FINAL REPORT NUMBER 201UI-MGA-13-03

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

NISSAN MOTOR CO., LTD.
2013 Nissan Altima
NHTSA No. C20135203

MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083

Test Dates: April 2-4, 2013
Report Date: May 30, 2013

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: _____
Sean Moran, Project Engineer

_____
Helen A. Kaleto, Project Manager

Approved By: _____

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Accepted By: _____

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15. Supplementary Notes			
16. Abstract A compliance test series was conducted on the subject 2013 Nissan Altima, NHTSA No. C20135203, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-201U-01 for the determination of FMVSS 201 compliance. The testing was conducted at MGA Research Corporation in Troy, Michigan on April 2-4, 2013. Test failures identified were as follows: None The data recorded indicates that the 2013 Nissan Altima tested appears to comply with the upper interior requirements of FMVSS 201.			
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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 2013 Nissan Altima, meets the performance requirements of FMVSS 201, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted on April 2-4, 2013 on a 2013 Nissan Altima, manufactured by Nissan Motor Co., 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 May 8, 2012.

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

2.0 COMPLIANCE TEST DATA SUMMARY

The 2013 Nissan Altima was equipped with A, B, O, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, and a grab handle located on the side rail above the front passenger door and each rear door.

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	FH1	UR1@SR2B	UR4@x=1935
BP1	SR3-1	UR2@SR2A	UR5@SR3-1
OP2	SR3-2	UR3@BP1	UR6@SR3-2

The 2013 Nissan Altima 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: 2013 Nissan Altima

VEH. NHTSA NO.: C20135203 VIN: 1N4AL3AP5DN427231 COLOR: Brilliant Silver

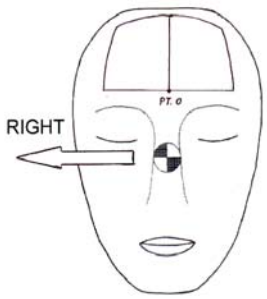
VEH. BUILD DATE: August, 2012 TEST DATES: April 2-4, 2013

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Sean Moran, Dustin Parens, David Burkett

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	116	35	19.0	504	447	10	1 Left
BP1	Right	90	20	18.9	435	356	39	1 Right
OP2	Left	270	10	23.9	601	576	14	12 Right
FH1	Left	180	50	23.8	532	484	25	20 Left
SR3-1	Right	90	40	18.8	317	200	9	6 Right
SR3-2	Left	270	40	19.1	306	185	11	4 Right
UR1@SR2B	Left	270	50	23.5	566	529	51	5 Right
UR2@SR2A	Right	90	50	23.9	610	588	42	2 Right
UR3@BP1	Left	270	50	23.9	715	728	44	11 Right
UR4@x=1935	Right	90	50	23.6	767	796	37	1 Left
UR5@SR3-1	Left	270	50	24.0	560	521	42	8 Right
UR6@SR3-2	Right	90	50	23.6	570	535	42	9 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.

OP2 Left: Dislodged headliner.

SR3-1 Right: Headliner deformation.

SR3-2 Left: Grab handle deformation, headliner deformation.

UR1@SR2B Left: Headliner deformation.

UR5@SR3-1 Left: Headliner deformation.

UR6@SR3-2 Right: Headliner deformation.

REMARKS:

The targets listed were impacted in the following order:

Right: AP1, UR2@SR2A, BP1, UR4@x=1935, SR3-1, UR6@SR3-2

Left: FH1, UR3@BP1, UR1@SR2B, SR3-2, UR5@SR3-1, OP2

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

RECORDED BY: Sean Moran DATE: April 4, 2013

APPROVED BY: Helen A. Kaleto

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2013 Nissan Altima

VEH. NHTSA NO.: C20135203 VIN: 1N4AL3AP5DN427231 COLOR: Brilliant Silver

VEH. BUILD DATE: August, 2012 TEST DATES: April 2-4, 2013

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Sean Moran, Dustin Parens, David Burkett

INTERIOR TRIM INFORMATION: The 2013 Nissan Altima was equipped with A, B, O, and rear-pillars, an adjustable seat belt anchorage on each B-pillar, and a grab handle located on the side rail above the front passenger door and each rear door.

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: January 4, 2013; Odometer Reading 84 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Nissan Motor Company, Ltd.

Date of Manufacture: August, 2012; VIN: 1N4AL3AP5DN427231

GVWR: 1910 kg; GAWR FRONT: 1005 kg;

GAWR REAR: 940 kg;

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 220 kPa REAR: 220 kPa

Recommended Tire Size: 215/60R16

Recommended Cold Tire Pressure:

FRONT: 220 kPa REAR: 220 kPa

Size of Tire on Test Vehicle: 215/60R16

Type of Spare Tire: T135/70D16; Space Saver: X; Standard__

VEHICLE CAPACITY DATA:

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

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

VEHICLE CAPACITY WEIGHT:

Vehicle Capacity Weight (VCW) = 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 =	425.5 kg	Right Rear =	272.5 kg
Left Front =	420.5 kg	Left Rear =	292.0 kg
TOTAL FRONT =	846.0 kg	TOTAL REAR =	564.5 kg
% Total Weight =	60.0 %	% Total Weight =	40.0 %

TOTAL DELIVERED WEIGHT = 1410.5 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1410.5 kg

Max. Test Cargo/Luggage Weight = 68.0 kg

Target Test Weight = 1478.5 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	418.5 kg	Right Rear =	312.0 kg
Left Front =	413.5 kg	Left Rear =	333.5 kg
TOTAL FRONT =	832.0 kg	TOTAL REAR =	645.5 kg
% Total Weight =	56.3 %	% Total Weight =	43.7 %

TOTAL TEST WEIGHT = 1477.5 kg

Weight of ballast secured in vehicle's cargo area = 67.0 kg

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 713 mm; Left Front 712 mm;
Right Rear 725 mm; Left Rear 717 mm;
Pitch Angle at Right Door Sill = 0.0
Pitch Angle at Left Door Sill = 0.0
Roll Angle at Front Bumper = 0.4 Right is higher
Roll Angle at Rear Bumper = 0.2 Right is higher

FULLY LOADED: Right Front 717 mm; Left Front 714 mm;
Right Rear 714 mm; Left Rear 706 mm;
Pitch Angle at Right Door Sill = 0.2 Front is higher
Pitch Angle at Left Door Sill = 0.2 Front is higher
Roll Angle at Front Bumper = 0.0
Roll Angle at Rear Bumper = 0.5 Right is higher

AS TARGETED: Right Front 860 mm; Left Front 859 mm;
Right Rear 861 mm; Left Rear 858 mm;
Pitch Angle at Right Door Sill = 0.2 Front is higher
Pitch Angle at Left Door Sill = 0.2 Front is higher
Roll Angle at Front Bumper = 0.4 Right is higher
Roll Angle at Rear Bumper = 0.2 Right is higher

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill =	0.2 Front is higher
Pitch Angle at Left Door Sill =	0.1 Front is higher
Roll Angle at Front Bumper =	0.2 Right is higher
Roll Angle at Rear Bumper =	0.3 Right is higher

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill =	0.1 Front is higher
Pitch Angle at Left Door Sill =	0.2 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 = 2775 mm

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

RECORDED BY: Sean Moran DATE: March 14, 2013

APPROVED BY: Helen A. Kaleto

TABLE 2-3

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2013 Nissan Altima

VEH. NHTSA NO.: C20135203 VIN: 1N4AL3AP5DN427231 COLOR: Brilliant Silver

VEH. BUILD DATE: August, 2012 TEST DATES: April 2-4, 2013

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Sean Moran, Dustin Parens, David Burkett

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 199.1º	L 244.4º
	R 105º-165º	R 115.7º	R 160.7º
B-PILLAR	L 195º-345º	L 199.5º	L 288.5º
	R 15º-165º	R 73.1º	R 160.3º

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Sean Moran DATE: March 14, 2013

APPROVED BY: Helen A. Kaleto

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2013 Nissan Altima

VEH. NHTSA NO.: C20135203 VIN: 1N4AL3AP5DN427231 COLOR: Brilliant Silver

VEH. BUILD DATE: August, 2012 TEST DATES: April 2-4, 2013

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Sean Moran, Dustin Parens, David Burkett

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	35º
		R	0º-50º	R	0º	R	25º
	SR2A	L	0º-50º	L	0º	L	32º
		R	0º-50º	R	0º	R	45º
	SR2B	L	0º-50º	L	0º	L	17º
		R	0º-50º	R	0º	R	50º
	SR3-1	L	0º-50º	L	0º	L	40º
		R	0º-50º	R	0º	R	40º
	SR3-2	L	0º-50º	L	0º	L	40º
		R	0º-50º	R	0º	R	40º
REAR HEADER	RH	L	0º-50º	L	0º	L	50º
		R	0º-50º	R	0º	R	50º
A-PILLAR	AP1	L	-5º-50º	L	-5º	L	35º
		R	-5º-50º	R	-5º	R	35º

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
	AP2	L -5º-50º	L -5º	L 50º
		R -5º-50º	R -5º	R 50º
	AP3	L -5º-50º	L -5º	L 45º
		R -5º-50º	R -5º	R 45º
B-PILLAR	BP1	L -10º-50º	L -10º	L 20º
		R -10º-50º	R -10º	R 20º
	BP2*	L 0º-50º	L 0º	L 1º
		R 0º-50º	R 0º	R 1º
	BP3	L -10º-50º	L -10º	L -4º
		R -10º-50º	R -10º	R -4º
	BP4	L -10º-50º	L -10º	L 8º
		R -10º-50º	R -10º	R 8º
OTHER PILLAR	OP1	L -10º-50º	L -10º	L 20º
		R -10º-50º	R -10º	R 20º
	OP2	L -10º-50º	L -10º	L 10º
		R -10º-50º	R -10º	R 10º
REAR PILLAR	RP1	L -10º-50º	L -10º	L 20º
		R -10º-50º	R -10º	R 20º
	RP2	L -10º-50º	L -10º	L 25º
		R -10º-50º	R -10º	R 25º
UPPER ROOF 1		0º-50º	0º	50º
UPPER ROOF 2		0º-50º	0º	50º
UPPER ROOF 3		0º-50º	0º	50º
UPPER ROOF 4		0º-50º	0º	50º
UPPER ROOF 5		0º-50º	0º	50º
UPPER ROOF 6		0º-50º	0º	50º

As determined using the Procedures specified in S8.13.4.2. *Target BP2 is a seat belt anchorage location.
RECORDED BY: Sean Moran DATE: March 14, 2013
APPROVED BY: Helen A. Kaleto

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2013 Nissan Altima

VEH. NHTSA NO.: C20135203 VIN: 1N4AL3AP5DN427231 COLOR: Brilliant Silver

VEH. BUILD DATE: August, 2012 TEST DATES: April 2-4, 2012

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Sean Moran, Dustin Parens, David Burkett

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	240 mm	240 mm
T^o	Horizontal < {CG-F1 (Left Seat) to (Right A-Pillar)}	116.6^o	--
A1^o	360^o - T^o	244.4^o	--
W^o	Horizontal < {CG-2 (Left Seat) to (Left A-Pillar)}	199.1^o	--
A2^o	A2^o = W^o	199.1^o	--
U^o	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	288.5^o	--
B1^o	B1^o = U^o	288.5^o	--
V^o	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	199.5^o	--
B2^o	B2^o = V^o	199.5^o	--
W^o (right)	Horizontal < {CG-F2 (Right Seat) to (Right A-Pillar)}	--	160.7^o
A1^o (right)	A1^o (right) = W^o (right)	--	160.7^o
T ^{o} (right)	Horizontal < {CG-F1 (Right Seat) to (Left A-Pillar)}	--	243.3^o
A2^o (right)	360^o-T^o (right)	--	115.7^o
V ^{o} (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	160.3^o
B1^o (right)	B1^o (right) = V^o (right)	--	160.3^o
U ^{o} (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	73.1^o
B2^o (right)	B2^o (right) = U^o (right)	--	73.1^o
J	A-Pillar {(Plane 3) – (Plane 5)}	307.1 mm	306.4 mm
J/2	J ÷ 2	153.6 mm	153.2 mm
D1	Upper Roof {(Plane A) – (Plane B)}	1705.0 mm	
D1/2	D1 ÷ 2	852.5 mm	

Measurement	Description	Left Side	Right Side
D2	Upper Roof {(Plane C) – (Plane D)}	1142.7 mm	
D2/2	D2 ÷ 2	571.4 mm	
.35D1	.35 x D1	596.8 mm	
.35D2	.35 x D2	399.9 mm	
N	B-Pillar {(BPR) – (lowest point on daylight opening forward of B-Pillar)}	397.9 mm	399.1 mm
N/2	B-Pillar {(BP3) – (lowest point on daylight opening forward of B-Pillar)}	199.0 mm	200.0 mm
N/4	B-Pillar {(BP4) – (lowest point on daylight opening forward of B-Pillar)}	99.5 mm	99.8 mm
Q	O-Pillar (Plane 13 – Plane 14)	353.8 mm	352.8 mm
Q/2	Q / 2	176.9 mm	176.4 mm
D	R-Pillar (Point 7 – Point M)	735.0 mm	736.0 mm
3D/7	3*D / 7	315.0 mm	315.4 mm

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

SgRP Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1468.5	-365.0	215.0	1468.5	365.0	215.0
Rear	2301.5	-350.0	278.8	2301.5	350.0	278.8

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1468.5	-365.0	215.0	1468.5	365.0	215.0
Rear	2301.5	-350.0	278.8	2301.5	350.0	278.8

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
CGF1	1385.5	-365.0	875.0	1385.5	365.0	875.0
CGF2	1628.5	-365.0	875.0	1628.5	365.0	875.0
CGR	2461.5	-350.0	938.8	2461.5	350.0	938.8

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

LH front door upper striker (x, y, z) = 1581.1, -788.8, 417.2

Front driver seat outboard seat mount (x, y, z) = 1074.0, -570.0, 12.4

RH front door upper striker (x, y, z) = 1581.1, 788.8, 417.2

REMARKS:

RECORDED BY: Sean Moran DATE: March 14, 2013

APPROVED BY: Helen A. Kaleto

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2013 Nissan Altima

VEH. NHTSA NO.: C20135203 VIN: 1N4AL3AP5DN427231 COLOR: Brilliant Silver

VEH. BUILD DATE: August, 2012 TEST DATES: April 2-4, 2013

TEST LABORATORY: MGA Research Corporation

OBSERVERS: Helen Kaleto, Sean Moran, Dustin Parens, David Burkett

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (No. of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
A Pillar Left Side								
AP1	1189.5	-529.4	1028.8	244	35	-	-	No
AP2	1043.9	-582.6	941.3	200	50	-	-	No
AP3	907.5	-610.3	875.9	200	45	-	-	No
A Pillar Right Side								
AP1	1188.4	528.2	1028.6	116	35	-	-	Yes
AP2	1045.2	582.5	940.0	160	50	-	-	No
AP3	906.0	608.5	876.3	160	45	-	-	No
B Pillar Left Side								
BP1	1738.0	-472.0	1108.3	270	20	-	-	No
BP2	1696.7	-604.7	837.5	270	1	-	-	No
BP3	1691.0	-588.7	908.7	270	-4	-	-	No
BP4	1743.1	-654.5	809.3	200	8	-	-	No
B Pillar Right Side								
BP1	1741.8	472.2	1109.5	90	20	-	-	Yes
BP2	1696.3	605.4	837.9	90	1	-	-	No
BP3	1694.4	589.4	909.3	90	-4	-	-	No
BP4	1745.1	650.5	809.8	160	8	-	-	No
Other Pillar Left Side								
OP1	2469.4	-456.5	1101.1	270	20	-	-	No
OP2	2552.0	-624.7	924.2	-	-	Yes	2	-
REL	2517.5	-614.8	895.6	270	10	-	-	Yes
Other Pillar Right Side								
OP1	2470.0	452.6	1101.2	90	20	-	-	No
OP2	2546.1	624.4	924.0	-	-	Yes	2	-

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (No. of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
REL	2507.7	613.2	903.3	90	10	-	-	No
Rear Pillar Left Side								
RP1	2553.5	-484.7	1061.8	270	20	-	-	No
RP2	2661.7	-595.1	912.5	-	-	Yes	4	-
REL	2580.4	-568.6	960.1	270	25	-	-	No
Rear Pillar Right Side								
RP1	2553.1	485.4	1061.2	90	20	-	-	No
RP2	2665.0	591.9	910.3	-	-	Yes	4	-
REL	2577.4	572.0	957.0	90	25	-	-	No
Front Header Left Side								
FH1	1109.4	-414.1	1056.6	--	--	Yes	-	Yes
REL	1108.4	-394.5	1052.8	180	50	--		--
FH2	1095.8	-266.0	1063.0	180	50	-	-	No
Front Header Right Side								
FH1	1109.7	413.1	1057.8	--	--	Yes	-	No
REL	1114.0	387.2	1056.9	180	50	--		--
FH2	1094.6	265.2	1062.9	180	50	-	-	No
Side Rail Left Side								
SR1	1338.5	-485.3	1078.1	270	35	-	-	No
SR2A	1489.7	-480.3	1101.7	270	32	-	-	No
SR2B	1437.2	-487.2	1094.2	270	17	-	-	No
SR3-1	2133.0	-489.0	1067.5	270	40	-	-	No
SR3-2	2304.1	-491.4	1054.8	270	40	-	-	Yes
Side Rail Right Side								
SR1	1338.3	481.7	1092.8	-	-	Yes	1	-
REL	1338.8	490.6	1064.7	90	25	-	-	No
SR2A	1488.6	479.9	1108.8	-	-	Yes	1	-
REL	1488.1	480.0	1084.0	90	45	-	-	No
SR2B	1441.8	487.5	1107.8	-	-	Yes	1	-
REL	1338.1	487.7	1067.9	90	50	-	-	No
SR3-1	2133.0	489.9	1067.5	90	40	-	-	Yes
SR3-2	2305.3	491.4	1055.4	90	40	-	-	No
Rear Header Left Side								
RH	2559.5	-350.0	1096.6	0	50	-	-	No
Rear Header Right Side								
RH	2559.4	350.3	1093.5	0	50	-	-	No
Upper Roof Left Side								

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (No. of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
UR1@SR2B	1459.0	-338.3	1122.9	270	50	-	-	Yes
UR3@BP1	1753.0	-345.0	1146.0	270	50	-	-	Yes
UR5@SR3-1	2153.5	-356.1	1133.2	270	50	-	-	Yes
Upper Roof Right Side								
UR2@SR2A	1492.4	374.4	1126.4	90	50	-	-	Yes
UR4@X=1935	1935.1	357.9	1141.6	90	50	-	-	Yes
UR6@SR3-2	2300.7	352.2	1123.7	90	50	-	-	Yes

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

RECORDED BY: Sean Moran DATE: April 4, 2013

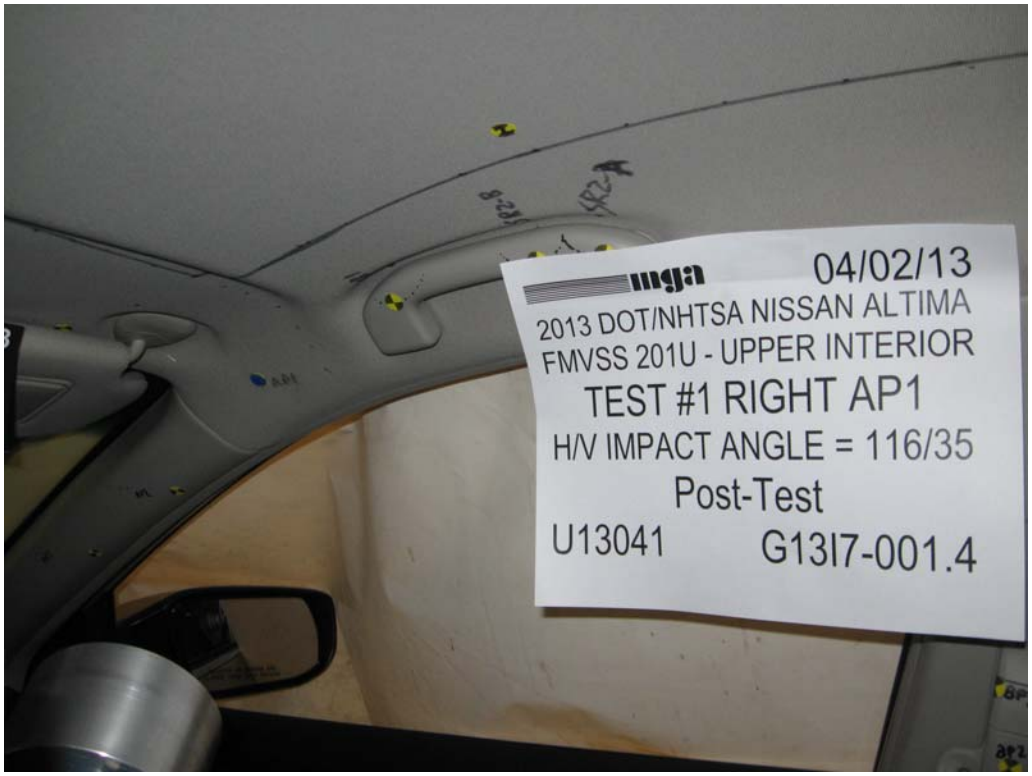
APPROVED BY: Helen A. Kaleto

3.0 TEST DATA (Including Acceleration and Velocity Plots)

Pre-Test Photograph No. 1 of Test U13041

Pre-Test Photograph No. 2 of Test U13041

Post-Test Photograph No. 1 of Test U13041



Post-Test Photograph No. 2 of Test U13041

Post-Test Photograph No. 3 of Test U13041

Post-Test Photograph No. 4 of Test U13041

mga research corporation

FMVSS 201U
Test No.: U13041 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 04/02/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #1 Time: 9:34 am

Horizontal Approach Angle: 116 deg Temperature: 21.1 °C

Vertical Approach Angle: 35 deg Humidity: 16.2 %RH

Impact Form ID No.: H35 Impact Form Mass: 4.51 kg

Target Location: AP1 Right

Additional Description: None

Test Results

Impact Velocity: 19.03 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	446.84	87.1	93	5.9
HIC 15	446.84	87.1	93	5.9
HIC (d)	503.52	87.1	93	5.9

3 ms Clip = 86.33 G , Time 1 = 87.98 ms , Time 2 = 90.98 ms

Impact Location on FMH: 10 mm Above Pt. 0 , 1 Left mm Lateral of Pt. 0

Post-Test Comments: No visible damage

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 2, 2013

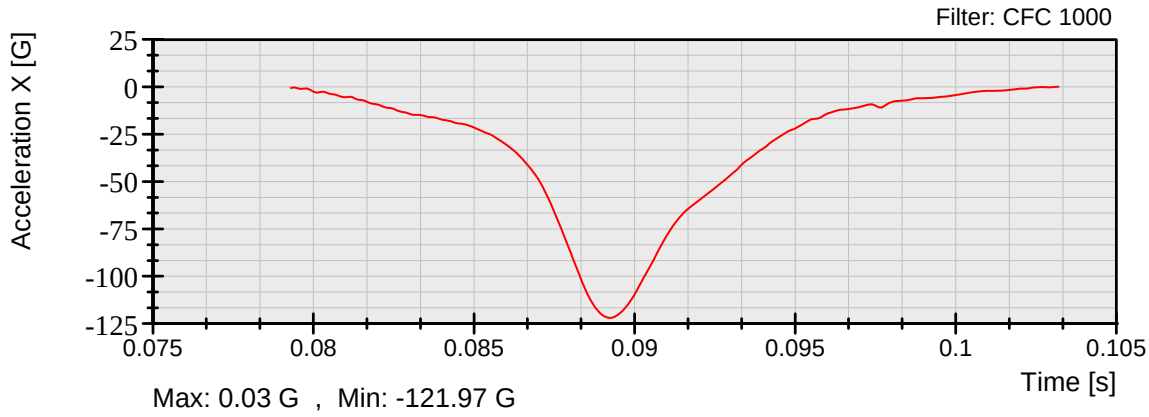
APPROVED BY: _____

mga research corporation

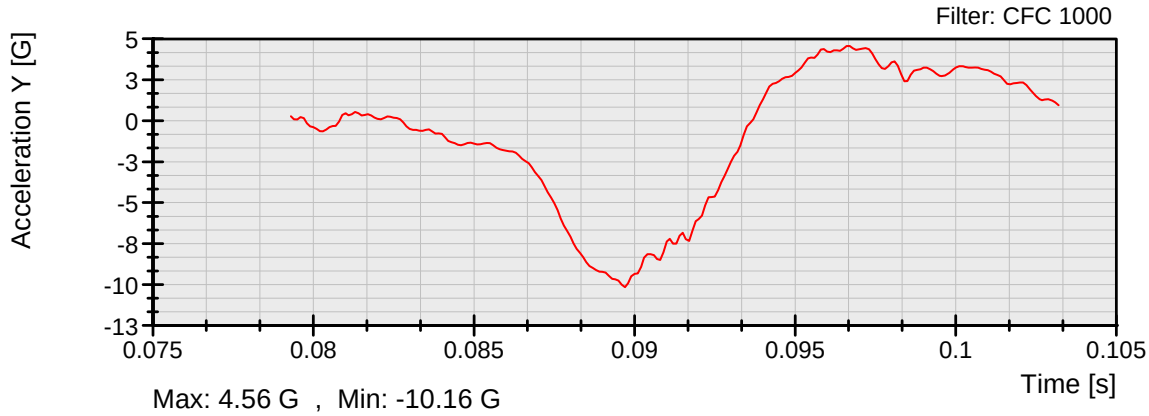
FMVSS 201U

Test No.: U13041 Report No.: G13I7-001.4

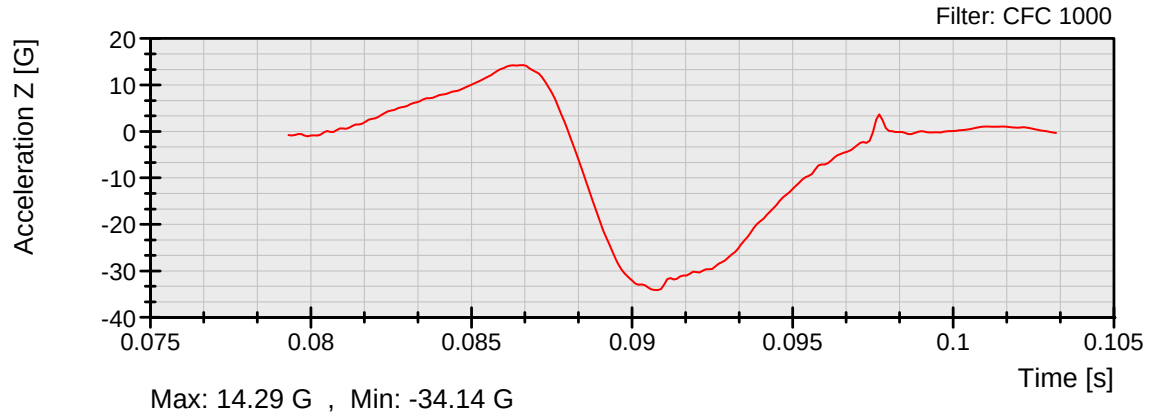
Customer: NHTSA/DOT Date: 04/02/2013



Max: 0.03 G , Min: -121.97 G



Max: 4.56 G , Min: -10.16 G



Max: 14.29 G , Min: -34.14 G

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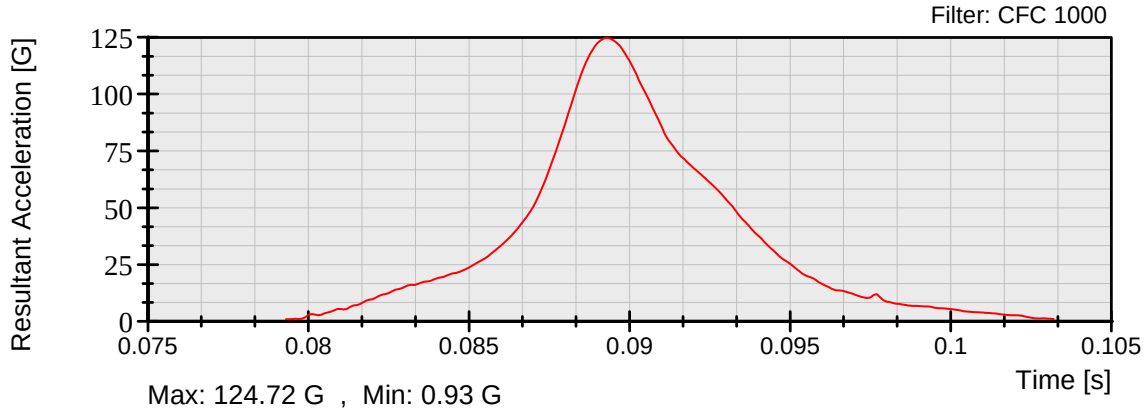
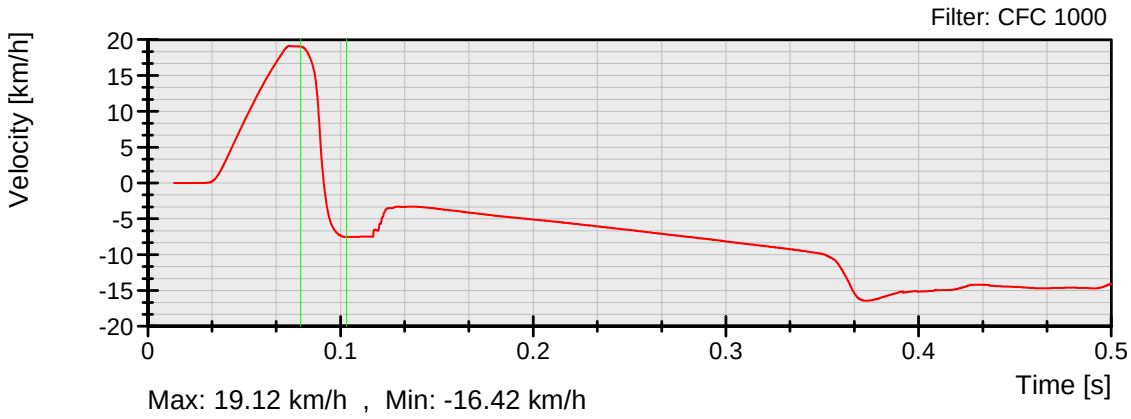
FMVSS 201U

Test No.: U13041 Report No.: G13I7-001.4

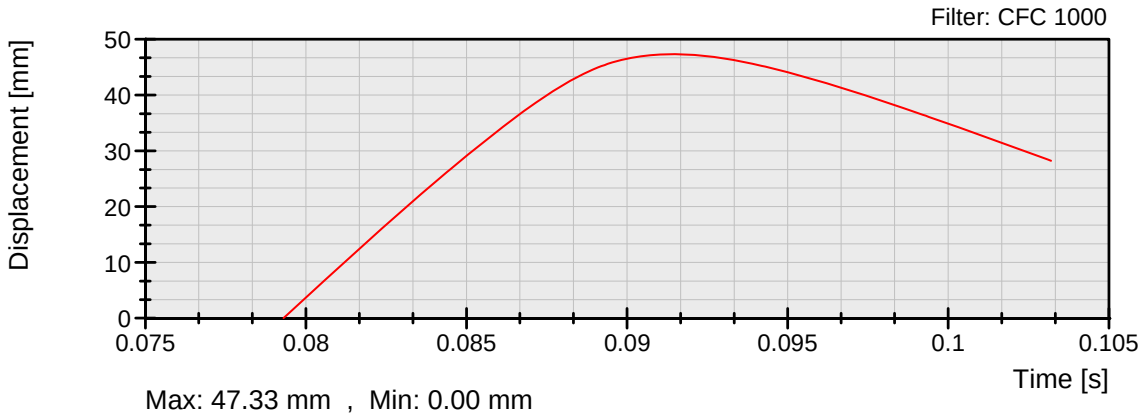
Customer: NHTSA/DOT Date: 04/02/2013



Max: 124.72 G , Min: 0.93 G

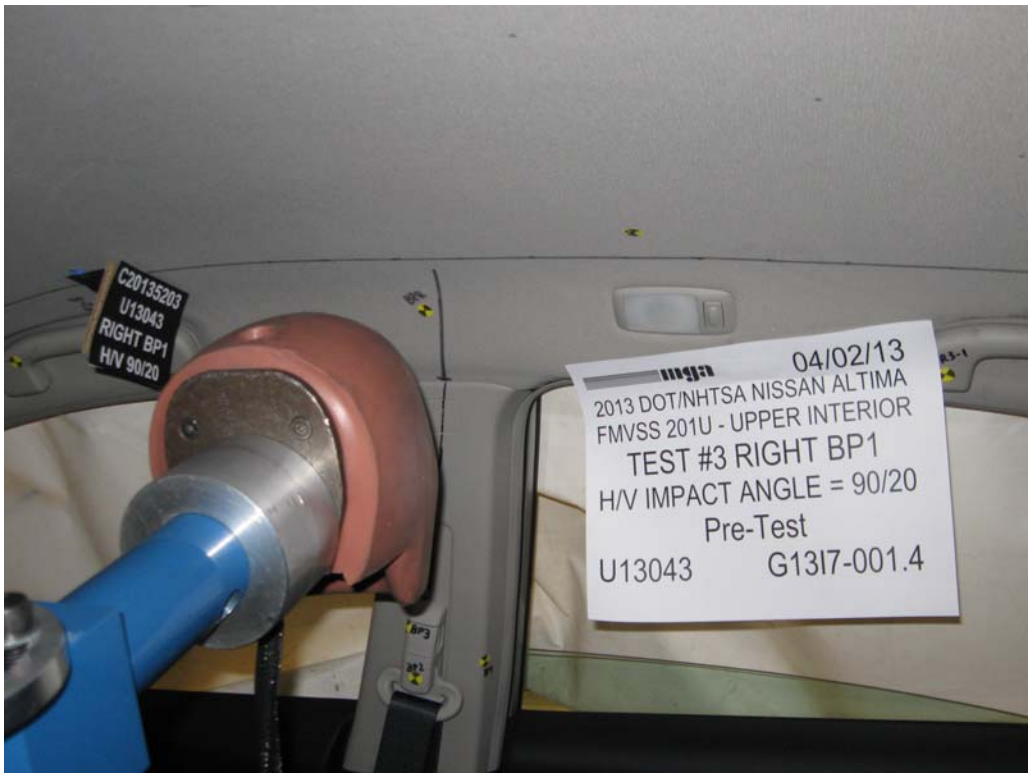


Max: 19.12 km/h , Min: -16.42 km/h



Max: 47.33 mm , Min: 0.00 mm

Pre-Test Photograph No. 1 of Test U13043



Pre-Test Photograph No. 2 of Test U13043

Post-Test Photograph No. 1 of Test U13043

Post-Test Photograph No. 2 of Test U13043

Post-Test Photograph No. 3 of Test U13043

Post-Test Photograph No. 4 of Test U13043

mga research corporation

FMVSS 201U
Test No.: U13043 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 4/2/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #3 Time: 11:06 am

Horizontal Approach Angle: 90 deg Temperature: 21.4 °C

Vertical Approach Angle: 20 deg Humidity: 14.6 %RH

Impact Form ID No.: H38 Impact Form Mass: 4.51 kg

Target Location: BP1 Right

Additional Description: None

Test Results

Impact Velocity: 18.98 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	355.66	84.8	92.5	7.7
HIC 15	355.66	84.8	92.5	7.7
HIC (d)	434.73	84.8	92.5	7.7

3 ms Clip = 81.88 G , Time 1 = 87.46 ms , Time 2 = 90.46 ms

Impact Location on FMH: 39 mm Above Pt. 0 , 1 Right mm Lateral of Pt. 0

Post-Test Comments: No visible damage

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 2, 2013

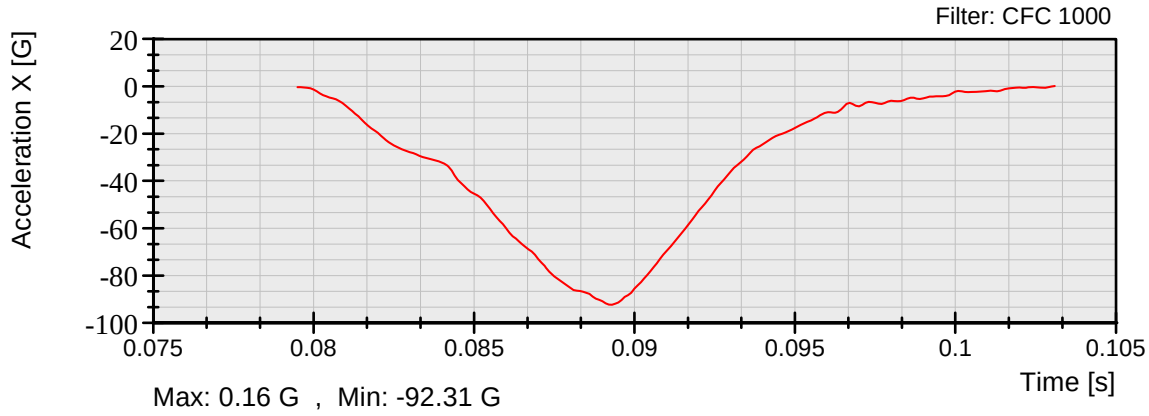
APPROVED BY: _____

mga research corporation

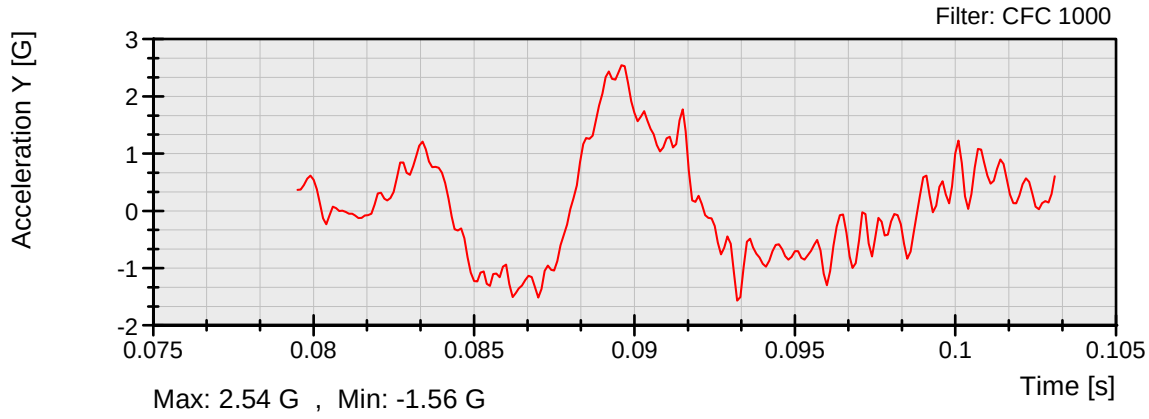
FMVSS 201U

Test No.: U13043 Report No.: G13I7-001.4

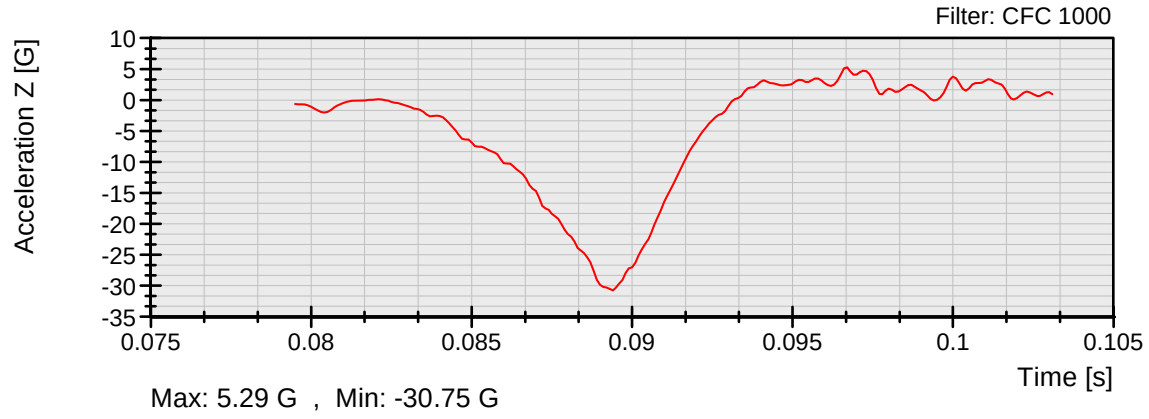
Customer: NHTSA/DOT Date: 4/2/2013



Max: 0.16 G , Min: -92.31 G



Max: 2.54 G , Min: -1.56 G



Max: 5.29 G , Min: -30.75 G

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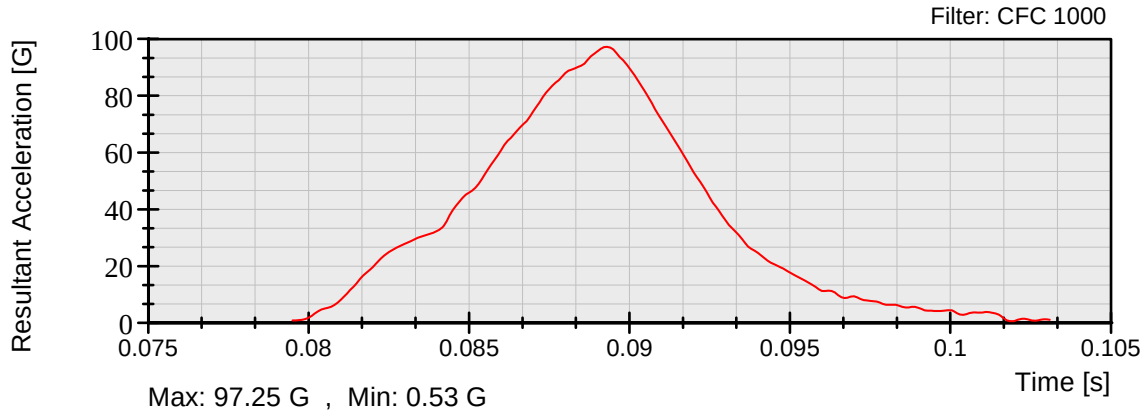
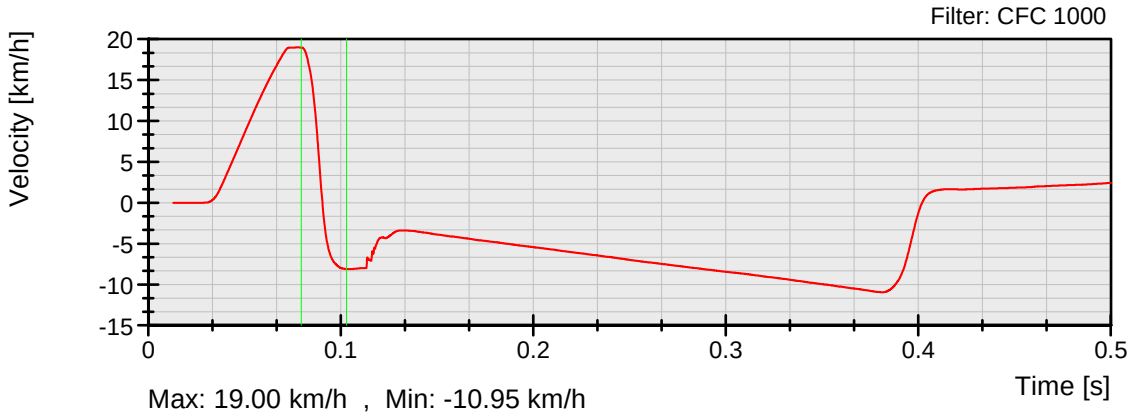
FMVSS 201U

Test No.: U13043 Report No.: G13I7-001.4

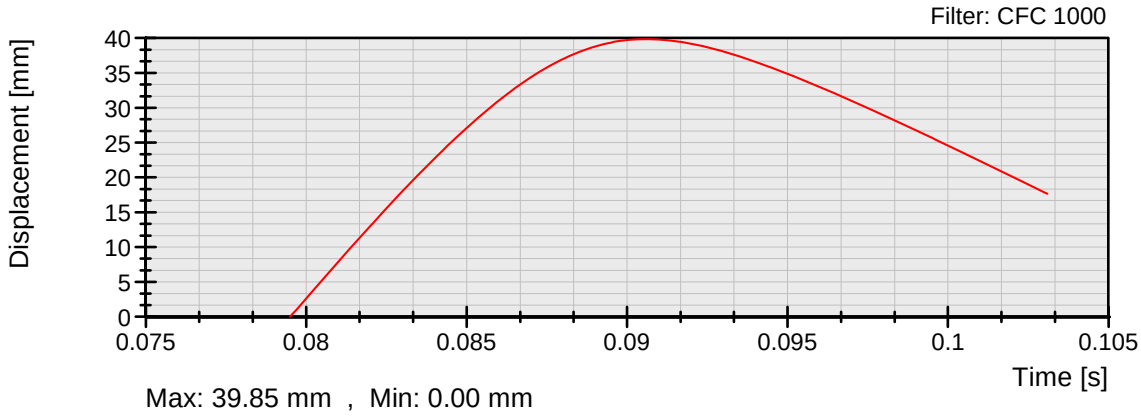
Customer: NHTSA/DOT Date: 4/2/2013



Max: 97.25 G , Min: 0.53 G

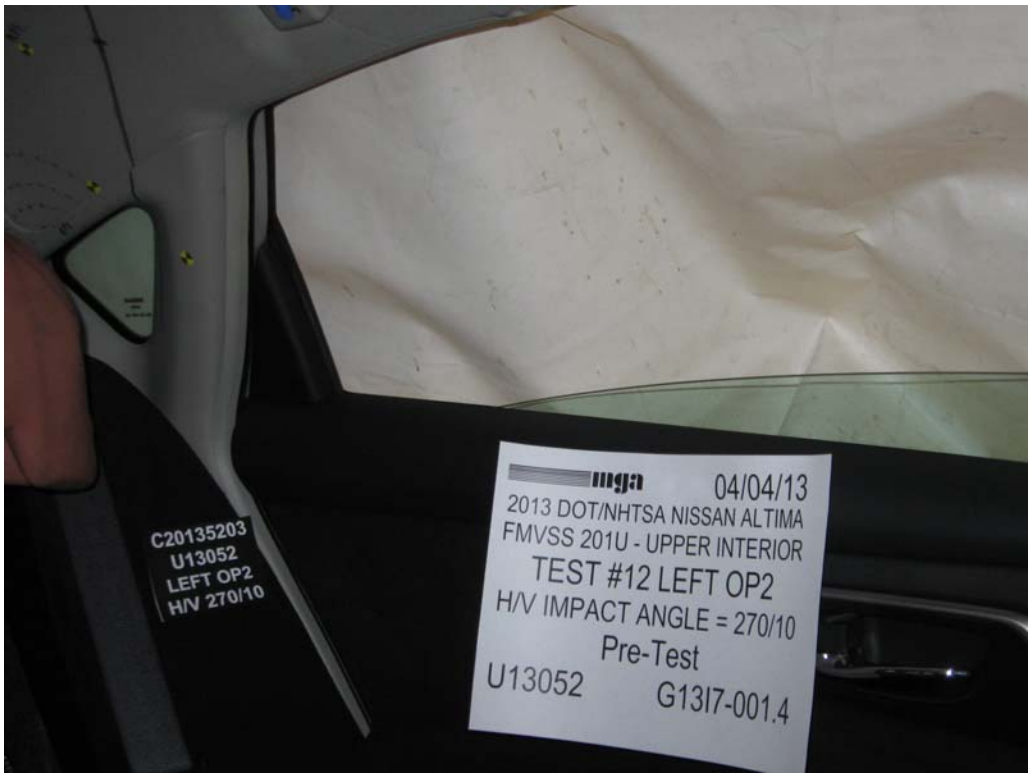


Max: 19.00 km/h , Min: -10.95 km/h

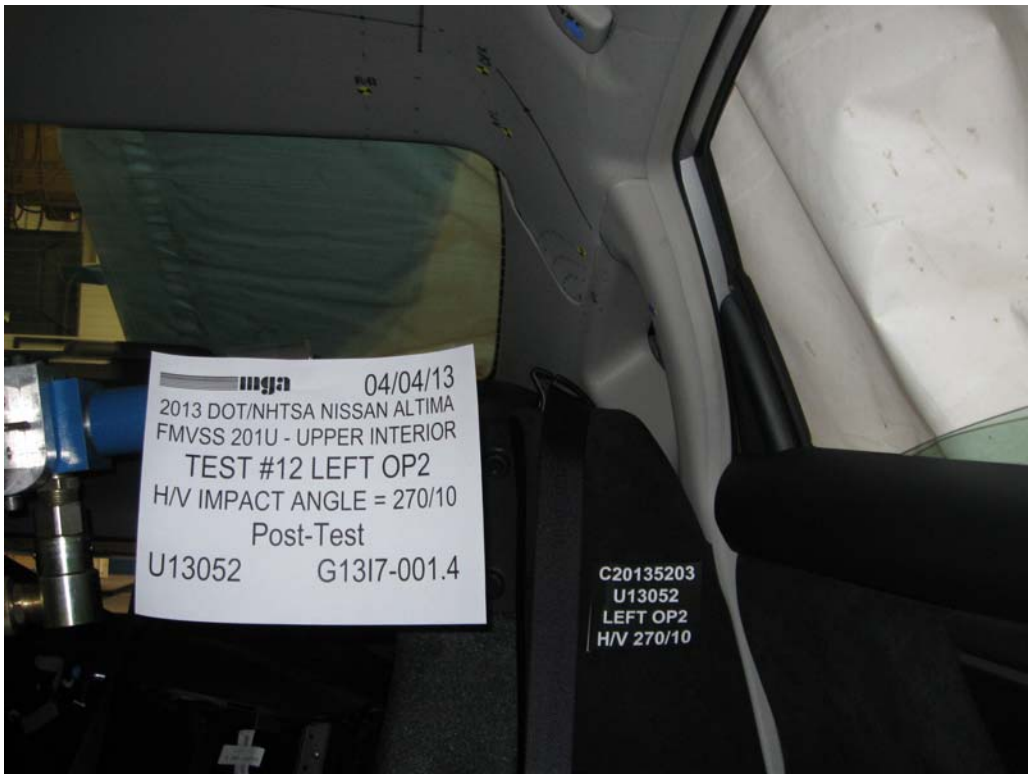


Max: 39.85 mm , Min: 0.00 mm

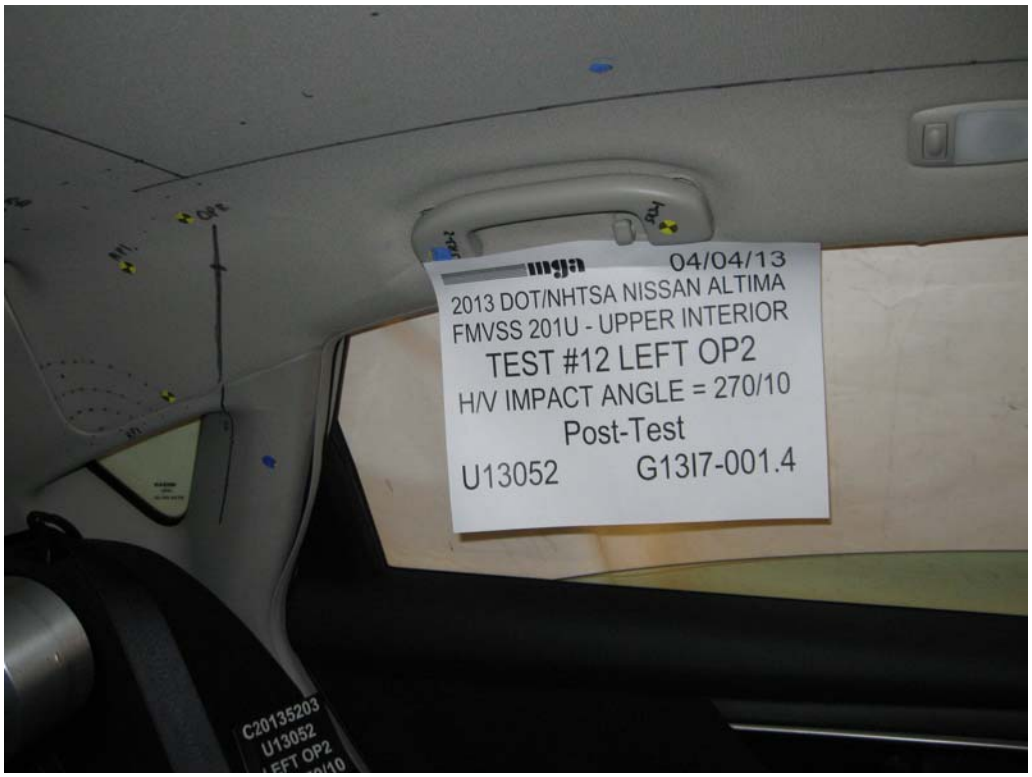
Pre-Test Photograph No. 1 of Test U13052



Pre-Test Photograph No. 2 of Test U13052

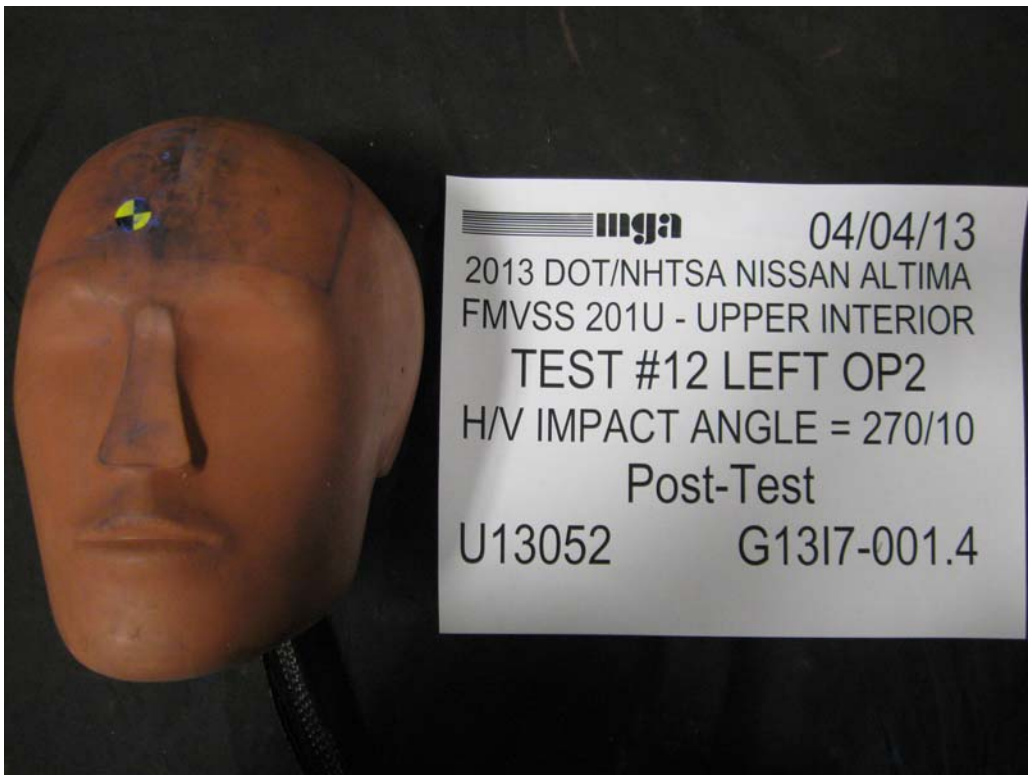


Post-Test Photograph No. 1 of Test U13052



Post-Test Photograph No. 2 of Test U13052

Post-Test Photograph No. 3 of Test U13052



Post-Test Photograph No. 4 of Test U13052

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FMVSS 201U
Test No.: U13052 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 4/4/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #12 Time: 3:28 pm

Horizontal Approach Angle: 270 deg Temperature: 21.7 °C

Vertical Approach Angle: 10 deg Humidity: 16.3 %RH

Impact Form ID No.: H38 Impact Form Mass: 4.51 kg

Target Location: OP2 Left

Additional Description: None

Test Results

Impact Velocity: 23.86 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	575.85	78.6	85.3	6.7
HIC 15	575.85	78.6	85.3	6.7
HIC (d)	600.85	78.6	85.3	6.7

3 ms Clip = 101.97 G , Time 1 = 80.13 ms , Time 2 = 83.13 ms

Impact Location on FMH: 14 mm Above Pt. 0 , 12 right mm Lateral of Pt. 0

Post-Test Comments: Dislodged headliner

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 4, 2013

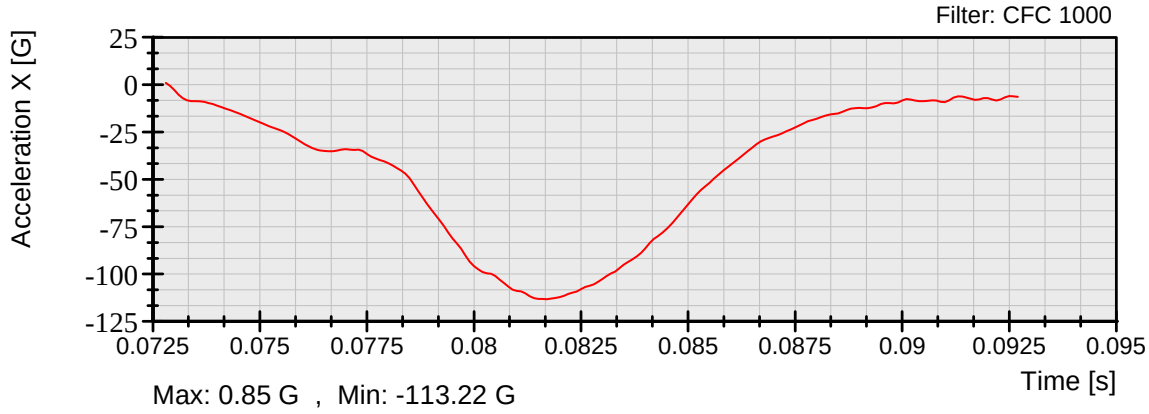
APPROVED BY: _____

mga research corporation

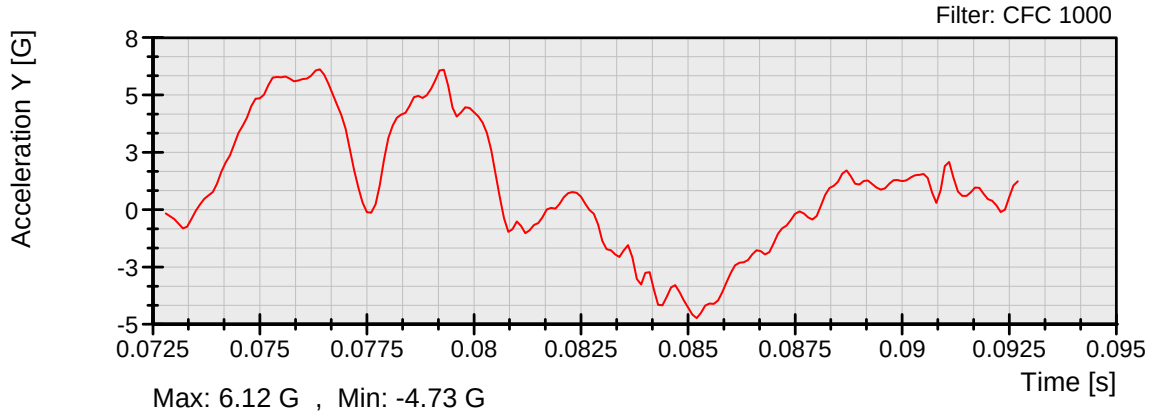
FMVSS 201U

Test No.: U13052 Report No.: G13I7-001.4

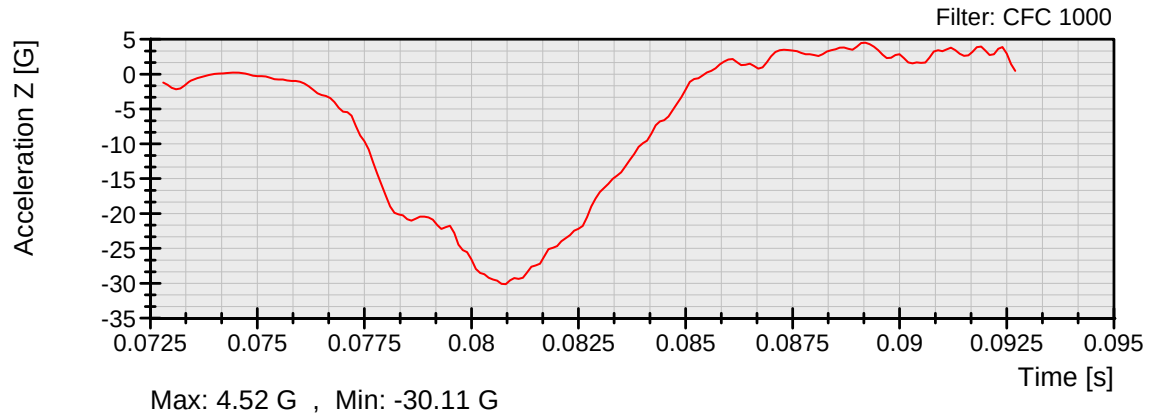
Customer: NHTSA/DOT Date: 4/4/2013



Max: 0.85 G , Min: -113.22 G



Max: 6.12 G , Min: -4.73 G



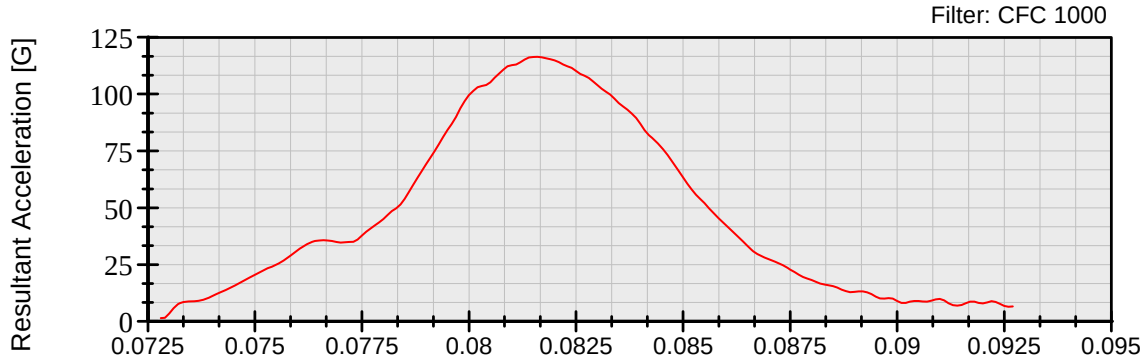
Max: 4.52 G , Min: -30.11 G

mga research corporation

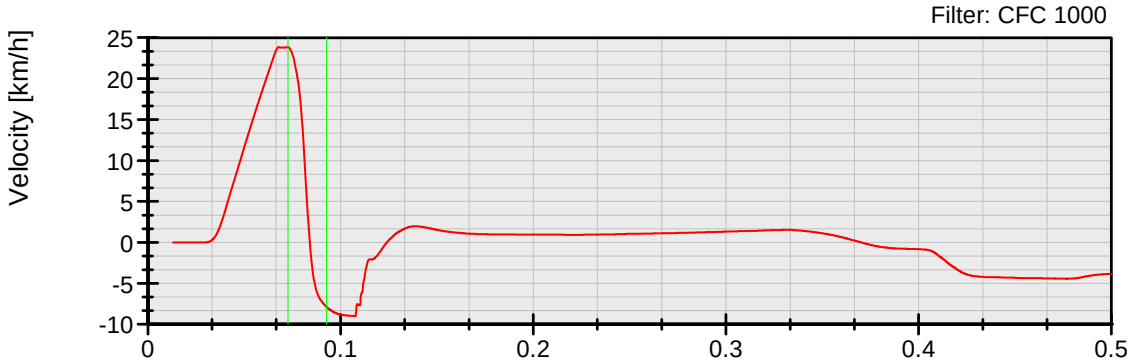
FMVSS 201U

Test No.: U13052 Report No.: G13I7-001.4

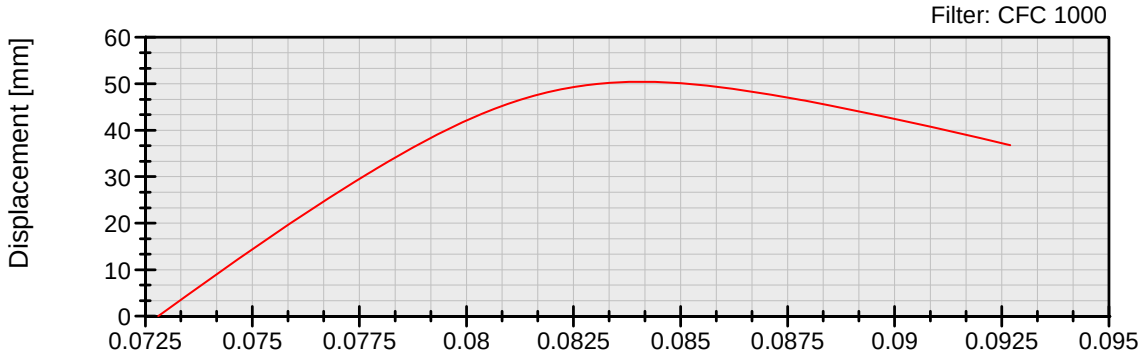
Customer: NHTSA/DOT Date: 4/4/2013



Max: 116.36 G , Min: 1.48 G



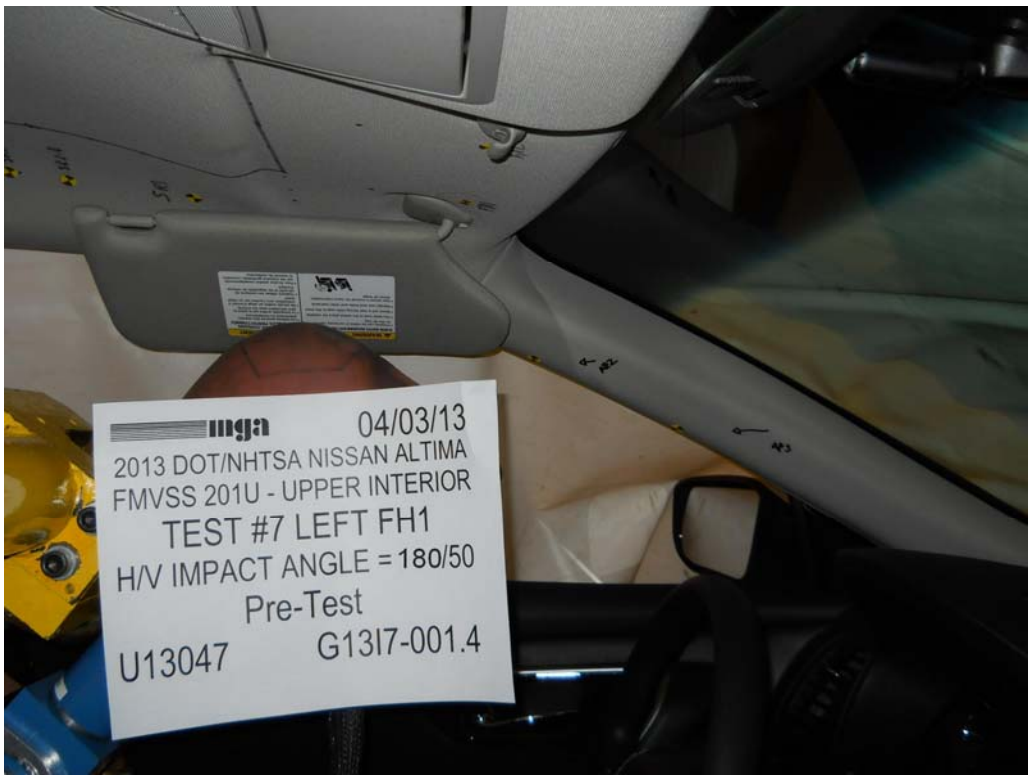
Max: 23.86 km/h , Min: -9.02 km/h



Max: 50.44 mm , Min: 0.00 mm

Page 3 of 3

Pre-Test Photograph No. 1 of Test U13047



Pre-Test Photograph No. 2 of Test U13047

Post-Test Photograph No. 1 of Test U13047

Post-Test Photograph No. 2 of Test U13047

Post-Test Photograph No. 3 of Test U13047

Post-Test Photograph No. 4 of Test U13047

mga research corporation

FMVSS 201U
Test No.: U13047 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 4/3/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #7 Time: 4:07 pm

Horizontal Approach Angle: 180 deg Temperature: 20.9 °C

Vertical Approach Angle: 50 deg Humidity: 14.8 %RH

Impact Form ID No.: H35 Impact Form Mass: 4.51 kg

Target Location: FH1

Additional Description: None

Test Results

Impact Velocity: 23.76 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	483.92	74.5	83.3	8.8
HIC 15	483.92	74.5	83.3	8.8
HIC (d)	531.5	74.5	83.3	8.8

3 ms Clip = 85.81 G , Time 1 = 75.48 ms , Time 2 = 78.48 ms

Impact Location on FMH: 25 mm Above Pt. 0 , 20 Left mm Lateral of Pt. 0

Post-Test Comments: No visible damage

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 3, 2013

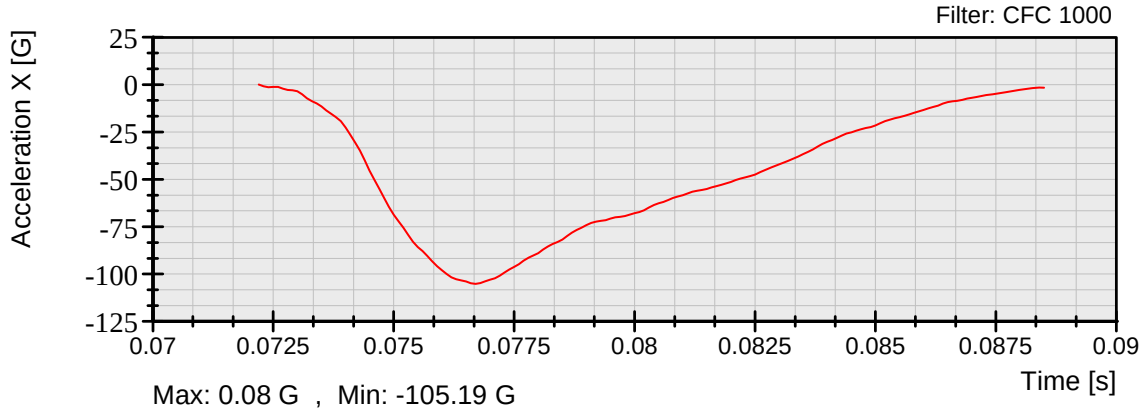
APPROVED BY: _____

mga research corporation

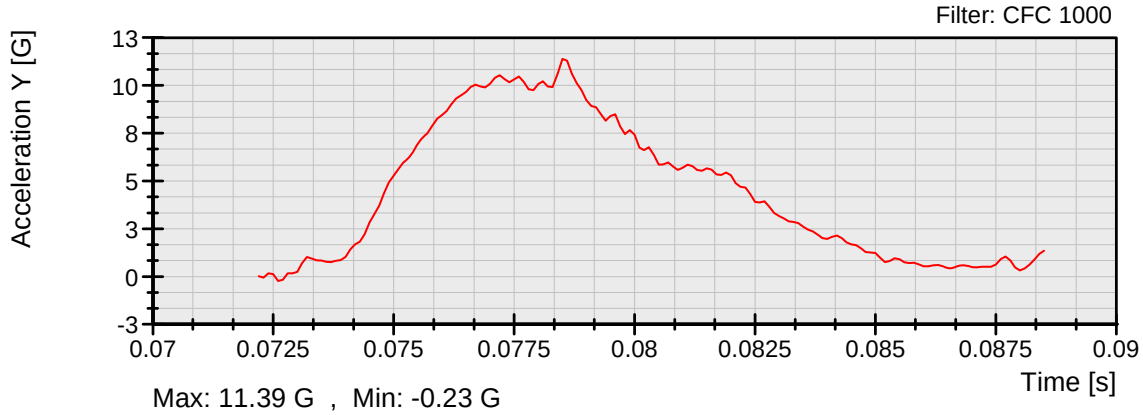
FMVSS 201U

Test No.: U13047 Report No.: G13I7-001.4

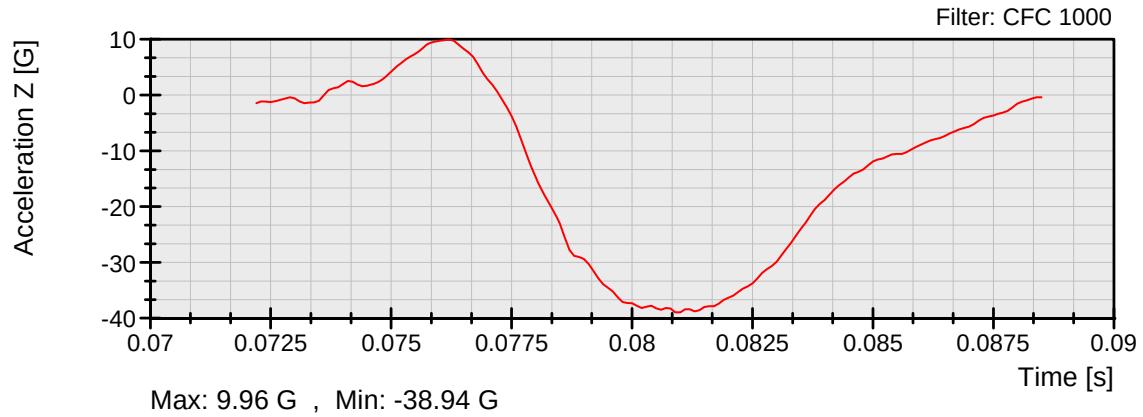
Customer: NHTSA/DOT Date: 4/3/2013



Max: 0.08 G , Min: -105.19 G



Max: 11.39 G , Min: -0.23 G



Max: 9.96 G , Min: -38.94 G

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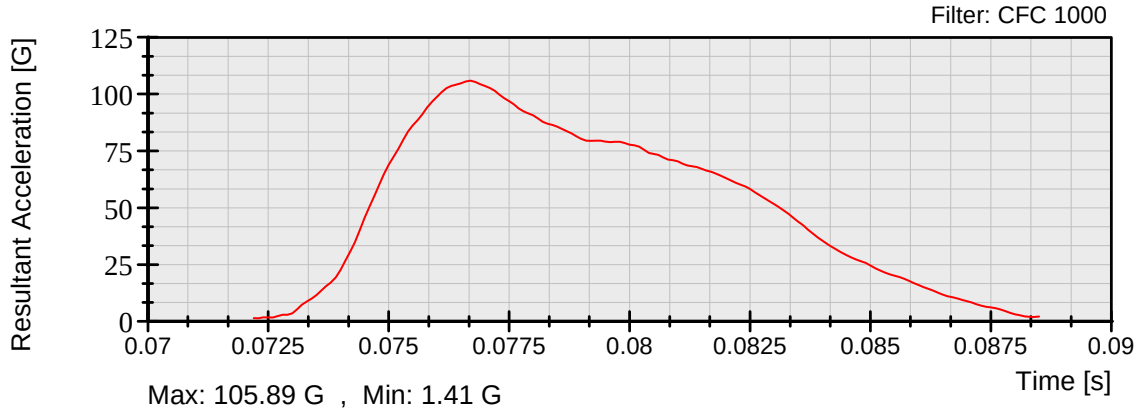
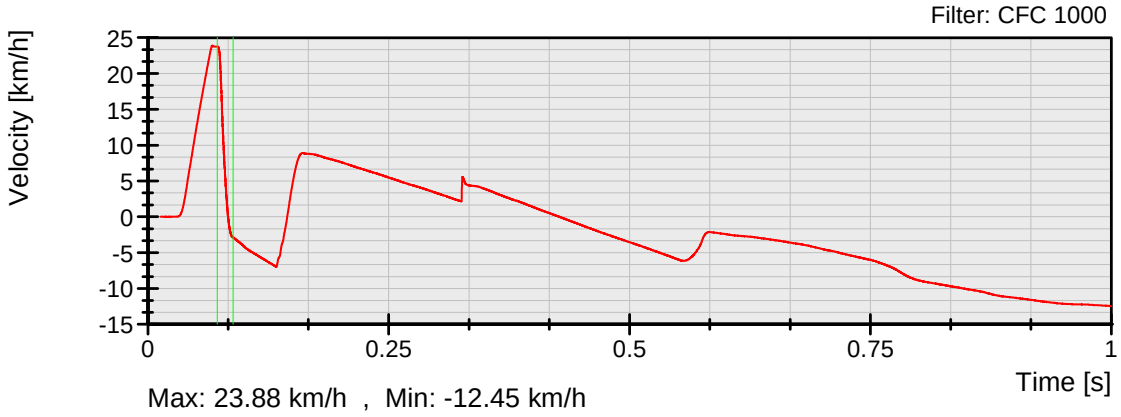
FMVSS 201U

Test No.: U13047 Report No.: G13I7-001.4

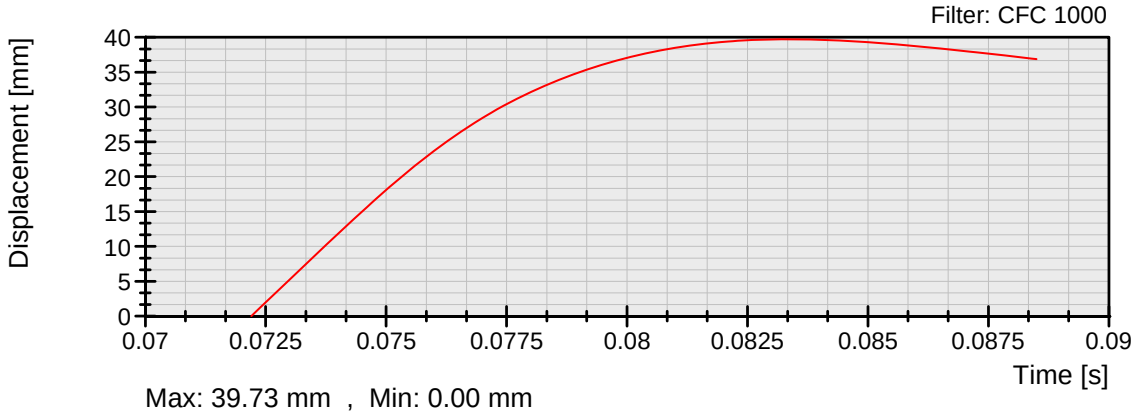
Customer: NHTSA/DOT Date: 4/3/2013



Max: 105.89 G , Min: 1.41 G

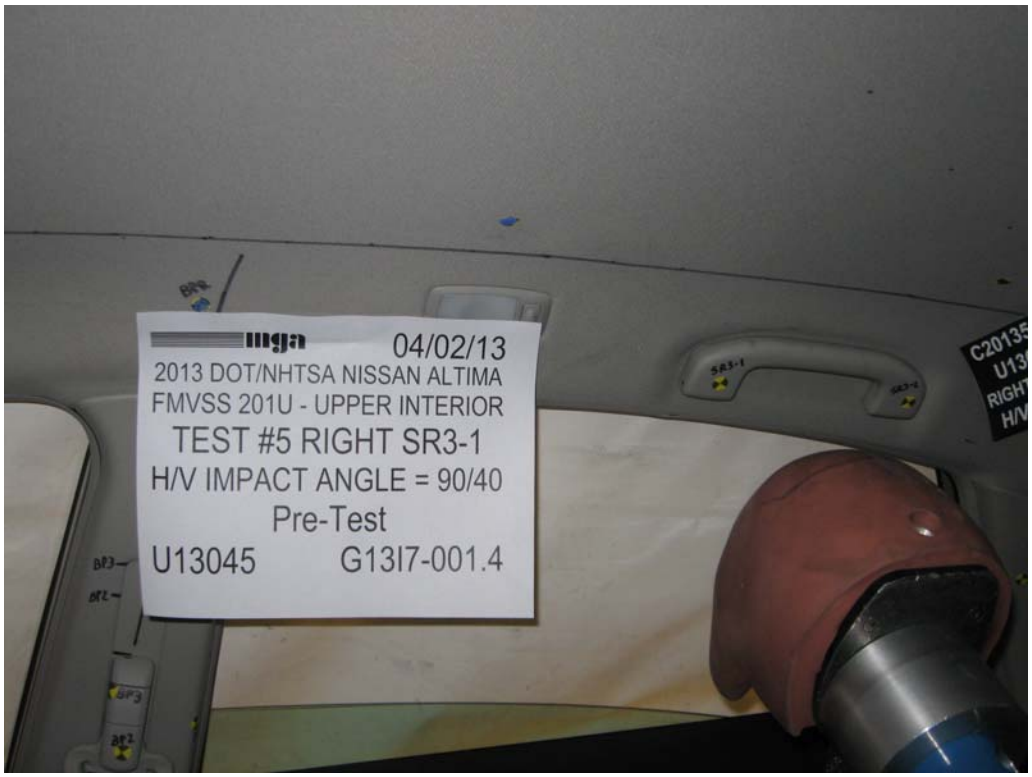


Max: 23.88 km/h , Min: -12.45 km/h

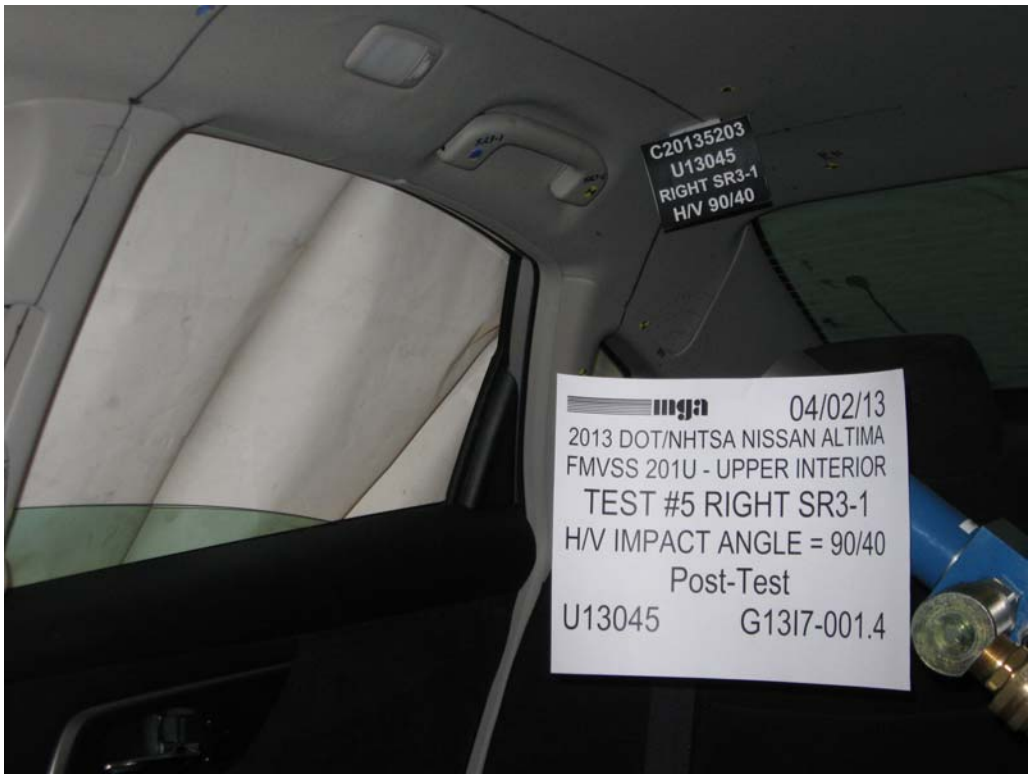


Max: 39.73 mm , Min: 0.00 mm

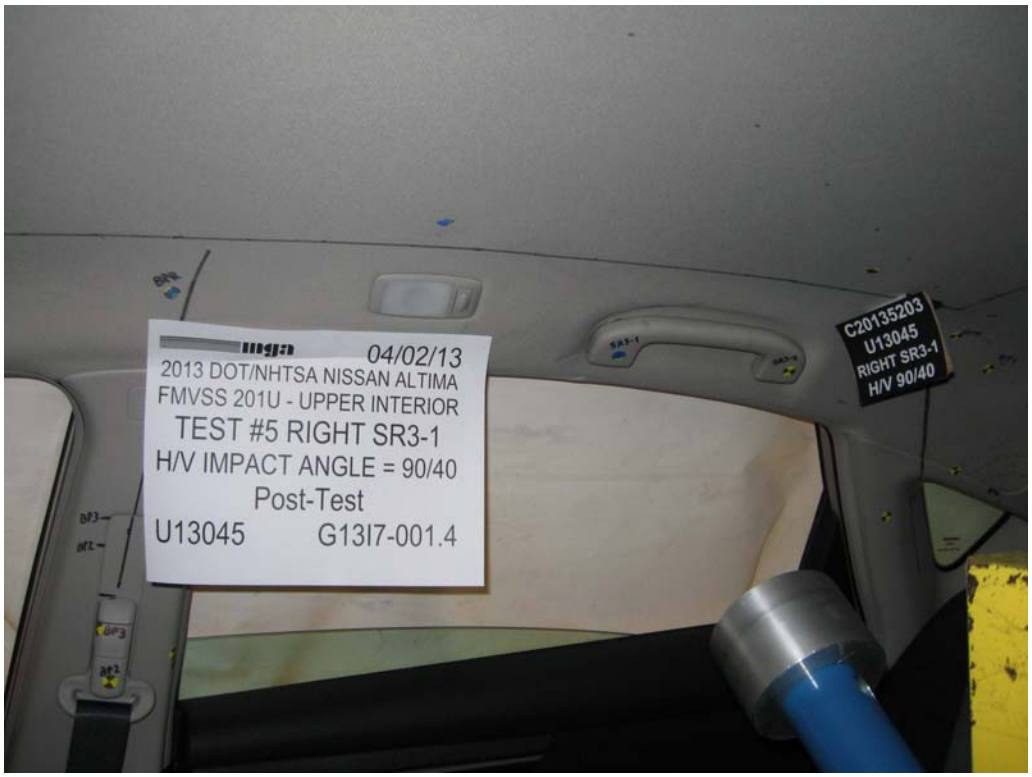
Pre-Test Photograph No. 1 of Test U13045



Pre-Test Photograph No. 2 of Test U13045

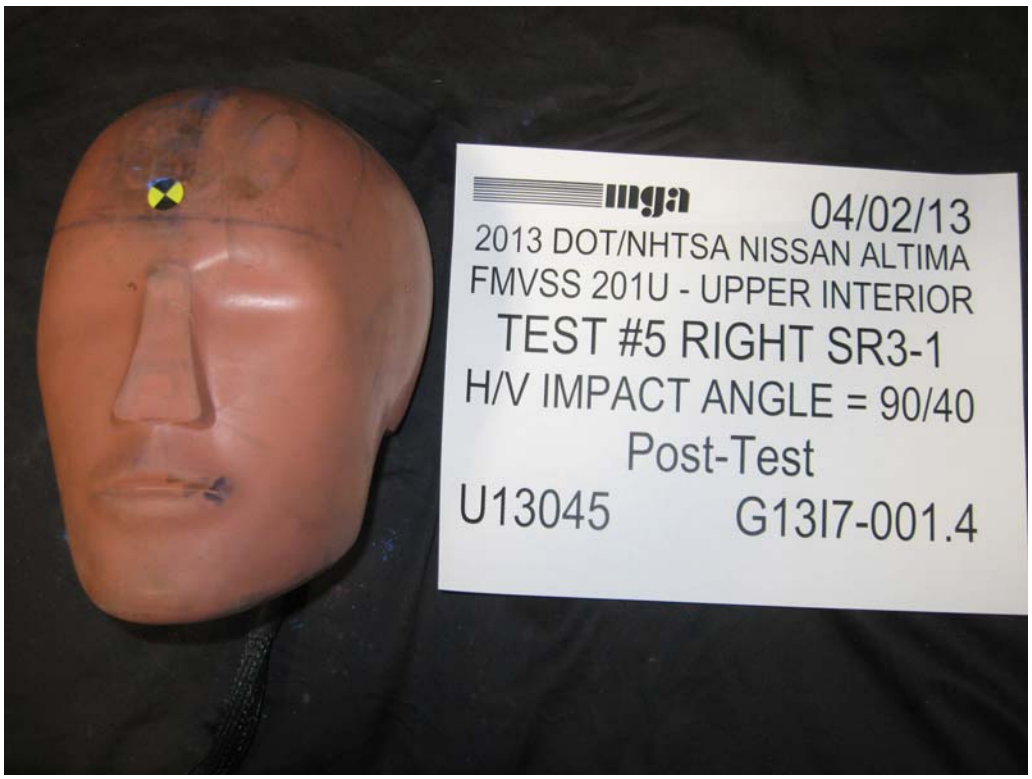


Post-Test Photograph No. 1 of Test U13045



Post-Test Photograph No. 2 of Test U13045

Post-Test Photograph No. 3 of Test U13045



Post-Test Photograph No. 4 of Test U13045

mga research corporation

FMVSS 201U
Test No.: U13045 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 4/2/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: 5 Time: 13:46:52

Horizontal Approach Angle: 90 deg Temperature: 21.4 °C

Vertical Approach Angle: 40 deg Humidity: 14.3 %RH

Impact Form ID No.: H37 Impact Form Mass: 4.54 kg

Target Location: SR3-1 Right

Additional Description:

Test Results

Impact Velocity: 18.83 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	199.89	81.5	93	11.5
HIC 15	199.89	81.5	93	11.5
HIC (d)	317.21	81.5	93	11.5

3 ms Clip = 47.29 G , Time 1 = 87.75 ms , Time 2 = 90.75 ms

Impact Location on FMH: 9 mm Above Pt. 0 , 6 Right mm Lateral of Pt. 0

Post-Test Comments: Headliner deformation

Test Series Performed By: DP, JC, SM

Recorded By: _____ Approved By: _____

Date: 7/2/2013

RECORDED BY: _____ DATE: April 2, 2013

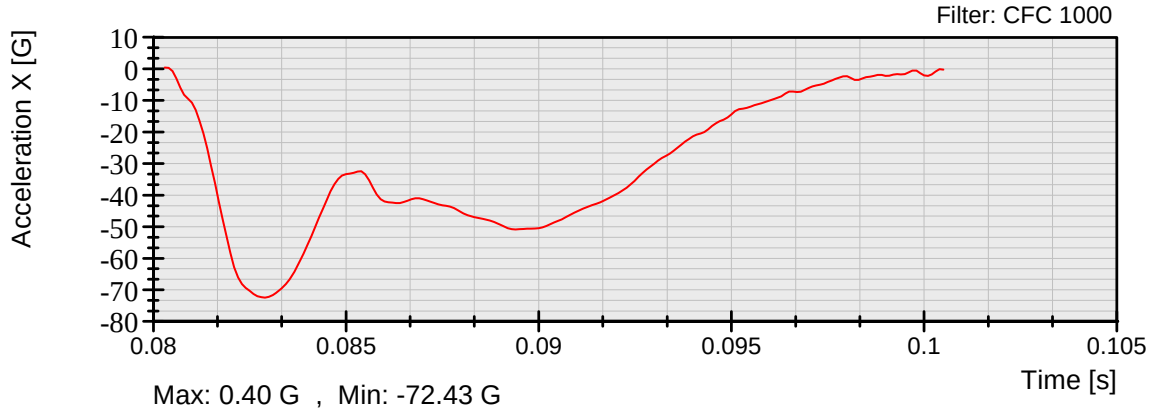
APPROVED BY: _____

mga research corporation

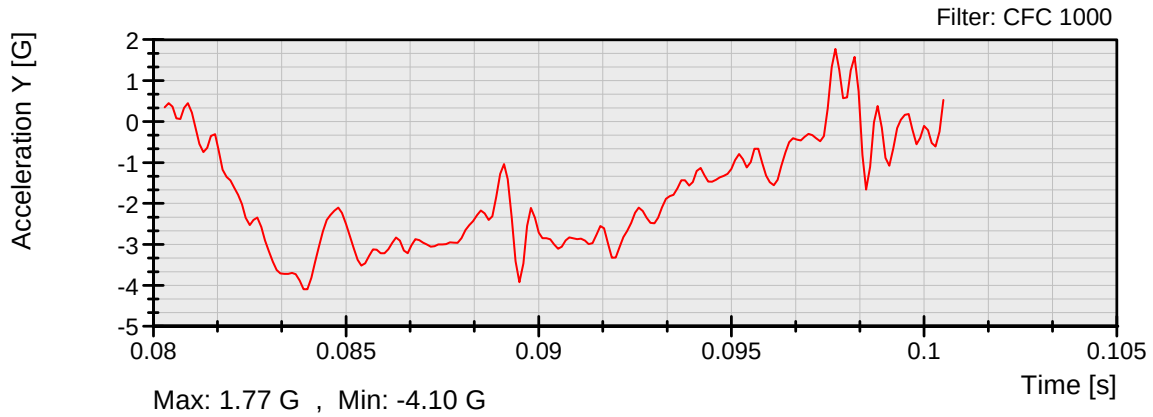
FMVSS 201U

Test No.: U13045 Report No.: G13I7-001.4

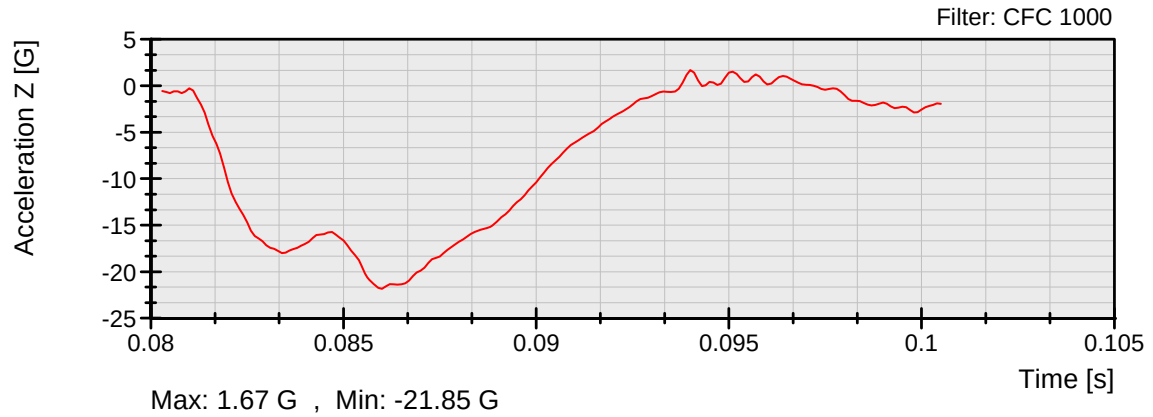
Customer: NHTSA/DOT Date: 04/02/2013



Max: 0.40 G , Min: -72.43 G



Max: 1.77 G , Min: -4.10 G



Max: 1.67 G , Min: -21.85 G

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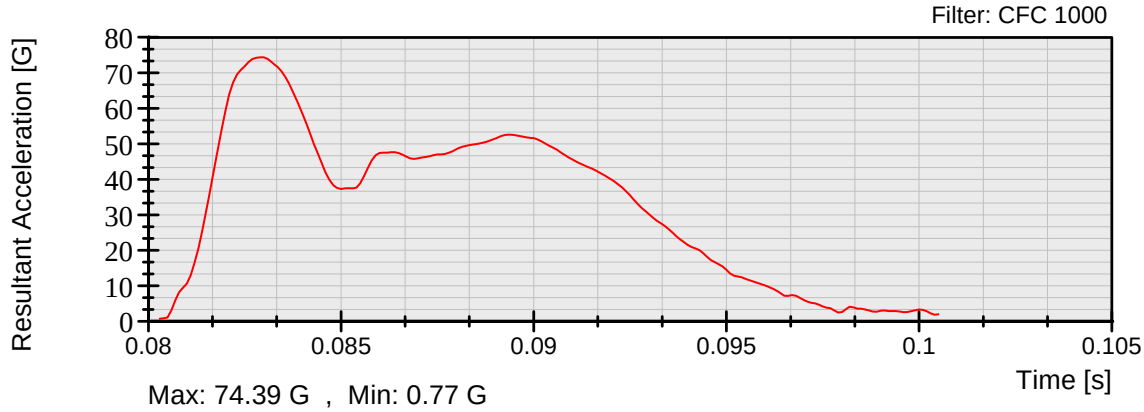
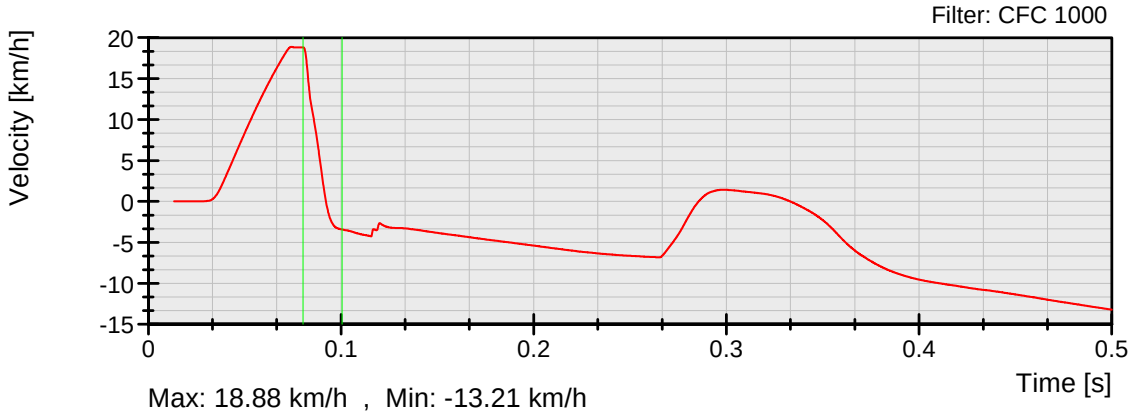
FMVSS 201U

Test No.: U13045 Report No.: G13I7-001.4

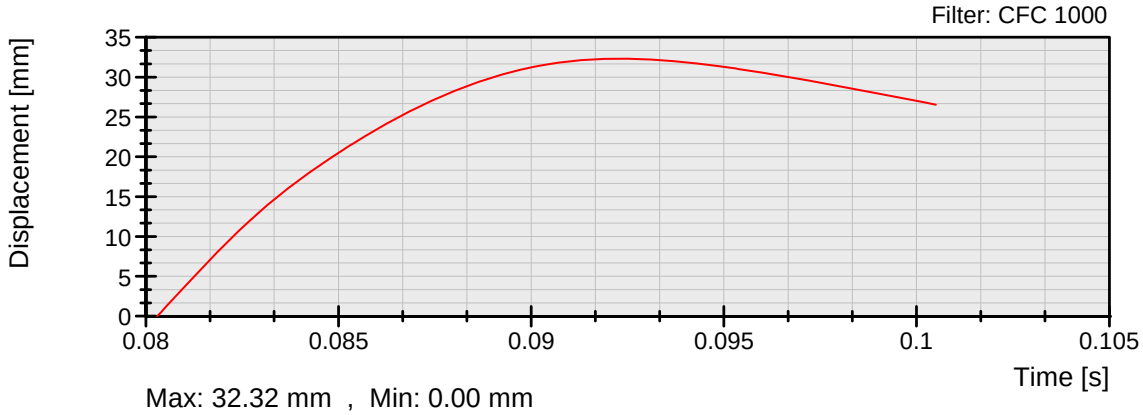
Customer: NHTSA/DOT Date: 04/02/2013



Max: 74.39 G , Min: 0.77 G



Max: 18.88 km/h , Min: -13.21 km/h

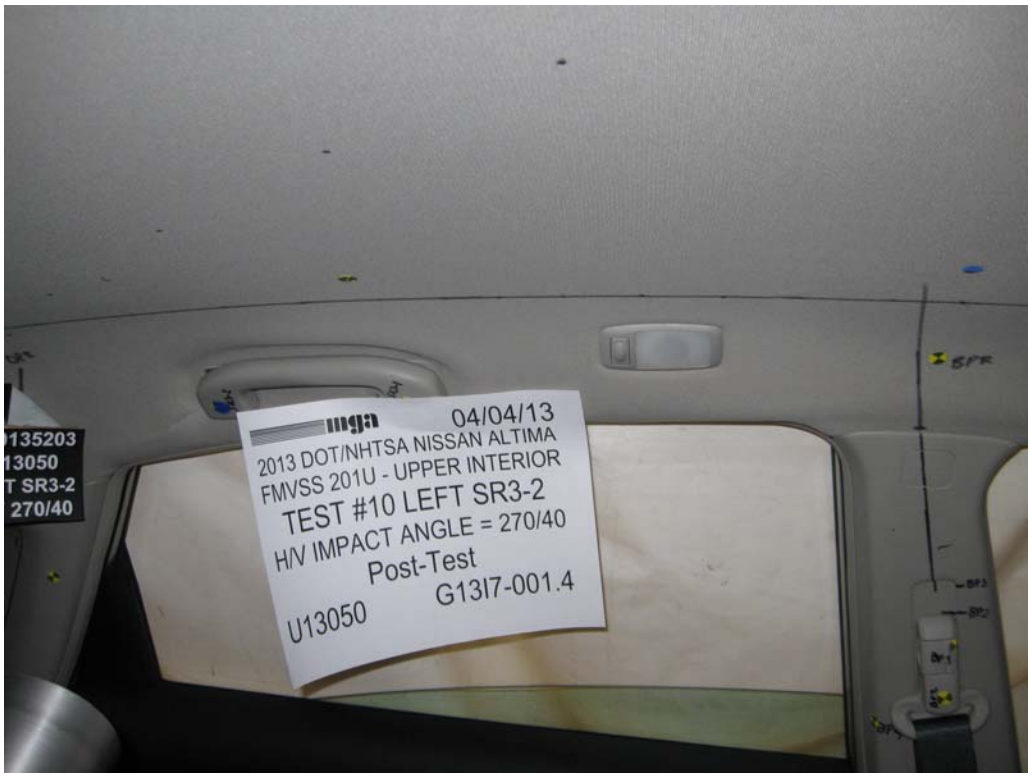


Max: 32.32 mm , Min: 0.00 mm

Pre-Test Photograph No. 1 of Test U13050

Pre-Test Photograph No. 2 of Test U13050

Post-Test Photograph No. 1 of Test U13050



Post-Test Photograph No. 2 of Test U13050

Post-Test Photograph No. 3 of Test U13050

Post-Test Photograph No. 4 of Test U13050

mga research corporation

FMVSS 201U
Test No.: U13050 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 4/4/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #10 Time: 1:27 pm

Horizontal Approach Angle: 270 deg Temperature: 21.6 °C

Vertical Approach Angle: 40 deg Humidity: 15.7 %RH

Impact Form ID No.: H35 Impact Form Mass: 4.51 kg

Target Location: SR3-2 Left

Additional Description: None

Test Results

Impact Velocity: 19.05 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	185.26	80.9	92.7	11.8
HIC 15	185.26	80.9	92.7	11.8
HIC (d)	306.17	80.9	92.7	11.8

3 ms Clip = 46.54 G , Time 1 = 81.23 ms , Time 2 = 84.23 ms

Impact Location on FMH: 11 mm Above Pt. 0 , 4 right mm Lateral of Pt. 0

Post-Test Comments: Grab handle deformation, headliner deformation

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 4, 2013

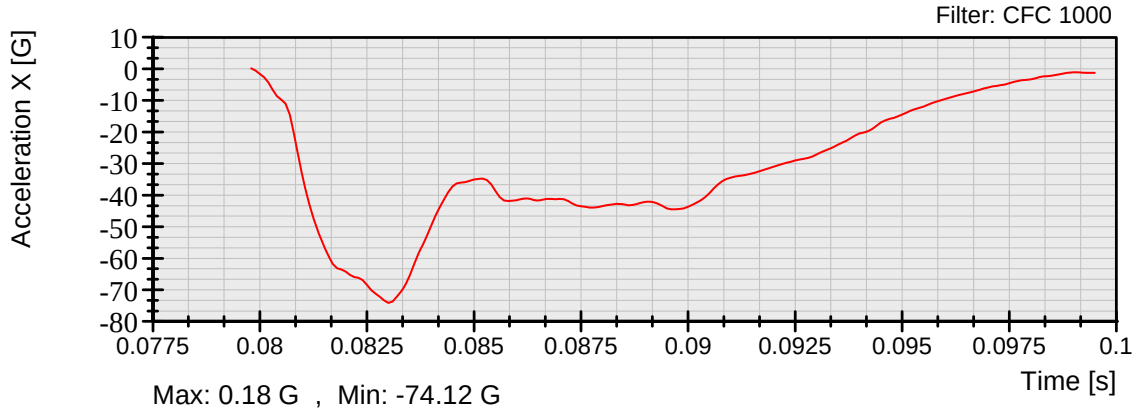
APPROVED BY: _____

mga research corporation

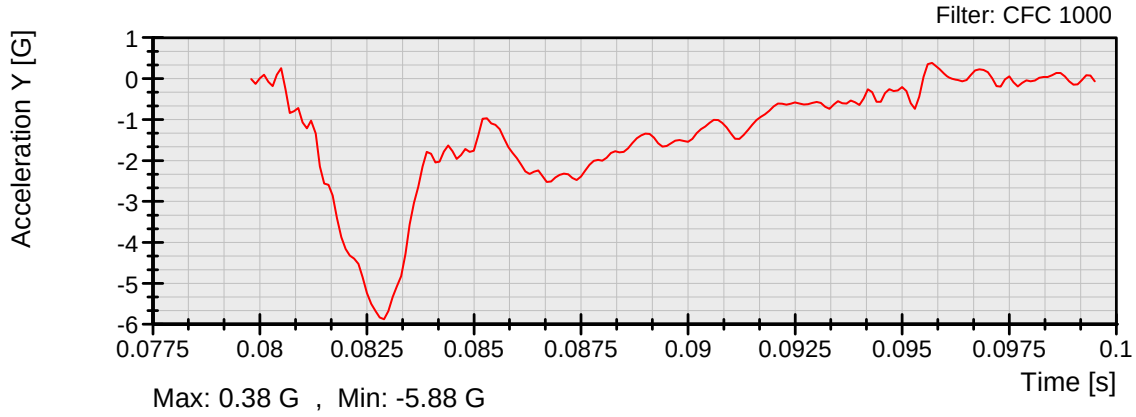
FMVSS 201U

Test No.: U13050 Report No.: G13I7-001.4

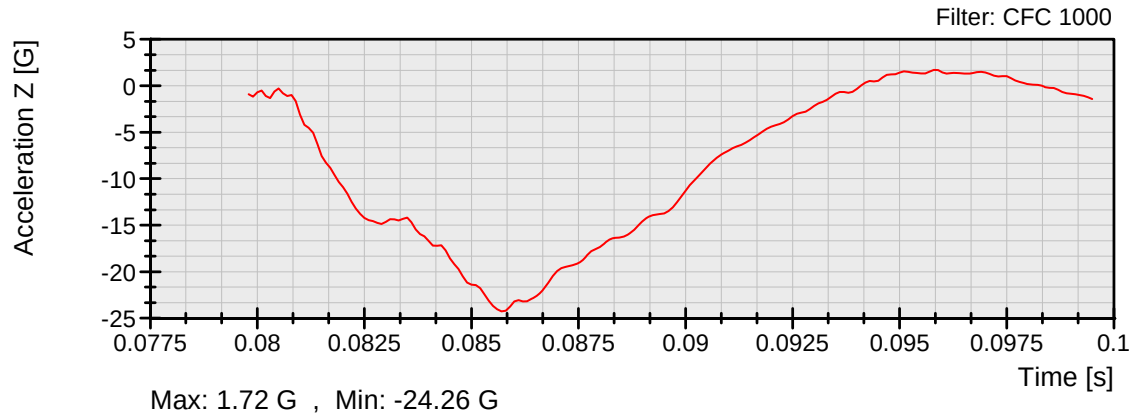
Customer: NHTSA/DOT Date: 4/4/2013



Max: 0.18 G , Min: -74.12 G



Max: 0.38 G , Min: -5.88 G



Max: 1.72 G , Min: -24.26 G

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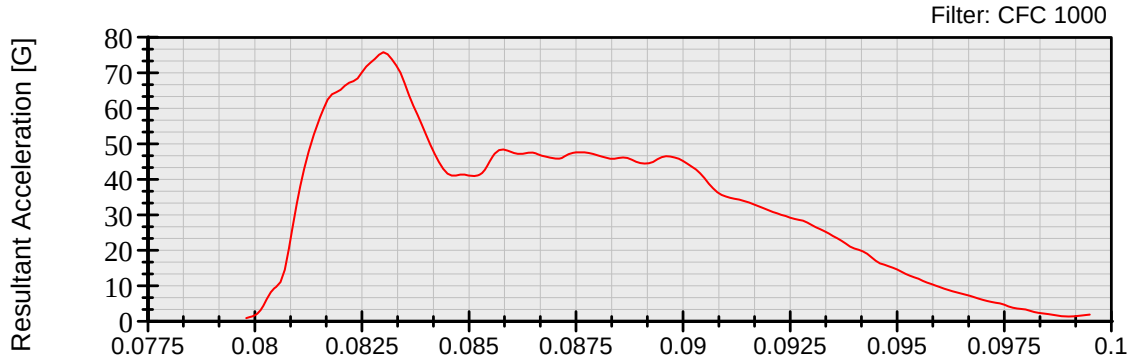
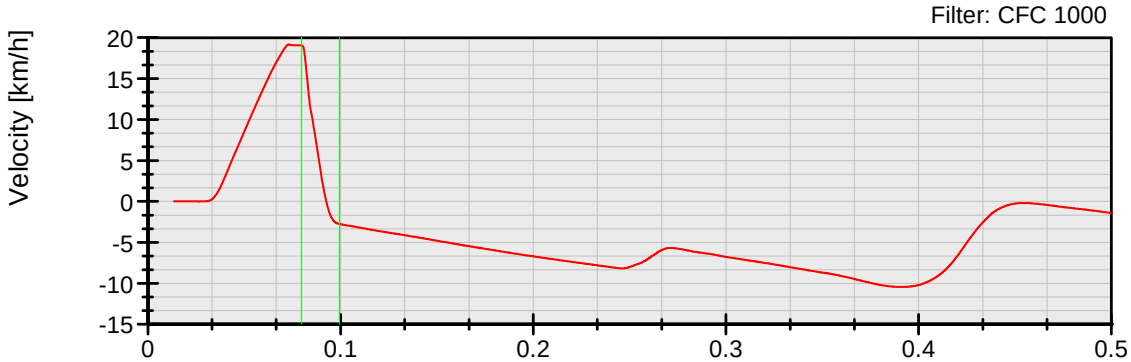
FMVSS 201U

Test No.: U13050 Report No.: G13I7-001.4

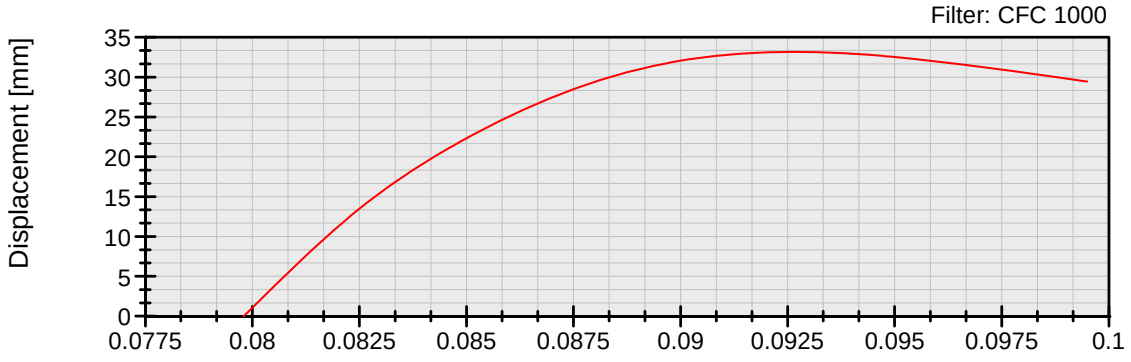
Customer: NHTSA/DOT Date: 4/4/2013



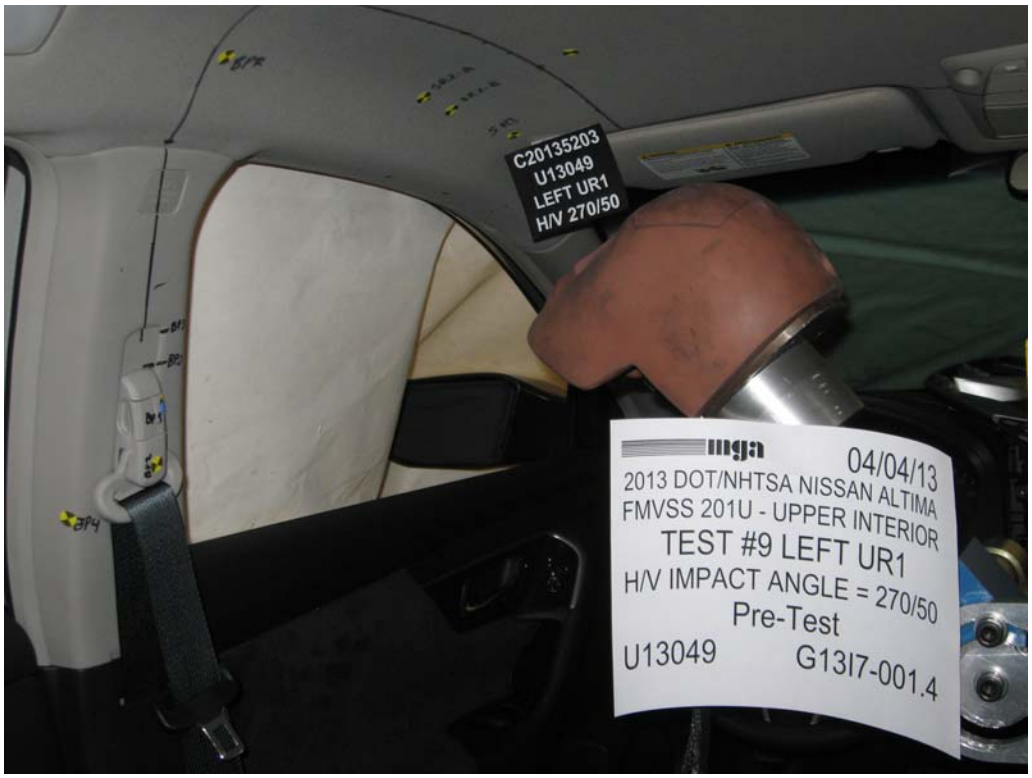
Max: 75.77 G , Min: 0.93 G



Max: 19.16 km/h , Min: -10.44 km/h



Max: 33.17 mm , Min: 0.00 mm

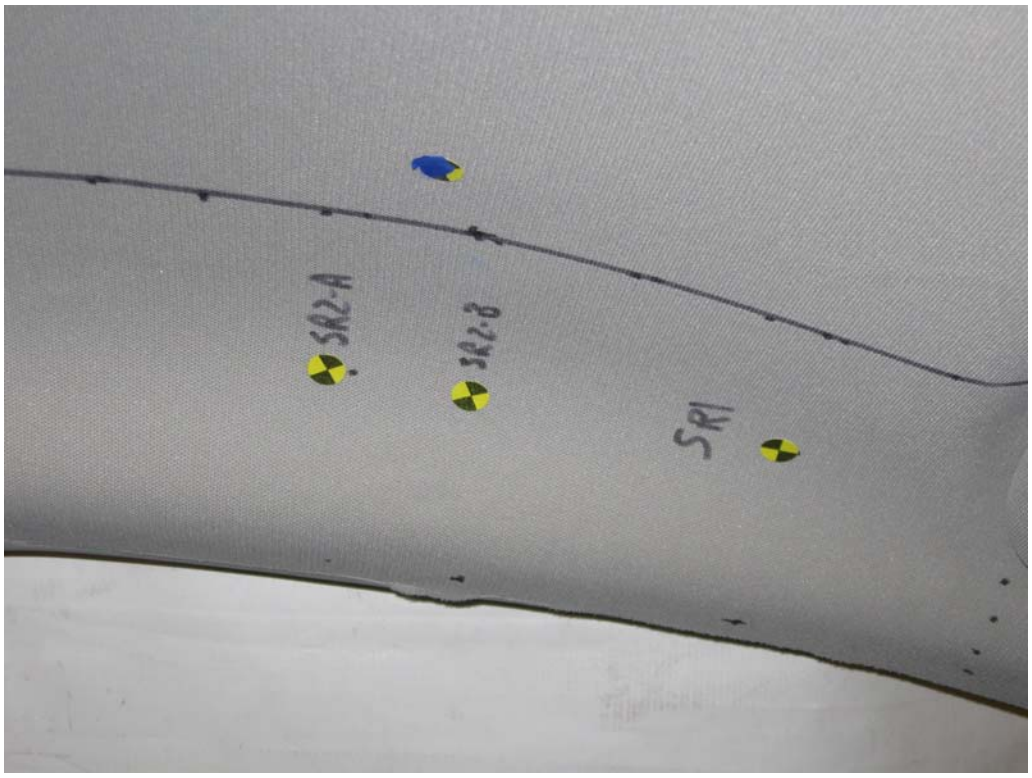


Pre-Test Photograph No. 1 of Test U13049

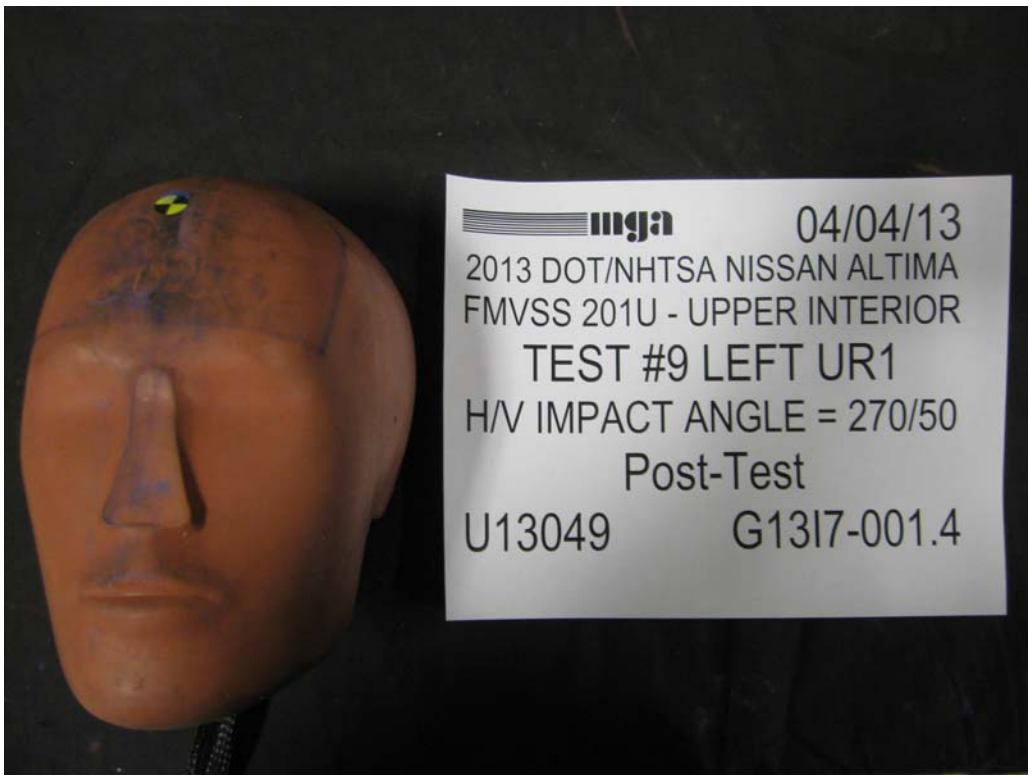
Pre-Test Photograph No. 2 of Test U13049

Post-Test Photograph No. 1 of Test U13049

Post-Test Photograph No. 2 of Test U13049



Post-Test Photograph No. 3 of Test U13049



Post-Test Photograph No. 4 of Test U13049

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FMVSS 201U
Test No.: U13049 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 4/4/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #9 Time: 10:56 am

Horizontal Approach Angle: 270 deg Temperature: 21.4 °C

Vertical Approach Angle: 50 deg Humidity: 16.0 %RH

Impact Form ID No.: H38 Impact Form Mass: 4.51 kg

Target Location: UR1 @ SR2B

Additional Description: None

Test Results

Impact Velocity: 23.52 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	529.2	77.2	88.4	11.2
HIC 15	529.2	77.2	88.4	11.2
HIC (d)	565.66	77.2	88.4	11.2

3 ms Clip = 76.35 G , Time 1 = 78.45 ms , Time 2 = 81.94 ms

Impact Location on FMH: 51 mm Above Pt. 0 , 5 right mm Lateral of Pt. 0

Post-Test Comments: Headliner deformation

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 4, 2013

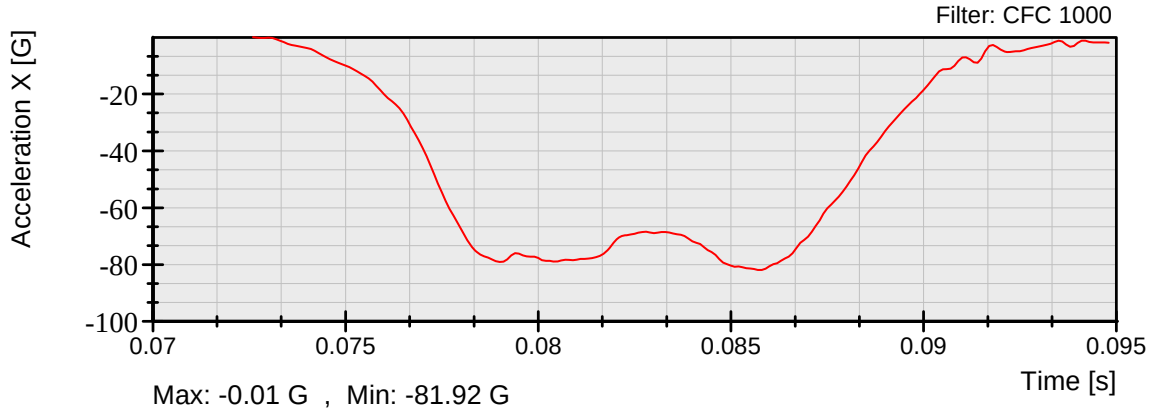
APPROVED BY: _____

mga research corporation

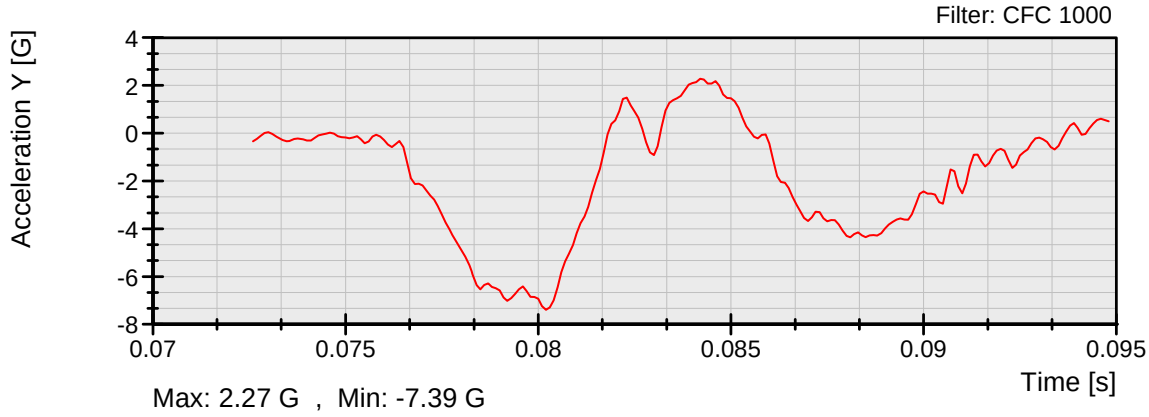
FMVSS 201U

Test No.: U13049 Report No.: G13I7-001.4

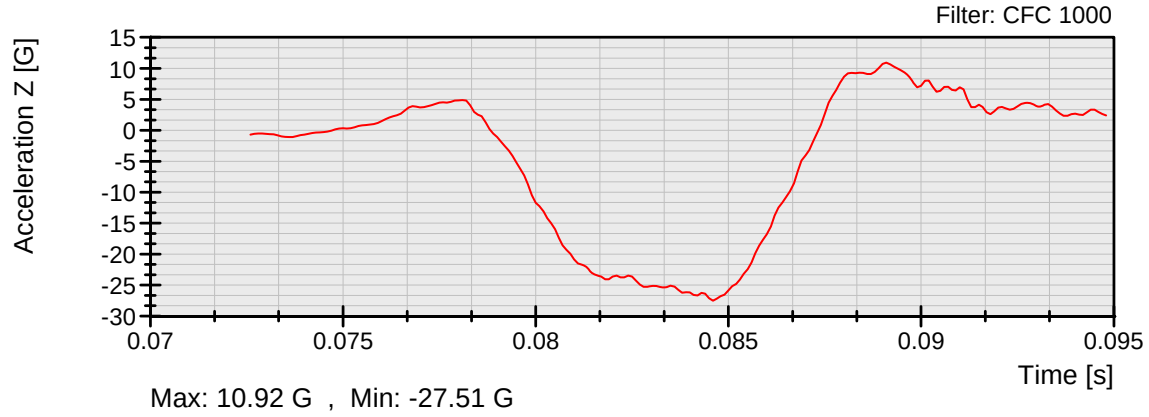
Customer: NHTSA/DOT Date: 4/4/2013



Max: -0.01 G , Min: -81.92 G



Max: 2.27 G , Min: -7.39 G



Max: 10.92 G , Min: -27.51 G

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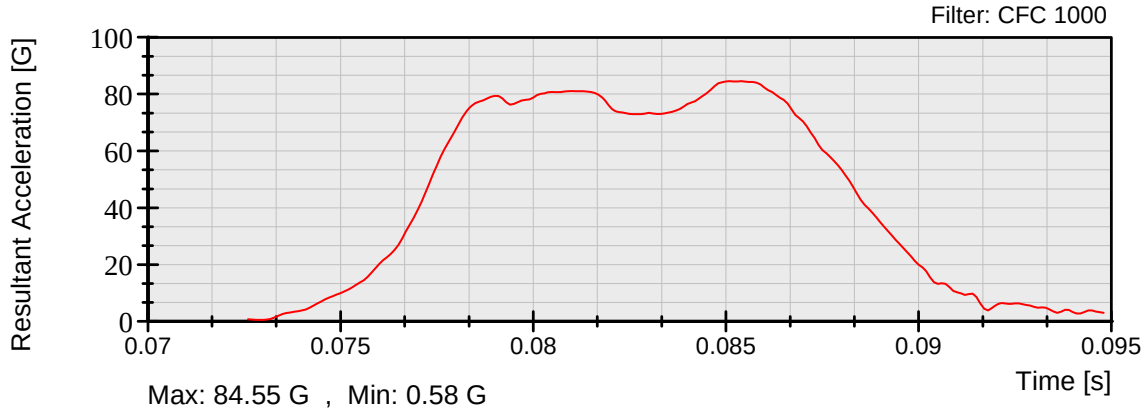
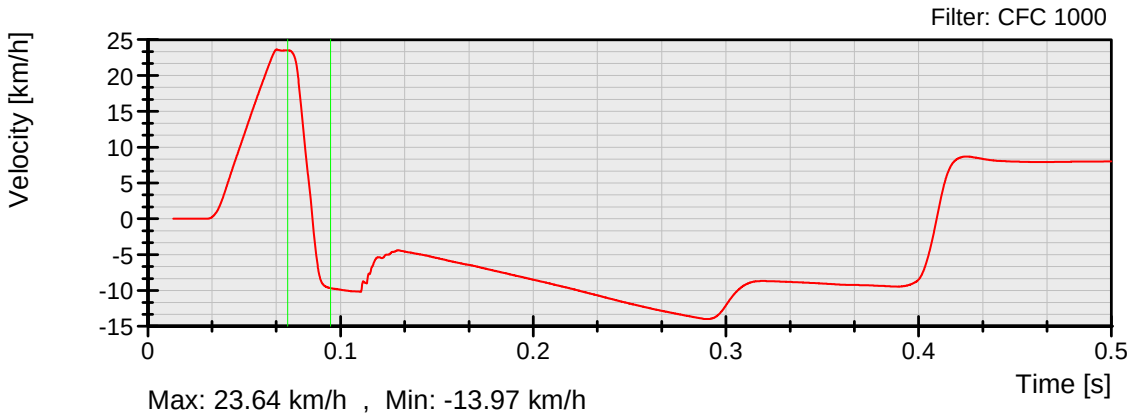
FMVSS 201U

Test No.: U13049 Report No.: G13I7-001.4

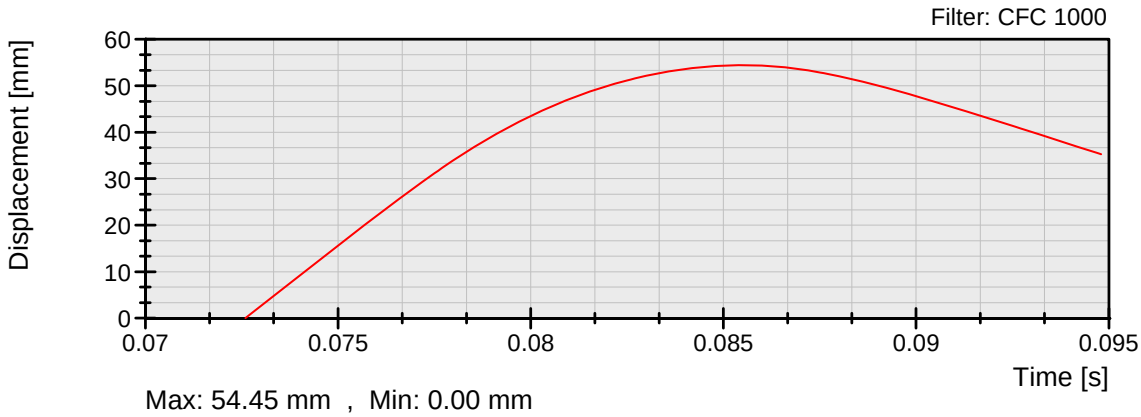
Customer: NHTSA/DOT Date: 4/4/2013



Max: 84.55 G , Min: 0.58 G



Max: 23.64 km/h , Min: -13.97 km/h



Max: 54.45 mm , Min: 0.00 mm

Pre-Test Photograph No. 1 of Test U13042

Pre-Test Photograph No. 2 of Test U13042

Post-Test Photograph No. 1 of Test U13042

Post-Test Photograph No. 2 of Test U13042

Post-Test Photograph No. 3 of Test U13042

Post-Test Photograph No. 4 of Test U13042

mga research corporation

FMVSS 201U
Test No.: U13042 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 04/02/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #2 Time: 10:08 am

Horizontal Approach Angle: 90 deg Temperature: 21.1 °C

Vertical Approach Angle: 50 deg Humidity: 14.9 %RH

Impact Form ID No.: H37 Impact Form Mass: 4.55 kg

Target Location: UR2 @ SR2A Right

Additional Description: None

Test Results

Impact Velocity: 23.91 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	588.01	76.4	85.2	8.8
HIC 15	588.01	76.4	85.2	8.8
HIC (d)	610.03	76.4	85.2	8.8

3 ms Clip = 90.56 G , Time 1 = 79.57 ms , Time 2 = 82.57 ms

Impact Location on FMH: 42 mm Above Pt. 0 , 2 Right mm Lateral of Pt. 0

Post-Test Comments: No visible damage

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 2, 2013

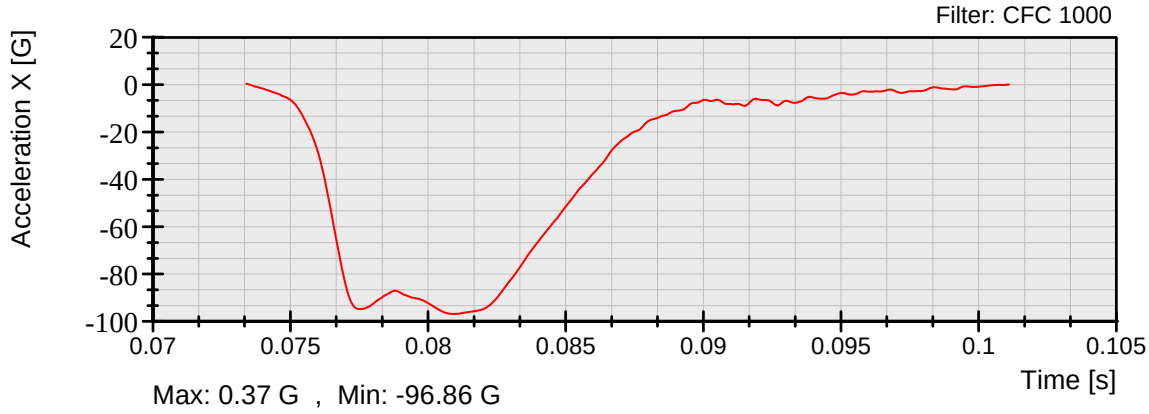
APPROVED BY: _____

mga research corporation

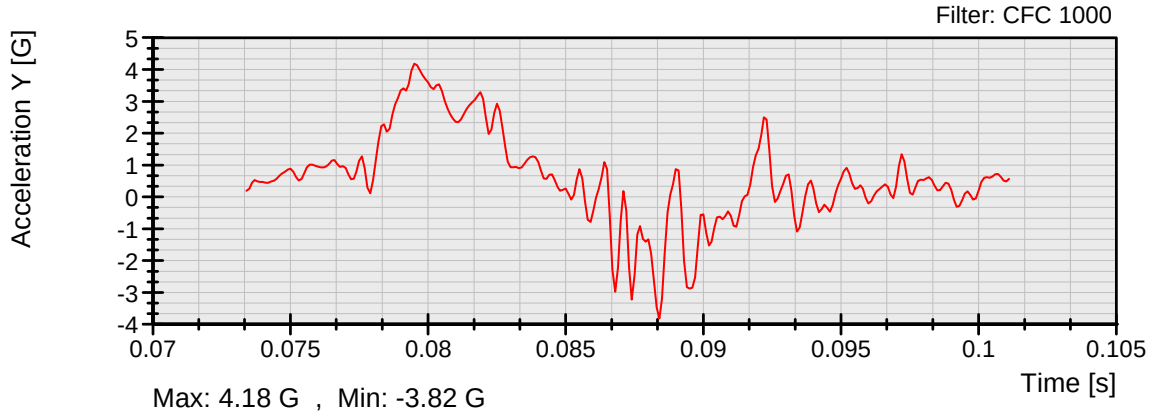
FMVSS 201U

Test No.: U13042 Report No.: G13I7-001.4

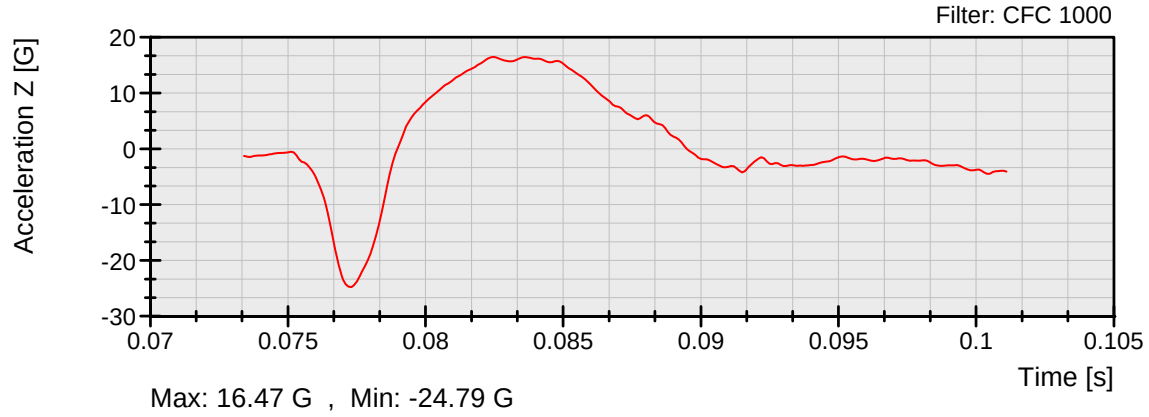
Customer: NHTSA/DOT Date: 04/02/2013



Max: 0.37 G , Min: -96.86 G



Max: 4.18 G , Min: -3.82 G



Max: 16.47 G , Min: -24.79 G

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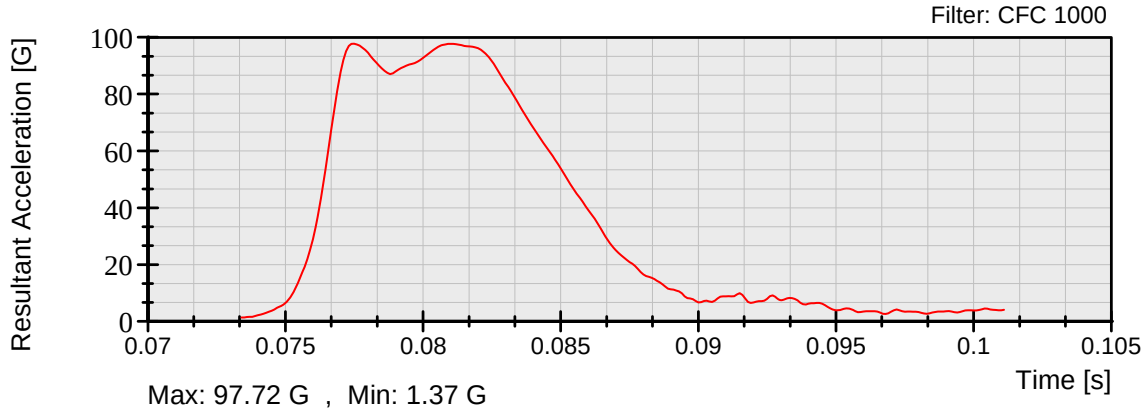
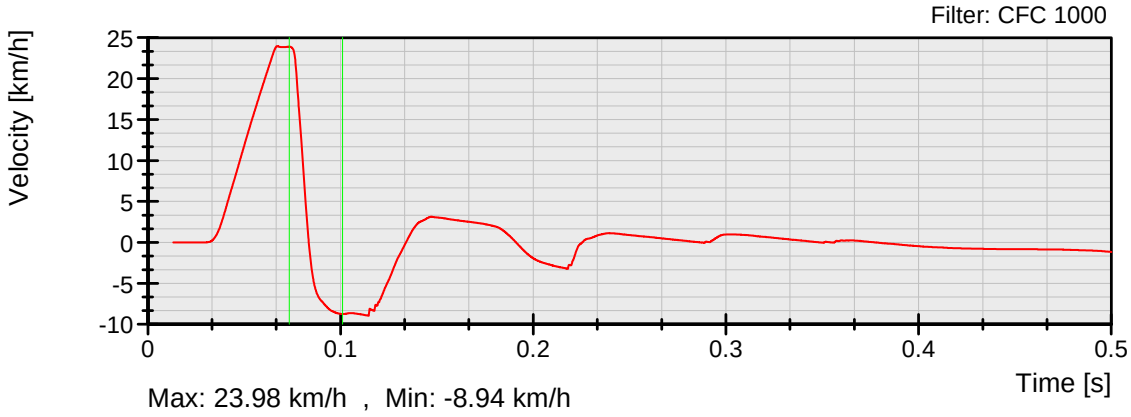
FMVSS 201U

Test No.: U13042 Report No.: G13I7-001.4

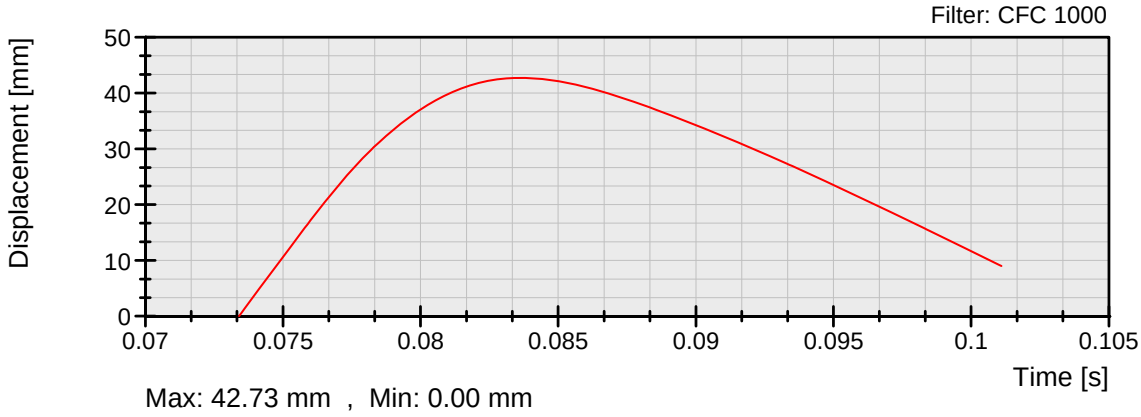
Customer: NHTSA/DOT Date: 04/02/2013



Max: 97.72 G , Min: 1.37 G

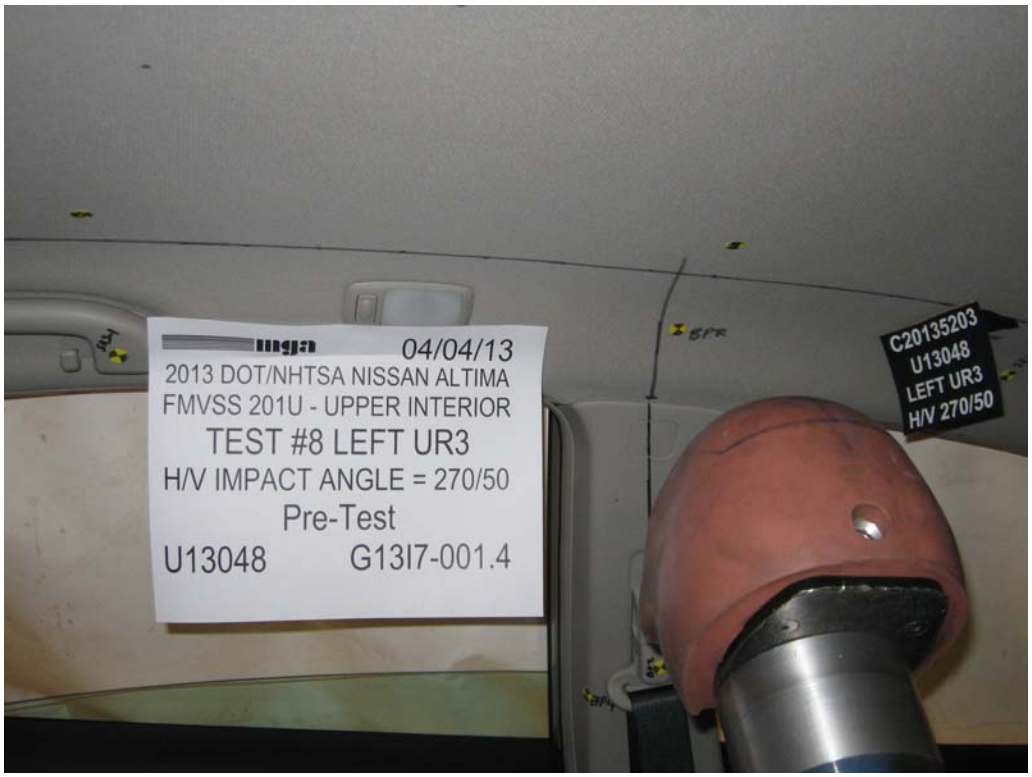


Max: 23.98 km/h , Min: -8.94 km/h



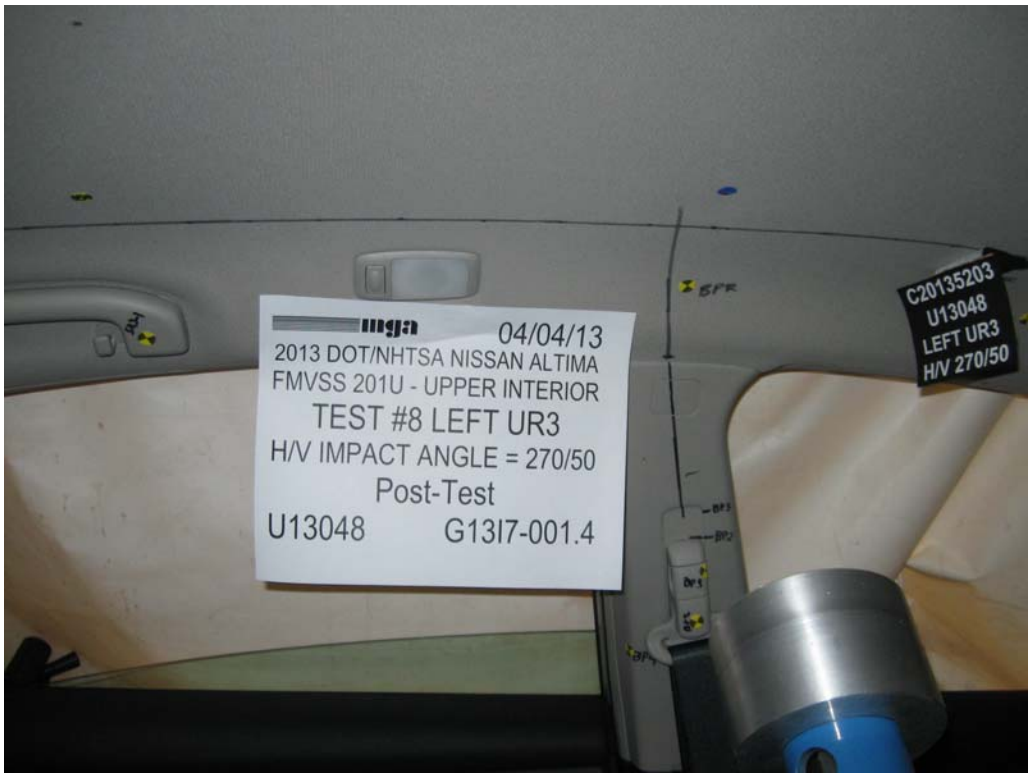
Max: 42.73 mm , Min: 0.00 mm

Pre-Test Photograph No. 1 of Test U13048



Pre-Test Photograph No. 2 of Test U13048

Post-Test Photograph No. 1 of Test U13048



Post-Test Photograph No. 2 of Test U13048

Post-Test Photograph No. 3 of Test U13048

Post-Test Photograph No. 4 of Test U13048

mga research corporation

FMVSS 201U
Test No.: U13048 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 4/4/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #8 Time: 9:20 am

Horizontal Approach Angle: 270 deg Temperature: 21.2 °C

Vertical Approach Angle: 50 deg Humidity: 16.3 %RH

Impact Form ID No.: H37 Impact Form Mass: 4.55 kg

Target Location: UR3 @ BP1 Left

Additional Description: None

Test Results

Impact Velocity: 23.88 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	727.7	76.1	84.7	8.6
HIC 15	727.7	76.1	84.7	8.6
HIC (d)	715.42	76.1	84.7	8.6

3 ms Clip = 105.21 G , Time 1 = 78.48 ms , Time 2 = 81.48 ms

Impact Location on FMH: 44 mm Above Pt. 0 , 11 Right mm Lateral of Pt. 0

Post-Test Comments: No visible damage

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 4, 2013

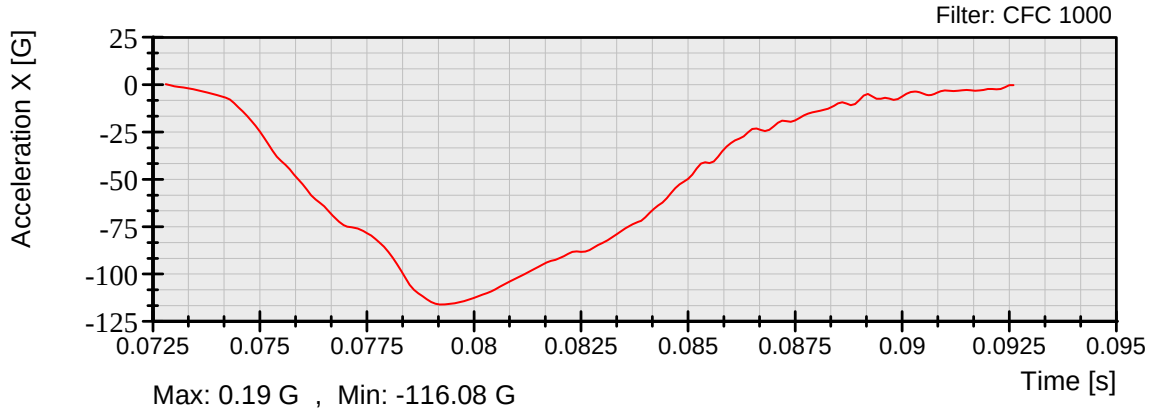
APPROVED BY: _____

mga research corporation

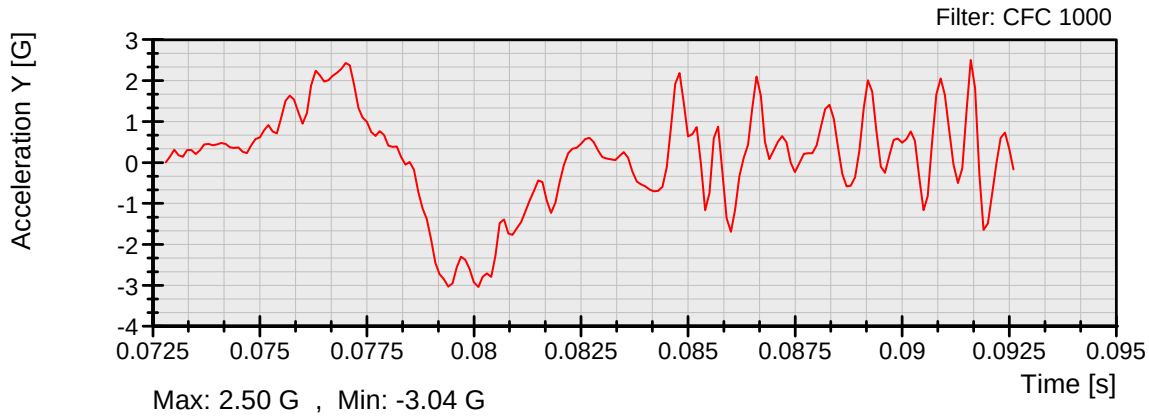
FMVSS 201U

Test No.: U13048 Report No.: G13I7-001.4

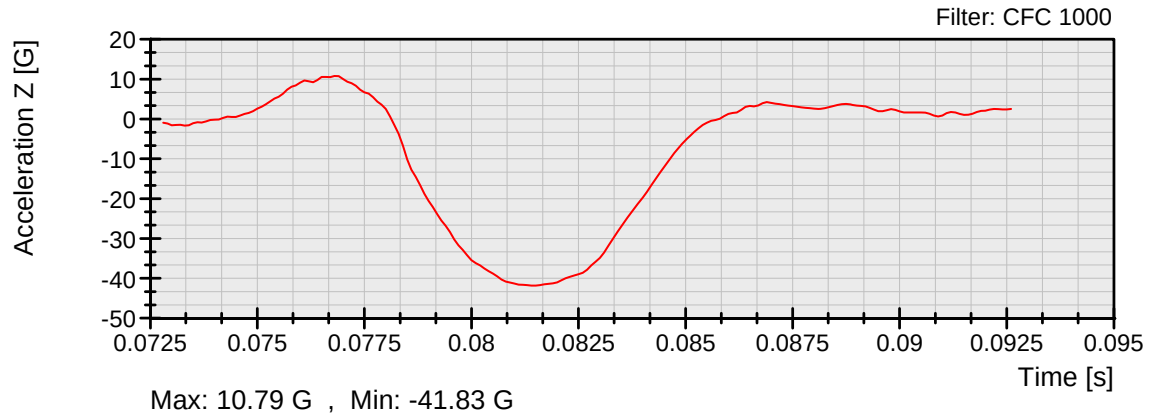
Customer: NHTSA/DOT Date: 4/4/2013



Max: 0.19 G , Min: -116.08 G



Max: 2.50 G , Min: -3.04 G



Max: 10.79 G , Min: -41.83 G

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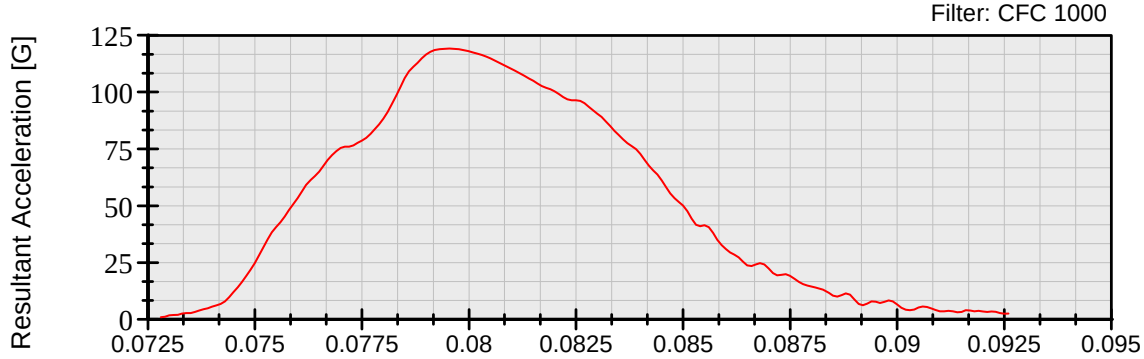
FMVSS 201U

Test No.: U13048 Report No.: G13I7-001.4

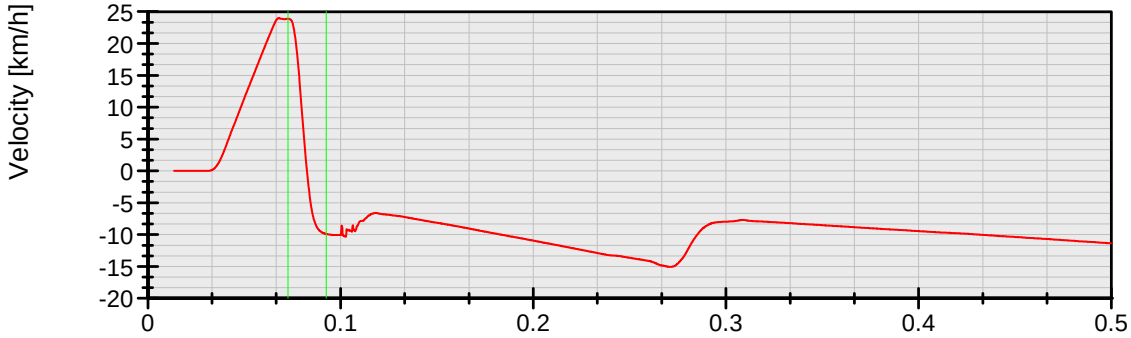
Customer: NHTSA/DOT Date: 4/4/2013

Filter: CFC 1000



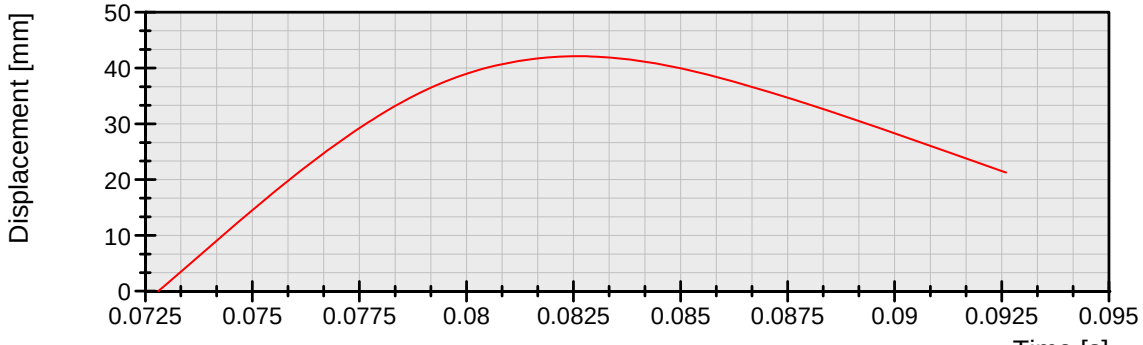
Max: 119.14 G , Min: 0.94 G

Filter: CFC 1000

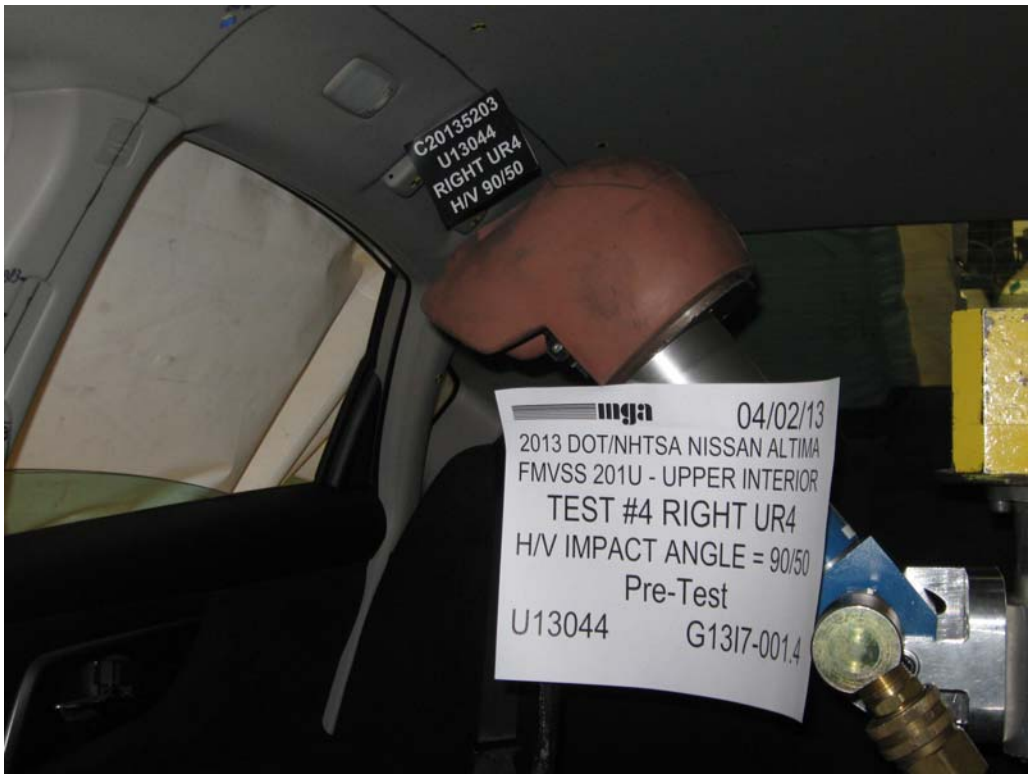


Max: 23.98 km/h , Min: -15.06 km/h

Filter: CFC 1000



Max: 42.13 mm , Min: 0.00 mm



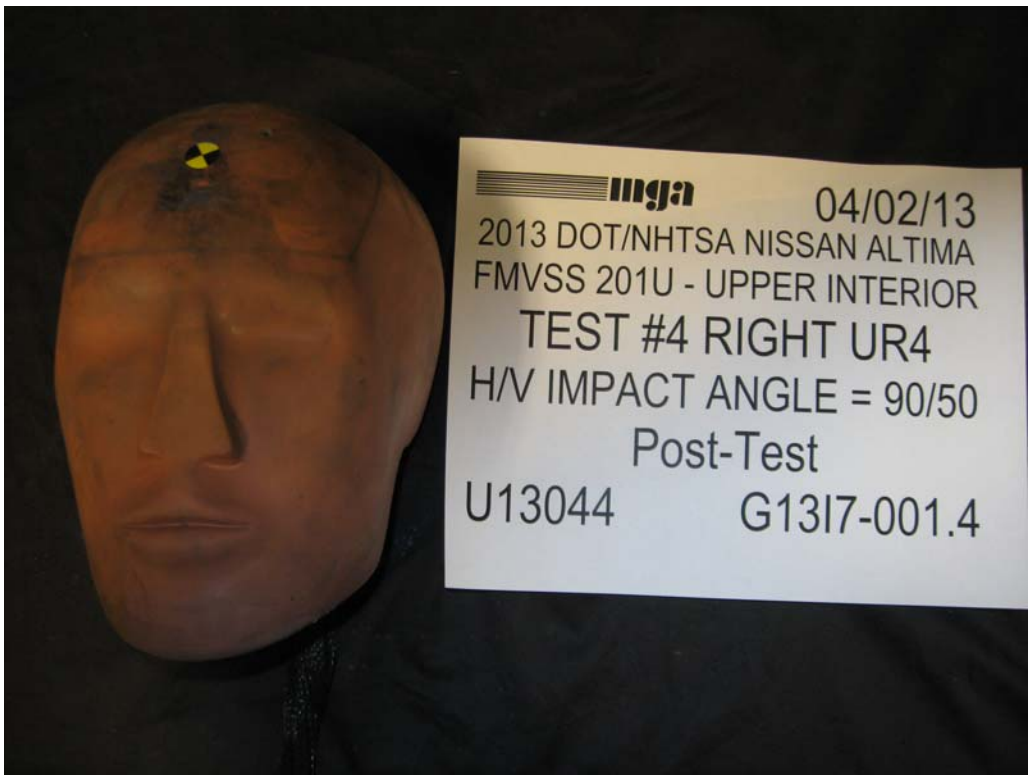
Pre-Test Photograph No. 1 of Test U13044

Pre-Test Photograph No. 2 of Test U13044

Post-Test Photograph No. 1 of Test U13044

Post-Test Photograph No. 2 of Test U13044

Post-Test Photograph No. 3 of Test U13044



Post-Test Photograph No. 4 of Test U13044

mga research corporation

FMVSS 201U
Test No.: U13044 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 04/02/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #4 Time: 1:22 pm

Horizontal Approach Angle: 90 deg Temperature: 21.4 °C

Vertical Approach Angle: 50 deg Humidity: 14.0 %RH

Impact Form ID No.: H35 Impact Form Mass: 4.51 kg

Target Location: UR4 @ X=1935 Right

Additional Description: None

Test Results

Impact Velocity: 23.59 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	795.77	75.6	83.9	8.3
HIC 15	795.77	75.6	83.9	8.3
HIC (d)	766.78	75.6	83.9	8.3

3 ms Clip = 103.31 G , Time 1 = 79.15 ms , Time 2 = 82.15 ms

Impact Location on FMH: 37 mm Above Pt. 0 , 1 Left mm Lateral of Pt. 0

Post-Test Comments: No visible damage

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 2, 2013

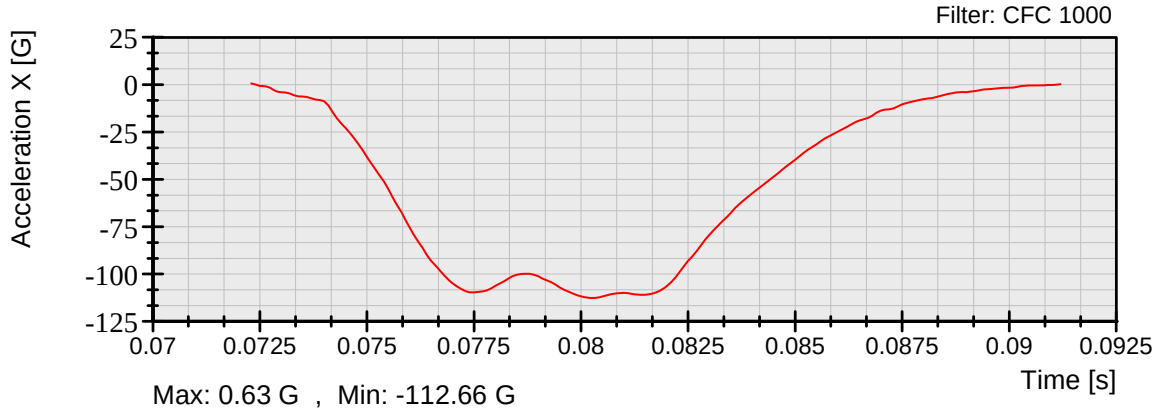
APPROVED BY: _____

mga research corporation

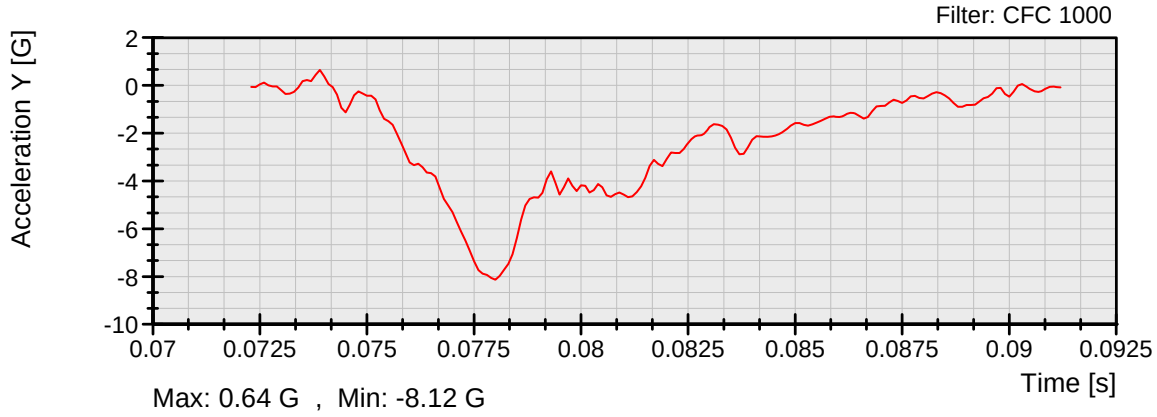
FMVSS 201U

Test No.: U13044 Report No.: G13I7-001.4

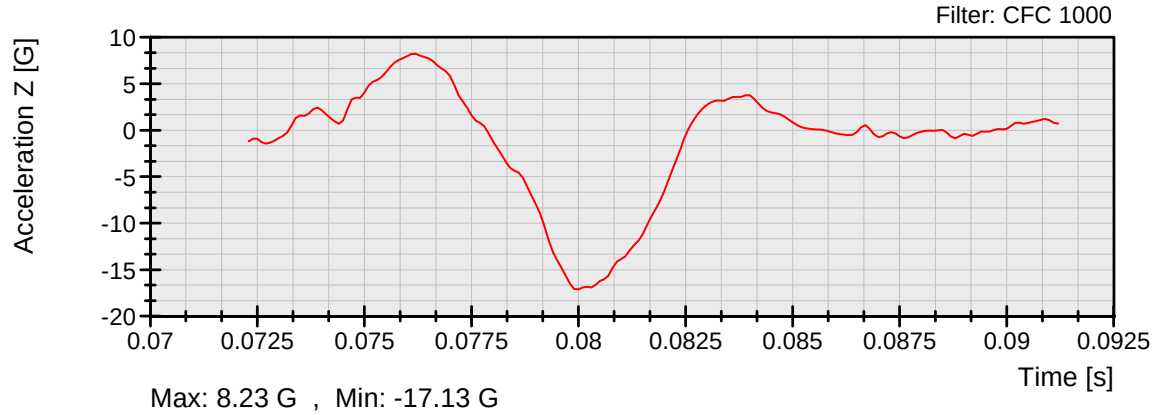
Customer: NHTSA/DOT Date: 04/02/2013



Max: 0.63 G , Min: -112.66 G



Max: 0.64 G , Min: -8.12 G



Max: 8.23 G , Min: -17.13 G

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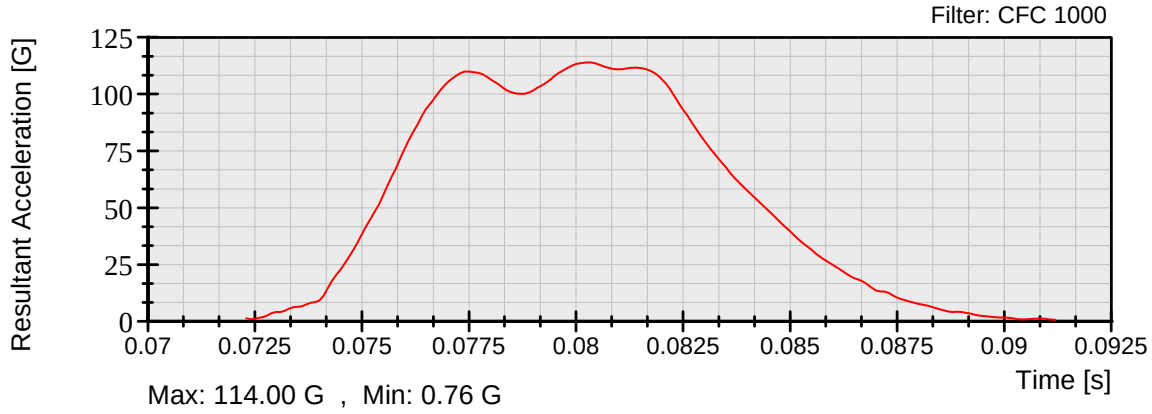
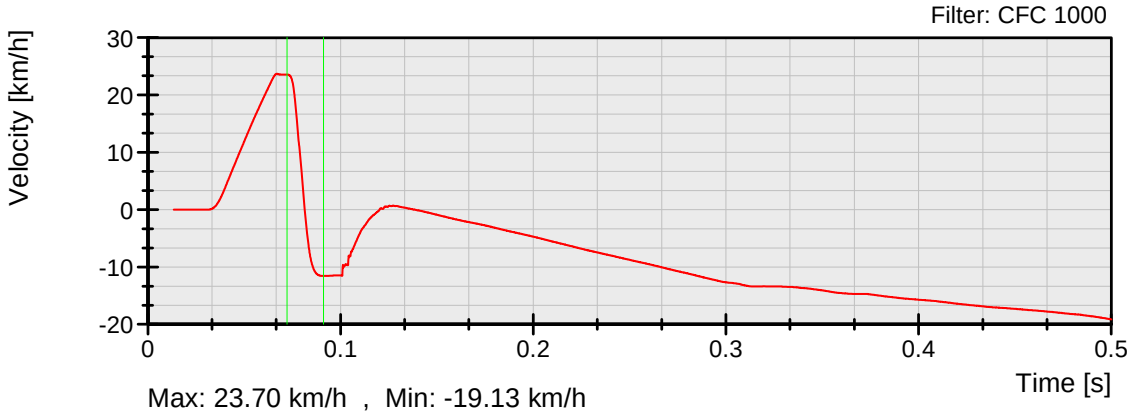
FMVSS 201U

Test No.: U13044 Report No.: G13I7-001.4

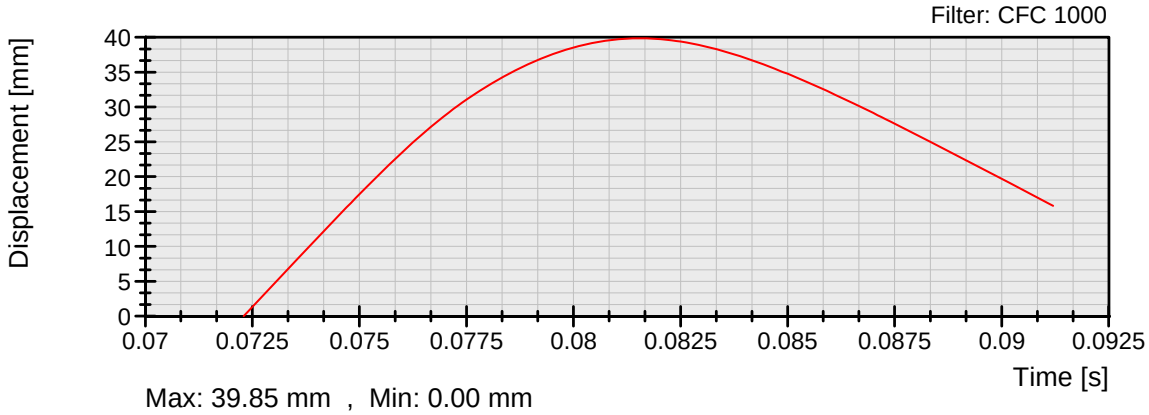
Customer: NHTSA/DOT Date: 04/02/2013



Max: 114.00 G , Min: 0.76 G

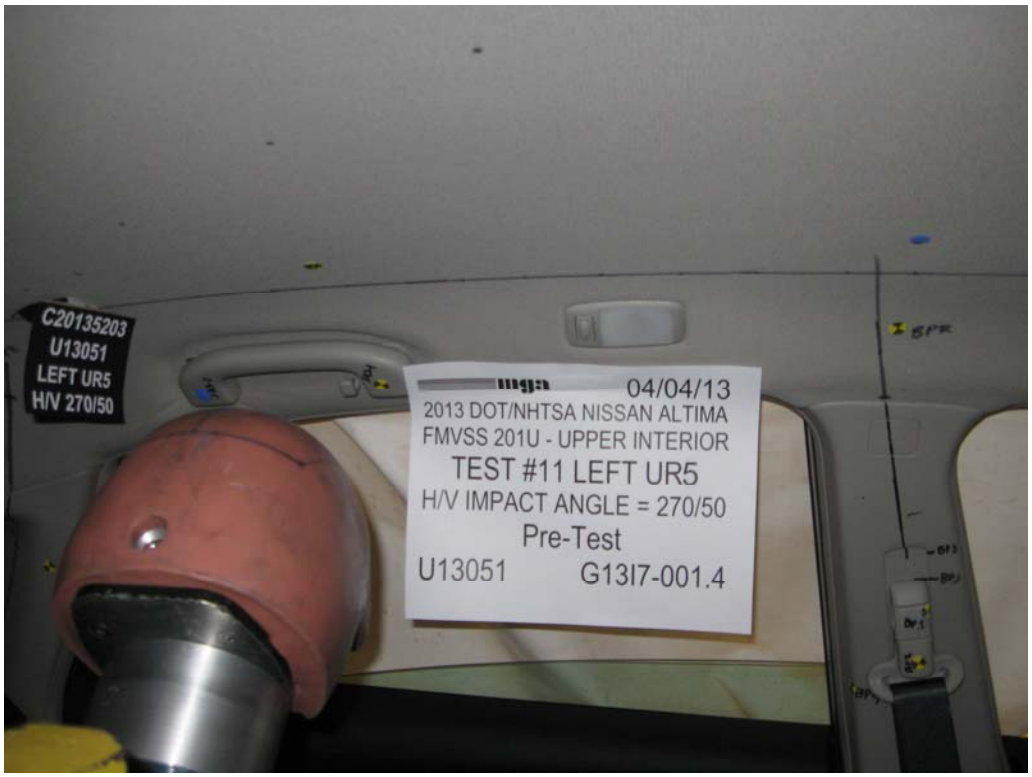


Max: 23.70 km/h , Min: -19.13 km/h



Max: 39.85 mm , Min: 0.00 mm

Pre-Test Photograph No. 1 of Test U13051

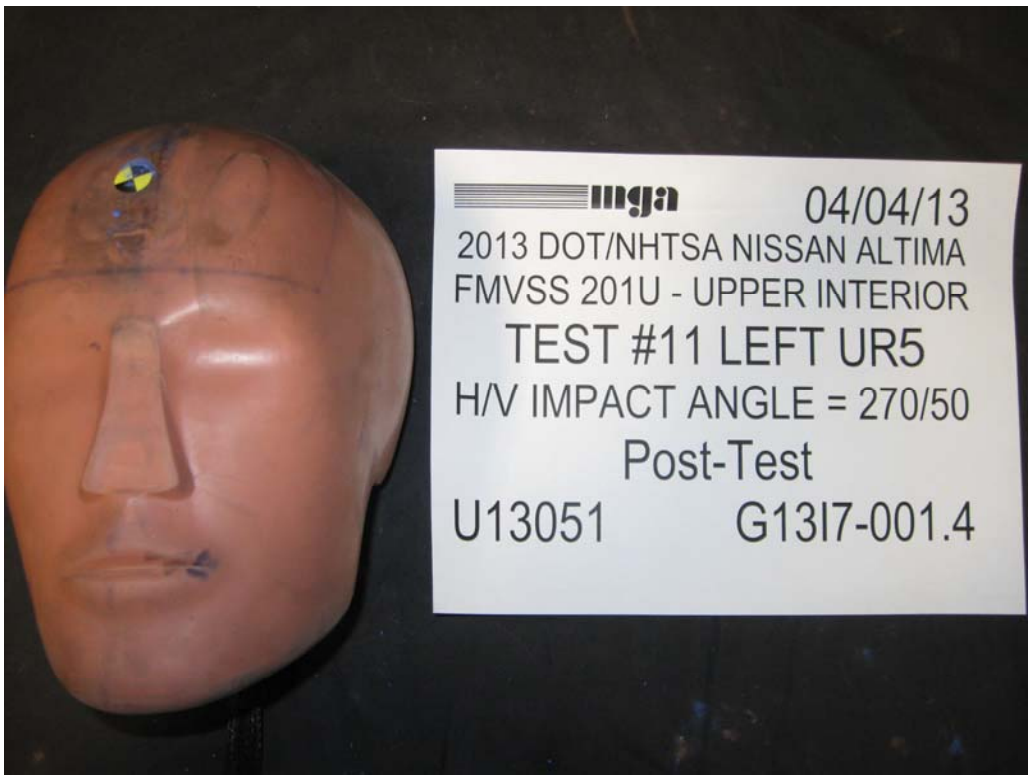


Pre-Test Photograph No. 2 of Test U13051

Post-Test Photograph No. 1 of Test U13051

Post-Test Photograph No. 2 of Test U13051

Post-Test Photograph No. 3 of Test U13051



Post-Test Photograph No. 4 of Test U13051

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FMVSS 201U
Test No.: U13051 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 4/4/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #11 Time: 2:15 pm

Horizontal Approach Angle: 270 deg Temperature: 21.6 °C

Vertical Approach Angle: 50 deg Humidity: 16.1 %RH

Impact Form ID No.: H37 Impact Form Mass: 4.55 kg

Target Location: UR5 @ SR3-1 Left

Additional Description: None

Test Results

Impact Velocity: 23.97 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	521.44	76	86.1	10.1
HIC 15	521.44	76	86.1	10.1
HIC (d)	559.81	76	86.1	10.1

3 ms Clip = 83.45 G , Time 1 = 79.93 ms , Time 2 = 82.93 ms

Impact Location on FMH: 42 mm Above Pt. 0 , 8 right mm Lateral of Pt. 0

Post-Test Comments: Headliner deformation

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 4, 2013

APPROVED BY: _____

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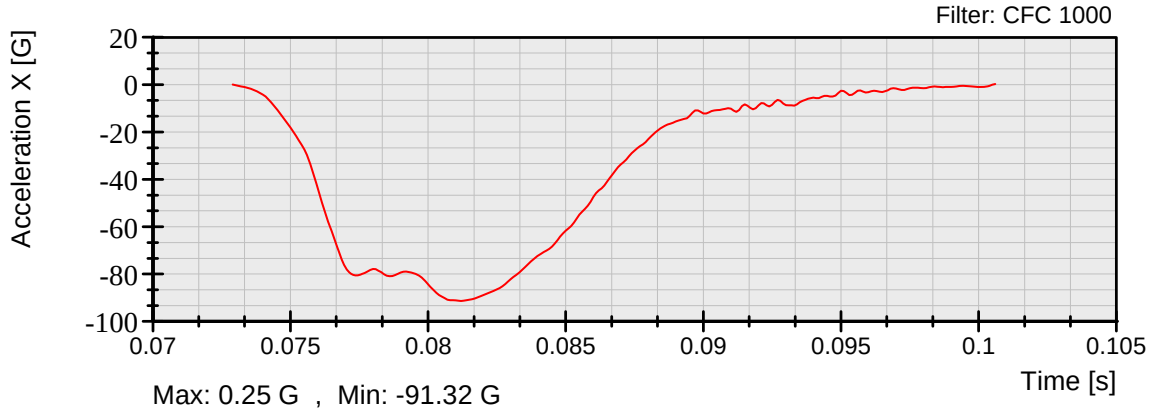
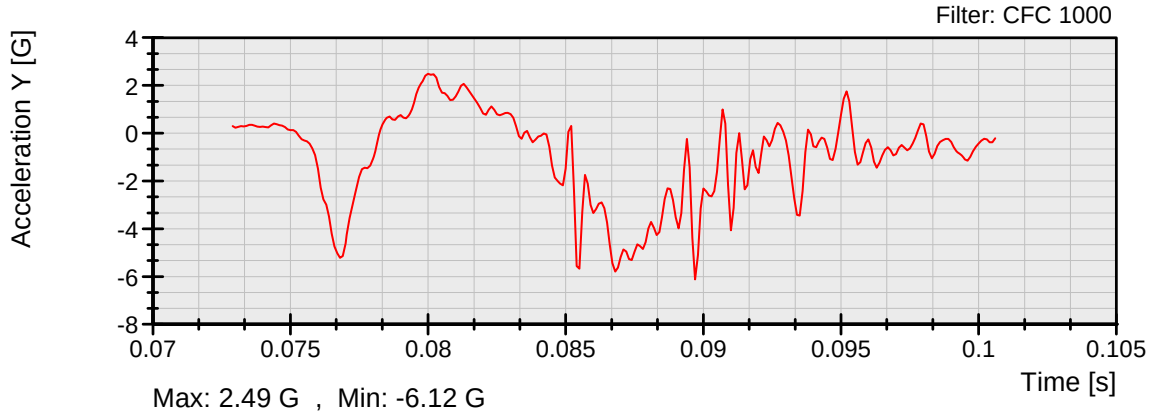
FMVSS 201U

Test No.: U13051 Report No.: G13I7-001.4

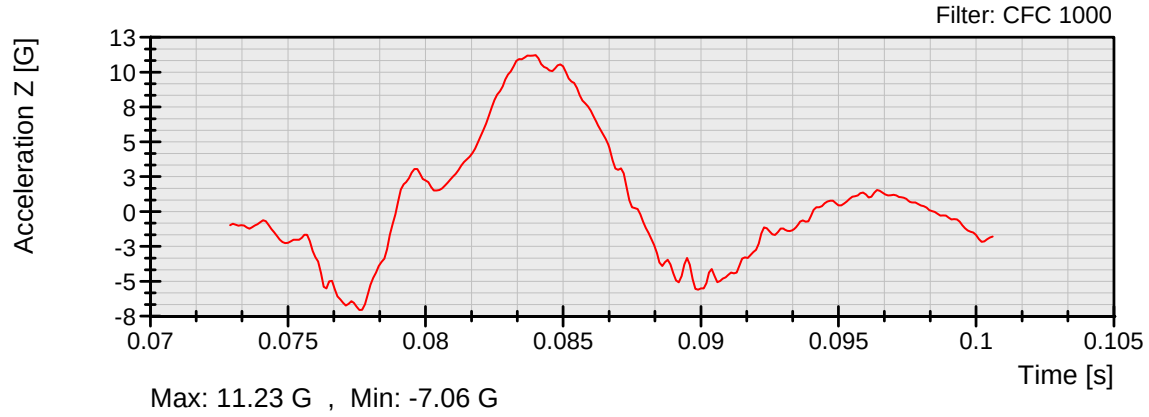
Customer: NHTSA/DOT Date: 4/4/2013



Max: 0.25 G , Min: -91.32 G



Max: 2.49 G , Min: -6.12 G



Max: 11.23 G , Min: -7.06 G

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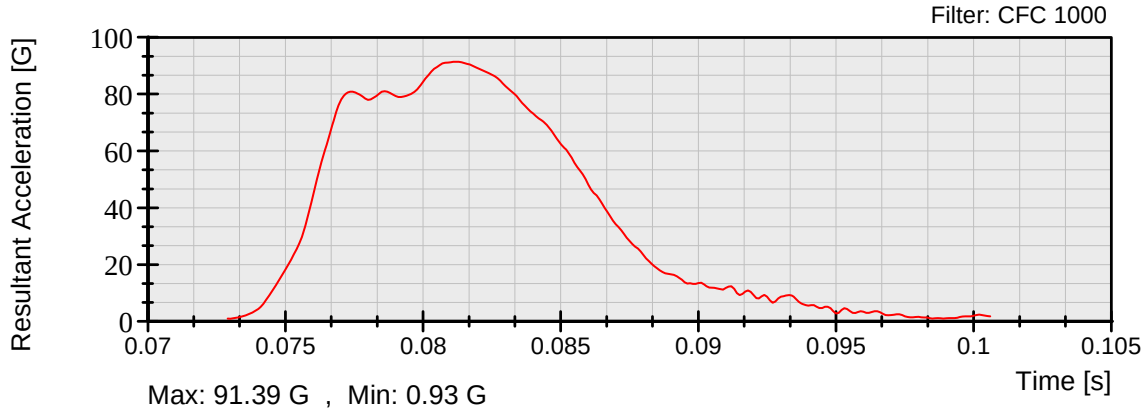
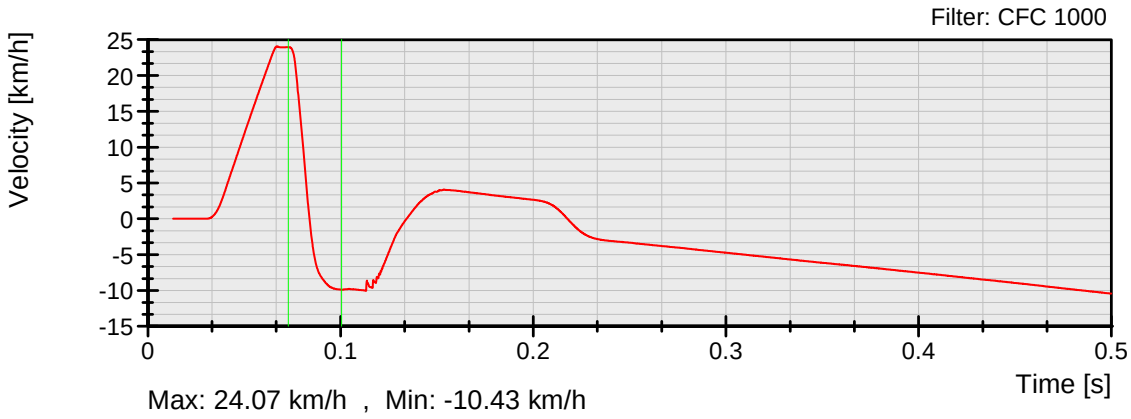
FMVSS 201U

Test No.: U13051 Report No.: G13I7-001.4

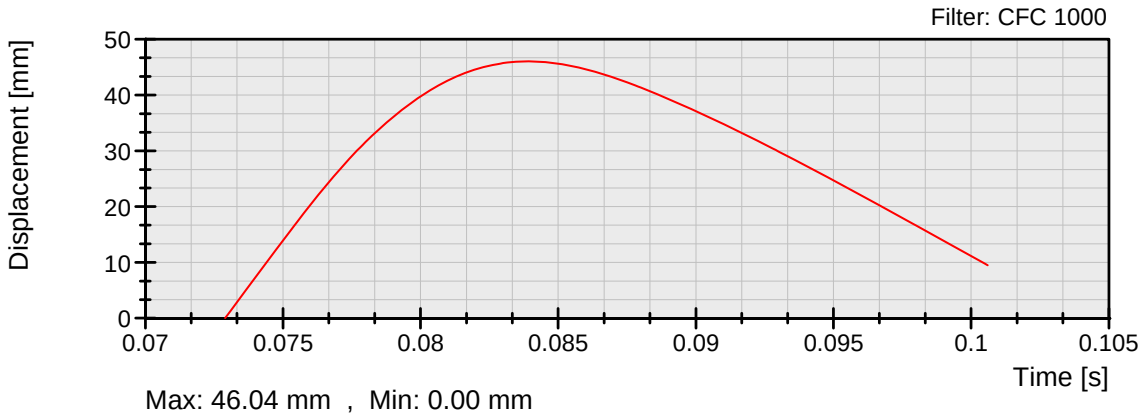
Customer: NHTSA/DOT Date: 4/4/2013



Max: 91.39 G , Min: 0.93 G

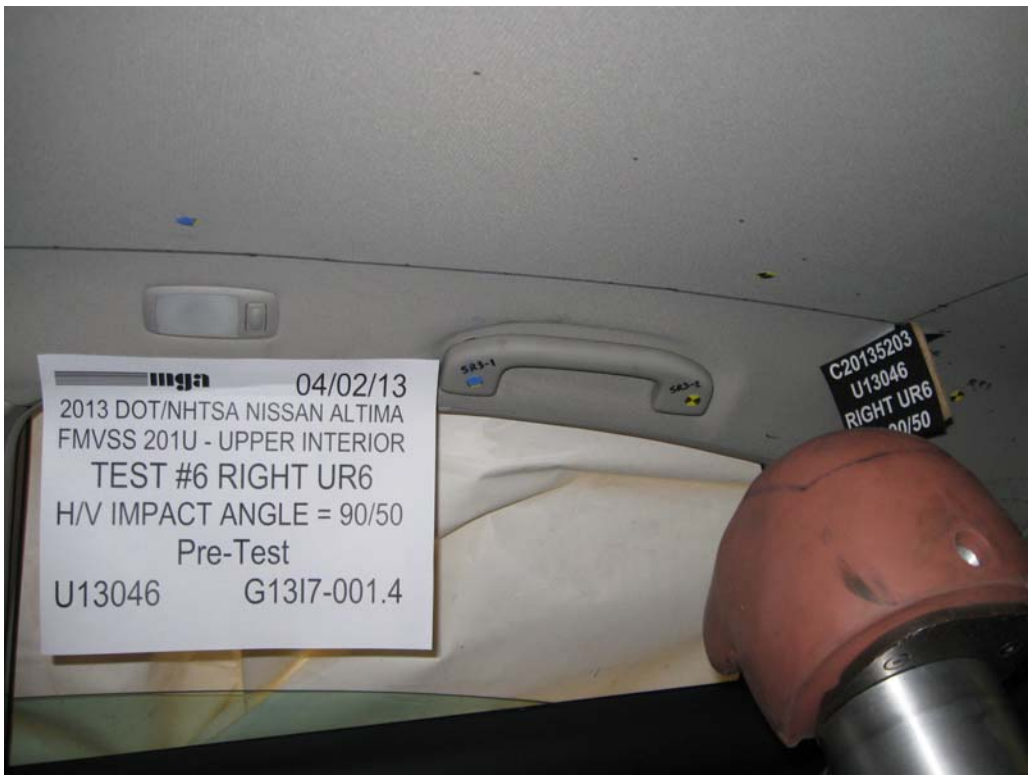


Max: 24.07 km/h , Min: -10.43 km/h



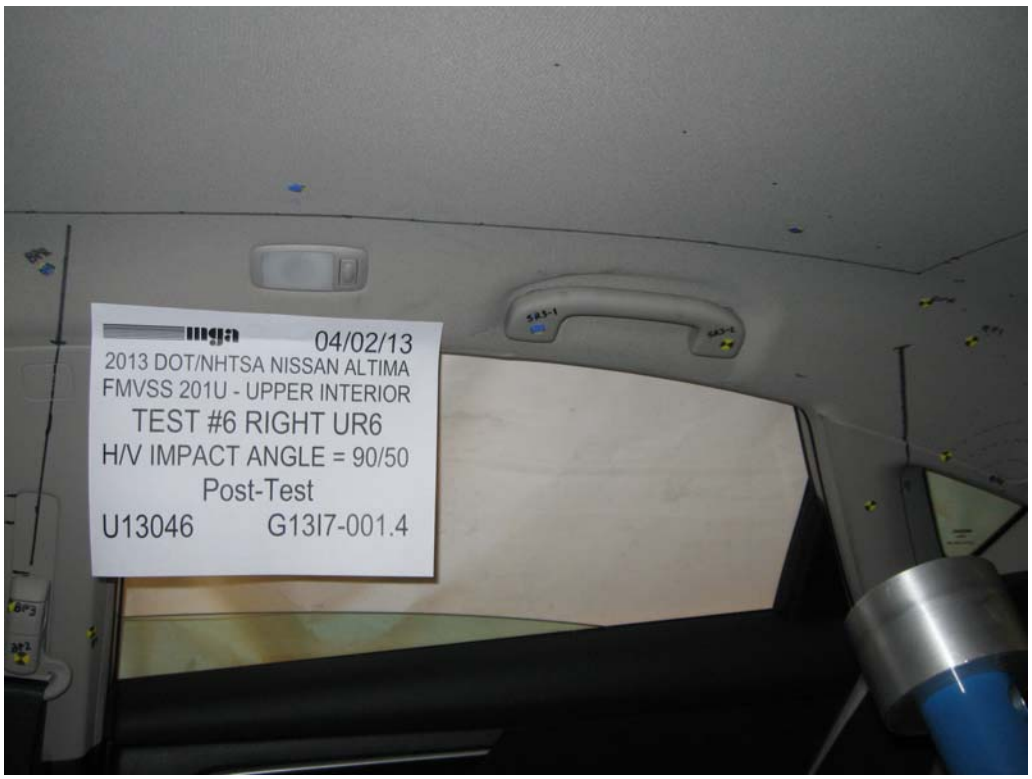
Max: 46.04 mm , Min: 0.00 mm

Pre-Test Photograph No. 1 of Test U13046



Pre-Test Photograph No. 2 of Test U13046

Post-Test Photograph No. 1 of Test U13046



Post-Test Photograph No. 2 of Test U13046

Post-Test Photograph No. 3 of Test U13046

Post-Test Photograph No. 4 of Test U13046

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FMVSS 201U
Test No.: U13046 Report No.: G13I7-001.4
Customer: NHTSA/DOT Date: 04/02/2013

Summary of the Test

Setup Information

Sample Description: 2013 Nissan Altima

Test Sequence No.: #6 Time: 2:35 pm

Horizontal Approach Angle: 90 deg Temperature: 21.4 °C

Vertical Approach Angle: 50 deg Humidity: 14.0 %RH

Impact Form ID No.: H38 Impact Form Mass: 4.51 kg

Target Location: UR6 @ SR3-2

Additional Description: None

Test Results

Impact Velocity: 23.64 km/h

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	534.86	76.3	85.4	9.1
HIC 15	534.86	76.3	85.4	9.1
HIC (d)	569.93	76.3	85.4	9.1

3 ms Clip = 87.61 G , Time 1 = 77.99 ms , Time 2 = 82.24 ms

Impact Location on FMH: 42 mm Above Pt. 0 , 9 Right mm Lateral of Pt. 0

Post-Test Comments: Headliner Deformation

Test Series Performed By: DP, JC, SM

RECORDED BY: _____ DATE: April 2, 2013

APPROVED BY: _____

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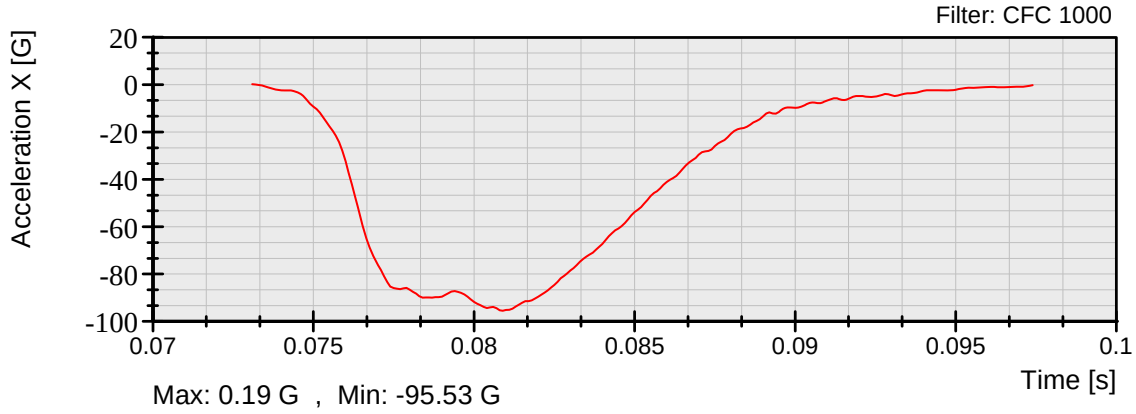
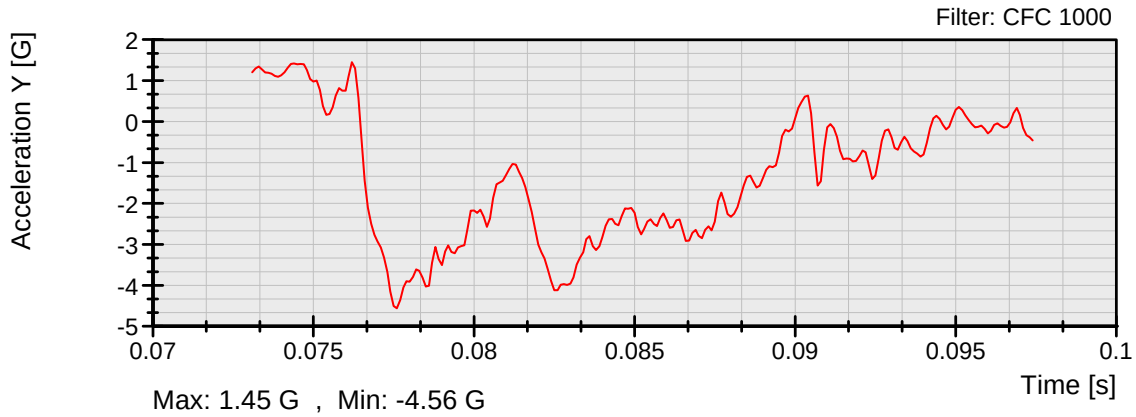
FMVSS 201U

Test No.: U13046 Report No.: G13I7-001.4

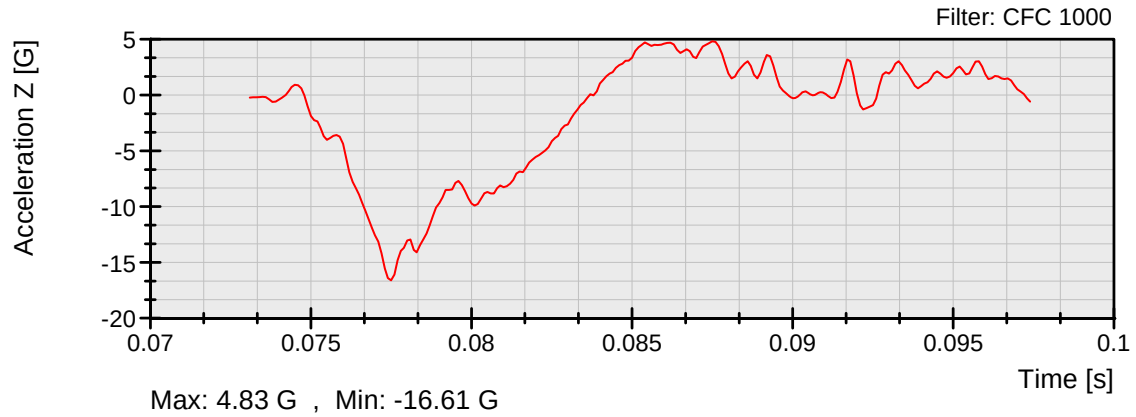
Customer: NHTSA/DOT Date: 04/02/2013



Max: 0.19 G , Min: -95.53 G



Max: 1.45 G , Min: -4.56 G



Max: 4.83 G , Min: -16.61 G

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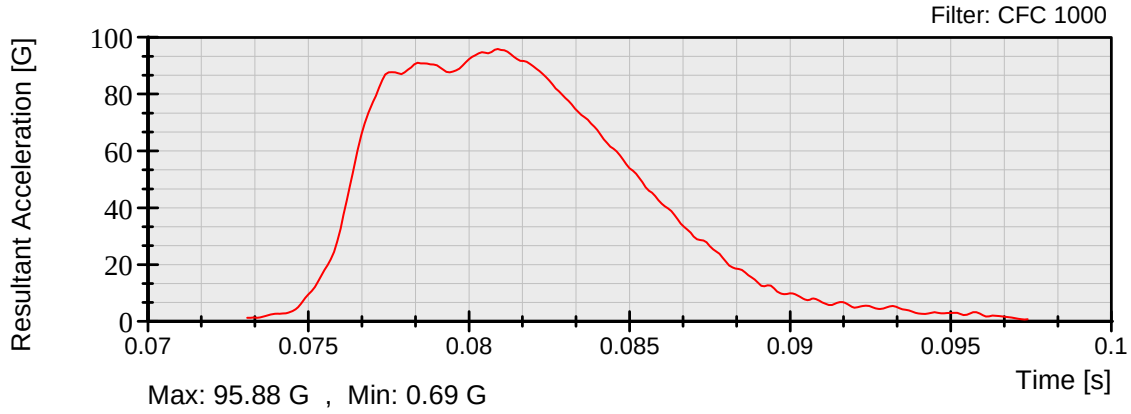
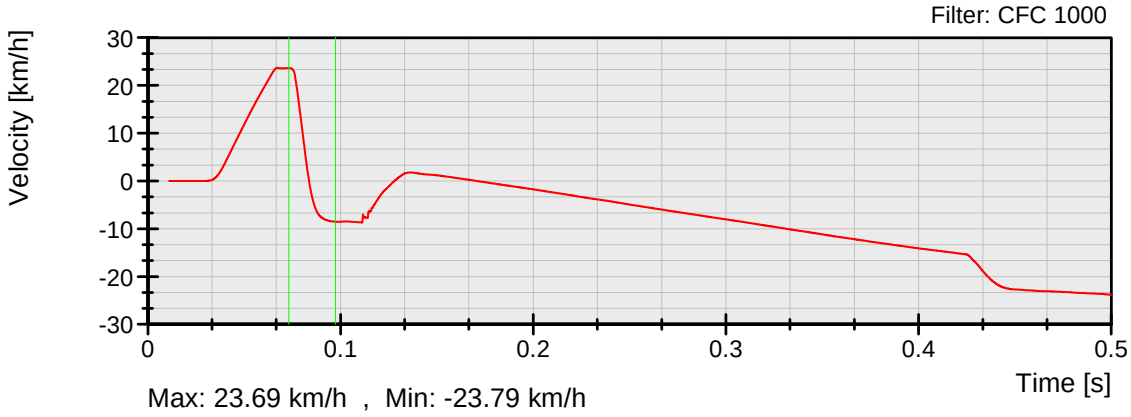
FMVSS 201U

Test No.: U13046 Report No.: G13I7-001.4

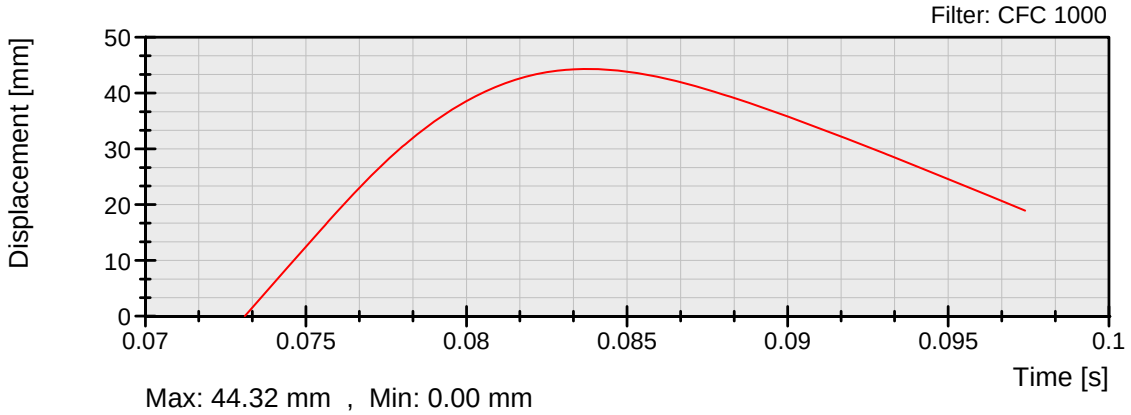
Customer: NHTSA/DOT Date: 04/02/2013



Max: 95.88 G , Min: 0.69 G



Max: 23.69 km/h , Min: -23.79 km/h



Max: 44.32 mm , Min: 0.00 mm

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

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

TABLE 4-1 LIST OF ITEMS USED

ITEM	MANUFACTURER NAME	MODEL #	FUNCTION OF ITEM	ACCURACY	CAL. INTERNAL
Head Drop Tower (includes test frame and DAS)	MGA Research Corp.	MGA-100-DC	FMH Calibration	N/A	N/A
Accelerometers	Endevco	7264-2000	Acceleration Data	±0.5%	6 months
FMVSS 201U Test Frame (includes the propulsion control system, actuator, test frame, and DAS)	MGA Research Corp.	MGA-100-FMH	Test System	N/A	N/A
Free Motion Headforms	UTAMA UTAMA UTAMA	035 037 038	Test Device	N/A	Pre and Post-Test Series
High Speed Video	Vision Research	Miro Ex4	Record Event	N/A	N/A
*FARO™	Faro Technologies	G10020001619	Targeting	0.1 mm	Annual
Measuring Devices: - Tape Measure - Plumb Bobs - Digital Protractor	 Stanley N/A Westward	 TPM331 -- MGA00967	 Measurement Targeting FMH setup Horizontal Measurement	 1 mm N/A 0.5°	Annual
*Temperature Recorder	Dickson	MGA00152	Record Temperature and Humidity	± 1°C ± 1% RH	Annual
* Scale	Detecto	MGA00783	Weigh FMH Head	± 0.01 lb	Annual
*Vehicle Scale	Sterling Scale	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 (kg)	Temp (ºC)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
35	Pre	4/1/2013	4.51	20.8	19.6	263.6	6.08	Yes
35	Post	4/8/2013	4.51	21.9	26.0	265.3	2.75	Yes
37	Pre	4/1/2013	4.54	20.9	19.4	233.7	3.16	Yes
37	Post	4/8/2013	4.54	21.8	26.0	235.3	3.51	Yes
38	Pre	4/1/2013	4.51	20.9	18.8	231.7	8.20	Yes
38	Post	4/8/2013	4.51	21.7	26.0	242.0	10.42	Yes

4-1 Pre-Test Calibration

Calibration Series: FMVSS 201U FMH

Test No.: H35006 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/1/2013

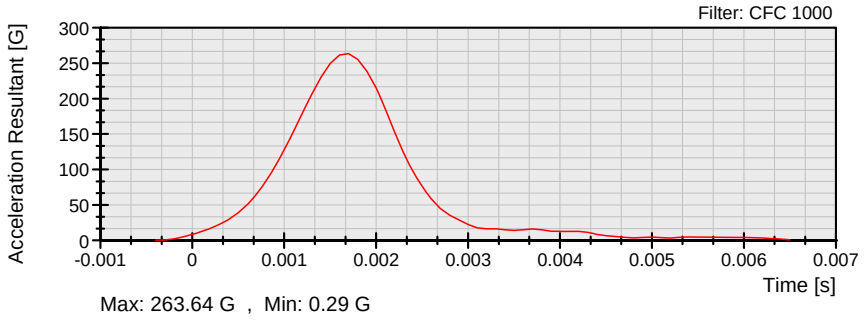
Summary of Results:

Impact Form ID No.: H35

Item Description	Result	Requirement
Temperature (°C)	20.8 °C	19ºC and 26ºC
Humidity (%RH)	19.6 % RH	10% to 70% RH
Impact Form Mass (kg)	4.51 kg	4.54 ± 0.05 kg
Resultant Acceleration (G)	263.64 G	225 to 275 G
Peak Y-Acceleration (G)	6.08 G	< 15 G
Unimodal?	Yes	Yes

Calibration Performed By: Joshua Campbell Time: 09:44:52

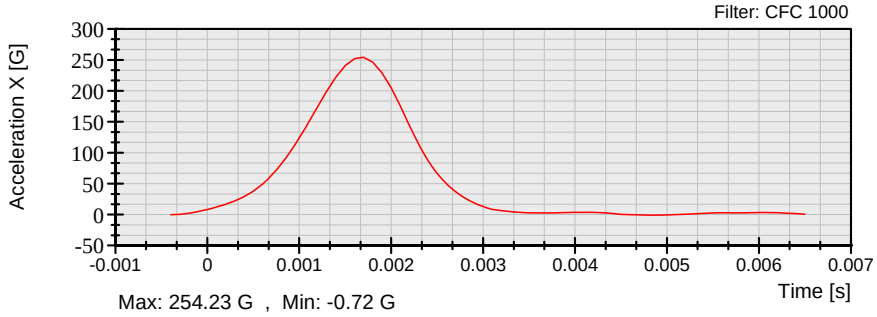
Comments: NA



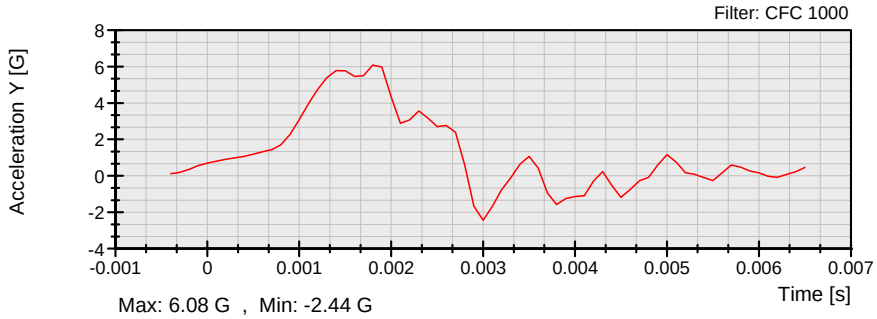
Max: 263.64 G , Min: 0.29 G

Calibration Series: FMVSS 201U FMH

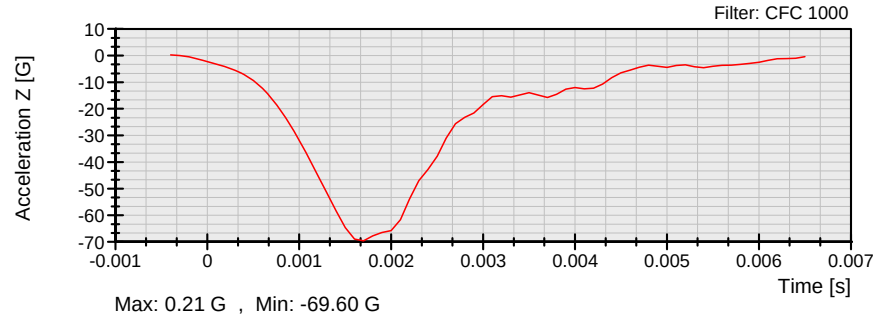
Test No: H35006 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/1/2013



Max: 254.23 G , Min: -0.72 G



Max: 6.08 G , Min: -2.44 G



Max: 0.21 G , Min: -69.60 G

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Calibration Series: FMVSS 201U FMH

Test No.: H35006 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/1/2013

Test Results

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	820.96	1	2.3	1.3
HIC 15	820.96	1	2.3	1.3
HIC (d)	785.78	1	2.3	1.3

RECORDED BY: _____ DATE: April 1, 2013

APPROVED BY: _____

4-2 Post-Test Calibration

mga research corporation

Calibration Series: FMVSS 201U FMH

Test No.: H35007 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/8/2013

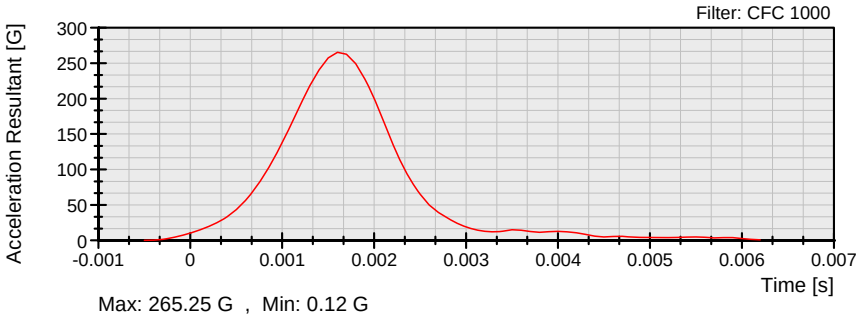
Summary of Results:

Impact Form ID No.: H35

Item Description	Result	Requirement
Temperature (°C)	21.9 °C	19ºC and 26ºC
Humidity (%RH)	26 % RH	10% to 70% RH
Impact Form Mass (kg)	4.51 kg	4.54 ± 0.05 kg
Resultant Acceleration (G)	265.25 G	225 to 275 G
Peak Y-Acceleration (G)	2.75 G	< 15 G
Unimodal?	Yes	Yes

Calibration Performed By: Joshua Campbell Time: 08:53:09

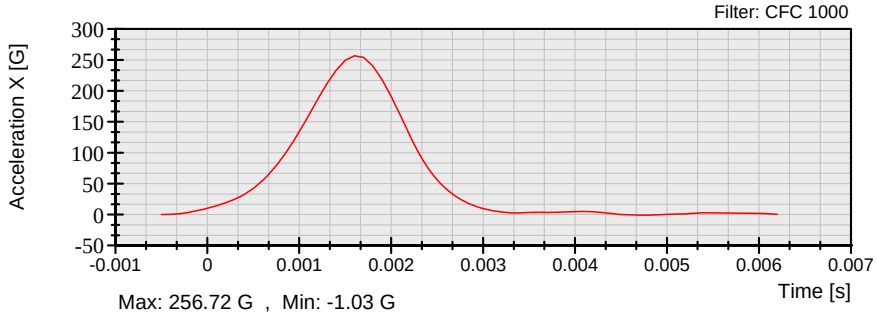
Comments: NA



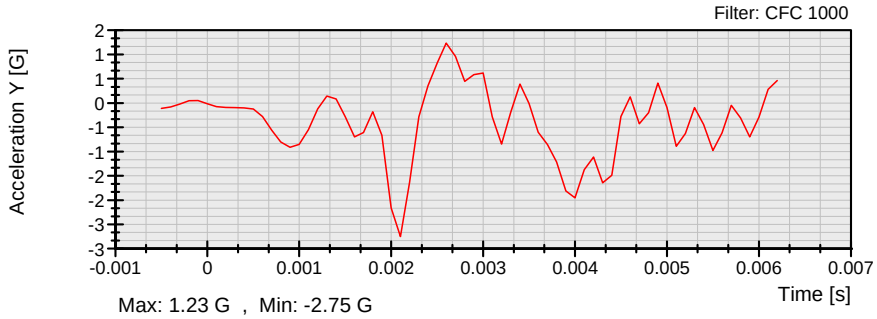
Max: 265.25 G , Min: 0.12 G

Calibration Series: FMVSS 201U FMH

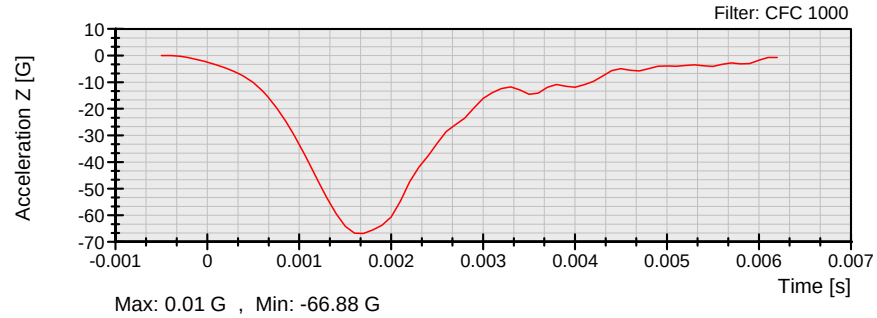
Test No: H35007 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/8/2013



Max: 256.72 G , Min: -1.03 G



Max: 1.23 G , Min: -2.75 G



Max: 0.01 G , Min: -66.88 G

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Calibration Series: FMVSS 201U FMH

Test No.: H35007 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/8/2013

Test Results

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	816.02	1	2.2	1.2
HIC 15	816.02	1	2.2	1.2
HIC (d)	782.05	1	2.2	1.2

RECORDED BY: _____ DATE: April 8, 2013

APPROVED BY: _____

4-3 Pre-Test Calibration

Calibration Series: FMVSS 201U FMH

Test No.: H37006 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/1/2013

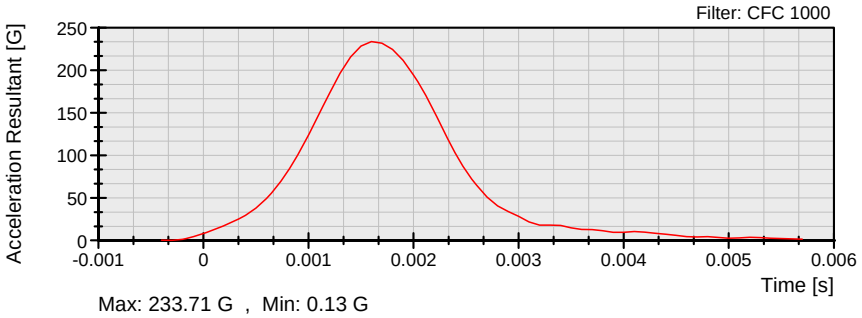
Summary of Results:

Impact Form ID No.: H37

Item Description	Result	Requirement
Temperature (°C)	20.9 °C	19ºC and 26ºC
Humidity (%RH)	19.4 % RH	10% to 70% RH
Impact Form Mass (kg)	4.54 kg	4.54 ± 0.05 kg
Resultant Acceleration (G)	233.71 G	225 to 275 G
Peak Y-Acceleration (G)	3.16 G	< 15 G
Unimodal?	Yes	Yes

Calibration Performed By: Joshua Campbell Time: 10:27:21

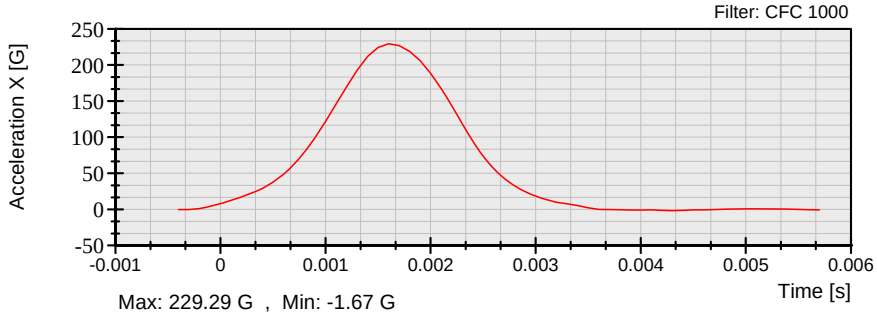
Comments: NA



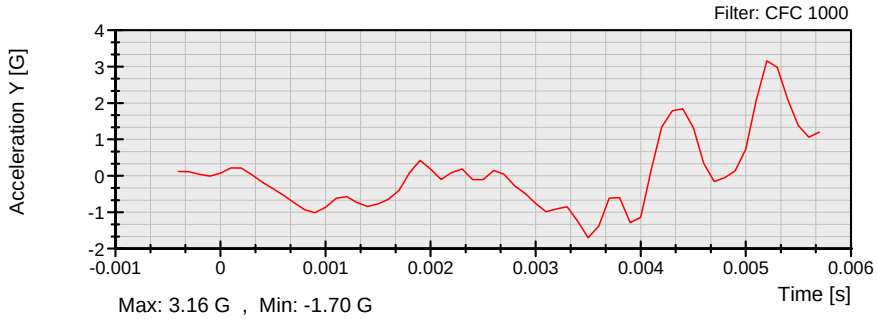
Max: 233.71 G , Min: 0.13 G

Calibration Series: FMVSS 201U FMH

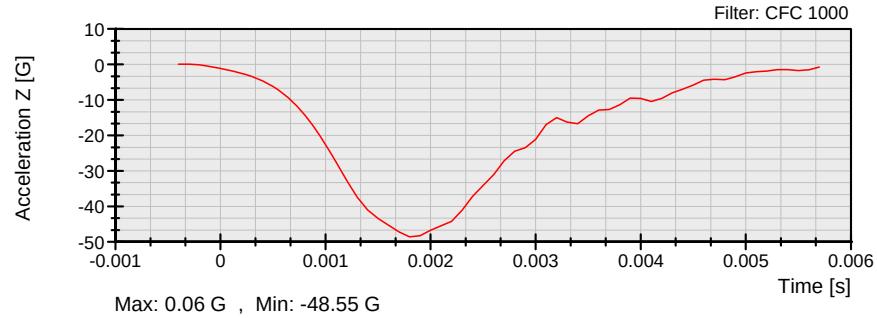
Test No: H37006 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/1/2013



Max: 229.29 G , Min: -1.67 G



Max: 3.16 G , Min: -1.70 G



Max: 0.06 G , Min: -48.55 G

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Calibration Series: FMVSS 201U FMH

Test No.: H37006 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/1/2013

Test Results

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	672.62	0.9	2.4	1.5
HIC 15	672.62	0.9	2.4	1.5
HIC (d)	673.87	0.9	2.4	1.5

Page 3 of 3

RECORDED BY: _____ DATE: April 1, 2013

APPROVED BY: _____

4-4 Post-Test Calibration

Calibration Series: FMVSS 201U FMH

Test No.: H37007 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/8/2013

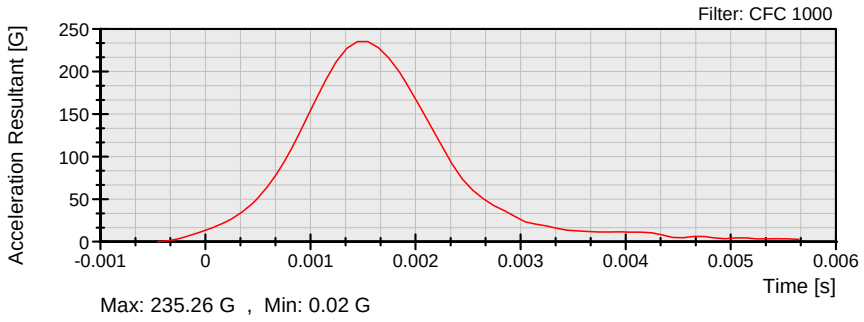
Summary of Results:

Impact Form ID No.: H37

Item Description	Result	Requirement
Temperature (°C)	21.8 °C	19ºC and 26ºC
Humidity (%RH)	26 % RH	10% to 70% RH
Impact Form Mass (kg)	4.54 kg	4.54 ± 0.05 kg
Resultant Acceleration (G)	235.26 G	225 to 275 G
Peak Y-Acceleration (G)	3.51 G	< 15 G
Unimodal?	Yes	Yes

Calibration Performed By: Joshua Campbell Time: 09:44:54

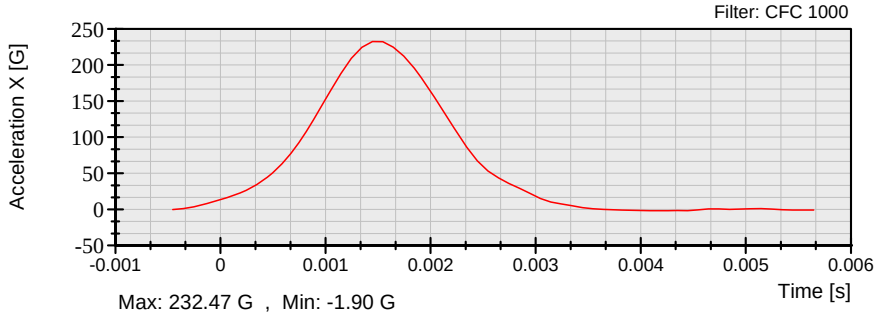
Comments: NA



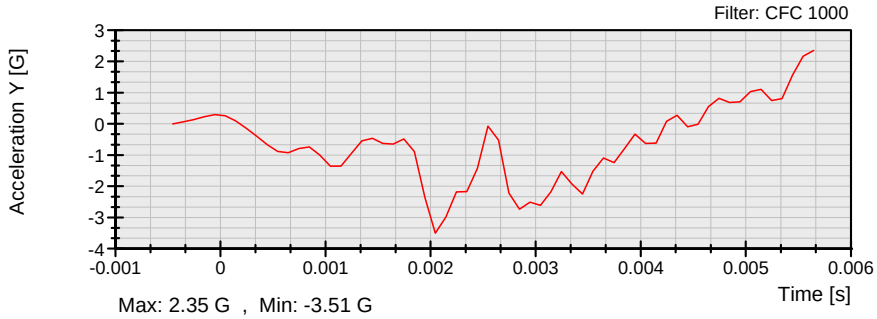
Max: 235.26 G , Min: 0.02 G

Calibration Series: FMVSS 201U FMH

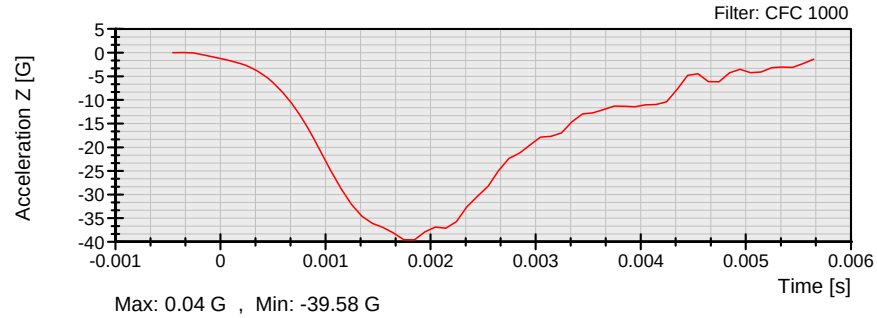
Test No: H37007 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/8/2013



Max: 232.47 G , Min: -1.90 G



Max: 2.35 G , Min: -3.51 G



Max: 0.04 G , Min: -39.58 G

mga research corporation

Calibration Series: FMVSS 201U FMH

Test No.: H37007 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/8/2013

Test Results

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	682.06	0.85	2.25	1.4
HIC 15	682.06	0.85	2.25	1.4
HIC (d)	680.99	0.85	2.25	1.4

Page 3 of 3

RECORDED BY: _____ DATE: April 8, 2013

APPROVED BY: _____

4-5 Pre-Test Calibration

Calibration Series: FMVSS 201U FMH

Test No.: H38006 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/1/2013

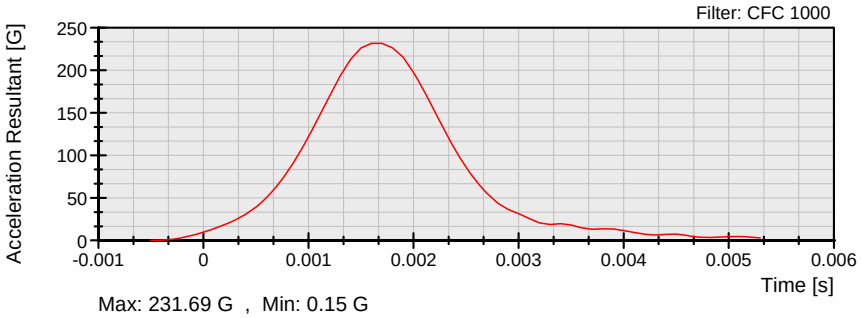
Summary of Results:

Impact Form ID No.: H38

Item Description	Result	Requirement
Temperature (°C)	20.9 °C	19ºC and 26ºC
Humidity (%RH)	18.8 % RH	10% to 70% RH
Impact Form Mass (kg)	4.51 kg	4.54 ± 0.05 kg
Resultant Acceleration (G)	231.69 G	225 to 275 G
Peak Y-Acceleration (G)	8.20 G	< 15 G
Unimodal?	Yes	Yes

Calibration Performed By: Joshua Campbell Time: 10:51:25

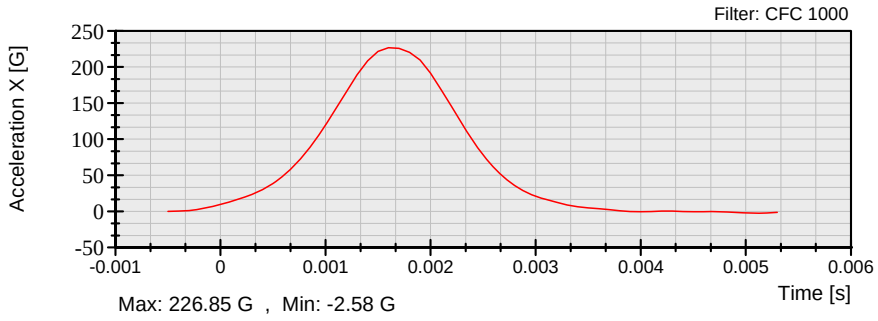
Comments: NA



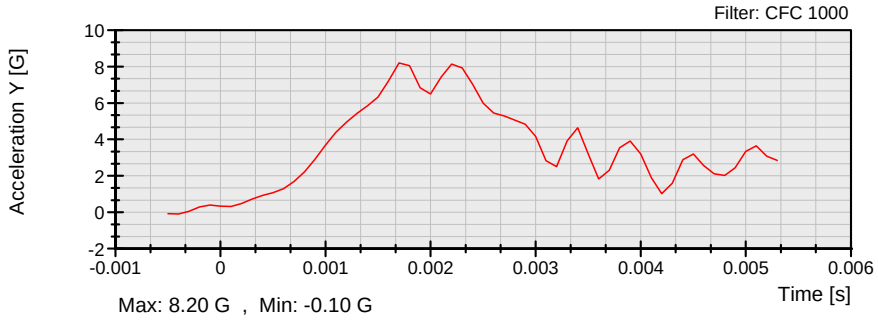
Max: 231.69 G , Min: 0.15 G

Calibration Series: FMVSS 201U FMH

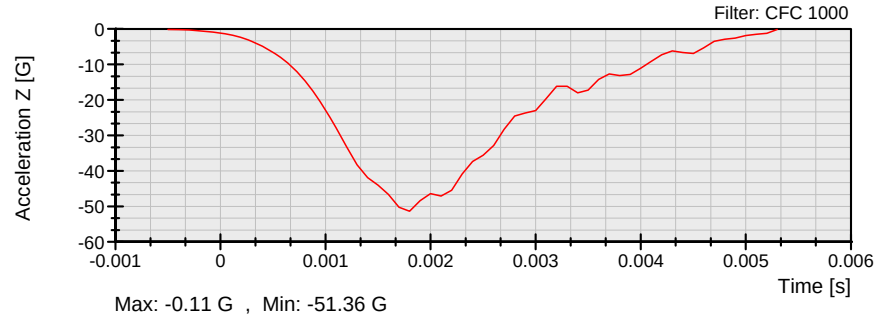
Test No: H38006 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/1/2013



Max: 226.85 G , Min: -2.58 G



Max: 8.20 G , Min: -0.10 G



Max: -0.11 G , Min: -51.36 G

mga research corporation

Calibration Series: FMVSS 201U FMH

Test No.: H38006 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/1/2013

Test Results

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	670.36	0.9	2.4	1.5
HIC 15	670.36	0.9	2.4	1.5
HIC (d)	672.16	0.9	2.4	1.5

RECORDED BY: _____ DATE: April 1, 2013

APPROVED BY: _____

4-6 Post-Test Calibration

mga research corporation

Calibration Series: FMVSS 201U FMH

Test No.: H38007 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/8/2013

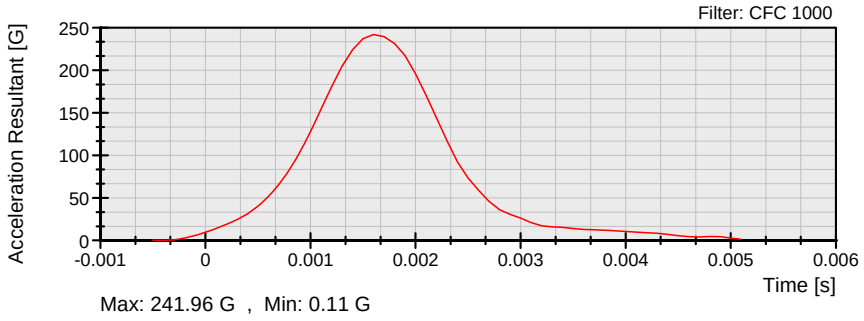
Summary of Results:

Impact Form ID No.: H38

Item Description	Result	Requirement
Temperature (°C)	21.7 °C	19ºC and 26ºC
Humidity (%RH)	26 % RH	10% to 70% RH
Impact Form Mass (kg)	4.51 kg	4.54 ± 0.05 kg
Resultant Acceleration (G)	241.96 G	225 to 275 G
Peak Y-Acceleration (G)	10.42 G	< 15 G
Unimodal?	Yes	Yes

Calibration Performed By: Joshua Campbell Time: 10:08:25

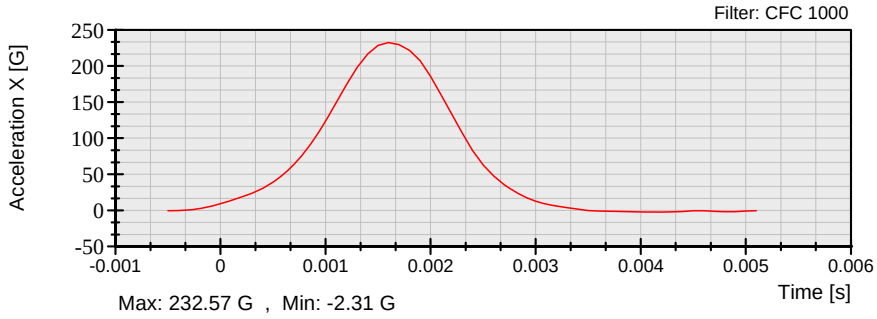
Comments: NA



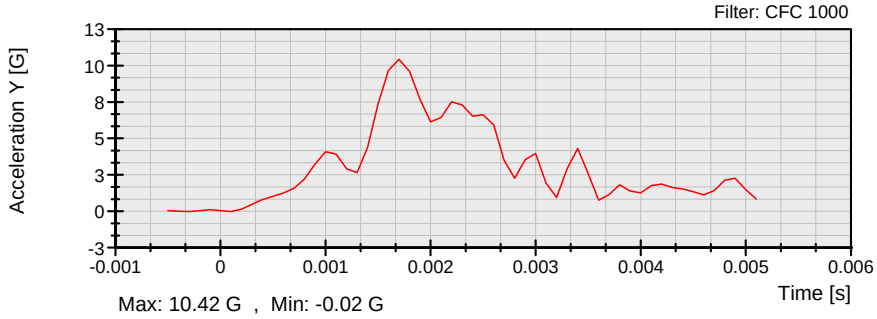
Max: 241.96 G , Min: 0.11 G

Calibration Series: FMVSS 201U FMH

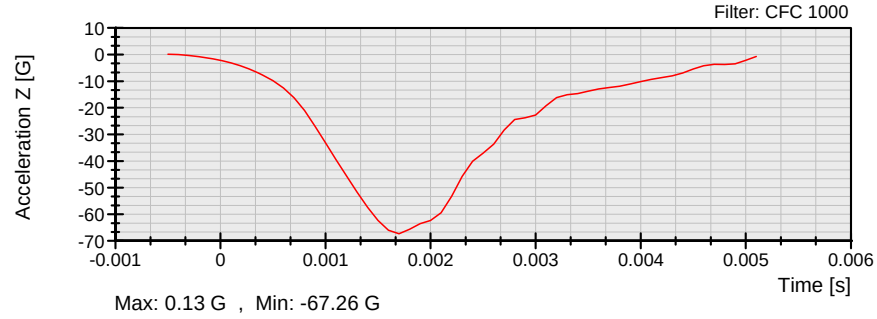
Test No: H38007 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/8/2013



Max: 232.57 G , Min: -2.31 G



Max: 10.42 G , Min: -0.02 G



Max: 0.13 G , Min: -67.26 G

Calibration Series: FMVSS 201U FMH

Test No.: H38007 Report No.: G13I7-001.4
Customer: NHTSA Date: 4/8/2013

Test Results

HIC Type	HIC Value	Time 1 (ms)	Time 2 (ms)	Delta-T (ms)
HIC 36	710.12	1	2.3	1.3
HIC 15	710.12	1	2.3	1.3
HIC (d)	702.16	1	2.3	1.3

RECORDED BY: _____ DATE: April 8, 2013

APPROVED BY: _____

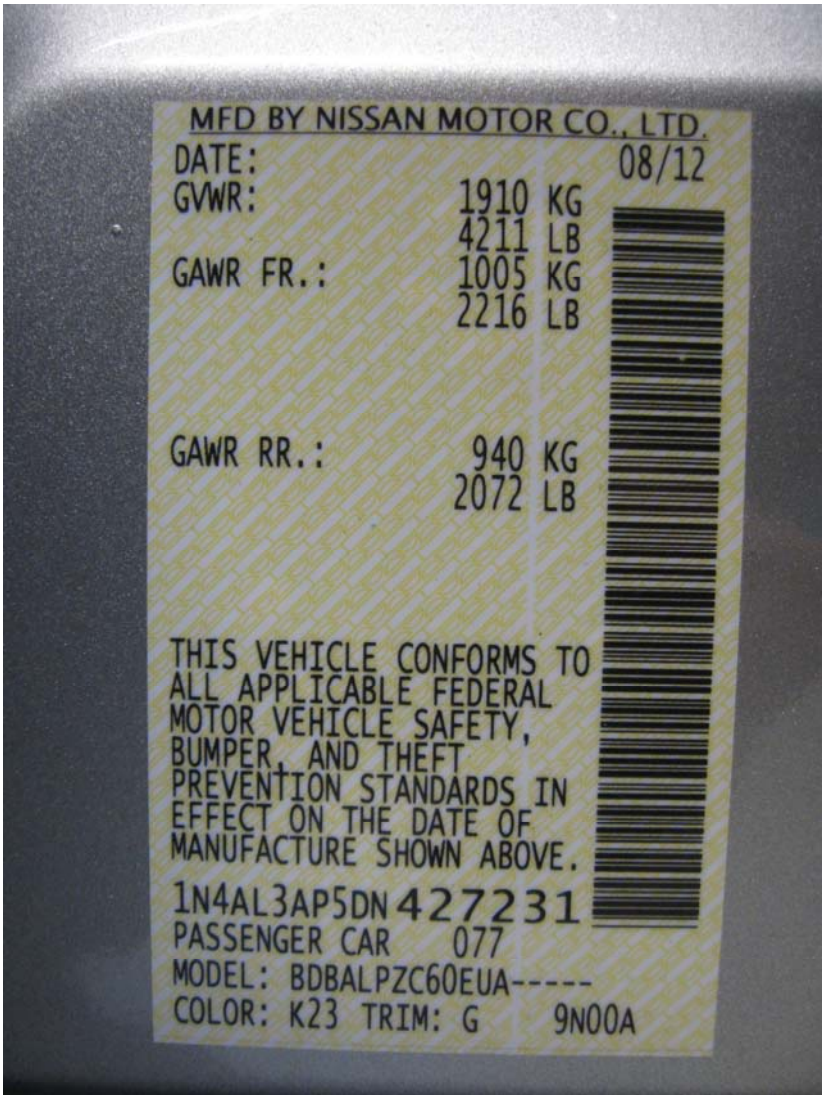
5.0 PHOTOGRAPHS

As Delivered – Left Side View

As Delivered – Right Side View

As Delivered – ¾ Front View From Left Side

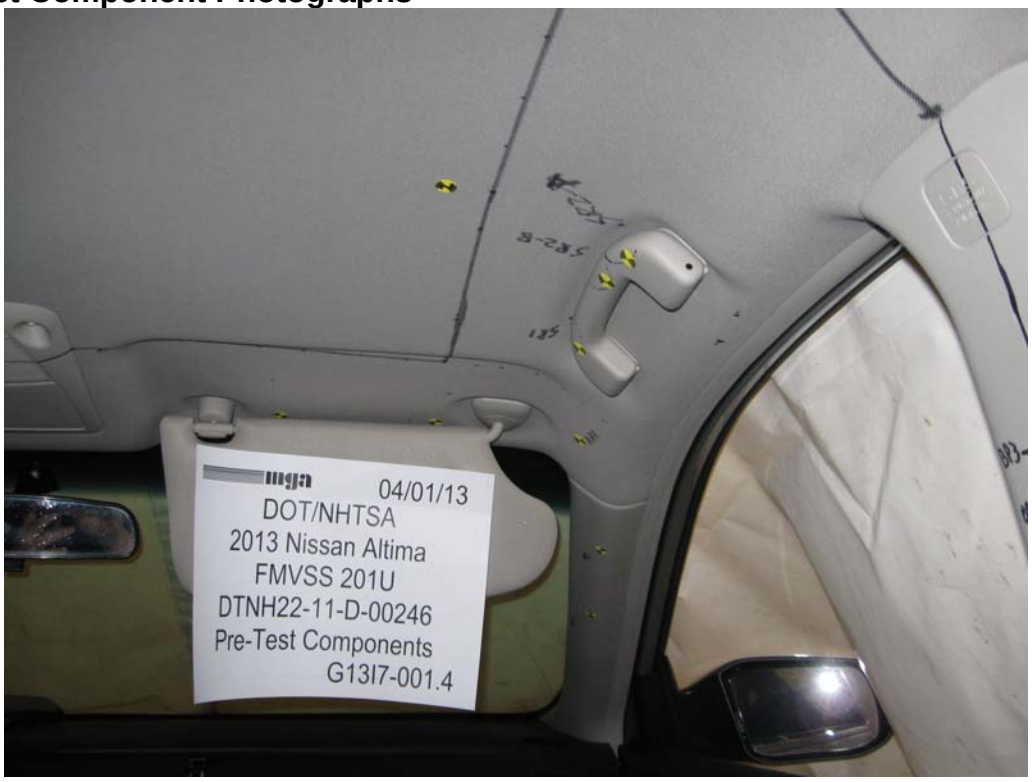
As Delivered – ¾ Rear View From Right Side



As Delivered – Vehicle's Certification Label

As Delivered – Vehicle's Tire Information Label

Pre-Test Component Photographs




mga
04/01/13
DOT/NHTSA
2013 Nissan Altima
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G13I7-001.4


SR3-1
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DOT/NHTSA
2013 Nissan Altima
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G13I7-001.4


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2013 Nissan Altima
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G13I7-001.4


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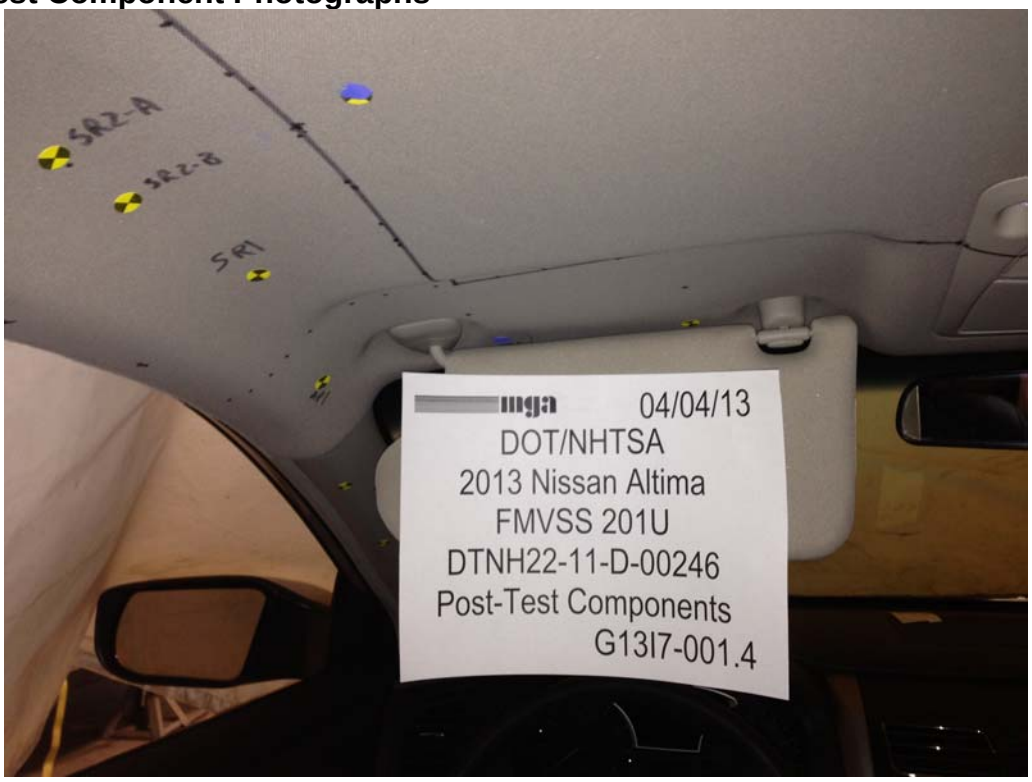
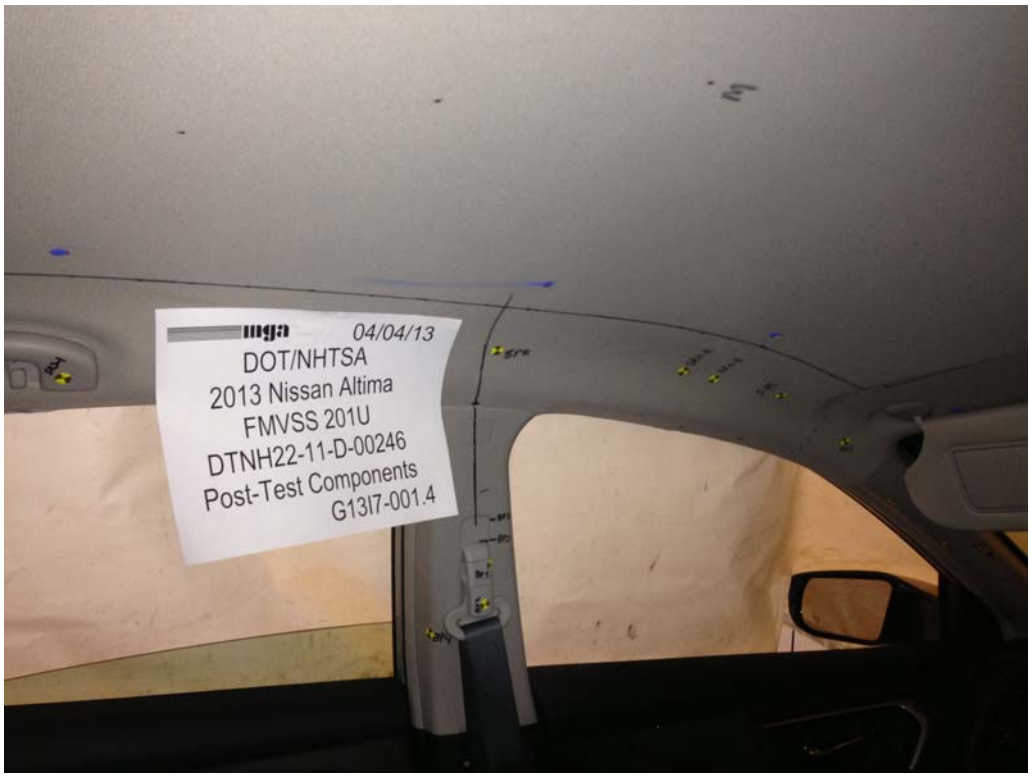
DOT/NHTSA
2013 Nissan Altima
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G13I7-001.4


SRZ-A
SRZ-B
SRI
mga 04/01/13
DOT/NHTSA
2013 Nissan Altima
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G13I7-001.4


BPR
SRZ-A
SRI
mga 04/01/13
DOT/NHTSA
2013 Nissan Altima
FMVSS 201U
DTNH22-11-D-00246
Pre-Test Components
G13I7-001.4

Post-Test Component Photographs

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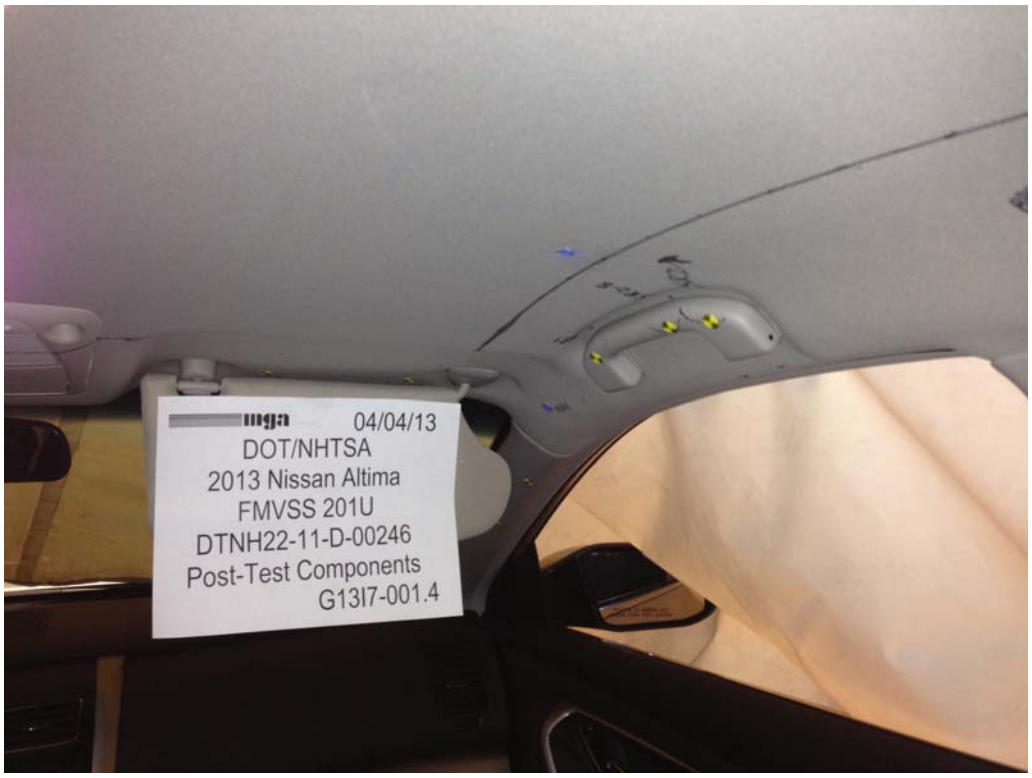
G13I7-001.4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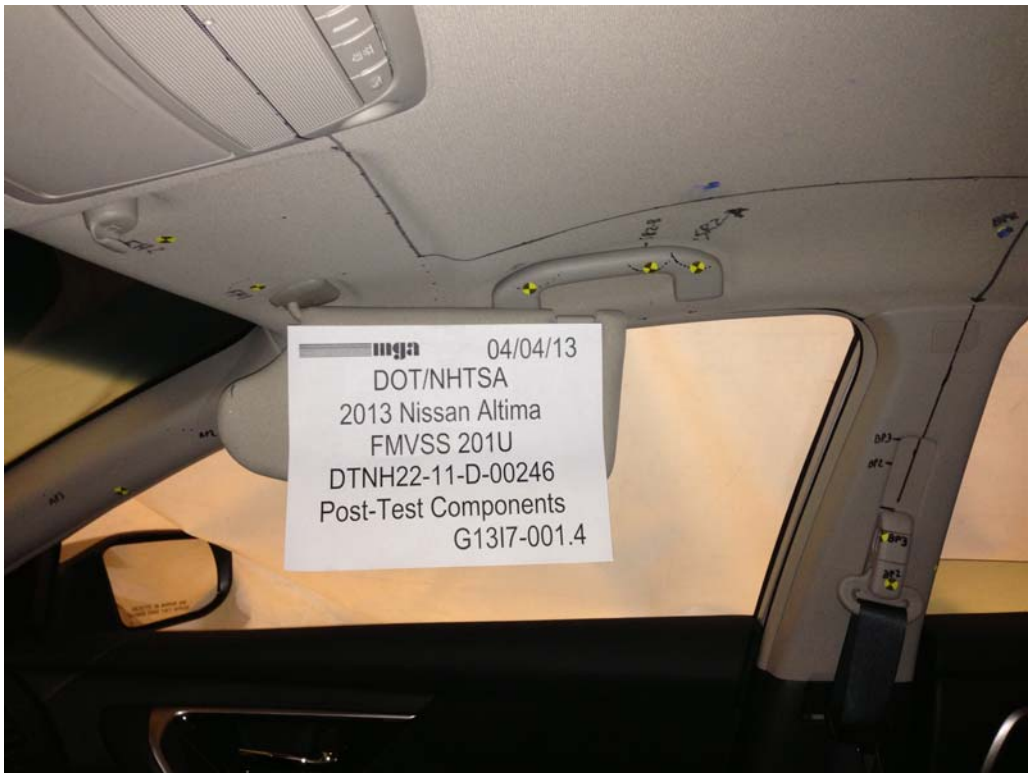
Post-Test Components
G13I7-001.4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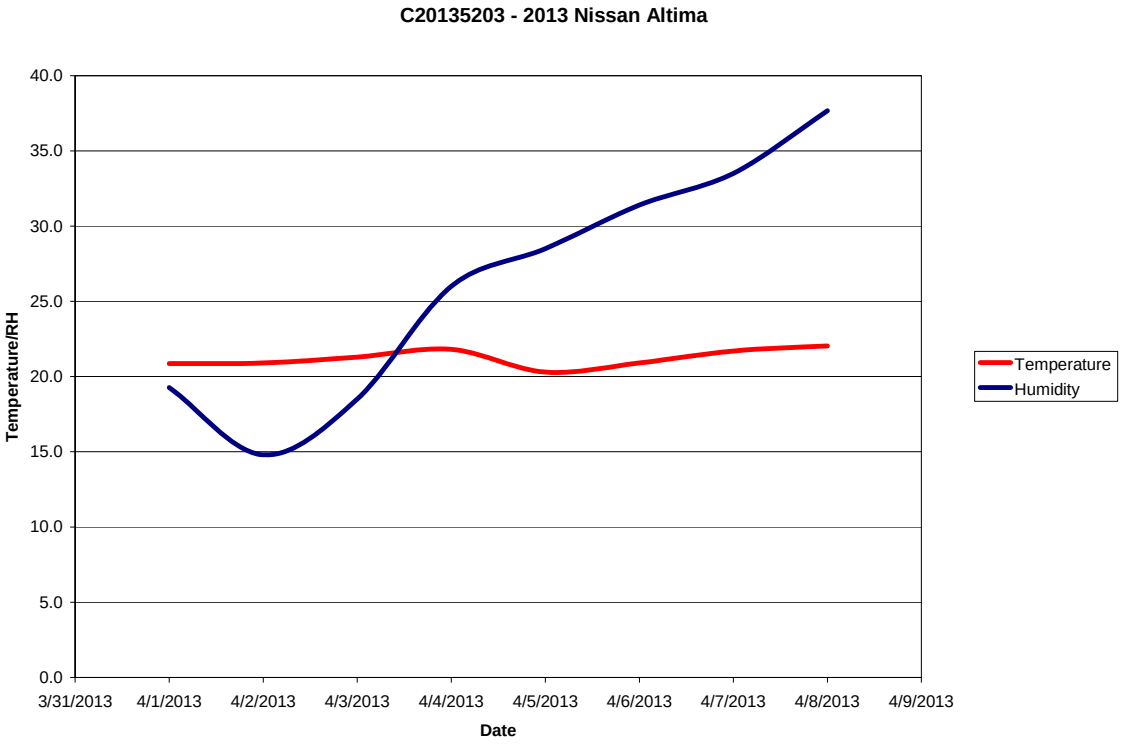
DOT/NHTSA
2013 Nissan Altima
FMVSS 201U
DTNH22-11-D-00246
Post-Test Components
G13I7-001.4

Appendix A – Temperature Trace



Appendix B – Calibration Certificates

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	8/3/2012
Calibrated By:	NovaStar

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

Calibration Date:	2/14/2013
New DLR(Units:G'S) [1] 100K SHUNT	93.8
Linearity:[2]	0.99942
New vs Old Sensitivit (% Difference)	0.5
Temperature:	74.9 ^{0}F
Humidity:	31 %
Sensitivity (mV/V/G):	0.026526
Calibrated By:	Robert Grupido

Signature: _____

Approved by: Helen A. Kalata

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

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

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

Calibration uncertainty no greater than 3.8 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	8/3/2012
Calibrated By:	NovaStar

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

Calibration Date:	2/14/2013
New DLR(Units:G'S) [1] 100K SHUNT	94.6
Linearity: [2]	0.99976
New vs Old Sensitivit (% Difference)	-0.3
Temperature:	73.1 ^{o}F
Humidity:	30 %
Sensitivity (mV/V/G):	0.026311
Calibrated By:	Robert Grupido

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 3.8 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	8/3/2012
Calibrated By:	NovaStar

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

Calibration Date:	2/14/2013
New DLR(Units:G'S) [1] 100K SHUNT	96.0
Linearity: [2]	0.99952
New vs Old Sensitivit (% Difference)	0.9
Temperature:	73.1 °F
Humidity:	30 %
Sensitivity (mV/V/G):	0.025920
Calibrated By:	Robert Grupido

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 3.8 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	8/3/2012
Calibrated By:	NovaStar

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

Calibration Date:	2/14/2013
New DLR(Units:G'S) [1] 100K SHUNT	113.5
Linearity: [2]	0.99933
New vs Old Sensitivit (% Difference)	0.2
Temperature:	74.9 °F
Humidity:	31 %
Sensitivity (mV/V/G):	0.021942
Calibrated By:	Robert Grupido

Signature: Robert Grupido

Approved by: Helen A. Kalata

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

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

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

Calibration uncertainty no greater than 3.8 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	8/3/2012
Calibrated By:	NovaStar

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

Calibration Date:	2/14/2013
New DLR(Units:G'S) [1] 100K SHUNT	98.0
Linearity:[2]	0.99779
New vs Old Sensitivit (% Difference)	0.4
Temperature:	74.9 °F
Humidity:	31 %
Sensitivity (mV/V/G):	0.025414
Calibrated By:	Robert Grupido

Signature: _____

Approved by: Helen A. Kalata

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

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

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

Calibration uncertainty no greater than 3.8 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	8/3/2012
Calibrated By:	NovaStar

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

Calibration Date:	2/14/2013
New DLR(Units:G'S) [1] 100K SHUNT	96.0
Linearity:[2]	0.99953
New vs Old Sensitivit (% Difference)	-0.8
Temperature:	73.1 ^{o}F
Humidity:	30 %
Sensitivity (mV/V/G):	0.025932
Calibrated By:	Robert Grupido

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 3.8 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	8/3/2012
Calibrated By:	NovaStar

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

Calibration Date:	2/14/2013
New DLR(Units:G'S) [1] 100K SHUNT	93.0
Linearity:[2]	0.99974
New vs Old Sensitivit (% Difference)	-0.5
Temperature:	73.1 °F
Humidity:	30 %
Sensitivity (mV/V/G):	0.026812
Calibrated By:	Robert Grupido

Signature: _____

Approved by: Helen A. Kalata

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

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

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

Calibration uncertainty no greater than 3.8 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	8/3/2012
Calibrated By:	NovaStar

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

Calibration Date:	2/14/2013
New DLR(Units:G'S) [1] 100K SHUNT	109.1
Linearity:[2]	0.99951
New vs Old Sensitivit (% Difference)	-0.7
Temperature:	73.1 ^{o}F
Humidity:	30 %
Sensitivity (mV/V/G):	0.022792
Calibrated By:	Robert Grupido

Signature: Robert Grupido

Approved by: Helen A. Kalata

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

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

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

Calibration uncertainty no greater than 3.8 % at the 95% confidence level.

MGA Research Corporation-Calibration Certificate

ACCELEROMETER

Reference	
Name:	Accel Standard
Model #	352C03
Serial #:	95980
Capacity:	G's:250
Calibration Date:	8/3/2012
Calibrated By:	NovaStar

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

Calibration Date:	2/14/2013
New DLR(Units:G'S) [1] 100K SHUNT	99.3
Linearity:[2]	0.99941
New vs Old Sensitivit (% Difference)	0.1
Temperature:	73.1 °F
Humidity:	30 %
Sensitivity (mV/V/G):	0.025098
Calibrated By:	Robert Grupido

Signature: _____

Approved by: Helen A Kalata

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

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

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

Calibration uncertainty no greater than 3.8 % at the 95% confidence level.

NovaStar SOLUTIONS
Metrology Management Services

Calibration Certificate

ACCREDITED Certificate # 1277.01

35200 Plymouth Rd. / Livonia, MI 48150

Certificate # Z54778:69519

PCB 352C03 ACCELEROMETER

SERIAL NUMBER:	95980	WORK ORDER:	AC080312001
ASSET NUMBER:	Z54778		
CUST ASSET NUMBER:	N/A		
PROCEDURE NAME:	MOD 9150	TEST RESULT:	PASS
PROCEDURE REV:	D	PERFORMED ON:	8/3/2012
CALIBRATED BY:	ALBERT CAIRNS JR.	CAL DUE DATE:	8/3/2013
CUSTOMER:	MGA RESEARCH 446 EXECUTIVE DRIVE TROY, MI 48083	DATA TYPE: TEMPERATURE:	FOUND-LEFT 22.00 °C
PRIMARY CONTACT:	BOB MILLER	HUMIDITY:	41 %

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

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

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

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

This report may not be reproduced, except in full, without written approval from NovaStar Solutions.

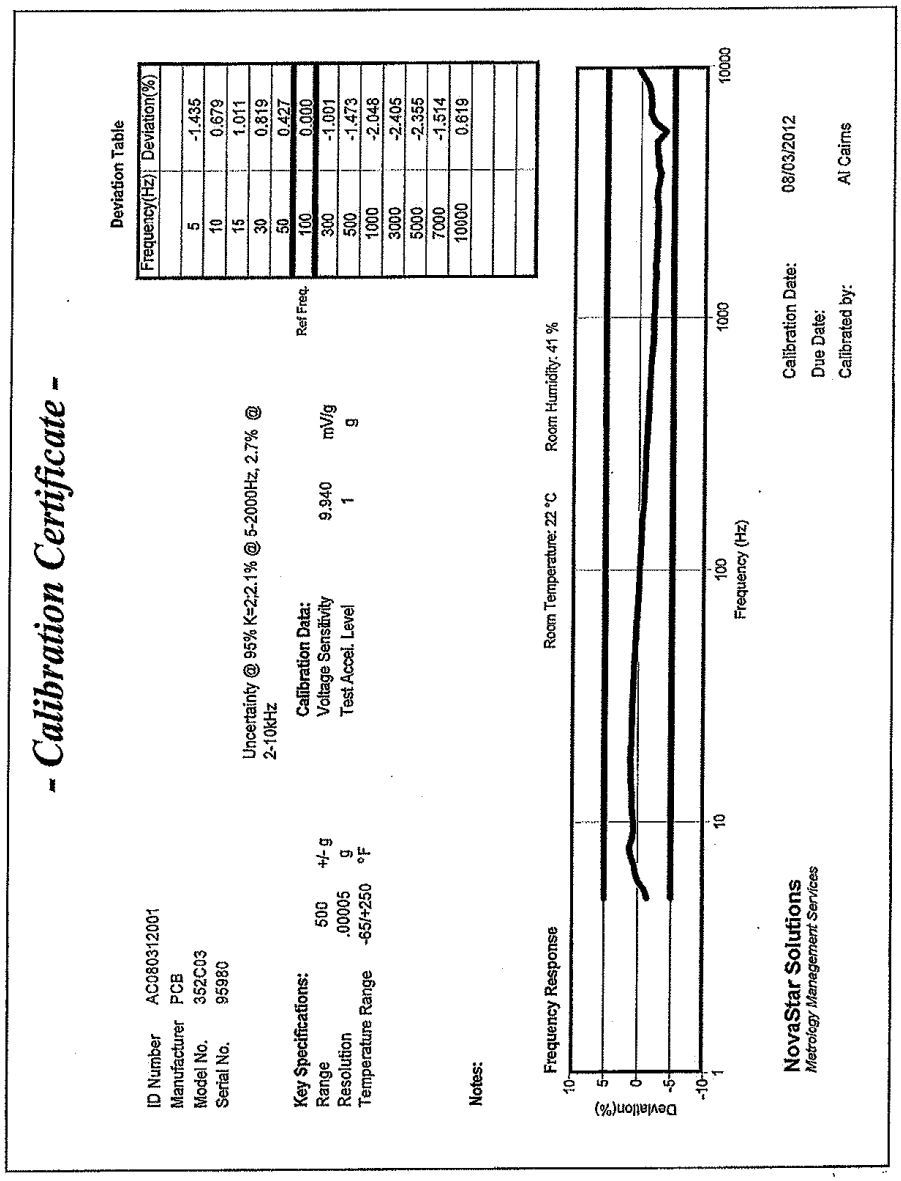
AS RECEIVED CONDITION:	IN TOLERANCE	REMARKS:
AS RETURNED CONDITION:	IN TOLERANCE	
ACTION TAKEN:	FULL CALIBRATION	

Standards Used

Asset #	Cert #	Description	Cal Date	Due Date
002664	002664;1091515041	VERITEQ 5000A-RH/T RH/TEMPERATURE DATA LOGGER	2/14/2012	2/14/2013
1727	1727;1193650836	MODAL SHOP 9150C ACCELEROMETER CAL SYSTEM	10/26/2011	10/26/2012

QA Signature: Date: 8/3/2012

8/7/12



- Calibration Certificate -

ID Number AC080312001
Manufacturer PCB
Model No. 352C03
Serial No. 95960

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

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

Calibration Data:
Voltage Sensitivity 9.940 mV/g
Test Accel. Level 1 g

Deviation Table

Frequency(Hz):	Deviation(%)
5	-1.435
10	0.679
15	1.011
30	0.819
50	0.427
100	0.000
300	-1.001
500	-1.473
1000	-2.048
3000	-2.405
5000	-2.355
7000	-1.514
10000	0.619

Ref Freq.

Notes:

Frequency Response

Room Temperature: 22 °C Room Humidity: 41 %

NovaStar Solutions
Metrology Management Services

Calibration Date: 08/03/2012
Due Date:
Calibrated by: Al Cairns

Calibration Certificate

Part Description: Gold **Certification Date:** 5/17/2012 (MMDDYYYY) **Serial#:** G10-02-00-01619

Single Point - (Max-Min)/2 Specification: G10-02 .084mm (.0033") **Certificate#:** G0161941046

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

Measurement Standards Traceability

Ball Bar Kit	Asset Number:	603	Calibration Due: 7/24/2012	*SI Traceability: L120206AB5
Thermometer	Asset Number:	TQ012	Calibration Due: 6/1/2012	*SI Traceability: 1001216918
Reference Sphere	Asset Number:	1248	Calibration Due: 5/28/2013	*SI Traceability: NIST-821/276660-08

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

Calibration Results*

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

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

Instrument condition as received:
Inoperative

Instrument condition outgoing:
Within specifications

Technician: Arnold Torres Date: 5/17/12

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

125 Technology Park
Lake Mary, FL 32746
USA

FARO®

LABORATORY ACCREDITATION BUREAU ACCREDITED

LM-07FRM077-024.XLS

f:\control\records\05manufa\partspec\XH08-0495.eps Rev3 RevDate: 12/29/10

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

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

Tape Measure Calibration Certificate

Reference Steel Rule

Brand: Swanson
S/N: MGA00799
Calibration Date: 2/21/2012

Subject Tape Measure

Brand: Stanley
S/N: TPM 331
Calibration Date: 9/17/2012

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

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

Date: 9/17/2012 Performed By: RJ Mill

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

NovaStar SOLUTIONS
Metrology Management Services

Calibration Certificate

ACCREDITED Certificate # 1277.01

35200 Plymouth Rd. / Livonia, MI 48150

Certificate # Z60469:73764

WESTWARD 2YNJ1 DIGITAL PROTRACTOR

SERIAL NUMBER:	N/A	WORK ORDER:	73764
ASSET NUMBER:	Z60469		
CUST ASSET NUMBER:	MGA00967		
PROCEDURE NAME:	WWD - 2YNJ1 - MMC	TEST RESULT:	PASS
PROCEDURE REV:	1.0	PERFORMED ON:	12/04/12
CALIBRATED BY:	MARK CIAVATTONE	CAL DUE DATE:	12/04/13
CUSTOMER:	MGA RESEARCH 446 EXECUTIVE DRIVE TROY, MI 48083	DATA TYPE: TEMPERATURE:	FOUND-LEFT 20.00 °C
PRIMARY CONTACT:	BOB MILLER	HUMIDITY:	44 %

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

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

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

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

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

Standards Used

Asset #	Cert #	Description	Cal Date	Due Date
002664	002664:1091515041	VERITEQ 5000A-RH/T RH/TEMPERATURE DATA LOGGER	2/14/2012	2/14/2013
1715	1715:1193650836	OMEGA CTH89 TEMPERATURE/HUMIDITY RECORDER	11/14/2012	5/14/2013
1437	1437:1193650835	PHASE 2 220-006 ROTARY TABLE	1/15/2009	1/15/2013
1577	1577:1193650836	RAHN SUPER 100 SURFACE PLATE	2/16/2012	2/16/2013

QA Signature: Date: 12/5/2012

12/5/12

NovaStar SOLUTIONS
Metrology Management Services
Remit to address:

Report of Calibration

NovaStar Solutions
35200 Plymouth Rd.
Livonia, MI 48150

ACCREDITED CALIBRATION # 1277.01

WESTWARD 2YNJ1 DIGITAL PROTRACTOR				WORK ORDER #:	73764
SERIAL NUMBER:	N/A				
ASSET NUMBER:	Z60469			TEST RESULT:	PASS
CUST. ASSET NUM:	MGA00967			PERFORMED ON:	12/4/2012
PROCEDURE NAME:	WWD - 2YNJ1 - MMC			CAL DUE DATE:	12/4/2013
PROCEDURE REV:	1.0			DATA TYPE:	FOUND-LEFT
CALIBRATED BY:	MARK CIAVATTONE			TEMPERATURE:	20.00 °C
CUSTOMER:	MGA RESEARCH			HUMIDITY:	44 %
	446 EXECUTIVE DRIVE				
	TROY	MI	48083		
PRIMARY CONTACT:	BOB MILLER				

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

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Due to any number of factors, the recommended due date on the item does not imply continuing conformance to specifications during the recommended interval.
For range and best measurement capability specifications for the standards used to perform this calibration, see the most recent calibration report maintained by this calibration laboratory (available upon request).

REMARKS:

Test Results for Calibration with Certificate# : Z60469;73764

Standards Used

Asset #	Cert#	Description	Cal Date	Due Date
002664	002664;1329210656	VERITEQ 5000A-RH/T RH/TEMPERATURE DATA LOGGER	2/14/2012	2/14/2013
1437	1437;1232010439	PHASE 2 220-006 ROTARY TABLE	1/15/2009	1/15/2013
1577	1577;1329401191	RAHN SUPER 100 SURFACE PLATE	2/16/2012	2/16/2013
1715	B5027F6D8A6641418FE694A	OMEGA CTH89 TEMPERATURE/HUMIDITY RECORDER	11/14/2012	5/14/2013

Test Procedure Results

Test Description	Nominal	Test Result	Lower Limit	Upper Limit	Units	Exp Uncert	Pass/Fail
LINEARITY CHECK							
0° REFERENCE	0.0	0.0	-0.1	0.1	°		Pass
5°	5.0	5.0	4.9	5.1	°	0.02°	Pass

Test Results for Calibration with Certificate# : Z60469:73764

Test Procedure Results

Test Description	Nominal	Test Result	Lower Limit	Upper Limit	Units	Exp Uncert	Pass/Fail
30°	30.0	30.1	29.9	30.1	°	0.02°	Pass
60°	60.0	60.0	59.9	60.1	°	0.02°	Pass
90°	90.0	90.0	89.9	90.1	°	0.02°	Pass
60°	60.0	60.0	59.9	60.1	°	0.02°	Pass
30°	30.0	30.1	29.9	30.1	°	0.02°	Pass
5°	5.0	5.0	4.9	5.1	°	0.02°	Pass
0°	0.0	0.0	-0.1	0.1	°		Pass
5°	5.0	5.1	4.9	5.1	°	0.02°	Pass
30°	30.0	30.0	29.9	30.1	°	0.02°	Pass
60°	60.0	60.0	59.9	60.1	°	0.02°	Pass
90°	90.0	90.0	89.9	90.1	°	0.02°	Pass
60°	60.0	60.0	59.9	60.1	°	0.02°	Pass
30°	30.0	30.0	29.9	30.1	°	0.02°	Pass
5°	5.0	5.1	4.9	5.1	°	0.02°	Pass
0°	0.0	0.0	-0.1	0.1	°		Pass
ABSOLUTE ZERO ANGLE	0.0	0.0	-0.1	0.1	°		Pass

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

NovaStar SOLUTIONS
Metrology Management Services

Calibration Certificate

ACCREDITED
Certificate # 1277.01

35200 Plymouth Rd. / Livonia, MI 48150

Certificate # Z50918:75301

DICKSON FH125 TEMP/RH RECORDER

SERIAL NUMBER:	06163263	WORK ORDER:	75301
ASSET NUMBER:	Z50918		*75301*
CUST ASSET NUMBER:	MGA00152		
PROCEDURE NAME:	DIC - FH125 - MMC	TEST RESULT:	PASS
PROCEDURE REV:	1.0	PERFORMED ON:	01/21/13
CALIBRATED BY:	NAHSHUN NEVILS	CAL DUE DATE:	01/21/14
CUSTOMER:	MGA RESEARCH - OPERATIONS 2839 ELLIOT DR TROY, MI 48083	DATA TYPE: TEMPERATURE:	FOUND-LEFT 24.19 °C
PRIMARY CONTACT:	DARWIN WLUDYKA	HUMIDITY:	33 %

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

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

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

Standards Used

Asset #	Cert #	Description	Cal Date	Due Date
1917	1917:1263999738	VAISALA M170/HMP76 MEASUREMENT INDICATOR/PROBE	4/25/2012	4/25/2013
1914	1914:1262687426	FLUKE 1502A THERMOMETER READOUT	4/5/2012	4/5/2013
1715	1715:1193650836	OMEGA CTH89 TEMPERATURE/HUMIDITY RECORDER	11/14/2012	5/14/2013

QA Signature: [signature] Date: 1/22/2013

[signature] 1/22/2013

NovaStar SOLUTIONS
Metrology Management Services
Remit to address:

Report of Calibration

NovaStar Solutions
35200 Plymouth Rd.
Livonia, MI 48150

ACCREDITED CALIBRATION # 1277.01

DICKSON FH125 TEMP/RH RECORDER		WORK ORDER #:	76301
SERIAL NUMBER:	06163263		
ASSET NUMBER:	Z50918		
CUST. ASSET NUM:	MGA00152	TEST RESULT:	PASS
PROCEDURE NAME:	DIC - FH125 - MMC	PERFORMED ON:	1/21/2013
PROCEDURE REV:	1.0	CAL DUE DATE:	1/21/2014
CALIBRATED BY:	NAHSHUN NEVILS	DATA TYPE:	FOUND-LEFT
		TEMPERATURE:	24.19 °C
CUSTOMER:	MGA RESEARCH - OPERATIONS	HUMIDITY:	34 %
	2839 ELLIOT DR		
	TROY MI 48083		
PRIMARY CONTACT:	DARWIN WLUDYKA		

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REMARKS:

Test Results for Calibration with Certificate# : Z50918:75301

Standards Used

Asset #	Cert#	Description	Cal Date	Due Date
1715	B5027F6D8A6641418FE694A	OMEGA CTH89 TEMPERATURE/HUMIDITY RECORDER	11/14/2012	5/14/2013
1914	1914:1333612671	FLUKE 1502A THERMOMETER READOUT	4/5/2012	4/5/2013
1917	1917:1335863859	VAISALA M170/HMP76 MEASUREMENT INDICATOR/PROBE	4/25/2012	4/25/2013

Test Procedure Results

Test Description	Nominal	Test Result	Lower Limit	Upper Limit	Units	Exp Uncert	Pass/Fail
RH ACCURACY							
	13.6	14.4	11.6	15.6	%RH		Pass
	38.7	40.4	36.7	40.7	%RH		Pass
	65.2	66.1	63.2	67.2	%RH		Pass
TEMPERATURE ACCURACY							

Test Results for Calibration with Certificate# : Z50918:75301

Test Procedure Results

Test Description	Nominal	Test Result	Lower Limit	Upper Limit	Units	Exp Uncert	Pass/Fail
	21.7	21.2	19.9	23.5	°C		Pass

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

NovaStar SOLUTIONS
Metrology Management Services

Calibration Certificate

ACCREDITED
Certificate # 1277.01

35200 Plymouth Rd. / Livonia, MI 48150

Certificate # Z64487:70735

DETECTO AP-20 SCALE

SERIAL NUMBER:	E10807-0187	WORK ORDER:	70735
ASSET NUMBER:	Z64487		
CUST ASSET NUMBER:	MGA00783		
PROCEDURE NAME:	122-040	TEST RESULT:	PASS
PROCEDURE REV:	B	PERFORMED ON:	09/10/12
CALIBRATED BY:	ALBERT CAIRNS JR.	CAL DUE DATE:	09/10/13
CUSTOMER:	MGA RESEARCH 446 EXECUTIVE DRIVE TROY, MI 48083	DATA TYPE: TEMPERATURE:	FOUND-LEFT 22.00 °C
PRIMARY CONTACT:	BOB MILLER	HUMIDITY:	43 %

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

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

AS RECEIVED CONDITION:	IN TOLERANCE	REMARKS:	Received with a bad power adaptor
AS RETURNED CONDITION:	IN TOLERANCE		
ACTION TAKEN:	FULL CALIBRATION		

Standards Used

Asset #	Cert #	Description	Cal Date	Due Date
002664	002664:1091515041	VERITEQ 5000A-RH/T RH/TEMPERATURE DATA LOGGER	2/14/2012	2/14/2013
1081	1081:1193650835	RICE LAKE CLASS 6 18 PC WEIGHT SET	3/2/2012	3/2/2013
1633	1633:1193863229	RICE LAKE CLASS 6 17 PC WEIGHT SET	5/17/2011	11/17/2012

QA Signature: Date: 9/12/2012

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

Test report for commercial device

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

accredited for calibration 1448.01

Customer: MGA Research ***Cert#*** 12-9087 ***Temp/Humidity:*** Ok
Location of Calibration: 2839 Elliot Troy, MI. 48083
Calibration Date: 7/10/2012 ***Cal Due:*** Jul-13 ***Condition of Item:*** fair
Equipment Make: Intercomp ***Model:*** SW Deluxe ***Serial:*** 26032389 ***Capacity:*** 6800lb x 1lb
NTEP: ***Class:*** ***COC #:*** section- 2200lb x 1lb

Applied Test Wt	*Before Adustment*	*Tolerance*	*In-Tolerance Y/N*	*After Adjustment*	*In-Tolerance Y/N*	*Unc*	
100lb	100lb	1lb	y	100lb	y	.11lb	LF
1000lb	1000lb	2lb	y	1000lb	y	.5lb	
100lb	100lb	1lb	y	100lb	y	.11lb	RF
1000lb	1000lb	2lb	y	1000lb	y	.5lb	
100lb	100lb	1lb	y	100lb	y	.11lb	LR
1000lb	1000lb	2lb	y	1000lb	y	.5lb	
100lb	100lb	1lb	y	100lb	y	.11lb	RR
1000lb	1000lb	2lb	y	1000lb	y	.5lb	

shift test
N/A

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

☐ Pass ☐ Pass ☐ Pass

☐ Fail ☐ Fail ☐ Fail

Tests performed: ☑ Repeatability ☑ Linearity ☐ Sensitivity ☑ Discrimination

Technician comments: Scale passed all tests performed

Traceable certificate for weights used: 50lb wts.- 1163,1168 1k wt.- 10002

☑ Scale Certified ☐ Scale Rejected

Sterling Scale Service Rep: Dan W **Date:** **7/10/2012** 1 of 1

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

SM
7/10/12