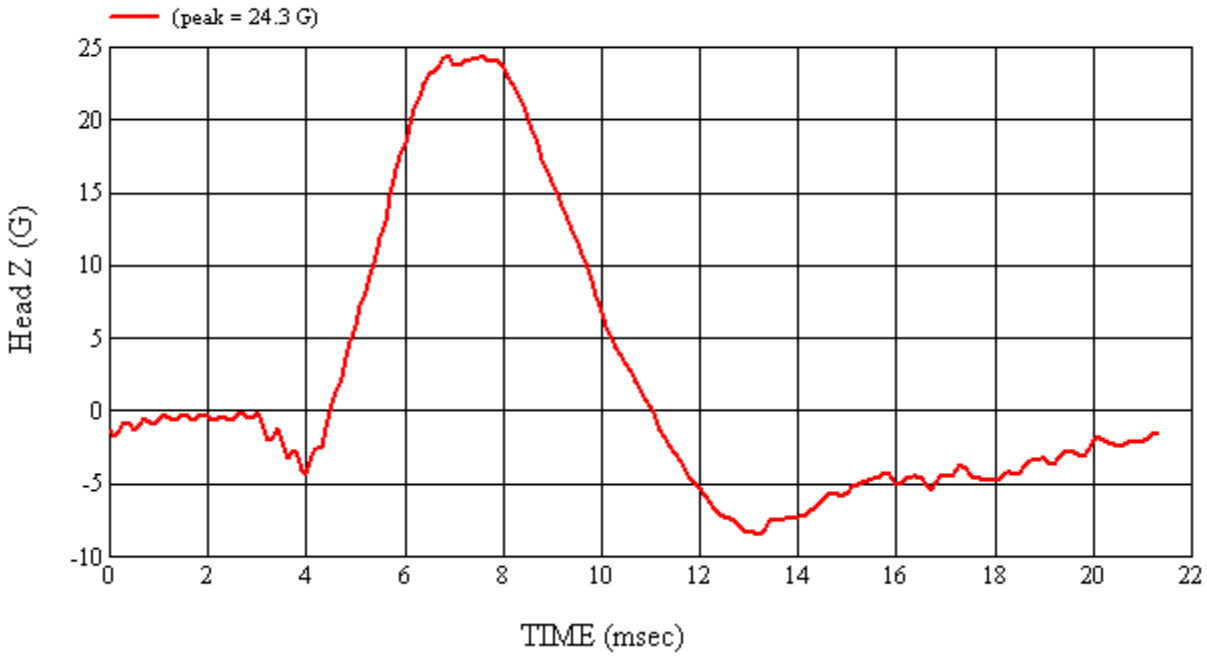
MGA Test #: U12133 Target Location: UR5, Left Side Test Date: 4/26/2012

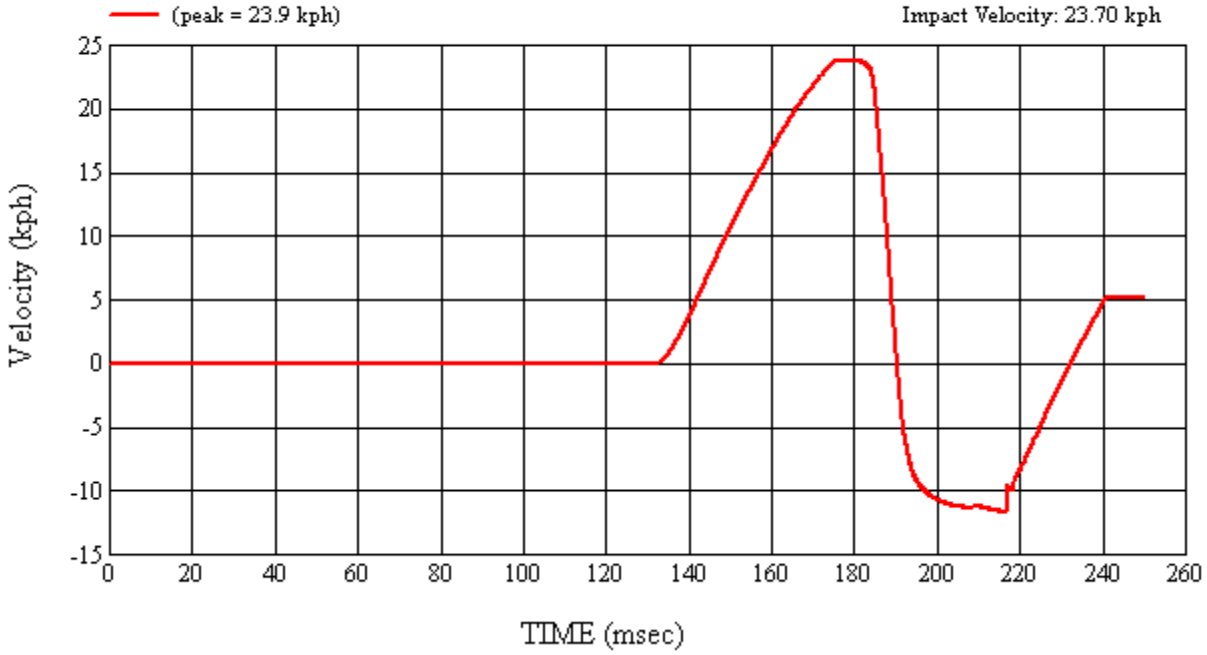


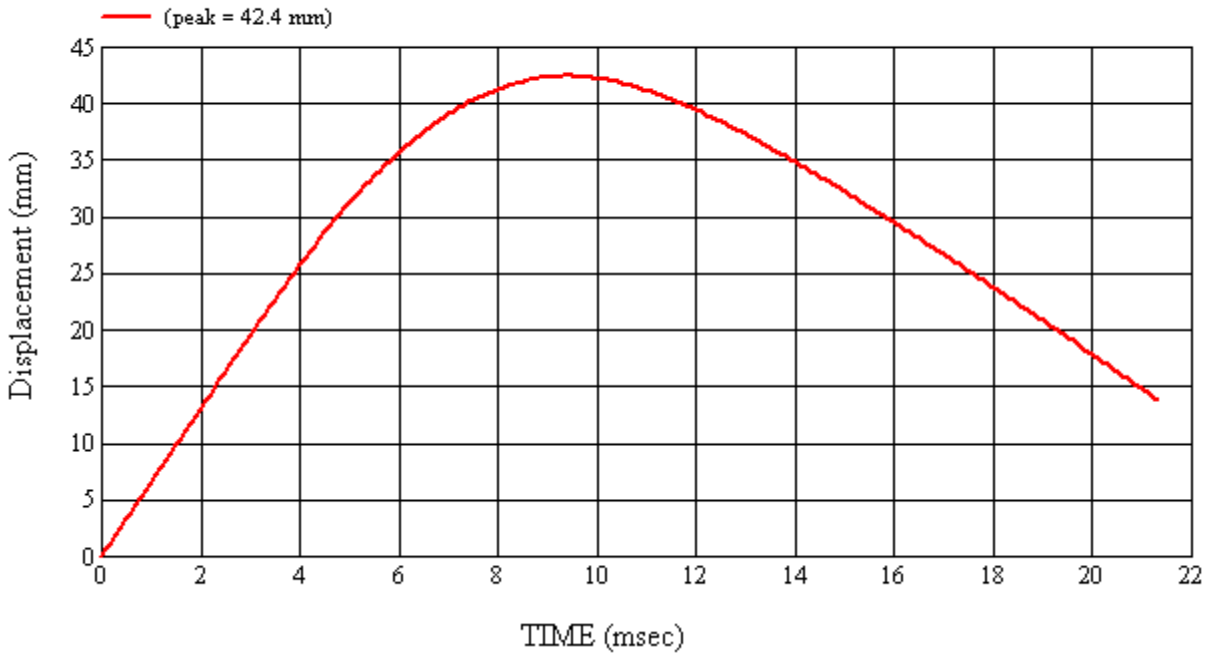



(peak = 125.3 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 2.9 G)
Head Y (G)
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 24.3 G)
Head Z (G)
25
20
15
10
5
0
-5
-10
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 23.9 kph)
Impact Velocity: 23.70 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 = 42.4 mm)
Displacement (mm)
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

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	G10020001619	Targeting	0.1 mm	Annual
Measuring Devices: - Tape Measure - Plumb Bobs - Digital Protractor	 Stanley N/A Mitutoyo	 TPM163 -- MGA00712	 Measurement Targeting FMH setup Horizontal Measurement	 1 mm N/A 0.5°	Annual
*Temperature Recorder	Dickson	MGA00894	Record Temperature and Humidity	± 1°C ± 1% RH	Annual
* Scale	Detecto	MGA00783	Weigh FMH Head	± 0.01 lb	Annual
*Vehicle Scale	Intercomp	26032389	Weighing Vehicle	± .5 kg	Annual

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

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

TABLE 4-2 FMH CALIBRATION SUMMARY

FMH Serial #		Headform Calibration Date	Weight (lbs)	Temp (ºC)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
Pre	#035	4/26/2012	9.94	21.6	37.1	269.9	4.9	Yes
Post	#035	4/30/2012	9.94	21.8	28.7	268.8	4.0	Yes
Pre	#037	4/26/2012	9.96	21.1	37.1	241.5	6.6	Yes
Post	#037	4/30/2012	9.96	22.1	28.5	240.2	2.0	Yes
Pre	#038	4/26/2012	9.94	21.2	37.1	235.4	13.2	Yes
Post	#038	4/30/2012	9.94	21.7	33.5	231.8	6.3	Yes

4-1 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 035 CALIBRATION DATE: 4/26/2012 CALIBRATION TIME: 6:10:39 AM		
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.94
Temperature	19° C to 26° C	21.6
Relative Humidity	10% to 70%	37.1
Peak Resultant Acceleration	225 G's to 275 G's	269.9
Peak Lateral Acceleration	15 G's Maximum	4.9
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION

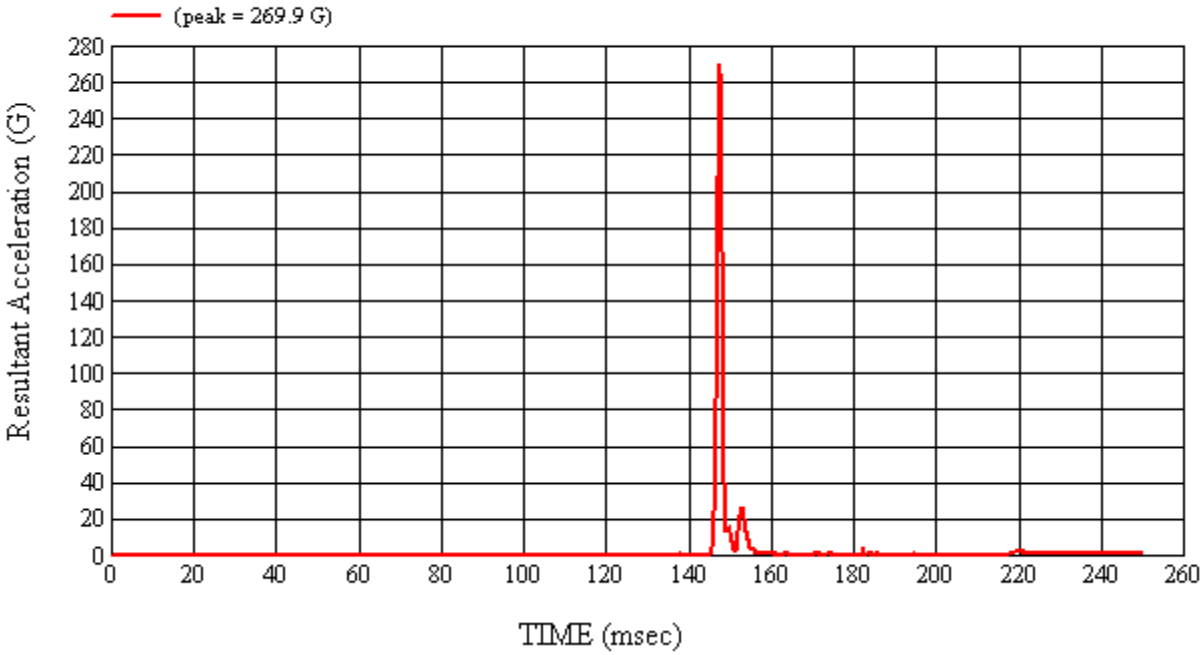
HEAD ACCELEROMETERS

Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	J35919	02/21/12	08/21/12
2	ENDEVCO	7264-2000	J22664	02/21/12	08/21/12
3	ENDEVCO	7264-2000	J35924	02/21/12	08/21/12

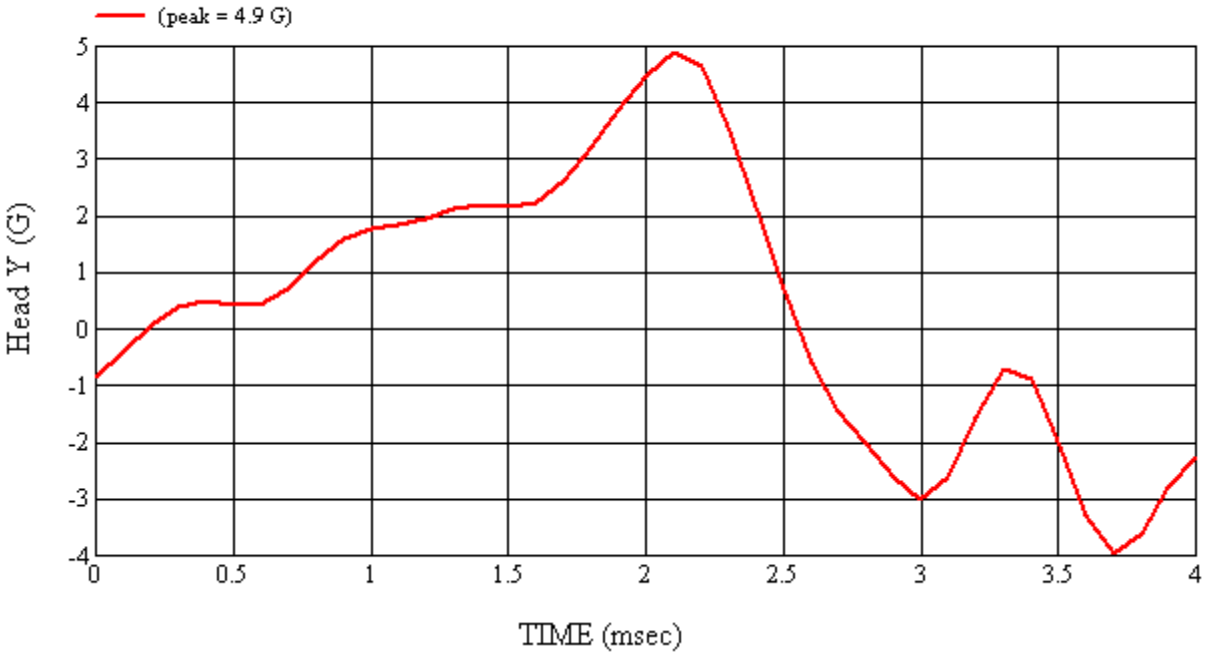
REMARKS:

RECORDED BY: _____ DATE: 04/26/2012

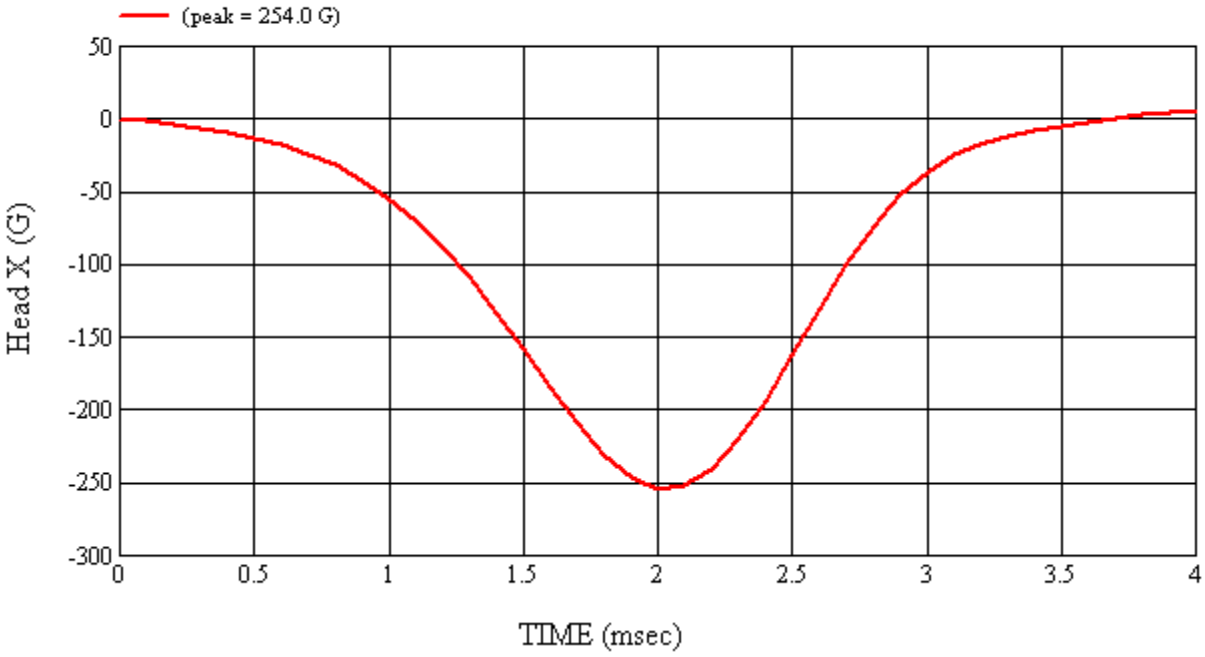
APPROVED BY: _____



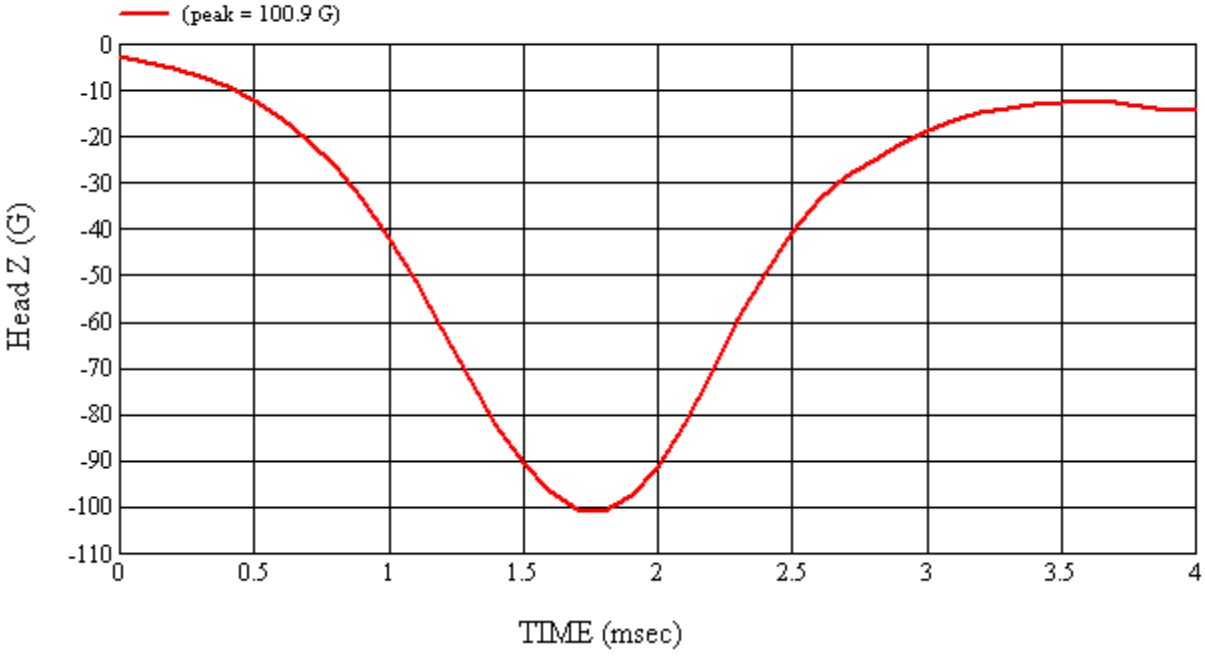
Head 35 (Pre) Calibration #H35021



Head 35 (Pre) Calibration #H35021



Head 35 (Pre) Calibration #H35021



Head 35 (Pre) Calibration #H35021

4-2 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 4/30/2012 CALIBRATION TIME: 8:32:19 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.94
Temperature	19° C to 26° C	21.8
Relative Humidity	10% to 70%	28.7
Peak Resultant Acceleration	225 G's to 275 G's	268.8
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	02/21/12	08/21/12
2	ENDEVCO	7264-2000	J22664	02/21/12	08/21/12
3	ENDEVCO	7264-2000	J35924	02/21/12	08/21/12

REMARKS:

RECORDED BY:  DATE: 04/30/2012

APPROVED BY: 

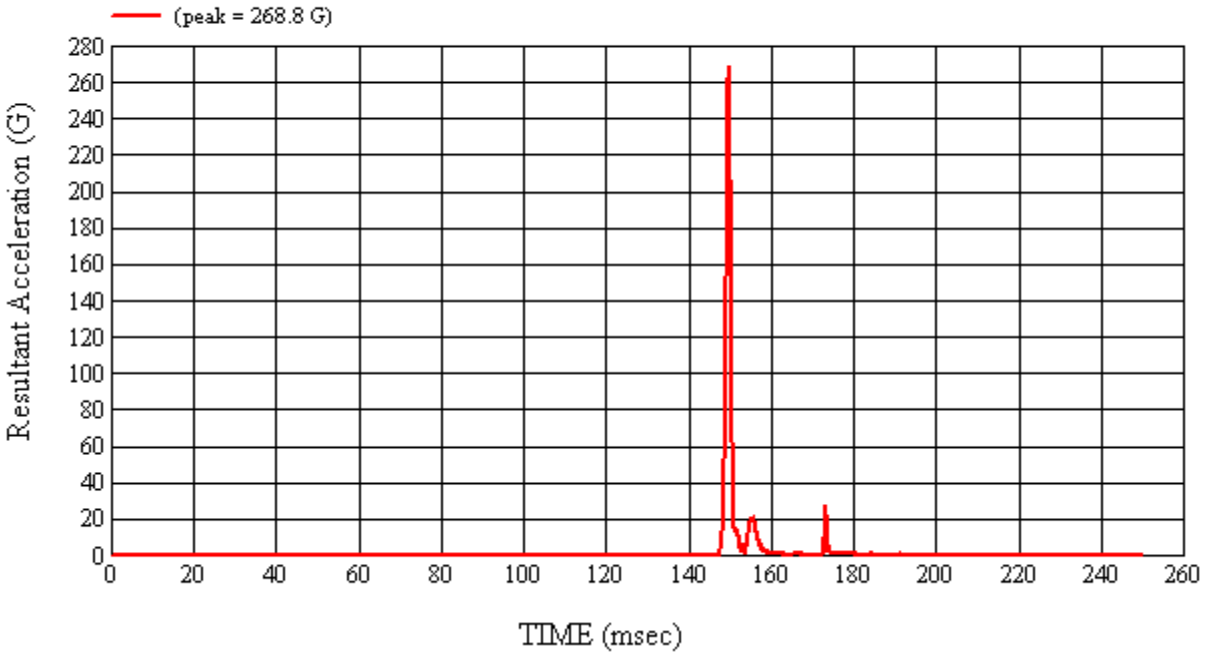


Figure 12 Head 035 (Pre) Calibration #H35022

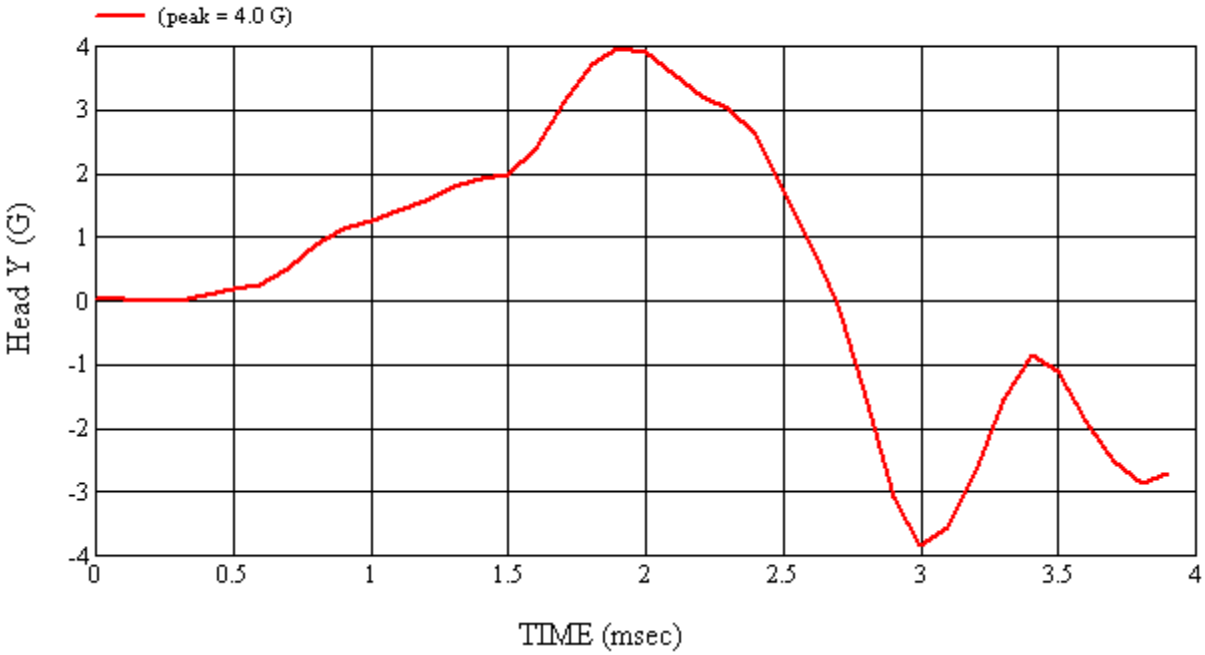


Figure 13 Head 035 (Pre) Calibration #H35022

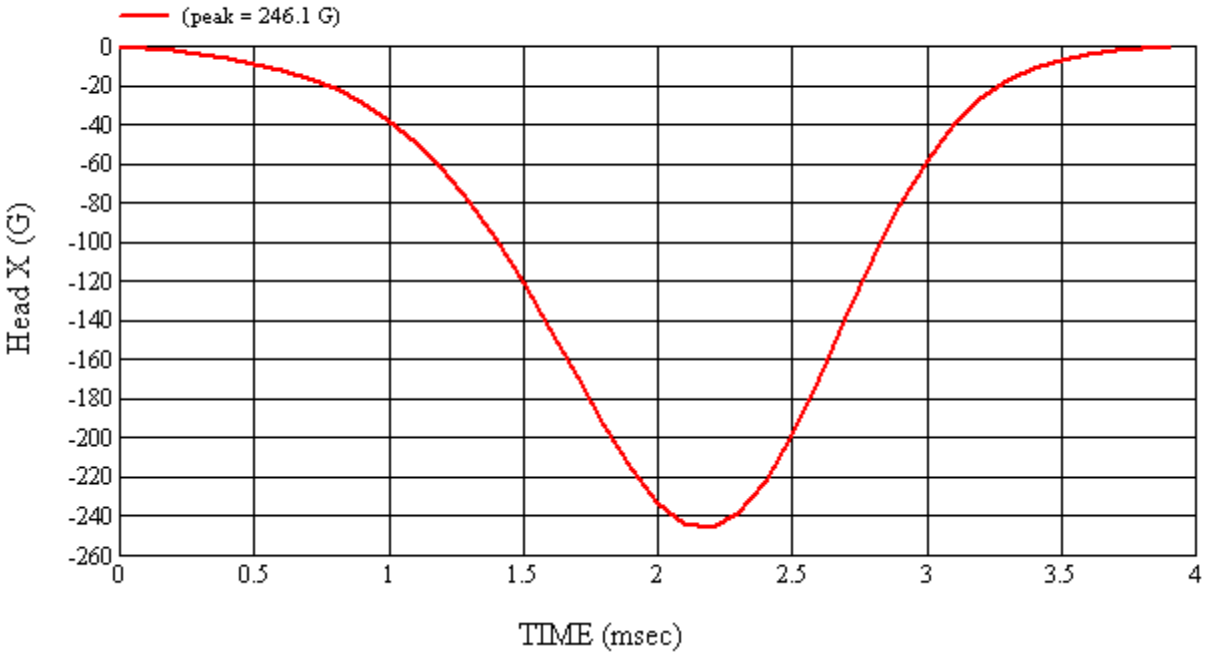


Figure 14 Head 035 (Pre) Calibration #H35022

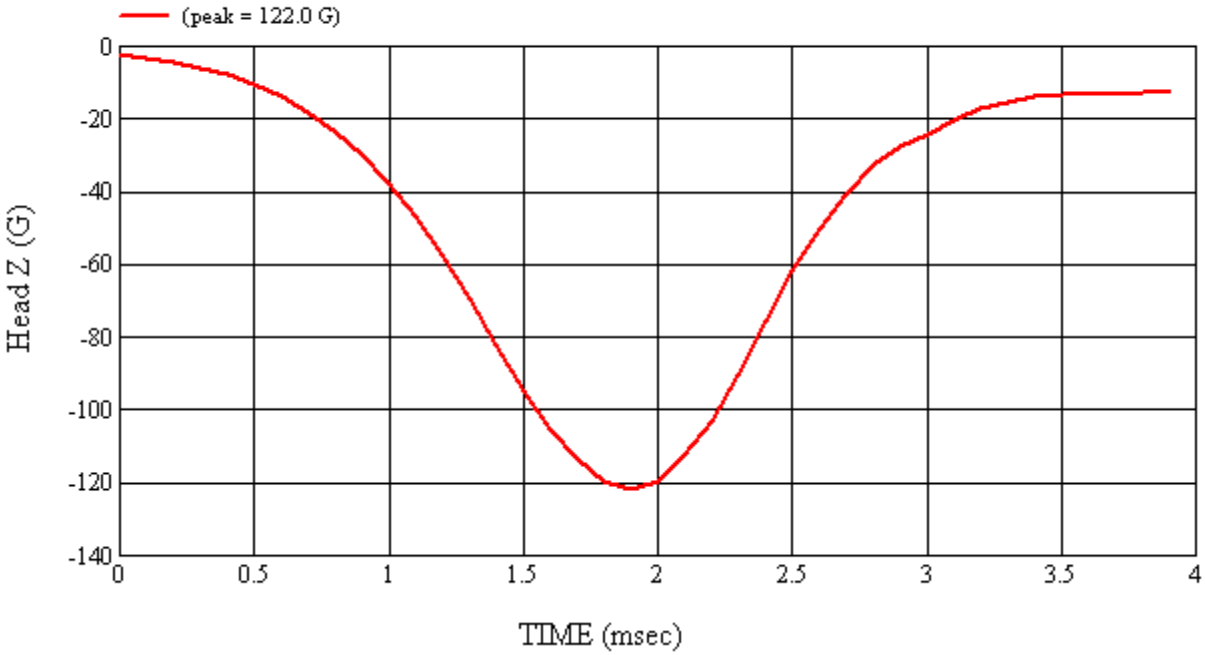


Figure 15 Head 035 (Pre) Calibration #H35022

4-3 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

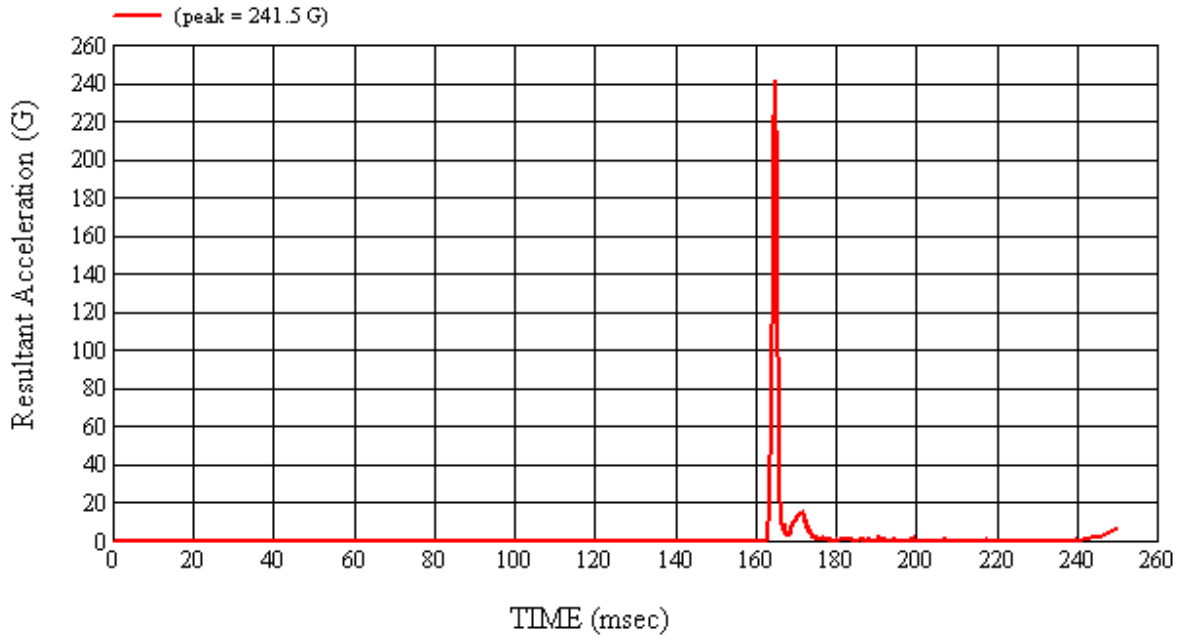
HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 4/26/2012 CALIBRATION TIME: 6:25:58 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	21.1
Relative Humidity	10% to 70%	37.1
Peak Resultant Acceleration	225 G's to 275 G's	241.5
Peak Lateral Acceleration	15 G's Maximum	6.6
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J32177	02/24/12	08/24/12
2	ENDEVCO	7264-2000	J14103	02/24/12	08/24/12
3	ENDEVCO	7264-2000	J35800	02/24/12	08/24/12

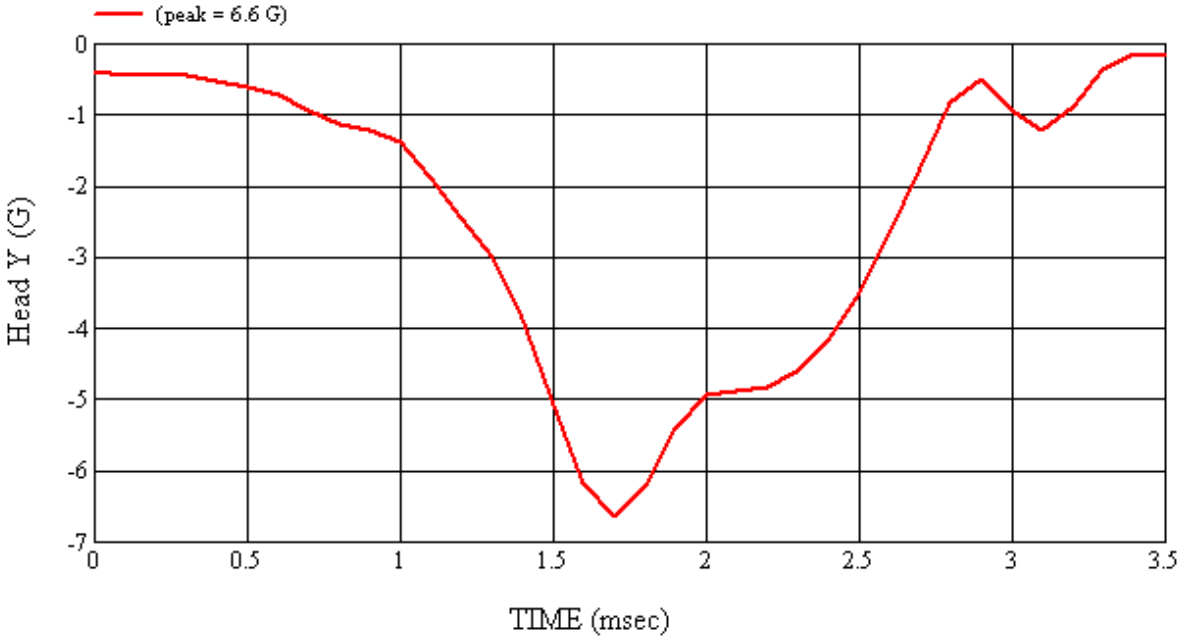
REMARKS:

RECORDED BY:  DATE: 04/26/2012

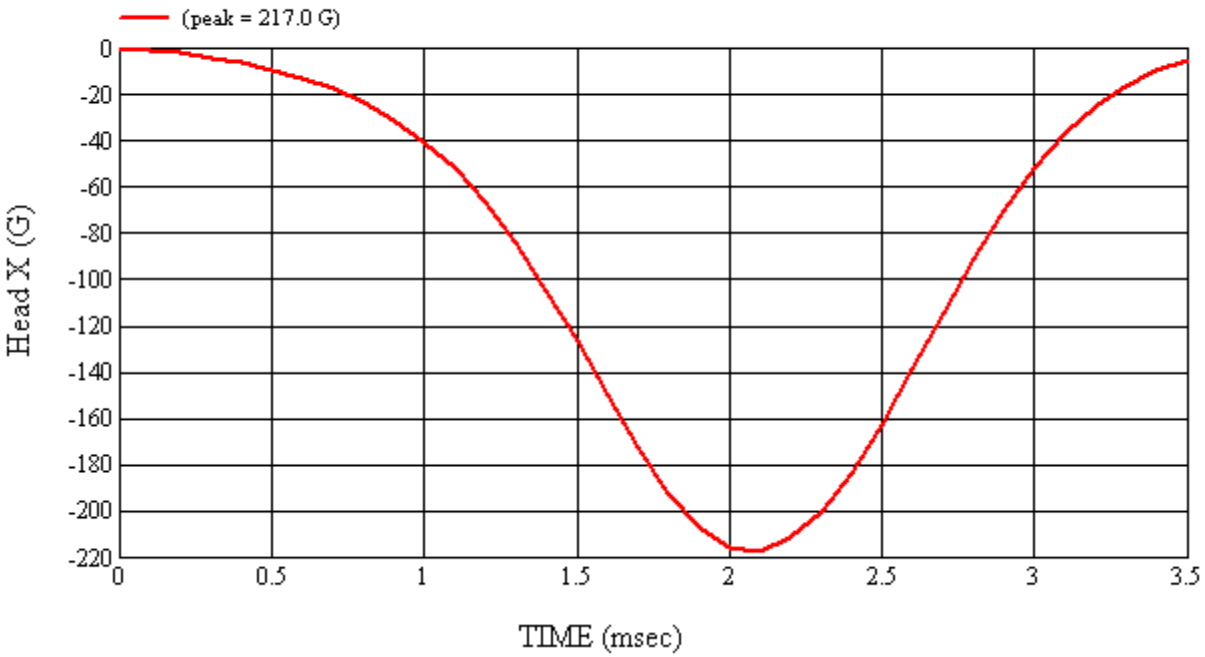
APPROVED BY: 



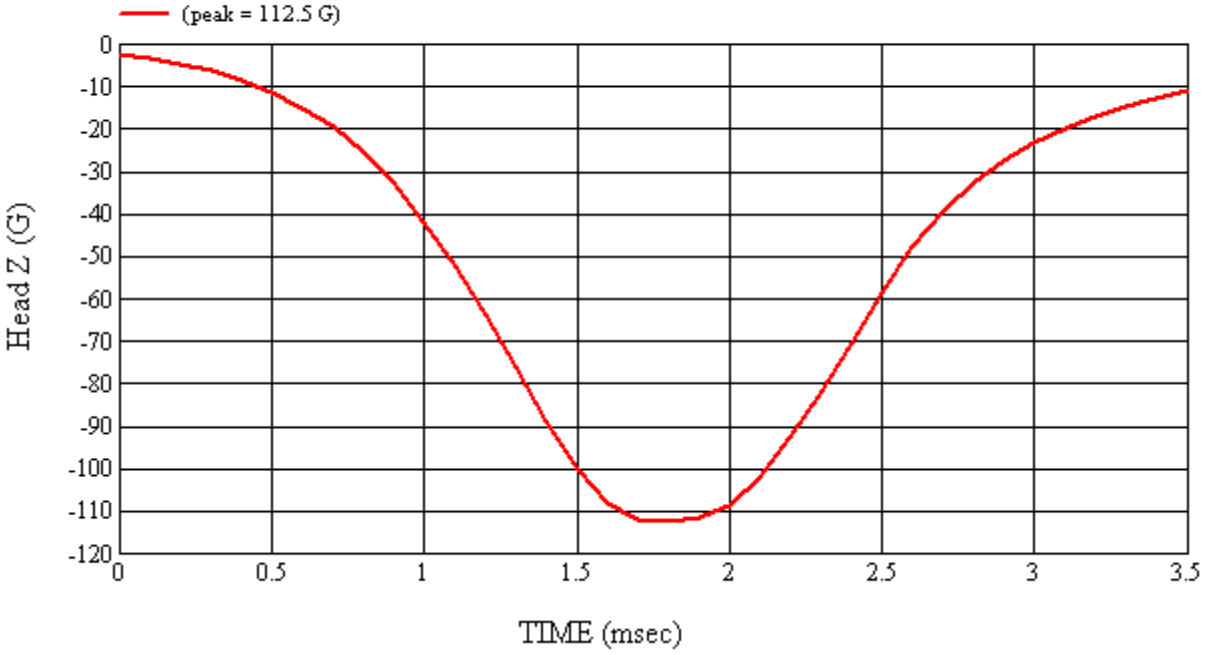
Head 037 (Pre) Calibration #H37017



Head 037 (Pre) Calibration #H37017



Head 037 (Pre) Calibration #H37017



Head 037 (Pre) Calibration #H37017

4-4 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

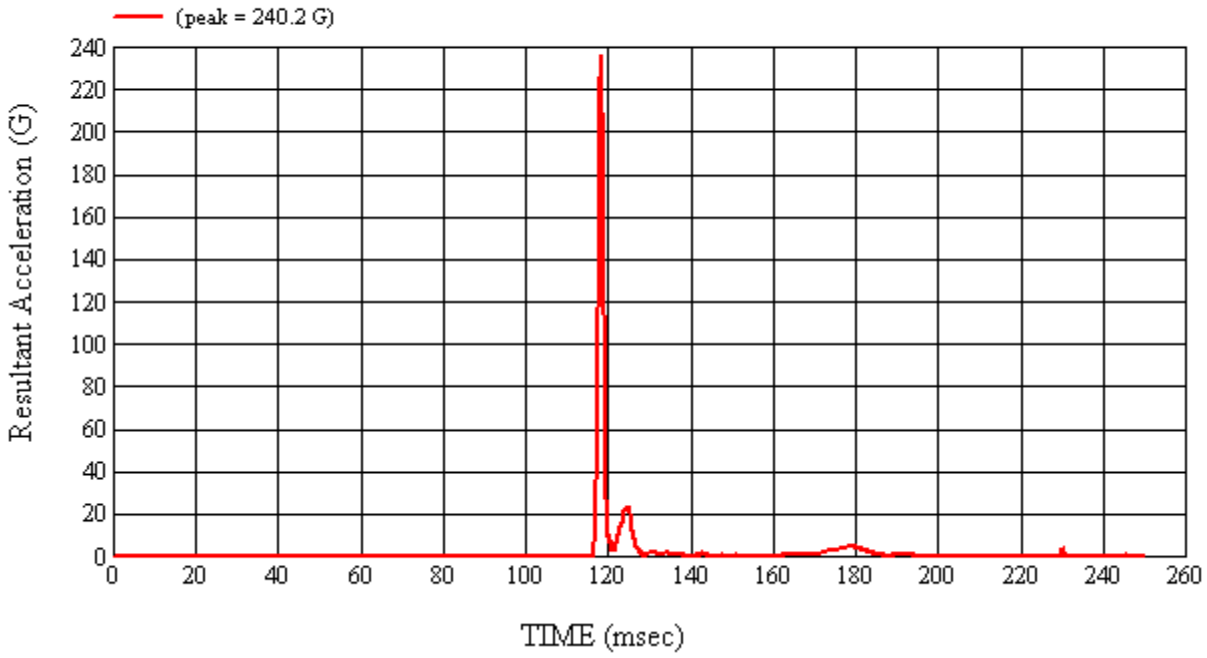
HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 4/30/2012 CALIBRATION TIME: 9:07:06 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22.1
Relative Humidity	10% to 70%	28.5
Peak Resultant Acceleration	225 G's to 275 G's	240.2
Peak Lateral Acceleration	15 G's Maximum	2.0
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	J32177	02/24/12	08/24/12
2	ENDEVCO	7264-2000	J14103	02/24/12	08/24/12
3	ENDEVCO	7264-2000	J35800	02/24/12	08/24/12

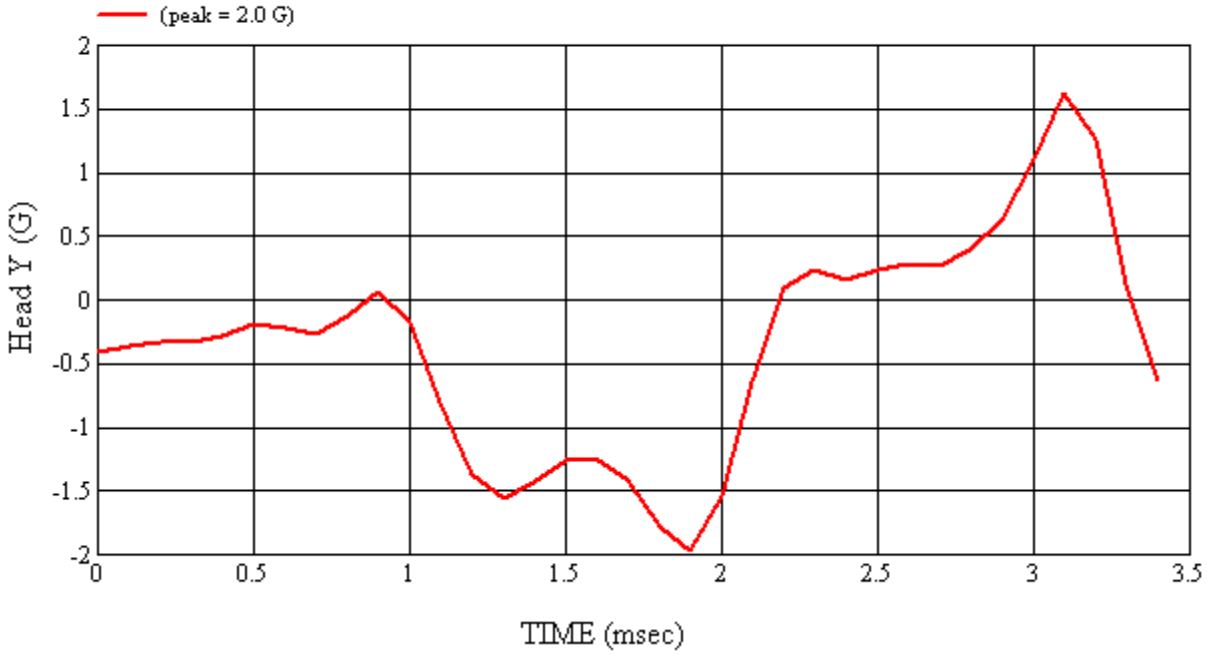
REMARKS:

RECORDED BY: _____ DATE: 04/30/2012

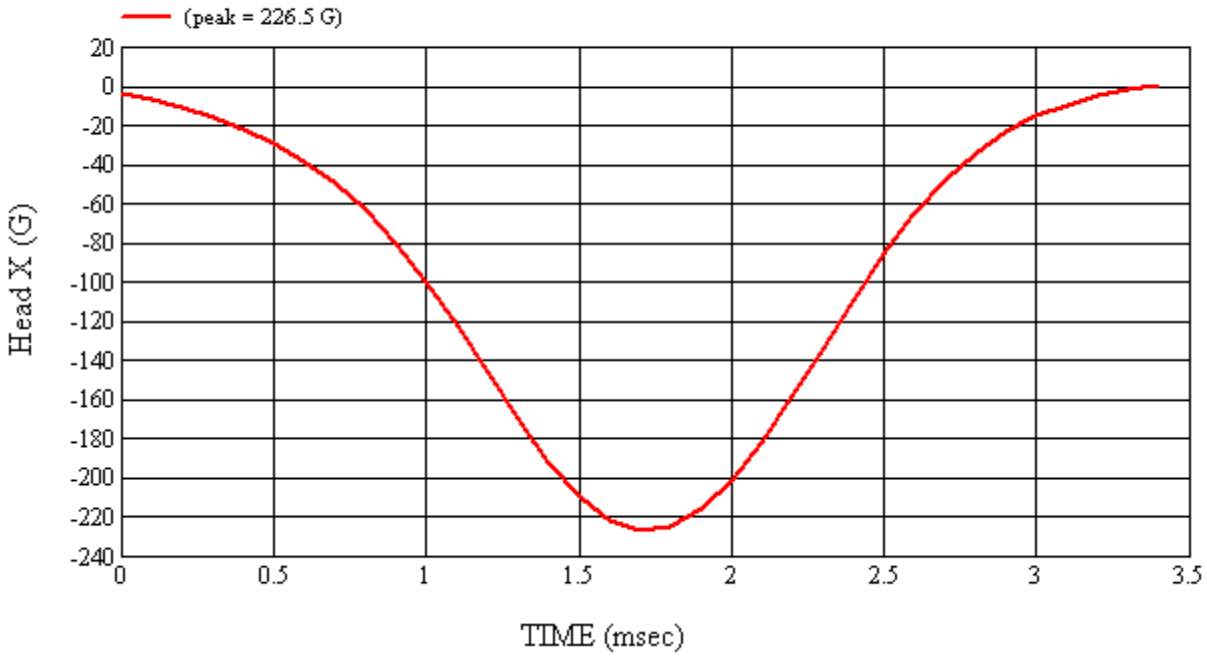
APPROVED BY: _____



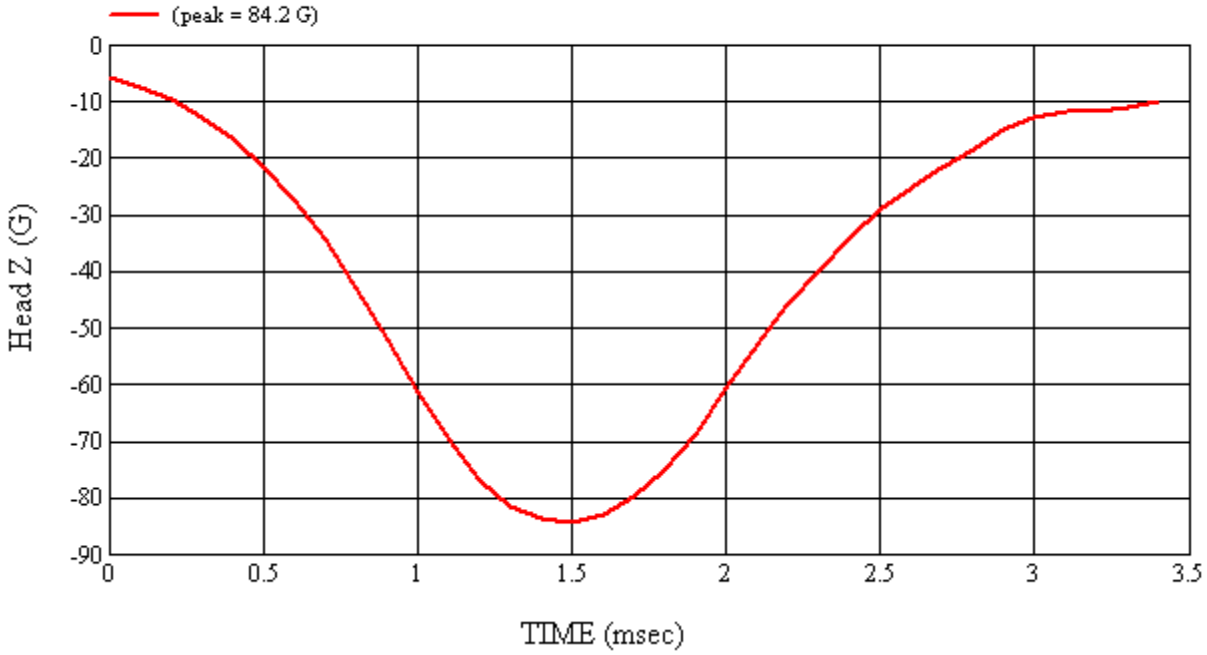
Head 037 (Pre) Calibration #H37018



Head 037 (Pre) Calibration #H37018



Head 037 (Pre) Calibration #H37018



Head 037 (Pre) Calibration #H37018

4-5 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

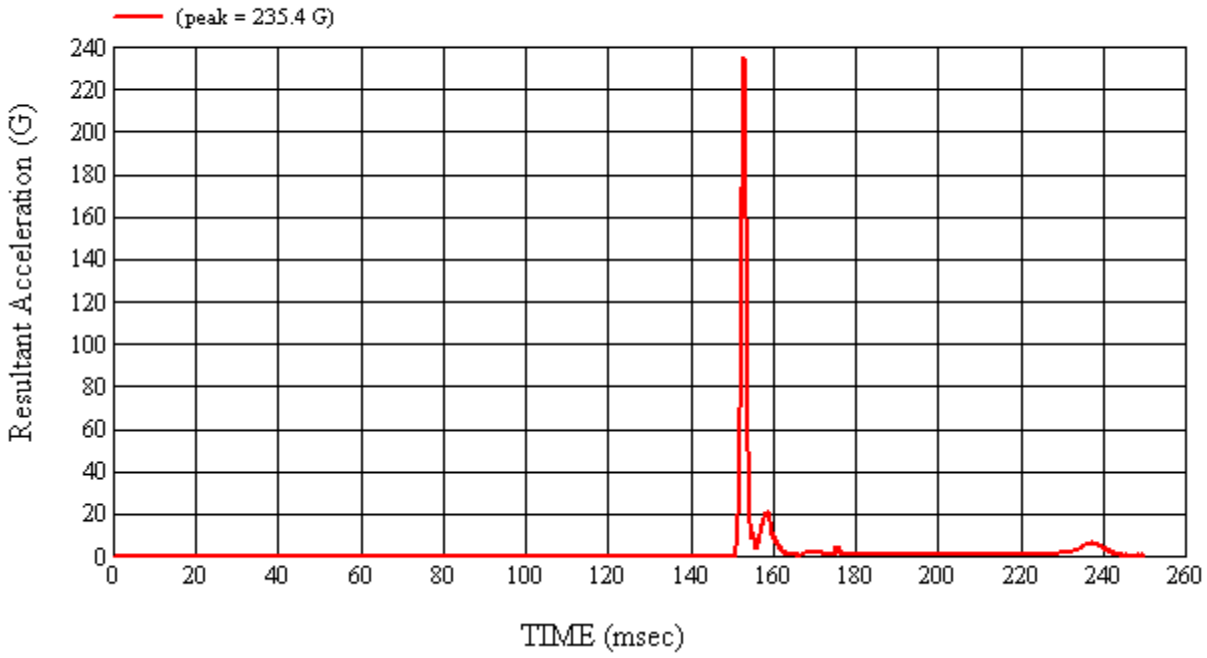
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 4/26/2012 CALIBRATION TIME: 6:37:02 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.94
Temperature	19° C to 26° C	21.2
Relative Humidity	10% to 70%	37.1
Peak Resultant Acceleration	225 G's to 275 G's	235.4
Peak Lateral Acceleration	15 G's Maximum	13.2
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	**Manufacturer**	**Model Number**	**Serial Number**	**Date of Last Calibration**	**Date of Next Calibration**
1	ENDEVCO	7264-2000	J22700	02/21/12	08/21/12
2	ENDEVCO	7264-2000	J36197	02/21/12	08/21/12
3	ENDEVCO	7264-2000	J36353	02/21/12	08/21/12

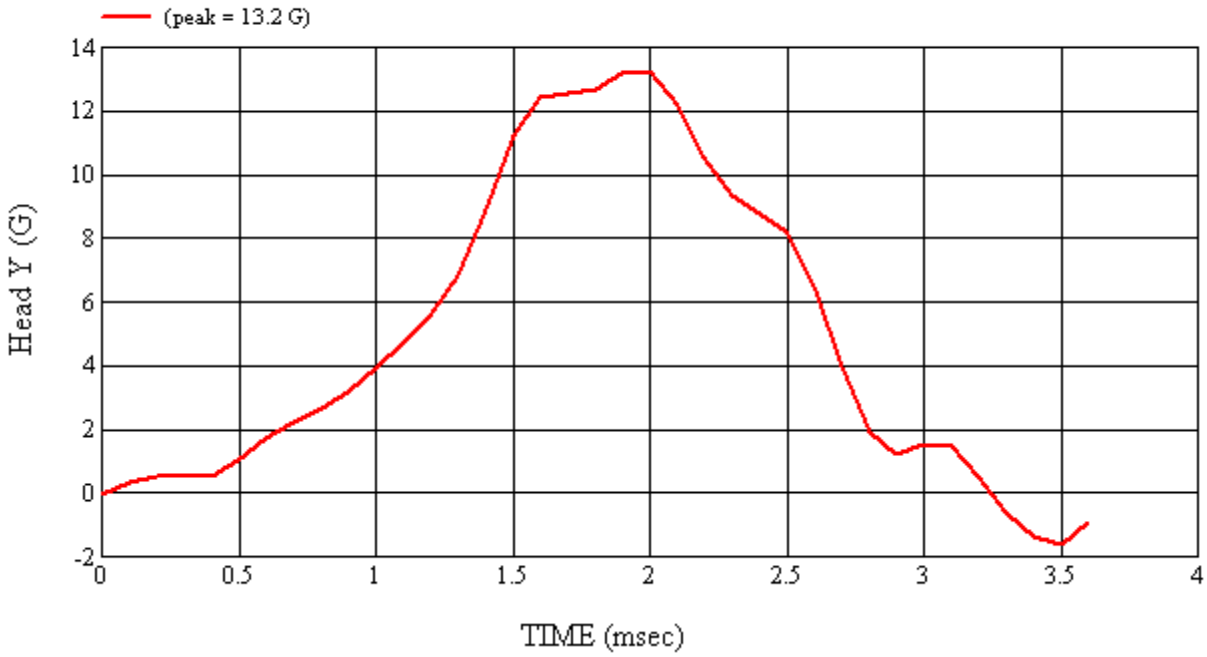
REMARKS:

RECORDED BY:  DATE: 04/26/2012

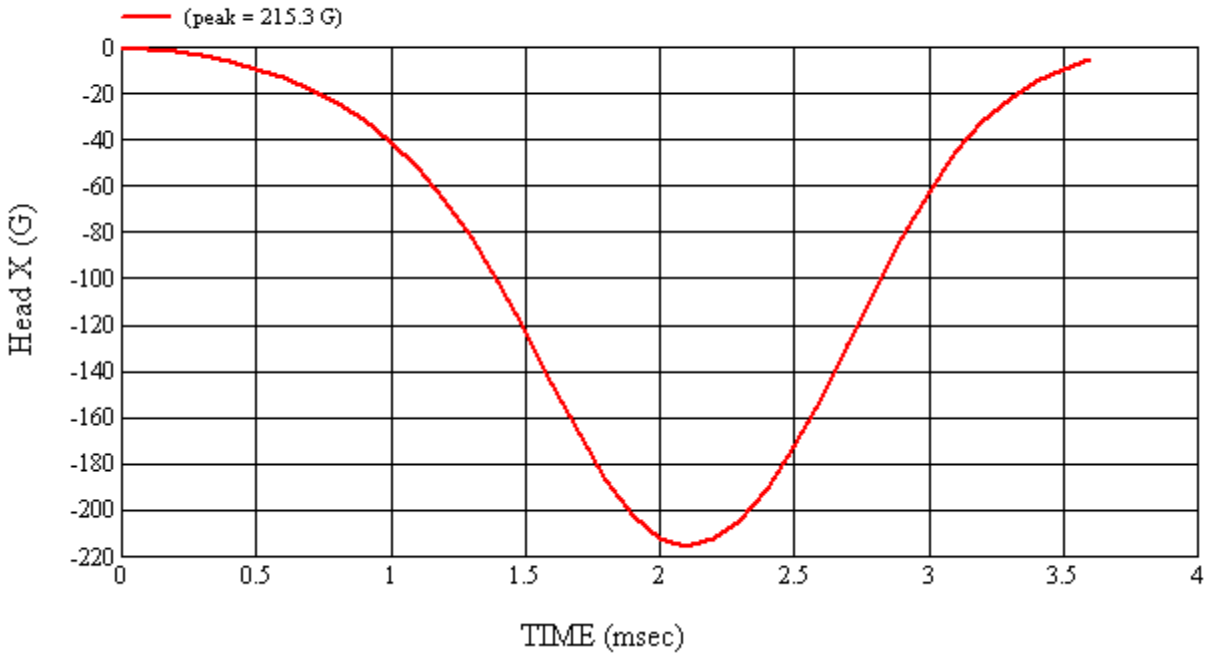
APPROVED BY: 



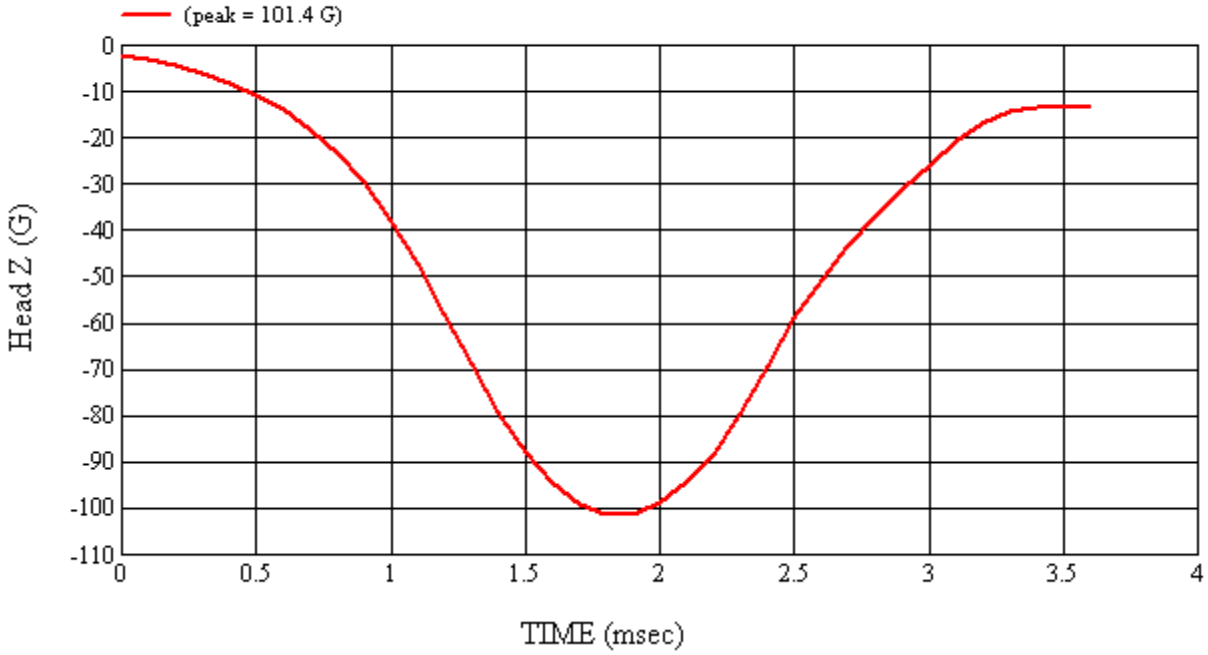
Head 038 (Pre) Calibration #H38019



Head 038 (Pre) Calibration #H38019



Head 038 (Pre) Calibration #H38019



Head 038 (Pre) Calibration #H38019

4-6 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 4/30/2012 CALIBRATION TIME: 9:35:26 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.94
Temperature	19° C to 26° C	21.7
Relative Humidity	10% to 70%	33.5
Peak Resultant Acceleration	225 G's to 275 G's	231.8
Peak Lateral Acceleration	15 G's Maximum	6.3
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION

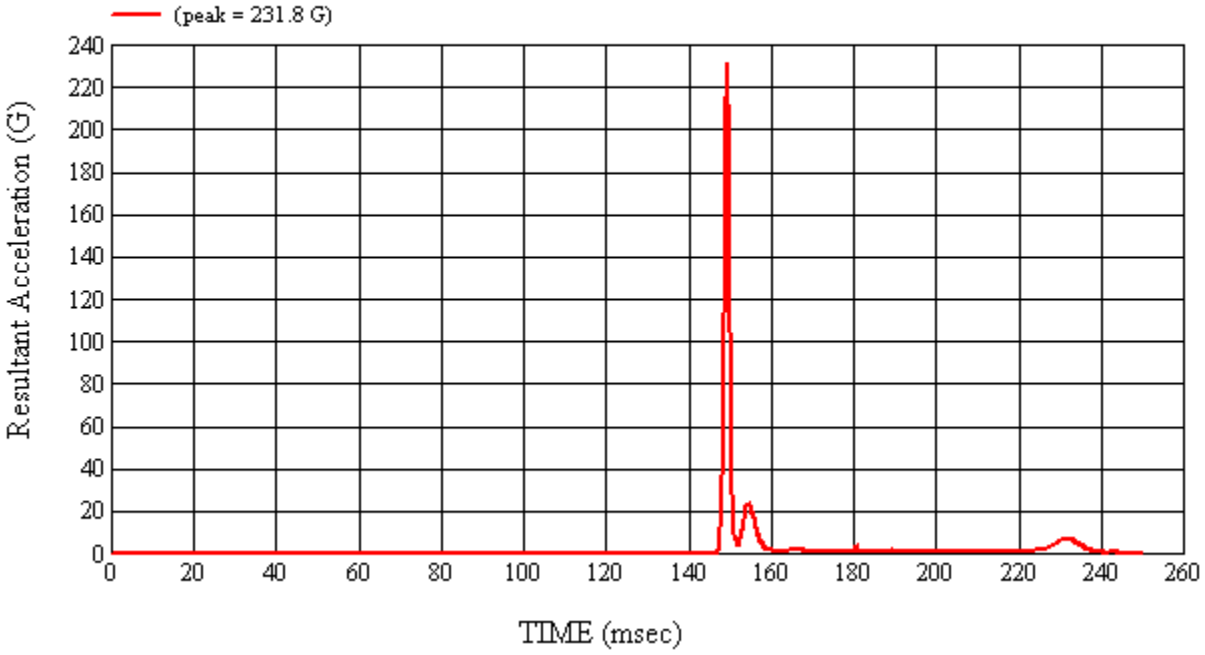
HEAD ACCELEROMETERS

Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
1	ENDEVCO	7264-2000	J22700	02/21/12	08/21/12
2	ENDEVCO	7264-2000	J36197	02/21/12	08/21/12
3	ENDEVCO	7264-2000	J36353	02/21/12	08/21/12

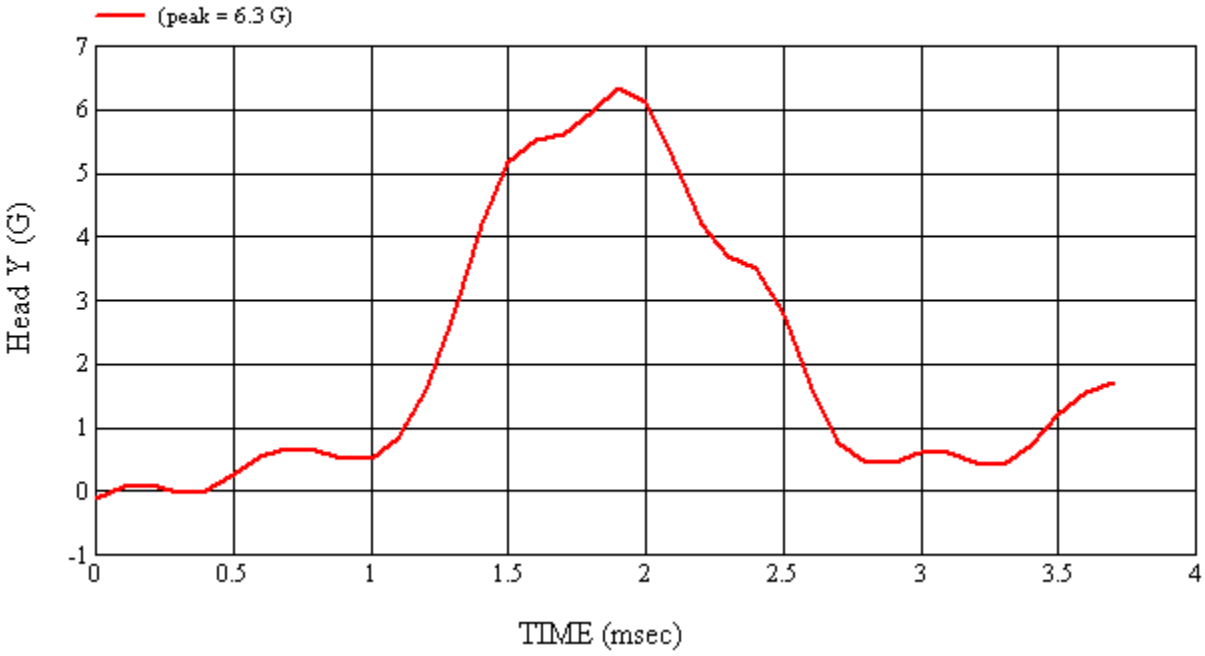
REMARKS:

RECORDED BY:  DATE: 04/30/2012

APPROVED BY: 



Head 038 (Pre) Calibration #H38020



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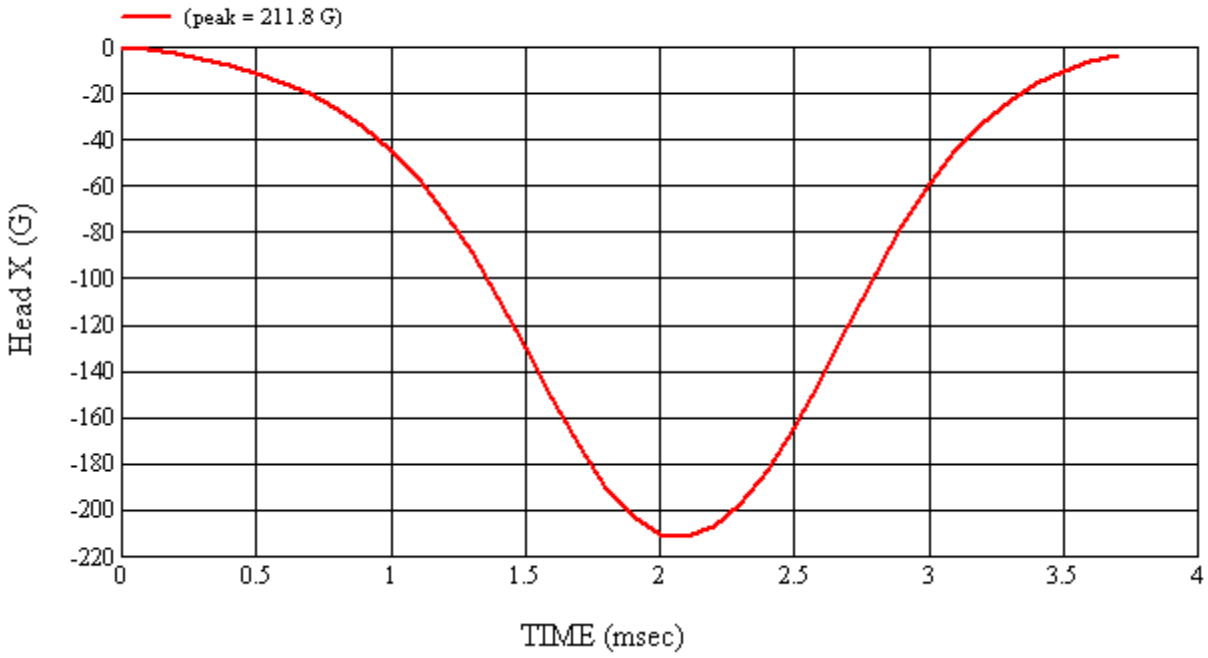
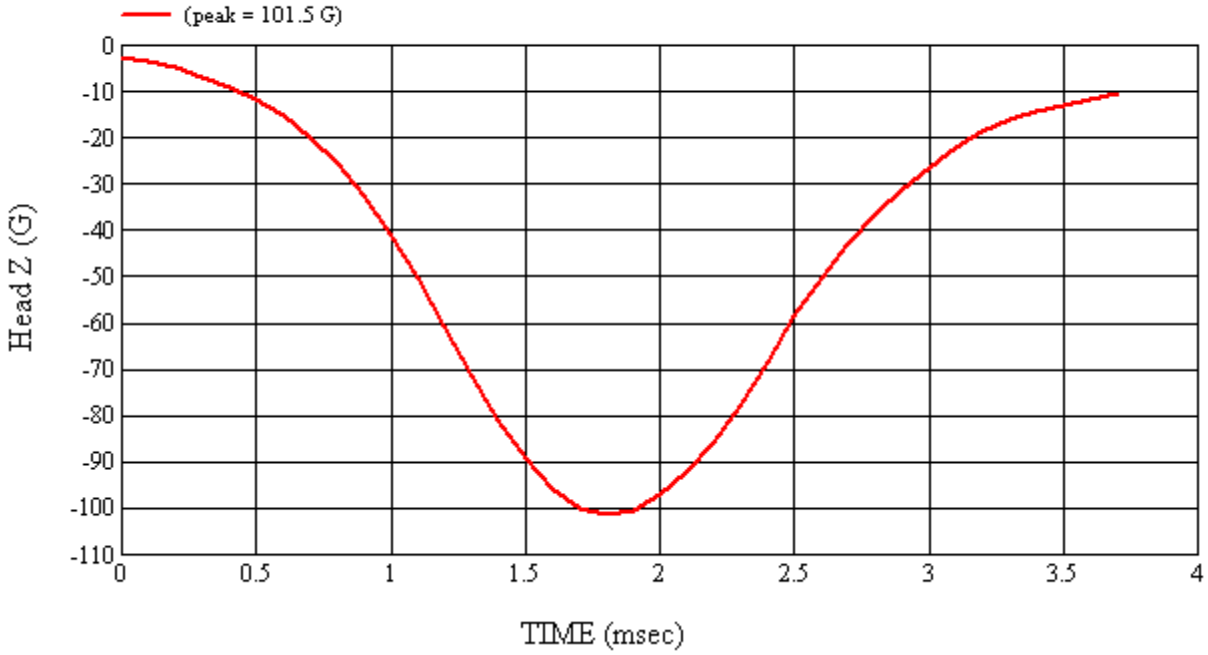


Head 038 (Pre) Calibration #H38020



Head 038 (Pre) Calibration #H38020

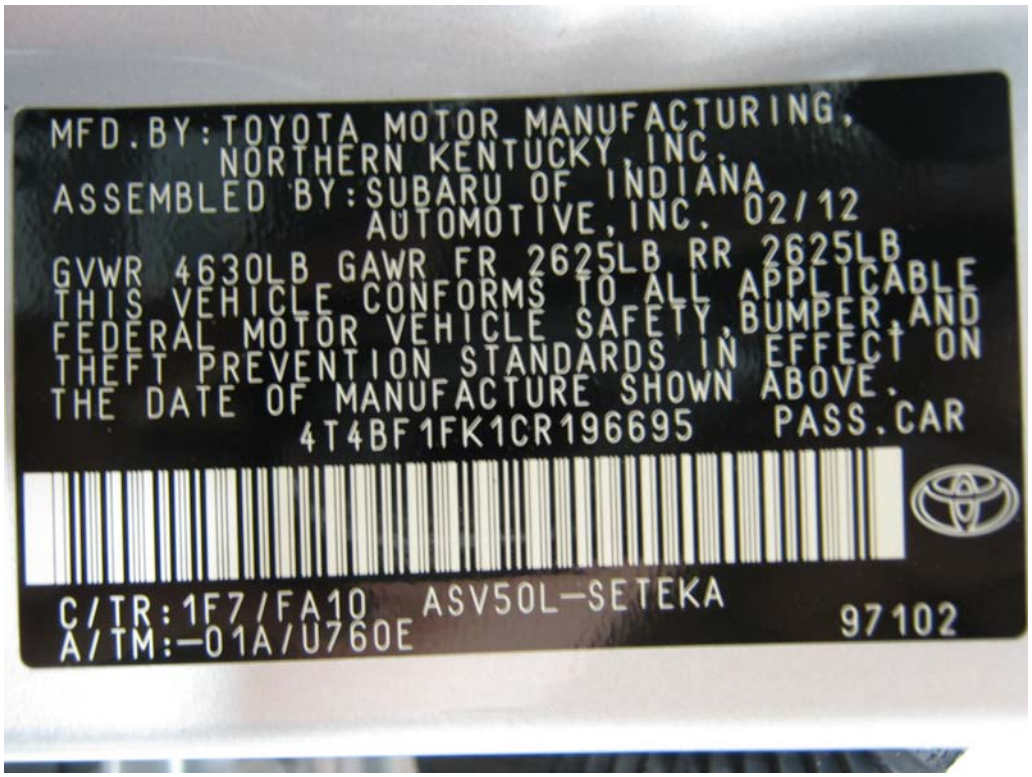
5.0 PHOTOGRAPHS

As Delivered – Left Side View

As Delivered – Right Side View

As Delivered – ¾ Front View From Left Side

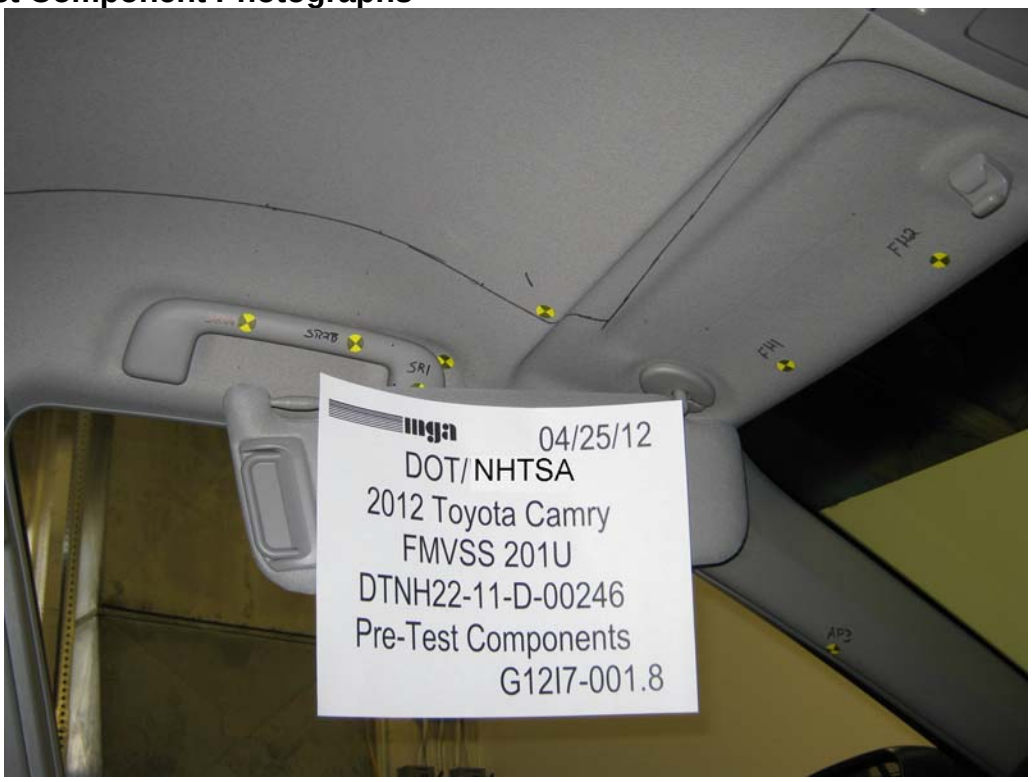
As Delivered – ¾ Rear View From Right Side



As Delivered – Vehicle's Certification Label

As Delivered – Vehicle's Tire Information Label

Pre-Test Component Photographs




04/25/12
DOT/ NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G12I7-001.8


04/25/12
DOT/ NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G12I7-001.8


mga
04/25/12
DOT/ NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G12I7-001.8


mga
04/25/12
DOT/ NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G12I7-001.8


mga
04/25/12
DOT/ NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G12I7-001.8


mga
04/25/12
DOT/ NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G12I7-001.8

Post-Test Component Photographs

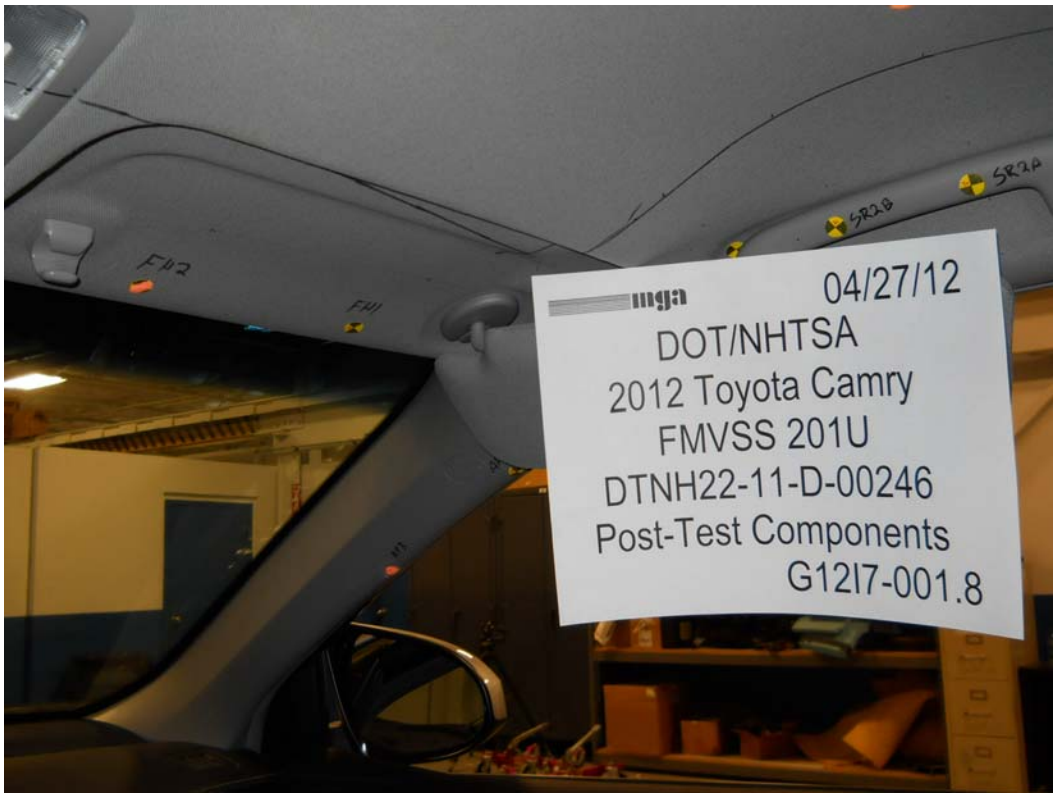

mga
04/27/12
DOT/NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Post-Test Components
G12I7-001.8


mga
04/27/12
DOT/NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Post-Test Components
G12I7-001.8

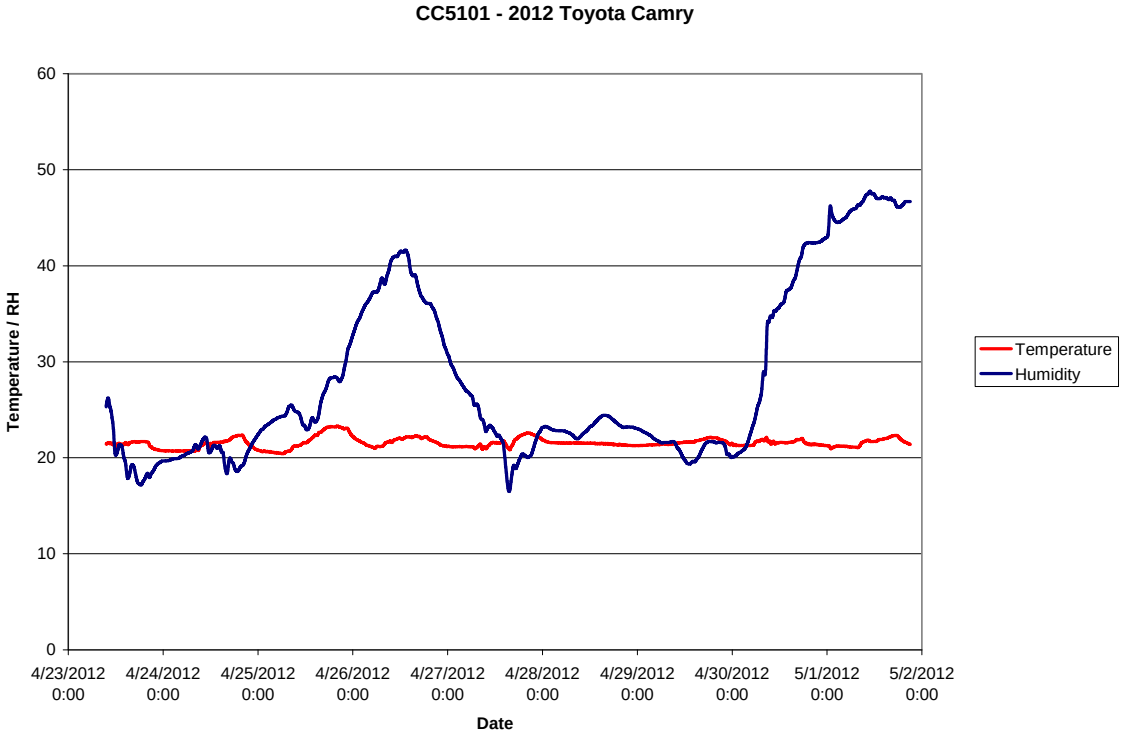

SR31
SR32
RH
RP1
RP2
EXIT
mga
04/27/12
DOT/NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Post-Test Components
G12I7-001.8


DSP1
SR31
SR32
mga
04/27/12
DOT/NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Post-Test Components
G12I7-001.8


SR2A
SR2B
SR1
mga
04/27/12
DOT/NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Post-Test Components
G12I7-001.8


SR2A
SR2B
FH2
FH1
mga
04/27/12
DOT/NHTSA
2012 Toyota Camry
FMVSS 201U
DTNH22-11-D-00246
Post-Test Components
G12I7-001.8

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:	9/27/2011
Calibrated By:	Modal Shop

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

Calibration Date:	2/21/2012
New DLR(Units:G'S) [1] 100K SHUNT	96.8
Linearity:[2]	0.99969
New vs Old Sensitivit (% Difference)	-0.5
Temperature:	68 °F
Humidity:	33.3
Sensitivity (mV/V/G):	0.025711
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Helen A. Kalata

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

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

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

Calibration uncertainty no greater than 3.8 % 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:	9/27/2011
Calibrated By:	Modal Shop

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

Calibration Date:	2/21/2012
New DLR(Units:G'S) [1] 100K SHUNT	95.5
Linearity:[2]	0.9995
New vs Old Sensitivit (% Difference)	0.0
Temperature:	68 °F
Humidity:	33.3
Sensitivity (mV/V/G):	0.026054
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Edward D. Kalette

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 3.8 % 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:	9/27/2011
Calibrated By:	Modal Shop

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

Calibration Date:	2/21/2012
New DLR(Units:G'S) [1] 100K SHUNT	94.1
Linearity:[2]	0.99964
New vs Old Sensitivit (% Difference)	-0.8
Temperature:	68 °F
Humidity:	33.3
Sensitivity (mV/V/G):	0.026444
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Helen R. Kalata

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

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

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

Calibration uncertainty no greater than 3.8 % 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:	9/27/2011
Calibrated By:	Modal Shop

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

Calibration Date:	2/24/2012
New DLR(Units:G'S) [1] 100K SHUNT	113.3
Linearity:[2]	0.99941
New vs Old Sensitivit (% Difference)	0.2
Temperature:	67.3 °F
Humidity:	41.5
Sensitivity (mV/V/G):	0.021951
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Edward A. Kabat

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 3.8 % 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:	9/27/2011
Calibrated By:	Modal Shop

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

Calibration Date:	2/24/2012
New DLR(Units:G'S) [1] 100K SHUNT	95.2
Linearity:[2]	0.99929
New vs Old Sensitivit (% Difference)	-1.5
Temperature:	67.3 °F
Humidity:	41.5
Sensitivity (mV/V/G):	0.026153
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 3.8 % 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:	9/27/2011
Calibrated By:	Modal Shop

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

Calibration Date:	2/24/2012
New DLR(Units:G'S) [1] 100K SHUNT	98.5
Linearity:[2]	0.99924
New vs Old Sensitivit (% Difference)	-1.0
Temperature:	67.3 °F
Humidity:	41.5
Sensitivity (mV/V/G):	0.025245
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Howard Kalstrom

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 3.8 % 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:	9/27/2011
Calibrated By:	Modal Shop

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

Calibration Date:	2/21/2012
New DLR(Units:G'S) [1] 100K SHUNT	96.7
Linearity:[2]	0.99986
New vs Old Sensitivit (% Difference)	-0.3
Temperature:	68 °F
Humidity:	33.3
Sensitivity (mV/V/G):	0.025721
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 3.8 % 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:	9/27/2011
Calibrated By:	Modal Shop

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

Calibration Date:	2/21/2012
New DLR(Units:G'S) [1] 100K SHUNT	110.3
Linearity:[2]	0.99938
New vs Old Sensitivit (% Difference)	-0.8
Temperature:	68 °F
Humidity:	33.3
Sensitivity (mV/V/G):	0.022531
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Harold Kalsto

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 3.8 % 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:	9/27/2011
Calibrated By:	Modal Shop

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

Calibration Date:	2/21/2012
New DLR(Units:G'S) [1] 100K SHUNT	100.2
Linearity:[2]	0.99951
New vs Old Sensitivit (% Difference)	-1.4
Temperature:	68 °F
Humidity:	33.3
Sensitivity (mV/V/G):	0.024827
Calibrated By:	Chris Collins

Signature: Chris Collins

Approved by: Edward A. Kabelac

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 3.8 % at the 95% confidence level.

NovaStar SOLUTIONS

Calibration Certificate

ACCREDITED
CALIBRATION # 1277.01

Metrology Management Services
Remit to address:

35200 Plymouth Rd.
Livonia, MI 48150

Calibration Certificate #:
Z54778:1317143337

PCB 352C03 ACCELEROMETER

SERIAL NUMBER:	95980
ASSET NUMBER:	Z54778
CUST. ASSET NUM:	N/A
PROCEDURE NAME:	MOD 9150
PROCEDURE REV:	D
CALIBRATED BY:	ALBERT CAIRNS JR.
CUSTOMER:	MGA RESEARCH 446 Executive Drive Troy, MI 48083
PRIMARY CONTACT:	BOB MILLER

WORK ORDER: AC092711012

TEST RESULT:	PASS
PERFORMED ON:	9/27/2011
CAL DUE DATE:	9/27/2012
DATA TYPE:	FOUND-LEFT
TEMPERATURE:	22.00 °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. Unless otherwise stated the unit under test meets or exceeds manufacturer specifications.

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

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

Action Taken: FULL CALIBRATION

REMARKS: CALIBRATED AS A SYSTEM WITH Z53161.

Standards Used

Asset #	Cert#	Description	Cal Date	Due Date
1719	1719:1297768007	DICKSON TH300 THERMOHYGROMETER	2/15/2011	2/15/2012
1727	1727:1286354489	MODAL SHOP 9150C ACCELEROMETER CAL SYSTEM	10/5/2010	10/5/2011

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

10/4/11 mm

QA approved: mc Date: 9-28-11

Signature:

Asset Barcode:

- Calibration Certificate -

ID Number AC092711012
Manufacturer PCB
Model No. 352C03
Serial No. 95980

Uncertainty @ 95% K=2; 2.1% @ 5-2000Hz, 2.7% @ 2-10kHz

Key Specifications:

Range	500	+/- g
Resolution	.00005	g
Temperature Range	-65/+250	°F

Calibration Data:

Voltage Sensitivity	9.845	mV/g
Test Accel. Level	1	g

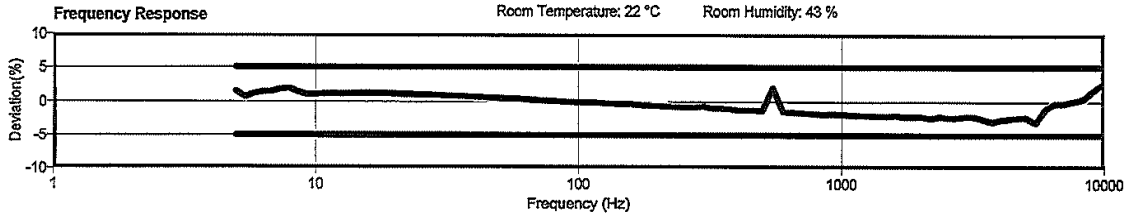
Notes:

Deviation Table

Frequency(Hz)	Deviation(%)
5	1.550
10	1.068
15	1.208
30	0.937
50	0.522
Ref Freq. 100	0.000
300	-0.649
500	-1.314
1000	-1.880
3000	-2.186
5000	-2.330
7000	-0.287
10000	2.803

Frequency Response

Room Temperature: 22 °C Room Humidity: 43 %



NovaStar Solutions
Metrology Management Services

Calibration Date: 09/27/2011
Due Date:
Calibrated by: Al Cairns

Calibration Certificate

Part Description: Gold **Certification Date:** 6/28/2011 (MMDDYYYY) **Serial#:** G10-02-00-01619

Single Point - (Max-Min)/2 Specification: G10-02 .084mm (.0033") **Certificate#:** G0161940722

Volumetric (Max Deviation) Specification: G10-02 +/-.119mm (+/-.0047") **Temperature:** See attached data

Measurement Standards Traceability

Ball Bar Kit	Asset Number: 1041	Calibration Due: 9/28/2011	*SI Traceability: L20110405KG3
Thermometer	Asset Number: 668	Calibration Due: 2/13/2012	*SI Traceability: A2LA-1001187681
Reference Sphere	Asset Number: TQ223	Calibration Due: 10/5/2012	*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 + 5.9X 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:
Within Specifications

Instrument condition outgoing:
Within specifications

Technician: Neil Maclean Date: 6/28/11

FARO Technologies, Inc.
Michigan Regional Office
PH1:248-669-8620

FAX:248-669-8656
L-A-B Cert Number:L1147.01-1

46998 Magellan Drive
Wixom, MI 48393
USA

6/28/11 JHAIR

LABORATORY ACCREDITATION BUREAU 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: M6A00798
Calibration Date: 1/25/11

Subject Tape Measure
Brand: STANLEY
S/N: TPM 163
Calibration Date: 9/16/11

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

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

Date: 9/16/11 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.

NovaStar SOLUTIONS

Calibration Certificate

ACCREDITED
CALIBRATION # 1277.01

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

Calibration Certificate #:
Z54482:1314618024

MITUTOYO PRO 360 PROTRACTOR

SERIAL NUMBER:	06091641
ASSET NUMBER:	Z54482
CUST. ASSET NUM:	MGA00712
PROCEDURE NAME:	PROTRACTOR
PROCEDURE REV:	1.2
CALIBRATED BY:	JOE McCONNAUGHHAY
CUSTOMER:	MGA RESEARCH 446 Executive Drive Troy, MI 48083
PRIMARY CONTACT:	BOB MILLER

WORK ORDER: 1314618024

TEST RESULT:	PASS
PERFORMED ON:	8/29/2011
CAL DUE DATE:	8/29/2012
DATA TYPE:	FOUND-LEFT
TEMPERATURE:	22.51 °C
HUMIDITY:	39 %

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

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

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

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

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

Action Taken: FULL CALIBRATION

REMARKS:

Standards Used

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

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

9/7/11 HAM

QA approved: Steve Hall **Date:** 8-31-11
Signature:

Asset Barcode:

NovaStar SOLUTIONS
Metrology Management Services

Calibration Certificate

ACCREDITED
Certificate # 1277.01

35200 Plymouth Rd. / Livonia, MI 48150

Certificate # Z52549:63397

DICKSON TM325 TEMP/HUMD DISP

SERIAL NUMBER:	N/A	WORK ORDER:	63397
ASSET NUMBER:	Z52549		
CUST ASSET NUMBER:	MGA00894		
PROCEDURE NAME:	DIC - TM325 - MMC	TEST RESULT:	PASS
PROCEDURE REV:	1.0	PERFORMED ON:	3/28/2012
CALIBRATED BY:	DUKE PAYNE	CAL DUE DATE:	3/28/2013
CUSTOMER:	MGA RESEARCH 446 EXECUTIVE DRIVE TROY, MI 48083	DATA TYPE: TEMPERATURE:	FOUND-LEFT 22.20 °C
PRIMARY CONTACT:	BOB MILLER	HUMIDITY:	46 %

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 ISO/IEC 17025:2005 and ANSI/NCSL Z540-1-1994.

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

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

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

AS RECEIVED CONDITION:	IN TOLERANCE	REMARKS:
AS RETURNED CONDITION:	IN TOLERANCE	
ACTION TAKEN:	FULL CALIBRATION	

Standards Used

Asset #	Cert #	Description	Cal Date	Due Date
1541	1541:1193650836	NEWPORT CT485AL HYGROTHERMOGRAPH	3/1/2012	3/1/2013
1917	1917:1263999738	VAISALA M170/HMP76 MEASUREMENT INDICATOR/PROBE	2/14/2012	2/14/2013

QA Signature: Date: 3/28/2012

4/12/12

NovaStar SOLUTIONS

Report of Calibration

ACCREDITED CALIBRATION # 1277.01

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

DICKSON TM325 TEMP/HUMD DISP

WORK ORDER #: 63397

SERIAL NUMBER:	N/A
ASSET NUMBER:	Z52549
CUST. ASSET NUM:	MGA00894
PROCEDURE NAME:	DIC - TM325 - MMC
PROCEDURE REV:	1.0
CALIBRATED BY:	DUKE PAYNE
CUSTOMER:	MGA RESEARCH 446 EXECUTIVE DRIVE TROY MI 48083
PRIMARY CONTACT:	BOB MILLER

TEST RESULT:	PASS
PERFORMED ON:	3/28/2012
CAL DUE DATE:	3/28/2013
DATA TYPE:	FOUND-LEFT
TEMPERATURE:	22.20 °C
HUMIDITY:	46 %

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).

REMARKS:

Test Results for Calibration with Certificate# : Z52549:63397

Standards Used

Asset #	Cert#	Description	Cal Date	Due Date
1541	1541:1330611210	NEWPORT CT485AL HYGROTHERMOGRAPH	3/1/2012	3/1/2013
1917	1917:1329205675	VAISALA M170/HMP76 MEASUREMENT INDICATOR/PROBE	2/14/2012	2/14/2013

Test Procedure Results

Test Description	Nominal	Test Result	Lower Limit	Upper Limit	Units	Exp Uncert	Pass/Fail
RH ACCURACY							
	15.20	17.10	13.30	17.10	%RH	2.8%	Pass
	44.20	46.00	42.30	46.10	%RH	2.8%	Pass
	70.60	73.40	67.75	73.45	%RH	2.8%	Pass
TEMP ACCURACY							
	21.88	21.60	21.48	22.28	°C	.025°C	Pass

***** End of Report *****

NovaStar SOLUTIONS

Calibration Certificate

ACCREDITED
CALIBRATION # 1277.01

Metrology Management Services
Remit to address:

35200 Plymouth Rd.
Livonia, MI 48150

Calibration Certificate #:
Z54487:1314709345

DETECTO AP-20 SCALE

SERIAL NUMBER:	B10807-0187
ASSET NUMBER:	Z54487
CUST. ASSET NUM:	MGA00783
PROCEDURE NAME:	122-040
PROCEDURE REV:	B
CALIBRATED BY:	JOE McCONNAUGHHAY
CUSTOMER:	MGA RESEARCH 446 Executive Drive Troy, MI 48083
PRIMARY CONTACT:	BOB MILLER

WORK ORDER: 1314709345

TEST RESULT:	PASS
PERFORMED ON:	8/30/2011
CAL DUE DATE:	8/30/2012
DATA TYPE:	FOUND-LEFT
TEMPERATURE:	21.00 °C
HUMIDITY:	40 %

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

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

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

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

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

Action Taken: FULL CALIBRATION

REMARKS:

Standards Used

Asset #	Cert#	Description	Cal Date	Due Date
1541	1541:1300372477	NEWPORT CT485AL HYGROTHERMOGRAPH	3/17/2011	3/17/2012
1633	1633:1305646133	RICE LAKE CLASS 6 17 PC WEIGHT SET	5/17/2011	11/17/2012

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

9/7/11 HMC

QA approved: Steve Hall Date: 8-31-11
Signature:

Asset Barcode:

NovaStar SOLUTIONS
Metrology Managment Services

Calibration Data Sheet

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

Page 1 of 1

Inst. Type	Scale	Mfr.	Detecto	W.O.	1314709345
Last Cal Date	8/26/2011	Mod.	AP-20	Date	8/30/2011
Form Number	25146 Rev A	S/N	E10807-0187	Test Eng'r	JM

Note

Function	Calibration Point	Unit		As Found	Note	As Left	Low Limit	Hi Limit	Unit
Linearity	1.00	lb		1.00		1.00	0.95	1.05	lb
	5.00	lbs		5.00		5.00	4.95	5.05	lbs
	10.00	lbs		10.01		10.01	9.95	10.05	lbs
	15.00	lbs		15.02		15.02	14.95	15.05	lbs
	20.00	lbs		20.03		20.03	19.95	20.05	lbs
Shift Test	Center			10.01		10.01	9.99	10.01	lbs
@ 10lbs	Front			10.01		10.01	9.99	10.01	lbs
	Back			10.00		10.00	9.99	10.01	lbs
	Left			10.00		10.00	9.99	10.01	lbs
	Right			10.00		10.00	9.99	10.01	lbs

1314709345

ilac-MRA

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Laboratory

A2LA has accredited

STERLING SCALE

Southfield, MI

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 16th day of March 2011.

President & CEO
For the Accreditation Council
Certificate Number 1448.01
Valid to March 31, 2013

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.

7/18/2011

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

Test report for commercial device

F410/12-4
Rev. Date 7/28/08

accredited for calibration 1448.01

Customer: MGA ***Cert#*** 11-8007 ***Temp/Humidity:*** 0k
Location of Calibration: 2839 Elliott Troy, MI 48038
Calibration Date: 7/18/2011 ***Cal Due:*** Jul-12 ***Condition of Item:*** fair
Equipment Make: Intercomp ***Model:*** SW Deluxe ***Serial:*** 26032389 ***Capacity:*** 8800lb x 1lb
NTEP: ***Class:*** ***COC #:***

Applied Test Wt	*Before Adustment*	*Tolerance*	*In-Tolerance Y/N*	*After Adjustment*	*In-Tolerance Y/N*	*Unc*	
1000lb	1000lb	2lb	y	1000lb	y	.5lb	LF
200lb	200lb	1lb	y	200lb	y	.11lb	
1000lb	1000lb	2lb	y	1000lb	y	.5lb	RF
200lb	200lb	1lb	y	200lb	y	.11lb	
1000lb	1000lb	2lb	y	1000lb	y	.5lb	LR
200lb	200lb	1lb	y	200lb	y	.11lb	
1000lb	1000lb	2lb	y	1000lb	y	.5lb	RR
200lb	200lb	1lb	y	200lb	y	.11lb	

shift test
n/a

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

Tests performed: ☑ Repeatability ☑ Linearity ☐ Sensitivity ☑ Discrimination

Technician comments: Scale passed all tests performed

Traceable certificate for weights used: A1160,1163,20950,5003,10002

☑ Scale Certified ☐ Scale Rejected

Sterling Scale Service Rep: Dan W. **Date:** **7/18/2011** 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.
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
for this reason Sterling Scale does not warranty calibration.
This report shall not be reproduced, except in full without approval of the laboratory
Tolerances followed are maintenance/acceptance per HB 44 or customer specific.