FINAL REPORT NUMBER 201UI-MGA-09-08

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

FUJI HEAVY INDUSTRIES LTD.
2009 Subaru Forester 2.5X / 9FA
NHTSA No. C95501

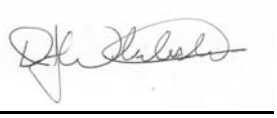
MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083

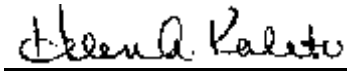
Test Dates: June 9-10, 2009
Report Date: June 11, 2009

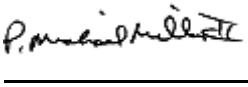
FINAL REPORT

PREPARED FOR:

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

Prepared By: 
Donald J. Whiteside, Project Engineer


Helen A. Kaleto, Project Manager

Approved By: 

Approval Date: June 11, 2009

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Accepted By: _____

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1. Report No. 201UI-MGA-09-08	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Final Report of FMVSS 201 Compliance Testing of a 2009 Subaru Forester 2.5X / 9FA, NHTSA No. C95501		5. Report Date June 11, 2009 6. Performing Organization Code MGA	
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15. Supplementary Notes			
16. Abstract A compliance test series was conducted on the subject 2009 Subaru Forester 2.5X / 9FA, NHTSA No. C95501, 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 June 9-10, 2009. Test failures identified were as follows: None The data recorded indicates that the 2009 Subaru Forester 2.5X / 9FA tested appears to comply with the upper interior requirements of FMVSS 201.			
17. Key Words Compliance Testing Safety Engineering FMVSS 201UI 2009 Subaru Forester 2.5X / 9FA		18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division, Mail Code: NPO-410 1200 New Jersey Avenue, SE West Building Washington, D.C. 20590	
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1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this head impact compliance test was to determine whether the subject vehicle, a 2009 Subaru Forester 2.5X / 9FA, met the performance requirements of FMVSS 201, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted on June 9-10, 2009 on a 2009 Subaru Forester 2.5X / 9FA manufactured by Fuji Heavy Industries, Ltd.

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

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

2.0 COMPLIANCE TEST DATA SUMMARY

The 2009 Subaru Forester 2.5X / 9FA was equipped with A, B, O (Other), and rear-pillars, an adjustable seat belt anchorage on each B-pillar, a seat belt anchorage located on the upper roof, a grab handle located on the side rail above each door (front and rear), an overhead console located on the front upper roof, and a dome light located on the middle upper roof.

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

AP1	BP2	FH1	UR2@SR1
AP2	BP3	FH2	UR4@BP1
BP1	OP2	SR3-3	UR6@OP1

The 2009 Subaru Forester 2.5X / 9FA tested appears to comply with the upper interior performance criteria for FMVSS 201. The HIC(d) measured using the Part 572L (Free Motion Headform) was below 1000 for each tested component.

TABLE 2-1

SUMMARY TABLE OF TEST RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Subaru Forester 2.5X / 9FA

VEH. NHTSA NO.: C95501 VIN: JF2SH61669G787839 COLOR: Silver

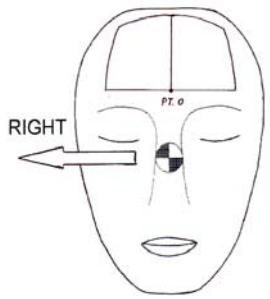
VEH. BUILD DATE: January, 2009 TEST DATES: June 9-10, 2009

TEST LABORATORY: MGA Research Corporation

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

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	113	34	19.2	425	342	16	6 Left
AP2	Left	203	44	19.1	435	355	14	8 Left
BP1	Left	270	20	19.0	467	398	17	6 Left
BP2	Right	90	9	24.1	596	569	7	7 Left
BP3	Left	287	0	24.0	527	478	12	1 Right
OP2	Left	270	1	23.9	633	619	15	3 Left
FH1	Left	180	50	24.1	598	573	16	26 Left
FH2	Right	180	50	24.1	523	472	10	1 Left
SR3-3	Right	90	43	23.7	427	345	45	12 Left
UR2@SR1	Right	90	40	23.9	659	652	45	0
UR4@BP1	Right	90	25	24.1	608	585	68	5 Right
UR6@OP1	Left	270	38	23.9	669	666	40	2 Right

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



POST TEST COMMENTS:

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

AP2 Left: Loose trim piece.

BP3 Left: Crack in adjuster cover; adjuster non-functional.

FH1 Left: Overhead console opened on impact.

FH2 Right: Windshield cracked due to head rotation; overhead console opened on impact.

SR3-3 Right: Side window shattered after initial contact.

REMARKS:

The targets listed were impacted in the following order:

Left: AP2, FH1, BP3, BP1, OP2, UR6@OP1

Right: AP1, FH2, UR2@SR1, BP2, UR4@BP1, SR3-3

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

RECORDED BY: Donald J. Whiteside DATE: June 10, 2009

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Subaru Forester 2.5X / 9FA

VEH. NHTSA NO.: C95501 VIN: JF2SH61669G787839 COLOR: Silver

VEH. BUILD DATE: January, 2009 TEST DATES: June 9-10, 2009

TEST LABORATORY: MGA Research Corporation

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

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

SUNROOF INFORMATION:

Installed: _____Yes __X__ No

Operation: _____Electric ____ Manual

SIDE RAIL CURTAIN AIRBAG INFORMATION:

Installed: __X__Yes ____ No

ROLL-BAR INFORMATION:

Installed: _____Yes __X__ No

Padded: _____Yes __X__ No

Braces: _____Yes __X__ No

GENERAL INFORMATION:

Date Received: March 11, 2009; Odometer Reading 24 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Fuji Heavy Industries Ltd.

Date of Manufacture: January, 2009; VIN: JF2SH61669G787839

GVWR: 2035 kg; GAWR FRONT: 1050 kg;

GAWR REAR: 1095 kg;

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 210 kPa REAR: 200 kPa

Recommended Tire Size: P215/65R16

Recommended Cold Tire Pressure:

FRONT: 210 kPa REAR: 200 kPa

Size of Tire on Test Vehicle: P215/65R16

Type of Spare Tire: T155/70D17; Space Saver: X; Standard__

VEHICLE CAPACITY DATA:

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

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

VEHICLE CAPACITY WEIGHT:

Vehicle Capacity Weight (VCW) = 408 kg

No. of Occupants x 68 kg = 340 kg

Rated Cargo/Luggage Weight (RCLW) = 68 kg (difference)

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

Right Front =	393.0 kg	Right Rear =	319.5 kg
Left Front =	399.5 kg	Left Rear =	340.5 kg
TOTAL FRONT =	792.5 kg	TOTAL REAR =	660.0 kg
% Total Weight =	54.6 %	% Total Weight =	45.4 %

TOTAL DELIVERED WEIGHT = 1452.5 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1452.5 kg

Max. Test Cargo/Luggage Weight = 68.0 kg

Target Test Weight = 1520.5 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	386.5 kg	Right Rear =	359.0 kg
Left Front =	397.0 kg	Left Rear =	378.0 kg
TOTAL FRONT =	783.5 kg	TOTAL REAR =	737.0 kg
% Total Weight =	51.5 %	% Total Weight =	48.5 %

TOTAL TEST WEIGHT = 1520.5 kg

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

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 784 mm; Left Front 776 mm;
Right Rear 774 mm; Left Rear 769 mm;
Pitch Angle at Right Door Sill = 0.6 Front is higher
Pitch Angle at Left Door Sill = 0.3 Front is higher
Roll Angle at Front Bumper = 0.4 Right is higher
Roll Angle at Rear Bumper = 0.5 Right is higher

FULLY LOADED: Right Front 781 mm; Left Front 772 mm;
Right Rear 760 mm; Left Rear 755 mm;
Pitch Angle at Right Door Sill = 0.8 Front is higher
Pitch Angle at Left Door Sill = 0.5 Front is higher
Roll Angle at Front Bumper = 0.3 Right is higher
Roll Angle at Rear Bumper = 0.4 Right is higher

AS TARGETED: Right Front 860 mm; Left Front 851 mm;
Right Rear 837 mm; Left Rear 832 mm;
Pitch Angle at Right Door Sill = 0.8 Front is higher
Pitch Angle at Left Door Sill = 0.5 Front is higher
Roll Angle at Front Bumper = 0.3 Right is higher
Roll Angle at Rear Bumper = 0.4 Right is higher

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill =	0.7 Front is higher
Pitch Angle at Left Door Sill =	0.3 Front is higher
Roll Angle at Front Bumper =	0.3 Right is higher
Roll Angle at Rear Bumper =	0.4 Right is higher

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill =	0.8 Front is higher
Pitch Angle at Left Door Sill =	0.5 Front is higher
Roll Angle at Front Bumper =	0.3 Right is higher
Roll Angle at Rear Bumper =	0.4 Right is higher

VEHICLE WHEELBASE = 2640 mm

REMARKS: The seat travel distance was measured to be 220 mm for the driver front seat and 230 mm for the passenger front seat.

RECORDED BY: Donald J. Whiteside DATE: June 2, 2009

APPROVED BY: Helen A. Kaleto

TABLE 2-3

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Subaru Forester 2.5X / 9FA

VEH. NHTSA NO.: C95501 VIN: JF2SH61669G787839 COLOR: Silver

VEH. BUILD DATE: January, 2009 TEST DATES: June 9-10, 2009

TEST LABORATORY: MGA Research Corporation

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

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

	HORIZONTAL ANGLE SPECIFIED RANGE	MINIMUM HORIZONTAL ANGLE	MAXIMUM HORIZONTAL ANGLE
A-PILLAR	L 195º-255º	L 203.1º	L 247.0º
	R 105º-165º	R 113.2º	R 157.4º
B-PILLAR	L 195º-345º	L 200.1º	L 287.2º
	R 15º-165º	R 74.2º	R 159.9º

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Donald J. Whiteside DATE: June 2, 2009

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Subaru Forester 2.5X / 9FA

VEH. NHTSA NO.: C95501 VIN: JF2SH61669G787839 COLOR: Silver

VEH. BUILD DATE: January, 2009 TEST DATES: June 9-10, 2009

TEST LABORATORY: MGA Research Corporation

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

VERTICAL IMPACT ANGLE RANGES

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	FH1	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
	FH2	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º
SIDE RAIL	SR1	L 0º-50º	L 0º	L 21º
		R 0º-50º	R 0º	R 30º
	SR2A	L 0º-50º	L 0º	L 22º
		R 0º-50º	R 0º	R 22º
	SR2B	L 0º-50º	L 0º	L 27º
		R 0º-50º	R 0º	R 25º
	SR3-1	L 0º-50º	L 0º	L 23º
		R 0º-50º	R 0º	R 21º
	SR3-2	L 0º-50º	L 0º	L 25º
		R 0º-50º	R 0º	R 26º
	SR3-3	L 0º-50º	L 0º	L 44º
		R 0º-50º	R 0º	R 43º
REAR HEADER	RH	L 0º-50º	L 0º	L 50º
		R 0º-50º	R 0º	R 50º

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
A-PILLAR	AP1	L -5º-50º	L -5º	L 35º
		R -5º-50º	R -5º	R 34º
	AP2	L -5º-50º	L -5º	L 44º
		R -5º-50º	R -5º	R 43º
	AP3	L -5º-50º	L -5º	L 41º
		R -5º-50º	R -5º	R 41º
B-PILLAR	BP1	L -10º-50º	L -10º	L 20º
		R -10º-50º	R -10º	R 20º
	BP2*	L 0º-50º	L 0º	L 9º
		R 0º-50º	R 0º	R 9º
	BP3*	L 0º-50º	L 0º	L 0º
		R 0º-50º	R 0º	R 0º
	BP4	L -10º-50º	L -10º	L -6º
		R -10º-50º	R -10º	R -7º
OTHER-PILLAR	OP1	L -10º-50º	L -10º	L 22º
		R -10º-50º	R -10º	R 21º
	OP2	L -10º-50º	L -10º	L 1º
		R -10º-50º	R -10º	R 2º
REAR PILLAR	RP1	L -10º-50º	L -10º	L 22º
		R -10º-50º	R -10º	R 23º
	RP2	L -10º-50º	L -10º	L 1º
		R -10º-50º	R -10º	R 1º
UPPER ROOF 1		0º-50º	0º	44º
UPPER ROOF 2		0º-50º	0º	40º
UPPER ROOF 3		0º-50º	0º	25º
UPPER ROOF 4		0º-50º	0º	25º
UPPER ROOF 5		0º-50º	0º	40º

	VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
UPPER ROOF 6	0º-50º	0º	38º

As determined using the Procedures specified in S8.13.4.2. *Targets BP2 and BP3 are seat belt anchorage locations.

RECORDED BY: Donald J. Whiteside DATE: June 2, 2009

APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Subaru Forester 2.5X / 9FA

VEH. NHTSA NO.: C95501 VIN: JF2SH61669G787839 COLOR: Silver

VEH. BUILD DATE: January, 2009 TEST DATES: June 9-10, 2009

TEST LABORATORY: MGA Research Corporation

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

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	220 mm	230 mm
Tº	Horizontal < {CG-F1 (Left Seat) to (Right A-Pillar)}	113.0º	--
A1º	360º - Tº	247.0º	--
Wº	Horizontal < {CG-2 (Left Seat) to (Left A-Pillar)}	203.1º	--
A2º	A2º = Wº	203.1º	--
Uº	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	287.2º	--
B1º	B1º = Uº	287.2º	--
Vº	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	200.1º	--
B2º	B2º = Vº	200.1º	--
Wº (right)	Horizontal < {CG-F2 (Right Seat) to (Right A-Pillar)}	--	157.4º
A1º (right)	A1º (right) = Wº (right)	--	157.4º
T º (right)	Horizontal < {CG-F1 (Right Seat) to (Left A-Pillar)}	--	246.8º
A2º (right)	360º-Tº (right)	--	113.2º
V º (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	159.9º
B1º (right)	B1º (right) = Vº (right)	--	159.9º
U º (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	74.2º
B2º (right)	B2º (right) = Uº (right)	--	74.2º
J	A-Pillar {(Plane 3) – (Plane 5)}	335.6 mm	335.6 mm
J/2	J ÷ 2	167.8 mm	167.8 mm
D1	Upper Roof {(Plane A) – (Plane B)}	2231.0 mm	
D1/2	D1 ÷ 2	1115.5 mm	
D2	Upper Roof {(Plane C) – (Plane D)}	1241.3 mm	

Measurement	Description	Left Side	Right Side
D2/2	D2 ÷ 2	620.7 mm	
.35D1	.35 x D1	780.9 mm	
.35D2	.35 x D2	434.5 mm	
N	B-Pillar {(BPR) – (lowest point on daylight opening forward of B-Pillar)}	452.9 mm	459.3 mm
N/2	B-Pillar {(BP3) – (lowest point on daylight opening forward of B-Pillar)}	226.5 mm	229.7 mm
N/4	B-Pillar {(BP4) – (lowest point on daylight opening forward of B-Pillar)}	113.2 mm	114.8 mm
Q	O-Pillar (Plane 13 – Plane 14)	444.4 mm	435.7 mm
Q/2	Q / 2	222.2 mm	217.9 mm
D	R-Pillar (Point 7 – Point M)	910.0 mm	910.0 mm
3D/7	3*D / 7	390.0 mm	390.0 mm

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

SgRP Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1280.6	-355.0	308.0	1286.0	355.0	298.0
Rear	2111.0	-365.0	346.0	2111.0	365.0	346.0

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1280.6	-355.0	308.0	1286.0	355.0	298.0
Rear	2111.0	-365.0	346.0	2111.0	365.0	346.0

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	X	y	z
CGF1	1220.6	-355.0	968.0	1216.0	355.0	958.0
CGF2	1440.6	-355.0	968.0	1446.0	355.0	958.0
CGR	2271.0	-365.0	1006.0	2271.0	365.0	1006.0

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Front passenger door right upper striker bolt hole (x, y, z) = 1405.1, 773.4, 477.8

Front driver door left upper striker bolt hole (x, y, z) = 1405.1, -773.4, 477.8

Front driver door check bolt hole (x, y, z) = 433.2, -735.2, 444.7

REMARKS:

RECORDED BY: Donald J. Whiteside DATE: June 2, 2009

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2009 Subaru Forester 2.5X / 9FA

VEH. NHTSA NO.: C95501 VIN: JF2SH61669G787839 COLOR: Silver

VEH. BUILD DATE: January, 2009 TEST DATES: June 9-10, 2009

TEST LABORATORY: MGA Research Corporation

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

SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
A-Pillar Left Side								
AP1	1041.0	-560.1	1112.2	247	35	No	--	No
AP2	899.8	-604.9	1024.2	203	44	No	--	Yes
AP3	779.8	-628.4	945.0	203	41	No	--	No
A-Pillar Right Side								
AP1	1037.5	556.8	1114.6	113	34	No	--	Yes
AP2	902.4	600.8	1026.6	157	43	No	--	No
AP3	781.3	624.7	946.9	157	41	No	--	No
B-Pillar Left Side								
BP1	1549.7	-483.4	1200.0	270	20	No	--	Yes
BP2	1517.4	-608.7	940.6	270	9	No	--	No
BP3	1509.3	-601.8	973.2	287	0	No	--	Yes
BP4	1562.6	-668.4	859.5	200	-6	No	--	No
B-Pillar Right Side								
BP1	1552.7	475.5	1205.6	90	20	No	--	No
BP2	1518.4	605.2	940.4	90	9	No	--	Yes
BP3	1512.8	597.3	975.4	74	0	No	--	No
BP4	1564.0	662.9	861.1	159	-7	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**					
Other Pillar Left Side								
OP1	2296.2	-488.6	1219.0	270	22	No	--	No
OP2	2358.5	-621.7	996.7	270	1	No	--	Yes
Other Pillar Right Side								
OP1	2303.3	486.7	1214.1	90	21	No	--	No
OP2	2367.8	612.8	996.6	90	2	No	--	No
Rear Pillar Left Side								
RP1	2871.5	-522.7	1138.5	Target exempt from testing per S6.3(b).				No
RP2	2932.7	-632.7	989.2	Target exempt from testing per S6.3(b).				--
REL	2942.8	-597.9	1004.0	Target exempt from testing per S6.3(b).				No
Rear Pillar Right Side								
RP1	2880.0	522.0	1127.2	Target exempt from testing per S6.3(b).				No
RP2	2948.3	618.9	977.9	Target exempt from testing per S6.3(b).				--
REL	2955.1	578.0	1002.0	Target exempt from testing per S6.3(b).				No
Front Header Left Side								
FH1	945.9	-467.4	1161.1	--	--	Yes	--	--
REL	937.5	-442.8	1159.9	180	50	--	1	Yes
FH2	914.0	-324.3	1168.1	180	50	No	--	No
Front Header Right Side								
FH1	946.5	465.2	1162.3	--	--	Yes	--	--
REL	939.0	439.8	1160.1	180	50	--	1	No
FH2	915.0	317.6	1169.3	180	50	No	--	Yes
Side Rail Left Side								
SR1	1190.3	-513.3	1148.9	270	21	No	--	No
SR2A	1341.7	-506.9	1164.0	270	22	No	--	No
SR2B	1249.3	-494.4	1174.7	270	27	No	--	No
SR3-1	1933.6	-497.9	1183.7	270	23	No	--	No
SR3-2	2092.8	-497.0	1183.3	270	25	No	--	No
SR3-3	2445.5	-519.8	1188.2	270	44	No	--	No

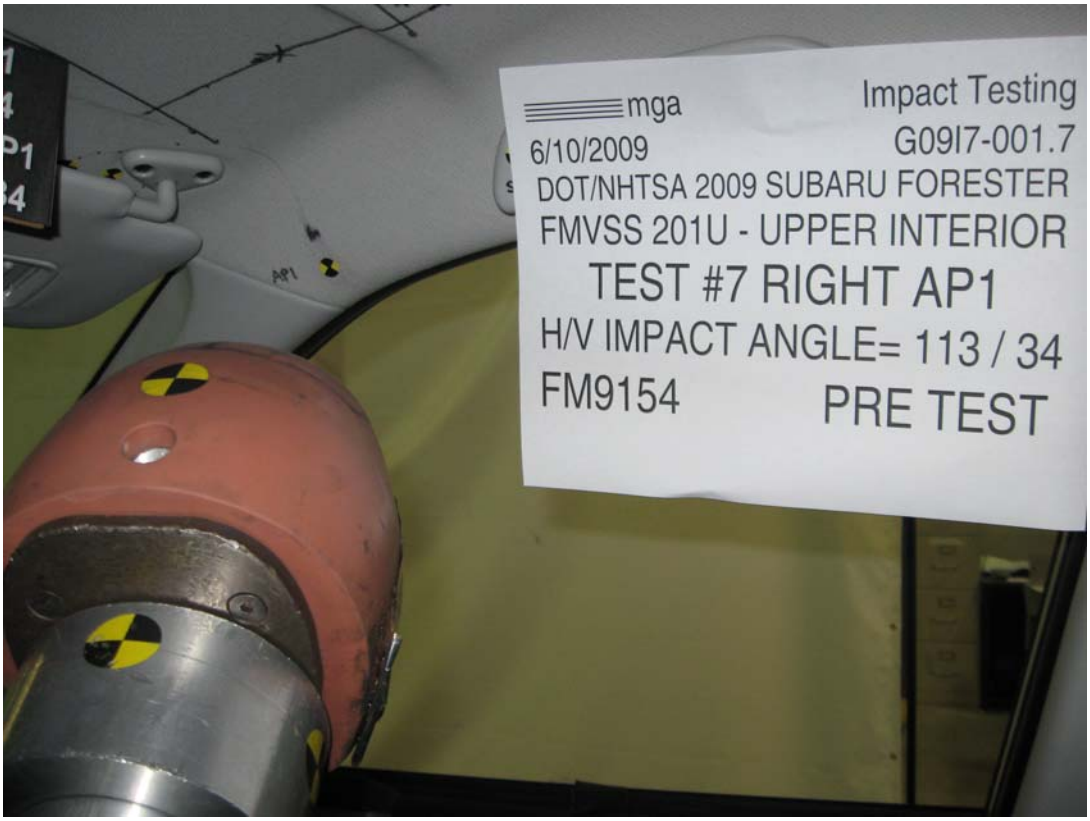
SUMMARY OF TARGETING RESULTS								
Target	**Location (mm)**			**Horizontal Angle (deg)**	**Vertical Angle (deg)**	**Relocation (Yes/No)**	**Extension (# of 25 mm Spheres)**	**Impact (Yes/No)**
	x	**y**	**z**					
Side Rail Right Side								
SR1	1187.9	507.7	1152.7	90	30	No	--	No
SR2A	1337.8	505.0	1162.2	90	22	No	--	No
SR2B	1253.2	497.8	1168.4	90	25	No	--	No
SR3-1	1934.1	492.8	1179.5	90	21	No	--	No
SR3-2	2096.9	489.8	1180.8	90	26	No	--	No
SR3-3	2452.6	513.5	1189.5	90	43	No	--	Yes
Rear Header Left Side								
RH	2885.3	-365.5	1193.6	Target exempt from testing per S6.3(b).				No
Rear Header Right Side								
RH	2891.3	364.3	1190.4	Target exempt from testing per S6.3(b).				No
Upper Roof Left Side								
UR1@Front Center	1178.6	-22.5	1235.3	180	44	No	--	No
UR3@BPR	1565.5	-417.9	1258.0	270	25	No	--	No
UR6@OP1	2284.4	-416.9	1264.0	270	38	No	--	Yes
Upper Roof Right Side								
UR2@SR1	1171.6	422.0	1203.6	90	40	No	--	Yes
UR4@BPR	1571.0	413.4	1259.2	90	25	No	--	Yes
UR5@SR3-2	2122.0	415.0	1269.4	90	40	No	--	No

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

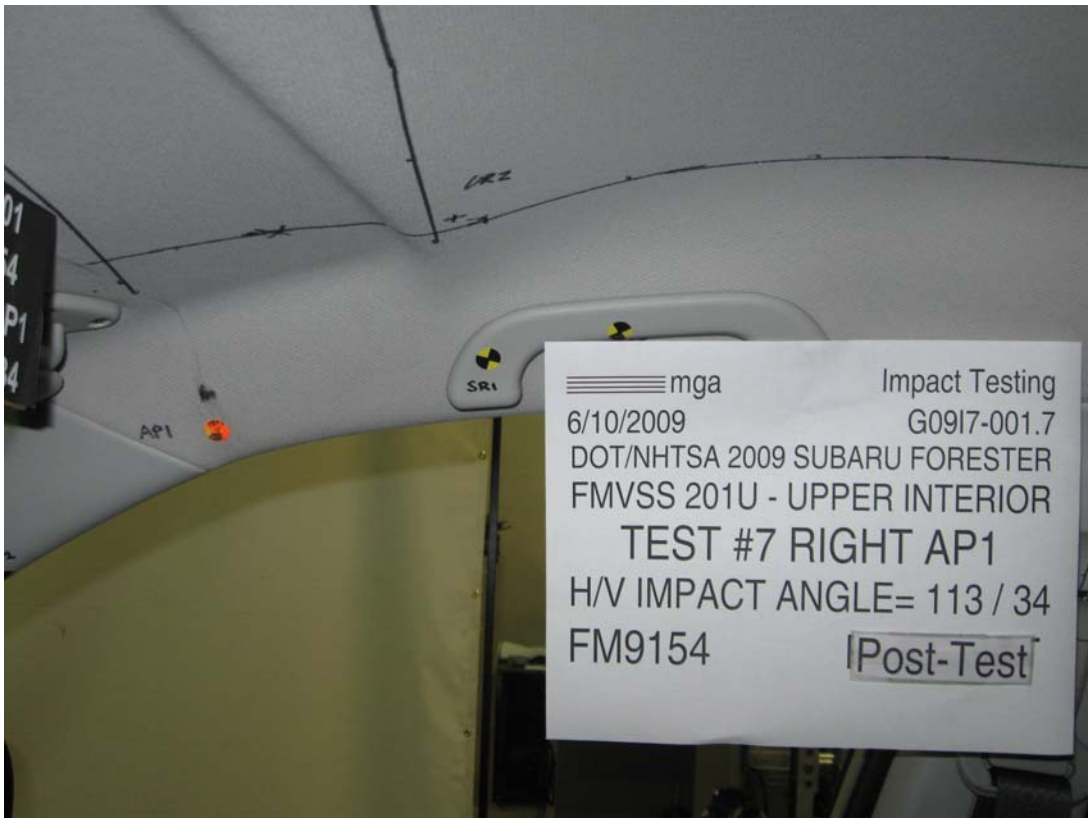
RECORDED BY: Donald J. Whiteside DATE: June 2, 2009

APPROVED BY: Helen A. Kaleto

3.0 TEST DATA (Including Acceleration and Velocity Plots)




C95501
FM9154
RIGHT AP1
H/V 113/34
mga
6/10/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP1
H/V IMPACT ANGLE= 113 / 34
FM9154
Post-Test


SR1
AP1
mga
6/10/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP1
H/V IMPACT ANGLE= 113 / 34
FM9154
Post-Test


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #7 RIGHT AP1
H/V IMPACT ANGLE= 113 / 34
FM9154
Post-Test

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#7

Target (Vehicle Side): AP1Right

Temperature:22.5C

MGA Test Reference No.:FM9154

Humidity:52.1%

Approach Horizontal Angles:113º

Time of Test:10:13:11 AM

Approach Vertical Angles:34º

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
425	342	7	19.2	16	6 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.6	1.07	1.06
Y	6	J22664	94.3	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

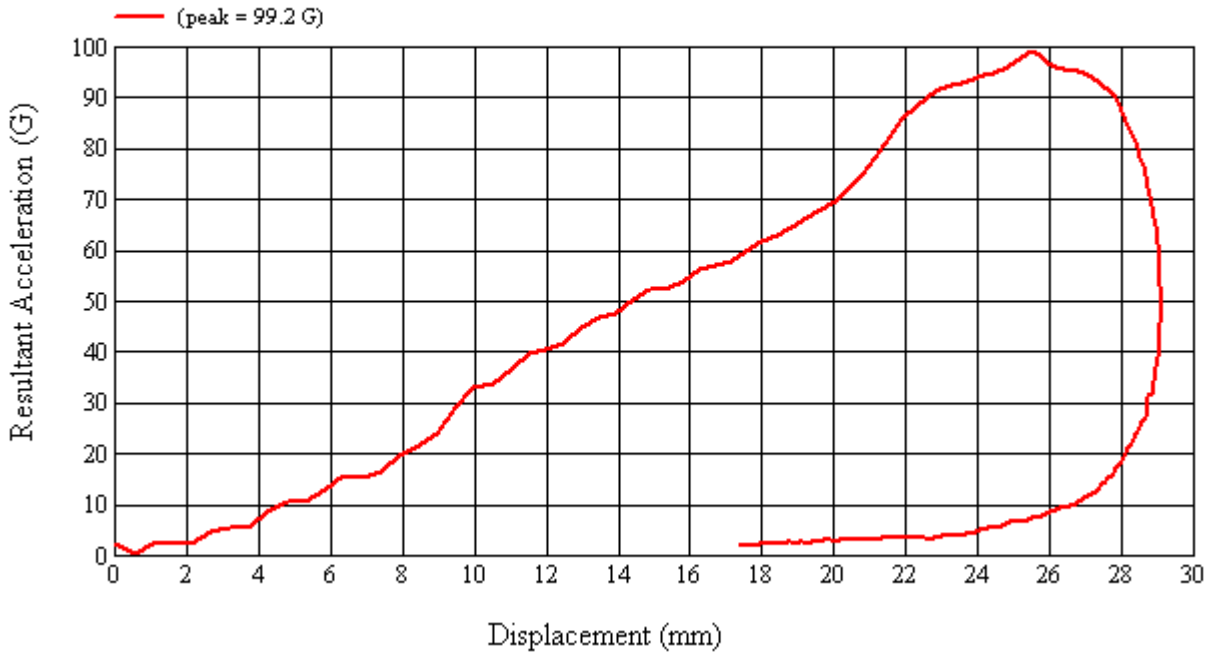
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

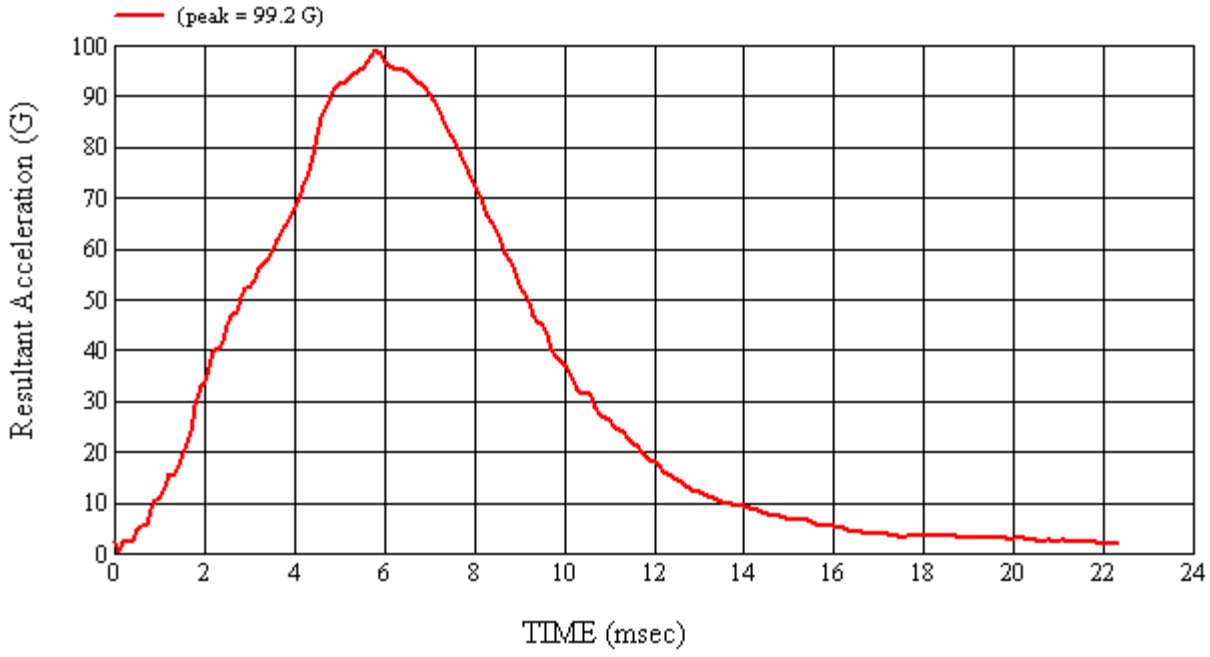
No damage observed

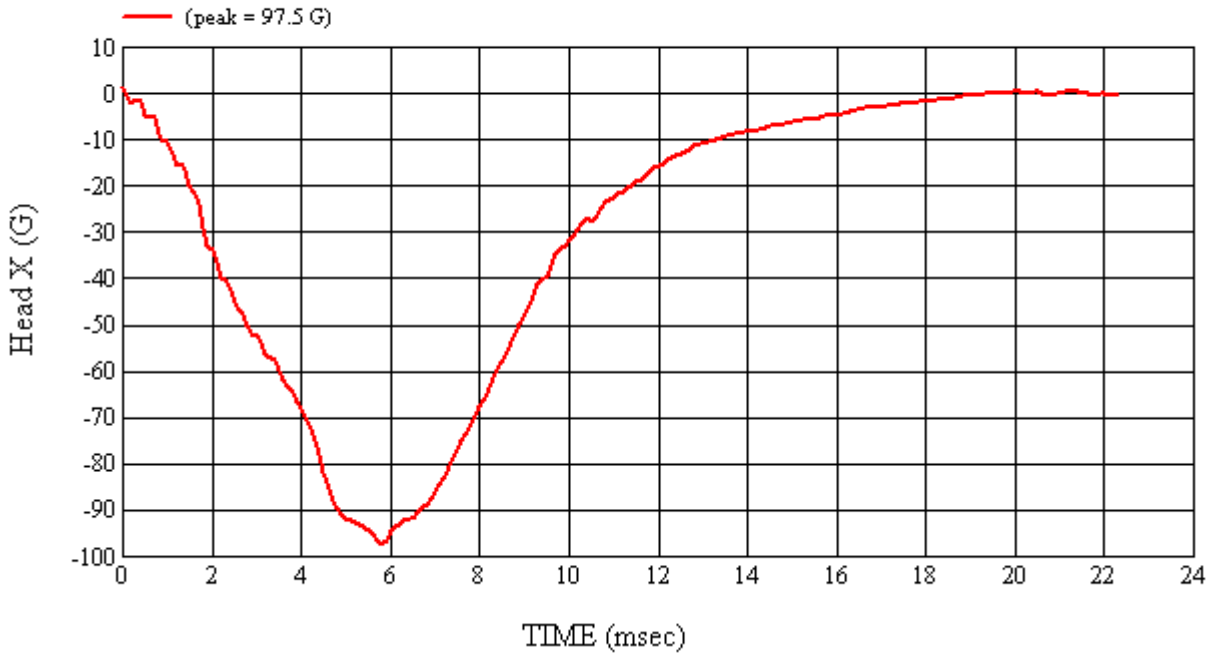
Recorded By: _____ Approved By*: _____ Date: 6/10/2009

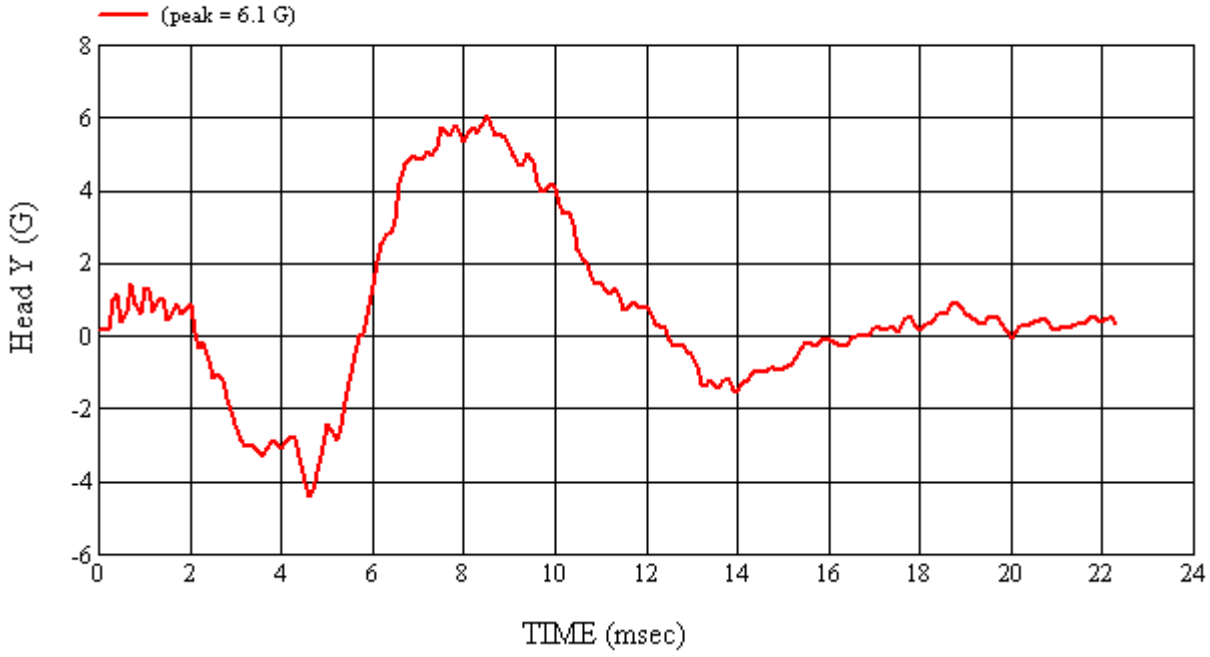
*Only necessary for NHTSA (Government) Compliance testing.

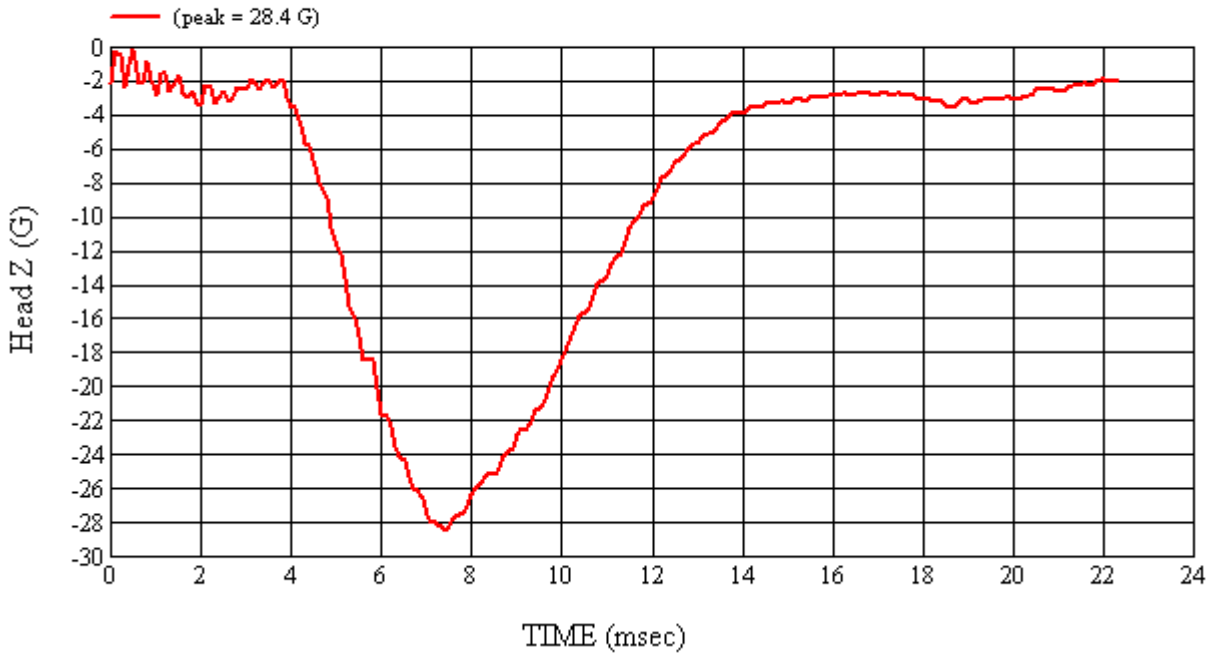
MGA Test #: FM9154 Target Location: AP1, Right Side Test Date: 6/9/2009

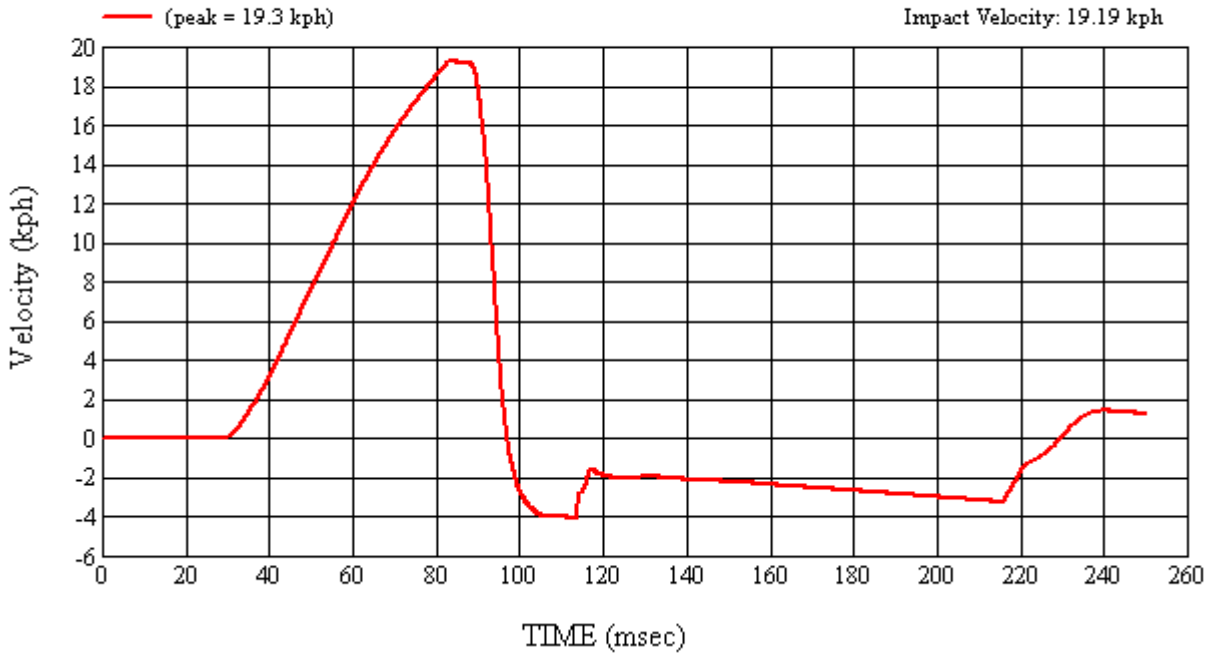


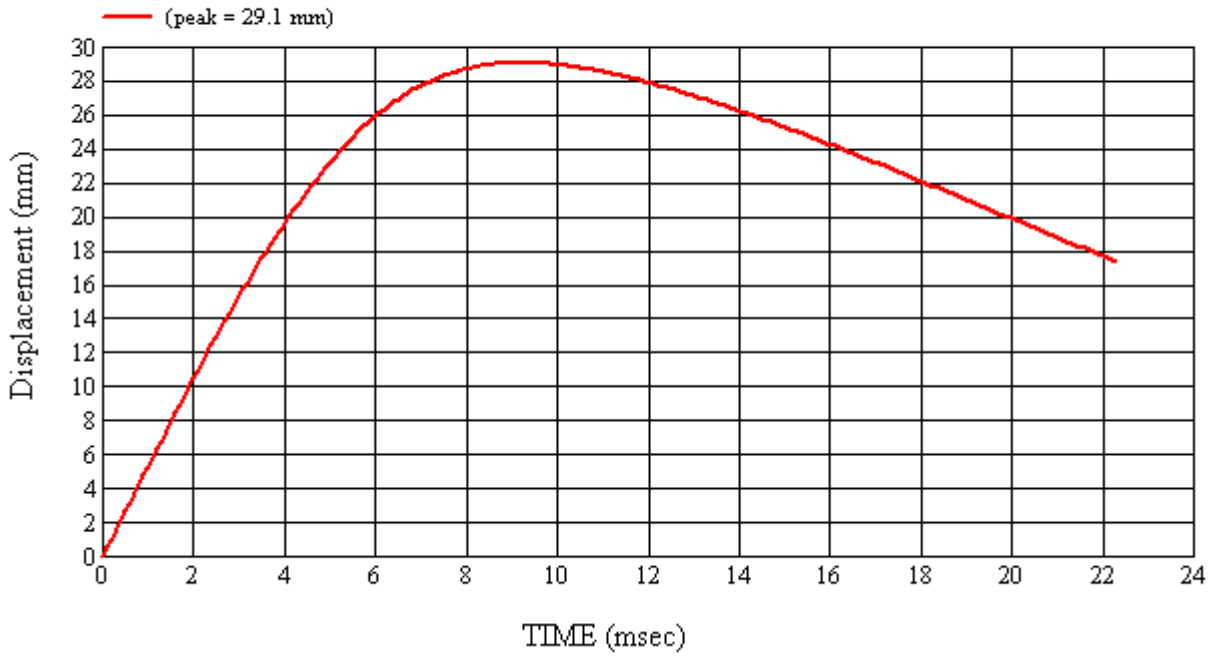


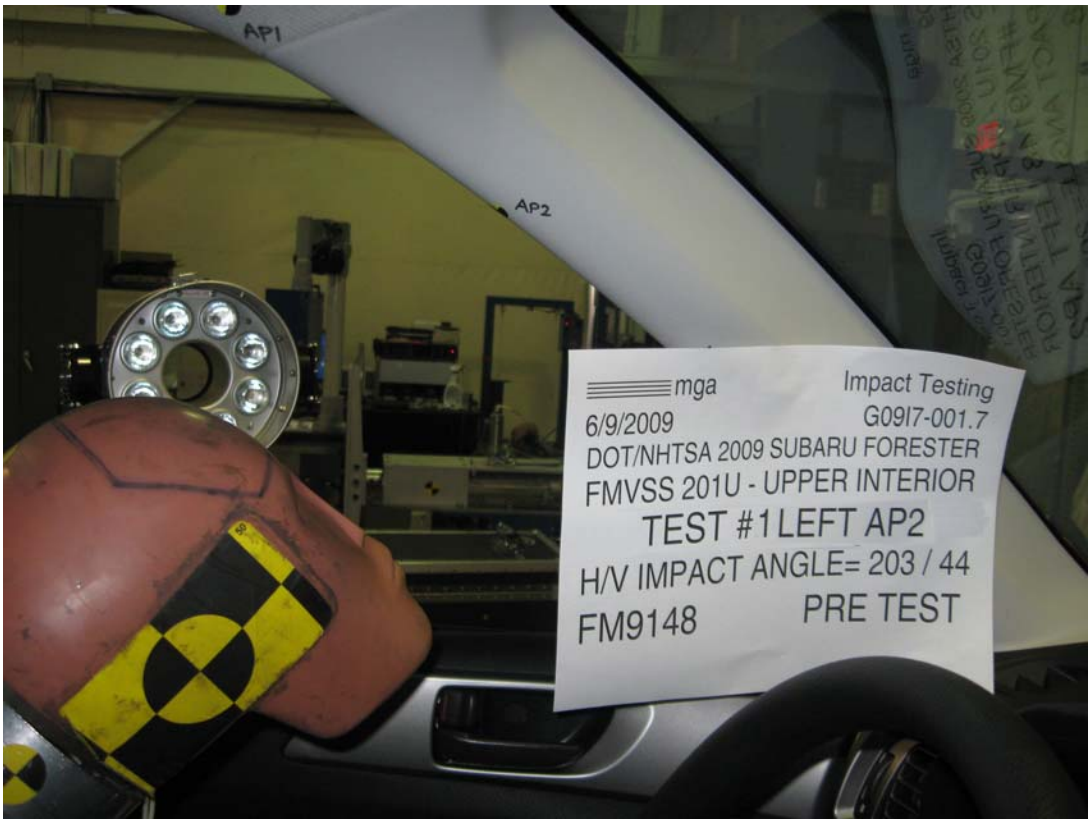

(peak = 97.5 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 6.1 G)
Head Y (G)
8
6
4
2
0
-2
-4
-6
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 28.4 G)
Head Z (G)
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)


(peak = 19.3 kph)
Impact Velocity: 19.19 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 29.1 mm)
Displacement (mm)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


AP1
AP2
mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT AP2
H/V IMPACT ANGLE= 203 / 44
FM9148
PRE TEST


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT AP2
H/V IMPACT ANGLE= 203 / 44
FM9148
PRE TEST


AVERTISSEMENT
mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT AP2
H/V IMPACT ANGLE= 203 / 44
FM9148
Post-Test


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #1 LEFT AP2
H/V IMPACT ANGLE= 203 / 44
FM9148
Post-Test
AP1
AP2
AP3


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #1LEFT AP2
H/V IMPACT ANGLE= 203 / 44
FM9148
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#1

Target (Vehicle Side): AP2Left

Temperature:22.4C

MGA Test Reference No.:FM9148

Humidity:56.9%

Approach Horizontal Angles:203º

Time of Test:11:44:05 AM

Approach Vertical Angles:44º

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
435	355	10.3	19.1	14	8 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.6	1.07	1.07
Y	6	J22664	94.3	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

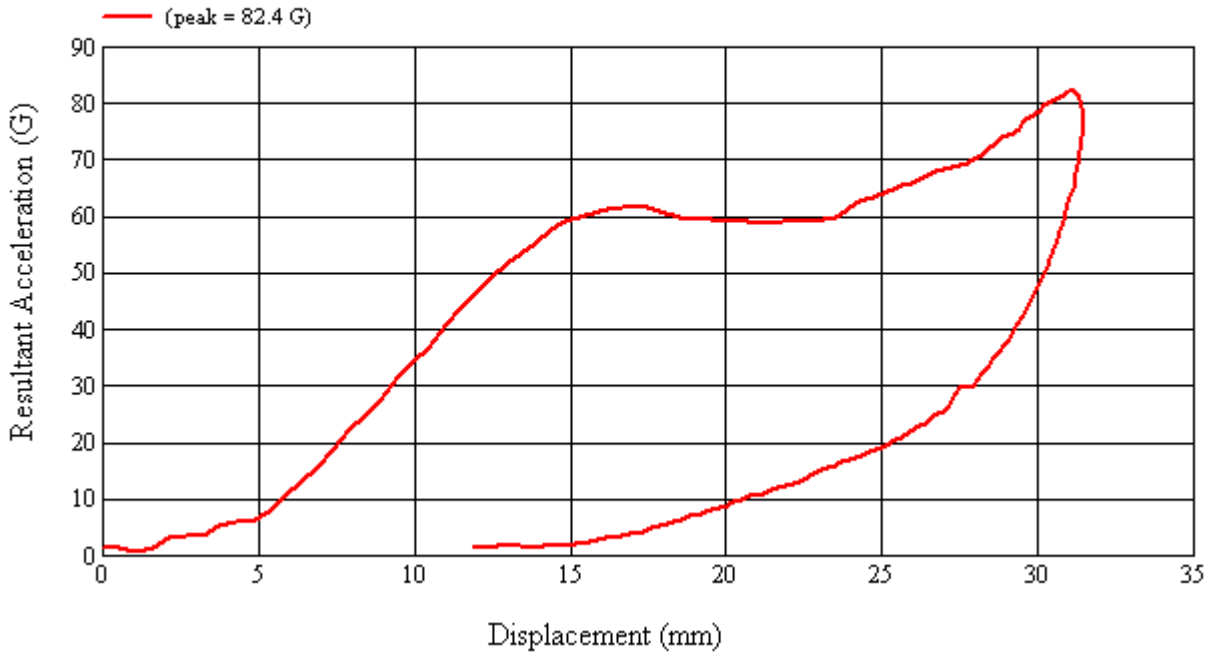
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

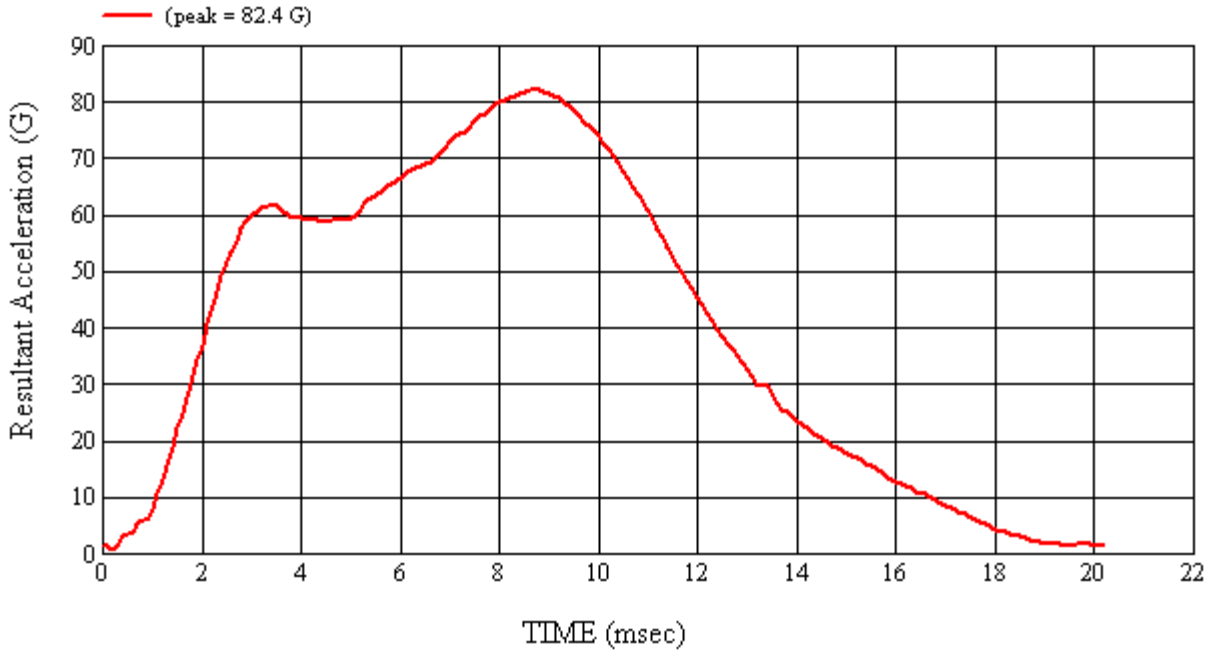
Loose trim piece

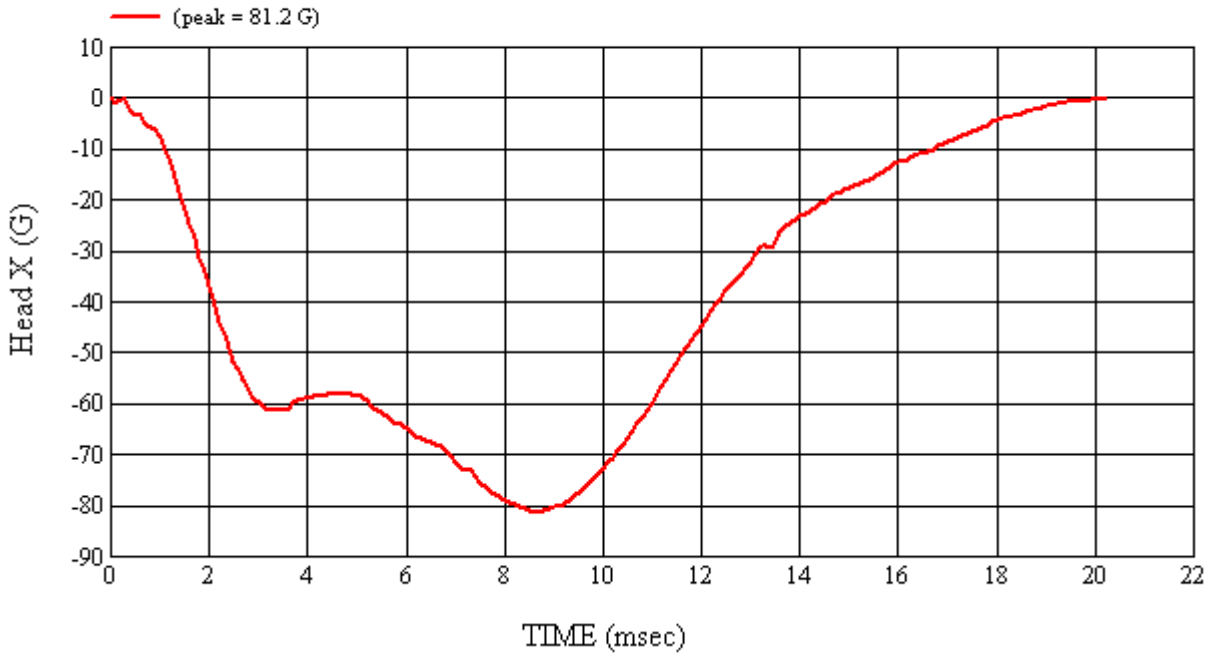
Recorded By: _____ Approved By*: _____ Date: 6/9/2009

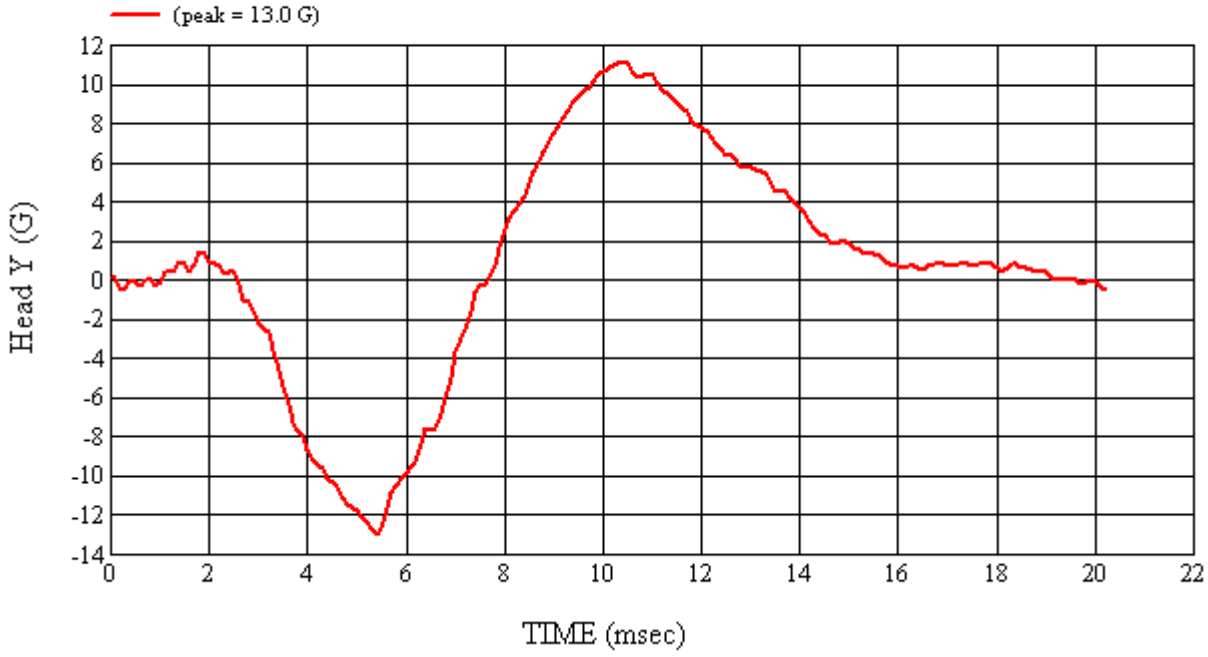
*Only necessary for NHTSA (Government) Compliance testing.

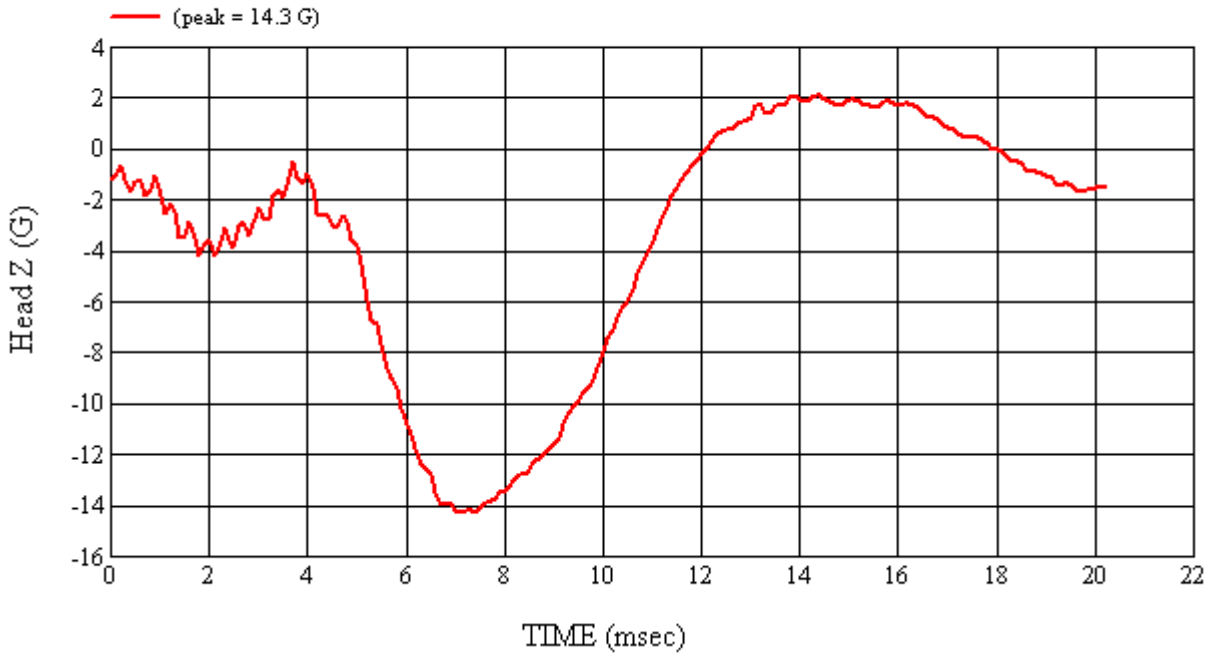
MGA Test #: FM9148 Target Location: AP2, Left Side Test Date: 6/9/2009

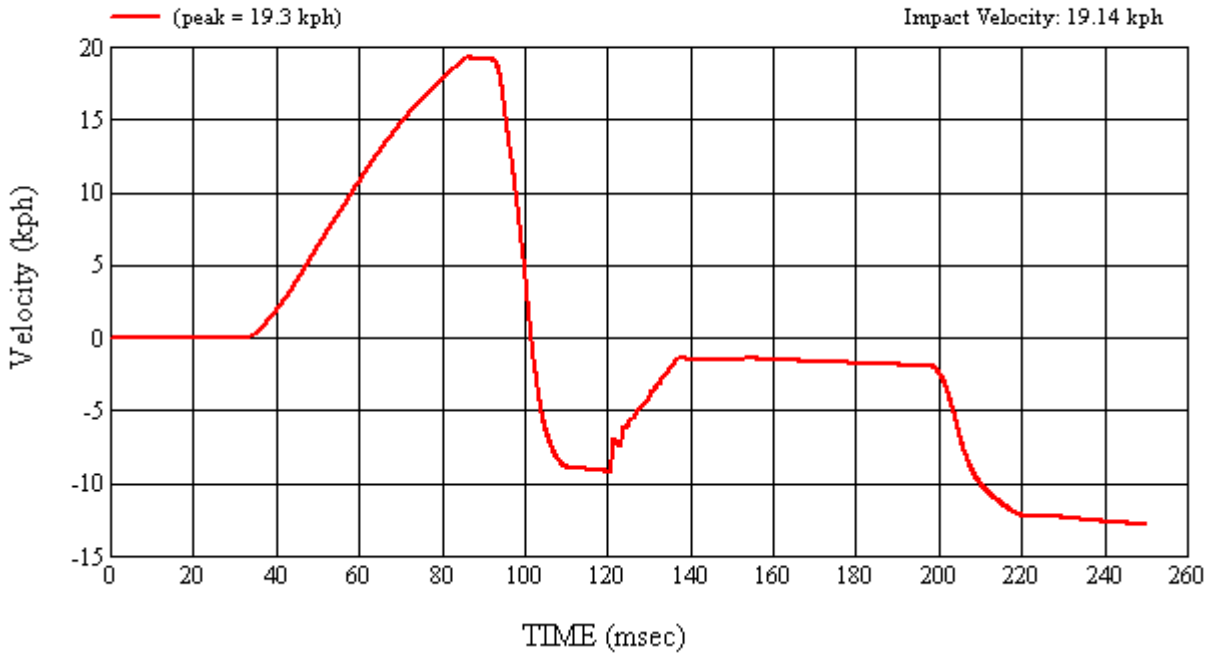


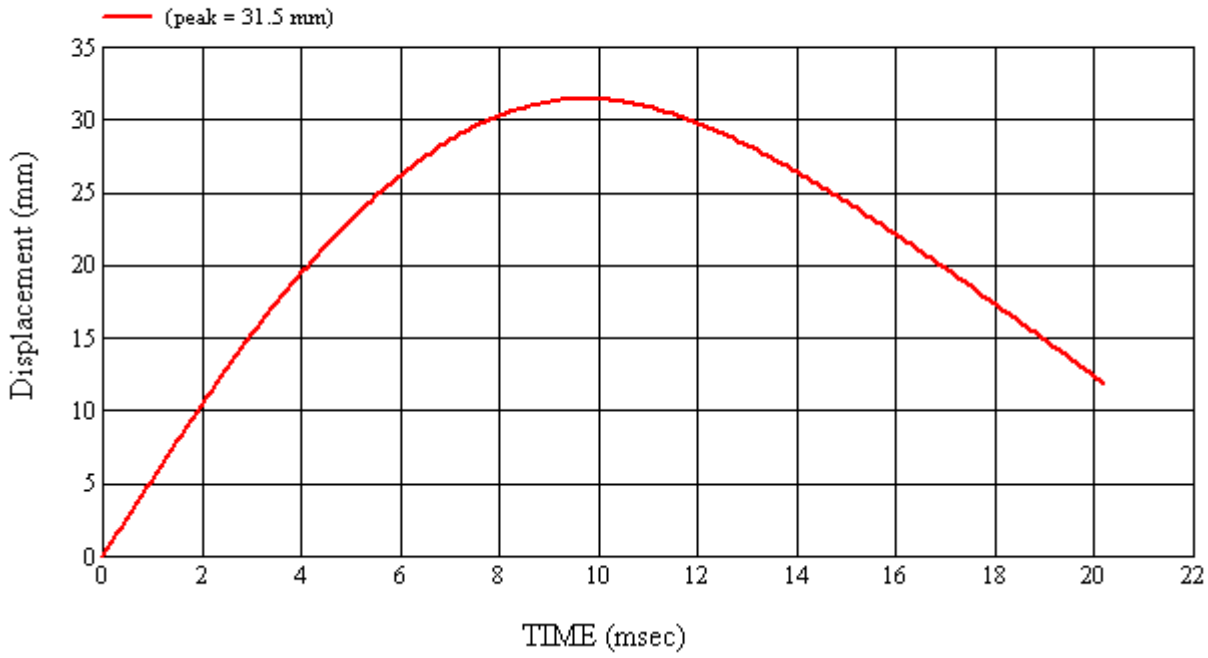


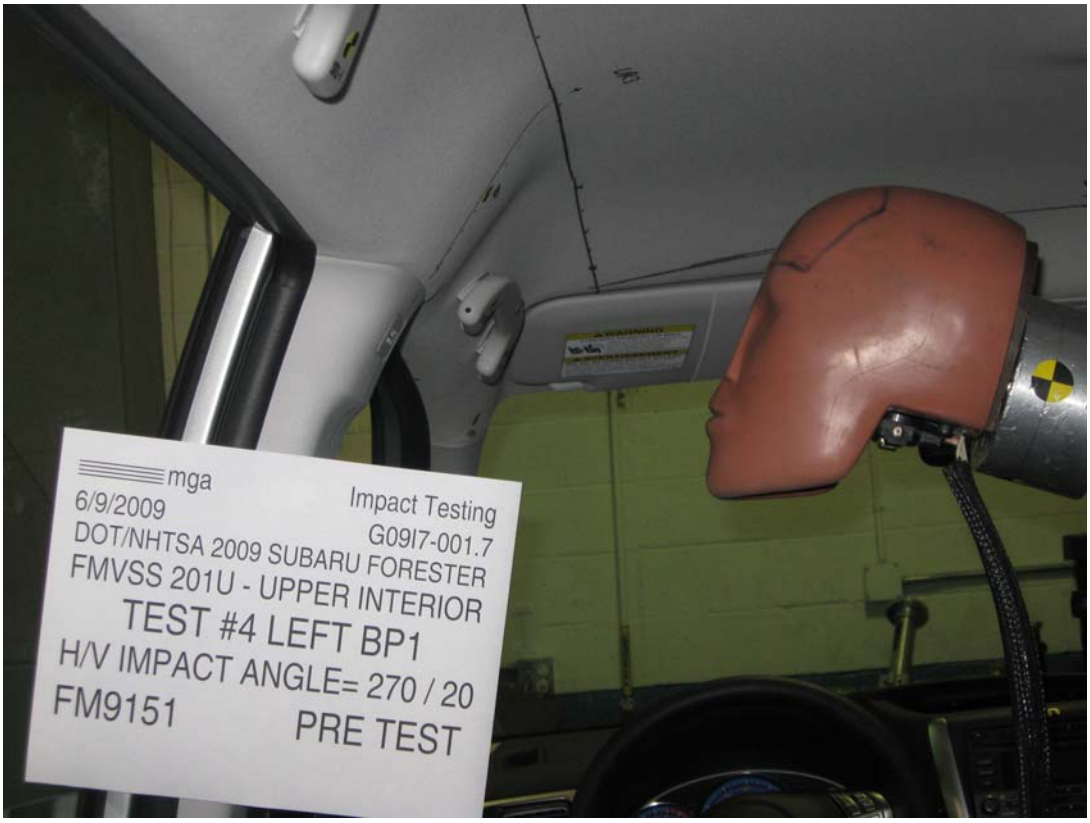

(peak = 81.2 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

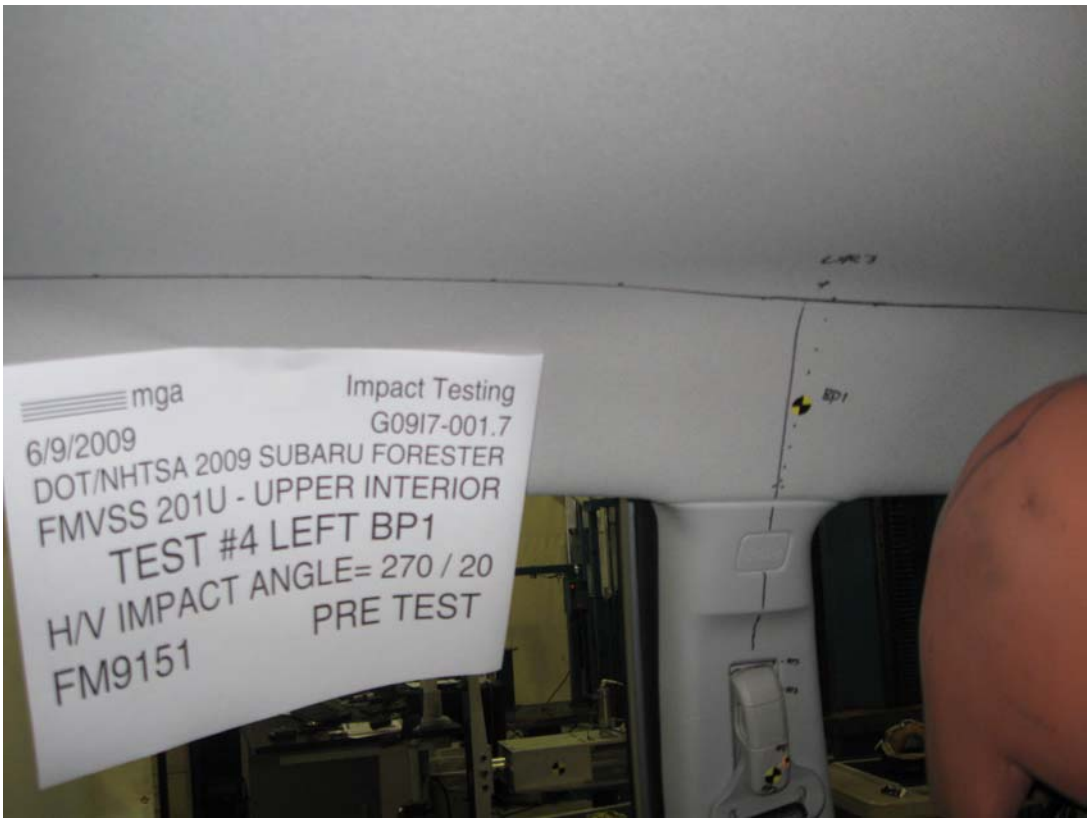

(peak = 13.0 G)
Head Y (G)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 14.3 G)
Head Z (G)
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

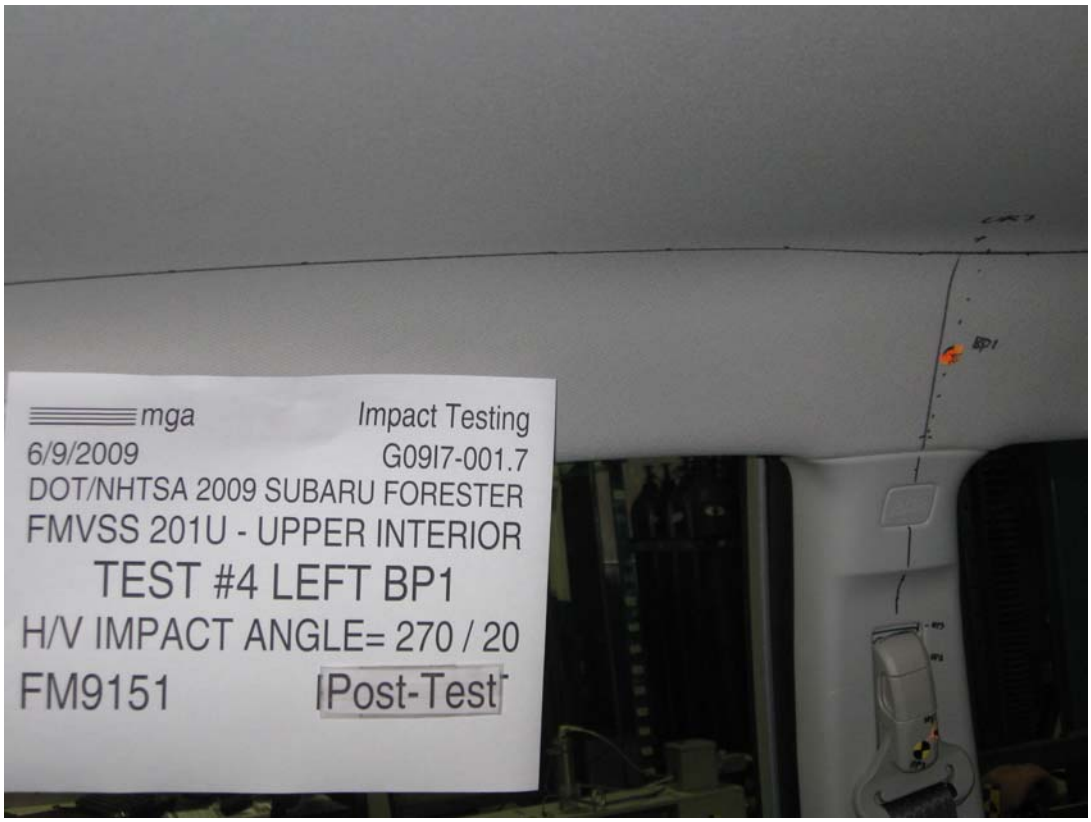

(peak = 19.3 kph)
Impact Velocity: 19.14 kph
Velocity (kph)
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 31.5 mm)
Displacement (mm)
TIME (msec)
0
5
10
15
20
25
30
35
0
2
4
6
8
10
12
14
16
18
20
22


mga
6/9/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT BP1
H/V IMPACT ANGLE= 270 / 20
FM9151
PRE TEST


mga
6/9/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT BP1
H/V IMPACT ANGLE= 270 / 20
FM9151
PRE TEST


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT BP1
H/V IMPACT ANGLE= 270 / 20
FM9151
Post-Test


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT BP1
H/V IMPACT ANGLE= 270 / 20
FM9151
Post-Test


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #4 LEFT BP1
H/V IMPACT ANGLE= 270 / 20
FM9151
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#4

Target (Vehicle Side): BP1Left

Temperature:22.3C

MGA Test Reference No.:FM9151

Humidity:48.6%

Approach Horizontal Angles:270º

Time of Test:3:02:59 PM

Approach Vertical Angles:20º

FMH Serial No:[035]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
467	398	7.8	19.0	17	6 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35919	-95.6	1.07	1.07
Y	6	J22664	94.3	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

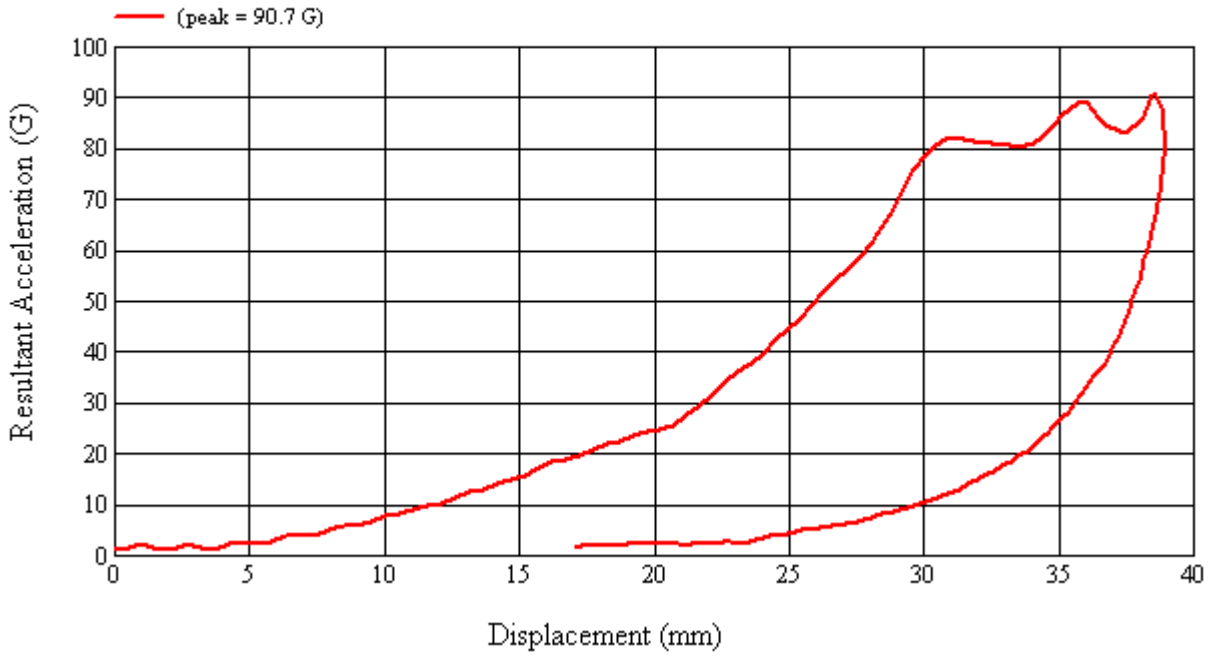
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

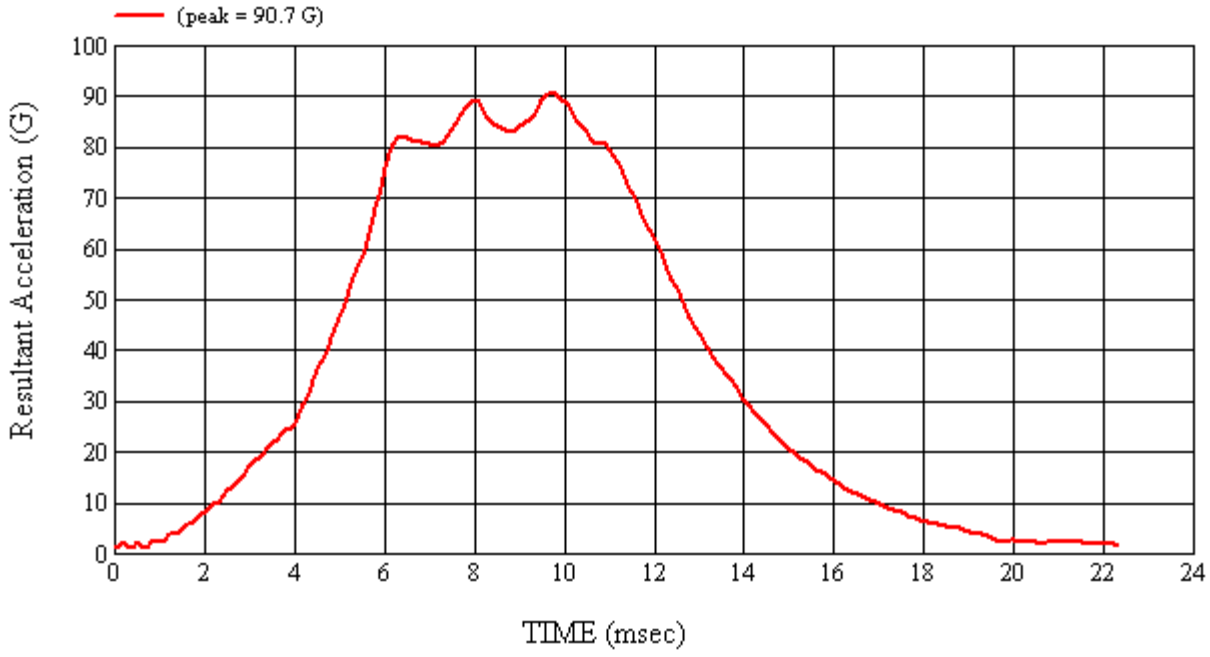
No damage observed

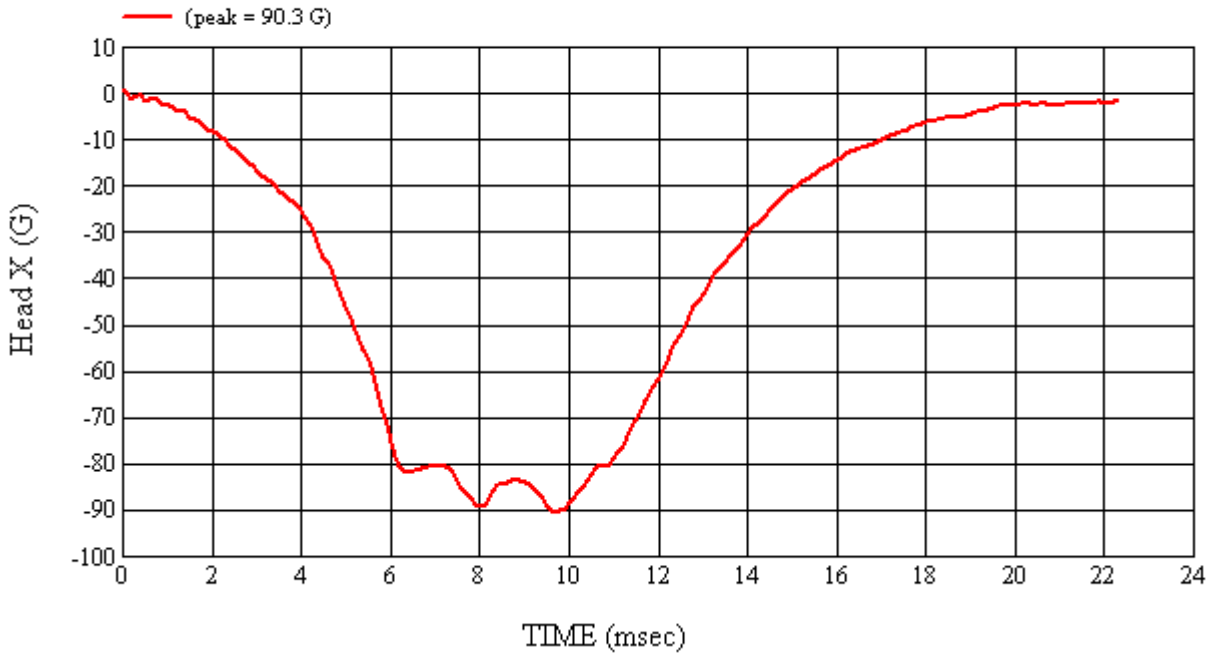
Recorded By: _____ Approved By*: _____ Date: 6/9/2009

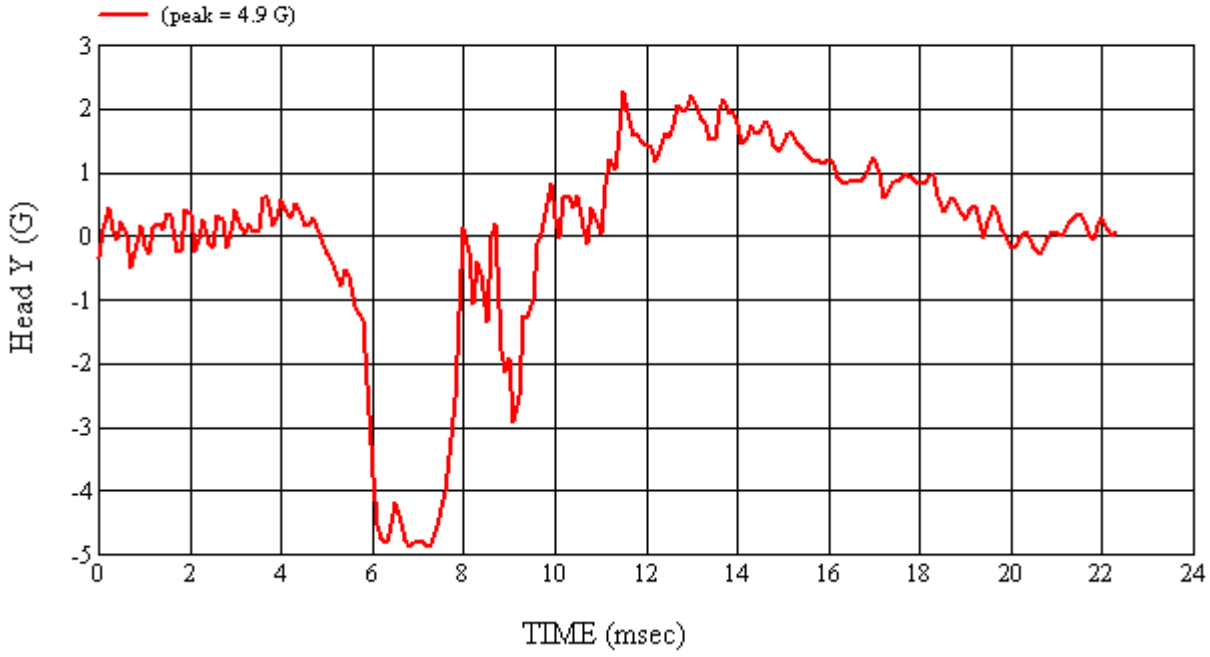
*Only necessary for NHTSA (Government) Compliance testing.

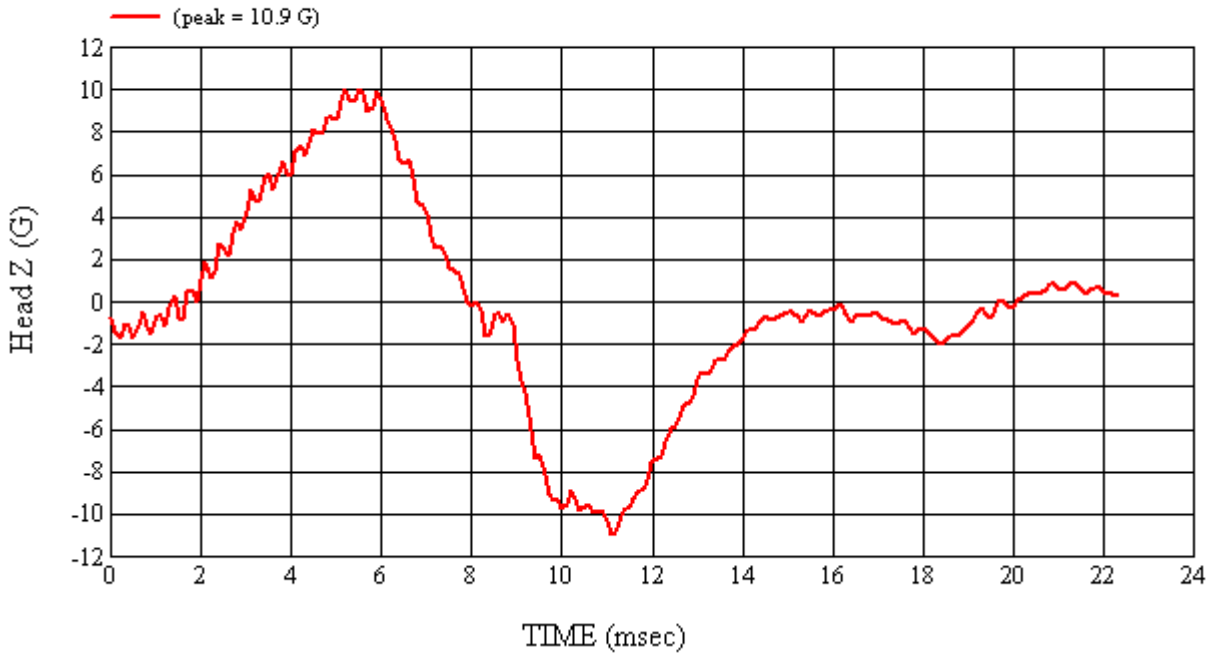
MGA Test #: FM9151 Target Location: BP1, Left Side Test Date: 6/9/2009

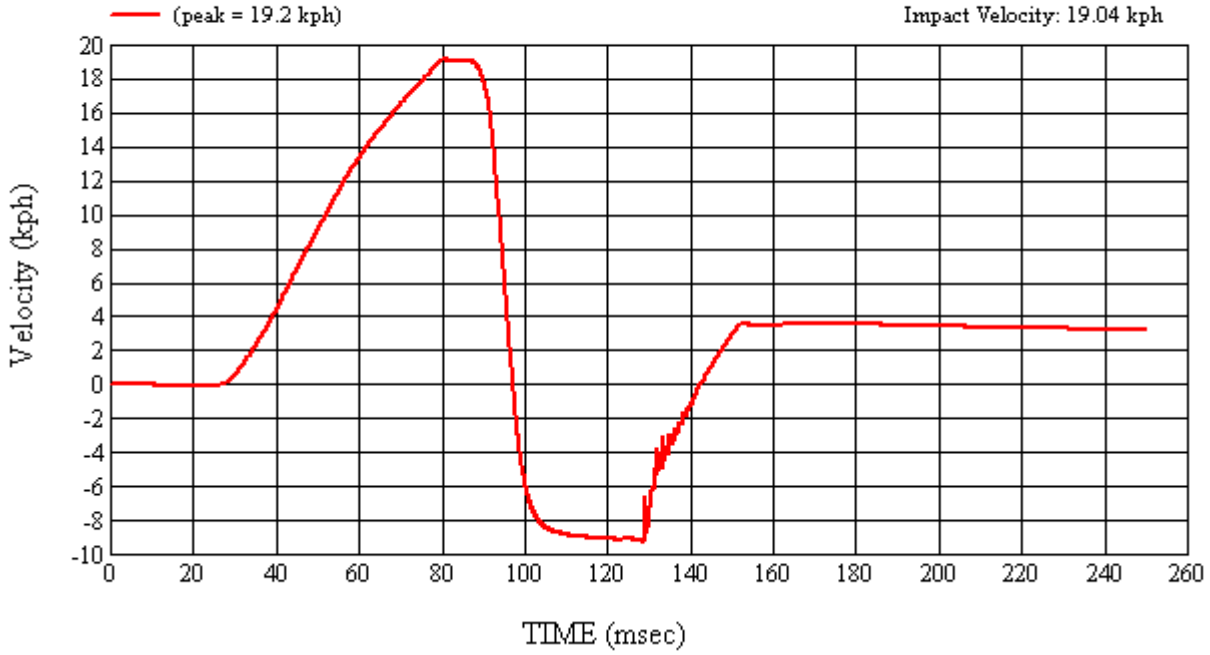


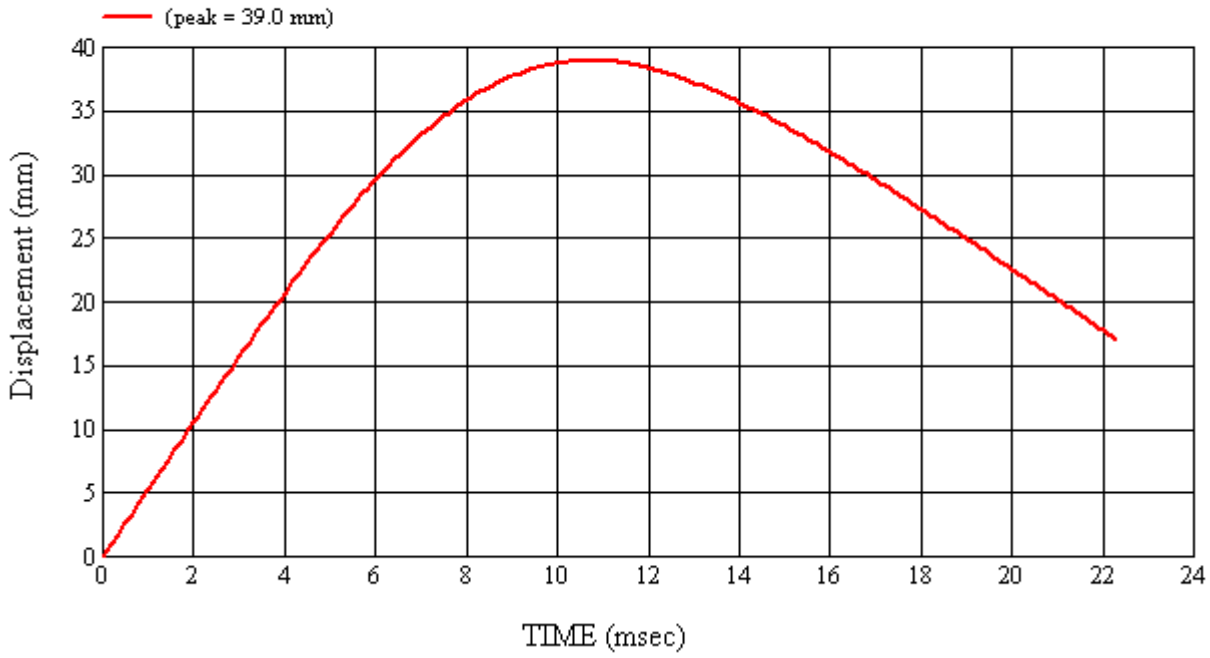



(peak = 90.3 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)

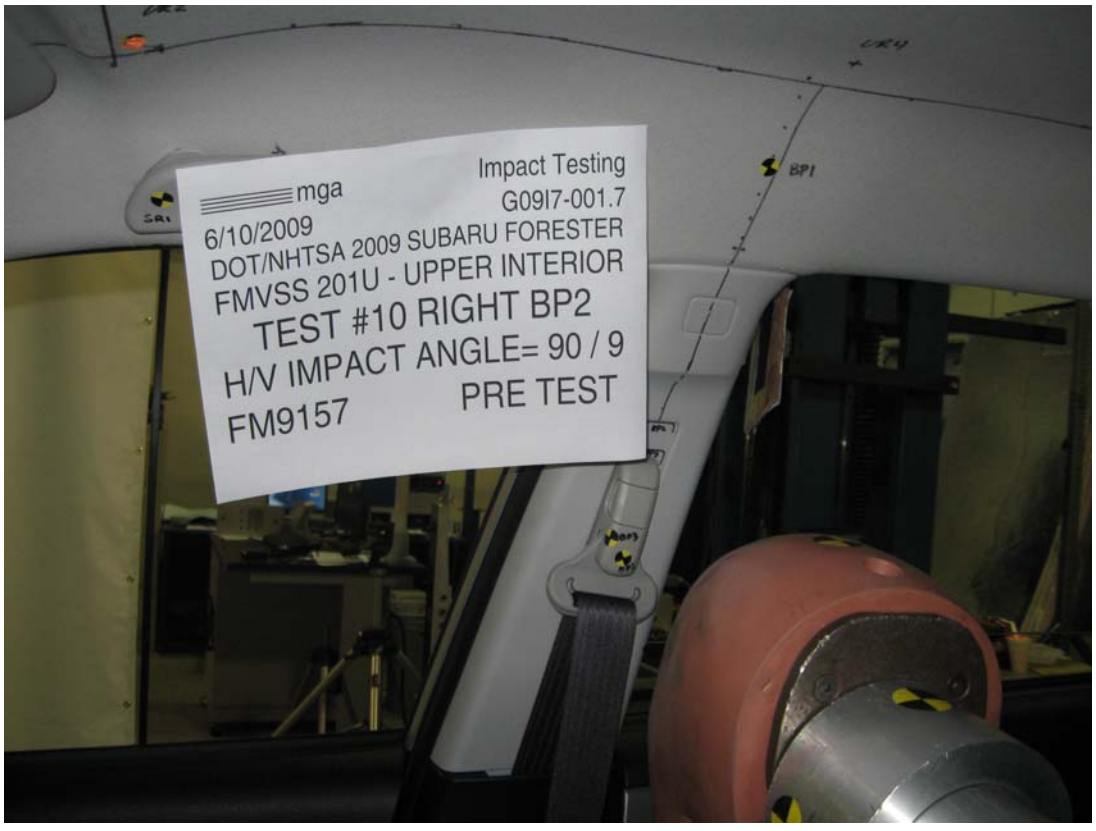

(peak = 4.9 G)
Head Y (G)
3
2
1
0
-1
-2
-3
-4
-5
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)

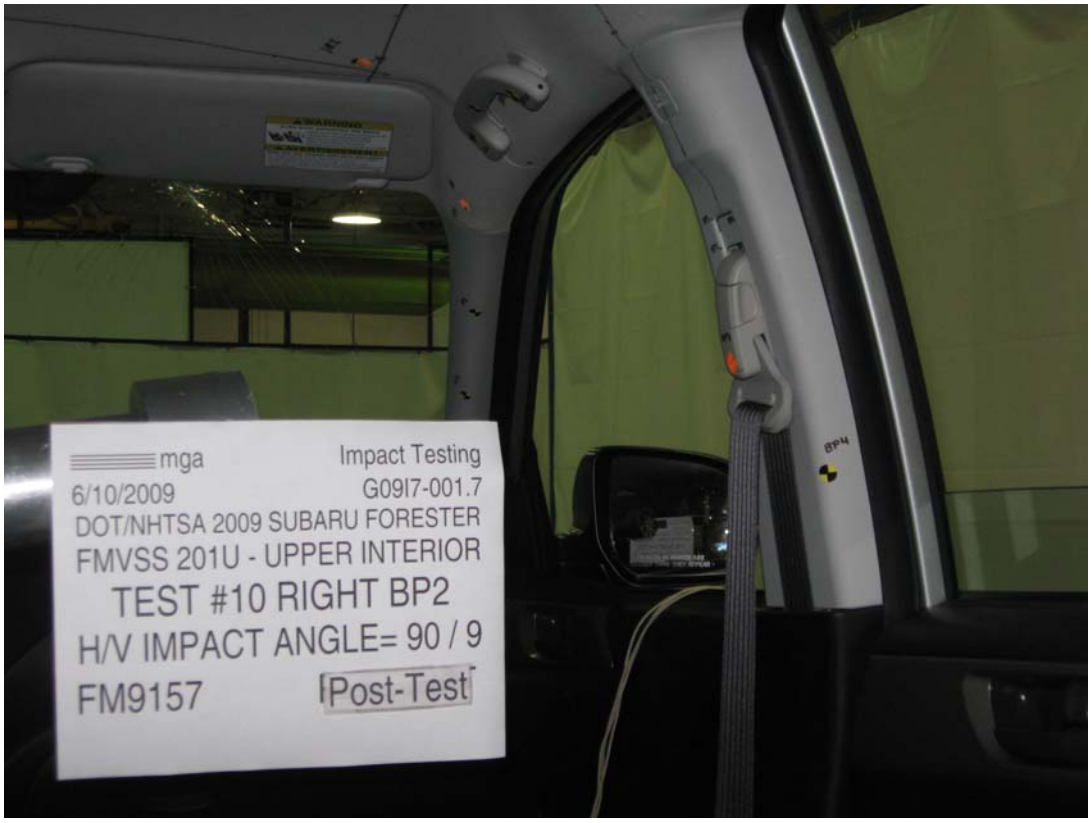

(peak = 10.9 G)
Head Z (G)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 19.2 kph)
Impact Velocity: 19.04 kph
Velocity (kph)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 39.0 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


C95501
FM9157
RIGHT BP2
H/V 90/9
mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP2
H/V IMPACT ANGLE= 90 / 9
FM9157
PRE TEST


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP2
H/V IMPACT ANGLE= 90 / 9
FM9157
PRE TEST


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP2
H/V IMPACT ANGLE= 90 / 9
FM9157
Post-Test
BP4


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP2
H/V IMPACT ANGLE= 90 / 9
FM9157
Post-Test
BP1


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #10 RIGHT BP2
H/V IMPACT ANGLE= 90 / 9
FM9157
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#10

Target (Vehicle Side): BP2Right

Temperature:22.8C

MGA Test Reference No.:FM9157

Humidity:50.9%

Approach Horizontal Angles:90º

Time of Test:2:28:02 PM

Approach Vertical Angles:9º

FMH Serial No:[035]

Additional Description:adjuster positioned one above mid

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
596	569	9	24.1	7	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	-95.6	1.07	1.07
Y	6	J22664	94.3	0.85	0.85
Z	7	J35924	92.8	0.94	0.94

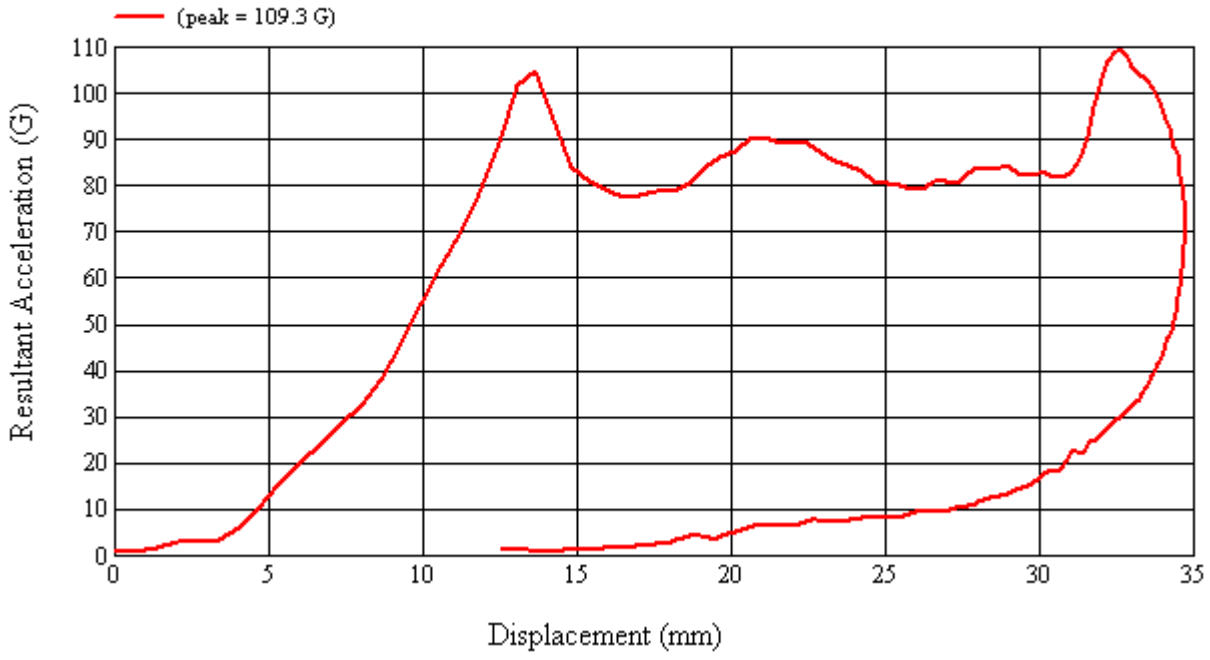
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

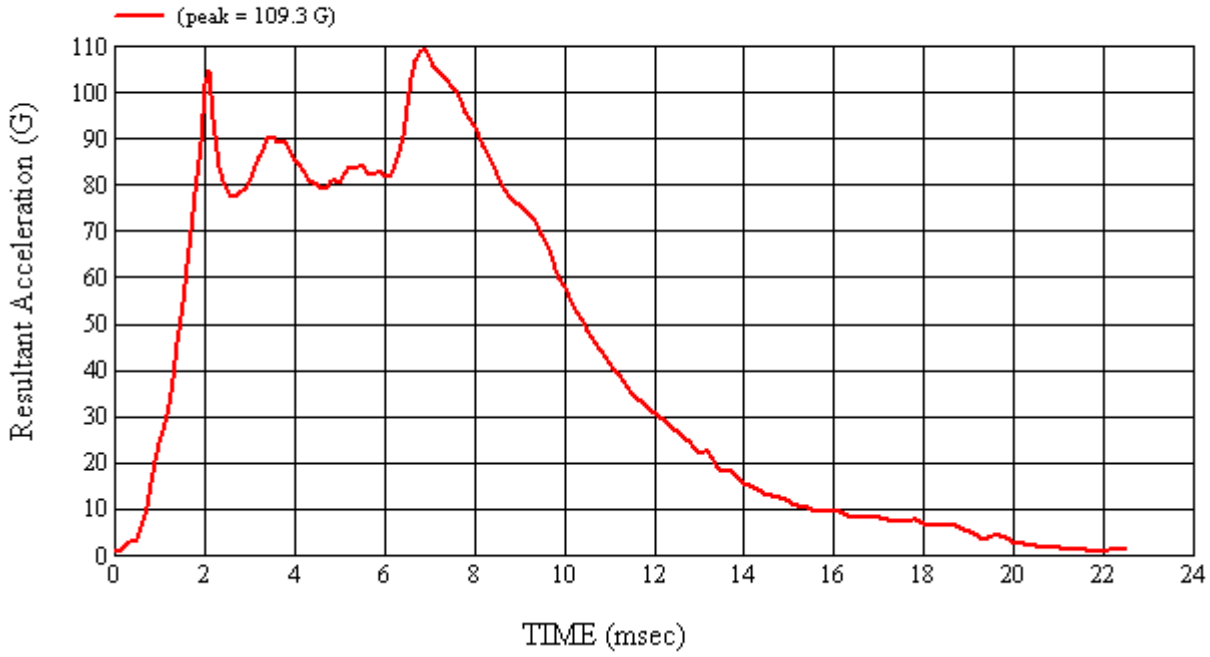
No damage observed

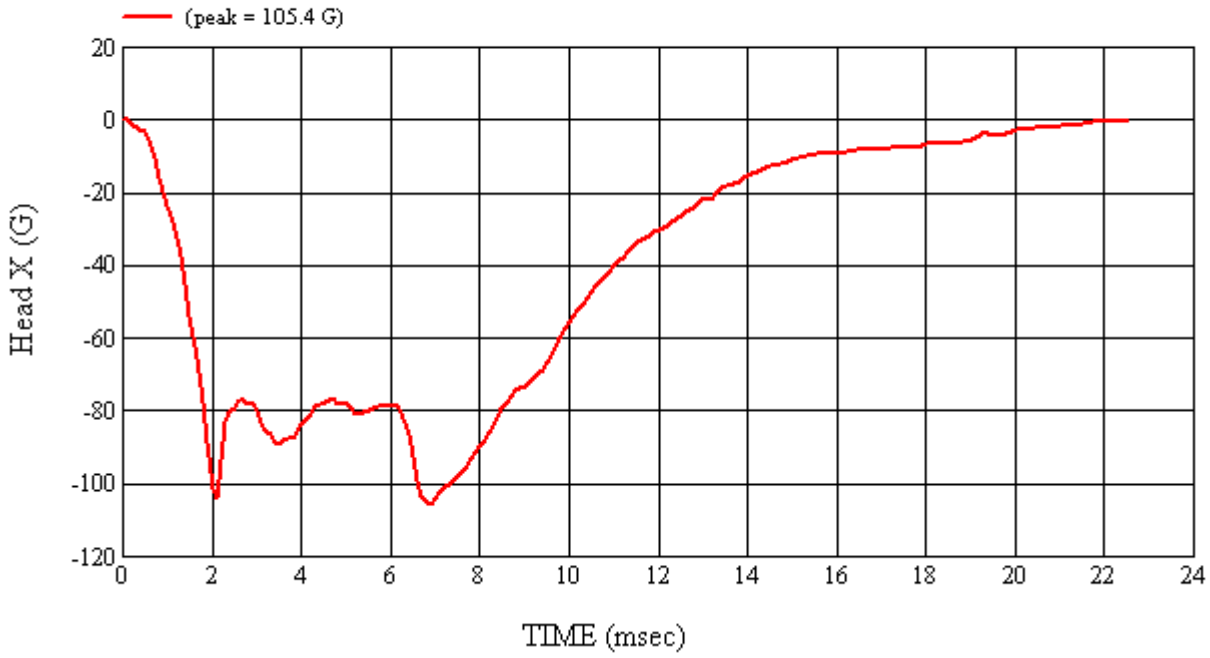
Recorded By: _____ Approved By*: _____ Date: 6/10/2009

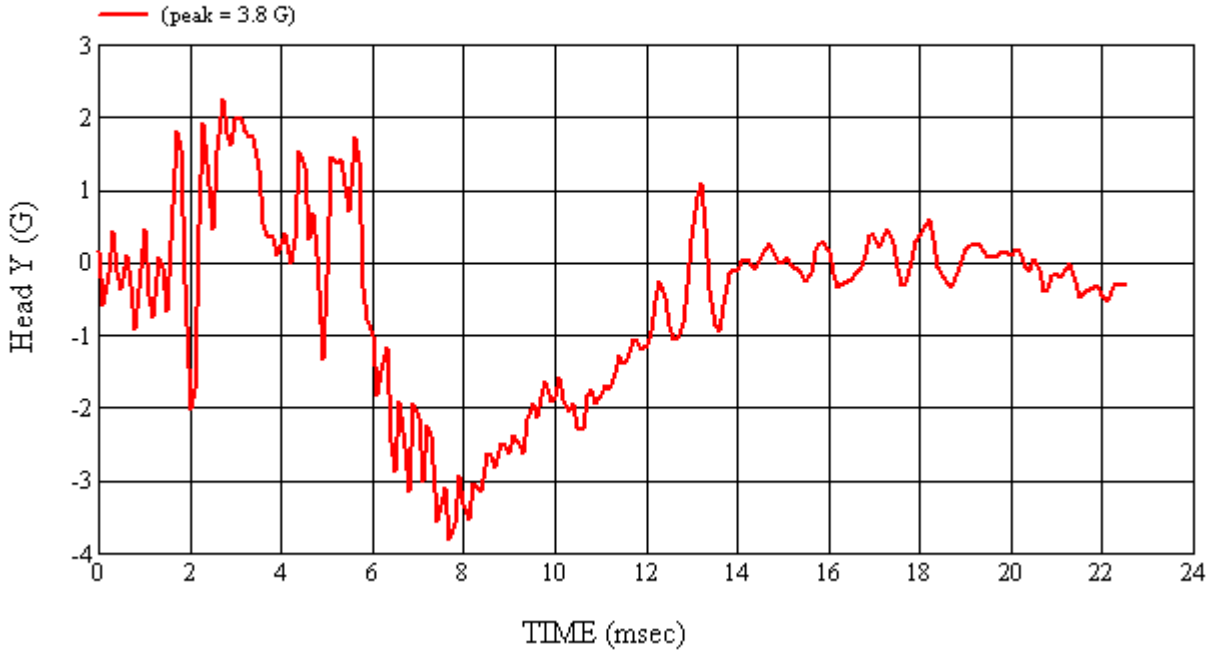
*Only necessary for NHTSA (Government) Compliance testing.

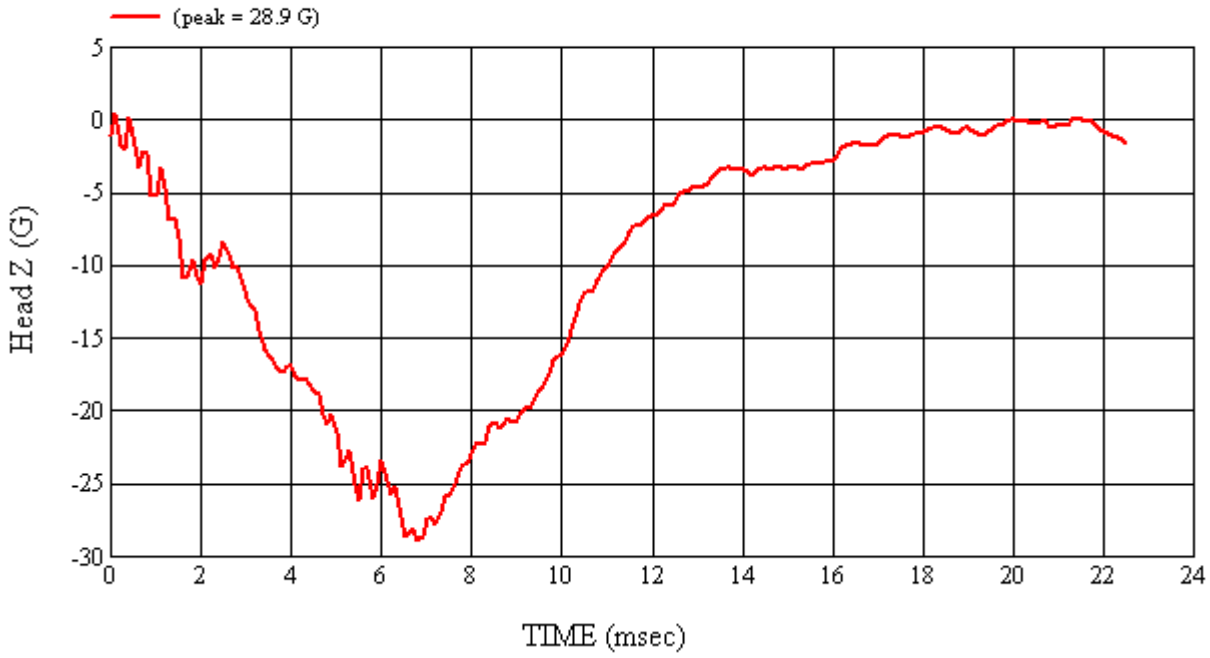
MGA Test #: FM9157 Target Location: BP2, Right Side Test Date: 6/10/2009

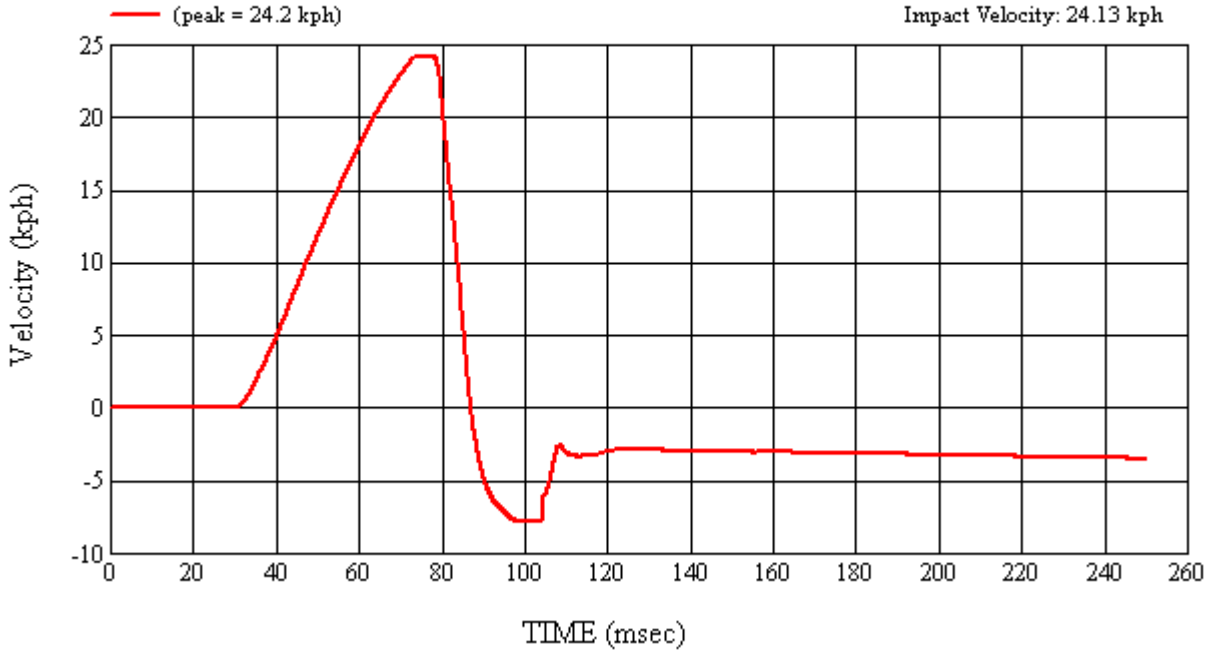


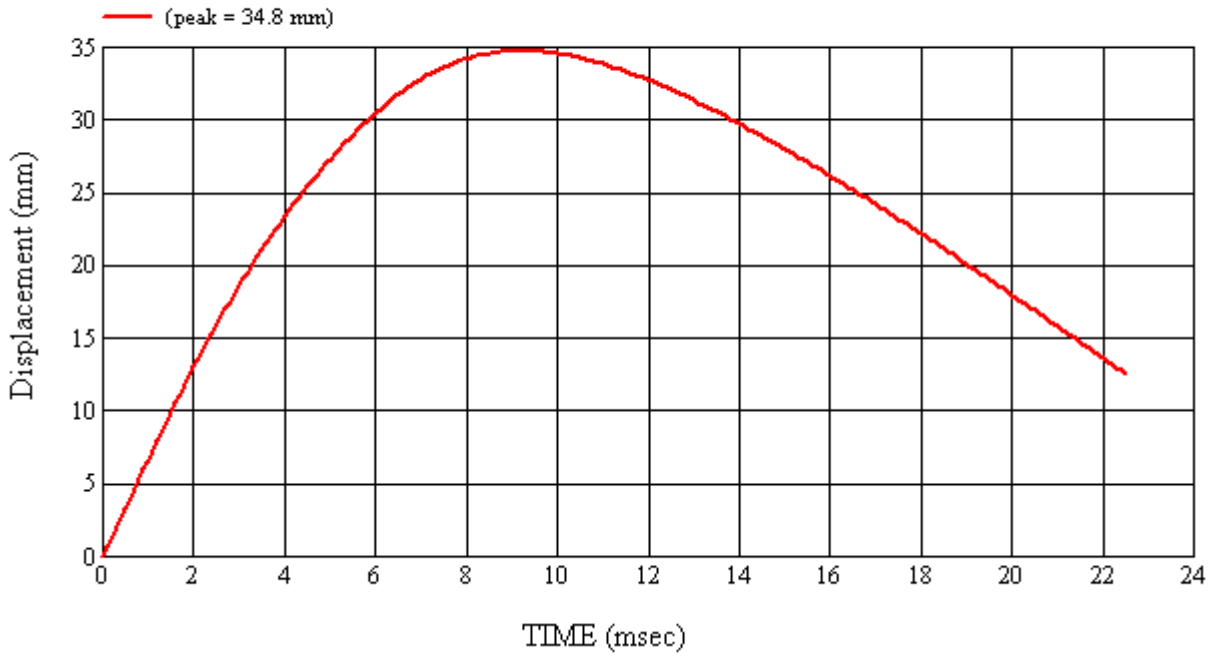



(peak = 105.4 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)

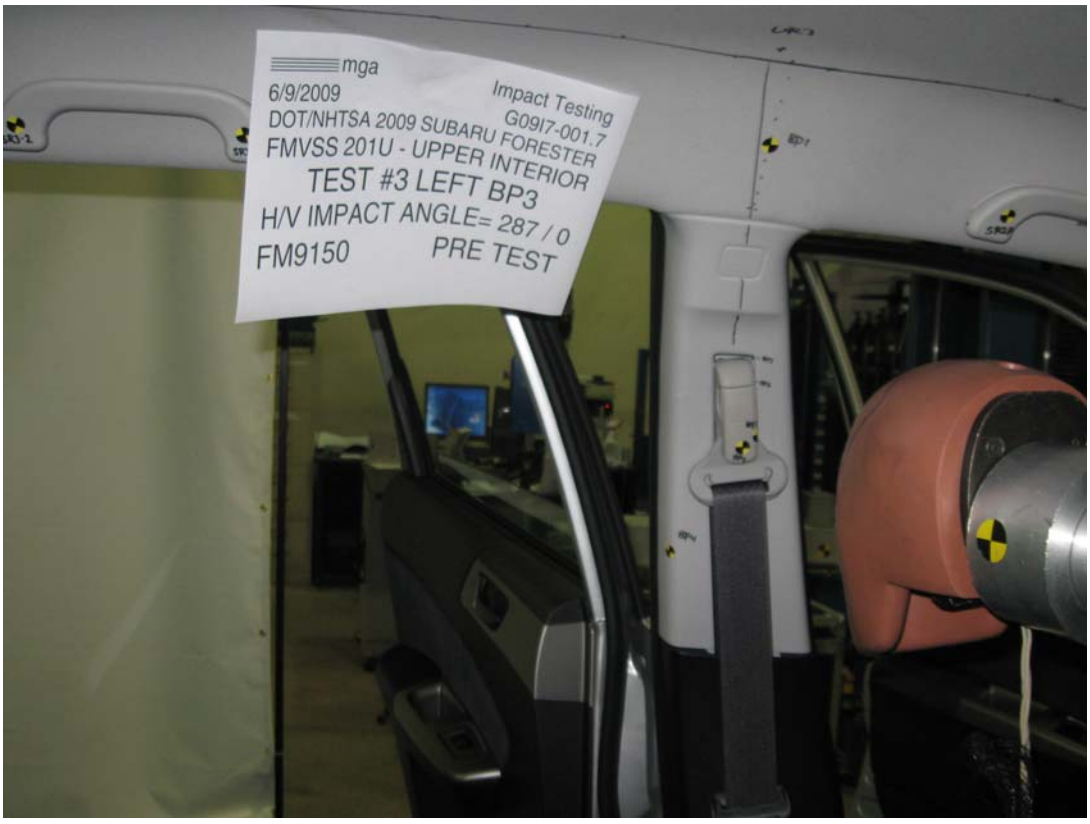

(peak = 3.8 G)
Head Y (G)
3
2
1
0
-1
-2
-3
-4
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 28.9 G)
Head Z (G)
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


(peak = 24.2 kph)
Impact Velocity: 24.13 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 34.8 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
0
2
4
6
8
10
12
14
16
18
20
22
24
TIME (msec)


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP3
H/V IMPACT ANGLE= 287 / 0
FM9150
PRE TEST


mga
6/9/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP3
H/V IMPACT ANGLE= 287 / 0
FM9150
PRE TEST


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP3
H/V IMPACT ANGLE= 287 / 0
FM9150
Post-Test


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP3
H/V IMPACT ANGLE= 287 / 0
FM9150
Post-Test


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #3 LEFT BP3
H/V IMPACT ANGLE= 287 / 0
FM9150
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#3

Target (Vehicle Side): BP3Left

Temperature:22.3C

MGA Test Reference No.:FM9150

Humidity:50.6%

Approach Horizontal Angles:287º

Time of Test:2:30:42 PM

Approach Vertical Angles:0º

FMH Serial No:[038]

Additional Description: adjuster in full up position

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
527	478	9.2	24.0	12	1 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-94	1.06	1.07
Y	6	J36197	106.3	0.85	0.85
Z	7	J36353	97.5	0.94	0.94

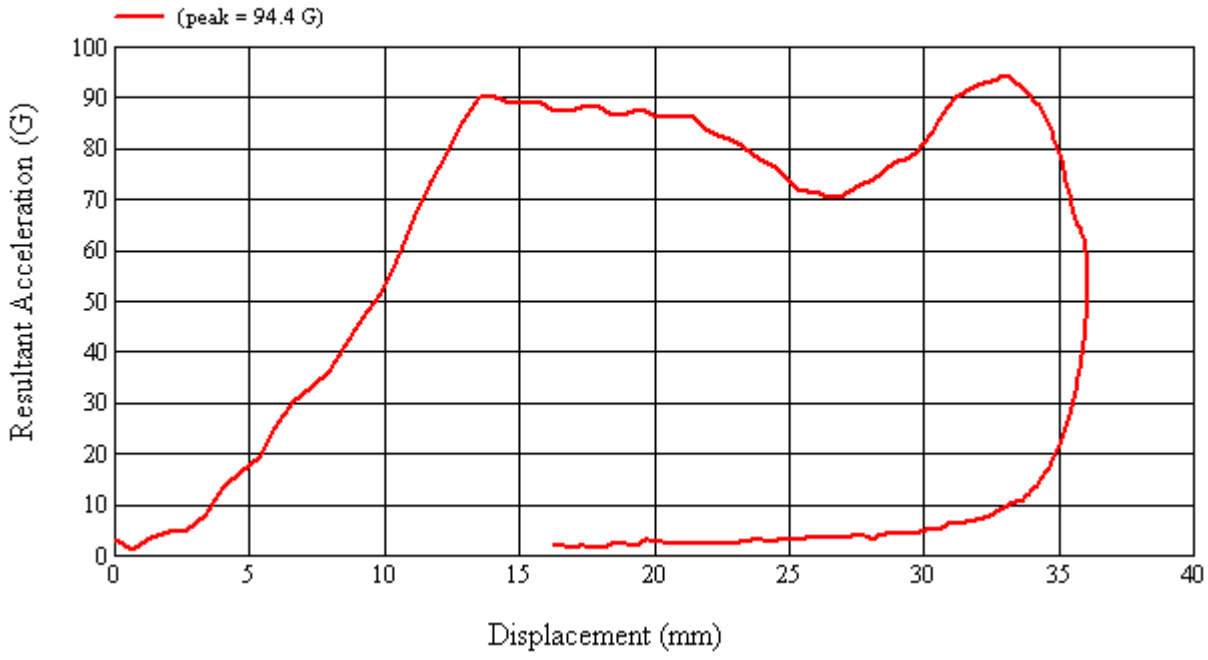
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

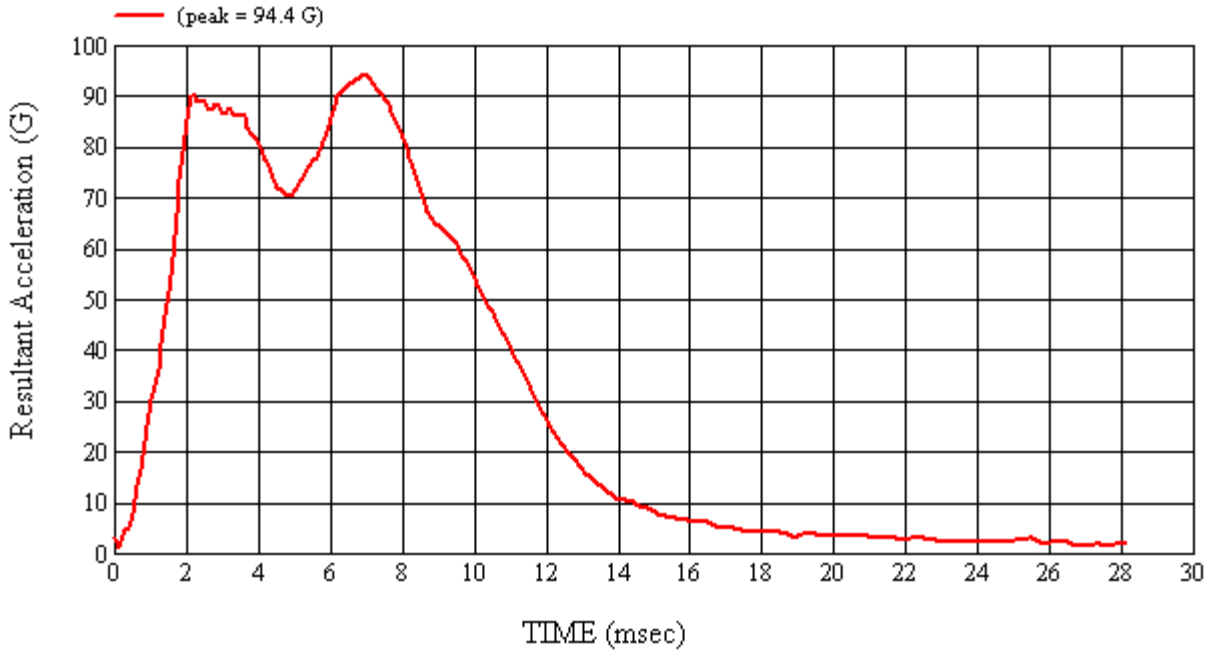
Crack in adjuster cover; adjuster not functional

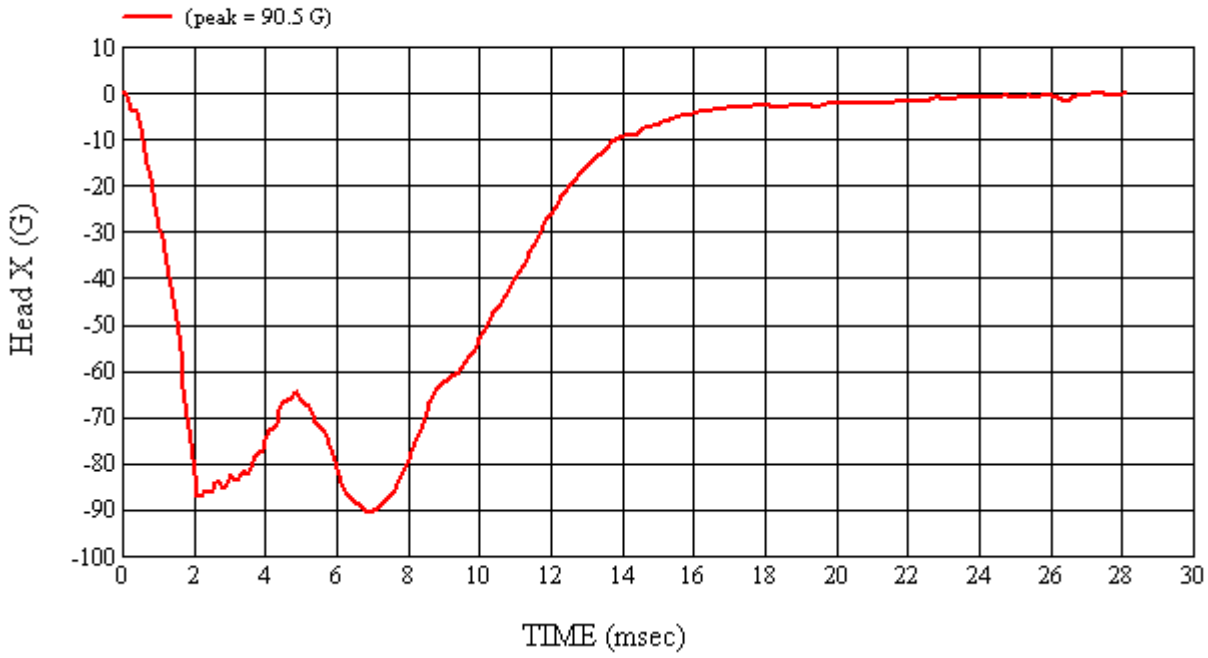
Recorded By: _____ Approved By*: _____ Date: 6/9/2009

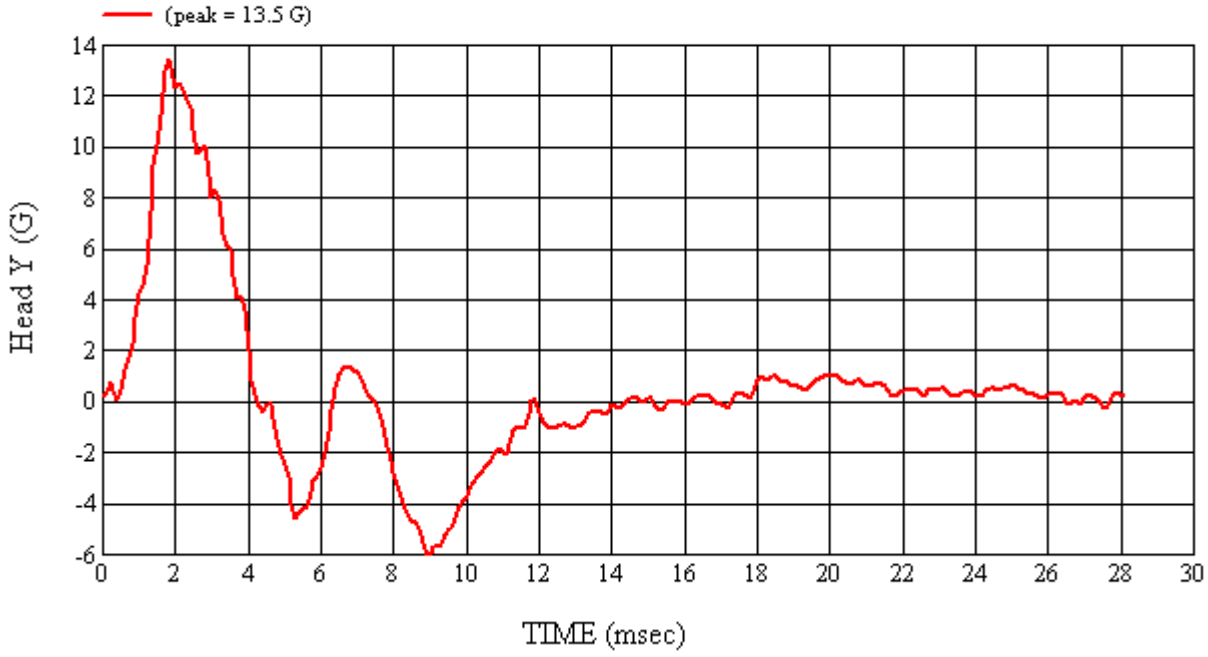
*Only necessary for NHTSA (Government) Compliance testing.

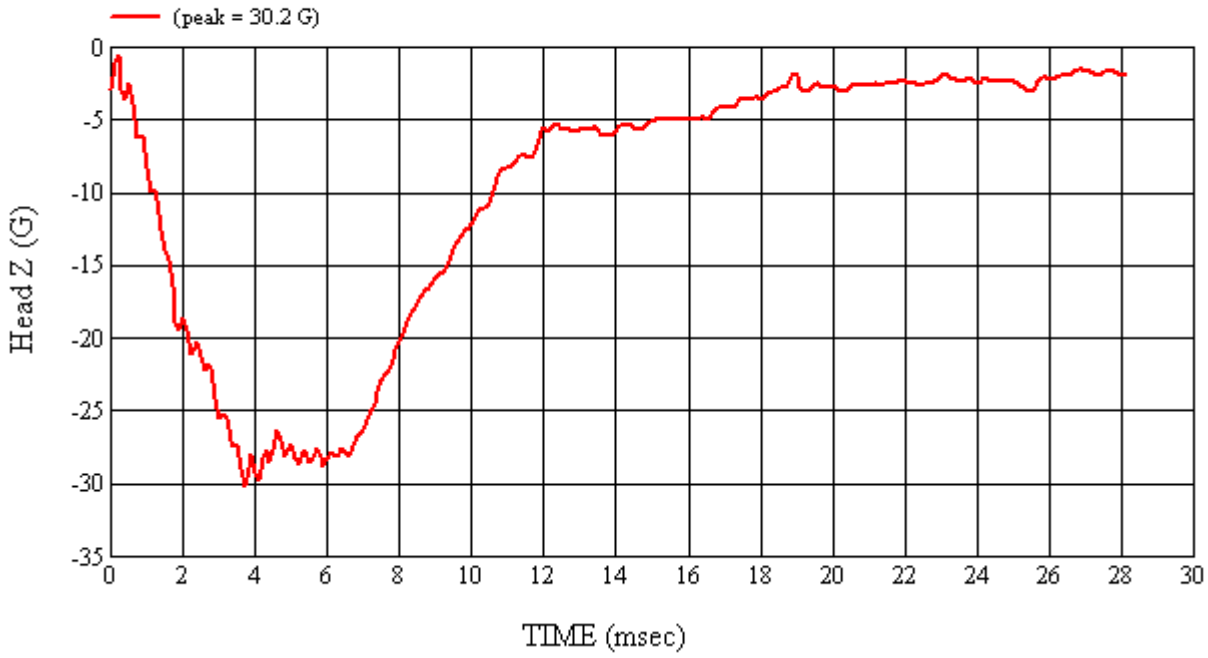
MGA Test #: FM9150 Target Location: BP3, Left Side Test Date: 6/9/2009

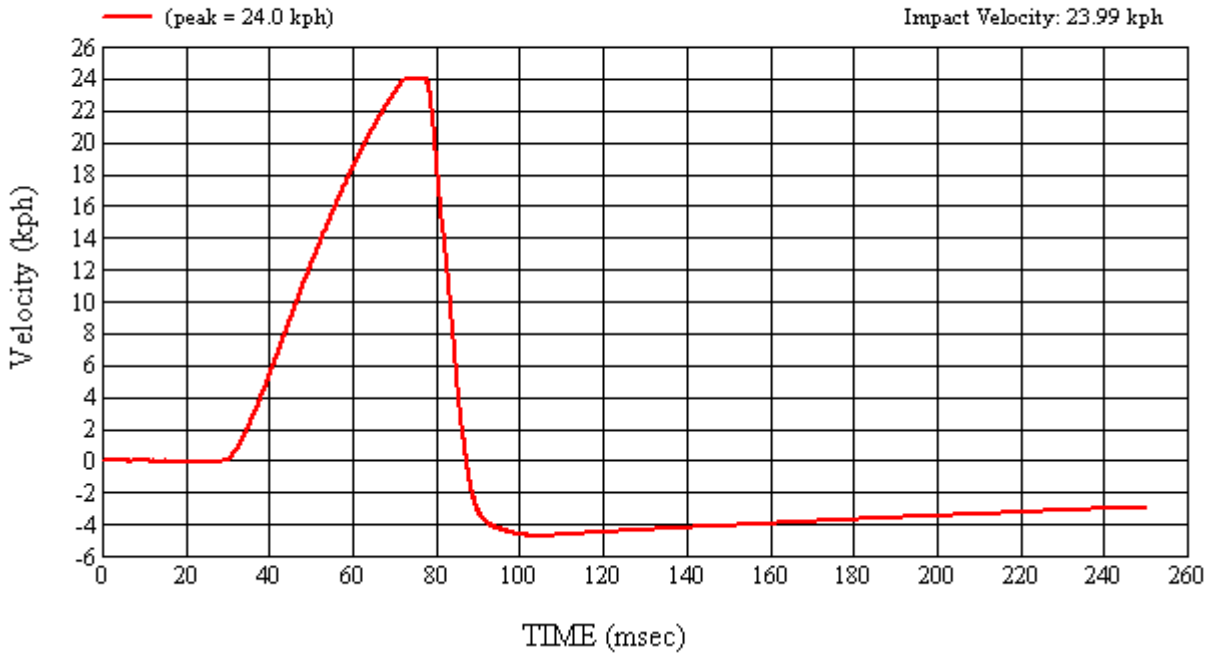


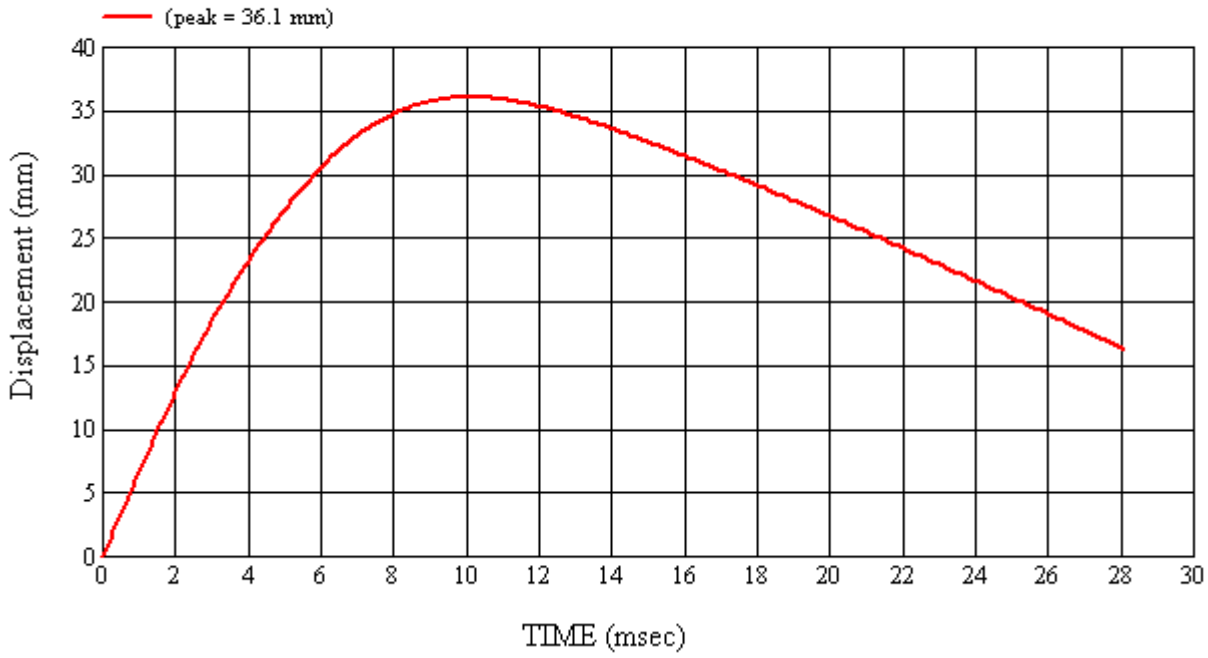


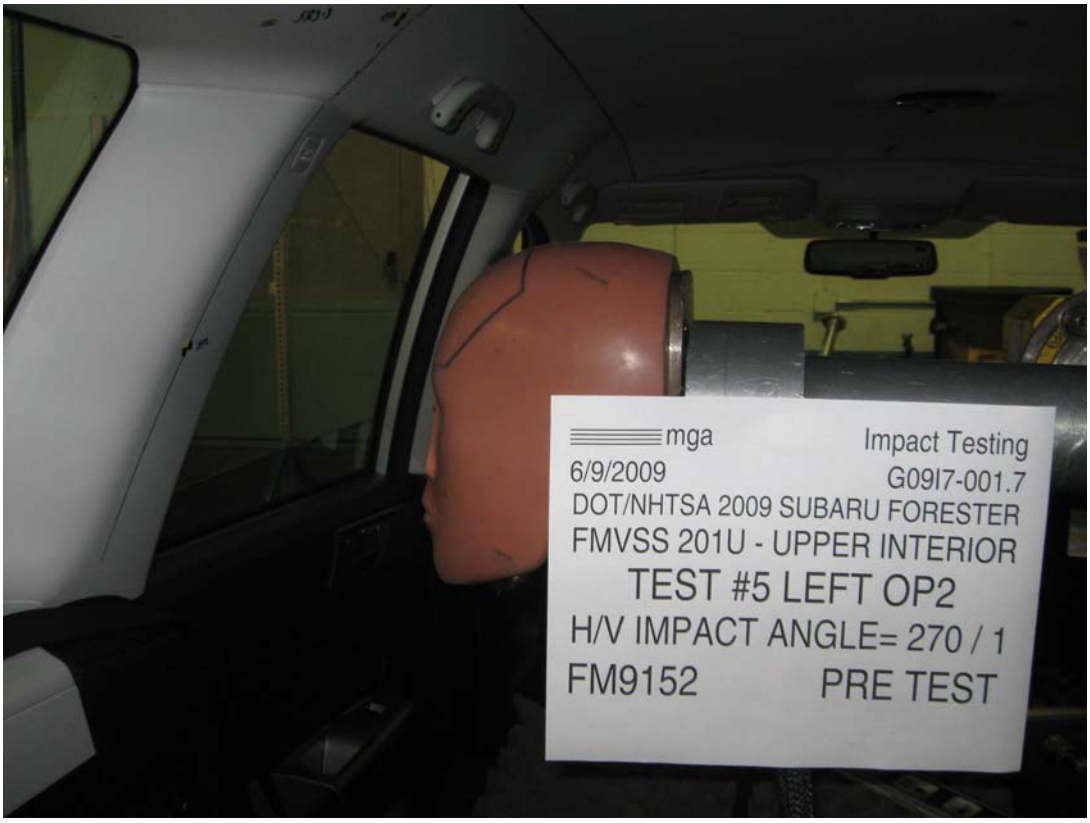

(peak = 90.5 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)


(peak = 13.5 G)
Head Y (G)
14
12
10
8
6
4
2
0
-2
-4
-6
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)


(peak = 30.2 G)
Head Z (G)
0
-5
-10
-15
-20
-25
-30
-35
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)

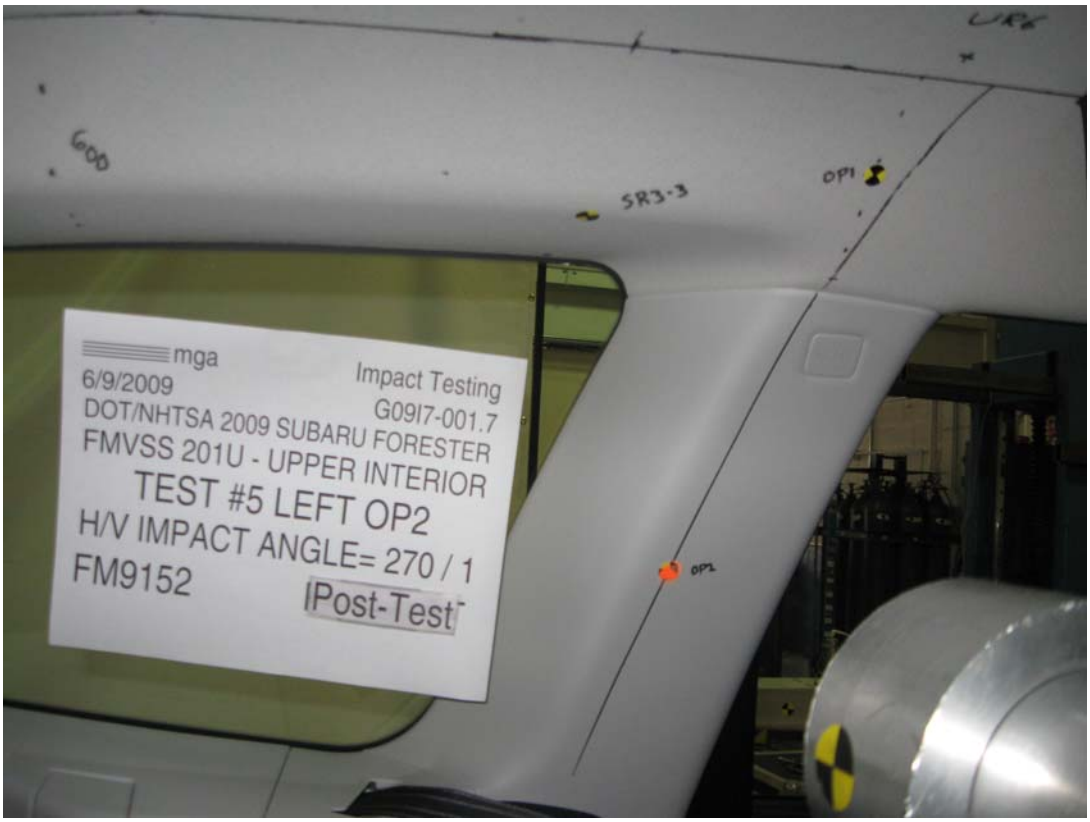

(peak = 24.0 kph)
Impact Velocity: 23.99 kph
Velocity (kph)
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 36.1 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT OP2
H/V IMPACT ANGLE= 270 / 1
FM9152
PRE TEST


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT OP2
H/V IMPACT ANGLE= 270 / 1
FM9152
PRE TEST
SR3-3
OP1
OP2


FM9152
LEFT OP2
H/V 270/1
mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT OP2
H/V IMPACT ANGLE= 270 / 1
FM9152
Post-Test


SR3-3
OP1
mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT OP2
H/V IMPACT ANGLE= 270 / 1
FM9152
Post-Test


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #5 LEFT OP2
H/V IMPACT ANGLE= 270 / 1
FM9152
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#5

Target (Vehicle Side): OP2Left

Temperature:22.4C

MGA Test Reference No.:FM9152

Humidity:45.8%

Approach Horizontal Angles:270º

Time of Test:4:12:19 PM

Approach Vertical Angles:1º

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
633	619	7.4	23.9	15	3 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	AHTB2	-115.9	1.07	1.07
Y	6	J14103	93.7	0.85	0.85
Z	7	J35800	97.1	0.94	0.94

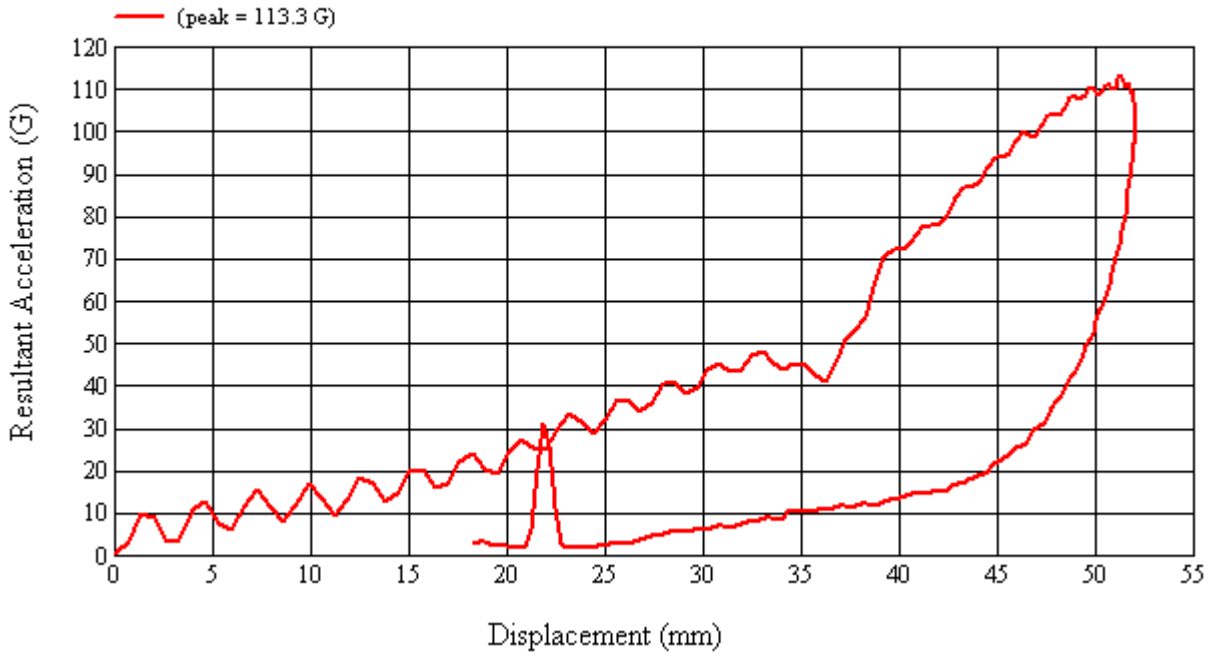
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

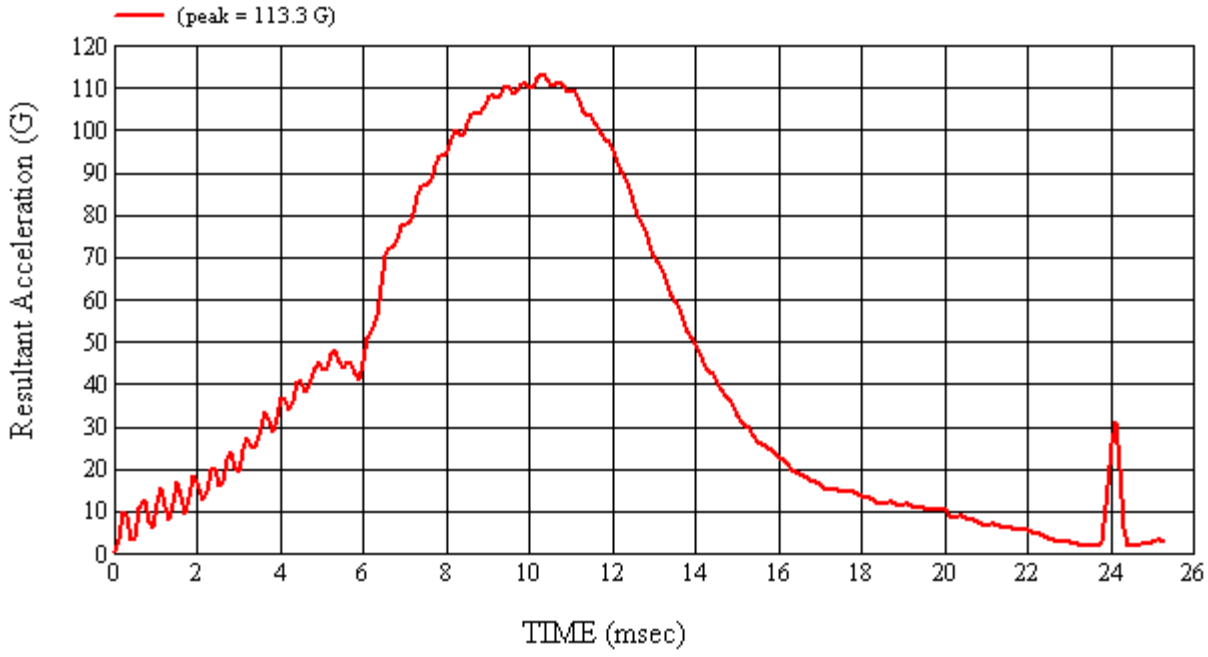
No damage observed

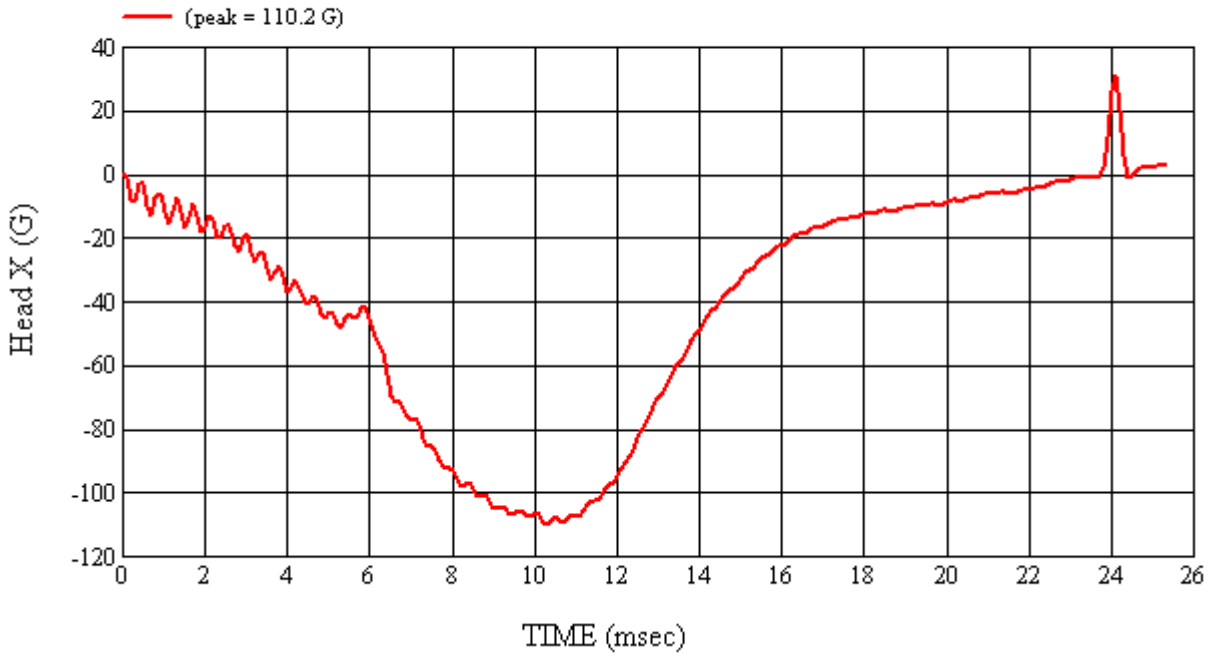
Recorded By: _____ Approved By*: _____ Date: 6/9/2009

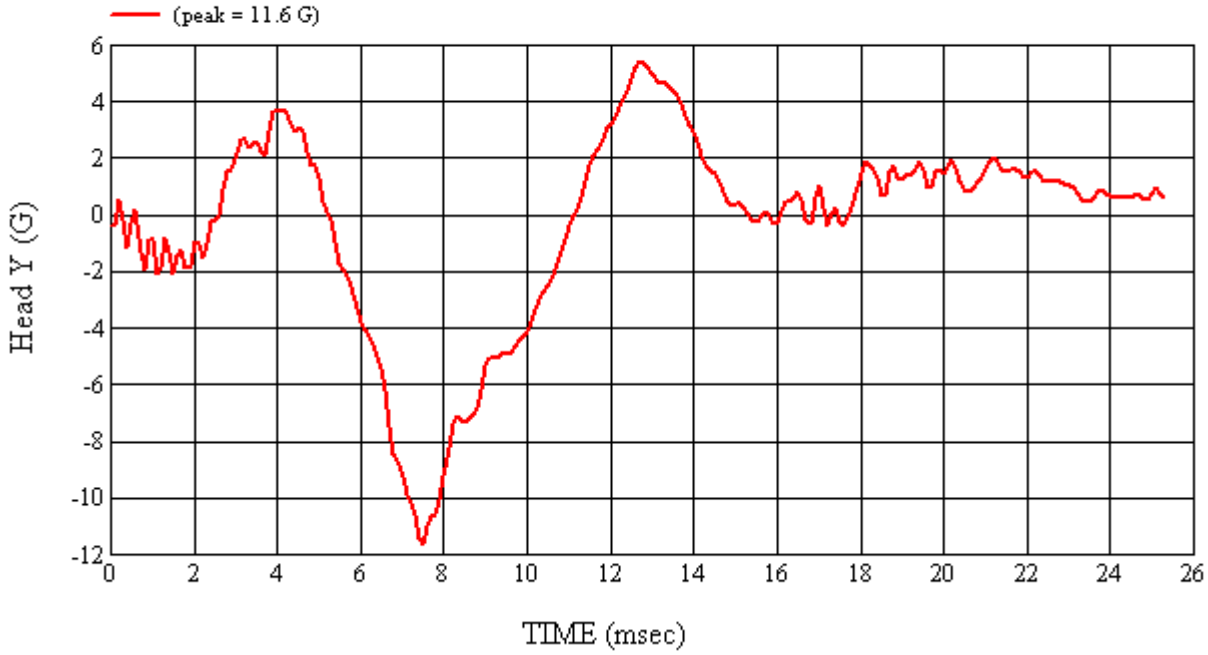
*Only necessary for NHTSA (Government) Compliance testing.

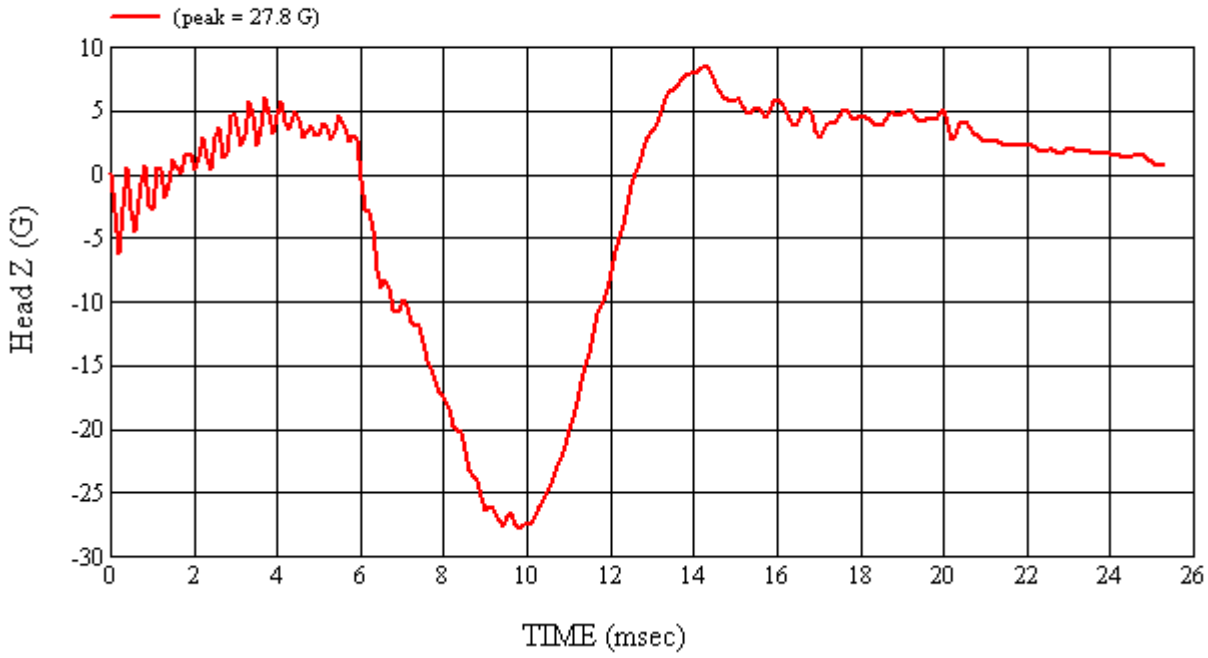
MGA Test #: FM9152 Target Location: OP2, Left Side Test Date: 6/9/2009

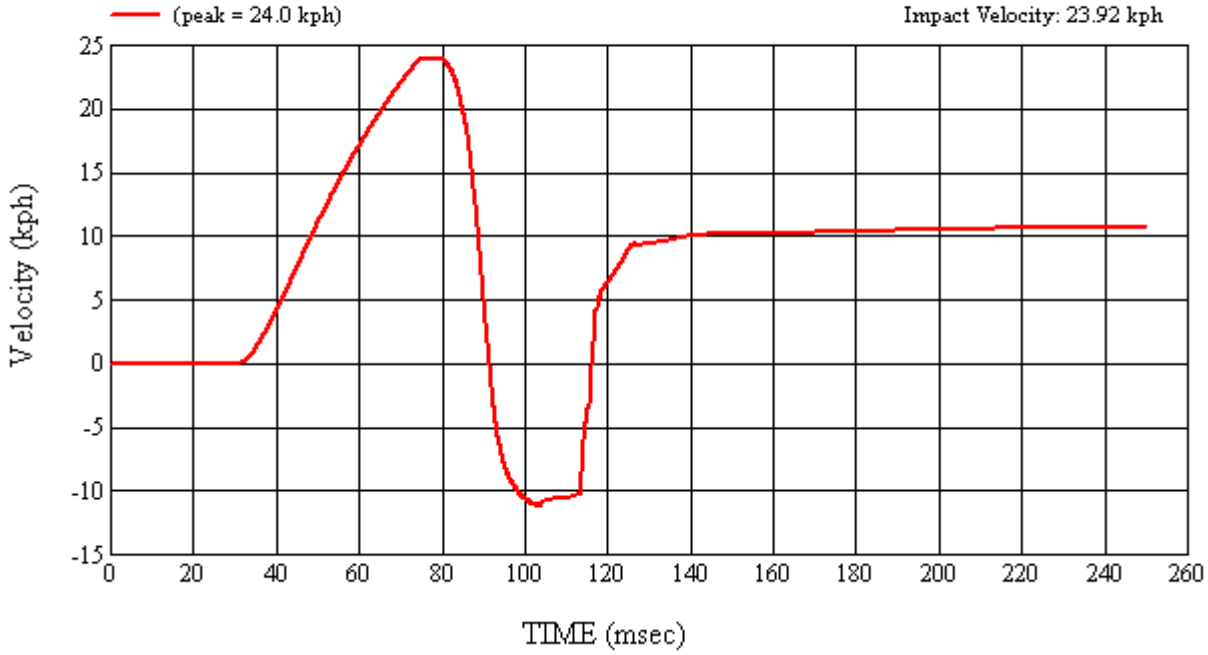


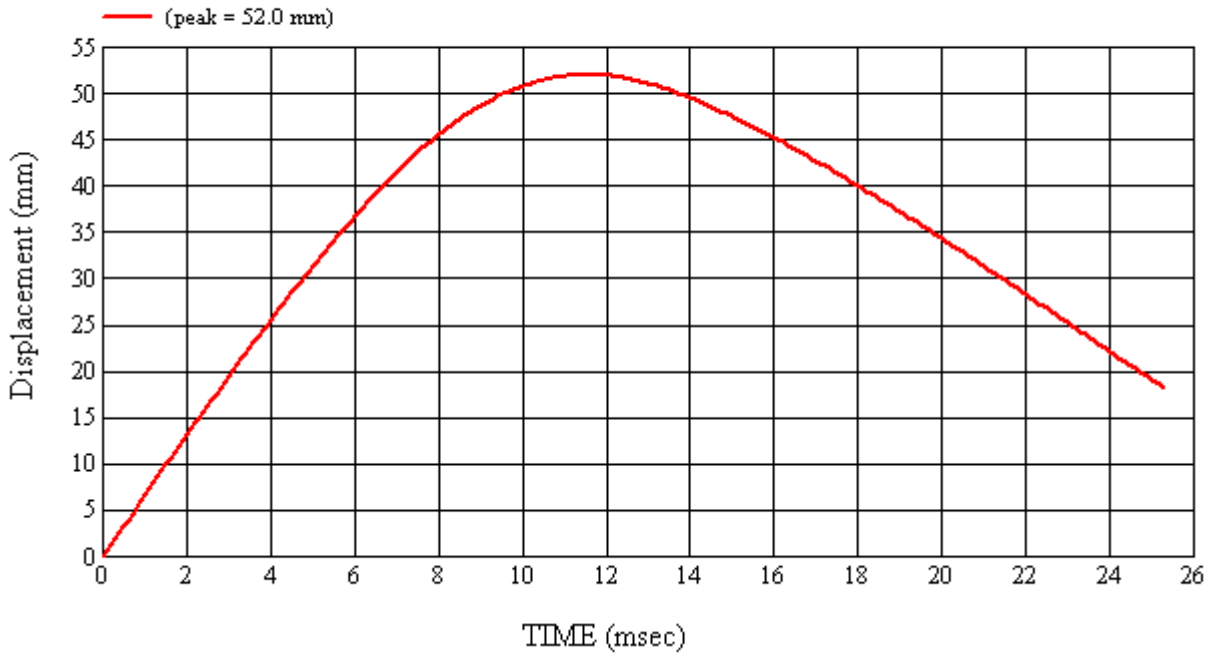


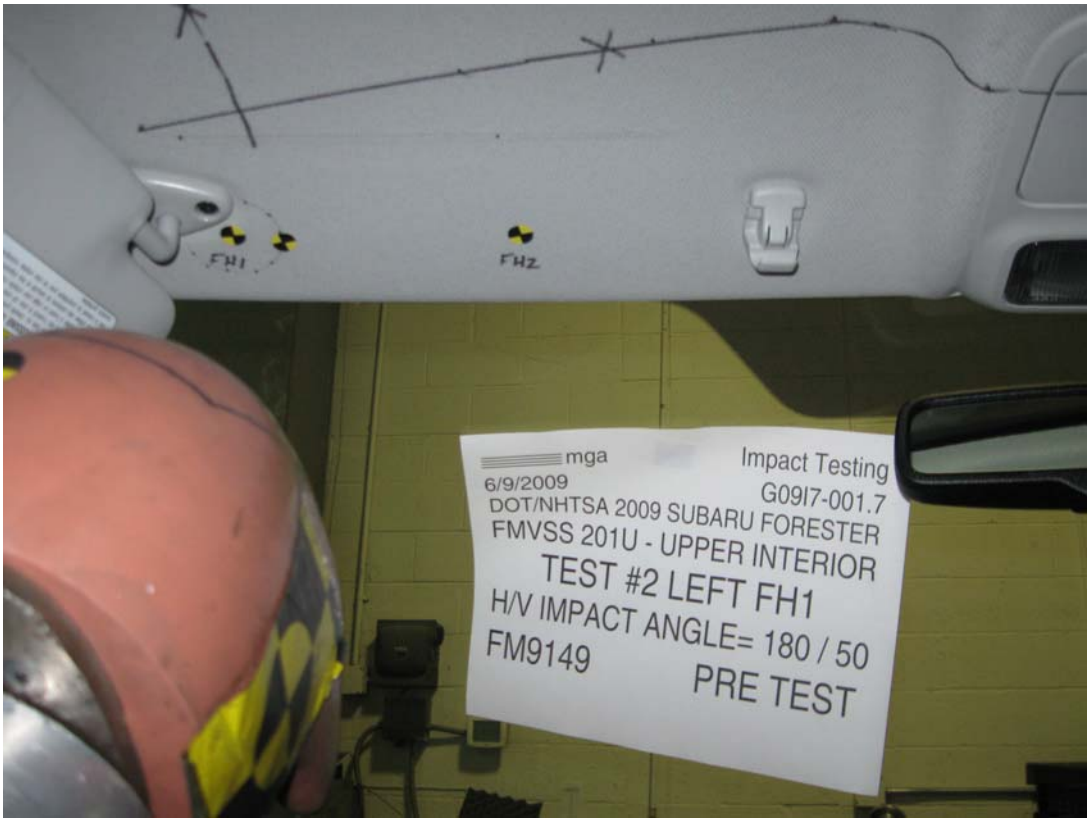

(peak = 110.2 G)
Head X (G)
40
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


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

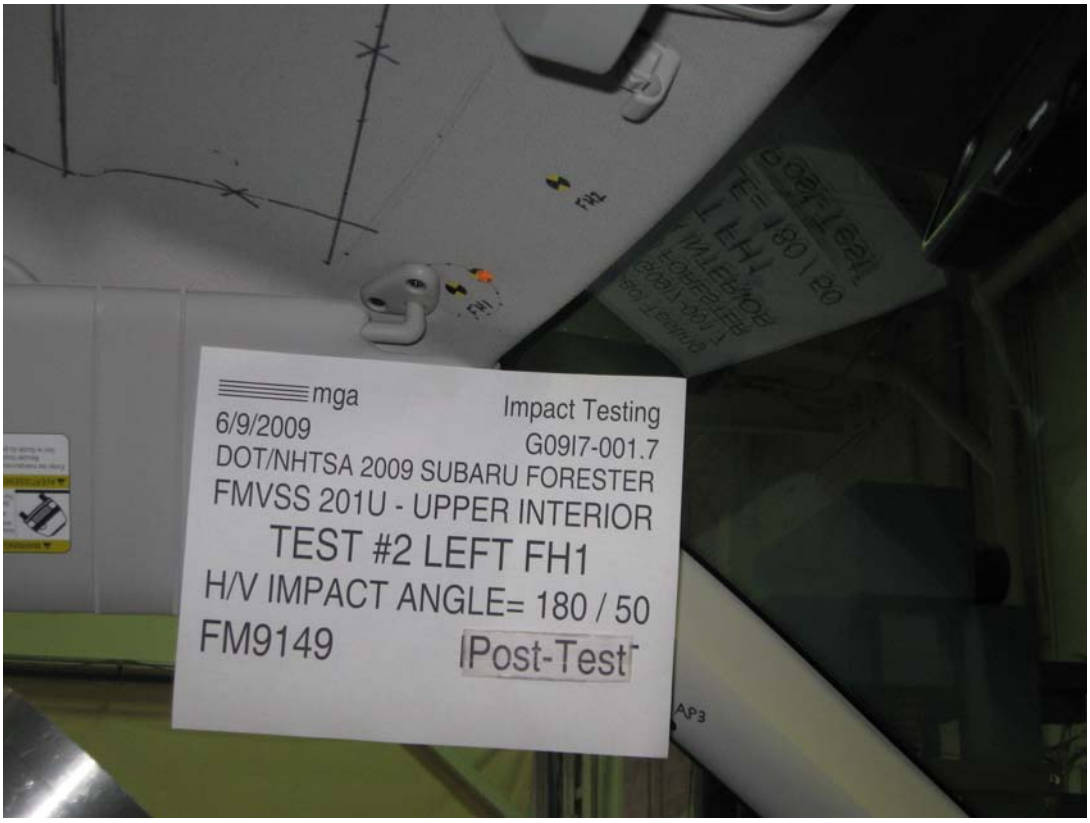

(peak = 27.8 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)

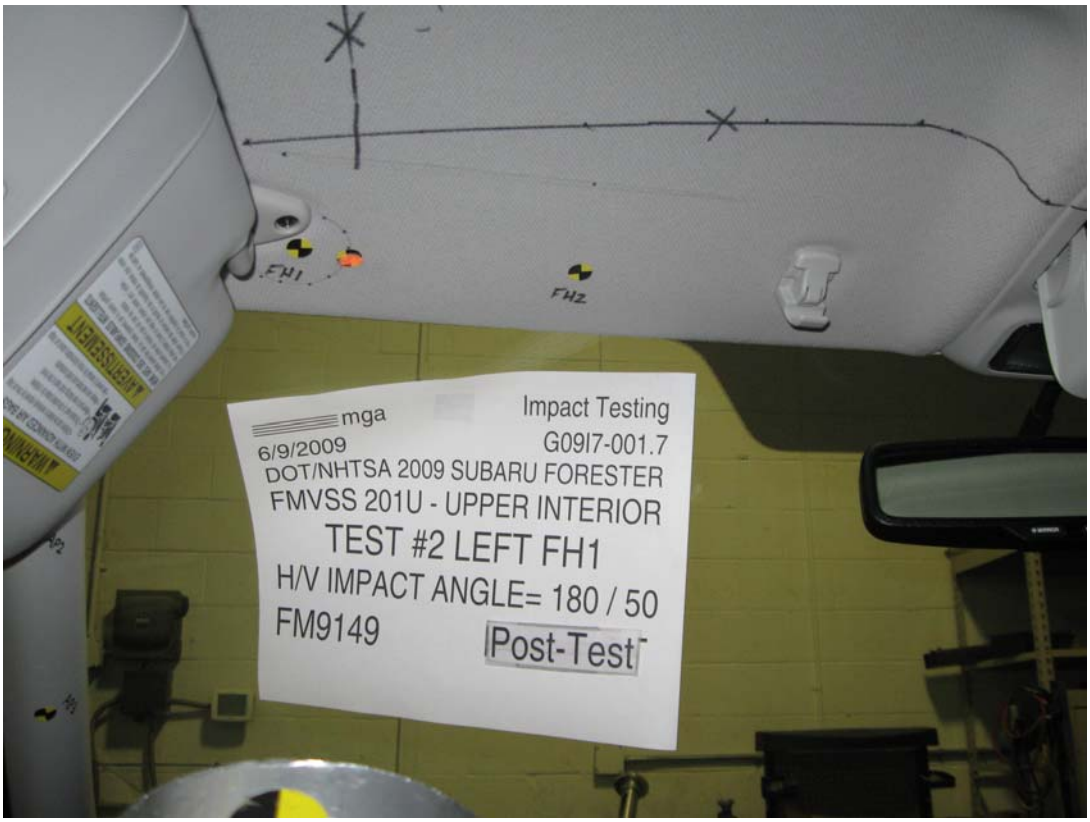

(peak = 24.0 kph)
Impact Velocity: 23.92 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 52.0 mm)
Displacement (mm)
55
50
45
40
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


FH1
FH2
mga
6/9/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
FM9149
PRE TEST


mga
6/9/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
FM9149
PRE TEST


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
FM9149
Post-Test


FH1
FH2
mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
FM9149
Post-Test


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #2 LEFT FH1
H/V IMPACT ANGLE= 180 / 50
FM9149
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#2

Target (Vehicle Side): FH1Left

Temperature:22.6C

MGA Test Reference No.:FM9149

Humidity:56.5%

Approach Horizontal Angles:180º

Time of Test:12:40:09 PM

Approach Vertical Angles:50º

FMH Serial No:[037]

Additional Description:Relocation Spheres: 1

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
598	573	10.7	24.1	16	26 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	AHTB2	-115.9	1.07	1.07
Y	6	J14103	93.7	0.85	0.85
Z	7	J35800	97.1	0.94	0.94

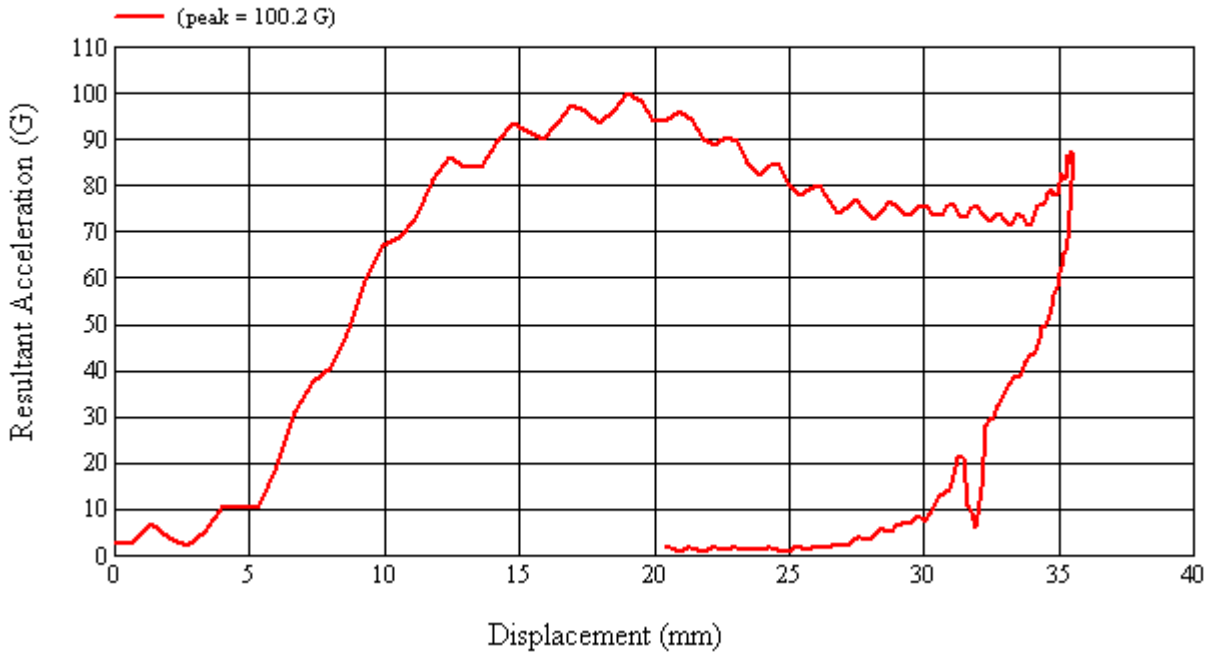
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

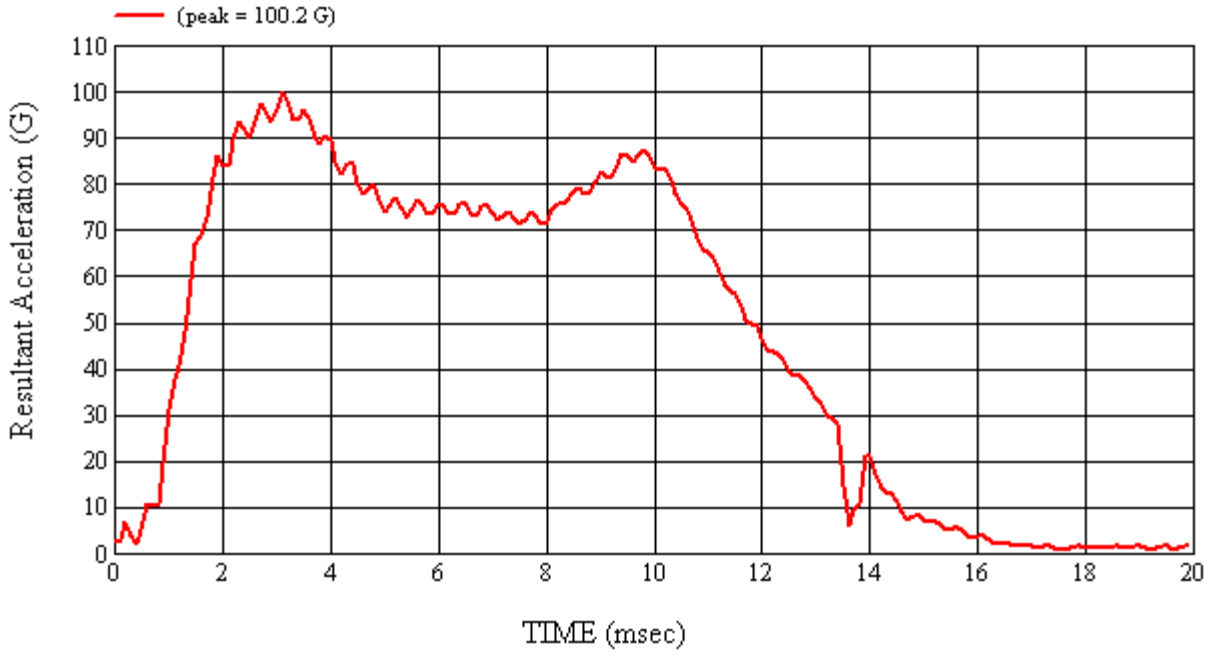
Overhead console opened on impact

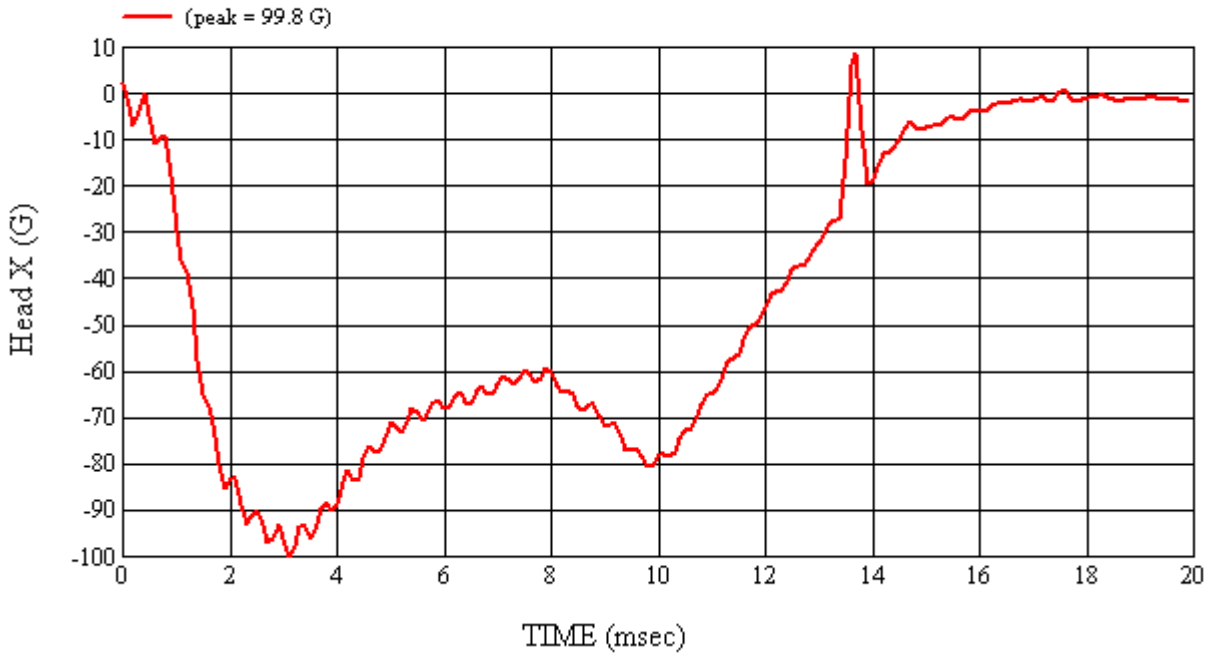
Recorded By: _____ Approved By*: _____ Date: 6/9/2009

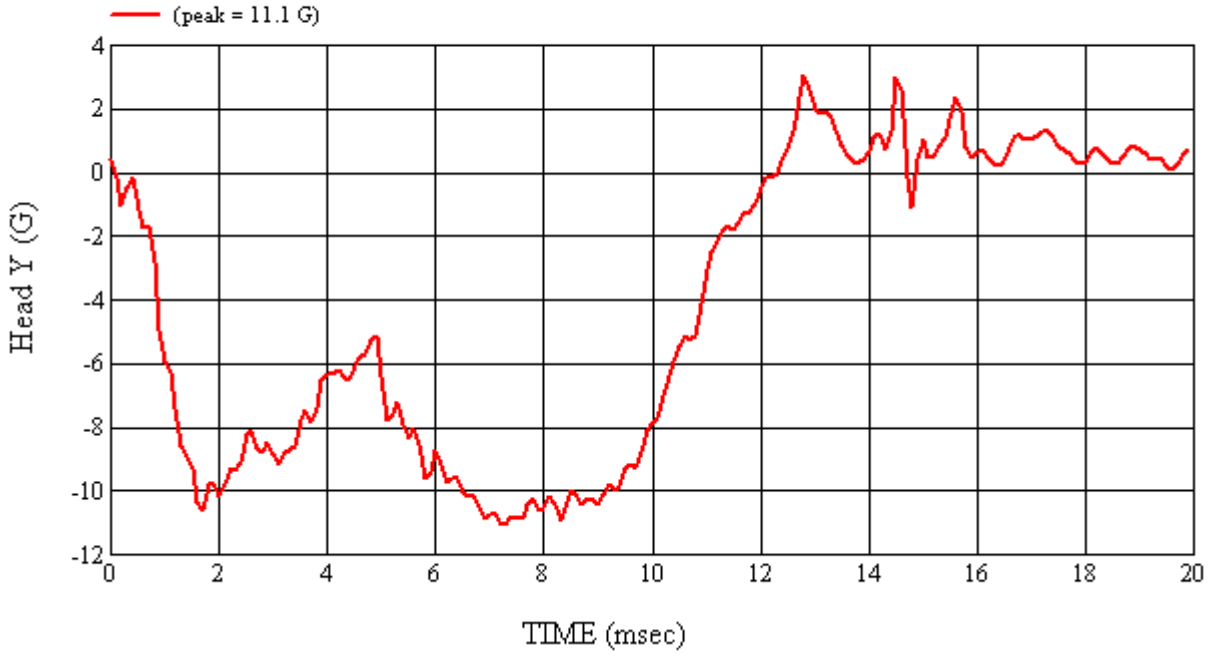
*Only necessary for NHTSA (Government) Compliance testing.

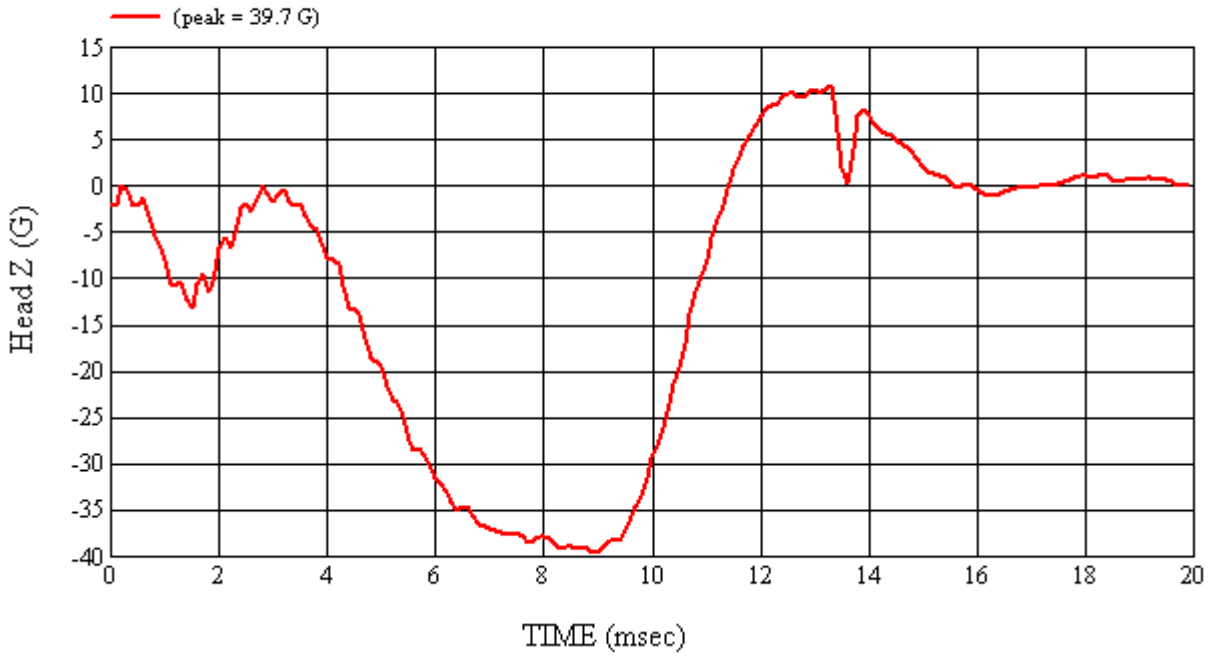
MGA Test #: FM9149 Target Location: FH1, Left Side Test Date: 6/9/2009

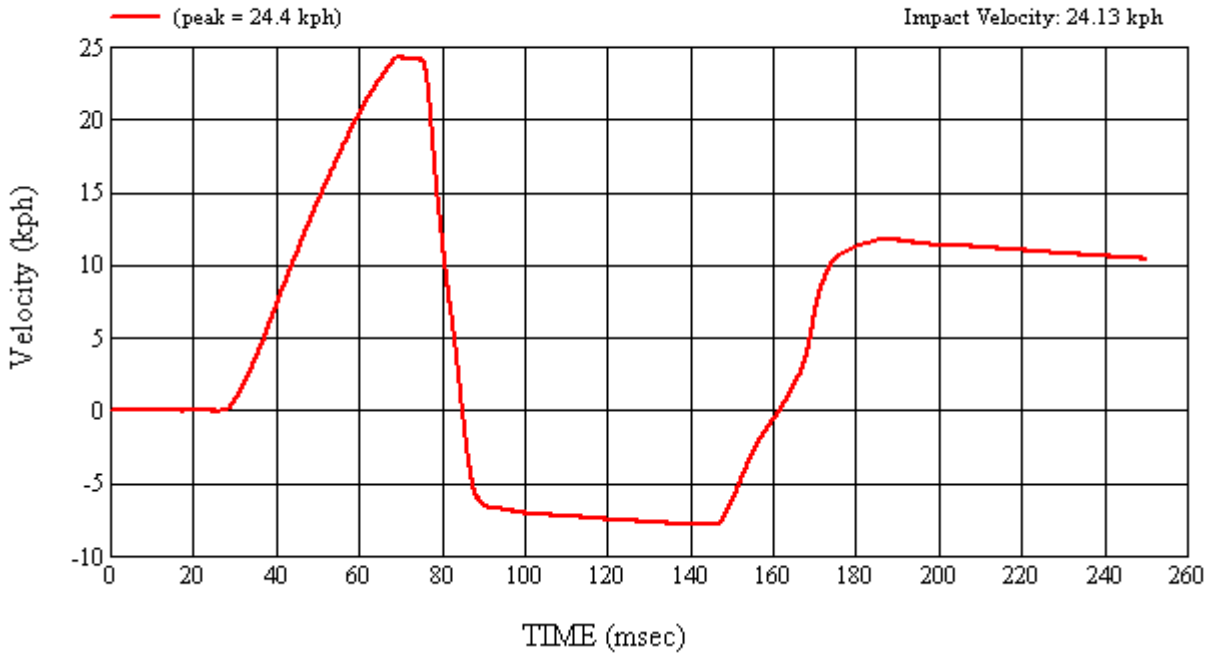


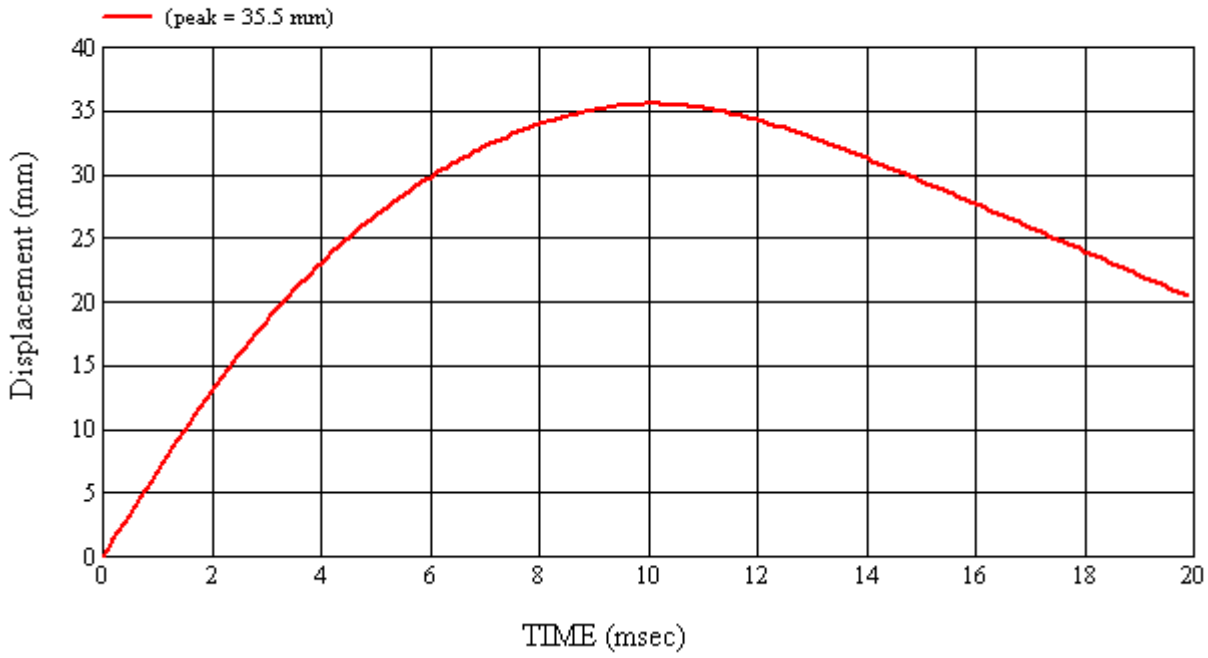


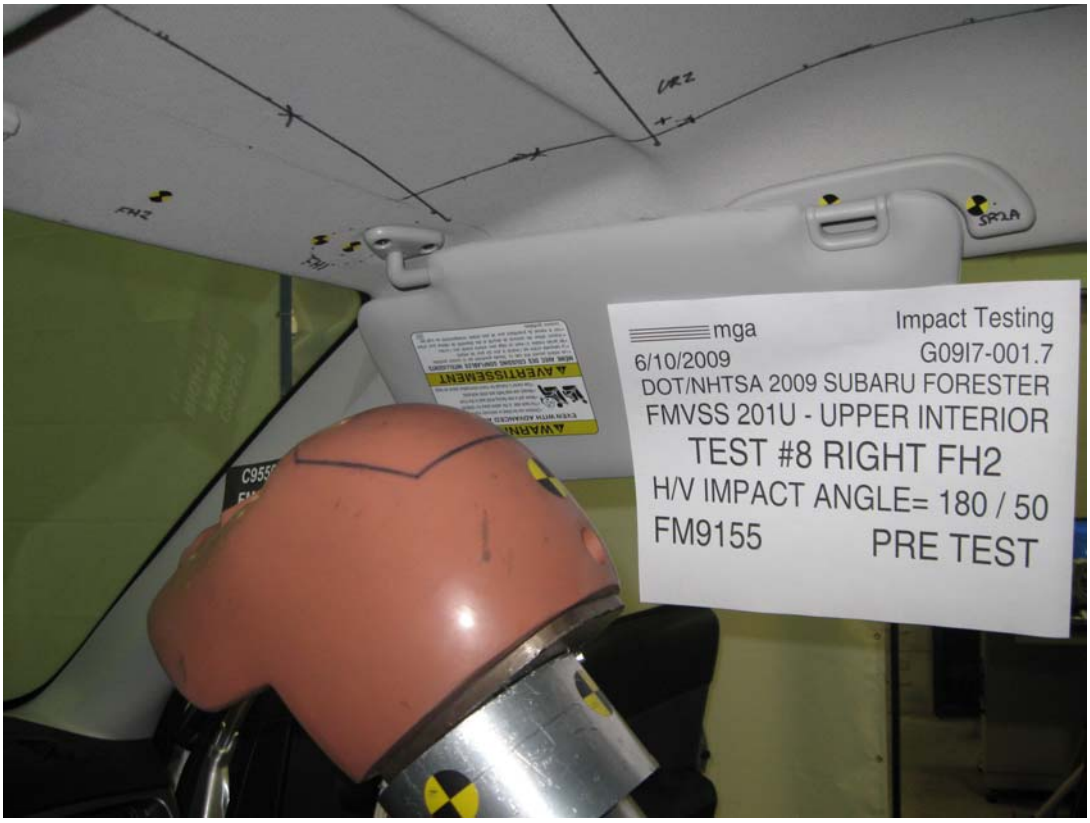

(peak = 99.8 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

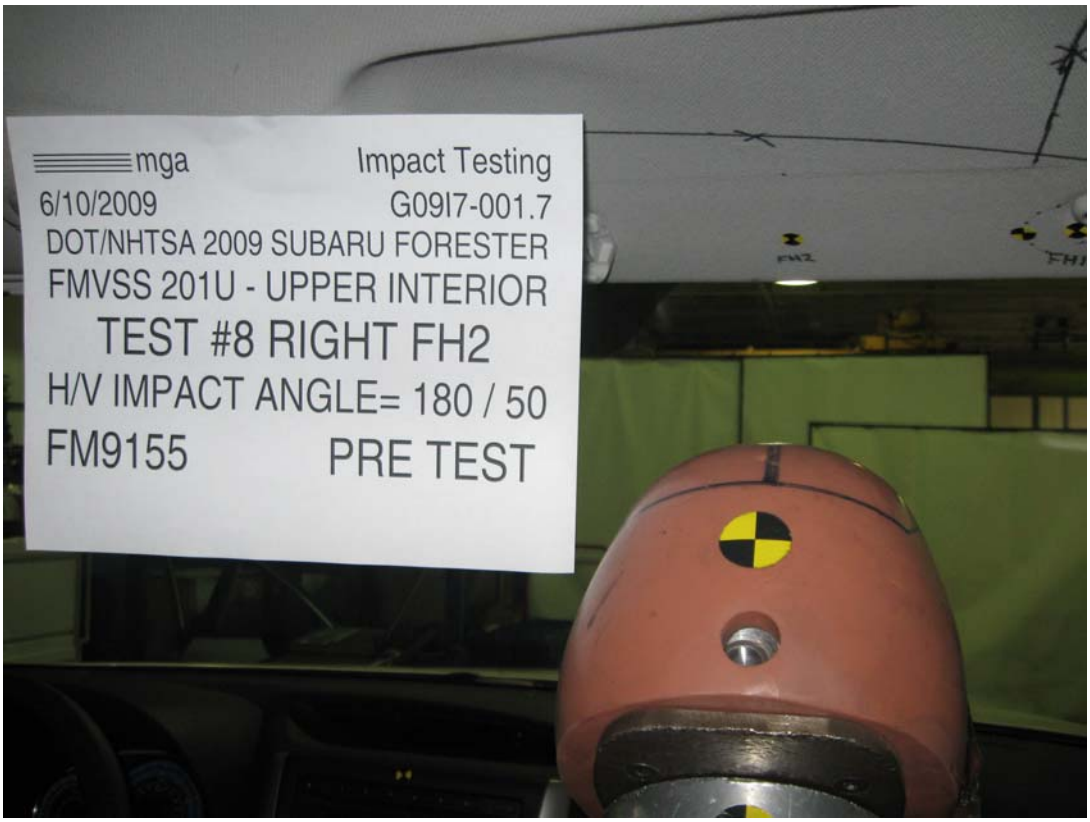

(peak = 11.1 G)
Head Y (G)
4
2
0
-2
-4
-6
-8
-10
-12
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)

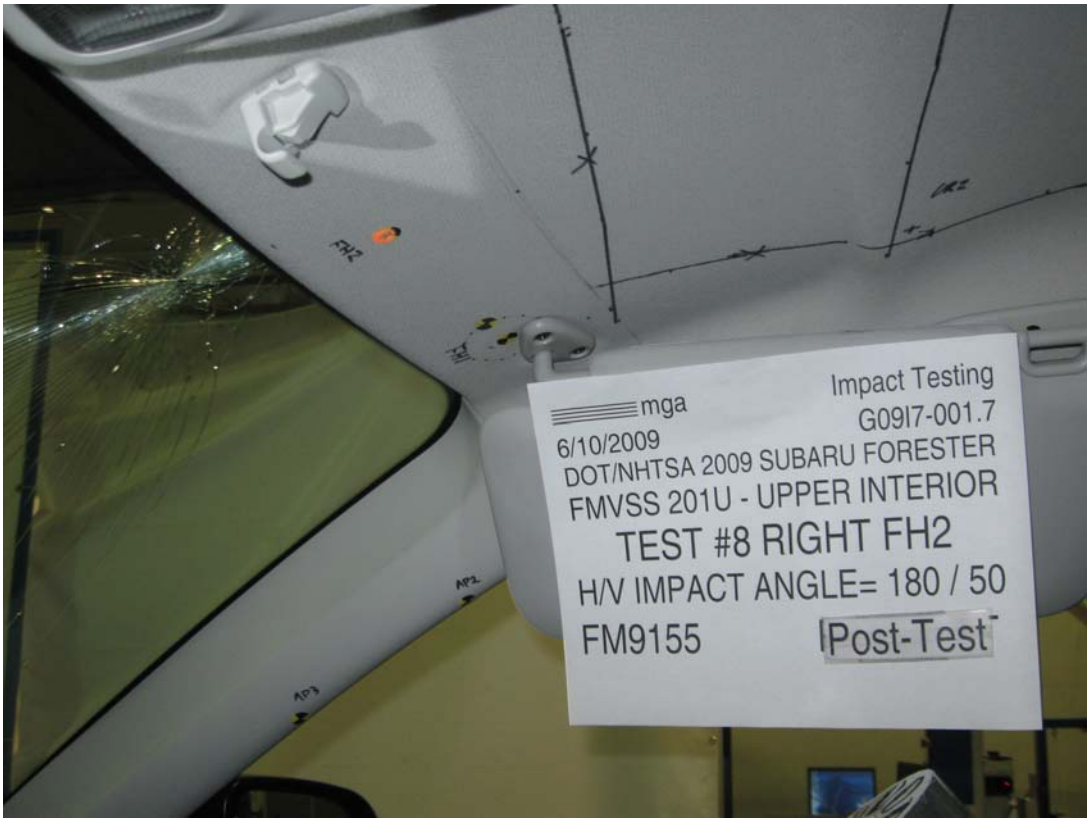

(peak = 39.7 G)
Head Z (G)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


(peak = 24.4 kph)
Impact Velocity: 24.13 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 35.5 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
TIME (msec)


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT FH2
H/V IMPACT ANGLE= 180 / 50
FM9155
PRE TEST


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT FH2
H/V IMPACT ANGLE= 180 / 50
FM9155
PRE TEST


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT FH2
H/V IMPACT ANGLE= 180 / 50
FM9155
Post-Test


FH2
FH1
mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT FH2
H/V IMPACT ANGLE= 180 / 50
FM9155
Post-Test


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #8 RIGHT FH2
H/V IMPACT ANGLE= 180 / 50
FM9155
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#8

Target (Vehicle Side): FH2Right

Temperature:22.5C

MGA Test Reference No.:FM9155

Humidity:52.1%

Approach Horizontal Angles:180º

Time of Test:11:26:27 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
523	472	11.6	24.1	10	1 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	AHTB2	-115.9	1.07	1.07
Y	6	J14103	93.7	0.85	0.85
Z	7	J35800	97.1	0.94	0.94

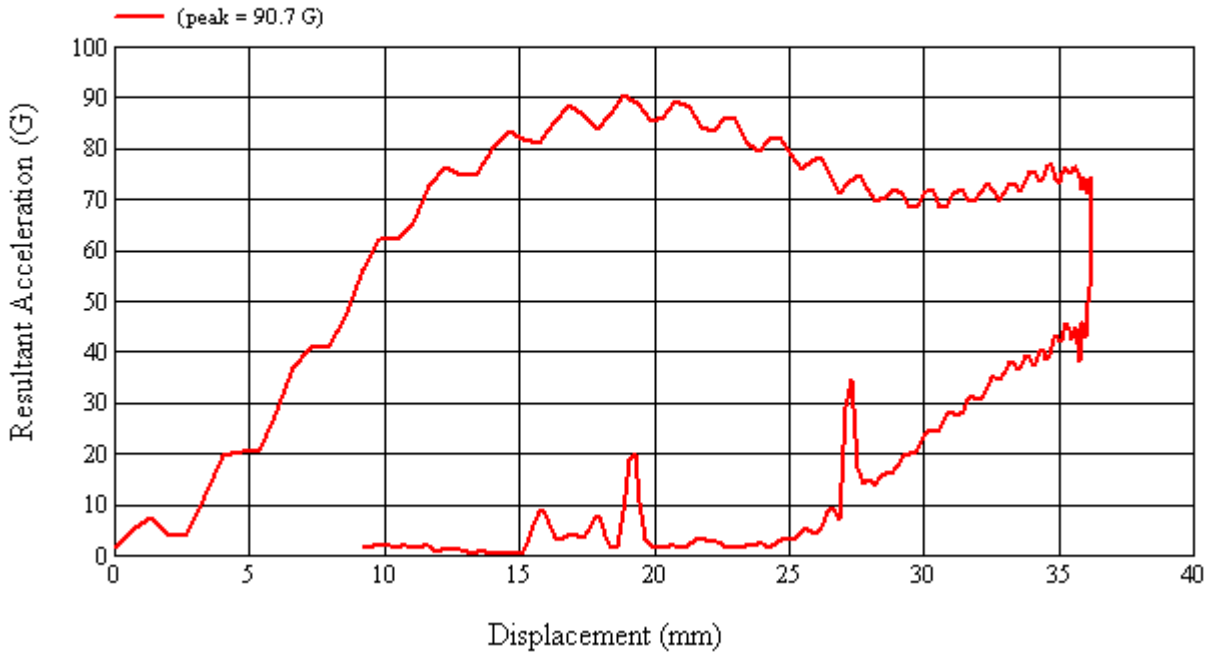
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

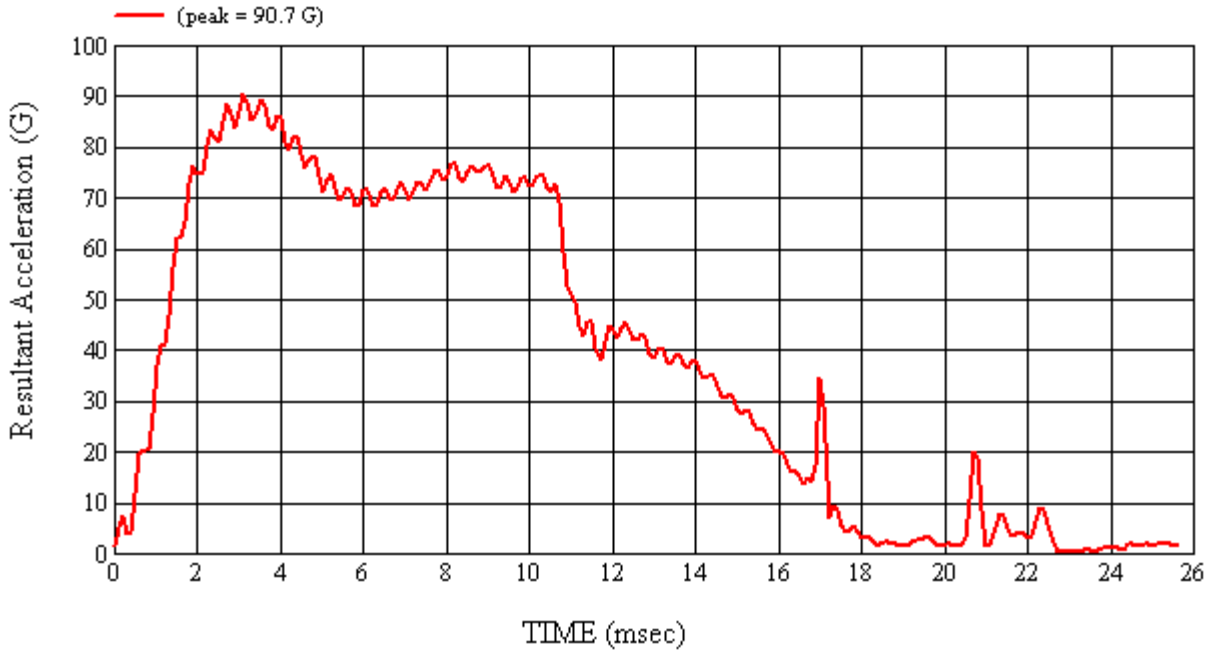
Windshield cracked due to head rotation; overhead console opened on impact

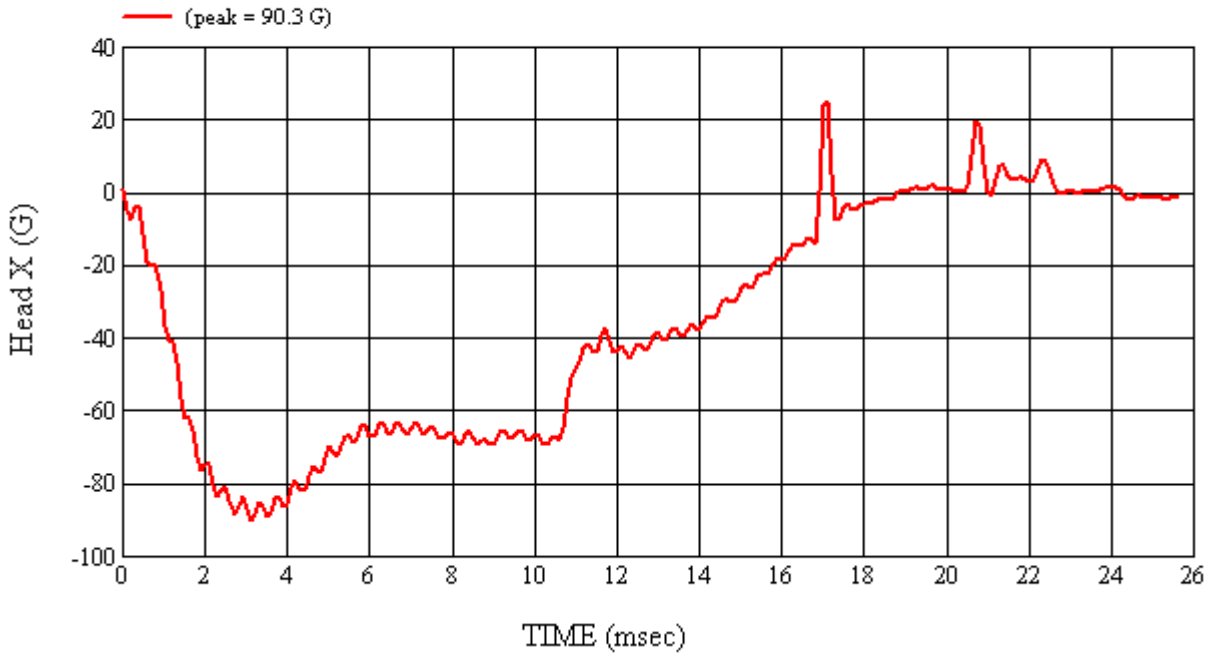
Recorded By: _____ Approved By*: _____ Date: 6/10/2009

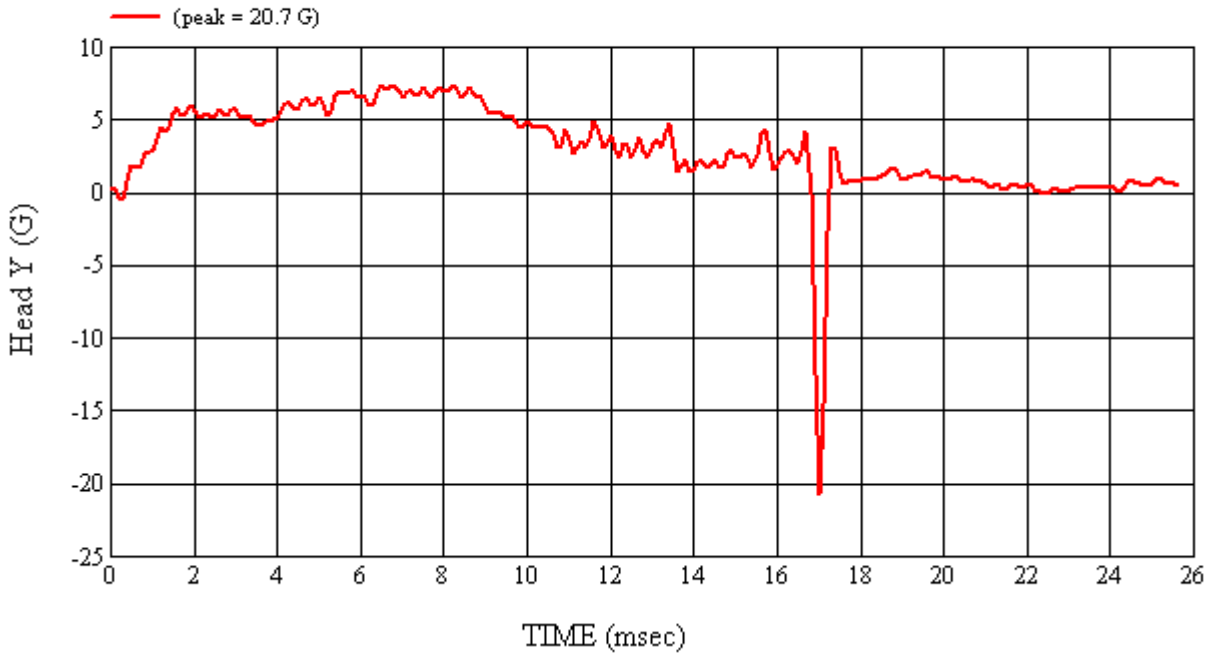
*Only necessary for NHTSA (Government) Compliance testing.

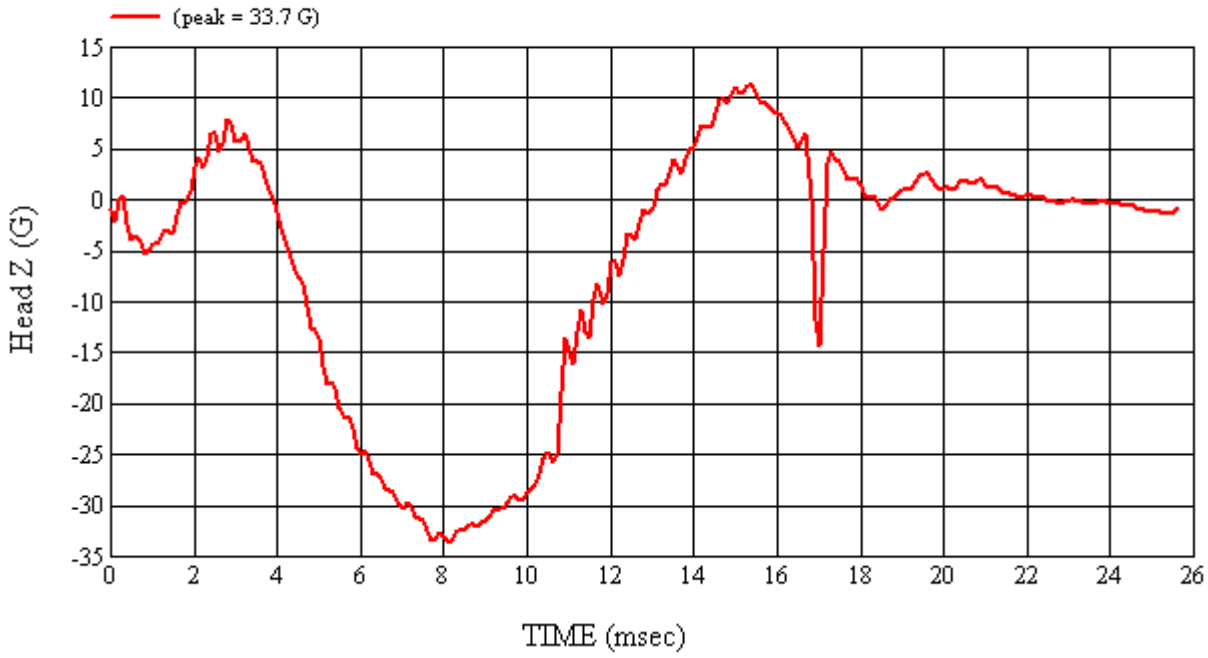
MGA Test #: FM9155 Target Location: FH2, Right Side Test Date: 6/9/2009

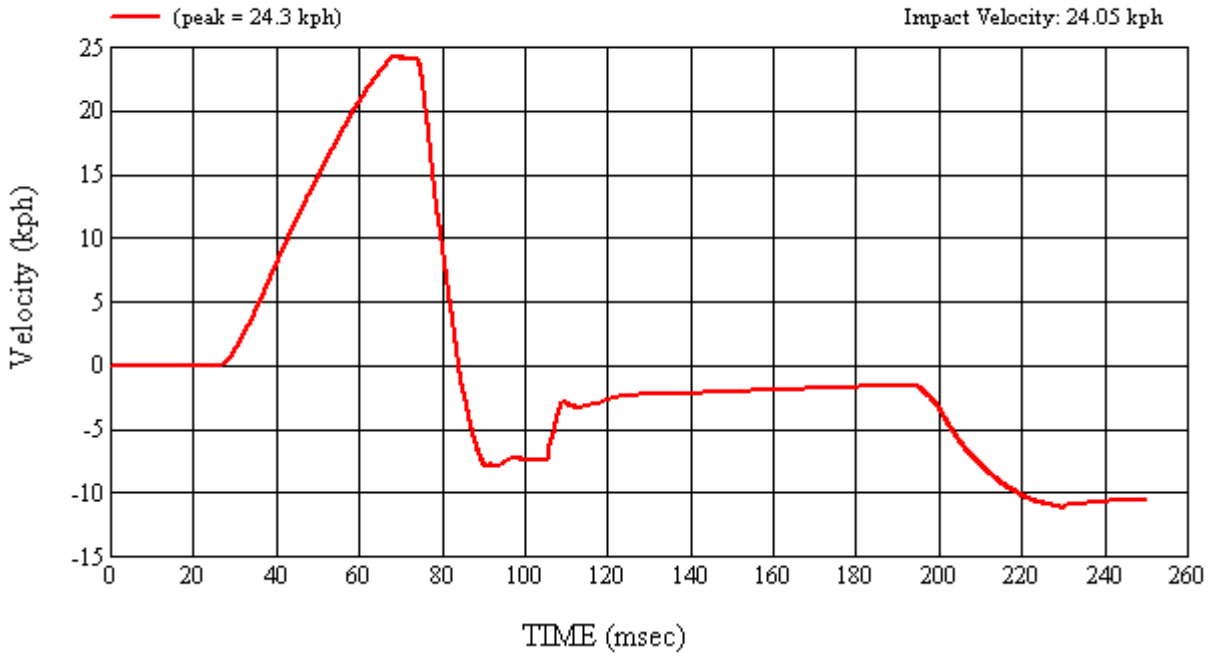


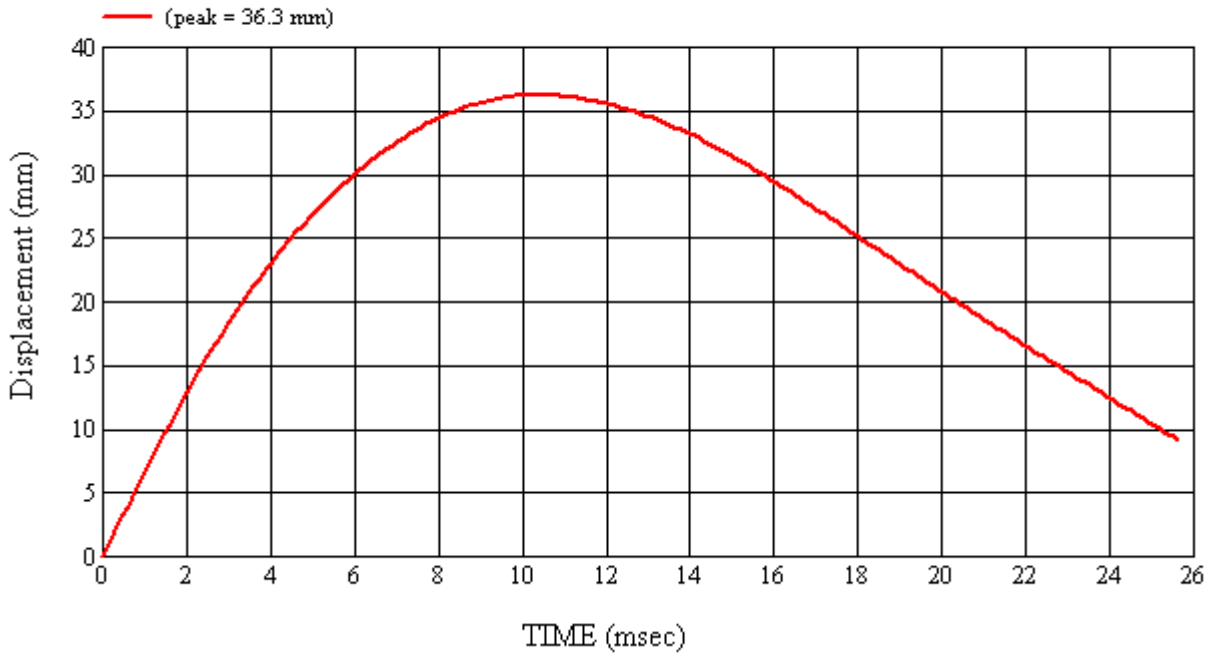



(peak = 90.3 G)
Head X (G)
40
20
0
-20
-40
-60
-80
-100
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)

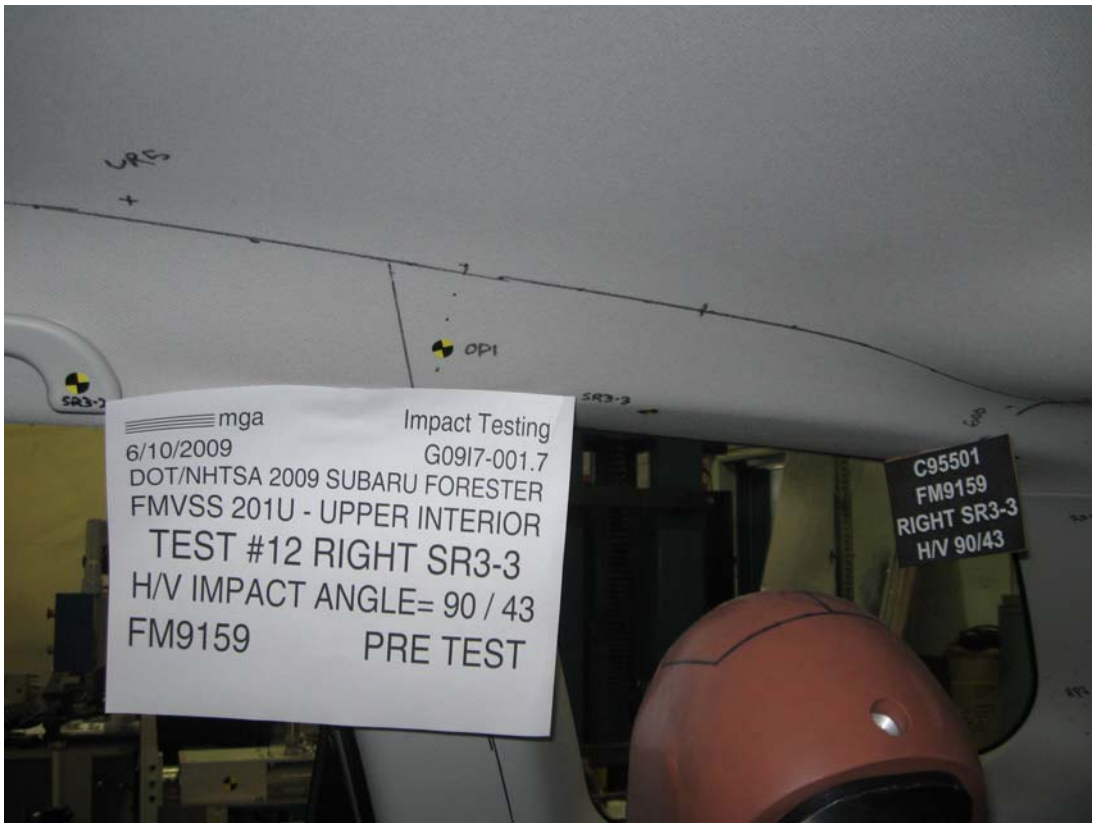

(peak = 20.7 G)
Head Y (G)
10
5
0
-5
-10
-15
-20
-25
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 33.7 G)
Head Z (G)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


(peak = 24.3 kph)
Impact Velocity: 24.05 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
-15
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)


(peak = 36.3 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
24
26
TIME (msec)


C95501
FM9159
RIGHT SR3-3
H/V 90/43
mga
Impact Testing
G09I7-001.7
6/10/2009
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT SR3-3
H/V IMPACT ANGLE= 90 / 43
FM9159
PRE TEST


mga
Impact Testing
G09I7-001.7
6/10/2009
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT SR3-3
H/V IMPACT ANGLE= 90 / 43
FM9159
PRE TEST
C95501
FM9159
RIGHT SR3-3
H/V 90/43


C95501
FM9159
RIGHT SR3-3
H/V 90/43
mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT SR3-3
H/V IMPACT ANGLE= 90 / 43
FM9159
IPost-Test


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT SR3-3
H/V IMPACT ANGLE= 90 / 43
FM9159
IPost-Test
C95501
FM9159
RIGHT SR3-
H/V 90/43


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #12 RIGHT SR3-3
H/V IMPACT ANGLE= 90 / 43
FM9159
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#12

Target (Vehicle Side): SR3-3Right

Temperature:22.9C

MGA Test Reference No.:FM9159

Humidity:50.6%

Approach Horizontal Angles:90º

Time of Test:4:06:49 PM

Approach Vertical Angles:43º

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
427	345	8.9	23.7	45	12 Left

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-94	1.07	1.07
Y	6	J36197	106.3	0.85	0.85
Z	7	J36353	97.5	0.94	0.94

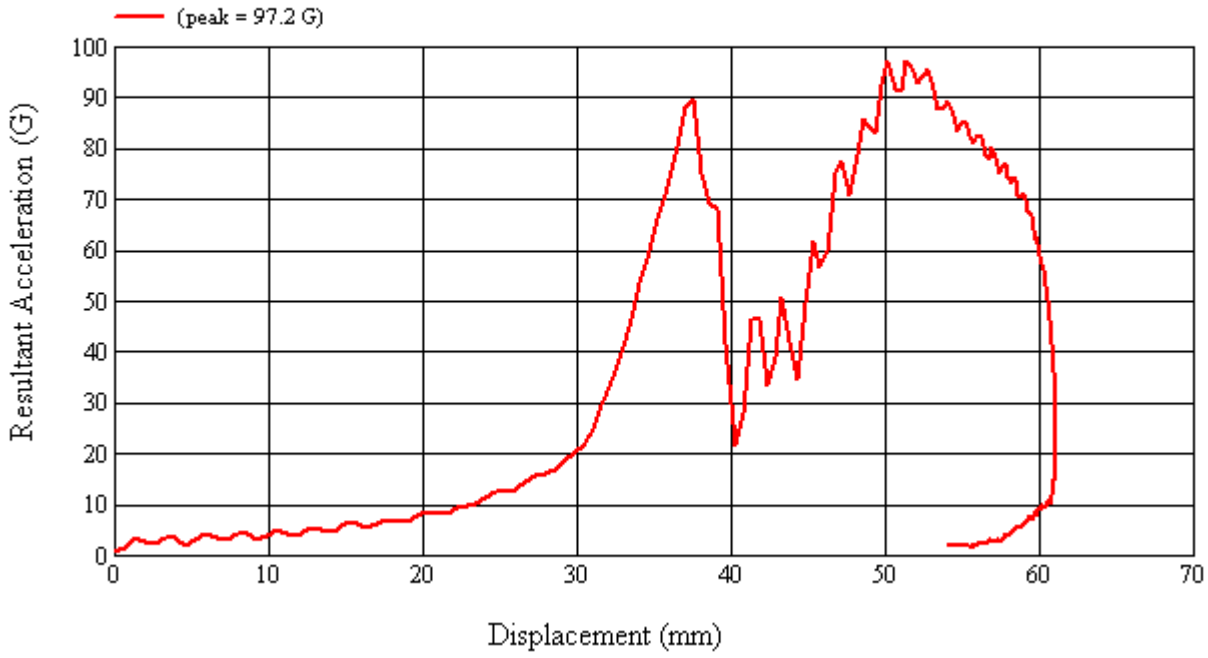
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

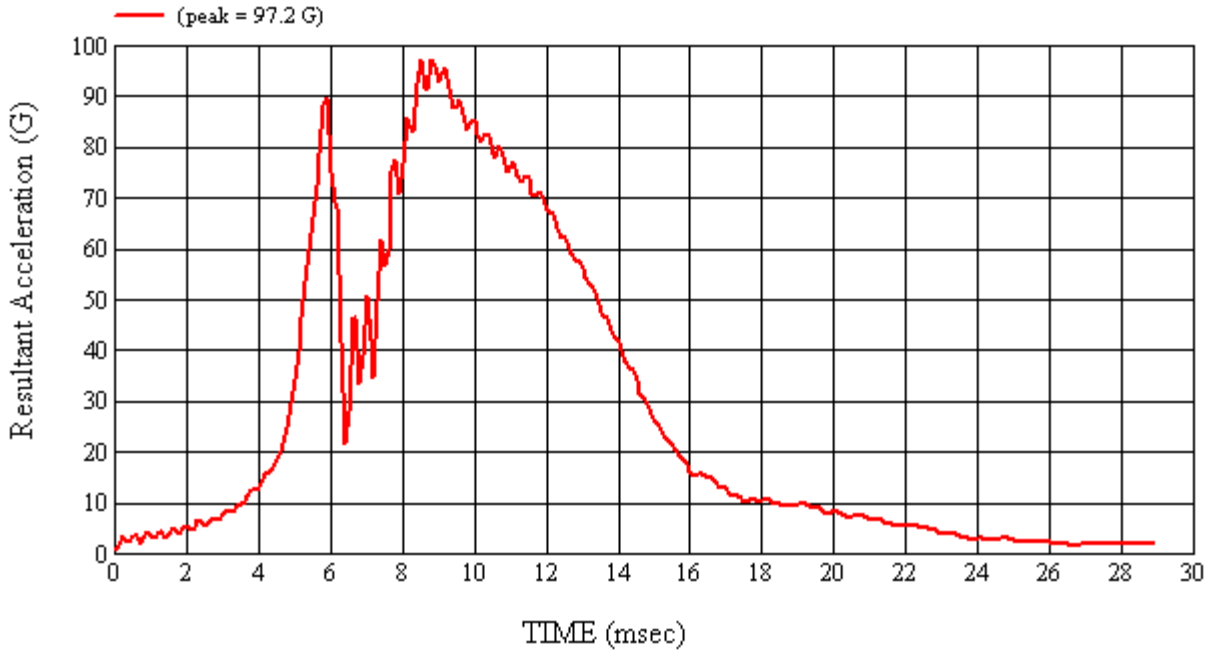
Side window shattered after initial contact

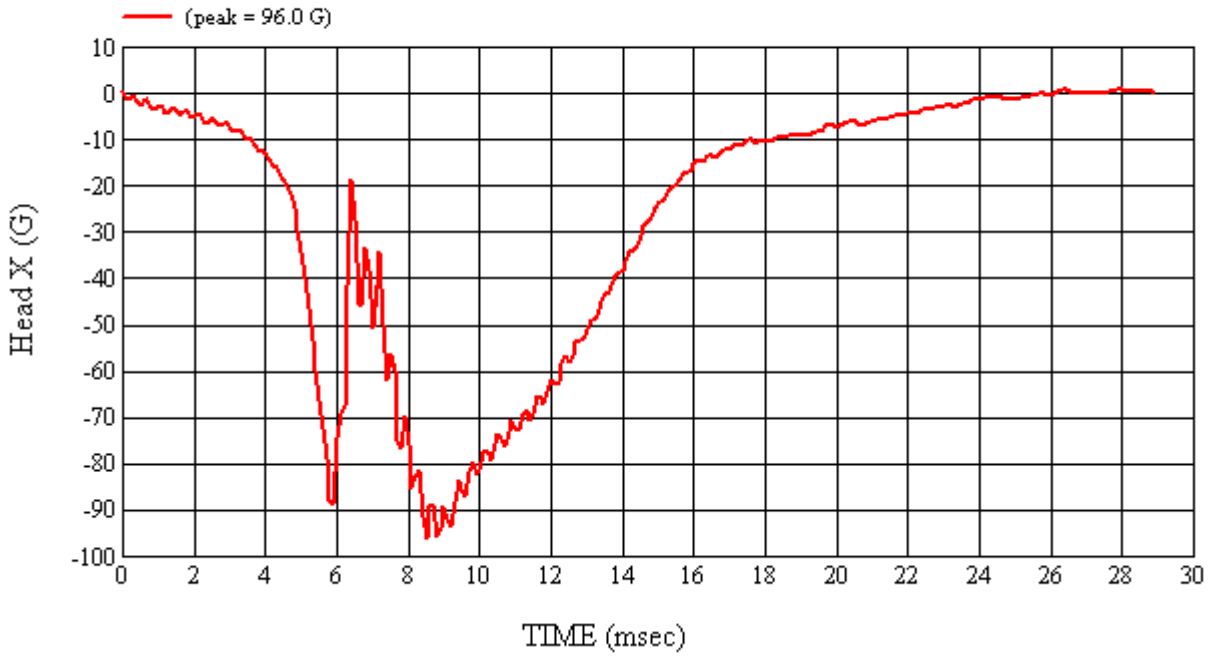
Recorded By: _____ Approved By*: _____ Date: 6/10/2009

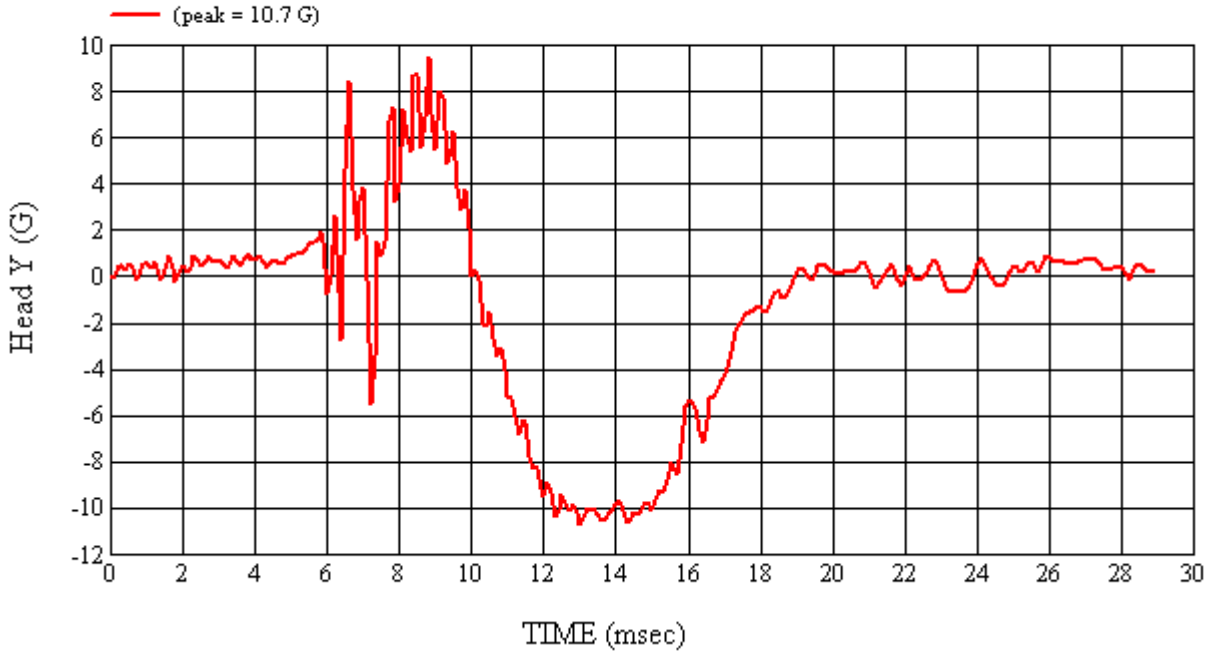
*Only necessary for NHTSA (Government) Compliance testing.

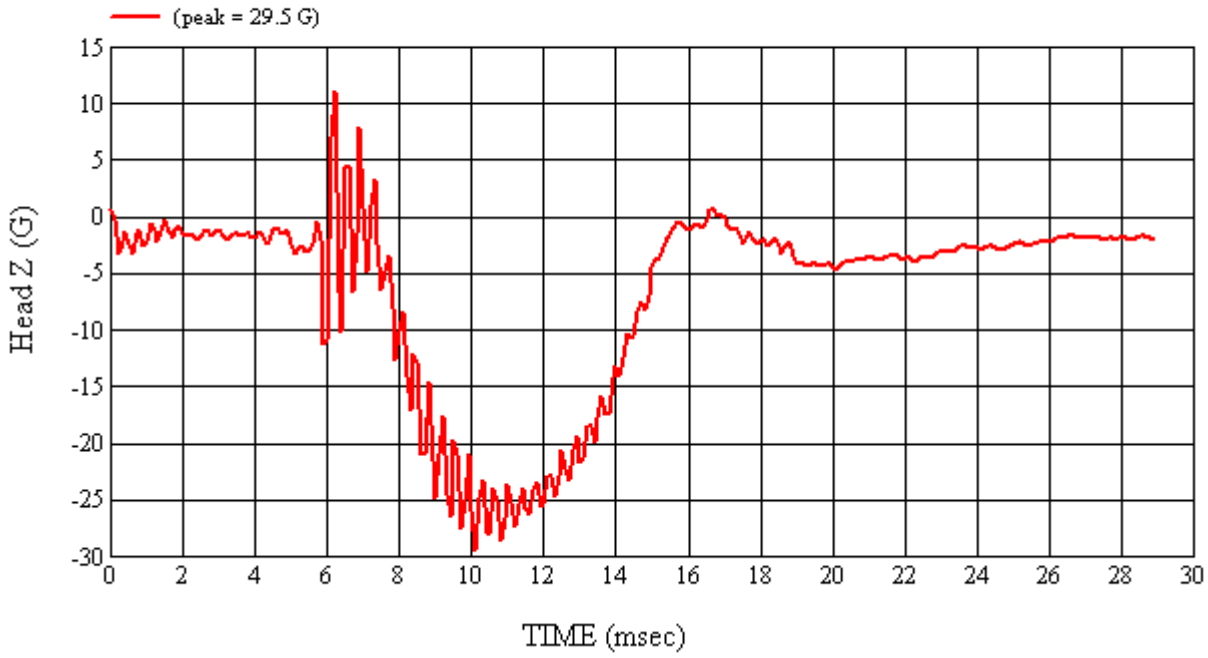
MGA Test #: FM9159 Target Location: SR3-3, Right Side Test Date: 6/10/2009

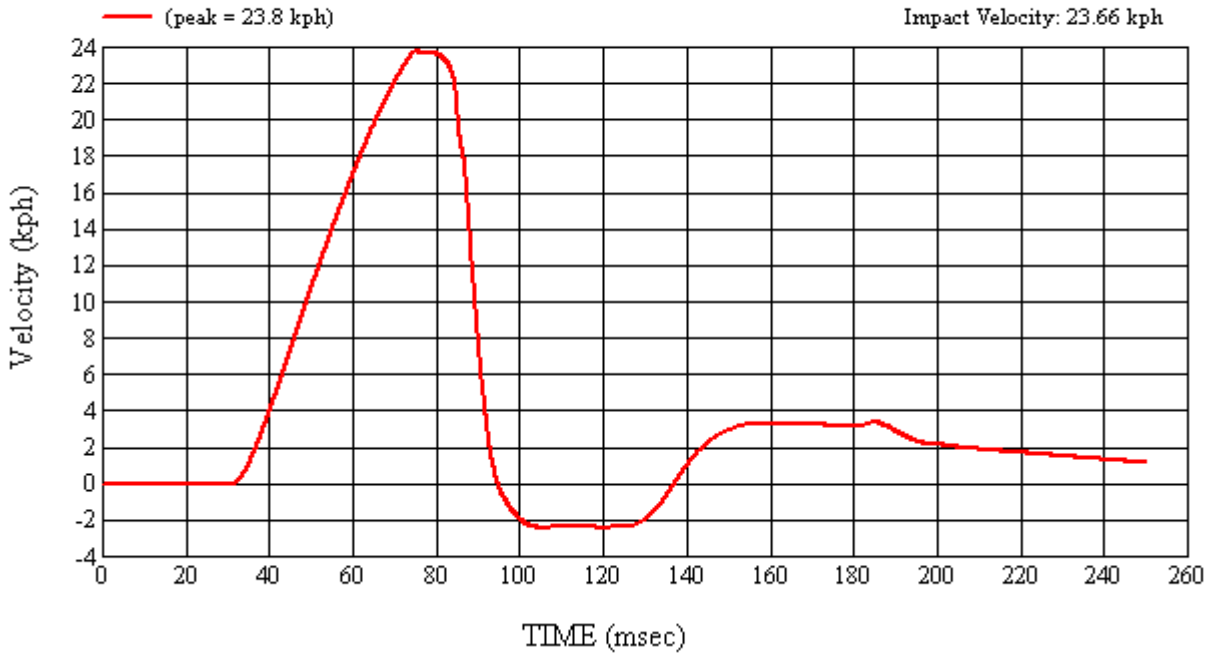


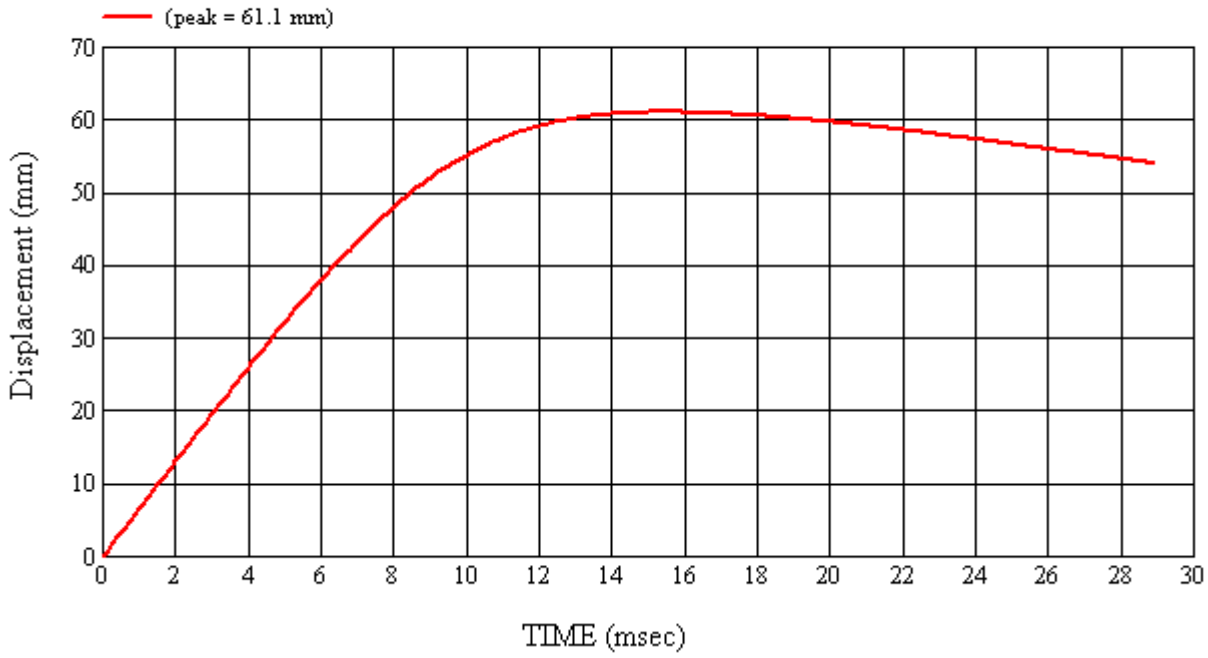


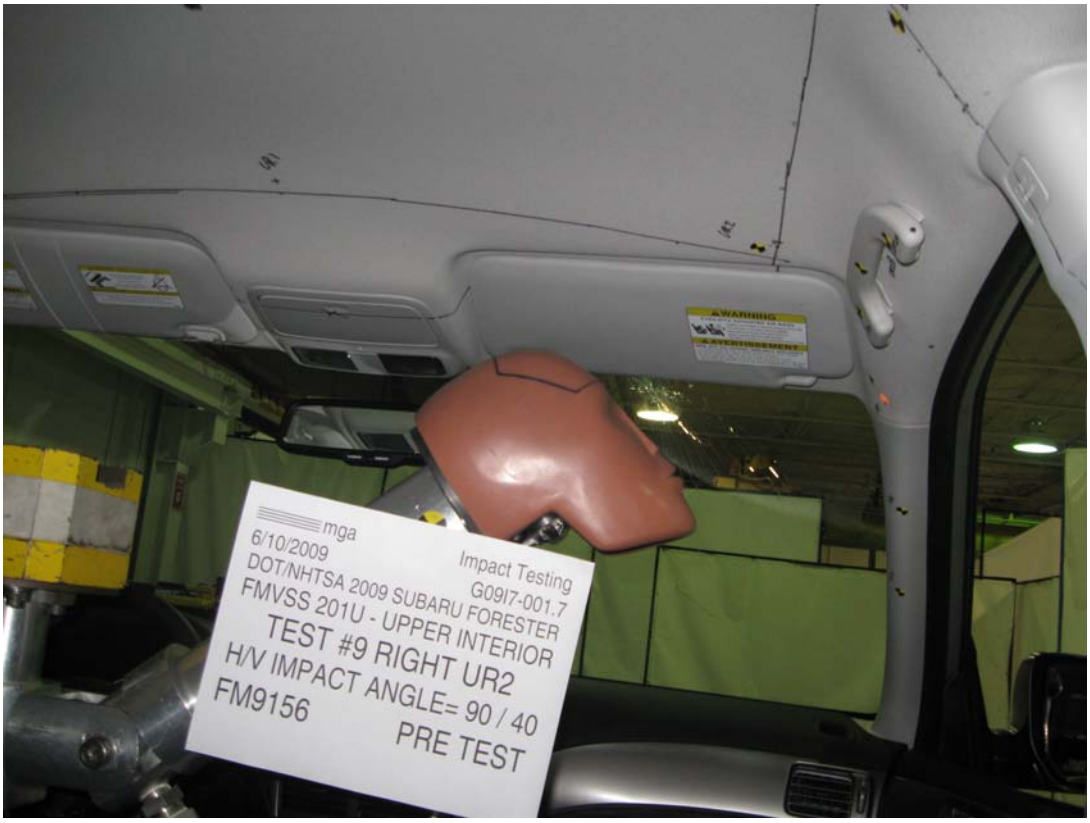

(peak = 96.0 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)

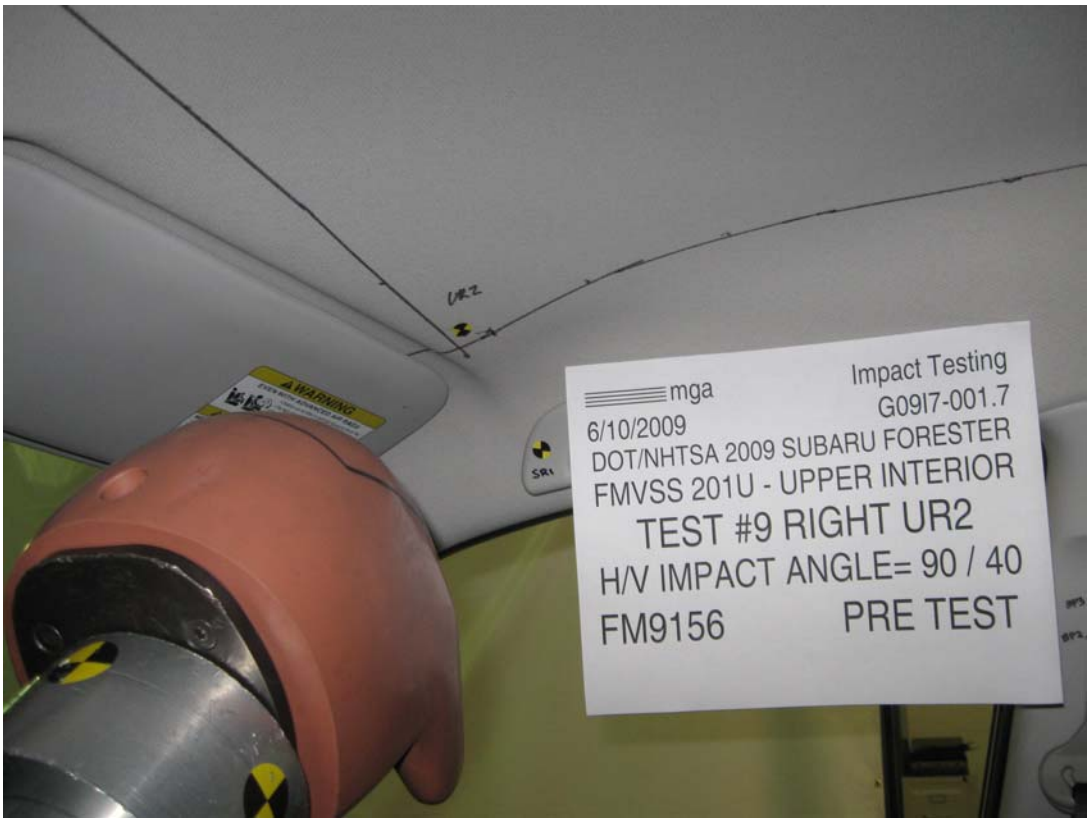

(peak = 10.7 G)
Head Y (G)
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)


(peak = 29.5 G)
Head Z (G)
15
10
5
0
-5
-10
-15
-20
-25
-30
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)

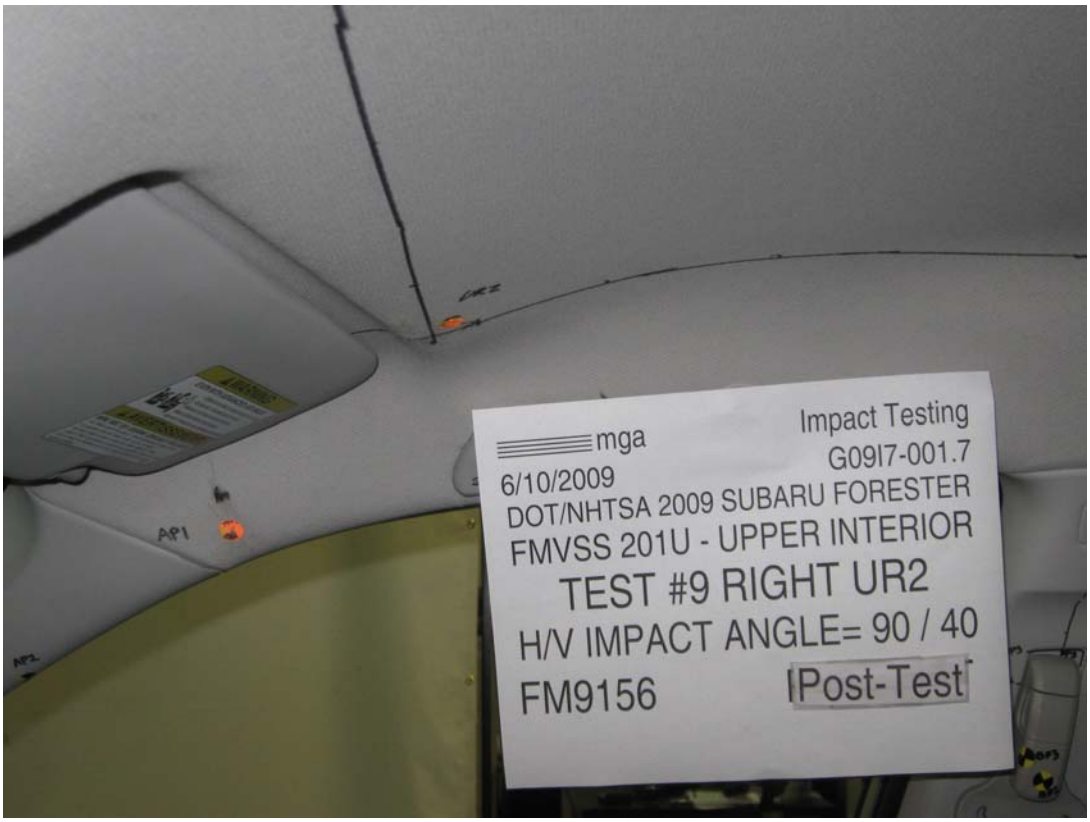

(peak = 23.8 kph)
Impact Velocity: 23.66 kph
Velocity (kph)
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
0
20
40
60
80
100
120
140
160
180
200
220
240
260
TIME (msec)

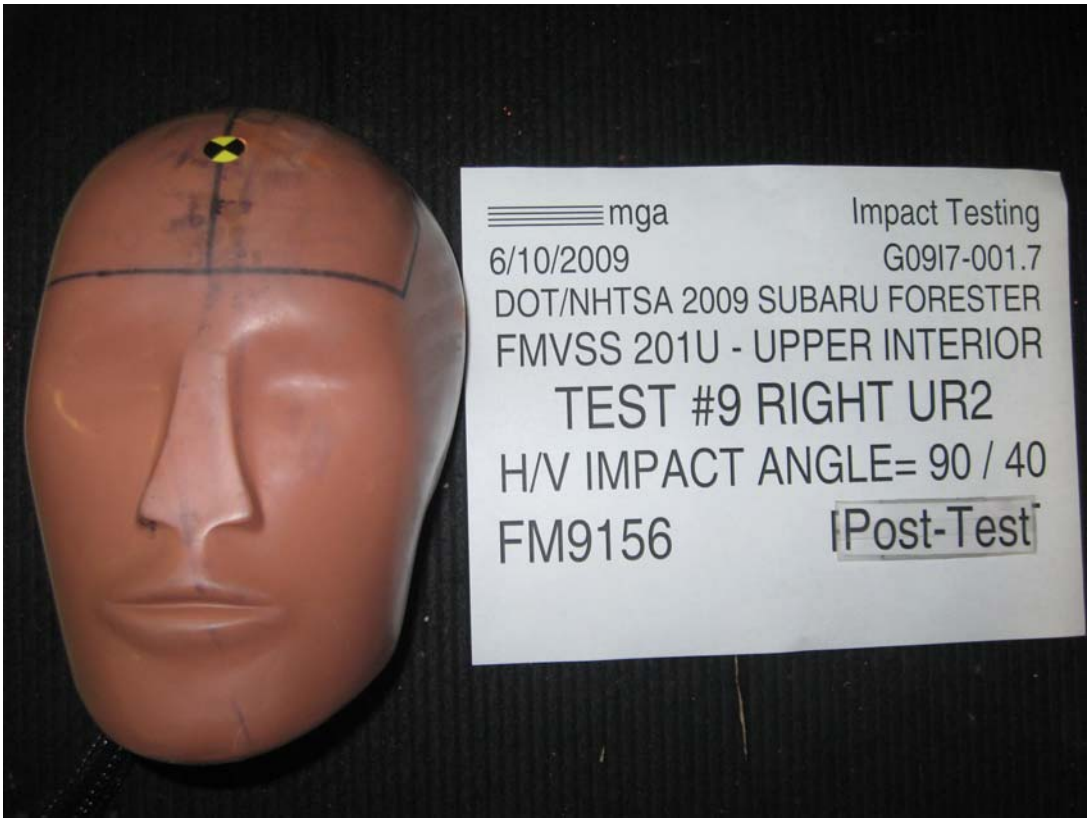

(peak = 61.1 mm)
Displacement (mm)
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
TIME (msec)


mga
6/10/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 40
FM9156
PRE TEST


mga
6/10/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 40
FM9156
PRE TEST


C95501
FM9156
RIGHT UR2
H/V 90/40
mga
6/10/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 40
FM9156
Post-Test


mga
6/10/2009
Impact Testing
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 40
FM9156
Post-Test


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #9 RIGHT UR2
H/V IMPACT ANGLE= 90 / 40
FM9156
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#9

Target (Vehicle Side): UR2Right

Temperature:22.6C

MGA Test Reference No.:FM9156

Humidity:50.8%

Approach Horizontal Angles:90º

Time of Test:12:10:34 PM

Approach Vertical Angles:40º

FMH Serial No:[038]

Additional Description: Located above SR1

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
659	652	8.4	23.9	45	0

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

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

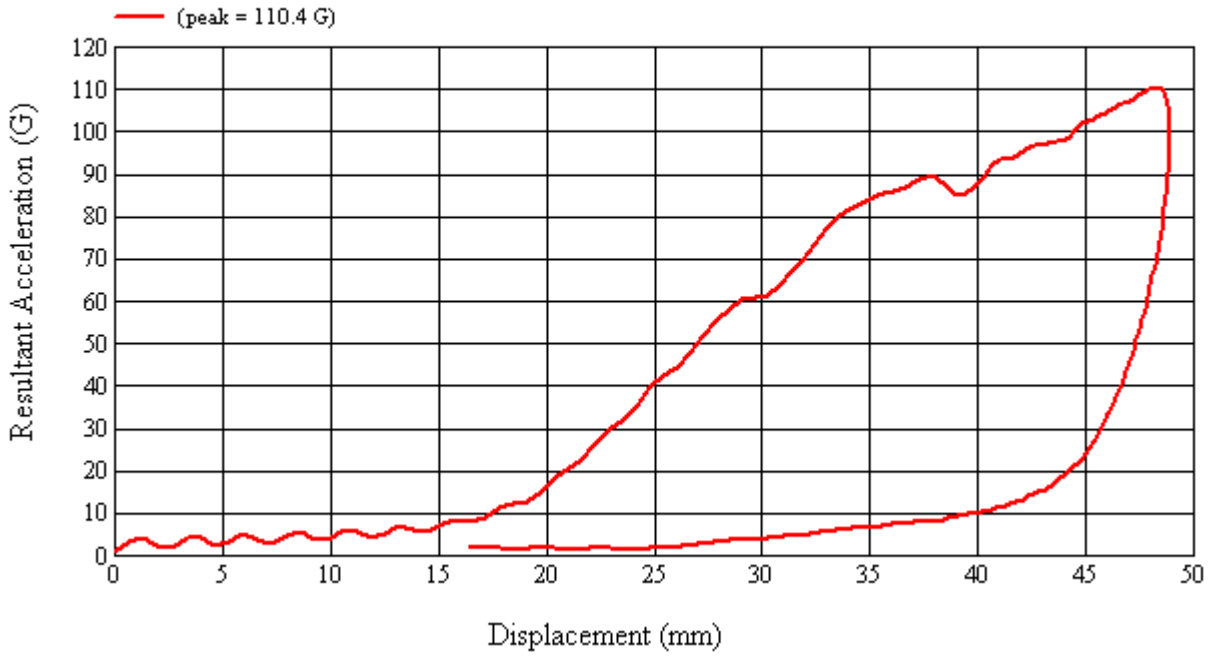
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

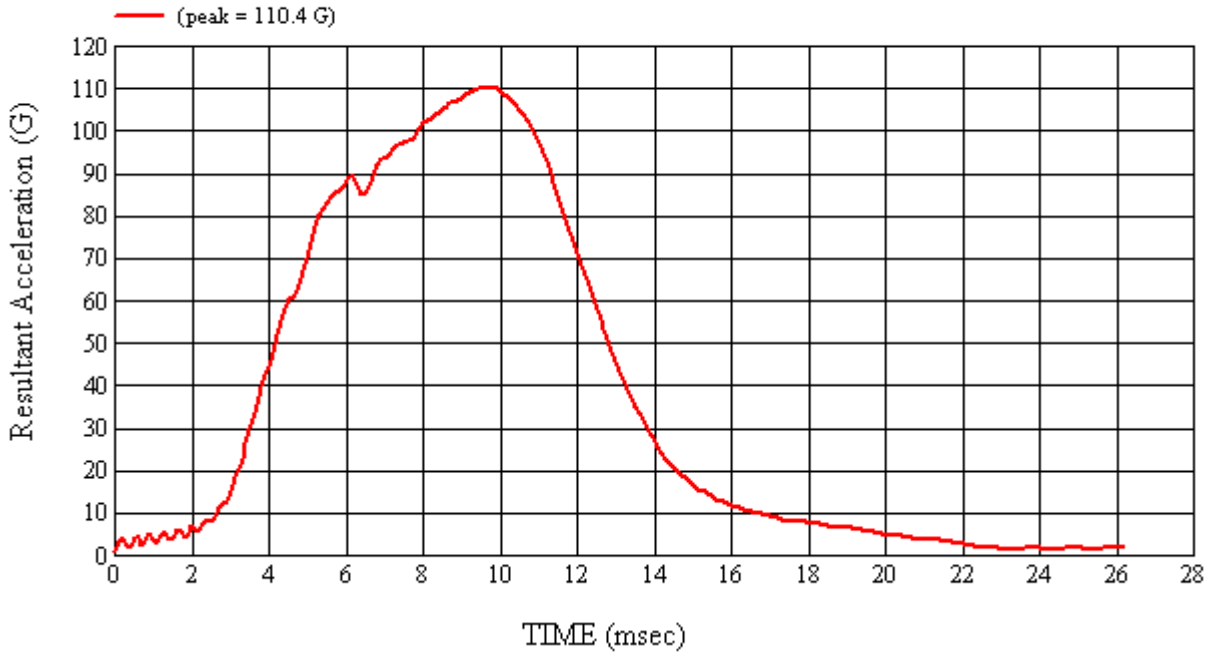
No damage observed

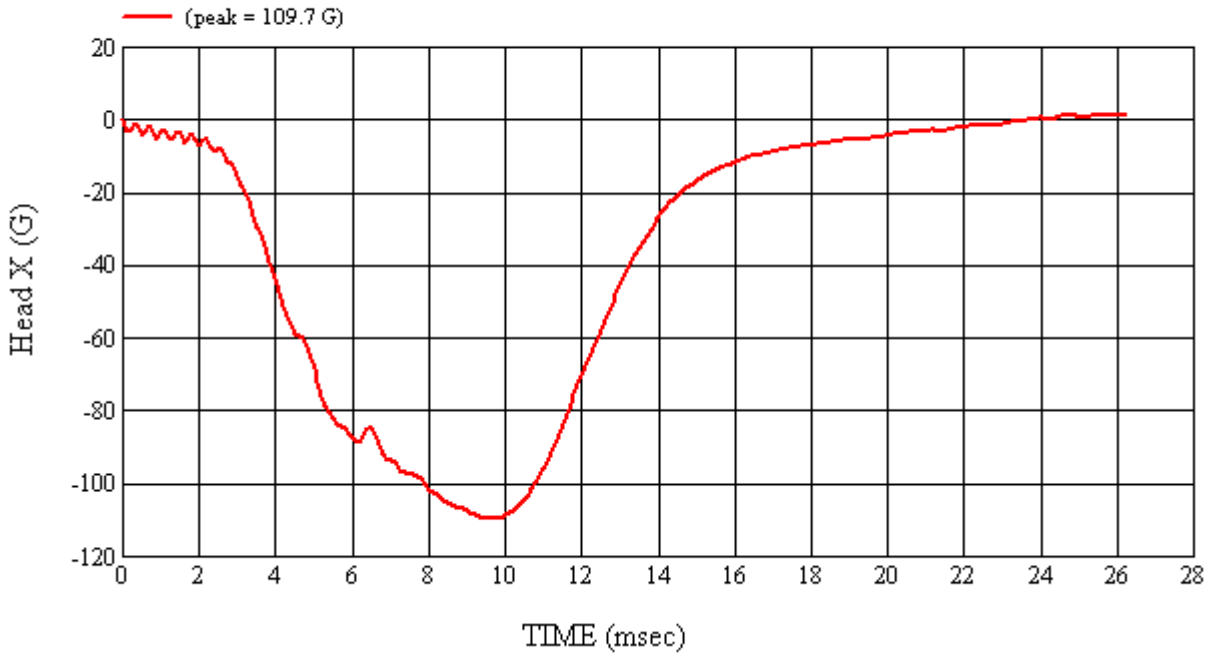
Recorded By: _____ Approved By*: _____ Date: 6/10/2009

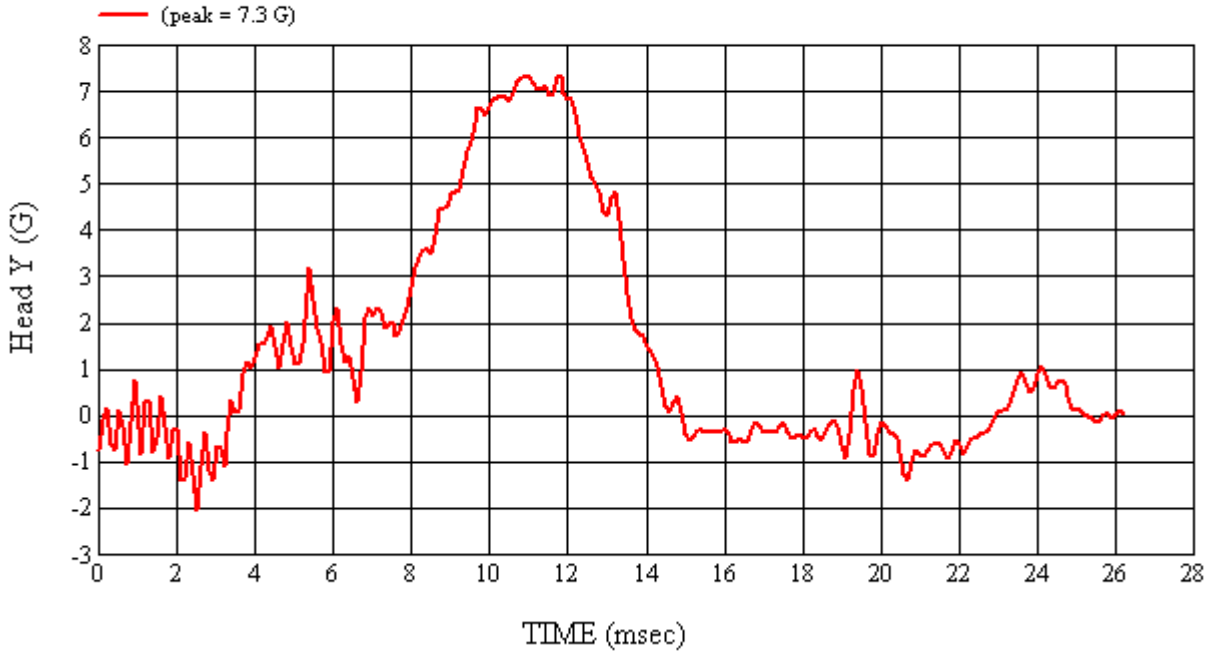
*Only necessary for NHTSA (Government) Compliance testing.

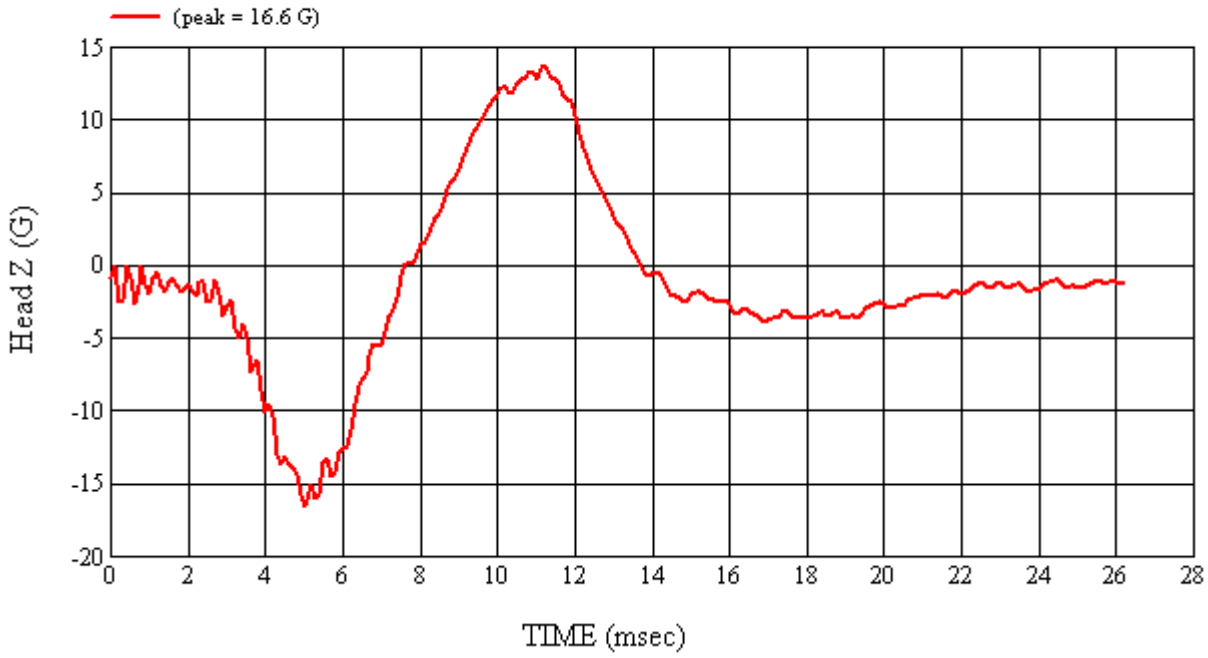
MGA Test #: FM9156 Target Location: UR2, Right Side Test Date: 6/10/2009

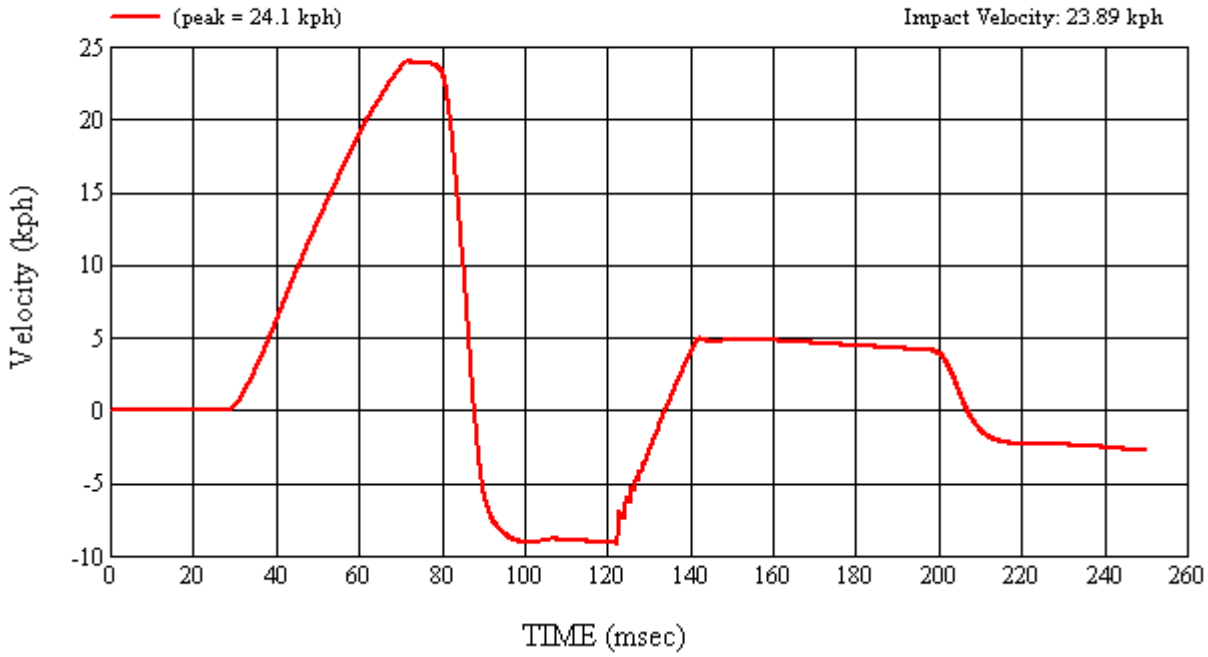


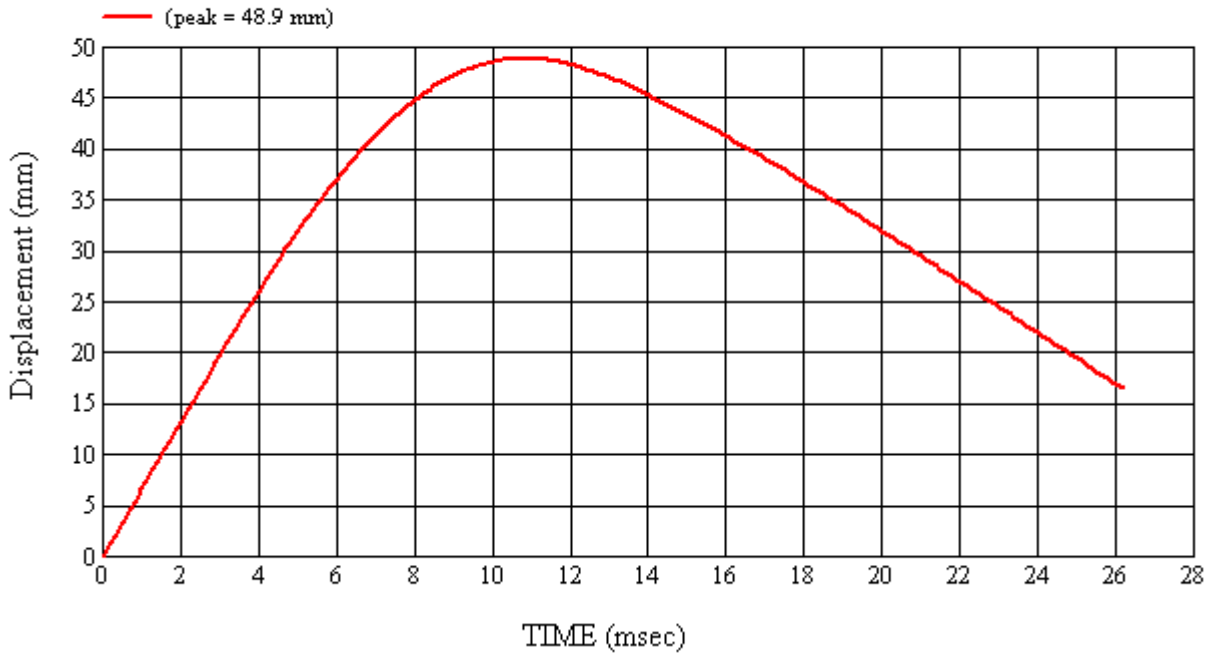


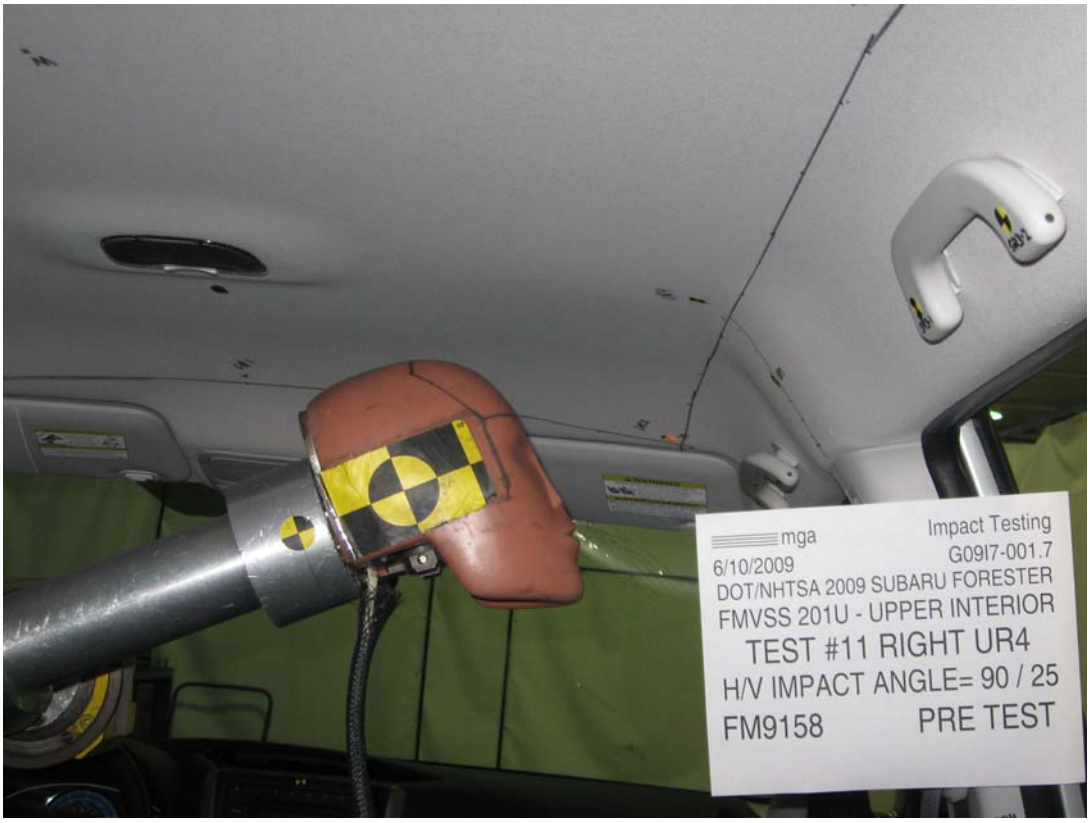

(peak = 109.7 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)


(peak = 7.3 G)
Head Y (G)
8
7
6
5
4
3
2
1
0
-1
-2
-3
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)


(peak = 16.6 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 = 24.1 kph)
Impact Velocity: 23.89 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)

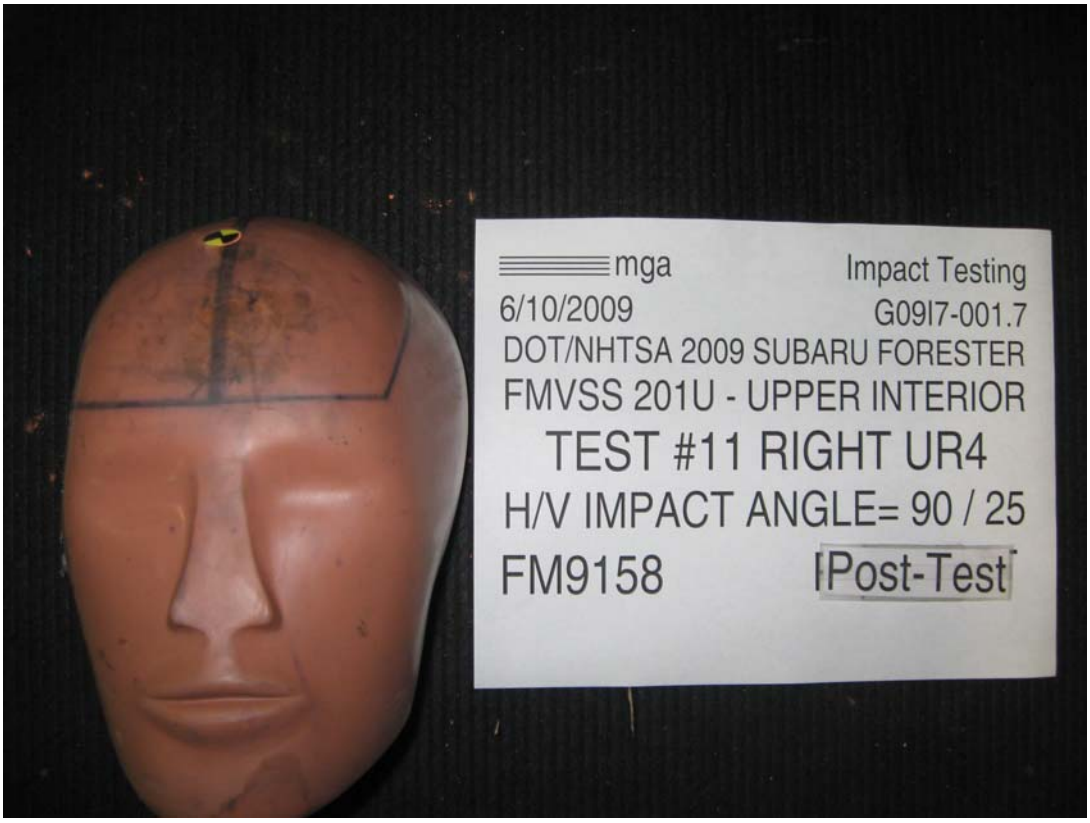

(peak = 48.9 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
45
50
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
TIME (msec)


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 25
FM9158
PRE TEST


C95501
FM9158
RIGHT UR4
H/V 90/25
mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 25
FM9158
PRE TEST


C95501
FM9158
RIGHT UR4
H/V 90/25
mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 25
FM9158
Post-Test


C95501
FM9158
RIGHT UR4
H/V 90/25
mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 25
FM9158
Post-Test


mga
Impact Testing
6/10/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #11 RIGHT UR4
H/V IMPACT ANGLE= 90 / 25
FM9158
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#11

Target (Vehicle Side): UR4Right

Temperature:22.7C

MGA Test Reference No.:FM9158

Humidity:50.9%

Approach Horizontal Angles:90º

Time of Test:3:00:10 PM

Approach Vertical Angles:25º

FMH Serial No:[037]

Additional Description: Located above BP1

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
608	585	8.6	24.1	68	5 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	AHTB2	-115.9	1.07	1.07
Y	6	J14103	93.7	0.85	0.85
Z	7	J35800	97.1	0.94	0.94

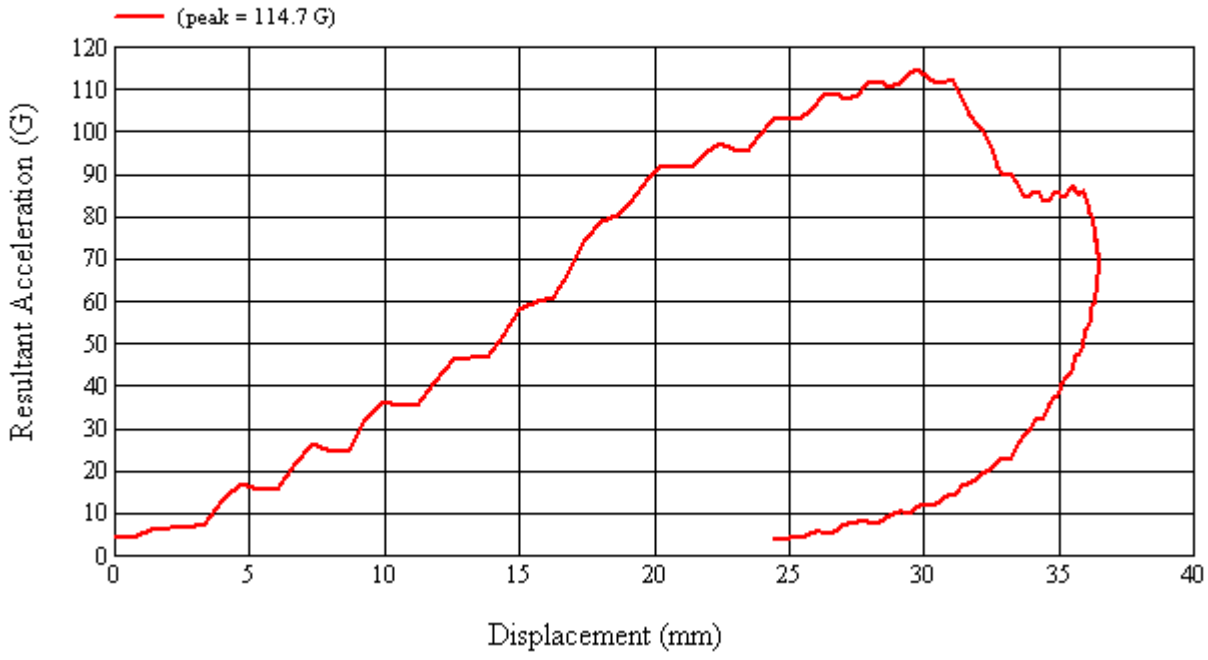
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

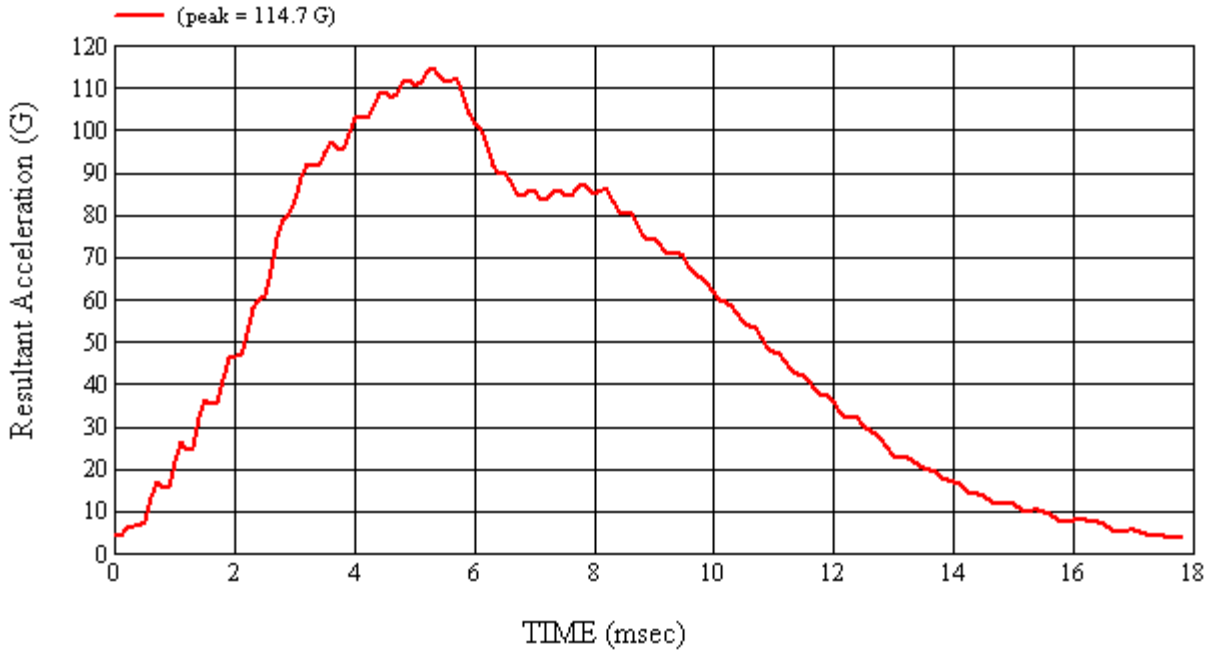
No damage observed

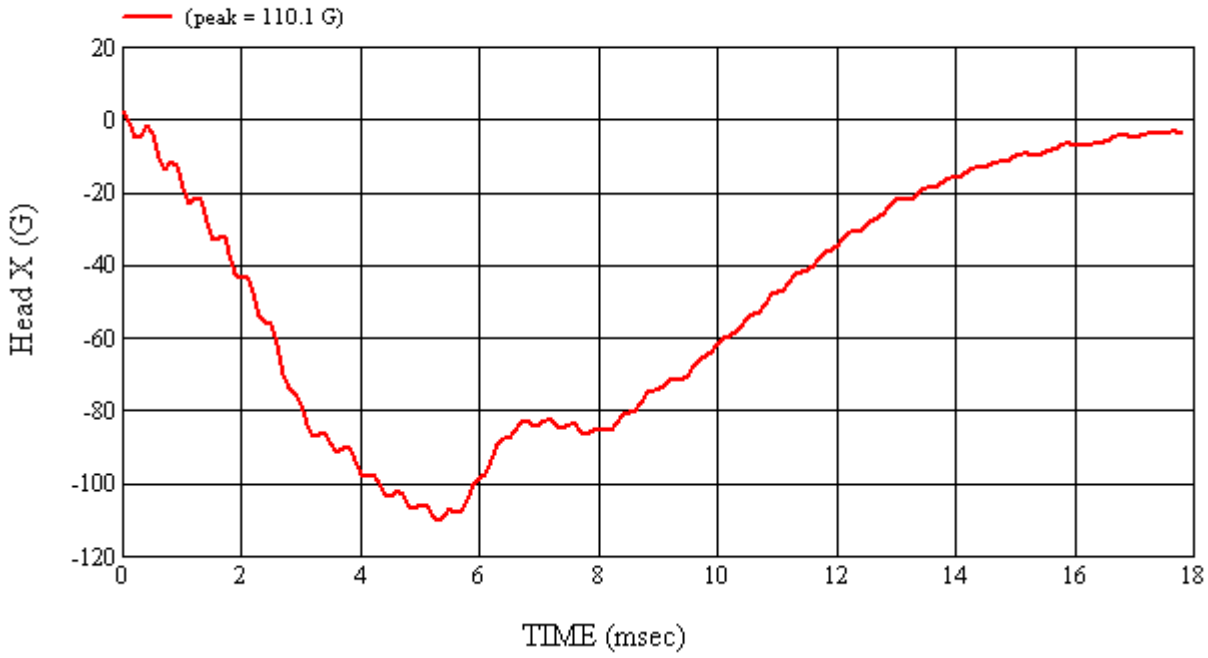
Recorded By: _____ Approved By*: _____ Date: 6/10/2009

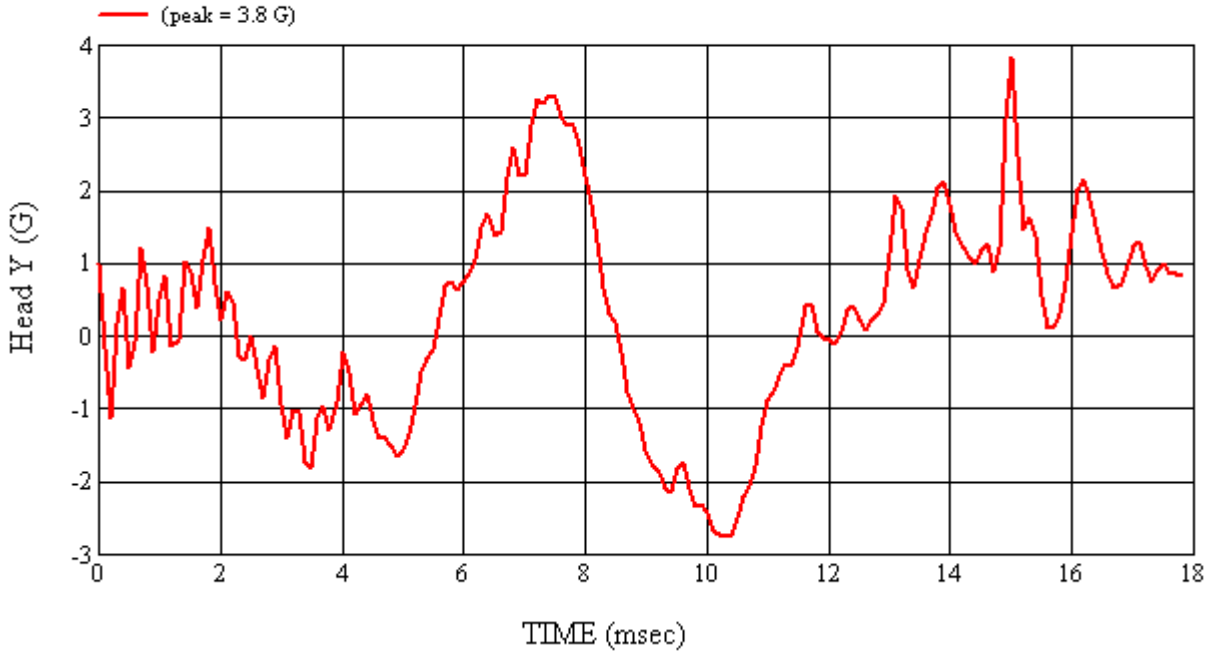
*Only necessary for NHTSA (Government) Compliance testing.

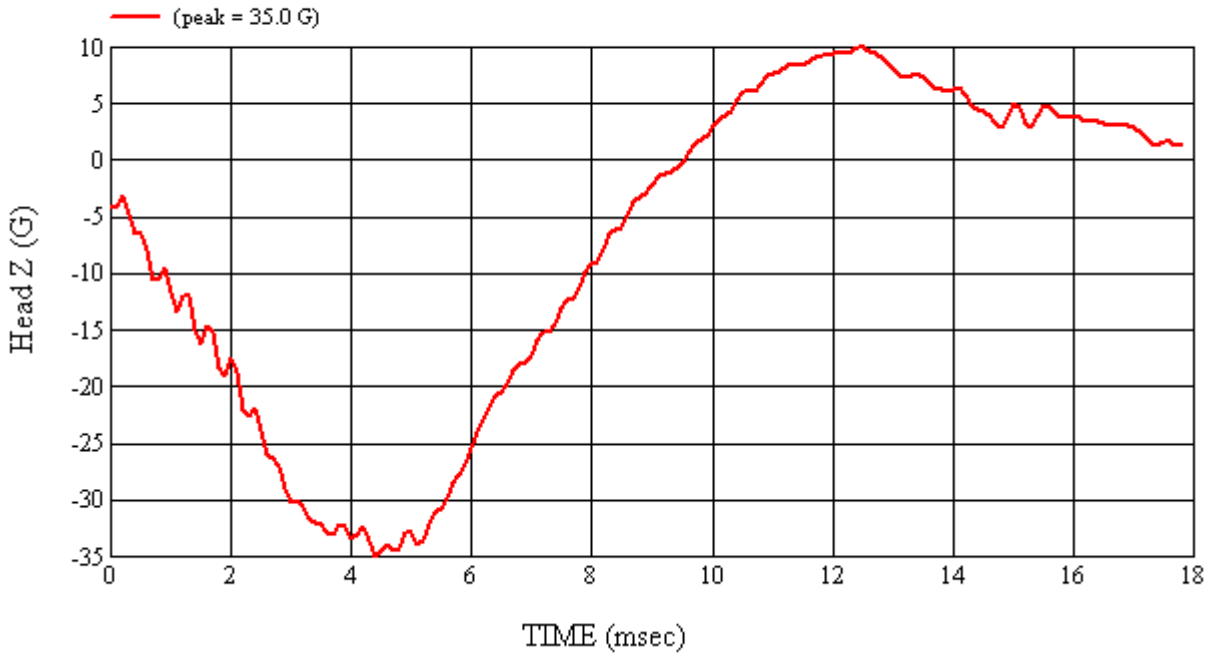
MGA Test #: FM9158 Target Location: UR4, Right Side Test Date: 6/10/2009

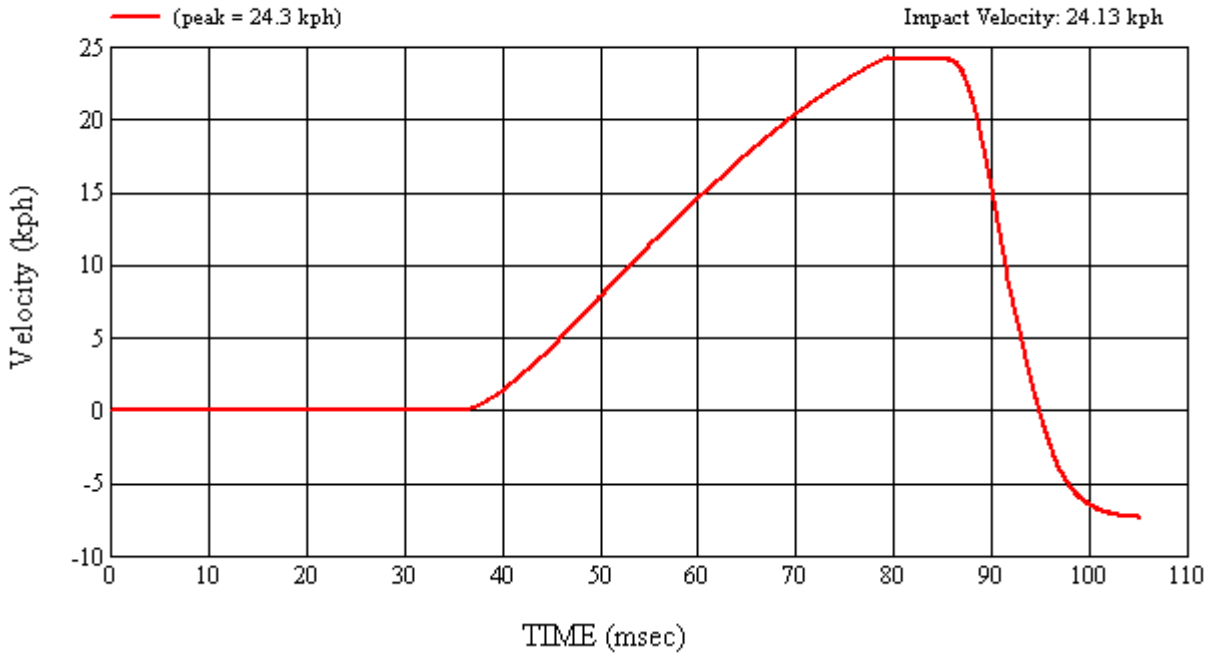


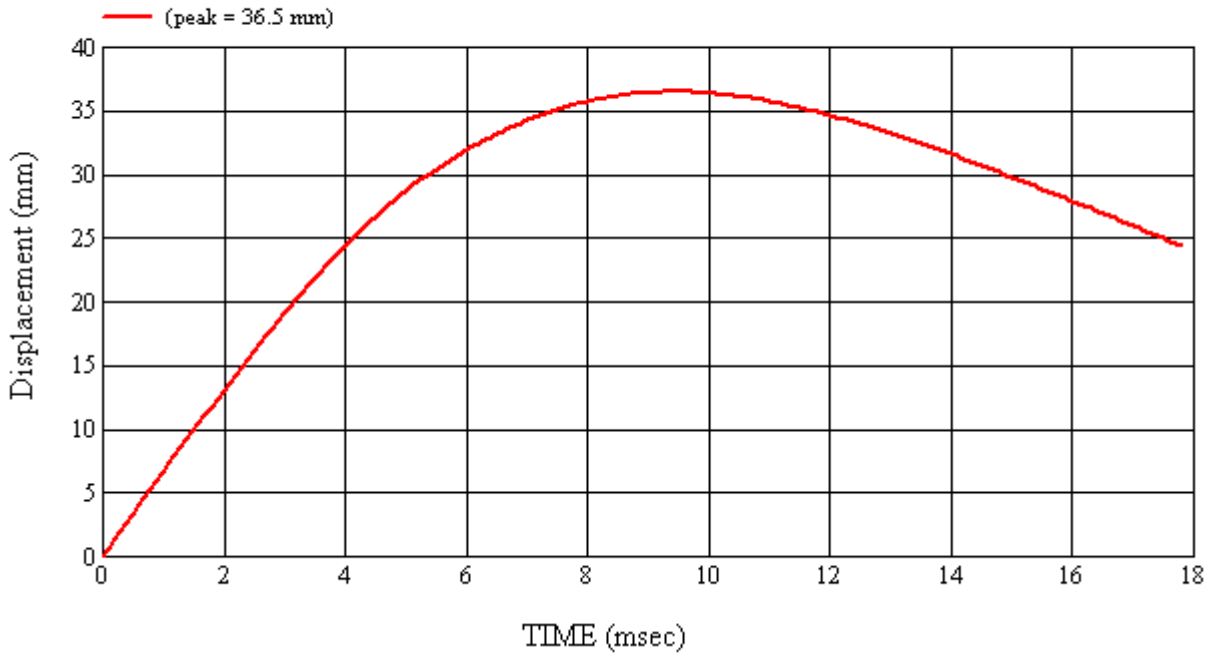


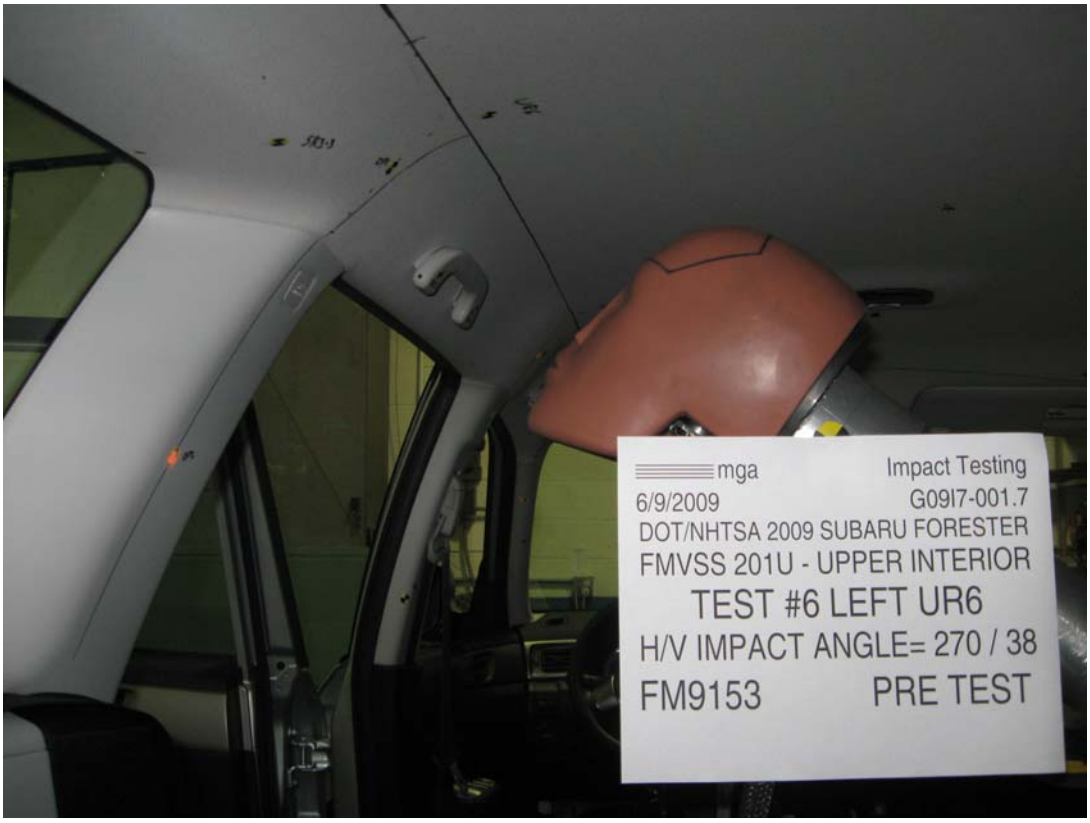

(peak = 110.1 G)
Head X (G)
20
0
-20
-40
-60
-80
-100
-120
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 3.8 G)
Head Y (G)
4
3
2
1
0
-1
-2
-3
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 35.0 G)
Head Z (G)
10
5
0
-5
-10
-15
-20
-25
-30
-35
0
2
4
6
8
10
12
14
16
18
TIME (msec)


(peak = 24.3 kph)
Impact Velocity: 24.13 kph
Velocity (kph)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
60
70
80
90
100
110
TIME (msec)


(peak = 36.5 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
TIME (msec)


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT UR6
H/V IMPACT ANGLE= 270 / 38
FM9153
PRE TEST


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT UR6
H/V IMPACT ANGLE= 270 / 38
FM9153
PRE TEST


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT UR6
H/V IMPACT ANGLE= 270 / 38
FM9153
Post-Test


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT UR6
H/V IMPACT ANGLE= 270 / 38
FM9153
Post-Test
SR3-3
SR3-2


mga
Impact Testing
6/9/2009
G09I7-001.7
DOT/NHTSA 2009 SUBARU FORESTER
FMVSS 201U - UPPER INTERIOR
TEST #6 LEFT UR6
H/V IMPACT ANGLE= 270 / 38
FM9153
Post-Test

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G09I7-001.7 VEHICLE YR/MAKE/MODEL:2009/DOT/NHTSA/Subaru Forester

GENERAL TEST PARAMETERS:

Test Number:#6

Target (Vehicle Side): UR6Left

Temperature:22.1C

MGA Test Reference No.:FM9153

Humidity:44.9%

Approach Horizontal Angles:270º

Time of Test:5:30:50 PM

Approach Vertical Angles:38º

FMH Serial No:[038]

Additional Description:located above OP1

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
669	666	8.9	23.9	40	2 Right

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J22700	-94	1.07	1.07
Y	6	J36197	106.3	0.85	0.85
Z	7	J36353	97.5	0.94	0.94

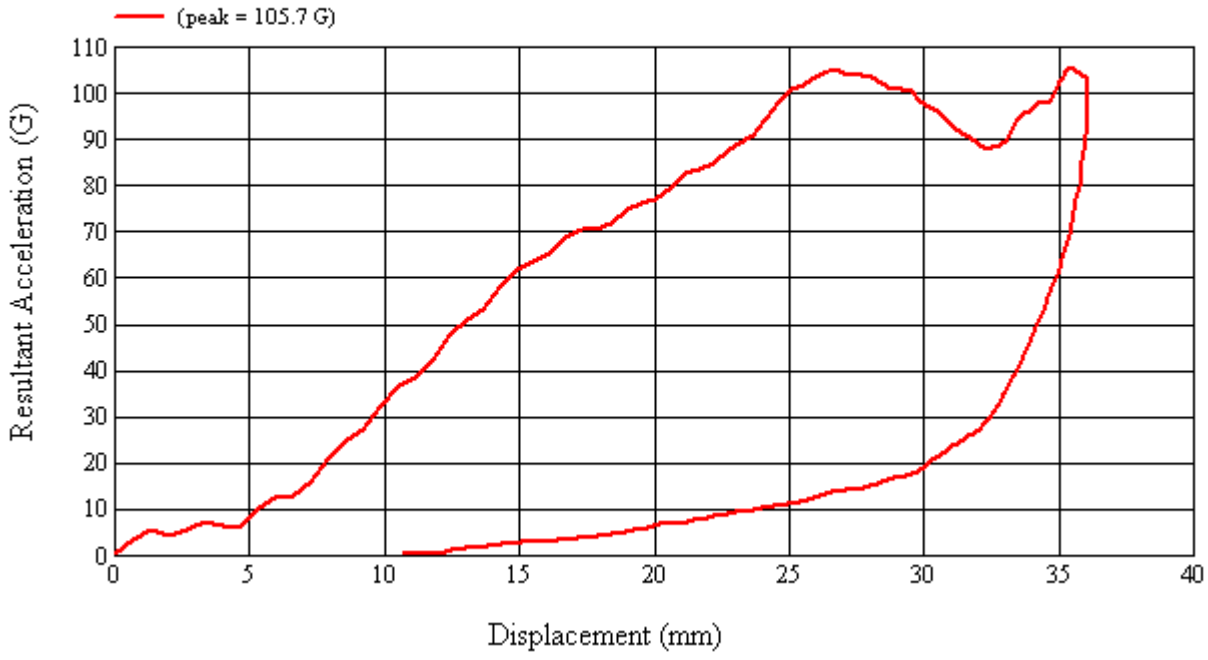
REMARKS (Summary of test, damage, non-compliance, invalid test, etc.):

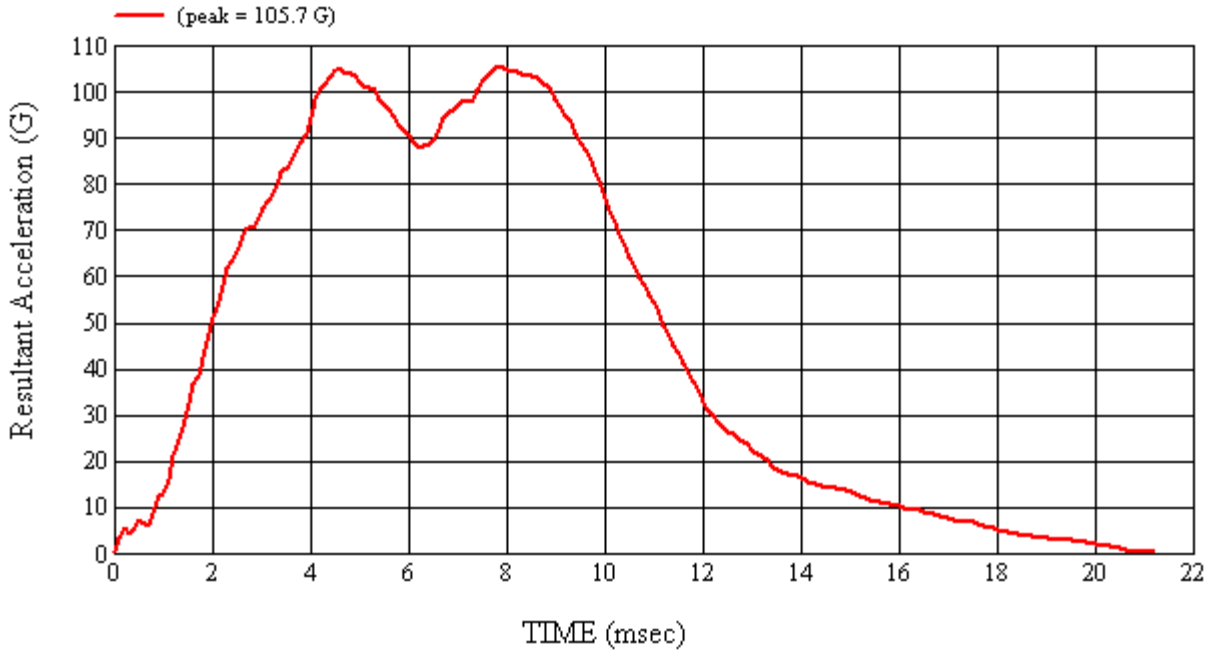
No damage observed

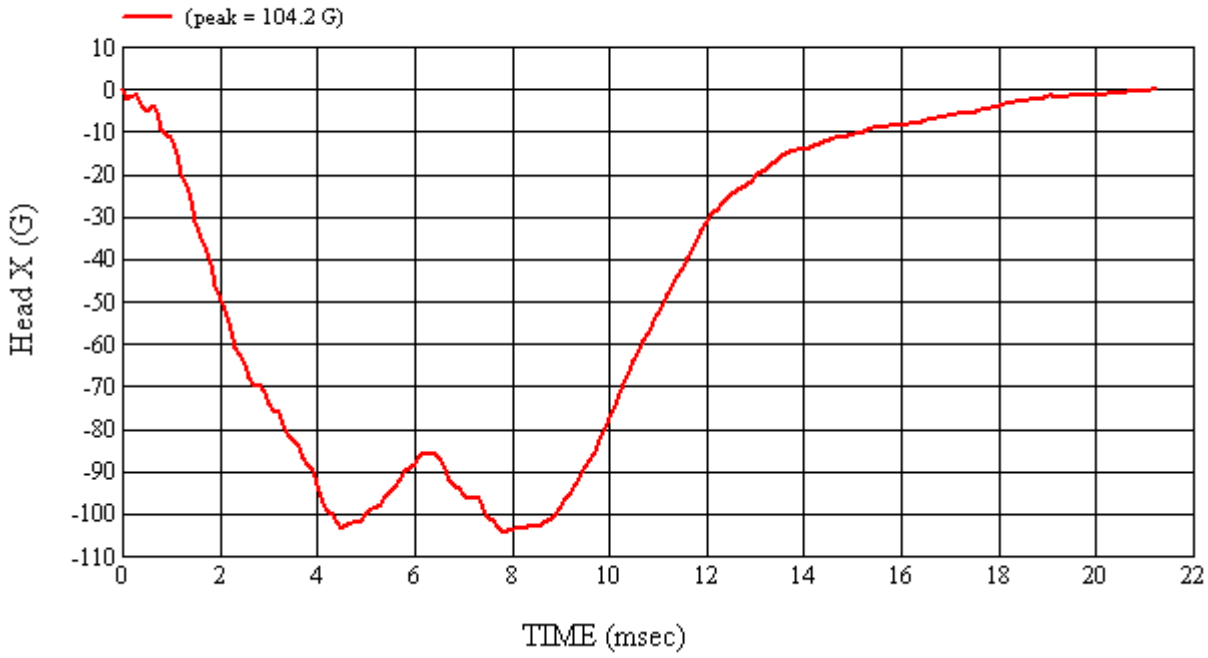
Recorded By: _____ Approved By*: _____ Date: 6/9/2009

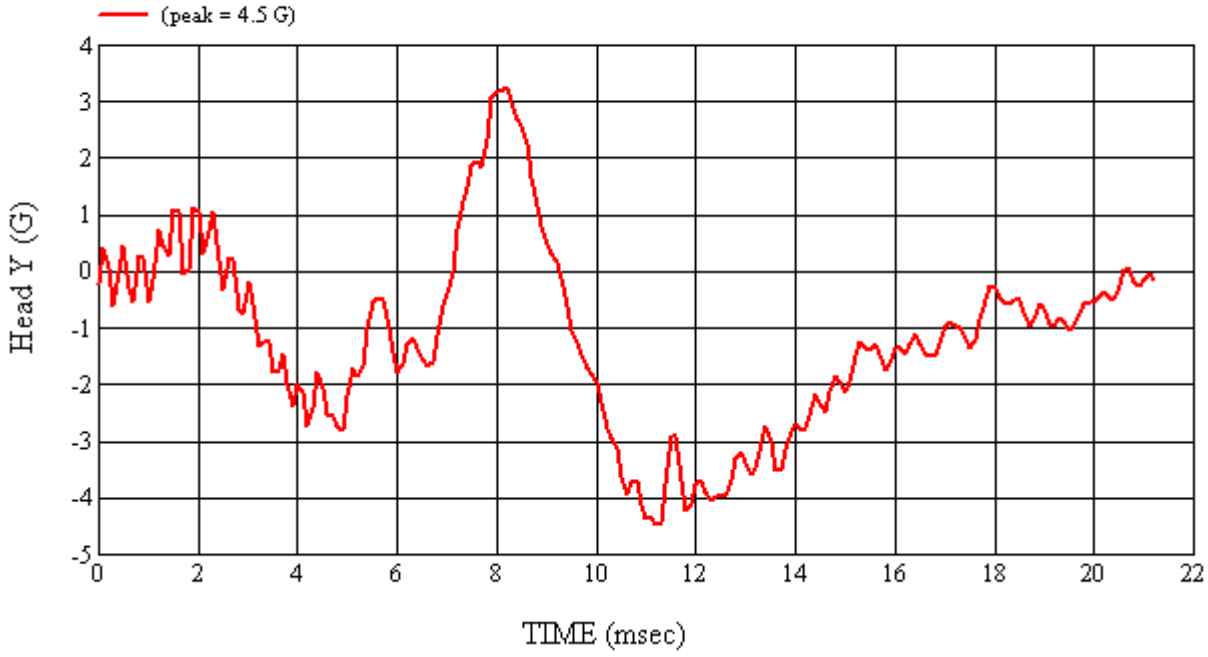
*Only necessary for NHTSA (Government) Compliance testing.

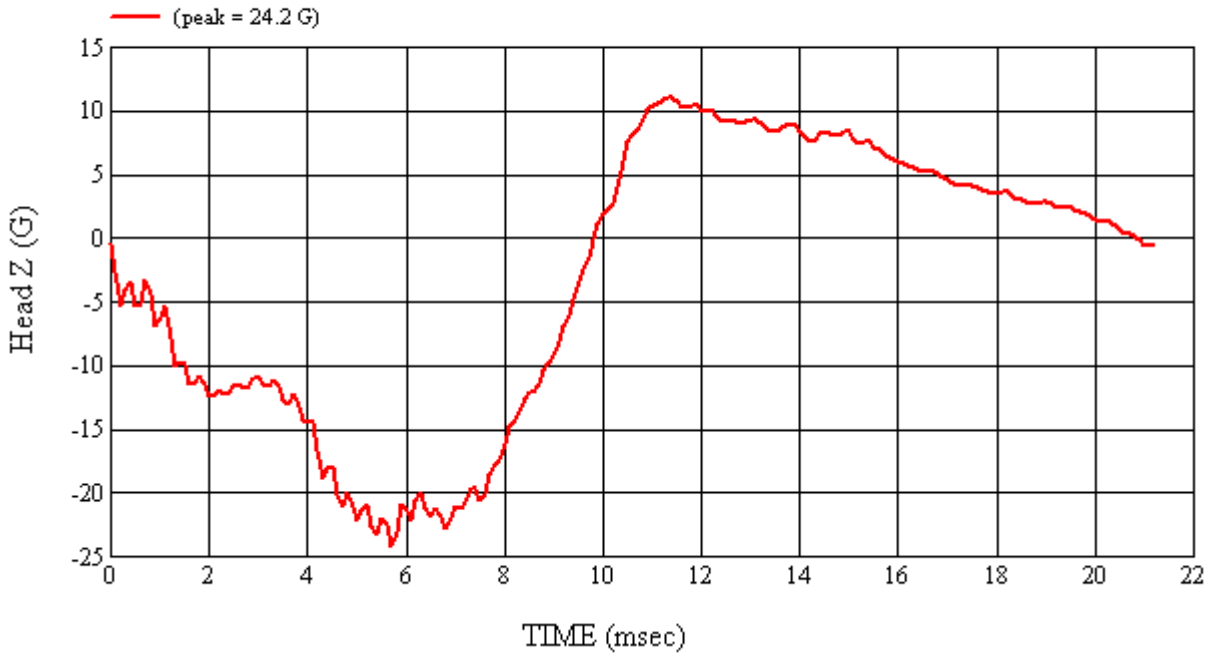
MGA Test #: FM9153 Target Location: UR6, Left Side Test Date: 6/9/2009

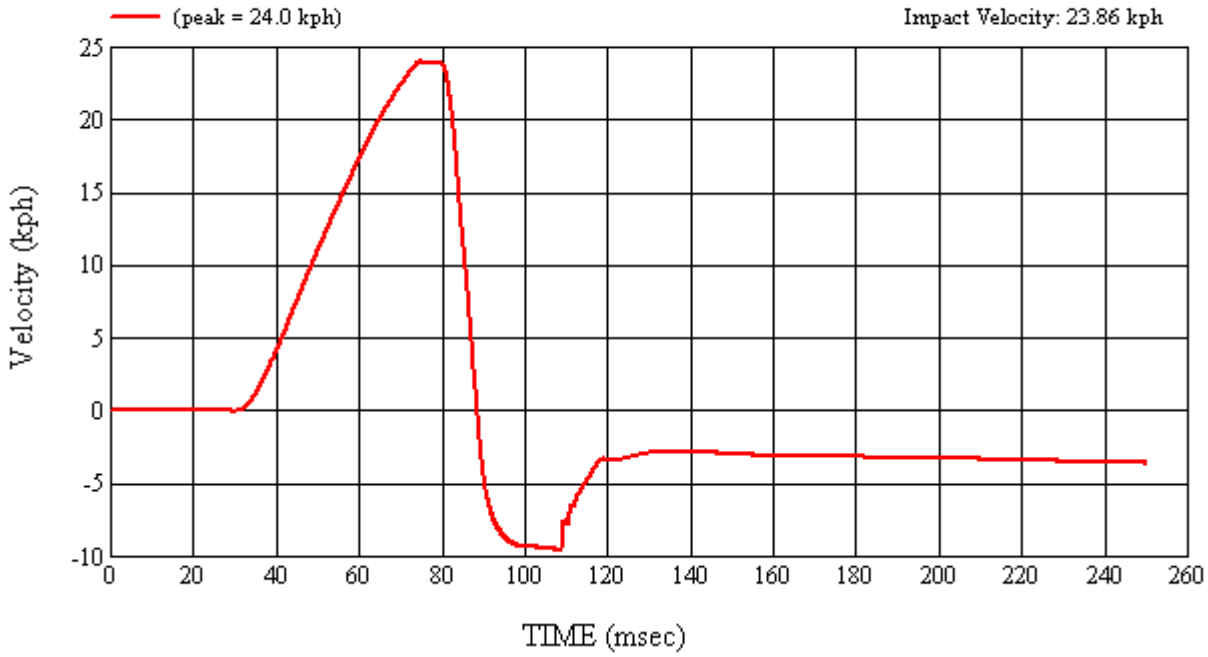


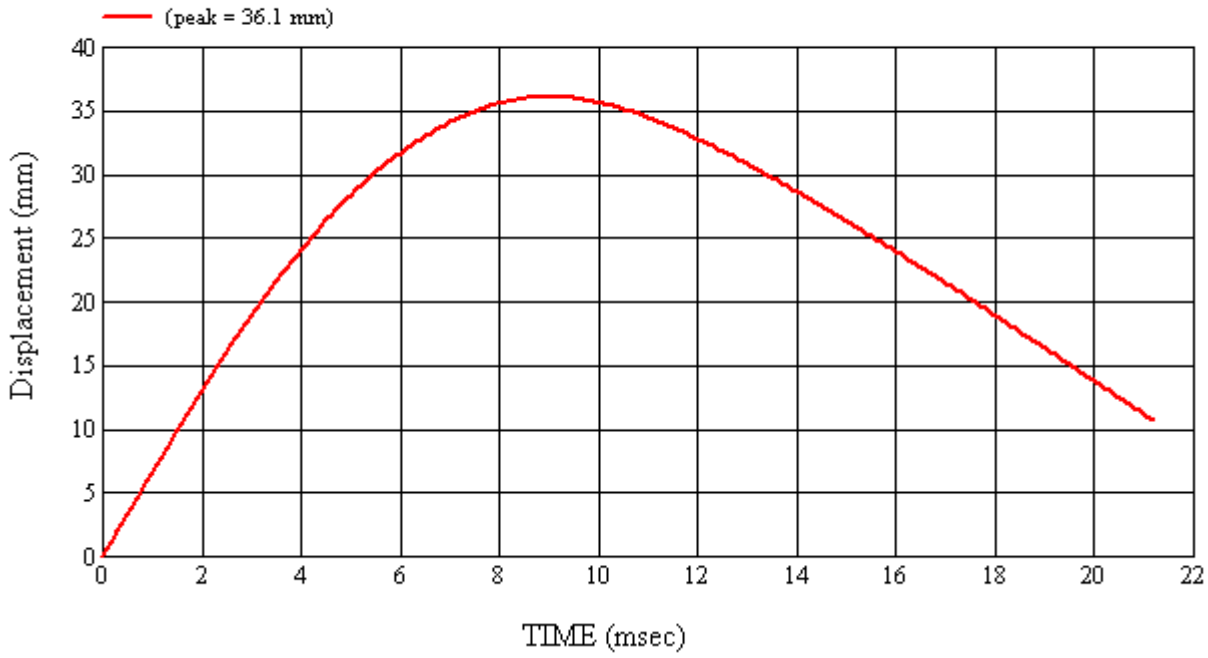



(peak = 104.2 G)
Head X (G)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 4.5 G)
Head Y (G)
4
3
2
1
0
-1
-2
-3
-4
-5
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 24.2 G)
Head Z (G)
15
10
5
0
-5
-10
-15
-20
-25
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)


(peak = 24.0 kph)
Impact Velocity: 23.86 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 = 36.1 mm)
Displacement (mm)
0
5
10
15
20
25
30
35
40
0
2
4
6
8
10
12
14
16
18
20
22
TIME (msec)

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

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

TABLE 4-1 LIST OF ITEMS USED

ITEM	MANUFACTURER NAME	MODEL #	FUNCTION OF ITEM	ACCURACY	CAL. INTERNAL
Head Drop Tower (includes test frame and DAS)	MGA Research Corp.	MGA-100-DC	FMH Calibration	N/A	N/A
Accelerometers	Endevco	7264-2000	Acceleration Data	±0.5%	6 months
*Digital Inclinometer	Macklanburg-Duncan	PRO 360 (MGA00730)	Set Angle of FMH/Targeting	0.1°	Annual
FMVSS 201U Test Frame (includes the propulsion control system, actuator, test frame, and DAS)	MGA Research Corp.	MGA-100-FMH	Test System	N/A	N/A
Free Motion Headforms	UTAMA UTAMA UTAMA	035 037 038	Test Device	N/A	Pre and Post-Test Series
High Speed Video	Vision Research	Miro	Record Event	N/A	N/A
*FARO™	Faro Technologies	S08059801273	Targeting	0.1 mm	Annual
Measuring Devices: - Tape Measure - Plumb Bobs - Digital Protractor	 Stanley N/A Macklanburg-Duncan	 TPM906 -- MGA00730	 Measurement Targeting FMH setup Horizontal Measurement	 1 mm N/A 0.5°	Annual
*Temperature Recorder	Dickson	MGA00717	Record Temperature and Humidity	± 1°C ± 1% RH	Annual
* Scale	Detecto	MGA00081	Weigh FMH Head	± 0.01 lb	Annual
*Vehicle Scale	Sterling Scale Co.	26032389	Weighing Vehicle	± .5 kg	Annual

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

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

TABLE 4-2 FMH CALIBRATION SUMMARY

FMH Serial #		Headform Calibration Date	Weight (lbs)	Temp (ºC)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
Pre	#035	6/8/2009	9.90	22.7	62.7	237.5	5.1	Yes
Post	#035	6/11/2009	9.90	22.5	58.3	243.3	9.5	Yes
Pre	#037	6/9/2009	9.96	22.2	58.6	261.0	4.9	Yes
Post	#037	6/11/2009	9.96	22.4	51.5	253.7	9.4	Yes
Pre	#038	6/9/2009	9.90	22.2	58.6	258.7	9.0	Yes
Post	#038	6/11/2009	9.90	22.3	55.3	254.7	11.6	Yes

4-1 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 6/8/2009 CALIBRATION TIME: 6:49:20 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.7
Relative Humidity	10% to 70%	62.7
Peak Resultant Acceleration	225 G's to 275 G's	237.5
Peak Lateral Acceleration	15 G's Maximum	5.1
Unimodal Acceleration Curve	YES	YES

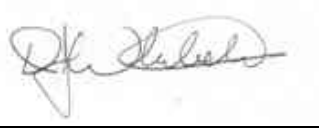
FMH INSTRUMENTATION

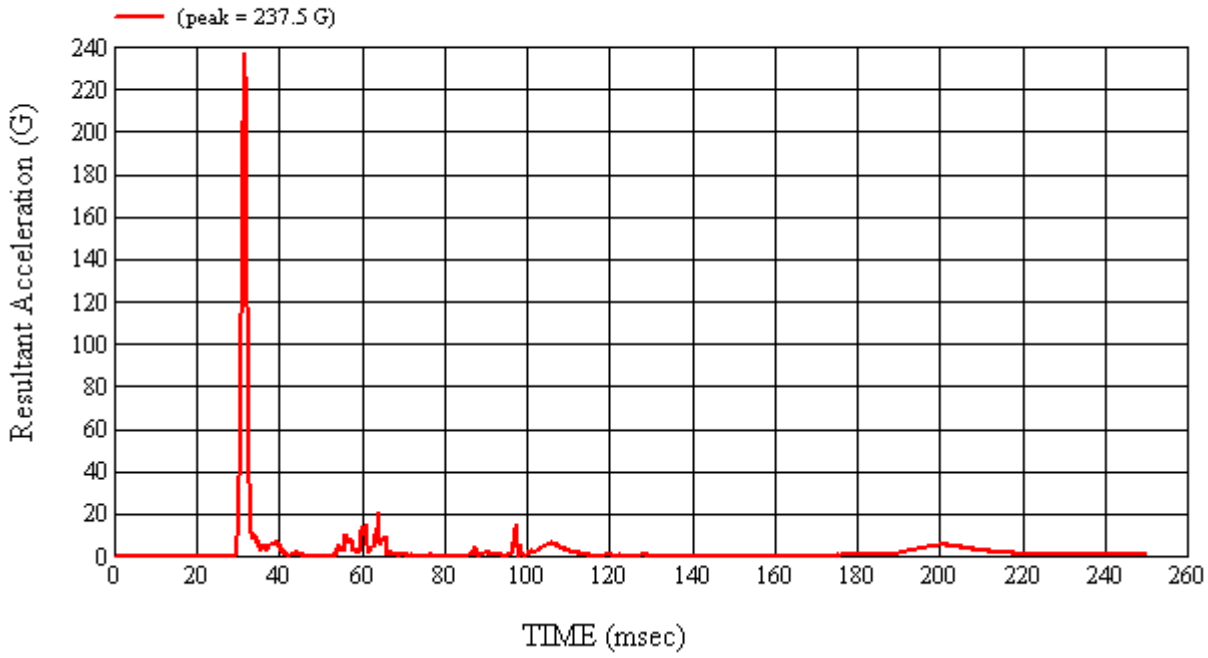
HEAD ACCELEROMETERS

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

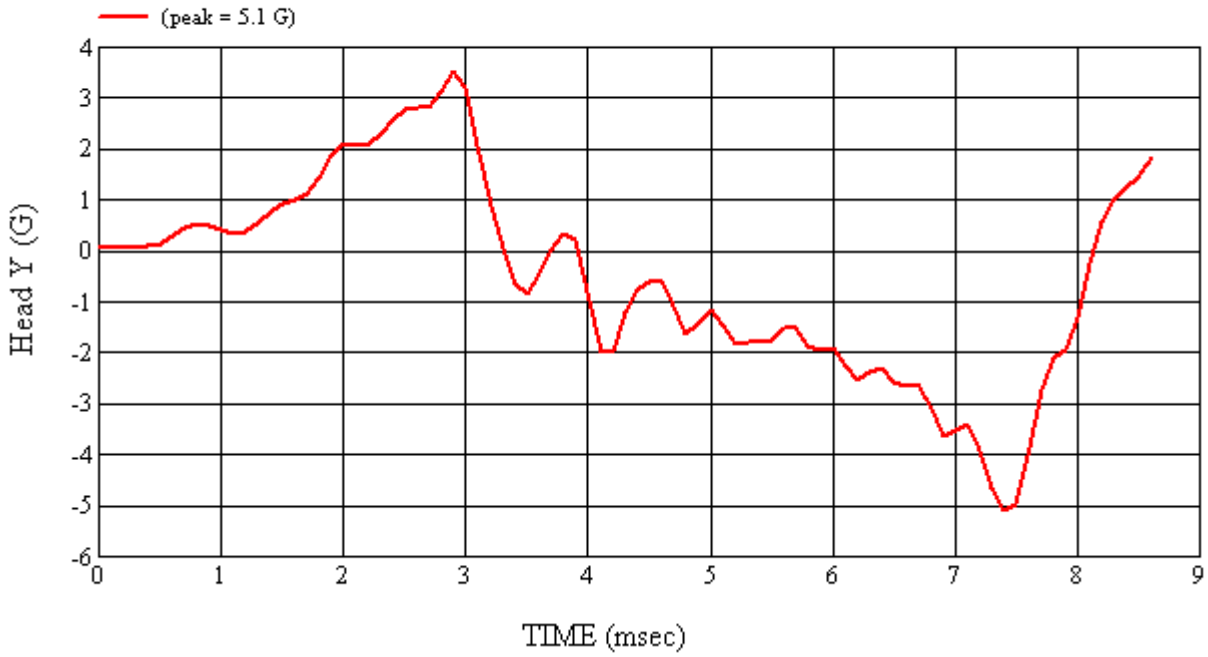
REMARKS:

RECORDED BY:  DATE: 6/8/2009

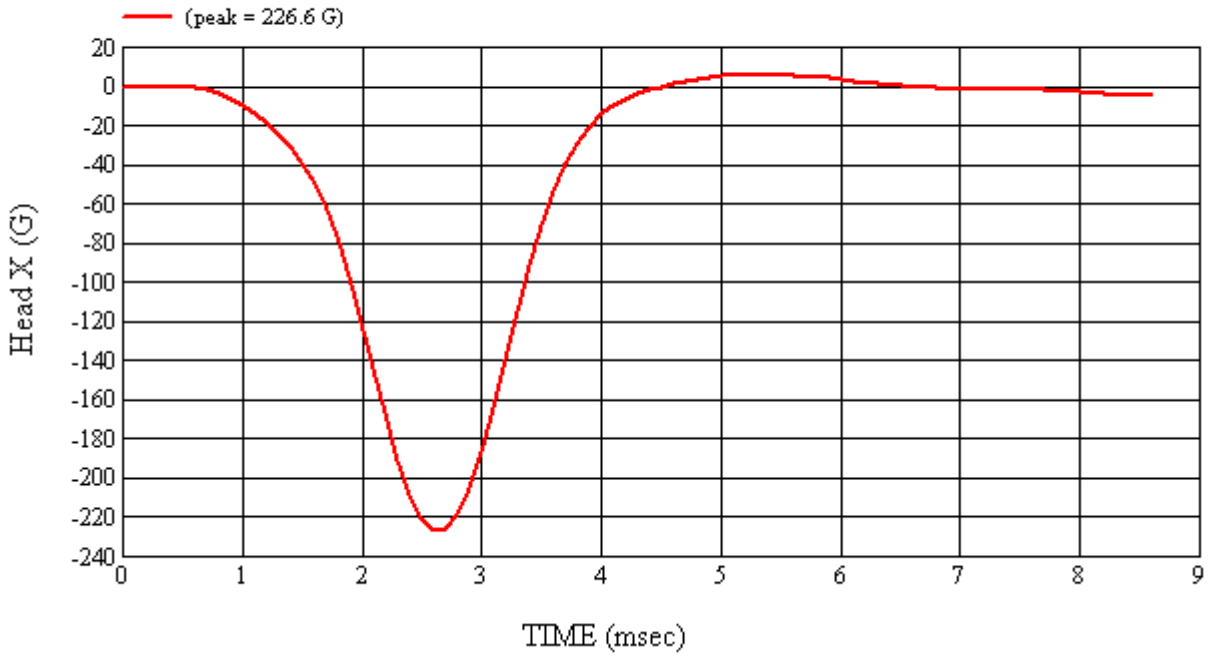
APPROVED BY: 



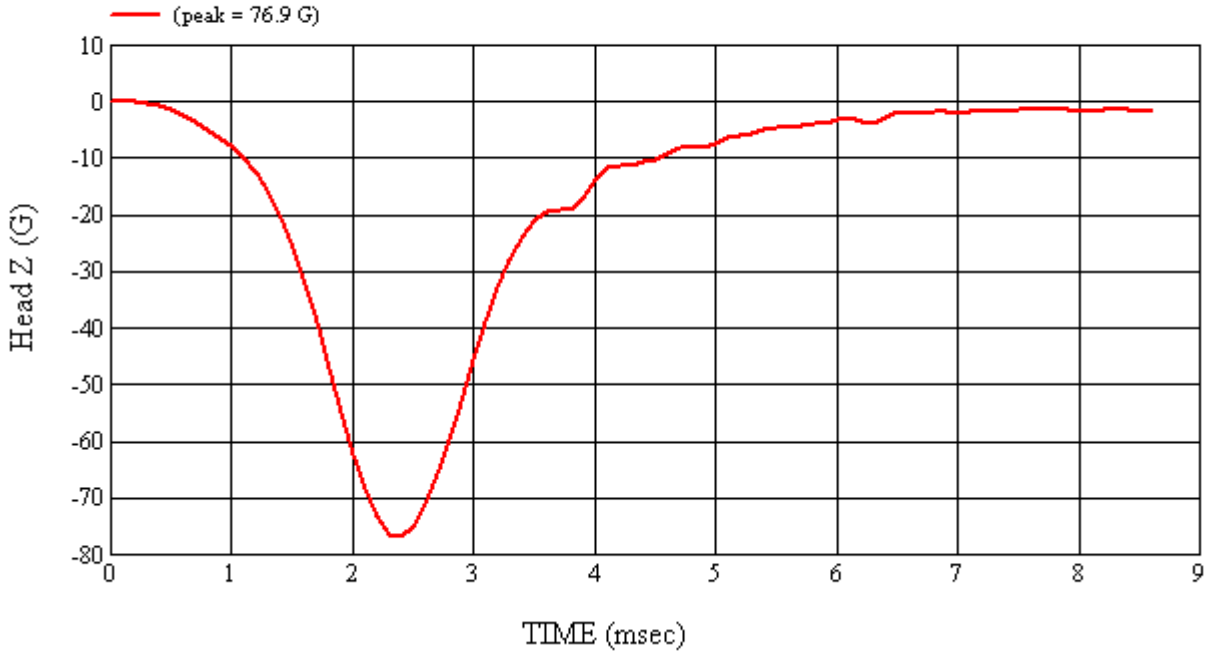
Head 035 (Pre) Calibration #H35019



Head 035 (Pre) Calibration #H35019



Head 035 (Pre) Calibration #H35019



Head 035 (Pre) Calibration #H35019

4-2 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

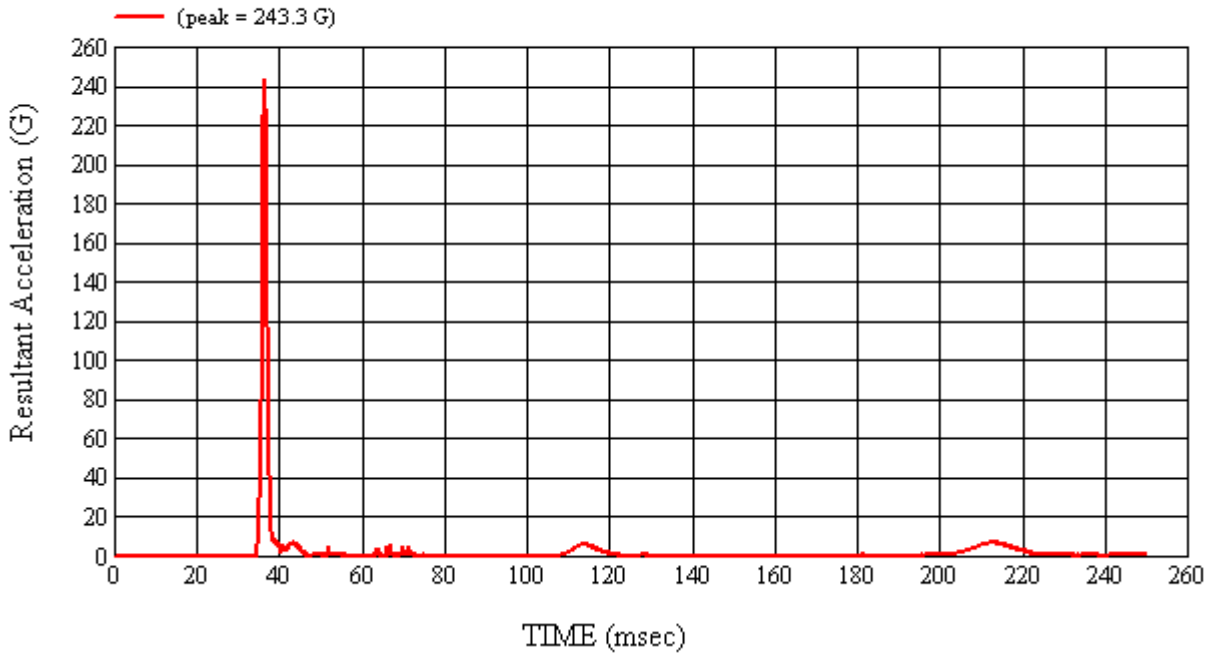
HEADFORM SERIAL NUMBER: 035	CALIBRATION DATE: 6/11/2009 CALIBRATION TIME: 9:13:32 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.5
Relative Humidity	10% to 70%	58.3
Peak Resultant Acceleration	225 G's to 275 G's	243.3
Peak Lateral Acceleration	15 G's Maximum	9.5
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	J35919	03/02/09	09/02/09
2	ENDEVCO	7264-2000	J22664	03/02/09	09/02/09
3	ENDEVCO	7264-2000	J35924	03/02/09	09/02/09

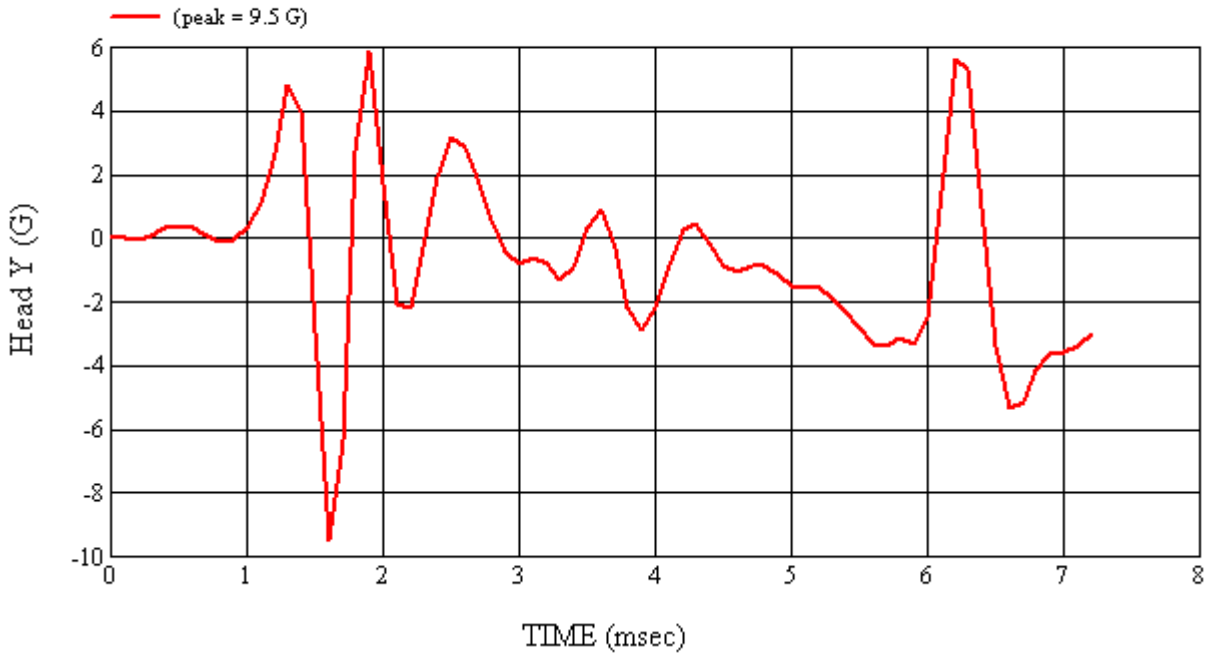
REMARKS:

RECORDED BY: _____ DATE: 6/11/2009

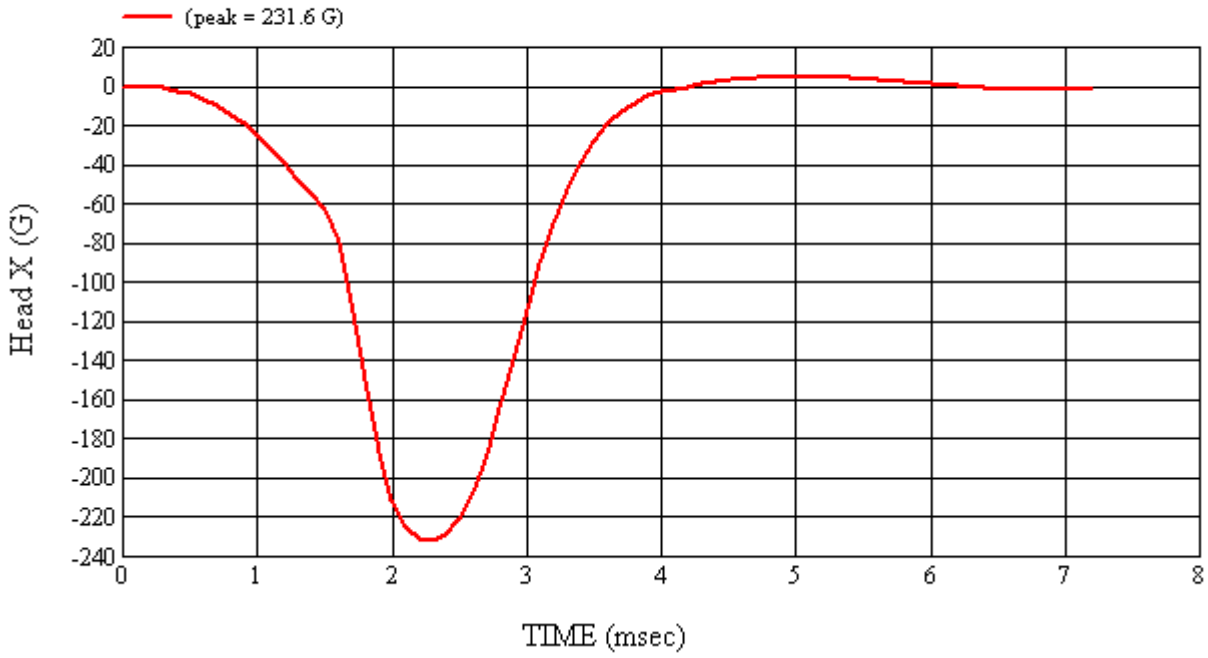
APPROVED BY: _____



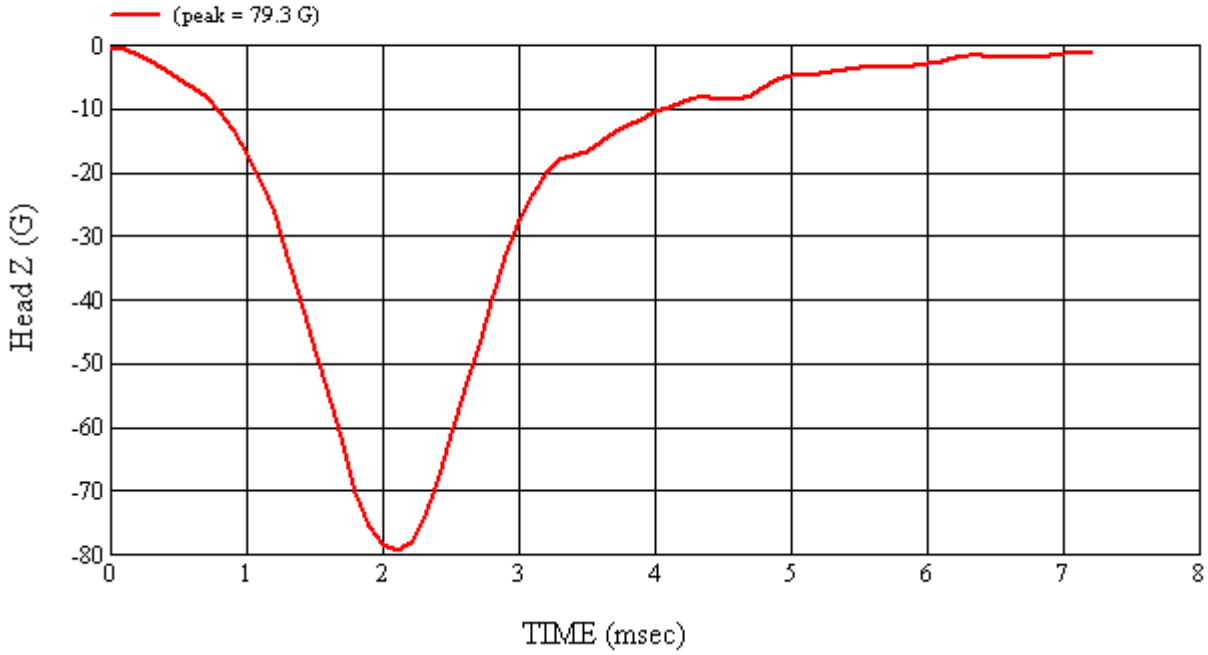
Head 035 (Post) Calibration #H35020



Head 035 (Post) Calibration #H35020



Head 035 (Post) Calibration #H35020



Head 035 (Post) Calibration #H35020

4-3 Pre-Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 6/09/2009 CALIBRATION TIME: 7:18:36 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22.2
Relative Humidity	10% to 70%	58.6
Peak Resultant Acceleration	225 G's to 275 G's	261.0
Peak Lateral Acceleration	15 G's Maximum	4.9
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION

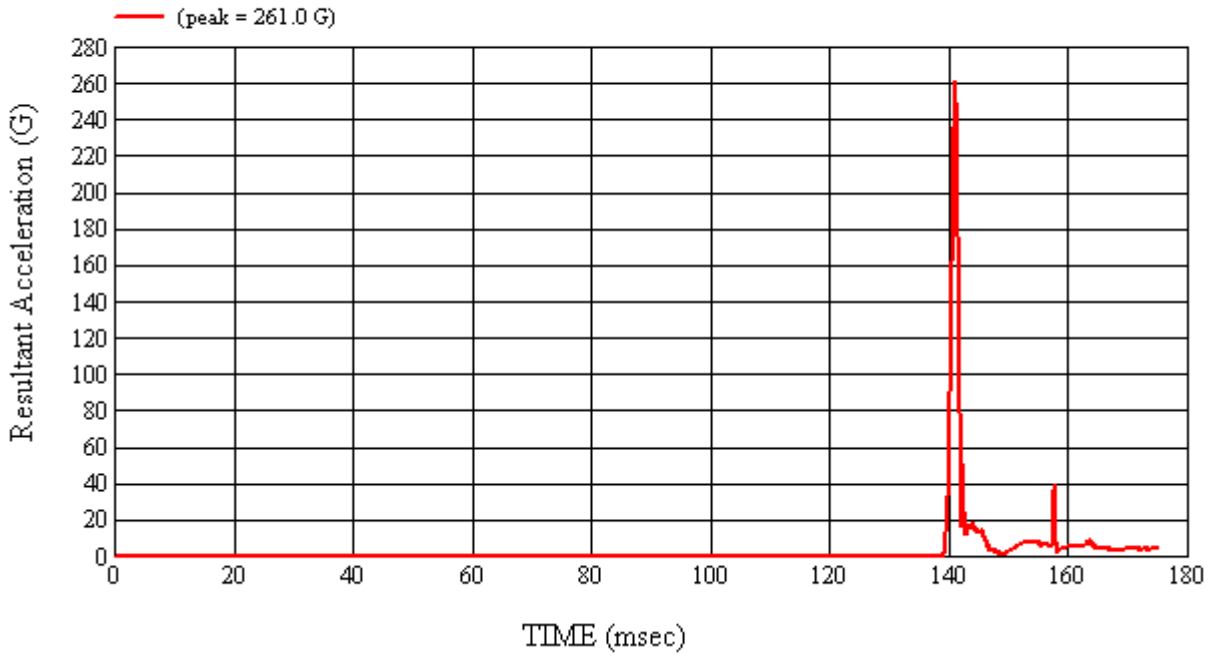
HEAD ACCELEROMETERS

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

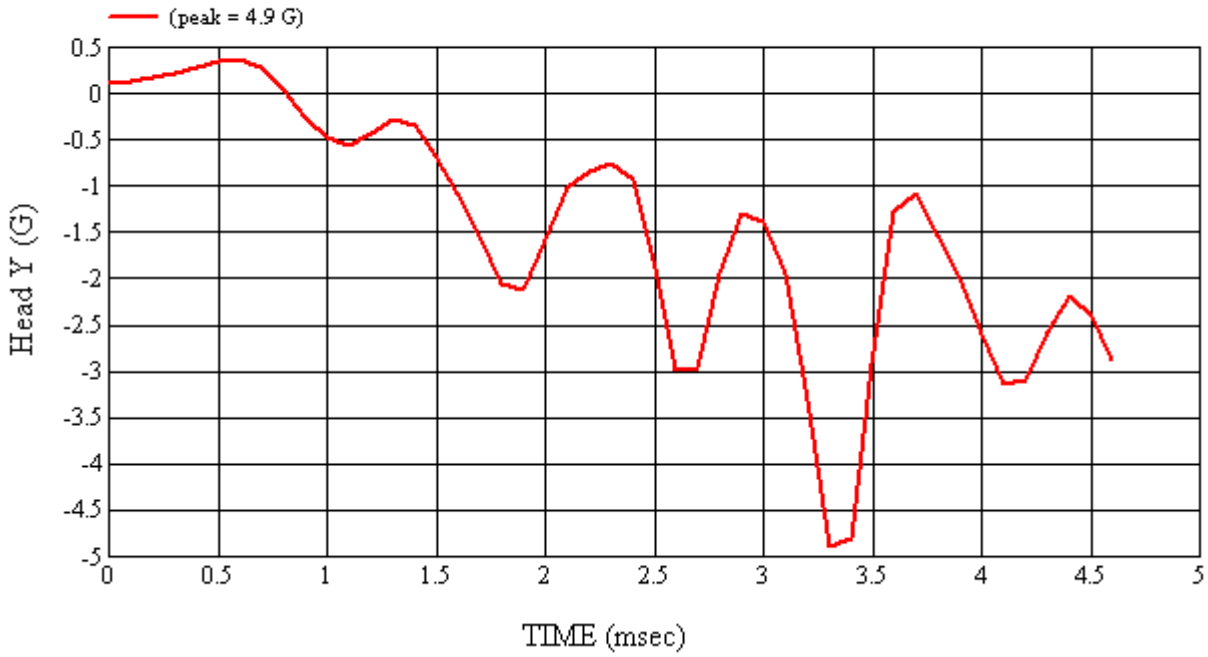
REMARKS:

RECORDED BY: _____ DATE: 6/9/2009

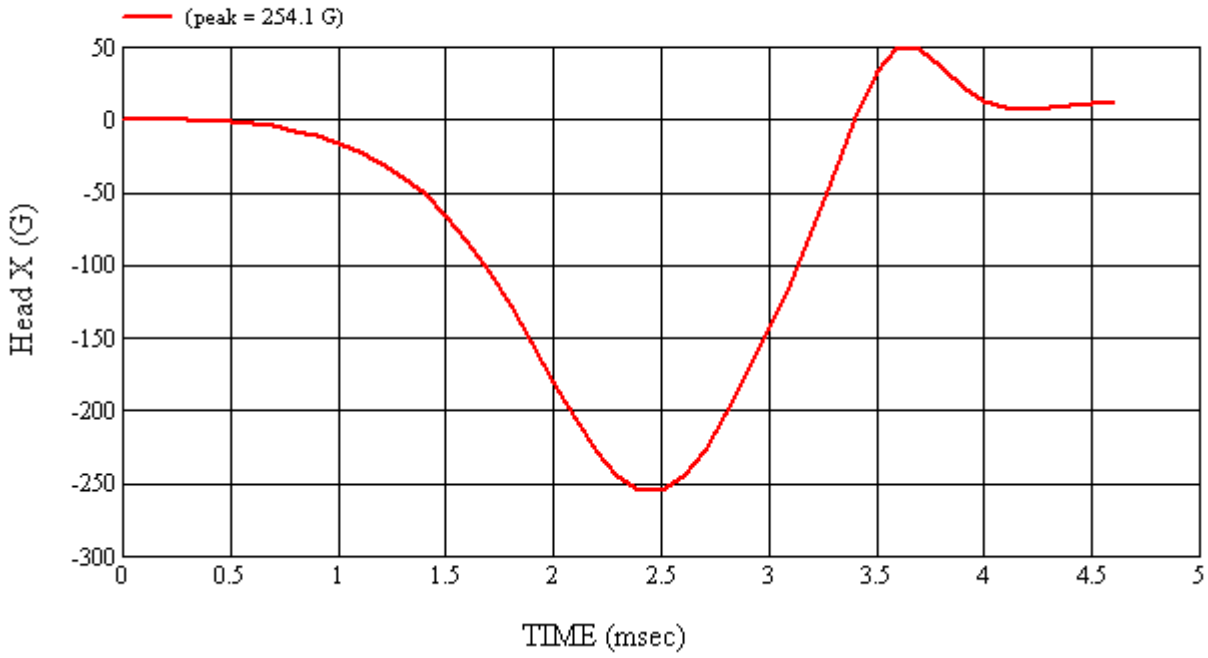
APPROVED BY: _____



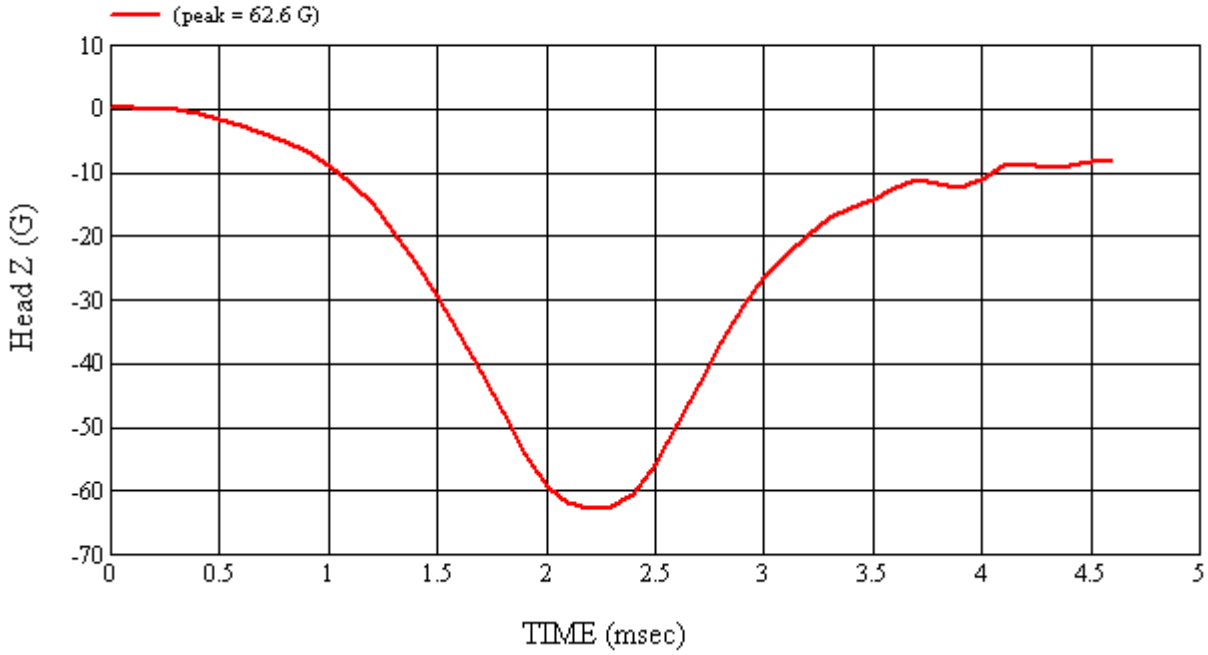
Head 037 (Pre) Calibration #H37019



Head 037 (Pre) Calibration #H37019



Head 037 (Pre) Calibration #H37019



Head 037 (Pre) Calibration #H37019

4-4 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

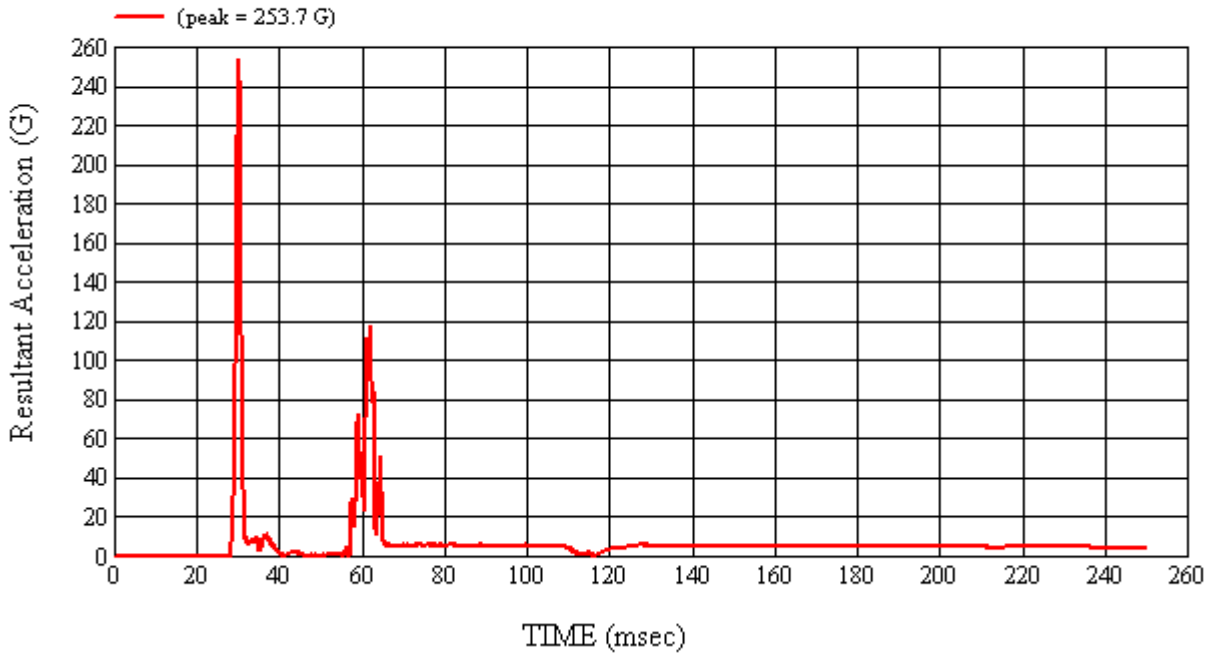
HEADFORM SERIAL NUMBER: 037	CALIBRATION DATE: 6/11/2009 CALIBRATION TIME: 9:36:02 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.96
Temperature	19° C to 26° C	22.4
Relative Humidity	10% to 70%	51.5
Peak Resultant Acceleration	225 G's to 275 G's	253.7
Peak Lateral Acceleration	15 G's Maximum	9.4
Unimodal Acceleration Curve	YES	YES

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

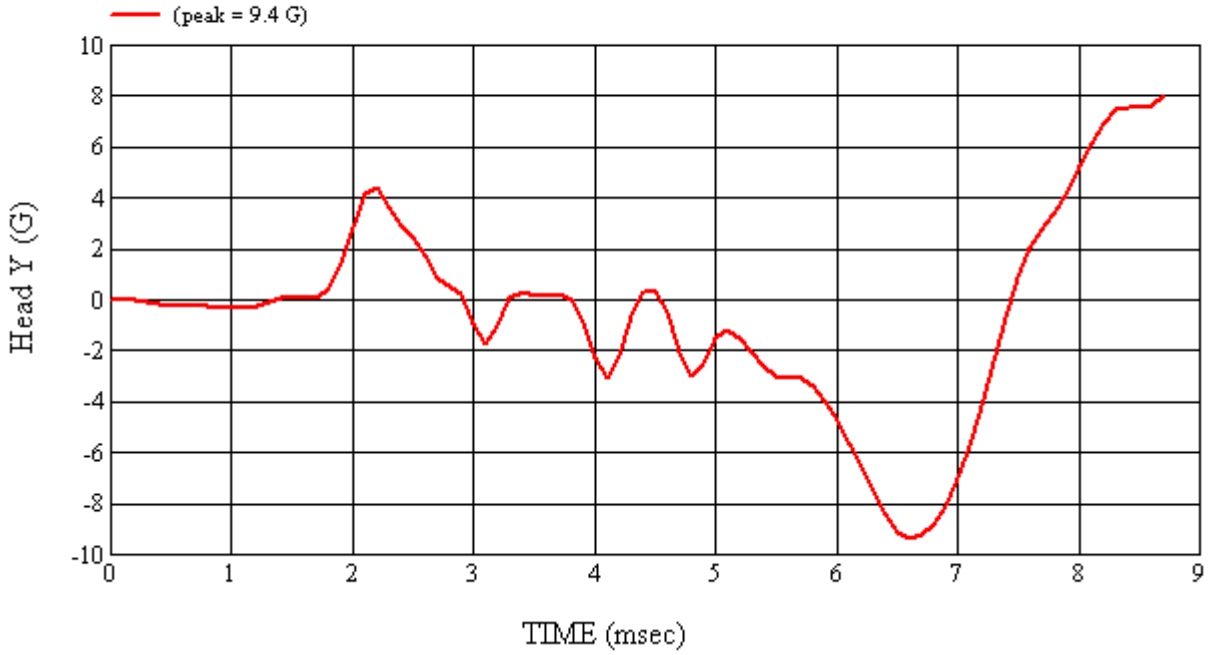
REMARKS:

RECORDED BY: _____ DATE: 6/11/2009

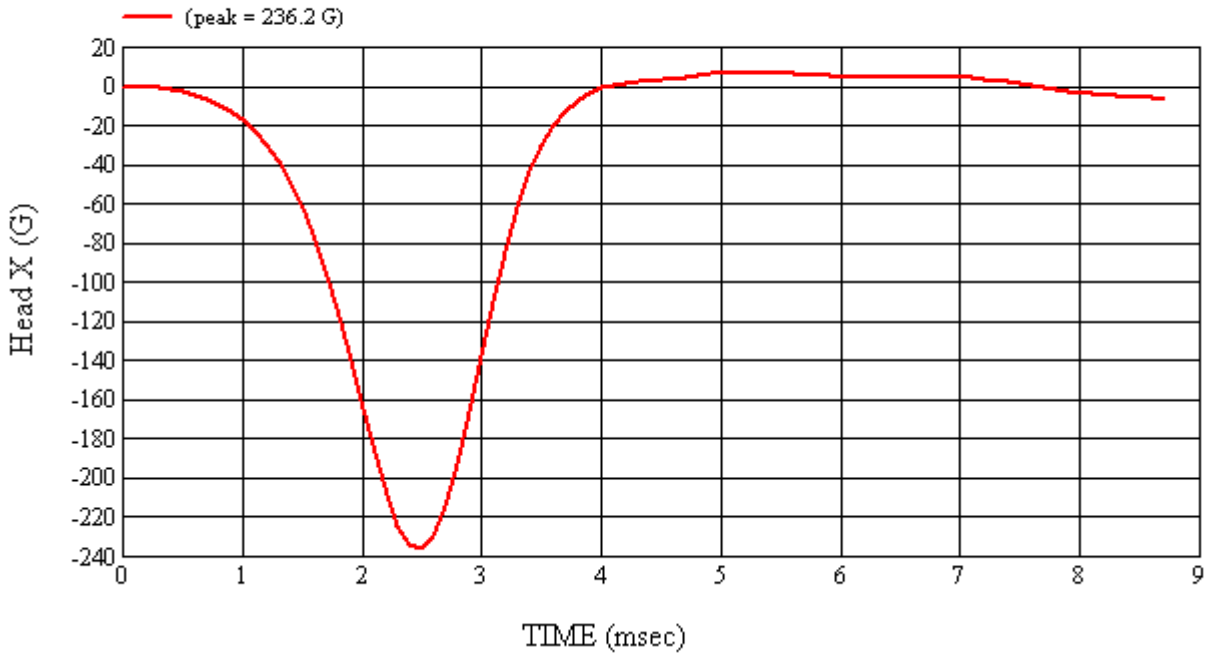
APPROVED BY: _____



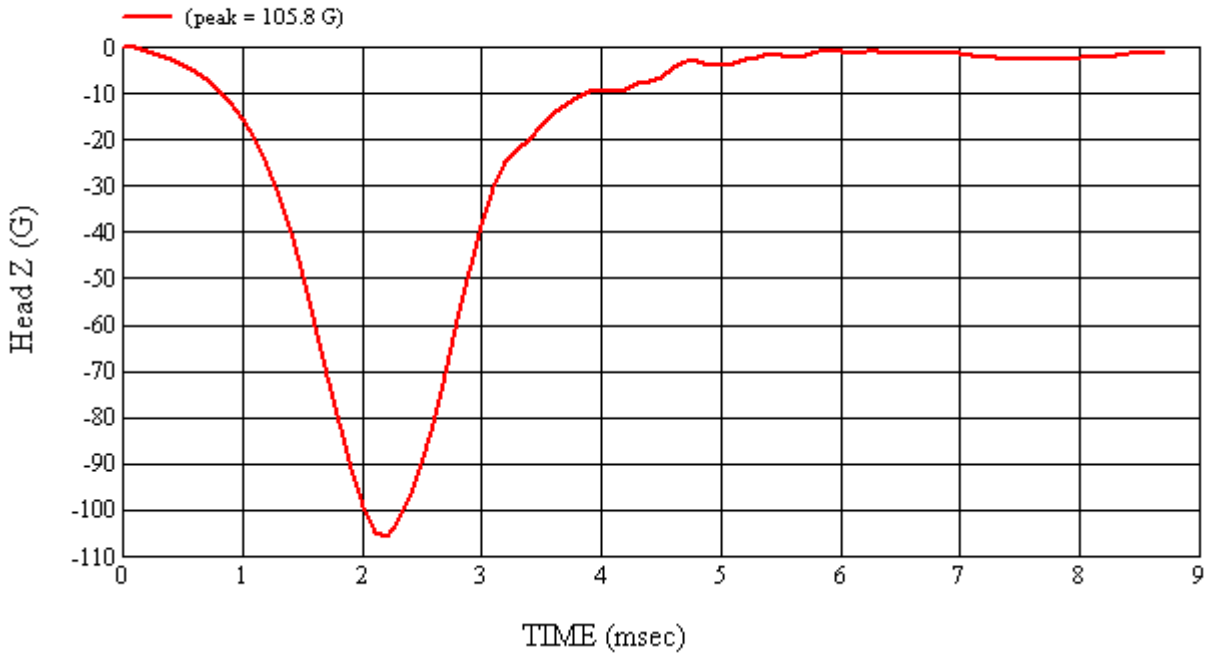
Head 037 (Post) Calibration #H37020



Head 037 (Post) Calibration #H37020



Head 037 (Post) Calibration #H37020



Head 037 (Post) Calibration #H37020

4-5 Pre-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 6/09/2009 CALIBRATION TIME: 7:51:28 AM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.2
Relative Humidity	10% to 70%	58.6
Peak Resultant Acceleration	225 G's to 275 G's	258.7
Peak Lateral Acceleration	15 G's Maximum	9.0
Unimodal Acceleration Curve	YES	YES

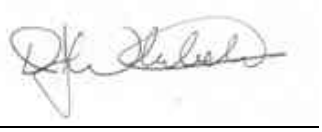
FMH INSTRUMENTATION

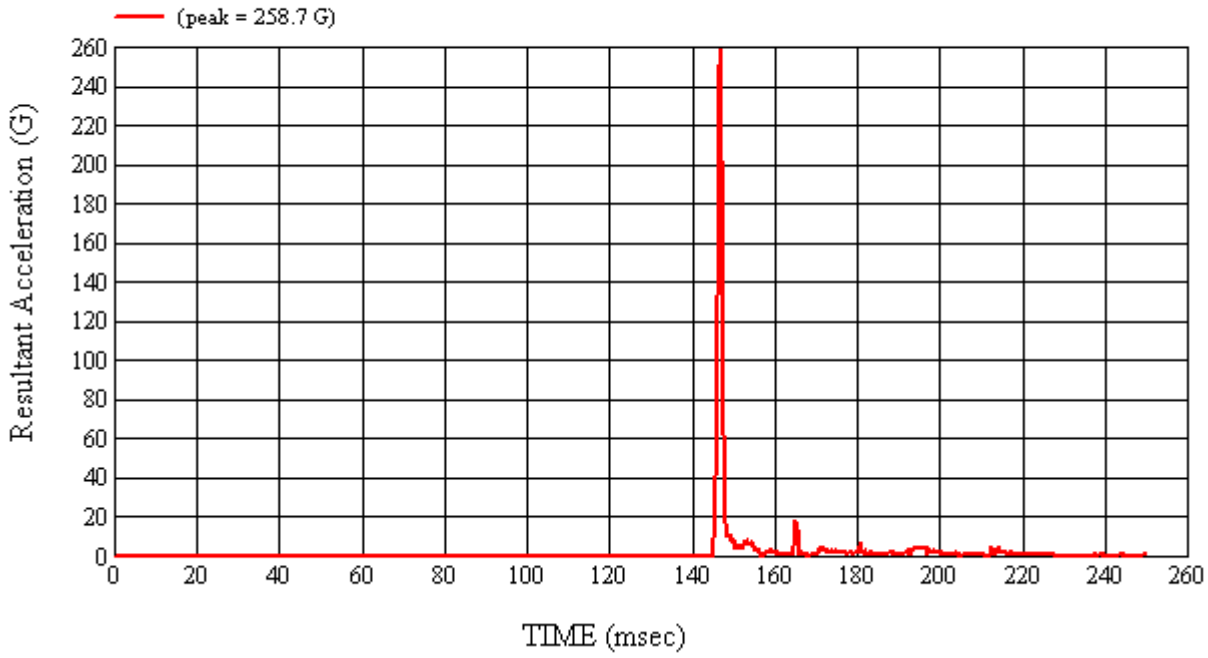
HEAD ACCELEROMETERS

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

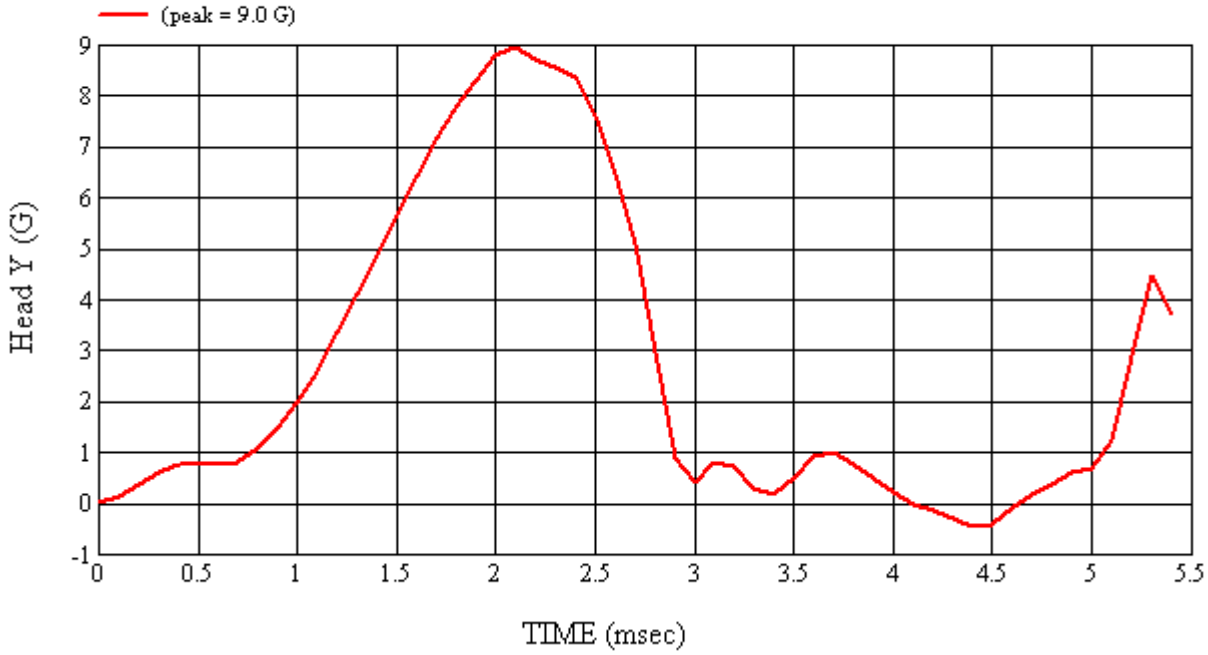
REMARKS:

RECORDED BY:  DATE: 6/9/2009

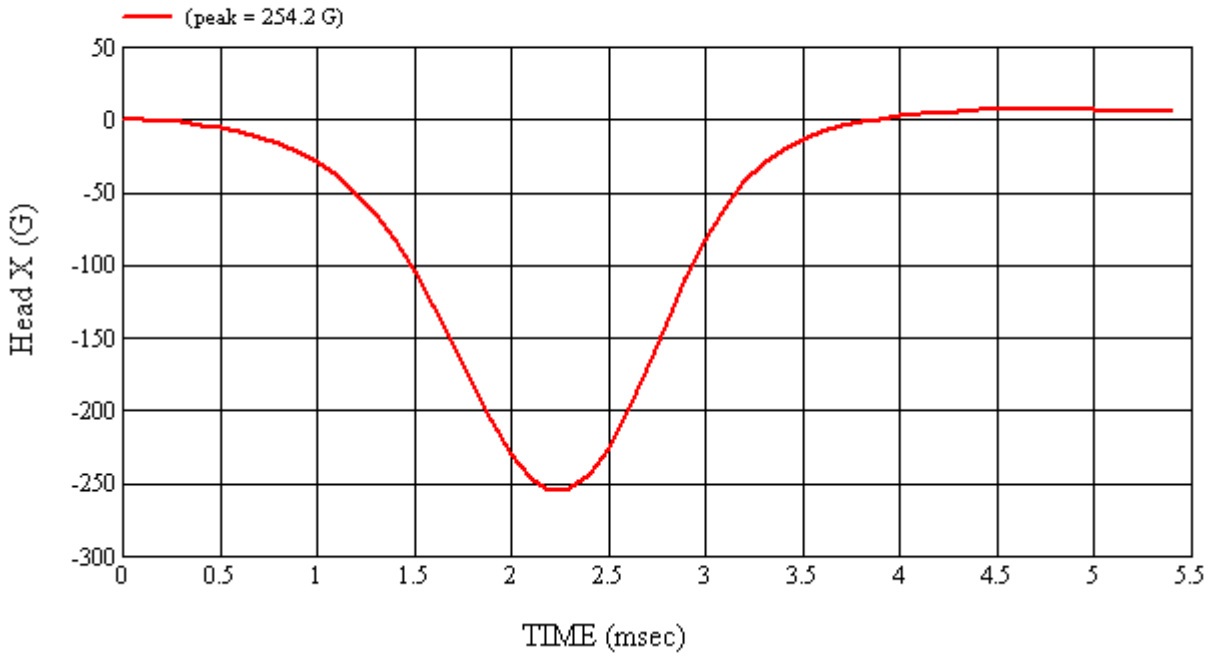
APPROVED BY: 



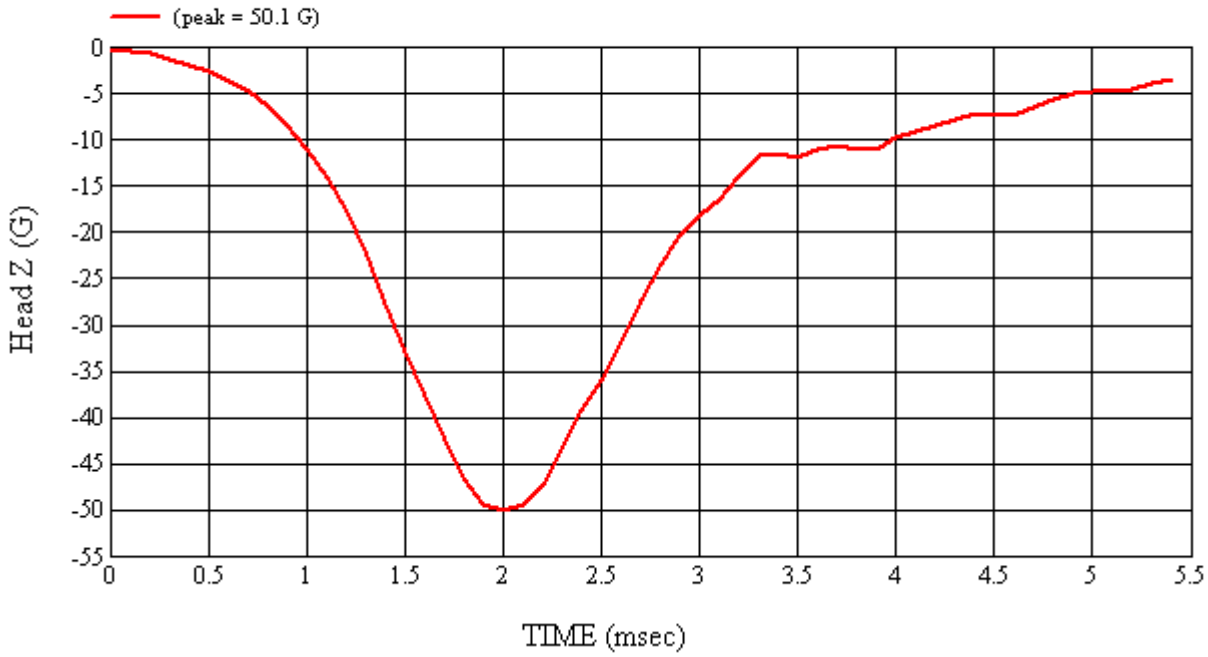
Head 038 (Pre) Calibration #H38019



Head 038 (Pre) Calibration #H38019



Head 038 (Pre) Calibration #H38019



Head 038 (Pre) Calibration #H38019

4-6 Post-Test Calibration

HEAD DROP TEST SUMMARY
PART 572L

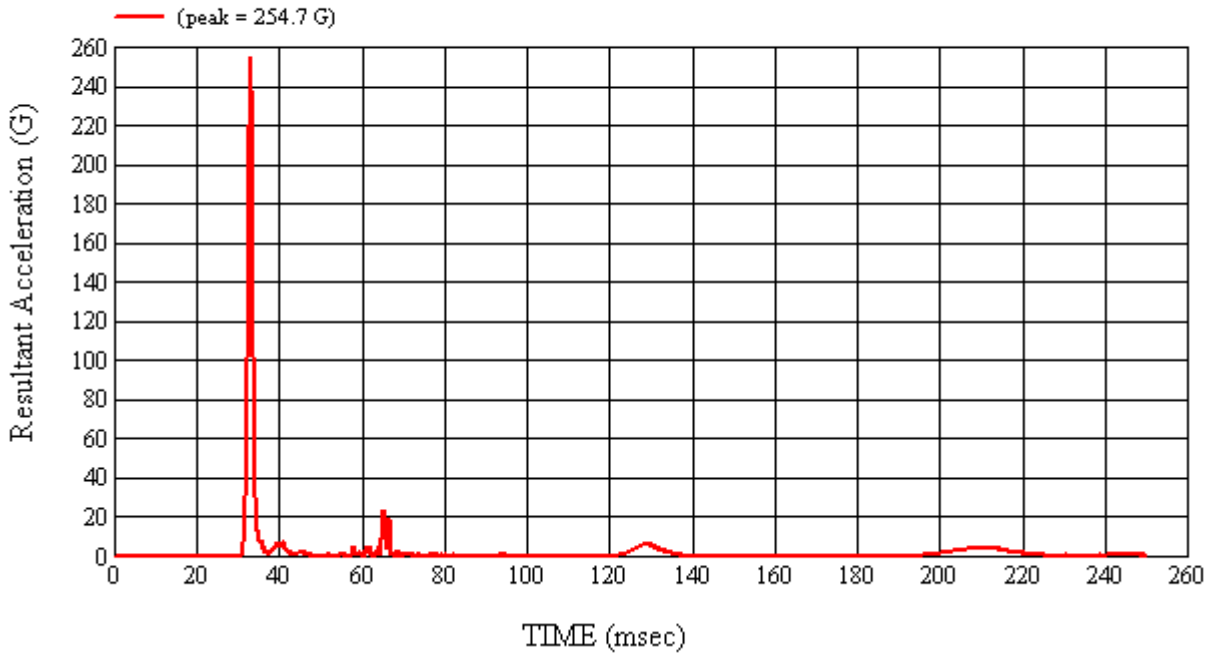
HEADFORM SERIAL NUMBER: 038	CALIBRATION DATE: 6/11/2009 CALIBRATION TIME: 12:51:13 PM	
TEST PARAMETER	**SPECIFICATION**	**TEST RESULTS**
Weight	9.90 to 10.10 lbs.	9.90
Temperature	19° C to 26° C	22.3
Relative Humidity	10% to 70%	55.3
Peak Resultant Acceleration	225 G's to 275 G's	254.7
Peak Lateral Acceleration	15 G's Maximum	11.6
Unimodal Acceleration Curve	YES	YES

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

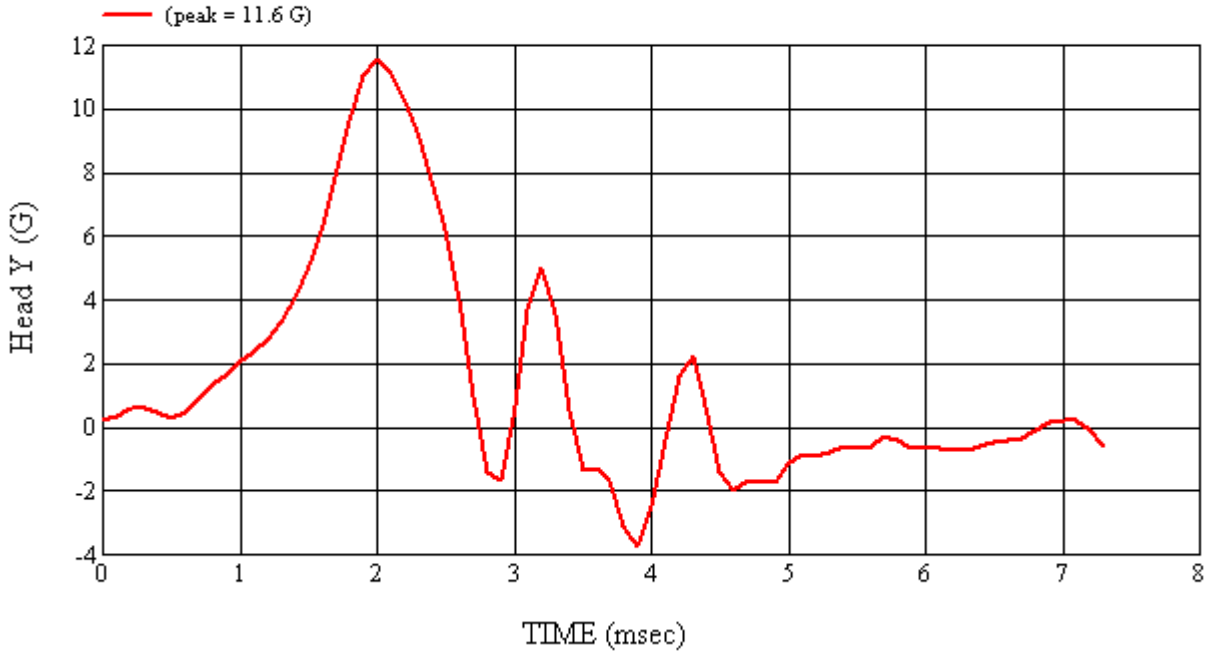
REMARKS:

RECORDED BY: _____ DATE: 6/11/2009

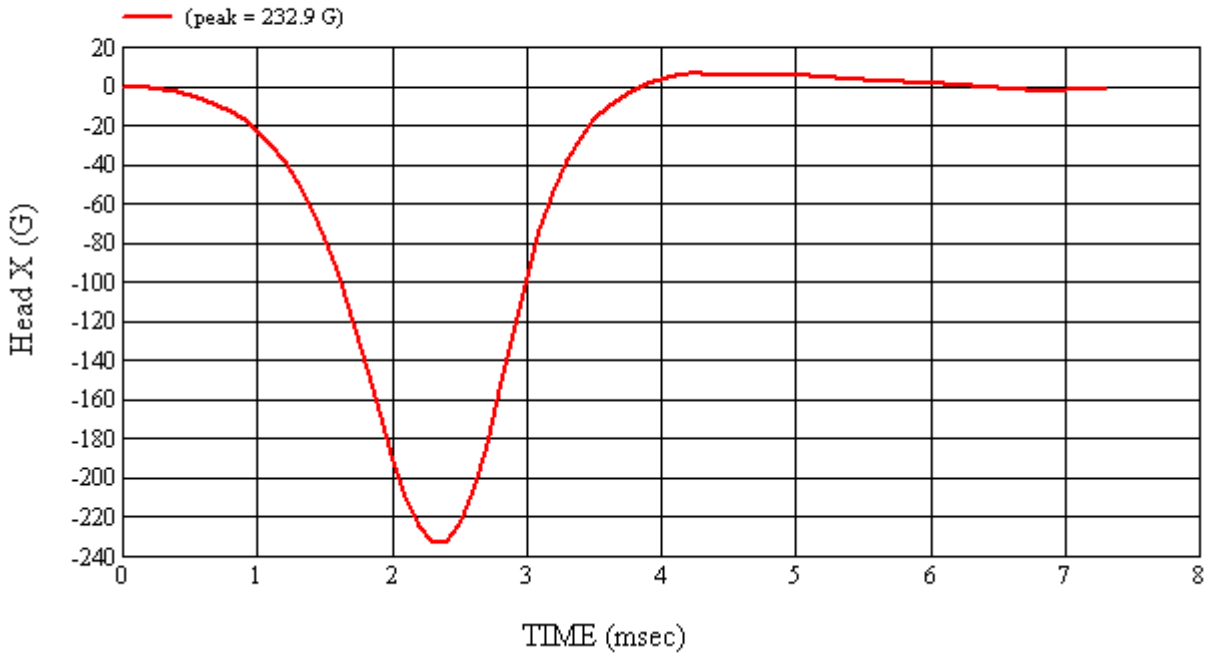
APPROVED BY: _____



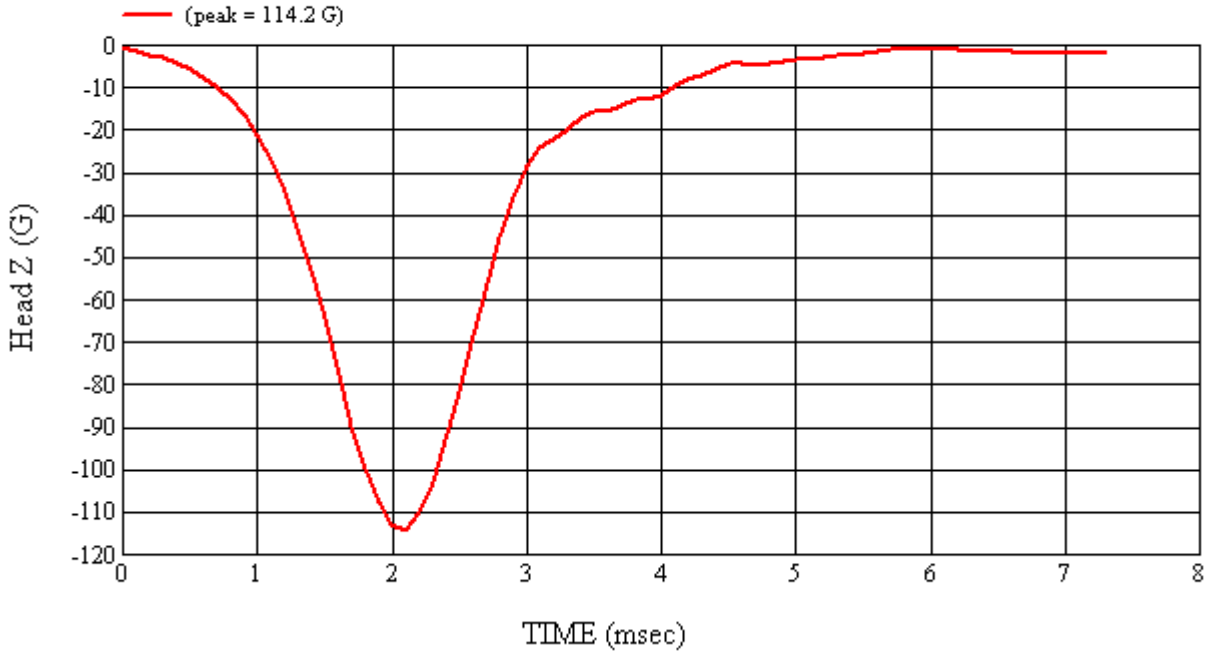
Head 038 (Post) Calibration #H38020



Head 038 (Post) Calibration #H38020



Head 038 (Post) Calibration #H38020



Head 038 (Post) Calibration #H38020

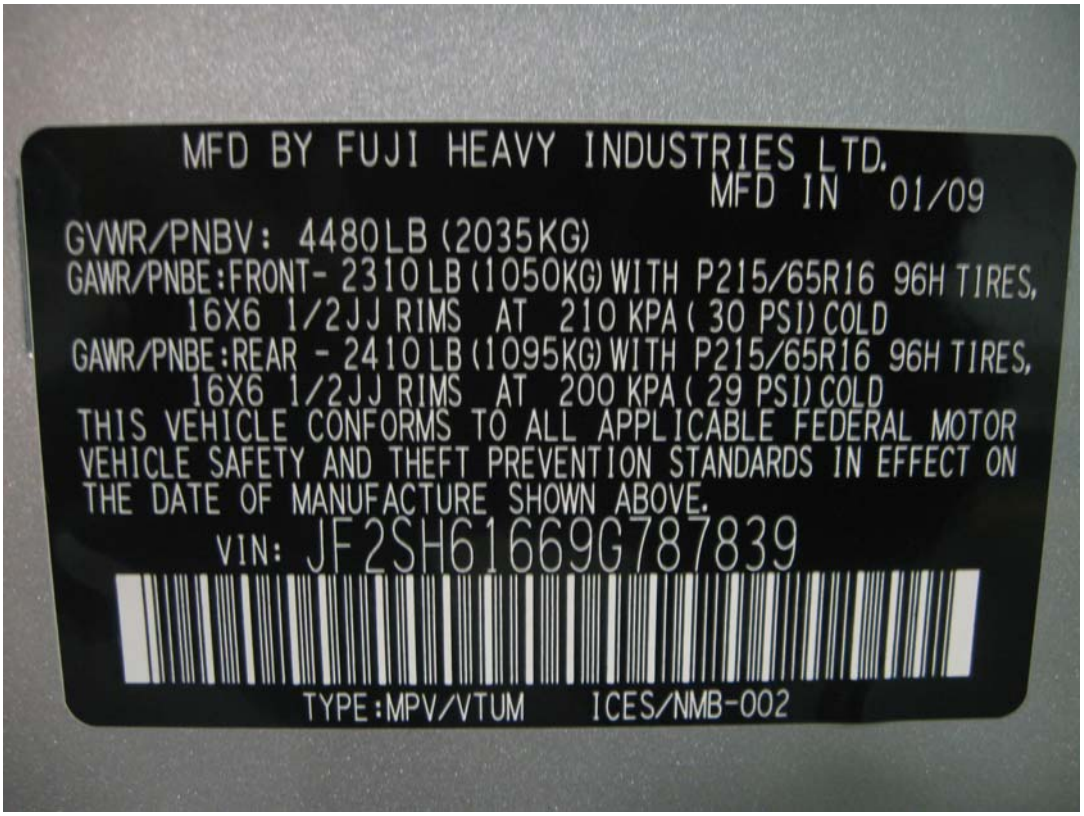
5.0 PHOTOGRAPHS

As Delivered – Left Side View

As Delivered – Right Side View

As Delivered – ¾ Front View From Left Side

As Delivered – ¾ Front View From Right Side



As Delivered – Vehicle's Certification Label

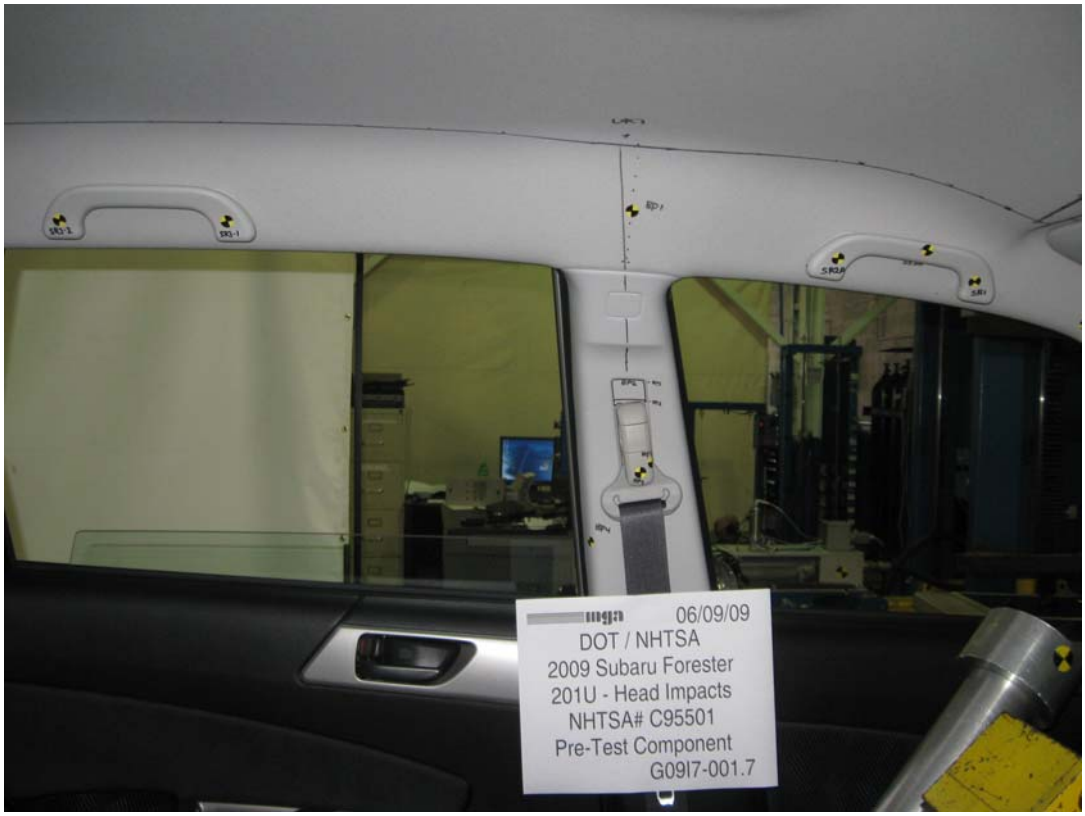
As Delivered – Vehicle's Tire Information Label

Pre-Test Component Photographs


06/09/09
DOT / NHTSA
2009 Subaru Forester
201U - Head Impacts
NHTSA# C95501
Pre-Test Component
G09I7-001.7


06/09/09
DOT / NHTSA
2009 Subaru Forester
201U - Head Impacts
NHTSA# C95501
Pre-Test Component
G09I7-001.7


mga
06/09/09
DOT / NHTSA
2009 Subaru Forester
201U - Head Impacts
NHTSA# C95501
Pre-Test Component
G09I7-001.7


mga
06/09/09
DOT / NHTSA
2009 Subaru Forester
201U - Head Impacts
NHTSA# C95501
Pre-Test Component
G09I7-001.7

Post-Test Component Photographs


mga
06/12/09
DOT / HNTSA
2009 Subaru Forester
201U - Head Impacts
NHTSA# - C95501
Post-Test Component
G09I7-001.7


mga
06/12/09
DOT / HNTSA
2009 Subaru Forester
201U - Head Impacts
NHTSA# - C95501
Post-Test Component
G09I7-001.7

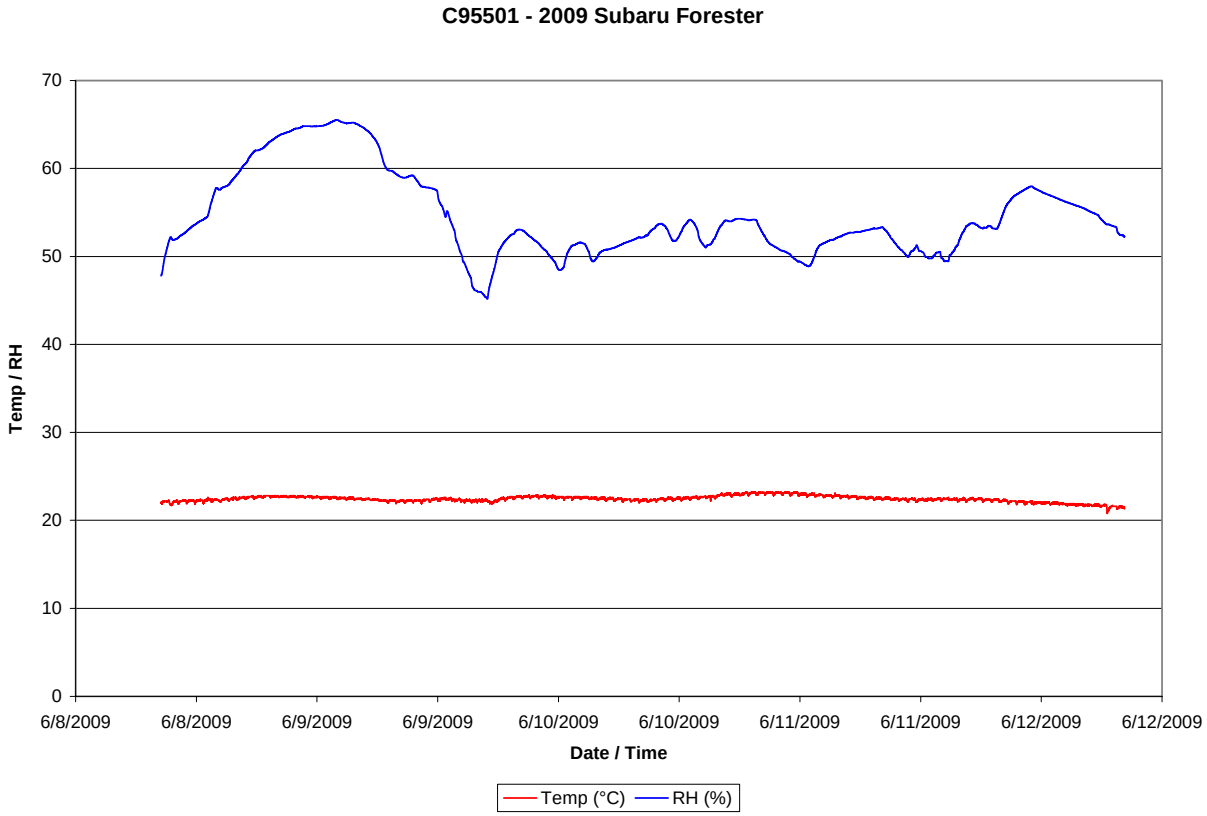

mga
06/12/09
DOT / HNTSA
2009 Subaru Forester
201U - Head Impacts
NHTSA# - C95501
Post-Test Component
G09I7-001.7


mga
06/12/09
DOT / HNTSA
2009 Subaru Forester
201U - Head Impacts
NHTSA# - C95501
Post-Test Component
G09I7-001.7


URC
SR3-3
SR3-2
SR3-1
mga
06/12/09
DOT / HNTSA
2009 Subaru Forester
201U - Head Impacts
NHTSA# - C95501
Post-Test Component
G09I7-001.7


SR2A
SR1
mga
06/12/09
DOT / HNTSA
2009 Subaru Forester
201U - Head Impacts
NHTSA# - C95501
Post-Test Component
G09I7-001.7

Appendix A – Temperature Trace



Appendix B – Calibration Certificates

Calibration Certificate

Part Description: Silver
Certification Date: 08/26/08
Serial#: S08-05-98-01273
Single Point (Max-Min/2) Specification: S08-05 .076mm (.0030")
Certificate#: S0127339686
Volumetric (Max Deviation) Specification: S08-05 +/-.108mm (+/-.0042")
Temperature: See attached data

Measurement Standards Traceability

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

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

Certification Results

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

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

Instrument condition as received:
Inoperative

Instrument condition outgoing:
Within specifications

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

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

125 Technology Park
Lake Mary, FL 32746
USA

@ 9/2/08

FARO®

Page 1 of 6

LABORATORY ACCREDITATION BUREAU
ISO/IEC 17025 Accredited

Revised: March 15, 2008

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

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

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

Tape Measure Calibration Certificate

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

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

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

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

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

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

MetroCal inc.

Cert#0513.01

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

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

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

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

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

As Found Condition: **In Tolerance**

As Left Condition: **In Tolerance**

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

Standard Used	Cal Date	Due Date	Traceable No.	Calibration Procedure Uncertainty Expressed at 95% confidence (K=2)
Gage Blk Set ID# 105	6/12/07	6/12/08	821/273187-06	0.0015°
DoAll Sine Bar ID#1879	12/31/07	12/31/08	Cert# 071231399	0.0015°

Results:

As Found Readings

Units	Nominal	Actual	Deviation
Decimal Deg.	5.00	5.0	0.00
	10.00	10.1	0.10
	20.00	20.0	0.00
Tolerance	30.00	30.0	0.00
± 0.1°	40.00	40.0	0.00

Reference Level Check: Within ± 0.1 degrees

As Left Readings

Nominal	Actual	Deviation
5.00	5.0	0.00
10.00	10.1	0.10
20.00	20.0	0.00
30.00	30.0	0.00
40.00	40.0	0.00

Reference Level Check: Within ± 0.1 degrees

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

Issued: 6/5/08

Shannon Shoemaker/bjk
Calibration Technician

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

6/6/08

Certificate of Calibration

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

ACCREDITED
CALIBRATION 1563.01

Certificate Number: 0002521:1244035703

CUSTOMER: MGA Research Corporation
446 Executive Drive
Troy MI 48083
Contact: Thomas Hutter

Calibration Location: **On-site**

Equipment Calibrated

Manufacturer:	Dickson	Date Received:	06/03/2008
Description:	Temp/Humidity Recorder	Date Calibrated:	06/03/2009
Model Number:	FH125	Calibration Due Date:	06/03/2010
Serial Number:	06018122	Calibration Procedure:	CP0001
Asset Number:	MGA00717	Revision:	
Received Status:	Good	Performed By:	P. Vella

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

Notes:

Ambient Calibration Conditions

Ambient Temperature: 23 °C Relative Humidity: 45 % RH Barometric Pressure: mbar

Calibration Equipment Used

Asset Number:	Manufacturer:	Model:	Serial:	Cal Due:
RMS042	Fluke/Hart	1502A	A6C537	24 Apr 2010
RMS043	Hart Scientific	5614	778109	24 Apr 2010
RMS045	Vaisala	HMP76	C0630009	27 Mar 2010

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

Approved By: _____ Quality Manager Date: 6-17-09

TIH 6/22/09

Calibration Data

MFG/MODEL: **Dickson / FH125**

Serial / ID #: **06018122 / MGA 00717**

Customer: **MGA Research**

Date Calibrated: **06/03/09**

Certificate No.: **0002521:1244035703**

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

Range	Nominal	Lower Limit	As Found	As Left	Upper Limit
Data Logger with Sensor System Tests					
Channel 1					
	-9.7° F	-11.5° F	-9.1° F	-9.1° F	-7.9° F
	75.1° F	73.3° F	75.6° F	75.6° F	76.9° F
	103.3° F	101.5° F	102.6° F	102.6° F	105.1° F
Channel 2 (RH @ 21° C)					
	41.1 %rh	39.1 %rh	42.5 %rh	42.5 %rh	43.1 %rh
	71.8 %rh	69.8 %rh	70.7 %rh	70.7 %rh	73.8 %rh
Calibration Performed By: P. Vella					

Bold Font Indicates Out Of Tolerance Condition.

6/22/09

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

Certificate of Calibration

MGA Research
446 Executive Drive
Troy, MI 48083

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

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

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

As Found Condition: **In Tolerance**

As Left Condition: **In Tolerance**

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

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

Results:
Tolerance used: ± 0.02

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

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

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

Issued: 7/15/08

Shannon Shoemaker/bjk
Calibration Technician

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

7/17/08

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

Certificate of Calibration

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

calibration cert. 1448.01

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

Applied Test Wt	*Before Adustment*	*Tolerance*	*In-Tolerance Y/N*	*After Adjustment*	*In-Tolerance Y/N*	*Unc .6lb*	
100lb	100lb	1lb	y	n/a	n/a	.6lb	RR
1000lb	1000lb	2lb	y	n/a	n/a	.6lb	
100lb	101lb	1lb	y	n/a	n/a	.6lb	LR
1000lb	1000lb	2lb	y	n/a	n/a	.6lb	
100lb	100lb	1lb	y	n/a	n/a	.6lb	RF
1000lb	1000lb	2lb	y	n/a	n/a	.6lb	
100lb	100lb	1lb	y	n/a	n/a	.6lb	LF
1000lb	1000lb	2lb	y	n/a	n/a	.6lb	

shift test

Platform #1 *Platform #2* *Platform #3*

☑ Pass ☐ Pass ☐ Pass

☐ Fail ☐ Fail ☐ Fail

Tests performed: ☑ Repeatability ☑ Linearl ☐ Sensitivity ☑ Discrimination

Technician COMMENTS/ System passes all tests.

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

☑ Scale Certified ☐ Scale Rejected

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

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

6/19/08

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Thom D Miller

Approved by: David Winkelbauer

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Thom D Miller

Approved by: David Winkelbauer

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Thom D Mille

Approved by: Dave Winkelman

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

Signature: [signature]

Approved by: [signature]

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Thomas L Miller

Approved by: David Winkelbauer

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: 

Approved by: 

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

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

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

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

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

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

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

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

Signature: Chris Collins

Approved by: Eileen 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:	7/24/2008
Calibrated By:	PCB

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

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

Signature: Chris Collins

Approved by: Eileen 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:	7/24/2008
Calibrated By:	PCB

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

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

Signature: Chris Collins

Approved by: Helen A. Kaleto

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

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

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

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

Dynamic Technology, Inc.

Certificate of Calibration

Certificate #: 125456001 *T*

Calibration Laboratory
Certificate #: 1022.01

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

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

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

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

Technical Remarks:
Uncertainty data to follow.

Calibration Standards Utilized

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

System Instrumentation Includes

ID	Manufacturer	Model	Description	Serial Number
84592	PCB	Q353B01	Accelerometer	84592

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

Technician Name/Date: Joseph Leonard, 09/18/2008 Signatory: Barry Spanley QA Approved:

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

~Report of Calibration~

Sensor Information

Model Number	484B06/Q353B01
Serial Number	1458/84592
Manufacturer:	PCB
ID Number:	1458/84592
Description:	ICP® Accelerometer

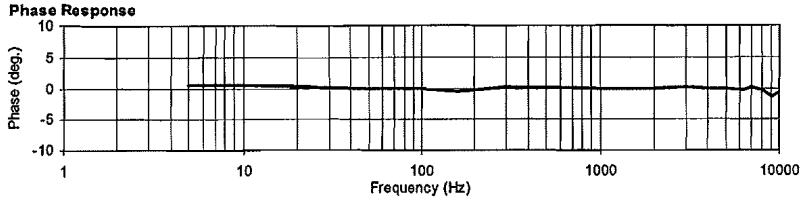
Calibration Data

Sensitivity @ Ref. Freq.:	20.28	mV/g
Phase @ Ref. Freq.:	-0.06	deg.
Test Level:	1.00	g

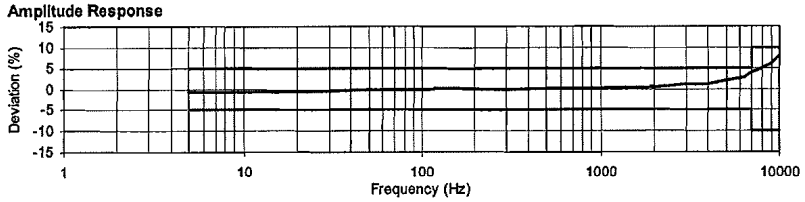
Transducer Specifications

Range:	250.00	+/- g
Resolution:	0.0000	g
Temp Range:	-54 to 121	°C
	-65 to 250	°F
Axis:	Uniaxial	

Phase Response



Amplitude Response



Data Table

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

Notes

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

Back-to-Back Comparison Calibration

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

Calibration is NIST Traceable through project number 822/271196.

Customer

090100

User Notes

125456001 T

Unit Condition

As Found:	In Tolerance
As Left:	In Tolerance

Lab Conditions

Temperature:	23.89	°C
	75.00	°F
Humidity:	36.00	%

Approval Information

Technician: J Leonard

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

2 of 2

~ Calibration Certificate ~

Per ISO 16063-21

Model Number: 352C03

Serial Number: 95980

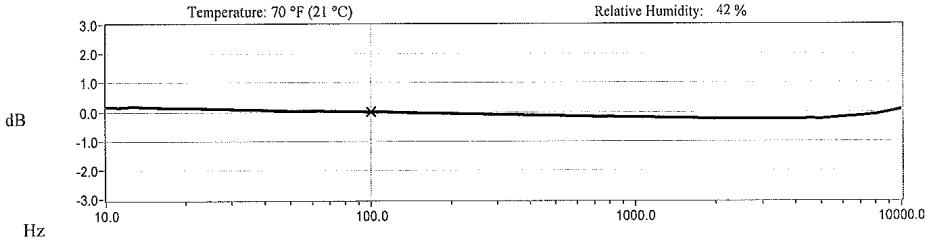
Description: ICP® Accelerometer Method: Back-to-Back Comparison (AT401-3)

Manufacturer: PCB

Calibration Data

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

Sensitivity Plot



Data Points

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

Mounting Surface: Stainless Steel w/Silicone Grease Coating Fastener: Stud Mount Fixture Orientation: Vertical
Acceleration Level (rms)[1]: 10.0 g (98.1 m/s²)[2]
[1]The acceleration level may be limited by shaker displacement at low frequencies. If the listed level cannot be obtained, the calibration system uses the following formula to set the vibration amplitude; Acceleration Level (g) = 0.010 x (freq)².
[2]The gravitational constant used for calculations by the calibration system is: 1 g = 9.80665 m/s².

Condition of Unit

As Found: n/a

As Left: New Unit, In Tolerance

Notes

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

Technician: Susan Lyon Date: 07/31/08

ACCREDITED
CALIBRATION CERT #1862.02

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

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