FINAL REPORT NUMBER 201UI-MGA-11-16

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

CHRYSLER GROUP, LLC
2011 Dodge Grand Caravan Express
NHTSA No. CB0301

MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083

Test Dates: July 7-8, 2011
Report Date: July 12, 2011

FINAL REPORT

PREPARED FOR:

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

Prepared By: _____
Nathaniel Newth, Project Engineer

_____
Helen A. Kaleto, Project Manager

Approved By: _____

Approval Date: _____

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Accepted By: _____

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16. Abstract A compliance test series was conducted on the subject 2011 Dodge Grand Caravan Express, NHTSA No. CB0301, 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 July 7-8, 2011. Test failures identified were as follows: None The data recorded indicates that the 2011 Dodge Grand Caravan Express tested appears to comply with the upper interior requirements of FMVSS 201.			
17. Key Words Compliance Testing Safety Engineering FMVSS 201UI 2011 Dodge Grand Caravan Express		18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division, Mail Code: NPO-410 1200 New Jersey Avenue, SE West Building Washington, D.C. 20590	
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1.0 PURPOSE OF COMPLIANCE TEST

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

Tests were conducted on July 7-8, 2011 on a 2011 Dodge Grand Caravan Express, manufactured by Chrysler Group, LLC.

All tests were conducted in accordance with the U. S. Department of Transportation, National Highway Traffic Safety Administration's Laboratory Test Procedure TP-201U-01 dated April 3, 1998 and the corresponding MGA Research Corporation's FMVSS 201U procedure number MGATP201U_FRAME#2 dated November 9, 2009.

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

2.0 COMPLIANCE TEST DATA SUMMARY

The 2011 Dodge Grand Caravan Express was equipped with A, B, O, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, an adjustable seat belt anchorage on each O-pillar, a grab handle located on the side rail above each rear door (driver and passenger), an assist handle located on the passenger A-pillar, and an assist handle on the driver and passenger B-pillar.

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

AP1	BP3	FH1	UR3@SR3-1
AP3	BP4	UR1@SR2A	UR4@SR3-2
BP2	OP2	UR2@BP	UR5@OP

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

TABLE 2-1

SUMMARY TABLE OF TEST RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Dodge Grand Caravan Express

VEH. NHTSA NO.: CB0301 VIN: 2D4RN4DG5BR602735 COLOR: Deep Water Blue

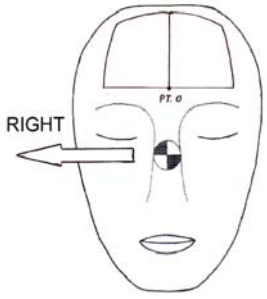
VEH. BUILD DATE: January, 2011 TEST DATES: July 7-8, 2011

TEST LABORATORY: MGA Research Corporation

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

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Left	251	48	18.8	474	407	13	18 Right
AP3	Right	150	50	18.8	390	296	21	11 Right
BP2	Right	90	18	23.7	513	459	13	7 Left
BP3	Left	270	-10	23.8	645	634	34	4 Right
BP4	Left	252	-2	24.0	581	550	19	15 Left
OP2	Right	90	-1	23.8	576	543	10	1 Right
FH1	Right	180	50	23.3	368	267	16	4 Right
UR1@SR2A	Left	270	50	23.8	484	421	34	1 Left
UR2@BP	Right	90	50	23.6	514	460	32	4 Right
UR3@SR3-1	Left	270	50	23.5	740	760	33	0
UR4@SR3-2	Right	90	49	23.6	801	841	22	11 Right
UR5@OP	Left	270	50	23.8	435	355	20	2 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.

BP4 Left: Assist handle dislodged and broken.

FH1 Right: Headliner deformation, cracked windshield.

UR1@SR2A Left: Dislodged headliner.

UR4@SR3-2 Right: Headliner deformation.

REMARKS:

The targets listed were impacted in the following order:

Left: AP1, UR1@SR2A, BP3, UR3@SR3-1, UR5@OP, BP4

Right: FH1, AP3, UR2@BP, BP2, UR4@SR3-2, OP2

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

RECORDED BY: Nathaniel Newth DATE: July 8, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Dodge Grand Caravan Express

VEH. NHTSA NO.: CB0301 VIN: 2D4RN4DG5BR602735 COLOR: Deep Water Blue

VEH. BUILD DATE: January, 2011 TEST DATES: July 7-8, 2011

TEST LABORATORY: MGA Research Corporation

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

INTERIOR TRIM INFORMATION: A, B, O, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, an adjustable seat belt anchorage on each O-pillar, a grab handle located on the side rail above each rear door (driver and passenger), an assist handle located on the passenger A-pillar, and an assist handle on the driver and passenger B-pillar.

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: March 14, 2011; Odometer Reading 72 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Chrysler Group, LLC

Date of Manufacture: January, 2011; VIN: 2D4RN4DG5BR602735

GVWR: 2745 kg; GAWR FRONT: 1339 kg;

GAWR REAR: 1407 kg;

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 250 kPa REAR: 250 kPa

Recommended Tire Size: 225/65R16

Recommended Cold Tire Pressure:

FRONT: 250 kPa REAR: 250 kPa

Size of Tire on Test Vehicle: 225/65R16

Type of Spare Tire: T145/90R16; Space Saver: X; Standard__

VEHICLE CAPACITY DATA:

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

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

VEHICLE CAPACITY WEIGHT:

Vehicle Capacity Weight (VCW) = 521 kg

No. of Occupants x 68 kg = 476 kg

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

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

Right Front =	556.5 kg	Right Rear =	441.5 kg
Left Front =	589.0 kg	Left Rear =	440.0 kg
TOTAL FRONT =	1145.5 kg	TOTAL REAR =	881.5 kg
% Total Weight =	56.5 %	% Total Weight =	43.5 %

TOTAL DELIVERED WEIGHT = 2027.0 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 2027.0 kg

Max. Test Cargo/Luggage Weight = 45.0 kg

Target Test Weight = 2072.0 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	551.5 kg	Right Rear =	465.5 kg
Left Front =	586.0 kg	Left Rear =	465.5 kg
TOTAL FRONT =	1137.5 kg	TOTAL REAR =	931.0 kg
% Total Weight =	55.0 %	% Total Weight =	45.0 %

TOTAL TEST WEIGHT = 2068.5 kg

Weight of ballast secured in vehicle's cargo area = 41.5 kg

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 766 mm; Left Front 767 mm;
Right Rear 777 mm; Left Rear 775 mm;
Pitch Angle at Right Door Sill = 1.7 Rear is higher
Pitch Angle at Left Door Sill = 1.7 Rear is higher
Roll Angle at Front Bumper = 0.7 Right is higher
Roll Angle at Rear Bumper = 0.3 Right is higher

FULLY LOADED: Right Front 769 mm; Left Front 767 mm;
Right Rear 767 mm; Left Rear 768 mm;
Pitch Angle at Right Door Sill = 1.3 Rear is higher
Pitch Angle at Left Door Sill = 1.4 Rear is higher
Roll Angle at Front Bumper = 0.5 Right is higher
Roll Angle at Rear Bumper = 0.1 Right is higher

AS TARGETED: Right Front 912 mm; Left Front 907 mm;
Right Rear 921 mm; Left Rear 922 mm;
Pitch Angle at Right Door Sill = 1.6 Rear is higher
Pitch Angle at Left Door Sill = 1.7 Rear is higher
Roll Angle at Front Bumper = 0.7 Right is higher
Roll Angle at Rear Bumper = 0.2 Right is higher

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill =	1.7 Rear is higher
Pitch Angle at Left Door Sill =	1.4 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 =	1.6 Rear is higher
Pitch Angle at Left Door Sill =	1.5 Rear is higher
Roll Angle at Front Bumper =	0.6 Right is higher
Roll Angle at Rear Bumper =	0.1 Right is higher

VEHICLE WHEELBASE = 3080 mm

REMARKS: The seat travel distance was measured to be 220 mm for the driver front seat and 220 mm for the passenger front seat.

RECORDED BY: Nathaniel Newth DATE: June 27, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-3

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Dodge Grand Caravan Express

VEH. NHTSA NO.: CB0301 VIN: 2D4RN4DG5BR602735 COLOR: Deep Water Blue

VEH. BUILD DATE: January, 2011 TEST DATES: July 7-8, 2011

TEST LABORATORY: MGA Research Corporation

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

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

	HORIZONTAL ANGLE SPECIFIED RANGE	MINIMUM HORIZONTAL ANGLE	MAXIMUM HORIZONTAL ANGLE
A-PILLAR	L 195º-255º	L 203.3º	L 251.4º
	R 105º-165º	R 111.0º	R 156.5º
B-PILLAR	L 195º-345º	L 202.3º	L 273.4º
	R 15º-165º	R 86.6º	R 156.4º

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Nathaniel Newth DATE: June 27, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Dodge Grand Caravan Express

VEH. NHTSA NO.: CB0301 VIN: 2D4RN4DG5BR602735 COLOR: Deep Water Blue

VEH. BUILD DATE: January, 2011 TEST DATES: July 7-8, 2011

TEST LABORATORY: MGA Research Corporation

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

VERTICAL IMPACT ANGLE RANGES

			VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	FH1	L	0º-50º	0º	50º
		R	0º-50º	0º	50º
	FH2	L	0º-50º	0º	50º
		R	0º-50º	0º	50º
SIDE RAIL	SR1	L	0º-50º	0º	19º
		R	0º-50º	0º	19º
	SR2A	L	0º-50º	0º	21º
		R	0º-50º	0º	21º
	SR2B	L	0º-50º	0º	22º
		R	0º-50º	0º	22º
	SR3-1	L	0º-50º	0º	45º
		R	0º-50º	0º	45º
	SR3-2	L	0º-50º	0º	45º
		R	0º-50º	0º	45º
	SR3-3	L	0º-50º	0º	50º
		R	0º-50º	0º	50º
REAR HEADER	RH	L	0º-50º	0º	48º
		R	0º-50º	0º	48º

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
SLIDING DOOR	SD	L 0º-50º	L 0º	L 45º
		R 0º-50º	R 0º	R 45º
A-PILLAR	AP1	L -5º-50º	L -5º	L 48º
		R -5º-50º	R -5º	R 48º
	AP2	L -5º-50º	L -5º	L 49º
		R -5º-50º	R -5º	R 26º
	AP3	L -5º-50º	L -5º	L 49º
		R -5º-50º	R -5º	R 50º
B-PILLAR	BP1	L -10º-50º	L -10º	L 28º
		R -10º-50º	R -10º	R 28º
	BP2*	L 0º-50º	L 0º	L 18º
		R 0º-50º	R 0º	R 18º
	BP3	L -10º-50º	L -10º	L -10º
		R -10º-50º	R -10º	R -10º
	BP4	L -10º-50º	L -10º	L -2º
		R -10º-50º	R -10º	R -2º
OTHER PILLAR	OP1*	L 0º-50º	L 0º	L 0º
		R 0º-50º	R 0º	R 0º
	OP2	L -10º-50º	L -10º	L -1º
		R -10º-50º	R -10º	R -1º
REAR PILLAR	RP1	L -10º-50º	L -10º	L -3º
		R -10º-50º	R -10º	R -3º
	RP2	L -10º-50º	L -10º	L -9º
		R -10º-50º	R -10º	R -9º
UPPER ROOF 1		0º-50º	0º	50º
UPPER ROOF 2		0º-50º	0º	50º
UPPER ROOF 3		0º-50º	0º	50º

	VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
UPPER ROOF 4	0º-50º	0º	49º
UPPER ROOF 5	0º-50º	0º	50º
UPPER ROOF 6	0º-50º	0º	50º

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

RECORDED BY: Nathaniel Newth DATE: June 27, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Dodge Grand Caravan Express

VEH. NHTSA NO.: CB0301 VIN: 2D4RN4DG5BR602735 COLOR: Deep Water Blue

VEH. BUILD DATE: January, 2011 TEST DATES: July 7-8, 2011

TEST LABORATORY: MGA Research Corporation

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

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	220 mm	220 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)}	203.3º	--
A2º	A2º = Wº	203.3º	--
Uº	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	273.4º	--
B1º	B1º = Uº	273.4º	--
Vº	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	202.3º	--
B2º	B2º = Vº	202.3º	--
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)}	--	249.0º
A2º (right)	360º-Tº (right)	--	111.0º
V º (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	156.4º
B1º (right)	B1º (right) = Vº (right)	--	156.4º
U º (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	86.6º
B2º (right)	B2º (right) = Uº (right)	--	86.6º
J	A-Pillar {(Plane 3) – (Plane 5)}	345.3 mm	342.4 mm
J/2	J ÷ 2	172.7 mm	171.2 mm
D1	Upper Roof {(Plane A) – (Plane B)}	2756.0 mm	
D1/2	D1 ÷ 2	1378.0 mm	

Measurement	Description	Left Side	Right Side
D2	Upper Roof {(Plane C) – (Plane D)}	1449.6 mm	
D2/2	D2 ÷ 2	724.8 mm	
.35D1	.35 x D1	964.6 mm	
.35D2	.35 x D2	507.4 mm	
N	B-Pillar {(BPR) – (lowest point on daylight opening forward of B-Pillar)}	509.4 mm	509.0 mm
N/2	B-Pillar {(BP3) – (lowest point on daylight opening forward of B-Pillar)}	254.7 mm	254.5 mm
N/4	B-Pillar {(BP4) – (lowest point on daylight opening forward of B-Pillar)}	127.4 mm	127.3 mm
D	R-Pillar (Point 7 – Point M)	973.8 mm	973.9 mm
3D/7	3*D / 7	486.9 mm	487.0 mm

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

SgRP Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
1st Row	2376.0	-425.0	905.1	2376.0	413.0	892.6
2nd Row	3235.0	-412.0	873.8	3235.0	388.1	873.8
3rd Row	4130.4	-367.6	817.7	4130.4	343.6	817.7

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
1st Row	2376.0	-425.0	905.1	2376.0	413.0	892.6
2nd Row	3235.0	-412.0	873.8	3235.0	388.1	873.8
3rd Row	4130.4	-367.6	817.7	4130.4	343.6	817.7

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
CGF1	2316.0	-425.0	1565.1	2316.0	413.0	1552.6
CGF2	2536.0	-425.0	1565.1	2536.0	413.0	1552.6
2nd Row CGR	3395.0	-412.0	1533.8	3395.0	388.1	1533.8
3rd Row CGR	4290.4	-367.6	1477.7	4290.4	343.6	1477.7

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Front passenger front outboard bolt hole (x, y, z) = 2072.95, 614.98, 543.61

Front passenger door striker upper bolt (x, y, z) = 2553.06, 862.24, 920.26

Front driver door upper striker bolt (x, y, z) = 2553.06, -862.24, 920.26

REMARKS:

RECORDED BY: Nathaniel Newth DATE: June 27, 2011

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2011 Dodge Grand Caravan Express

VEH. NHTSA NO.: CB0301 VIN: 2D4RN4DG5BR602735 COLOR: Deep Water Blue

VEH. BUILD DATE: January, 2011 TEST DATES: July 7-8, 2011

TEST LABORATORY: MGA Research Corporation

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

SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
A-Pillar Left Side								
AP1	2113.7	-669.4	1647.4	251	48	No	--	Yes
AP2	1915.7	-696.4	1559.8	204	49	No	--	No
AP3	1767.7	-714.2	1475.5	204	49	No	--	No
A-Pillar Right Side								
AP1	2112.1	673.4	1647.5	111	48	No	--	No
AP2	1943.2	679.5	1560.4	156	26	No	--	No
AP3	1802.0	695.5	1477.3	150	50	No	--	Yes
B-Pillar Left Side								
BP1	2578.2	-556.8	1713.2	270	28	No	--	No
BP2	2574.3	-681.4	1513.3	270	18	No	--	No
BP3	2546.9	-745.6	1459.1	270	-10	No	--	Yes
BP4	2650.3	-753.7	1331.9	--	--	Yes	--	--
REL	2642.3	-743.7	1334.9	252	-2	--	1	Yes
B-Pillar Right Side								
BP1	2581.6	554.8	1714.0	90	28	No	--	No
BP2	2574.7	683.9	1514.7	90	18	No	--	Yes
BP3	2545.0	746.7	1460.5	90	-10	No	--	No
BP4	2652.4	753.8	1334.6	--	--	Yes	--	--

SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
REL	2644.4	743.8	1337.6	108	-2	--	1	No
Other Pillar Left Side								
OP1	3685.6	-667.2	1578.7	270	0	No	--	No
OP2	3681.5	-732.7	1508.6	--	--	Yes	--	--
REL	3694.6	-684.4	1533.6	270	-1	--	3	No
Other Pillar Right Side								
OP1	3688.4	664.2	1581.4	90	0	No	--	No
OP2	3680.6	723.3	1510.5	--	--	Yes	--	--
REL	3695.9	680.3	1537.0	90	-1	--	3	Yes
Rear Pillar Left Side								
RP1	4405.9	-589.0	1606.7	--	--	Yes	--	--
REL	4418.2	-582.1	1600.2	335	-3	--	1	No
RP2	4468.3	-597.4	1455.7	305	-9	No	--	No
Rear Pillar Right Side								
RP1	4406.7	590.4	1605.6	--	--	Yes	--	--
REL	4418.7	582.5	1603.2	25	-3	--	1	No
RP2	4471.3	592.2	1455.1	55	-9	No	--	No
Front Header Left Side								
FH1	2040.4	-584.2	1699.2	--	--	Yes	--	--
REL	2031.2	-561.2	1692.5	180	50	--	1	No
FH2	2014.9	-435.4	1696.3	180	50	No	--	No
Front Header Right Side								
FH1	2040.6	587.4	1696.5	--	--	Yes	--	--
REL	2028.6	565.4	1690.7	180	50	--	1	Yes
FH2	2011.5	436.0	1695.8	180	50	No	--	No
Side Rail Left Side								
SR1	2263.4	-606.7	1737.5	--	--	Yes	--	--
REL	2252.3	-635.1	1698.1	270	19	--	2	No
SR2A	2414.4	-587.8	1745.5	270	21	No	--	No

SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
SR2B	2278.8	-603.4	1736.6	--	--	Yes	--	--
REL	2301.9	-628.5	1700.8	270	22	--	2	No
SR3-1	3001.5	-540.3	1730.2	270	45	No	--	No
SR3-2	3146.7	-538.3	1734.0	270	45	No	--	No
SR3-3	3824.6	-566.2	1737.3	--	--	Yes	--	--
REL	3805.5	-549.2	1742.8	270	50	--	1	No
Side Rail Right Side								
SR1	2263.0	606.7	1737.0	--	--	Yes	--	--
REL	2249.2	638.3	1698.5	90	19	--	2	No
SR2A	2412.3	589.4	1743.9	90	21	No	--	No
SR2B	2281.3	605.3	1736.6	--	--	Yes	--	--
REL	2325.4	595.3	1660.1	90	22	--	2	No
SR3-1	2993.9	547.3	1727.0	90	45	No	--	No
SR3-2	3146.1	543.6	1731.4	90	45	No	--	No
SR3-3	3820.3	568.4	1736.0	--	--	Yes	--	--
REL	3805.1	545.0	1742.8	90	50	--	1	No
Rear Header Left Side								
RH	4371.7	-368.5	1742.3	0	48	No	--	No
Rear Header Right Side								
RH	4388.8	342.8	1761.5	0	48	No	--	No
Sliding Door Left Side								
SD	3113.9	-555.8	1750.9	--	--	Yes	--	--
REL	3142.4	-543.9	1729.9	270	45	--	2	No
Sliding Door Right Side								
SD	3112.3	563.1	1748.0	--	--	Yes	--	--
REL	3144.8	540.3	1731.7	90	45	--	2	No
Upper Roof Left Side								
UR1@SR2A	2407.2	-453.8	1793.2	270	50	No	--	Yes

SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
UR3@SR3-1	3022.0	-356.9	1818.2	270	50	No	--	Yes
UR5@OP	3657.0	-454.9	1799.6	270	50	No	--	Yes
Upper Roof Right Side								
UR2@BP	2593.8	377.4	1808.9	90	50	No	--	Yes
UR4@SR3-2	3163.5	384.0	1816.9	90	49	No	--	Yes
UR6@SR3-3	3794.3	446.3	1802.5	90	50	No	--	No

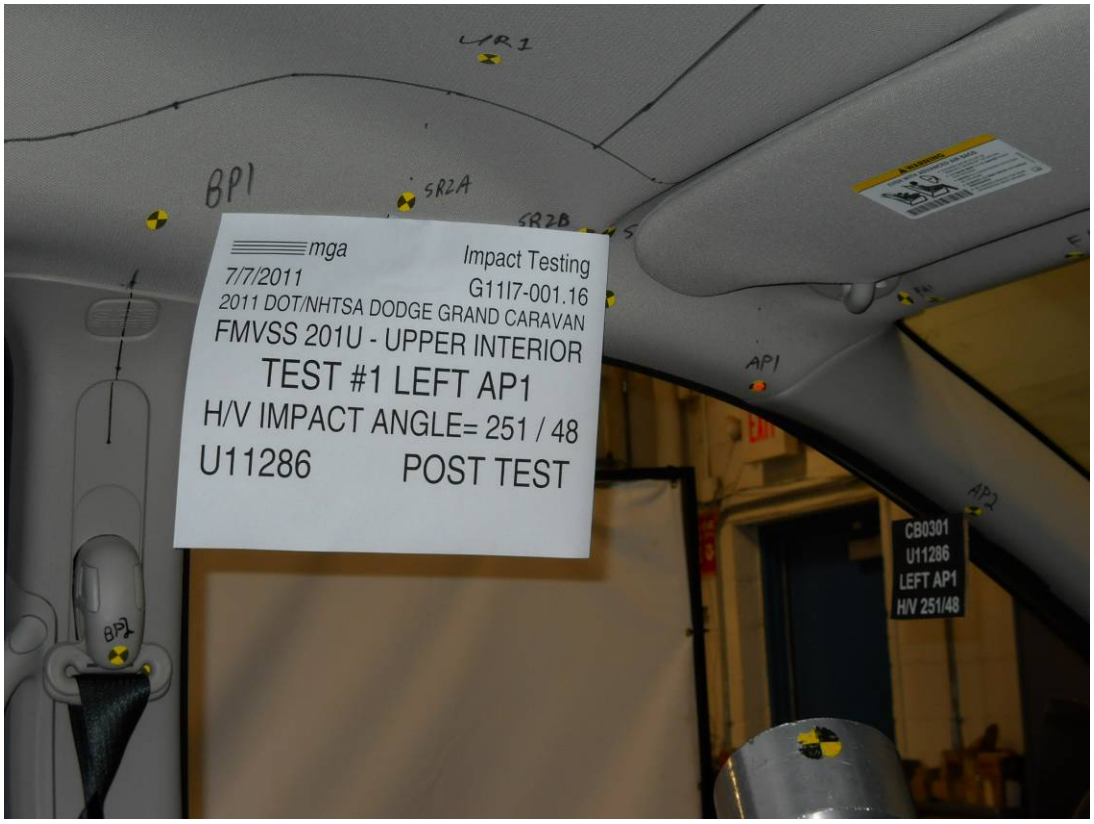
As determined using the Procedures specified in S10.1-10.13.

RECORDED BY: Nathaniel Newth DATE: June 27, 2011

APPROVED BY: Helen A. Kaleto

3.0 TEST DATA (Including Acceleration and Velocity Plots)


CB0301
U11286
LEFT AP1
H/V 251/48
mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT AP1
H/V IMPACT ANGLE= 251 / 48
U11286
POST TEST


BP1
SR2A
SR2B
AP1
AP2
mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT AP1
H/V IMPACT ANGLE= 251 / 48
U11286
POST TEST
CB0301
U11286
LEFT AP1
H/V 251/48


mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT AP1
H/V IMPACT ANGLE= 251 / 48
U11286
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#1

Target (Vehicle Side): AP1Left

Temperature:22.0C

MGA Test Reference No.:U11286

Humidity:49.9%

Approach Horizontal Angles:251º

Time of Test:10:50:00 AM

Approach Vertical Angles:48º

FMH Serial No:[035]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
474	407	4.6	18.8	13	18 Right

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

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

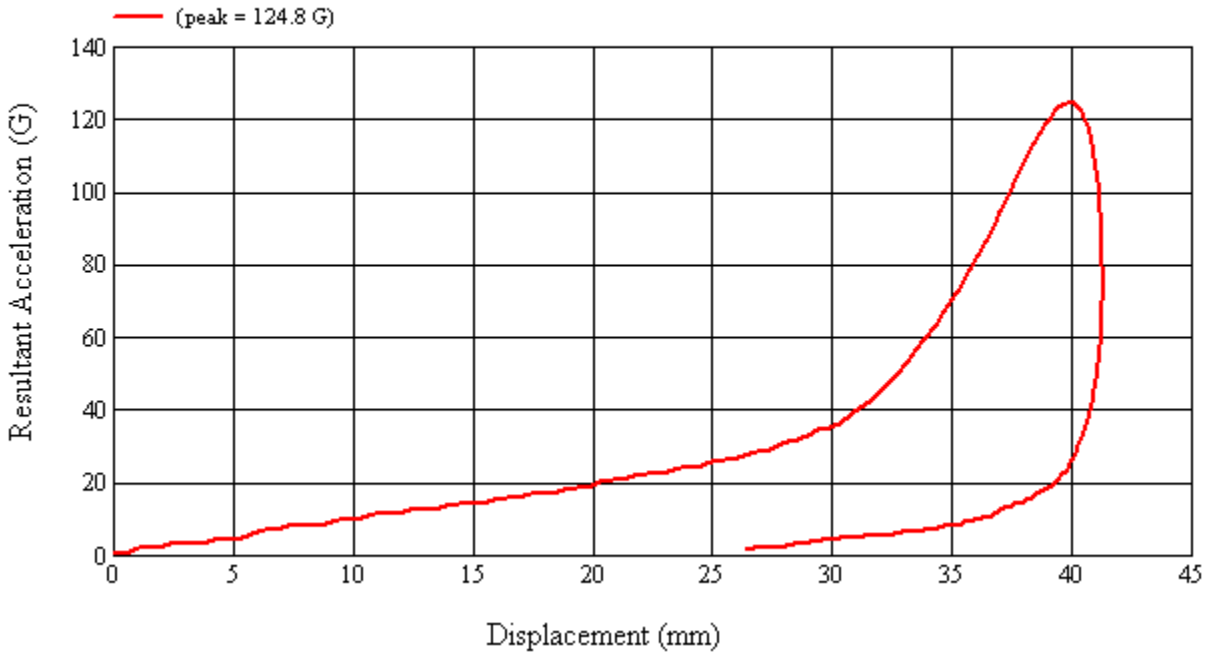
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

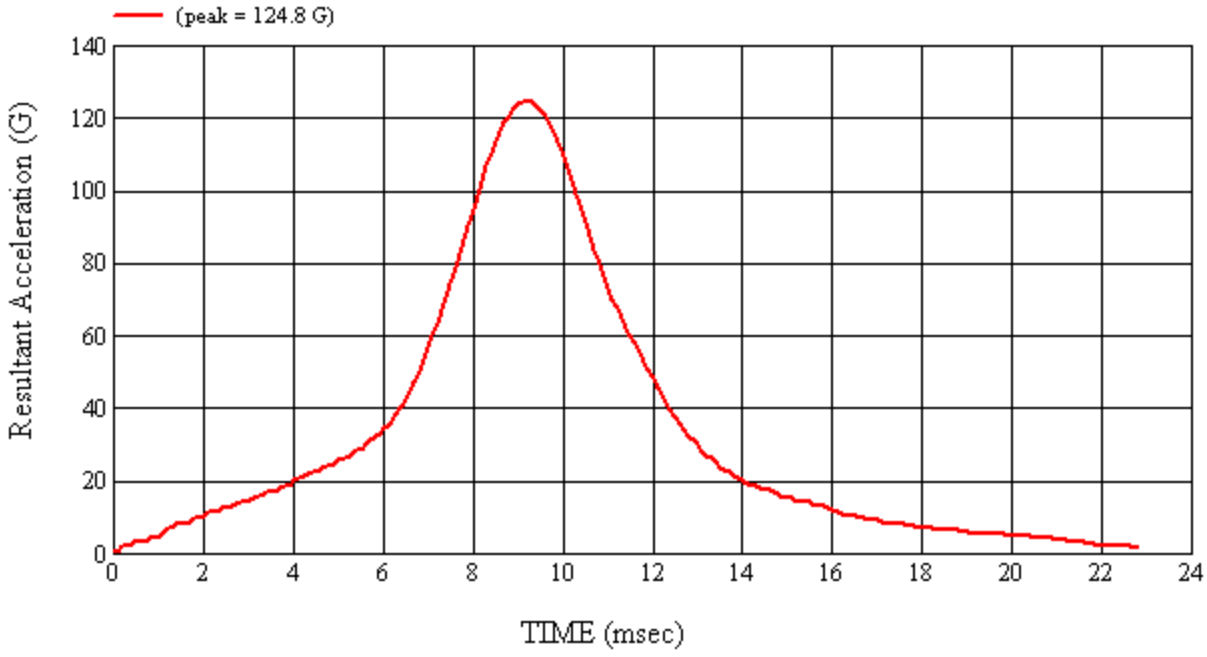
No visible damage

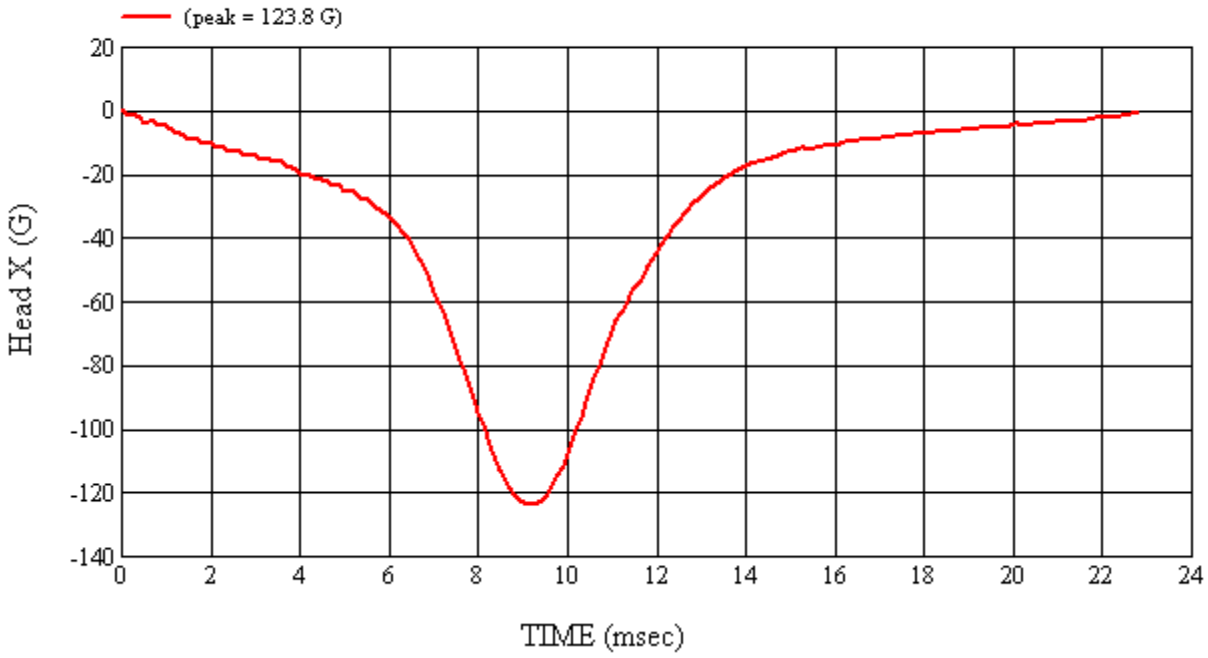
Recorded By: _____ Approved By*: _____ Date: 7/7/2011

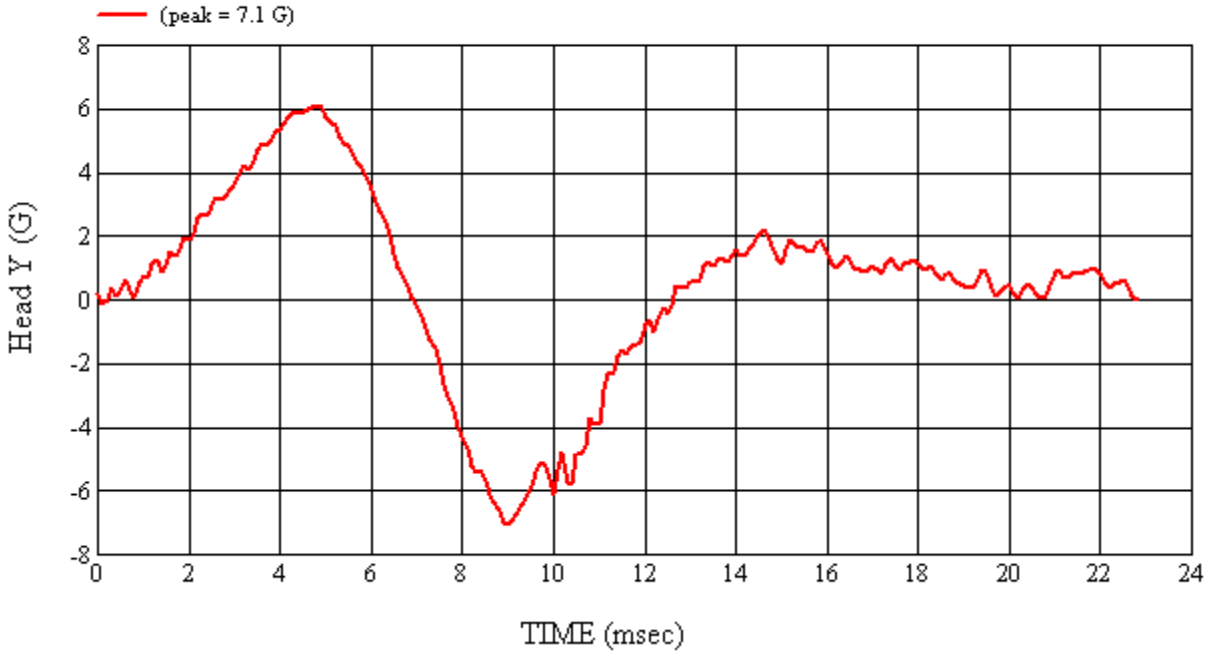
*Only necessary for NHTSA (Government) Compliance testing.

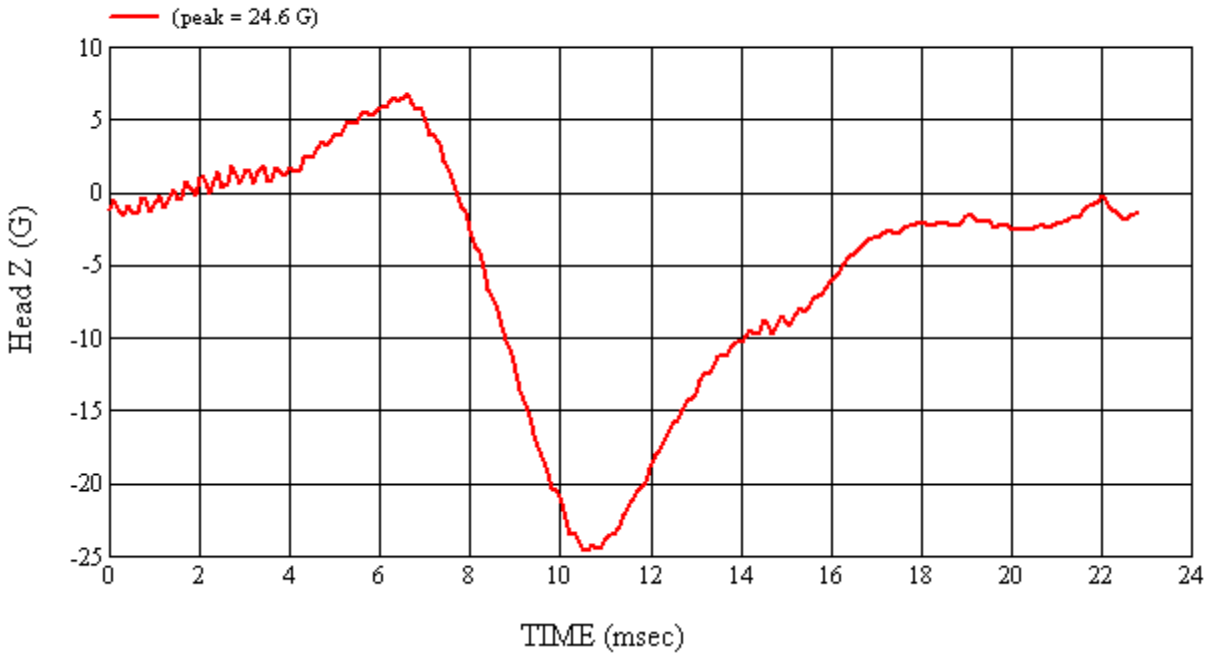
MGA Test #: U11286 Target Location: AP1, Left Side Test Date: 7/7/2011

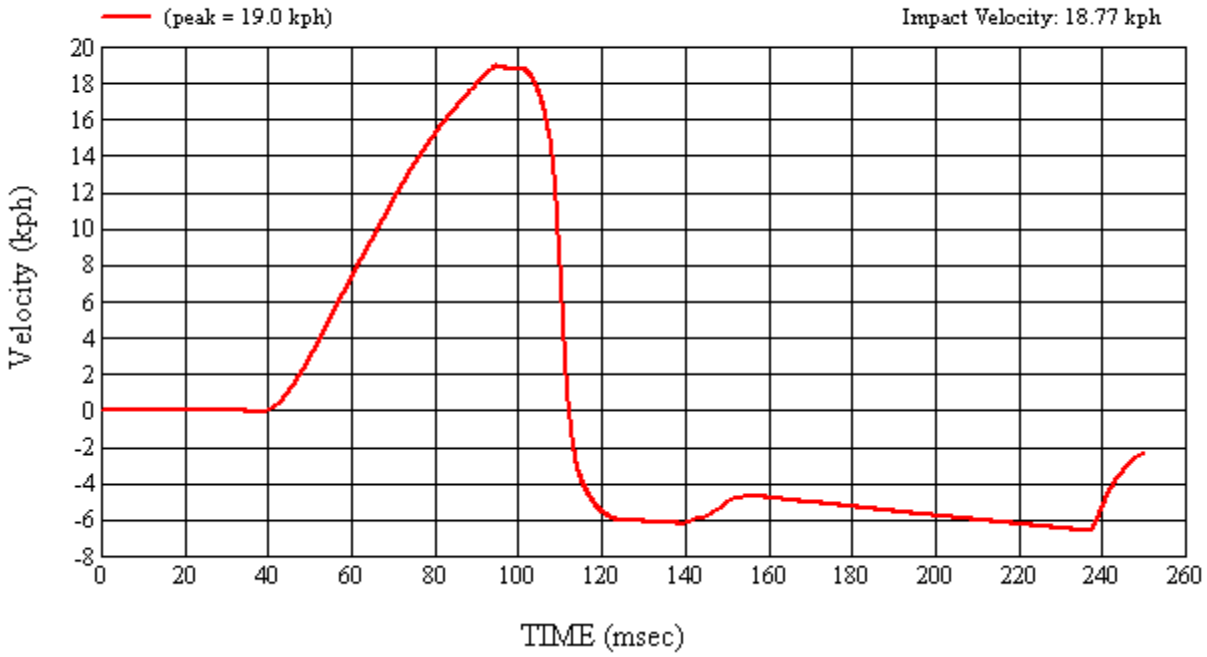


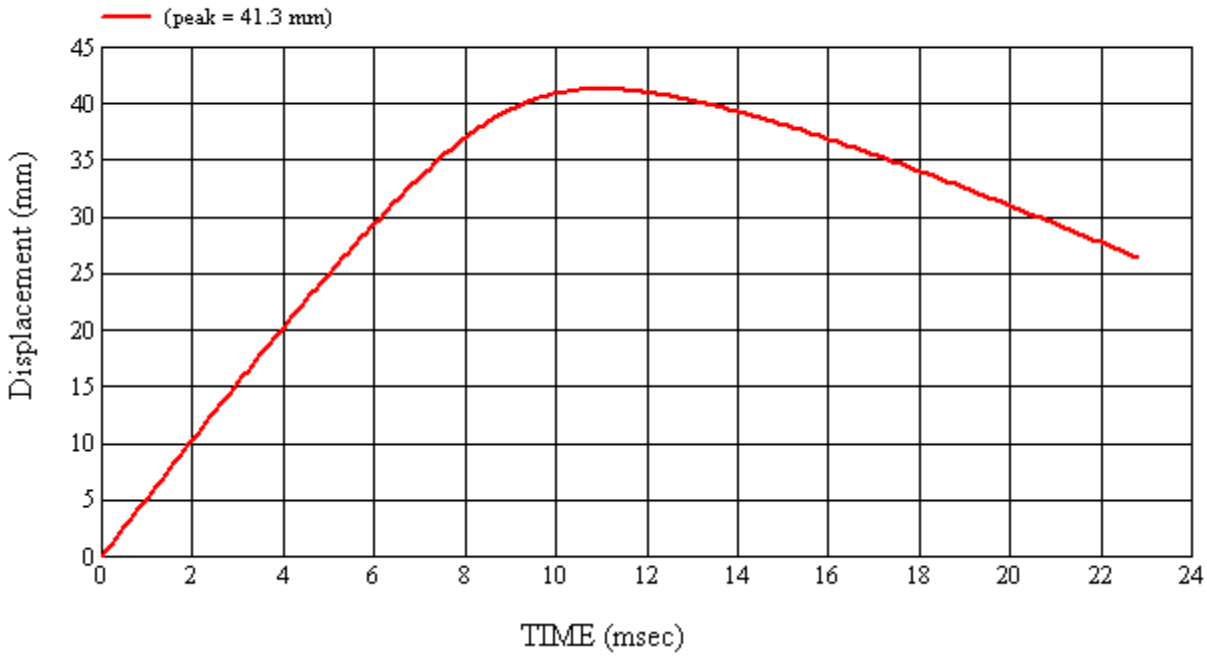


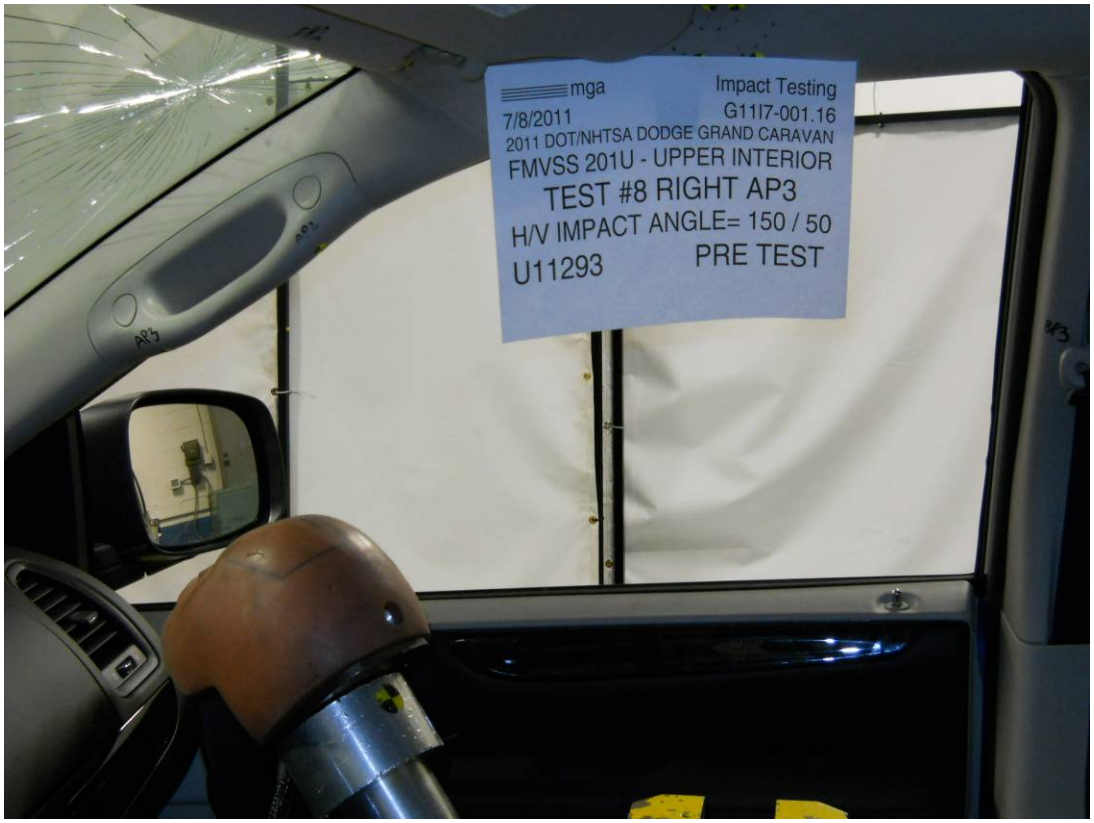

(peak = 123.8 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 7.1 G)
Head Y (G)
8
6
4
2
0
-2
-4
-6
-8
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 24.6 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
TIME (msec)

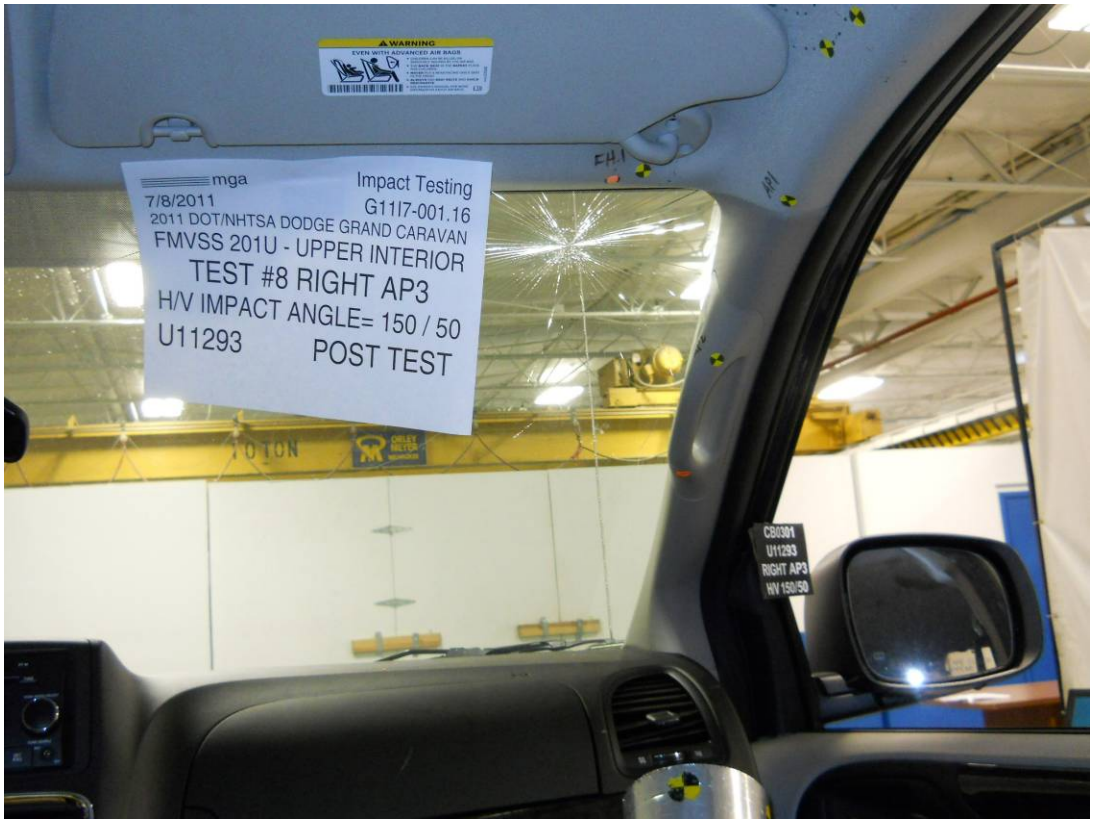

(peak = 19.0 kph)
Impact Velocity: 18.77 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

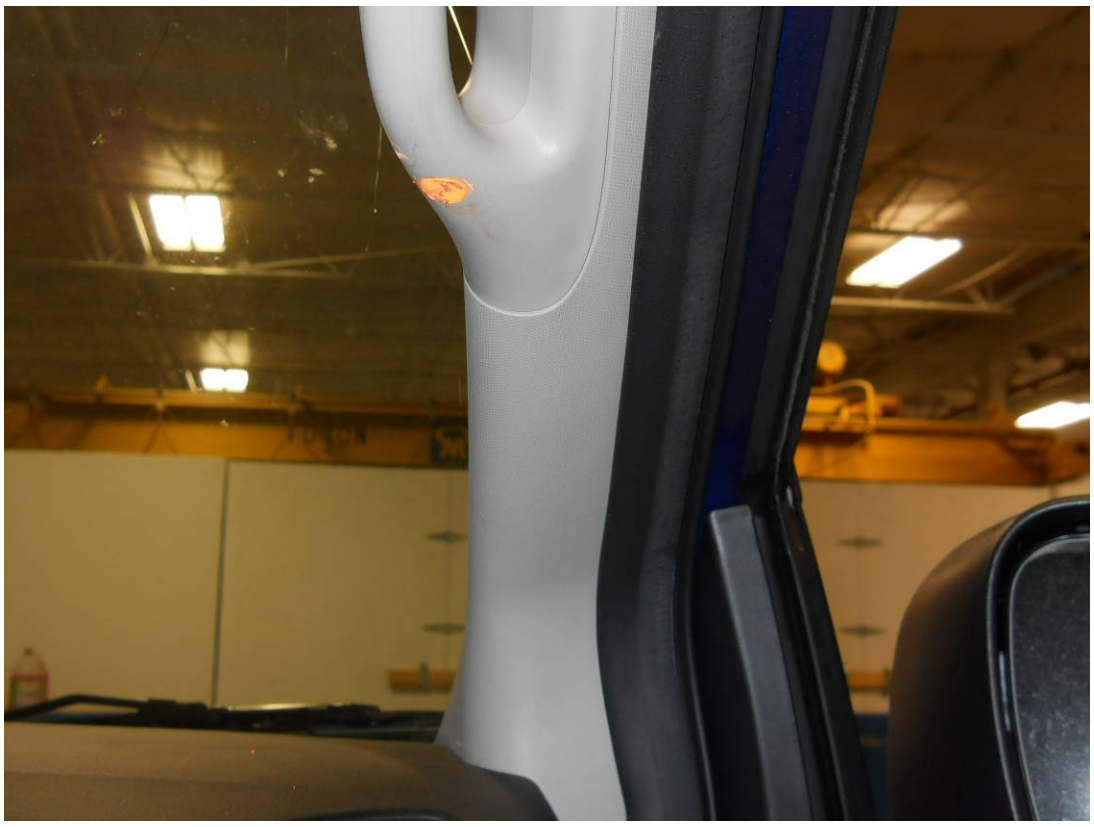

(peak = 41.3 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP3
H/V IMPACT ANGLE= 150 / 50
U11293
PRE TEST


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP3
H/V IMPACT ANGLE= 150 / 50
U11293
PRE TEST


mga
Impact Testing
G11I7-001.16
7/8/2011
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP3
H/V IMPACT ANGLE= 150 / 50
U11293
POST TEST
SR2B
SR2A
AP3


WARNING
EVEN WITH ADVANCED AIR BAGS
mga
Impact Testing
G11I7-001.16
7/8/2011
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP3
H/V IMPACT ANGLE= 150 / 50
U11293
POST TEST
CB0301
U11293
RIGHT AP3
HV 150/50




mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT AP3
H/V IMPACT ANGLE= 150 / 50
U11293
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#8

Target (Vehicle Side): AP3Right

Temperature:21.7C

MGA Test Reference No.:U11293

Humidity:48.7%

Approach Horizontal Angles:150º

Time of Test:10:34:44 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
390	296	10.7	18.8	21	11 Right

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

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

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

No visible damage

Recorded By: _____ Approved By*: _____ Date: 7/8/2011

*Only necessary for NHTSA (Government) Compliance testing.

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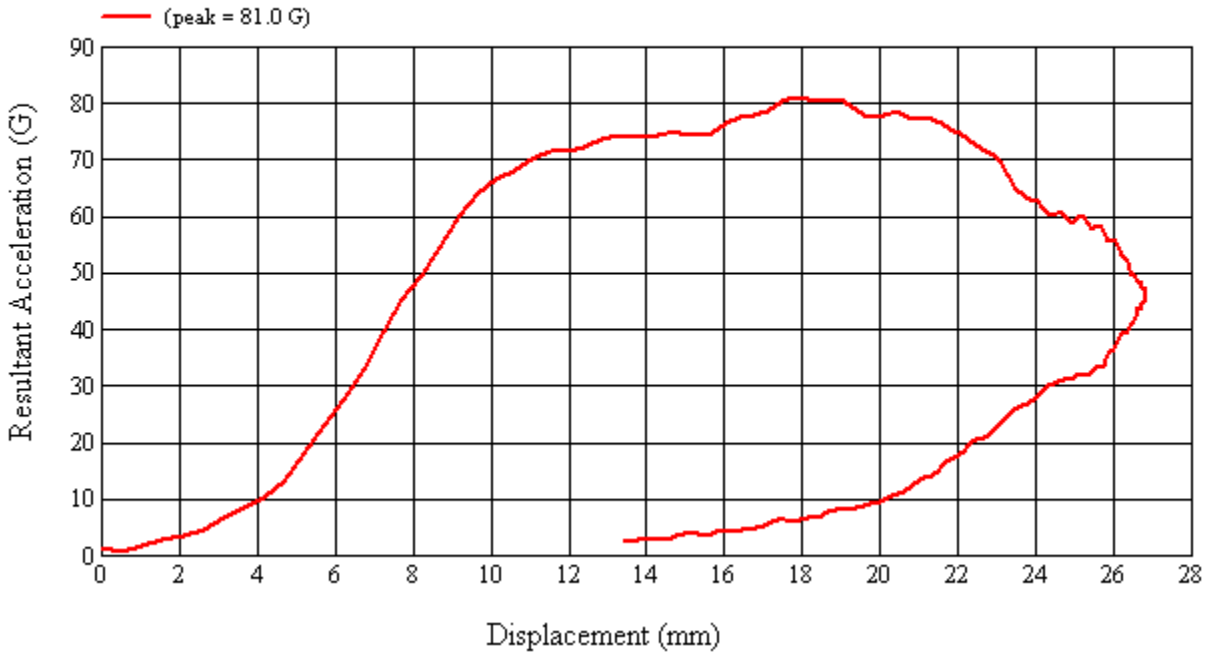
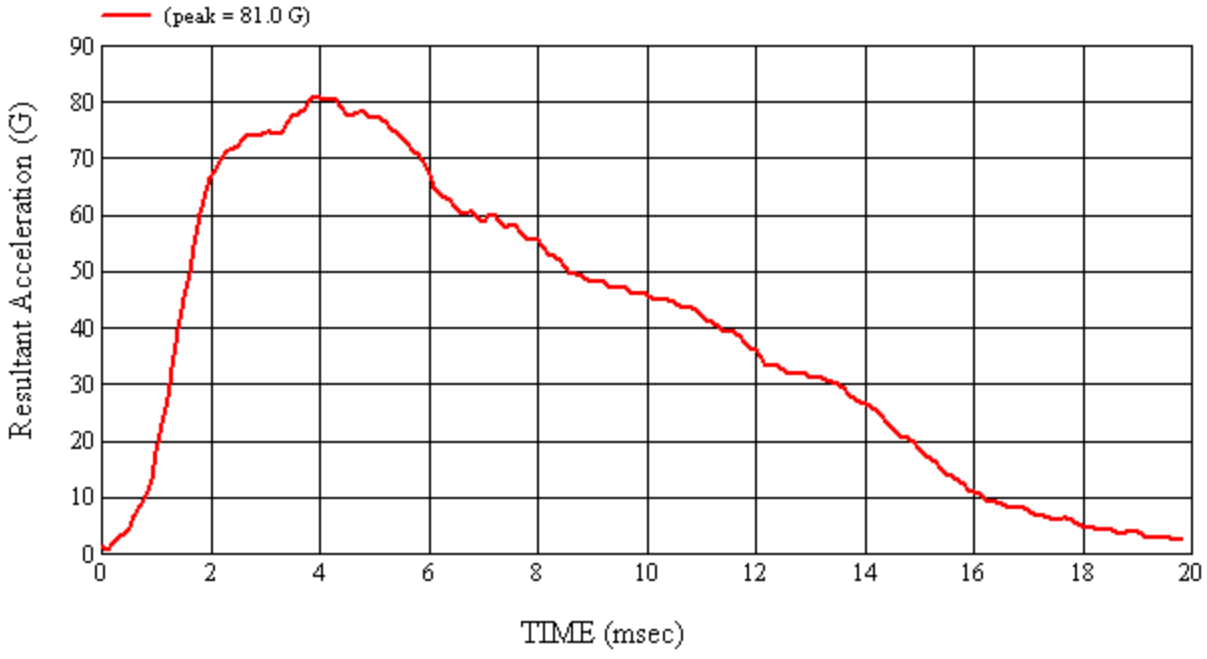
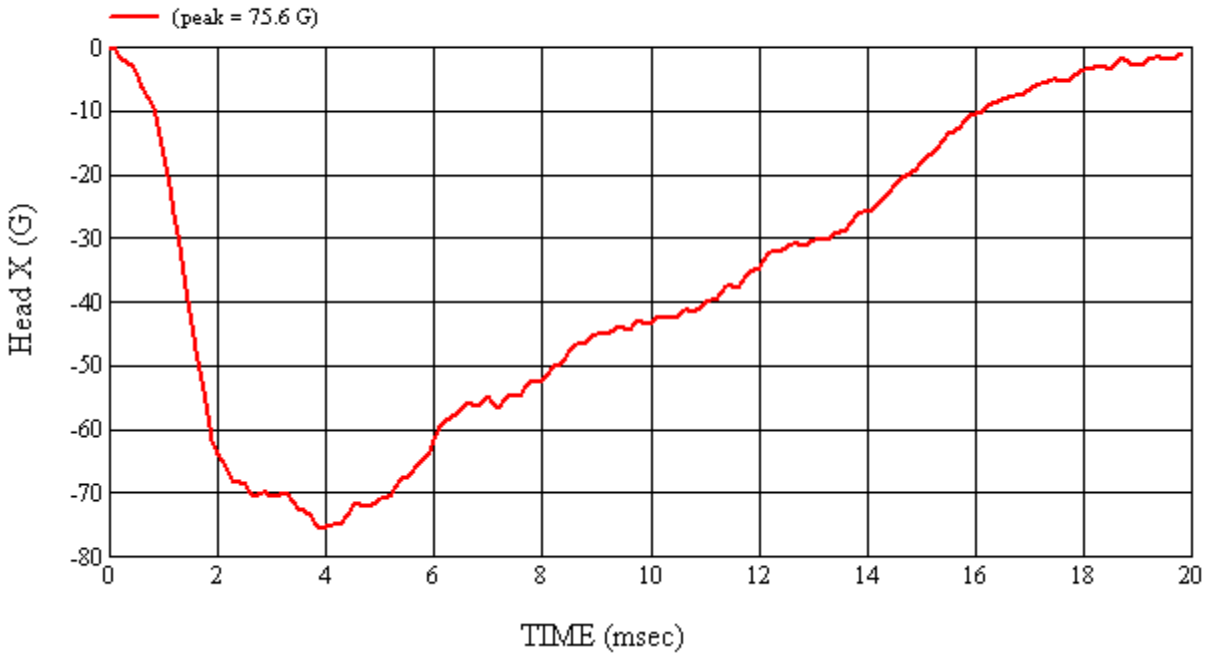
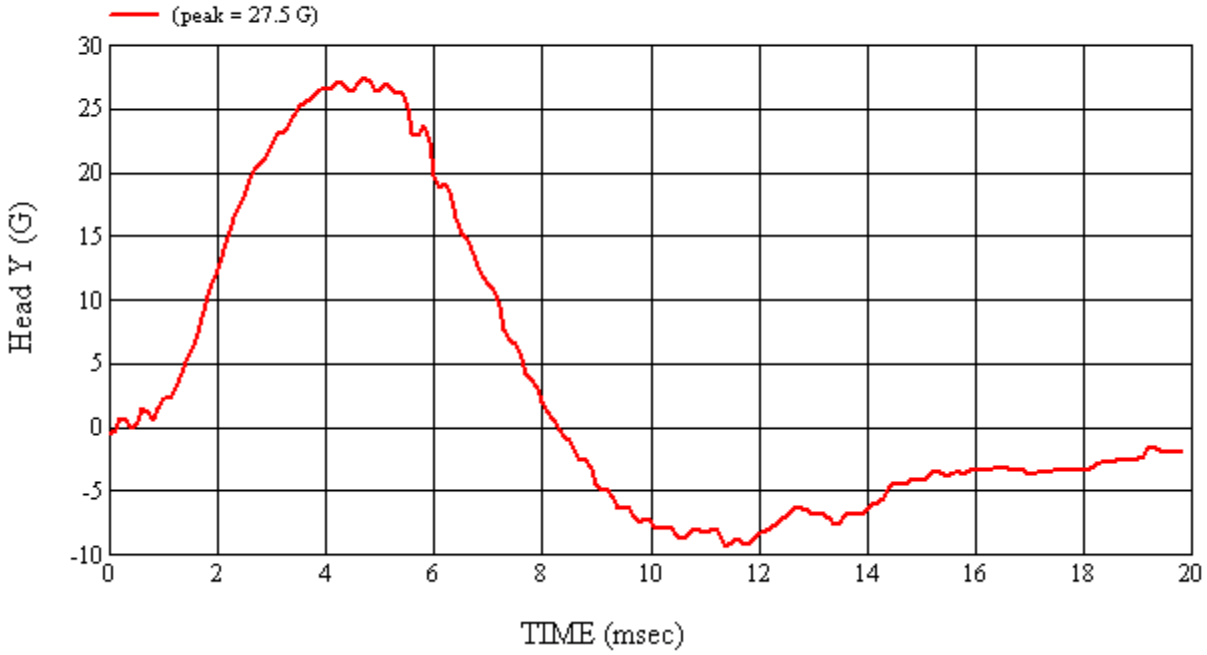
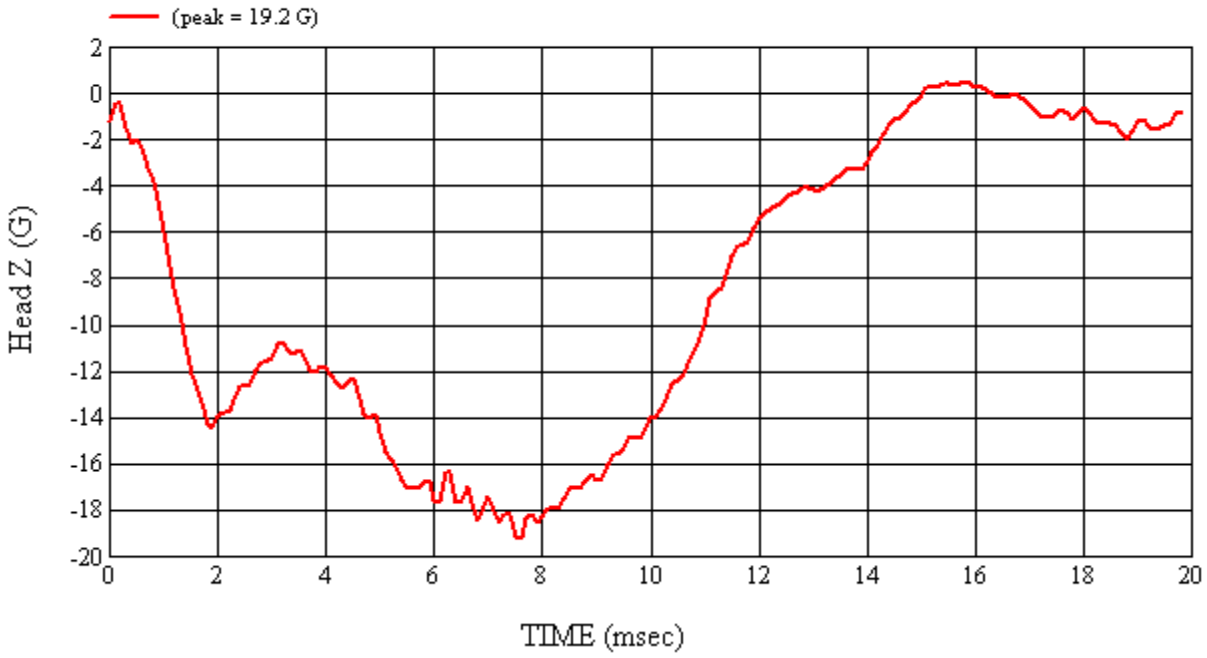
MGA Test #: U11293 Target Location: AP3, Right Side Test Date: 7/8/2011

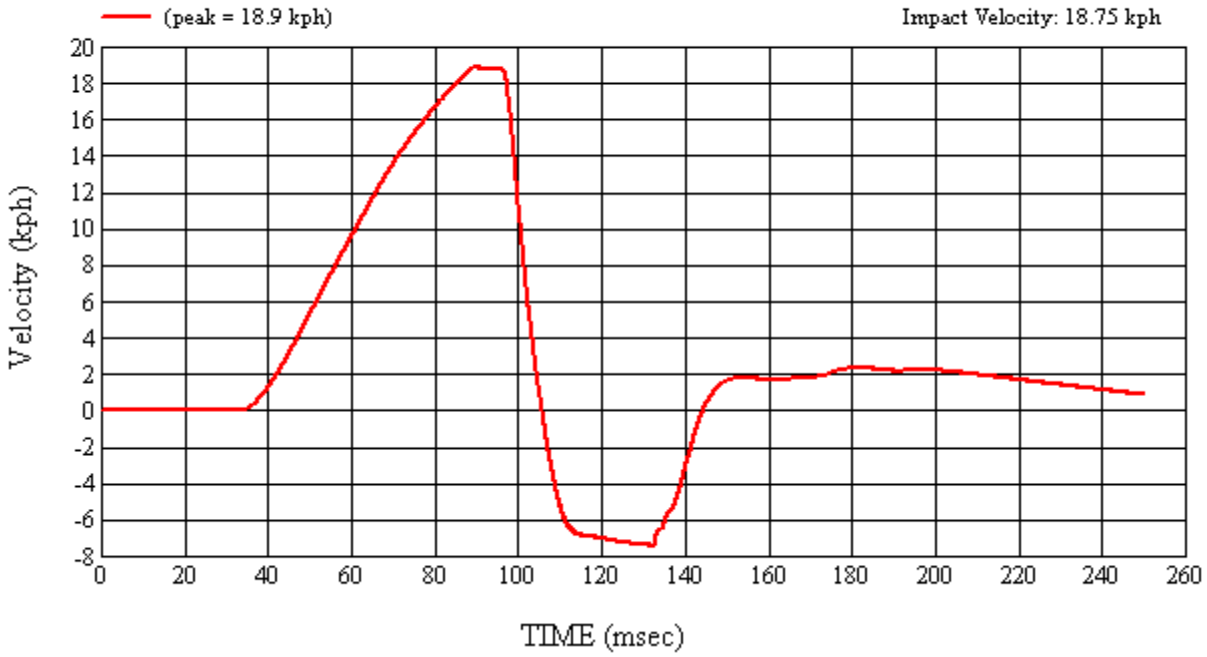


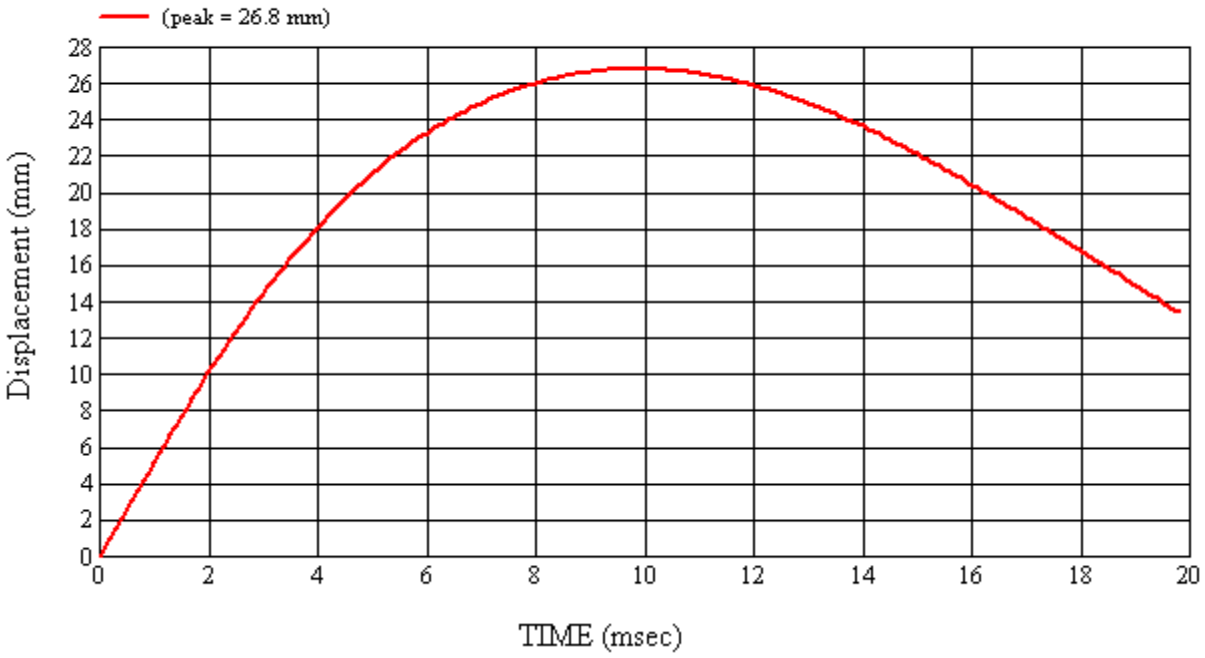



(peak = 75.6 G)
Head X (G)
0
-10
-20
-30
-40
-50
-60
-70
-80
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

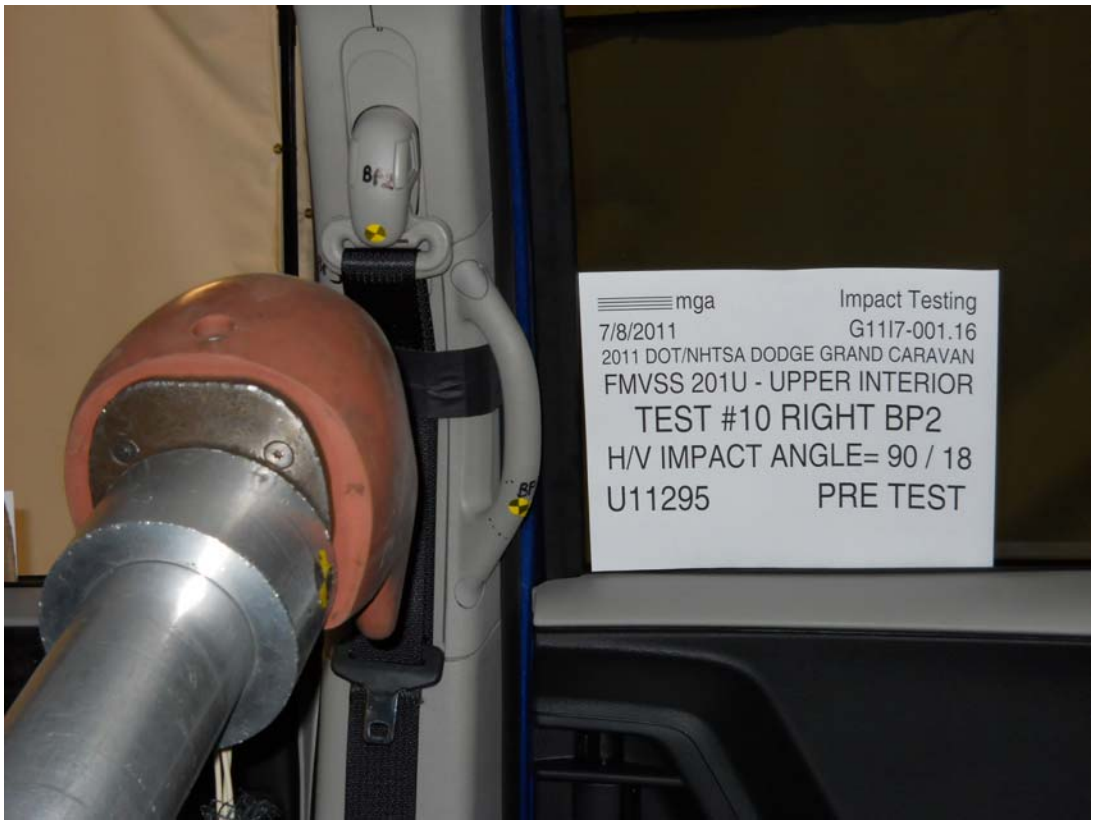

(peak = 27.5 G)
Head Y (G)
30
25
20
15
10
5
0
-5
-10
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 19.2 G)
Head Z (G)
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 = 18.9 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 = 26.8 mm)
Displacement (mm)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP2
H/V IMPACT ANGLE= 90 / 18
U11295
PRE TEST


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP2
H/V IMPACT ANGLE= 90 / 18
U11295
PRE TEST


CB0301
U11295
RIGHT BP2
H/V 90/18
mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP2
H/V IMPACT ANGLE= 90 / 18
U11295
POST TEST


SR2B
SR2A
BP1
CB0301
U11295
RIGHT BP2
H/V 90/18
mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP2
H/V IMPACT ANGLE= 90 / 18
U11295
POST TEST


BP3


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP2
H/V IMPACT ANGLE= 90 / 18
U11295
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#10

Target (Vehicle Side): BP2Right

Temperature:21.3C

MGA Test Reference No.:U11295

Humidity:49.8%

Approach Horizontal Angles:90º

Time of Test:1:01:40 PM

Approach Vertical Angles:18º

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
513	459	7.3	23.7	13	7 Left

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

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

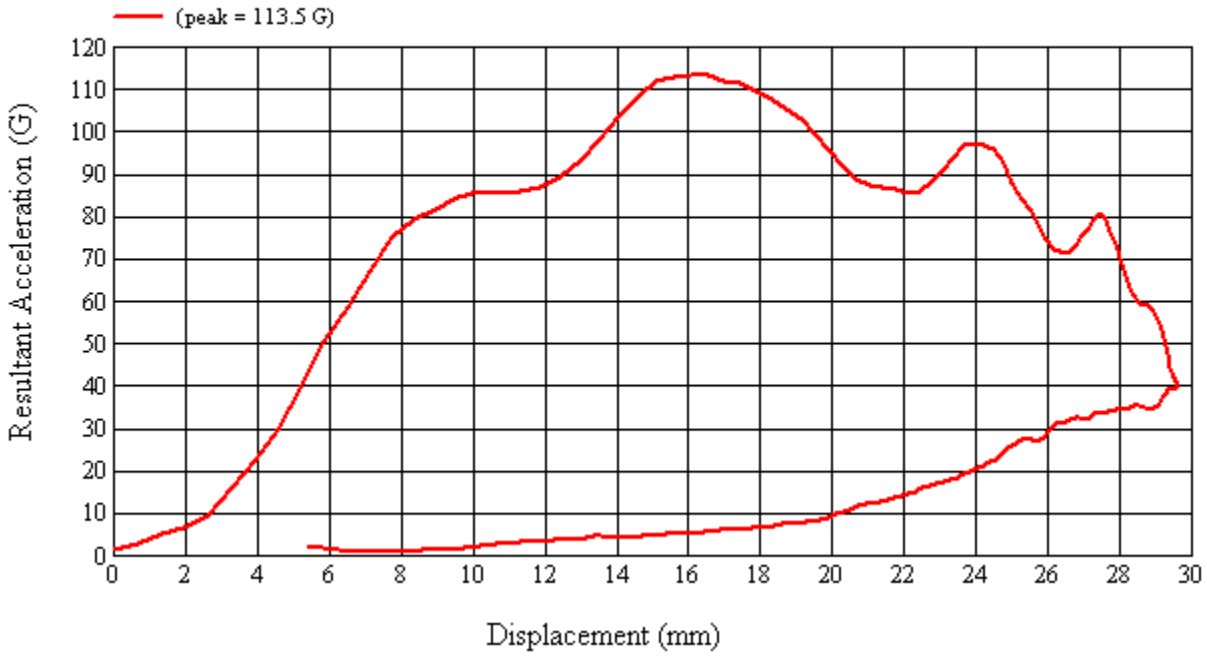
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

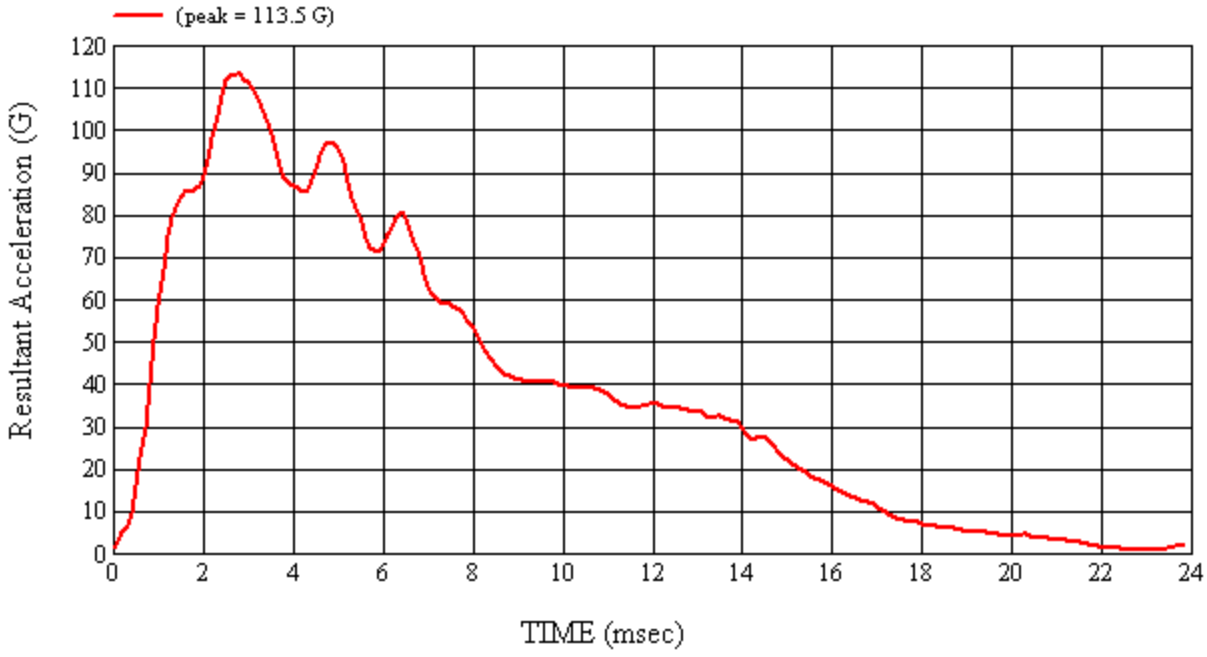
No visible damage

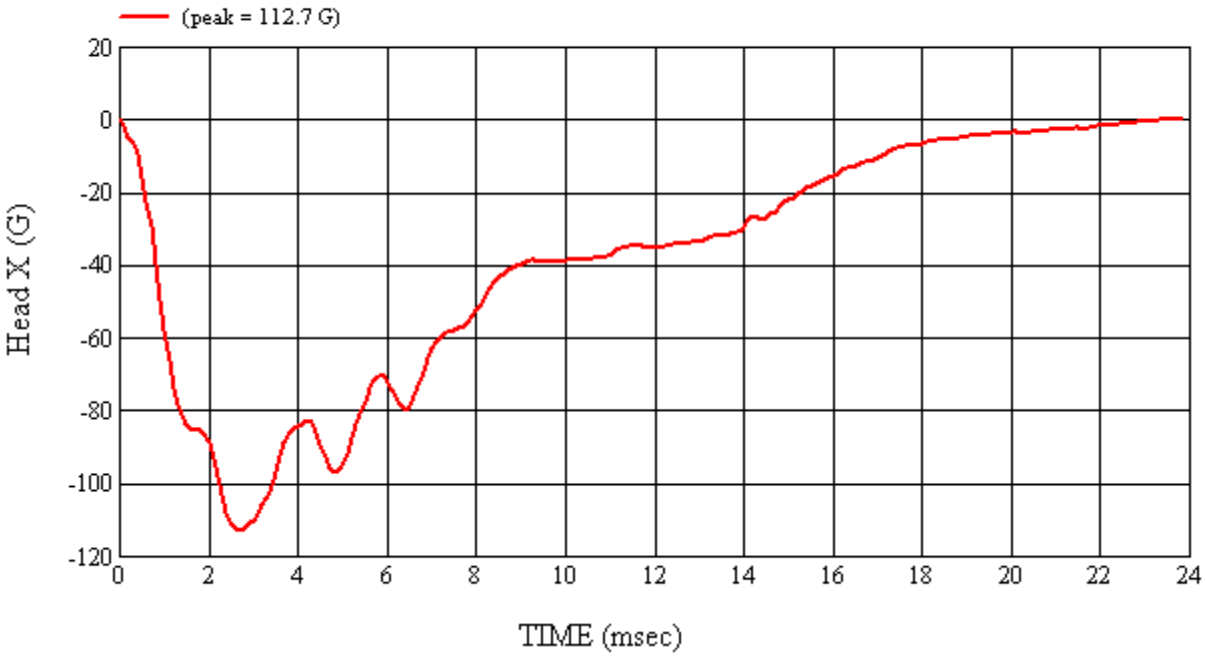
Recorded By: _____ Approved By*: _____ Date: 7/8/2011

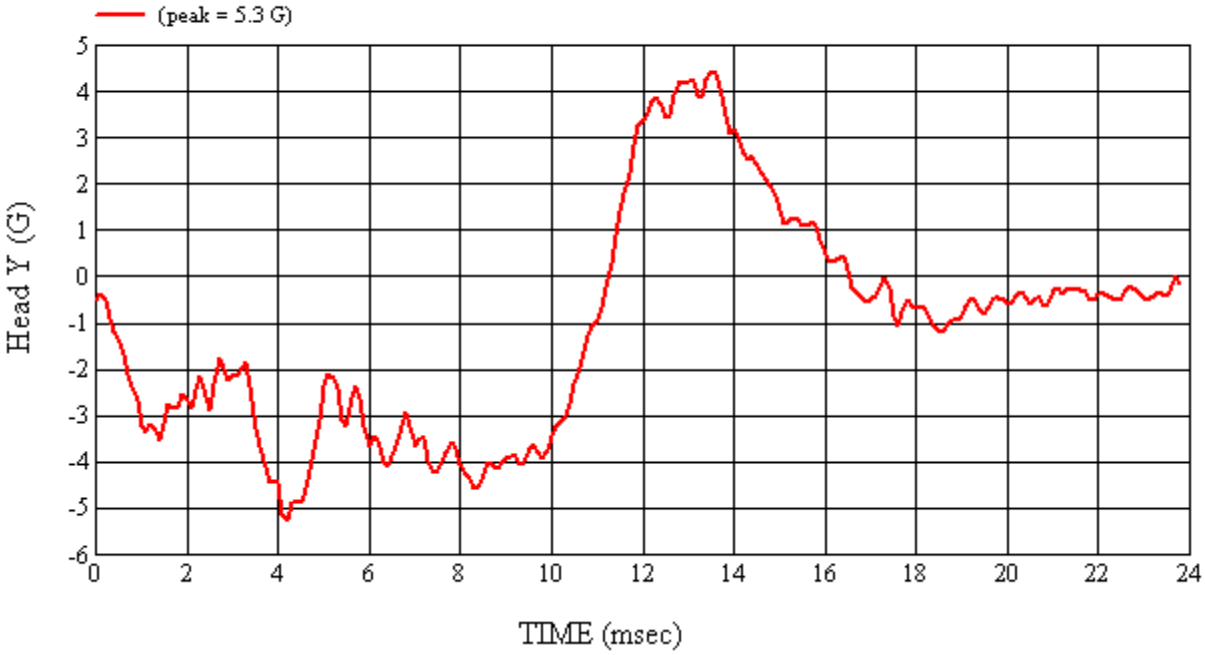
*Only necessary for NHTSA (Government) Compliance testing.

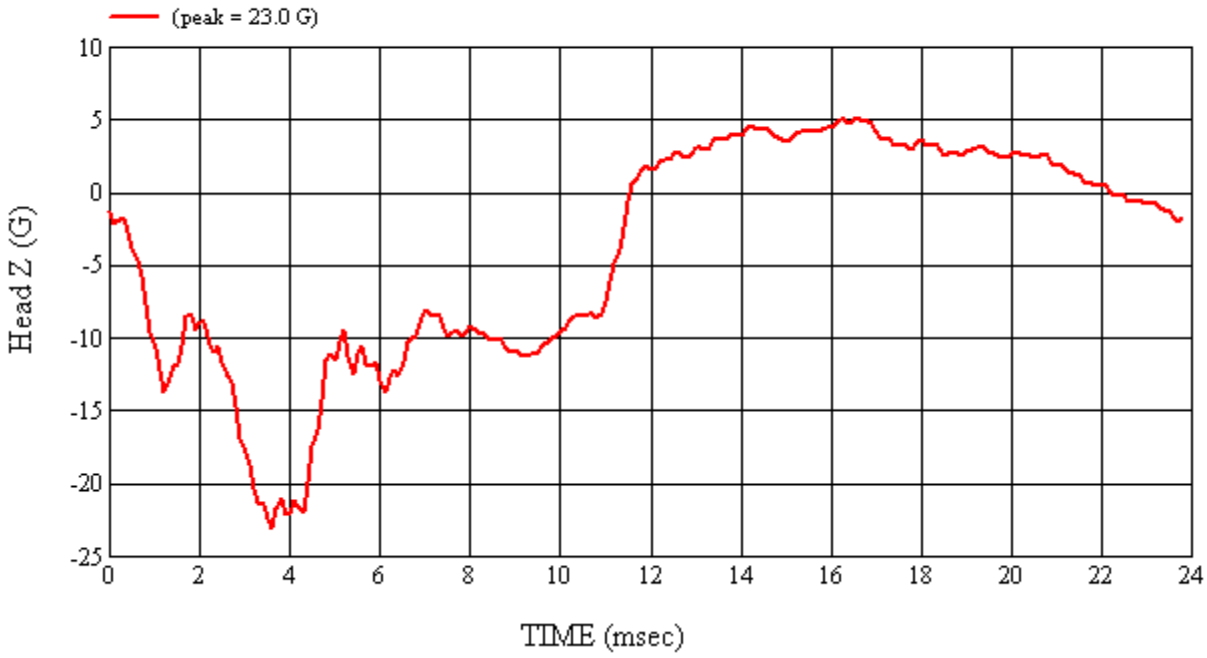
MGA Test #: U11295 Target Location: BP2, Right Side Test Date: 7/8/2011

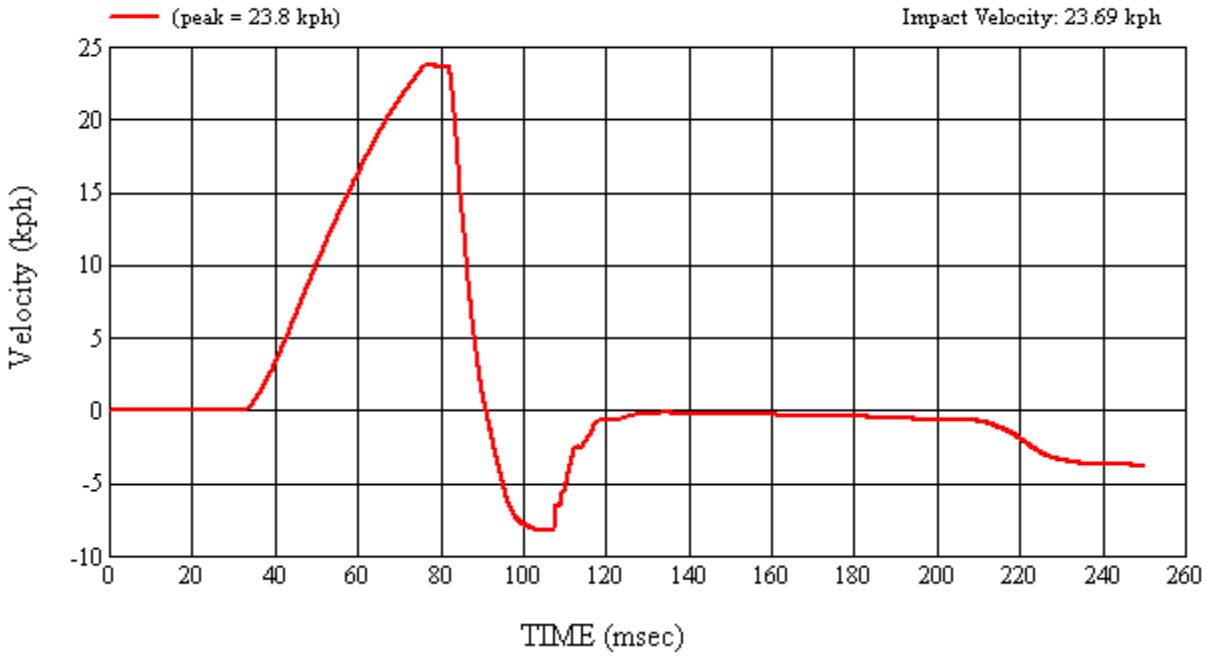


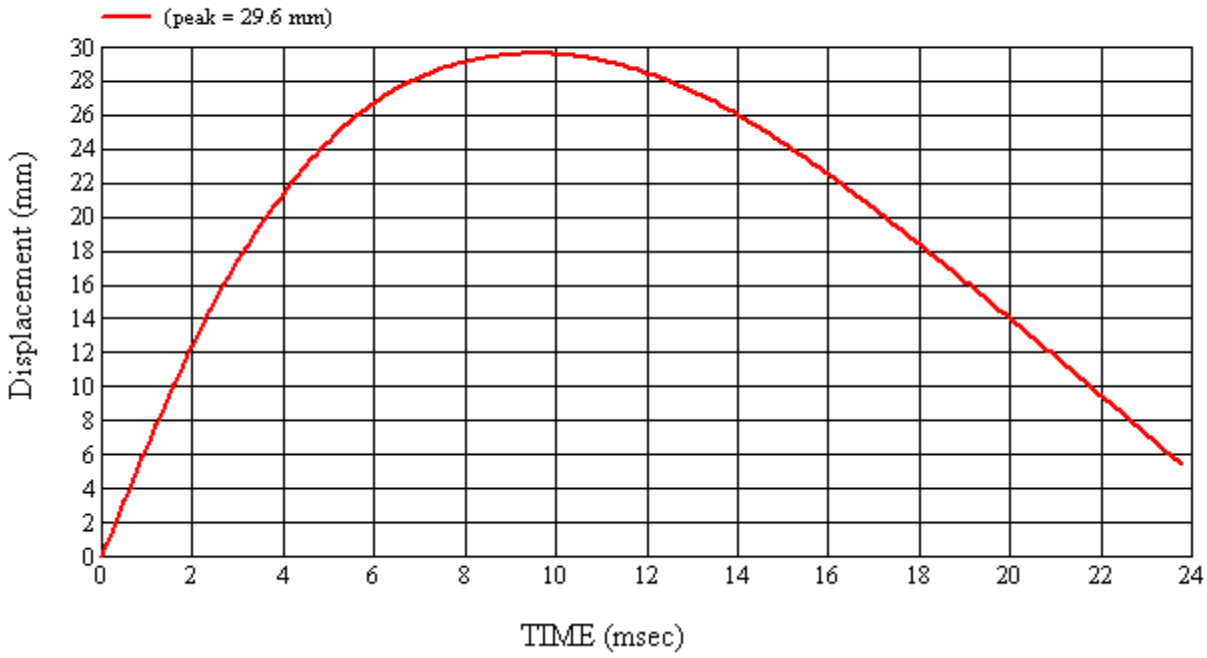


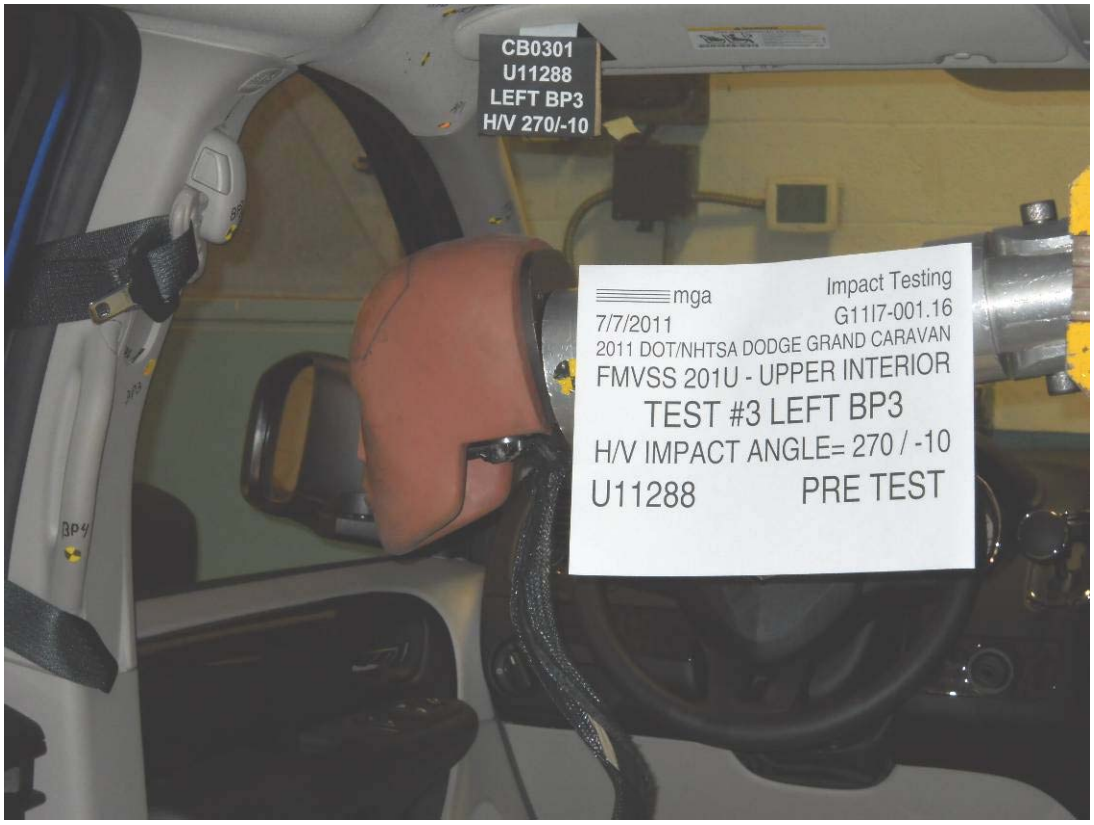

(peak = 112.7 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)

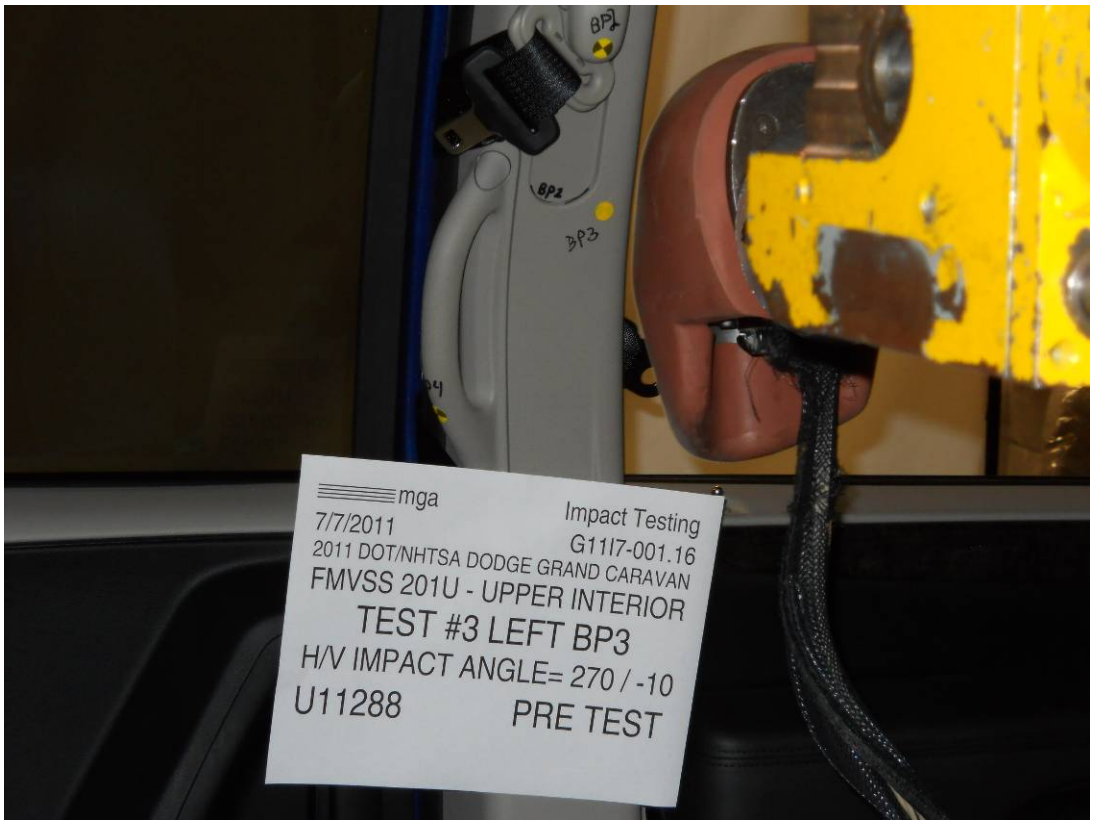

(peak = 5.3 G)
Head Y (G)
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 23.0 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
TIME (msec)

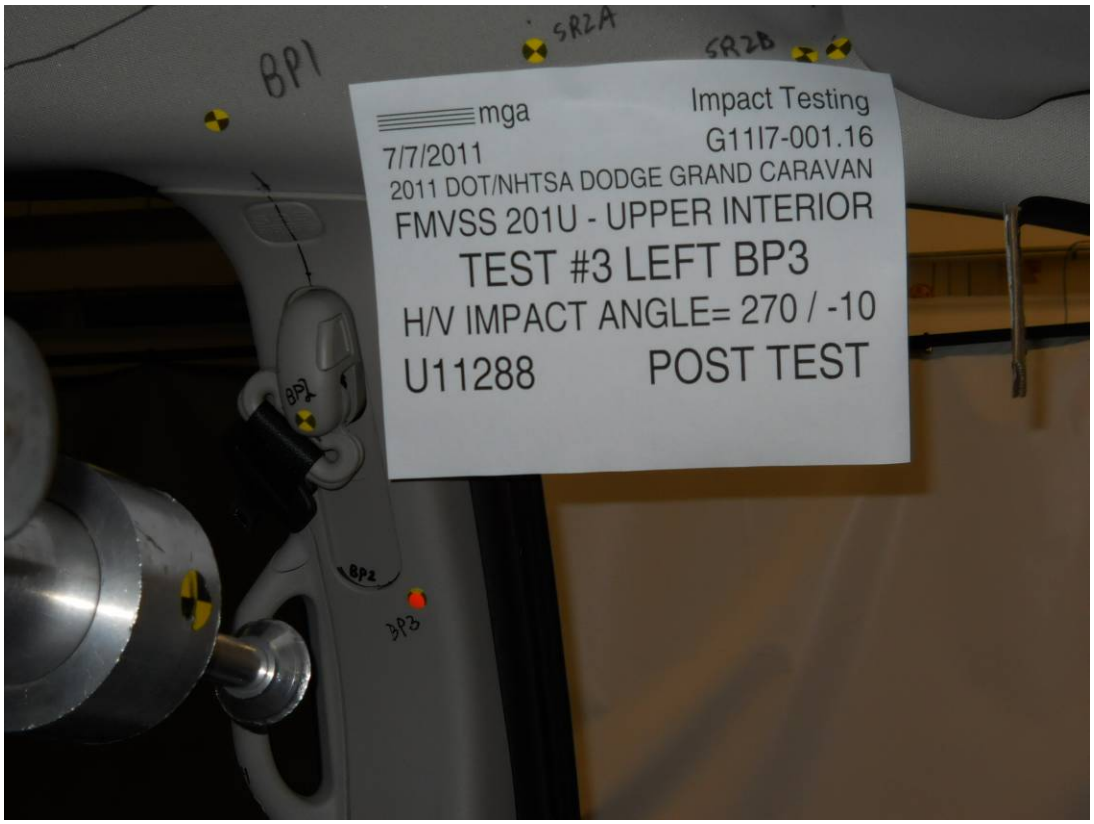

(peak = 23.8 kph)
Impact Velocity: 23.69 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

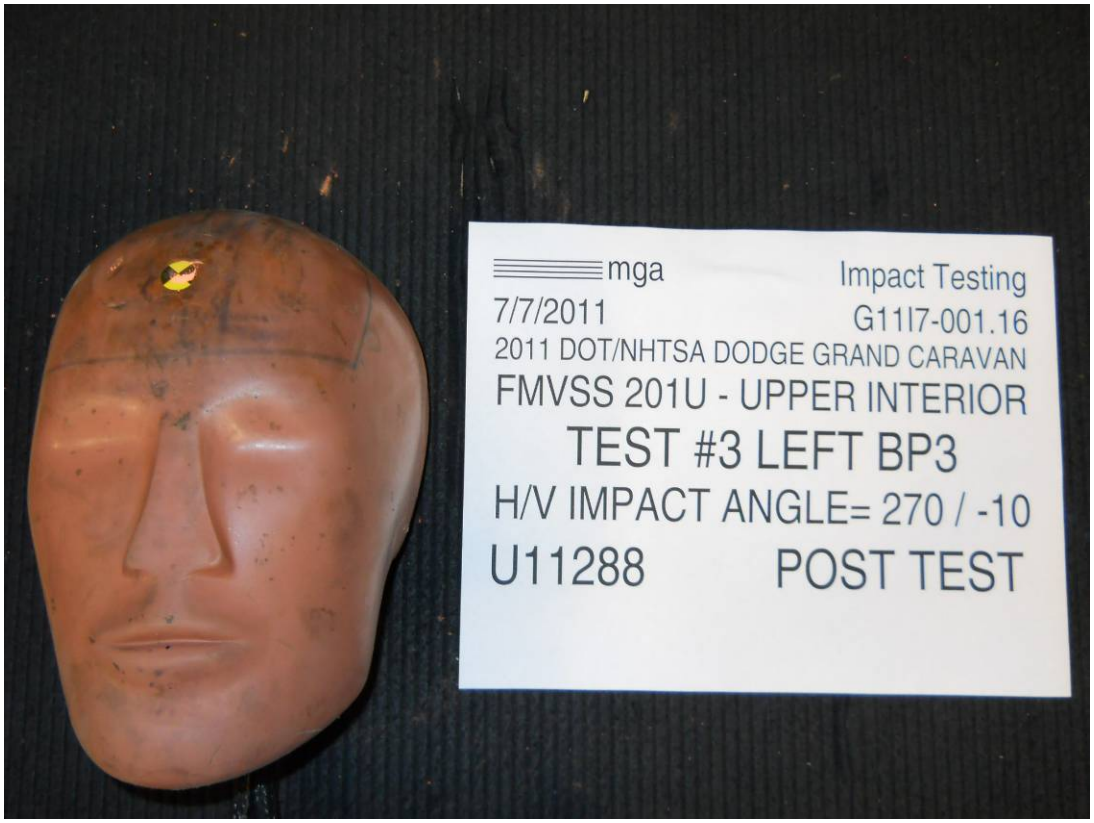

(peak = 29.6 mm)
Displacement (mm)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


CB0301
U11288
LEFT BP3
H/V 270/-10
mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP3
H/V IMPACT ANGLE= 270 / -10
U11288
PRE TEST


mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP3
H/V IMPACT ANGLE= 270 / -10
U11288
PRE TEST


CB0301
U11288
LEFT BP3
H/V 270/-10
mga
Impact Testing
G11I7-001.16
7/7/2011
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP3
H/V IMPACT ANGLE= 270 / -10
U11288
POST TEST


BP1
SR2A
SR2D
mga
Impact Testing
G11I7-001.16
7/7/2011
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP3
H/V IMPACT ANGLE= 270 / -10
U11288
POST TEST
BP2
BP2
BP3


mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP3
H/V IMPACT ANGLE= 270 / -10
U11288
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#3

Target (Vehicle Side): BP3Left

Temperature:22.8C

MGA Test Reference No.:U11288

Humidity:43.4%

Approach Horizontal Angles:270º

Time of Test:1:10:42 PM

Approach Vertical Angles:-10º

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
645	634	10.1	23.8	34	4 Right

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

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

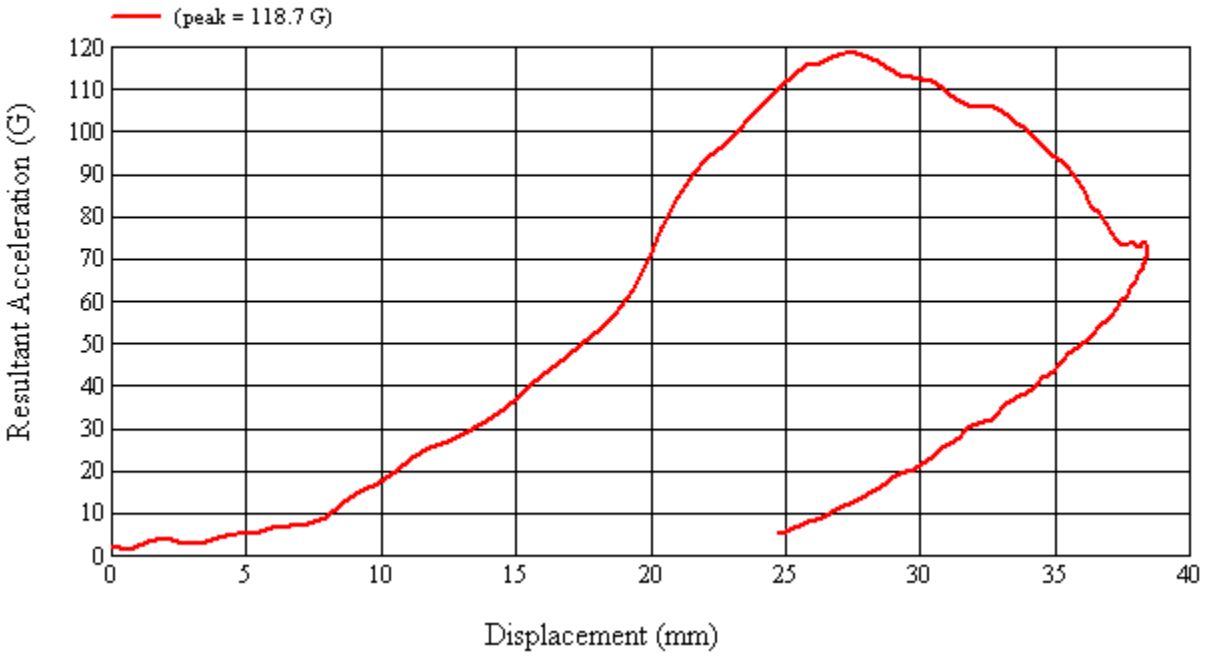
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

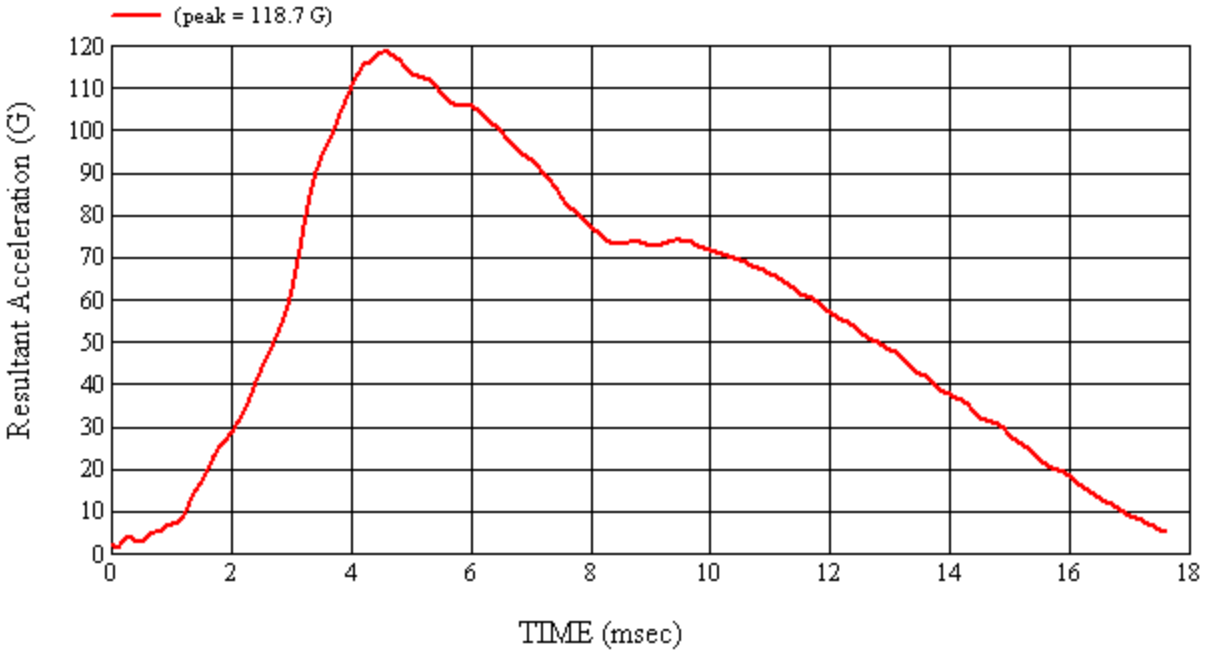
No visible damage

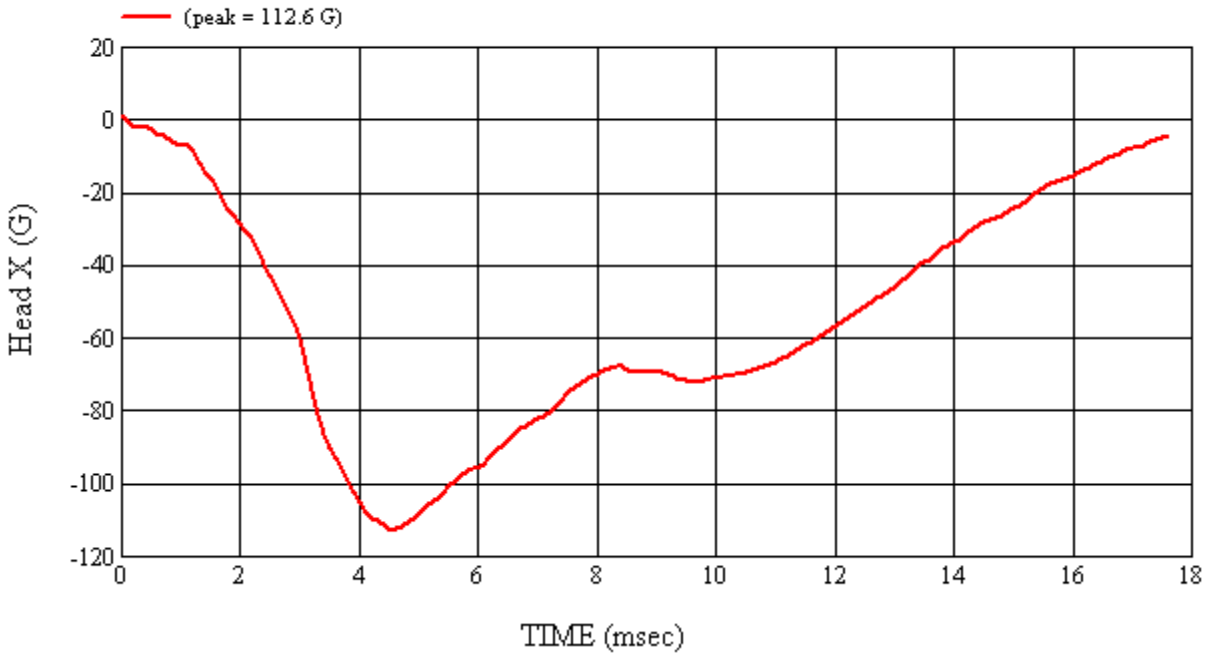
Recorded By: _____ Approved By*: _____ Date: 7/7/2011

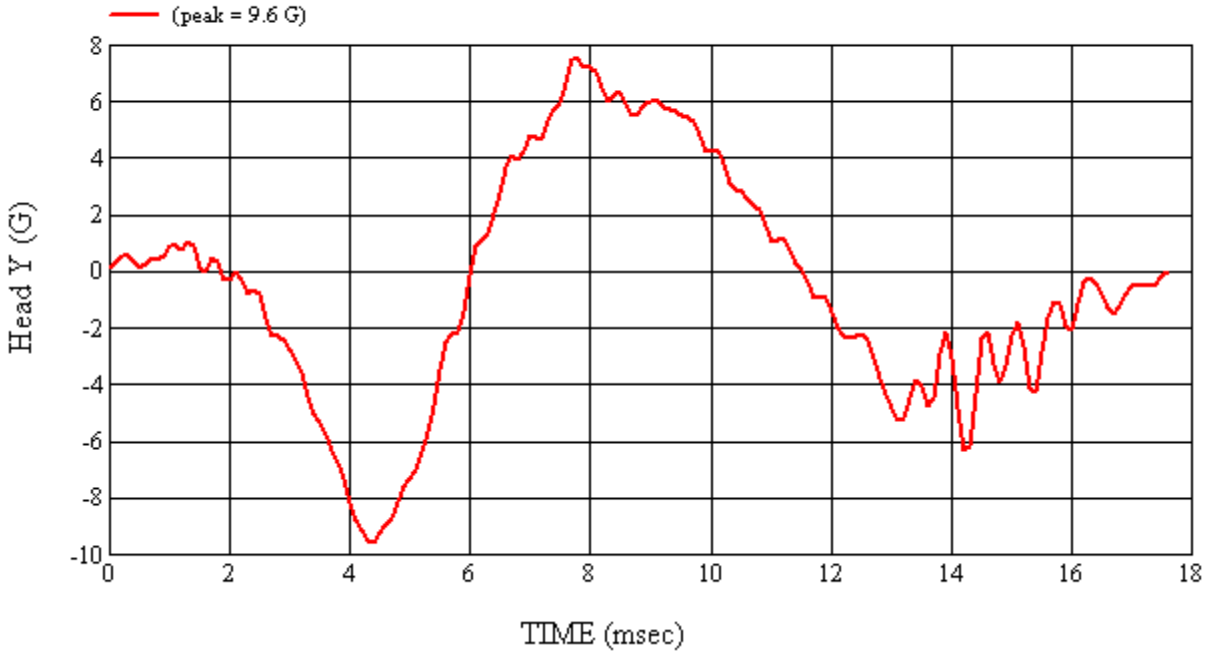
*Only necessary for NHTSA (Government) Compliance testing.

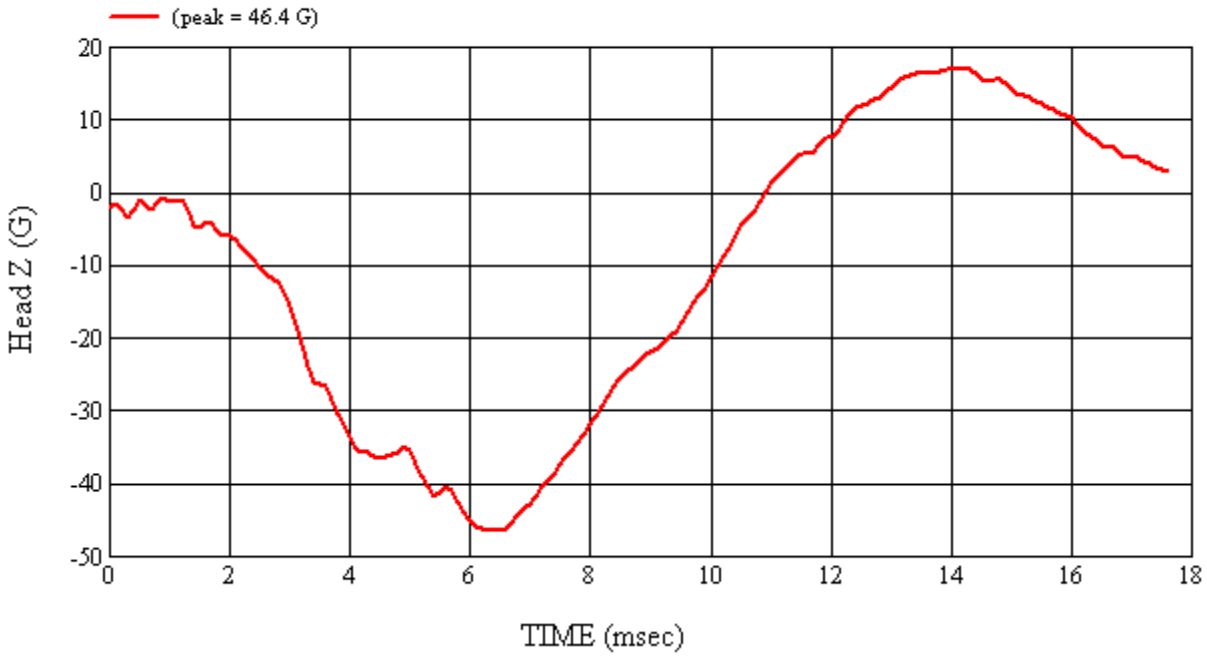
MGA Test #: U11288 Target Location: BP3, Left Side Test Date: 7/7/2011

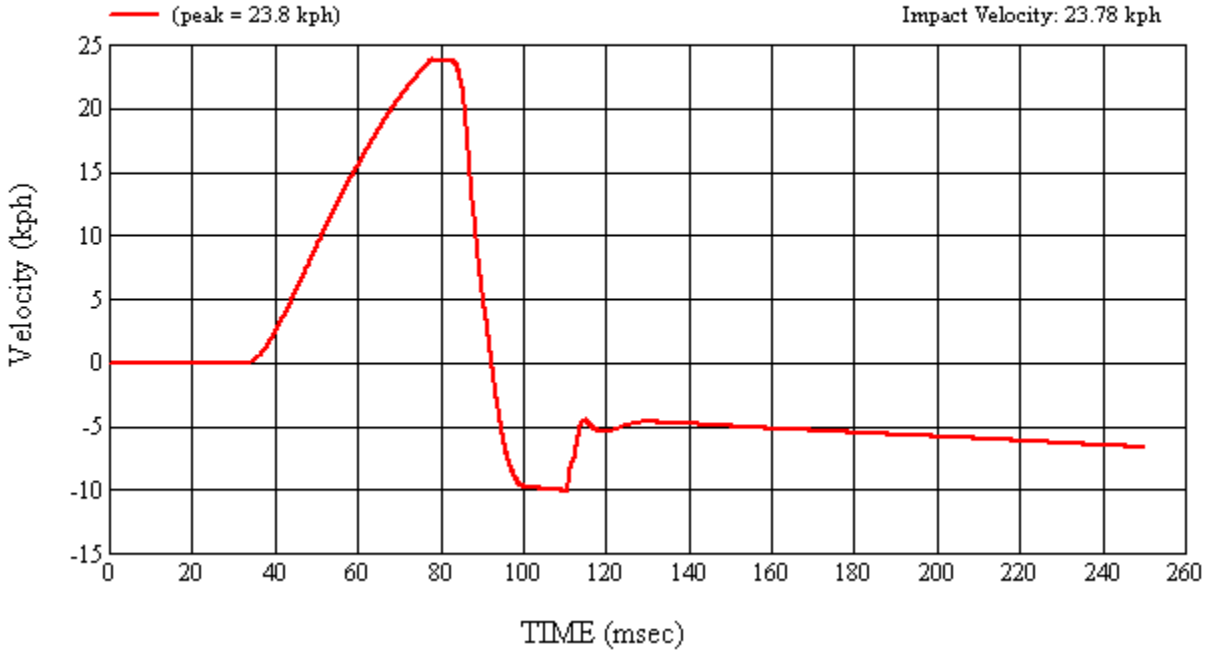


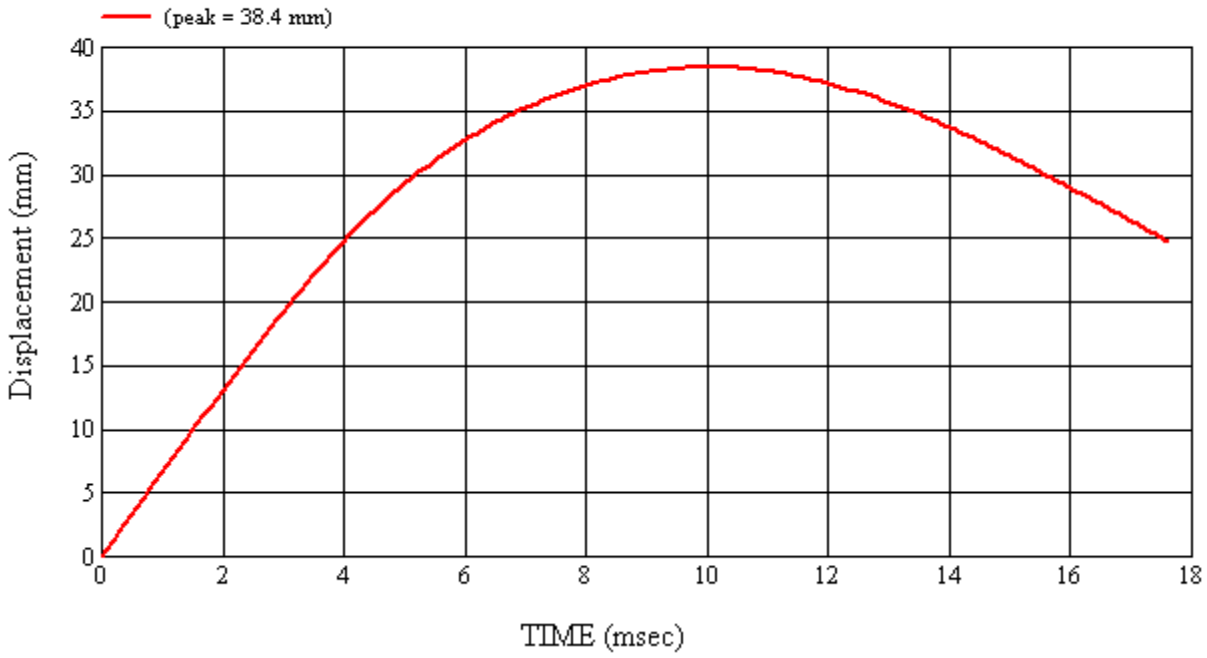


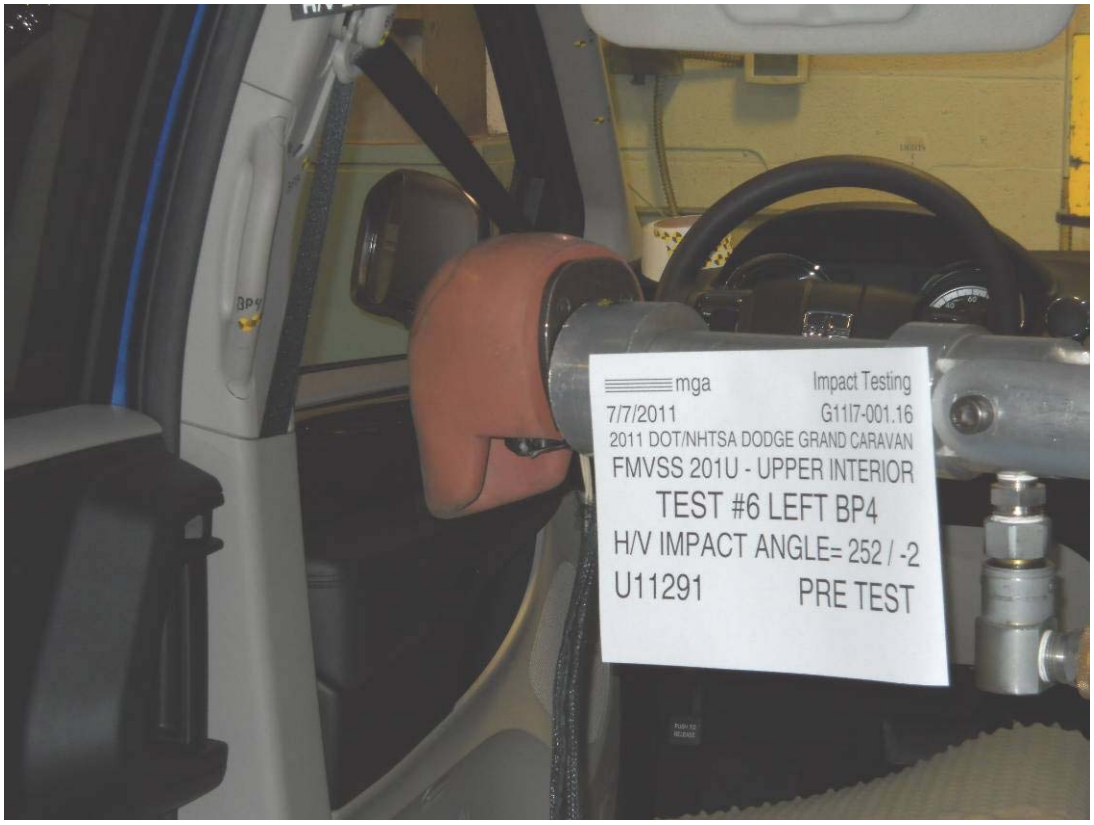

(peak = 112.6 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 9.6 G)
Head Y (G)
8
6
4
2
0
-2
-4
-6
-8
-10
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 46.4 G)
Head Z (G)
20
10
0
-10
-20
-30
-40
-50
0
2
4
6
8
10
12
14
16
18
TIME (msec)

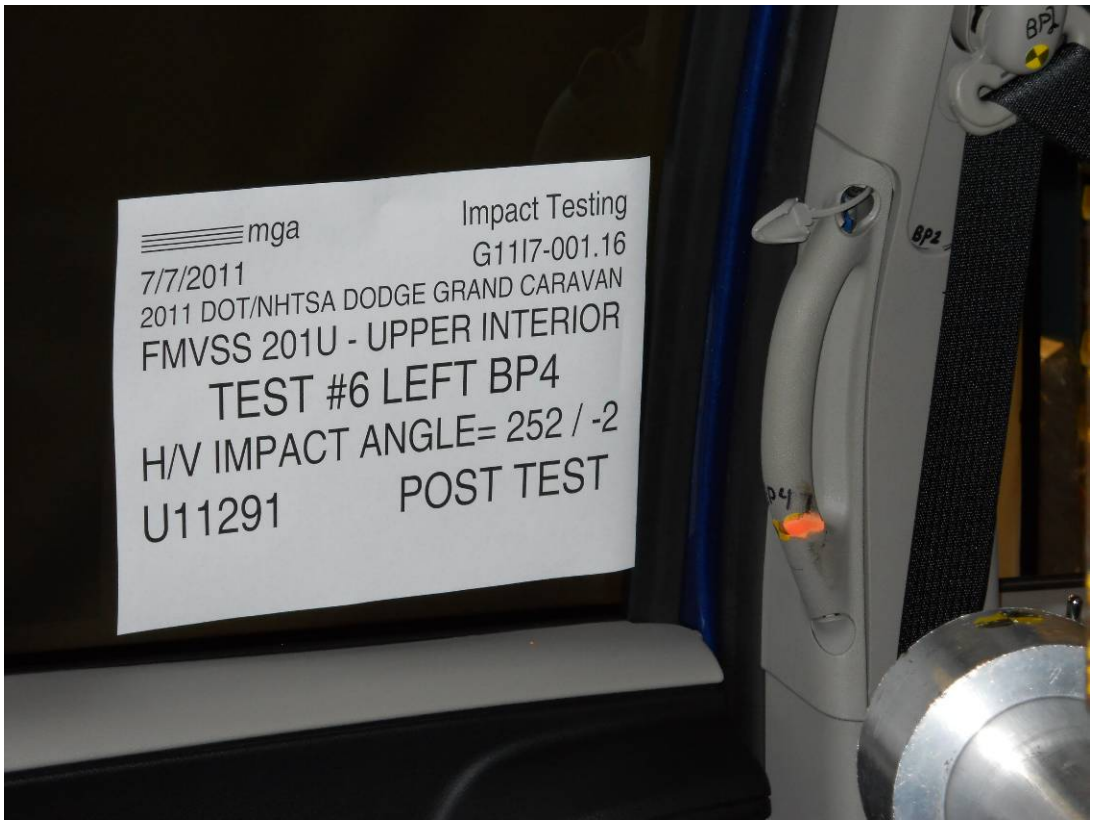

(peak = 23.8 kph)
Impact Velocity: 23.78 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

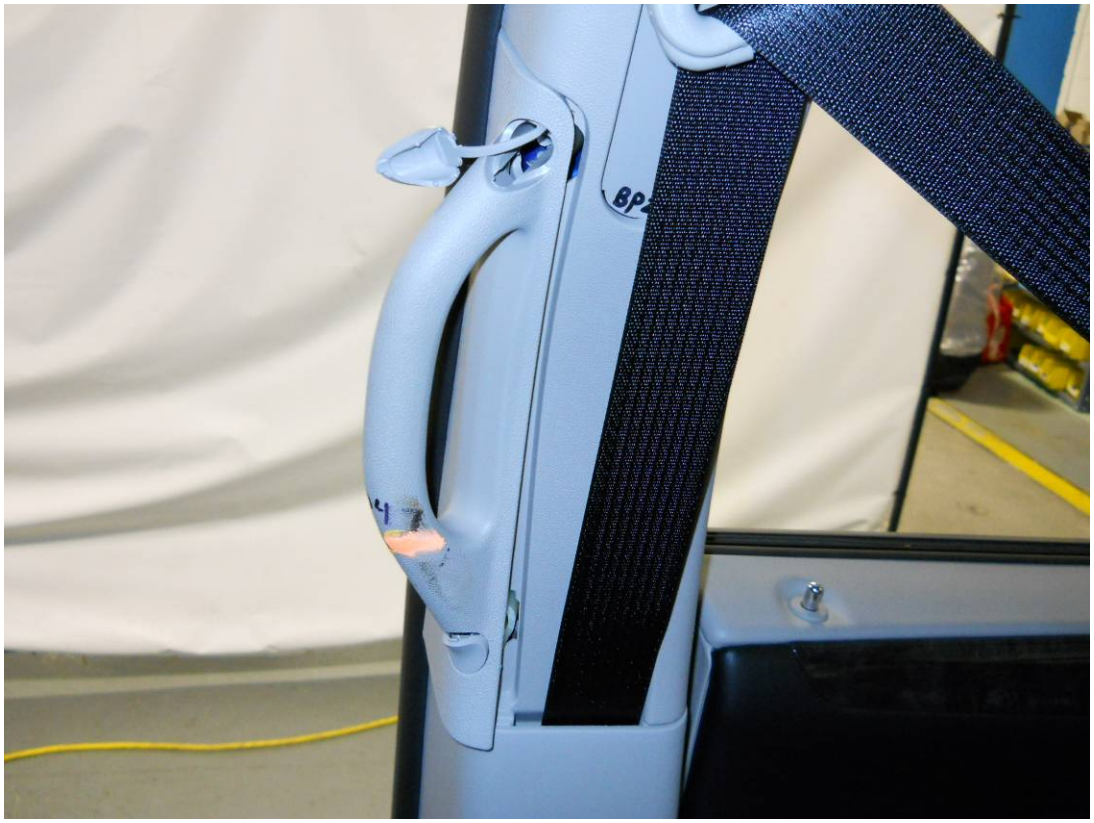

(peak = 38.4 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
TIME (msec)

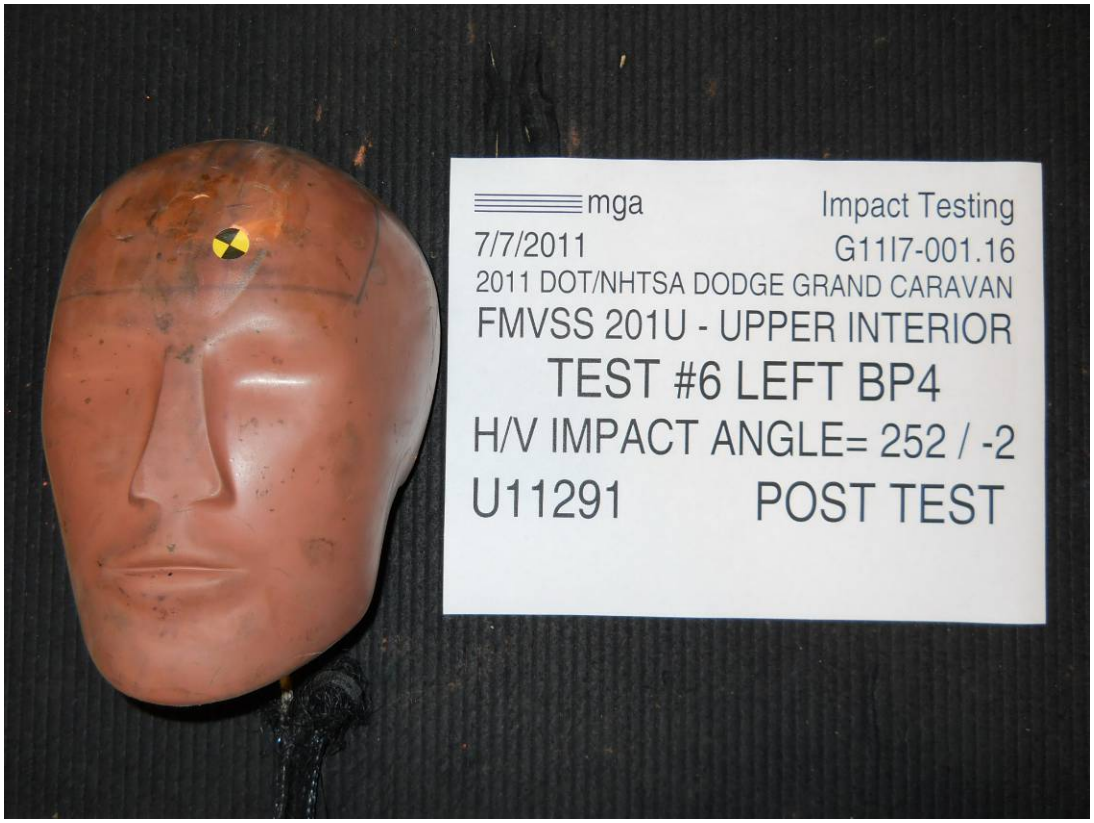

mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT BP4
H/V IMPACT ANGLE= 252 / -2
U11291
PRE TEST


U11291
LEFT BP4
H/V 252/-2
mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT BP4
H/V IMPACT ANGLE= 252 / -2
U11291
PRE TEST


mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT BP4
H/V IMPACT ANGLE= 252 / -2
U11291
POST TEST


mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT BP4
H/V IMPACT ANGLE= 252 / -2
U11291
POST TEST
BP2




mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT BP4
H/V IMPACT ANGLE= 252 / -2
U11291
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#6

Target (Vehicle Side): BP4Left

Temperature:23.2C

MGA Test Reference No.:U11291

Humidity:48.1%

Approach Horizontal Angles:252º

Time of Test:5:21:03 PM

Approach Vertical Angles:-2º

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
581	550	10.3	24.0	19	15 Left

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

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

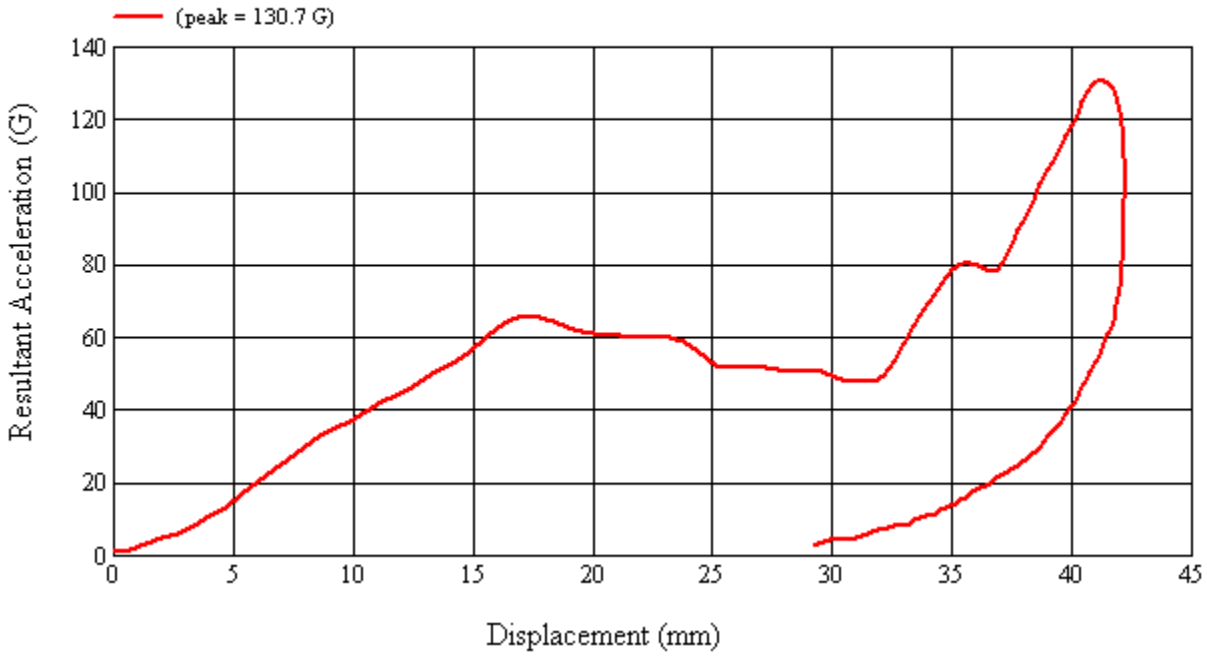
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

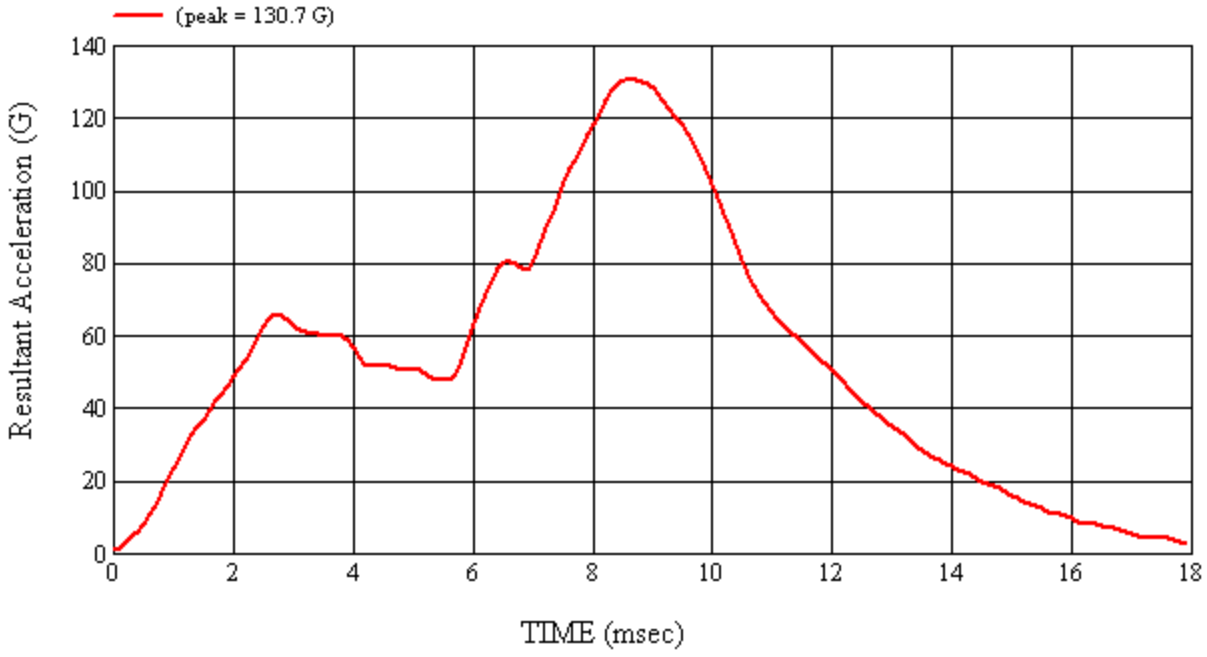
Assist handle dislodged and broken.

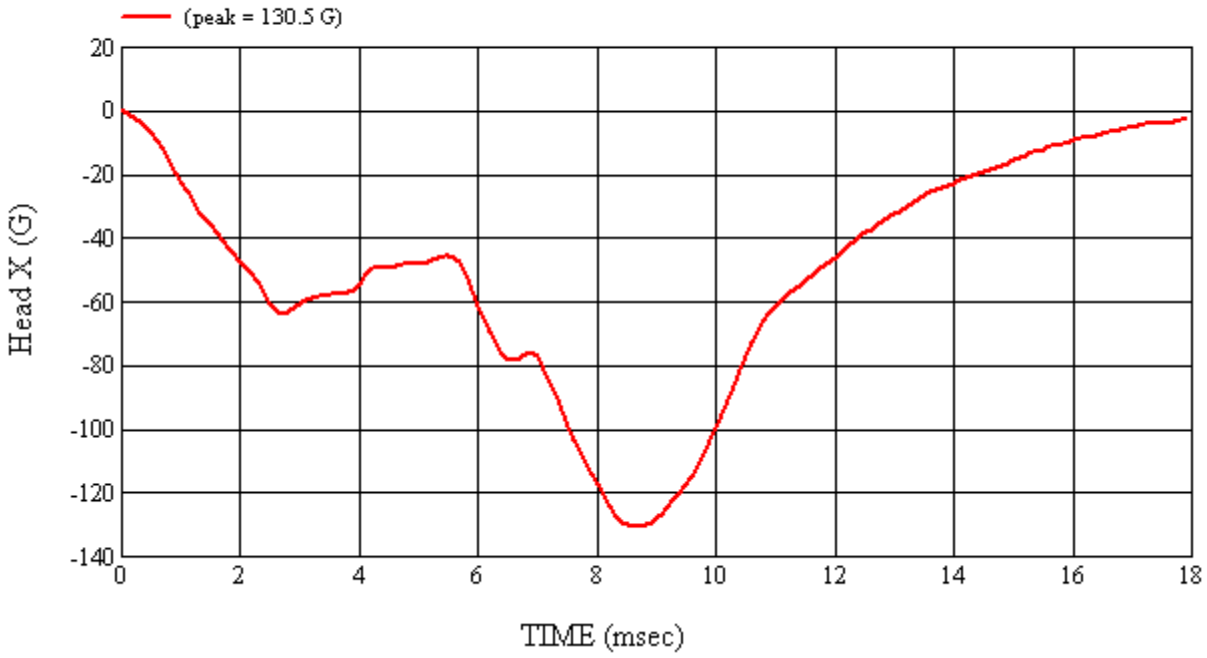
Recorded By: _____ Approved By*: _____ Date: 7/7/2011

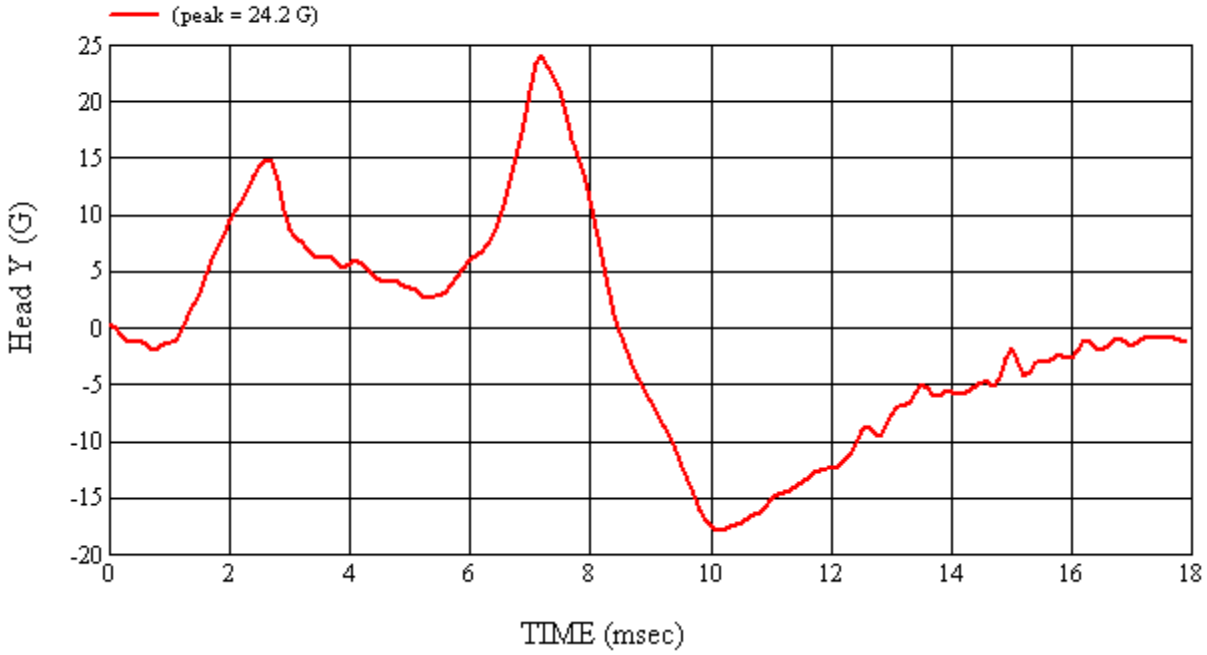
*Only necessary for NHTSA (Government) Compliance testing.

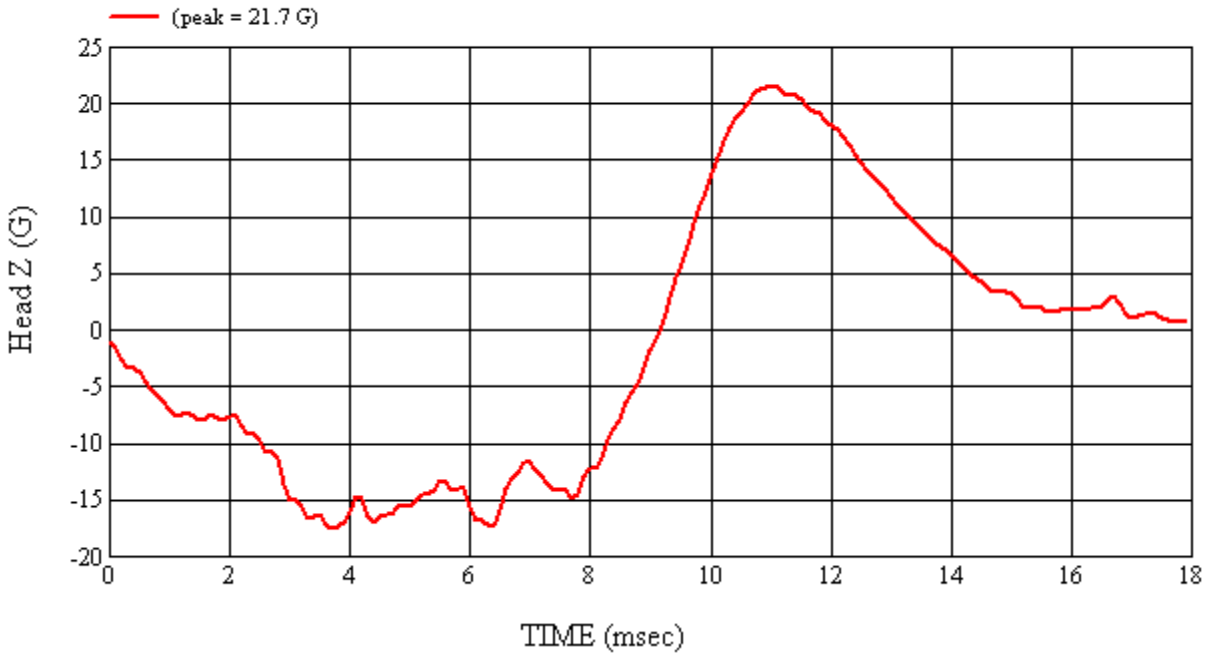
MGA Test #: U11291 Target Location: BP4, Left Side Test Date: 7/7/2011

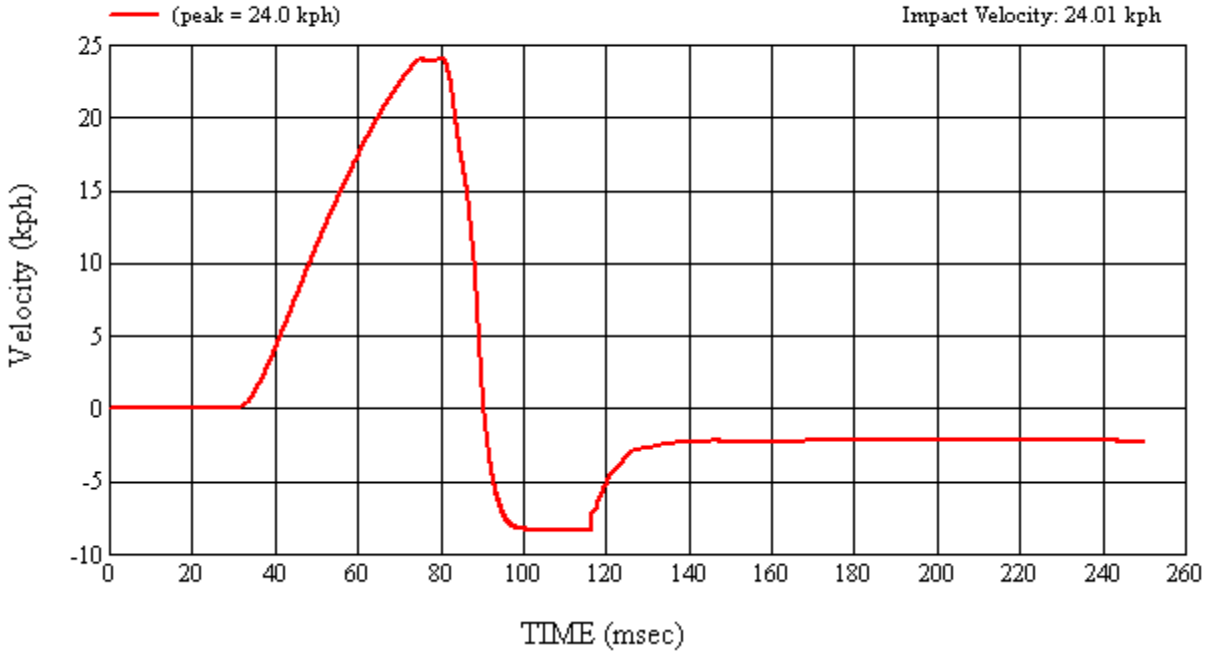


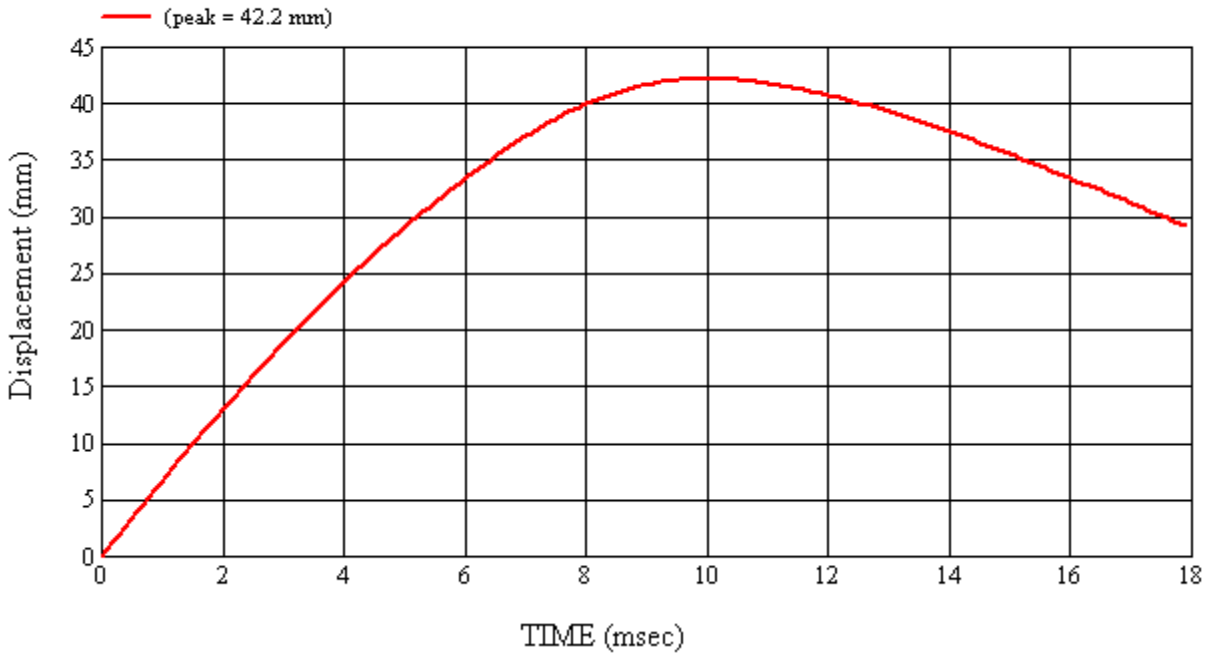


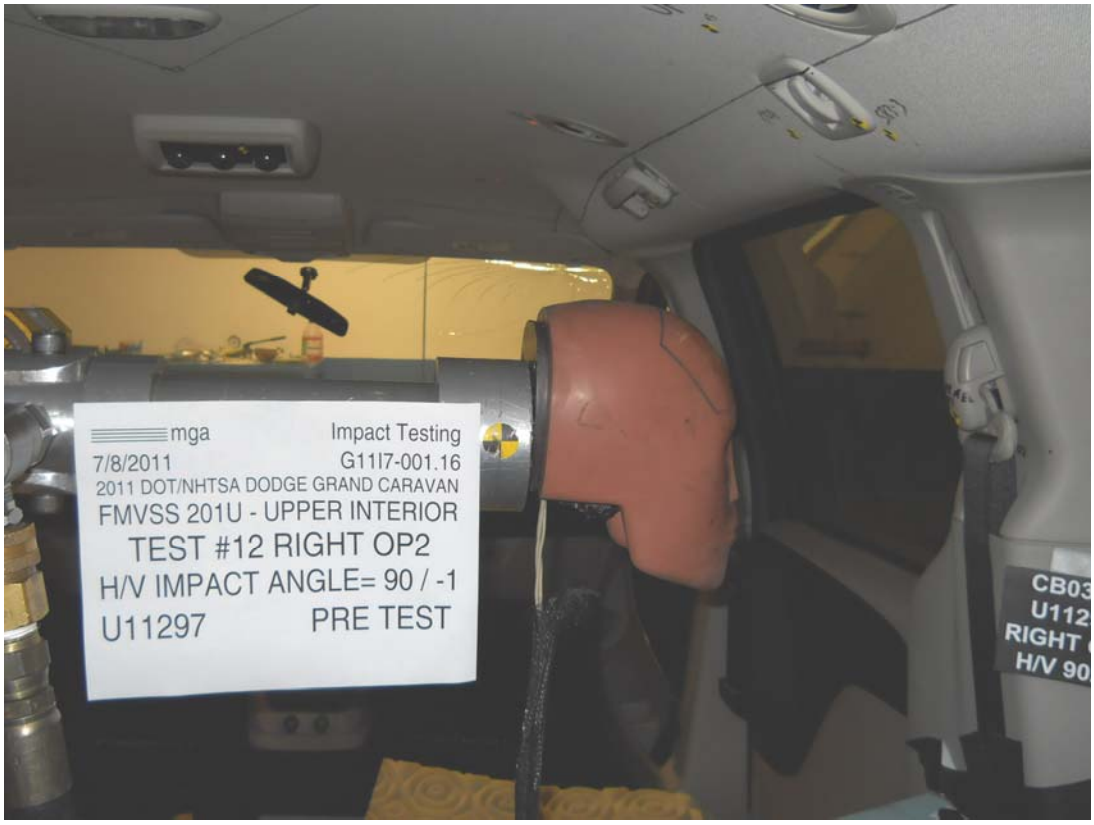

(peak = 130.5 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
16
18
TIME (msec)

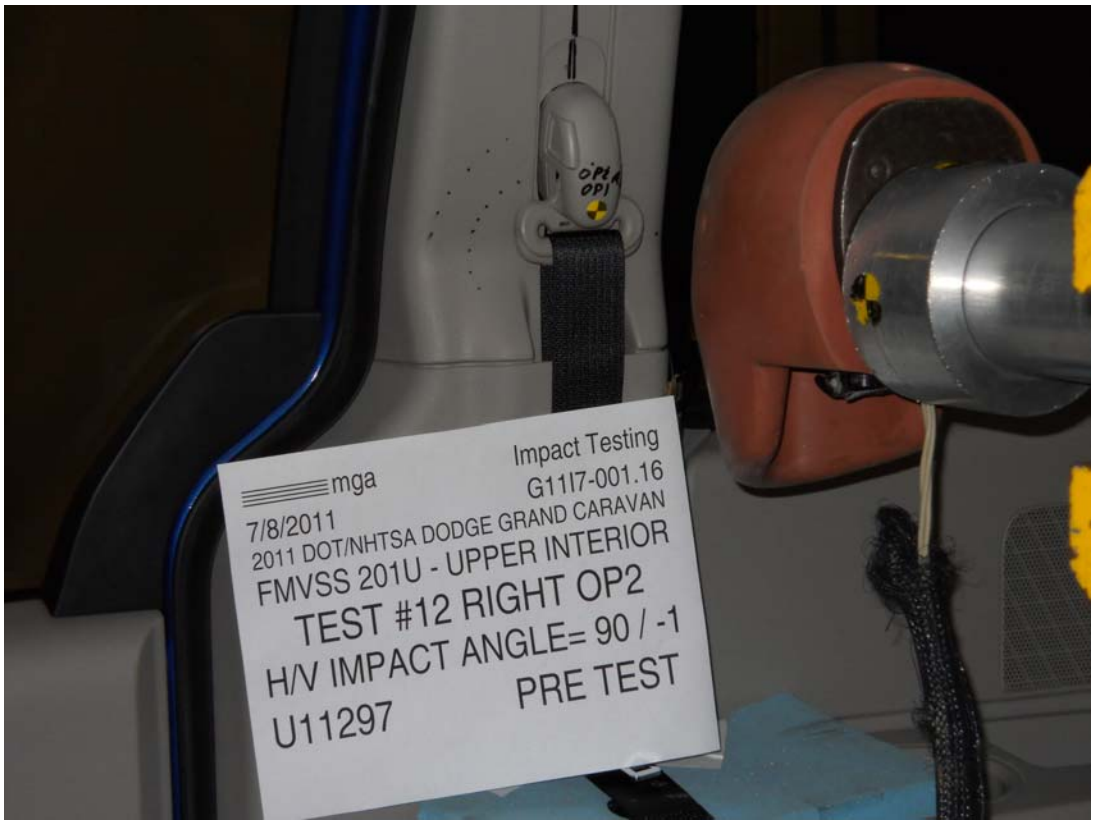

(peak = 24.2 G)
Head Y (G)
25
20
15
10
5
0
-5
-10
-15
-20
0
2
4
6
8
10
12
14
16
18
TIME (msec)

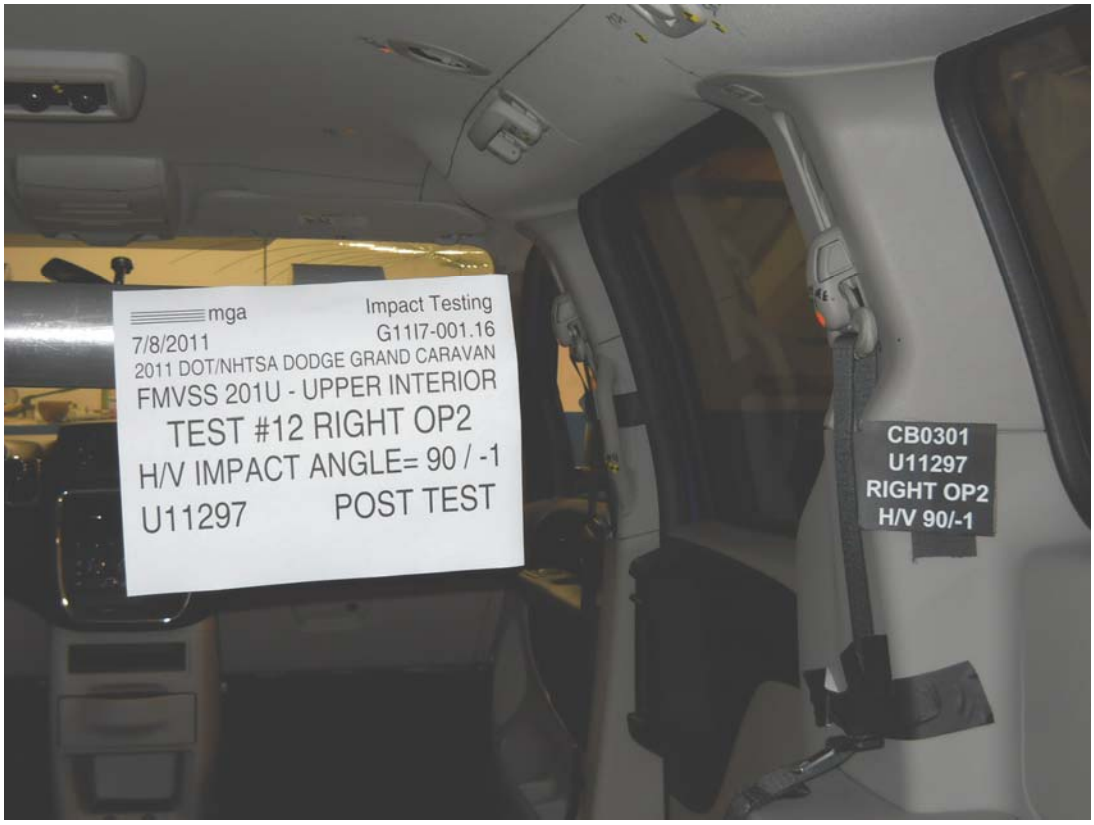

(peak = 21.7 G)
Head Z (G)
25
20
15
10
5
0
-5
-10
-15
-20
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 24.0 kph)
Impact Velocity: 24.01 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)

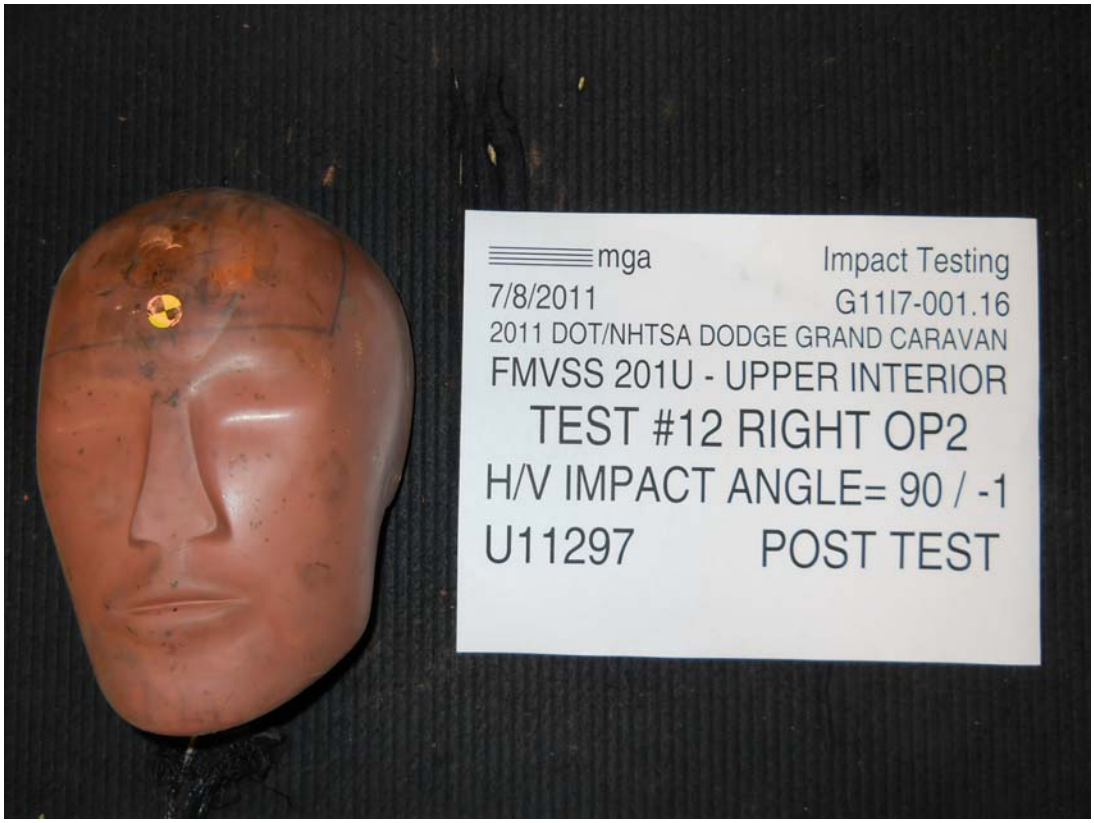

(peak = 42.2 mm)
Displacement (mm)
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
TIME (msec)


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT OP2
H/V IMPACT ANGLE= 90 / -1
U11297
PRE TEST


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT OP2
H/V IMPACT ANGLE= 90 / -1
U11297
PRE TEST


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT OP2
H/V IMPACT ANGLE= 90 / -1
U11297
POST TEST
CB0301
U11297
RIGHT OP2
H/V 90/-1


mga
7/8/2011
Impact Testing
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT OP2
H/V IMPACT ANGLE= 90 / -1
U11297
POST TEST
UR6
ODR
SR3-3


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT OP2
H/V IMPACT ANGLE= 90 / -1
U11297
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#12

Target (Vehicle Side): OP2Right

Temperature:22.7C

MGA Test Reference No.:U11297

Humidity:49.3%

Approach Horizontal Angles:90º

Time of Test:3:19:07 PM

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
576	543	7.9	23.8	10	1 Right

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

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

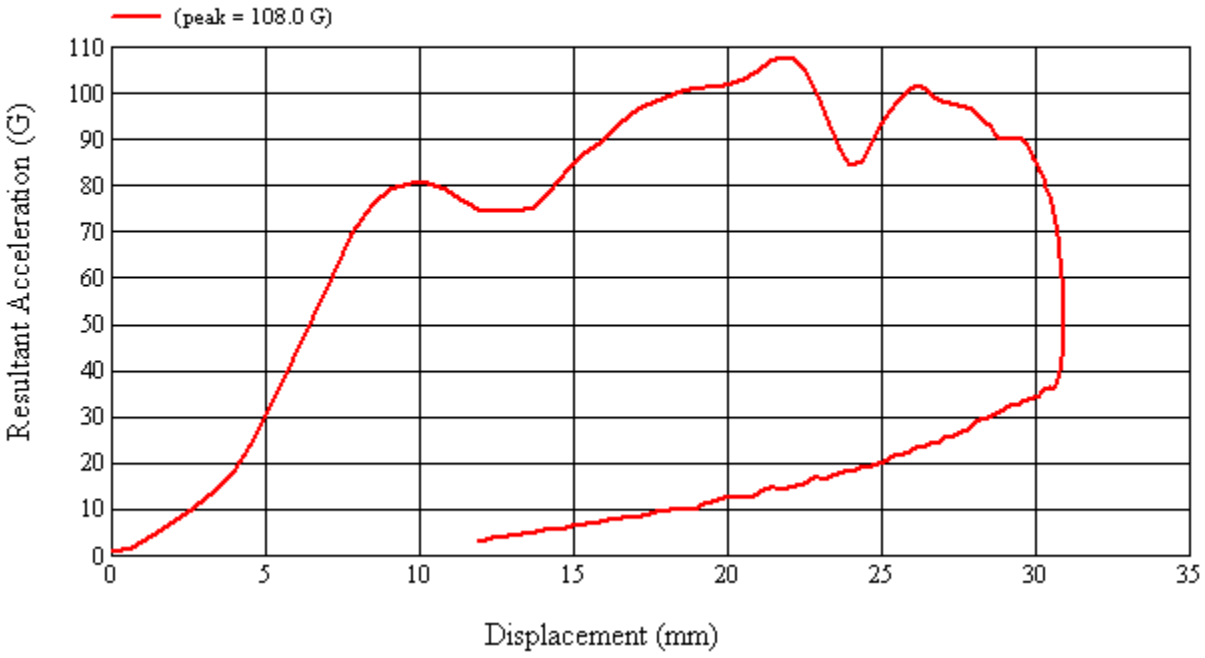
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

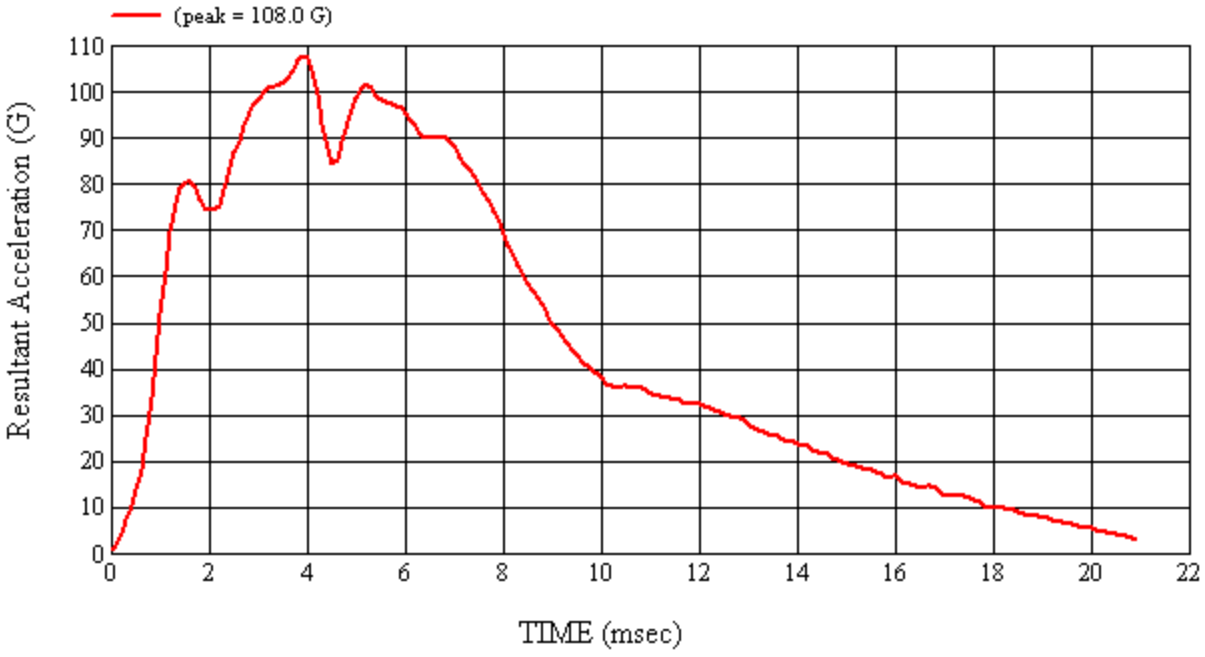
No visible damage

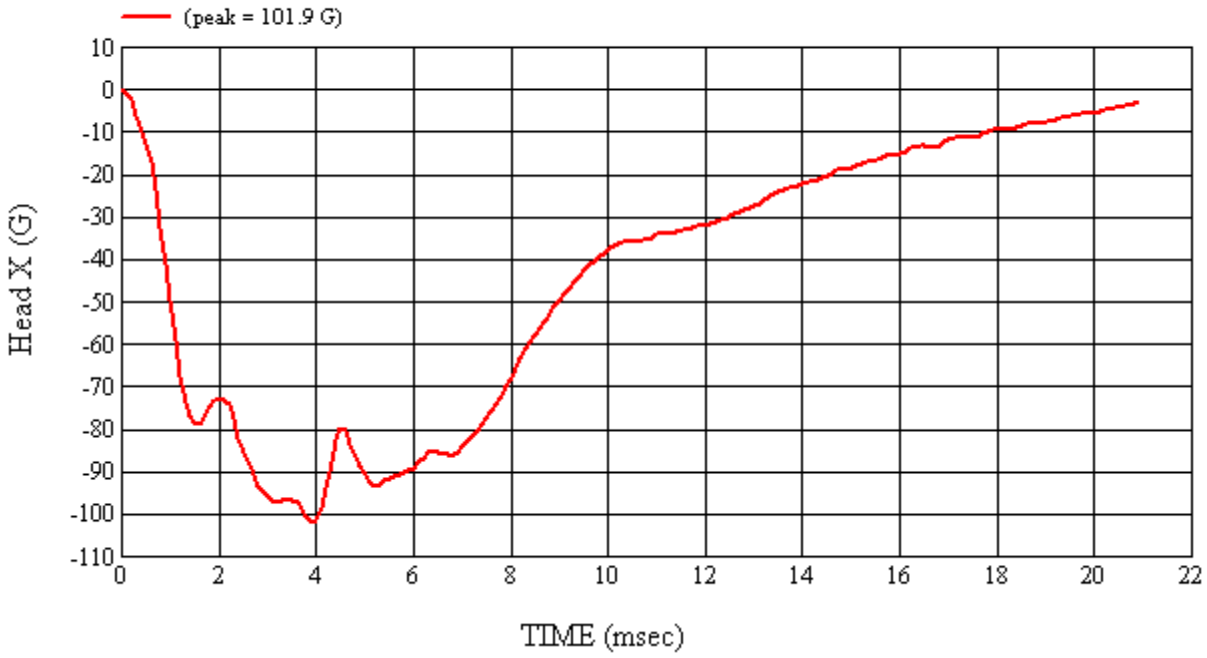
Recorded By: _____ Approved By*: _____ Date: 7/8/2011

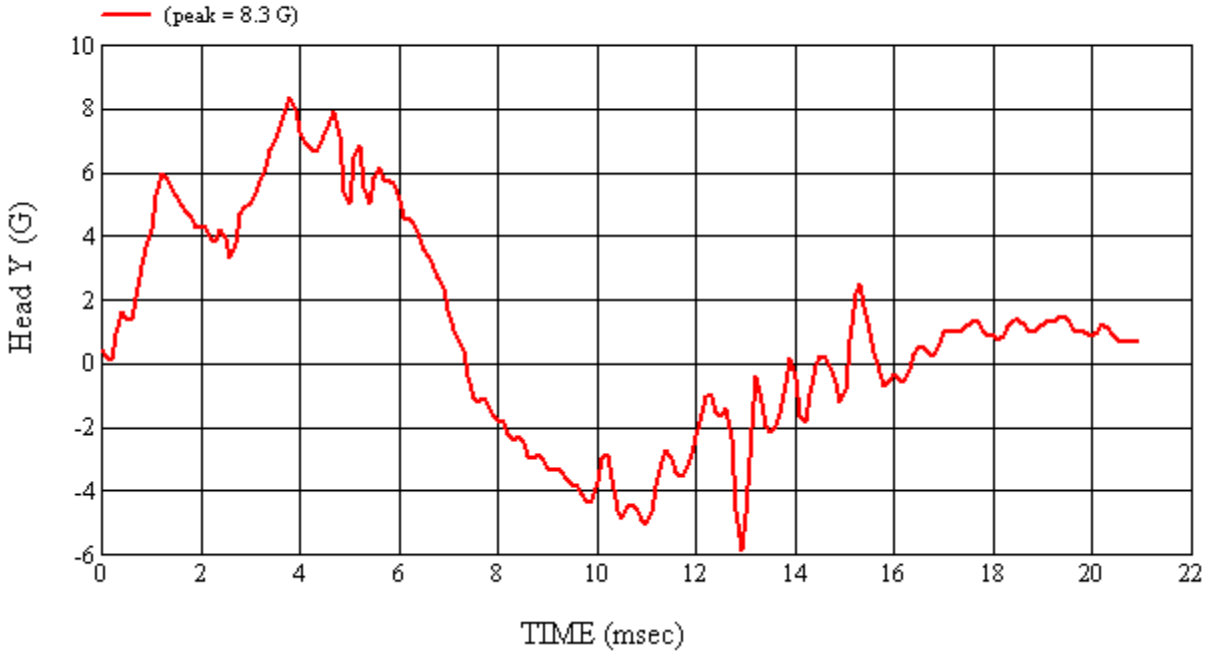
*Only necessary for NHTSA (Government) Compliance testing.

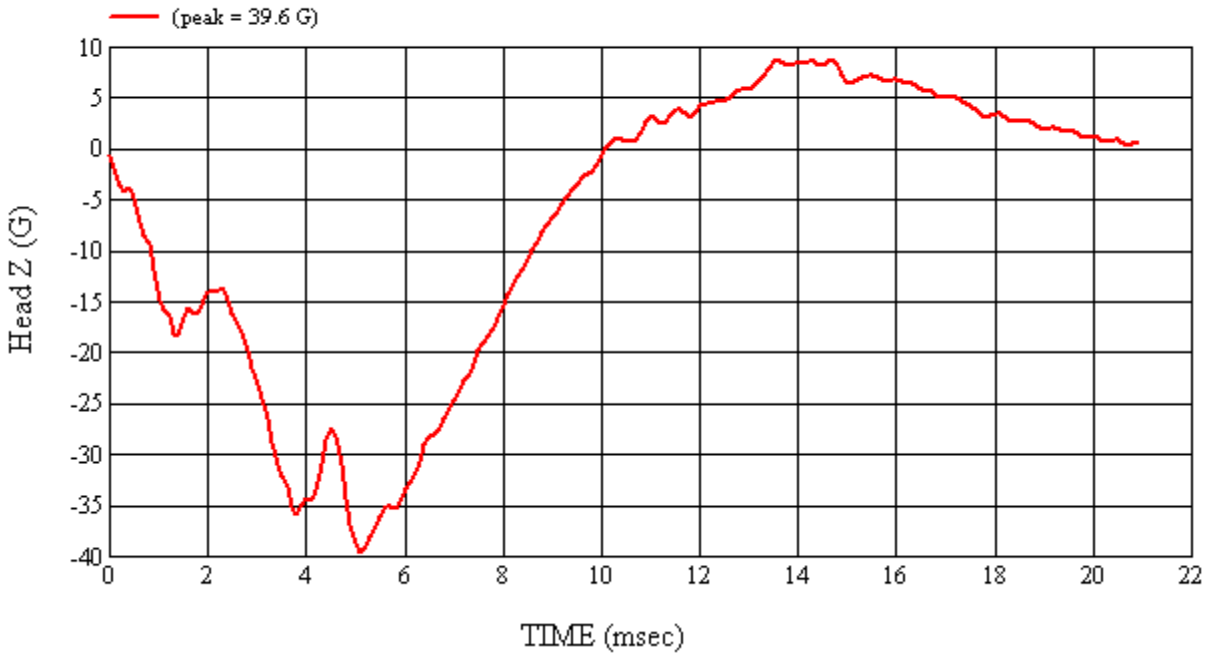
MGA Test #: U11297 Target Location: OP2, Right Side Test Date: 7/8/2011

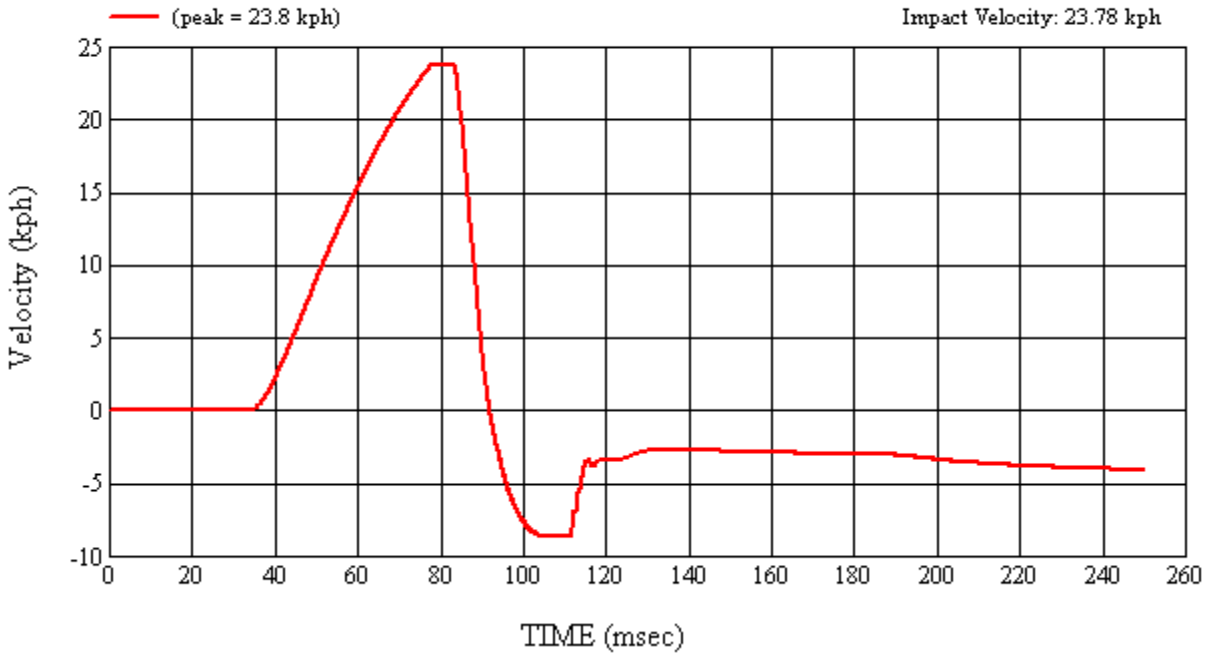


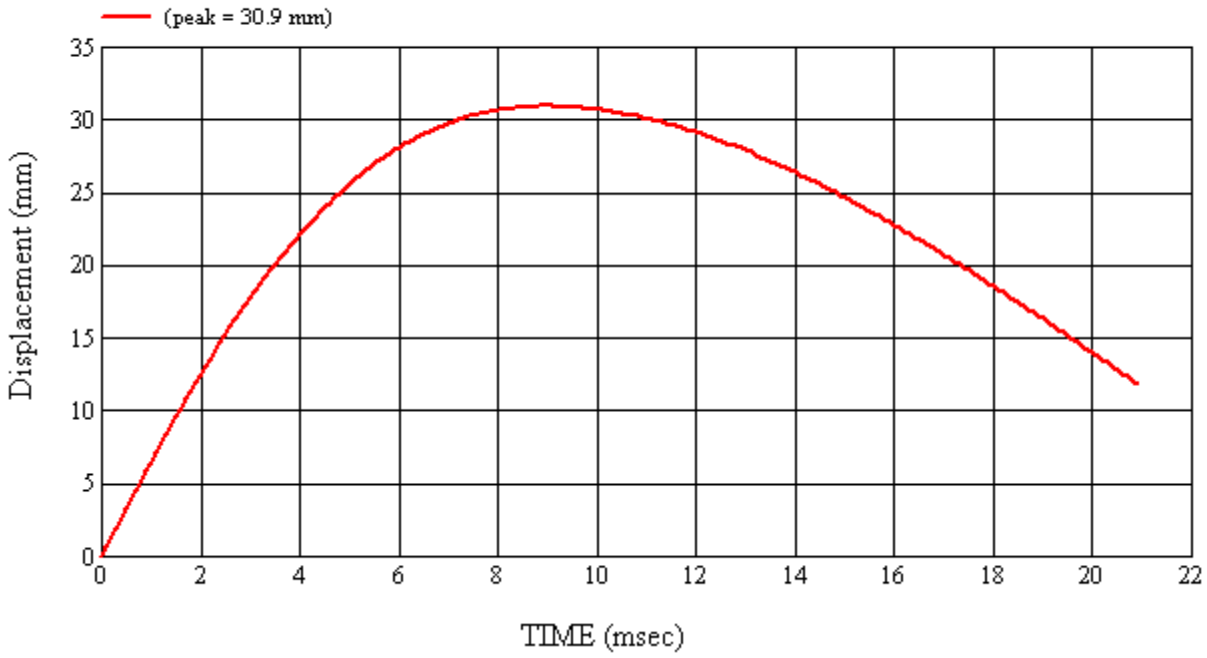



(peak = 101.9 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 8.3 G)
Head Y (G)
10
8
6
4
2
0
-2
-4
-6
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 39.6 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 23.8 kph)
Impact Velocity: 23.78 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 = 30.9 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

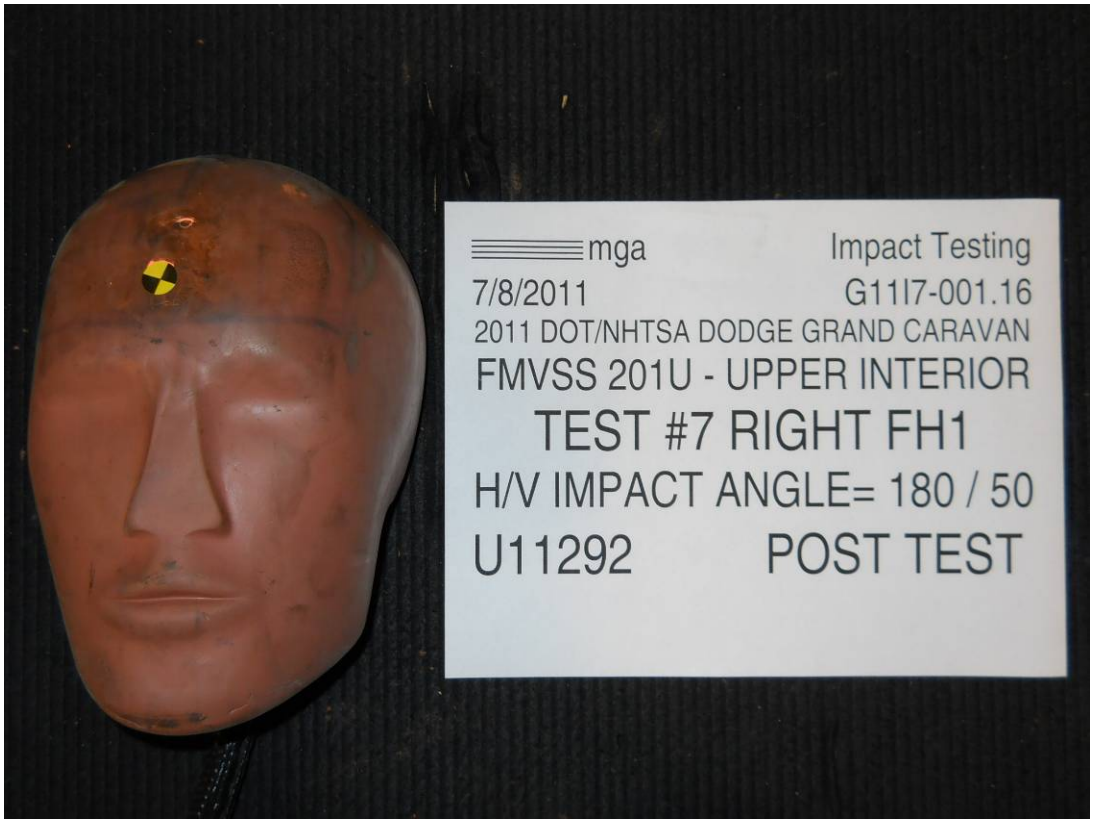

SR1
SR2B
SR2A
BP1
mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT FH1
H/V IMPACT ANGLE= 180 / 50
U11292
PRE TEST


FH2
FH1
10TON
mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT FH1
H/V IMPACT ANGLE= 180 / 50
U11292
PRE TEST


SR1
SR2B
SR2A
CB0301
U11292
RIGHT FH1
H/V 180/50
mga
7/8/2011
Impact Testing
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT FH1
H/V IMPACT ANGLE= 180 / 50
U11292
POST TEST


mga
7/8/2011
Impact Testing
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT FH1
H/V IMPACT ANGLE= 180 / 50
U11292
POST TEST
CB0301
U11292
RIGHT FH1
H/V 180/50


FH2
FH1


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT FH1
H/V IMPACT ANGLE= 180 / 50
U11292
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#7

Target (Vehicle Side): FH1Right

Temperature:21.7C

MGA Test Reference No.:U11292

Humidity:51.7%

Approach Horizontal Angles:180º

Time of Test:9:20:16 AM

Approach Vertical Angles:50º

FMH Serial No:[035]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
368	267	6.5	23.3	16	4 Right

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

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

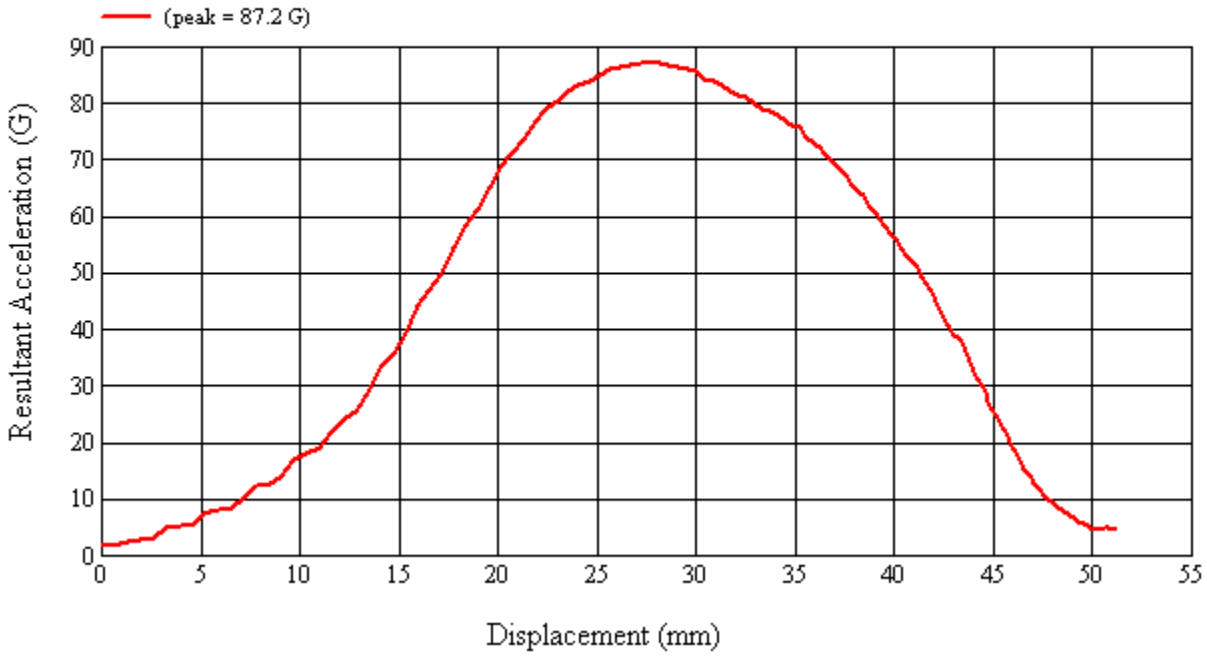
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

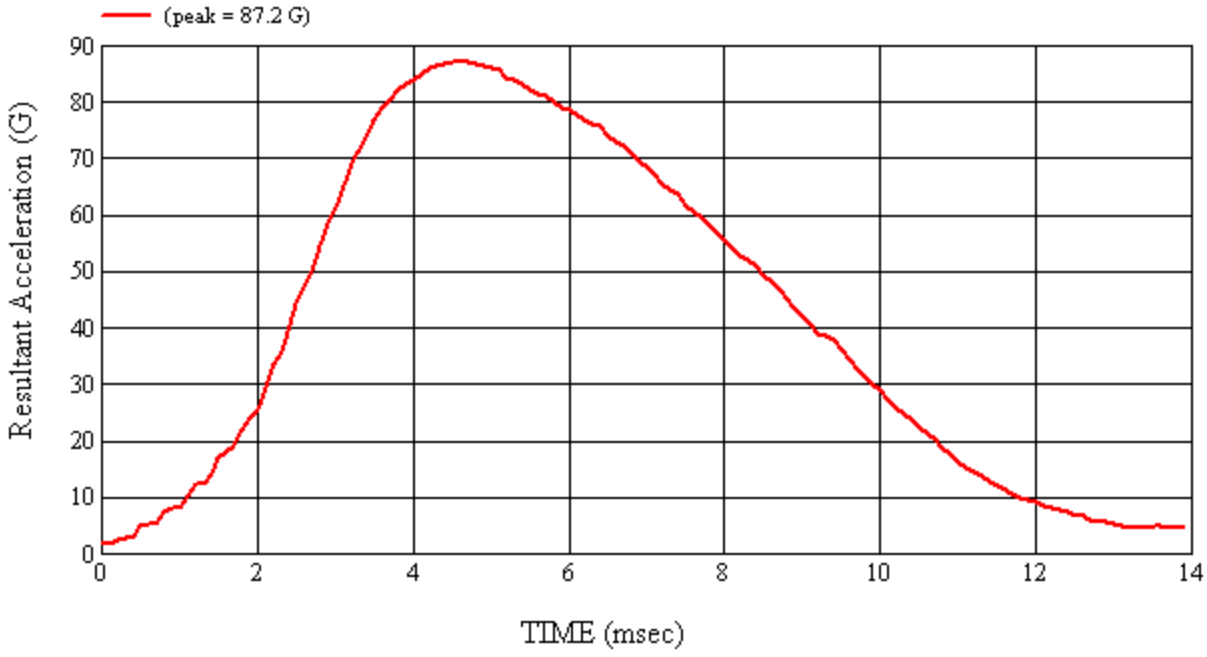
Headliner deformation, cracked windshield

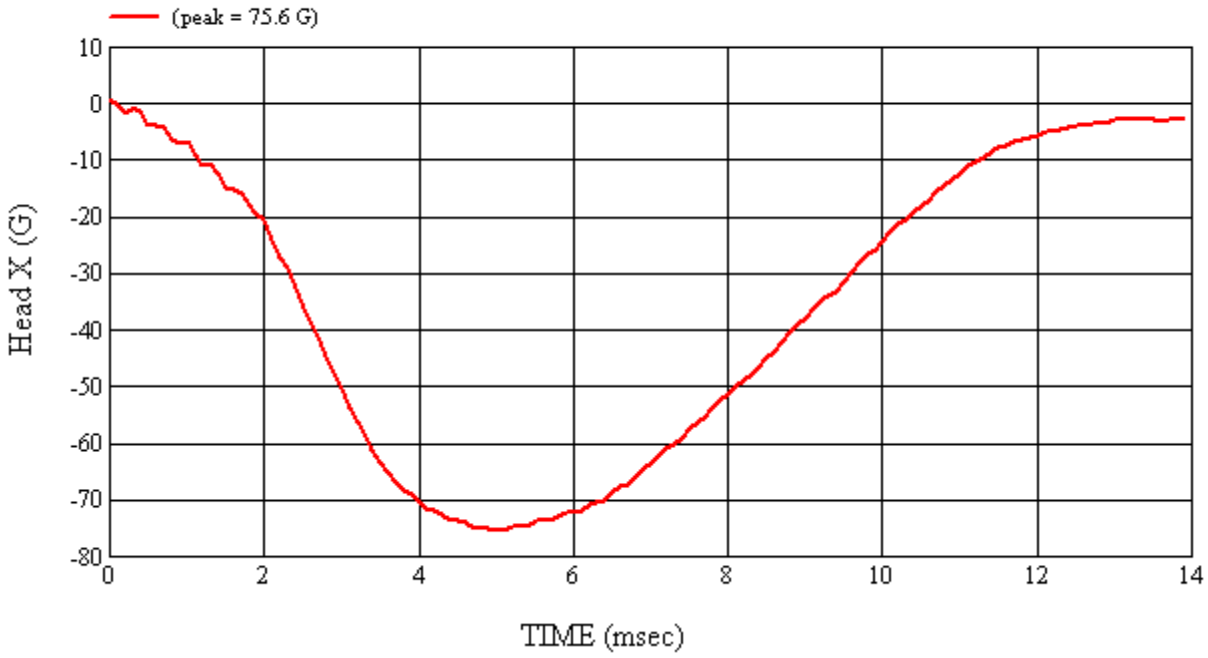
Recorded By: _____ Approved By*: _____ Date: 7/8/2011

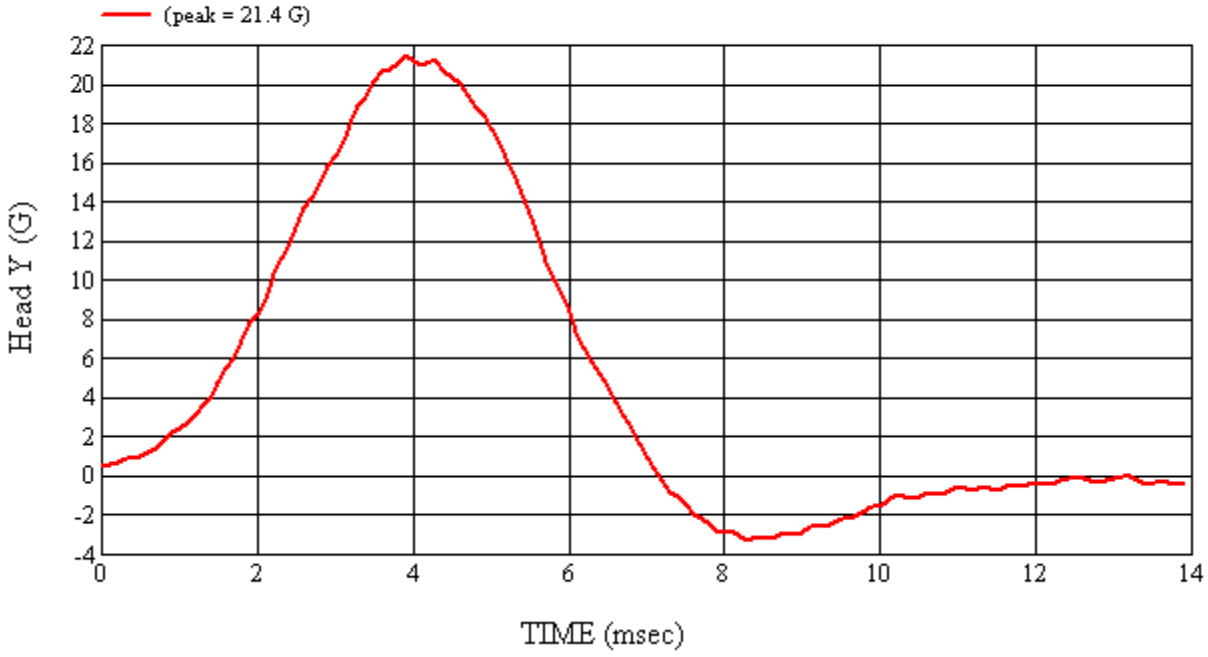
*Only necessary for NHTSA (Government) Compliance testing.

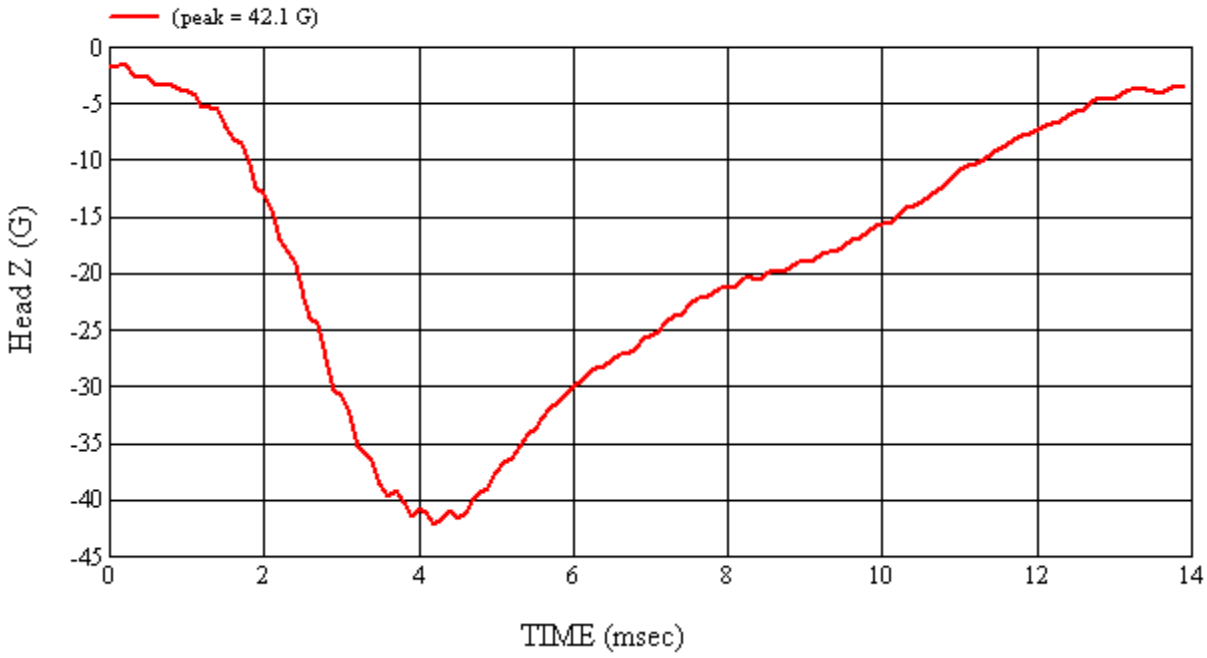
MGA Test #: U11292 Target Location: FH1, Right Side Test Date: 7/8/2011

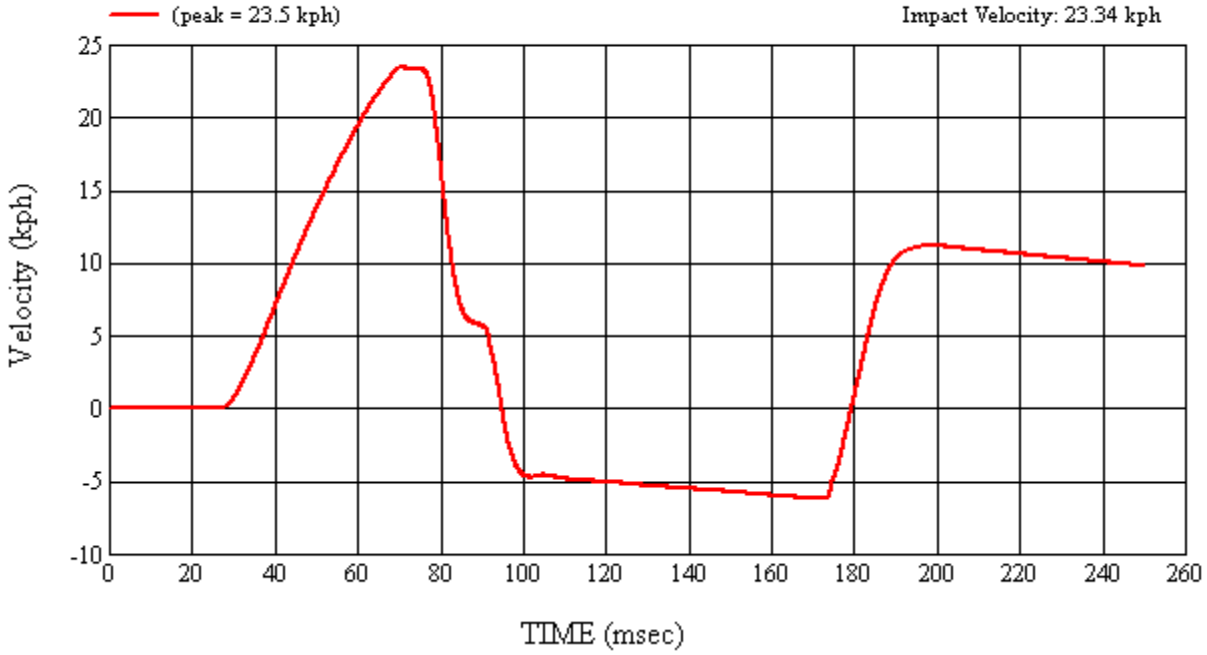


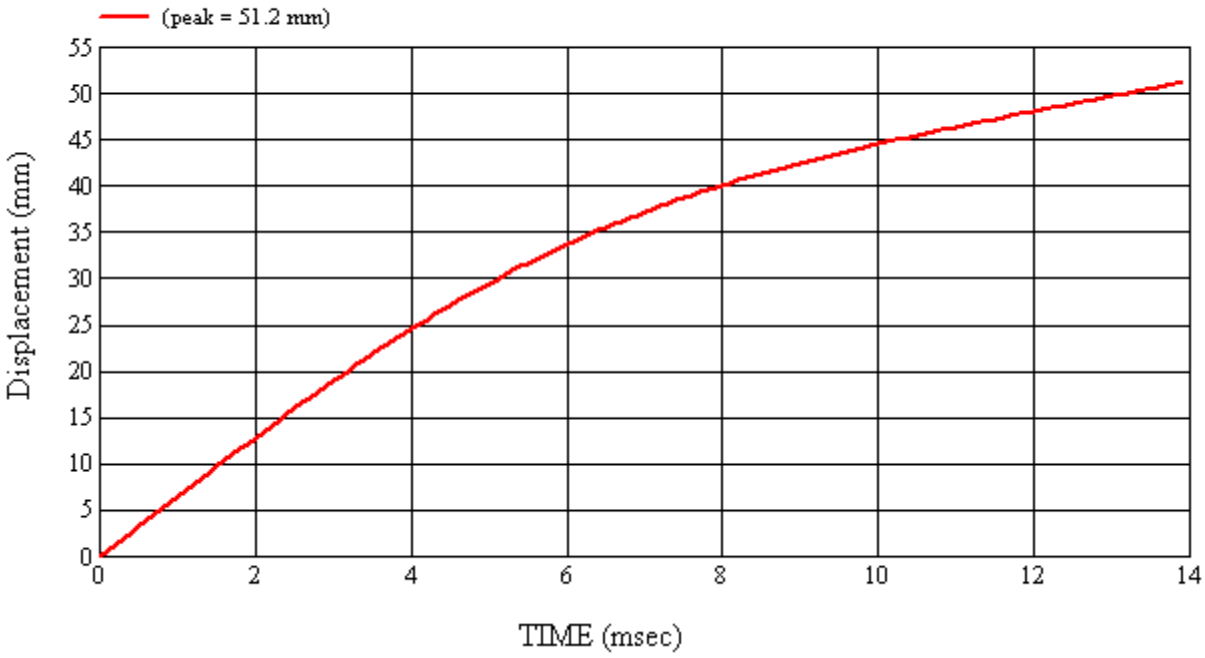


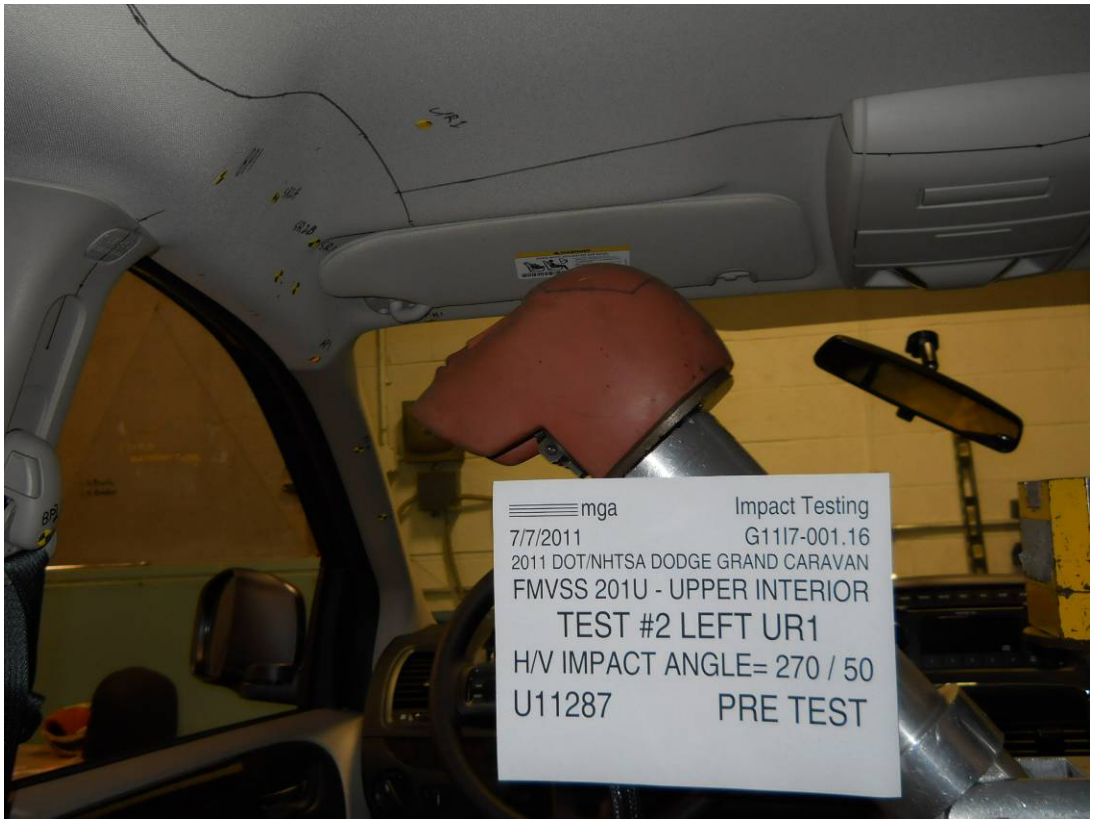

(peak = 75.6 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
0
2
4
6
8
10
12
14
TIME (msec)

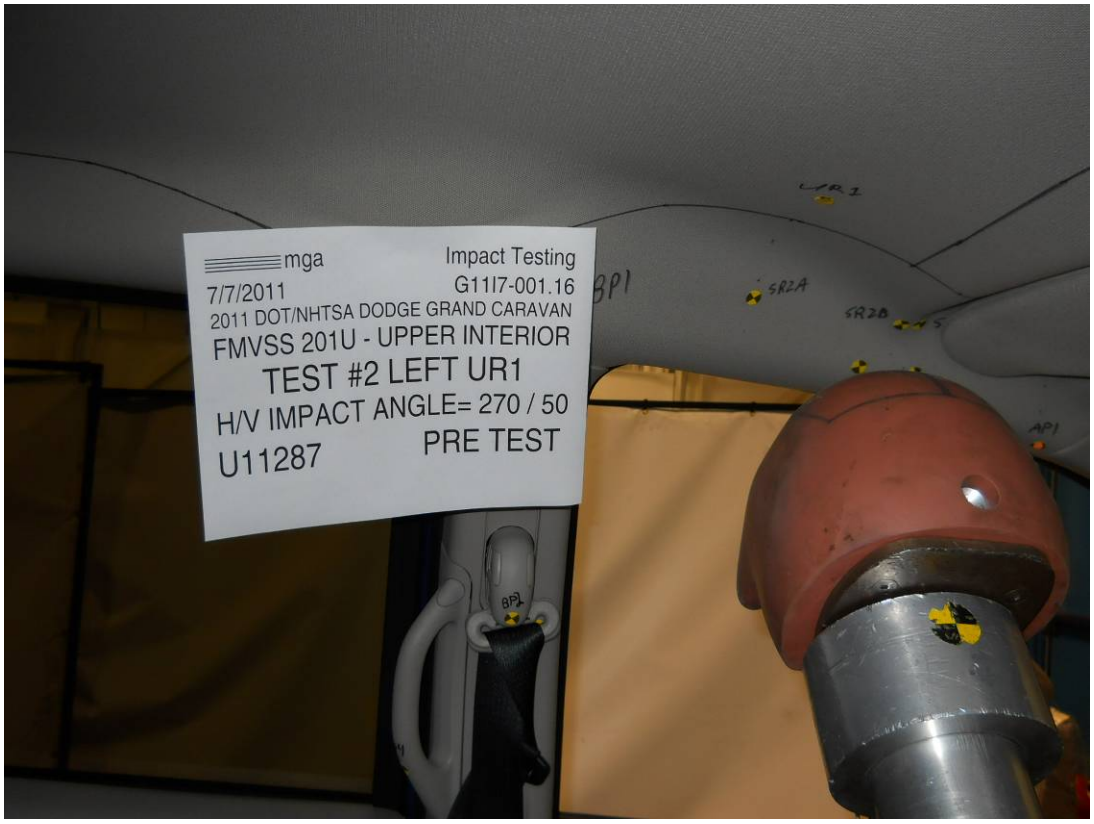

(peak = 21.4 G)
Head Y (G)
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
0
2
4
6
8
10
12
14
TIME (msec)


(peak = 42.1 G)
Head Z (G)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
0
2
4
6
8
10
12
14
TIME (msec)

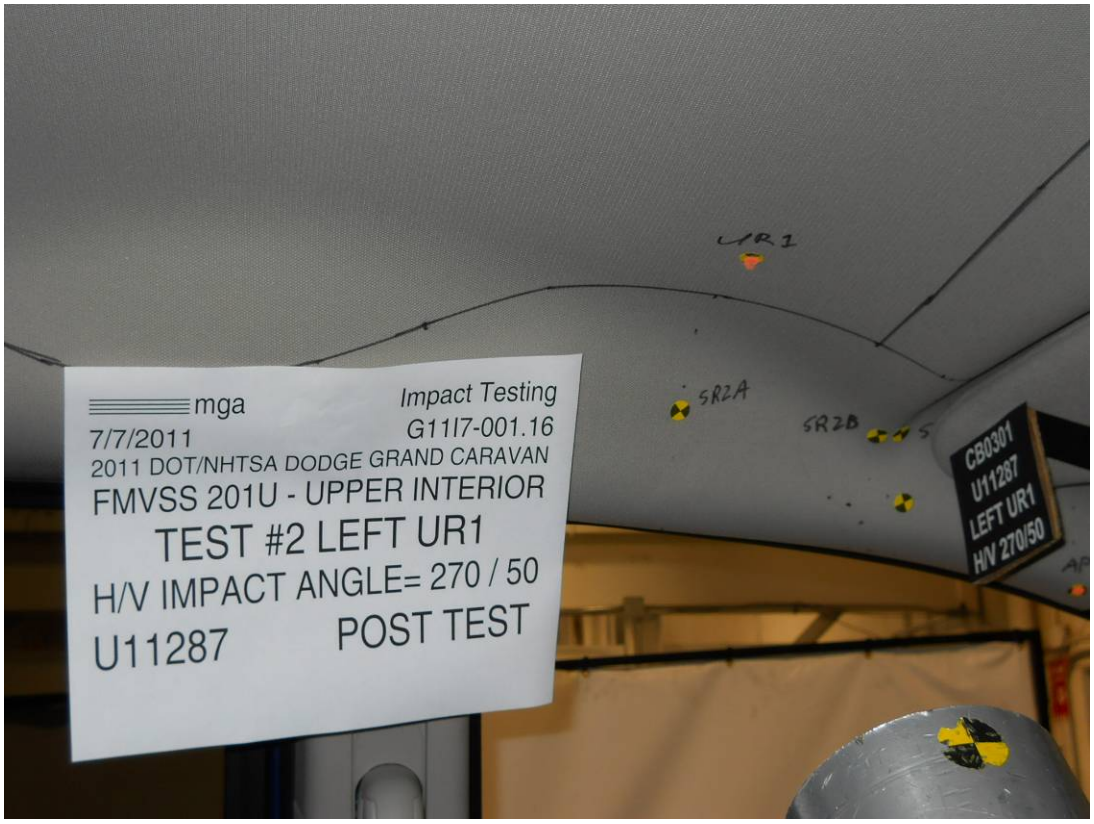

(peak = 23.5 kph)
Impact Velocity: 23.34 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

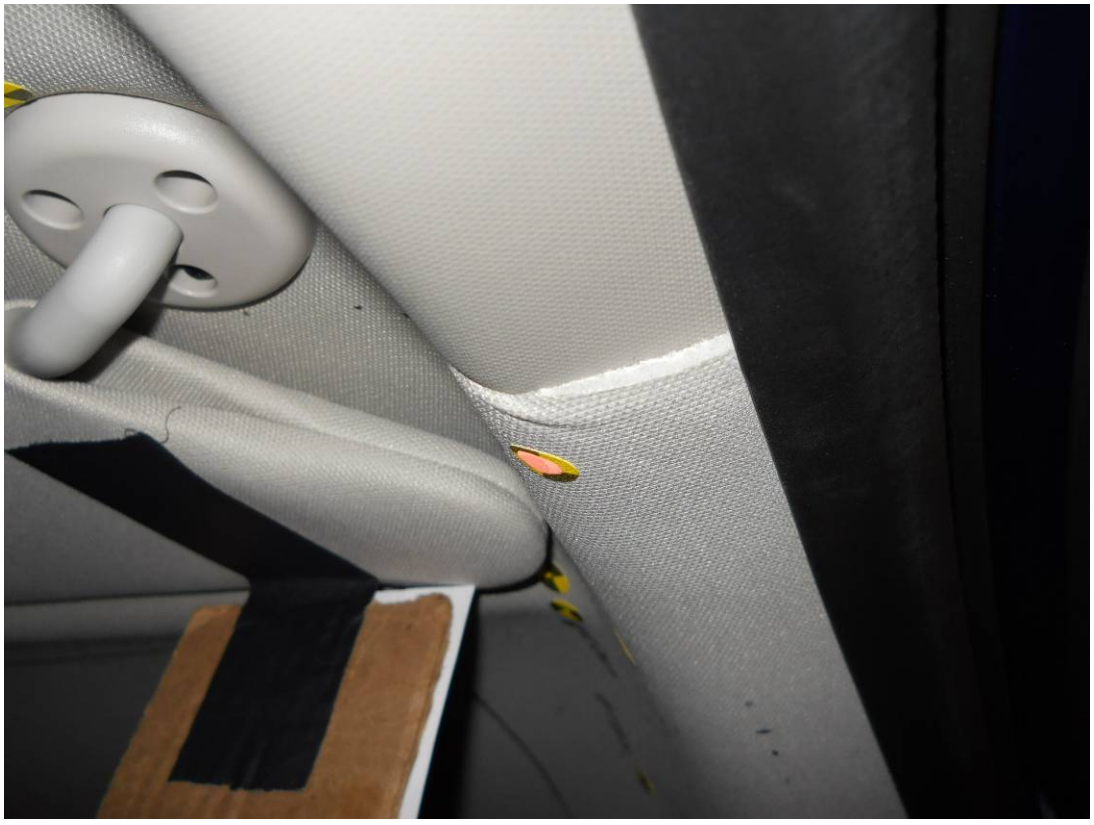

(peak = 51.2 mm)
Displacement (mm)
55
50
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
TIME (msec)


mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT UR1
H/V IMPACT ANGLE= 270 / 50
U11287
PRE TEST


mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT UR1
H/V IMPACT ANGLE= 270 / 50
U11287
PRE TEST


CB0301
U11287
LEFT UR1
H/V 270/50
mga
Impact Testing
G11I7-001.16
7/7/2011
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT UR1
H/V IMPACT ANGLE= 270 / 50
U11287
POST TEST


UR1
SR2A
SR2B
mga
Impact Testing
G11I7-001.16
7/7/2011
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT UR1
H/V IMPACT ANGLE= 270 / 50
U11287
POST TEST
CB0301
U11287
LEFT UR1
H/V 270/50




mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT UR1
H/V IMPACT ANGLE= 270 / 50
U11287
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#2

Target (Vehicle Side): UR1Left

Temperature:23.0C

MGA Test Reference No.:U11287

Humidity:47.3%

Approach Horizontal Angles:270º

Time of Test:11:39:15 AM

Approach Vertical Angles:50º

FMH Serial No:[037]

Additional Description:@ SR2A

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
484	421	11.4	23.8	34	1 Left

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

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

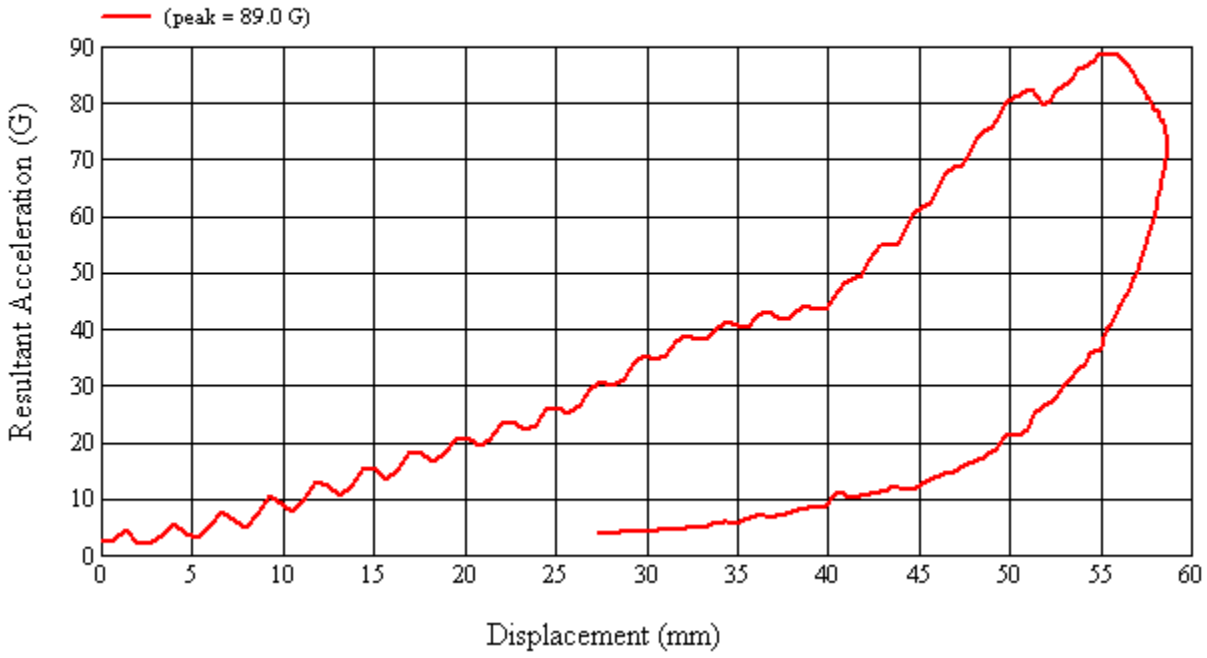
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

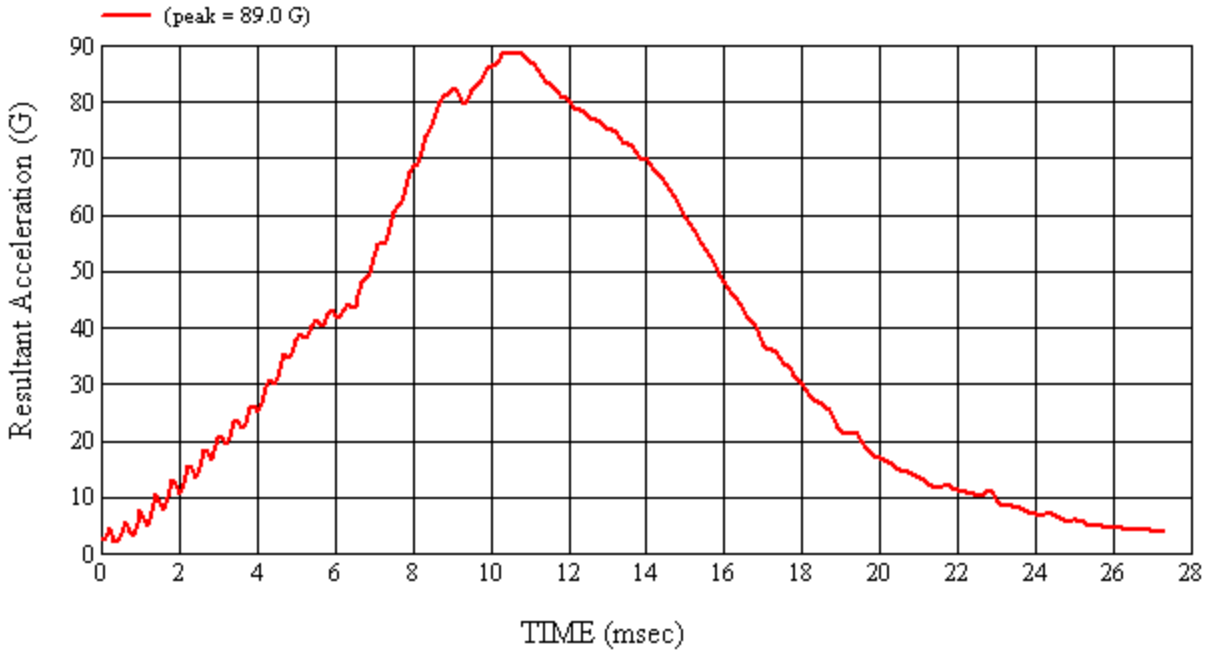
Dislodged headliner

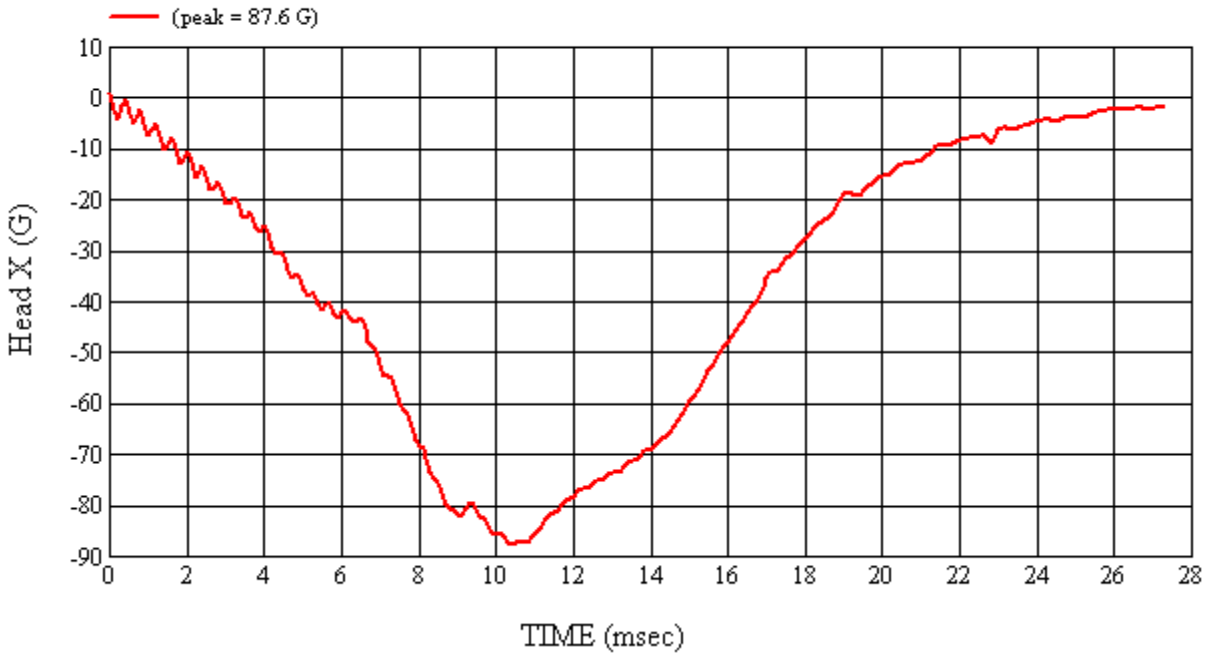
Recorded By: _____ Approved By*: _____ Date: 7/7/2011

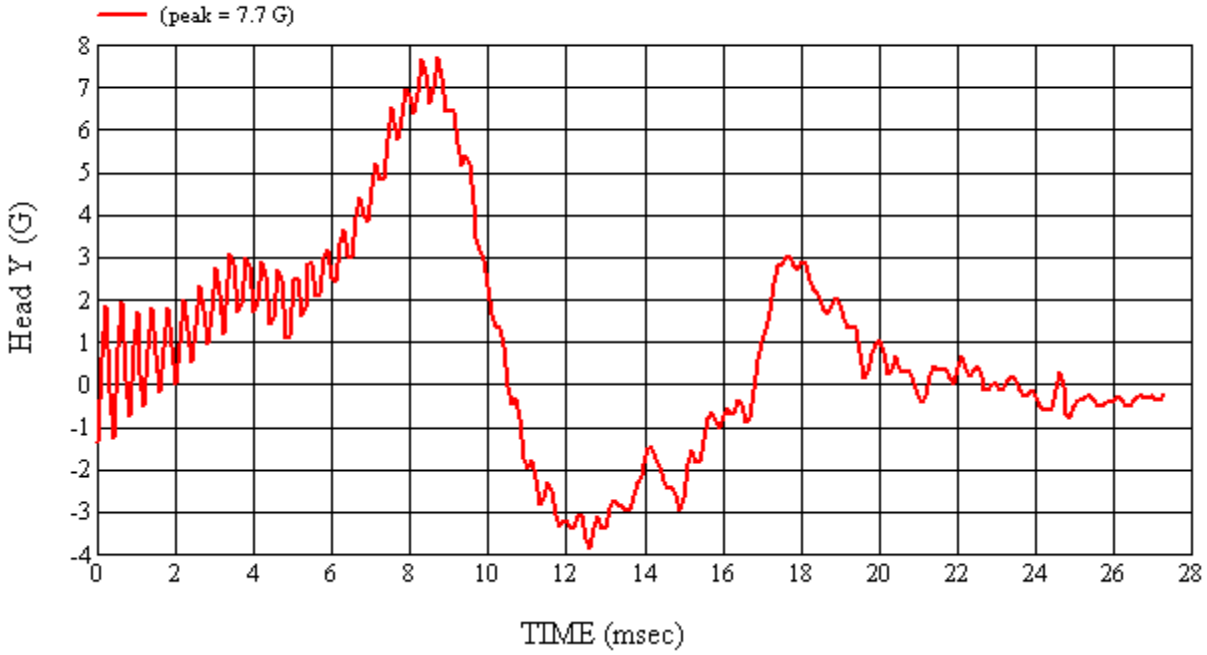
*Only necessary for NHTSA (Government) Compliance testing.

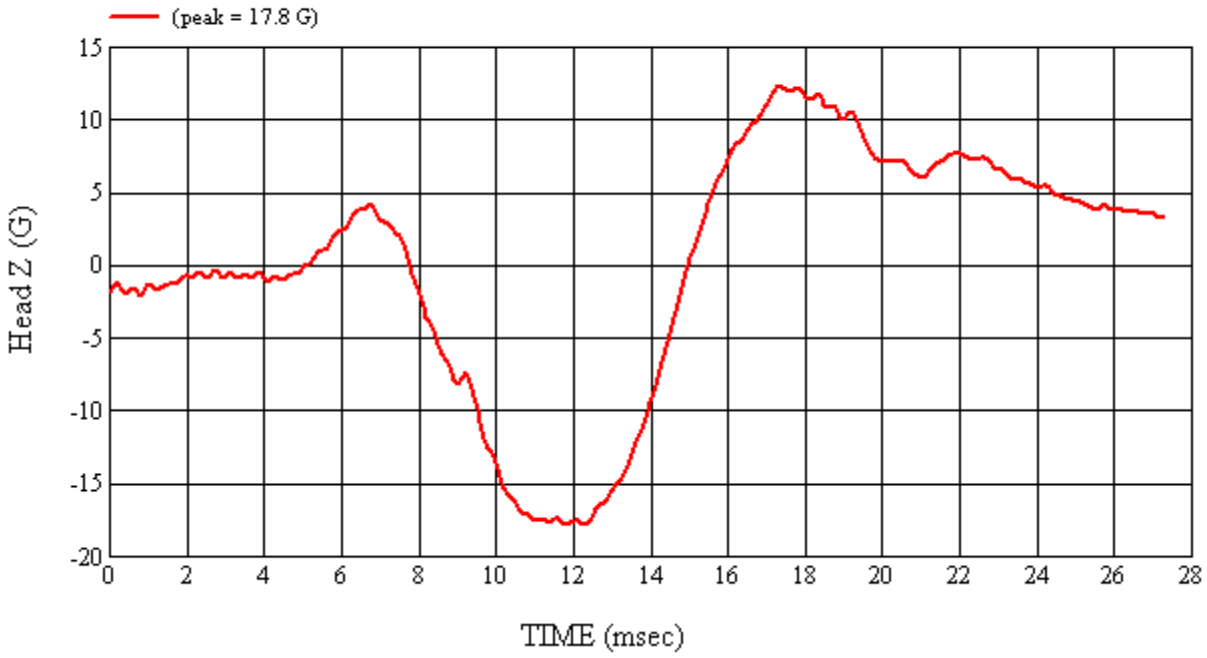
MGA Test #: U11287 Target Location: UR1, Left Side Test Date: 7/7/2011

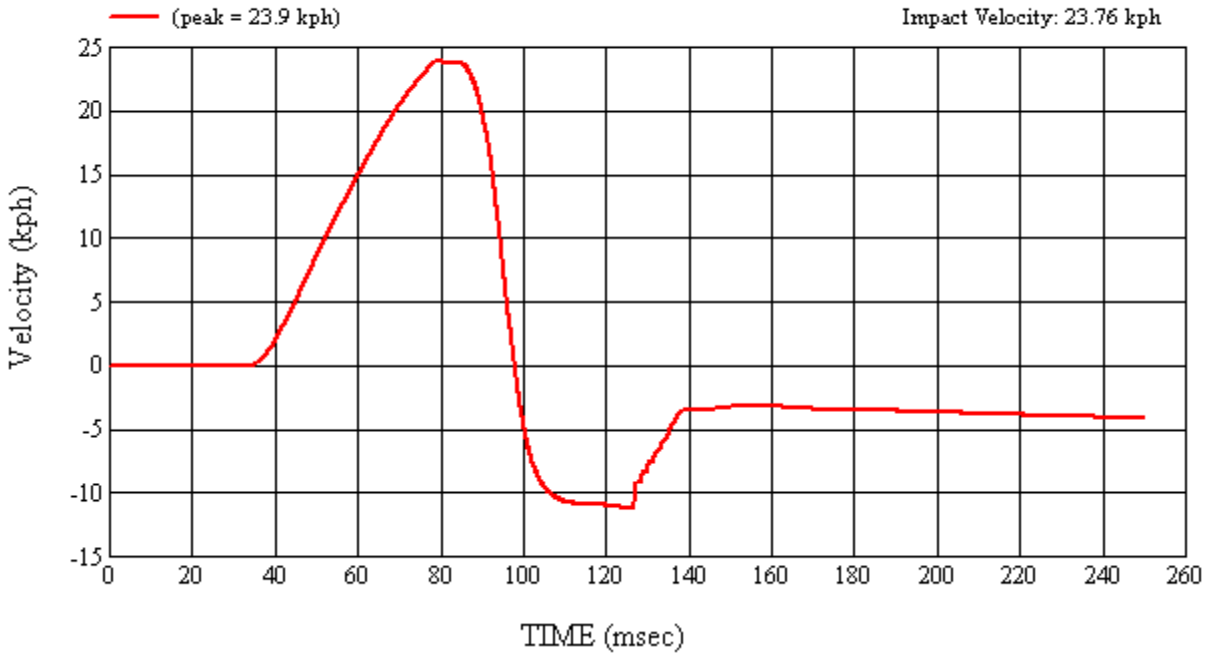


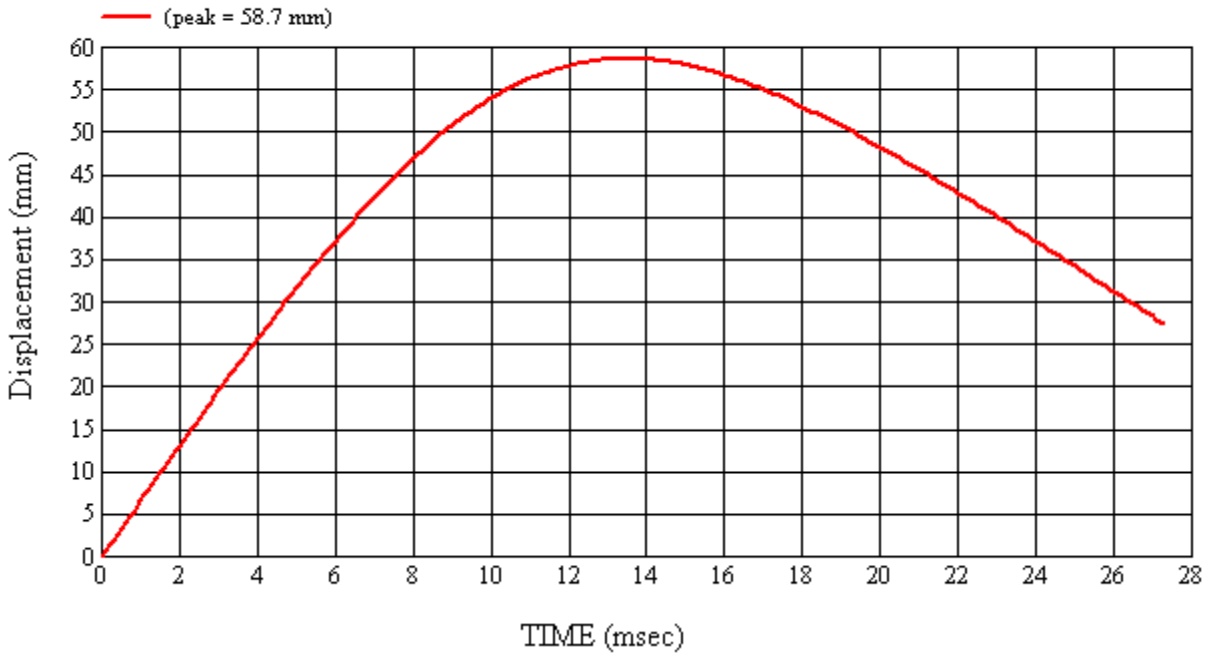



(peak = 87.6 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)


(peak = 7.7 G)
Head Y (G)
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)


(peak = 17.8 G)
Head Z (G)
15
10
5
0
-5
-10
-15
-20
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)


(peak = 23.9 kph)
Impact Velocity: 23.76 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 = 58.7 mm)
Displacement (mm)
60
55
50
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)

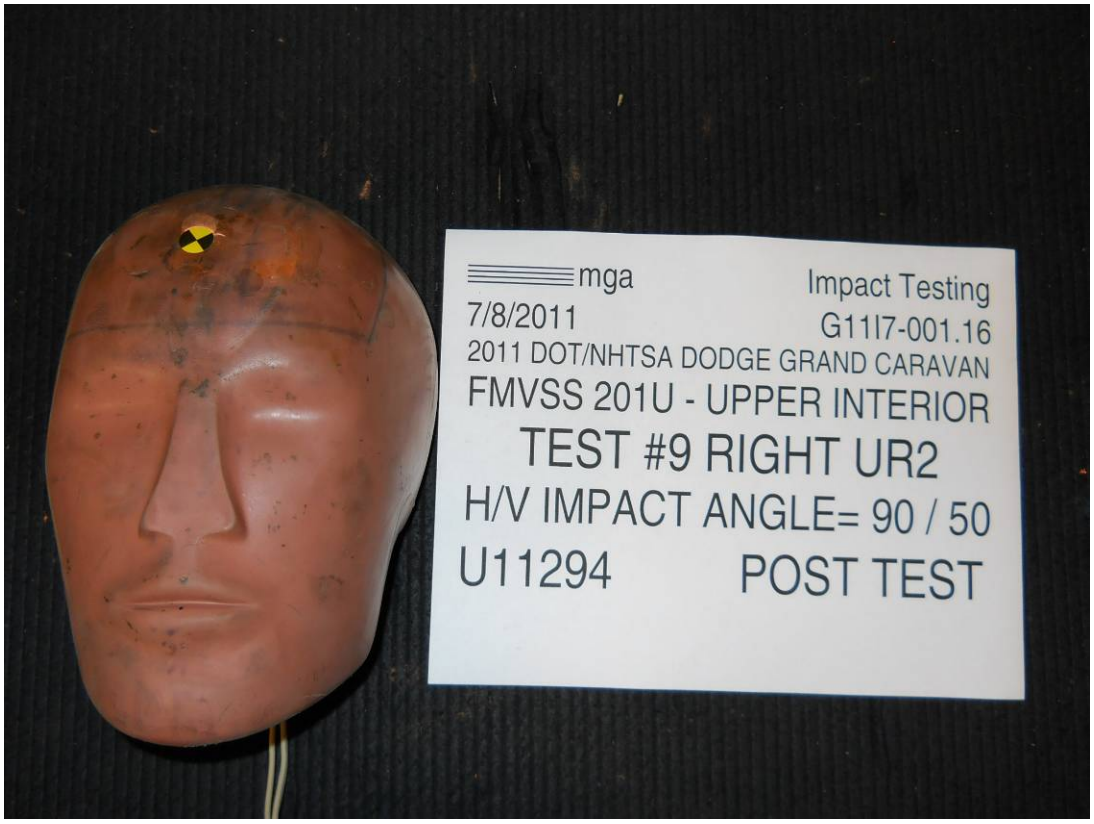

CB0301
U11294
RIGHT UR2
H/V 90/50
mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11294
PRE TEST


CB0301
U11294
SR2A
BP1
mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11294
PRE TEST


CB0301
U11294
RIGHT UR2
H/V 90/50
mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11294
POST TEST


CB0301
U11294
RIGHT UR2
H/V 90/50
SR2A
BP1
mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11294
POST TEST


CB0301
U11294
RIGHT UR2
H/V 90/50


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 50
U11294
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#9

Target (Vehicle Side): UR2Right

Temperature:21.8C

MGA Test Reference No.:U11294

Humidity:48.0%

Approach Horizontal Angles:90º

Time of Test:11:04:14 AM

Approach Vertical Angles:50º

FMH Serial No:[038]

Additional Description:@ BP

TEST RESULTS:

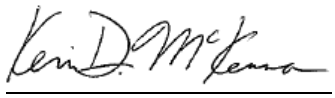
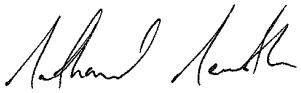
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
514	460	10	23.6	32	4 Right

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

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

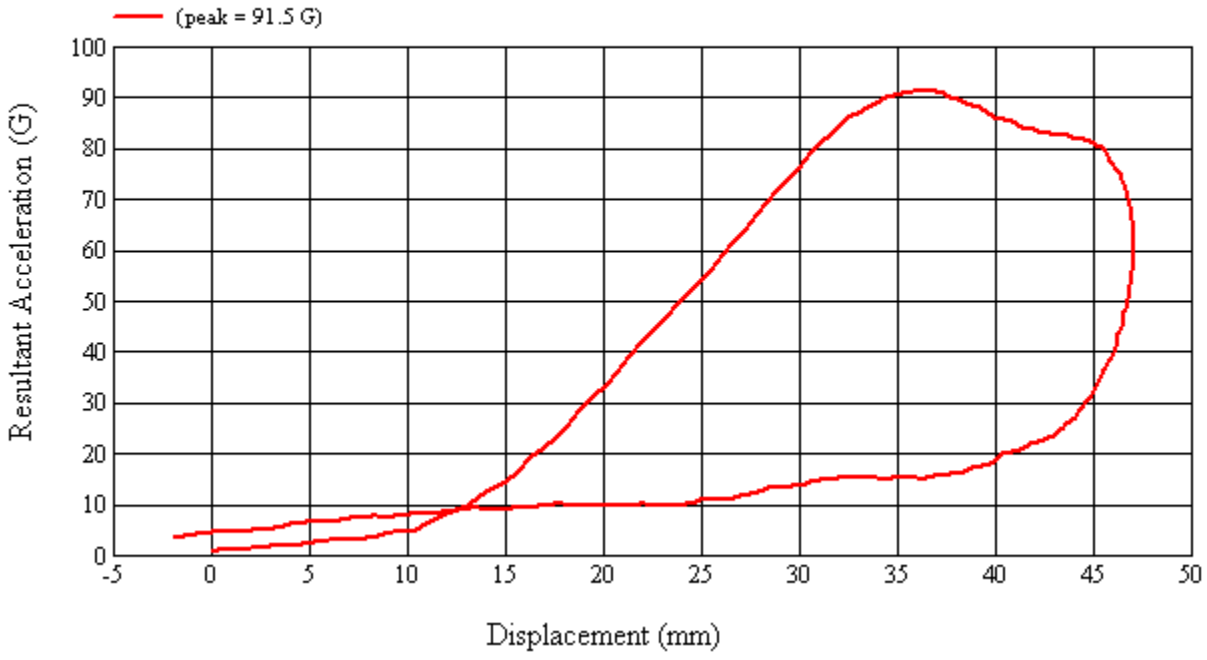
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

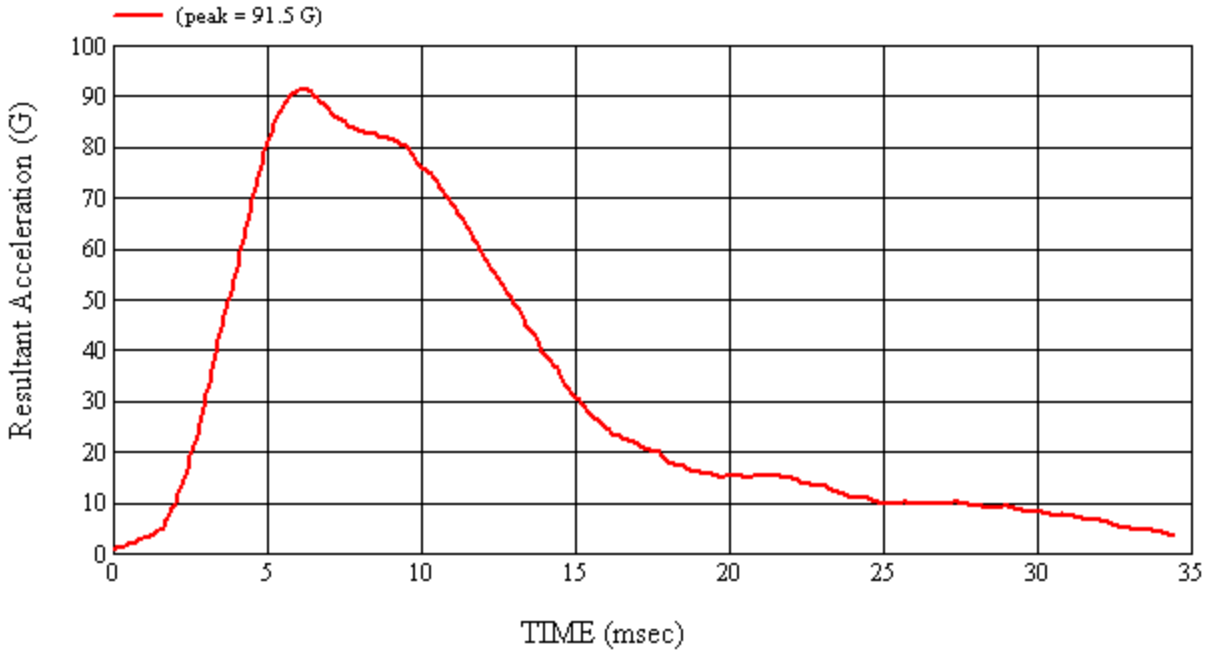
No visible damage

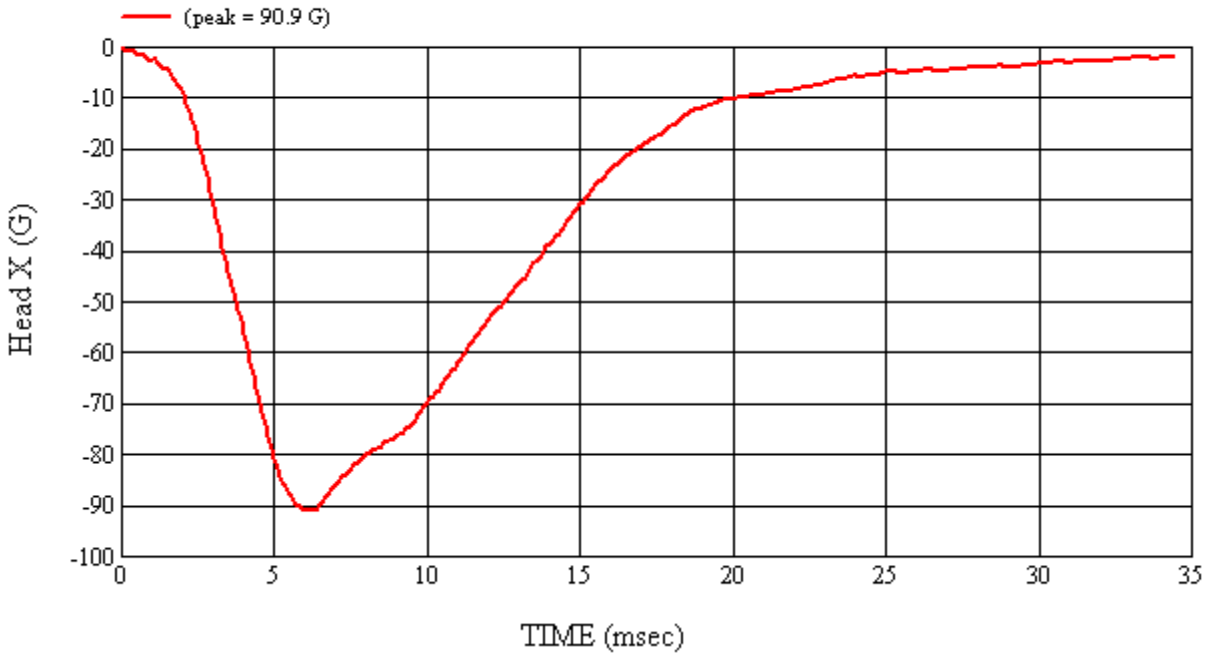
Recorded By:  Approved By*:  Date: 7/8/2011

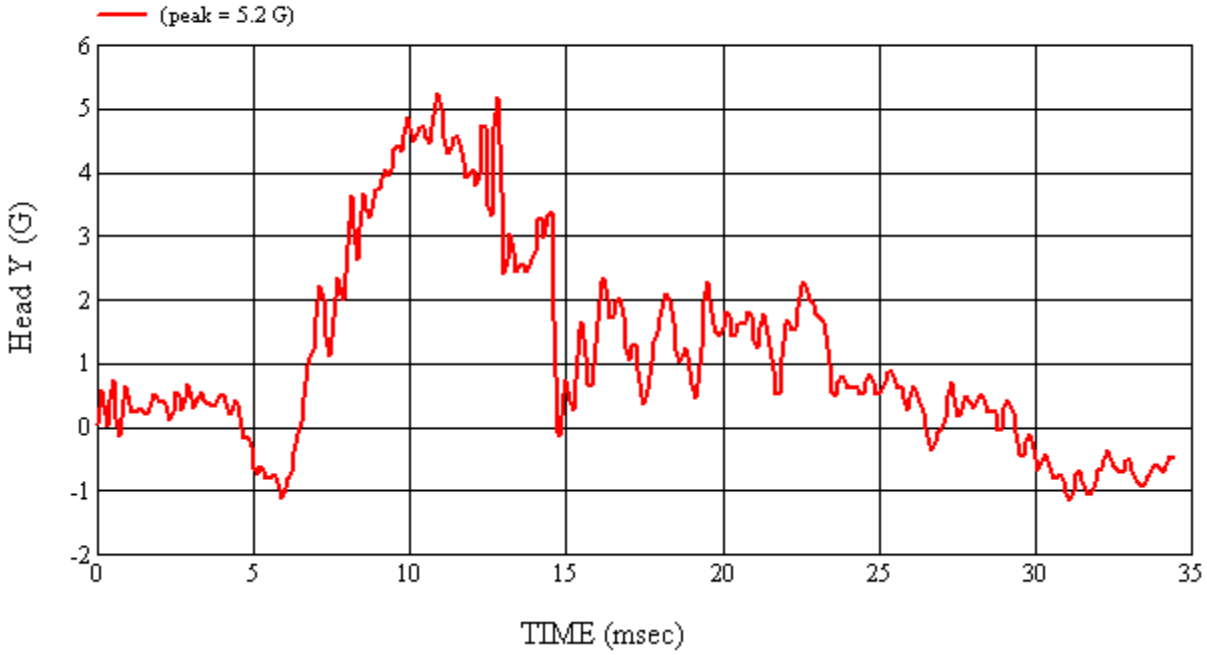
*Only necessary for NHTSA (Government) Compliance testing.

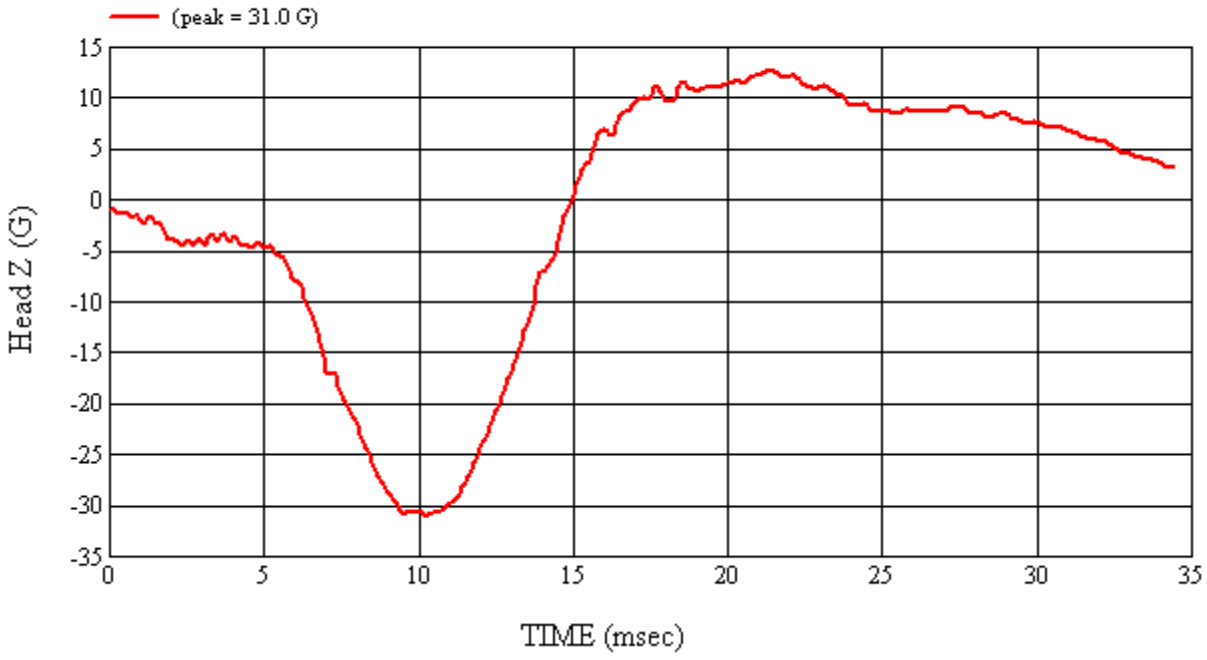
MGA Test #: U11294 Target Location: UR2, Right Side Test Date: 7/8/2011

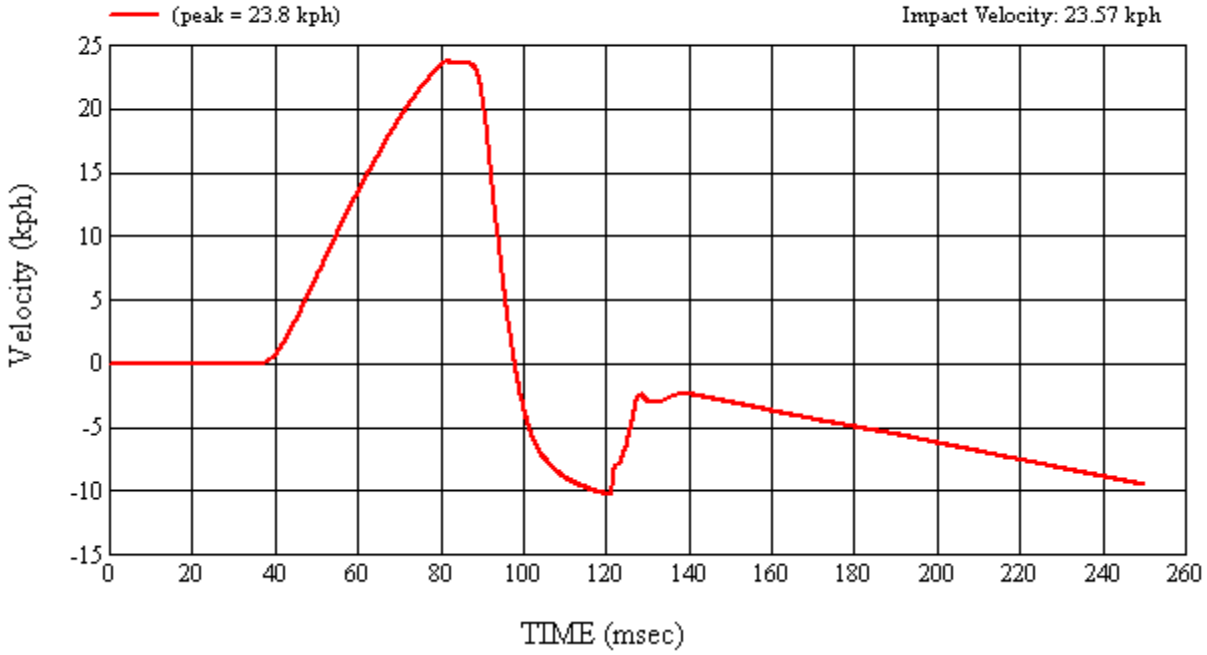


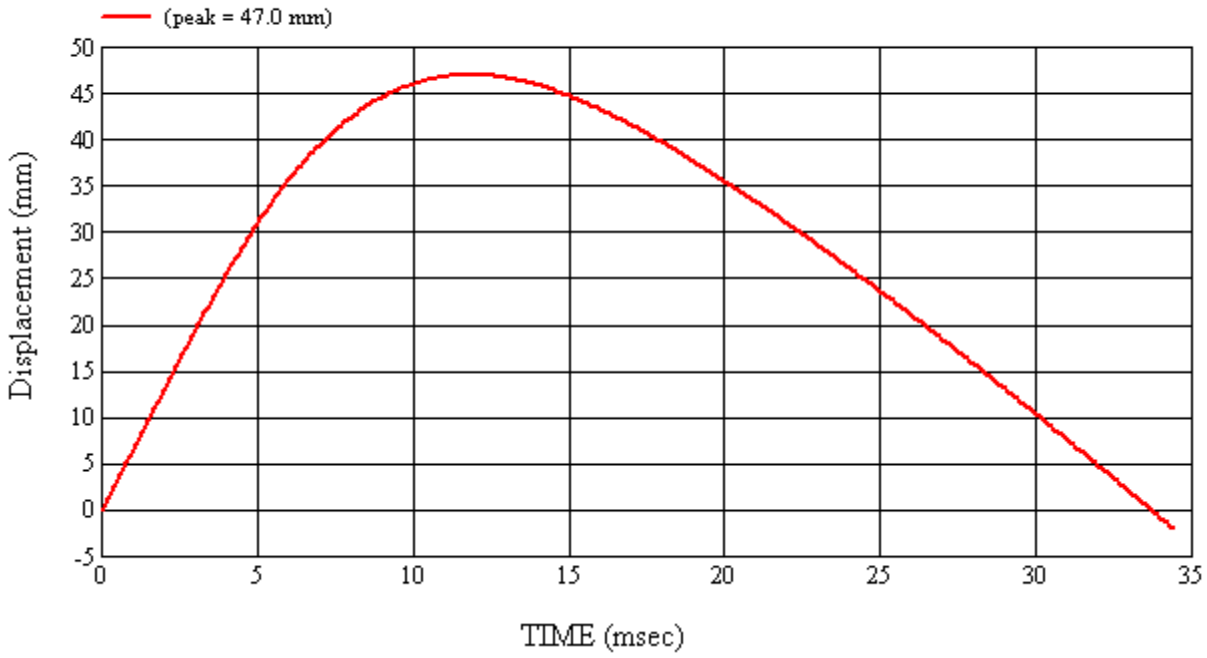



(peak = 90.9 G)
Head X (G)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
0
5
10
15
20
25
30
35
TIME (msec)

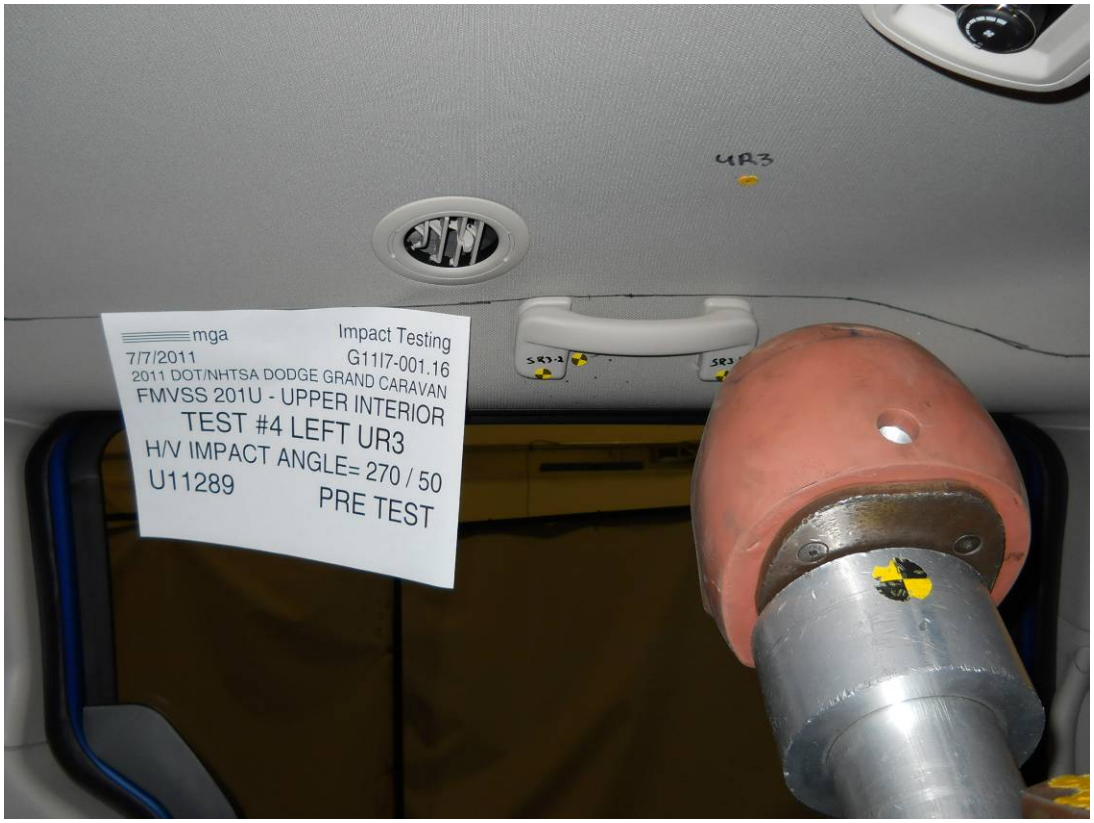

(peak = 5.2 G)
Head Y (G)
6
5
4
3
2
1
0
-1
-2
0
5
10
15
20
25
30
35
TIME (msec)


(peak = 31.0 G)
Head Z (G)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
0
5
10
15
20
25
30
35
TIME (msec)

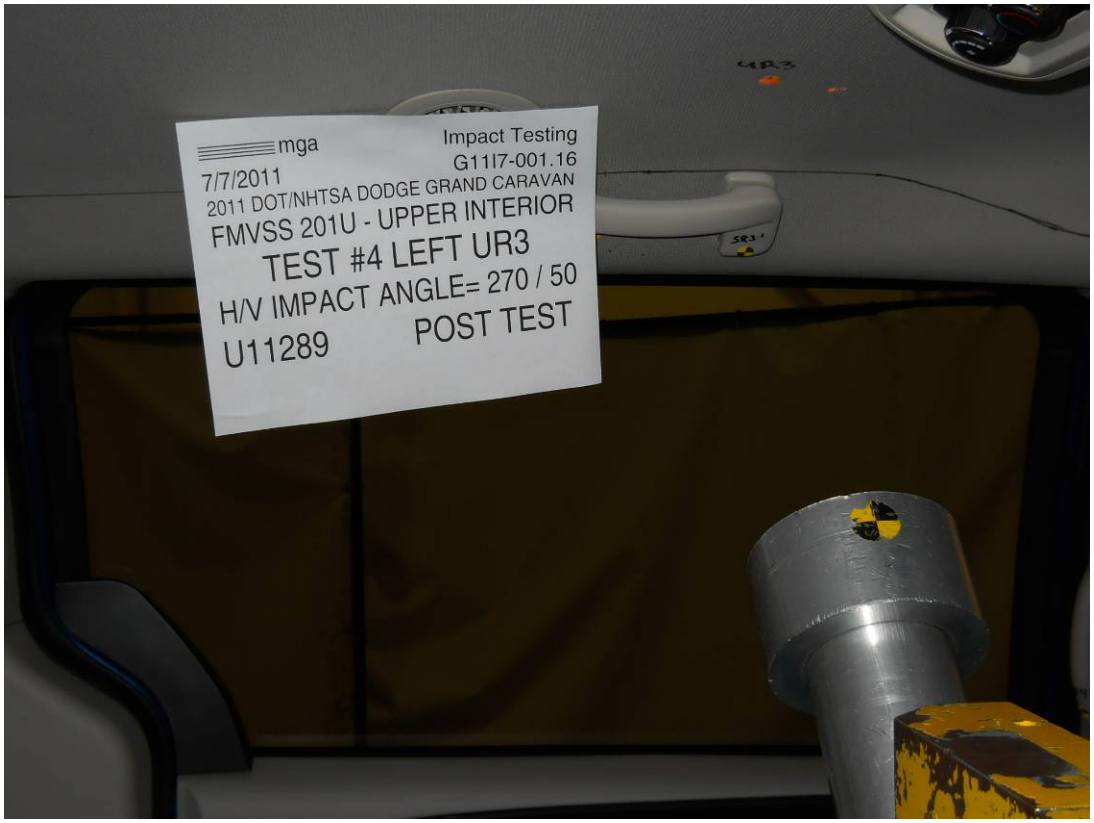

(peak = 23.8 kph)
Impact Velocity: 23.57 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 47.0 mm)
Displacement (mm)
50
45
40
35
30
25
20
15
10
5
0
-5
0
5
10
15
20
25
30
35
TIME (msec)


CB0301
U11289
LEFT UR3
H/V 270/50
mga
Impact Testing
G11I7-001.16
7/7/2011
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U11289
PRE TEST


UR3
mga
Impact Testing
G11I7-001.16
7/7/2011
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U11289
PRE TEST


CB0301
U11289
LEFT UR3
H/V 270/50
mga
Impact Testing
G11I7-001.16
7/7/2011
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U11289
POST TEST


mga
Impact Testing
G11I7-001.16
7/7/2011
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U11289
POST TEST


CB0301
U11289
LEFT UR3
H/V 270/50


mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT UR3
H/V IMPACT ANGLE= 270 / 50
U11289
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#4

Target (Vehicle Side): UR3Left

Temperature:22.5C

MGA Test Reference No.:U11289

Humidity:45.7%

Approach Horizontal Angles:270º

Time of Test:1:57:36 PM

Approach Vertical Angles:50º

FMH Serial No:[035]

Additional Description:@ SR3-1

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
740	760	6.9	23.5	33	0

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

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

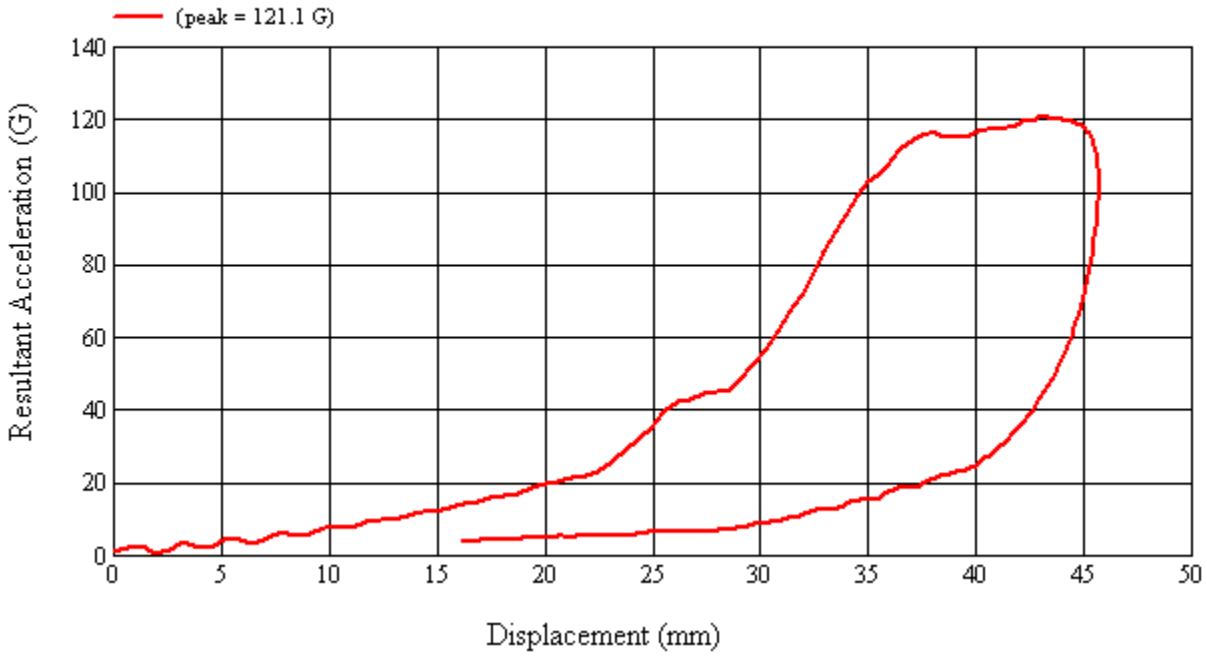
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

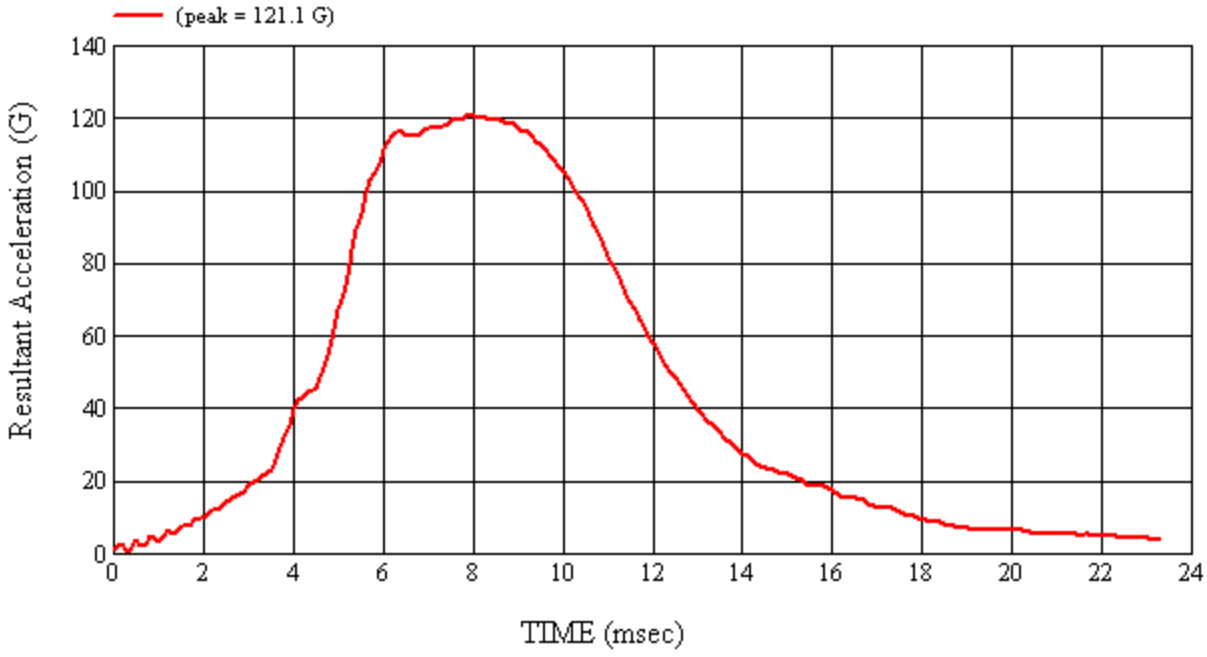
No visible damage

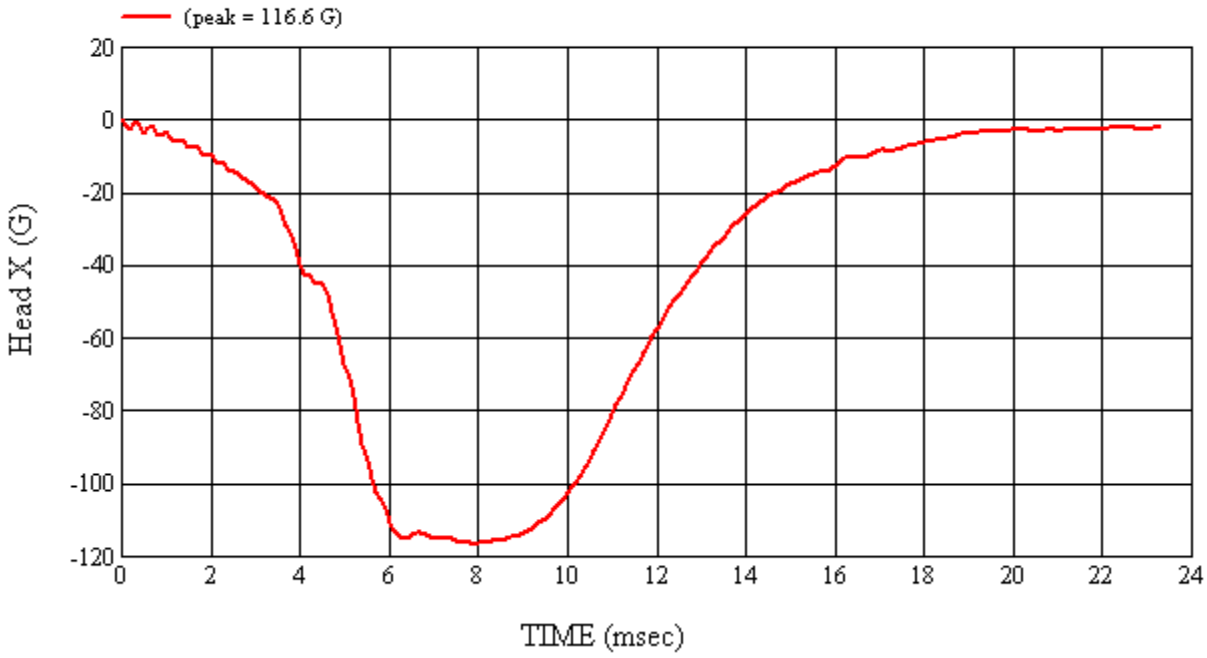
Recorded By: _____ Approved By*: _____ Date: 7/7/2011

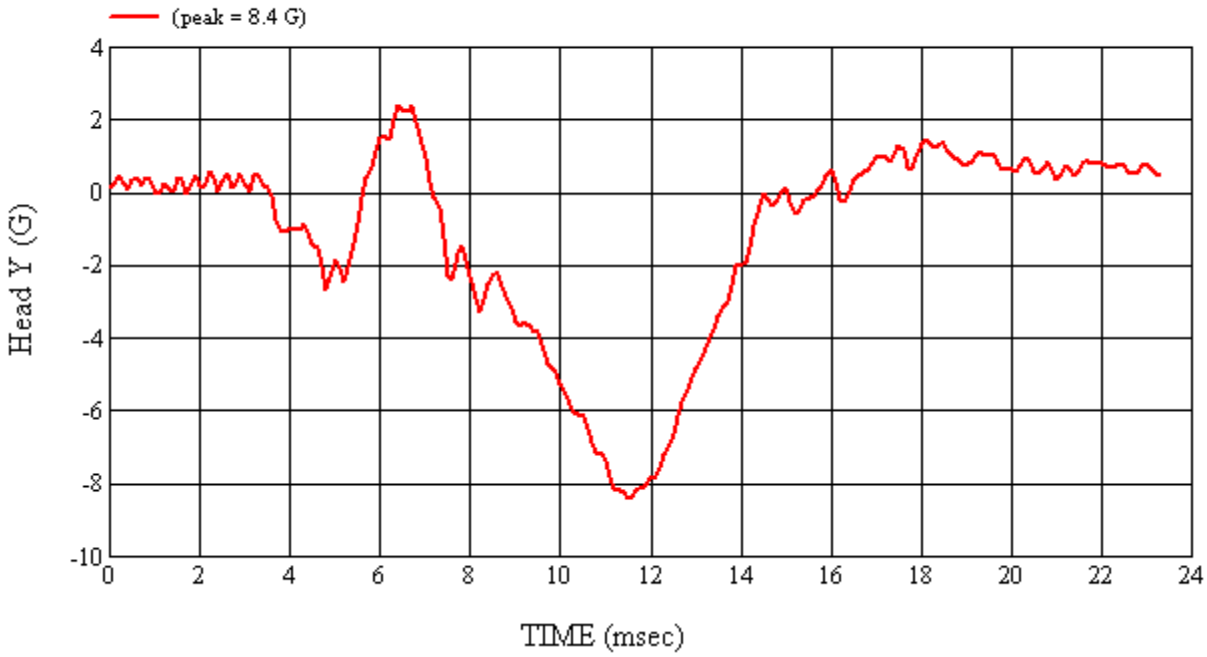
*Only necessary for NHTSA (Government) Compliance testing.

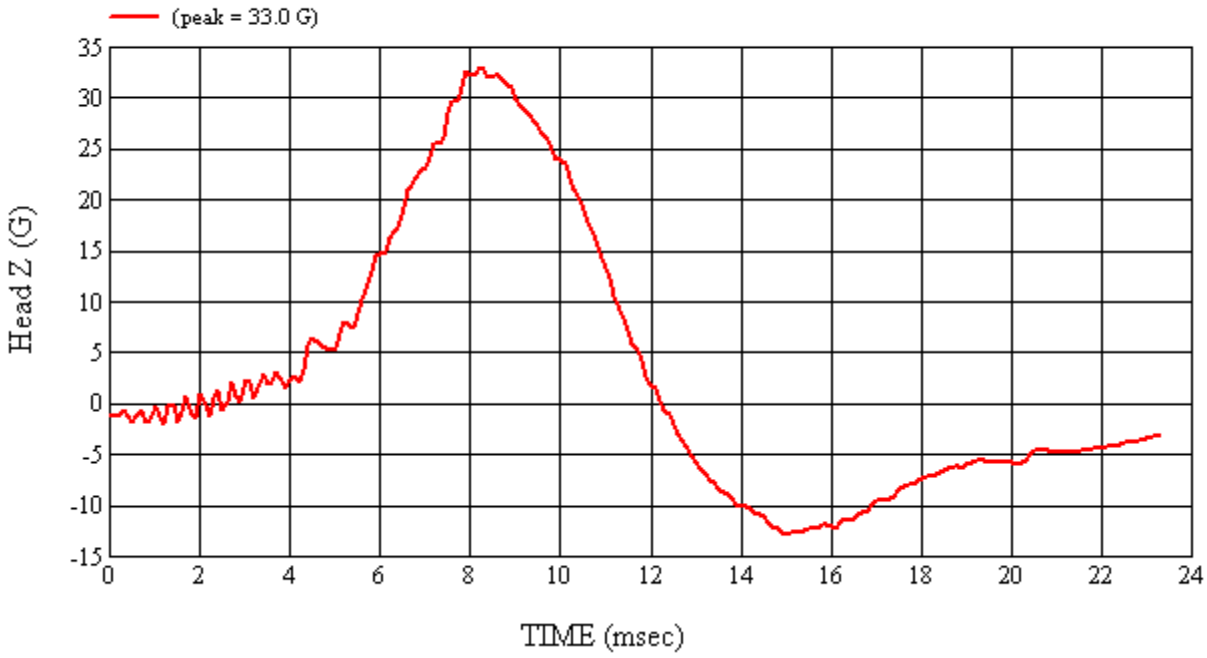
MGA Test #: U11289 Target Location: UR3, Left Side Test Date: 7/7/2011

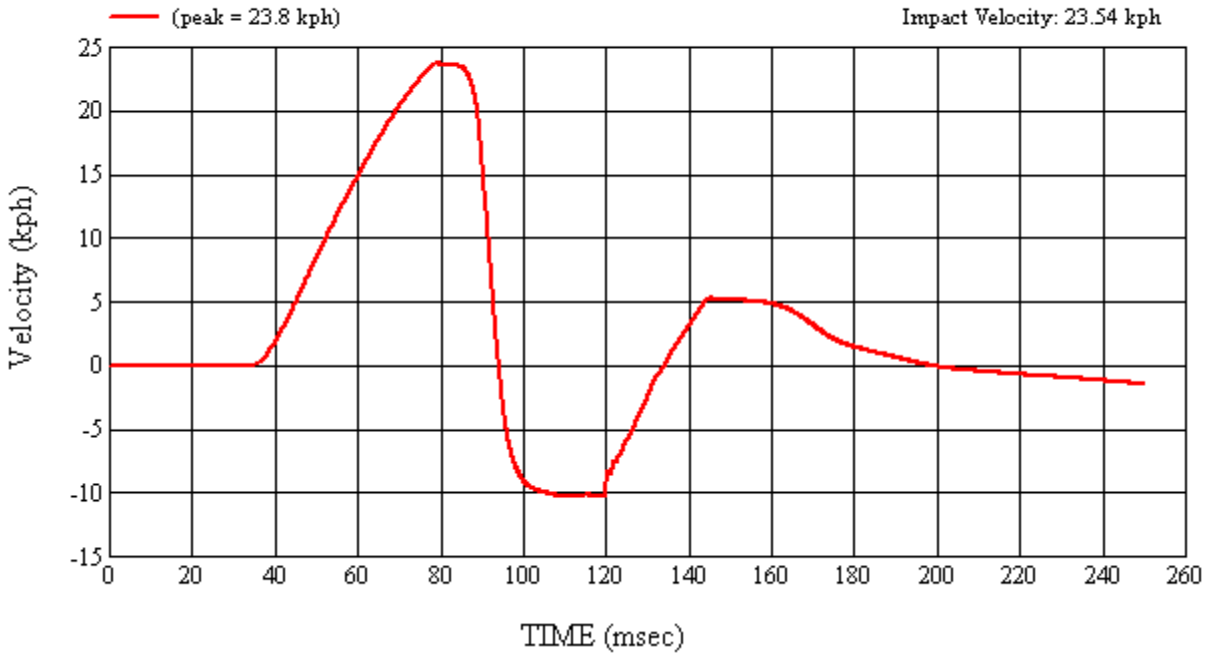


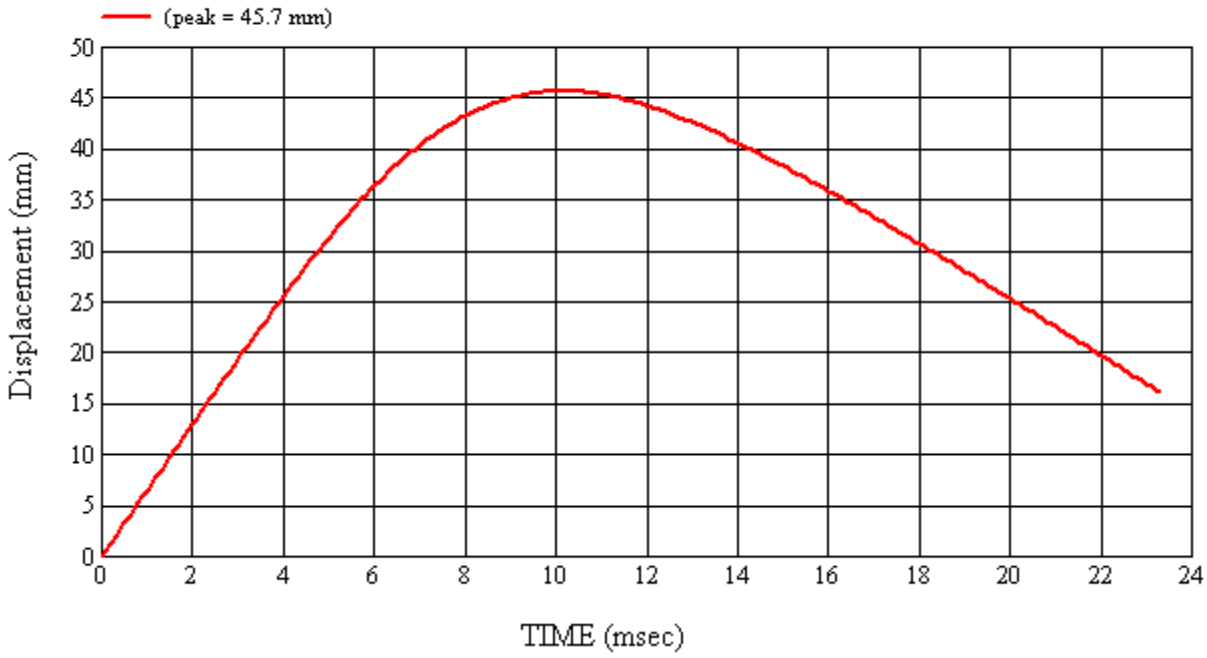



(peak = 116.6 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 8.4 G)
Head Y (G)
4
2
0
-2
-4
-6
-8
-10
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)

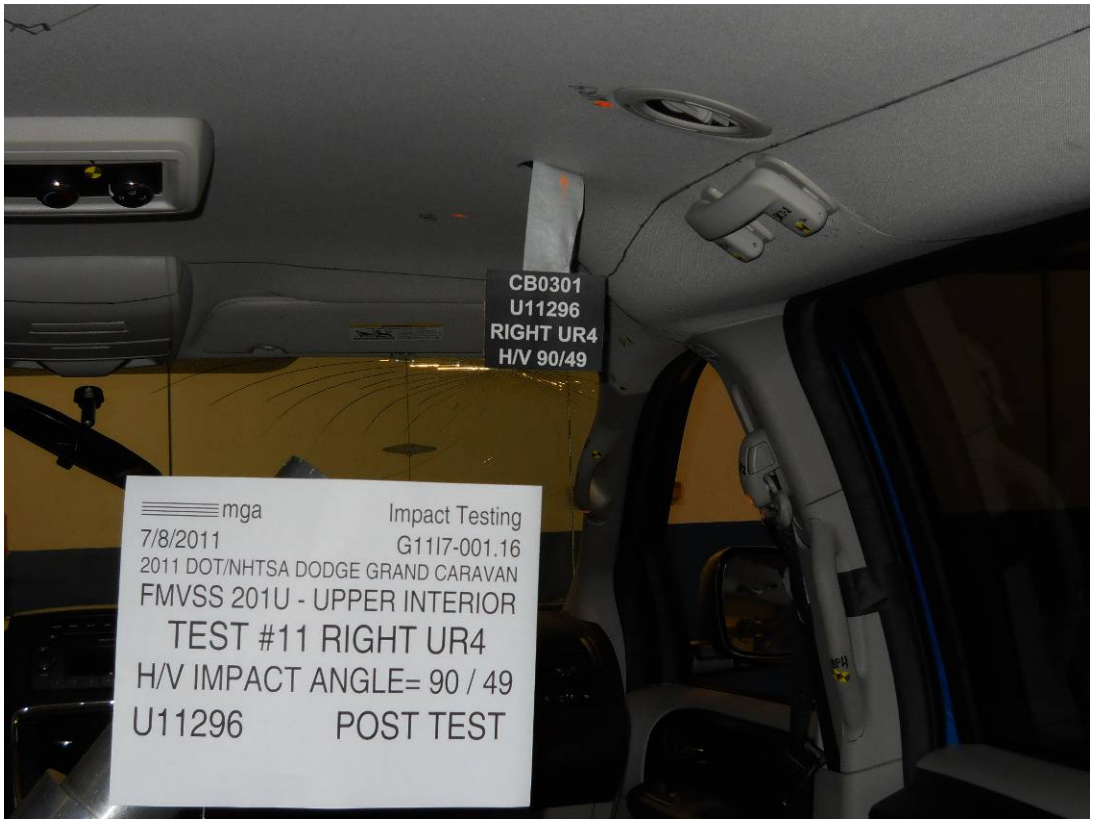

(peak = 33.0 G)
Head Z (G)
35
30
25
20
15
10
5
0
-5
-10
-15
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)

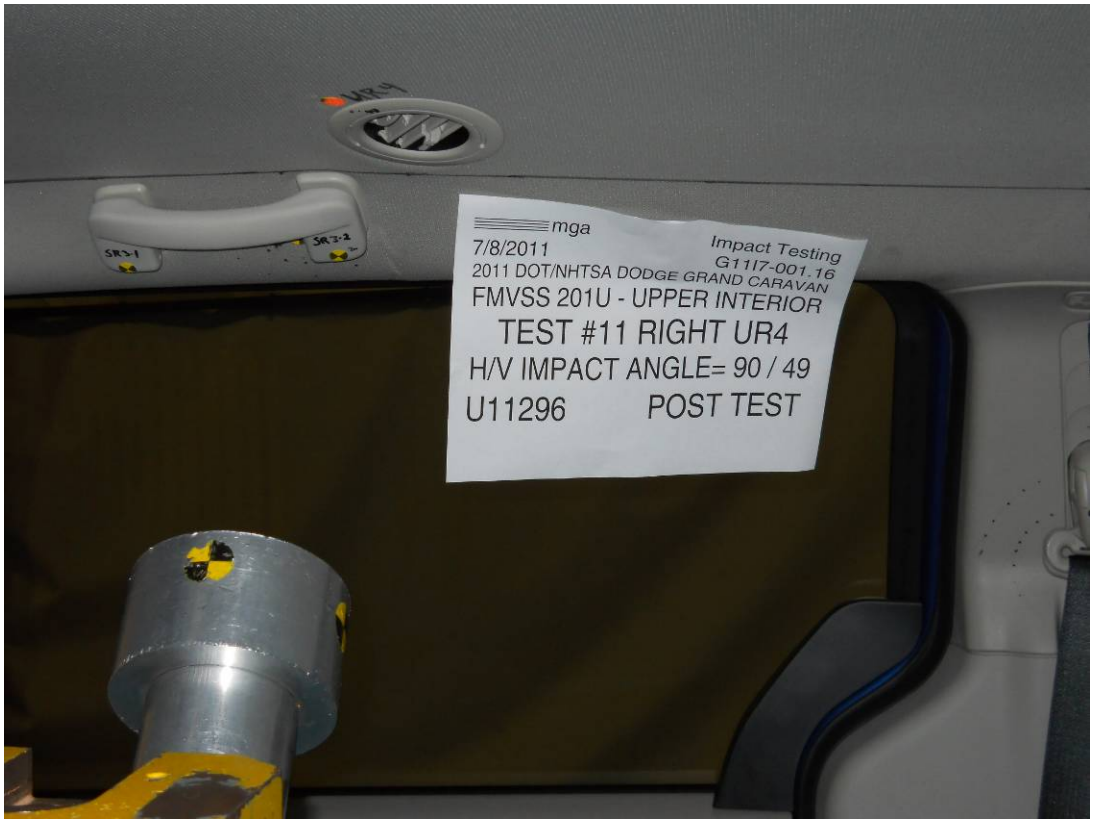

(peak = 23.8 kph)
Impact Velocity: 23.54 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 45.7 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
50
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)

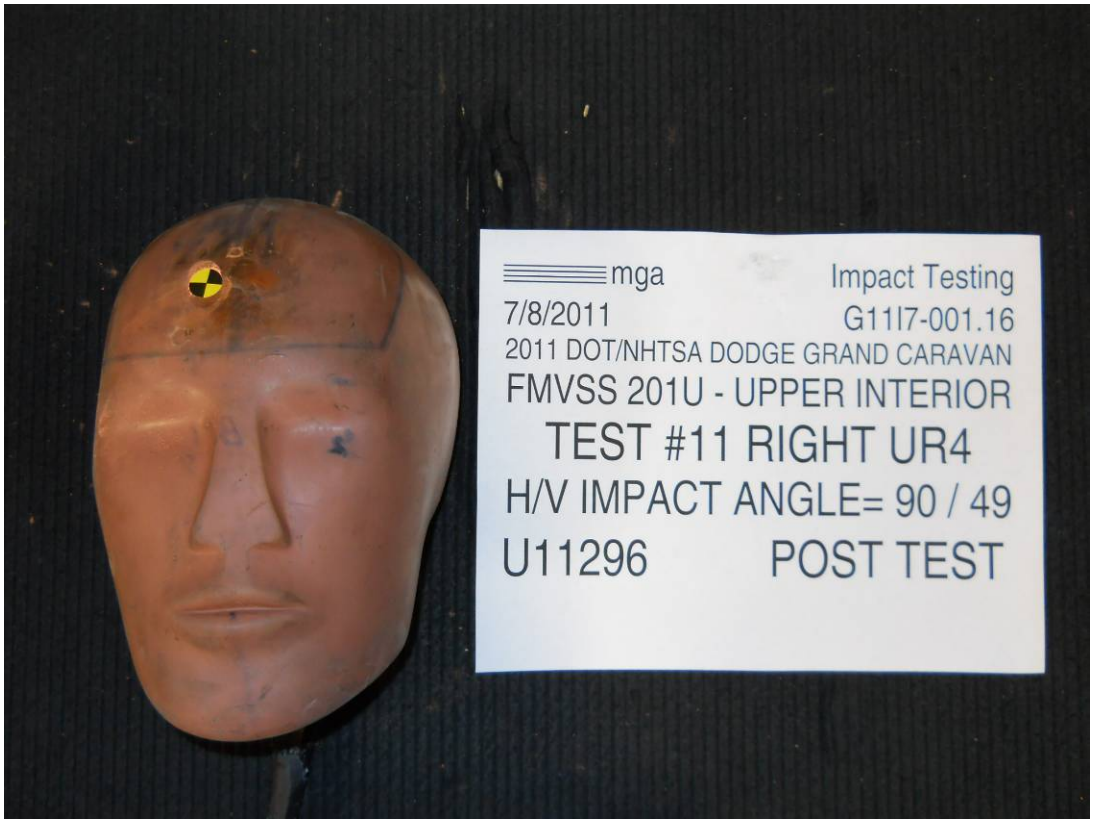

mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 49
U11296
PRE TEST


UR-4
SR>1
mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 49
U11296
PRE TEST


CB0301
U11296
RIGHT UR4
H/V 90/49
mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 49
U11296
POST TEST


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 49
U11296
POST TEST


SR1
SD


mga
Impact Testing
7/8/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 49
U11296
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#11

Target (Vehicle Side): UR4Right

Temperature:22.0C

MGA Test Reference No.:U11296

Humidity:49.9%

Approach Horizontal Angles:90º

Time of Test:2:26:10 PM

Approach Vertical Angles:49º

FMH Serial No:[037]

Additional Description:@ SR3-2

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
801	841	6.3	23.6	22	11 Right

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

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

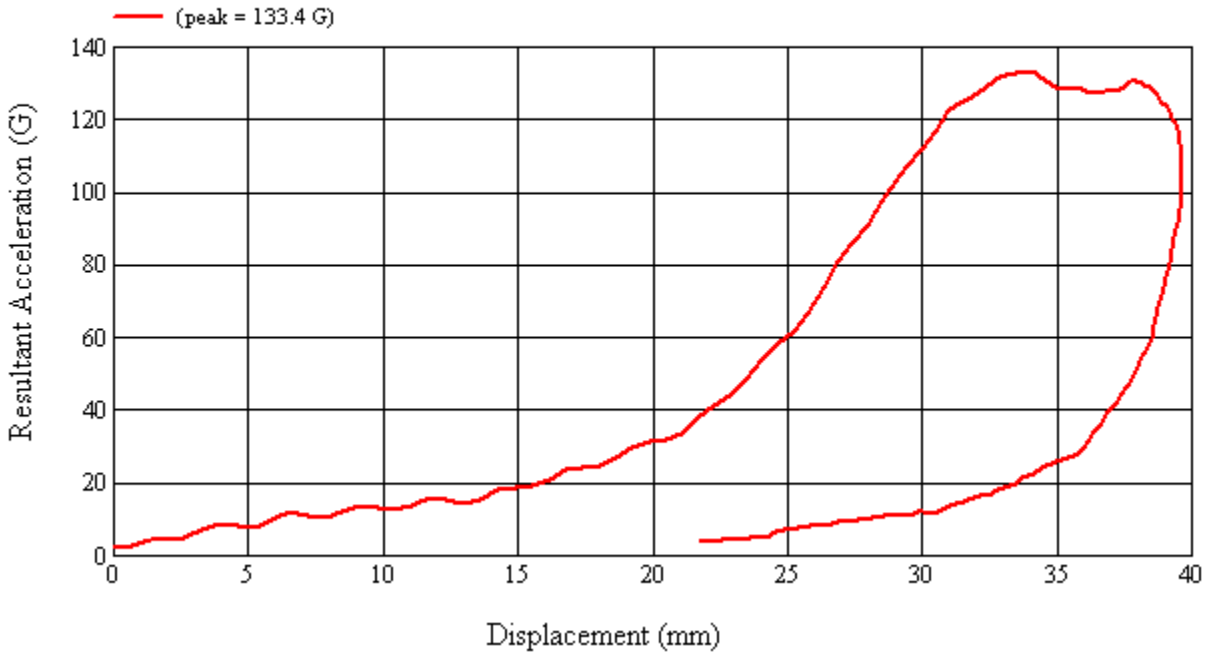
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

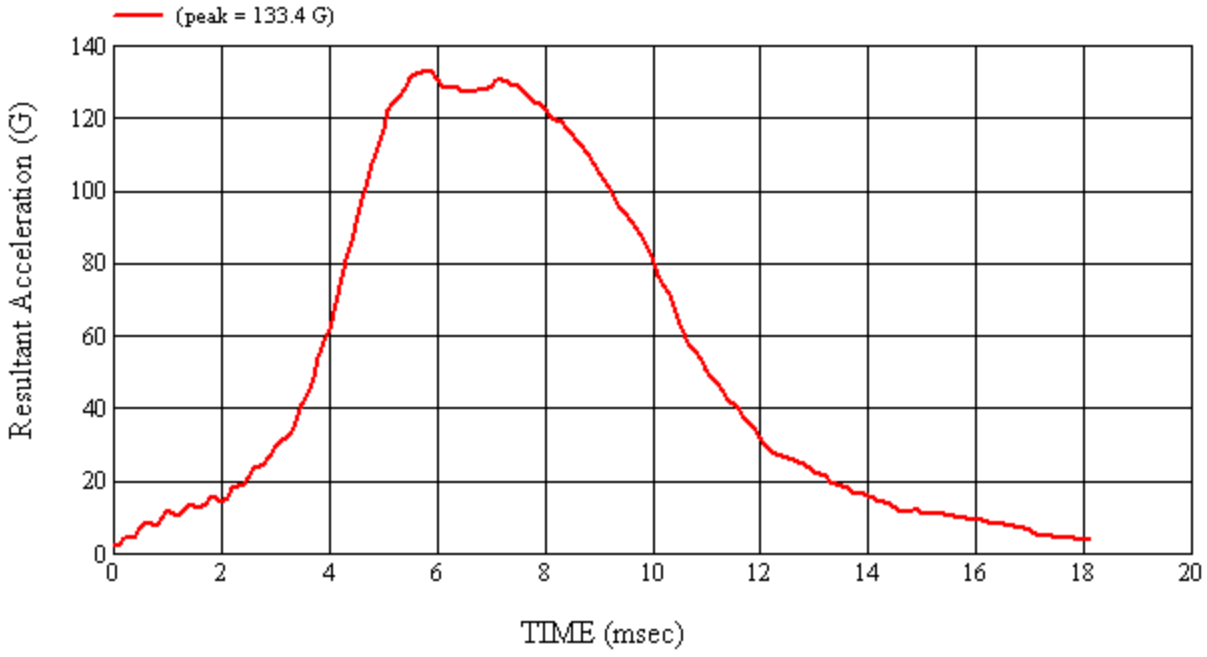
Headliner deformation

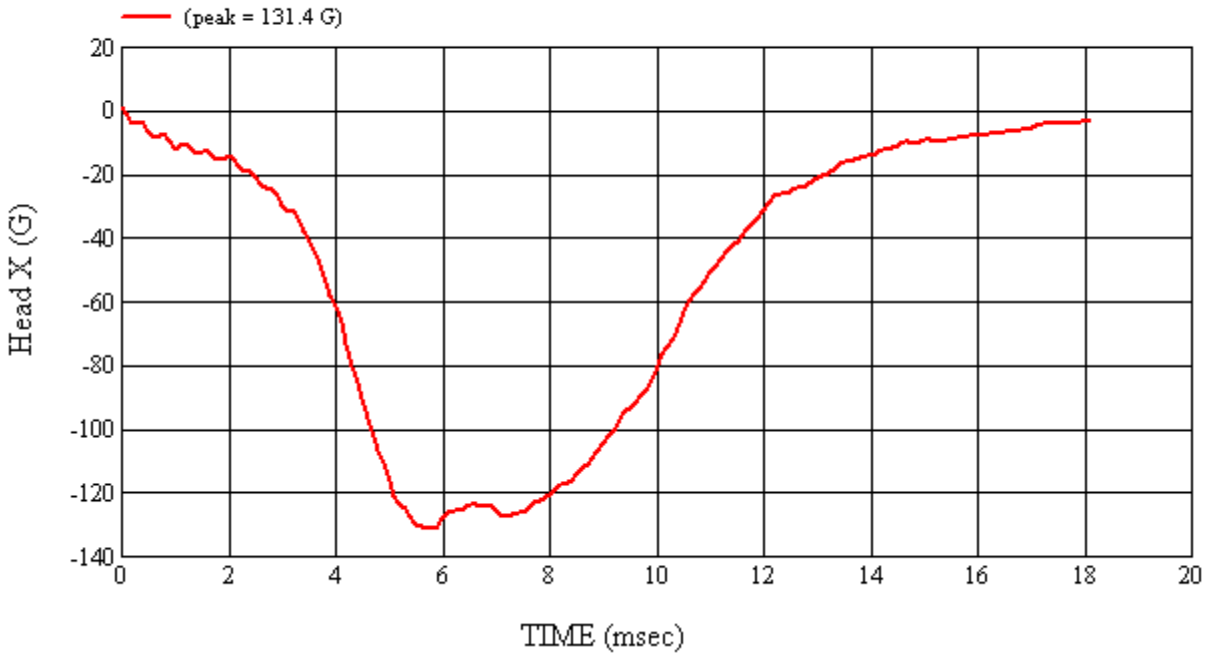
Recorded By: _____ Approved By*: _____ Date: 7/8/2011

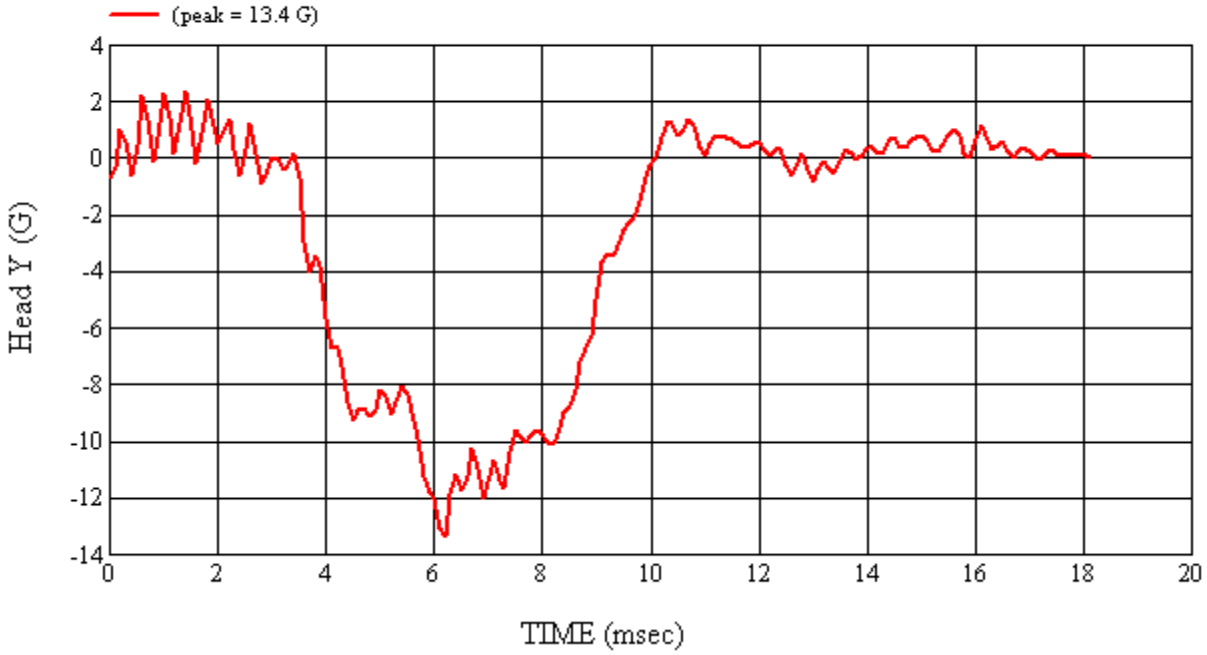
*Only necessary for NHTSA (Government) Compliance testing.

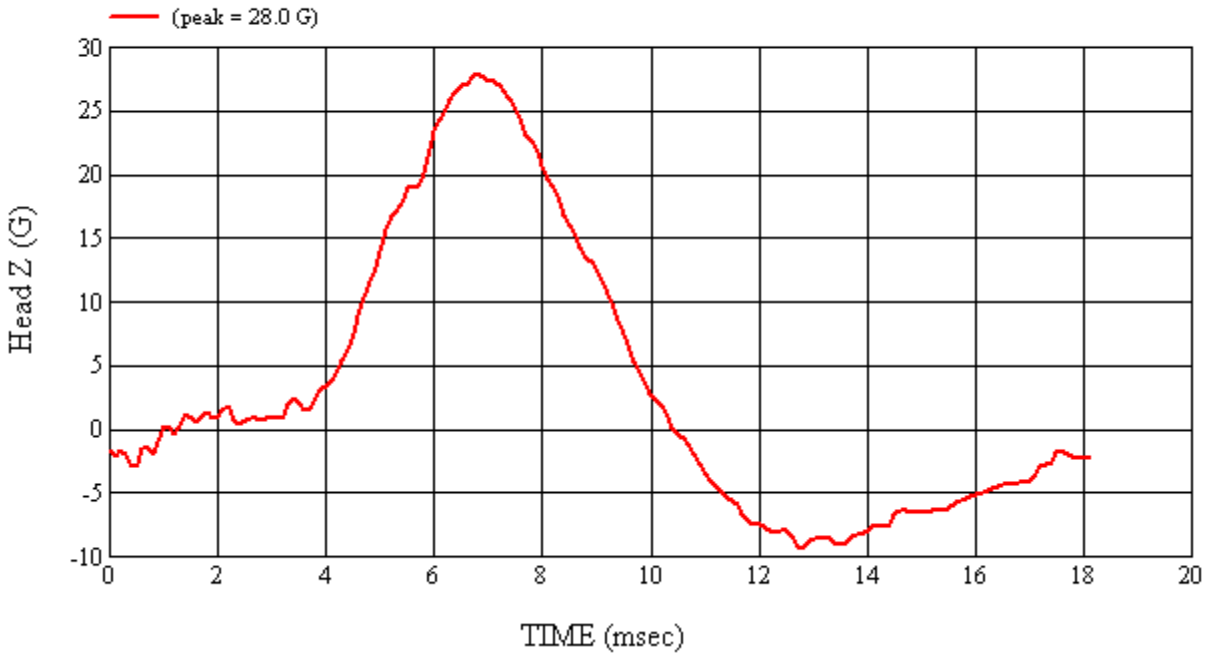
MGA Test #: U11296 Target Location: UR4, Right Side Test Date: 7/8/2011

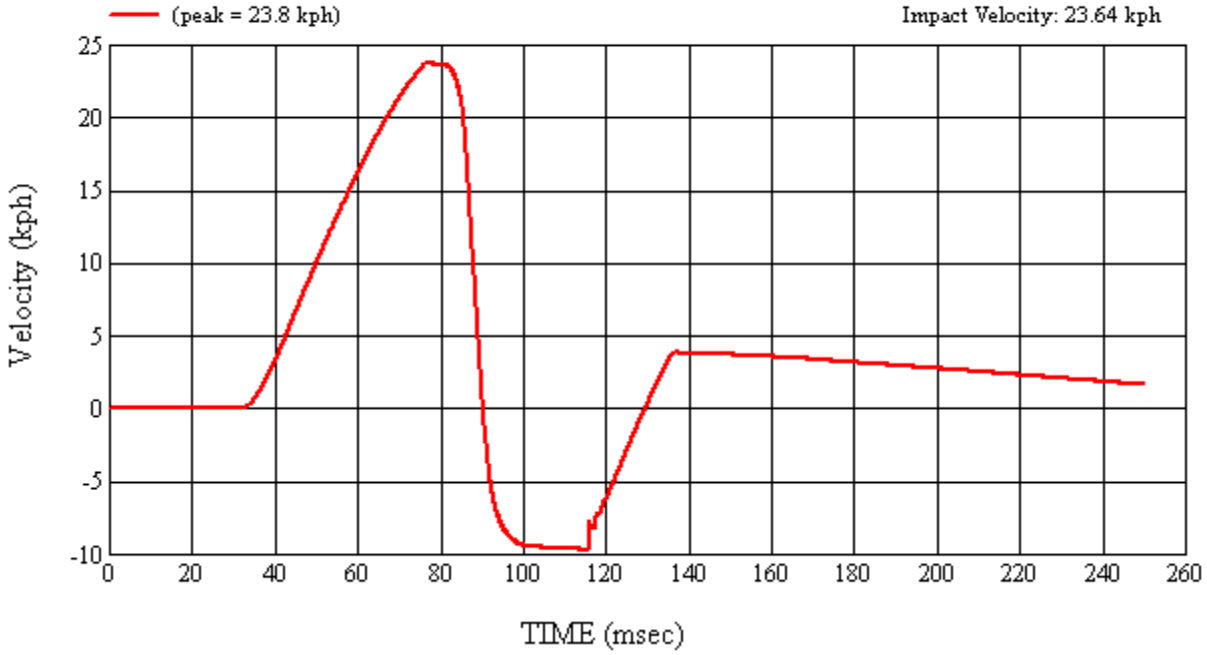


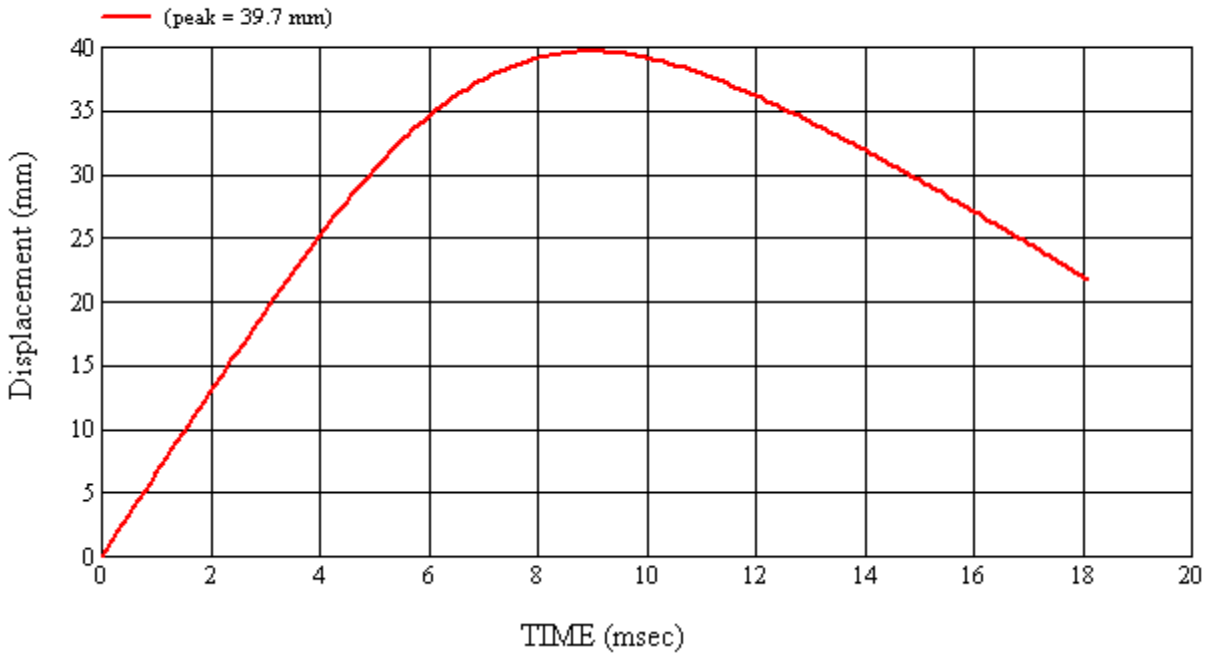



(peak = 131.4 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
-140
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

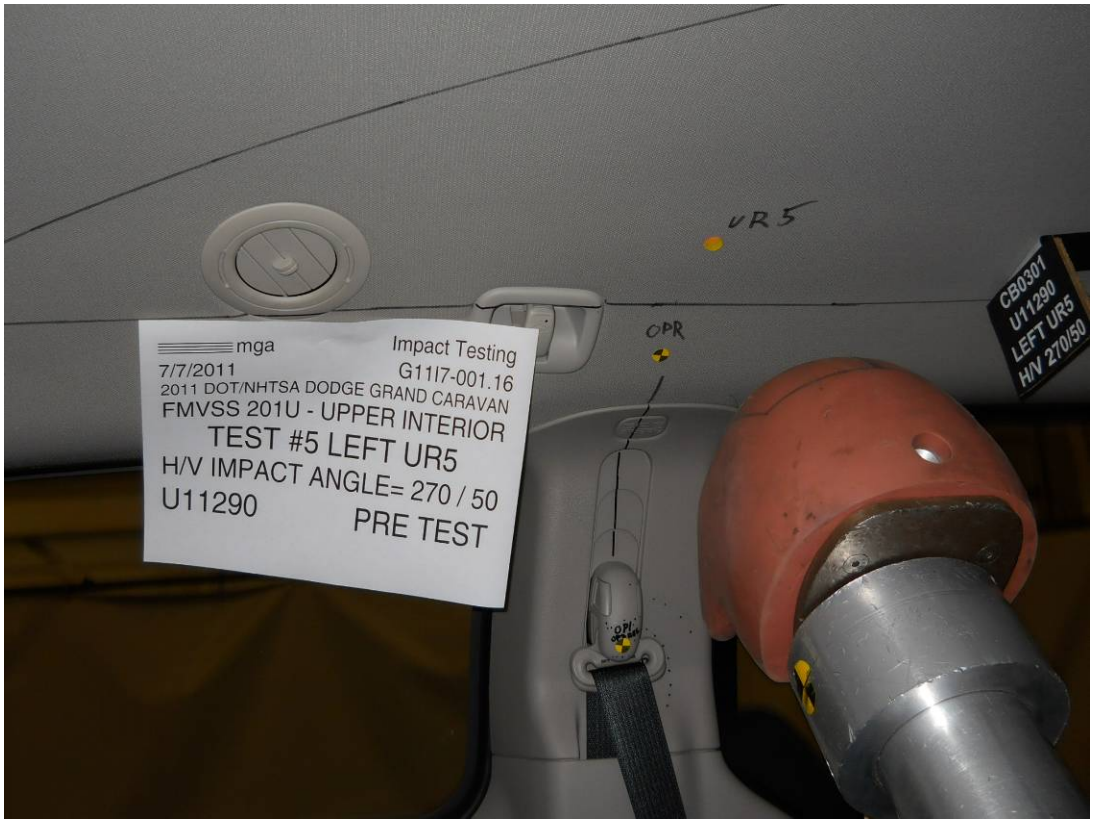

(peak = 13.4 G)
Head Y (G)
4
2
0
-2
-4
-6
-8
-10
-12
-14
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

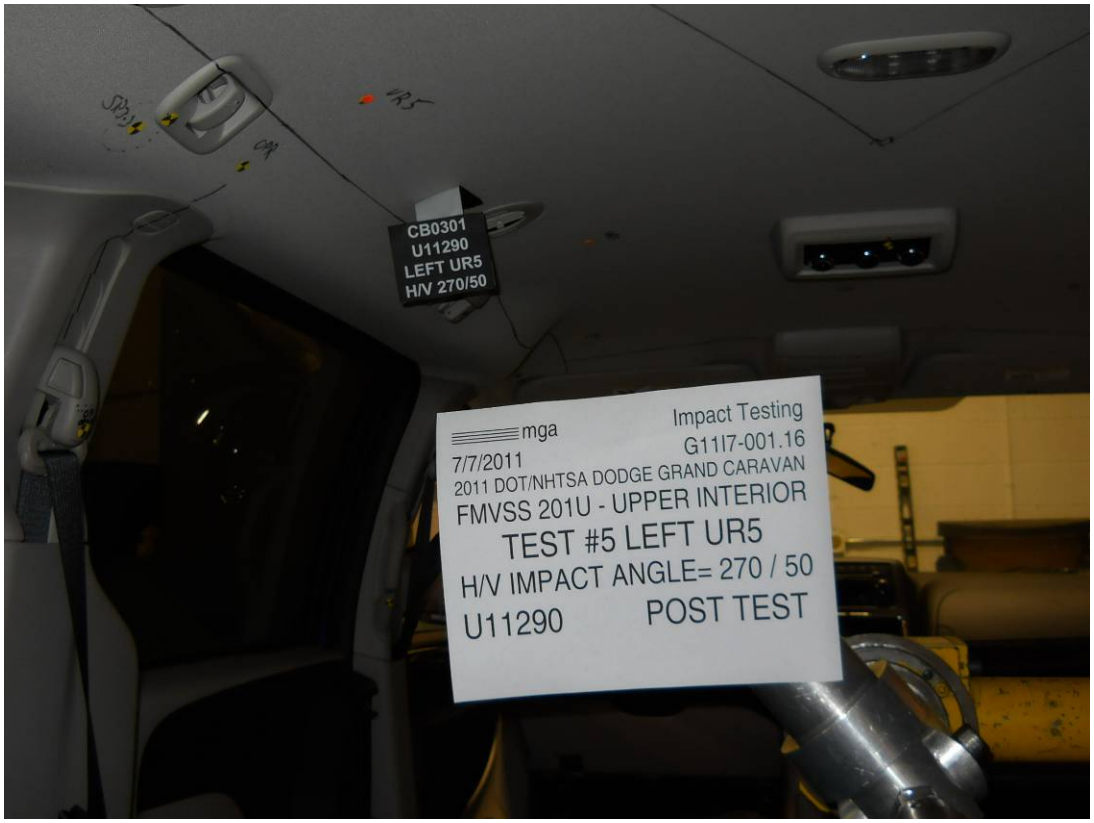

(peak = 28.0 G)
Head Z (G)
30
25
20
15
10
5
0
-5
-10
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

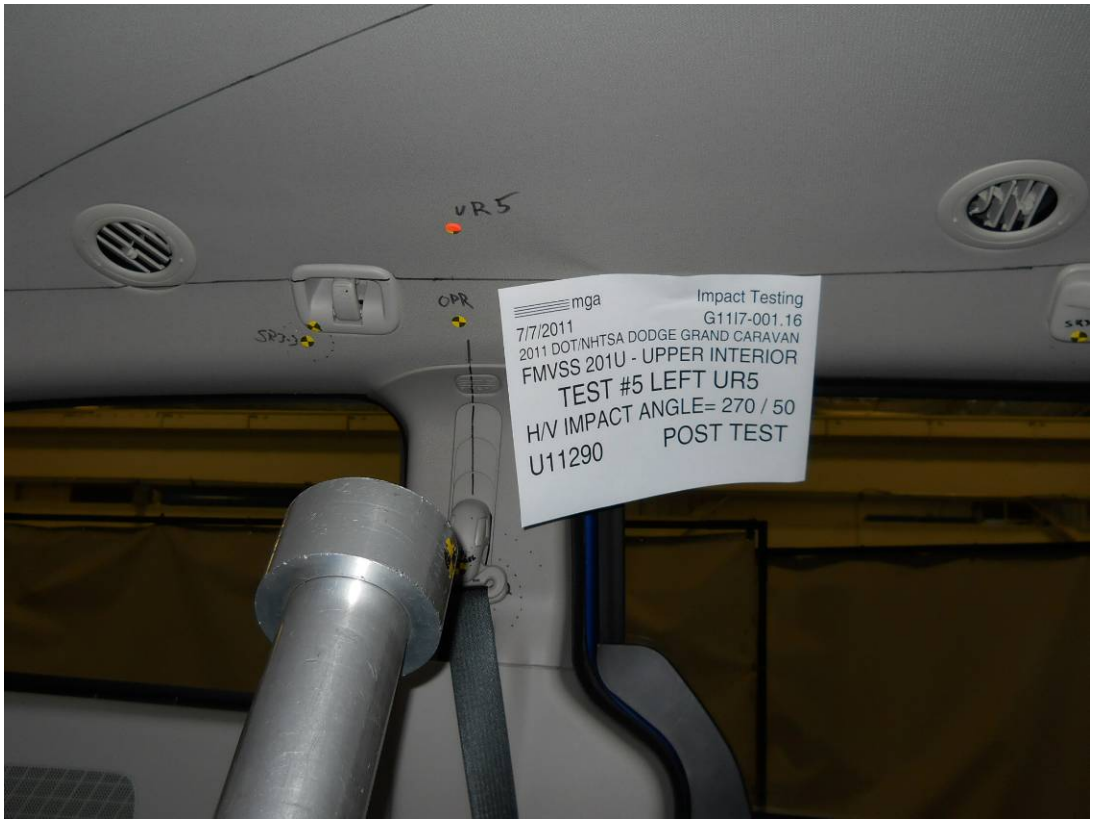

(peak = 23.8 kph)
Impact Velocity: 23.64 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 39.7 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)

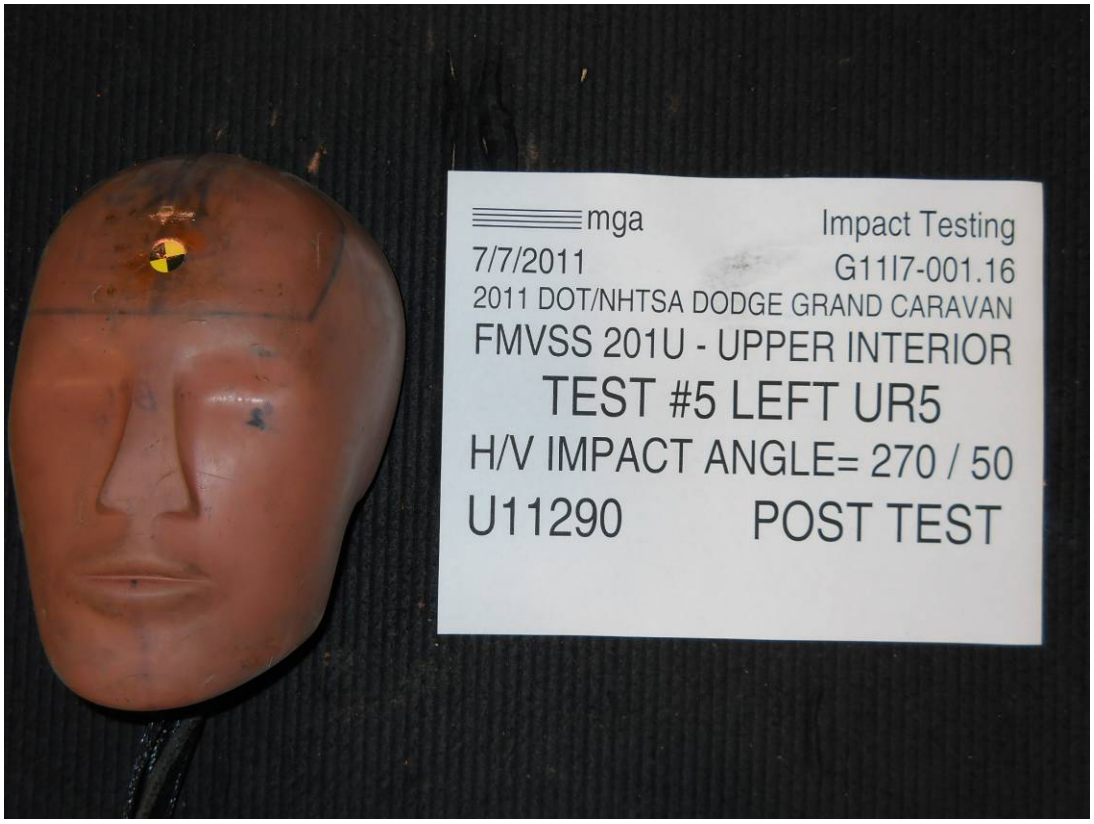

CB0301
U11290
LEFT UR5
H/V 270/50
mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11290
PRE TEST


UR5
OPR
CB0301
U11290
LEFT UR5
H/V 270/50
mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11290
PRE TEST


CB0301
U11290
LEFT UR5
H/V 270/50
mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11290
POST TEST


UR5
OPR
mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11290
POST TEST


UR5
CRR


mga
Impact Testing
7/7/2011
G11I7-001.16
2011 DOT/NHTSA DODGE GRAND CARAVAN
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT UR5
H/V IMPACT ANGLE= 270 / 50
U11290
POST TEST

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G11I7-001.16

VEHICLE YR/MAKE/MODEL:2011/DOT/NHTSA/Dodge Grand Caravan

GENERAL TEST PARAMETERS:

Test Number:#5

Target (Vehicle Side): UR5Left

Temperature:22.8C

MGA Test Reference No.:U11290

Humidity:50.2%

Approach Horizontal Angles:270º

Time of Test:2:52:31 PM

Approach Vertical Angles:50º

FMH Serial No:[037]

Additional Description:@ OP

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
435	355	16.3	23.8	20	2 Left

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

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

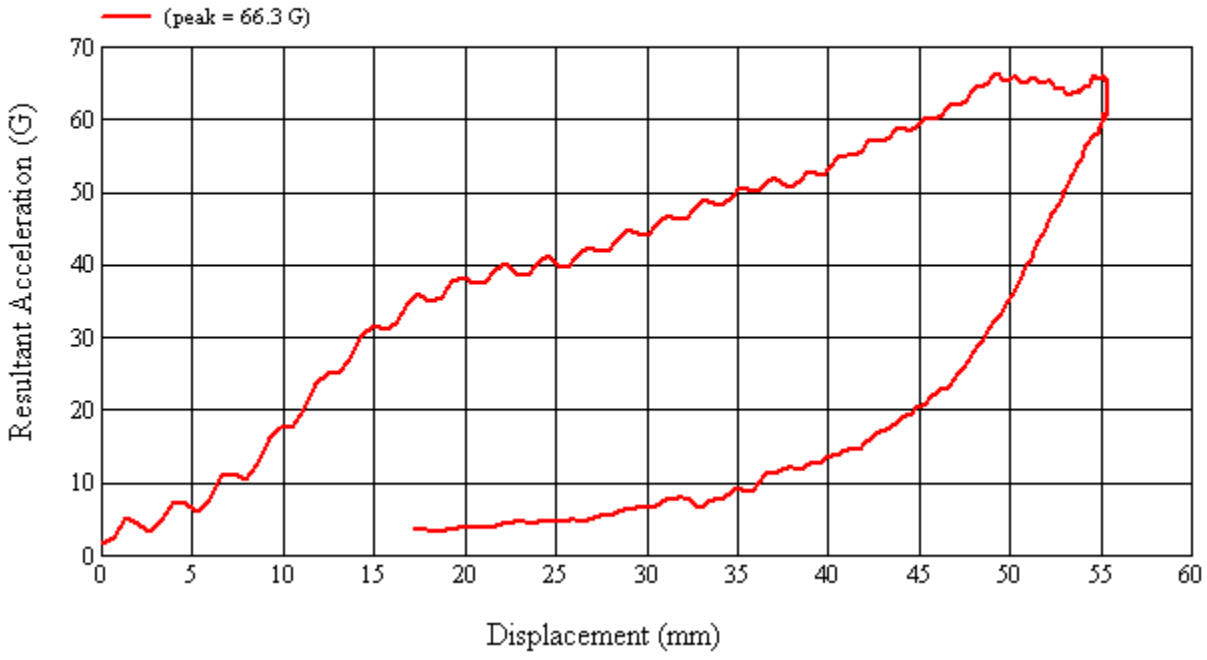
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

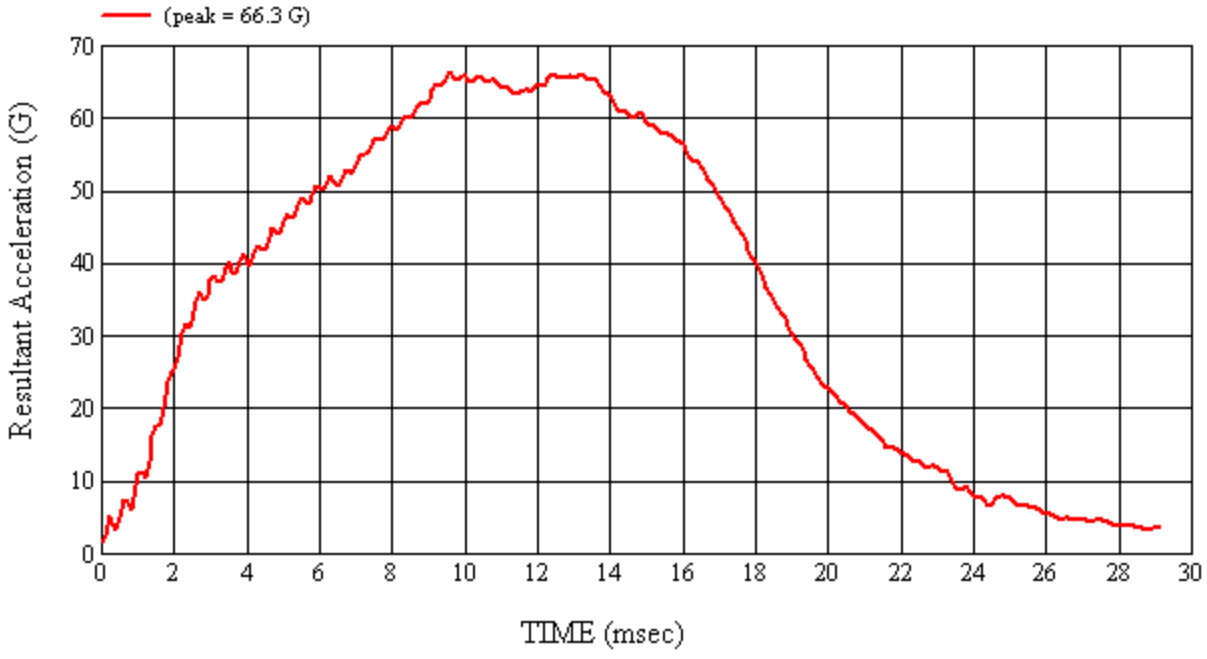
No visible damage

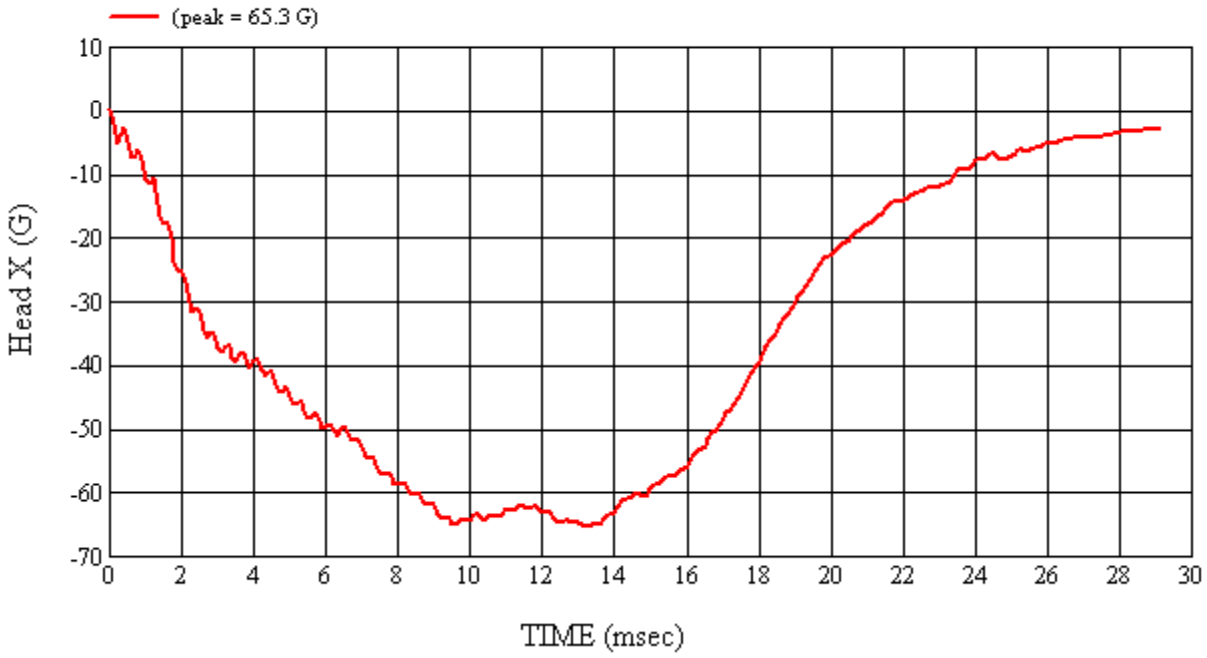
Recorded By: _____ Approved By*: _____ Date: 7/7/2011

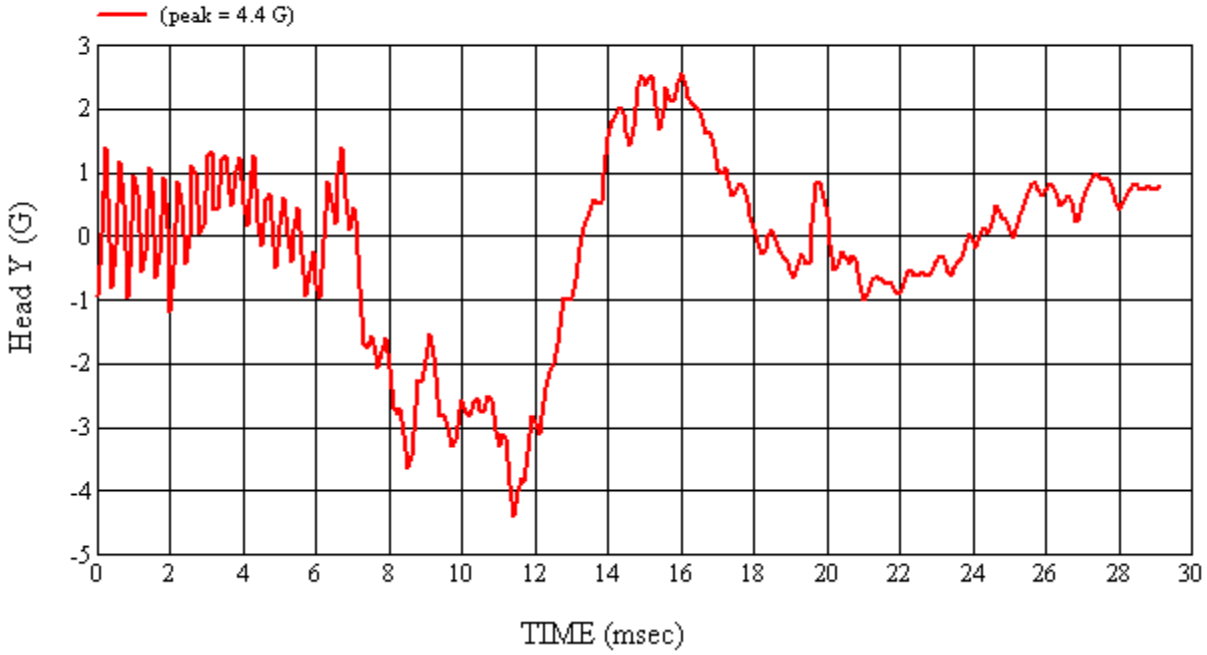
*Only necessary for NHTSA (Government) Compliance testing.

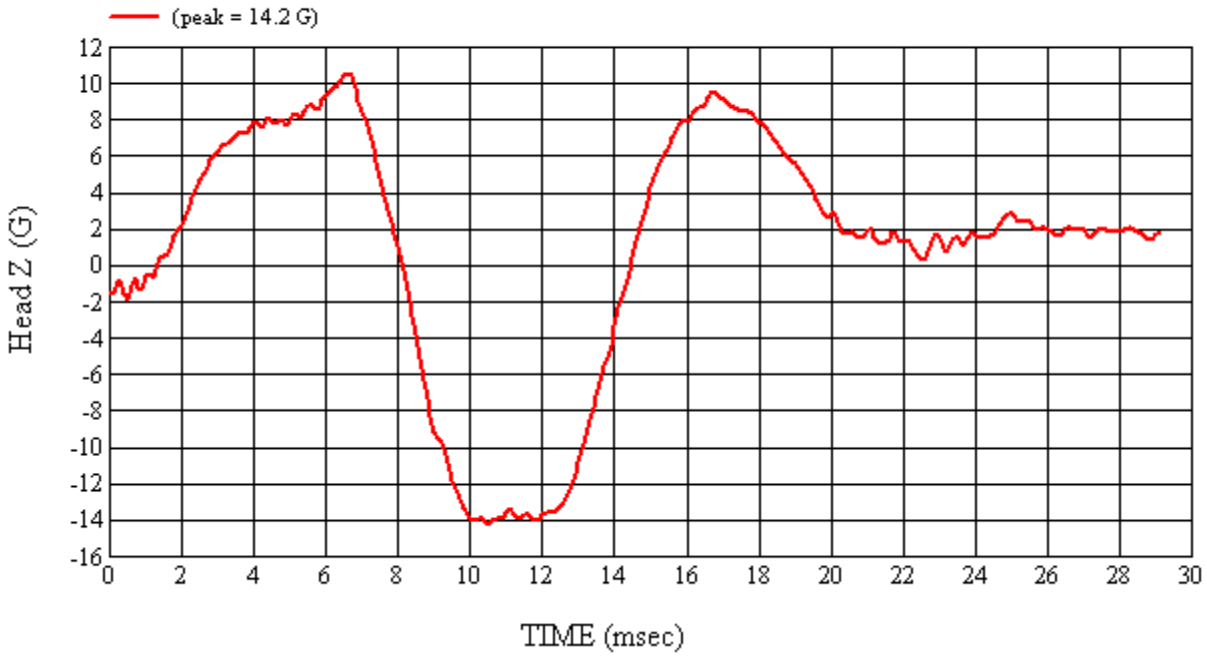
MGA Test #: U11290 Target Location: UR5, Left Side Test Date: 7/7/2011

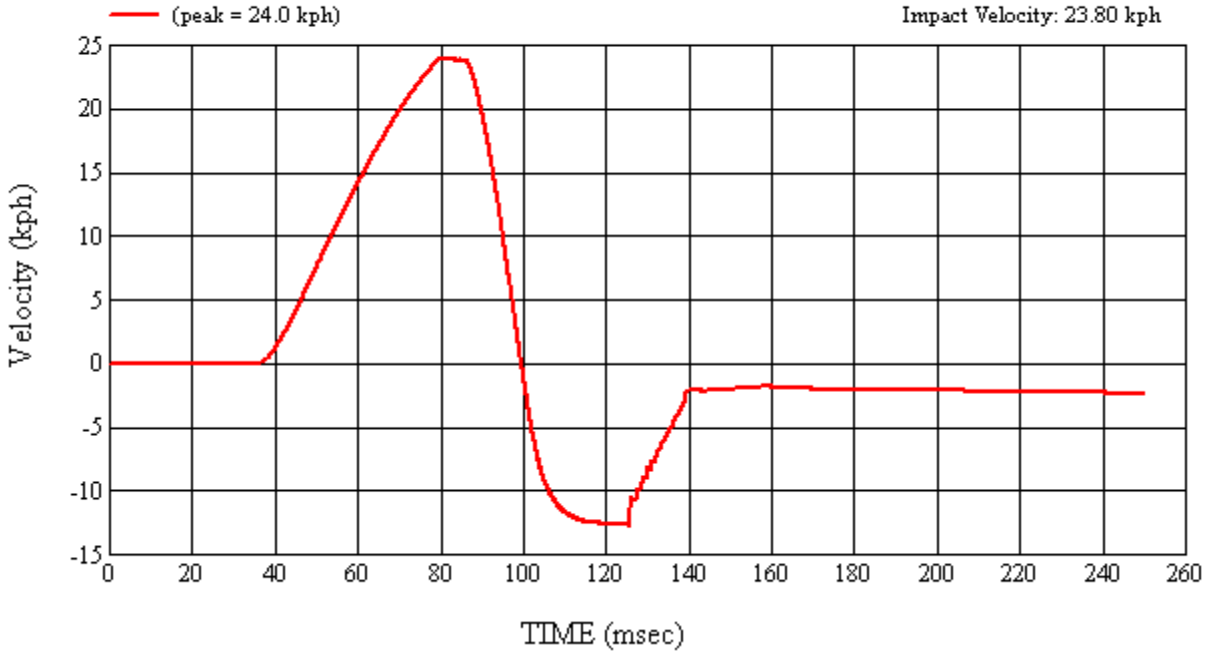


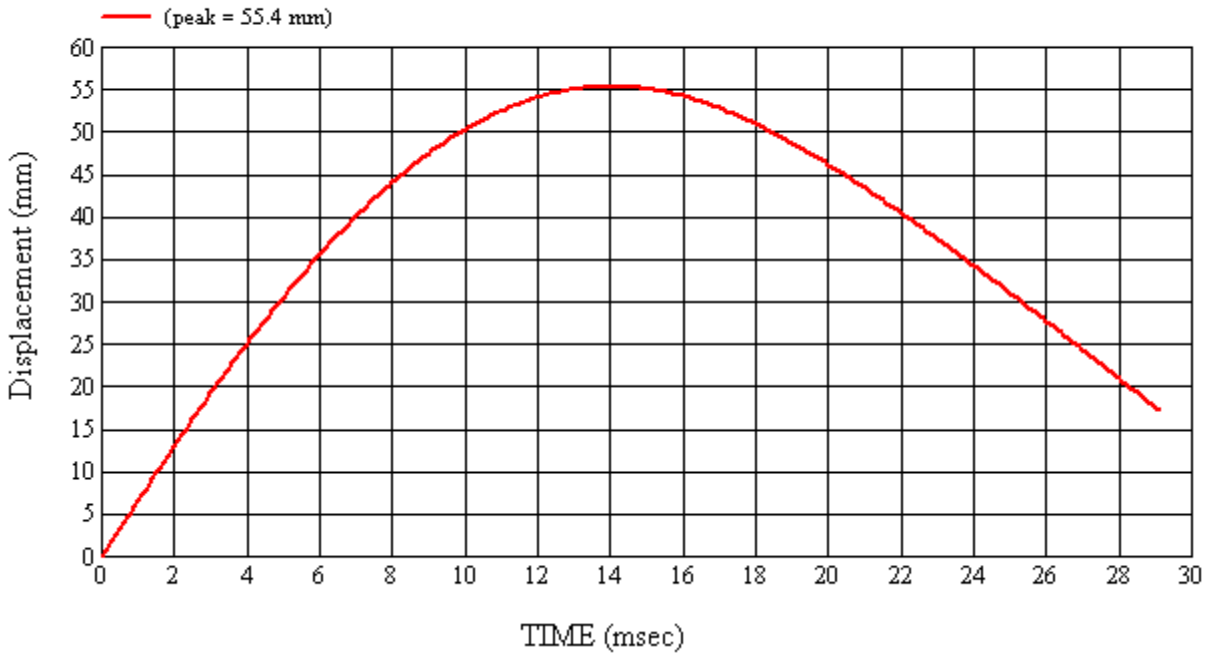



(peak = 65.3 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)


(peak = 4.4 G)
Head Y (G)
3
2
1
0
-1
-2
-3
-4
-5
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)


(peak = 14.2 G)
Head Z (G)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)


(peak = 24.0 kph)
Impact Velocity: 23.80 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 = 55.4 mm)
Displacement (mm)
60
55
50
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
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	 TPM112 -- MGA00049	 Measurement Targeting FMH setup Horizontal Measurement	 1 mm N/A 0.5°	Annual
*Temperature Recorder	Dickson	MGA00894	Record Temperature and Humidity	± 1°C ± 1% RH	Annual
* Scale	Detecto	MGA00081	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	7/6/2011	9.90	24.1	56.9	250.5	2.3	Yes
Post	#035	7/8/2011	9.90	23.2	48.2	255.0	6.9	Yes
Pre	#037	7/6/2011	9.96	24.2	55.6	257.5	6.5	Yes
Post	#037	7/11/2011	9.96	21.0	58.0	265.2	5.0	Yes
Pre	#038	7/6/2011	9.90	24.6	54.8	256.4	11.9	Yes
Post	#038	7/11/2011	9.90	21.1	58.1	256.7	12.3	Yes

4-1 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

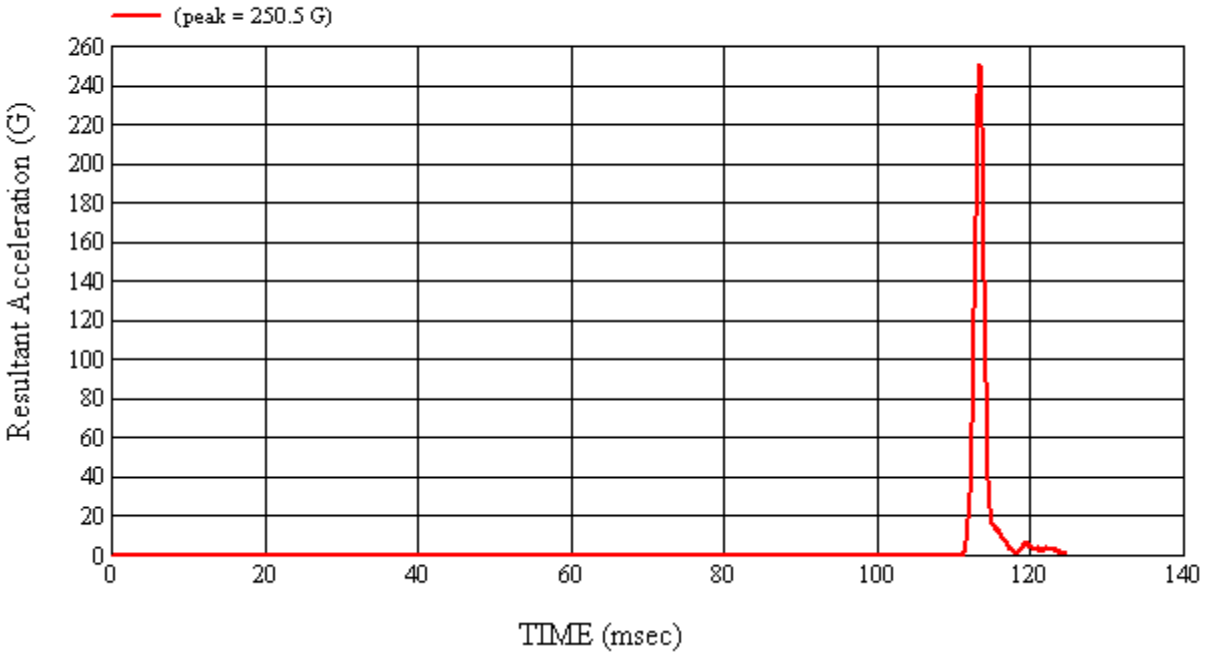
HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 7/6/2011 CALIBRATION TIME: 3:10:58 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	24.1
Relative Humidity	10% to 70%	56.9
Peak Resultant Acceleration	225 G's to 275 G's	250.5
Peak Lateral Acceleration	15 G's Maximum	2.3
Unimodal Acceleration Curve	YES	YES

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

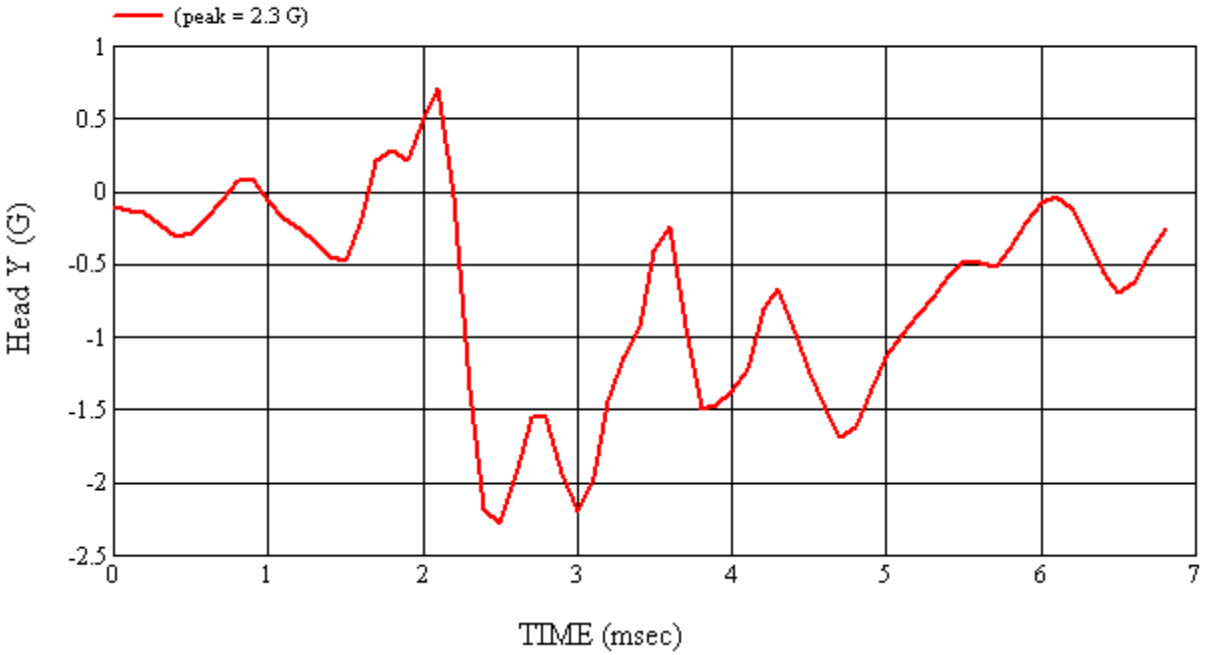
REMARKS:

RECORDED BY: _____ DATE: __7/6/2011____

APPROVED BY: _____



Head 035 (Pre) Calibration #H35037



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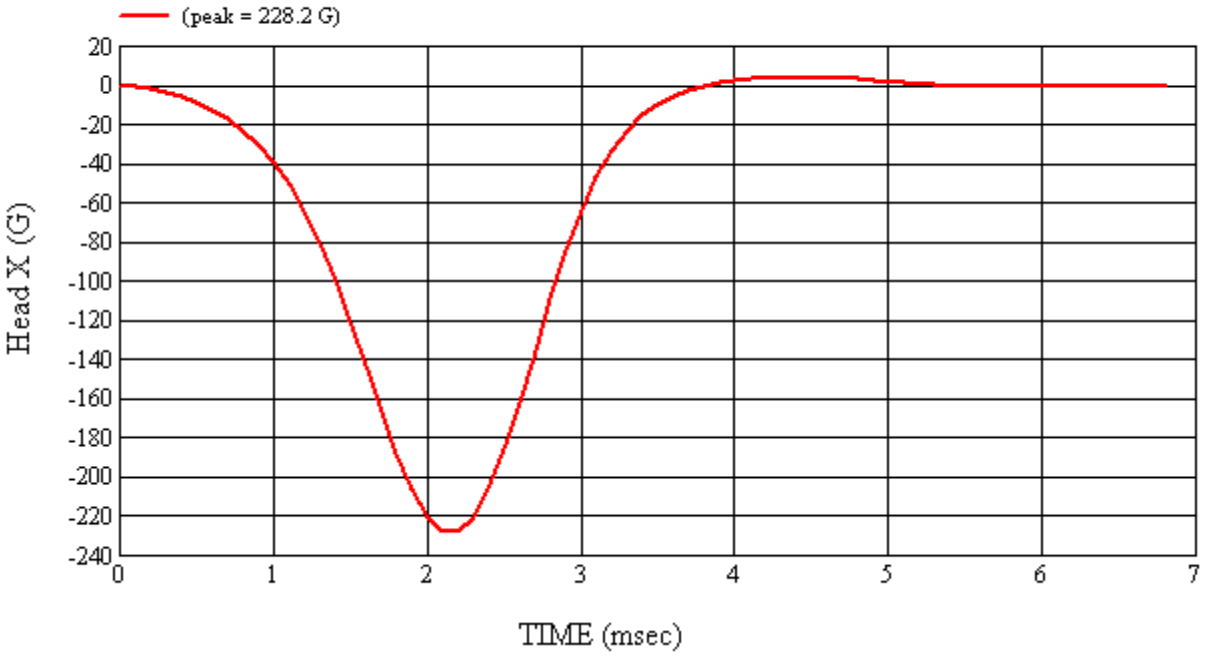

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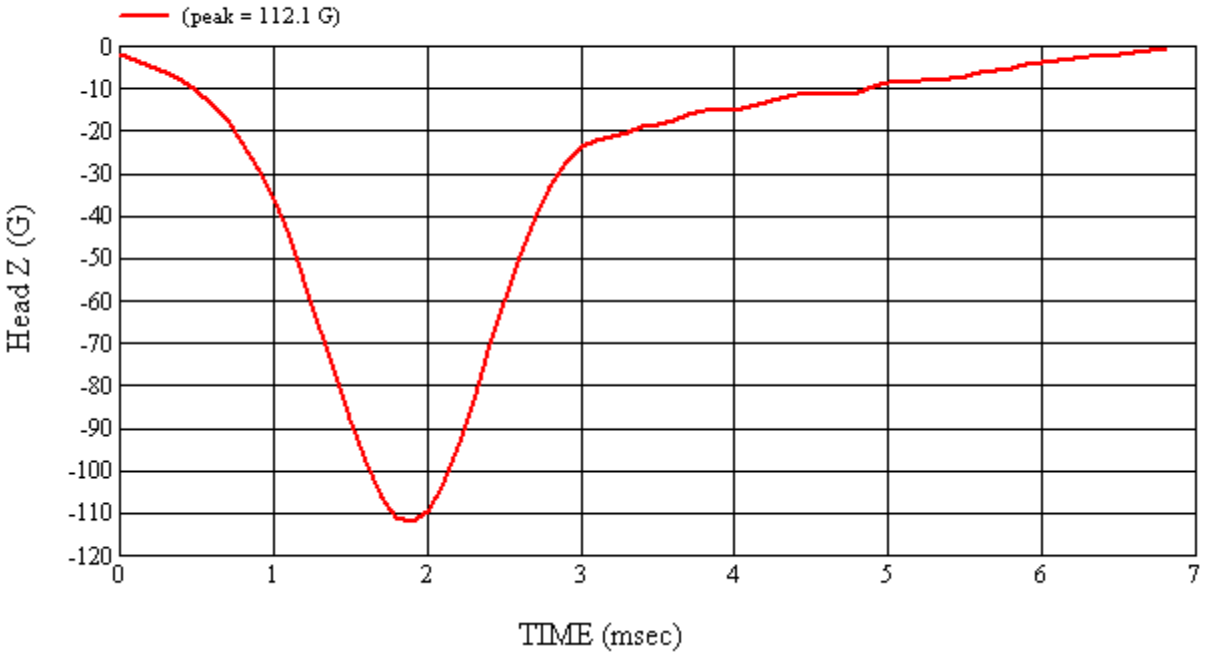


Head 035 (Pre) Calibration #H35037

4-2 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 7/8/2011 CALIBRATION TIME: 4:06:07 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	23.2
Relative Humidity	10% to 70%	48.2
Peak Resultant Acceleration	225 G's to 275 G's	255.0
Peak Lateral Acceleration	15 G's Maximum	6.9
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION

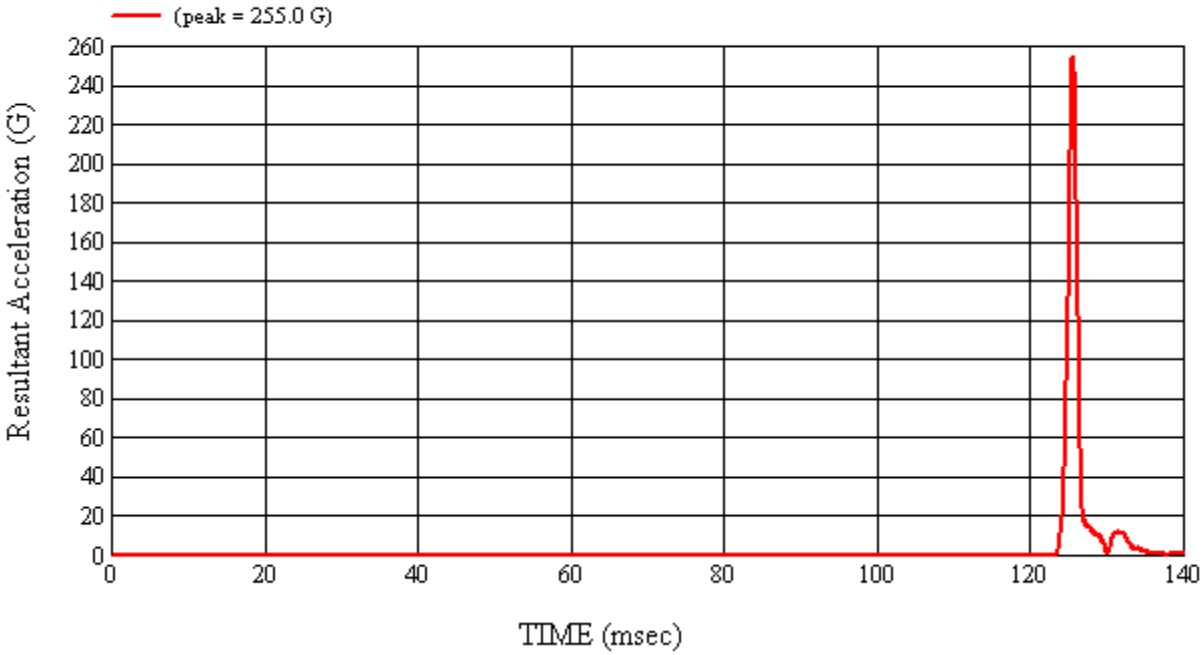
HEAD ACCELEROMETERS

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

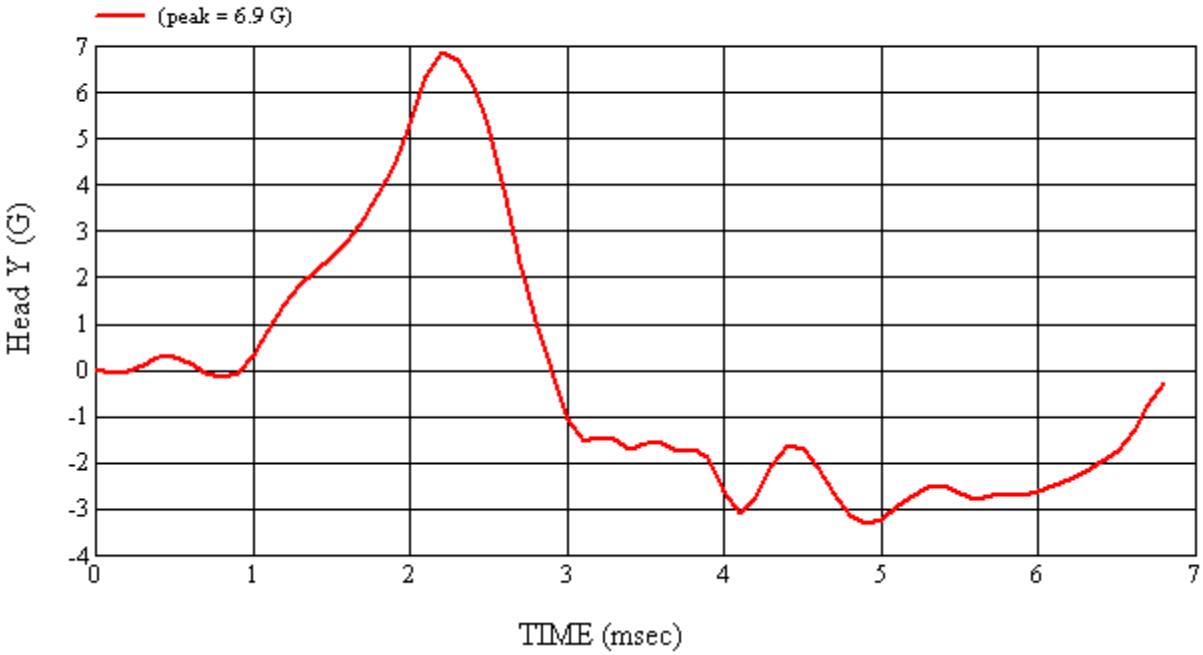
REMARKS:

RECORDED BY: _____ DATE: __7/8/2011____

APPROVED BY: _____



Head 035 (Post) Calibration #H35038



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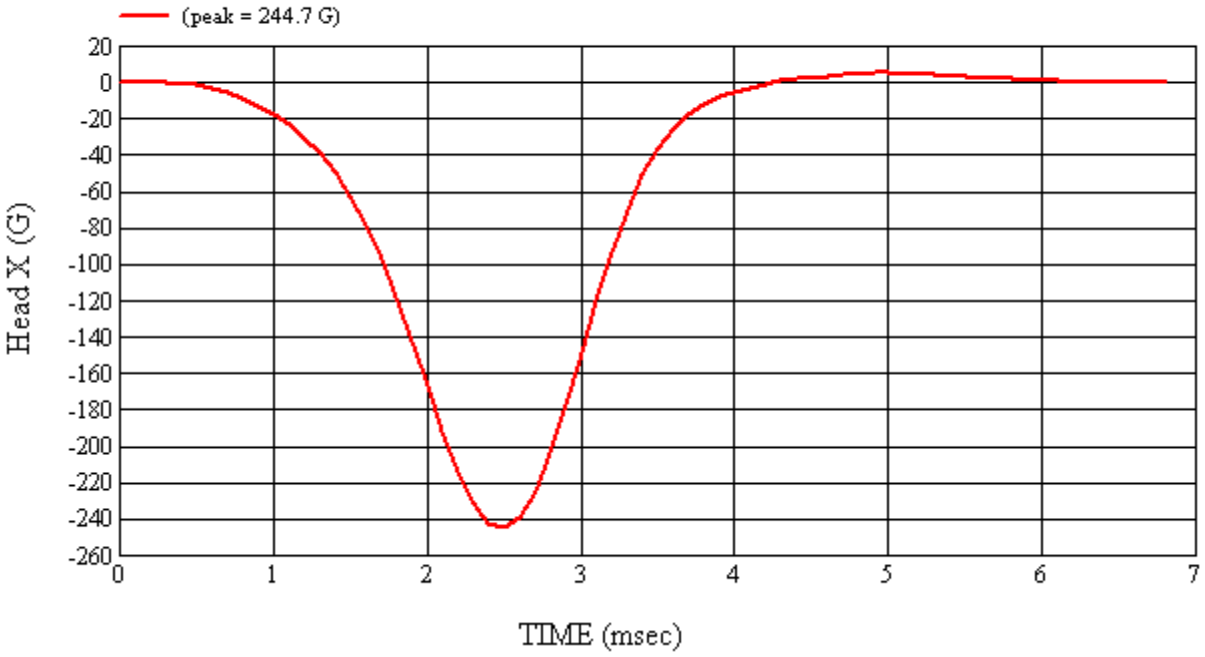

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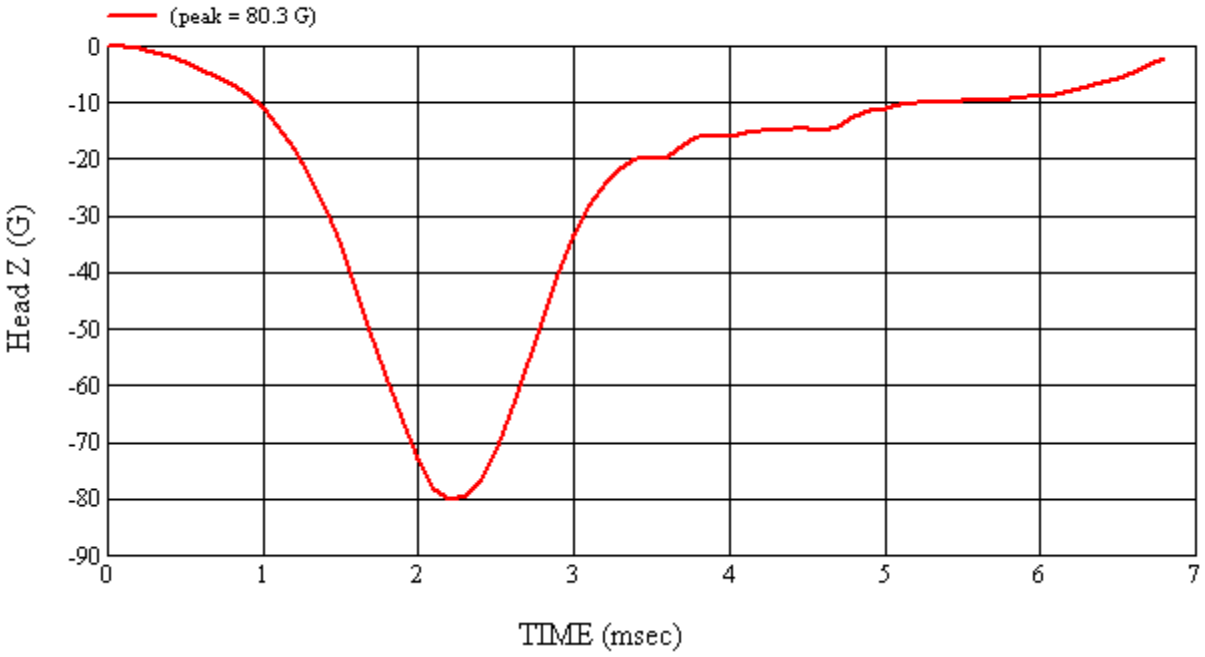


Head 035 (Post) Calibration #H35038

4-3 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

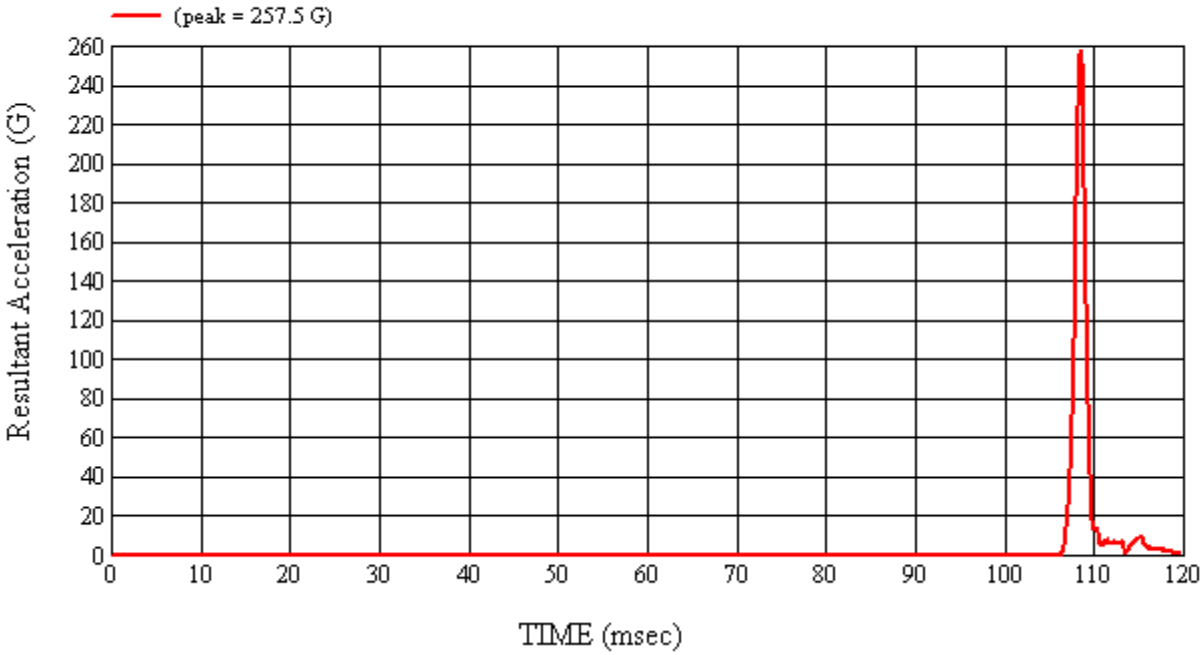
HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 7/6/2011 CALIBRATION TIME: 3:24:54 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	24.2
Relative Humidity	10% to 70%	55.6
Peak Resultant Acceleration	225 G's to 275 G's	257.5
Peak Lateral Acceleration	15 G's Maximum	6.5
Unimodal Acceleration Curve	YES	YES

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

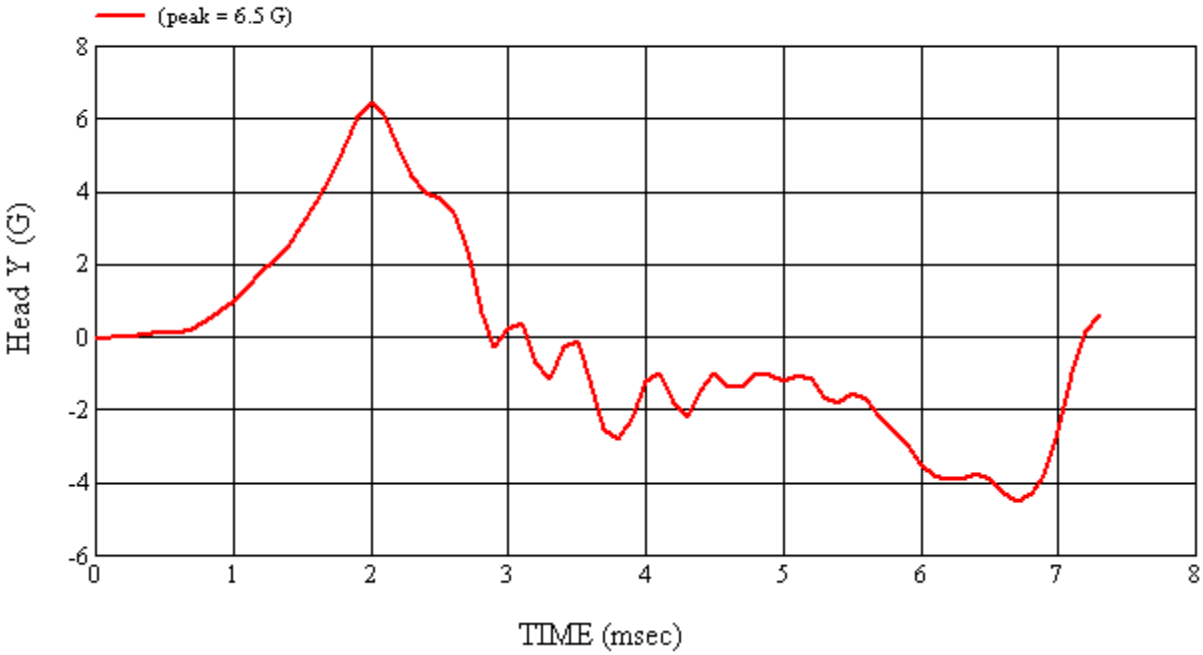
REMARKS:

RECORDED BY: _____ DATE: __7/6/2011____

APPROVED BY: _____



Head 037 (Pre) Calibration #H37037



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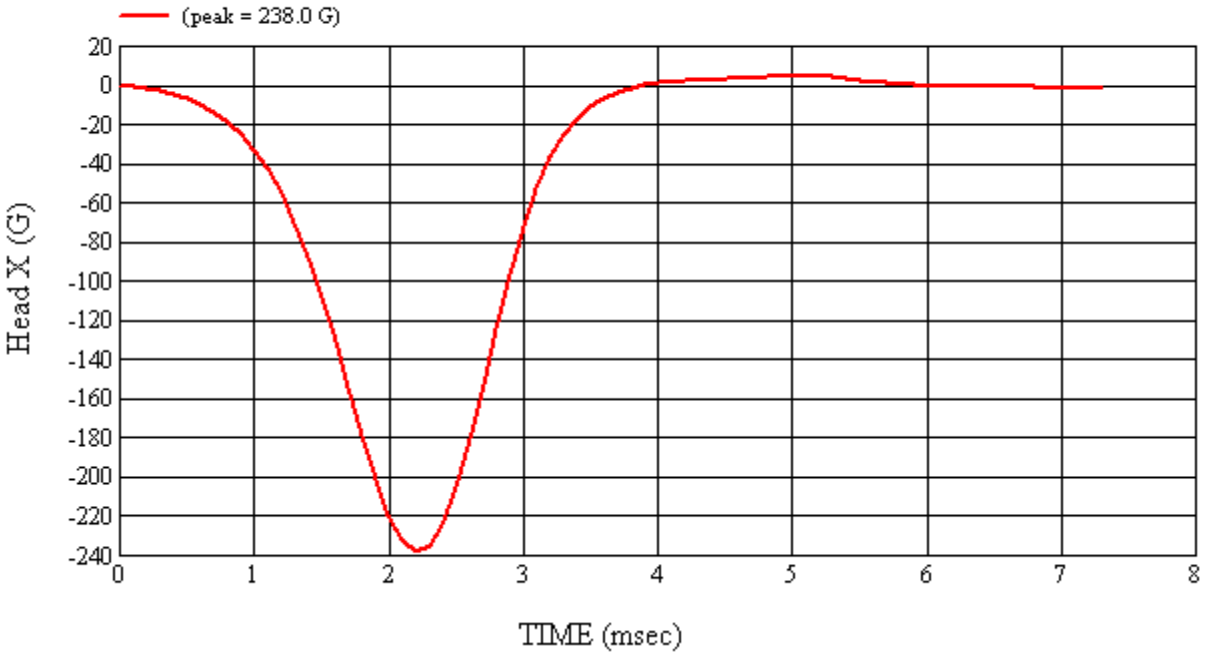

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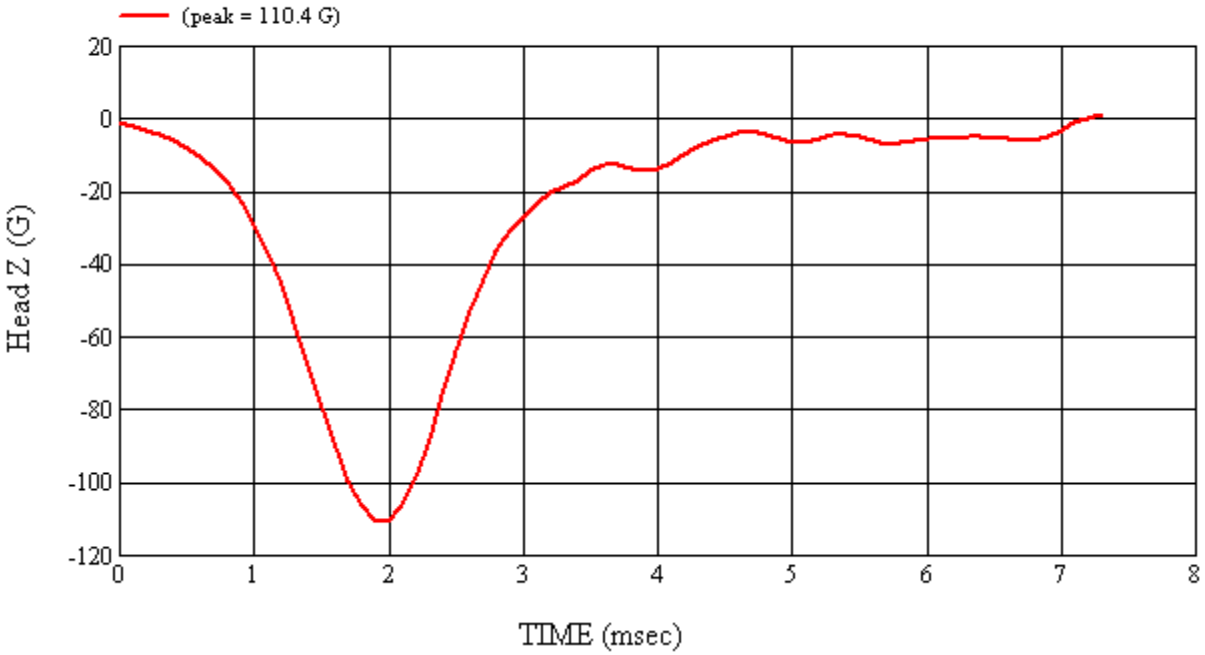


Head 037 (Pre) Calibration #H37037

4-4 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 7/11/2011 CALIBRATION TIME: 7:43:36 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	21.0
Relative Humidity	10% to 70%	58.0
Peak Resultant Acceleration	225 G's to 275 G's	265.2
Peak Lateral Acceleration	15 G's Maximum	5.0
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION

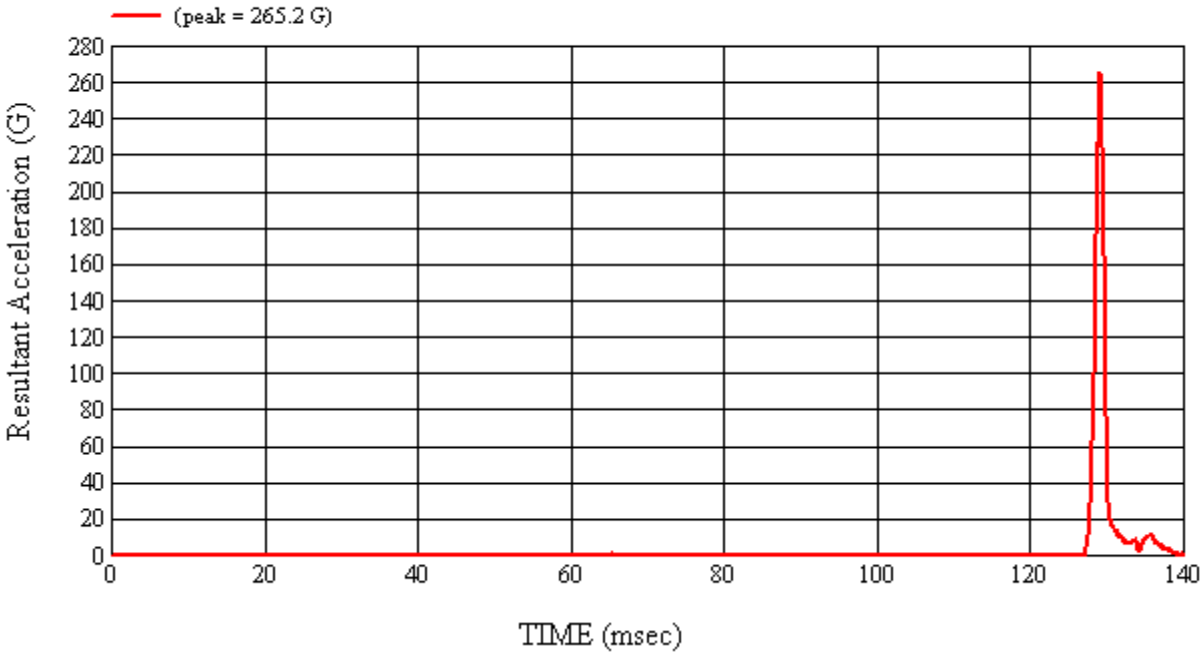
HEAD ACCELEROMETERS

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

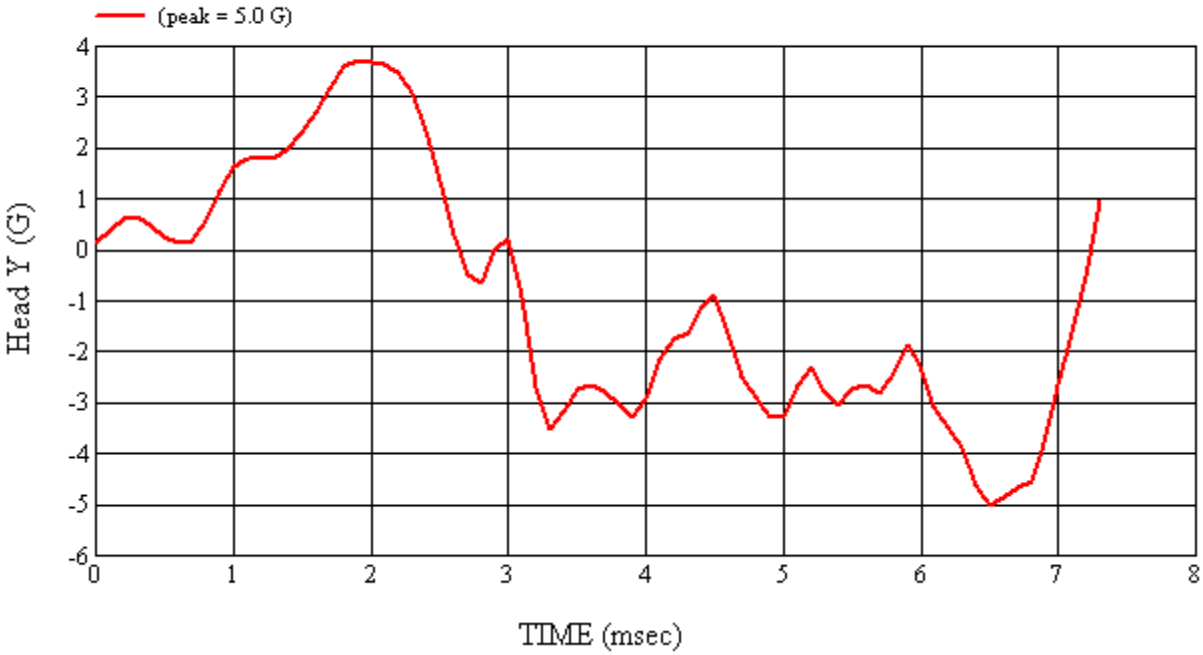
REMARKS:

RECORDED BY: _____ DATE: __7/11/2011____

APPROVED BY: _____



Head 037 (Post) Calibration #H37038



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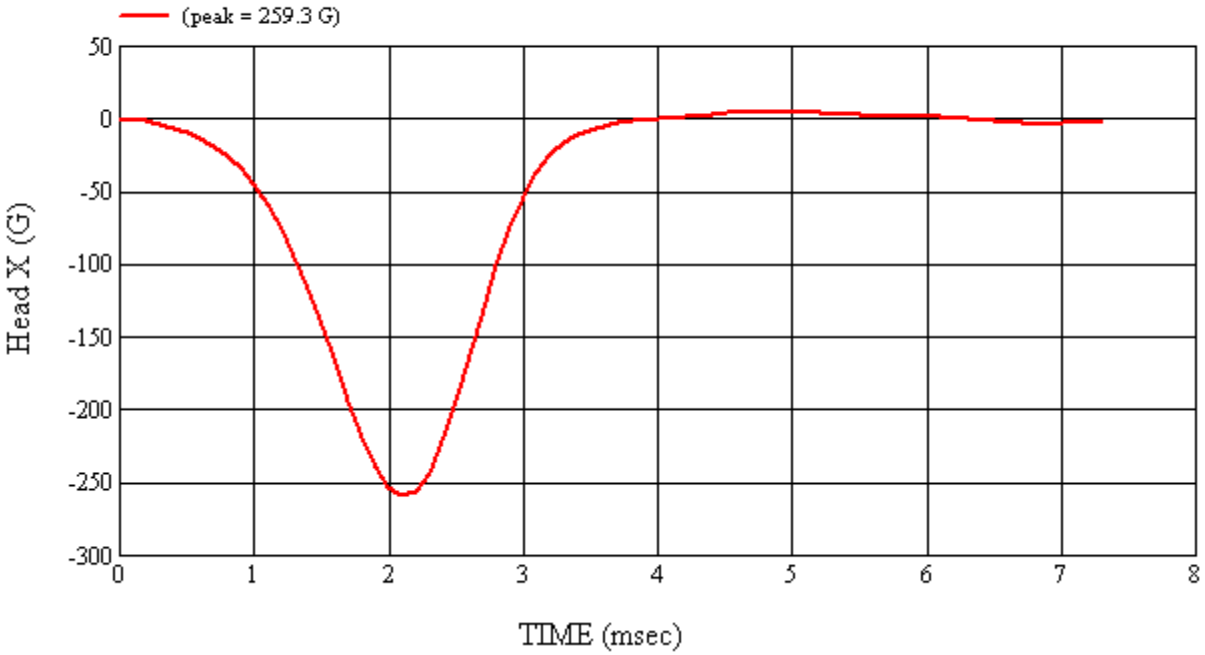

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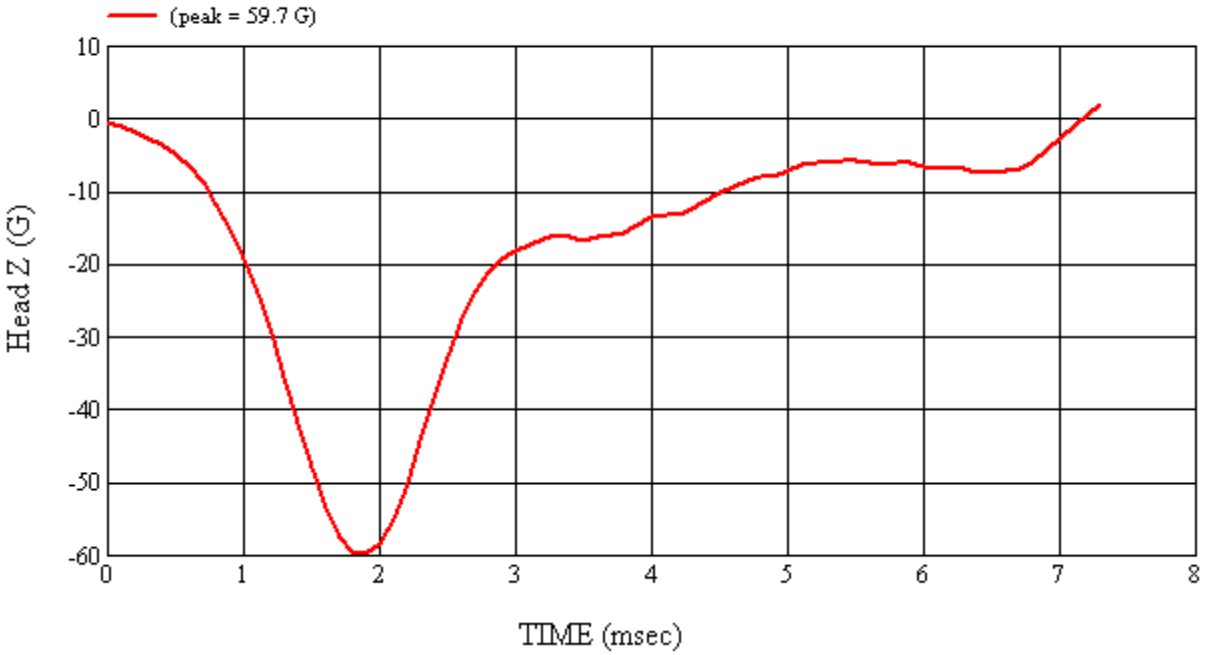


Head 037 (Post) Calibration #H37038

4-5 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

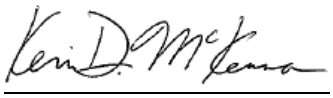
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 7/6/2011 CALIBRATION TIME: 3:45:02 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	24.6
Relative Humidity	10% to 70%	54.8
Peak Resultant Acceleration	225 G's to 275 G's	256.4
Peak Lateral Acceleration	15 G's Maximum	11.9
Unimodal Acceleration Curve	YES	YES

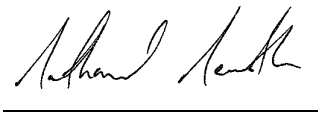
FMH INSTRUMENTATION

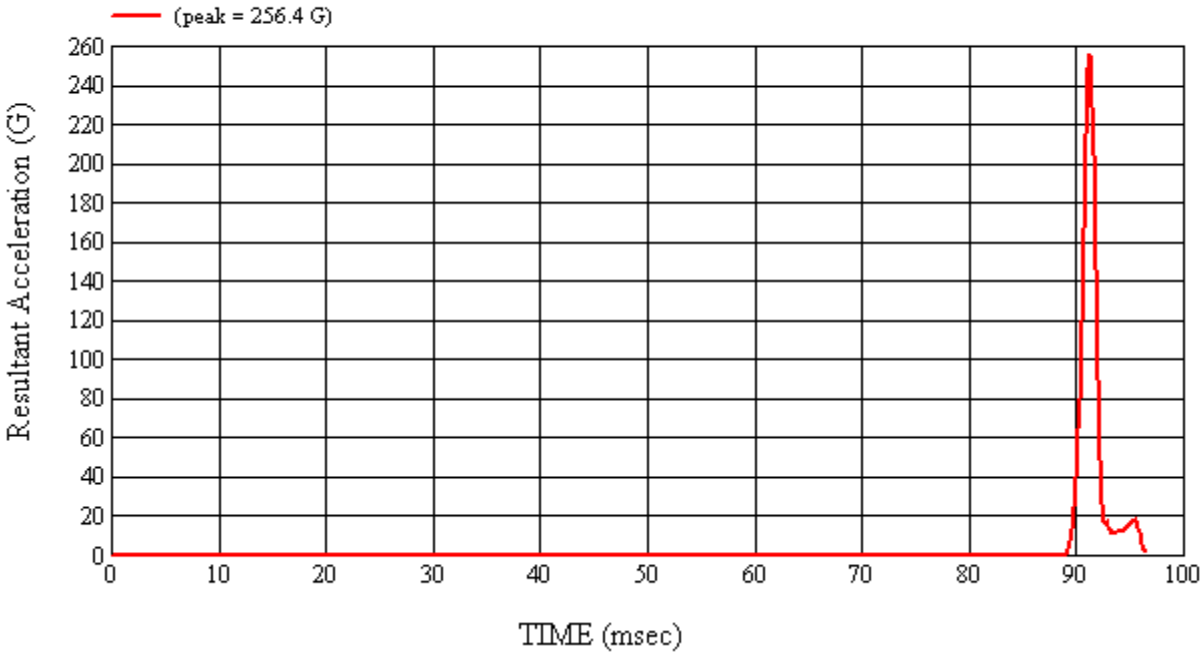
HEAD ACCELEROMETERS

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

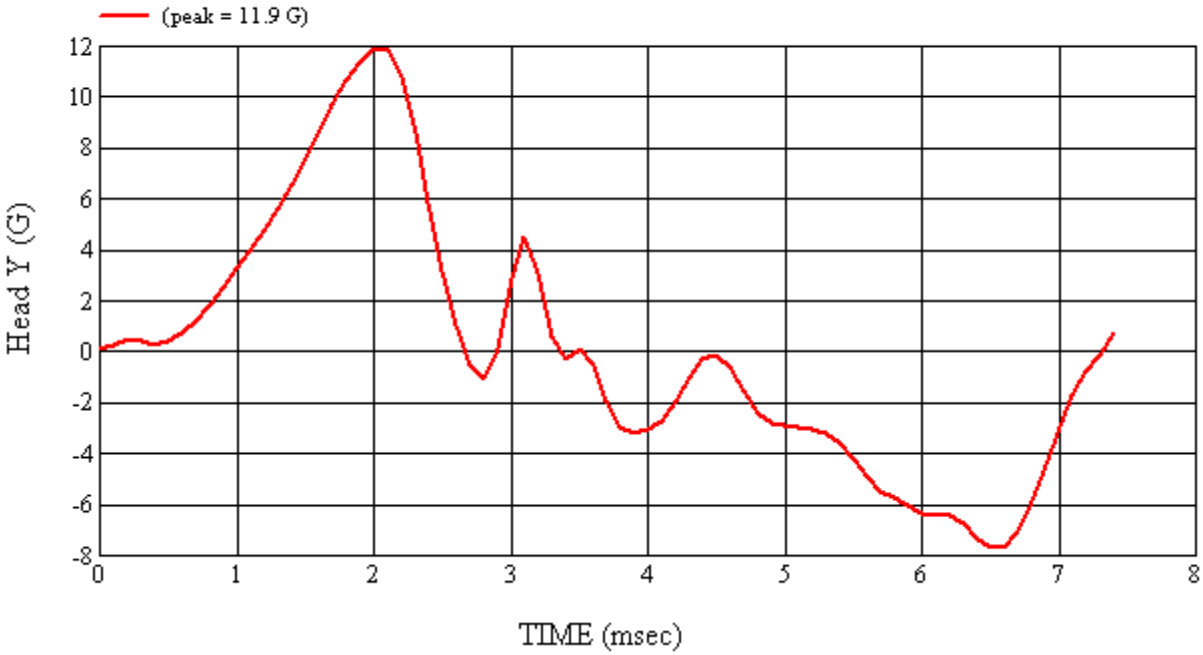
REMARKS:

RECORDED BY:  DATE: 7/6/2011

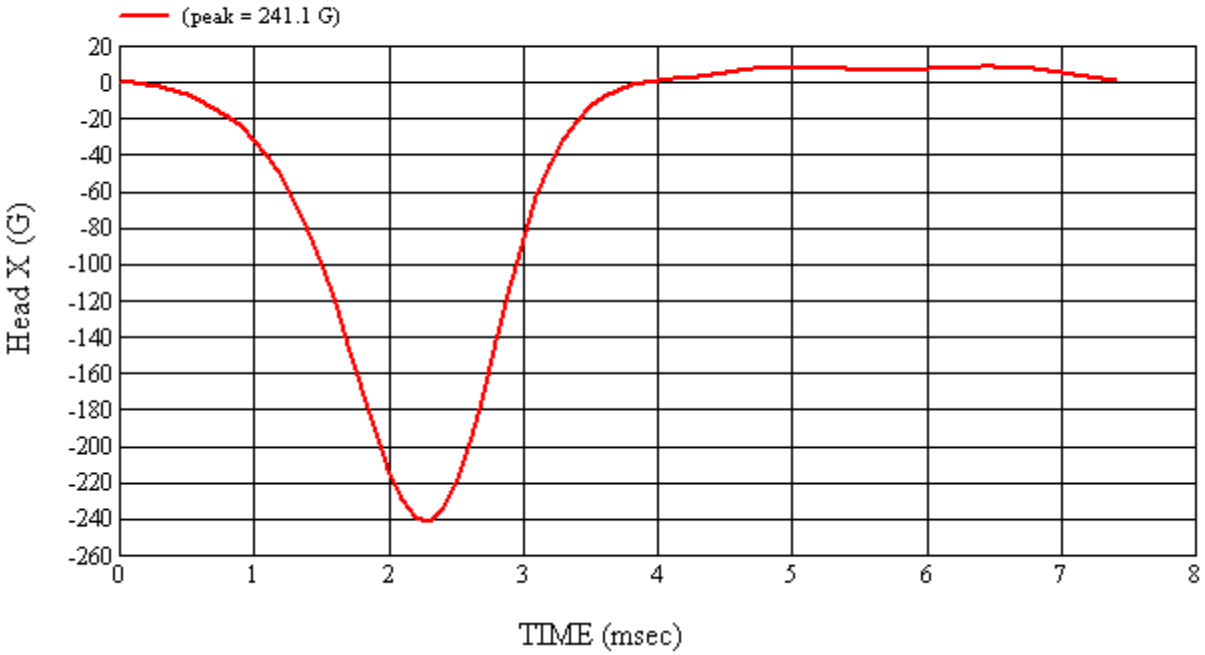
APPROVED BY: 



Head 038 (Pre) Calibration #H38037



Head 038 (Pre) Calibration #H38037



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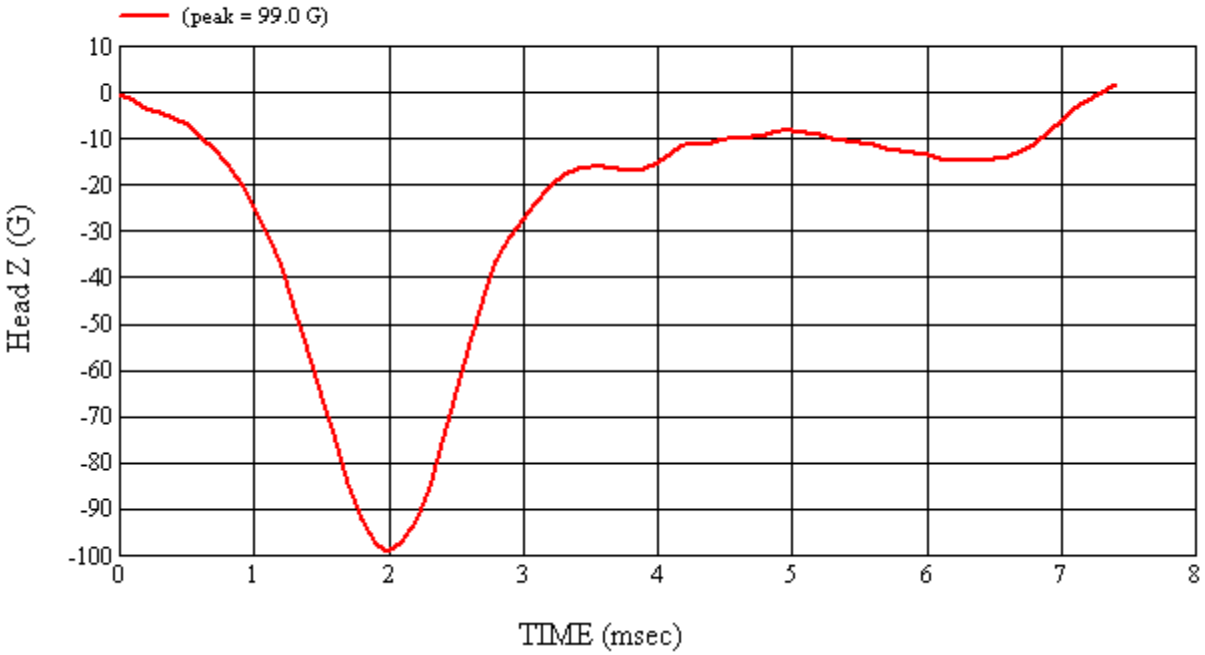


Head 038 (Pre) Calibration #H38037

4-6 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

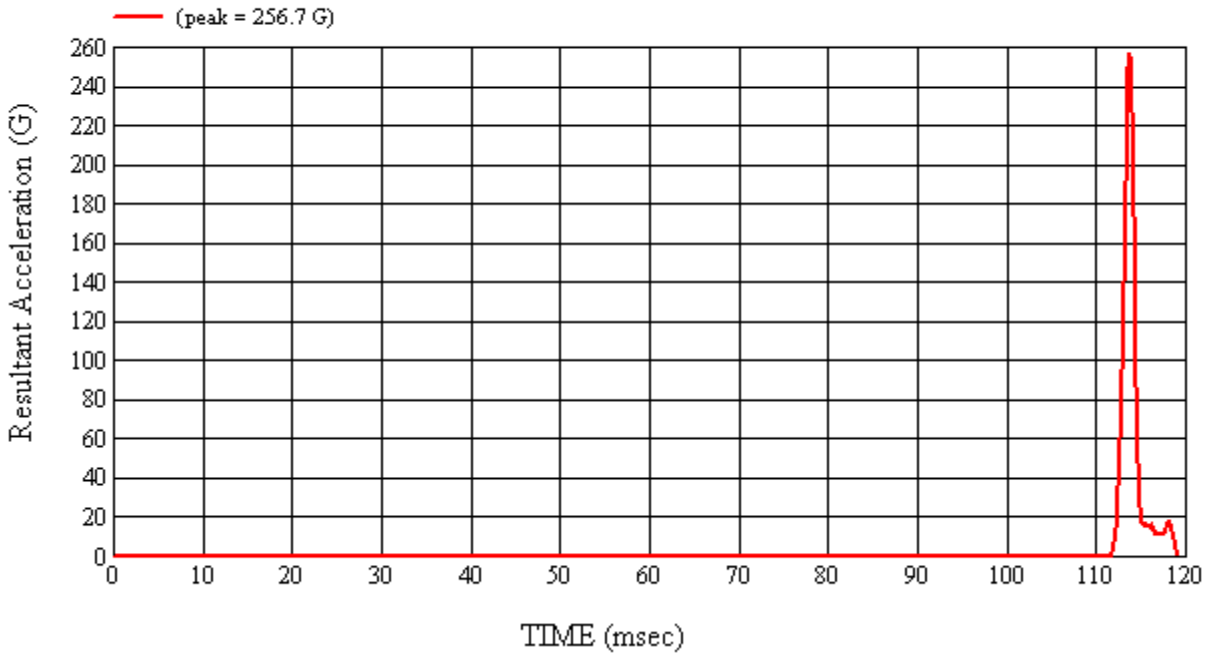
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 7/11/2011 CALIBRATION TIME: 7:55:36 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	21.1
Relative Humidity	10% to 70%	58.1
Peak Resultant Acceleration	225 G's to 275 G's	256.7
Peak Lateral Acceleration	15 G's Maximum	12.3
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	02/07/11	08/07/11
2	ENDEVCO	7264-2000	J36197	02/07/11	08/07/11
3	ENDEVCO	7264-2000	J36353	02/07/11	08/07/11

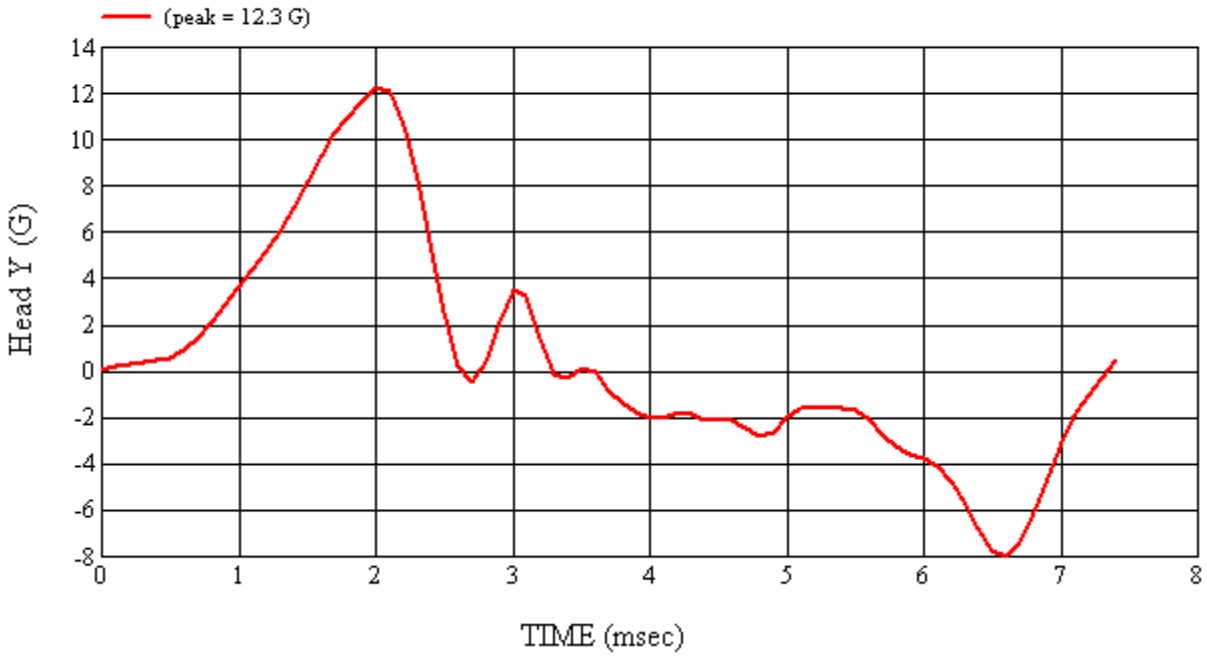
REMARKS:

RECORDED BY:  DATE: 7/11/2011

APPROVED BY: 



Head 038 (Post) Calibration #H38038



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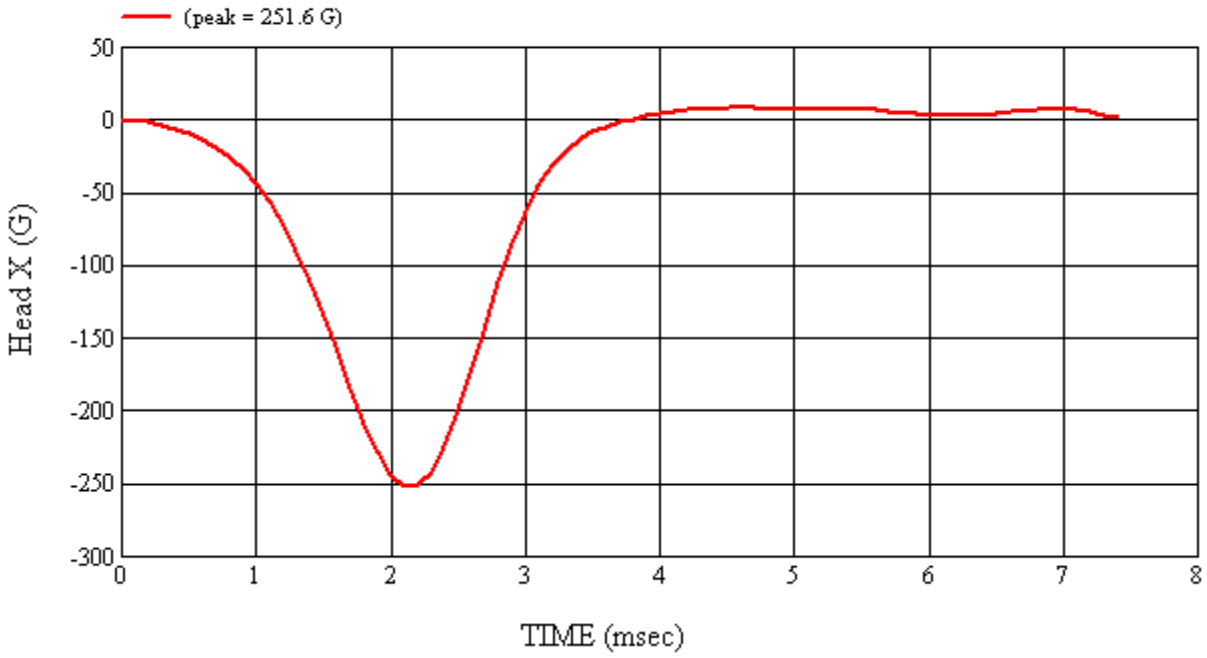
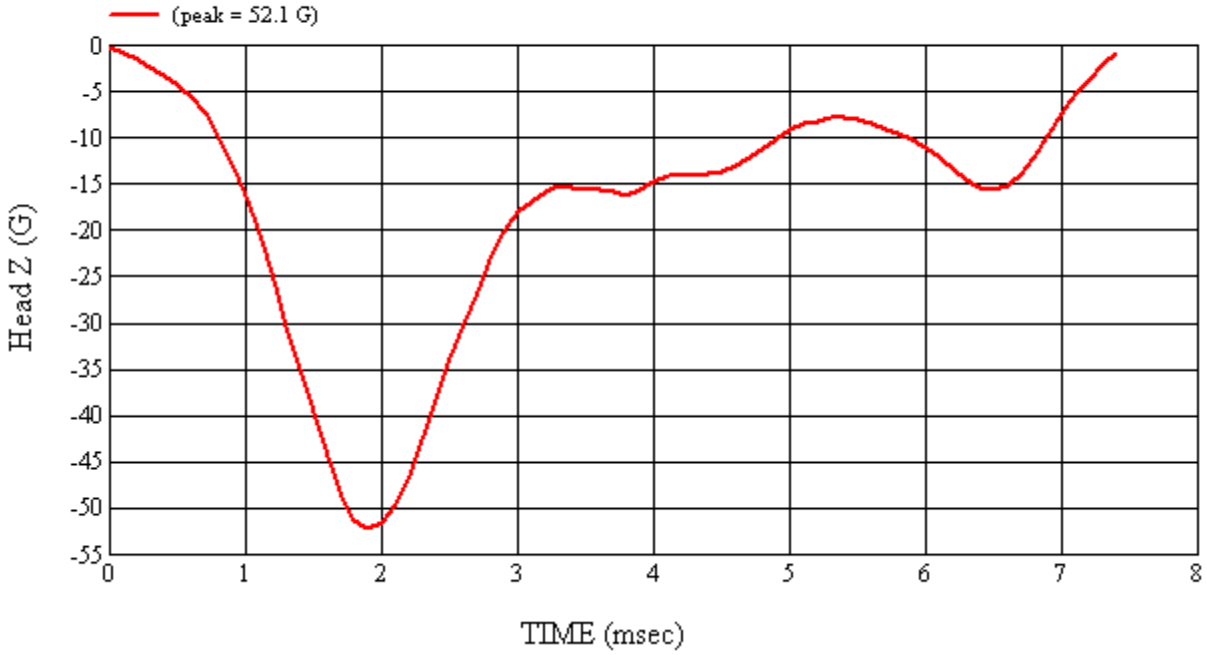


Head 038 (Post) Calibration #H38038



Head 038 (Post) Calibration #H38038

5.0 PHOTOGRAPHS

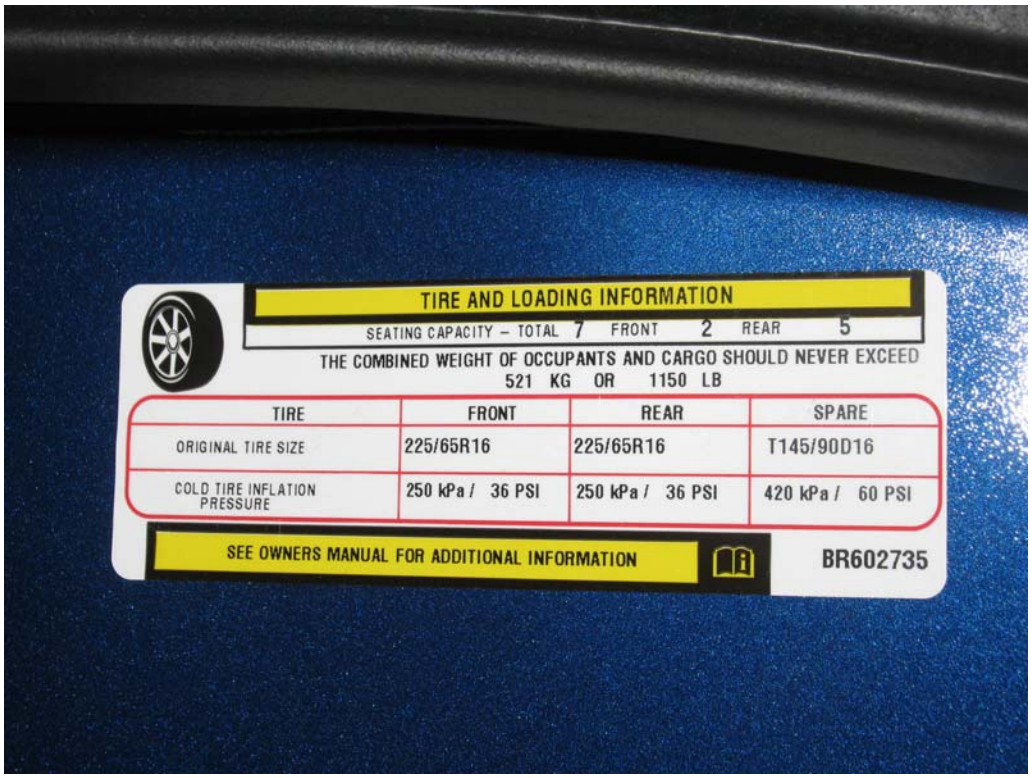
As Delivered – Left Side View

As Delivered – Right Side View

As Delivered – ¾ Front View From Left Side

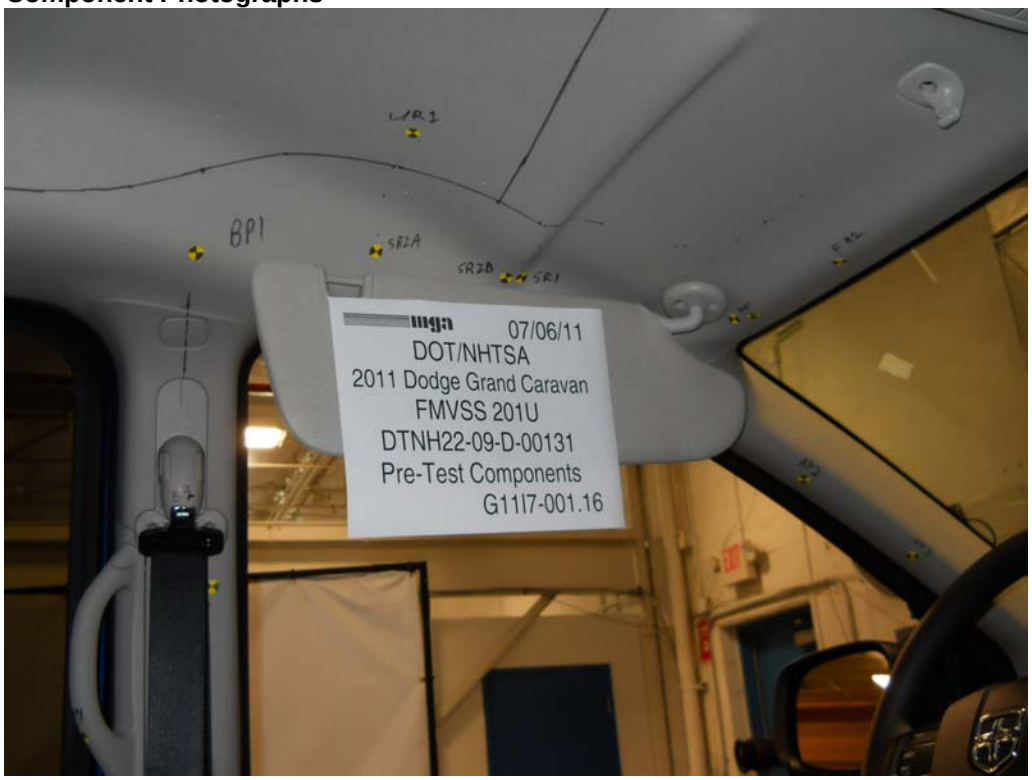
As Delivered – ¾ Rear View From Right Side

As Delivered – Vehicle's Certification Label

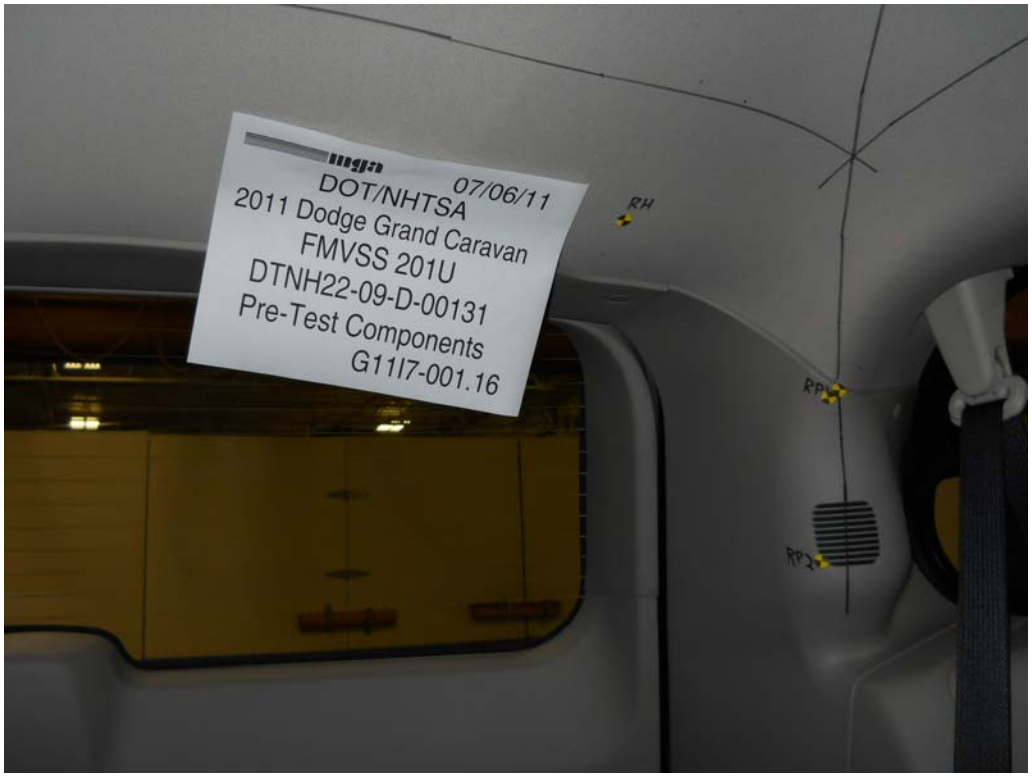


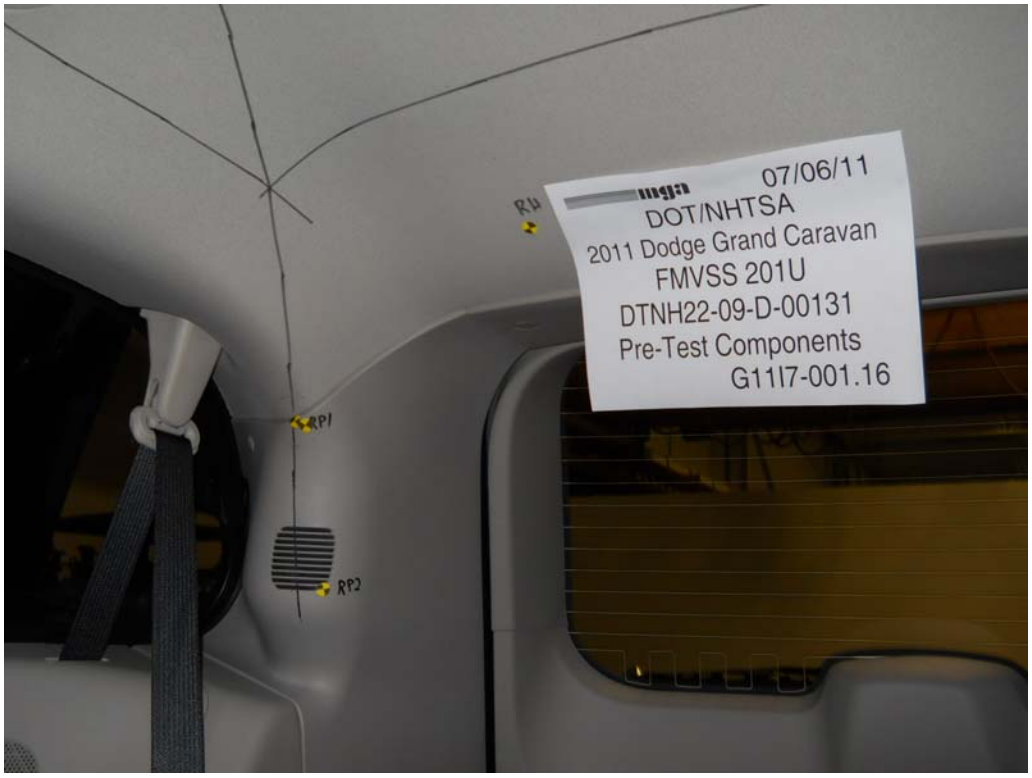
As Delivered – Vehicle's Tire Information Label

Pre-Test Component Photographs




UR5
4R3
OPR
SD
07/06/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.16


07/06/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.16
RH
RP1
RP2

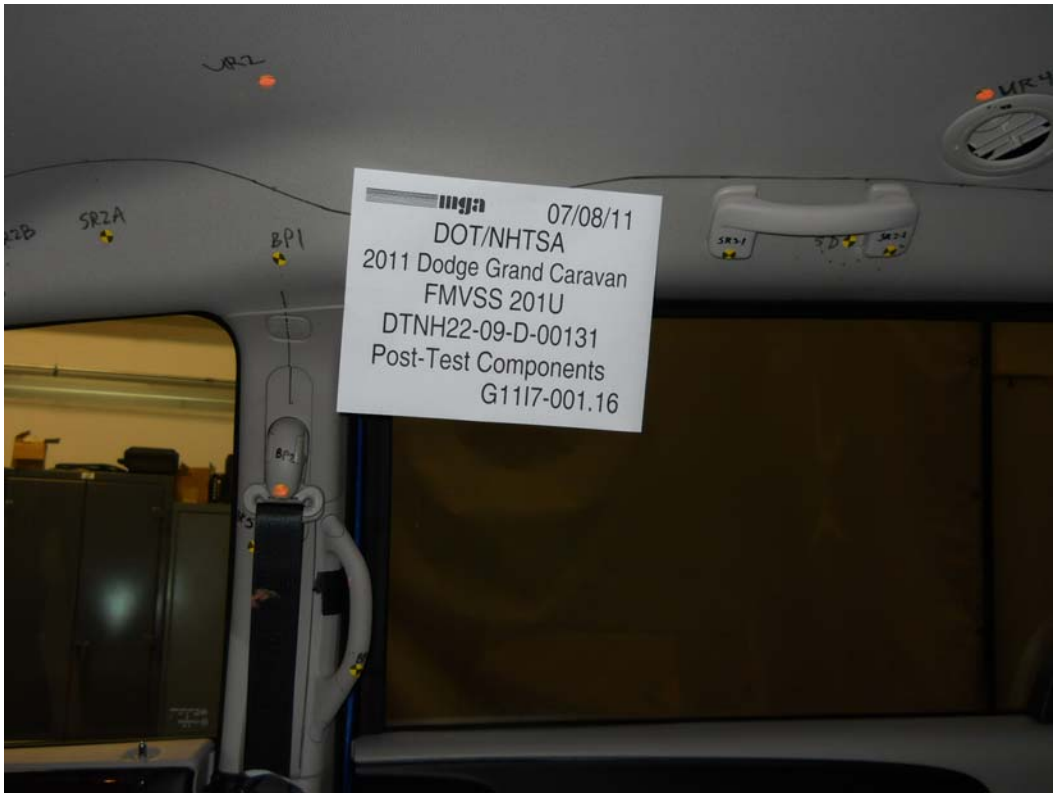

07/06/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.16
RP1
RP2

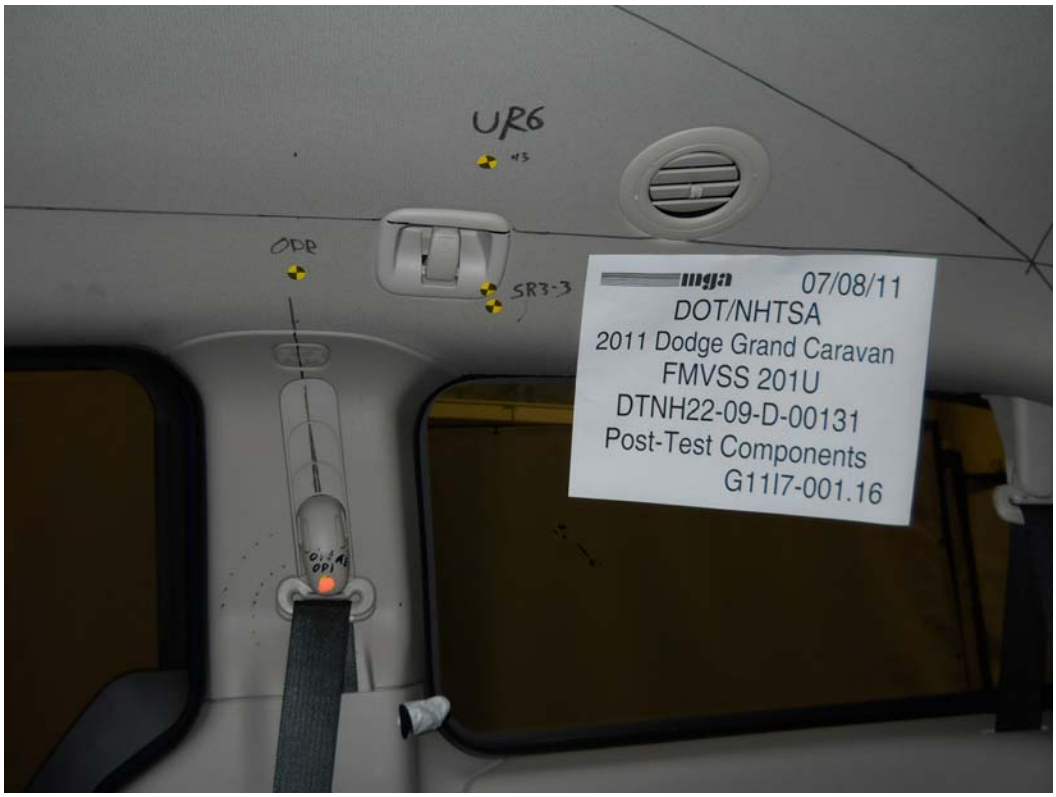

UR4
UR6
SRT-1
SRT-2
SRT-3
07/06/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.16


mga
07/06/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.16
SR1
SR2B
SR2A
BP1
BP2

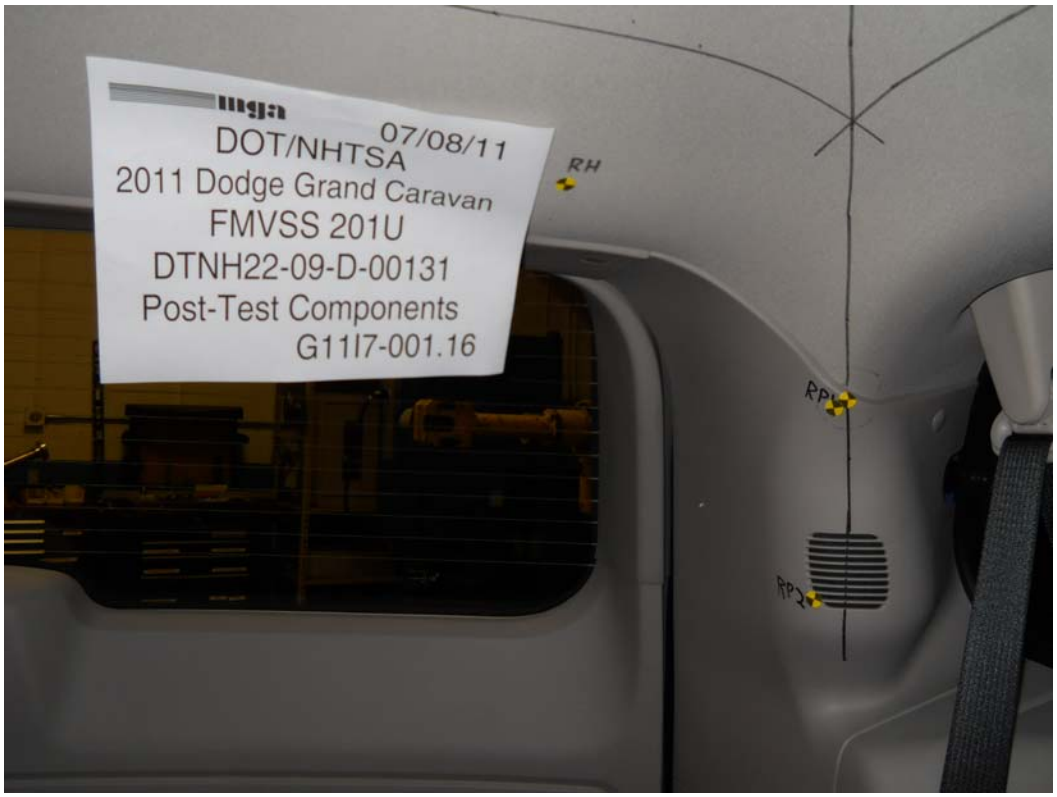

mga
07/06/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Pre-Test Components
G11I7-001.16
SR1
SR2B
SR2A
BP1
BP2

Post-Test Component Photographs


SR2A
BP1
mga
07/08/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.16

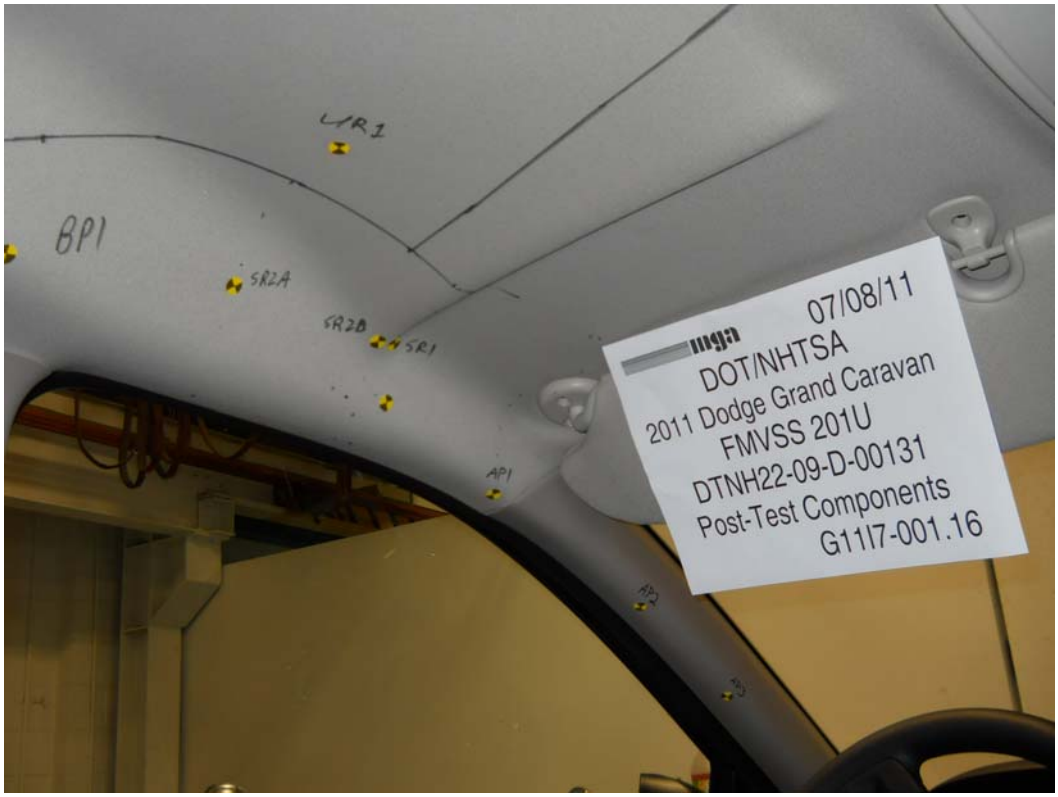

UR6
ODB
SR3-3
mga
07/08/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.16

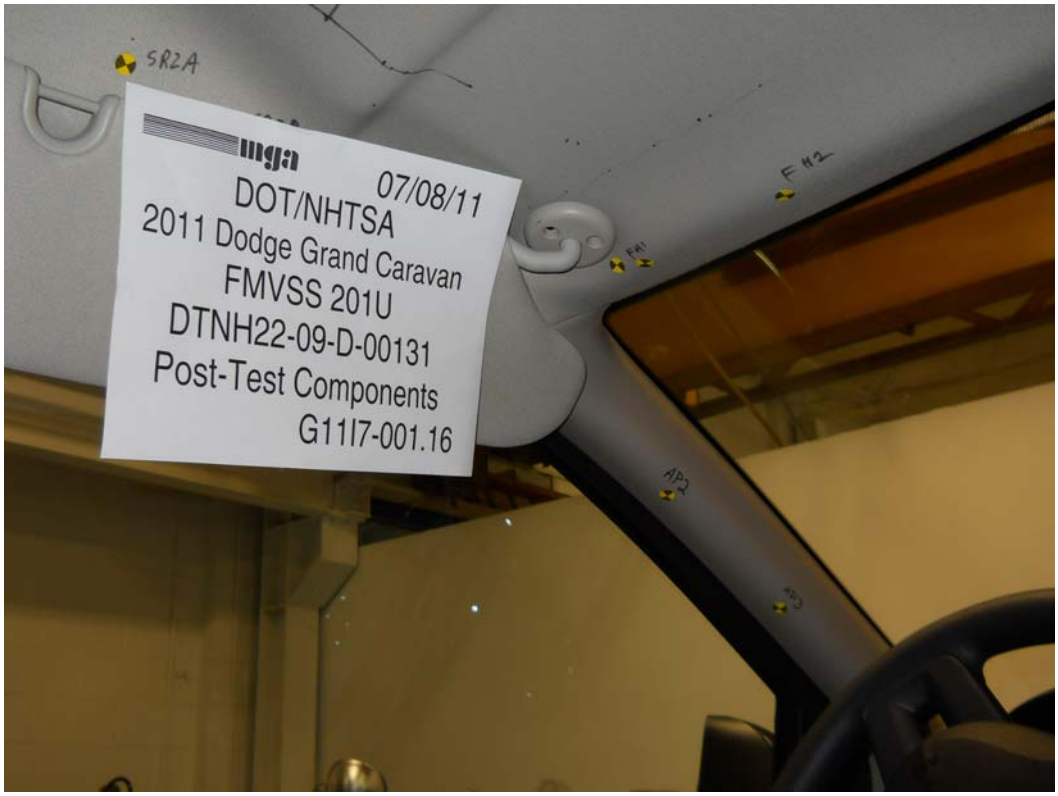

RH
mga
07/08/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.16
RP1
RP2


mga
07/08/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.16
RH
RP1
RP2

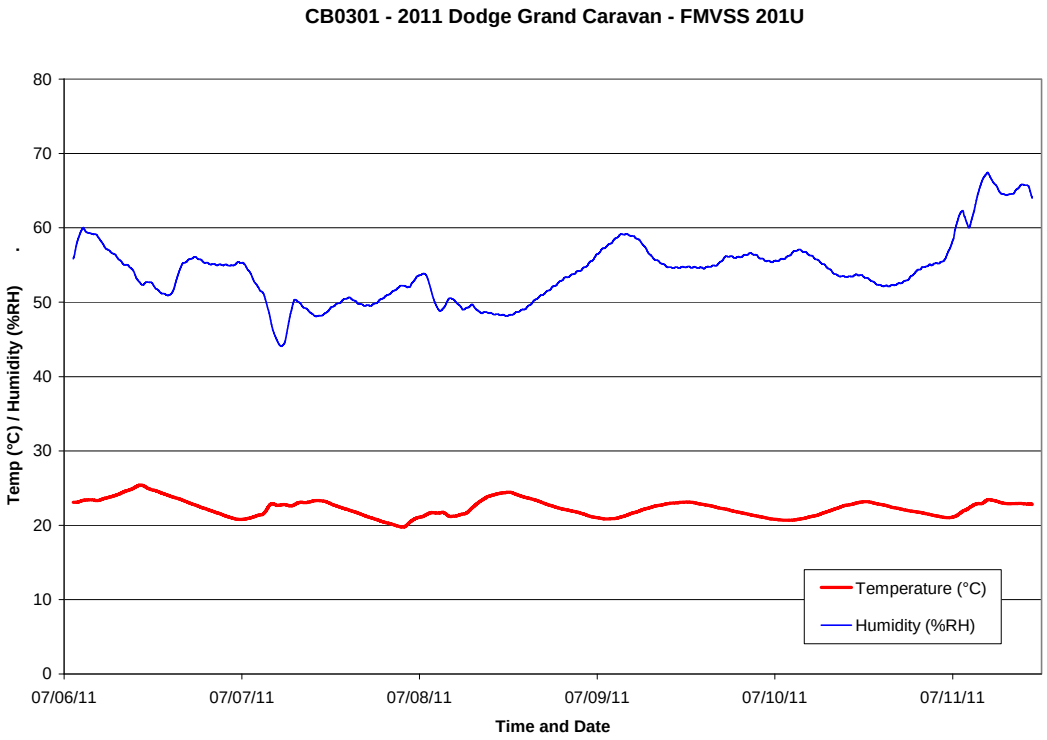

UR5
OPR
SR3-3
mga
07/08/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.16


UR3
BP1
mga
07/08/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.16


LIR1
BP1
SR2A
SR2B
SR1
AP1
mga
07/08/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.16


SR2A
mga
07/08/11
DOT/NHTSA
2011 Dodge Grand Caravan
FMVSS 201U
DTNH22-09-D-00131
Post-Test Components
G11I7-001.16
F M2
F M1
AP2

Appendix A – Temperature Trace



Appendix B – Calibration Certificates

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Edward A. Kalista

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Helen A. Kalata

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Steven A. Kaleto

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Helen A. Kaleto

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Helen A. Kalata

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: _____

Approved by: Edward R. Kaleto

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Chris Collins

Approved by: Steven A. Kaleto

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Chris Collins

Approved by: Helen A. Kaleto

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Chris Collins

Approved by: Helen R. Kaleto

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

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

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

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

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

~Calibration Certificate~

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

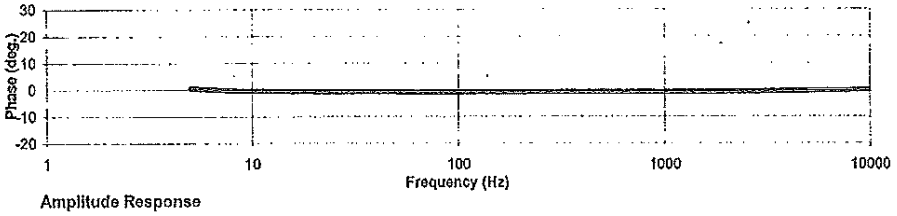
Calibration Data

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

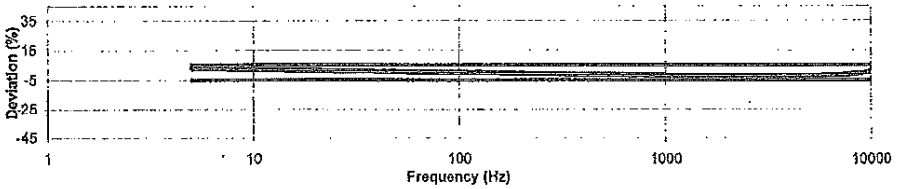
Transducer Specifications

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

Phase Response



Amplitude Response



Data Table

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

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

Customer
MGA Research Corp.

User Notes

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

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

Approval Information
Technician: Ed Devlin
Approval:

Cal Date: 9/14/2010
Due Date:

ACCREDITED

Cal ID: 15600 264901

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

~Calibration Certificate~

Sensor Information

Model Number	352C03
Serial Number	95980
Manufacturer	PCB
ID Number	

Note

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

Standards and/or Equipment Used During Calibration

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

Technician: Ed Devlin

Cal Date: 9/14/2010

Customer: MGA Research Corp.

Due Date:

ACCREDITED

Cal ID: 16800 2849.01

Calibration Certificate

Part Description: Gold **Certification Date:** 6/28/2011 **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 3.0 + 5.0X micrometers, where X = length in meters.
Uncertainty is expressed at approximately a 95% Level of Confidence using k=2.00.

Calibration Results*

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

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

Instrument condition as received:
Within Specifications

Instrument condition outgoing:
Within specifications

Technician: Neil Maclean Date: 6/28/11

6/28/11

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

FARO Technologies, Inc.
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

FARO®

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: MGA007999
Calibration Date: 1/15/10

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

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

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

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

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

NovaStar SOLUTIONS

Calibration Certificate

ACCREDITED
CALIBRATION # 1277.01

Metrology Management Services
Remit to address:

35200 Plymouth Rd.
Livonia, MI 48150

Calibration Certificate #:
Z52545:1300708444

PRO PRO 360 PROTRACTOR

SERIAL NUMBER:	N/A	WORK ORDER:	1300708444
ASSET NUMBER:	Z52545		
CUST. ASSET NUM:	MGA00049		
PROCEDURE NAME:	PRO 3600		
PROCEDURE REV:	A	TEST RESULT:	PASS
CALIBRATED BY:	JOE McCONNAUGHHAY	PERFORMED ON:	3/21/2011
CUSTOMER:	MGA RESEARCH 446 Executive Drive Troy, MI 48083	CAL DUE DATE:	3/21/2012
		DATA TYPE:	FOUND-LEFT
		TEMPERATURE:	21.00 °C
PRIMARY CONTACT:	BOB MILLER	HUMIDITY:	38 %

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

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

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

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

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
1541	1541:1300372477	NEWPORT CT485AL HYGROTHERMOGRAPH	3/17/2011	3/17/2012
1577	1577:1297694647	RAHN SUPER 100 SURFACE PLATE	2/14/2011	2/14/2012

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

@ 3/28/11

QA approved: Steve Hall **Date:** 3-22-11

Signature:

Asset Barcode:

NovaStar SOLUTIONS

Calibration Certificate

ACCREDITED
CALIBRATION # 1277.01

Metrology Management Services
Remit to address:

35200 Plymouth Rd.
Livonia, MI 48150

Calibration Certificate #:
Z52549:1300715528

DICKSON TM325 TEMP/HUMD DISP

SERIAL NUMBER:	N/A
ASSET NUMBER:	Z52549
CUST. ASSET NUM:	MGA00894
PROCEDURE NAME:	1012
PROCEDURE REV:	A
CALIBRATED BY:	JOE McCONNAUGHHAY
CUSTOMER:	MGA RESEARCH 446 Executive Drive Troy, MI 48083
PRIMARY CONTACT:	BOB MILLER

WORK ORDER: 1300715528

TEST RESULT:	PASS
PERFORMED ON:	3/21/2011
CAL DUE DATE:	3/21/2012
DATA TYPE:	FOUND-LEFT
TEMPERATURE:	21.00 °C
HUMIDITY:	38 %

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

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

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

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

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

Action Taken: FULL CALIBRATION

REMARKS:

Standards Used

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

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

@ 3/28/11

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

Asset Barcode:

MetroCal inc.

ACCREDITED
CALIBRATION CERT #0513.01

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

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

Order Number: **69158**
Certificate Number: **100817600**
Page: **1 of 1**

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

Customer PO: **N/A**
Last Calibration: **7/29/09**
Calibration Date: **8/17/10**
Next Calibration: **8/17/11**

As Found Condition: **In Tolerance**

As Left Condition: **In Tolerance**

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

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

Results:
Tolerance used: ± 0.02lb

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

	As Found				As Left		
Weight Test	**Nominal**	**Indication**	**Deviation**		**Nominal**	**Indication**	**Deviation**
Zero	0.00	0.00	0.00		0.00	0.00	0.00
0-25% fs	5.00	5.00	0.00		5.00	5.00	0.00
26-50% fs	10.00	9.99	-0.01		10.00	9.99	-0.01
51-75% fs	15.00	14.99	-0.01		15.00	14.99	-0.01
76-100% fs	20.00	19.98	-0.02		20.00	19.98	-0.02
1/2 load test	10.00	9.99	-0.01		10.00	9.99	-0.01
return to zero	0.00	0.00	0.00		0.00	0.00	0.00
4 quad/Shift Test:	Pass			**4 quad/Shift Test:**	Pass		

Comments: Environmental conditions during calibration: 78 °F, 51 % RH.
No adjustment required.

Karen Shipley
Calibration Technician

Issued: 8/17/10

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

@ 8/20/10

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

Certificate of Calibration

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

calibration cert. 1448.01

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

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

shift test
n/a

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

Tests performed: ☑ Repeatability ☑ Linearity ☐ Sensitivity ☑ Discrimination

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

Page 2 of 2

☑ Scale Certified ☐ Scale Rejected

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

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